



June 14, 2021

Ministry of the Environment, Conservation and Parks
Sudbury District Office
199 Larch Street, Suite 1201
Sudbury, ON
P3E 5P9

Dear District Manager,

Re: 2021 Q1 Report - SO₂ Monitoring Network for Sudbury

Please find enclosed the 2021 Q1 report for the Sudbury SO₂ Monitoring Network prepared by BESTECH on behalf of Vale Canada Limited (Vale) and Sudbury Integrated Nickel Operations (Sudbury INO).

BESTECH submits the SO₂ and meteorological data to the Ministry of the Environment, Conservation and Parks (MECP) quarterly, as required by Appendix 3 of the Operations *Manual for Air Quality Monitoring in Ontario* (February 2018).

Submission of this report has been delayed with approval of MECP, to address comments received on the Q1, Q2, Q3 and Q4 2020 Quarterly Reports that also apply to this report.

Please do not hesitate to contact me at 705-673-4444 ext. 362, or via email at Adam.Cecchetto@FROSKRcorp.com if you have any concerns or require additional information.

Yours very truly,

BESTECH/FROSKR

Adam Cecchetto, EP.
Principal, Environmental Services

Cc:

Guowan Qiu
Air Quality Analyst
MECP
199 Larch St, Suite 1201
Sudbury, ON, P3E 5P9

Gary Remington
Superintendent, Environment
Vale Canada Limited
337 Power Street
Copper Cliff, ON, P0M 1N0

Lea Willemse
Environmental Lead
Sudbury Integrated Nickel
Operations
2 Longyear Drive
Falconbridge, ON, P0M 1S0

Steve Raymond
Environmental Coordinator
Sudbury Integrated Nickel
Operations
2 Longyear Drive
Falconbridge, ON, P0M 1S0

Kati McCartney
President
FROSKR
1010 Lorne Street, Unit 102
Sudbury, ON, P3C 4R9

Kerry Whitney
Senior Environmental Officer
MECP
199 Larch St, Suite 1201
Sudbury, ON, P3E 5P9



2021 Q1 REPORT:
SO₂ MONITORING NETWORK FOR
SUDBURY

Prepared for:

Vale Canada Limited & Sudbury Integrated Nickel Operations

Prepared by:

BESTECH/FROSKR
1010 Lorne Street, Unit 102
Sudbury, Ontario
P3C 4R9

June 2021

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1. Introduction

BESTECH was retained by Vale Canada Limited (Vale) and Sudbury Integrated Nickel Operations (Sudbury INO) to operate and maintain 18 SO₂ monitoring stations in the Sudbury area. In addition to the operation and maintenance of these stations, BESTECH also performs data analysis and reporting on the information collected by the stations. An objective of the work is to provide quarterly reports to the Ontario Ministry of the Environment, Conservation and Parks (MECP). This quarterly report is submitted on behalf of Vale and Sudbury INO per the MECP *Manual for Air Quality Monitoring in Ontario* (February 2018).

This quarterly report summarizes the observed hourly and daily SO₂ concentrations, wind speed, wind direction, and ambient temperature at the eighteen (18) monitoring stations and the meteorological data at the two (2) meteorological stations located in the City of Greater Sudbury, Ontario and the surrounding area.

As per MECP's request, the 10-minute averaging period Ambient Air Quality Criteria (AAQC) of 67 ppb has been included in this report and will continue to be reported moving forward. The 1-hour AAQC of 40 ppb has also been updated and used for comparison purposes within this report. For the purposes of illustrating compliance with Ontario Regulation 419 SO₂ standards, the 1-hour limit of 250 ppb and 24-hour limit of 100 ppb have been used.

1.1 Monitoring Stations

The monitoring and meteorological stations that BESTECH operates, maintains, and reports on are as follows:

- STN77012 – Skead
- STN77013 – Hanmer
- STN77028 – Coniston
- STN77065 – Garson
- STN77075 – New Sudbury
- STN77203 – Science North
- STN77206 – Rayside
- STN77218 – Copper Cliff
- STN77225 – Kelly Lake
- STN77227 – Kinsmen
- STN77228 – Dozzi Park
- STN77230 – Spruce Street
- STN77231 – Algonquin
- STN77330 – Union
- STN77600 – Edison
- STN77601 – Parkinson
- STN77602 – Sunderland
- STN77603 – Wahnapiatae
- STN77025 – CKNC Tower at Frood
- Falconbridge MET

1.2 Data Summary

During Q1 there were no measured concentrations above the 1-hour limit of 250 ppb and the 24-hour limit of 100 ppb. All SO₂ monitoring stations met the 90% valid data performance requirement. All MET station parameters met the 90% valid data performance requirement.

Tables 1-1 through 1-3 summarize the maximum hourly and daily average SO₂ concentrations for each month. Table 1-4 presents the quarterly averages.

Table 1-1 – Ambient SO₂ Concentrations (ppb) for January 2021

Station	Monthly Arithmetic Mean (ppb)	Maximum 1-hr (ppb)	Maximum 24-hr (ppb)	Number of Valid Hours	Number of Hrs > 1-Hr AAQC (40 ppb)	Number of Hrs > 1-Hr Limit (250 ppb)	Number of Days > 24-Hr Limit (100 ppb)	Monthly % Valid Data
STN77231 - Algonquin	0.3	43.3	3.1	742	1	0	0	99.7%
STN77028 - Coniston	2.2	127.6	28.1	742	19	0	0	99.7%
STN77218 - Copper Cliff	1.0	41.3	10.7	742	1	0	0	99.7%
STN77228 - Dozzi Park	0.4	27.9	5.7	742	0	0	0	99.7%
STN77600 - Edison	0.5	57.4	11.1	741	2	0	0	99.6%
STN77065 - Garson	0.6	61.7	12.7	740	3	0	0	99.5%
STN77013 - Hanmer	0.1	36.5	3.1	737	0	0	0	99.1%
STN77225 - Kelly Lake	0.3	14.6	3.1	743	0	0	0	99.9%
STN77227 - Kinsmen	0.5	38.9	7.6	742	0	0	0	99.7%
STN77075 - New Sudbury	0.1	18.9	3.6	742	0	0	0	99.7%
STN77601 - Parkinson	0.6	76.1	13.9	743	3	0	0	99.9%
STN77206 - Rayside	0.0	19.8	1.1	739	0	0	0	99.3%
STN77203 - Science North	0.5	23.4	5.4	742	0	0	0	99.7%
STN77012 - Skead	1.2	42.3	8.9	742	1	0	0	99.7%
STN77230 - Spruce	0.9	35.7	6.6	741	0	0	0	99.6%
STN77602 - Sunderland	0.7	61.5	11.7	741	2	0	0	99.6%
STN77330 - Union	1.3	51.4	9.0	742	2	0	0	99.7%
STN77603 - Wahnapiatae	0.4	40.3	6.4	740	2	0	0	99.5%

NOTE: Exceedances of the AAQC and limits are based on running 1-hr or 24-hr averages.

Table 1-2 – Ambient SO₂ Concentrations (ppb) for February 2021

Station	Monthly Arithmetic Mean (ppb)	Maximum 1-hr (ppb)	Maximum 24-hr (ppb)	Number of Valid Hours	Number of Hrs > 1-Hr AAQC (40 ppb)	Number of Hrs > 1-Hr Limit (250 ppb)	Number of Days > 24-Hr Limit (100 ppb)	Monthly % Valid Data
STN77231 - Algonquin	0.7	61.7	5.1	671	2	0	0	99.9%
STN77028 - Coniston	1.4	45.9	9.0	670	3	0	0	99.7%
STN77218 - Copper Cliff	1.0	42.2	8.9	670	1	0	0	99.7%
STN77228 - Dozzi Park	1.1	43.3	5.3	649	1	0	0	96.6%
STN77600 - Edison	0.6	63.0	5.5	670	2	0	0	99.7%
STN77065 - Garson	0.9	55.3	7.4	670	5	0	0	99.7%
STN77013 - Hanmer	0.3	38.6	2.8	666	0	0	0	99.1%
STN77225 - Kelly Lake	0.7	40.7	3.8	670	1	0	0	99.7%
STN77227 - Kinsmen	1.3	79.4	8.7	667	3	0	0	99.3%
STN77075 - New Sudbury	1.1	62.1	7.8	670	3	0	0	99.7%
STN77601 - Parkinson	0.8	73.5	7.5	670	2	0	0	99.7%
STN77206 - Rayside	0.1	6.4	0.6	667	0	0	0	99.3%
STN77203 - Science North	0.7	42.8	4.5	671	1	0	0	99.9%
STN77012 - Skead	1.5	138.2	17.8	650	8	0	0	96.7%
STN77230 - Spruce	1.8	46.5	8.9	669	4	0	0	99.6%
STN77602 - Sunderland	0.7	93.2	6.8	669	2	0	0	99.6%
STN77330 - Union	0.8	41.3	5.7	665	1	0	0	99.0%
STN77603 - Wahnapiatae	0.3	34.5	3.6	670	0	0	0	99.7%

NOTE: Exceedances of the AAQC and limits are based on running 1-hr or 24-hr averages.

Table 1-3 - Ambient SO₂ Concentrations (ppb) for March 2021

Station	Monthly Arithmetic Mean (ppb)	Maximum 1-hr (ppb)	Maximum 24-hr (ppb)	Number of Valid Hours	Number of Hrs > 1-Hr AAQC (40 ppb)	Number of Hrs > 1-Hr Limit (250 ppb)	Number of Days > 24-Hr Limit (100 ppb)	Monthly % Valid Data
STN77231 - Algonquin	0.3	32.3	2.1	742	0	0	0	99.7%
STN77028 - Coniston	0.8	81.5	6.4	742	2	0	0	99.7%
STN77218 - Copper Cliff	1.1	60.3	5.7	738	6	0	0	99.2%
STN77228 - Dozzi Park	1.3	47.8	5.6	742	3	0	0	99.7%
STN77600 - Edison	0.6	43.3	3.9	742	1	0	0	99.7%
STN77065 - Garson	0.4	53.0	4.2	742	2	0	0	99.7%
STN77013 - Hanmer	0.4	34.6	4.3	742	0	0	0	99.7%
STN77225 - Kelly Lake	0.8	60.5	5.0	742	3	0	0	99.7%
STN77227 - Kinsmen	0.7	45.8	4.8	742	1	0	0	99.7%
STN77075 - New Sudbury	0.6	28.0	3.7	742	0	0	0	99.7%
STN77601 - Parkinson	0.8	63.0	5.8	742	2	0	0	99.7%
STN77206 - Rayside	0.3	17.7	2.6	737	0	0	0	99.1%
STN77203 - Science North	0.1	7.3	0.6	742	0	0	0	99.7%
STN77012 - Skead	3.3	112.2	18.7	743	27	0	0	99.9%
STN77230 - Spruce	1.8	41.3	8.1	743	2	0	0	99.9%
STN77602 - Sunderland	0.6	66.8	5.8	741	3	0	0	99.6%
STN77330 - Union	0.4	37.5	2.7	741	0	0	0	99.6%
STN77603 - Wahnapiatae	1.4	80.1	11.8	743	3	0	0	99.9%

NOTE: Exceedances of the AAQC and limits are based on running 1-hr or 24-hr averages.

Table 1-4 – Q1 2021 Average Ambient SO₂ Concentrations

Station	Quarterly Arithmetic Mean (ppb)	Maximum 1-hr (ppb)	Month in which 1-hr max. occurred	Maximum 24-hr (ppb)	Month in which 24-hr max. occurred	Number of Hours > 1-Hr AAQC (40 ppb)	Number of Hrs > 1-Hr Limit (250 ppb)	Number of Days > 24-Hr Limit (100 ppb)	Valid Data Collection (%)
STN77231 - Algonquin	0.4	61.7	February	5.1	February	3	0	0	99.8%
STN77028 - Coniston	1.5	127.6	January	28.1	January	24	0	0	99.7%
STN77218 - Copper Cliff	1.1	60.3	March	10.7	January	8	0	0	99.5%
STN77228 - Dozzi Park	1.0	47.8	March	5.7	January	4	0	0	98.8%
STN77600 - Edison	0.6	63.0	February	11.1	January	5	0	0	99.7%
STN77065 - Garson	0.6	61.7	January	12.7	January	10	0	0	99.6%
STN77013 - Hanmer	0.3	38.6	February	4.3	March	0	0	0	99.3%
STN77225 - Kelly Lake	0.6	60.5	March	5.0	March	4	0	0	99.8%
STN77227 - Kinsmen	0.8	79.4	February	8.7	February	4	0	0	99.6%
STN77075 - New Sudbury	0.6	62.1	February	7.8	February	3	0	0	99.7%
STN77601 - Parkinson	0.7	76.1	January	13.9	January	7	0	0	99.8%
STN77206 - Rayside	0.1	19.8	January	2.6	March	0	0	0	99.2%
STN77203 - Science North	0.4	42.8	February	5.4	January	1	0	0	99.8%
STN77012 - Skead	2.0	138.2	February	18.7	March	36	0	0	98.8%
STN77230 - Spruce	1.5	46.5	February	8.9	February	6	0	0	99.7%
STN77602 - Sunderland	0.7	93.2	February	11.7	January	7	0	0	99.6%
STN77330 - Union	0.8	51.4	January	9.0	January	3	0	0	99.4%
STN77603 - Wahnapiatae	0.8	80.1	March	11.8	March	5	0	0	99.7%

NOTE: Exceedances of the AAQC and limits are based on running 1-hr or 24-hr averages.

Table 1-5 summarizes the monthly valid data percentage for meteorological parameters at STN 77025 (CKNC Tower at Frood) and the Falconbridge MET. In this quarter, all meteorological parameters met the 90% valid collection requirement.

Table 1-5 – Meteorological Data Summary for Q1 2021

Meteorological Parameter	% Valid Data
STN77025 - CKNC Tower at Frood	
Temperature at 12m (T1)	100.00%
Temperature at 114m (T3)	100.00%
Delta Temp. (T3 - T1)	100.00%
Wind Direction at 12m (WD1)	100.00%
Wind Direction at 114m (WD3)	100.00%
Wind Speed at 12m (WS1)	100.00%
Wind Speed at 114m (WS3)	100.00%
Falconbridge MET - Met Tower at Falconbridge	
Temperature at 2m (T1)	100.0%
Temperature at 60m (T3)	100.0%
Delta Temp. (T3 - T1)	100.0%
Wind Direction at 60m (WD1)	100.0%
Wind Direction at 30m (WDL)	100.0%
Wind Speed at 60m (WS1)	100.0%
Wind Speed at 30m (WSL)	100.0%

2. Calibration and Maintenance Summary

Appendix I presents the monthly analyzer span and zero calibration response curves, which represent the calibration control charts for the quarter. The allowable drift range for the analyzer span is +/- 10% as stipulated in the MECP's *Manual for Air Quality Monitoring in Ontario* (MECP Operations Manual).

The calibration control charts (Appendix I) show a range of +/- 5% to allow for the early identification of calibration issues. For the zero response, the allowable drift range is +/- 2 ppb before an offset adjustment is required, as described by the MECP Operations Manual.

The following sections provide monthly summaries of the equipment and maintenance issues encountered in the quarter. Data invalidation due to monthly calibration and MECP audits (if applicable) are not included in these summaries.

2.1 January

2.1.1 Equipment Issues and Maintenance

Kinsmen STN77227

- January 29, 2021: Servicing from 10:08 – 10:17. 0 invalid hour(s).

Rayside STN77206

- January 28, 2021: Servicing from 15:29 – 15:38. 0 invalid hour(s).
- January 29, 2021: Servicing from 8:33 – 9:08, 11:20 – 11:36. 2 invalid hour(s).

Garson STN77065

- January 21, 2021: Servicing from 12:21 – 12:54. 1 invalid hour(s).
- January 25, 2021: Servicing from 10:19 – 10:54. 1 invalid hour(s).

Sunderland STN77602

- January 24, 2021: Brief negative under range at 11:16. 0 invalid hour(s).

Wahnapitae STN77603

- January 4, 2021: Servicing from 16:10 – 17:14. 1 invalid hour(s).

2.2 February

2.2.1 Equipment Issues and Maintenance

Dozzi Park STN77228

- February 8, 2021 at 13:28 – February 9, 2021 at 9:25: Invalid data due to instrument problems. 21 invalid hour(s).

Kinsmen STN77227

- February 28, 2021: Missing data due to power failure from 17:39 – 19:23. 3 invalid hour(s).

Rayside STN77206

- February 2, 2021: Servicing from 11:58 – 00:00. 1 invalid hour(s).
- February 8, 2021: Servicing and monthly calibration from 12:25 – 15:22. 4 invalid hour(s).

Spruce STN77230

- February 25, 2021: Servicing and monthly calibration from 11:08 – 13:31. 3 invalid hour(s).

Union STN77230

- February 9, 2021: Servicing and monthly calibration from 14:21 – 18:43. 5 invalid hour(s).
- February 26, 2021: Servicing from 11:39 – 12:59. 2 invalid hour(s).

Hanmer STN77013

- February 3, 2021: Servicing and monthly calibration from 15:35 – 17:47. 3 invalid hour(s).
- February 11, 2021: Servicing from 12:32 – 15:00. 3 invalid hour(s).

Skead STN77012

- February 8, 2021 at 13:34 – February 9, 2021 at 9:06: Invalid data due to instrument problems. 20 invalid hour(s).
- February 9, 2021: Brief negative under range from 9:04 – 9:05. 0 invalid hour(s).

2.3 March

2.3.1 Equipment Issues and Maintenance

Copper Cliff STN77218

- March 17, 2021: Servicing from 12:00 – 15:01. 3 invalid hour(s).

Rayside STN77206

- March 2, 2021: Servicing from 12:06 – 12:12. 0 invalid hour(s).
- March 3, 2021: Servicing from 9:29 – 11:32. 3 invalid hour(s).
- March 29, 2021: Servicing from 9:30 – 10:17. 2 invalid hour(s).

Spruce STN77230

- March 24, 2021: Brief negative under range at 11:36, 11:40. 0 invalid hour(s).

Falconbridge MET TEM1 (2m)

- March 31, 2021: Missing data due to highspeed outage from 23:53 – 23:59. 0 invalid hour(s).

Falconbridge MET WS (60m)

- March 31, 2021: Missing data due to highspeed outage from 23:53 – 23:59. 0 invalid hour(s).

Falconbridge MET WSL (30m)

- March 31, 2021: Missing data due to highspeed outage from 23:58 – 23:59. 0 invalid hour(s).

3. Valid Data Collection Performance

3.1 Meteorological Parameters

During the quarter, meteorological parameters at the CKNC Tower at Frood (STN77025) reported 100% valid data collection, with the Falconbridge MET reporting 100% valid data collection, as illustrated in Table 3-1. This meets the minimum target of 90% valid data per quarter as defined in the MECP Operations Manual.

Table 3-1 – Quarterly Valid Data Collection of Meteorological Parameters

	January	March	April	Average
STN77025 - CKNC Tower at Frood				
Temperature at 12m (T1)	100.0%	100.0%	100.0%	100.0%
Temperature at 114m (T3)	100.0%	100.0%	100.0%	100.0%
Delta Temp. (T3 - T1)	100.0%	100.0%	100.0%	100.0%
Wind Direction at 12m (WD1)	100.0%	100.0%	100.0%	100.0%
Wind Direction at 114m (WD3)	100.0%	100.0%	100.0%	100.0%
Wind Speed at 12m (WS1)	100.0%	100.0%	100.0%	100.0%
Wind Speed at 114m (WS3)	100.0%	100.0%	100.0%	100.0%
			Overall Average:	100.0%
Falconbridge MET - Met Tower at Falconbridge				
Temperature at 2m (T1)	100.0%	100.0%	100.0%	100.0%
Temperature at 60m (T3)	100.0%	100.0%	100.0%	100.0%
Delta Temp. (T3 - T1)	100.0%	100.0%	100.0%	100.0%
Wind Direction at 60m (WD1)	100.0%	100.0%	100.0%	100.0%
Wind Direction at 30m (WDL)	100.0%	100.0%	100.0%	100.0%
Wind Speed at 60m (WS1)	100.0%	100.0%	100.0%	100.0%
Wind Speed at 30m (WSL)	100.0%	100.0%	100.0%	100.0%
			Overall Average:	100.0%

3.2 SO₂ Data

The quarterly average valid data collection performance for all SO₂ stations ranged from 98.8% to 99.8%, as illustrated in Table 3-2. This meets the minimum target of 90% valid data per quarter as defined in the MECP Operations Manual.

Table 3-2 - Quarterly Valid Data Collection for SO₂

Station	January	March	April	Valid Data Collection (%)
STN77231 - Algonquin	99.7%	99.9%	99.7%	99.8%
STN77028 - Coniston	99.7%	99.7%	99.7%	99.7%
STN77218 - Copper Cliff	99.7%	99.7%	99.2%	99.5%
STN77228 - Dozzi Park	99.7%	96.6%	99.7%	98.8%
STN77600 - Edison	99.6%	99.7%	99.7%	99.7%
STN77065 - Garson	99.5%	99.7%	99.7%	99.6%
STN77013 - Hanmer	99.1%	99.1%	99.7%	99.3%
STN77225 - Kelly Lake	99.9%	99.7%	99.7%	99.8%
STN77227 - Kinsmen	99.7%	99.3%	99.7%	99.6%
STN77075 - New Sudbury	99.7%	99.7%	99.7%	99.7%
STN77601 - Parkinson	99.9%	99.7%	99.7%	99.8%
STN77206 - Rayside	99.3%	99.3%	99.1%	99.2%
STN77203 - Science North	99.7%	99.9%	99.7%	99.8%
STN77012 - Skead	99.7%	96.7%	99.9%	98.8%
STN77230 - Spruce	99.6%	99.6%	99.9%	99.7%
STN77602 - Sunderland	99.6%	99.6%	99.6%	99.6%
STN77330 - Union	99.7%	99.0%	99.6%	99.4%
STN77603 - Wahnapiatae	99.5%	99.7%	99.9%	99.7%

4 Meteorological Data

Local meteorological data is collected from two monitoring stations, recording wind velocities, wind direction and ambient temperature at two elevations above ground level.

The CKNC Tower at Frood (STN77025) records hourly ambient wind speed (km/h), wind direction (degrees) and temperature (°C) at 12 m and 114 m above ground level.

The Falconbridge MET station records hourly temperature (°C) at 2 m and 60 m above ground level, and hourly wind speed (km/h) and wind direction (degrees) at 30 m and 60 m above ground level.

The following sections summarize the meteorological data for Q1 at the CKNC Tower and Falconbridge MET. Appendix I presents the monthly statistics for the above-mentioned meteorological parameters.

4.1 Wind Speed

Mean vector wind speeds for the quarter are summarized in Table 4-1.

Table 4-1 – Mean Vector Wind Speeds Observed from January to March 2021

	Units	January	March	April
STN77025 - CKNC Tower at Frood				
Wind Speed at 12m (WS1)	km/hr	2.9	2.2	4.0
Wind Speed at 114m (WS3)	km/hr	6.2	3.4	9.1
Falconbridge MET - Met Tower at Falconbridge				
Wind Speed at 60m (WS1)	km/hr	6.3	4.4	9.9
Wind Speed at 30m (WSL)	km/hr	5.2	3.9	7.5

4.2 Wind Direction

The average wind direction was calculated using vector calculations based on Appendix 6 of the U.S. EPA’s document *Meteorological Monitoring Guidance for Regulatory Modeling Applications* (February 2000).

For each day of the months within the quarter, a daily average wind direction was calculated using the following formulas:

$$V_x = -1/N \sum \sin(\theta_i)$$

$$V_y = -1/N \sum \cos(\theta_i)$$

Where θ_i = measured wind direction (in degrees).

V_x = magnitude of the East-West component of the unit vector mean wind direction.

V_y = magnitude of the North-South component of the unit vector mean wind direction.

N = Number of observations.

The vector unit mean wind direction is as follows:

$$WD = \text{ArcTan} \left(\frac{V_y}{V_x} \right) + \text{Flow}$$

Where $\text{Flow} = +180$; for $\text{ArcTan} \left(\frac{V_y}{V_x} \right) < 180$
 -180 ; for $\text{ArcTan} \left(\frac{V_y}{V_x} \right) > 180$

The mean vector wind directions are summarized in Table 4-2. The wind directions at all levels were predominately from the northwest in January, from the west in February, and from the southwest in March.

Table 4-2 – Mean Vector Wind Direction Observed from January to March 2021

	Units	January	March	April
STN77025 - CKNC Tower at Frood				
Wind Direction at 12m (WD1)	degrees	343.2	272.7	257.8
Wind Direction at 114m (WD3)	degrees	336.9	272.8	249.5
Falconbridge MET - Met Tower at Falconbridge				
Wind Direction at 60m (WD1)	degrees	334.9	277.1	259.7
Wind Direction at 30m (WDL)	degrees	335.7	277.7	267.7

4.3 Ambient Temperature

Table 4-3 summarizes the average observed temperatures for the quarter.

Table 4-3 – Average Temperatures Observed from January to March 2021

	Units	January	March	April
STN77025 - CKNC Tower at Frood				
Temperature at 12m (T1)	°C	-7.81	-8.80	-1.55
Temperature at 114m (T3)	°C	-7.99	-8.61	-1.55
Delta Temp. (T3 - T1)	°C	-0.11	0.21	-0.06
Falconbridge MET - Met Tower at Falconbridge				
Temperature at 2m (T1)	°C	-7.65	-8.60	-1.32
Temperature at 60m (T3)	°C	-8.45	-8.98	-2.07
Delta Temp. (T3 - T1)	°C	-0.84	-0.39	-0.76

5 Monthly Statistics

The following section provides the hourly, daily and monthly SO₂ concentrations recorded from each of the 18 monitoring stations. A valid daily mean requires at least 18 valid hourly averages out of 24-hours for a station, as described in the MECP Operations Manual. For a monthly mean to be valid, it requires at least 23 valid daily means for a station.

5.1 January

There were no concentrations above the 1-hour limit of 250 ppb for the month. There were no concentrations above the 24-hour limit.

A summary of the hourly observed data for each of the 18 monitoring stations for January is presented in Table 5-1. The minimum hourly SO₂ concentration was measured at 0.0 ppb and was found at all monitoring stations. The maximum hourly SO₂ ambient concentration was 127.6 ppb measured at STN77028 (Coniston).

The monthly mean SO₂ concentration was calculated using the hourly average concentrations during January. The highest monthly average ambient SO₂ concentration was 2.2 ppb measured at STN77028 (Coniston). The lowest monthly average ambient SO₂ concentration was 0.0 ppb measured at STN77206 (Rayside).

Table 5-1 – Observed Hourly SO₂ Concentrations for January

Station ID	Number of Hrs > 1-Hr AAQC (40 ppb)	Number of Hrs > 1-Hr Limit (250 ppb)	Minimum Hourly SO ₂ Concentration (ppb)	Maximum Hourly SO ₂ Concentration (ppb)	Monthly Mean SO ₂ Concentration (ppb)
STN77231 - Algonquin	1	0	0.0	43.3	0.3
STN77028 - Coniston	19	0	0.0	127.6	2.2
STN77218 - Copper Cliff	1	0	0.0	41.3	1.0
STN77228 - Dozzi Park	0	0	0.0	27.9	0.4
STN77600 - Edison	2	0	0.0	57.4	0.5
STN77065 - Garson	3	0	0.0	61.7	0.6
STN77013 - Hanmer	0	0	0.0	36.5	0.1
STN77225 - Kelly Lake	0	0	0.0	14.6	0.3
STN77227 - Kinsmen	0	0	0.0	38.9	0.5
STN77075 - New Sudbury	0	0	0.0	18.9	0.1
STN77601 - Parkinson	3	0	0.0	76.1	0.6
STN77206 - Rayside	0	0	0.0	19.8	0.0
STN77203 - Science North	0	0	0.0	23.4	0.5
STN77012 - Skead	1	0	0.0	42.3	1.2
STN77230 - Spruce	0	0	0.0	35.7	0.9
STN77602 - Sunderland	2	0	0.0	61.5	0.7
STN77330 - Union	2	0	0.0	51.4	1.3
STN77603 - Wahnapiatae	2	0	0.0	40.3	0.4

NOTE: Exceedances of the AAQC and limit are based on running 1-hr averages.

Table 5-2 summarizes the daily SO₂ statistics for January. The maximum daily SO₂ concentrations ranged from 1.1 ppb at STN77206 (Rayside) to 28.1 ppb at STN77028 (Coniston).

Table 5-2 – Observed Daily SO₂ Concentrations for February

Station ID	Number of Days > 24-Hr Limit (100 ppb)	Minimum Daily SO ₂ Concentration (ppb)	Maximum Daily SO ₂ Concentration (ppb)
STN77231 - Algonquin	0	0.0	3.1
STN77028 - Coniston	0	0.0	28.1
STN77218 - Copper Cliff	0	0.0	10.7
STN77228 - Dozzi Park	0	0.0	5.7
STN77600 - Edison	0	0.0	11.1
STN77065 - Garson	0	0.0	12.7
STN77013 - Hanmer	0	0.0	3.1
STN77225 - Kelly Lake	0	0.0	3.1
STN77227 - Kinsmen	0	0.0	7.6
STN77075 - New Sudbury	0	0.0	3.6
STN77601 - Parkinson	0	0.0	13.9
STN77206 - Rayside	0	0.0	1.1
STN77203 - Science North	0	0.0	5.4
STN77012 - Skead	0	0.0	8.9
STN77230 - Spruce	0	0.0	6.6
STN77602 - Sunderland	0	0.0	11.7
STN77330 - Union	0	0.0	9.0
STN77603 - Wahnapiatae	0	0.0	6.4

NOTE: Exceedances of the limit are based on running 24-hr averages.

5.2 February

There were no concentrations above the 1-hour limit of 250 ppb for the month. There were no concentrations above the 24-hour limit.

A summary of the hourly observed data for each of the 18 monitoring stations for February is presented in Table 5-3. The minimum hourly SO₂ concentration was measured at 0.0 ppb and was found at all monitoring stations. The maximum hourly SO₂ ambient concentration was 138.2 ppb measured at STN77012 (Skead).

The monthly mean SO₂ concentration was calculated using the hourly average concentrations during February. The highest monthly average ambient SO₂ concentration was 1.8 ppb measured at STN77230 (Spruce). The lowest monthly average ambient SO₂ concentration was 0.1 ppb measured at STN77206 (Rayside).

Table 5-3 - Observed Hourly SO₂ Concentrations for February

Station ID	Number of Hrs > 1-Hr AAQC (40 ppb)	Number of Hrs > 1-Hr Limit (250 ppb)	Minimum Hourly SO ₂ Concentration (ppb)	Maximum Hourly SO ₂ Concentration (ppb)	Monthly Mean SO ₂ Concentration (ppb)
STN77231 - Algonquin	2	0	0.0	61.7	0.7
STN77028 - Coniston	3	0	0.0	45.9	1.4
STN77218 - Copper Cliff	1	0	0.0	42.2	1.0
STN77228 - Dozzi Park	1	0	0.0	43.3	1.1
STN77600 - Edison	2	0	0.0	63.0	0.6
STN77065 - Garson	5	0	0.0	55.3	0.9
STN77013 - Hanmer	0	0	0.0	38.6	0.3
STN77225 - Kelly Lake	1	0	0.0	40.7	0.7
STN77227 - Kinsmen	3	0	0.0	79.4	1.3
STN77075 - New Sudbury	3	0	0.0	62.1	1.1
STN77601 - Parkinson	2	0	0.0	73.5	0.8
STN77206 - Rayside	0	0	0.0	6.4	0.1
STN77203 - Science North	1	0	0.0	42.8	0.7
STN77012 - Skead	8	0	0.0	138.2	1.5
STN77230 - Spruce	4	0	0.0	46.5	1.8
STN77602 - Sunderland	2	0	0.0	93.2	0.7
STN77330 - Union	1	0	0.0	41.3	0.8
STN77603 - Wahnapiatae	0	0	0.0	34.5	0.3

NOTE: Exceedances of the AAQC and limit are based on running 1-hr averages.

Table 5-4 summarizes the daily SO₂ statistics for February. The maximum daily SO₂ concentrations ranged from 0.6 ppb at STN77206 (Rayside) to 17.8 ppb at STN77012 (Skead).

Table 5-4 - Observed Daily SO₂ Concentrations for February

Station ID	Number of Days > 24-Hr Limit (100 ppb)	Minimum Daily SO ₂ Concentration (ppb)	Maximum Daily SO ₂ Concentration (ppb)
STN77231 - Algonquin	0	0.0	5.1
STN77028 - Coniston	0	0.0	9.0
STN77218 - Copper Cliff	0	0.0	8.9
STN77228 - Dozzi Park	0	0.0	5.3
STN77600 - Edison	0	0.0	5.5
STN77065 - Garson	0	0.0	7.4
STN77013 - Hanmer	0	0.0	2.8
STN77225 - Kelly Lake	0	0.0	3.8
STN77227 - Kinsmen	0	0.0	8.7
STN77075 - New Sudbury	0	0.0	7.8
STN77601 - Parkinson	0	0.0	7.5
STN77206 - Rayside	0	0.0	0.6
STN77203 - Science North	0	0.0	4.5
STN77012 - Skead	0	0.0	17.8
STN77230 - Spruce	0	0.0	8.9
STN77602 - Sunderland	0	0.0	6.8
STN77330 - Union	0	0.0	5.7
STN77603 - Wahnapiatae	0	0.0	3.6

NOTE: Exceedances of the limit are based on running 24-hr averages.

5.3 March

There were no concentrations above the 1-hour limit of 250 ppb for the month. There were no concentrations above the 24-hour limit.

A summary of the hourly observed data for each of the 18 monitoring stations for March is presented in Table 5-5. The minimum hourly SO₂ concentration was measured at 0.0 ppb and was found at all monitoring stations. The maximum hourly SO₂ ambient concentration was 112.2 ppb measured at STN77012 (Skead).

The monthly mean SO₂ concentration was calculated using the hourly average concentrations during March. The highest monthly average ambient SO₂ concentration was 3.3 ppb measured at STN77012 (Skead). The lowest monthly average ambient SO₂ concentration was 0.1 ppb measured at STN77203 (Science North).

Table 5-5 - Observed Hourly SO₂ Concentrations for March

Station ID	Number of Hrs > 1-Hr AAQC (40 ppb)	Number of Hrs > 1-Hr Limit (250 ppb)	Minimum Hourly SO ₂ Concentration (ppb)	Maximum Hourly SO ₂ Concentration (ppb)	Monthly Mean SO ₂ Concentration (ppb)
STN77231 - Algonquin	0	0	0.0	32.3	0.3
STN77028 - Coniston	2	0	0.0	81.5	0.8
STN77218 - Copper Cliff	6	0	0.0	60.3	1.1
STN77228 - Dozzi Park	3	0	0.0	47.8	1.3
STN77600 - Edison	1	0	0.0	43.3	0.6
STN77065 - Garson	2	0	0.0	53.0	0.4
STN77013 - Hanmer	0	0	0.0	34.6	0.4
STN77225 - Kelly Lake	3	0	0.0	60.5	0.8
STN77227 - Kinsmen	1	0	0.0	45.8	0.7
STN77075 - New Sudbury	0	0	0.0	28.0	0.6
STN77601 - Parkinson	2	0	0.0	63.0	0.8
STN77206 - Rayside	0	0	0.0	17.7	0.3
STN77203 - Science North	0	0	0.0	7.3	0.1
STN77012 - Skead	27	0	0.0	112.2	3.3
STN77230 - Spruce	2	0	0.0	41.3	1.8
STN77602 - Sunderland	3	0	0.0	66.8	0.6
STN77330 - Union	0	0	0.0	37.5	0.4
STN77603 - Wahnapiatae	3	0	0.0	80.1	1.4

NOTE: Exceedances of the AAQC and limit are based on running 1-hr averages.

Table 5-6 summarizes the daily SO₂ statistics for March. The maximum daily SO₂ concentrations ranged from 0.6 ppb at STN77203 (Science North) to 18.7 ppb at STN77012 (Skead).

Table 5-6 - Observed Daily SO₂ Concentrations for March

Station ID	Number of Days > 24-Hr Limit (100 ppb)	Minimum Daily SO ₂ Concentration (ppb)	Maximum Daily SO ₂ Concentration (ppb)
STN77231 - Algonquin	0	0.0	2.1
STN77028 - Coniston	0	0.0	6.4
STN77218 - Copper Cliff	0	0.0	5.7
STN77228 - Dozzi Park	0	0.0	5.6
STN77600 - Edison	0	0.0	3.9
STN77065 - Garson	0	0.0	4.2
STN77013 - Hanmer	0	0.0	4.3
STN77225 - Kelly Lake	0	0.0	5.0
STN77227 - Kinsmen	0	0.0	4.8
STN77075 - New Sudbury	0	0.0	3.7
STN77601 - Parkinson	0	0.0	5.8
STN77206 - Rayside	0	0.0	2.6
STN77203 - Science North	0	0.0	0.6
STN77012 - Skead	0	0.0	18.7
STN77230 - Spruce	0	0.0	8.1
STN77602 - Sunderland	0	0.0	5.8
STN77330 - Union	0	0.0	2.7
STN77603 - Wahnapiatae	0	0.0	11.8

NOTE: Exceedances of the limit are based on running 24-hr averages.

6 Quarterly Statistics

6.1 1-Hour SO₂ Concentrations

MECP requested inclusion of the revised 1-hour AAQC for SO₂ (40 ppb) within quarterly reports commencing Q1 2021.

During the quarter there were no measured concentrations above the 1-hour limit of 250 ppb.

The maximum hourly SO₂ concentration was 138.2 ppb measured at STN77012 (Skead). The quarterly mean SO₂ concentrations ranged from 0.1 ppb at STN77206 (Rayside) to 2.0 ppb at STN77012 (Skead).

The observed maximum and quarterly mean SO₂ concentrations, and valid data collection percentage are summarized in Table 6-1.

Table 6-1 – 1-Hour SO₂ Concentrations for Q1 2021

STATION ID	Quarterly Mean SO ₂ Concentration (ppb)	Max. 1-hr SO ₂ Concentration (ppb)	Valid Data Collection (%)	Number of Hrs > 1-hr AAQC (40 ppb)	Number of Hrs > 1-Hr Limit (250 ppb)
STN77231 - Algonquin	0.4	61.7	99.8%	3	0
STN77028 - Coniston	1.5	127.6	99.7%	24	0
STN77218 - Copper Cliff	1.1	60.3	99.5%	8	0
STN77228 - Dozzi Park	1.0	47.8	98.8%	4	0
STN77600 - Edison	0.6	63.0	99.7%	5	0
STN77065 - Garson	0.6	61.7	99.6%	10	0
STN77013 - Hanmer	0.3	38.6	99.3%	0	0
STN77225 - Kelly Lake	0.6	60.5	99.8%	4	0
STN77227 - Kinsmen	0.8	79.4	99.6%	4	0
STN77075 - New Sudbury	0.6	62.1	99.7%	3	0
STN77601 - Parkinson	0.7	76.1	99.8%	7	0
STN77206 - Rayside	0.1	19.8	99.2%	0	0
STN77203 - Science North	0.4	42.8	99.8%	1	0
STN77012 - Skead	2.0	138.2	98.8%	36	0
STN77230 - Spruce	1.5	46.5	99.7%	6	0
STN77602 - Sunderland	0.7	93.2	99.6%	7	0
STN77330 - Union	0.8	51.4	99.4%	3	0
STN77603 - Wahnapiatae	0.8	80.1	99.7%	5	0

NOTE: Exceedances of the AAQC and limit are based on running 1-hr averages.

6.2 24-Hour SO₂ Concentrations

During the quarter there were no measured concentrations above the 24-hour limit.

The maximum daily SO₂ concentration was 28.1 ppb measured at STN77028 (Coniston). The observed maximum daily concentration and the number of daily measured concentrations above the 24-hour limit for the quarter is summarized in Table 6-2.

Table 6-2 – 24-Hour SO₂ Concentrations for Q1 2021

STATION ID	Maximum 24-hr SO ₂ Concentration (ppb)	Number of Days > 24-hr Limit (100 ppb)
STN77231 - Algonquin	5.1	0
STN77028 - Coniston	28.1	0
STN77218 - Copper Cliff	10.7	0
STN77228 - Dozzi Park	5.7	0
STN77600 - Edison	11.1	0
STN77065 - Garson	12.7	0
STN77013 - Hanmer	4.3	0
STN77225 - Kelly Lake	5.0	0
STN77227 - Kinsmen	8.7	0
STN77075 - New Sudbury	7.8	0
STN77601 - Parkinson	13.9	0
STN77206 - Rayside	2.6	0
STN77203 - Science North	5.4	0
STN77012 - Skead	18.7	0
STN77230 - Spruce	8.9	0
STN77602 - Sunderland	11.7	0
STN77330 - Union	9.0	0
STN77603 - Wahnapiatae	11.8	0

NOTE: Exceedances of the limit are based on running 24-hr averages.

6.3 10-Minute Averaging SO₂ Concentrations

MECP requested inclusion of the 10-minute AAQC for SO₂ (67 ppb) within quarterly reports commencing Q1 2021.

The observed maximum 10-minute concentration and the number of measured concentrations above the 10-minute AAQC for the quarter is summarized in Table 6-3.

Table 6-3 – 10-Minute SO₂ Concentrations for Q1 2021

STATION ID	Maximum 10-Minute SO ₂ Concentration (ppb)	Maximum 10-Minute SO ₂ Concentration Timestamp		Instances > 10-minute AAQC (67 ppb)
		Date	Time	
STN77231 - Algonquin	243.5	19-02-2021	13:05:00	5
STN77028 - Coniston	189.0	01-10-2021	01:55:00	53
STN77218 - Copper Cliff	175.5	27-03-2021	11:20:00	19
STN77228 - Dozzi Park	265.5	03-05-2021	13:00:00	12
STN77600 - Edison	114.5	15-03-2021	15:10:00	7
STN77065 - Garson	153.0	02-12-2021	11:30:00	15
STN77013 - Hanmer	65.5	22-02-2021	04:50:00	0
STN77225 - Kelly Lake	123.5	29-03-2021	10:45:00	7
STN77227 - Kinsmen	233.5	18-02-2021	13:25:00	10
STN77075 - New Sudbury	246.0	13-02-2021	11:00:00	10
STN77601 - Parkinson	197.5	28-03-2021	05:05:00	15
STN77206 - Rayside	44.0	01-05-2021	15:50:00	0
STN77203 - Science North	61.5	19-02-2021	13:10:00	0
STN77012 - Skead	292.0	26-02-2021	18:40:00	81
STN77230 - Spruce	128.5	13-02-2021	11:35:00	12
STN77602 - Sunderland	244.5	18-02-2021	11:20:00	18
STN77330 - Union	264.0	01-05-2021	11:10:00	8
STN77603 - Wahnapiatae	156.5	03-05-2021	01:10:00	6

8 Closing

If you have any questions concerning this report, please do not hesitate to contact the undersigned.

Adam Cecchetto, EP
Principal, Environmental Services
Adam_Cecchetto@FROSKRcorp.com
T: 1 (705) 419-2554 ext. 362