

Appendix G7

2017 Blast Monitoring Report for the Protection of Nearby Fish Habitat

ANNUAL REPORT MEMORANDUM

Agnico Eagle Mines Ltd Meadowbank Division
Environment Department

SUBJECT: 2017 Blast Monitoring Report for the Protection of Nearby Fish Habitat

1- Introduction and Objectives

In accordance with NIRB Project Certificate No.004, Condition 85, Agnico Meadowbank Division developed a blasting program which complies with *The Guidelines for the Use of Explosives In or Near Canadian Fisheries Water* (Wright and Hopky, 1998) as modified by the DFO for use in the North. As a result, Agnico conducts monitoring to evaluate blast related peak particle velocity and overpressure to protect nearby fish bearing waters.

The detonation of explosives in or near water produces compressive shock waves that can cause significant impacts to the swim bladders of fish, rupture other internal organs and/or damage or kill fish eggs and larvae. In addition, the effects of the shock waves can be intensified in the presence of ice. Consequently, *the Guidelines for the Use of Explosives In or Near Canadian Fisheries Water* guidelines have been developed by DFO to protect fish and fish habitat from works or undertakings that involve explosives in or near fisheries waters. It includes the following requirements:

1. No explosive is to be detonated in or near fish habitat that produces an instantaneous pressure change (IPC) greater than 100 kPa in the swim bladder of a fish; representatives from DFO requested that Agnico use a value of 50 kPa instead of 100 kPa; and
2. No explosive is to be detonated that produces a peak particle velocity greater than 13 mm/s in a spawning bed during the period of egg incubation (for lakes near the Meadowbank mine, it takes place between August 15 and June 30).

Peak particle velocity (PPV) and overpressure monitoring data was recorded throughout 2017 during blasting activities at the North Portage Pit, South Portage Pit, and Vault Pit. The locations of the blast monitoring stations in 2016 are called Portage Pit North (14W 7214597N 639457E), Portage Pit South (14W 7213663N 639349E) and Vault Pit station #2 (15W 7220873N 359907E). These monitoring stations are illustrated in Figure 1 for Portage and Figure 2 for Vault Pit. The Portage stations are located near the shoreline of Second Portage Lake. The Vault Pit station #2 is located near Wally Lake.

No more blast monitoring was conducted at Goose Pit in 2017 as mining has ceased in this pit since April 2015. The blast monitoring station (Goose Pit (14W 7212116N 638881E)) was originally situated on the Bay Goose Dike near the Third Portage Lake East Basin. Vault Pit station #1 (14W 7219726N 640741E), located between the Vault Attenuation Pond (dewatered Vault Lake) and the Vault Pit, was also not monitored in 2016 as the nearest potential fish habitat is in Wally Lake and the Vault Pit station #2 is used to monitor the potential impact. These monitoring stations are also illustrated in Figure 1 and Figure 2 for Vault Pit.

Figure 1 - Portage and Goose Pit Blast Monitoring Stations

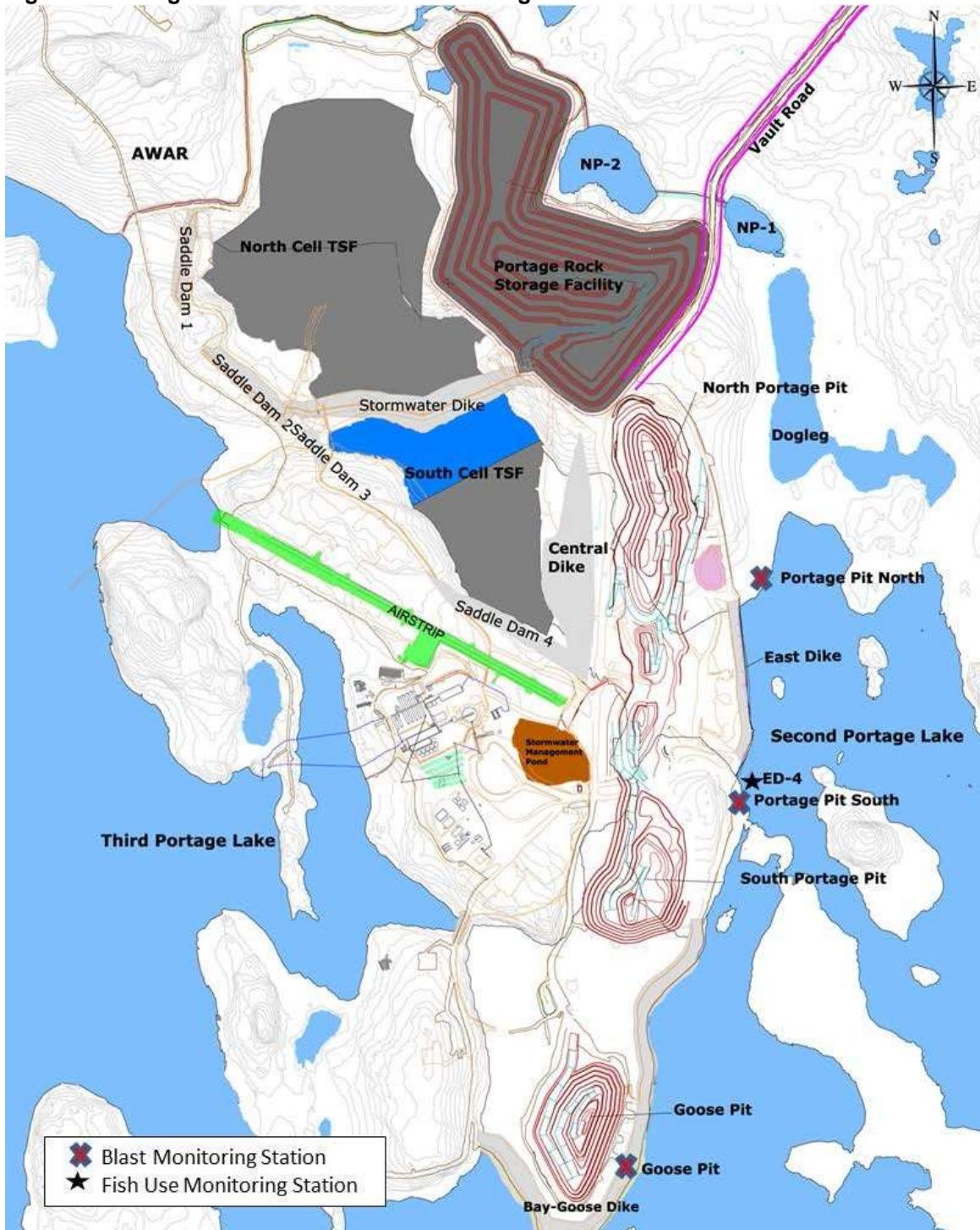
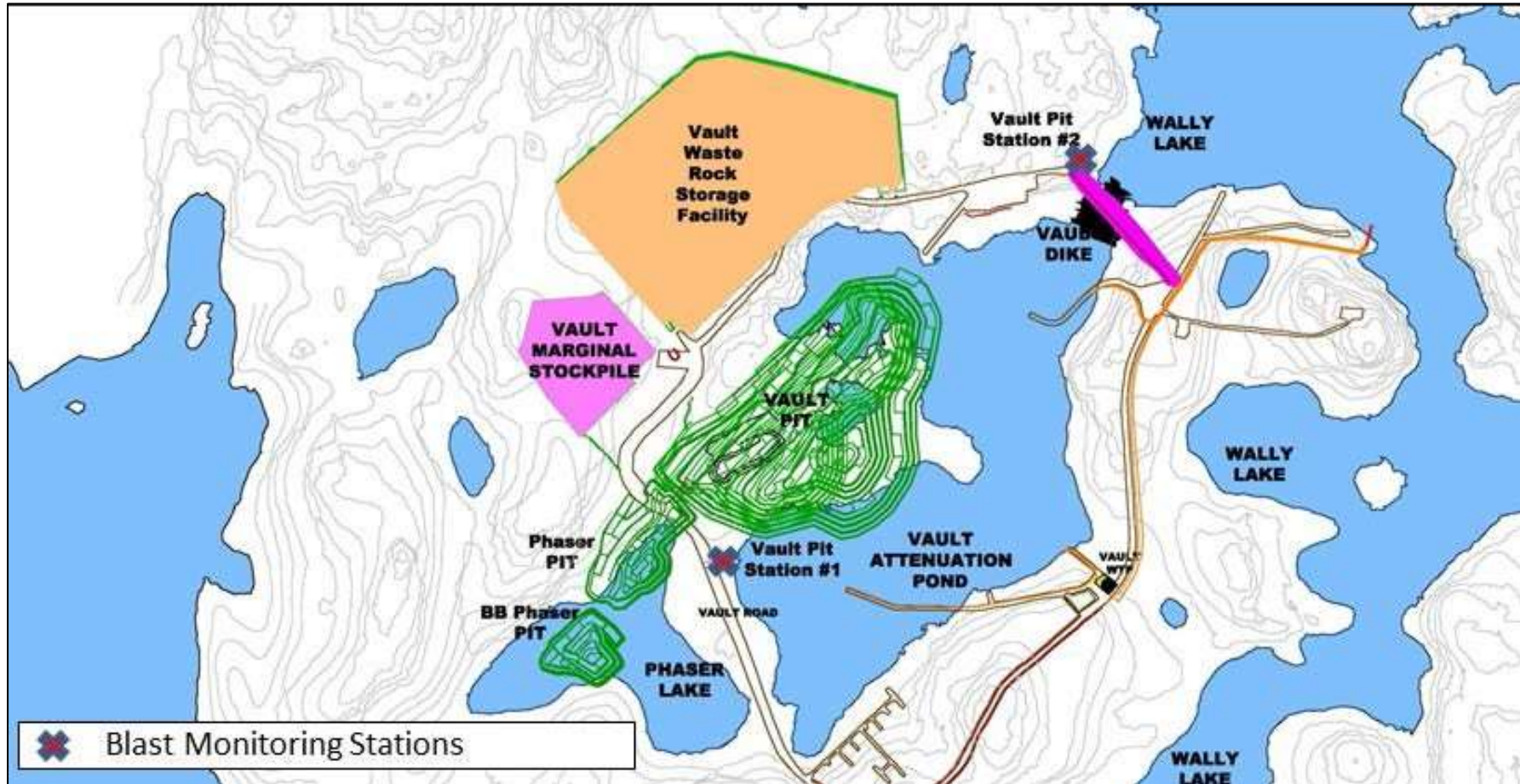


Figure 2 - Vault Pit Blast Monitoring Stations



2- Methods

2.1- Blast Monitoring

Blasts were monitored using an InstanTel Minimate Blaster which is fully compliant with the international Society of Explosives and Engineers performance specifications for blasting seismographs (InstanTel, 2005). The Minimate Blaster has three main parts: a monitor, a standard transducer (geophone) and a microphone. The monitor contains the battery and electronic components of the instrument. It also checks the two sensors to ensure they are functioning. The transducer measures ground vibration with a mechanism called a geophone.

This instrument measures transverse, vertical and longitudinal ground vibrations. Transverse ground vibrations agitate particles in a side to side motion. Vertical ground vibrations agitate particles in an up and down motion. Longitudinal ground vibrations agitate particles in a back and forth motion progressing outward from the event site (InstanTel, 2005). The Minimate Blaster calculates the PPV for each geophone and calculates the vector sum of the three axes. The final result is the Peak Vector Sum (PVS) and is the resultant particle velocity magnitude of the event:

$$PVS = \sqrt{(T^2 + V^2 + L^2)}$$

Where:

T = particle velocity along the transverse plane

V = particle velocity along the vertical plane

L = particle velocity along the longitudinal plane

The transducer is installed as per the model specifications. All monitoring follows Agnico (2017) Blast Monitoring Plan.

2.2- Data Analysis

The blast monitoring data was screened to ensure blast PPV and IPC monitoring results corresponded to a single blast event. As previously discussed, in 2017 the blast engineers thoroughly documented blast patterns, sequencing, and detonation results to track the material accurately, optimize blasts and review procedures. As a result, blast monitoring data is collected as a composite of blast patterns and may include multiple blast patterns that could have occurred during the same monitoring event (i.e. a single PPV and IPC value for 3 blast patterns). The data was screened to remove all redundant data points (such as replicate readings).

3- Results, Discussion and Conclusions

2017 PPV and IPC blast monitoring results are presented in Table 1. In 2017, 337 blasts were monitored. In 2017, none PPV concentrations exceeded the DFO limit of 13 mm/s. The number of PPV exceedances has decreased significantly since 2013. In 2013, 2014, 2015 and 2016 the number of exceedances recorded were 16, 8, 2 and 0 respectively. IPC measurements were all below the DFO limit of 50 kpa. The blast monitoring results are reviewed after each blast and the blast mitigation plan was implemented immediately if the vibrations or the overpressure exceed the guidelines. This plan includes a retroactive analysis to determine what caused the higher than expected results.

In 2017, the average PPV was 0.78 (CI +/- 0.20) with a maximum of , 11.2 (maximum in 2016, 2015, 2014 and 2013 were 9.54, 16.5, 23.8 and 32.7 mm/s respectively). The average in 2017 was lower than 2016 (1.18), 2015 (2.38 mm/s), 2014 (3.93 mm/s) and 2013 (5.39 mm/s) averages. This difference can be explained by the fact that mining ceased at Goose Pit in April 2015. Goose Pit was the closest pit to blast monitoring stations. As there were less blasts occurring in this area, the probability of exceeding the DFO guidelines was reduced. Also, blasting activities at Portage Pit and Vault Pit were conducted deeper this year reducing vibrations recorded at the monitoring station. The upper 95% confidence limit for all of the annual data was 3.81 mm/s.

As discussed in the 2011 monitoring report, Wright (1982)¹ determined that peak particle velocity greater than 13 mm/s is potentially damaging to incubating eggs, however Faulkner et al. (2006)² found no effects on lake trout eggs due to blasts at Diavik Mine, NWT with maximum PPVs of 28.5 mm/s (16.5 at Meadowbank in 2015). Faulkner et al. (2006) measured mean PPV at three exposure stations from September to July, 2003-2004 and found a mean range of 5.8 - 6.4 mm/s (1.18 mm/s at Meadowbank in 2016) and reported 80 exceedances (0 at Meadowbank in 2017) of 13 mm/s PPV at these stations with a maximum PPV being double the DFO guideline. They found there were no differences in mortality of lake trout eggs in incubators between exposure sites and reference sites that resulted from blasting at Diavik in 2003-2004. As a result, Agnico suggests that additional studies may not be necessary to confirm low PPV at spawning and incubation sites, since results of this study suggest impacts are likely not occurring even if no attenuation of PPV is occurring between blast monitoring sites and spawning habitat.

In 2017, monitoring of habitat compensation features (i.e. dike faces) was conducted by Agnico in Second Portage Lake. Angling (17h) and underwater camera (28h) techniques were used along the East Dike and the Second Portage Lake reference station to establish fish presence. In total, 12 fish were caught at the station (ED-4) nearest to peak particle velocity exceedances recorded in 2016 (i.e. South Portage Pit blast monitoring station) (See 2016 Blast Monitoring Report in Appendix G6 of the 2016 Annual Report). The location of station ED-4 is illustrated on Figure 1. In comparison, 11 fish were caught at the Second Portage Lake reference station. Five (5) and zero (0) fish were captured by underwater camera video at ED-4 and Second Portage Lake Reference Area, respectively.

1 Wright, D.G. 1982. A Discussion Paper on the Effects of Explosives on Fish and Marine Mammals in the Waters of the Northwest Territories. Canadian Technical Report of Fisheries and Aquatic Sciences 1052.

2 Faulkner, Sean G., Tonn, William, Welz, Marek, Welz, and Schmitt, Douglas. 2006. Effects of Explosives on Incubating Lake Trout Eggs in the Canadian Arctic. North American Journal of Fisheries Management. 26:833-842.

This indicates that fish use of habitat near recorded exceedances in 2015 is not reduced compared to reference stations. Although the fish use monitoring doesn't coincide with the blast exceedances, it confirms no avoidance of the habitat closest to Agnico's main operations. In 2017, Agnico started partial construction of the new habitat compensation feature of dikes faces in Second Portage Lake. A comparison of blast and habitat compensation result will permit to confirm the previous affirmation and fish use pattern once construction has been finalized.

Table 1 - 2017 PPV and IPC blast monitoring results

Date of Blast	Station	Blast Pattern	Peak Particulate Velocity (mm/s)	Peak Sound Pressure (kpa)	(sec)
DFO Limit			13	50	
01-01-2017	Vault Pit Station #2	5060814-1	0	0	0
01-03-2017	Portage Pit South	5109PS682-1	0	0	0
01-03-2017	Portage Pit South	5109PS680-1	0	0	0
01-04-2017	Portage Pit North	5046FM340-1	0	0	0
01-04-2017	Vault Pit Station #2	5046854-1	0	0	0
01-05-2017	Vault Pit Station #2	5039853-1	0	0	0
01-06-2017	Portage Pit South	5088PS678-3	0	0	0
01-07-2017	Portage Pit South	5088PS670-4	1.47	0.002	4.464
01-07-2017	Vault Pit Station #2	5137903-1	0	0	0
01-08-2017	Portage Pit South	5095673-1	1.65	0.0025	2.202
01-09-2017	Vault Pit Station #2	5025809-1	1.8	0.0055	1.508
01-10-2017	Vault Pit Station #2	5025821-1	4.49	0.0283	0.453
01-11-2017	Portage Pit North	5011357-1	2.54	0.0648	2.854
01-12-2017	Vault Pit Station #2	5123915-1	0	0	0
02-04-2017	Portage Pit South	5109677-2	0	0	0
02-05-2017	Portage Pit North	5025349-1	0	0	0
02-06-2017	Portage Pit South	5088PS678-4	0	0	0
02-09-2017	Portage Pit North	5018RA354-1	2.62	0.0453	2.802
02-10-2017	Vault Pit Station #2	5004PS802-2	0	0	0
02-10-2017	Vault Pit Station #2	5004PS802-1	0	0	0
02-10-2017	Vault Pit Station #2	5130952-1	1.36	0.0195	5.094
02-11-2017	Portage Pit South	5081679-1	0	0	0
02-11-2017	Vault Pit Station #2	5109PS907-3	0	0	0
02-12-2017	Vault Pit Station #2	5011805-1	0	0	0
03-02-2017	Portage Pit North	5109PS689-1	0	0	0
03-03-2017	Portage Pit North	5032350-1	2.38	0.00675	2.046
03-05-2017	Vault Pit Station #2	5130SU950-1	0	0	0
03-06-2017	Portage Pit South	5088PS678-5	0	0	0
03-06-2017	Vault Pit Station #2	5039859-1	0	0	0
03-07-2017	Vault Pit Station #2	5039817-1	0	0	0
03-07-2017	Vault Pit Station #2	5137905-1	0	0	0
03-08-2017	Portage Pit South	5095RA675-1	1.05	0.0075	4.99

Agnico Eagle Ltd: Meadowbank Division

03-09-2017	Vault Pit Station #2	5025811-1	0	0	0
03-10-2017	Portage Pit South	5081673-1	2.58	0.00825	5.404
03-10-2017	Vault Pit Station #2	5025863-1	0	0	0
04-01-2017	Portage Pit North	5039351-1	7.43	0.00925	1.441
04-01-2017	Portage Pit North	5025SU341-1	7.43	0.00925	1.441
04-01-2017	Vault Pit Station #2	5053853-2	0	0	0
04-02-2017	Portage Pit North	5032346-1	0	0	0
04-05-2017	Portage Pit South	5102672-1	1.51	0.00525	4.252
04-06-2017	Vault Pit Station #2	5032SU850-1	0	0	0
04-07-2017	Portage Pit South	5102678-1	2.83	0.0178	3.172
04-08-2017	Vault Pit Station #2	5032822-1	3.28	0.0115	3.426
04-09-2017	Portage Pit South	5088674-1	1.81	0.004	0.173
04-10-2017	Portage Pit North	5004PS353-1	0	0	0
04-10-2017	Vault Pit Station #2	5018800-1	0	0	0
04-12-2017	Vault Pit Station #2	5004PS822-1	0	0	0
05-01-2017	Portage Pit North	5032342-1	7.43	0.00925	1.441
05-02-2017	Portage Pit South	5123687-1	0	0	0
05-03-2017	Portage Pit North	5032RA340-1	1.33	0.00525	2.38
05-04-2017	Portage Pit North	5011PS345-1	0	0	0
05-04-2017	Vault Pit Station #2	5046820-1	0	0	0
05-05-2017	Vault Pit Station #2	5025PS855-1	0	0	0
05-06-2017	Vault Pit Station #5	5088PS680-1	0	0	0
05-06-2017	Vault Pit Station #2	5039803-1	0	0	0
05-07-2017	Portage Pit South	5004PS352-1	3.81	0.0175	2.395
05-07-2017	Vault Pit Station #2	5137907-1	0	0	0
05-07-2017	Vault Pit Station #2	5032800-2	0	0	0
05-09-2017	Vault Pit Station #2	5025857-1	2.88	0.00775	5.82
05-09-2017	Vault Pit Station #2	5025SU821-1	0	0	0
05-09-2017	Vault Pit Station #2	5137923-1	0	0	0
05-10-2017	Portage Pit South	5081RA675-1	0	0	0
05-10-2017	Vault Pit Station #2	5123905-1	0	0	0
05-11-2017	Portage Pit South	5074670-1	0	0	0
05-11-2017	Vault Pit Station #2	5130958-1	0	0	0
05-12-2017	Vault Pit Station #2	5109PS911-2	0	0	0
06-01-2017	Vault Pit Station #2	5053857-2	0	0	0
06-02-2017	Portage Pit South	5123685-1	0	0	0
06-02-2017	Portage Pit South	5109PS671-1	0	0	0
06-03-2017	Portage Pit South	5116680-1	0	0	0
06-03-2017	Portage Pit South	5123POP677-1	0	0	0
06-04-2017	Vault Pit Station #2	5039SU851-1	0	0	0
06-05-2017	Portage Pit North	5025351-1	0	0	0
06-06-2017	Vault Pit Station #2	5039829-1	0	0	0
06-07-2017	Portage Pit South	5102RA680-1	1.33	0.00425	5.994
06-08-2017	Portage Pit South	5095677-1	1.72	0.007	2.836

06-10-2017	Vault Pit Station #2	5004PS852-1	0	0	0
06-11-2017	Vault Pit Station #2	5018814-1	0	0	0
06-12-2017	Portage Pit South	5074RA672-1	0	0	0
06-12-2017	Vault Pit Station #2	5011809-1	0	0	0
07-02-2017	Vault Pit Station #2	5046SU854-1	0	0	0
07-03-2017	Vault Pit Station #2	5053821-1	0	0	0
07-04-2017	Portage Pit North	5011PS345-2	3.49	0.0118	1.68
07-06-2017	Portage Pit South	5025357-1	5.94	0.011	3.649
07-07-2017	Vault Pit Station #2	5032800-3	0	0	0
07-08-2017	Vault Pit Station #2	5137915-1	0	0	0
07-10-2017	Vault Pit Station #2	5130RA954-1	0	0	0
08-01-2017	Vault Pit Station #2	5053857-3	0	0	0
08-02-2017	N/A	5123689-1	0	0	0
08-03-2017	Portage Pit South	5116682-1	0	0	0
08-04-2017	Vault Pit Station #2	5025PS851-1	1.53	0.046	1.588
08-07-2017	Vault Pit Station #2	5137909-1	0	0	0
08-09-2017	Portage Pit South	5088680-1	0	0	0
08-09-2017	Vault Pit Station #2	5025859-1	0	0	0
08-10-2017	Portage Pit South	5067PS677-1	0	0	0
08-10-2017	Portage Pit South	5067PS655-1	0	0	0
08-10-2017	Vault Pit Station #2	5018800-2	0	0	0
08-11-2017	Vault Pit Station #2	5018808-1	0	0	0
09-01-2017	Vault Pit Station #2	5053857-4	0	0	0
09-02-2017	Portage Pit South	5123RA679-1	0	0	0
09-08-2017	Vault Pit Station #2	5032814-1	1.9	0.0005	-0.072
09-09-2017	Vault Pit Station #2	5130904-2	0	0	0
09-10-2017	Vault Pit Station #2	5018RA804-1	0	0	0
09-10-2017	Vault Pit Station #2	5081RA804-1	0	0	0
09-12-2017	Vault Pit Station #2	5018822-1	0	0	0
10-01-2017	Portage Pit South	5126674-1	0	0	0
10-07-2017	Portage Pit South	5088PS684-1	2.07	0.00625	2.321
10-08-2017	Portage Pit South	5095679-1	1.57	0.00325	4.762
10-08-2017	Portage Pit South	5004PS354-1	0	0	0
10-10-2017	Portage Pit South	5067PS677-2	0	0	0
10-10-2017	Vault Pit Station #2	5004PS852-2	0	0	0
10-11-2017	Vault Pit Station #2	5130956-1	0	0	0
10-12-2017	Vault Pit Station #2	5123959-1	0	0	0
11-01-2017	Portage Pit South	5126678-1	0	0	0
11-06-2017	Vault Pit Station #2	5039831-1	0	0	0
11-07-2017	Vault Pit Station #2	5137911-1	0	0	0
11-07-2017	Vault Pit Station #2	5032804-1	2.17	0.00225	4.212
11-08-2017	Vault Pit Station #2	5025801-1	0	0	0
11-08-2017	Vault Pit Station #2	5137915-2	0	0	0
11-09-2017	Vault Pit Station #2	5130910-3	0	0	0

11-10-2017	Portage Pit South	5011351-1	2.7	0.00475	1.936
11-10-2017	Vault Pit Station #2	5004PS852-3	0	0	0
11-11-2017	Vault Pit Station #2	5018816-1	0	0	0
11-12-2017	Vault Pit Station #2	5011807-1	0	0	0
12-05-2017	Vault Pit Station #2	5025PS855-2	0	0	0
12-06-2017	Vault Pit Station #2	5039SU811-1	0	0	0
12-06-2017	Vault Pit Station #2	5039805-1	0	0	0
12-07-2017	Portage Pit North	5018SU350-1	3.81	0.0175	2.395
12-07-2017	Portage Pit North	5004PS350-3	2.07	0.009	2.06
12-08-2017	Vault Pit Station #2	5032824-1	3.49	0.0203	2.725
12-08-2017	Vault Pit Station #2	5123SU901-1	0	0	0
12-09-2017	Portage Pit South	5018360-1	3.36	0.00475	1.955
12-10-2017	Vault Pit Station #2	5130912-1	0	0	0
12-10-2017	Vault Pit Station #2	5004PS852-4	0	0	0
12-12-2017	Portage Pit South	5074676-1	4.26	0.0515	4.361
13-01-2017	Vault Pit Station #2	5053815-1	0	0	0
13-02-2017	Portage Pit South	5116674-1	0	0	0
13-03-2017	N/A	5123POP679-1	0	0	0
13-03-2017	Portage Pit South	5116684-1	0	0	0
13-04-2017	Portage Pit South	5109675-1	0	0	0
13-04-2017	Vault Pit Station #2	5046856-1	0	0	0
13-05-2017	Portage Pit North	5025355-1	2.28	0.00575	5.3
13-06-2017	Portage Pit South	5088PS682-1	0	0	0
13-06-2017	Vault Pit Station #2	5039861-1	0	0	0
13-07-2017	Portage Pit North	5004PS352-2	5.31	0.0143	1.929
13-08-2017	Portage Pit South	5088670-1	1.37	0.011	2.593
13-11-2017	Vault Pit Station #2	5123951-1	0	0	0
14-01-2017	Vault Pit Station #2	5046PS818-1	8.26	0.156	0.525
14-02-2017	Vault Pit Station #2	5053817-1	0	0	0
14-03-2017	Vault Pit Station #5	5116RA670-1	0	0	0
14-03-2017	Vault Pit Station #2	5053829-1	0	0	0
14-03-2017	Vault Pit Station #2	5046SU800-1	0	0	0
14-04-2017	Vault Pit Station #2	5046804-1	0	0	0
14-05-2017	Portage Pit South	5109RA671-1	0	0	0
14-05-2017	Vault Pit Station #2	5025PS855-3	0	0	0
14-07-2017	Portage Pit South	5004PS356-1	0	0	0
14-07-2017	Vault Pit Station #2	5032802-1	0	0	0
14-10-2017	Portage Pit South	5067PS677-3	0	0	0
14-10-2017	Vault Pit Station #2	5018802-1	0	0	0
14-12-2017	Vault Pit Station #2	5011813-1	0	0	0
15-02-2017	Portage Pit North	5032348-1	2.41	0.007	1.858
15-04-2017	Portage Pit South	5088PS671-1	1.42	0.0113	2.595
15-05-2017	Portage Pit North	5025RA359-1	2.29	0.0025	2.45
15-07-2017	Portage Pit South	5102682-1	0	0	0

15-07-2017	Portage Pit North	5004PS356-2	1.43	0.0738	2.34
15-07-2017	Vault Pit Station #2	5137913-1	0	0	0
15-08-2017	Vault Pit Station #2	5025801-2	0	0	0
15-08-2017	Vault Pit Station #2	5032860-1	0	0	0
15-12-2017	Vault Pit Station #2	5116902-1	0	0	0
16-01-2017	Vault Pit Station #2	5046SU852-1	0	0	0
16-03-2017	Vault Pit Station #5	5116RA670-2	0	0	0
16-06-2017	Vault Pit Station #2	5039807-1	0	0	0
16-07-2017	Portage Pit North	5004PS356-3	2.89	0.002	2.088
16-07-2017	Vault Pit Station #2	5032856-1	0	0	0
16-07-2017	Vault Pit Station #2	5130904-1	0	0	0
16-10-2017	Vault Pit Station #2	5025823-1	1.43	0.00075	0.652
16-11-2017	Vault Pit Station #2	5123953-1	0	0	0
16-12-2017	Vault Pit Station #2	5011SU801-1	0	0	0
17-01-2017	Vault Pit Station #2	5053811-1	1.11	0.00825	1.043
17-02-2017	Vault Pit Station #2	5053823-1	0	0	0
17-05-2017	Vault Pit Station #2	5025PS827-1	0	0	0
17-05-2017	Vault Pit Station #2	5039855-1	2.74	0.00525	0.539
17-05-2017	Vault Pit Station #2	5025PS801-1	1.81	0.001	0.033
17-08-2017	Portage Pit South	5004PS354-2	3.61	0.0143	3.25
17-11-2017	Portage Pit South	5081681-1	0	0	0
17-12-2017	Portage Pit North	5004350-1	0	0	0
17-12-2017	Vault Pit Station #2	5116904-1	0	0	0
17-12-2017	Vault Pit Station #2	5011819-1	0	0	0
18-01-2017	Portage Pit South	5130672-1	3.79	0.0568	3.048
18-03-2017	Vault Pit Station #2	5046850-1	0	0	0
18-04-2017	Portage Pit South	5109683-1	0	0	0
18-04-2017	Vault Pit Station #2	5046822-1	0	0	0
18-05-2017	Vault Pit Station #2	5025PS801-2	2	0.0145	2.963
18-06-2017	Portage Pit South	5088PS670-1	2.67	0.0175	1.872
18-07-2017	Vault Pit Station #2	5032854-1	0	0	0
18-08-2017	Vault Pit Station #2	5130910-1	0	0	0
18-09-2017	Vault Pit Station #2	5025813-1	0	0	0
18-10-2017	Vault Pit Station #2	5018SU808-1	0	0	0
18-11-2017	Vault Pit Station #2	5123RA955-1	0	0	0
18-11-2017	Vault Pit Station #2	5109PS911-1	0	0	0
19-04-2017	Vault Pit Station #2	5025PS851-2	0	0	0
19-05-2017	Vault Pit Station #2	5039821-1	0	0	0
19-05-2017	Vault Pit Station #2	5025PS803-2	1.55	0.0113	2.952
19-06-2017	Portage Pit South	5102674-1	1.44	0.00775	2.695
19-06-2017	Portage Pit South	5102676-1	1.05	0.009	2.372
19-08-2017	Vault Pit Station #2	5032830-1	2.57	0.0203	2.823
19-09-2017	Portage Pit South	5088678-1	0	0	0
19-10-2017	Portage Pit South	5081677-1	1.64	0.00075	0.039

19-12-2017	Portage Pit South	5074682-1	0	0	0
20-01-2017	Portage Pit South	5130FM680-1	0	0	0
20-02-2017	Vault Pit Station #2	5053827-1	0	0	0
20-03-2017	Vault Pit Station #5	5109679-1	0	0	0
20-04-2017	Vault Pit Station #2	5025PS851-3	0	0	0
20-05-2017	Portage Pit South	5102670-1	1.96	0.0085	2.304
20-07-2017	Portage Pit North	5018352-1	2.93	0.00375	0.294
20-09-2017	Vault Pit Station #2	5018SU800-1	0	0	0
20-10-2017	Vault Pit Station #2	5109PS907-1	0	0	0
20-12-2017	Portage Pit North	5004352-1	0	0	0
21-02-2017	Portage Pit South	5109PS675-1	0	0	0
21-04-2017	Vault Pit Station #2	5046814-1	0	0	0
21-05-2017	Vault Pit Station #2	5025PS803-3	0	0	0
21-05-2017	Vault Pit Station #2	5039823-1	0	0	0
21-05-2017	Vault Pit Station #2	5025PS805-2	0	0	0
21-06-2017	Vault Pit Station #2	5039815-1	0	0	0
21-07-2017	Portage Pit South	5095681-1	1.06	0.00425	5.395
21-07-2017	Portage Pit North	5011PS360-1	5.86	0.0258	1.81
21-07-2017	Vault Pit Station #2	5032806-1	1.73	0.0253	4.111
21-08-2017	Portage Pit North	5018358-1	4.88	0.0223	1.657
21-09-2017	Portage Pit South	5067PS651-1	0	0	0
21-12-2017	Vault Pit Station #2	5116914-1	0	0	0
21-12-2017	Vault Pit Station #2	5123917-1	0	0	0
22-02-2017	Portage Pit South	5123POP681-1	0	0	0
22-02-2017	Portage Pit South	5116676-1	0	0	0
22-03-2017	Portage Pit South	5116672-1	0	0	0
22-04-2017	Portage Pit South	5116SL670-1	0	0	0
22-05-2017	Vault Pit Station #2	5025PS805-3	0	0	0
22-07-2017	Vault Pit Station #2	5032820-1	1.88	0.0035	0.207
22-08-2017	Vault Pit Station #2	5025803-1	0	0	0
22-09-2017	Portage Pit South	5081671-1	1.55	0.00225	2.461
22-09-2017	Portage Pit South	5067PS651-2	0	0	0
22-09-2017	Vault Pit Station #2	5137917-1	0	0	0
23-01-2017	Vault Pit Station #2	5060818-1	0	0	0
23-03-2017	Portage Pit South	5109677-1	2.2	0.014	0.71
23-04-2017	Vault Pit Station #2	5046808-1	0	0	0
23-05-2017	Vault Pit Station #2	5039825-1	0	0	0
23-05-2017	Vault Pit Station #2	5025PS807-2	0	0	0
23-06-2017	Vault Pit Station #2	5144902-1	0	0	0
23-06-2017	Vault Pit Station #2	5025SU851-1	0	0	0
23-06-2017	Vault Pit Station #2	5032SU852-1	0	0	0
23-08-2017	Vault Pit Station #2	5018SU850-1	2.42	0.00275	0.258
23-09-2017	Vault Pit Station #2	5116SU900-1	0	0	0
23-09-2017	Vault Pit Station #2	5025815-1	0	0	0

23-11-2017	Vault Pit Station #2	5123911-1	0	0	0
23-11-2017	Vault Pit Station #2	5130PP962-1	0	0	0
23-12-2017	Vault Pit Station #2	5116916-1	0	0	0
24-01-2017	Portage Pit South	5123675-1	0	0	0
24-02-2017	Vault Pit Station #2	5053819-1	0	0	0
24-03-2017	Vault Pit Station #2	5025PS852-1	0	0	0
24-03-2017	Vault Pit Station #2	5046800-1	0	0	0
24-06-2017	Vault Pit Station #2	5032800-1	1.15	0.00075	-0.249
24-09-2017	Vault Pit Station #2	5123901-2	0	0	0
24-10-2017	Portage Pit South	5011353-1	1.63	0.00075	0.124
24-11-2017	Vault Pit Station #2	5018818-1	0	0	0
24-12-2017	Vault Pit Station #2	5011811-1	0	0	0
25-02-2017	East dyke road (station F)	5116678-1	11.2	0.124	3.756
25-03-2017	Portage Pit South	5109681-1	3.2	0.016	0.753
25-06-2017	Portage Pit South	5102676-2	0	0	0
25-07-2017	Vault Pit Station #2	5032810-1	1.98	0.0145	2.092
25-08-2017	Portage Pit South	5088672-1	3.53	0.00925	0.439
25-09-2017	Portage Pit South	5067PS651-3	0	0	0
25-10-2017	Vault Pit Station #2	5018806-1	0	0	0
25-11-2017	Portage Pit South	5067PS672-1	0	0	0
25-11-2017	Vault Pit Station #2	5011RA801-1	0	0	0
26-02-2017	East dyke road (station F)	5123679-1	1.4	0.0108	1.653
26-02-2017	Vault Pit Station #2	5053825-1	0	0	0
26-03-2017	Vault Pit Station #2	5025PS852-2	0	0	0
26-05-2017	Vault Pit Station #2	5039827-1	1.11	0.0238	1.5
26-05-2017	Vault Pit Station #2	5039801-1	0	0	0
26-06-2017	Vault Pit Station #2	5137901-1	0	0	0
26-07-2017	Portage Pit North	5018356-1	1.96	0.004	1.789
26-08-2017	Vault Pit Station #2	5025807-1	2.76	0.012	0.644
26-10-2017	Portage Pit North	5011RA355-1	0	0	0
26-11-2017	Vault Pit Station #2	5123913-1	0	0	0
26-12-2017	Vault Pit Station #2	5116RA900-1	0	0	0
27-01-2017	Vault Pit Station #2	5060816-1	0	0	0
27-05-2017	Vault Pit Station #2	5039SU801-1	1.97	0.01	2.366
27-07-2017	Vault Pit Station #2	5032858-1	2.25	0.0125	3.392
27-08-2017	Vault Pit Station #2	5032826-1	4.24	0.016	0.944
27-09-2017	Vault Pit Station #2	5025817-1	0	0	0
27-09-2017	Vault Pit Station #2	5137919-1	1.28	0.00975	3.339
27-10-2017	Vault Pit Station #2	5130960-1	0	0	0
27-11-2017	Vault Pit Station #2	5123957-1	0	0	0
27-12-2017	Vault Pit Station #2	5011821-1	0	0	0
28-01-2017	Portage Pit South	5130FM670-1	6.27	0.0213	-0.1

28-04-2017	Portage Pit North	5004PS355-1	0	0	0
28-04-2017	Vault Pit Station #2	5046810-1	0	0	0
28-05-2017	Vault Pit Station #2	5039801-2	0	0	0
28-05-2017	Vault Pit Station #2	5039SU803-1	0	0	0
28-06-2017	Portage Pit South	5088PS670-2	0	0	0
28-08-2017	Vault Pit Station #2	5130908-1	0	0	0
28-09-2017	Portage Pit South	5067PS653-1	1.84	0.0143	1.966
28-09-2017	Vault Pit Station #2	5067PS651-4	1.84	0.0143	1.966
28-10-2017	Vault Pit Station #2	5123907-1	0	0	0
28-11-2017	Vault Pit Station #2	5109PS907-2	0	0	0
29-01-2017	Portage Pit South	5032344-1	4.96	0.007	1.573
29-01-2017	Portage Pit South	5123683-1	0	0	0
29-03-2017	Vault Pit Station #2	5046FM850-1	0	0	0
29-04-2017	Portage Pit South	5109685-1	0	0	0
29-05-2017	Portage Pit North	5025353-1	0	0	0
29-05-2017	Portage Pit South	5088PS676-1	0	0	0
29-06-2017	Portage Pit South	5088PS670-3	1.36	0.018	2.169
29-06-2017	Vault Pit Station #2	5130900-1	0	0	0
29-06-2017	Vault Pit Station #2	5039833-1	2.12	0.002	4.3
29-07-2017	Portage Pit South	5088PS675-1	0	0	0
29-07-2017	Portage Pit South	5088PS675-2	0	0	0
29-08-2017	Portage Pit South	5088682-1	1.58	0.006	0.173
29-08-2017	Vault Pit Station #2	5025RA805-1	0	0	0
29-09-2017	Vault Pit Station #2	5130950-1	1.16	0.0118	5.172
29-10-2017	Vault Pit Station #2	5130962-1	0	0	0
29-11-2017	Portage Pit South	5074678-1	3.29	0.012	2.114
29-11-2017	Vault Pit Station #2	5109PS909-3	0	0	0
30-04-2017	Portage Pit South	5109673-1	0	0	0
30-04-2017	Vault Pit Station #2	5046806-1	7.64	0.001	0.452
30-05-2017	Portage Pit South	5088PS678-1	0	0	0
30-07-2017	Vault Pit Station #2	5032RA808-1	2.79	0.0045	2.493
30-07-2017	Vault Pit Station #2	5032820-2	2.29	0.002	2.979
30-09-2017	Portage Pit South	5067PS675-1	1.82	0.011	2.659
30-10-2017	Portage Pit North	5067PS681-1	0	0	0
30-10-2017	Portage Pit South	5067PS681-2	0	0	0
30-11-2017	Vault Pit Station #2	5011803-1	0	0	0
30-12-2017	Vault Pit Station #2	5116906-1	0	0	0
31-03-2017	Vault Pit Station #2	5046802-1	0	0	0
31-05-2017	Portage Pit South	5088PS678-2	0	0	0
31-08-2017	Portage Pit South	5088RA676-1	1.28	0.0183	4.699
31-08-2017	Vault Pit Station #2	5130908-2	0	0	0
31-08-2017	Vault Pit Station #2	5130930-2	0	0	0
31-10-2017	Vault Pit Station #2	5018810-1	0	0	0