APPENDIX E.3

STREAMFLOW DATA FOR TYPE A WATER LICENCE MONITORING LOCATIONS

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MEMO

To:	Andrew Vermeer Regulatory Reporting Specialist Baffinland Iron Mines	**From:**	Andrew Rees, Ph.D., EP Senior Environmental Scientist
Re:	2017 Hydrometric Monitoring Program at Water License Sites	**Date:** **Proj No:**	19 March 2018 199-04-09

1 Introduction

A monitoring requirement of the Type A Water Licence #2AM-MRY1325 issued to Baffinland Iron Mines Corporation (Baffinland) for the Mary River Project is to measure the flow and the water quality of surface discharge at locations established as part of the Surveillance Network Program (SNP). Hydrometric monitoring at or near nine of the SNP Stations was initiated in 2014. The SNP Station names, types, and data collected in 2017 are summarized in Table 1.1.

Table 1.1 SNP Hydrometric Stations

SNP Station	Hydrometric Station Type	Data Collected
MQ-C-B MQ-C-D MS-C-A/B	Hydrometric station installed using natural channel control	Discharge and water level were measured during weekly sampling events to validate stage-discharge relationships. Water level data loggers were downloaded monthly.
MP-Q1-01 MP-Q1-02 MP-C-B MS-MRY-13a MQ-C-A	Hydrometric station installed using thin plate V-notch weir flow measurement structures	Water level measured weekly. Water level data loggers downloaded monthly.

2 Measurement of Discharge

Site visits were made to the SNP hydrometric stations in June, July, and August 2017. An initial site visit was conducted in June to re-install the water level data loggers, measure flow, and perform maintenance where required. Additional site visits were made in July and August to measure flow. The stations were removed in September prior to freeze-up.

Water level data were recorded at each site on 15 minute intervals and daily discharge was calculated by averaging the 15 minute data on a daily basis.

The daily discharge data recorded at all SNP Stations for June and July are shown in Table 2.1 and for August and September in Table 2.2. The daily discharge data for the SNP Stations at the Milne is shown on Figure 2.1 and for the SNP Stations near

3 Status of Flow Monitoring Sites

The SNP hydrometric stations were established in July 2014. Weirs were installed at six of the stations using aluminum plates brought to site and plywood and other lumber found around the mine site. The installations were originally intended as a short-term trial to test the effectiveness of using

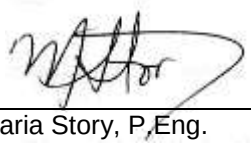
flow control structures for more accurately measuring continuous discharge at the SNP stations. The installations functioned well in 2014 and have been relatively stable for the 2015, 2016, and 2017 seasons. Several of the installations are beginning to show signs of deterioration, primarily the wood used to construct the weir boxes. Maintenance was performed in 2017 and should be performed again in 2018 to address the deterioration of the weir boxes. The weir at MS-C-E was removed during winter road construction and the installation of new culverts. The MS-C-E weir was not reinstalled in June as the site is no longer suitable for the installation of a weir. In the future, a flume would be a more suitable monitoring structure for that location.

The sites without weirs have been reliable, especially the MS-C-A/B station. The local benchmarks at MQ-C-D and MQ-C-B have been less stable due to the nature of the sites and not as reliable from year to year. It is recommended that all the stations be assessed in 2018 and the installations be repaired and/or replaced as needed.

If you have any questions about the SNP hydrometric stations or the data collected in 2017, please feel free to contact us.

Prepared by: 

Andrew Rees, Ph.D.
Senior Environmental Scientist

Reviewed by: 

Maria Story, P.Eng.
President

Attachments:

Table 2.1	SNP Station Daily Average Discharge – June and July
Table 2.2	SNP Station Daily Average Discharge – August and September
Figure 2.1	Milne Port SNP Stations – Daily Discharge
Figure 2.2	Mine Site SNP Stations – Daily Discharge

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Attachments

Table 2.1 - SNP Station Daily Average Discharge - June and July

Date	Daily Average Discharge (l/s)							
	MP-C-B	MP-Q1-01	MP-Q1-02	MQ-C-A	MQ-C-B	MQ-C-D	MRY-13a	MS-C-AB
23-Jun-17				6.3			0.008	57.7
24-Jun-17				3.3	21.5		0.005	52.4
25-Jun-17	6.2	0.0	2.2	2.6	18.3		0.020	43.3
26-Jun-17	4.8	0.0	2.4	3.1	14.0		0.008	36.6
27-Jun-17	5.0	0.0	2.5	2.9	13.6		0.012	34.9
28-Jun-17	5.0	0.0	2.6	1.7	12.6		0.024	34.3
29-Jun-17	4.4	0.0	2.5	1.2	8.3	12.8	0.019	27.9
30-Jun-17	4.0	0.0	2.3	1.3	6.0	10.9	0.004	22.3
1-Jul-17	4.5	0.0	2.0	0.66	3.6	7.0	0.001	18.1
2-Jul-17	2.1	0.0	1.7	0.77	2.8	5.1	0	13.6
3-Jul-17	1.5	0.0	1.7	0.49	1.8	3.9	0	10.9
4-Jul-17	1.6	0.0	1.8	0.50	1.4	2.6	0	9.0
5-Jul-17	1.5	0.0	1.5	0.36	1.0	1.9	0	7.7
6-Jul-17	1.2	0.0	1.2	0.10	0.56	1.6	0	6.2
7-Jul-17	0.7	0.0	0.80	0.09	0.24	0.9	0	4.7
8-Jul-17	0.5	0.0	0.82	0.08	0	0.2	0	3.6
9-Jul-17	0.3	0.0	0.62	0.08	0	0.1	0	3.1
10-Jul-17	0.5	0.0	0.56	0.07	0	0.6	0.006	4.2
11-Jul-17	0.7	0.0	0.56	0.01	0.39	0.9	0	5.4
12-Jul-17	0.7	0.1	0.48	0.08	2.0	2.7	0.006	6.7
13-Jul-17	0.8	0.1	0.41	0.02	1.1	3.7	0	6.6
14-Jul-17	0.4	0.0	0.36	0.04	1.2	3.9	0.010	7.5
15-Jul-17	0.2	0.0	0.25	0.00	0.53	2.7	0	7.5
16-Jul-17	0.1	0.0	0.20	0.00	0.35	2.0	0	7.4
17-Jul-17	0.1	0.0	0.15	0.00	0.79	2.5	0	7.5
18-Jul-17	0.0	0.2	0.04	0.00	0	3.1	0	7.3
19-Jul-17	0.0	0.6	0.14	0.00	0	0.6	0	6.2
20-Jul-17	0.0	0.5	0.15	0.00	0	0.2	0	5.7
21-Jul-17	0.0	0.4	0.13	0.01	0.24	0.4	0	5.4
22-Jul-17	0.0	0.4	0.11	0.00	0	0.4	0	4.8
23-Jul-17	0.0	0.3	0.08	0.00	0.06	0.5	0	4.0
24-Jul-17	0.0	0.3	0.03	0.00	0	0.4	0	3.6
25-Jul-17	0.0	0.4	0.07	0.00	0	0.8	0	4.1
26-Jul-17	0.1	0.5	0.10	0.82	6.9	7.0	0.237	16.2
27-Jul-17	0.5	0.5	0.19	0.27	6.8	11.4	0.040	34.9
28-Jul-17	0.8	0.6	0.18	0.10	6.1	12.9	0.001	46.6
29-Jul-17	1.1	0.8	0.18	0.48	9.4	15.1	0.014	46.6
30-Jul-17	3.9	1.4	0.65	4.5	34.8	36.8	0.490	74.9
31-Jul-17	12.9	1.6	0.60	4.5	55.9	80.5	0.873	217.9

Table 2.2 - SNP Station Daily Average Discharge - August and September

Date	Daily Average Discharge (l/s)							
	MP-C-B	MP-Q1-01	MP-Q1-02	MQ-C-A	MQ-C-B	MQ-C-D	MRY-13a	MS-C-AB
1-Aug-17	4.5	0.6	0.59	1.9	32.0	51.8	0.467	126.3
2-Aug-17	2.6	0.4	0.54	0.87	20.6	36.4	0.102	90.2
3-Aug-17	1.6	0.5	0.51	0.51	14.3	26.8	0.071	70.6
4-Aug-17	1.3	0.6	0.50	0.34	10.6	20.8	0.050	54.4
5-Aug-17	1.1	0.4	0.47	0.26	8.6	17.2	0.030	42.5
6-Aug-17	0.7	0.3	0.45	0.20	6.7	14.4	0.009	35.0
7-Aug-17	0.7	0.2	0.45	0.19	6.6	13.1	0.004	30.6
8-Aug-17	1.3	0.2	0.44	0.69	11.4	19.6	0.023	30.8
9-Aug-17	2.5	0.3	0.57	0.54	11.4	19.9	0.005	28.8
10-Aug-17	13.2	1.3	0.75	0.38	10.0	17.7	0	25.5
11-Aug-17	6.7	1.6	0.74	0.26	7.3	13.7	0	22.8
12-Aug-17	4.7	1.5	0.72	0.19	6.5	11.6	0	20.6
13-Aug-17	3.8	1.4	0.71	0.17	5.9	10.5	0	18.6
14-Aug-17	4.1	1.3	0.74	1.57	9.5	14.6	0.010	19.2
15-Aug-17	4.1	1.1	0.67	2.31	17.1	27.2	0.001	22.4
16-Aug-17	2.8	0.8	0.63	0.59	10.0	17.8	0	20.3
17-Aug-17	2.3	1.0	0.56	0.30	7.9	13.4	0	19.1
18-Aug-17	2.3	2.4	0.50	0.16	6.1	10.6	0	17.8
19-Aug-17	2.6	2.0	0.44	0.13	5.3	9.1	0	16.3
20-Aug-17	2.5	1.6	0.39	0.12	5.3	8.7	0	14.9
21-Aug-17	2.1	1.4	0.35	0.11	5.3	8.5	0	13.8
22-Aug-17	1.9	1.2	0.30	0.09	4.9	7.7	0	12.6
23-Aug-17	1.7	1.0	0.25	0.08	4.6	7.0	0	11.6
24-Aug-17	1.2	0.9	0.21	0.07	4.1	6.7	0	10.5
25-Aug-17	1.0	0.8	0.17	0.06	4.2	6.7	0	9.7
26-Aug-17	1.0	0.8	0.17	0.30	7.2	9.9	0	9.9
27-Aug-17	8.9	1.2	0.53	4.78	24.9	33.9	0	16.0
28-Aug-17	18.1	4.8	0.71	4.90	32.2	49.5	0	23.3
29-Aug-17	14.5	7.3	0.70	7.31	50.1	66.2	0	45.7
30-Aug-17	11.4	6.2	0.66	4.54	45.3	69.2	0	88.4
31-Aug-17	12.5	6.0	0.92	3.09	37.0	56.4	0	89.3
1-Sep-17	17.6	7.327	0.82	3.72	36.9	57.2	0	85.4
2-Sep-17	12.4	7.271	0.78	1.55	25.8	40.1	0	76.2
3-Sep-17	10.3	5.9	0.73	1.00		34.4	0	67.0
4-Sep-17				0.67		29.4	0	56.8
5-Sep-17				0.46			0	47.3
6-Sep-17								38.1
7-Sep-17								32.0
8-Sep-17								26.5

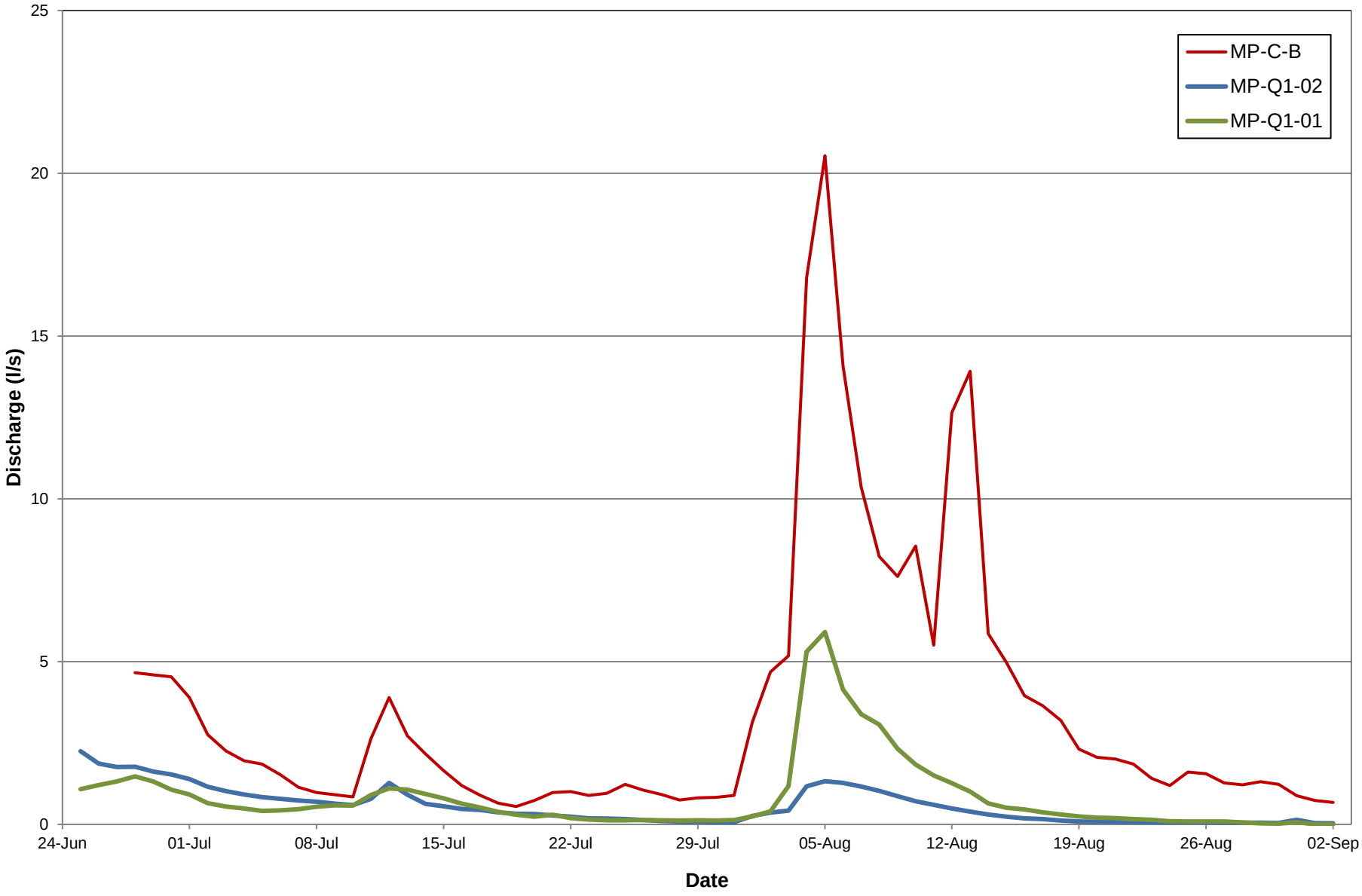

Figure 2.1 Milne Port SNP Stations - Daily Dischrge

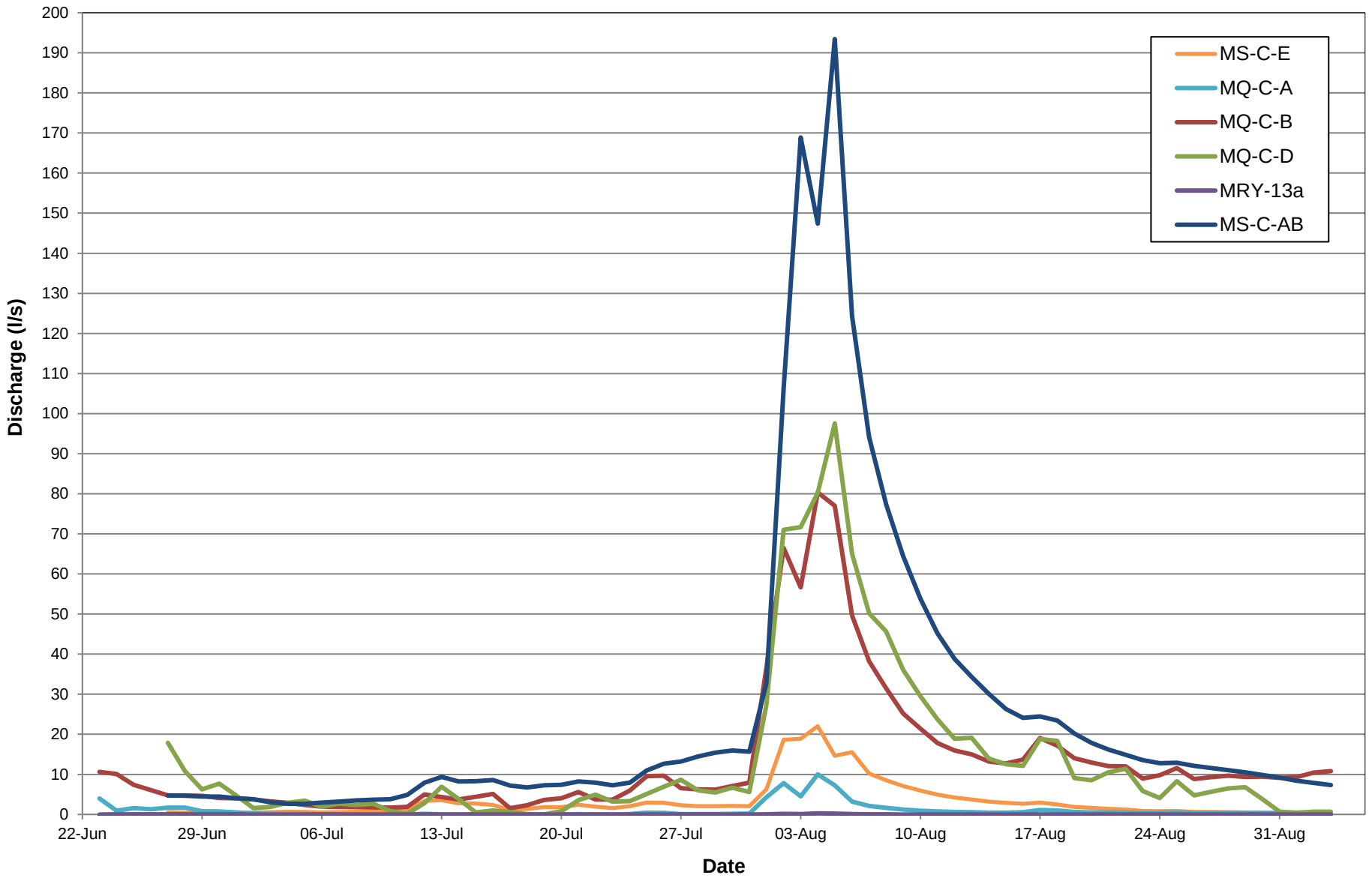

Figure 2.2 Mine Site SNP Stations - Daily Dischrge