



REPORT

**Omya Canada Inc. Permit to Take Water
(8030-82RPF4)**

2019 Annual Monitoring Report

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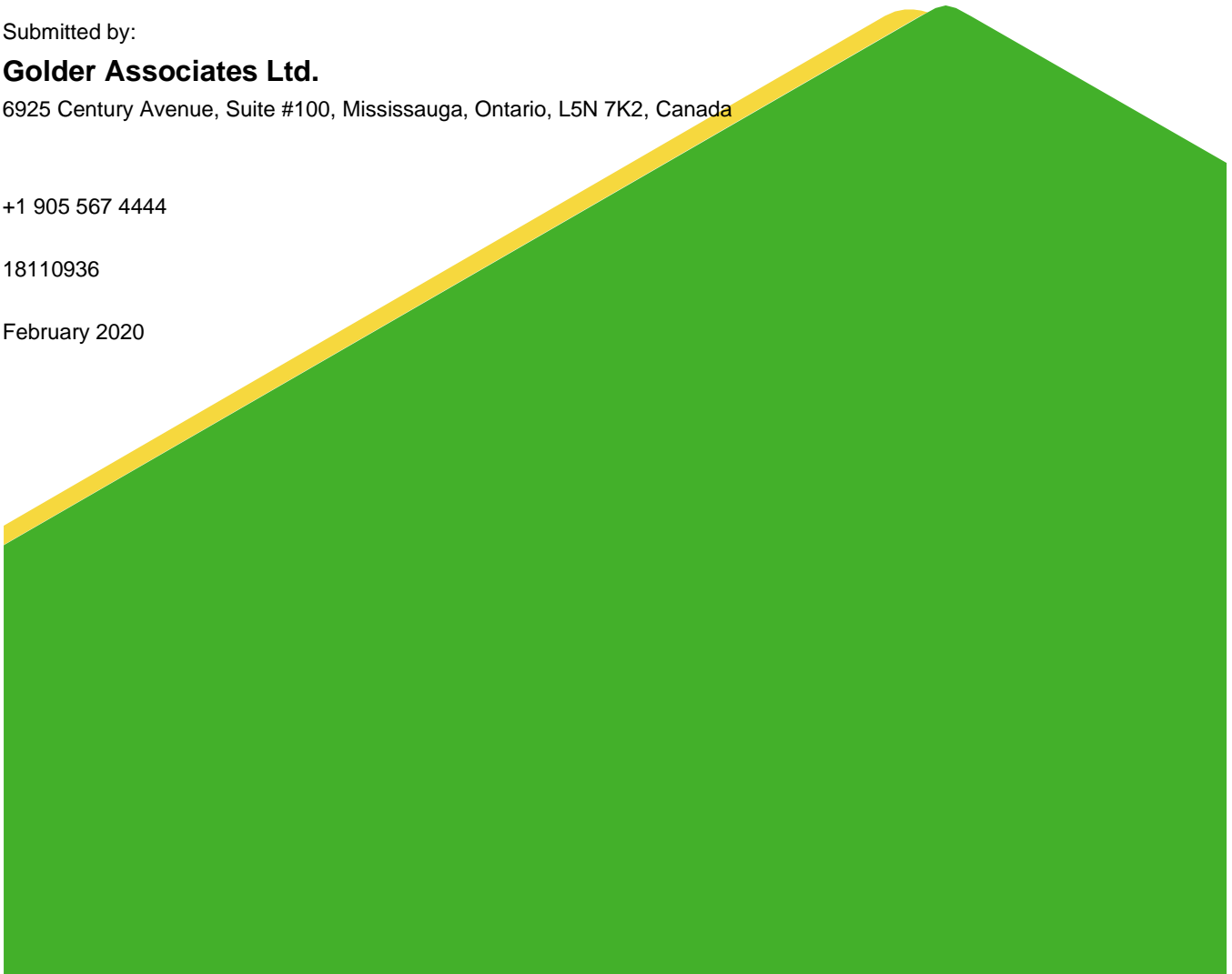
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Distribution List

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1.0 INTRODUCTION

In 2019, Golder Associates Ltd. (Golder), on behalf of Omya Canada Inc. (Omya), completed monitoring of the Tay River and groundwater wells as required for Permit to Take Water Number 8030-82RPF4 (PTTW), in Perth Ontario (Figure 1). Omya has been completing flow monitoring in support of the PTTW since 2003. The following report summarizes the monitoring completed in 2019 as required under the PTTW.

2.0 MONITORING

2.1 Streamflow Monitoring

The Tay River is controlled upstream by the Bolingbroke Dam at Bob's Lake. A hydrometric monitoring station, including a staff gauge, water level transducer and datalogger, was previously installed by Omya to monitor water levels within the Tay River near Bowes Road, downstream of the Bolingbroke Dam.

The 2019 flow monitoring data aligns well with the existing stage discharge rating curve and no modifications were needed. Daily open water streamflow conditions were derived from daily water level records at the hydrometric station using the stage discharge rating curve. Streamflow records were adjusted to account for ice cover conditions, when present, based on Water Survey of Canada standards. The open water rating curve was reviewed and found to not be representative of iced conditions. To adjust for ice cover conditions, a second stage discharge relationship was developed, using desktop analysis, following the collection of the monitoring data to estimate stream flow under ice conditions. Monitoring records were summarized in a format that would be acceptable for inclusion in the Water Survey of Canada Hydrometric Database (HYDAT). Stream flow monitoring data were compared to nearby gauging stations, including the Tay River at Perth station (#02LA024) maintained by Water Survey of Canada (WSC) and the Tay River at Bobs Lake station (#02LA017) maintained by Parks Canada. Flow data from the WSC Tay River at Perth station was unavailable for comparison for dates between January 1, 2019 and July 8, 2019 because of a recording error. However, the complete record of data from the Tay River at Bob's Lake station was available for comparison.

2.2 Omya Daily Water Takings

Daily surface water takings were recorded at the Omya water intake facility near Bowes Road, using the existing flow meter and totalizer. The flow meter was factory calibrated and is manually checked annually by Omya to confirm its accuracy. The data relating to daily surface water takings, as well as the majority of daily groundwater taking data, between January 1 and August 22 are unavailable due to a security breach of Omya's computer network. The information between these dates was corrupted and is subsequently unusable for the purposes of the assessment. Weekly totals for surface water takings were recorded and are available during the same period. The weekly totals have been used as a replacement for the missing daily results in this report.

Daily peak and daily total groundwater takings are recorded for each well at the Omya plant site (PW1, PW2, PW3, PW4, PW5, PW6, RW1, DP1, and W1) on a continuous basis using a flow meter and totalizer. The pumps at each well are controlled to shut down if they reach the daily limit. The pumps are also designed not to exceed the instantaneous water taking rates and therefore, Omya is confident that the daily and instantaneous limits were not exceeded in 2019.

Similar to the surface water takings, data relating to the daily groundwater takings between January 1 and September 21 are largely unavailable due to a security breach of Omya's computer network where the information was corrupted and rendered unusable. Individual process wells have daily records available as early as August 23, 2019, with weekly totals available before that date. Weekly totals for groundwater takings have been used as a replacement for the missing results in this report.

3.0 RESULTS

3.1 Streamflow Data

Table 1 summarizes daily discharge at the hydrometric station for the period of January 1, 2019 through December 31, 2019. The streamflow recorded at the Bowes Road hydrometric station are displayed on Figure 2. The maximum streamflow measurement recorded throughout the monitoring period was 24.53 m³/day and the minimum streamflow measurement recorded throughout the monitoring period was 1.16 m³/day.

Table 1: Daily Average Discharge (m³/s) at the Omya Hydrometric Station for 2019

Day	Flow (m ³ /s)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1	4.69 B	11.49 B	5.17	12.64	22.35	16.86	3.62	2.94	2.42	2.02	3.65	6.29
2	6.32 B	12.26 B	4.74	12.43	22.48	15.94	3.28	2.70	2.60	2.56	3.24	6.22
3	6.35 B	12.68 B	4.26	12.60	22.39	15.36	2.99	2.51	2.79	2.42	3.17	6.47
4	4.93 B	12.73 B	3.91	12.27	22.63	14.39	2.87	2.67	2.85	2.30	2.99	6.47
5	4.87 B	13.17 B	3.76	10.98	22.54	13.95	2.68	2.27	2.91	2.26	2.62	6.13
6	5.13 B	12.66 B	5.44	10.30	22.29	13.16	2.64	2.17	2.87	2.29	2.36	5.86 B
7	6.35 B	12.36 B	5.52	10.73	22.23	12.38	2.50	2.31	3.21	2.38	2.24	5.63 B
8	7.64 B	12.11 B	3.60	10.64	22.06	11.54	2.31	2.15	2.99	2.39	2.36	7.76 B
9	4.90 B	11.36 B	3.56	12.03	21.85	10.84	2.25	2.29	2.82	2.35	2.37	5.22 B
10	6.01 B,E	12.13 B	3.39	12.43	21.90	10.11	2.14	2.17	2.75	2.26	2.45	5.69 B
11	7.13 B,E	9.42 B	3.75	13.09	22.99	10.18	2.12	2.08	2.71	2.22	2.49	5.72 B
12	8.24 B,E	5.46 B	3.71	13.90	22.62	9.71	2.33	1.99	2.65	2.17	2.53	7.54 B
13	9.36 B,E	17.02 B	3.57	15.25	22.37	9.04	2.32	1.90	2.43	2.13	2.54	5.60 B
14	10.48 B,E	17.45 B	3.50	15.99	23.38	9.33	2.53	1.68	2.54	2.09	2.21	5.10 B
15	11.59 B,E	9.00 B,E	3.58	20.81	23.63	8.95	2.44	1.82	2.60	2.03	2.36	6.29 B
16	12.71 B,E	8.08 B	5.55	22.56	23.87	8.79	2.52	1.89	2.48	1.84	2.42	7.15 B
17	13.82 B,E	7.27 B	4.79	20.78	24.01	8.30	2.56	1.92	2.44	2.22	2.39	7.76 B
18	14.94 B,E	7.01 B	4.07	19.61	24.25	7.92	3.00	2.07	2.35	2.13	2.42	6.07 B
19	16.05 B,E	6.87 B	3.52	19.51	24.16	7.52	2.86	2.08	2.31	1.72	2.47	6.01 B,E
20	17.17 B	6.81 B	2.02	22.97	24.17	7.15	3.27	2.11	2.27	1.68	2.55	5.93 B,E
21	16.69 B	6.64 B	2.79	24.53	24.34	7.26	3.52	2.02	2.26	1.64	2.94	5.85 B,E
22	16.31 B	6.56 B	3.11	24.26	23.90	6.81	3.61	2.13	2.41	1.50	3.52	5.76 B,E
23	15.19 B	6.30 B	3.47	23.41	23.73	6.32	3.80	2.00	2.65	1.78	4.31	5.68 B,E
24	16.40 B	6.07 B	3.27	23.30	23.93	5.83	3.81	2.02	2.76	1.69	4.65	5.60 B,E
25	14.67 B	6.67 B	3.51	22.92	22.65	5.39	3.56	2.01	2.57	1.50	4.93	5.52 B,E
26	13.58 B	7.35 B	3.34	22.62	22.47	5.07	3.46	2.03	2.50	1.26	5.22	5.44 B,E
27	12.81 B	8.07 B	3.16	23.19	21.71	4.72	3.27	2.06	2.51	1.16	5.48	5.42 B
28	12.10 B	7.44	3.89	23.03	20.88	4.35	3.38	2.25	2.35	2.15	6.26	5.51 B
29	11.25 B		4.64	22.72	20.51	4.07	3.50	2.34	2.23	1.91	6.29	5.31 B
30	11.92 B		6.16	22.44	19.35	4.03	3.48	2.30	2.11	1.79	6.29	5.16 B
31	10.86 B		11.18		18.04		3.31	2.39		1.65		5.66 B
Monthly High Flow	17.17	17.45	11.18	24.53	24.34	16.86	3.81	2.94	3.21	2.56	6.29	7.76
Monthly Low Flow	4.69	5.46	2.02	10.30	18.04	4.03	2.12	1.68	2.11	1.16	2.21	5.10

Notes: B – Ice conditions, E – Estimated

3.2 Omya Water Taking Data

Daily surface water takings from the Tay River recorded at the Omya water intake facility are presented in Table 2 and Figure 3 for the period of January 1, 2019 to December 31, 2019. As stated in Section 2.2, the data relating to surface water takings between January 1 and August 22 are unavailable due to a security breach of Omya's computer network. The information between these dates was corrupted and is subsequently unusable for the purposes of the assessment. Weekly totals, recorded on the Wednesday of each week, have been averaged during their respective weeks between January 1 and August 22, as seen in the table below. The following table presents the most complete record of the available surface water taking information provided by Omya.

Table 2: Daily Surface Water Takings (m³) for 2019

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1	240.9	370.2	228.5	254.3	249.2	263.6	339.7	357.4	353.4	166.6	151.3	178.9
2	240.9	370.2	228.5	254.3	249.2	263.6	339.7	357.4	410.5	78.0	211.2	392.1
3	240.9	370.2	228.5	211.3	249.2	263.6	111.4	357.4	385.4	489.7	178.8	88.1
4	240.9	370.2	228.5	211.3	249.2	263.6	111.4	357.4	163.0	548.1	223.0	0.3
5	240.9	370.2	228.5	211.3	249.2	200.0	111.4	357.4	516.4	587.9	555.1	0.3
6	240.9	272.4	218.3	211.3	249.2	200.0	111.4	357.4	138.0	354.0	348.2	264.5
7	240.9	272.4	218.3	211.3	249.2	200.0	111.4	359.7	229.5	441.0	267.0	351.9
8	240.9	272.4	218.3	211.3	248.0	200.0	111.4	359.7	347.5	321.3	360.7	277.5
9	279.2	272.4	218.3	211.3	248.0	200.0	111.4	359.7	419.4	210.7	345.3	370.4
10	279.2	272.4	218.3	297.1	248.0	200.0	141.7	359.7	402.1	283.2	146.8	325.6
11	279.2	272.4	218.3	297.1	248.0	200.0	141.7	359.7	118.6	266.4	343.5	452.2
12	279.2	272.4	218.3	297.1	248.0	286.2	141.7	359.7	412.8	305.4	317.1	414.5
13	279.2	306.7	422.3	297.1	248.0	286.2	141.7	359.7	319.2	100.3	313.8	418.7
14	279.2	306.7	422.3	297.1	248.0	286.2	141.7	660.1	323.1	127.6	261.3	232.9
15	279.2	306.7	422.3	297.1	205.4	286.2	141.7	660.1	378.7	301.8	81.5	397.4
16	422.5	306.7	422.3	297.1	205.4	286.2	141.7	660.1	341.6	258.0	226.6	142.2
17	422.5	306.7	422.3	306.9	205.4	286.2	180.8	660.1	121.9	263.3	221.2	353.1
18	422.5	306.7	422.3	306.9	205.4	286.2	180.8	660.1	319.1	154.7	331.5	186.7
19	422.5	306.7	422.3	306.9	205.4	190.1	180.8	660.1	341.2	115.6	345.2	227.1
20	422.5	162.9	251.2	306.9	205.4	190.1	180.8	660.1	284.5	182.7	512.5	185.5
21	422.5	162.9	251.2	306.9	205.4	190.1	180.8	653.4	189.6	288.0	200.4	208.1
22	422.5	162.9	251.2	306.9	150.3	190.1	180.8	653.4	198.4	253.0	123.3	237.2
23	342.6	162.9	251.2	306.9	150.3	190.1	180.8	223.5	298.9	239.6	231.3	127.4
24	342.6	162.9	251.2	201.9	150.3	190.1	178.3	293.4	335.3	252.1	366.8	87.3
25	342.6	162.9	251.2	201.9	150.3	190.1	178.3	304.0	244.6	241.1	434.2	223.8
26	342.6	162.9	251.2	201.9	150.3	339.7	178.3	466.0	324.1	155.5	453.8	144.0

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
27	342.6	228.5	254.3	201.9	150.3	339.7	178.3	536.3	197.9	136.1	140.0	138.0
28	342.6	228.5	254.3	201.9	150.3	339.7	178.3	374.0	353.6	216.7	273.4	250.4
29	342.6	-	254.3	201.9	263.6	339.7	178.3	241.4	248.8	247.8	112.2	165.4
30	370.2	-	254.3	201.9	263.6	339.7	178.3	341.2	447.2	357.8	183.1	179.5
31	370.2	-	254.3	-	263.6	-	357.4	333.0	-	276.0	-	189.8

Note(s):

Italicised values are based on weekly averages. Daily data records are available for August 23 to December 31, 2019.

Total daily groundwater takings from the on-site wells are summarized in Table 3 and Figure 4 for the period of January 1, 2019 to December 31, 2019. Daily maximum and average water takings from each individual well are presented on Figures 5 to 13. As stated previously, information relating to the total daily groundwater takings between January 1 and September 21 is mostly unavailable due to a security breach of Omya's computer network where the information was corrupted and rendered unusable. Individual process wells have daily records available as early as August 23, 2019, with weekly totals available before that date, as seen on Figures 5 to 13. Weekly totals, recorded on the Wednesday of each week, have been averaged during their respective weeks, as seen in the table below. The following table presents the most complete record of the available groundwater taking information.

Table 3: Total Daily Groundwater Takings (m³) for 2019

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1	5	7	6	6	6	7	7	5	6	7	7	5
2	5	7	6	6	6	7	7	5	6	6	5	7
3	5	7	6	7	6	7	6	5	15	7	5	254
4	5	7	6	7	6	7	6	5	16	7	7	356
5	5	7	6	7	6	6	6	5	7	8	6	182
6	5	5	7	7	6	6	6	5	7	5	6	7
7	5	5	7	7	6	6	6	6	5	7	7	5
8	5	5	7	7	7	6	6	6	6	7	6	5
9	6	5	7	7	7	6	6	6	7	7	5	7
10	6	5	7	7	7	6	9	6	7	6	6	7
11	6	5	7	7	7	6	9	6	7	6	6	7
12	6	5	7	7	7	13	9	6	7	5	6	8
13	6	6	8	7	7	13	9	6	7	5	9	5
14	6	6	8	7	7	13	9	5	6	6	7	4
15	6	6	8	7	6	13	9	5	6	6	7	5
16	3	6	8	7	6	13	9	5	7	7	6	6
17	3	6	8	4	6	13	5	5	8	7	5	6

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
18	3	6	8	4	6	13	5	5	7	6	14	6
19	3	6	8	4	6	3	5	5	7	5	15	5
20	3	6	5	4	6	3	5	5	7	6	7	5
21	3	6	5	4	6	3	5	7	6	7	7	5
22	3	6	5	4	7	3	5	7	6	7	7	5
23	6	6	5	4	7	3	5	7	7	7	5	6
24	6	6	5	3	7	3	5	6	11	7	6	6
25	6	6	5	3	7	3	5	6	9	6	7	5
26	6	6	5	3	7	7	5	7	8	5	7	5
27	6	6	6	3	7	7	5	7	7	5	7	6
28	6	6	6	3	7	7	5	7	5	6	7	5
29	6	-	6	3	7	7	5	7	5	7	7	5
30	7	-	6	3	7	7	5	6	7	7	6	7
31	7	-	6	-	7	-	5	6	-	7	-	6

Note(s):

Italicised values are based on weekly averages. Daily data records are available for September 22 to December 31, 2019.

3.3 Groundwater Levels

In reference to Condition 4.1.3 of the PTTW, water was not taken from the combined Site wells at a rate greater than 50,000 Litres per day, for more than seven consecutive days. Review comments from the Ministry of Environment and Climate Change groundwater reviewer on the 2016 annual report (received March 30, 2017) clarified that Condition 4.1.3 required measuring water levels at a spare production well as well as measuring water levels at monitoring wells on a monthly basis (once this condition was triggered). Monthly water levels were measured at production well PW1 on a monthly basis, starting on January 19, 2018, and continued into 2019 as can be seen in Table 4. Water levels remained fairly constant within the well throughout the year with the highest levels recorded in the spring and early summer months.

Table 4: Production Well PW1 Manual Water Level Measurements

Measurement Date	Water Level Below Top of Pipe (m)
18-Jan-19	3.19
12-Feb-19	3.40
27-Mar-19	2.79
29-Apr-19	2.90
24-May-19	2.89

Measurement Date	Water Level Below Top of Pipe (m)
20-Jun-19	2.90
25-Jul-19	3.49
22-Aug-19	3.77
26-Sep-19	3.81
23-Oct-19	3.62
14-Nov-19	3.12
5-Dec-19	3.64

As per Condition 4.1.3, in lieu of monthly monitoring at the other monitoring wells, the 2019 groundwater levels recorded hourly monitoring well M3, the Provincial Groundwater Monitoring Network (PGMN) well W083 (located South of the Omya plant off Christie Lake Road) are presented on Figure 14.

4.0 DATA ANALYSIS

4.1 Water Takings

Total surface water takings did not exceed the permitted value of 1,483 m³/day in 2019 (for the available surface water record stated in Section 2.2). Additionally, the recorded maximum instantaneous rates did not exceed the permitted amount of 1,030 L/min during the available 2019 monitoring period. As mentioned above, the weekly logged water taking data suggests that the daily surface water taking limit was not exceeded for the period where daily records are unavailable.

The total combined daily groundwater takings were below the limit of 875,534 Litres per day (875.5 m³/day) permitted under Condition 3.5 of the PTTW during 2019, according to the available data (Figure 4). The maximum water taking rates for individual wells were not exceeded during 2019 (Figures 5 to 13). As stated previously, the pumps at each well are controlled to shut down if they reach the daily limit. This pump control and the weekly logged water takings suggest the daily groundwater takings were not exceeded during the period where daily records are unavailable.

As per Condition 4.1.4 of the PTTW, process wells PW1 through PW6 were not used, beyond maintenance flows (i.e., pumps regularly circulate small volumes of water to confirm proper operation), for more than 30 consecutive days or a total of 60 days between January 1, 2019 and December 31, 2019. As such, a summary review report is not required for 2019 as per this condition of the PTTW.

Groundwater elevations at the PGMN well W083 decreased by approximately 0.5 m in early December 2019 coincident with when water was taken from production wells PW1, PW2, PW3, PW4, and PW6 and may be a result of the water taking. The observed decrease in groundwater levels is within the natural groundwater level fluctuations observed at the monitoring well over 2019.

4.2 Surface Water Taking Cut Off Conditions

Condition 4.2.11 of the PTTW states that the surface water takings are not to occur when the discharge at the hydrometric station is measured to be equal to or less than 1 m³/s. Omya maintained a hydrometric station throughout the monitoring period to monitor streamflow within the Tay River. Within the monitoring period, the Tay River discharge was not less than or equal to 1 m³/s on any day in 2019.

5.0 SUMMARY

For the 2019 monitoring period, the following summary statements can be made:

- 1) The daily surface water taking from the Tay River did not exceed the permitted amount of 1,483 m³/day in 2019, during the period of available data. Additionally, the maximum instantaneous water taking did not exceed the 1,030 L/min limit during the period of available data in 2019.
- 2) The maximum total daily groundwater taking volume did not exceed the permitted amount of 875.5 m³/day in 2019. The maximum per minute water taking rates were not exceeded at any wells in 2019 during the period of available data.
- 3) Water was not taken at a rate greater than 50,000 Litres per day, for more than seven consecutive days. Manual measurements from PW1, have been collected and can be found in Table 4.
- 4) During 2019, Omya did not receive any water well interference complaints.

6.0 CLOSURE

We trust that this report is sufficient for your current requirements. Should you have questions regarding the content please contact the undersigned.

Signature Page

Golder Associates Ltd.



Craig De Vito, PEng
Water Resources Engineer



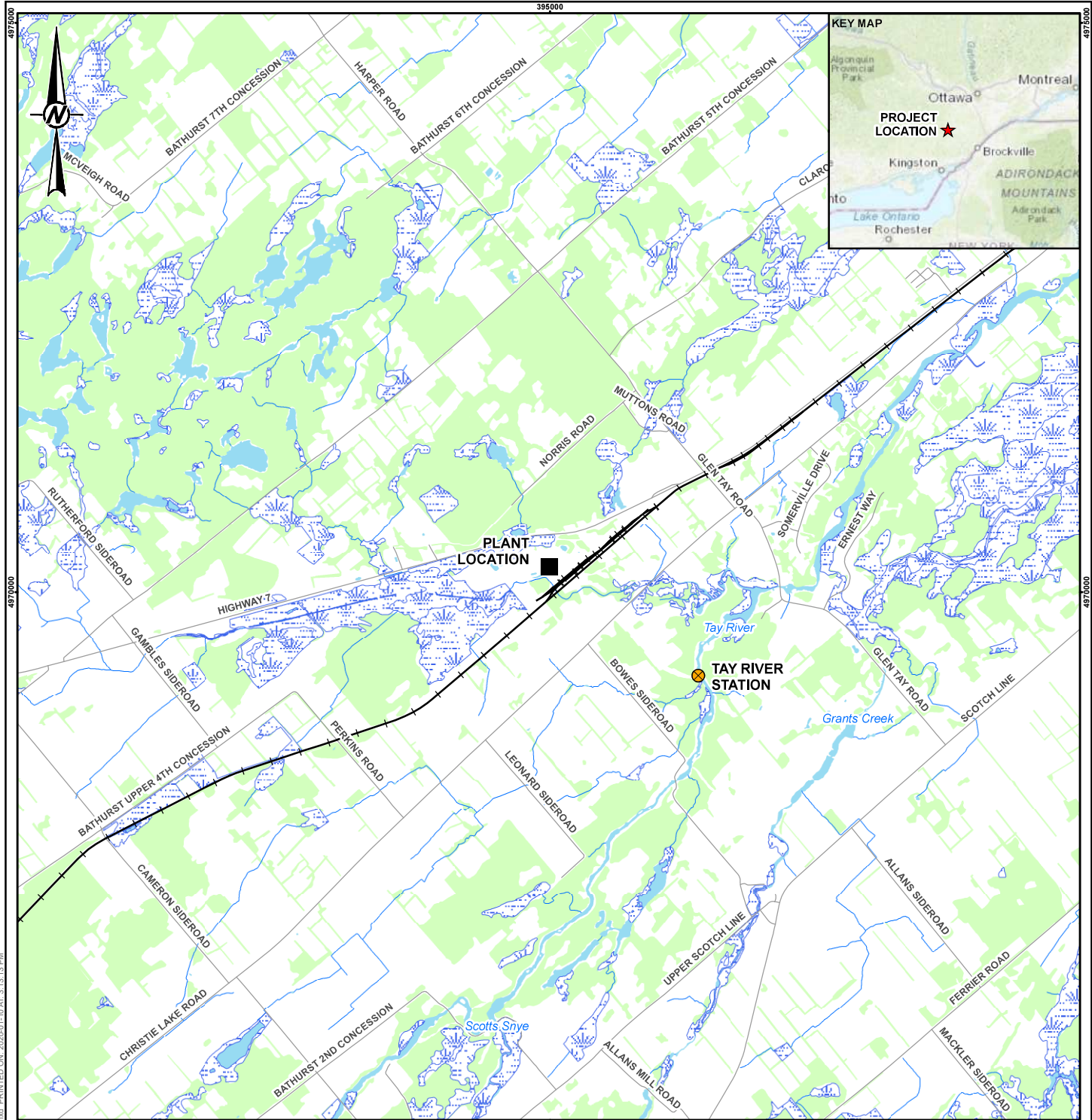
Kevin MacKenzie, MSc, PEng
Principal, Senior Water Resources Engineer

NP/CDV/KM/wlm/mp

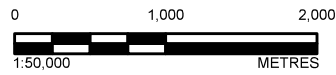
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FIGURES



- LEGEND**
- TAY RIVER STATION
 - PLANT LOCATION
 - ROAD
 - RAILWAY
 - RIVER/STREAM
 - WATERBODY
 - WETLAND
 - WOODED AREA



REFERENCE(S)
 1. BASEDATA MNRF LIO 2017
 2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18N

CLIENT
OMYA CANADA INC.

CONSULTANT



YYYY-MM-DD 2020-01-10

DESIGNED SO

PREPARED SO

REVIEWED CDV

APPROVED KMAC

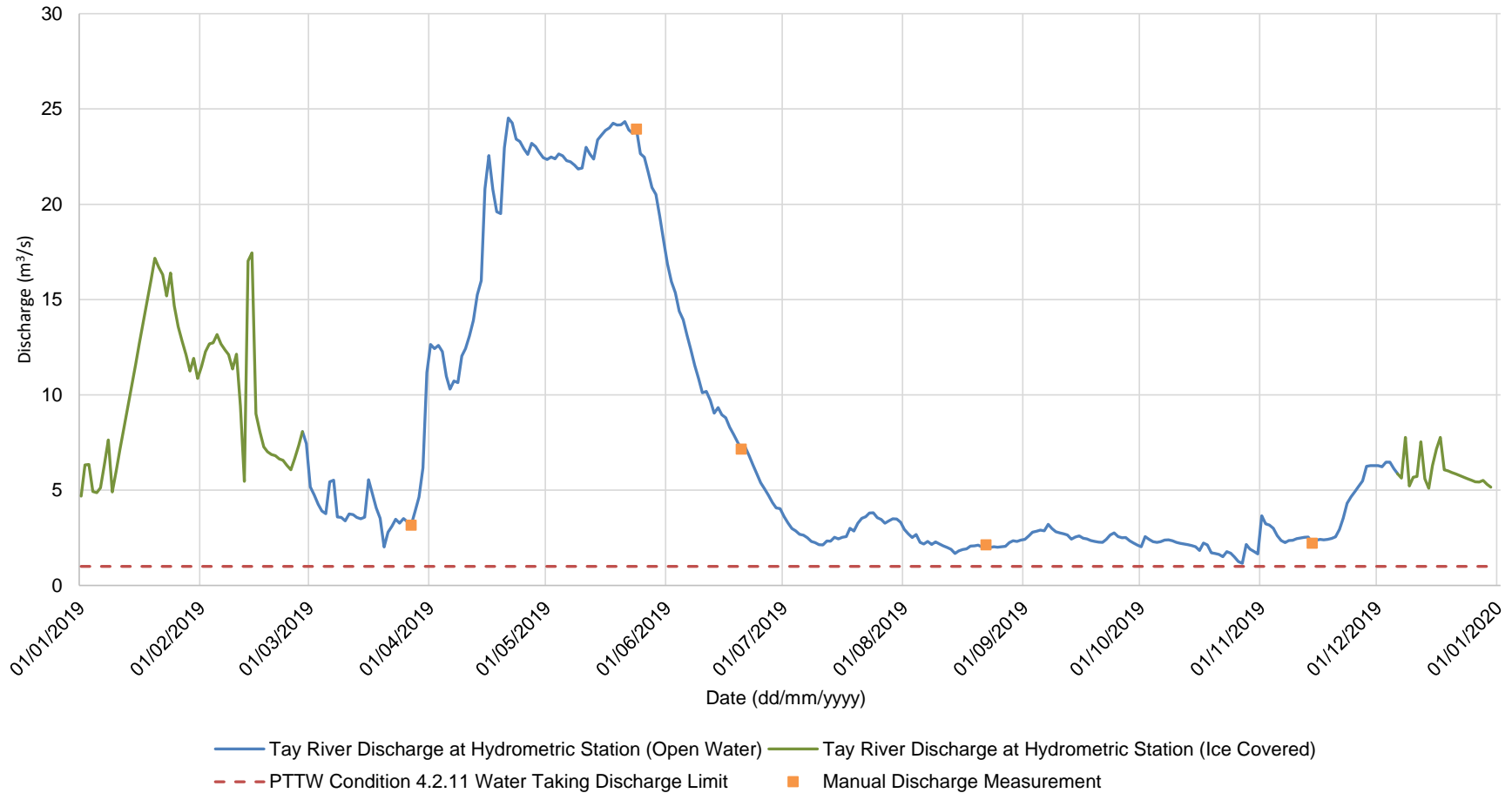
PROJECT
**2019 TAY RIVER PTTW MONITORING
 PERTH, ON**

TITLE
SITE LOCATION

PROJECT NO. 18110936	CONTROL 0001	REV. 0.0	FIGURE 1
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Omya Canada Inc.
Permit to Take Water (8030-82RPF4)
Annual Monitoring Report
Tay River Average Daily Discharge 2019

FIGURE 2



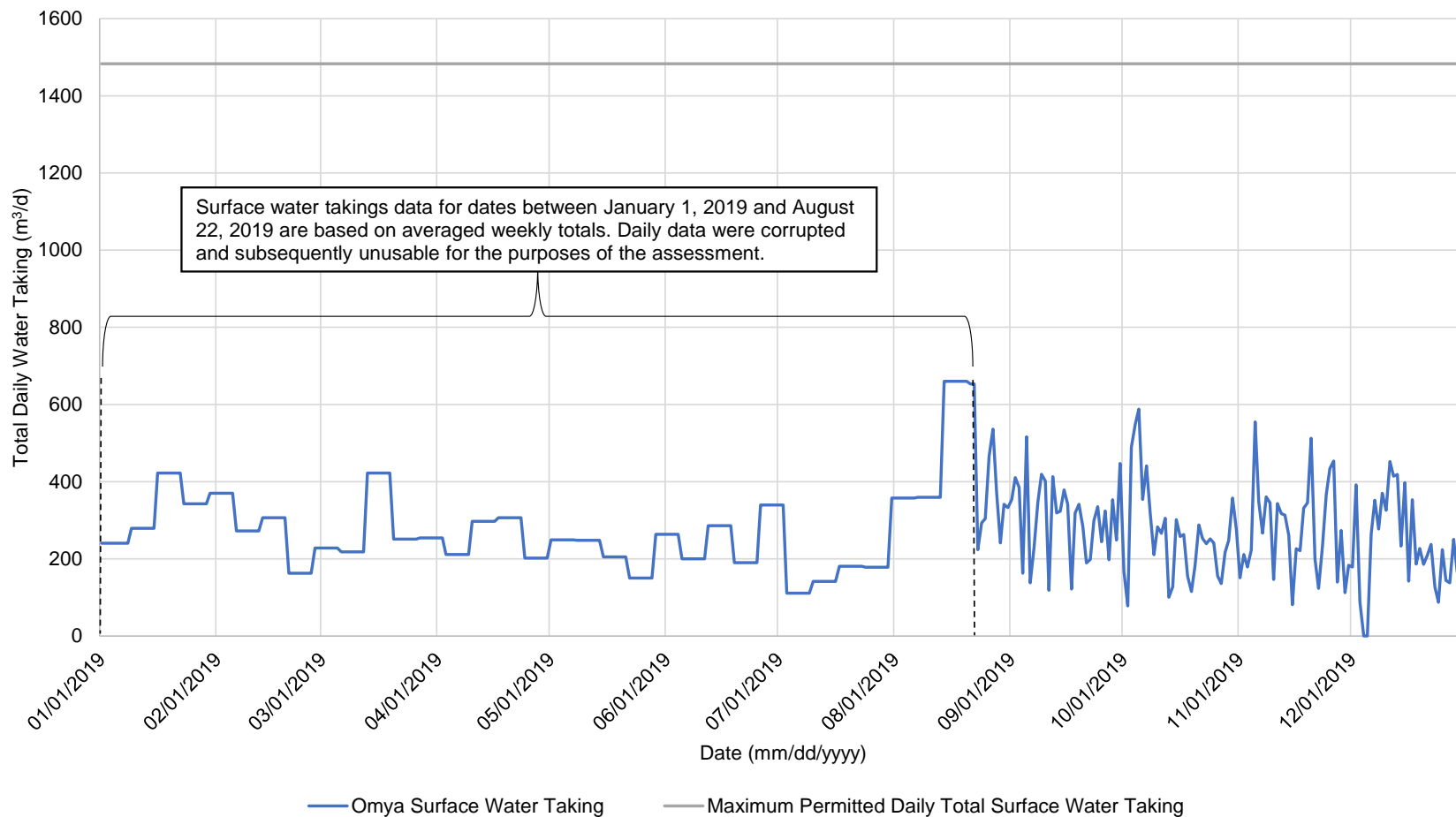
PROJECT: 18110936
 DATE: February 2020



DRAWN: NP
 CHECK: CDV

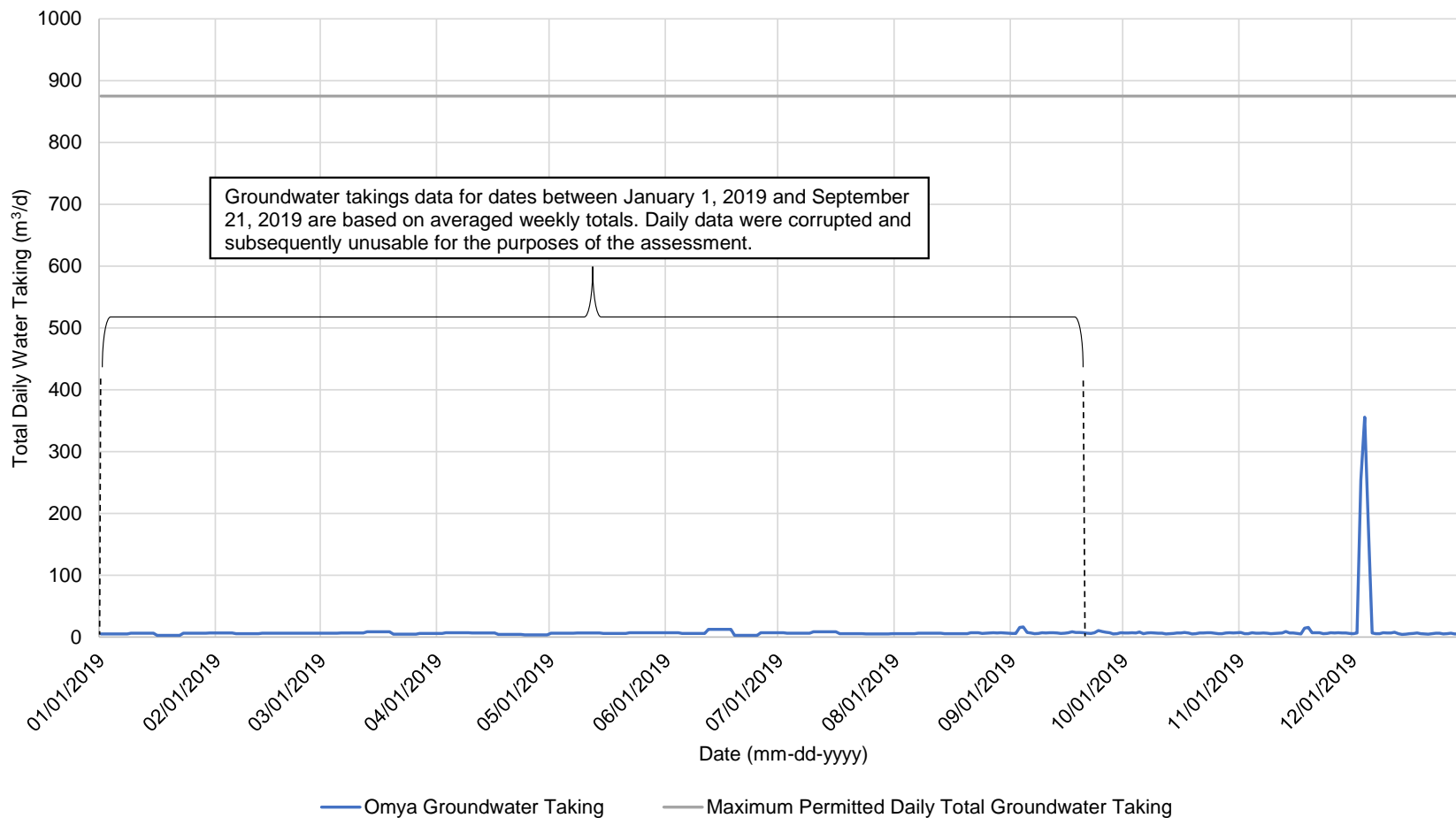
Omya Canada Inc.
Permit to Take Water (8030RPF4)
Annual Monitoring Report
Total Daily Surface Water Takings

FIGURE 3



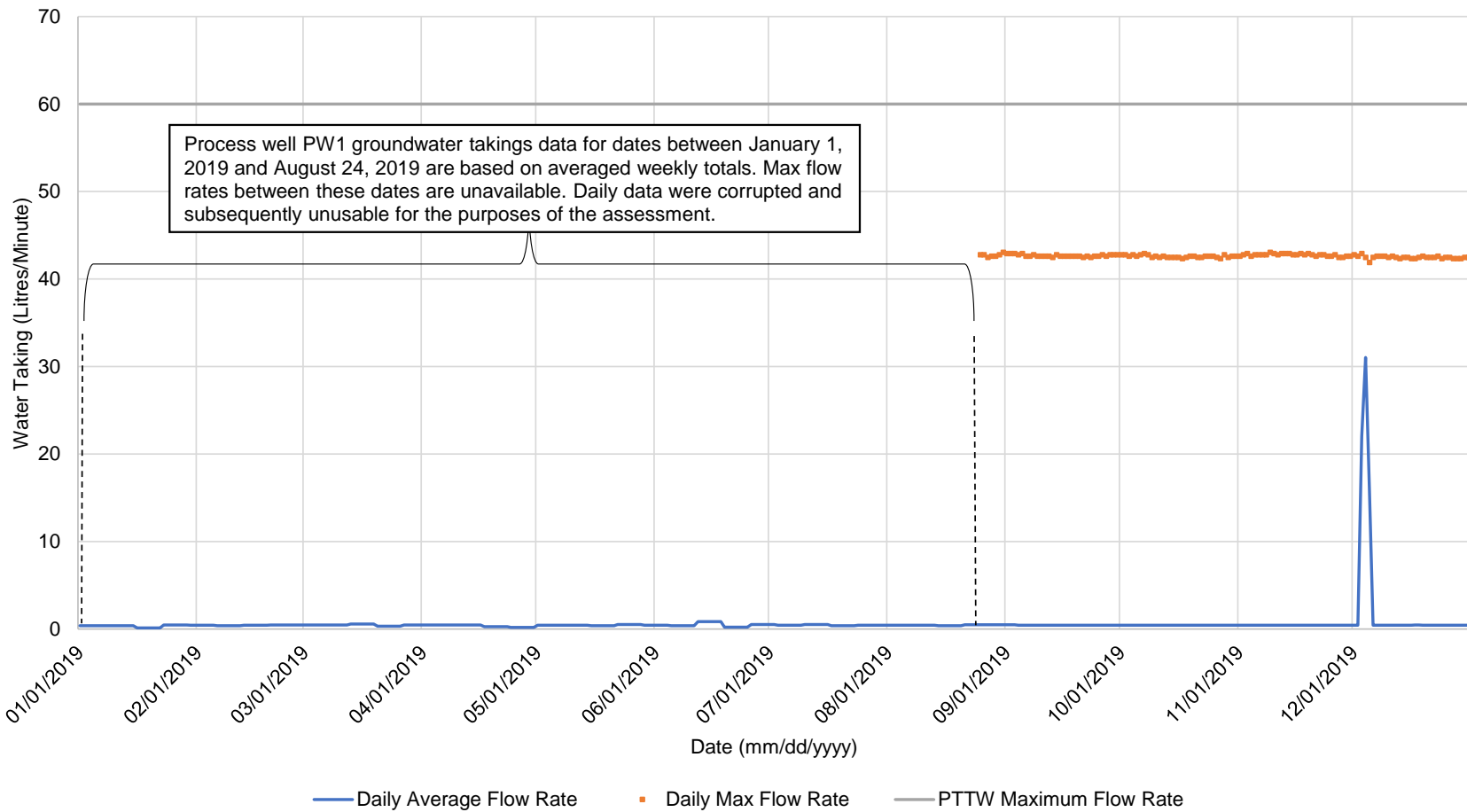
Omya Canada Inc.
Permit to Take Water (8030RPF4)
Annual Monitoring Report
Total Daily Groundwater Takings

FIGURE 4



Omya Canada Inc.
Permit to Take Water (8030RPF4)
Annual Monitoring Report
Maximum and Average Daily Groundwater Takings PW1

FIGURE 5



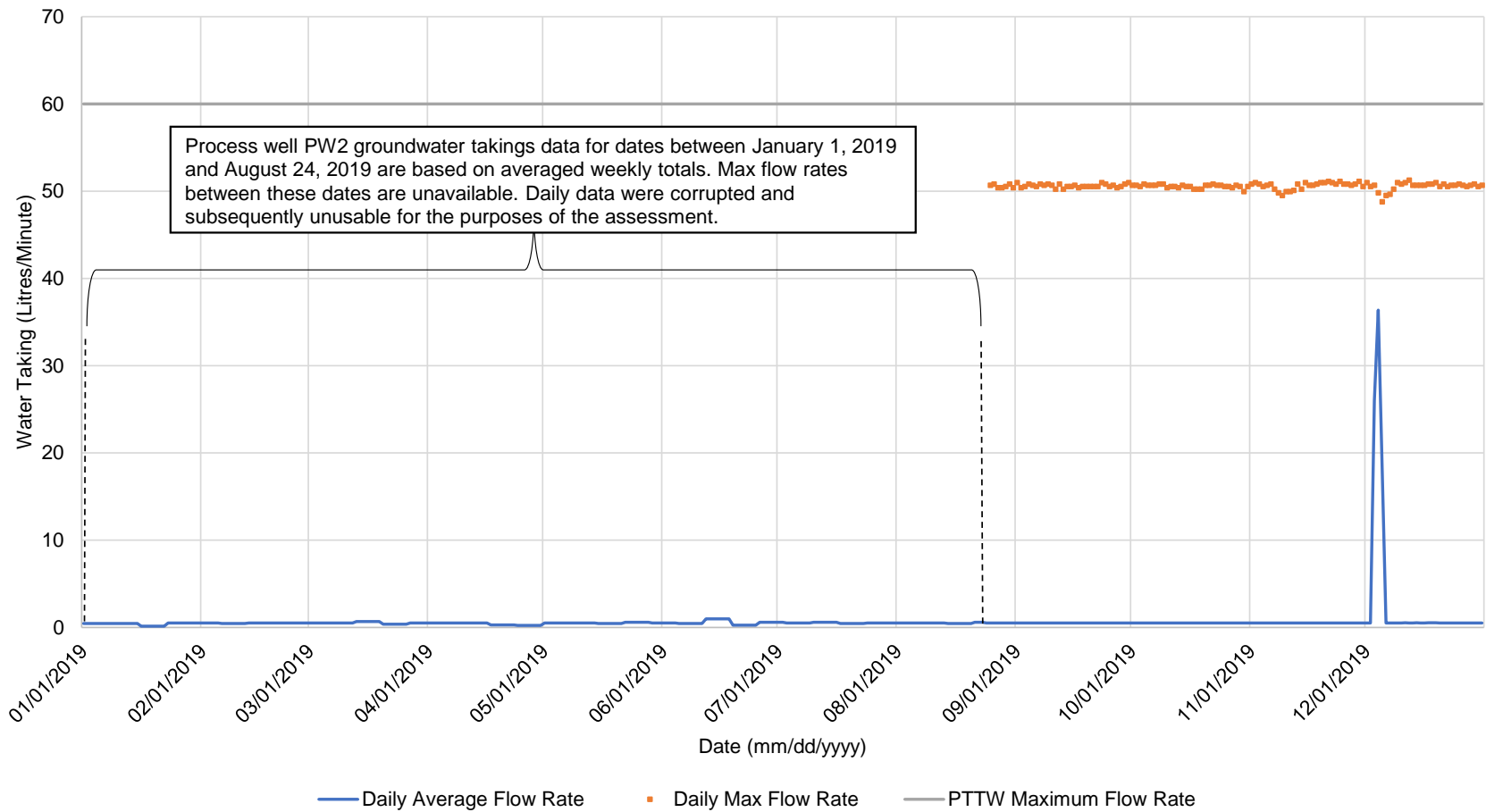
PROJECT: 18110936
 DATE: February 2020



DRAWN: NP
 CHECK: CDV

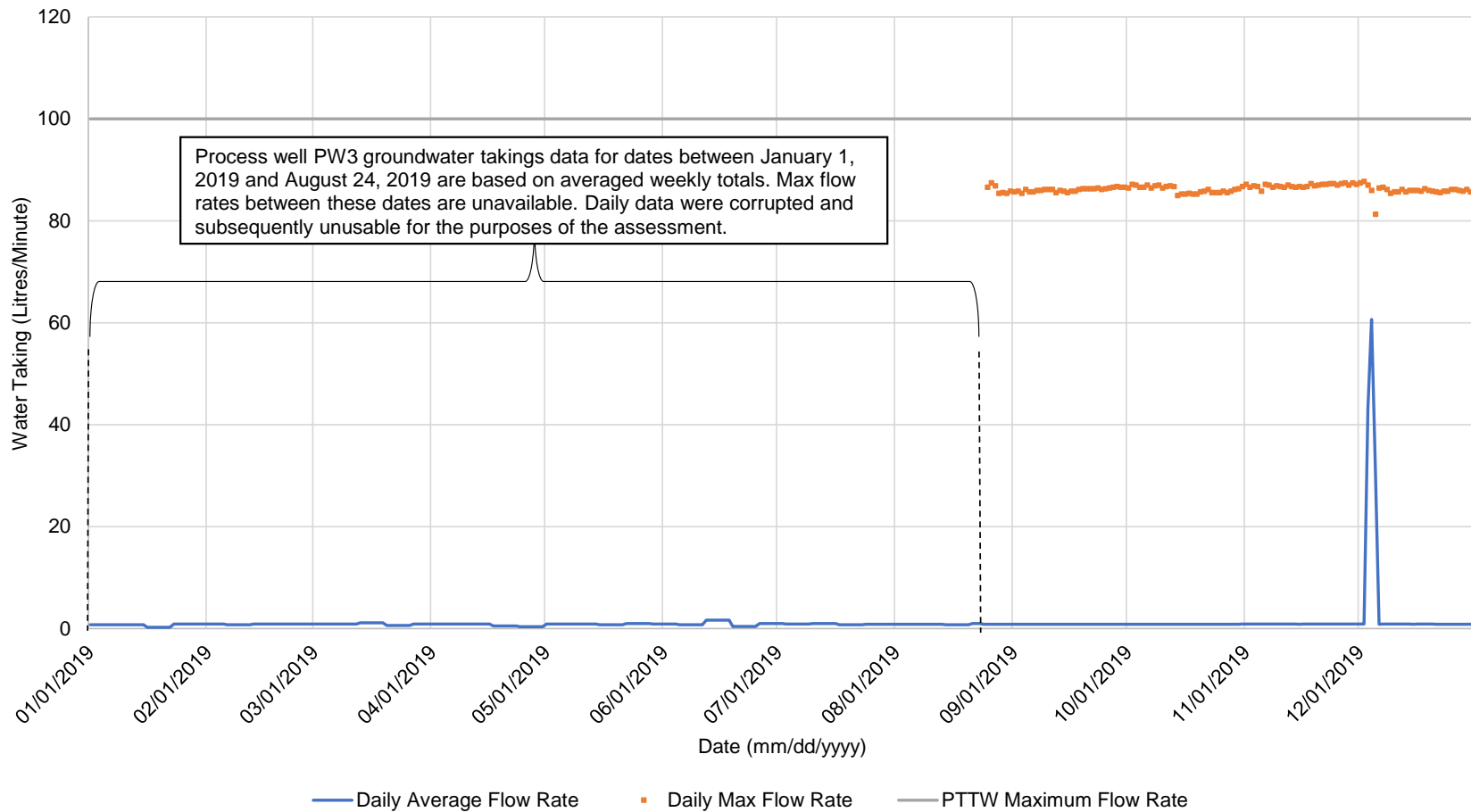
Omya Canada Inc.
Permit to Take Water (8030RPF4)
Annual Monitoring Report
Maximum and Average Daily Groundwater Takings PW2

FIGURE 6



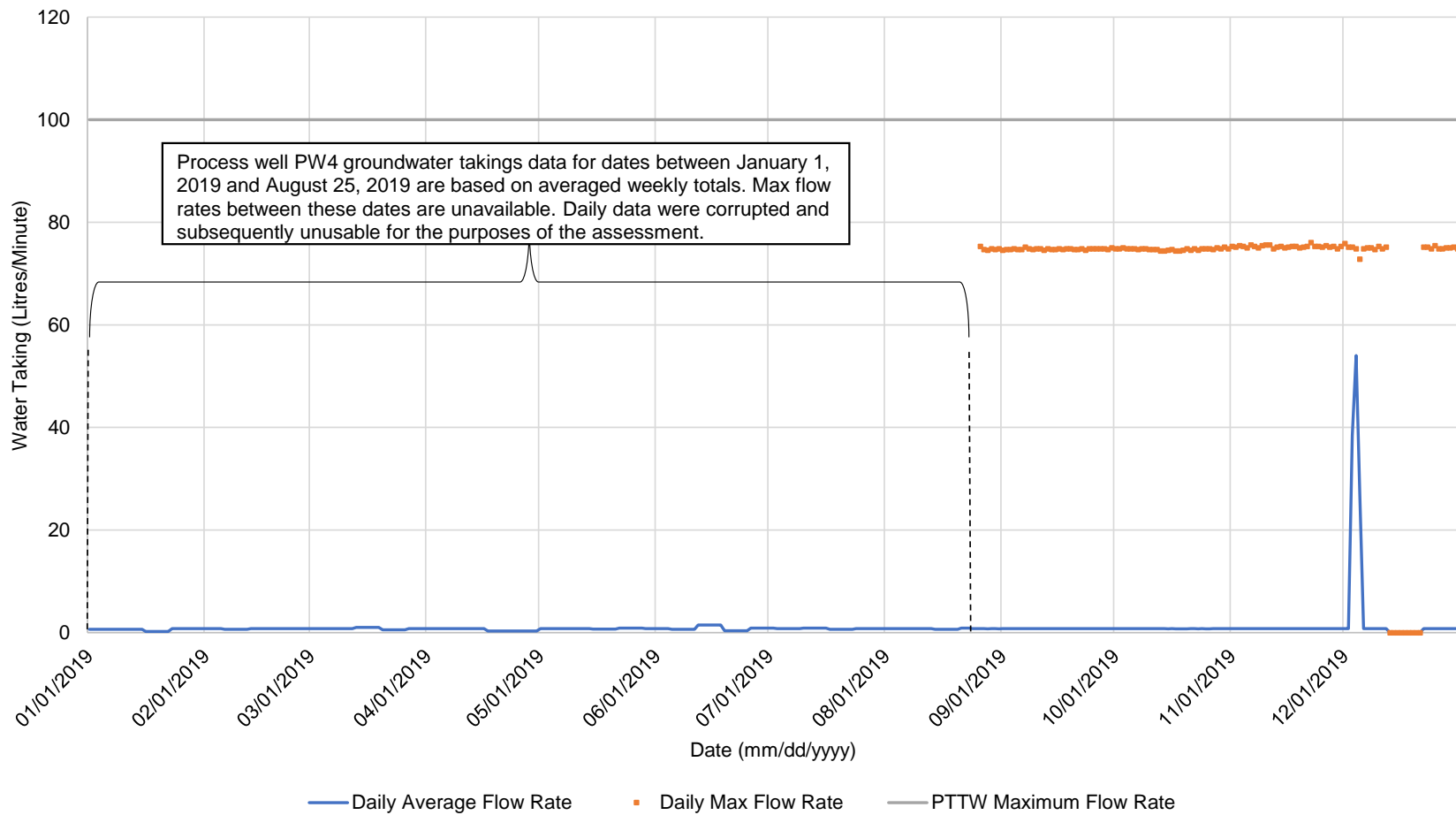
Omya Canada Inc.
Permit to Take Water (8030RPF4)
Annual Monitoring Report
Maximum and Average Daily Groundwater Takings PW3

FIGURE 7



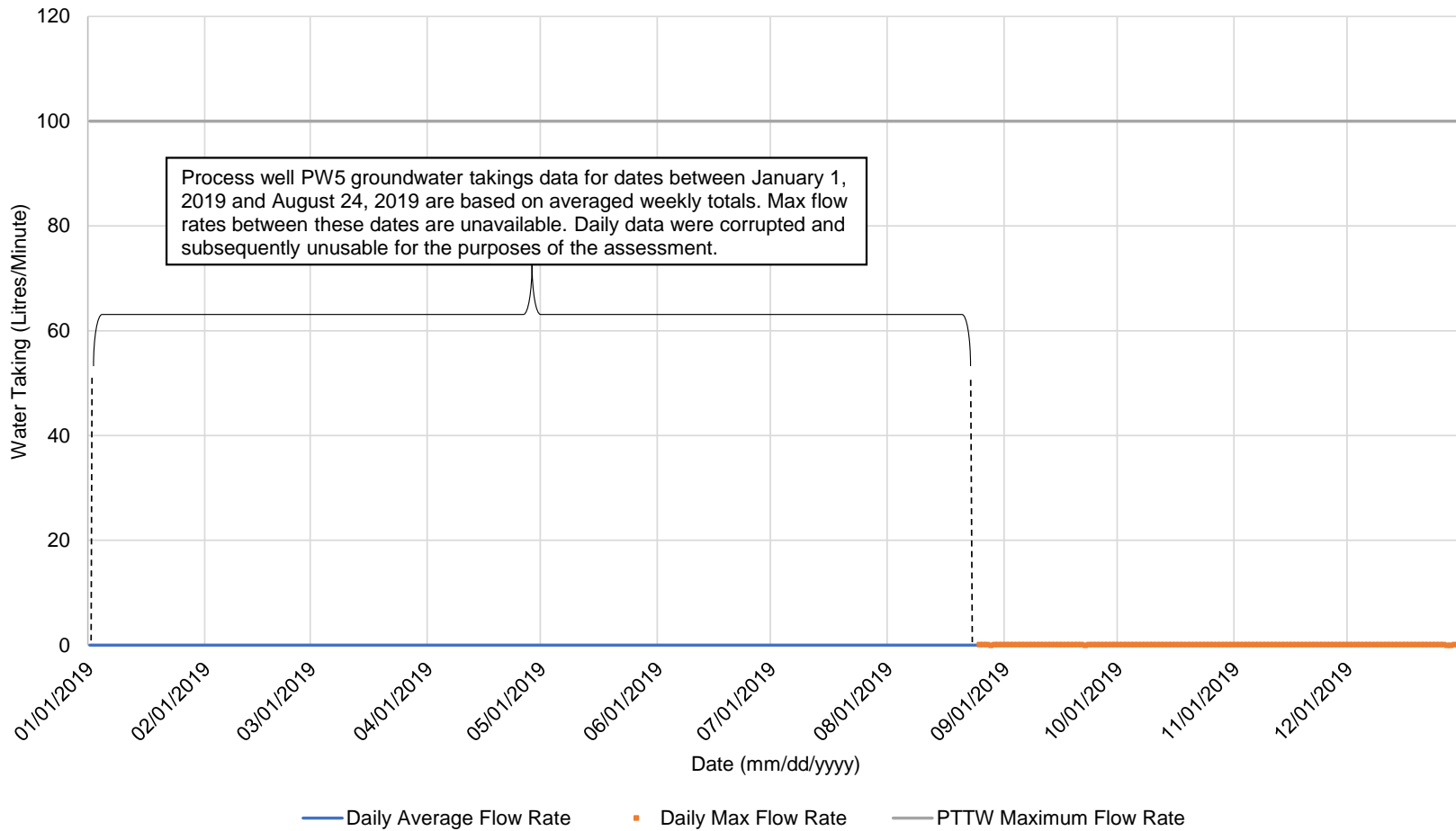
Omya Canada Inc.
Permit to Take Water (8030RPF4)
Annual Monitoring Report
Maximum and Average Daily Groundwater Takings PW4

FIGURE 8



Omya Canada Inc.
Permit to Take Water (8030RPF4)
Annual Monitoring Report
Maximum and Average Daily Groundwater Takings PW5

FIGURE 9



PROJECT: 18110936

DATE: February 2020

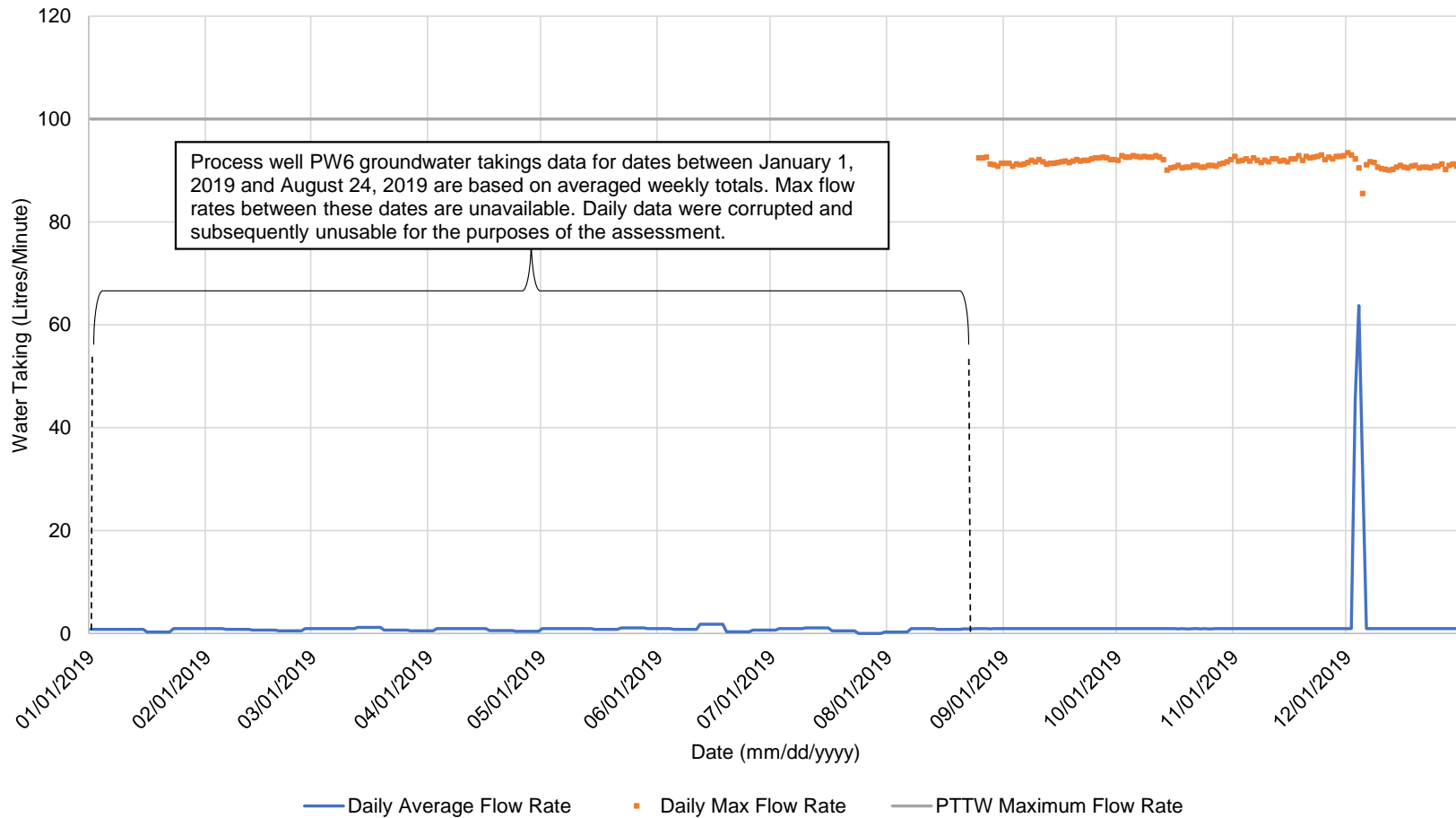


DRAWN: NP

CHECK: CDV

Omya Canada Inc.
Permit to Take Water (8030RPF4)
Annual Monitoring Report
Maximum and Average Daily Groundwater Takings PW6

FIGURE 10



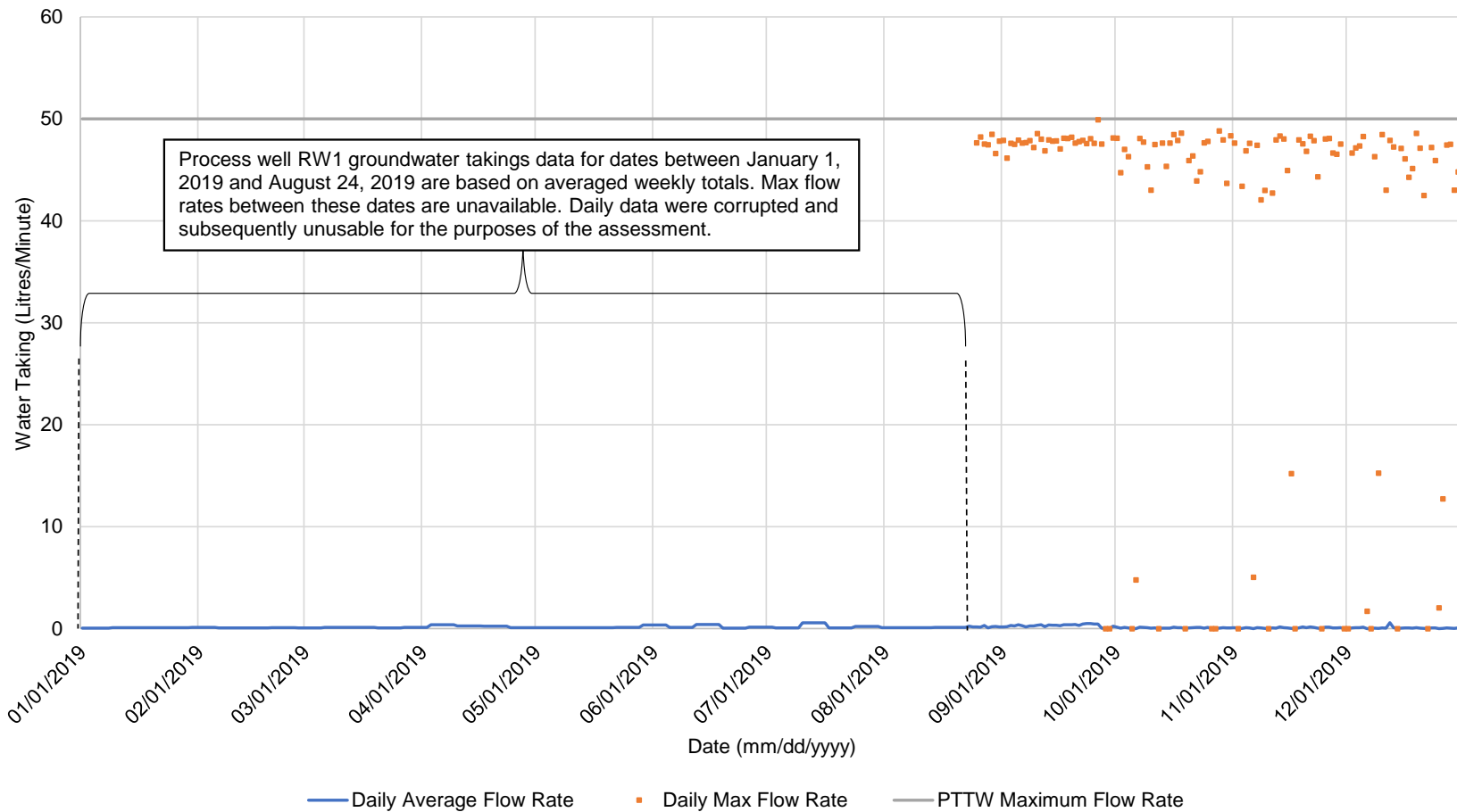
PROJECT: 18110936
 DATE: February 2020



DRAWN: NP
 CHECK: CDV

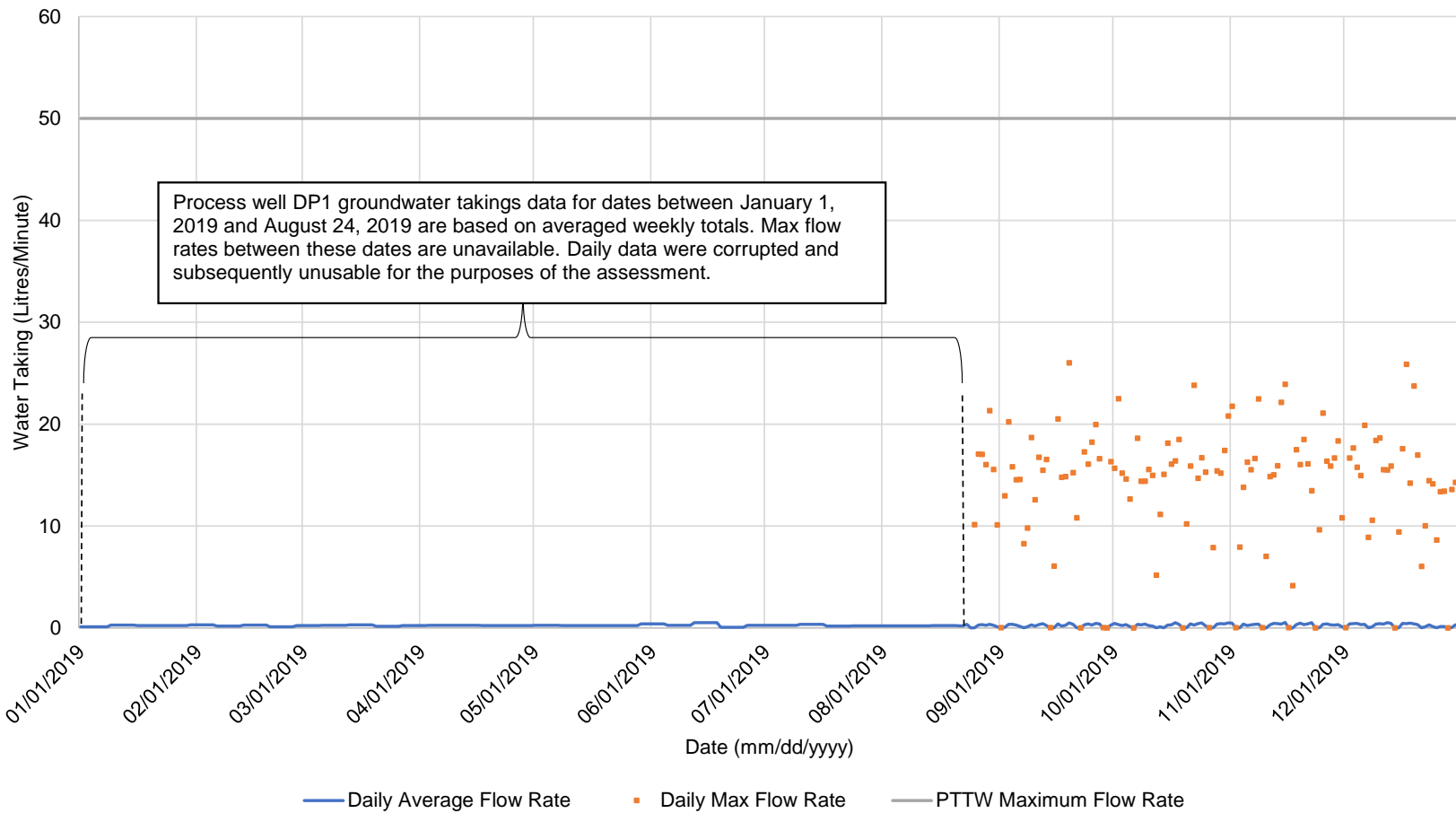
Omya Canada Inc.
Permit to Take Water (8030RPF4)
Annual Monitoring Report
Maximum and Average Daily Groundwater Takings RW1

FIGURE 11



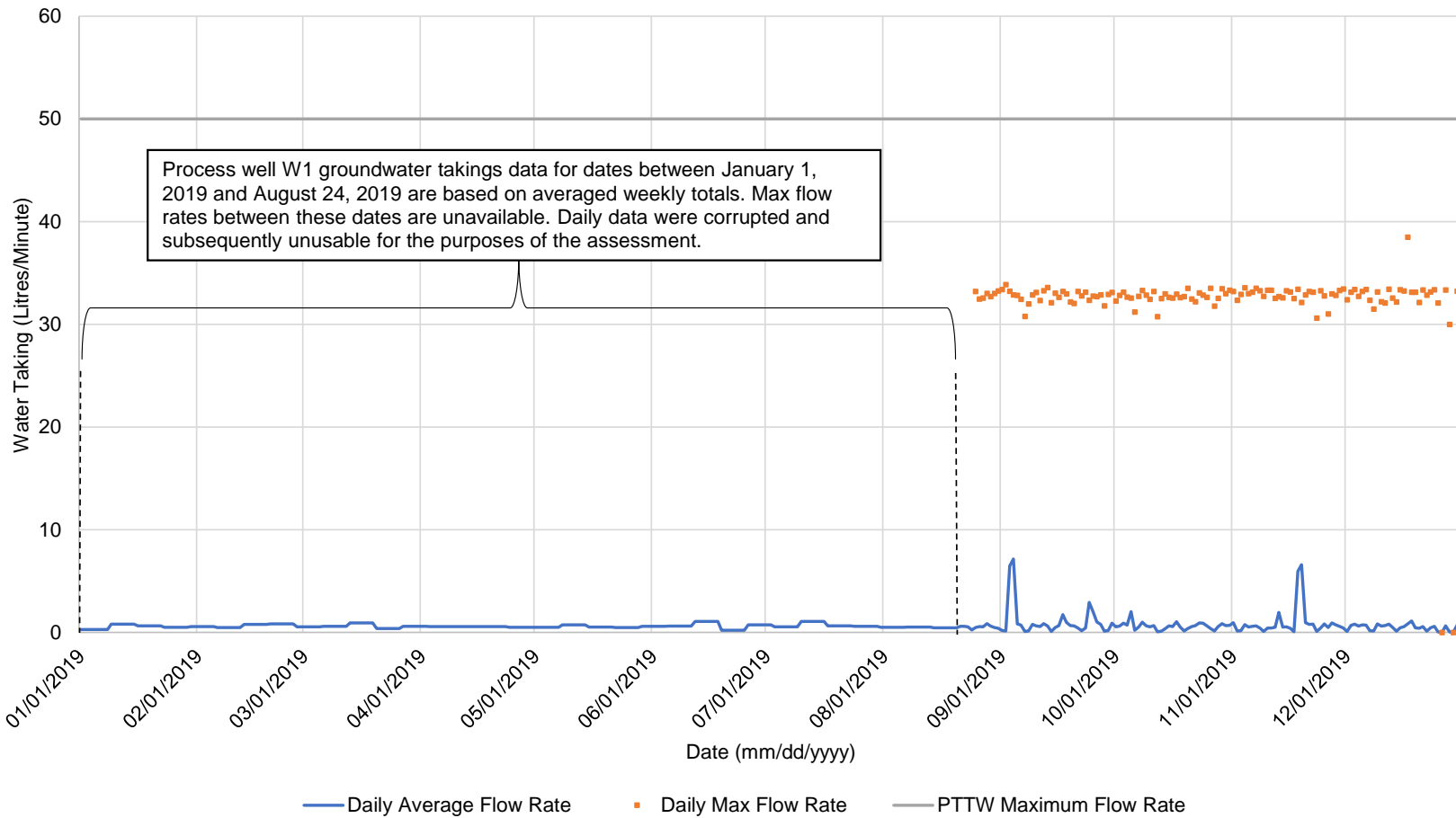
Omya Canada Inc.
Permit to Take Water (8030RPF4)
Annual Monitoring Report
Maximum and Average Daily Groundwater Takings DP1

FIGURE 12



Omya Canada Inc.
Permit to Take Water (8030RPF4)
Annual Monitoring Report
Maximum and Average Daily Groundwater Takings W1

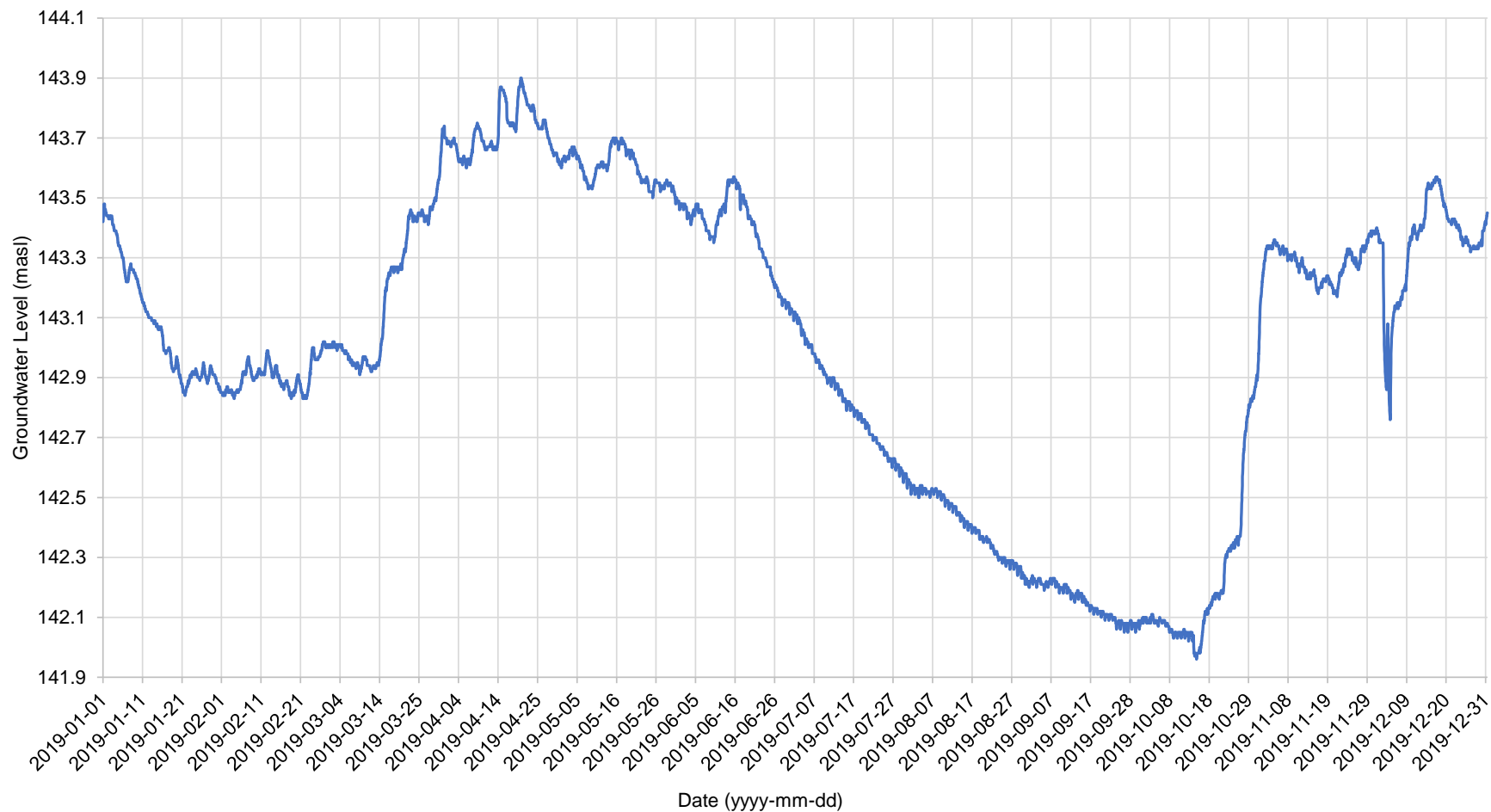
FIGURE 13



Omya Canada Inc.
Permit to Take Water (8030RPF4)
Annual Monitoring Report

FIGURE 14

Hourly Groundwater Elevations at Groundwater Monitoring Well M3 (PGMN Well W083)



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DATE: February 2020



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