



Water and Waste Department  
Environmental Standards Division

# Brady Road Resource Management Facility Annual Report - 2017



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## EXECUTIVE SUMMARY

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The Brady Road Resource Management Facility (BRRMF) is the City of Winnipeg's only active landfill. The site is bordered by the Perimeter Highway on the North, Waverley Street on the East, Brady Road and the R.M. of Macdonald on the West, and Rue des Trappistes on the South. The landfill has been in operation since 1973 and is estimated to have sufficient capacity for another 97 years, assuming waste diversion practices are continued.

Environment Act Licence No. 3081 R, issued on April 23, 2014, requires the City of Winnipeg to submit an annual report on or before April 15<sup>th</sup> detailing activities conducted at BRRMF in the previous year. This report provides a summary of major expenditures and construction, major incidents, waste diversion operations, ground water management, surface water management, leachate management, landfill gas management, and nuisance management for 2017.

Major construction in 2017 included: completion of a new waste cell and leachate manhole, addition of landfill gas collection wells, construction of a centralized leachate collection system, and work on the lime mud berm. Two fires occurred at the site in 2017; both incidents were dealt with according to safety procedures, and were reported to an Environment Officer as required.

In 2017, approximately 47% of the 651,286 metric tonnes of material received at the BRRMF was either beneficially re-used, removed from the site, or remains segregated in the BRRMF 4R depot.

Monitoring programs for ground water, surface water, leachate, and subsurface gas migration followed the sampling and analysis plans in 2017, with the exception of one groundwater well that could not be sampled because it was collapsing due to age. We will evaluate statistically significant increases over background water quality starting in 2019, once we have collected 5 years of historical data. No contingency plans were activated in 2017.

In 2017, the BRRMF received 11 odour complaints; in all cases the customer was contacted for follow-up and corrective actions were taken if necessary.

The Appendices of the report contain incident reports for 2017, the 2017 BRRMF tonnage spreadsheet, statistical analyses of ground water quality, surface water quality, leachate quality and elevations, and the 2017 Landfill Gas Collection and Flaring Report, prepared by Integrated Gas Recovery Systems Inc.

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## 1.0 INTRODUCTION

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The Brady Road Resource Management Facility (BRRMF) was issued Environment Act Licence No. 3081 R on April 23, 2014. Clause 127 of the licence requires the City of Winnipeg to prepare and submit an Annual Report on the activities undertaken at the site during the previous year on or before April 15<sup>th</sup> of each year. This report contains results and/or comments for each of the clauses of Licence No. 3081 R under which the BRRMF has generated pertinent information during 2017. The report also provides information on the BRRMF proposed activities for 2018.

## 2.0 CONSTRUCTION

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Major construction activities undertaken in 2017 included:

1. Construction of a new waste cell (Cell 31) and leachate manhole (MH46) was completed.
2. Twenty-two wells were added to the landfill gas collection system.
3. Construction began on a centralized leachate collection system. Phase 1 includes the incorporation of manholes serving waste cells 30 and 31 and three pumping manholes on the north side of the existing landfill area.
4. Construction continued on the lime mud berms, which provide a visual and wind buffer for the site. The southeast section of the berm is now complete and the berm on the northeast section of the site will be completed in 2018.

Major construction activities planned for 2018 include:

1. Rough cut of a future waste cell (Cell 32).
2. Repave Charrette Road from Brady Road to the Compost facility.
3. Complete construction of Phase 1 of the centralized leachate collection system.
4. Improve drainage in the ditch along the North side of Charrette Road.

### 3.0 MAJOR INCIDENTS

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In 2017, there were no disruptions or failures of waste management practices due to equipment breakdown, no spills occurred, and no alarms were activated. Two fires occurred in 2017 at the BRRMF; both incidents were reported to Manitoba Sustainable Development and follow-up or corrective actions were taken. Incident reports are provided in Appendix A.

### 4.0 WASTE DIVERSION OPERATIONS

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In 2017, 348,364.0 metric tonnes of material were landfilled, 298,169.8 metric tonnes were composted or re-used on-site, 4,094.1 metric tonnes were removed from BRRMF for further processing or beneficial re-use, and 8,846.3 metric tonnes remain segregated at the 4R depot. The 2017 diversion rate was 46.5%, which is an increase from the 2016 diversion rate of 26.8%.

The largest contributing factor to the increased diversion rate for 2017 is improved tracking of clean fill, which is re-used as cover material at the BRRMF. Prior to 2017, clean fill loads used an alternate entrance; these loads now pass through the main gate where they are weighed. In addition, the majority of material collected from street sweeping operations were stockpiled at the Summit landfill for use in a planned soil fabrication project, which resulted in a large decrease in the amount received at the BRRMF.

Please note that the net total material received and diversion rates the 2014-2016 Annual BRRMF Reports were incorrect. The total material reported was actually the total amount that was landfilled, which skewed the calculated diversion rate; corrected totals and diversion rates appear in Table 1.

Assuming continued and improved waste diversion practices, the estimated remaining landfill life is 97 years. A summary of the BRRMF Waste Diversion Operations is provided in Table 1.

The 2017 BRRMF Tonnage Spreadsheet is provided in Appendix B. Please note that leachate (line 115) is not included in diversion calculations because it is a by-product of landfill operations, and dutch elm (lines 26, 45, and 75) has been added to the composted or re-used on site calculation because dutch elm is chipped, not landfilled.

<b>Table 1. 2017 BRRMF Waste Diversion Summary</b>		<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Total Landfilled	metric tonnes	395,468.7	395,828.3	357,245.5	348,364.0
Total Composted or Re-used On Site	metric tonnes	69,158.9	69,327.8	128,540.8	298,169.8
Glass	metric tonnes	12,826.0	9,339.4	11,489.4	11,110.7
Sweepings	metric tonnes	6,924.5	10,813.6	11,620.4	398.3
Pond	metric tonnes	2,003.3	528.5	723.8	4,466.1
Leaf and Yard Waste	metric tonnes	22,733.4	32,946.8	33,307.8	21,925.8
Dutch Elm Wood Chips	metric tonnes	5,497.2	5,836.1	6,414.5	6,860.4
Clean Fill	metric tonnes	16,438.8	4,957.0	61,640.2	245,324.6
Concrete	metric tonnes	1,903.3	362.0	341.8	1,243.8
Wood Chips	metric tonnes	462.1	172.4	1,104.1	1,897.7
Biosolids	metric tonnes	222.3	3,938.6	1,898.8	4,942.4
Wood Chips (for compost)	metric tonnes	148.3	414.8	0.0	0.0
Total 4R Depot	metric tonnes	n/a	n/a	3,988.5	8,846.3
Battery	metric tonnes			24.3	33.4
Bicycles	metric tonnes			12.8	11.3
Ceramic	metric tonnes			164.2	245.3
Clean Fill	metric tonnes			338.3	2,527.2
Concrete	metric tonnes			996.1	1,557.4
Electronics	metric tonnes			375.4	530.1
Household Hazardous Waste	metric tonnes			302.5	341.2
Oil	metric tonnes			22.3	32.5
Glass	metric tonnes			44.7	70.6
Lumber	metric tonnes			186.6	185.3
Leaf and Yard Waste	metric tonnes			694.4	2,139.8
Ozone Depleting Substances	metric tonnes			66.1	111.5
Oversized Plastics	metric tonnes			14.8	22.5
Recyclables	metric tonnes			156.4	273.7
Scrap Metals	metric tonnes			532.4	618.7
Tires	metric tonnes			57.4	146.0
Total Material Removed from Site	metric tonnes	-1,157.8	-1,204.8	-1,921.4	-4,094.1
Battery	metric tonnes	-27.5	0.0	0.0	0.0
City Compost	metric tonnes	0.0	-342.9	-403.2	-3,286.7
Glass	metric tonnes	0.0	0.0	0.0	0.0
Ozone Depleting Substances	metric tonnes	-96.5	-78.3	-48.0	0.0
Scrap Metal	metric tonnes	-921.6	-543.5	-1,388.8	-705.1
Dutch Elm	metric tonnes	0.0	-18.6	-2.7	-102.3
Tires	metric tonnes	-112.2	-221.5	-78.7	0.0
Total Net All Material	metric tonnes	463,469.8	463,951.3	487,853.4	651,286.0
Diversion Rate	percent	14.7%	14.7%	26.8%	46.5%

## 5.0 GROUND WATER, SURFACE WATER, LEACHATE, AND LANDFILL GAS MONITORING

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### 5.1 GROUND WATER

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Ground water is monitored to ensure that operation of the BRRMF does not negatively impact downgradient ground water quality parameters. Ground water beneath the BRRMF flows from south west to north east as determined by well elevation data. It is saline and is not used as potable water for rural residences surrounding the site.

As per the BRRMF Operating Plan, ground water is monitored in accordance with the Ground Water Sampling and Analysis Plan (SAP), as specified under Clause 123. The primary focus of ground water monitoring is on 13 bedrock wells, with a secondary focus on 13 till wells and 8 clay wells. Sampling frequency is twice per year (spring and fall) for bedrock wells and downgradient till wells, and once per year (spring) for clay wells and other till wells distant from the waste areas. The parameters analyzed are determined by well type and location.

In 2017, a total of 47 ground water samples were analyzed – 4 samples from wells upgradient of the site (background water quality), and 43 samples from wells crossgradient and downgradient of the site. There were no deviations from the Ground Water SAP or from normal sample collection and preservation practices except GWQ25-4N34B was not sampled because the well casing was collapsing due to age; the well will be re-drilled in 2018. The 2017 ground water results are provided in Table 2.

The analytical results for groundwater obtained in 2017 were found to be similar to those obtained in 2014, 2015, and 2016. A comparison of the average values obtained in 2014, 2015, 2016, and 2017 are provided in Table 3. The data collected in 2017 will be used to enhance the existing ground water quality data in order to better evaluate trends. Statistical analyses of background ground water quality data are attached in Appendix C. The Contingency Action Plan required under Clause 125 was not implemented in 2017.

At this time we have no recommendations for changes in the ground water monitoring program.



Table 2. 2017 Ground Water Monitoring

	Units	Criteria*	Upgradient				Downgradient & Crossgradient									
			GWO25-6N60DR		GWO25-6N60ER		GWO25-W6		GWO25-W8		GWO25-5N62D		GWO25-5N62E		GWO25-W11	
			Clay		Till		Bedrock		Bedrock		Clay		Till		Bedrock	
			Spring	Spring	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Spring	Autumn	Spring	Autumn	
<b>Inorganic Parameters</b>																
Alkalinity - Bicarbonate	mg/L		621	663	168	159	167	158	580	208	225	150	154			
Alkalinity - Carbonate	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50			
Alkalinity - Hydroxide	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50			
Alkalinity - Total	mg/L		509	544	138	130	129	475	170	185	123	126				
Dissolved Hardness (CaCO3)	mg/L		2,120	1,550	1,490	1,290	1,840	1,250	3,260	1,290	1,360	1,090	1,090			
pH	units		7.04	6.92	7.44	7.40	7.52	7.43	6.83	7.30	7.33	7.60	7.58			
Specific Conductivity	(µS/cm)		4,780	4,300	9,970	9,960	8,620	8,610	8,880	8,430	8,500	8,520	8,610			
Turbidity	(ntu)		91.8	183	8.90	11.1	11.7	8.36	15.3	258	2,530	38.6	60.8			
Total Dissolved Solids	mg/L		3,840	3,260	6,110	6,180	5,070	5,270	6,660	5,040	5,270	5,050	5,050			
Total Suspended Solids	mg/L		500	640	820	460	810	450	850	1,890	2,710	660	660			
Total Solids	mg/L		4,340	3,900	6,930	6,640	5,880	5,720	7,510	6,930	7,980	5,710	5,710			
Dissolved Chloride (Cl)	mg/L	2,300	470	390	3,000	2,700	2,100	2,200	1,900	2,000	2,300	2,000	2,300			
Dissolved Sulphate (SO4)	mg/L	2,300	1,670	1,430	940	945	866	833	1,900	802	806	706	729			
<b>Nutrients</b>																
Ammonia - Dissolved	mg/L N		0.175	0.304	1.33	1.38	1.02	1.10	0.589	1.08	0.997	1.01	1.07			
Nitrate - Dissolved	mg/L N		0.630	0.371	<0.003	<0.003	<0.003	<0.003	0.238	<0.003	0.090	<0.003	<0.003			
Total Kjeldahl Nitrogen	mg/L N		0.7	0.8	1.5	1.7	1.2	1.3	1.4	1.3	1.5	1.1	1.3			
Phosphorus - Dissolved	mg/L P		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01	<0.01	<0.01			
<b>Other</b>																
Cyanide - Total (CN)	mg/L	0.066		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005			<0.0005	<0.0005	<0.0005			
<b>Organic Indicators</b>																
Carbonaceous Oxygen Demand	mg/L		50	40	120	60	80	60	110	130	120	90	60			
Total Organic Carbon	mg/L		10.8	10.0	1.7	5.7	1.2	6.1	23.4	3.8	12.3	2.8	<0.6			
<b>Metals</b>																
Arsenic (As)- Dissolved	ug/L	1,900	0.36	1.21	1.14	4.69	0.36	5.86	1.12	1.64	0.91	5.80	5.04			
Barium (Ba)- Dissolved	ug/L	29,000	8.69	8.09	17.0	11.0	71.5	11.6	13.6	11.3	11.2	15.1	14.5			
Beryllium (Be)- Dissolved	ug/L	67	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10			
Cadmium (Cd)- Dissolved	ug/L	2.7	0.052	<0.050	0.402	<0.050	<0.050	0.615	0.108	<0.050	0.062	<0.050	<0.050			
Calcium (Ca)- Dissolved	mg/L		540	367	332	291	736	271	824	289	302	242	242			
Chromium (Cr)- Dissolved	ug/L	810	<1.0	<1.0	<1.0	<1.0	53.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			
Copper (Cu)- Dissolved	ug/L	87	1.63	1.85	6.08	<0.50	5.71	<0.50	1.73	2.31	<0.50	2.06	<0.50			
Iron (Fe)- Dissolved	ug/L		23	194	15	1,250	<10	754	<10	91	109	419	430			
Lead (Pb)- Dissolved	ug/L	25	0.103	0.067	0.142	0.180	0.552	<0.050	<0.050	0.113	<0.050	0.199	<0.050			
Magnesium (Mg)- Dissolved	mg/L		187	154	160	137	0.51	140	292	138	146	118	118			
Manganese (Mn)- Dissolved	ug/L		1,590	868	20.6	27.5	<0.50	30.5	2,250	46.2	59.3	28.3	27.5			
Mercury (Hg)- Total	ug/L	0.29 (2.8)	<0.002	<0.002	0.002	<0.002	0.004	<0.002	<0.002	0.002	<0.002	<0.010	<0.002			
Nickel (Ni)- Dissolved	ug/L	490	6.43	7.59	2.76	1.23	0.82	1.45	11.8	1.28	1.37	0.62	0.66			
Potassium (K)- Dissolved	mg/L		9.21	7.47	43.0	38.9	18.7	32.4	12.2	30.4	30.8	34.1	34.0			
Selenium (Se)- Dissolved	ug/L	63	<0.40	<0.40	<0.40	<0.40	0.75	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40			
Silver (Ag)- Dissolved	ug/L	1.5	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050			
Sodium (na)- Dissolved	mg/L	2,300	325	422	1,660	1,520	507	1,250	820	1,240	1,230	1,300	1,300			
Zinc (Zn)- Dissolved	ug/L	1,100	5.5	5.5	76.4	3.2	3.4	1.1	9.8	4.9	2.1	3.5	<1.0			
<b>Bacteria</b>																
Total Coliforms (MTF)	MPN/100mL				<3	<3	<3	<3				<3	<3			
Fecal Coliforms (MTF)	MPN/100mL				<3	<3	<3	<3				<3	<3			
E. coli (MTF)	MPN/100mL				<3	<3	<3	<3				<3	<3			
<b>Field Parameters</b>																
pH	units		7.84	7.85	8.41	8.26	8.62	8.16	7.91	8.41	8.50	8.15	8.34			
Specific Conductivity	(µS/cm)		4,010	3,790	5,190	10,840	6,800	9,330	7,000	6,970	8,190	7,080	9,330			
<b>Polycyclic Aromatic Hydrocarbons</b>																
Naphthalene	µg/L	1400 (6400)	nr**	nr**	nr**	<0.05	nr**	<0.05		nr**		<0.05	<0.05			
Benzo(a)pyrene	µg/L	0.81	nr**	nr**	nr**	<0.01	nr**	<0.01		nr**		<0.01	<0.01			
Anthracene	µg/L	2.4	nr**	nr**	nr**	<0.05	nr**	<0.05		nr**		<0.05	<0.05			
<b>Petroleum Hydrocarbons</b>																
F1 (C6-C10 Hydrocarbons)	µg/L	750	<25	<25	<25	<25	<25	<25		<25		<25	<25			
F2 (C10-C16 Hydrocarbons)	µg/L	150	<100	<100	<100	<100	<100	<100		<100		<100	<100			
F3 (C16-C34 Hydrocarbons)	µg/L	500	<200	<200	<200	<200	<200	<200		<200		<200	<200			
F4 (C34-C50 Hydrocarbons)	µg/L	500	<200	<200	<200	<200	<200	<200		<200		<200	<200			
Benzene	µg/L	44 (430)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10		<0.10		<0.10	<0.10			
EthylBenzene	µg/L	2,300	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10		<0.10		<0.10	<0.10			
Toluene	µg/L	18,000	<0.20	<0.20	<0.20	<0.20	0.83	<0.20		<0.20		<0.20	<0.20			
Xylene (Total)	µg/L	4,200	<0.10	<0.10	<0.10	<0.10	0.69	<0.10		<0.10		<0.10	<0.10			
<b>Volatile Organic Carbons</b>																
Vinyl chloride	µg/L	0.5 (1.7)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		<0.2		<0.2	<0.2			
<b>Pesticides</b>																
Diazinon	µg/L		<2	<2	<2	<2	<2	<2		<2		<2	<2			
<b>Herbicides</b>																
2,4-D	µg/L		<1	<1	<1	<1	<1	<1		<1		<1	<1			

Note: Criteria from Ontario Ministry of the Environment. (2009, July 27). Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition  
 Note: Bracketed criteria are for till and clay.  
 Note: Criteria exceedences are highlighted in red.  
 \* Criteria for total chloride and total metals  
 \*\*nr - No result due to contract lab error.





Table 2. 2017 Ground Water Monitoring

			Downgradient & Crossgradient											
			GWO25-W13A		GWO25-W13		GWO25-W14A		GWO25-W14		GWO25-W15A		GWO25-W15	
			Till		Bedrock		Till		Bedrock		Till		Bedrock	
	Units	Criteria*	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
<b>Inorganic Parameters</b>														
Alkalinity - Bicarbonate	mg/L		301	298	251	242	196	183	169	162	512	503	166	165
Alkalinity - Carbonate	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Alkalinity - Hydroxide	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Alkalinity - Total	mg/L		247	244	206	198	161	150	139	133	420	412	136	135
Dissolved Hardness (CaCO3)	mg/L		1,740	1,810	1,580	1,560	1,550	1,290	1,090	1,240	2,800	2,720	437	1,250
pH	units		7.31	7.13	7.25	7.28	7.43	7.45	7.49	7.43	6.82	6.81	7.52	7.47
Specific Conductivity	(µS/cm)		8,110	8,210	8,300	8,440	8,310	8,420	8,690	8,820	6,900	7,080	8,080	8,090
Turbidity	(ntu)		10,200	21,700	3.92	2.93	3,980	5,580	10.1	7.74	8,040	3,660	6.57	5.02
Total Dissolved Solids	mg/L		5,190	5,160	5,010	4,990	5,120	5,110	5,370	5,200	5,350	5,290	4,890	4,760
Total Suspended Solids	mg/L		24,810	23,640	1,070	750	10,680	9,490	410	530	19,450	14,010	410	550
Total Solids	mg/L		30,000	28,800	6,080	5,740	15,800	14,600	5,780	5,730	24,800	19,300	5,300	5,310
Dissolved Chloride (Cl)	mg/L	2,300	2,000	2,200	2,300	2,300	2,300	2,300	2,500	2,300	1,300	1,400	2,000	2,100
Dissolved Sulphate (SO4)	mg/L	2,300	1,090	1,030	786	753	824	852	792	766	1,700	1,800	776	749
<b>Nutrients</b>														
Ammonia - Dissolved	mg/L N		0.751	0.767	0.996	1.09	1.07	1.11	1.04	1.07	0.745	0.899	0.927	0.986
Nitrate - Dissolved	mg/L N		0.090	0.070	<0.003	0.060	0.008	<0.003	<0.003	0.030	0.030	0.600	<0.003	0.030
Total Kjeldahl Nitrogen	mg/L N		4.6	1.1	1.2	1.3	1.3	1.4	1.2	1.3	1.7	2.0	1.1	1.1
Phosphorus - Dissolved	mg/L P		<0.01	<0.01	<0.01	<0.01	0.07	<0.01	<0.01	<0.01	0.05	<0.01	<0.01	<0.01
<b>Other</b>														
Cyanide - Total (CN)	mg/L	0.066	<0.0005		<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	0.0006		<0.0005	<0.0005
<b>Organic Indicators</b>														
Carbonaceous Oxygen Demand	mg/L		980	480	80	60	260	120	80	70	710	400	70	70
Total Organic Carbon	mg/L		30.9	111.0	2.0	8.6	13.3	105.0	2.0	5.8	32.3	62.0	2.0	6.2
<b>Metals</b>														
Arsenic (As)- Dissolved	ug/L	1,900	0.98	2.03	0.61	6.56	1.72	5.12	0.67	5.84	0.56	1.12	3.12	6.66
Barium (Ba)- Dissolved	ug/L	29,000	12.8	12.4	26.1	10.9	14.9	13.2	24.5	12.3	15.7	16.6	38.8	11.9
Beryllium (Be)- Dissolved	ug/L	67	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.34	<0.01	<0.10
Cadmium (Cd)- Dissolved	ug/L	2.7	0.056	<0.050	<0.050	<0.050	<0.050	<0.050	0.161	<0.050	0.402	0.129	0.032	<0.050
Calcium (Ca)- Dissolved	mg/L		399	414	357	351	362	284	248	277	727	691	52.4	272
Chromium (Cr)- Dissolved	ug/L	810	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.39	<1.0
Copper (Cu)- Dissolved	ug/L	87	2.13	0.62	1.33	<0.50	<0.50	3.95	1.08	<0.50	9.76	1.13	11.0	<0.50
Iron (Fe)- Dissolved	ug/L		<10	429	76	458	42	573	62	586	<10	402	52	535
Lead (Pb)- Dissolved	ug/L	25	0.146	0.073	<0.050	<0.050	<0.050	0.274	0.065	<0.050	0.194	0.279	0.142	0.116
Magnesium (Mg)- Dissolved	mg/L		180	188	168	166	157	142	115	134	239	242	74.3	138
Manganese (Mn)- Dissolved	ug/L		148	370	67.3	53.3	393	77.9	15.8	24.4	1,520	1,760	85.7	34.6
Mercury (Hg)- Total	ug/L	0.29 (2.8)	0.110	<0.002	<0.002	<0.002	0.026	<0.002	<0.002	<0.002	0.245	<0.002	<0.002	<0.002
Nickel (Ni)- Dissolved	ug/L	490	2.57	3.06	2.97	2.03	2.25	1.58	0.62	1.22	8.07	8.41	6.06	1.55
Potassium (K)- Dissolved	mg/L		21.7	17.7	24.8	23.5	25.1	31.2	33.1	31.7	12.4	11.9	7.76	28.6
Selenium (Se)- Dissolved	ug/L	63	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	1.54	<0.40
Silver (Ag)- Dissolved	ug/L	1.5	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.005	<0.050
Sodium (Na)- Dissolved	mg/L	2,300	1,070	985	1,030	1,090	1,120	1,230	1,280	1,260	571	562	50	1,140
Zinc (Zn)- Dissolved	ug/L	1,100	5.9	2.6	30.0	14.4	1.1	3.8	21.1	18.9	13.4	5.1	17.3	7.30
<b>Bacteria</b>														
Total Coliforms (MTF)	MPN/100mL				<3	<3			<3	<3			<3	<3
Fecal Coliforms (MTF)	MPN/100mL				<3	<3			<3	<3			<3	<3
E. coli (MTF)	MPN/100mL				<3	<3			<3	<3			<3	<3
<b>Field Parameters</b>														
pH	units		8.30	7.10	7.96	7.72	8.10	7.95	8.20	8.20	8.20	6.90	8.80	8.10
Specific Conductivity	(µS/cm)		7,340	8,700	7,800	9,070	7,080	7,910	7,630	8,990	6,880	7,340	5,840	8,650
<b>Polycyclic Aromatic Hydrocarbons</b>														
Naphthalene	µg/L	1400 (6400)	nr**		nr**	<0.05	nr**		nr**	<0.05	nr**		nr**	<0.05
Benzo(a)pyrene	µg/L	0.81	nr**		nr**	<0.01	nr**		nr**	<0.01	nr**		nr**	<0.01
Anthracene	µg/L	2.4	nr**		nr**	<0.05	nr**		nr**	<0.05	nr**		nr**	<0.05
<b>Petroleum Hydrocarbons</b>														
F1 (C6-C10 Hydrocarbons)	µg/L	750	<25		120	<25	<25		<25	<25	<25		<25	<25
F2 (C10-C16 Hydrocarbons)	µg/L	150	<100		<100	<100	<100		<100	<100	<100		<100	<100
F3 (C16-C34 Hydrocarbons)	µg/L	500	<200		<200	<200	<200		<200	<200	<200		<200	<200
F4 (C34-C50 Hydrocarbons)	µg/L	500	<200		<200	<200	<200		<200	<200	<200		<200	<200
Benzene	µg/L	44 (430)	<0.10		<0.10	<0.10	0.25		<0.10	<0.10	<0.10		0.16	<0.10
EthylBenzene	µg/L	2,300	<0.10		0.15	<0.10	0.29		0.13	<0.10	<0.10		0.29	<0.10
Toluene	µg/L	18,000	<0.20		0.35	<0.20	1.80		0.64	<0.20	<0.20		1.40	<0.20
Xylene (Total)	µg/L	4,200	<0.10		1.00	<0.10	1.60		0.78	<0.10	<0.10		1.80	<0.10
<b>Volatile Organic Carbons</b>														
Vinyl chloride	µg/L	0.5 (1.7)	<0.2		<0.2	<0.2	<0.2		<0.2	<0.2	<0.2		<0.2	<0.2
<b>Pesticides</b>														
Diazinon	µg/L		<2		<2	<2	<2		<2	<2	<2		<2	<2
<b>Herbicides</b>														
2,4-D	µg/L		<1		<1	<1	<2		<1	<1	<2		<1	<1

Note: Criteria from Ontario Ministry of the Environment. (2009, July 27). Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition  
 Note: Bracketed criteria are for till and clay.  
 Note: Criteria exceedences are highlighted in red.  
 \* Criteria for total chloride and total metals  
 \*\*nr - No result due to contract lab error.



Table 2. 2017 Ground Water Monitoring

			Downgradient & Crossgradient													
			GWO25-W16A		GWO25-W16		GWO25-6N63E		GWO25-6N63F		GWO25-W9		GWO25-6N57DR		GWO25-6N57FR	
			Till		Bedrock		Clay		Till		Bedrock		Clay		Till	
			Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
<b>Inorganic Parameters</b>	Units	Criteria*														
Alkalinity - Bicarbonate	mg/L		429	423	162	158	705	400	168	164	594	483				
Alkalinity - Carbonate	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50		
Alkalinity - Hydroxide	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50		
Alkalinity - Total	mg/L		352	347	132	129	578	328	137	134	487	396				
Dissolved Hardness (CaCO3)	mg/L		1,920	1,880	1,310	1,270	2,540	2,460	1,330	1,330	2,540	2,070				
pH	units		7.07	6.98	7.49	7.49	7.02	6.93	7.49	7.44	6.98	6.99				
Specific Conductivity	(µS/cm)		5,300	5,380	8,060	8,110	4,880	6,780	9,710	9,650	6,360	6,320				
Turbidity	(ntu)		1,170	13.7	236	8.70	27.3	522	15.4	20.0	32.0	1,570				
Total Dissolved Solids	mg/L		3,780	3,960	4,930	4,830	3,830	4,550	5,800	5,810	5,090	4,360				
Total Suspended Solids	mg/L		1,840	16,540	1,180	560	270	4,520	780	720	390	3,300				
Total Solids	mg/L		5,620	20,500	6,110	5,390	4,100	9,070	6,580	6,530	5,480	7,660				
Dissolved Chloride (Cl)	mg/L	2,300	1,100	1,000	2,200	2,100	930	1,600	2,500	2,600	760	1,100				
Dissolved Sulphate (SO4)	mg/L	2,300	1,080	1,120	776	749	1,760	1,210	897	910	1,930	1,390				
<b>Nutrients</b>																
Ammonia - Dissolved	mg/L N		0.755	0.790	0.929	0.973	0.672	0.859	1.26	1.30	0.079	0.958				
Nitrate - Dissolved	mg/L N		0.009	0.060	<0.003	<0.003	0.100	<0.003	0.009	0.050	1.69	0.010				
Total Kjeldahl Nitrogen	mg/L N		1.2	1.4	1.1	1.1	1.1	1.3	1.4	1.6	0.7	1.4				
Phosphorus - Dissolved	mg/L P		<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01	<0.01	0.02	0.02				
<b>Other</b>																
Cyanide - Total (CN)	mg/L	0.066	0.0006		<0.0005	<0.0005			<0.0005	<0.0005						
<b>Organic Indicators</b>																
Carbonaceous Oxygen Demand	mg/L		130	300	100	60	50	160	80	90	60	150				
Total Organic Carbon	mg/L		5.9	14.6	3.0	5.7	11.8	12.1	3.2	3.3	15.6	13.6				
<b>Metals</b>																
Arsenic (As)- Dissolved	ug/L	1,900	1.23	1.79	0.71	5.69	0.55	5.18	7.55	6.05	0.42	8.31				
Barium (Ba)- Dissolved	ug/L	29,000	13.1	14.5	19.0	10.8	11.9	12.6	11.1	10.4	9.03	12.5				
Beryllium (Be)- Dissolved	ug/L	67	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10				
Cadmium (Cd)- Dissolved	ug/L	2.7	0.079	0.051	0.089	<0.050	0.222	<0.050	<0.050	<0.050	0.128	<0.050				
Calcium (Ca)- Dissolved	mg/L		476	462	286	273	608	521	291	294	648	503				
Chromium (Cr)- Dissolved	ug/L	810	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0				
Copper (Cu)- Dissolved	ug/L	87	2.01	17.9	1.40	<0.50	1.92	0.67	<0.50	<0.50	2.80	<0.50				
Iron (Fe)- Dissolved	ug/L		36	450	11	607	78	2,360	770	814	<10	1,900				
Lead (Pb)- Dissolved	ug/L	25	0.143	1.14	<0.050	<0.050	<0.050	0.230	<0.050	<0.050	<0.050	0.327				
Magnesium (Mg)- Dissolved	mg/L		179	177	145	144	247	282	147	145	225	199				
Manganese (Mn)- Dissolved	ug/L		619	657	50.7	35.8	2,070	228	19.6	19.4	1,900	511				
Mercury (Hg)- Total	ug/L	0.29 (2.8)	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.010	<0.002	<0.002	0.002				
Nickel (Ni)- Dissolved	ug/L	490	4.85	5.38	3.17	1.41	11.4	4.16	11.2	1.29	9.90	5.61				
Potassium (K)- Dissolved	mg/L		9.57	9.80	30.6	28.6	9.55	9.89	37.2	36.4	10.4	12.3				
Selenium (Se)- Dissolved	ug/L	63	<0.40	<0.40	<0.40	<0.40	0.55	<0.40	<0.40	<0.40	<0.40	<0.40				
Silver (Ag)- Dissolved	ug/L	1.5	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050				
Sodium (Na)- Dissolved	mg/L	2,300	442	439	1,120	1,120	575	522	1,480	1,440	543	586				
Zinc (Zn)- Dissolved	ug/L	1,100	5.1	11.3	32.4	2.4	8.3	3.6	1.2	<1.0	6.5	4.8				
<b>Bacteria</b>																
Total Coliforms (MTF)	MPN/100mL				<3	<3			<3	<3						
Fecal Coliforms (MTF)	MPN/100mL				<3	<3			<3	<3						
E. coli (MTF)	MPN/100mL				<3	<3			<3	<3						
<b>Field Parameters</b>																
pH	units		7.85	7.39	8.19	8.28	7.58	7.69	8.09	8.07	7.85	7.98				
Specific Conductivity	(µS/cm)		4,600	5,720	6,510	8,530	5,160	2,540	6,740	10,530	5,140	5,180				
<b>Polycyclic Aromatic Hydrocarbons</b>																
Naphthalene	ug/L	1400 (6400)	nr**		nr**	<0.05			<0.05	<0.05						
Benzo(a)pyrene	ug/L	0.81	nr**		nr**	<0.01			<0.01	<0.01						
Anthracene	ug/L	2.4	nr**		nr**	<0.05			<0.05	<0.05						
<b>Petroleum Hydrocarbons</b>																
F1 (C6-C10 Hydrocarbons)	ug/L	750	<25		<25	<25			<25	<25						
F2 (C10-C16 Hydrocarbons)	ug/L	150	<100		<100	<100			<100	<100						
F3 (C16-C34 Hydrocarbons)	ug/L	500	<200		<200	<200			<200	<200						
F4 (C34-C50 Hydrocarbons)	ug/L	500	<200		<200	<200			<200	<200						
Benzene	ug/L	44 (430)	<0.10		<0.10	<0.10			<0.10	<0.10						
Ethylbenzene	ug/L	2,300	<0.10		<0.10	<0.10			<0.10	<0.10						
Toluene	ug/L	18,000	0.28		<0.20	<0.20			<0.20	<0.20						
Xylene (Total)	ug/L	4,200	0.43		<0.10	<0.10			<0.10	<0.10						
<b>Volatile Organic Carbons</b>																
Vinyl chloride	ug/L	0.5 (1.7)	<0.2		<0.2	<0.2			<0.2	<0.2						
<b>Pesticides</b>																
Diazinon	ug/L		<2		<2	<2			<2	<2						
<b>Herbicides</b>																
2,4-D	ug/L		<2		<1	<1			<1	<1						

Note: Criteria from Ontario Ministry of the Environment. (2009, July 27). Soil, Ground Water and Sediment Standards for Use Under Part XV.I of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition  
 Note: Bracketed criteria are for till and clay.  
 Note: Criteria exceedences are highlighted in red.  
 \* Criteria for total chloride and total metals  
 \*\*nr - No result due to contract lab error.



Table 2. 2017 Ground Water Monitoring

			Downgradient & Crossgradient									
			GWO25-W10		GWO25-W7		GWO25-6N67E	GWO25-6N67F	GWO25-W12		GWO25-4N34B	GWO25-4N34DR
			Bedrock		Bedrock		Clay	Till	Bedrock		Clay	Till
	Units	Criteria*	Spring	Autumn	Spring	Autumn	Spring	Spring	Spring	Autumn	Spring	Spring
<b>Inorganic Parameters</b>												
Alkalinity - Bicarbonate	mg/L		162	156	149	147	564	464	167	172	ns***	501
Alkalinity - Carbonate	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50	<0.5	<0.50	<0.50	ns***	<0.50
Alkalinity - Hydroxide	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50	<0.5	<0.50	<0.50	ns***	<0.50
Alkalinity - Total	mg/L		133	128	122	120	462	380	137	141	ns***	411
Dissolved Hardness (CaCO3)	mg/L		1,210	1,200	965	1,010	2,110	1,840	1,340	1,230	ns***	3,290
pH	units		7.49	7.45	7.58	7.51	7.02	6.89	7.45	7.44	ns***	7.05
Specific Conductivity	(µS/cm)		8,960	9,080	7,020	7,030	6,480	4,580	8,830	8,610	ns***	6,060
Turbidity	(ntu)		31.2	13.3	14.5	10.4	138	124	9.36	38.3	ns***	278
Total Dissolved Solids	mg/L		5,400	5,590	4,030	4,090	3,830	3,270	5,430	5,260	ns***	5,390
Total Suspended Solids	mg/L		760	250	600	400	90	1,890	390	660	ns***	2,990
Total Solids	mg/L		6,160	5,840	4,630	4,490	3,920	5,160	5,820	5,920	ns***	8,380
Dissolved Chloride (Cl)	mg/L	2,300	2,300	2,400	2,000	1,900	620	720	2,400	2,200	ns***	550
Dissolved Sulphate (SO4)	mg/L	2,300	813	814	609	589	1,470	1,140	846	925	ns***	2,770
<b>Nutrients</b>												
Ammonia - Dissolved	mg/L N		1.21	1.26	1.76	1.95	0.672	0.546	1.02	1.06	ns***	0.502
Nitrate - Dissolved	mg/L N		<0.003	<0.003	<0.003	0.020	0.100	0.010	<0.003	<0.003	ns***	0.224
Total Kjeldahl Nitrogen	mg/L N		1.4	1.5	2.2	2.3	1.1	0.9	1.2	1.3	ns***	1.0
Phosphorus - Dissolved	mg/L P		<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01	<0.01	ns***	0.07
<b>Other</b>												
Cyanide - Total (CN)	mg/L	0.066	<0.0005		<0.0005				<0.0050			<0.0005
<b>Organic Indicators</b>												
Carbonaceous Oxygen Demand	mg/L		100	80	70	50	50	40	100	60	ns***	30
Total Organic Carbon	mg/L		1.9	<0.6	3.5	4.2	15.4	8.2	1.8	4.2	ns***	9.7
<b>Metals</b>												
Arsenic (As)- Dissolved	ug/L	1,900	5.66	4.51	0.26	2.38	0.61	1.05	3.97	4.06	ns***	5.04
Barium (Ba)- Dissolved	ug/L	29,000	12.6	12.0	53.2	10.6	12.5	11.1	12.7	11.5	ns***	37.7
Beryllium (Be)- Dissolved	ug/L	67	<0.10	<0.10	<0.050	<0.10	<0.10	<0.010	<0.10	<0.10	ns***	0.15
Cadmium (Cd)- Dissolved	ug/L	2.7	<0.050	<0.050	<0.025	<0.050	0.117	<0.050	<0.050	<0.050	ns***	<0.050
Calcium (Ca)- Dissolved	mg/L		274	271	361	221	519	403	297	267	ns***	561
Chromium (Cr)- Dissolved	ug/L	810	<1.0	<1.0	22.5	<1.0	<1.0	<1.0	<1.0	<1.0	ns***	11.7
Copper (Cu)- Dissolved	ug/L	87	1.26	<0.50	0.97	<0.50	3.14	4.21	1.02	<0.50	ns***	6.25
Iron (Fe)- Dissolved	ug/L		827	851	<5.0	804	165	46	555	495	ns***	5,930
Lead (Pb)- Dissolved	ug/L	25	0.120	<0.050	<0.025	<0.050	0.325	0.230	0.104	<0.050	ns***	3.74
Magnesium (Mg)- Dissolved	mg/L		128	127	15.2	112	197	204	145	136	ns***	460
Manganese (Mn)- Dissolved	ug/L		14.3	12.9	0.33	8.4	1,310	176	24.2	26.4	ns***	241
Mercury (Hg)- Total	ug/L	0.29 (2.8)	<0.010	<0.002	0.003	<0.002	0.004	0.002	<0.002	<0.002	ns***	0.002
Nickel (Ni)- Dissolved	ug/L	490	1.48	1.44	0.89	0.23	7.84	3.93	1.47	1.49	ns***	12.2
Potassium (K)- Dissolved	mg/L		36.8	35.7	21.7	28.5	8.71	8.21	34.1	32.5	ns***	15.9
Selenium (Se)- Dissolved	ug/L	63	<0.40	<0.40	<0.20	<0.40	<0.40	<0.40	<0.40	<0.40	ns***	<0.40
Silver (Ag)- Dissolved	ug/L	1.5	<0.050	<0.050	<0.025	<0.050	<0.050	<0.050	<0.050	<0.050	ns***	<0.050
Sodium (Na)- Dissolved	mg/L	2,300	1,400	1,340	675	1,000	319	288	1,340	1,270	ns***	521
Zinc (Zn)- Dissolved	ug/L	1,100	2.4	<1.0	1.8	<1.0	5.5	5.2	2.6	<1.0	ns***	15.4
<b>Bacteria</b>												
Total Coliforms (MTF)	MPN/100mL		<3		<3	<3			<3	<3		
Fecal Coliforms (MTF)	MPN/100mL		<3		<3	<3			<3	<3		
E. coli (MTF)	MPN/100mL		<3		<3	<3			<3	<3		
<b>Field Parameters</b>												
pH	units		8.18	8.18	8.80	8.14	8.05	8.36	8.36	7.33	ns***	8.29
Specific Conductivity	(µS/cm)		7,300	9,620	5,850	6,840	4,330	7,220	7,220	9,570	ns***	5,070
<b>Polycyclic Aromatic Hydrocarbons</b>												
Naphthalene	µg/L	1400 (6400)	<0.05		nr**				nr**			nr**
Benzo(a)pyrene	µg/L	0.81	<0.01		nr**				nr**			nr**
Anthracene	µg/L	2.4	<0.05		nr**				nr**			nr**
<b>Petroleum Hydrocarbons</b>												
F1 (C6-C10 Hydrocarbons)	µg/L	750	<25		61				<25			<25
F2 (C10-C16 Hydrocarbons)	µg/L	150	<100		<100				<100			<100
F3 (C16-C34 Hydrocarbons)	µg/L	500	<200		<200				<200			<200
F4 (C34-C50 Hydrocarbons)	µg/L	500	<200		<200				<200			<200
Benzene	µg/L	44 (430)	<0.10		0.34				<0.10			<0.10
Ethylbenzene	µg/L	2,300	<0.10		2.10				<0.10			<0.10
Toluene	µg/L	18,000	<0.20		4.70				<0.20			<0.20
Xylene (Total)	µg/L	4,200	<0.10		14.00				<0.10			<0.10
<b>Volatile Organic Carbons</b>												
Vinyl chloride	µg/L	0.5 (1.7)	<0.2		<0.2				<0.2			<0.2
<b>Pesticides</b>												
Diazinon	µg/L		<2		<2				<2			<2
<b>Herbicides</b>												
2,4-D	µg/L		<1		<1				<1			<1

Note: Criteria from Ontario Ministry of the Environment. (2009, July 27). Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition

Note: Bracketed criteria are for till and clay.

Note: Criteria exceedences are highlighted in red.

\* Criteria for total chloride and total metals

\*\*nr - No result due to contract lab error.

\*\*\*ns - Replaced by GWO25-4N34C due to issues with the well.



Table 2. 2017 Ground Water Monitoring

			Downgradient & Crossgradient								
			GWO25-4N34CR	GWO25-6N58DR	GWO25-6N58FR	GWO25-W4		GWO25-6N59DR*	GWO25-6N59FR*	GWO25-W5	
			Clay	Till	Till	Bedrock		Clay	Till	Bedrock	
	Units	Criteria*	Spring	Spring	Spring	Spring	Autumn	Spring	Spring	Spring	Autumn
<b>Inorganic Parameters</b>											
Alkalinity - Bicarbonate	mg/L		574	ns***	ns***	91	87	ns***	ns***	160	160
Alkalinity - Carbonate	mg/L		<0.50	ns***	ns***	<0.5	<0.5	ns***	ns***	<0.50	<0.50
Alkalinity - Hydroxide	mg/L		<0.50	ns***	ns***	<0.5	<0.5	ns***	ns***	<0.50	<0.50
Alkalinity - Total	mg/L		471	ns***	ns***	75	71	ns***	ns***	131	131
Dissolved Hardness (CaCO3)	mg/L		2,340	ns***	ns***	784	755	ns***	ns***	1,370	1,280
pH	units		6.98	ns***	ns***	7.81	7.78	ns***	ns***	7.43	7.44
Specific Conductivity	(µS/cm)		5,330	ns***	ns***	7,220	7,320	ns***	ns***	8,150	8,430
Turbidity	(ntu)		32,100	ns***	ns***	22.9	33.3	ns***	ns***	14.0	4.38
Total Dissolved Solids	mg/L		4,190	ns***	ns***	4,150	4,280	ns***	ns***	4,960	5,270
Total Suspended Solids	mg/L		42,610	ns***	ns***	460	190	ns***	ns***	740	180
Total Solids	mg/L		46,800	ns***	ns***	4,610	4,470	ns***	ns***	5,700	5,450
Dissolved Chloride (Cl)	mg/L	2,300	740	ns***	ns***	1,700	2,000	ns***	ns***	2,500	2,200
Dissolved Sulphate (SO4)	mg/L	2,300	1,630	ns***	ns***	523	514	ns***	ns***	829	820
<b>Nutrients</b>											
Ammonia - Dissolved	mg/L N		0.907	ns***	ns***	0.749	0.767	ns***	ns***	0.968	0.997
Nitrate - Dissolved	mg/L N		<0.003	ns***	ns***	<0.003	<0.003	ns***	ns***	<0.003	0.050
Total Kjeldahl Nitrogen	mg/L N		1.9	ns***	ns***	0.8	0.7	ns***	ns***	1.2	1.3
Phosphorus - Dissolved	mg/L P		0.02	ns***	ns***	<0.01	<0.01	ns***	ns***	<0.01	<0.01
<b>Other</b>											
Cyanide - Total (CN)	mg/L	0.066				<0.0005	<0.0005			<0.0005	
<b>Organic Indicators</b>											
Carbonaceous Oxygen Demand	mg/L		3,690	ns***	ns***	70	50	ns***	ns***	100	60
Total Organic Carbon	mg/L		31.9	ns***	ns***	<0.6	<0.6	ns***	ns***	4.2	3.8
<b>Metals</b>											
Arsenic (As)- Dissolved	ug/L	1,900	0.91	ns***	ns***	<0.20	<0.20	ns***	ns***	3.92	4.52
Barium (Ba)- Dissolved	ug/L	29,000	11.9	ns***	ns***	10.4	11.2	ns***	ns***	14.0	13.1
Beryllium (Be)- Dissolved	ug/L	67	<0.10	ns***	ns***	<0.10	<0.10	ns***	ns***	<0.10	<0.10
Cadmium (Cd)- Dissolved	ug/L	2.7	0.503	ns***	ns***	<0.050	<0.050	ns***	ns***	<0.050	<0.050
Calcium (Ca)- Dissolved	mg/L		587	ns***	ns***	162	162	ns***	ns***	293	276
Chromium (Cr)- Dissolved	ug/L	810	<1.0	ns***	ns***	<1.0	<1.0	ns***	ns***	<1.0	<1.0
Copper (Cu)- Dissolved	ug/L	87	1.73	ns***	ns***	<0.50	1.87	ns***	ns***	0.92	0.57
Iron (Fe)- Dissolved	ug/L		200	ns***	ns***	2,910	2,320	ns***	ns***	560	650
Lead (Pb)- Dissolved	ug/L	25	0.090	ns***	ns***	<0.050	0.167	ns***	ns***	<0.050	0.073
Magnesium (Mg)- Dissolved	mg/L		212	ns***	ns***	92.0	85.2	ns***	ns***	155	143
Manganese (Mn)- Dissolved	ug/L		1,800	ns***	ns***	41.2	34.9	ns***	ns***	21.2	27.2
Mercury (Hg)- Total	ug/L	0.29 (2.8)	<0.002	ns***	ns***	<0.010	<0.002	ns***	ns***	0.003	<0.002
Nickel (Ni)- Dissolved	ug/L	490	8.64	ns***	ns***	<0.20	0.29	ns***	ns***	0.92	1.23
Potassium (K)- Dissolved	mg/L		9.59	ns***	ns***	28.3	27.1	ns***	ns***	33.6	31.2
Selenium (Se)- Dissolved	ug/L	63	<0.40	ns***	ns***	<0.40	<0.40	ns***	ns***	<0.40	<0.40
Silver (Ag)- Dissolved	ug/L	1.5	<0.050	ns***	ns***	<0.050	<0.050	ns***	ns***	<0.050	<0.050
Sodium (na)- Dissolved	mg/L	2,300	412	ns***	ns***	1,170	1,100	ns***	ns***	1,230	1,140
Zinc (Zn)- Dissolved	ug/L	1,100	8.2	ns***	ns***	2.4	3.5	ns***	ns***	32.6	34.3
<b>Bacteria</b>											
Total Coliforms (MTF)	MPN/100mL					<3	<3			<3	
Fecal Coliforms (MTF)	MPN/100mL					<3	<3			<3	
E. coli (MTF)	MPN/100mL					<3	<3			<3	
<b>Field Parameters</b>											
pH	units		7.50	ns***	ns***	8.33	9.85	ns***	ns***	8.03	9.42
Specific Conductivity	(µS/cm)		4,610	ns***	ns***	6,200	7,460	ns***	ns***	6,450	8,150
<b>Polycyclic Aromatic Hydrocarbons</b>											
Naphthalene	µg/L	1400 (6400)				<0.05	<0.05			nr**	
Benzo(a)pyrene	µg/L	0.81				<0.01	<0.01			nr**	
Anthracene	µg/L	2.4				<0.05	<0.05			nr**	
<b>Petroleum Hydrocarbons</b>											
F1 (C6-C10 Hydrocarbons)	µg/L	750				<25	<25			<25	
F2 (C10-C16 Hydrocarbons)	µg/L	150				<100	<100			<100	
F3 (C16-C34 Hydrocarbons)	µg/L	500				<200	<200			<200	
F4 (C34-C50 Hydrocarbons)	µg/L	500				<200	<200			<200	
Benzene	µg/L	44 (430)				<0.10	<0.10			<0.10	
EthylBenzene	µg/L	2,300				<0.10	<0.10			<0.10	
Toluene	µg/L	18,000				<0.20	0.26			<0.20	
Xylene (Total)	µg/L	4,200				<0.10	<0.10			<0.10	
<b>Volatile Organic Carbons</b>											
Vinyl chloride	µg/L	0.5 (1.7)				<0.2	<0.2			<0.2	
<b>Pesticides</b>											
Diazinon	µg/L					<2	<2			<2	
<b>Herbicides</b>											
2,4-D	µg/L					<1	<1			<1	

Note: Criteria from Ontario Ministry of the Environment. (2009, July 27). Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition  
 Note: Bracketed criteria are for till and clay.  
 Note: Criteria exceedences are highlighted in red.  
 \* Criteria for total chloride and total metals  
 \*\*nr - No result due to contract lab error.  
 \*\*\*ns - Sampled every other year. Sampled in 2016.

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Table 3. 2017 Ground Water Quality Comparison

	Units	Criteria*	2014		2015		2016		2017	
			Average		Average		Average		Average	
			Upgradient	Downgradient	Upgradient	Downgradient	Upgradient	Downgradient	Upgradient	Downgradient
<b>Inorganic Parameters</b>										
Alkalinity - Bicarbonate	mg/L		359	293	399	272	405	318	403	290
Alkalinity - Carbonate	mg/L		<0.50	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Alkalinity - Hydroxide	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Alkalinity - Total	mg/L		294	240	327	223	332	261	330	238
Dissolved Hardness (CaCO3)	mg/L		1,680	2,056	1,830	1,910	1,492	1,707	1,613	1,619
pH	units		7.88	7.79	7.22	7.42	7.26	7.41	7.20	7.30
Specific Conductivity	(µS/cm)		6,910	7,098	6,482	7,159	7,410	7,510	7,253	7,666
Turbidity	(ntu)		112	1,226	391	1,871	70.1	1,194	73.7	1,976
Total Dissolved Solids	mg/L		5,305	5,729	4,956	5,266	4,990	4,906	4,848	4,900
Total Suspended Solids	mg/L		1,068	3,967	868	4,911	390	4,357	605	4,225
Total Solids	mg/L		6,373	9,696	5,824	10,177	5,380	9,263	5,453	9,125
Dissolved Chloride (Cl)	mg/L	2,300	1,270	1,529	1,438	1,801	1,708	1,860	1,640	1,838
Dissolved Sulphate (SO4)	mg/L		1,139	1,128	1,283	1,072	1,350	1,141	1,246	1,057
<b>Nutrients</b>										
Ammonia - Dissolved	mg/L N		0.879	0.98	0.739	0.83	0.696	0.804	0.797	0.946
Nitrate - Dissolved	mg/L N		0.407	0.196	0.318	0.105	0.435**	0.203	0.251	0.098
Total Kjeldahl Nitrogen	mg/L N		2.5	3.5	1.8	3.1	1.7	2.1	1.2	1.4
Phosphorus - Dissolved	mg/L P		na	na*	0.02	0.03	0.06	<-0.02	<-0.01	0.01
<b>Other</b>										
Cyanide - Total (CN)	mg/L	0.066	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
<b>Organic Indicators</b>										
Carbonaceous Oxygen Demand	mg/L		100	226	115	159	78	163	68	213
Total Organic Carbon	mg/L		11	79	26	26.4	7	18.3	7	13.6
<b>Metals</b>										
Arsenic (As)- Dissolved	ug/L	1,900	3.27	3.03	3.48	3.15	1.47	2.17	1.85	2.93
Barium (Ba)- Dissolved	ug/L	29,000	15.0	24.2	13.6	19.0	9.65	14.5	11.2	16.2
Beryllium (Be)- Dissolved	ug/L	67	<0.20	0.11	<0.010	<0.010	<0.050	0.015	<0.10	0.056
Cadmium (Cd)- Dissolved	ug/L	2.7	<0.10	0.113	0.056	0.092	0.047	0.060	0.126	0.084
Calcium (Ca)- Dissolved	mg/L		389	505	446	452	360	414	383	381
Chromium (Cr)- Dissolved	ug/L	810	<2.0	2.40	<0.10	2.41	<0.50	2.33	<1.0	2.32
Copper (Cu)- Dissolved	ug/L	87	1.62	1.99	1.91	1.21	1.39	2.31	2.45	2.23
Iron (Fe)- Dissolved	ug/L		674	1,539	567	441	44.6	195	371	635
Lead (Pb)- Dissolved	ug/L	25	0.353	1.07	0.105	0.047	0.0319	0.039	0.123	0.209
Magnesium (Mg)- Dissolved	mg/L		172	193	174	190	144	172	160	162
Manganese (Mn)- Dissolved	ug/L		467	646	555	452	634	414	627	412
Mercury (Hg)- Total	ug/L	0.29 (2.8)	<0.010	0.004	<0.010	0.004	<0.010	<0.010	<0.002	0.010
Nickel (Ni)- Dissolved	ug/L	490	5.1	5.9	5.0	3.7	4.23	3.5	4.50	3.6
Potassium (K)- Dissolved	mg/L		28.4	23.9	24.0	23.7	19.5	21.2	24.7	23.6
Selenium (Se)- Dissolved	ug/L	63	<0.80	0.37	0.13	0.15	<0.20	0.12	<0.40	0.25
Silver (Ag)- Dissolved	ug/L	1.5	<0.10	<0.10	<0.005	<0.005	<0.025	0.007	<0.050	<0.050
Sodium (na)- Dissolved	mg/L	2,300	1,014	905	1,007	951	784	838	982	945
Zinc (Zn)- Dissolved	ug/L	1,100	5.3	11.2	12.8	9.6	8.41	7.6	22.7	9.5
<b>Bacteria</b>										
Total Coliforms (MTF)	MPN/100mL		<3	5	<3	128	12	23	<3	<3
Fecal Coliforms (MTF)	MPN/100mL		<3	<3	<3	16	<3	<3	<3	<3
E. coli (MTF)	MPN/100mL		<3	<3	<3	16	<3	<3	<3	<3
<b>Field Parameters</b>										
pH	units		6.69	6.64	7.33	7.26	7.61	7.60	8.09	8.12
Specific Conductivity	(µS/cm)		7,073	7,229	4,759	5,372	3,512	4,086	5,958	6,985
<b>Polycyclic Aromatic Hydrocarbons</b>										
Naphthalene	µg/L	1400 (6400)	<0.050	0.040	<0.050	0.111	<0.050	0.070	<0.050	<0.050
Benzo(a)pyrene	µg/L	0.81	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Anthracene	µg/L	2.4	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
<b>Petroleum Hydrocarbons</b>										
F1 (C6-C10 Hydrocarbons)	µg/L	750	<25	<25	<25	176	<25	85	<25	<25
F2 (C10-C16 Hydrocarbons)	µg/L	150	<100	<100	<100	<100	<100	<100	<100	<100
F3 (C16-C34 Hydrocarbons)	µg/L	500	<200	<200	<200	<200	<200	<200	<200	<200
F4 (C34-C50 Hydrocarbons)	µg/L	500	<200	<200	<200	<200	<200	<200	<200	<200
Benzene	µg/L	44 (430)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.07
Ethylbenzene	µg/L	2,300	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.14
Toluene	µg/L	18,000	<0.20	0.21	<0.20	<0.20	<0.20	0.38	<0.20	0.42
Xylenes (Total)	µg/L	4,200	<0.10	<0.10	<0.10	<0.10	<0.10	0.23	<0.10	0.72
<b>Volatile Organic Carbons</b>										
Vinyl chloride	µg/L	0.5 (1.7)	<0.20	<0.20	<0.20	1.15	<0.20	<10	<0.20	<0.20
<b>Pesticides</b>										
Diazinon	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0
<b>Herbicides</b>										
2,4-D	µg/L		<1.0	<2.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0

Note: Criteria from Ontario Ministry of the Environment, (2009, July 27). Soil, Ground Water and Sediment Standards for Use Under Part XV.I of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition  
 Note: Where value is expressed as less than (<), the value is halved and used in the calculations, where value is expressed as (>), the value is used in the calculations.  
 Note: Bracketed criteria are for till and clay.  
 Note: Criteria exceedences are highlighted in red.  
 \* Criteria for total chloride and total metals  
 \*\* Correction from previous year due to data entry error

## 5.2 SURFACE WATER

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The BRRMF surface water management system is designed to run dry for most of the year. As such, grab sampling is performed three times per year: spring run-off, summer run-off, and fall run-off.

As per the BRRMF Operating Plan, surface water is managed in accordance with the Surface Water Sampling and Analysis Plan (SAP), as specified under Clause 115. Compliance parameters are applied to the upstream and downstream sampling points and at the weir, with modifications at other locations interior to the site. Sampling for the clean water ponds is similar to sampling for perimeter ditching. Sampling for impacted water ponds (Active Area Collection Pond, Biosolids Storm Water Pond, and Leaf and Yard Waste Storm Water Pond) and dry ponds is performed only prior to discharge events. Weekly field monitoring is performed at the weir from spring thaw to freeze-up.

In 2017, a total of 29 surface water samples were analyzed – 4 upstream samples, 18 samples downstream and intermediate to the site, and 7 pond samples. Because 2017 was an extremely dry year, the pond samples did not meet discharge criteria; the water was retained in the ponds instead of being hauled for treatment. There were no deviations from the Surface Water SAP or from normal sample collection and preservation practices. Weekly weir data is provided in Table 4 and the 2017 surface water results are provided in Table 5.

Some analytical results for surface water obtained in 2017 were found to be highly variable compared to those obtained in 2014, 2015, and 2016. A comparison of the average values for upstream, intermediate and downstream locations obtained in 2014, 2015, 2016, and 2017 are provided in Table 6. The data collected in 2017 will be used to enhance the existing surface water quality data in order to better evaluate trends. Statistical analyses of background surface water quality data are attached in Appendix D. The Contingency Action Plan required under Clause 125 was not implemented in 2017.

At this time we have no recommendations for changes in the surface water monitoring program.



Table 4. 2017 Weekly Weir Data

Date	Flow (m/s)	pH (units)	Conductivity (m/s)	DO (mg/L)	Temp (°C)
28-Apr-17	0.0	9.42	0.33	14.7	9.6
5-May-17	0.0	8.30	1.15	9.7	15.7
12-May-17	0.0	8.97	1.20	8.8	12.8
19-May-17	0.0	9.01	1.27	12.3	19.1
2-Jun-17	0.0	9.56	1.46	15.6	26.2
9-Jun-17	0.0	10.51	1.27	12.3	19.1
16-Jun-17	0.0	10.23	1.75	8.6	21.6
23-Jun-17	0.0	10.03	1.50	9.2	15.9
30-Jun-17	0.0	10.00	1.49	7.0	18.5
7-Jul-17	0.0	10.10	0.79	12.9	24.2
14-Jul-17	0.0	10.13	0.71	16.3	20.6
21-Jul-17	0.0	9.76	0.81	8.4	21.2
28-Jul-17	0.0	9.45	1.71	4.9	20.7
4-Jul-17	0.0	9.49	1.56	5.8	19.3
11-Aug-17	0.0	9.41	2.21	4.6	21.4
18-Aug-17	0.0	9.36	1.67	6.9	18.3
25-Aug-17	0.0	9.78	2.58	19.8	25.8
15-Sep-17	ns*	ns*	ns*	ns*	ns*
22-Sep-17	ns*	ns*	ns*	ns*	ns*
29-Sep-17	0.0	9.09	3.61	13.4	13.6
6-Oct-17	0.0	8.69	3.96	11.1	8.4
20-Oct-17	0.0	8.65	1.06	10.7	9.3

\*ns - no sample because weir was completely dry

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Table 5. 2017 Surface Water Monitoring

			Ponds									Upstream						Downstream											
			SW25-7			SW25-8			SW25-11a			SW25-11b			SW25-11c			SW25-1			SW25-12			SW25-2			SW25-16		
Sampling date	Units	Criteria*	Fall	Fall	11-Apr-17	26-Jul-17	11-Apr-17	26-Jul-17	11-Apr-17	26-Jul-17	30-Oct-17	11-Apr-17	26-Jul-17	Fall	11-Apr-17	26-Jul-17	Fall	11-Apr-17	26-Jul-17	Fall	11-Apr-17	26-Jul-17	Fall	11-Apr-17	26-Jul-17				
<b>Inorganic Parameters</b>																													
Alkalinity - Bicarbonate	mg/L		ns**	ns**	506	151	463	571	425	654	960	171	546	ns**	176	427	ns**	224	642	ns**	242	642							
Alkalinity - Carbonate	mg/L		ns**	ns**	6.10	240	2.42	118	<0.50	122	45.3	<0.50	<0.50	ns**	<0.50	<0.50	ns**	<0.50	<0.50	ns**	<0.50	<0.50	ns**	<0.50	<0.50	<0.50			
Alkalinity - Hydroxide	mg/L		ns**	ns**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	ns**	<0.50	<0.50	ns**	<0.50	<0.50	ns**	<0.50	<0.50	ns**	<0.50	<0.50	<0.50			
Alkalinity - Total	mg/L		ns**	ns**	425	524	384	666	348	740	862	140	447	ns**	144	350	ns**	184	526	ns**	198	526							
Dissolved Hardness (CaCO3)	mg/L		ns**	ns**	528	1020	484	1130	417	1150	1680	135	497	ns**	138	676	ns**	210	686	ns**	248	686							
pH	units	6.5-9.0	ns**	ns**	8.62	10.0	9.21	9.10	9.01	9.02	8.73	7.76	7.59	ns**	7.74	7.38	ns**	8.06	9.54	ns**	7.47	7.03							
Specific Conductivity	(µS/cm)		ns**	ns**	1,910	4,010	1,780	4,080	1,630	3,860	5,950	347	1,200	ns**	396	1,790	ns**	598	1,710	ns**	686	1,980							
Turbidity	(ntu)		ns**	ns**	61.2	265	72.0	31.3	74.8	35.2	492	12.1	224	ns**	85.2	631	ns**	139	35.4	ns**	15.4	921							
Total Dissolved Solids	mg/L		ns**	ns**	1,200	3,040	1,110	3,040	1,040	2,980	3,830	191	801	ns**	232	1,340	ns**	329	1,290	ns**	394	1,350							
Total Suspended Solids	mg/L		ns**	ns**	160	740	210	140	130	100	1,140	29	729	ns**	410	2,220	ns**	287	50	ns**	164	27,950							
Total Solids	mg/L		ns**	ns**	1,360	3,780	1,320	3,180	1,170	3,080	4,970	220	1,530	ns**	642	3,560	ns**	616	1,340	ns**	558	29,300							
Dissolved Chloride (Cl)	mg/L	640	ns**	ns**	180	770	160	690	180	620	1,200	14	110	ns**	15	180	ns**	42	260	ns**	56	260							
Dissolved Sulphate (SO4)	mg/L		ns**	ns**	224	483	205	479	94.0	453	550	19.7	45.3	ns**	22.6	272	ns**	44.0	22.3	ns**	31.9	22.3							
<b>Nutrients</b>																													
Ammonia - Dissolved	mg/L N		ns**	ns**	9.50	0.014	8.27	0.065	6.64	0.111	5.94	<0.003	0.016	ns**	<0.003	0.047	ns**	1.12	<0.003	ns**	<0.003	5.31							
Nitrate - Dissolved	mg/L N	13	ns**	ns**	0.536	<0.003	1.07	<0.003	1.27	<0.003	<0.003	<0.003	<0.003	ns**	<0.003	<0.003	ns**	0.366	<0.003	ns**	<0.003	<0.003							
Total Kjeldahl Nitrogen	mg/L N		ns**	ns**	16.6	8.8	15.3	9.5	13.6	10.6	22.9	1.0	2.9	ns**	1.1	2.6	ns**	2.5	4.2	ns**	3.2	11.7							
Phosphorus - Dissolved	ug/L P		ns**	ns**	54.8	149	116	517	252	1,200	498	116	647	ns**	117	142	ns**	285	104	ns**	138	1,870							
<b>Other</b>																													
Cyanide - Total (CN)	mg/L	5	ns**	ns**	0.00547	0.00625	0.00498	0.00812	0.00570	0.00900	0.00650	0.00137	0.00254	ns**	0.00139	0.00161	ns**	0.00192	0.00265	ns**									
<b>Organic Indicators</b>																													
Carbonaceous Oxygen Demand	mg/L		ns**	ns**	160	360	180	320	170	340	630	40	470	ns**	130	660	ns**	100	170	ns**									
Biochemical Oxygen Demand	mg/L		ns**	ns**	13	3	22	3	16	6	18	<3	3	ns**	17	>11	ns**	18	27	ns**									
<b>Metals</b>																													
Arsenic (As)- Dissolved	ug/L	5	ns**	ns**	4.19	18.1	4.33	32.4	4.48	36.5	28.6	2.46	8.03	ns**	2.39	3.85	ns**	3.68	13.6	ns**	3.52	6.5							
Barium (Ba)- Dissolved	ug/L		ns**	ns**	73.4	54.2	61.3	86.9	57.6	116	169	24.7	83.3	ns**	27.6	139	ns**	46.6	91.1	ns**	43.7	157							
Beryllium (Be)- Dissolved	ug/L		ns**	ns**	<0.010	<0.050	<0.010	<0.050	<0.010	<0.050	<0.050	<0.010	<0.010	ns**	<0.010	<0.010	ns**	<0.010	<0.010	ns**	<0.010	<0.010							
Cadmium (Cd)- Dissolved	ug/L	0.09	ns**	ns**	0.0155	0.0410	0.0142	<0.0250	0.0205	<0.0250	0.0350	0.0054	<0.0050	ns**	<0.0050	<0.0050	ns**	0.0116	<0.0050	ns**	0.0066	<0.0050							
Calcium (Ca)- Dissolved	mg/L		ns**	ns**	61.7	25.7	60.4	52.6	53.8	89.6	87.6	28.3	81.6	ns**	27.9	82.1	ns**	37.8	48.0	ns**	51.1	86.2							
Chromium (Cr)- Dissolved	ug/L		ns**	ns**	1.47	0.94	1.34	1.07	1.16	1.08	1.11	0.13	0.32	ns**	<0.10	0.26	ns**	0.20	0.31	ns**	0.25	0.40							
Copper (Cu)- Dissolved	ug/L	4	ns**	ns**	6.54	9.75	6.86	10.5	24.3	12.3	3.90	2.03	2.37	ns**	1.72	1.18	ns**	2.92	2.42	ns**	2.53	0.492							
Iron (Fe)- Dissolved	ug/L	300	ns**	ns**	72.3	<5.00	38.8	9.10	96.2	15.1	33.9	41.5	271	ns**	55.5	182	ns**	54.7	12.3	ns**	61.9	39.4							
Lead (Pb)- Dissolved	ug/L	7	ns**	ns**	0.1160	0.0570	0.0974	0.0870	0.2330	0.1440	0.1750	0.0381	0.2760	ns**	0.0433	0.1460	ns**	0.0889	0.2120	ns**	0.0523	0.0582							
Magnesium (Mg)- Dissolved	mg/L		ns**	ns**	90.9	233	80.9	242	68.6	225	355	15.6	71.3	ns**	16.6	114	ns**	28.1	82.6	ns**	29.3	114							
Manganese (Mn)- Dissolved	ug/L		ns**	ns**	147	0.98	93.8	24.7	68.9	22.3	503	9.93	592	ns**	14.6	727	ns**	63.6	12.0	ns**	26.1	332							
Mercury (Hg)- Dissolved	ug/L	0.026	ns**	ns**	<0.0020	<0.0020	0.0023	0.0021	<0.0020	0.0021	<0.0020	0.0022	0.0022	ns**	<0.0020	<0.0020	ns**	<0.0020	0.0021	ns**	<0.0020	<0.0020							
Nickel (Ni)- Dissolved	ug/L	150	ns**	ns**	27.7	60.6	24.0	61.1	21.8	57.1	111	1.85	3.05	ns**	1.93	1.69	ns**	5.05	16.8	ns**	3.65	4.08							
Potassium (K)- Dissolved	mg/L		ns**	ns**	53.2	125	58.2	130	60.9	139	130	8.11	9.89	ns**	8.12	6.70	ns**	15.1	38.8	ns**	12.7	14.4							
Selenium (Se)- Dissolved	ug/L	1	ns**	ns**	0.506	0.750	0.502	0.710	0.469	0.610	0.750	0.136	0.195	ns**	0.098	1.97	ns**	0.154	0.361	ns**	0.170	9.90							
Sodium (Na)- Dissolved	mg/L		ns**	ns**	124	424	110	388	93.6	352	632	8.91	63.9	ns**	9.46	131	ns**	21.4	157	ns**	33.2	164							
Zinc (Zn)- Dissolved	ug/L	30	ns**	ns**	4.60	0.57	5.33	1.03	5.33	1.64	8.72	2.18	3.63	ns**	3.32	3.26	ns**	4.65	1.97	ns**	3.63	1.32							
<b>Bacteria</b>																													
Total Coliforms (MTF)	MPN/100mL		ns**	ns**	1,500	430	2,400	>11,000	1,500	4,600	4,600	930	11,000	ns**	750	43	ns**	11,000	430	ns**	93	2,400							
Fecal Coliforms (MTF)	MPN/100mL		ns**	ns**	230	150	150	230	430	430	4,600	<3	4,600	ns**	<3	23	ns**	23	43	ns**	<3	930							
E. coli (MTF)	MPN/100mL		ns**	ns**	15	150	150	230	430	93	4,600	<3	4,600	ns**	<3	23	ns**	23	15	ns**	<3	43							
<b>Field Parameters</b>																													
pH	units	6.5-9.0	ns**	ns**	9.26	10.73	9.24	9.82	9.09	9.58	10.18	9.10	8.70	ns**	8.75	8.40	ns**	8.73	10.30	ns**	8.36	8.13							
Specific Conductivity	(µS/cm)		ns**	ns**	1,610	1,600	1,500	1,900	1,390	1,580	6,360	280	1,160	ns**	340	1,730	ns**	860	40	ns**	820	1,930							

Note: Criteria from Canadian Council of Ministers of the Environment. Canadian Environmental Quality Guidelines Summary Table. Water Quality Guidelines for the Protection of Aquatic Life, Freshwater. (Retrieved April 2016)  
 \* Criteria for total chloride and total metals  
 \*\*ns - no sample due to dry season



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Table 5. 2017 Surface Water Monitoring

			Intermediate																
			SW25-9A		SW25-9B		SW25-13A		SW25-13B		SW25-14A		SW25-14B		SW25-15A		SW25-15B		
Sampling date	Units	Criteria*	11-Apr-17	26-Jul-17	11-Apr-17	26-Jul-17	11-Apr-17	26-Jul-17	11-Apr-17	26-Jul-17	11-Apr-17	Summer	11-Apr-17	Summer	11-Apr-17	26-Jul-17	11-Apr-17	26-Jul-17	
<b>Inorganic Parameters</b>																			
Alkalinity - Bicarbonate	mg/L		227	183	216	159	178	473	177	183	218	ns**	212	ns**	211	587	226	523	
Alkalinity - Carbonate	mg/L		<0.50	32.5	<0.50	34.0	<0.50	<0.50	<0.50	10.4	<0.50	ns**	<0.50	ns**	<0.50	20.8	<0.50	49.8	
Alkalinity - Hydroxide	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	ns**	<0.50	ns**	<0.50	<0.50	<0.50	<0.50	
Alkalinity - Total	mg/L		186	204	177	187	146	387	145	167	179	ns**	174	ns**	173	516	185	511	
Dissolved Hardness (CaCO3)	mg/L		212	326	199	236	136	815	145	627	186	ns**	187	ns**	196	886	212	861	
pH	units	6.5-9.0	7.85	9.26	8.06	9.35	7.77	7.26	7.77	8.48	8.23	ns**	8.66	ns**	8.38	8.86	8.05	8.58	
Specific Conductivity	(µS/cm)		550	887	574	623	372	2,280	377	1,630	522	ns**	531	ns**	553	3,370	601	3,390	
Turbidity	(ntu)		35.1	150	69.6	92.5	8.44	70.0	13.2	33.8	67.4	ns**	214	ns**	546	109	122	10,400	
Total Dissolved Solids	mg/L		303	682	356	491	218	1,610	228	1,330	304	ns**	304	ns**	317	2,560	358	2,640	
Total Suspended Solids	mg/L		59	438	142	227	16	310	20	160	306	ns**	806	ns**	873	110	252	20,460	
Total Solids	mg/L		362	1,120	498	718	234	1,920	248	1,490	610	ns**	1,110	ns**	1,190	2,670	610	23,100	
Dissolved Chloride (Cl)	mg/L	640	34	100	36	51	16	380	20	150	27	ns**	33	ns**	35	580	44	580	
Dissolved Sulphate (SO4)	mg/L		44.3	113	47.9	62.2	23.7	142	25.9	426	44.7	ns**	31.2	ns**	39.3	295	47.2	294	
<b>Nutrients</b>																			
Ammonia - Dissolved	mg/L N		1.09	0.007	1.13	0.013	0.012	0.093	<0.003	0.004	<0.003	ns**	1.16	ns**	1.04	0.049	1.42	0.691	
Nitrate - Dissolved	mg/L N	13	0.366	<0.003	0.256	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	ns**	0.286	ns**	0.279	<0.003	0.419	<0.003	
Total Kjeldahl Nitrogen	mg/L N		1.9	1.2	2.4	1.3	1.0	2.3	1.0	1.2	1.0	ns**	2.6	ns**	0.3	8.9	0.4	10.6	
Phosphorus - Dissolved	ug/L P		268	53.2	338	104	121	233	124	74.7	88.5	ns**	349	ns**	316	434	319	629	
<b>Other</b>																			
Cyanide - Total (CN)	mg/L	5	0.00189	0.00159	0.00179	0.00162	0.00133	0.00159	0.00141	0.00209	0.00163	ns**	0.00177	ns**	0.00177	0.00935	0.00199	0.00790	
<b>Organic Indicators</b>																			
Carbonaceous Oxygen Demand	mg/L		40	100	60	100	30	130	30	100	70	ns**	120	ns**	150	330	80	3,180	
Biochemical Oxygen Demand	mg/L		4	>10	4	>7	<3	>11	6	5	5	ns**	5	ns**	10	>9	12	>34	
<b>Metals</b>																			
Arsenic (As)- Dissolved	ug/L	5	3.58	8.24	3.52	9.41	2.49	7.39	2.37	2.27	2.48	ns**	3.58	ns**	3.70	32.4	3.76	40.4	
Barium (Ba)- Dissolved	ug/L		38.5	68.8	41.0	53.1	25.4	146	27.6	61.0	39.4	ns**	49.3	ns**	44.7	118	44.9	144	
Beryllium (Be)- Dissolved	ug/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	ns**	<0.010	ns**	<0.010	<0.050	<0.010	<0.050	
Cadmium (Cd)- Dissolved	ug/L	0.09	0.0080	<0.0050	0.0063	<0.0050	<0.0050	<0.0050	0.0075	<0.0050	<0.0050	ns**	0.0077	ns**	0.0114	<0.0250	0.0088	<0.0250	
Calcium (Ca)- Dissolved	mg/L		39.6	35.3	37.0	30.9	27.2	112	29.4	77.9	37.1	ns**	34.6	ns**	36.7	51.7	38.0	49.8	
Chromium (Cr)- Dissolved	ug/L		0.15	0.14	0.15	<0.10	0.15	0.31	0.15	0.25	0.19	ns**	0.17	ns**	0.23	1.12	0.34	1.10	
Copper (Cu)- Dissolved	ug/L	4	1.39	2.79	1.45	2.69	2.50	4.01	8.26	1.47	1.87	ns**	1.27	ns**	1.75	2.76	1.90	0.93	
Iron (Fe)- Dissolved	ug/L	300	41.5	40.3	31.2	8.90	50.5	240	50.5	51.0	60.7	ns**	34.0	ns**	81.2	39.0	46.2	28.2	
Lead (Pb)- Dissolved	ug/L	7	0.0434	0.2680	0.0555	0.1870	0.0497	0.4830	0.1910	0.0572	0.0827	ns**	0.0377	ns**	0.1040	0.2180	0.0631	0.0680	
Magnesium (Mg)- Dissolved	mg/L		27.5	57.8	26.0	38.6	16.5	130	17.3	105	22.7	ns**	24.4	ns**	25.2	184	28.6	179	
Manganese (Mn)- Dissolved	ug/L		99.8	18.0	108	9.83	5.43	938	10.3	38.7	30.6	ns**	99.2	ns**	61.7	246	62.5	272	
Mercury (Hg)- Dissolved	ug/L	0.026	<0.0020	<0.0020	0.0021	<0.0020	<0.0020	0.0026	<0.0020	<0.0020	<0.0020	ns**	0.0022	ns**	0.0027	0.0036	0.0021	0.0035	
Nickel (Ni)- Dissolved	ug/L	150	3.82	4.74	3.95	3.64	1.91	3.21	2.33	4.32	2.74	ns**	4.04	ns**	4.31	52.4	5.53	49.3	
Potassium (K)- Dissolved	mg/L		12.8	14.6	12.9	14.6	8.11	12.1	8.51	10.7	9.37	ns**	13.1	ns**	13.1	109	16.4	116	
Selenium (Se)- Dissolved	ug/L	1	0.154	0.226	0.147	0.177	0.096	0.213	0.094	0.363	0.117	ns**	0.141	ns**	0.168	0.560	0.172	0.490	
Sodium (Na)- Dissolved	mg/L		18.8	49.2	19.5	30.3	9.10	120	10.1	93.9	14.4	ns**	17.0	ns**	17.9	319	23.3	318	
Zinc (Zn)- Dissolved	ug/L	30	5.11	3.28	5.19	2.40	3.22	3.52	13.5	3.25	7.95	ns**	3.11	ns**	11.1	2.54	3.59	0.610	
<b>Bacteria</b>																			
Total Coliforms (MTF)	MPN/100mL		2,400	930	2,100	430	93	2,400	930	>11,000	4,600	ns**	2,400	ns**	930	>11,000	430	>11,000	
Fecal Coliforms (MTF)	MPN/100mL		38	210	4	430	<3	2,400	14	>11,000	43	ns**	14	ns**	43	11,000	38	>11,000	
E. coli (MTF)	MPN/100mL		38	210	4	430	<3	2,400	7	230	43	ns**	14	ns**	23	150	23	230	
<b>Field Parameters</b>																			
pH	units	6.5-9.0	8.87	9.74	8.16	10.00	8.77	8.00	8.55	8.60	9.11	ns**	8.84	ns**	8.59	9.40	8.67	9.58	
Specific Conductivity	(µS/cm)		230	1,010	250	640	330	2,190	340	1,560	210	ns**	380	ns**	450	3,200	510	1,580	

Note: Criteria from Canadian Council of Ministers of the Environment. Canadian Environmental Quality Guidelines Summary Table. Water Quality Guidelines for the Protection of Aquatic Life, Freshwater. (Retrieved April 2016)  
 \* Criteria for total chloride and total metals  
 \*\*ns - no sample collected



Table 6. 2017 Surface Water Quality Comparison

	Units	Criteria*	2014		2015		2016		2017	
			Average		Average		Average		Average	
			Upstream	Intermediate/Downstream	Upstream	Intermediate/Downstream	Upstream	Intermediate/Downstream	Upstream	Intermediate/Downstream
<b>Inorganic Parameters</b>										
Alkalinity - Bicarbonate	mg/L		470	253	270	229	277	243	330	307
Alkalinity - Carbonate	mg/L		<0.5	15.8	<0.5	11.15	<0.50	4.11	<0.50	8.38
Alkalinity - Hydroxide	mg/L		<0.5	<0.50	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50
Alkalinity - Total	mg/L		385	233	221	206	227	206	270	265
Dissolved Hardness (CaCO3)	mg/L		723	327	302	332	418	319	362	392
pH	units	6.5-9.0	7.72	8.35	7.62	8.67	7.43	8.00	7.62	8.26
Specific Conductivity	(µS/cm)		1,667	877	721	944	941	857	933	1,180
Turbidity	(ntu)		388	539	336	347	313	711	238	725
Total Dissolved Solids	mg/L		1,340	653	537	764	629	565	641	837
Total Suspended Solids	mg/L		1,099	1,650	373	1,442	476	1,891	847	2,924
Total Solids	mg/L		2,439	2,304	909	2,206	1,105	2,457	1,488	3,761
Dissolved Chloride (Cl)	mg/L	640	172	90	59	99	65	88	80	150
Dissolved Sulphate (SO4)	mg/L		289	82	46	93	146	90	90	98
<b>Nutrients</b>										
Ammonia - Dissolved	mg/L N		7.46**	1.03	0.279	1.118	0.277	0.335	0.017	0.730
Nitrate - Dissolved	mg/L N	13	0.990	0.276	0.348	0.153	4.23	4.43	0.017	0.111
Total Kjeldahl Nitrogen	mg/L N		10.0	6.0	2.60	4.92	3.67	5.07	1.90	3.20
Phosphorus - Dissolved	mg/L P		190	151	132	186	192	166	256	325
<b>Other</b>										
Cyanide - Total (CN)	mg/L	5	0.00363	0.00198	0.00139	0.00204	0.00171	0.00197	0.00173	0.00264
<b>Organic Indicators</b>										
Carbonaceous Oxygen Demand	mg/L		283	178	104	125	199	148	325	299
Biochemical Oxygen Demand	mg/L		12	18	6	10	89	20	8	11
<b>Metals</b>										
Arsenic (As)- Dissolved	ug/L	5	5.14	7.78	2.89	7.19	3.02	4.43	4.18	8.78
Barium (Ba)- Dissolved	ug/L		103.8	91.8	59.9	63.6	56.0	58.8	68.7	70.2
Beryllium (Be)- Dissolved	ug/L		<0.050	<0.050	0.013	<0.010	0.019	0.009	<0.010	<0.010
Cadmium (Cd)- Dissolved	ug/L	0.09	0.057	0.018	0.045	0.015	0.040	0.009	<0.005	0.006
Calcium (Ca)- Dissolved	mg/L		143.5	57.4	57.0	45.7	93.4	48.1	55.0	48.4
Chromium (Cr)- Dissolved	ug/L		3.63	0.74	0.12	0.22	0.31	0.39	0.19	0.32
Copper (Cu)- Dissolved	ug/L	4	6.73	2.18	1.69	2.75	4.67	3.01	1.83	2.38
Iron (Fe)- Dissolved	ug/L	300	146	61	104	43	252	151	138	54
Lead (Pb)- Dissolved	ug/L	7	0.177	0.119	0.063	0.073	0.297	0.140	0.126	0.131
Magnesium (Mg)- Dissolved	mg/L		188.6	65.7	38.8	53.0	44.9	48.3	54.4	65.2
Manganese (Mn)- Dissolved	ug/L		416	184	56.8	114	163	81.6	336	139
Mercury (Hg)- Dissolved	ug/L	0.026	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.0016	0.0023
Nickel (Ni)- Dissolved	ug/L	150	34.5	13.7	2.78	9.67	3.00	6.23	2.13	10.1
Potassium (K)- Dissolved	mg/L		27.8	22.7	12.0	21.7	11.6	17.3	8.2	25.7
Selenium (Se)- Dissolved	ug/L	1	0.952	0.357	0.116	0.288	0.201	0.265	0.600	0.797
Sodium (Na)- Dissolved	mg/L		243	69.6	28.7	57.0	34.7	44.7	53.3	83.2
Zinc (Zn)- Dissolved	ug/L	30	4.9	5.23	18.8	4.47	4.97	5.05	3.10	4.43
<b>Bacteria</b>										
Total Coliforms (MTF)	MPN/100mL		5,886	4,473	5,633	4,600	9,567	8,503	3,181	3,151
Fecal Coliforms (MTF)	MPN/100mL		3,207	591	343	2,556	723	2,349	1,157	2,069
E. coli (MTF)	MPN/100mL		3,207	591	185	1,973	723	2,328	1,157	216
<b>Field Parameters</b>										
pH	units	6.5-9.0	7.71	8.21	7.50	8.77	7.85	8.17	8.74	8.91
Specific Conductivity	(µS/cm)		1,460	1,850	712	853	895	831	878	918

Note: Criteria from Canadian Council of Ministers of the Environment. Canadian Environmental Quality Guidelines Summary Table. Water Quality Guidelines for the Protection of Aquatic Life, Freshwater. (Retrieved April 2016)

Note: Where value is expressed as less than (<), the value is halved and used in the calculations, where value is expressed as (>), the value is used in the calculations.

\* Criteria for total chloride and total metals

\*\* Total ammonia reported

### 5.3 LEACHATE

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The leachate management system is currently a passive collection system which includes a network of drains, sumps, and pumping stations. Leachate is pumped from leachate manholes (MH) and a leachate riser (R) around the perimeter of the landfill cells and hauled for treatment at NEWPCC; these sites also serve as sampling points. In 2017, construction began on a centralized leachate collection system – R1, MH13, MH24, and MH46 (the new MH for Cell 31) will be incorporated in 2018; MH3, MH8, and MH31 will be incorporated by 2020. The manholes/sumps will pump into a header pipe which will feed by gravity and lift stations to a 300,000 L storage tank located at the intersection of Charette Road and the access road. The system will be designed as a truck fill station to haul to the North End Sewage Treatment Plant.

As per the BRRMF Operating Plan, leachate is managed in accordance with the Leachate Sampling and Analysis Plan (SAP), as specified under Clause 100. The Leachate SAP proposes annual sampling at the leachate manholes and riser, and monthly leachate elevation measurements.

The total volume of leachate removed from the BRRMF in 2017 was 31,150kL. There were no occurrences of leachate breakout from the development in 2017, and the maximum leachate head in Cell 30 was not exceeded in 2017.

In 2017, eight leachate samples were analyzed; there were no deviations from the Leachate SAP or from normal sample collection and preservation practices. Although required detection limits are specified in our contract, they could not be reached for some parameters due to the presence of suspended solids in some leachate samples.

Monthly leachate levels are provided in Table 7 and the 2017 leachate results are provided in Table 8.

Some analytical results for leachate in 2017 were found to be highly variable compared to those obtained in 2014, 2015, and 2016. A comparison of the average values obtained in 2014, 2015, 2016, and 2017 are provided in Table 9.

The data collected in 2017 will be used to enhance the existing leachate quality data in order to better evaluate trends. Statistical analyses of background leachate quality data are attached in Appendix E. The Contingency Action Plan required under Clause 125 was not implemented in 2017. We have no recommendations for changes in the leachate monitoring program at this time.



Table 7. Leachate Levels 2017

	Date	16-Jan-17	7-Feb-17	17-Mar-17	12-Apr-17	20-May-17	15-Jun-17	17-Jul-17	21-Aug-17	13-Sep-17	3-Oct-17	14-Nov-17	6-Dec-17
Manhole 3	Top of Manhole Elevation (m)	233.66	233.66	233.66	233.66	233.66	233.66	233.66	233.66	233.66	233.66	233.66	233.66
	Depth to Leachate (m)	1.45	1.50	3.59	1.63	2.04	1.90	2.02	2.09	2.35	2.34	2.16	2.04
	Manhole Leachate Elevation (m)	232.21	232.16	230.07	232.03	231.62	231.76	231.64	231.57	231.31	231.32	231.50	231.62
Manhole 8	Top of Manhole Elevation (m)	236.61	236.61	236.61	236.61	236.61	236.61	236.61	236.61	236.61	236.61	236.61	236.61
	Depth to Leachate (m)	5.45	5.57	5.57	5.86	6.99	8.06	5.32	6.70	7.25	7.31	6.10	6.99
	Manhole Leachate Elevation (m)	231.16	231.04	231.04	230.75	229.62	228.55	231.29	229.91	229.36	229.30	230.51	229.62
Manhole 13	Top of Manhole Elevation (m)	234.89	234.89	234.89	234.89	234.89	234.89	234.89	234.89	234.89	234.89	234.89	234.89
	Depth to Leachate (m)	4.63	5.29	3.78	4.38	5.88	6.12	5.49	3.73	4.34	3.77	4.61	5.82
	Manhole Leachate Elevation (m)	230.26	229.60	231.11	230.51	229.01	228.77	229.40	231.16	230.55	231.12	230.28	229.07
Manhole 24	Top of Manhole Elevation (m)	235.00	235.00	235.00	235.00	235.00	235.00	235.00	235.00	235.00	235.00	235.00	235.00
	Depth to Leachate (m)	2.30	2.29	1.18	CNM*	1.33	1.44	1.46	1.03	0.90	0.95	3.69	1.94
	Manhole Leachate Elevation (m)	232.70	232.71	233.82	CNM*	233.67	233.56	233.54	233.97	234.10	234.05	231.31	233.06
Manhole 27	Top of Manhole Elevation (m)	235.71	235.71	235.71	235.71	235.71	235.71	235.71	235.71	235.71	235.71	235.71	235.71
	Depth to Leachate (m)	1.91	2.04	1.88	2.09	2.11	2.08	2.02	2.04	2.14	2.14	2.11	2.17
	Manhole Leachate Elevation (m)	233.80	233.67	233.83	233.62	233.60	233.63	233.69	233.67	233.57	233.57	233.60	233.54
Manhole 31	Top of Manhole Elevation (m)	234.74	234.74	234.74	234.74	234.74	234.74	234.74	234.74	234.74	234.74	234.74	234.74
	Depth to Leachate (m)	1.10	0.96	0.63	0.86	1.11	1.62	1.65	2.68	2.10	2.43	1.90	1.61
	Manhole Leachate Elevation (m)	233.64	233.78	234.11	234.74	233.63	233.12	233.09	232.06	232.64	232.31	232.84	233.13
Manhole 34	Top of Manhole Elevation (m)	235.42	235.42	235.42	235.42	235.42	235.42	235.42	235.42	235.42	235.42	235.42	235.42
	Depth to Leachate (m)	3.41	3.00	3.14	3.26	3.17	3.02	2.96	3.00	3.06	9.11	2.85	3.21
	Manhole Leachate Elevation (m)	232.01	232.42	232.28	232.16	232.25	232.40	232.46	232.42	232.36	226.31	232.57	232.21
Riser 1	Top of Riser Elevation (m)	234.97	234.97	234.97	234.97	234.97	234.97	234.97	234.97	234.97	234.97	234.97	234.97
	Depth to Leachate (m)	16.25	19.15	20.48	21.06	24.35	24.20	22.23	22.69	22.14	22.23	24.42	24.50
	Riser Leachate Elevation (m)	218.72	215.82	214.49	213.91	210.62	210.77	212.74	212.28	212.83	212.74	210.55	210.47

\*CNM - could not measure - frozen



Table 8. 2017 Leachate Monitoring

			LQ25-MH3	LQ25-MH8	LQ25-MH13	LQ25-MH24	LQ25-MH27	LQ25-MH31	LQ25-MH34	RISER 1	Composite
Sampling Date	Units	Criteria*	September-17	September-17	September-17	September-17	September-17	September-17	September-17	September-17	September-17
<b>Field Parameters</b>											
pH	units		7.49	7.68	6.77	7.28	8.42	7.46	8.51	7.39	
Turbidity	ntu		309	154	8.94	50.0	43.2	199	69.5	nr**	
Specific Conductivity	uS/cm		13,880	10,780	3,510	13,900	880	13,080	1,400	14,940	
<b>Inorganic Parameters</b>											
Alkalinity - Bicarbonate	mg/L		7,720	3,830	1,630	7,120	455	5,910	467	8,700	
Alkalinity - Carbonate	mg/L		<5	<5	<5	<5	<0.5	<5	<0.5	<5	
Alkalinity - Hydroxide	mg/L		<5	<5	<5	<5	<0.5	<5	<0.5	<5	
Alkalinity - Total	mg/L		6,330	3,140	1,340	5,840	373	4,840	383	7,130	
Hardness (as CaCO3)	mg/L		1,990	2,540	1,900	2,190	409	1,340	626	4,730	
pH	units		7.32	7.35	6.78	7.27	7.79	7.25	7.93	7.08	
Specific Conductivity	uS/cm		15,800	12,100	4,220	15,500	993	15,000	1,540	18,800	
Turbidity	ntu		254	143	111	35.8	8.47	131	15.6	326	
Total Dissolved Solids	mg/L		7,960	7,720	2,540	7,170	558	6,350	914	13,700	
Total Suspended Solids	mg/L		980	530	240	380	56	560	86	1,800	
Chloride (dissolved)	mg/L	2300	2,300	1,800	190	1,700	53	1,600	230	1,900	
Sulphate (dissolved)	mg/L		36	1,400	426	82	84	32	116	<10	
<b>Other</b>											
Cyanide (CN)	mg/L	0.066	0.0177	0.0168	<0.0005	0.0091	0.0011	0.0095	0.0020	0.0073	
<b>Nutrients</b>											
Dissolved Ammonia	mg/L		790	266	47.4	983	0.33	1000	0.05	942	
Nitrate Nitrite Nitrogen	mg/L		1.89	<0.003	<0.003	<0.003	1.84	<0.003	6.33	0.758	
Total Kjeldhal Nitrogen	mg/L		998	478	61	1,050	3	1,140	<0.2	1,240	
Phosphorus (Total)	mg/L		3.85	2.41	<0.004	5.32	<0.004	4.88	<0.004	9.88	
<b>Organic Indicators</b>											
Biological Oxygen Demand	mg/L		147	161	15	87	4	141	<3	5,250	
Chemical Oxygen Demand	mg/L		1,940	2,100	150	1,460	40	2,650	80	11,900	
<b>Metals</b>											
Total Arsenic (As)	mg/L	1.9	0.0170	0.0402	0.0039	0.0167	0.0006	0.0233	0.0012	0.0955	
Total Barium (Ba)	mg/L	29	0.413	0.650	0.163	0.453	0.035	0.458	0.158	0.678	
Total Beryllium (Be)	mg/L	0.067	0.00020	0.00016	<0.00005	<0.00020	<0.00005	<0.00020	<0.00005	0.00030	
Total Cadmium (Cd)	mg/L	0.0027	0.000356	0.000263	<0.000025	0.000120	<0.000025	0.000470	<0.000025	0.001220	
Total Calcium (Ca)	mg/L		95.0	282	224	193	36.8	84.2	90.3	693	
Total Chromium (Cr)	mg/L	0.81	0.0949	0.1030	0.0016	0.0566	<0.0005	0.1430	0.0009	0.1790	
Total Chromium (Hexavalent)	mg/L	0.14	<0.010	0.0130	<0.001	<0.010	0.0014	<0.050	0.0020	0.0560	
Total Copper (Cu)	mg/L	0.087	0.0319	0.0174	0.0031	0.0027	0.0011	0.0163	0.0038	0.0258	
Total Iron (Fe)	mg/L		18.3	7.62	14.6	1.97	0.534	5.61	0.501	101	
Total Lead (Pb)	mg/L	0.025	0.01600	0.00834	0.00028	0.00428	0.00013	0.02750	0.00029	0.02380	
Total Magnesium (Mg)	mg/L		271	425	248	500	23.9	254	76.4	836	
Total Manganese (Mn)	mg/L		0.218	0.483	2.00	0.263	0.045	0.126	0.220	3.30	
Total Mercury (Hg)	mg/L	0.0028	0.000033	0.000020	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.000065	
Total Nickel (Ni)	mg/L	0.49	0.2020	0.2200	0.0106	0.2010	0.0018	0.2200	0.0065	0.3710	
Total Potassium (K)	mg/L		367	250	20.4	597	6.20	511	44.8	541	
Dissolved Selenium (Se)	mg/L	0.063	0.00166	0.00222	0.00089	0.00134	0.00013	0.00148	0.00026	0.00160	
Total Silver (Ag)	mg/L	0.0015	0.00022	0.00014	<0.00005	<0.00002	<0.00005	<0.00002	<0.00005	<0.0002	
Total Sodium (Na)	mg/L	2,300	912	1,150	130	1,530	23.2	1,025	73.5	1,840	
Total Zinc (Zn)	mg/L	1.1	0.358	0.869	0.019	0.047	<0.005	0.129	0.012	2.19	
<b>Extractables</b>											
Benzo (a) Pyrene (PAH)	mg/L	0.00081	<0.00080	<0.00080	0.00008	0.00090	0.00001	0.00017	<0.00020	<0.00001	
Anthracene	mg/L	0.0024	0.00090	0.00420	0.00062	<0.00020	0.00016	0.00098	<0.00020	<0.00005	
3'3' Dichlorobenzidine	mg/L		<0.003	0.008	<0.003	<0.008	<0.003	<0.30	<0.0008	<0.020	
4'4' Methylenebis 2 Chloroaniline	mg/L		<5.0	<5.0	<0.50	<5.0	<0.50	<5.0	<0.50	<5.0	
Benzo (a) anthracene (PAH)	mg/L	0.0047	<0.0080	0.00170	0.00028	0.00070	<0.00005	0.00028	<0.00020	<0.00005	
Benzo (b/j) fluoroanthene (PAH)	mg/L		<0.00080	<0.00080	0.00016	0.00240	<0.00005	0.00040	<0.00020	<0.00005	
Benzo (g,h,i) Perylene (PAH)	mg/L	0.0002	<0.00080	<0.00080	<0.00005	0.00120	<0.00005	0.00044	<0.00020	<0.00005	
1,3-Dinitropyrene	mg/L		<0.0020	<0.0020	<0.0020	<0.0004	<0.0020	<0.20	<0.00040	<0.0080	
1,6-Dinitropyrene	mg/L		<0.0020	<0.0020	<0.0020	<0.0004	<0.0020	<0.20	<0.00040	<0.0080	
1,8-Dinitropyrene	mg/L		<0.0020	<0.0020	<0.0020	<0.0004	<0.0020	<0.20	<0.00040	<0.0080	
Hexachlorobenzene	ug/L	3.1	<0.050	<0.050	<0.005	<0.050	<0.050	<0.30	<0.050	<0.050	
Octachlorostyrene	ug/L		<0.050	<0.050	<0.005	<0.050	<0.050	<0.30	<0.050	<0.050	
Pentachlorophenol	mg/L		<0.020	<0.004	<0.020	<0.001	<0.008	<0.40	<0.002	<0.020	
Perylene	mg/L		<0.0008	<0.0008	<0.0008	0.0003	<0.0008	<0.080	<0.0002	<0.0040	
Phenanthrene	mg/L	0.58	0.0008	0.0094	0.0013	<0.0002	0.0012	0.0035	<0.0002	<0.00003	
Phenol	mg/L	12	0.230	0.230	0.014	0.033	0.0054	1.50	0.0045	3.40	
Toxaphene	ug/L		<2.0	<2.0	<0.2	<2.0	<2.0	<10	<0.20	<2.0	

Note: Criteria from Ontario Ministry of the Environment. (2009, July 27). Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition

\* Criteria for total chloride and total metals

\*\*nr - no result due to interference



Table 8. 2017 Leachate Monitoring

			LQ25-MH3	LQ25-MH8	LQ25-MH13	LQ25-MH24	LQ25-MH27	LQ25-MH31	LQ25-MH34	RISER 1	Composite
Sampling Date	Units	Criteria*	September-17	September-17	September-17	September-17	September-17	September-17	September-17	September-17	September-17
<b>Petroleum Hydrocarbons</b>											
CCME Petroleum Hydrocarbon Fraction	ug/L	750	340	210	<50	29	<25	130	<25	2,500	
CCME Petroleum Hydrocarbon Fraction	ug/L	150	410	260	140	450	<100	8,900**	<100	250	
CCME Petroleum Hydrocarbon Fraction	ug/L	500	370	<200	330	1,800	<200	86,000**	<200	<200	
CCME Petroleum Hydrocarbon Fraction	ug/L	500	<200	<200	<200	<200	<200	10,000**	<200	<200	
<b>Volatile Organic Carbons</b>											
BTEX	ug/L		<25	49	<50	<25	<25	89	<25	2,300	
Vinyl Chloride	ug/L	1.7	<10	<10	<1.0	<5.0	<0.2	<5.0	<0.2	<40	
1,4 Dichlorobenzene	ug/L	67	<10	<10	8.4	5.1	0.22	<5.0	<0.2	<40	
Chloroform	ug/L	22	<5.0	<5.0	<0.5	<2.5	<0.1	<2.5	<0.1	<20	
Trichloroethylene	ug/L	17	<5.0	<5.0	<0.5	<2.5	<0.1	<2.5	<0.1	<20	
Tetrachloroethylene	ug/L	17	<5.0	<5.0	<0.5	<2.5	<0.1	<2.5	<0.1	<20	
<b>Dioxins and Furans</b>											
2378 TeCDD	pg/L	14,000									<1.18
12378 PeCDD	pg/L	14,000									<1.27
123478 HxCDD	pg/L	14,000									<1.23
123678 HxCDD	pg/L	14,000									5.17
123789 HxCDD	pg/L	14,000									2.87
1234678 HpCDD	pg/L	14,000									178
OCDD	pg/L	14,000									1720
Total TCDDs	pg/L	14,000									11.0
Total PeCDD	pg/L	14,000									4.53
Total HxCDD	pg/L	14,000									58.6
Total HpCDD	pg/L	14,000									397
2378 TeCDF	pg/L	14,000									2.18
12378 PeCDF	pg/L	14,000									<1.36
23478 PeCDF	pg/L	14,000									<1.34
123478 HxCDF	pg/L	14,000									2.69
123678 HxCDF	pg/L	14,000									<1.44
123789 HxCDF	pg/L	14,000									<1.24
234678 HxCDF	pg/L	14,000									<1.26
1234678 HpCDF	pg/L	14,000									<23.7
1234789 HpCDF	pg/L	14,000									<1.84
OCDF	pg/L	14,000									52.6
Total TCDF	pg/L	14,000									3.93
Total PeCDF	pg/L	14,000									2.89
Total HxCDF	pg/L	14,000									29.2
Total HpCDF	pg/L	14,000									41.3
<b>Polychlorinated Biphenyls</b>											
Aroclor 1016	mg/L		<0.0005	<0.0005	<0.00005	<0.0005	<0.0005	<0.003	<0.0005	<0.0005	
Aroclor 1221	mg/L		<0.0005	<0.0005	<0.0001	<0.0005	<0.0005	<0.003	<0.0005	<0.0005	
Aroclor 1232	mg/L		<0.0005	<0.0005	<0.00005	<0.0005	<0.0005	<0.003	<0.0005	<0.0005	
Aroclor 1242	mg/L		<0.0005	<0.0005	<0.00005	<0.0005	<0.0005	<0.003	<0.0005	<0.0005	
Aroclor 1248	mg/L		<0.0005	<0.0005	<0.00005	<0.0005	<0.0005	<0.003	<0.0005	<0.0005	
Aroclor 1254	mg/L		<0.0005	<0.0005	<0.00005	<0.0005	<0.0005	<0.003	<0.0005	<0.0005	
Aroclor 1260	mg/L		<0.0005	<0.0005	<0.00005	<0.0005	<0.0005	<0.003	<0.0005	<0.0005	
Total PCBs	mg/L	0.015	<0.0005	<0.0005	<0.0001	<0.0005	<0.0005	<0.003	<0.00005	<0.00005	
<b>Pesticides and Herbicides</b>											
Diazinon	ug/L		<8.0	<8.0	<8.0	<8.0	<2.0	<320	<8.0	<8.0	
2, 4-D	ug/L		<10	<10	<1.0	<10	<1.0	<1000	<1.0	<10	
Aldrin	ug/L	8.5	<0.05	<0.05	<0.005	<0.05	<0.05	<0.30	<0.05	<0.05	
Chlordane	ug/L	28	<0.05	<0.05	<0.005	<0.07	<0.05	<0.40	<0.05	<0.07	
Hexachlorocyclohexane (Lindane)	ug/L	1.2	<0.03	<0.03	<0.003	<0.03	<0.03	<0.20	<0.03	<0.03	
MCPA	ug/L		<20	<20	<2.0	<20	<2.0	<2000	<2.0	<20	
Mirex	ug/L		<0.05	<0.05	<0.005	<0.05	<0.05	<0.30	<0.05	<0.05	
Methoxychlor	ug/L	6.5	<0.10	<0.10	<0.01	<0.10	<0.10	<0.70	<0.10	<0.10	
DDT	ug/L	2.8	<0.05	<0.05	<0.005	<0.05	<0.05	<0.30	<0.05	<0.05	
<b>Bacteria</b>											
Total Coliforms	MPN/100mL		>11,000	>11,000	4,600	11,000	75	11,000	160	430	
Fecal Coliforms	MPN/100mL		93	430	15	1,200	23	160	9	15	
E. coli	MPN/100mL		43	230	15	1,200	23	11	9	15	

Note: Criteria from Ontario Ministry of the Environment. (2009, July 27). Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition

\* Criteria for total chloride and total metals

\*\* Pump malfunction allowed hydraulic fluid to leak into manhole



Table 9. 2017 Leachate Quality Comparison

			2014	2015	2016	2017
			Average	Average	Average	Average
Sampling Date	Units	Criteria*				
<b>Field Parameters</b>						
pH	units		na**	6.98	7.41	7.63
Turbidity - NTU	ntu		na**	21.4	37.9	119
Specific Conductivity	uS/cm		na**	6,493	4,278	9,046
<b>Inorganic Parameters</b>						
Alkalinity - Bicarbonate	mg/L		5,363	2,937	4,276	4,479
Alkalinity - Carbonate	mg/L		191	<5.0	130	<5.0
Alkalinity - Hydroxide	mg/L		<5.0	<5.0	<5.0	<5.0
Alkalinity - Total	mg/L		4,713	2,406	3,720	3,672
Hardness (as CaCO3)	mg/L		2,526	1,575	1,708	1,966
pH - units	units		7.29	7.57	7.24	7.35
Specific Conductivity	uS/cm		13,031	6,776	10,604	10,494
Turbidity - NTU	ntu		257	108	193	128
Total Dissolved Solids	mg/L		8,493	4,584	6,057	5,864
Total Suspended Solids	mg/L		1,327	245	13,543	579
Chloride (dissolved)	mg/L	2300	1,757	744	1,060	1,222
Sulphate (dissolved)	mg/L		45.8	128	115	273
<b>Other</b>						
Cyanide (CN)	mg/L	0.066	0.0128	0.0103	0.0104	0.0080
<b>Nutrients</b>						
Dissolved Ammonia	mg/L		342	250	570	504
Nitrate Nitrite Nitrogen	mg/L		0.237	0.159	0.310	1.35
Total Kjeldhal Nitrogen	mg/L		750.6	304.1	275.8	621.2
Phosphorus (Total)	mg/L		4.37	1.87	3.32	3.29
<b>Organic Indicators</b>						
Biological Oxygen Demand	mg/L		229	64.3	583	726
Chemical Oxygen Demand	mg/L		1,610	902	1,140	2,540
<b>Metals</b>						
Total Arsenic (As)	mg/L	1.9	0.0149	0.0115	0.0139	0.0248
Total Barium (Ba)	mg/L	29	0.720	0.401	0.372	0.376
Total Beryllium (Be)	mg/L	0.067	<0.00010	0.03126	0.00014	0.00012
Total Cadmium (Cd)	mg/L	0.0027	0.000320	0.000195	0.000307	0.000308
Total Calcium (Ca)	mg/L		237	129	147	212
Total Chromium (Cr)	mg/L	0.81	0.0671	0.0315	0.0635	0.0724
Total Chromium (Hexavalent)	mg/L		<0.0050	<0.0010	0.0050	0.0135
Total Copper (Cu)	mg/L	0.087	0.0068	0.0080	0.0084	0.0128
Total Iron (Fe)	mg/L		19.8	10.7	6.80	18.8
Total Lead (Pb)	mg/L	0.025	0.01682	0.00718	0.01072	0.01008
Total Magnesium (Mg)	mg/L		469	248	279	329
Total Manganese (Mn)	mg/L		0.492	1.018	0.437	0.832
Total Mercury (Hg)	mg/L	0.0028	<0.000002	0.000004	0.000002	0.000021
Total Nickel (Ni)	mg/L	0.49	0.1713	0.1222	0.1546	0.1541
Total Potassium (K)	mg/L		494	254	314	292
Dissolved Selenium (Se)	mg/L	0.063	0.00094	0.1733	0.0009	0.0012
Total Silver (Ag)	mg/L	0.0015	0.000102	0.000095	0.00015	0.00009
Total Sodium (Na)	mg/L	2,300	1,352	598	824	835
Total Zinc (Zn)	mg/L	1.1	0.5891	0.0545	1.18	0.4530
<b>Extractables</b>						
Benzo (a) Pyrene (PAH)	mg/L	0.00081	0.00008	0.0138	0.0008	0.0003
Anthracene	mg/L	0.0024	0.00038	0.0138	0.00105	0.00089
3'3' Dichlorobenzidine	mg/L		na**	na**	<0.080	0.0221
4'4' Methylenebis 2 Chloroaniline	mg/L		na**	na**	na**	<50
Benzo (a) anthracene (PAH)	mg/L	0.0047	0.00022	0.0138	0.0012	0.0009
Benzo (b) fluoroanthene (PAH)	mg/L		0.00016	<0.050	0.0014	0.0005
Benzo (g,h,i) Perylene (PAH)	mg/L	0.0002	0.00010	0.0138	0.0007	0.0003
1,3-Dinitropyrene	mg/L		na**	na**	<0.040	<0.20
1,6-Dinitropyrene	mg/L		na**	na**	<0.040	<0.20
1,8-Dinitropyrene	mg/L		na**	na**	<0.040	<0.20
Hexachlorobenzene	ug/L	3.1	<0.050	<0.050	<0.050	<0.30
Octachlorostyrene	ug/L		<0.050	<0.050	<0.050	<0.30
Pentachlorophenol	mg/L		na**	na**	<0.010	<0.40
Perylene	mg/L		na**	na**	<0.0020	0.0055
Phenanthrene	mg/L	0.58	0.00161	0.00062	0.0037	0.0021
Phenol	mg/L	12	0.389	0.221	0.391	0.677
Toxaphene	ug/L		<2.0	<2.0	0.25	<10

Note: Criteria from Ontario Ministry of the Environment. (2009, July 27). Soil, Ground Water and Sediment Standards for Use Under Part XV.I of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition

\* Criteria for total chloride and total metals

\*\*na - not analysed for this parameter



Table 9. 2017 Leachate Quality Comparison

			2014	2015	2016	2017
			Average	Average	Average	Average
Sampling Date	Units	Criteria*				
<b>Petroleum Hydrocarbons</b>						
CCME Petroleum Hydrocarbon Fraction	ug/L	750	3,881	186	111	447**
CCME Petroleum Hydrocarbon Fraction	ug/L	150	566	<100	171	230**
CCME Petroleum Hydrocarbon Fraction	ug/L	500	11,129	<200	<200	414**
CCME Petroleum Hydrocarbon Fraction	ug/L	500	1,561	<200	<200	<200**
<b>Volatile Organic Carbons</b>						
BTEX	ug/L		3,529	76	26	314
Vinyl Chloride	ug/L	1.7	4.64	1.84	<40	<40
1,4 Dichlorobenzene	ug/L	67	5.5	2.44	5.1	5.8
Chloroform	ug/L	22	<10	<5.0	<20	<20
Trichloroethylene	ug/L	17	<10	<5.0	<20	<20
Tetrachloroethylene	ug/L	17	<10	<5.0	<20	<20
<b>Dioxins and Furans</b>						
2378 TeCDD	pg/L	14,000	na***	<1.25	<1.48	<1.18
12378 PeCDD	pg/L	14,000	na***	<1.53	<2.22	<1.27
123478 HxCDD	pg/L	14,000	na***	<1.53	3.49	<1.23
123678 HxCDD	pg/L	14,000	na***	4.5	21.2	5.2
123789 HxCDD	pg/L	14,000	na***	2.2	13.1	2.9
1234678 HpCDD	pg/L	14,000	na***	95	538	178
OCDD	pg/L	14,000	na***	953	7,220	1,720
Total TCDDs	pg/L	14,000	na***	<1.4	25.6	11.0
Total PeCDD	pg/L	14,000	na***	<1.53	16.3	4.5
Total HxCDD	pg/L	14,000	na***	42	166	59
Total HpCDD	pg/L	14,000	na***	197	1,110	397
2378 TeCDF	pg/L	14,000	na***	1.29	5.59	2.18
12378 PeCDF	pg/L	14,000	na***	<1.31	<1.34	<1.36
23478 PeCDF	pg/L	14,000	na***	<1.32	<1.61	<1.34
123478 HxCDF	pg/L	14,000	na***	1.47	8.39	2.69
123678 HxCDF	pg/L	14,000	na***	<1.19	4.86	<1.44
123789 HxCDF	pg/L	14,000	na***	<1.26	<1.81	<1.24
234678 HxCDF	pg/L	14,000	na***	<1.37	5.61	<1.26
1234678 HpCDF	pg/L	14,000	na***	<17.4	124	<23.7
1234789 HpCDF	pg/L	14,000	na***	<1.39	7.09	<1.84
OCDF	pg/L	14,000	na***	54	407	53
Total TCDF	pg/L	14,000	na***	1.3	30.4	3.9
Total PeCDF	pg/L	14,000	na***	<1.31	22.8	2.9
Total HxCDF	pg/L	14,000	na***	22	129	29
Total HpCDF	pg/L	14,000	na***	33	379	41
<b>Polychlorinated Biphenyls</b>						
Aroclor 1016	mg/L		<0.0005	<0.0005	<0.0005	<0.0005
Aroclor 1221	mg/L		<0.0005	<0.0005	<0.0005	<0.0005
Aroclor 1232	mg/L		<0.0005	<0.0005	<0.0005	<0.0005
Aroclor 1242	mg/L		0.00057	<0.0005	0.00011	<0.0005
Aroclor 1248	mg/L		<0.0005	<0.0005	<0.0005	<0.0005
Aroclor 1254	mg/L		0.00023	<0.0005	0.00009	<0.0005
Aroclor 1260	mg/L		<0.0005	<0.0005	0.00010	<0.0005
Total PCBs	mg/L	0.015	0.00058	<0.0005	0.00010	<0.0030
<b>Pesticides and Herbicides</b>						
Diazinon	ug/L		na***	<40	<10	<320
2, 4-D	ug/L		<8	<20	<2000	<1000
Aldrin	ug/L	8.5	<0.05	<0.05	<0.05	<0.30
Chlordane	ug/L	28	<0.05	<0.05	<0.05	<0.40
Hexachlorocyclohexane (Lindane)	ug/L	1.2	<0.03	<0.03	<0.03	<0.20
MCPA	ug/L		<40	<40	<4000	<2000
Mirex	ug/L		<0.20	<0.20	<0.05	<0.30
Methoxychlor	ug/L	6.5	<0.10	<0.10	<0.10	<0.70
DDT	ug/L	2.8	<0.05	<0.05	<0.05	<0.30
<b>Bacteria</b>						
Total Coliforms	MPN/100mL		3,130	141,751	4,859	6,158
Fecal Coliforms	MPN/100mL		1,718	144,943	323	243
E. coli	MPN/100mL		186	139,665	322	193

Note: Criteria from Ontario Ministry of the Environment. (2009, July 27). Soil, Ground Water and Sediment Standards for Use Under Part XV.I of the Environmental Protection Act Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition

\* Criteria for total chloride and total metals

\*\* Manhole 31 results not included in average due to pump malfunction

\*\*\* na - Not analysed for this parameter



## **5.4 LANDFILL GAS**

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### **5.4.1 COLLECTION AND FLARING SYSTEM**

The landfill gas collection and flaring system is run by Integrated Gas Recovery Systems Inc. on behalf of the City of Winnipeg.

As per the BRRMF Operating Plan, landfill gas operations and monitoring are managed through the Landfill Gas Operating Plan, submitted October 23, 2014, as per Clause 110. The Landfill Gas Operating Plan states that if the flare is operating as per the manufacturer's recommendations, the required particulate matter limits listed in Clause 108 will be met. If the flare is not operating as designed, the system will shut down, and corrective action will be taken.

In 2017, the BRRMF Gas Collection and Flaring System operated as intended. In 2017, twenty-two additional collection wells were added to our landfill gas collection system for a total of seventy-seven collection wells.

The 2017 Landfill Gas Collection and Flaring Report, prepared by Integrated Gas Recovery Services Inc., is attached in Appendix F.

### **5.4.2 SUBSURFACE LANDFILL GAS MONITORING PROGRAM**

Landfill gas that is not collected or that cannot escape into the atmosphere may migrate into neighbouring land below the ground surface. The purpose of landfill gas migration monitoring is to detect gas migration before it becomes a safety hazard to neighbouring properties.

As per the BRRMF Operating Plan, subsurface landfill gas migration is managed in accordance with the Subsurface Landfill Gas Monitoring Program, submitted on October 23, 2014, as specified under Clause 111. Probes are monitored monthly for methane, oxygen, carbon monoxide, and hydrogen sulphide.

The monitoring program states that the Subsurface Landfill Gas Contingency Plan will be activated if >1% methane is measured at any probe. In 2017, the contingency plan was not activated, indicating that the collection and flaring system is operating effectively.

The 2017 subsurface gas migration probe data is provided in Table 10.



Table 10. 2017 External Gas Probe Monitoring

Well No.	Date	CH4	O2	CO	H2S
		% LEL	(%)	PPM	PPM
1	17-Jan-17	0.0	20.9	0.0	0.0
1	16-Feb-17	0.0	20.9	0.0	0.0
1	15-Mar-17	0.0	21.1	0.0	0.0
1	24-Apr-17	0.0	22.5	0.0	0.0
1	19-May-17	0.0	20.3	0.0	0.0
1	15-Jun-17	0.0	21.5	0.0	0.0
1	17-Jul-17	0.0	20.9	1.0	0.0
1	14-Aug-17	0.0	20.1	0.0	0.0
1	12-Sep-17	0.0	20.6	1.0	0.0
1	3-Oct-17	0.0	20.9	0.0	0.0
1	24-Nov-17	0.0	20.5	0.0	0.0
1	7-Dec-17	0.4	21.2	0.0	0.0
2	17-Jan-17	0.0	20.9	0.0	0.0
2	16-Feb-17	0.0	21.8	0.0	0.0
2	15-Mar-17	0.0	22.8	0.0	0.0
2	24-Apr-17	0.0	22.5	0.0	0.0
2	19-May-17	0.0	21.3	0.0	0.0
2	15-Jun-17	0.0	21.5	0.0	0.0
2	17-Jul-17	0.0	20.8	0.0	0.0
2	14-Aug-17	0.0	20.3	0.0	0.0
2	12-Sep-17	0.0	20.6	1.0	0.0
2	3-Oct-17	0.0	21.2	1.0	0.0
2	24-Nov-17	0.0	20.5	0.0	0.0
2	7-Dec-17	0.4	21.8	0.0	0.0
3	17-Jan-17	0.0	23.9	0.0	0.0
3	15-Feb-17	0.0	22.3	0.0	0.0
3	15-Mar-17	0.0	23.1	0.0	0.0
3	24-Apr-17	0.0	22.4	0.0	0.0
3	19-May-17	0.0	20.8	1.0	0.0
3	15-Jun-17	0.0	21.5	0.0	0.0
3	17-Jul-17	0.1	20.8	0.0	0.0
3	14-Aug-17	0.0	20.7	0.0	0.0
3	12-Sep-17	0.0	20.4	1.0	0.0
3	4-Oct-17	0.0	21.1	0.0	0.0
3	24-Nov-17	0.0	20.9	0.0	0.0
3	7-Dec-17	0.4	22.3	0.0	0.0



Table 10. 2017 External Gas Probe  
Monitoring

Well No.	Date	CH4	O2	CO	H2S
		% LEL	(%)	PPM	PPM
4	17-Jan-17	0.0	24.3	0.0	0.0
4	15-Feb-17	0.0	22.2	0.0	0.0
4	17-Mar-17	0.0	22.3	0.0	0.0
4	24-Apr-17	0.0	22.6	0.0	0.0
4	19-May-17	0.0	22.0	1.0	0.0
4	15-Jun-17	0.0	21.5	0.0	0.0
4	17-Jul-17	0.0	20.1	1.0	0.0
4	14-Aug-17	0.0	20.7	0.0	0.0
4	12-Sep-17	0.0	20.5	1.0	0.0
4	4-Oct-17	0.0	21.1	1.0	0.0
4	24-Nov-17	0.0	20.5	0.0	0.0
4	7-Dec-17	0.4	22.4	0.0	0.0
5	17-Jan-17	0.0	20.5	0.0	0.0
5	15-Feb-17	0.0	21.7	0.0	0.0
5	17-Mar-17	0.0	22.2	0.0	0.0
5	24-Apr-17	0.0	21.9	0.0	0.0
5	19-May-17	0.0	20.7	1.0	0.0
5	15-Jun-17	0.0	21.5	0.0	0.0
5	17-Jul-17	0.0	20.9	0.0	0.0
5	14-Aug-17	0.0	20.3	0.0	0.0
5	12-Sep-17	0.0	20.5	1.0	0.0
5	4-Oct-17	0.0	21.1	0.0	0.0
5	24-Nov-17	0.0	20.4	0.0	0.0
5	7-Dec-17	0.4	22.5	0.0	0.0
6	16-Jan-17	0.0	23.5	0.0	0.0
6	15-Feb-17	0.0	22.1	0.0	0.0
6	17-Mar-17	0.0	23.1	0.0	0.0
6	24-Apr-17	0.0	22.3	0.0	0.0
6	18-May-17	0.0	20.3	1.0	0.0
6	15-Jun-17	0.0	21.5	0.0	0.0
6	17-Jul-17	0.0	20.8	0.0	0.0
6	14-Aug-17	0.0	20.9	0.0	0.0
6	12-Sep-17	0.0	20.6	1.0	0.0
6	3-Oct-17	0.0	21.9	0.0	0.0
6	21-Nov-17	0.4	20.8	0.0	0.0
6	7-Dec-17	0.4	20.0	0.0	0.0



Table 10. 2017 External Gas Probe  
Monitoring

Well No.	Date	CH4	O2	CO	H2S
		% LEL	(%)	PPM	PPM
7	16-Jan-17	0.0	23.1	0.0	0.0
7	15-Feb-17	0.0	22.3	0.0	0.0
7	17-Mar-17	0.0	22.2	0.0	0.0
7	24-Apr-17	0.0	20.9	0.0	0.0
7	18-May-17	0.0	20.1	1.0	0.0
7	15-Jun-17	0.0	21.5	0.0	0.0
7	17-Jul-17	0.0	20.8	2.0	0.0
7	21-Aug-17	0.0	20.8	0.0	0.0
7	12-Sep-17	0.0	20.5	1.0	0.0
7	3-Oct-17	0.0	21.8	0.0	0.0
7	21-Nov-17	0.4	21.8	0.0	0.0
7	7-Dec-17	0.4	21.9	0.0	0.0
8	16-Jan-17	0.0	22.6	0.0	0.0
8	15-Feb-17	0.0	22.3	0.0	0.0
8	17-Mar-17	0.0	21.7	0.0	0.0
8	24-Apr-17	0.0	21.8	0.0	0.0
8	18-May-17	0.0	20.8	1.0	0.0
8	15-Jun-17	0.0	21.5	0.0	0.0
8	17-Jul-17	0.0	20.9	0.0	0.0
8	21-Aug-17	0.0	20.8	0.0	0.0
8	12-Sep-17	0.0	20.0	1.0	0.0
8	3-Oct-17	0.0	21.4	0.0	0.0
8	21-Nov-17	0.4	21.7	0.0	0.0
8	7-Dec-17	0.4	21.6	0.0	0.0
9	16-Jan-17	0.0	22.3	0.0	0.0
9	15-Feb-17	0.0	22.1	0.0	0.0
9	17-Mar-17	0.0	21.5	0.0	0.0
9	24-Apr-17	0.0	21.8	0.0	0.0
9	18-May-17	0.0	20.9	1.0	0.0
9	15-Jun-17	0.0	21.5	0.0	0.0
9	17-Jul-17	0.0	20.9	0.0	0.0
9	21-Aug-17	0.0	20.8	0.0	0.0
9	12-Sep-17	0.0	20.7	1.0	0.0
9	3-Oct-17	0.0	21.1	0.0	0.0
9	21-Nov-17	0.4	21.0	0.0	0.0
9	7-Dec-17	0.3	20.1	0.0	0.0



Table 10. 2017 External Gas Probe Monitoring

Well No.	Date	CH4	O2	CO	H2S
		% LEL	(%)	PPM	PPM
10	16-Jan-17	0.0	22.4	0.0	0.0
10	15-Feb-17	0.0	21.4	0.0	0.0
10	17-Mar-17	0.0	21.1	0.0	0.0
10	24-Apr-17	0.0	21.9	0.0	0.0
10	18-May-17	0.0	21.0	0.0	0.0
10	15-Jun-17	0.0	21.5	0.0	0.0
10	17-Jul-17	0.0	19.6	0.0	0.0
10	14-Aug-17	0.0	21.3	0.0	0.0
10	12-Sep-17	0.0	20.6	1.0	0.0
10	3-Oct-17	0.0	21.6	0.0	0.0
10	21-Nov-17	0.4	20.8	0.0	0.0
10	7-Dec-17	0.4	21.4	0.0	0.0
P28E	17-Jan-17	0.0	20.9	0.0	0.0
P28E	15-Feb-17	0.0	23.1	0.0	0.0
P28E	17-Mar-17	0.0	22.2	0.0	0.0
P28E	24-Apr-17	0.0	21.6	0.0	0.0
P28E	18-May-17	0.0	20.3	0.0	0.0
P28E	15-Jun-17	0.0	21.5	0.0	0.0
P28E	17-Jul-17	0.0	20.5	1.0	0.0
P28E	21-Aug-17	0.0	20.8	0.0	0.0
P28E	12-Sep-17	0.0	20.3	1.0	0.0
P28E	3-Oct-17	0.0	19.8	1.0	0.0
P28E	20-Nov-17	0.0	20.9	0.0	0.0
P28E	8-Dec-17	0.4	20.8	0.0	0.0
P30E	17-Jan-17	0.0	22.4	0.0	0.0
P30E	15-Feb-17	0.0	22.3	0.0	0.0
P30E	17-Mar-17	0.0	23.1	0.0	0.0
P30E	24-Apr-17	0.0	22.8	0.0	0.0
P30E	18-May-17	0.0	20.8	0.0	0.0
P30E	15-Jun-17	0.0	21.5	0.0	0.0
P30E	17-Jul-17	0.0	20.7	1.0	0.0
P30E	21-Aug-17	0.0	21.6	0.0	0.0
P30E	12-Sep-17	0.0	20.3	1.0	0.0
P30E	3-Oct-17	0.0	22.3	1.0	0.0
P30E	20-Nov-17	0.0	21.5	1.0	0.0
P30E	7-Dec-17	0.4	22.2	0.0	0.0



Table 10. 2017 External Gas Probe  
Monitoring

Well No.	Date	CH4	O2	CO	H2S
		% LEL	(%)	PPM	PPM
P34E	17-Jan-17	0.0	20.6	0.0	0.0
P34E	15-Feb-17	0.0	21.9	0.0	0.0
P34E	17-Mar-17	0.0	23.1	0.0	0.0
P34E	24-Apr-17	0.0	22.3	0.0	0.0
P34E	18-May-17	0.0	20.6	1.0	0.0
P34E	15-Jun-17	0.0	21.5	0.0	0.0
P34E	17-Jul-17	0.0	20.9	0.0	0.0
P34E	21-Aug-17	0.0	21.6	0.0	0.0
P34E	12-Sep-17	0.0	20.7	0.0	0.0
P34E	3-Oct-17	0.0	18.9	0.0	0.0
P34E	20-Nov-17	0.0	20.6	0.0	0.0
P34E	8-Dec-17	0.4	22.4	0.0	0.0
P106E	16-Jan-17	0.0	19.4	1.0	0.0
P106E	15-Feb-17	0.0	20.9	0.0	0.0
P106E	15-Mar-17	0.0	20.9	0.0	0.0
P106E	24-Apr-17	0.0	21.2	1.0	0.0
P106E	19-May-17	0.0	21.3	1.0	0.0
P106E	15-Jun-17	0.1	21.2	0.0	0.0
P106E	17-Jul-17	0.0	20.9	0.0	0.0
P106E	14-Aug-17	0.0	20.9	0.0	0.0
P106E	12-Sep-17	0.0	20.6	0.0	0.0
P106E	3-Oct-17	0.0	20.6	0.0	0.0
P106E	20-Nov-17	0.0	20.7	0.0	0.0
P106E	7-Dec-17	0.0	20.8	0.0	0.0
P107E	16-Jan-17	0.0	22.4	0.0	0.0
P107E	15-Feb-17	0.0	21.7	0.0	0.0
P107E	15-Mar-17	0.0	20.9	0.0	0.0
P107E	24-Apr-17	0.0	21.2	0.0	0.0
P107E	19-May-17	0.0	21.1	0.0	0.0
P107E	15-Jun-17	0.0	21.2	0.0	0.0
P107E	17-Jul-17	0.0	20.9	0.0	0.0
P107E	14-Aug-17	0.0	20.7	0.0	0.0
P107E	12-Sep-17	0.0	20.4	1.0	0.0
P107E	3-Oct-17	0.0	20.5	0.0	0.0
P107E	20-Nov-17	0.0	17.2	0.0	0.0
P107E	7-Dec-17	0.4	20.4	0.0	0.0



Table 10. 2017 External Gas Probe  
Monitoring

Well No.	Date	CH4	O2	CO	H2S
		% LEL	(%)	PPM	PPM
P108E	16-Jan-17	0.0	22.8	0.0	0.0
P108E	15-Feb-17	0.0	22.1	0.0	0.0
P108E	15-Mar-17	0.0	22.2	0.0	0.0
P108E	24-Apr-17	0.0	21.4	0.0	0.0
P108E	19-May-17	0.0	20.9	0.0	0.0
P108E	15-Jun-17	0.0	21.1	0.0	0.0
P108E	17-Jul-17	0.0	20.9	0.0	0.0
P108E	14-Aug-17	0.0	20.6	0.0	0.0
P108E	12-Sep-17	0.0	20.4	2.0	0.0
P108E	3-Oct-17	0.0	20.5	1.0	0.0
P108E	20-Nov-17	0.0	21.0	0.0	0.0
P108E	7-Dec-17	0.4	21.2	0.0	0.0
P109E	16-Jan-17	0.0	22.8	0.0	0.0
P109E	15-Feb-17	0.0	22.1	0.0	0.0
P109E	15-Mar-17	0.0	20.9	0.0	0.0
P109E	24-Apr-17	0.0	21.3	0.0	0.0
P109E	19-May-17	0.0	20.8	0.0	0.0
P109E	15-Jun-17	0.0	21.1	0.0	0.0
P109E	17-Jul-17	0.0	20.9	0.0	0.0
P109E	14-Aug-17	0.0	20.7	0.0	0.0
P109E	12-Sep-17	0.0	20.4	2.0	0.0
P109E	3-Oct-17	0.0	20.3	1.0	0.0
P109E	20-Nov-17	0.0	21.4	0.0	0.0
P109E	7-Dec-17	could not open needs new lock			
P110E	16-Jan-17	0.0	21.9	1.0	0.0
P110E	15-Feb-17	0.0	21.9	0.0	0.0
P110E	15-Mar-17	0.0	22.1	0.0	0.0
P110E	24-Apr-17	0.0	21.4	0.0	0.0
P110E	19-May-17	0.0	20.8	0.0	0.0
P110E	15-Jun-17	0.0	21.1	0.0	0.0
P110E	17-Jul-17	0.0	20.9	0.0	0.0
P110E	14-Aug-17	0.0	20.7	0.0	0.0
P110E	12-Sep-17	0.0	20.6	0.0	0.0
P110E	3-Oct-17	0.0	13.1	0.0	0.0
P110E	20-Nov-17	0.0	17.9	0.0	0.0
P110E	7-Dec-17	0.4	20.4	0.0	0.0



Table 10. 2017 External Gas Probe  
Monitoring

Well No.	Date	CH4	O2	CO	H2S
		% LEL	(%)	PPM	PPM
P111E	16-Jan-17	0.0	23.1	0.0	0.0
P111E	16-Feb-17	0.0	21.8	0.0	0.0
P111E	15-Mar-17	0.0	22.1	0.0	0.0
P111E	24-Apr-17	0.0	21.4	0.0	0.0
P111E	19-May-17	0.0	20.7	1.0	0.0
P111E	15-Jun-17	0.0	21.4	0.0	0.0
P111E	17-Jul-17	0.0	20.9	0.0	0.0
P111E	14-Aug-17	0.0	20.6	0.0	0.0
P111E	12-Sep-17	0.0	20.4	2.0	0.0
P111E	3-Oct-17	0.0	20.9	0.0	0.0
P111E	20-Nov-17	0.0	21.8	0.0	0.0
P111E	7-Dec-17	0.4	21.8	0.0	0.0
P112E	16-Jan-17	0.0	23.0	0.0	0.0
P112E	16-Feb-17	0.0	22.8	0.0	0.0
P112E	15-Mar-17	0.0	22.7	0.0	0.0
P112E	24-Apr-17	0.0	22.3	0.0	0.0
P112E	19-May-17	0.0	20.7	0.0	0.0
P112E	15-Jun-17	0.0	21.5	0.0	0.0
P112E	17-Jul-17	0.0	20.9	1.0	0.0
P112E	14-Aug-17	0.0	20.7	0.0	0.0
P112E	12-Sep-17	0.0	20.4	2.0	0.0
P112E	3-Oct-17	0.0	22.0	0.0	0.0
P112E	20-Nov-17	0.0	21.8	0.0	0.0
P112E	7-Dec-17	0.4	22.1	0.0	0.0



## 6.0 NUISANCE MANAGEMENT

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In order to reduce odour, litter, and vector nuisances at the landfill, several best practices and operating procedures are used, such as placement of screens, minimizing the working face of each cell, application of appropriate cover material (daily, intermediate, or final), site landscaping, weekly litter control patrols, and odour monitoring. If necessary, a licensed professional will apply vector control products to ensure that proper chemicals are used and properly handled. Noise is not a significant issue due to the separation from surrounding homes. Fugitive dust emissions are minimized by spraying site roads with uncontaminated surface water.

The landfill gas collection system was expanded by twenty-two wells in 2017; construction of the wells required open trenches, which created a temporary odour nuisance. The long term benefit of the construction is the reduction of fugitive landfill gas.

Cell 30 was used for active disposals throughout 2017 and Cell 31 was used for active disposals beginning in late December 2017. We anticipate a decrease in odour complaints because Cell 30 now has an intermediate cover, and there is an increased distance between Cell 31 and surrounding developments.

In 2017, there were 11 odour complaints from 9 customers; in all cases the source of the odour was investigated. If the source of the odour could be located within the BRRMF, we immediately covered the odour causing material, moved the tipping face to a more favorable area, and used compost or wood chips to reduce the odour and prevent further occurrence.

Table 11 provides a summary of nuisance complaints received in 2017.

## 7.0 CONCLUSION

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The diversion operations taking place at the BRRMF have been effective in diverting tens of thousands of metric tonnes of material from the landfill.

Due to the limited amount of historical data, we could not determine if there were any statistically significant increases (SSI) over background levels; we will evaluate SSI starting in 2019, once we have collected 5 years of historical data.

The BRRMF will continue to operate so as to ensure that the environment is maintained in such a manner as to sustain a high quality of life, including social and economic development, recreation and leisure for present and future Manitobans.

**APPENDIX B**  
**2017 BRRMF TONNAGE**  
**SPREADSHEET**

CITY OF WINNIPEG : Brady Road Resource Management Facility Tonnage (metric tonnes) 2017

Manually entered as not tracked in wasteworks

Material Type	WW Material	Item/Acct	January	February	March	April	May	June	July	August	September	October	November	December	Total
Domestic Collection - East Area (Zone 2) & Bulk Waste		2200	4,249.8	3,663.3	4,245.8	4,632.85	5,271.9	5,112.6	4,545.9	5,340.0	4,642.8	4.6	0.0	0.0	41,709.50
Domestic Collection - South Area (Zone 3)		2300	1,579.4	1,344.9	1,608.9	1,686.72	1,742.4	1,856.6	1,852.5	1,663.5	1,885.0	16.3	0.0	0.0	15,236.24
Domestic Collection - West Area (Zone 1B)		1508	2,124.8	1,892.0	2,245.1	2,515.27	3,055.3	3,010.2	2,816.0	3,055.5	2,664.9	131.3	19.7	10.6	23,540.57
Domestic Collection - North Area (Zone 1A)		2100	1,024.6	927.7	1,166.1	1,230.11	1,487.9	1,379.5	1,253.3	1,314.2	1,172.5	2.0	0.0	0.0	10,957.82
Domestic Collection - AREA 1-MILLER		2400										5,764.3	4,975.5	4,473.1	15,212.85
Domestic Collection - AREA 2-GFL		2500										4,910.1	4,546.1	4,009.2	13,465.44
Domestic Collection - BULKY PU-WASTE CONNECTION		3500										52.8	75.4	49.4	177.59
<b>Subtotal Single Family Collection</b>	<b>DOM REF CT</b>		<b>8,978.5</b>	<b>7,827.8</b>	<b>9,265.9</b>	<b>10,065.0</b>	<b>11,557.6</b>	<b>11,358.8</b>	<b>10,467.7</b>	<b>11,373.2</b>	<b>10,365.2</b>	<b>10,881.3</b>	<b>9,616.7</b>	<b>8,542.380</b>	<b>120,300.01</b>
BFI Northwest Apartments		1093	1,777.8	1,518.3	1,787.2	1,793.69	2,056.6	1,963.4	1,920.2	2,039.8	1,880.6	2,033.4	1,753.2	1,643.4	22,167.59
BFI Southwest (432-2007)		1504	1,248.5	1,035.5	1,197.2	1,257.47	1,431.4	1,377.3	1,266.2	1,342.3	1,300.7	1,367.2	1,246.1	1,159.0	15,228.79
BFI East Apartments		1519	1,093.4	996.2	1,114.4	1,199.30	1,356.7	1,328.0	1,264.7	1,286.9	1,292.6	1,389.1	1,125.0	1,066.9	14,513.03
<b>Subtotal Apt Collection</b>	<b>APT WT</b>		<b>4,119.7</b>	<b>3,550.0</b>	<b>4,098.8</b>	<b>4,250.5</b>	<b>4,844.6</b>	<b>4,668.6</b>	<b>4,451.2</b>	<b>4,669.1</b>	<b>4,473.9</b>	<b>4,789.6</b>	<b>4,124.3</b>	<b>3,869.21</b>	<b>51,909.41</b>
<b>Total Residential Collection</b>			<b>13,098.2</b>	<b>11,377.9</b>	<b>13,364.7</b>	<b>14,315.4</b>	<b>16,402.2</b>	<b>16,027.4</b>	<b>14,918.8</b>	<b>16,042.3</b>	<b>14,839.0</b>	<b>15,670.9</b>	<b>13,741.0</b>	<b>12,411.6</b>	<b>172,209.42</b>
City Refuse - eg. Street Cleaning	CITY REFUS	4	350.3	299.6	498.0	1,281.1	749.5	668.4	2,580.5	767.3	893.6	822.6	2,477.9	404.5	11,793.33
Construction / Demolition Waste - City	CITY CNDEM	5	38.5	81.1	17.3	0.0	164.0	86.6	84.5	27.5	2.2	42.0	7.5	50.8	601.90
Landscaping - City - trees, etc., & (DE)	TREES CITY	6	731.9	639.0	848.4	415.8	492.0	369.5	346.6	405.6	364.2	458.8	887.4	628.3	
	TREES DE 1														
	TREELFCITY														6,587.40
Grit	GRIT	7	222.1	166.3	297.0	201.4	301.2	257.4	250.5	200.8	188.3	216.5	152.1	127.6	
	SEWER-GRIT														2,581.10
Bio solids landfilled	SLUDGE		3,918.9	3,649.3	4,621.8	3,268.6	3,812.3	4,210.9	3,547.2	3,983.4	2,700.8	861.9	3,883.6	3,938.8	42,397.49
Residue from MRF	RESIDUE		504.7	398.3	530.9	258.9	316.2	418.2	483.6	564.7	556.1	634.5	673.3	740.0	6,079.25
Sweepings	SWEEP		0.0	0.0	0.0	14.6	10.0	4.0	18.1	126.1	0.2	2,345.5	20.9	0.0	2,539.40
<b>Total City Depts - Charged</b>			<b>5,766.4</b>	<b>5,233.5</b>	<b>6,813.5</b>	<b>5,440.3</b>	<b>5,845.2</b>	<b>6,015.0</b>	<b>7,310.8</b>	<b>6,075.4</b>	<b>4,705.5</b>	<b>5,381.7</b>	<b>8,102.7</b>	<b>5,890.0</b>	<b>72,579.87</b>
<b>Total Residential + City Depts</b>			<b>18,864.6</b>	<b>16,611.3</b>	<b>20,178.1</b>	<b>19,755.7</b>	<b>22,247.4</b>	<b>22,042.4</b>	<b>22,229.7</b>	<b>22,117.7</b>	<b>19,544.5</b>	<b>21,052.6</b>	<b>21,843.7</b>	<b>18,301.6</b>	<b>244,789.29</b>
Dead Animals-Charge	ANIMAL WAS	8													
Asbestos	ANIMLS-CHG		545.2	418.4	587.5	664.1	527.4	774.7	657.9	676.7	716.5	684.4	994.2	739.6	7,986.68
Charitable Organization - C / special rate	SRM	9	26.1	50.5	64.4	54.3	43.5	27.2	15.2	27.5	12.8	32.2	33.5	6.9	394.15
Commercial / Industrial - all sources	C-CHARITY	18	111.1	80.4	107.5	124.7	160.9	319.0	185.7	175.0	190.5	181.7	165.6	119.9	1,922.01
	COMM/INDUS	10	4,395.0	4,067.7	5,349.1	7,173.2	8,353.5	8,080.9	7,108.9	7,537.9	7,322.9	6,834.5	6,024.9	4,770.8	77,019.24
Commercial Flat Fee	COMM_FF		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Construction / Demolition Waste	CONST/DEM	11	458.2	212.5	149.0	141.8	244.1	446.5	359.3	511.2	359.0	1,141.9	591.7	537.7	5,152.81
Concrete - charged	CONC - CHG	12	0.0	0.0	2.3	1.5	6.2	0.9	2.6	2.3	1.2	1.1	0.0	0.0	17.94
Food waste	FOOD WASTE		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Hospital Waste	HOSP WASTE	13	0.3	0.5	1.2	0.9	0.8	0.8	1.1	1.5	0.8	0.4	0.6	0.6	9.37
	LANDSCAPE														
	TREELFCOMM														
	TREES COMM														
Landscaping - Com. - trees, etc., & (DE)	TREES DE 2	14	4.0	4.6	3.3	18.3	75.4	25.2	17.0	31.1	36.9	33.5	26.4	99.6	375.27
Sawdust - Charged	SAWDUST CH	15	0.0	0.0	0.0	0.0	0.0	0.0	4.7	0.0	0.0	0.0	0.0	0.0	4.72
	HYDRO POLE														
	RECYC-REFU														
	RES/OVER														
	SANDBAG														
	TIRES														
	TOILETS_\$5														
	TOILETS_CH														
Special Waste	WEEDS	17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.3	0.0	0.2	8.1	1.5	26.11
Manure	MANURE-P	16	141.6	0.0	0.0	124.3	0.0	0.0	156.9	0.0	75.5	0.0	0.0	0.0	498.22
<b>Total Non City Depts - Charged</b>			<b>5,681.6</b>	<b>4,834.5</b>	<b>6,264.2</b>	<b>8,303.1</b>	<b>9,411.8</b>	<b>9,675.1</b>	<b>8,509.3</b>	<b>8,979.5</b>	<b>8,716.1</b>	<b>8,909.8</b>	<b>7,844.9</b>	<b>6,276.6</b>	<b>93,406.52</b>
Dead Animals - TFW	ANIMALS N/C	20	0.6	1.3	1.9	1.8	1.1	0.8	0.6	0.7	1.3	1.3	1.5	0.2	13.05
Brady Admin Building Construction Material	1777 BRADY														4.45
Charitable Organization - TFW	CHARITY	19	68.5	54.7	54.3	38.8	85.6	72.3	61.4	80.5	72.9	43.8	50.6	29.8	713.18
Neighbourhood clean ups	CLEAN-UP		0.0	0.0	0.0	1.7	12.2	0.0	0.0	9.4	25.2	0.0	40.7	0.0	89.18
<b>Total Non City Depts - Not Charged</b>			<b>69.1</b>	<b>56.0</b>	<b>56.2</b>	<b>42.4</b>	<b>99.0</b>	<b>73.1</b>	<b>62.0</b>	<b>90.6</b>	<b>99.4</b>	<b>45.1</b>	<b>96.9</b>	<b>30.3</b>	<b>819.86</b>
<b>Total Non City Depts</b>			<b>5,750.6</b>	<b>4,890.5</b>	<b>6,320.4</b>	<b>8,345.5</b>	<b>9,510.7</b>	<b>9,748.2</b>	<b>8,571.3</b>	<b>9,070.1</b>	<b>8,815.5</b>	<b>8,954.9</b>	<b>7,941.8</b>	<b>6,306.9</b>	<b>94,226.38</b>

Material Type	WW Material	Item/Acct	January	February	March	April	May	June	July	August	September	October	November	December	Total	
<b>Other Municipalities</b>																
Manitoba Conservation (Falcon Lake/Hecla)	DOM REF RM	772	39.8	51.0	58.6	67.2	184.5	191.7	289.1	275.1	180.8	147.9	53.4	36.7	1,575.79	
R. M. of Springfield / Emterra	DOM REF RM	1212	95.7	94.4	107.8	131.1	163.7	214.7	162.0	149.7	148.9	0.0	0.0	0.0	1,267.96	
R. M. of West St.Paul / Emterra	DOM REF RM	1263	84.4	77.2	101.9	115.8	159.0	15.6	36.4	36.8	15.0	0.0	0.0	0.0	642.02	
R.M. of MacDonald / Blackhawk Enterprises	DOM REF RM	1127	4.0	3.2	6.0	4.6	1.8								19.59	
<b>Total Municipalities 445-454084-201904</b>	<b>DOM REF RM</b>		<b>223.9</b>	<b>225.8</b>	<b>274.3</b>	<b>318.6</b>	<b>509.0</b>	<b>422.0</b>	<b>487.5</b>	<b>461.5</b>	<b>344.7</b>	<b>147.9</b>	<b>53.4</b>	<b>36.7</b>	<b>3,505.36</b>	
<b>4R Depots</b>																
4R Contaminated Bins (Garbage)	4RDCONTGRB		21.6	1.3	0.3	5.6	18.5	3.0	0.6	4.5	4.8	4.3	0.0	1.6	66.16	
4R Flat fee garbage	4RDEPTFF		70.1	0.0	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.6	152.11	
4R Weighed garbage	4RDEPTREG		359.5	476.4	616.7	1,394.7	1,529.9	1,469.5	1,633.4	1,431.6	1,283.7	1,320.2	641.2	430.5	12,587.35	
<b>Total Garbage from 4R Depots 445-454570-201910</b>			<b>451.1</b>	<b>477.7</b>	<b>624.4</b>	<b>1,400.4</b>	<b>1,548.5</b>	<b>1,472.5</b>	<b>1,634.0</b>	<b>1,436.1</b>	<b>1,288.5</b>	<b>1,324.4</b>	<b>641.2</b>	<b>506.7</b>	<b>12,805.62</b>	
															<b>Trees are chipped and not landfilled</b>	-6,962.67
<b>Total Landfilled</b>			<b>25,290.3</b>	<b>22,205.3</b>	<b>27,397.2</b>	<b>29,820.2</b>	<b>33,815.6</b>	<b>33,685.1</b>	<b>32,922.5</b>	<b>33,085.4</b>	<b>29,993.3</b>	<b>31,479.8</b>	<b>30,480.1</b>	<b>25,152.0</b>	<b>348,363.98</b>	
Glass delivered to site	GLASS	33	974.2	840.1	1,171.4	986.4	778.6	676.8	829.7	764.1	886.1	1,325.0	883.4	994.9	11,110.65	
Sweepings N/C	SWEEP NC	24	0.0	0.0	0.0	118.1	9.4	0.0	40.1	206.2	0.0	24.7	0.0	0.0	398.31	
Compostable -Yard waste/Ponds/Street Leaves/Cattails	PONDS ST LEAVES YARD WASTE SAWDUST NC CATTAILS	26	0.5	15.1	56.9	606.5	608.1	550.2	462.9	383.1	423.0	1,050.4	245.3	64.1	4,466.11	
Account 3100 Zone 1 A and 1B- Yard Waste	LEAFIT-CUR 3100	27	0.0	0.0	0.0	109.4	236.0	66.3	140.1	77.5	47.8	2,771.4	0.0	0.0	3,448.48	
Account 3200 - Zone 2- Yard Waste	LEAFIT-CUR 3200	28	0.0	0.0	0.0	1,055.1	1,720.6	2,221.4	1,433.8	1,282.5	955.4	2,886.4	0.0	0.0	11,555.19	
Account 3300 - Zone 3 - Yard Waste	LEAFIT-CUR 3300	29	0.0	0.0	0.0	491.8	1,086.3	1,473.4	1,045.0	549.6	808.4	0.0	0.0	0.0	5,454.48	
2600 AREA 1 YARDWASTE-MILLER	LEAFIT-CUR 2600												779.3	779.25		
2700 AREA 2 YARDWASTE-GFL	LEAFIT-CUR 2700												688.4	688.43		
Leaf & Yard Waste self-hauled (per Foreman)														0.0	0.00	
Clean Fill - TFW ( Tipping Fee Waived )	CLEAN FILL	30	17,251.4	15,685.5	19,114.9	6,135.3	25,932.2	49,486.7	17,902.5	16,722.0	10,916.6	22,160.3	29,537.7	14,479.7	245,324.59	
Concrete - TFW	CONC - N/C WOOD N/C	31	10.2	49.2	23.8	97.9	107.1	35.7	52.5	158.5	574.9	116.3	17.6	0.3	1,243.81	
Wood Chips	WC NC LF	32	0.0	0.0	9.1	124.2	481.1	430.8	228.4	313.8	78.6	41.6	131.4	58.7	1,897.67	
Bio solids composted	BIO SLUDGE		152.5	136.7	207.8	551.9	880.7	222.2	457.3	527.2	652.9	450.3	452.1	250.9	4,942.36	
Wood Chips composted	BIOWOODCHI		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	
<b>Total compostable material</b>			<b>18,388.74</b>	<b>16,726.52</b>	<b>20,583.93</b>	<b>10,276.51</b>	<b>31,839.84</b>	<b>55,163.42</b>	<b>22,592.13</b>	<b>20,984.40</b>	<b>15,343.76</b>	<b>30,826.28</b>	<b>32,735.18</b>	<b>15,848.62</b>	<b>291,309.33</b>	
4R Battery	4R Battery		0.00	0.00	2.17	2.65	4.12	4.42	1.86	6.39	2.50	0.00	4.44	0.00	28.54	
4R Battery - Small (Call2 Recycle)	N/A		0.00	0.00	0.13	0.56	0.34	0.00	0.65	0.00	0.00	0.65	0.00	2.51	4.85	
4R Bicycles	4R Bicycl		0.03	0.28	0.79	0.51	0.63	3.93	0.24	1.89	1.24	1.01	0.54	0.20	11.29	
4R Ceramic	4RCERAMIC		8.77	14.18	14.83	28.86	30.43	25.05	22.62	27.29	21.19	26.72	17.06	8.32	245.32	
4R Clean Fill	4RDCLEANFL		0.00	0.00	24.17	51.26	457.28	468.19	506.97	479.52	268.99	237.38	33.45	0.00	2,527.21	
4R Concrete	4RCONCRETE		10.87	53.32	45.97	76.11	227.54	214.65	250.44	235.63	190.29	189.08	47.26	16.19	1,557.35	
4R Electronics	4RELECTRO		19.04	9.51	38.71	40.61	83.87	71.56	50.98	35.87	54.40	46.47	47.01	32.10	530.13	
4R HHW	4RDSOLVENT		4.70	8.62	6.22	16.18	41.82	58.12	28.64	38.58	48.08	29.89	38.25	22.07	341.16	
4R Oil	4RDOIL		0.63	0.00	0.90	2.70	4.41	4.23	2.97	5.31	3.42	4.50	1.71	1.67	32.45	
4R Glass	4RDGLASS		3.05	2.43	1.47	7.00	4.29	9.16	10.46	9.89	5.91	5.04	9.15	2.77	70.62	
4R Lumber	4RDLUMBER		8.55	7.16	10.60	12.77	21.94	20.97	24.80	26.20	17.15	21.46	9.65	4.06	185.31	
4R Leaf and Yard Waste	4RD LYW 4RDLYWLG		10.11	13.89	20.93	220.78	288.48	304.95	314.57	289.74	234.39	361.99	62.58	17.34	2,139.75	
4R ODS	4RDODS		1.61	5.43	5.42	5.85	11.79	14.15	12.60	12.62	15.82	11.68	10.92	3.58	111.47	
4R Oversized Plastics	4RDOSPLAST		0.00	0.00	0.00	4.11	4.77	3.80	1.12	4.99	2.87	0.81	0.00	0.00	22.47	
4R Recyclables	4RDRECYCL		6.99	14.65	18.70	22.62	28.16	37.76	31.12	28.99	20.09	21.29	20.91	22.42	273.70	
4R Scrap Metal	4RDSCRAPMT		17.98	21.31	31.52	68.30	90.19	75.07	79.52	70.76	55.53	52.38	45.81	10.28	618.65	
4R Tires	4RDTIRES		3.67	0.00	2.24	6.65	12.98	24.46	17.02	47.05	9.55	19.15	0.00	3.22	145.99	
<b>Total 4R Depot</b>			<b>96.00</b>	<b>150.78</b>	<b>224.77</b>	<b>567.52</b>	<b>1,313.04</b>	<b>1,340.47</b>	<b>1,356.57</b>	<b>1,320.71</b>	<b>951.42</b>	<b>1,029.51</b>	<b>348.73</b>	<b>146.74</b>	<b>8,846.25</b>	
Battery Removal	(BATTERYRMV)		0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.00	
City Compost Removal	(COMPOSTREM)		0.0	0.0	0.0	0.0	(46.8)	(11.4)	(29.0)	0.0	(19.6)	(48.6)	(3,131.3)	0.0	-3,286.69	
Glass Removal	(GLASS REMV)		0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.00	
Leachate Removal	(LEACH REMV)		(455.3)	(1,026.0)	(1,814.0)	(1,964.6)	(2,652.3)	(1,898.9)	(1,970.6)	(2,121.1)	(2,334.6)	(1,771.9)	(1,469.4)	(941.9)	-20,420.39	
ODS Removal	(ODS REMOVA)	25	0.00	0.00	0.00	(1.85)	(1.09)	2.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Scrap Metal Removed	(SCRAP REMV)	22	0.0	0.0	0.0	(211.6)	0.0	0.0	0.0	0.0	0.0	(493.5)	0.0		-705.14	
Dutch Elm Removal (Wood Anchor)	(TREESDE-WA)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	102.3	102.32	
Tires Removed	(TIRES REMV)	23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	
<b>Total material removed from site</b>			<b>(455.3)</b>	<b>(1,026.0)</b>	<b>(1,814.0)</b>	<b>(2,178.0)</b>	<b>(2,700.1)</b>	<b>(1,907.4)</b>	<b>(1,999.6)</b>	<b>(2,121.1)</b>	<b>(2,354.2)</b>	<b>(2,314.0)</b>	<b>(4,600.6)</b>	<b>(839.6)</b>	<b>-24,309.90</b>	
<b>Total Net All Items</b>			<b>43,319.8</b>	<b>38,056.7</b>	<b>46,391.9</b>	<b>38,486.2</b>	<b>64,268.3</b>	<b>88,281.6</b>	<b>54,871.6</b>	<b>53,269.4</b>	<b>43,934.3</b>	<b>61,021.5</b>	<b>58,963.4</b>	<b>40,307.7</b>	<b>624,209.7</b>	

**NUMBER OF VEHICLES / LOADS**

Description	Item/Acct	January	February	March	April	May	June	July	August	September	October	November	December	Total
<b>BRADY ROAD LANDFILL - VEHICLES / LOADS</b>														
Vehicles - Domestic Refuse - City	1													0.00

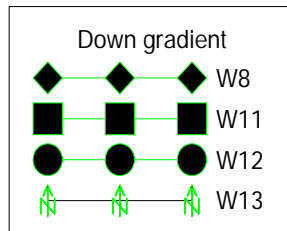
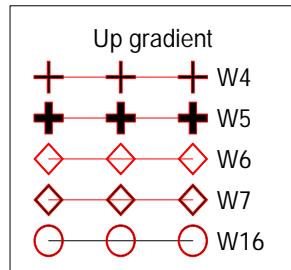
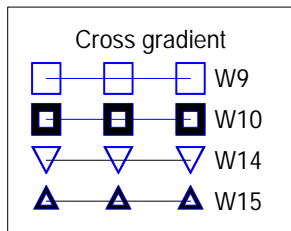
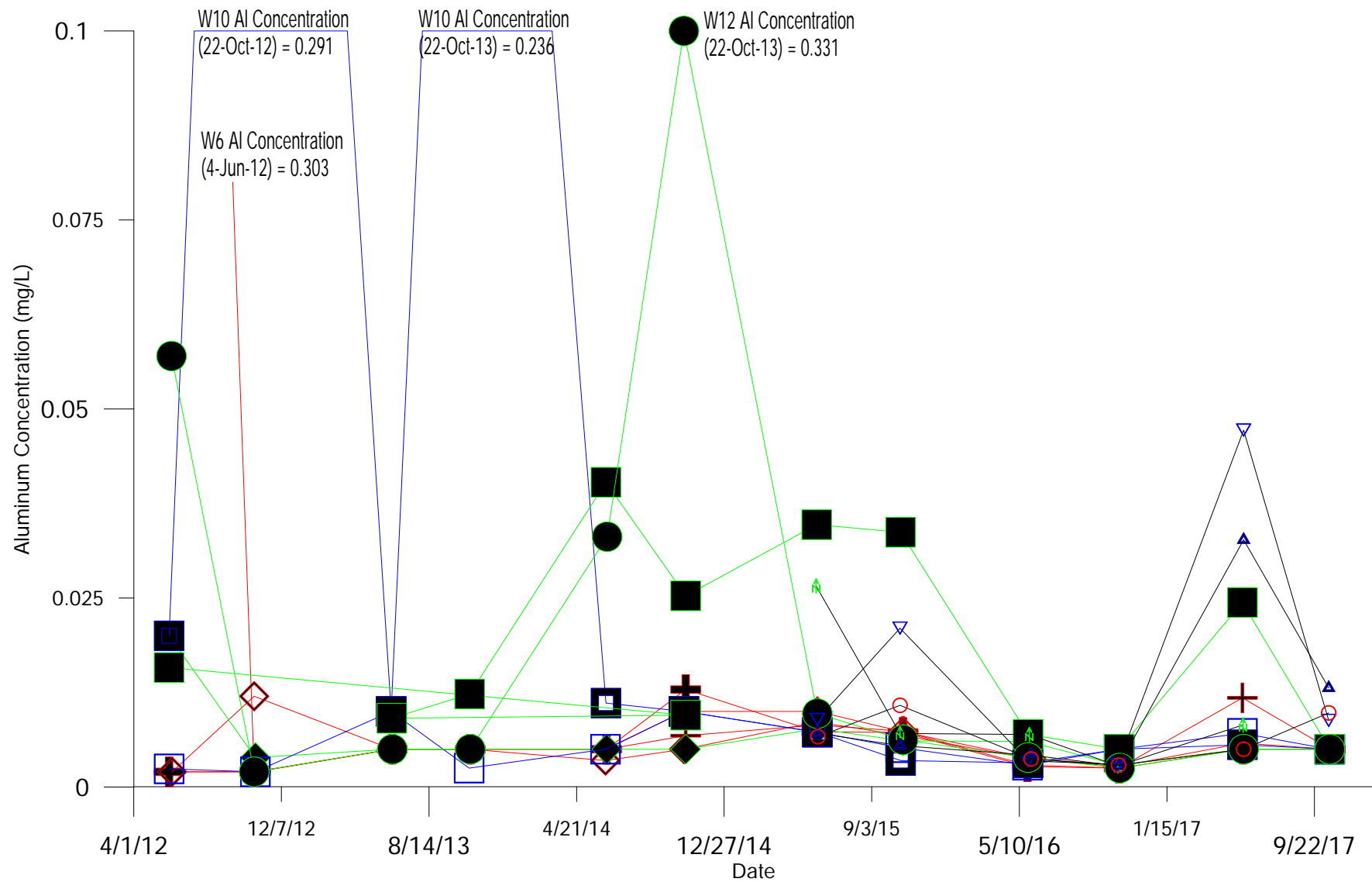
Material Type	WW Material	Item/Acct	January	February	March	April	May	June	July	August	September	October	November	December	Total
Vehicles - Domestic Refuse - Contract	DOM REF CT	2	1,377	1,190	1,354	1,314	1,502	1,448	1,369	1,487	1,349	1,490	1,398	1,333	16,611.00
Vehicles - Residential - Small Loads	RES/REFUSE	21	0	0	0	0	0	0	0	0	0	0	0	0	0.00
Vehicles - 4R Depot (Brady) - Garbage Area			2,858	2,763	3,762	7,251	8,145	7,661	8,586	7,836	6,986	7,336	3,660	2,814	69,658.00
Vehicles - 4R Depot (Pacific)			147	650	738	1,618	2,027	2,012	2,259	2,285	2,017	2,644	1,251	1,188	18,836.00
Vehicles - Commercial / Industrial	COMM/INDUS	10	2,767	2,811	3,769	4,731	5,982	5,374	5,047	5,329	7,323	4,601	3,840	2,804	54,377.85
Vehicles - Special Waste		17							0	0					0.00
Vehicles - Mud Trucks - Tandem (manually tracked)			963	733	757	340	1,076	1,357	425	654	306	774	971	617	8,973.00
Vehicles - Mud Trucks - Semi (manually tracked)			439	406	601	87	952	1,823	662	540	372	600	677	423	7,582.00
<b>OTHER MUNICIPALITIES - VEHICLES / LOADS</b>															
RM of Tache		886	0	0	0	0	0	0	0	0	0	0	0	0	0.00
Manitoba Conservation ( Falcon Lake )		772	7	11	12	13	37	33	47	46	181	25	10	8	429.83
R. M. of Springfield / Emterra		1212	14	14	14	22	23	25	20	24	149	0	0	0	304.93
R. M. of West St.Paul / Emterra		1263	13	12	14	17	20	3	5	4	15	0	0	0	102.97
R.M. of MacDonald / Blackhawk Enterprises		1127	6	5	7	8	3	0	0	0	0	0	0	0	29.00
<b>TOTAL VEHICLES - ALL PAYING CUSTOMERS</b>			<b>8,591</b>	<b>8,595</b>	<b>11,028</b>	<b>15,401.00</b>	<b>19,767</b>	<b>19,736</b>	<b>18,420</b>	<b>18,205</b>	<b>18,698</b>	<b>17,470</b>	<b>11,807</b>	<b>9,187</b>	<b>176,904.58</b>

Blue font = formula = don't type in

Reconcile Monthly Tonnage to WasteWorks Material Analysis report

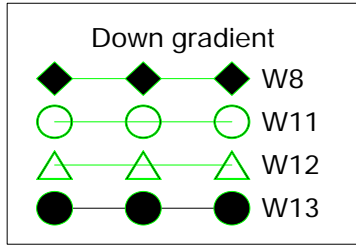
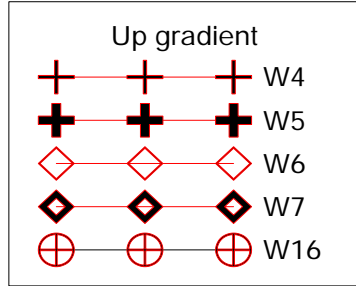
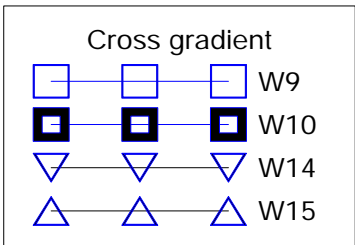
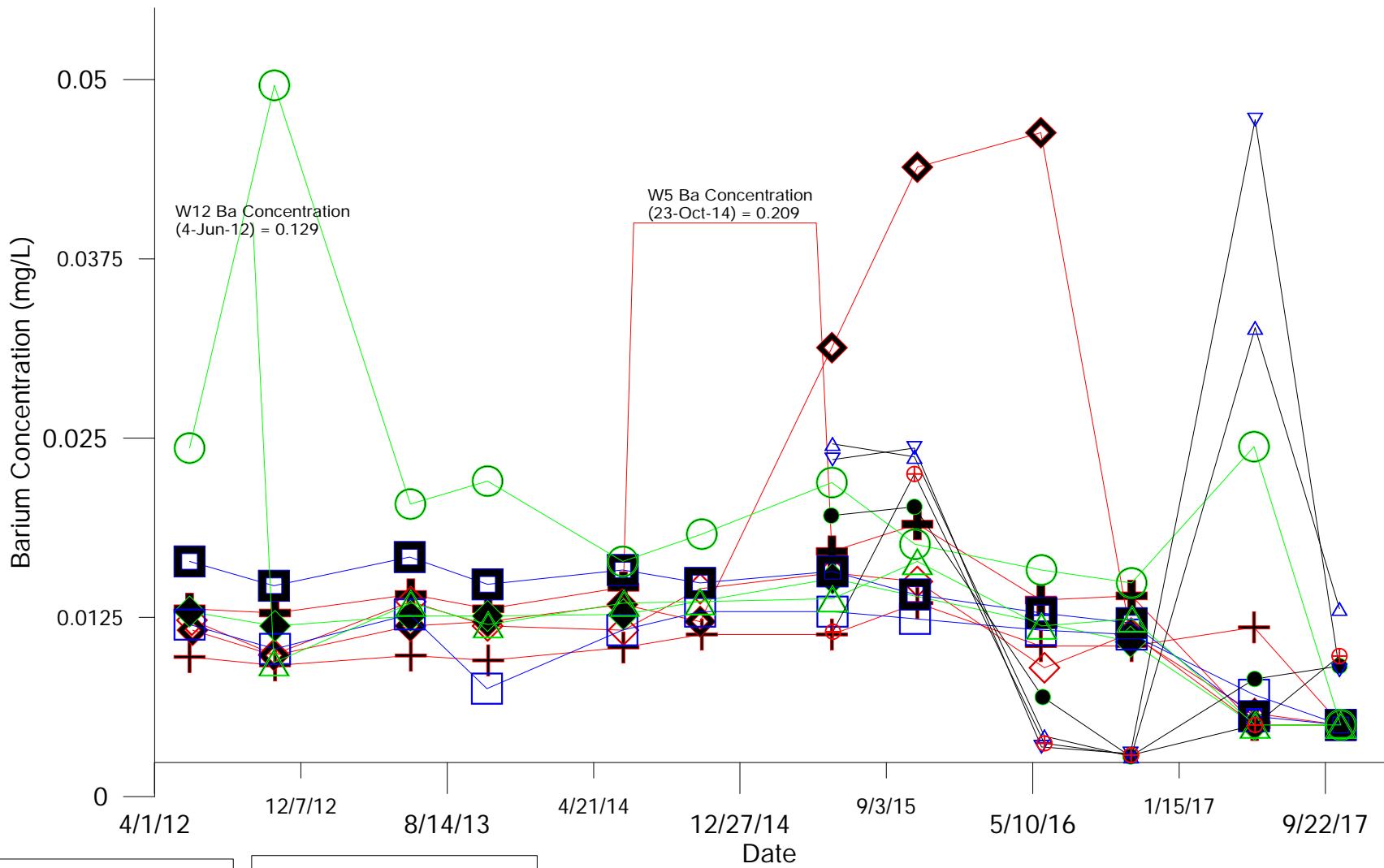
Total Actual Weight per WW		28,502.12	25,308.60	32,244.51	38,806.48	45,598.09	44,063.91	41,825.41	41,556.31	42,173.78	47,719.88	47,194.82	28,968.74
Less: Removals X 2 (negative here but positive in WW)	(BATTERYRMV)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(COMPOSTREM)	0.00	0.00	0.00	0.00	(93.52)	(22.78)	(58.08)	0.00	(39.22)	(97.22)	(6,262.56)	0.00
	(GLASS REMV)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(LEACH REMV)	(910.54)	(2,051.90)	(3,627.96)	(3,929.16)	(5,304.58)	(3,797.84)	(3,941.14)	(4,242.26)	(4,669.10)	(3,543.78)	(2,938.70)	(1,883.82)
	(ODS REMOVA)	0.00	0.00	0.00	(3.70)	(2.18)	5.88	0.00	0.00	0.00	0.00	0.00	0.00
	(SCRAP REMV)	0.00	0.00	0.00	(423.22)	0.00	0.00	0.00	0.00	0.00	(987.06)	0.00	0.00
	(TREESDE-WA)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	204.64
	(TIRES REMV)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MUD TRUCKS MANULLY TRACKED		15,698.00	14,782.50	17,842.00	4,080.50	24,022.00	48,015.00	16,995.50	15,861.00	9,987.00	17,931.00	20,867.00	13,105.00
Less: Items not on tonnage report	RES/REFUSE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	WEIGH ONLY	(64.32)	(2.19)	(117.06)	(117.63)	(105.92)	(133.76)	(51.36)	(44.33)	(3,640.38)	(93.51)	(36.10)	(44.84)
	4R MATERIALS	24.37	19.65	54.09	72.93	154.42	151.20	101.22	138.64	122.20	92.23	138.93	60.35
	ZRATE ADJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CASH CUSTOMER	70.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ACCT 472 ARSON PILOT ZONE	0.00	0.00	-3.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Net</b>		<b>43,319.75</b>	<b>38,056.66</b>	<b>46,391.94</b>	<b>38,486.20</b>	<b>64,268.31</b>	<b>88,281.61</b>	<b>54,871.55</b>	<b>53,269.36</b>	<b>43,934.28</b>	<b>61,021.54</b>	<b>58,963.39</b>	<b>40,410.07</b>
Total per Tonnage Report		43,319.75	38,056.66	46,391.94	38,486.20	64,268.31	88,281.61	54,871.55	53,269.36	43,934.28	61,021.54	58,963.39	40,307.75
Difference should be zero		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-102.32

**APPENDIX C**  
**2017 STATISTICAL ANALYSIS OF**  
**GROUNDWATER QUALITY**



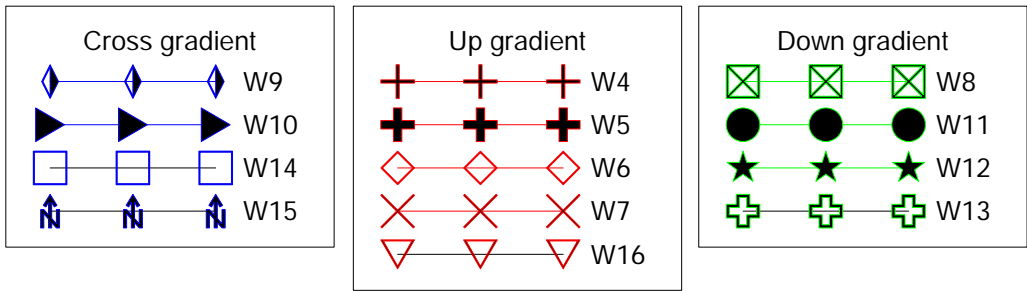
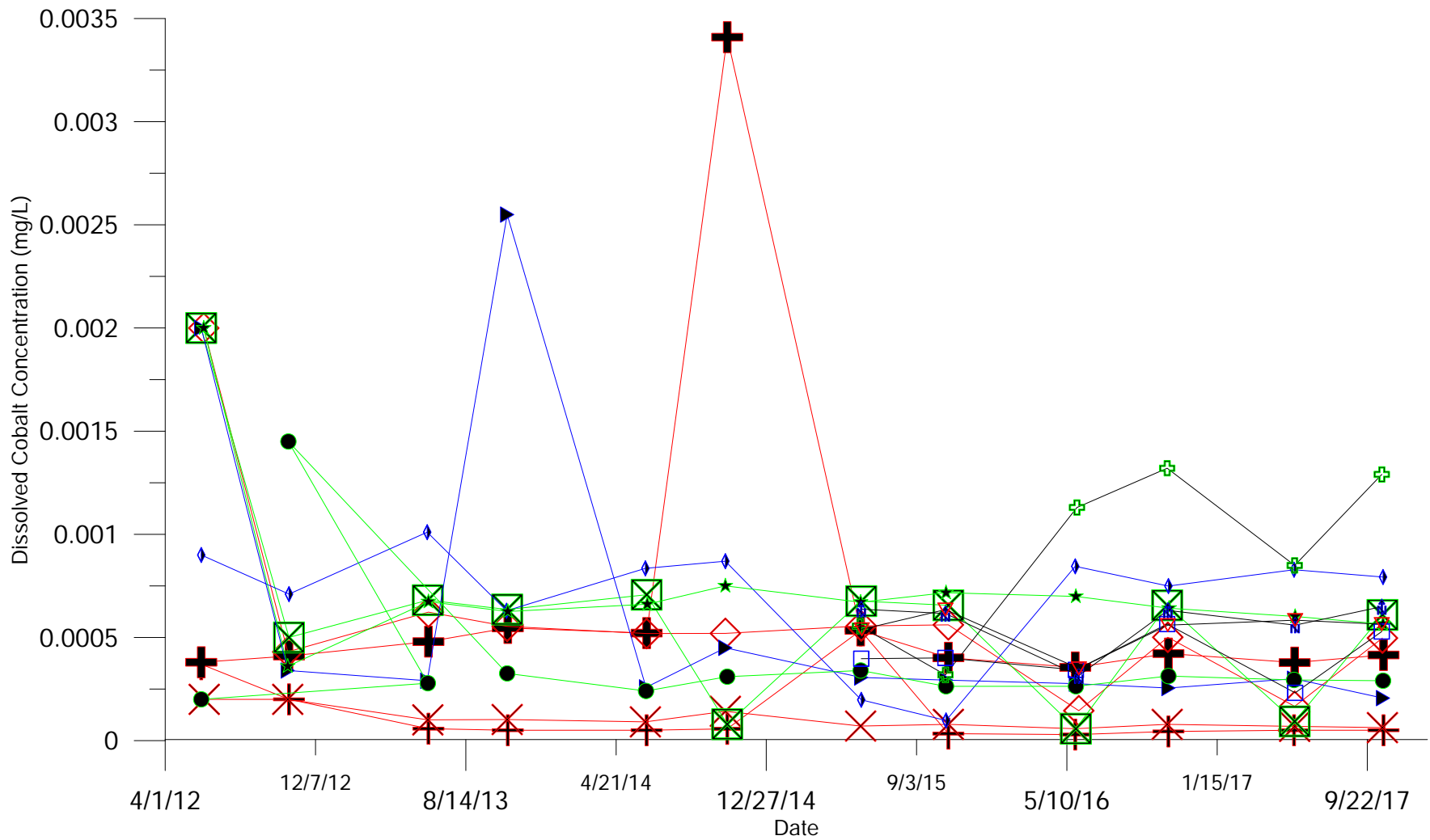
	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Aluminium Concentration Bedrock Wells</b>		
APRIL 2018	FIGURE 1	REV 0





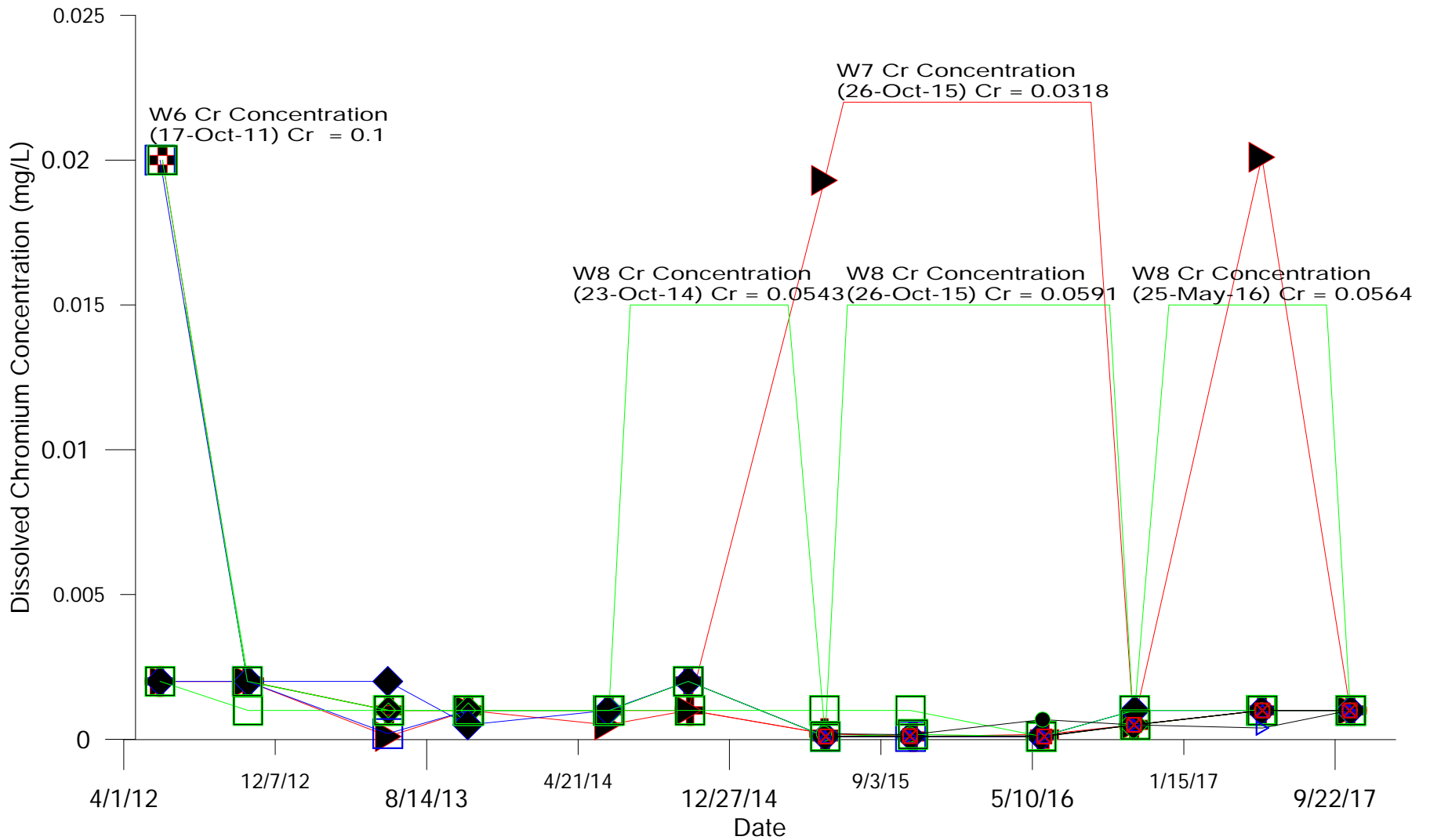
Barium MOE Criteria = 29 mg/L

	City of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Barium Concentration Bedrock Wells</b>		
APRIL 2018	FIGURE 2	REV 0

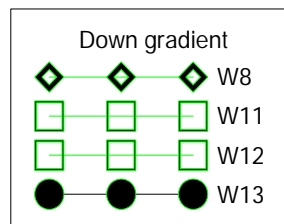
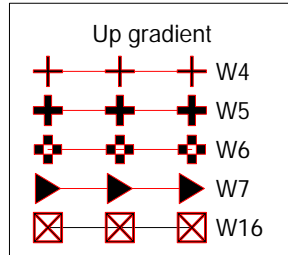
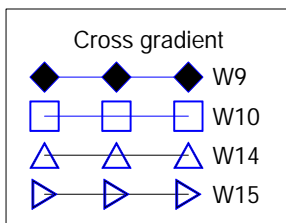


**MOE Cobalt Criteria = 0.066 mg/L**

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Cobalt Concentration Bedrock Wells</b>		
APRIL 2018	FIGURE 3	REV 0



**Chromium MOE Criteria = 0.81 mg/L**



City Of Winnipeg  
Solid Waste Services

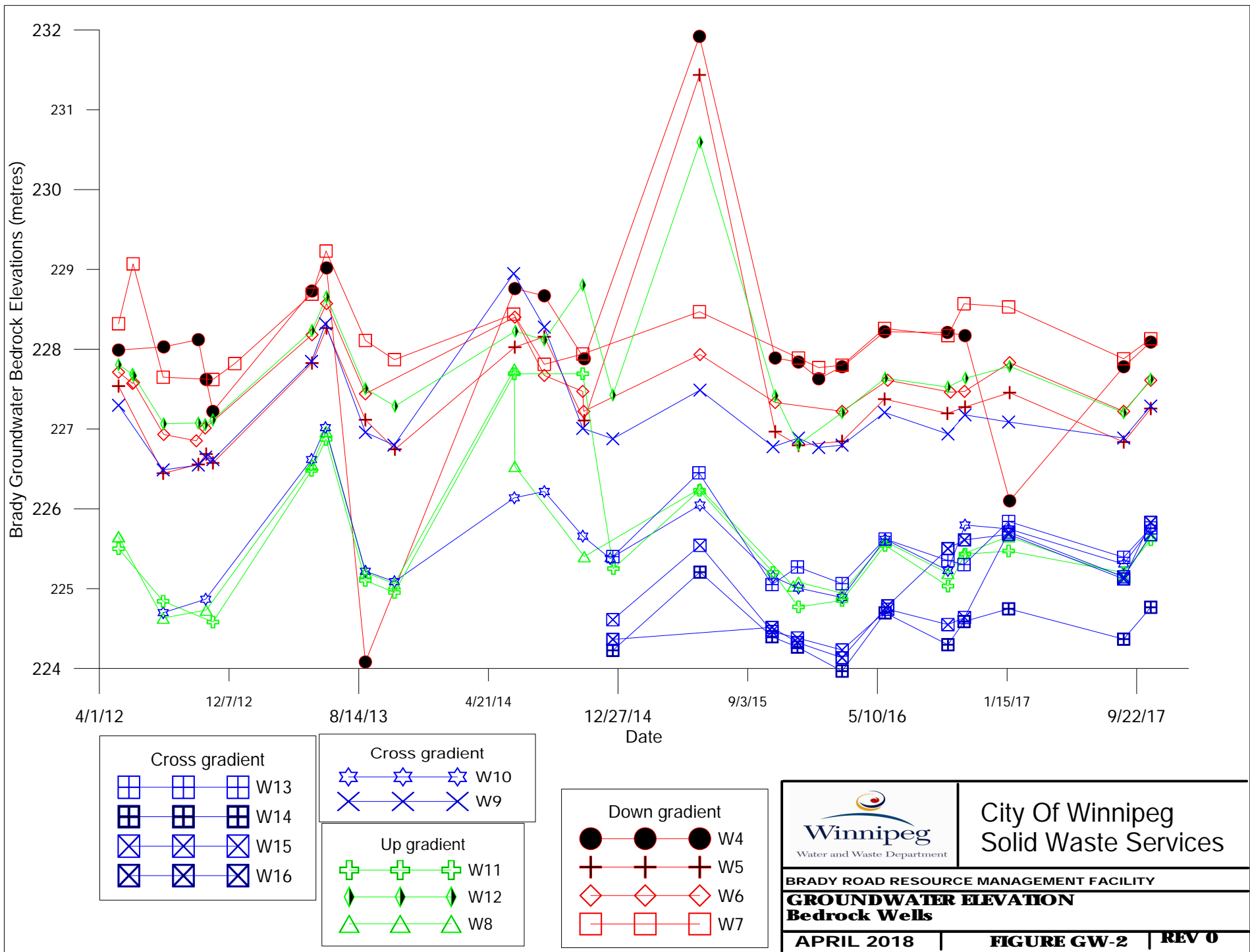
BRADY ROAD RESOURCE MANAGEMENT FACILITY

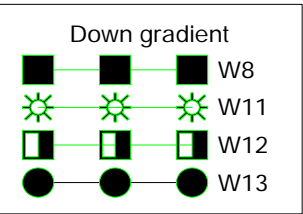
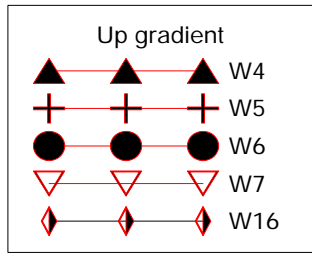
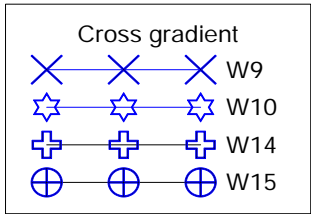
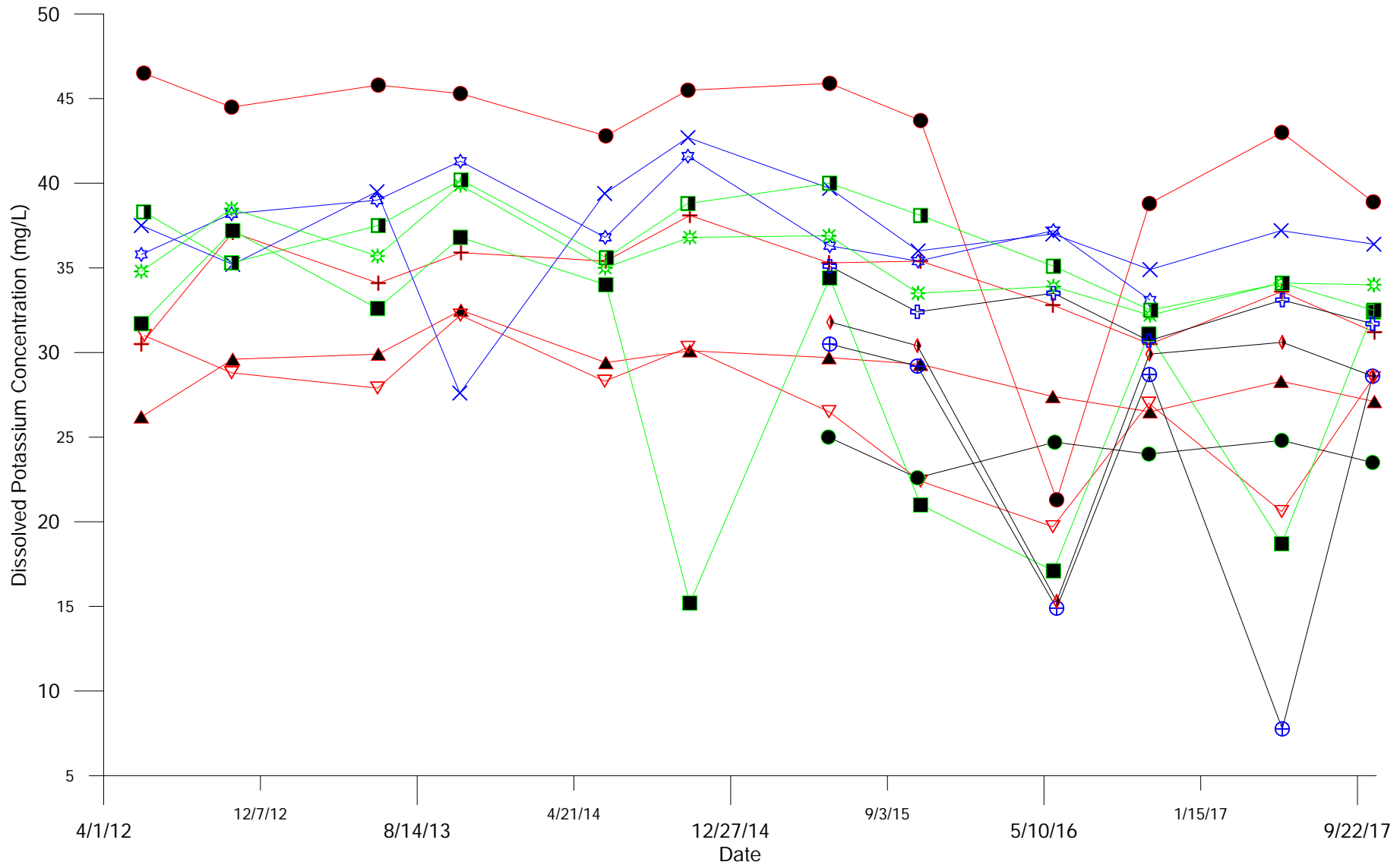
**Dissolved Chromium Concentration  
Bedrock Wells**

APRIL 2018

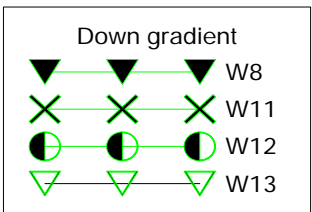
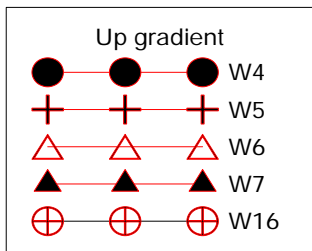
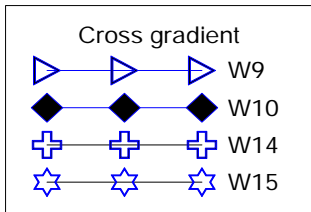
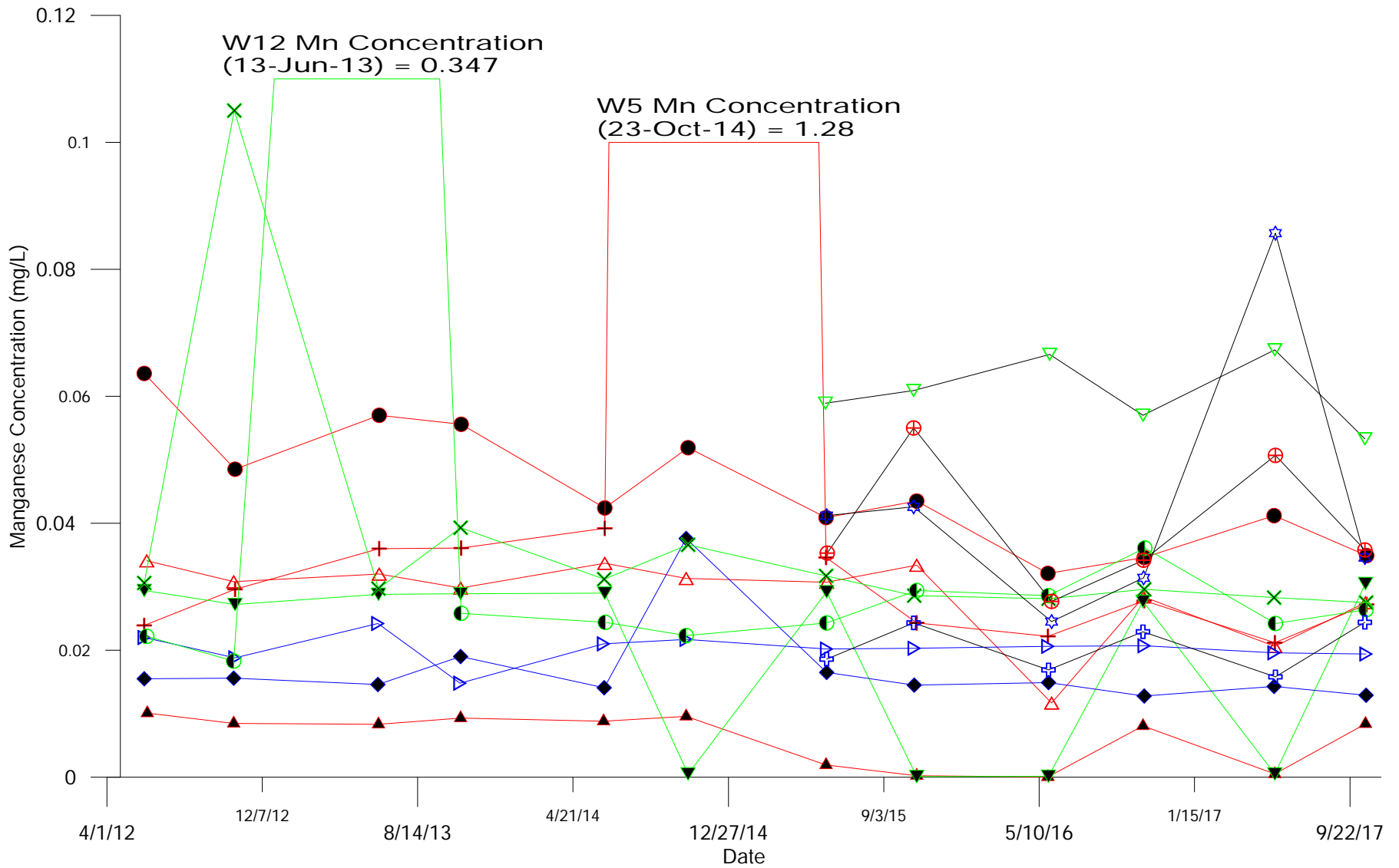
FIGURE 4

REV 0

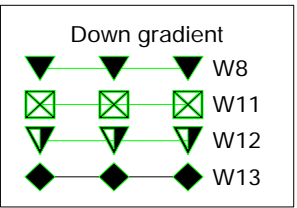
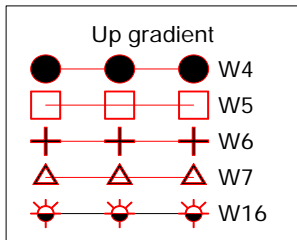
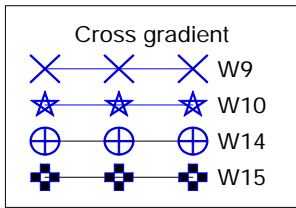
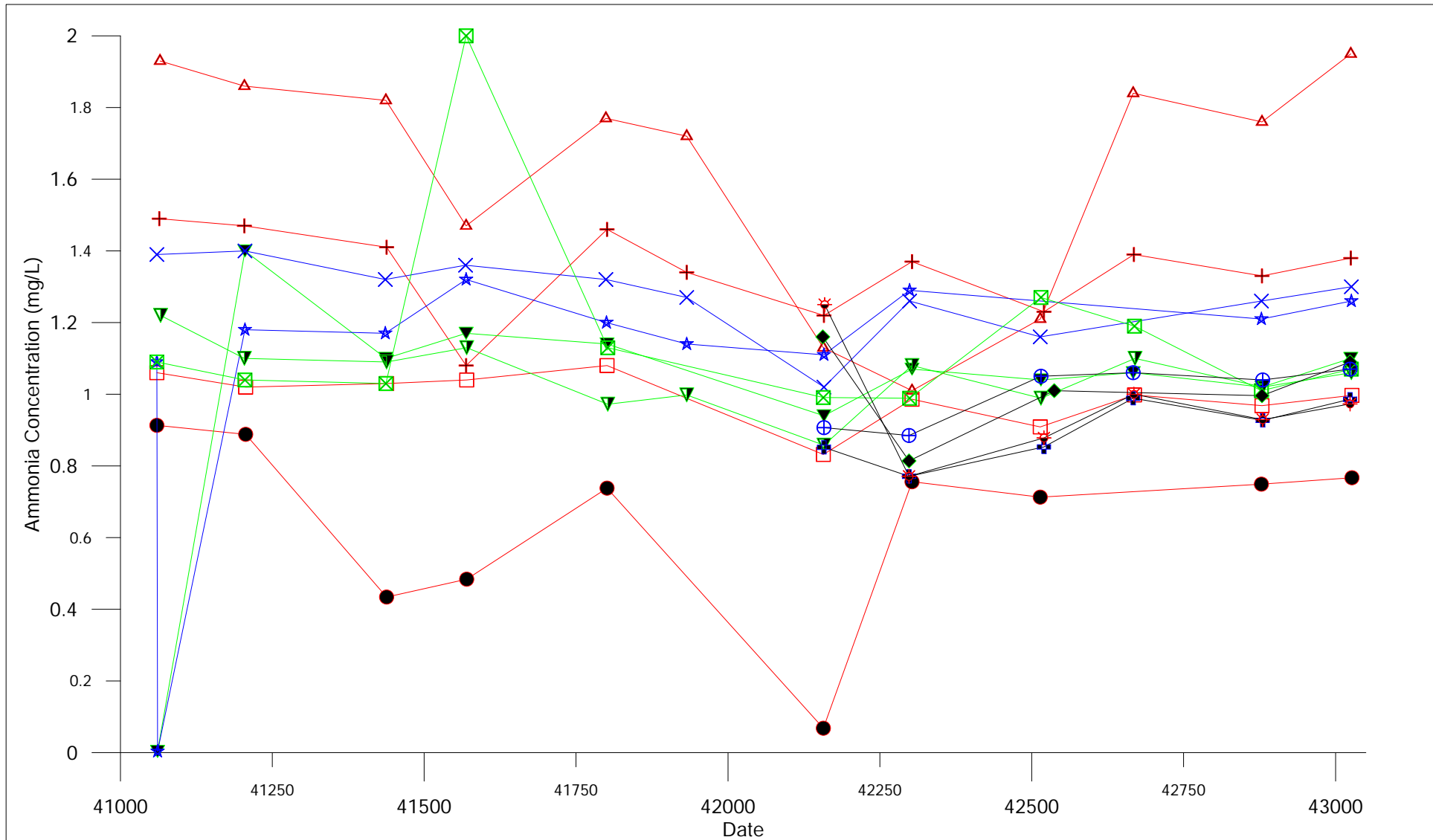




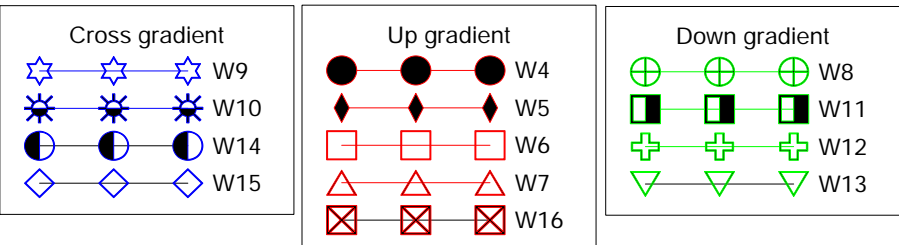
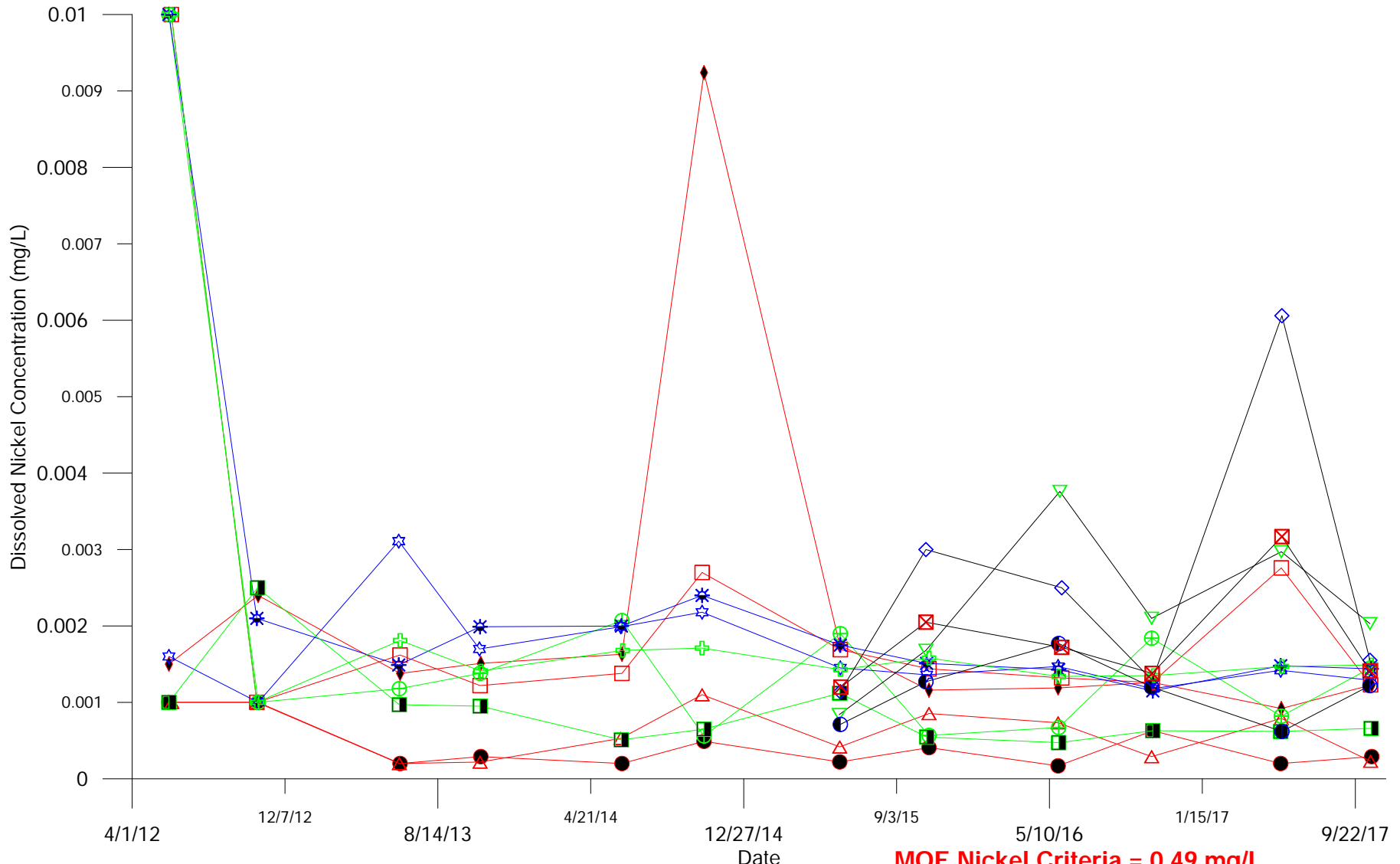
	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Potassium Concentration Bedrock Wells</b>		
APRIL 2018	FIGURE 5	REV 0



	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Manganese Concentration Bedrock Wells</b>		
APRIL 2018	FIGURE 7	REV 0



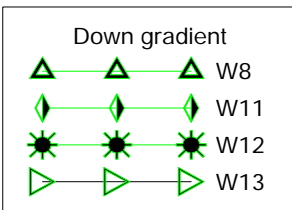
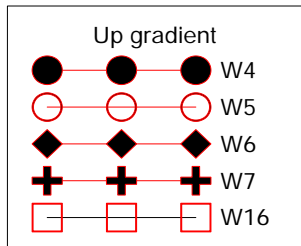
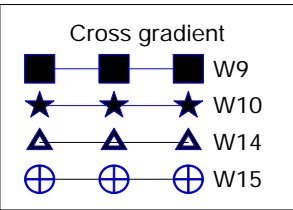
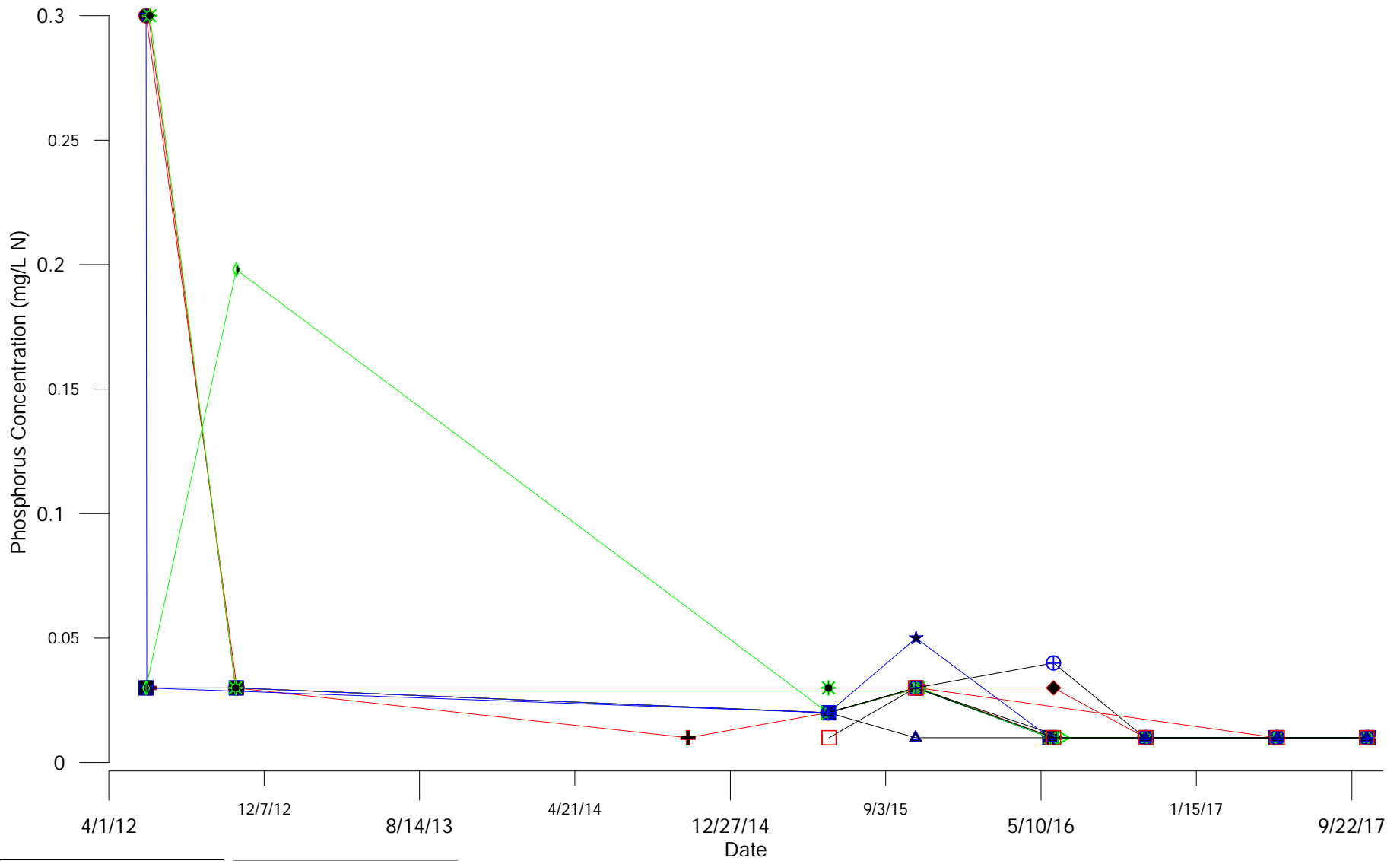
	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Ammonia Concentration Bedrock Wells</b>		
APRIL 2018	FIGURE 8	REV 0



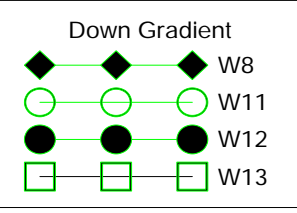
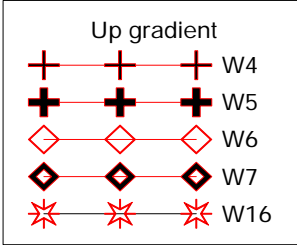
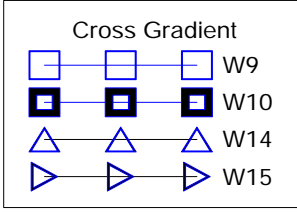
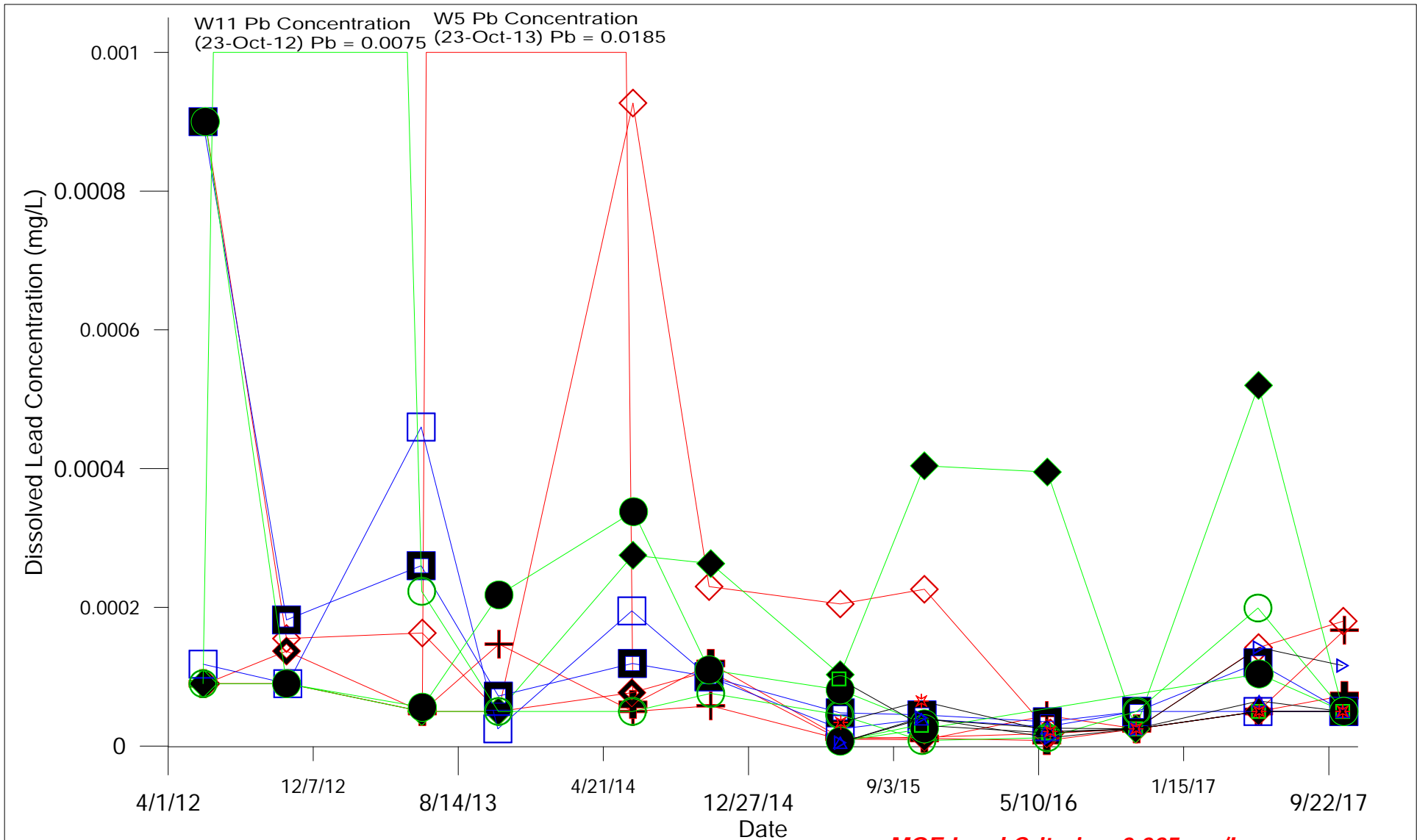
**MOE Nickel Criteria = 0.49 mg/L**

	<p>City Of Winnipeg Solid Waste Services</p>	
	<p>BRADY ROAD RESOURCE MANAGEMENT FACILITY</p>	
<p><b>Dissolved Nickel Concentration Bedrock Wells</b></p>		
<p>APRIL 2018</p>	<p>FIGURE 9</p>	<p>REV 0</p>



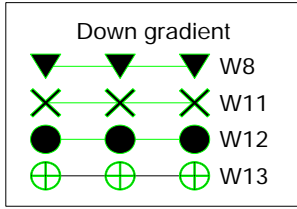
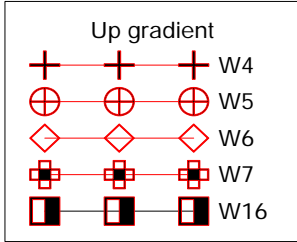
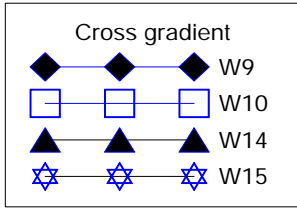
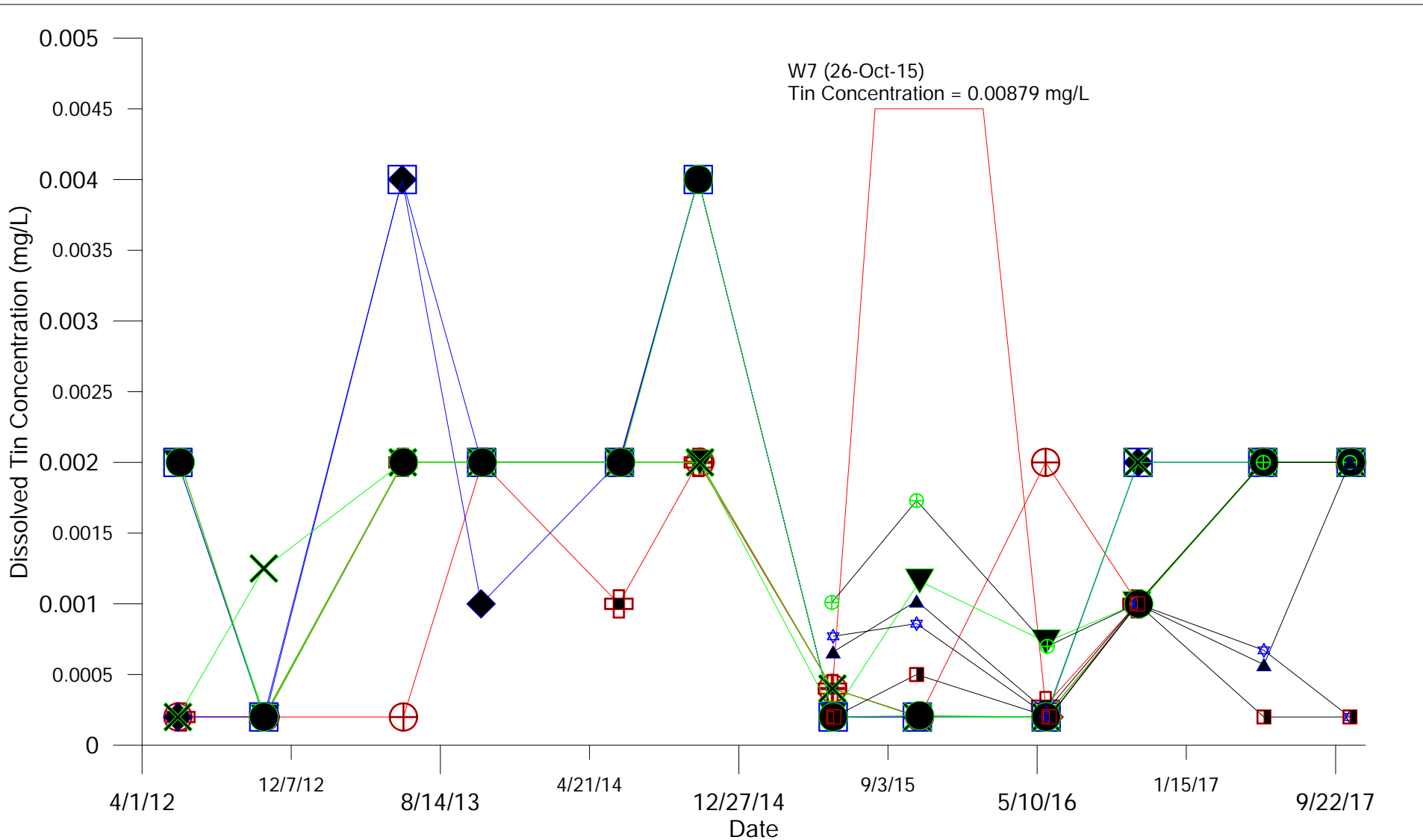


	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Phosphorus Concentration Bedrock Wells</b>		
APRIL 2018	FIGURE 10	REV 0

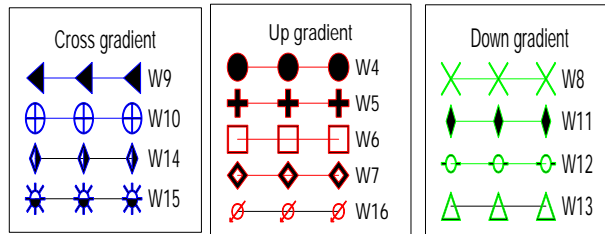
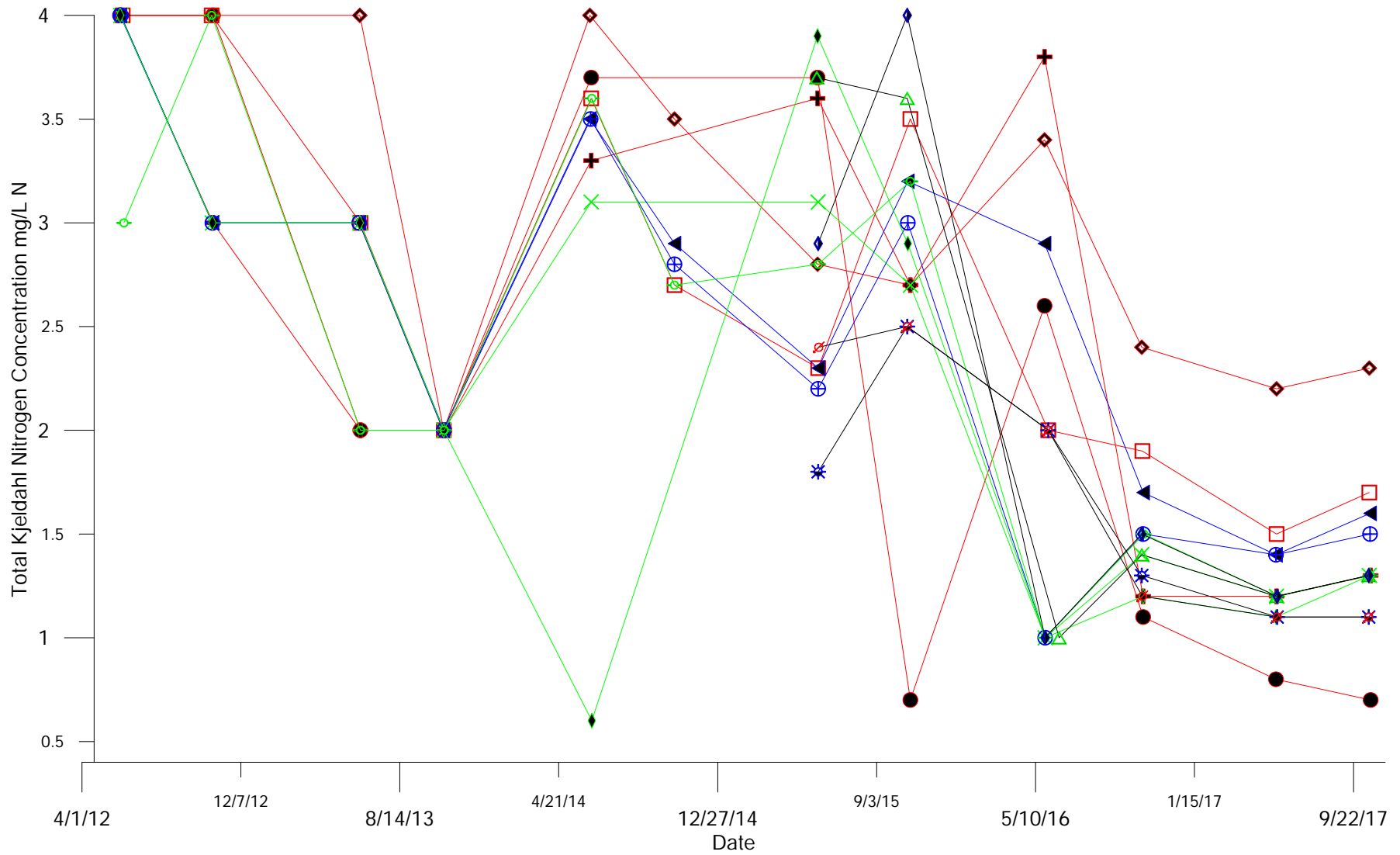


**MOE Lead Criteria = 0.025 mg/L**

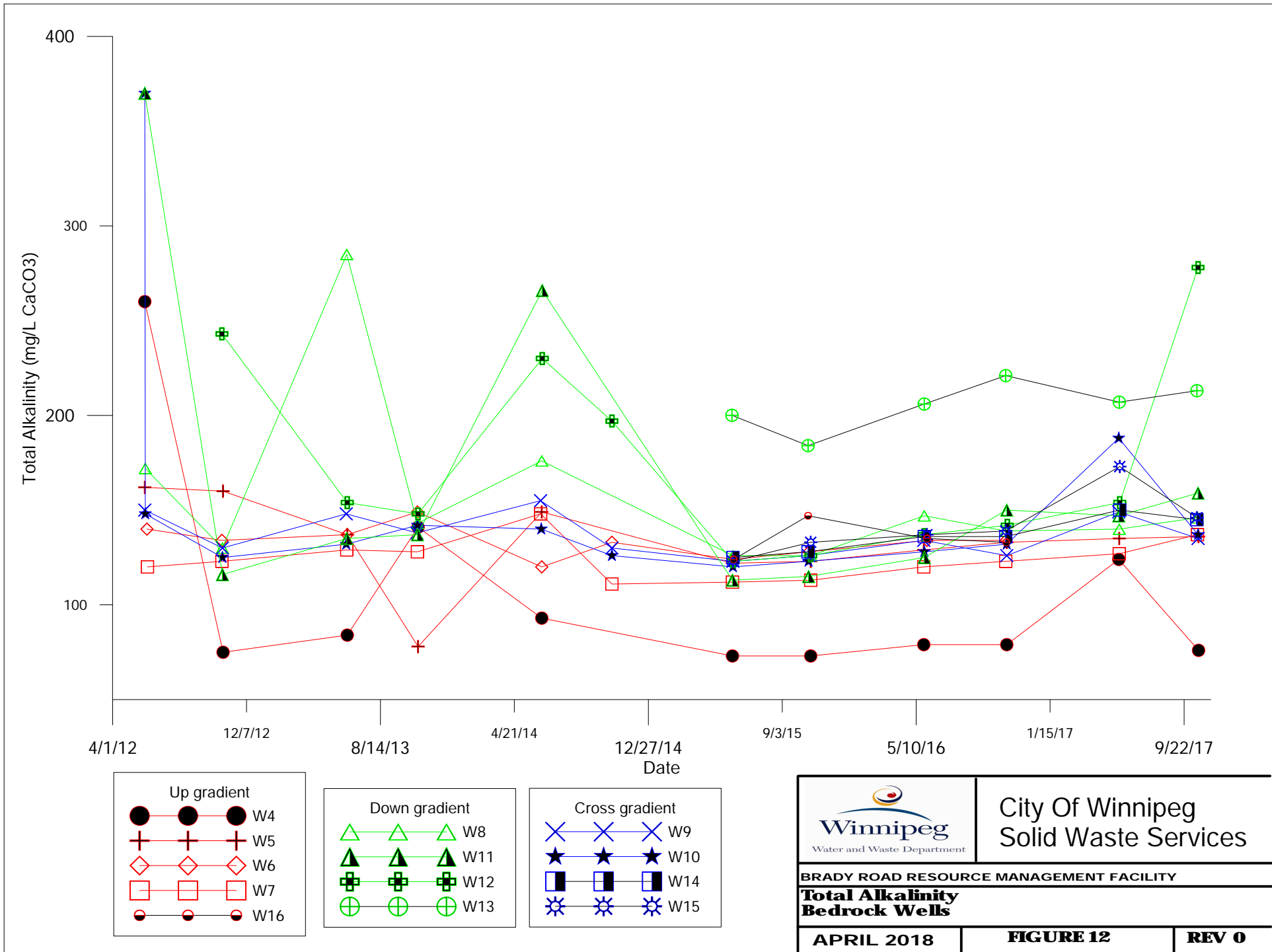
	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Lead Concentration Bedrock Wells</b>		
APRIL 2018	FIGURE 6	REV 0



	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Tin Concentration Bedrock Wells</b>		
APRIL 2018	FIGURE 11	REV 0



	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>TKN Concentration Bedrock Wells</b>		
APRIL 2018	FIGURE 12	REV 0



**Up gradient**

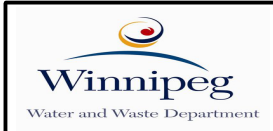
- W4
- + W5
- ◇ W6
- W7
- W16

**Down gradient**

- △ W8
- ▲ W11
- ⊕ W12
- ⊕ W13

**Cross gradient**

- × W9
- ★ W10
- W14
- ⚙ W15



City Of Winnipeg  
Solid Waste Services

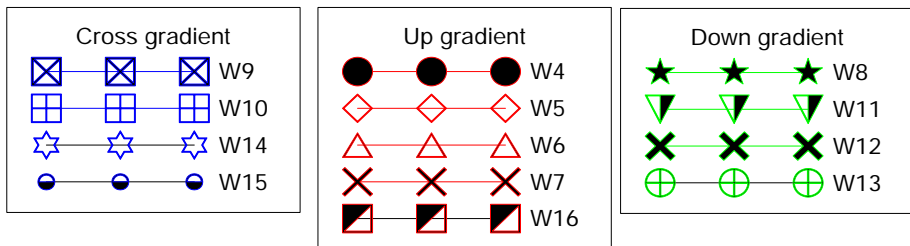
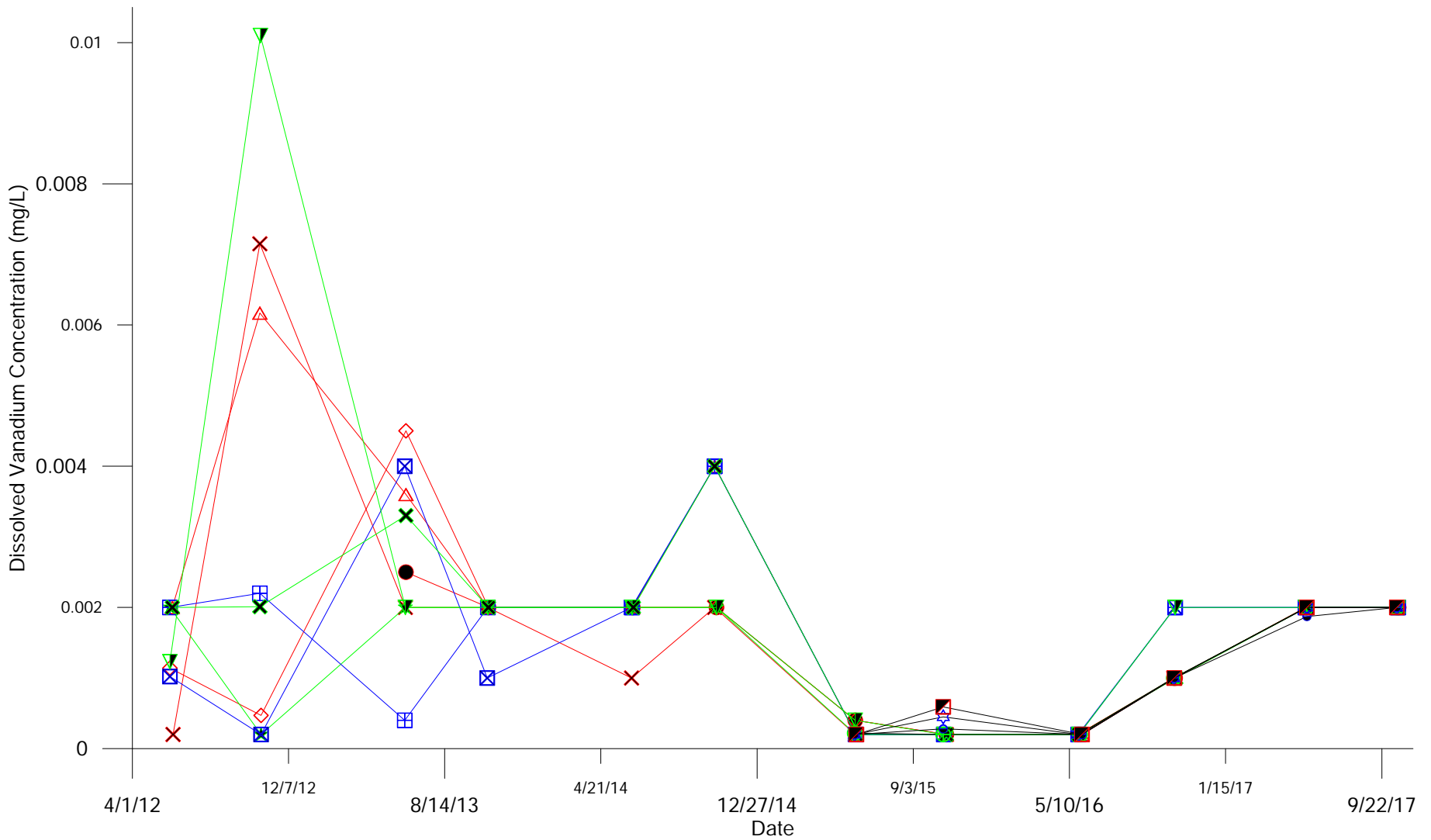
BRADY ROAD RESOURCE MANAGEMENT FACILITY

**Total Alkalinity  
Bedrock Wells**

APRIL 2018

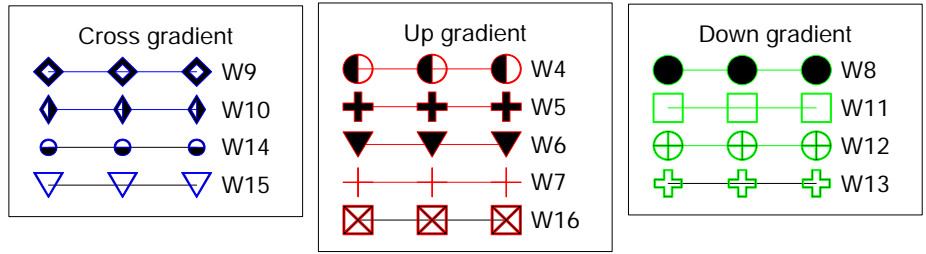
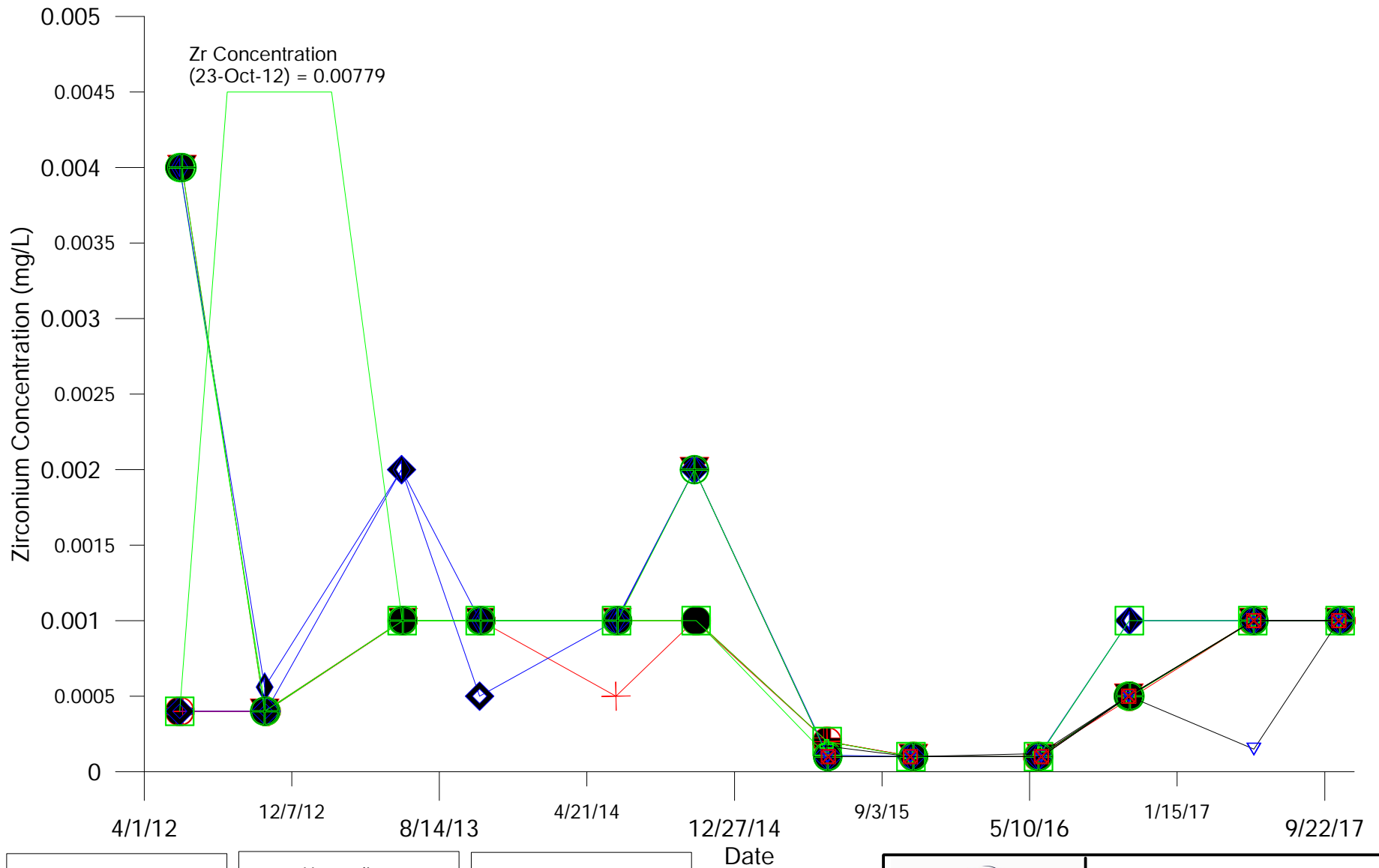
FIGURE 12

REV 0

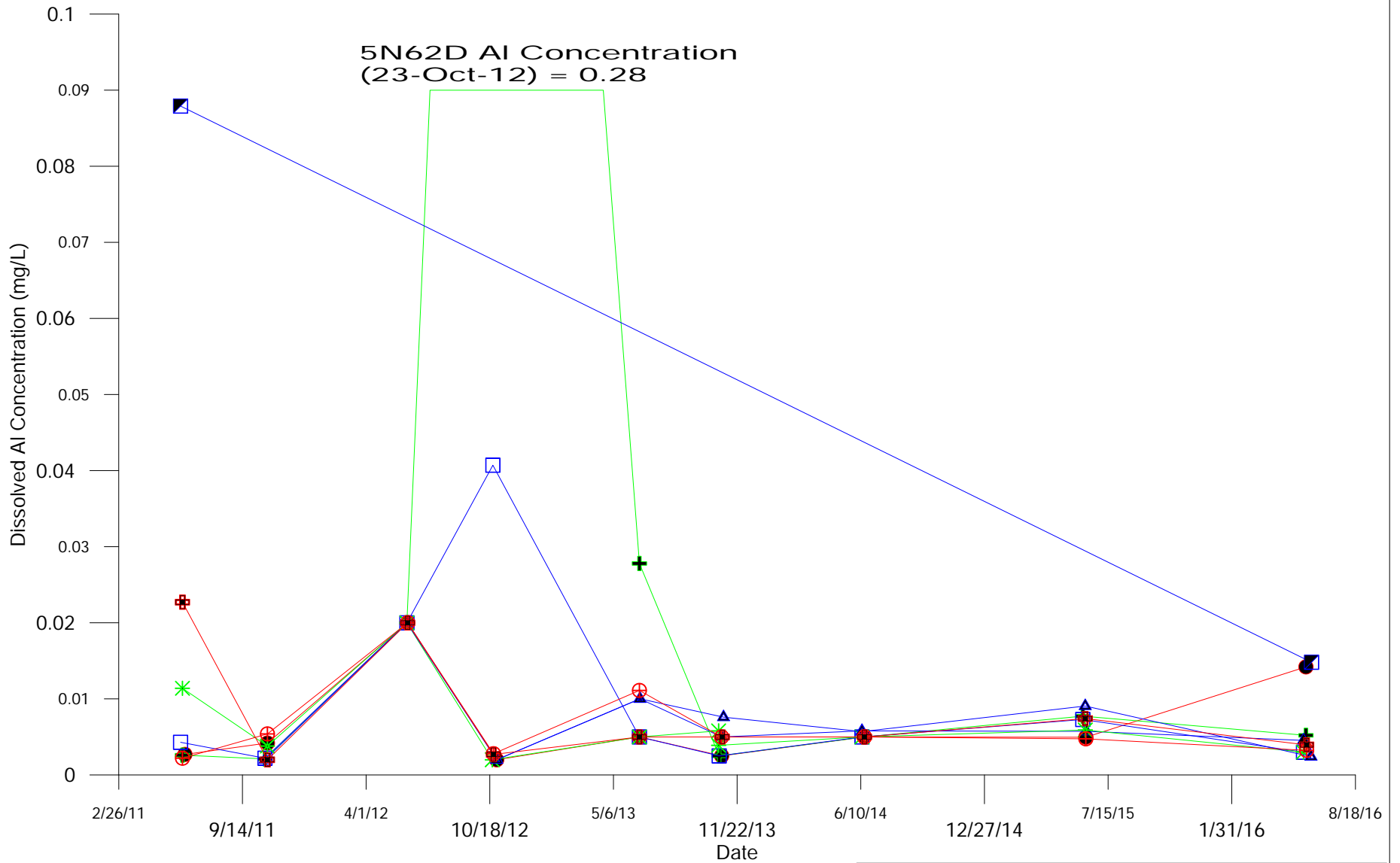


**Vanadium MOE Criteria = 0.25 mg/L**

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Vanadium Bedrock Wells</b>		
APRIL 2018	FIGURE 13	REV 0



	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Zirconium Bedrock Wells</b>		
APRIL 2018	FIGURE 14	REV 0



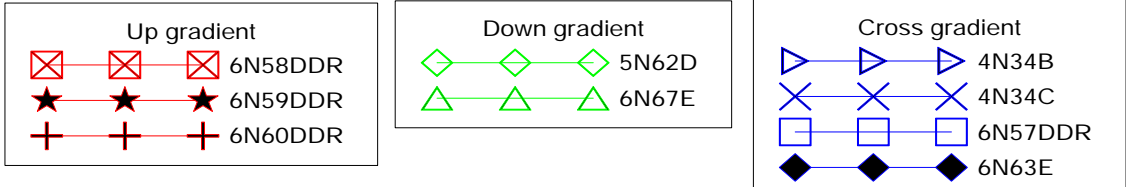
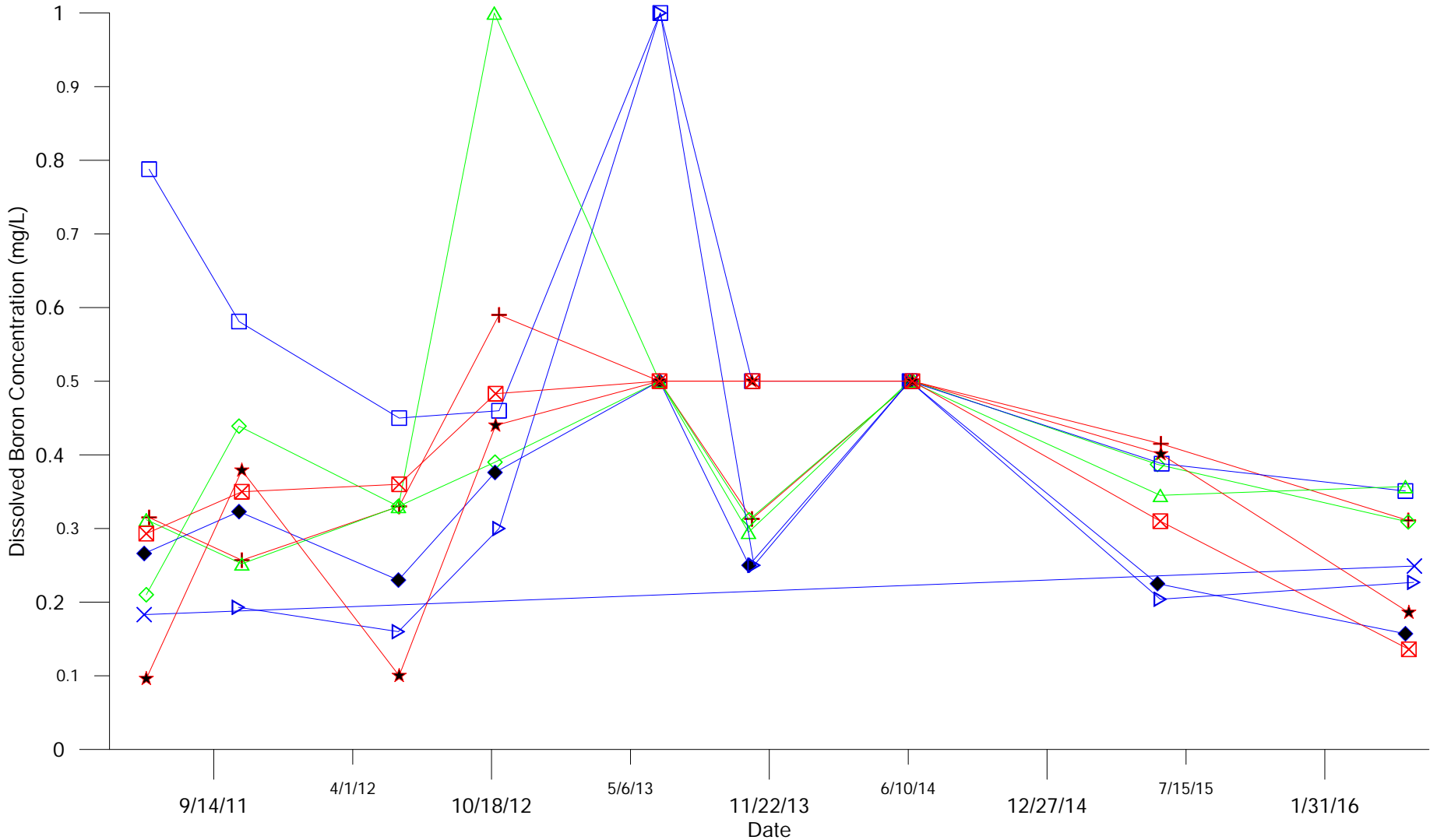
Down gradient  
 + 5N62D  
 \* 6N67E

Up gradient  
 ● 6060DDR  
 ⊕ 6N59DDR  
 ⊕ 6N58DDR

Cross gradient  
 ▲ 4N34B  
 □ 6N63E  
 ▣ 4N34C  
 ▲ 6N57DDR

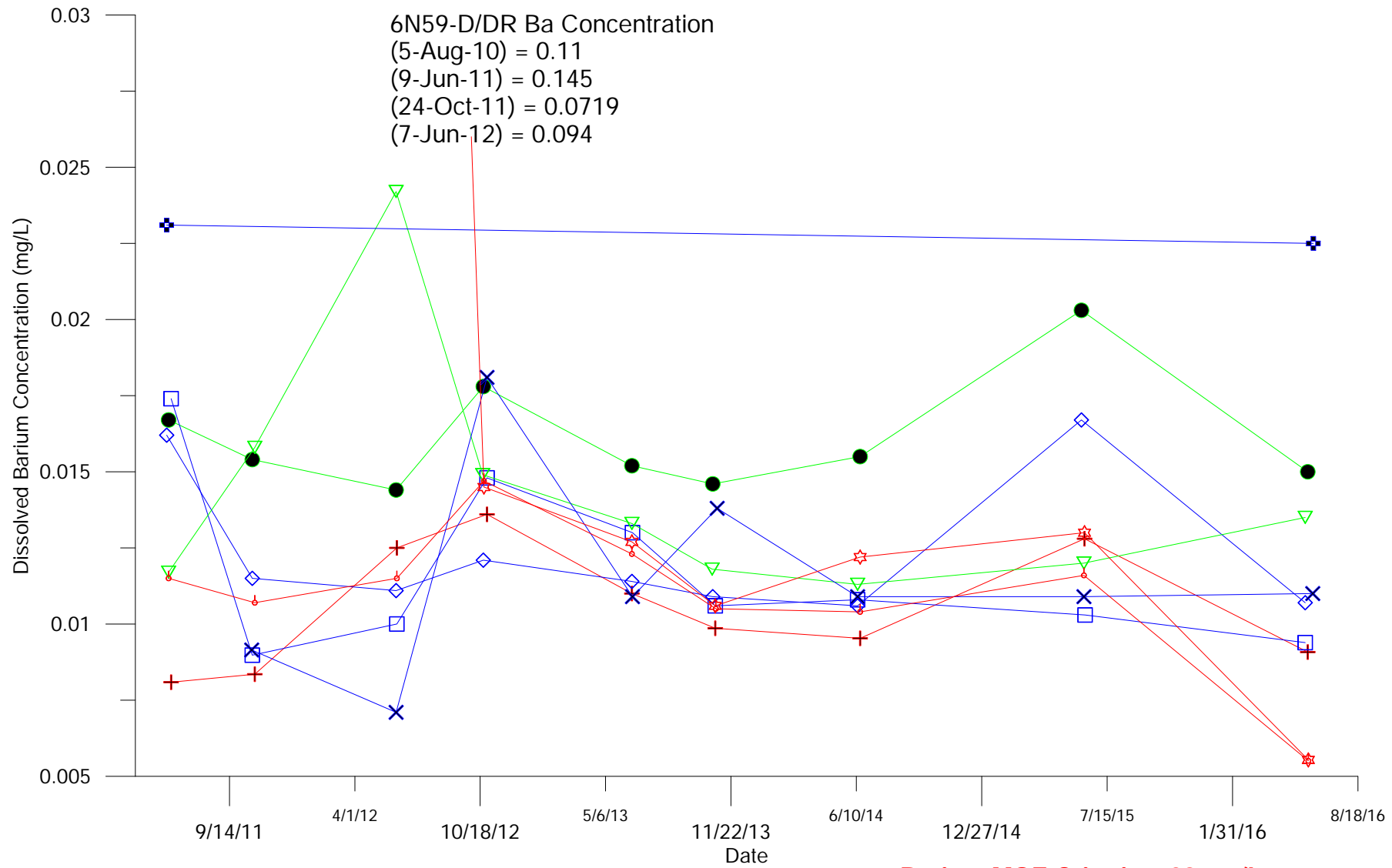
	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Aluminium Clay Wells</b>		
APRIL 2017	FIGURE 15	REV 0





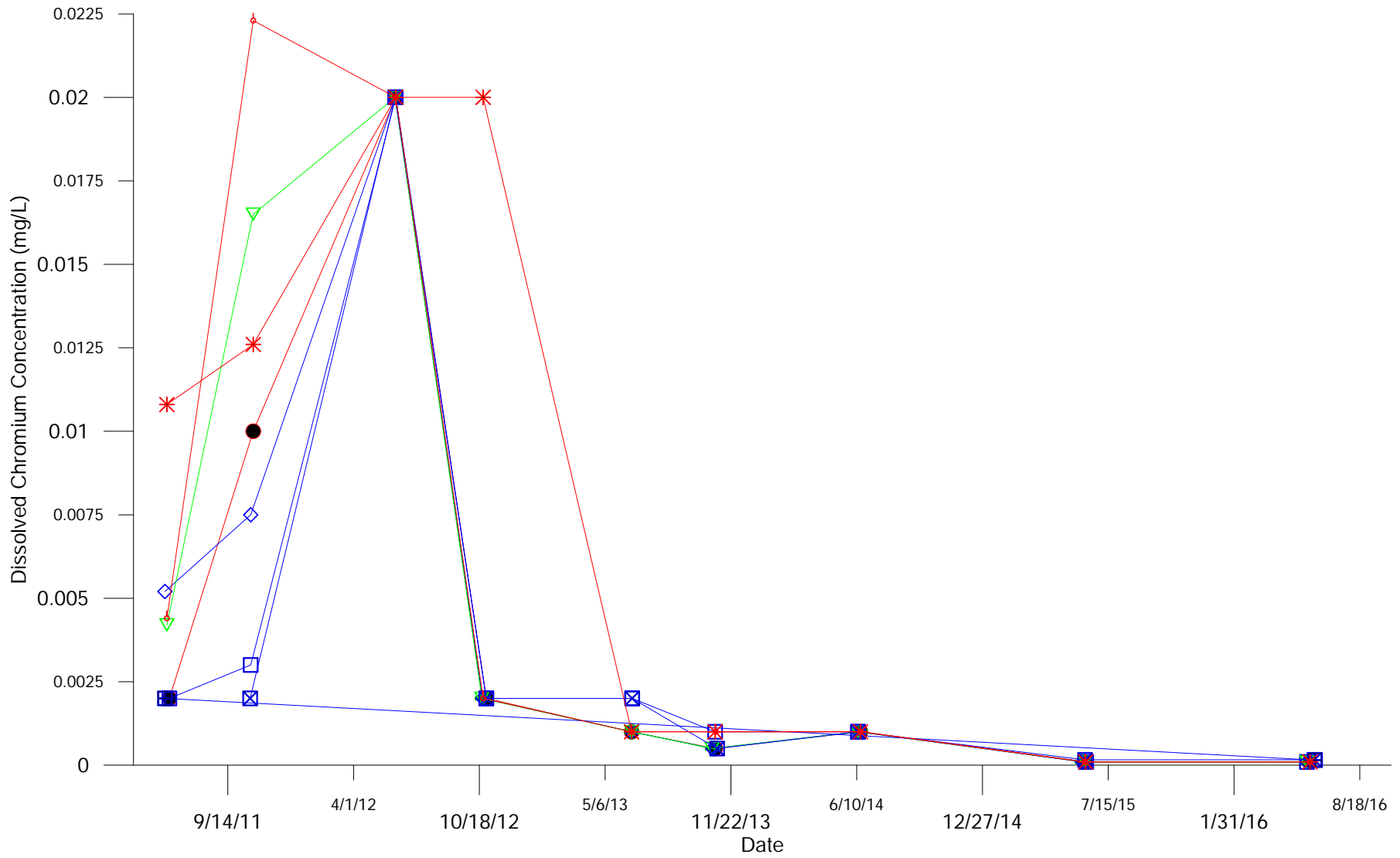
**TOTAL Boron MOE Criteria = 45 mg/L**

	<b>City Of Winnipeg</b> <b>Solid Waste Services</b>
<b>BRADY ROAD RESOURCE MANAGEMENT FACILITY</b>	
<b>Dissolved Boron Clay Wells</b>	
<b>APRIL 2017</b>	<b>FIGURE 16</b>
<b>REV 0</b>	

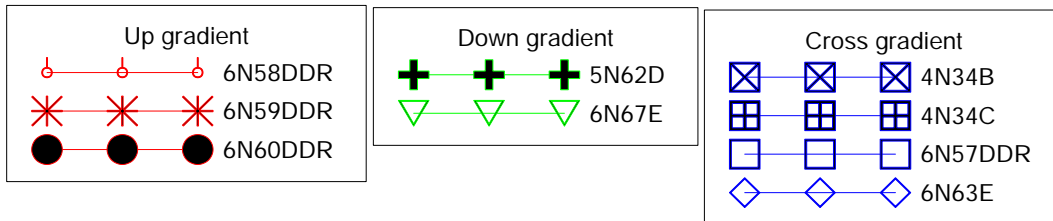


Barium MOE Criteria = 29 mg/L

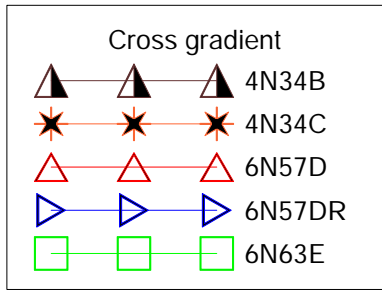
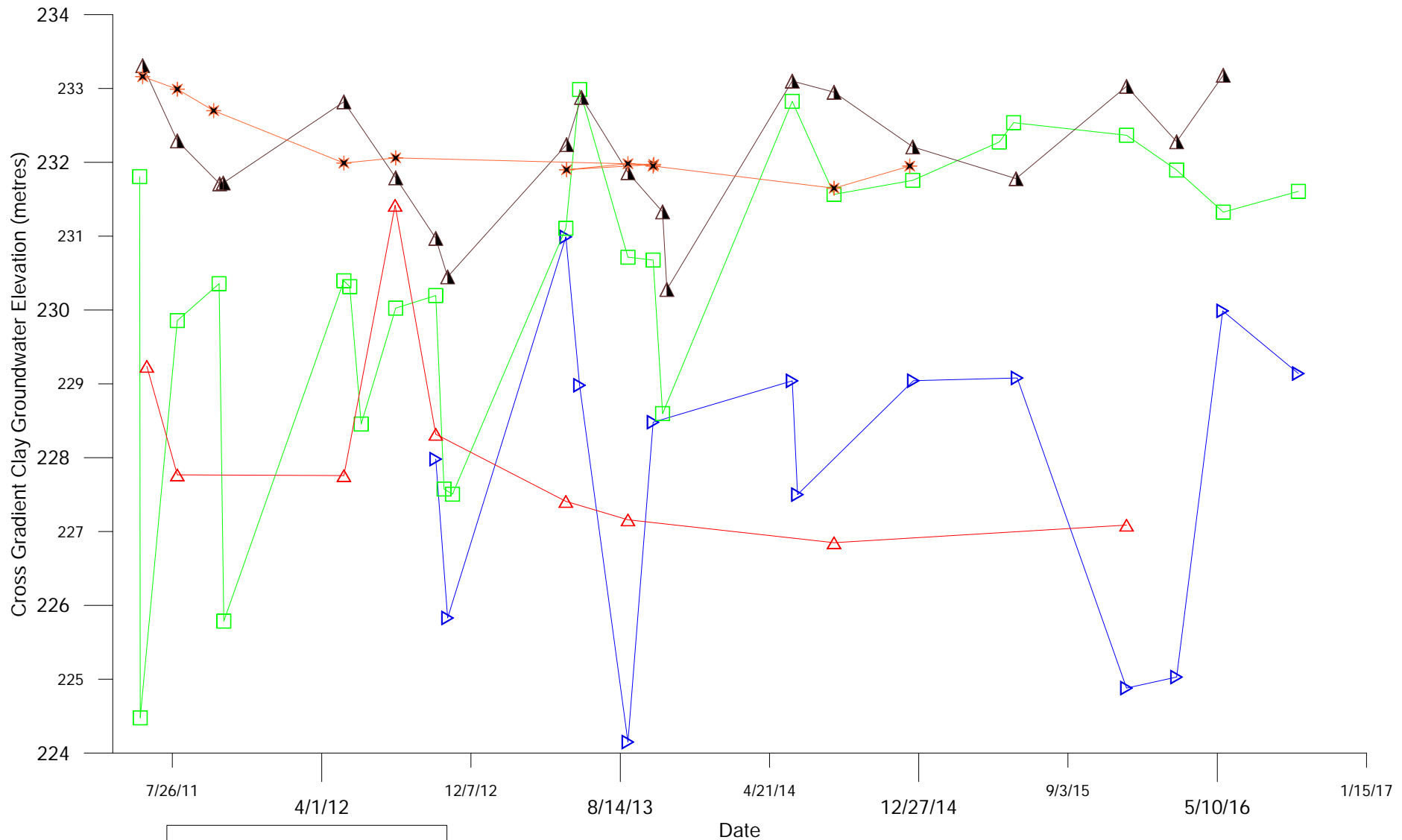
	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Barium Clay Wells</b>		
APRIL 2017	FIGURE 17	REV 0



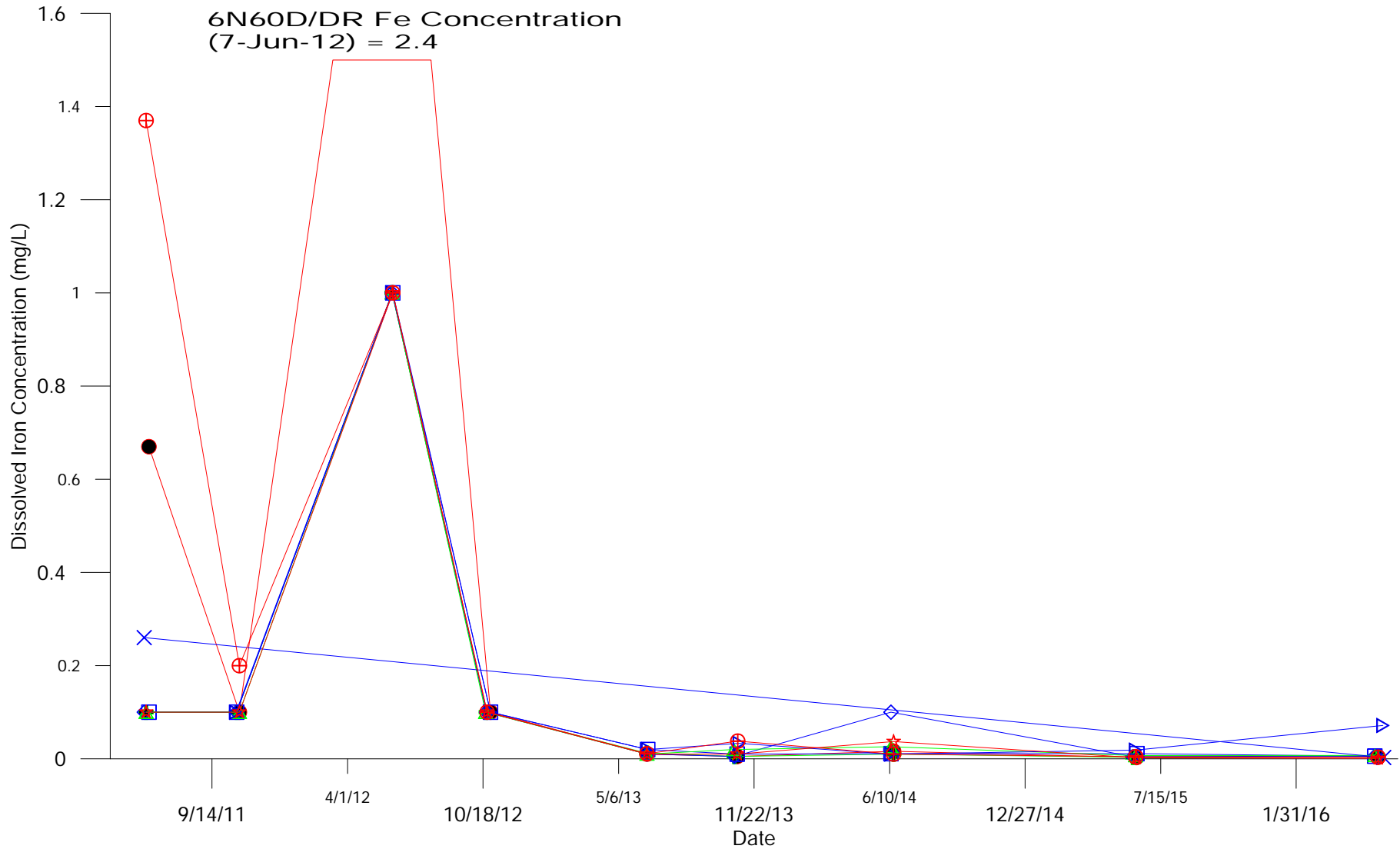
**Chromium MOE Criteria = 0.81 mg/L**



	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Chromium Clay Wells</b>		
APRIL 2017	FIGURE 18	REV 0



	City of Winnipeg Solid Waste Services
	BRADY ROAD RESOURCE MANAGEMENT FACILITY
<b>GROUNDWATER ELEVATION</b> <b>Cross Gradient Clay Wells</b>	
APRIL 2017	FIGURE GW-31   REV 0



**Up gradient**

- ⊕ ⊕ ⊕ 6N58DDR
- ☆ ☆ ☆ 6N59DDR
- ● ● 6N60DDR

**Down gradient**

- + + + 5N62D
- △ △ △ 6N67E

**Cross gradient**

- ▷ ▷ ▷ 4N34B
- × × × 4N34C
- □ □ 6N57DDR
- ◇ ◇ ◇ 6N63E



City Of Winnipeg  
Solid Waste Services

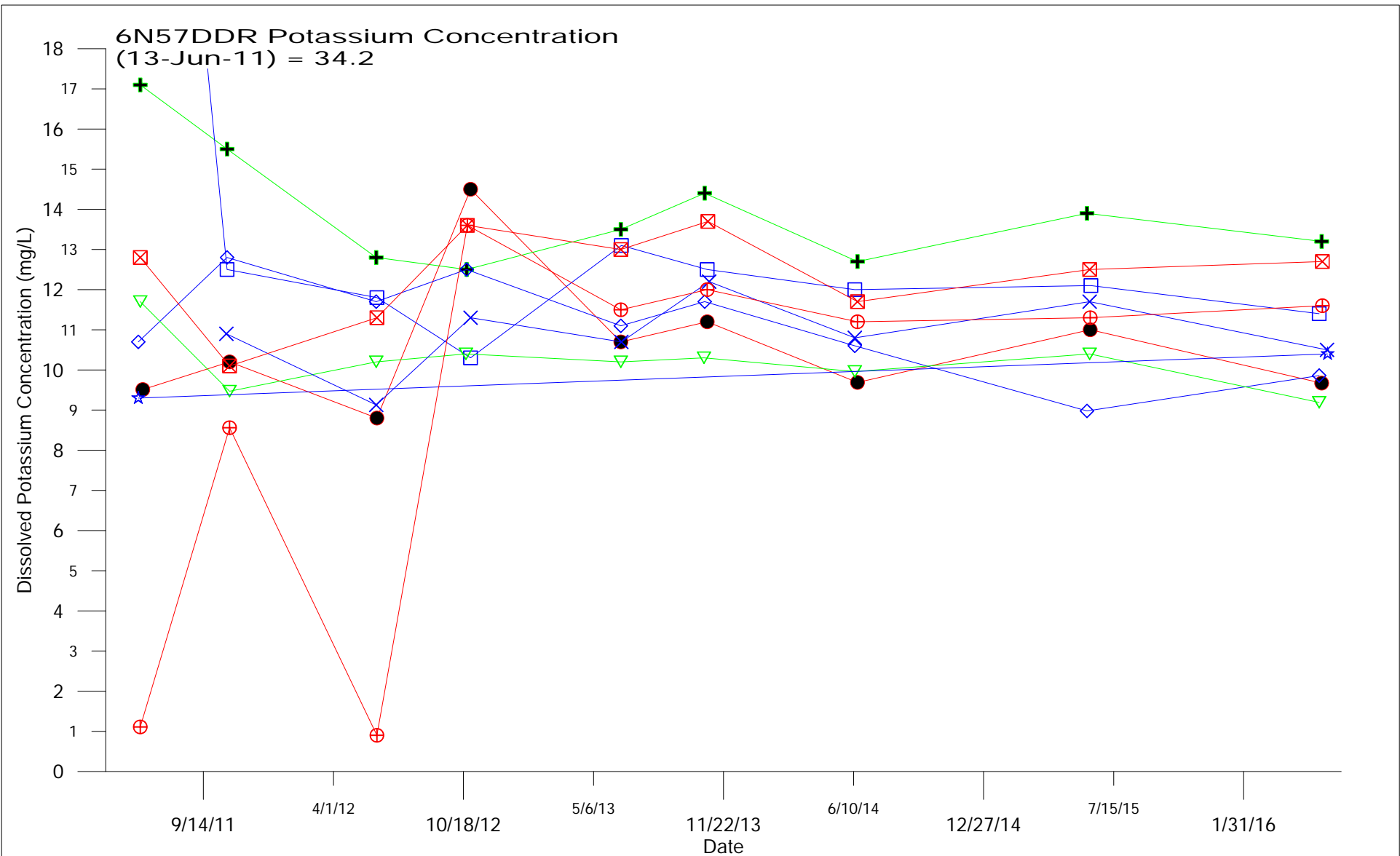
BRADY ROAD RESOURCE MANAGEMENT FACILITY

**Dissolved Iron  
Clay Wells**

APRIL 2017

FIGURE 19

REV 0



**Up gradient**

- ⊠ 6N58DDR
- ⊕ 6N59DDR
- 6N60DDR

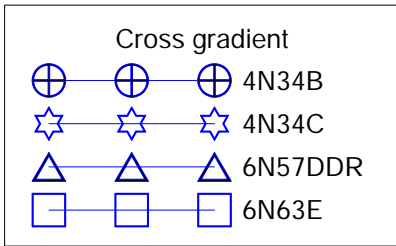
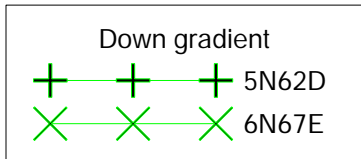
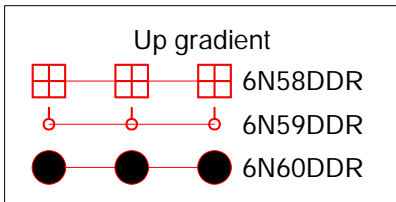
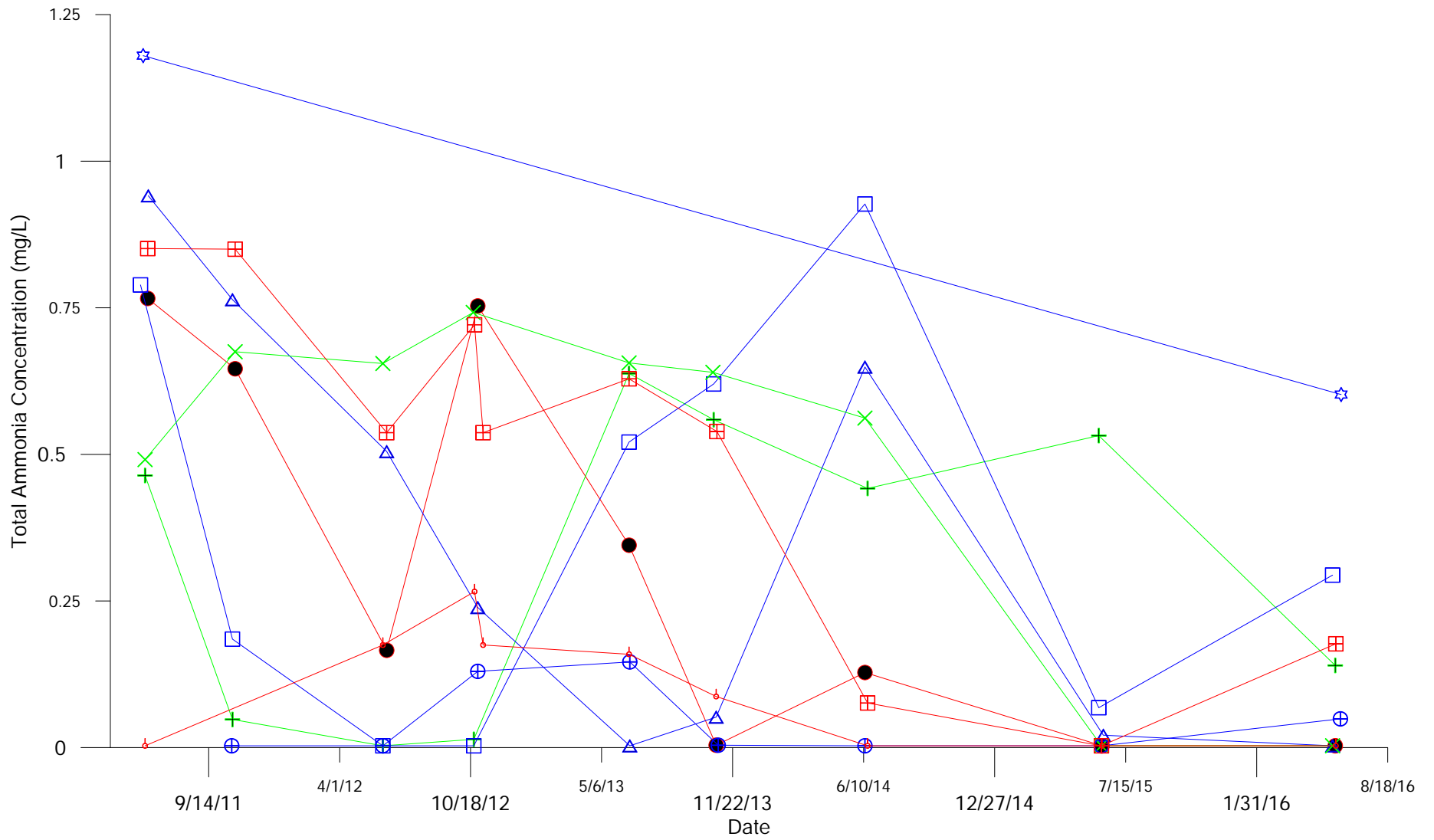
**Down gradient**

- ⊕ 5N62D
- ▽ 6N67E

**Cross gradient**

- × 4N34B
- ☆ 4N34C
- 6N57DDR
- ◇ 6N63E

	<b>City Of Winnipeg Solid Waste Services</b>
<b>BRADY ROAD RESOURCE MANAGEMENT FACILITY</b>	
<b>Dissolved Potassium Clay Wells</b>	
<b>APRIL 2017</b>	<b>FIGURE 20</b>
<b>REV 0</b>	



City Of Winnipeg  
Solid Waste Services

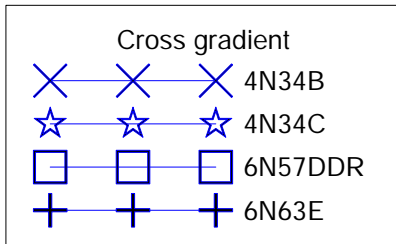
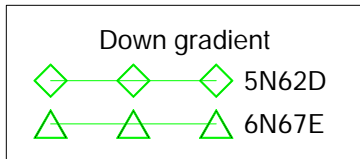
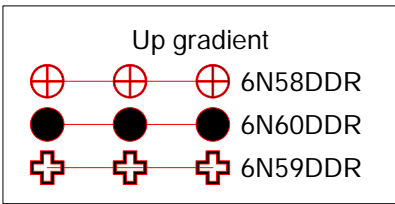
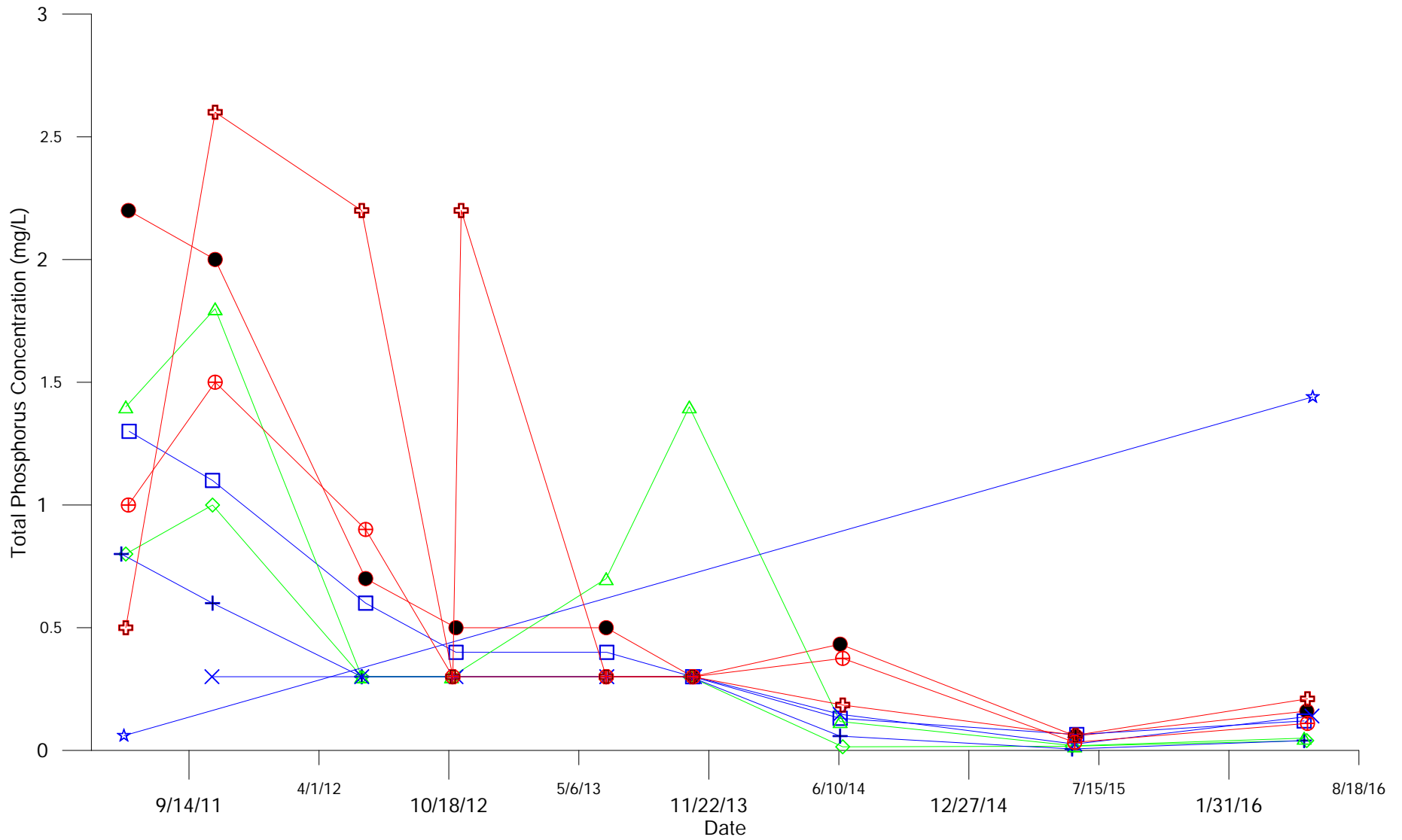
BRADY ROAD RESOURCE MANAGEMENT FACILITY

**Total Ammonia  
Clay Wells**

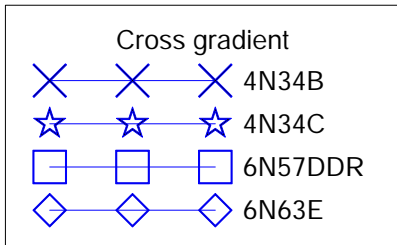
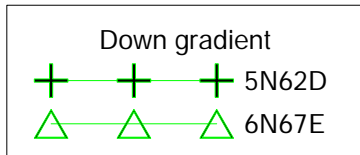
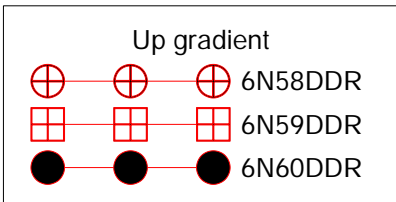
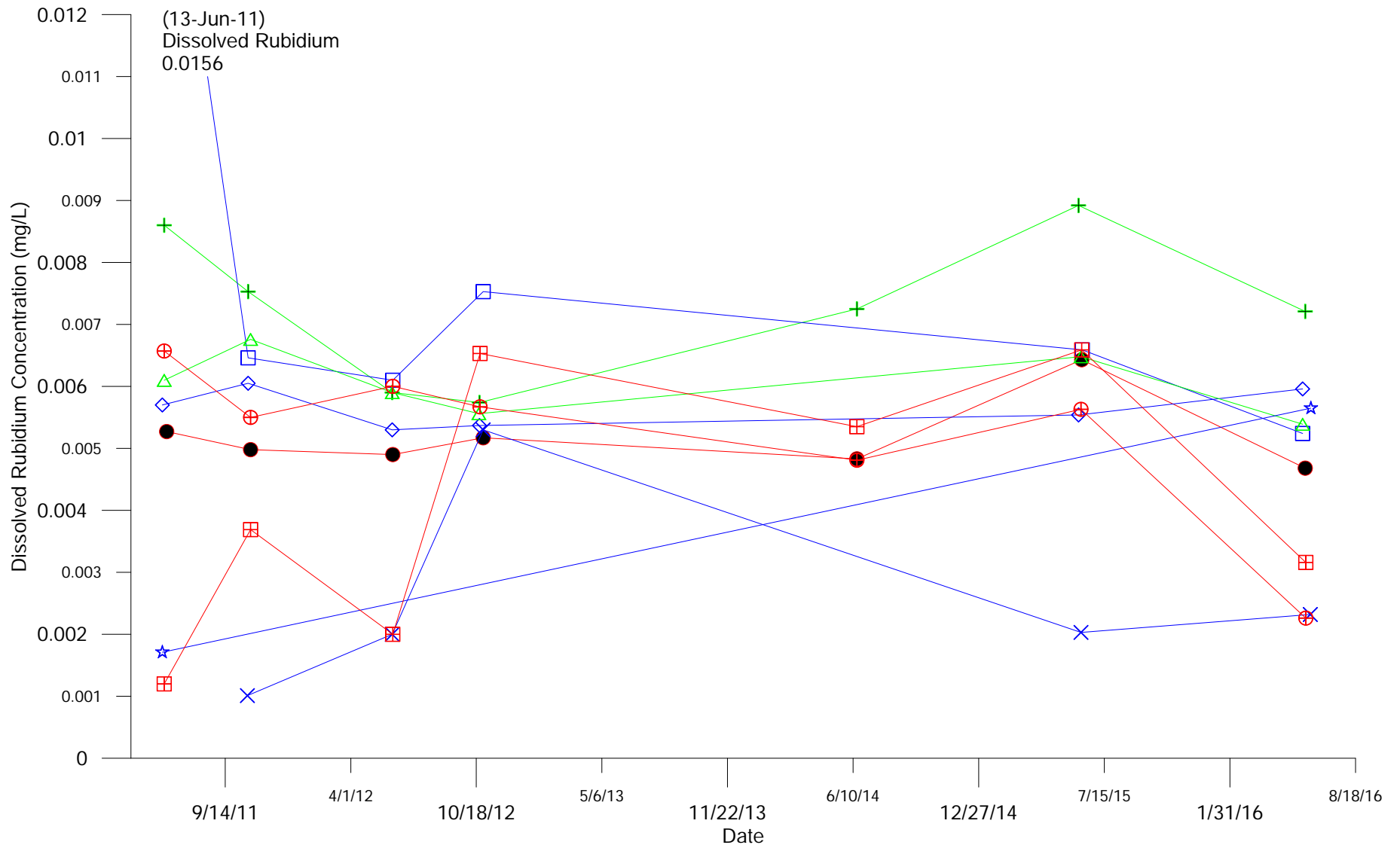
APRIL 2017

FIGURE 21

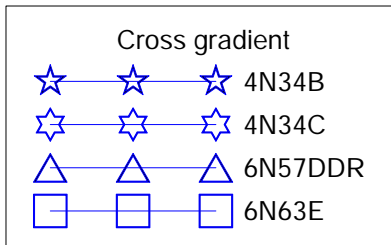
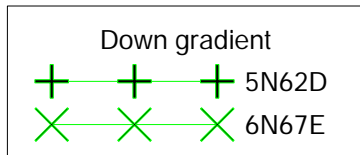
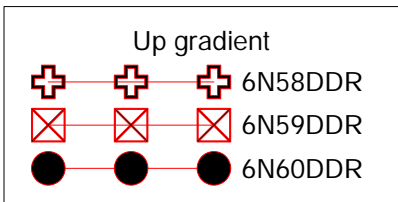
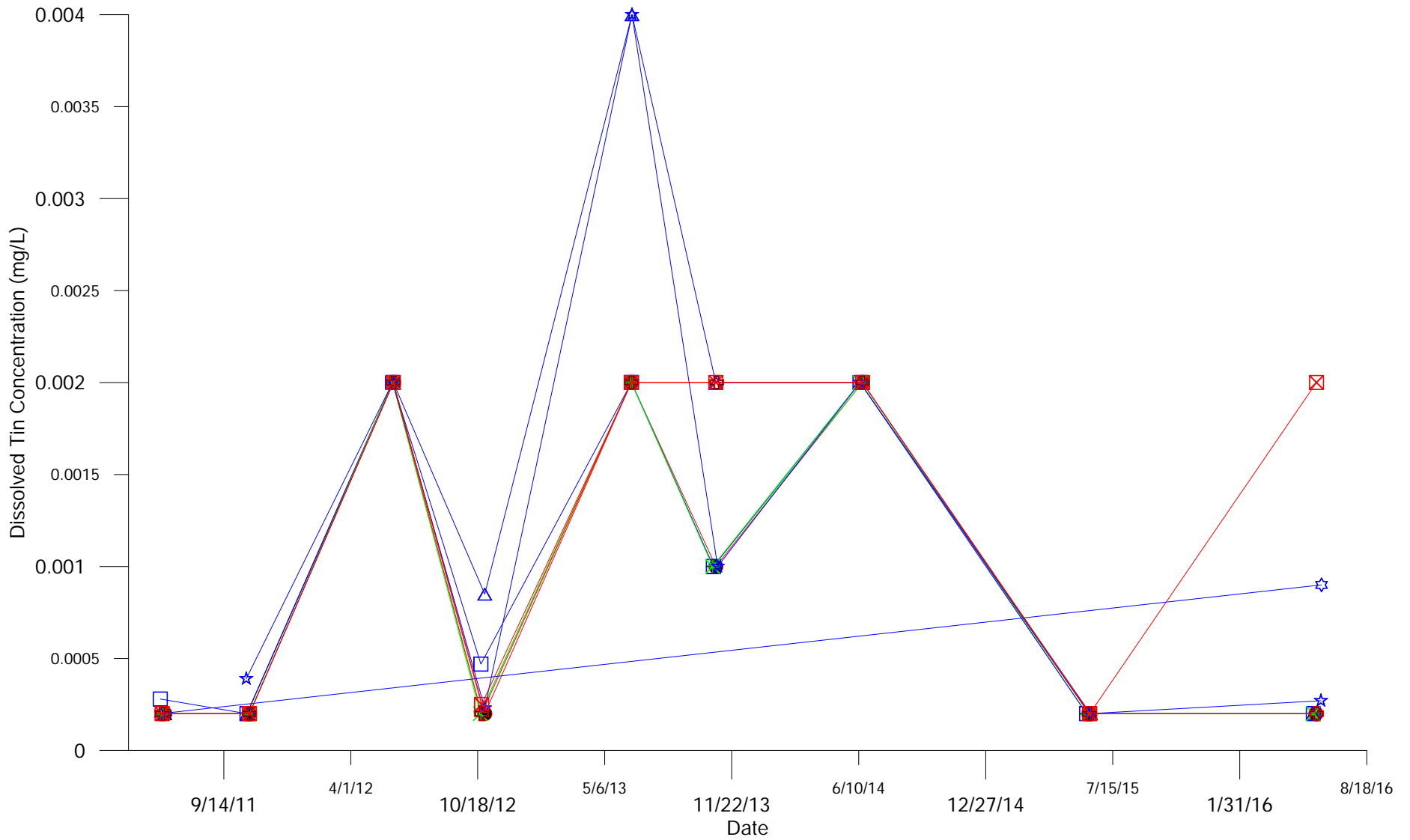
REV 0



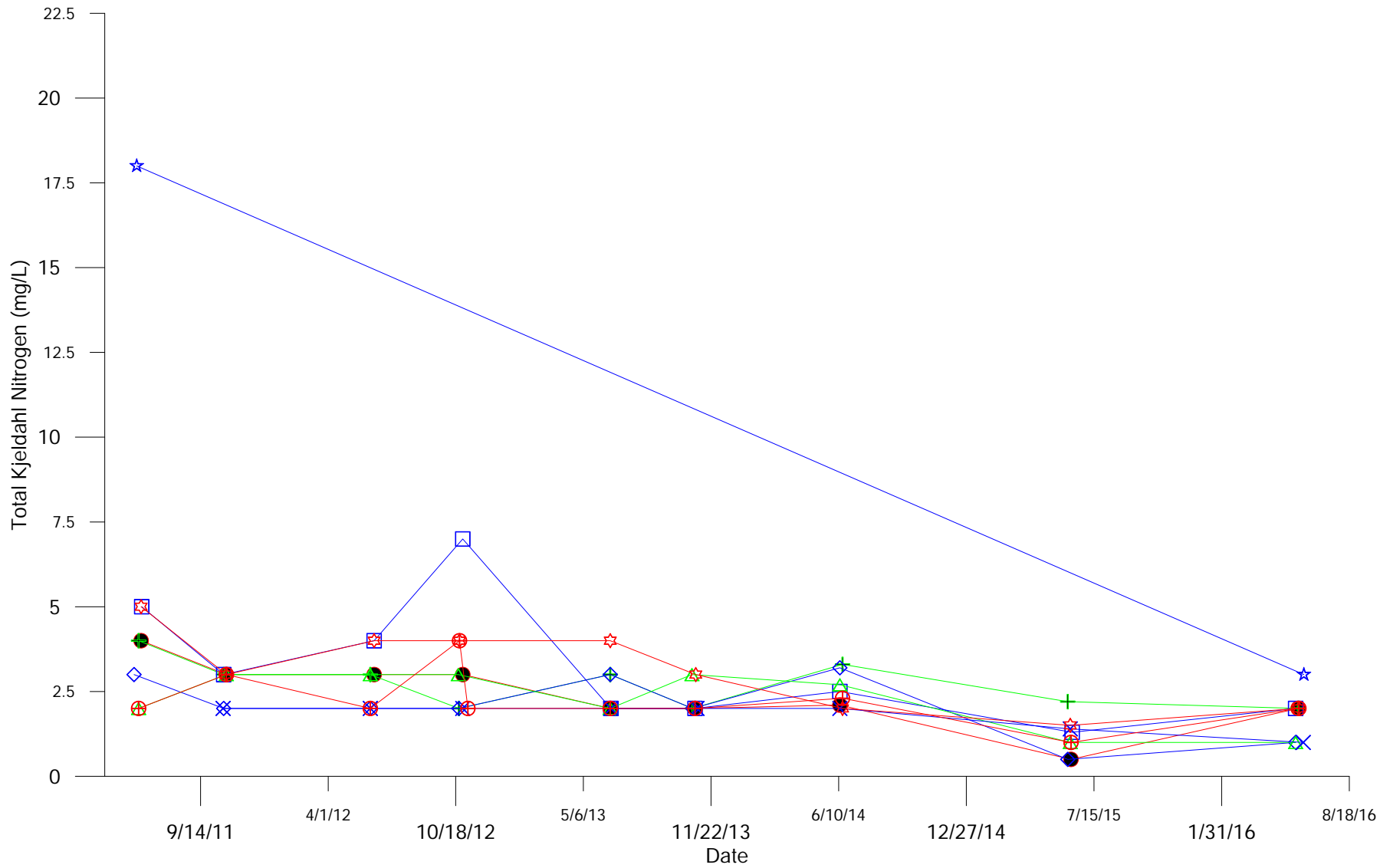




	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Rubidium Clay Wells</b>		
APRIL 2017	FIGURE 23	REV 0



	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Tin Clay Wells</b>		
APRIL 2017	FIGURE 24	REV 0



**Up gradient**

- 6N58DDR (Red Star)
- 6N59DDR (Red Circle)
- 6N60DDR (Black Circle)

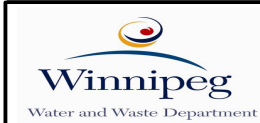
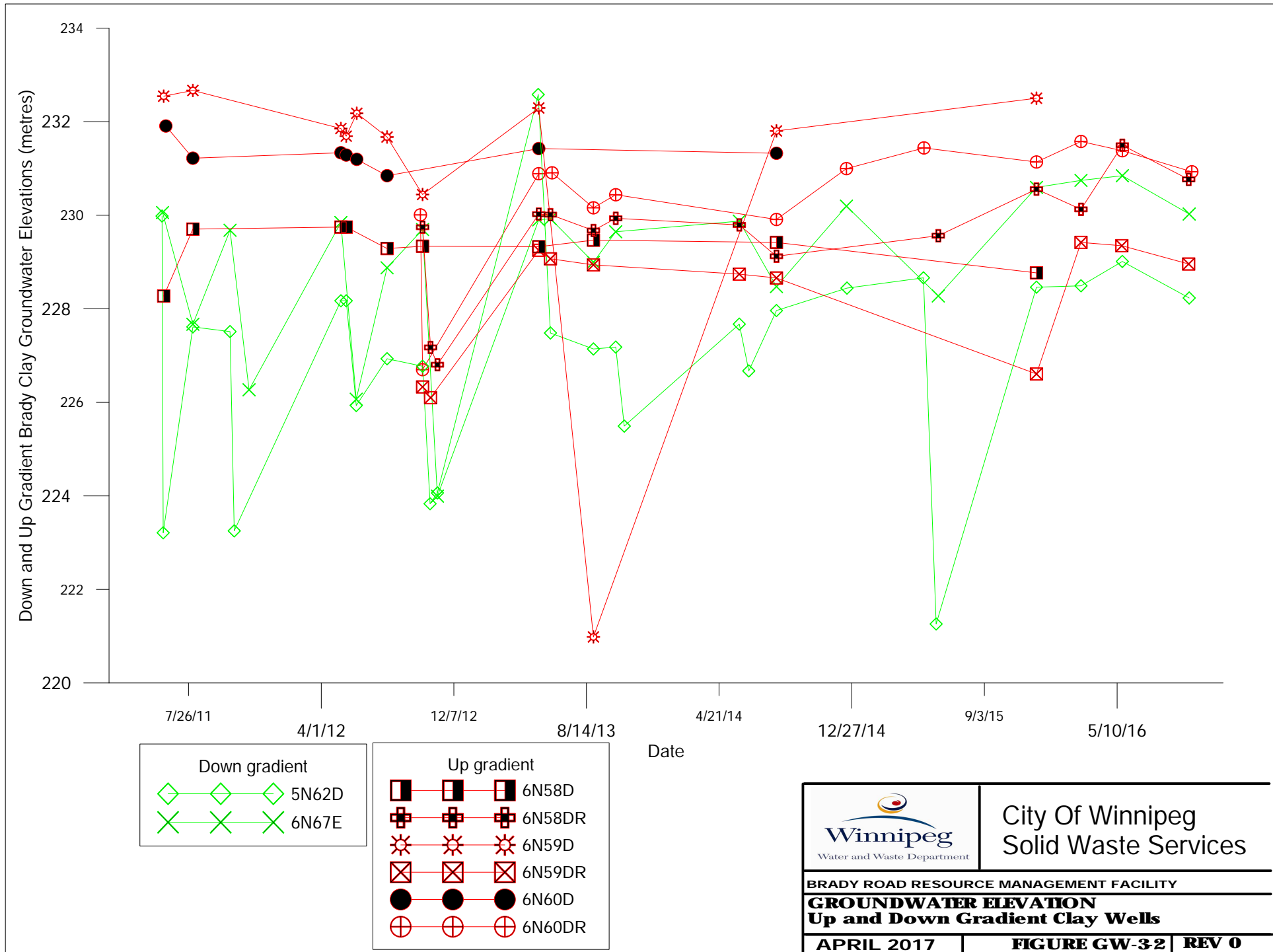
**Down gradient**

- 5N62D (Green Plus)
- 6N67E (Green Triangle)

**Cross gradient**

- 4N34B (Blue X)
- 4N34C (Blue Star)
- 6N57DDR (Purple Square)
- 6N63E (Purple Diamond)

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Total Kjeldahl Nitrogen Clay Wells</b>		
APRIL 2016	FIGURE 25	REV 0



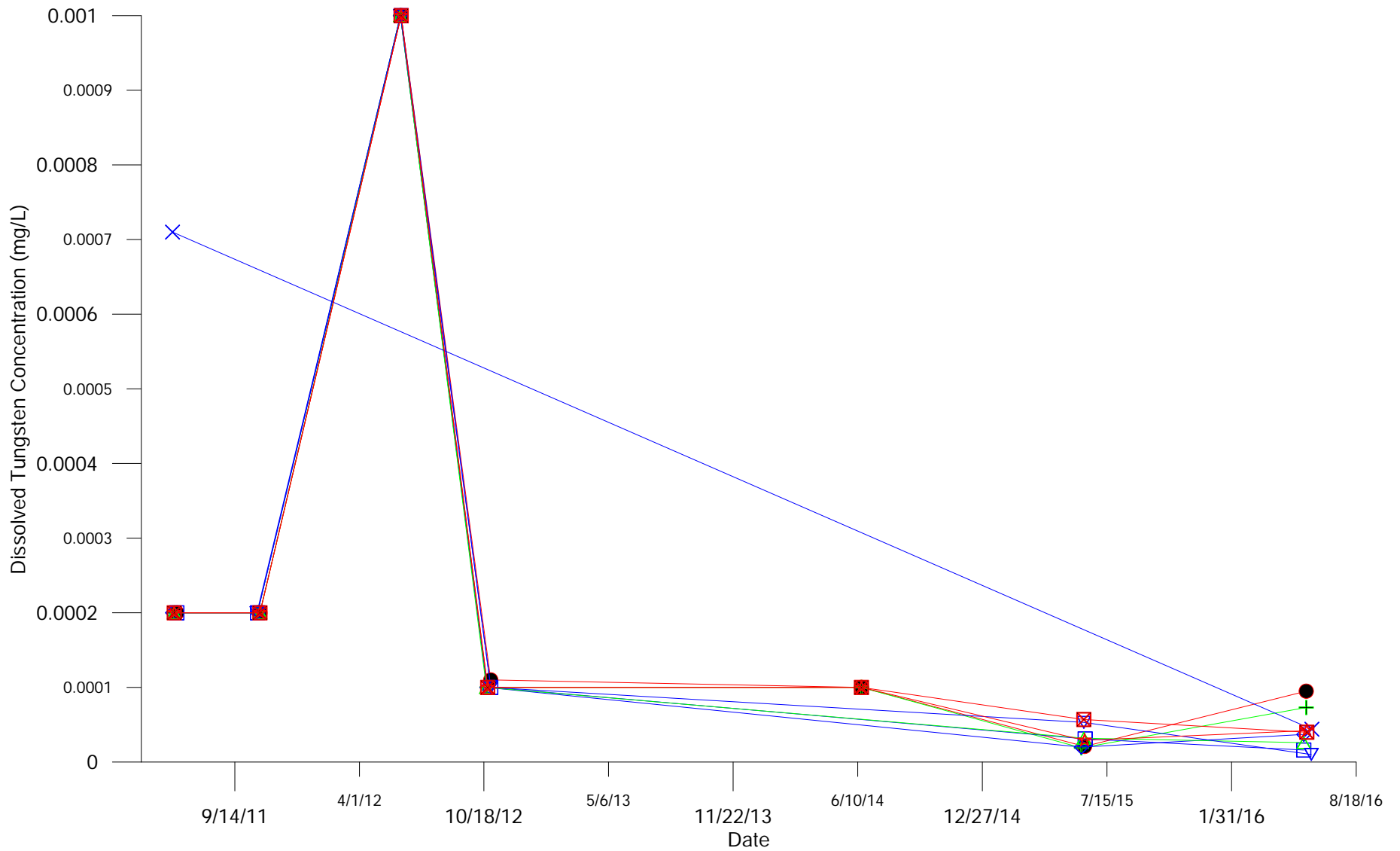
City of Winnipeg  
Solid Waste Services

BRADY ROAD RESOURCE MANAGEMENT FACILITY

**GROUNDWATER ELEVATION**  
**Up and Down Gradient Clay Wells**

APRIL 2017

FIGURE GW-32 | REV 0



**Up gradient**

- ☒ 6N58DDR
- ☆ 6N59DDR
- 6N60DDR

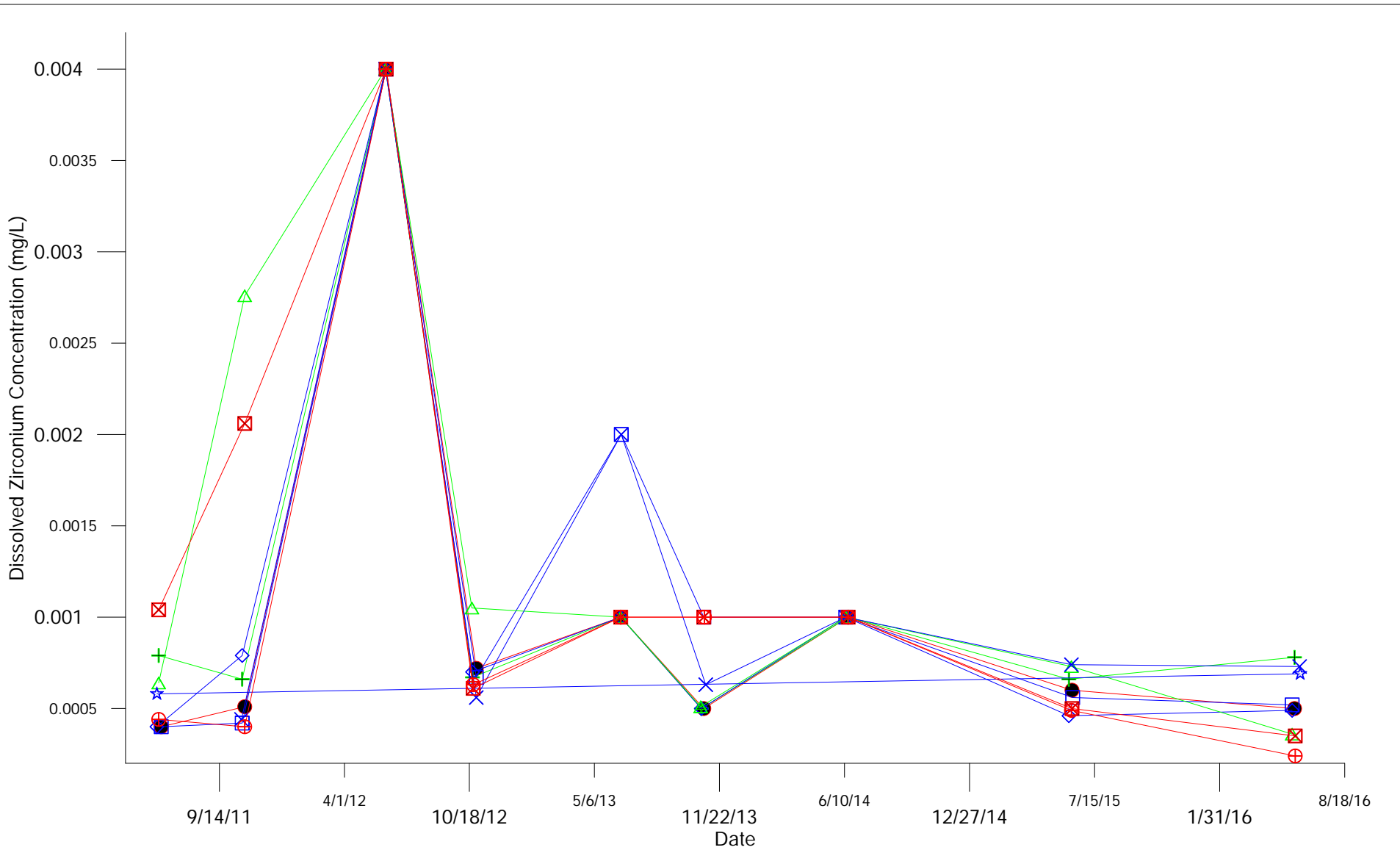
**Down gradient**

- + 5N62D
- △ 6N67E

**Cross gradient**

- ▽ 4N34B
- × 4N34C
- 6N57DDR
- ◇ 6N63E

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Tungsten Clay Wells</b>		
APRIL 2017	FIGURE 26	REV 0



Up gradient

- ⊕ 6N58DDR
- ⊗ 6N59DDR
- 6N60DDR

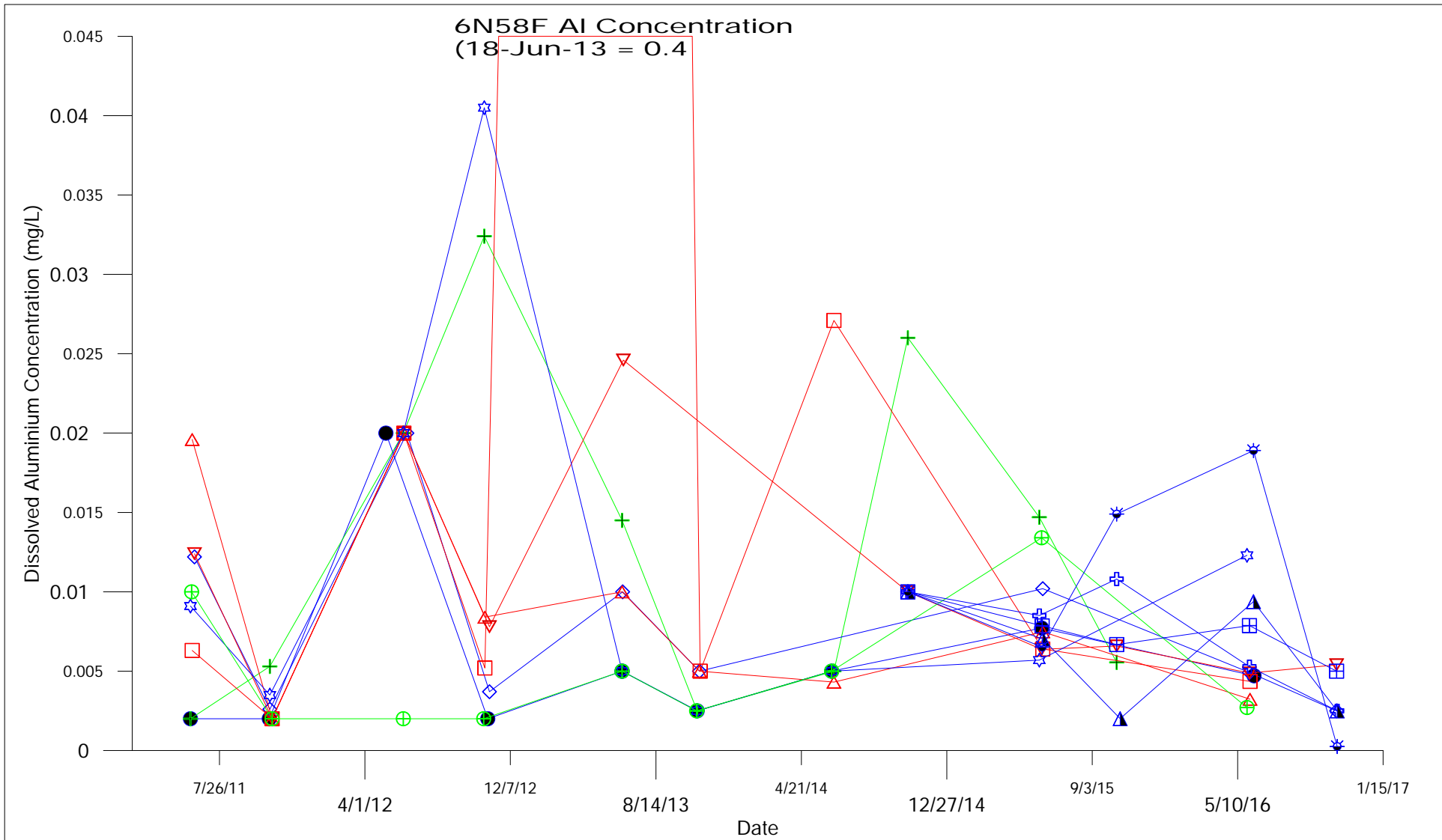
Down gradient

- + 5N62D
- △ 6N67E

Cross gradient

- × 4N34B
- ☆ 4N34C
- 6N57DDR
- ◇ 6N63E

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Zirconium Clay Wells</b>		
APRIL 2017	FIGURE 27	REV 0



**Up gradient**

- 6N58F
- △ 6N59F
- ▽ 6N60E

**Cross gradient**

- ⊞ 13A
- ⊕ 14A

**Down gradient**

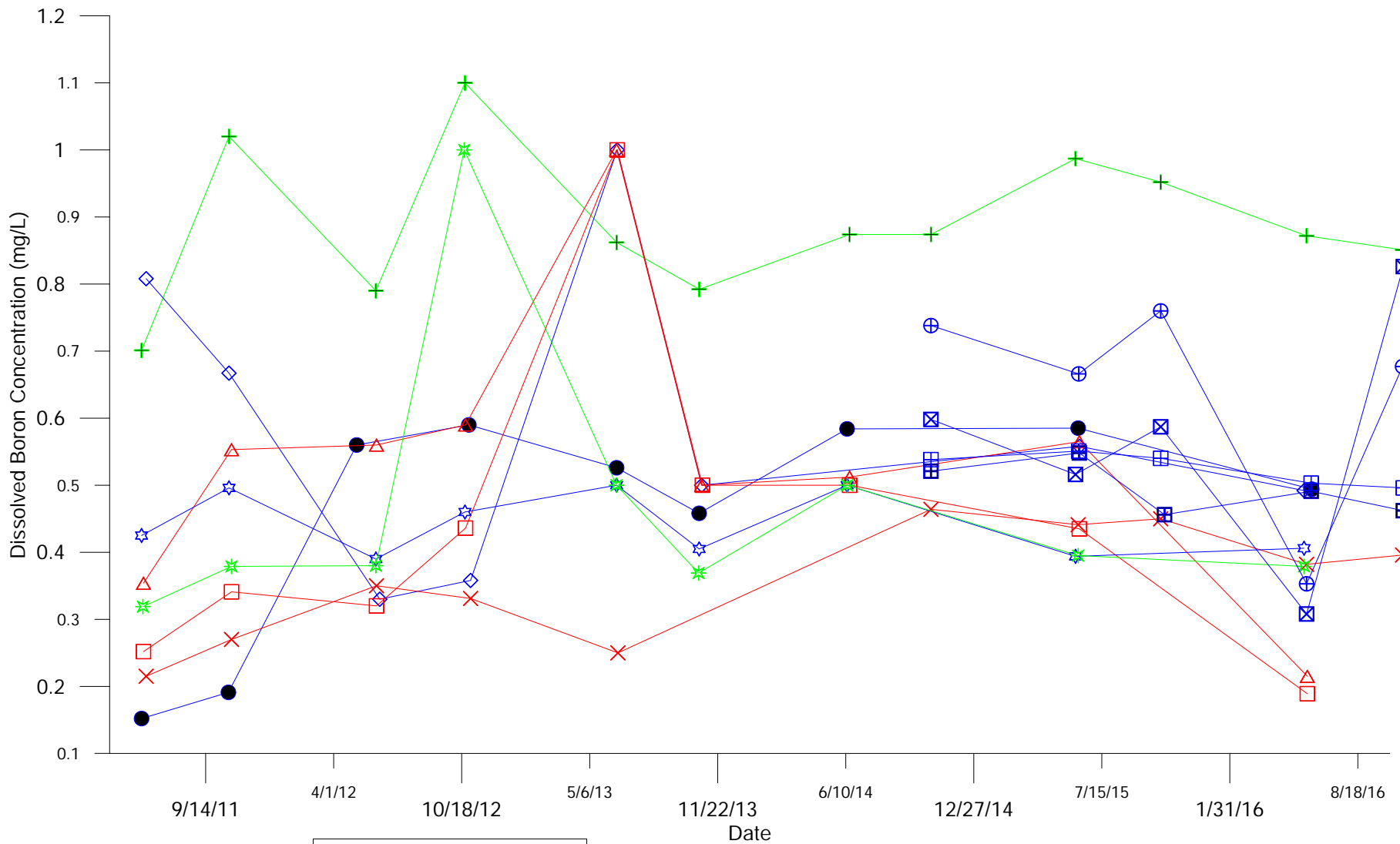
- ⊕ 5N62E
- ⊕ 6N67F

**Cross gradient**

- ☀ 16A
- 4N34DDR
- ◇ 6N57F
- ☆ 6N63F
- ▲ 15A



**City Of Winnipeg**  
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**Up gradient**

- 6N58F
- 6N59F
- 6N60EER

**Down gradient**

- 5N62E
- 6N67F

**Cross gradient**

- 13A
- 14A

**Cross gradient**

- 15A
- 16A
- 4N34DDR
- 6N57F
- 6N63F

**Boron MOE Criteria = 45 mg/L**

City of Winnipeg  
 Solid Waste Services

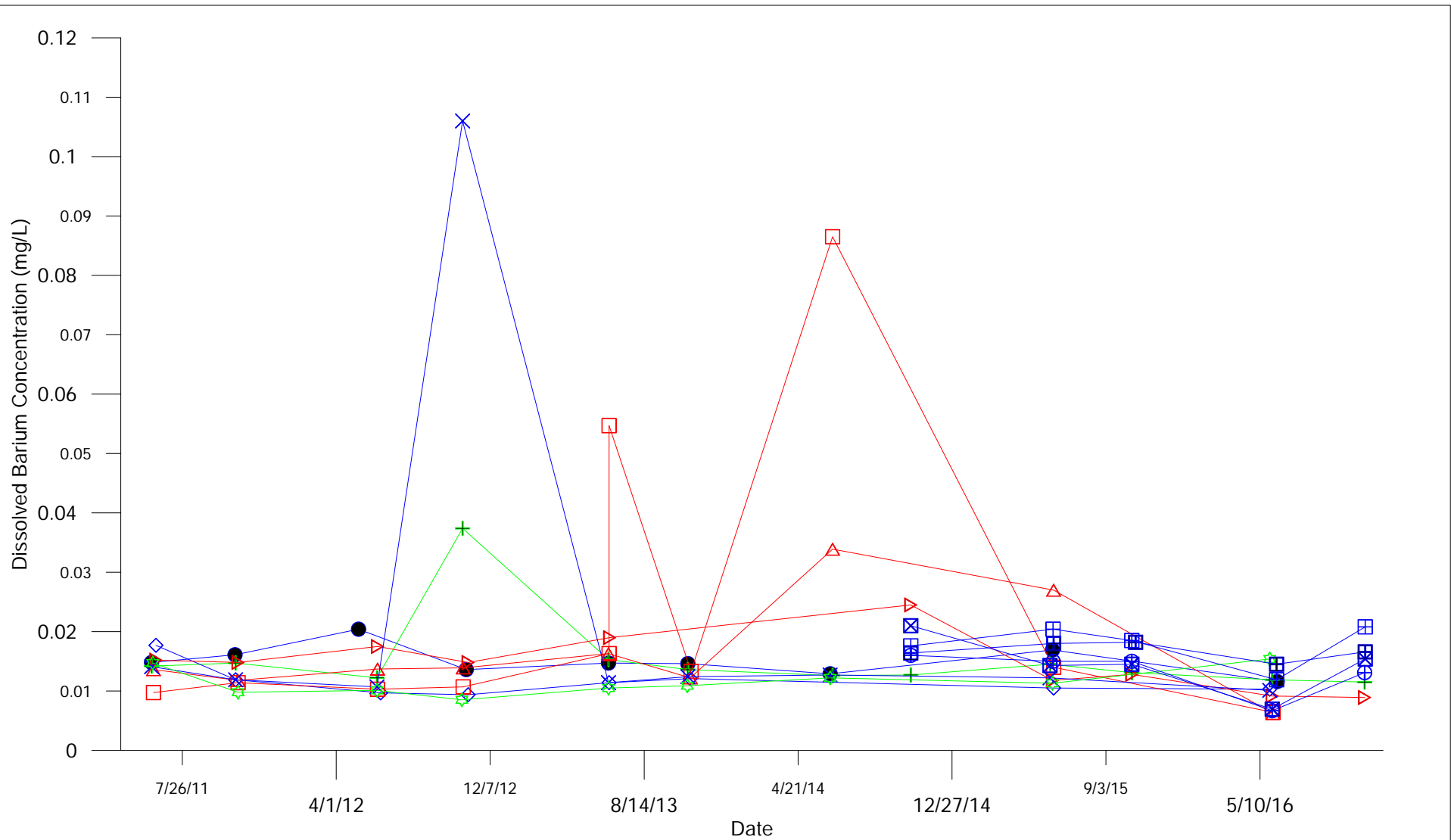
---

BRADY ROAD RESOURCE MANAGEMENT FACILITY

**Dissolved Boron Till Wells**

APRIL 2017 | **FIGURE 29** | **REV 0**





**Up gradient**

- 6N58F
- △ 6N59F
- ▷ 6N60EER

**Down gradient**

- + 5N62E
- ☆ 6N67F

**Cross gradient**

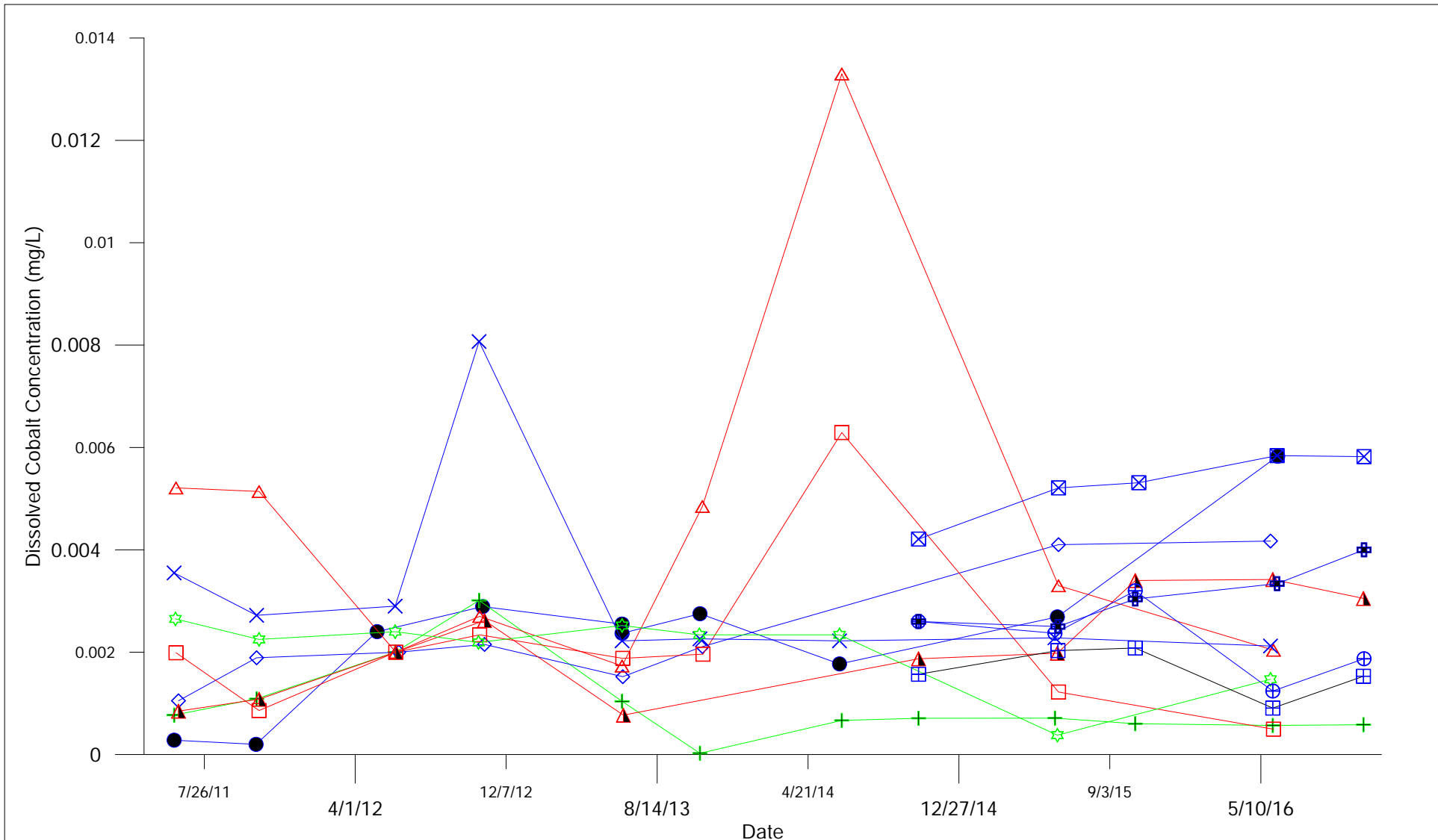
- ⊕ 13A
- ⊗ 14A

**Cross gradient**

- ⊞ 15A
- ⊠ 16A
- 4N34DDR
- ◇ 6N57F
- × 6N63F

**Barium MOE Criteria = 29 mg/L**

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Barium Till Wells</b>		
APRIL 2017	FIGURE 30	REV 0



**Up gradient**

- 6N58F
- △ 6N59F
- ▲ 6N60EER

**Down gradient**

- + 5N62E
- ☆ 6N67F

**Cross gradient**

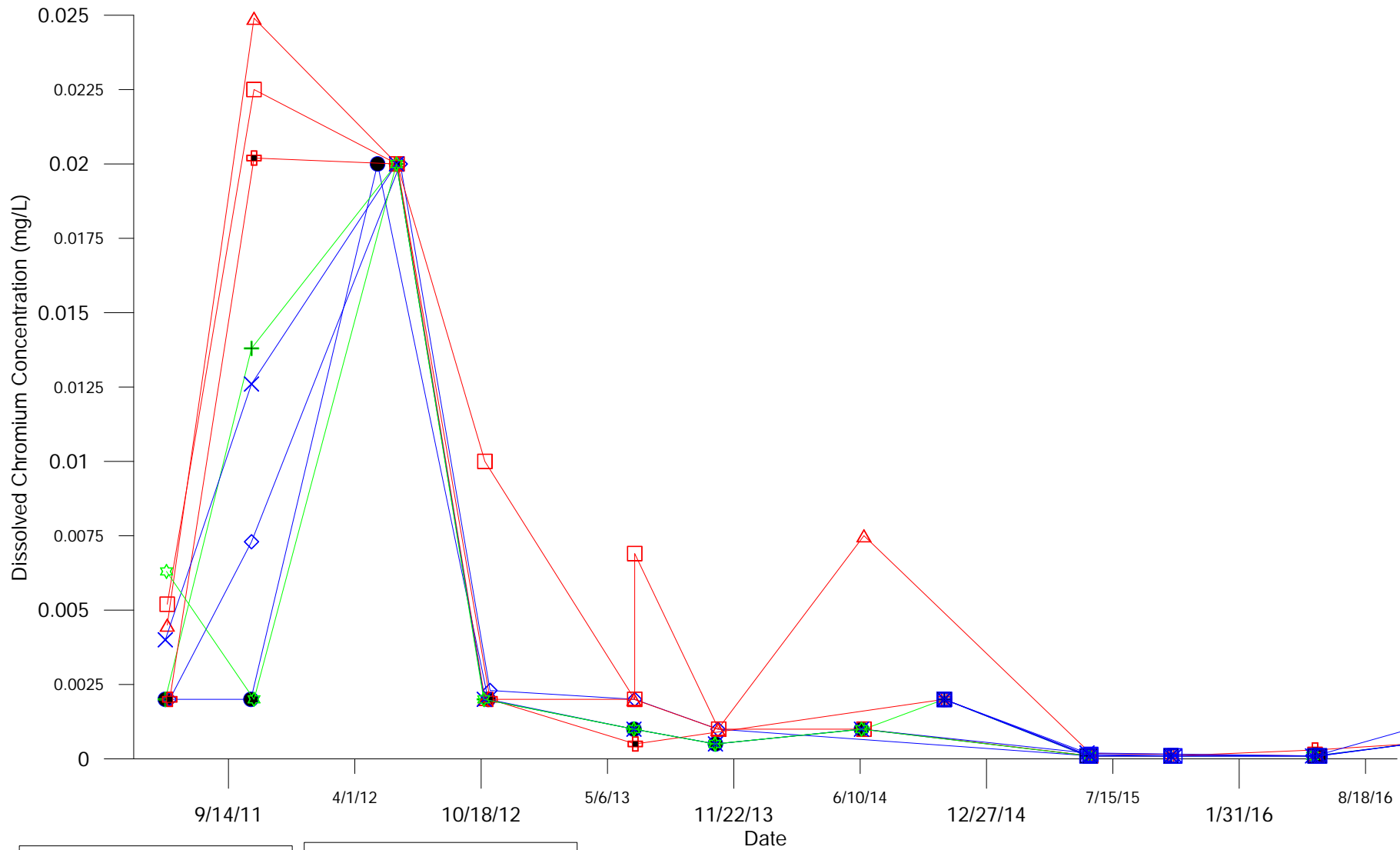
- ⊞ 13A
- ⊕ 14A

**Cross gradient**

- ⊠ 15A
- ⊞ 16A
- 4N34DDR
- ◇ 6N57F
- × 6N63F

**Cobalt MOE Criteria = 0.066 mg/L**

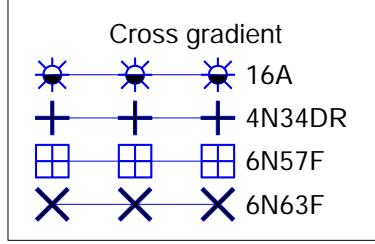
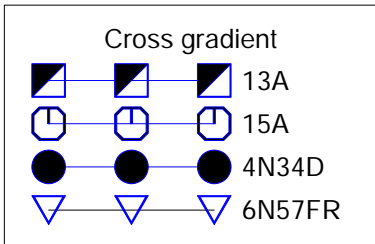
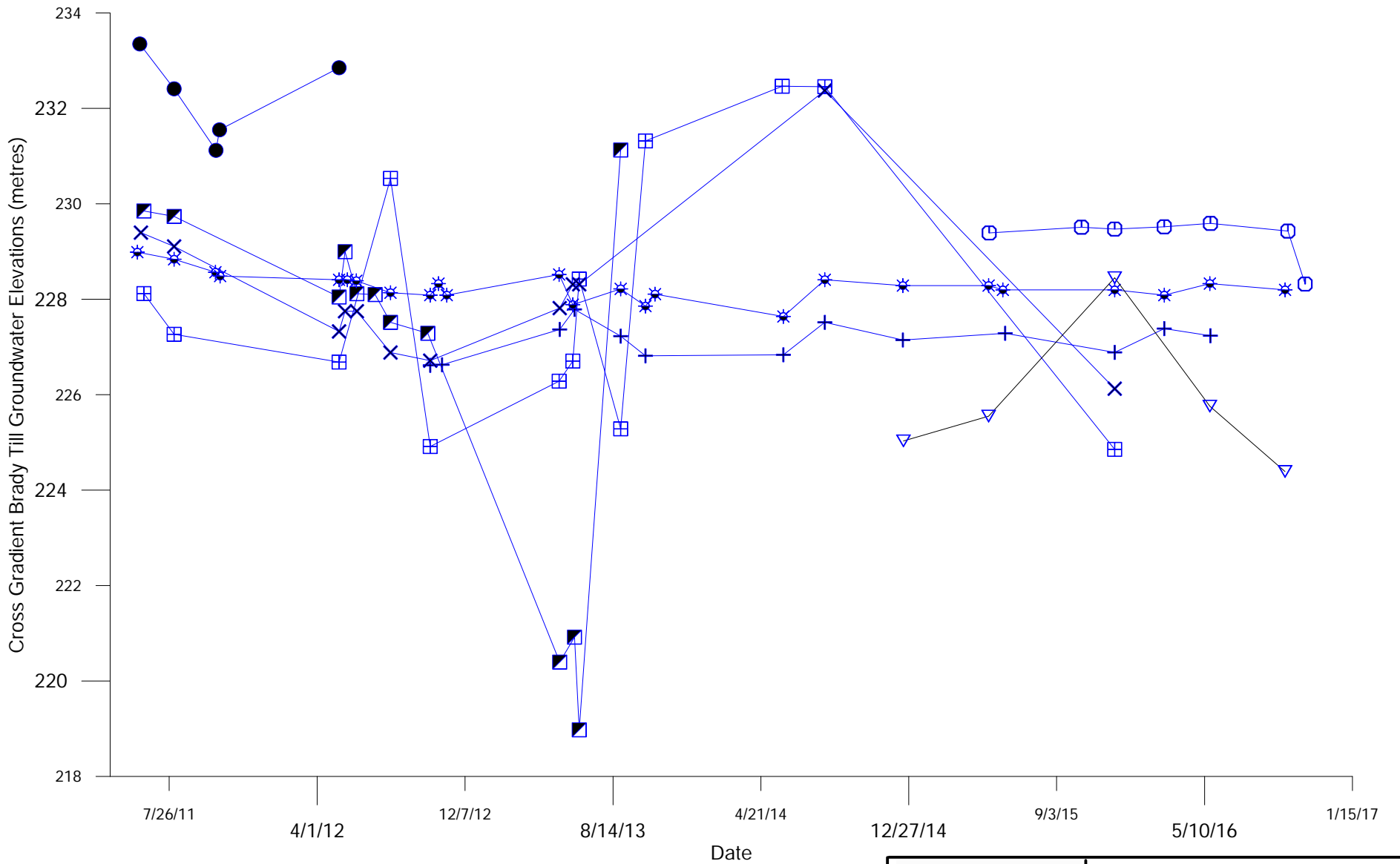
	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Cobalt Till Wells</b>		
APRIL 2017	FIGURE 31	REV 0



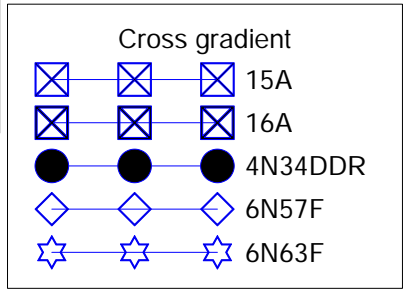
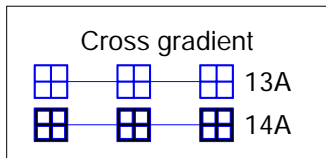
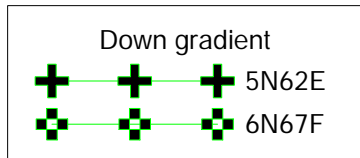
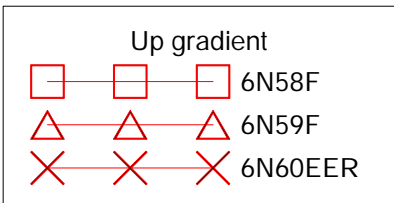
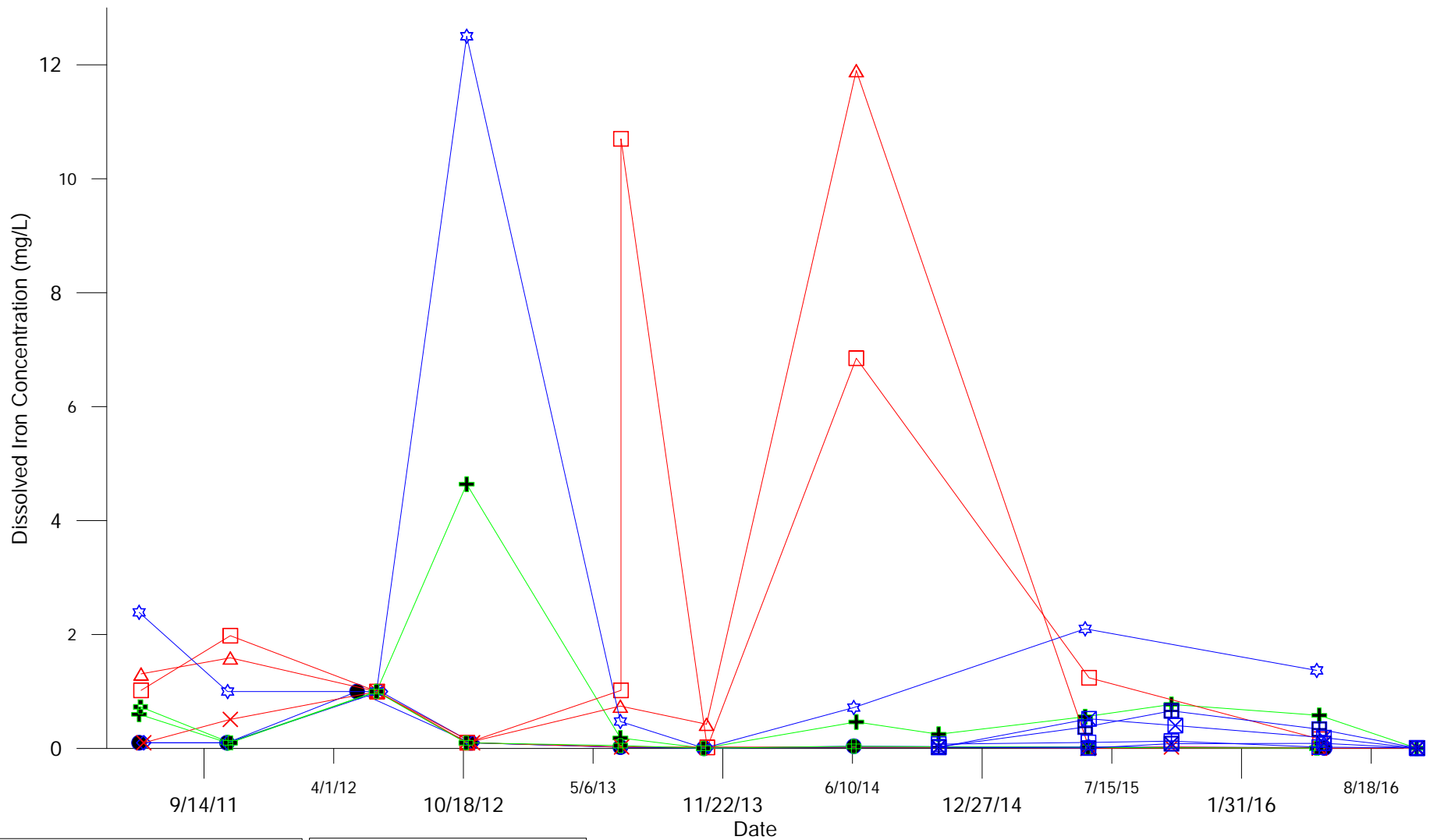
**Chromium MOE Criteria = 0.81 mg/L**

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Chromium Till Wells</b>		
APRIL 2017	FIGURE 32	REV 0

<p><b>Up gradient</b></p> <p>□ 6N58F</p> <p>△ 6N59F</p> <p>■ 6N60E</p>	<p><b>Down gradient</b></p> <p>+ 5N62E</p> <p>☆ 6N67F</p>	<p><b>Cross gradient</b></p> <p>⊠ 15A</p> <p>⊠ 16A</p> <p>● 4N34DDR</p> <p>◇ 6N57F</p> <p>× 6N63F</p>
<p><b>Cross gradient</b></p> <p>⊠ 13A</p> <p>⊠ 14A</p>		



	City Of Winnipeg Solid Waste Services
	BRADY ROAD RESOURCE MANAGEMENT FACILITY
<b>GROUNDWATER ELEVATION</b>	
<b>Cross Gradient Till Wells</b>	
APRIL 2015	FIGURE GW-1-1   REV 0



City Of Winnipeg  
Solid Waste Services

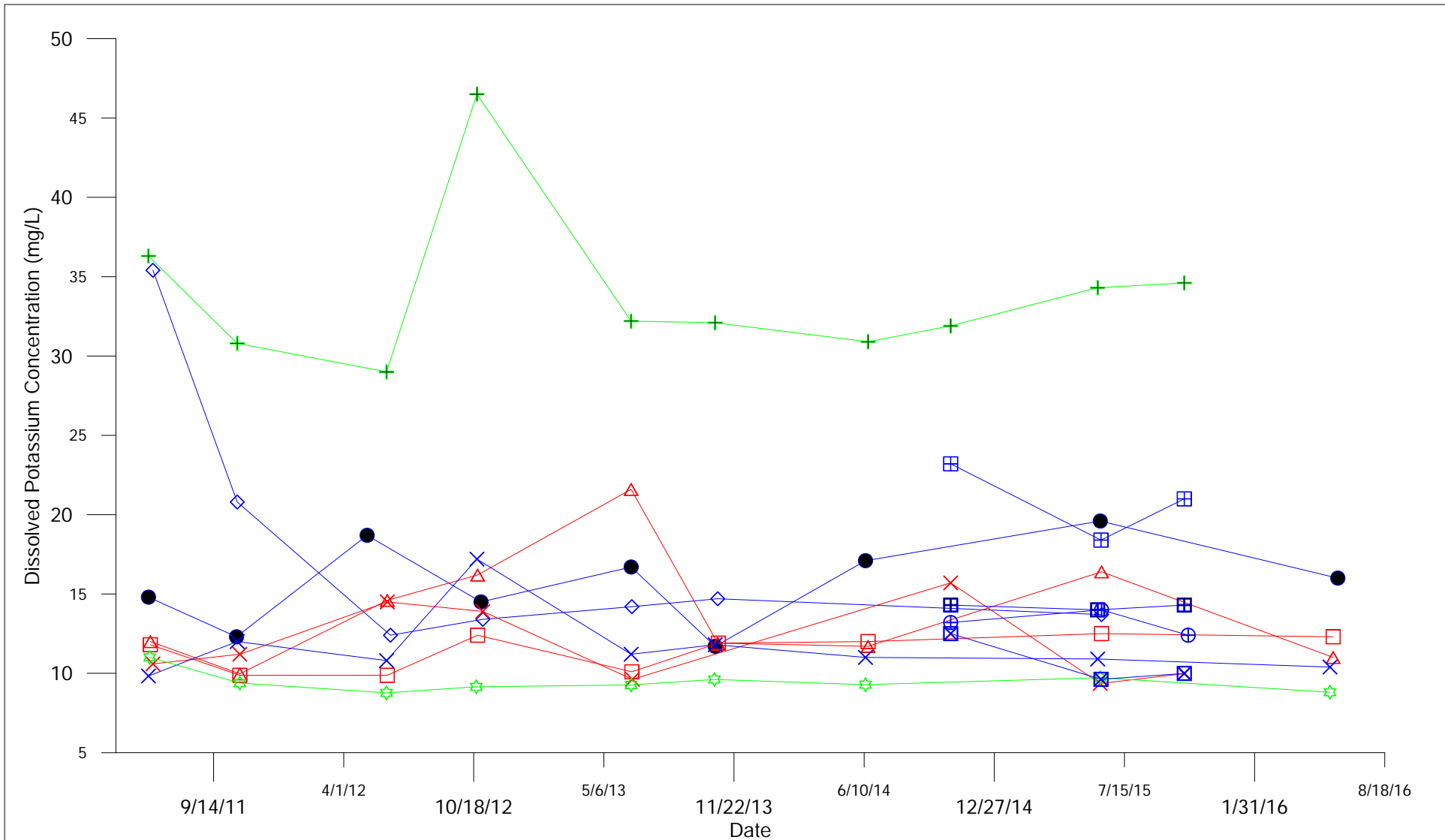
BRADY ROAD RESOURCE MANAGEMENT FACILITY

**Dissolved Iron  
Till Wells**

APRIL 2017

FIGURE 33

REV 0



**Up gradient**

- 6N58F
- △ 6N59F
- × 6N60EER

**Down gradient**

- + 5N62E
- ☆ 6N67F

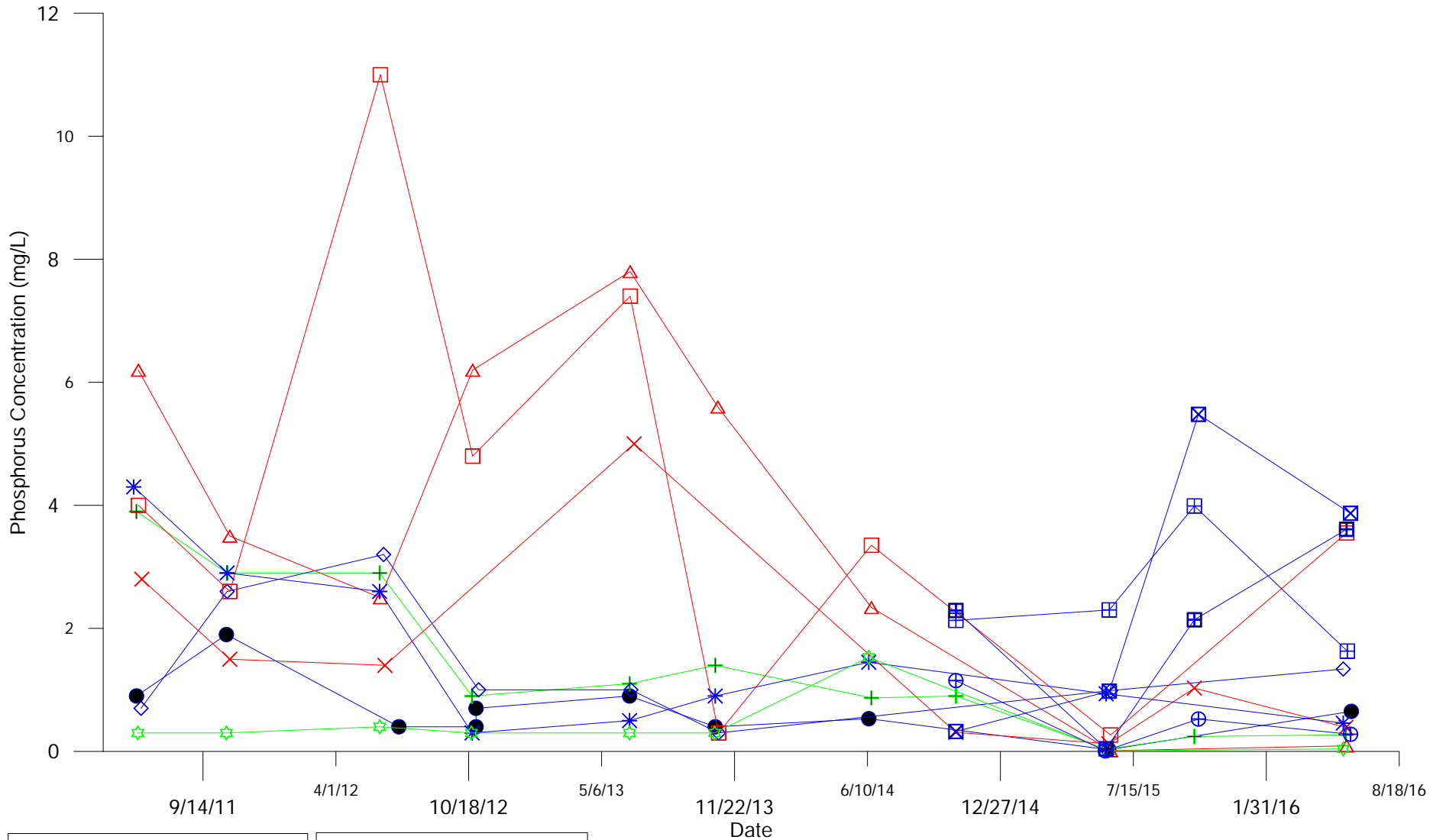
**Cross gradient**

- ⊠ 13A
- ⊞ 14A

**Cross gradient**

- ⊕ 15A
- ⊞ 16A
- 4N34DDR
- ◇ 6N57F
- × 6N63F

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Potassium Till Wells</b>		
APRIL 2017	FIGURE 34	REV 0



**Up gradient**

- 6N58F
- △ 6N59F
- × 6N60EER

**Down gradient**

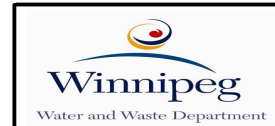
- + 5N62E
- ☆ 6N67F

**Cross gradient**

- ⊞ 13A
- ⊞ 14A

**Cross gradient**

- ⊞ 16A
- 4N34DDR
- ◇ 6N57F
- ✱ 6N63F
- ⊕ 15A



City of Winnipeg  
Solid Waste Services

BRADY ROAD RESOURCE MANAGEMENT FACILITY

**Phosphorus  
Till Wells**

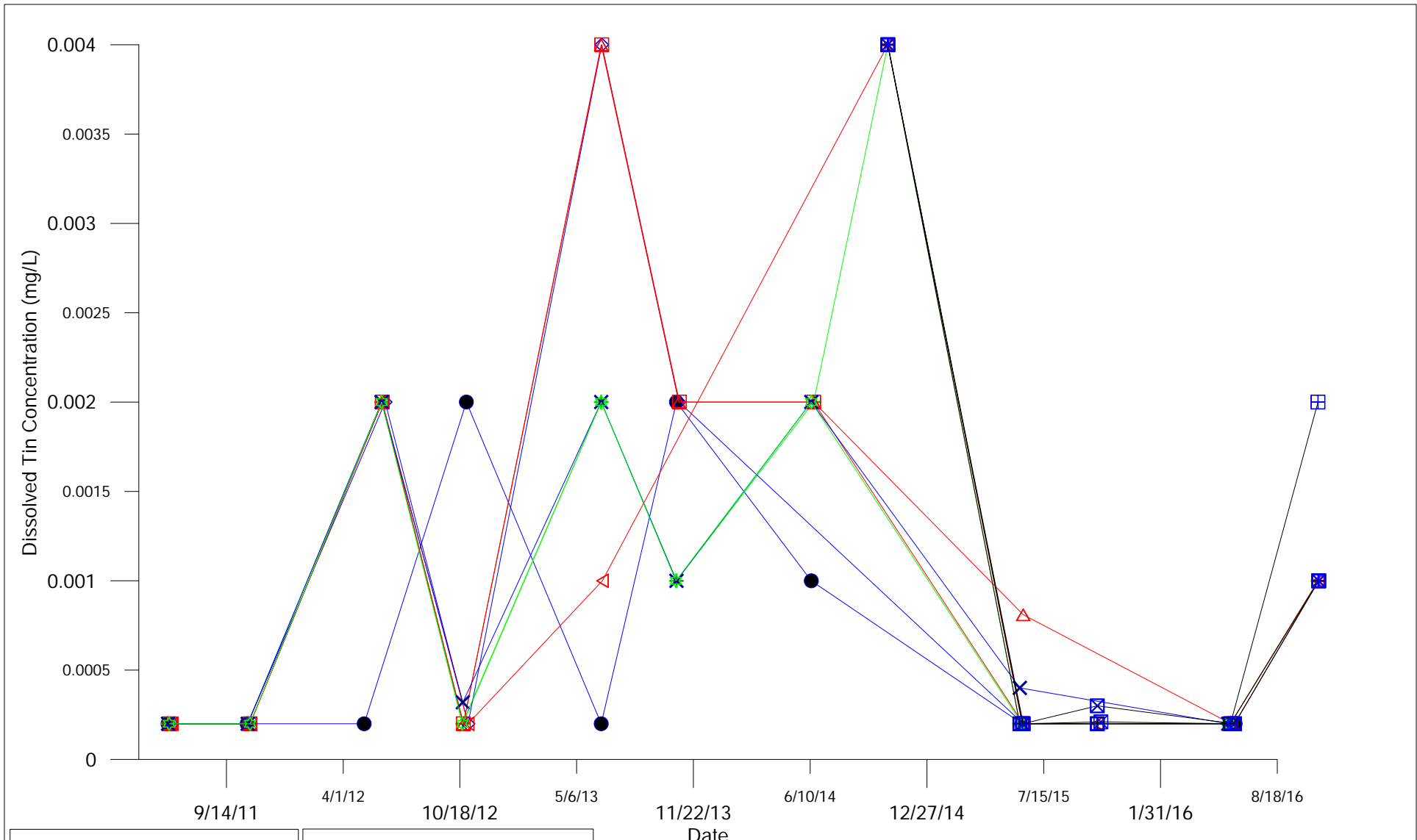
APRIL 2017

FIGURE 35

REV 0







**Up gradient**

- 6N58F
- △ 6N59F
- ◁ 6N60EER

**Cross gradient**

- 4N34DDR
- ◇ 6N57F
- × 6N63F
- 13A
- 14A

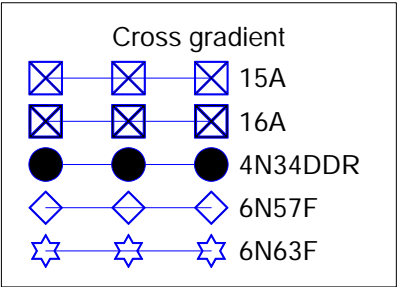
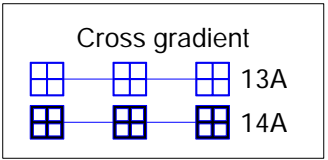
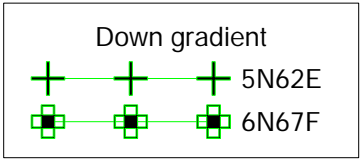
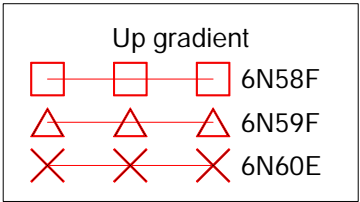
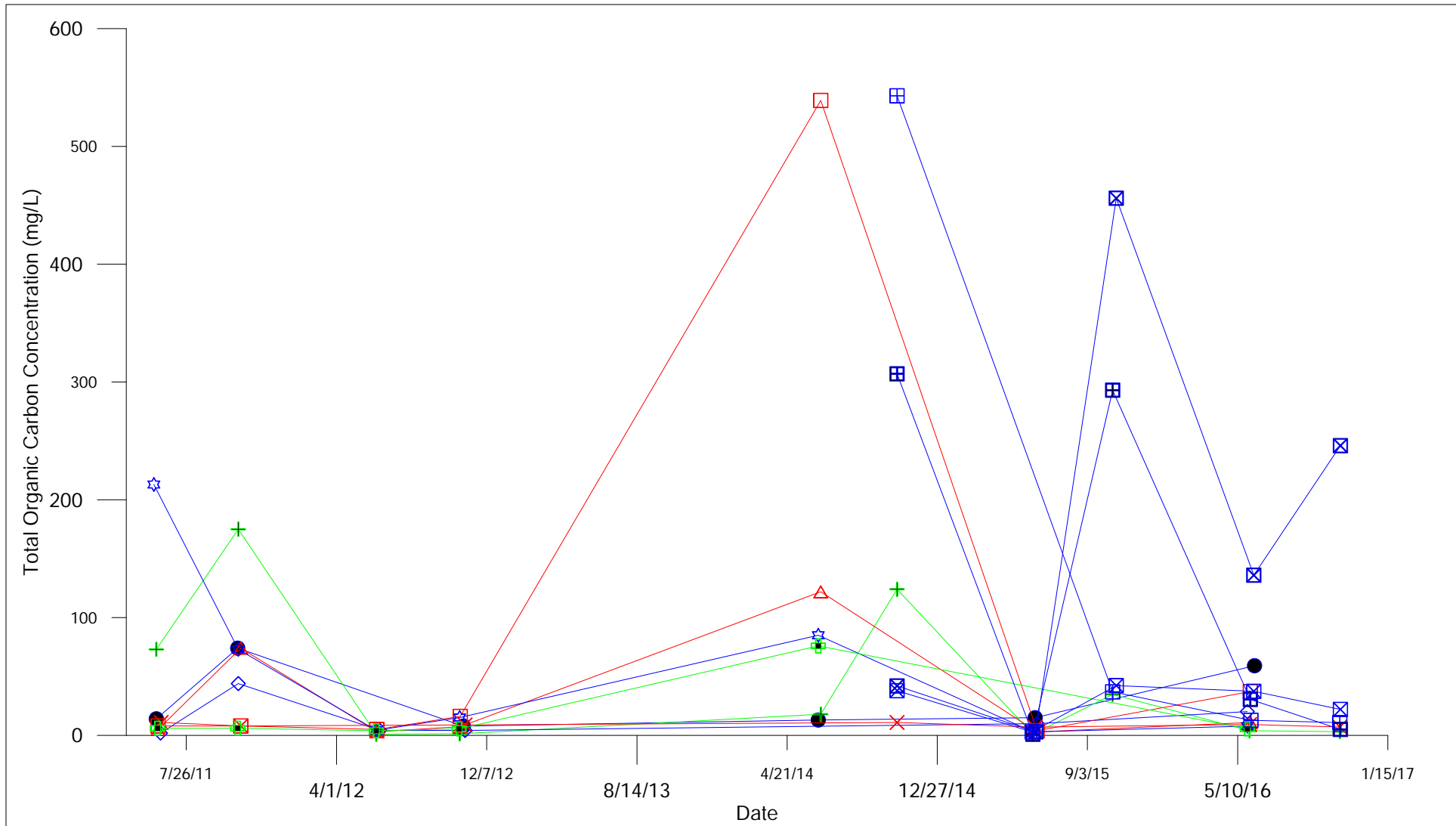
**Down gradient**

- + 5N62E
- ☆ 6N67F

**Cross gradient**

- 15A
- 16A

	<b>City Of Winnipeg Solid Waste Services</b>	
	<b>BRADY ROAD RESOURCE MANAGEMENT FACILITY</b>	
<b>Dissolved Tin Till Wells</b>		
<b>APRIL 2017</b>	<b>FIGURE 38</b>	<b>REV 0</b>

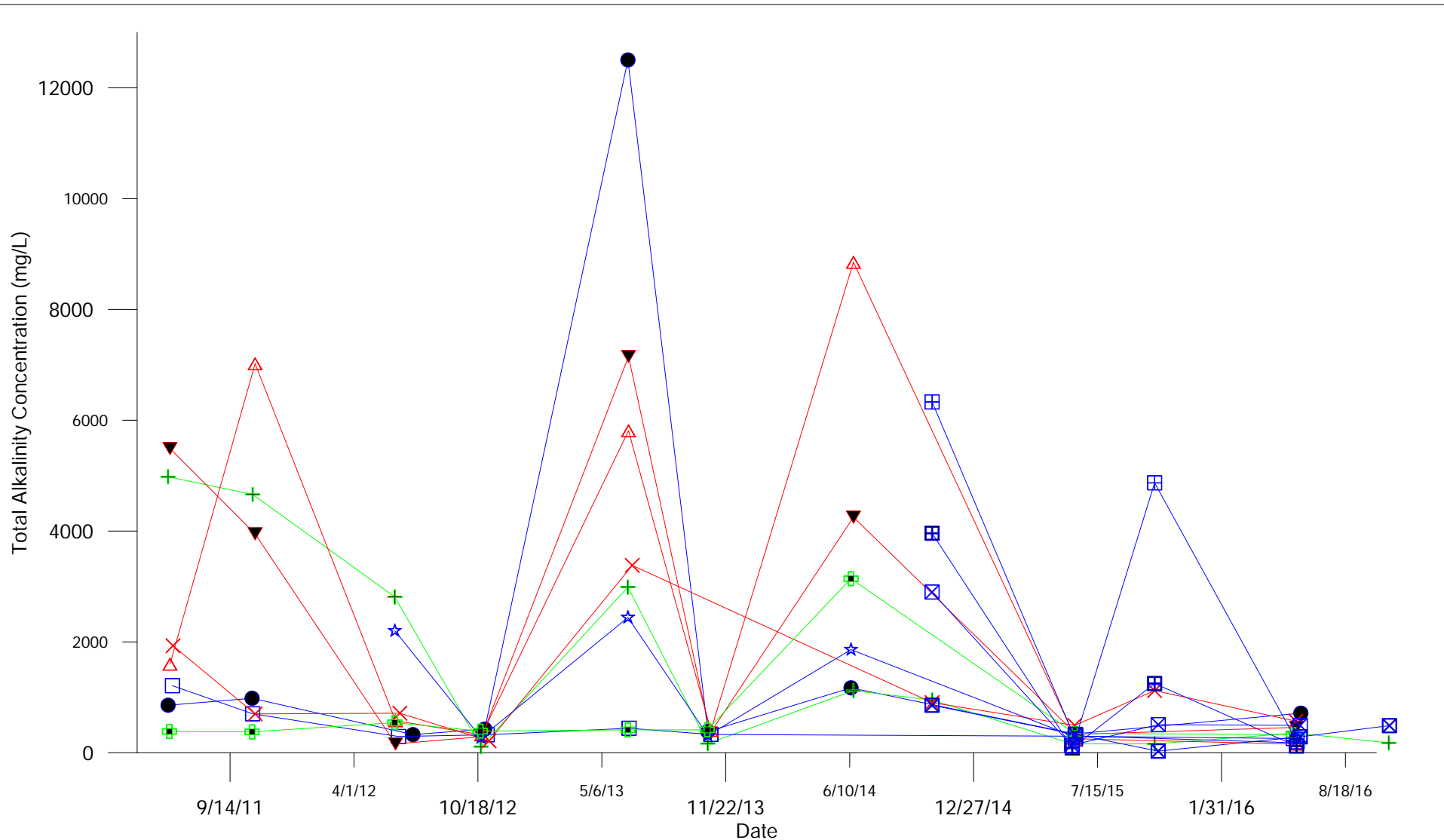


City Of Winnipeg  
Solid Waste Services

BRADY ROAD RESOURCE MANAGEMENT FACILITY

**Total Organic Carbon  
Till Wells**

APRIL 2017 | **FIGURE 39** | **REV 0**



**Up gradient**

- △ 6N58F
- ▼ 6N59F
- × 6N60E

**Down gradient**

- + 5N62E
- ⊕ 6N67F

**Cross gradient**

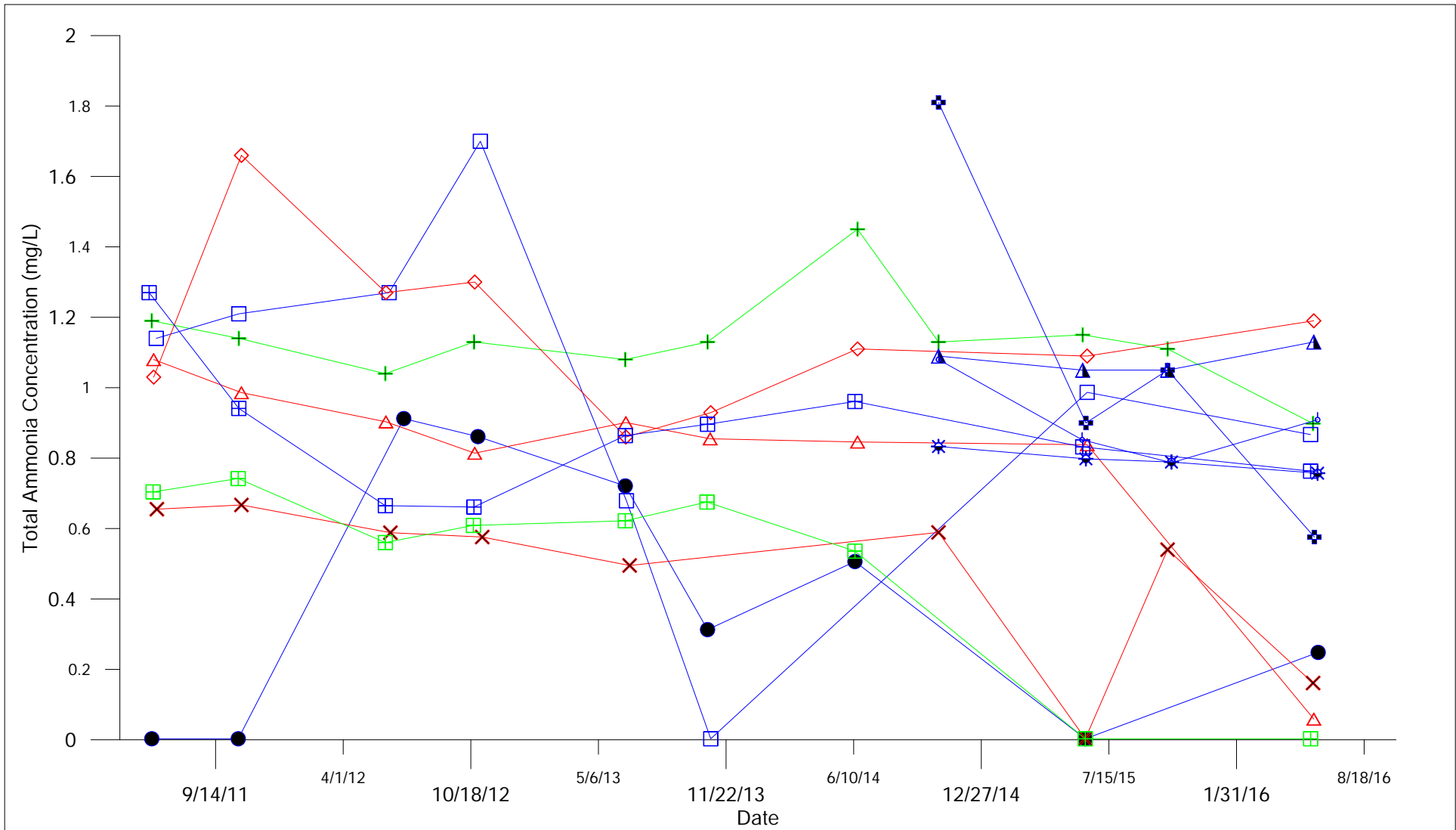
- ⊞ 13A
- ⊞ 14A

**Cross gradient**

- ⊞ 15A
- ⊞ 16A
- 4N34DDR
- 6N57F
- ☆ 6N63F



City Of Winnipeg  
Solid Waste Services



**Up gradient**

- ◇ 6N58F
- △ 6N59F
- × 6N60EER

**Cross gradient**

- ⊠ 13A
- ▲ 14A

**Cross gradient**

- 15A
- ★ 16A
- 4N34DDR
- 6N57F
- ⊞ 6N63F

**Down gradient**

- ⊕ 5N62E
- ⊞ 6N67F



City Of Winnipeg  
Solid Waste Services

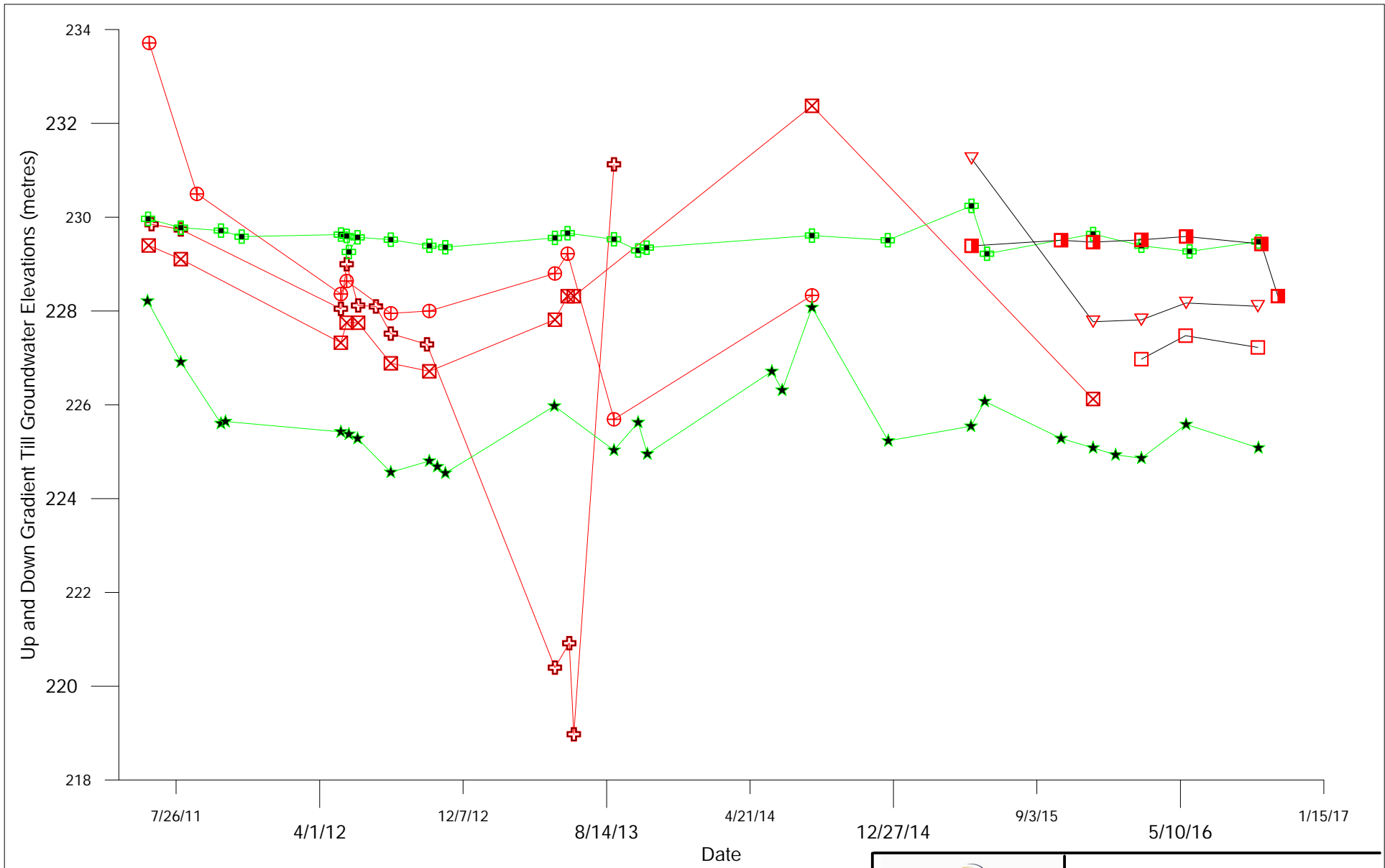
BRADY ROAD RESOURCE MANAGEMENT FACILITY

**Total Ammonia  
Till Wells**

APRIL 2017

FIGURE 37

REV 0



**Up gradient**

- ⊕ 6N58F
- ⊠ 6N59F
- ⊕ 6N60E

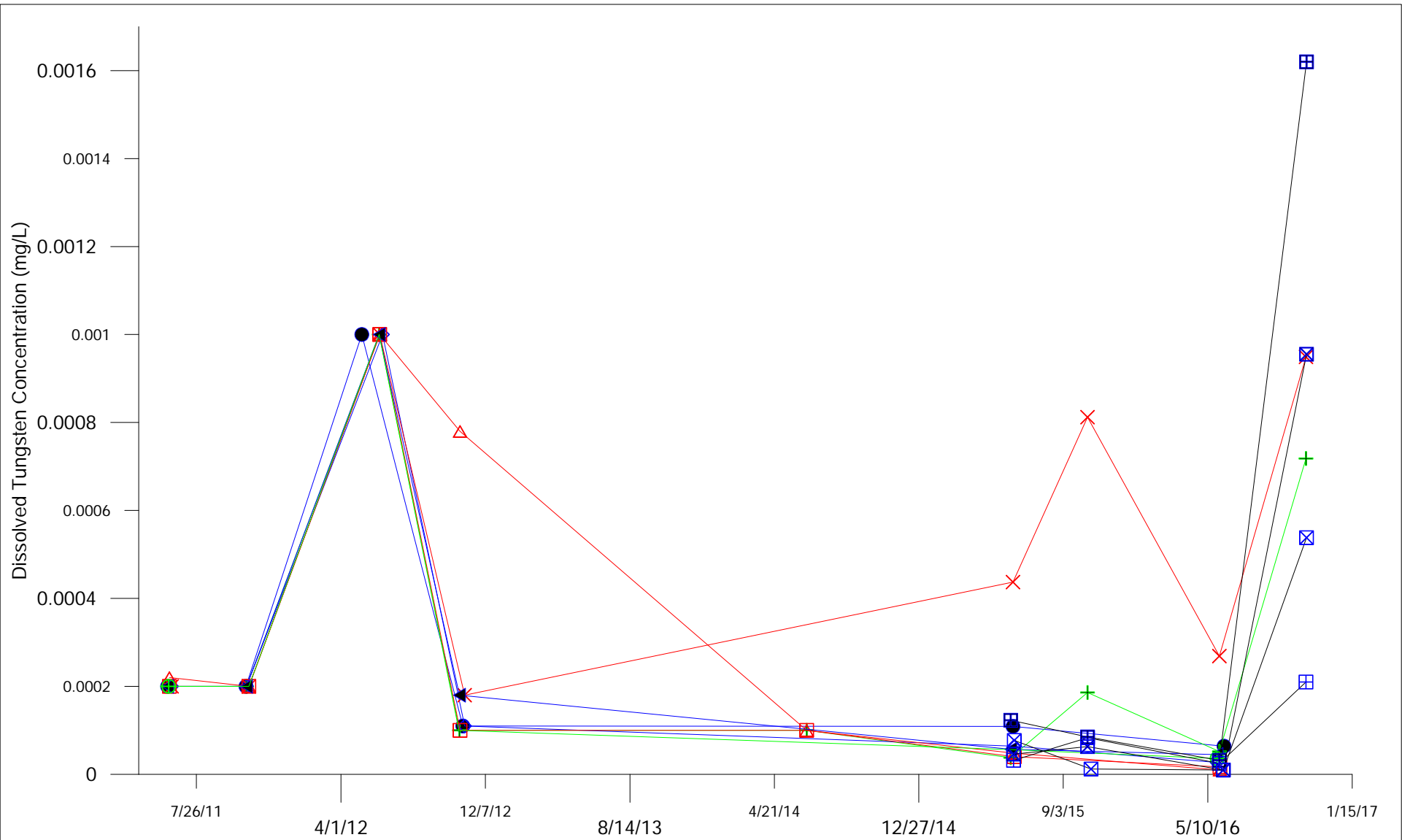
**Down gradient**


- ★ 5N62E
- ⊠ 6N67F

**Up gradient**

- ▽ 6N58FR
- 6N59FR
- 6N60ER

	<p>City Of Winnipeg Solid Waste Services</p>
	<p>BRADY ROAD RESOURCE MANAGEMENT FACILITY</p>
<p><b>GROUNDWATER ELEVATION</b> <b>Up and Down Gradient Till Wells</b></p>	
<p>APRIL 2017</p>	<p>FIGURE GW-1-2   REV 0</p>



<p><b>Up gradient</b></p> <ul style="list-style-type: none"> <li>□ 6N58F</li> <li>△ 6N59F</li> <li>× 6N60E</li> </ul>	<p><b>Down gradient</b></p> <ul style="list-style-type: none"> <li>+ 5N62E</li> <li>⊕ 6N67F</li> </ul>	<p><b>Cross gradient</b></p> <ul style="list-style-type: none"> <li>● 4N34DDR</li> <li>◇ 6N57F</li> <li>◀ 6N63F</li> <li>⊠ 13A</li> <li>⊞ 14A</li> <li>⊠ 15A</li> <li>⊞ 16A</li> </ul>	<div style="display: flex; justify-content: space-between; align-items: center;">  <div style="text-align: right;"> <p><b>City of Winnipeg</b> Solid Waste Services</p> </div> </div> <hr/> <p style="text-align: center;"><b>BRADY ROAD RESOURCE MANAGEMENT FACILITY</b></p> <hr/> <p style="text-align: center;"><b>Dissolved Tungsten Till Wells</b></p> <hr/> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; text-align: center;"><b>APRIL 2017</b></td> <td style="width: 33%; text-align: center;"><b>FIGURE 41</b></td> <td style="width: 33%; text-align: center;"><b>REV 0</b></td> </tr> </table>	<b>APRIL 2017</b>	<b>FIGURE 41</b>	<b>REV 0</b>
<b>APRIL 2017</b>	<b>FIGURE 41</b>	<b>REV 0</b>				



# Site: Brady Well #: W4

## Dates:

- 24-Oct-12
- 13-Jun-13
- 23-Oct-13
- 11-Jun-14
- 23-Oct-14
- 2-Jun-15
- 26-Oct-15
- 24-May-16
- 26-Oct-16
- 23-May-17
- 19-Oct-17

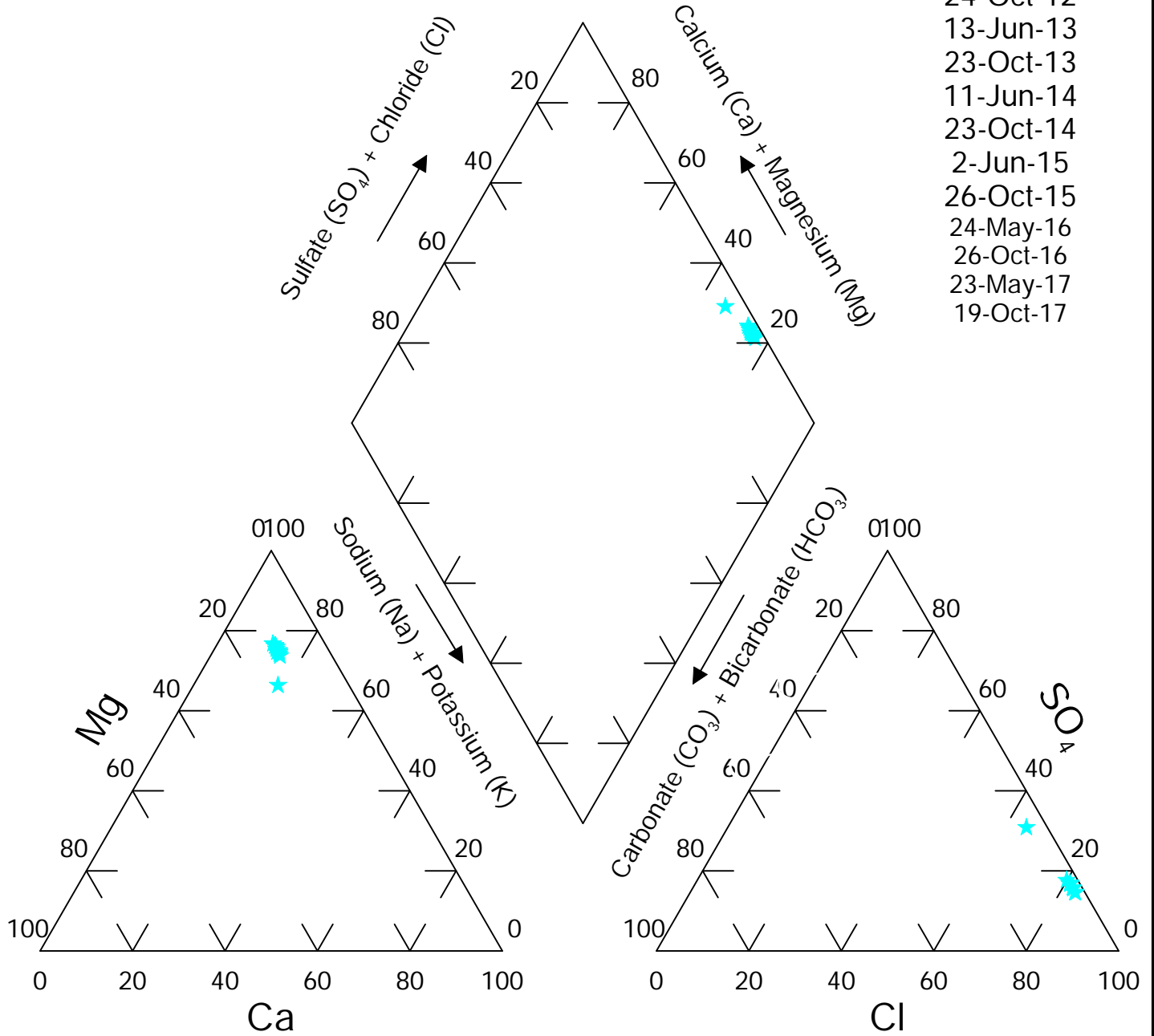


FIGURE: 1P



# Site: Brady Well #: W5

- Dates:**  
 31-May-12  
 24-Oct-12  
 13-Jun-13  
 23-Oct-13  
 11-Jun-14  
 23-Oct-14  
 2-Jun-15  
 26-Oct-15  
 24-May-16  
 26-Oct-16  
 23-May-17  
 19-Oct-17

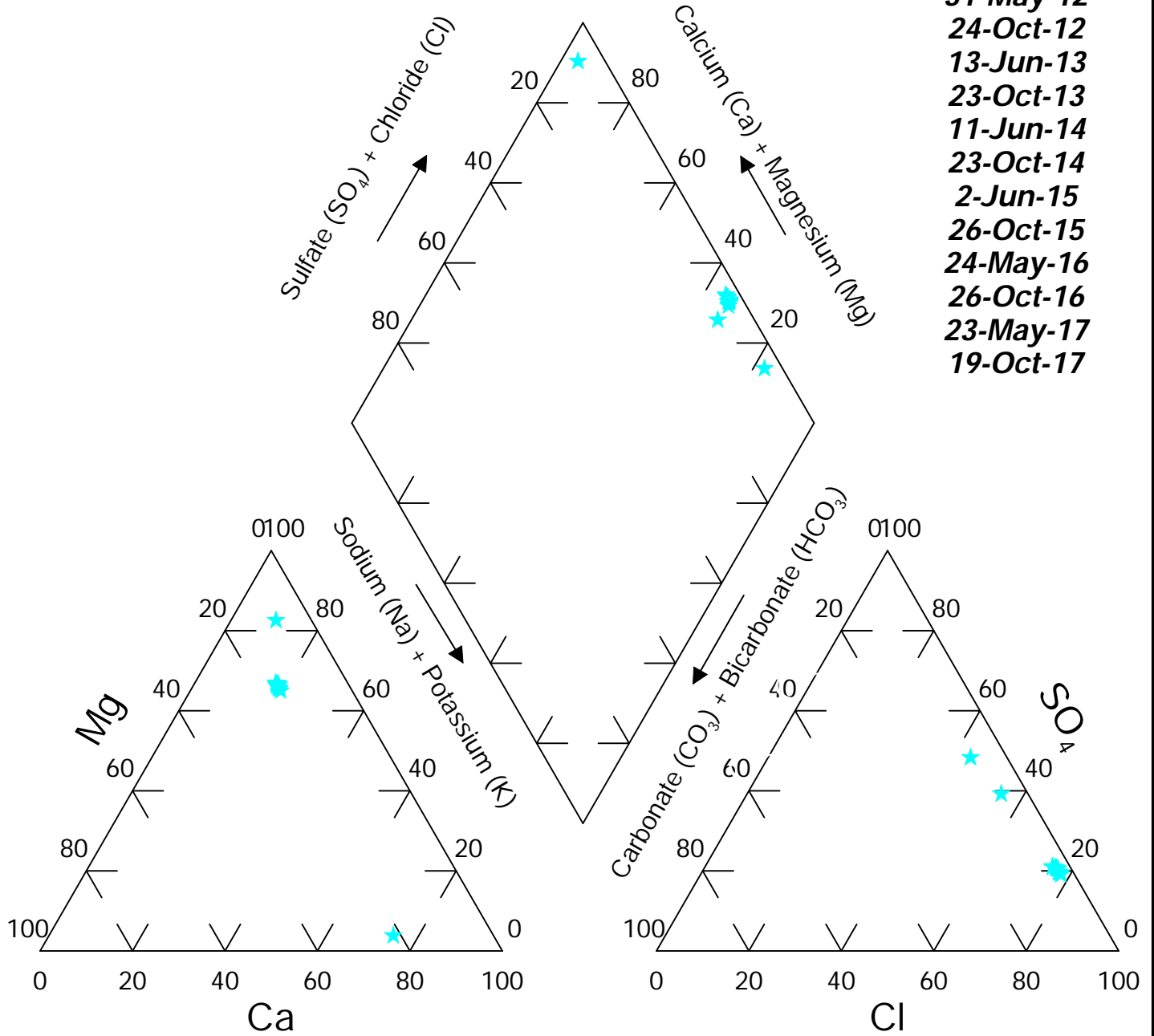


FIGURE: 2P

# Site: Brady Well #: W6

## Dates:

- 4-Jun-12
- 22-Oct-12
- 13-Jun-13
- 22-Oct-13
- 11-Jun-14
- 20-Oct-14
- 3-Jun-15
- 26-Oct-15
- 30-May-16
- 25-Oct-16
- 24-May-17
- 17-Oct-17

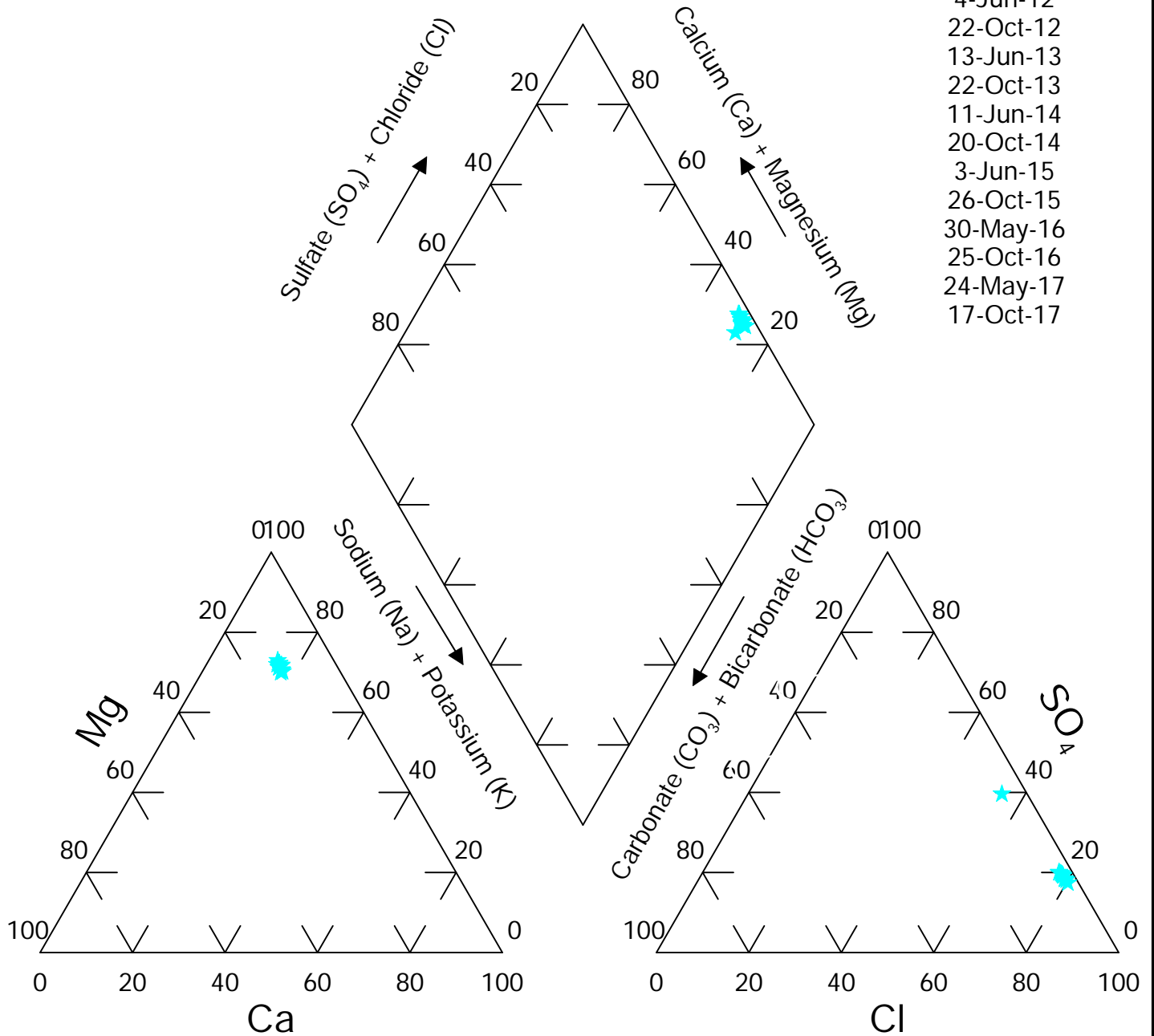
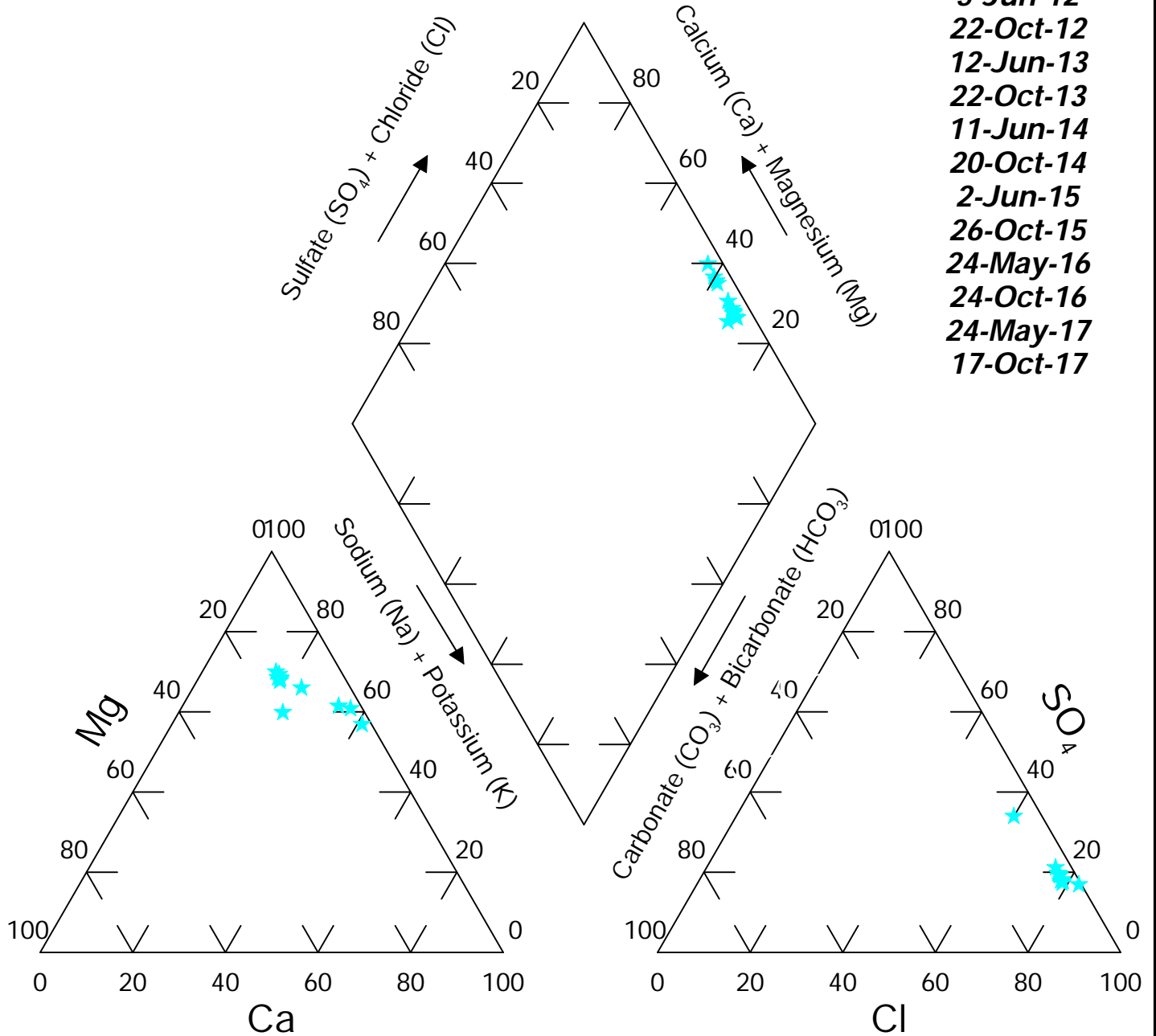


FIGURE: 3P

# Site: Brady Well #: W7

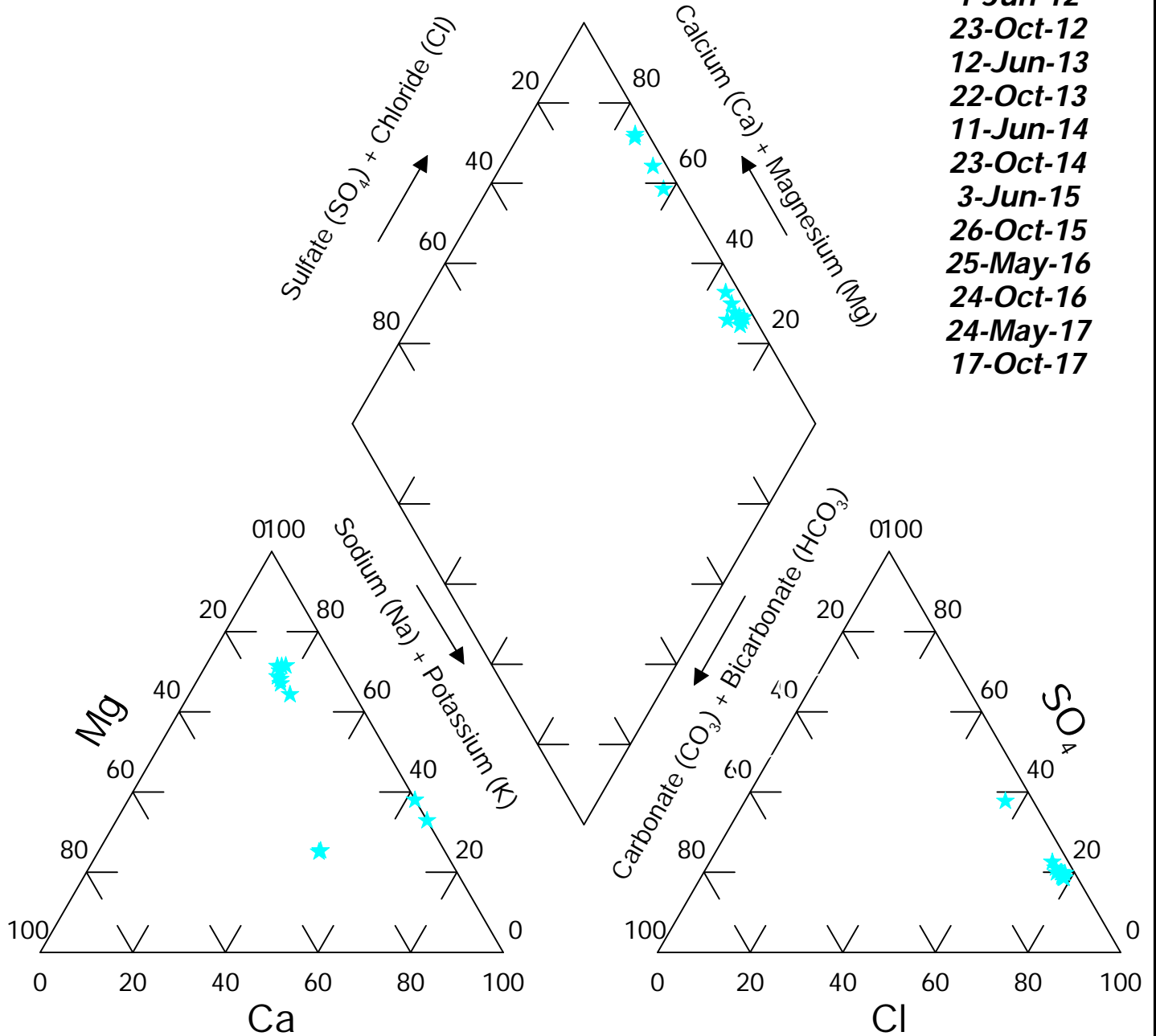
**Dates:**  
 5-Jun-12  
 22-Oct-12  
 12-Jun-13  
 22-Oct-13  
 11-Jun-14  
 20-Oct-14  
 2-Jun-15  
 26-Oct-15  
 24-May-16  
 24-Oct-16  
 24-May-17  
 17-Oct-17



**FIGURE: 4P**

# Site: Brady Well #: W8

- Dates:**  
 1-Jun-12  
 23-Oct-12  
 12-Jun-13  
 22-Oct-13  
 11-Jun-14  
 23-Oct-14  
 3-Jun-15  
 26-Oct-15  
 25-May-16  
 24-Oct-16  
 24-May-17  
 17-Oct-17



**FIGURE: 5P**

# Site: Brady Well #: W9

- Dates:**  
 31-May-12  
 23-Oct-12  
 11-Jun-13  
 21-Oct-13  
 1-Jun-14  
 20-Oct-14  
 3-Jun-15  
 22-Oct-15  
 24-May-16  
 26-Oct-16  
 23-May-17  
 18-Oct-17

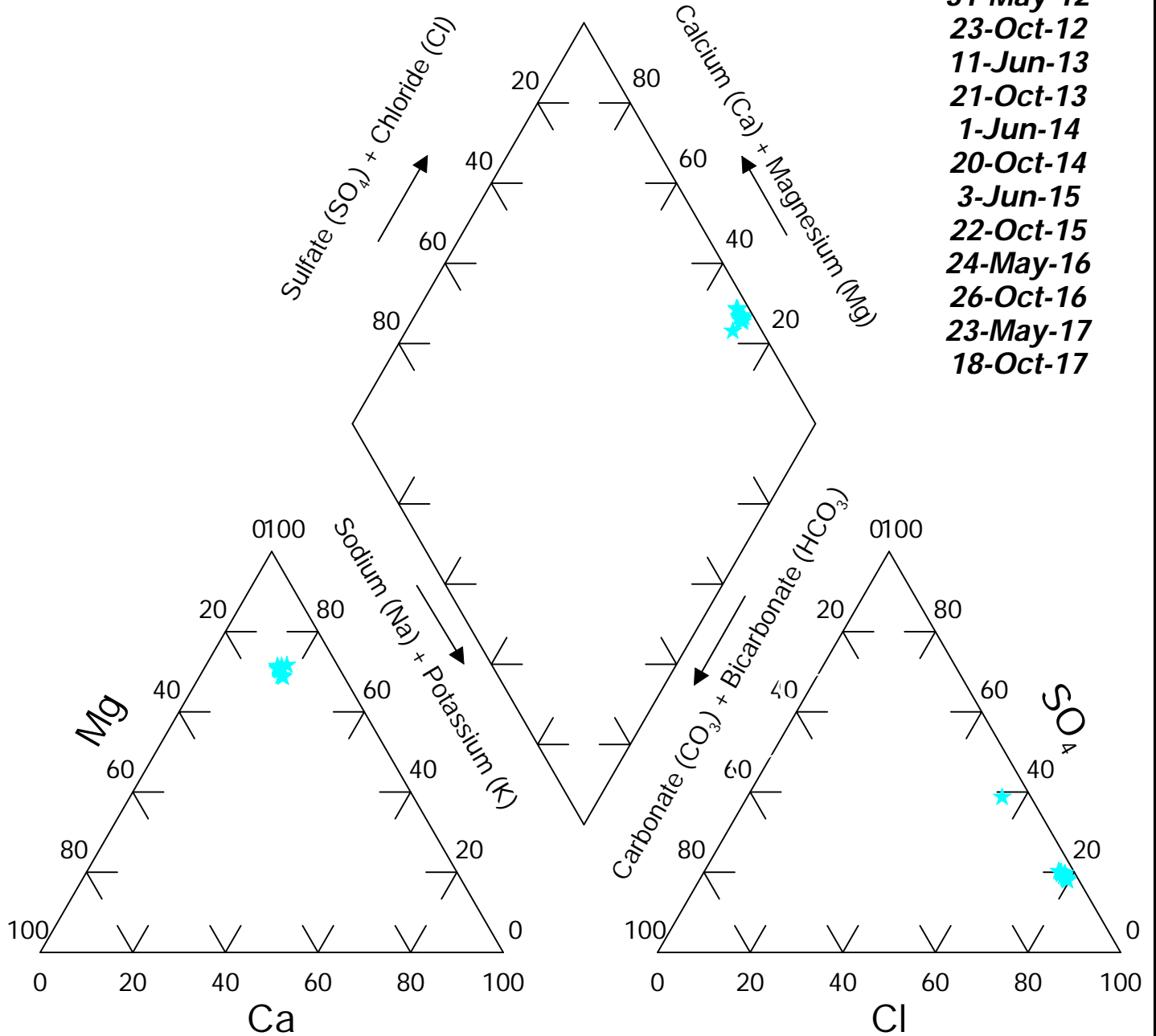
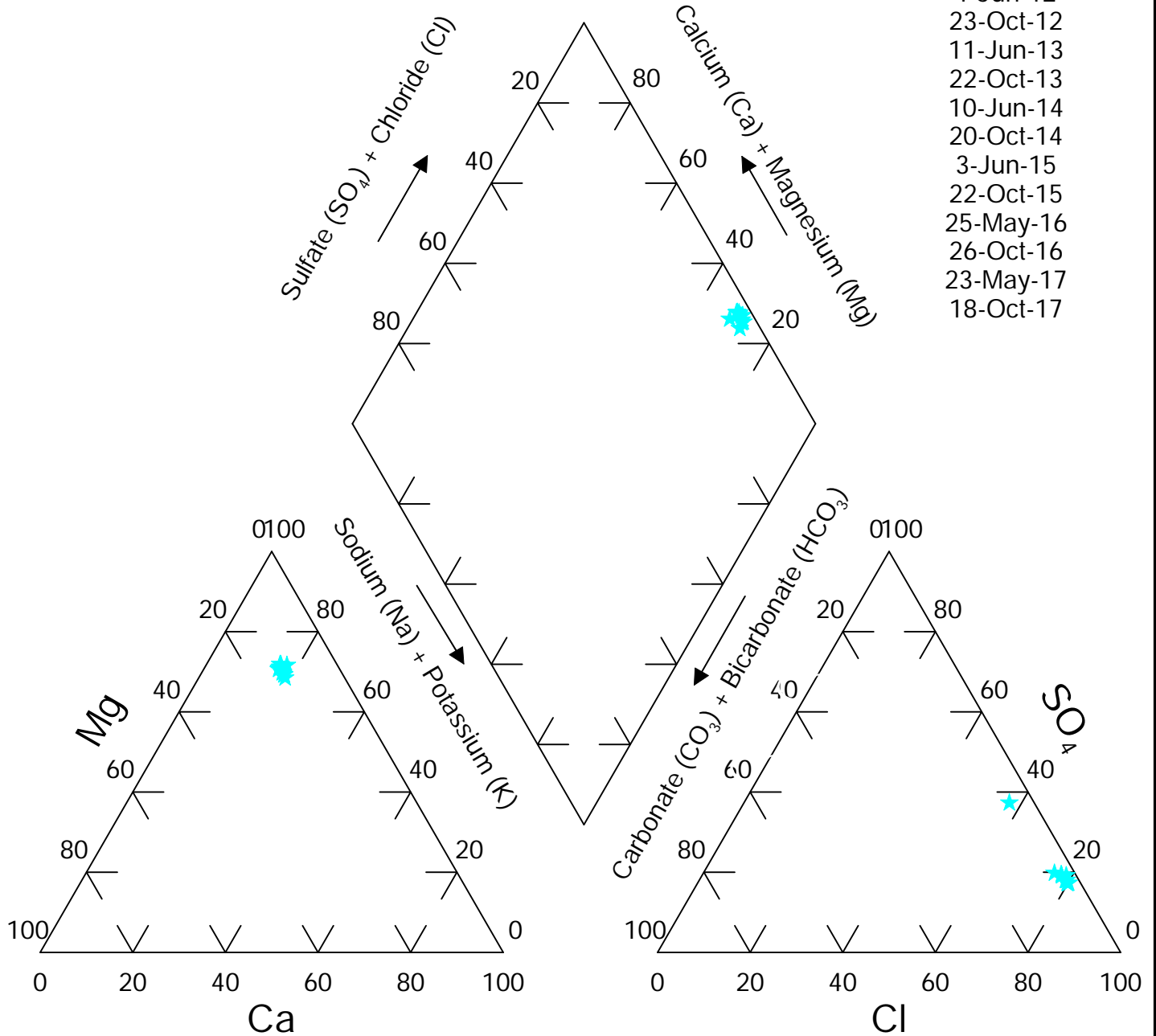


FIGURE: 6P

# Site: Brady Well #: W10

- Dates:**
- 1-Jun-12
  - 23-Oct-12
  - 11-Jun-13
  - 22-Oct-13
  - 10-Jun-14
  - 20-Oct-14
  - 3-Jun-15
  - 22-Oct-15
  - 25-May-16
  - 26-Oct-16
  - 23-May-17
  - 18-Oct-17



**FIGURE: 7P**

# Site: Brady Well #: W11

## Dates:

- 31-May-12
- 23-Oct-12
- 12-Jun-13
- 22-Oct-13
- 10-Jun-14
- 23-Oct-14
- 2-Jun-15
- 22-Oct-15
- 25-May-16
- 26-Oct-16
- 23-May-17
- 18-Oct-17

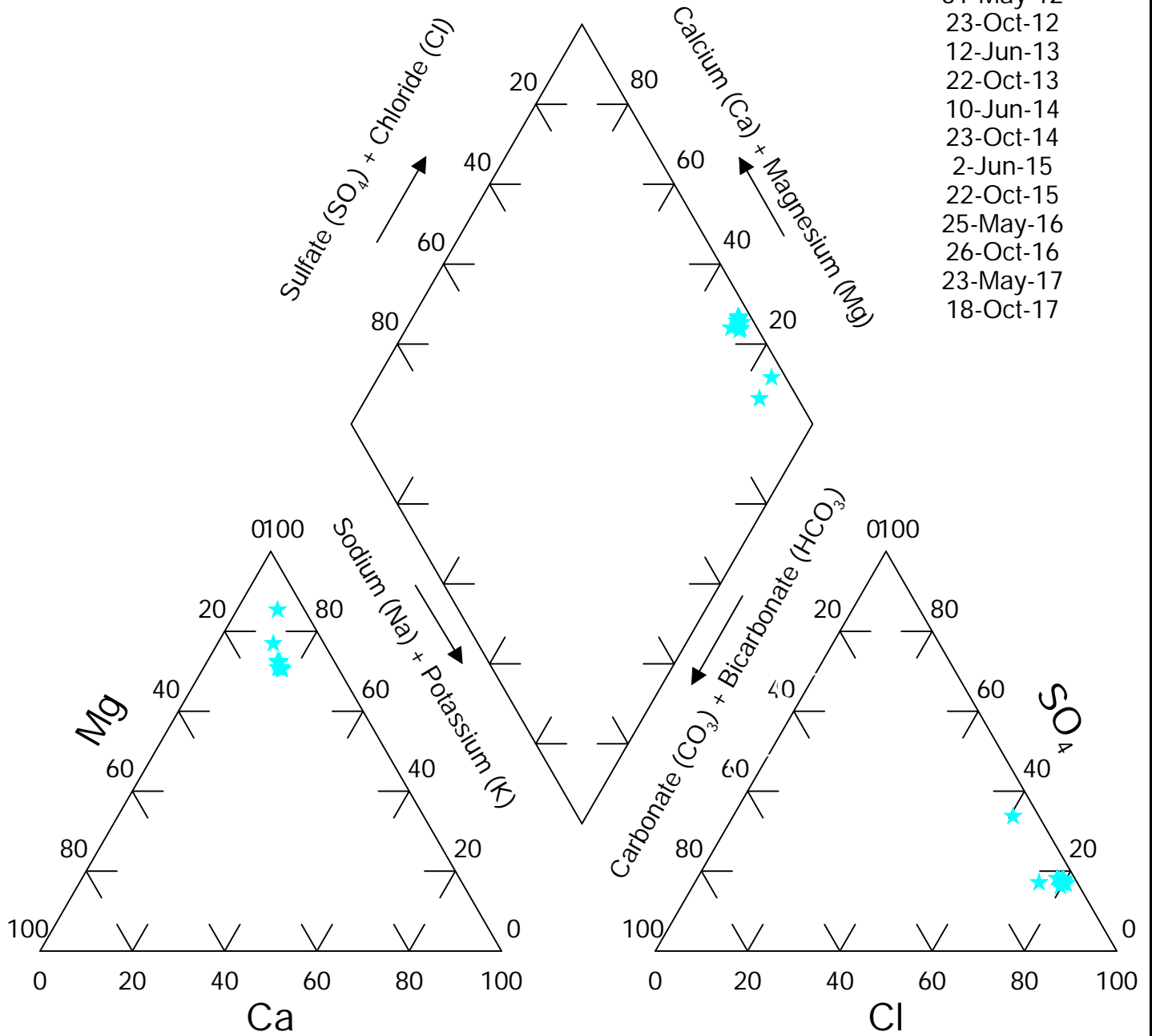
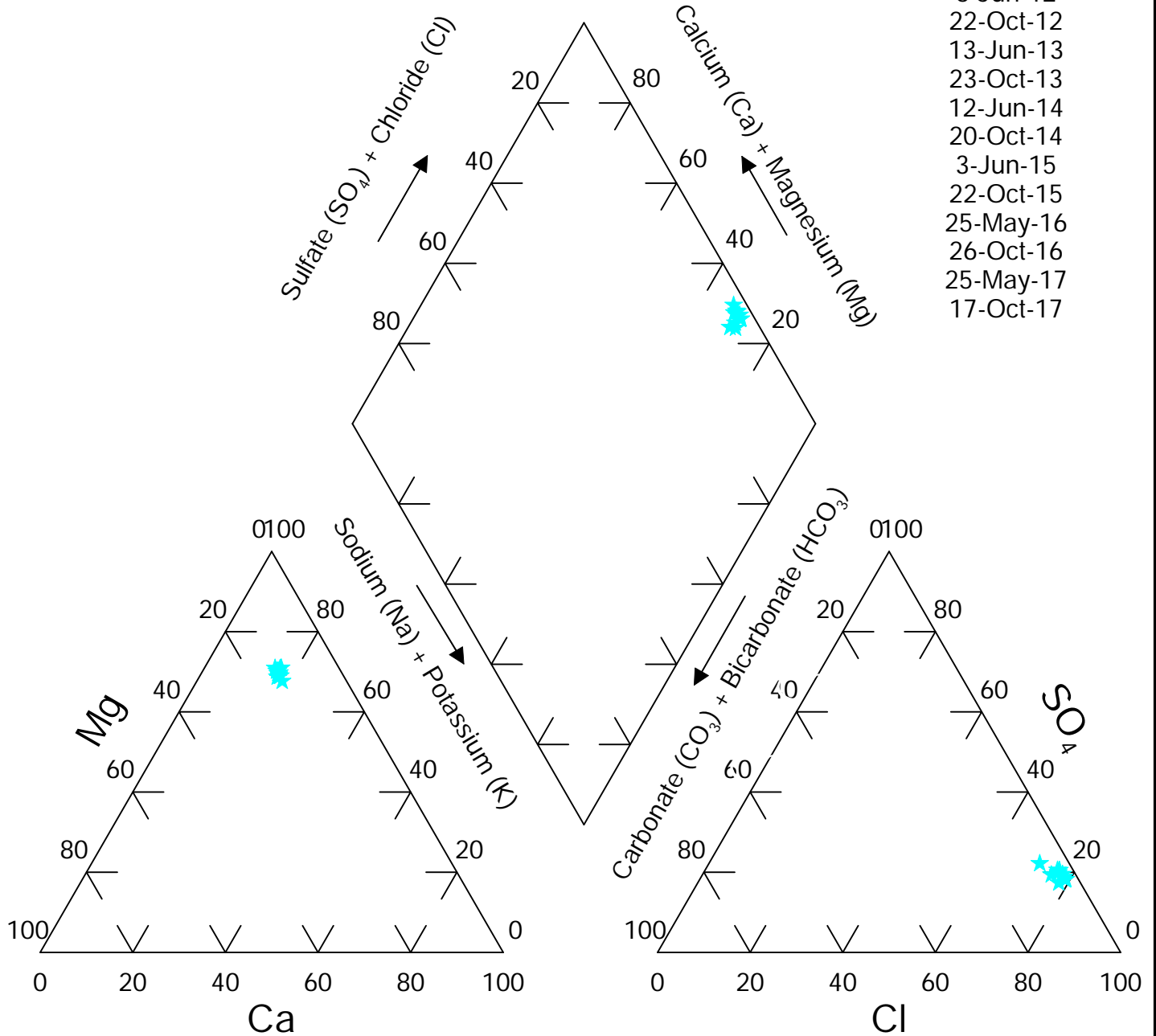


FIGURE: 8P

# Site: Brady Well #: W12

- Dates:**
- 6-Jun-12
  - 22-Oct-12
  - 13-Jun-13
  - 23-Oct-13
  - 12-Jun-14
  - 20-Oct-14
  - 3-Jun-15
  - 22-Oct-15
  - 25-May-16
  - 26-Oct-16
  - 25-May-17
  - 17-Oct-17



**FIGURE: 9P**



# Site: Brady Location : W13

**Dates:**  
 1-Jun-15  
 21-Oct-15  
 27-May-16  
 24-Oct-16  
 24-May-17  
 16-Oct-17

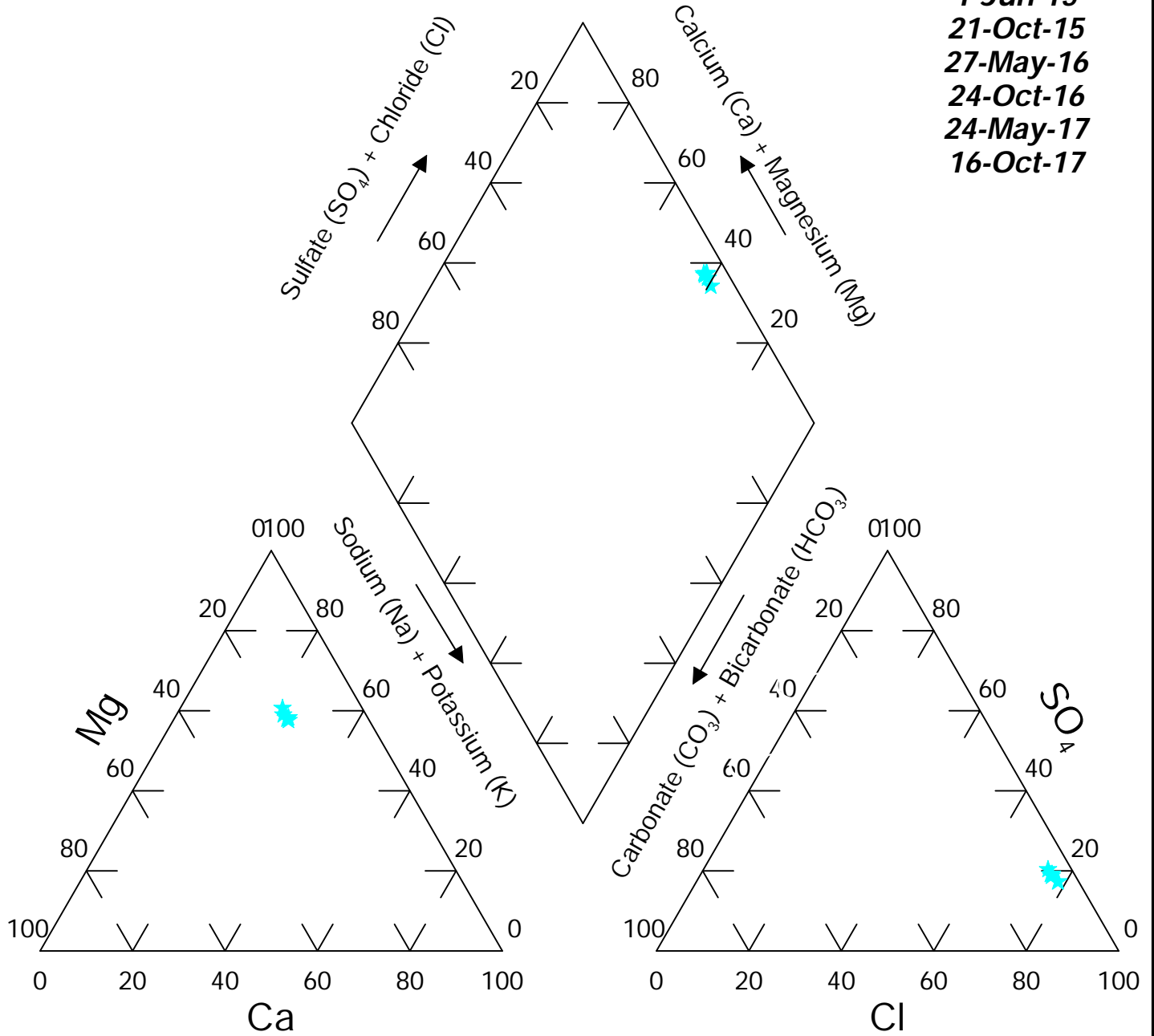
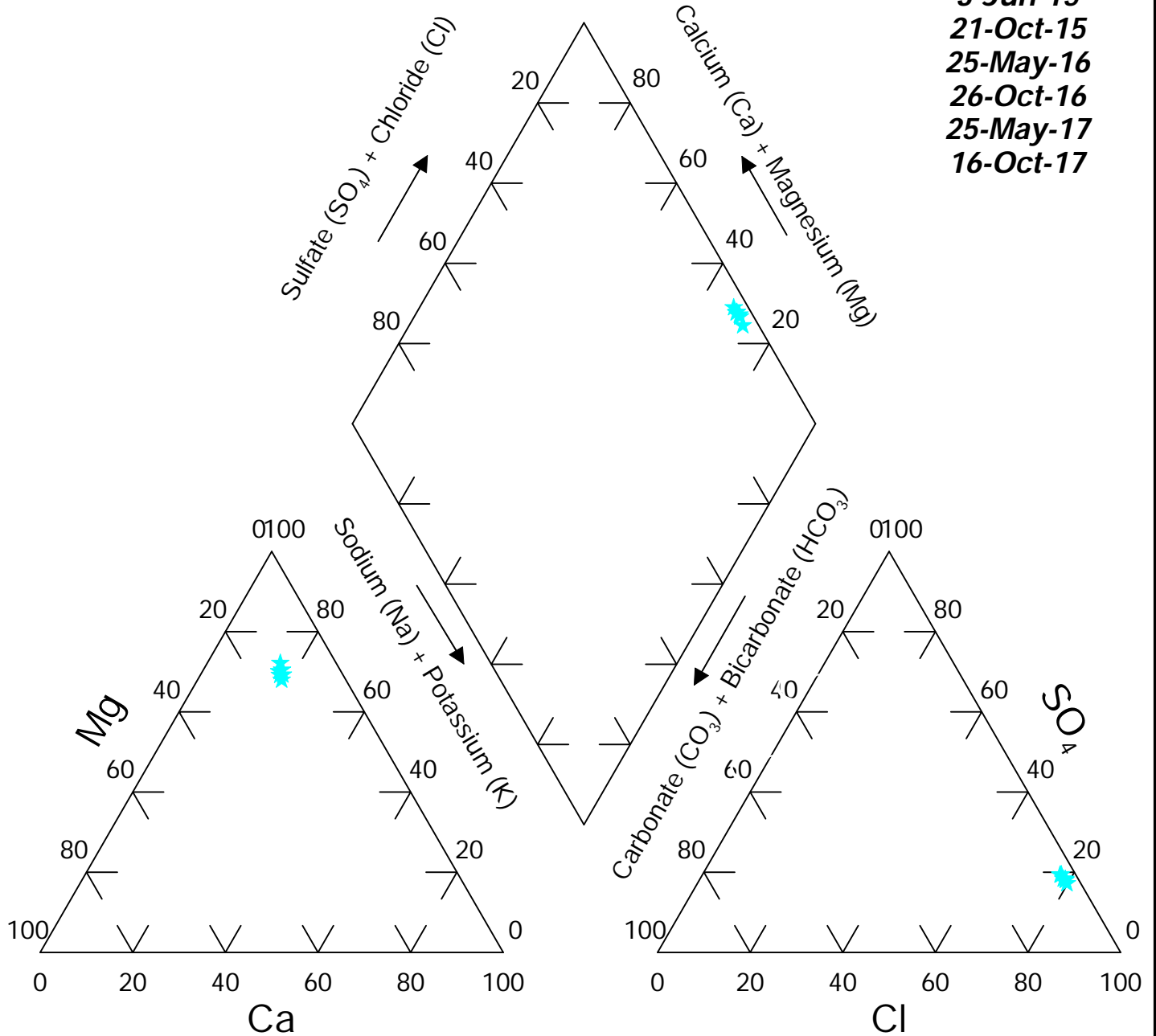


FIGURE: 1z

**Site: Brady**  
**Location : GWQ25-W14**

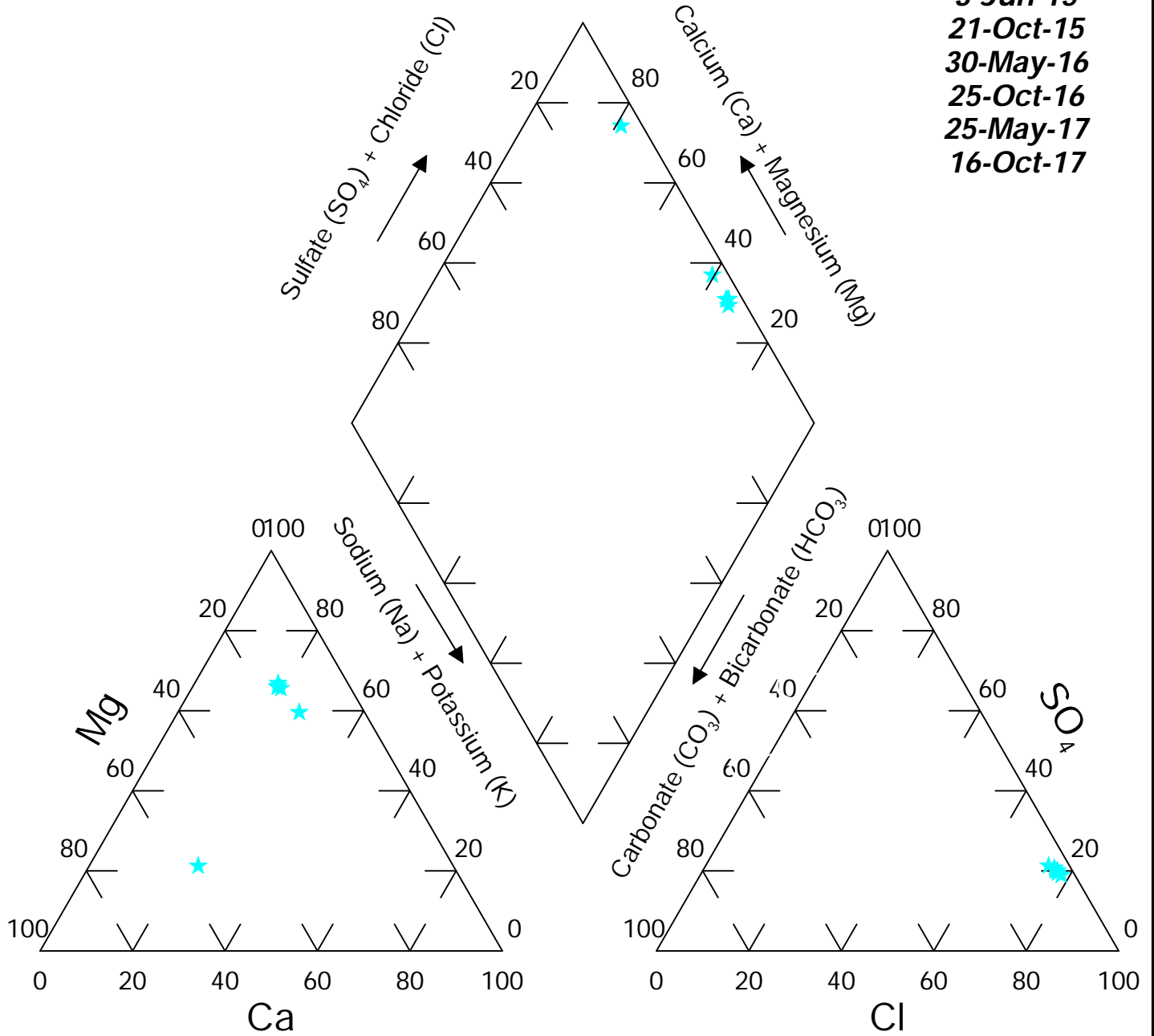
**Dates:**  
**3-Jun-15**  
**21-Oct-15**  
**25-May-16**  
**26-Oct-16**  
**25-May-17**  
**16-Oct-17**



**FIGURE: 2z**

# Site: Brady Location : GWQ25-W15

**Dates:**  
 3-Jun-15  
 21-Oct-15  
 30-May-16  
 25-Oct-16  
 25-May-17  
 16-Oct-17

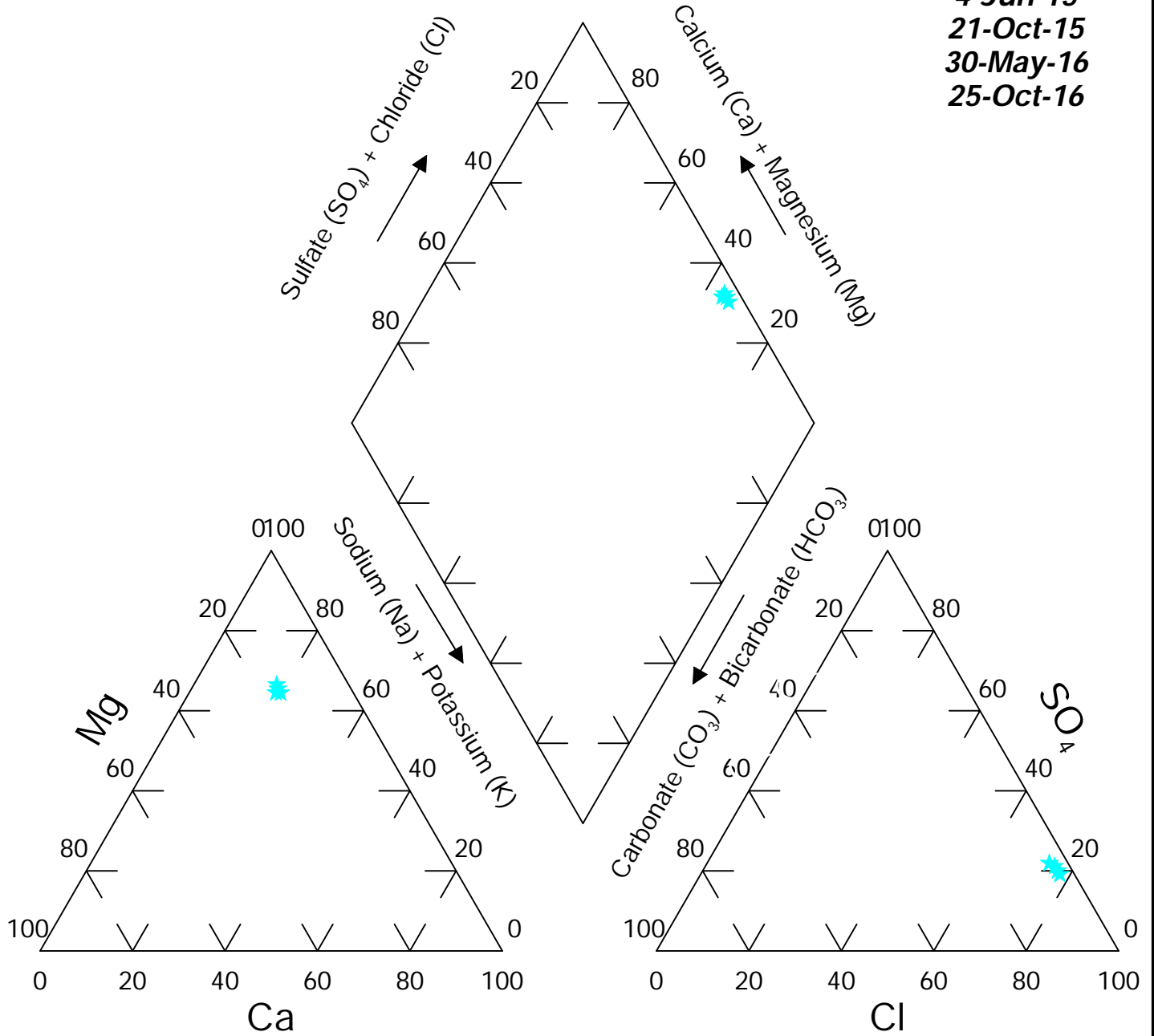


**FIGURE: 3z**

# Site: Brady

## Location : GWQ25-W16

**Dates:**  
 4-Jun-15  
 21-Oct-15  
 30-May-16  
 25-Oct-16

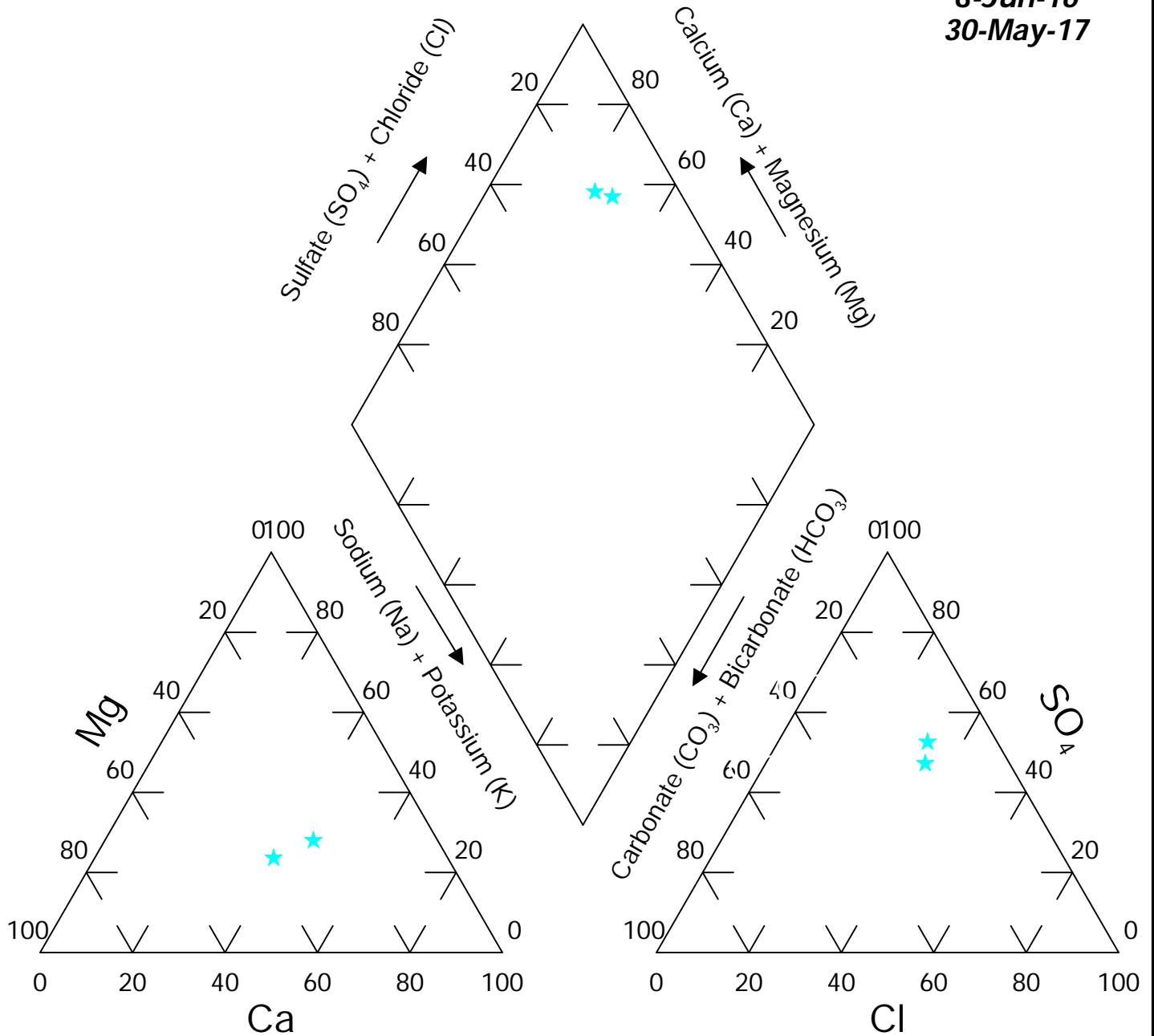


**FIGURE: 4z**

# Site: Brady

## Location : GWQ25-4N34-CR

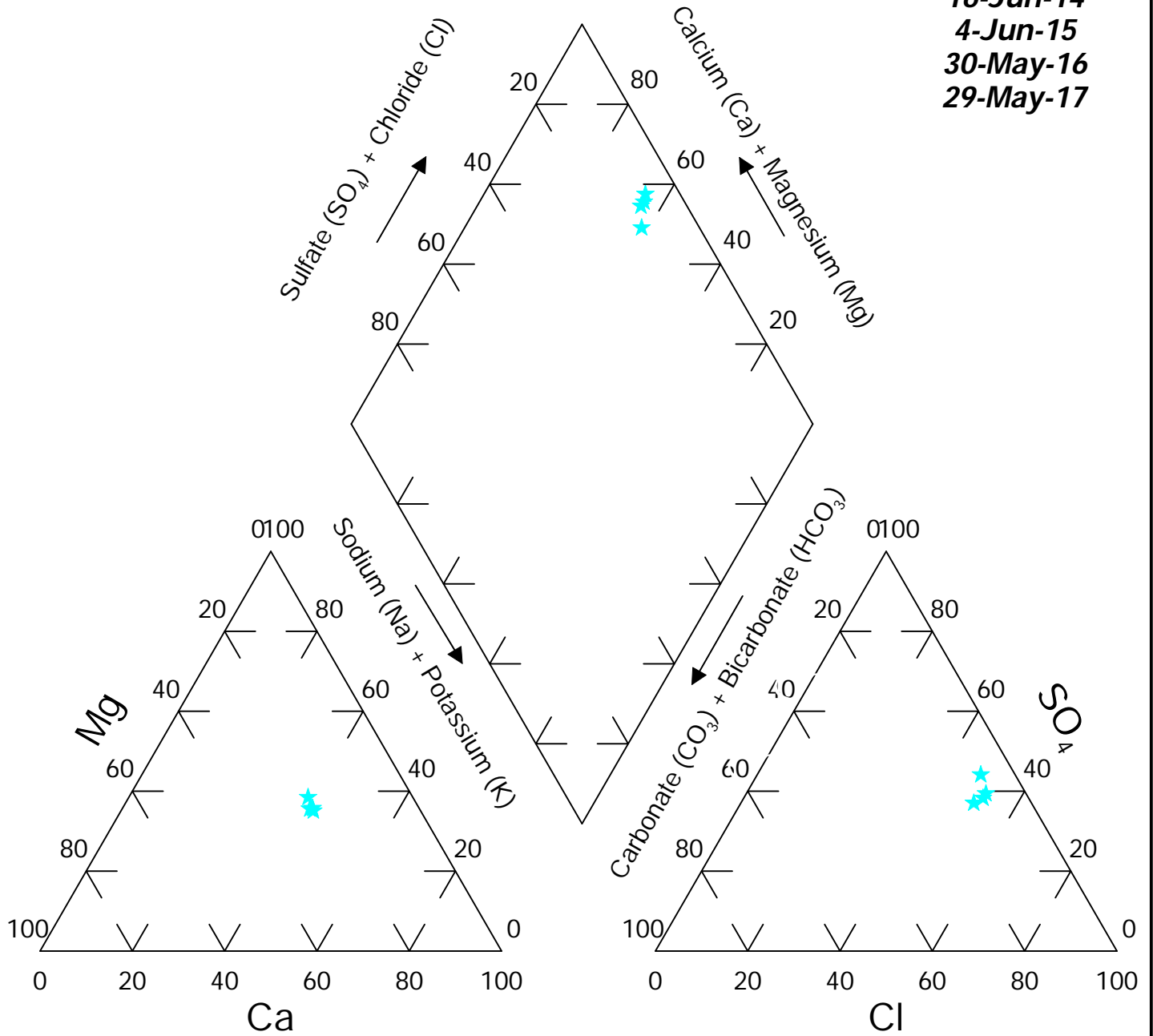
Dates:  
8-Jun-16  
30-May-17



# Site: Brady

## Location : GWQ25-5N62-D

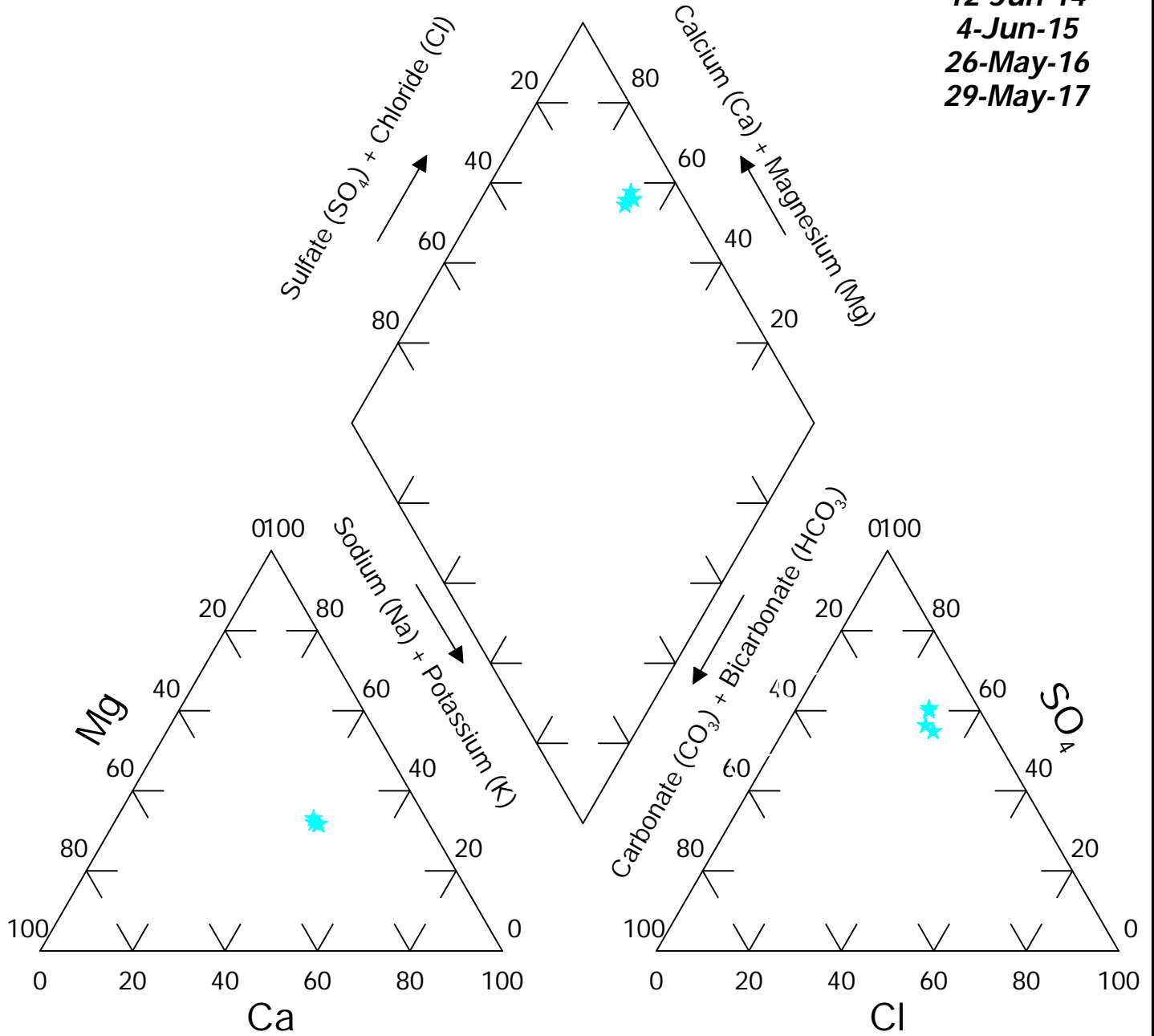
**Dates:**  
 16-Jun-14  
 4-Jun-15  
 30-May-16  
 29-May-17



# Site: Brady

## Location : GWQ25-6N57-DR

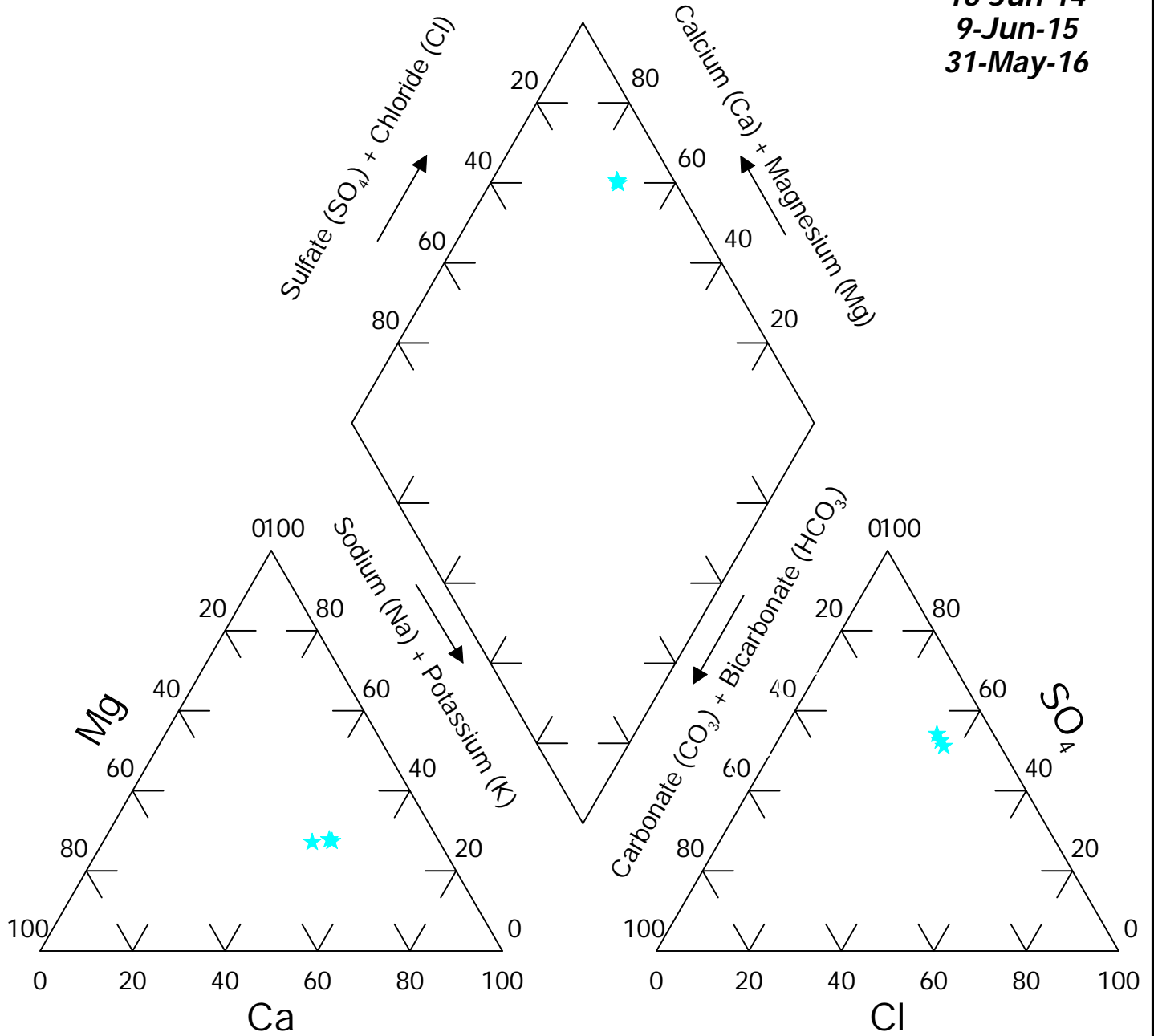
**Dates:**  
 12-Jun-14  
 4-Jun-15  
 26-May-16  
 29-May-17



# Site: Brady

## Location : GWQ25-6N59-DR

Dates:  
16-Jun-14  
9-Jun-15  
31-May-16

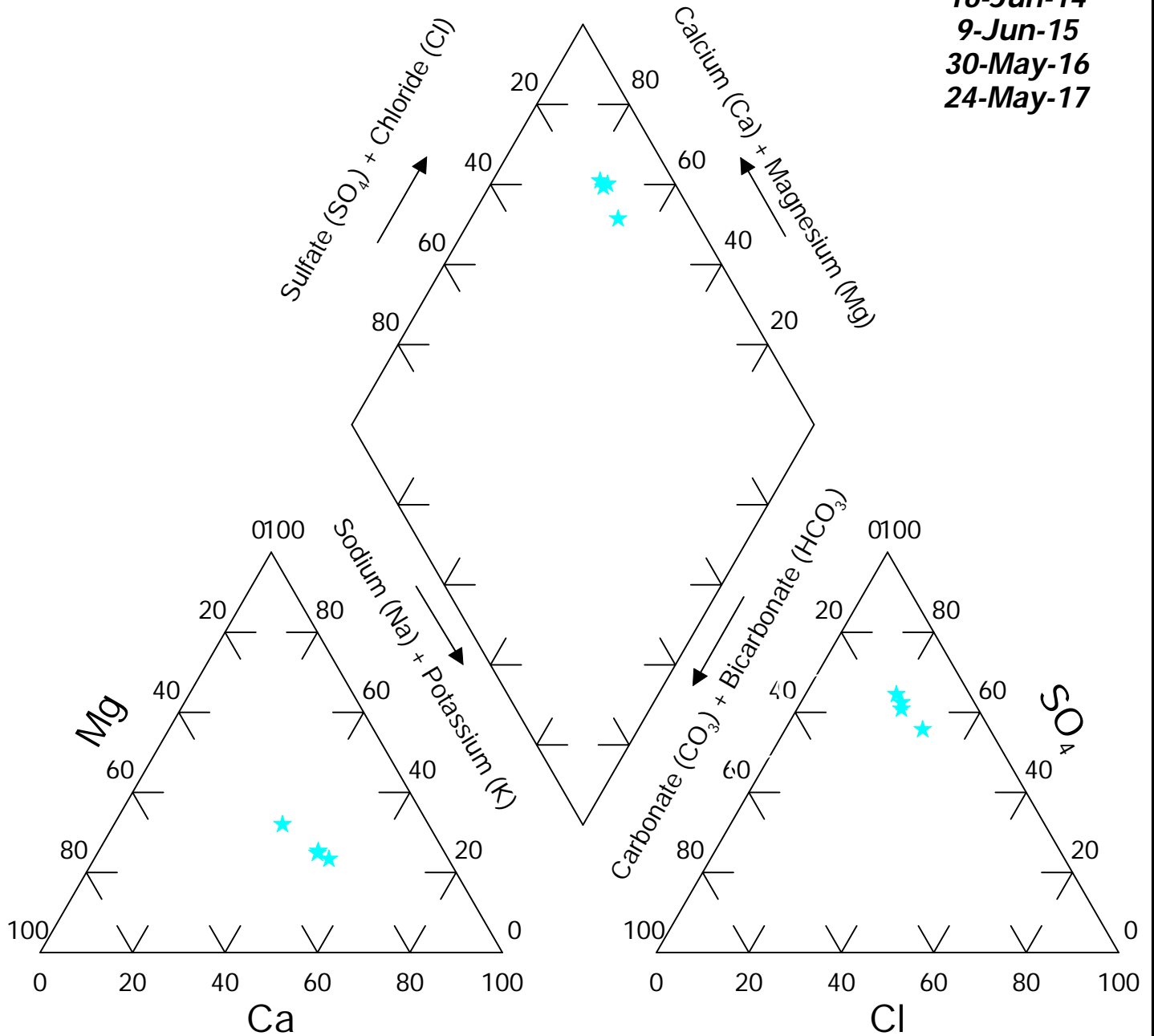




# Site: Brady

## Location : GWQ25-6N60-DR

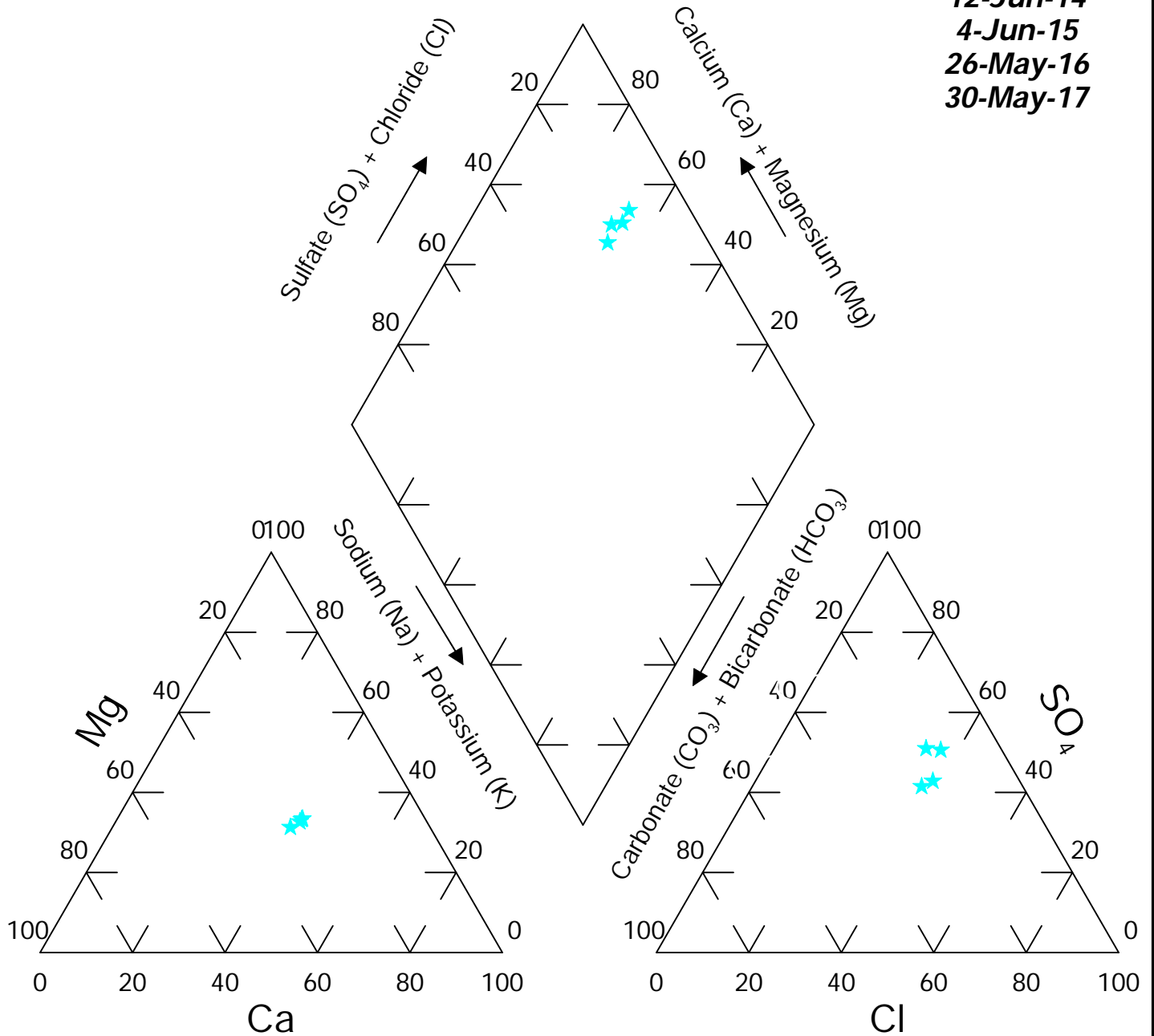
Dates:  
16-Jun-14  
9-Jun-15  
30-May-16  
24-May-17



# Site: Brady

## Location : GWQ25-6N63-E

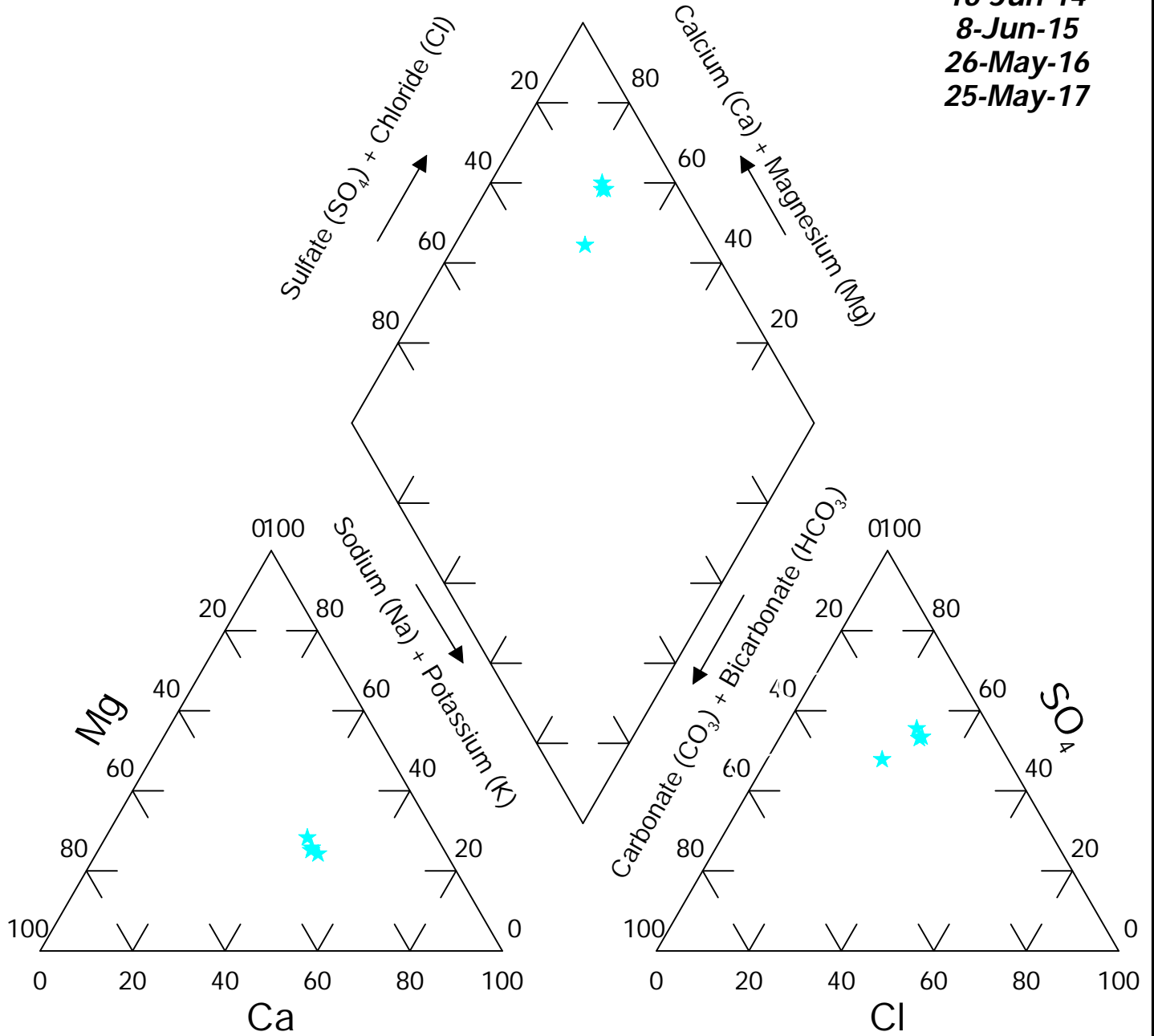
**Dates:**  
 12-Jun-14  
 4-Jun-15  
 26-May-16  
 30-May-17



# Site: Brady

## Location : GWQ25-6N67-E

**Dates:**  
 16-Jun-14  
 8-Jun-15  
 26-May-16  
 25-May-17



# Site: Brady

## Well #: 4N34-D/DR

### Dates:

- 5-Jul-12
- 29-Oct-12
- 17-Jun-13
- 24-Oct-13
- 12-Jun-14
- 8-Jun-15
- 7-Jun-16
- 25-May-17

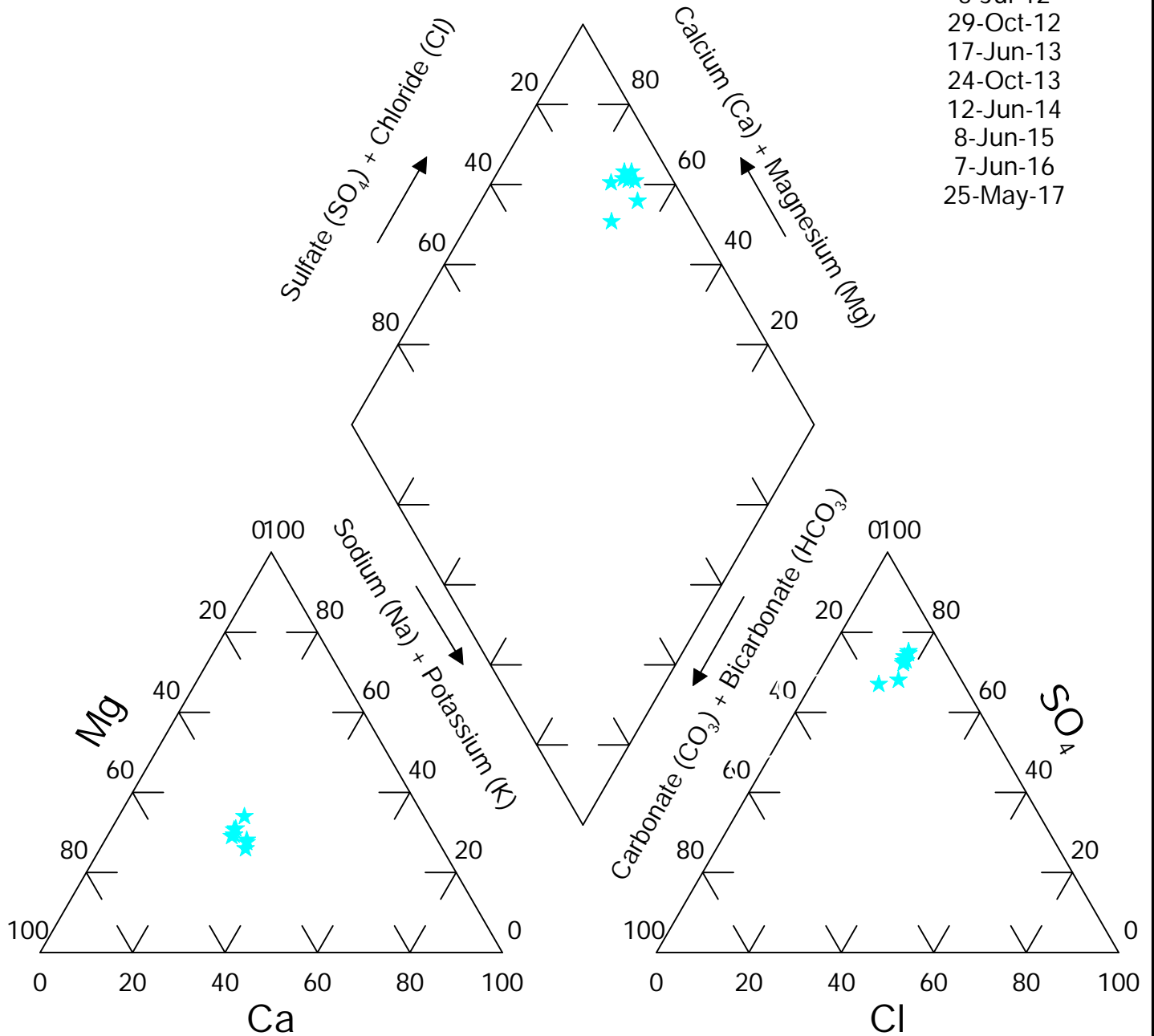


FIGURE: 10P

# Site: Brady

## Well #: 5N62-E

### Dates:

- 6-Jun-12
- 23-Oct-12
- 17-Jun-13
- 24-Oct-13
- 16-Jun-14
- 23-Oct-14
- 4-Jun-15
- 15-Oct-15
- 30-May-16
- 27-Oct-16
- 29-May-17
- 17-Oct-17

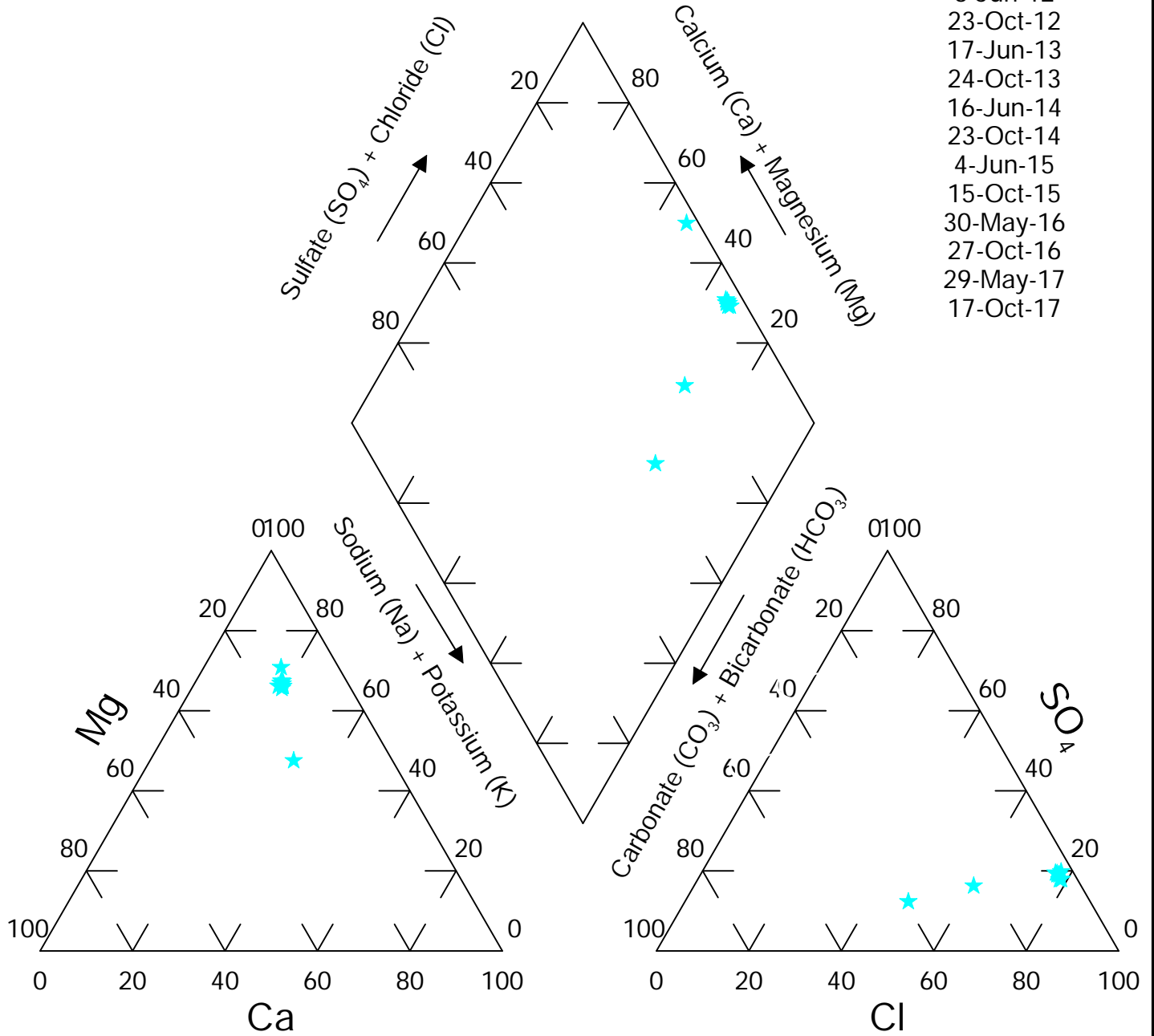
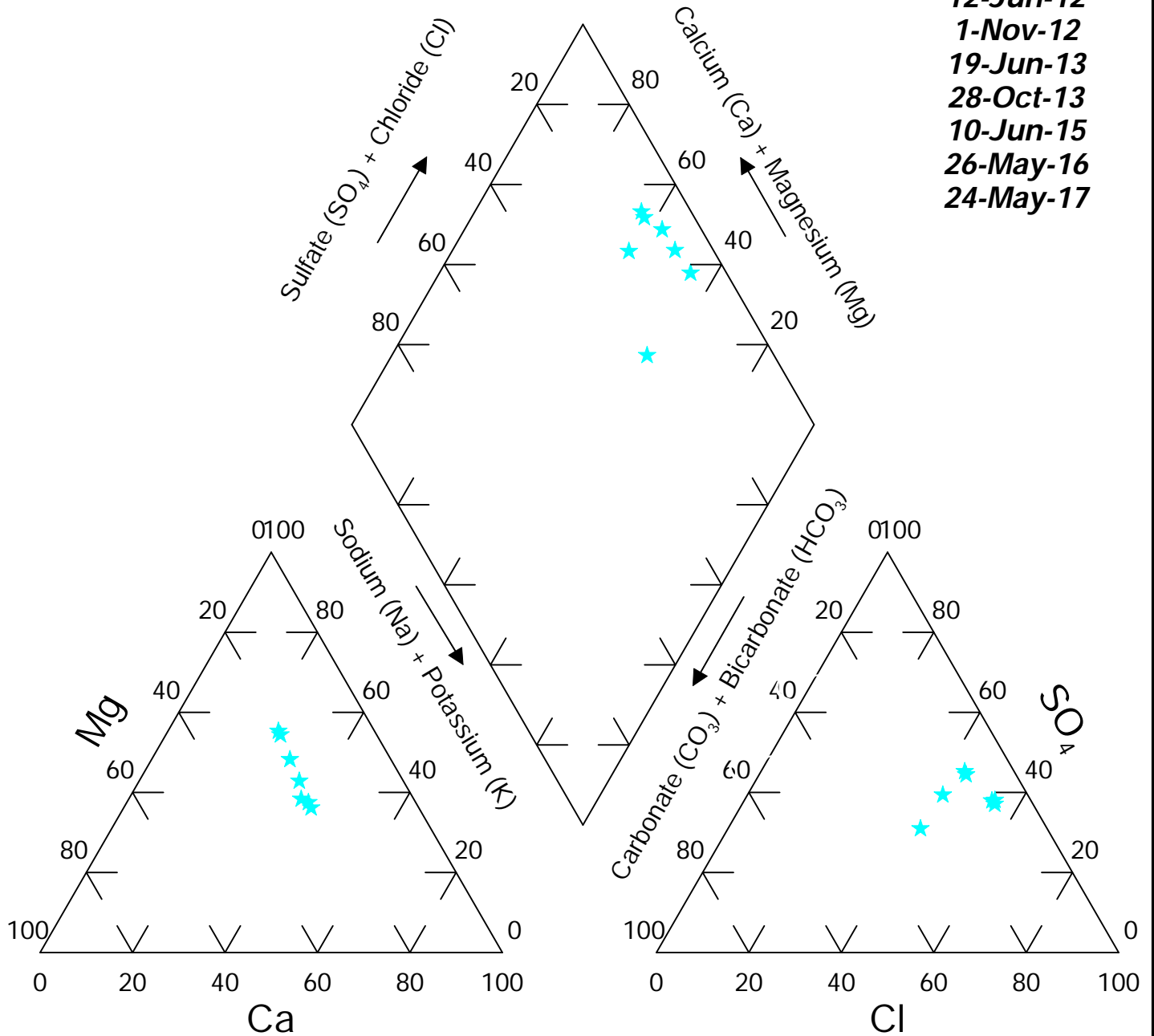


FIGURE: 11P

**Site: Brady**  
**Well #: 6N57-F/FR**

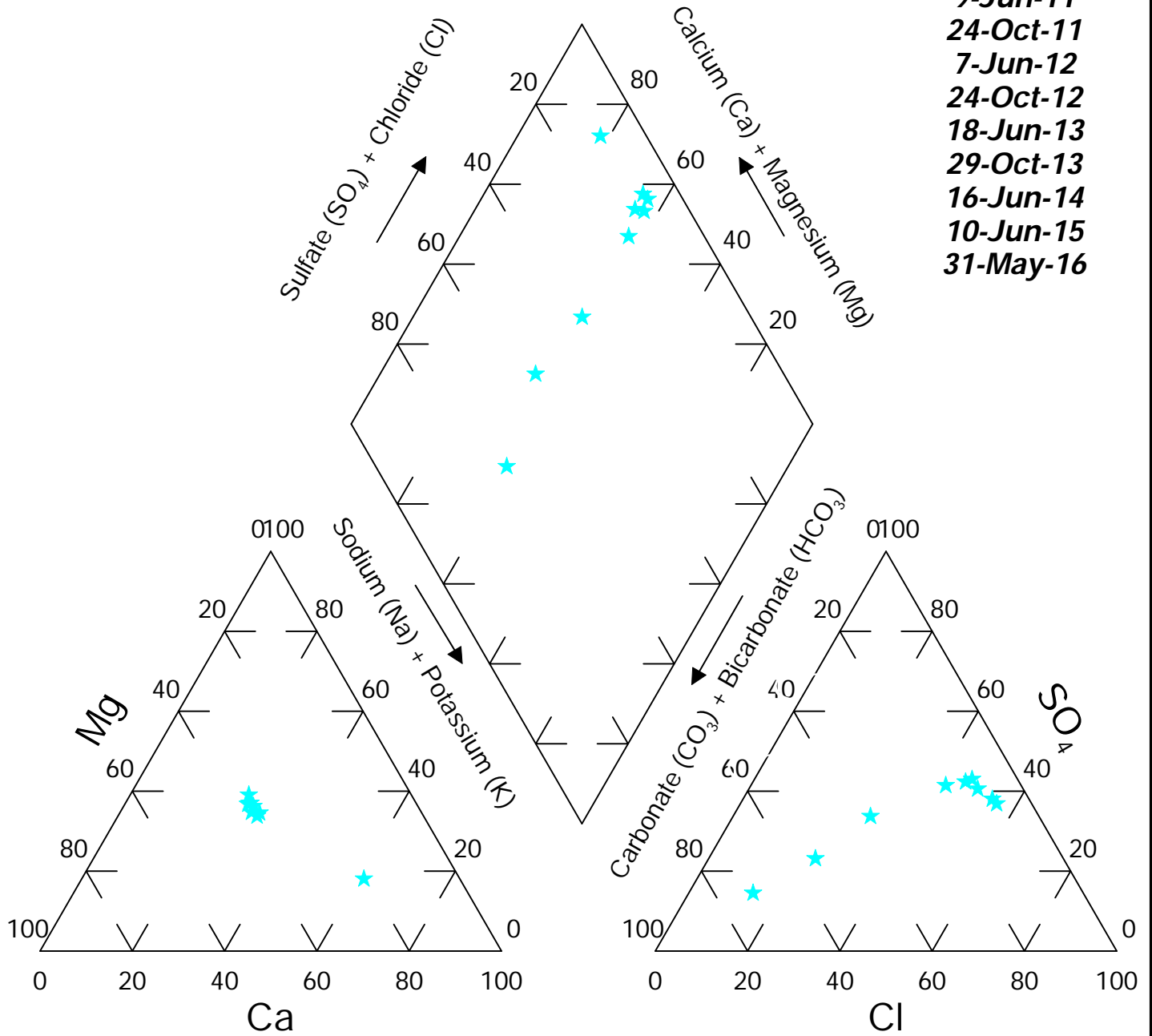
**Dates:**  
**12-Jun-12**  
**1-Nov-12**  
**19-Jun-13**  
**28-Oct-13**  
**10-Jun-15**  
**26-May-16**  
**24-May-17**



**FIGURE: 12P**

**Site: Brady**  
**Well #: 6N58-F/FR**

**Dates:**  
 9-Jun-11  
 24-Oct-11  
 7-Jun-12  
 24-Oct-12  
 18-Jun-13  
 29-Oct-13  
 16-Jun-14  
 10-Jun-15  
 31-May-16

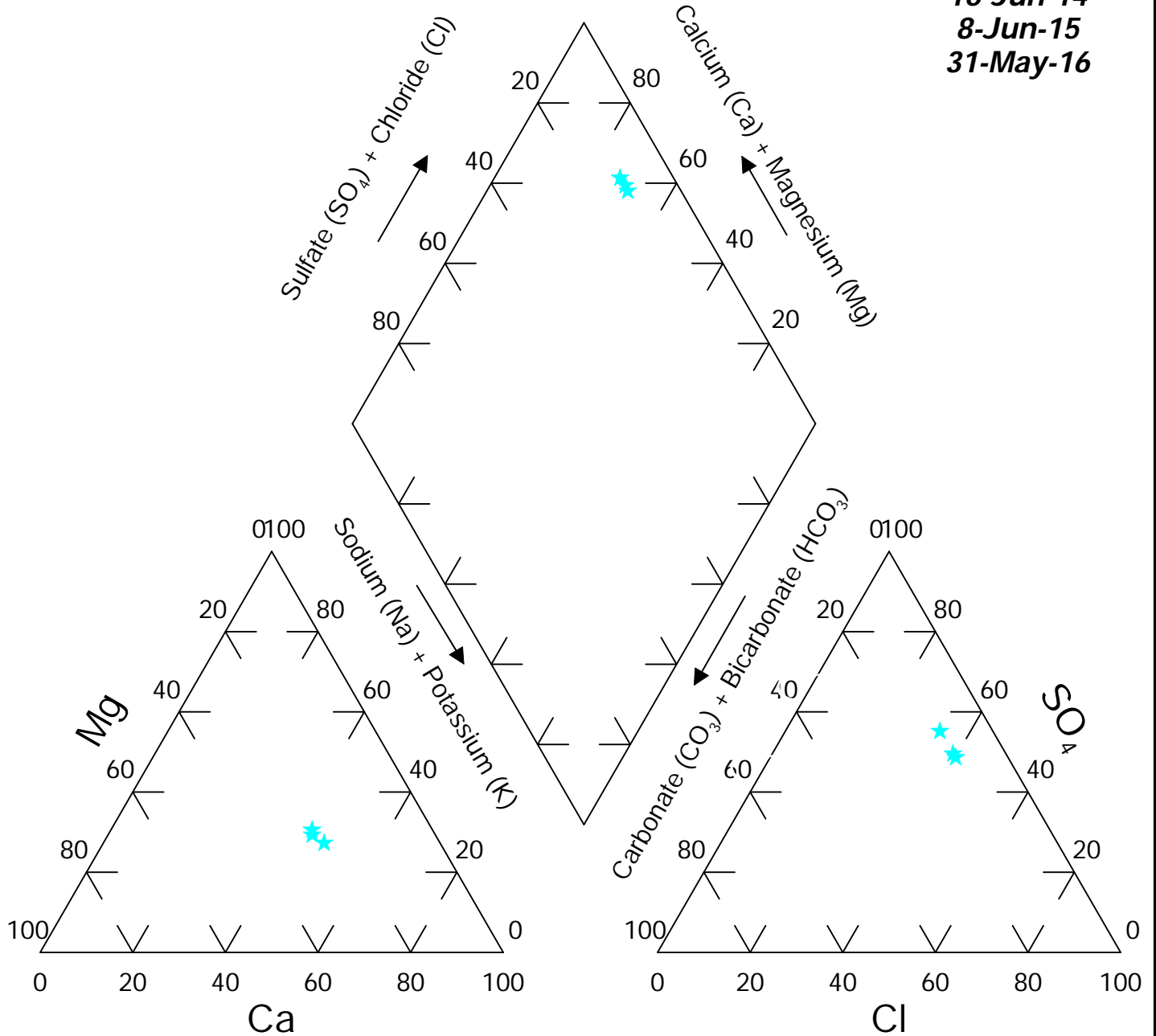


**FIGURE: 13P**

# Site: Brady

## Location : GWQ25-6N58-DR

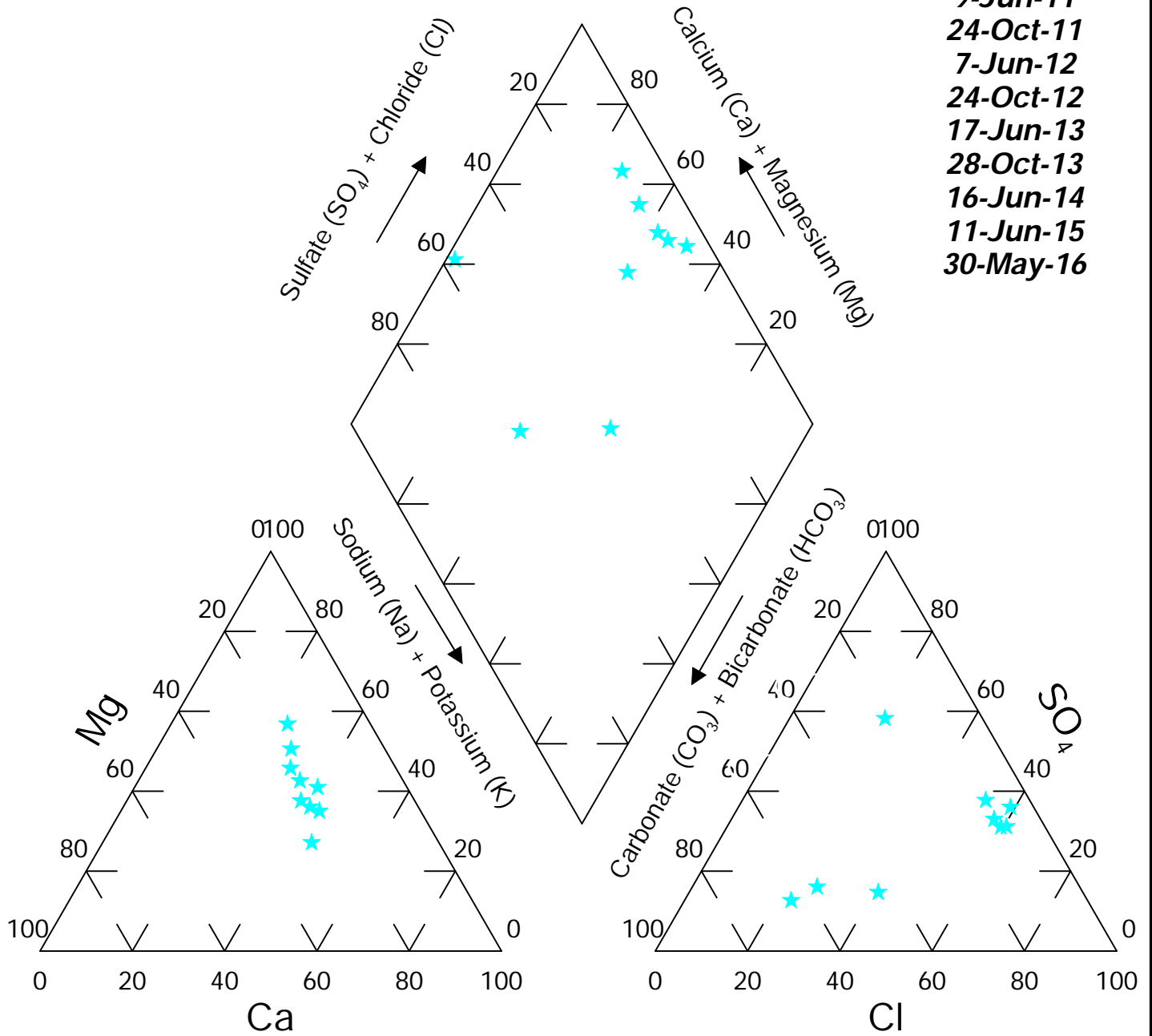
Dates:  
16-Jun-14  
8-Jun-15  
31-May-16





**Site: Brady**  
**Well #: 6N59-F/FR**

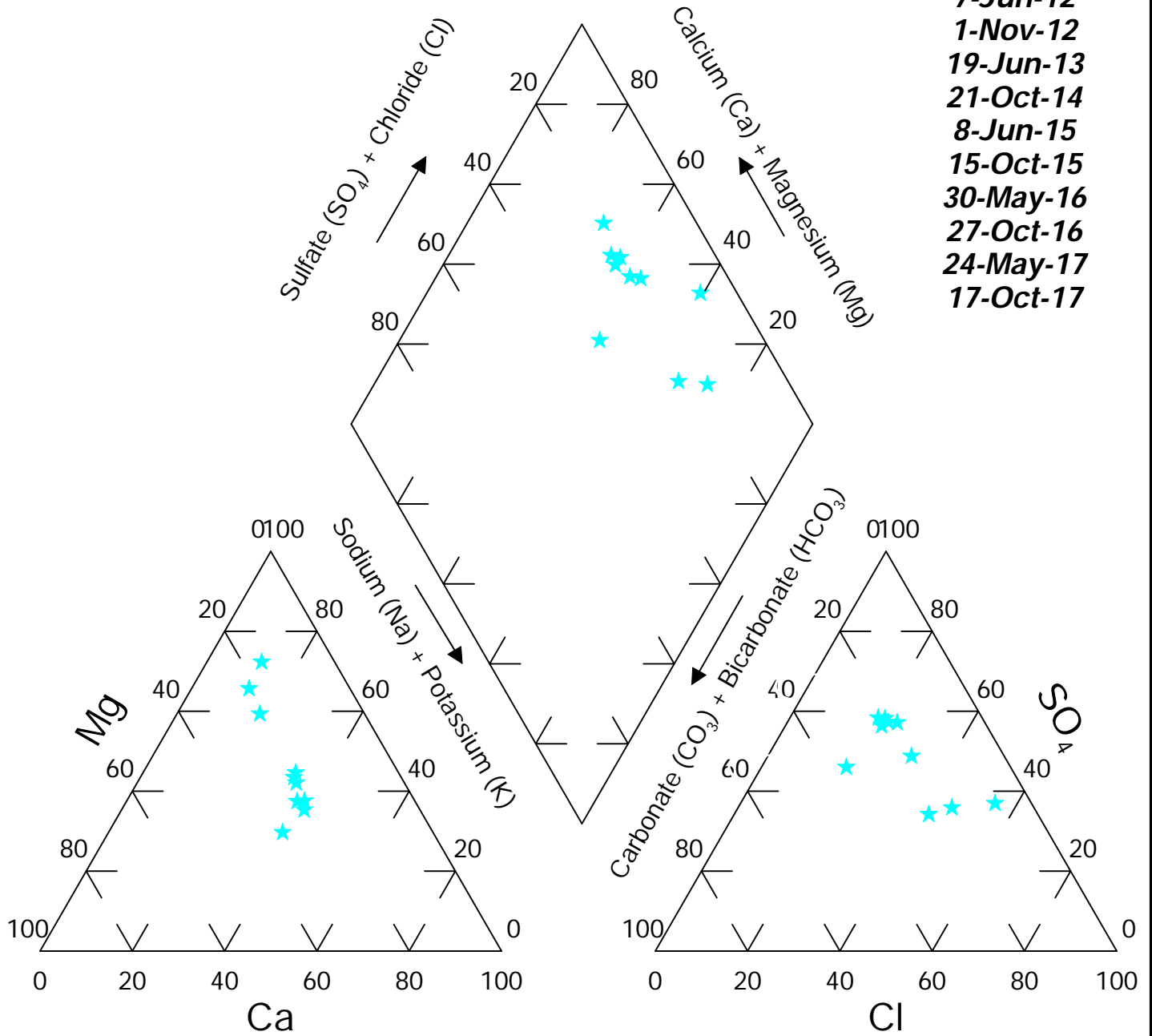
**Dates:**  
 9-Jun-11  
 24-Oct-11  
 7-Jun-12  
 24-Oct-12  
 17-Jun-13  
 28-Oct-13  
 16-Jun-14  
 11-Jun-15  
 30-May-16



**FIGURE: 14P**

**Site: Brady**  
**Well #: 6N60-E/ER**

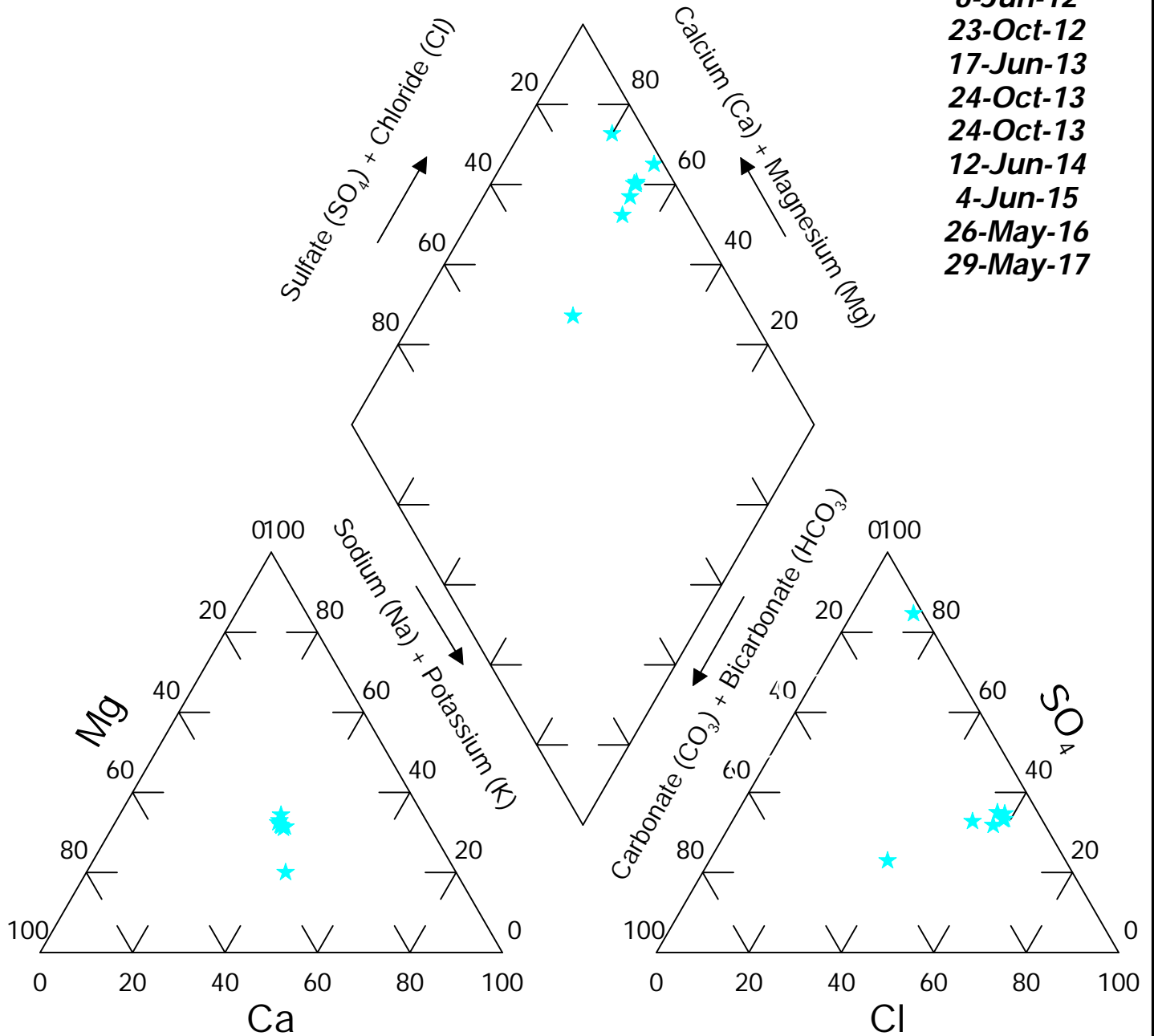
**Dates:**  
 7-Jun-12  
 1-Nov-12  
 19-Jun-13  
 21-Oct-14  
 8-Jun-15  
 15-Oct-15  
 30-May-16  
 27-Oct-16  
 24-May-17  
 17-Oct-17



**FIGURE: 15P**

**Site: Brady**  
**Well #: 6N63-F**

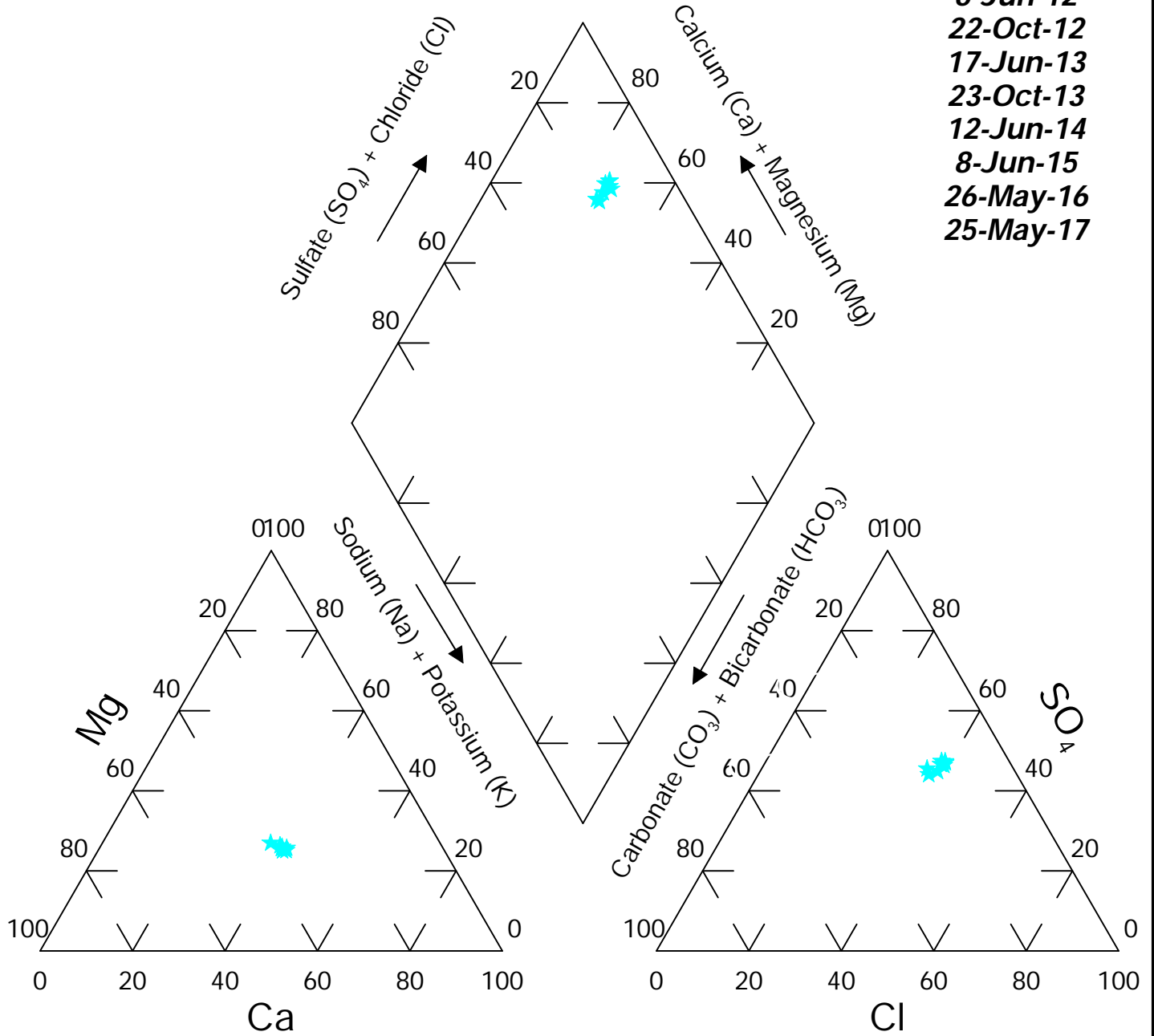
**Dates:**  
 6-Jun-12  
 23-Oct-12  
 17-Jun-13  
 24-Oct-13  
 24-Oct-13  
 12-Jun-14  
 4-Jun-15  
 26-May-16  
 29-May-17



**FIGURE: 16P**

**Site: Brady**  
**Well #: 6N67-F**

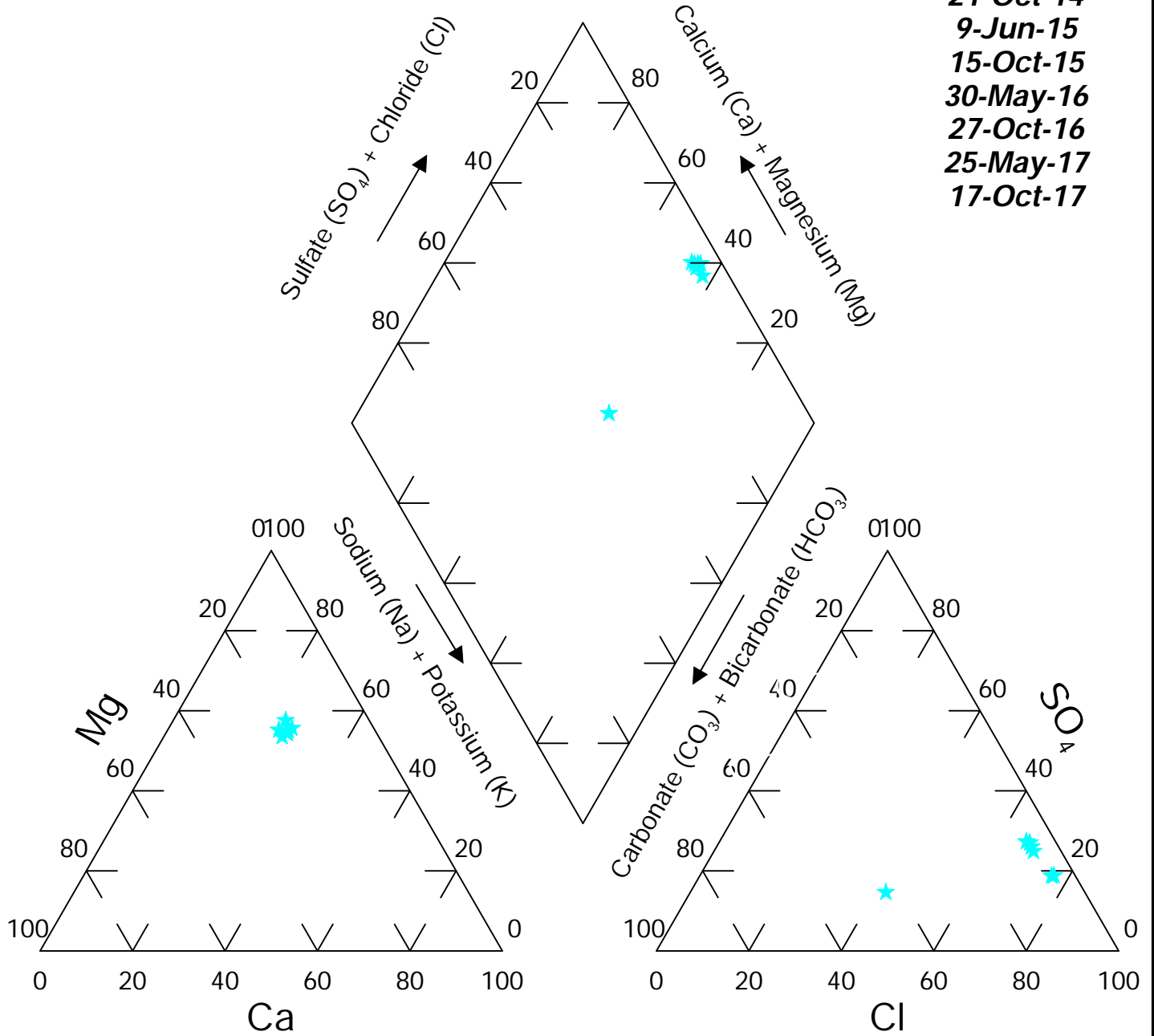
**Dates:**  
 6-Jun-12  
 22-Oct-12  
 17-Jun-13  
 23-Oct-13  
 12-Jun-14  
 8-Jun-15  
 26-May-16  
 25-May-17



**FIGURE: 17P**

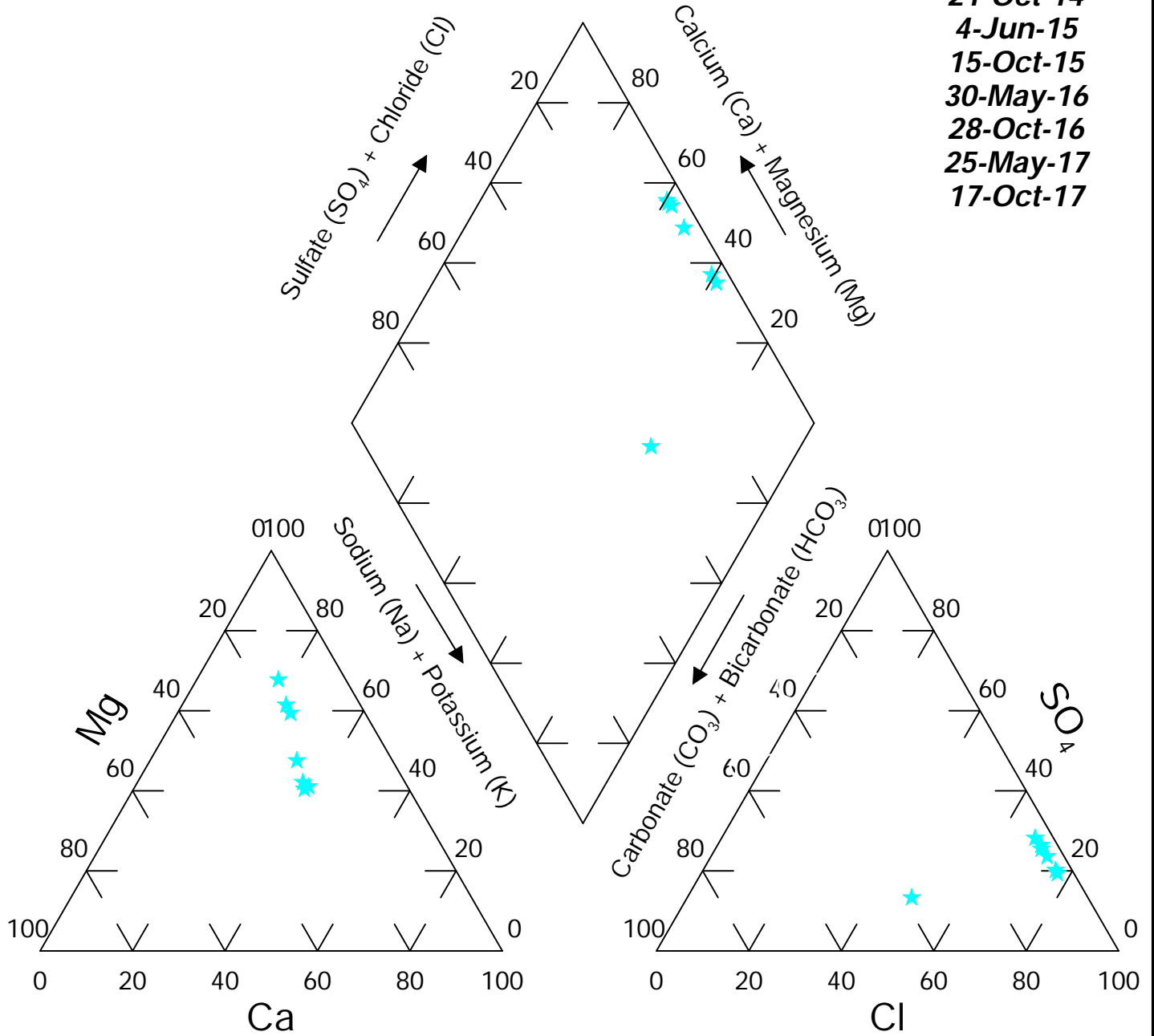
# Site: Brady Well #: 13A

**Dates:**  
 21-Oct-14  
 9-Jun-15  
 15-Oct-15  
 30-May-16  
 27-Oct-16  
 25-May-17  
 17-Oct-17



# Site: Brady Well #: 14A

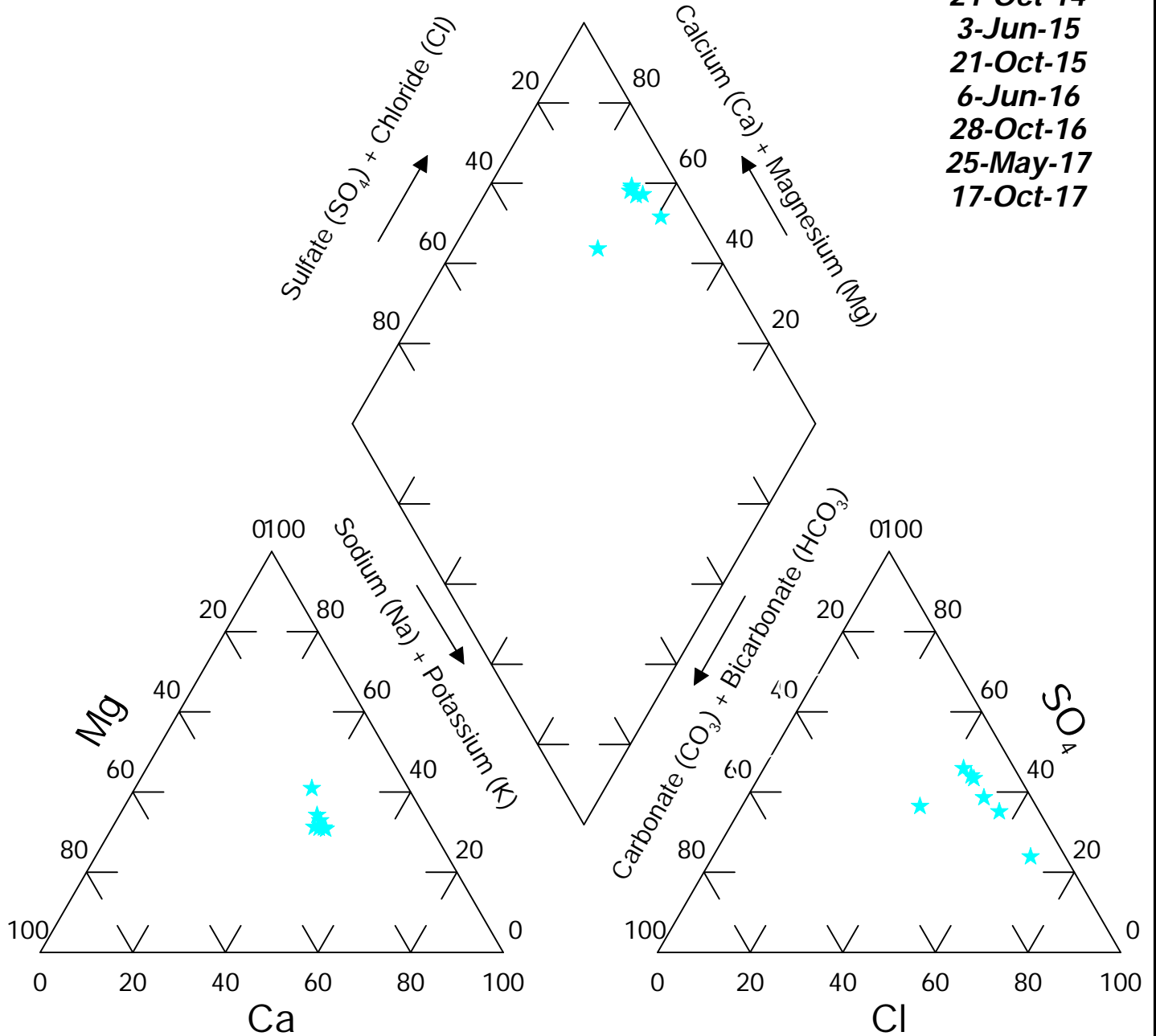
**Dates:**  
 21-Oct-14  
 4-Jun-15  
 15-Oct-15  
 30-May-16  
 28-Oct-16  
 25-May-17  
 17-Oct-17



**FIGURE: 13P**

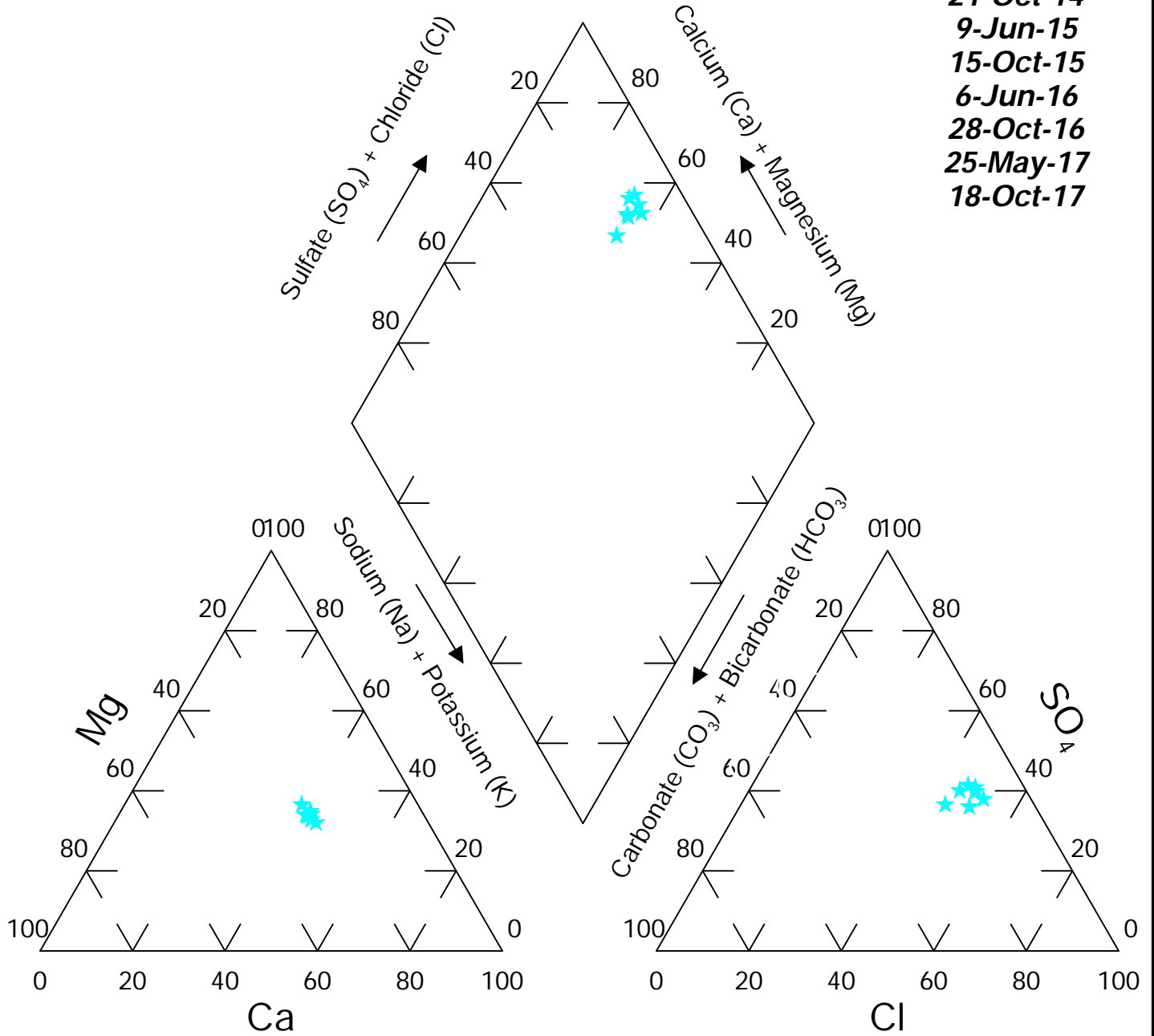
# Site: Brady Well #: 15A

**Dates:**  
 21-Oct-14  
 3-Jun-15  
 21-Oct-15  
 6-Jun-16  
 28-Oct-16  
 25-May-17  
 17-Oct-17



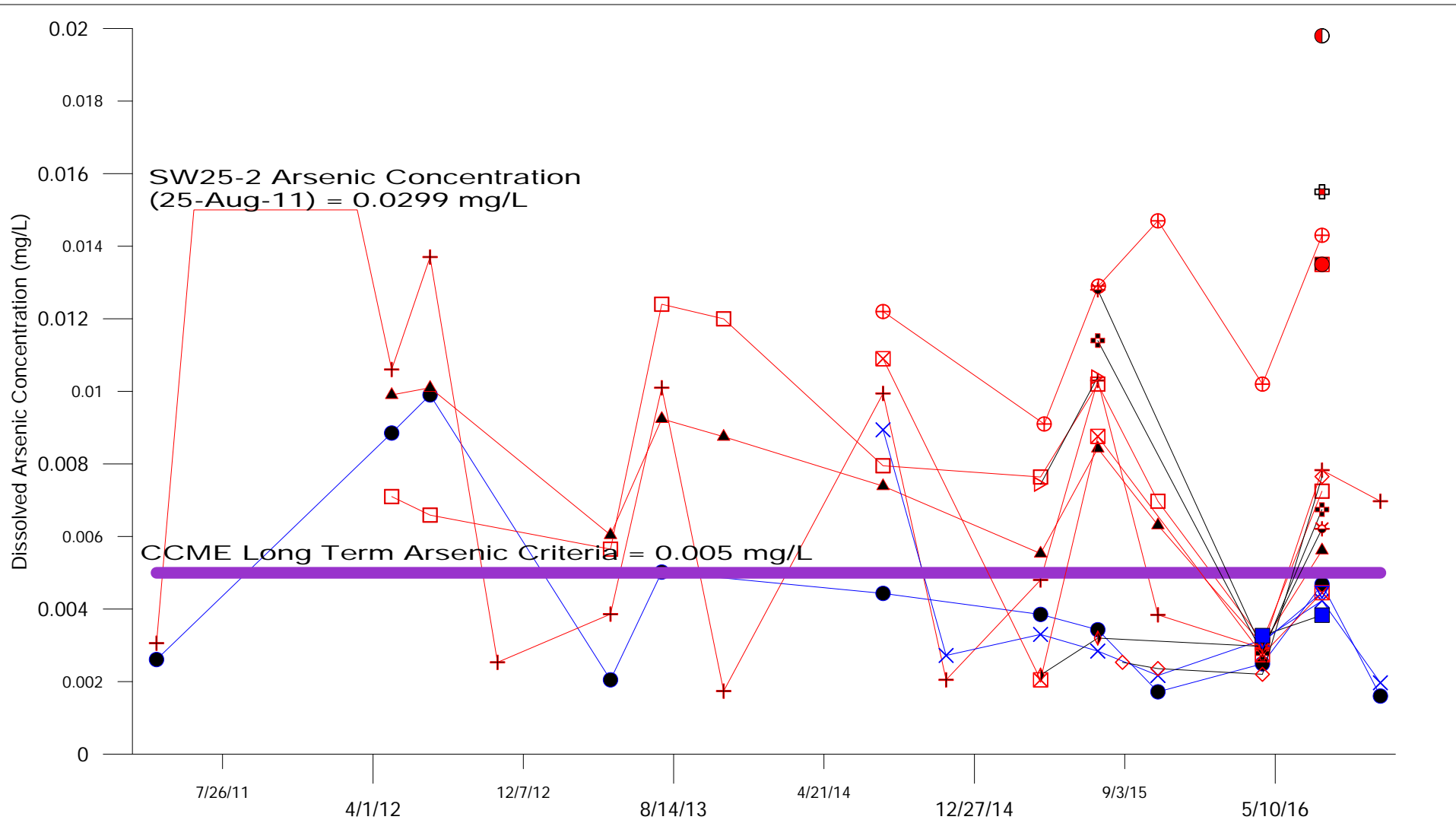
# Site: Brady Well #: 16A

**Dates:**  
 21-Oct-14  
 9-Jun-15  
 15-Oct-15  
 6-Jun-16  
 28-Oct-16  
 25-May-17  
 18-Oct-17





**APPENDIX D**  
**2017 STATISTICAL ANALYSIS OF**  
**SURFACE WATER QUALITY**

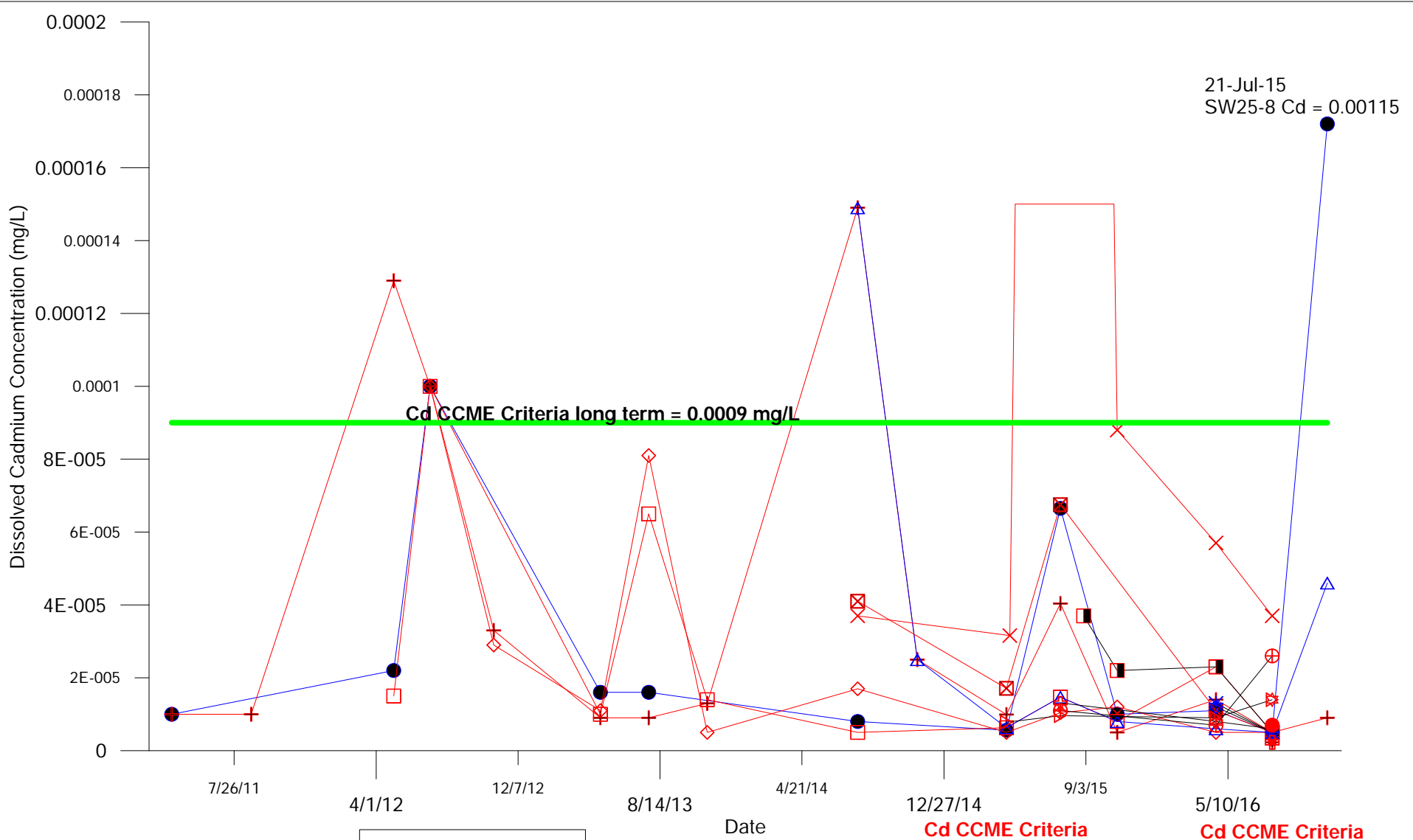


- Up Stream**
- SW25-1
  - × SW25-12
  - SW25-13A
  - ▽ SW25-13B

- Down Stream**
- ⊠ SW25-16
  - ⊕ SW25-2
  - ⊕ SW25-8
  - SW25-9B
  - ▲ SW25-9A
  - ⊠ SW25-11B
  - ◐ SW25-11C

- Down Stream**
- ▬ CCME
  - ▷ SW25-14A
  - ⊠ SW25-14B
  - ⊠ SW25-15A
  - ◇ SW25-15B
  - ◊ SW25-11
  - ◊ SW25-7
  - SW25-11A

	<b>City of Winnipeg</b> Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Arsenic Surface Water</b>		
<b>APRIL 2017</b>	<b>FIGURE 43</b>	<b>REV 0</b>



Cd CCME Criteria  
0.001 mg/L short term

Cd CCME Criteria  
0.00009 Long Term

**Up Stream**

- SW25-1
- △ SW25-12
- \* SW25-13A
- ◇ SW25-13B
- CCME Cd long term

**Down Stream**

- ⊠ SW25-16
- + SW25-2
- × SW25-8
- ◇ SW25-9B
- SW25-9A
- ☆ SW25-11B
- SW25-11C

**Down stream**

- ▷ SW25-14A
- ⊕ SW25-14B
- ⊕ SW25-15A
- SW25-15B
- ⊙ SW25-7
- ⊕ SW25-11A

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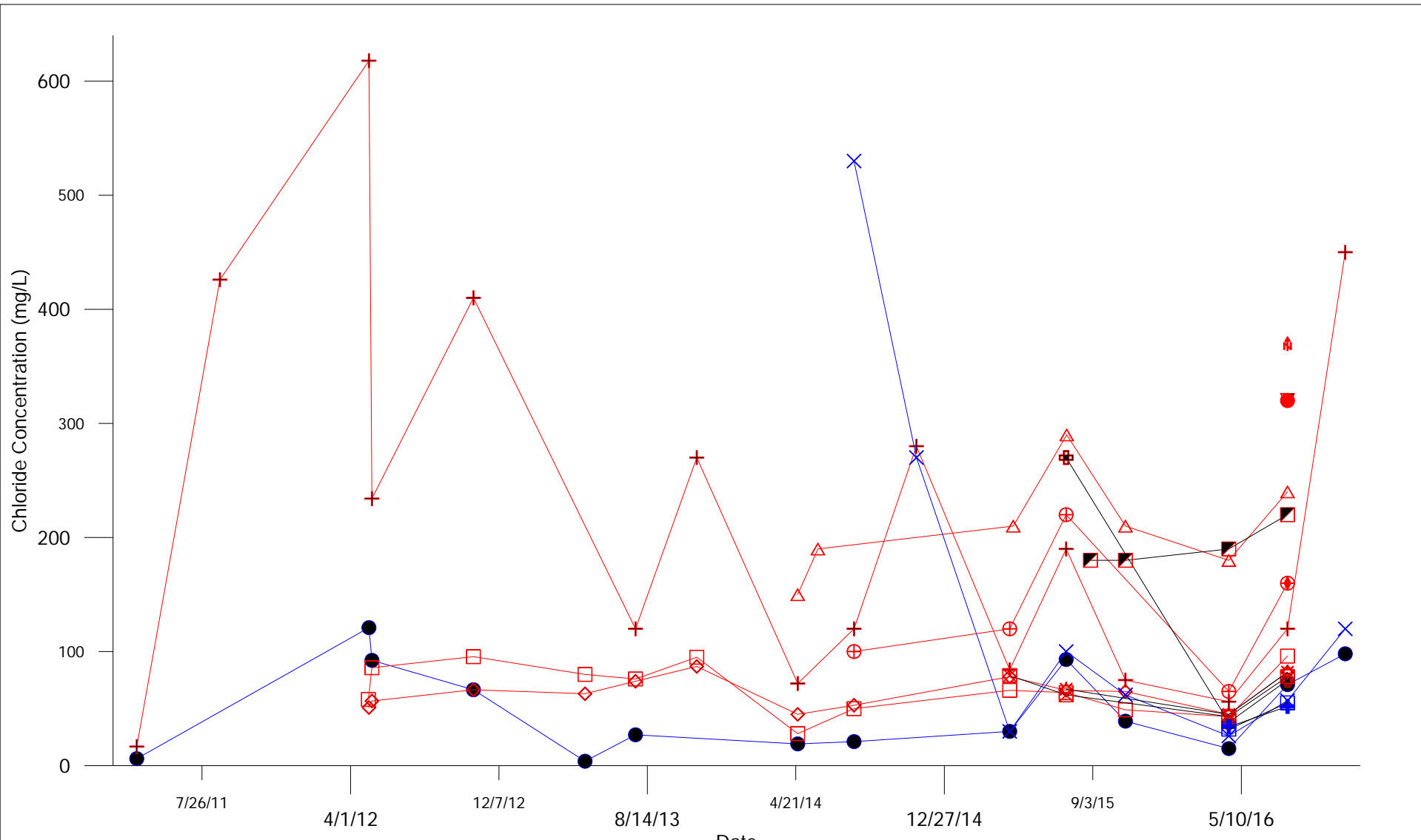
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**BRADY ROAD RESOURCE MANAGEMENT FACILITY**

**Dissolved Cadmium  
Surface Water**

---

APRIL 2017
FIGURE 44
REV 0

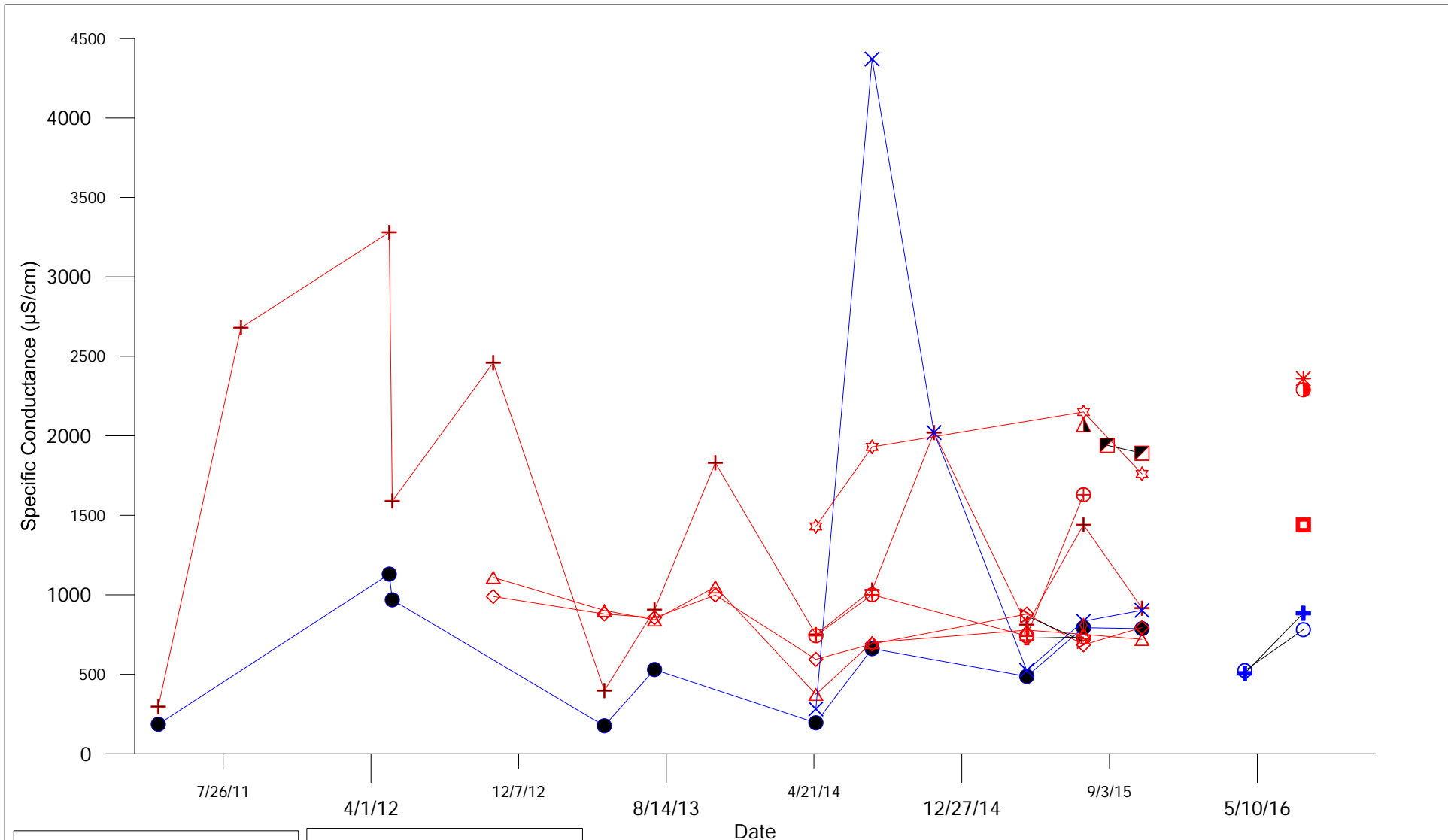


Up Stream	
●	SW25-1
×	SW25-12
+	SW25-13A
□	SW25-13B

Down Stream	
⊕	SW25-16
+	SW25-2
△	SW25-8
◇	SW25-9B
□	SW25-9A
●	SW25-11A

Down stream	
⊗	SW25-14A
⊕	SW25-14B
⊗	SW25-15A
⊗	SW25-15B
▽	SW25-7
⬆	SW25-11B
⬆	SW25-11C

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Chloride Surface Water</b>		
APRIL 2017	FIGURE 45	REV 0



**Up Stream**

- SW25-1
- × SW25-12
- SW25-13A
- ⊕ SW25-13B

**Down Stream**

- ⊕ SW25-16
- ⊕ SW25-2
- ☆ SW25-8
- ◇ SW25-9B
- △ SW25-9A
- ◐ SW25-11A
- ✱ SW25-11B

**Down stream**

- ⊕ SW25-14A
- ▷ SW25-14B
- ▲ SW25-15A
- ◆ SW25-15B
- ◼ SW25-7
- ◻ SW25-11C

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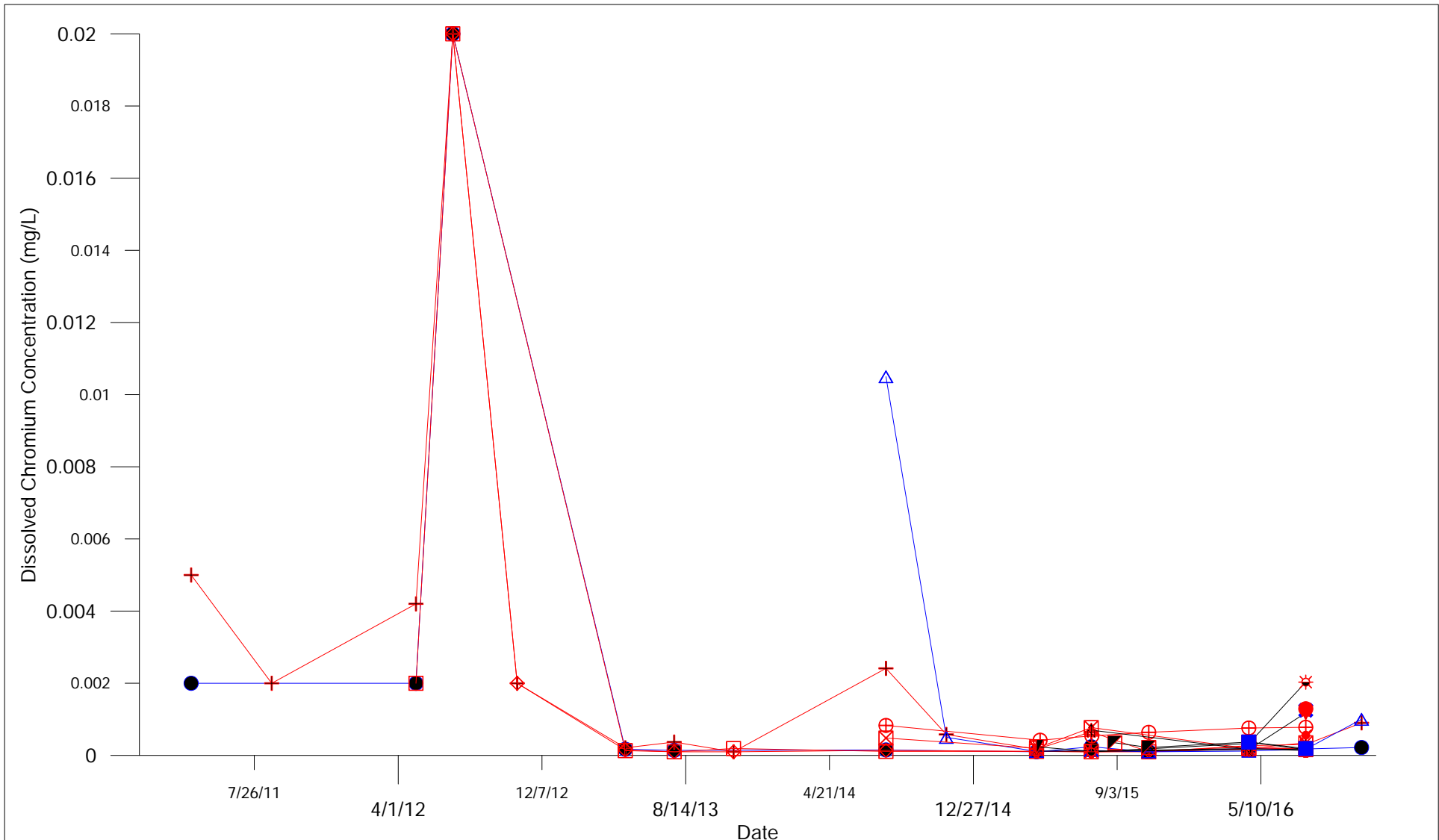
**BRADY ROAD RESOURCE MANAGEMENT FACILITY**

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**Specific Conductance  
Surface Water**

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**APRIL 2017**
**FIGURE 51**
**REV 0**



**Up Stream**

- SW25-1
- △ SW25-12
- SW25-13A
- × SW25-13B

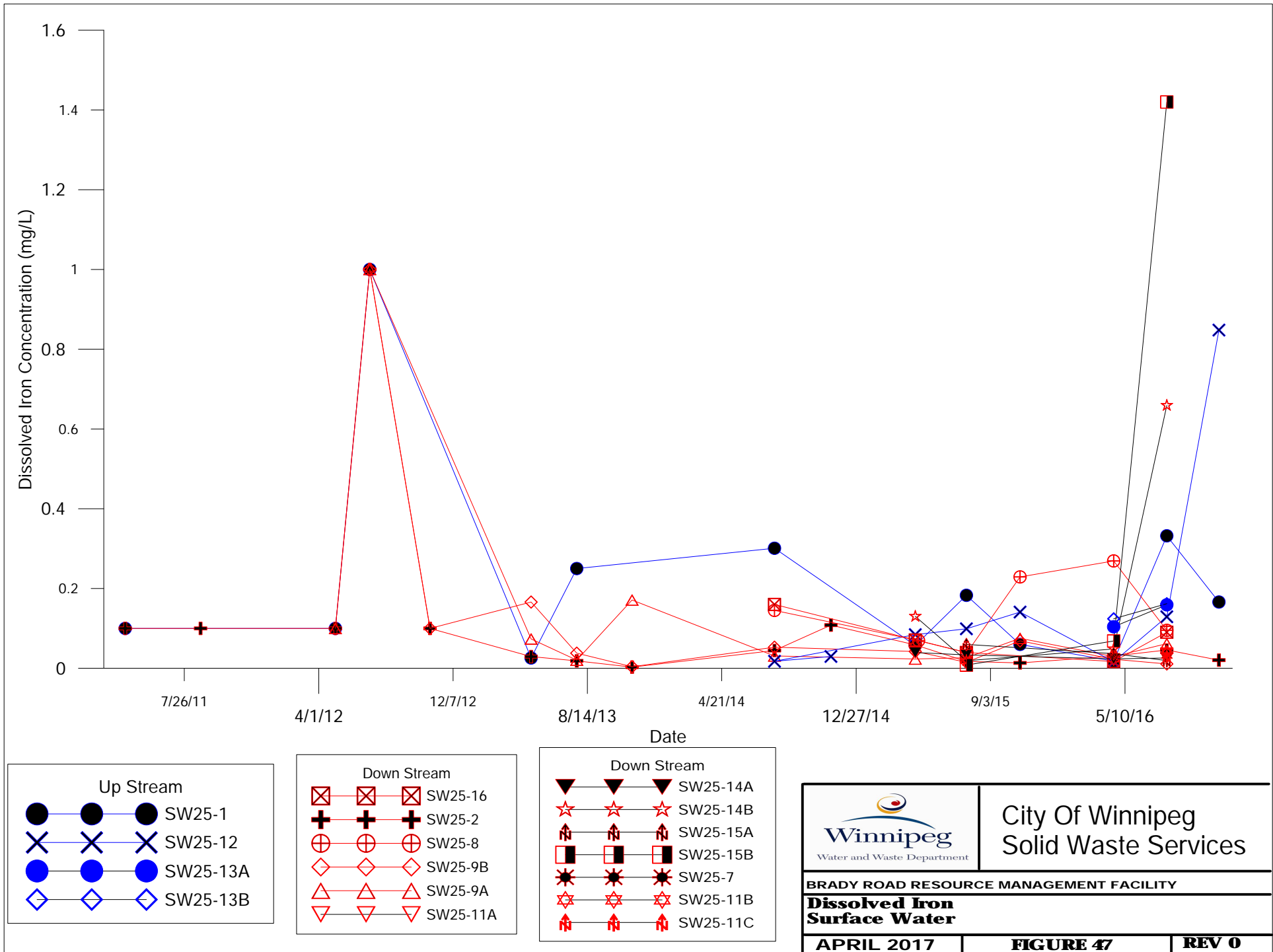
**Down Stream**

- ⊠ SW25-16
- ⊕ SW25-2
- ⊗ SW25-8
- ◇ SW25-9B
- SW25-9A
- SW25-11A

**Down stream**

- ⊕ SW25-14A
- ▽ SW25-14B
- ⬆ SW25-15A
- ☀ SW25-15B
- ◼ SW25-7
- ⬆ SW25-11B
- ⬆ SW25-11C

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Chromium Surface Water</b>		
APRIL 2017	FIGURE 46	REV 0



**Up Stream**

- SW25-1
- × SW25-12
- SW25-13A
- ◇ SW25-13B

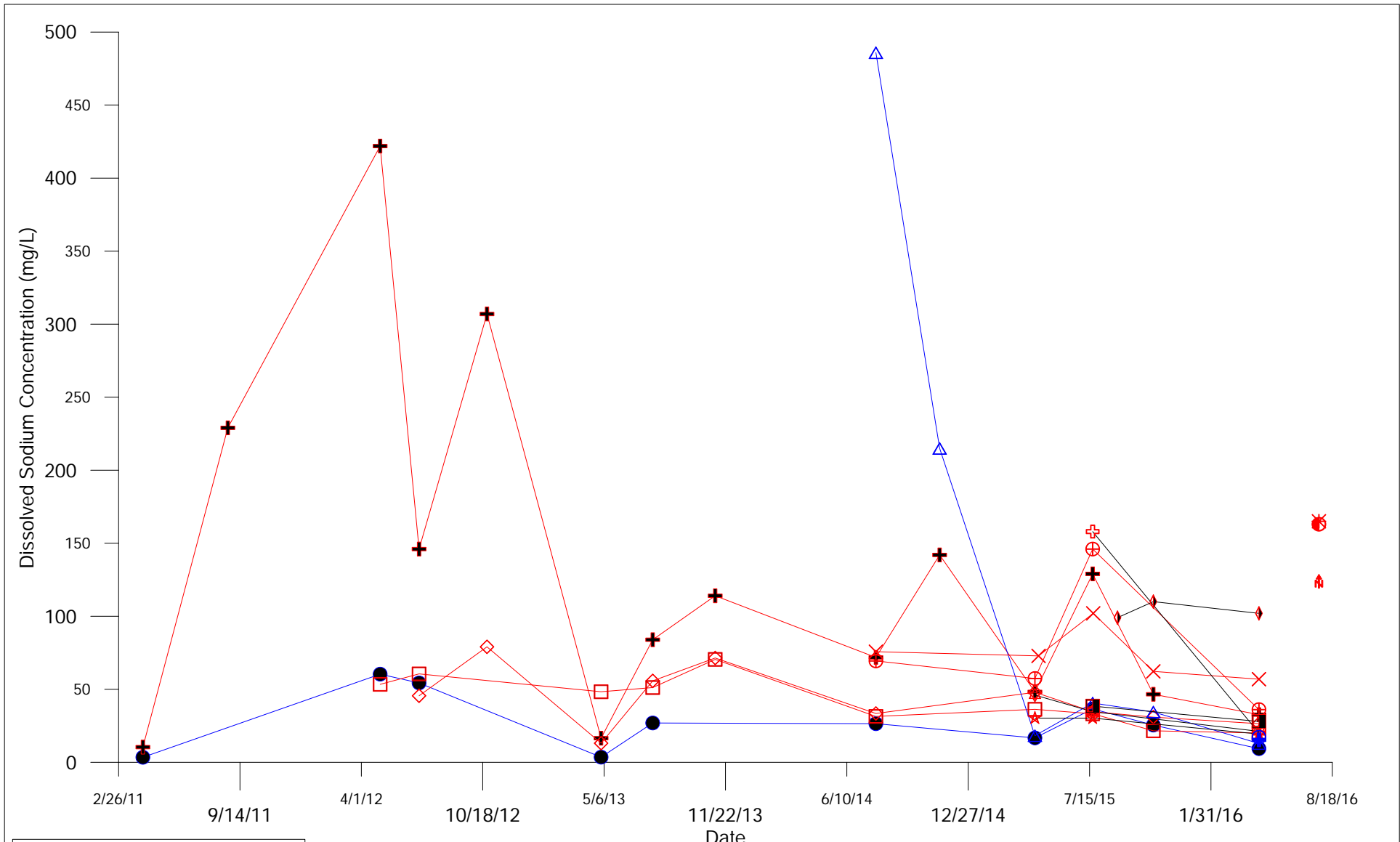
**Down Stream**

- ⊠ SW25-16
- ⊕ SW25-2
- ⊕ SW25-8
- ◇ SW25-9B
- △ SW25-9A
- ▽ SW25-11A

**Down Stream**

- ▼ SW25-14A
- ☆ SW25-14B
- ⬆ SW25-15A
- ⬆ SW25-15B
- ⬆ SW25-7
- ☆ SW25-11B
- ⬆ SW25-11C

	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>Dissolved Iron Surface Water</b>		
APRIL 2017	FIGURE 47	REV 0



**Up Stream**

- SW25-1
- △ SW25-12
- SW25-13A
- ⊕ SW25-13B

**Down Stream**

- ⊕ SW25-16
- ⊕ SW25-2
- ⊗ SW25-8
- ◇ SW25-9B
- SW25-9A
- ⊗ SW25-11A
- ◐ SW25-11B

**Down stream**

- ☆ SW25-14A
- ☆ SW25-14B
- ⊕ SW25-15A
- SW25-15B
- ◆ SW25-7
- ♠ SW25-11C

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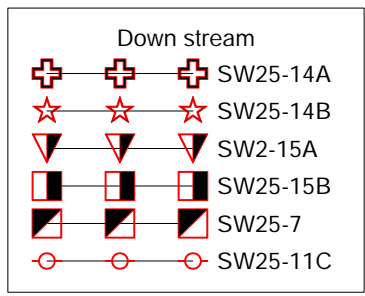
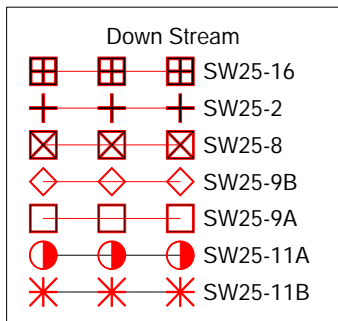
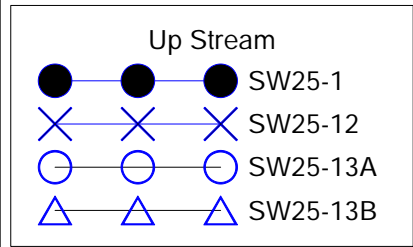
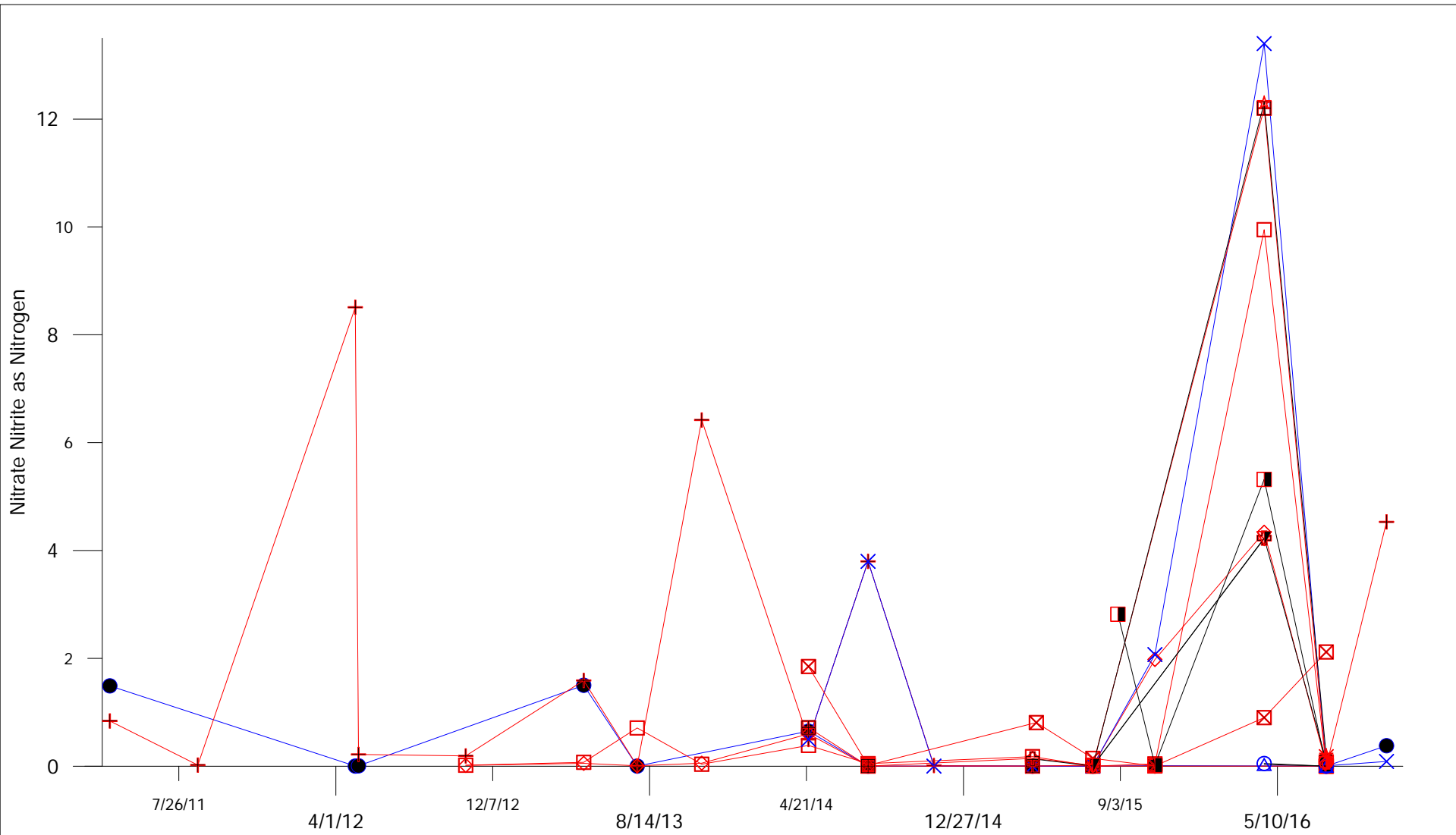
**BRADY ROAD RESOURCE MANAGEMENT FACILITY**

**Dissolved Sodium Surface Water**

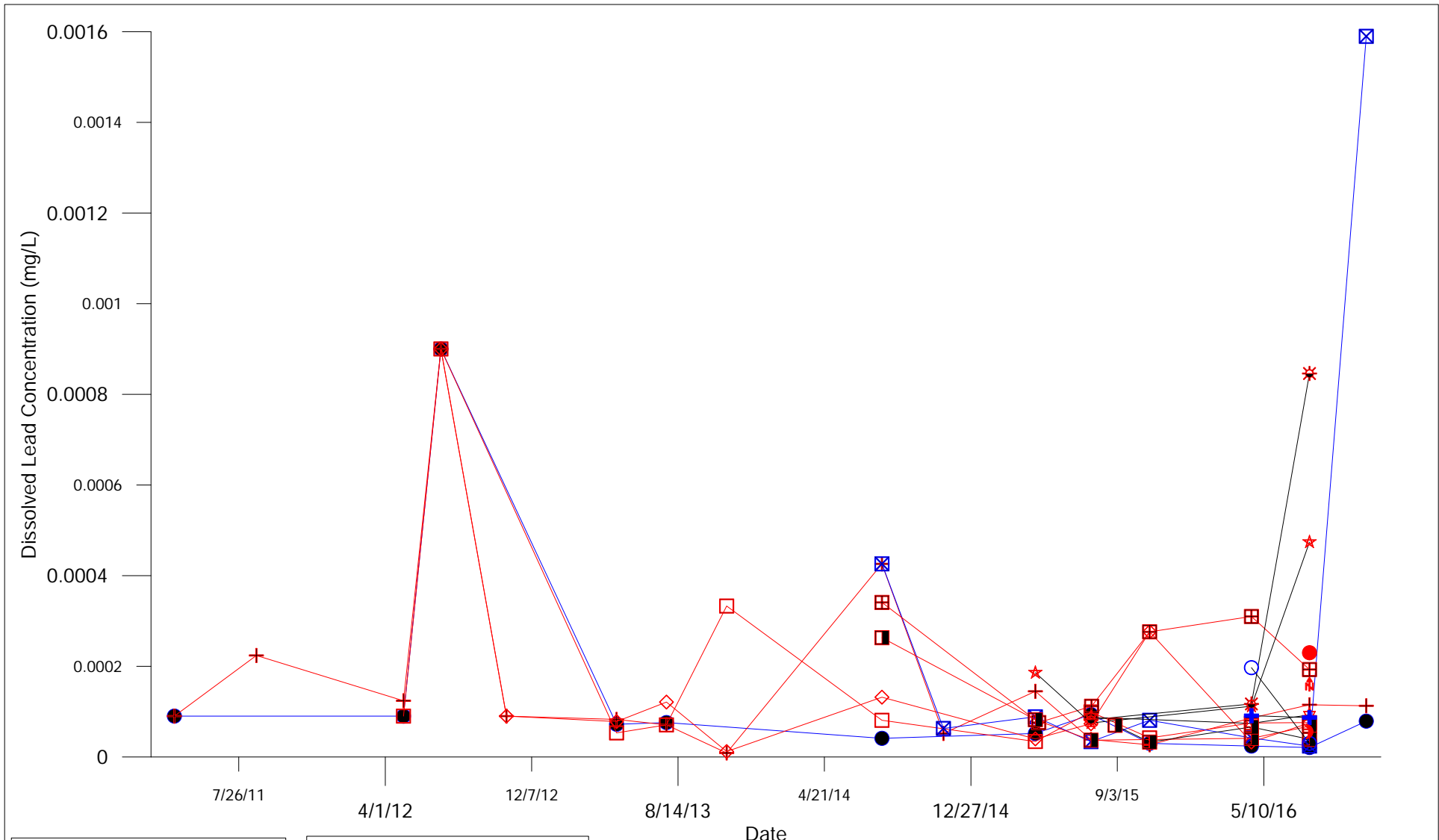
---

**APRIL 2017**
**FIGURE 50**
**REV 0**





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**Up Stream**

- SW25-1
- ⊠ SW25-12
- SW25-13A
- ⊕ SW25-13B

**Down Stream**

- ◻ SW25-16
- ⊕ SW25-2
- ⊠ SW25-8
- ◇ SW25-9B
- ◻ SW25-9A
- SW25-11A

**Down stream**

- ☆ SW25-14A
- ☆ SW25-14B
- ⊠ SW25-15A
- ◻ SW25-15B
- ◆ SW25-7
- ♠ SW25-11B
- ☾ SW25-11C

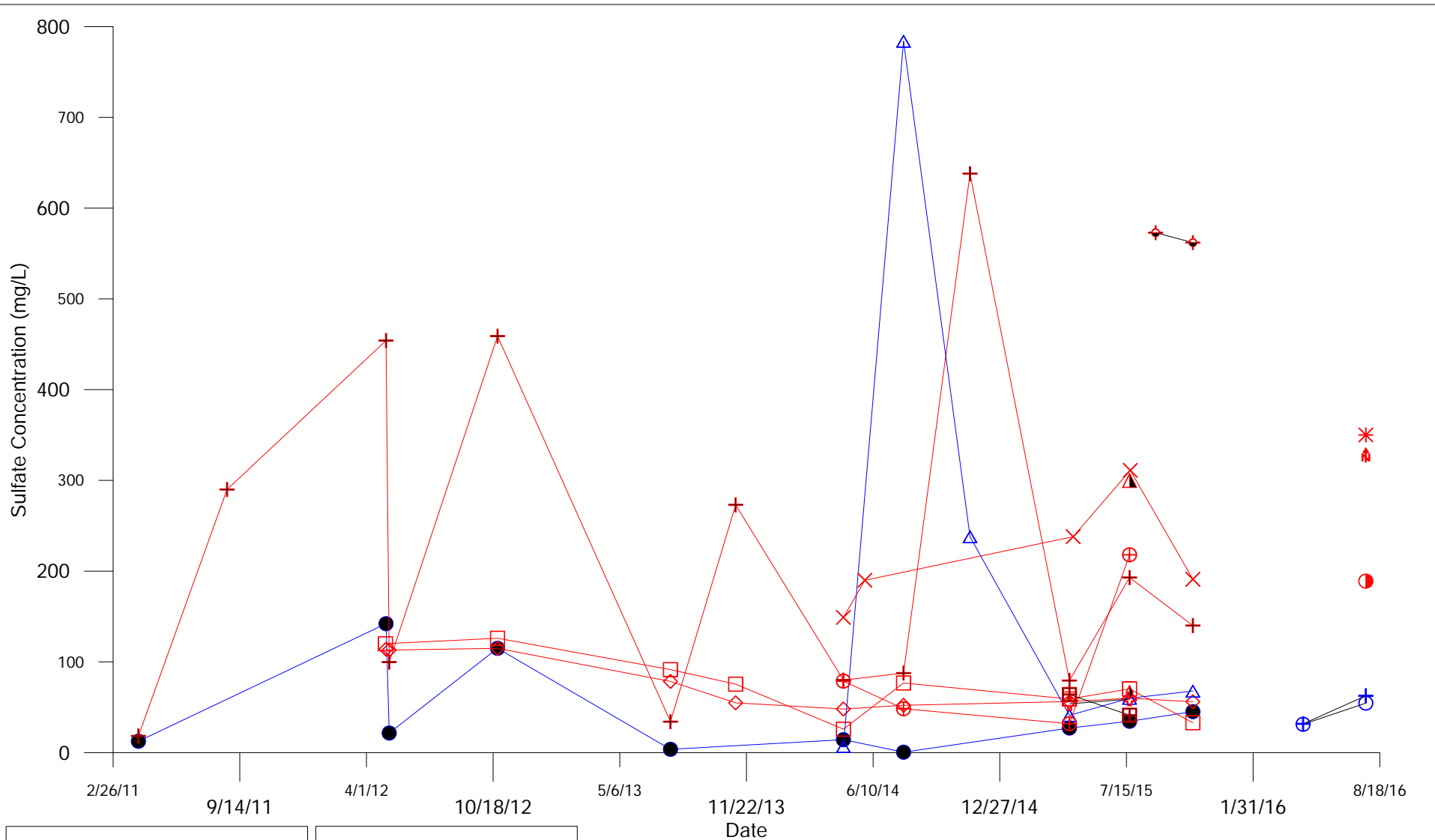


City Of Winnipeg  
Solid Waste Services

BRADY ROAD RESOURCE MANAGEMENT FACILITY

**Dissolved Lead Surface Water**

APRIL 2017      **FIGURE 4B**      **REV 0**



**Up Stream**

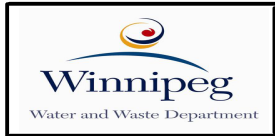
- SW25-1
- △ SW25-12
- SW25-13A
- ⊕ SW25-13B

**Down Stream**

- ⊕ SW25-16
- ⊕ SW25-2
- ⊕ SW25-8
- ◇ SW25-9B
- SW25-9A
- \* SW25-11A
- ♠ SW25-11B

**Down stream**

- ⊕ SW25-14A
- ⊕ SW25-14B
- ▲ SW25-15A
- ◆ SW25-15B
- ⊕ SW25-7
- ◐ SW25-11C



City Of Winnipeg  
Solid Waste Services

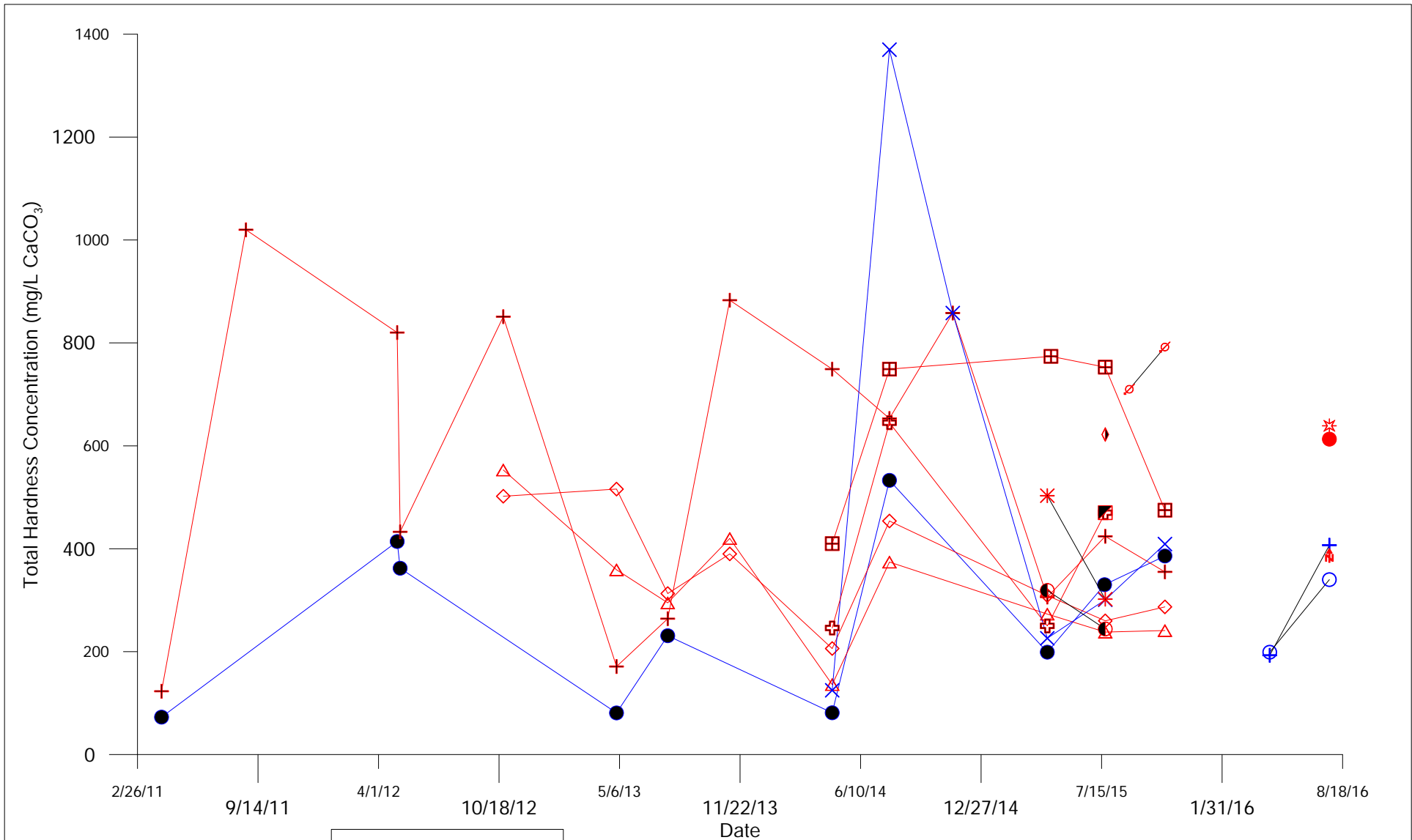
BRADY ROAD RESOURCE MANAGEMENT FACILITY

**Sulfate Surface Water**

APRIL 2017

FIGURE 52

REV 0



Up Stream			
●	●	●	SW25-1
×	×	×	SW25-12
○	○	○	SW25-13A
+	+	+	SW25-13B

Down Stream			
⊕	⊕	⊕	SW25-16
+	+	+	SW25-2
⊞	⊞	⊞	SW25-8
◇	◇	◇	SW25-9B
△	△	△	SW25-9A
●	●	●	SW25-11A
*	*	*	SW25-11B

Down stream			
◐	◐	◐	SW25-14A
◑	◑	◑	SW25-14B
◒	◒	◒	SW25-15A
◓	◓	◓	SW25-15B
⊘	⊘	⊘	SW25-7
⬆	⬆	⬆	SW25-11C



City Of Winnipeg  
Solid Waste Services

BRADY ROAD RESOURCE MANAGEMENT FACILITY

**Total Hardness Surface Water**

APRIL 2017 | FIGURE 53 | REV 0

# Site: Brady Location : SW25-1

**Dates:**  
 2-May-12  
 25-Jul-13  
 28-Jul-14  
 16-Apr-15  
 20-Jul-15  
 28-Oct-15  
 19-Apr-16  
 27-Jul-16  
 1-Nov-16  
 11-Apr-17  
 26-Jul-17

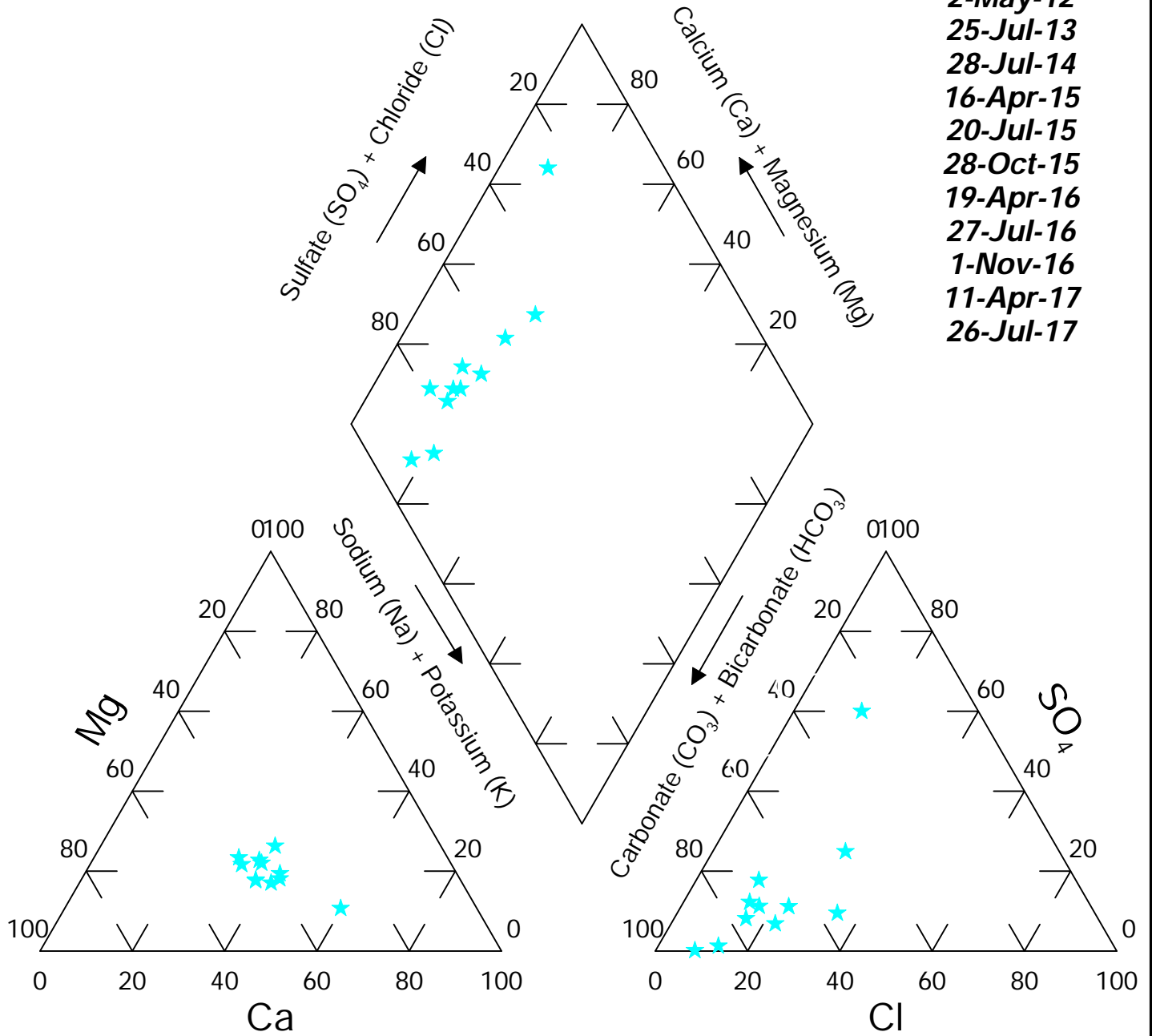


FIGURE: 25P

# Site: Brady Location : SW25-2

**Dates:**  
 2-May-12  
 25-Oct-12  
 25-Jul-13  
 5-Nov-13  
 28-Jul-14  
 10-Nov-14  
 16-Apr-15  
 20-Jul-15  
 28-Oct-15  
 19-Apr-16  
 27-Jul-16  
 1-Nov-16  
 11-Apr-17  
 26-Jul-17

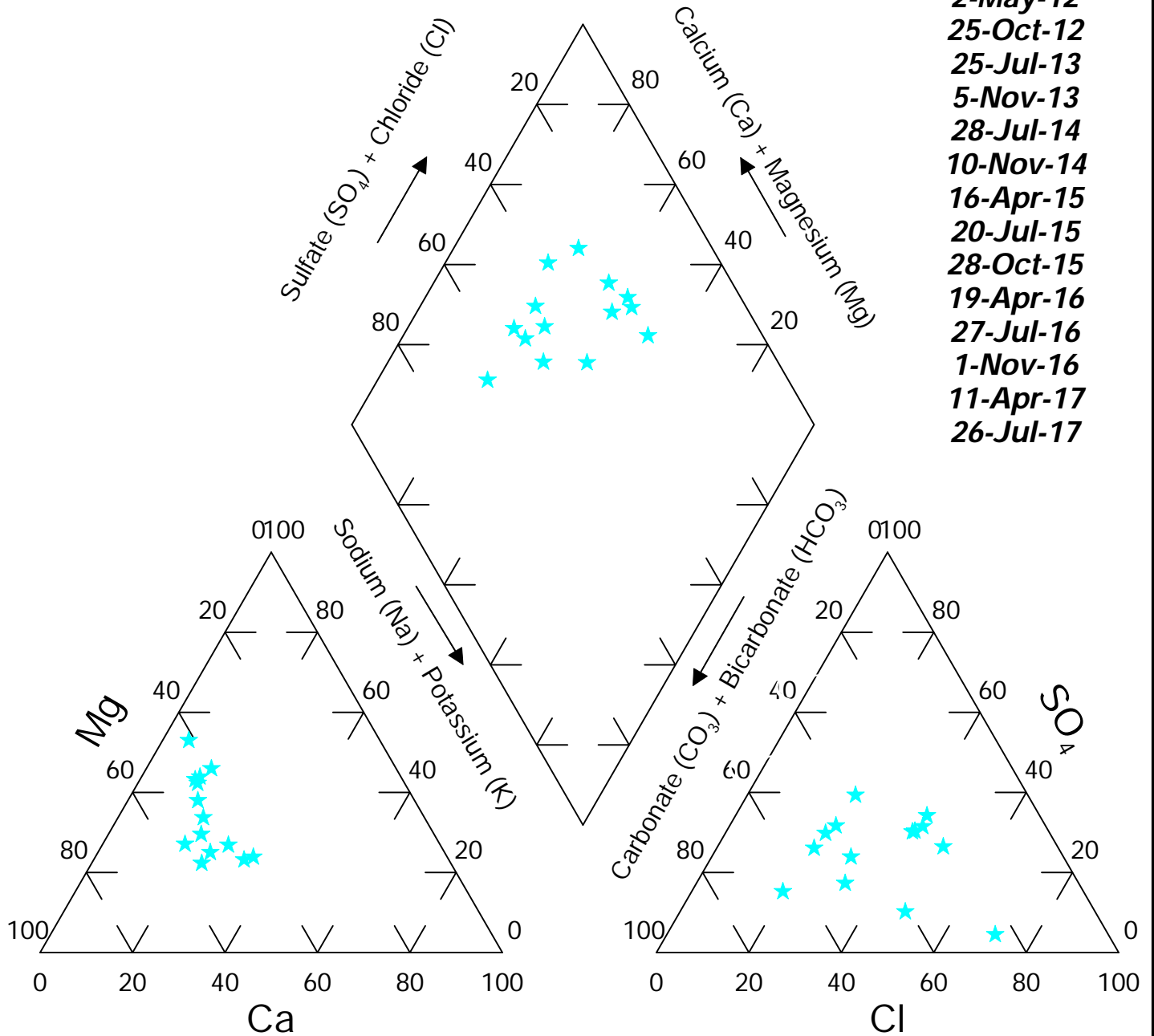
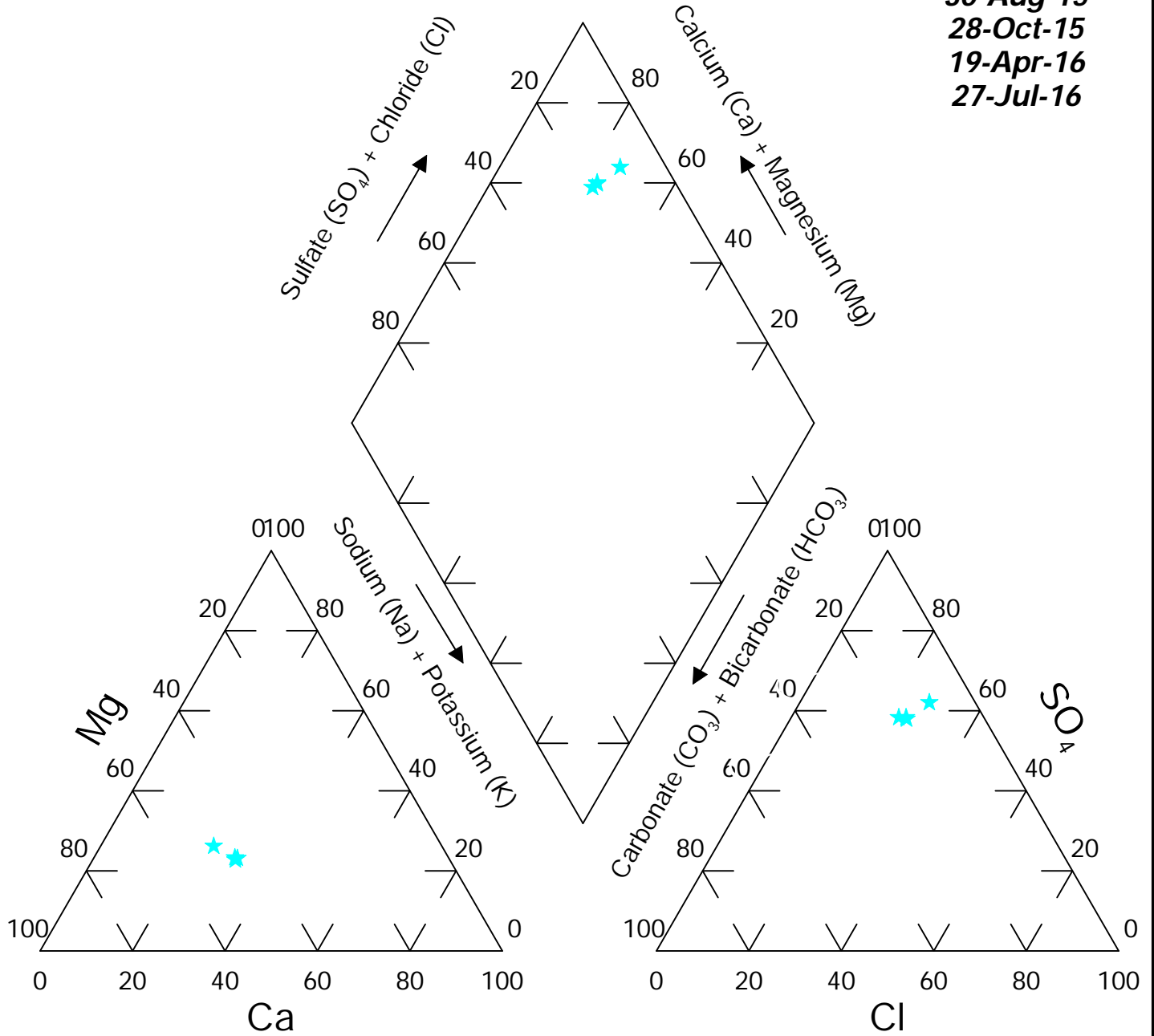


FIGURE: 26P

# Site: Brady

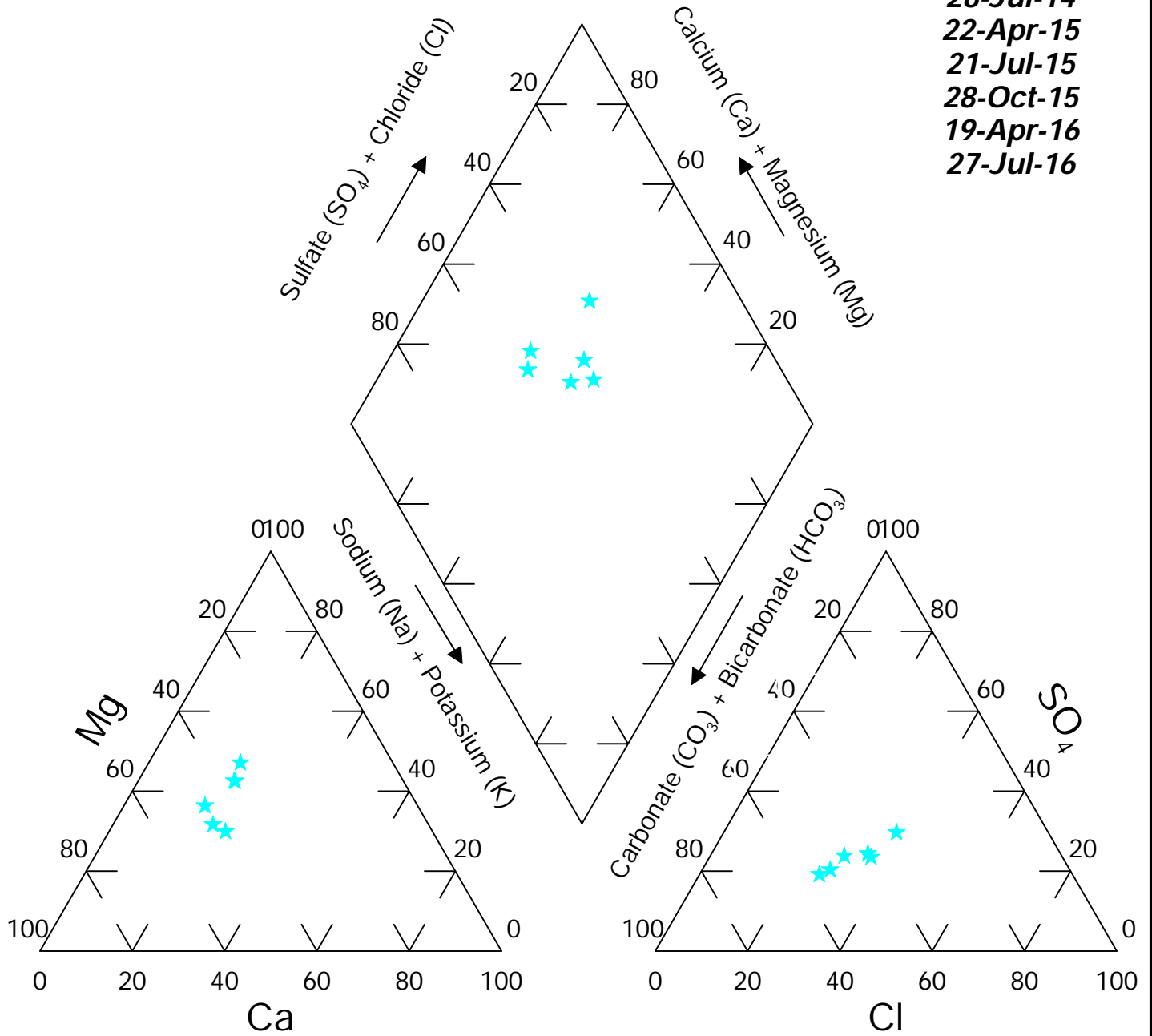
## Location : SW25-7

**Dates:**  
**30-Aug-15**  
**28-Oct-15**  
**19-Apr-16**  
**27-Jul-16**



# Site: Brady Location : SW25-8

**Dates:**  
 28-Jul-14  
 22-Apr-15  
 21-Jul-15  
 28-Oct-15  
 19-Apr-16  
 27-Jul-16



**FIGURE: 27P**



# Site: Brady Location : SW25-9A

**Dates:**  
 1-May-12  
 25-Oct-12  
 25-Jul-13  
 28-Jul-14  
 16-Apr-15  
 20-Jul-15  
 28-Oct-15  
 19-Apr-16  
 27-Jul-16  
 11-Apr-17  
 26-Jul-17

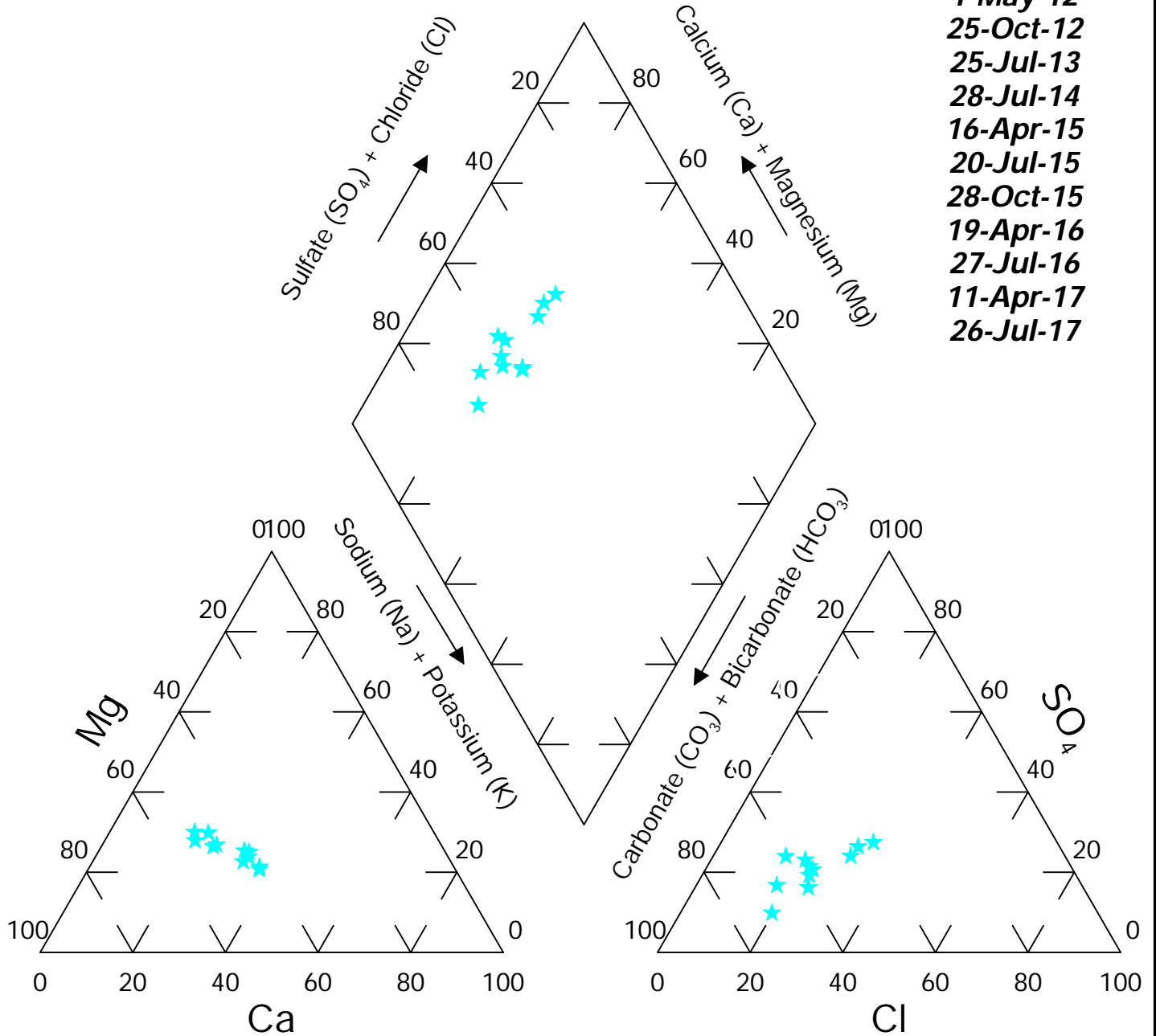


FIGURE: 31P

# Site: Brady Location : SW25-9B

**Dates:**  
 25-Oct-12  
 25-Jul-13  
 5-Nov-13  
 28-Jul-14  
 16-Apr-15  
 20-Jul-15  
 28-Oct-15  
 19-Apr-16  
 27-Jul-16  
 11-Apr-17  
 26-Jul-17

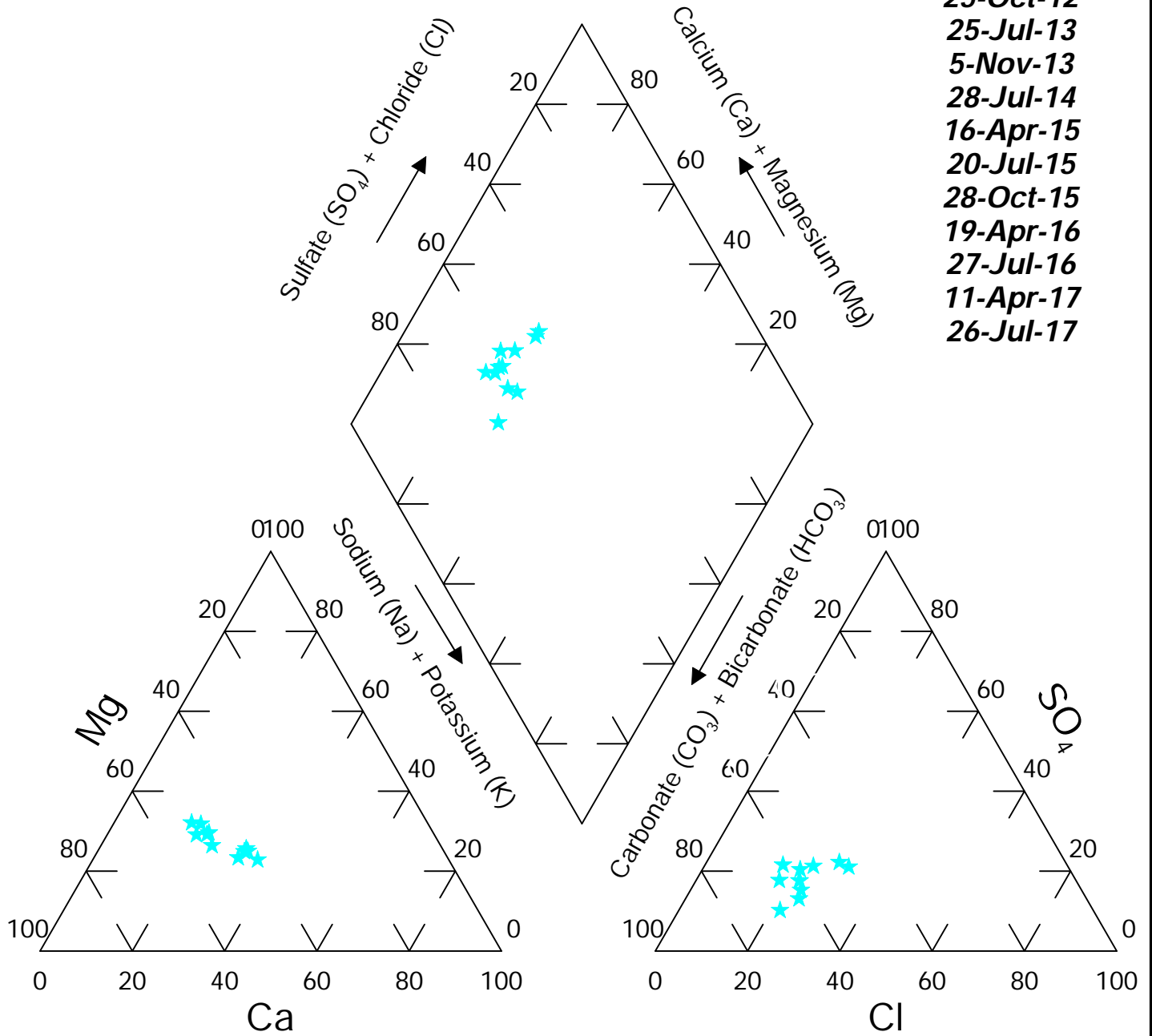
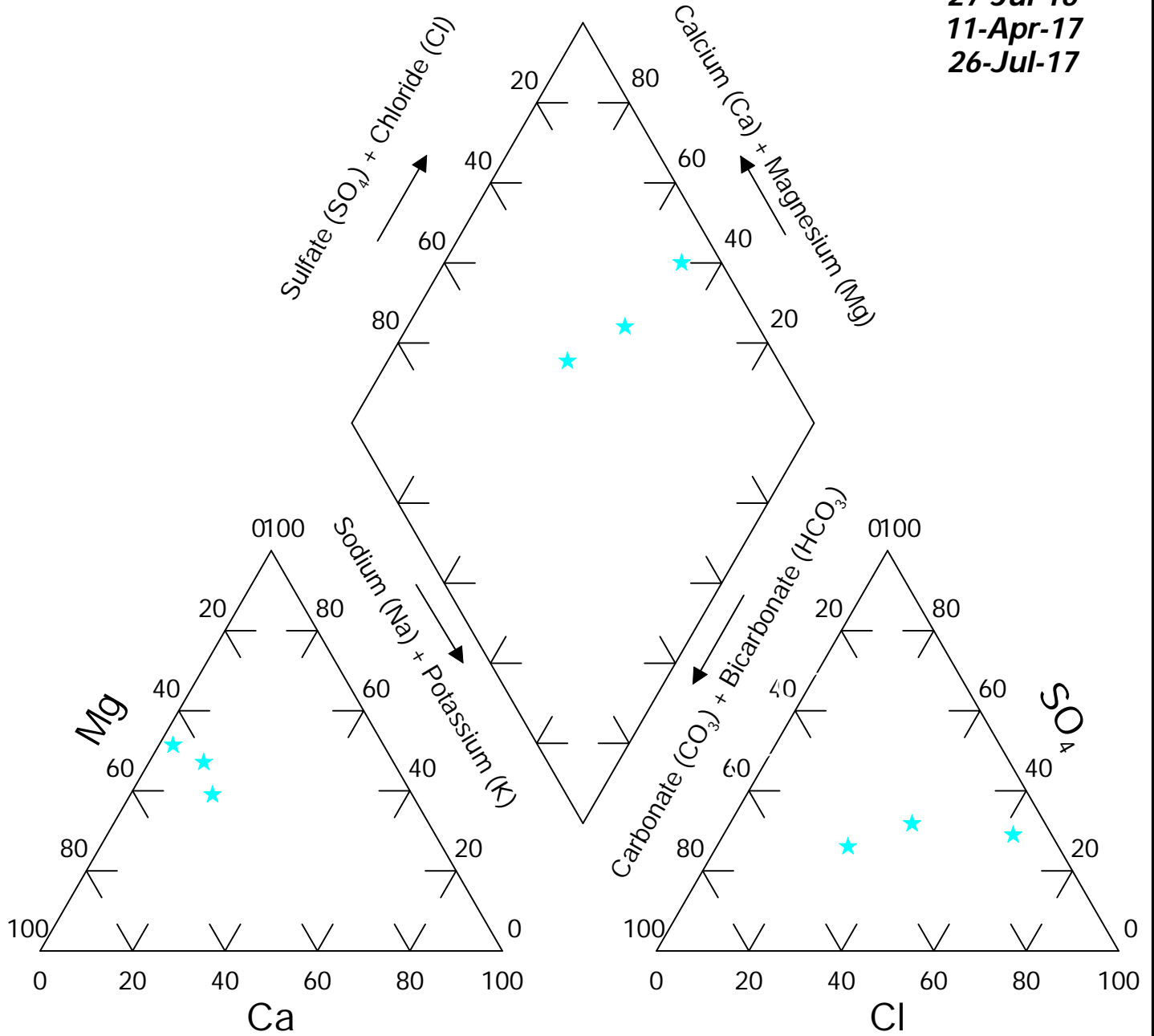


FIGURE: 30P

# Site: Brady

## Location : SW25-11A

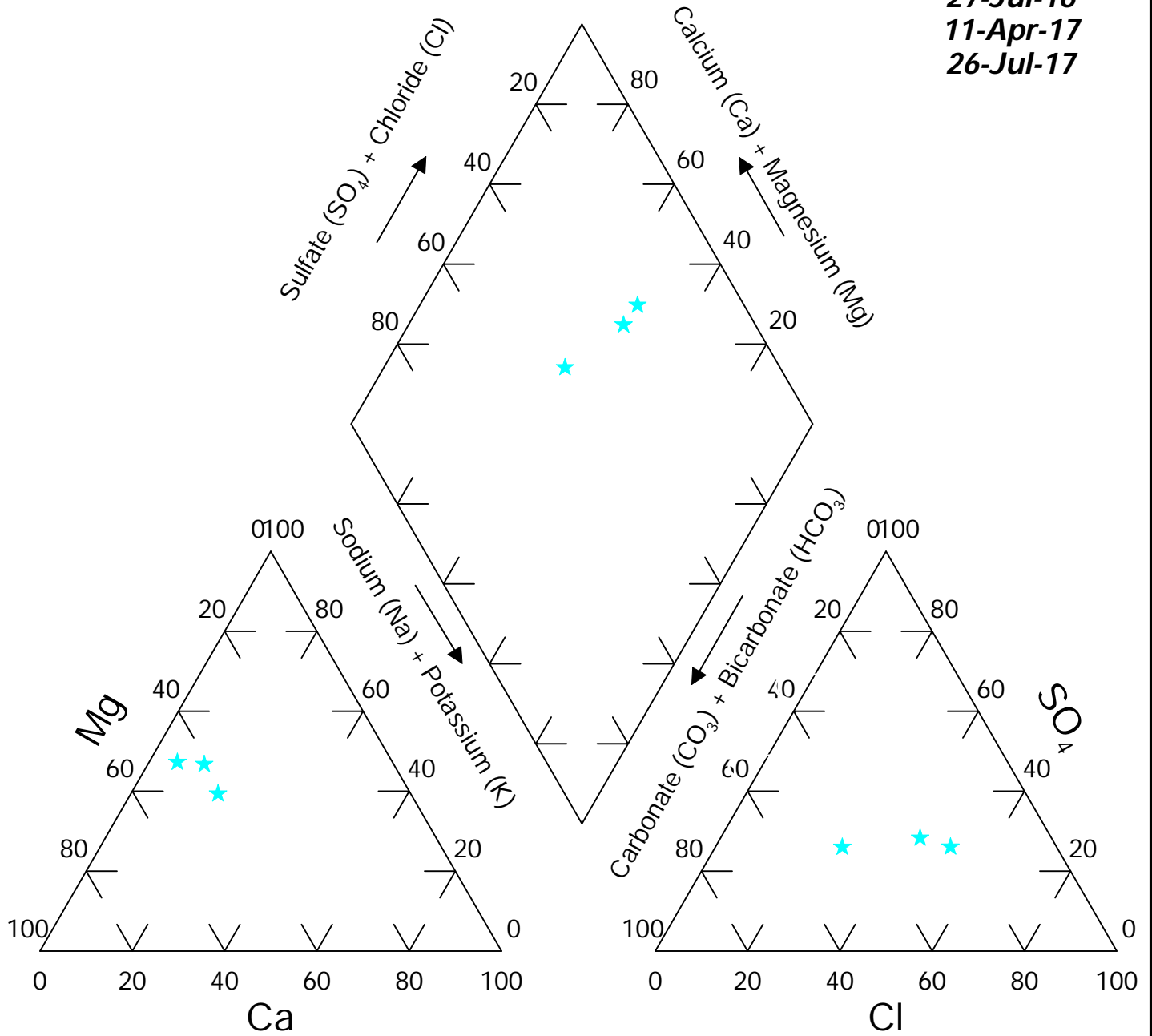
**Dates:**  
**27-Jul-16**  
**11-Apr-17**  
**26-Jul-17**



# Site: Brady

## Location : SW25-11B

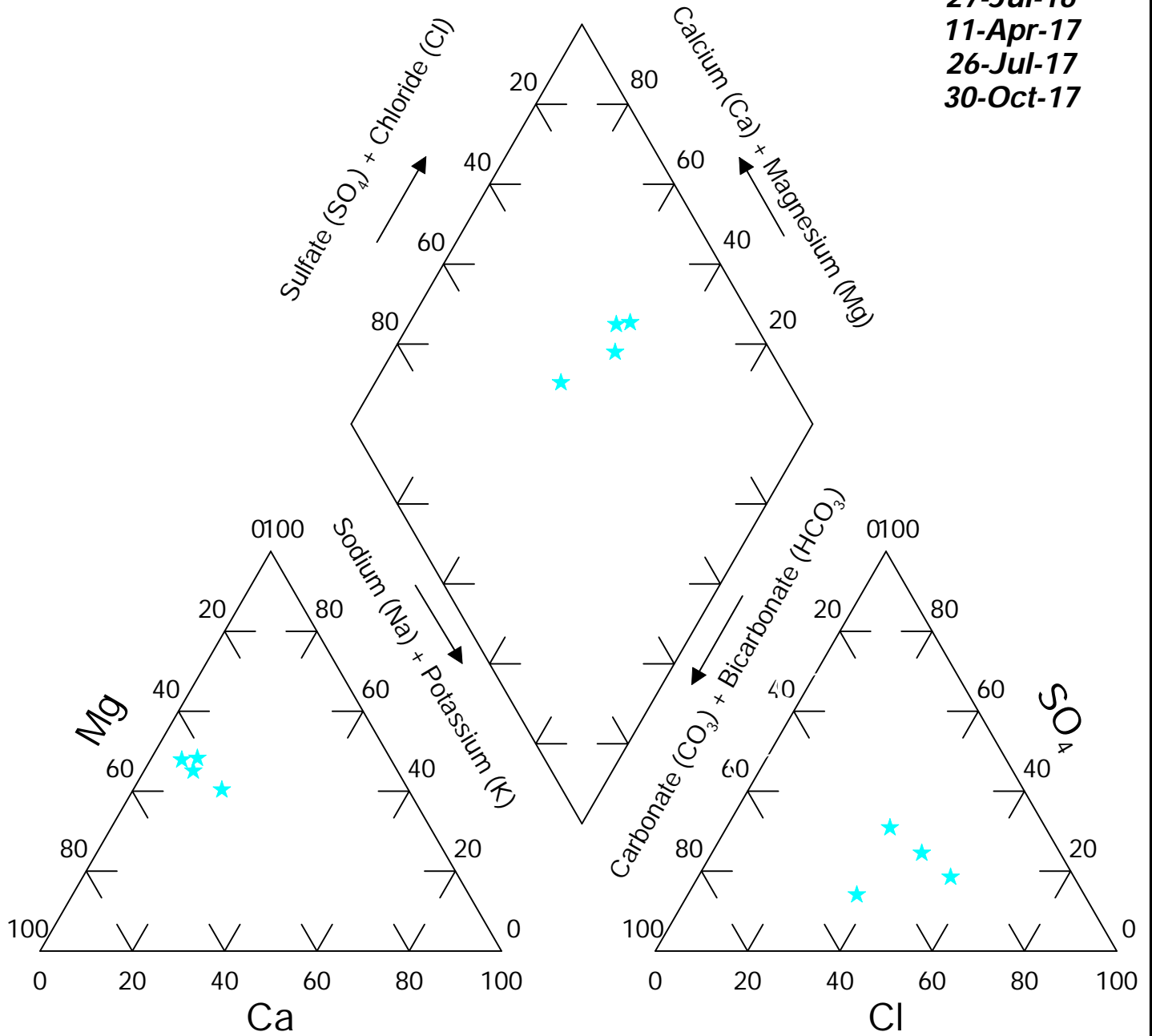
**Dates:**  
**27-Jul-16**  
**11-Apr-17**  
**26-Jul-17**



# Site: Brady

## Location : SW25-11C

**Dates:**  
 27-Jul-16  
 11-Apr-17  
 26-Jul-17  
 30-Oct-17



# Site: Brady Location : SW25-12

**Dates:**  
 28-Jul-14  
 16-Apr-15  
 20-Jul-15  
 28-Oct-15  
 19-Apr-16  
 27-Jul-16  
 1-Nov-16  
 11-Apr-17  
 26-Jul-17

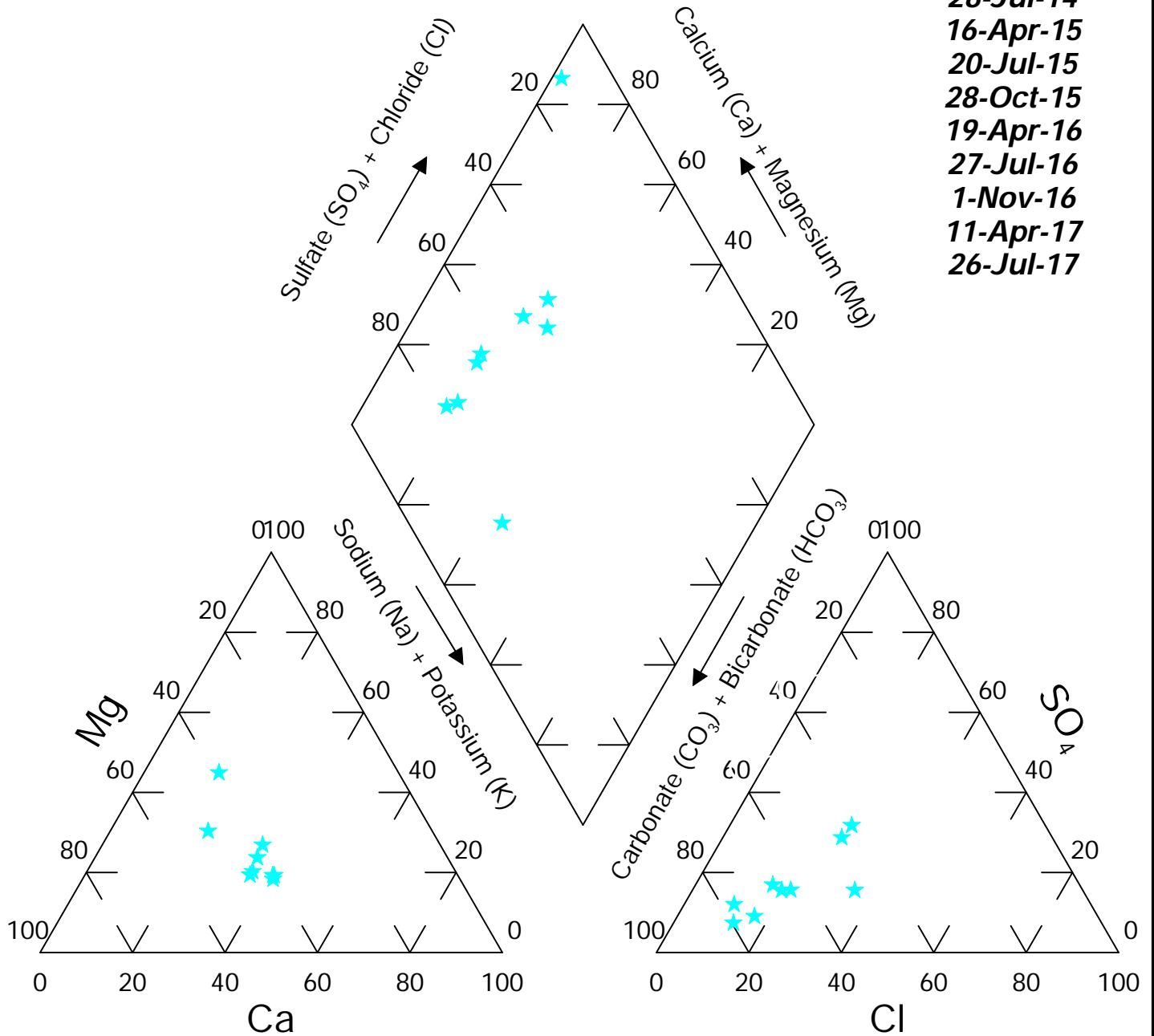
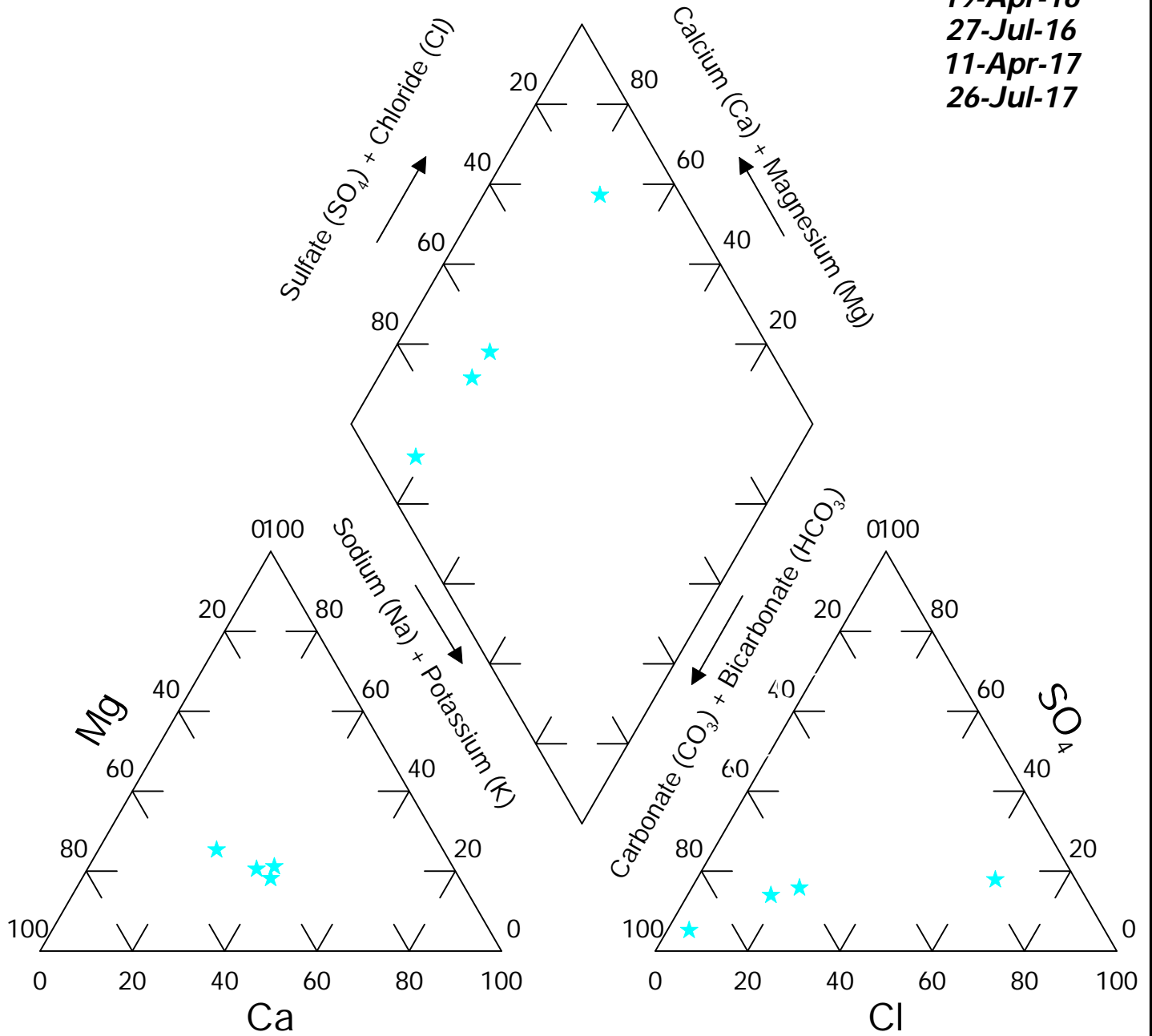


FIGURE: 28P

# Site: Brady

## Location : SW25-13A

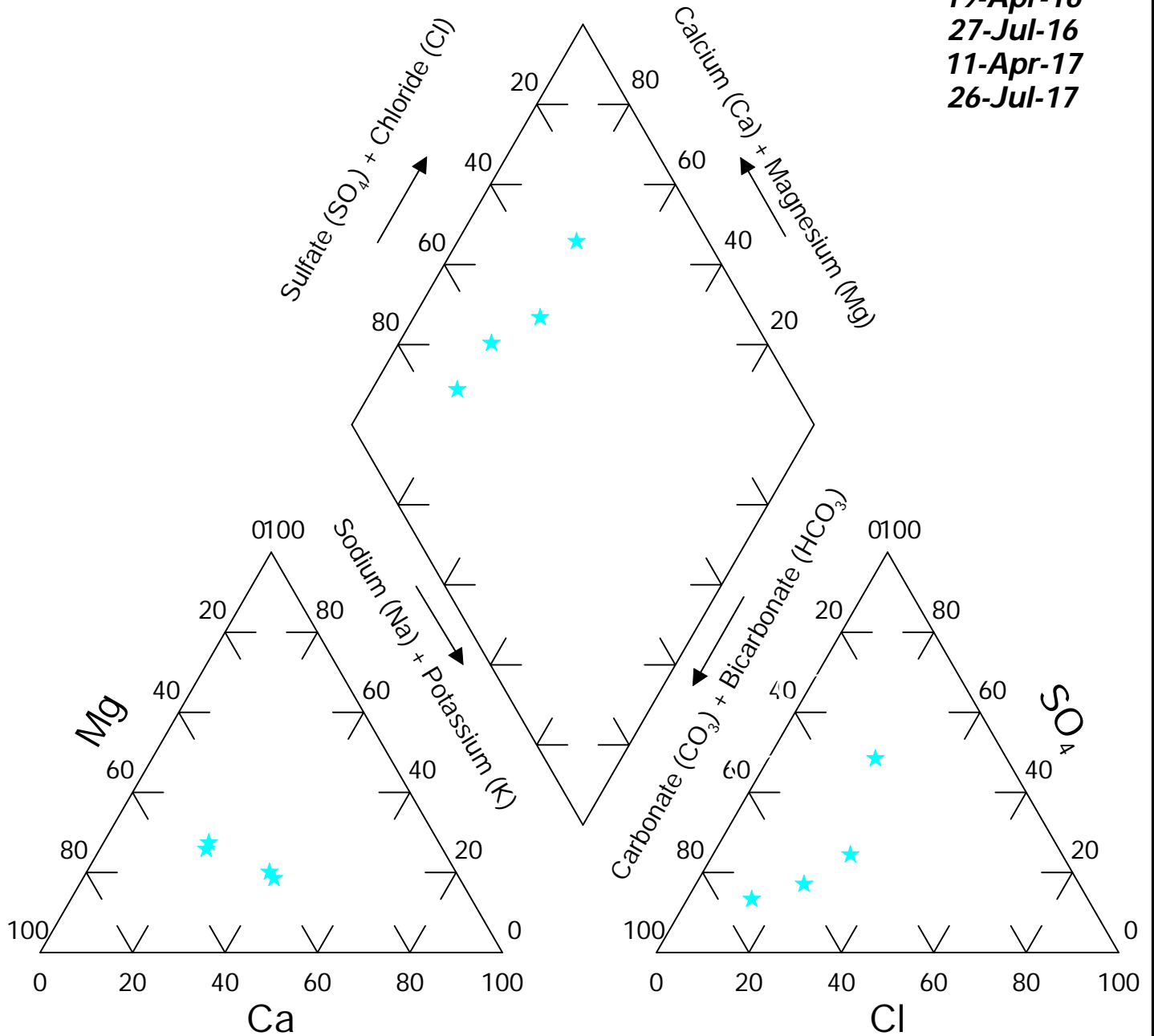
**Dates:**  
 19-Apr-16  
 27-Jul-16  
 11-Apr-17  
 26-Jul-17



# Site: Brady

## Location : SW25-13B

**Dates:**  
 19-Apr-16  
 27-Jul-16  
 11-Apr-17  
 26-Jul-17

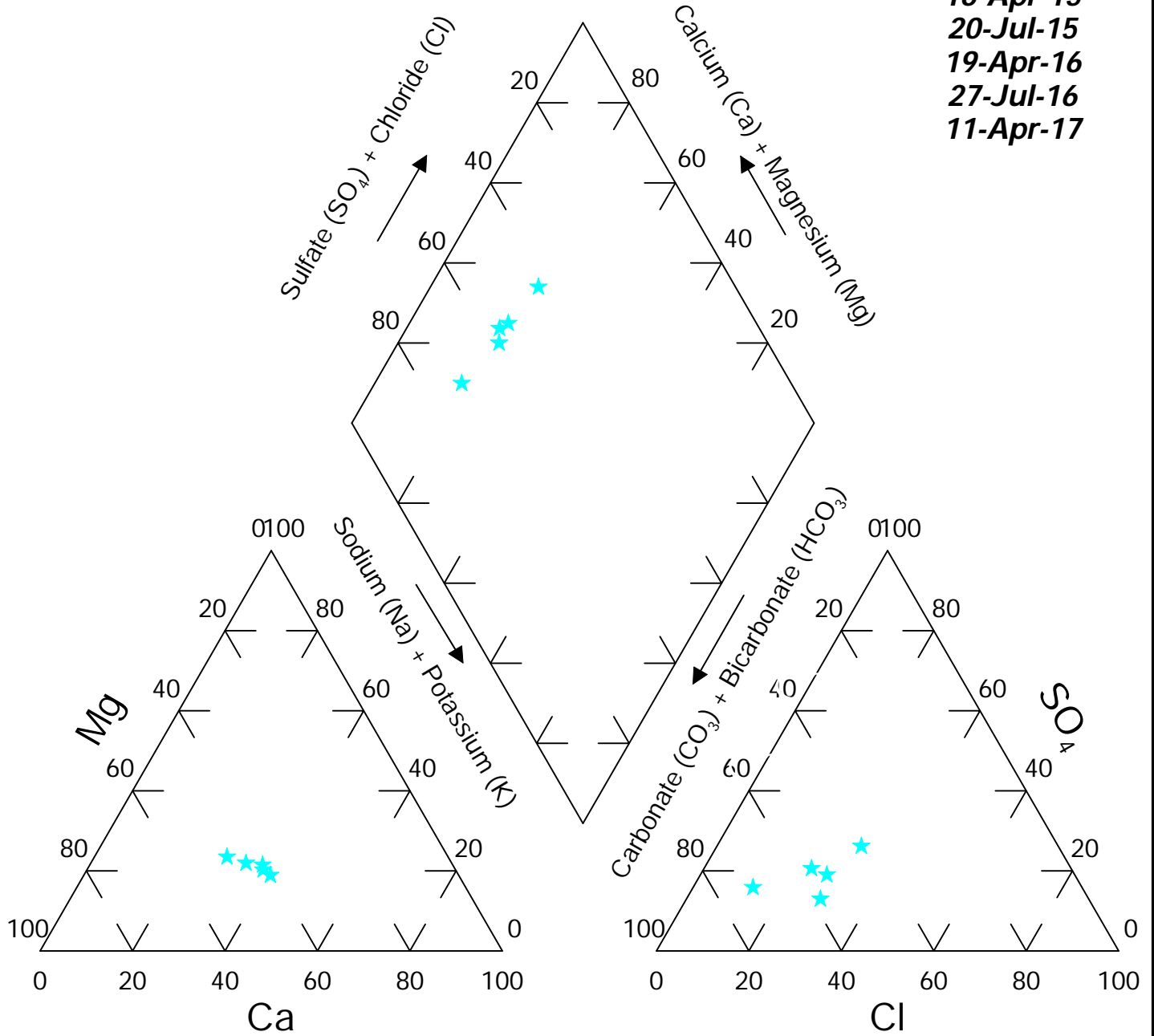




# Site: Brady

## Location : SW25-14A

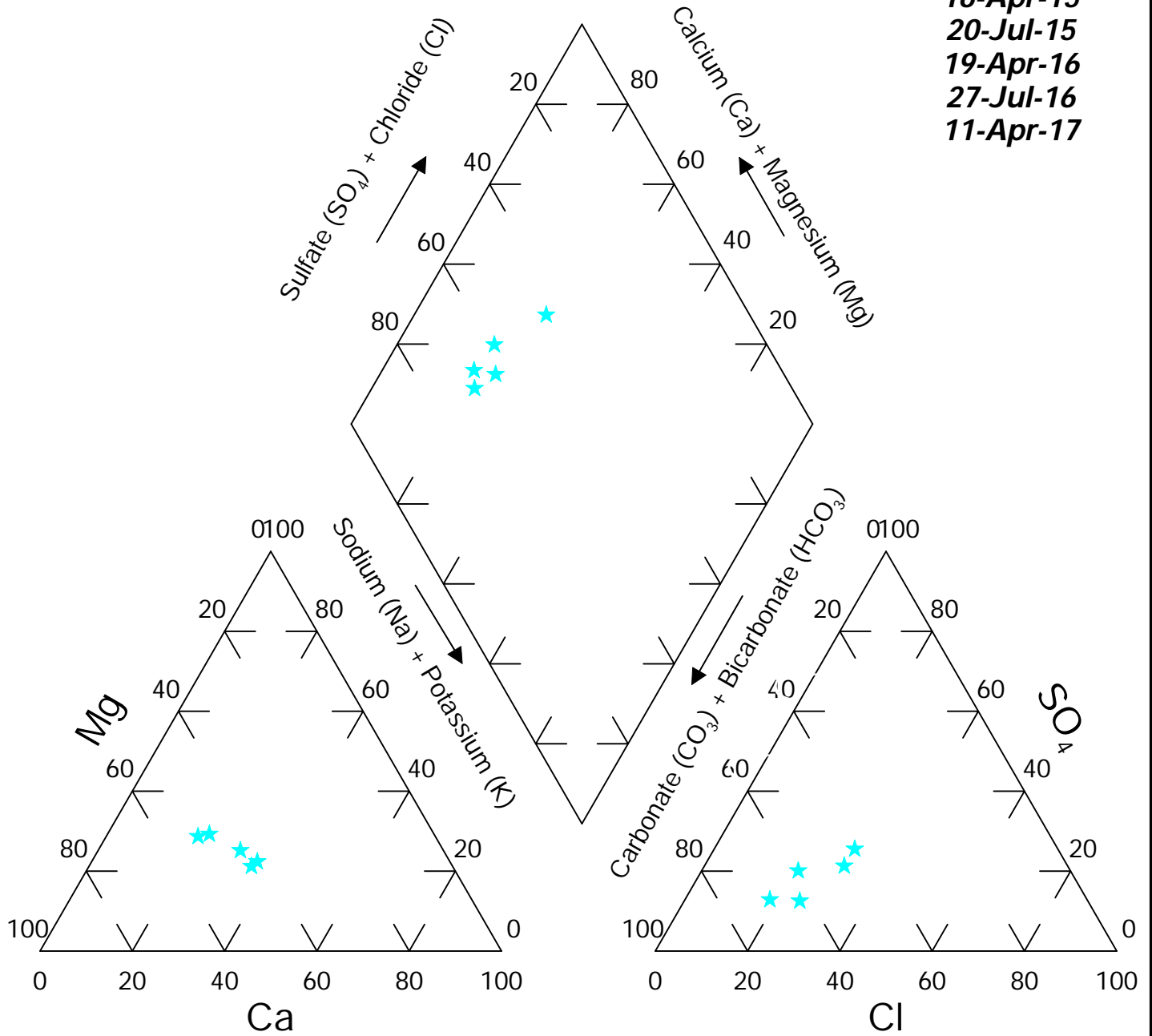
**Dates:**  
 16-Apr-15  
 20-Jul-15  
 19-Apr-16  
 27-Jul-16  
 11-Apr-17



# Site: Brady

## Location : SW25-14B

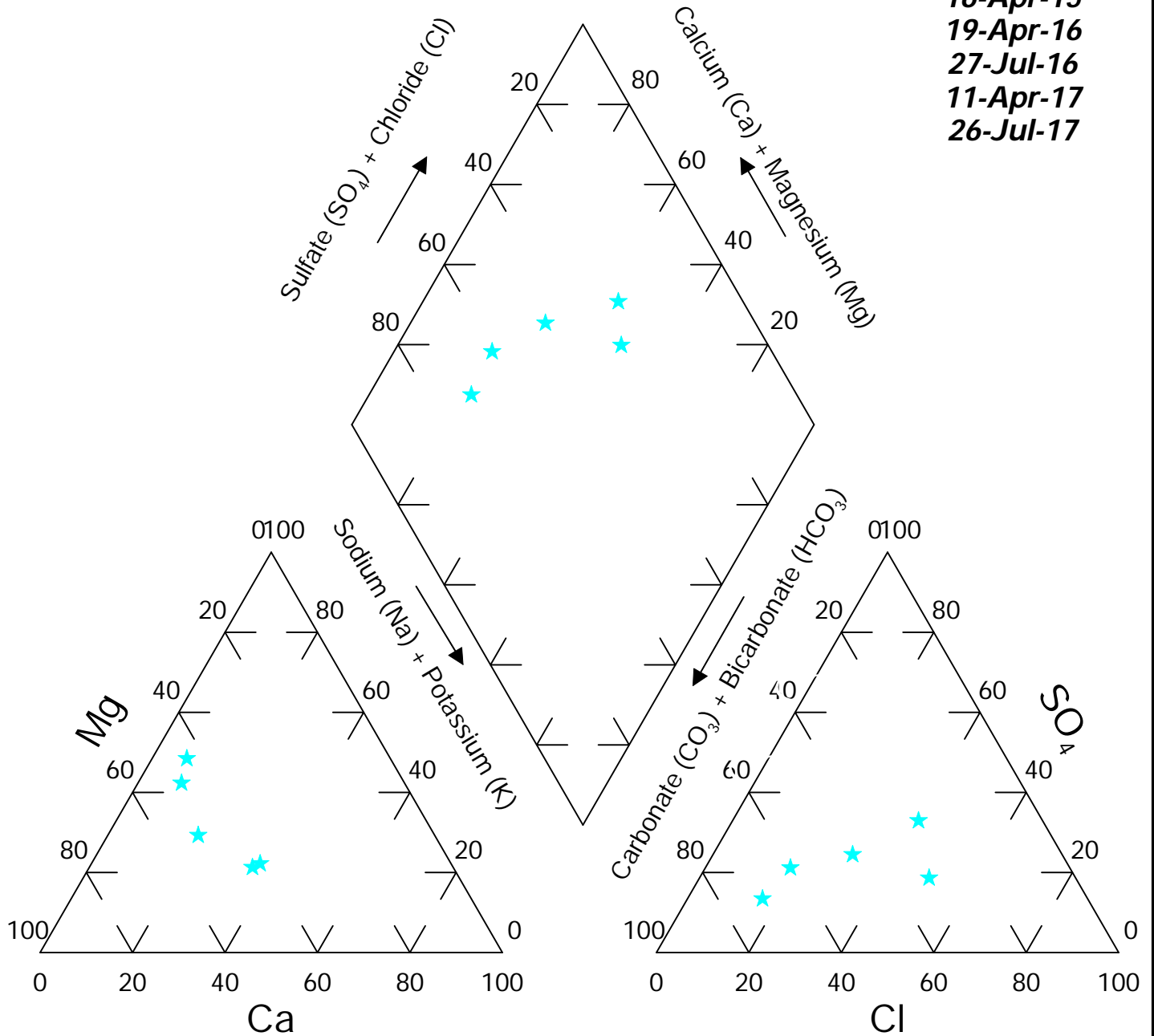
**Dates:**  
 16-Apr-15  
 20-Jul-15  
 19-Apr-16  
 27-Jul-16  
 11-Apr-17



# Site: Brady

## Location : SW25-15A

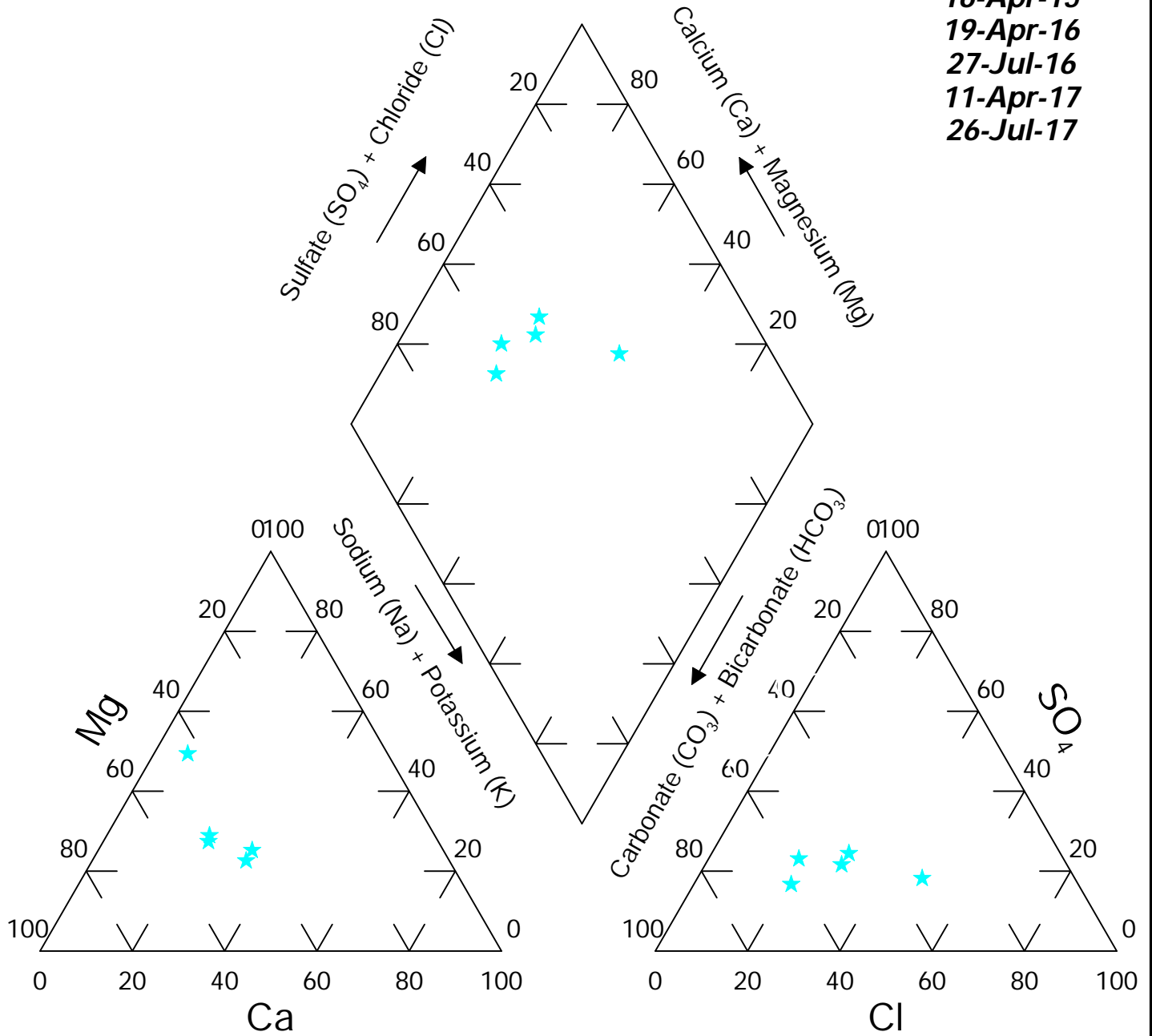
**Dates:**  
 16-Apr-15  
 19-Apr-16  
 27-Jul-16  
 11-Apr-17  
 26-Jul-17



# Site: Brady

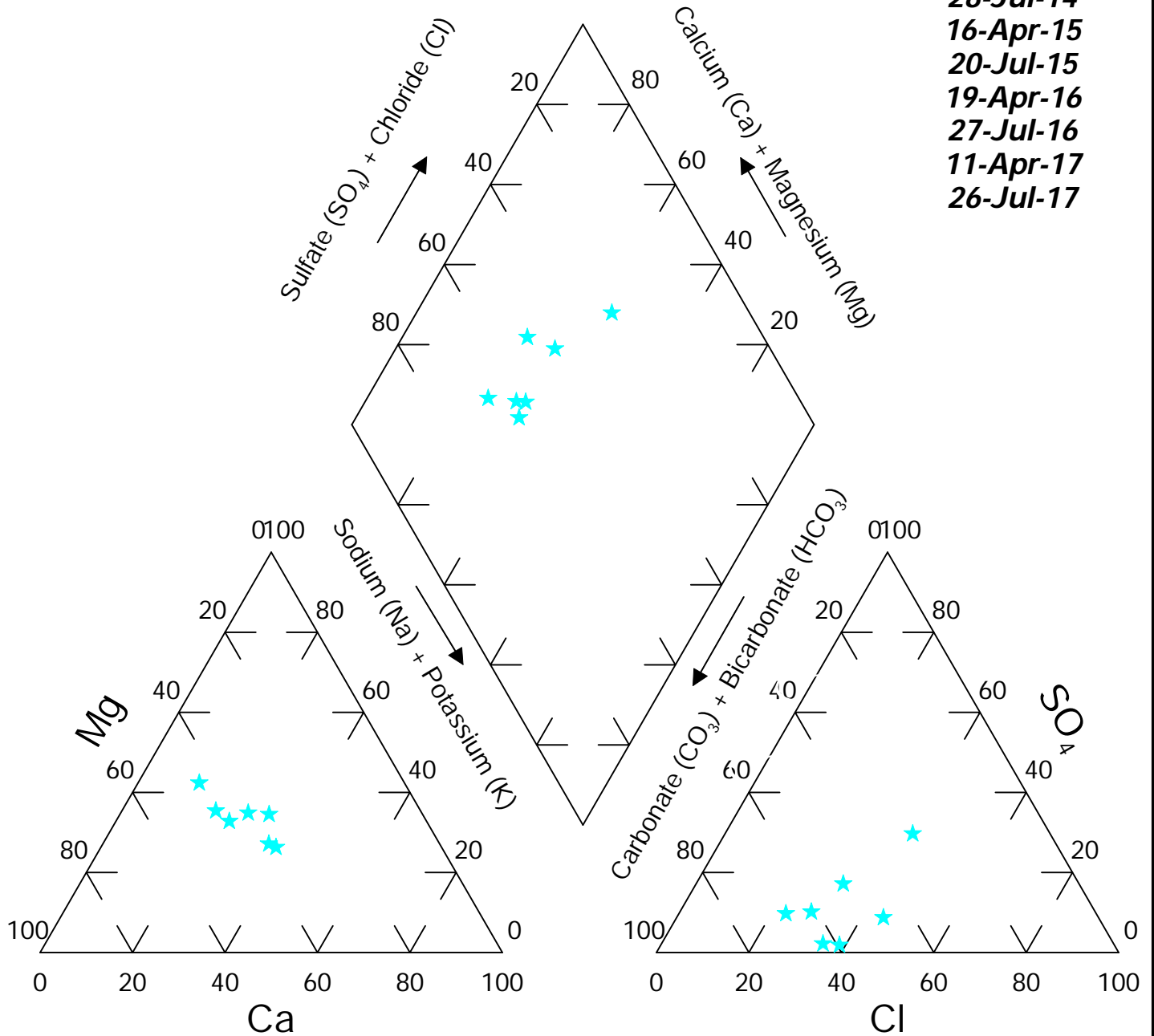
## Location : SW25-15B

**Dates:**  
 16-Apr-15  
 19-Apr-16  
 27-Jul-16  
 11-Apr-17  
 26-Jul-17



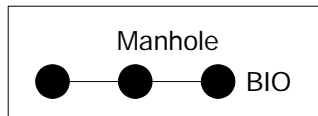
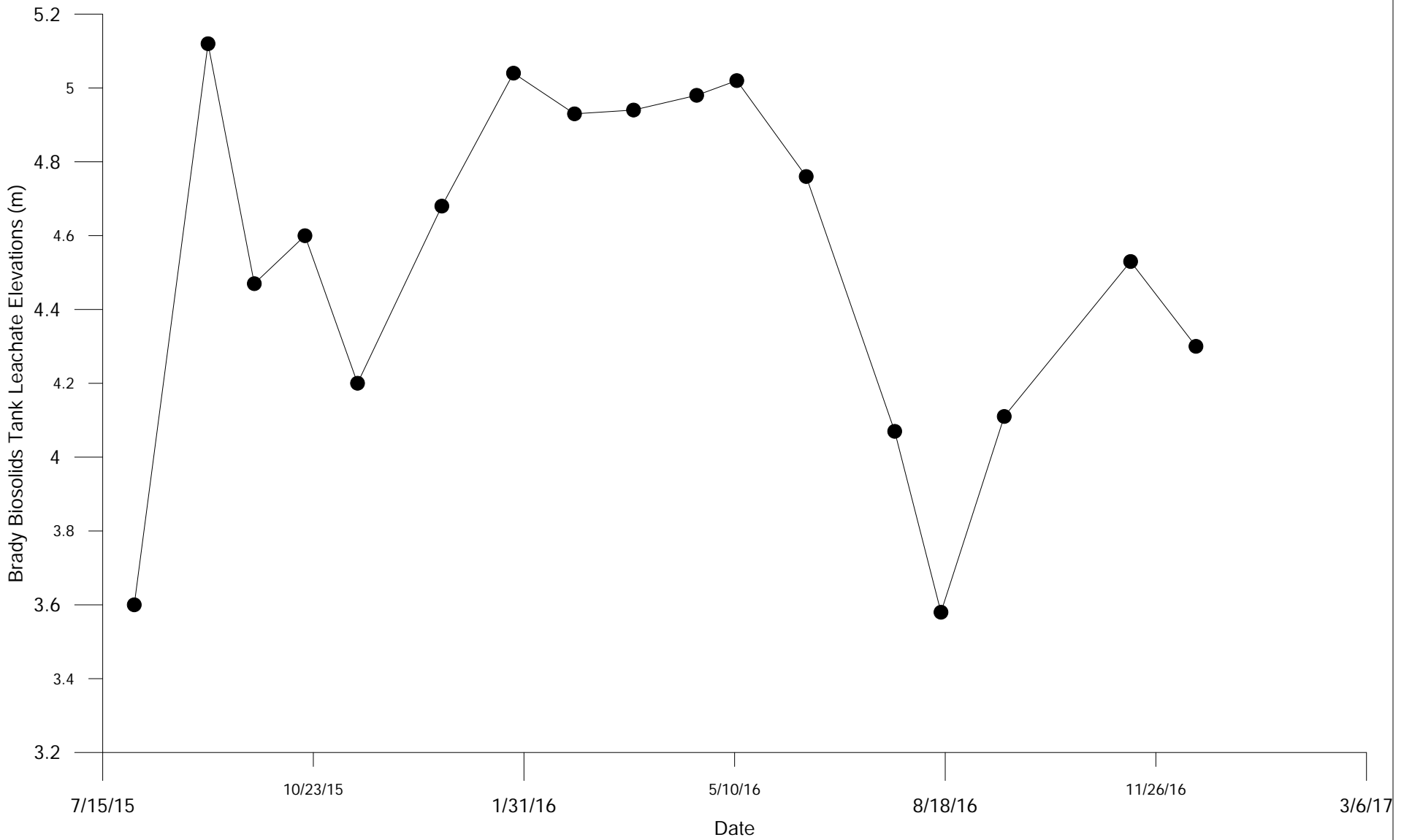
# Site: Brady Location : SW25-16

**Dates:**  
 28-Jul-14  
 16-Apr-15  
 20-Jul-15  
 19-Apr-16  
 27-Jul-16  
 11-Apr-17  
 26-Jul-17

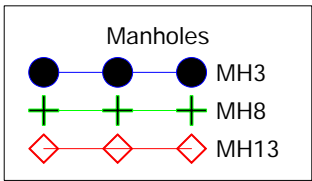
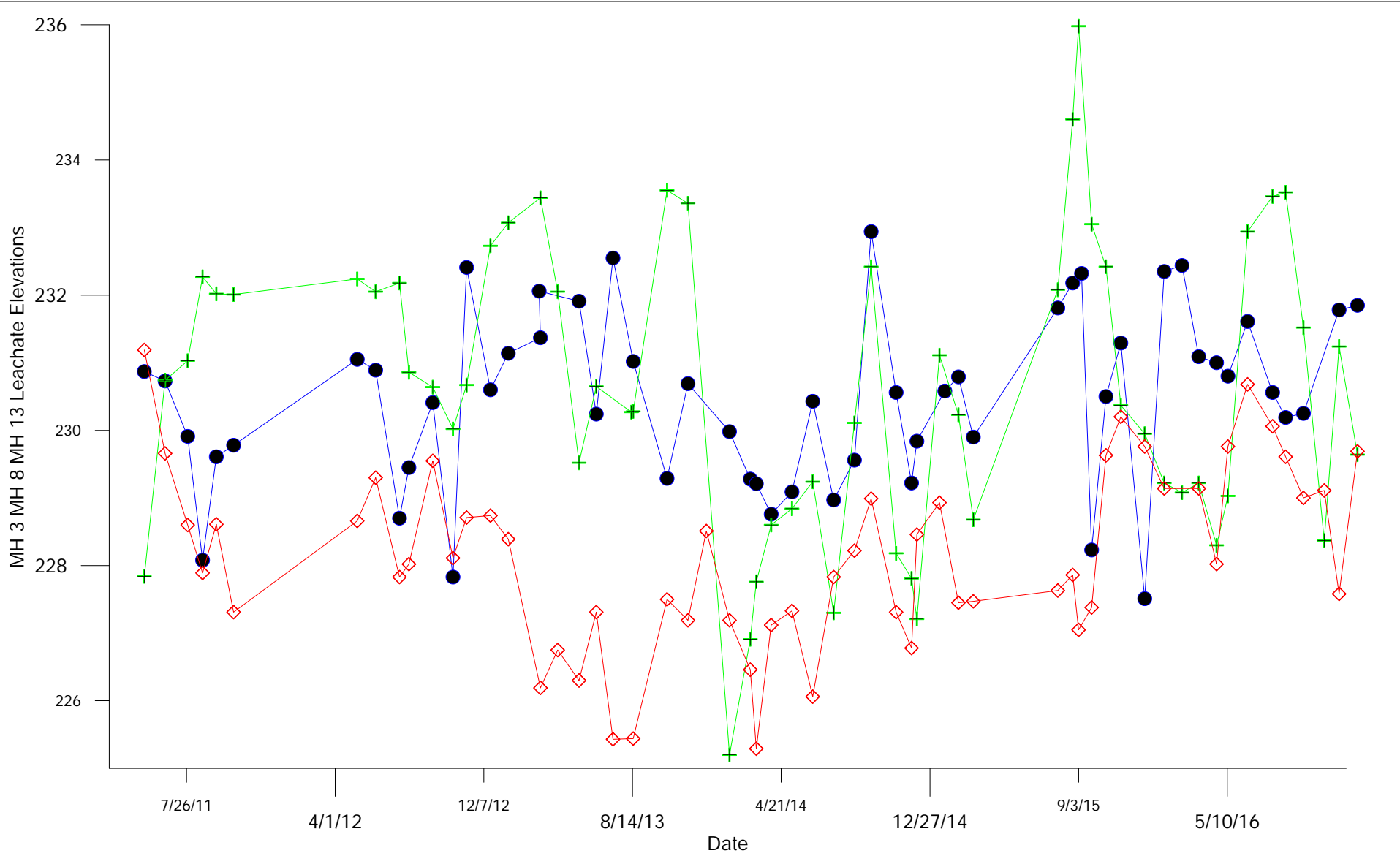


**FIGURE: 29P**

**APPENDIX E**  
**2017 STATISTICAL ANALYSIS OF**  
**LEACHATE QUALITY**

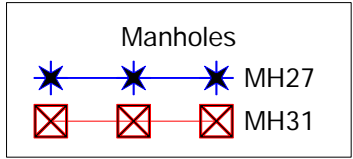
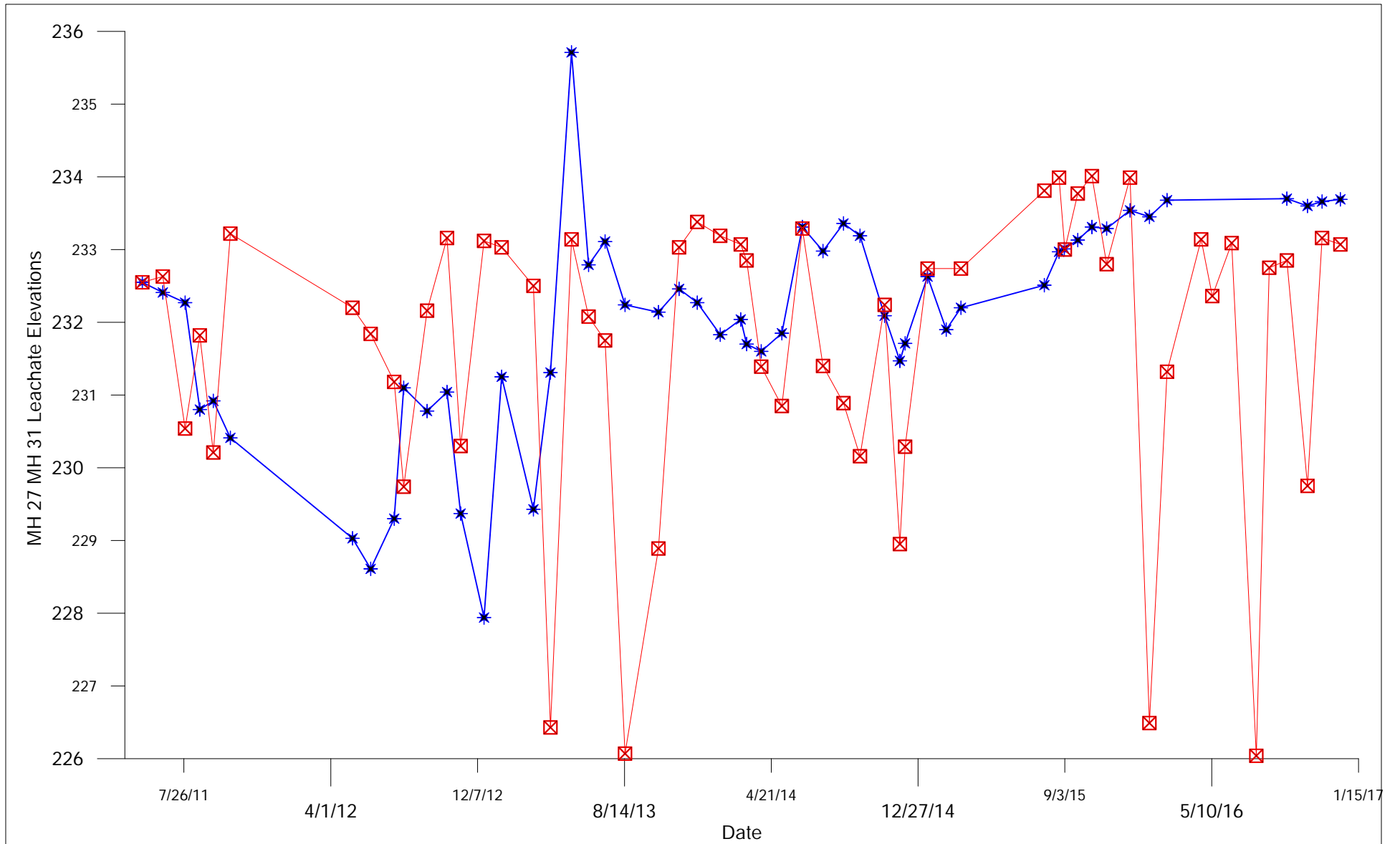


	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>LEACHATE ELEVATION</b> <b>Brady Manholes</b>		
<b>APRIL 2017</b>	<b>FIGURE LQ-3</b>	<b>REV 0</b>

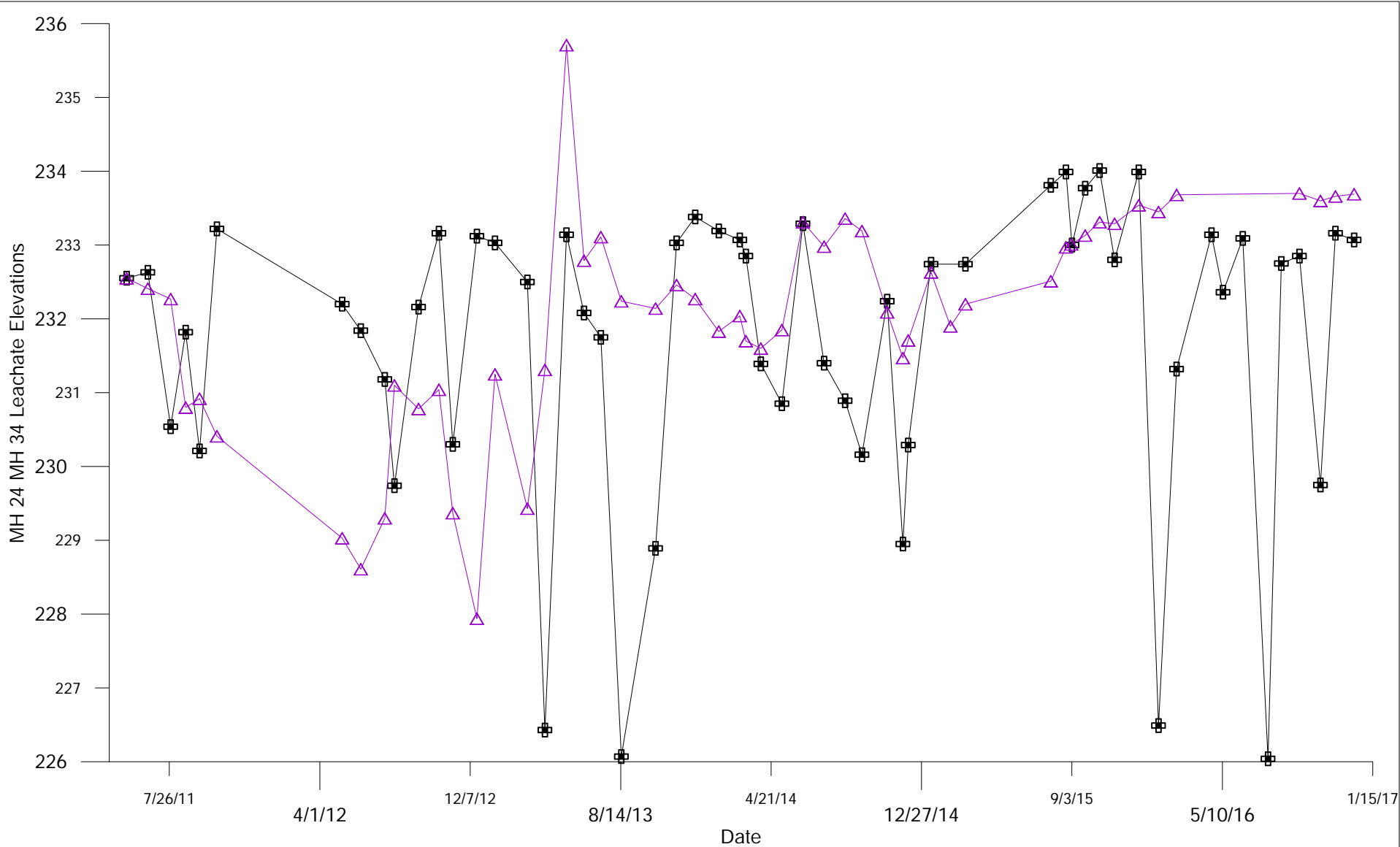


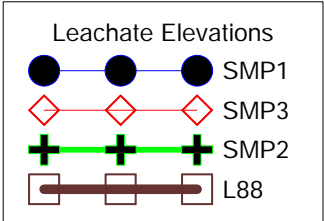
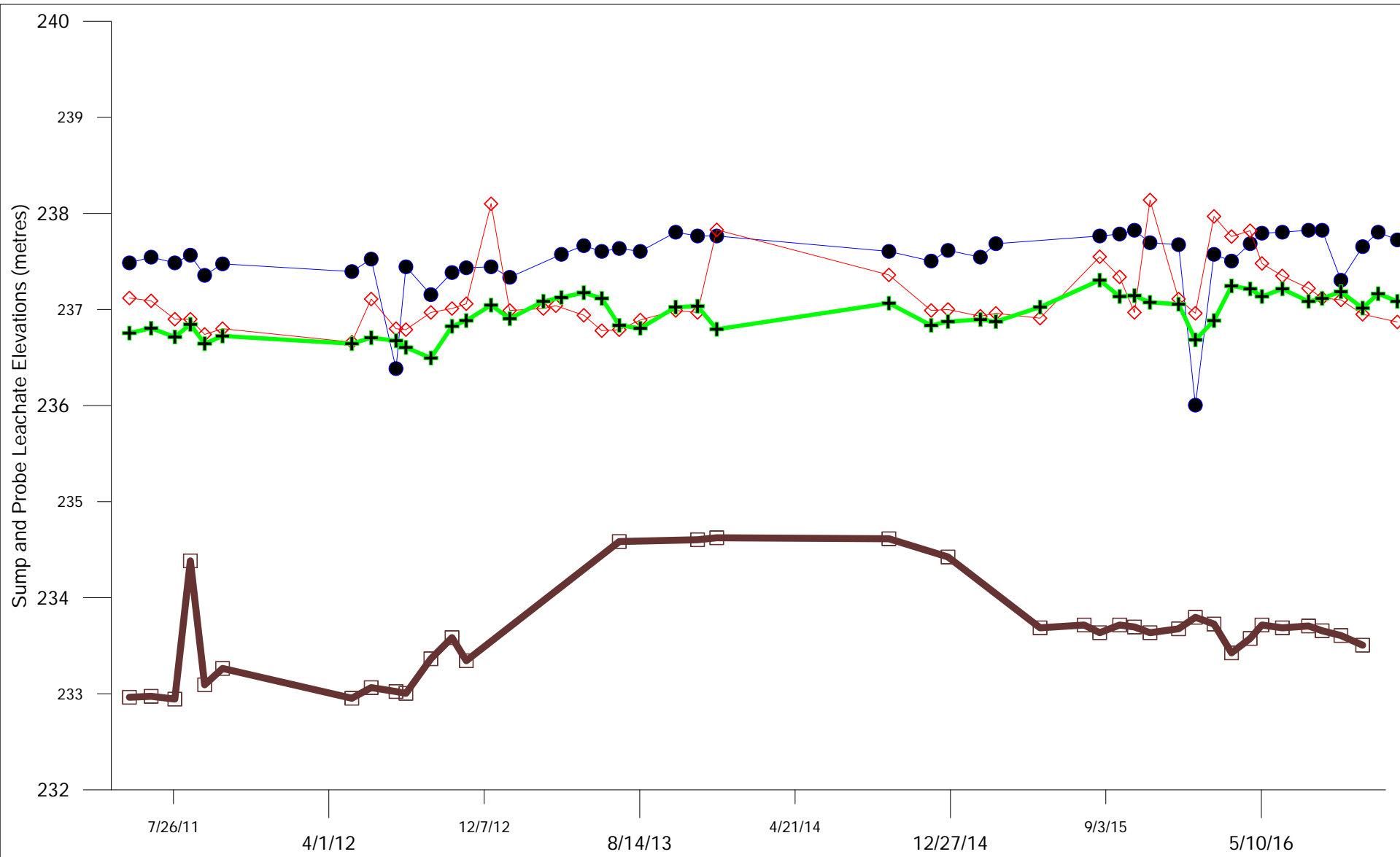
	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>LEACHATE ELEVATION Brady Manholes</b>		
APRIL 2017	FIGURE IQ-1	REV 0



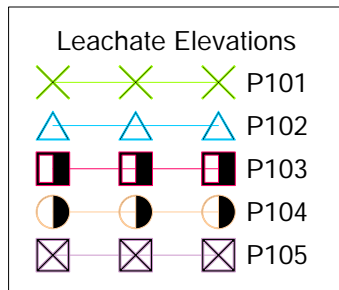
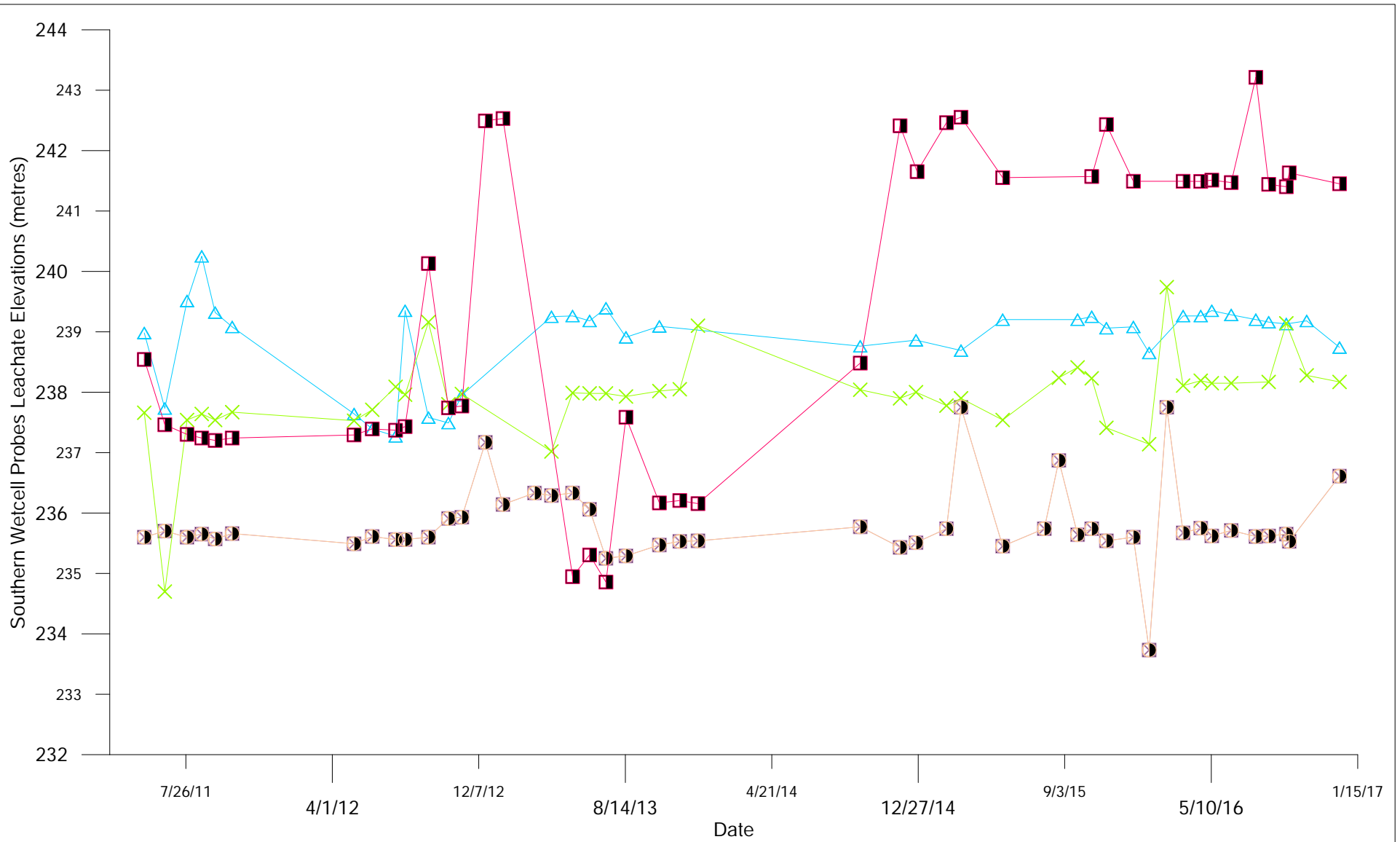


	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY <b>LEACHATE ELEVATION</b> <b>Brady Manholes</b>	
<b>APRIL 2017</b>	<b>FIGURE IQ-2</b>	<b>REV 0</b>





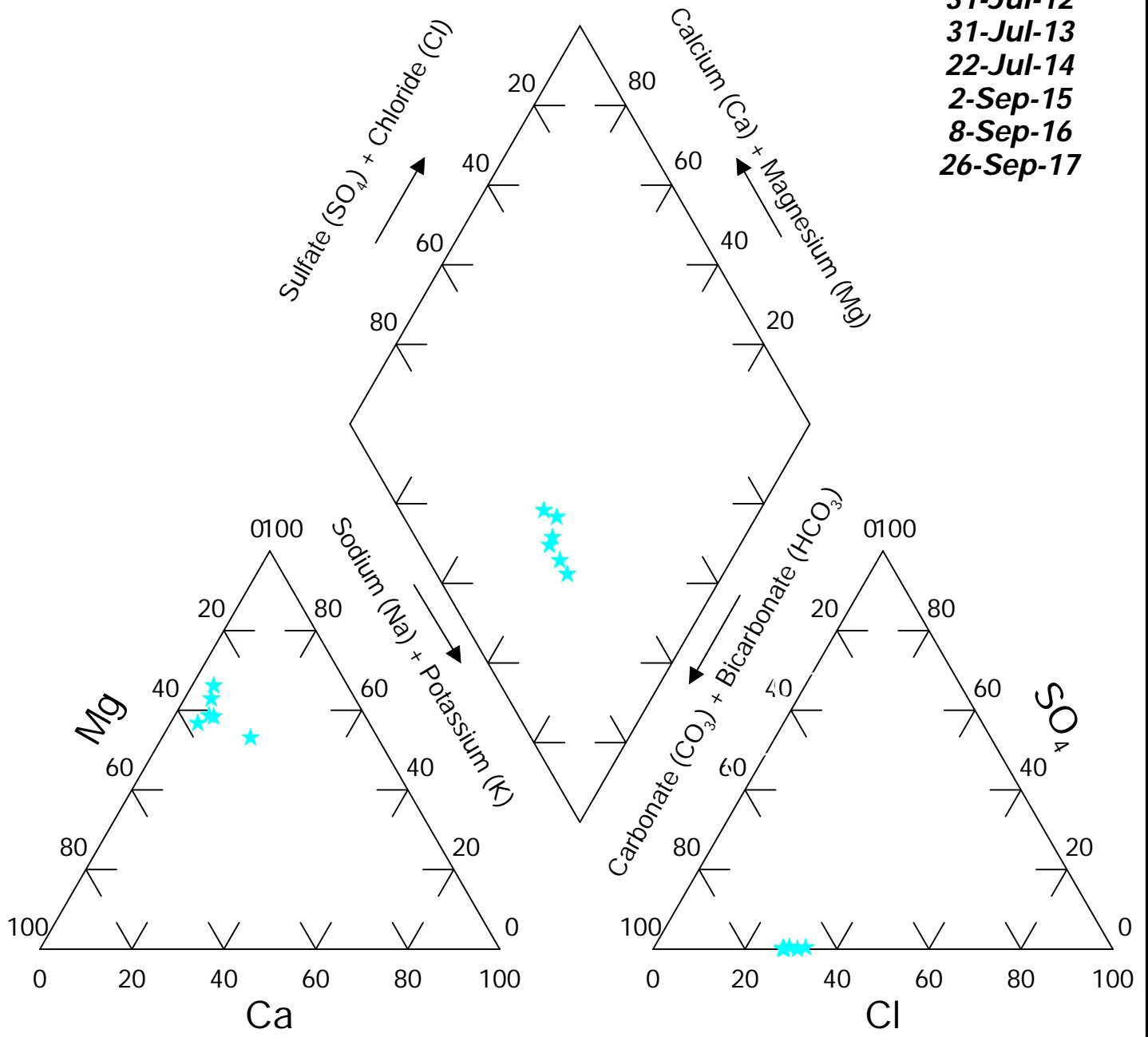
	City Of Winnipeg Solid Waste Services	
	BRADY ROAD RESOURCE MANAGEMENT FACILITY	
<b>LEACHATE ELEVATION Sumps and Probes</b>		
APRIL 2017	FIGURE LQ-4	REV 0



<p>Winnipeg Water and Waste Department</p>	<p>City Of Winnipeg Solid Waste Services</p>	
	<p>BRADY ROAD RESOURCE MANAGEMENT FACILITY</p>	
<p><b>LEACHATE ELEVATION</b> <b>South Wetcell Probes</b></p>		
<p>APRIL 2017</p>	<p>FIGURE LQ-5</p>	<p>REV 0</p>

# Site: Brady Location: MH3

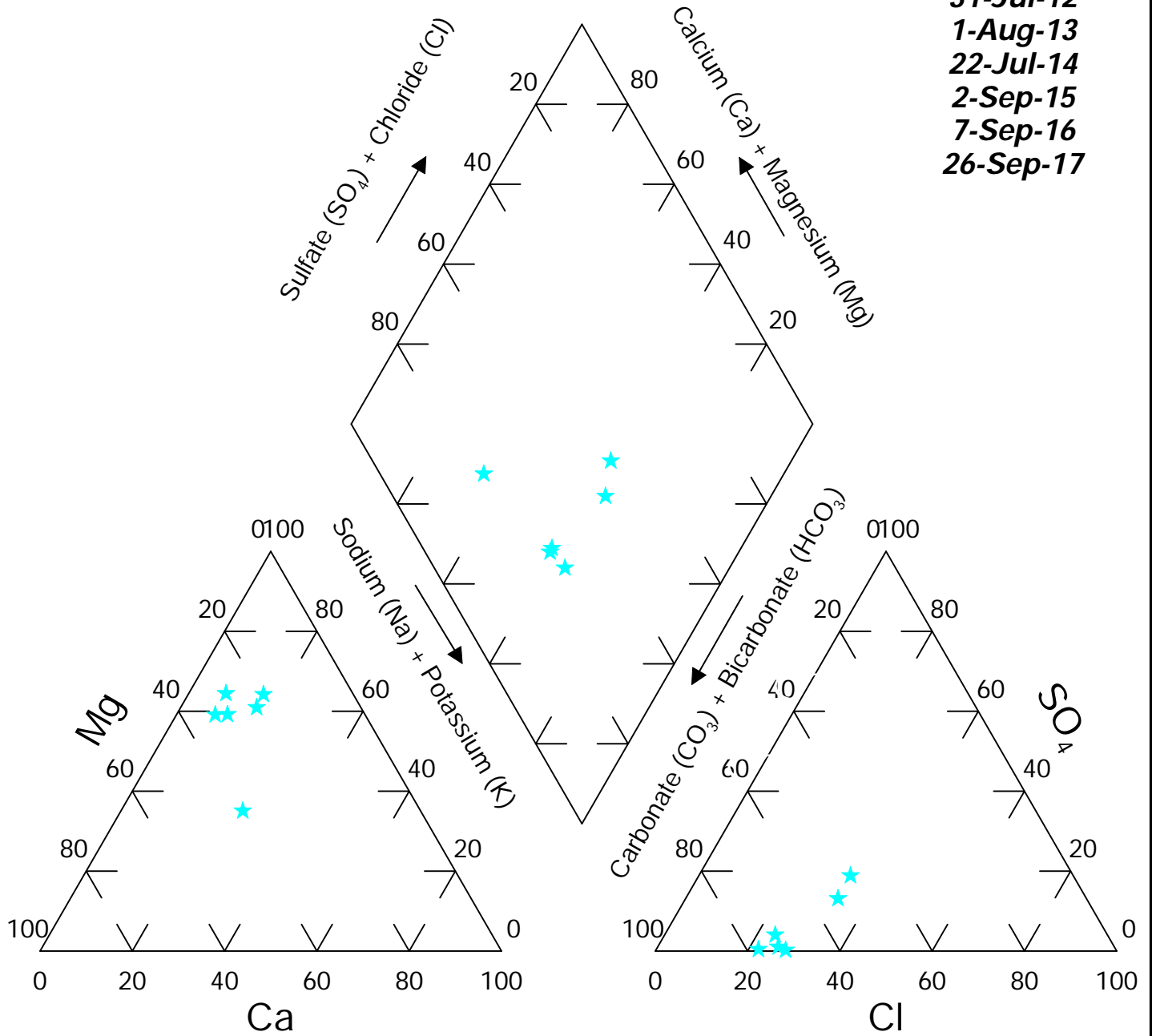
**Dates:**  
 31-Jul-12  
 31-Jul-13  
 22-Jul-14  
 2-Sep-15  
 8-Sep-16  
 26-Sep-17



**FIGURE: 18P**

# Site: Brady Location: MH8

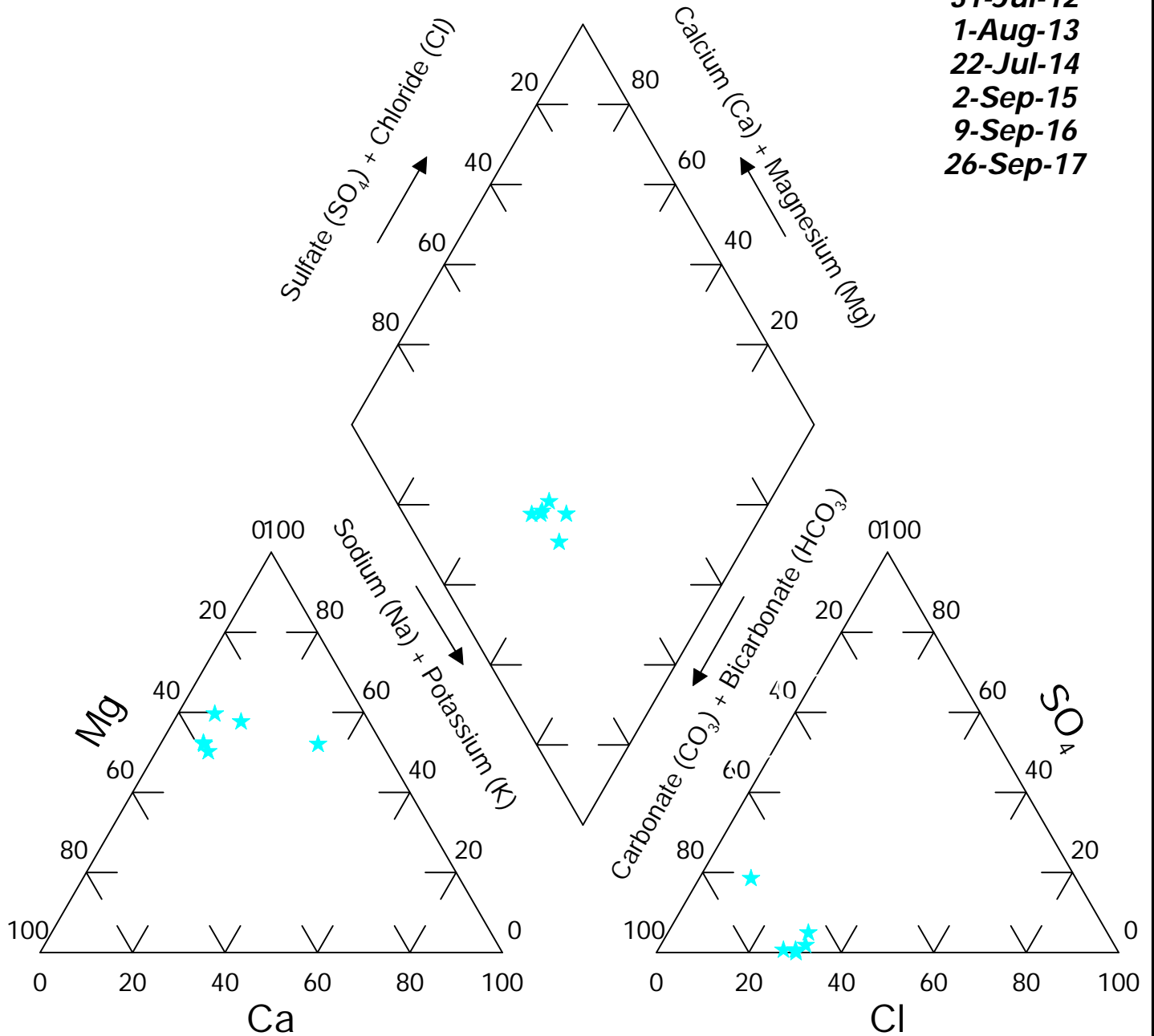
**Dates:**  
 31-Jul-12  
 1-Aug-13  
 22-Jul-14  
 2-Sep-15  
 7-Sep-16  
 26-Sep-17



**FIGURE: 19P**

**Site: Brady**  
**Location: MH13**

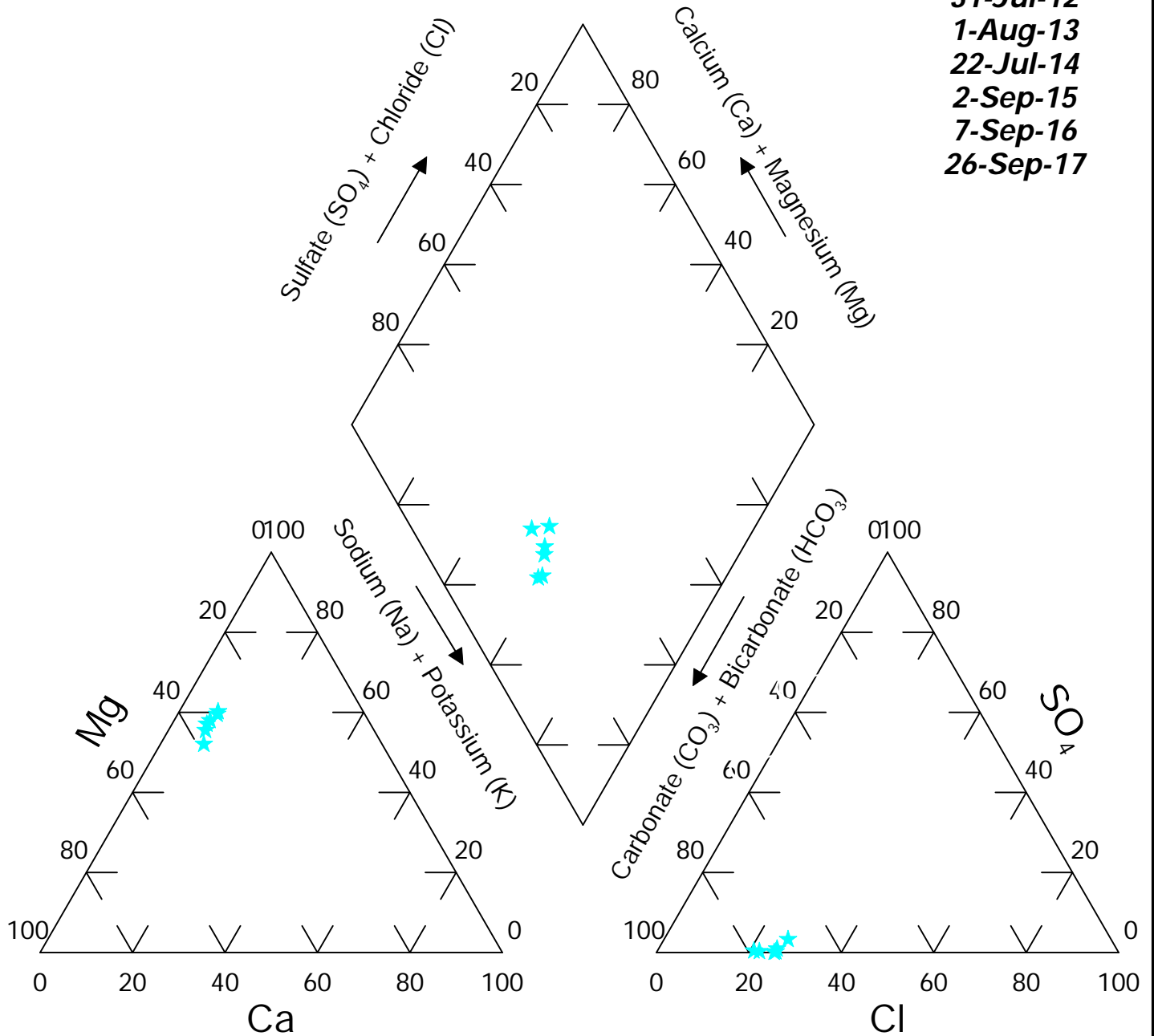
**Dates:**  
**31-Jul-12**  
**1-Aug-13**  
**22-Jul-14**  
**2-Sep-15**  
**9-Sep-16**  
**26-Sep-17**



**FIGURE: 20P**

**Site: Brady**  
**Location: MH24**

**Dates:**  
**31-Jul-12**  
**1-Aug-13**  
**22-Jul-14**  
**2-Sep-15**  
**7-Sep-16**  
**26-Sep-17**

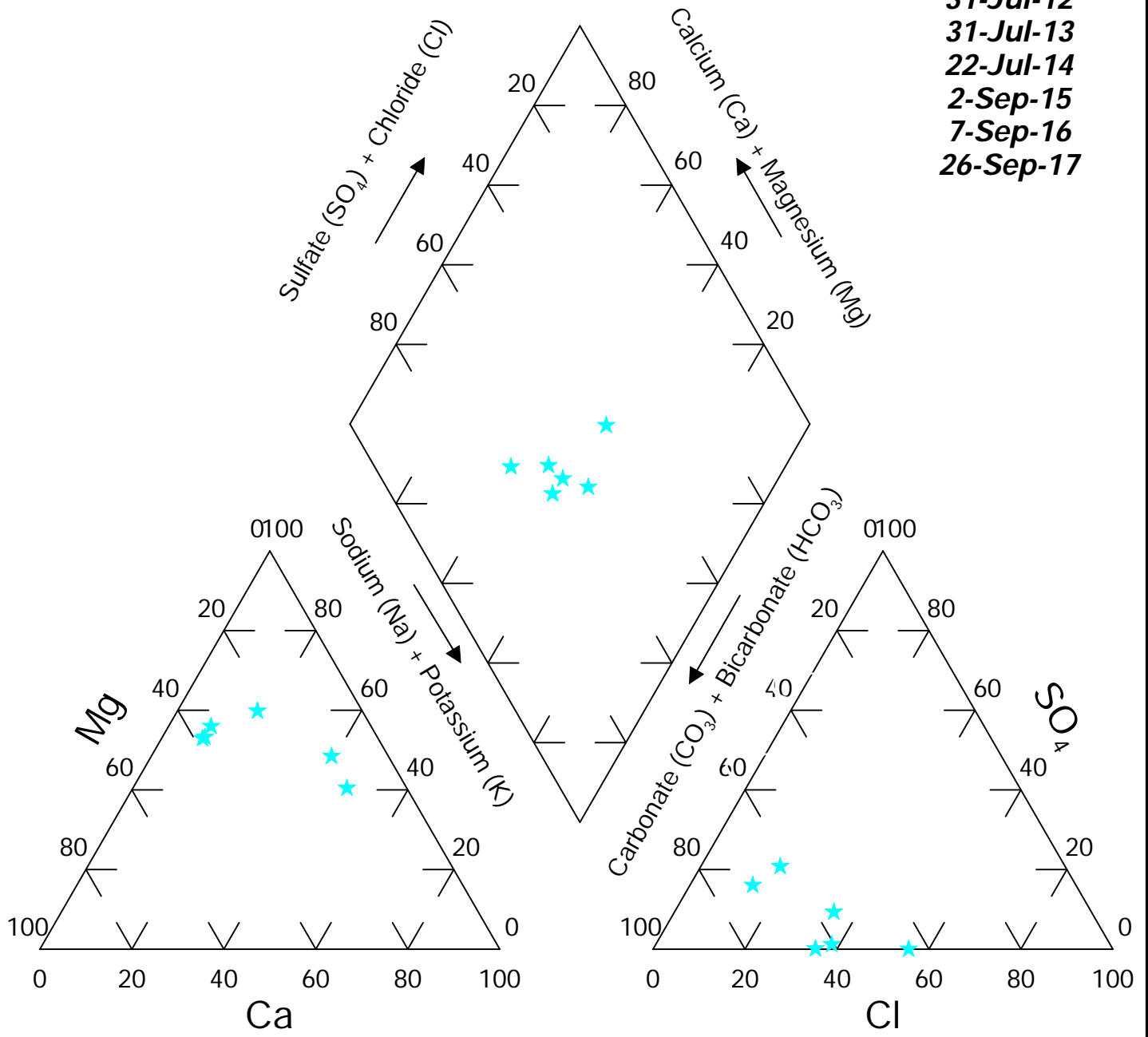


**FIGURE: 21P**



# Site: Brady Location: MH27

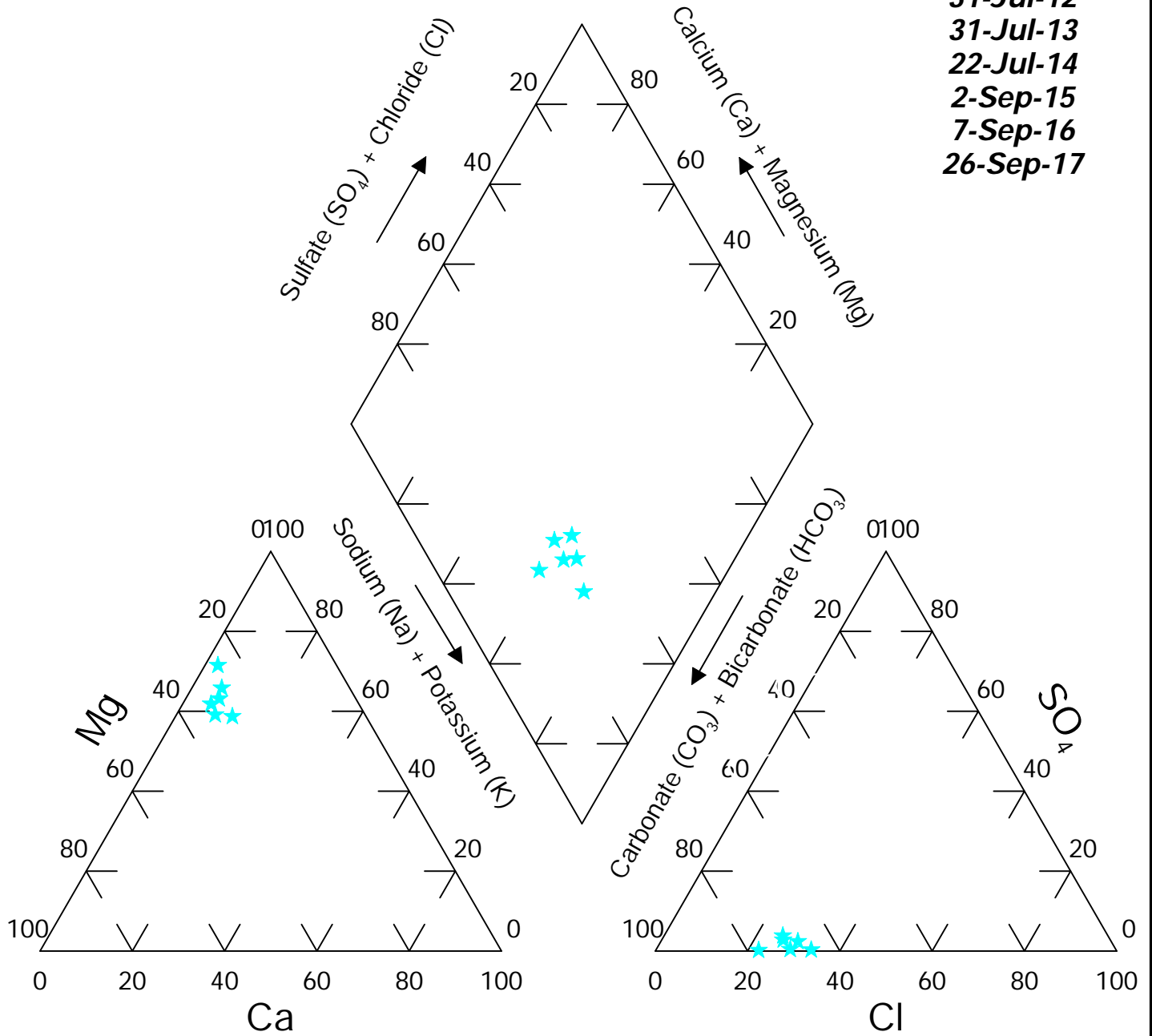
**Dates:**  
 31-Jul-12  
 31-Jul-13  
 22-Jul-14  
 2-Sep-15  
 7-Sep-16  
 26-Sep-17



**FIGURE: 22P**

# Site: Brady Location: MH31

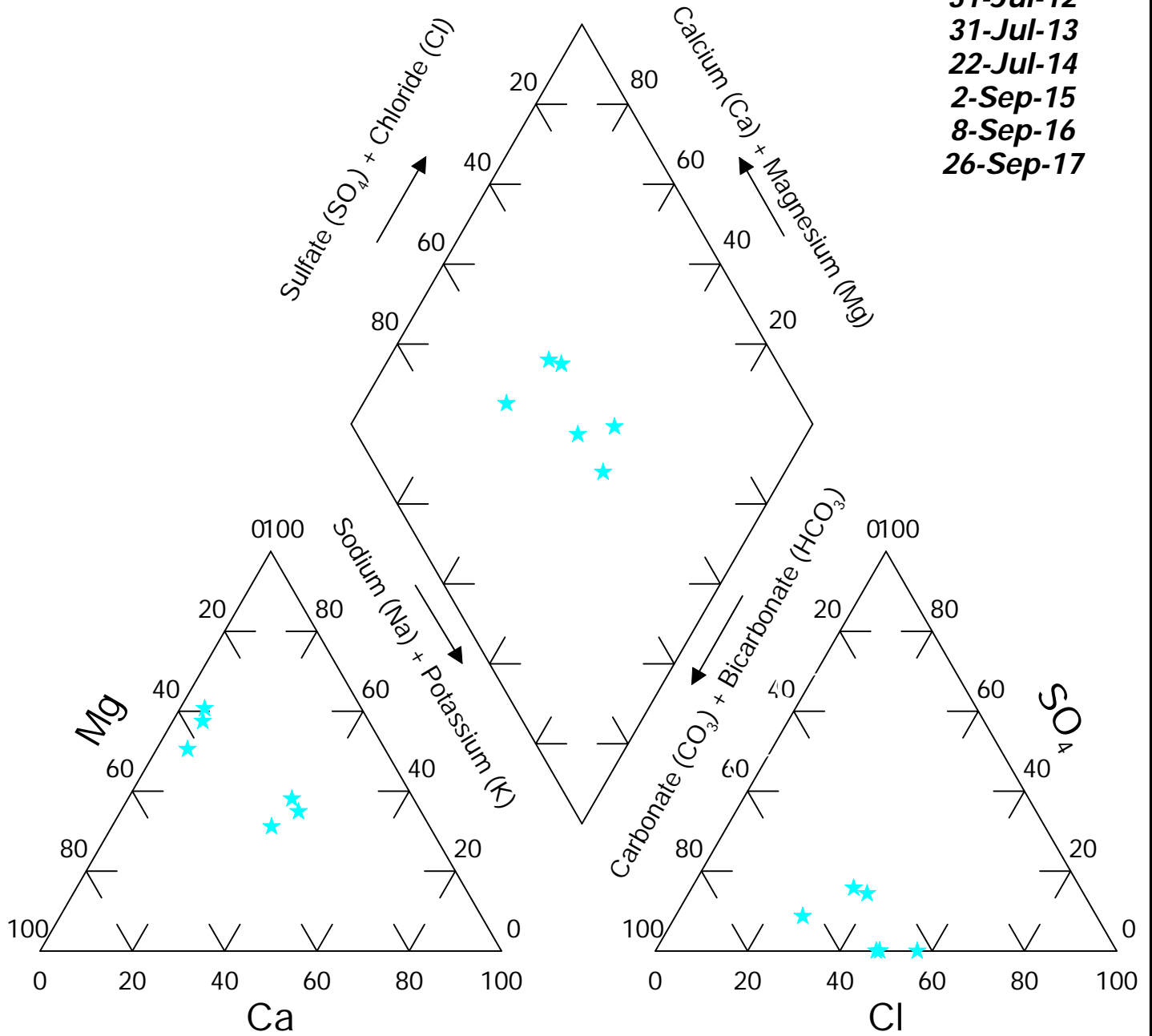
**Dates:**  
 31-Jul-12  
 31-Jul-13  
 22-Jul-14  
 2-Sep-15  
 7-Sep-16  
 26-Sep-17



**FIGURE: 23P**

# Site: Brady Location: MH34

**Dates:**  
 31-Jul-12  
 31-Jul-13  
 22-Jul-14  
 2-Sep-15  
 8-Sep-16  
 26-Sep-17



**FIGURE: 24P**

**APPENDIX F**  
**2017 LANDFILL GAS COLLECTION**  
**AND FLARING REPORT**

**2017 ANNUAL MONITORING REPORT  
CITY OF WINNIPEG**

**BRADY ROAD RESOURCE MANAGEMENT FACILITY  
LANDFILL GAS COLLECTION AND FLARING SYSTEM**

Prepared for

**THE CITY OF WINNIPEG**

Prepared by

**INTEGRATED GAS RECOVERY SERVICES INC.**

April 5, 2018

**2017 ANNUAL MONITORING REPORT  
CITY OF WINNIPEG**

**BRADY ROAD RESOURCE MANAGEMENT FACILITY  
LANDFILL GAS COLLECTION AND FLARING SYSTEM**

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## 1.0 INTRODUCTION

The City of Winnipeg operates the Landfill Gas Collection and Flaring System at the Brady Road Resource Management Facility in Winnipeg, Manitoba, which operates under Manitoba Conservation Licence 3081. After a short commissioning phase, the system became operational full time in August 2013 after approval to operate was received by the Office of the Fire Commissioner.

Operation of the system including maintenance and monitoring was completed by Comcor Environmental Limited (Comcor) on behalf of its partner Integrated Gas Recovery Services (IGRS).

This report outlines work performed and data collected during the operation of the Landfill Gas Collection and Flaring System during 2017.

## 2.0 LANDFILL GAS COLLECTION SYSTEM

There are two main components of the LGCFS that require monitoring. These include:

- Landfill Gas Collection Wellfield
- Mechanical System

The purpose and procedures associated with the monitoring of each of these components are discussed separately below. The recommended monitoring frequency is presented in Table 1.

**Table 1: Summary of Monitoring Frequency**

<b>System Component</b>	<b>Monitoring Frequency</b>
Wellfield Monitoring	Monthly
Remote Mechanical System Monitoring	Weekly
Mechanical System Monitoring	Weekly

### 2.1 Wellfield System Monitoring

The wellfield system monitoring consists of measuring vacuum/pressure in each well and lateral pipe, as well as the percentage of methane, oxygen and carbon dioxide in the landfill gas, and parts per million of carbon monoxide and hydrogen sulphide at each location. These measurements were taken using a proper gas meter/analyzer such as a Landtec GEM-5000, or equivalent. Vacuum fluctuations were noted, as it can be an indication of water within in the piping system.

Each wellhead was monitored for the velocity of gas using an anemometer. The measured velocities were used to calculate landfill gas flow rates by multiplying the velocity by the pipe cross-sectional area.

The monitoring data collected during the monthly round is beneficial to determine if the wellfield is operating as intended. Changes to the wellhead valve position were made to ensure maximum gas collection from the landfill. The system was monitored and field balanced by a technician experienced in the operation of this type of system.

Construction for a wellfield expansion occurred in July through October of 2017. The expansion included the drilling and installation of 22 new wells, and permanent connection of two existing wells and six leachate manhole connections in Area B of the landfill. The installation also included the extension of the header by approximately 1000 meters as well as two new laterals and associated sublateral piping. A number of manhole lids (MH13 to MH 25) along the north



were retrofit to improve gas tightness and some additional drainage lines were installed into manholes. The new wells were commissioned in October 2017. Comcor performed intermittent construction supervision during this period. Figure 1 presents the existing wellfield conditions at the site.

During 2017, elevated levels of Carbon Monoxide (CO) (>500 ppm) had continuously been found at GW 2-13, which is consistent with historical monitoring. In addition, GW1-7 had elevated levels of CO from May through December. From mid 2016 to October 2017, GW1-7 was closed due to low methane levels and high CO. The CO levels dropped in late 2017 and the temperature readings were within a more typical range so the well was cracked for gas collection. The highest CO levels at 1-7 tends to occur during spring and summer. Elevated carbon monoxide within landfill gas can be an indicator of a subsurface fire within the waste. There was no indication of a subsurface fire in 2017.

The wellfield monitoring data and valve positions can be found in Table 2.

Pump counter measurements were recorded on a monthly basis at all dual purpose gas/leachate collection wells. Table 3 presents the pump counter measurements recorded at both the pump drain traps and dual purpose wells in 2017. The following wells were fitted with pneumatic pumps for leachate removal during 2017: H-4, 1-9, 1-10, H-11, 2-18, 3-27, 3-29 and 3-30. Dual purpose well locations were chosen based on the incidence of elevated leachate levels in the surrounding area. Additional well locations were designed with compressed air and forcemain coming up to the well which allows for pumps to be relocated, as necessary. The pumps in 3-37 and 3-30 were removed in October 2017 for maintenance. The pumps will be returned in 2018.

Table 4 presents the water levels measured on a twice annual basis in 2017. The percent of open screen available for gas collection at each well is estimated based on water levels.

Based on pump counters and water levels recorded throughout 2017, dual purpose well pumps continue to remove leachate consistently. Most of the dual-purpose wells have open screen percentages on average 40%. The pump counter at 3-27 shows no operation throughout 2017. However, leachate levels indicate that this well was mostly flooded most of the year. It is suspected that the pump may not be functioning as designed, due to leachate and siltation residue making the pump inoperable. The pump was pulled for maintenance from 3-27, as well as 3-30 for similar reasons, in October 2017. The pumps have been cleaned and will be reinstalled in 2018 when staff are available to perform the necessary confined space entry.

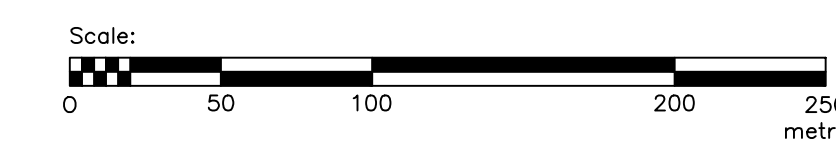
## 2.2 Surface Emission Monitoring

As required by the City, surface emission monitoring was carried out semi-annually, weather conditions permitting, by Comcor. This monitoring was performed using a portable flame ionization detector (FID). A Comcor technician walked the site in a grid pattern with the FID and a GPS, marking locations where concentrations of hydrocarbons were greater than 500 ppm.



**LEGEND**

- ROADS
  - MANHOLES
  - BUILDINGS
  - PERIMETER DITCHES/POND EDGE
  - FENCE
- 
- GRAVITY DRAIN TRAP  
c/w 75mm HDPE DRAIN LINE  
TO LEACHATE MANHOLE  
AND DESIGNATION.
  - EXISTING LEACHATE MANHOLE  
c/w 100mm HDPE SUB-LATERAL PIPE,  
FLOW CONTROL ASSEMBLY  
AND DESIGNATION.
  - DUAL-PURPOSE WELL - LANDFILL  
GAS EXTRACTION & LEACHATE PUMP -  
c/w 100mm SUB-LATERAL PIPE  
AND DESIGNATION.
  - FLOW CONTROL ASSEMBLY  
AND DESIGNATION.
  - ABOVE-GROUND WELL HEAD  
AT LEACHATE MANHOLE  
c/w 100mm HDPE SUB-LATERAL  
PIPE AND DESIGNATION.
  - LANDFILL GAS EXTRACTION WELL  
c/w 100mm HDPE SUB-LATERAL PIPE,  
COMPRESSED AIR AND FORCE MAIN  
PIPING AND DESIGNATION.
  - 250mm LANDFILL GAS LATERAL,  
75mm FORCE MAIN &  
75mm COMPRESSED AIR  
IN SAME TRENCH.
  - LANDFILL GAS EXTRACTION WELL  
c/w 100mm HDPE SUB-LATERAL PIPE  
AND DESIGNATION.
  - PUMPED CONDENSATE  
DRAIN TRAP  
AND DESIGNATION.
  - 450mm LANDFILL GAS HEADER,  
75mm CONDENSATE PUMP DISCHARGE  
75mm WELLFIELD FORCE MAIN &  
75mm COMPRESSED AIR  
IN SAME TRENCH.



**COMCOR**  
 ENVIRONMENTAL LIMITED  
 Consulting Engineers and Landfill Gas Specialists  
 320 Pinebush Road, Suite 12, Cambridge, Ontario N1T 1Z6  
 tel (519) 621-6669 • fax (519) 621-9944

**INTEGRATED GAS RECOVERY SERVICES**  
 A Landfill Gas Utilization Company

City of Winnipeg  
 Brady Road  
 Resource Management  
 Facility

FIGURE 1  
 EXISTING  
 SITE CONDITIONS

Table 2: Wellfield Monitoring Data

Units		30-Jan-17	27-Feb-17	30-Mar-17	28-Apr-17	29-May-17	27-Jun-17	28-Aug-17	15-Sep-17	19-Sep-17	25-Oct-17	9-Nov-17	6-Dec-17		
<b>Conditions</b>		Light Snow	Mostly Cloudy	Mostly Cloudy	Mainly Sunny	Cloudy	Partially Cloudy	Partially Cloudy	Light Rain	Cloudy	Partially Cloudy	Sunny/Snow Sh.	Sunny/Snow Sh.		
<b>Ambient Temperature</b>		° C	-4	-10	9	10	9	23	30	10	16	7	-13	-12	
<b>Control Panel</b>	Flow Rate	CFM	906	906	906	913	903	908	896	892	798	800	1000	959	
	CH <sub>4</sub>	%	45.8	44.5	45.2	44.9	46.6	50.9	35.5	37.0	37.0	43.4	48.8	40.4	
	O <sub>2</sub>	%	2.0	1.6	1.2	1.1	0.9	0.1	7.1	3.10	3.8	3.9	0.7	5.1	
	Wellfield Vac	"H <sub>2</sub> O	-21.6	-18.9	-18.3	-18.0	-16.4	-13.8	-20.7	-56.4	-31.8	-30.4	-15.0	-10.3	
Outlet Press.	"H <sub>2</sub> O	3.2	3.3	3.0	3.9	4.0	3.6	3.3	3.4	2.9	2.8	3.6	3.7		
<b>LOCATIONS</b>															
<b>H-1</b>	Well	"H <sub>2</sub> O	-12.9	-10.78	-9.35	-9.08	-8.33	-8.65	-10.04	-28.58	-18.90	-14.33	-8.04	-7.07	
	well bore seal	Lateral	"H <sub>2</sub> O	-17.67	-15.16	-15.20	-15.72	-13.28	-13.57	-21.33	-56.65	-34.61	-16.74	-8.56	-7.62
		CH <sub>4</sub>	%	30.5	31.1	32.1	41.9	42.6	47.5	48.7	34.0	31.2	55.3	43.9	43.9
		CO <sub>2</sub>	%	30.8	30.2	30.7	33.1	33.6	34.9	35.7	33.8	31.6	35.8	36.0	34.4
		O <sub>2</sub>	%	0.8	0.4	0.4	0.4	0.4	0.1	0.3	0.4	0.4	0.7	0.4	0.5
		BAL (N <sub>2</sub> )	%	37.9	38.2	36.8	24.5	23.4	17.6	15.4	31.8	36.8	8.3	17.6	21.1
		CO	PPM	0	40	38	30	28	16	66	37	40	62	17	33
		H <sub>2</sub> S	PPM	19	14	19	25	22	30	11	19	19	25	18	8
		Vel Max	m/s	3.71	2.86	3.11	2.58	3.07	3.33	4.76	10.38	7.36	9.23	3.88	4.55
		Vel Min	m/s	3.55	2.79	2.98	2.38	2.94	3.08	7.25	10.12	7.08	8.67	3.42	4.41
		Flow	CFM	34.30145813	26.69466094	28.77353719	23.434605	28.39555969	30.28544719	56.74387219	96.85673438	68.22493875	84.57246563	34.49044688	42.33348
		Temp	° C	14.1	20.4	21.3	22.3	21.5	24.7	23.1	21.2	19.1	16.1	13.3	16.1
		Comments		no change	closed 1/4T	closed 1/4T	opened 1/4T more	no change	no change	opened 1/4T more	no change	opened 3/4T more	2-1/2T -> no change	2-1/2T -> no change	2-1/2T -> no change
	<b>H-2</b>	Well	"H <sub>2</sub> O	-13.05	-11.58	-11.49	-13.11	-10.61	-8.89	-6.12	-0.03	0.17	1.14	0.61	0.23
Lateral		"H <sub>2</sub> O	-15.15	-13.21	-13.15	-13.62	-11.20	-10.91	-8.05	-54.76	-36.02	-19.13	-8.41	-7.69	
		CH <sub>4</sub>	%	49.7	40.8	40.8	43.1	43.4	45.1	17.9	0.0	24.1	58.2	56.6	55.3
		CO <sub>2</sub>	%	40.3	36.9	37.1	37.1	37.2	37.7	14.6	0.1	18.0	41.6	42.8	41.6
		O <sub>2</sub>	%	1	0.2	0.3	0.3	0.4	0.2	11.6	19.9	11.7	0.2	0.2	1.6
		BAL (N <sub>2</sub> )	%	9.1	22.1	21.8	19.6	19.0	17.0	55.9	80.0	46.1	0.0	0.0	1.6
		CO	PPM	0	45	39	35	33	14	26	12	27	45	35	34
		H <sub>2</sub> S	PPM	7	10	12	14	13	11	3	0	0	47	21	0
		Vel Max	m/s	15.17	10.90	11.39	10.69	10.78	13.41	18.52	-	-	1.96	0.78	0.81
		Vel Min	m/s	14.61	10.53	11.13	10.21	10.35	12.99	18.04	-	-	1.81	0.63	0.53
		Flow	CFM	140.7021244	101.2507228	106.4006663	98.74662188	99.83330719	124.732575	172.7357175	#VALUE!	#VALUE!	17.81218969	6.661853438	6.331123125
		Temp	° C	25.6	27.3	27.4	28.0	28.1	26.1	19.3	-	-	11.6	10.2	16.2
		Comments		opened 4T more	no change	no change	1/2T -> full	closed 1/4T	well open full	full open -> closed	well closed	well closed	closed -> 1/4T	1/4T -> 1/2T	1/4T -> no change
<b>H-3</b>		Well	"H <sub>2</sub> O	0.48	-1.60	-4.50	-7.57	-4.65	-5.01	-5.89	-4.17	-0.02	1.99	0.36	0.26
	Lateral	"H <sub>2</sub> O	-18.55	-14.77	-15.19	-15.81	-13.14	-13.68	-21.53	-53.21	-36.70	-19.29	-9.23	-8.04	
		CH <sub>4</sub>	%	54.9	56.5	55.9	51.1	55.2	54.7	42.9	21.8	18.7	54.1	43.6	33.2
		CO <sub>2</sub>	%	44.6	43.0	42.7	40.3	41.8	42.0	35.2	17.6	15.4	45.3	35.9	28.4
		O <sub>2</sub>	%	0.4	0.4	1.0	1.4	1.1	0.9	4.4	12.1	13.3	0.3	4.2	8.0
		BAL (N <sub>2</sub> )	%	0.0	0.0	0.4	6.9	1.9	2.4	17.6	48.6	52.6	0.0	16.5	30.4
		CO	PPM	104	111	124	145	138	140	142	84	38	236	59	43
		H <sub>2</sub> S	PPM	13	9	11	11	10	13	12	5	0	27	6	0
		Vel Max	m/s	1.58	1.38	2.29	1.97	2.24	2.12	3.01	4.79	1.47	1.07	0.00	0.00
		Vel Min	m/s	1.31	1.21	2.14	1.88	2.18	1.99	2.66	4.29	1.41	0.94	0.00	0.00
		Flow	CFM	13.65443719	12.23702156	20.93050406	18.19016719	20.88325688	19.41859406	26.78915531	42.90044625	13.60719	9.496684688	0	0
		Temp	° C	2.9	16.3	16.3	16.4	18.3	20.0	18.9	18.5	14.7	8.3	9.0	6.6
		Comments		closed -> 1/2T	opened 1/4T more	no change	no change	no change	no change	no change	closed 1/4T	1/2T -> closed	closed -> 1/4T	1/4T -> no change	1/4T -> closed
	<b>H-4 DP</b>	Well	"H <sub>2</sub> O	-10.61	2.46	1.37	-6.57	0.49	-4.21	-6.75	-17.89	-22.63	0.47	-1.68	-4.08
Lateral		"H <sub>2</sub> O	-17.19	-14.15	-15.09	-15.45	-13.22	-13.65	-21.02	-54.75	-35.88	-19.74	-8.92	-7.98	
		CH <sub>4</sub>	%	31.6	58.2	56.2	40.6	56.9	55.9	48.8	27.0	56.7	55.9	20.8	
		CO <sub>2</sub>	%	23.9	40.9	43.3	30.2	42.7	42.3	41.0	39.5	22.7	42.6	43.5	15.9
		O <sub>2</sub>	%	9.9	0.9	0.4	6.2	0.4	0.7	1.1	0.9	8.4	0.6	0.4	13.9
		BAL (N <sub>2</sub> )	%	34.7	0.0	0.0	23.0	0.0	1.1	2.3	10.8	42.1	0.0	0.0	49.4
		CO	PPM	0	17	77	75	69	84	100	140	43	36	65	29
		H <sub>2</sub> S	PPM	7	49	32	14	26	41	32	28	0	43	36	0
		Vel Max	m/s	6.34	0.54	0.00	2.94	1.14	1.91	1.76	4.03	8.15	1.40	1.68	7.71
		Vel Min	m/s	6.16	0.00	0.00	2.77	1.11	1.78	1.59	3.87	7.63	1.22	1.57	7.54
		Flow	CFM	59.05898438	2.551348125	0	26.97814406	10.63061719	17.43421219	15.82780781	37.32527813	74.55606188	12.37876313	15.35533594	72.05196094
		Temp	° C	9.2	21.0	21.7	17.8	22.4	24.3	21.0	19.0	17.0	8.8	12.1	10.0
		Comments		closed well	closed -> 1/4T	1/4T -> 3/4T	closed 1/2T	opened 1/4T more	no change	no change	opened 1T more	1-3/4T -> 1/4T	1/4T -> 1/2T	1/2T -> 2T	2T -> 1/4T

Table 2: Wellfield Monitoring Data

Units			30-Jan-17	27-Feb-17	30-Mar-17	28-Apr-17	29-May-17	27-Jun-17	28-Aug-17	15-Sep-17	19-Sep-17	25-Oct-17	9-Nov-17	6-Dec-17
1-5 well bore seal	Well	"H <sub>2</sub> O	-6.55	-7.87	-9.41	-12.31	-9.54	-9.74	-11.64	-10.33	-4.79	0.50	0.30	-0.31
	Lateral	"H <sub>2</sub> O	-18.47	-15.00	-15.24	-15.53	-13.28	-13.89	-20.75	-54.17	-35.71	-18.31	-9.28	-7.87
	CH <sub>4</sub>	%	50.6	52.5	52.3	46.0	46.5	48.1	34.6	24.0	19.6	57.9	55.7	51.3
	CO <sub>2</sub>	%	38.7	38.8	39.1	37.4	37.8	38.3	31.7	25.0	23.0	41.7	43.8	40.0
	O <sub>2</sub>	%	1.5	0.8	1.0	0.8	0.8	0.5	2.7	5.0	5.5	0.3	0.3	1.3
	BAL (N <sub>2</sub> )	%	9.3	7.8	7.5	15.8	15.0	13.0	30.9	46.0	52.0	0.0	0.0	7.8
	CO	PPM	0	38	41	49	43	50	98	59	57	18	25	32
	H <sub>2</sub> S	PPM	9	4	6	14	11	9	7	10	1	147	105	6
	Vel Max	m/s	4.46	4.88	5.61	4.59	4.97	5.79	7.86	7.47	4.22	0.85	0.00	0.76
	Vel Min	m/s	4.27	4.76	5.28	4.39	4.61	5.43	7.33	7.25	4.08	0.00	0.00	0.71
	Flow	CFM	41.24679469	45.54628875	51.45218719	42.42797438	45.26280563	53.01134438	71.76847781	69.54786	39.21516563	4.016010938	0	6.945336563
	Temp	°C	13.3	20.2	20.6	20.7	22.6	26.0	33.6	34.6	33.0	4.4	4.2	10.7
	Comments		opened 1/4T more	opened 1/4T more	no change	no change	no change	opened 1/4T more	closed 1/2T	closed 1/4T	1/2T -> closed	closed -> 1/4T	1/4T -> 1T	1/4T -> no change
	1-6 DP	Well	"H <sub>2</sub> O	0.10	0.00	0.20	-1.36	0.00	0.00	0.32	-0.32	-0.22	0.04	0.23
Lateral		"H <sub>2</sub> O	-18.64	-15.09	-15.59	-15.99	-13.78	-14.02	-21.68	-55.32	-36.37	-18.79	-8.75	-7.96
CH <sub>4</sub>		%	57.4	0.2	56.3	1.3	38.7	41.1	58.0	38.5	39.4	50.9	58.3	53.9
CO <sub>2</sub>		%	41.6	0.1	39.0	1.1	27.7	28.9	41.8	30.1	30.7	34.9	41.3	36.8
O <sub>2</sub>		%	0.9	20.3	0.9	20.1	6.3	6.0	0.3	4.8	4.6	2.9	0.2	2.2
BAL (N <sub>2</sub> )		%	0.0	79.4	3.7	77.6	27.3	24.0	0.0	26.6	25.3	11.2	0.0	7.0
CO		PPM	0	7	44	18	59	73	23	38	27	30	23	21
H <sub>2</sub> S		PPM	125	0	0	0	0	0	356	85	93	118	178	68
Vel Max		m/s	-	-	1.33	1.16	-	-	1.82	2.40	1.61	1.29	1.19	1.41
Vel Min		m/s	-	-	1.30	1.02	-	-	1.72	1.98	1.54	1.26	0.59	1.13
Flow		CFM	#VALUE!	#VALUE!	12.42601031	10.29988688	#VALUE!	#VALUE!	16.72550438	20.69426813	14.88286406	12.04803281	8.409999375	12.00078563
Temp		°C	-	-	26.0	27.2	-	-	29.9	29.7	24.2	17.1	12.9	8.2
Comments			well closed	well closed	closed -> 1/4T	closed well	well closed	well closed	closed -> 1/2T	no change	no change	1/2T -> no change	1/2T -> no change	1/2T -> no change
1-7		Well	"H <sub>2</sub> O	-0.10	-0.27	0.03	-0.45	0.20	0.10	0.11	-0.08	0.05	0.12	0.12
	Lateral	"H <sub>2</sub> O	-19.64	-15.63	-15.25	-16.41	-12.65	-13.50	-18.27	-36.10	-25.57	-25.89	-8.68	-8.24
	CH <sub>4</sub>	%	0.3	0.1	0.6	0.0	43.0	44.7	54.4	51.9	53.7	52.9	52.5	52.5
	CO <sub>2</sub>	%	0.2	0.1	0.6	0.1	42.5	42.0	45.2	47.7	48.1	45.9	46.8	46.5
	O <sub>2</sub>	%	20.9	20.7	19.9	21.0	1.1	1.0	0.3	0.3	0.4	0.3	0.2	0.7
	BAL (N <sub>2</sub> )	%	78.6	79.1	78.9	78.9	13.3	12.3	0.0	0.0	0.0	0.0	0.0	0.0
	CO	PPM	0	19	89	15	>>>>	>>>>	1408	1686	2000	772	642	810
	H <sub>2</sub> S	PPM	0	0	3	0	262	331	170	229	278	91	71	85
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	0.65	0.65	0.00
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	0.42	0.50	0.00
	Flow	CFM	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	5.055449063	5.433426563	0
	Temp	°C	-	-	-	-	-	-	-	-	-	5.4	2.0	-4.8
	Comments		well closed	well closed	well closed	well closed	well closed	well closed	well closed	well closed	well closed	closed -> cracked	cracked -> no change	cracked -> no change
	1-8	Well	"H <sub>2</sub> O	-0.70	-1.07	-0.63	-1.17	0.05	0.00	0.22	-0.41	-0.20	0.18	-0.02
Lateral		"H <sub>2</sub> O	-19.41	-15.84	-15.13	-16.12	-12.82	-13.56	-18.77	-36.76	-25.66	-27.99	-8.93	-7.85
CH <sub>4</sub>		%	1.1	0.2	1.3	3.0	0.2	0.1	57.3	49.3	40.1	55.9	54.6	53.7
CO <sub>2</sub>		%	0.9	0.5	2.3	5.5	0.2	0.1	42.4	42.5	43.8	43.5	45.1	45.8
O <sub>2</sub>		%	20.9	20.1	18.7	16.8	21.4	21.1	0.3	1.5	0.7	0.5	0.3	0.4
BAL (N <sub>2</sub> )		%	77.1	79.2	77.6	74.7	78.2	78.7	0.0	6.7	15.2	0.0	0.0	0.0
CO		PPM	0	24	15	13	26	18	42	382	255	71	79	167
H <sub>2</sub> S		PPM	0	0	0	1	0	0	168	222	159	134	135	80
Vel Max		m/s	-	-	-	-	-	-	1.20	1.24	0.79	0.56	1.30	2.05
Vel Min		m/s	-	-	-	-	-	-	1.03	1.11	0.68	0.00	1.25	1.86
Flow		CFM	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	10.53612281	11.10308906	6.945336563	2.6458425	12.04803281	18.47365031
Temp		°C	-	-	-	-	-	-	27.4	20.9	17.3	7.8	13.1	20.6
Comments			well closed	well closed	well closed	well closed	well closed	well closed	closed -> 1/4T	1/4T -> nc	1/4T -> no change	1/4T -> 1/2T	1/2T -> 3/4T	3/4T -> no change
1-9 DP		Well	"H <sub>2</sub> O	-17.48	-6.80	-3.30	-0.71	0.64	-1.92	-2.02	-33.57	0.09	-2.75	-1.09
	Lateral	"H <sub>2</sub> O	-17.94	-15.50	-15.53	-16.28	-12.58	-13.45	-21.03	-35.96	-36.29	-28.03	-8.84	-7.99
	CH <sub>4</sub>	%	30.7	20.8	22.4	8.2	62.7	58.3	57.3	21.8	62.6	35.9	46.9	55.3
	CO <sub>2</sub>	%	26.4	19.7	19.7	5.5	36.8	41.8	38.2	21.3	36.7	31.2	35.6	37.8
	O <sub>2</sub>	%	3.9	6.2	6.6	17.4	0.4	0.2	0.3	5.8	0.3	1.1	0.4	0.5
	BAL (N <sub>2</sub> )	%	39.1	53.1	50.8	68.9	0.0	0.0	4.2	51.0	0.4	31.8	17.1	6.4
	CO	PPM	117	342	411	32	20	591	679	328	79	438	272	238
	H <sub>2</sub> S	PPM	30	38	56	1	17	65	74	66	73	81	92	67
	Vel Max	m/s	10.35	4.65	3.00	-	2.38	7.45	12.86	20.06	3.92	2.66	1.87	0.84
	Vel Min	m/s	10.08	4.54	2.83	-	2.27	6.88	10.67	19.76	3.85	2.54	1.57	0.77
	Flow	CFM	96.52600406	43.42016531	27.54511031	#VALUE!	21.96994219	67.70521969	111.1726322	188.1383006	36.71106469	24.5685375	16.2530325	7.606797188
	Temp	°C	53.7	56.0	52.8	-	34.0	50.8	51.3	58.4	41.7	46.3	35.5	23.5
	Comments		full -> 1T	1/4T -> cracked	cracked -> closed	well closed	closed -> 1/2T	1/2T -> 1T	1T -> full open	full open -> closed	closed -> 1/4T	1/4T -> no change	1/4T -> no change	1/4T -> no change

Table 2: Wellfield Monitoring Data

		Units	30-Jan-17	27-Feb-17	30-Mar-17	28-Apr-17	29-May-17	27-Jun-17	28-Aug-17	15-Sep-17	19-Sep-17	25-Oct-17	9-Nov-17	6-Dec-17
H-10 DP	Well	"H <sub>2</sub> O	0.06	-1.01	-0.03	-0.94	1.01	1.00	1.03	-11.83	-9.61	-6.72	-2.12	0.05
	Lateral	"H <sub>2</sub> O	-19.44	-15.53	-15.62	-16.41	-12.73	-13.74	-19.00	-44.84	-36.32	-28.47	-8.83	-8.02
	CH <sub>4</sub>	%	64.5	1.0	65.3	35.7	66.0	65.6	66.0	51.0	31.3	52.7	51.1	61.3
	CO <sub>2</sub>	%	35.0	0.6	34.0	19.3	34.0	33.2	32.8	34.4	28.3	34.2	31.2	31.7
	O <sub>2</sub>	%	0.3	20.0	0.6	9.2	0.5	0.8	0.4	0.8	1.7	1.4	4.2	1.6
	BAL (N <sub>2</sub> )	%	0.0	78.4	0.0	34.9	0.0	0.0	1.2	13.9	38.9	11.7	13.3	5.4
	CO	PPM	0	13	18	9	11	12	32	106	84	49	18	<<<<
	H <sub>2</sub> S	PPM	0	0	5	3	6	15	62	21	3	19	2	0
	Vel Max	m/s	-	-	-	-	-	-	1.82	2.07	2.25	2.29	1.04	0.00
	Vel Min	m/s	-	-	-	-	-	-	1.70	1.89	2.18	2.13	1.00	0.00
	Flow	CFM	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	16.63101	18.70988625	20.93050406	20.88325688	9.63842625	0
	Temp	°C	-	-	-	-	-	-	20.6	19.7	11.8	7.2	8.3	
	Comments		well closed	well closed	well closed	well closed	well closed	well closed	closed -> 1/2T	1/2T -> nc	1/2T -> no change	1/2T -> no change	1/2T -> 1/4T	1/4T -> no change
	H-11 DP	Well	"H <sub>2</sub> O	-7.36	-10.35	-9.49	-11.57	-9.28	-8.99	-13.43	-38.94	-0.13	-17.53	-8.76
Lateral		"H <sub>2</sub> O	-17.11	-14.32	-14.74	-15.28	-12.93	-13.67	-21.45	-53.80	-36.12	-19.14	-9.16	-9.06
CH <sub>4</sub>		%	50.6	46.2	49.1	46.3	46.3	48.5	49.2	28.3	56.9	54.4	44.9	35.9
CO <sub>2</sub>		%	39.0	34.1	36.1	35.0	35.1	36.9	37.7	25.1	42.2	45.2	34.9	27.7
O <sub>2</sub>		%	2.4	3.1	2.7	3.2	3.1	2.8	1.9	6.0	0.8	0.3	4.1	7.5
BAL (N <sub>2</sub> )		%	7.9	16.4	12.2	15.4	15.3	11.9	11.2	40.6	0.0	0.0	15.9	28.8
CO		PPM	0	12	16	14	10	13	20	16	18	9	13	13
H <sub>2</sub> S		PPM	149	35	47	50	44	52	64	26	75	205	96	41
Vel Max		m/s	2.91	1.23	1.46	1.25	1.54	1.58	1.89	2.67	0.42	16.59	3.79	2.74
Vel Min		m/s	2.38	1.21	1.29	1.19	1.30	1.43	1.74	2.10	0.00	15.36	2.94	2.69
Flow		CFM	24.99376219	11.52831375	12.99297656	11.52831375	13.41820125	14.22140344	17.15072906	22.53690844	1.984381875	150.9547641	31.79735719	25.65522281
Temp		°C	9.6	22.2	22.9	22.5	22.5	25.6	24.9	23.6	15.0	22.4	18.9	15.2
Comments			no change	no change	no change	no change	no change	no change	no change	closed 1/2T	cracked -> full	full -> no change	full -> 2T	1T -> cracked
H-12 well bore seal		Well	"H <sub>2</sub> O	-0.08	0.00	0.32	-2.23	-0.40	-0.43	-0.08	-0.75	-0.18	-0.50	-0.34
	Lateral	"H <sub>2</sub> O	-17.06	-14.40	-14.56	-15.37	-12.86	-13.61	-21.16	-52.88	-35.14	-23.95	-8.70	-9.38
	CH <sub>4</sub>	%	51.2	51.5	59.3	34.9	56.1	57.2	59.4	43.9	56.2	58.9	52.5	37.0
	CO <sub>2</sub>	%	34.1	33.3	40.2	23.9	37.3	38.5	39.9	31.6	37.9	40.5	35.3	26.1
	O <sub>2</sub>	%	4.2	3.5	0.4	8.6	1.9	1.4	0.5	4.1	1.3	0.4	3.1	7.1
	BAL (N <sub>2</sub> )	%	10.4	11.7	0.0	32.5	4.7	2.9	0.0	20.5	4.7	0.0	9.1	30.0
	CO	PPM	0	10	12	16	12	18	25	20	17	9	17	11
	H <sub>2</sub> S	PPM	50	52	68	16	37	43	81	38	56	104	39	20
	Vel Max	m/s	1.26	1.13	0.89	1.81	1.21	1.23	1.24	2.23	1.23	1.95	1.19	1.55
	Vel Min	m/s	1.15	1.04	0.86	1.75	1.18	1.15	1.20	1.84	1.10	1.88	1.15	1.47
	Flow	CFM	11.38657219	10.25263969	8.268257813	16.81999875	11.29207781	11.24483063	11.52831375	19.22960531	11.00859469	18.09567281	11.05584188	14.26865063
	Temp	°C	5.4	20.8	21.8	20.6	24.0	26.7	25.4	22.5	16.7	10.5	11.9	7.7
	Comments		20T -> nc	20T -> nc	20T -> 30T	30T -> 20T	20T -> nc	20T -> nc	20T -> nc	20T -> nc	20T -> no change	20T -> 25T	25T -> no change	25T -> 20T
	H-13	Well	"H <sub>2</sub> O	-2.22	-1.47	-1.26	-1.72	-1.40	-1.44	-0.34	0.19	0.26	-0.13	0.05
Lateral		"H <sub>2</sub> O	-19.52	-14.59	-14.34	-14.30	-12.41	-12.89	-16.71	-53.35	-35.86	-27.61	-9.05	-8.85
CH <sub>4</sub>		%	54.3	55.9	55.5	56.1	55.7	55.1	26.6	55.7	56.1	45.3	55.7	46.2
CO <sub>2</sub>		%	44.7	43.7	44.1	43.6	43.8	44.0	22.9	43.9	43.7	35.3	42.8	43.4
O <sub>2</sub>		%	0.7	0.4	0.4	0.3	0.4	0.3	10.3	0.3	0.3	4.4	1.3	1.1
BAL (N <sub>2</sub> )		%	0.0	0.0	0.0	0.0	0.0	0.6	39.9	0.0	0.0	15.0	0.0	9.3
CO		PPM	814	1432	1336	1375	1320	1174	643	1245	690	604	600	200
H <sub>2</sub> S		PPM	331	409	379	354	382	314	211	>>>>	500	308	338	44
Vel Max		m/s	3.00	2.87	2.80	2.94	2.74	2.97	3.12	1.14	0.45	2.15	1.15	1.47
Vel Min		m/s	2.76	2.81	2.64	2.84	2.44	2.63	2.93	0.98	0.00	2.03	1.09	1.38
Flow		CFM	27.21438	26.8364025	25.70247	27.30887438	24.47404313	26.458425	28.58454844	10.01640375	2.126123438	19.74932438	10.58337	13.46544844
Temp		°C	15.5	24.2	24.6	25.3	25.1	25.3	25.6	21.6	14.0	15.6	9.2	7.8
Comments			no change	no change	no change	no change	no change	no change	1/4T -> closed	closed -> cracked	cracked -> 1/4T	1/4T -> no change	1/4T -> no change	1/4T -> no change
H-14 well bore seal		Well	"H <sub>2</sub> O	-0.06	0.14	0.19	-0.24	-0.56	-0.52	-0.22	-0.03	0.22	0.02	0.10
	Lateral	"H <sub>2</sub> O	-18.60	-15.16	-14.55	-14.16	-12.50	-13.12	-13.35	-31.26	-37.67	-27.36	-9.15	-13.02
	CH <sub>4</sub>	%	33.7	56.6	56.2	52.4	50.2	51.9	36.0	33.4	56.6	47.0	55.9	43.8
	CO <sub>2</sub>	%	25.4	43.1	43.5	40.0	39.1	39.8	28.7	25.9	43.1	35.3	43.7	32.7
	O <sub>2</sub>	%	9.6	0.3	0.2	1.4	1.8	1.4	6.3	8.5	0.3	4.1	0.3	6.5
	BAL (N <sub>2</sub> )	%	31.3	0.0	0.0	6.1	8.8	6.9	28.9	32.4	0.0	13.2	0.0	17.7
	CO	PPM	14	35	43	73	80	66	41	53	44	44	37	29
	H <sub>2</sub> S	PPM	17	34	38	26	26	7	9	22	40	25	35	20
	Vel Max	m/s	4.75	2.10	3.01	4.44	5.51	5.58	5.78	4.70	1.92	4.04	2.80	2.14
	Vel Min	m/s	4.23	1.70	2.87	4.14	5.32	5.42	5.59	4.52	1.82	3.88	2.72	1.98
	Flow	CFM	42.42797438	17.95393125	27.78134625	40.53808688	51.16870406	51.97190625	53.72005219	43.56190688	17.67044813	37.4197725	26.0804475	19.46584125
	Temp	°C	16.3	23.9	25.7	24.0	26.0	28.5	29.0	23.3	20.6	21.6	16.8	9.4
	Comments		closed 1/4T	opened 1/4T more	opened 1/4T more	opened 1/4T more	no change	opened 1/4T more	closed 1/2T	closed 1/4T	opened 1/4T more	1/4T -> no change	1/4T -> no change	1/4T -> cracked

Table 2: Wellfield Monitoring Data

	Units	30-Jan-17	27-Feb-17	30-Mar-17	28-Apr-17	29-May-17	27-Jun-17	28-Aug-17	15-Sep-17	19-Sep-17	25-Oct-17	9-Nov-17	6-Dec-17	
2-15	Well	"H <sub>2</sub> O	-3.32	-4.43	-2.67	-2.77	-2.64	-2.28	-0.04	0.09	0.14	0.10	0.05	0.05
	Lateral	"H <sub>2</sub> O	-19.76	-14.32	-14.33	-14.02	-12.70	-13.10	-13.39	-31.76	-36.83	-27.00	-9.40	-8.92
	CH <sub>4</sub>	%	50.6	42.8	44.0	45.0	43.9	44.7	57.1	56.0	56.0	56.0	56.0	55.9
	CO <sub>2</sub>	%	41.1	35.1	35.8	36.8	36.7	37.4	11.7	42.5	40.5	19.9	43.6	43.6
	O <sub>2</sub>	%	0.6	0.4	0.3	0.4	0.5	0.4	14.7	0.3	1.2	11.8	0.3	0.4
	BAL (N <sub>2</sub> )	%	7.6	21.6	19.7	17.8	18.9	17.5	60.1	0.0	2.1	42.2	0.0	0.0
	CO	PPM	177	215	252	356	321	274	62	57	55	156	46	39
	H <sub>2</sub> S	PPM	22	19	26	33	33	24	2	44	29	15	32	27
	Vel Max	m/s	6.06	6.90	4.84	5.01	5.22	4.81	3.53	0.44	1.12	1.52	0.64	0.00
	Vel Min	m/s	5.74	6.60	4.51	4.68	5.01	4.57	3.26	0.00	0.86	1.15	0.49	0.00
	Flow	CFM	55.75168125	63.78370313	44.17612031	45.78252469	48.33387281	44.31786188	32.08084031	2.07887625	9.354943125	12.61499906	5.338932188	0
	Temp	°C	11.7	17.4	19.4	21.1	19.1	20.8	22.9	16.9	15.0	10.4	3.6	17.7
	Comments		opened 1/4T more	closed 1/4T	no change	no change	closed 1/4T	no change	closed 3/4T	closed -> cracked	cracked -> no change	cracked -> closed	closed -> cracked	cracked -> 1/4T
	2-16	Well	"H <sub>2</sub> O	-0.86	-0.43	-0.21	-0.63	-0.06	-0.09	-0.44	-2.61	-0.49	-8.14	0.65
Lateral		"H <sub>2</sub> O	-18.10	-14.07	-13.91	-13.53	-11.45	-12.73	-32.97	-34.95	-39.95	-13.66	-8.75	-8.97
CH <sub>4</sub>		%	33.0	49.1	51.4	46.5	53.9	55.3	55.3	43.1	49.0	23.5	56.6	56.3
CO <sub>2</sub>		%	25.5	38.0	39.5	36.7	40.6	41.0	41.0	36.4	38.7	23.2	43.3	43.4
O <sub>2</sub>		%	8.9	1.4	1.0	1.6	0.8	0.6	0.8	1.8	1.2	6.8	0.2	0.3
BAL (N <sub>2</sub> )		%	32.6	11.6	8.1	15.2	4.7	3.1	2.9	18.8	10.9	46.5	0.0	0.0
CO		PPM	35	178	139	158	180	197	227	163	118	121	99	56
H <sub>2</sub> S		PPM	15	57	35	35	48	63	69	65	42	14	53	92
Vel Max		m/s	7.96	5.83	5.79	5.61	5.48	5.88	6.77	12.22	7.22	29.72	2.09	1.80
Vel Min		m/s	7.47	5.66	5.56	5.51	5.36	5.60	6.34	11.86	7.02	28.65	2.00	1.78
Flow		CFM	72.90241031	54.28701844	53.62555781	52.5388725	51.21595125	54.23977125	61.94106281	113.7712275	67.279995	275.7818334	19.32409969	16.91449313
Temp		°C	14.7	24.5	22.7	24.6	22.3	22.5	24.6	24.6	21.4	23.9	7.3	14.5
Comments			closed 1/4T	no change	no change	no change	no change	opened 1/4T more	opened 1/4T more	closed 1/2T	3/4T -> full	full -> closed	closed -> 1/4T	1/4T -> 1T
2-17		Well	"H <sub>2</sub> O	-0.93	-2.59	-2.29	-2.50	-3.13	-3.90	-1.31	0.11	-0.05	0.80	0.62
	Lateral	"H <sub>2</sub> O	-19.11	-14.45	-13.96	-13.66	-12.86	-13.49	-9.08	-32.63	-21.87	-27.73	-8.89	-8.98
	CH <sub>4</sub>	%	49.5	51.6	52.1	53.3	54.2	53.3	34.2	57.8	0.0	57.4	57.0	52.5
	CO <sub>2</sub>	%	34.6	38.8	31.4	39.5	39.9	38.0	26.6	41.8	0.5	42.4	42.5	36.7
	O <sub>2</sub>	%	4.4	0.4	0.4	0.4	0.5	0.7	7.2	0.4	20.3	0.2	0.2	3.0
	BAL (N <sub>2</sub> )	%	11.5	9.3	8.1	6.8	5.3	8.0	32.1	0.0	79.2	0.0	0.0	7.8
	CO	PPM	2	35	30	40	35	27	37	52	16	48	17	21
	H <sub>2</sub> S	PPM	2	9	9	10	8	0	0	21	0	10	13	6
	Vel Max	m/s	2.82	2.79	3.90	3.59	4.66	5.21	5.47	0.00	0.44	1.87	0.96	0.77
	Vel Min	m/s	2.67	2.64	3.79	3.39	4.43	5.02	5.11	0.00	0.00	1.61	0.90	0.44
	Flow	CFM	25.93870594	25.65522281	36.33308719	32.97853688	42.94769344	48.33387281	49.98752438	0	2.07887625	16.44202125	8.787976875	5.716909688
	Temp	°C	11.5	18.8	20.0	22.3	20.4	20.7	23.3	17.3	16.2	8.3	6.6	12.4
	Comments		no change	opened 1/4T more	no change	opened 1/4T more	opened 1/4T more	no change	1.75T -> closed	closed -> cracked	cracked -> closed	closed -> 1/4T	1/4T -> 1/2T	1/2T -> no change
	2-18	Well	"H <sub>2</sub> O	-0.06	-7.54	-6.97	-7.44	-3.92	-2.78	-1.51	-4.17	-10.29	0.30	0.05
Lateral		"H <sub>2</sub> O	-0.06	-12.17	-11.78	-13.08	-9.93	-10.13	-8.57	-44.55	-17.08	-28.40	-8.97	-9.00
CH <sub>4</sub>		%	26.3	43.0	25.0	23.7	25.7	39.2	36.5	35.1	17.8	59.7	57.1	53.0
CO <sub>2</sub>		%	17.0	34.7	25.7	24.6	26.1	31.4	30.8	30.6	20.5	40.0	42.7	38.0
O <sub>2</sub>		%	13.3	3.6	3.3	4.2	3.2	2.4	3.8	2.4	5.7	0.2	0.2	2.2
BAL (N <sub>2</sub> )		%	43.4	18.7	46.0	47.5	45.0	27.1	30.4	30.4	55.9	0.0	0.0	6.7
CO		PPM	0	154	172	221	183	177	167	199	254	26	96	201
H <sub>2</sub> S		PPM	4	22	28	31	33	29	4	40	19	156	80	61
Vel Max		m/s	-	16.55	16.68	17.75	13.85	8.57	6.82	14.84	30.46	3.76	1.82	2.25
Vel Min		m/s	-	16.26	16.20	17.19	13.25	8.36	6.51	14.23	29.51	3.62	1.68	2.16
Flow		CFM	#VALUE!	155.0180222	155.3487525	165.0816731	128.0398781	79.98948844	62.98050094	137.3475741	283.3413834	34.86842438	16.53651563	20.83600969
Temp		°C	-	44.2	45.1	46.2	45.3	45.5	45.5	45.0	45.0	20.7	31.4	36.6
Comments			frozen	closed 1/2T	closed 1T	closed 1/2T	closed 1T	no change	closed 1/4T	opened 5T more	7T -> closed	closed -> 1/4T	1/4T -> 1/2T	1/2T -> no change
3-19		Well	"H <sub>2</sub> O	-1.05	0.21	-0.54	-2.25	-0.83	-0.98	-1.29	-1.38	0.13	-0.25	1.28
	Lateral	"H <sub>2</sub> O	-16.30	-13.74	-13.05	-14.58	-12.70	-13.56	-12.32	-44.02	-47.33	-20.48	-9.68	-10.94
	CH <sub>4</sub>	%	43.5	57.8	57.5	52.0	56.0	56.9	41.5	38.4	57.2	48.7	56.3	56.1
	CO <sub>2</sub>	%	31.4	41.8	41.5	37.3	39.9	40.5	31.2	29.3	42.4	35.5	43.3	43.1
	O <sub>2</sub>	%	6.4	0.3	0.9	2.7	1.5	0.5	4.8	5.6	0.3	3.8	0.2	0.5
	BAL (N <sub>2</sub> )	%	18.7	0.0	0.0	8.0	2.6	2.1	22.5	26.7	0.0	12.1	0.0	0.0
	CO	PPM	5	13	15	13	16	17	28	16	19	12	18	0
	H <sub>2</sub> S	PPM	41	58	59	50	54	68	29	32	74	50	115	72
	Vel Max	m/s	5.48	4.07	4.80	5.21	5.35	5.55	5.65	7.05	4.09	6.11	2.23	3.58
	Vel Min	m/s	5.31	3.95	4.61	5.06	5.25	5.39	5.53	6.60	3.87	5.94	2.12	3.45
	Flow	CFM	50.97971531	37.89224438	44.45960344	48.52286156	50.08201875	51.68842313	52.82235563	64.49241094	37.60876125	56.93286094	20.55252656	33.21477281
	Temp	°C	11.2	17.6	17.9	16.8	18.7	19.6	19.7	21.4	13.8	15.9	11.9	11.2
	Comments		closed 1/4T	opened 1/4T more	no change	no change	opened 1/4T more	opened 1/4T more	closed 1/2T	closed 1/4T	opened 1/2T more	1/2T -> 1/4T	1/4T -> 1/4T	1/2T -> 3/4T

Table 2: Wellfield Monitoring Data

	Units	30-Jan-17	27-Feb-17	30-Mar-17	28-Apr-17	29-May-17	27-Jun-17	28-Aug-17	15-Sep-17	19-Sep-17	25-Oct-17	9-Nov-17	6-Dec-17	
3-20	Well	"H <sub>2</sub> O	-15.15	-12.70	-12.78	-13.91	-11.17	-12.49	-8.04	-0.76	0.32	-0.14	0.75	0.94
	Lateral	"H <sub>2</sub> O	-15.74	-13.17	-13.45	-14.13	-11.88	-13.01	-10.26	-19.01	-50.79	-19.84	-9.19	-11.57
	CH <sub>4</sub>	%	55.3	56.4	55.8	55.9	55.8	56.1	55.8	56.1	55.6	47.8	54.7	54.7
	CO <sub>2</sub>	%	43.9	43.2	44.2	43.7	43.8	43.2	15.5	26.3	44.0	37.1	45.1	44.8
	O <sub>2</sub>	%	0.6	0.4	0.3	0.4	0.4	0.5	12.4	7.6	0.3	3.7	0.2	0.3
	BAL (N <sub>2</sub> )	%	0.0	0.0	0.0	0.0	0.0	0.2	52.8	33.2	0.0	11.4	0.0	0.0
	CO	PPM	50	125	151	152	171	134	62	109	100	138	112	77
	H <sub>2</sub> S	PPM	6	8	11	16	12	15	13	9	12	29	11	4
	Vel Max	m/s	9.71	8.62	8.68	7.36	8.45	8.81	19.90	8.80	2.98	5.30	2.41	2.04
	Vel Min	m/s	9.44	8.34	8.30	6.98	7.97	8.27	19.36	8.64	2.68	5.16	2.31	1.95
	Flow	CFM	90.47836406	80.13123	80.22572438	67.75246688	77.57988188	80.69819625	185.4924581	82.399095	26.74190813	49.42055813	22.3006725	18.85162781
	Temp	°C	9.0	12.0	12.2	12.2	12.6	12.3	11.5	14.7	9.4	10.1	8.4	3.3
	Comments		well open full	well open full	well open full	well open full	well open full	well open full	open full -> 3/4T	closed 1/2T	1/4T -> 3/4T	1/2T -> 1/4T	1/4T -> 1-1/2T	3/4T -> no change
	3-21	Well	"H <sub>2</sub> O	0.22	1.22	0.85	0.22	0.74	0.56	0.26	0.54	0.64	0.27	0.32
Lateral		"H <sub>2</sub> O	-16.79	-14.38	-14.56	-15.26	-12.74	-13.57	-14.95	-47.92	-48.60	-21.18	-9.06	-11.10
CH <sub>4</sub>		%	55.0	56.1	55.1	55.6	55.5	55.4	55.7	54.9	54.9	54.3	54.3	54.8
CO <sub>2</sub>		%	44.4	43.5	44.5	44.0	44.1	44.0	44.1	43.9	44.6	45.3	45.3	44.9
O <sub>2</sub>		%	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.4	0.3
BAL (N <sub>2</sub> )		%	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.8	0.0	0.0	0.0	0.0
CO		PPM	10	17	19	11	11	15	14	15	26	13	14	0
H <sub>2</sub> S		PPM	46	30	36	51	43	52	62	50	40	39	42	20
Vel Max		m/s	-	-	-	-	-	-	-	0.00	-	-	-	-
Vel Min		m/s	-	-	-	-	-	-	-	0.00	-	-	-	-
Flow		CFM	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Temp		°C	-	-	-	-	-	-	-	25.8	-	-	-	-
Comments			well closed	well closed	well closed	well closed	well closed	well closed	well closed	sed -> cracked -> closed	closed -> 1/4T -> closed	closed -> cracked -> closed	closed -> no change	closed -> no change
3-22		Well	"H <sub>2</sub> O	-0.16	0.01	0.04	-0.08	0.43	0.21	0.38	-0.21	0.56	-0.14	-1.22
	Lateral	"H <sub>2</sub> O	-16.38	-15.11	-15.47	-15.40	-12.46	-13.21	-14.92	-33.73	51.46	-20.56	-8.92	-10.14
	CH <sub>4</sub>	%	42.3	46.5	57.4	31.0	56.9	57.2	58.1	37.2	0.0	57.4	56.2	43.2
	CO <sub>2</sub>	%	30.2	33.3	42.2	22.3	42.6	41.9	41.2	28.6	0.4	42.3	39.6	32.6
	O <sub>2</sub>	%	7.3	4.9	0.3	10.0	0.4	0.4	0.3	5.8	20.6	0.2	2.1	3.7
	BAL (N <sub>2</sub> )	%	20.3	15.3	0.0	37.1	0.0	0.5	0.5	28.5	79.1	0.0	2.5	20.5
	CO	PPM	13	12	28	11	38	33	20	14	10	14	39	73
	H <sub>2</sub> S	PPM	452	482	>>>>	366	>>>>	>>>>	>>>>	>>>>	6	>>>>	>>>>	237
	Vel Max	m/s	2.00	1.46	1.44	1.51	0.64	0.42	0.00	0.79	-	3.23	2.06	1.72
	Vel Min	m/s	1.86	1.34	1.35	1.43	0.50	0.00	0.00	0.72	-	3.06	1.88	1.60
	Flow	CFM	18.23741438	13.2292125	13.18196531	13.89067313	5.386179375	1.984381875	0	7.134325313	#VALUE!	29.71848094	18.61539188	15.68606625
	Temp	°C	11.3	17.1	24.7	22.3	20.9	20.1	17.6	22.2	-	18.5	17.1	12.9
	Comments		no change	no change	no change	closed 1/4T	no change	no change	no change	1/4T -> closed	well closed	closed -> 1/2T	1/2T -> no change	1/2T -> no change
	3-23	Well	"H <sub>2</sub> O	1.74	1.63	3.17	-12.72	-10.91	-12.29	-1.05	0.02	0.09	0.87	-0.04
Lateral		"H <sub>2</sub> O	-16.57	-15.74	-14.79	-14.59	-11.81	-12.43	-6.04	-32.10	-49.50	-21.64	-15.14	-9.70
CH <sub>4</sub>		%	57.2	58.9	58.3	49.5	49.4	48.4	4.8	58.1	57.7	57.7	32.9	19.4
CO <sub>2</sub>		%	42.4	40.6	41.5	37.9	38.0	37.9	3.8	41.5	41.1	42.0	22.9	13.2
O <sub>2</sub>		%	0.3	0.4	0.2	0.9	0.8	1.3	18.0	0.3	0.9	0.3	10.2	15.4
BAL (N <sub>2</sub> )		%	0.0	0.0	0.0	11.5	11.8	12.5	73.3	0.0	0.3	0.0	34.1	52.0
CO		PPM	12	215	217	16	15	9	10	14	13	13	10	6
H <sub>2</sub> S		PPM	438	227	220	66	77	62	17	317	270	347	89	18
Vel Max		m/s	-	-	-	5.18	5.58	7.41	16.43	0.42	1.48	3.69	2.86	0.98
Vel Min		m/s	-	-	-	4.97	5.37	7.23	16.04	0.43	3.63	2.79	0.88	
Flow		CFM	#VALUE!	#VALUE!	#VALUE!	47.95589531	51.73567031	69.1698825	153.4116178	1.984381875	13.74893156	34.58494125	26.69466094	8.787976875
Temp		°C	-	-	-	27.7	27.8	26.2	22.1	20.3	22.7	22.7	15.3	13.7
Comments			wellhead broken	wellhead broken	wellhead broken	2T -> 2.5T	2.5T -> 3T	3T -> nc	3T -> closed	closed -> cracked	icked -> 1/4T -> crack	closed -> 1/2T	1/2T -> 1/4T	1/4T -> closed
3-24		Well	"H <sub>2</sub> O	0.11	0.12	0.05	0.01	0.06	-0.12	0.02	0.01	0.09	0.12	-0.53
	Lateral	"H <sub>2</sub> O	-16.53	-15.51	-15.74	-15.28	-12.32	-13.63	-12.97	-33.18	-50.61	-21.19	-9.31	-9.91
	CH <sub>4</sub>	%	55.8	53.7	56.5	0.1	56.4	57.0	55.8	43.7	0.0	56.2	54.7	9.9
	CO <sub>2</sub>	%	43.7	39.2	43.2	0.3	43.1	42.9	42.7	34.2	0.1	43.6	45.0	7.4
	O <sub>2</sub>	%	0.4	2.1	0.3	20.8	0.4	0.1	0.3	4.1	20.6	0.2	0.3	18.3
	BAL (N <sub>2</sub> )	%	0.0	5.0	0.0	78.8	0.0	0.0	1.2	17.8	79.2	0.0	0.0	64.2
	CO	PPM	50	25	102	8	162	185	329	44	10	73	273	37
	H <sub>2</sub> S	PPM	380	145	354	14	397	483	366	403	11	365	460	55
	Vel Max	m/s	-	-	-	-	-	-	-	-	-	1.47	0.78	-
	Vel Min	m/s	-	-	-	-	-	-	-	-	-	1.30	0.73	-
	Flow	CFM	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	13.08747094	7.134325313	#VALUE!
	Temp	°C	-	-	-	-	-	-	-	-	-	13.5	10.8	-
	Comments		well closed	well closed	well closed	well closed	well closed	well closed	well closed	well closed	well closed	closed -> 1/4T	1/4T -> 1/2T	1/2T -> closed

Table 2: Wellfield Monitoring Data

	Units	30-Jan-17	27-Feb-17	30-Mar-17	28-Apr-17	29-May-17	27-Jun-17	28-Aug-17	15-Sep-17	19-Sep-17	25-Oct-17	9-Nov-17	6-Dec-17	
3-25	Well	"H <sub>2</sub> O	-15.67	-14.34	-15.00	-14.74	-12.09	-13.19	-12.66	-32.19	-46.10	-19.42	-15.03	-9.95
	Lateral	"H <sub>2</sub> O	-16.23	-14.86	-15.54	-15.28	-12.39	-13.80	-12.90	-33.84	-48.48	-19.93	-15.28	-9.99
	CH <sub>4</sub>	%	51.5	49.0	46.6	47.2	46.7	46.2	48.1	46.2	34.3	45.0	51.7	48.2
	CO <sub>2</sub>	%	40.3	39.7	38.6	39.2	39.2	40.3	40.4	40.2	35.2	39.3	40.0	39.7
	O <sub>2</sub>	%	0.7	0.4	0.4	0.4	0.4	0.7	0.4	0.3	0.4	0.2	0.3	0.4
	BAL (N <sub>2</sub> )	%	7.5	10.8	14.3	13.2	13.7	10.9	11.1	13.2	30.1	15.4	11.4	8.2
	CO	PPM	11	12	10	14	12	12	17	15	14	19	11	2
	H <sub>2</sub> S	PPM	49	36	49	41	41	53	32	61	15	47	50	1
	Vel Max	m/s	9.71	8.66	9.00	8.75	8.48	8.71	8.34	15.45	20.59	11.59	11.41	5.62
	Vel Min	m/s	9.26	8.40	8.50	8.05	8.13	8.32	7.78	15.00	20.18	11.01	5.79	5.33
	Flow	CFM	89.62791469	80.60370188	82.68257813	79.375275	78.47757844	80.46196031	76.16246625	143.8676859	192.6267834	106.7786438	81.2651625	51.73567031
	Temp	°C	22.0	22.6	24.8	24.5	24.0	26.3	29.0	26.0	27.2	27.0	27.0	25.4
	Comments		well open full	well open full	well open full	well open full	well open full	well open full	well open full	well full open	well open full	full -> no change	full -> no change	full -> no change
	3-26	Well	"H <sub>2</sub> O	-19.07	-15.08	-13.86	-14.53	-12.91	-14.63	-12.80	-35.68	-39.94	-21.11	-8.07
Lateral		"H <sub>2</sub> O	-19.10	-15.15	-14.96	-14.61	-13.06	-14.69	-12.88	-35.95	-39.94	-21.30	-8.36	-12.20
CH <sub>4</sub>		%	57.7	56.8	57.9	57.9	58.0	57.5	53.5	50.7	51.0	51.6	56.1	51.7
CO <sub>2</sub>		%	41.2	40.4	41.3	41.3	41.2	40.7	40.2	39.2	37.8	37.8	39.4	37.0
O <sub>2</sub>		%	1.0	1.2	0.8	0.8	0.8	0.9	0.7	1.2	2.0	2.4	1.8	3.4
BAL (N <sub>2</sub> )		%	0.0	1.0	0.0	0.0	0.0	1.0	5.5	8.8	9.2	8.3	2.7	7.9
CO		PPM	0	13	14	12	13	10	18	17	13	13	3	16
H <sub>2</sub> S		PPM	81	59	61	62	64	59	75	59	53	80	83	78
Vel Max		m/s	2.71	2.79	3.18	2.86	2.93	3.00	2.02	2.79	2.61	2.38	1.60	1.83
Vel Min		m/s	2.47	2.70	3.04	2.74	2.76	2.81	1.94	2.47	2.35	2.04	1.38	1.29
Flow		CFM	24.47404313	25.93870594	29.38775063	26.458425	26.88364969	27.45061594	18.70988625	24.85202063	23.434605	20.88325688	14.07966188	14.7411225
Temp		°C	13.5	19.5	20.4	23.8	20.2	22.1	31.4	25.8	20.2	17.6	12.9	4.1
Comments			well open full	well open full	well open full	well open full	well open full	well open full	well full open	well full open	full -> no change	full -> 2T	2T -> no change	2T -> no change
3-27 DP		Well	"H <sub>2</sub> O	-15.96	-15.22	-14.68	-15.20	-12.21	-13.68	-10.50	-2.75	0.11	-0.22	0.29
	Lateral	"H <sub>2</sub> O	-16.18	-15.22	-14.82	-15.11	-12.23	-13.72	-10.62	-19.34	-51.17	-20.09	-15.46	-9.73
	CH <sub>4</sub>	%	56.6	55.8	56.7	56.4	56.6	55.7	45.5	7.0	55.6	22.2	55.8	21.2
	CO <sub>2</sub>	%	42.0	43.4	42.7	43.0	43.0	42.1	35.9	5.4	43.8	15.8	43.9	16.2
	O <sub>2</sub>	%	1.3	0.5	0.5	0.5	0.4	0.2	3.2	17.7	0.4	13.0	0.2	13.4
	BAL (N <sub>2</sub> )	%	0.1	0.0	0.0	0.0	0.0	2.0	15.4	70.0	0.0	19.0	0.0	49.5
	CO	PPM	18	16	17	20	18	16	22	10	19	14	15	7
	H <sub>2</sub> S	PPM	55	182	188	162	168	181	125	40	191	33	233	12
	Vel Max	m/s	3.04	2.68	2.15	2.68	2.57	2.40	2.89	25.64	1.05	5.98	2.44	1.15
	Vel Min	m/s	2.63	2.42	1.92	2.40	2.35	2.19	2.53	24.78	0.76	5.73	2.14	1.06
	Flow	CFM	26.78915531	24.09606563	19.22960531	24.00157125	23.24561625	21.68645906	25.60797563	238.2203194	8.551740938	55.32645656	21.63921188	10.44162844
	Temp	°C	20.6	25.4	30.0	29.6	30.2	33.0	32.9	19.2	21.3	21.6	22.6	17.4
	Comments		opened 1/2T more	no change	no change	no change	no change	no change	closed 3T	2.5T -> closed	opened 1/4T more	1/4T -> closed	closed -> cracked	cracked -> closed
	3-28	Well	"H <sub>2</sub> O	0.00	-0.05	0.04	-0.06	-0.03	-0.17	-0.06	-0.37	-0.07	0.19	0.17
Lateral		"H <sub>2</sub> O	-18.79	-14.88	-14.82	-14.28	-12.93	-13.98	-12.91	-33.51	-39.54	-21.39	-8.07	-12.09
CH <sub>4</sub>		%	52.4	57.4	57.2	58.0	57.6	57.2	54.4	39.3	57.4	56.9	56.7	44.6
CO <sub>2</sub>		%	37.2	41.9	42.5	41.4	42.1	42.0	39.7	28.9	42.2	42.8	43.1	32.0
O <sub>2</sub>		%	3.1	0.5	0.3	0.6	0.3	0.1	1.1	7.0	0.3	0.3	0.2	6.3
BAL (N <sub>2</sub> )		%	7.4	0.0	0.0	0.0	0.0	0.7	4.6	24.8	0.0	0.0	0.0	17.5
CO		PPM	28	49	55	70	70	54	58	47	46	45	41	35
H <sub>2</sub> S		PPM	77	81	93	94	103	132	93	83	110	136	120	74
Vel Max		m/s	4.12	3.78	4.00	4.04	3.58	4.11	3.46	4.96	3.63	2.62	2.60	3.69
Vel Min		m/s	3.64	3.40	3.65	3.75	3.15	3.92	2.88	4.65	3.49	2.51	2.18	3.55
Flow		CFM	36.6638175	33.92348063	36.14409844	36.80555906	31.79735719	37.93949156	29.95471688	45.40454719	33.6399975	24.23780719	22.58415563	34.20696375
Temp		°C	14.3	20.5	21.3	25.1	22.1	24.2	31.8	20.0	20.0	16.6	15.2	10.1
Comments			no change	no change	no change	no change	no change	no change	3/4T -> nc	3/4T -> 1/2T	med 1/4T -> closed 1	1/4T -> 1/2T	1/2T -> 3/4T	3/4T -> 1/2T
3-29 DP		Well	"H <sub>2</sub> O	-13.48	-8.85	-4.64	-1.56	-0.78	-0.98	-2.27	-3.07	1.98	-2.26	0.63
	Lateral	"H <sub>2</sub> O	-18.81	-14.91	-15.03	-14.87	-13.07	-14.55	-13.00	-33.92	-40.81	-20.74	-8.44	-12.25
	CH <sub>4</sub>	%	51.8	49.6	52.1	52.2	55.8	56.1	32.9	21.7	58.6	33.8	58.0	50.7
	CO <sub>2</sub>	%	35.9	34.7	36.3	35.9	37.9	39.2	16.9	24.6	41.1	25.7	41.7	33.9
	O <sub>2</sub>	%	2.9	3.6	2.8	2.8	2.0	1.7	7.3	10.6	0.3	6.6	0.3	4.2
	BAL (N <sub>2</sub> )	%	9.3	12.1	8.8	9.1	4.3	3.1	35.2	50.9	0.0	33.8	0.0	10.7
	CO	PPM	0	12	13	11	12	10	15	16	14	12	0	16
	H <sub>2</sub> S	PPM	165	104	119	113	129	160	57	32	136	98	179	117
	Vel Max	m/s	4.38	4.75	5.20	3.47	3.47	3.99	2.76	5.26	1.01	3.22	0.96	1.44
	Vel Min	m/s	4.15	4.35	5.06	3.42	3.27	3.78	2.68	5.11	0.90	3.12	0.84	1.34
	Flow	CFM	40.30185094	42.99494063	48.47561438	32.55331219	31.84460438	36.71106469	25.70247	48.99533344	9.024212813	29.95471688	8.50449375	13.13471813
	Temp	°C	22.4	28.0	28.3	30.7	27.9	28.5	34.6	25.9	17.3	21.8	10.0	4.0
	Comments		no change	closed 1/4T	closed 1/4T	no change	no change	no change	closed 1/4T	1/2T -> closed	closed -> cracked	3/4T -> cracked	cracked -> 1/4T	1/4T -> no change



Table 2: Wellfield Monitoring Data

		Units	30-Jan-17	27-Feb-17	30-Mar-17	28-Apr-17	29-May-17	27-Jun-17	28-Aug-17	15-Sep-17	19-Sep-17	25-Oct-17	9-Nov-17	6-Dec-17	
3-30 DP	Well	"H <sub>2</sub> O	-1.52	-0.46	-1.78	-1.30	-1.85	-2.01	-1.02	-0.94	-0.20	-0.10	-0.05	-0.31	
	Lateral	"H <sub>2</sub> O	-18.87	-14.76	-15.01	-15.14	-12.97	-13.22	-12.07	-33.08	-40.93	-20.69	-8.06	-12.36	
	CH <sub>4</sub>	%	48.6	58.5	49.6	56.7	53.8	41.8	38.7	49.1	54.0	49.1	57.3	52.6	
	CO <sub>2</sub>	%	35.4	40.8	36.7	39.7	37.6	36.1	31.4	29.1	34.9	37.8	39.2	37.2	
	O <sub>2</sub>	%	2.4	0.3	1.8	0.5	1.2	1.4	4.3	5.3	3.3	2.1	1.4	2.6	
	BAL (N <sub>2</sub> )	%	13.6	0.0	12.0	3.2	7.4	10.5	22.6	26.9	13.0	6.1	2.1	7.6	
	CO	PPM	0	0	18	14	14	11	21	21	15	14	1	22	
	H <sub>2</sub> S	PPM	104	137	67	91	79	100	43	59	88	141	120	108	
	Vel Max	m/s	6.97	3.53	6.57	7.25	8.68	8.87	7.65	9.55	5.91	4.36	3.99	3.25	
	Vel Min	m/s	6.89	3.41	6.45	7.05	8.54	8.58	7.35	9.10	5.67	4.22	3.81	3.09	
	Flow	CFM	65.48460188	32.78954813	61.51583813	67.56347813	81.35965688	82.44634219	70.87078125	88.11600469	54.71224313	40.53808688	36.85280625	29.95471688	
	Temp	°C	35.9	31.1	33.1	34.7	33.9	35.4	38.3	34.8	30.8	29.7	28.2	21.8	
	Comments		no change	opened 1/4T more	no change	opened 1/4T more	no change	no change	no change	closed 1/2T	closed 1/4T	no change	1/4T -> no change	1/4T -> no change	1/4T -> no change
	4-31	Well	"H <sub>2</sub> O	-14.18	-11.47	-12.50	-12.90	-10.11	-11.31	-11.26	-28.78	-4.40	-1.44	0.81	0.09
Lateral		"H <sub>2</sub> O	-15.42	-13.05	-13.70	-14.34	-11.81	-12.87	-12.55	-33.70	-45.24	-21.08	-10.27	-8.76	
CH <sub>4</sub>		%	50.1	57.7	56.7	50.5	56.9	55.9	50.5	27.2	57.1	37.3	56.0	56.2	
CO <sub>2</sub>		%	36.5	41.4	42.8	37.0	41.4	40.9	38.5	23.3	42.6	28.0	43.7	43.6	
O <sub>2</sub>		%	4.0	0.8	0.4	2.9	1.0	1.3	1.7	7.3	0.3	7.6	0.3	0.2	
BAL (N <sub>2</sub> )		%	9.5	0.0	0.0	9.6	0.7	1.9	9.1	42.2	0.0	27.1	0.0	0.0	
CO		PPM	9	15	17	15	23	23	20	20	20	11	20	17	
H <sub>2</sub> S		PPM	46	41	47	50	44	40	54	15	69	32	135	82	
Vel Max		m/s	7.44	7.77	8.70	8.21	8.13	9.00	7.83	18.80	6.42	8.38	2.04	2.74	
Vel Min		m/s	6.95	7.48	8.27	7.75	7.82	8.49	7.53	18.35	6.00	8.15	1.88	2.59	
Flow		CFM	67.98870281	72.05196094	80.17847719	75.40651125	75.35926406	82.63533094	72.57168	175.5233016	58.68100688	78.09960094	18.5208975	25.18275094	
Temp		°C	17.9	20.9	21.5	20.4	22.3	23.0	20.6	23.0	21.6	21.0	14.9	12.8	
Comments			closed 1/4T	opened 1/4T more	no change	closed 1/4T	opened 1/4T more	no change	opened 1/2T more	opened 1/2T more	2.25T -> closed	opened 1/2T more	1T -> 1/2T	1/2T -> 1-1/2T	1/2T -> 1T
4-32		Well	"H <sub>2</sub> O	-1.53	0.23	-0.18	0.43	0.60	0.39	1.08	-19.88	0.31	-13.70	0.12	-2.33
	Lateral	"H <sub>2</sub> O	-16.99	-14.17	-14.74	-15.32	-12.75	-13.49	-13.18	-35.15	-43.20	-23.18	-10.66	-8.83	
	CH <sub>4</sub>	%	55.6	56.1	55.4	55.7	55.6	54.7	55.2	20.3	55.5	37.9	55.0	55.0	
	CO <sub>2</sub>	%	43.5	43.5	44.1	43.9	43.9	43.2	43.7	17.4	44.3	29.7	44.8	44.8	
	O <sub>2</sub>	%	0.6	0.3	0.3	0.4	0.4	0.5	0.3	10.9	0.2	7.1	0.3	0.2	
	BAL (N <sub>2</sub> )	%	0.0	0.0	0.0	0.0	0.0	1.7	0.8	51.3	0.0	25.3	0.0	0.0	
	CO	PPM	1	12	13	12	13	12	18	13	15	9	16	13	
	H <sub>2</sub> S	PPM	383	309	319	334	320	446	285	53	275	125	274	226	
	Vel Max	m/s	0.89	0.89	0.98	1.11	0.87	1.01	1.03	6.35	1.90	4.44	2.23	2.60	
	Vel Min	m/s	0.67	0.80	0.88	1.07	0.84	0.93	0.63	6.12	1.79	4.37	2.12	2.51	
	Flow	CFM	7.37056125	7.984774688	8.787976875	10.29988688	8.079269063	9.165954375	7.843033125	58.91724281	17.43421219	41.62477219	20.55252656	24.14331281	
	Temp	°C	10.9	22.1	25.5	20.6	25.5	25.7	37.4	23.1	12.5	15.8	12.6	10.5	
	Comments		no change	no change	no change	no change	no change	no change	opened 3/4T more	closed 3/4T	opened 1/2T more	3/4T -> 1/2T	1/2T -> 1T	1T -> 2T	
	4-33	Well	"H <sub>2</sub> O	-0.08	0.15	-0.25	-0.03	0.27	-0.01	0.06	-0.03	0.09	0.22	-0.11	0.38
Lateral		"H <sub>2</sub> O	-15.73	-15.08	-14.07	-14.85	-12.61	-13.63	-10.09	-24.13	-50.51	-21.96	-14.34	-8.39	
CH <sub>4</sub>		%	47.2	57.0	50.4	53.7	57.4	56.9	50.1	32.0	41.5	56.9	48.2	45.5	
CO <sub>2</sub>		%	33.8	40.4	36.2	38.3	42.2	42.0	37.3	23.9	31.0	42.7	34.1	34.4	
O <sub>2</sub>		%	5.3	1.4	3.2	2.2	0.2	0.1	2.3	8.9	5.7	0.3	4.5	4.0	
BAL (N <sub>2</sub> )		%	13.7	1.1	10.5	5.8	0.0	1.0	10.4	35.2	21.9	0.0	13.2	16.0	
CO		PPM	26	23	27	28	30	42	34	18	21	26	22	10	
H <sub>2</sub> S		PPM	266	287	295	268	321	397	305	226	191	348	241	180	
Vel Max		m/s	5.38	4.37	5.50	4.43	4.30	4.19	4.35	5.95	5.63	3.44	5.79	4.81	
Vel Min		m/s	5.17	4.30	5.31	4.31	4.10	3.97	4.11	5.77	5.47	3.32	5.53	4.54	
Flow		CFM	49.84578281	40.96331156	51.07420969	41.29404188	39.6876375	38.553705	39.97112063	55.37370375	52.44437813	31.93909875	53.48381625	44.17612031	
Temp		°C	20.3	22.0	24.6	24.9	25.0	24.2	28.1	25.2	24.4	23.8	22.3	19.8	
Comments			closed 1/4T	opened 1/4T more	closed 1/4T	no change	opened 1/4T more	opened 1/4T more	no change	1/4T -> cracked	no change	cracked -> 1/2T	1/2T -> 1/4T	1/4T -> cracked	
4-34		Well	"H <sub>2</sub> O	0.31	-0.69	-0.15	-2.75	-3.31	-3.70	-2.09	0.32	1.92	0.80	0.04	0.53
	Lateral	"H <sub>2</sub> O	-16.23	-15.95	-14.90	-15.28	-13.07	-14.21	-9.78	-24.74	-55.46	-21.96	-13.67	-8.14	
	CH <sub>4</sub>	%	49.6	50.4	56.8	57.0	56.4	56.1	26.9	56.3	0.0	38.4	55.7	54.6	
	CO <sub>2</sub>	%	36.5	40.3	42.8	42.2	41.9	42.1	22.4	43.3	0.1	29.5	43.9	43.9	
	O <sub>2</sub>	%	4.3	4.2	0.4	0.6	0.6	0.5	8.8	0.3	19.8	6.5	0.3	0.5	
	BAL (N <sub>2</sub> )	%	9.5	5.1	0.0	0.0	1.1	1.3	42.0	0.0	80.1	25.7	0.0	0.0	
	CO	PPM	19	14	12	17	15	33	16	14	12	14	12	8	
	H <sub>2</sub> S	PPM	>>>>	>>>>	>>>>	>>>>	490	>>>>	255	>>>>	0	>>>>	>>>>	>>>>	
	Vel Max	m/s	1.94	1.86	1.78	2.38	2.88	3.13	4.72	3.13	6.82	2.63	1.03	0.96	
	Vel Min	m/s	1.56	1.75	1.65	2.26	2.76	3.01	4.43	4.43	6.65	2.57	0.98	0.81	
	Flow	CFM	16.53651563	17.05623469	16.20578531	21.922695	26.64741375	29.00977313	43.23117656	#VALUE!	63.64196156	24.5685375	9.496684688	8.362752188	
	Temp	°C	11.8	17.6	26.0	24.7	25.3	25.9	30.5	-	29.0	24.6	6.8	7.2	
	Comments		no change	no change	opened 1/4T more	opened 1/4T more	opened 1/4T more	opened 1/4T more	1T -> closed	-> 1/4T -> cracked ->	closed -> 1/2T	1/2T -> cracked	cracked -> 1/4T	1/4T -> 1/2T	

Table 2: Wellfield Monitoring Data

			30-Jan-17	27-Feb-17	30-Mar-17	28-Apr-17	29-May-17	27-Jun-17	28-Aug-17	15-Sep-17	19-Sep-17	25-Oct-17	9-Nov-17	6-Dec-17	
4-35 well bore seal	Well	"H <sub>2</sub> O	-0.07	-0.38	-0.42	-0.36	0.10	0.07	-0.03	-0.66	-0.42	0.03	-0.02	-1.69	
	Lateral	"H <sub>2</sub> O	-15.96	-15.51	-15.00	-15.38	-13.78	-14.32	-10.42	-24.65	-51.98	-22.42	-14.68	-8.76	
	CH <sub>4</sub>	%	54.7	43.3	44.4	45.3	56.7	55.9	56.8	36.2	44.4	57.2	46.4	46.4	
	CO <sub>2</sub>	%	39.5	32.1	32.9	32.7	42.9	42.4	42.3	27.4	33.4	42.0	43.1	37.5	
	O <sub>2</sub>	%	2.2	5.8	4.9	5.1	0.2	0.3	0.4	7.5	4.7	0.8	0.2	2.5	
	BAL (N <sub>2</sub> )	%	3.5	18.8	17.8	17.0	0.0	1.4	0.4	29.0	17.4	0.0	0.0	13.6	
	CO	PPM	114	39	62	58	59	57	61	28	31	45	44	5	
	H <sub>2</sub> S	PPM	166	166	235	194	271	259	330	277	337	455	441	127	
	Vel Max	m/s	2.92	2.42	2.15	2.41	1.41	1.35	1.66	2.74	2.44	1.63	1.11	1.71	
	Vel Min	m/s	2.68	2.31	1.99	2.34	1.29	1.17	1.50	2.67	2.13	1.59	0.93	1.51	
	Flow	CFM	26.458425	22.34791969	19.56033563	22.44241406	12.75674063	11.90629125	14.93011125	25.56072844	21.59196469	15.21359438	9.63842625	15.21359438	
	Temp	°C	12.7	14.4	22.8	18.2	19.5	21.0	29.6	20.1	14.8	15.3	8.8	8.1	
	Comments		no change	no change	no change	closed 1/4T	no change	no change	opened 1/4T more	1/4T -> cracked	no change	cracked -> no change	cracked -> 1/4T	1/4T -> no change	
	4-36	Well	"H <sub>2</sub> O	-1.71	-2.25	-1.73	-1.87	-0.40	-0.38	-0.08	-0.81	-0.22	0.40	-1.17	-0.86
Lateral		"H <sub>2</sub> O	-14.45	-14.82	-14.50	-14.30	-13.48	-13.97	-9.76	-23.67	-56.12	-21.32	-13.67	-8.45	
CH <sub>4</sub>		%	50.3	48.8	50.3	47.6	54.2	53.4	49.6	35.6	42.4	55.9	45.7	40.8	
CO <sub>2</sub>		%	37.5	37.2	38.2	35.4	40.0	40.2	38.5	27.3	33.1	43.6	34.0	31.8	
O <sub>2</sub>		%	3.4	3.4	2.5	3.9	1.7	1.3	1.9	7.5	5.0	0.4	5.0	6.0	
BAL (N <sub>2</sub> )		%	8.8	10.6	9.1	13.0	4.0	5.0	9.9	29.5	19.4	0.0	15.4	20.7	
CO		PPM	73	44	64	51	48	50	46	22	29	31	21	24	
H <sub>2</sub> S		PPM	322	327	479	326	433	447	492	366	393	>>>>	415	431	
Vel Max		m/s	4.48	4.64	4.73	4.66	3.30	3.21	2.99	4.53	3.98	2.38	4.50	2.90	
Vel Min		m/s	4.13	4.01	4.58	3.69	3.08	3.00	2.76	4.27	3.80	2.03	4.16	2.40	
Flow		CFM	40.67982844	40.86881719	43.98713156	39.45140156	30.14370563	29.34050344	27.16713281	41.577525	36.75831188	20.83600969	40.91606438	25.04100938	
Temp		°C	17.0	21.5	25.8	24.5	24.7	30.5	26.1	24.5	22.8	20.4	17.0	20.4	
Comments			no change	no change	no change	closed 1/4T	no change	no change	no change	closed 1/4T	no change	cracked -> 1/2T	1/2T -> 1/4T	1/4T -> cracked	
4-37		Well	"H <sub>2</sub> O	-0.13	-0.02	0.02	0.00	0.01	0.01	-0.05	-0.03	0.10	0.11	0.10	0.02
	Lateral	"H <sub>2</sub> O	-15.87	-16.04	-14.77	-15.50	-13.94	-14.58	-10.46	-24.06	-52.60	-22.61	-14.80	-8.48	
	CH <sub>4</sub>	%	46.0	35.1	56.7	56.1	57.4	56.3	52.8	35.0	56.9	57.2	57.2	35.4	
	CO <sub>2</sub>	%	33.8	26.2	42.7	39.0	41.2	40.9	40.4	26.0	42.7	42.3	42.5	27.1	
	O <sub>2</sub>	%	4.9	8.3	0.4	2.1	1.1	0.9	0.8	8.1	0.3	0.4	0.3	7.8	
	BAL (N <sub>2</sub> )	%	15.1	30.3	0.0	3.1	0.1	1.9	0.1	5.7	30.9	0.0	0.0	31.3	
	CO	PPM	62	34	49	50	35	41	49	25	24	20	20	21	
	H <sub>2</sub> S	PPM	128	67	240	130	162	62	167	123	469	>>>>	>>>>	63	
	Vel Max	m/s	1.75	1.85	0.96	0.53	1.33	0.42	0.00	1.09	0.44	0.00	0.00	-	
	Vel Min	m/s	1.63	1.75	0.61	0.45	1.14	0.00	0.00	0.88	0.00	0.00	0.00	-	
	Flow	CFM	15.96954938	17.0089875	7.417808438	4.630224375	11.67005531	1.984381875	0	9.307695938	2.07887625	0	0	#VALUE!	
	Temp	°C	11.4	17.1	24.4	19.9	20.4	21.1	29.7	20.2	9.9	11.4	4.2	-	
	Comments		no change	closed 1/4T	no change	no change	no change	no change	no change	1/4T -> closed	closed -> cracked	cracked -> no change	cracked -> 1/4T	1/4T -> closed	
	5-38	Well	"H <sub>2</sub> O	0.58	4.26	0.18	0.78	1.57	0.00	-0.04	-0.03	0.05	0.01	0.20	
Lateral		"H <sub>2</sub> O	-17.15	-14.15	-14.43	-15.21	-13.07	-14.85	-13.11	-19.07	LATERAL 5	-23.29	-10.05	-9.44	
CH <sub>4</sub>		%	56.3	55.4	55.0	55.1	54.7	54.6	49.4	55.8	LATERAL 5	55.1	54.7	55.3	
CO <sub>2</sub>		%	42.4	44.2	44.3	44.5	42.9	42.2	39.0	43.6	CLOSED	44.2	41.4	43.6	
O <sub>2</sub>		%	1.2	0.3	0.7	0.3	1.2	1.6	1.6	0.5	0.4	0.4	1.8	1.0	
BAL (N <sub>2</sub> )		%	0.0	0.0	0.0	0.0	1.0	1.6	8.9	0.0	0.0	0.0	2.8	0.0	
CO		PPM	0	9	10	10	11	17	15	25	25	24	21	11	
H <sub>2</sub> S		PPM	7	128	124	135	126	25	142	33	CONSTRUCTION	99	139	124	
Vel Max		m/s	-	0.00	-	-	-	-	-	-	-	-	-	-	
Vel Min		m/s	-	0.00	-	-	-	-	-	-	-	-	-	-	
Flow		CFM	#VALUE!	0	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0	#VALUE!	#VALUE!	#VALUE!	
Temp		°C	-	21.3	-	-	-	-	-	-	-	-	-	-	
Comments			well closed	losed -> 1/4T -> close	well closed	well closed	well closed	well closed	well closed	well closed	well closed	closed -> no change	closed -> no change	closed -> no change	
5-39		Well	"H <sub>2</sub> O	-16.38	-13.02	-13.84	-14.96	-11.97	-12.66	-12.54	-19.27	-12.70	-9.10	-9.01	
	Lateral	"H <sub>2</sub> O	-15.48	-13.33	-13.78	-15.05	-12.21	-13.26	-12.57	-19.07	LATERAL 5	-22.73	-10.02	-9.28	
	CH <sub>4</sub>	%	55.7	57.2	56.4	56.6	56.4	56.5	56.1	56.5	CLOSED	56.6	56.0	55.6	
	CO <sub>2</sub>	%	43.1	42.5	43.2	43.0	43.2	43.0	42.7	42.9	CLOSED	42.8	43.2	44.0	
	O <sub>2</sub>	%	0.8	0.3	0.4	0.4	0.4	0.5	0.3	0.6	0.7	0.7	0.7	0.3	
	BAL (N <sub>2</sub> )	%	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	FOR	0.0	0.0	0.0	
	CO	PPM	76	170	172	150	193	153	268	131	CONSTRUCTION	154	156	111	
	H <sub>2</sub> S	PPM	50	73	77	74	79	94	111	93	CONSTRUCTION	101	92	74	
	Vel Max	m/s	4.11	4.14	4.30	4.00	4.71	4.71	2.80	2.38	CONSTRUCTION	2.22	2.61	2.11	
	Vel Min	m/s	3.91	3.94	3.95	3.71	3.82	4.12	2.65	2.09	CONSTRUCTION	1.94	1.84	1.91	
	Flow	CFM	37.89224438	38.1757275	38.97892969	36.42758156	36.94730063	41.71926656	25.74971719	21.11949281	0	19.65483	21.02499844	18.99336938	
	Temp	°C	9.9	15.8	17.9	15.7	17.5	18.5	25.4	14.6	closed	13.5	9.8	6.3	
	Comments		well open full	well open full	well open full	well open full	well open full	well open full	well open full	well open full	well open full	closed	full -> 1T	1T -> 4T	4T -> full

Table 2: Wellfield Monitoring Data

Units			30-Jan-17	27-Feb-17	30-Mar-17	28-Apr-17	29-May-17	27-Jun-17	28-Aug-17	15-Sep-17	19-Sep-17	25-Oct-17	9-Nov-17	6-Dec-17
5-40	Well	"H <sub>2</sub> O	0.28	0.34	0.32	0.41	0.32	0.22	0.31	0.72		0.28	-0.21	1.79
	Lateral	"H <sub>2</sub> O	-15.64	-15.06	-14.59	-15.42	-13.00	-14.18	-10.05	-18.55	LATERAL 5	-22.72	-13.59	-8.23
	CH <sub>4</sub>	%	49.9	48.4	51.4	43.6	51.6	55.9	57.0	57.0		56.2	57.4	57.4
	CO <sub>2</sub>	%	36.4	16.4	37.5	32.1	37.6	40.8	41.0	41.5	CLOSED	43.4	21.5	42.2
	O <sub>2</sub>	%	3.9	3.4	2.3	4.9	2.2	0.9	0.5	0.6		0.3	11.2	0.3
	BAL (N <sub>2</sub> )	%	9.8	11.8	8.9	19.3	8.4	2.2	2.3	0.9	FOR	0.0	39.4	0.0
	CO	PPM	20	16	13	18	15	30	20	23		16	11	9
	H <sub>2</sub> S	PPM	197	179	222	142	193	129	295	176	CONSTRUCTION	437	126	>>>>
	Vel Max	m/s	2.80	2.16	1.98	1.79	1.76	1.11	1.42	1.26		1.42	3.29	2.25
	Vel Min	m/s	2.52	2.06	1.85	1.38	1.70	0.89	1.36	1.13		1.23	3.13	2.13
	Flow	CFM	25.13550375	19.93831313	18.09567281	14.97735844	16.34752688	9.4494375	13.13471813	11.29207781	0	12.52050469	30.33269438	20.69426813
	Temp	°C	20.5	20.7	28.4	24.4	26.3	25.5	30.9	21.5		16.3	15.8	6.0
	Comments		no change	no change	no change	no change	no change	no change	opened then closed 1/	no change	closed	1T -> 1-1/2T	1-1/2T -> closed	closed -> 1/2T
	5-41	Well	"H <sub>2</sub> O	-0.84	-0.56	0.35	-0.63	0.17	0.06	0.24	-1.80		-1.78	0.48
Lateral		"H <sub>2</sub> O	-15.09	-15.01	-14.44	-14.32	-12.82	-13.68	-9.56	-16.21	LATERAL 5	-20.54	-13.96	-8.51
CH <sub>4</sub>		%	50.4	58.0	58.3	46.7	57.3	52.3	54.7	34.1		43.8	58.1	56.1
CO <sub>2</sub>		%	35.4	40.8	41.2	32.3	39.4	36.3	38.3	24.4	CLOSED	31.0	41.6	38.0
O <sub>2</sub>		%	4.2	0.9	0.4	4.7	1.3	2.6	1.2	8.4		5.2	0.3	2.6
BAL (N <sub>2</sub> )		%	10.0	0.0	0.0	16.5	1.9	8.7	5.8	33.2	FOR	19.9	0.0	3.3
CO		PPM	55	43	50	49	47	22	33	22		18	18	8
H <sub>2</sub> S		PPM	320	348	385	308	376	>>>>	>>>>	296	CONSTRUCTION	460	>>>>	431
Vel Max		m/s	6.16	5.50	5.24	6.79	5.47	6.54	5.87	10.83		8.10	5.91	5.78
Vel Min		m/s	5.68	5.24	4.59	6.28	5.33	6.31	5.55	10.17		7.68	5.57	5.55
Flow		CFM	55.94067	50.74347938	46.44398531	61.75207406	51.0269625	60.71263594	53.95628813	99.21909375	0	74.55606188	54.23977125	53.53106344
Temp		°C	18.7	23.0	26.9	25.2	26.3	25.0	28.6	22.3		23.4	19.2	19.2
Comments			closed 1/4T	opened 1/4T more	opened 1/4T more	closed 1/4T	opened 1/4T more	no change	opened then closed 1/	closed 3/4T	closed	3/4T -> 1/2T	1/2T -> 3/4T	3/4T -> no change
5-42		Well	"H <sub>2</sub> O	-0.56	-0.82	-0.54	-0.76	-0.69	-0.74	-0.67	-1.26		-1.23	-1.24
	Lateral	"H <sub>2</sub> O	-15.93	-15.72	-14.69	-15.40	-13.88	-14.46	-10.29	-19.52	LATERAL 5	-22.50	-14.87	-7.87
	CH <sub>4</sub>	%	56.1	55.6	56.8	56.1	56.2	54.3	55.8	49.2		56.3	56.2	57.5
	CO <sub>2</sub>	%	42.9	43.0	42.6	42.9	43.2	40.3	41.7	37.0	CLOSED	43.3	43.3	41.0
	O <sub>2</sub>	%	1.0	1.0	0.6	0.7	0.4	1.5	0.7	3.0		0.3	0.3	0.2
	BAL (N <sub>2</sub> )	%	0.0	0.0	0.0	0.0	0.0	3.8	1.9	10.8	FOR	0.0	0.0	1.3
	CO	PPM	386	231	497	313	312	124	247	118		119	116	24
	H <sub>2</sub> S	PPM	263	258	351	285	298	286	381	249	CONSTRUCTION	458	388	67
	Vel Max	m/s	2.90	2.79	2.92	3.24	3.06	3.33	2.45	3.75		3.64	3.30	2.70
	Vel Min	m/s	2.67	2.63	2.79	3.12	2.94	3.14	2.38	3.64		3.49	3.17	2.57
	Flow	CFM	26.31668344	25.60797563	26.97814406	30.04921125	28.3483125	30.56893031	22.82039156	34.91567156	0	33.68724469	30.56893031	24.89926781
	Temp	°C	13.8	16.6	23.0	19.2	19.7	20.0	25.4	19.7		19.1	15.6	14.5
	Comments		20T -> nc	20T -> nc	20T -> nc	20T -> nc	20T -> nc	20T -> nc	20T -> nc	20T -> nc	closed	20T -> 25T	25T -> 30T	30T -> nc
	5-43	Well	"H <sub>2</sub> O										0.19	0.20
Lateral		"H <sub>2</sub> O										-22.19	-10.65	-8.77
CH <sub>4</sub>		%										49.4	58.2	25.9
CO <sub>2</sub>		%										34.2	41.3	17.6
O <sub>2</sub>		%										3.7	0.4	13.4
BAL (N <sub>2</sub> )		%										12.8	0.0	43.3
CO		PPM										20	22	<<<<
H <sub>2</sub> S		PPM										223	194	57
Vel Max		m/s										3.48	1.40	6.93
Vel Min		m/s										3.39	1.31	6.69
Flow		CFM	0	0	0	0	0	0	0	0	0	32.45881781	12.80398781	64.35066938
Temp		°C										13.2	8.7	5.5
Comments												1/4T -> no change	1/4T -> 1T	1T -> 1/2T
5-44		Well	"H <sub>2</sub> O										0.94	0.77
	Lateral	"H <sub>2</sub> O										-23.32	-15.40	-7.31
	CH <sub>4</sub>	%										56.0	55.6	41.8
	CO <sub>2</sub>	%										43.3	43.8	31.9
	O <sub>2</sub>	%										0.5	0.6	7.0
	BAL (N <sub>2</sub> )	%										0.0	0.0	19.2
	CO	PPM										26	32	19
	H <sub>2</sub> S	PPM										>>>>	>>>>	>>>>
	Vel Max	m/s										2.24	2.00	2.74
	Vel Min	m/s										2.15	1.94	2.54
	Flow	CFM	0	0	0	0	0	0	0	0	0	20.74151531	18.61539188	24.946515
	Temp	°C										19.2	13.9	10.5
	Comments											1/4T -> no change	1/4T -> 3/4T	3/4T -> 1/2T

Table 2: Wellfield Monitoring Data

	Units	30-Jan-17	27-Feb-17	30-Mar-17	28-Apr-17	29-May-17	27-Jun-17	28-Aug-17	15-Sep-17	19-Sep-17	25-Oct-17	9-Nov-17	6-Dec-17
5-45	Well "H <sub>2</sub> O										0.09	0.01	0.03
	Lateral "H <sub>2</sub> O										-22.79	-14.72	-7.54
	CH <sub>4</sub> %										48.5	48.9	48.6
	CO <sub>2</sub> %										51.2	50.7	46.4
	O <sub>2</sub> %										0.3	0.4	1.9
	BAL (N <sub>2</sub> ) %										0.0	0.0	2.8
	CO PPM										24	26	15
	H <sub>2</sub> S PPM										215	205	204
	Vel Max m/s										1.07	0.00	0.00
	Vel Min m/s										0.98	0.00	0.00
	Flow CFM	0	0	0	0	0	0	0	0	0	9.685673438	0	0
	Temp °C										12.5	6.2	-7.6
	Comments										closed -> cracked	cracked -> no change	cracked -> no change
5-46	Well "H <sub>2</sub> O										0.09	-0.03	0.04
	Lateral "H <sub>2</sub> O										-23.88	-15.06	-7.68
	CH <sub>4</sub> %										54.0	28.0	34.5
	CO <sub>2</sub> %										45.5	21.4	26.4
	O <sub>2</sub> %										0.3	12.1	10.2
	BAL (N <sub>2</sub> ) %										0.0	38.4	29.0
	CO PPM										36	61	28
	H <sub>2</sub> S PPM										65	46	37
	Vel Max m/s										0.88	0.77	0.80
	Vel Min m/s										0.73	0.73	0.71
	Flow CFM	0	0	0	0	0	0	0	0	0	7.606797188	7.087078125	7.134325313
	Temp °C										13.0	-5.1	-4.0
	Comments										closed -> 1/4T	1/4T -> cracked	cracked -> closed
6-47	Well "H <sub>2</sub> O										-9.41	-9.12	-8.12
	Lateral "H <sub>2</sub> O										-9.68	-8.53	-8.53
	CH <sub>4</sub> %										59.4	58.7	58.7
	CO <sub>2</sub> %										39.1	40.5	40.5
	O <sub>2</sub> %										1.4	0.7	0.7
	BAL (N <sub>2</sub> ) %										0.0	0.0	0.0
	CO PPM										21	<<<<	<<<<
	H <sub>2</sub> S PPM										32	24	24
	Vel Max m/s										0.99	0.00	0.00
	Vel Min m/s										0.44	0.00	0.00
	Flow CFM	0	0	0	0	0	0	0	0	0	6.756347813	0	0
	Temp °C										6.6	6.4	6.4
	Comments										full -> no change	full -> no change	full -> no change
6-48	Well "H <sub>2</sub> O										-8.70	-7.58	-7.58
	Lateral "H <sub>2</sub> O										-9.30	-8.07	-8.07
	CH <sub>4</sub> %										48.3	44.5	44.5
	CO <sub>2</sub> %										31.2	28.8	28.8
	O <sub>2</sub> %										3.2	5.5	5.5
	BAL (N <sub>2</sub> ) %										17.3	21.3	21.3
	CO PPM										21	0	0
	H <sub>2</sub> S PPM										19	1	1
	Vel Max m/s										3.50	1.75	1.75
	Vel Min m/s										1.88	1.66	1.66
	Flow CFM	0	0	0	0	0	0	0	0	0	25.41898688	16.11129094	16.11129094
	Temp °C										16.5	23.0	23.0
	Comments										full -> no change	full -> 1T	full -> 1T
6-49	Well "H <sub>2</sub> O										0.55	0.52	0.52
	Lateral "H <sub>2</sub> O										-14.82	-6.48	-6.48
	CH <sub>4</sub> %										56.4	44.5	44.5
	CO <sub>2</sub> %										43.2	34.6	34.6
	O <sub>2</sub> %										0.3	5.9	5.9
	BAL (N <sub>2</sub> ) %										0.0	15.2	15.2
	CO PPM										70	111	111
	H <sub>2</sub> S PPM										>>>>	>>>>	>>>>
	Vel Max m/s										1.68	3.44	3.44
	Vel Min m/s										1.58	3.04	3.04
	Flow CFM	0	0	0	0	0	0	0	0	0	15.40258313	30.6161775	30.6161775
	Temp °C										10.6	12.1	12.1
	Comments										1/2T -> 1T	1T -> no change	1T -> no change

Table 2: Wellfield Monitoring Data

	Units	30-Jan-17	27-Feb-17	30-Mar-17	28-Apr-17	29-May-17	27-Jun-17	28-Aug-17	15-Sep-17	19-Sep-17	25-Oct-17	9-Nov-17	6-Dec-17
6-50	Well "H <sub>2</sub> O											0.43	0.11
	Lateral "H <sub>2</sub> O											-14.75	-6.27
	CH <sub>4</sub> %											53.0	34.8
	CO <sub>2</sub> %											46.1	29.7
	O <sub>2</sub> %											0.5	8.3
	BAL (N <sub>2</sub> ) %											0.0	27.2
	CO PPM											460	213
	H <sub>2</sub> S PPM											408	59
	Vel Max m/s											0.56	1.41
	Vel Min m/s											0.47	1.26
	Flow CFM	0	0	0	0	0	0	0	0	0	0	4.866460313	12.61499906
	Temp °C											2.3	2.9
	Comments											cracked -> 1/4T	1/4T -> closed
6-51	Well "H <sub>2</sub> O											0.15	0.08
	Lateral "H <sub>2</sub> O											-6.12	-5.95
	CH <sub>4</sub> %											50.8	0.6
	CO <sub>2</sub> %											48.4	0.4
	O <sub>2</sub> %											0.7	21.9
	BAL (N <sub>2</sub> ) %											0.0	77.0
	CO PPM											0	18
	H <sub>2</sub> S PPM											465	43
	Vel Max m/s											0.00	0.00
	Vel Min m/s											0.00	0.00
	Flow CFM	0	0	0	0	0	0	0	0	0	0	0	0
	Temp °C											-10.4	15.9
	Comments											cracked -> no change	cracked -> closed
6-52	Well "H <sub>2</sub> O											0.19	0.29
	Lateral "H <sub>2</sub> O											-6.54	-6.46
	CH <sub>4</sub> %											50.3	62.2
	CO <sub>2</sub> %											28.0	37.2
	O <sub>2</sub> %											5.4	0.5
	BAL (N <sub>2</sub> ) %											16.3	0.0
	CO PPM											<<<<	10
	H <sub>2</sub> S PPM											0	1
	Vel Max m/s											-	0.00
	Vel Min m/s											-	0.00
	Flow CFM	0	0	0	0	0	0	0	0	0	0	#VALUE!	0
	Temp °C											-	-7.1
	Comments											closed -> no change	losed -> cracked -> close
6-53	Well "H <sub>2</sub> O											-1.55	-1.66
	Lateral "H <sub>2</sub> O											-3.04	-3.55
	CH <sub>4</sub> %											44.4	46.4
	CO <sub>2</sub> %											34.0	35.6
	O <sub>2</sub> %											0.3	0.2
	BAL (N <sub>2</sub> ) %											21.2	17.7
	CO PPM											48	33
	H <sub>2</sub> S PPM											>>>>	>>>>
	Vel Max m/s											15.44	12.60
	Vel Min m/s											14.02	11.73
	Flow CFM	0	0	0	0	0	0	0	0	0	0	139.1902144	114.9524072
	Temp °C											34.9	35.7
	Comments											full -> no change	full -> no change
6-54	Well "H <sub>2</sub> O											-0.51	0.01
	Lateral "H <sub>2</sub> O											-4.05	-5.10
	CH <sub>4</sub> %											41.6	50.6
	CO <sub>2</sub> %											29.1	34.2
	O <sub>2</sub> %											6.6	4.6
	BAL (N <sub>2</sub> ) %											22.7	10.4
	CO PPM											0	11
	H <sub>2</sub> S PPM											90	125
	Vel Max m/s											9.39	3.37
	Vel Min m/s											7.46	2.44
	Flow CFM	0	0	0	0	0	0	0	0	0	0	79.61151094	27.45061594
	Temp °C											29.1	15.9
	Comments											2T -> 1T	1T -> 3/4T

Table 2: Wellfield Monitoring Data

	Units	30-Jan-17	27-Feb-17	30-Mar-17	28-Apr-17	29-May-17	27-Jun-17	28-Aug-17	15-Sep-17	19-Sep-17	25-Oct-17	9-Nov-17	6-Dec-17
6-55	Well	"H <sub>2</sub> O										-0.67	-0.58
	Lateral	"H <sub>2</sub> O										-2.07	-2.07
	CH <sub>4</sub>	%										52.8	39.9
	CO <sub>2</sub>	%										40.1	32.3
	O <sub>2</sub>	%										1.1	4.4
	BAL (N <sub>2</sub> )	%										5.8	23.6
	CO	PPM										48	41
	H <sub>2</sub> S	PPM										>>>>	>>>>
	Vel Max	m/s										14.45	14.38
	Vel Min	m/s										13.51	13.05
	Flow	CFM	0	0	0	0	0	0	0	0	0	132.1031363	129.5990353
	Temp	°C										26.6	25.1
	Comments											full -> no change	full -> 2T
	6-56	Well	"H <sub>2</sub> O										0.11
Lateral		"H <sub>2</sub> O										0.12	0.04
CH <sub>4</sub>		%										36.8	59.0
CO <sub>2</sub>		%										31.3	40.4
O <sub>2</sub>		%										0.3	0.4
BAL (N <sub>2</sub> )		%										31.7	0.0
CO		PPM										0	18
H <sub>2</sub> S		PPM										32	>>>>
Vel Max		m/s										-	-
Vel Min		m/s										-	-
Flow		CFM	0	0	0	0	0	0	0	0	0	#VALUE!	#VALUE!
Temp		°C										-	-
Comments												closed -> no change	closed -> no change
6-57		Well	"H <sub>2</sub> O										0.28
	Lateral	"H <sub>2</sub> O										0.28	0.14
	CH <sub>4</sub>	%										31.9	58.2
	CO <sub>2</sub>	%										27.5	41.3
	O <sub>2</sub>	%										2.3	0.4
	BAL (N <sub>2</sub> )	%										38.2	0.0
	CO	PPM										51	14
	H <sub>2</sub> S	PPM										140	198
	Vel Max	m/s										0.00	-
	Vel Min	m/s										0.00	-
	Flow	CFM	0	0	0	0	0	0	0	0	0	0	#VALUE!
	Temp	°C										-7.8	-
	Comments											full -> no change	full -> no change
	6-58	Well	"H <sub>2</sub> O										0.20
Lateral		"H <sub>2</sub> O										0.23	0.07
CH <sub>4</sub>		%										47.5	54.2
CO <sub>2</sub>		%										33.0	34.9
O <sub>2</sub>		%										1.3	3.1
BAL (N <sub>2</sub> )		%										18.2	7.8
CO		PPM										20	9
H <sub>2</sub> S		PPM										6	1
Vel Max		m/s										-	-
Vel Min		m/s										-	-
Flow		CFM	0	0	0	0	0	0	0	0	0	#VALUE!	#VALUE!
Temp		°C										-	-
Comments												1/2T -> no change	1/2T -> no change
6-59		Well	"H <sub>2</sub> O										0.29
	Lateral	"H <sub>2</sub> O										0.26	0.10
	CH <sub>4</sub>	%										53.1	41.3
	CO <sub>2</sub>	%										34.6	27.5
	O <sub>2</sub>	%										3.9	6.9
	BAL (N <sub>2</sub> )	%										8.5	24.3
	CO	PPM										13	8
	H <sub>2</sub> S	PPM										29	0
	Vel Max	m/s										0.00	-
	Vel Min	m/s										0.00	-
	Flow	CFM	0	0	0	0	0	0	0	0	0	0	#VALUE!
	Temp	°C										-0.1	-
	Comments											1/2T -> no change	1/2T -> no change

Table 2: Wellfield Monitoring Data

	Units	30-Jan-17	27-Feb-17	30-Mar-17	28-Apr-17	29-May-17	27-Jun-17	28-Aug-17	15-Sep-17	19-Sep-17	25-Oct-17	9-Nov-17	6-Dec-17
7-60	Well	"H <sub>2</sub> O										-5.72	0.41
	Lateral	"H <sub>2</sub> O										-6.17	-4.27
	CH <sub>4</sub>	%										62.2	62.4
	CO <sub>2</sub>	%										37.2	37.3
	O <sub>2</sub>	%										0.5	0.3
	BAL (N <sub>2</sub> )	%										0.0	0.0
	CO	PPM										20	2
	H <sub>2</sub> S	PPM										71	45
	Vel Max	m/s										1.47	0.76
	Vel Min	m/s										0.51	0.66
	Flow	CFM	0	0	0	0	0	0	0	0	0	9.354943125	6.709100625
	Temp	°C										7.0	1.0
	Comments											full -> no change	full -> no change
	7-61	Well	"H <sub>2</sub> O										0.42
Lateral		"H <sub>2</sub> O										0.18	-4.46
CH <sub>4</sub>		%										52.6	52.5
CO <sub>2</sub>		%										47.0	46.7
O <sub>2</sub>		%										0.4	0.7
BAL (N <sub>2</sub> )		%										0.0	0.0
CO		PPM										529	379
H <sub>2</sub> S		PPM										>>>>	>>>>
Vel Max		m/s										1.64	15.69
Vel Min		m/s										1.54	12.75
Flow		CFM	0	0	0	0	0	0	0	0	0	15.02460563	134.3710013
Temp		°C										1.5	0.5
Comments												full -> no change	full -> no change
7-62		Well	"H <sub>2</sub> O										-1.06
	Lateral	"H <sub>2</sub> O										-1.18	-5.82
	CH <sub>4</sub>	%										55.3	19.0
	CO <sub>2</sub>	%										44.2	13.7
	O <sub>2</sub>	%										0.4	14.0
	BAL (N <sub>2</sub> )	%										0.0	53.3
	CO	PPM										398	51
	H <sub>2</sub> S	PPM										>>>>	289
	Vel Max	m/s										0.00	2.43
	Vel Min	m/s										0.00	2.14
	Flow	CFM	0	0	0	0	0	0	0	0	0	0	21.59196469
	Temp	°C										6.4	5.6
	Comments											1/2T -> no change	1/2T -> 1/4T
	7-64	Well	"H <sub>2</sub> O										-0.30
Lateral		"H <sub>2</sub> O										-3.13	-3.28
CH <sub>4</sub>		%										28.2	30.8
CO <sub>2</sub>		%										28.5	29.2
O <sub>2</sub>		%										2.0	0.8
BAL (N <sub>2</sub> )		%										41.6	39.2
CO		PPM										34	21
H <sub>2</sub> S		PPM										89	152
Vel Max		m/s										20.28	2.79
Vel Min		m/s										8.27	1.91
Flow		CFM	0	0	0	0	0	0	0	0	0	134.8907203	22.20617813
Temp		°C										21.8	13.2
Comments												full -> 2T	2T -> 1T
7-65		Well	"H <sub>2</sub> O										0.22
	Lateral	"H <sub>2</sub> O										-5.33	-1.88
	CH <sub>4</sub>	%										34.8	42.3
	CO <sub>2</sub>	%										34.1	34.9
	O <sub>2</sub>	%										0.6	0.4
	BAL (N <sub>2</sub> )	%										30.5	22.5
	CO	PPM										27	30
	H <sub>2</sub> S	PPM										351	>>>>
	Vel Max	m/s										3.53	2.88
	Vel Min	m/s										1.97	0.73
	Flow	CFM	0	0	0	0	0	0	0	0	0	25.98595313	17.05623469
	Temp	°C										21.9	17.5
	Comments											1T -> no change	1T -> no change

Table 2: Wellfield Monitoring Data

	Units	30-Jan-17	27-Feb-17	30-Mar-17	28-Apr-17	29-May-17	27-Jun-17	28-Aug-17	15-Sep-17	19-Sep-17	25-Oct-17	9-Nov-17	6-Dec-17
MH-16	Well	"H <sub>2</sub> O										0.02	-0.04
	Lateral	"H <sub>2</sub> O										-8.04	-10.03
	CH <sub>4</sub>	%										54.8	55.7
	CO <sub>2</sub>	%										44.5	43.9
	O <sub>2</sub>	%										0.7	0.3
	BAL (N <sub>2</sub> )	%										0.0	0.0
	CO	PPM										19	6
	H <sub>2</sub> S	PPM										11	33
	Vel Max	m/s										6.71	5.62
	Vel Min	m/s										6.71	5.37
	Flow	CFM	0	0	0	0	0	0	0	0	0	63.40572563	51.92465906
	Temp	°C										1.9	0.1
	Comments											closed -> 1/2T	1/2T -> no change
	MH-19	Well	"H <sub>2</sub> O										-0.02
Lateral		"H <sub>2</sub> O										-8.39	3.61
CH <sub>4</sub>		%										50.8	45.2
CO <sub>2</sub>		%										37.1	34.0
O <sub>2</sub>		%										3.6	4.7
BAL (N <sub>2</sub> )		%										8.4	17.5
CO		PPM										21	2
H <sub>2</sub> S		PPM										5	16
Vel Max		m/s										-	-
Vel Min		m/s										-	-
Flow		CFM	0	0	0	0	0	0	0	0	0	#VALUE!	#VALUE!
Temp		°C										-	-
Comments												closed -> no change	no lat vac
MH-22		Well	"H <sub>2</sub> O										0.00
	Lateral	"H <sub>2</sub> O										-0.05	0.02
	CH <sub>4</sub>	%										48.6	56.0
	CO <sub>2</sub>	%										36.0	40.9
	O <sub>2</sub>	%										4.0	1.5
	BAL (N <sub>2</sub> )	%										11.5	1.4
	CO	PPM										24	0
	H <sub>2</sub> S	PPM										110	64
	Vel Max	m/s										0.00	-
	Vel Min	m/s										0.00	-
	Flow	CFM	0	0	0	0	0	0	0	0	0	0	#VALUE!
	Temp	°C										-0.1	-
	Comments											1T -> no change	no lat vac
	MH-25	Well	"H <sub>2</sub> O										-0.02
Lateral		"H <sub>2</sub> O										0.16	0.53
CH <sub>4</sub>		%										7.3	0.1
CO <sub>2</sub>		%										4.8	0.2
O <sub>2</sub>		%										18.0	18.8
BAL (N <sub>2</sub> )		%										69.9	80.9
CO		PPM										27	0
H <sub>2</sub> S		PPM										3	0
Vel Max		m/s										no	-
Vel Min		m/s										lateral vacuum	-
Flow		CFM	0	0	0	0	0	0	0	0	0	#VALUE!	#VALUE!
Temp		°C										-	-
Comments												closed -> no change	no lat vac
MH-7		Well	"H <sub>2</sub> O										0.03
	Lateral	"H <sub>2</sub> O										0.01	-
	CH <sub>4</sub>	%										0.4	-
	CO <sub>2</sub>	%										0.4	-
	O <sub>2</sub>	%										19.8	-
	BAL (N <sub>2</sub> )	%										79.4	-
	CO	PPM										1	-
	H <sub>2</sub> S	PPM										0	-
	Comments											closed -> no change	no lat vac
	MH-43	Well	"H <sub>2</sub> O										0.02
Lateral		"H <sub>2</sub> O										0.19	-
CH <sub>4</sub>		%										33.3	-
CO <sub>2</sub>		%										22.0	-
O <sub>2</sub>		%										9.5	-
BAL (N <sub>2</sub> )		%										35.1	-
CO		PPM										8	-
H <sub>2</sub> S		PPM										23	-
Comments												2T -> closed	no lat vac



Table 3: Pump Counters

Location	14-Dec-16			19-Jan-17			27-Feb-17			23-Mar-17			25-Apr-17			23-May-17		
	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo
PDT 1	3277	-	3390	113	293.8	3562	172	447.2	3745	183	475.8	3901	156	405.6	4086	185	481	
PDT 2	39942	-	41289	1347	3502.2	43952	2663	6923.8	46478	2526	6567.6	47822	1344	3494.4	49540	1718	4466.8	
PDT 3	10189	-	10344	155	403	10540	196	509.6	inaccessible	-	-	inaccessible	-	-	11122	-	-	
PDT 4	no counter	-	no counter	-	-	no counter	-	-	no counter	-	-	no counter	-	-	no counter	-	-	
PDT 5	frozen	-	frozen	-	-	frozen	-	-	flooded	-	-	flooded	-	-	23656	-	-	
PDT 6	47104	-	48097	993	2581.8	49637	1540	4004	50941	1304	3390.4	flooded	-	-	flooded	-	-	
PDT 7	7652	-	7701	49	127.4	7764	63	163.8	7803	39	101.4	7803	0	0	7803	0	0	
PDT 8	2699	-	2705	6	15.6	2705	0	0	2719	14	36.4	2719	0	0	2719	0	0	
PDT 9	frozen	-	frozen	-	-	frozen	-	-	flooded	-	-	flooded	-	-	149780	-	-	
H-4	184351	-	190212	5861	15238.6	197003	6791	17656.6	199604	2601	6762.6	200821	1217	3164.2	201745	924	2402.4	
1-9	574467	-	582544	8077	21000.2	591910	9366	24351.6	597444	5534	14388.4	607242	9798	25474.8	615777	8535	22191	
1-10	455493	-	458007	2514	6536.4	463714	5707	14838.2	472347	8633	22445.8	479171	6824	17742.4	482080	2909	7563.4	
H-11	570135	-	591690	21555	56043	607726	16036	41693.6	607726	0	0	607726	0	0	607726	0	0	
2-18	343860	-	343860	0	0	411409	67549	175627.4	481041	69632	181043.2	481041	0	0	481041	0	0	
3-27	238279	-	238279	0	0	238279	0	0	238279	0	0	238279	0	0	238279	0	0	
3-29	661084	-	692010	30926	80407.6	713970	21960	57096	745318	31348	81504.8	784780	39462	102601.2	809519	24739	64321.4	
3-30	917870	-	934334	16464	42806.4	951866	17532	45583.2	986063	34197	88912.2	999452	13389	34811.4	14750	15297	39772.2	

Location	27-Jun-17			28-Jul-17			28-Aug-17			15-Sep-17			25-Oct-17			27-Nov-17		
	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo	Counter	Counts / mo	Litres / mo
PDT 1	4089	3	7.8	4096	7	18.2	4098	2	5.2	4139	41	106.6	4281	142	369.2	4410	129	335.4
PDT 2	50466	926	2407.6	50979	513	1333.8	51240	261	678.6	51422	182	473.2	52080	658	1710.8	52714	634	1648.4
PDT 3	11489	367	954.2	11799	310	806	11913	114	296.4	11962	49	127.4	12091	129	335.4	12354	263	683.8
PDT 4	no counter	-	-	no counter	-	-	no counter	-	-	no counter	-	-	no counter	-	-	no counter	-	-
PDT 5	25081	1425	3705	26001	920	2392	26277	276	717.6	27122	845	2197	28242	1120	2912	28738	496	1289.6
PDT 6	flooded	-	-	flooded	-	-	flooded	-	-	flooded	-	-	57003	-	-	58243	1240	3224
PDT 7	7803	0	0	7803	0	0	7803	0	0	7803	0	0	7806	3	7.8	7806	0	0
PDT 8	2720	1	2.6	2720	0	0	2720	0	0	2720	0	0	2722	2	5.2	2722	0	0
PDT 9	157541	7761	20178.6	161269	3728	9692.8	165026	3757	9768.2	166932	1906	4955.6	168052	1120	2912	171453	3401	8842.6
H-4	201746	1	2.6	201746	0	0	201746	0	0	201746	0	0	203151	1405	3653	212633	9482	24653.2
1-9	623474	7697	20012.2	632933	9459	24593.4	637074	4141	10766.6	644871	7797	20272.2	651164	6293	16361.8	656927	5763	14983.8
1-10	487221	5141	13366.6	491869	4648	12084.8	493874	2005	5213	496197	2323	6039.8	501484	5287	13746.2	505213	3729	9695.4
H-11	668314	60588	157528.8	704981	36667	95334.2	739765	34784	90438.4	774901	35136	91353.6	796782	21881	56890.6	823543	26761	69578.6
2-18	672943	191902	498945.2	796213	123270	320502	889785	93572	243287.2	910523	20738	53918.8	928877	18354	47720.4	928877	0	0
3-27	238279	0	0	238279	0	0	238279	0	0	238279	0	0	no pump	-	-	no pump	-	-
3-29	818111	8592	22339.2	824375	6264	16286.4	829909	5534	14388.4	829910	1	2.6	no counter	-	-	no counter	-	-
3-30	33164	18414	47876.4	46212	13048	33924.8	53733	7521	19554.6	58810	5077	13200.2	69250	10440	27144	no pump	-	-

Location	14-Dec-17		
	Counter	Counts / mo	Litres / mo
PDT 1	4562	152	395.2
PDT 2	53779	1065	2769
PDT 3	12481	127	330.2
PDT 4	no counter	-	-
PDT 5	29188	450	1170
PDT 6	59032	789	2051.4
PDT 7	7806	0	0
PDT 8	2722	0	0
PDT 9	173912	2459	6393.4
H-4	217585	4952	12875.2
1-9	659131	2204	5730.4
1-10	507089	1876	4877.6
H-11	849881	26338	68478.8
2-18	928877	0	0
3-27	no pump	-	-
3-29	no counter	-	-
3-30	no pump	-	-

Table 4: Water Levels

Units	29-Mar-17						11-Dec-17			
	meters	meters	meters	meters	°C	%	meters	meters	°C	%
Location	Screen Length	Installed Well Depth	Depth to Water	Depth to Bottom	Temperature	% Open Screen	Depth to Water	Depth to Bottom	Temperature	% Open Screen
H-1	12	14.63	7.59	14.24	26.1	42.24	7.38	14.02	8.6	40.52
H-2	14	16.77	8.97	17.36	29.6	43.16	9.25	17.74	17.0	45.20
H-3	12	15.24	7.65	16.02	13.1	37.73	7.47	15.50	3.8	36.25
H-4*	11	14.02	7.38	9.06	14.7	39.46	8.12	9.29	46.1	46.20
1-5	11	13.72	8.61	14.16	20.0	52.12	9.03	14.08	13.6	56.05
1-6	12	15.55	10.90	16.10	24.4	61.88	11.53	15.67	14.2	67.05
1-7	18	21.34	15.27	20.10	25.6	66.81	15.21	19.72	9.4	66.48
1-8	21	24.39	16.04	23.92	29.2	60.87	15.86	23.72	19.6	60.03
1-9*	12	14.63	13.20	14.65	32.6	88.24	7.23	14.35	16.3	39.29
1-10*	9	12.20	10.21	11.90	27.4	78.30	9.80	10.64	15.6	73.81
H-11*	9	12.80	5.07	12.16	22.0	15.43	6.58	10.82	51.2	31.94
H-12	13	16.16	7.77	15.71	21.6	36.01	?	7.48	?	-
2-13	21	25.00	8.17	17.91	42.1	21.14	8.21	9.10	20.7	21.33
2-14	20	22.56	11.00	22.17	27.1	41.66	6.83	21.44	27.0	20.62
2-15	18	21.65	13.21	21.70	17.5	53.88	13.28	21.45	10.0	54.26
2-16	26	28.35	22.03	29.70	16.9	75.60	22.03	29.02	8.0	75.60
2-17	15	18.29	13.05	17.78	21.7	65.61	12.84	17.29	14.6	64.23
2-18*	15	18.29	14.40	18.26	29.1	74.46	7.35	18.25	21.1	28.22
3-19	12	14.94	8.25	14.41	17.0	45.15	7.81	14.06	5.2	41.54
3-20	11	13.26	9.61	9.93	15.2	65.77	8.88	9.77	7.1	58.93
3-21	5	7.62	5.33	7.27	9.1	49.88	4.78	7.31	0.0	37.86
3-22	24	26.68	4.82	20.24	31.3	9.25	4.49	19.85	15.1	7.88
3-23	23	25.91	6.16	22.29	33.8	13.61	8.07	21.79	10.7	21.96
3-24	21	23.48	10.76	21.37	30.1	40.42	2.48	21.68	8.3	1.62
3-25	18	21.34	7.75	20.87	32.1	25.70	6.80	20.46	10.6	20.51
3-26	9	12.20	4.00	12.93	21.8	10.40	4.03	11.91	21.0	10.73
3-27*	21	24.09	7.60	21.34	43.3	22.75	4.58	14.74	15.6	8.60
3-28	12	15.24	6.62	14.60	24.9	29.28	4.86	14.22	9.0	14.85
3-29*	12	14.63	10.68	12.14	29.3	67.58	6.93	13.48	32.9	36.83
3-30*	7	9.76	foamy	9.65	39.4	#VALUE!	6.05	8.44	32.7	49.35
4-31	16	18.75	8.84	18.24	23.7	38.67	7.81	14.06	5.2	32.30
4-32	10	12.50	4.69	10.03	19.3	19.95	7.44	9.90	17.9	48.14
4-33	24	26.68	4.84	23.78	31.7	10.47	3.46	25.39	12.6	4.81
4-34	20	22.56	6.21	21.02	38.3	17.49	CNM	CNM	CNM	-
4-35	15	17.38	9.09	16.78	20.9	45.63	CNM	CNM	CNM	-
4-36	15	18.29	5.39	17.04	35.4	15.36	2.00	17.26	16.7	0.00
4-37	12	14.94	6.13	12.24	39.9	27.77	4.62	13.32	15.6	15.38
5-38	8	10.67	4.00	11.49	12.4	12.48	4.16	11.48	26.3	14.58
5-39	8	10.67	4.97	11.91	13.6	25.21	4.96	9.41	10.4	25.08
5-40	18	21.95	8.11	21.69	40.2	24.33	CNM	CNM	CNM	-
5-41	17	18.90	12.81	15.77	29.5	63.67	CNM	CNM	CNM	-
5-42	12	16.16	10.74	14.98	22.5	55.57	10.53	15.58	13.4	53.85
5-43	14	16.16					6.38	12.66	16.7	28.73
5-44	19	21.95					14.90	21.85	14.6	62.70
5-45	15	16.77					6.98	14.93	24.2	35.79
5-46	16	18.90					7.75	13.12	16.7	29.65
6-47	14	15.85					4.91	13.20	19.9	20.23
6-48	15	17.68					5.24	14.75	18.6	14.97
6-49	20	23.48					13.05	23.36	12.7	48.96
6-50	14	17.38					13.76	15.36	29.1	74.75
6-51	12	14.94					4.88	4.98	4.9	17.52
6-52	6	9.15					3.04	7.87	13.3	0.00
6-53	22	23.63					13.64	20.79	31.1	54.81
6-54	13	15.85					6.82	14.50	26.3	31.09
6-55	18	21.34					16.61	21.18	32.4	74.13
6-56	10	12.80					4.55	12.60	18.7	17.95
6-57	21	24.39					11.76	13.68	18.1	40.70
6-58	17	22.50					9.84	11.71	13.5	24.46
6-59	17	20.12					16.77	21.13	12.1	80.37
7-60	13	15.55					5.41	13.22	23.9	18.89
7-61	13	15.24					10.50	13.80	15.6	62.95
7-62	17	18.29					14.10	15.65	17.8	75.00
7-64	22	24.09					17.46	26.30	26.7	69.82
7-65	24	26.22					17.35	27.5	34.3	62.70

CNM - Can not monitor

\*Dual Purpose

Several areas were noted where there were significant volumes of gas detected, including areas where cap was weak, uncovered manholes, and around some LFG wells.

## 2.3 Mechanical System Monitoring

The main operational control of the mechanical system is carried out by the Programmable Logic Controller (PLC). The PLC also provides information on the operating status of the system, and records all data electronically which can be downloaded when required. Specific details on these items are included in the Flare Operation and Maintenance Manual. At a minimum the PLC records:

- Landfill gas composition and temperature
- Flare operating times
- Blower operating times
- Landfill gas flow rate
- Volume of landfill gas collected and flared
- Greenhouse Gas Emission Reduction in CO<sub>2</sub> equivalents.

These items were also monitored remotely and were reviewed at minimum on a weekly basis to ensure that all parameters outlined above are being recorded and that all system data indicates that the overall system is operating properly. The system review was carried out by a technician experienced in the operation of such systems.

Comcor staff also carried out the maintenance of the system as outlined by the Operations and Maintenance Manual. In June 2017, the air dryer on the compressor was removed for service by Dynamic Machine. The solenoid valve and desiccant towers were replaced and reinstalled. No other major repairs had to be made to the mechanical system during 2017.

Data for 2017 has been compiled, and is found in Appendix A.

### 2.3.1 System Pressure Measurements

Monitoring ports at the inlet and outlet to the blower were measured and recorded on a monthly frequency, using a suitably scaled pressure gauge. Gauge fluctuations were noted, as it can be an indication of water within the system.

Data for 2017 has been compiled, and is found in Table 2.

### 2.3.2 System Gas Measurements

The purpose of the main blower skid gas analyzer system is to monitor the oxygen and methane concentrations of the landfill gas being transferred by the LGFCS to the flare. As a safety precaution, if either the oxygen concentration gets too high, or the methane concentration gets

too low, an alarm is sent to the main computer control panel PLC to shut the system down. Having records of the gas concentrations also allows for better analysis of the system and aids in troubleshooting when problems arise.

A pump, located within the gas analyzer system cabinet in the control room, is used to draw a continuous sample of process gas from the header pipe on the blower discharge side. After entering the analyzer, the sample is drawn through a de-mister and a series of filters to remove any particulate or moisture that may affect the monitoring equipment. The methane and oxygen concentrations of the sample are then measured by an infra-red methane analyzer and oxygen analyzer. The methane and oxygen concentrations are displayed on separate LED display screens mounted on the front face of the gas analyzer panel. The gas analyzer system will send signals to the PLC that will trigger a number of system alarms/warnings including low methane and high oxygen.

All system failures and/or alarms are displayed on the main control circuit panel. Any alarms that shut down the system are relayed by the auto messaging to the system operator.

During 2017, the system operated as intended with the analyzer data recorded at an interval of 5 minutes or better and any system alarms were sent to the operator. This data was recorded and summarized into a daily value and can be found in Appendix A.

In addition to the main system analyser, concentrations of methane (CH<sub>4</sub>), carbon dioxide (CO<sub>2</sub>) and oxygen (O<sub>2</sub>) were measured manually, recorded monthly at the blower inlet and blower outlet, and compared to the insitu monitoring devices to ensure accuracy. These measurements were taken using a proper gas meter/analyzer such as a Landtec GEM-5000+, or equivalent.

### **2.3.3 System Flow Rate Measurements**

Landfill gas velocities and temperatures at each landfill gas extraction well in the wellfield were measured and recorded on a monthly basis using an anemometer. These velocities were used to calculate landfill gas flow rates by multiplying by the pipe's cross sectional area.

A thermal mass flow meter continuously calculates flows to the flare and this data was recorded on an interval of 5 minutes or less.

The monitoring completed in 2017 is found in Table 2 and a summary of daily plant data can be found in Appendix A.

### **3.0 FLARE AND GREENHOUSE GAS EMISSIONS**

#### **3.1 Flare Emissions**

The flare stack is equipped with four thermocouples that measure the temperature in the flare stack. These thermocouples are monitored by the system control panel PLC at intervals of 5 minutes or better. The control system is continuously monitoring the flame conditions and will shut down the LGCFS system immediately if flame is lost.

If the system shuts down for any reason, the fail safe valve will close and prevent any non-combusted landfill gas from being released to the atmosphere, thereby controlling the emissions from the flare.

#### **3.2 Greenhouse Gas Emissions**

The landfill gas comprises primarily methane and carbon dioxide in approximately equal amounts. In addition there are other trace amounts of a large number of compounds. Methane and carbon dioxide are greenhouse gases but methane has a global warming potential 21 times that of carbon dioxide. By combusting the methane in the flare the resultant products are carbon dioxide and water vapour which reduces its global warming potential by approximately 95 percent.

The control panel records both flow and methane gas concentration being collected from the system and sent to be combusted in the flare. These quantities are measured and recorded at intervals of 5 minutes or less. The data collected can be readily processed to calculate the greenhouse gas emission reduction expressed as carbon dioxide equivalents.

For the Brady Road Landfill, greenhouse gas emissions have been calculated based on operational data and can be found in Appendix A.

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## 4.0 CONDENSATE COLLECTION SYSTEM

The purpose of the Condensate Collection System component of the LGCFSS is to remove moisture from the landfill gas and to collect condensate from the collection laterals/header pipes. Collection and removal of the condensate increases the efficiency of the landfill gas collection in the wellfield and minimizes the moisture being passed through the mechanical system.

Condensate and moisture are removed from the system at three main locations. First, relative low points have been provided in the gas collection header to allow any free moisture to drain by gravity out of the underground gas collection system. In the wellfield, this moisture drains into condensate gravity style and pump style drain traps which have pneumatic pumps installed inside the sump. Next, prior to the gas entering the blowers, a condensate moisture separator removes most of the residual water droplets remaining in the gas. At this stage the residual water drains by gravity into the condensate chamber.

The condensate chamber stores the water until the pump at the bottom of the chamber is activated either manually or automatically through a series of floats. The water is then pumped through a 75 mm diameter HDPE forcemain and is discharged into the leachate collection system.

The Condensate Collection System operated as intended during 2017.

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## 5.0 CONCLUSIONS AND RECOMMENDATIONS

1. During operation in 2017, the Brady Road Resource Management Facility Gas Collection and Flaring System operated as was intended.
2. During surface emission monitoring, some areas were noted where gas was escaping. These areas included open manholes and areas of weak surface cap. In order to get maximum efficiency from the LFGCS, these issues should be looked at in the future.
3. The system should continue to operate on a full-time basis and be monitored according to the Operation and Maintenance Manual for the site.

All of which is Respectfully Submitted,

**INTEGRATED GAS RECOVERY SERVICES**

Diana Pepall, P.Eng.  
Project Engineer

**APPENDIX A**  
**PLANT AND FLARE DATA**



Date	CO2 Equivalents			Landfill Gas Flow							CH4	O2	Flare	Flare	Temp			Blower 1		Blower 2	
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total	Avg					Avg	Run	Min	Avg.	Max.	Daily	Cumu.
	Tonnes	Tonnes	Tonnes	Yearly	Monthly	Daily	Daily	Avg	Total	Avg	Avg	Run	°C	°C	°C	Hours	Hours	Hours	Hours		
	CO2	CO2	CO2	scf	scf	scf	m3	scfm	MMBTU	(%)	(%)	Hours	Starts	°C	°C	°C	Hours	Hours	Hours	Hours	
Jan 1 2017	218	218	218	1295933	1295933	1295933	36711	900	478	36.5	6.7	23:59	0	875	900	920	0	14599	23.9	13891.1	
Jan 2 2017	444	444	226	2591285	2591285	1295352	36695	900	498	38	6.1	23:58	0	885	900	922	0	14599	24	13915.1	
Jan 3 2017	670	670	226	3887877	3887877	1296592	36730	900	497	37.9	6.1	23:59	0	887	900	914	0	14599	23.9	13939	
Jan 4 2017	895	895	225	5184150	5184150	1296273	36721	900	496	37.8	6.2	23:58	0	879	900	923	0	14599	24	13963	
Jan 5 2017	1117	1117	222	6480558	6480558	1296408	36725	900	489	37.2	6.5	23:59	0	884	900	920	0	14599	23.9	13986.9	
Jan 6 2017	1333	1333	216	7776573	7776573	1296015	36714	900	476	36.3	6.9	23:59	0	887	900	918	0	14599	24	14010.9	
Jan 7 2017	1545	1545	212	9072198	9072198	1295625	36702	900	466	35.5	7.1	23:59	0	886	900	920	0	14599	23.9	14034.8	
Jan 8 2017	1769	1769	224	10368377	10368377	1296179	36718	900	493	37.6	6.4	23:59	0	882	900	917	0	14599	24	14058.8	
Jan 9 2017	1996	1996	227	11664442	11664442	1296065	36715	900	499	38.1	6.3	23:58	0	887	900	913	0	14599	23.9	14082.7	
Jan 10 2017	2220	2220	224	12960293	12960293	1295851	36709	900	492	37.5	6.6	23:58	0	882	900	915	0	14599	22.9	14105.7	
Jan 11 2017	2437	2437	217	14256550	14256550	1296257	36720	900	477	36.4	7.1	23:59	0	880	900	919	0	14599	24	14129.7	
Jan 12 2017	2524	2524	87	14745999	14745999	489449	13865	895	191	38.6	6.5	09:06	6	-2	859	918	0.7	14599.7	9.4	14139	
Jan 13 2017	2579	2579	55	15019581	15019581	273582	7750	894	122	44.1	3.8	05:07	2	-15	873	920	4.3	14604	0	14139	
Jan 14 2017	2808	2808	229	16315278	16315278	1295697	36705	900	503	38.4	5.5	23:58	0	854	898	939	24	14628	0	14139	
Jan 15 2017	3036	3036	228	17610901	17610901	1295623	36702	900	502	38.3	5.6	23:59	0	882	900	917	23.9	14651.9	0	14139	
Jan 16 2017	3257	3257	221	18906550	18906550	1295649	36703	900	485	37	6.1	23:58	0	864	900	932	23.9	14675.8	0	14139	
Jan 17 2017	3483	3483	226	20183018	20183018	1276468	36160	900	496	38.4	5.6	23:58	0	0	899	922	23.8	14699.6	0	14139	
Jan 18 2017	3710	3710	227	21479548	21479548	1296530	36728	900	500	38.1	5.9	23:59	0	886	900	919	24	14723.6	0	14139	
Jan 19 2017	3943	3943	233	22775433	22775433	1295885	36710	900	513	39.1	5.6	23:59	0	886	900	924	23.9	14747.5	0	14139	
Jan 20 2017	4177	4177	234	24071513	24071513	1296080	36715	900	515	39.2	5.6	23:58	0	887	900	933	24	14771.5	0	14139	
Jan 21 2017	4429	4429	252	25367542	25367542	1296029	36714	900	554	42.3	4.3	23:58	0	889	900	908	23.9	14795.5	0	14139	
Jan 22 2017	4628	4628	199	26357881	26357881	990339	28054	900	438	43.7	3.5	18:18	0	883	900	928	18	14813.5	0	14139	
Jan 23 2017	4697	4697	69	26698038	26698038	340157	9636	899	152	44.1	3.1	23:59	0	891	900	910	30.1	14843.6	0	14139	
Jan 24 2017	4958	4958	261	27989825	27989825	1291787	36594	900	573	43.8	3.2	23:49	1	0	899	925	23.9	14867.5	0	14139	
Jan 25 2017	5225	5225	267	29287016	29287016	1297191	36747	901	586	44.7	2.7	23:58	0	880	900	926	23.9	14891.4	0	14139	
Jan 26 2017	5497	5497	272	30583058	30583058	1296042	36714	900	599	45.6	2.2	23:58	0	874	900	929	24	14915.4	0	14139	
Jan 27 2017	5768	5768	271	31878840	31878840	1295782	36707	900	596	45.4	2.3	23:59	0	875	900	922	23.9	14939.3	0	14139	
Jan 28 2017	5995	5995	227	32975199	32975199	1096359	31058	900	499	45	2.4	20:17	0	877	900	929	20	14959.3	0	14139	
Jan 29 2017	5995	5995	0	32975199	32975199	0	0	0	0	0	0	00:00	0	0	0	0	0	0	0	0	
Jan 30 2017	6154	6154	159	33728498	33728498	753299	21339	900	349	45.8	2.2	23:58	1	0	898	931	51.2	15010.5	0	14139	
Jan 31 2017	6419	6419	265	35024445	35024445	1295947	36712	900	584	44.5	2.4	23:59	0	870	900	919	23.9	15034.4	0	14139	
Feb 1 2017	6681	262	262	36319963	1295518	1295518	36699	900	577	44	2.4	23:59	0	882	900	916	24	15058.4	0	14139	
Feb 2 2017	6940	521	259	37615357	2590912	1295394	36696	900	570	43.5	2.5	23:58	0	885	900	918	23.9	15082.3	0	14139	
Feb 3 2017	7197	778	257	38910861	3886416	1295504	36699	900	566	43.2	2.6	23:59	0	878	900	920	24	15106.3	0	14139	
Feb 4 2017	7452	1033	255	40207312	5182867	1296451	36726	900	562	42.8	2.9	23:58	0	880	900	921	23.9	15130.2	0	14139	
Feb 5 2017	7699	1280	247	41503237	6478792	1295925	36711	900	543	41.4	3.5	23:58	0	857	900	927	24	15154.2	0	14139	
Feb 6 2017	7947	1528	248	42799259	7774814	1296022	36714	900	545	41.5	3.5	23:58	0	891	900	912	23.9	15178.1	0	14139	
Feb 7 2017	8191	1772	244	44094168	9069723	1294909	36682	899	536	40.9	3.8	23:59	0	871	900	931	24	15202.2	0	14139	
Feb 8 2017	8428	2009	237	45389981	10365536	1295813	36708	900	521	39.8	4.1	23:59	0	882	900	924	23.9	15226.1	0	14139	

Date	CO2 Equivalents			Landfill Gas Flow							CH4	O2	Flare	Flare	Temp			Blower 1		Blower 2	
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total	Avg					Avg	Run	Flare	Min	Avg.	Max.	Daily
	Tonnes	Tonnes	Tonnes	Yearly	Monthly	Daily	Daily	Avg	Total	Avg	Avg	Run	Flare	Min	Avg.	Max.	Daily	Cumu.	Daily	Cumu.	
	CO2	CO2	CO2	scf	scf	scf	m3	scfm	MMBTU	(%)	(%)	Hours	Starts	°C	°C	°C	Hours	Hours	Hours	Hours	
Feb 9 2017	8667	2248	239	46686630	11662185	1296649	36731	900	526	40.1	3.9	23:59	0	876	900	924	24	15250.1	0	14139	
Feb 10 2017	8905	2486	238	47982422	12957977	1295792	36707	900	524	40	4.1	23:59	0	879	900	951	24	15274.1	0	14139	
Feb 11 2017	9139	2720	234	49279383	14254938	1296961	36740	901	516	39.3	4.3	23:58	0	876	900	925	23.9	15298	0	14139	
Feb 12 2017	9363	2944	224	50514031	15489586	1234648	34975	899	494	39.5	4.4	22:53	1	13	894	971	23	15321	0	14139	
Feb 13 2017	9613	3194	250	51809894	16785449	1295863	36709	900	550	41.9	3.6	23:59	0	874	900	922	22.9	15343.9	0	14139	
Feb 14 2017	9852	3433	239	53105804	18081359	1295910	36711	900	525	40	4.4	23:59	0	877	900	926	24	15367.9	0	14139	
Feb 15 2017	10103	3684	251	54401966	19377521	1296162	36718	900	553	42.1	3.6	23:59	0	884	900	913	23.9	15391.8	0	14139	
Feb 16 2017	10358	3939	255	55698212	20673767	1296246	36720	900	560	42.7	3.5	23:59	0	881	900	920	24	15415.8	0	14139	
Feb 17 2017	10610	4191	252	56994839	21970394	1296627	36731	900	555	42.3	3.8	23:59	0	886	900	917	23.9	15439.7	0	14139	
Feb 18 2017	10859	4440	249	58290703	23266258	1295864	36709	900	547	41.7	3.9	23:59	0	880	900	922	24	15463.7	0	14139	
Feb 19 2017	11138	4719	279	59586983	24562538	1296280	36721	900	614	46.8	1.7	23:59	0	883	900	915	24	15487.7	0	14139	
Feb 20 2017	11420	5001	282	60883432	25858987	1296449	36726	900	621	47.3	1.3	23:58	0	882	900	921	23.9	15511.6	0	14139	
Feb 21 2017	11699	5280	279	62179976	27155531	1296544	36729	900	613	46.7	1.3	23:59	0	881	900	918	24	15535.6	0	14139	
Feb 22 2017	11972	5553	273	63476015	28451570	1296039	36714	900	601	45.8	1.5	23:59	0	868	900	932	23.9	15559.6	0	14139	
Feb 23 2017	12239	5820	267	64771895	29747450	1295880	36710	900	588	44.9	1.6	23:59	0	875	900	921	24	15583.6	0	14139	
Feb 24 2017	12509	6090	270	66067530	31043085	1295635	36703	900	593	45.3	1.3	23:58	0	882	900	919	23.9	15607.5	0	14139	
Feb 25 2017	12786	6367	277	67363818	32339373	1296288	36721	900	610	46.5	0.9	23:59	0	881	900	920	24	15631.5	0	14139	
Feb 26 2017	13056	6637	270	68660154	33635709	1296336	36723	900	593	45.2	1.4	23:59	0	888	900	916	24	15655.5	0	14139	
Feb 27 2017	13321	6902	265	69955670	34931225	1295516	36699	900	583	44.5	1.6	23:59	0	880	900	929	23.9	15679.4	0	14139	
Feb 28 2017	13587	7168	266	71251515	36227070	1295845	36709	900	586	44.7	1.5	23:59	0	881	900	919	24	15703.4	0	14139	
Mar 1 2017	13848	261	261	72548904	1297389	1297389	36752	901	574	43.7	1.8	23:59	0	878	900	912	23.9	15727.3	0	14139	
Mar 2 2017	14103	516	255	73844520	2593005	1295616	36702	900	560	42.7	2	23:58	0	884	900	912	24	15751.3	0	14139	
Mar 3 2017	14369	782	266	75140228	3888713	1295708	36705	900	585	44.6	1.4	23:59	0	883	900	919	22.9	15774.2	0	14139	
Mar 4 2017	14644	1057	275	76436685	5185170	1296457	36726	900	605	46.1	1	23:59	0	882	900	918	24	15798.2	0	14139	
Mar 5 2017	14918	1331	274	77732756	6481241	1296071	36715	900	603	46	1.2	23:59	0	883	900	920	23.9	15822.1	0	14139	
Mar 6 2017	15203	1616	285	79029760	7778245	1297004	36742	901	627	47.8	0.6	23:59	0	885	900	917	24	15846.1	0	14139	
Mar 7 2017	15476	1889	273	80324849	9073334	1295089	36687	899	601	45.8	1	23:59	0	884	900	921	23.9	15870	0	14139	
Mar 8 2017	15734	2147	258	81621112	10369597	1296263	36721	900	568	43.3	1.8	23:59	0	870	900	935	24	15894	0	14139	
Mar 9 2017	15987	2400	253	82916774	11665259	1295662	36704	900	557	42.5	1.7	23:59	0	882	900	925	24	15918	0	14139	
Mar 10 2017	16241	2654	254	84211685	12960170	1294911	36682	899	558	42.6	1.4	23:58	0	883	900	922	23.9	15942	0	14139	
Mar 11 2017	16496	2909	255	85506634	14255119	1294949	36683	899	561	42.8	1.4	23:58	0	869	900	932	24	15966	0	14139	
Mar 12 2017	16754	3167	258	86803134	15551619	1296500	36727	900	568	43.3	1.4	23:58	0	881	900	920	22.9	15988.9	0	14139	
Mar 13 2017	17013	3426	259	88099035	16847520	1295901	36710	900	569	43.4	1.4	23:59	0	870	900	933	24	16012.9	0	14139	
Mar 14 2017	17214	3627	201	89111909	17860394	1012874	28693	900	442	43	1.9	18:43	0	878	900	929	19.2	16032.1	0	14139	
Mar 15 2017	17392	3805	178	89893932	18642417	782023	22153	899	392	49.5	0.5	14:31	1	-12	892	955	14.1	16046.2	0	14139	
Mar 16 2017	17676	4089	284	91190106	19938591	19938591	36718	900	624	47.6	0.7	23:58	0	881	900	914	23.9	16070.2	0	14139	
Mar 17 2017	17914	4327	238	92279638	21028123	1089532	30864	899	524	47.5	0.8	20:09	1	1	895	949	20.1	16090.3	0	14139	
Mar 18 2017	18191	4604	277	93575849	22324334	1296211	36719	900	610	46.5	0.8	23:59	0	882	900	924	24	16114.3	0	14139	
Mar 19 2017	18474	4887	283	94872281	23620766	1296432	36725	900	623	47.5	0.6	23:59	0	877	900	916	24	16138.3	0	14139	

Date	CO2 Equivalents			Landfill Gas Flow							CH4	O2	Flare	Flare	Temp			Blower 1		Blower 2	
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total	Avg					Avg	Run	Flare	Min	Avg.	Max.	Daily
	Tonnes	Tonnes	Tonnes							scf	scf	scf	m3	scfm	MMBTU	(%)	(%)	Hours	Starts	°C	°C
	CO2	CO2	CO2	scf	scf	scf	m3	scfm	MMBTU	(%)	(%)	Hours	Starts	°C	°C	°C	Hours	Hours	Hours	Hours	
Mar 20 2017	18745	5158	271	96167958	24916443	1295677	36704	900	595	45.4	1.2	23:59	0	881	900	916	23.9	16162.2	0	14139	
Mar 21 2017	19007	5420	262	97463827	26212312	1295869	36709	900	576	44	1.4	23:59	0	878	900	921	24	16186.2	0	14139	
Mar 22 2017	19282	5695	275	98759937	27508422	1296110	36716	900	605	46.1	0.6	23:59	0	874	900	925	22.9	16209.1	0	14139	
Mar 23 2017	19559	5972	277	100052075	28800560	1292138	36604	901	609	46.6	0.7	23:58	0	0	899	925	24.3	16233.4	0	14139	
Mar 24 2017	19824	6237	265	101348153	30096638	1296078	36715	900	582	44.4	1.4	23:58	0	882	900	920	23.9	16257.3	0	14139	
Mar 25 2017	20097	6510	273	102644557	31393042	1296404	36725	900	600	45.8	0.8	23:59	0	885	900	916	24	16281.3	0	14139	
Mar 26 2017	20369	6782	272	103940067	32688552	1295510	36699	900	598	45.6	1	23:58	0	883	900	922	23.9	16305.2	0	14139	
Mar 27 2017	20636	7049	267	105235989	33984474	1295922	36711	900	588	44.8	1.2	23:58	0	876	900	924	24	16329.2	0	14139	
Mar 28 2017	20901	7314	265	106532062	35280547	1296073	36715	900	582	44.4	1.3	23:59	0	870	900	925	23.9	16353.1	0	14139	
Mar 29 2017	21173	7586	272	107828290	36576775	1296228	36720	900	598	45.6	0.9	23:59	0	882	900	927	23.9	16377	0	14139	
Mar 30 2017	21446	7859	273	109124938	37873423	1296648	36731	900	600	45.7	1	23:58	0	881	900	917	24	16401.1	0	14139	
Mar 31 2017	21712	8125	266	110421442	39169927	1296504	36727	900	585	44.6	1.4	23:59	0	882	900	922	23.9	16425	0	14139	
Apr 1 2017	21982	270	270	111717853	1296411	1296411	36725	900	594	45.3	1.1	23:59	0	884	900	919	24	16449	0	14139	
Apr 2 2017	22259	547	277	113013914	2592472	1296061	36715	900	610	46.5	0.8	23:59	0	880	900	922	23.9	16472.9	0	14139	
Apr 3 2017	22530	818	271	114309934	3888492	1296020	36714	900	596	45.4	1.2	23:58	0	885	900	930	23.9	16496.8	0	14139	
Apr 4 2017	22797	1085	267	115606497	5185055	1296563	36729	900	587	44.7	1.4	23:58	0	884	900	918	23.9	16520.7	0	14139	
Apr 5 2017	23062	1350	265	116902128	6480686	1295631	36703	900	582	44.4	1.4	23:58	0	880	900	925	24	16544.7	0	14139	
Apr 6 2017	23329	1617	267	118198332	7776890	1296204	36719	900	587	44.7	1.2	23:58	0	878	900	921	23.9	16568.6	0	14139	
Apr 7 2017	23607	1895	278	119494464	9073022	1296132	36717	900	611	46.5	0.7	23:58	0	878	900	920	23.9	16592.5	0	14139	
Apr 8 2017	23883	2171	276	120790100	10368658	1295636	36703	900	607	46.3	0.9	23:59	0	880	900	920	23	16615.5	0	14139	
Apr 9 2017	24145	2433	262	122086314	11664872	1296214	36719	900	576	43.9	1.7	23:59	0	886	900	913	23.9	16639.4	0	14139	
Apr 10 2017	24404	2692	259	123377430	12955988	1291116	36575	900	569	43.5	1.5	23:58	0	0	899	931	24.3	16663.7	0	14139	
Apr 11 2017	24669	2957	265	124673093	14251651	1295663	36704	900	584	44.5	1.2	23:58	0	873	900	929	23.9	16687.6	0	14139	
Apr 12 2017	24932	3220	263	125955519	15534077	1282426	36329	899	579	44.6	1.3	23:44	1	205	898	939	16.5	16704.2	7.2	14146.2	
Apr 13 2017	25201	3489	269	127251275	16829833	1295756	36706	900	593	45.2	1.1	23:59	0	875	900	932	0	16704.2	23.9	14170.1	
Apr 14 2017	25479	3767	278	128546736	18125294	1295461	36698	900	611	46.6	0.6	23:59	0	854	900	938	0	16704.2	24	14194.1	
Apr 15 2017	25748	4036	269	129842293	19420851	1295557	36701	900	592	45.2	1.2	23:58	0	873	900	928	0	16704.2	23.9	14218	
Apr 16 2017	26016	4304	268	131138061	20716619	1295768	36707	900	589	44.9	1.1	23:59	0	871	900	924	0	16704.2	23.9	14241.9	
Apr 17 2017	26284	4572	268	132433924	22012482	1295863	36709	900	589	44.9	1	23:58	0	881	900	925	0	16704.2	24	14265.9	
Apr 18 2017	26557	4845	273	133729830	23308388	1295906	36710	900	599	45.7	0.8	23:59	0	869	900	926	0	16704.2	23.9	14289.8	
Apr 19 2017	26827	5115	270	135025458	24604016	1295628	36703	900	595	45.4	1	23:58	0	876	900	927	0	16704.2	24	14313.8	
Apr 20 2017	27099	5387	272	136322008	25900566	1296550	36729	900	598	45.6	0.9	23:58	0	881	900	921	0	16704.2	23.9	14337.7	
Apr 21 2017	27371	5659	272	137618963	27197521	1296955	36740	901	598	45.5	0.9	23:59	0	878	900	919	0	16704.2	23.9	14361.7	
Apr 22 2017	27641	5929	270	138915513	28494071	1296550	36729	900	593	45.2	0.9	23:59	0	871	900	916	0	16704.2	24	14385.7	
Apr 23 2017	27913	6201	272	140211703	29790261	1296190	36718	900	599	45.7	0.7	23:59	0	865	900	938	0	16704.2	23.9	14409.6	
Apr 24 2017	28189	6477	276	141506962	31085520	1295259	36692	899	608	46.4	0.6	23:59	0	874	900	922	0	16704.2	24	14433.6	
Apr 25 2017	28460	6748	271	142802413	32380971	1295451	36698	900	596	45.5	0.9	23:59	0	868	900	927	0	16704.2	23.9	14457.5	
Apr 26 2017	28734	7022	274	144098444	33677002	1296031	36714	900	602	45.9	0.7	23:59	0	860	900	931	0	16704.2	22.9	14480.4	
Apr 27 2017	29009	7297	275	145394229	34972787	1295785	36707	900	604	46.1	0.7	23:58	0	881	900	924	0	16704.2	24	14504.4	

Date	CO2 Equivalents			Landfill Gas Flow							CH4	O2	Flare	Flare	Temp			Blower 1		Blower 2	
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total	Avg					Avg	Run	Min	Avg.	Max.	Daily	Cumu.
	Tonnes	Tonnes	Tonnes	Yearly	Monthly	Daily	Daily	Avg	Total	Avg	Avg	Hours	°C	°C	°C	Hours	Hours	Hours	Hours		
	CO2	CO2	CO2	scf	scf	scf	m3	scfm	MMBTU	(%)	(%)	Starts	Starts	Starts	Starts	Starts	Starts	Starts	Starts		
Apr 28 2017	29277	7565	268	146690750	36269308	1296521	36728	900	590	45	1.1	23:59	0	880	900	922	0	16704.2	23.9	14528.3	
Apr 29 2017	29546	7834	269	147987035	37565593	1296285	36721	900	591	45.1	1	23:59	0	874	900	926	0	16704.2	24	14552.3	
Apr 30 2017	29822	8110	276	149283703	38862261	1296668	36732	900	606	46.2	0.7	23:59	0	870	900	934	0	16704.2	23.9	14576.2	
May 1 2017	30100	278	278	150580444	1296741	1296741	36734	901	611	46.6	0.6	23:58	0	863	900	931	0	16704.2	23.9	14600.1	
May 2 2017	30374	552	274	151876818	2593115	1296374	36724	900	604	46	0.8	23:59	0	870	900	928	0	16704.2	24	14624.1	
May 3 2017	30647	825	273	153172917	3889214	1296099	36716	900	600	45.8	0.9	23:59	0	878	900	917	0	16704.2	23.9	14648	
May 4 2017	30922	1100	275	154468852	5185149	1295935	36711	900	605	46.1	0.8	23:58	0	875	900	921	0	16704.2	23.9	14671.9	
May 5 2017	31199	1377	277	155763986	6480283	1295134	36689	899	609	46.4	0.7	23:58	0	874	900	932	0	16704.2	24	14695.9	
May 6 2017	31472	1650	273	157059912	7776209	1295926	36711	900	600	45.8	0.9	23:58	0	870	900	930	0	16704.2	23.9	14719.8	
May 7 2017	31747	1925	275	158356079	9072376	1296167	36718	900	605	46.1	0.8	23:59	0	875	900	924	0	16704.2	23.9	14743.8	
May 8 2017	31975	2153	228	159432025	10148322	1075946	30479	900	502	46.1	0.8	19:53	1	19	896	949	0	16704.2	19.9	14763.7	
May 9 2017	32248	2426	273	160727277	11443574	1295252	36692	899	601	45.9	0.8	23:58	0	890	900	918	0	16704.2	23.9	14787.6	
May 10 2017	32516	2694	268	162024310	12740607	1297033	36742	901	590	44.9	1	23:59	0	887	900	912	0	16704.2	24	14811.6	
May 11 2017	32784	2962	268	163320638	14036935	1296328	36722	900	590	45	0.9	23:58	0	870	900	932	0	16704.2	23.9	14835.5	
May 12 2017	33054	3232	270	164616740	15333037	1296102	36716	900	594	45.3	0.8	23:58	0	855	900	935	0	16704.2	23.9	14859.4	
May 13 2017	33327	3505	273	165912345	16628642	1295605	36702	900	600	45.8	0.7	23:59	0	878	900	934	0	16704.2	24	14883.4	
May 14 2017	33601	3779	274	167208604	17924901	1296259	36720	900	603	45.9	0.7	23:58	0	868	900	930	0	16704.2	23.9	14907.3	
May 15 2017	33874	4052	273	168504452	19220749	1295848	36709	900	600	45.7	0.8	23:59	0	873	900	933	0	16704.2	23.9	14931.2	
May 16 2017	34075	4253	201	169424057	20140354	919605	26051	899	441	47.4	0.5	17:03	1	15	893	952	0	16704.2	17.1	14948.4	
May 17 2017	34348	4526	273	170720531	21436828	1296474	36727	900	600	45.8	0.9	23:59	0	869	900	931	0	16704.2	23.9	14972.3	
May 18 2017	34612	4790	264	172016234	22732531	1295703	36705	900	581	44.3	1.2	23:58	0	866	900	931	0	16704.2	23.9	14996.2	
May 19 2017	34879	5057	267	173312768	24029065	1296534	36728	900	587	44.8	1	23:58	0	859	900	935	0	16704.2	24	15020.2	
May 20 2017	35149	5327	270	174609482	25325779	1296714	36733	900	593	45.2	0.9	23:59	0	868	900	931	0	16704.2	23.9	15044.1	
May 21 2017	35421	5599	272	175905673	26621970	1296191	36718	900	599	45.7	0.7	23:59	0	862	900	930	0	16704.2	23.9	15068	
May 22 2017	35692	5870	271	177201337	27917634	1295664	36704	900	596	45.4	0.8	23:59	0	872	900	929	0	16704.2	24	15092	
May 23 2017	35965	6143	273	178496908	29213205	1295571	36701	900	600	45.8	0.8	23:58	0	865	900	943	0	16704.2	22.9	15114.9	
May 24 2017	36248	6426	283	179792288	30508585	1295380	36696	900	622	47.5	0.5	23:58	0	845	900	950	0	16704.2	24	15138.9	
May 25 2017	36533	6711	285	181088294	31804591	1296006	36713	900	627	47.8	0.6	23:59	0	874	900	935	0	16704.2	23.9	15162.8	
May 26 2017	36814	6992	281	182384171	33100468	1295877	36710	900	618	47.2	0.8	23:58	0	869	900	931	0	16704.2	23.9	15186.7	
May 27 2017	37097	7275	283	183679777	34396074	1295606	36702	900	622	47.4	0.7	23:58	0	856	900	947	0	16704.2	24	15210.7	
May 28 2017	37378	7556	281	184974616	35690913	1294839	36680	899	619	47.2	0.8	23:58	0	870	900	927	0	16704.2	23.9	15234.6	
May 29 2017	37656	7834	278	186270460	36986757	1295844	36709	900	611	46.6	0.9	23:58	0	871	900	939	0	16704.2	24	15258.6	
May 30 2017	37935	8113	279	187566979	38283276	1296519	36728	900	614	46.8	0.9	23:59	0	856	900	948	0	16704.2	23.9	15282.5	
May 31 2017	38216	8394	281	188863049	39579346	1296070	36715	900	617	47.1	0.9	23:59	0	863	900	950	0	16704.2	24	15306.5	
Jun 1 2017	38501	285	285	190158142	1295093	1295093	36687	900	627	47.6	0.8	23:59	0	872	900	940	0	16704.2	23.6	15330.2	
Jun 2 2017	38790	574	289	191453934	2590885	1295792	36707	900	636	48.4	0.6	23:58	0	866	900	941	0	16704.2	24.1	15354.3	
Jun 3 2017	39076	860	286	192750619	3887570	1296685	36732	901	630	48	0.8	23:59	0	854	900	940	0	16704.2	23.9	15378.2	
Jun 4 2017	39358	1142	282	194045661	5182612	1295042	36686	899	620	47.3	1	23:58	0	854	900	937	0	16704.2	24	15402.2	
Jun 5 2017	39641	1425	283	195340993	6477944	1295332	36694	900	623	47.5	0.9	23:58	0	872	900	935	0	16704.2	24	15426.2	

Date	CO2 Equivalents			Landfill Gas Flow							CH4	O2	Flare	Flare	Temp			Blower 1		Blower 2	
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total	Avg					Avg	Run	Flare	Min	Avg.	Max.	Daily
	Tonnes	Tonnes	Tonnes								scf	scf	scf	m3							
	CO2	CO2	CO2	scf	scf	scf	m3	scfm	MMBTU	(%)	(%)	Hours	Starts	°C	°C	°C	Hours	Hours	Hours	Hours	
Jun 6 2017	39922	1706	281	196619376	7756327	1278383	36214	900	617	47.7	0.8	23:26	1	864	900	930	0	16704.2	23.5	15449.7	
Jun 7 2017	40205	1989	283	197914727	9051678	1295351	36695	900	623	47.5	0.9	23:59	0	867	900	954	0	16704.2	23.9	15473.6	
Jun 8 2017	40490	2274	285	199210780	10347731	1296053	36715	900	627	47.8	0.8	23:58	0	855	900	942	0	16704.2	24	15497.6	
Jun 9 2017	40708	2492	218	200188806	11325757	978026	27706	899	480	48.4	0.6	18:07	0	875	900	923	0	16704.2	18.8	15516.4	
Jun 10 2017	40708	2492	0	200188806	11325757	0	0	0	0	0	0	00:00	0	0	0	0	0	0	0	0	
Jun 11 2017	40893	2677	185	201037138	12174089	848332	24032	901	407	47.4	1	15:40	1	872	900	933	0	16704.2	53.1	15569.5	
Jun 12 2017	41171	2955	278	202333057	13470008	1295919	36711	900	611	46.6	1.1	23:59	0	852	900	957	0	16704.2	23.9	15593.4	
Jun 13 2017	41458	3242	287	203629132	14766083	1296075	36715	900	632	48.2	0.5	23:59	0	866	900	949	0	16704.2	24	15617.4	
Jun 14 2017	41743	3527	285	204868521	16005472	1239389	35109	900	628	50.1	-0.1	23:05	3	0	896	933	0	16704.2	24.3	15641.7	
Jun 15 2017	41854	3638	111	205327884	16464835	459363	13013	898	244	52.4	0.1	08:29	1	34	891	960	0	16704.2	8.6	15650.3	
Jun 16 2017	42012	3796	158	205964679	17101630	636795	18039	900	349	54.1	0.1	11:47	1	133	895	963	0	16704.2	11.7	15662	
Jun 17 2017	42316	4100	304	207260500	18397451	1295821	36708	900	670	51.1	0.3	23:58	0	885	900	916	0	16704.2	23.9	15685.9	
Jun 18 2017	42614	4398	298	208555880	19692831	1295380	36696	900	656	50.1	0.5	23:58	0	883	900	914	0	16704.2	23.9	15709.8	
Jun 19 2017	42755	4539	141	209131205	20268156	575325	16298	894	310	53.2	-0.1	10:42	3	24	880	966	0	16704.2	10.7	15720.4	
Jun 20 2017	43061	4845	306	210428293	21565244	1297088	36744	901	673	51.3	0.3	23:59	0	886	900	916	0	16704.2	23.9	15744.3	
Jun 21 2017	43367	5151	306	211724573	22861524	1296280	36721	900	672	51.2	0.1	23:59	0	864	900	921	0	16704.2	23.9	15768.2	
Jun 22 2017	43669	5453	302	213020456	24157407	1295883	36710	900	664	50.7	0.2	23:59	0	878	900	920	0	16704.2	23.9	15792.1	
Jun 23 2017	43963	5747	294	214315918	25452869	1295462	36698	900	647	49.4	0.6	23:58	0	883	900	916	0	16704.2	23.9	15816	
Jun 24 2017	44254	6038	291	215611345	26748296	1295427	36697	900	640	48.8	0.7	23:59	0	889	900	918	0	16704.2	23.9	15840	
Jun 25 2017	44545	6329	291	216906814	28043765	1295469	36698	900	640	48.8	0.6	23:59	0	884	900	918	0	16704.2	23.9	15863.9	
Jun 26 2017	44840	6624	295	218203359	29340310	1296545	36729	900	649	49.4	0.4	23:59	0	888	900	912	0	16704.2	23.9	15887.8	
Jun 27 2017	45139	6923	299	219499295	30636246	1295936	36711	900	659	50.2	0.2	23:58	0	861	900	935	0	16704.2	23.9	15911.7	
Jun 28 2017	45433	7217	294	220795529	31932480	1296234	36720	900	647	49.3	0.7	23:58	0	882	900	920	0	16704.2	23.9	15935.6	
Jun 29 2017	45721	7505	288	222091478	33228429	1295949	36712	900	634	48.4	1.1	23:59	0	882	900	920	0	16704.2	23.9	15959.5	
Jun 30 2017	46007	7791	286	223387402	34524353	1295924	36711	900	629	48	1.2	23:59	0	883	900	916	0	16704.2	23.9	15983.4	
Jul 1 2017	46291	284	284	224683566	1296164	1296164	36718	900	624	47.6	1.4	23:58	0	878	900	921	0	16704.2	23.9	16007.3	
Jul 2 2017	46572	565	281	225979751	2592349	1296185	36718	900	617	47.1	1.6	23:58	0	878	900	917	0	16704.2	23.9	16031.2	
Jul 3 2017	46857	850	285	227276143	3888741	1296392	36724	900	626	47.7	1.4	23:59	0	881	900	919	0	16704.2	23.9	16055.1	
Jul 4 2017	47144	1137	287	228572265	5184863	1296122	36717	900	631	48.1	1.3	23:59	0	874	900	930	0	16704.2	23.9	16079	
Jul 5 2017	47428	1421	284	229868832	6481430	1296567	36729	900	625	47.6	1.5	23:58	0	874	900	913	0	16704.2	23.9	16102.9	
Jul 6 2017	47707	1700	279	231165101	7777699	1296269	36721	900	615	46.9	1.9	23:58	0	884	900	915	0	16704.2	23.9	16126.8	
Jul 7 2017	47984	1977	277	232461667	9074265	1296566	36729	900	608	46.4	2.1	23:58	0	883	900	918	0	16704.2	23.9	16150.7	
Jul 8 2017	48260	2253	276	233757676	10370274	1296009	36713	900	606	46.2	2.3	23:58	0	883	900	912	0	16704.2	23.9	16174.6	
Jul 9 2017	48534	2527	274	235053723	11666321	1296047	36714	900	603	46	2.5	23:59	0	877	900	925	0	16704.2	23.9	16198.5	
Jul 10 2017	48804	2797	270	236349916	12962514	1296193	36719	900	594	45.3	2.9	23:58	0	877	900	923	0	16704.2	23.9	16222.5	
Jul 11 2017	49072	3065	268	237637662	14250260	1287746	36479	900	588	45.2	3.1	23:59	0	0	897	923	0	16704.2	23.8	16246.3	
Jul 12 2017	49339	3332	267	238934313	15546911	1296651	36732	900	587	44.7	3.1	23:59	0	884	900	916	0	16704.2	23.9	16270.2	
Jul 13 2017	49607	3600	268	240230270	16842868	1295957	36712	900	591	45	3	23:58	0	882	900	919	0	16704.2	23.9	16294.1	
Jul 14 2017	49879	3872	272	241526794	18139392	1296524	36728	900	599	45.7	2.9	23:58	0	884	900	917	0	16704.2	23.9	16318	

Date	CO2 Equivalents			Landfill Gas Flow							CH4	O2	Flare	Flare	Temp			Blower 1		Blower 2	
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total	Avg					Avg	Run	Flare	Min	Avg.	Max.	Daily
	Tonnes	Tonnes	Tonnes								scf	scf	scf	m3							
	CO2	CO2	CO2	scf	scf	scf	m3	scfm	MMBTU	(%)	(%)	Hours	Starts	°C	°C	°C	Hours	Hours	Hours	Hours	
Jul 15 2017	50049	4042	170	242358411	18971009	831617	23558	900	373	44.3	3.5	15:21	0	887	900	921	0	16704.2	15.4	16333.4	
Jul 16 2017	50049	4042	0	242358411	18971009	0	0	0	0	0	0	00:00	0	0	0	0	0	16704.2	0	16333.4	
Jul 17 2017	50194	4187	145	243026498	19639096	668087	18926	899	320	47.3	3.4	12:25	1	24	892	929	0	16704.2	12.3	16345.7	
Jul 18 2017	50462	4455	268	244323357	20935955	1296859	36737	901	590	44.9	4	23:59	0	875	900	918	0	16704.2	23.9	16369.6	
Jul 19 2017	50731	4724	269	245619066	22231664	1295709	36705	900	591	45.1	3.8	23:58	0	876	900	921	0	16704.2	23.9	16393.5	
Jul 20 2017	50996	4989	265	246915630	23528228	1296564	36729	900	582	44.4	4.1	23:58	0	877	900	925	0	16704.2	23.9	16417.4	
Jul 21 2017	51263	5256	267	248212390	24824988	1296760	36735	901	587	44.7	4	23:59	0	876	900	927	0	16704.2	23.9	16441.3	
Jul 22 2017	51526	5519	263	249508240	26120838	1295850	36709	900	578	44.1	4.2	23:59	0	883	900	920	0	16704.2	23.9	16465.2	
Jul 23 2017	51787	5780	261	250803166	27415764	1294926	36683	899	573	43.7	4.2	23:58	0	887	900	917	0	16704.2	23.9	16489.1	
Jul 24 2017	52051	6044	264	252100138	28712736	1296972	36741	901	581	44.3	4.1	23:58	0	882	900	919	0	16704.2	23.9	16513	
Jul 25 2017	52314	6307	263	253396776	30009374	1296638	36731	900	577	44	4.2	23:59	0	880	900	931	0	16704.2	23.9	16536.9	
Jul 26 2017	52573	6566	259	254692925	31305523	1296149	36717	900	570	43.4	4.3	23:59	0	886	900	910	0	16704.2	23.9	16560.8	
Jul 27 2017	52833	6826	260	255988314	32600912	1295389	36696	900	572	43.7	4.3	23:58	0	883	900	917	0	16704.2	23.9	16584.7	
Jul 28 2017	53074	7067	241	257172842	33785440	1184528	33555	899	529	44.2	4.1	21:57	1	37	896	959	0	16704.2	21.9	16606.6	
Jul 29 2017	53333	7326	259	258469042	35081640	1296200	36719	900	571	43.5	4.4	23:59	0	884	900	914	0	16704.2	23.9	16630.6	
Jul 30 2017	53592	7585	259	259764801	36377399	1295759	36706	900	570	43.5	4.4	23:59	0	881	900	922	0	16704.2	23.9	16654.5	
Jul 31 2017	53852	7845	260	261060670	37673268	1295869	36709	900	572	43.6	4.4	23:58	0	884	900	915	0	16704.2	23.9	16678.4	
Aug 1 2017	54105	253	253	262357085	1296415	1296415	36725	900	556	42.3	4.8	23:58	0	883	900	918	0	16704.2	23.9	16702.3	
Aug 2 2017	54355	503	250	263652620	2591950	1295535	36700	900	549	41.9	4.9	23:59	0	879	900	917	0	16704.2	23.9	16726.2	
Aug 3 2017	54605	753	250	264948199	3887529	1295579	36701	900	550	42	4.9	23:58	0	887	900	911	0	16704.2	23.9	16750.1	
Aug 4 2017	54799	947	194	265954519	4893849	1006320	28507	900	427	41.9	5	18:35	0	878	900	921	0	16704.2	18.6	16768.7	
Aug 5 2017	54894	1042	95	266417614	5356944	463095	13119	898	208	44.3	4.6	08:36	1	27	889	937	0	16704.2	8.5	16777.2	
Aug 6 2017	55143	1291	249	267713068	6652398	1295454	36698	900	548	41.8	5.2	23:59	0	878	900	924	0	16704.2	23.9	16801.1	
Aug 7 2017	55212	1360	69	268077681	7017011	364613	10329	899	151	40.9	5.6	06:42	0	884	900	913	0	16704.2	6.8	16807.9	
Aug 8 2017	55275	1423	63	268377370	7316700	299689	8490	896	138	45.5	3.9	05:40	2	0	880	966	0	16704.2	5.2	16813	
Aug 9 2017	55527	1675	252	269673161	8612491	1295791	36707	900	554	42.3	4.7	23:58	0	880	900	916	0	16704.2	23.9	16836.9	
Aug 10 2017	55773	1921	246	270969293	9908623	1296132	36717	900	540	41.2	5.3	23:58	0	882	900	921	0	16704.2	23.9	16860.9	
Aug 11 2017	56017	2165	244	272265252	11204582	1295959	36712	900	537	41	5.5	23:58	0	880	900	924	0	16704.2	23.9	16884.8	
Aug 12 2017	56261	2409	244	273561037	12500367	1295785	36707	900	536	40.9	5.5	23:59	0	882	900	922	0	16704.2	23.9	16908.7	
Aug 13 2017	56504	2652	243	274856192	13795522	1295155	36689	899	535	40.8	5.6	23:59	0	878	900	922	0	16704.2	23.9	16932.6	
Aug 14 2017	56744	2892	240	276152814	15092144	1296622	36731	900	529	40.3	5.9	23:59	0	880	900	921	0	16704.2	23.9	16956.5	
Aug 15 2017	56875	3023	131	276840090	15779420	687276	19469	900	288	41.4	5.2	12:41	1	26	893	994	6.3	16710.4	6.4	16962.9	
Aug 16 2017	57119	3267	244	278136357	17075687	1296267	36721	900	536	40.9	5.1	23:58	0	885	900	921	23.9	16734.3	0	16962.9	
Aug 17 2017	57360	3508	241	279432245	18371575	1295888	36710	900	529	40.4	5.6	23:59	0	887	900	914	23.9	16758.3	0	16962.9	
Aug 18 2017	57598	3746	238	280727945	19667275	1295700	36705	900	524	39.9	5.9	23:58	0	886	900	915	23.9	16782.2	0	16962.9	
Aug 19 2017	57836	3984	238	282023632	20962962	1295687	36704	900	523	39.9	5.9	23:59	0	885	900	911	23.9	16806.1	0	16962.9	
Aug 20 2017	58064	4212	228	283320914	22260244	1297282	36749	901	501	38.2	6.6	23:59	0	891	900	916	23.9	16830	0	16962.9	
Aug 21 2017	58291	4439	227	284617148	23556478	1296234	36720	900	500	38.1	6.5	23:58	0	885	900	918	23.9	16853.9	0	16962.9	
Aug 22 2017	58514	4662	223	285913451	24852781	1296303	36722	900	492	37.5	6.6	23:58	0	886	900	916	23.9	16877.8	0	16962.9	

Date	CO2 Equivalents			Landfill Gas Flow							CH4	O2	Flare	Flare	Temp			Blower 1		Blower 2	
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total	Avg					Avg	Run	Flare	Min	Avg.	Max.	Daily
	Tonnes	Tonnes	Tonnes								scf	scf	scf	m3							
	CO2	CO2	CO2	scf	scf	scf	m3	scfm	MMBTU	(%)	(%)	Hours	Starts	°C	°C	°C	Hours	Hours	Hours	Hours	
Aug 23 2017	58735	4883	221	287209297	26148627	1295846	36709	900	485	37	6.8	23:58	0	886	900	917	23.9	16901.7	0	16962.9	
Aug 24 2017	58947	5095	212	288446310	27385640	1237013	35042	899	466	37.2	6.6	22:55	1	44	895	998	22.8	16924.5	0	16962.9	
Aug 25 2017	59158	5306	211	289643044	28582374	1196734	33901	900	463	38.3	6.4	22:08	1	30	896	1002	22.1	16946.6	0	16962.9	
Aug 26 2017	59389	5537	231	290938999	29878329	1295955	36712	900	509	38.8	6	23:59	0	884	900	913	23.9	16970.5	0	16962.9	
Aug 27 2017	59619	5767	230	292234675	31174005	1295676	36704	900	505	38.5	6	23:59	0	882	900	915	23.9	16994.4	0	16962.9	
Aug 28 2017	59851	5999	232	293530506	32469836	1295831	36708	900	510	38.9	6	23:58	0	884	900	920	23.9	17018.3	0	16962.9	
Aug 29 2017	60084	6232	233	294826358	33765688	1295852	36709	900	513	39.1	6	23:58	0	888	900	912	23.9	17042.2	0	16962.9	
Aug 30 2017	60300	6448	216	296122260	35061590	1295902	36710	900	474	36.2	7	23:59	0	884	900	916	23.9	17066.1	0	16962.9	
Aug 31 2017	60505	6653	205	297418756	36358086	1296496	36727	900	451	34.4	7.6	23:58	0	886	900	916	23.9	17090.1	0	16962.9	
Sep 1 2017	60634	129	129	298199878	781122	781122	22128	900	283	35.8	7.1	14:27	1	22	892	930	14.4	17104.5	0	16962.9	
Sep 2 2017	60849	344	215	299496630	2077874	1296752	36734	901	473	36	6.7	23:59	0	886	900	919	23.9	17128.4	0	16962.9	
Sep 3 2017	61058	553	209	300793493	3374737	1296863	36738	901	461	35.1	7.5	23:58	0	885	900	916	23.9	17152.3	0	16962.9	
Sep 4 2017	61089	584	31	300994488	3575732	200995	5694	900	69	34	7.9	03:42	0	891	900	911	4.3	17156.6	0	16962.9	
Sep 5 2017	61147	642	58	301323002	3904246	328514	9306	899	128	38.5	6.7	06:07	1	16	882	1010	5.5	17162.1	0	16962.9	
Sep 6 2017	61324	819	177	302387548	4968792	1064546	30156	899	390	36.2	7.6	19:41	1	26	894	943	19.6	17181.7	0	16962.9	
Sep 7 2017	61367	862	43	302635000	5216244	247452	7010	899	95	38	7	04:34	1	20	876	982	5.2	17186.9	0	16962.9	
Sep 8 2017	61476	971	109	303208976	5790220	573976	16260	897	241	41.5	5.4	10:41	1	20	890	994	10.1	17196.9	0	16962.9	
Sep 9 2017	61712	1207	236	304505292	7086536	1296316	36722	900	519	39.6	5.8	23:59	0	884	900	916	23.9	17220.8	0	16962.9	
Sep 10 2017	61943	1438	231	305801860	8383104	1296568	36729	900	508	38.7	6	23:58	0	878	900	920	23.9	17244.7	0	16962.9	
Sep 11 2017	62162	1657	219	307098957	9680201	1297097	36744	901	481	36.6	6.6	23:58	0	891	900	913	23.9	17268.7	0	16962.9	
Sep 12 2017	62384	1879	222	308395247	10976491	1296290	36721	900	489	37.3	6.4	23:59	0	883	900	920	23.9	17292.6	0	16962.9	
Sep 13 2017	62594	2089	210	309683254	12264498	1288007	36487	900	462	35.4	7.1	23:58	1	0	899	918	23.6	17316.2	0	16962.9	
Sep 14 2017	62803	2298	209	310979790	13561034	1296536	36728	900	459	35	6.4	23:59	0	883	900	936	23.9	17340.1	0	16962.9	
Sep 15 2017	63008	2503	205	312275329	14856573	1295539	36700	900	450	34.4	5.1	23:58	0	882	900	913	23.9	17364	0	16962.9	
Sep 16 2017	63207	2702	199	313571092	16152336	1295763	36706	900	438	33.4	5	23:58	0	883	900	913	23.9	17387.9	0	16962.9	
Sep 17 2017	63400	2895	193	314868126	17449370	1297034	36742	901	424	32.3	5.2	23:59	0	886	900	915	24	17411.9	0	16962.9	
Sep 18 2017	63597	3092	197	316164919	18746163	1296793	36736	901	433	33	4.5	23:58	0	886	900	914	23.9	17435.8	0	16962.9	
Sep 19 2017	63803	3298	206	317461731	20042975	1296812	36736	901	452	34.4	3.3	23:59	0	881	900	918	23.9	17459.7	0	16962.9	
Sep 20 2017	63915	3410	112	318194873	20776117	733142	20768	900	247	33.3	3.8	13:32	0	855	900	918	14.2	17473.9	0	16962.9	
Sep 21 2017	63915	3410	0	318194873	20776117	0	0	0	0	0	0	00:00	0	0	0	0	0	17473.9	0	16962.9	
Sep 22 2017	63915	3410	0	318194873	20776117	0	0	0	0	0	0	00:00	0	0	0	0	0	17473.9	0	16962.9	
Sep 23 2017	63915	3410	0	318194873	20776117	0	0	0	0	0	0	00:00	0	0	0	0	0	17473.9	0	16962.9	
Sep 24 2017	63915	3410	0	318194873	20776117	0	0	0	0	0	0	00:00	0	0	0	0	0	17473.9	0	16962.9	
Sep 25 2017	63996	3491	81	318569025	21150269	374152	10599	898	178	47	1.9	06:56	1	42	886	936	6.1	17480	0	16962.9	
Sep 26 2017	64234	3729	238	319865474	22446718	1296449	36726	900	524	39.9	2.8	23:58	0	887	900	920	23.9	17503.9	0	16962.9	
Sep 27 2017	64453	3948	219	321162323	23743567	1296849	36737	901	481	36.7	3.4	23:59	0	878	900	933	23.9	17527.8	0	16962.9	
Sep 28 2017	64658	4153	205	322458165	25039409	1295842	36709	900	451	34.4	3.8	23:59	0	873	900	938	23.9	17551.7	0	16962.9	
Sep 29 2017	64858	4353	200	323755031	26336275	1296866	36738	901	439	33.5	3.9	23:58	0	874	900	919	23.9	17575.6	0	16962.9	
Sep 30 2017	65062	4557	204	325052603	27633847	1297572	36758	901	448	34.1	3.7	23:59	0	872	900	934	23.9	17599.6	0	16962.9	

Date	CO2 Equivalents			Landfill Gas Flow							CH4	O2	Flare	Flare	Temp			Blower 1		Blower 2	
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total	Avg					Avg	Run	Flare	Min	Avg.	Max.	Daily
	Tonnes	Tonnes	Tonnes								scf	scf	scf	m3							
	CO2	CO2	CO2	scf	scf	scf	m3	scfm	MMBTU	(%)	(%)	Hours	Starts	°C	°C	°C	Hours	Hours	Hours	Hours	
Oct 1 2017	65265	203	203	326348111	1295508	1295508	36699	900	446	34	3.9	23:59	0	886	900	913	23.9	17623.5	0	16962.9	
Oct 2 2017	65460	398	195	327644782	2592179	1296671	36732	900	429	32.7	4.2	23:58	0	887	900	915	23.9	17647.4	0	16962.9	
Oct 3 2017	65648	586	188	328940987	3888384	1296205	36719	900	413	31.5	4.8	23:58	0	874	900	928	23.9	17671.3	0	16962.9	
Oct 4 2017	65848	786	200	330237562	5184959	1296575	36729	900	441	33.6	4.6	23:59	0	883	900	929	23.9	17695.2	0	16962.9	
Oct 5 2017	66061	999	213	331534214	6481611	1296652	36732	900	468	35.7	4.4	23:58	0	868	900	944	23.9	17719.1	0	16962.9	
Oct 6 2017	66266	1204	205	332782561	7729958	1248347	35363	867	451	35.8	4.2	23:58	0	876	900	913	23.9	17743	0	16962.9	
Oct 7 2017	66459	1397	193	333935328	8882725	1152767	32656	801	426	36.5	4	23:58	0	872	900	928	23.9	17766.9	0	16962.9	
Oct 8 2017	66638	1576	179	335088090	10035487	1152762	32655	801	393	33.7	5	23:58	0	883	900	917	23.9	17790.8	0	16962.9	
Oct 9 2017	66811	1749	173	336240529	11187926	1152439	32646	800	381	32.7	5.2	23:59	0	878	900	919	23.9	17814.7	0	16962.9	
Oct 10 2017	66908	1846	97	336879540	11826937	639011	18102	798	214	33.1	5	13:17	0	868	900	934	14.1	17828.9	0	16962.9	
Oct 11 2017	66908	1846	0	336879540	11826937	0	0	0	0	0	0	00:00	0	0	0	0	0	17828.9	0	16962.9	
Oct 12 2017	66908	1846	0	336879540	11826937	0	0	0	0	0	0	00:00	0	0	0	0	0	17828.9	0	16962.9	
Oct 13 2017	66908	1846	0	336879540	11826937	0	0	0	0	0	0	00:00	0	0	0	0	0	17828.9	0	16962.9	
Oct 14 2017	66908	1846	0	336879540	11826937	0	0	0	0	0	0	00:00	0	0	0	0	0	17828.9	0	16962.9	
Oct 15 2017	66908	1846	0	336879540	11826937	0	0	0	0	0	0	00:00	0	0	0	0	0	17828.9	0	16962.9	
Oct 16 2017	66908	1846	0	336879540	11826937	0	0	0	0	0	0	00:00	0	0	0	0	0	17828.9	0	16962.9	
Oct 17 2017	67017	1955	109	337439915	12387312	560375	15874	797	239	42.2	4.7	11:44	3	6	874	940	10.8	17839.6	0	16962.9	
Oct 18 2017	67206	2144	189	338514894	13462291	1074979	30452	799	415	38.2	5.6	22:23	2	17	891	938	22.4	17862	0	16962.9	
Oct 19 2017	67412	2350	206	339666073	14613470	1151179	32611	799	453	38.9	5	23:59	0	809	900	948	23.9	17885.9	0	16962.9	
Oct 20 2017	67619	2557	207	340818262	15765659	1152189	32639	800	455	39	4.9	23:58	0	887	900	914	23.9	17909.8	0	16962.9	
Oct 21 2017	67817	2755	198	341970729	16918126	1152467	32647	800	436	37.4	5.5	23:59	0	883	900	917	23.9	17933.7	0	16962.9	
Oct 22 2017	68012	2950	195	343123425	18070822	1152696	32654	800	428	36.7	5.6	23:58	0	886	900	917	23.9	17957.6	0	16962.9	
Oct 23 2017	68196	3134	184	344275309	19222706	1151884	32631	800	404	34.7	6.2	23:58	0	852	893	914	23.9	17981.6	0	16962.9	
Oct 24 2017	68388	3326	192	345427673	20375070	1152364	32644	800	423	36.3	5.6	23:58	0	870	900	918	23.9	18005.5	0	16962.9	
Oct 25 2017	68587	3525	199	346579125	21526522	1151452	32618	800	438	37.6	5.2	23:59	0	877	900	923	23.9	18029.4	0	16962.9	
Oct 26 2017	68791	3729	204	347731225	22678622	1152100	32637	800	448	38.4	4.5	23:59	0	852	899	928	23.9	18053.3	0	16962.9	
Oct 27 2017	69005	3943	214	348883437	23830834	1152212	32640	800	472	40.4	4.4	23:58	0	820	899	931	23.9	18077.2	0	16962.9	
Oct 28 2017	69234	4172	229	350036343	24983740	1152906	32660	801	503	43.1	3.8	23:58	0	884	900	912	23.9	18101.1	0	16962.9	
Oct 29 2017	69455	4393	221	351189049	26136446	1152706	32654	800	485	41.6	4.3	23:58	0	866	900	928	23.9	18125	0	16962.9	
Oct 30 2017	69674	4612	219	352378697	27326094	1189648	33700	826	481	39.8	5	23:58	0	771	899	968	23.9	18148.9	0	16962.9	
Oct 31 2017	69918	4856	244	353674579	28621976	1295882	36710	900	538	41	4.8	23:59	0	876	900	932	23.9	18172.8	0	16962.9	
Nov 1 2017	70149	231	231	354970576	1295997	1295997	36713	900	508	38.7	5.9	23:58	0	888	900	912	23.9	18196.7	0	16962.9	
Nov 2 2017	70384	466	235	356267129	2592550	1296553	36729	900	517	39.4	5.4	23:59	0	865	900	932	23.9	18220.6	0	16962.9	
Nov 3 2017	70651	733	267	357563209	3888630	1296080	36715	900	588	44.9	3.1	23:59	0	884	900	917	23.9	18244.5	0	16962.9	
Nov 4 2017	70938	1020	287	358859514	5184935	1296305	36722	900	631	48.1	1.7	23:58	0	886	900	915	23.9	18268.4	0	16962.9	
Nov 5 2017	71214	1296	276	360155231	6480652	1295717	36705	900	606	46.2	2.2	23:59	0	888	900	914	24.9	18293.3	0	16962.9	
Nov 6 2017	71478	1560	264	361371434	7696855	1216203	34453	900	582	47.3	1.3	22:30	1	0	896	999	22.4	18315.7	0	16962.9	
Nov 7 2017	71758	1840	280	362667602	8993023	1296168	36718	900	616	47	1.4	23:58	0	885	900	924	23.9	18339.7	0	16962.9	
Nov 8 2017	72029	2111	271	363963456	10288877	1295854	36709	900	597	45.5	1.6	23:59	0	881	900	918	23.9	18363.6	0	16962.9	



Date	CO2 Equivalents			Landfill Gas Flow							CH4	O2	Flare	Flare	Temp			Blower 1		Blower 2	
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total	Avg					Avg	Run	Flare	Min	Avg.	Max.	Daily
	Tonnes	Tonnes	Tonnes								scf	scf	scf	m3							
	CO2	CO2	CO2	scf	scf	scf	m3	scfm	MMBTU	(%)	(%)	Hours	Starts	°C	°C	°C	Hours	Hours	Hours	Hours	
Nov 9 2017	72297	2379	268	365259587	11585008	1296131	36717	900	590	45	1.7	23:58	0	874	900	923	23.9	18387.5	0	16962.9	
Nov 10 2017	72597	2679	300	366624467	12949888	1364880	38664	948	659	47.7	0.9	23:59	0	879	900	930	23.9	18411.4	0	16962.9	
Nov 11 2017	72893	2975	296	368064580	14390001	1440113	40796	1000	651	44.6	2.2	23:58	0	882	900	913	23.9	18435.3	0	16962.9	
Nov 12 2017	73182	3264	289	369504287	15829708	1439707	40784	1000	636	43.7	2.4	23:59	0	883	900	927	23.9	18459.2	0	16962.9	
Nov 13 2017	73482	3564	300	370945137	17270558	1440850	40816	1001	660	45.2	1.6	23:59	0	879	900	918	23.9	18483.1	0	16962.9	
Nov 14 2017	73785	3867	303	372386121	18711542	1440984	40820	1001	667	45.7	1.9	23:58	0	870	900	924	23.9	18507	0	16962.9	
Nov 15 2017	74073	4155	288	373825826	20151247	1439705	40784	1000	634	43.5	3.2	23:59	0	877	900	921	23.9	18530.9	0	16962.9	
Nov 16 2017	74381	4463	308	375257814	21583235	1431988	40565	1001	676	46.7	1.9	23:58	1	0	899	923	24.6	18555.5	0	16962.9	
Nov 17 2017	74686	4768	305	376740117	23065538	1482303	41991	1030	671	44.8	2.9	23:58	0	873	900	931	23.9	18579.4	0	16962.9	
Nov 18 2017	74996	5078	310	378324568	24649989	1584451	44884	1100	683	42.6	3.4	23:59	0	888	900	927	23.9	18603.3	0	16962.9	
Nov 19 2017	75305	5387	309	379907939	26233360	1583371	44854	1100	679	42.4	3.7	23:59	0	877	900	925	23.9	18627.2	0	16962.9	
Nov 20 2017	75615	5697	310	381486522	27811943	1578583	44718	1101	681	42.6	3.8	23:56	1	0	899	927	23.1	18650.3	0	16962.9	
Nov 21 2017	75877	5959	262	383071455	29396876	1584933	44898	1101	576	35.9	6.6	23:58	0	865	900	921	23.9	18674.2	0	16962.9	
Nov 22 2017	76149	6231	272	384655844	30981265	1584389	44883	1100	599	37.4	6.3	23:59	0	881	900	920	23.9	18698.1	0	16962.9	
Nov 23 2017	76433	6515	284	386240354	32565775	1584510	44886	1100	625	39	5.8	23:59	0	881	900	921	23.9	18722.1	0	16962.9	
Nov 24 2017	76703	6785	270	387768365	34093786	1528011	43286	1061	593	38.4	5.9	23:59	0	873	900	921	23.9	18746	0	16962.9	
Nov 25 2017	76957	7039	254	389136378	35461799	1368013	38753	950	559	40.4	4.7	23:59	0	884	900	923	23.9	18769.9	0	16962.9	
Nov 26 2017	77216	7298	259	390505577	36830998	1369199	38787	951	569	41.1	4.6	23:58	0	876	900	924	23.9	18793.8	0	16962.9	
Nov 27 2017	77491	7573	275	391874164	38199585	1368587	38769	950	604	43.6	3.9	23:59	0	878	900	928	23.9	18817.7	0	16962.9	
Nov 28 2017	77756	7838	265	393236245	39561666	1362081	38585	950	583	42.3	4.3	23:56	1	0	899	920	24.6	18842.3	0	16962.9	
Nov 29 2017	78028	8110	272	394604232	40929653	1367987	38752	950	599	43.3	4.2	23:58	0	886	900	922	23.9	18866.2	0	16962.9	
Nov 30 2017	78293	8375	265	395972073	42297494	1367841	38748	950	582	42.1	4.5	23:58	0	886	900	914	23.9	18890.1	0	16962.9	
Dec 1 2017	78557	264	264	397339959	1367886	1367886	38749	950	580	41.9	4.9	23:59	0	882	900	923	23.9	18914	0	16962.9	
Dec 2 2017	78820	527	263	398708462	2736389	1368503	38767	950	577	41.7	5	23:58	0	881	900	917	23.9	18937.9	0	16962.9	
Dec 3 2017	79083	790	263	400076494	4104421	1368032	38754	950	577	41.7	5	23:59	0	880	900	925	23.9	18961.8	0	16962.9	
Dec 4 2017	79347	1054	264	401445766	5473693	1369272	38789	951	582	42	4.8	23:59	0	882	900	922	23.9	18985.7	0	16962.9	
Dec 5 2017	79604	1311	257	402814114	6842041	1368348	38763	950	565	40.8	5.1	23:59	0	880	900	918	23.9	19009.6	0	16962.9	
Dec 6 2017	79850	1557	246	404182189	8210116	1368075	38755	950	542	39.1	5.6	23:59	0	884	900	921	23.9	19033.5	0	16962.9	
Dec 7 2017	80117	1824	267	405550094	9578021	1367905	38750	950	587	42.4	4.2	23:59	0	883	900	917	23.9	19057.4	0	16962.9	
Dec 8 2017	80385	2092	268	406918585	10946512	1368491	38767	950	590	42.6	4	23:58	0	876	900	928	23.9	19081.3	0	16962.9	
Dec 9 2017	80654	2361	269	408287293	12315220	1368708	38773	951	593	42.8	4.2	23:59	0	880	900	920	23.9	19105.2	0	16962.9	
Dec 10 2017	80913	2620	259	409654867	13682794	1367574	38741	950	569	41.1	5.1	23:58	0	874	900	922	23.9	19129.2	0	16962.9	
Dec 11 2017	81158	2865	245	411022655	15050582	1367788	38747	950	540	39	5.9	23:59	0	867	900	934	23.9	19153.1	0	16962.9	
Dec 12 2017	81434	3141	276	412391334	16419261	1368679	38772	950	607	43.8	3.8	23:58	0	873	900	925	23.9	19177	0	16962.9	
Dec 13 2017	81697	3404	263	413752218	17780145	1360884	38551	951	578	42	4.8	23:58	1	0	899	923	24.1	19201.1	0	16962.9	
Dec 14 2017	81962	3669	265	415080161	19108088	1327943	37618	936	584	43.5	4.1	23:39	1	100	896	966	16.9	19218	6.6	16969.4	
Dec 15 2017	82228	3935	266	416375873	20403800	1295712	36705	900	586	44.7	3.6	23:59	0	869	900	921	0	19218	23.9	16993.3	
Dec 16 2017	82477	4184	249	417671307	21699234	1295434	36697	900	548	41.8	4.9	23:59	0	882	900	924	0	19218	23.9	17017.2	
Dec 17 2017	82725	4432	248	418966961	22994888	1295654	36703	900	546	41.7	5.1	23:58	0	884	900	916	0	19218	23.9	17041.1	

Date	CO2 Equivalents			Landfill Gas Flow						CH4	O2	Flare	Flare	Temp			Blower 1		Blower 2					
	Yearly	Monthly	Daily	Yearly	Monthly	Daily	Daily	Avg	Total					Avg	Avg	Run	Min	Avg.	Max.	Daily	Cum.	Daily	Cum.	
	Tonnes	Tonnes	Tonnes																					scf
	CO2	CO2	CO2	scf	scf	scf	m3	scfm	MMBTU					(%)	(%)	Hours	Starts	°C	°C	°C	Hours	Hours	Hours	Hours
Dec 18 2017	82975	4682	250	420262198	24290125	1295237	36691	899	551	42	5.2	23:59	0	886	900	923	0	19218	23.9	17065				
Dec 19 2017	83202	4909	227	421526325	25554252	1264127	35810	878	499	39	6.2	23:59	0	862	900	929	0	19218	23.9	17089				
Dec 20 2017	83433	5140	231	422749223	26777150	1222898	34642	849	508	41.1	5.1	23:58	0	880	900	925	0	19218	23.9	17112.9				
Dec 21 2017	83678	5385	245	423997481	28025408	1248258	35361	867	538	42.6	4.5	23:59	0	880	900	921	0	19218	23	17135.9				
Dec 22 2017	83921	5628	243	425293033	29320960	1295552	36700	900	534	40.8	5.3	23:58	0	884	900	922	0	19218	23.9	17159.8				
Dec 23 2017	84160	5867	239	426588835	30616762	1295802	36707	900	525	40	5.5	23:58	0	883	900	916	0	19218	23.9	17183.7				
Dec 24 2017	84392	6099	232	427884845	31912772	1296010	36713	900	510	38.9	5.8	23:59	0	878	900	928	0	19218	23.9	17207.6				
Dec 25 2017	84610	6317	218	429180167	33208094	1295322	36694	900	480	36.6	6.1	23:59	0	878	900	923	0	19218	23.9	17231.5				
Dec 26 2017	84818	6525	208	430477179	34505106	1297012	36742	901	457	34.8	6.5	23:58	0	878	900	933	0	19218	23.9	17255.4				
Dec 27 2017	85023	6730	205	431772711	35800638	1295532	36700	900	450	34.3	6.6	23:58	0	875	900	928	0	19218	23.9	17279.3				
Dec 28 2017	85227	6934	204	433069754	37097681	1297043	36743	901	449	34.2	6.6	23:58	0	876	900	930	0	19218	23.9	17303.2				
Dec 29 2017	85426	7133	199	434366906	38394833	1297152	36746	901	439	33.4	6.9	23:58	0	870	900	932	0	19218	23.9	17327.1				
Dec 30 2017	85623	7330	197	435662626	39690553	1295720	36705	900	433	33	7	23:59	0	860	900	934	0	19218	23.9	17351				
Dec 31 2017	85819	7526	196	436957985	40985912	1295359	36695	900	431	32.9	7	23:59	0	868	900	944	0	19218	23.9	17374.9				