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June 9, 2015
Parametrix No. 553-1625-014

Mr. Richard H. Morck, P.E.
Landmarc Technologies, Inc.
14816 439th Place SE
North Bend, WA 98045-9248

Re: March 2015 Groundwater Sampling Event, Newcastle Demolition Landfill

Dear Mr. Morck:

INTRODUCTION

This report summarizes the groundwater monitoring data collected in March 2015 at the Newcastle Demolition Landfill. Sample collection and data analyses were conducted in accordance with the Newcastle Demolition Landfill Post-Closure Plan (Parametrix 1998).

The landfill was formerly owned and operated by Coal Creek Development Corporation, and accepted demolition and inert waste until 1992. It was formally closed in June 1993 and has since been developed as a golf course by Newcastle Golf LLC.

The Newcastle Demolition Landfill is located in an area historically mined for coal (Parametrix 1991). The underlying geology of the site consists of a thick sequence of inclined interbedded coal, sandstone, and shale beds of the Eocene Renton Formation. The site is underlain by a complex network of coal mine workings that appear to control much of the groundwater flow beneath the site. Southwesterly regional groundwater flow is substantially intercepted by the mine workings that drain to the west and discharge directly or indirectly into the Richmond Tunnel that flows into Coal Creek. The monitoring wells are installed within bedrock between the workings, and the observed water levels are at elevations expected for groundwater influenced by the draining of the mine workings by the Richmond Tunnel.

MONITORING PROGRAM HISTORY

The downgradient monitoring wells on the golf course (MW-2, MW-3, and MW-4) were disturbed during golf course construction beginning in 1996. Some interim repairs were made during the golf course construction to allow groundwater monitoring to continue, although final completion of the well monuments did not occur until February 2000. At that time the wells were redeveloped, and were thought to be suitable for detecting potential impacts to groundwater quality from the former landfill. However, during the golf course construction period there may have been some impacts to groundwater quality in the monitoring wells due to surface water or soil intrusion. The history of activity associated with the wells during golf course construction was summarized in the November 1999 report (Parametrix 2000).

Damage to well MW-4 indicated by high turbidity was first noted in December 2000. Attempts to redevelop the well in February 2001 were unsuccessful. Well MW-4 was properly decommissioned and replaced in August 2001 with new monitoring well MW-5. MW-5 is located approximately 500 ft northwest of MW-4 (see Figures 1 and 2). The installation of well MW-5 was documented in a letter from Parametrix to Landmarc Technologies (Parametrix 2001).

From 1996 through 2000, a variable groundwater monitoring schedule was established by the Seattle-King County Department of Public Health (Coal Creek Development Corporation 1996). However, the downgradient wells, particularly well MW-3, were frequently dry during much of the year. During the September 2001 sampling event, all the wells were dry except for upgradient well MW-1. Therefore, no samples were collected, and an alternative sampling schedule was proposed to the Health Department (now known as Public Health – Seattle & King County). The proposed sampling schedule consisted of sampling in January and April when water volumes were expected to be adequate for sampling, and measuring depth to groundwater during the fall when groundwater levels were expected to be at their lowest point.

The current groundwater monitoring program for the closed Newcastle Demolition Landfill consists of sampling four groundwater monitoring wells (MW-1, MW-2, MW-3, and MW-5) and two off-site surface water stations (SW-6 and SW-7). Well MW-1 is upgradient of the landfill, and the other wells and stations are downgradient or downstream of the landfill. Surface water station SW-6, located at the Richmond Tunnel mine discharge, is thought to be representative of groundwater intercepted by a network of mine workings beneath the site that discharges into Coal Creek. Surface water station SW-7 is located farther downstream along Coal Creek. The monitoring well locations are shown on Figures 1 and 2, and the surface water station locations are shown on Figure 3. The locations of the downgradient wells with respect to landfill and golf course features are shown on Figure 2.

In September 2006, recommendations were submitted by Landmarc Technologies, Inc. to Public Health for reducing the monitoring frequency and parameters at the Newcastle Demolition Landfill (Parametrix 2006). It was recommended that the frequency of groundwater monitoring be reduced to annual, and analyses for volatile organic compounds, semi-volatile organic compounds, and metals (except for arsenic) be discontinued. These parameters are not required by Chapter 173-304 Washington Administrative Code (WAC), and the historical data since landfill closure have not indicated any detections of these parameters associated with impacts from the landfill. Reduction in monitoring frequency and parameters based on consistent lack of contamination from the landfill is in accordance with the language of the Post-Closure Monitoring Plan. These recommendations were implemented beginning with the February 2007 event.

MARCH 2015 SAMPLING EVENT

Samples were collected on March 17 and 18, 2015, by Parametrix personnel. Samples were collected from wells MW-1 and MW-2 using dedicated Hydrostar pumps, and from wells MW-3 and MW-5 using dedicated electrical submersible pumps. Samples were collected using low-flow purging methods. Samples to be analyzed for dissolved metals were field-filtered through 0.45-micron filters. A duplicate sample was collected at monitoring well MW-3 (designated MW-6).

In addition to the routine sampling locations, two replicate seep samples were collected from one location (designated Seep-A and Seep-B) as requested by Public Health. This recurrent seep has been present for a number of years and is located in an area of ponding east of the landfill and west of 155th Avenue SE near the vicinity of gas probe GP-4 (see Figure 2).

Samples were delivered directly to Analytical Resources, Inc. (ARI) in Seattle, Washington, for analysis. Samples were measured for field parameters (pH, specific conductivity, and temperature), and analyzed for chloride, nitrite, nitrate, ammonia, sulfate, hardness (dissolved calcium and magnesium), dissolved arsenic, dissolved iron, dissolved manganese, dissolved zinc, chemical oxygen demand (COD), total organic carbon (TOC), and total dissolved solids (TDS). Additional field parameters measured included Dissolved oxygen (DO) and redox.

SAMPLING RESULTS

The analytical results for the wells, surface water stations, and seeps are summarized in Table 1. The laboratory report and chain-of-custody forms are presented in Appendix A.

Data Validation

Parametrix conducted a quality assurance (QA) review of the laboratory data, including holding times, field duplicate results, and blank results. The laboratory QA internal standard data were also reviewed, including matrix spikes, matrix spike duplicates, surrogate recoveries, and laboratory control samples. The QA review indicated acceptable accuracy and precision, and no qualifiers were necessary.

Data Analysis

Data analysis consisted of comparing groundwater data (from monitoring wells and surface water station SW-6) to established state groundwater quality standards (GWQSs; 173-200 WAC) and state maximum contaminant levels (MCLs) for drinking water (246-290 WAC), preparing time-series plots, and conducting Mann-Kendall trend analyses for selected analytes.

Comparison of Data to Groundwater Quality Standards

The following constituents were present in groundwater at concentrations above secondary GWQSs and/or MCLs (established based on aesthetic characteristics such as taste, appearance, and/or staining):

- Specific conductivity in samples from wells MW-1 (upgradient), MW-2, MW-3, and surface water station SW-6;
- Total dissolved solids in samples from well MW-1 (upgradient), and surface water station SW-6;
- Sulfate in the sample from well MW-1 (upgradient);
- Dissolved iron in samples from wells MW-1 (upgradient), MW-2, MW-3, MW-5, and surface water station SW-6;
- Dissolved manganese in samples from wells MW-1 (upgradient), MW-2, MW-5, and surface water station SW-6.

Dissolved arsenic concentrations in samples from wells MW-1 (upgradient), MW-2, MW-3, and surface water station SW-6 exceeded the carcinogenic GWQS but not the MCL. The dissolved arsenic concentration in well MW-5 slightly exceeded the MCL.

The presence of constituents above their GWQS and/or MCL upgradient from the landfill at MW-1 indicates that the aesthetic characteristics of groundwater in the landfill vicinity are a natural artifact of the local geochemistry.

Time-Series Plots

Groundwater and surface water time-series plots were prepared for dissolved arsenic, ammonia, dissolved calcium, chloride, chemical oxygen demand (COD), hardness, dissolved iron, dissolved manganese, specific conductivity, sulfate, and total organic carbon (TOC). These constituents were selected for statistical analyses to include parameters that were elevated in leachate with respect to groundwater (Pacific Groundwater Group 1994a). Dissolved arsenic has been added because it was a constituent of interest discussed in Ecology's Periodic Review

(Ecology 2013). These plots are presented in Appendix B and show data collected since 1994. Based on the time-series plots, the following observations can be made:

- Sulfate and hardness (and dissolved calcium) concentrations continued to be highest in upgradient well MW-1.
- In MW-2, concentrations of dissolved iron, dissolved manganese, and TOC continued to be lower than the relatively high concentrations measured between 1999 and 2000. Specific conductivity and concentrations of chloride and hardness (and dissolved calcium) have increased during the past few years.
- In MW-3, concentrations of most parameters have remained stable or decreased over the last few years. Specific conductivity, and concentrations of ammonia, chloride, hardness (and dissolved calcium), dissolved iron, dissolved manganese, and TOC continued to be lower compared to the relatively high values observed during 2002.
- In MW-5, stable or decreasing trends in most parameters have been observed in the last few years. Dissolved manganese concentrations are an exception, and have shown a slight increase since 2007. Because this is a low-yield well, continuing development over several years is likely to occur, resulting in improving water quality.
- At SW-6, concentrations of hardness, sulfate, and dissolved manganese have decreased since over the history of monitoring.

Mann-Kendall Tests

The Mann-Kendall test for trends (Gilbert 1987, Gibbons 1994) was used to evaluate the Newcastle Demolition Landfill groundwater data (Pacific Groundwater Group 1994a,b,c). Trends in each well were evaluated separately because the upgradient well continues to show higher concentrations of some constituents than the downgradient wells. The trend analyses used all data collected between April 1988 and March 2015 (except for specific conductivity results for the second 1998 semi-annual monitoring event, which are suspected to be erroneously low due to an error in calibrating the meter). All non-detected values were given a value equal to the reporting limit (Gilbert 1987, Gibbons 1994).

The results of the trend analyses are summarized in Table 2. The Mann-Kendall tests indicate the following:

- MW-1: statistically significant increasing trends in chloride, dissolved iron, and TOC; statistically significant decreasing trends in dissolved arsenic and dissolved manganese, upgradient from the landfill;
- MW-2: statistically significant increasing trends in ammonia, dissolved calcium, chloride, hardness, dissolved iron, specific conductivity, and TOC; a statistically significant decreasing trend in dissolved arsenic;
- MW-3: statistically significant increasing trends in ammonia, dissolved iron, specific conductivity, and TOC; statistically significant decreasing trends in chloride, hardness, and dissolved manganese; and
- MW-5: a statistically significant increasing trend in dissolved manganese; statistically significant decreasing trends in dissolved calcium, hardness, and sulfate.

GROUNDWATER LEVEL MONITORING RESULTS

Groundwater levels were measured at three of the four monitoring wells prior to sampling. Depth to water could not be measured at MW-1 due to wellhead constraints. The measurements are presented in Table 3 with calculated water elevations.

SEEP SAMPLING RESULTS

The replicate seep sample results showed elevated concentrations of dissolved iron and manganese compared to the other groundwater and surface water samples, but otherwise were generally similar to or lower than those for surface water station SW-7. The seep samples likely reflect naturally occurring conditions and do not indicate impacts from the landfill.

DISCUSSION AND CONCLUSIONS

Analysis of the March 2015 groundwater data from the Newcastle Demolition Landfill indicates the following:

- The differences in groundwater chemistry between monitoring wells suggest that the observed water chemistry is influenced by local geochemical conditions, and therefore do not clearly demonstrate landfill impacts. Concentrations exceeding secondary GWQSs or MCLs (specific conductivity, TDS, sulfate, dissolved iron, and dissolved manganese) occurred in the upgradient well and in downgradient wells and the surface water station. Dissolved arsenic concentrations exceeded the carcinogenic GWQS in all wells (including the upgradient well) and the surface water station. All arsenic concentrations were below the MCL except for well MW-5. Statistically significant increasing trends in indicator parameters were also observed in both upgradient and downgradient wells.
- Some of the variations in concentrations may be related to changed geochemical conditions associated with golf course development activities. The March 2015 data for wells MW-2 and MW-3 indicate continuing lower concentrations for parameters that were elevated following the golf course construction period during 1996 through 2000. In well MW-2 lower concentrations continued to be observed for dissolved iron, dissolved manganese, and TOC, although specific conductivity and concentrations of chloride and hardness have been higher in the past few years, and dissolved iron and TOC show overall statistically significant increasing trends. In well MW-3, lower specific conductivity and concentrations of ammonia, chloride, COD, hardness (and dissolved calcium), dissolved iron, dissolved manganese, and TOC continued to be observed, although overall increasing trends have been observed in ammonia, dissolved iron, specific conductivity, and TOC.

Please contact me at (206) 394-3667 or lgilbert@parametrix.com if you have questions regarding this report.

Sincerely,

Parametrix

Lisa A. Gilbert, LHG
Project Hydrogeologist

cc: Bill Lasby, Public Health – Seattle & King County
Eugene Freeman, Cleanup Program, NWRO, Washington State Department of Ecology
David South, Cleanup Program, NWRO, Washington State Department of Ecology

REFERENCES

Coal Creek Development Corporation. 1996. Letter to Parametrix. February 2, 1996.

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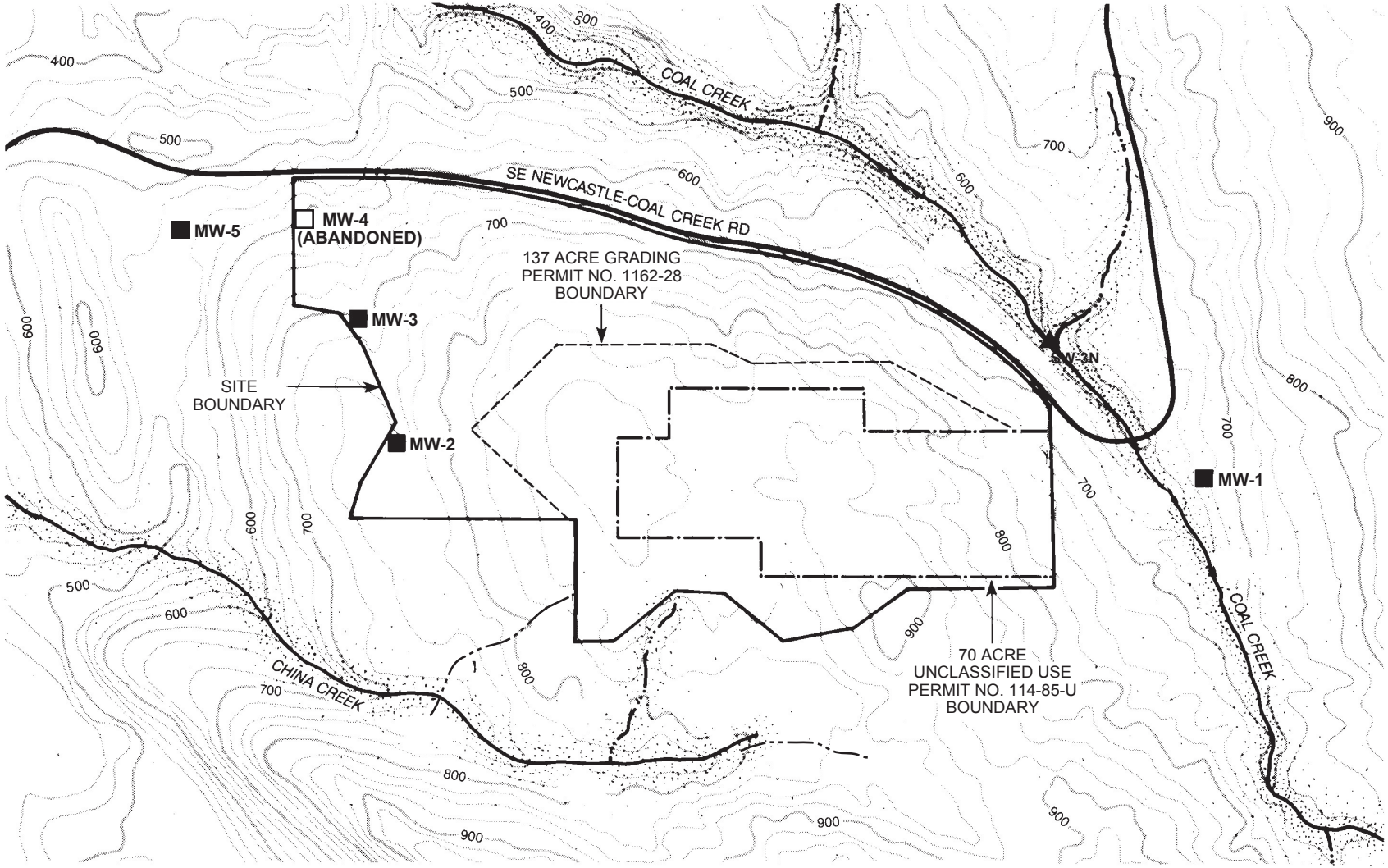
Figures



Parametrix 555-3747-001/01(01) 5/09 (B)

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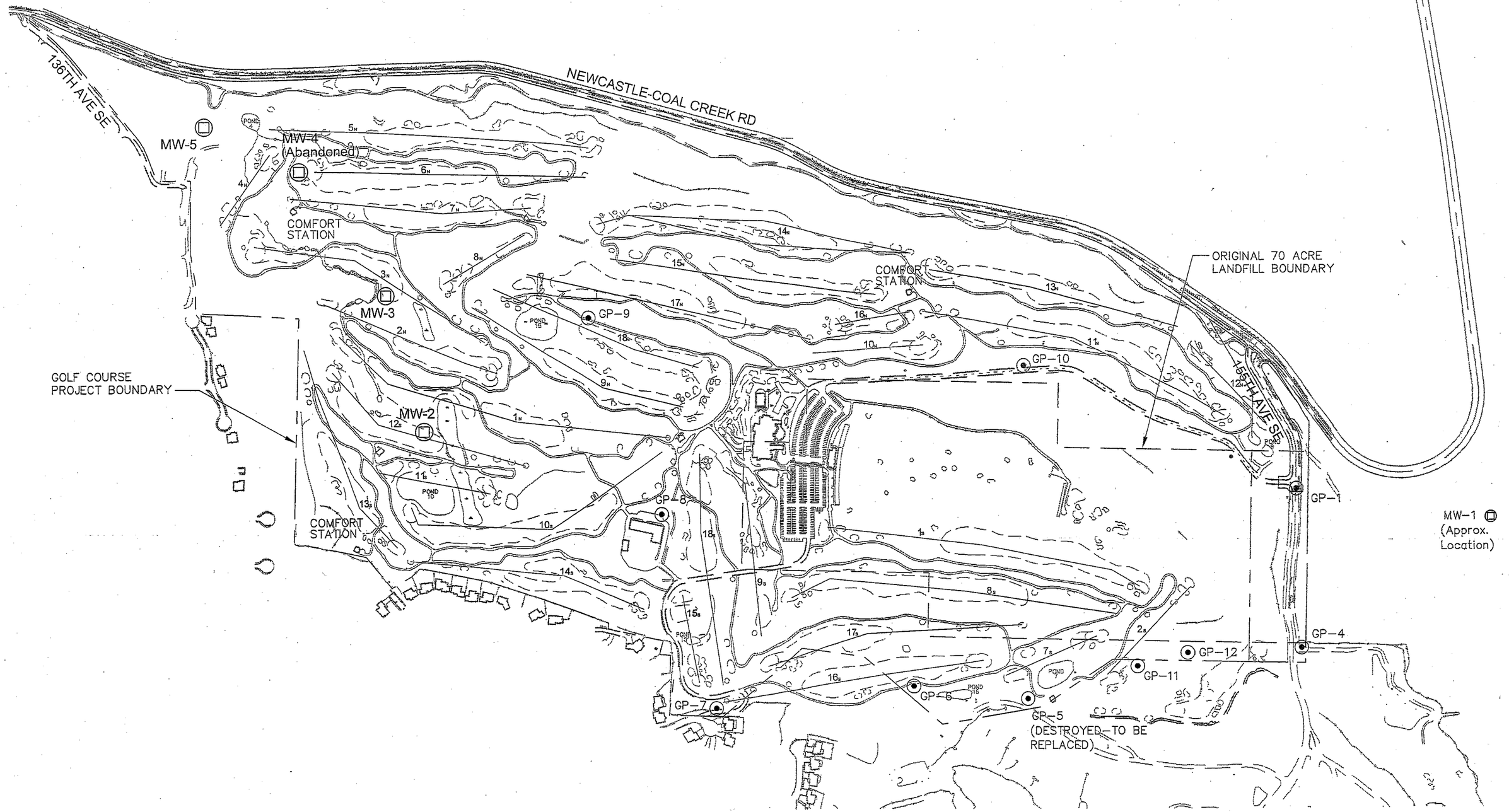
SCALE IN FEET

■ **MW-1** Groundwater Monitoring Well

Figure 1
Groundwater Monitoring Locations in Site Vicinity
Newcastle Demolition Landfill



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DATE: 04/10/03

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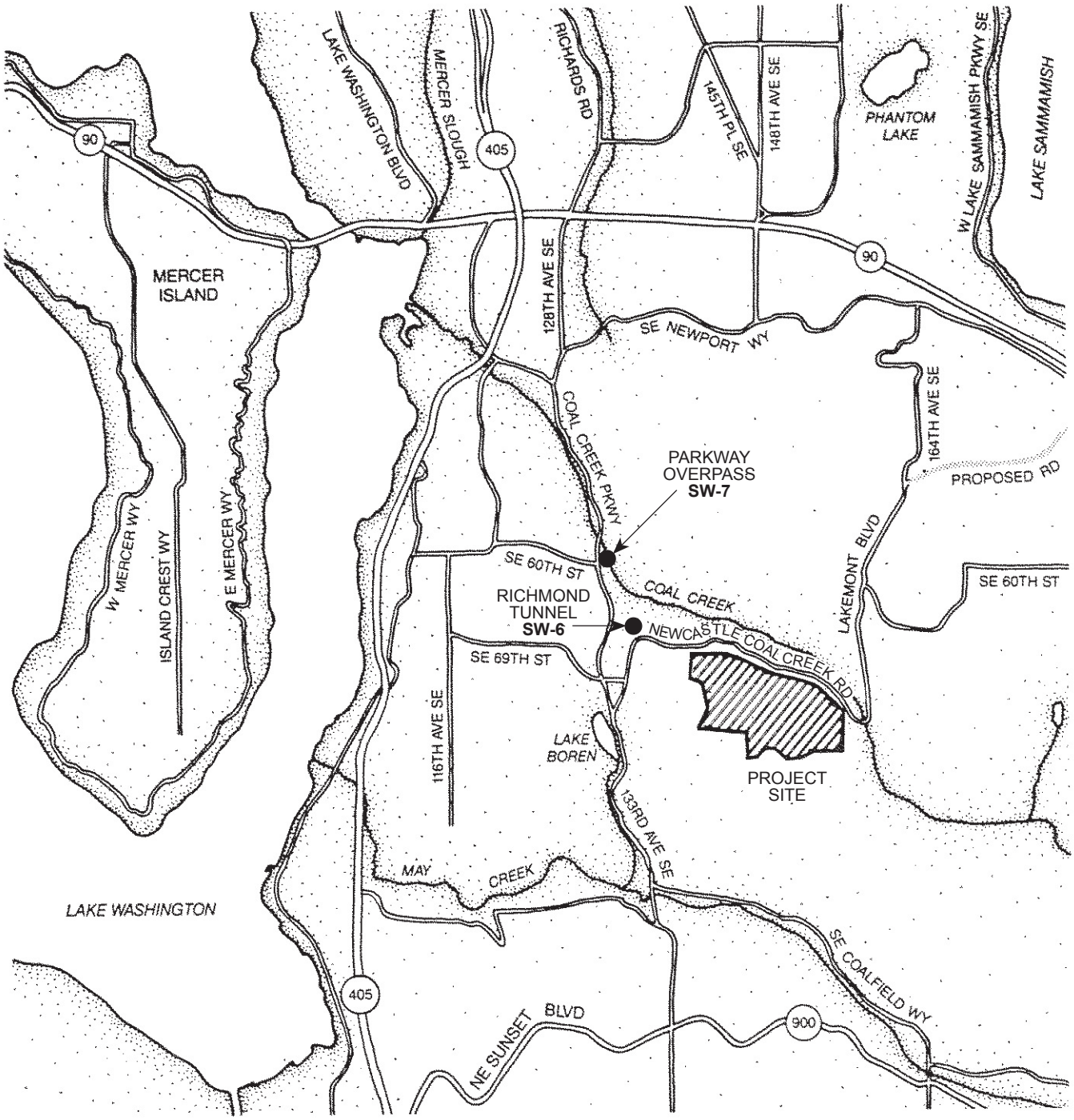
LEGEND

- MW-2 — Groundwater Monitoring Well (Field Located 10/22/01)
- GP-1 — Gas Probe Location (Field Located 10/22/01)
- COMFORT STATION — Comfort Station (Restroom)
- Pond and "Creek" System
- Storm Drainage Control Facility
- Golf Cart Path
- 14s — Golf Course Fairway Alignment and Number

Figure 2
Groundwater Monitoring Well Locations and Golf Course Features, Newcastle Demolition Landfill Area



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SCALE IN MILES

● Surface Water Monitoring Site

Figure 3
Off-site Monitoring Locations
Newcastle Demolition Landfill

Tables

Table 1. Newcastle Groundwater and Surface Water Data

				Groundwater					Surface Water		SEEP	
Parameter	**Units**	**GWQS**	**MCL**	**MW-1 3/18/2015**	**MW-2 3/18/2015**	**MW-3 3/18/2015**	**MW-6 (MW-3 Dup) 3/18/2015**	**MW-5 3/18/2015**	**SW-6 3/17/2015**	**SW-7 3/17/2015**	**A 3/18/2015**	**B 3/18/2015**
Field Data												
Temperature	°C			9.79	11.10	13.55	- -	13.57	11.98	10.18	13.47	
pH	standard	6.5-8.5 **		7.62	7.70	7.88	- -	6.91	7.37	8.46	6.94	
Specific Conductivity	uS/cm		700 **	**892.8**	**765.0**	**764.0**	- -	613.0	**894.0**	182.0	298.0	
DO	mg/L			0.70	0.41	1.40	- -	0.48	10.69	11.06	2.11	
Redox	mV			-25	-92	-107	- -	-24	- -	- -	2.06	
Conventionals												
Total Dissolved Solids	mg/L	500 **	500 **	**652**	452	485	461	356	**563**	130	150	153
Chloride	mg/L	250 **	250 **	3.0	13.6	7.0	7.1	4.0	4.5	3.4	3.3	3.4
Ammonia	mg-N/L			0.098	0.654	0.401	0.382	0.097	0.180	0.111	0.118	0.094
Nitrate	mg-N/L	10 *	10 *	0.042	0.010 U	0.043	0.044	0.050 U	0.145	1.59	0.050 U	0.050 U
Nitrite	mg-N/L		1 *	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Nitrate + Nitrite	mg-N/L			0.042	0.010 U	0.043	0.044	0.050 U	0.145	1.59	0.050 U	0.050 U
Sulfate	mg/L	250 **	250 **	**253**	12.2	32.6	33.7	76.7	135	24.9	6.6	7.2
Chemical Oxygen Demand	mg/L			10.0 U	10.0 U	10.0 U	12.2	10.0 U	10.0 U	13.5	21.6	23.8
Total Organic Carbon	mg/L			1.50 U	2.47	3.22	3.27	1.57	1.86	4.69	8.12	8.01
Dissolved Hardness	mg/L CaCO3			510	300	71	72	310	330	65	110	110
Dissolved Metals												
Arsenic	mg/L	0.00005 ***	0.01 *	**0.0006**	**0.0004**	**0.0028**	**0.0027**	**0.0162**	**0.0044**	**0.0008**	**0.0004**	**0.0004**
Calcium	mg/L			135	72.5	15.1	15.1	72.8	66.2	16.1	28.6	28.6
Iron	mg/L	0.3 **	0.3 **	**0.870**	**0.680**	**0.620**	**0.640**	**5.64**	**0.530**	0.090	**16.9**	**16.8**
Magnesium	mg/L			41.7	28.3	8.13	8.28	31.7	40.2	6.07	10.5	10.5
Manganese	mg/L	0.05 **	0.05 **	**0.076**	**0.110**	0.014	0.014	**0.694**	**0.211**	0.022	**7.89**	**7.86**
Zinc	mg/L	5 **	5 **	0.010	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U

Notes:

GWQS = Water Quality Standards for Ground Waters of the State of Washington (173-200 WAC)
MCL = Maximum Contaminant Level, Washington State Drinking Water Regulations (Chapter 246-290 WAC)
* = Primary contaminant criteria
** = Secondary contaminant criteria
*** = Carcinogenic contaminant criteria
= Exceeds GWQS or MCL
U = Compound undetected at the specified reporting limit

Table 2. Results of Mann-Kendall Tests for Trend, Newcastle Demolition Landfill, March 2015

Well ID	Analyte	n	S	Variance	Z	Trend
MW-1	Ammonia-N[1]	55	229	18951.0	1.66	Positive
	Arsenic, Dissolved	**17**	**-81**	**558.3**	**-3.39**	**Negative**
	Calcium, Dissolved	52	-68	16025.3	-0.53	No Trend
	Chloride	**55**	**459**	**18867.7**	**3.33**	**Positive**
	COD[1]	55	175	8520.3	1.89	Positive
	Hardness	54	-87	17899.7	-0.64	No Trend
	Iron, Dissolved	**55**	**446**	**18952.7**	**3.23**	**Positive**
	Manganese, Dissolved	**55**	**-408**	**18950.7**	**-2.96**	**Negative**
	Specific Conductivity	54	-8	17966.0	-0.05	No Trend
	Sulfate	55	-30	18946.0	-0.21	No Trend
	TOC	**55**	**492**	**16670.0**	**3.80**	**Positive**
MW-2	**Ammonia-N**	**49**	**287**	**13455.7**	**2.47**	**Positive**
	Arsenic, Dissolved	**17**	**-81**	**494.3**	**-3.60**	**Negative**
	Calcium, Dissolved	**44**	**511**	**9774.3**	**5.16**	**Positive**
	Chloride	**49**	**765**	**13431.0**	**6.59**	**Positive**
	COD	49	164	13284.0	1.41	No Trend
	Hardness	**46**	**503**	**11096.3**	**4.77**	**Positive**
	Iron, Dissolved	**49**	**561**	**13451.0**	**4.83**	**Positive**
	Manganese, Dissolved[1]	48	221	12651.7	1.96	Positive
	Specific Conductivity	**46**	**455**	**11155.0**	**4.30**	**Positive**
	Sulfate	48	-32	12650.0	-0.28	No Trend
	TOC	**49**	**417**	**13449.0**	**3.59**	**Positive**
MW-3	**Ammonia-N**	**35**	**169**	**4956.3**	**2.39**	**Positive**
	Arsenic, Dissolved	15	**0**	**402.7**	0.00	No Trend
	Calcium, Dissolved[1]	32	-113	3801.7	-1.82	Negative
	Chloride	**36**	**-210**	**5381.3**	**-2.85**	**Negative**
	COD[1]	36	142	5221.3	1.95	Positive
	Hardness	**33**	**-156**	**4153.3**	**-2.41**	**Negative**
	Iron, Dissolved	**36**	**153**	**5387.0**	**2.07**	**Positive**
	Manganese, Dissolved	**35**	**-307**	**4951.7**	**-4.35**	**Negative**
	Specific Conductivity	**36**	**239**	**5389.0**	**3.24**	**Positive**
	Sulfate	36	-5	5387.0	-0.05	No Trend
	TOC	**36**	**235**	**5385.0**	**3.19**	**Positive**

n = Sample size

S = Mann-Kendall test statistic. Positive number implies an increasing trend; negative number implies a decreasing trend.

Z = Approximate normal test statistic; calculated based on S and the estimated variance when the sample size is greater than 10.

The comparison level (critical value of Z) at 1.0 - (α/ 2) = (0.05 / 2) = 97.5% confidence level = 1.97737 for a two-tailed Mann-Kendall test.

If the absolute value of the calculated Z statistic (|Z|) > 1.97737, a significant trend is present in the data. There is no trend in the data when |Z| < 1.97737.

[1] When run as a one-tailed test, there is a trend (i.e., |Z| > 1.65463). The comparison level (critical value of Z) at 1.0 - (α) = (0.05) = 95% confidence level = 1.65463.

Trends significant at a confidence level of 97.5% are shown in **BOLD BLACK FONT.**

Table 2. Results of Mann-Kendall Tests for Trend, Newcastle Demolition Landfill, March 2015 (continued)

Well ID	Analyte	n	S	Variance	Z	Trend
MW-5	Ammonia-N	17	-13	588.3	-0.49	No Trend
	Arsenic, Dissolved[1]	11	-25	165.0	-1.87	Negative
	Calcium, Dissolved	**17**	**-86**	**589.3**	**-3.50**	**Negative**
	Chloride[1]	17	-43	588.3	-1.73	Negative
	COD[1]	17	-45	571.7	-1.84	Negative
	Hardness	**17**	**-92**	**580.0**	**-3.78**	**Negative**
	Iron, Dissolved	17	40	589.3	1.61	No Trend
	Manganese, Dissolved	**17**	**63**	**588.3**	**2.56**	**Positive**
	Specific Conductivity[1]	17	-45	588.3	-1.81	Negative
	Sulfate	**17**	**-99**	**588.3**	**-4.04**	**Negative**
	TOC	17	-21	588.3	-0.82	No Trend

n = Sample size

S = Mann-Kendall test statistic. Positive number implies an increasing trend; negative number implies a decreasing trend.

Z = Approximate normal test statistic; calculated based on S and the estimated variance when the sample size is greater than 10.

The comparison level (critical value of Z) at 1.0 - (α/ 2) = (0.05 / 2) = 97.5% confidence level = 1.97737 for a two-tailed Mann-Kendall test.

If the absolute value of the calculated Z statistic (|Z|) > 1.97737, a significant trend is present in the data. There is no trend in the data when |Z| < 1.97737.

[1] When run as a one-tailed test, there is a trend (i.e., |Z| > 1.65463). The comparison level (critical value of Z) at 1.0 - (α) = (0.05) = 95% confidence level = 1.65463.

Table 3. Groundwater Elevations for Newcastle Landfill, March 2015

Well	Date	Reference Elevation[1]	Depth to Groundwater[2]	Groundwater Elevation[1]
MW-1	3/18/2015	649	NM	NM
MW-2	3/18/2015	753	24.18	729
MW-3	3/18/2015	716	154.71	561
MW-5	3/18/2015	542	53.17	489

Notes:

[1] Reference Elevation and Groundwater Elevation approximate

[2] Depth to groundwater measured from well seal

NM = Not Measured

Appendix A

Laboratory Report and
Chain-of-Custody Forms

Analytical Resources, Incorporated
Analytical Chemists and Consultants

31 March 2015

Lisa Gilbert
Parametrix, Inc.
719 2nd Avenue, Suite 200
Seattle, WA 98104

RE: Project No. Newcastle LF, 553-1625-002
ARI Job No: AA90

Dear Lisa:

Please find enclosed the original Chain-of-Custody documentation and the final reports for the samples from the project referenced above. Analytical Resources, Inc. (ARI) accepted two water samples in good condition on March 18, 2015. The samples were analyzed for dissolved metals, hardness and conventional parameters as requested.

No analytical complications were noted.

As always, a copy of this report and all raw data will remain on file at ARI. If you have questions, or require further information, please contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.

Mark D. Harris
Project Manager
206/695-6210
<markh@arilabs.com>

Enclosures

cc: File AA90

MDH/mdh

4611 South 134th Place, Suite 100 • Tukwila WA 98168 • **206-695-6200** • **206-695-6201** fax

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)
www.arilabs.com

ARI Assigned Number: AA90	Turn-around Requested: Standard (48 hr Nitrates)
ARI Client Company: Parametrix	Phone: 425-458-6200
Client Contact: Lisa Gilbert (X6320)	
Client Project Name: Newcastle LF GW monitoring	
Client Project #: 553-1625-002	Samplers: I. Saul
Page: 1 of 1	
Date: 3/18/15	Ice Present? Y
No. of Coolers: 1	Cooler Temps: 4.7

Sample ID	Date	Time	Matrix	No. Containers	* Dissolved metals	NH4, TOC, COD	Nitrates (NO3, NO2), Cl, SO4, TDS						Notes/Comments
SW-6	3/17/15	1554	W	3	X	X	X						* Field Filtered
SW-7	↓	1626	W	3	X	X	X						

Comments/Special Instructions:

	Relinquished by:	Received by:	Relinquished by:	Received by:
(Signature)	[signature]	[signature]		
Printed Name:	Ingmar Saul	Jennifer Millsap		
Company:	Parametrix	ARI		
Date & Time:	3/18/15 0700	3/18/15 700		

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.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Parametrix | Project Name: Newcastle LF GW Monitoring

COC No(s): _____ (NA) | Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: AA90 | 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): 4.7 ____ ____ ____ ____ ____

Time: _____

If cooler temperature is out of compliance fill out form 00070F | Temp Gun ID#: 90877452

Cooler Accepted by: JM | Date: 3/18/15 | Time: 700

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 : (NA) YES Date/Time: _____ Equipment: _____ Split by: _____

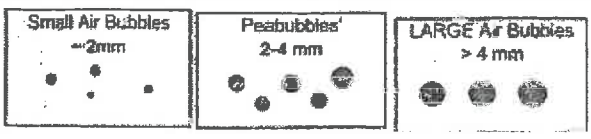
Samples Logged by: JM | Date: 3/18/15 | Time: 732

***** 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:

By: Date:



Small → "sm" (< 2 mm)
Peabubbles → "pb" (2 to < 4 mm)
Large → "lg" (4 to < 6 mm)
Headspace → "hs" (> 6 mm)

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: AA90
Client: Parametrix, Inc.
Project Event: 553-1625-002
Project Name: Newcastle LF GW Monitoring

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	SW-6	AA90A	15-4973	Water	03/17/15 15:54	03/18/15 07:00
2.	SW-7	AA90B	15-4974	Water	03/17/15 16:26	03/18/15 07:00

Data Reporting Qualifiers

Effective 12/31/13

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 ≥ 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 ≤5 times the Reporting Limit and the replicate control limit defaults to ±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).
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
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 ≥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

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AA90

Parameter: Total Dissolved Solids-EPA 160.1

Matrix: Water

Holding Time: 7 Days

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
SW-6	AA90A	03/17/15	03/18/15	N/A	03/23/15
SW-7	AA90B	03/17/15	03/18/15	N/A	03/23/15
Method Blank	MB032315	N/A	N/A	N/A	03/23/15
Lab Control	LCS032315	N/A	N/A	N/A	03/23/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AA90

Parameter: Chloride-EPA 325.2

Matrix: Water

Holding Time: 28 Days

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
SW-6	AA90A	03/17/15	03/18/15	N/A	03/30/15
SW-7	AA90B	03/17/15	03/18/15	N/A	03/30/15
Method Blank	MB033015	N/A	N/A	N/A	03/30/15
Standard Ref.	SRM033015	N/A	N/A	N/A	03/30/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AA90

Parameter: N-Ammonia-EPA 350.1M

Matrix: Water

Holding Time: 28 Days

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
SW-6	AA90A	03/17/15	03/18/15	N/A	03/18/15
SW-7	AA90B	03/17/15	03/18/15	N/A	03/18/15
Method Blank	MB031815	N/A	N/A	N/A	03/18/15
Standard Ref.	SRM031815	N/A	N/A	N/A	03/18/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AA90

Parameter: N-Nitrate-Calculated

Matrix: Water

Holding Time: 48 Hours

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
SW-6	AA90A	03/17/15	03/18/15	N/A	03/18/15
SW-7	AA90B	03/17/15	03/18/15	N/A	03/18/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AA90

Parameter: N-Nitrite-EPA 353.2

Matrix: Water

Holding Time: 48 Hours

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
SW-6	AA90A	03/17/15	03/18/15	N/A	03/18/15
SW-7	AA90B	03/17/15	03/18/15	N/A	03/18/15
Method Blank	MB031815	N/A	N/A	N/A	03/18/15
Standard Ref.	SRM031815	N/A	N/A	N/A	03/18/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AA90

Parameter: Nitrate + Nitrite-EPA 353.2

Matrix: Water

Holding Time: 48 Hours (unpreserved)
28 Days (preserved)

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
SW-6	AA90A	03/17/15	03/18/15	N/A	03/18/15
SW-7	AA90B	03/17/15	03/18/15	N/A	03/18/15
Method Blank	MB031815	N/A	N/A	N/A	03/18/15
Standard Ref.	SRM031815	N/A	N/A	N/A	03/18/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AA90

Parameter: Sulfate-EPA 375.2

Matrix: Water

Holding Time: 28 Days

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
SW-6	AA90A	03/17/15	03/18/15	N/A	03/25/15
SW-7	AA90B	03/17/15	03/18/15	N/A	03/25/15
Method Blank	MB032515	N/A	N/A	N/A	03/25/15
Standard Ref.	SRM032515	N/A	N/A	N/A	03/25/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AA90

Parameter: Chemical Oxygen Demand-EPA 410.4

Matrix: Water

Holding Time: 28 Days

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
SW-6	AA90A	03/17/15	03/18/15	N/A	03/26/15
SW-7	AA90B	03/17/15	03/18/15	N/A	03/26/15
Method Blank	MB032615	N/A	N/A	N/A	03/26/15
Standard Ref.	SRM032615	N/A	N/A	N/A	03/26/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AA90

Parameter: Total Organic Carbon-EPA 9060

Matrix: Water

Holding Time: 28 Days

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
SW-6	AA90A	03/17/15	03/18/15	N/A	03/19/15
SW-7	AA90B	03/17/15	03/18/15	N/A	03/19/15
Method Blank	MB031915	N/A	N/A	N/A	03/19/15
Standard Ref.	SRM031915	N/A	N/A	N/A	03/19/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AA90

Parameter: ICP Dissolved Metals-6010C

Matrix: Water

Holding Time: 6 Months

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
SW-6	AA90A	03/17/15	03/18/15	03/19/15	03/23/15
SW-7	AA90B	03/17/15	03/18/15	03/19/15	03/23/15
Method Blank	MB031915	N/A	N/A	03/19/15	03/23/15
Lab Control	LCS031915	N/A	N/A	03/19/15	03/23/15

Preparation Summary Table

SAMPLE RESULTS-CONVENTIONALS
AA90-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: 03/17/15
Date Received: 03/18/15

Client ID: SW-6
ARI ID: 15-4973 AA90A

Analyte	Date Batch	Method	Units	RL	Sample
Total Dissolved Solids	03/23/15 032315#1	EPA 160.1	mg/L	10.0	563
Chloride	03/30/15 033015#1	EPA 325.2	mg/L	1.0	4.5
N-Ammonia	03/18/15 031815#1	EPA 350.1M	mg-N/L	0.010	0.180
N-Nitrate	03/18/15	Calculated	mg-N/L	0.010	0.145
N-Nitrite	03/18/15 031815#1	EPA 353.2	mg-N/L	0.010	< 0.010 U
Nitrate + Nitrite	03/18/15 031815#1	EPA 353.2	mg-N/L	0.010	0.145
Sulfate	03/25/15 032515#1	EPA 375.2	mg/L	20.0	135
Chemical Oxygen Demand	03/26/15 032615#1	EPA 410.4	mg/L	10.0	< 10.0 U
Total Organic Carbon	03/19/15 031915#1	EPA 9060	mg/L	1.50	1.86

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
AA90-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: 03/17/15
Date Received: 03/18/15

Client ID: SW-7
ARI ID: 15-4974 AA90B

Analyte	Date Batch	Method	Units	RL	Sample
Total Dissolved Solids	03/23/15 032315#1	EPA 160.1	mg/L	5.0	130
Chloride	03/30/15 033015#1	EPA 325.2	mg/L	1.0	3.4
N-Ammonia	03/18/15 031815#1	EPA 350.1M	mg-N/L	0.010	0.111
N-Nitrate	03/18/15	Calculated	mg-N/L	0.050	1.59
N-Nitrite	03/18/15 031815#1	EPA 353.2	mg-N/L	0.010	< 0.010 U
Nitrate + Nitrite	03/18/15 031815#1	EPA 353.2	mg-N/L	0.050	1.59
Sulfate	03/25/15 032515#1	EPA 375.2	mg/L	2.0	24.9
Chemical Oxygen Demand	03/26/15 032615#1	EPA 410.4	mg/L	10.0	13.5
Total Organic Carbon	03/19/15 031915#1	EPA 9060	mg/L	1.50	4.69

RL Analytical reporting limit
U Undetected at reported detection limit

METHOD BLANK RESULTS-CONVENTIONALS
AA90-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: NA
Date Received: NA

Analyte	Method	Date	Units	Blank	ID
Total Dissolved Solids	EPA 160.1	03/23/15	mg/L	< 5.0 U	
Chloride	EPA 325.2	03/30/15	mg/L	< 1.0 U	FB
N-Ammonia	EPA 350.1M	03/18/15	mg-N/L	< 0.010 U	FB
N-Nitrite	EPA 353.2	03/18/15	mg-N/L	< 0.010 U	FB
Nitrate + Nitrite	EPA 353.2	03/18/15	mg-N/L	< 0.010 U	FB
Sulfate	EPA 375.2	03/25/15	mg/L	< 2.0 U	FB
Chemical Oxygen Demand	EPA 410.4	03/26/15	mg/L	< 10.0 U	
Total Organic Carbon	EPA 9060	03/19/15	mg/L	< 1.50 U	

FB Filtration Blank

LAB CONTROL RESULTS-CONVENTIONALS
AA90-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: NA
Date Received: NA

Analyte/Method	QC ID	Date	Units	LCS	Spike Added	Recovery
Total Dissolved Solids EPA 160.1	ICVL	03/23/15	mg/L	485	500	97.0%

STANDARD REFERENCE RESULTS-CONVENTIONALS
AA90-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: NA
Date Received: NA

Analyte/SRM ID	Method	Date	Units	SRM	True Value	Recovery
Chloride ERA #290313	EPA 325.2	03/30/15	mg/L	4.9	5.0	98.0%
N-Ammonia ERA #360114	EPA 350.1M	03/18/15	mg-N/L	0.502	0.500	100.4%
N-Nitrite ERA #141113	EPA 353.2	03/18/15	mg-N/L	0.493	0.500	98.6%
Nitrate + Nitrite ERA #320614	EPA 353.2	03/18/15	mg-N/L	0.478	0.500	95.6%
Sulfate ERA 131013	EPA 375.2	03/25/15	mg/L	15.1	15.0	100.7%
Chemical Oxygen Demand Orion #RP1	EPA 410.4	03/26/15	mg/L	99.0	100	99.0%
Total Organic Carbon ERA #0408-13-02	EPA 9060	03/19/15	mg/L	18.9	20.0	94.5%

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: SW-6
SAMPLE

Lab Sample ID: AA90A
LIMS ID: 15-4973
Matrix: Water
Data Release Authorized:
Reported: 03/24/15

QC Report No: AA90-Parametrix, Inc.
Project: Newcastle LF GW Monitoring
553-1625-002
Date Sampled: 03/17/15
Date Received: 03/18/15

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	µg/L	Q
200.8	03/19/15	200.8	03/23/15	**7440-38-2**	**Arsenic**	0.2	**4.4**	
6010C	03/19/15	6010C	03/23/15	**7440-70-2**	**Calcium**	50	**66,200**	
6010C	03/19/15	6010C	03/23/15	**7439-89-6**	**Iron**	50	**530**	
6010C	03/19/15	6010C	03/23/15	**7439-95-4**	**Magnesium**	50	**40,200**	
6010C	03/19/15	6010C	03/23/15	**7439-96-5**	**Manganese**	1	**211**	
6010C	03/19/15	6010C	03/23/15	7440-66-6	Zinc	10	10	U

Calculated Dissolved Hardness (ug-CaCO3/L): 330000

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: SW-7
SAMPLE

Lab Sample ID: AA90B
LIMS ID: 15-4974
Matrix: Water
Data Release Authorized:
Reported: 03/24/15

QC Report No: AA90-Parametrix, Inc.
Project: Newcastle LF GW Monitoring
553-1625-002
Date Sampled: 03/17/15
Date Received: 03/18/15

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	µg/L	Q
200.8	03/19/15	200.8	03/23/15	**7440-38-2**	**Arsenic**	0.2	**0.8**	
6010C	03/19/15	6010C	03/23/15	**7440-70-2**	**Calcium**	50	**16,100**	
6010C	03/19/15	6010C	03/23/15	**7439-89-6**	**Iron**	50	**90**	
6010C	03/19/15	6010C	03/23/15	**7439-95-4**	**Magnesium**	50	**6,070**	
6010C	03/19/15	6010C	03/23/15	**7439-96-5**	**Manganese**	1	**22**	
6010C	03/19/15	6010C	03/23/15	7440-66-6	Zinc	10	10	U

Calculated Dissolved Hardness (ug-CaCO3/L): 65000

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: METHOD BLANK

Lab Sample ID: AA90MB
LIMS ID: 15-4974
Matrix: Water
Data Release Authorized:
Reported: 03/24/15

QC Report No: AA90-Parametrix, Inc.
Project: Newcastle LF GW Monitoring
553-1625-002
Date Sampled: NA
Date Received: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	µg/L	Q
200.8	03/19/15	200.8	03/23/15	7440-38-2	Arsenic	0.2	0.2	U
6010C	03/19/15	6010C	03/23/15	7440-70-2	Calcium	50	50	U
6010C	03/19/15	6010C	03/23/15	7439-89-6	Iron	50	50	U
6010C	03/19/15	6010C	03/23/15	7439-95-4	Magnesium	50	50	U
6010C	03/19/15	6010C	03/23/15	7439-96-5	Manganese	1	1	U
6010C	03/19/15	6010C	03/23/15	7440-66-6	Zinc	10	10	U

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: LAB CONTROL

Lab Sample ID: AA90LCS
LIMS ID: 15-4974
Matrix: Water
Data Release Authorized:
Reported: 03/24/15

QC Report No: AA90-Parametrix, Inc.
Project: Newcastle LF GW Monitoring
553-1625-002
Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Arsenic	200.8	23.2	25.0	92.8%	
Calcium	6010C	9210	10000	92.1%	
Iron	6010C	1840	2000	92.0%	
Magnesium	6010C	9720	10000	97.2%	
Manganese	6010C	442	500	88.4%	
Zinc	6010C	470	500	94.0%	

Reported in µg/L

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

Analytical Resources, Incorporated
Analytical Chemists and Consultants

31 March 2015

Lisa Gilbert
Parametrix, Inc.
719 2nd Avenue, Suite 200
Seattle, WA 98104

RE: Project No. Newcastle LF, 553-1625-002
ARI Job No: AB23

Dear Lisa:

Please find enclosed the original Chain-of-Custody documentation and the final reports for the samples from the project referenced above. Analytical Resources, Inc. (ARI) accepted seven water samples in good condition on March 18, 2015. The samples were analyzed for dissolved metals, hardness and conventional parameters as requested.

No analytical complications were noted.

As always, a copy of this report and all raw data will remain on file at ARI. If you have questions, or require further information, please contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.

Mark D. Harris
Project Manager
206/695-6210
<markh@arilabs.com>

Enclosures

cc: File AB23

MDH/mdh

4611 South 134th Place, Suite 100 • Tukwila WA 98168 • **206-695-6200** • **206-695-6201** fax

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: AB23	Turn-around Requested: Standard (48 hr Nitrates)	Page: 1 of 1	
ARI Client Company: Parametrix	Phone: 425-458-6200	Date: 3/18/15	Ice Present? Y
Client Contact: Lisa Gilbert (X-6320)		No. of Coolers: 1	Cooler Temps: 3.7
Client Project Name: Newcastle LF GW monitoring			
Client Project #: 553-1625-002	Samplers: I. Saul		

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

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: # Dissolved metals	N-NH4, TOC COD	Nitrates (NO3, NO2), Cl, SO4, TDS						Notes/Comments
MW-1	3/18/15	0859	W	3	X	X	X						* Field Filtered
MW-2		1030			X	X	X						
MW-3		1125			X	X	X						
MW-5		1400			X	X	X						
MW-6		1140			X	X	X						
Seep-a		1570			X	X	X						
Seep-b		1570			X	X	X						

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Inymar Saul	Printed Name: A. Volgardsen	Printed Name:	Printed Name:
	Company: Parametrix	Company: ARI	Company:	Company:
	Date & Time: 3/18/15 1606	Date & Time: 3/18/15 1606	Date & Time:	Date & Time:

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: PMX Project Name: Newcastle LF

COC No(s): _____ (NA) Delivered by: Fed-Ex UPS Courier (Hand Delivered) Other: _____

Assigned ARI Job No: AB23 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) 3.7 ____ ____ ____ ____ ____
Time: 1606

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: 90871953

Cooler Accepted by: AV Date: 3/18/15 Time: 1606

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 : (NA) YES Date/Time: _____ Equipment: _____ Split by: _____

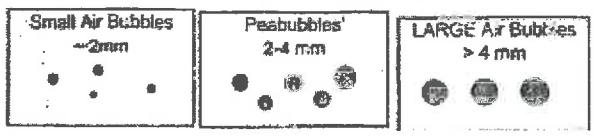
Samples Logged by: JM Date: 3/19/15 Time: 0616

***** 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:

By: Date:



Small → "sm"	(< 2 mm)
Peabubbles → "pb"	(2 to < 4 mm)
Large → "lg"	(4 to < 6 mm)
Headspace → "hs"	(> 6 mm)

PRESERVATION VERIFICATION 03/19/15
Page 1 of 1

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **AB23**

Inquiry Number: NONE
Analysis Requested: 03/19/15
Contact: Gilbert, Lisa
Client: Parametrix, Inc.
Logged by: JM
Sample Set Used: Yes-481
Validatable Package: No
Deliverables:

PC: Mark
VTSR: 03/18/15

Project #: 553-1675-002
Project: Newcastle LF GW Monitoring
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	PEEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	TPHD <2	Fe2+ <2	DMET FLT	DOC FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
15-5175 **AB23A**	MW-1			P	P		DIS P					P				Y						
15-5176 **AB23B**	MW-2			P	P		DIS P					P				Y						
15-5177 **AB23C**	MW-3			P	P		DIS P					P				Y						
15-5178 **AB23D**	MW-5			P	P		DIS P					P				Y						
15-5179 **AB23E**	MW-6			P	P		DIS P					P				Y						
15-5180 **AB23F**	Seep-a			P	P		DIS P					P				Y						
15-5181 **AB23G**	Seep-b			P	P		DIS P					P				Y						

P=Pass

Checked By dm Date 3/19/15

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: AB23
Client: Parametrix, Inc.
Project Event: 553-1675-002
Project Name: Newcastle LF GW Monitoring

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	MW-1	AB23A	15-5175	Water	03/18/15 08:59	03/18/15 16:06
2.	MW-2	AB23B	15-5176	Water	03/18/15 10:30	03/18/15 16:06
3.	MW-3	AB23C	15-5177	Water	03/18/15 11:25	03/18/15 16:06
4.	MW-5	AB23D	15-5178	Water	03/18/15 14:00	03/18/15 16:06
5.	MW-6	AB23E	15-5179	Water	03/18/15 11:40	03/18/15 16:06
6.	Seep-a	AB23F	15-5180	Water	03/18/15 15:10	03/18/15 16:06
7.	Seep-b	AB23G	15-5181	Water	03/18/15 15:10	03/18/15 16:06

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Data Reporting Qualifiers

Effective 12/31/13

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 ≥ 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 ≤5 times the Reporting Limit and the replicate control limit defaults to ±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).
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
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 ≥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

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AB23

Parameter: Total Dissolved Solids-EPA 160.1

Matrix: Water

Holding Time: 7 Days

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
MW-1	AB23A	03/18/15	03/18/15	N/A	03/20/15
MW-2	AB23B	03/18/15	03/18/15	N/A	03/20/15
MW-3	AB23C	03/18/15	03/18/15	N/A	03/20/15
MW-5	AB23D	03/18/15	03/18/15	N/A	03/20/15
MW-6	AB23E	03/18/15	03/18/15	N/A	03/20/15
Seep-a	AB23F	03/18/15	03/18/15	N/A	03/20/15
Seep-b	AB23G	03/18/15	03/18/15	N/A	03/20/15
Method Blank	MB032015	N/A	N/A	N/A	03/20/15
Lab Control	LCS032015	N/A	N/A	N/A	03/20/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AB23

Parameter: Chloride-EPA 325.2

Matrix: Water

Holding Time: 28 Days

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
MW-1	AB23A	03/18/15	03/18/15	N/A	03/30/15
MW-2	AB23B	03/18/15	03/18/15	N/A	03/30/15
MW-3	AB23C	03/18/15	03/18/15	N/A	03/30/15
MW-5	AB23D	03/18/15	03/18/15	N/A	03/30/15
MW-6	AB23E	03/18/15	03/18/15	N/A	03/30/15
Seep-a	AB23F	03/18/15	03/18/15	N/A	03/30/15
Seep-b	AB23G	03/18/15	03/18/15	N/A	03/30/15
Method Blank	MB033015	N/A	N/A	N/A	03/30/15
Standard Ref.	SRM033015	N/A	N/A	N/A	03/30/15
MW-1	AB23ADP	03/18/15	03/18/15	N/A	03/30/15
MW-1	AB23AMS	03/18/15	03/18/15	N/A	03/30/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AB23

Parameter: N-Ammonia-EPA 350.1M

Matrix: Water

Holding Time: 28 Days

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
MW-1	AB23A	03/18/15	03/18/15	N/A	03/26/15
MW-2	AB23B	03/18/15	03/18/15	N/A	03/26/15
MW-3	AB23C	03/18/15	03/18/15	N/A	03/26/15
MW-5	AB23D	03/18/15	03/18/15	N/A	03/26/15
MW-6	AB23E	03/18/15	03/18/15	N/A	03/26/15
Seep-a	AB23F	03/18/15	03/18/15	N/A	03/26/15
Seep-b	AB23G	03/18/15	03/18/15	N/A	03/26/15
Method Blank	MB032615	N/A	N/A	N/A	03/26/15
Standard Ref.	SRM032615	N/A	N/A	N/A	03/26/15
MW-1	AB23ADP	03/18/15	03/18/15	N/A	03/26/15
MW-1	AB23AMS	03/18/15	03/18/15	N/A	03/26/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AB23

Parameter: N-Nitrate-Calculated

Matrix: Water

Holding Time: 48 Hours

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
MW-1	AB23A	03/18/15	03/18/15	N/A	03/19/15
MW-2	AB23B	03/18/15	03/18/15	N/A	03/19/15
MW-3	AB23C	03/18/15	03/18/15	N/A	03/19/15
MW-5	AB23D	03/18/15	03/18/15	N/A	03/19/15
MW-6	AB23E	03/18/15	03/18/15	N/A	03/19/15
Seep-a	AB23F	03/18/15	03/18/15	N/A	03/19/15
Seep-b	AB23G	03/18/15	03/18/15	N/A	03/19/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AB23

Parameter: N-Nitrite-EPA 353.2

Matrix: Water

Holding Time: 48 Hours

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
MW-1	AB23A	03/18/15	03/18/15	N/A	03/19/15
MW-2	AB23B	03/18/15	03/18/15	N/A	03/19/15
MW-3	AB23C	03/18/15	03/18/15	N/A	03/19/15
MW-5	AB23D	03/18/15	03/18/15	N/A	03/19/15
MW-6	AB23E	03/18/15	03/18/15	N/A	03/19/15
Seep-a	AB23F	03/18/15	03/18/15	N/A	03/19/15
Seep-b	AB23G	03/18/15	03/18/15	N/A	03/19/15
Method Blank	MB031915	N/A	N/A	N/A	03/19/15
Standard Ref.	SRM031915	N/A	N/A	N/A	03/19/15
MW-1	AB23ADP	03/18/15	03/18/15	N/A	03/19/15
MW-1	AB23AMS	03/18/15	03/18/15	N/A	03/19/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AB23

Parameter: Nitrate + Nitrite-EPA 353.2

Matrix: Water

Holding Time: 48 Hours (unpreserved)
28 Days (preserved)

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
MW-1	AB23A	03/18/15	03/18/15	N/A	03/19/15
MW-2	AB23B	03/18/15	03/18/15	N/A	03/19/15
MW-3	AB23C	03/18/15	03/18/15	N/A	03/19/15
MW-5	AB23D	03/18/15	03/18/15	N/A	03/19/15
MW-6	AB23E	03/18/15	03/18/15	N/A	03/19/15
Seep-a	AB23F	03/18/15	03/18/15	N/A	03/19/15
Seep-b	AB23G	03/18/15	03/18/15	N/A	03/19/15
Method Blank	MB031915	N/A	N/A	N/A	03/19/15
Standard Ref.	SRM031915	N/A	N/A	N/A	03/19/15
MW-1	AB23ADP	03/18/15	03/18/15	N/A	03/19/15
MW-1	AB23AMS	03/18/15	03/18/15	N/A	03/19/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AB23

Parameter: Sulfate-EPA 375.2

Matrix: Water

Holding Time: 28 Days

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
MW-1	AB23A	03/18/15	03/18/15	N/A	03/25/15
MW-2	AB23B	03/18/15	03/18/15	N/A	03/25/15
MW-3	AB23C	03/18/15	03/18/15	N/A	03/25/15
MW-5	AB23D	03/18/15	03/18/15	N/A	03/25/15
MW-6	AB23E	03/18/15	03/18/15	N/A	03/25/15
Seep-a	AB23F	03/18/15	03/18/15	N/A	03/25/15
Seep-b	AB23G	03/18/15	03/18/15	N/A	03/25/15
Method Blank	MB032515	N/A	N/A	N/A	03/25/15
Standard Ref.	SRM032515	N/A	N/A	N/A	03/25/15
MW-1	AB23ADP	03/18/15	03/18/15	N/A	03/25/15
MW-1	AB23AMS	03/18/15	03/18/15	N/A	03/25/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AB23

Parameter: Chemical Oxygen Demand-EPA 410.4

Matrix: Water

Holding Time: 28 Days

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
MW-1	AB23A	03/18/15	03/18/15	N/A	03/26/15
MW-2	AB23B	03/18/15	03/18/15	N/A	03/26/15
MW-3	AB23C	03/18/15	03/18/15	N/A	03/26/15
MW-5	AB23D	03/18/15	03/18/15	N/A	03/26/15
MW-6	AB23E	03/18/15	03/18/15	N/A	03/26/15
Seep-a	AB23F	03/18/15	03/18/15	N/A	03/26/15
Seep-b	AB23G	03/18/15	03/18/15	N/A	03/26/15
Method Blank	MB032615	N/A	N/A	N/A	03/26/15
Standard Ref.	SRM032615	N/A	N/A	N/A	03/26/15
MW-1	AB23ADP	03/18/15	03/18/15	N/A	03/26/15
MW-1	AB23AMS	03/18/15	03/18/15	N/A	03/26/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AB23

Parameter: Total Organic Carbon-EPA 9060

Matrix: Water

Holding Time: 28 Days

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
MW-1	AB23A	03/18/15	03/18/15	N/A	03/19/15
MW-2	AB23B	03/18/15	03/18/15	N/A	03/19/15
MW-3	AB23C	03/18/15	03/18/15	N/A	03/19/15
MW-5	AB23D	03/18/15	03/18/15	N/A	03/19/15
MW-6	AB23E	03/18/15	03/18/15	N/A	03/19/15
Seep-a	AB23F	03/18/15	03/18/15	N/A	03/19/15
Seep-b	AB23G	03/18/15	03/18/15	N/A	03/19/15
Method Blank	MB031915	N/A	N/A	N/A	03/19/15
Standard Ref.	SRM031915	N/A	N/A	N/A	03/19/15
MW-1	AB23ADP	03/18/15	03/18/15	N/A	03/19/15
MW-1	AB23AMS	03/18/15	03/18/15	N/A	03/19/15

Preparation Summary Table

ANALYTICAL RESOURCES INCORPORATED

Client Project ID: 553-1625-002, Newcastle LF GW Monitoring

ARI Job No: AB23

Parameter: ICP Dissolved Metals-6010C

Matrix: Water

Holding Time: 6 Months

Date Reported: 03/31/15

Client Sample ID	ARI Sample ID	Date Sampled	Date Received	Date Extracted	Date Analyzed
MW-1	AB23A	03/18/15	03/18/15	03/20/15	03/26/15
MW-2	AB23B	03/18/15	03/18/15	03/20/15	03/26/15
MW-3	AB23C	03/18/15	03/18/15	03/20/15	03/26/15
MW-5	AB23D	03/18/15	03/18/15	03/20/15	03/26/15
MW-6	AB23E	03/18/15	03/18/15	03/20/15	03/26/15
Seep-a	AB23F	03/18/15	03/18/15	03/20/15	03/26/15
Seep-b	AB23G	03/18/15	03/18/15	03/20/15	03/26/15
Method Blank	MB032015	N/A	N/A	03/20/15	03/26/15
Lab Control	LCS032015	N/A	N/A	03/20/15	03/26/15
MW-1	AB23ADP	03/18/15	03/18/15	03/20/15	03/26/15
MW-1	AB23AMS	03/18/15	03/18/15	03/20/15	03/26/15

Preparation Summary Table

SAMPLE RESULTS-CONVENTIONALS
AB23-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Client ID: MW-1
ARI ID: 15-5175 AB23A

Analyte	Date Batch	Method	Units	RL	Sample
Total Dissolved Solids	03/20/15 032015#1	EPA 160.1	mg/L	10.0	652
Chloride	03/30/15 033015#1	EPA 325.2	mg/L	1.0	3.0
N-Ammonia	03/26/15 032615#1	EPA 350.1M	mg-N/L	0.010	0.098
N-Nitrate	03/19/15	Calculated	mg-N/L	0.010	0.042
N-Nitrite	03/19/15 031915#1	EPA 353.2	mg-N/L	0.010	< 0.010 U
Nitrate + Nitrite	03/19/15 031915#1	EPA 353.2	mg-N/L	0.010	0.042
Sulfate	03/25/15 032515#1	EPA 375.2	mg/L	40.0	253
Chemical Oxygen Demand	03/26/15 032615#1	EPA 410.4	mg/L	10.0	< 10.0 U
Total Organic Carbon	03/19/15 031915#1	EPA 9060	mg/L	1.50	< 1.50 U

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
AB23-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Client ID: MW-2
ARI ID: 15-5176 AB23B

Analyte	Date Batch	Method	Units	RL	Sample
Total Dissolved Solids	03/20/15 032015#1	EPA 160.1	mg/L	10.0	452
Chloride	03/30/15 033015#1	EPA 325.2	mg/L	5.0	13.6
N-Ammonia	03/26/15 032615#1	EPA 350.1M	mg-N/L	0.010	0.654
N-Nitrate	03/19/15	Calculated	mg-N/L	0.010	< 0.010 U
N-Nitrite	03/19/15 031915#1	EPA 353.2	mg-N/L	0.010	< 0.010 U
Nitrate + Nitrite	03/19/15 031915#1	EPA 353.2	mg-N/L	0.010	< 0.010 U
Sulfate	03/25/15 032515#1	EPA 375.2	mg/L	4.0	12.2
Chemical Oxygen Demand	03/26/15 032615#1	EPA 410.4	mg/L	10.0	< 10.0 U
Total Organic Carbon	03/19/15 031915#1	EPA 9060	mg/L	1.50	2.47

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
AB23-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Client ID: MW-3
ARI ID: 15-5177 AB23C

Analyte	Date Batch	Method	Units	RL	Sample
Total Dissolved Solids	03/20/15 032015#1	EPA 160.1	mg/L	10.0	485
Chloride	03/30/15 033015#1	EPA 325.2	mg/L	1.0	7.0
N-Ammonia	03/26/15 032615#1	EPA 350.1M	mg-N/L	0.010	0.401
N-Nitrate	03/19/15	Calculated	mg-N/L	0.010	0.043
N-Nitrite	03/19/15 031915#1	EPA 353.2	mg-N/L	0.010	< 0.010 U
Nitrate + Nitrite	03/19/15 031915#1	EPA 353.2	mg-N/L	0.010	0.043
Sulfate	03/25/15 032515#1	EPA 375.2	mg/L	4.0	32.6
Chemical Oxygen Demand	03/26/15 032615#1	EPA 410.4	mg/L	10.0	< 10.0 U
Total Organic Carbon	03/19/15 031915#1	EPA 9060	mg/L	1.50	3.22

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
AB23-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Client ID: MW-5
ARI ID: 15-5178 AB23D

Analyte	Date Batch	Method	Units	RL	Sample
Total Dissolved Solids	03/20/15 032015#1	EPA 160.1	mg/L	10.0	356
Chloride	03/30/15 033015#1	EPA 325.2	mg/L	1.0	4.0
N-Ammonia	03/26/15 032615#1	EPA 350.1M	mg-N/L	0.010	0.097
N-Nitrate	03/19/15	Calculated	mg-N/L	0.050	< 0.050 U
N-Nitrite	03/19/15 031915#1	EPA 353.2	mg-N/L	0.010	< 0.010 U
Nitrate + Nitrite	03/19/15 031915#1	EPA 353.2	mg-N/L	0.050	< 0.050 U
Sulfate	03/25/15 032515#1	EPA 375.2	mg/L	8.0	76.7
Chemical Oxygen Demand	03/26/15 032615#1	EPA 410.4	mg/L	10.0	< 10.0 U
Total Organic Carbon	03/19/15 031915#1	EPA 9060	mg/L	1.50	1.57

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
AB23-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Client ID: MW-6
ARI ID: 15-5179 AB23E

Analyte	Date Batch	Method	Units	RL	Sample
Total Dissolved Solids	03/20/15 032015#1	EPA 160.1	mg/L	10.0	461
Chloride	03/30/15 033015#1	EPA 325.2	mg/L	1.0	7.1
N-Ammonia	03/26/15 032615#1	EPA 350.1M	mg-N/L	0.010	0.382
N-Nitrate	03/19/15	Calculated	mg-N/L	0.010	0.044
N-Nitrite	03/19/15 031915#1	EPA 353.2	mg-N/L	0.010	< 0.010 U
Nitrate + Nitrite	03/19/15 031915#1	EPA 353.2	mg-N/L	0.010	0.044
Sulfate	03/25/15 032515#1	EPA 375.2	mg/L	4.0	33.7
Chemical Oxygen Demand	03/26/15 032615#1	EPA 410.4	mg/L	10.0	12.2
Total Organic Carbon	03/19/15 031915#1	EPA 9060	mg/L	1.50	3.27

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
AB23-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Client ID: Seep-a
ARI ID: 15-5180 AB23F

Analyte	Date Batch	Method	Units	RL	Sample
Total Dissolved Solids	03/20/15 032015#1	EPA 160.1	mg/L	5.0	150
Chloride	03/30/15 033015#1	EPA 325.2	mg/L	1.0	3.3
N-Ammonia	03/26/15 032615#1	EPA 350.1M	mg-N/L	0.050	0.118
N-Nitrate	03/19/15	Calculated	mg-N/L	0.050	< 0.050 U
N-Nitrite	03/19/15 031915#1	EPA 353.2	mg-N/L	0.010	< 0.010 U
Nitrate + Nitrite	03/19/15 031915#1	EPA 353.2	mg-N/L	0.050	< 0.050 U
Sulfate	03/25/15 032515#1	EPA 375.2	mg/L	4.0	6.6
Chemical Oxygen Demand	03/26/15 032615#1	EPA 410.4	mg/L	10.0	21.6
Total Organic Carbon	03/19/15 031915#1	EPA 9060	mg/L	1.50	8.12

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
AB23-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Client ID: Seep-b
ARI ID: 15-5181 AB23G

Analyte	Date Batch	Method	Units	RL	Sample
Total Dissolved Solids	03/20/15 032015#1	EPA 160.1	mg/L	5.0	153
Chloride	03/30/15 033015#1	EPA 325.2	mg/L	1.0	3.4
N-Ammonia	03/26/15 032615#1	EPA 350.1M	mg-N/L	0.050	0.094
N-Nitrate	03/19/15	Calculated	mg-N/L	0.050	< 0.050 U
N-Nitrite	03/19/15 031915#1	EPA 353.2	mg-N/L	0.010	< 0.010 U
Nitrate + Nitrite	03/19/15 031915#1	EPA 353.2	mg-N/L	0.050	< 0.050 U
Sulfate	03/25/15 032515#1	EPA 375.2	mg/L	4.0	7.2
Chemical Oxygen Demand	03/26/15 032615#1	EPA 410.4	mg/L	10.0	23.8
Total Organic Carbon	03/19/15 031915#1	EPA 9060	mg/L	1.50	8.01

RL Analytical reporting limit
U Undetected at reported detection limit

METHOD BLANK RESULTS-CONVENTIONALS
AB23-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: NA
Date Received: NA

Analyte	Method	Date	Units	Blank	ID
Total Dissolved Solids	EPA 160.1	03/20/15	mg/L	< 5.0 U	
Chloride	EPA 325.2	03/30/15	mg/L	< 1.0 U	FB
N-Ammonia	EPA 350.1M	03/26/15	mg-N/L	< 0.010 U	FB
N-Nitrite	EPA 353.2	03/19/15	mg-N/L	< 0.010 U	FB
Nitrate + Nitrite	EPA 353.2	03/19/15	mg-N/L	< 0.010 U	FB
Sulfate	EPA 375.2	03/25/15	mg/L	< 2.0 U	FB
Chemical Oxygen Demand	EPA 410.4	03/26/15	mg/L	< 10.0 U	
Total Organic Carbon	EPA 9060	03/19/15	mg/L	< 1.50 U	

FB Filtration Blank

LAB CONTROL RESULTS-CONVENTIONALS
AB23-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: NA
Date Received: NA

Analyte/Method	QC ID	Date	Units	LCS	Spike Added	Recovery
Total Dissolved Solids EPA 160.1	ICVL	03/20/15	mg/L	488	500	97.6%

STANDARD REFERENCE RESULTS-CONVENTIONALS
AB23-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: NA
Date Received: NA

Analyte/SRM ID	Method	Date	Units	SRM	True Value	Recovery
Chloride ERA #290313	EPA 325.2	03/30/15	mg/L	4.9	5.0	98.0%
N-Ammonia ERA #360114	EPA 350.1M	03/26/15	mg-N/L	0.523	0.500	104.6%
N-Nitrite ERA #141113	EPA 353.2	03/19/15	mg-N/L	0.499	0.500	99.8%
Nitrate + Nitrite ERA #320614	EPA 353.2	03/19/15	mg-N/L	0.500	0.500	100.0%
Sulfate ERA 131013	EPA 375.2	03/25/15	mg/L	15.1	15.0	100.7%
Chemical Oxygen Demand Orion #RP1	EPA 410.4	03/26/15	mg/L	99.0	100	99.0%
Total Organic Carbon ERA #0408-13-02	EPA 9060	03/19/15	mg/L	18.9	20.0	94.5%

REPLICATE RESULTS-CONVENTIONALS
AB23-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Analyte	Method	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: AB23A Client ID: MW-1						
Chloride	EPA 325.2	03/30/15	mg/L	3.0	3.0	0.0%
N-Ammonia	EPA 350.1M	03/26/15	mg-N/L	0.098	0.100	2.0%
N-Nitrite	EPA 353.2	03/19/15	mg-N/L	< 0.010	< 0.010	NA
Nitrate + Nitrite	EPA 353.2	03/19/15	mg-N/L	0.042	0.042	0.0%
Sulfate	EPA 375.2	03/25/15	mg/L	253	255	0.8%
Chemical Oxygen Demand	EPA 410.4	03/26/15	mg/L	< 10.0	< 10.0	NA
Total Organic Carbon	EPA 9060	03/19/15	mg/L	< 1.50	< 1.50	NA

MS/MSD RESULTS-CONVENTIONALS
AB23-Parametrix, Inc.

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/31/15

Project: Newcastle LF GW Monitoring
Event: 553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Analyte	Method	Date	Units	Sample	Spike	Spike Added	Recovery
ARI ID: AB23A Client ID: MW-1							
Chloride	EPA 325.2	03/30/15	mg/L	3.0	8.2	5.0	104.0%
N-Ammonia	EPA 350.1M	03/26/15	mg-N/L	0.098	0.614	0.500	103.2%
N-Nitrite	EPA 353.2	03/19/15	mg-N/L	< 0.010	0.500	0.500	100.0%
Nitrate + Nitrite	EPA 353.2	03/19/15	mg-N/L	0.042	0.553	0.500	102.2%
Sulfate	EPA 375.2	03/25/15	mg/L	253	876	600	103.8%
Chemical Oxygen Demand	EPA 410.4	03/26/15	mg/L	< 10.0	95.4	100	95.4%
Total Organic Carbon	EPA 9060	03/19/15	mg/L	< 1.50	20.3	20.0	101.5%

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: MW-1
SAMPLE

Lab Sample ID: AB23A
LIMS ID: 15-5175
Matrix: Water
Data Release Authorized:
Reported: 03/30/15

QC Report No: AB23-Parametrix, Inc.
Project: Newcastle LF GW Monitoring
553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	µg/L	Q
200.8	03/20/15	200.8	03/24/15	**7440-38-2**	**Arsenic**	0.2	**0.6**	
6010C	03/20/15	6010C	03/26/15	**7440-70-2**	**Calcium**	50	**135,000**	
6010C	03/20/15	6010C	03/26/15	**7439-89-6**	**Iron**	50	**870**	
6010C	03/20/15	6010C	03/26/15	**7439-95-4**	**Magnesium**	50	**41,700**	
6010C	03/20/15	6010C	03/26/15	**7439-96-5**	**Manganese**	1	**76**	
6010C	03/20/15	6010C	03/26/15	**7440-66-6**	**Zinc**	10	**10**	

Calculated Dissolved Hardness (ug-CaCO3/L): 510000

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: MW-1
DUPLICATE

Lab Sample ID: AB23A
LIMS ID: 15-5175
Matrix: Water
Data Release Authorized:
Reported: 03/30/15

QC Report No: AB23-Parametrix, Inc.
Project: Newcastle LF GW Monitoring
553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

MATRIX DUPLICATE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Duplicate	RPD	Control Limit	Q
Arsenic	200.8	0.6	0.6	0.0%	+/- 0.2	L
Calcium	6010C	135,000	135,000	0.0%	+/- 20%	
Iron	6010C	870	880	1.1%	+/- 20%	
Magnesium	6010C	41,700	41,800	0.2%	+/- 20%	
Manganese	6010C	76	77	1.3%	+/- 20%	
Zinc	6010C	10	10	0.0%	+/- 10	L

Reported in µg/L

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

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-1
MATRIX SPIKE

Lab Sample ID: AB23A
LIMS ID: 15-5175
Matrix: Water
Data Release Authorized:
Reported: 03/30/15

QC Report No: AB23-Parametrix, Inc.
Project: Newcastle LF GW Monitoring
553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

MATRIX SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Spike	Spike Added	% Recovery	Q
Arsenic	200.8	0.6	30.2	25.0	118%	
Calcium	6010C	135,000	143,000	10,000	80.0%	H
Iron	6010C	870	2,760	2,000	94.5%	
Magnesium	6010C	41,700	49,600	10,000	79.0%	H
Manganese	6010C	76	565	500	97.8%	
Zinc	6010C	10	480	500	94.0%	

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%

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: MW-2
SAMPLE

Lab Sample ID: AB23B
LIMS ID: 15-5176
Matrix: Water
Data Release Authorized:
Reported: 03/30/15

QC Report No: AB23-Parametrix, Inc.
Project: Newcastle LF GW Monitoring
553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	µg/L	Q
200.8	03/20/15	200.8	03/24/15	**7440-38-2**	**Arsenic**	0.2	**0.4**	
6010C	03/20/15	6010C	03/26/15	**7440-70-2**	**Calcium**	50	**72,500**	
6010C	03/20/15	6010C	03/26/15	**7439-89-6**	**Iron**	50	**680**	
6010C	03/20/15	6010C	03/26/15	**7439-95-4**	**Magnesium**	50	**28,300**	
6010C	03/20/15	6010C	03/26/15	**7439-96-5**	**Manganese**	1	**110**	
6010C	03/20/15	6010C	03/26/15	7440-66-6	Zinc	10	10	U

Calculated Dissolved Hardness (ug-CaCO3/L): 300000

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-3
SAMPLE

Lab Sample ID: AB23C
LIMS ID: 15-5177
Matrix: Water
Data Release Authorized:
Reported: 03/30/15

QC Report No: AB23-Parametrix, Inc.
Project: Newcastle LF GW Monitoring
553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	µg/L	Q
200.8	03/20/15	200.8	03/24/15	**7440-38-2**	**Arsenic**	0.2	**2.8**	
6010C	03/20/15	6010C	03/26/15	**7440-70-2**	**Calcium**	50	**15,100**	
6010C	03/20/15	6010C	03/26/15	**7439-89-6**	**Iron**	50	**620**	
6010C	03/20/15	6010C	03/26/15	**7439-95-4**	**Magnesium**	50	**8,130**	
6010C	03/20/15	6010C	03/26/15	**7439-96-5**	**Manganese**	.1	**14**	
6010C	03/20/15	6010C	03/26/15	7440-66-6	Zinc	10	10	U

Calculated Dissolved Hardness (ug-CaCO3/L): 71000

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: MW-5
SAMPLE

Lab Sample ID: AB23D
LIMS ID: 15-5178
Matrix: Water
Data Release Authorized:
Reported: 03/30/15

QC Report No: AB23-Parametrix, Inc.
Project: Newcastle LF GW Monitoring
553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	µg/L	Q
200.8	03/20/15	200.8	03/24/15	**7440-38-2**	**Arsenic**	0.2	**16.2**	
6010C	03/20/15	6010C	03/26/15	**7440-70-2**	**Calcium**	50	**72,800**	
6010C	03/20/15	6010C	03/26/15	**7439-89-6**	**Iron**	50	**5,640**	
6010C	03/20/15	6010C	03/26/15	**7439-95-4**	**Magnesium**	50	**31,700**	
6010C	03/20/15	6010C	03/26/15	**7439-96-5**	**Manganese**	1	**694**	
6010C	03/20/15	6010C	03/26/15	7440-66-6	Zinc	10	10	U

Calculated Dissolved Hardness (ug-CaCO3/L): 310000

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW-6
SAMPLE

Lab Sample ID: AB23E
LIMS ID: 15-5179
Matrix: Water
Data Release Authorized:
Reported: 03/30/15

QC Report No: AB23-Parametrix, Inc.
Project: Newcastle LF GW Monitoring
553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	µg/L	Q
200.8	03/20/15	200.8	03/24/15	**7440-38-2**	**Arsenic**	0.2	**2.7**	
6010C	03/20/15	6010C	03/26/15	**7440-70-2**	**Calcium**	50	**15,100**	
6010C	03/20/15	6010C	03/26/15	**7439-89-6**	**Iron**	50	**640**	
6010C	03/20/15	6010C	03/26/15	**7439-95-4**	**Magnesium**	50	**8,280**	
6010C	03/20/15	6010C	03/26/15	**7439-96-5**	**Manganese**	1	**14**	
6010C	03/20/15	6010C	03/26/15	7440-66-6	Zinc	10	10	U

Calculated Dissolved Hardness (ug-CaCO3/L): 72000

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: Seep-a
SAMPLE

Lab Sample ID: AB23F
LIMS ID: 15-5180
Matrix: Water
Data Release Authorized:
Reported: 03/30/15

QC Report No: AB23-Parametrix, Inc.
Project: Newcastle LF GW Monitoring
553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	µg/L	Q
200.8	03/20/15	200.8	03/24/15	**7440-38-2**	**Arsenic**	0.2	**0.4**	
6010C	03/20/15	6010C	03/26/15	**7440-70-2**	**Calcium**	50	**28,600**	
6010C	03/20/15	6010C	03/26/15	**7439-89-6**	**Iron**	50	**16,900**	
6010C	03/20/15	6010C	03/26/15	**7439-95-4**	**Magnesium**	50	**10,500**	
6010C	03/20/15	6010C	03/26/15	**7439-96-5**	**Manganese**	1	**7,890**	
6010C	03/20/15	6010C	03/26/15	7440-66-6	Zinc	10	10	U

Calculated Dissolved Hardness (ug-CaCO3/L): 110000

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: Seep-b
SAMPLE

Lab Sample ID: AB23G
LIMS ID: 15-5181
Matrix: Water
Data Release Authorized:
Reported: 03/30/15

QC Report No: AB23-Parametrix, Inc.
Project: Newcastle LF GW Monitoring
553-1625-002
Date Sampled: 03/18/15
Date Received: 03/18/15

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	µg/L	Q
200.8	03/20/15	200.8	03/24/15	**7440-38-2**	**Arsenic**	0.2	**0.4**	
6010C	03/20/15	6010C	03/26/15	**7440-70-2**	**Calcium**	50	**28,600**	
6010C	03/20/15	6010C	03/26/15	**7439-89-6**	**Iron**	50	**16,800**	
6010C	03/20/15	6010C	03/26/15	**7439-95-4**	**Magnesium**	50	**10,500**	
6010C	03/20/15	6010C	03/26/15	**7439-96-5**	**Manganese**	1	**7,860**	
6010C	03/20/15	6010C	03/26/15	7440-66-6	Zinc	10	10	U

Calculated Dissolved Hardness (ug-CaCO3/L): 110000

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: METHOD BLANK

Lab Sample ID: AB23MB
LIMS ID: 15-5181
Matrix: Water
Data Release Authorized:
Reported: 03/30/15

QC Report No: AB23-Parametrix, Inc.
Project: Newcastle LF GW Monitoring
553-1625-002
Date Sampled: NA
Date Received: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	µg/L	Q
200.8	03/20/15	200.8	03/24/15	7440-38-2	Arsenic	0.2	0.2	U
6010C	03/20/15	6010C	03/26/15	7440-70-2	Calcium	50	50	U
6010C	03/20/15	6010C	03/26/15	7439-89-6	Iron	50	50	U
6010C	03/20/15	6010C	03/26/15	7439-95-4	Magnesium	50	50	U
6010C	03/20/15	6010C	03/26/15	7439-96-5	Manganese	1	1	U
6010C	03/20/15	6010C	03/26/15	7440-66-6	Zinc	10	10	U

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: LAB CONTROL

Lab Sample ID: AB23LCS
LIMS ID: 15-5181
Matrix: Water
Data Release Authorized:
Reported: 03/30/15

QC Report No: AB23-Parametrix, Inc.
Project: Newcastle LF GW Monitoring
553-1625-002
Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Arsenic	200.8	28.9	25.0	116%	
Calcium	6010C	9860	10000	98.6%	
Iron	6010C	1970	2000	98.5%	
Magnesium	6010C	10200	10000	102%	
Manganese	6010C	487	500	97.4%	
Zinc	6010C	500	500	100%	

Reported in µg/L

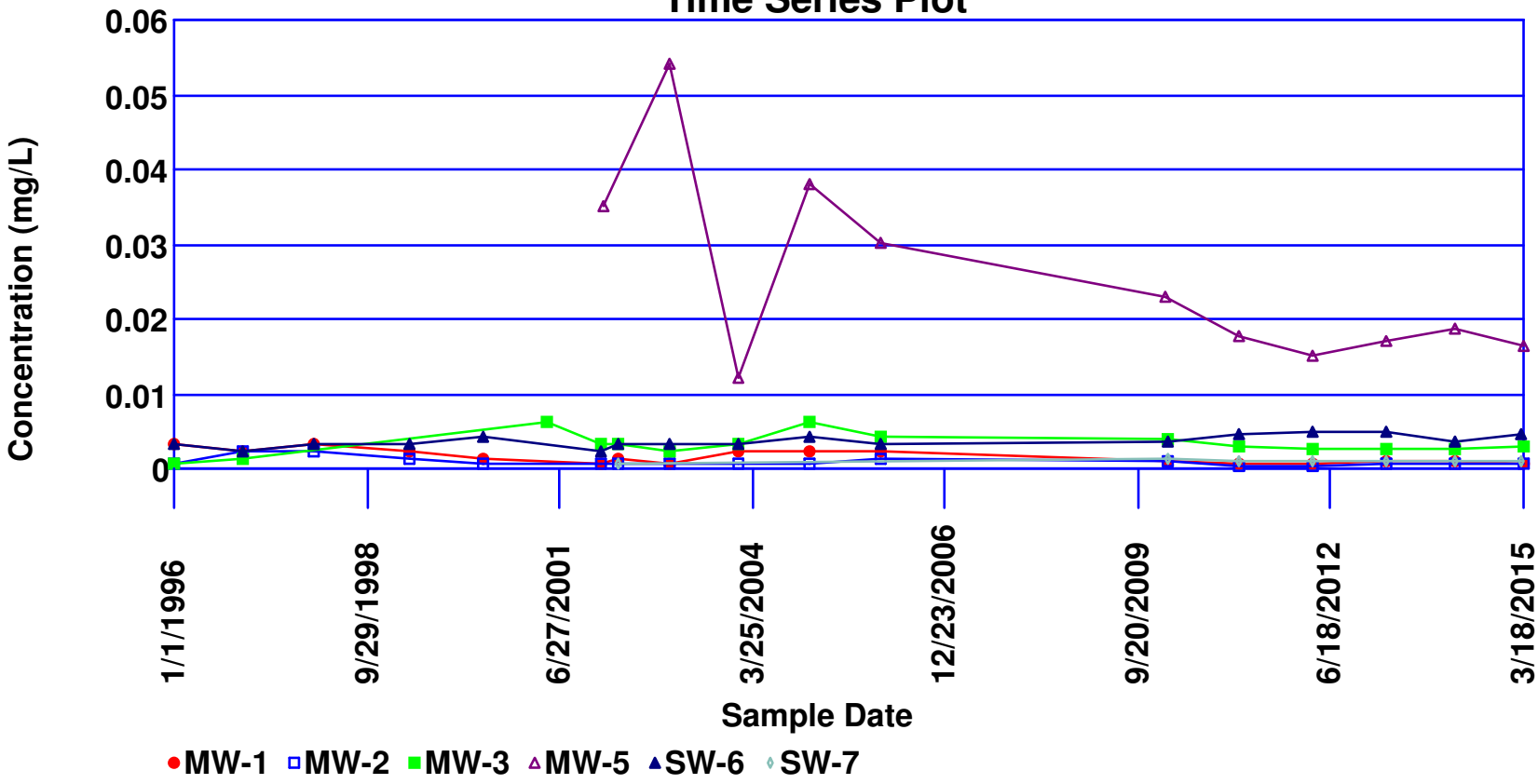
N-Control limit not met
Control Limits: 80-120%

Appendix B

Time-Series Plots

Newcastle Landfill

Time Series Plot

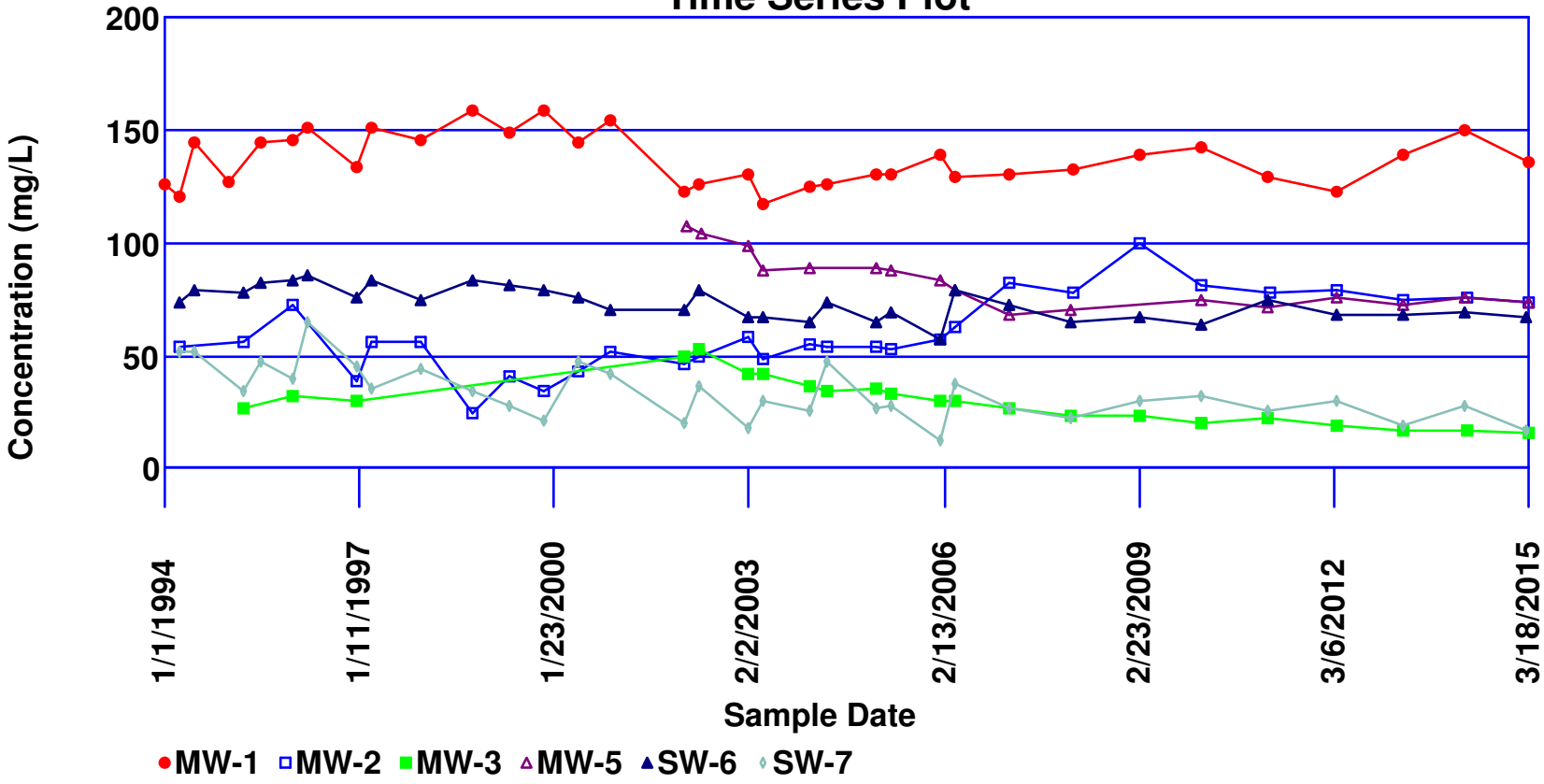


Arsenic, Dissolved

Non-Detects Replaced with 1/2 DL

Newcastle Landfill

Time Series Plot

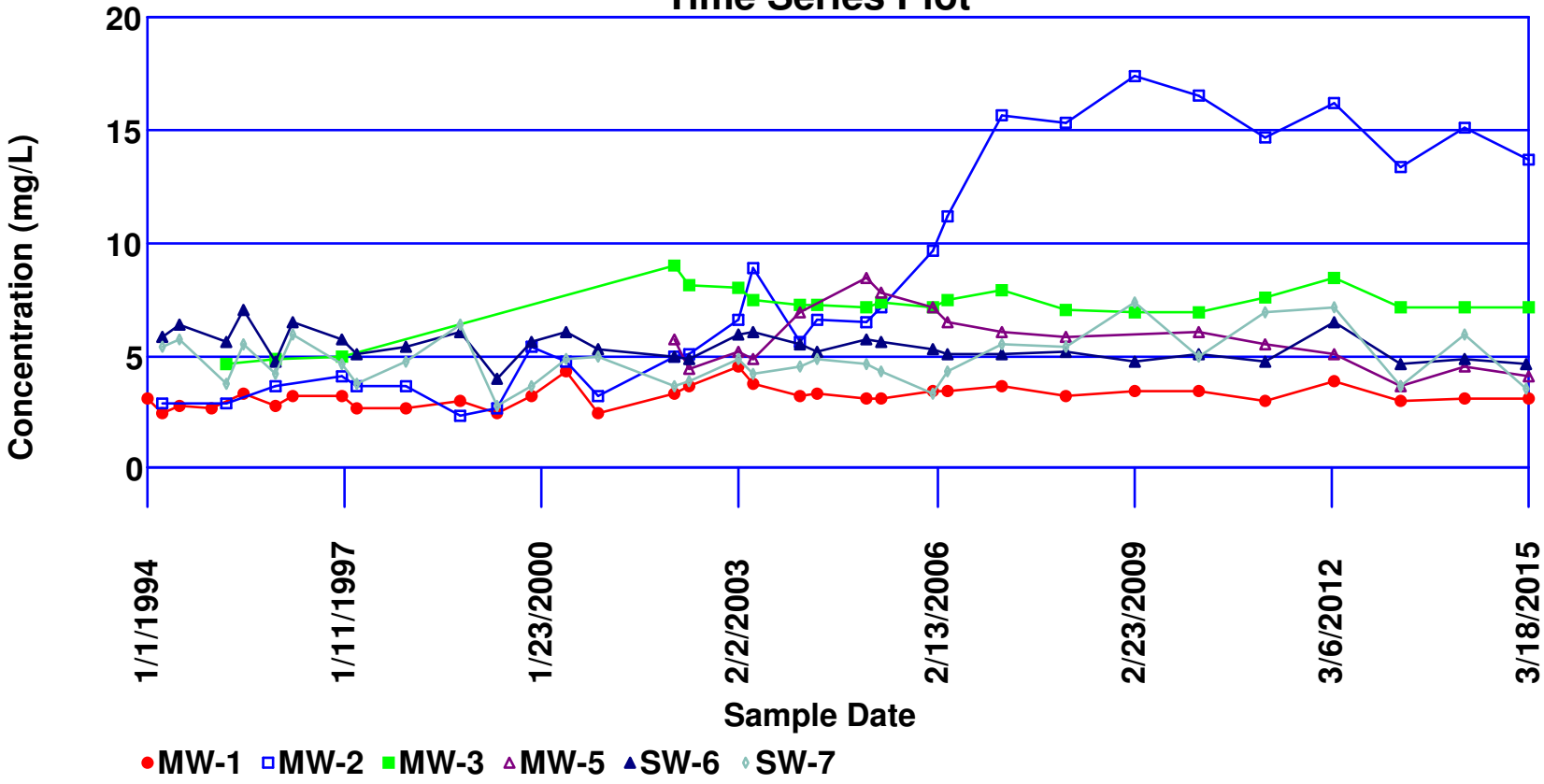


Calcium, Dissolved

Non-Detects Replaced with 1/2 DL

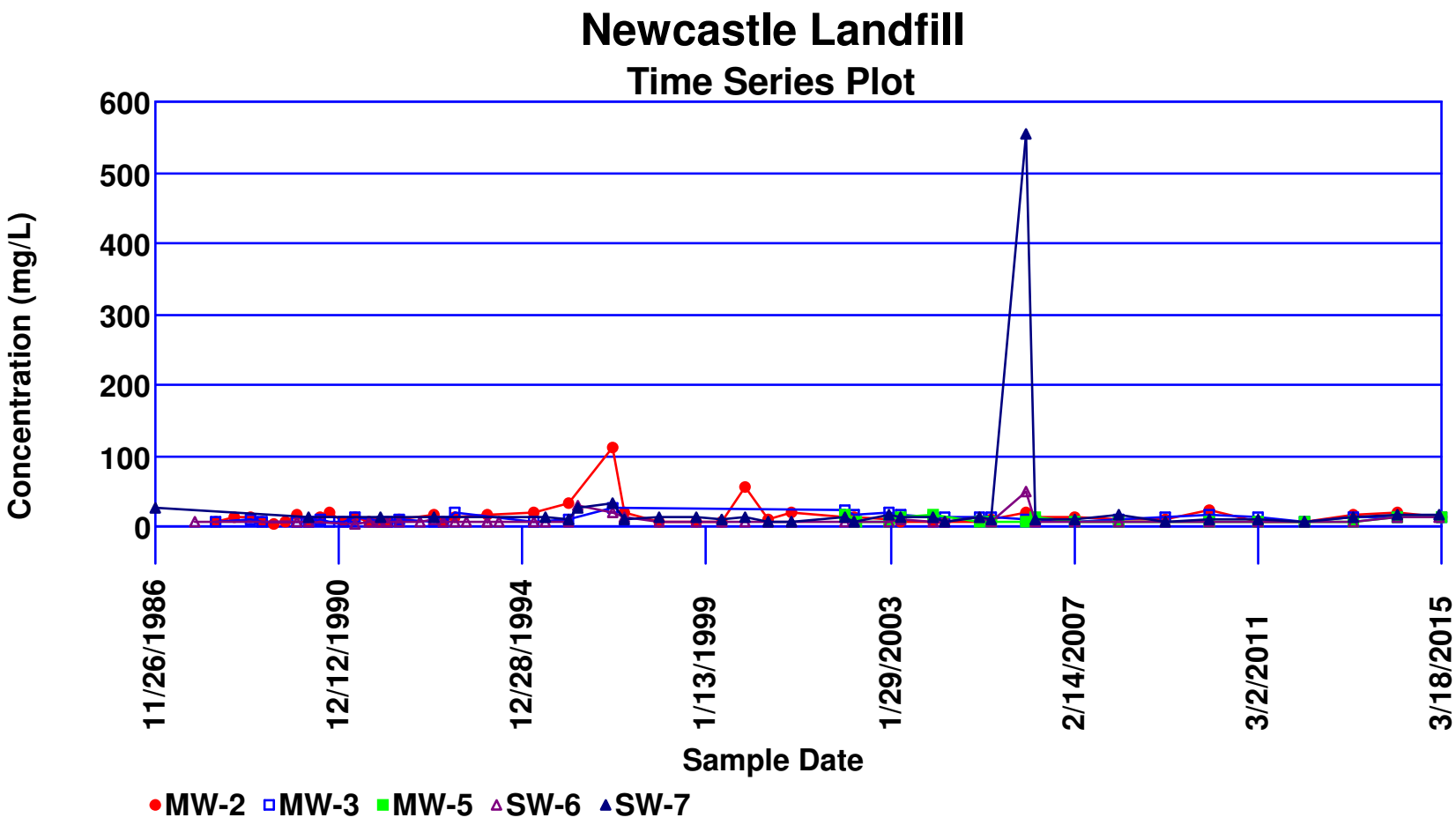
Newcastle Landfill

Time Series Plot



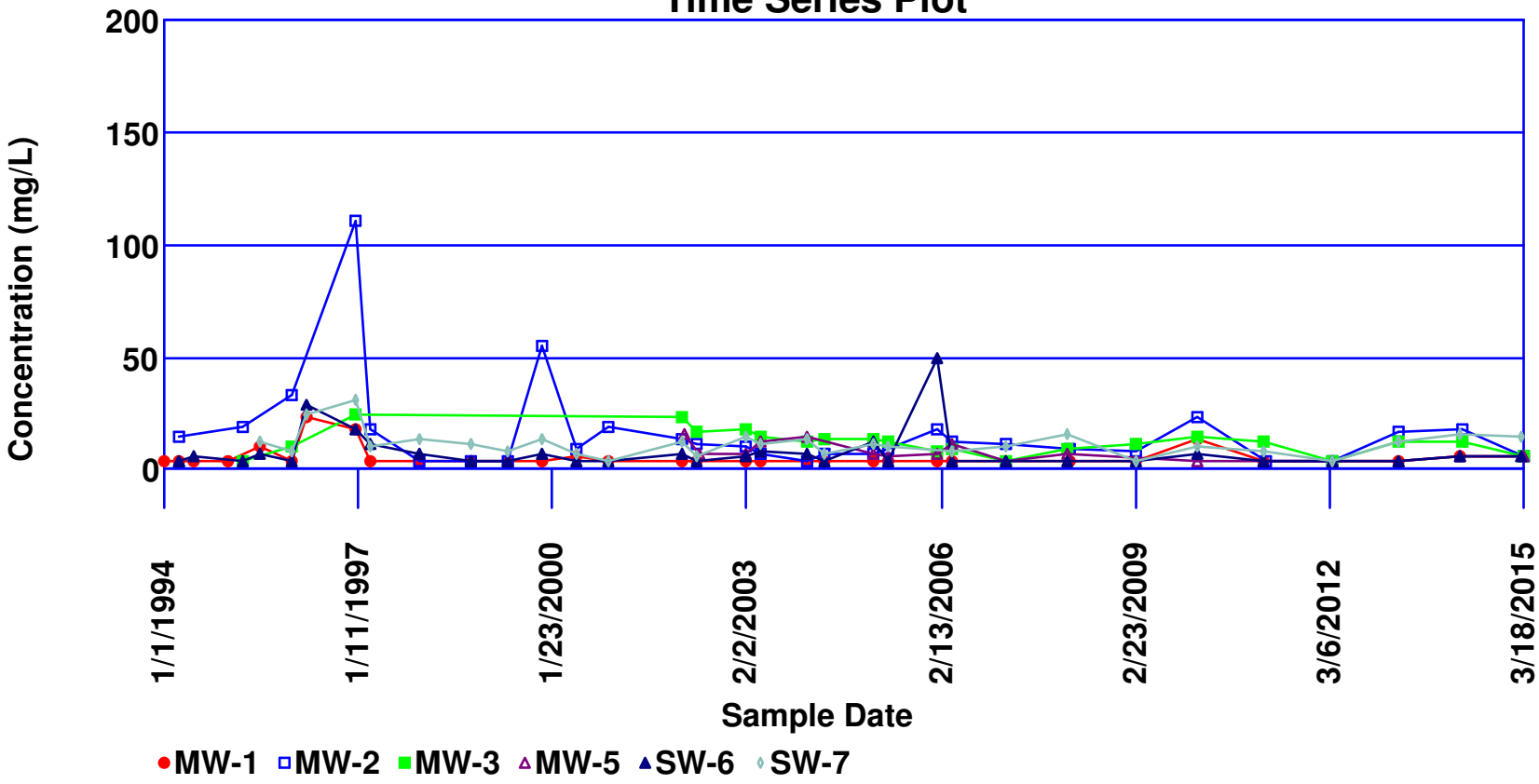
Chloride

Non-Detects Replaced with 1/2 DL


Newcastle Landfill
Time Series Plot
Concentration (mg/L)
600
500
400
300
200
100
0
11/26/1986
12/12/1990
12/28/1994
1/13/1999
1/29/2003
2/14/2007
3/2/2011
3/18/2015
Sample Date
MW-2
MW-3
MW-5
SW-6
SW-7

Newcastle Landfill

Time Series Plot

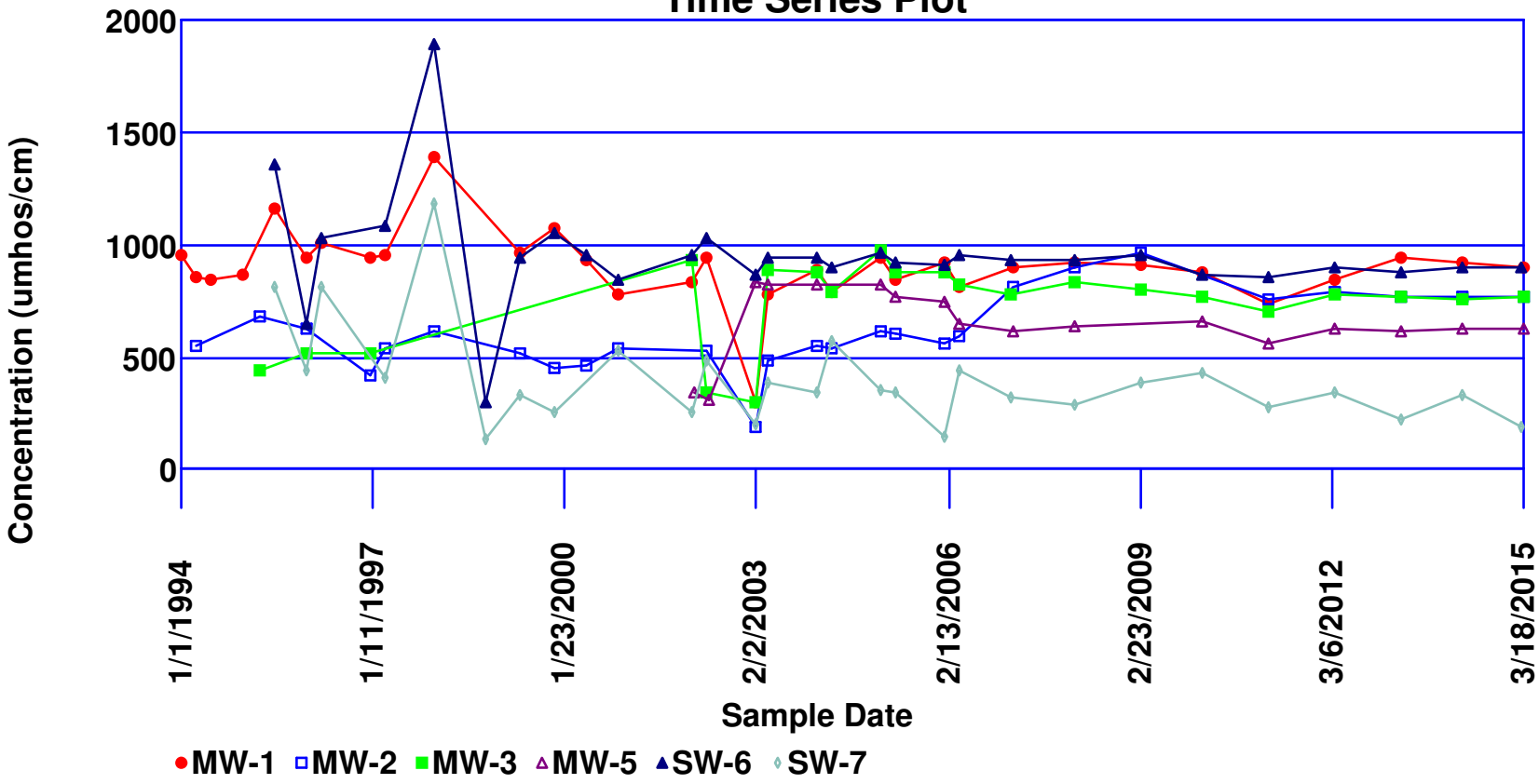


COD

Non-Detects Replaced with 1/2 DL

Newcastle Landfill

Time Series Plot

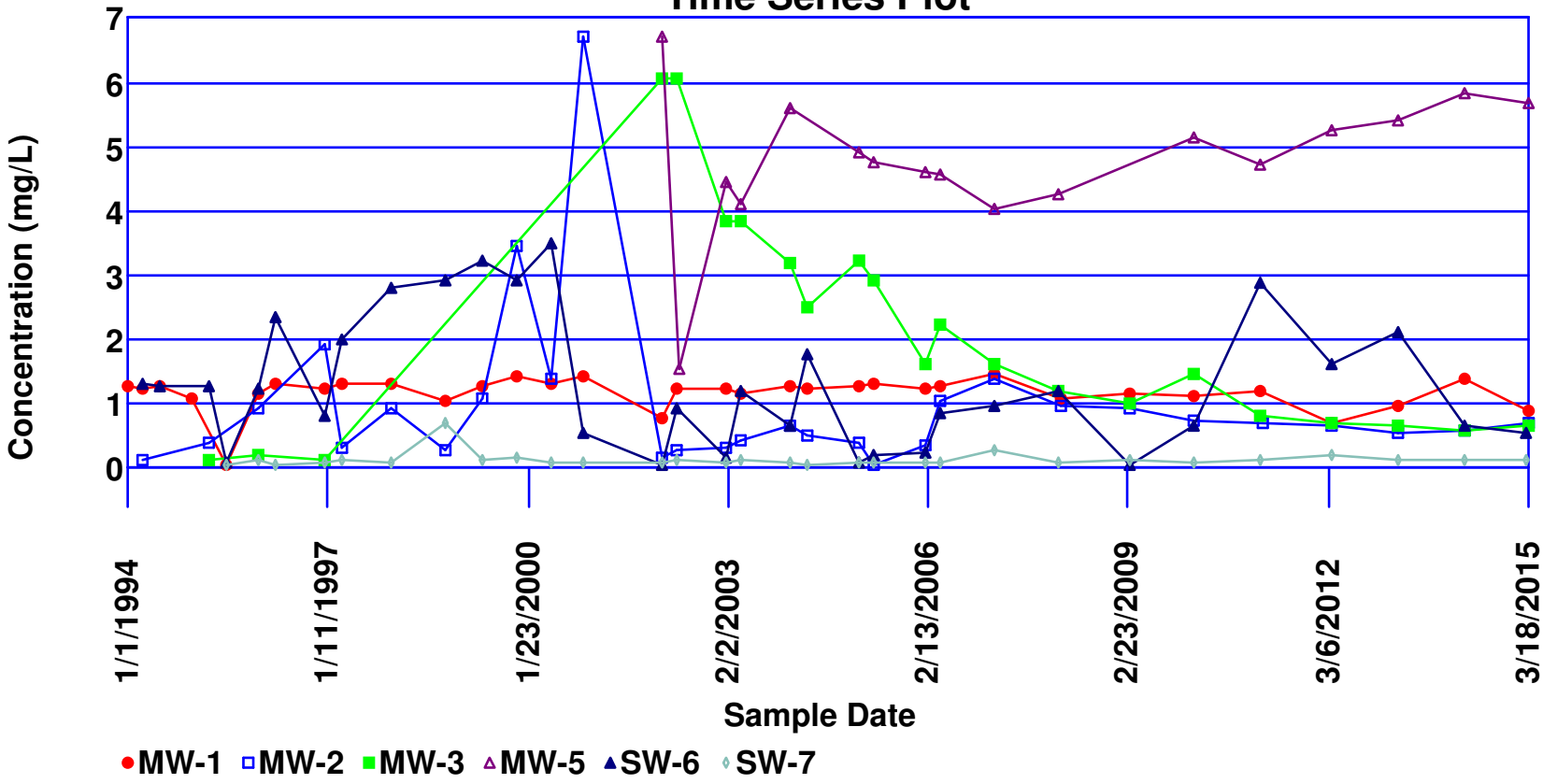


Specific Conductivity

Non-Detects Replaced with 1/2 DL

Newcastle Landfill

Time Series Plot

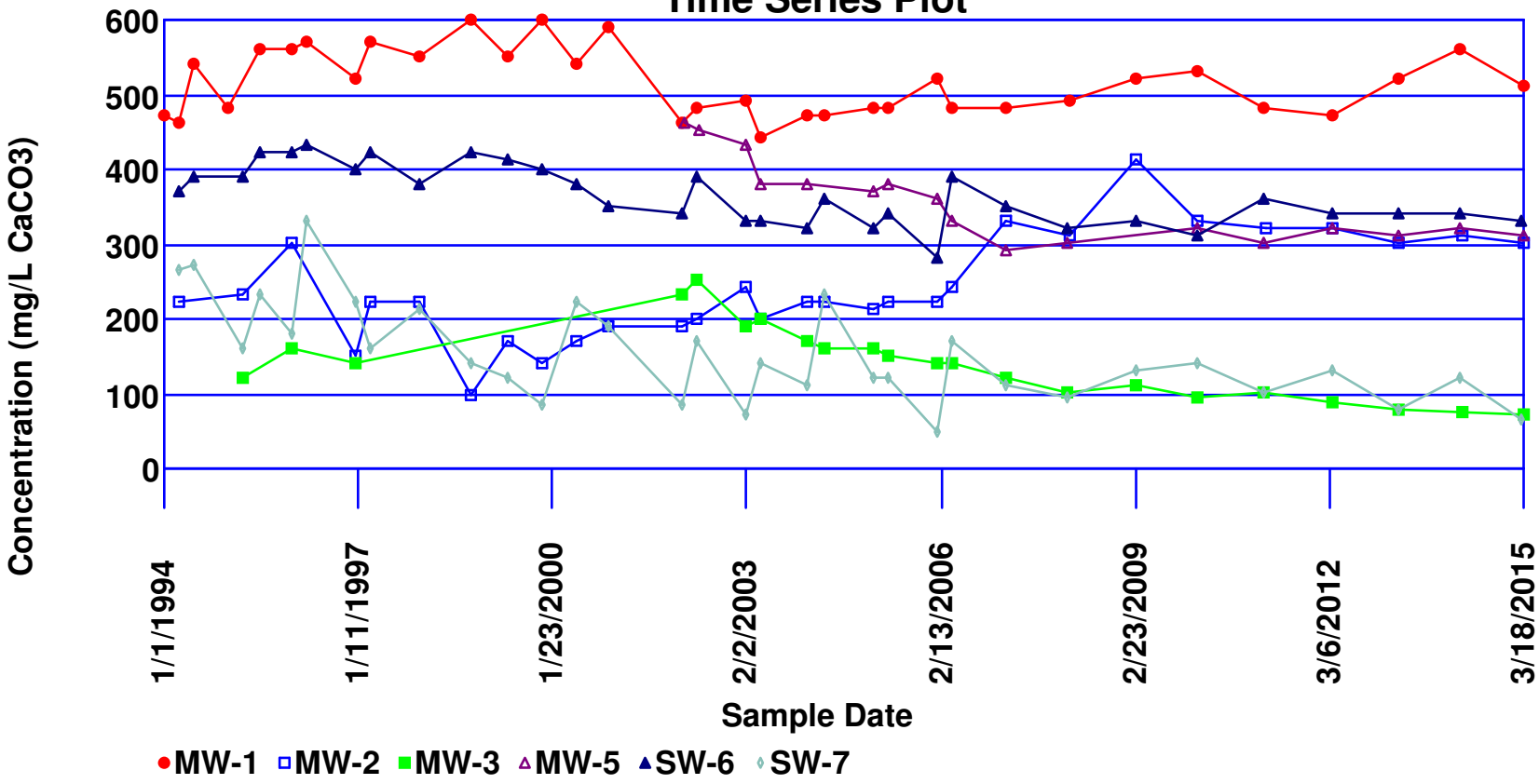


Iron, Dissolved

Non-Detects Replaced with 1/2 DL

Newcastle Landfill

Time Series Plot

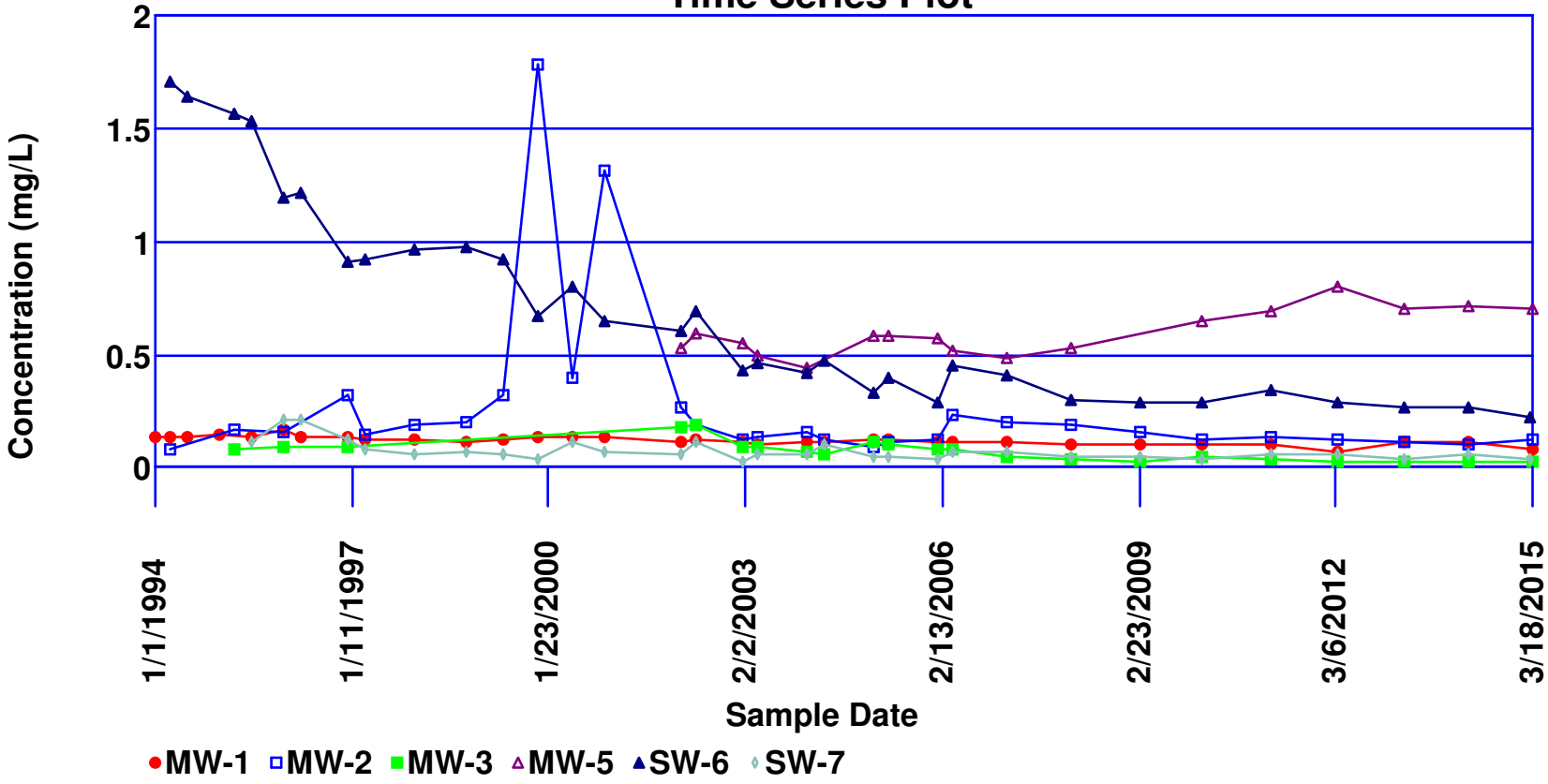


Hardness, Dissolved

Non-Detects Replaced with 1/2 DL

Newcastle Landfill

Time Series Plot

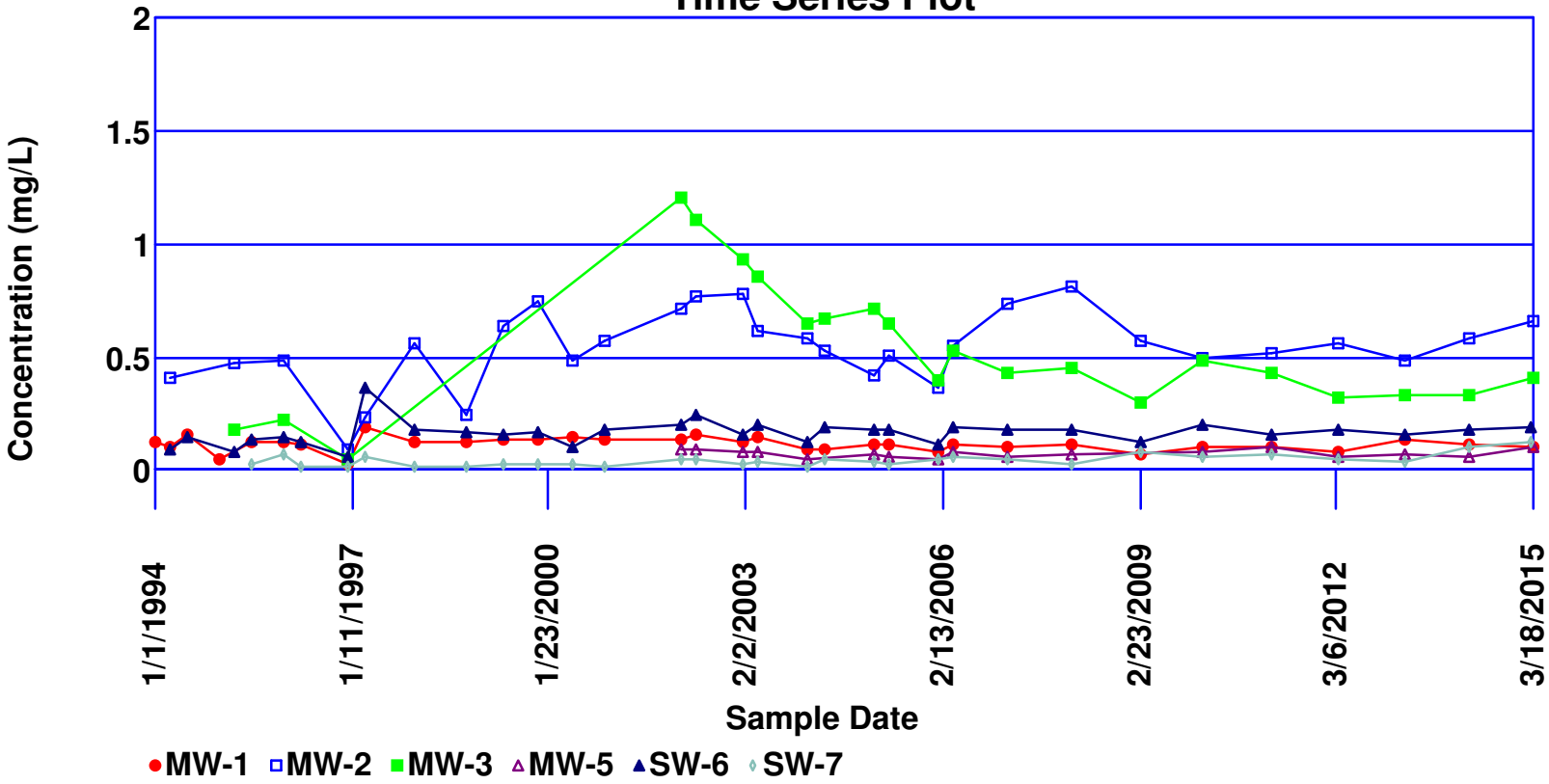


Manganese, Dissolved

Non-Detects Replaced with 1/2 DL

Newcastle Landfill

Time Series Plot

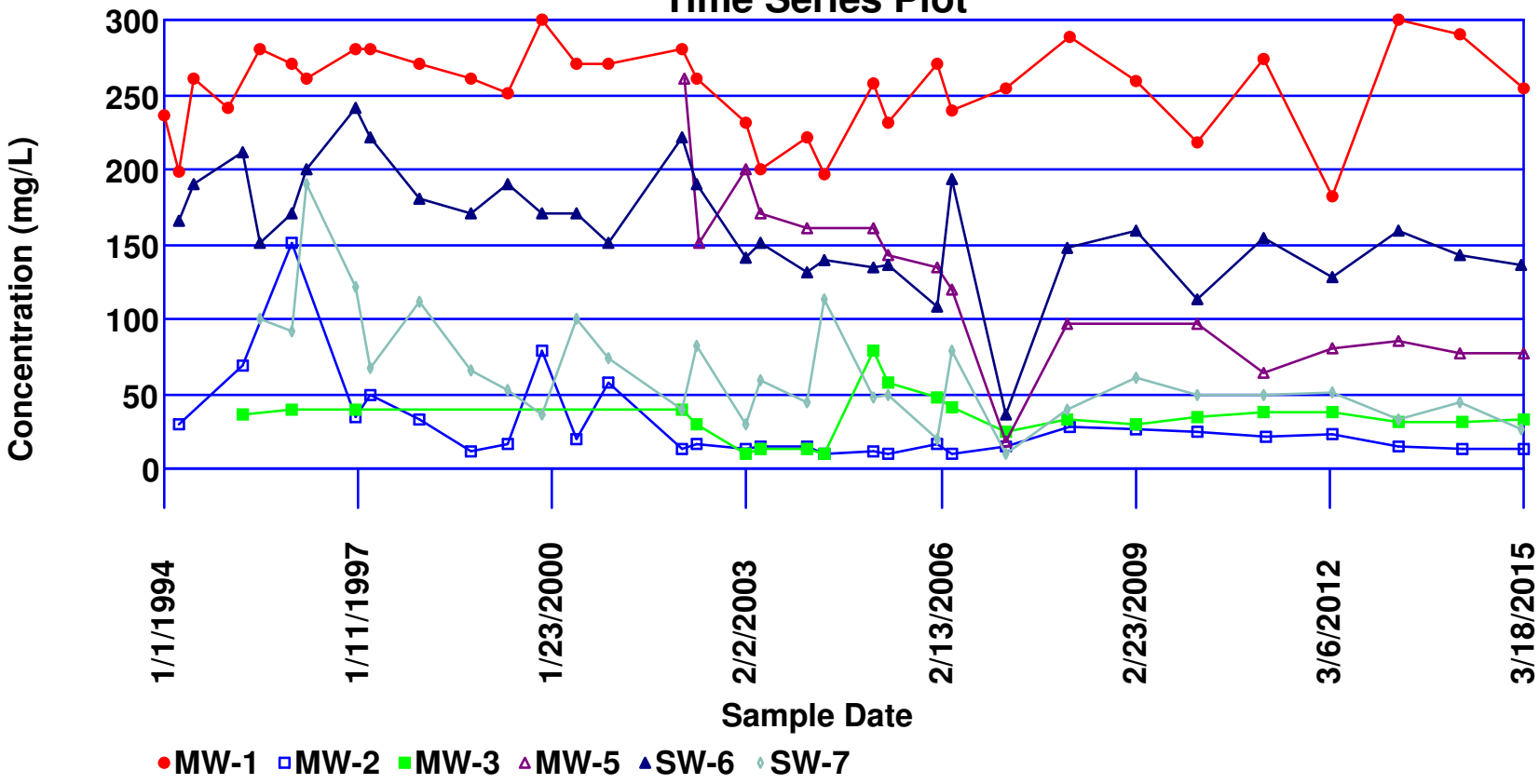


Ammonia-N

Non-Detects Replaced with 1/2 DL

Newcastle Landfill

Time Series Plot

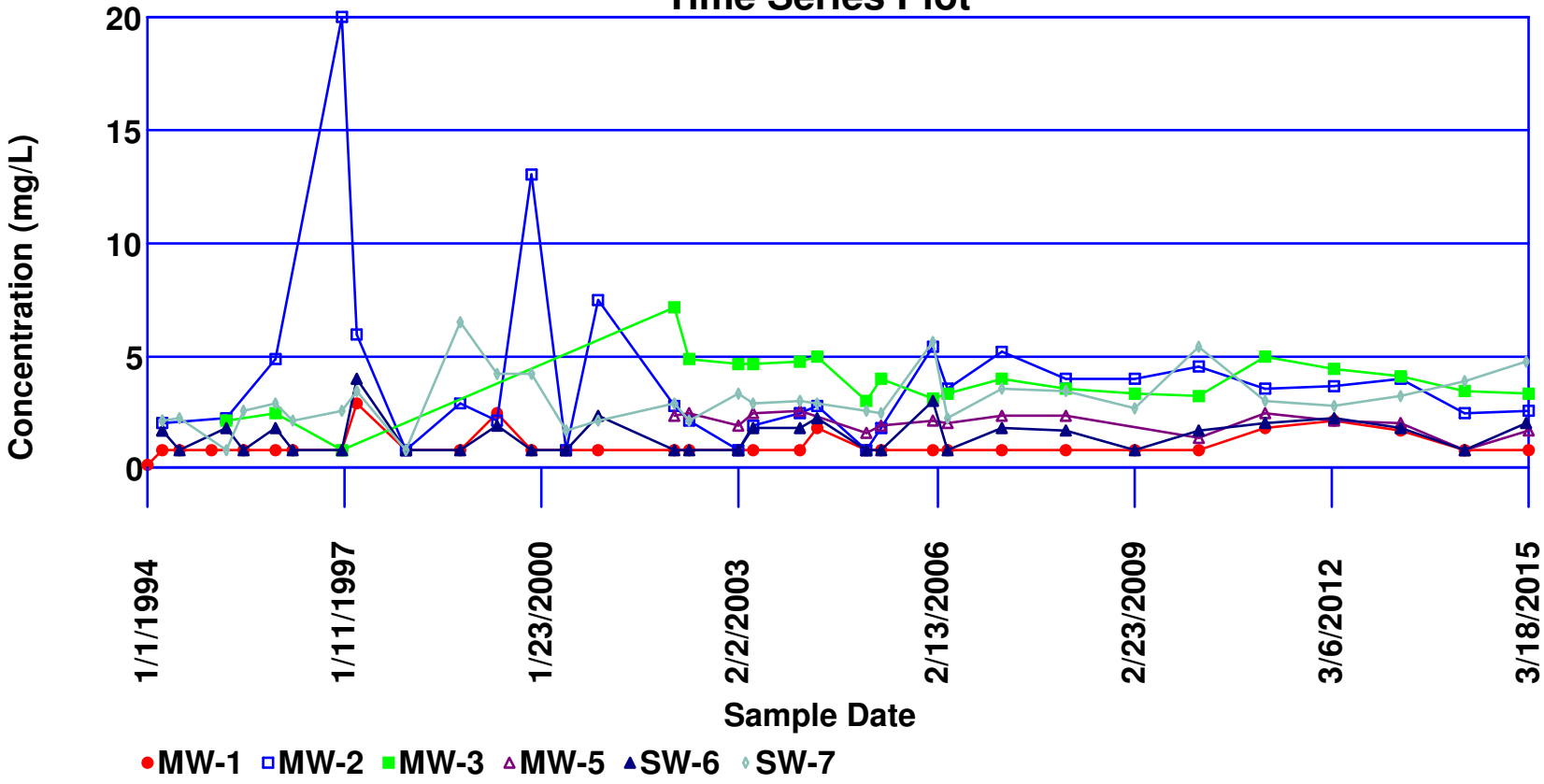


Sulfate

Non-Detects Replaced with 1/2 DL

Newcastle Landfill

Time Series Plot



TOC

Non-Detects Replaced with 1/2 DL