Tennessee Valley Authority
Johnsonville Fossil Plant
DuPont Road Dredged Ash Disposal Area
IDL 43-102-0082

GROUNDWATER MONITORING REPORT
SEPTEMBER 2015

Prepared by:
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Nashville, Tennessee
November 2015

TVA Johnsonville Fossil Plant
DuPont Road Dredged Ash Disposal Area (IDL 43-102-0082)
Groundwater Monitoring Report – September 2015

DOCUMENT CERTIFICATION

I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. As specified in T.C.A. § 39-16-702(a)(4), this declaration is made under penalty of perjury.

Stephen L. Holland, Acting Plant Manager
Johnsonville Fossil Plant
November 20, 2015

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INTRODUCTION

This report contains semiannual detection monitoring results for groundwater samples collected on September 22, 2015, from the four designated monitoring wells associated with the closed Class II DuPont Road Dredged Ash Disposal Area at Johnsonville Fossil Plant (JOF). The disposal area is also referred to as the DuPont Dredge Cell, and carries solid waste permit number IDL 43-102-0082. TVA completed closure of the DuPont Dredge Cell in 2012 by capping it with a polyethylene and geocomposite cap, covered with 18 inches of soil. The TDEC verification of final closure was dated September 19, 2012, and the site is in post-closure monitoring. Water samples were analyzed by ESC Lab Sciences (ESC) of Mt. Juliet, TN. Sample collection and statistical evaluation of monitoring data were performed by TVA staff in accordance with Tennessee Department of Environment and Conservation (TDEC) Rule 0400-11-01-.04 and the Groundwater Detection Monitoring Program Plan approved by TDEC in a letter dated August 14, 2012.

As indicated in the approved Groundwater Detection Monitoring Program Plan, interwell-based prediction intervals are used for statistical analysis of the September 2015 groundwater detection monitoring data. A narrative description of the statistical methodology, including the outlier screening approach for background monitoring data, is presented in the *Statistical Evaluation* section of this report. This method replaces an intrawell-based statistical method used in evaluating monitoring data between March 1995 and March 2011.

GROUNDWATER SAMPLING

Groundwater sampling was performed by Monte W. Starks (TVA). Unfiltered water samples were collected using a submersible (centrifugal) pump from downgradient monitoring wells B10, B11 and B12, and from upgradient well B13. Field quality control (QC) samples included an equipment rinsate blank collected after sampling well B13, and a pair of duplicate samples obtained from B12. Field parameters (i.e., temperature, specific conductance, pH, dissolved oxygen, oxidation-reduction potential, and turbidity) were monitored during well purging using a flow-through cell and calibrated instruments. Each well was considered properly evacuated when field parameters remained stable, and after purging a minimum of three well volumes. Field data sheets are given in Appendix A.

Immediately following collection, samples were transferred to new sample bottles provided by

the laboratory with appropriate preservatives, where applicable. The samples were then sealed, labeled, recorded on a custody form, and placed in an iced cooler for transport. Samples were received by ESC on September 24, 2015. A copy of the sample custody record is presented in Appendix B.

ANALYTICAL RESULTS

Groundwater samples were analyzed for the 17 required inorganic constituents specified in Appendix I of TDEC Rule 0400-11-01-.04. Appendix B contains the ESC lab report (L754493) with the analytical results. Table 1 presents a summary of laboratory results by monitoring well. There were no maximum contaminant level (MCL) or statistical exceedances for any of the samples, therefore meeting drinking water standards for the parameters analyzed. The statistical exceedance for chromium at Well B10 during the September 2014 sampling event was not confirmed during resampling on November 25, 2014. The resampled chromium measurement was below the detection limit of 2 micrograms per liter (ug/L), and therefore the result is statistically insignificant. Statistical testing results for the September 2015 groundwater monitoring data are also summarized in Table 1, and are indicated as background upper prediction limits (UPLs).

All analytical testing for this sampling event was conducted within recommended sample holding times. The complete laboratory report presented in Appendix B includes analytical methods, detection limits, and QC qualifiers (where applicable).

STATISTICAL EVALUATION

Prediction interval methods applied on an interwell basis were used for statistical evaluation of the September 2015 groundwater detection monitoring data. In general, one-sided UPLs derived from *n* background measurements and having a (1-α) probability of including at least one of two future measurements at compliance wells are computed for each constituent using the methodology of Gibbons (1994, pp. 8-76), where α is the Type 1 (false-positive) error level. Future sample constituent measurements from compliance wells are compared to background prediction limits derived from available background monitoring data. If any new measurements exceed the background UPL, one independent resample is collected from each monitoring well having a statistical exception. Resamples are analyzed only for exceeded constituents. If the resample also exceeds the UPL, the exceedance would be deemed statistically significant; otherwise, the original UPL exceedance would be considered insignificant.

Table 1. September 22, 2015 Groundwater Monitoring Results

Constituent	Units	B10 downgradient	B11 downgradient	B12 downgradient	B12 - DUP downgradient	B13 background	Background UPL[a]	MCL
Antimony	µg/L	<2	<2	<2	<2	<2	3.0	6
Arsenic	µg/L	<2	<2	<2	<2	<2	5.0	10
Barium	µg/L	20.6	244	502	492	826	1000	2,000
Beryllium	µg/L	<2	<2	<2	<2	<2	2.0	4
Cadmium	µg/L	<1	<1	<1	<1	2.05	2.5	5
Chromium	µg/L	2.47	<2	<2	<2	5.58	9.7	100
Cobalt	µg/L	<2	<2	<2	<2	3.11	12.0	--
Copper	µg/L	<5	<5	<5	<5	<5	20.0	--
Fluoride	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	0.40	4
Lead	µg/L	<2	<2	<2	<2	<2	12.0	15
Mercury	µg/L	<0.2	<0.2	<0.2	<0.2	0.301	0.32	2
Nickel	µg/L	4.93	6.22	17.5	17.1	19.2	36.6	100
Selenium	µg/L	<2	<2	<2	<2	<2	5.6	50
Silver	µg/L	<2	<2	<2	<2	<2	10.0	100
Thallium	µg/L	<2	<2	<2	<2	<2	2.0	2
Vanadium	µg/L	<5	<5	<5	<5	<5	10.0	--
Zinc	µg/L	<25	<25	25.9	<25	30.6	83.6	--
Turbidity	NTU	5.1	2.7	4.7	--	5.2	--	--

a - UPL based on B13 data between 9/24/1996 and 9/23/2015 after outlier removal.

***Bold** values exceed background UPLs.*

Implementation of the prediction interval analysis is performed using the MANAGES groundwater data management and analysis software (EPRI, 2014). The appropriate form of the prediction interval method, i.e., either parametric or nonparametric, is selected for each constituent based on background data normality and the percentage of nondetectable values. Background constituent data, which are either normally or log-normally distributed (based on Shapiro-Wilk testing at the 95% confidence level), are evaluated with parametric prediction intervals. Otherwise, the non-parametric form of the prediction interval is applied.

The parametric and nonparametric forms of prediction intervals used in the analysis comply with performance standards specified in 0400-11-01-.04(7)(a)4(vi). A site-wide Type 1 error rate of 0.05 is maintained in application of the parametric prediction interval method. The corresponding individual sample constituent confidence levels (1-α) for comparisons are

computed and reported by MANAGES based on the number of compliance locations, constituents, and verification resamples using the methodology presented in the American Society for Testing and Materials (ASTM) D6312-98. For nonparametric prediction interval testing, the confidence level is based on the number of background sample data and the number of resamples.

Appendix C presents a summary of background monitoring data for well B13 collected between September 1996 and September 2015. Outliers in background data that were identified and removed prior to constituent UPL estimation for the September 2015 monitoring data evaluation are indicated in the summary table. Outliers are generally defined as constituent concentration data that do not conform to the range and distribution of other measurements. The goal is to remove abnormally high constituent concentration data that could produce a high (non-conservative) bias in background UPL estimates. Potential causes of abnormal data include analytical errors, reporting errors, and sampling bias. Of particular concern, is potential bias in metals analyses caused by the presence of suspended solids in unfiltered, acid-preserved groundwater samples. Suspended solids in groundwater samples often consist of particles of geologic material containing naturally-occurring metals, some of which may be the same as Appendix I inorganic constituents. Consequently, the measured total suspended solids (TSS) content of water samples is one factor considered in screening data outliers.

Another screening guide is comparison of sample data to the box plot extreme outlier limit concentration for each constituent dataset, where the extreme outlier limit is defined as the concentration equal to the 75^{th} data percentile plus 3 times the interquartile range (IQR). EPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities - Unified Guidance* (EPA 2009, pp. 12-5 to 12-7) indicates that box plot outlier limits can provide a useful method for screening of outliers for non-normally distributed datasets. The method is applicable to B13 background data since constituent data are largely non-normally distributed due to a high percentage of non-detects. The TSS and box plot outlier limit screening guides cannot be rigidly applied, but must be considered together and in conjunction with other factors. For example, TSS is not an appropriate screening tool for all detection monitoring constituents, since (1) not all constituents are metals, e.g., fluoride; (2) the degree of correlation between TSS and metals varies; and (3) some metals may not be present in local geologic media. Allowances are also made in applying box plot outlier limits for constituent datasets in which there is a high percentage of non-detects, particularly in cases where detection limits are

variable (e.g., antimony, beryllium, etc.). Computed background UPLs and other details pertaining to statistical analysis of constituent data are provided in Appendix D.

Time-series graphs of groundwater monitoring data for the period of record are given in Appendix E. Concentration trends have generally been stable for most of the TDEC Appendix I constituents since the mid-1990s. For many of the constituents, there is a spike in 2001 that appears to be an anomaly and possibly a lab error. For the last 18 years, from 1996 through 2014, groundwater analyses for 11 of the 17 chemical constituents (i.e., Antimony, Arsenic [prior to 2008, the MCL for arsenic was 50 ug/L], Barium, Cadmium, Chromium, Copper, Fluoride, Mercury, Nickel, Selenium, and Silver) have not shown any MCL exceedances, therefore meeting drinking water standards.

For the last 14 years, from 2001 through 2015, groundwater analyses for 3 of the 17 chemical constituents (i.e., Beryllium [once in 2001, which appears to be an anomaly], Lead [last MCL exceedance was the 2001 anomaly], and Thallium [the only detection of thallium was in 2001]) have not shown any MCL exceedances, therefore meeting drinking water standards. There are no MCLs for some of the parameters required to be monitored. TVA reviewed the EPA Regional Screening Levels (RSLs) for these constituents. For Zinc, the highest result at 200 ug/L is far less than the EPA RSL for tap water of 600 ug/L, and the secondary MCL of 5000 ug/L. Cobalt generally shows up in the background well first, and early in the sampling of the site showed up in Well B10, which is also nearest the roadway separating TVA from DuPont. This provides a strong argument that the cobalt is moving onto TVA property instead of the result of ash disposal in the TVA landfill. Based on the above-mentioned observations, TVA respectfully requests that TDEC join TVA in a formal discussion to explore the reduction in the number of parameters being monitored. TVA recognizes that any change to the parameters monitored will result in a minor modification of the permit for the groundwater monitoring plan.

The neighboring DuPont landfills, located approximately 0.5 mile east-northeast of the Dredged Ash Disposal Area, are possible sources of the elevated metals. These landfills contain process byproducts derived from titanium dioxide production from ilemenite ore. The titanium extraction process generally involves exposure of ore to chlorine gas at very high temperatures. Reaction of chloride gas with metals present in the ore would be expected to produce a variety of chloride salts as byproducts. Unless the DuPont process waste landfills include impervious bottom liners and leachate collection systems, waste leachate reaching shallow groundwater beneath

these facilities would be expected to produce elevated chloride levels in groundwater migrating toward the Dredged Ash Disposal Area.

In addition to elevated metal cations associated with ilemenite ore. Figure 1 presents time-series graphs of chloride and major cation concentrations for background well B13 groundwater samples. Data presented in Figure 1 is provided in Appendix F. The increasing trends of chloride and major cations could be indicative of dissolution of chloride salts from the DuPont landfills and their migration with shallow groundwater flow toward the Dredged Ash Disposal Area. However, additional information regarding the DuPont landfills would be required before the cause of observed constituent trends at our monitoring wells could be determined with certainty, including chemical characteristics of DuPont landfill contents, timing of landfill development, leachate containment design measures, and groundwater monitoring data for DuPont landfills.

GROUNDWATER CONDITIONS

Groundwater levels measured on September 22, 2015 prior to sample collection are presented in Table 2. The groundwater potentiometric surface derived from these measurements is shown on Figure 2. Groundwater generally flows south across the disposal site with an average horizontal hydraulic gradient of approximately 0.0015 ft/ft.

Table 2. September 22, 2015 Groundwater Level Measurements

Monitoring Well	Reference Point Elevation (feet)	Depth to Water (feet)	Water Elevation (feet)	Bottom Depth (feet)
B10	404.49	26.64	377.85	41.90
B11	401.51	21.98	379.53	36.61
B12	393.63	14.60	379.03	36.71
B13	410.50	30.38	380.12	43.83

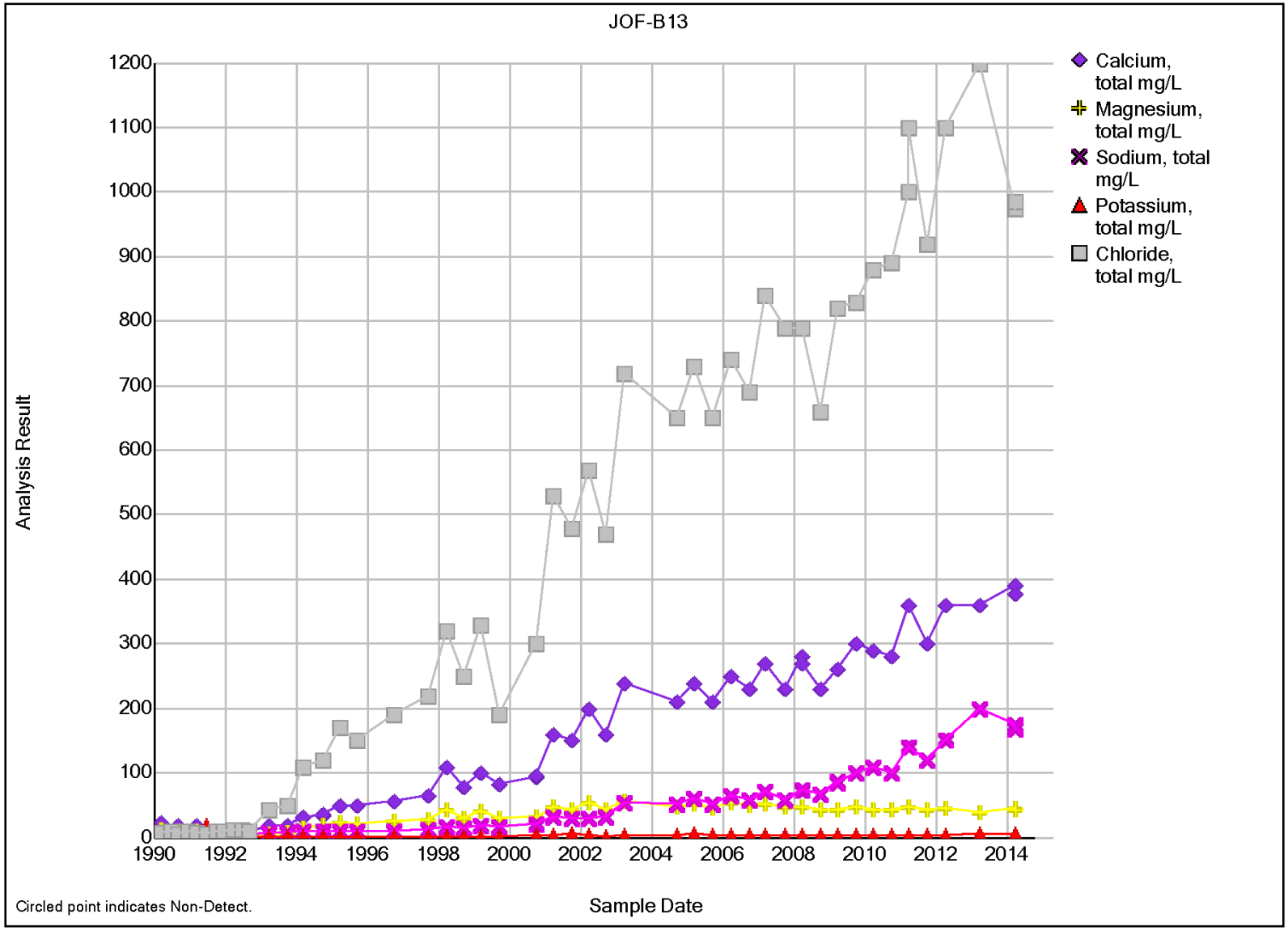


Figure 1. Chloride and Major Cation Concentration Time Series for Background Well B13 (1990 - 2014)

The DuPont Dredge Cell is immediately underlain by approximately 34 to 41 ft of alluvial terrace deposits followed by limestone bedrock of the Warsaw Formation. The hydraulic conductivity of the terrace deposits averages approximately $3x10^{-5}$ cm/s (or 0.085 ft/d) and the effective porosity is estimated to be about 30%. Using these hydraulic data and the current groundwater gradient given above, the local horizontal groundwater seepage velocity in the uppermost aquifer is estimated from Darcy's Law to be approximately 6.6×10^{-4} ft/d.

The DuPont Dredge Cell and down gradient monitoring wells are located upgradient of Kentucky Lake (Tennessee River), which is the dominant regional hydrologic feature. The down-gradient boundary for any movement of potential contaminants from the closed landfill is defined as the river's edge. Any potential contamination emanating from the closed landfill would be limited in vertical and areal extent within the TVA JOF property, and would not migrate beneath private property. Because the groundwater vertical gradients between the landfill and Kentucky Lake are upward, any potential contaminant migration from the facility into bedrock would be expected to discharge upward either into the alluvium on TVA property prior to reaching the shoreline, or assimilate into the lake itself. Groundwater contamination is effectively limited both horizontally and vertically to the JOF site boundary.

Groundwater is not used as a potable water supply at JOF. It is unlikely that ash-related constituents would be found in wells or potable water supplies near JOF because groundwater flow is to Kentucky Lake and it acts as a barrier, isolating shallow groundwater in the DuPont Dredge Cell vicinity from the region on the opposite side of the river. Therefore, it is highly unlikely that constituents originating at the landfill would impact offsite wells or a potable water supply.

CONCLUSIONS

Groundwater monitoring data for the September 22, 2015 sampling event of the DuPont Road Dredged Ash Disposal Area showed no exceedances of MCLs or statistical limits, therefore meeting drinking water standards for the parameters analyzed.

Time-series graphs of groundwater monitoring data for the period of record are given in Appendix E. Concentration trends have generally been stable for most of the TDEC Appendix I constituents since the mid-1990s. Groundwater monitoring data for the last 10 years, from 2004 to present, have shown no MCL exceedances or confirmed statistical exceedances. Based on

the above-mentioned observations, TVA respectfully requests that TDEC join TVA in a formal discussion to explore the reduction in the number of parameters being monitored. TVA recognizes that any change to the parameters monitored will result in a minor modification of the permit for the groundwater monitoring plan. The next sampling event is planned for March 2016.

REFERENCES

- ASTM, 2012, Standard Guide for Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs, ASTM D 6312-98.
- EPA, 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities - Unified Guidance, EPA-530/R 09-007.
- EPRI, 2014. "MANAGES (version 3.4), Groundwater Data Management and Evaluation Software", EPRI product # 1012581, Palo Alto, CA.
- Gibbons, R.D., 1994. Statistical Methods for Groundwater Monitoring, John Wiley & Sons, Inc.
- Tennessee Department of Environment and Conservation (TDEC), Division of Solid Waste Management. *Rule 0400-11-01-.04 Solid Waste Processing and Disposal*. Revised March 2013.

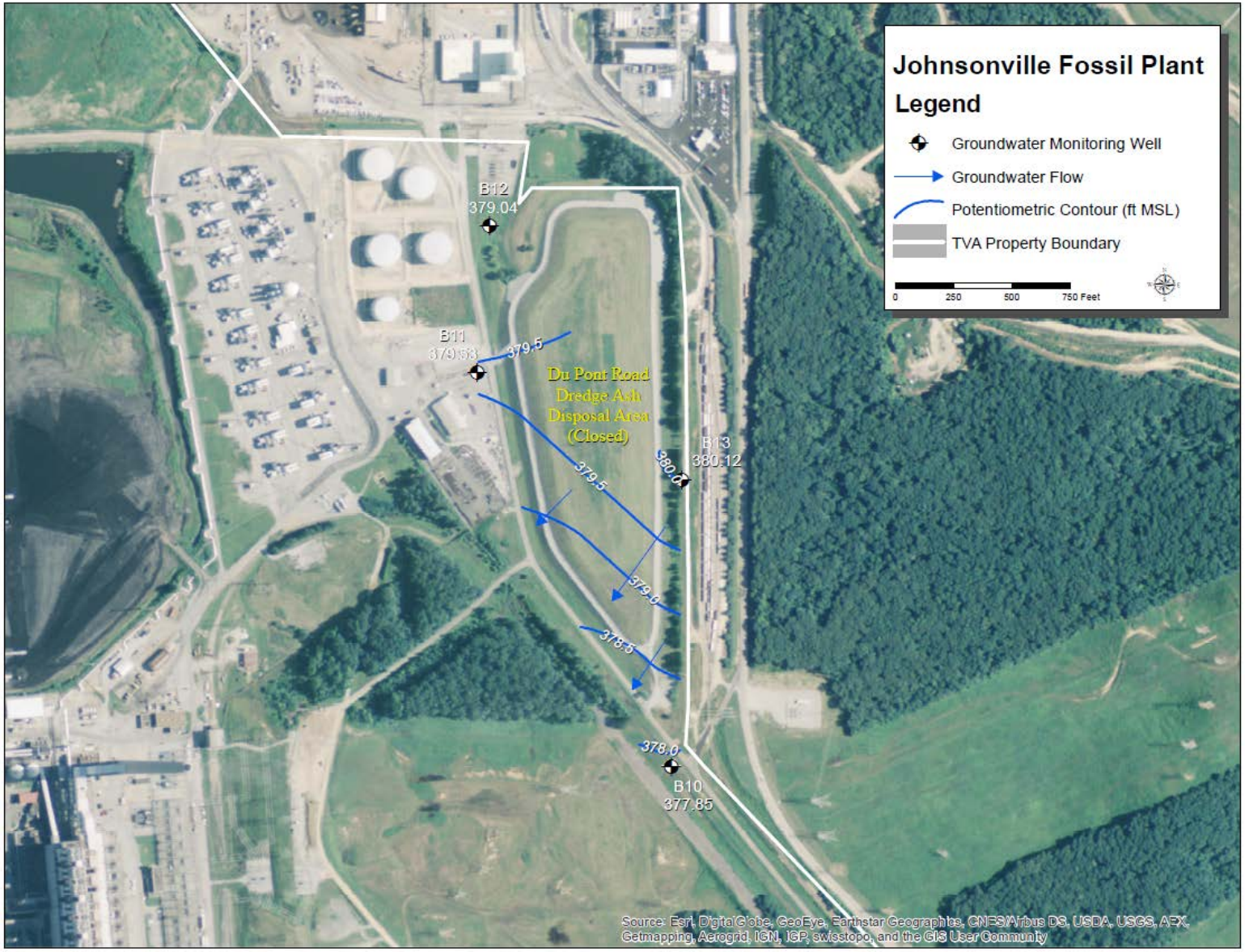


Figure 2. Groundwater Potentiometric Surface on September 22, 2015

Appendix A

Field Sampling Sheets

Preliminary Groundwater Data Field Worksheet

Sheet 1 of 1

Project/Site	Well Number	Purge Date	Year	Month	Day
JOHNSONVILLE	B6R 84068		15	09	23

Depth to Water (m)	Bottom of Well (m)	Well Diameter (mm)	Survey Leader	Field Crew
5.52 4195	6.42 4194	51 4188	M. STARKS	J. EUBANKS

☐ Depth of Screen ☐ Open Bore Hole

(m)	To	(m)	Sample Label	
4191		4190	JOF-B6R-0915	☑ Unfiltered ☐ Filtered ☐ Both Filter Type and Size:

[Bottom of Well - Depth to Water] x Volume Factor =	Well Volume	Target Purge Volume	Actual Purge Volume
[(6.42)m - (5.52)m] x (2.027)L/m =	1.82 (L)	5.47 (L)	7.0 (L) 4186

Purge Pump: ☑ Bladder ☐ Centrifugal ☐ Peristaltic ☐ Dedicated Other (list):
Sample Pump: ☑ Bladder ☐ Centrifugal ☐ Peristaltic ☐ Dedicated Other (list):

Notes and WQ Observations	Time ET CT	Pump Rate (L/min)	Depth to Water (m)	Pump Depth (m)	Temp °C	pH (s.u.)	DO (mg/L)	COND (umhos/cm)	(+/-) ORP (mV)	Turbidity (NTU)
Begin Purge →	0740		5.52	6.0	15.8	4.7	3.4	655	403	13.5
Pumped 1L	0745	0.2			17.9	4.9	2.0	662	393	54.5
1.5L	0750	0.3			18.1	5.1	1.8	662	391	32.8
1.5L	0755	0.3	5.56		18.5	5.2	1.8	664	400	16.6
1.5L	0800	0.3			18.7	5.2	1.8	667	409	10.4
1.5L	0805	0.3	5.57		18.9	5.2	1.8	664	415	4.7

Remarks: EQ BLANK BEFORE (SRLEQ)@ 0715

Reviewed By: Matt W. Starks 9-25-15 Survey Leader Date
Becky Seaton 9/28/15 Project Leader Date

Sample Collector: MWS		
Sample Date		Time
Year 15	Month 09 / Day 23	0805 ET CT
Pump Duration: 25 min		72004

"999" = 2 days

Sample Readings

Analysis Time ET CT	Pump Rate (L/min) 4193	Pump Depth (m) 4192	Temp °C EPA 170.1	pH (s.u.) EPA 150.1	DO (mg/L) EPA 360.1	COND (umhos/cm) EPA 120.1	(+/-) ORP (mv) SM 2580B	Turbidity (NTU) EPA 180.1
0805	0.3	6.0	18.9	5.2	1.8	664	415	4.7
		10	400	300	94	90		

Additional Sample Data

Analyst: JLE

Date Analyzed	415	431	436	437
Year 15 / Month 09 / Day 23	Phenol Alkalinity mg/L (EPA 310.1)	Total Alk. mg/L (EPA 310.1)	Mineral Acidity mg/L (EPA 305.1)	CO_2 Acidity mg/L (EPA 305.1)
		10		102
Turbidity 1350 ☑ Clear ☐ Slightly Turbid ☐ Turbid ☐ Highly Turbid	Time:	Time: 1405	Time:	Time: 1402
	Initial:	Initial: JLE	Initial:	Initial: JLE

Well Diameter (mm)		Vol. Factor (L/m)
12.7	(0.5 in)	0.127
51	(2 in)	2.027
76	(3 in)	4.560
102	(4 in)	8.107
127	(5 in)	12.668
153	(6 in)	18.228

Color: CLEAR
Odor: NONE

Bottles Required ☐ BOD ☐ TOC ☐ COD ☐ TIC ☐ Ferrous ☐ Metals ☐ Dis. Metals ☐ Mineral ☐ Dis. Mineral ☐ Nutrient ☐ Phenol ☐ Filt TIC ☐ TSS/TDS

Others (list):

Preliminary Groundwater Data Field Worksheet

Sheet 1 of 1

Project/Site	Well Number	Purge Date	Year	Month	Day
JOHNSONVILLE	B8R 84068		15	09	22

Depth to Water (m)	Bottom of Well (m)	Well Diameter (mm)	Survey Leader	Field Crew
3.80 4195	5.13 4194	51 4188	M. STARKS	J. EUBANKS

☐ Depth of Screen ☐ Open Bore Hole

(m)	To	(m)	Sample Label	
4191		4190	JOF-B8R-0915	☑ Unfiltered ☐ Filtered ☐ Both Filter Type and Size:

[Bottom of Well - Depth to Water]	x	Volume Factor	=	Well Volume	Target Purge Volume	Actual Purge Volume
[(5.13)m - (3.80)m]	x	(2.027)L/m	=	2.69 (L)	8.08 (L)	12.0 (L) 4186

Purge Pump: ☑ Bladder ☐ Centrifugal ☐ Peristaltic ☐ Dedicated Other (list):
Sample Pump: ☑ Bladder ☐ Centrifugal ☐ Peristaltic ☐ Dedicated Other (list):

Notes and WQ Observations	Time ET CT	Pump Rate (L/min)	Depth to Water (m)	Pump Depth (m)	Temp °C	pH (s.u.)	DO (mg/L)	COND (umhos/cm)	(+/-) ORP (mV)	Turbidity (NTU)
Begin Purge →	1440		3.80	4.5	27.5	5.1	4.9	278	428	10.7
Pumped 2L	1445	0.4			24.8	4.6	2.5	286	446	9.2
2L	1450	0.4	3.80		23.7	4.6	2.3	287	448	6.7
2L	1455	0.4			23.6	4.9	2.7	287	449	~~8.0~~ JLE 9.1
2L	1500	0.4			23.5	4.6	2.0	286	447	7.4
2L	1505	0.4			23.4	4.6	1.8	287	447	5.3
2L	1510	0.4	3.86		23.5	4.7	1.8	286	430	3.7

Remarks: Pump Setting 22 psi - 7.0 / 7.0

Reviewed By: Matt W. Starks 9-25-15 Survey Leader / Date
Becky Seaton 9/28/15 Project Leader / Date

Sample Collector: JLE

Sample Date			Time
Year	Month	Day	1510 ET CT
15	09	22	

Pump Duration: 30 min 72004
"999" = 2 days

Sample Readings

Analysis Time ET CT	Pump Rate (L/min) 4193	Pump Depth (m) 4192	Temp °C EPA 170.1 10	pH (s.u.) EPA 150.1 400	DO (mg/L) EPA 360.1 300	COND (umhos/cm) EPA 120.1 94	(+/-) ORP (mv) SM 2580B 90	Turbidity (NTU) EPA 180.1
1510	0.4	4.5	23.5	4.7	1.8	286	430	3.7

Additional Sample Data

Analyst: JLE

Date Analyzed			415	431	436	437
Year	Month	Day	Phenol Alkalinity mg/L (EPA 310.1)	Total Alk. mg/L (EPA 310.1)	Mineral Acidity mg/L (EPA 305.1)	CO_2 Acidity mg/L (EPA 305.1)
15	09	22		8		132
			Time:	Time: 1739	Time:	Time: 1736
			Initial:	Initial: JLE	Initial:	Initial: JLE

Turbidity 1350: ☑ Clear ☐ Slightly Turbid ☐ Turbid ☐ Highly Turbid
Color: CLEAR
Odor: NONE

Bottles Required: ☐ BOD ☐ TOC ☐ COD ☐ TIC ☐ Ferrous ☐ Metals ☐ Dis. Metals ☐ Mineral ☐ Dis. Mineral ☐ Nutrient ☐ Phenol ☐ Filt TIC ☐ TSS/TDS
Others (list):

Well Diameter (mm)		Vol. Factor (L/m)
12.7	(0.5 in)	0.127
51	(2 in)	2.027
76	(3 in)	4.560
102	(4 in)	8.107
127	(5 in)	12.668
153	(6 in)	18.228

Preliminary Groundwater Data Field Worksheet

Sheet 1 of 1

Project/Site	Well Number	Purge Date	Year	Month	Day
JOHNSONVILLE	B9 84068		15	09	22

Depth to Water (m)	Bottom of Well (m)	Well Diameter (mm)	Survey Leader	Field Crew
9.38 4195	15.24 4194	51 4188	M. STARKS	

☐ Depth of Screen ☐ Open Bore Hole

(m)	To	(m)	Sample Label	
4191		4190	JOF-B9-0915	☑ Unfiltered ☐ Filtered ☐ Both; Filter Type and Size:

[Bottom of Well - Depth to Water]	x Volume Factor	=	Well Volume	Target Purge Volume	Actual Purge Volume
[(15.24)m - (9.38)m]	x (2.027)L/m	=	11.87 (L)	35.63 (L)	48.0 (L) 4186

Purge Pump: ☐ Bladder ☐ Centrifugal ☐ Peristaltic ☑ Dedicated Other (list):
Sample Pump: ☐ Bladder ☐ Centrifugal ☐ Peristaltic ☑ Dedicated Other (list):

Notes and WQ Observations	Time ET CT	Pump Rate (L/min)	Depth to Water (m)	Pump Depth (m)	Temp °C	pH (s.u.)	DO (mg/L)	COND (umhos/cm)	(+/-) ORP (mV)	Turbidity (NTU)
Begin Purge →	0725		9.38	QED Q 11.0	13.7	5.1	8.0	63	364	0.0
Pumped 6L	0730	1.2			15.0	5.9	7.2	67	318	6.0
6L	0735	1.2			15.3	5.9	7.0	68	321	59.1
6L	0740	1.2			15.3	5.9	6.9	67	330	50.6
6L	0745	1.2	9.63		15.4	5.9	6.8	65	331	17.5
6L	0750	1.2			15.4	5.9	6.8	63	335	11.9
6L	0755	1.2			15.4	5.8	6.7	62	342	9.7
6L	0800	1.2			15.5	5.8	6.7	62	340	5.9
6L	0805	1.2	9.65		15.6	5.8	6.7	61	347	4.4

Remarks: PUMP INSTALLED @ 12.82 m RAISED TO 11.0 m COLLECT DUP

Reviewed By: [signature] Survey Leader 9-25-15 Date Becky Seaton Project Leader 9/28/15 Date

Sample Collector: MWS			
Sample Date			Time
Year	Month	Day	0805 ET CT
15	09	22	
Pump Duration: 40 min 72004			

"999" = 2 days

Sample Readings

Analysis Time ET CT	Pump Rate (L/min)	Pump Depth (m)	Temp °C EPA 170.1	pH (s.u.) EPA 150.1	DO (mg/L) EPA 360.1	COND (umhos/cm) EPA 120.1	(+/-) ORP (mv) SM 2580B	Turbidity (NTU) EPA 180.1
0805	1.0	11.0	15.6	5.8	6.7	61	347	4.4
	4193	4192	10	400	300	94	90	

Additional Sample Data

Analyst: JLB

Date Analyzed			415	431	436	437
Year	Month	Day	Phenol Alkalinity mg/L (EPA 310.1)	Total Alk. mg/L (EPA 310.1)	Mineral Acidity mg/L (EPA 305.1)	CO_2 Acidity mg/L (EPA 305.1)
15	09	22		24/24		60/60
Turbidity 1350 ☑ Clear ☐ Slightly Turbid ☐ Turbid ☐ Highly Turbid			Time:	Time: 1641/1648	Time:	Time: 1637/1644
			Initial:	Initial: JLB	Initial:	Initial: JLB

Well Diameter (mm)		Vol. Factor (L/m)
12.7	(0.5 in)	0.127
51	(2 in)	2.027
76	(3 in)	4.560
102	(4 in)	8.107
127	(5 in)	12.668
153	(6 in)	18.228

Color: CLEAR
Odor: NONE

Bottles Required: ☐ BOD ☐ TOC ☐ COD ☐ TIC ☐ Ferrous ☐ Metals ☐ Dis. Metals ☐ Mineral ☐ Dis. Mineral ☐ Nutrient ☐ Phenol ☐ Filt TIC ☐ TSS/TDS

Others (list):

Preliminary Groundwater Data Field Worksheet

Sheet 1 of 1

Project/Site	Well Number	Purge Date	Year	Month	Day
JOHNSONVILLE	B 10 84068		15	09	22

Depth to Water (m)	Bottom of Well (m)	Well Diameter (mm)	Survey Leader	Field Crew
8.12 4195	12.77 4194	51 4188	M. STARKS	J. EUBANKS

☐ Depth of Screen ☐ Open Bore Hole

(m)	To	(m)	Sample Label	
10.66 4191		13.41 4190	JOF-B10-0915	☑ Unfiltered ☐ Filtered ☐ Both Filter Type and Size:

[Bottom of Well - Depth to Water]	x	Volume Factor	=	Well Volume	Target Purge Volume	Actual Purge Volume
[(12.77)m - (8.13)m]	x	(2.027)L/m	=	9.42 (L)	28.27 (L)	90.0 (L) 4186

Purge Pump: ☐ Bladder ☑ Centrifugal ☐ Peristaltic ☐ Dedicated Other (list):
Sample Pump: ☐ Bladder ☑ Centrifugal ☐ Peristaltic ☐ Dedicated Other (list):

Notes and WQ Observations	Time ET CT	Pump Rate (L/min)	Depth to Water (m)	Pump Depth (m)	Temp °C	pH (s.u.)	DO (mg/L)	COND (umhos/cm)	(+/-) ORP (mV)	Turbidity (NTU)
Begin Purge →	0840		8.12	10.0	19.3	5.6	6.8	67	354	7.3
PUMPED 5L	0845	1.0			19.5	5.6	6.4	66	355	876
5L	0850	1.0			19.1	5.5	6.2	102	363	394
5L	0855	1.0	8.21		19.5	5.3	6.1	116	370	151
5L	0900	1.0			19.8	5.4	6.1	122	371	97.5
5L	0905	1.0			19.9	5.3	6.0	123	378	65.2
5L	0910	1.0			19.9	5.3	6.0	124	380	41.1
5L	0915	1.0			20.0	5.4	5.9	125	375	28.8
5L	0920	1.0	8.27		20.1	5.3	5.9	124	378	21.1
5L	0925	1.0			20.1	5.3	6.0	126	382	17.2
5L	0930	1.0			20.2	5.3	5.9	126	383	14.6
10 MIN INTERVALS 10L	0940	1.0			20.1	5.3	5.9	128	385	10.7
10L	0950	1.0			19.9	5.2	5.9	129	391	7.8
10L	1000	1.0			20.1	5.3	5.9	131	393	6.3
10L	1010	1.0	8.32		20.2	5.3	5.9	131	393	5.1

Remarks:

Reviewed By: M. W. Starks (Survey Leader) 9-25-15 (Date) Becky Seaton (Project Leader) 9/28/15 (Date)

Sample Collector: MWS		
Sample Date		Time
Year 15	Month 09 Day 22	1010 ET CT
Pump Duration: 90 min		72004

"999" = 2 days

Sample Readings

Time ET CT	Pump Rate (L/min) 4193	Pump Depth (m) 4192	Temp °C EPA 170.1	pH (s.u.) EPA 150.1	DO (mg/L) EPA 360.1	COND (umhos/cm) EPA 120.1	(+/-) ORP (mV) SM 2580B	Turbidity (NTU) EPA 180.1
1010	1.0	10.0	20.2	5.3	5.9	131	393	5.1
Analysis Time		10	400	300	94	90		

Additional Sample Data

Analyst: JLB		12		78	Well Diameter (mm)	Vol. Factor (L/m)
Date Analyzed	415	431	436	437	12.7 (0.5 in)	0.127
Year 15 Month 09 Day 22	Phenol Alkalinity mg/L (EPA 310.1)	Total Alk. mg/L (EPA 310.1)	Mineral Acidity mg/L (EPA 305.1)	CO_2 Acidity mg/L (EPA 305.1)	51 (2 in)	2.027
Turbidity 1350 ☑ Clear	Time:	Time: 1657	Time:	Time: 1652	76 (3 in)	4.560
☐ Slightly Turbid	Initial:	Initial: JLB	Initial:	Initial: JLB	102 (4 in)	8.107
☐ Turbid					127 (5 in)	12.668
☐ Highly Turbid					153 (6 in)	18.228

Color: CLEAR
Odor: NONE

Bottles Required: ☐ BOD ☐ TOC ☐ COD ☐ TIC ☐ Ferrous ☐ Metals ☐ Dis. Metals ☐ Mineral ☐ Dis. Mineral ☐ Nutrient ☐ Phenol ☐ Filt TIC ☐ TSS/TDS

Others (list):

Preliminary Groundwater Data Field Worksheet

Sheet 1 of 1

Project/Site	Well Number	Purge Date	Year	Month	Day
JOHNSONVILLE	B11 84068		15	09	22

Depth to Water (m)	Bottom of Well (m)	Well Diameter (mm)	Survey Leader	Field Crew
6.70 4195	11.16 4194	51 4188	M. STARKS	J. EUBANKS

☐ Depth of Screen ☐ Open Bore Hole

(m)	To	(m)	Sample Label	
8.20 4191		11.24 4190	JOF-B11-0915	☑ Unfiltered ☐ Filtered ☐ Both Filter Type and Size:

[Bottom of Well - Depth to Water]	x	Volume Factor	=	Well Volume	Target Purge Volume	Actual Purge Volume
[(11.16)m - (6.70)m]	x	(2.027)L/m	=	9.04 (L)	27.12 (L)	28.0 (L) 4186

Purge Pump: ☐ Bladder ☑ Centrifugal ☐ Peristaltic ☐ Dedicated Other (list):
Sample Pump: ☐ Bladder ☑ Centrifugal ☐ Peristaltic ☐ Dedicated Other (list):

Notes and WQ Observations	Time ET CT	Pump Rate (L/min)	Depth to Water (m)	Pump Depth (m)	Temp °C	pH (s.u.)	DO (mg/L)	COND (umhos/cm)	(+/-) ORP (mV)	Turbidity (NTU)
Begin Purge →	1345		6.70	8.0	25.4	5.4	2.4	968	397	1.5
Pumped 6L	1350	1.2			22.6	5.2	1.5	966	403	3.9
6L	1355	1.2			22.1	5.2	1.3	964	406	3.4
8L	1400	1.6			22.7	5.2	1.2	965	405	2.7
8L	1405	1.6	6.69		23.0	5.1	1.1	966	416	2.7

Remarks:

Reviewed By: M. W. Starks 9-25-15 Becky Seaton 9/28/15
Survey Leader Date Project Leader Date

Sample Collector: MWS			
Sample Date			Time
Year 15	Month 09	Day 22	1405 ET CT
Pump Duration: 20 min 72004			

"999" = 2 days

Sample Readings

Analysis Time ET CT	Pump Rate (L/min)	Pump Depth (m)	Temp °C EPA 170.1	pH (s.u.) EPA 150.1	DO (mg/L) EPA 360.1	COND (umhos/cm) EPA 120.1	(+/-) ORP (mv) SM 2580B	Turbidity (NTU) EPA 180.1
1405	1.0	8.0	23.0	5.1	1.1	966	416	2.7
	4193	4192	10	400	300	94	90	

Additional Sample Data

Analyst: JLE

Date Analyzed			415	431	436	437
Year 15	Month 09	Day 22	Phenol Alkalinity mg/L (EPA 310.1)	Total Alk. mg/L (EPA 310.1)	Mineral Acidity mg/L (EPA 305.1)	CO_2 Acidity mg/L (EPA 305.1)
				10		102
			Time:	Time: 1706	Time:	Time: 1703
			Initial:	Initial: JLE	Initial:	Initial: JLE

Turbidity 1350: ☑ Clear ☐ Slightly Turbid ☐ Turbid ☐ Highly Turbid
Color: CLEAR
Odor: NONE

Bottles Required: ☐ BOD ☐ TOC ☐ COD ☐ TIC ☐ Ferrous ☐ Metals ☐ Dis. Metals ☐ Mineral ☐ Dis. Mineral ☐ Nutrient ☐ Phenol ☐ Filt TIC ☐ TSS/TDS
Others (list):

Well Diameter (mm)		Vol. Factor (L/m)
12.7	(0.5 in)	0.127
51	(2 in)	2.027
76	(3 in)	4.560
102	(4 in)	8.107
127	(5 in)	12.668
153	(6 in)	18.228

Preliminary Groundwater Data Field Worksheet

Sheet 1 of 1

Project/Site	Well Number	Purge Date	Year	Month	Day
JOHNSONVILLE	B12 84068		15	09	22

Depth to Water (m)	Bottom of Well (m)	Well Diameter (mm)	Survey Leader	Field Crew
4.45 4195	11.18 4194	51 4188	M. STARKS	

☐ Depth of Screen ☐ Open Bore Hole

(m)	To	(m)	Sample Label	Filter Type and Size:
8.24 4191		11.27 4190	JOF-B12-0915	☑ Unfiltered ☐ Filtered ☐ Both

[Bottom of Well - Depth to Water] x Volume Factor =	Well Volume	Target Purge Volume	Actual Purge Volume
[(11.18)m - (4.45)m] x (2.027)L/m =	13.64 (L)	40.92 (L)	54.0 (L) 4186

Purge Pump: ☐ Bladder ☑ Centrifugal ☐ Peristaltic ☐ Dedicated Other (list):

Sample Pump: ☐ Bladder ☑ Centrifugal ☐ Peristaltic ☐ Dedicated Other (list):

Notes and WQ Observations	Time ET CT	Pump Rate (L/min)	Depth to Water (m)	Pump Depth (m)	Temp °C	pH (s.u.)	DO (mg/L)	COND (umhos/cm)	(+/-) ORP (mV)	Turbidity (NTU)
Begin Purge →	1240		4.45	6.0	27.6	5.3	3.7	1788	399	4.4
Pumped 6L	1245	1.2			23.9	5.3	2.3	1990	406	4.9
8L	1250	1.6			23.0	5.2	1.3	3073	407	2.11
8L	1255	1.6			21.3	5.2	0.9	3242	413	34.5
8L	1300	1.6			21.0	5.2	0.8	3360	412	13.5
8L	1305	1.6			21.0	5.3	0.8	3382	409	9.2
8L	1310	1.6			21.1	5.3	0.8	3371	409	6.2
8L	1315	1.6	4.77		21.1	5.3	0.8	3374	409	4.7

Remarks: COLLECT DUP/(DEFEQ)@1335

Reviewed By: Mat W. Starks 9-25-15 Survey Leader / Date

Becky Seaton 9/28/15 Project Leader / Date

Sample Collector: MWS

Sample Date			Time
Year	Month	Day	1315 ET CT
15	09	22	

Pump Duration: 35 min 72004

"999" = 2 days

Sample Readings

Pump Depth (m)	Pump Rate (L/min)	Temp °C EPA 170.1	pH (s.u.) EPA 150.1	DO (mg/L) EPA 360.1	COND (umhos/cm) EPA 120.1	(+/-) ORP (mv) SM 2580B	Turbidity (NTU) EPA 180.1
6.0	21.1	5.3	0.8	3374	409	4.7	
4192	4193	10	400	300	94	90	
Analysis Time ET CT: 1315	1.0						

Additional Sample Data

Analyst: JLE

Date Analyzed: Year 15 Month 09 Day 22

Turbidity 1350: ☑ Clear ☐ Slightly Turbid ☐ Turbid ☐ Highly Turbid

Color: CLEAR

Odor: NONE

415 Phenol Alkalinity mg/L (EPA 310.1)	431 Total Alk. mg/L (EPA 310.1)	436 Mineral Acidity mg/L (EPA 305.1)	437 CO_2 Acidity mg/L (EPA 305.1)
	28/18		116/124
Time:	Time: 1715/1723	Time:	Time: 1710/1719
Initial:	Initial: JLE	Initial:	Initial: JLE

Well Diameter (mm)		Vol. Factor (L/m)
12.7	(0.5 in)	0.127
51	(2 in)	2.027
76	(3 in)	4.560
102	(4 in)	8.107
127	(5 in)	12.668
153	(6 in)	18.228

Bottles Required: ☐ BOD ☐ TOC ☐ COD ☐ TIC ☐ Ferrous ☐ Metals ☐ Dis. Metals ☐ Mineral ☐ Dis. Mineral ☐ Nutrient ☐ Phenol ☐ Filt TIC ☐ TSS/TDS

Others (list):

Preliminary Groundwater Data Field Worksheet

Sheet 1 of 1

Project/Site	Well Number	Purge Date	Year	Month	Day
JOHNSONVILLE	B 13 84068		15	09	22

Depth to Water (m)	Bottom of Well (m)	Well Diameter (mm)	Survey Leader	Field Crew
9.26 4195	13.36 4194	51 4188	M. STARKS	J. EUBANKS

☐ Depth of Screen ☐ Open Bore Hole

(m)	To	(m)	Sample Label	
10.36 4191	To	13.41 4190	JOF-B13-0915	☑ Unfiltered ☐ Filtered ☐ Both Filter Type and Size:

[Bottom of Well - Depth to Water]	x	Volume Factor	=	Well Volume	Target Purge Volume	Actual Purge Volume
[(13.36)m - (9.26)m]	x	(2,027)L/m	=	8.31 (L)	24.93 (L)	85.0 (L) 4186

Purge Pump: ☐ Bladder ☑ Centrifugal ☐ Peristaltic ☐ Dedicated Other (list):
Sample Pump: ☐ Bladder ☑ Centrifugal ☐ Peristaltic ☐ Dedicated Other (list):

Notes and WQ Observations	Time ET CT	Pump Rate (L/min)	Depth to Water (m)	Pump Depth (m)	Temp °C	pH (s.u.)	DO (mg/L)	COND (umhos/cm)	(+/-) ORP (mV)	Turbidity (NTU)
Begin Purge →	1045		9.26	~~10.5~~ 11.0 MWS	22.9	4.9	5.9	2969	407	118
Pumped 8L	1050	1.6			21.9	4.9	5.7	3062	409	104
5L	1055	1.0			22.7	4.9	5.6	3075	411	68.7
5L	1100	1.0	9.28		23.4	4.9	5.5	3098	415	35.8
5L	1105	1.0			23.7	4.9	5.5	3102	418	19.3
5L	1110	1.0			23.2	4.9	5.5	3111	418	16.7
5L	1115	1.0			23.0	4.9	5.4	3115	419	14.9
5L	1120	1.0			23.1	4.9	5.4	3121	421	12.8
10 MIN INTERVALS 10L	1130	1.0			22.9	4.9	5.4	3140	423	10.1
10L	1140	1.0			22.5	4.9	5.4	3134	424	8.7
10L	1150	1.0			22.6	4.9	5.4	3159	428	6.8
10L	1200	1.0			22.6	4.9	5.4	3154	429	6.1
10L	1210	1.0	9.28		22.7	4.9	5.4	3146	429	5.2

Remarks: ~~GOOD DUP~~ MWS

Reviewed By: Matt W. Starks 9-25-15 Survey Leader Date
Becky Seaton 9/28/15 Project Leader Date

Sample Collector: MWS		
Sample Date		Time
Year 15	Month 09 Day 22	1210 ET CT
Pump Duration: 85 min		72004

"999" = 2 days

Sample Readings

Analysis Time ET CT	Pump Rate (L/min)	Pump Depth (m)	Temp °C	pH (s.u.)	DO (mg/L)	COND (umhos/cm)	(+/-) ORP (mv)	Turbidity (NTU)
1210	1.0	11.0	22.7	4.9	5.4	3146	429	5.2
	4193	4192	10	400	300	94	90	
		Pump Depth (m)	Temp °C EPA 170.1	pH (s.u.) EPA 150.1	DO (mg/L) EPA 360.1	COND (umhos/cm) EPA 120.1	(+/-) ORP (mv) SM 2580B	Turbidity (NTU) EPA 180.1

Additional Sample Data

Analyst: JLB		6		108
Date Analyzed	415	431	436	437
Year 15 Month 09 Day 22	Phenol Alkalinity mg/L (EPA 310.1)	Total Alk. mg/L (EPA 310.1)	Mineral Acidity mg/L (EPA 305.1)	CO_2 Acidity mg/L (EPA 305.1)
Turbidity 1350 ☑ Clear ☐ Slightly Turbid ☐ Turbid ☐ Highly Turbid	Time:	Time: 1732	Time:	Time: 1728
	Initial:	Initial: JLB	Initial:	Initial: JLB
Color: CLEAR	Bottles Required ☐ BOD ☐ TOC ☐ COD ☐ TIC	☐ Ferrous ☐ Metals ☐ Dis. Metals	☐ Mineral ☐ Dis. Mineral ☐ Nutrient	☐ Phenol ☐ Filt TIC ☐ TSS/TDS
Odor: NONE				Others (list):

Well Diameter (mm)		Vol. Factor (L/m)
12.7	(0.5 in)	0.127
51	(2 in)	2.027
76	(3 in)	4.560
102	(4 in)	8.107
127	(5 in)	12.668
153	(6 in)	18.228

Appendix B

Laboratory Analytical Report with Chain-of-Custody Documentation

ANALYTICAL REPORT

October 05, 2015

TVA-Environmental Affairs

Sample Delivery Group:	L790477
Samples Received:	09/24/2015
Project Number:	JOF-B8R
Description:	JOF GW WELL

Report To: Ronda Hooper
400 W. Summit Hill Mailstop TVA WT 9D-K
Knoxville, TN 37902

Entire Report Reviewed By:

Pam Langford
Technical Service Representative

JOF-B6R-0915 L790477-01 GW

Collected by: Monte W. Starks
Collected date/time: 09/23/15 08:05
Received date/time: 09/24/15 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analysis Analyst
Gravimetric Analysis by Method 2540 D-2011	WG817922	1	09/28/15 10:10	09/30/15 01:26	MF
Mercury by Method 7470A	WG817535	1	09/25/15 09:00	09/25/15 17:30	TRB
Metals (ICPMS) by Method 6020	WG818559	1	09/30/15 19:23	10/02/15 11:05	LAT
Wet Chemistry by Method 9056MOD	WG818435	1	10/01/15 21:46	10/01/15 21:46	NJM

JOF-B8R-0915 L790477-02 GW

Collected by: Monte W. Starks
Collected date/time: 09/22/15 15:10
Received date/time: 09/24/15 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analysis Analyst
Gravimetric Analysis by Method 2540 D-2011	WG817633	1	09/25/15 16:43	09/26/15 17:29	MF
Mercury by Method 7470A	WG817535	1	09/25/15 09:00	09/25/15 17:32	TRB
Metals (ICPMS) by Method 6020	WG818559	1	09/30/15 19:23	10/02/15 11:15	LAT
Wet Chemistry by Method 9056MOD	WG818435	1	10/01/15 22:00	10/01/15 22:00	NJM

JOF-B9-0915 DUP L790477-03 GW

Collected by: Monte W. Starks
Collected date/time: 09/22/15 08:05
Received date/time: 09/24/15 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analysis Analyst
Gravimetric Analysis by Method 2540 D-2011	WG817633	1	09/25/15 16:43	09/26/15 17:37	MF
Mercury by Method 7470A	WG817535	1	09/25/15 09:00	09/25/15 17:34	TRB
Metals (ICPMS) by Method 6020	WG818559	1	09/30/15 19:23	10/02/15 11:17	LAT
Wet Chemistry by Method 9056MOD	WG818435	1	10/01/15 22:14	10/01/15 22:14	NJM

JOF-B9-0915 L790477-04 GW

Collected by: Monte W. Starks
Collected date/time: 09/22/15 08:05
Received date/time: 09/24/15 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analysis Analyst
Gravimetric Analysis by Method 2540 D-2011	WG817633	1	09/25/15 16:43	09/26/15 17:36	MF
Mercury by Method 7470A	WG817535	1	09/25/15 09:00	09/25/15 17:41	TRB
Metals (ICPMS) by Method 6020	WG818559	1	09/30/15 19:23	10/02/15 11:20	LAT
Wet Chemistry by Method 9056MOD	WG818435	1	10/01/15 22:28	10/01/15 22:28	NJM

JOF-B10-0915 L790477-05 GW

Collected by: Monte W. Starks
Collected date/time: 09/22/15 10:10
Received date/time: 09/24/15 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analysis Analyst
Gravimetric Analysis by Method 2540 D-2011	WG817633	1	09/25/15 16:43	09/26/15 17:31	MF
Mercury by Method 7470A	WG817535	1	09/25/15 09:00	09/25/15 17:43	TRB
Metals (ICPMS) by Method 6020	WG818559	1	09/30/15 19:23	10/02/15 11:31	LAT
Wet Chemistry by Method 9056MOD	WG818435	1	10/01/15 23:10	10/01/15 23:10	NJM

JOF-B11-0915 L790477-06 GW

Collected by: Monte W. Starks
Collected date/time: 09/22/15 14:05
Received date/time: 09/24/15 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analysis Analyst
Gravimetric Analysis by Method 2540 D-2011	WG817633	1	09/25/15 16:43	09/26/15 17:36	MF
Mercury by Method 7470A	WG817535	1	09/25/15 09:00	09/25/15 17:45	TRB
Metals (ICPMS) by Method 6020	WG818559	1	09/30/15 19:23	10/02/15 11:33	LAT
Wet Chemistry by Method 9056MOD	WG818435	1	10/01/15 23:24	10/01/15 23:24	NJM

JOF-B12-0915 L790477-07 GW

Collected by: Monte W. Starks
Collected date/time: 09/22/15 13:15
Received date/time: 09/24/15 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analysis Analyst
Gravimetric Analysis by Method 2540 D-2011	WG817633	1	09/25/15 16:43	09/26/15 17:35	MF
Mercury by Method 7470A	WG817535	1	09/25/15 09:00	09/25/15 17:47	TRB
Metals (ICPMS) by Method 6020	WG818559	1	09/30/15 19:23	10/02/15 11:35	LAT
Wet Chemistry by Method 9056MOD	WG818435	1	10/01/15 23:51	10/01/15 23:51	NJM

JOF-B13-0915 L790477-08 GW

Collected by: Monte W. Starks
Collected date/time: 09/22/15 12:10
Received date/time: 09/24/15 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analysis Analyst
Gravimetric Analysis by Method 2540 D-2011	WG817633	1	09/25/15 16:43	09/26/15 17:32	MF
Mercury by Method 7470A	WG817535	1	09/25/15 09:00	09/25/15 17:50	TRB
Metals (ICPMS) by Method 6020	WG818559	1	09/30/15 19:23	10/02/15 11:38	LAT
Wet Chemistry by Method 9056MOD	WG818435	1	10/02/15 00:33	10/02/15 00:33	NJM

JOF-DRFEQ-0915 L790477-09 GW

Collected by: Monte W. Starks
Collected date/time: 09/22/15 12:35
Received date/time: 09/24/15 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analysis Analyst
Gravimetric Analysis by Method 2540 D-2011	WG817633	1	09/25/15 16:43	09/26/15 17:26	MF
Mercury by Method 7470A	WG817535	1	09/25/15 09:00	09/25/15 17:52	TRB
Metals (ICPMS) by Method 6020	WG818559	1	09/30/15 19:23	10/02/15 11:40	LAT
Wet Chemistry by Method 9056MOD	WG818435	1	10/02/15 00:47	10/02/15 00:47	NJM

JOF-SRLEQ-0915 L790477-10 GW

Collected by: Monte W. Starks
Collected date/time: 09/23/15 07:15
Received date/time: 09/24/15 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analysis Analyst
Gravimetric Analysis by Method 2540 D-2011	WG817922	1	09/28/15 10:10	09/30/15 01:24	MF
Mercury by Method 7470A	WG817535	1	09/25/15 09:00	09/25/15 17:54	TRB
Metals (ICPMS) by Method 6020	WG818559	1	09/30/15 19:23	10/02/15 11:43	LAT
Wet Chemistry by Method 9056MOD	WG818435	1	10/02/15 01:01	10/02/15 01:01	NJM

JOF-B12-0915-DUP L790477-11 GW

Collected by: Monte W. Starks
Collected date/time: 09/22/15 13:15
Received date/time: 09/24/15 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analysis Analyst
Gravimetric Analysis by Method 2540 D-2011	WG817444	1	09/25/15 10:19	09/28/15 00:40	MF
Mercury by Method 7470A	WG817535	1	09/25/15 09:00	09/25/15 17:56	TRB
Metals (ICPMS) by Method 6020	WG818559	1	09/30/15 19:23	10/02/15 11:45	LAT
Wet Chemistry by Method 9056MOD	WG818435	1	10/02/15 01:15	10/02/15 01:15	NJM

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Pam Langford
Technical Service Representative

Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Suspended Solids	ND		2.50	1	09/30/2015 01:26	WG817922

Wet Chemistry by Method 9056MOD

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Fluoride	ND		0.100	1	10/01/2015 21:46	WG818435

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	09/25/2015 17:30	WG817535

Metals (ICPMS) by Method 6020

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Antimony	ND		0.00200	1	10/02/2015 11:05	WG818559
Arsenic	ND		0.00200	1	10/02/2015 11:05	WG818559
Barium	0.0174		0.00500	1	10/02/2015 11:05	WG818559
Beryllium	ND		0.00200	1	10/02/2015 11:05	WG818559
Cadmium	ND		0.00100	1	10/02/2015 11:05	WG818559
Chromium	ND		0.00200	1	10/02/2015 11:05	WG818559
Copper	ND		0.00500	1	10/02/2015 11:05	WG818559
Cobalt	ND		0.00200	1	10/02/2015 11:05	WG818559
Lead	ND		0.00200	1	10/02/2015 11:05	WG818559
Nickel	0.00940		0.00200	1	10/02/2015 11:05	WG818559
Selenium	ND		0.00200	1	10/02/2015 11:05	WG818559
Silver	ND		0.00200	1	10/02/2015 11:05	WG818559
Thallium	ND		0.00200	1	10/02/2015 11:05	WG818559
Vanadium	ND		0.00500	1	10/02/2015 11:05	WG818559
Zinc	ND		0.0250	1	10/02/2015 11:05	WG818559

Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Suspended Solids	ND		2.50	1	09/26/2015 17:29	WG817633

Wet Chemistry by Method 9056MOD

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Fluoride	ND		0.100	1	10/01/2015 22:00	WG818435

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	09/25/2015 17:32	WG817535

Metals (ICPMS) by Method 6020

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Antimony	ND		0.00200	1	10/02/2015 11:15	WG818559
Arsenic	ND		0.00200	1	10/02/2015 11:15	WG818559
Barium	0.0301		0.00500	1	10/02/2015 11:15	WG818559
Beryllium	ND		0.00200	1	10/02/2015 11:15	WG818559
Cadmium	ND		0.00100	1	10/02/2015 11:15	WG818559
Chromium	ND		0.00200	1	10/02/2015 11:15	WG818559
Copper	ND		0.00500	1	10/02/2015 11:15	WG818559
Cobalt	ND		0.00200	1	10/02/2015 11:15	WG818559
Lead	ND		0.00200	1	10/02/2015 11:15	WG818559
Nickel	0.00999		0.00200	1	10/02/2015 11:15	WG818559
Selenium	ND		0.00200	1	10/02/2015 11:15	WG818559
Silver	ND		0.00200	1	10/02/2015 11:15	WG818559
Thallium	ND		0.00200	1	10/02/2015 11:15	WG818559
Vanadium	ND		0.00500	1	10/02/2015 11:15	WG818559
Zinc	ND		0.0250	1	10/02/2015 11:15	WG818559

Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Suspended Solids	ND		2.50	1	09/26/2015 17:37	WG817633

Wet Chemistry by Method 9056MOD

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Fluoride	ND		0.100	1	10/01/2015 22:14	WG818435

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	09/25/2015 17:34	WG817535

Metals (ICPMS) by Method 6020

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Antimony	ND		0.00200	1	10/02/2015 11:17	WG818559
Arsenic	ND		0.00200	1	10/02/2015 11:17	WG818559
Barium	0.00574		0.00500	1	10/02/2015 11:17	WG818559
Beryllium	ND		0.00200	1	10/02/2015 11:17	WG818559
Cadmium	ND		0.00100	1	10/02/2015 11:17	WG818559
Chromium	ND		0.00200	1	10/02/2015 11:17	WG818559
Copper	ND		0.00500	1	10/02/2015 11:17	WG818559
Cobalt	ND		0.00200	1	10/02/2015 11:17	WG818559
Lead	ND		0.00200	1	10/02/2015 11:17	WG818559
Nickel	ND		0.00200	1	10/02/2015 11:17	WG818559
Selenium	ND		0.00200	1	10/02/2015 11:17	WG818559
Silver	ND		0.00200	1	10/02/2015 11:17	WG818559
Thallium	ND		0.00200	1	10/02/2015 11:17	WG818559
Vanadium	ND		0.00500	1	10/02/2015 11:17	WG818559
Zinc	ND		0.0250	1	10/02/2015 11:17	WG818559

Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Suspended Solids	ND		2.50	1	09/26/2015 17:36	WG817633

Wet Chemistry by Method 9056MOD

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Fluoride	ND		0.100	1	10/01/2015 22:28	WG818435

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	09/25/2015 17:41	WG817535

Metals (ICPMS) by Method 6020

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Antimony	ND		0.00200	1	10/02/2015 11:20	WG818559
Arsenic	ND		0.00200	1	10/02/2015 11:20	WG818559
Barium	0.00650		0.00500	1	10/02/2015 11:20	WG818559
Beryllium	ND		0.00200	1	10/02/2015 11:20	WG818559
Cadmium	ND		0.00100	1	10/02/2015 11:20	WG818559
Chromium	ND		0.00200	1	10/02/2015 11:20	WG818559
Copper	ND		0.00500	1	10/02/2015 11:20	WG818559
Cobalt	ND		0.00200	1	10/02/2015 11:20	WG818559
Lead	ND		0.00200	1	10/02/2015 11:20	WG818559
Nickel	ND		0.00200	1	10/02/2015 11:20	WG818559
Selenium	ND		0.00200	1	10/02/2015 11:20	WG818559
Silver	ND		0.00200	1	10/02/2015 11:20	WG818559
Thallium	ND		0.00200	1	10/02/2015 11:20	WG818559
Vanadium	ND		0.00500	1	10/02/2015 11:20	WG818559
Zinc	ND		0.0250	1	10/02/2015 11:20	WG818559

Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Suspended Solids	ND		2.50	1	09/26/2015 17:31	WG817633

Wet Chemistry by Method 9056MOD

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Fluoride	ND		0.100	1	10/01/2015 23:10	WG818435

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	09/25/2015 17:43	WG817535

Metals (ICPMS) by Method 6020

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Antimony	ND		0.00200	1	10/02/2015 11:31	WG818559
Arsenic	ND		0.00200	1	10/02/2015 11:31	WG818559
Barium	0.0206		0.00500	1	10/02/2015 11:31	WG818559
Beryllium	ND		0.00200	1	10/02/2015 11:31	WG818559
Cadmium	ND		0.00100	1	10/02/2015 11:31	WG818559
Chromium	0.00247		0.00200	1	10/02/2015 11:31	WG818559
Copper	ND		0.00500	1	10/02/2015 11:31	WG818559
Cobalt	ND		0.00200	1	10/02/2015 11:31	WG818559
Lead	ND		0.00200	1	10/02/2015 11:31	WG818559
Nickel	0.00493		0.00200	1	10/02/2015 11:31	WG818559
Selenium	ND		0.00200	1	10/02/2015 11:31	WG818559
Silver	ND		0.00200	1	10/02/2015 11:31	WG818559
Thallium	ND		0.00200	1	10/02/2015 11:31	WG818559
Vanadium	ND		0.00500	1	10/02/2015 11:31	WG818559
Zinc	ND		0.0250	1	10/02/2015 11:31	WG818559

Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Suspended Solids	ND		2.50	1	09/26/2015 17:36	WG817633

Wet Chemistry by Method 9056MOD

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Fluoride	ND		0.100	1	10/01/2015 23:24	WG818435

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	09/25/2015 17:45	WG817535

Metals (ICPMS) by Method 6020

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Antimony	ND		0.00200	1	10/02/2015 11:33	WG818559
Arsenic	ND		0.00200	1	10/02/2015 11:33	WG818559
Barium	0.244		0.00500	1	10/02/2015 11:33	WG818559
Beryllium	ND		0.00200	1	10/02/2015 11:33	WG818559
Cadmium	ND		0.00100	1	10/02/2015 11:33	WG818559
Chromium	ND		0.00200	1	10/02/2015 11:33	WG818559
Copper	ND		0.00500	1	10/02/2015 11:33	WG818559
Cobalt	ND		0.00200	1	10/02/2015 11:33	WG818559
Lead	ND		0.00200	1	10/02/2015 11:33	WG818559
Nickel	0.00622		0.00200	1	10/02/2015 11:33	WG818559
Selenium	ND		0.00200	1	10/02/2015 11:33	WG818559
Silver	ND		0.00200	1	10/02/2015 11:33	WG818559
Thallium	ND		0.00200	1	10/02/2015 11:33	WG818559
Vanadium	ND		0.00500	1	10/02/2015 11:33	WG818559
Zinc	ND		0.0250	1	10/02/2015 11:33	WG818559

Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Suspended Solids	ND		2.50	1	09/26/2015 17:35	WG817633

Wet Chemistry by Method 9056MOD

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Fluoride	ND		0.100	1	10/01/2015 23:51	WG818435

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	09/25/2015 17:47	WG817535

Metals (ICPMS) by Method 6020

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Antimony	ND		0.00200	1	10/02/2015 11:35	WG818559
Arsenic	ND		0.00200	1	10/02/2015 11:35	WG818559
Barium	0.502		0.00500	1	10/02/2015 11:35	WG818559
Beryllium	ND		0.00200	1	10/02/2015 11:35	WG818559
Cadmium	ND		0.00100	1	10/02/2015 11:35	WG818559
Chromium	ND		0.00200	1	10/02/2015 11:35	WG818559
Copper	ND		0.00500	1	10/02/2015 11:35	WG818559
Cobalt	ND		0.00200	1	10/02/2015 11:35	WG818559
Lead	ND		0.00200	1	10/02/2015 11:35	WG818559
Nickel	0.0175		0.00200	1	10/02/2015 11:35	WG818559
Selenium	ND		0.00200	1	10/02/2015 11:35	WG818559
Silver	ND		0.00200	1	10/02/2015 11:35	WG818559
Thallium	ND		0.00200	1	10/02/2015 11:35	WG818559
Vanadium	ND		0.00500	1	10/02/2015 11:35	WG818559
Zinc	0.0259		0.0250	1	10/02/2015 11:35	WG818559

Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Suspended Solids	3.00		2.50	1	09/26/2015 17:32	WG817633

Wet Chemistry by Method 9056MOD

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Fluoride	ND		0.100	1	10/02/2015 00:33	WG818435

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	0.000301		0.000200	1	09/25/2015 17:50	WG817535

Metals (ICPMS) by Method 6020

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Antimony	ND		0.00200	1	10/02/2015 11:38	WG818559
Arsenic	ND		0.00200	1	10/02/2015 11:38	WG818559
Barium	0.826		0.00500	1	10/02/2015 11:38	WG818559
Beryllium	ND		0.00200	1	10/02/2015 11:38	WG818559
Cadmium	0.00205		0.00100	1	10/02/2015 11:38	WG818559
Chromium	0.00558		0.00200	1	10/02/2015 11:38	WG818559
Copper	ND		0.00500	1	10/02/2015 11:38	WG818559
Cobalt	0.00311		0.00200	1	10/02/2015 11:38	WG818559
Lead	ND		0.00200	1	10/02/2015 11:38	WG818559
Nickel	0.0192		0.00200	1	10/02/2015 11:38	WG818559
Selenium	ND		0.00200	1	10/02/2015 11:38	WG818559
Silver	ND		0.00200	1	10/02/2015 11:38	WG818559
Thallium	ND		0.00200	1	10/02/2015 11:38	WG818559
Vanadium	ND		0.00500	1	10/02/2015 11:38	WG818559
Zinc	0.0306		0.0250	1	10/02/2015 11:38	WG818559

Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Suspended Solids	ND		2.50	1	09/26/2015 17:26	WG817633

Wet Chemistry by Method 9056MOD

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Fluoride	ND		0.100	1	10/02/2015 00:47	WG818435

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	09/25/2015 17:52	WG817535

Metals (ICPMS) by Method 6020

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Antimony	ND		0.00200	1	10/02/2015 11:40	WG818559
Arsenic	ND		0.00200	1	10/02/2015 11:40	WG818559
Barium	ND		0.00500	1	10/02/2015 11:40	WG818559
Beryllium	ND		0.00200	1	10/02/2015 11:40	WG818559
Cadmium	ND		0.00100	1	10/02/2015 11:40	WG818559
Chromium	ND		0.00200	1	10/02/2015 11:40	WG818559
Copper	ND		0.00500	1	10/02/2015 11:40	WG818559
Cobalt	ND		0.00200	1	10/02/2015 11:40	WG818559
Lead	ND		0.00200	1	10/02/2015 11:40	WG818559
Nickel	ND		0.00200	1	10/02/2015 11:40	WG818559
Selenium	ND		0.00200	1	10/02/2015 11:40	WG818559
Silver	ND		0.00200	1	10/02/2015 11:40	WG818559
Thallium	ND		0.00200	1	10/02/2015 11:40	WG818559
Vanadium	ND		0.00500	1	10/02/2015 11:40	WG818559
Zinc	ND		0.0250	1	10/02/2015 11:40	WG818559

Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Suspended Solids	ND		2.50	1	09/30/2015 01:24	WG817922

Wet Chemistry by Method 9056MOD

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Fluoride	ND		0.100	1	10/02/2015 01:01	WG818435

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	09/25/2015 17:54	WG817535

Metals (ICPMS) by Method 6020

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Antimony	ND		0.00200	1	10/02/2015 11:43	WG818559
Arsenic	ND		0.00200	1	10/02/2015 11:43	WG818559
Barium	ND		0.00500	1	10/02/2015 11:43	WG818559
Beryllium	ND		0.00200	1	10/02/2015 11:43	WG818559
Cadmium	ND		0.00100	1	10/02/2015 11:43	WG818559
Chromium	ND		0.00200	1	10/02/2015 11:43	WG818559
Copper	ND		0.00500	1	10/02/2015 11:43	WG818559
Cobalt	ND		0.00200	1	10/02/2015 11:43	WG818559
Lead	ND		0.00200	1	10/02/2015 11:43	WG818559
Nickel	ND		0.00200	1	10/02/2015 11:43	WG818559
Selenium	ND		0.00200	1	10/02/2015 11:43	WG818559
Silver	ND		0.00200	1	10/02/2015 11:43	WG818559
Thallium	ND		0.00200	1	10/02/2015 11:43	WG818559
Vanadium	ND		0.00500	1	10/02/2015 11:43	WG818559
Zinc	ND		0.0250	1	10/02/2015 11:43	WG818559

Gravimetric Analysis by Method 2540 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Suspended Solids	ND		2.50	1	09/28/2015 00:40	WG817444

Wet Chemistry by Method 9056MOD

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Fluoride	ND		0.100	1	10/02/2015 01:15	WG818435

Mercury by Method 7470A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Mercury	ND		0.000200	1	09/25/2015 17:56	WG817535

Metals (ICPMS) by Method 6020

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Antimony	ND		0.00200	1	10/02/2015 11:45	WG818559
Arsenic	ND		0.00200	1	10/02/2015 11:45	WG818559
Barium	0.492		0.00500	1	10/02/2015 11:45	WG818559
Beryllium	ND		0.00200	1	10/02/2015 11:45	WG818559
Cadmium	ND		0.00100	1	10/02/2015 11:45	WG818559
Chromium	ND		0.00200	1	10/02/2015 11:45	WG818559
Lead	ND		0.00200	1	10/02/2015 11:45	WG818559
Nickel	0.0171		0.00200	1	10/02/2015 11:45	WG818559
Selenium	ND		0.00200	1	10/02/2015 11:45	WG818559
Silver	ND		0.00200	1	10/02/2015 11:45	WG818559
Thallium	ND		0.00200	1	10/02/2015 11:45	WG818559

Method Blank (MB)

(MB) 09/28/15 00:38

Analyte	MB Result mg/l	MB Qualifier	MB RDL mg/l
Suspended Solids	ND		2.50

L790142-01 Original Sample (OS) • Duplicate (DUP)

(OS) 09/28/15 00:40 • (DUP) 09/28/15 00:40

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Suspended Solids	272	248	1	9.23	J3	5

L790337-01 Original Sample (OS) • Duplicate (DUP)

(OS) 09/28/15 00:37 • (DUP) 09/28/15 00:37

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Suspended Solids	72.0	75.0	1	4.08		5

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) 09/28/15 00:39 • (LCSD) 09/28/15 00:38

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Suspended Solids	773	816	820	106	106	85.0-115			0.489	5

Method Blank (MB)

(MB) 09/26/15 17:14

Analyte	MB Result	MB Qualifier	MB RDL
	mg/l		mg/l
Suspended Solids	ND		2.50

L790606-01 Original Sample (OS) • Duplicate (DUP)

(OS) 09/26/15 17:26 • (DUP) 09/26/15 17:40

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	mg/l	mg/l		%		%
Suspended Solids	12400	12500	1	1.36		5

L790606-05 Original Sample (OS) • Duplicate (DUP)

(OS) 09/26/15 17:21 • (DUP) 09/26/15 17:20

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	mg/l	mg/l		%		%
Suspended Solids	299	294	1	1.59		5

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) 09/26/15 17:31 • (LCSD) 09/26/15 17:30

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
Suspended Solids	773	800	808	103	105	85.0-115			0.995	5

Method Blank (MB)

(MB) 09/30/15 01:24

Analyte	MB Result	MB Qualifier	MB RDL
	mg/l		mg/l
Suspended Solids	ND		2.50

L790553-01 Original Sample (OS) • Duplicate (DUP)

(OS) 09/30/15 01:25 • (DUP) 09/30/15 01:25

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	mg/l	mg/l		%		%
Suspended Solids	24.6	25.0	1	1.44		5

L790631-01 Original Sample (OS) • Duplicate (DUP)

(OS) 09/30/15 01:29 • (DUP) 09/30/15 01:28

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	mg/l	mg/l		%		%
Suspended Solids	128	129	1	0.778		5

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) 09/30/15 01:24 • (LCSD) 09/30/15 01:24

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	%	%	%			%	%
Suspended Solids	773	752	756	97.3	97.8	85.0-115			0.531	5

Method Blank (MB)

(MB) 10/01/15 18:33

Analyte	MB Result mg/l	MB Qualifier	MB RDL mg/l
Fluoride	ND		0.100

L790475-01 Original Sample (OS) • Duplicate (DUP)

(OS) 10/01/15 20:24 • (DUP) 10/01/15 20:38

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Fluoride	0.125	0.124	1	0		20

L790477-06 Original Sample (OS) • Duplicate (DUP)

(OS) 10/01/15 23:24 • (DUP) 10/01/15 23:38

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Fluoride	ND	-0.0166	1	0		20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) 10/01/15 18:47 • (LCSD) 10/01/15 19:01

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Fluoride	8.00	7.82	7.85	98	98	90-110			0	20

L790475-02 Original Sample (OS) • Matrix Spike (MS)

(OS) 10/01/15 20:52 • (MS) 10/01/15 21:06

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Fluoride	5.00	0.115	5.33	104	1	80-120	

L790477-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) 10/01/15 23:51 • (MS) 10/02/15 00:05 • (MSD) 10/02/15 00:19

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Fluoride	5.00	ND	4.96	5.00	99	100	1	80-120			1	20

Method Blank (MB)

(MB) 09/25/15 17:07

Analyte	MB Result mg/l	MB Qualifier	MB RDL mg/l
Mercury	ND		0.000200

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) 09/25/15 19:09 • (LCSD) 09/25/15 19:12

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Mercury	0.00300	0.00270	0.00264	90	88	80-120			2	20

L790475-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) 09/25/15 17:19 • (MS) 09/25/15 17:21 • (MSD) 09/25/15 17:23

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Mercury	0.00300	ND	0.00195	0.00221	65	74	1	75-125	J6	J6	13	20

Method Blank (MB)

(MB) 10/02/15 10:58

Analyte	MB Result mg/l	MB Qualifier	MB RDL mg/l
Antimony	ND		0.00200
Arsenic	ND		0.00200
Barium	ND		0.00500
Beryllium	ND		0.00200
Cadmium	ND		0.00100
Chromium	ND		0.00200
Copper	ND		0.00500
Cobalt	ND		0.00200
Lead	ND		0.00200
Nickel	ND		0.00200
Selenium	ND		0.00200
Silver	ND		0.00200
Thallium	ND		0.00200
Vanadium	ND		0.00500
Zinc	ND		0.0250

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) 10/02/15 11:01 • (LCSD) 10/02/15 11:03

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Antimony	0.0500	0.0500	0.0493	100	99	80-120			1	20
Arsenic	0.0500	0.0494	0.0475	99	95	80-120			4	20
Barium	0.0500	0.0477	0.0478	95	96	80-120			0	20
Beryllium	0.0500	0.0486	0.0468	97	94	80-120			4	20
Cadmium	0.0500	0.0500	0.0478	100	96	80-120			4	20
Chromium	0.0500	0.0481	0.0487	96	97	80-120			1	20
Copper	0.0500	0.0507	0.0512	101	102	80-120			1	20
Cobalt	0.0500	0.0491	0.0499	98	100	80-120			2	20
Lead	0.0500	0.0483	0.0472	97	94	80-120			2	20
Nickel	0.0500	0.0493	0.0498	99	100	80-120			1	20
Selenium	0.0500	0.0501	0.0490	100	98	80-120			2	20
Silver	0.0500	0.0499	0.0499	100	100	80-120			0	20
Thallium	0.0500	0.0472	0.0458	94	92	80-120			3	20
Vanadium	0.0500	0.0476	0.0484	95	97	80-120			2	20
Zinc	0.0500	0.0482	0.0474	96	95	80-120			2	20

L790477-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) 10/02/15 11:05 • (MS) 10/02/15 11:10 • (MSD) 10/02/15 11:13

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Antimony	0.0500	0.000178	0.0509	0.0517	101	103	1	75-125			2	20
Arsenic	0.0500	0.000913	0.0535	0.0550	105	108	1	75-125			3	20
Barium	0.0500	0.0174	0.0651	0.0647	95	95	1	75-125			1	20
Beryllium	0.0500	0.0000909	0.0487	0.0496	97	99	1	75-125			2	20
Cadmium	0.0500	0.000535	0.0522	0.0545	103	108	1	75-125			4	20
Chromium	0.0500	0.000553	0.0473	0.0498	93	98	1	75-125			5	20
Copper	0.0500	0.000749	0.0491	0.0512	97	101	1	75-125			4	20
Cobalt	0.0500	0.0000832	0.0480	0.0503	96	100	1	75-125			5	20
Lead	0.0500	0.000564	0.0490	0.0493	97	98	1	75-125			1	20
Nickel	0.0500	0.00940	0.0572	0.0590	96	99	1	75-125			3	20
Selenium	0.0500	0.000287	0.0503	0.0514	100	102	1	75-125			2	20
Silver	0.0500	0.000130	0.0506	0.0514	101	102	1	75-125			2	20
Thallium	0.0500	0.0000751	0.0477	0.0476	95	95	1	75-125			0	20
Vanadium	0.0500	0.000390	0.0474	0.0499	94	99	1	75-125			5	20
Zinc	0.0500	0.0235	0.0680	0.0707	89	94	1	75-125			4	20

Abbreviations and Definitions

SDG	Sample Delivery Group.
MDL	Method Detection Limit.
RDL	Reported Detection Limit.
ND,U	Not detected at the Reporting Limit (or MDL where applicable).
RPD	Relative Percent Difference.
(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
Rec.	Recovery.
SDL	Sample Detection Limit.
MQL	Method Quantitation Limit.
Unadj. MQL	Unadjusted Method Quantitation Limit.

Qualifier	Description
J3	The associated batch QC was outside the established quality control range for precision.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.

ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our "one location" design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be **YOUR LAB OF CHOICE.**

State Accreditations

Alabama	40660	Nevada	TN-03-2002-34
Alaska	UST-080	New Hampshire	2975
Arizona	AZ0612	New Jersey–NELAP	TN002
Arkansas	88-0469	New Mexico	TN00003
California	01157CA	New York	11742
Colorado	TN00003	North Carolina	Env375
Conneticut	PH-0197	North Carolina [1]	DW21704
Florida	E87487	North Carolina [2]	41
Georgia	NELAP	North Dakota	R-140
Georgia [1]	923	Ohio–VAP	CL0069
Idaho	TN00003	Oklahoma	9915
Illinois	200008	Oregon	TN200002
Indiana	C-TN-01	Pennsylvania	68-02979
Iowa	364	Rhode Island	221
Kansas	E-10277	South Carolina	84004
Kentucky [1]	90010	South Dakota	n/a
Kentucky [2]	16	Tennessee [1 4]	2006
Louisiana	AI30792	Texas	T 104704245-07-TX
Maine	TN0002	Texas [5]	LAB0152
Maryland	324	Utah	6157585858
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	109
Minnesota	047-999-395	Washington	C1915
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA
Nebraska	NE-OS-15-05		

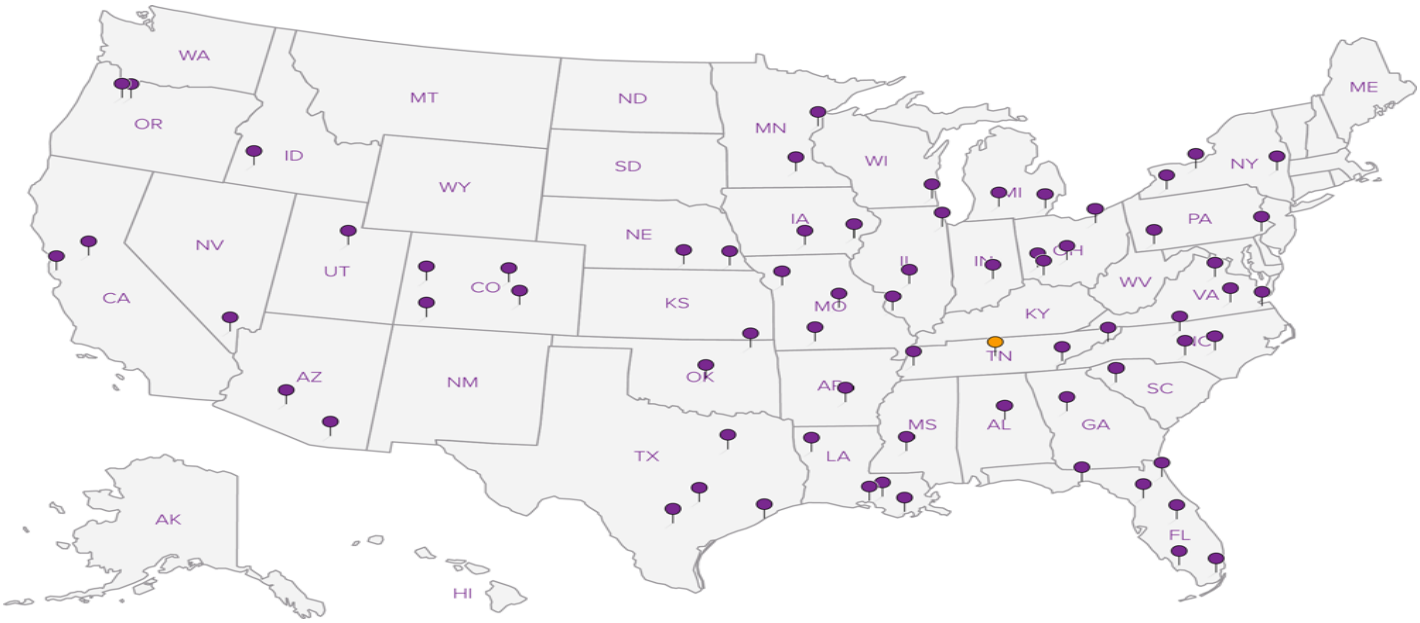
[1.] Drinking Water [2.] Underground Storage Tanks [3.] Aquatic Toxicity [4.] Chemical/Microbiological [5.] Mold [n/a] Accreditation not applicable

Third Party & Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA	100789
Canada	1461.01	DOD	1461.01
EPA–Crypto	TN00003	USDA	S-67674

Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. **ESC Lab Sciences performs all testing at our central laboratory.**



TVA-Environmental Affairs

400 W. Summit Hill Mailstop TVA WT 9D-K
Knoxville, TN 37902

Billing Information:
TVA Accounts Payable
1101 Market St. Mailstop: LP-5D-C
Chattanooga, TN 37402

Report to: Ronda Hooper

Email To: TVA_GW_Analytical@tva.gov

Project Description: JOF GW WEL

City/State Collected: NEW JOHNSONVILLE TN

Phone: 865-632-6941
Fax:

Client Project # JOF GW WEL

Lab Project # TVAENVAFF-JOF GW WEL

Collected by (print): Monte W. Starks

Site/Facility ID #

P.O. # 727593

Collected by (signature): M W Starks

Immediately Packed on Ice N ___ Y ✓

Rush? (Lab MUST Be Notified)
___ Same Day 200%
___ Next Day 100%
___ Two Day 50%
___ Three Day 25%

Date Results Needed: STD

Email? ___No X_Yes
FAX? ___No ___Yes

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	FLUORIDE 125mlHDPE-NoPres	Metals 500mlHDPE-HNO3 ☐2	TSS 1L-HDPE NoPres	Rem./Contaminant	Sample # (lab only)
JOF-B6R-0915	GRAB	GW		9-23-15	0805	3	X	X	X		-01
JOF-B8R-0915	↑	GW		9-22-15	1510	3	X	X	X		-02
JOF-B9-0915 DUP		GW		9-22-15	0805	3	X	X	X		-03
JOF-B9-0915		GW		9-22-15	0805	3	X	X	X		-04
JOF-B10-0915		GW		9-22-15	1010	3	X	X	X		-05
JOF-B11-0915		GW		9-22-15	1405	3	X	X	X		-06
JOF-B12-0915		GW		9-22-15	1315	3	X	X	X		-07
JOF-B13-0915	↓	GW		9-22-15	1210	3	X	X	X		-08
~~JOF-B18-0915 DUP~~	—	~~GW~~		—	—	~~3~~	~~X~~	~~X~~	~~X~~		
JOF-DRFEQ-0915	GRAB	GW		9-22-15	1235	3	X	X	X		-09

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other_____

Remarks:

pH _____ Temp _____
Flow _____ Other _____

Chain of Custody Page ___ of ___

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Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# L790477

T 1002

Acctnum: TVAENVAFF
Template: T81496
Prelogin: P521342
TSR: 633 - Pam Langford
PB: 8-25 KW

Shipped Via: FedEx Ground

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
M W Starks	9-23-15	1600	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)
			Grey Deaun

Samples returned via: ☐ UPS ☐ FedEx ☐ Courier ☐ _____
Temp: 3.7 °C Bottles Received: 33
Date: 9-24-15 Time: 900

Hold #

Condition: (lab use only) NN OK

COC Seal Intact: ✓ Y ___N ___NA

pH Checked: CR NCF:

TVA-Environmental Affairs

400 W. Summit Hill Mailstop TVA WT 9D-K
Knoxville, TN 37902

Billing Information:
TVA Accounts Payable
1101 Market St. Mailstop: LP-5D-C
Chattanooga, TN 37402

Report to: Ronda Hooper

Email To: TVA_GW_Analytical@tva.gov

Project Description: JOF GW WEL

City/State Collected: NEW JOHNSONVILLE TN

Phone: 865-632-6941
Fax:

Client Project # JOF GW WEL

Lab Project # TVAENVAFF-JOF GW WEL

Collected by (print): Monte W. Starks

Site/Facility ID #

P.O. # 727593

Collected by (signature): Mtn. Stks

Immediately Packed on Ice N ___ Y ✓

Rush? (Lab MUST Be Notified)
___ Same Day 200%
___ Next Day 100%
___ Two Day 50%
___ Three Day 25%

Date Results Needed: STD

Email? ___No X__Yes
FAX? ___No ___Yes

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	FLUORIDE 125mlHDPE-NoPres	Metals 500mlHDPE-HNO3 C2	TSS 1L-HDPE NoPres							Rem./Contaminant	Sample # (lab only)
JOF-SRLEQ-0915	GRAB	GW		9-23-15	0715	3	X	X	X								-10
JOF-B12-0915-DUP	GRAB	GW		9-22-15	1315	3	X	X	X								-11

Analysis / Container / Preservative

Chain of Custody Page ___ of ___

ESC LABORATORY SCIENCES
12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# L790477

Table #

Acctnum: TVAENVAFF
Template: T81496
Prelogin: P521342
TSR: 633 - Pam Langford
PB: 8-25 KW

Shipped Via: FedEX Ground

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other_____

Remarks:

pH _____ Temp _____

Flow _____ Other _____

Hold #

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Mtn. Stks	9-23-15	1600	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)
			Joey Mcann

Samples returned via: ☐ UPS ☐ FedEx ☐ Courier ☐ _____

Temp: 3.7 °C Bottles Received: 33

Date: 9-24-15 Time: 900

Condition: (lab use only) ADJ OK

COC Seal Intact: ✓ Y ___N ___NA

pH Checked: CL NCF:

Appendix C

Outliers

APPENDIX C. BACKGROUND MONITORING DATA FOR WELL B13

Well	Sample Date	Antimony, total (ug/L)	Arsenic, total (ug/L)	Barium, total (ug/L)	Beryllium, total (ug/L)	Cadmium, total (ug/L)	Chromium, total (ug/L)	Cobalt, total (ug/L)	Copper, total (ug/L)	Fluoride, total (mg/L)	Lead, total (ug/L)	Mercury, total (ug/L)	Nickel, total (ug/L)	Selenium, total (ug/L)	Silver, total (ug/L)	Thallium, total (ug/L)	Vanadium, total (ug/L)	Zinc, total (ug/L)	Solids, Total Suspended (mg/L)
JOF-B13	9/24/1996	< 1	4	260	< 1	0.2	7	5	< 10	< 0.1	5	< 0.2	14	< 1	< 10	< 2	< 10	30	95
JOF-B13	3/25/1997	< 1	1	360	< 1	0.7	6	5	< 10	< 0.1	4	< 0.2	28	< 1	< 10	< 2	< 10	30	110
JOF-B13	9/10/1997	< 1	< 1	250	< 1	0.4	5	< 1	< 10	< 0.1	3	< 0.2	18	< 1	< 10	< 2	< 10	20	17
JOF-B13	3/17/1998	< 1	3	430	< 1	1	7	6	< 10	< 0.1	2	< 0.2	25	< 1	< 10	< 2	10	40	98
JOF-B13	9/15/1998	< 1	2	300	< 1	0.8	9	6	< 10	< 0.1	5	< 0.2	17	< 1	< 10	< 2	10	40	46
JOF-B13	3/10/1999	1	4	390	1	0.5	24	8	10	0.1	6	0.2	29	1	10	2	10	40	
JOF-B13	9/9/1999	1	2	300	1	0.7	26	12	10	0.1	3	0.2	27	1	10	2	10	30	85
JOF-B13	3/7/2000	1	8.1	520	1	1	14	9.5	10	0.1	8	0.2	31	1	10	2	28	61	180
JOF-B13	9/19/2000	< 1	1	340	1.3	1.9	3.3	3.7	< 10	< 0.1	4.6	0.2	16	< 1	< 10	< 2	< 10	31	48
JOF-B13	3/21/2001	< 1	3	570	< 1	1.3	11	2.7	13	< 0.1	4.3	< 0.2	27	< 1	< 10	< 2	< 10	53	130
JOF-B13	9/18/2001	< 1	< 1	540	1.1	5.4	9	6.7	10	< 0.1	12	< 0.1	22	< 1	< 10	< 2	< 10	62	88
JOF-B13	3/13/2002	< 1	2	660	1	1.3	3	< 1	20	< 0.1	< 1	< 0.1	20	< 1	< 10	< 2	< 10	40	66
JOF-B13	9/10/2002	9.3	< 1	560	< 1	1.8	2.9	< 1	< 10	< 0.1	3.2	< 0.1	15	< 1	< 10	< 2	10	60	98
JOF-B13	3/11/2003	< 1	< 1	820	< 1	1.7	4	1.8	20	< 0.1	4	< 0.1	32	< 1	< 10	< 2	< 10	60	78
JOF-B13	9/9/2003	0.2	2.8	840	< 1	2.53	< 1	1.4	10	< 0.1	8.7	0.1	20.2	1.5	< 10	< 0.1	10	60	170
JOF-B13	3/9/2004	< 0.6	2.4	680	< 1	2.16	15.6	4.7	< 10	< 0.1	12.3	< 0.1	36.3	1	< 10	0.2	< 10	20	110
JOF-B13	9/14/2004	< 3	2	670	< 1	1.2	7	2	< 10	< 0.1	4	0.1	23	< 1	< 10	< 2	< 10	10	57
JOF-B13	3/8/2005	< 3	1	750	< 1	1.4	5	5	< 10	< 0.1	1	0.1	27	< 1	< 10	< 2	< 10	10	24
JOF-B13	9/7/2005	< 3	2	670	< 1	1.4	5	2	< 10	< 0.1	4	0.2	23	< 1	< 10	< 2	< 10	10	31
JOF-B13	3/22/2006	< 3	< 1	810	< 1	1.8	7	2	10	< 0.1	2	0.2	28	< 1	< 10	< 2	< 10	10	23
JOF-B13	9/19/2006	< 3	< 1	730	< 1	1.5	2	2	< 10	< 0.1	2	0.2	22	< 1	< 10	< 2	< 10	20	26
JOF-B13	3/6/2007	< 1	< 1	840	< 2	2.1	5.7	3.5	2.1	0.29	1.7	< 0.2	26	2.2	< 0.5	< 1	< 10	67	22
JOF-B13	9/19/2007	< 1	1.5	710	< 2	1.7	9.6	< 10	3	0.27	2	< 0.2	27	3.6	< 0.5	< 1	< 10	73	30
JOF-B13	3/12/2008	< 1	7.1	840	< 2	1.7	8.2	< 10	2	< 0.1	2.5	< 0.2	32	4.2	< 0.5	< 1	< 10	78	32
JOF-B13	9/16/2008	< 1	2.8	720	< 2	1.6	3.6	< 10	2.7	< 0.1	2	0.32	52	3.7	< 0.5	< 1	< 10	56	11
JOF-B13	3/10/2009	< 1	1	780	< 2	1.9	5.4	< 10	2.5	< 0.1	1.2	< 0.2	28	3.6	< 0.5	< 1	< 10	69	10
JOF-B13	9/15/2009	< 1	< 1	880	< 2	2	5.4	< 10	< 2	0.12	1.2	0.21	32	3.3	< 1	< 1	< 10	72	17
JOF-B13	3/10/2010	< 1	1.1	860	< 2	1.8	5.7	< 10	< 2	< 0.1	1.9	0.22	28	3.6	< 1	< 1	11	75	30
JOF-B13	9/14/2010	< 1	< 1	800	< 2	1.1	4.9	< 10	< 2	< 0.1	< 1	0.24	26	1.9	< 1	< 1	5	73	16
JOF-B13	3/15/2011	< 1	< 1	1000	< 2	1.3	5.3	< 10	< 2	< 0.1	< 1	0.2	43	6	< 1	< 1	< 10	65	16
JOF-B13	9/13/2011	< 1	1.5	840	< 2	1.6	4.4	< 10	< 2	< 0.1	< 1	0.31	23	2.7	< 1	< 1	< 10	36	21
JOF-B13	3/20/2012	< 1	< 1	995	< 2	1.75	4	< 10	< 2	< 0.1	< 1	< 0.2	26.5	3.85	< 1	< 1	< 10	36	8
JOF-B13	9/18/2012	< 1	< 1	970	< 1	2	< 2	2.6	< 2	< 0.1	< 1	< 0.2	31	3.5	< 1	< 1	5.8	39	8
JOF-B13	3/19/2013	<1	1.2	780	<1	1.8	3.9	6	<2	<0.1	<1	<0.2	33	4.3	<1	<1	4.4	43	5.3
JOF-B13	9/24/2013	< 1	< 5	925	< 1	< 5	5.8	3.2	< 1	< 0.4	< 1	< 0.2	19.6	< 5	< 2.5	< 1	< 1	37	6.4
JOF-B13	3/11/2014	<1	<10	913.5	<1	<10	2.5	<5	<1	<0.4	<1	0.23	19.3	<10	<5	<1	<10	40.65	3.3
JOF-B13	9/8/2014	<1	<1	980	<1	1.4	2.7	2.6	<2	<0.1	<1	0.31	26	2.7	<1	<1	4.9	38	<2.5
JOF-B13	3/17/2015	<2	<2	1000	<2	2.2	3.7	5.2	<5	<0.1	<2	<0.2	22	<2	<2	<2	<5	42	<2.5
JOF-B13	9/22/2015	<2	<2	826	<2	2.05	5.58	3.11	<5	<0.1	<2	0.301	19.2	<2	<2	<2	<5	30.6	<2.5

Estimation of Box Plot Upper Extreme Outlier Limits

25th percentile	1	1	565	1	1.275	3.7	2.6	2	0.1	1	0.2	20.5	1	1	1	10	30.8	
75th percentile	1	2	850	2	1.8	7	10	10	0.1	3.6	0.2	28	3.575	10	2	10	61	
Interquartile Range (IQR)	0	1	285	1	0.525	3.3	7.4	8	0	2.6	0	7.5	2.575	9	1	0	30.2	
Upper Extreme Outlier Limit	1	5	1705	5	3	17	32	34	0	11	0	51	11	37	5	10	152	
Background value count	32	31	33	33	30	31	33	33	33	33	33	32	32	33	33	32	33	

NOTES:

Highlighted data outliers removed before computing constituent UPLs.

Upper extreme outlier limit defined as 75th percentile plus 3 times IQR.

Appendix D

Statistics

Statistical Analysis Procedure

Background Date Range: 01/01/1996 to 09/23/2015
Background Locations: JOF-B13

Number of Future Observations: 51.00

Compliance Date Range: 09/22/2015 to 09/23/2015
Compliance Locations: JOF-B10,JOF-B11,JOF-B12

Comparison Method if all Background Results are Non-Detect:	STmdl = Last MDL
Statistical Test for Parametric Background Data Distributions:	STpar = Parametric Prediction Interval on Background
Statistical Test for Cases with High Percentage of Non-Detect Background Data:	STlow1 = Non-Parametric Prediction Interval on Background (ND Frequency > 55%)
Statistical Test for Cases with High Percentage of Non-Detect Background Data:	STlow2 = Non-Parametric Prediction Interval on Background (ND Frequency > 55%)
Statistical Test for Non-Parametric Background Data Distributions:	STnon = Non-Parametric Prediction Interval on Background
Background Comparison:	Interwell
Number of Verification Samples:	1
Default Type 1 Individual Comparison Error Level (False Positive Rate) for tests other than Prediction Interval	0.01
Type 1 Individual Comparison Error Level (False Positive Rate) for Prediction Interval	Calculate based on number of locations, parameters, and number of verification resamples, assumes site-wide Error Level of 0.05, using the approach of ASTM (1998).
Non-Detect Processing (Parametric Tests):	<=55% using MDL * 1.0 >55% using MDL * 1.0
Non-Detect Processing (All Other):	<=55% using MDL * 1.0 >55% using MDL * 1.0

Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
JOF-B10	Antimony, total, ug/L	09/22/2015	34	94.12	No/No	STlow1	99.53	3.000		<2.000	No	
JOF-B10	Arsenic, total, ug/L	09/22/2015	33	48.48	No/No	STnon	99.50	5.000		<2.000	No	
JOF-B10	Barium, total, ug/L	09/22/2015	35	0.00	No/No	STnon	99.55	1,000.000		20.600	No	
JOF-B10	Beryllium, total, ug/L	09/22/2015	35	85.71	No/No	STlow1	99.55	2.000		<2.000	No	
JOF-B10	Cadmium, total, ug/L	09/22/2015	32	0.00	Yes/No	STpar	96.83	2.482		<1.000	No	
JOF-B10	Chromium, total, ug/L	09/22/2015	33	3.03	Yes/Yes	STpar	96.83	9.746		2.470	No	
JOF-B10	Cobalt, total, ug/L	09/22/2015	35	40.00	No/No	STnon	99.55	12.000		<2.000	No	
JOF-B10	Copper, total, ug/L	09/22/2015	35	65.71	No/No	STlow1	99.55	20.000		<5.000	No	
JOF-B10	Fluoride, total, mg/L	09/22/2015	35	85.71	No/No	STlow1	99.55	0.400		<0.100	No	
JOF-B10	Lead, total, ug/L	09/22/2015	35	34.29	No/No	STnon	99.55	12.000		<2.000	No	

Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
JOF-B10	Mercury, total, ug/L	09/22/2015	35	51.43	No/No	STnon	99.55	0.320		<0.200	No	
JOF-B10	Nickel, total, ug/L	09/22/2015	34	0.00	Yes/Yes	STpar	96.83	36.647		4.930	No	
JOF-B10	Selenium, total, ug/L	09/22/2015	34	52.94	No/No	STnon	99.53	5.600		<2.000	No	
JOF-B10	Silver, total, ug/L	09/22/2015	35	94.29	No/No	STlow1	99.55	10.000		<2.000	No	
JOF-B10	Thallium, total, ug/L	09/22/2015	35	94.29	No/No	STlow1	99.55	2.000		<2.000	No	
JOF-B10	Vanadium, total, ug/L	09/22/2015	34	73.53	No/No	STlow1	99.53	10.000		<5.000	No	
JOF-B10	Zinc, total, ug/L	09/22/2015	35	0.00	Yes/No	STpar	96.83	83.646		<25.000	No	

Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
JOF-B11	Antimony, total, ug/L	09/22/2015	34	94.12	No/No	STlow1	99.53	3.000		<2.000	No	
JOF-B11	Arsenic, total, ug/L	09/22/2015	33	48.48	No/No	STnon	99.50	5.000		<2.000	No	
JOF-B11	Barium, total, ug/L	09/22/2015	35	0.00	No/No	STnon	99.55	1,000.000		244.000	No	
JOF-B11	Beryllium, total, ug/L	09/22/2015	35	85.71	No/No	STlow1	99.55	2.000		<2.000	No	
JOF-B11	Cadmium, total, ug/L	09/22/2015	32	0.00	Yes/No	STpar	96.83	2.482		<1.000	No	
JOF-B11	Chromium, total, ug/L	09/22/2015	33	3.03	Yes/Yes	STpar	96.83	9.746		<2.000	No	
JOF-B11	Cobalt, total, ug/L	09/22/2015	35	40.00	No/No	STnon	99.55	12.000		<2.000	No	
JOF-B11	Copper, total, ug/L	09/22/2015	35	65.71	No/No	STlow1	99.55	20.000		<5.000	No	
JOF-B11	Fluoride, total, mg/L	09/22/2015	35	85.71	No/No	STlow1	99.55	0.400		<0.100	No	
JOF-B11	Lead, total, ug/L	09/22/2015	35	34.29	No/No	STnon	99.55	12.000		<2.000	No	

Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
JOF-B11	Mercury, total, ug/L	09/22/2015	35	51.43	No/No	STnon	99.55	0.320		<0.200	No	
JOF-B11	Nickel, total, ug/L	09/22/2015	34	0.00	Yes/Yes	STpar	96.83	36.647		6.220	No	
JOF-B11	Selenium, total, ug/L	09/22/2015	34	52.94	No/No	STnon	99.53	5.600		<2.000	No	
JOF-B11	Silver, total, ug/L	09/22/2015	35	94.29	No/No	STlow1	99.55	10.000		<2.000	No	
JOF-B11	Thallium, total, ug/L	09/22/2015	35	94.29	No/No	STlow1	99.55	2.000		<2.000	No	
JOF-B11	Vanadium, total, ug/L	09/22/2015	34	73.53	No/No	STlow1	99.53	10.000		<5.000	No	
JOF-B11	Zinc, total, ug/L	09/22/2015	35	0.00	Yes/No	STpar	96.83	83.646		<25.000	No	

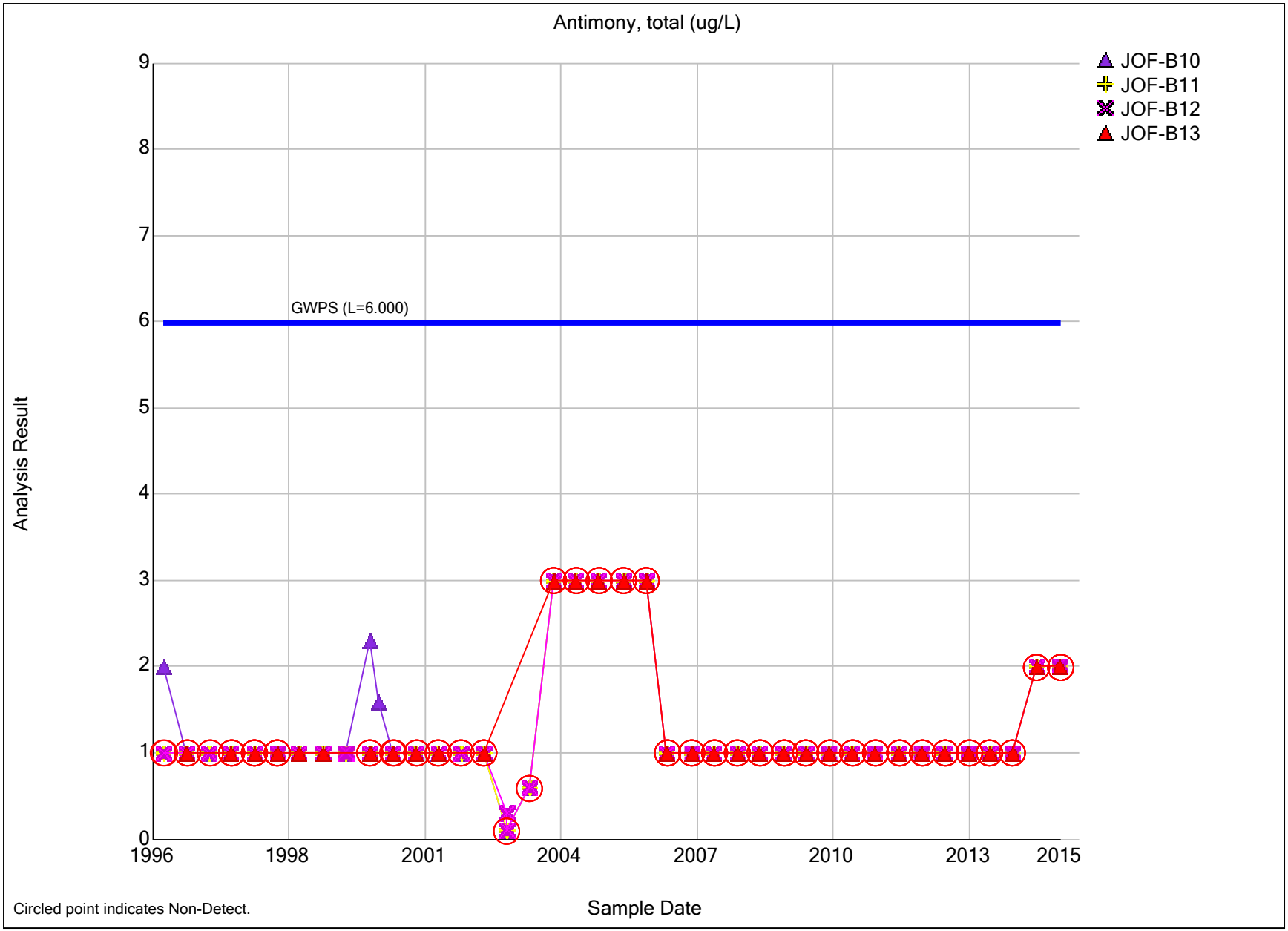
Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
JOF-B12	Antimony, total, ug/L	09/22/2015	34	94.12	No/No	STlow1	99.53	3.000		<2.000	No	
		09/22/2015	34	94.12	No/No		99.53	3.000		<2.000	No	
JOF-B12	Arsenic, total, ug/L	09/22/2015	33	48.48	No/No	STnon	99.50	5.000		<2.000	No	
		09/22/2015	33	48.48	No/No		99.50	5.000		<2.000	No	
JOF-B12	Barium, total, ug/L	09/22/2015	35	0.00	No/No	STnon	99.55	1,000.000		492.000	No	
		09/22/2015	35	0.00	No/No		99.55	1,000.000		502.000	No	
JOF-B12	Beryllium, total, ug/L	09/22/2015	35	85.71	No/No	STlow1	99.55	2.000		<2.000	No	
		09/22/2015	35	85.71	No/No		99.55	2.000		<2.000	No	
JOF-B12	Cadmium, total, ug/L	09/22/2015	32	0.00	Yes/No	STpar	96.83	2.482		<1.000	No	
		09/22/2015	32	0.00	Yes/No		96.83	2.482		<1.000	No	
JOF-B12	Chromium, total, ug/L	09/22/2015	33	3.03	Yes/Yes	STpar	96.83	9.746		<2.000	No	
		09/22/2015	33	3.03	Yes/Yes		96.83	9.746		<2.000	No	
JOF-B12	Cobalt, total, ug/L	09/22/2015	35	40.00	No/No	STnon	99.55	12.000		<2.000	No	
JOF-B12	Copper, total, ug/L	09/22/2015	35	65.71	No/No	STlow1	99.55	20.000		<5.000	No	

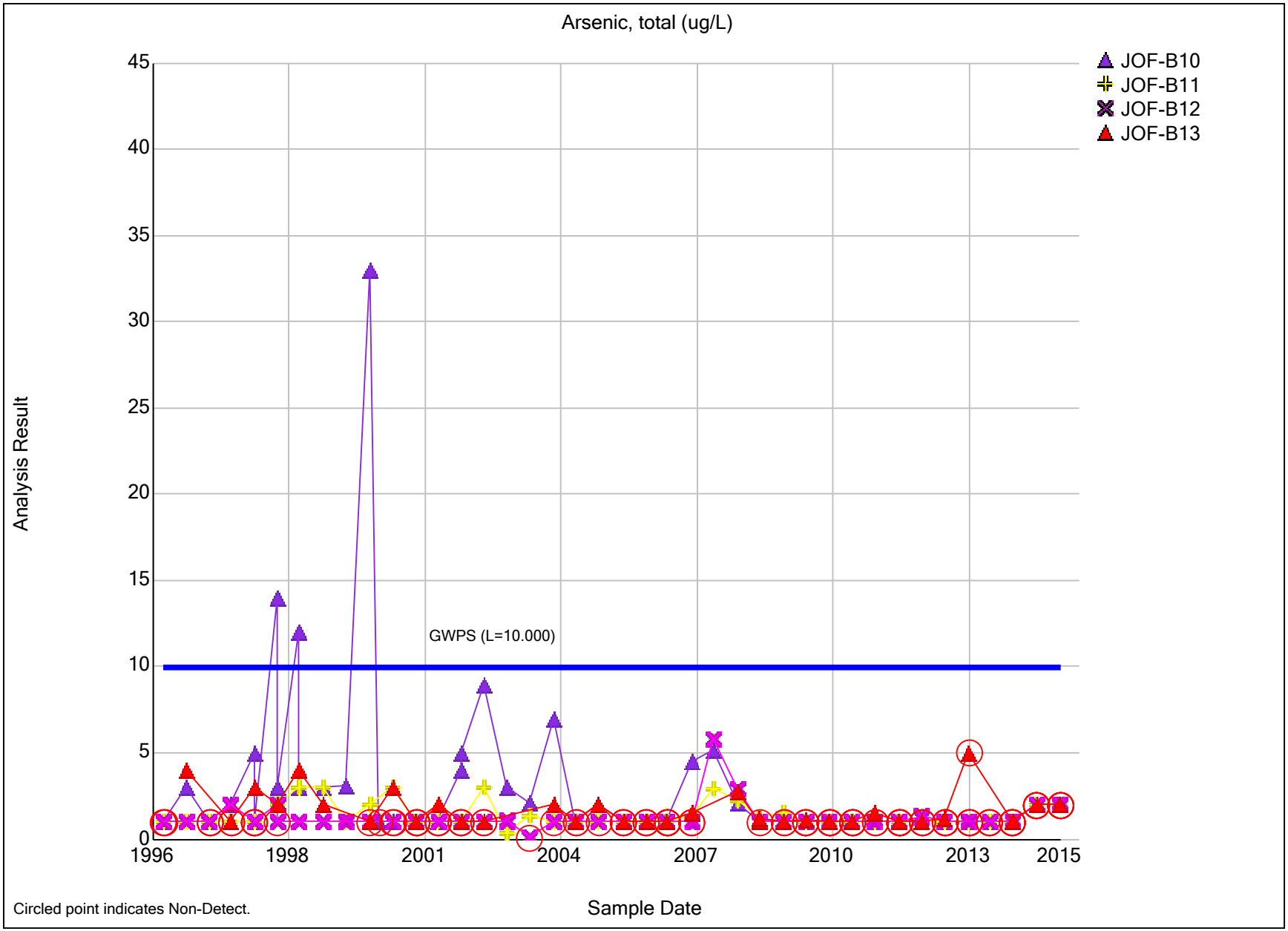
Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
JOF-B12	Fluoride, total, mg/L	09/22/2015	35	85.71	No/No	STlow1	99.55	0.400		<0.100	No	
		09/22/2015	35	85.71	No/No		99.55	0.400		<0.100	No	
JOF-B12	Lead, total, ug/L	09/22/2015	35	34.29	No/No	STnon	99.55	12.000		<2.000	No	
		09/22/2015	35	34.29	No/No		99.55	12.000		<2.000	No	
JOF-B12	Mercury, total, ug/L	09/22/2015	35	51.43	No/No	STnon	99.55	0.320		<0.200	No	
		09/22/2015	35	51.43	No/No		99.55	0.320		<0.200	No	
JOF-B12	Nickel, total, ug/L	09/22/2015	34	0.00	Yes/Yes	STpar	96.83	36.647		17.100	No	
		09/22/2015	34	0.00	Yes/Yes		96.83	36.647		17.500	No	
JOF-B12	Selenium, total, ug/L	09/22/2015	34	52.94	No/No	STnon	99.53	5.600		<2.000	No	
		09/22/2015	34	52.94	No/No		99.53	5.600		<2.000	No	
JOF-B12	Silver, total, ug/L	09/22/2015	35	94.29	No/No	STlow1	99.55	10.000		<2.000	No	
		09/22/2015	35	94.29	No/No		99.55	10.000		<2.000	No	
JOF-B12	Thallium, total, ug/L	09/22/2015	35	94.29	No/No	STlow1	99.55	2.000		<2.000	No	
		09/22/2015	35	94.29	No/No		99.55	2.000		<2.000	No	
JOF-B12	Vanadium, total, ug/L	09/22/2015	34	73.53	No/No	STlow1	99.53	10.000		<5.000	No	

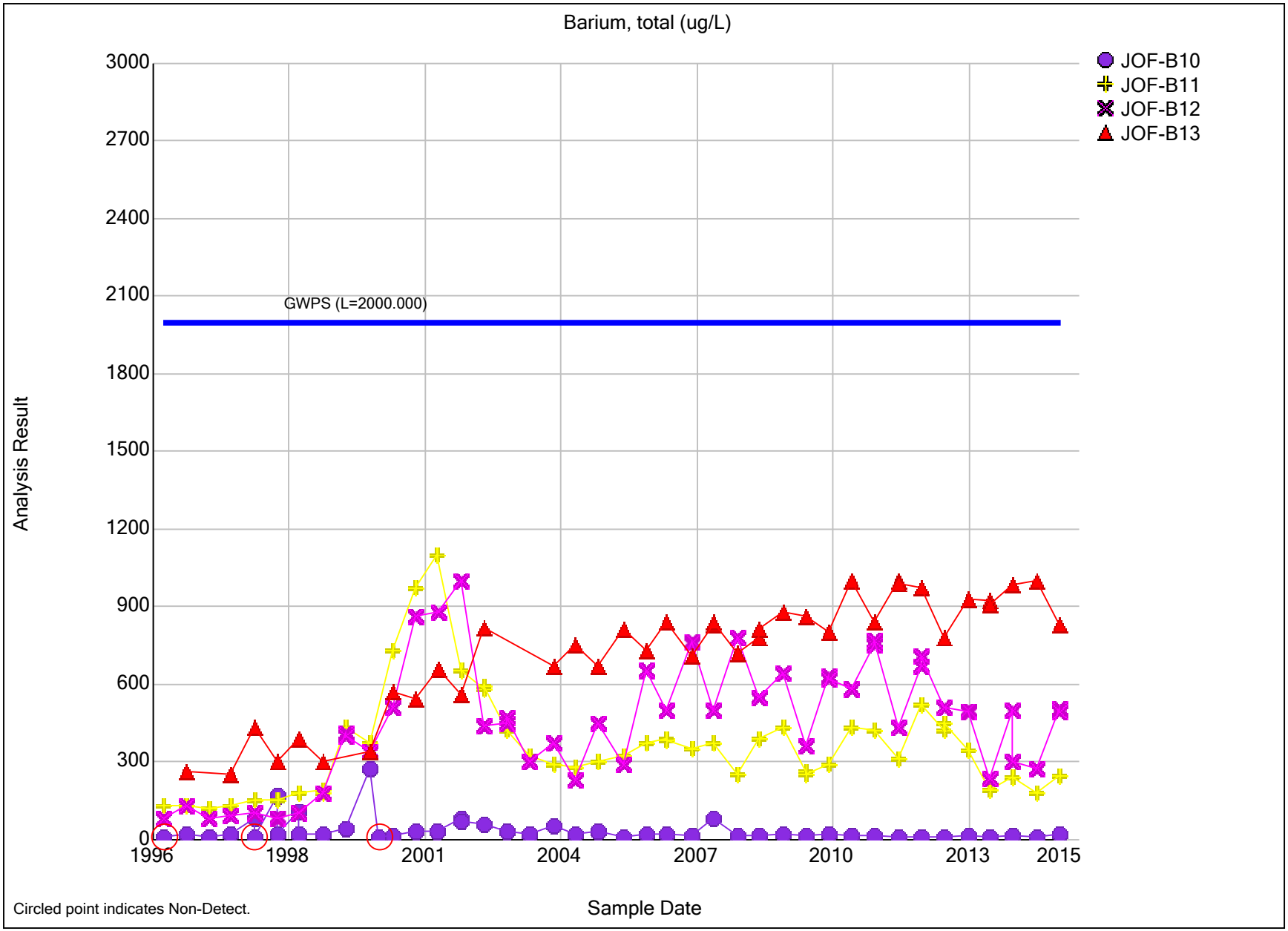
Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
JOF-B12	Zinc, total, ug/L	09/22/2015	35	0.00	Yes/No	STpar	96.83	83.646		25.900	No	

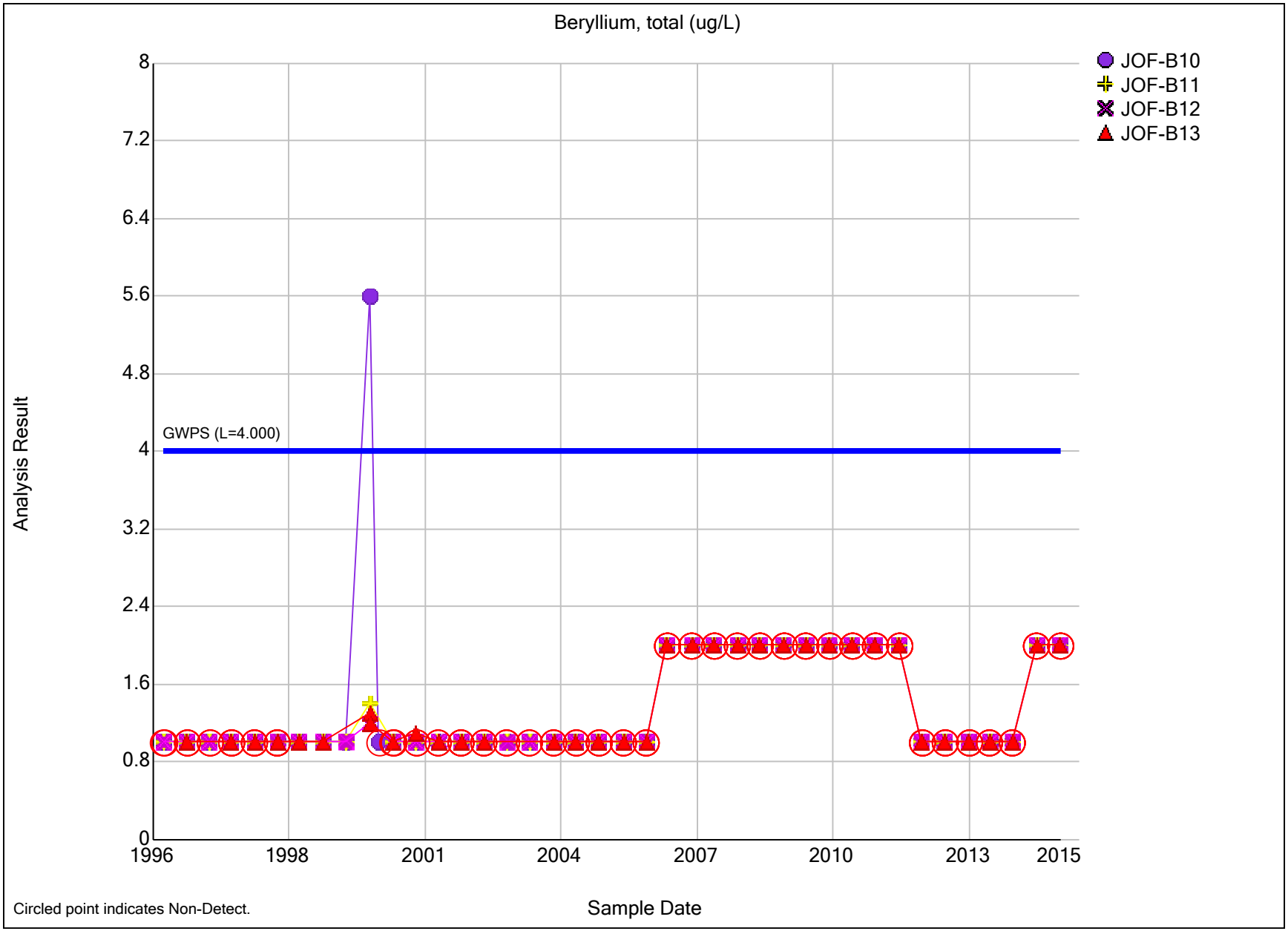
Appendix E

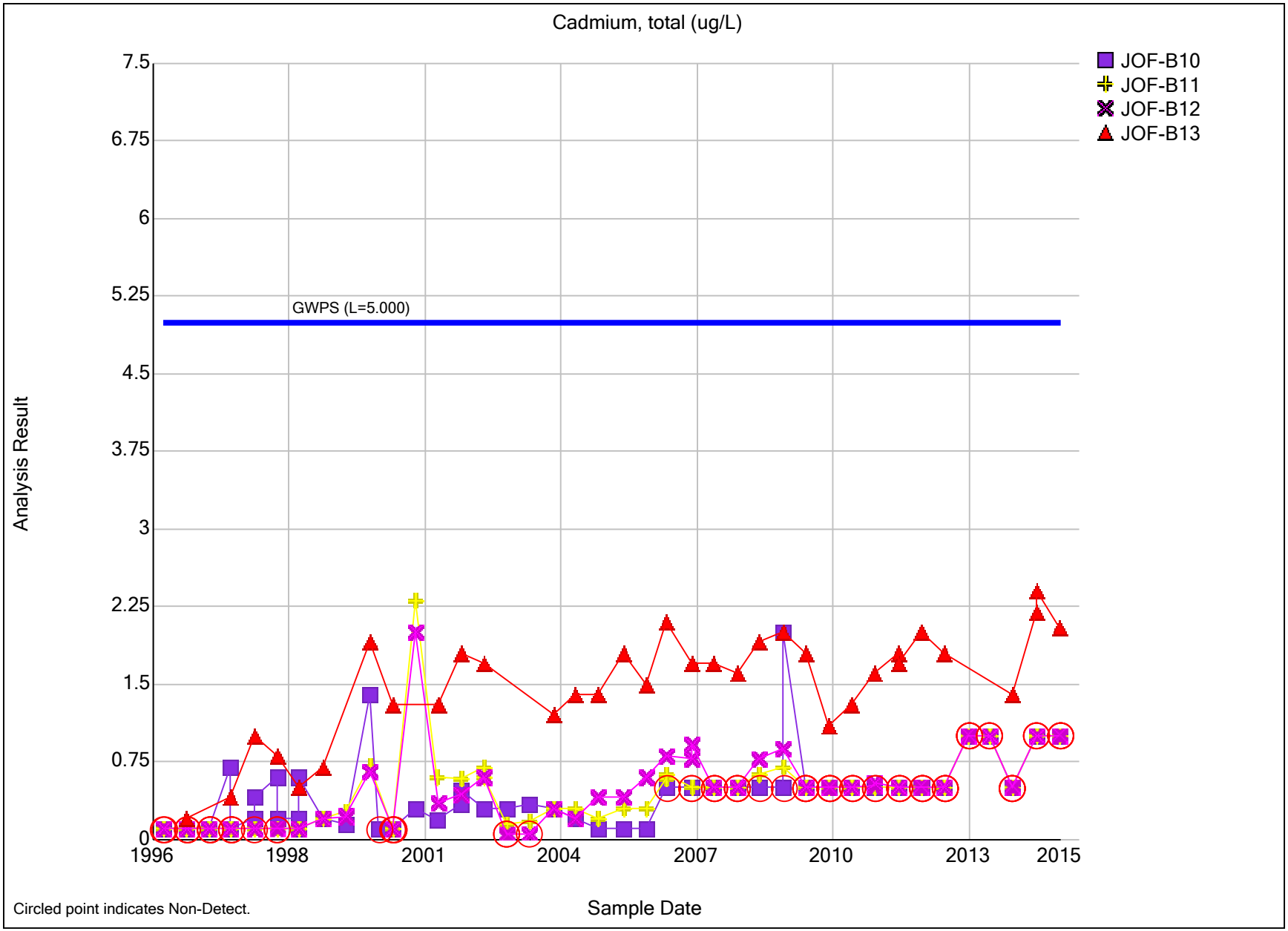
Time Series

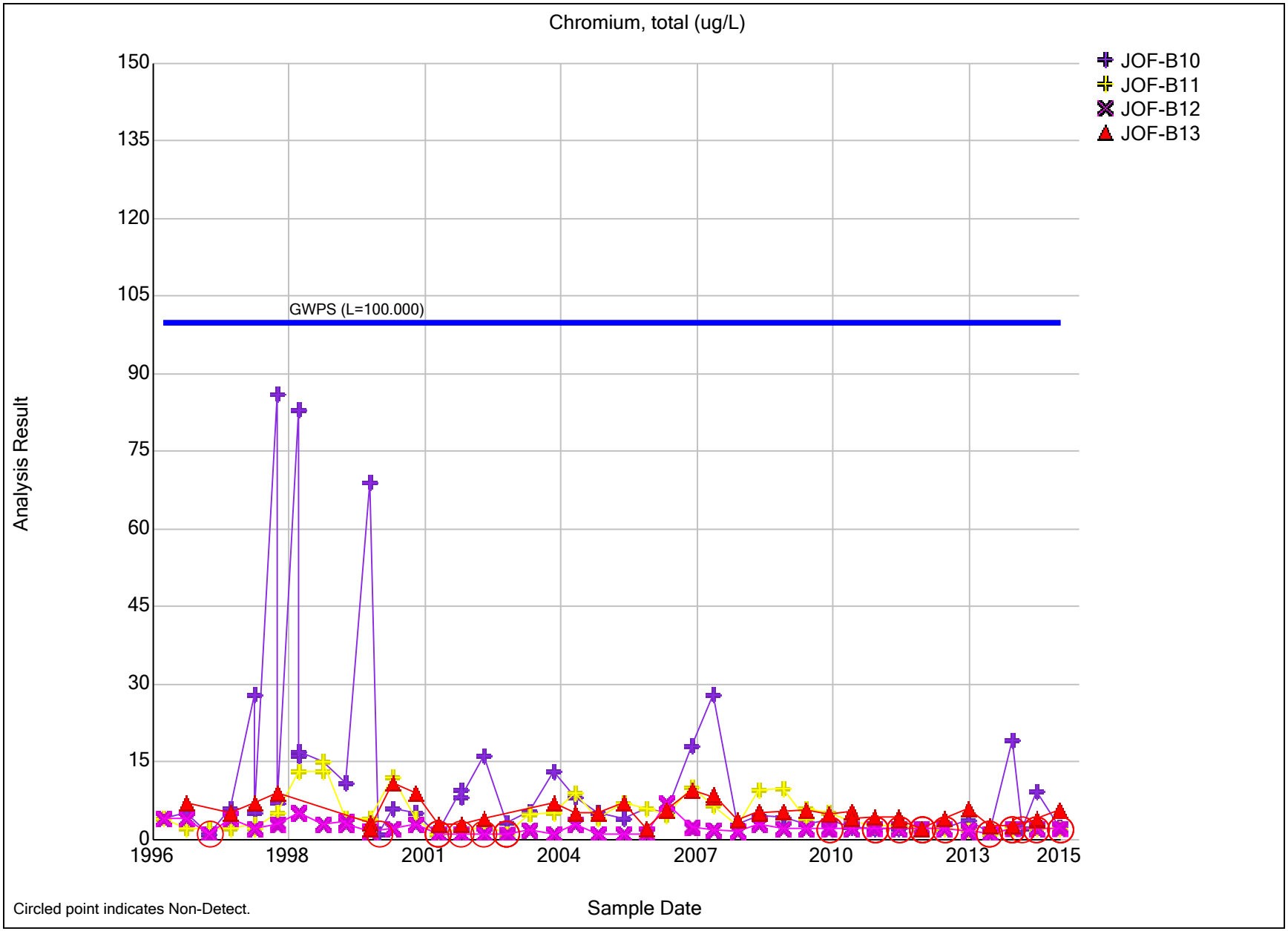

Antimony, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
GWPS (L=6.000)
Analysis Result
Sample Date
0
1
2
3
4
5
6
7
8
9
1996
1998
2001
2004
2007
2010
2013
2015
Circled point indicates Non-Detect.

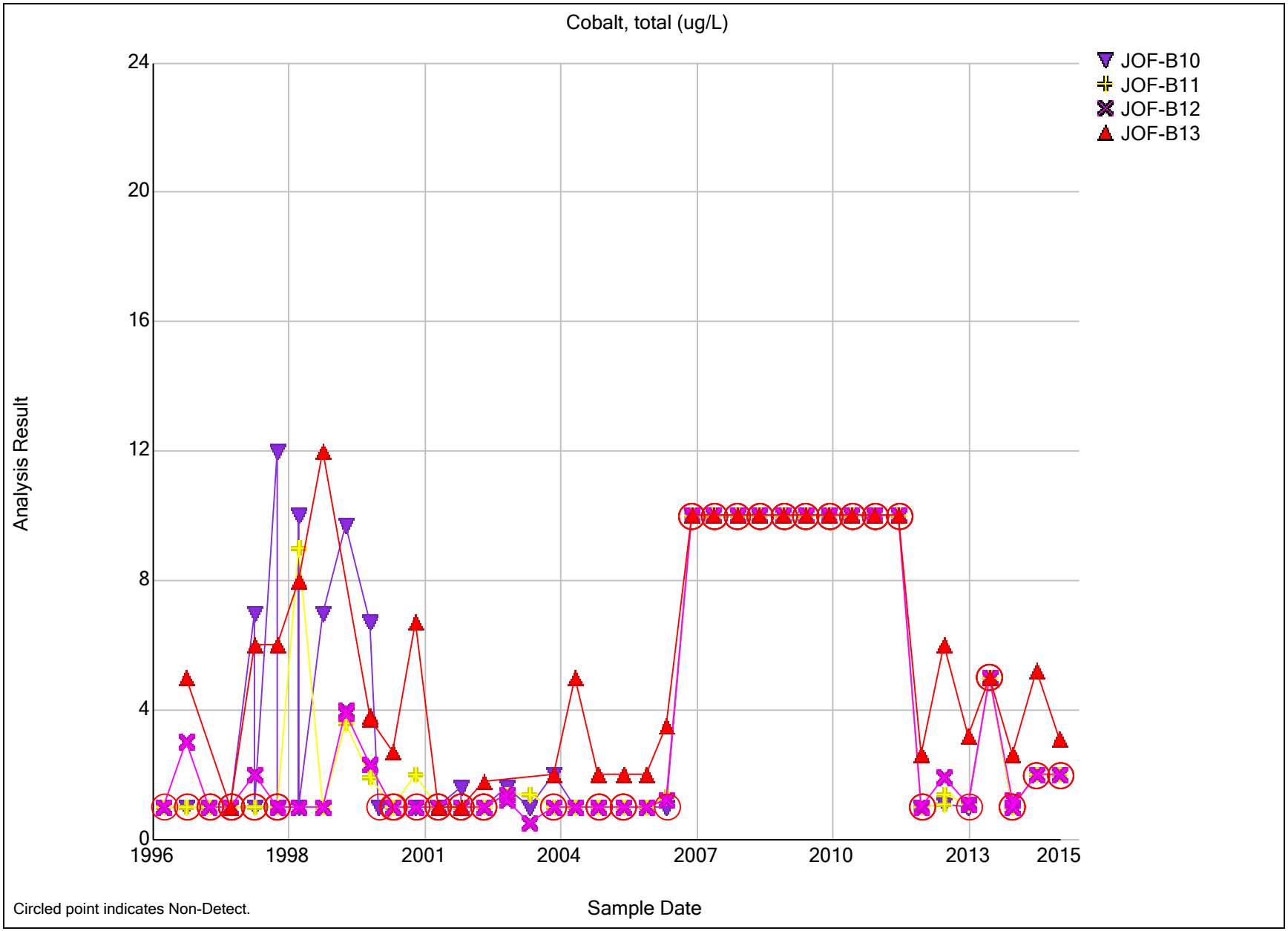

Arsenic, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
45
40
35
30
25
20
15
10
5
0
Analysis Result
GWPS (L=10.000)
1996
1998
2001
2004
2007
2010
2013
2015
Sample Date
Circled point indicates Non-Detect.

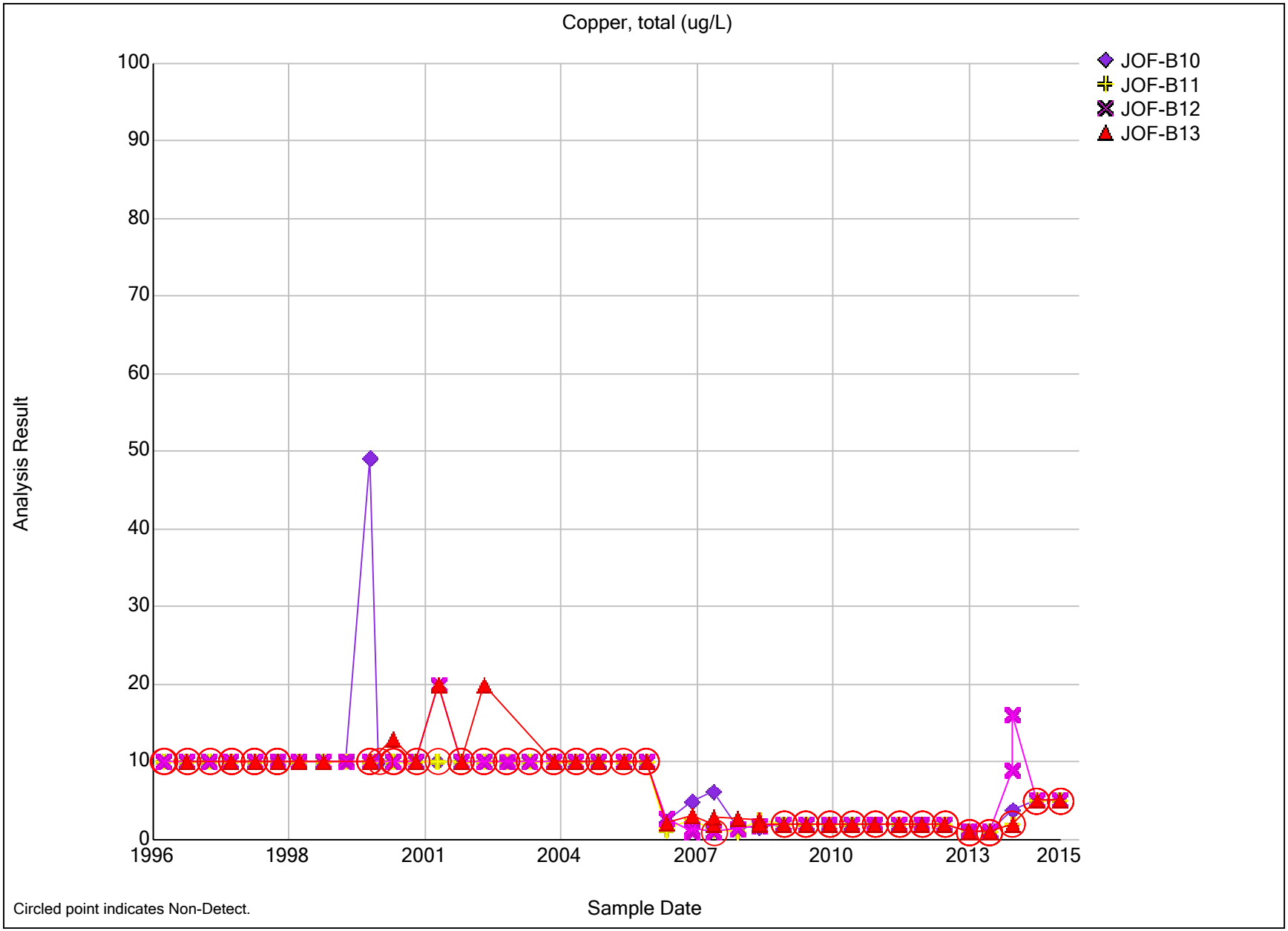

Barium, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
GWPS (L=2000.000)
Analysis Result
Sample Date
3000
2700
2400
2100
1800
1500
1200
900
600
300
0
1996
1998
2001
2004
2007
2010
2013
2015
Circled point indicates Non-Detect.

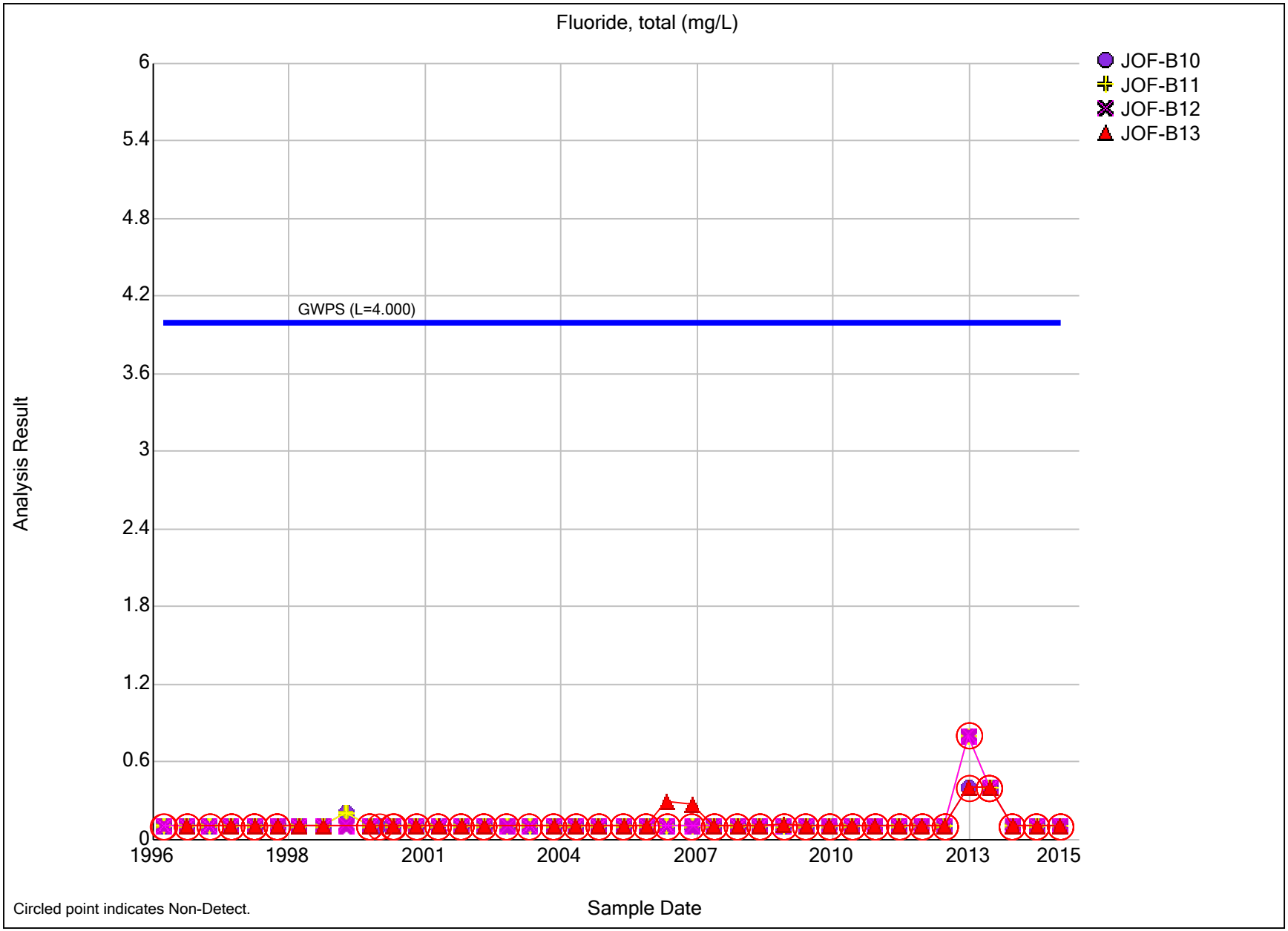

Beryllium, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
GWPS (L=4.000)
Analysis Result
Sample Date
Circled point indicates Non-Detect.
0
0.8
1.6
2.4
3.2
4
4.8
5.6
6.4
7.2
8
1996
1998
2001
2004
2007
2010
2013
2015

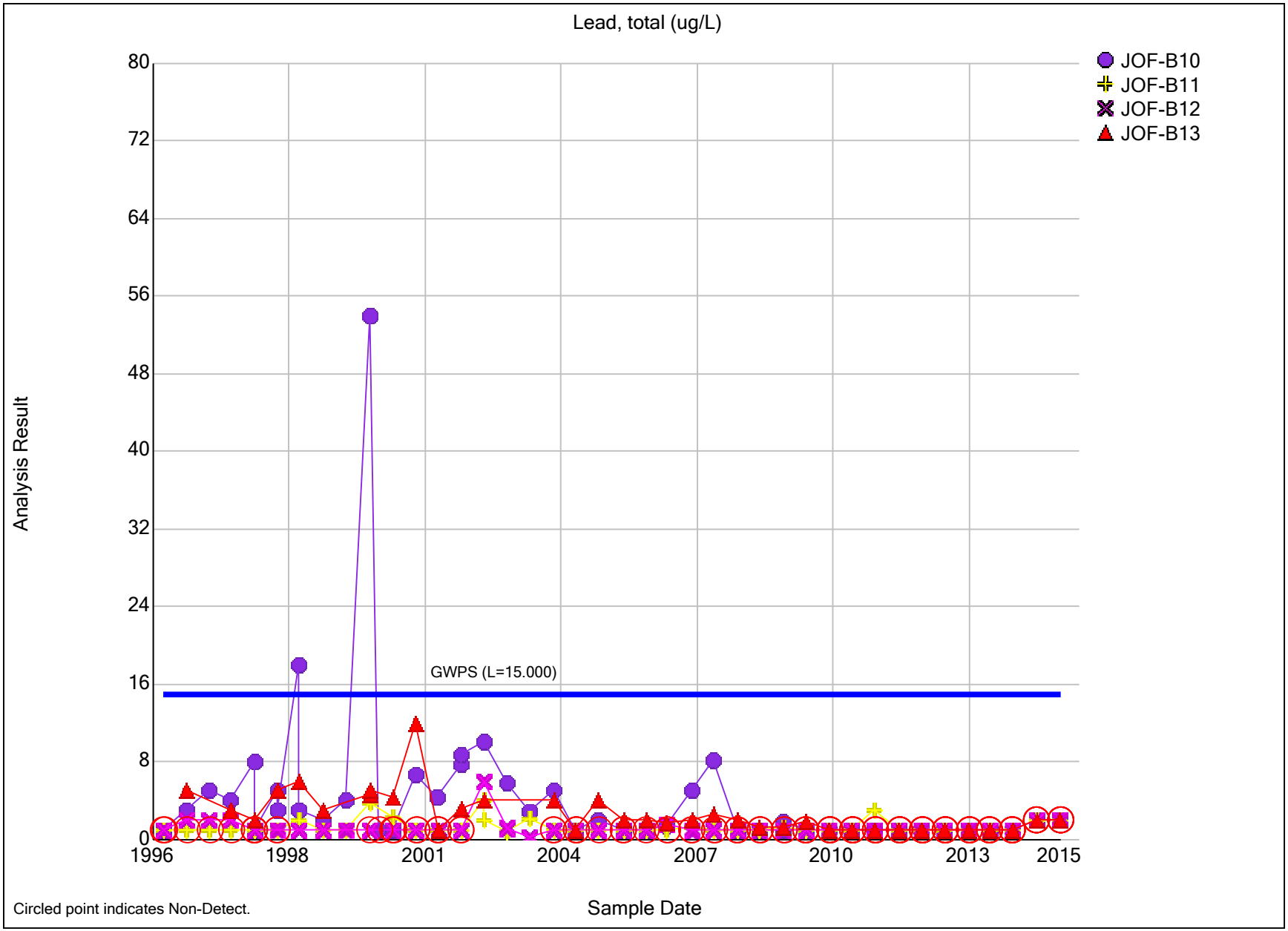

Cadmium, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
GWPS (L=5.000)
Analysis Result
7.5
6.75
6
5.25
4.5
3.75
3
2.25
1.5
0.75
0
1996
1998
2001
2004
2007
2010
2013
2015
Sample Date
Circled point indicates Non-Detect.

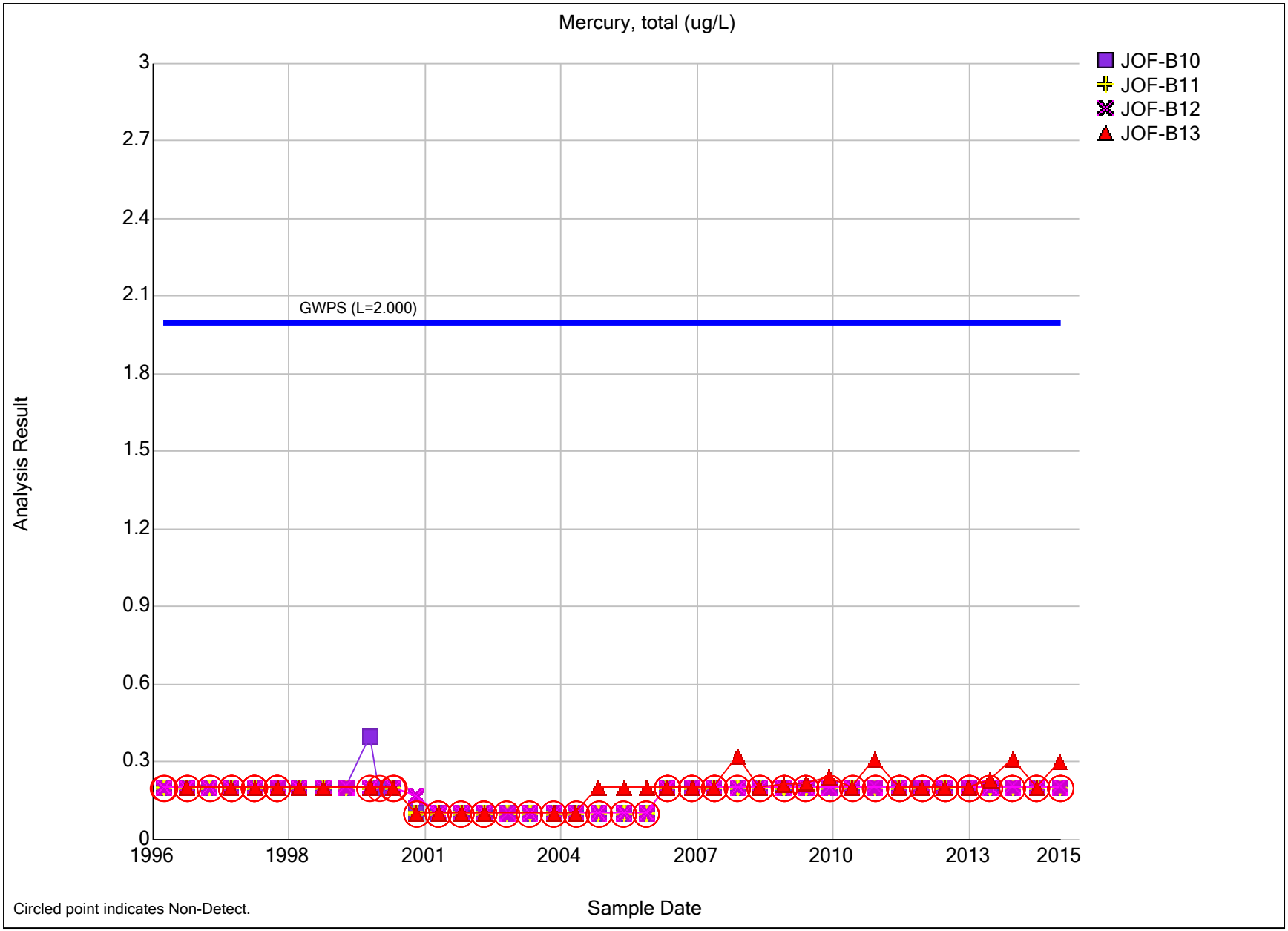

Chromium, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
GWPS (L=100.000)
Analysis Result
Sample Date
Circled point indicates Non-Detect.
150
135
120
105
90
75
60
45
30
15
0
1996
1998
2001
2004
2007
2010
2013
2015

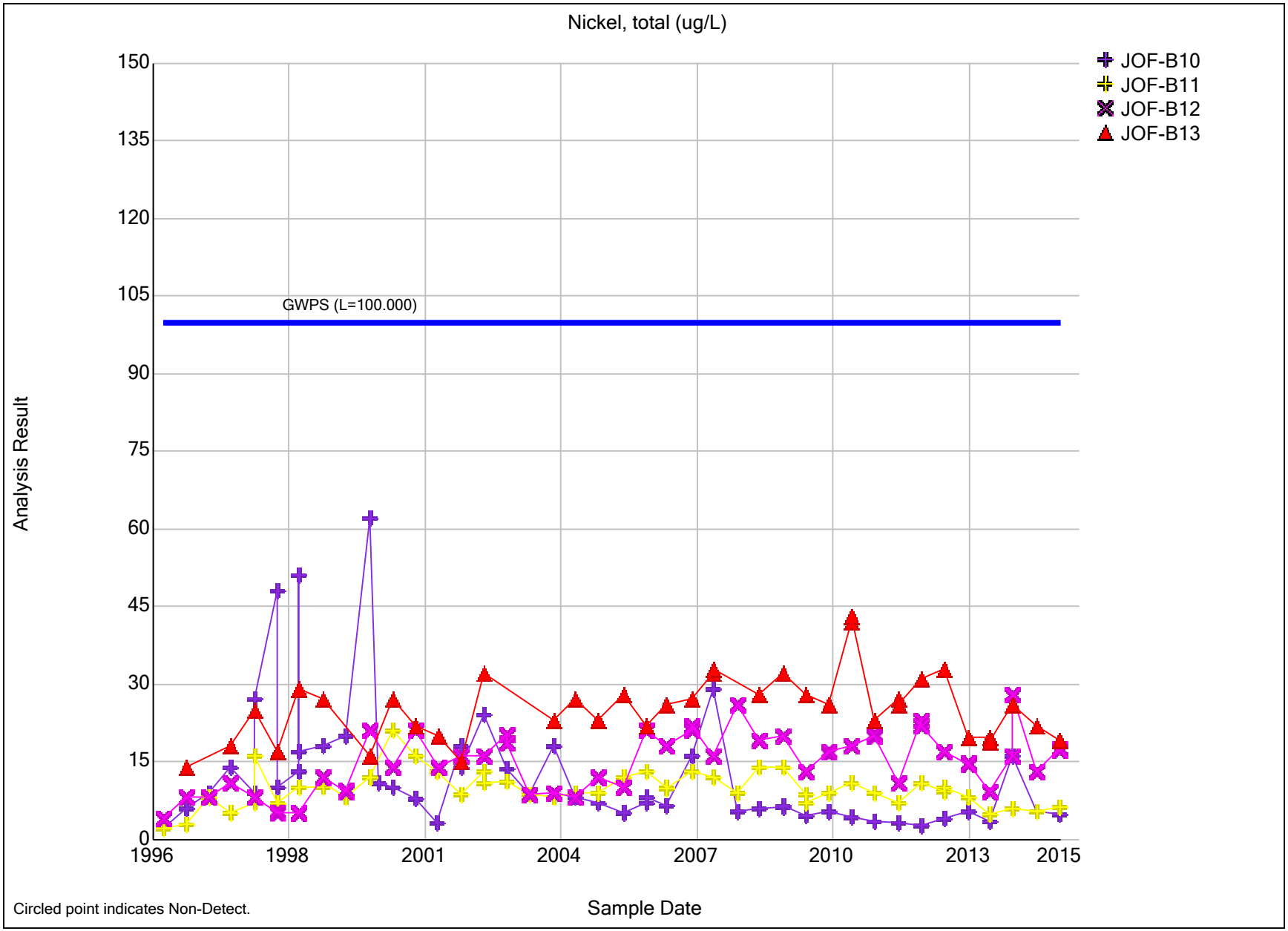

Cobalt, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
Analysis Result
24
20
16
12
8
4
0
1996
1998
2001
2004
2007
2010
2013
2015
Sample Date
Circled point indicates Non-Detect.

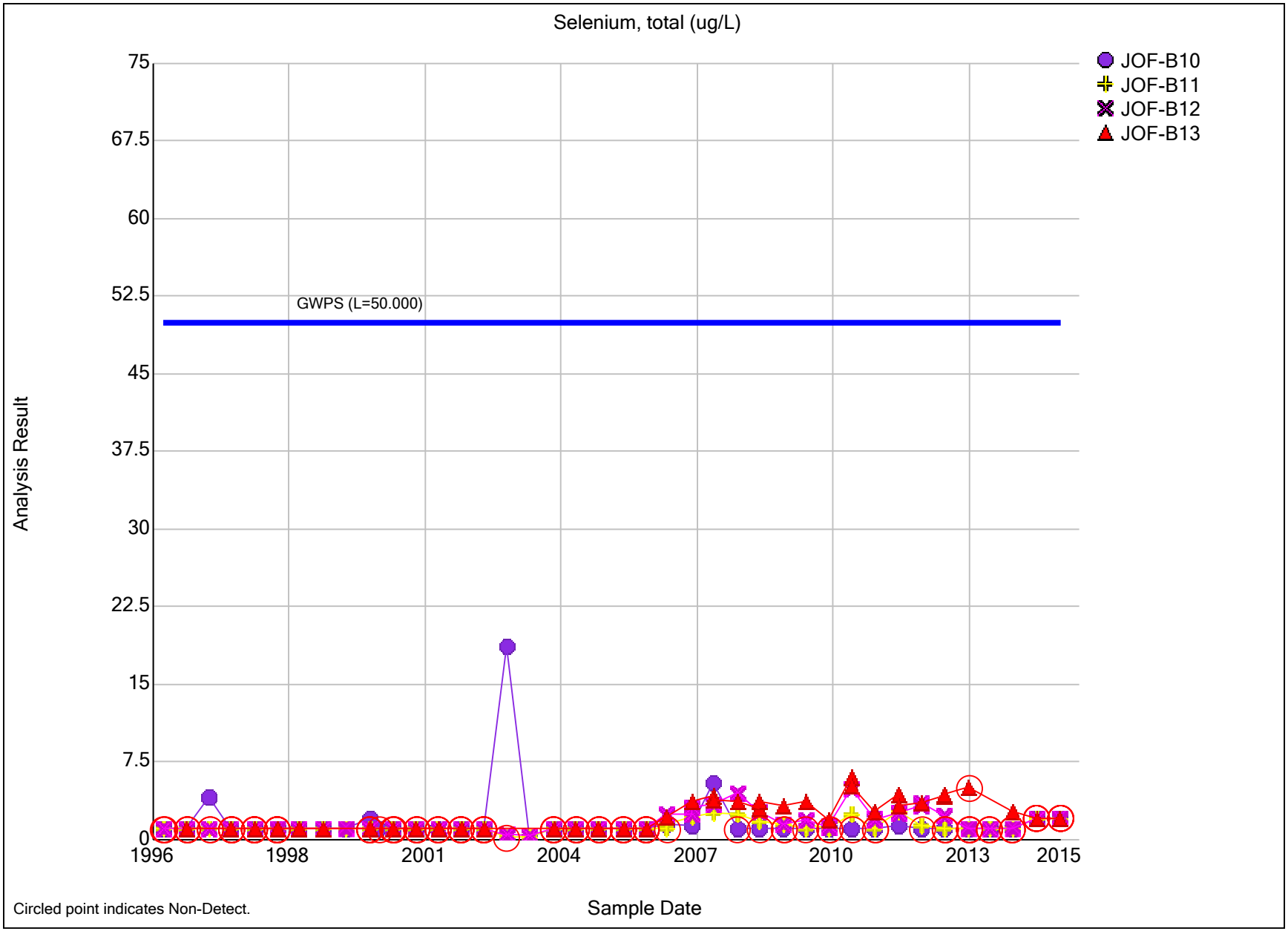

Copper, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
Analysis Result
100
90
80
70
60
50
40
30
20
10
0
1996
1998
2001
2004
2007
2010
2013
2015
Sample Date
Circled point indicates Non-Detect.

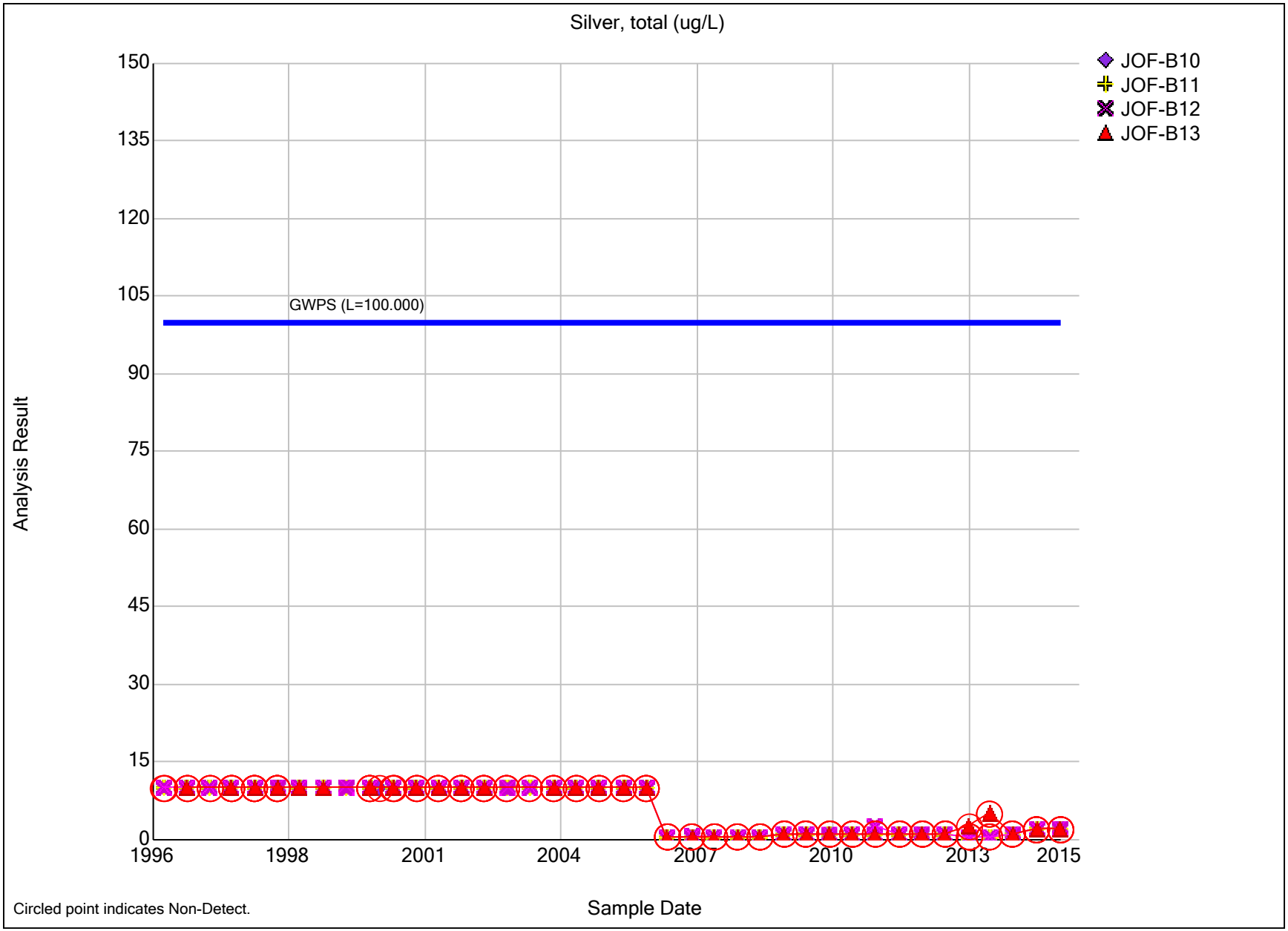

Fluoride, total (mg/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
GWPS (L=4.000)
Analysis Result
6
5.4
4.8
4.2
3.6
3
2.4
1.8
1.2
0.6
0
1996
1998
2001
2004
2007
2010
2013
2015
Sample Date
Circled point indicates Non-Detect.

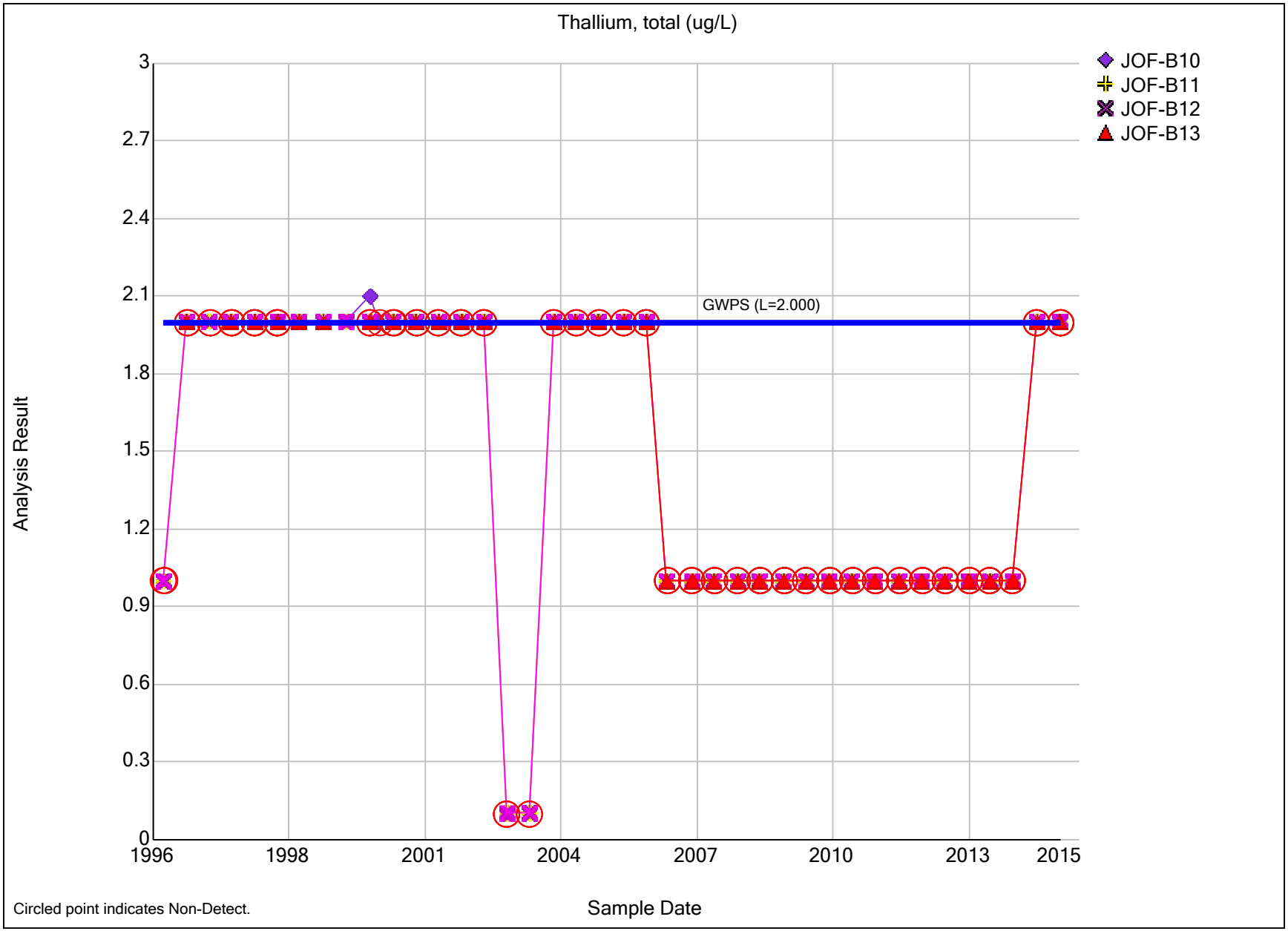

Lead, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
Analysis Result
80
72
64
56
48
40
32
24
16
8
0
GWPS (L=15.000)
1996
1998
2001
2004
2007
2010
2013
2015
Sample Date
Circled point indicates Non-Detect.

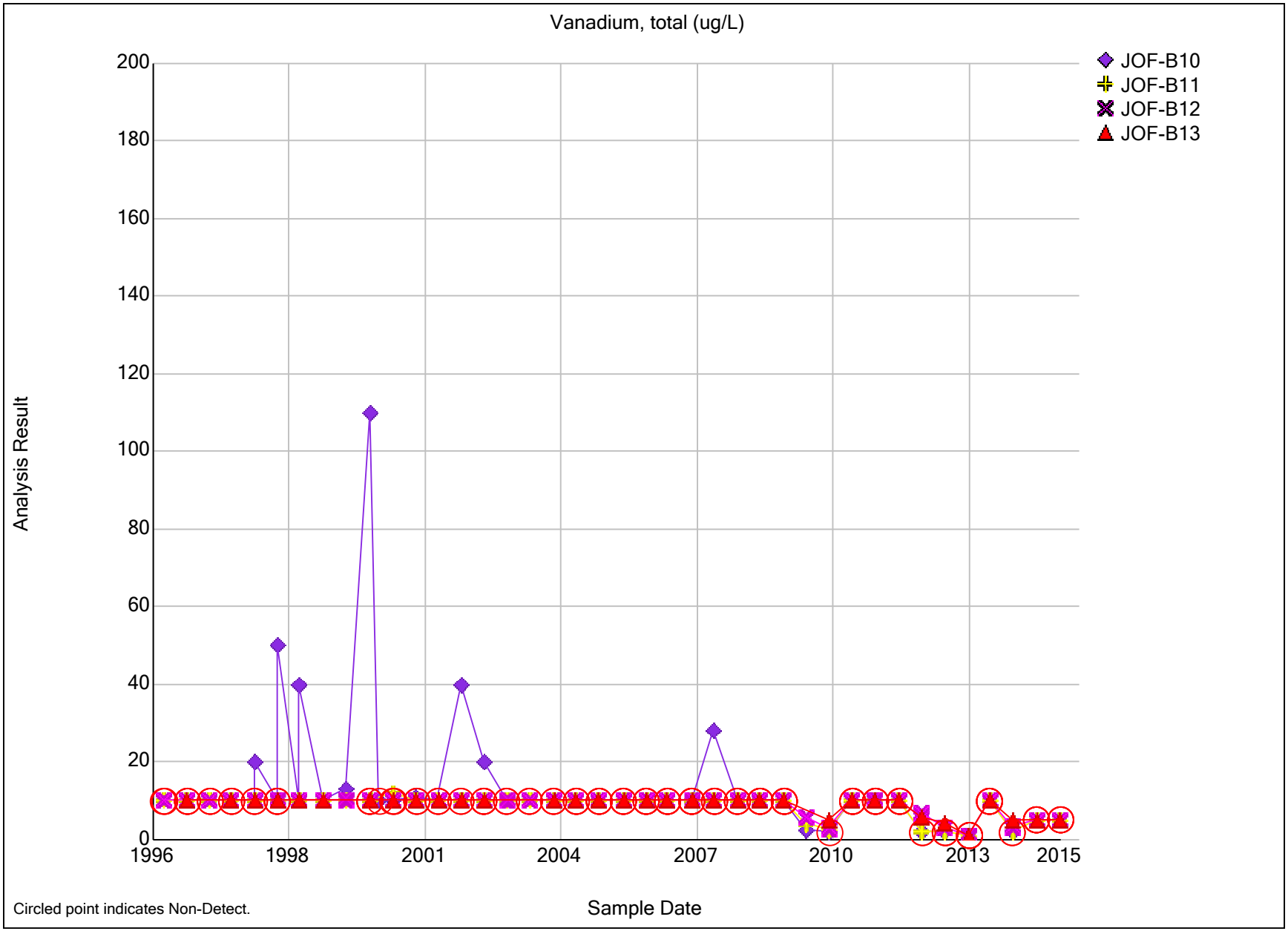

Mercury, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
GWPS (L=2.000)
Analysis Result
Sample Date
Circled point indicates Non-Detect.
3
2.7
2.4
2.1
1.8
1.5
1.2
0.9
0.6
0.3
0
1996
1998
2001
2004
2007
2010
2013
2015

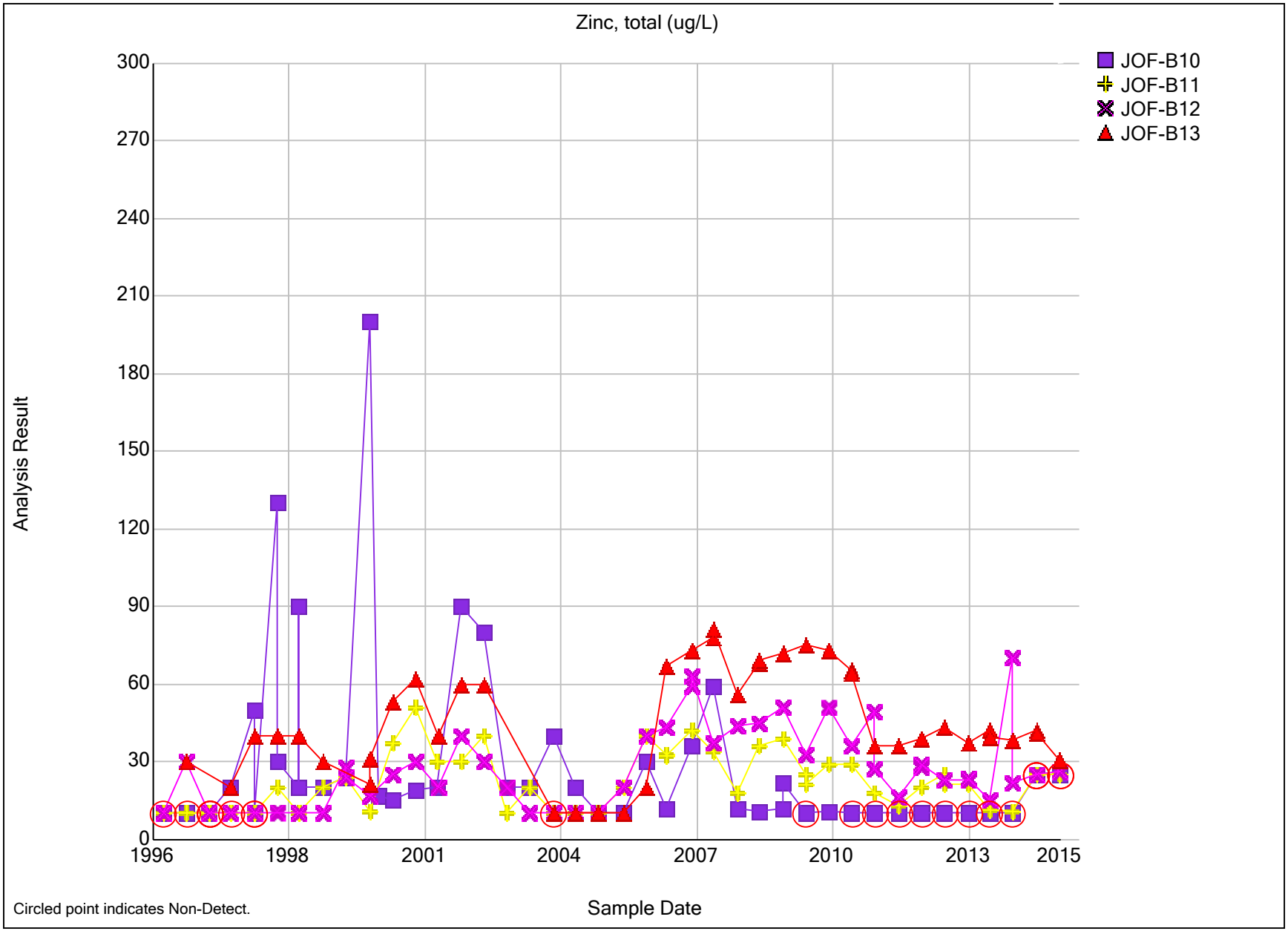

Nickel, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
GWPS (L=100.000)
Analysis Result
Sample Date
Circled point indicates Non-Detect.
150
135
120
105
90
75
60
45
30
15
0
1996
1998
2001
2004
2007
2010
2013
2015

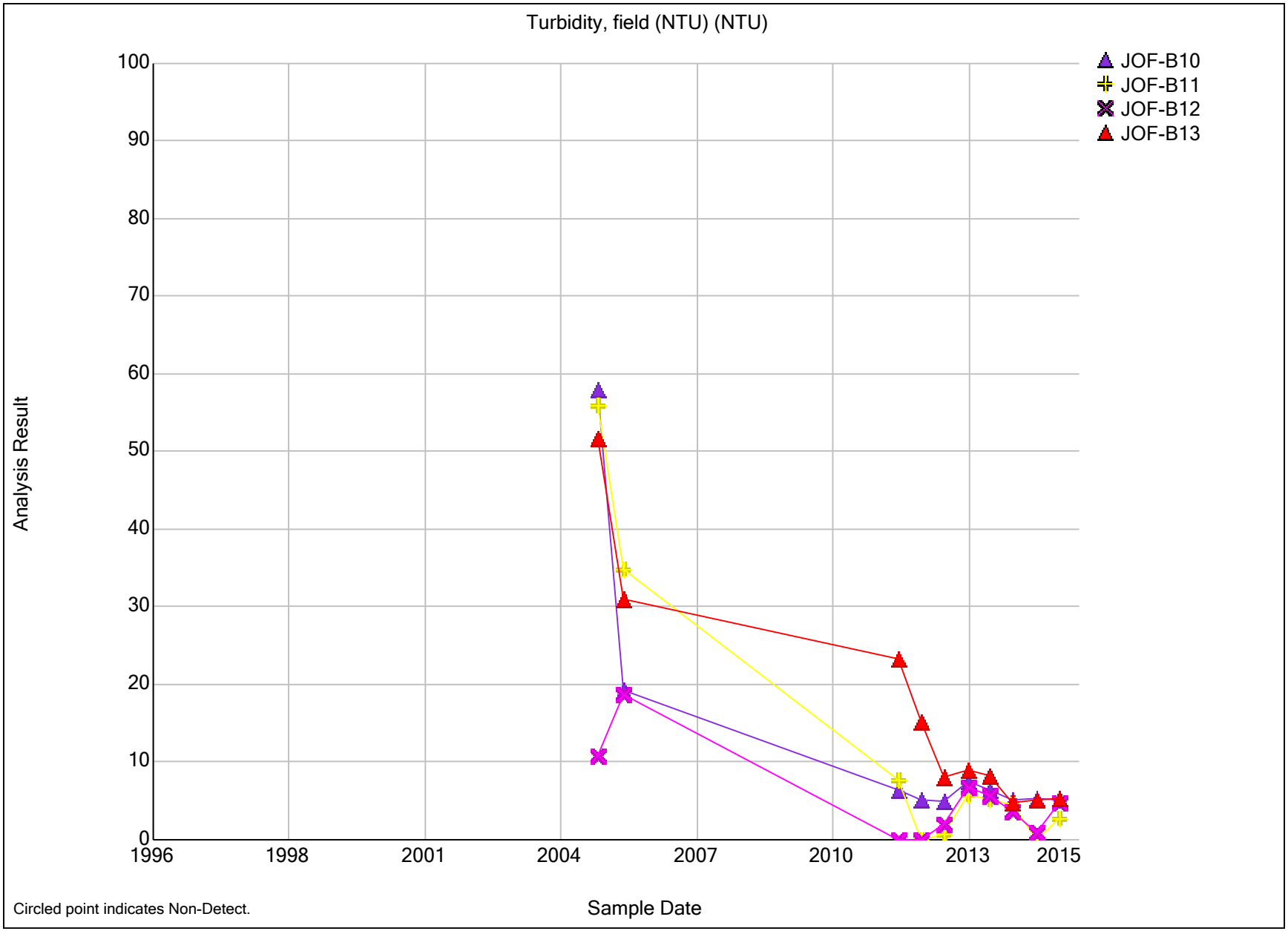

Selenium, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
GWPS (L=50.000)
Analysis Result
75
67.5
60
52.5
45
37.5
30
22.5
15
7.5
0
1996
1998
2001
2004
2007
2010
2013
2015
Sample Date
Circled point indicates Non-Detect.


Silver, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
GWPS (L=100.000)
Analysis Result
150
135
120
105
90
75
60
45
30
15
0
1996
1998
2001
2004
2007
2010
2013
2015
Sample Date
Circled point indicates Non-Detect.


Thallium, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
GWPS (L=2.000)
Analysis Result
Sample Date
3
2.7
2.4
2.1
1.8
1.5
1.2
0.9
0.6
0.3
0
1996
1998
2001
2004
2007
2010
2013
2015
Circled point indicates Non-Detect.


Vanadium, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
Analysis Result
200
180
160
140
120
100
80
60
40
20
0
1996
1998
2001
2004
2007
2010
2013
2015
Sample Date
Circled point indicates Non-Detect.


Zinc, total (ug/L)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
Analysis Result
300
270
240
210
180
150
120
90
60
30
0
1996
1998
2001
2004
2007
2010
2013
2015
Sample Date
Circled point indicates Non-Detect.


Turbidity, field (NTU) (NTU)
JOF-B10
JOF-B11
JOF-B12
JOF-B13
Analysis Result
100
90
80
70
60
50
40
30
20
10
0
1996
1998
2001
2004
2007
2010
2013
2015
Sample Date
Circled point indicates Non-Detect.

Appendix F

Cations

APPENDIX F. CHLORIDE AND MAJOR CATION CONCENTRATION DATA FOR WELL B13

Well	Sample Date	Barium, total (ug/L)	Calcium, total (mg/L)	Magnesium, total (mg/L)	Potassium, total (mg/L)	Sodium, total (mg/L)	Chloride, total (mg/L)
JOF-B13	3/12/1990	1800	23	12	2.9	4.3	8
JOF-B13	6/19/1990	340	8.5	4	1.3	3.6	9
JOF-B13	9/4/1990	1500	18	10	1.6	3.5	6
JOF-B13	12/11/1990	290	6.8	4	1	3.6	9
JOF-B13	3/5/1991	1600	18	10	2.6	3	7
JOF-B13	6/24/1991	440	6.8	5.1	18	3.4	6
JOF-B13	9/24/1991	150	7.2	3.4	0.88	3	10
JOF-B13	12/4/1991	850	9.1	11	0.95	3.2	10
JOF-B13	3/17/1992	330	6.3	1	0.7	3.9	13
JOF-B13	6/10/1992	260	7.7	2.9	4.5	3.2	12
JOF-B13	9/1/1992	390	7.4	4.1	1	4.1	10
JOF-B13	3/15/1993	400	18	6.6	1.5	7.4	44
JOF-B13	9/21/1993	290	18	8.8	0.9	7.1	50
JOF-B13	3/8/1994	200	33	14	1.3	9.7	110
JOF-B13	9/20/1994	600	35	18	2	9.3	120
JOF-B13	3/21/1995	140	50	24	1.5	10	170
JOF-B13	9/5/1995	230	49	22	1.3	9.5	150
JOF-B13	3/26/1996	330	65	31	1.6	11	220
JOF-B13	9/24/1996	260	56	25	1.3	9.6	190
JOF-B13	3/25/1997	360	95	41	1.6	14	240
JOF-B13	9/10/1997	250	64	28	1.4	12	220
JOF-B13	3/17/1998	430	110	44	2	16	320
JOF-B13	9/15/1998	300	79	30	1.6	15	250
JOF-B13	3/10/1999	390	100	40	1.9	19	330
JOF-B13	9/9/1999	300	82	30	1.7	16	191
JOF-B13	3/7/2000	520	110	42	2.4	23	390
JOF-B13	9/19/2000	340	94	30	2.3	20	300
JOF-B13	3/21/2001	570	160	48	2.9	32	530
JOF-B13	9/18/2001	540	150	44	6.2	30	480
JOF-B13	3/13/2002	660	200	53	2.3	30	570
JOF-B13	9/10/2002	560	160	43	2.1	32	470
JOF-B13	3/11/2003	820	240	57	4.1	53	720
JOF-B13	9/9/2003	840	270	57	2.7	55	690

APPENDIX F. CHLORIDE AND MAJOR CATION CONCENTRATION DATA FOR WELL B13

Well	Sample Date	Barium, total (ug/L)	Calcium, total (mg/L)	Magnesium, total (mg/L)	Potassium, total (mg/L)	Sodium, total (mg/L)	Chloride, total (mg/L)
JOF-B13	3/9/2004	680	210	47	3.7	48	650
JOF-B13	9/14/2004	670	210	48	2.7	51	650
JOF-B13	3/8/2005	750	240	51	4.7	60	730
JOF-B13	9/7/2005	670	210	46	3.1	51	650
JOF-B13	3/22/2006	810	250	53	3.4	65	740
JOF-B13	9/19/2006	730	230	49	3.6	58	690
JOF-B13	3/6/2007	840	270	52	3.6	72	840
JOF-B13	9/19/2007	710	230	48	2.8	59	790
JOF-B13	3/12/2008	840	280	47	3.6	73	790
JOF-B13	9/16/2008	720	230	42	3.3	68	660
JOF-B13	3/10/2009	780	260	42	3.4	85	820
JOF-B13	9/15/2009	880	300	47	3.7	100	830
JOF-B13	3/10/2010	860	290	44	4.2	110	880
JOF-B13	9/14/2010	800	280	44	4	100	890
JOF-B13	3/15/2011	1000	360	48	4	140	1100
JOF-B13	9/13/2011	840	300	43	4.3	120	920
JOF-B13	3/20/2012	1000	360	46	3.9	150	1100
JOF-B13	3/20/2012	990	360	46	3.6	150	1100
JOF-B13	9/18/2012	970	--	--	--	--	--
JOF-B13	3/19/2013	780	360	39	4.6	200	1200
JOF-B13	3/11/2014	904	391	45	5.12	174	974
JOF-B13	3/11/2014	923	378	43.4	5.03	168	985
JOF-B13	9/8/2014	980	--	--	--	--	--
JOF-B13	3/17/2015	1000	--	--	--	--	--
JOF-B13	9/22/2015	826	--	--	--	--	--