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Annual 2018 Groundwater and Cap Compliance Monitoring Report

BNSF Hillyard Dross Cap
Spokane, Washington

19 April 2019

Prepared for

BNSF Railway Company
605 Puyallup Avenue
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ANNUAL 2018
GROUNDWATER AND CAP COMPLIANCE MONITORING REPORT
BNSF Hillyard Dross Cap
Spokane, Washington

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Section 1: Introduction

This report is the annual 2018 groundwater and compliance monitoring report for the BNSF Railway Company (BNSF) Hillyard Dross Cap site (Site), located at the southwestern intersection of Wellesley Avenue and Ferrall Street in Spokane, Washington. The Site is also referred to as the Aluminum Recycling Corporation Site in the Washington State Department of Ecology (Ecology) Consent Decree No. 01202037-9 (Ecology 2001). The Site location relative to the surrounding area is illustrated on Figure 1. Major Site features are displayed on Figure 2.

1.1 Background

The Final Remedial Action Work Plan (FRAWP) for the Site was completed in 2001 (EMR 2001). The Final Cleanup Action Plan (FCAP), including the Operations and Maintenance Plan, was completed in July 2003 (GeoEngineers 2003). Ecology completed a second 5-year periodic review of the Site in March 2013. Ecology concluded that "contaminant concentrations are showing improvements" and "the measures that were taken for the original cleanup action remain protective today" (Ecology 2013). The 2013 Periodic Review is included as Appendix A. The contaminants of concern (COCs) for the Site include chloride, nitrate (as nitrogen), and nitrite (as nitrogen). The cleanup levels (CULs), which are defined in the FCAP, are 250 milligrams per liter (mg/L) for chloride, 10 mg/L for nitrate, and 1 mg/L for nitrite. Fluoride was also a COC at the Site prior to 2013. However, Ecology removed fluoride from the COC list in the 2013 5-year periodic review based on a statistical analysis of the data collected to date (see Appendix A).

In a 30 July 2014 email, Ecology requested that BNSF establish criteria for a data evaluation to determine whether compliance with the groundwater CULs was being achieved.

Ecology recommended conducting a statistical analysis of a rolling dataset to evaluate attainment of CULs. Based on Ecology's publication 94-49, "*Guidance on Sampling and Data Analysis Methods"*, attainment of CULs is evaluated by comparing the 95 percent upper confidence limit (95% UCL) of the mean (calculated from sampling data) to the CUL. Ecology recommended using a rolling data set of the most recent 20 samples (5 years of quarterly data) for the analysis. The constituent in the designated well is considered to have met the CUL if, after evaluating the last 20 samples at a given monitoring well, the 95% UCL of the mean is lower than the CUL AND no single sample exceeds twice the CUL AND less than 10% of the samples exceed the CUL. The statistical analysis will be conducted on an annual basis and reported to Ecology. The Ecology Model Toxics Control Act (MCTA) Stat program is used for the analysis. The results of the 2018 statistical analyses are presented in Section 2.4.

In a letter dated 5 July 2017 to Ecology, BNSF requested that the frequency of remedial cap inspection and groundwater monitoring at the Site be reduced to once per year, with both activities to be conducted in the second quarter. Ecology approved the requested change in a letter dated 25 July 2017. Therefore, a single groundwater monitoring event was performed in 2018. Although Ecology also approved annual cap monitoring and stormwater system operation and maintenance (O&M), these activities were conducted on a semiannual basis in 2018 because vandalism of the system was observed in 2017. Semiannual system maintenance may reduce system down time should vandalism or other issues occur in the future.

Section 2: 2018 Groundwater Sampling

2.1 General

Groundwater monitoring and sampling activities were conducted at the Site in June 2018. Groundwater levels were measured in each of the four groundwater monitoring wells (MW-3 through MW-6) in the monitoring network.

Dedicated submersible bladder pumps, outfitted with dedicated Teflon-lined tubing, were used for groundwater purging and sampling. Groundwater samples were collected from monitoring wells MW-4 through MW-6. Monitoring well MW-3 was not sampled due to an insufficient amount of water in the well. Field methods are summarized in Appendix B.

The groundwater samples were submitted to ESC Lab Sciences, Inc. in Mt. Juliet, Tennessee, for analysis of chloride by U.S. Environmental Protection Agency (EPA) Method 9056A and nitrate-nitrite by EPA Method 353.2.

A summary of groundwater elevations from each monitoring event is presented in Table 1. The analytical results for each groundwater event are summarized in Table 2. A copy of the laboratory report is presented in Appendix C.

2.2 Groundwater Elevation and Hydraulic Gradient Direction

Groundwater elevations during the June 2018 event ranged from 1,866.33 feet (monitoring well MW-6) to 1,867.39 feet (monitoring well MW-4) (Table 1). The interpreted groundwater flow direction beneath the Site, at the time of the monitoring event, was toward the north under a hydraulic gradient of approximately 0.001 feet per foot. Interpreted groundwater elevation contours and groundwater hydraulic gradient direction for the June 2018 monitoring event are presented on Figure 3.

2.3 Groundwater Analytical Results

The analytical results for this event and previous sampling events are summarized in Table 2. In previous years, nitrate and nitrite were analyzed by EPA Method 300.0 and reported separately. In 2018, nitrate-nitrite was analyzed by EPA Method 353.2 and reported as a single value. Based on correspondence with the analytical laboratory and recent analytical results for nitrite, it is assumed that the nitrate-nitrite analytical results are representative of nitrate concentrations in the water samples. Prior to 2018, nitrite had not been detected in any of the groundwater samples collected from any of the monitoring wells since 2013.

The analytical results of the groundwater samples collected on 27 June 2018 indicate the constituents were not detected or were detected at concentrations less than the CULs in the samples from wells MW-4 and MW-6. Chloride and nitrate were reported above the respective CULs in the primary and field duplicate samples from well MW-5.

Figures 5 through 6 present graphical representations of historical and current chloride, nitrate, and nitrite concentrations, respectively.

For quality control purposes, a duplicate sample was collected from monitoring well MW-5 during the 2018 sampling event. The results of the duplicate samples differed [relative percent difference (RPD)] from the results of the primary sample by 33.2 percent for chloride and by 3.8 percent for nitrate-nitrite. The RPD for chloride was above the standard acceptance criteria of 20%, therefore the associated results were qualified as estimated, J.

The laboratory reports were reviewed for quality control/quality assurance purposes and were found to be acceptable for their intended purpose.

2.4 2018 Groundwater Statistical Analysis

Statistical analysis was applied to results of the last 20 groundwater samples collected from monitoring wells MW-3 (nitrate-N) and MW-5 (nitrate-N and chloride). Nitrite-N has not been detected in any of the groundwater samples collected from any of the monitoring wells since 2013. In addition, no analyte concentration exceeded the CULs in any of the last 20 samples collected from monitoring well MW-4 or MW-6. Therefore, statistical analyses were not performed on the dataset from these monitoring wells or for nitrite-N on any of the monitoring wells.

To perform the statistical analyses, the dataset from a date range of April 2010 to April 2017 was used for monitoring well MW-3 and July 2012 to June 2018 for monitoring well MW-5. A longer date range was required for monitoring well MW-3 because this well was dry during some sampling events and no samples could be collected.

Table 4 presents a summary of the statistical analysis. The MTCA Stat output files are included in Appendix D. Based on the results of the statistical analysis and data evaluation, the following conclusions are made:

- The 95% UCL of the mean nitrate-N concentration in the dataset of monitoring well MW-3 was 9.35 mg/L in 2018, which is less than the CUL of 10 mg/L. However, three samples out of the last 20 samples (15 percent) have nitrate-N concentrations that exceed the CUL. Therefore, monitoring nitrate-N concentrations in this well will continue.

- The 95% UCL of the mean nitrate-N concentration in the dataset of monitoring well MW-5 increased to 11.4 mg/L in 2018, which is greater than the CUL of 10 mg/L. The nitrate-N CUL has been exceeded in three samples (15 percent) collected during the last 20 sampling events, including the June 2018 sample. Therefore, monitoring nitrate-N concentrations in this well will continue.

- The 95% UCL of the mean chloride concentration in the dataset of monitoring well MW-5 increased to 281 mg/L in 2018, which is greater than the CUL of 250 mg/L. The chloride CUL has been exceeded in two samples (10 percent) collected during the last 20 sampling events, including the June 2018 sample. Therefore, monitoring chloride concentrations in this well will continue.

Section 3: Operation and Maintenance Activities

3.1 General

The dross encapsulation cell (cap) and associated stormwater system were constructed between 2001 and 2003. The dross cap consists of a low permeability, 40-millimeter-thick, high-density polyethylene (HDPE) geomembrane placed over the graded and prepared dross and soil surface. The geomembrane is overlain by 18 to 30 inches of rounded gravel that acts as a drain to shed water off of the geomembrane. A woven, permeable HDPE geotextile fabric is placed above the gravel and covered with approximately 18 inches of topsoil. The topsoil was hydroseeded upon installation.

Stormwater from the dross cap is directed to a channel along the perimeter of the cap, which drains either directly to the stormwater retention pond or to a sump located in the western portion of the Site. Stormwater that drains to the sump is pumped to the retention pond. Secondary overflow from the retention pond is routed to an onsite drywell.

O&M activities in 2018 consisted of annual remedial component system checks performed consistent with the approved O&M Plan. The annual inspection was completed in June 2018 and included assessment of the following: (1) the dross cap; (2) the stormwater conveyance, evaporation, and disposal system; and (3) other physical facilities such as access roads, setbacks, fencing, electrical system, and groundwater monitoring wells. A second inspection of the remedial system was performed in December 2018 to verify the system was operational.

3.2 Dross Encapsulation Cell

No erosion or settlement of the dross cap was observed during 2018. Grasses and forbs were abundant on and surrounding the dross encapsulation cell during the growing season and were dormant during dry months, as is normal.

3.3 Stormwater Conveyance, Evaporation, and Disposal System

Stormwater conveyance, evaporation, and disposal system components were monitored in June and December 2018.

The evaporation pond that collects Site stormwater is located directly northeast of the dross encapsulation cell. Water level elevations measured in the pond are referenced to the North American Vertical Datum of 1988. Post-construction evaporation pond water level elevations are presented in Table 3. The evaporation pond was not observed to be full during either June or December 2018, and water was not discharging to the overflow sump and drywell. During the December 2018 monitoring event, water in the evaporation pond was observed to be frozen.

3.4 Monitoring Wells

Monitoring wells MW-3 through MW-6 were observed to be in good condition during the cap monitoring event conducted in 2018. No physical damage to the well monuments was observed.

3.5 Other Physical Features

Other physical features such as access roads, setbacks, fencing, and the electrical system, were checked in June and December 2018, and appear to be in good condition.

Section 4: Summary

4.1 Departures from Consent Decree

Tasks completed during 2018 did not deviate from tasks outlined in the Consent Decree for groundwater monitoring and cap monitoring activities.

4.2 Groundwater Elevations and Estimated Flow

Groundwater elevations measured in June 2018 are within the range of previous groundwater elevation measurements at the Site. The hydraulic gradient and estimated groundwater flow direction during the 2018 monitoring event was generally towards the north, which is consistent with the general groundwater flow direction in the unconfined aquifer underlying the Site and general area (Spokane Valley-Rathdrum Prairie Aquifer) (U.S. Geological Survey 1988).

4.3 Groundwater Analytical Results

Chloride and nitrate-nitrite were reported at concentrations above than their respective CULs in the primary sample and duplicate collected from well MW-5 in 2018. Prior to 2018, chloride was last reported above the CUL in July 2012 (also in well MW-5). Nitrate was also reported above the CUL in January 2017 in well MW-3 and in April 2017 in well MW-5. Nitrite has not been reported above its analytical method reporting limit since 2013 (a total of 16 monitoring events) in any of the groundwater samples collected. However, nitrite concentrations were not reported separately from nitrate in 2018.

4.4 Site Conditions

The network of groundwater monitoring wells at the Site appeared to be secure and in good condition. Stormwater conveyance, evaporation, and disposal system components were found to be in good condition during this reporting period.

4.5 Planned Future Activities

The next quarterly groundwater monitoring and sampling event will be conducted in second quarter 2019.

Section 5: References

EMR, Inc. 2001. Final Remedial Action Work Plan for the Hillyard Dross Site, 3412 East Wellesley Avenue, Spokane, Washington. August 2001.

GeoEngineers, Inc. 2003. Final Cleanup Action Report - Aluminum Recycling Corporation Site, 3412 East Wellesley Avenue, Spokane, Washington.

United States Geological Survey. 1988. The Spokane Aquifer, Washington: Its Geologic Origin and Water-Bearing and Water-Quality Characteristics. U.S. Geological Survey Water Supply Paper 2265, 81 p.

Washington State Department of Ecology. 2013. Periodic Review, Aluminum Recycling Corporation (FSID 627, CSID 1133).

Washington State Department of Ecology. 2014. Email Correspondence from Ecology to BNSF. 30 July 2014.

Washington State Department of Ecology. 2015. MTCA Stat 97 Site Module, Workbook for Calculating Compliance Statistics. Accessed January 2017.

Tables

Table 1: Summary of Groundwater Level Measurements

Well Number	Date Measured	Top of Casing Elevation[a] (feet)	Depth to Water[b] (feet)	Groundwater Elevation (feet)	Change in Elevation[c] (feet)
MW-3	6/30/1997	2,039.01	DRY	NA[d]	NA
	12/15/1998	2,039.01	176.16	1,862.85	NA
	2/22/1999	2,039.01	174.37	1,864.64	-1.79
	5/4/1999	2,039.01	171.21	1,867.80	-3.16
	7/28/1999	2,039.01	174.31	1,864.70	3.10
	12/8/1999	2,039.01	176.00	1,863.01	1.69
	6/20/2000	2,039.01	172.05	1,866.96	-3.95
	12/8/2000	2,039.01	176.65	1,862.36	4.60
	10/30/2002	2,039.01	DRY	NA	NA
	2/4/2003	2,039.01	DRY	NA	NA
	4/29/2003	2,039.01	172.37	1,866.64	4.28
	07/24/03	2,039.01	DRY	NA	NA
	10/30/03	2,039.01	DRY	NA	NA
	01/26/04	2,039.01	DRY	NA	NA
	4/16/2004	2,039.01	173.38	1,865.63	-0.91
	7/26/2004	2,039.01	176.45	1,862.56	-3.07
	10/15/2004	2,039.01	DRY	NA	NA
	1/28/2005	2,039.01	174.17	1,864.84	2.28
	4/29/2005	2,039.01	173.56	1,865.45	0.61
	7/20/2005	2,039.01	176.49	1,862.52	-2.93
	10/27/2005	2,039.01	DRY	NA	NA
	1/11/2006	2,039.01	175.31	1,863.70	1.18
	4/12/2006	2,039.01	173.11	1,865.90	2.20
	7/13/2006	2,039.01	174.24	1,864.77	-1.13
	10/24/2006	2,039.01	176.71	1,862.30	-2.47
	1/29/2007	2,039.01	174.57	1,864.44	2.14
	4/19/2007	2,039.01	170.08	1,868.93	4.49
	7/19/2007	2,039.01	176.11	1,862.90	-6.03
	9/13/2007	2,039.01	DRY	NA	NA
	10/29/2007	2,039.01	DRY	NA	NA
	1/30/2008 [e]	2,039.01	174.57	1,864.44	1.54
	4/22/2008	2,039.01	174.19	1,864.82	0.38
	7/23/2008	2,039.01	172.83	1,866.18	1.36
	10/22/2008	2,039.01	DRY	NA	NA
	1/29/2009	2,039.01	174.28	1,864.73	-1.45
	4/28/2009	2,039.01	171.43	1,867.58	2.85
	7/9/2009	2,039.01	174.09	1,864.92	-2.66
	10/29/2009	2,039.01	DRY	NA	NA
	1/19/2010	2,039.01	176.20	1,862.81	-2.11
	4/6/2010	2,039.01	175.52	1,863.49	0.68
	7/27/2010	2,039.01	175.26	1,863.75	0.26

Table 1: Summary of Groundwater Level Measurements

Well Number	Date Measured	Top of Casing Elevation[(a)] (feet)	Depth to Water[(b)] (feet)	Groundwater Elevation (feet)	Change in Elevation[(c)] (feet)
MW-3 cont.	10/20/2010	2,039.01	DRY	NA	NA
	1/18/2011	2,039.01	174.19	1,864.82	1.07
	4/21/2011	2,039.01	170.21	1,868.80	3.98
	7/14/2011	2,039.01	169.85	1,869.16	0.36
	10/6/2011	2,039.01	176.50	1,862.51	-6.65
	1/24/2012	2,039.01	176.01	1,863.00	0.49
	4/10/2012	2,039.01	171.43	1,867.58	4.58
	7/11/2012	2,039.01	171.23	1,867.78	0.20
	10/30/2012	2,039.01	DRY	NA	NA
	1/29/2013	2,039.01	174.86	1,864.15	-3.63
	4/11/2013	2,039.01	DRY	NA	NA
	10/24/2013	2,039.01	177.80	1,861.21	-2.94
	1/29/2014	2,039.01	175.67	1,863.34	2.13
	4/23/2014	2,039.01	170.72	1,868.29	4.95
	7/28/2014	2,039.01	175.14	1,863.87	-4.42
	10/29/2014	2,039.01	DRY	NA	NA
	1/28/2015	2,039.01	174.26	1,864.75	0.88
	4/14/2015	2,039.01	171.57	1,867.44	2.69
	7/14/2015	2,039.01	DRY	NA	NA
	10/27/2015	2,039.01	DRY	NA	NA
	1/26/2016	2,039.01	175.65	1,863.36	NA
	4/28/2016	2,039.01	170.76	1,868.25	4.89
	7/13/2016	2,039.01	175.72	1,863.29	-4.96
	10/12/2016	2,039.01	DRY	NA	NA
	1/31/2017	2,039.01	175.34	1,863.67	NA
	4/18/2017	2,039.01	167.18	1,871.83	8.16
	6/27/2018	2,039.01	172.34	1,866.67	-5.16
MW-4	12/15/1998	2,039.42	175.53	1,863.89	0.02
	2/22/1999	2,039.42	173.84	1,865.58	1.69
	5/4/1999	2,039.42	170.43	1,868.99	3.41
	7/28/1999	2,039.42	173.96	1,865.46	-3.53
	12/8/1999	2,039.42	175.50	1,863.92	-1.54
	6/15/2000	2,039.42	171.56	1,867.86	3.94
	12/7/2000	2,039.42	176.40	1,863.02	-4.84
	10/30/2002	2,039.42	NA	NA	NA
	2/4/2003	2,039.42	174.80	1,864.62	1.60
	4/29/2003	2,039.42	171.78	1,867.64	3.02
	7/24/2003	2,039.42	176.53	1,862.89	-4.75
	10/30/2003	2,039.42	177.05	1,862.37	-0.52
	1/26/2004	2,039.42	176.30	1,863.12	0.75
	4/16/2004	2,039.42	172.61	1,866.81	3.69

Table 1: Summary of Groundwater Level Measurements

Well Number	Date Measured	Top of Casing Elevation[(a)] (feet)	Depth to Water[(b)] (feet)	Groundwater Elevation (feet)	Change in Elevation[(c)] (feet)
MW-4 Cont.	7/26/2004	2,039.42	176.08	1,863.34	-3.47
	10/15/2004	2,039.42	176.70	1,862.72	-0.62
	1/28/2005	2,039.42	173.48	1,865.94	3.22
	4/29/2005	2,039.42	172.98	1,866.44	0.50
	7/20/2005	2,039.42	176.11	1,863.31	-3.13
	10/27/2005	2,039.42	176.86	1,862.56	-0.75
	1/11/2006	2,039.42	174.57	1,864.85	2.29
	4/12/2006	2,039.42	172.33	1,867.09	2.24
	7/13/2006	2,039.42	173.94	1,865.48	-1.61
	10/24/2006	2,039.42	177.00	1,862.42	-3.06
	1/29/2007	2,039.42	174.03	1,865.39	2.97
	4/19/2007	2,039.42	170.23	1,869.19	3.80
	7/19/2007	2,039.42	175.79	1,863.63	-5.56
	9/13/2007	2,039.42	177.81	1,861.61	-2.02
	10/29/2007	2,039.42	176.87	1,862.55	0.94
	1/30/2008	2,039.42	175.73	1,863.69	1.14
	4/22/2008	2,039.42	173.54	1,865.88	2.19
	7/23/2008	2,039.42	172.55	1,866.87	0.99
	10/22/2008	2,039.42	176.17	1,863.25	-3.62
	1/29/2009	2,039.42	173.64	1,865.78	2.53
	4/28/2009	2,039.42	170.61	1,868.81	3.03
	7/9/2009	2,039.42	173.76	1,865.66	-3.15
	10/29/2009	2,039.42	176.65	1,862.77	-2.89
	1/19/2010	2,039.42	175.72	1,863.70	0.93
	4/6/2010	2,039.42	174.96	1,864.46	0.76
	7/27/2010	2,039.42	174.92	1,864.50	0.04
	10/20/2010	2,039.42	176.63	1,862.79	-1.71
	1/18/2011	2,039.42	173.58	1,865.84	3.05
	4/21/2011	2,039.42	169.50	1,869.92	4.08
	7/14/2011	2,039.42	169.48	1,869.94	0.02
	10/6/2011	2,039.42	176.10	1,863.32	-6.62
	1/24/2012	2,039.42	175.53	1,863.89	0.57
	4/10/2012	2,039.42	170.55	1,868.87	4.98
	7/11/2012	2,039.42	170.91	1,868.51	-0.36
	10/30/2012	2,039.42	176.01	1,863.41	-5.10
	1/29/2013	2,039.42	174.40	1,865.02	1.61
	4/11/2013	2,039.42	DRY	NA	NA
	10/24/2013	2,039.42	176.16	1,863.26	-1.76
	1/29/2014	2,039.42	175.40	1,864.02	0.76
	4/23/2014	2,039.42	170.09	1,869.33	5.31
	7/28/2014	2,039.42	174.81	1,864.61	-4.72

Table 1: Summary of Groundwater Level Measurements

Well Number	Date Measured	Top of Casing Elevation[(a)] (feet)	Depth to Water[(b)] (feet)	Groundwater Elevation (feet)	Change in Elevation[(c)] (feet)
MW-4 Cont.	10/29/2014	2,039.42	176.28	1,863.14	-1.47
	1/28/2015	2,039.42	173.69	1,865.73	2.59
	4/14/2015	2,039.42	171.03	1,868.39	2.66
	7/14/2015	2,039.42	176.83	1,862.59	-5.80
	10/27/2015	2,039.42	177.47	1,861.95	-0.64
	1/26/2016	2,039.42	175.11	1,864.31	2.36
	4/28/2016	2,039.42	170.13	1,869.29	4.98
	7/13/2016	2,039.42	175.37	1,864.05	-5.24
	10/12/2016	2,039.42	177.27	1,862.15	-1.90
	1/31/2017	2,039.42	174.91	1,864.51	2.36
	4/18/2017	2,039.42	166.48	1,872.94	8.43
	6/27/2018	2,039.42	172.03	1,867.39	-5.55
MW-5	12/15/1998	2,041.80	177.61	1,864.19	NA
	2/22/1999	2,041.80	177.10	1,864.70	0.51
	5/4/1999	2,041.80	173.90	1,867.90	3.20
	7/28/1999	2,041.80	177.07	1,864.73	-3.17
	12/10/1999	2,041.80	178.82	1,862.98	-1.75
	6/20/2000	2,041.80	174.78	1,867.02	4.04
	12/8/2000	2,041.80	178.61	1,863.19	-3.83
	10/30/2002	2,041.80	DRY	NA	NA
	2/4/2003	2,041.80	178.00	1,863.80	0.61
	4/29/2003	2,041.80	175.01	1,866.79	2.99
	7/24/2003	2,041.80	179.69	1,862.11	-4.68
	10/30/2003	2,041.80	180.37	1,861.43	-0.68
	1/26/2004	2,041.80	179.49	1,862.31	0.88
	4/16/2004	2,041.80	176.02	1,865.78	3.47
	7/26/2004	2,041.80	179.19	1,862.61	-3.17
	10/15/2004	2,041.80	179.97	1,861.83	-0.78
	1/28/2005	2,041.80	176.88	1,864.92	3.09
	4/29/2005	2,041.80	176.32	1,865.48	0.56
	7/20/2005	2,041.80	179.27	1,862.53	-2.95
	10/27/2005	2,041.80	180.14	1,861.66	-0.87
	1/11/2006	2,041.80	177.99	1,863.81	2.15
	4/12/2006	2,041.80	175.71	1,866.09	2.28
	7/13/2006	2,041.80	177.04	1,864.76	-1.33
	10/24/2006	2,041.80	180.24	1,861.56	-3.20
	1/29/2007	2,041.80	177.28	1,864.52	2.96
	4/19/2007	2,041.80	173.61	1,868.19	3.67
	7/19/2007	2,041.80	178.90	1,862.90	-5.29
	9/13/2007	2,041.80	180.97	1,860.83	-2.07
	10/29/2007	2,041.80	180.12	1,861.68	0.85

Table 1: Summary of Groundwater Level Measurements

Well Number	Date Measured	Top of Casing Elevation[a] (feet)	Depth to Water[b] (feet)	Groundwater Elevation (feet)	Change in Elevation[c] (feet)
MW-5 Cont.	1/30/2008	2,041.80	178.94	1,862.86	1.18
	4/22/2008	2,041.80	176.89	1,864.91	2.05
	7/23/2008	2,041.80	175.60	1,866.20	1.29
	10/22/2008	2,041.80	179.38	1,862.42	-3.78
	1/29/2009	2,041.80	176.98	1,864.82	2.40
	4/28/2009	2,041.80	174.12	1,867.68	2.86
	7/9/2009	2,041.80	176.85	1,864.95	-2.73
	10/29/2009	2,041.80	179.86	1,861.94	-3.01
	1/19/2010	2,041.80	178.91	1,862.89	0.95
	3/10/2010 [f]	2,041.80	178.51	1,863.29	0.40
	4/6/2010	2,041.80	178.21	1,863.59	0.30
	7/27/2010	2,041.80	178.05	1,863.75	0.16
	10/20/2010	2,041.80	179.84	1,861.96	-1.79
	1/18/2011	2,041.80	176.90	1,864.90	2.94
	4/21/2011	2,041.80	172.91	1,868.89	3.99
	7/14/2011	2,041.80	172.65	1,869.15	0.26
	10/6/2011	2,041.80	179.26	1,862.54	-6.61
	1/24/2012	2,041.80	178.77	1,863.03	0.49
	4/10/2012	2,041.80	174.14	1,867.66	4.63
	7/11/2012	2,041.80	174.03	1,867.77	0.11
	10/30/2012	2,041.80	179.20	1,862.60	-5.17
	1/29/2013	2,041.80	177.60	1,864.20	1.60
	4/11/2013	2,041.80	DRY	NA	NA
	10/24/2013	2,041.80	179.28	1,862.52	-1.68
	1/29/2014	2,041.80	178.40	1,863.40	0.88
	4/23/2014	2,041.80	173.48	1,868.32	4.92
	7/28/2014	2,041.80	177.92	1,863.88	-4.44
	10/29/2014	2,041.80	179.49	1,862.31	-1.57
	1/28/2015	2,041.80	176.99	1,864.81	2.50
	4/14/2015	2,041.80	174.31	1,867.49	2.68
	7/14/2015	2,041.80	179.97	1,861.83	-5.66
	10/27/2015	2,041.80	180.69	1,861.11	-0.72
	1/26/2016	2,041.80	178.38	1,863.42	2.31
	4/28/2016	2,041.80	173.49	1,868.31	4.89
	7/13/2016	2,041.80	178.51	1,863.29	-5.02
	10/12/2016	2,041.80	180.52	1,861.28	-2.01
	1/31/2017	2,041.80	178.11	1,863.69	2.41
	4/18/2017	2,041.80	169.91	1,871.89	8.20
	6/27/2018	2,041.80	175.12	1,866.68	-5.21

Table 1: Summary of Groundwater Level Measurements

Well Number	Date Measured	Top of Casing Elevation[(a)] (feet)	Depth to Water[(b)] (feet)	Groundwater Elevation (feet)	Change in Elevation[(c)] (feet)
MW-6	12/15/1998	2,042.73	177.20	1,865.53	NA
	2/22/1999	2,042.73	178.44	1,864.29	-1.24
	5/4/1999	2,042.73	175.37	1,867.36	3.07
	7/28/1999	2,042.73	178.33	1,864.40	-2.96
	12/10/1999	2,042.73	182.40	1,860.33	-4.07
	6/20/2000	2,042.73	176.16	1,866.57	6.24
	12/7/2000	2,042.73	180.97	1,861.76	-4.81
	10/30/2002	2,042.73	DRY	NA	NA
	2/4/2003	2,042.73	179.70	1,863.03	1.27
	4/29/2003	2,042.73	176.39	1,866.34	3.31
	7/24/2003	2,042.73	180.98	1,861.75	-4.59
	10/30/2003	2,042.73	181.77	1,860.96	-0.79
	1/26/2004	2,042.73	180.85	1,861.88	0.92
	4/16/2004	2,042.73	177.56	1,865.17	3.29
	7/26/2004	2,042.73	180.55	1,862.18	-2.99
	10/15/2004	2,042.73	181.39	1,861.34	-0.84
	1/28/2005	2,042.73	178.33	1,864.40	3.06
	4/29/2005	2,042.73	177.73	1,865.00	0.60
	7/20/2005	2,042.73	180.60	1,862.13	-2.87
	10/27/2005	2,042.73	181.54	1,861.19	-0.94
	1/11/2006	2,042.73	179.49	1,863.24	2.05
	4/12/2006	2,042.73	177.23	1,865.50	2.26
	7/13/2006	2,042.73	178.47	1,864.26	-1.24
	10/24/2006	2,042.73	181.64	1,861.09	-3.17
	1/29/2007	2,042.73	178.70	1,864.03	2.94
	4/19/2007	2,042.73	175.08	1,867.65	3.62
	7/19/2007	2,042.73	180.18	1,862.55	-5.10
	9/13/2007	2,042.73	182.37	1,860.36	-2.19
	10/29/2007	2,042.73	181.52	1,861.21	0.85
	1/30/2008	2,042.73	180.32	1,862.41	1.20
	4/22/2008	2,042.73	178.39	1,864.34	1.93
	7/23/2008	2,042.73	176.88	1,865.85	1.51
	10/22/2008	2,042.73	180.75	1,861.98	-3.87
	1/29/2009	2,042.73	178.41	1,864.32	2.34
	4/28/2009	2,042.73	175.65	1,867.08	2.76
	7/9/2009	2,042.73	178.15	1,864.58	-2.50
	10/29/2009	2,042.73	181.27	1,861.46	-3.12
	1/19/2010	2,042.73	180.34	1,862.39	0.93
	4/6/2010	2,042.73	179.68	1,863.05	0.66
	7/27/2010	2,042.73	179.36	1,863.37	0.32
	10/20/2010	2,042.73	181.23	1,861.50	-1.87

Table 1: Summary of Groundwater Level Measurements

Well Number	Date Measured	Top of Casing Elevation[(a)] (feet)	Depth to Water[(b)] (feet)	Groundwater Elevation (feet)	Change in Elevation[(c)] (feet)
MW-6 Cont.	1/18/2011	2,042.73	178.39	1,864.34	2.84
	4/21/2011	2,042.73	174.43	1,868.30	3.96
	7/14/2011	2,042.73	174.00	1,868.73	0.43
	10/6/2011	2,042.73	180.63	1,862.10	-6.63
	1/24/2012	2,042.73	180.13	1,862.60	0.50
	4/10/2012	2,042.73	175.73	1,867.00	4.40
	7/11/2012	2,042.73	175.32	1867.41	0.41
	10/30/2012	2,042.73	180.59	1862.14	-5.27
	1/29/2013	2,042.73	178.94	1863.79	1.65
	4/11/2013	2,042.73	DRY	NA	NA
	10/24/2013	2,042.73	180.81	1861.92	-1.87
	1/29/2014	2,042.73	179.81	1862.92	1.00
	4/23/2014	2,042.73	174.96	1867.77	4.85
	7/28/2014	2,042.73	179.21	1863.52	-4.25
	10/29/2014	2,042.73	180.87	1861.86	-1.66
	1/28/2015	2,042.73	178.43	1864.30	2.44
	4/14/2015	2,042.73	175.72	1867.01	2.71
	7/14/2015	2,042.73	181.31	1861.42	-5.59
	10/27/2015	2,042.73	182.08	1,860.65	-0.77
	1/26/2016	2,042.73	179.80	1,862.93	2.28
	4/28/2016	2,042.73	174.94	1,867.79	4.86
	7/13/2016	2,042.73	179.80	1,862.93	-4.86
	10/12/2016	2,042.73	181.92	1,860.81	-2.12
	1/31/2017	2,042.73	179.44	1,863.29	2.48
	4/18/2017	2,042.73	171.41	1,871.32	8.03
	6/27/2018	2,042.73	176.40	1,866.33	-4.99

Notes:
(a) Top of well casing elevations were provided by EMR Inc.
(b) Depth to water measurements recorded relative to top of well casing.
(c) Change in groundwater elevation since previous event.
(d) NA = Elevation not available because well was dry.
(e) Anomalous groundwater elevation is a suspected measurement error.
(f) Monitoring well MW-5 was re-sampled on 10 March 2010 because of a laboratory error with respect to the sample collected 19 January 2010.

Table 2: Summary of Groundwater Analytical Results

Well Number	Date Sampled	Chloride[a] (mg/L)[b]	Nitrate-Nitrite[c] (mg/L)	Nitrate-Nitrogen[a] (mg/L)	Nitrite-Nitrogen[a] (mg/L)
MW-3	06/30/97	**397**[d]	--	**83.8**	NA[e]
	12/15/98	181	--	**42.4**	NA
	07/28/99	134	--	**14.3**	NA
	06/20/00	61.1	--	9.58	NA
	04/29/03 [f]	68.4	--	6.37	ND[g]
	04/16/04	107	--	**13.2**	ND
	01/28/05	67.3	--	**14.4**	**1.14**
	04/29/05	75.4	--	**12.7**	***<5.00*** [h,i]
	01/11/06	93.3	--	**16.1**	<0.400
	04/12/06	62.6	--	6.16	<0.200
	07/13/06	5.03	--	**13.8**	<1.00
	10/24/06	50.2	--	**12.9 J** [j]	<0.200
	01/29/07	128	--	**23.0**	<0.200
	04/19/07	36.6	--	3.18	<0.200
	07/19/07 [k]	85.6	--	**19.4**	<0.0100
	01/30/08 [k]	74.5	--	**14.1**	<0.0100
	04/22/08	53.8	--	7.90	<0.200
	07/23/08	80.6	--	**11.3**	<0.200
	01/29/09	68.2	--	7.95	<0.200
	04/28/09	74.2	--	8.44	<0.200
	07/09/09	77.1	--	6.24	<0.200
	01/19/10	NS[l]	--	NS	NS
	04/07/10	40	--	7.5	**1.8**
	07/27/10	77	--	**13**	<0.60
	10/20/10	NS	--	NS	NS
	01/18/11	51	--	6.0	<0.60
	04/21/11	35	--	4.2	<0.60
	07/14/11	39	--	6.9	<0.60
	10/06/11	NS	--	NS	NS
	01/24/12	71	--	9.7	<0.60
	04/10/12	60	--	5.1	<0.60
	07/11/12	57	--	9.5	<0.60
	10/30/12	NS	--	NS	NS
	01/29/13	110	--	**15**	**3.8**
	04/11/13	37	--	4.7	***<6.0***
	10/24/13 [k]	NS	--	NS	NS
	01/29/14	67	--	8.1	<0.100
	04/23/14	43	--	5.6	<0.100
	07/28/14	60	--	**11**	<0.100
	10/29/14	NS	--	NS	NS
	01/28/15	25	--	2.5	<0.100
	04/14/15	44.00	--	6.27	<0.100
	07/14/15	NS	--	NS	NS
	10/27/15	NS	--	NS	NS
	01/26/16	44.8	--	6.51	<0.100

Table 2: Summary of Groundwater Analytical Results

Well Number	Date Sampled	Chloride[a] (mg/L)[b]	Nitrate-Nitrite[c] (mg/L)	Nitrate-Nitrogen[a] (mg/L)	Nitrite-Nitrogen[a] (mg/L)
MW-3 Cont.	04/28/16	34.7	--	4.67	<0.100
	07/13/16	51.90	--	9.83	<0.100
	10/12/16	NS	--	NS	NS
	01/31/17	86.10	--	**11.2**	<0.100
	04/18/17	21.20	--	4.57	<0.100
	06/27/18 [c]	NS	NS	NS	NS
MW-4	12/15/98	2.46	--	1.22	NA
	07/28/99	133.00	--	4.2	NA
	12/08/99	2.13	--	1.5	NA
	06/15/00	70.50	--	2.49	NA
	12/07/00	3.89	--	1.36	ND
	10/30/02	2.80	--	2.72	ND
	02/04/03 [e]	2.76	--	1.61	<0.100
	04/29/03	21.20	--	2.13	<0.500
	07/24/03	16.50	--	2.69	0.740
	10/30/03	1.97	--	2.59	<0.500
	01/26/04	2.65	--	1.96	<0.500
	04/16/04	2.25	--	1.03	<0.500
	07/26/04	14.70	--	4.43	<0.500
	10/15/04	4.60	--	2.79	ND
	01/28/05	5.18	--	3.23	ND
	04/29/05	106.00	--	6.20	***<5.0***
	07/20/05	48.30	--	**10.2**	***<5.0***
	10/27/05	2.47	--	2.40	<0.500
	01/11/06	1.97	--	0.684	<0.200
	04/12/06	1.80	--	0.570	<0.200
	07/13/06	41.00	--	5.25	<0.400
	10/24/06	5.44	--	1.11	<0.200
	01/29/07	28.50	--	4.59	<0.200
	04/19/07	28.20	--	4.37	<0.200
	07/19/07 [k]	16.60	--	6.11	<0.0100
	09/13/07	2.08	--	0.94	ND
	10/29/07	2.60	--	1.77	<0.0100
	01/30/08 [k]	4.70	--	6.25	<0.0100
	04/22/08	3.98	--	3.49	<0.200
	07/23/08	7.32	--	3.86	<0.200
	10/22/08	2.75	--	1.28	<0.200
	01/29/09	2.59	--	0.780	<0.200
	04/28/09	2.50	--	0.680	<0.200
	07/09/09	19.30	--	4.42	<0.100
	10/29/09	2.70	--	1.9	**1.4[m]**
	01/19/10	5.60	--	3.9	**1.8**
	04/07/10	3.20	--	1.4	**1.6**
	07/27/10	7.80	--	4.0	<0.60
	10/20/10	2.70	--	2.0	<0.60

Table 2: Summary of Groundwater Analytical Results

Well Number	Date Sampled	Chloride[a] (mg/L)[b]	Nitrate-Nitrite[c] (mg/L)	Nitrate-Nitrogen[a] (mg/L)	Nitrite-Nitrogen[a] (mg/L)
MW-4 Cont.	01/18/11	2.60	--	ND	<0.60
	04/21/11	2.40	--	ND	<0.60
	07/14/11	3.80	--	1.6	<0.60
	10/06/11	4.30	--	2.4	<0.60
	01/24/12	3.60	--	2.3	<0.60
	04/10/12	3.00	--	1.0	**1.3**
	07/11/12	4.70	--	2.7	<0.60
	10/30/12	2.80	--	2.4	<0.60
	01/29/13	3.60	--	2.3	**1.6**
	04/11/13	2.70	--	<0.90	***<6.0***
	10/24/13 [k]	2.60	--	1.4	<0.100
	01/29/14	5.50	--	2.5	<0.100
	04/23/14	3.20	--	0.93	<0.100
	07/28/14	5.90	--	2.9	<0.100
	10/29/14	3.80	--	2.7	<0.100
	01/28/15	3.20	--	0.92	<0.100
	04/14/15	3.55	--	1.55	<0.100
	07/14/15	4.47	--	2.36	<0.100
	10/27/15	3.70	--	1.58	<0.100
	01/26/16	5.16	--	1.89	<0.100
	04/28/16	3.32	--	0.98	<0.100
	07/13/16	3.39	--	1.75	<0.100
	10/12/16	3.25	--	1.49	<0.100
	01/31/17	3.29	--	4.93	<0.100
	04/18/17	2.88	--	0.94	<0.100
	06/27/18 [c]	4.41	2.70	2.70	--
MW-5	12/15/98	**690**	--	**19.4**	NA
	07/28/99	113	--	2.5	NA
	12/10/99	**432**	--	5.65	NA
	06/20/00	**257**	--	0.804	NA
	12/08/00	**518**	--	6.37	ND
	10/30/02	**1660**	--	**16.2**	ND
	02/04/03 [e]	227	--	8.39	<0.100
	04/29/03	**345**	--	ND	<0.500
	07/24/03	**928**	--	**11.1**	<0.500
	10/30/03	**1490**	--	ND	<0.500
	01/26/04	**1330**	--	**11.4**	ND
	04/16/04	**1260**	--	ND	***<25.0***
	07/26/04	**896**	--	**18.1**	<0.500
	10/15/04	**4810**	--	**43.6**	ND
	01/28/05	**970**	--	**32.8**	ND
	04/29/05	**1030**	--	**31.0**	***<25.0***
	07/20/05	**492**	--	**19.2**	***<10.0***
	10/27/05	**1020**	--	**31.5**	***<25.0***
	01/11/06	**650**	--	9.95	***<2.00***

Table 2: Summary of Groundwater Analytical Results

Well Number	Date Sampled	Chloride[a] (mg/L)[b]	Nitrate-Nitrite[c] (mg/L)	Nitrate-Nitrogen[a] (mg/L)	Nitrite-Nitrogen[a] (mg/L)
MW-5 Cont.	04/12/06	**902**	--	9.35	***<2.00***
	07/13/06	**740**	--	8.42	***<2.00***
	10/24/06	**644**	--	**10.9[h]**	0.48
	01/29/07	**587**	--	**18.5**	***<2.0***
	04/19/07	**693**	--	**11.1**	**1.18**
	07/19/07 [k]	122	--	5.89	0.0114
	09/13/07	**438**	--	**12.3**	ND
	10/29/07	**700**	--	**16.2**	0.0410
	01/30/08 [k]	**513**	--	**13.3**	<0.0100
	04/22/08	**546**	--	3.05	<0.200
	07/23/08	**914**	--	6.36	**1.80**
	10/22/08	**292**	--	**10.0**	<0.200
	01/29/09	**298**	--	9.43	<0.200
	04/28/09	**417**	--	**10.5**	0.83
	07/09/09	112	--	3.20	<0.100
	10/29/09	**290**	--	**11[k]**	**1.4[m]**
	01/19/10	**360**	--	**13[k]**	ND
	03/10/10	**330**	--	**14**	**1.1**
	04/07/10	**330**	--	**15**	<0.60
	07/27/10	48	--	5.5	<0.60
	10/20/10	**330**	--	**15**	<0.60
	01/18/11	**260**	--	**14**	<0.60
	04/21/11	**370**	--	**11**	<0.60
	07/14/11	**1500**	--	**24**	<0.60
	10/06/11	**320**	--	8.2	<0.60
	01/24/12	240	--	**13**	<0.60
	04/10/12	150	--	6.7	<0.60
	07/11/12	**680**	--	**14**	0.60
	10/30/12	69	--	1.3	0.60
	01/29/13	89	--	7.5	**1.3**
	04/11/13	160	--	8.7	***<3.0***
	10/24/13 [k]	140	--	9.1	<0.100
	10/24/13 (Dup)	140	--	9.2	<0.100
	01/29/14	130	--	9.4	<0.100
	01/29/14 (Dup)	130	--	9.4	<0.100
	04/23/14	120	--	7.2	<0.100
	04/23/14 (Dup)	120	--	7.2	<0.100
	07/28/14	25	--	4	<0.100
	07/28/14 (Dup)	25	--	4	<0.100
	10/29/14	44	--	4.2	<0.100
	10/29/14 (Dup)	43	--	4.2	<0.100
	01/28/15	160	--	7.6	<0.100
	01/28/15 (Dup)	160	--	7.7	<0.100
	04/14/15	47	--	4.15	<0.100
	04/14/15	47	--	3.87	<0.100

Table 2: Summary of Groundwater Analytical Results

Well Number	Date Sampled	Chloride[a] (mg/L)[b]	Nitrate-Nitrite[c] (mg/L)	Nitrate-Nitrogen[a] (mg/L)	Nitrite-Nitrogen[a] (mg/L)
MW-5 Cont.	07/14/15	65	--	5.43	<0.100
	07/14/15 (Dup)	66	--	5.46	<0.100
	10/27/15	99	--	5.83	<0.100
	10/27/15 (Dup)	102	--	6.32	<0.100
	01/26/16	89	--	6.04	<0.100
	01/26/16 (Dup)	88	--	5.99	<0.100
	04/28/16	26	--	2.49	<0.100
	04/28/16 (Dup)	26	--	2.50	<0.100
	07/13/16	152	--	5.35	<0.100
	07/13/16 (Dup)	153	--	5.35	<0.100
	10/12/16	149	--	3.61	<0.100
	10/12/16 (Dup)	148	--	3.62	<0.100
	01/31/17	15	--	3.80	<0.100
	01/31/17 (Dup)	15	--	3.89	<0.100
	04/18/17	83	--	**11.5**	<0.100
	04/18/17 (Dup)	83	--	**11.4**	<0.100
	06/27/18 [c]	**923 J**	**41.8**	**41.8**	--
	06/27/18 (Dup)	**1290 J**	**43.4**	**43.4**	--
MW-6	12/15/98	14.20	--	7.85	NA
	07/28/99	9.52	--	1.9	NA
	12/10/99	17.90	--	1.09	NA
	06/20/00	2.27	--	0.804	NA
	12/07/00	38.60	--	2.49	NA
	10/30/02	68.00	--	4.79	ND
	02/04/03 [e]	12.60	--	1.39	<0.100
	04/29/03	5.05	--	2.31	<0.500
	07/24/03	16.00	--	2.43	<0.500
	10/30/03	31.00	--	4.13	<0.500
	01/26/04	16.20	--	2.21	ND
	04/16/04	11.40	--	1.37	<0.500
	07/26/04	13.90	--	3.03	<0.500
	10/15/04	28.00	--	3.31	<0.500
	01/28/05	17.70	--	4.50	0.610
	04/29/05	5.80	--	8.20	***<5.0***
	07/20/05	17.50	--	7.60	***<5.0***
	10/27/05	21.10	--	1.73	<0.500
	01/11/06	14.20	--	1.61	<0.200
	04/12/06	10.30	--	1.21	<0.200
	07/13/06	2.07	--	0.892	<0.200
	10/24/06	5.73	--	0.680	<0.200
	01/29/07	13.10	--	1.52	<0.200
	04/19/07	8.08	--	1.18	0.250
	07/19/07 [k]	3.78	--	1.32	<0.0100
	09/13/07	45.60	--	4.61	ND
	10/29/07	30.00	--	2.47	<0.0100

Table 2: Summary of Groundwater Analytical Results

Well Number	Date Sampled	Chloride[a] (mg/L)[b]	Nitrate-Nitrite[c] (mg/L)	Nitrate-Nitrogen[a] (mg/L)	Nitrite-Nitrogen[a] (mg/L)
MW-6 Cont.	01/30/08 [k]	19.20	--	1.98	0.100
	04/22/08	14.40	--	1.04	0.980
	07/23/08	2.47	--	1.02	<0.200
	10/22/08	61.80	--	4.45	<0.200
	01/29/09	5.32	--	0.880	<0.200
	04/28/09	3.49	--	1.36	<0.200
	07/09/09	2.89	--	1.08	<0.100
	10/29/09	51.00	--	4.0	**1.5[m]**
	01/19/10	9.70	--	1.4	**1.4**
	04/07/10	4.80	--	1.8	**1.7**
	07/27/10	2.70	--	1.0	<0.60
	10/20/10	4.50	--	1.0	<0.60
	01/18/11	5.70	--	1.3	<0.60
	04/21/11	2.70	--	1.0	<0.60
	07/14/11	4.10	--	1.4	<0.60
	10/06/11	25.00	--	6.8	<0.60
	01/24/12	5.80	--	1.1	<0.60
	04/10/12	6.90	--	1.7	**1.2**
	07/11/12	2.70	--	ND	**1.2**
	10/30/12	31.00	--	4.8	<0.60
	01/29/13	16.00	--	2.7	**1.3**
	04/11/13	5.10	--	1.9	***<6.0***
	10/24/13 [k]	28.00	--	2.3	<0.100
	01/29/14	5.40	--	0.990	<0.100
	04/23/14	2.90	--	0.780	<0.100
	07/28/14	3.30	--	0.780	<0.100
	10/29/14	36.00	--	1.900	<0.100
	01/28/15	3.20	--	0.680	<0.100
	04/14/15	3.29	--	1.79	<0.100
	07/14/15	5.01	--	1.45	<0.100
	10/27/15	9.85	--	1.44	<0.100
	01/26/16	5.46	--	2.09	<0.100
	04/28/16	2.54	--	0.66	<0.100
	07/13/16	4.65	--	1.12	<0.100
	10/12/16	28.00	--	2.11	<0.100

Table 2: Summary of Groundwater Analytical Results

Well Number	Date Sampled	Chloride[a] (mg/L)[b]	Nitrate-Nitrite[c] (mg/L)	Nitrate-Nitrogen[a] (mg/L)	Nitrite-Nitrogen[a] (mg/L)
MW-6 Cont.	01/31/17	4.43	--	1.48	<0.100
	04/18/17	3.27	--	0.97	<0.100
	06/27/18 [c]	2.62	1.01	1.01	--
Cleanup Level[n]		250	10	10	1

Notes:

(a) Analysis by U.S. Environmental Protection Agency (EPA) Method 300.0 except where noted.

(b) mg/L = milligrams per liter

(c) Nitrate-Nitrite analysis by EPA Method 353.2 and Chloride analysis by EPA Method 9056A for samples collected on 06/27/18. Based on correspondence with the analytical laboratory and analytical results for nitrite since 2013, it is assumed that the nitrate-nitrite analytical results are representative of nitrate concentrations in the water samples.

(d) Bold indicates analyte reported at a concentration that exceeds the cleanup level.

(e) NA = Not analyzed

(f) Groundwater monitoring conducted by EMR through 2002, GeoEngineers between 2003 and 2012, and Kennedy Jenks since 2013.

(g) ND = Not detected

(h) < = Analyte not detected above the indicated laboratory reporting limit.

(i) BOLD and Italicized indicates the laboratory reporting limit was greater than the cleanup level.

(j) Estimated value.

(k) On 07/09/07, 01/30/08, and 10/24/13, nitrite-nitrogen analysis was performed using EPA Method 353.2.

(l) NS = Not sampled

(m) Analysis performed outside of method-specified hold time because concentration of analyte in sample required a dilution.

(n) Cleanup level defined in the site Final Cleanup Action Plan (FCAP, GeoEnginers 2003).

(Dup) "Dup" = blind field duplicate sample

"J" indicates an estimated concentration based on either the being less than the laboratory reporting limit or data validation findings.

Table 3: Summary of Evaporation Pond Water Levels

Date Measured	Water Level Elevation[a] (feet)
8/26/2003	2,035.85
9/25/2003	2,035.64
10/30/2003	2,035.50
11/26/2003	2,035.60
12/22/2003	2,036.64
1/28/2004	2,038.77
02/20/04[b]	2,039.18
3/16/2004	2,039.08
4/19/2004	2,038.64
5/20/2004	2,038.10
6/16/2004	2,038.81
7/26/2004	2,037.98
8/23/2004	2,037.73
9/13/2004	2,037.48
10/15/2004	2,037.52
11/8/2004	2,037.48
12/15/2004	2,038.52
01/28/05[b]	2,039.12
2/16/2005	2,039.06
3/10/2005	2,039.00
4/20/2005	2,039.02
5/14/2005	2,038.93
6/9/2005	2,039.02
7/14/2005	2,038.77
8/15/2005	2,037.77
9/27/2005	2,036.85
10/21/2005	2,037.85
11/3/2006	2,038.02
12/16/2006	2,037.85
01/17/06[b]	2,039.10
02/03/06[b]	2,039.10
03/17/06[b]	2,039.10
04/14/06[b]	2,039.10
05/03/06[b]	2,039.10
6/7/2006	2,038.18
7/6/2006	2,038.85
8/31/2006	2,038.85
9/13/2006	2,038.77
10/30/2006	NM
11/13/2006	2,038.89
12/4/2006	2,038.93
01/04/07[b]	2,039.14
02/02/07[c]	NM

Table 3: Summary of Evaporation Pond Water Levels

Date Measured	Water Level Elevation[a] (feet)
03/06/07[b]	2,039.10
4/7/2007	2,036.87
5/3/2007	2,036.90
6/1/2007	2,038.94
07/03/07[c]	NM
8/1/2007	2,037.70
9/7/2007	2,037.07
10/9/2007	2,037.17
11/19/2007	2,037.24
12/20/2007	2,038.64
1/29/2008	2,039.39
2/6/2008	2,039.31
3/17/2008	2,039.39
04/04/08[b]	2,039.41
5/1/2008	2,039.27
6/16/2008	2,039.03
7/4/2008	2,038.69
8/5/2008	2,037.99
9/10/2008	2,037.59
10/7/2008	2,037.38
11/11/2008	2,037.56
12/5/2008	2,037.59
01/09/09[b]	2,039.57
02/22/09[b]	2,039.49
03/10/09[b]	2,039.55
04/09/09	2,039.39
5/4/2009	2,039.21
6/5/2009	2,038.79
7/10/2009	2,038.28
8/13/2009	2,037.69
9/8/2009	2,037.34
10/5/2009	2,036.65
11/12/2009	2,037.54
12/7/2009	2,037.75
01/19/10[b]	2,039.48
02/17/10[b]	2,039.49
03/08/10[b]	2,039.41
4/22/2010	2,039.32
5/12/2010	2,039.21
6/4/2010	2,039.30
7/30/2010	2,038.88
8/20/2010	2,038.47
9/9/2010	2,038.18

Table 3: Summary of Evaporation Pond Water Levels

Date Measured	Water Level Elevation[a] (feet)
10/11/2010	2,038.07
11/10/2010	2,038.42
12/10/10[b]	2,039.59
01/20/11[b]	2,039.49
02/17/11[b]	2,039.48
03/21/11[b]	2,039.49
04/09/11[b]	2,039.45
5/11/2011	2,039.39
06/10/11[b]	2,039.49
7/8/2011	2,039.09
8/8/2011	2,038.39
9/21/2011	2,037.39
10/12/2011	2,037.90
11/17/2011	2,037.89
12/9/2012	2,037.99
1/11/2012	2,038.29
02/16/12[b]	2,039.49
03/14/12[b]	2,039.49
04/07/12[b]	2,039.49
05/15/12[b]	2,039.37
6/12/2012	2,039.18
7/12/2012	2,038.79
8/22/2012	2,039.09
9/14/2012	2,037.51
10/22/2012	2,037.09
November 2012[b][d]	NA
12/12/12[b]	2,039.37
01/15/13[b]	2,039.27
10/24/2013	2,038.09
11/19/2013	2,038.09
12/18/2013	2,038.15
1/29/2014	2038.69
2/26/2014[b]	2,039.29
3/28/2014 [b]	2,039.23
4/23/2014	2,039.13
5/28/2014	2,038.84
6/17/2014	2,038.61
7/28/2014	2,038.12
8/21/2014	2,037.39
9/17/2014	2,038.39
10/24/2014	2,038.31
11/25/2014	2,037.52
12/11/2014	2,038.39

Table 3: Summary of Evaporation Pond Water Levels

Date Measured	Water Level Elevation[(a)] (feet)
1/29/2015	2,039.39
2/20/2015	2,039.36
3/31/2015	2,039.39
4/24/2015	2,039.20
5/22/2015	2,038.89
6/25/2015	2,038.30
7/14/2015	2,037.94
8/10/2015	2,037.44
9/30/2015	2,036.84
10/28/2015	2,036.69
11/23/2015	2,036.78
12/18/2015	2,037.99
1/26/2016	2,039.41
2/25/2016	2,039.37
3/21/2016	2,039.44
4/22/2016	2,039.22
5/27/2016	2,039.01
6/28/2016	2,038.49
7/19/2016	2,038.09
8/18/2016	2,037.59
9/23/2016	2,037.04
10/21/2016	2,037.95
11/14/2016	2,039.39
12/22/2016	2,039.45
1/31/2017	2,039.47
2/27/2017	2,039.53
3/16/2017	2,039.49
4/19/2017	2,039.53
5/17/2017	2,039.43
6/15/2017	2,038.95
6/27/2018	2,038.59

Notes:
(a) Pond water surface elevation relative to NAVD 88. Water level elevation corresponds to the event gauge reading at the pond plus a base elevation of 2,036.59 feet mean sea level (MSL).
(b) Water within the pond was discharging to overflow sump.
(c) Not measured because the pond's staff gauge shifted position, requiring maintenance during subsequent operation and maintenance (O&M) visit.
(d) Water level was within normal range for the time of year. However, a precise water level is not available
NM = not measured.
NA = not available.

Table 4: Statistical Analysis Summary

Constituent	Well ID	No. of Samples	No. of Detections	Minimum Detected (mg/L)[(b)]	Maximum Detected (mg/L)	95% UCL[(a)]		
						Data Distribution	95% UCL Method	95% UCL (mg/L)
Nitrate-N	MW-3	20	20	2.50	15.00	Lognormal	Land	9.35
	MW-5	20	20	1.30	41.80	Lognormal	Land	11.4
Washington State Department of Ecology Model Toxics Control Act Cleanup Level								10
Chloride	MW-5	20	20	14.9	923	Lognormal	Land	281
Washington State Department of Ecology Model Toxics Control Act Cleanup Level								250

Notes:

(a) 95% UCL = 95 percent upper confidence limit on the mean. Statistical calculations were performed using Model Toxics Control Act Stat (accessed March 2018).

(b) mg/L = milligrams per liter

Figures

N:\Projects\2013\1396114.02 Hillyard Dross Monitoring\GIS\Events\Fig1_VicinityMap.mxd

N

0 1,000 2,000 Feet

Kennedy Jenks Consultants

BNSF Railway Company
Hillyard Dross
Spokane, Washington

Vicinity Map

KJ 1896114.00

April 2019

Figure 1

N:\Projects\2013\1396114.02 Hillyard Dross Monitoring\GIS\Events\Fig1_VicinityMap.mxd

N

0 50 100
Feet

Legend

Monitoring Well

Notes

1. The locations of features shown are approximate.

Kennedy Jenks Consultants

BNSF Railway Company
Hillyard Dross
Spokane, Washington

Site Map

KJ 1896114.00

April 2019

Figure 2

N:\Projects\2013\1396114.02 Hillyard Dross Monitoring\GIS\Events\Fig1_VicinityMap.mxd

Legend

- Monitoring Well
- MW-4 1867.39 — Groundwater elevation (ft amsl) and approximate location
- Groundwater Elevation Contour
- Groundwater Elevation Contour (dashed where inferred)
- Interpreted Groundwater Flow Direction

N

0 50 100 Feet

Notes
1. The locations of features shown are approximate.
2. Ft AMSL = feet above mean sea level

Kennedy Jenks Consultants

BNSF Railway Company
Hillyard Dross
Spokane, Washington

Groundwater Potentiometric Surface Contours: June 2018

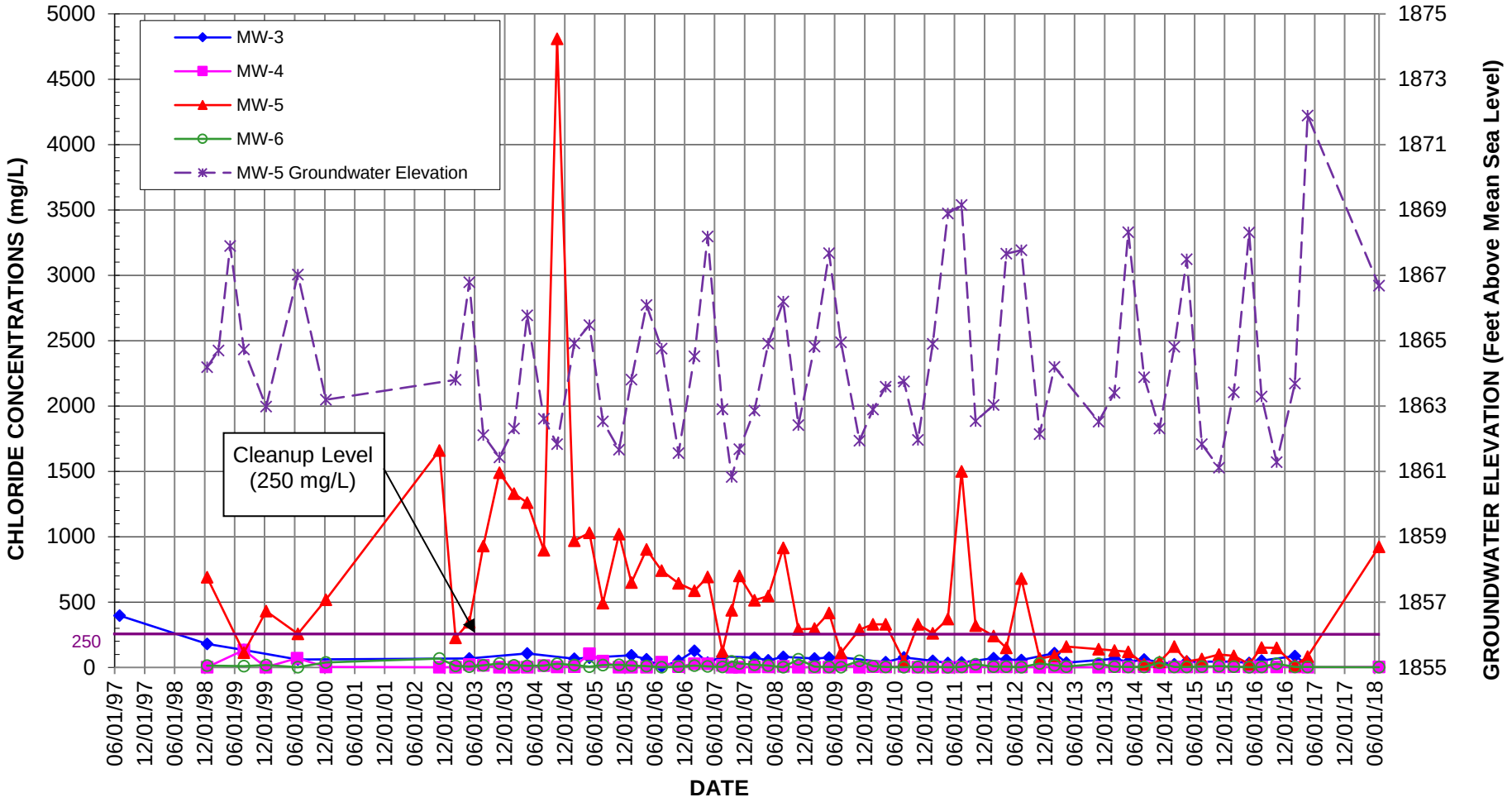
KJ 1896114.00

April 2019

Figure 3

FIGURE 4

BNSF HILLYARD DROSS CAP
CHLORIDE CONCENTRATIONS AND MW-5 GROUNDWATER ELEVATION



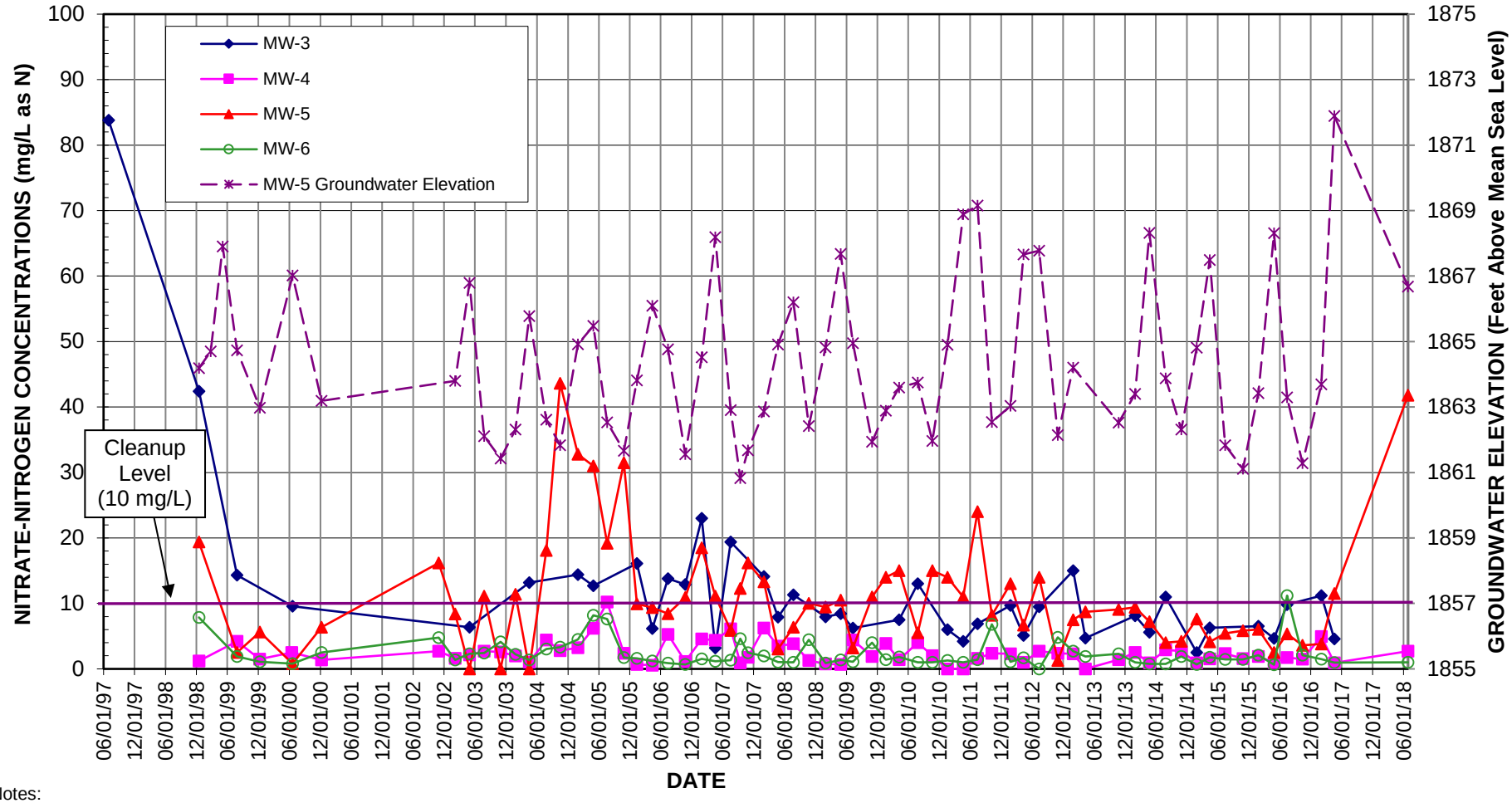
Notes:

1. Non-detectable concentrations are presented as zero.

\\fwybnsf2\bnsfdata\Projects\2018\1896114.00 Hillyard Dross Monitoring\2018 Report\Figures\2018 report Tables 1-4 Fig 4-6.xlsx

FIGURE 5

BNSF HILLYARD DROSS CAP
NITRATE-NITROGEN CONCENTRATIONS AND MW-5 GROUNDWATER ELEVATION



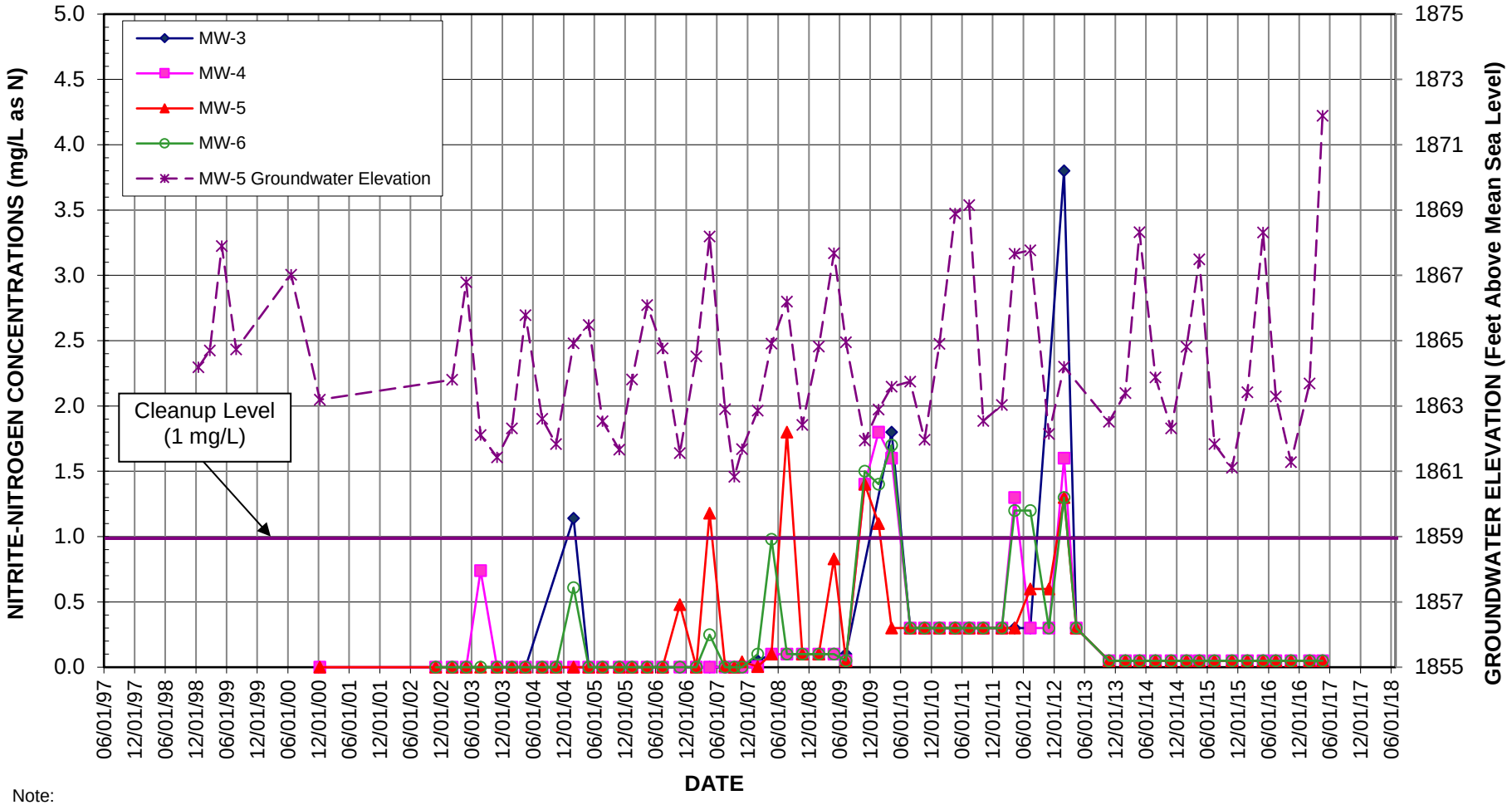
Notes:

1. Non-detectable concentrations are presented as zero.
2. June 2018 results include nitrite.

\\fwybnsf2\bnsfdata\Projects\2018\1896114.00 Hillyard Dross Monitoring\2018 Report\Figures\2018 report Tables 1-4 Fig 4-6.xlsx

FIGURE 6

BNSF HILLYARD DROSS CAP
NITRITE-NITROGEN CONCENTRATIONS AND MW-5 GROUNDWATER ELEVATION



Note:

1. Non-detectable concentrations are presented as half the laboratory reporting limit.

Appendix A

Washington State Department of Ecology 2013 Periodic Review

PERIODIC REVIEW

ALUMINUM RECYCLING CORPORATION

FSID 627

CSID 1133

Prepared by
Washington State Department of Ecology
Eastern Regional Office
Toxics Cleanup Program
Spokane, WA

March 2013

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1.0 INTRODUCTION

This report presents the Washington State Department of Ecology's (Ecology) second periodic review for the Aluminum Recycling Corporation Site (Site). This periodic review is required as part of the site cleanup process under the Model Toxics Control Act (MTCA), Ch. 70.105D RCW, implemented by Ecology. Periodic reviews evaluate post-cleanup site conditions and monitoring data to assure human health and the environment are being protected. They are required for sites where an institutional control is part of the cleanup action.

Cleanup actions were conducted at the Site by the Burlington Northern Santa Fe Railroad Corporation (BNSF) in 2003. These actions addressed contaminated soils, but residual groundwater contamination remained. Groundwater monitoring has been ongoing since completion of the cleanup action. The first periodic review was completed in 2008.

2.0 SUMMARY OF SITE CONDITIONS

2.1 SITE DESCRIPTION AND HISTORY

The eight-acre Site, located at 3412 E. Wellesley Avenue, Spokane, Washington, was initially used as a gravel pit for an asphalt plant (Figure 1). Beginning in 1954, Site use changed to an aluminum reprocessing facility using scrap aluminum and aluminum dross. Several lessees continued these operations until 1987, when the property was abandoned by all lessees with an estimated 65,000 cubic yards of dross material remaining on-site. BNSF retained ownership of the property throughout that timeframe.

The facility processed white dross, which was composed of aluminum skim and other materials derived from primary smelting operations. White dross, which contains various oxides, aluminum metal, carbides, and nitrides, was treated through the addition of salts, cryolite, and heat to separate out molten aluminum metal. The resulting residue after the secondary treatment was high-salt black dross. This material, along with a small volume of semi-processed white dross, was deposited on-site in various waste piles and in the former gravel pit. Approximately 65,000 cubic yards of dross remained on-site when the property was abandonded in 1987. When the black dross is wet, it generates ammonia odors and heat. This caused complaints from the public and one fire. Temporary surface stabilization measures had been taken to limit these reactions.

2.2 SITE INVESTIGATIONS AND CLEANUP

In 1985, Ecology completed a Preliminary Assessment (PA) of the property, and recommended dust and fumes be controlled; the dross materials be appropriately disposed of; and local water supply wells be sampled to ensure they hadn't been contaminated. Ecology then conducted a PA/Site Inspection (SI) Phase I in 1987. It concluded the Site was potentially contaminated with hazardous substances. No dangerous waste designation was completed at that time.

In 1988, BNSF performed a Site characterization study. Groundwater, soil, and deeper dross samples were collected, and surface stabilization and Site access restrictions occurred.

In 1989, a dross characterization study was done for BNSF. About 95% of the dross on-site could be considered a dangerous waste under Washington State regulations due to high concentrations of chloride, fluoride, and nitrate. Also, groundwater under the dross piles contained chloride, fluoride, and nitrate at levels exceeding state drinking water standards.

In 1991, Ecology completed a Site ranking using the Washington Ranking Method (WARM); the Site received a rank of 2 on a scale of 1 to 5, with 1 representing the greatest threat to human health and the environment. In 1996, BNSF's consultant reviewed the previous work and provided information on the physical and chemical properties of the dross, indicating it was not a dangerous waste according to bioassay testing. It also indicated the remaining salts were encapsulated and unable to be leached. Site access restrictions were also established.

BNSF and Ecology signed an Agreed Order in November 1998 to complete a Remedial Investigation/Feasibility Study (RI/FS) which was finalized one year later. Results indicated groundwater was contaminated with chloride, fluoride, nitrate, and nitrite. Soil was also contaminated where it was mixed with dross.

A Cleanup Action Plan (CAP) was prepared in 2000 which summarized investigations and contamination at the Site, and selected the remedy. The remedy, implemented in 2001, involved excavation and consolidation of dross and soil mixed with dross into an on-site pit, capping of the consolidation area with a low permeability multimedia cover system, and routing of surface water drainage into an on-site lined evaporation pond. Fencing, signs, and deed restrictions are maintained for the property. Four existing monitoring wells, installed prior to the RI/FS, are also sampled on a quarterly basis for chloride, fluoride, nitrate, and nitrite.

3.0 PERIODIC REVIEW

3.1 REGULATION

Under WAC 173-340-420, a periodic review of the cleanup action takes place at least every five years after the initiation of the cleanup action. A periodic review is required at sites where any of the following occur:

- Ecology conducts a cleanup action.
- Ecology approves a cleanup action under an order, agreed order, or consent decree.
- As resources permit, whenever Ecology issues a no further action opinion.

AND one of the following conditions exists:

- An institutional control and/or financial assurance is required as part of the cleanup action.
- Cleanup level is based on a practical quantitation limit as provided for in WAC 173-340-707.
- Modifications to the default equations or assumptions using site-specific information would significantly increase the concentration of hazardous substances remaining at the site after cleanup or the uncertainty in the ecological evaluation or the reliability of the cleanup action is such that additional review is necessary to assure long-term protection of human health and the environment.

When conducting a periodic review of a cleanup action and evaluating whether human health and the environment are being protected, the factors Ecology shall consider include [WAC 173-340-420(4)]:

- The effectiveness of ongoing or completed cleanup actions;
- New scientific information for individual hazardous substances of mixtures present at the site;
- New applicable state and federal laws for hazardous substances present at the site;
- Current and projected site use;
- Availability and practicability of higher preference technologies; and
- The availability of improved analytical techniques to evaluate compliance with cleanup levels.

Because the cleanup action was performed under a consent decree and institutional controls are required, the site is subject to periodic reviews at a frequency of no less than every five years. A periodic review was completed by Ecology in 2008. Ecology determined in that review the remedy remained protective and no changes were needed.

3.2 BASIS FOR REVIEW

This review is based on documents describing the actions listed in Section 2.2. These include periodic groundwater compliance monitoring reports submitted quarterly from 2008 through 2012.

3.3 THE EFFECTIVENESS OF ONGOING OR COMPLETED CLEANUP ACTIONS

An engineered cover system was placed over the dross materials remaining on the Site. This low-permeability cover was designed to minimize the infiltration of surface water and route it away from the emplaced waste. Although grasses were planted on the cover surface, they did not grow successfully. Despite that, surface erosion appears to be minimal. The lined evaporation pond, installed to capture surface runoff, functions well, and can handle high flow events without overflow. The cover system and evaporation pond are visually inspected on a monthly basis to ensure there is no significant deterioration.

Institutional controls at the Site include access restrictions and a restrictive covenant. Fencing and signs are checked and maintained on a monthly basis along with the cover and pond. The restrictive covenant, which limits the use of the Site, was recorded and is in place. These limitations include: maintenance of fences and signs; industrial use only; limitations on groundwater withdrawal and use; and restrictions on activities which would interfere with the performance of the remedy. These institutional controls have proven effective in limiting exposure and protecting the integrity of the remedy.

Groundwater contaminant concentrations have been monitored quarterly since June 1997 at four Site monitoring wells (Figure 2). Fluoride has been below cleanup levels throughout this review period at wells MW4, MW5, and MW6 (Figure 3, Table 1). MW3 has shown two detections exceeding cleanup levels. A statistical analysis of fluoride data at this well shows that the data is lognormal, and the upper one-sided 95% confidence limit (0.69 mg/L) does not exceed the cleanup level (0.96 mg/L). Additionally, no single sample concentration is greater than two times the cleanup level, and less than 10% of the sample concentrations exceed the cleanup level. (Tables 1 through 4) Therefore, the cleanup level for fluoride in groundwater at the Site has been achieved, and fluoride can be removed from future monitoring events.

Chloride has been below cleanup levels throughout this review period at MW3, MW4, and MW6 (Figure 4, Table 2). However, chloride has exceeded the cleanup level in 15 of 20 samples at MW5 during this evaluation period. A statistical analysis of chloride data at this well shows the data is lognormal, and the upper one-sided 95% confidence limit (617.1 mg/L) exceeds the cleanup level (250 mg/L), indicating the well has not yet achieved cleanup levels. However, the Mann-Kendall statistical test shows a slightly decreasing trend in chloride concentrations.

Nitrate was below cleanup levels throughout this review period at MW4 and MW6 (Figure 5, Table 3). The cleanup level was exceeded in 3 of 14 samples in MW3, and in 11 of 20 samples in MW5. The trend is decreasing at MW3 and slightly increasing at MW5. This represents an improvement since the last periodic review.

Nitrite has had more detections at all wells as compared to the last periodic review, including multiple exceedances at wells MW4, MW5, and MW6 (Figure 6, Table 4). The exceedances are frequently interspersed with non-detections, including a one year period with no detections at any wells between October 2010 and October 2011. Trends at these wells are unclear and unpredictable. However, the magnitude of the exceedances is not great; the maximum concentration is only 1.8 mg/L (cleanup level 1 mg/L).

Overall, contaminant concentrations are showing improvements.

3.4 New scientific information for individual hazardous substances or mixtures present at the Site

No new scientific information is available for chloride, nitrate, nitrite, or fluoride.

3.5 New applicable state and federal laws for hazardous substances present at the Site

No new federal or state laws exist that would apply to contaminants at the Site.

3.6 Current and projected Site and resource uses

The Site is currently vacant. Trespassing is discouraged by the presence of a chain-link fence at the Site perimeter. Regular Site inspections indicate the fencing does keep trespassers off the Site.

No change in land use is currently projected for the Site. When the CAP was originally written, it was anticipated a freeway would be built very near the Site. Accommodations were made during the design for rerouting train tracks and other issues specific to the freeway corridor. Work on this freeway has now started, and it is expected to reach areas proximal to the Site in the next five years. Initial conversations have begun with Washington State Department of Transportation (WDOT) representatives to ensure that freeway-related work will not impact the protectiveness of the cleanup action. If any work may impact the cleanup action, Ecology will work closely with WDOT and BNSF to ensure human health and the environment remain protected. Additional public outreach work would be performed for any plans that may change the cleanup action.

3.7 The availability and practicability of more permanent remedies

A “permanent” cleanup action is defined in MTCA as a cleanup action in which cleanup standards can be met without further action being required. Several remedial alternatives were evaluated in the CAP. Of these, the only remedy evaluated that would be more permanent would be removal and off-site disposal. No new technologies have been developed since the CAP that would be more permanent.

3.8 THE AVAILABILITY OF IMPROVED ANALYTICAL TECHNIQUES TO EVALUATE COMPLIANCE WITH CLEANUP LEVELS

No improved analytical techniques are available.

4.0 CONCLUSIONS

Ecology has determined the remedy at the Aluminum Recycling Corporation Site is generally protective of human health and the environment. The measures that were taken for the original cleanup action remain protective today. Continued inspections ensure the cap remains functioning, and compliance monitoring allows for groundwater impacts and trends to be measured. The existence of institutional controls in the form of deed restrictions confirms Site uses will remain consistent with the presence of contamination. Further periodic reviews will be required as long as institutional controls are in place at the Site, in accordance with WAC 173-340-420(7).

5.0 REFERENCES CITED

Washington State Department of Ecology, 2001, Model Toxics Cleanup Act Regulation Chapter 173-340 WAC

FIGURES

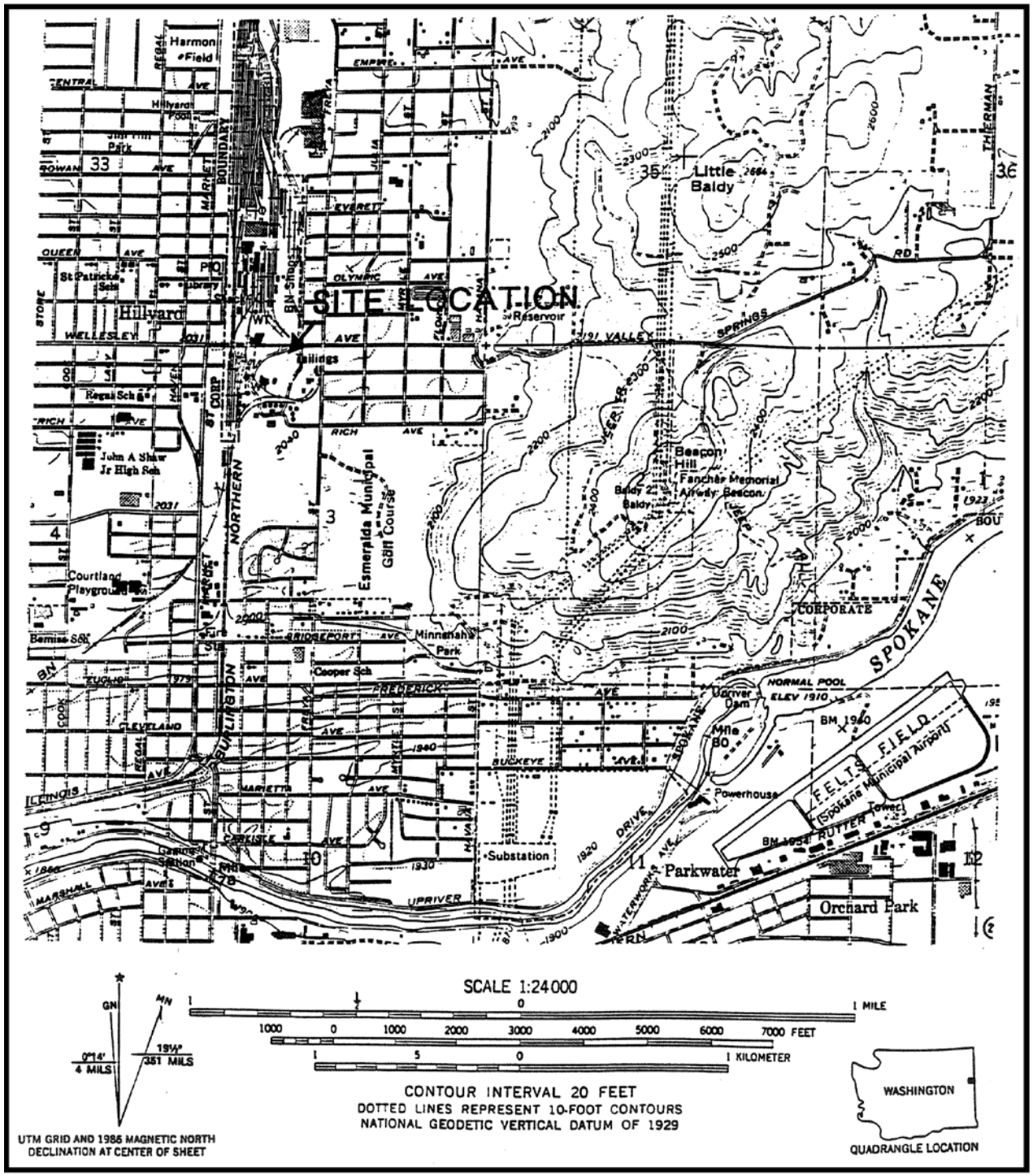


Figure 1. Site Map

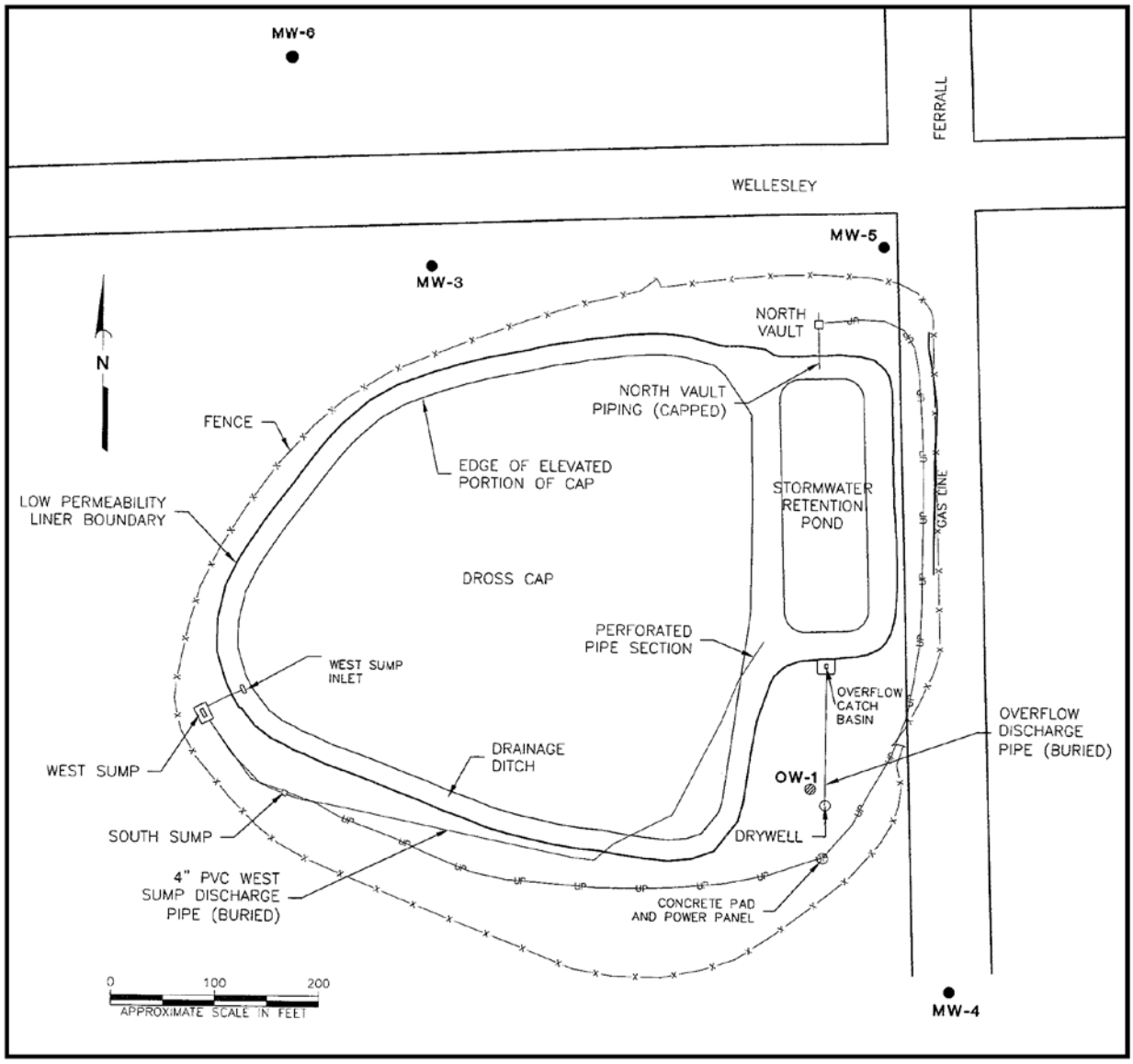


Figure 2. Well Locations and Final Site Configuration

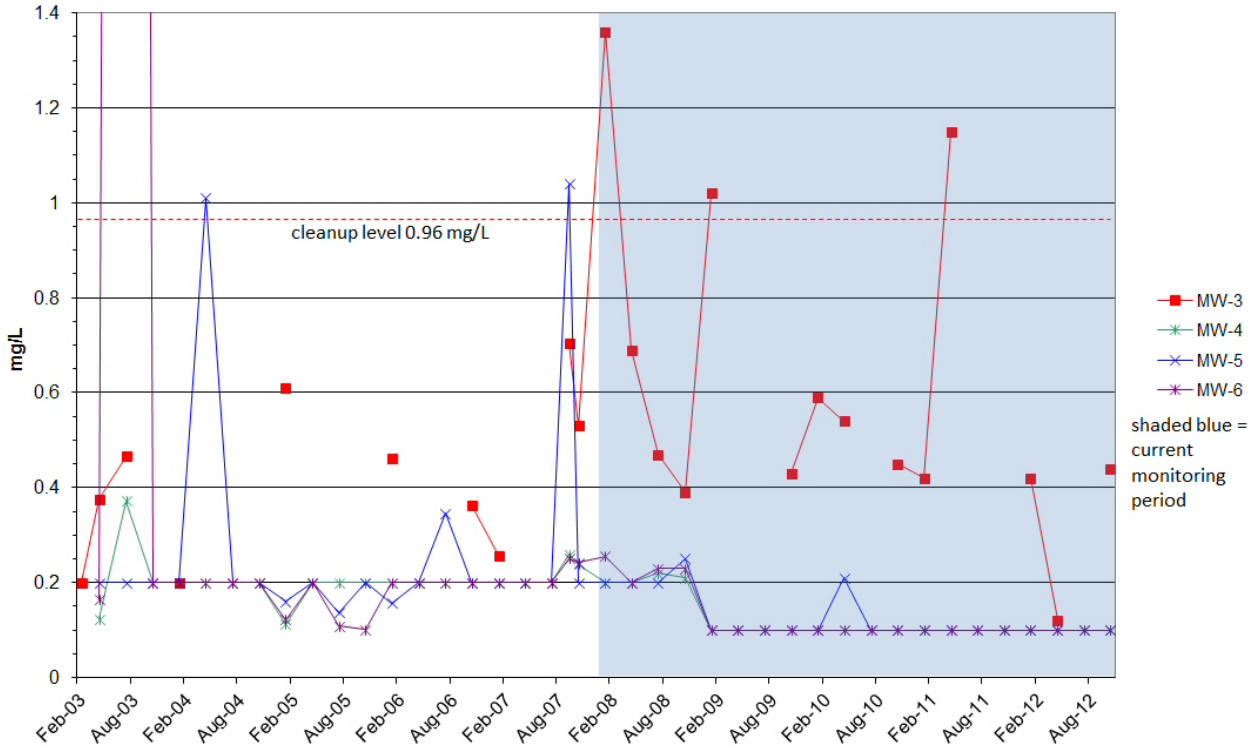


Figure 3. Fluoride Concentrations

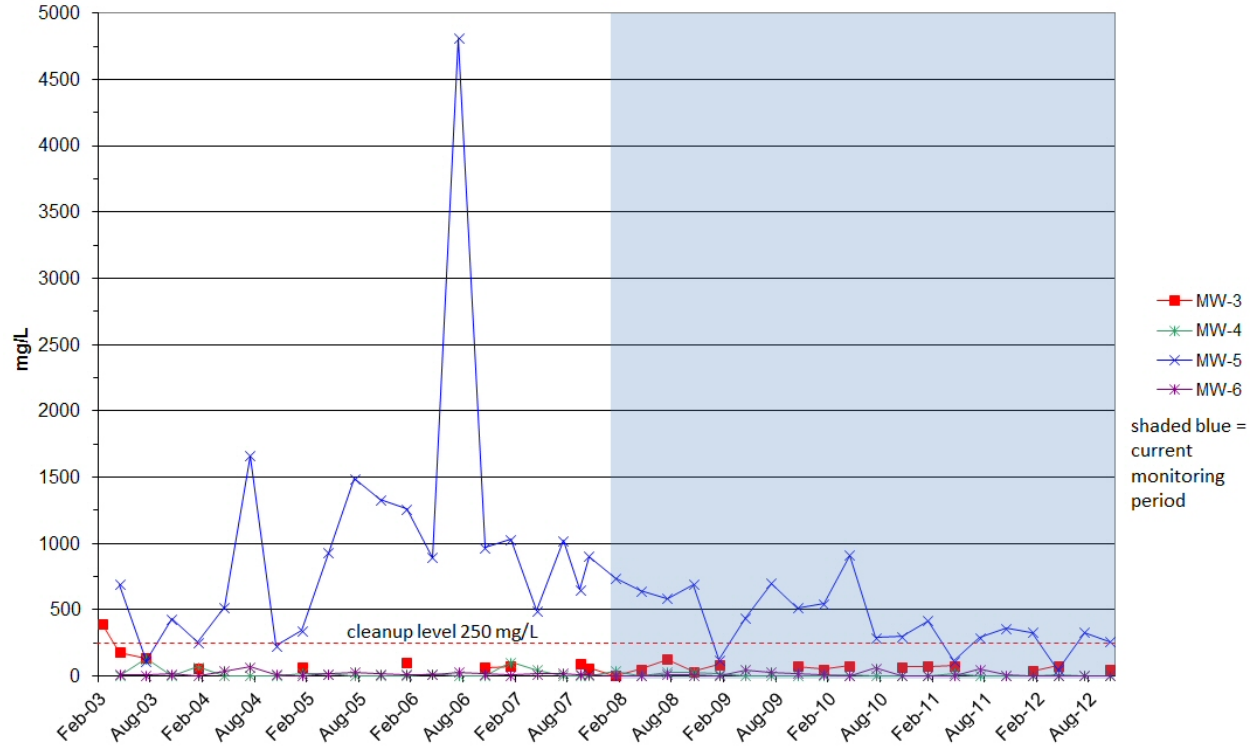


Figure 4. Chloride Concentrations

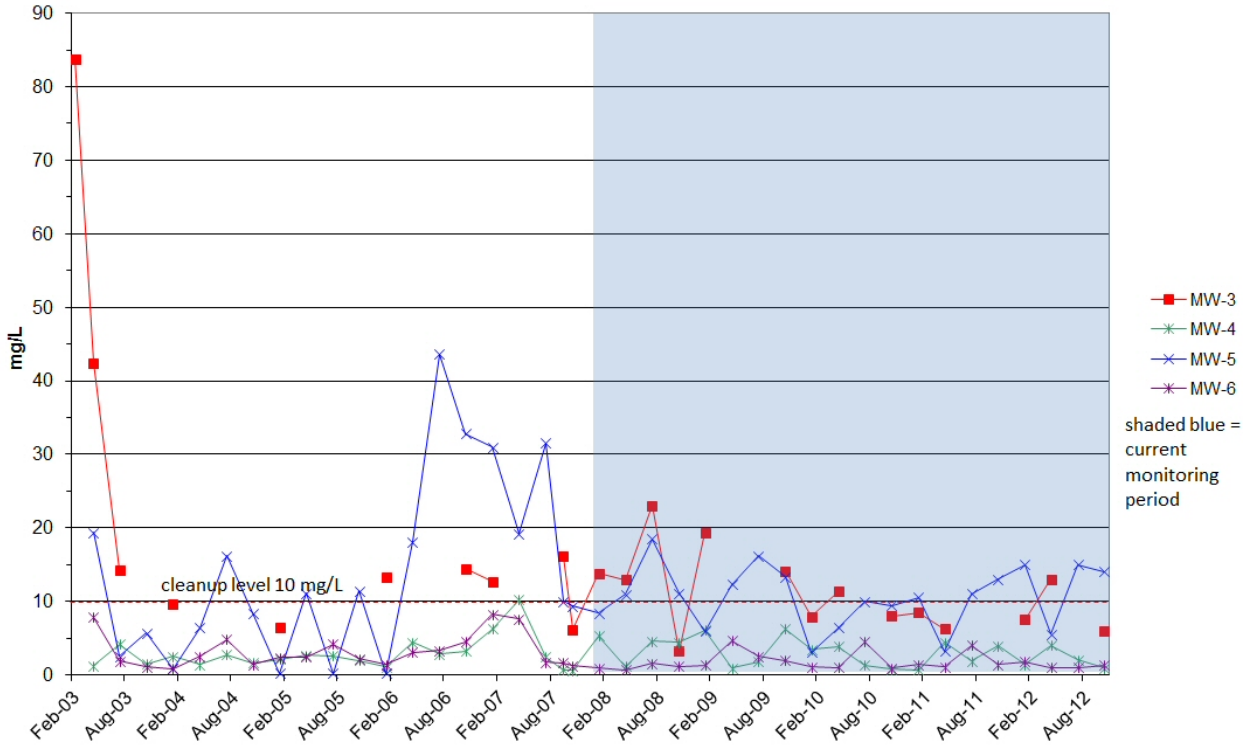


Figure 5. Nitrate Concentrations

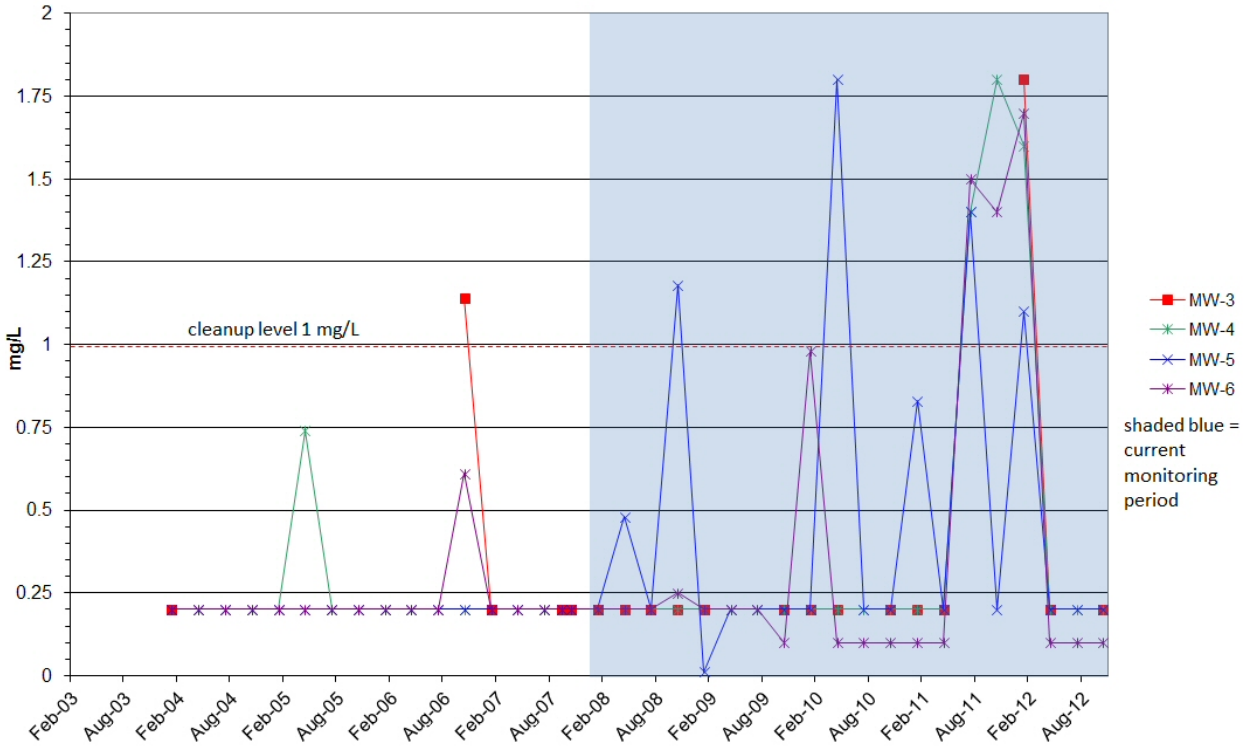


Figure 6. Nitrite Concentrations

TABLES

Date	Fluoride	Chloride	Nitrate	Nitrite
1/30/2008	0.43	74.5	14.1	0.2
4/22/2008	0.59	53.8	7.9	0.2
7/23/2008	0.54	80.6	11.3	0.2
10/22/2008	NS	NS	NS	NS
1/29/2009	0.45	68.2	7.95	0.2
4/28/2009	0.42	74.2	8.44	0.2
7/9/2009	1.15	77.1	6.24	0.2
10/29/2009	NS	NS	NS	NS
1/19/2010	NS	NS	NS	NS
4/7/2010	0.42	40	7.5	1.8
7/27/2010	0.12	77	13	0.2
10/20/2010	NS	NS	NS	NS
1/18/2011	0.44	51	6	0.2
4/21/2011	1.2	35	4.2	0.2
7/14/2011	0.41	39	6.9	0.2
10/6/2011	NS	NS	NS	NS
1/24/2012	0.31	71	9.7	0.2
4/10/2012	0.38	60	5.1	0.2
7/11/2012	0.26	57	9.5	0.2
10/30/2012	NS	NS	NS	NS

NS = not sampled

Table 1. MW3 Groundwater Results

Date	Fluoride	Chloride	Nitrate	Nitrite
1/30/2008	0.1	4.7	6.25	0.2
4/22/2008	0.1	3.98	3.49	0.2
7/23/2008	0.1	7.32	3.86	0.2
10/22/2008	0.1	2.75	1.28	0.2
1/29/2009	0.1	2.59	0.78	0.2
4/28/2009	0.1	2.5	0.68	0.2
7/9/2009	0.1	19.3	4.42	0.2
10/29/2009	0.1	2.7	1.9	1.4
1/19/2010	0.1	5.6	3.9	1.8
4/7/2010	0.1	3.2	1.4	1.6
7/27/2010	0.1	7.8	4	0.2
10/20/2010	0.1	2.7	2	0.2
1/18/2011	0.1	2.6	0.9	0.2
4/21/2011	0.21	2.4	0.9	0.2
7/14/2011	0.1	3.8	1.6	0.2
10/6/2011	0.1	4.3	2.4	0.2
1/24/2012	0.1	3.6	2.3	0.2
4/10/2012	0.1	3	1	1.3
7/11/2012	0.1	4.7	2.7	0.2
10/30/2012	0.1	2.8	2.4	0.2

NS = not sampled

Table 2. MW4 Groundwater Results

Date	Fluoride	Chloride	Nitrate	Nitrite
1/30/2008	0.1	513	13.3	0.2
4/22/2008	0.1	546	3.05	0.2
7/23/2008	0.21	914	6.36	1.8
10/22/2008	0.1	292	10	0.2
1/29/2009	0.1	298	9.43	0.2
4/28/2009	0.1	417	10.5	0.83
7/9/2009	0.1	112	3.2	0.2
10/29/2009	0.1	290	11	1.4
1/19/2010	0.1	360	13	0.2
4/7/2010	0.1	330	15	1.1
7/27/2010	0.1	48	5.5	0.2
10/20/2010	0.1	330	15	0.2
1/18/2011	0.1	260	14	0.2
4/21/2011	0.1	370	11	0.2
7/14/2011	0.1	1500	24	0.2
10/6/2011	0.1	320	8.2	0.2
1/24/2012	0.1	240	13	0.2
4/10/2012	0.1	150	6.7	0.2
7/11/2012	0.1	680	14	0.6
10/30/2012	0.1	69	1.3	0.6

NS = not sampled

Table 3. MW5 Groundwater Results

Date	Fluoride	Chloride	Nitrate	Nitrite
1/30/2008	0.1	19.2	1.98	0.1
4/22/2008	0.1	14.4	1.04	0.98
7/23/2008	0.1	2.47	1.02	0.1
10/22/2008	0.1	61.8	4.45	0.1
1/29/2009	0.1	5.32	0.88	0.1
4/28/2009	0.1	3.49	1.36	0.1
7/9/2009	0.1	2.89	1.08	0.1
10/29/2009	0.1	51	4	1.5
1/19/2010	0.1	9.7	1.4	1.4
4/7/2010	0.1	4.8	1.8	1.7
7/27/2010	0.1	2.7	1	0.1
10/20/2010	0.1	4.5	1	0.1
1/18/2011	0.1	5.7	1.3	0.1
4/21/2011	0.1	2.7	1	0.1
7/14/2011	0.16	4.1	1.4	0.1
10/6/2011	0.1	25	6.8	0.1
1/24/2012	0.1	5.8	1.1	0.1
4/10/2012	0.1	6.9	1.7	1.2
7/11/2012	0.1	2.7	0.2	1.2
10/30/2012	0.1	31	4.8	0.1

NS = not sampled

Table 4. MW6 Groundwater Results

Appendix B

Field Methods

Appendix B

Field Methods

General

Groundwater monitoring activities completed at the Hillyard Dross Cap facility followed standard U.S. Environmental Protection Agency (EPA) low-flow methods and procedures. Procedures were consistent with those previously conducted during recent sampling events. Known deviations from the Washington State Department of Ecology (Ecology) approved sampling methods [documented in EMR's *Final Remedial Action Work Plan* (FRAWP) finalized on 22 April 2003] were related to purge water disposal, sampling equipment and methods, decontamination methods, and instrument calibration and included the following:

- Purge water was containerized within a labeled 55-gallon drum located within the fenced portion of the Site.
- Sampling was performed at monitoring wells MW-4 through MW-6 using low-flow sampling methods and dedicated bladder pumps.
- Instrument calibration was performed consistent with manufacturer's recommendations, rather than with the procedures detailed in the FRAWP.

Groundwater Elevations

Depths to groundwater were measured relative to the monitoring well casing rims using an electronic water level indicator. Prior to groundwater sample collection, water level measurements were collected from each well. After removing the well cap, sufficient time was allowed for the water level to equilibrate with the ambient air pressure. Prior to water level measuring, the existing reference point on the well casing was determined. A water level indicator probe was slowly lowered into the well until the sound from the indicator was audible. The probe was then slowly pulled out a few inches, and dropped back down at smaller increments until the water level could be determined to within 0.01 foot. The water level was measured based on an existing reference point on the well casing. Following sampling activities, the total depth of the well was then measured and recorded to the nearest 0.01 foot by allowing the measuring tape to contact the base of the well. The probe of the water level indicator was decontaminated between wells with a detergent wash, a tap water rinse, and a distilled water rinse. Groundwater table elevations were calculated by subtracting the depth to the groundwater table from the casing rim elevations. Groundwater table elevations measured during this reporting period are presented in the report.

Groundwater Sampling

Groundwater purging and sampling was performed consistent with EPA's low-flow groundwater sampling procedure, as described in EPA (1996) and Puls and Barcelona (1996). Dedicated submersible bladder pumps, outfitted with dedicated Teflon-lined tubing, were used for groundwater purging and sampling. During purging activities, water quality parameters, including pH, conductivity, temperature, turbidity, and oxidation-reduction potential and dissolved oxygen, were measured using a YSI 556 MPS multi-parameter meter equipped with a flow-through cell and recorded. The meter was calibrated on a daily basis in a manner consistent with manufacturer procedures. Groundwater samples were collected after 1) water quality parameters had stabilized or 2) a maximum purge time of 1 hour was achieved. During purging and sampling, drawdown was not allowed to exceed 0.3 foot and purge rate was not allowed to exceed 400 milliliters per minute.

Water quality parameter stabilization criteria include the following:

- Turbidity: ±10 percent for values greater than 5 nephelometric turbidity units (NTU)
- Dissolved oxygen: ±10 percent
- Conductivity: ±3 percent
- pH: ±0.1 unit
- Temperature: ±3 percent.

After groundwater quality stabilization criteria were satisfied, the pump's discharge tubing was disconnected from the flow-through cell and groundwater samples were collected for analysis of the following compounds in the following order: chloride, nitrate-nitrogen, and nitrite-nitrogen. Each sample was decanted into sample containers supplied by the analytical laboratory. Groundwater samples collected for chemical analysis were kept cool during onsite storage and transport to the analytical laboratory. Chain-of-custody procedures were observed during transport of the groundwater samples.

Monitoring well MW-3 not sampled as insufficient groundwater was present.

Purge water was retained in a labeled 55-gallon drum stored within the fenced portion of the Site.

References

Puls, R.W. and Barcelona, M.J. 1996. Low-flow (minimal drawdown) ground-water sampling procedures: EPA Ground Water Issue, April, pp. 1-9.

U.S. Environmental Protection Agency. Region 1. 1996. Low stress (low-flow) purging and sampling procedure for the collection of ground water samples from monitoring wells. EPA SOP No. GW 0001, Revision No. 2. July 30, 1996.

Appendix C

Laboratory Analytical Report

DATA VALIDATION SUMMARY
BNSF Hillyard Dross

Laboratory Reports included in Data Validation	Dates	Sample IDs
Laboratory: ESC SDG: L1005438 Analyses: Anions	**Report Date:** 7/6/2018 **Sample Dates:** 6/27/2018-6/27/2018 **Validation Date:** 4/12/2019	Aqueous Samples: HD-MW4-062718, HD-MW5-062718, HD-MW6-062718 Field Duplicates: HD-DUP-062718 (duplicate of HD-MW5-062718) Equipment Blank: HD-FIELDBLANK-062718 Trip Blank: Not Collected

Criteria	(Yes or No)	Comment
Chain-of-Custody (COC) – Chain-of-custody protocol followed?	No	See Note
Temperature Blank – Sample temperature criteria met?	Yes	
Holding times – Samples analyzed within specified holding time?	Yes	
Laboratory method blank samples – Analytes present in method blank samples?	No	
Field/Equipment blank samples – Analytes present in field/equipment blank samples?	No	
Trip blank samples – Analytes present in trip blank samples?	No	See Note
Matrix Spikes (MS)/Matrix Spike Duplicate (MSD) samples – Control limits met?	No	See Note
Surrogate percent recoveries – Control limits met?	Yes	
Laboratory Control Sample (LCS) – Control limits met?	Yes	
Laboratory duplicate samples (if applicable) – Control limits met?	Yes	
Field duplicate samples (if submitted) – Relative percent differences within control limits?	No	See Note
Other Issues?	No	

COC Note: A trip blank was indicated on the COC but not received by the laboratory, no action was taken as a field blank was included in the sample delivery group.
Temperature Note: Samples arrived at a temperature of 4.2 degrees Celsius (°C) which was within the recommended temperature of 0- 6°C.
Trip Blank Note: See COC note.
MS/MSD Note: The recovery of Nitrate-Nitrite in batch WG1131955 was below the laboratory acceptance criteria. No action was taken as the sample was non-delivery group specific.
Field Duplicate Note: For the duplicate pair HD-MW5-062718 and HD-DUP-062718 the RPD for Chloride was 33% which is above the standard acceptance criteria of 20%, the associated results were qualified as estimated, J.

SUMMARY
Overall, the findings with respect to the quality assurance/quality control (QA/QC) data do not adversely affect the use of the analytical results.

ANALYTICAL REPORT

July 06, 2018

Kennedy/Jenks Con-BNSF Region 1

Sample Delivery Group:	L1005438
Samples Received:	06/28/2018
Project Number:	1896114.00
Description:	BNSF Hillyard Dross

Report To: Steve Misner
421 SW 6th Avenue, Suite 1000
Portland, OR 97204

Entire Report Reviewed By:

Jason Romer
Technical Service Representative

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

TABLE OF CONTENTS

HD-MW6-062718 L1005438-01 GW

Collected by: Flavio Ishihara | Collected date/time: 06/27/18 12:00 | Received date/time: 06/28/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 353.2	WG1131955	1	07/02/18 16:02	07/02/18 16:02	JER
Wet Chemistry by Method 9056A	WG1133386	1	07/03/18 16:07	07/03/18 16:07	DR

HD-MW4-062718 L1005438-02 GW

Collected by: Flavio Ishihara | Collected date/time: 06/27/18 14:36 | Received date/time: 06/28/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 353.2	WG1131955	1	07/02/18 16:09	07/02/18 16:09	JER
Wet Chemistry by Method 9056A	WG1133386	1	07/03/18 16:21	07/03/18 16:21	DR

HD-MW5-062718 L1005438-03 GW

Collected by: Flavio Ishihara | Collected date/time: 06/27/18 15:54 | Received date/time: 06/28/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 353.2	WG1131955	20	07/02/18 16:50	07/02/18 16:50	JER
Wet Chemistry by Method 9056A	WG1133386	100	07/03/18 17:17	07/03/18 17:17	DR

HD-DUP-062718 L1005438-04 GW

Collected by: Flavio Ishihara | Collected date/time: 06/27/18 12:30 | Received date/time: 06/28/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 353.2	WG1131955	20	07/02/18 16:51	07/02/18 16:51	JER
Wet Chemistry by Method 9056A	WG1133641	100	07/04/18 01:31	07/04/18 01:31	DR

HD-FIELDBLANK-062718 L1005438-05 GW

Collected by: Flavio Ishihara | Collected date/time: 06/27/18 16:00 | Received date/time: 06/28/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 353.2	WG1131955	1	07/02/18 16:14	07/02/18 16:14	JER
Wet Chemistry by Method 9056A	WG1133641	1	07/04/18 01:45	07/04/18 01:45	DR

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. 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.

Jason Romer
Technical Service Representative

Wet Chemistry by Method 353.2

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Nitrate-Nitrite	1010		19.7	100	1	07/02/2018 16:02	WG1131955

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Chloride	2620		51.9	1000	1	07/03/2018 16:07	WG1133386

Wet Chemistry by Method 353.2

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Nitrate-Nitrite	2700		19.7	100	1	07/02/2018 16:09	WG1131955

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Chloride	4410		51.9	1000	1	07/03/2018 16:21	WG1133386

Wet Chemistry by Method 353.2

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Nitrate-Nitrite	41800		394	2000	20	07/02/2018 16:50	WG1131955

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Chloride	923000		5190	100000	100	07/03/2018 17:17	WG1133386

Wet Chemistry by Method 353.2

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Nitrate-Nitrite	43400		394	2000	20	07/02/2018 16:51	WG1131955

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Chloride	1290000		5190	100000	100	07/04/2018 01:31	WG1133641

Wet Chemistry by Method 353.2

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Nitrate-Nitrite	U		19.7	100	1	07/02/2018 16:14	WG1131955

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Chloride	U		51.9	1000	1	07/04/2018 01:45	WG1133641

Method Blank (MB)

(MB) R3322584-1 07/02/18 15:48

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Nitrate-Nitrite	U		19.7	100

L1005412-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1005412-01 07/02/18 15:56 • (DUP) R3322584-4 07/02/18 15:57

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Nitrate-Nitrite	569	566	1	0.529		20

L1005554-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1005554-04 07/02/18 16:30 • (DUP) R3322584-6 07/02/18 16:32

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Nitrate-Nitrite	512	509	1	0.588		20

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

(LCS) R3322584-2 07/02/18 15:49 • (LCSD) R3322584-3 07/02/18 15:51

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Nitrate-Nitrite	4000	3940	3880	98.4	97.1	90.0-110			1.36	20

L1005422-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1005422-01 07/02/18 15:59 • (MS) R3322584-5 07/02/18 16:00

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Nitrate-Nitrite	2500	ND	2600	102	1	90.0-110	

L1005554-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1005554-06 07/02/18 16:33 • (MS) R3322584-7 07/02/18 16:35 • (MSD) R3322584-8 07/02/18 16:36

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Nitrate-Nitrite	2500	2220	4370	4410	86.0	87.6	1	90.0-110	J6	J6	0.934	20

Method Blank (MB)

(MB) R3322947-1 07/03/18 10:24

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	ug/l		ug/l	ug/l
Chloride	U		51.9	1000

L1005438-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1005438-02 07/03/18 16:21 • (DUP) R3322947-4 07/03/18 16:35

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	ug/l	ug/l		%		%
Chloride	4410	4220	1	4.30		15

L1006459-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1006459-01 07/03/18 17:31 • (DUP) R3322947-7 07/03/18 17:45

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	ug/l	ug/l		%		%
Chloride	32400	32200	1	0.590		15

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

(LCS) R3322947-2 07/03/18 10:38 • (LCSD) R3322947-3 07/03/18 10:52

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	ug/l	ug/l	ug/l	%	%	%			%	%
Chloride	40000	39100	39000	97.7	97.5	80.0-120			0.240	15

L1005438-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1005438-02 07/03/18 16:21 • (MS) R3322947-5 07/03/18 16:49 • (MSD) R3322947-6 07/03/18 17:03

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	ug/l	ug/l	ug/l	ug/l	%	%		%			%	%
Chloride	50000	4410	55500	55500	102	102	1	80.0-120			0.0308	15

L1006459-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1006459-01 07/03/18 17:31 • (MS) R3322947-8 07/03/18 17:59

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
	ug/l	ug/l	ug/l	%		%	
Chloride	50000	32400	82300	99.7	1	80.0-120	

Method Blank (MB)

(MB) R3323305-1 07/04/18 00:35

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Chloride	U		51.9	1000

L1005438-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1005438-05 07/04/18 01:45 • (DUP) R3323305-4 07/04/18 01:59

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Chloride	U	0.000	1	0.000		15

L1005463-07 Original Sample (OS) • Duplicate (DUP)

(OS) L1005463-07 07/04/18 04:04 • (DUP) R3323305-6 07/04/18 04:18

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Chloride	7290	7190	1	1.34		15

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

(LCS) R3323305-2 07/04/18 00:49 • (LCSD) R3323305-3 07/04/18 01:03

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Chloride	40000	38800	38600	96.9	96.6	80.0-120			0.351	15

L1005438-05 Original Sample (OS) • Matrix Spike (MS)

(OS) L1005438-05 07/04/18 01:45 • (MS) R3323305-5 07/04/18 02:13

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Chloride	50000	U	56000	112	1	80.0-120	

L1005463-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1005463-07 07/04/18 04:04 • (MS) R3323305-7 07/04/18 04:32 • (MSD) R3323305-8 07/04/18 04:46

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Chloride	50000	7290	63200	59500	112	104	1	80.0-120			6.01	15

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

MDL	Method Detection Limit.
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
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.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
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.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.

State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO00356
Kentucky [1 6]	90010	South Carolina	84004
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana [1]	LA180010	Texas	T 104704245-17-14
Maine	TN0002	Texas [5]	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

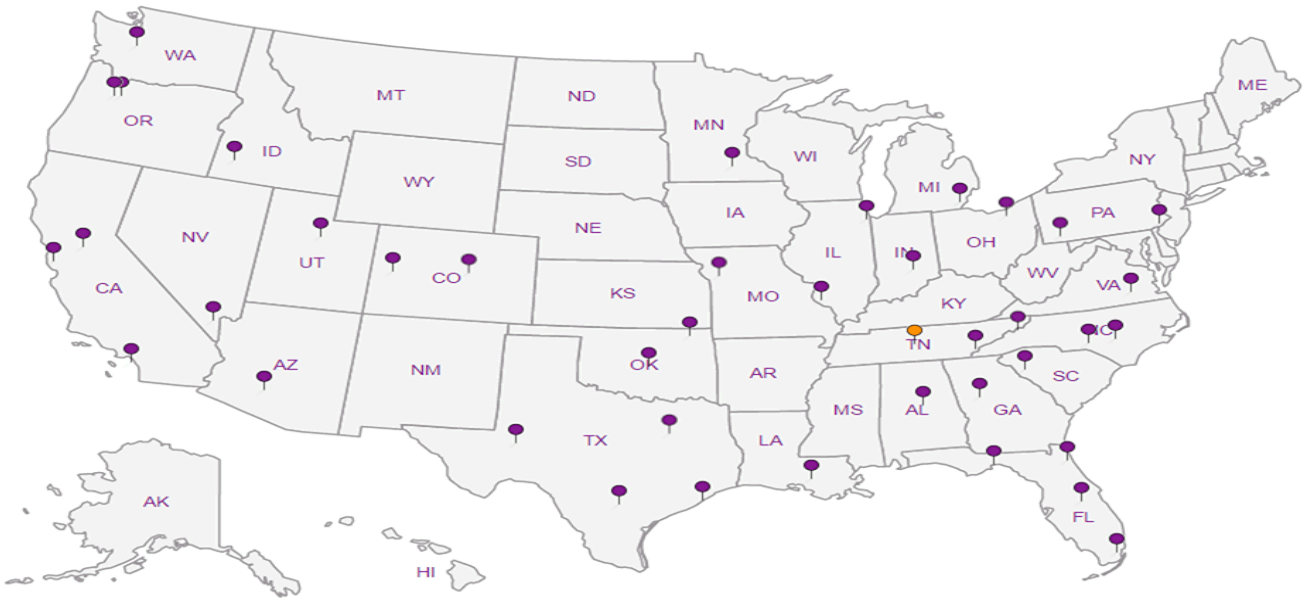
Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

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.



Kennedy/Jenks Con-BNSF Region 1

421 SW 6th Avenue, Suite 1000
Portland, OR 97204

Billing Information:
Accounts Payable
32001 32nd Ave. S.,Ste. 100
Federal Way, WA 98001

Report to: Steve Misner

Email To: stevenmisner@KennedyJenks.com

Project Description: BNSF Hillyard Dross

City/State Collected: SPOKANE, WA

Phone: 503-423-4000
Fax:

Client Project # 1896114.00

Lab Project # BNSF1KEN-HILLYARD

Collected by (print): FLAVIO ISHIHARA

Site/Facility ID #

P.O. #

Collected by (signature):

Quote #

Immediately Packed on Ice N ___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Date Results Needed: STANDARD TA.

Pres Chk

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	CHLORIDE 125mlHDPE-NoPres	NO2NO3 250mlHDPE-H2SO4	Remarks	Sample # (lab only)
~~MW-3~~ HD-MW6-062718	-	GW	-	06-27-18	12:00	2	X	X		-04
~~MW-4~~ HD-MW4-062718	-	GW	-	06-27-18	14:36	2	X	X		-02
~~MW-5~~ HD-MW5-062718	-	GW	-	06-27-18	15:54	2	X	X		-03
~~MW-6~~ HD-DUP-062718	-	GW	-	06-27-18	12:30	2	X	X		-04
~~DUP~~ ~~HD-DUP~~		GW				2	X	X		
~~FIELD BLANK~~		GW				2	X	X		
~~TRIP BLANK~~		GW				2	X	X		
HD-FIELDBLANK-062718		GW	-	06-27-18	16:00	2	X	X		-05
HD-TRIPBLANK-062718		GW	-			2	X	X		

Chain of Custody Page ___ of ___

ESC LABORATORY SCIENCES
a subsidiary of Pace Analytical

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

L# 108543

A012

Acctnum: BNSF1KEN
Template: T137688
Prelogin: P659822
TSR: 134 - Mark W. Beasley
PB:
Shipped Via:

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks: TRIP BLANK WAS NOT PROVIDED pH _____ Temp _____ Flow _____ Other _____

Samples returned via:
__ UPS __ FedEx __ Courier _____

Tracking # 7466 1466 5111

Sample Receipt Checklist:
COC Seal Present/Intact: __NP Y N
COC Signed/Accurate: Y N
Bottles arrive intact: Y N
Correct bottles used: Y N
Sufficient volume sent: Y N
If Applicable
VOA Zero Headspace: Y N
Preservation Correct/Checked: Y N

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeoH TBR
	06-27-18	16:20	6-27-18 16:20	
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Temp: 4.2 °C Bottles Received: 10
	6-27-18	16:50		If preservation required by Login: Date/Time
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 6/28/18 Time: 845
				Hold: Condition: NCF OK

L1005438

ESC
L·A·B S·C·I·E·N·C·E·S
A Subsidiary of Pace Analytical

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Shipping Batch Detail Report

Batch ID: P659822

Date: 06/22/18

Client: BNSF1KEN Kennedy/Jenks Con-BNSF Region 1 **Active: Y**
TSR: Mark W. Beasley

Order#	Frequency	Type	Description	Due Dt	#Kit Template
P659822	As Needed	BRANCH		06/22/18 P 1	T137688

Proj.Desc.: BNSF Hillyard Dross ESC Key : BNSF1KEN-HILLYARD
Project No: Site ID:

Comments:

Client ID: MW-3 Sample No:P659822-01

Packing List: Analysis Required	QTY	Container/Preservative
Chloride by IC	1	125mlHDPE-NoPres
Nitrate-Nitrite	1	250mlHDPE-H2SO4
Total Cntrs:	2	

Client ID: MW-4 Sample No:P659822-09

Packing List: Analysis Required	QTY	Container/Preservative
Chloride by IC	1	125mlHDPE-NoPres
Nitrate-Nitrite	1	250mlHDPE-H2SO4
Total Cntrs:	2	

Client ID: MW-5 Sample No:P659822-10

Packing List: Analysis Required	QTY	Container/Preservative
Chloride by IC	1	125mlHDPE-NoPres
Nitrate-Nitrite	1	250mlHDPE-H2SO4
Total Cntrs:	2	

Client ID: MW-6 Sample No:P659822-11

Packing List: Analysis Required	QTY	Container/Preservative
Chloride by IC	1	125mlHDPE-NoPres
Nitrate-Nitrite	1	250mlHDPE-H2SO4
Total Cntrs:	2	

Client ID: DUP Sample No:P659822-12

Packing List: Analysis Required	QTY	Container/Preservative
Chloride by IC	1	125mlHDPE-NoPres
Nitrate-Nitrite	1	250mlHDPE-H2SO4
Total Cntrs:	2	

L1005938

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Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Shipping Batch Detail Report

Date: 06/22/18

Batch ID: P659822

Client: BNSFIKEN Kennedy/Jenks Con-BNSF Region 1 **Active: Y**
TSR: Mark W. Beasley

Client ID: FIELD BLANK Sample No:P659822-13

Packing List: Analysis Required	QTY	Container/Preservative
Chloride by IC	1	125mlHDPE-NoPres
Nitrate-Nitrite	1	250mlHDPE-H2SO4
Total Cntrs:	2	

Client ID: TRIP BLANK Sample No:P659822-14

Packing List: Analysis Required	QTY	Container/Preservative
Chloride by IC	1	125mlHDPE-NoPres
Nitrate-Nitrite	1	250mlHDPE-H2SO4
Total Cntrs:	2	

Client ID: Sample No:P659822-15

Packing List: Analysis Required	QTY	Container/Preservative
Chloride by IC	1	125mlHDPE-NoPres
Nitrate-Nitrite	1	250mlHDPE-H2SO4
Total Cntrs:	2	

Outbound Method of Shipment Return Method of Shipment Paid By

Shipping Audit Trail Date Shipped:_____ Carrier:_____ # Pieces:_____
Cooler:_____ Size:____ Color:_____ Initials:_____

Ship To: Kennedy/Jenks Con-BNSF Region 1
Flavio Ishihara
3810 E. Boone Avenue, Suite 101
Spokane, WA 99202

Appendix D

2018 MTCA Stat Output

7.5	4/7/10
13	7/27/10
6	1/18/11
4.2	4/21/11
6.9	7/14/11
9.7	1/24/12
5.1	4/10/12
9.5	7/11/12
15	1/29/13
4.7	4/11/13
8.1	1/29/14
5.6	4/23/14
11	7/28/14
2.5	1/28/15
6.27	4/14/15
6.51	1/26/16
4.67	4/28/16
9.83	7/13/16
11.2	1/31/17
4.57	4/18/17

MW-3 Nitrate: 2018

Number of samples		Uncensored values	
Uncensored	20	Mean	7.59
Censored		Lognormal mean	7.66
Detection limit or PQL		Std. devn.	3.25814425
Method detection limit		Median	6.705
TOTAL	20	Min.	2.5
		Max.	15

Lognormal distribution?		Normal distribution?	
r-squared is:	0.976	r-squared is:	0.952

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 9.34797883316685

680	7/11/12
69	10/30/12
89	1/29/13
160	4/11/13
140	10/24/13(k)
130	1/29/14
120	4/23/14
25	7/28/14
44	10/29/14
160	1/28/15
47.4	4/14/15
65.4	7/14/15
98.7	10/27/15
88.7	1/26/16
26.3	4/28/16
152	7/13/16
149	10/12/16
14.9	1/31/17
82.6	4/18/17
923	6/27/18

MW-5 Chloride: 2018

Number of samples		Uncensored values	
Uncensored	20	Mean	163.25
Censored		Lognormal mean	156.80
Detection limit or PQL		Std. devn.	226.626926
Method detection limit		Median	93.85
TOTAL	20	Min.	14.9
		Max.	923

Lognormal distribution?		Normal distribution?	
r-squared is:	0.932	r-squared is:	0.542

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 281.519722914286

14	7/11/12	MW-5 Nitrate: 2018
1.3	10/30/12	
7.5	1/29/13	
8.7	4/11/13	
9.1	10/24/13(k)	
9.4	1/29/14	
7.2	4/23/14	
4	7/28/14	
4.2	10/29/14	
7.6	1/28/15	
4.15	4/14/15	
5.43	7/14/15	
5.83	10/27/15	
6.04	1/26/16	
2.49	4/28/16	
5.35	7/13/16	
3.61	10/12/16	
3.8	1/31/17	
11.5	4/18/17	
41.8	6/27/18	

Number of samples			Uncensored values		
Uncensored		20	Mean		8.15
Censored			Lognormal mean		7.95
Detection limit or PQL			Std. devn.		8.50557897
Method detection limit			Median		5.935
TOTAL		20	Min.		1.3
			Max.		41.8

Lognormal distribution?		Normal distribution?	
r-squared is:	0.929	r-squared is:	0.545

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 11.4178932871709