BACKGROUND AIR QUALITY IN THE AOSERP STUDY AREA MARCH 1977 TO MARCH 1980

by

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1. INTRODUCTION

An initial objective of the air quality data acquisition program of AOSERP was to gather sufficient data to establish a baseline condition. The purpose of this brief report is to summarize the continuous data that has been collected, primarily in tabular and graphical form. The following sections present information for:

1. Frequency distribution analysis of one-half hour SO_2 concentrations, in both graphs and tables.
2. Average and peak readings for NO_x, NO_2, O_3 and CO.
3. Metals in suspended particulate analysis.
4. Recommendations on how this information could best be utilized when future air quality assessments are undertaken.

2. FREQUENCY DISTRIBUTIONS OF ONE-HALF HOUR SO_2 CONCENTRATIONS

The primary purpose of the AOSERP air monitoring stations has been to gather a quantity of historic ambient concentration data to establish a baseline condition for the study area. This objective has been achieved by using data from a total of 13 ambient monitoring stations operating over the past several years. Table 1 illustrates the operating history of these stations. Figures 1 and 2 illustrate their locations.

Frequency distribution tables in the report by Strosher, 1978, have been expanded to include three to four years of data. The expanded tables are contained in Appendix 7.1. SO_2 data from the AOSERP stations were discarded for the few months prior to June 1977 due to instrument problems. A graphical illustration of the frequency distributions for the two lowest concentration ranges is contained in Figures 3 and 4. A number of significant features are contained in these figures and are discussed in the following sections.

2.1 TRUNCATED DATA SETS AND DATA QUALITY CONTROL

Three point permeation tube calibrations were performed regularly on all monitors by their respective operators. Procedures and calibrations were periodically audited by staff of Alberta Environment whose objective was to ensure compatibility of monitoring results in the study area. All operators in the area used Teco 43 pulse fluorescent SO_2 analyzers. On a range of 0 to 1 ppm the lower detectable limit is 0.005 ppm; zero drift is ±0.005 ppm; precision is 0.005 ppm; and noise is 0.001 ppm (Strosher 1978).

These kinds of characteristics of a multi-operator monitoring system allow for a valid comparison of results, especially at levels of 0.02 ppm and higher. However, below 0.02 ppm the question of truncating data sets at or near the detection limit becomes a question of interpretation rather than fact. Consequently, readings near the detection limit can vary in frequency of occurrence, depending on their interpretation. Inspection of Figure 3a gives a good indication of the foregoing, with the Mildred Lake site being run by two independent operators before and after June 1977. The variability

Table 1. Operating history of 13 ambient monitoring stations in the AOSERP study area

Station Name	Commissioning Data	Status as of July 1980	Gaseous Parameters
Birch Mountain	February 1977	Shut down February 1980	O_3, SO_2
Bitumount Tower	February 1977	Shut down April 1980	O_3, SO_2, NO/NO_x CO, HC, H_2S
Fort McMurray	February 1977	Operating	O_3, SO_2, NO/NO_x CO, HC, H_2S
Supertest	Prior to 1976	Operating	SO_2, H_2S, HC
Mannix	July 1976	Operating	SO_2, H_2S
Ruth Lake	July 1976	Operating	SO_2, H_2S
Lower Camp	July 1977	Operating	SO_2, H_2S
Fina	July 1976	Operating	SO_2, H_2S
Syncrude #1	June 1977	Operating	SO_2, H_2S
Syncrude #2	June 1977	Operating	SO_2, H_2S
Syncrude #3 (orginally Mildred Lake)	Prior to 1976	Operating	SO_2, H_2S
Syncrude #4	June 1977	Operating	SO_2, H_2S
Syncrude #5	June 1977	Operating	SO_2, H_2S

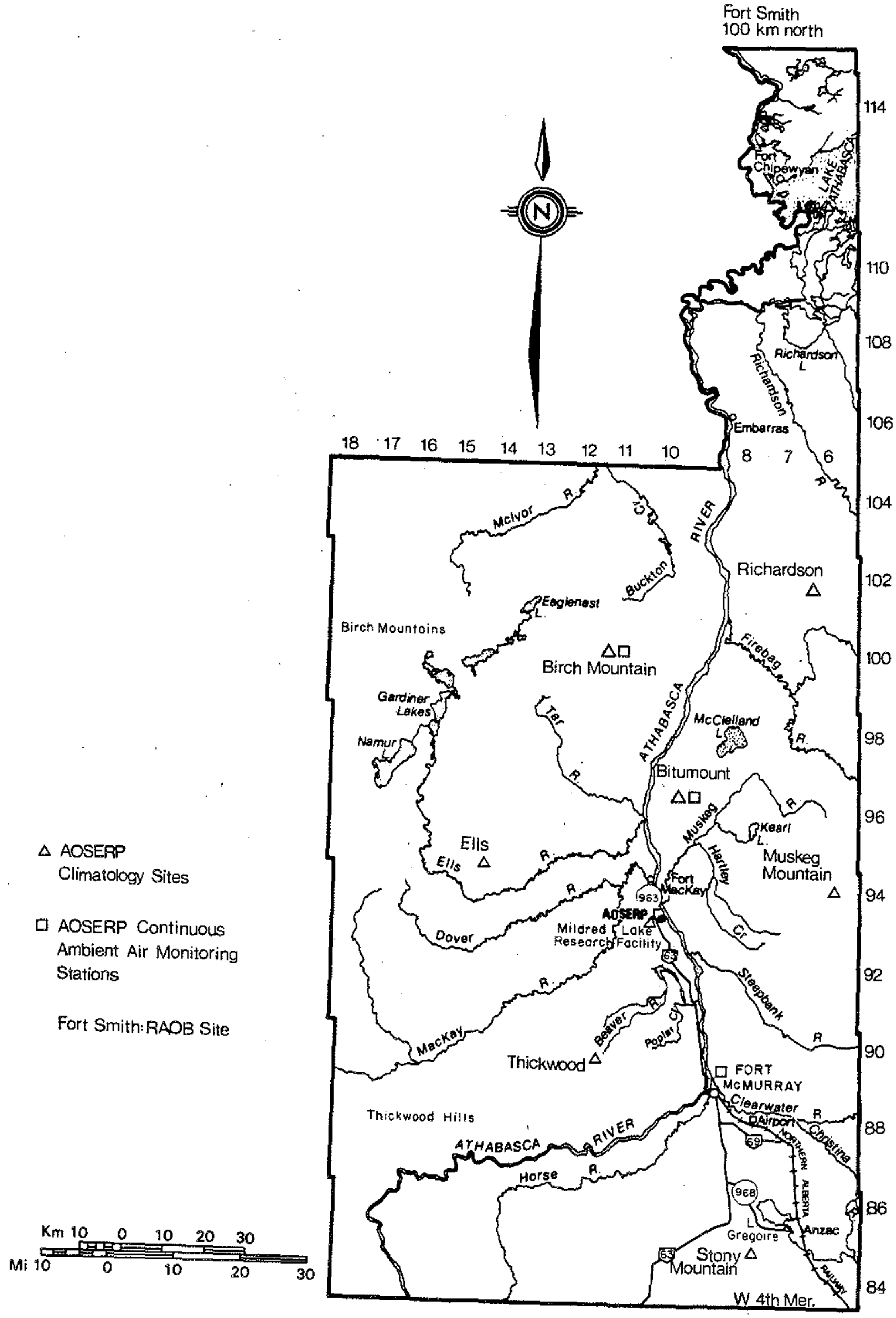

Figure 1. Map of AOSERP study area showing monitoring stations.

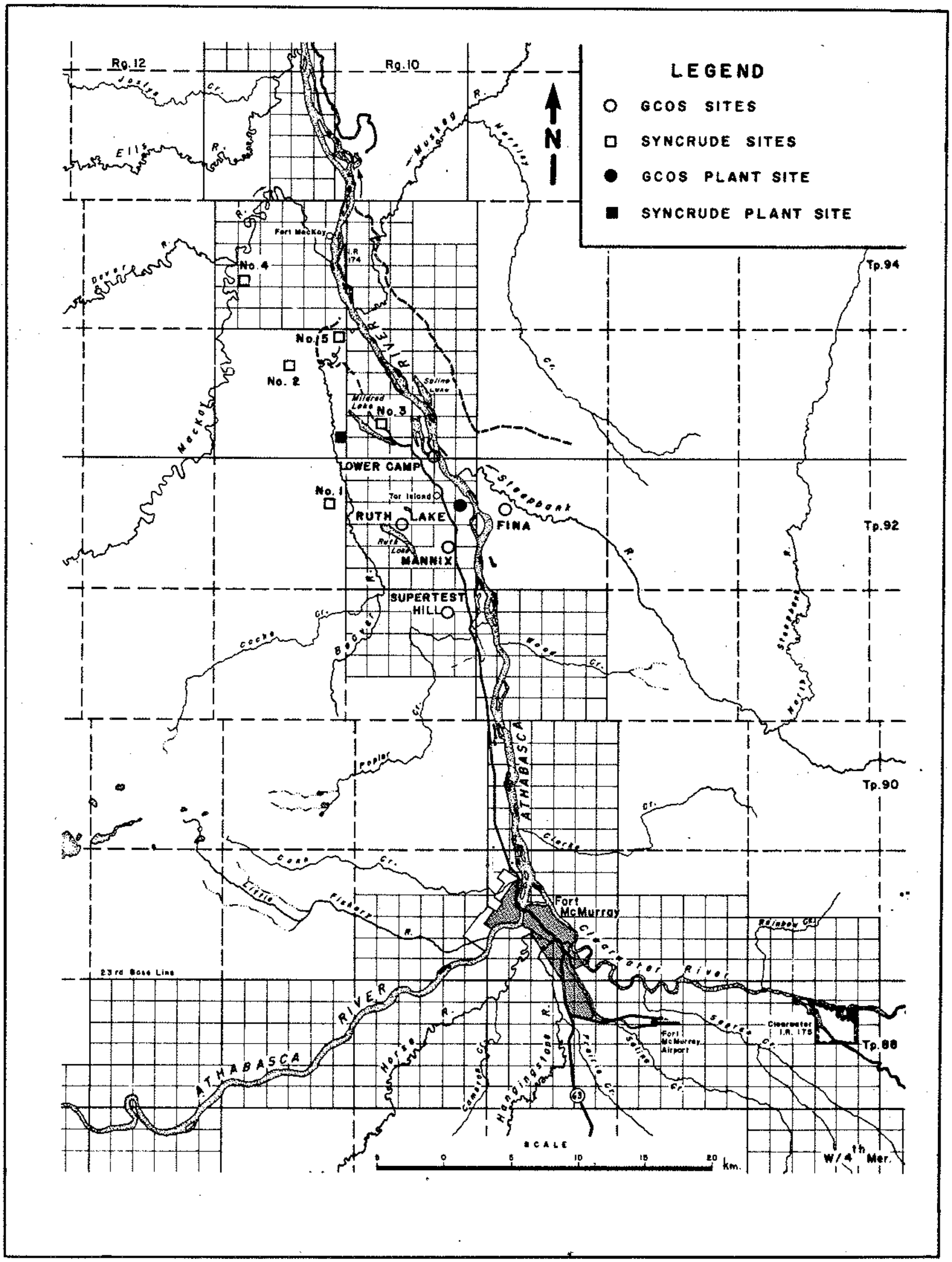

Figure 2. Map of continuous ambient air monitoring stations.

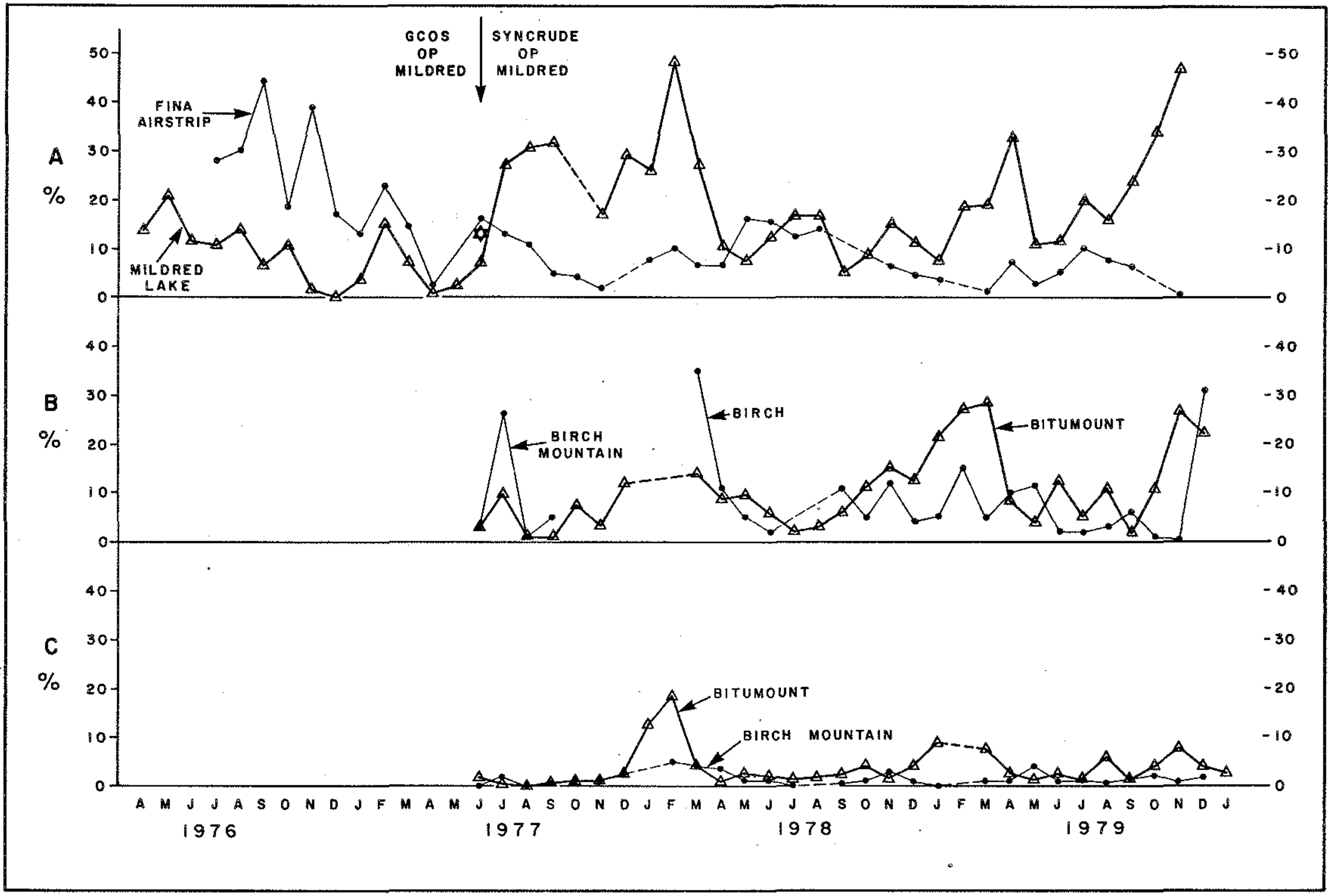

Figure 3. SO_2 frequency distributions of one-half hour readings (A and B: 0.005 to 0.06 ppm; C: 0.02 to 0.06 ppm).

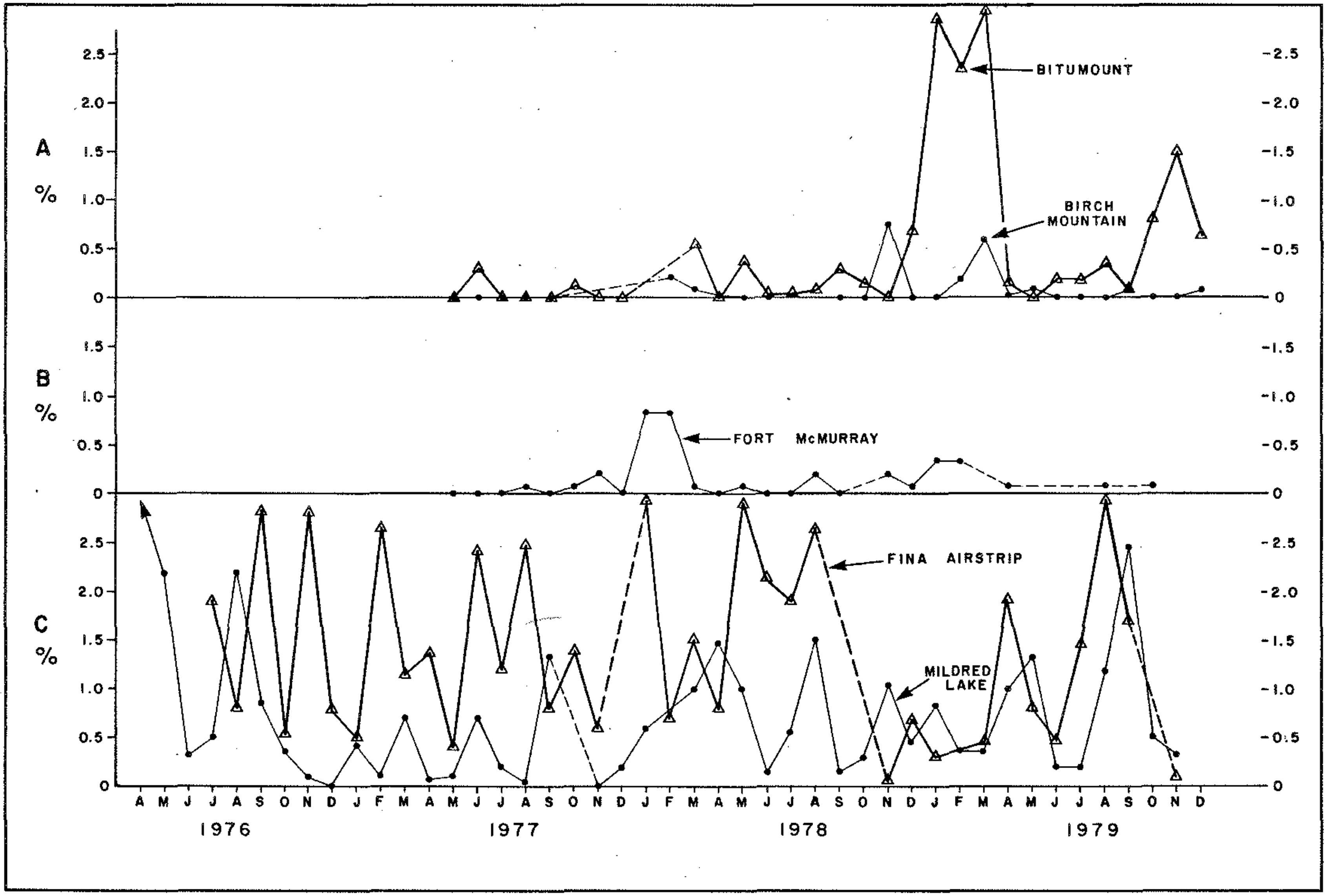

Figure 4. SO_2 frequency distributions of one-half hour readings (0.061 to 0.17 ppm).

in frequency of occurrence of 0.001 to 0.06 ppm readings at the Mildred Lake site before and after June 1977 can best be attributed to operator interpretation of the near zero readings. Observation of Figures 3b and 3c further reinforces this theory. The elimination of readings interpreted as 0.01 ppm smooths the trace considerably (Figure 3c). Consequently, what is left more accurately represents the environmental changes in air quality.

Only Bitumount and Birch Mountain stations were plotted using this new truncated range of 0.02 to 0.06 ppm, as its value was only discovered during the course of the analysis. Once it is firmly decided to use either the one-half hour or one hour time base, the remaining stations should be reviewed with this analysis to establish a continuing method for baseline study comparisons.

2.2 EFFECTS OF DISTANCE FROM SOURCE

The plots in Figure 4 are taken from three types of station locations. Reference to Figure 1 will illustrate the geographic locations. The frequency of occurrence of one-half hour SO_2 concentrations in the range 0.061 to 0.17 ppm versus time is illustrated for remote stations (greater than 20 km from the source) in Figure 4a; an urban station in Figure 4b; and compliance stations (less than 20 km from the source) in Figure 4c. The contrast in frequency distribution from remote to compliance stations is sharp. This analytical technique should most certainly be used in future comparisons of remote and compliance monitors.

A feature evident from one of the remote stations, Bitumount, indicates a peak in frequency of occurrence during the winter season, (Figures 3c and 4a). This is a feature that is not as prominent at the compliance stations.

2.3 EFFECTS OF ADDITIONAL OIL SANDS PLANT

There is some noticeable effect of the start up of the second oil sands plant, in July 1978, based on the frequency distributions of SO_2 readings. Figure 4a (Bitumount) illustrates two time periods (January to March 1979 and October to November 1979) of greater occurrence of readings 0.061 to 0.17 ppm for a 16-month period since start up compared to a low and more steady occurrence for the 15-month period prior to start up. Figure 3c (Bitumount) illustrates a steady and near zero percentage of readings 0.02 to 0.06 ppm for the summer periods of 1977 and 1978 while some increase is detectable during the summer of 1979. Table 4 of Appendix 7.1 shows that no readings greater than 0.17 ppm occurred prior to July 1978 at the Bitumount site. However, readings in excess of 0.17 ppm occurred once in December 1978, once in January 1979 and four times in August 1979.

The frequency of occurrence of the low concentration ranges at Birch Mountain has remained steady and near zero, other than two small peaks in 1978/79 (Figure 4a), illustrating the continuing value of this station as a background location since Syncrude's start up.

It should be stated that these changes are presumed to be caused by additional oil sands development and no argument has been presented as to the significance of the differences in air quality observed here. It is only being focused on as a measurable difference observed with the existing monitoring system.

3. GASEOUS CONCENTRATIONS OTHER THAN SO_2

In Appendix 7.2 are located the summary results for O_3, NO_2, NO_x and CO for Bitumount and Fort McMurray stations and O_3 for Birch Mountain Station. No evaluations have been made with these data sets. At this point they have been offered as a baseline condition only.

An important feature regarding a change in calibration procedure for O_3 accounts for a slight change in concentration magnitude. The current method for calibrating O_3 was instituted in June 1979 and concentrations since that time are observed to be slightly higher. Ozone concentrations prior to that date could be increased by a factor of 1.2 to 1.4. It is difficult to actually apply a factor since parameters that affect the calibration, such as barometric pressure and ambient temperature, are variable.

4. METALS IN SUSPENDED PARTICULATES

From September 1978 to February 1979 high volume samplers were operated at Birch Mountain, Bitumount Tower, Mannix and the town of Fort McMurray. The suspended particulate samples, collected for approximately 100 hour time periods, were analyzed for a number of elements shown in Table 2. The units are micrograms per thousand cubic meters of air. The method of analysis was plasma emission. Some of the elements analyzed occur in abundance in the blank filter papers. Because of the high blank loading some of the data are difficult to interpret. This is especially true for the aluminum and iron analysis. An attempt was made to analyze for arsenic and mercury but because of their volatility and low levels in air, the results were below any detectable limit.

Table 2. Metals in particulates (high volume, continuous 3- to 4-day samples)

Site	Date	Metal in ug/10^3 m^3 air												
		Cu	Pb	Zn	Ni	Co	K	Mo	Cr	Fe	Al	V	Cl	Mn
Birch	Sep 23-25/78	135	10	80	8	*	*	2	1	50	3110	3	2770	2
	Oct 5-7/78	98	15	20	5	1	*	4	3	64	3280	14	213	3
	Oct 17-19/78	119	12	50	4	*	*	4	3	77	3380	4	157	5
	Oct 29-31/78	62	9	20	4	*	*	2	1	52	2840	4	62	3
	Nov 10-12/78	56	11	50	3	*	*	3	96	50	3010	3	2570	3
	Nov 24-26/78	66	18	130	7	*	*	3	2	20	0	30	424	2
	Dec 4-6/78	57	*	40	3	*	*	*	*	7	0	*	461	2
	Dec 15-17/78	81	*	30	4	*	*	*	2	1	0	5	1620	1
	Jan 9-12/79	22	*	20	1	*	*	*	1	10	0	*	277	5
	Jan 18-21/79	28	6	20	2	*	*	*	1	6	0	*	138	*
	Feb 2-5/79	32	*	20	1	*	*	*	*	*	0	4	255	*
	Feb 26-29/79	14	5	10	2	*	*	*	*	7	0	1	83	2
Bitumount	Sep 20-23/78	*	11	40	3	1	*	2	3	37	2550	8	95	6
	Nov 20-24/78	101	26	60	2	1	*	2	1	27	1580	5	55	2
	Dec 4-6/78	174	30	60	15	2	240	8	4	80	3150	62	35	5
	Dec 16-18/78	288	304	30	7	1	260	2	1	82	0	23	153	5
	Jan 21-23/79	92	6	10	2	*	120	*	*	7	0	4	28	1
	Feb 2-5/79	11	4	10	4	1	110	1	102	11	0	18	125	2
Mannix	Oct 5-12/78	158	72	30	2	*	80	*	*	41	0	4	202	4
	Oct 14-17/78	145	167	140	3	1	220	1	2	180	0	9	198	1
	Oct 26-29/78	158	79	120	3	1	270	1	*	108	0	13	269	6
	Nov 20-23/78	74	133	170	1	1	220	1	1	53	0	6	296	4
	Dec 4-6, 11-13/78	187	481	20	7	1	170	2	1	105	0	25	968	6
	Dec 28-30/78	494	0	30	10	1	190	4	1	127	0	43	658	7
	Jan 9-11/79	1030	296	80	4	1	330	2	1	71	0	13	1040	4
	Jan 21-23/79	809	330	70	14	5	800	7	6	89	0	34	626	6
	Feb 2-4/79	186	75	10	7	*	*	1	*	35	0	25	368	2
	Feb 15-17, 22-24/79	214	169	10	4	*	*	7	*	34	0	24	100	3

continued...

Table 2. Concluded.

Site	Date	Metal in ug/10^3 m^3 air												
		Cu	Pb	Zn	Ni	Co	K	Mo	Cr	Fe	Al	V	Cl	Mn
Fort McMurray	Aug 30, 31, Sep 1/78	71	156	30	2	*	230	*	4	683	502	4	276	37
	Sep 11-13/78	53	142	10	1	*	210	*	*	316	0	5	640	17
	Sep 23-25/78	74	142	50	5	2	220	4	2	335	2664	15	2770	19
	Oct 17-19/78	65	349	80	2	2	440	3	2	918	3580	8	524	48
	Oct 29-30/78	60	279	120	5	2	190	3	2	236	2680	20	493	14
	Nov 10-12/78	55	315	30	4	3	660	4	4	202	4280	11	4740	64
	Nov 22-24/78	93	204	20	1	1	170	1	*	55	0	6	880	4
	Dec 4-6/78	53	49	0	6	*	*	3	*	33	0	26	395	2
	Dec 27-30/78	292	371	10	3	*	*	1	*	25	0	16	1080	2
	Jan 9-11/79	129	138	0	1	*	*	1	*	13	0	6	1370	1
	Feb 2-6/79	39	47	*	4	*	110	2	*	24	0	20	244	1
	Feb 15-19/79	62	111	10	4	*	70	2	*	42	0	23	212	3

* Below detection limit

5. RECOMMENDATIONS

Baseline data collection is a desirable objective for the assessment of changes in environmental quality. However, in order to strictly assess environmental quality, a number of variables need to be carefully controlled so that they do not bias the results. It is with these control variables in mind that the following recommendations are made.

1. Because of the variability in operator interpretation of readings less than 0.02 ppm, it is recommended that all readings less than this value not be used in interpretive comparisons of the data. It is further recommended, because of these truncated data sets, that averages not be considered at all for assessing changes in environmental air quality.
2. Because of the revealing nature of the frequency distribution graphs of concentration ranges versus time for remote, compliance and urban monitoring stations, it is recommended that this method continue to be used in further assessments of air quality, and that sites be available or chosen accordingly.
3. It is recommended that any efforts at continuing this data base be done with significant concern for:
   i) using similar response instrumentation (see Strosher, 1978 for instrument types used);
   ii) conducting regular zeros and spans;
   iii) conducting three point permeation tube calibrations, and;
   iv) performing an audit calibration program on all operators in the area, to ensure widespread quality control of the data.
4. A number of key stations should be identified for which there should be no alteration in location over the entire duration of oil sands development. Among these key stations, the following are recommended:

i) Syncrude No. 3 SC075035,

ii) Suncor Fina Site,

iii) Environment's Birch Mountain, Bitumount and Fort McMurray sites.

Locations of these sites are documented in Strosher 1978.

5. Monitoring and analytical techniques for metals in suspended particulates are specialized and need to be carefully chosen if in-depth interpretation of the results is desired. For this reason it is recommended that future work with metals in ambient air be carried out using other than high volume samplers with pre-treated filters. It is further recommended that more precise analytical techniques be employed (Barrie and Whelpdale 1976).

6. REFERENCES CITED

Barrie, L.A. and D.M. Whelpdale. 1978. Background air and precipitation chemistry. pp. 124-159 in F. Fanaki, compiler. 1978. Meteorology and air quality winter field study in the AOSERP study area, March 1976. Prep. by Fisheries and Environment Canada, Atmospheric Environment Service for the Alberta Oil Sands Environmental Research Program. AOSERP Report 27. 249 pp.

Strosher, M.M. 1978. Ambient air quality in the AOSERP study area, 1977. Prep. by Alberta Environment for the Alberta Oil Sands Environmental Research Program. AOSERP Report 30. 74 pp.

7. APPENDICES

7.1 TABLES OF MONTHLY AVERAGE AND SO_2 FREQUENCY DISTRIBUTIONS OF ONE-HALF HOUR READINGS FROM 13 AMBIENT MONITORING STATIONS

Table 3. Birch Mountain Station

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
May/77	563	49.7	571	50.3	0		0		0		0		.003
June	1338	99.6	5	0.4	0		0		0		0		.000
July	1018	73.4	368	26.6	0		0		0		0		.002
Aug.	1107	99.8	2	0.2	0		0		0		0		.000
Sept.	1177	95.0	62	5.0	0		0		0		0		.001
Oct.		Less than 75% operational											
Nov.		Less than 75% operational											
Dec.		Less than 75% operational											
Jan./78		Less than 75% operational											
Feb.	531	44.1	671	55.7	2	0.2	0		0		0		.005
Mar.	701	65.6	367	34.3	1	0.1	0		0		0		.003
Apr.	1265	89.6	146	10.3	0		0		0		0		.001
May	1144	95.8	50	4.2	0		0		0		0		.000
June	961	98.0	20	2.0	0		0		0		0		.000
July		Less than 75% operational											
Aug.		Less than 75% operational											
Sept.	1267	89.0	156	11.0	0		0		0		0		.001

continued...

Table 3. Concluded.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Oct./78	1264	95.2	64	4.8	0		0		0		0		.000
Nov.	1180	87.0	165	12.2	11	0.8	0		0		0		.002
Dec.	1365	95.9	29	4.1	0		0		0		0		.001
Jan./79	1094	95.7	49	4.3	0		0		0		0		.000
Feb.	1052	84.1	196	15.7	3	0.2	0		0		0		.003
Mar.	1389	95.0	65	4.4	8	0.6	0		0		0		.001
Apr.	1227	90.0	136	10.0	0		0		0		0		.001
May	1101	87.4	177	12.5	2	0.1	0		0		0		.002
June	1242	98.0	25	2.0	0		0		0		0		.000
July	1430	97.4	38	2.6	0		0		0		0		.000
Aug.	1433	97.3	40	2.7	0		0		0		0		.000
Sept.	912	93.8	60	6.2	0		0		0		0		.001
Oct.	1227	96.9	39	3.1	0		0		0		0		.000
Nov.	1119	99.6	5	0.4	0		0		0		0		.000
Dec.	966	67.4	466	32.5	2	0.1	0		0		0		.003

Table 4. Bitumount Tower Station

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
May/77	1032	72.8	386	27.2	0		0		0		0		.008
June	1068	96.2	39	3.5	3	0.3	0		0		0		.001
July	1261	90.3	135	9.7	0		0		0		0		.001
Aug.	1144	99.0	12	1.0	0		0		0		0		.000
Sept.	1393	98.9	15	1.1	0		0		0		0		.000
Oct.	1376	93.0	103	7.0	1	0.1	0		0		0		.001
Nov.	871	95.4	42	4.6	0		0		0		0		.000
Dec.	871	87.3	127	12.7	0		0		0		0		.001
Jan./78		Less than 75% operational											
Feb.		Less than 75% operational											
Mar.	1190	85.3	196	14.0	9	0.6	0		0		0		.003
Apr.	1297	91.2	126	8.8	0		0		0		0		.001
May	1262	89.8	138	9.8	5	0.4	0		0		0		.001
June	1328	93.8	88	6.2	0		0		0		0		.001
July	1341	96.8	45	3.2	0		0		0		0		.000
Aug.	1411	96.0	56	3.8	2	0.1	0		0		0		.001

continued...

Table 4. Concluded.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		SO_2 ppm Monthly Average
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Month													
Sept./78	1335	93.5	89	6.2	4	0.3	0		0		0		.001
Oct.	1115	86.0	178	13.7	3	0.2	0		0		0		.002
Nov.	1031	84.6	188	15.4	0		0		0		0		.001
Dec.	1002	86.4	146	12.6	10	0.9	1	0.1	0		0		.003
Jan./79	833	75.1	244	22.0	31	2.8	1	0.1	0		0		.007
Feb.	783	71.8	282	25.9	25	2.3	0		0		0		.006
Mar.	1030	70.0	393	26.7	48	3.3	0		0		0		.007
Apr.	1110	91.2	105	8.6	3	0.2	0		0		0		.002
May	1139	97.1	34	2.9	0		0		0		0		.000
June	1139	87.7	157	12.1	3	0.2	0		0		0		.002
July	1254	95.5	57	4.3	3	0.2	0		0		0		.001
Aug.	1221	87.9	162	11.6	4	0.3	0		2	0.1	2	0.1	.004
Sept.	1153	97.9	23	2.0	2	0.1	0		0		0		.000
Oct.	1140	88.4	139	10.8	10	0.8	0		0		0		.002
Nov.	985	72.9	347	25.6	21	1.5	0		0		0		.005
Dec.	920	76.0	282	23.3	8	0.7	0		0		0		.003

Table 5. Fort McMurray Station.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
May/77	904	61.7	560	38.3	0		0		0		0		.000
June	1398	97.5	36	2.5	0		0		0		0		.000
July	1371	92.8	107	7.2	0		0		0		0		.001
Aug.	1394	94.8	76	5.2	1	0.1	0		0		0		.001
Sept.	1383	96.2	55	3.8	0		0		0		0		.000
Oct.	1247	84.2	233	15.7	1	0.1	0		0		0		.001
Nov.	1306	91.1	125	8.7	3	0.2	0		0		0		.001
Dec.	1214	82.9	251	17.1	0		0		0		0		.001
Jan./78	1228	83.2	234	15.8	12	0.8	1	0.1	1	0.1	0		.003
Feb.	1015	76.3	306	23.0	10	0.8	0		0		0		.003
Mar.	1149	82.8	236	17.0	2	0.1	0		1	0.1	0		.002
Apr.	1315	94.3	80	5.7	0		0		0		0		.001
May	1231	88.7	155	11.2	2	0.1	0		0		0		.001
June	1316	98.4	21	1.6	0		0		0		0		.000
July	1294	93.7	87	6.3	0		0		0		0		.001
Aug.	1357	91.7	120	8.1	3	0.2	0		0		0		.001
Sept.	1150	92.3	96	7.7	0		0		0		0		.001

continued...

Table 5. Concluded.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No	%	No.	%	No	%	SO_2 ppm Monthly Average
Month													
Oct./78	Less than 75% operational												
Nov.	1014	73.5	363	26.3	3	0.2	0		0		0		.003
Dec.	1166	82.6	244	17.3	1	0.1	0		0		0		.002
Jan./79	934	80.2	227	19.5	3	0.3	0		0		0		.002
Feb.	757	72.1	289	27.6	3	0.3	0		0		0		.004
Mar.	Less than 75% operational												
Apr.	1087	85.0	191	14.9	1	0.1	0		0		0		.002
May	Less than 75% operational												
June	1168	97.5	30	2.5	0		0		0		0		.000
July	775	53.3	679	46.7	0		0		0		0		.005
Aug.	1250	91.0	123	8.9	1	0.1	0		0		0		.001
Sept.	1154	88.7	147	11.3	0		0		0		0		.001
Oct.	1005	70.3	423	29.6	2	0.1	0		0		0		.002
Nov.	1011	73.0	373	27.0	0		0		0		0		.002
Dec.	Less than 75% operational												

Table 6. Suncor Inc. Resources Group: Supertest Hill Station.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Apr./76	1319	91.8	104	7.2	13	1.0	0		0		0		.003
May	1222	84.7	215	14.9	5	0.4	0		0		0		.003
June	1037	76.6	287	21.2	30	2.2	0		0		0		.006
July	1367	91.9	119	8.0	2	0.1	0		0		0		.002
Aug.	1339	90.1	146	9.8	1	0.1	0		0		0		.002
Sept.	1180	95.2	56	4.5	3	0.2	1	0.1	0		0		.001
Oct.	1459	98.1	29	1.9	0		0		0		0		.000
Nov.	1328	98.1	26	1.9	0		0		0		0		.001
Dec.	1406	94.6	75	5.0	5	0.3	0		0		0		.001
Jan./77	1358	97.3	37	2.6	1	0.1	0		0		0		.001
Feb.	1321	98.3	21	1.6	2	0.1	0		0		0		.000
Mar.	1335	89.9	142	9.6	7	0.5	0		0		0		.002
Apr.	1361	94.5	72	5.0	7	0.5	0		0		0		.002
May	1431	98.9	15	1.1	0		0		0		0		.000
June	1388	96.9	44	3.1	0		0		0		0		.001
July	1429	96.5	44	3.0	8	0.5	0		0		0		.001

continued...

Table 6. Continued.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Aug./77	1376	93.0	88	5.9	15	1.0	1	0.1	0		0		.002
Sept.	1401	97.8	28	2.0	3	0.2	0		0		0		.001
Oct.	1472	99.2	12	0.8	0		0		0		0		.000
Nov.	1374	95.9	58	4.0	1	0.1	0		0		0		.001
Dec.	1383	93.4	95	6.4	3	0.2	0		0		0		.001
Jan./78		No data											
Feb.	1243	93.0	90	6.7	4	0.3	0		0		0		.002
Mar.	1249	84.5	195	13.2	26	1.8	2	0.1	6	0.4	0		.006
Apr.	1289	89.8	139	9.7	7	0.5	0		0		0		.002
May	1221	82.2	227	15.3	34	2.3	1	0.1	1	0.1	0		.006
June	1129	96.0	44	3.7	4	0.3	0		0		0		.001
July	1341	90.7	137	9.2	2	0.1	0		0		0		.002
Aug.	1336	90.4	120	8.1	21	1.4	2	0.1	0		0		.003
Sept		Less than 75% operational											
Oct.	1338	94.2	78	5.5	4	0.3	0		0		0		.002
Nov.	1333	93.1	95	6.6	4	0.3	0		0		0		.002

continued...

Table 6. Concluded.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Dec./78	1353	91.3	125	8.4	4	0.3	0		0		0		.002
Jan./79	1398	94.3	82	5.5	3	0.2	0		0		0		.001
Feb.	1092	81.6	226	16.9	17	1.3	1	0.1	1	0.1	0		.005
Mar.	1248	84.9	187	12.7	31	2.1	1	0.1	3	0.2	0		.006
Apr.	1203	86.6	168	12.1	18	1.3	0		0		0		.005
May	1387	93.7	85	5.7	9	0.6	0		0		0		.002
June	1347	94.8	69	4.8	5	0.4	0		0		0		.001
July	1197	84.7	207	14.6	10	0.7	0		0		0		.005
Aug.	1065	74.9	319	22.4	36	2.5	2	0.1	2	0.1	0		.008
Sept.	1165	86.3	175	13.0	9	0.7	0		0		0		.003
Oct.	1358	94.5	74	5.1	6	0.4	0		0		0		.002
Nov.	1385	96.7	46	3.2	1	0.1	0		0		0		.001

Table 7. Suncor Inc. Resources Group: Mannix Station.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
July/76	1193	81.2	269	18.3	6	0.3	1	0.1	1	0.1	0		.004
Aug.	1173	81.0	245	16.9	29	2.0	0		1	0.1	0		.005
Sept.	1232	85.7	194	13.5	9	0.6	1	0.1	2	0.1	0		.003
Oct.	1423	95.6	57	3.8	8	0.5	0		0		0		.006
Nov.	1383	96.0	49	3.4	8	0.5	0		0		0		.001
Dec.	1400	94.2	72	4.8	11	0.7	1	0.1	2	0.1	0		.002
Jan./77	1335	89.8	104	7.0	42	2.8	2	0.1	3	0.2	0		.005
Feb.	1276	94.9	66	4.9	2	0.1	0		0		0		.001
Mar.	1378	92.8	92	6.2	14	1.0	0		0		0		.002
Apr.	1364	95.0	51	3.5	21	1.5	0		0		0		.002
May	1399	96.4	51	3.5	1	0.1	0		0		0		.001
June	1431	100.0	0		0		0		0		0		.000
July	1337	90.3	138	9.3	5	0.3	0		1	0.1	0		.001
Aug.	1372	92.7	100	6.8	7	0.5	0		1	0.1	0		.001
Sept.	1397	97.6	30	2.1	5	0.3	0		0		0		.000
Oct.	1472	99.3	10	0.7	0		0		0		0		.000

continued...

Table 7. Continued.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Nov./77	1434	100.0	0		0		0		0		0		.000
Dec.	1356	91.5	105	7.1	21	1.4	0		0		0		.002
Jan./78	1320	94.4	75	5.4	3	0.2	0		0		0		.001
Feb.	1270	95.8	52	3.9	4	0.3	0		0		0		.001
Mar.	1409	96.0	36	2.4	20	1.4	2	0.1	2	0.1	0		.004
Apr.	1226	85.6	170	11.9	27	1.9	4	0.3	5	0.3	0		.006
May	1289	88.8	154	10.6	8	0.6	0		0		0		.003
June	1275	89.0	152	10.6	4	0.3	1	0.1	0		0		.002
July	1206	87.3	173	12.5	3	0.2	0		0		0		.002
Aug.	1308	90.6	134	9.3	1	0.1	0		0		0		.002
Sept.	Less than 75% operational												
Oct.	1466	99.1	14	0.9	0		0		0		0		.000
Nov.	1300	90.5	118	8.2	14	1.0	1	0.1	1	0.1	1	0.1	.004
Dec.	1253	84.6	223	15.0	6	0.4	0		0		0		.003
Jan./79	1204	89.2	122	9.0	23	1.7	1	0.1	0		0		.004
Feb.	1105	79.5	233	16.8	48	3.5	0		3	0.2	0		.009

continued...

Table 7. Concluded.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.601 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Mar./79	1192	83.1	204	14.2	30	2.1	2	0.1	6	0.4	1	0.1	.006
Apr.	1237	86.6	170	11.9	22	1.5	0		0		0		.004
May	1231	85.0	187	12.9	30	2.0	0		2	0.1	0		.005
June	1170	85.7	184	13.5	12	0.8	0		0		0		.005
July	1150	79.2	274	18.9	26	1.8	2	0.1	0		0		.006
Aug.	1059	71.4	406	27.4	18	1.2	0		0		0		.006
Sept.	1179	82.3	235	16.4	18	1.2	0		0		1	0.1	.005
Oct.	1409	95.1	66	4.4	6	0.4	0		2	0.1	0		.001
Nov.	1399	97.1	40	2.8	1	0.1	0		0		0		.001

Table 8. Suncor Inc. Resources Group: Ruth Lake Station.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
July/76	1162	78.2	322	21.7	2	0.1	0		0		0		.005
Aug.	1199	83.1	239	16.6	5	0.3	0		0		0		.003
Sept.	1120	77.9	309	21.5	7	0.5	0		1	0.1	1	0.1	.004
Oct.	1196	80.4	292	19.6	0		0		0		0		.005
Nov.	1384	98.9	16	1.1	0		0		0		0		.000
Dec.	1425	95.9	61	4.1	0		0		0		0		.000
Jan./77	1269	85.4	197	13.2	19	1.3	1	0.1	0		0		.004
Feb.	1058	81.0	248	19.0	0		0		0		0		.003
Mar.	1479	99.7	5	0.3	0		0		0		0		.000
Apr.	1380	95.8	60	4.2	0		0		0		0		.001
May	1135	98.6	16	1.4	0		0		0		0		.000
June	1425	99.4	8	0.6	0		0		0		0		.000
July	1448	97.8	31	2.1	2	0.1	0		0		0		.000
Aug.	1477	99.9	2	0.1	0		0		0		0		.000
Sept.	1417	98.4	22	1.5	1	0.1	0		0		0		.000
Oct.	1464	98.9	17	1.1	0		0		0		0		.000

continued...

Table 8. Continued.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Nov./77	1433	100.0	0		0		0		0		0		.000
Dec.	1442	100.0	0		0		0		0		0		.000
Jan./78	1469	99.1	13	0.9	0		0		0		0		.000
Feb.	1283	97.1	37	2.8	1	0.1	0		0		0		.001
Mar.	1422	96.2	53	3.6	3	0.2	0		0		0		.001
Apr.	1389	96.9	39	2.7	6	0.4	0		0		0		.001
May	1363	92.0	113	7.6	6	0.4	0		0		0		.002
June	1360	94.7	76	5.3	0		0		0		0		.001
July	1413	95.5	66	4.4	1	0.1	0		0		0		.001
Aug.	1339	94.5	74	5.2	4	0.3	0		0		0		.001
Sept.		Less than 75% operational											
Oct.	1390	99.5	7	0.5	0		0		0		0		.000
Nov.	1401	97.8	32	2.2	0		0		0		0		.001
Dec.	1147	95.2	58	4.8	0		0		0		0		.000
Jan./79	1465	98.8	16	1.1	2	0.1	0		0		0		.000
Feb.	1207	93.3	76	5.9	11	0.8	0		0		0		.002

continued...

Table 8. Concluded.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Mar./79	1367	92.1	111	7.5	4	0.3	0		1	0.1	0		.002
Apr.	1333	92.9	100	7.0	2	0.1	0		0		0		.001
May	1286	86.9	166	11.2	24	1.6	2	0.1	1	0.1	1	0.1	.006
June	1273	88.8	160	11.1	2	0.1	0		0		0		.002
July	1258	84.9	210	14.2	11	0.7	0		1	0.1	2	0.1	.004
Aug.	1319	88.9	152	10.2	10	0.7	1	0.1	2	0.1	0		.003
Sept.	1225	85.4	199	13.9	8	0.6	0		1	0.1	0		.003
Oct.	1409	95.0	74	5.0	0		0		0		0		.001
Nov.	1385	96.7	46	3.2	1	0.1	0		0		0		.001

Table 9. Suncor Inc. Resources Group: Lower Camp Station.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
July/77	1386	93.6	95	6.4	0		0		0		0		.001
Aug.	1464	98.8	16	1.1	1	0.1	0		0		0		.000
Sept.	1424	99.3	10	0.7	0		0		0		0		.000
Oct.	1483	100.0	0		0		0		0		0		.000
Nov.	1431	99.9	2	0.1	0		0		0		0		.000
Dec.	1477	99.7	5	0.3	0		0		0		0		.000
Jan./78	1357	91.6	124	8.4	1	0.1	0		0		0		.001
Feb.	1129	84.4	158	11.8	49	3.7	1	0.1	0		0		.004
Mar.	1389	94.1	80	5.4	8	0.5	0		0		0		.002
Apr.	1260	88.7	129	9.1	28	2.0	2	0.1	1	0.1	0		.005
May	1270	92.3	92	6.7	10	0.7	1	0.1	0		3	0.2	.003
June	1159	81.9	248	17.5	8	0.6	0		0		0		.004
July	1315	89.5	132	9.0	21	1.4	0		0		1	0.1	.004
Aug.	1193	85.4	180	12.9	22	1.6	1	0.1	0		0		.004
Sept.	Less than 75% operational												
Oct.	1400	94.4	73	4.9	5	0.3	3	0.2	1	0.1	2	0.1	.002

continued...

Table 9. Concluded.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Nov./78	1383	97.0	42	2.9	1	0.1	0		0		0		.001
Dec.	1376	92.8	106	7.2	0		0		0		0		.001
Jan./79	1438	97.0	41	2.8	3	0.2	0		0		0		.001
Feb.	1085	81.0	240	17.9	13	1.0	1	0.1	0		0		.006
Mar.	1211	83.2	233	16.0	9	0.6	1	0.1	2	0.1	0		.003
Apr.	1333	92.9	95	6.6	6	0.4	0		1	0.1	0		.002
May	1138	82.7	211	15.3	24	1.7	2	0.1	2	0.1	2	0.1	.006
June	1172	86.9	159	11.8	18	1.3	0		0		0		.004
July	1237	83.6	223	15.0	20	1.3	2	0.1	0		0		.005
Aug.	1156	78.1	282	19.0	34	2.3	1	0.1	7	0.5	0		.008
Sept.	1374	96.0	53	3.7	4	0.3	0		0		0		.001
Oct.	1432	96.7	48	3.2	2	0.1	0		0		0		.001
Nov.	1415	98.7	13	0.9	5	0.3	0		1	0.1	0		.001

Table 10. Suncor Inc. Resources Group: Fina Airstrip Station.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
July/76	820	70.8	317	27.3	22	1.9	0		0		0		.007
Aug.	973	68.9	429	30.4	11	0.8	0		0		0		.007
Sept.	636	44.2	646	44.9	144	10.0	6	0.4	8	0.5	0		.024
Oct.	1132	81.0	258	18.5	8	0.6	0		0		0		.006
Nov.	807	57.0	543	38.4	47	3.3	6	0.4	11	0.8	1	0.1	.013
Dec.	1214	81.8	255	17.2	12	0.8	0		3	0.2	0		.004
Jan./77	1287	86.7	186	12.5	8	0.5	1	0.1	2	0.1	0		.003
Feb.	914	73.6	291	23.4	34	2.7	0		3	0.2	0		.008
Mar.	1202	84.6	199	14.0	17	1.2	1	0.1	1	0.1	0		.004
Apr.	1364	94.7	51	3.5	20	1.4	2	0.1	1	0.1	2	0.1	.003
May	1428	96.4	49	3.3	5	0.3	0		0		0		.001
June	1148	80.2	243	17.0	35	2.4	3	0.2	3	0.2	0		.007
July/77	1267	85.4	202	13.6	13	0.9	1	0.1	0		0		.003
Aug.	1277	86.3	159	10.8	35	2.4	5	0.3	2	0.1	1	0.1	.006
Sept.	1358	94.3	72	5.0	8	0.6	0		2	0.1	0		.002
Oct.	1392	93.9	68	4.6	20	1.4	1	0.1	0		0		.003

continued...

Table 10. Continued.

Conc. Range ($ppm\ SO_2$)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Nov./77	1389	96.9	36	2.5	9	0.6	0		0		0		.001
Dec.		Less than 75% operational											
Jan./78	997	86.1	95	8.2	66	5.7	0		0		0		.007
Feb.	1189	88.9	139	10.4	9	0.7	0		0		0		.003
Mar.	1197	92.1	83	6.4	19	1.5	0		0		0		.003
Apr.	1322	92.3	93	6.5	12	0.8	2	0.1	4	0.3	0		.004
May	986	80.6	196	16.0	36	2.9	1	0.1	4	0.3	1	0.1	.007
June	1176	82.0	222	15.5	31	2.2	2	0.1	3	0.2	0		.006
July	1128	84.7	167	12.5	25	1.9	2	0.2	9	0.7	0		.006
Aug.	1147	82.3	198	14.2	38	2.7	7	0.5	4	0.3	0		.007
Sept.		Less than 75% operational											
Oct.		Less than 75% operational											
Nov.	1346	94.3	82	5.7	0		0		0		0		.001
Dec.	1405	94.7	59	4.0	10	0.7	1	0.1	7	0.5	0		.003
Jan./79	1425	96.1	54	3.6	4	0.3	0		0		0		.001
Feb.		Less than 75% operational											

continued...

Table 10. Concluded.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Mar./79	1368	98.5	14	1.0	5	0.4	1	0.1	0		0		.001
Apr.	1273	88.8	128	8.9	27	1.9	2	0.1	1	0.1	3	0.2	.005
May	1411	95.1	56	3.8	12	0.8	1	0.1	3	0.2	0		.002
June	1349	94.0	78	5.4	6	0.4	1	0.1	1	0.1	0		.001
July	1301	88.1	153	10.3	20	1.4	0		3	0.2	0		.004
Aug.	1301	87.7	125	8.4	46	3.1	6	0.4	4	0.3	1	0.1	.008
Sept.	936	89.8	81	7.8	18	1.7	2	0.2	5	0.5	0		.011
Oct.	Less than 75% operational												
Nov.	1409	98.4	22	1.5	2	0.1	0		0		0		.001

Table 11. Syncrude Canada Ltd.: Station 1

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
June/77	1222	98.1	24	1.9	0		0		0		0		.00
July	1326	98.2	24	1.8	0		0		0		0		.00
Aug.	637	80.5	154	19.5	0		0		0		0		.01
Sept.	1	0.1	929	93.4	65	6.5	0		0		0		.04
Oct.	516	91.2	50	8.8	0		0		0		0		.01
Nov.	1193	99.3	8	0.7	0		0		0		0		.00
Dec.	1268	97.4	34	2.6	0		0		0		0		.00
Jan./78	1320	97.4	36	2.6	0		0		0		0		.00
Feb.	973	82.5	203	17.2	3	0.2	0		0		0		.00
Mar.	1294	94.5	72	5.3	1	0.1	1	0.1	0		0		.00
Apr.	1258	97.6	30	2.3	1	0.1	0		0		0		.00
May	1328	95.0	64	4.6	5	0.4	0		0		0		.00
June	1311	95.5	53	3.9	7	0.5	0		1	0.1	0		.00
July	1291	91.0	108	7.6	15	1.0	3	0.2	1	0.1	1	0.1	.00
Aug.	1299	90.2	130	9.0	12	0.8	0		0		0		.00
Sept.	1323	94.7	70	5.0	4	0.3	0		0		0		.00

continued...

Table 11. Concluded.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Oct./78	1430	99.0	13	0.9	1	0.1	0		0		0		.00
Nov.	1307	93.7	86	6.2	1	0.1	0		0		0		.00
Dec.	1369	94.9	71	4.9	3	0.2	0		0		0		.00
Jan./79	1374	95.1	62	4.3	9	0.6	0		0		0		.00
Feb.	1017	83.0	203	16.6	5	0.4	0		0		0		.00
Mar.	1245	85.8	195	13.4	7	0.5	1	0.1	1	0.1	1	0.1	.00
Apr.	1294	91.8	114	8.1	1	0.1	0		0		0		.00
May	936	67.8	438	31.7	7	0.5	0		0		0		.00
June	1198	86.6	182	13.1	4	0.3	0		0		0		.00
July	1057	77.5	288	21.1	19	1.4	0		0		0		.01
Aug.	1270	89.4	140	9.9	7	0.5	1	0.1	1	0.1	0		.00
Sept.		Less than 75% operational											
Oct.	1160	82.4	247	17.5	1	0.1	0		0		0		.00
Nov.	1328	94.4	78	5.6	0		0		0		0		.00

Table 12. Syncrude Canada Ltd.: Station 2.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
June/77	772	73.7	242	23.1	34	3.2	0		0		0		.01
July	1178	87.7	165	12.3	0		0		0		0		.00
Aug.	Less than 75% operational												
Sept.	1194	95.9	49	3.9	2	0.2	0		0		0		.00
Oct.	1043	98.0	21	2.0	0		0		0		0		.00
Nov.	1054	86.2	169	13.8	0		0		0		0		.00
Dec.	1030	86.0	168	14.0	0		0		0		0		.00
Jan./78	1259	92.8	97	7.1	1	0.1	0		0		0		.00
Feb.	895	84.3	166	15.6	1	0.1	0		0		0		.00
Mar.	924	66.8	442	31.9	16	1.2	2	0.1	0		0		.01
Apr.	1177	91.9	100	7.8	4	0.3	0		0		0		.00
May	1340	93.9	85	6.0	2	0.1	0		0		0		.00
June	1307	96.8	42	3.1	1	0.1	0		0		0		.00
July	1369	96.7	29	2.0	19	1.3	0		0		0		.00
Aug.	1345	93.2	89	6.2	6	0.4	1	0.1	1	0.1	0		.00
Sept.	1326	95.0	69	4.9	2	0.1	0		0		0		.00

continued...

Table 12. Concluded.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Oct./78	1413	97.6	34	2.3	2	0.1	0		0		0		.00
Nov.	1337	95.8	56	4.0	3	0.2	0		0		0		.00
Dec.	1278	91.3	119	8.5	3	0.2	0		0		0		.00
Jan./79	1380	95.7	58	4.0	5	0.3	0		0		0		.00
Feb.	930	79.3	234	19.9	9	0.8	0		0		0		.00
Mar.	1253	86.3	194	13.4	4	0.3	0		0		0		.00
Apr.	1268	92.9	93	6.8	4	0.3	0		0		0		.00
May	1278	91.4	114	8.2	6	0.4	0		0		0		.00
June	1174	86.9	174	12.9	3	0.2	0		0		0		.00
July	1276	92.7	94	6.8	7	0.5	0		0		0		.00
Aug.	1337	92.9	89	6.2	13	0.9	0		0		0		.00
Sept.	1323	94.0	71	5.0	14	1.0	0		0		0		.00
Oct.	1365	94.3	81	5.6	2	0.1	0		0		0		.00
Nov.	1311	96.1	50	3.7	3	0.2	0		0		0		.00

Table 13. Suncor Inc. Resources Group: Mildred Lake Station.*

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Apr./76	992	77.3	185	14.4	90	7.0	1	0.1	12	0.9	4	0.3	.013
May	1110	74.8	330	22.3	32	2.2	2	0.1	7	0.5	2	0.1	.011
June	1229	86.3	191	13.4	4	0.3	0		0		0		.002
July	1136	88.6	137	10.7	6	0.5	1	0.1	2	0.2	0		.003
Aug.	1197	82.9	213	14.8	32	2.2	1	0.1	1	0.1	0		.005
Sept.	1310	91.1	114	7.9	11	0.8	0		3	0.2	0		.003
Oct.	1272	87.8	171	11.8	5	0.3	0		0		0		.004
Nov.	1396	97.5	35	2.4	1	0.1	0		0		0		.001
Dec.	1486	100.0	0		0		0		0		0		.000
Jan./77	1409	94.8	71	4.8	6	0.4	0		0		0		.001
Feb.	1137	84.6	206	15.3	1	0.1	0		0		0		.002
Mar.	1364	91.9	109	7.3	11	0.7	0		0		0		.002
Apr.	1400	97.2	38	2.6	2	0.1	0		0		0		.001
May	1440	96.8	46	3.1	2	0.1	0		0		0		.001
June	986	92.0	77	7.2	8	0.7	1	0.1	0		0		.002

* Mildred Lake changes to Syncrude Station #3 in June/77.

continued...

Table 13. Continued.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		SO_2 ppm Monthly Average
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Month													
June/77	1179	85.2	195	14.1	10	0.7	0		0		0		.00
July	1003	72.7	373	27.0	3	0.2	1	0.1	0		0		.01
Aug.	687	68.0	323	31.9	1	0.1	0		0		0		.00
Sept.	814	65.1	413	33.0	16	1.3	5	0.4	3	0.2	0		.00
Oct.		Less than 75% operational											
Nov.	1011	82.6	213	17.4	0		0		0		0		.00
Dec.	847	69.9	358	29.6	3	0.2	2	0.2	1	0.1	0		.01
Jan./78	969	73.6	339	25.7	8	0.6	1	0.1	0		0		.01
Feb.	507	48.8	501	48.3	30	2.9	0		0		0		.02
Mar.	973	71.7	368	27.1	14	1.0	1	0.1	2	0.1	0		.01
Apr.	1131	87.9	133	10.3	19	1.5	1	0.1	3	0.2	0		.00
May	1313	91.4	103	7.2	14	1.0	1	0.1	3	0.2	1	0.1	.00
June	1218	88.9	149	10.9	3	0.2	0		0		0		.00
July	1174	82.8	236	16.6	8	0.6	0		0		0		.00
Aug.	1157	80.8	247	17.2	21	1.5	1	0.1	5	0.3	2	0.1	.01
Sept.	1318	94.8	69	5.0	3	0.2	0		0		0		.00

continued...

Table 13. Concluded.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Oct./78	1305	90.6	127	8.8	5	0.3	0		4	0.3	0		.00
Nov.	1160	83.3	216	15.5	15	1.1	0		0		1	0.1	.00
Dec.	1261	87.4	174	12.1	7	0.5	0		0		0		.00
Jan./79	1319	91.4	112	7.8	11	0.8	0		0		0		.00
Feb.	969	81.7	214	18.0	3	0.3	0		0		0		.00
Mar.	1162	80.6	275	19.1	4	0.3	0		0		0		.00
Apr.	918	65.5	470	33.5	14	1.0	0		0		0		.01
May	1234	88.1	147	10.5	19	1.3	1	0.1	0		0		.00
June	1219	88.7	153	11.1	3	0.2	0		0		0		.00
July	1093	79.1	285	20.6	3	0.2	1	0.1	0		0		.00
Aug.	1174	82.1	238	16.6	17	1.2	2	0.1	0		0		.00
Sept.	1031	73.6	333	23.8	34	2.4	1	0.1	1	0.1	0		.01
Oct.	967	66.8	473	32.7	8	0.5	0		0		0		.00
Nov.	725	52.8	643	46.9	4	0.3	0		0		0		.01

Table 14. Syncrude Canada Ltd. Station 4.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
June/77	125	9.1	1241	90.6	4	0.3	0		0		0		.02
July	805	58.3	567	41.0	8	0.6	0		1	0.1	0		.01
Aug.	Less than 75% operational												
Sept.	540	43.6	692	55.8	7	0.6	0		0		0		.01
Oct.	924	81.7	207	18.3	0		0		0		0		.00
Nov.	1229	99.0	12	1.0	0		0		0		0		.00
Dec.	579	52.8	517	47.2	0		0		0		0		.01
Jan./78	725	56.2	553	42.9	9	0.7	1	0.1	1	0.1	0		.01
Feb.	581	49.0	587	49.5	18	1.5	0		0		0		.01
Mar.	1035	75.6	328	24.0	5	0.4	0		0		0		.01
Apr.	1176	92.5	86	6.8	9	0.7	0		0		0		.00
May	1368	95.4	65	4.5	1	0.1	0		0		0		.00
June	1347	98.4	19	1.4	3	0.2	0		0		0		.00
July	1419	98.3	23	1.6	1	0.1	0		0		0		.00
Aug.	1117	77.3	320	22.2	7	0.5	0		0		0		.00
Sept.	1336	95.6	62	4.4	0		0		0		0		.00

continued...

Table 14. Concluded.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
Oct./78	1423	97.9	29	2.0	1	0.1	0		0		0		.00
Nov.	1365	97.8	27	1.9	4	0.3	0		0		0		.00
Dec.	1378	95.1	67	4.6	4	0.3	0		0		0		.00
Jan./79	1310	93.2	92	6.5	4	0.3	0		0		0		.00
Feb.	917	77.3	257	21.7	12	1.0	0		0		0		.01
Mar.	1244	85.5	206	14.2	5	0.3	0		0		0		.00
Apr.	1348	95.7	58	4.1	2	0.2	0		0		0		.00
May	1239	88.0	150	10.6	20	1.4	0		0		0		.00
June	1144	82.5	243	17.5	0		0		0		0		.00
July	1201	86.6	185	13.4	0		0		0		0		.00
Aug.	1180	82.1	252	17.5	5	0.3	1	0.1	0		0		.00
Sept.	1208	85.9	192	13.7	6	0.4	0		0		0		.00
Oct.	1344	92.7	104	7.2	1	0.1	0		0		0		.00
Nov.	1305	97.9	28	2.1	0		0		0		0		.00

Table 15. Syncrude Canada Ltd.: Station 5.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.061 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	SO_2 ppm Monthly Average
Month													
June/77	319	23.2	1028	74.7	29	2.1	0		0		0		.02
July	883	64.0	490	35.6	5	0.4	0		0		0		.01
Aug.		Less than 75% operational											
Sept.		Less than 75% operational											
Oct.	1104	97.1	33	2.9	0.		0		0		0		.00
Nov.	599	55.1	486	44.8	1	0.1	0		0		0		.01
Dec.	1304	99.6	6	0.4	0		0		0		0		.00
Jan./78	1003	74.1	341	25.2	4	0.3	3	0.2	3	0.2	0		.01
Feb.	569	53.9	459	43.5	27	2.6	0		0		0		.01
Mar.	1065	77.8	294	21.5	10	0.7	0		0		0		.01
Apr.	1032	80.2	239	18.6	15	1.2	0		0		0		.01
May	1234	87.1	182	12.8	1	0.1	0		0		0		.00
June	1323	96.7	38	2.8	7	0.5	0		0		0		.00
July	1356	95.8	47	3.3	9	0.6	3	0.2	2	0.1	0		.00
Aug.	1313	93.2	93	6.6	2	0.1	1	0.1	0		0		.00
Sept.	1270	92.2	108	7.8	0		0		0		0		.00

continued...

Table 15. Concluded.

Conc. Range (ppm SO_2)	0		0.001 - 0.060		0.601 - 0.170		0.171 - 0.200		0.201 - 0.340		0.341 +		SO_2 ppm Monthly Average
Readings	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Month													
Oct./78	1308	90.6	133	9.2	3	0.2	0		0		0		.00
Nov.	1248	91.0	120	8.7	3	0.2	0		0		1	0.1	.00
Dec.	1184	83.2	238	16.7	2	0.1	0		0		0		.00
Jan./79	1113	78.8	285	20.2	13	0.9	2	0.1	0		0		.00
Feb.	998	85.7	151	13.0	16	1.3	0		0		0		.00
Mar.	1210	84.2	225	15.6	3	0.2	0		0		0		.00
Apr.	894	63.9	499	35.7	6	0.4	0		0		0		.00
May	1217	86.4	160	11.4	30	2.1	1	0.1	0		0		.01
June	1203	87.5	167	12.1	6	0.4	0		0		0		.00
July	1148	82.9	236	17.1	0		0		0		0		.00
Aug.	1203	83.7	225	15.7	9	0.6	0		0		0		.00
Sept.	1290	91.9	109	7.8	5	0.3	0		0		0		.00
Oct.	1318	95.0	70	5.0	0		0		0		0		.00
Nov.	1272	93.3	88	6.5	3	0.2	0		0		0		.00

7.2 TABLES OF O_3, NO_2, NO_x AND CO DATA FROM BIRCH MOUNTAIN, BITUMOUNT AND FORT McMURRAY

Table 16. O_3 data, Birch Mountain Station.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (pphm)		Monthly Average (pphm)	Maximum 24 h Concentration (pphm)	No. of Readings	
		Low	High			>5.1 pphm per 1 h	>1.5 pphm per 24 h
Mar./77	94.5	0.5	6.0	4.15	5.35	40	26
Apr.	69.3	3.5	6.5	4.54	5.70	36	16
May	75.8	1.5	7.5	4.76	6.15	202	20
June	93.1	2.0	6.0	3.84	5.06	35	26
July	93.8	1.5	4.0	2.80	3.63	0	28
Aug.	74.1	0.0	5.0	3.13	4.08	0	20
Sept.	86.0	1.5	12.0	2.92	5.11	6	25
Oct.	47.4	1.5	5.5	3.64	4.88	8	13
Nov.				NO DATA			
Dec.				NO DATA			
Jan./78				NO DATA			
Feb.	68.4	1.5	5.0	3.61	4.33	0	16
Mar.	96.9	3.0	5.0	4.05	4.90	0	29
Apr.	97.6	2.5	8.0	4.76	6.60	206	29
May	77.4	1.5	7.0	4.82	6.40	220	19
June	67.5	0.5	6.5	3.10	5.88	49	14
July	98.5	1.5	6.0	3.64	5.44	23	31
Aug.	61.7	1.5	6.0	3.07	4.55	8	18

continued...

Table 16. Concluded.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (pphm) Low	Range of 1 h Concentration (pphm) High	Monthly Average (pphm)	Maximum 24 h Concentration (pphm)	No. of Readings >5.1 pphm per 1 h	No. of Readings >1.5 pphm per 24 h
Sept./78	84.2	1.0	4.5	2.50	3.63	0	22
Oct.	88.8	1.0	5.0	3.45	4.63	0	25
Nov.	78.6	0.5	5.0	3.73	4.78	0	22
Dec.	79.7	0.0	5.0	3.74	5.00	0	19
Jan./79	70.8	1.0	4.0	3.30	4.00	0	16
Feb.	75.4	0.0	5.0	3.10	4.75	0	16
Mar.	76.3	1.5	5.5	3.87	5.27	17	17
Apr.	98.8	2.0	4.5	3.43	4.15	0	30
May	89.3	2.0	4.5	3.66	4.36	0	26
June	86.7	2.0	6.5	4.52	5.48	108	23
July	98.4	2.0	7.5	4.34	5.71	117	30
Aug.	98.8	2.0	6.0	3.71	5.00	26	31
Sept.	69.0	0.5	5.0	2.60	4.50	0	14
Oct.	86.7	1.0	7.0	2.80	6.46	46	24
Nov.	97.9	1.5	7.5	4.64	6.63	232	29
Dec.	98.7	1.5	5.5	4.38	5.21	50	31
Jan./80	65.2	3.0	6.0	4.28	5.73	82	19

Table 17. O_3 data, Bitumount Station.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (pphm) Low	Range of 1 h Concentration (pphm) High	Monthly Average (pphm)	Maximum 24 h Concentration (pphm)	No. of Readings >5.1 pphm per 1 hr	No. of Readings >1.5 pphm per 24 h
Mar./77	87.6	0.5	13.0	3.34	8.31	126	19
Apr.	64.2	0.0	4.0	1.08	2.50	0	5
May	68.2	1.0	6.5	3.28	4.65	19	15
June	73.1	1.0	6.0	3.21	4.40	8	20
July	90.5	0.5	4.5	2.55	3.38	0	24
Aug.	81.3	0.5	5.0	2.50	3.48	0	20
Sept.	93.6	0.5	3.5	2.16	3.23	0	24
Oct.	98.8	1.0	4.5	2.83	4.02	0	29
Nov.	83.9	0.5	7.0	2.92	4.91	23	23
Dec.	81.8	1.0	3.5	2.58	3.17	0	25
Jan./78	26.2	0.5	4.0	2.85	3.40	0	5
Feb.				NO DATA			
Mar.	53.1	0.0	7.5	4.17	5.20	16	13
Apr.	97.4	0.0	7.5	4.19	5.63	70	28
May	89.2	1.0	7.5	4.27	6.10	153	26
June	97.8	1.5	6.0	3.98	4.90	50	29
July	92.5	1.0	6.0	2.99	4.50	5	28
Aug.	97.2	0.0	7.0	2.39	3.69	2	26

continued...

Table 17. Concluded.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (pphm) Low	Range of 1 h Concentration (pphm) High	Monthly Average (pphm)	Maximum 24 h Concentration (pphm)	No. of Readings >5.1 pphm per 1 h	No. of Readings >1.5 pphm per 24 h
Sept./78	98.5	0.5	4.0	1.83	3.17	0	20
Oct.	98.4	0.5	4.0	2.29	3.67	0	30
Nov.	91.1	0.5	4.0	2.30	3.63	0	21
Dec.	69.2	0.5	3.0	2.19	2.70	0	19
Jan/79	74.2	0.5	3.5	2.34	2.98	0	18
Feb.	98.7	0.5	3.0	2.37	2.90	0	28
Mar.	98.7	1.5	5.0	3.00	4.20	0	31
Apr.	8.01	1.5	4.0	3.33	4.50	0	21
May	78.4	1.5	5.0	3.52	4.42	0	21
June	89.7	1.0	5.5	3.22	4.38	12	24
July	98.7	1.0	7.5	3.00	4.33	17	31
Aug.	92.3	0.5	6.5	2.32	3.68	5	24
Sept.	75.6	0.0	5.5	2.36	4.00	2	19
Oct.	54.0	0.0	3.5	1.76	2.54	0	10
Nov.	98.3	0.0	4.0	1.91	2.86	0	20
Dec.	81.6	0.5	3.5	2.32	3.00	0	21
Jan./80	34.5	1.0	4.0	2.55	3.23	0	10
Feb.	75.6	0.0	3.5	2.80	3.48	0	21

Table 18. O_3 data, Fort McMurray Station.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (pphm)		Monthly Average(pphm)	Maximum 24 h Concentration (pphm)	No. of Readings	
		Low	High			>5.1 pphm per 1 hr	>1.5 pphm per 24 h
Feb./77	79.9	0.5	4.0	1.37	2.35	0	6
Mar.	87.1	0.5	6.5	2.31	3.63	2	20
Apr.	98.7	0.5	5.5	2.84	4.04	6	30
May	97.7	0.5	6.0	3.02	4.07	23	29
June	89.7	0.5	5.5	2.54	4.36	10	26
July	98.9	0.0	5.5	2.03	2.77	5	24
Aug.	98.8	0.0	5.5	2.14	3.17	3	29
Sept.	97.5	0.0	4.5	1.30	1.96	0	8
Oct.	76.6	0.0	5.0	1.57	3.69	0	6
Nov.	91.4	0.0	4.0	1.64	3.38	0	9
Dec.	91.4	0.0	4.0	1.28	3.83	0	10
Jan./78	94.4	0.0	4.0	1.28	2.83	0	8
Feb.	95.8	0.0	4.5	1.73	3.00	0	13
Mar.	97.6	0.0	5.0	2.71	3.90	0	29
Apr.	84.9	0.0	5.0	2.94	4.29	0	21
May	75.3	0.0	6.0	3.06	4.90	40	18
June	97.2	0.0	6.0	2.96	4.06	12	28
July	94.9	0.0	5.5	2.49	3.70	6	27
Aug.	41.1	0.0	8.0	1.97	3.15	3	9

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Table 18. Concluded.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (pphm)		Monthly Average (pphm)	Maximum 24 h Concentration (pphm)	No. of Readings	
		Low	High			>5.1 pphm per 1 hr	>1.5 pphm per 24 h
Sept./78				NO DATA			
Oct.	20.2	0.0	3.5	1.31	2.46	0	2
Nov.	98.3	0.0	3.5	1.15	2.33	0	9
Dec.	97.2	0.0	2.5	0.83	1.92	0	2
Jan./79	96.5	0.0	2.5	1.10	2.27	0	8
Feb.	99.7	0.0	2.5	1.33	2.00	0	9
Mar.	97.2	0.0	3.5	1.55	3.00	0	15
Apr.	84.2	0.5	3.5	2.14	2.79	0	21
May	97.9	0.0	4.0	2.34	3.41	0	30
June	98.2	0.0	5.5	2.41	3.85	17	26
July	99.1	0.0	8.0	2.42	3.75	25	28
Aug.	94.9	0.0	8.0	1.83	2.85	7	20
Sept.	98.5	0.0	5.0	1.50	2.61	0	14
Oct.	96.5	0.0	5.0	1.43	3.23	0	10
Nov.	90.4	0.0	4.0	0.98	2.64	0	5
Dec.	45.0	0.0	4.0	1.89	3.42	0	8
Jan./80				NO DATA			
Feb.	80.0	0.0	5.0	2.43	4.08	0	19

Table 19. NO_2 data, Bitumount Station.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (ppm)		Monthly Average (ppm)	Maximum 24 h Concentration (ppm)	No. of Readings	
		Low	High			>.21 ppm per 1 h	>.11 ppm per 24 h
Mar./77	60.6	0.00	0.05	0.01	0.04	0	0
Apr.	65.7	0.00	0.11	0.02	0.04	0	0
May	98.8	0.00	0.09	0.01	0.05	0	0
June	99.3	0.00	0.03	0.01	0.01	0	0
July	50.3	0.00	0.02	0.01	0.01	0	0
Aug.	90.3	0.00	0.02	0.01	0.01	0	0
Sept.	85.4	0.00	0.02	0.01	0.01	0	0
Oct.	82.3	0.00	0.03	0.01	0.01	0	0
Nov.	72.8	0.00	0.02	0.00	0.01	0	0
Dec.	81.7	0.00	0.03	0.00	0.01	0	0
Jan./78	34.0	0.00	0.02	0.00	0.01	0	0
Feb.	15.7	0.00	0.01	0.00	0.00	0	0
Mar.	42.7	0.00	0.00	0.00	0.00	0	0
Apr.	84.6	0.00	0.01	0.00	0.01	0	0
May	19.6	0.00	0.00	0.00	0.00	0	0
June	69.2	0.00	0.02	0.00	0.01	0	0
July	84.8	0.00	0.00	0.00	0.00	0	0
Aug.	96.2	0.00	0.00	0.00	0.00	0	0

continued...

Table 19. Concluded.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (ppm) Low	High	Monthly Average(ppm)	Maximum 24 h Concentration (ppm)	No. of Readings >.21 ppm per 1 h	>.11 ppm per 24 h
Sept./78	98.5	0.00	0.00	0.00	0.00	0	0
Oct.	96.1	0.00	0.00	0.00	0.00	0	0
Nov.	81.9	0.00	0.02	0.00	0.00	0	0
Dec.	68.0	0.00	0.06	0.01	0.01	0	0
Jan./79			NO DATA				
Feb.			NO DATA				
Mar.			NO DATA				
Apr.	50.7	0.00	0.02	0.00	0.01	0	0
May	77.4	0.00	0.03	0.00	0.01	0	0
June	75.0	0.00	0.015	0.00	0.005	0	0
July	55.2	0.00	0.00	0.00	0.00	0	0
Aug.	78.6	0.00	0.02	0.00	0.00	0	0
Sept.	88.3	0.00	0.01	0.00	0.00	0	0
Oct.	97.2	0.00	0.01	0.00	0.00	0	0
Nov.	46.8	0.00	0.01	0.00	0.00	0	0
Dec.	48.9	0.00	0.00	0.00	0.00	0	0
Jan./80	0.0	-	-1.00	0.00	-1.00	0	0
Feb.	56.9	0.00	0.01	0.00	0.00	0	0

Table 20. NO_2 data, Fort McMurray Station.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (ppm)		Monthly Average (ppm)	Maximum 24 h Concentration (ppm)	No. of Readings	
		Low	High			>.21 ppm per 1 h	>.11 ppm per 24 h
Feb./77	85.9	0.01	0.09	0.03	0.06	0	0
Mar.	71.5	0.00	0.01	0.00	0.00	0	0
Apr.	91.7	0.00	0.06	0.01	0.02	0	0
May	61.3	0.00	0.05	0.01	0.02	0	0
June	72.5	0.00	0.04	0.01	0.02	0	0
July	94.8	0.00	0.15	0.01	0.02	0	0
Aug.	92.2	0.00	0.07	0.01	0.02	0	0
Sept.	95.0	0.00	0.05	0.01	0.02	0	0
Oct.	93.3	0.00	0.09	0.01	0.03	0	0
Nov.	92.8	0.00	0.04	0.01	0.02	0	0
Dec.	87.8	0.00	0.03	0.01	0.02	0	0
Jan./78	71.1	0.00	0.04	0.02	0.03	0	0
Feb.	72.9	0.00	0.04	0.02	0.03	0	0
Mar.	78.8	0.00	0.05	0.01	0.02	0	0
Apr.	88.3	0.00	0.04	0.01	0.02	0	0
May	83.7	0.00	0.03	0.01	0.02	0	0
June	79.9	0.00	0.03	0.01	0.01	0	0
July	91.7	0.00	0.03	0.01	0.01	0	0

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Table 20. Concluded.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (ppm) Low	High	Monthly Average (ppm)	Maximum 24 h Concentration (ppm)	No. of Readings >.21 ppm per 1 h	>.11 ppm per 24 h
Aug./78	98.7	0.00	0.05	0.01	0.01	0	0
Sept.	98.6	0.00	0.03	0.01	0.01	0	0
Oct.	85.2	0.00	0.06	0.01	0.03	0	0
Nov.				NO DATA			
Dec.	73.1	0.00	0.05	0.01	0.02	0	0
Jan./79	59.7	0.00	0.06	0.01	0.03	0	0
Feb.				NO DATA			
Mar.				NO DATA			
Apr.	61.1	0.00	0.04	0.01	0.03	0	0
May	67.7	0.00	0.04	0.01	0.01	0	0
June	76.8	0.00	0.03	0.01	0.02	0	0
July	93.8	0.00	0.06	0.01	0.02	0	0
Aug.	91.1	0.00	0.03	0.01	0.01	0	0
Sept.	92.8	0.00	0.14	0.01	0.03	0	0
Oct.	30.2	0.00	0.03	0.00	0.01	0	0
Nov.				NO DATA			
Dec.				NO DATA			

Table 21. NO_x data, Bitumount Station.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (ppm) Low	High	Monthly Average (ppm)	Maximum 24 h Concentration (ppm)
Mar./77	60.6	0.01	0.09	0.02	0.04
Apr.	70.6	0.00	0.65	0.03	0.18
May	98.8	0.01	0.12	0.03	0.06
June	99.3	0.01	0.05	0.02	0.04
July	93.6	0.03	0.07	0.04	0.05
Aug.	98.9	0.02	0.06	0.04	0.04
Sept.	98.3	0.01	0.05	0.02	0.03
Oct.	97.2	0.00	0.05	0.02	0.03
Nov.	84.0	0.00	0.03	0.00	0.01
Dec.	77.2	0.00	0.07	0.00	0.01
Jan./78	23.4	0.00	0.02	0.00	0.01
Feb.	15.7	0.00	0.01	0.00	0.01
Mar.	81.6	0.00	0.02	0.00	0.01
Apr.	84.3	0.00	0.05	0.01	0.02
May	20.2	0.00	0.02	0.01	0.02
June	69.2	0.01	0.05	0.02	0.02
July	86.3	0.01	0.05	0.01	0.02
Aug.	96.8	0.01	0.03	0.01	0.02

continued...

Table 21. Concluded.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (ppm)		Monthly Average (ppm)	Maximum 24 h Concentration (ppm)
		Low	High		
Sept./78	97.4	0.01	0.02	0.01	0.02
Oct.	98.8	0.00	0.09	0.02	0.05
Nov.	82.5	0.00	0.03	0.01	0.02
Dec.	68.0	0.00	0.06	0.03	0.06
Jan./79			NO DATA		
Feb.			NO DATA		
Mar.			NO DATA		
Apr.	50.7	0.01	0.06	0.03	0.04
May	77.4	0.00	0.06	0.02	0.03
June	75.0	0.00	0.04	0.01	0.02
July	57.4	0.00	0.01	0.00	0.00
Aug.	78.6	0.00	0.03	0.00	0.01
Sept.	88.3	0.00	0.02	0.00	0.01
Oct.	97.3	0.00	0.02	0.00	0.00
Nov.	46.8	0.00	0.02	0.00	0.00
Dec.	48.9	0.00	0.00	0.00	0.00
Jan./80	0.0	-	-1.00	0.00	-1.00
Feb.	56.9	0.00	0.01	0.00	0.00

Table 22. NO_x data, Fort McMurray Station.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (ppm) Low	High	Monthly Average (ppm)	Maximum 24 h Concentration (ppm)
Feb./77	74.1	0.01	0.34	0.07	0.16
Mar.	70.7	0.00	0.02	0.00	0.01
Apr.	99.7	0.00	0.16	0.02	0.04
May	90.5	0.00	0.08	0.02	0.03
June	93.3	0.00	0.10	0.01	0.03
July	99.5	0.00	0.30	0.01	0.05
Aug.	83.5	0.00	0.15	0.02	0.04
Sept.	59.3	0.00	0.12	0.02	0.04
Oct.	98.8	0.00	0.27	0.03	0.09
Nov.	99.3	0.00	0.20	0.02	0.05
Dec.	97.7	0.00	0.15	0.02	0.07
Jan./78	81.2	0.00	0.17	0.03	0.05
Feb.	98.4	0.00	0.25	0.04	0.09
Mar.	99.2	0.00	0.16	0.02	0.04
Apr.	99.0	0.00	0.12	0.01	0.04
May	98.5	0.00	0.09	0.01	0.02
June	99.3	0.00	0.06	0.01	0.02
July	96.1	0.00	0.09	0.01	0.03

continued...

Table 22. Concluded.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (ppm) Low	High	Monthly Average (ppm)	Maximum 24 h Concentration (ppm)
Aug./78	99.2	0.00	0.11	0.02	0.03
Sept.	98.6	0.00	0.12	0.02	0.03
Oct.	93.3	0.00	0.21	0.03	0.09
Nov.			NO DATA		
Dec.	84.8	0.00	0.25	0.03	0.06
Jan./79	77.7	0.00	0.25	0.04	0.13
Feb.			NO DATA		
Mar.			NO DATA		
Apr.	70.0	0.00	0.12	0.01	0.01
May	78.5	0.00	0.19	0.01	0.03
June	97.8	0.00	0.08	0.01	0.03
July	89.8	0.00	0.08	0.01	0.03
Aug.	91.1	0.00	0.06	0.02	0.03
Sept.	93.1	0.00	0.26	0.02	0.07
Oct.	30.2	0.00	0.06	0.01	0.02
Nov.			NO DATA		
Dec.			NO DATA		

Table 23. CO data, Bitumount Station.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (ppm)		Monthly Average (ppm)	Maximum 8 h Concentration (ppm)	No. of Readings	
		Low	High			>13 ppm per 1 h	>5 ppm per 8 h
Mar./77	66.4	0.50	6.50	1.03	3.71	0	0
Apr.	13.8	1.00	1.50	1.02	1.25	0	0
May	46.6	0.00	3.00	0.73	2.50	0	0
June	99.3	0.50	10.00	1.28	2.50	0	0
July	94.1	0.50	1.00	0.58	1.00	0	0
Aug.	99.3	0.50	2.00	0.52	1.00	0	0
Sept.	93.1	0.50	1.50	0.57	1.00	0	0
Oct.	99.2	0.50	1.00	0.58	1.00	0	0
Nov.	53.6	0.00	1.00	0.00	0.13	0	0
Dec.	23.2	0.00	0.00	0.00	0.00	0	0
Jan./78				NO DATA			
Feb.				NO DATA			
Mar.	64.4	0.00	0.50	0.02	0.31	0	0
Apr.	15.7	0.00	1.00	0.25	0.50	0	0
May	89.0	0.00	1.50	0.16	1.00	0	0
June	98.6	0.00	1.00	0.03	0.50	0	0
July	93.0	0.00	0.50	0.01	0.13	0	0
Aug.	97.7	0.00	1.00	0.01	0.19	0	0

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Table 23. Concluded.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (ppm) Low	High	Monthly Average(ppm)	Maximum 8 h Concentration (ppm)	No. of Readings >13 ppm per 1 h	>5 ppm per 8 h
Sept./78	72.5	0.00	0.50	0.00	0.13	0	0
Oct.	87.4	0.00	0.00	0.00	0.00	0	0
Nov.	77.5	0.00	0.00	0.00	0.00	0	0
Dec.	56.5	0.00	1.50	0.34	1.44	0	0
Jan./79	74.1	0.00	1.50	0.33	1.44	0	0
Feb.	80.8	0.00	0.50	0.03	0.50	0	0
Mar.	98.7	0.00	0.50	0.06	0.50	0	0
Apr.	83.3	0.00	1.00	0.04	0.50	0	0
May	74.2	0.00	1.50	0.01	0.25	0	0
June	84.3	0.00	0.50	0.07	0.50	0	0
July	80.4	0.00	0.50	0.01	0.31	0	0
Aug.	93.8	0.00	0.50	0.01	0.13	0	0
Sept.	87.2	0.00	0.50	0.01	0.50	0	0
Oct.	78.6	0.00	0.00	0.00	0.00	0	0
Nov.	81.1	0.00	0.00	0.00	0.00	0	0
Dec.	81.9	0.00	0.00	0.00	0.00	0	0
Jan./80	34.95	0.00	0.00	0.00	0.00	0	0
Feb.	46.6	0.00	0.00	0.00	0.00	0	0

Table 24. CO data, Fort McMurray Station.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (ppm)		Monthly Average (ppm)	Maximum 8 h Concentration (ppm)	No. of Readings	
		Low	High			>13 ppm per 1 h	>5 ppm per h
Feb./77	95.4	0.50	8.00	1.02	6.63	0	0
Mar.	84.3	0.50	7.50	1.45	6.44	0	7
Apr.	90.0	0.00	12.50	1.33	6.00	0	3
May	82.9	0.00	3.50	0.60	2.00	0	0
June	70.8	0.50	1.50	0.60	1.06	0	0
July	72.2	0.00	1.00	0.04	0.5	0	0
Aug.	99.5	0.00	4.00	0.14	2.13	0	0
Sept.	41.9	0.00	2.00	0.13	0.75	0	0
Oct.	75.1	0.00	7.00	0.52	3.31	0	0
Nov.	79.9	0.00	7.00	0.41	2.44	0	0
Dec.	86.6	0.00	3.00	0.40	1.88	0	0
Jan./78	67.7	0.00	2.00	0.26	1.17	0	0
Feb.	64.0	0.00	6.50	0.51	2.50	0	0
Mar.	58.7	0.00	1.50	0.17	1.13	0	0
Apr.	89.6	0.00	2.00	0.22	0.81	0	0
May	89.6	0.00	2.00	0.08	0.69	0	0
June	87.2	0.00	0.50	0.03	0.25	0	0
July	20.7	0.00	1.00	0.04	0.25	0	0
Aug.	98.7	0.00	2.50	0.17	0.81	0	0

continued...

Table 24. Concluded.

Monitoring Period	Instrument Operational (%)	Range of 1 h Concentration (ppm)		Monthly Average (ppm)	Maximum 8 h Concentration (ppm)	No. of Readings	
		Low	High			>13 ppm per 1 h	>5 ppm per 8 h
Sept./78	81.7	0.00	7.0	0.25	1.69	0	0
Oct.	98.8	0.00	6.0	0.46	2.13	0	0
Nov.	99.0	0.00	7.5	0.66	4.19	0	0
Dec.	90.6	0.00	7.0	0.56	5.06	0	1
Jan./79	98.9	0.00	3.5	0.42	2.56	0	0
Feb.	57.7	0.00	2.0	0.23	1.00	0	0
Mar.				NO DATA			
Apr.	90.1	0.00	2.5	0.12	1.31	0	0
May	57.3	0.00	2.0	0.08	0.75	0	0
June	80.6	0.00	1.0	0.22	0.63	0	0
July	77.3	0.00	1.0	0.07	0.60	0	0
Aug.	43.0	0.00	1.5	0.18	0.69	0	0
Sept.	7.2	0.00	2.0	0.43	0.94	0	0
Oct.	94.2	0.00	9.5	0.80	4.50	0	0
Nov.	90.7	0.00	12.5	1.21	5.88	1	1
Dec.	93.3	0.00	17.0	1.06	8.50	1	2
Jan./80	99.2	0.00	7.0	0.58	4.13	0	0
Feb.	99.3	0.00	13.5	0.98	6.94	1	1