



**Wood Buffalo Environmental Association**

# **DECEMBER 2015 MONTHLY REPORT**

CONTINUOUS MONITORING  
INTEGRATED MONITORING  
January 27, 2016

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION  
MONTHLY AIR MONITORING SUMMARY  
for AMD SECTION III.B.1(c)

DECEMBER 2015

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Prepared: Jan 21 2016 16:51


APPROVAL NUMBERS	REPORT DATE						
	MONTH	YEAR					
289664-00-00	12	2015					
254465-00-00							
149968-00-01							
48522-01-00							
240008-00-03	CONTINUOUS AMBIENT MONITORING						
48263-00-00				ONE-HOUR AVERAGE		24-HOUR AVERAGE	
224816-00-03	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
189942-00-02	SO2(ppm)	1	99.87	0.017	0	0.002	0
206355-00-00	SO2(ppm)	2	100.00	0.120	0	0.013	0
46586-00-00	SO2(ppm)	4	95.03	0.012	0	0.002	0
216466-00-04	SO2(ppm)	5	100.00	0.136	0	0.023	0
137467-00-00	SO2(ppm)	6	100.00	0.021	0	0.007	0
20809-01-00	SO2(ppm)	7	100.00	0.051	0	0.008	0
241311-00-00	SO2(ppm)	8	100.00	0.004	0	0.001	0
094-02-00	SO2(ppm)	11	100.00	0.119	0	0.025	0
305529-00-00	SO2(ppm)	13	100.00	0.008	0	0.003	0
026-02-00	SO2(ppm)	14	99.06	0.023	0	0.006	0
228044-00-00	SO2(ppm)	15	100.00	0.015	0	0.004	0
73203-01-00	SO2(ppm)	16	100.00	0.030	0	0.005	0
	SO2(ppm)	17	100.00	0.014	0	0.004	0
	SO2(ppm)	18	100.00	0.011	0	0.002	0
	SO2(ppm)	19	100.00	0.018	0	0.004	0
	SO2(ppm)	501	100.00	0.022	0	0.004	0
	SO2(ppm)	502	100.00	0.011	0	0.003	0
	H2S(ppm)	2	100.00	0.008	0	0.002	0
	H2S(ppm)	4	99.46	0.003	0	0.001	0
	H2S(ppm)	5	99.87	0.005	0	0.002	0
	H2S(ppm)	11	99.73	0.009	0	0.002	0
	H2S(ppm)	17	100.00	0.001	0	0.000	0
	H2S(ppm)	19	100.00	0.002	0	0.000	0
	H2S(ppm)	501	99.19	0.001	0	0.000	0
	H2S(ppm)	502	99.46	0.001	0	0.001	0
	TRS(ppm)	1	99.87	0.004	0	0.002	0
	TRS(ppm)	6	100.00	0.001	0	0.000	0
	TRS(ppm)	7	100.00	0.001	0	0.001	0
	TRS(ppm)	9	100.00	0.003	0	0.001	0
	TRS(ppm)	13	99.87	0.002	0	0.001	0
	TRS(ppm)	14	100.00	0.002	0	0.001	0
	TRS(ppm)	15	100.00	0.001	0	0.000	0
	TRS(ppm)	18	100.00	0.001	0	0.000	0
	THC(ppm)	1	99.60	3.7	-	2.6	-
	THC(ppm)	2	100.00	5.2	-	3.3	-
	THC(ppm)	4	99.46	4.0	-	2.8	-
	THC(ppm)	5	99.87	7.5	-	2.9	-
	THC(ppm)	6	99.73	2.9	-	2.3	-
	THC(ppm)	7	99.60	3.1	-	2.4	-
	THC(ppm)	9	100.00	4.3	-	2.9	-
	THC(ppm)	11	100.00	3.6	-	2.7	-
	THC(ppm)	13	100.00	4.5	-	3.1	-
	THC(ppm)	14	100.00	3.3	-	2.4	-
	THC(ppm)	15	99.06	5.4	-	2.5	-
	THC(ppm)	16	100.00	5.6	-	3.2	-
	THC(ppm)	17	100.00	2.8	-	2.4	-
	THC(ppm)	18	100.00	2.4	-	2.3	-
	THC(ppm)	19	100.00	2.6	-	2.3	-
	O3(ppm)	1	97.04	0.034	0	0.024	-
	O3(ppm)	6	100.00	0.040	0	0.032	-
	O3(ppm)	7	100.00	0.032	0	0.021	-
	O3(ppm)	8	100.00	0.039	0	0.035	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION  
MONTHLY AIR MONITORING SUMMARY  
for AMD SECTION III.B.1(c)

DECEMBER 2015

page 2 of 2

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APPROVAL NUMBERS	REPORT DATE						
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240008-00-03	CONTINUOUS AMBIENT MONITORING						
48263-00-00			ONE-HOUR AVERAGE		24-HOUR AVERAGE		
224816-00-03	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
189942-00-02	O3(ppm)	13	99.87	0.033	0	0.019	-
206355-00-00	O3(ppm)	14	100.00	0.040	0	0.037	-
46586-00-00	O3(ppm)	17	100.00	0.040	0	0.032	-
216466-00-04	O3(ppm)	18	100.00	0.049	0	0.039	-
137467-00-00	NO2(ppm)	1	100.00	0.032	0	0.025	-
20809-01-00	NO2(ppm)	6	100.00	0.042	0	0.017	-
241311-00-02	NO2(ppm)	7	100.00	0.031	0	0.019	-
094-02-00	NO2(ppm)	8	100.00	0.019	0	0.006	-
305529-00-00	NO2(ppm)	13	100.00	0.030	0	0.016	-
026-02-00	NO2(ppm)	14	100.00	0.019	0	0.009	-
228044-00-00	NO2(ppm)	15	99.87	0.030	0	0.019	-
73203-01-00	NO2(ppm)	16	100.00	0.043	0	0.024	-
	NO2(ppm)	17	100.00	0.020	0	0.013	-
	NO2(ppm)	18	100.00	0.011	0	0.009	-
	NO2(ppm)	19	100.00	0.030	0	0.009	-
	NO2(ppm)	501	100.00	0.016	0	0.009	-
	NO2(ppm)	502	99.06	0.020	0	0.008	-
	CO(ppm)	7	100.00	0.6	0	0.3	-
	NH3(ppm)	1	93.28	0.000	0	0.000	-
	NH3(ppm)	6	95.97	0.011	0	0.000	-
	PM2.5(ug/m3)	1	100.00	49.5	-	12.8	0
	PM2.5(ug/m3)	6	100.00	37.9	-	12.9	0
	PM2.5(ug/m3)	7	100.00	36.4	-	11.4	0
	PM2.5(ug/m3)	8	100.00	32.6	-	8.4	0
	PM2.5(ug/m3)	13	100.00	47.4	-	10.0	0
	PM2.5(ug/m3)	14	100.00	12.6	-	6.3	0
	PM2.5(ug/m3)	15	100.00	22.2	-	9.1	0
	PM2.5(ug/m3)	16	100.00	82.8	-	21.8	0
	PM2.5(ug/m3)	17	100.00	20.7	-	7.2	0
	PM2.5(ug/m3)	18	99.73	20.9	-	11.5	0
	WIND	1	100.00	-	-	-	-
	WIND	2	99.87	-	-	-	-
	WIND	4	100.00	-	-	-	-
	WIND	5	99.60	-	-	-	-
	WIND	6	100.00	-	-	-	-
	WIND	7	100.00	-	-	-	-
	WIND	8	99.73	-	-	-	-
	WIND	9	99.87	-	-	-	-
	WIND	11	100.00	-	-	-	-
	WIND	13	96.64	-	-	-	-
	WIND	14	96.77	-	-	-	-
	WIND	15	99.06	-	-	-	-
	WIND	16	100.00	-	-	-	-
	WIND	17	99.87	-	-	-	-
	WIND	18	100.00	-	-	-	-
	WIND	19	99.06	-	-	-	-
	WIND	501	99.73	-	-	-	-
	WIND	502	95.03	-	-	-	-
							
SIGNATURE OF ASSOCIATION REPRESENTATIVE				FOR ALBERTA ENVIRONMENT USE ONLY			





January 27, 2016

Director, Environmental Monitoring and Evaluation Branch  
Alberta Environment and Parks  
11<sup>th</sup> Floor, Oxbridge Place  
9820 106 Street  
Edmonton, Alberta T5K 2J6

**RE: Monthly Ambient Air Quality Monitoring Report December 2015  
Wood Buffalo Environmental Association**

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Enclosed is the December 2015 Ambient Air Quality Monitoring Report for the continuous ambient air quality monitoring stations of the Wood Buffalo Environmental Association regional air quality monitoring network.

The continuous ambient air quality monitoring network stations are:

- AMS 1 - Fort McKay – Bertha Ganter
- AMS 2 - Mildred Lake
- AMS 3 - Lower Camp B (meteorology)
- AMS 4 - Buffalo Viewpoint
- AMS 5 - Mannix
- AMS 6 - Patricia McInnes
- AMS 7 - Athabasca Valley
- AMS 8 - Fort Chipewyan
- AMS 9 - Barge Landing
- AMS 11 - Lower Camp (air quality)
- AMS 13 - Fort McKay South
- AMS 14 - Anzac
- AMS 15 - CNRL Horizon
- AMS 16 - Shell Muskeg River
- AMS 17 - Wapasu
- AMS 18 - Conklin Lookout
- AMS 19 - Firebag
- AMS 501 - Statoil Leismer
- AMS 502 - ConocoPhillips Surmont

This report is submitted by WBEA on behalf its members and for some members to satisfy the requirements contained in their EPEA Approvals:

<b>Member</b>	<b>EPEA Approval No.</b>
Athabasca Oil Corporation	289664-00-00
Brion Energy	254465-00-00
Canadian Natural Resources Ltd.	149968-00-01
Cenovus Energy	48522-01-00

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<b>Member</b>	<b>EPEA Approval No.</b>
Connacher Oil and Gas Ltd.	240008-00-03
ConocoPhillips Canada	48263-00-00
Devon Canada Corporation	224816-00-03
Finning Canada Ltd.	Not Applicable
Hammerstone Corporation	189942-00-02
Husky Oil Operations Ltd.	206355-00-00
Imperial Oil Ltd.	00046586-00-00
MEG Energy Corporation	00216466-00-04
Nexen Energy ULC.	137467-00-00
Shell Canada Energy	20809-01-00
Statoil Canada Ltd.	241311-00-02
Suncor Energy Inc.	094-02-00
Sunshine Oilsands Ltd.	305529-00-00
Syncrude Canada Ltd.	026-02-00
Teck Resources Ltd.	EIA Application
Total E&P Canada Ltd.	228044-00-00
Williams Energy (Canada) Inc.	73203-01-00

#### **Aboriginal Communities**

Chipewyan Prairie Dene First Nation  
Christina River Dene Nation Council  
Fort McKay First Nation  
Fort McKay Métis Local 63  
Fort McMurray First Nation 468  
Fort McMurray Métis Local 1935

#### **Government and Non-Industrial Organizations**

Alberta Energy Regulator  
Alberta Environment & Sustainable Resource Development  
Alberta Health Services  
Alberta Health & Wellness  
Environment Canada  
Health Canada  
Parks Canada  
Pembina Institute for Appropriate Development  
Regional Municipality of Wood Buffalo  
Saskatchewan Environment

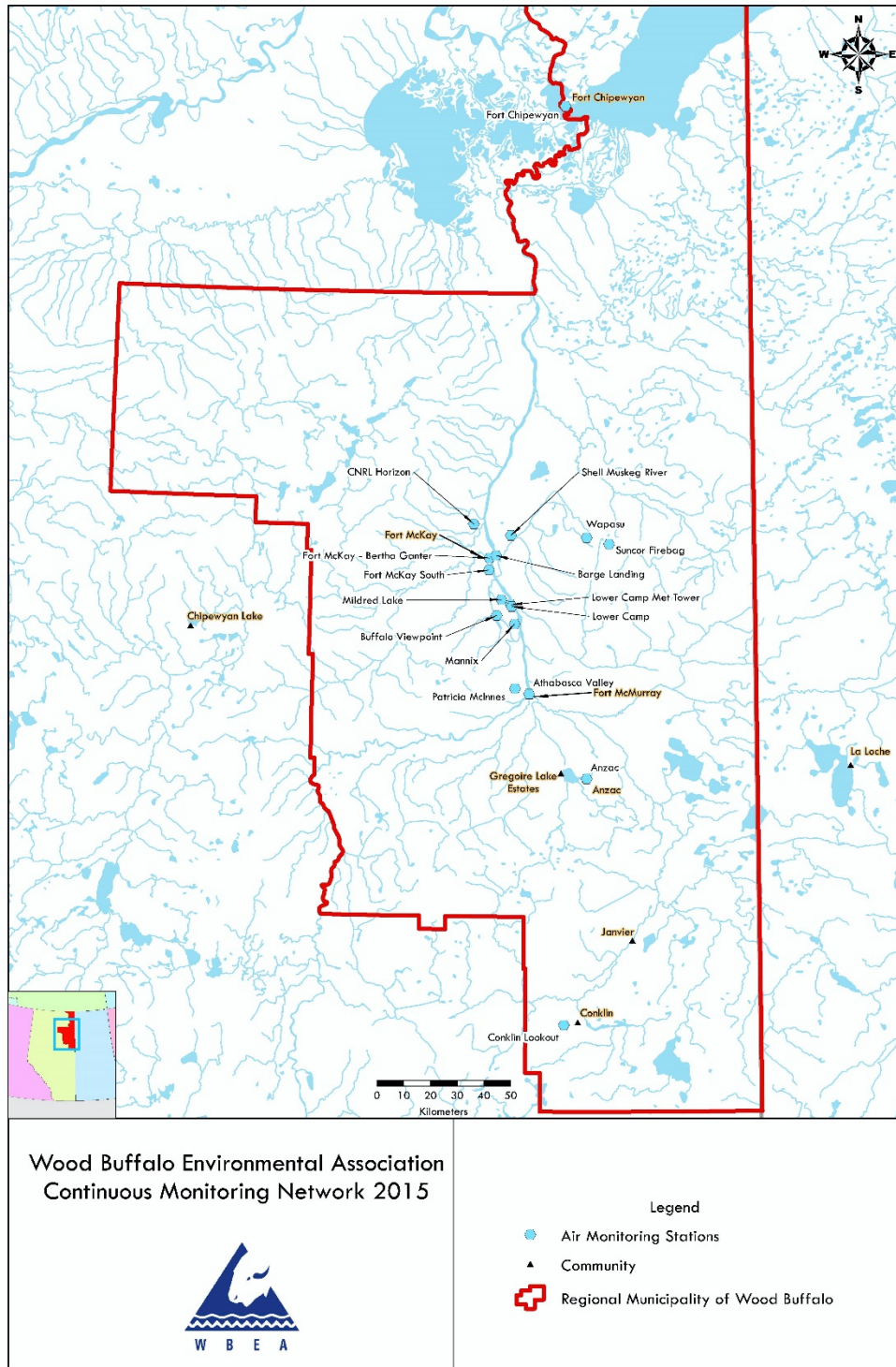


Figure 1: Map of WBEA Air Monitoring Network.

The following operational notes are provided as per the Air Monitoring Directive requirements.

## **1.0 Concentrations in Excess of Alberta Ambient Air Quality Objectives**

There were no ambient concentrations in excess of the air quality objectives as indicated in the Air Monitoring Directive Section III.A.3 (a & b) for SO<sub>2</sub>, H<sub>2</sub>S, PM<sub>2.5</sub>, CO, NO<sub>2</sub>, NH<sub>3</sub> and O<sub>3</sub>.

### **1.1 Data Processing and Validation**

Concentrations reported in near real-time were raw values. The final values were determined after processing of data for reporting. For all parameters except PM<sub>2.5</sub>, the final 5-minute data values were determined by subtracting from the raw 5-minute data values, the daily zero responses interpolated to the time of each raw 5-minute value. The final 5-minute data values were then rounded to one decimal place greater than the reporting precision indicated in the Air Monitoring Directive (AMD). The final 1-hour data values were calculated from final 5-minute data values and then rounded to reporting precision. The final 24-hour data values were calculated from final 1-hour values.

After data processing and validation, NO<sub>2</sub> concentrations were re-calculated from baseline-corrected NO<sub>x</sub> and NO concentrations. Specifically, the NO concentration was subtracted from the NO<sub>x</sub> concentration to determine the NO<sub>2</sub> concentration. In cases where the NO<sub>x</sub> and/or NO values exceeded the operating range of the analyzer, values reported for NO<sub>2</sub> were determined as the largest of either the difference between baseline-corrected NO<sub>x</sub> and NO values, or the NO<sub>2</sub> value reported by the data acquisition system with baseline correction applied.

### **1.2 Revisions to CASA Data Warehouse**

Historical data stored at the CASA Data Warehouse was re-submitted to correct the following errors in the data for AMS 18 – Conklin Lookout:

- Ozone was reported as THC
- THC (online September 2015) was reported as ozone
- RH was not uploaded in the correct column

Affected data ranged from August to November 2015 and has since been corrected, reviewed and verified to reflect station parameters at AMS 18. The errors were attributed to human error in the setup of a new station configuration file required to upload data to the CASA Data Warehouse.

## **2.0 Operational Status**

### **2.1 Continuous Monitoring**

In December 2015, there were zero incidents of a monitoring instrument operating less than 90% of the time.

Precipitation measurement was added to AMS 17 - Wapasu and AMS 18 - Conklin Lookout this reporting period. Weighing rain gauges were installed at these monitoring stations to record precipitation.

### **2.2 Intermittent Monitoring**

The results for passive and integrated monitoring of PAH, VOC, RSC, PM<sub>2.5</sub> and PM<sub>10</sub> samples were not available in time for submission with this report. These results will be submitted at a later date.

## **3.0 Monitoring Notes**

### **General Network Notes**

The Ammonia (NH<sub>3</sub>) analyzer currently operates on a 0 to 2500 ppb operating range with a detection level of 5 ppb in the WBEA network. In data processing, values less than 5 ppb have been considered below detection levels and are reported as zero.

Monitoring notes for the continuous monitoring stations are provided on a station by station basis.

#### ***Station 1, Fort McKay - Bertha Ganter***

The NH<sub>3</sub> analyzer required additional time to stabilize to levels below ambient concentrations following the automated daily spans and routine monthly multipoint calibrations. Additional time for stabilization after exposure to high concentrations of NH<sub>3</sub> gas is an inherent behavior in the NH<sub>3</sub> analyzer operations resulting from the properties of the NH<sub>3</sub> gas. Data for 1 to 2 hours following the daily spans have been reported as invalid for a total of 48 hours this month. Maintenance on December 30 to re-initiate the daily zero/span interrupted the normal operations of the NH<sub>3</sub> analyzer for 2 hours.

Maintenance and cleaning of the sample manifold on December 16 interrupted the normal operations of the SO<sub>2</sub>, TRS, THC, and O<sub>3</sub> analyzers for 1 hour.

Unstable operation due to debris in the reaction cells of the O<sub>3</sub> analyzer on December 16 resulted in 21 hours of invalid data.

Depletion and replacement of the fuel cylinder at the station on December 21 affected the normal operations of the THC analyzer for 2 hours.

The temperature sensors at 2 and 10 m are independent sensors and are not an integrated delta-t system. Although reported values are representative of ambient temperatures, they may not be suitable as measurements of vertical temperature gradients.

### ***Station 2, Mildred Lake***

Flat-lines in the output signal of the wind sensor resulted in 1 hour of invalid data this reporting period.

### ***Station 3, Lower Camp B - Meteorology***

Flat lines in output signals of the sonic wind sensors at 20, 45, and 167 m elevations resulted in 2, 2, and 30 hours of downtime for each respective sensor.

### ***Station 4, Buffalo Viewpoint***

Unstable operation due to excessive baseline drift of the SO<sub>2</sub> analyzer on December 19 resulted in 37 hours of invalid data.

The automated daily H<sub>2</sub>S span response on December 19 was outside of operational criteria; investigation by the station operator revealed the calibration system required re-calibration. Maintenance and testing of the calibrator interrupted the routine operations of the H<sub>2</sub>S and THC analyzers for a total of 4 hours.

### ***Station 5, Mannix***

Maintenance and cleaning of the sample manifold on December 2 interrupted the normal operations of the H<sub>2</sub>S analyzer for 1 hour.

Depletion and replacement of the fuel cylinder at the station on December 21 affected the normal operations of the THC analyzer for 1 hour.

Flat lines in output signals of the sonic wind sensors at 20, 45, 75, and 90 m elevations resulted in 3, 5, 31, and 1 hour(s) of downtime for each respective sensor. Inconsistent raw values were observed in the 75m elevation sonic wind sensor on December 8 and were invalidated for 1 hour.

### ***Station 6, Patricia McInnes***

The NH<sub>3</sub> analyzer required additional time to stabilize to levels below ambient concentrations following the automated daily span and routine monthly multipoint calibration periods. Additional time for stabilization after exposure to high concentrations of the NH<sub>3</sub> gas is an inherent behavior in the NH<sub>3</sub> analyzer operations resulting from the properties of the NH<sub>3</sub> gas. Data for 1 hour following each daily span has been reported as invalid for a total of 30 hours this month.

Depletion and replacement of the fuel cylinder at the station on December 22 affected the normal operations of the THC analyzer for 2 hours.

***Station 7, Athabasca Valley***

Depletion and replacement of the fuel cylinder at the station on December 23 affected the normal operations of the THC analyzer for 3 hours.

***Station 8, Fort Chipewyan***

Flat-lines in the output signal of the wind sensor resulted in 2 hours of invalid data this reporting period.

***Station 9, Barge Landing***

Flat-lines in the output signal of the wind sensor resulted in 1 hour of invalid data this reporting period.

***Station 11, Lower Camp***

Maintenance and cleaning of the sample manifold on December 7 interrupted the normal operations of the H<sub>2</sub>S analyzer for 1 hour.

A power spike at the station on December 18 affected the normal operations of the H<sub>2</sub>S analyzer for 1 hour.

***Station 13, Fort McKay South***

Maintenance and cleaning of the sample manifold on December 7 interrupted the normal operations of the TRS and O<sub>3</sub> analyzers for 1 hour.

Flat-lines in the output signal of the wind sensor resulted in 25 hours of invalid data this reporting period.

***Station 14, Anzac***

The SO<sub>2</sub> analyzer experienced a single episode of excessive baseline drift on December 14, resulting in 12 hours of invalid data.

Flat-lines in the output signal of the wind sensor resulted in 14 hours of invalid data this reporting period.

***Station 15, CNRL Horizon***

The data acquisition system failed to communicate with the THC and NO<sub>2</sub> analyzers on December 16, resulting in the absence of data for 1 hour.

Maintenance and re-calibration to improve the baseline response on December 21 interrupted the normal operation of the THC analyzer for 6 hours.

Flat-lines in the output signal of the wind sensor resulted in 7 hours of invalid data this reporting period.

***Station 16, Shell Muskeg River***

No operational issues to report this month.

***Station 17, Wapasu***

Flat-lines in the output signal of the wind sensor resulted in 1 hour of invalid data this reporting period.

***Station 18, Conklin Lookout***

Maintenance to adjust the zero on December 22 interrupted the normal operations of the PM<sub>2.5</sub> analyzer for 2 hours.

***Station 19, Firebag***

Flat-lines in the output signal of the wind sensor resulted in 7 hours of invalid data this reporting period.

***Station 501, Statoil Leismer***

The H<sub>2</sub>S analyzer experienced multiple instances of unstable operations due to a negative baseline resulting in 6 hours of invalid data this reporting period.

Flat-lines in the output signal of the wind sensor resulted in 2 hours of invalid data this reporting period.

***Station 502, ConocoPhillips Surmont***

The H<sub>2</sub>S analyzer experienced multiple instances of unstable operations due to a negative baseline resulting in 3 hours of invalid data this reporting period. Maintenance and cleaning of the sample manifold on December 8 interrupted the normal operations of the H<sub>2</sub>S analyzer for 1 hour.

Intermittent periods of excessive baseline drift, caused by fluctuating shelter temperature, affected the normal operations of the NO<sub>2</sub> analyzer for 7 hours this reporting period. Portable space heaters have been deployed until the HVAC system can be serviced.

Flat-lines in the output signal of the wind sensor resulted in 37 hours of invalid data this reporting period.



If additional information is required, please contact either Sanjay Prasad at (780) 215 4800 or the Wood Buffalo Environmental Association at (780) 799 4420.

Yours sincerely,

**Wood Buffalo Environmental Association**

Michael Martineau  
Data Technician

Sanjay Prasad  
Air Quality Scientist



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## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 1**  
**BERTHA GANTER FORT MCKAY**  
**DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY - BERTHA GANTER (AMS 1)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	707	36	37	99.87	17	0	2	0
TRS(ppb) Average	709	34	35	99.87	4	0	2	0
THC(ppm) Average	706	35	38	99.60	3.7	-	2.6	-
NMHC(ppm) Average	706	35	38	99.60	0.69	-	0.196	-
CH4(ppm) Average	706	35	38	99.60	3.2	-	2.4	-
O3 (ppb) Average	687	35	57	97.04	34	0	24	-
NO2 (ppb) Average	707	37	37	100.00	32	0	25	-
NO (ppb) Average	707	37	37	100.00	83	-	28	-
NOX (ppb) Average	707	37	37	100.00	113	-	45	-
NH3 (ppb) Average	654	40	90	93.28	0	0	0	-
PM2.5 (ug/m3) Average	742	2	2	100.00	49.5	-	12.8	0
Wind Speed 10 m (km/h) Average	744	0	0	100.00	14	-	11	-
Wind Direction 10 m (deg) Average	744	0	0	100.00	-	-	-	-
Temperature 2 m (C) Average	744	0	0	100.00	3.6	-	-2.0	-
Temperature 10 m (C) Average	744	0	0	100.00	4.3	-	-1.1	-
Relative Humidity (%) Average	744	0	0	100.00	94	-	93	-
Precipitation (mm) Total	744	0	0	100.00	0.6	-	2.2	-
Leaf Wetness (% of range) Average	744	0	0	100.00	12	-	3	-
Global Solar Radiation (W/m2) Average	744	0	0	100.00	200	-	35	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BERTHA GANTER FORT McKAY (AMS 1)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	707	0.6	1	-	0	0	0	0	1	1	17
TRS (ppb) Average	709	0.6	0	-	0	0	0	0	1	1	4
THC (ppm) Average	706	2.13	0.2	-	1.9	1.9	2	2	2.2	2.5	3.7
NMHC(ppm) Average	706	0.042	0.074	-	0	0	0	0	0.1	0.2	0.69
CH4(ppm) Average	706	2.09	0.2	-	1.9	1.9	2	2	2.2	2.3	3.2
O3 (ppb) Average	687	13.3	8	-	3	4	6	12	19	25	34
NO2 (ppb) Average	707	10.8	7	-	0	2	5	11	15	20	32
NO (ppb) Average	707	4.7	10	-	0	0	0	1	4	13	83
NOX (ppb) Average	707	15.5	15	-	0	2	5	12	21	31	113
NH3 (ppb) Average	654	0	0	-	0	0	0	0	0	0	0
PM2.5 (ug/m3) Average	742	5.65	4.4	-	0.8	1.9	2.7	4.8	7.3	10.1	49.5
Wind Speed 10 m (km/h) Average	744	4.4	3	-	0	2	2	4	6	8	14
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	744	-11.46	6.5	-	-29.7	-20	-16.5	-11.6	-5.3	-4	3.6
Temperature 10 m (C) Average	744	-10.93	6.4	-	-28.2	-19.4	-16.3	-10.8	-5	-3.7	4.3
Relative Humidity (%) Average	744	81.4	7	-	54	74	77	81	86	92	94
Precipitation (mm) Total	744	-	-	7.44	-	-	-	-	-	-	-
Leaf Wetness (% of range) Average	744	0.8	1	-	0	0	0	1	1	2	12
Global Solar Radiation (W/m2) Average	744	11.1	28	-	0	0	0	0	5	35	200

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BERTHA GANTER Fort MCKAY (AMS 1)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2, TRS, THC, O3	16 Dec 2015 13:00	16 Dec 2015 13:00	1	Maintenance - manifold cleaning
THC	21 Dec 2015 11:00	21 Dec 2015 12:00	2	Maintenance - replaced fuel cylinder
O3	16 Dec 2015 14:00	17 Dec 2015 10:00	21	Unstable Operation - debris in reaction cells
NH3	01 Dec 2015 09:00	31 Dec 2015 10:00	48	Stabilization after daily span
NH3	30 Dec 2015 09:00	30 Dec 2015 10:00	2	Maintenance - reinitiated daily QA check



Summary of Hour Averages

Fort McKay - Bertha Ganter - December 2015

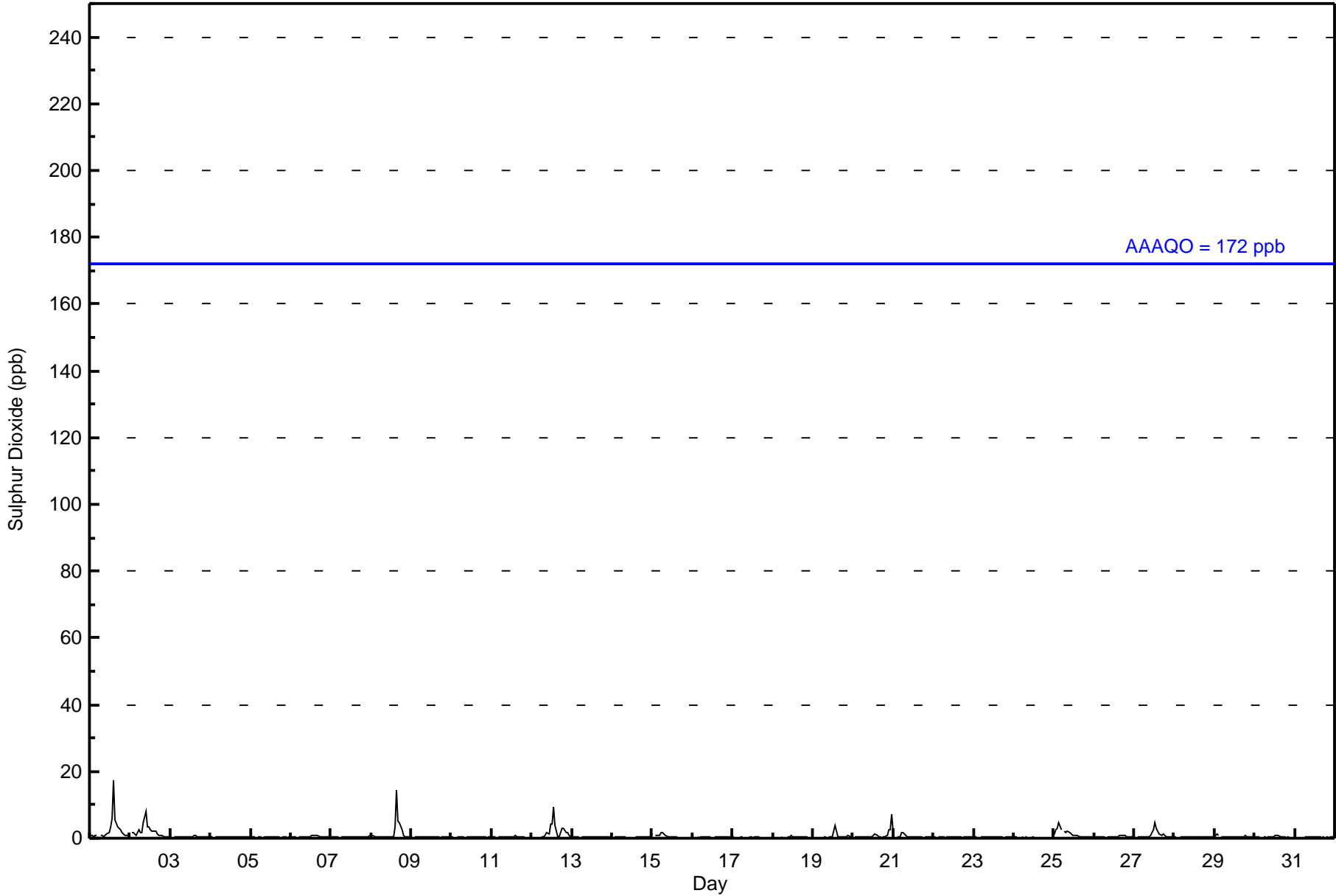
Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 17 ppb on Dec 1 15:00	Maximum Daily Average: 2.4 ppb on Dec 1		Hours of Data:	707
Minimum Value: 0 ppb on Dec 24 21:00	Minimum Daily Average: 0.2 ppb on Dec 24		Hours of Missing Data:	37
Maximum Diurnal Average: 1.4 ppb at hour 15	Minimum Diurnal Average: 0.4 ppb at hour 23		Hours of Calibration:	36
Monthly Average: 0.6 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 5		Percent Operational Time:	99.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	1	1	1	Z	1	1	1	1	1	2	3	6	17	5	3	3	3	2	1	1	1	1	2.4	17
2-Dec	Z	2	1	1	2	3	2	2	5	8	3	3	2	2	2	2	1	1	1	1	1	1	1	1	2.0	8
3-Dec	1	Z	1	0	0	0	0	0	1	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0.4	1
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0.4	1
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	0	0	0	0.4	1
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	1	0	1	0.4	1
8-Dec	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	3	14	5	4	3	1	0	0	0	0	1.6	14
9-Dec	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1
12-Dec	0	0	0	0	Z	0	0	0	1	2	1	4	4	9	4	1	0	2	3	3	2	2	1	1	1.7	9
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
14-Dec	Z	0	0	1	0	0	0	0	0	0	C	C	C	C	C	0	0	0	1	1	1	0	0	1	0.4	1
15-Dec	1	Z	1	1	1	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	2
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	M	1	0	0	0	0	0	0	0	0	0	0	0.3	1
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	2	4	2	1	0	0	0	0	1	1	1	0	0.6	4
20-Dec	Z	1	0	1	1	1	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	3	3	7	1.0	7
21-Dec	2	Z	1	0	0	2	2	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.5	2
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.2	1
25-Dec	1	3	3	5	3	Z	2	2	2	2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1.3	5
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0.4	1
27-Dec	0	Z	0	0	0	0	0	0	0	0	1	3	5	3	2	1	1	1	1	1	1	0	0	0	1.0	5
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
29-Dec	0	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0.4	1
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0.4	1
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0

0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.6	0.5	0.7	0.9	1.2	1.4	1.1	0.6	0.6	0.6	0.5	0.4	0.4	0.4	0.6	Diurnal Average
2	3	3	5	3	3	2	2	5	8	3	4	5	9	17	14	5	4	3	3	2	3	3	7	Diurnal Maximum	

Z - zerospan      C - Calibration      M - Maintenance  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	705	99.72	99.72
11 - 20	2	0.28	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	139	39	14	9	7	12	15	64	129	76	28	33	29	37	19	55	705
11 - 20	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	139	39	14	9	7	12	15	65	130	76	28	33	29	37	19	55	707

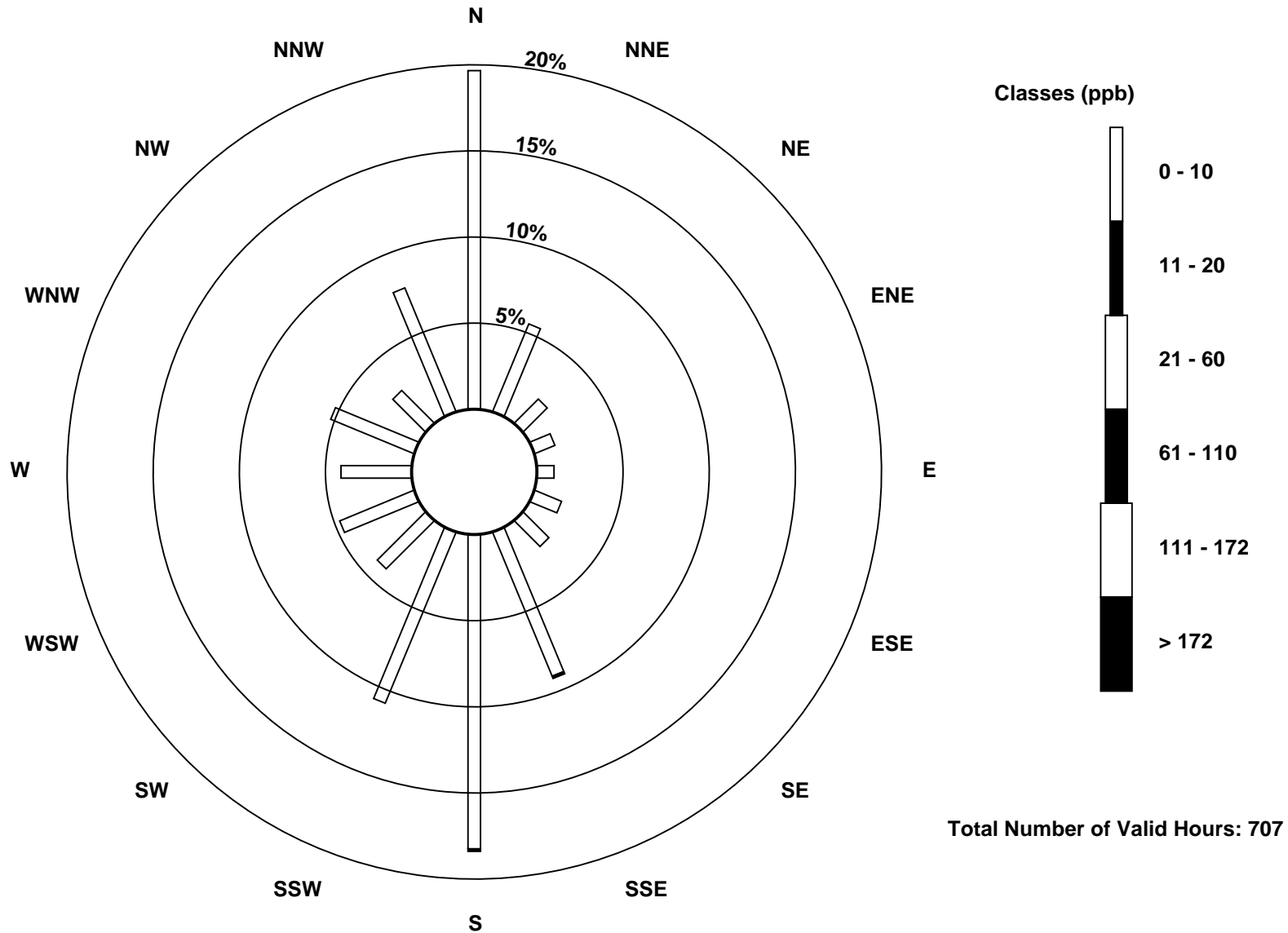
Total Number of Valid Hours: 707

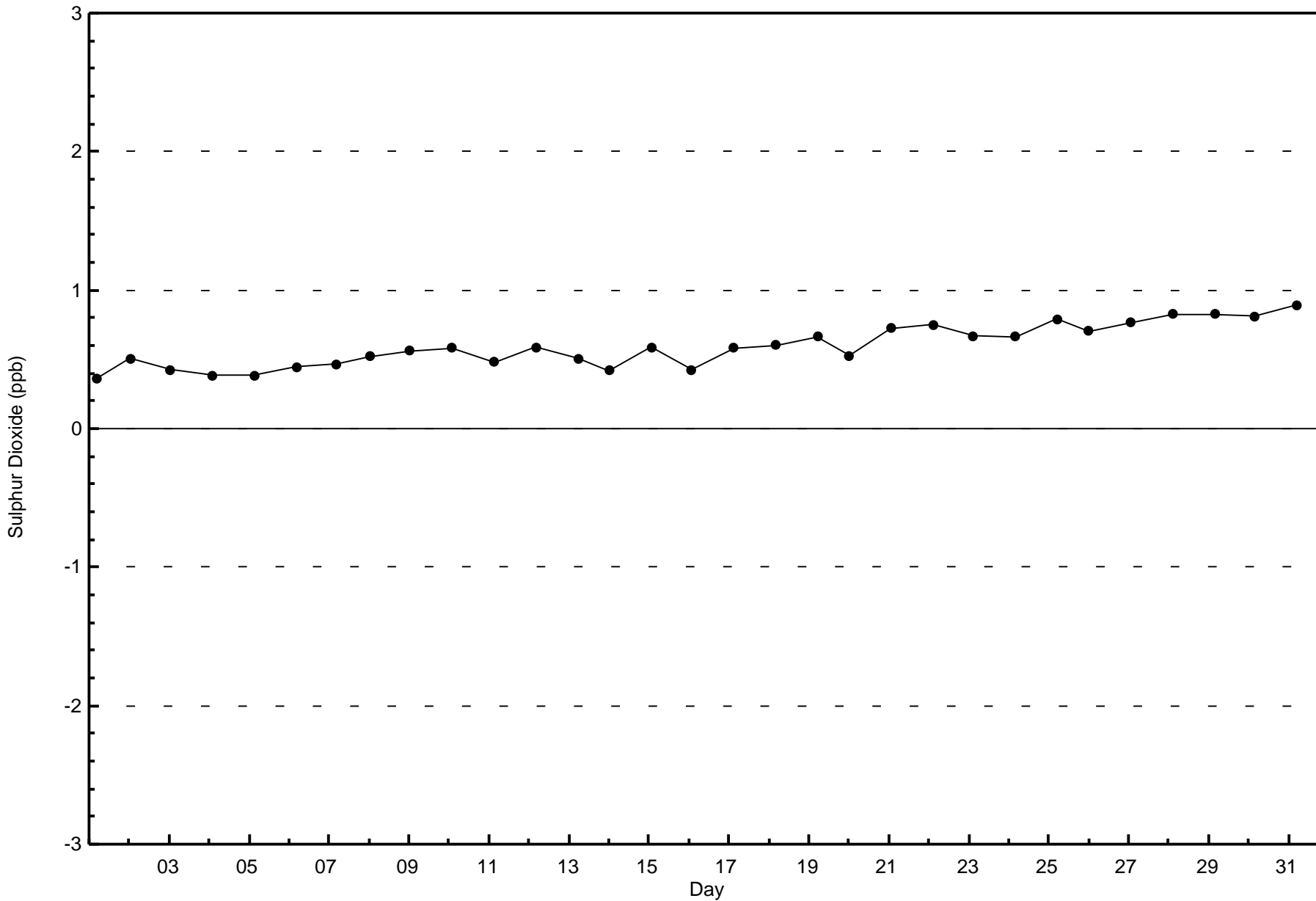
Total Number of Hours: 744

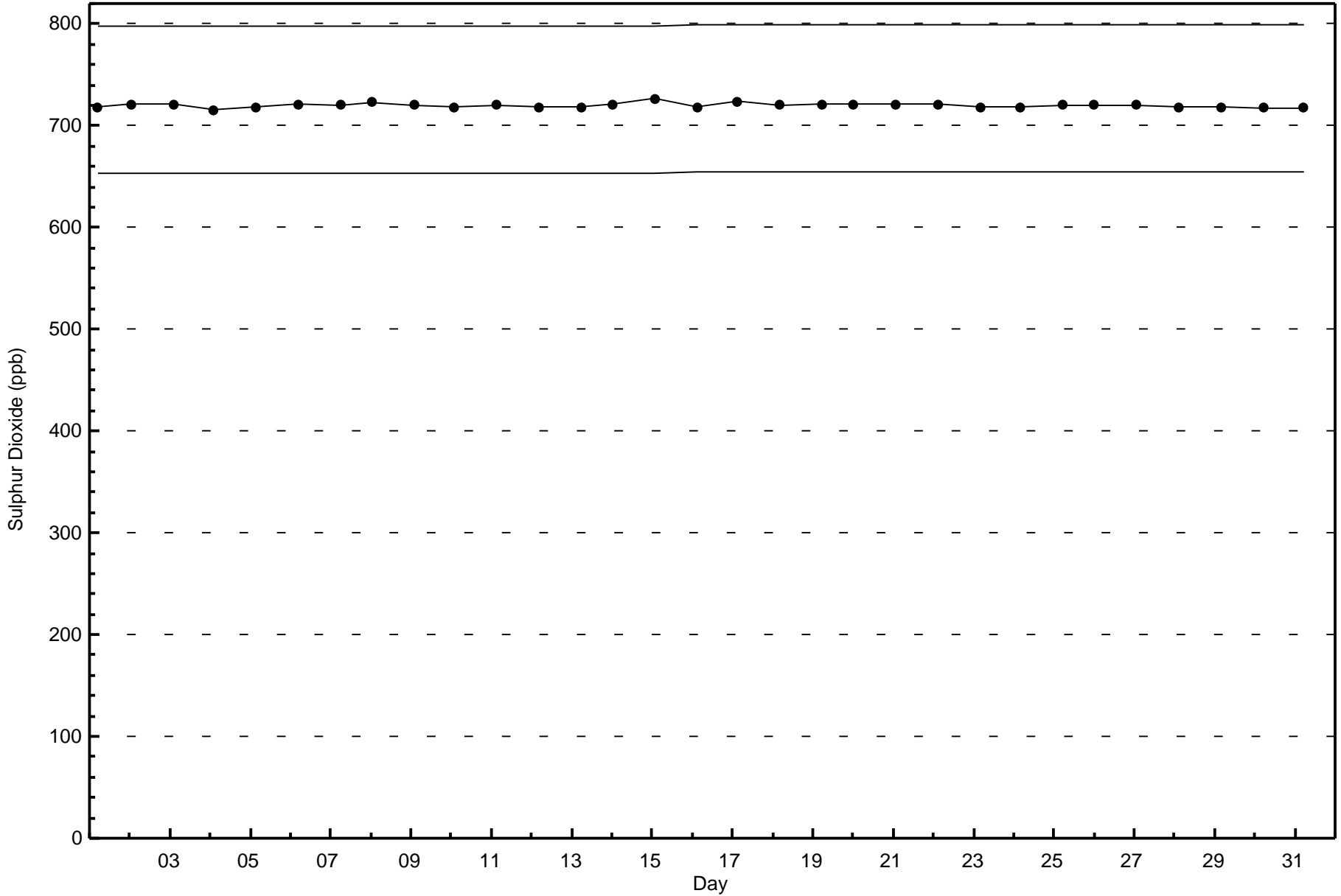


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Fort McKay - Bertha Ganter (AMS 1)

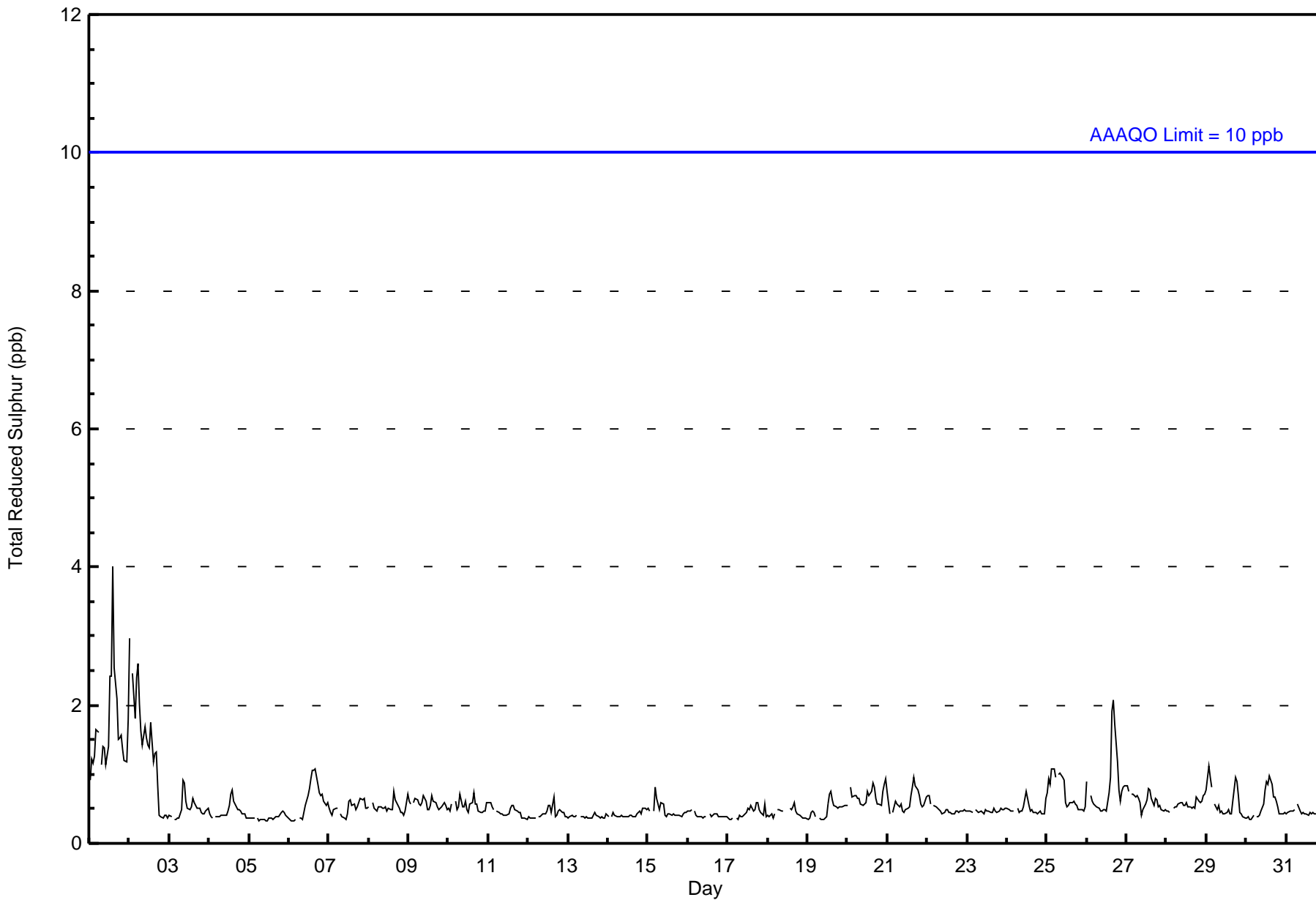








Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0																	Hours in Service: 744																																
Maximum Value: 4 ppb on Dec 1 15:00																	Maximum Daily Average: 1.6 ppb on Dec 1																																
Minimum Value: 0 ppb on Dec 6 03:00																	Minimum Daily Average: 0.4 ppb on Dec 5																																
Maximum Diurnal Average: 0.7 ppb at hour 15																	Minimum Diurnal Average: 0.5 ppb at hour 21																																
Monthly Average: 0.6 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 2																																
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	1	1	1	1	2	2	Z	1	1	1	1	1	2	2	4	3	2	2	2	2	1	1	1	2	1.6	4																							
2-Dec	3	Z	2	2	2	3	2	2	1	2	2	1	1	2	1	1	1	1	0	0	0	0	0	0	1.4	3																							
3-Dec	0	0	Z	0	0	0	0	0	1	1	1	1	0	1	1	1	1	0	1	0	0	0	0	0	0.5	1																							
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0.5	1																							
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																							
6-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1																							
7-Dec	1	0	0	0	1	0	Z	0	0	0	0	0	1	1	1	1	0	1	1	1	1	1	1	1	0.5	1																							
8-Dec	1	Z	1	1	0	0	1	1	1	1	1	0	1	0	0	1	1	1	1	0	0	0	0	1	0.5	1																							
9-Dec	1	1	Z	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	0	1	1	1	1	0	0.6	1																							
10-Dec	1	0	1	Z	1	0	1	1	1	1	1	0	0	1	1	1	1	1	0	0	0	0	0	1	0.5	1																							
11-Dec	1	1	1	0	Z	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.5	1																							
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0.4	1																							
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0																							
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.4	1																							
15-Dec	1	0	Z	0	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1																							
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0.4	0																							
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	0	0	1	0	0.4	1																							
18-Dec	0	0	0	0	0	Z	0	0	0	0	C	C	C	1	0	1	1	0	0	0	0	0	0	0	0.4	1																							
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1																							
20-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1																							
21-Dec	1	0	Z	0	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1																							
22-Dec	1	1	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1																							
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0.5	1																							
24-Dec	0	0	0	0	0	Z	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0.5	1																							
25-Dec	1	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0.7	1																							
26-Dec	1	Z	1	1	1	1	1	1	0	0	0	0	1	1	2	2	2	2	1	1	1	1	1	1	0.8	2																							
27-Dec	1	1	Z	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0.6	1																							
28-Dec	0	0	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1																							
29-Dec	1	1	1	1	Z	1	0	1	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0.6	1																							
30-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0.6	1																							
31-Dec	0	0	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1																							
																								0.6	0.5	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.5	0.6	Diurnal Average	
																								3	1	2	2	2	3	2	2	1	2	2	1	2	2	4	3	2	2	2	2	2	1	1	1	2	Diurnal Maximum
Z - zerospan      C - Calibration      M - Maintenance																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb      24-hr 3 ppb																																																	







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	705	99.44	99.44
3 - 4	4	0.56	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Fort McKay - Bertha Ganter - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	138	37	14	8	7	12	15	65	129	72	29	35	33	34	19	58	705
3 - 4	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	4
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	138	37	14	8	7	12	15	65	131	74	29	35	33	34	19	58	709

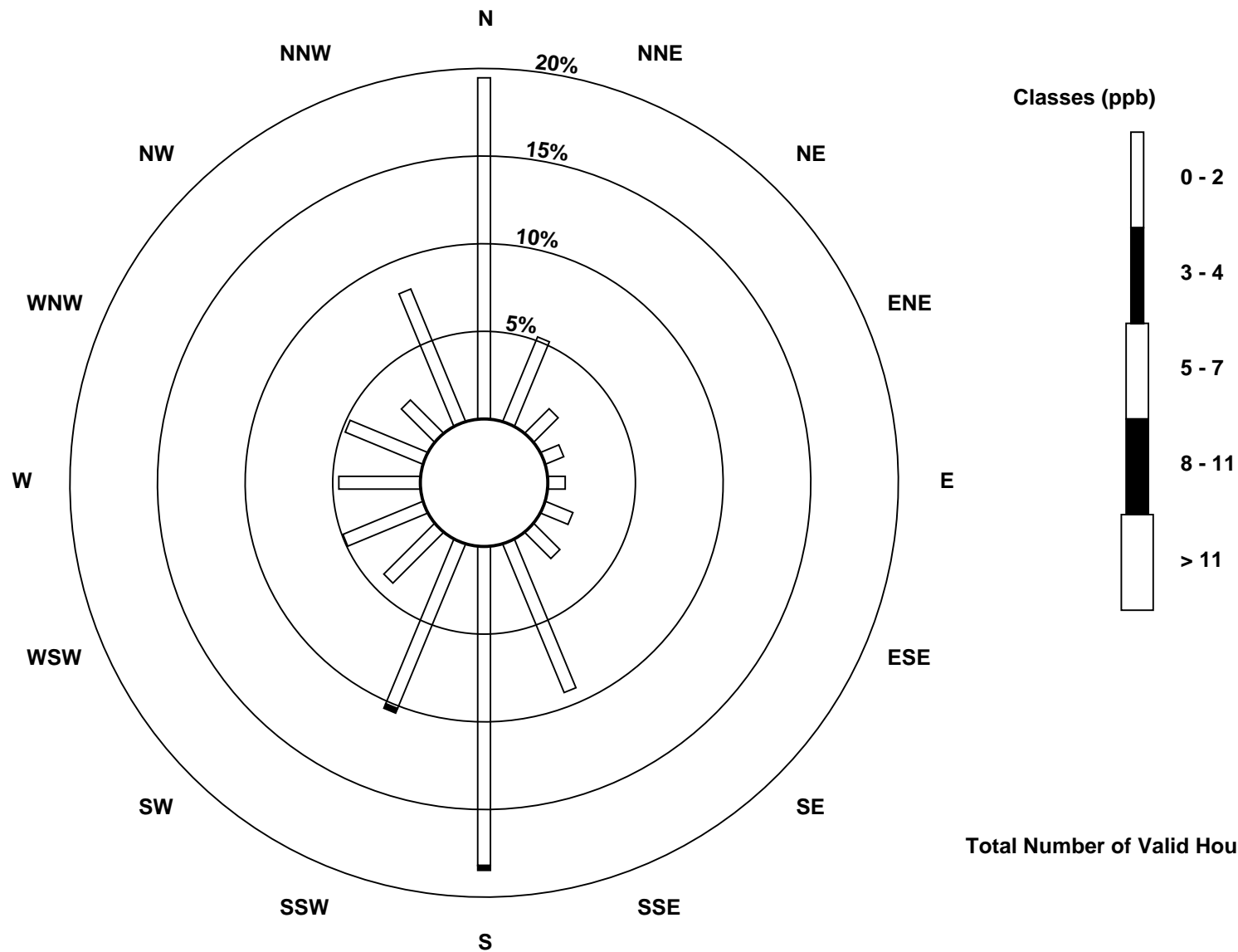
Total Number of Valid Hours: 709

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

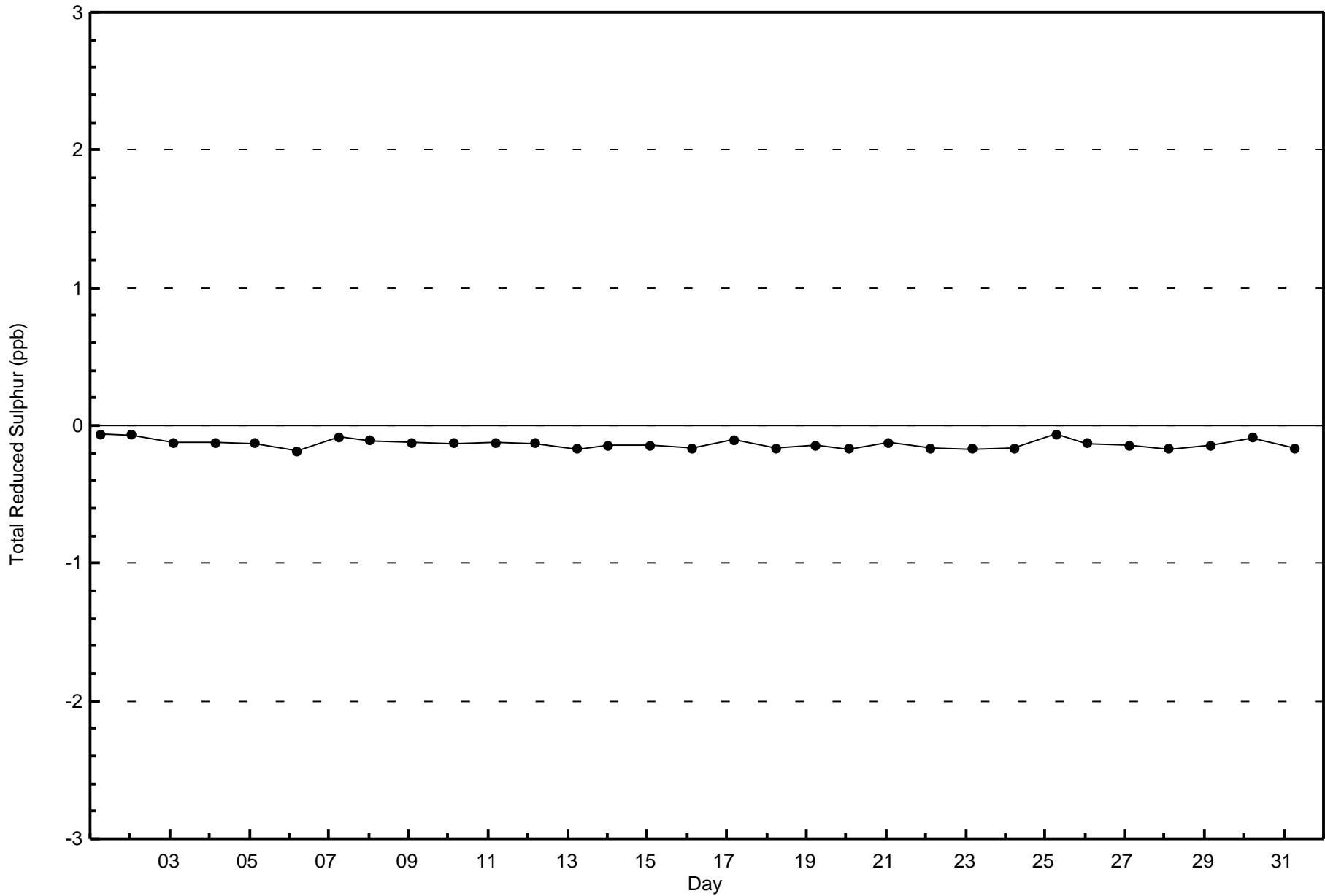
Total Reduced Sulphur (TRS) - ppb  
Fort McKay - Bertha Ganter (AMS 1)

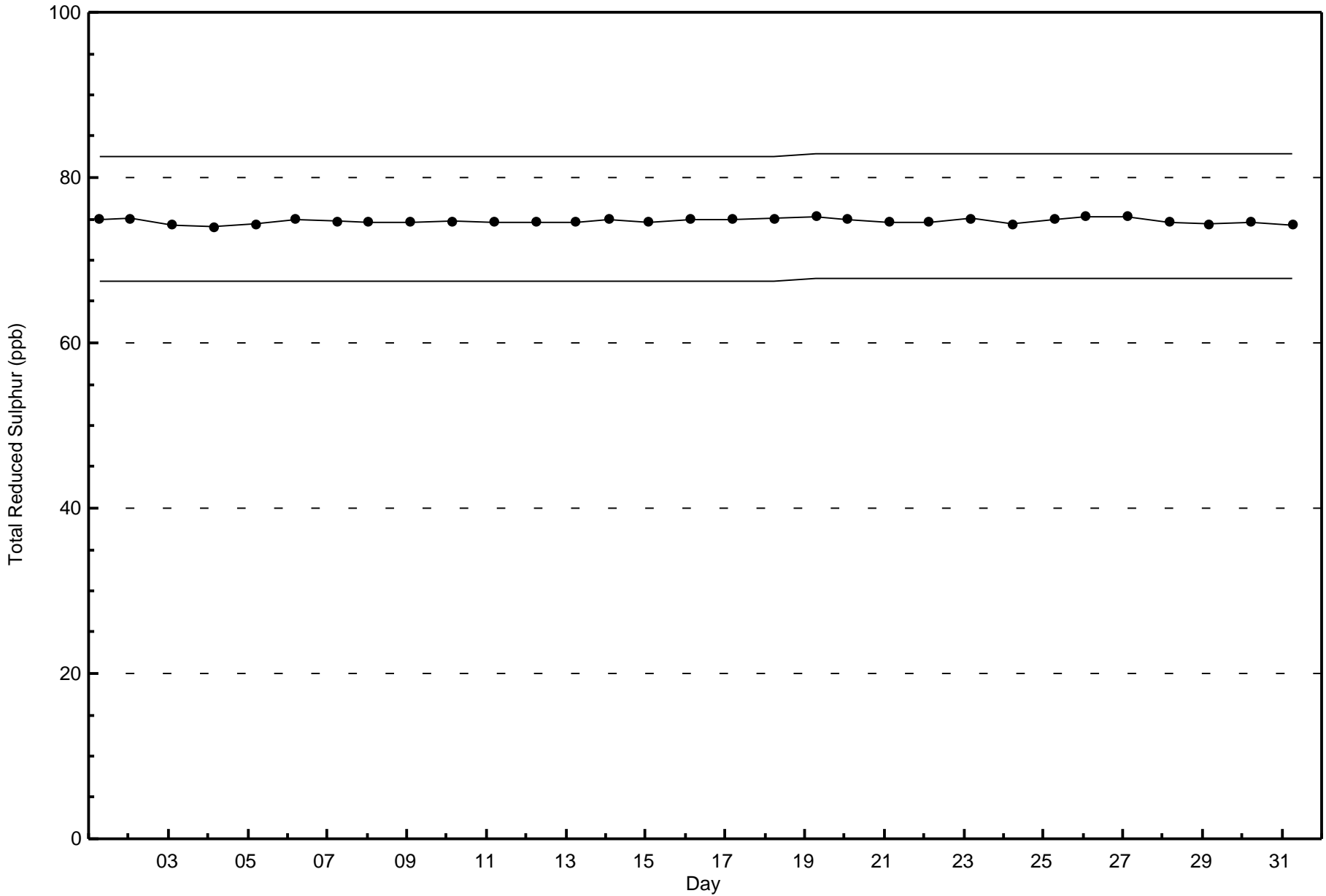




Wood Buffalo Environmental Association  
Zero Responses

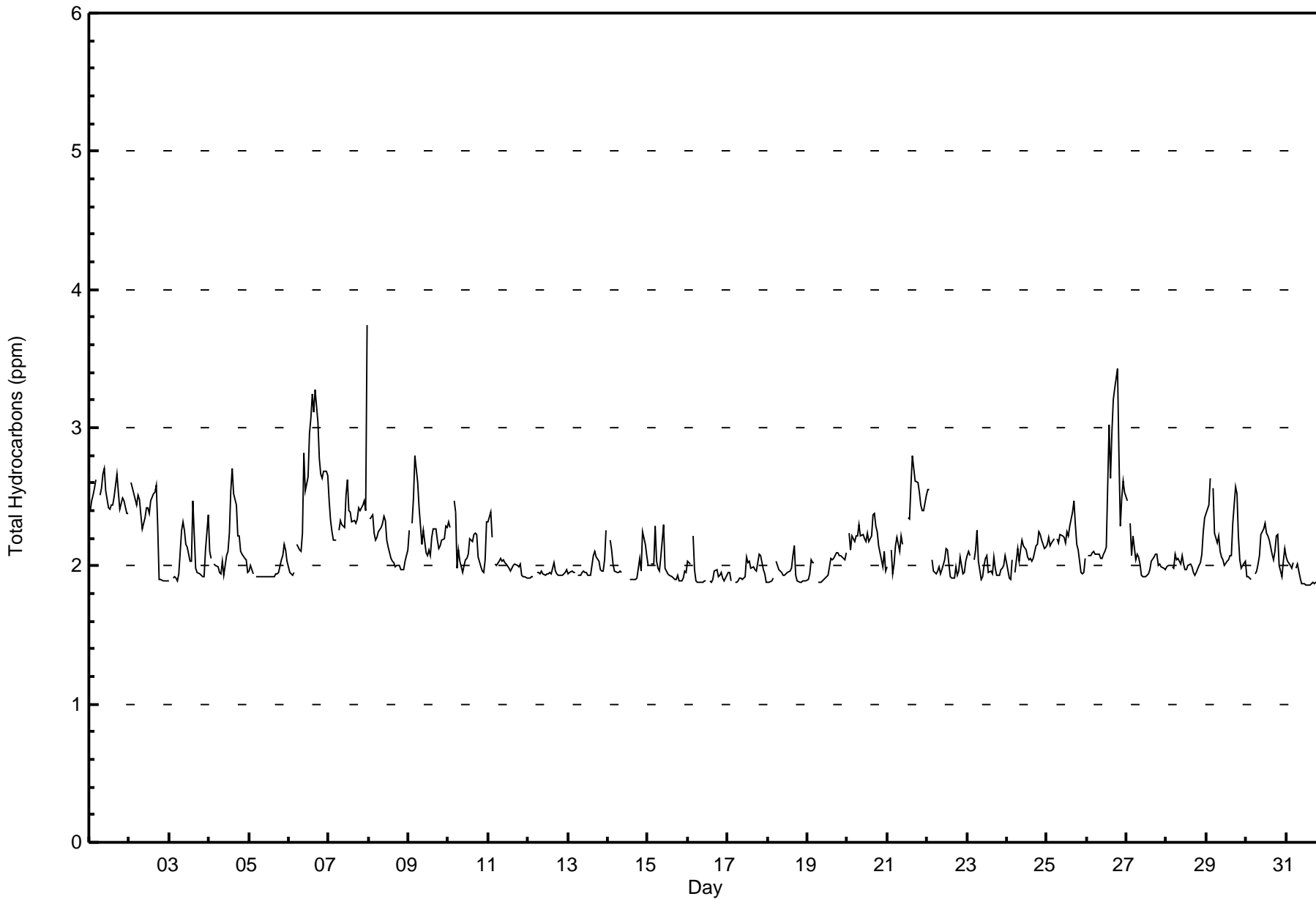
Total Reduced Sulphur (TRS) - ppb  
Fort McKay - Bertha Ganter - December 2015







Maximum Value: 3.7 ppm on Dec 8 00:00      Maximum Daily Average: 2.6 ppm on Dec 6 Minimum Value: 1.9 ppm on Dec 31 14:00      Minimum Daily Average: 1.9 ppm on Dec 16 Maximum Diurnal Average: 2.2 ppm at hour 17      Minimum Diurnal Average: 2.1 ppm at hour 6 Monthly Average: 2.13 ppm      Percentiles: P <sub>1</sub> = 1.9 P <sub>10</sub> = 1.9 Q <sub>1</sub> = 2.0 Median = 2.0 Q <sub>3</sub> = 2.2 P <sub>90</sub> = 2.5 P <sub>99</sub> = 3.1																				Hours in Service: 744 Hours of Data: 706 Hours of Missing Data: 38 Hours of Calibration: 35 Percent Operational Time: 99.6							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	2.4	2.5	2.5	2.6	2.6	Z	2.5	2.6	2.7	2.7	2.5	2.4	2.4	2.4	2.4	2.5	2.7	2.5	2.4	2.4	2.5	2.5	2.4	2.4	2.5	2.7	
2-Dec	Z	2.6	2.6	2.5	2.4	2.5	2.5	2.4	2.3	2.3	2.4	2.4	2.4	2.5	2.5	2.5	2.6	2.3	1.9	1.9	1.9	1.9	1.9	1.9	2.3	2.6	
3-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	2.3	2.3	2.3	2.2	2.1	2.0	2.0	2.5	2.2	2.0	1.9	1.9	1.9	1.9	1.9	2.1	2.4	2.1	2.5	
4-Dec	2.1	2.1	Z	2.0	2.0	2.0	2.0	1.9	2.0	1.9	2.1	2.1	2.2	2.5	2.7	2.5	2.4	2.2	2.2	2.1	2.0	2.0	2.0	2.0	2.1	2.7	
5-Dec	2.0	2.0	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.2	2.1	2.0	2.0	2.2	
6-Dec	2.0	1.9	1.9	2.0	Z	2.2	2.1	2.1	2.2	2.8	2.5	2.6	3.0	3.1	3.2	3.1	3.3	3.0	2.8	2.7	2.6	2.7	2.7	2.7	2.6	3.3	
7-Dec	2.5	2.3	2.2	2.2	2.2	Z	2.3	2.3	2.3	2.3	2.5	2.6	2.4	2.4	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.4	3.7	2.4	3.7	
8-Dec	Z	2.3	2.4	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.3	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.4	
9-Dec	2.3	Z	2.3	2.5	2.8	2.6	2.4	2.3	2.2	2.3	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.2	2.1	2.1	2.2	2.2	2.3	2.3	2.3	2.8	
10-Dec	2.3	2.3	Z	2.5	2.4	2.0	2.1	2.0	1.9	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.2	2.2	2.1	2.0	2.0	1.9	2.0	2.3	2.1	2.5	
11-Dec	2.3	2.4	2.2	Z	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.4	
12-Dec	1.9	1.9	1.9	1.9	Z	2.0	2.0	1.9	2.0	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	2.0	
13-Dec	1.9	2.0	2.0	2.0	2.0	Z	1.9	1.9	1.9	2.0	2.0	1.9	1.9	1.9	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.3	2.0	2.0	2.3	
14-Dec	Z	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	C	C	C	C	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.0	2.2	2.2	2.1	2.0	2.2
15-Dec	2.0	Z	2.0	2.0	2.3	2.0	2.0	2.0	2.1	2.3	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.3	
16-Dec	2.0	2.0	Z	2.2	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	M	1.9	1.9	1.9	2.0	2.0	1.9	1.9	2.0	1.9	1.9	1.9	1.9	2.2	
17-Dec	2.0	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	1.9	1.9	2.0	2.1	
18-Dec	1.9	1.9	1.9	1.9	Z	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	
19-Dec	1.9	1.9	2.0	2.0	2.0	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.0	2.1	
20-Dec	Z	2.2	2.1	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4	2.4	2.3	2.2	2.1	2.0	2.0	2.1	2.0	2.2	2.4	
21-Dec	2.0	Z	2.1	1.9	2.0	2.1	2.2	2.1	2.2	2.2	M	M	2.3	2.3	2.6	2.8	2.7	2.6	2.6	2.5	2.4	2.4	2.4	2.5	2.3	2.8	
22-Dec	2.6	2.5	Z	2.0	2.0	1.9	2.0	2.0	1.9	2.0	2.0	2.1	2.1	2.0	1.9	1.9	1.9	2.0	1.9	2.0	2.1	1.9	2.0	2.0	2.0	2.6	
23-Dec	2.1	2.1	2.1	Z	2.0	2.1	2.3	2.0	1.9	1.9	2.0	2.1	2.1	2.1	2.0	1.9	2.1	2.0	1.9	1.9	2.0	2.0	2.0	2.1	2.0	2.3	
24-Dec	2.0	1.9	1.9	2.0	Z	1.9	2.1	2.0	2.1	2.2	2.1	2.1	2.1	2.1	2.0	2.1	2.0	2.1	2.1	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.3
25-Dec	2.2	2.2	2.1	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.5	2.3	2.2	2.1	2.0	1.9	2.0	2.1	2.2	2.5
26-Dec	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	3.0	2.6	3.0	3.2	3.3	3.4	2.8	2.3	2.5	2.6	2.5	2.4	3.4	
27-Dec	2.5	Z	2.3	2.1	2.2	2.0	2.1	2.1	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.5	
28-Dec	2.0	2.0	Z	2.0	2.0	2.1	2.0	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.1	2.3	2.4	2.0	2.4	
29-Dec	2.4	2.4	2.6	Z	2.6	2.2	2.2	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.3	2.6	2.5	2.2	2.0	2.0	2.0	2.0	2.2	2.6
30-Dec	1.9	1.9	1.9	1.9	Z	1.9	2.0	2.0	2.1	2.2	2.3	2.3	2.2	2.2	2.2	2.1	2.0	2.1	2.2	2.2	2.0	1.9	2.0	2.1	2.1	2.3	
31-Dec	2.1	2.0	2.0	2.0	2.0	Z	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	2.0	2.0	1.9	2.1	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan      C - Calibration      M - Maintenance																											





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	365	51.70	51.70
2.1 - 3.0	333	47.17	98.87
3.1 - 10.0	8	1.13	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration</b> <b>Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	73	23	11	6	5	10	11	48	44	30	17	20	19	20	6	22	365
2.1 - 3.0	66	16	3	3	2	2	3	16	85	46	10	12	10	17	13	29	333
3.1 - 10.0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	4	8
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	139	39	14	9	7	12	15	65	129	76	28	33	29	37	19	55	706

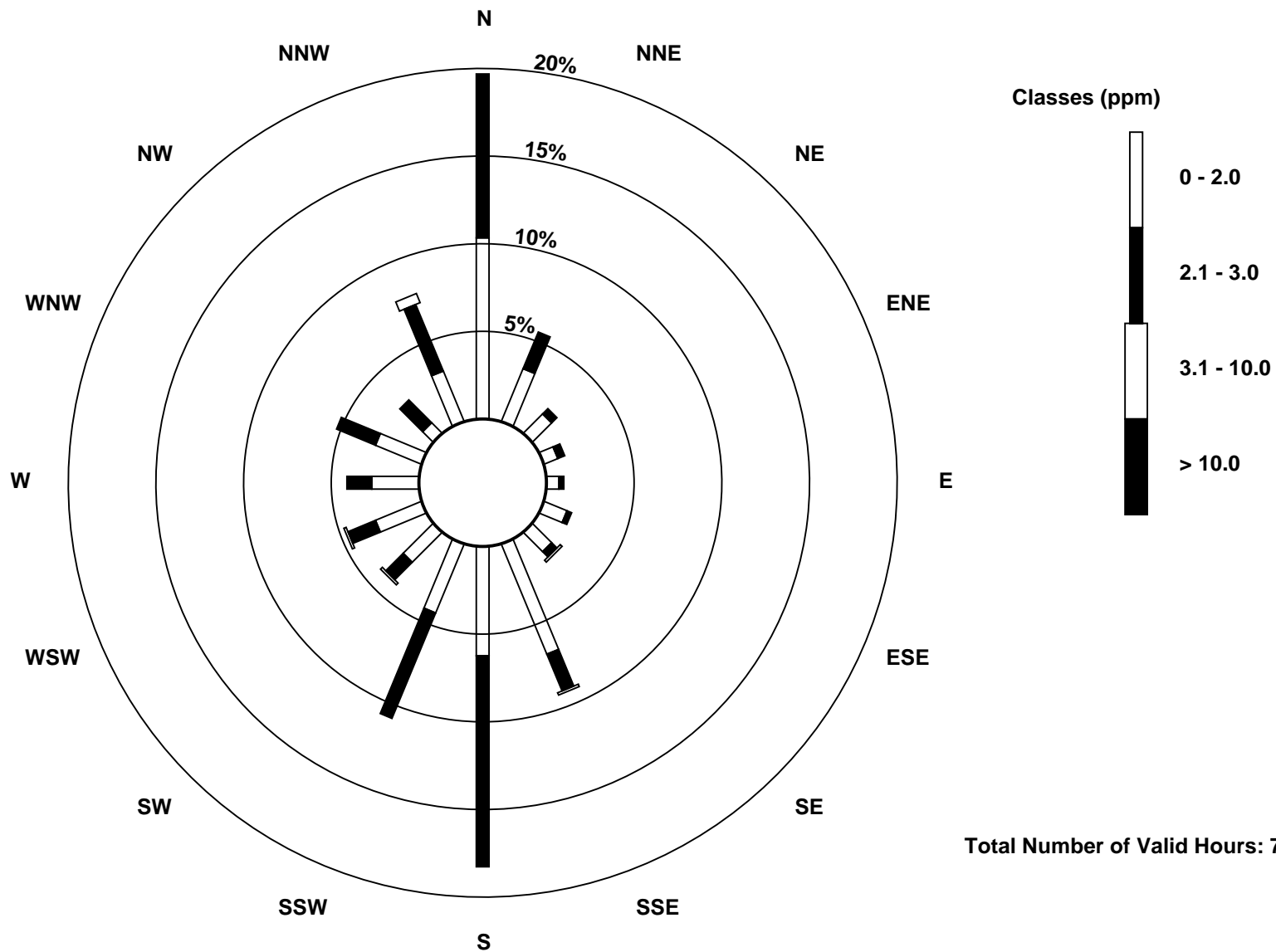
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Total Hydrocarbons (THC) - ppm  
Fort McKay - Bertha Ganter (AMS 1)



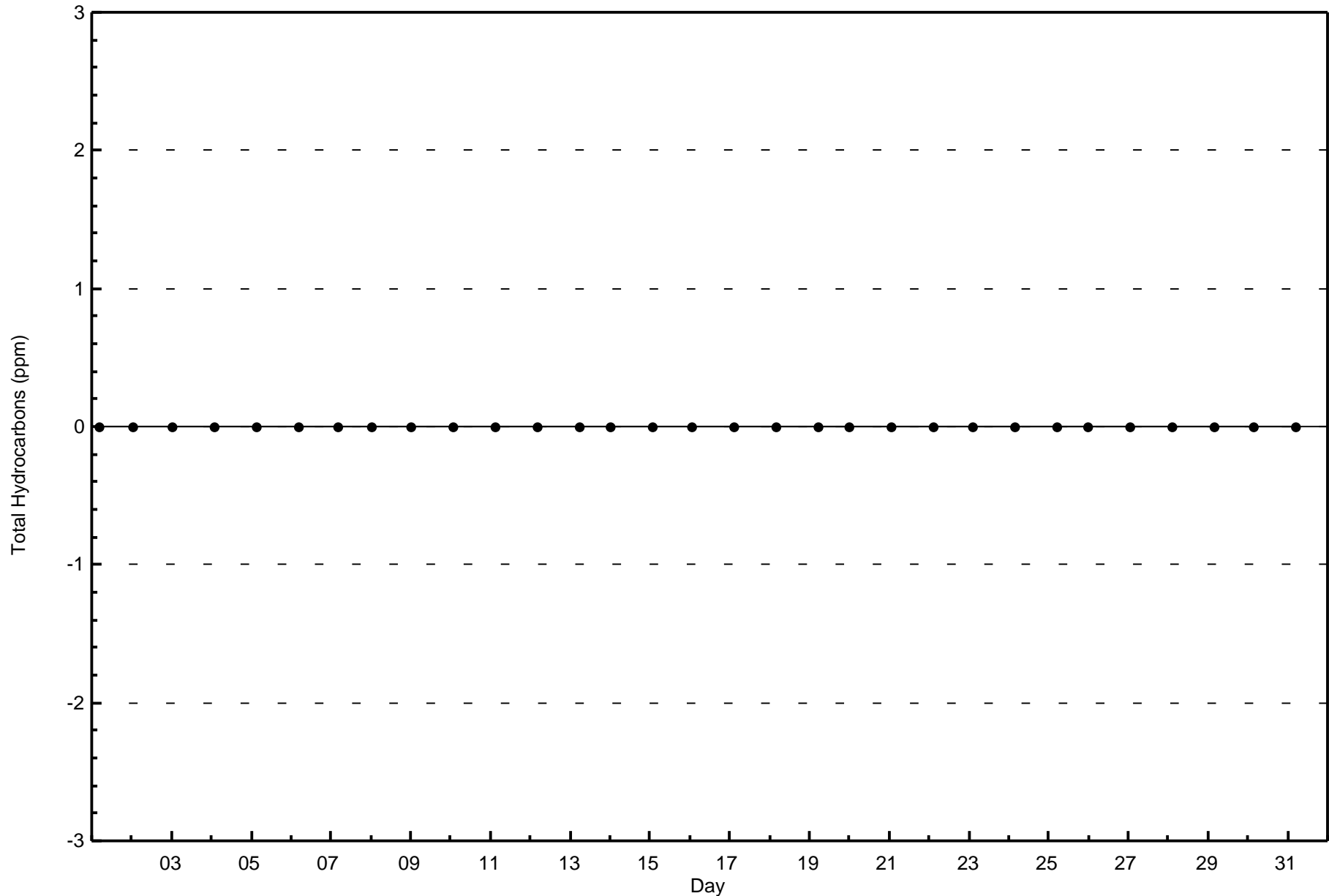


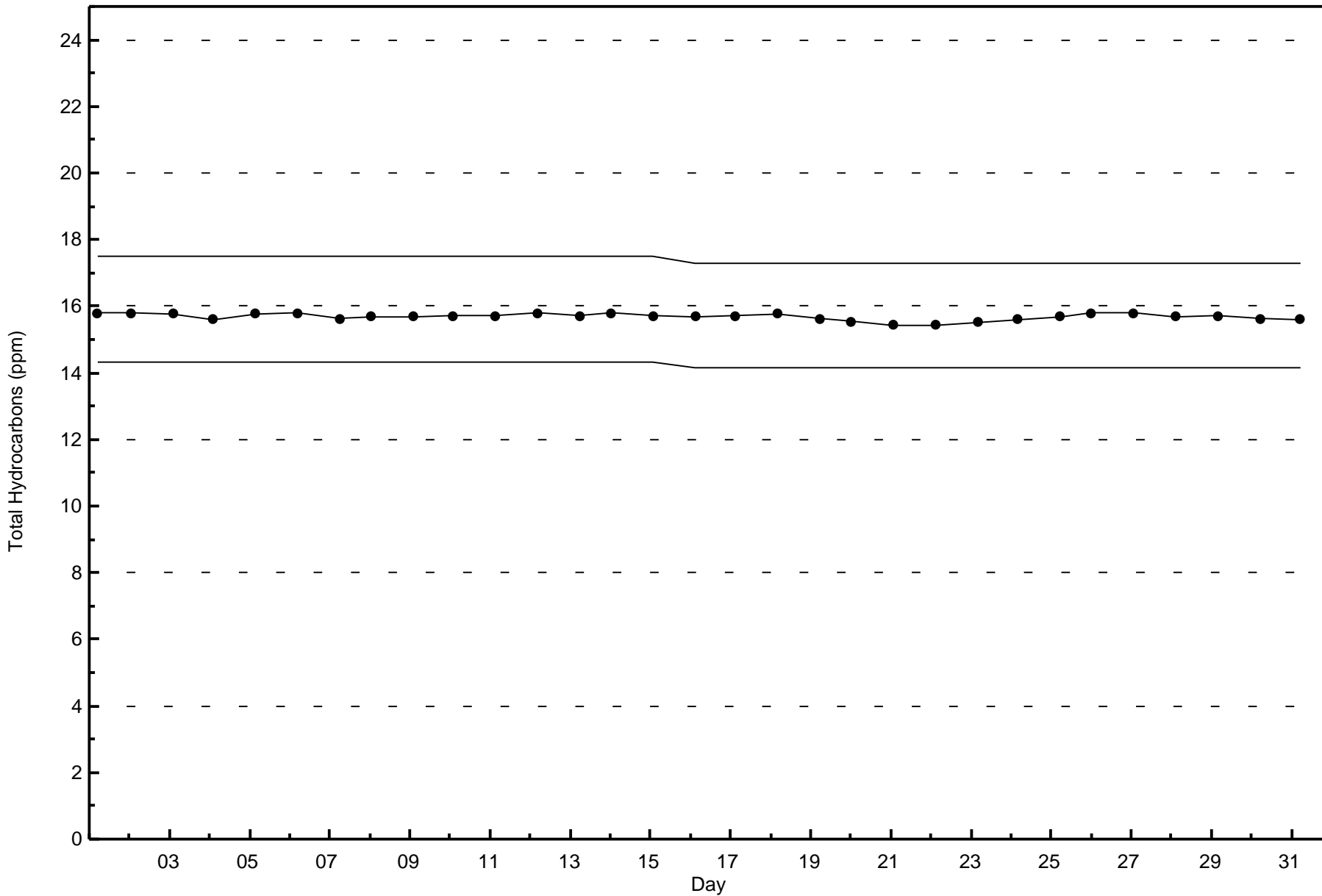
Wood Buffalo Environmental Association

Zero Responses

Total Hydrocarbons (THC) - ppm

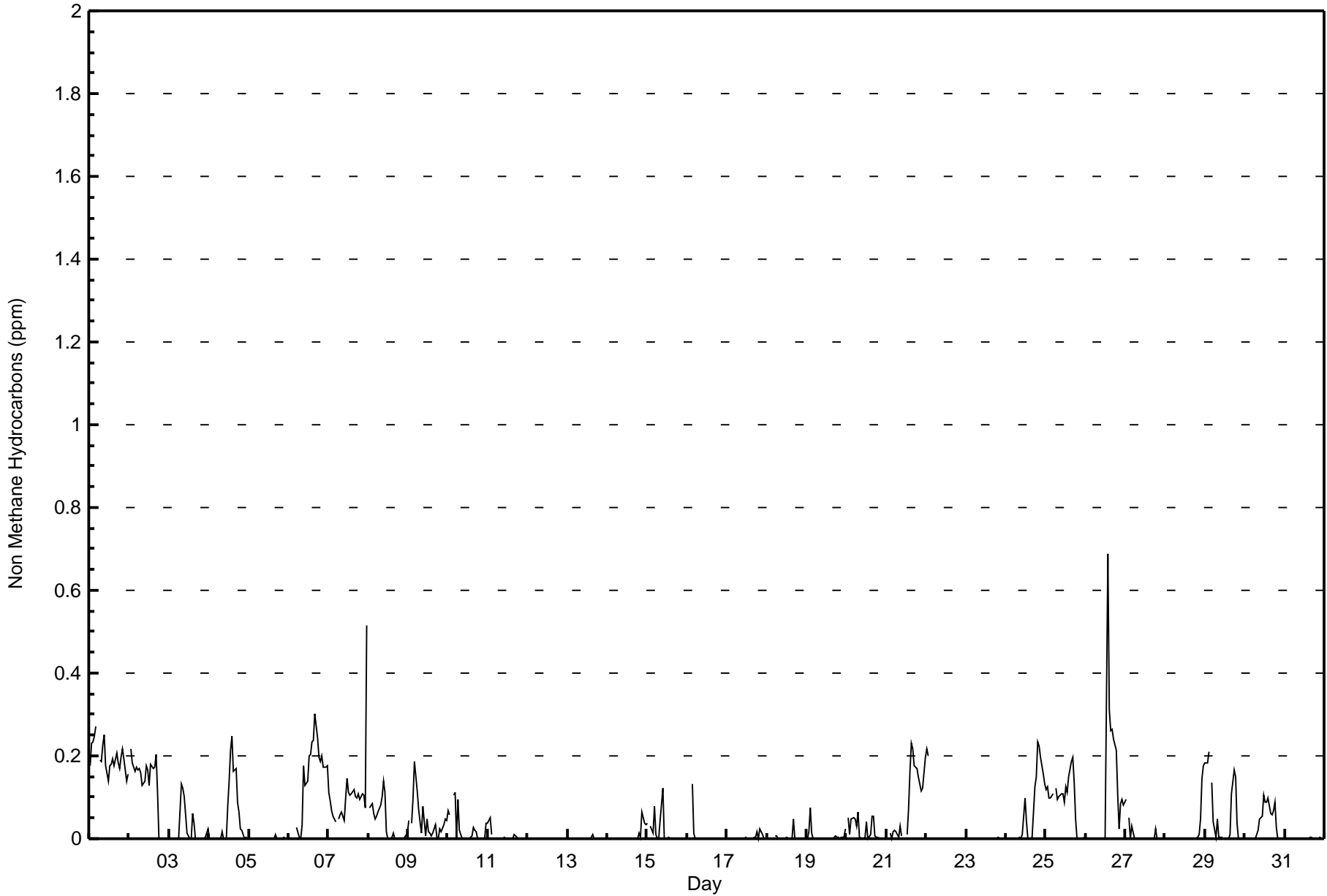
Fort McKay - Bertha Ganter - December 2015







Maximum Value: 0.690 ppm on Dec 26 14:00		Maximum Daily Average: 0.196 ppm on Dec 1		Hours in Service:	744																					
Minimum Value: 0.000 ppm on Dec 2 19:00		Minimum Daily Average: 0.000 ppm on Dec 12		Hours of Data:	706																					
Maximum Diurnal Average: 0.065 ppm at hour 17		Minimum Diurnal Average: 0.020 ppm at hour 6		Hours of Missing Data:	38																					
Monthly Average: 0.042 ppm		Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.1 P <sub>90</sub> = 0.2 P <sub>99</sub> = 0.3		Hours of Calibration:	35																					
				Percent Operational Time:	99.6																					
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0.175	0.229	0.233	0.247	0.270	Z	0.188	0.185	0.226	0.251	0.178	0.138	0.178	0.181	0.194	0.175	0.207	0.185	0.171	0.195	0.217	0.194	0.140	0.156	0.196	0.270
2-Dec	Z	0.215	0.184	0.162	0.174	0.168	0.170	0.159	0.128	0.140	0.175	0.167	0.129	0.181	0.170	0.173	0.204	0.112	0.000	0.000	0.000	0.000	0.000	0.000	0.122	0.215
3-Dec	0.000	Z	0.000	0.001	0.000	0.000	0.000	0.134	0.123	0.103	0.059	0.014	0.000	0.002	0.060	0.037	0.002	0.000	0.000	0.000	0.000	0.000	0.003	0.024	0.024	0.134
4-Dec	0.001	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.015	0.000	0.002	0.079	0.140	0.213	0.248	0.164	0.171	0.088	0.065	0.025	0.021	0.000	0.003	0.000	0.054	0.248
5-Dec	0.000	0.000	0.000	Z	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.001	0.001	0.003	0.000	0.000	0.001	0.010
6-Dec	0.000	0.000	0.000	0.000	Z	0.027	0.002	0.001	0.034	0.176	0.127	0.139	0.200	0.202	0.234	0.237	0.300	0.244	0.197	0.188	0.200	0.172	0.172	0.177	0.132	0.300
7-Dec	0.114	0.091	0.067	0.055	0.041	Z	0.049	0.058	0.064	0.046	0.099	0.147	0.113	0.104	0.108	0.117	0.103	0.099	0.107	0.095	0.108	0.104	0.076	0.516	0.108	0.516
8-Dec	Z	0.073	0.086	0.061	0.046	0.055	0.064	0.080	0.101	0.139	0.114	0.017	0.001	0.000	0.002	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.014	0.038	0.139
9-Dec	0.044	Z	0.038	0.097	0.186	0.114	0.070	0.040	0.015	0.078	0.007	0.046	0.015	0.012	0.008	0.013	0.035	0.003	0.000	0.023	0.016	0.032	0.046	0.043	0.043	0.186
10-Dec	0.069	0.057	Z	0.105	0.112	0.000	0.097	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.028	0.021	0.016	0.001	0.000	0.001	0.000	0.000	0.038	0.025	0.112
11-Dec	0.036	0.050	0.012	Z	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.011	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.050
12-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.004	0.010	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.010
14-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	C	C	C	C	0.000	0.000	0.000	0.000	0.000	0.013	0.004	0.066	0.037	0.033	0.008	0.066
15-Dec	0.038	Z	0.030	0.015	0.077	0.012	0.001	0.000	0.045	0.123	0.000	0.000	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.015	0.123
16-Dec	0.000	0.000	Z	0.131	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	M	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.131
17-Dec	0.000	0.000	0.000	Z	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.003	0.005	0.015	0.001	0.024	0.010	0.000	0.001	0.003	0.024
18-Dec	0.000	0.000	0.000	0.000	Z	0.007	0.007	0.001	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.048
19-Dec	0.000	0.016	0.074	0.013	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.004	0.003	0.002	0.002	0.004	0.023	0.006	0.074
20-Dec	Z	0.050	0.011	0.049	0.050	0.046	0.031	0.065	0.002	0.001	0.001	0.002	0.041	0.000	0.009	0.055	0.053	0.006	0.003	0.004	0.000	0.000	0.000	0.000	0.021	0.065
21-Dec	0.000	Z	0.013	0.000	0.018	0.020	0.018	0.002	0.029	0.006	M	M	0.009	0.071	0.162	0.230	0.216	0.176	0.171	0.148	0.133	0.117	0.123	0.197	0.089	0.230
22-Dec	0.216	0.199	Z	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.018	0.216
23-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.004
24-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.003	0.000	0.009	0.099	0.039	0.000	0.002	0.004	0.124	0.149	0.233	0.222	0.196	0.155	0.132	0.059	0.233	
25-Dec	0.119	0.127	0.099	0.097	0.107	Z	0.122	0.096	0.103	0.107	0.108	0.089	0.125	0.112	0.150	0.186	0.198	0.136	0.048	0.000	0.000	0.000	0.000	0.002	0.093	0.198
26-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.690	0.313	0.260	0.266	0.241	0.213	0.105	0.023	0.083	0.095	0.082	0.103	0.690
27-Dec	0.094	Z	0.049	0.002	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.002	0.023	0.000	0.000	0.000	0.000	0.000	0.009	0.094
28-Dec	0.000	0.000	Z	0.000	0.000	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.010	0.049	0.147	0.177	0.017	0.177
29-Dec	0.182	0.182	0.211	Z	0.136	0.042	0.002	0.047	0.002	0.002	0.003	0.000	0.001	0.001	0.001	0.010	0.107	0.168	0.148	0.039	0.000	0.001	0.001	0.000	0.056	0.211
30-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.011	0.020	0.049	0.056	0.105	0.089	0.089	0.097	0.060	0.056	0.069	0.087	0.028	0.000	0.000	0.000	0.000	0.035	0.105
31-Dec	0.003	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.005	0.000	0.000	0.001	0.000	0.004	0.000	0.000	0.001	0.005
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan      C - Calibration      M - Maintenance																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.005	429	60.76	60.76
0.006 - 0.05	97	13.74	74.50
0.06 - 0.1	101	14.31	88.81
> 0.1	79	11.19	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

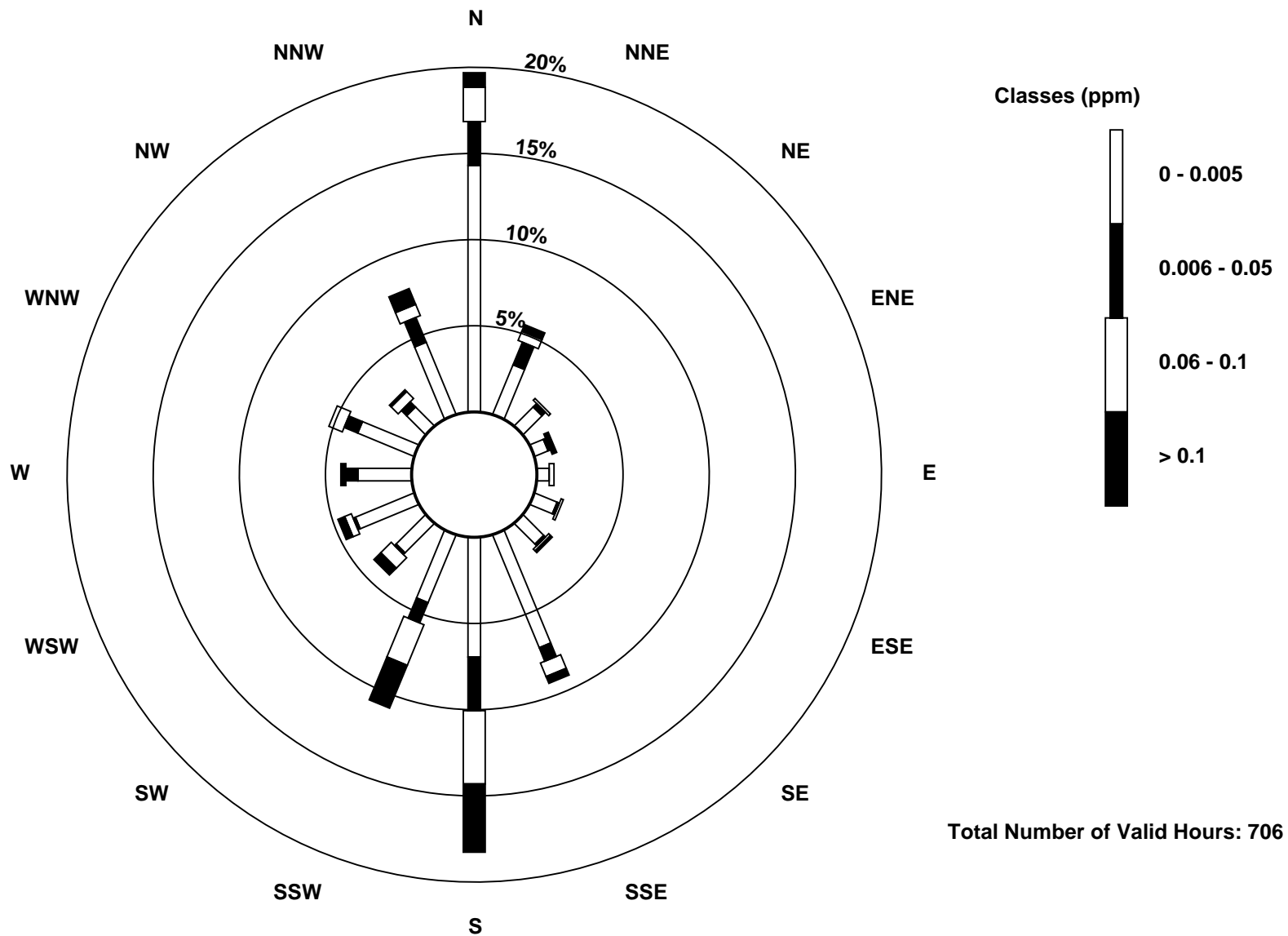
**Non Methane Hydrocarbons (NMHC) - ppm**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration</b> <b>Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	101	22	11	6	5	10	12	50	49	30	17	26	22	25	11	32	429
0.006 - 0.05	18	10	2	1	0	1	1	6	22	9	1	1	5	6	3	11	97
0.06 - 0.1	14	4	1	0	2	1	1	6	30	18	6	3	0	6	4	5	101
> 0.1	6	3	0	2	0	0	1	3	28	19	4	3	2	0	1	7	79
<b>Totals</b>	139	39	14	9	7	12	15	65	129	76	28	33	29	37	19	55	706

Total Number of Valid Hours: 706

Total Number of Hours: 744

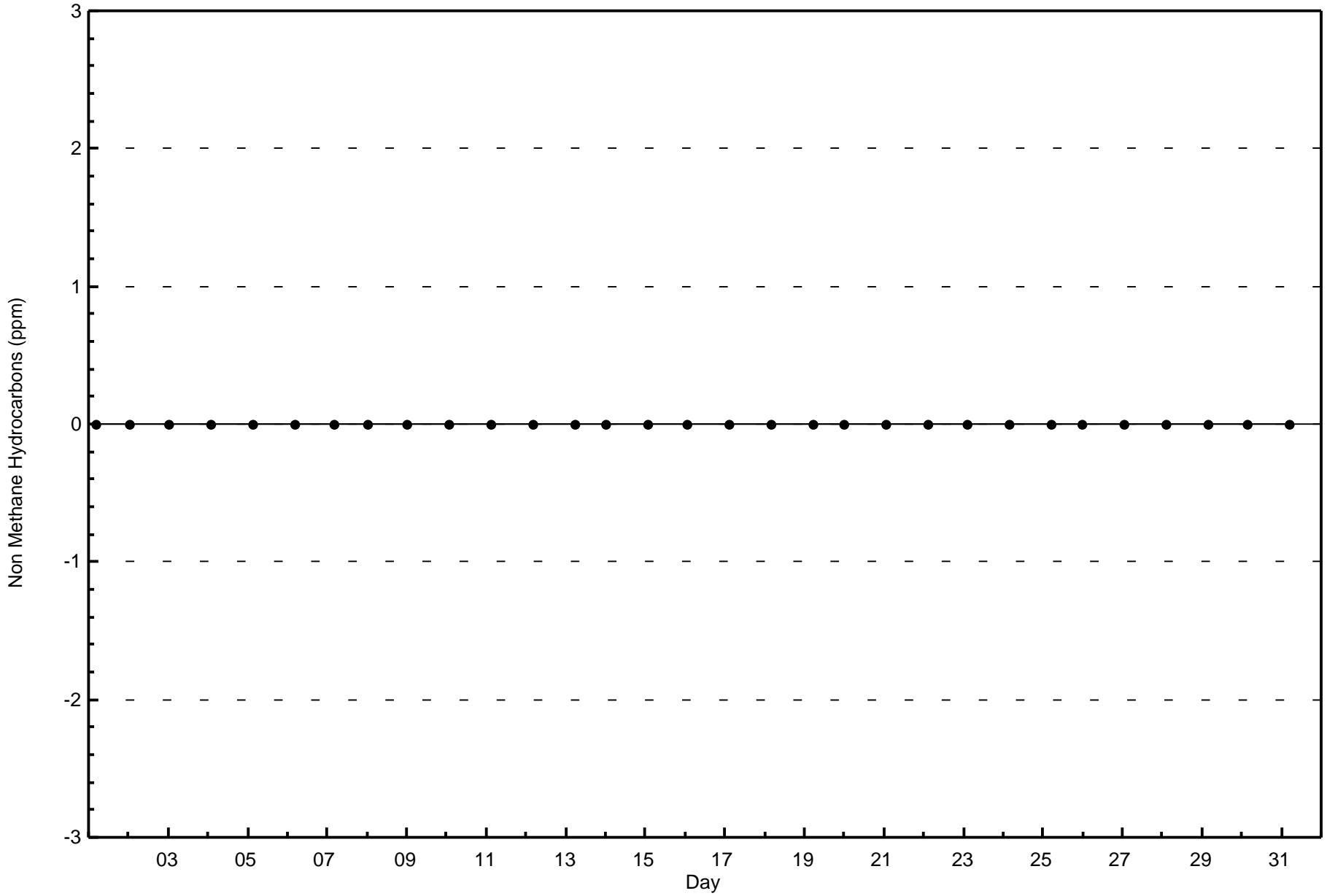


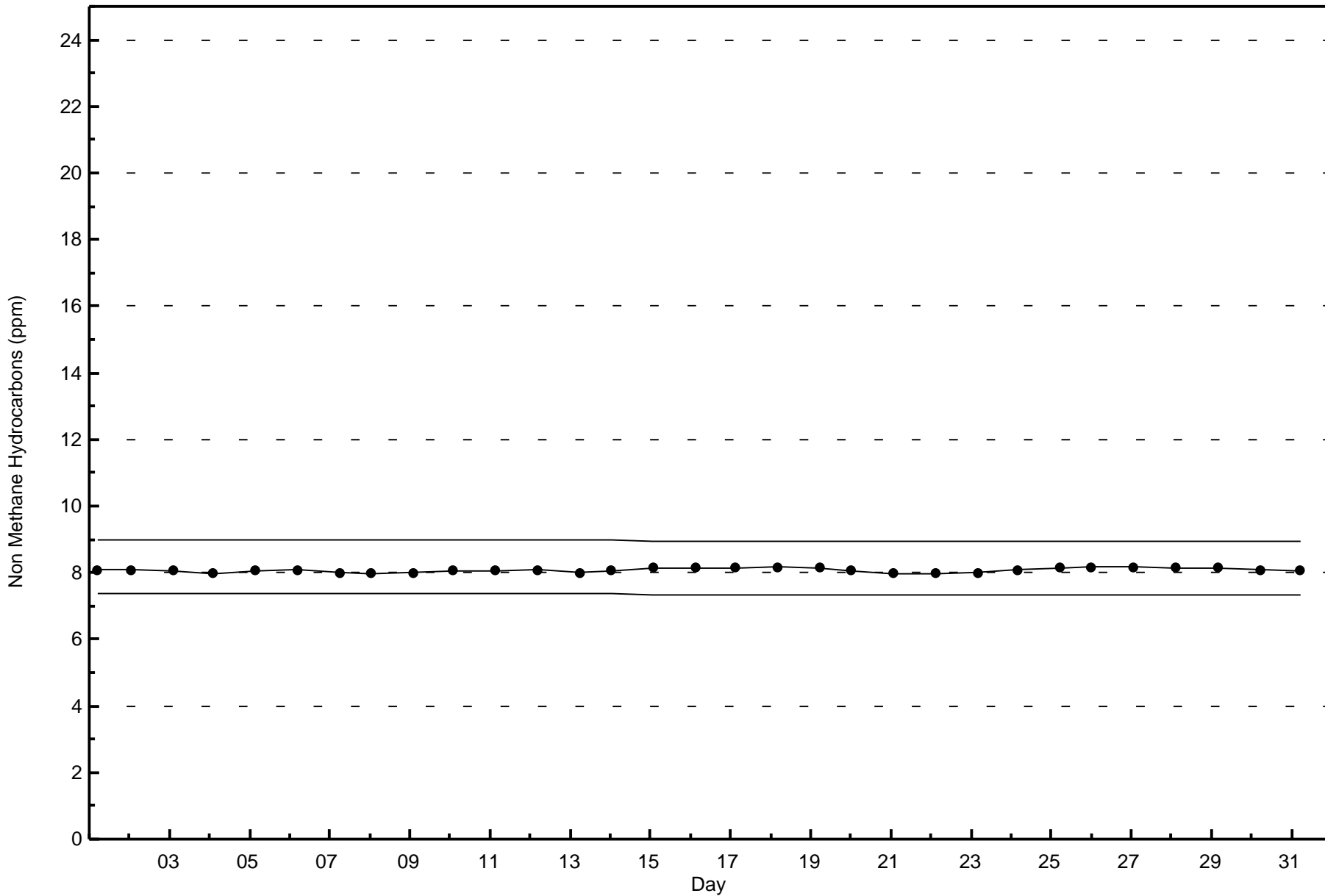




Wood Buffalo Environmental Association  
Zero Responses

Non Methane Hydrocarbons (NMHC) - ppm  
Fort McKay - Bertha Ganter - December 2015







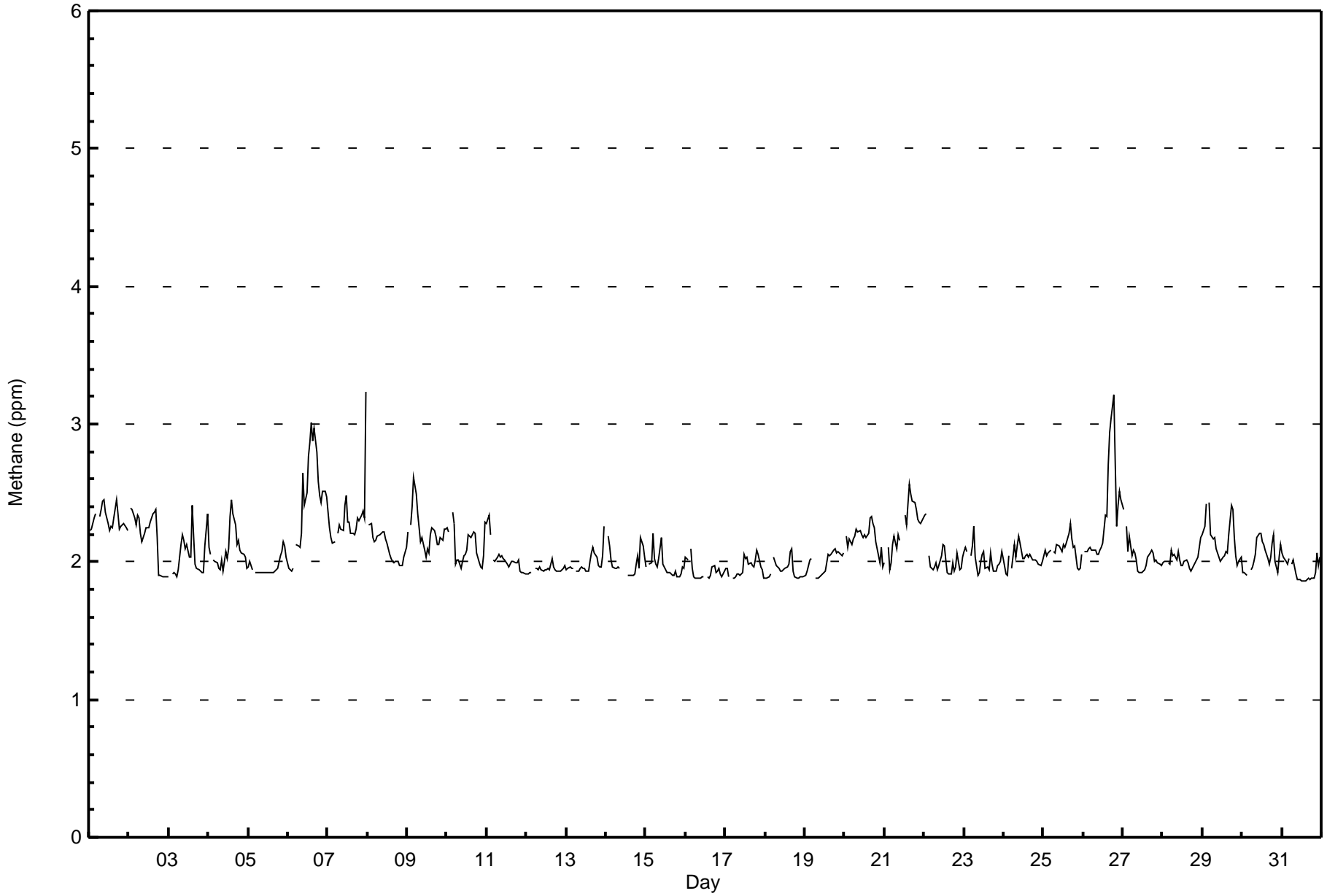
Summary of Hour Averages

Fort McKay - Bertha Ganter - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 3.2 ppm on Dec 8 00:00	Maximum Daily Average: 2.4 ppm on Dec 6		Hours of Data:	706
Minimum Value: 1.9 ppm on Dec 31 14:00	Minimum Daily Average: 1.9 ppm on Dec 16		Hours of Missing Data:	38
Maximum Diurnal Average: 2.2 ppm at hour 17	Minimum Diurnal Average: 2.0 ppm at hour 21		Hours of Calibration:	35
Monthly Average: 2.09 ppm	Percentiles: P <sub>1</sub> = 1.9 P <sub>10</sub> = 1.9 Q <sub>1</sub> = 2.0 Median = 2.0 Q <sub>3</sub> = 2.2 P <sub>90</sub> = 2.3 P <sub>99</sub> = 2.8		Percent Operational Time:	99.6

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																														
1-Dec	2.2	2.2	2.3	2.3	2.4	Z	2.3	2.4	2.4	2.5	2.4	2.3	2.2	2.3	2.3	2.3	2.5	2.4	2.2	2.3	2.3	2.3	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.3	2.5																		
2-Dec	Z	2.4	2.4	2.3	2.3	2.3	2.3	2.2	2.1	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.4	2.2	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.2	2.4																			
3-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	2.1	2.2	2.2	2.1	2.1	2.0	2.0	2.4	2.2	2.0	1.9	1.9	1.9	1.9	1.9	2.1	2.3	2.0	2.1	2.5	2.1	2.0	2.0	2.0	2.1	2.4	2.4																				
4-Dec	2.1	2.1	Z	2.0	2.0	2.0	2.0	2.0	1.9	2.0	1.9	2.1	2.0	2.1	2.3	2.5	2.4	2.3	2.1	2.2	2.1	2.0	2.0	2.0	2.1	2.5	2.1	2.0	2.0	2.0	2.0	2.1	2.5	2.5																				
5-Dec	2.0	2.0	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.0	2.1																		
6-Dec	2.0	1.9	1.9	2.0	Z	2.1	2.1	2.1	2.2	2.6	2.4	2.5	2.8	2.9	3.0	2.9	3.0	2.8	2.6	2.5	2.4	2.5	2.5	2.5	2.4	3.0	2.4	2.5	2.5	2.5	2.5	2.4	3.0	3.0																				
7-Dec	2.4	2.2	2.2	2.1	2.1	Z	2.2	2.3	2.2	2.2	2.4	2.5	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.3	3.2	2.3	2.3	2.4	2.3	3.2	2.3	3.2	3.2	3.2																				
8-Dec	Z	2.3	2.3	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.3	2.0	2.0	2.0	2.0	2.1	2.1	2.3	2.3	2.3																			
9-Dec	2.2	Z	2.3	2.4	2.6	2.5	2.3	2.2	2.1	2.2	2.1	2.0	2.1	2.1	2.2	2.3	2.2	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.6																	
10-Dec	2.2	2.2	Z	2.4	2.3	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.0	2.0	1.9	2.0	2.3	2.1	2.0	2.0	1.9	2.0	2.3	2.1	2.4	2.4	2.4																			
11-Dec	2.3	2.3	2.2	Z	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.3	2.3																		
12-Dec	1.9	1.9	1.9	1.9	Z	2.0	2.0	1.9	2.0	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0																		
13-Dec	1.9	2.0	2.0	2.0	2.0	Z	1.9	1.9	1.9	2.0	2.0	1.9	1.9	1.9	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.3	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.3	2.0	2.3	2.3																		
14-Dec	Z	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	C	C	C	C	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.2	2.1	2.0	2.0	2.0	2.2	2.1	2.0	2.0	2.2	2.0	2.2	2.2																			
15-Dec	2.0	Z	2.0	2.0	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.2	2.2																			
16-Dec	2.0	2.0	Z	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	M	1.9	1.9	1.9	2.0	2.0	1.9	1.9	2.0	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.1	2.1																			
17-Dec	2.0	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	1.9	1.9	1.9	2.0	2.1	2.1	2.0	1.9	1.9	1.9	2.0	2.1																			
18-Dec	1.9	1.9	1.9	1.9	Z	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1																		
19-Dec	1.9	1.9	2.0	2.0	2.0	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1																		
20-Dec	Z	2.2	2.1	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.1	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.1	2.0	2.2	2.3	2.3	2.3																		
21-Dec	2.0	Z	2.1	1.9	2.0	2.1	2.2	2.1	2.2	2.2	M	M	2.3	2.3	2.4	2.6	2.5	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.6	2.6																		
22-Dec	2.3	2.3	Z	2.0	2.0	1.9	2.0	2.0	1.9	2.0	2.0	2.1	2.1	2.0	1.9	1.9	1.9	2.0	1.9	2.0	1.9	2.0	2.1	1.9	2.0	2.0	2.0	2.1	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0																		
23-Dec	2.1	2.1	2.1	Z	2.0	2.1	2.3	2.0	1.9	1.9	2.0	2.1	2.1	2.0	2.0	1.9	2.1	2.0	1.9	1.9	2.0	1.9	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																		
24-Dec	2.0	1.9	1.9	2.0	Z	1.9	2.1	2.0	2.1	2.2	2.1	2.0	2.0	2.0	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																		
25-Dec	2.0	2.1	2.0	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.2	2.1	2.1	2.0	1.9	2.0	2.1	2.0	2.0	1.9	2.0	2.1	2.1	2.1	2.1	2.1	2.1																			
26-Dec	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.3	2.3	2.7	2.9	3.0	3.2	2.7	2.3	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5																		
27-Dec	2.4	Z	2.3	2.1	2.2	2.0	2.1	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																		
28-Dec	2.0	2.0	Z	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.1	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																		
29-Dec	2.2	2.3	2.4	Z	2.4	2.2	2.2	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.4	2.4	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																		
30-Dec	1.9	1.9	1.9	1.9	Z	1.9	2.0	2.0	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.2	2.0	1.9	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																		
31-Dec	2.1	2.0	2.0	2.0	2.0	Z	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																		
																												2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.1	Diurnal Average		
																												2.4	2.4	2.4	2.4	2.6	2.5	2.3	2.4	2.4	2.6	2.4	2.5	2.8	2.9	3.0	2.9	3.0	3.0	3.0	3.2	2.7	2.4	2.5	2.5	3.2	Diurnal Maximum	

Z - zerospan      C - Calibration      M - Maintenance





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	386	54.67	54.67
2.1 - 3.0	318	45.04	99.72
3.1 - 10.0	2	0.28	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



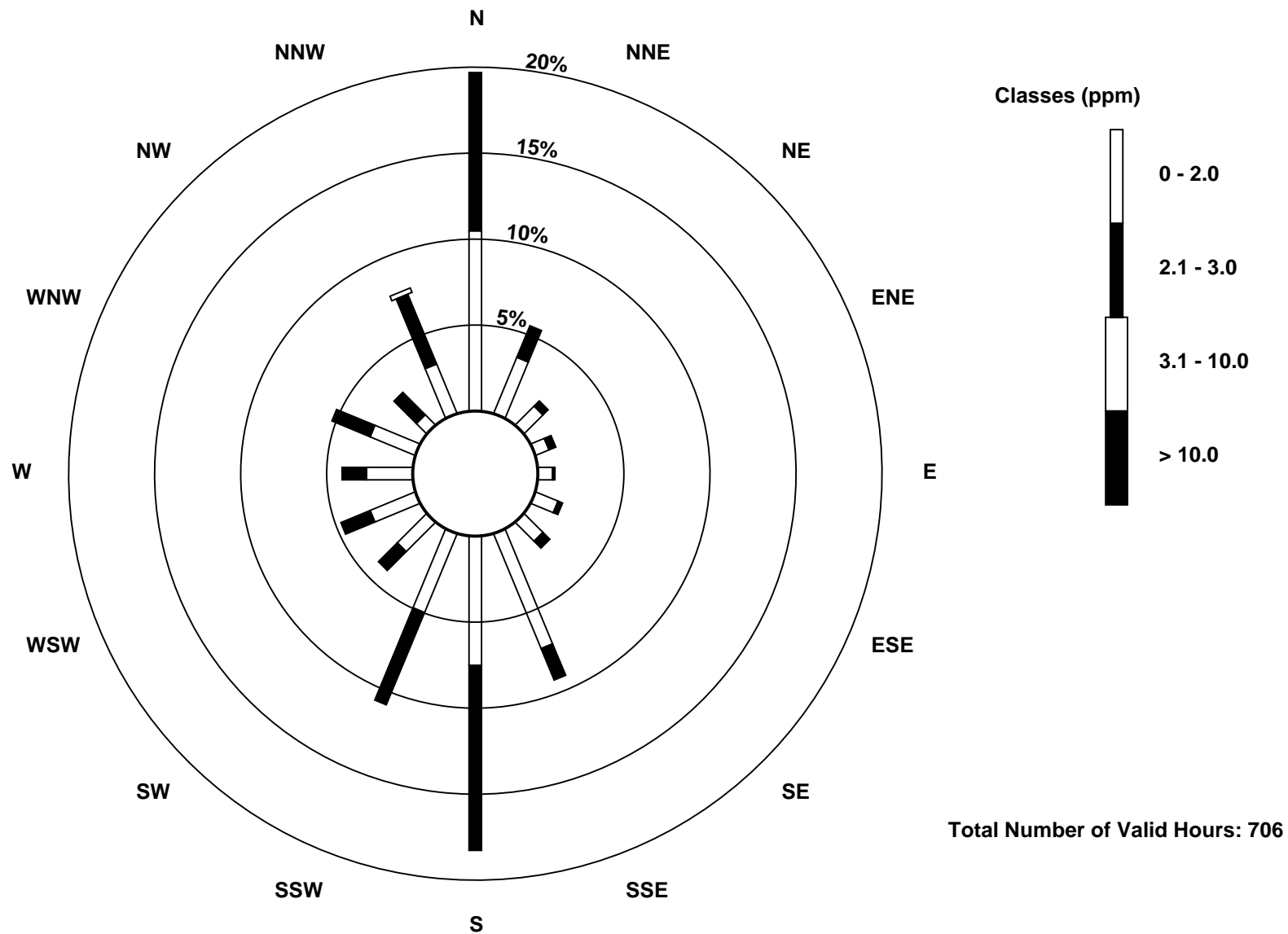
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm**  
**Fort McKay - Bertha Ganter - December 2015**

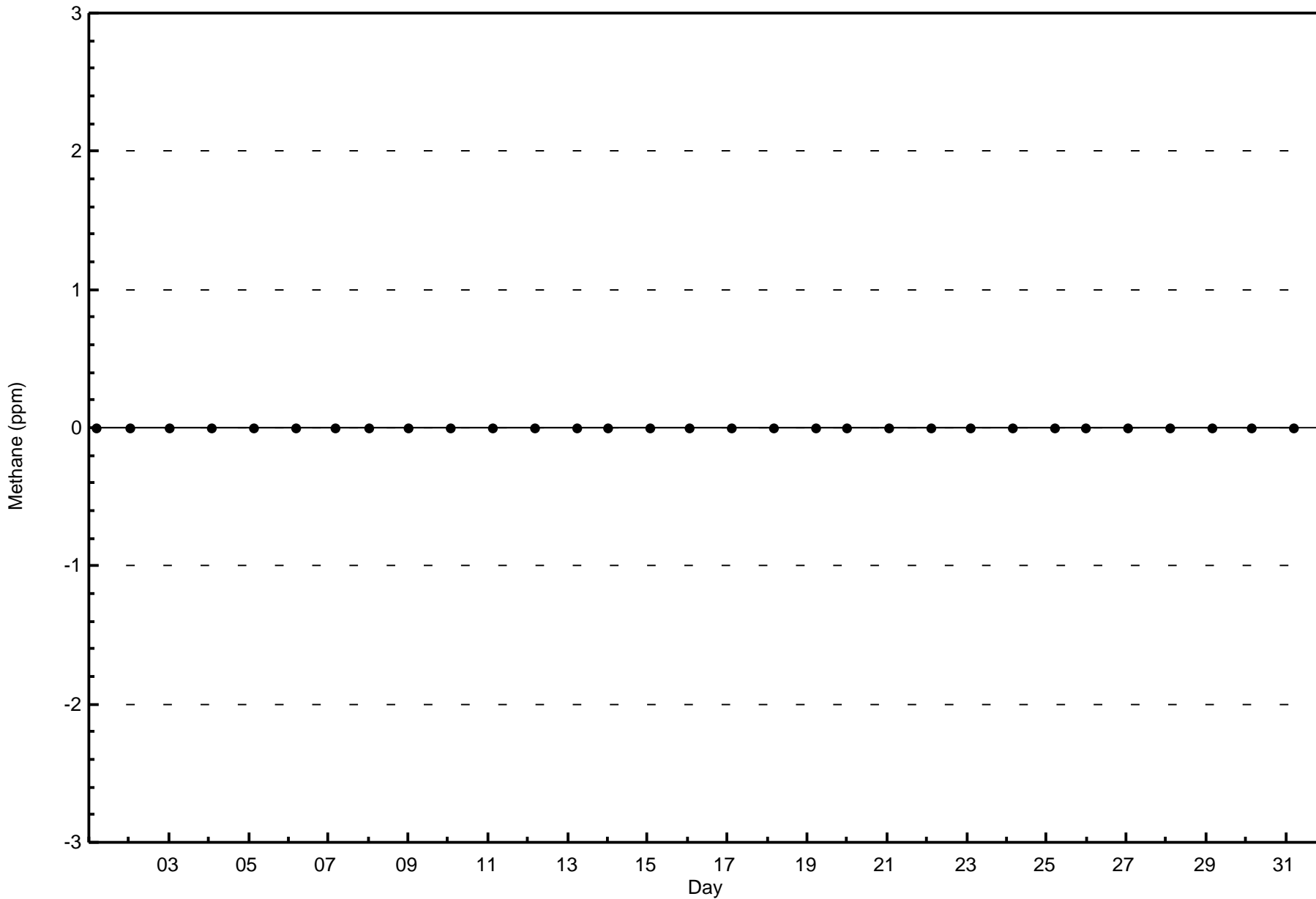
Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	74	25	11	6	6	10	11	51	53	35	17	20	19	20	6	22	386
2.1 - 3.0	65	14	3	3	1	2	4	14	76	41	11	13	10	17	13	31	318
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	139	39	14	9	7	12	15	65	129	76	28	33	29	37	19	55	706

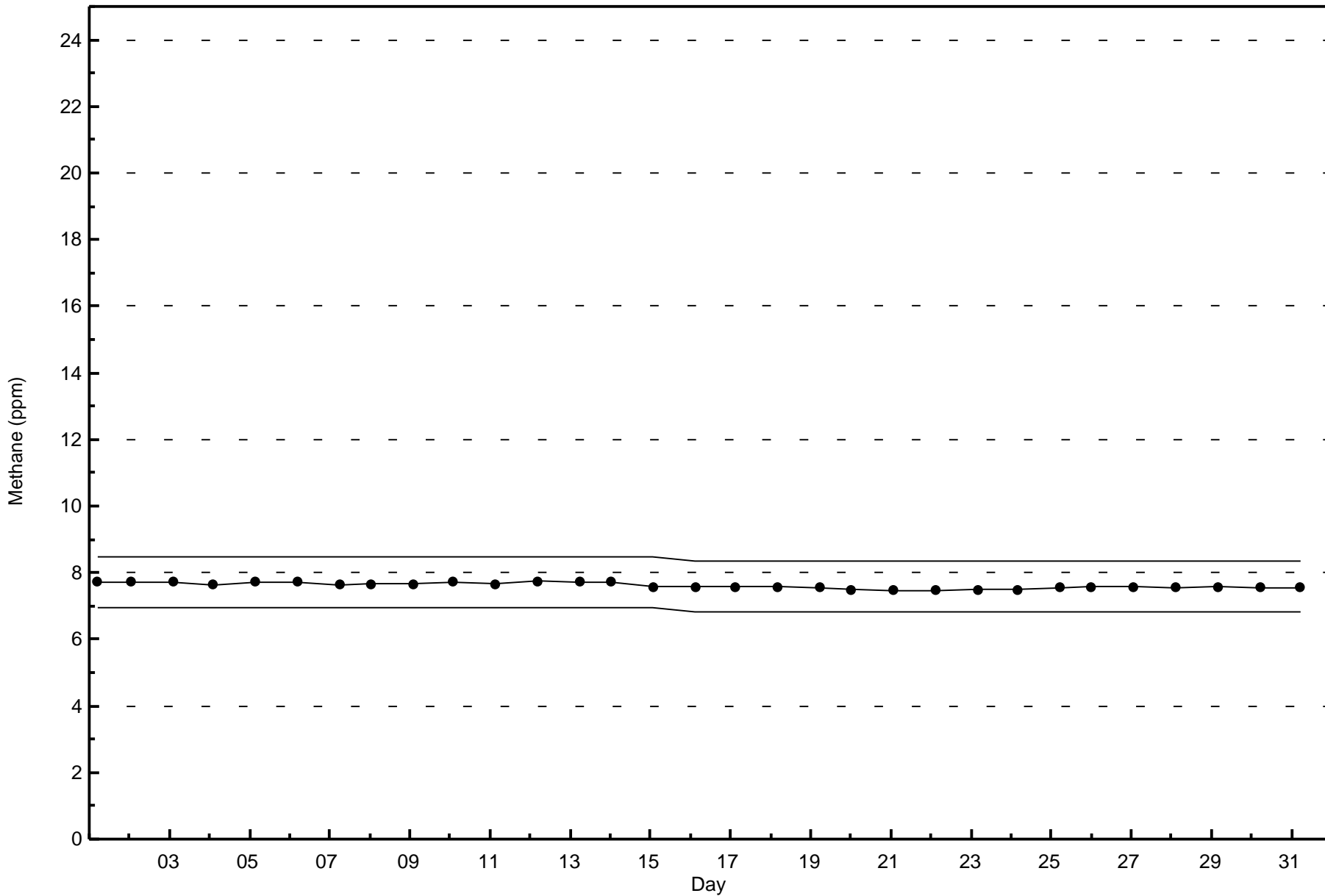
Total Number of Valid Hours: 706

Total Number of Hours: 744



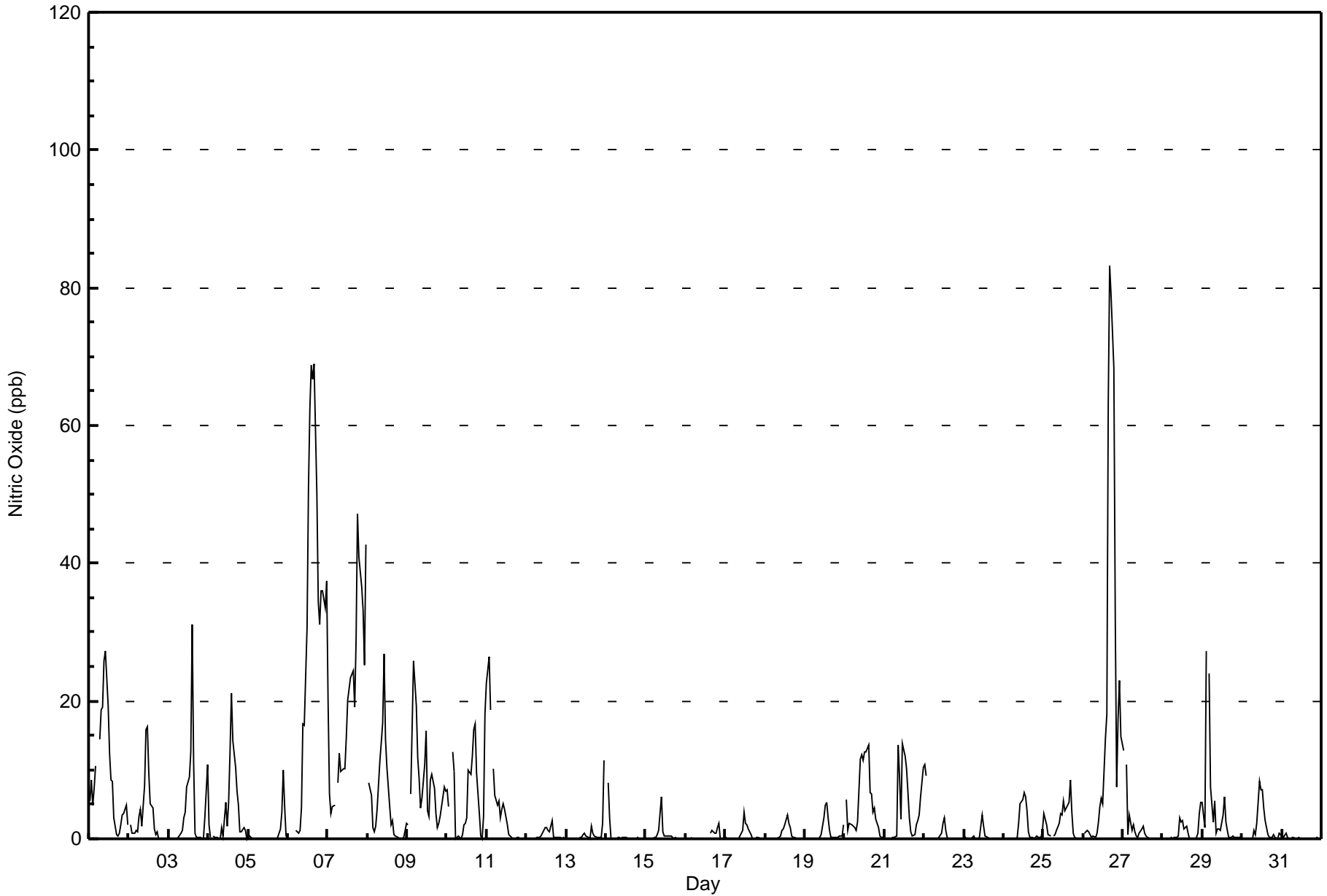








Maximum Value: 83 ppb on Dec 26 17:00																		Maximum Daily Average: 28.2 ppb on Dec 6						Hours in Service: 744			
Minimum Value: 0 ppb on Dec 14 18:00																		Minimum Daily Average: 0.1 ppb on Dec 31						Hours of Data: 707			
Maximum Diurnal Average: 8.0 ppb at hour 15																		Minimum Diurnal Average: 1.7 ppb at hour 6						Hours of Missing Data: 37			
Monthly Average: 4.7 ppb																		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 4 P <sub>90</sub> = 13 P <sub>99</sub> = 61						Hours of Calibration: 37			
																		Percent Operational Time: 100.0									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	5	9	5	7	11	Z	14	19	19	26	27	19	13	8	8	3	1	0	1	2	3	4	5	2	9.2	27	
2-Dec	Z	2	1	1	1	1	3	4	2	8	16	16	10	5	4	1	1	1	0	0	0	0	0	0	3.4	16	
3-Dec	0	Z	0	0	0	0	0	1	1	3	4	8	9	13	31	11	1	0	0	0	0	3	11	4.2	31		
4-Dec	2	0	Z	0	0	0	0	0	2	0	5	2	5	13	21	14	10	7	5	1	1	2	1	0	4.0	21	
5-Dec	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	10	5	0	1.0	10	
6-Dec	0	0	0	0	Z	1	1	1	4	17	17	31	51	62	69	67	69	50	34	31	36	36	34	37	28.2	69	
7-Dec	20	7	4	5	5	Z	8	12	10	10	10	15	20	22	23	24	19	29	47	41	37	33	25	43	20.4	47	
8-Dec	Z	8	6	2	1	2	4	11	14	17	27	14	10	5	2	3	1	0	0	0	0	0	0	2	5.7	27	
9-Dec	2	Z	7	16	26	19	12	9	5	6	11	16	4	3	9	9	7	4	2	2	3	6	7	7	8.3	26	
10-Dec	7	5	Z	13	10	0	0	0	0	1	2	2	3	10	9	12	16	17	10	4	0	0	3	18	6.2	18	
11-Dec	23	26	19	Z	10	6	5	6	3	4	5	4	2	1	0	0	0	0	0	0	0	0	0	0	5.0	26	
12-Dec	0	0	0	0	Z	0	0	0	0	0	1	2	2	1	1	3	0	0	0	0	0	0	0	0	0.5	3	
13-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	0	0	0	2	1	1	0	0	0	0	2	11	0.9	11	
14-Dec	Z	8	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	8	
15-Dec	0	Z	0	0	0	0	0	1	1	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	6	
16-Dec	0	0	Z	0	0	0	0	0	0	C	C	C	C	C	C	1	1	1	1	2	2	0	0	0	--	2	
17-Dec	0	0	0	Z	0	0	0	0	0	0	1	4	2	2	1	1	0	0	0	0	0	0	0	0	0.6	4	
18-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	2	3	2	2	0	0	0	0	0	0	0	0	0.6	3	
19-Dec	0	0	0	0	0	Z	0	0	0	0	1	3	5	5	3	1	0	0	0	0	0	0	0	2	1.0	5	
20-Dec	Z	6	1	2	2	2	2	1	2	12	12	11	13	13	14	7	6	4	4	3	2	0	0	0	5.2	14	
21-Dec	0	Z	0	0	0	0	0	0	14	9	3	14	12	10	7	3	1	0	1	2	3	3	6	10	4.3	14	
22-Dec	11	9	Z	0	0	0	0	0	0	0	1	2	3	1	0	0	0	0	0	0	0	0	0	0	1.2	11	
23-Dec	0	0	0	Z	0	0	0	0	0	0	2	3	2	0	0	0	0	0	0	0	0	0	0	0	0.4	3	
24-Dec	0	0	0	0	Z	0	0	0	0	2	5	6	7	6	4	1	0	0	0	0	0	0	0	1	1.5	7	
25-Dec	4	3	2	1	0	Z	0	1	1	2	4	3	6	4	4	5	9	4	1	0	0	0	0	0	2.3	9	
26-Dec	Z	1	1	1	1	0	1	0	1	2	5	6	5	15	18	63	83	79	68	32	7	18	23	15	19.3	83	
27-Dec	13	Z	11	1	3	1	2	1	1	0	1	1	2	1	0	0	0	0	0	0	0	0	0	0	1.7	13	
28-Dec	0	0	Z	0	0	0	0	0	0	0	3	2	3	1	2	1	0	0	0	0	0	1	4	5	1.0	5	
29-Dec	5	2	27	Z	24	8	2	6	1	1	1	1	3	6	3	1	0	0	0	0	0	0	0	0	4.0	27	
30-Dec	0	0	0	0	Z	0	0	1	1	2	8	7	7	4	3	1	0	0	0	1	0	0	1	1	1.6	8	
31-Dec	0	0	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	
3.6 3.3 3.4 1.9 3.6 1.7 1.8 2.4 2.6 4.4 5.8 6.6 6.7 7.2 8.0 7.6 7.3 6.4 5.7 4.0 3.2 3.7 3.9 5.4																		Diurnal Average									
23 26 27 16 26 19 14 19 19 26 27 31 51 62 69 67 83 79 68 41 37 36 34 43																		Diurnal Maximum									
Z - zerospan		C - Calibration																									





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	668	94.48	94.48
21 - 40	26	3.68	98.16
41 - 80	12	1.70	99.86
81 - 159	1	0.14	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Fort McKay - Bertha Ganter - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	133	38	14	8	7	12	14	63	123	68	26	31	29	33	19	50	668
21 - 40	5	1	0	0	0	0	0	0	6	6	2	2	1	2	0	1	26
11 - 80	1	0	0	1	0	0	1	2	1	0	1	1	1	0	0	3	12
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	139	39	14	9	7	12	15	65	130	74	29	34	31	35	19	55	707

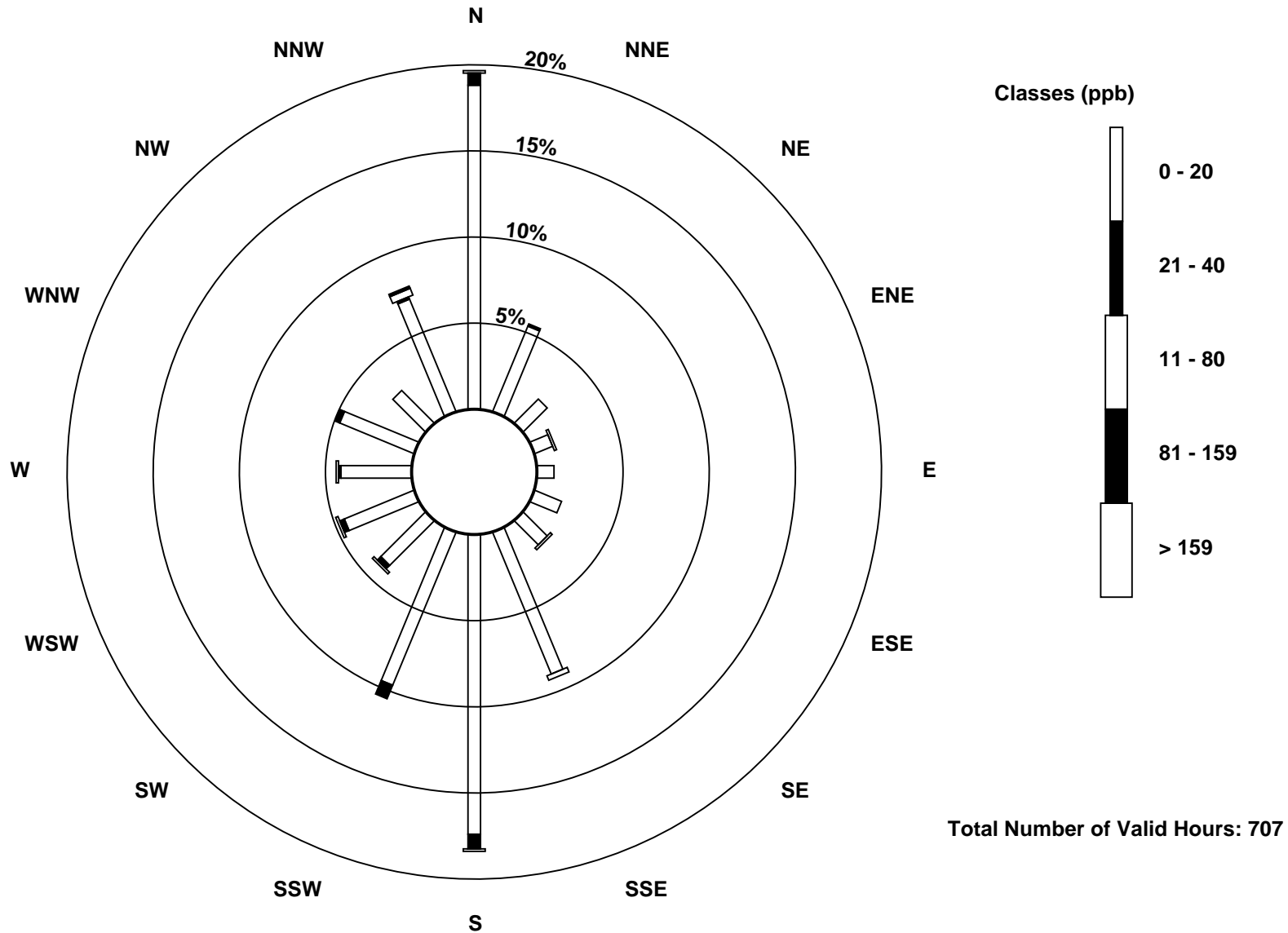
Total Number of Valid Hours: 707

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitric Oxide (NO) - ppb  
Fort McKay - Bertha Ganter (AMS 1)



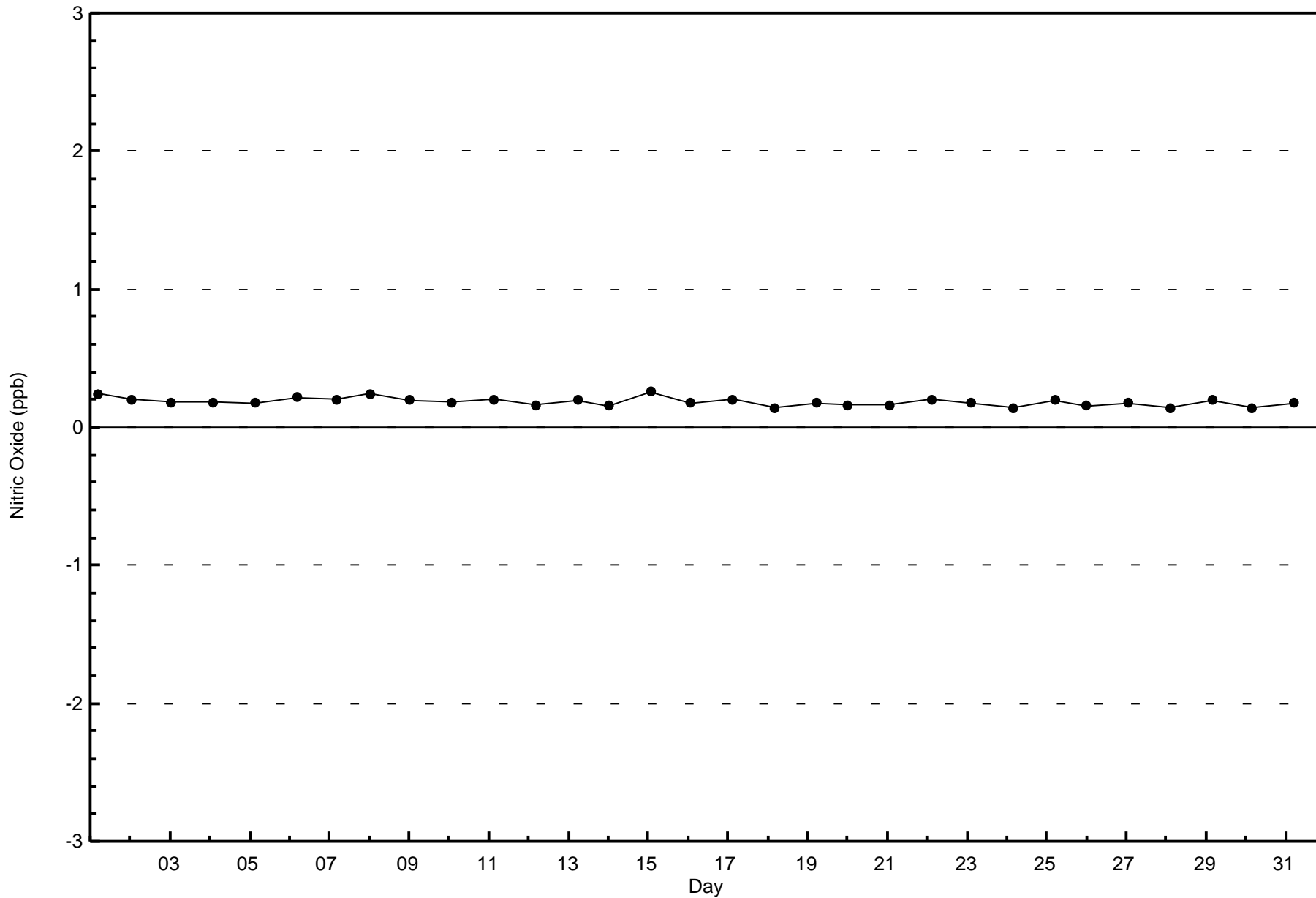


Wood Buffalo Environmental Association

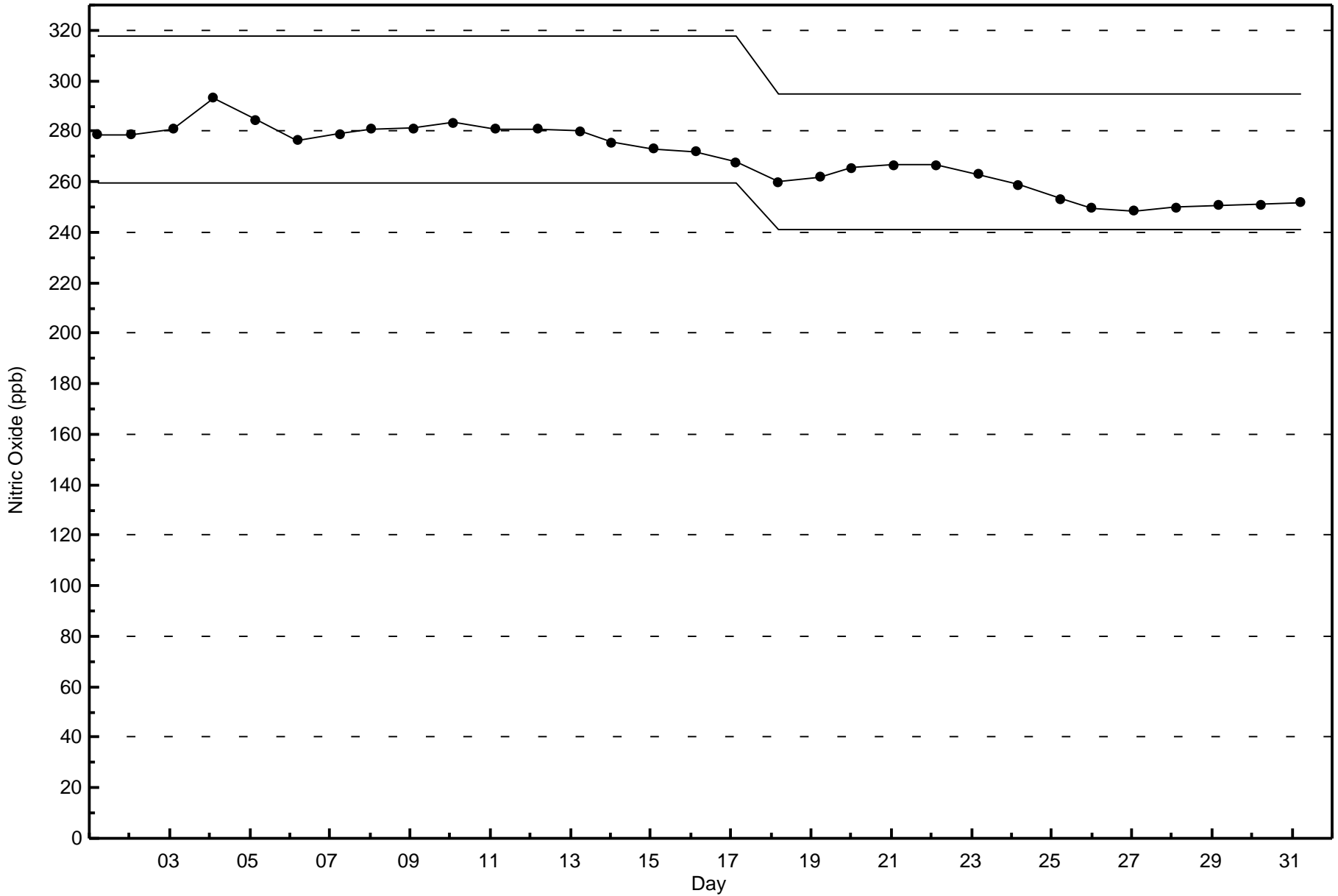
Zero Responses

Nitric Oxide (NO) - ppb

Fort McKay - Bertha Ganter - December 2015





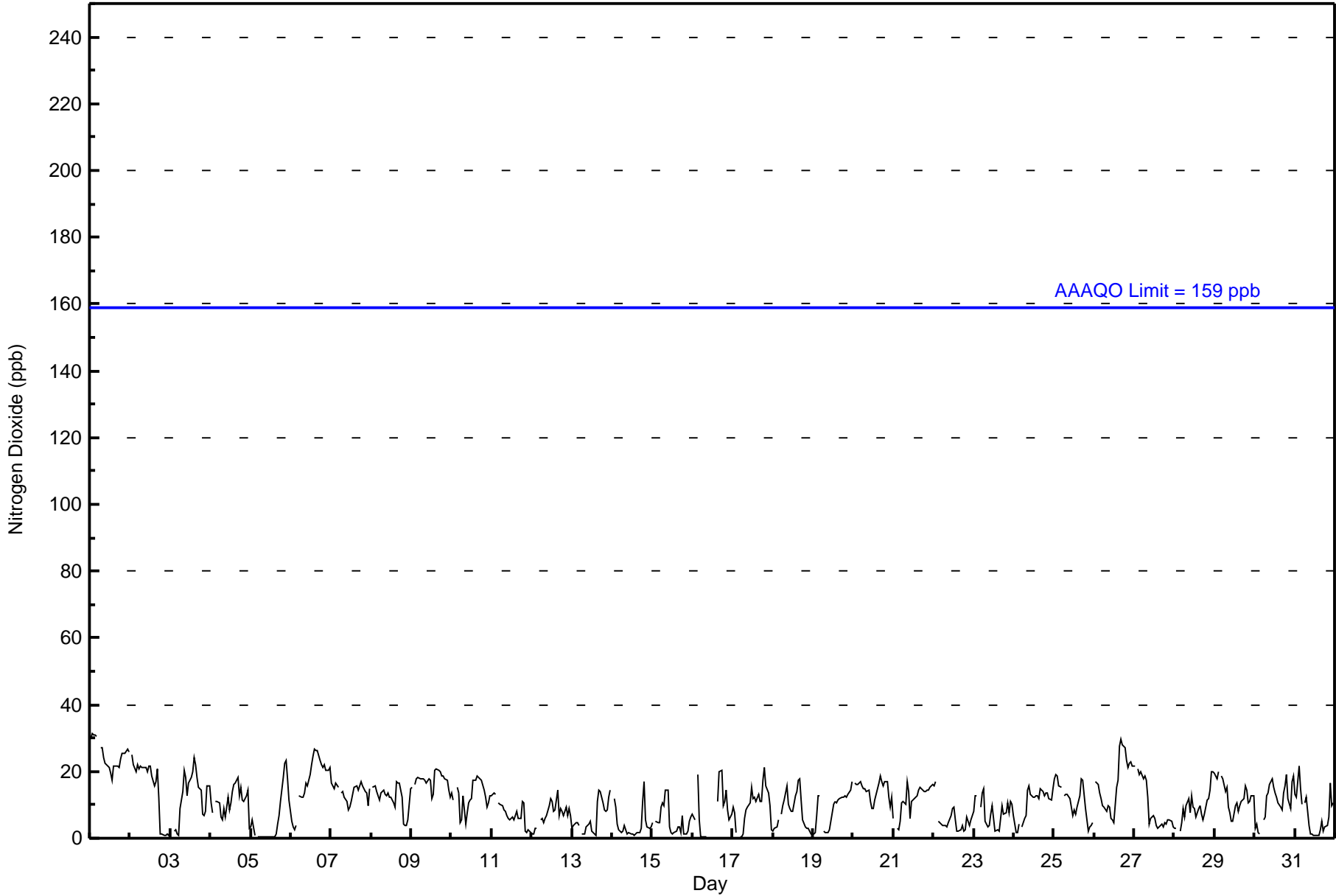




Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 32 ppb on Dec 1 02:00	Maximum Daily Average: 24.9 ppb on Dec 1		Hours of Data:	707
Minimum Value: 0 ppb on Dec 5 05:00	Minimum Daily Average: 4.2 ppb on Dec 14		Hours of Missing Data:	37
Maximum Diurnal Average: 13.3 ppb at hour 17	Minimum Diurnal Average: 8.8 ppb at hour 6		Hours of Calibration:	37
Monthly Average: 10.8 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 2 Q <sub>1</sub> = 5 Median = 11 Q <sub>3</sub> = 15 P <sub>90</sub> = 20 P <sub>99</sub> = 27		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	30	32	31	31	30	Z	27	27	24	22	22	21	20	17	22	22	22	21	24	25	26	25	27	26	24.9	32
2-Dec	Z	25	22	20	22	21	21	21	21	21	20	22	22	19	16	17	21	12	1	1	1	1	1	1	15.2	25
3-Dec	2	Z	2	3	1	1	9	14	20	18	13	17	18	20	24	22	18	15	14	7	7	8	16	16	12.4	24
4-Dec	11	8	Z	11	11	11	7	6	9	6	12	8	10	14	16	17	18	13	15	12	11	13	14	3	11.1	18
5-Dec	3	5	1	Z	0	1	0	1	0	1	0	0	0	0	0	1	4	7	11	18	22	23	18	11	5.6	23
6-Dec	5	4	2	4	Z	13	12	12	14	17	16	19	22	25	27	26	26	23	22	21	22	21	20	21	17.1	27
7-Dec	17	16	15	17	15	Z	14	14	12	11	8	9	11	13	15	16	15	16	17	16	14	13	10	15	13.8	17
8-Dec	Z	15	16	14	13	11	14	14	13	13	14	12	12	11	10	17	17	16	12	4	4	4	5	15	12.0	17
9-Dec	15	Z	16	18	18	18	18	18	17	16	18	17	12	13	20	21	20	20	19	19	18	17	15	12	17.2	21
10-Dec	14	11	Z	15	14	5	6	13	4	8	11	12	12	18	17	19	18	18	17	15	12	9	11	13	12.6	19
11-Dec	13	13	13	Z	11	10	10	8	8	7	6	5	6	6	7	8	6	6	11	11	2	2	3	2	7.5	13
12-Dec	1	1	3	3	Z	5	6	5	6	7	10	12	11	8	9	14	7	9	8	7	9	7	9	7	7.1	14
13-Dec	3	4	5	5	4	Z	1	1	4	4	4	5	2	1	1	11	15	14	11	9	8	9	12	15	6.3	15
14-Dec	Z	12	9	4	3	2	2	4	3	1	2	1	1	1	1	2	2	3	11	17	6	4	3	4	4.2	17
15-Dec	5	Z	5	5	5	9	11	10	14	14	3	2	1	2	2	3	3	2	7	1	1	2	5	7	5.2	14
16-Dec	7	6	Z	19	5	0	0	0	0	C	C	C	C	C	C	11	20	20	10	11	14	8	5	7	--	20
17-Dec	9	8	2	Z	1	1	1	6	9	9	11	15	12	12	11	13	11	11	17	21	16	14	10	2	9.6	21
18-Dec	2	3	3	6	Z	7	10	11	16	10	9	8	8	13	14	17	18	12	5	4	3	3	2	1	8.0	18
19-Dec	1	2	7	13	13	Z	2	2	2	2	3	8	10	11	10	12	12	12	12	13	12	13	14	17	8.8	17
20-Dec	Z	17	16	16	17	16	15	15	14	14	11	9	9	11	15	17	19	17	16	17	17	12	9	12	14.4	19
21-Dec	6	Z	3	3	5	11	11	10	17	14	6	11	12	12	13	15	15	15	14	14	14	15	15	16	11.6	17
22-Dec	16	17	Z	5	5	4	4	4	4	5	7	9	9	6	2	2	3	4	2	3	6	4	5	7	5.7	17
23-Dec	8	13	13	Z	9	13	15	5	4	4	7	10	6	2	2	2	6	10	7	8	11	8	11	10	7.9	15
24-Dec	7	2	2	4	Z	3	6	7	14	16	13	12	12	13	12	15	14	13	14	13	12	11	15	10.5	16	
25-Dec	18	19	19	16	15	Z	13	13	13	12	9	7	8	7	10	13	18	17	13	9	2	3	4	5	11.4	19
26-Dec	Z	17	16	14	12	10	9	8	10	10	6	6	5	15	17	27	30	28	27	23	21	23	23	22	16.4	30
27-Dec	22	Z	21	19	20	18	19	17	12	4	6	7	6	4	3	3	4	4	5	4	5	6	5	4	9.4	22
28-Dec	3	3	Z	2	5	9	6	10	12	8	13	9	9	6	9	10	7	5	7	11	12	14	20	20	9.1	20
29-Dec	20	18	20	Z	19	18	14	15	10	8	5	5	10	11	8	10	11	12	16	14	10	11	13	13	12.5	20
30-Dec	3	4	2	1	Z	6	6	13	14	16	18	15	13	12	10	9	9	14	16	19	12	9	17	19	11.1	19
31-Dec	13	12	21	15	10	Z	11	12	4	1	1	1	1	1	1	2	5	2	3	4	6	17	10	11	7.1	21
9.7 10.9 10.9 10.8 10.8 8.8 9.6 10.2 10.4 9.9 9.4 9.8 9.7 10.1 10.8 12.5 13.3 12.6 12.4 11.9 10.9 10.6 11.1 11.1																								Diurnal Average		
30 32 31 31 30 21 27 27 24 22 22 22 22 25 27 27 30 28 27 25 26 25 27 26																								Diurnal Maximum		

Z - zerospan C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	646	91.37	91.37
21 - 40	61	8.63	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	130	39	14	8	7	12	14	64	112	59	26	30	29	34	19	49	646
21 - 40	9	0	0	1	0	0	1	1	18	15	3	4	2	1	0	6	61
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	139	39	14	9	7	12	15	65	130	74	29	34	31	35	19	55	707

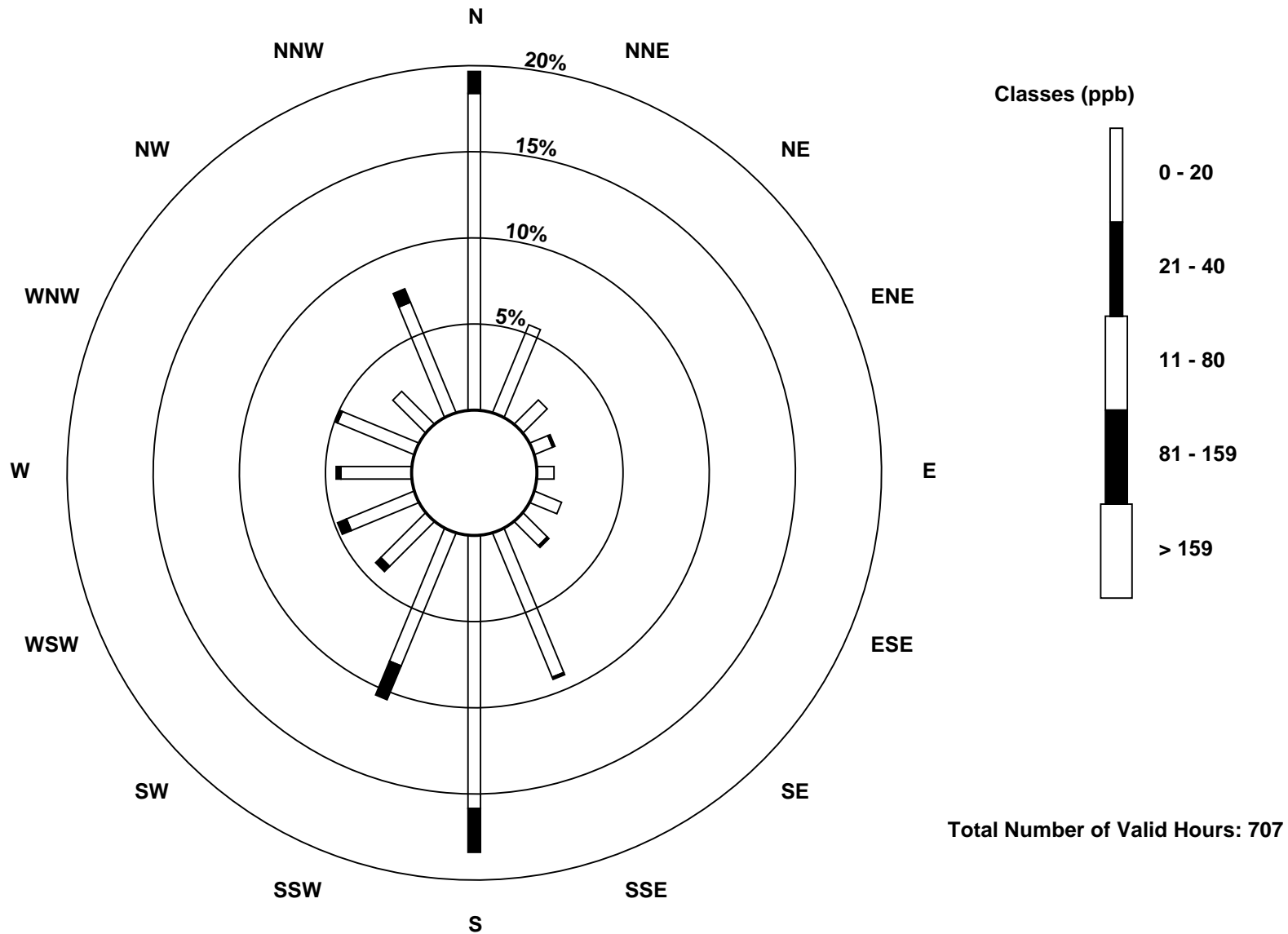
Total Number of Valid Hours: 707

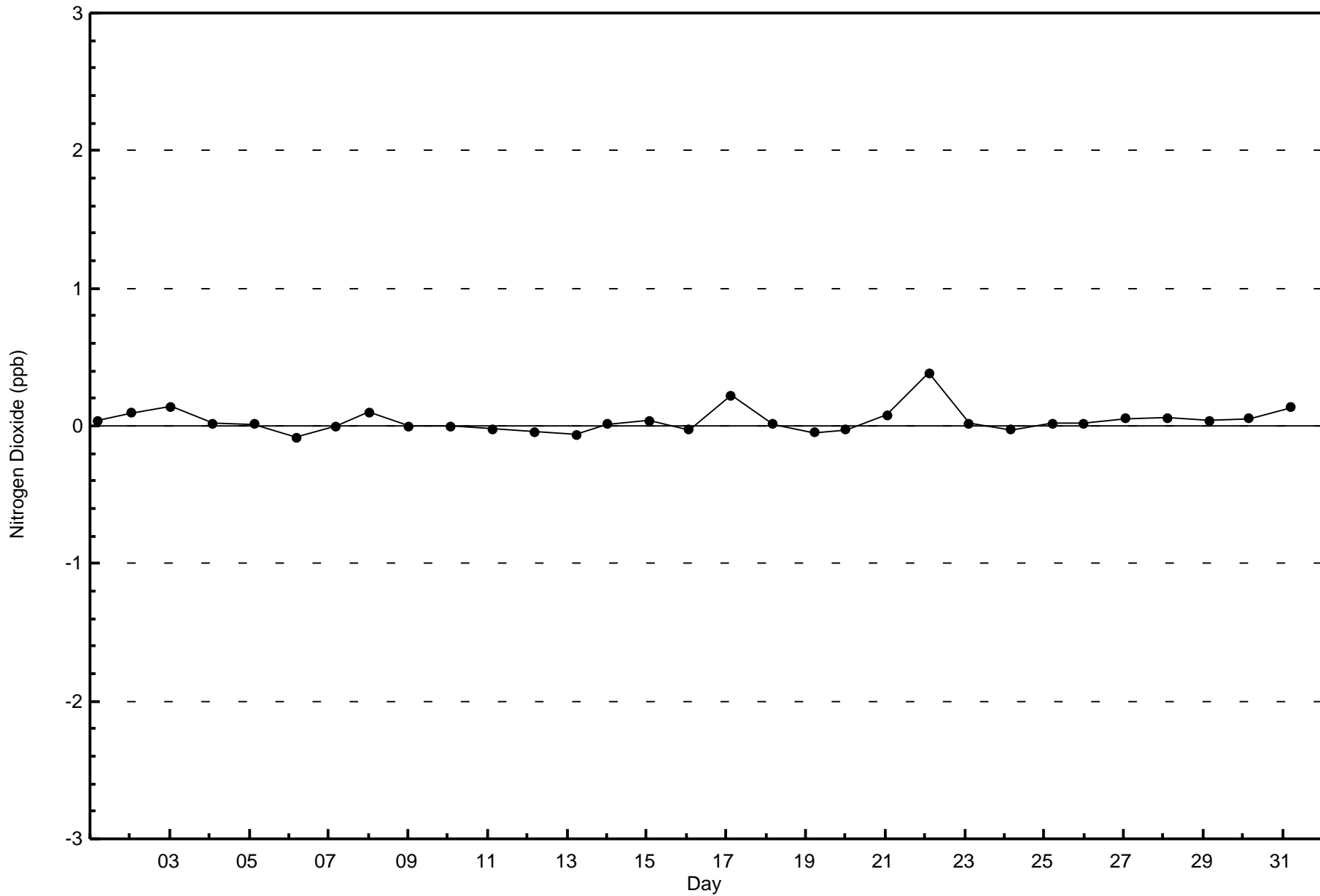
Total Number of Hours: 744

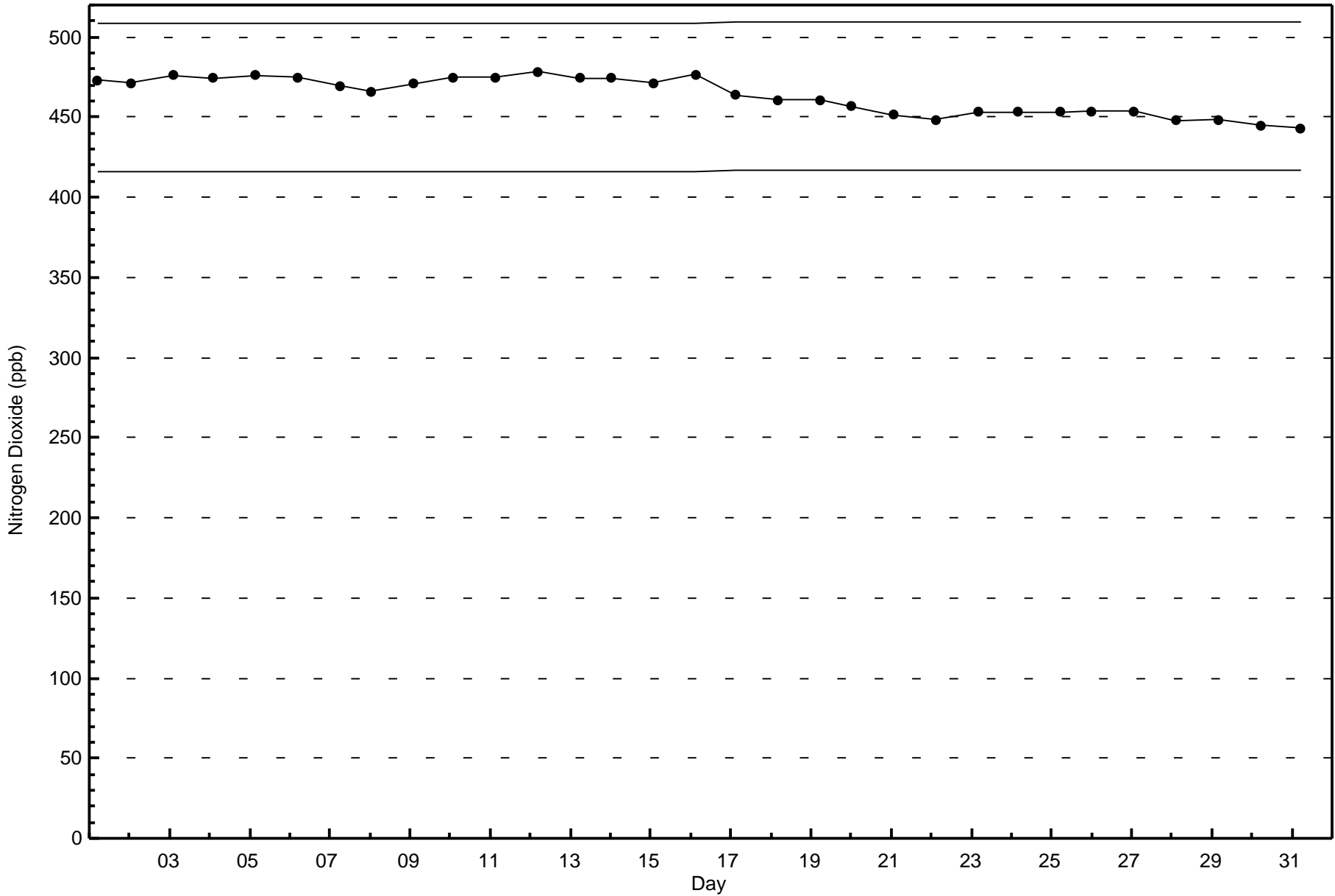


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort McKay - Bertha Ganter (AMS 1)



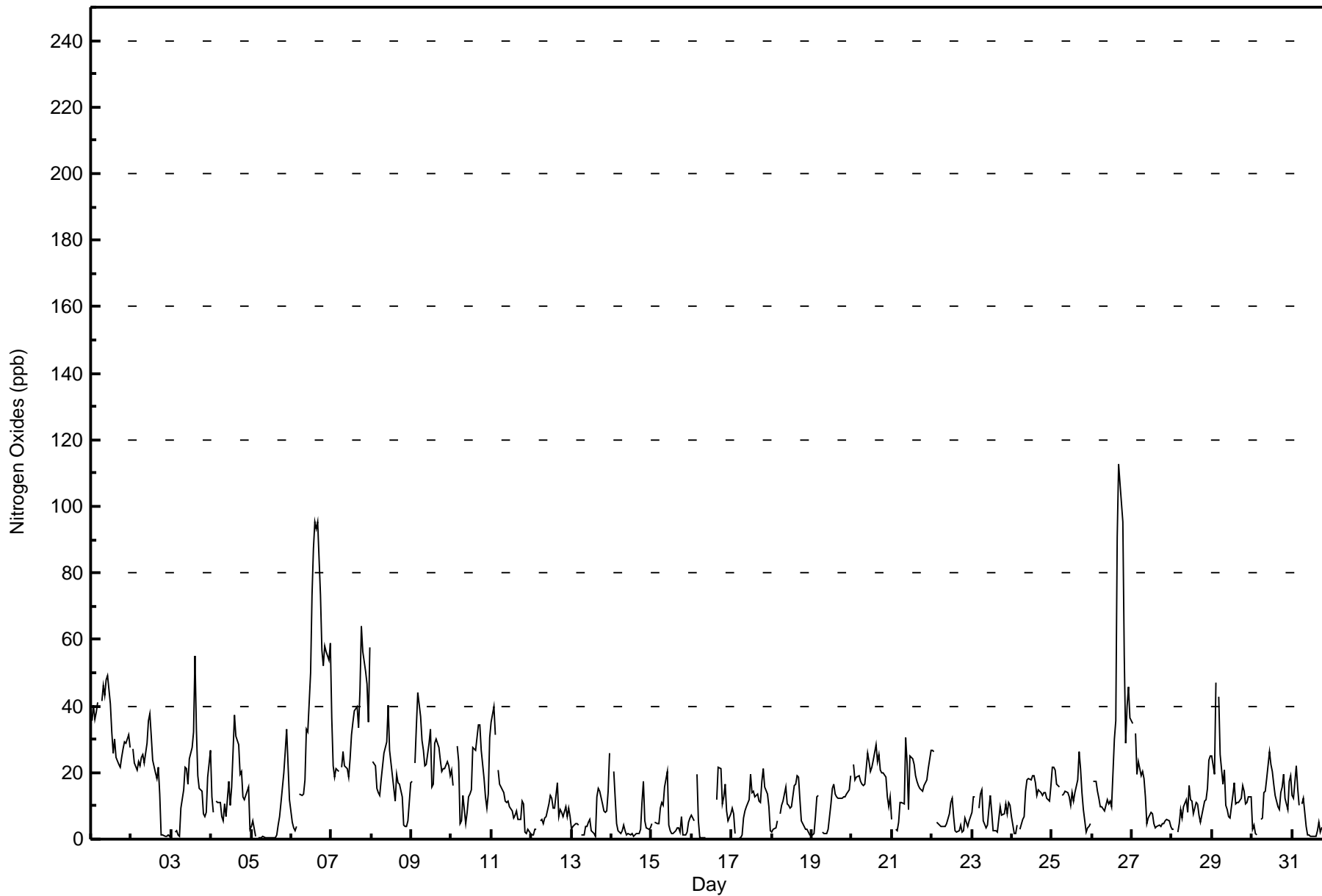








Maximum Value: 113 ppb on Dec 26 17:00																			Maximum Daily Average: 45.3 ppb on Dec 6						Hours in Service: 744	
Minimum Value: 0 ppb on Dec 16 07:00																			Minimum Daily Average: 4.7 ppb on Dec 14						Hours of Data: 707	
Maximum Diurnal Average: 20.7 ppb at hour 17																			Minimum Diurnal Average: 10.5 ppb at hour 6						Hours of Missing Data: 37	
Monthly Average: 15.5 ppb																			Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 2 Q <sub>1</sub> = 5 Median = 12 Q <sub>3</sub> = 21 P <sub>90</sub> = 31 P <sub>99</sub> = 89						Hours of Calibration: 37	
																									Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	36	40	36	38	41	Z	41	46	43	48	49	41	32	26	30	25	22	22	25	27	29	29	31	28	34.1	49
2-Dec	Z	27	23	21	23	22	25	25	23	29	36	38	31	24	20	18	22	14	1	1	1	1	1	1	18.5	38
3-Dec	2	Z	2	3	1	1	9	15	21	21	16	24	27	32	55	33	19	15	15	8	7	8	19	27	16.6	55
4-Dec	13	8	Z	11	11	11	7	6	10	7	17	10	16	26	37	31	29	20	20	13	12	14	16	3	15.1	37
5-Dec	4	6	1	Z	0	0	0	1	0	0	0	0	0	0	0	1	4	7	11	20	26	33	23	12	6.6	33
6-Dec	5	4	2	4	Z	14	13	14	18	33	32	50	73	87	95	93	95	73	57	52	58	56	54	59	45.3	95
7-Dec	37	22	19	21	20	Z	22	26	22	21	18	24	31	35	38	40	34	44	64	56	50	47	35	57	34.1	64
8-Dec	Z	23	22	15	14	13	18	26	27	29	40	27	23	15	12	20	17	17	13	4	4	4	6	17	17.6	40
9-Dec	17	Z	23	34	44	37	30	27	22	22	29	33	16	16	29	30	28	24	20	21	21	23	22	19	25.5	44
10-Dec	21	16	Z	28	23	5	6	13	4	8	13	14	15	28	27	31	34	34	27	18	13	9	14	31	18.7	34
11-Dec	35	40	32	Z	21	16	15	14	11	11	11	10	8	6	7	8	6	6	11	11	2	2	3	2	12.5	40
12-Dec	1	1	3	3	Z	5	6	5	6	7	11	13	12	9	10	17	7	9	8	7	10	7	9	7	7.5	17
13-Dec	3	4	5	5	4	Z	1	1	4	4	5	6	2	2	1	13	15	15	11	9	8	9	15	26	7.2	26
14-Dec	Z	20	12	4	3	2	2	4	3	1	2	1	2	1	1	2	2	3	11	17	5	4	3	4	4.7	20
15-Dec	5	Z	5	5	5	9	11	10	15	20	4	2	2	2	2	4	3	2	7	1	1	2	5	6	5.7	20
16-Dec	7	6	Z	20	5	0	0	0	0	C	C	C	C	C	C	12	21	21	11	13	17	8	5	7	--	21
17-Dec	9	8	2	Z	1	0	1	6	9	10	12	19	14	14	13	14	11	11	17	21	16	14	10	2	10.2	21
18-Dec	2	3	3	6	Z	7	10	12	16	10	10	9	10	16	16	19	19	12	5	4	3	3	2	1	8.6	19
19-Dec	1	2	7	13	13	Z	2	2	2	2	3	11	15	16	14	13	12	12	12	13	13	14	15	19	9.8	19
20-Dec	Z	22	18	19	19	17	17	16	16	26	23	20	21	24	28	23	25	21	20	20	19	13	10	13	19.6	28
21-Dec	6	Z	3	3	5	11	11	11	31	23	9	25	24	22	19	17	16	15	14	16	17	18	21	26	15.8	31
22-Dec	27	26	Z	5	5	4	4	4	4	5	7	11	12	7	3	2	3	4	2	3	6	4	5	7	6.9	27
23-Dec	8	13	13	Z	9	14	15	5	4	4	9	13	8	3	3	2	6	10	7	8	11	8	11	10	8.4	15
24-Dec	7	1	2	4	Z	3	6	7	14	18	18	19	19	17	13	15	14	13	14	14	14	12	11	16	12.0	19
25-Dec	22	22	21	16	16	Z	13	13	15	14	13	10	14	11	14	18	26	21	14	9	2	3	4	5	13.7	26
26-Dec	Z	18	18	15	12	10	10	8	10	12	10	11	10	30	35	91	113	107	95	55	29	40	46	37	35.7	113
27-Dec	35	Z	32	19	23	19	20	18	13	5	7	8	8	5	3	4	4	4	5	5	5	6	5	4	11.1	35
28-Dec	3	3	Z	2	5	9	7	10	12	8	16	12	12	8	11	10	7	5	7	11	12	15	24	25	10.1	25
29-Dec	25	19	47	Z	43	25	16	21	10	9	7	6	13	17	11	11	11	12	16	14	10	11	13	13	16.6	47
30-Dec	3	4	2	1	Z	6	6	14	14	18	26	23	21	16	13	10	9	14	16	20	12	9	18	19	12.7	26
31-Dec	13	12	22	15	10	Z	11	12	4	1	1	1	1	1	1	2	5	2	3	4	6	17	10	11	7.2	22
																			13.3 14.2 14.3 12.7 14.5 10.5 11.4 12.6 13.1 14.3 15.2 16.4 16.4 17.3 18.8 20.2 20.7 19.0 18.0 15.9 14.2 14.3 15.0 16.5						Diurnal Average	
																			37 40 47 38 44 37 41 46 43 48 49 50 73 87 95 93 113 107 95 56 58 56 54 59						Diurnal Maximum	
Z - zerospan		C - Calibration																								





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	528	74.68	74.68
21 - 40	143	20.23	94.91
41 - 80	28	3.96	98.87
81 - 159	8	1.13	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



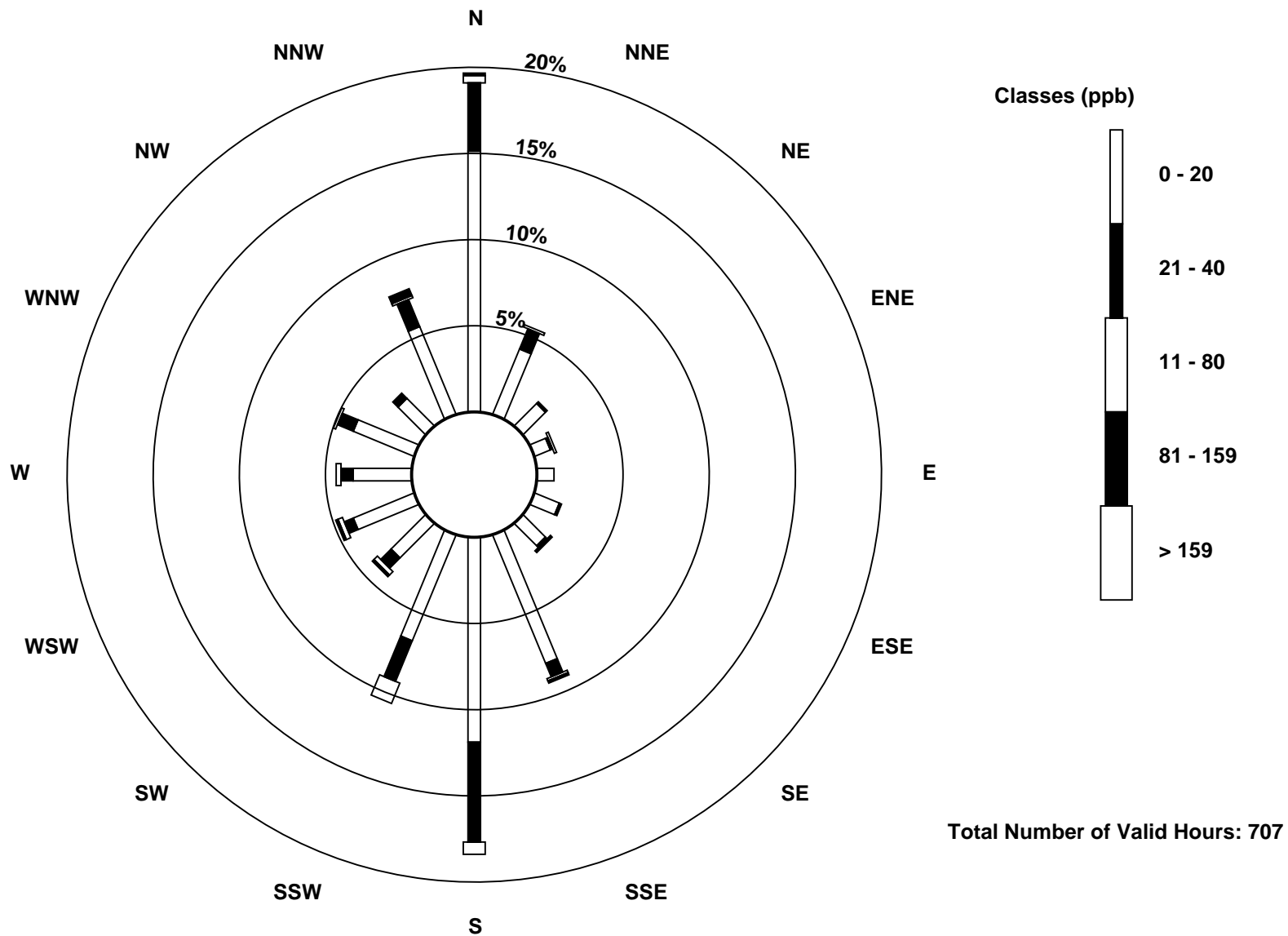
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

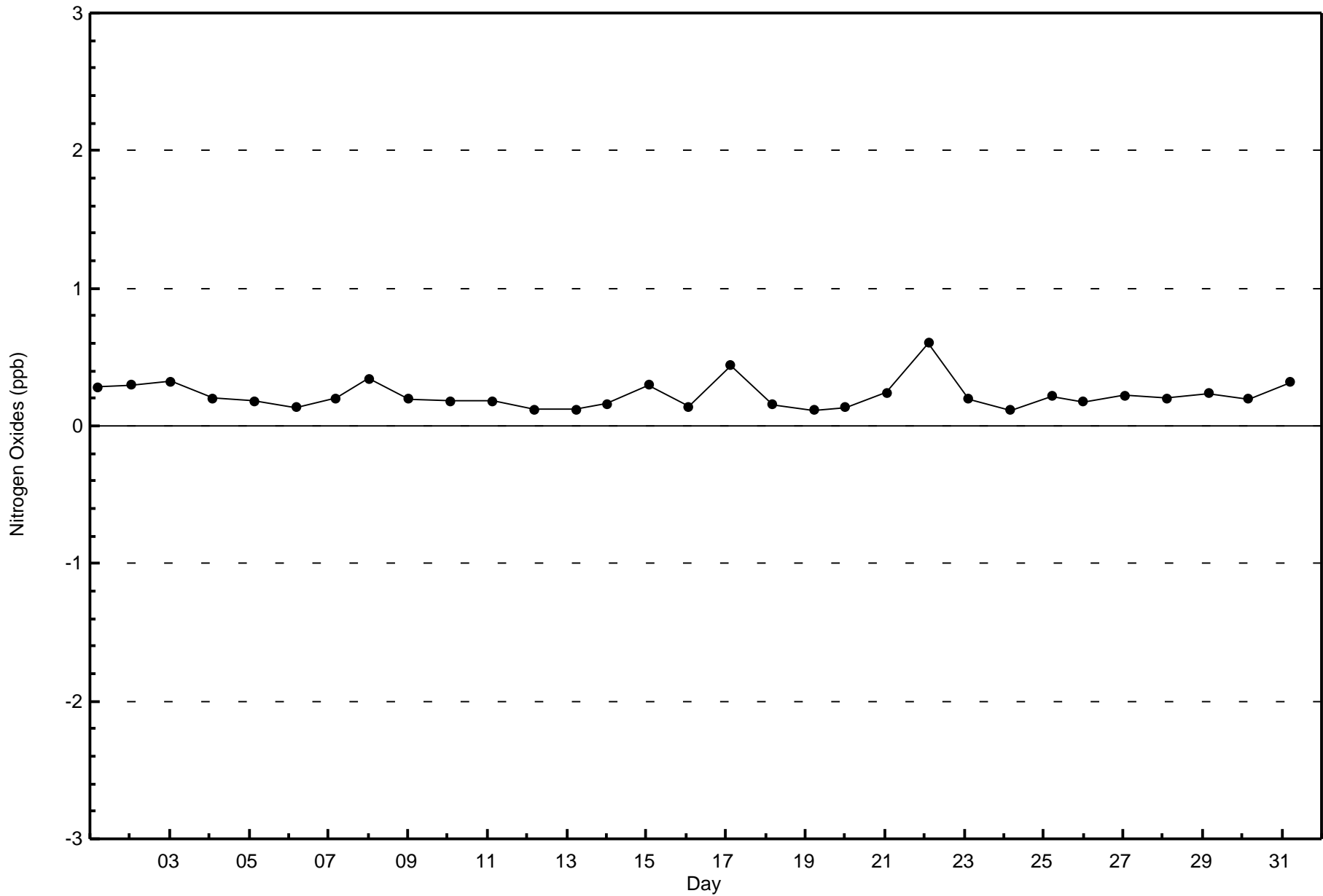
**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2015**

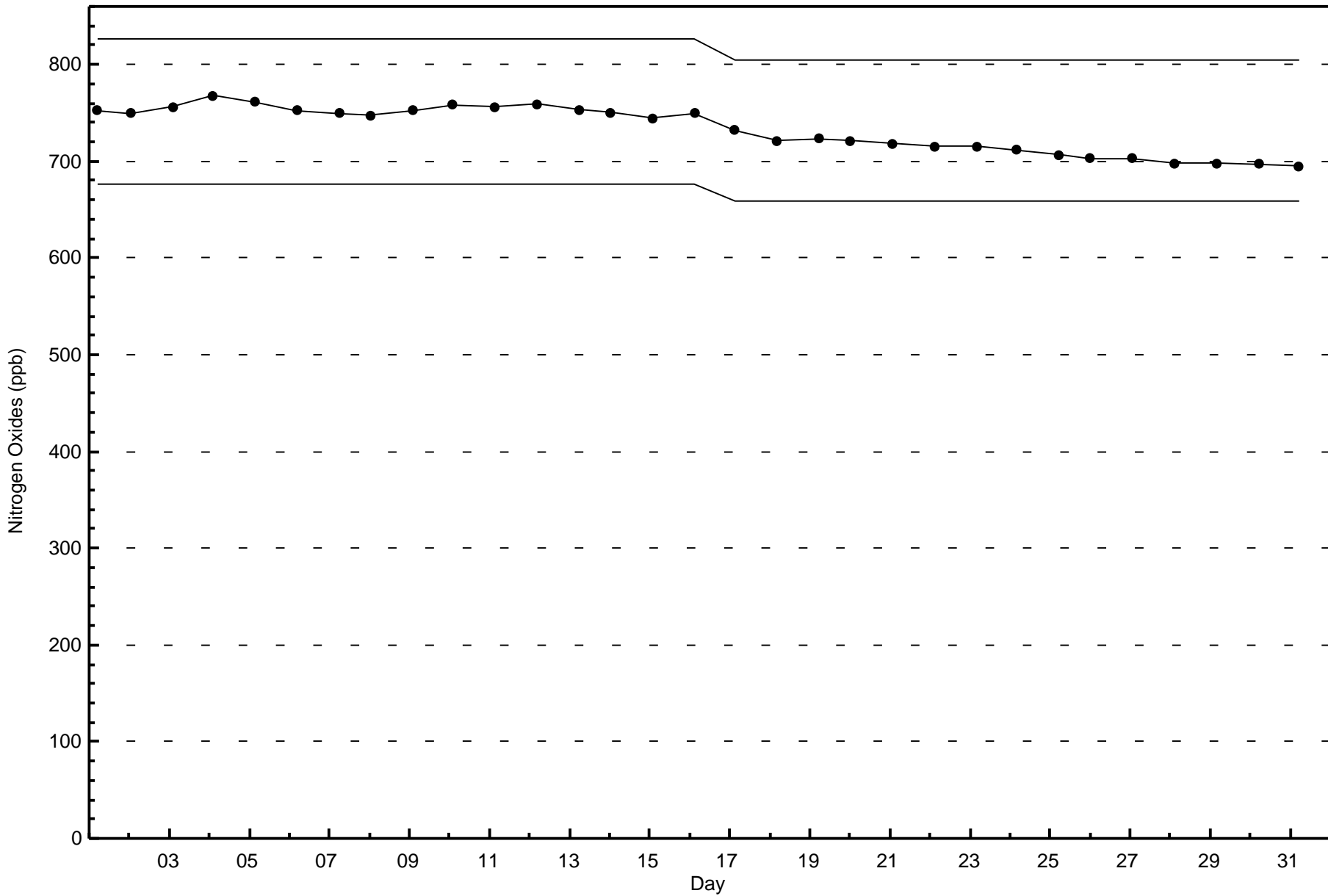
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	107	29	13	7	7	11	13	57	84	47	20	27	24	27	16	39	528
21 - 40	28	9	1	1	0	1	1	6	41	18	6	4	5	7	3	12	143
11 - 80	3	1	0	1	0	0	0	1	5	9	2	2	2	1	0	1	28
81 - 159	1	0	0	0	0	0	1	1	0	0	1	1	0	0	0	3	8
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	139	39	14	9	7	12	15	65	130	74	29	34	31	35	19	55	707

Total Number of Valid Hours: 707

Total Number of Hours: 744







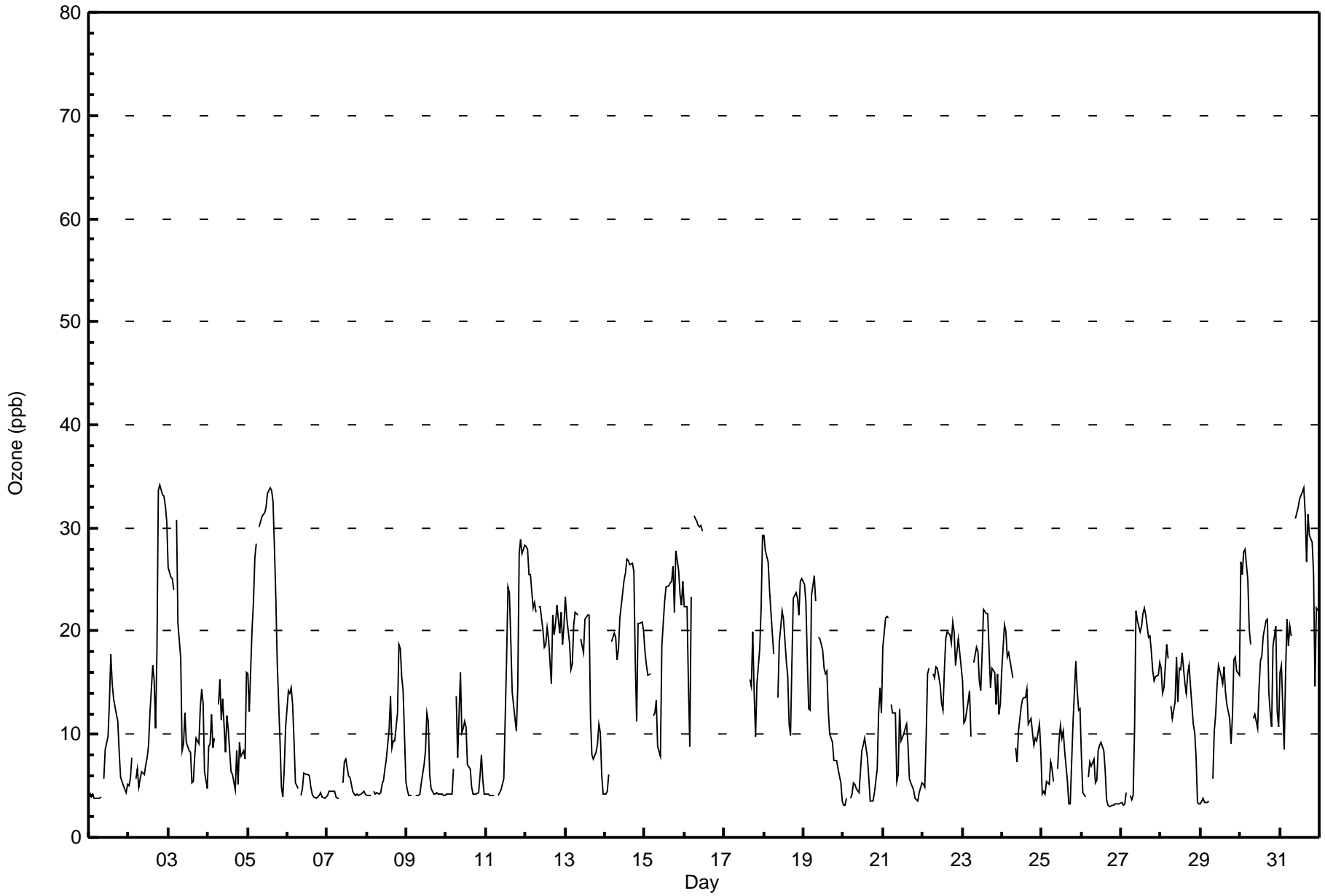


Summary of Hour Averages

Fort McKay - Bertha Ganter - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																								
Maximum Value: 34 ppb on Dec 2 20:00										Maximum Daily Average: 24.5 ppb on Dec 31										Hours of Data: 687																														
Minimum Value: 3 ppb on Dec 26 18:00										Minimum Daily Average: 4.8 ppb on Dec 7										Hours of Missing Data: 57																														
Maximum Diurnal Average: 16.1 ppb at hour 14										Minimum Diurnal Average: 12.0 ppb at hour 9										Hours of Calibration: 35																														
Monthly Average: 13.3 ppb										Percentiles: P <sub>1</sub> = 3 P <sub>10</sub> = 4 Q <sub>1</sub> = 6 Median = 12 O <sub>3</sub> = 19 P <sub>90</sub> = 25 P <sub>99</sub> = 33										Percent Operational Time: 97.0																														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																										
1-Dec	4	4	4	4	4	4	4	4	Z	6	9	10	13	18	15	13	12	11	8	6	5	5	4	5	7.5	18																								
2-Dec	5	6	8	Z	6	7	5	6	6	6	7	8	9	12	17	15	11	18	34	34	33	33	32	31	15.1	34																								
3-Dec	26	25	25	24	Z	31	21	17	8	9	12	9	8	8	5	5	8	10	9	13	14	13	6	5	13.6	31																								
4-Dec	9	9	12	9	10	Z	13	15	11	13	8	12	10	8	6	6	5	8	5	9	8	8	8	16	9.5	16																								
5-Dec	16	12	20	23	27	29	Z	30	31	31	31	32	33	34	34	33	28	23	17	9	5	4	7	11	22.6	34																								
6-Dec	14	14	15	13	9	5	5	Z	4	5	6	6	6	6	5	4	4	4	4	4	4	4	4	4	6.5	15																								
7-Dec	4	4	4	4	4	4	4	4	Z	5	7	8	7	6	6	5	4	4	4	4	4	4	4	4	4	4.8	8																							
8-Dec	4	4	4	Z	4	4	4	4	4	5	5	7	8	11	14	9	9	9	12	19	18	16	14	5	8.5	19																								
9-Dec	5	4	4	4	Z	4	4	4	4	5	7	8	12	11	6	5	4	4	4	4	4	4	4	4	5.3	12																								
10-Dec	4	4	4	4	7	Z	14	8	16	10	11	11	11	7	7	5	4	4	4	4	6	8	6	4	7.1	16																								
11-Dec	4	4	4	4	4	4	Z	4	4	5	5	6	17	24	24	19	14	12	10	15	28	29	28	28	12.9	29																								
12-Dec	28	28	26	26	22	23	22	Z	22	22	20	18	19	20	19	15	22	20	21	23	20	22	19	21	21.6	28																								
13-Dec	23	21	19	16	17	21	22	22	Z	19	19	18	21	21	22	11	8	8	8	9	11	10	6	4	15.5	23																								
14-Dec	4	5	6	Z	19	20	19	17	18	21	23	25	26	27	27	26	27	26	17	11	21	21	21	20	19.4	27																								
15-Dec	18	17	16	16	Z	12	12	13	9	8	19	21	23	24	24	25	25	26	22	28	26	24	23	25	19.7	28																								
16-Dec	22	22	15	9	23	Z	31	31	30	30	30	30	M	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	31																								
17-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	C	C	C	UO	C	C	15	15	20	14	10	15	18	22	29	--	29																							
18-Dec	29	28	27	24	22	20	18	Z	14	19	20	22	21	17	16	11	10	17	23	24	23	22	25	25	20.7	29																								
19-Dec	25	23	17	12	12	24	25	23	Z	19	19	18	16	16	16	12	10	9	7	7	8	7	5	3	14.6	25																								
20-Dec	3	3	4	Z	4	4	5	5	5	4	6	8	9	10	8	6	4	4	3	4	7	12	15	12	6.3	15																								
21-Dec	18	21	21	21	Z	13	12	12	5	6	13	9	10	11	11	9	6	5	5	4	4	4	4	5	10.0	21																								
22-Dec	5	5	10	16	16	Z	16	15	17	16	15	13	12	16	19	20	20	19	21	20	17	19	18	17	15.7	21																								
23-Dec	15	11	11	13	14	10	Z	17	18	18	15	14	18	22	22	18	14	16	16	13	16	12	13	15.6	22																									
24-Dec	16	21	20	17	18	17	15	Z	9	7	10	13	13	14	14	14	11	11	10	9	10	9	11	8	13.0	21																								
25-Dec	4	4	4	5	5	7	7	5	Z	7	9	11	10	10	8	5	3	3	7	11	17	14	12	12	8.0	17																								
26-Dec	8	4	4	Z	6	7	7	8	5	6	8	9	9	8	6	4	3	3	3	3	3	3	3	3	5.4	9																								
27-Dec	3	3	3	4	Z	4	4	4	10	22	21	20	20	22	22	22	19	19	18	16	15	16	16	17	14.0	22																								
28-Dec	16	14	15	19	17	Z	13	11	13	17	13	16	16	18	15	14	16	17	15	11	10	8	3	3	13.5	19																								
29-Dec	3	4	3	3	3	4	Z	6	10	12	15	17	16	15	17	14	13	12	9	12	17	18	16	16	11.0	18																								
30-Dec	27	26	28	28	25	20	19	Z	12	12	11	15	17	18	20	21	21	14	12	11	19	20	12	11	18.1	28																								
31-Dec	16	17	9	16	21	19	20	19	Z	31	31	32	33	34	34	31	27	31	29	29	26	15	22	22	24.5	34																								
																								12.7	12.2	12.1	13.4	12.8	12.6	13.1	12.2	12.0	13.3	14.2	14.8	15.3	16.1	15.8	13.9	12.6	12.9	12.5	12.6	13.7	13.5	12.7	12.8	Diurnal Average		
																								29	28	28	28	27	31	31	31	31	31	31	31	32	33	34	34	33	28	31	34	34	33	33	32	31	Diurnal Maximum	
Z - zerospan C - Calibration M - Maintenance UO - Unstable Operation																																																		
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																																																		







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	544	79.18	79.18
21 - 50	143	20.82	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 687

Total Number of Hours: 744



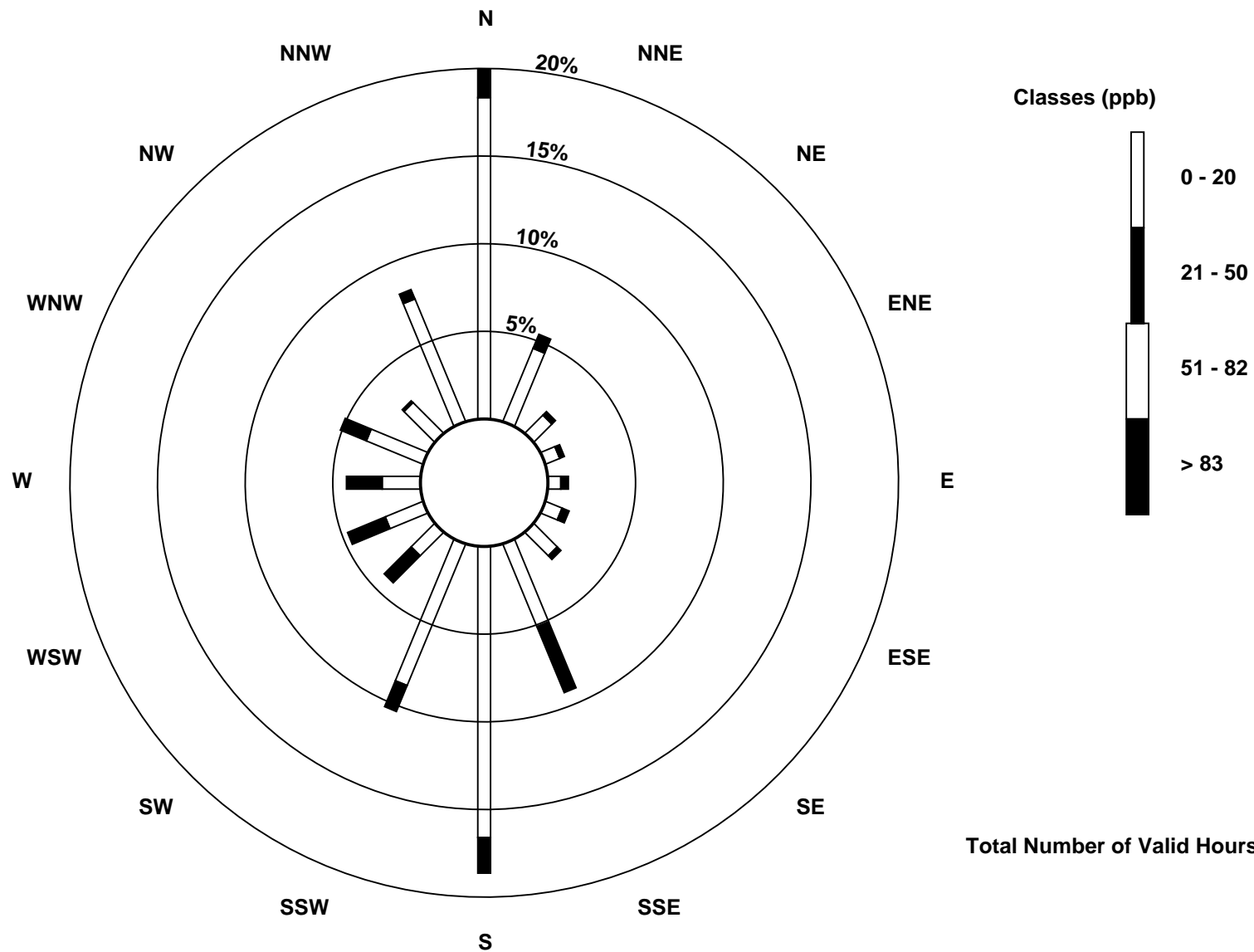
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

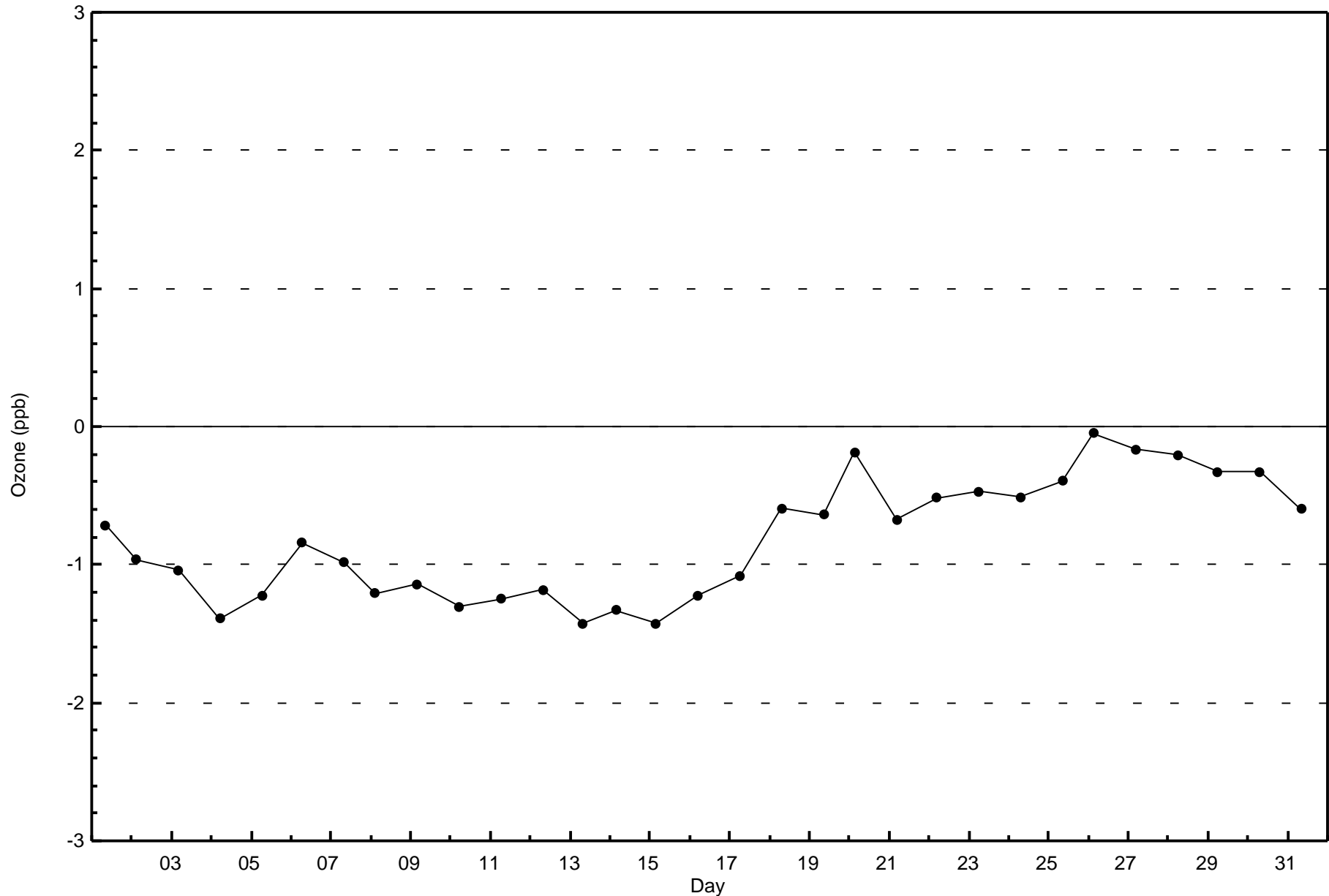
**Ozone (O<sub>3</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2015**

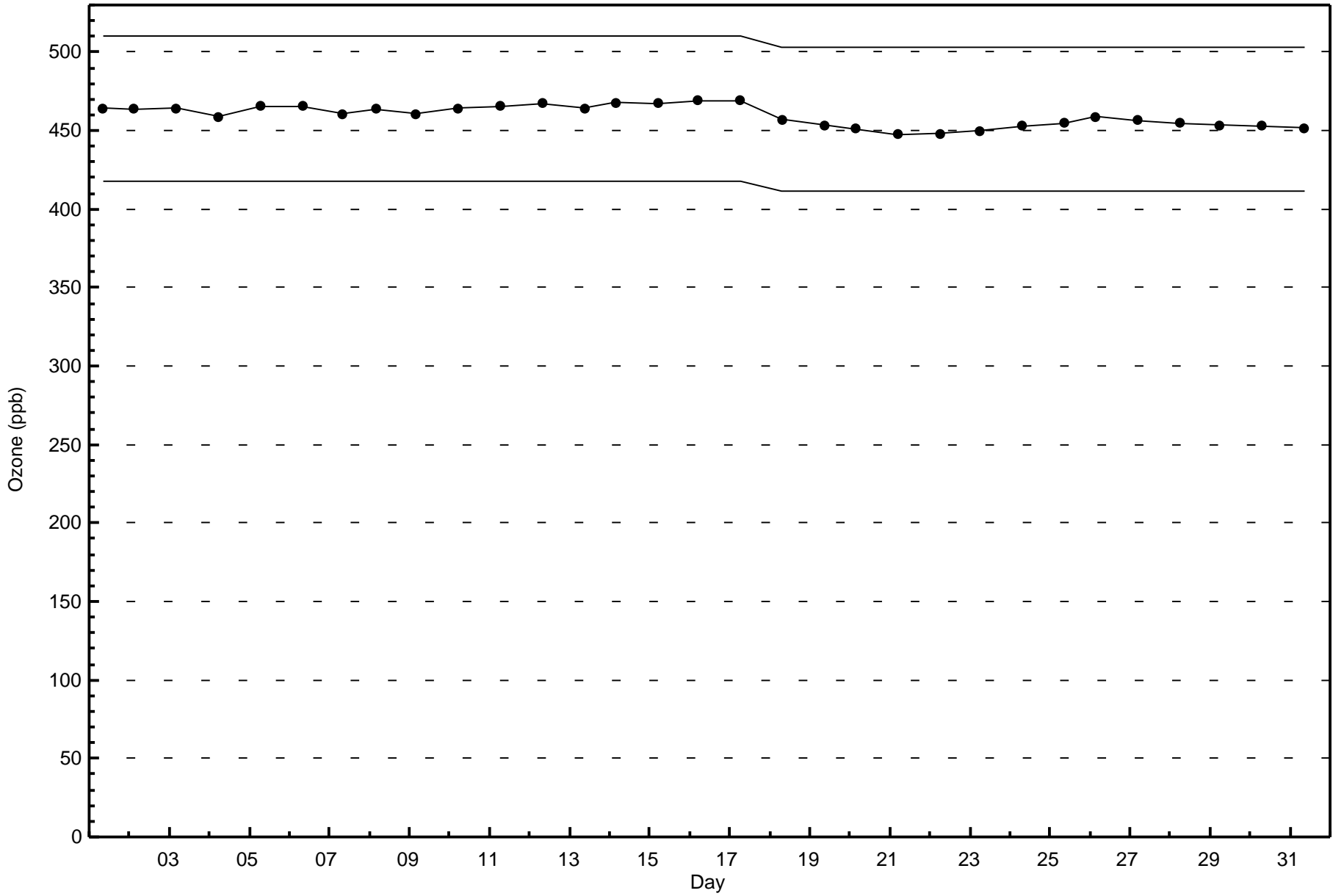
<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	126	31	10	6	5	7	13	35	114	60	13	16	15	24	17	52	544
21 - 50	11	6	2	2	3	3	2	28	14	11	15	16	14	11	1	4	143
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	137	37	12	8	8	10	15	63	128	71	28	32	29	35	18	56	687

Total Number of Valid Hours: 687

Total Number of Hours: 744









Number of Exceedences (AAAQO): 24-hr: 0	Hours in Service: 744
Maximum Value: 49.5 µg/m <sup>3</sup> on Dec 22 00:00	Maximum Daily Average: 12.8 µg/m <sup>3</sup> on Dec 1
Minimum Value: 0.8 µg/m <sup>3</sup> on Dec 5 15:00	Hours of Data: 742
Maximum Diurnal Average: 7.1 µg/m <sup>3</sup> at hour 17	Hours of Missing Data: 2
Monthly Average: 5.65 µg/m <sup>3</sup>	Hours of Calibration: 2
Minimum Daily Average: 2.2 µg/m <sup>3</sup> on Dec 31	Percent Operational Time: 100.0
Minimum Diurnal Average: 4.9 µg/m <sup>3</sup> at hour 11	
Percentiles: P <sub>1</sub> = 0.9 P <sub>10</sub> = 1.9 Q <sub>1</sub> = 2.7 Median = 4.8 Q <sub>3</sub> = 7.3 P <sub>90</sub> = 10.1 P <sub>99</sub> = 17.8	

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	10.6	10.1	9.4	9.5	10.9	11.4	10.7	15.1	15.9	14.5	10.7	12.1	14.6	13.7	14.5	15.4	15.2	14.7	14.1	12.7	16.7	13.2	10.7	11.2	12.8	16.7																						
2-Dec	16.3	19.0	17.5	16.3	15.9	16.4	14.2	12.9	12.1	13.0	13.8	14.6	11.6	12.0	10.6	10.2	9.9	8.0	3.1	1.9	1.9	2.3	6.3	1.7	10.9	19.0																						
3-Dec	1.7	2.5	2.4	7.7	3.8	1.6	1.9	3.1	4.2	3.9	4.2	6.6	11.7	12.6	10.8	9.8	9.1	8.7	7.7	7.5	7.2	6.9	6.7	7.0	6.2	12.6																						
4-Dec	6.8	6.9	8.1	9.4	8.6	9.3	9.2	6.5	6.5	6.6	8.6	8.3	10.2	9.0	7.9	7.6	8.1	6.7	5.9	6.1	8.5	7.1	6.0	4.4	7.6	10.2																						
5-Dec	4.9	5.5	4.0	3.0	2.5	2.1	1.7	1.6	1.5	1.5	1.3	0.9	0.9	0.9	0.8	0.8	9.5	8.6	4.7	5.4	4.8	2.7	2.2	2.7	3.1	9.5																						
6-Dec	1.4	1.3	1.1	1.3	1.4	1.9	1.6	3.0	3.2	2.3	2.7	3.9	4.5	5.0	5.6	9.3	14.0	10.1	7.7	18.2	18.8	5.1	4.2	3.9	5.5	18.8																						
7-Dec	3.6	6.9	3.2	4.4	2.4	2.4	2.3	2.4	2.3	2.5	2.4	3.2	5.8	5.4	6.9	7.5	7.1	6.2	7.9	7.3	8.0	10.3	5.9	4.4	5.0	10.3																						
8-Dec	5.2	5.9	6.1	6.1	5.9	5.6	6.9	8.9	8.2	14.6	8.9	7.8	6.2	6.0	7.5	18.9	6.9	4.9	5.1	3.4	3.6	3.8	4.1	4.2	6.9	18.9																						
9-Dec	4.9	5.6	5.6	6.3	7.0	6.7	6.0	5.8	6.0	5.3	4.0	3.3	2.8	2.9	3.1	3.4	4.7	6.8	9.0	8.5	7.9	8.0	8.6	8.0	5.8	9.0																						
10-Dec	10.5	9.4	7.8	7.5	6.2	4.7	5.3	5.3	5.2	5.2	5.0	5.1	4.7	5.6	5.4	5.5	5.1	5.0	4.6	4.4	4.5	5.0	5.4	6.3	5.8	10.5																						
11-Dec	6.8	7.1	6.3	6.0	5.6	5.7	5.5	5.2	5.4	5.1	5.3	5.1	3.6	2.9	3.3	3.4	3.7	3.9	4.6	3.7	1.1	0.9	1.0	0.9	4.3	7.1																						
12-Dec	0.9	0.9	1.2	1.2	1.5	1.5	1.4	1.6	2.3	3.4	3.5	3.3	4.1	3.9	3.5	5.1	2.6	3.0	3.1	3.5	2.9	2.2	1.6	1.3	2.5	5.1																						
13-Dec	1.7	2.7	3.5	3.7	2.9	1.4	1.2	1.1	1.3	1.6	2.0	2.7	2.7	2.2	1.8	2.4	2.5	2.8	2.7	2.8	2.7	2.6	2.8	3.5	2.4	3.7																						
14-Dec	2.7	3.1	3.9	4.2	3.1	3.1	3.1	3.1	3.1	2.3	2.2	1.6	2.7	C	C	2.6	3.0	2.4	3.0	3.6	3.7	3.5	3.1	4.4	3.1	4.4																						
15-Dec	6.8	4.5	6.0	7.5	7.6	11.7	11.0	8.2	8.6	10.1	5.4	4.4	4.4	3.6	3.3	8.5	8.3	8.7	7.3	5.2	4.2	5.4	5.3	1.9	6.6	11.7																						
16-Dec	1.7	1.7	2.0	2.8	2.1	1.8	1.6	1.4	1.4	1.4	1.4	3.9	1.6	1.1	1.5	1.6	8.1	3.8	2.7	2.9	3.8	2.0	1.7	7.5	2.6	8.1																						
17-Dec	7.5	2.7	1.6	1.9	1.5	1.5	1.6	1.9	2.0	2.6	4.0	3.7	2.1	2.4	2.5	2.7	2.9	2.5	2.6	2.2	2.1	1.8	1.8	1.7	2.5	7.5																						
18-Dec	1.7	1.6	1.6	1.9	1.9	2.1	2.1	2.2	2.3	2.1	2.4	4.4	3.8	3.6	3.6	3.7	3.5	3.2	2.5	2.6	2.2	2.3	2.3	2.2	2.6	4.4																						
19-Dec	1.9	2.1	2.3	3.0	3.0	2.4	2.1	2.0	1.9	2.1	2.0	2.8	3.7	3.5	3.4	3.6	3.8	5.0	4.6	4.9	5.1	4.7	4.9	5.3	3.3	5.3																						
20-Dec	5.4	5.4	5.9	10.1	9.5	7.5	7.6	8.0	6.3	5.8	5.5	4.8	6.7	7.6	9.5	7.7	7.8	7.6	6.6	7.9	6.3	6.1	7.1	7.2	7.1	10.1																						
21-Dec	6.3	6.2	6.7	6.5	7.1	9.4	8.1	9.8	10.3	8.8	6.8	9.4	9.2	10.2	10.2	13.3	17.6	12.8	11.4	10.5	9.4	9.0	20.4	49.5	11.6	49.5																						
22-Dec	44.2	40.9	11.5	4.5	4.1	4.4	6.6	8.0	9.9	6.4	4.7	3.9	3.4	3.5	5.1	6.0	5.4	3.0	2.6	2.7	2.9	2.8	2.9	3.0	8.0	44.2																						
23-Dec	2.6	2.5	2.5	2.4	2.3	2.4	2.6	2.7	3.3	3.6	2.9	2.5	2.3	2.2	2.2	2.4	2.4	2.5	2.5	2.7	2.8	2.8	2.6	2.6	2.6	3.6																						
24-Dec	2.8	3.1	3.2	3.1	3.3	3.2	3.2	3.6	3.9	4.1	4.3	5.5	5.9	6.0	6.3	6.2	7.2	7.1	6.6	6.9	7.1	6.4	19.0	30.7	6.6	30.7																						
25-Dec	7.5	22.2	12.7	9.3	8.2	9.5	14.5	7.2	6.0	5.6	7.9	4.9	4.3	4.5	4.8	5.1	8.3	7.4	6.2	4.3	3.7	4.0	3.7	3.6	7.3	22.2																						
26-Dec	4.4	4.2	4.0	3.6	3.7	3.5	3.4	3.1	3.0	3.1	2.8	4.2	3.6	8.7	7.1	10.2	12.6	10.5	9.3	7.1	7.2	10.0	9.2	8.4	6.1	12.6																						
27-Dec	9.8	7.1	5.6	5.1	5.0	5.6	5.2	5.0	4.8	5.0	5.0	4.9	5.5	5.9	6.2	6.8	7.1	6.9	7.3	7.1	7.5	6.8	5.1	4.5	6.0	9.8																						
28-Dec	5.7	6.5	6.4	5.7	5.2	6.8	6.6	7.4	6.5	5.0	5.5	5.1	5.4	4.8	5.2	5.6	6.1	6.5	7.4	7.4	6.8	6.7	6.4	6.5	6.1	7.4																						
29-Dec	7.8	9.3	9.0	9.7	8.6	7.6	9.0	9.5	10.2	10.2	10.4	7.5	5.5	5.3	5.4	6.4	6.9	8.1	7.5	5.5	4.4	4.0	3.8	4.2	7.3	10.4																						
30-Dec	3.1	3.2	2.7	2.5	2.6	3.0	5.4	8.2	4.7	4.3	4.1	4.9	4.0	3.2	3.5	3.8	8.9	9.7	7.7	3.3	3.1	3.4	2.8	3.3	4.4	9.7																						
31-Dec	2.2	1.8	2.3	2.4	2.2	2.3	2.2	2.5	1.8	1.5	1.4	1.3	1.3	1.3	1.2	1.0	2.0	2.7	2.5	2.0	2.5	3.1	2.6	7.1	2.2	7.1																						
																								6.4	6.8	5.4	5.4	5.0	5.1	5.3	5.4	5.3	5.3	4.9	5.1	5.1	5.3	5.4	6.3	7.1	6.5	5.8	5.6	5.6	5.0	5.5	6.9	Diurnal Average
																								44.2	40.9	17.5	16.3	15.9	16.4	14.5	15.1	15.9	14.6	13.8	14.6	14.6	13.7	14.5	18.9	17.6	14.7	14.1	18.2	18.8	13.2	20.4	49.5	Diurnal Maximum

C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m<sup>3</sup>

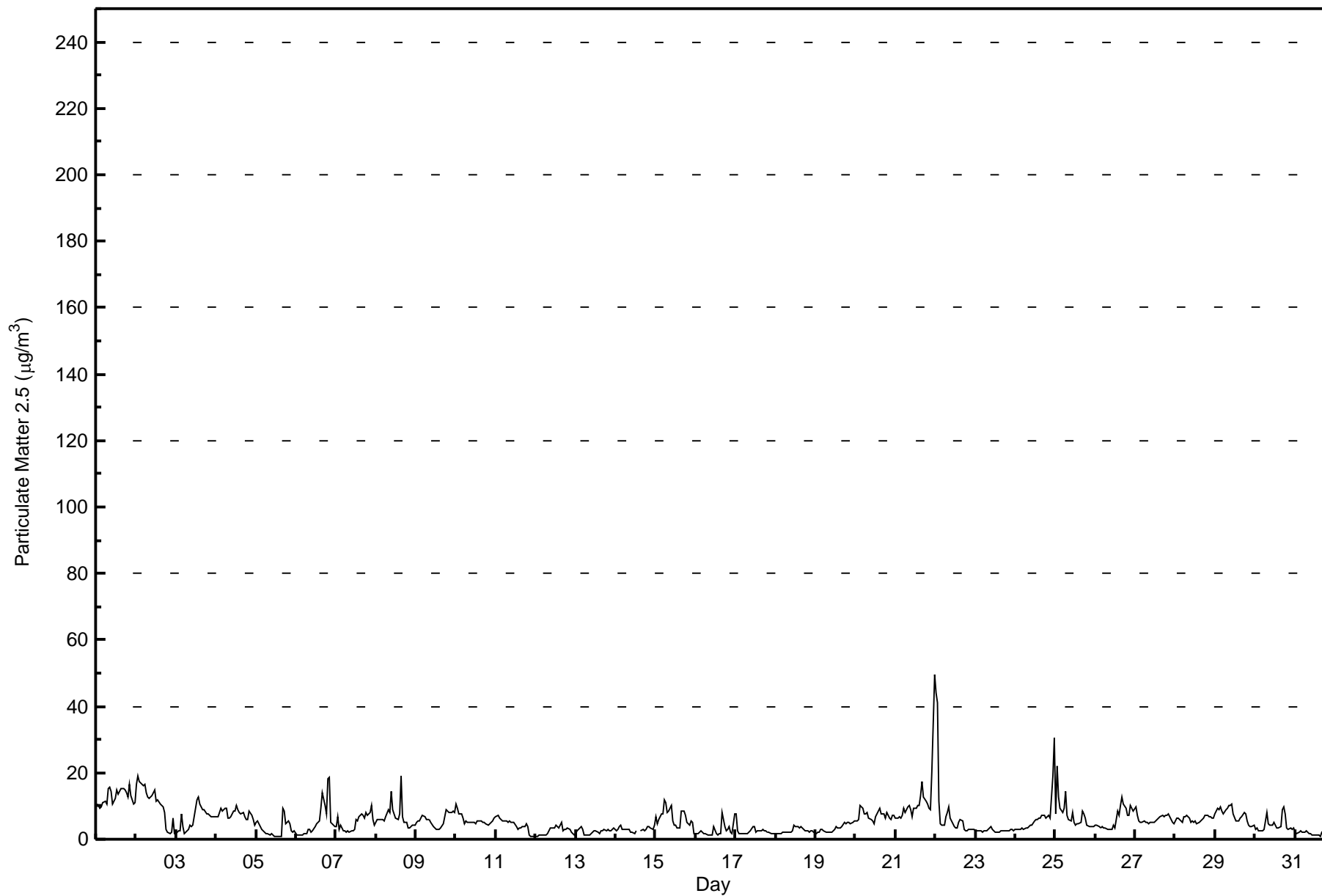


Wood Buffalo Environmental Association

Hourly Averages

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$

Fort McKay - Bertha Ganter - December 2015







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	428	57.68	57.68
6 - 15	285	38.41	96.09
16 - 25	15	2.02	98.11
26 - 80	4	0.54	98.65
> 81.0	0	0.00	98.65

Total Number of Valid Hours: 742

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) - μg/m<sup>3</sup>**  
**Fort McKay - Bertha Ganter - December 2015**

Concentration Ranges (μg/m <sup>3</sup> )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	93	27	12	9	8	8	13	44	41	22	17	22	27	32	17	36	428
6 - 15	49	13	2	0	0	4	3	17	91	46	9	13	6	7	3	22	285
16 - 25	1	0	0	0	0	0	0	1	1	10	1	0	0	0	1	0	15
26 - 80	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	4
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	145	40	14	9	8	12	16	62	134	78	27	35	33	39	21	59	732

Total Number of Valid Hours: 742

Total Number of Hours: 744

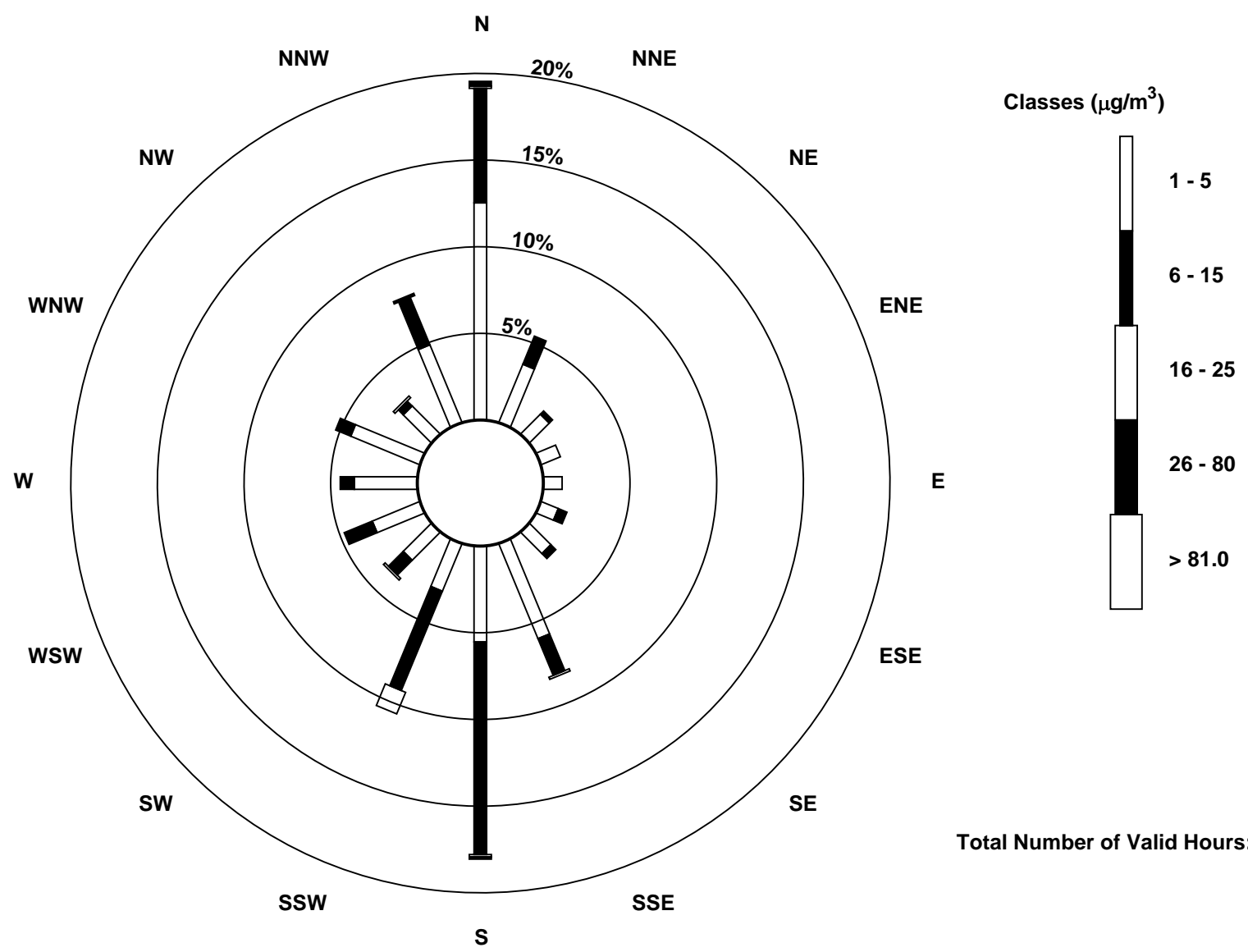


Wood Buffalo Environmental Association

Wind Rose Dec 2015

Particulate Matter 2.5 (PM<sub>2.5</sub>) - μg/m<sup>3</sup>

Fort McKay - Bertha Ganter (AMS 1)



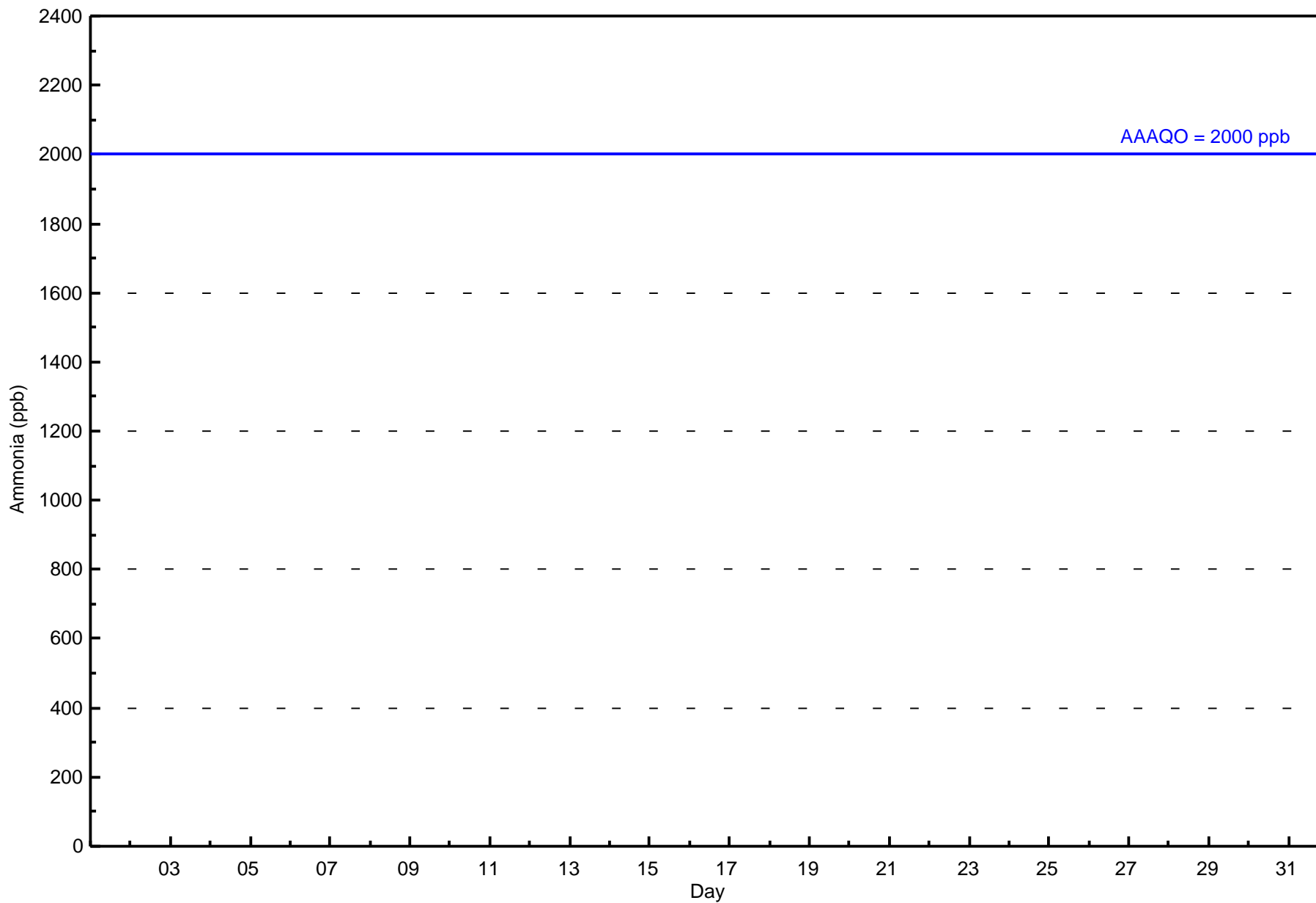
Total Number of Valid Hours: 742



Summary of Hour Averages

Fort McKay - Bertha Ganter - December 2015

Number of Exceedences (AAAQO): 1-hr: 0												Hours in Service: 744															
Maximum Value: 0 ppb on Dec 1 01:00												Maximum Daily Average: 0.0 ppb on Dec 1															
Minimum Value: 0 ppb on Dec 1 01:00												Hours of Data: 654															
Maximum Diurnal Average: 0.0 ppb at hour 1												Hours of Missing Data: 90															
Monthly Average: 0.0 ppb												Hours of Calibration: 40															
Minimum Daily Average: 0.0 ppb on Dec 1												Percent Operational Time: 93.3															
Minimum Diurnal Average: 0.0 ppb at hour 1												Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 0															
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2-Dec	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3-Dec	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
4-Dec	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
5-Dec	0	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Dec	0	0	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
7-Dec	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
8-Dec	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
9-Dec	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
10-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
11-Dec	0	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
12-Dec	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
13-Dec	0	0	0	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
14-Dec	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
15-Dec	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
16-Dec	0	0	0	0	Z	RE	0	0	0	C	C	C	C	C	C	C	C	C	0	0	0	0	0	0	0	--	0
17-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
18-Dec	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
19-Dec	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
20-Dec	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
21-Dec	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
22-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
23-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
24-Dec	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
25-Dec	0	0	0	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
26-Dec	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
27-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
28-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
29-Dec	0	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
30-Dec	0	0	0	0	0	0	Z	RE	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
31-Dec	0	0	0	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
0.0																								Diurnal Average			
0																								Diurnal Maximum			
Z - zerospan      C - Calibration      M - Maintenance      RE - Recovery																											
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 2000 ppb																											





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ammonia (NH<sub>3</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	654	100.00	100.00
6 - 10	0	0.00	100.00
11 - 15	0	0.00	100.00
16 - 20	0	0.00	100.00
21 - 25	0	0.00	100.00
> 26	0	0.00	100.00

Total Number of Valid Hours: 654

Total Number of Hours: 744



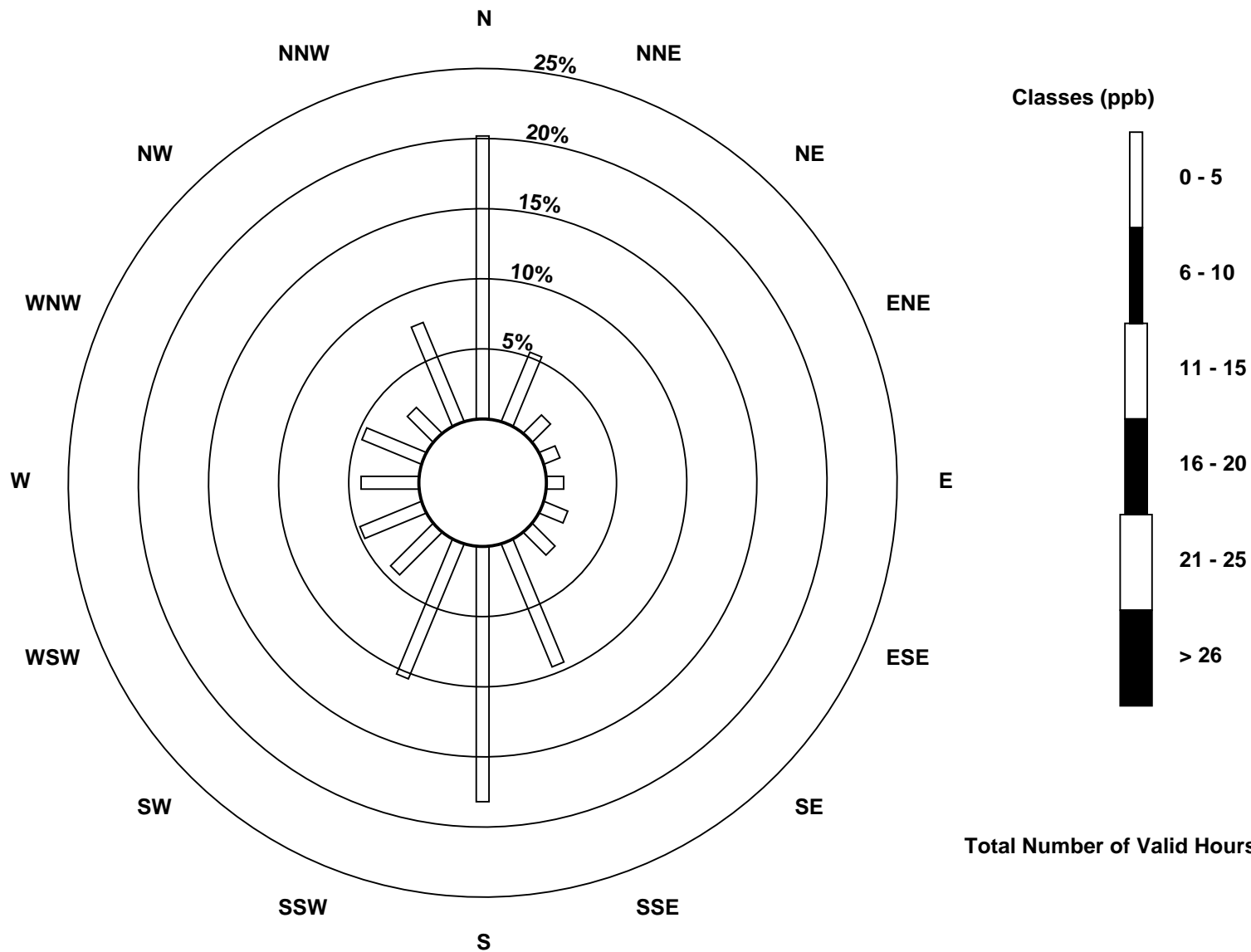
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Ammonia (NH<sub>3</sub>) - ppb**  
**Fort McKay - Bertha Ganter - December 2015**

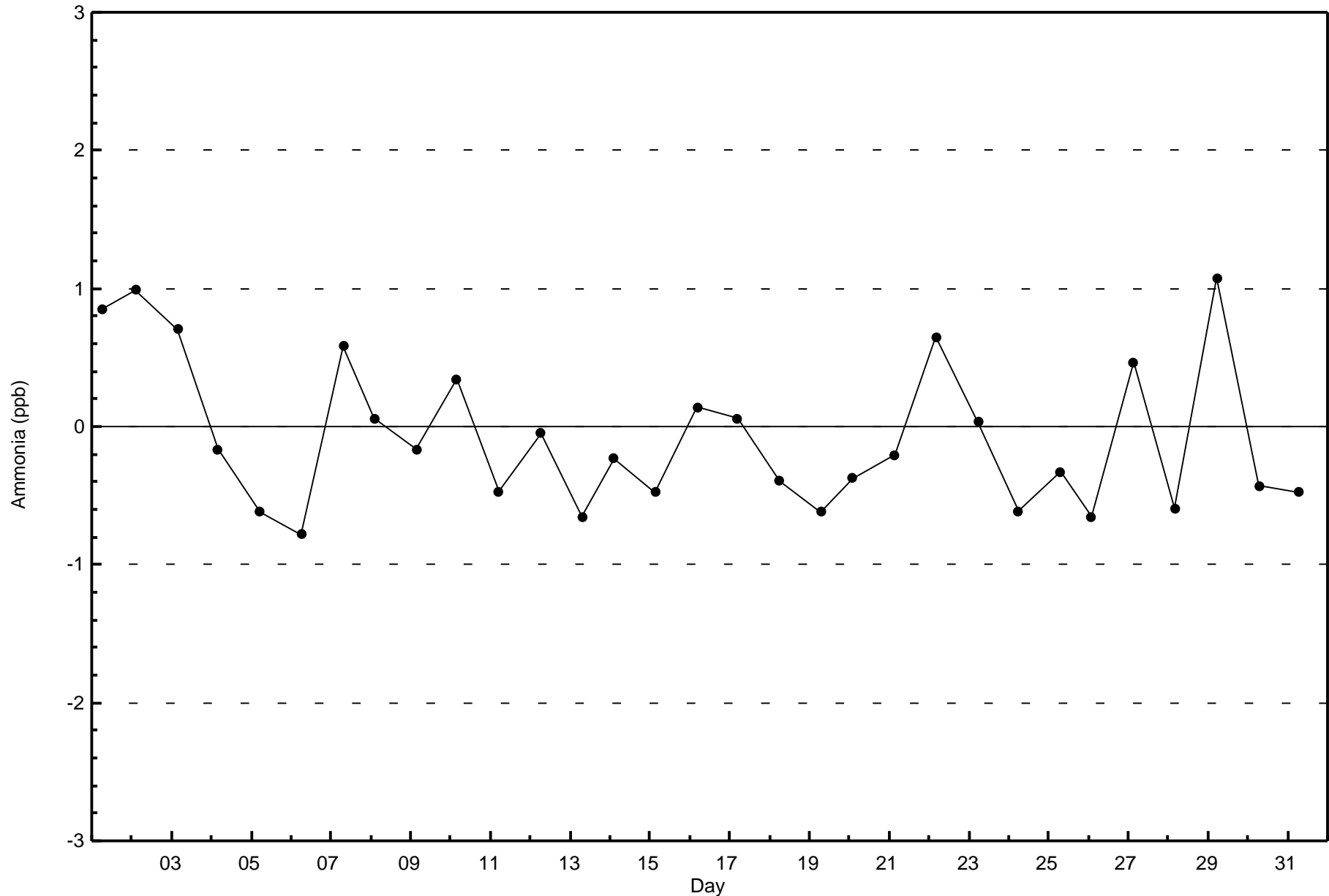
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	132	35	12	8	8	12	15	62	119	68	28	31	27	30	17	50	654
6 - 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	132	35	12	8	8	12	15	62	119	68	28	31	27	30	17	50	654

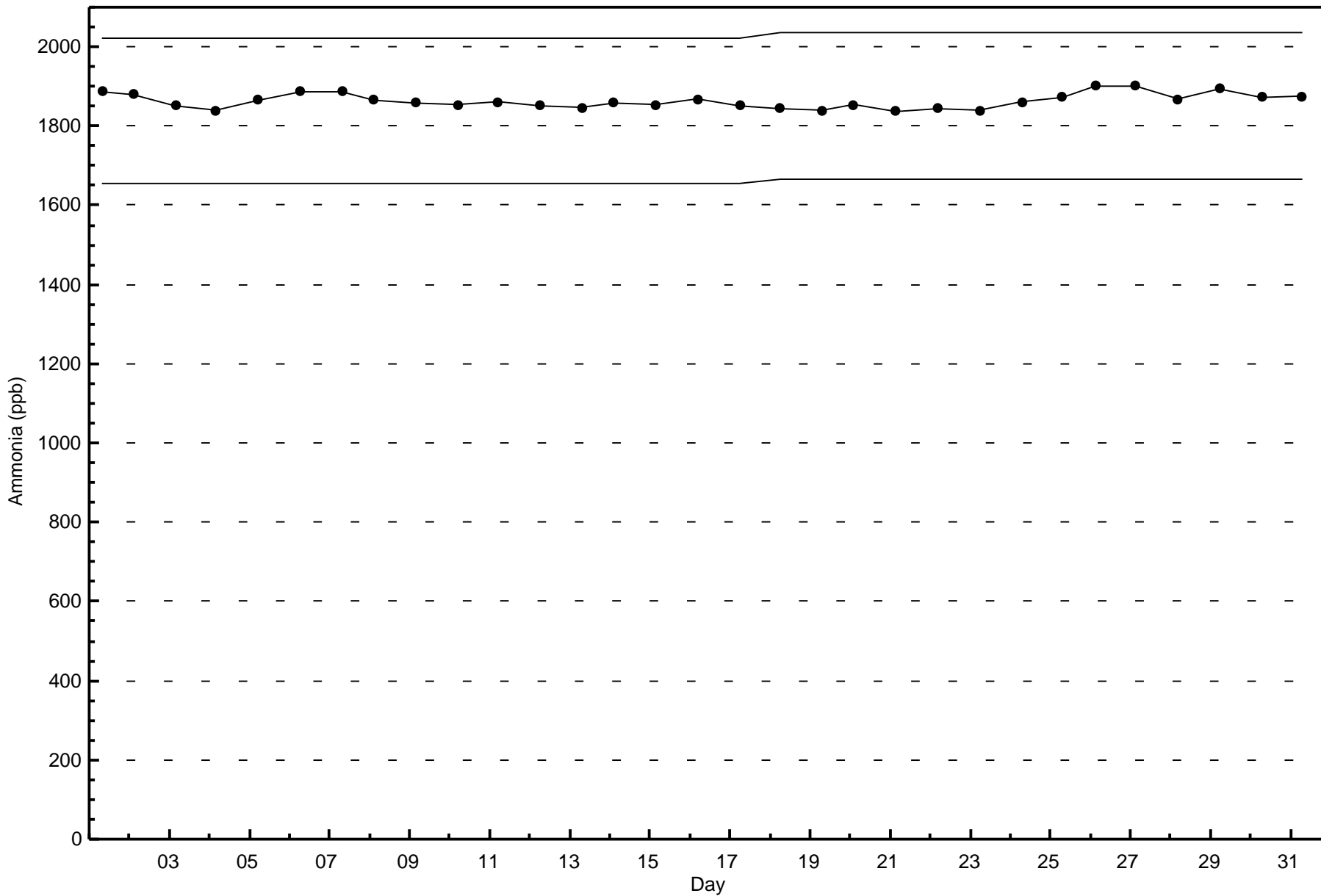
Total Number of Valid Hours: 654

Total Number of Hours: 744









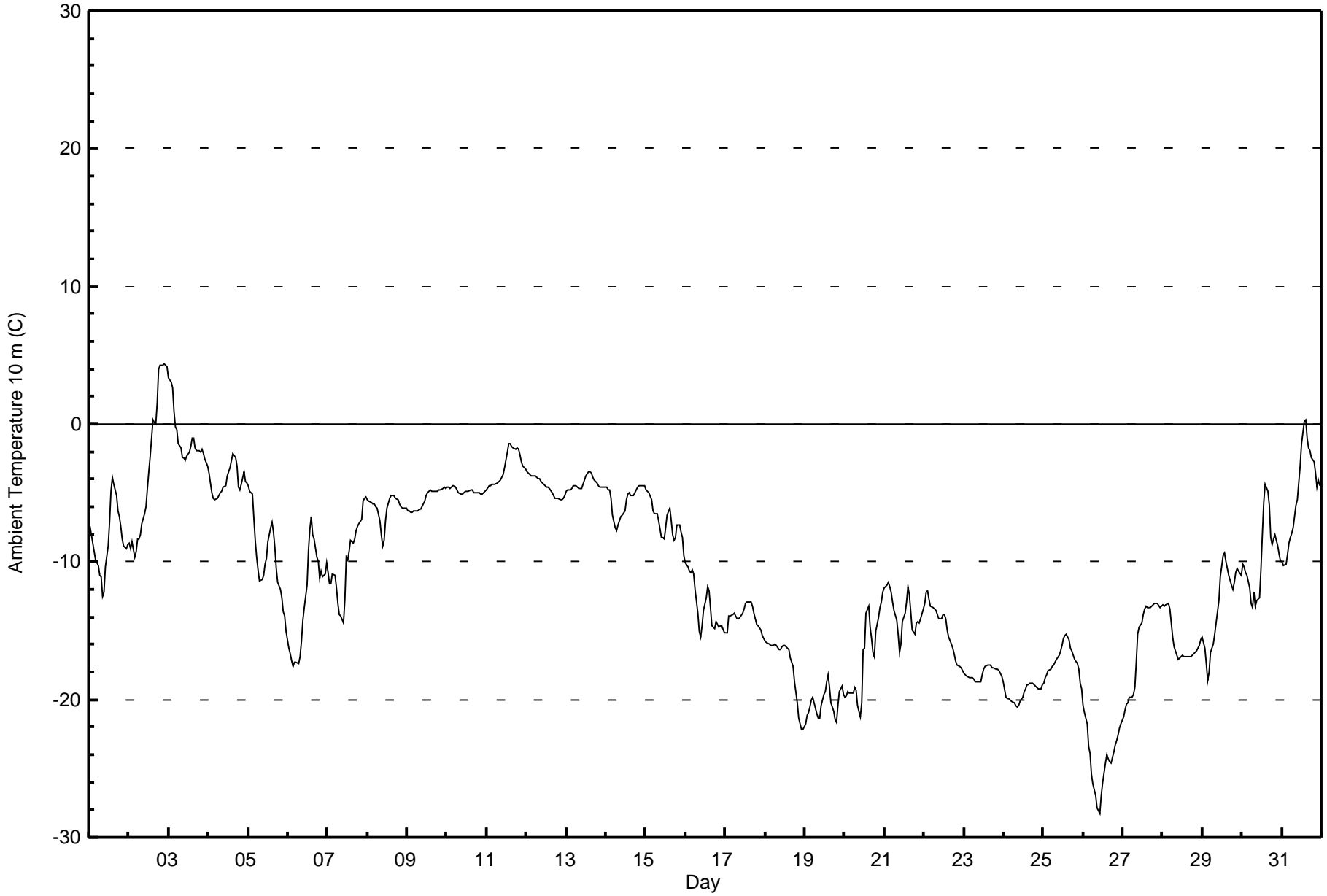


Maximum Value: 4.3 C on Dec 2 22:00		Maximum Daily Average: -1.1 C on Dec 3		Hours in Service: 744																						
Minimum Value: -28.2 C on Dec 26 11:00		Minimum Daily Average: -24.3 C on Dec 26		Hours of Data: 744																						
Maximum Diurnal Average: -9.2 C at hour 15		Minimum Diurnal Average: -12.3 C at hour 9		Hours of Missing Data: 0																						
Monthly Average: -10.93 C		Percentiles: P <sub>1</sub> = -25.5 P <sub>10</sub> = -19.4 Q <sub>1</sub> = -16.3 Median = -10.8 Q <sub>3</sub> = -5.0 P <sub>90</sub> = -3.7 P <sub>99</sub> = 2.8		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-7.4	-8.0	-8.6	-9.3	-9.9	-10.3	-11.0	-11.1	-12.5	-12.3	-10.3	-8.9	-7.1	-4.8	-3.8	-4.3	-5.2	-6.3	-6.7	-7.4	-8.3	-8.8	-9.0	-8.8	-8.3	-3.8
2-Dec	-8.7	-9.1	-8.5	-9.7	-9.2	-8.3	-8.3	-8.0	-7.2	-6.5	-6.0	-4.6	-3.4	-2.3	0.3	0.1	0.0	1.5	4.0	4.3	4.2	4.3	4.3	4.2	-3.0	4.3
3-Dec	3.4	3.0	2.7	0.9	-0.2	-0.4	-1.4	-1.7	-2.5	-2.4	-2.7	-2.4	-2.0	-1.6	-1.0	-1.1	-1.7	-2.0	-1.9	-2.0	-1.8	-2.1	-2.5	-3.0	-1.1	3.4
4-Dec	-3.5	-4.2	-5.0	-5.4	-5.5	-5.4	-5.2	-4.9	-4.9	-4.6	-4.4	-3.8	-3.5	-3.2	-2.7	-2.1	-2.4	-3.1	-4.6	-4.7	-4.4	-3.4	-4.1	-4.3	-4.1	-2.1
5-Dec	-4.5	-4.9	-5.0	-6.8	-8.5	-9.7	-10.6	-11.4	-11.3	-11.0	-10.2	-9.7	-8.6	-7.5	-7.1	-7.9	-9.0	-10.5	-11.5	-12.0	-12.6	-13.6	-13.9	-15.0	-9.7	-4.5
6-Dec	-16.2	-16.7	-17.2	-17.6	-17.3	-17.3	-17.4	-16.9	-15.8	-14.2	-13.3	-11.7	-9.2	-7.6	-6.7	-8.0	-8.4	-9.6	-10.0	-11.2	-10.7	-11.1	-10.9	-10.1	-12.7	-6.7
7-Dec	-10.8	-11.6	-11.6	-10.9	-11.0	-11.9	-13.0	-13.8	-13.9	-14.4	-12.7	-9.7	-9.8	-9.3	-8.5	-8.7	-8.3	-7.7	-7.4	-7.2	-6.9	-5.6	-5.4	-5.3	-9.8	-5.3
8-Dec	-5.5	-5.6	-5.7	-5.8	-5.8	-6.0	-6.1	-7.1	-8.0	-8.9	-8.5	-7.0	-6.1	-5.4	-5.2	-5.2	-5.2	-5.4	-5.5	-5.8	-6.0	-6.1	-6.1	-6.1	-6.2	-5.2
9-Dec	-6.3	-6.3	-6.4	-6.4	-6.3	-6.3	-6.3	-6.2	-6.2	-6.0	-5.6	-5.2	-5.0	-4.8	-4.8	-4.9	-4.9	-4.9	-4.9	-4.8	-4.8	-4.7	-4.6	-4.7	-5.5	-4.6
10-Dec	-4.6	-4.6	-4.6	-4.5	-4.5	-4.6	-4.8	-5.0	-5.1	-5.1	-5.0	-4.9	-4.9	-4.8	-4.8	-4.8	-5.0	-5.0	-5.0	-5.0	-5.1	-5.1	-5.0	-4.8	-4.9	-4.5
11-Dec	-4.7	-4.5	-4.5	-4.4	-4.4	-4.4	-4.2	-4.1	-4.1	-3.9	-3.6	-3.1	-2.0	-1.5	-1.5	-1.6	-1.7	-1.8	-1.8	-1.8	-2.2	-2.7	-3.0	-3.3	-3.1	-1.5
12-Dec	-3.4	-3.6	-3.7	-3.7	-3.8	-3.8	-3.9	-4.0	-4.0	-4.2	-4.3	-4.5	-4.6	-4.6	-4.6	-5.0	-5.2	-5.4	-5.4	-5.4	-5.5	-5.5	-5.4	-5.2	-4.5	-3.4
13-Dec	-4.9	-4.8	-4.8	-4.7	-4.5	-4.4	-4.5	-4.7	-4.7	-4.6	-4.4	-4.1	-3.8	-3.4	-3.5	-3.6	-3.9	-4.1	-4.2	-4.5	-4.6	-4.6	-4.6	-4.6	-4.4	-3.4
14-Dec	-4.6	-4.7	-4.8	-5.4	-6.6	-7.5	-7.7	-7.3	-7.0	-6.8	-6.6	-6.3	-5.5	-5.1	-5.0	-5.1	-5.1	-5.0	-4.8	-4.6	-4.4	-4.4	-4.5	-4.5	-5.6	-4.4
15-Dec	-4.8	-4.9	-5.0	-5.5	-6.3	-6.5	-6.5	-6.5	-7.0	-8.2	-8.2	-8.3	-7.5	-6.6	-6.1	-7.0	-8.0	-8.5	-8.2	-7.3	-7.3	-7.9	-8.2	-9.6	-7.1	-4.8
16-Dec	-10.0	-10.4	-10.7	-10.8	-10.6	-10.9	-12.0	-13.7	-15.1	-15.5	-14.6	-13.5	-12.6	-11.8	-12.1	-13.3	-14.6	-14.8	-14.3	-14.5	-14.7	-14.6	-14.6	-15.1	-13.1	-10.0
17-Dec	-15.2	-15.2	-14.0	-13.9	-13.8	-13.7	-13.9	-14.1	-14.1	-14.0	-13.7	-13.4	-13.1	-12.9	-12.9	-12.9	-13.2	-13.7	-14.1	-14.5	-14.7	-15.0	-15.3	-15.6	-14.0	-12.9
18-Dec	-15.7	-15.9	-16.0	-16.1	-16.1	-16.0	-16.0	-16.1	-16.3	-16.4	-16.2	-16.0	-16.1	-16.3	-16.4	-17.0	-17.3	-17.6	-18.7	-20.3	-21.3	-21.8	-22.2	-22.2	-17.5	-15.7
19-Dec	-21.7	-21.1	-20.9	-20.5	-20.0	-19.8	-20.6	-21.1	-21.4	-21.4	-20.4	-19.7	-19.4	-18.7	-18.2	-19.1	-20.3	-20.9	-21.5	-21.6	-20.4	-19.4	-19.0	-19.6	-20.3	-18.2
20-Dec	-19.8	-19.7	-19.4	-19.5	-19.5	-19.5	-19.2	-19.4	-20.4	-21.2	-20.3	-16.4	-16.2	-13.7	-13.3	-14.7	-15.6	-16.6	-16.9	-15.1	-14.0	-13.3	-12.9	-12.2	-17.0	-12.2
21-Dec	-11.9	-11.7	-11.5	-11.8	-12.2	-13.0	-13.5	-14.2	-15.3	-16.5	-16.0	-14.4	-13.7	-12.9	-11.8	-12.4	-13.6	-15.0	-15.3	-14.4	-14.4	-14.4	-14.1	-13.4	-13.6	-11.5
22-Dec	-13.0	-12.2	-12.2	-12.7	-13.2	-13.3	-13.4	-13.6	-13.9	-14.1	-14.1	-13.8	-13.8	-14.1	-14.9	-15.5	-16.0	-16.3	-16.7	-17.2	-17.5	-17.6	-17.7	-17.9	-14.8	-12.2
23-Dec	-18.1	-18.2	-18.3	-18.4	-18.4	-18.4	-18.5	-18.7	-18.7	-18.7	-18.7	-18.2	-17.8	-17.5	-17.5	-17.5	-17.6	-17.7	-17.8	-17.8	-17.8	-17.9	-18.1	-18.3	-18.1	-17.5
24-Dec	-18.7	-19.8	-20.0	-19.9	-20.0	-20.2	-20.3	-20.4	-20.5	-20.4	-20.1	-19.8	-19.4	-19.2	-18.9	-18.9	-18.8	-18.8	-18.9	-19.0	-19.1	-19.3	-19.2	-19.0	-19.5	-18.7
25-Dec	-18.8	-18.4	-18.2	-17.9	-17.8	-17.6	-17.5	-17.3	-17.0	-16.8	-16.5	-16.1	-15.5	-15.3	-15.3	-15.6	-16.3	-16.5	-16.7	-17.1	-17.4	-17.8	-18.8	-19.2	-17.2	-15.3
26-Dec	-20.4	-21.0	-21.8	-23.4	-23.9	-25.4	-26.1	-26.9	-27.8	-28.1	-28.2	-27.0	-26.0	-24.6	-24.0	-24.3	-24.5	-24.6	-23.8	-23.3	-23.0	-22.5	-22.0	-21.8	-24.3	-20.4
27-Dec	-21.2	-20.8	-20.4	-20.2	-19.8	-19.9	-19.6	-19.1	-17.3	-15.2	-14.8	-14.4	-13.9	-13.5	-13.2	-13.3	-13.3	-13.3	-13.1	-13.0	-13.1	-13.0	-13.3	-13.2	-15.9	-13.0
28-Dec	-13.1	-13.2	-13.1	-13.0	-13.4	-14.5	-15.5	-16.2	-16.8	-17.1	-17.0	-16.9	-16.8	-16.9	-16.9	-16.9	-16.9	-16.8	-16.7	-16.6	-16.5	-16.2	-16.0	-15.7	-15.8	-13.0
29-Dec	-15.5	-16.3	-17.4	-18.6	-18.0	-16.6	-15.9	-15.3	-14.4	-13.6	-12.8	-11.1	-9.6	-9.3	-9.9	-10.5	-11.0	-11.7	-12.1	-11.5	-10.8	-10.5	-10.6	-11.0	-13.1	-9.3
30-Dec	-10.2	-10.4	-10.8	-11.0	-11.9	-13.0	-13.4	-12.2	-13.2	-12.8	-12.6	-10.6	-8.0	-5.7	-4.3	-4.9	-5.9	-8.3	-8.7	-8.3	-8.0	-8.9	-9.4	-10.0	-9.7	-4.3
31-Dec	-10.0	-10.2	-10.2	-9.5	-8.7	-8.2	-7.9	-7.5	-5.9	-5.5	-4.2	-3.0	-1.5	0.2	0.3	-1.0	-1.7	-2.0	-2.5	-2.7	-3.6	-4.5	-4.1	-4.5	-4.9	0.3
																								Diurnal Average		
																								Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature 10 m (AT 10m) - C**  
**Fort McKay - Bertha Ganter - December 2015**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 10 m (AT 10m) - C  
Fort McKay - Bertha Ganter - December 2015**

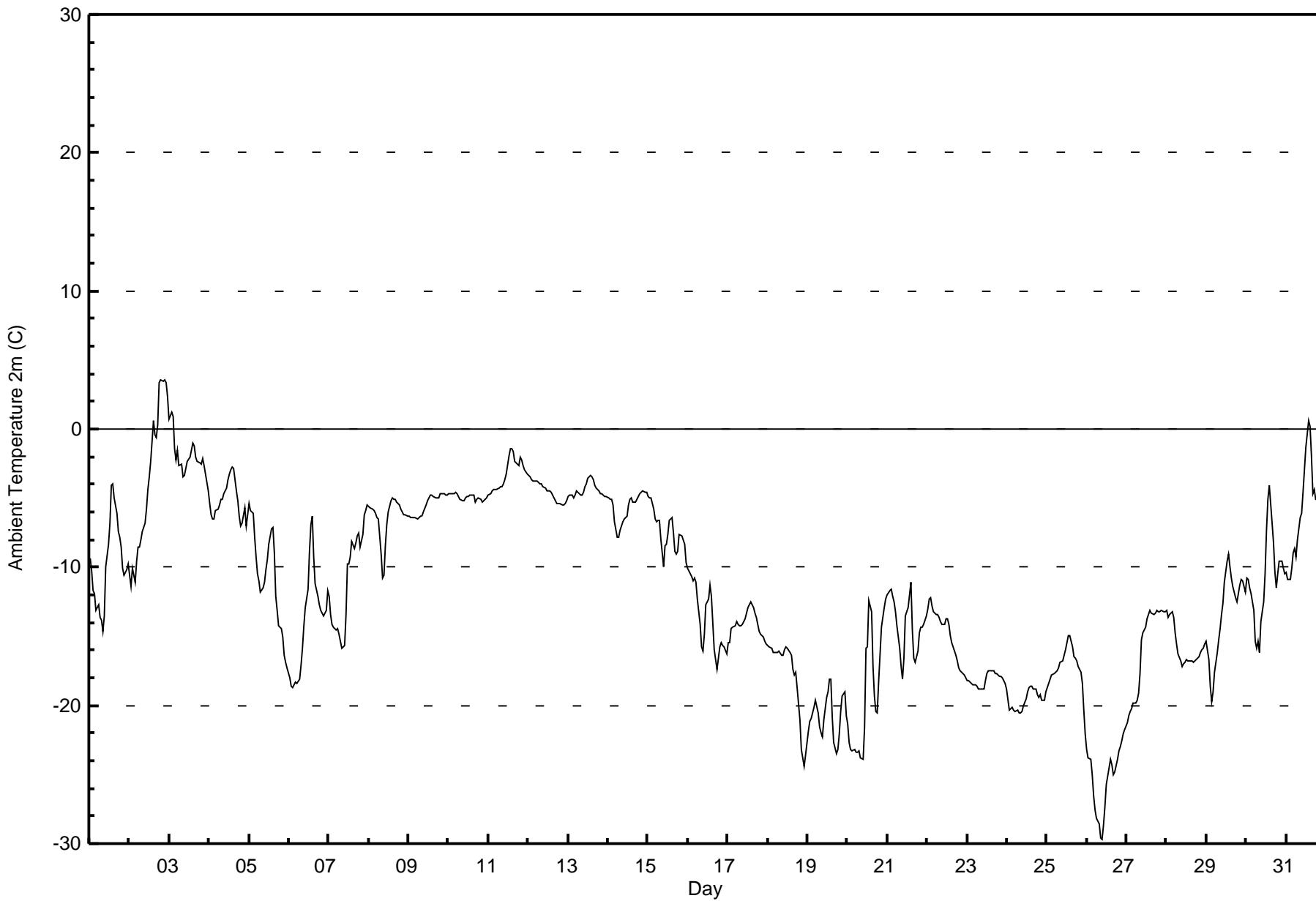
<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	58	7.80	7.80
-20 - 0	671	90.19	97.98
0 - 10	15	2.02	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 3.6 C on Dec 2 22:00      Maximum Daily Average: -2.0 C on Dec 3																								Hours in Service:	744		
Minimum Value: -29.7 C on Dec 26 10:00      Minimum Daily Average: -25.3 C on Dec 26																								Hours of Data:	744		
Maximum Diurnal Average: -9.1 C at hour 15      Minimum Diurnal Average: -13.1 C at hour 9																								Hours of Missing Data:	0		
Monthly Average: -11.46 C      Percentiles: P <sub>1</sub> = -26.6 P <sub>10</sub> = -20.0 Q <sub>1</sub> = -16.5 Median = -11.6 Q <sub>3</sub> = -5.3 P <sub>90</sub> = -4.0 P <sub>99</sub> = 0.1																								Hours of Calibration:	0		
																								Percent Operational Time:	100.0		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	-9.3	-10.2	-11.7	-11.9	-13.2	-12.7	-13.6	-13.8	-14.7	-13.6	-10.0	-8.4	-6.8	-4.1	-4.0	-4.9	-6.1	-7.4	-7.8	-8.5	-10.1	-10.6	-10.2	-9.8	-9.7	-4.0	
2-Dec	-10.6	-11.4	-10.0	-11.1	-9.6	-8.6	-8.5	-8.0	-7.4	-6.8	-5.8	-4.4	-3.4	-2.3	0.6	-0.4	-0.6	0.3	3.4	3.5	3.5	3.6	3.4	2.4	-3.7	3.6	
3-Dec	0.7	1.2	0.9	-1.4	-2.3	-1.6	-2.6	-2.5	-3.5	-3.4	-2.8	-2.4	-2.0	-1.5	-1.1	-1.2	-2.0	-2.3	-2.5	-2.6	-2.2	-2.6	-3.2	-4.5	-2.0	1.2	
4-Dec	-5.4	-6.2	-6.6	-6.5	-5.9	-5.8	-5.4	-5.1	-5.1	-4.7	-4.3	-3.7	-3.2	-2.9	-2.7	-2.9	-4.4	-5.2	-6.3	-7.0	-6.8	-5.7	-7.0	-6.2	-5.2	-2.7	
5-Dec	-5.3	-5.9	-6.1	-7.8	-9.3	-10.5	-10.9	-11.8	-11.5	-11.1	-10.2	-9.5	-8.4	-7.2	-7.1	-9.0	-12.1	-13.1	-14.2	-14.4	-15.0	-16.4	-16.9	-17.3	-10.9	-5.3	
6-Dec	-18.0	-18.6	-18.7	-18.5	-18.3	-18.4	-18.1	-17.1	-15.8	-14.2	-12.9	-11.6	-8.8	-6.9	-6.3	-9.3	-11.2	-12.1	-12.7	-13.1	-13.4	-13.5	-13.1	-11.7	-13.8	-6.3	
7-Dec	-12.1	-13.4	-14.1	-14.4	-14.5	-14.4	-14.9	-15.3	-15.9	-15.7	-13.4	-9.8	-9.7	-9.3	-8.2	-8.6	-8.3	-7.7	-7.6	-8.5	-7.7	-6.2	-5.9	-5.5	-10.9	-5.5	
8-Dec	-5.6	-5.7	-5.8	-5.9	-6.1	-6.4	-6.5	-9.0	-10.8	-10.6	-8.4	-6.9	-6.0	-5.2	-4.9	-5.0	-5.1	-5.3	-5.4	-5.8	-6.0	-6.2	-6.2	-6.3	-6.5	-4.9	
9-Dec	-6.3	-6.4	-6.4	-6.4	-6.4	-6.5	-6.4	-6.3	-6.3	-6.0	-5.5	-5.2	-4.9	-4.8	-4.8	-4.9	-5.0	-5.0	-5.0	-4.7	-4.7	-4.6	-4.7	-4.8	-5.5	-4.6	
10-Dec	-4.7	-4.7	-4.7	-4.7	-4.6	-4.6	-4.9	-5.1	-5.1	-5.2	-5.0	-4.9	-4.9	-4.8	-4.7	-4.8	-5.3	-5.1	-5.0	-5.1	-5.3	-5.2	-5.1	-5.0	-4.9	-4.6	
11-Dec	-4.8	-4.6	-4.5	-4.4	-4.4	-4.4	-4.3	-4.2	-4.2	-3.9	-3.6	-3.2	-2.0	-1.4	-1.4	-1.7	-2.3	-2.6	-2.6	-2.1	-2.2	-2.7	-3.0	-3.2	-3.2	-1.4	
12-Dec	-3.4	-3.5	-3.6	-3.7	-3.8	-3.8	-3.8	-4.0	-4.0	-4.2	-4.3	-4.5	-4.5	-4.5	-4.6	-4.9	-5.2	-5.4	-5.4	-5.4	-5.5	-5.5	-5.4	-5.2	-4.5	-3.4	
13-Dec	-4.9	-4.7	-4.8	-5.0	-4.7	-4.5	-4.6	-4.7	-4.7	-4.5	-4.2	-3.9	-3.6	-3.3	-3.5	-3.6	-4.0	-4.3	-4.4	-4.6	-4.7	-4.8	-4.9	-4.9	-4.4	-3.3	
14-Dec	-5.0	-5.1	-5.1	-5.5	-6.7	-7.8	-7.8	-7.4	-7.0	-6.7	-6.5	-6.3	-5.5	-5.1	-5.0	-5.2	-5.3	-5.1	-4.9	-4.7	-4.5	-4.5	-4.6	-4.6	-5.7	-4.5	
15-Dec	-4.8	-5.0	-5.0	-5.8	-6.5	-6.7	-6.6	-6.7	-7.9	-10.0	-8.4	-8.4	-7.6	-6.6	-6.4	-7.6	-8.9	-9.0	-8.8	-7.7	-7.7	-8.0	-8.3	-9.6	-7.4	-4.8	
16-Dec	-10.1	-10.4	-10.7	-11.0	-10.8	-11.1	-12.3	-14.2	-15.7	-16.0	-14.9	-12.7	-12.3	-11.3	-12.1	-14.0	-16.0	-17.4	-16.6	-15.8	-15.4	-15.7	-15.8	-16.3	-13.7	-10.1	
17-Dec	-15.5	-15.5	-14.5	-14.3	-14.2	-14.0	-14.1	-14.2	-14.2	-13.7	-13.3	-12.9	-12.7	-12.6	-12.9	-13.4	-13.7	-14.1	-14.7	-14.8	-15.0	-15.4	-15.5	-15.5	-14.1	-12.6	
18-Dec	-15.6	-15.7	-15.9	-16.2	-16.2	-16.1	-16.1	-16.1	-16.4	-16.4	-16.0	-15.8	-15.9	-16.2	-16.3	-17.3	-17.8	-17.6	-18.7	-21.1	-23.2	-23.7	-24.4	-23.6	-17.8	-15.6	
19-Dec	-21.9	-21.2	-20.9	-20.6	-20.1	-19.6	-20.6	-21.6	-22.0	-22.2	-21.1	-19.4	-19.0	-18.1	-18.1	-20.8	-22.7	-23.5	-23.2	-22.1	-20.4	-19.4	-19.0	-20.8	-20.8	-18.1	
20-Dec	-21.4	-22.6	-23.2	-23.3	-23.2	-23.4	-23.4	-23.3	-23.8	-23.9	-21.6	-15.9	-15.7	-12.4	-13.2	-17.2	-19.4	-20.4	-20.5	-18.3	-14.3	-13.6	-13.0	-12.4	-19.1	-12.4	
21-Dec	-12.0	-11.7	-11.6	-12.1	-12.5	-13.3	-14.3	-15.9	-17.2	-18.1	-16.6	-13.5	-12.9	-12.0	-11.1	-14.5	-16.6	-16.8	-16.0	-14.7	-14.4	-14.4	-14.1	-13.5	-14.2	-11.1	
22-Dec	-13.0	-12.3	-12.2	-12.8	-13.2	-13.4	-13.4	-13.6	-13.9	-14.1	-14.1	-13.7	-13.7	-14.1	-14.9	-15.5	-16.0	-16.4	-16.8	-17.3	-17.5	-17.7	-17.8	-18.0	-14.8	-12.2	
23-Dec	-18.2	-18.2	-18.3	-18.5	-18.5	-18.5	-18.7	-18.8	-18.8	-18.8	-18.8	-18.2	-17.7	-17.5	-17.5	-17.5	-17.7	-17.7	-17.7	-17.9	-17.9	-18.0	-18.2	-18.4	-18.2	-17.5	
24-Dec	-18.9	-20.3	-20.3	-20.1	-20.3	-20.4	-20.3	-20.5	-20.6	-20.4	-20.0	-19.5	-19.0	-18.7	-18.6	-18.6	-18.8	-18.8	-19.2	-19.5	-19.2	-19.7	-19.6	-19.0	-19.6	-18.6	
25-Dec	-18.7	-18.4	-18.1	-17.8	-17.6	-17.6	-17.5	-17.3	-16.9	-16.7	-16.4	-16.0	-15.4	-15.0	-15.8	-16.5	-16.6	-16.6	-16.8	-17.2	-17.6	-18.4	-20.4	-22.0	-17.3	-15.0	
26-Dec	-23.2	-23.8	-23.9	-25.0	-26.5	-27.6	-28.1	-28.6	-29.6	-29.7	-28.6	-27.4	-25.8	-24.5	-23.9	-24.3	-25.0	-24.8	-23.9	-23.3	-23.0	-22.6	-22.0	-21.8	-25.3	-21.8	
27-Dec	-21.3	-20.7	-20.4	-20.2	-19.8	-19.9	-19.6	-19.1	-17.7	-15.2	-14.7	-14.3	-13.7	-13.4	-13.2	-13.3	-13.4	-13.3	-13.2	-13.2	-13.2	-13.1	-13.3	-13.2	-15.9	-13.1	
28-Dec	-13.1	-13.7	-13.5	-13.2	-13.6	-14.8	-15.5	-16.2	-16.8	-17.1	-17.0	-16.9	-16.7	-16.7	-16.8	-16.8	-16.8	-16.8	-16.8	-16.7	-16.5	-16.2	-16.0	-15.9	-15.6	-15.8	-13.1
29-Dec	-15.4	-16.6	-18.6	-19.7	-19.0	-17.6	-16.2	-15.2	-14.5	-13.5	-12.6	-11.1	-9.6	-9.1	-9.9	-10.8	-11.4	-12.2	-12.5	-11.9	-11.2	-10.8	-11.0	-11.8	-13.4	-9.1	
30-Dec	-10.7	-10.9	-11.5	-11.9	-13.2	-15.3	-15.9	-15.4	-16.1	-13.9	-12.5	-10.5	-7.4	-5.1	-4.0	-6.8	-8.2	-10.4	-11.5	-10.4	-9.6	-9.5	-10.0	-10.4	-10.9	-4.0	
31-Dec	-10.4	-10.9	-10.9	-10.0	-9.0	-8.7	-9.2	-8.0	-6.5	-6.1	-4.6	-2.9	-1.4	0.6	0.2	-1.9	-4.6	-4.4	-5.1	-5.1	-6.2	-6.7	-6.3	-6.1	-6.0	0.6	
																								Diurnal Average			
																								Diurnal Maximum			





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C  
Fort McKay - Bertha Ganter - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	74	9.95	9.95
-20 - 0	657	88.31	98.25
0 - 10	13	1.75	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



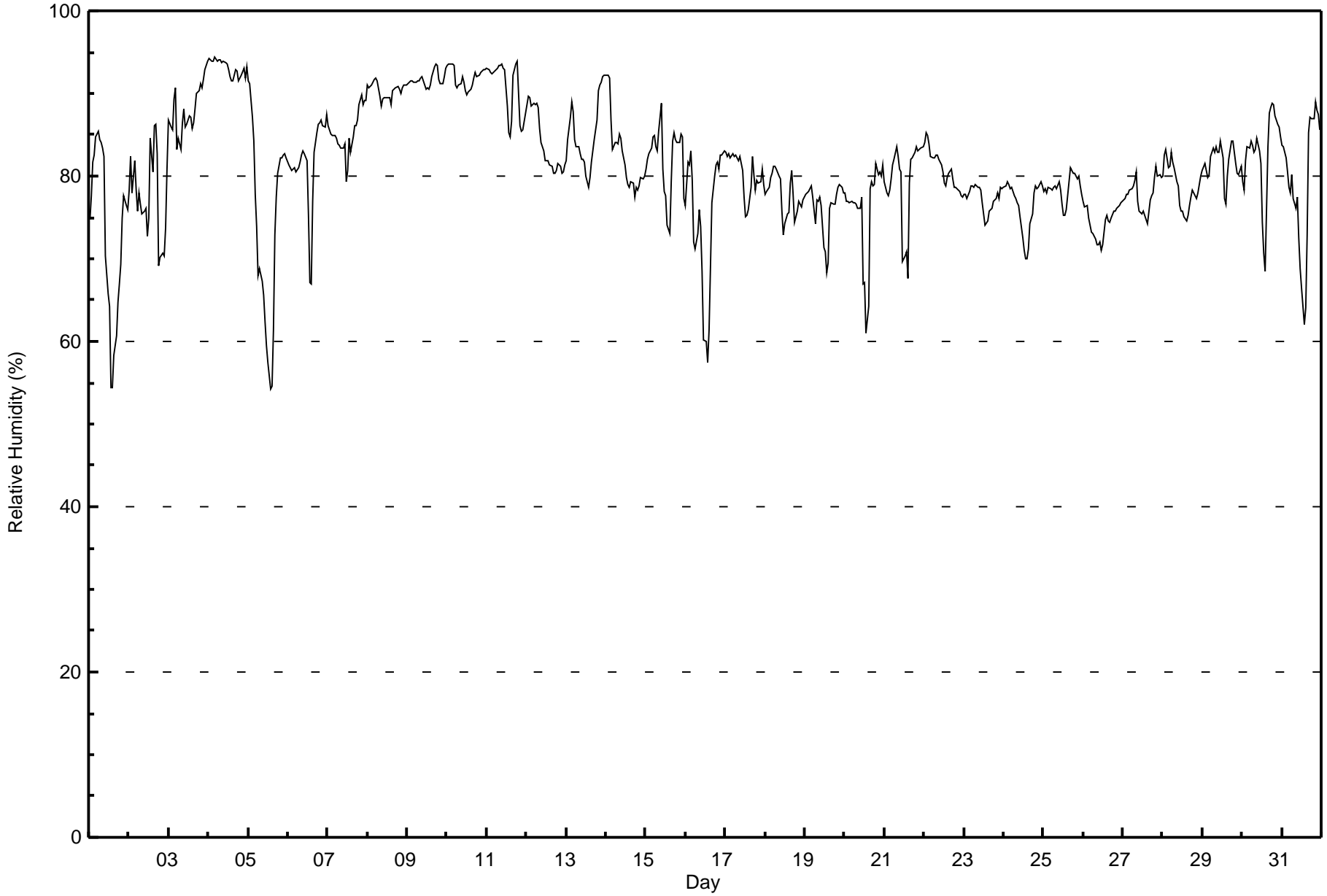


Maximum Value: 94 % on Dec 4 05:00																		Maximum Daily Average: 93.1 % on Dec 4																		Hours in Service: 744														
Minimum Value: 54 % on Dec 5 14:00																		Minimum Daily Average: 73.1 % on Dec 1																		Hours of Data: 744														
Maximum Diurnal Average: 83.5 % at hour 4																		Minimum Diurnal Average: 75.3 % at hour 15																		Hours of Missing Data: 0														
Monthly Average: 81.4 %																		Percentiles: P <sub>1</sub> = 59 P <sub>10</sub> = 74 Q <sub>1</sub> = 77 Median = 81 Q <sub>3</sub> = 86 P <sub>90</sub> = 92 P <sub>99</sub> = 94																		Hours of Calibration: 0														
																																				Percent Operational Time: 100.0														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																										
1-Dec	75	78	82	83	85	86	84	84	83	82	70	66	64	54	54	58	61	65	67	69	75	78	76	76	73.1	86																								
2-Dec	78	82	78	82	78	76	78	77	75	76	76	73	75	85	81	86	86	83	69	70	71	70	74	81	77.5	86																								
3-Dec	87	86	86	89	91	83	85	83	87	88	86	86	87	86	86	88	90	90	91	91	92	93	94	88.0	94																									
4-Dec	94	94	94	94	94	94	94	94	94	94	94	93	92	92	92	93	93	91	92	92	93	92	93	93	93.1	94																								
5-Dec	91	91	87	84	78	74	68	69	67	66	62	60	58	54	55	61	73	77	80	82	82	83	83	82	73.6	91																								
6-Dec	81	81	81	81	81	80	81	82	82	83	83	82	75	67	67	77	83	85	86	86	87	86	86	87	81.3	87																								
7-Dec	86	86	85	85	85	85	84	84	83	83	84	79	81	85	83	85	86	86	87	89	90	89	89	89	85.2	90																								
8-Dec	91	91	91	91	92	92	92	90	89	89	90	89	90	90	89	90	91	91	91	90	90	91	91	91	90.4	92																								
9-Dec	91	91	91	91	91	91	92	92	92	92	91	90	91	90	91	92	93	94	93	92	91	91	92	93	91.7	94																								
10-Dec	93	93	94	94	93	91	91	91	91	92	91	90	90	90	91	91	92	92	92	92	93	93	93	93	91.9	94																								
11-Dec	93	93	93	92	93	93	93	93	93	94	93	93	89	85	85	87	92	94	94	90	86	85	86	88	90.6	94																								
12-Dec	89	90	89	89	89	89	89	88	86	84	83	82	82	82	81	81	80	80	81	81	81	80	81	81	84.1	90																								
13-Dec	82	84	87	89	88	84	84	84	83	82	82	82	80	79	80	82	83	84	87	90	91	91	92	92	85.1	92																								
14-Dec	92	92	92	87	83	84	84	84	85	85	83	81	80	79	79	79	77	79	78	79	80	80	80	80	82.5	92																								
15-Dec	81	82	83	83	85	85	84	83	85	89	81	78	78	74	73	79	84	85	84	84	84	85	85	77	82.1	89																								
16-Dec	76	82	81	83	79	72	71	73	76	74	69	60	60	58	61	69	77	80	81	82	81	83	83	83	74.7	83																								
17-Dec	83	82	83	82	83	82	83	82	82	82	81	77	75	75	76	79	82	80	78	79	79	79	81	79	80.2	83																								
18-Dec	78	78	79	80	80	81	81	81	80	80	76	73	74	75	76	79	81	78	74	76	77	77	76	77	77.8	81																								
19-Dec	78	78	78	79	79	78	74	77	77	77	77	71	71	68	70	76	77	77	77	78	79	79	79	78	76.2	79																								
20-Dec	78	77	77	77	77	77	77	77	76	76	77	67	67	61	64	79	79	79	79	82	80	80	80	81	76.0	82																								
21-Dec	79	78	78	78	80	81	82	84	82	81	81	70	70	71	68	79	82	82	83	83	83	83	83	84	79.4	84																								
22-Dec	84	85	85	84	82	82	82	83	83	82	81	81	79	79	80	80	81	80	79	79	79	78	78	77	80.9	85																								
23-Dec	78	78	77	78	79	79	79	79	79	79	78	77	75	74	75	76	76	77	77	77	78	77	79	78	77.4	79																								
24-Dec	79	79	79	79	79	79	78	77	77	76	75	72	71	70	70	71	74	75	78	79	79	79	79	79	76.4	79																								
25-Dec	78	78	78	79	79	78	79	79	78	79	78	77	75	75	76	79	81	81	80	80	80	80	79	78	78.5	81																								
26-Dec	77	76	76	75	74	73	73	72	72	72	72	71	72	75	75	75	74	75	76	76	76	76	76	77	74.4	77																								
27-Dec	77	77	78	78	78	79	79	79	81	77	76	75	76	75	75	74	77	78	78	80	81	80	80	80	77.8	81																								
28-Dec	80	83	83	81	81	83	82	81	79	79	76	76	76	75	75	75	76	77	78	78	77	78	79	80	78.7	83																								
29-Dec	81	82	81	80	80	82	83	83	84	83	83	84	82	77	77	80	82	84	84	83	81	80	80	81	81.6	84																								
30-Dec	79	78	82	84	83	84	84	83	83	85	83	81	74	71	68	83	88	88	89	89	87	86	86	85	82.7	89																								
31-Dec	84	84	82	80	79	78	80	77	76	78	72	69	66	62	64	73	85	87	87	87	89	88	87	86	79.2	89																								
	83.0		83.5		83.5		83.5		83.1		82.4		82.2		82.0		81.9		81.9		80.1		77.6		76.6		75.3		75.3		79.2		81.8		82.4		82.3		82.7		82.8		82.9		83.1		83.3		Diurnal Average	
	94	94	94	94	94	94	94	94	94	94	94	94	94	93	92	92	92	92	93	94	94	92	93	93	94	Diurnal Maximum																								



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Fort McKay - Bertha Ganter - December 2015**



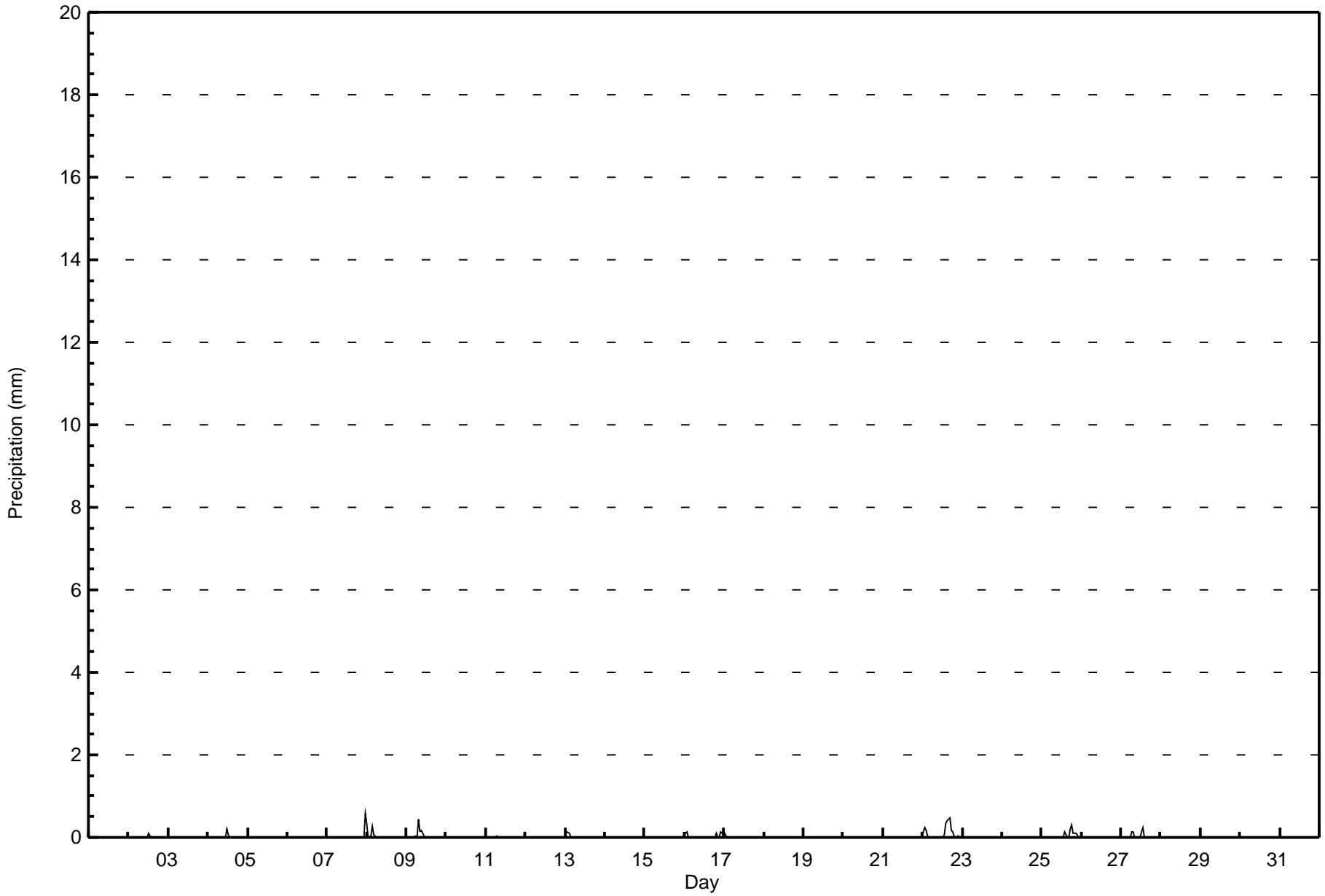


Maximum Value: 0.6 mm on Dec 8 00:00		Maximum Daily Total: 2.2 mm on Dec 22		Hours in Service: 744																								
Minimum Value: 0.0 mm on Dec 1 01:00		Minimum Daily Total: 0.0 mm on Dec 1		Hours of Data: 744																								
Maximum Diurnal Total: 0.7 mm at hour 1		Minimum Diurnal Total: 0.1 mm at hour 11		Hours of Missing Data: 0																								
Monthly Total: 7.44 mm		Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.3		Hours of Calibration: 0																								
				Percent Operational Time: 100.0																								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.6
8-Dec	0.4	0.0	0.1	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9-Dec	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.4	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13-Dec	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16-Dec	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
17-Dec	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22-Dec	0.1	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.4	0.5	0.2	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.3	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
26-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.7	0.6	0.3	0.3	0.1	0.1	0.2	0.6	0.1	0.2	0.1	0.2	0.3	0.3	0.5	0.4	0.5	0.4	0.4	0.2	0.1	0.1	0.1	0.1	0.7	Diurnal Average	
		0.4	0.3	0.2	0.3	0.1	0.1	0.2	0.4	0.1	0.2	0.1	0.2	0.2	0.2	0.3	0.4	0.5	0.2	0.3	0.1	0.1	0.1	0.1	0.6	Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Precipitation (PC) - mm**  
**Fort McKay - Bertha Ganter - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Precipitation (PC) - mm**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration Ranges (mm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	740	99.46	99.46
0.4 - 0.5	3	0.40	99.87
0.6 - 0.7	1	0.13	100.00
0.8 - 1.4	0	0.00	100.00
1.5 - 10	0	0.00	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 744

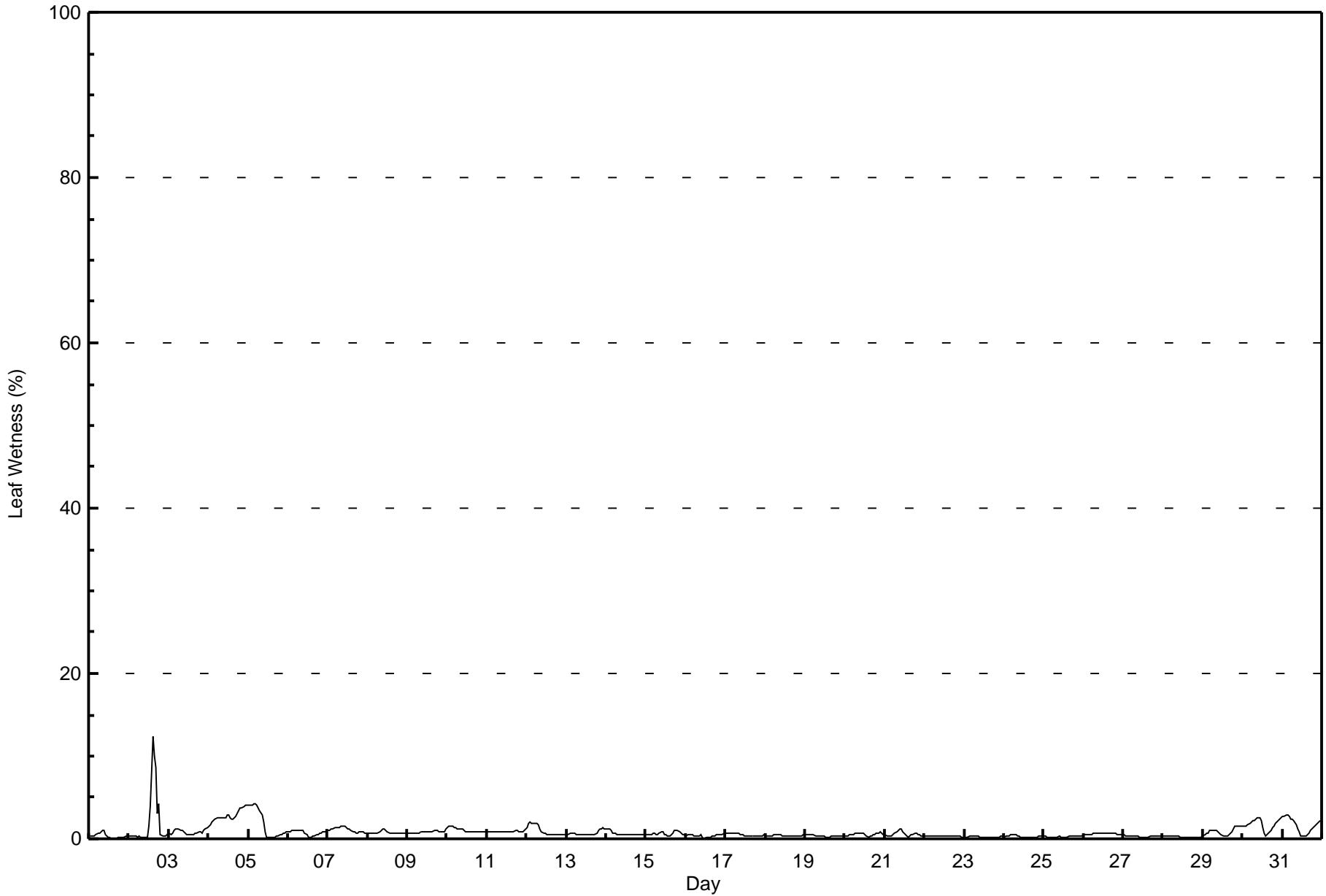
Total Number of Hours: 744



Summary of Hour Averages

Fort McKay - Bertha Ganter - December 2015

Maximum Value: 12 % on Dec 2 15:00																	Maximum Daily Average: 2.8 % on Dec 4																	Hours in Service: 744	
Minimum Value: 0 % on Dec 1 15:00																	Minimum Daily Average: 0.2 % on Dec 23																	Hours of Data: 744	
Maximum Diurnal Average: 0.9 % at hour 6																	Minimum Diurnal Average: 0.6 % at hour 13																	Hours of Missing Data: 0	
Monthly Average: 0.8 %																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 1 P <sub>90</sub> = 2 P <sub>99</sub> = 4																	Hours of Calibration: 0	
																																		Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1									
2-Dec	0	0	0	0	0	0	0	0	0	0	0	0	1	4	12	10	9	3	4	1	0	0	0	0	2.0	12									
3-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1									
4-Dec	1	2	2	2	2	2	3	3	3	3	3	3	3	3	2	2	3	3	3	4	4	4	4	4	2.8	4									
5-Dec	4	4	4	4	4	4	4	4	3	3	2	1	0	0	0	0	0	0	0	0	1	1	1	1	1.8	4									
6-Dec	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0.7	1									
7-Dec	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	2									
8-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1									
9-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1									
10-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	1									
11-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1									
12-Dec	1	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	2									
13-Dec	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	0.7	1									
14-Dec	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	1									
15-Dec	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	0	0.6	1									
16-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.4	1									
17-Dec	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1									
18-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0									
19-Dec	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1									
20-Dec	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	0	0.5	1									
21-Dec	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	0	0.6	1									
22-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0									
23-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0									
24-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0									
25-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0									
26-Dec	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0.6	1									
27-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0									
28-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0									
29-Dec	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	2	2	2	2	0.9	2									
30-Dec	2	1	2	2	2	2	2	2	2	3	3	2	1	1	0	1	1	1	1	2	2	2	2	3	1.7	3									
31-Dec	3	3	3	3	3	2	2	2	2	1	1	0	0	0	0	0	1	1	1	1	2	2	2	2	1.6	3									
0.8																	0.9																	Diurnal Average	
4																	4																	Diurnal Maximum	





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Leaf Wetness (LW) - %**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	202	27.15	27.15
0.4 - 0.5	172	23.12	50.27
0.6 - 0.7	121	16.26	66.53
0.8 - 1.4	159	21.37	87.90
1.5 - 10	79	10.62	98.52
> 10	1	0.13	98.66

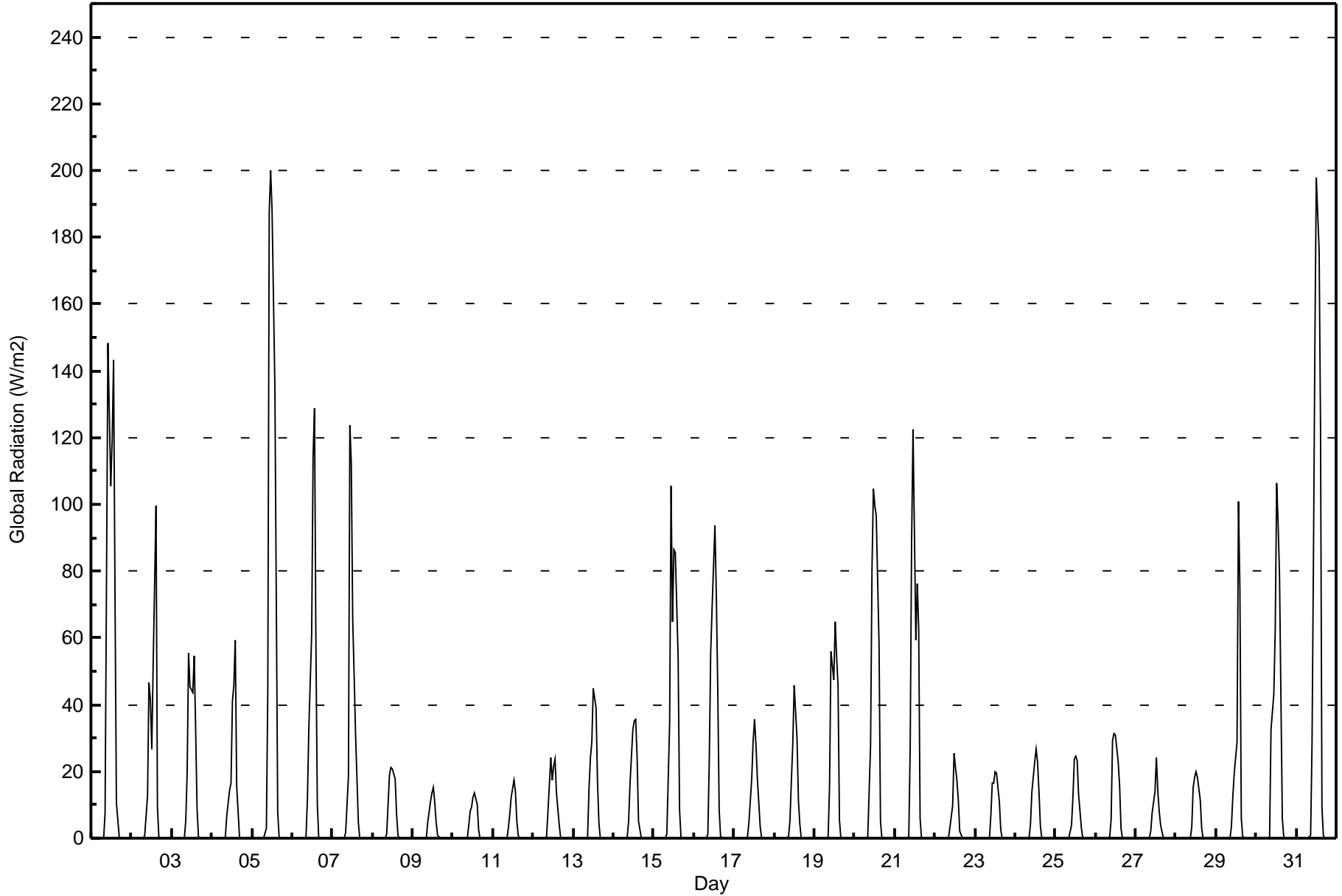
Total Number of Valid Hours: 744

Total Number of Hours: 744





Maximum Value: 200 W/m2 on Dec 5 12:00																		Maximum Daily Average: 34.9 W/m2 on Dec 5						Hours in Service: 744		
Minimum Value: 0 W/m2 on Dec 1 04:00																		Minimum Daily Average: 2.5 W/m2 on Dec 11						Hours of Data: 744		
Maximum Diurnal Average: 56.5 W/m2 at hour 13																		Minimum Diurnal Average: 0.0 W/m2 at hour 23						Hours of Missing Data: 0		
Monthly Average: 11.1 W/m2																		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 5 P <sub>90</sub> = 35 P <sub>99</sub> = 147						Hours of Calibration: 0		
																								Percent Operational Time: 100.0		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	0	0	0	8	77	148	105	119	143	73	11	0	0	0	0	0	0	0	0	28.5	148
2-Dec	0	0	0	0	0	0	0	0	1	13	47	41	27	52	99	9	0	0	0	0	0	0	0	0	12.1	99
3-Dec	0	0	0	0	0	0	0	0	5	19	56	45	43	55	33	9	0	0	0	0	0	0	0	0	11.1	56
4-Dec	0	0	0	0	0	0	0	0	1	7	15	17	41	46	59	16	1	0	0	0	0	0	0	0	8.4	59
5-Dec	0	0	0	0	0	0	0	0	3	45	187	200	188	135	71	8	0	0	0	0	0	0	0	0	34.9	200
6-Dec	0	0	0	0	0	0	0	0	1	12	33	61	115	129	58	10	0	0	0	0	0	0	0	0	17.4	129
7-Dec	0	0	0	0	0	0	0	0	2	18	124	112	66	49	31	5	0	0	0	0	0	0	0	0	16.9	124
8-Dec	0	0	0	0	0	0	0	0	1	10	19	21	21	18	7	1	0	0	0	0	0	0	0	0	4.1	21
9-Dec	0	0	0	0	0	0	0	0	0	5	11	14	15	11	5	1	0	0	0	0	0	0	0	0	2.6	15
10-Dec	0	0	0	0	0	0	0	0	0	4	8	9	12	13	10	2	0	0	0	0	0	0	0	0	2.5	13
11-Dec	0	0	0	0	0	0	0	0	0	3	7	12	17	14	5	1	0	0	0	0	0	0	0	0	2.5	17
12-Dec	0	0	0	0	0	0	0	0	0	8	24	17	21	24	14	4	0	0	0	0	0	0	0	0	4.7	24
13-Dec	0	0	0	0	0	0	0	0	1	15	24	29	45	39	17	5	0	0	0	0	0	0	0	0	7.2	45
14-Dec	0	0	0	0	0	0	0	0	0	5	16	33	35	36	24	5	0	0	0	0	0	0	0	0	6.4	36
15-Dec	0	0	0	0	0	0	0	0	1	35	105	65	86	86	54	8	0	0	0	0	0	0	0	0	18.4	105
16-Dec	0	0	0	0	0	0	0	0	1	23	55	69	93	72	44	9	0	0	0	0	0	0	0	0	15.3	93
17-Dec	0	0	0	0	0	0	0	0	0	5	18	29	35	28	18	3	0	0	0	0	0	0	0	0	5.7	35
18-Dec	0	0	0	0	0	0	0	0	0	5	17	28	46	30	12	4	0	0	0	0	0	0	0	0	5.9	46
19-Dec	0	0	0	0	0	0	0	0	0	16	56	47	65	54	46	6	0	0	0	0	0	0	0	0	12.1	65
20-Dec	0	0	0	0	0	0	0	0	1	28	80	105	100	97	58	5	0	0	0	0	0	0	0	0	19.7	105
21-Dec	0	0	0	0	0	0	0	0	1	27	89	122	59	76	63	6	0	0	0	0	0	0	0	0	18.5	122
22-Dec	0	0	0	0	0	0	0	0	0	3	10	25	21	18	12	2	0	0	0	0	0	0	0	0	3.8	25
23-Dec	0	0	0	0	0	0	0	0	0	7	17	17	20	19	11	2	0	0	0	0	0	0	0	0	3.9	20
24-Dec	0	0	0	0	0	0	0	0	0	4	14	23	27	23	14	4	0	0	0	0	0	0	0	0	4.5	27
25-Dec	0	0	0	0	0	0	0	0	0	4	12	24	25	24	13	3	0	0	0	0	0	0	0	0	4.4	25
26-Dec	0	0	0	0	0	0	0	0	0	5	29	31	31	23	16	3	0	0	0	0	0	0	0	0	5.8	31
27-Dec	0	0	0	0	0	0	0	0	0	2	8	14	24	14	8	4	0	0	0	0	0	0	0	0	3.1	24
28-Dec	0	0	0	0	0	0	0	0	0	4	15	18	20	18	12	3	0	0	0	0	0	0	0	0	3.7	20
29-Dec	0	0	0	0	0	0	0	0	0	4	12	19	29	101	75	6	0	0	0	0	0	0	0	0	10.2	101
30-Dec	0	0	0	0	0	0	0	0	0	33	43	63	106	94	79	6	0	0	0	0	0	0	0	0	17.7	106
31-Dec	0	0	0	0	0	0	0	0	1	29	84	147	198	176	122	9	1	0	0	0	0	0	0	0	32.0	198
0.0																		0.0						Diurnal Average		
0																		8						Diurnal Maximum		





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Global Radiation (GR) - W/m2**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Concentration Ranges (W/m2)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	633	85.08	85.08
21 - 100	90	12.10	97.18
101 - 300	21	2.82	100.00
301 - 600	0	0.00	100.00
601 - 900	0	0.00	100.00
> 900	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

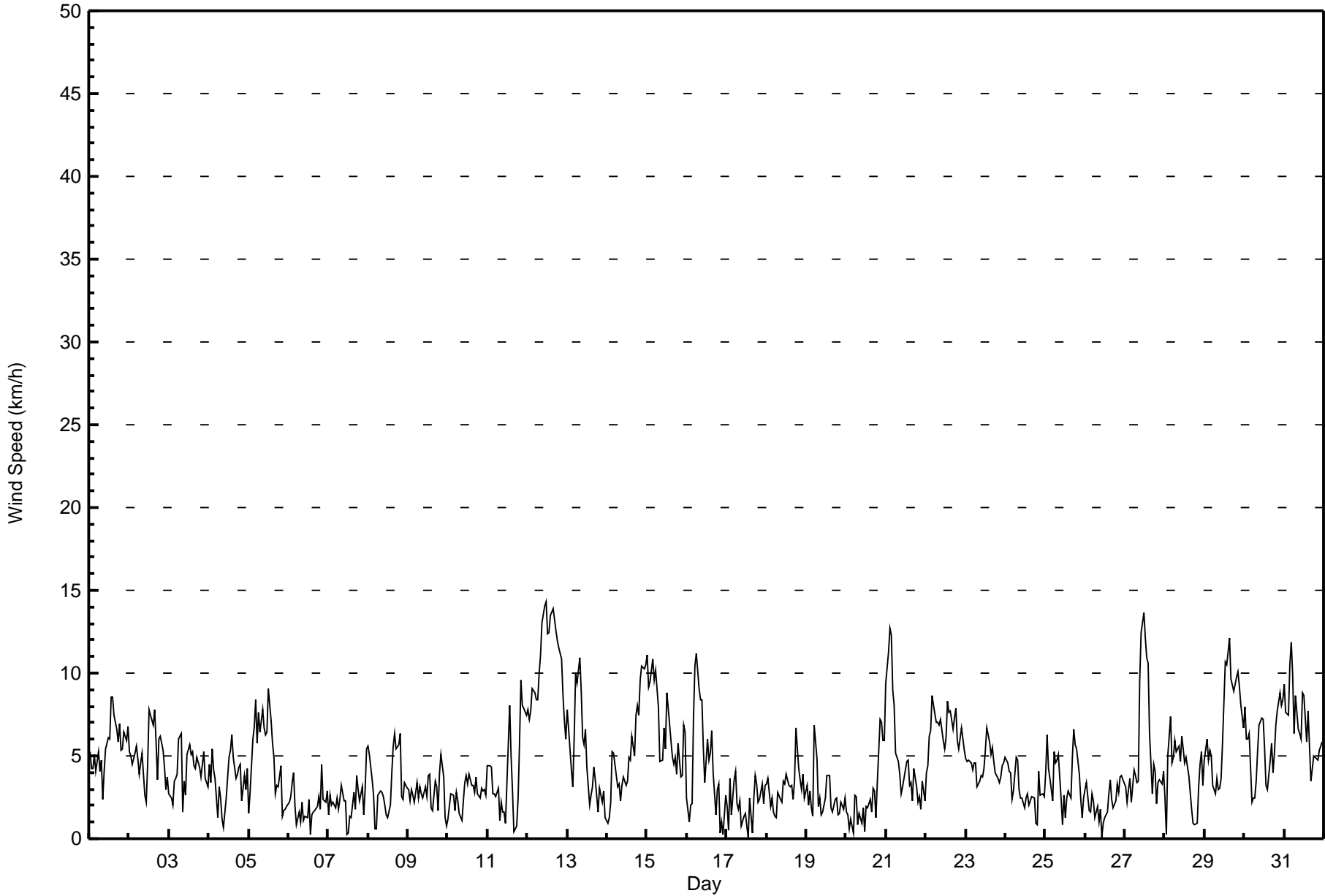


Maximum Speed: 14 km/h on Dec 12 12:00	Maximum Daily Speed Average: 10.6 km/h on Dec 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 17 14:00	Minimum Daily Speed Average: 0.3 km/h on Dec 25	Hours of Data: 744
Maximum Diurnal Speed Average: 2.1 km/h at hour 15	Minimum Diurnal Speed Average: 0.8 km/h at hour 24	Hours of Missing Data: 0
Monthly Average Velocity: 1.2 km/h 205.7 deg	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 2 Q <sub>1</sub> = 2 Median = 4 Q <sub>3</sub> = 6 P <sub>90</sub> = 8 P <sub>99</sub> = 13	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	S5	S4	SSW4	SSW5	SSW4	SSW5	SSW4	SSW5	SSW2	SSW4	S5	S6	S6	S9	S9	S7	S7	S6	SSW7	S5	SSW5	S6	S6	S7	S5.5	S9
2-Dec	SSW5	SSW5	SW4	S5	SSW6	SSW5	S4	S5	SSW5	SW3	S2	S4	S8	S7	S7	SSW8	S6	WSW4	WSW6	W6	W5	WSW4	WSW3	WNW4	SSW4.3	S8
3-Dec	WNW3	W2	WSW2	SSW3	W4	WSW4	S6	S6	SSE2	N3	N3	N5	N6	N5	N5	NNW4	N4	N5	NNW4	NNW4	N4	N5	N4	NNW3	NNW2.1	S6
4-Dec	NNW5	NNW3	N5	N4	NNW4	NNW1	N3	N2	WNW1	WSW1	SSE2	SSW4	S5	S5	S6	SSW5	SW4	SW4	S4	S4	SSW2	SSW4	WSW3	WNW4	SW1.2	S6
5-Dec	WSW2	SW3	WNW6	NW7	WNW8	W6	W8	W6	W8	WSW7	WSW6	SW6	SW9	WSW7	SW6	SSW5	SSW3	SSW3	SSW3	SSW4	WSW1	NNW2	WSW2	W2	WSW4.2	SW9
6-Dec	NNW2	NW3	NNW3	NNW4	NW2	NW1	N2	W1	NNW2	NNW1	SE1	WNW1	ENE2	SSE0	SE1	SW2	WSW2	W2	WSW3	SW2	SSW4	WSW2	SW2	W3	WNW1.0	SSW4
7-Dec	SW1	SSW3	SSW2	SW2	W2	WNW2	WNW2	WNW2	WNW3	W2	NW2	WSW0	ESE0	WNW1	S1	S3	S2	S4	SSE3	S2	S3	SW1	NNW3	NNW5	WSW1.2	NNW5
8-Dec	NNW6	NNW5	NW4	NW3	SE1	NNW1	SSW3	SSW3	SSW3	SSW3	SSW2	SSE1	SSE1	ESE2	SSE4	SSE6	SE6	SE5	ESE6	E6	ENE3	NNE2	NNE3	NNE3	ESE0.9	E6
9-Dec	NNE3	NNE2	NNE3	NNE3	NNE2	NNE3	N2	NNE3	N3	NNE2	ENE3	NNE3	N4	N4	NNE2	WNW2	WNW3	WNW3	WSW2	S4	S5	S4	S1	NNW1	N1.2	S5
10-Dec	SSW1	NNW2	NNW3	N3	NE2	NE3	NNE2	NE2	NE1	NW2	N3	N4	NNW3	N4	NNW3	N3	NNW3	NW4	NW3	N2	NNW3	N3	NNW3	N3	N2.3	N4
11-Dec	N4	N4	N4	N3	N3	NNW3	N3	NNW1	N2	N2	NNE2	ENE1	SSE6	SSE8	SSE5	SSE3	ESE0	ESE1	SE2	SSE6	SSE10	SSE8	SSE8	SSE7	SE1.6	SSE10
12-Dec	SSE8	SSE7	SSE8	SSE9	SSE9	SSE8	SSE8	SSE10	SSE11	SSE13	SSE14	SSE14	SSE12	SSE12	SSE13	SSE14	SSE13	SSE13	SSE12	SSE12	SSE11	SSE9	SSE7	SSE6	SSE10.6	SSE14
13-Dec	SSE8	SSE7	SSE4	SE3	SE6	SSE10	SSE9	SSE11	SSE9	S6	SE6	SE7	ESE4	NNE2	N3	N3	N4	NNW4	NW2	NNW3	N3	N2	NNW3	W1	SE2.6	SSE11
14-Dec	W1	NW1	NNW2	NW5	WNW5	WNW4	S3	SSW3	WSW2	W3	SW4	WSW3	WSW3	W5	W5	WNW6	WSW5	S7	S8	S7	S10	S10	S10	S11	SW3.7	S11
15-Dec	S11	S9	S10	S11	S10	S10	S9	S8	SSW5	SSW5	WSW7	WSW5	W9	W8	W6	WSW5	WSW4	WSW5	SW4	W6	NNW4	NNE4	N7	NNE6	SW4.1	S11
16-Dec	N2	N1	E2	SW2	WNW7	WNW10	WNW11	WNW9	WNW8	WNW8	WNW5	SSW3	W6	WSW5	SSW5	S7	S4	SW1	W3	W3	N0	NNW1	NE0	SSW3	W3.1	WNW11
17-Dec	S2	SW1	WNW4	WSW1	WNW4	NW4	NNE2	ESE2	SSE2	SSW1	SSW1	NNE2	ESE1	N0	SE2	SE0	NE2	NE4	NNE3	N2	N2	NNE3	NE2	ENE3	NNE0.7	NW4
18-Dec	E3	E4	E2	N2	NNW2	N1	NNW1	ENE3	NE2	ENE2	E4	ENE3	NNE4	NNE3	NE3	N3	NNE2	SE4	SSE7	ESE4	ESE4	NE3	NNE4	NNE2	ENE2.0	SSE7
19-Dec	NNW3	NNW2	N3	NNW2	NNE1	SE7	SE5	N2	NNW2	NNE1	N2	SSW2	S4	S4	S4	NW2	WNW2	NNW2	NW2	N1	NNW2	NNW2	NNW2	NW2	NNW0.5	SE7
20-Dec	W2	W1	WNW1	SSE1	NNE0	SW3	SSW3	SSW1	NW2	NNW1	N2	SSW0	SSE2	S2	S2	N2	N3	NNW3	WNW1	SSW3	S7	S7	S6	S6	SSW1.3	S7
21-Dec	S9	S11	S13	S12	SSW9	SSW8	S5	SSW5	WSW4	W3	W3	S4	SSE5	SSE5	SSE3	SSW3	NW2	N4	NNW3	WNW2	N3	N2	N3	NNW2	SSW3.2	S13
22-Dec	N4	N4	N6	N6	N9	N8	N7	N7	N7	N7	N6	N5	N6	N8	N8	N8	N7	N7	N8	N6	N5	N7	N6	N5	N6.6	N9
23-Dec	N5	N5	N5	N5	N4	N5	N5	N3	N3	N4	N4	N4	N5	N7	N6	N5	N5	NNE4	NNE4	N3	N4	N4	N5	N5	N4.4	N7
24-Dec	N5	N5	N4	N4	NNW2	NNE3	N5	N5	N3	N2	NE2	E2	SSE3	SSE3	SSE2	ESE2	S3	S2	SSE1	S1	S4	SSE3	SSW3	S3	NE0.6	N5
25-Dec	S4	SSW6	S4	S4	SSE2	S5	SSW5	S5	S5	S2	WSW1	NW3	WNW1	E2	E3	N2	N5	N7	N6	NNW5	NNW4	N2	N1	N2	SW0.3	N7
26-Dec	N3	NW3	WNW2	WSW2	W3	NNW2	NW1	NNW2	WNW1	N2	SE0	W1	NE1	NNE2	NNE3	N4	NNW2	NNW2	NNW2	N3	N3	N4	N4	N4	NNW1.9	N4
27-Dec	NNW3	N2	N3	N4	N2	NNE4	N4	N3	SE3	SSE10	SSE12	SSE14	SSE12	S11	S11	S6	S3	S4	S4	SSW2	S3	SSW4	SW3	SSW4	S3.2	SSE14
28-Dec	SSW2	W0	WNW5	WNW7	NNW5	N5	N6	N5	N6	N5	NNE6	N5	N5	N5	NNE4	NNE3	NNE2	NE1	W1	ESE1	S3	S4	S5	S3	N2.0	WNW7
29-Dec	S5	S6	SSW5	SSW5	SSW5	W3	WSW3	SSW4	WSW3	S3	SSW4	SSW6	S11	S11	S11	S12	S10	S9	S9	S10	S10	S9	S8	S7	S6.7	S12
30-Dec	SW8	SW6	W6	WNW6	SW2	SSW2	S2	SSW3	S5	S7	S7	SSW7	S5	SSW3	SSE3	SSW5	S6	S4	S5	S7	S8	S9	SSW8	S8	SSW5.0	S9
31-Dec	S9	S8	S7	S11	S12	S10	S6	S9	SSW7	W6	SSW6	SW9	SW9	SW6	SSW8	S6	WSW3	SW4	SW5	SSW5	SW5	S5	SSW6	SSW6	SSW6.5	S12

SSW1.1	SSW1.1	WSW1.0	WSW1.2	WSW1.3	SW1.0	SW0.8	SSW1.2	SW1.1	SW1.0	S1.1	S1.7	SSW1.8	SSW1.6	S2.1	SSW1.7	SW1.0	SW1.0	SSW1.4	SSW1.4	S1.7	S1.3	SSW0.8	SSW0.8	Diurnal Average	
S11	S11	S13	S12	S12	WNW10	WNW11	SSE11	SSE11	SSE13	SSE14	SSE14	SSE12	SSE12	SSE13	SSE14	SSE13	SSE13	SSE12	SSE12	SSE11	S10	S10	S11	Diurnal Maximum	

All monthly, daily, and diurnal averages have been calculated using vector methods





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Fort McKay - Bertha Ganter - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	539	72.45	72.45
6 - 11	187	25.13	97.58
12 - 19	18	2.42	100.00
20 - 28	0	0.00	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Fort McKay - Bertha Ganter - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	118	38	14	9	7	11	12	23	61	64	22	30	24	28	20	58	539
6 - 11	27	2	0	0	1	1	4	30	69	15	8	6	11	11	1	1	187
12 - 19	0	0	0	0	0	0	0	14	4	0	0	0	0	0	0	0	18
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	145	40	14	9	8	12	16	67	134	79	30	36	35	39	21	59	744

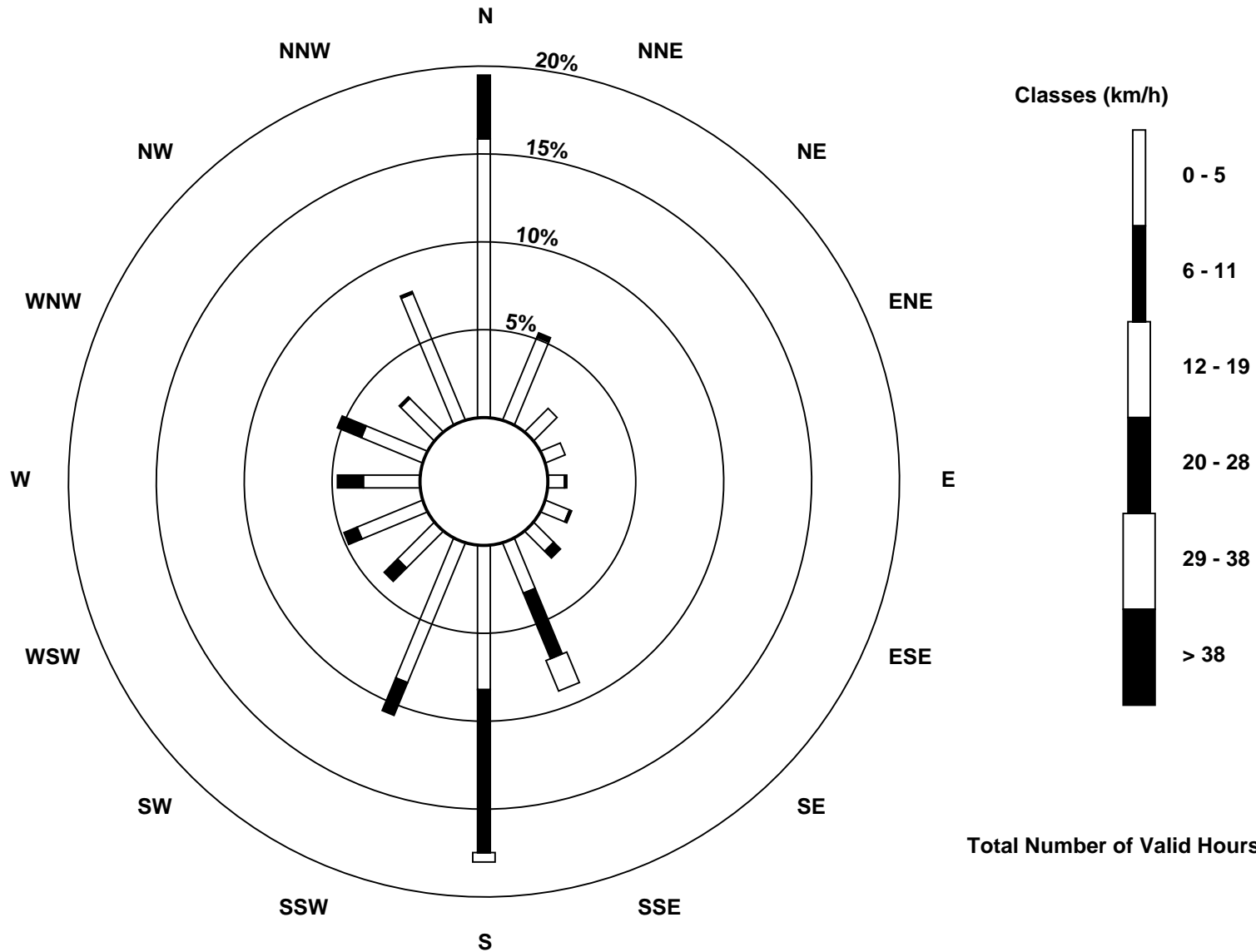
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
Fort McKay - Bertha Ganter (AMS 1)







Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 4 km/h on Dec 5 05:00 Minimum Value: 0 km/h on Dec 20 14:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 1 Q <sub>3</sub> = 2 P <sub>90</sub> = 2 P <sub>99</sub> = 3																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	1	1	2	1	1	1	1	1	1	1	1	2	2	2	3	2	2	1	2	1	1	1	2	1	3
2-Dec	1	1	2	1	2	1	2	2	1	1	1	1	2	2	2	1	2	3	3	3	2	2	1	1	3
3-Dec	1	1	2	1	2	1	2	1	2	1	1	2	2	2	2	1	1	2	2	2	2	1	2	1	2
4-Dec	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2
5-Dec	1	1	2	2	4	2	3	3	3	3	3	2	4	3	2	1	2	2	2	1	2	1	1	1	4
6-Dec	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
7-Dec	1	1	1	1	1	2	2	1	1	2	1	1	1	1	1	1	1	2	1	1	1	2	2	2	2
8-Dec	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	2
9-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10-Dec	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2
11-Dec	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	2	1	1	1	2	2	2	2	2	2
12-Dec	2	2	2	2	2	2	2	2	3	3	4	3	3	3	3	3	4	3	3	3	2	2	2	2	4
13-Dec	2	2	1	1	2	2	2	3	3	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	3
14-Dec	1	1	1	2	2	1	1	1	1	1	1	1	2	2	2	2	2	2	2	1	2	3	2	2	3
15-Dec	2	2	2	2	2	2	2	2	1	1	3	2	3	3	2	1	2	2	2	2	2	1	3	3	3
16-Dec	2	1	1	1	3	3	3	2	2	2	2	1	2	2	2	1	1	1	1	1	1	1	1	1	3
17-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2	1	1	2
18-Dec	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2
19-Dec	1	1	1	1	1	2	3	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	3
20-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	2	2	2	1	1	2
21-Dec	2	3	3	3	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3
22-Dec	1	1	2	2	3	3	2	2	2	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2	3
23-Dec	1	1	1	1	1	2	1	1	1	1	1	1	2	2	2	2	2	2	2	1	1	1	1	1	2
24-Dec	2	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	2	1	1	1	2
26-Dec	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
27-Dec	1	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	1	1	1	1	1	2	1	1	3
28-Dec	1	1	2	1	1	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	2
29-Dec	1	1	1	2	1	1	1	1	1	1	1	3	2	2	2	2	2	1	2	2	2	2	1	2	3
30-Dec	3	2	2	2	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	2	1	3
31-Dec	2	1	2	2	2	2	1	2	2	3	2	3	2	2	2	2	1	1	1	1	1	1	1	2	3
																	Diurnal Maximum								



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Wind Direction (WD) - deg**

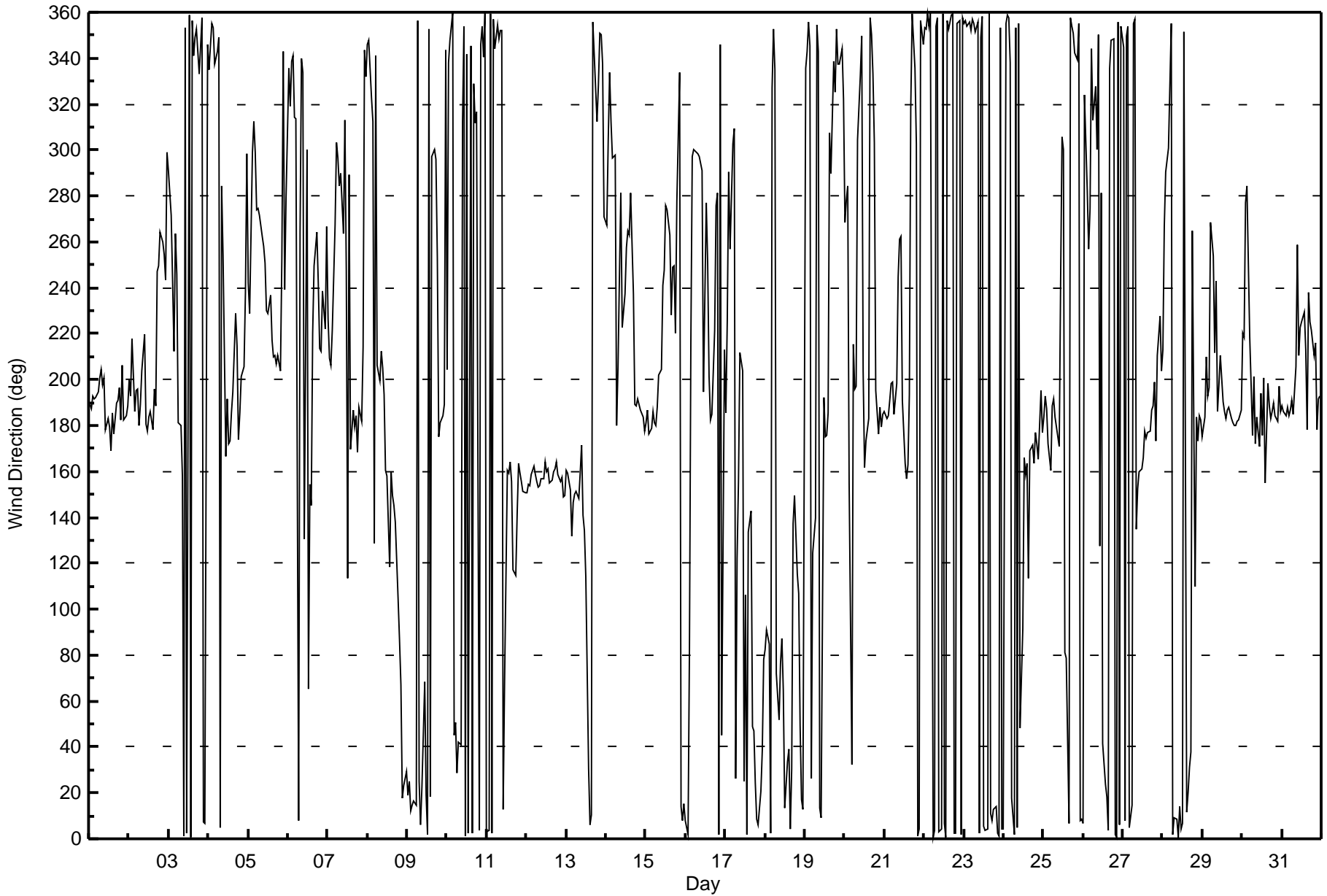
**Fort McKay - Bertha Ganter - December 2015**

Direction of Maximum Speed: 164 deg on Dec 12 12:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 157.4 deg on Dec 12		Hours of Data:	744
Direction of Minimum Speed: 2 deg on Dec 17 14:00		Hours of Missing Data:	0
Direction of Minimum Daily Speed Average: 0.3 deg on Dec 25		Percent Operational Time:	100.0
Monthly Average Direction: 267.8 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	189	187	193	192	192	195	201	204	197	201	178	183	179	169	186	177	190	191	197	182	207	182	184	189	188.0
2-Dec	200	193	218	186	195	196	180	189	204	220	180	178	183	186	178	196	188	247	250	264	260	255	244	299	207.6
3-Dec	291	271	243	212	263	246	181	180	158	1	353	2	359	1	356	341	349	353	346	358	7	7	346	334.9	
4-Dec	335	345	355	353	337	343	349	5	284	255	167	192	172	173	185	194	229	215	174	185	201	205	238	298	228.1
5-Dec	242	229	299	312	299	274	274	271	263	258	251	230	229	237	217	210	211	207	210	204	252	343	239	279	253.4
6-Dec	336	319	339	341	314	314	8	264	340	334	130	300	65	154	145	220	249	264	243	214	212	238	222	267	283.1
7-Dec	226	210	207	222	267	303	297	284	290	263	313	248	113	289	170	186	179	184	168	188	182	214	344	332	242.4
8-Dec	346	348	323	313	129	341	206	200	212	205	194	161	158	119	160	149	145	138	104	87	67	18	23	29	115.4
9-Dec	19	25	12	14	17	15	357	25	6	23	68	19	2	353	18	297	300	296	253	175	181	184	189	343	3.3
10-Dec	204	338	348	360	45	51	29	42	41	312	354	1	342	2	346	3	329	312	317	4	346	354	341	360	352.7
11-Dec	3	3	360	2	357	344	355	348	352	352	13	68	160	160	164	155	117	114	141	163	159	156	151	151	136.5
12-Dec	151	155	154	158	163	159	155	153	154	157	157	164	160	161	155	156	160	161	164	159	155	157	149	149	157.4
13-Dec	161	159	152	132	146	150	151	148	159	172	141	134	114	31	6	10	356	342	312	328	351	350	337	271	141.9
14-Dec	267	304	334	313	296	297	180	205	245	281	223	237	257	265	263	282	237	189	188	191	189	187	184	178	220.3
15-Dec	181	187	176	179	186	181	180	188	202	204	241	248	276	274	263	228	249	250	220	278	334	14	8	15	216.5
16-Dec	8	2	83	216	297	300	300	298	297	294	291	195	277	251	202	182	185	222	276	281	2	346	45	213	277.1
17-Dec	186	226	291	257	303	309	26	122	155	212	204	25	106	2	134	143	49	47	24	9	6	21	39	78	21.4
18-Dec	82	91	85	2	327	353	335	72	52	76	87	64	13	33	39	4	30	138	149	115	107	49	17	13	62.9
19-Dec	336	343	356	345	26	125	140	355	343	13	9	192	175	176	185	308	290	339	325	353	337	337	344	322	346.0
20-Dec	268	278	285	155	32	215	196	197	305	332	350	204	162	173	183	357	350	333	303	195	177	188	179	185	201.2
21-Dec	186	183	184	191	198	199	185	198	244	261	263	191	164	157	163	193	319	359	336	302	1	4	356	346	198.4
22-Dec	353	353	359	354	360	1	4	354	357	3	5	360	7	1	356	353	359	359	2	3	355	356	2	358	359.0
23-Dec	355	356	354	356	352	357	355	351	356	3	349	358	5	4	5	360	11	8	13	14	2	1	354	4	0.4
24-Dec	4	355	358	358	338	18	2	353	5	355	48	92	166	159	164	114	169	171	164	177	172	165	196	177	35.3
25-Dec	184	193	187	172	160	189	192	184	179	171	243	306	300	81	79	7	358	354	351	342	339	355	8	8	228.3
26-Dec	7	324	283	257	275	344	313	327	300	350	127	281	41	24	18	4	336	348	348	2	1	356	6	354	345.5
27-Dec	345	8	349	354	5	15	355	357	135	153	160	161	166	178	174	177	177	187	189	199	173	210	228	204	170.7
28-Dec	213	267	290	301	328	355	2	9	9	1	14	4	7	352	12	20	31	38	265	110	184	173	184	182	349.3
29-Dec	175	184	210	193	196	268	254	212	243	186	198	210	190	186	183	187	188	183	181	180	180	182	183	187	190.1
30-Dec	220	218	277	284	219	198	176	201	172	184	171	194	176	201	155	198	189	183	186	190	184	182	197	186	195.8
31-Dec	188	186	184	188	184	187	191	185	206	259	210	223	225	229	213	178	238	225	221	210	216	178	192	193	201.6

206.4 208.2 255.5 243.0 246.7 229.7 219.2 205.4 227.4 233.2 187.4 190.7 191.7 193.7 181.0 192.1 214.5 214.9 204.1 197.0 188.0 184.4 196.1 211.1  
Diurnal Average

All monthly, daily, and diurnal averages have been calculated using vector methods





**Wood Buffalo Environmental Association**

**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**

**Fort McKay - Bertha Ganter - December 2015**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 105 deg on Dec 7 13:00		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																							
Minimum Value: 10 deg on Dec 30 20:00																									
Percentiles: P <sub>1</sub> = 11 P <sub>10</sub> = 14 Q <sub>1</sub> = 19 Median = 29 Q <sub>3</sub> = 43 P <sub>90</sub> = 61 P <sub>99</sub> = 94																									
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	14	15	54	12	11	13	15	18	44	21	18	33	30	15	18	14	14	16	14	18	13	11	12	14	54
2-Dec	17	20	16	18	16	20	26	28	20	56	42	20	18	17	20	13	22	69	44	46	45	46	44	47	69
3-Dec	47	37	63	32	36	41	13	13	69	25	44	24	27	31	30	32	29	26	39	29	27	21	22	30	69
4-Dec	21	20	19	23	31	77	46	60	89	79	57	24	15	14	12	18	14	30	12	15	34	19	26	20	89
5-Dec	65	29	27	18	23	38	39	33	45	47	52	44	38	40	30	15	46	40	48	40	85	58	41	34	85
6-Dec	49	39	34	14	49	79	27	80	50	88	96	94	72	97	80	61	40	43	41	38	14	30	34	23	97
7-Dec	55	32	63	71	68	55	56	42	33	50	54	90	105	58	73	31	48	36	32	23	24	88	42	19	105
8-Dec	23	23	21	17	87	75	33	34	19	36	45	69	60	56	23	21	17	19	21	22	42	31	38	22	87
9-Dec	23	31	26	37	31	27	38	26	45	28	38	45	27	24	69	21	16	18	44	12	12	16	62	73	73
10-Dec	80	38	30	29	55	55	39	47	77	29	26	25	29	34	47	26	36	21	29	23	22	30	28	43	80
11-Dec	25	24	22	27	35	32	32	35	32	52	58	88	18	16	21	31	94	75	27	17	17	16	13	13	94
12-Dec	14	14	15	14	16	16	13	15	14	14	15	16	16	16	14	14	16	15	15	15	15	15	15	17	17
13-Dec	15	15	26	30	15	13	14	13	18	17	14	16	32	55	38	33	21	25	31	39	25	54	15	60	60
14-Dec	68	76	60	20	28	25	24	25	51	51	37	41	48	36	38	27	43	17	13	14	14	13	14	15	76
15-Dec	15	15	13	14	15	14	15	13	18	21	45	40	31	36	36	29	36	39	47	35	44	42	33	39	47
16-Dec	55	76	47	44	23	17	15	16	15	18	33	57	32	41	39	15	34	63	36	27	89	71	93	23	93
17-Dec	42	78	25	57	16	44	44	33	37	71	49	70	87	94	29	79	56	42	42	61	50	49	55	35	94
18-Dec	39	21	47	43	43	71	78	43	44	41	38	43	41	40	45	23	43	45	13	21	22	27	22	46	78
19-Dec	19	42	30	23	43	19	52	39	26	79	38	40	30	27	36	26	41	36	45	61	45	39	52	27	79
20-Dec	47	42	65	60	70	30	19	50	31	66	33	92	44	35	34	57	21	37	65	60	14	16	18	19	92
21-Dec	15	15	18	15	19	17	19	20	18	34	28	33	14	14	17	23	51	16	26	42	50	63	28	42	63
22-Dec	27	22	26	27	28	32	24	26	29	29	36	33	34	29	28	27	28	26	31	32	28	29	33	30	36
23-Dec	26	26	25	27	28	31	26	28	24	25	24	26	33	29	32	29	33	35	44	37	43	29	22	26	44
24-Dec	32	21	27	32	25	37	38	24	40	28	56	65	37	34	33	24	25	39	68	91	20	25	15	23	91
25-Dec	16	14	16	26	53	15	16	14	16	26	70	50	68	46	30	39	22	23	25	20	22	20	64	36	70
26-Dec	25	13	43	57	35	34	41	46	47	26	97	64	63	66	41	23	19	59	38	31	36	24	27	27	97
27-Dec	40	67	40	26	38	24	20	25	77	17	18	15	15	16	14	19	61	15	17	60	23	29	35	18	77
28-Dec	52	85	19	15	20	27	24	33	34	28	33	31	42	27	36	38	54	58	84	85	22	14	16	18	85
29-Dec	17	11	14	11	20	23	34	29	49	29	26	30	14	14	12	12	11	11	12	12	12	13	12	19	49
30-Dec	29	44	39	29	51	24	46	40	19	18	18	19	25	17	53	33	24	19	11	10	13	11	14	13	53
31-Dec	12	12	11	11	12	13	17	18	32	45	25	22	22	28	22	26	34	37	26	21	32	20	15	26	45
80 85 65 71 87 79 78 80 89 88 97 94 105 97 80 79 94 75 84 91 89 88 93 73																									
Diurnal Maximum																									



# Wood Buffalo Environmental Association SO2 Calibration Report

## Station Information

Calibration Date	December 14, 2015	Last Calibration	November 16, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	9:25	End Time (MST)	13:05
Gas Cert Reference	LL107945	Station temp.	21 Deg C
Cal Gas Concentration	49.7 ppm	Cal Gas Exp Date	08/09/2018
Calibrator Make/Model	Sabio 4010	Serial Number	1730512
ZAG Make/Model	API 701	Serial Number	587
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2582

## Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-614	-613
Analyzer IP address	192.168.1.43		Lamp voltage	815	816
Calculated slope	0.999055	0.964090	Chamber temp	45.0	45.1
Calculated intercept	2.041252	1.424436	Pressure	678.5	683.3
Analyzer Background	11.4	11.3	Flow	0.497	0.499
Analyzer Coefficient	0.932	0.932	Intensity	90	90

Analyzer make Thermo 43i Analyzer serial # JC1501301448

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0.0	0.0	0.5	----
as found span	5500	78.1	705.7	729.0	0.968
calibrator zero	5500	0.0	0.0	0.9	----
high point	5500	78.1	705.7	732.2	0.964
second point	5500	43.8	395.8	407.2	0.972
third point	5500	21.9	197.9	201.6	0.982
as left zero	5500	0.0	0.0	0.6	----
as left span	5500	78.1	705.7	730.3	0.966
Average Correction Factor					0.973

Corrected As found 728.5 Previous response 704.4 % change -3.3%

**Notes:**

Inlet filter changed after as founds. No adjustments made.

Calibration Performed By:

Devin Russell



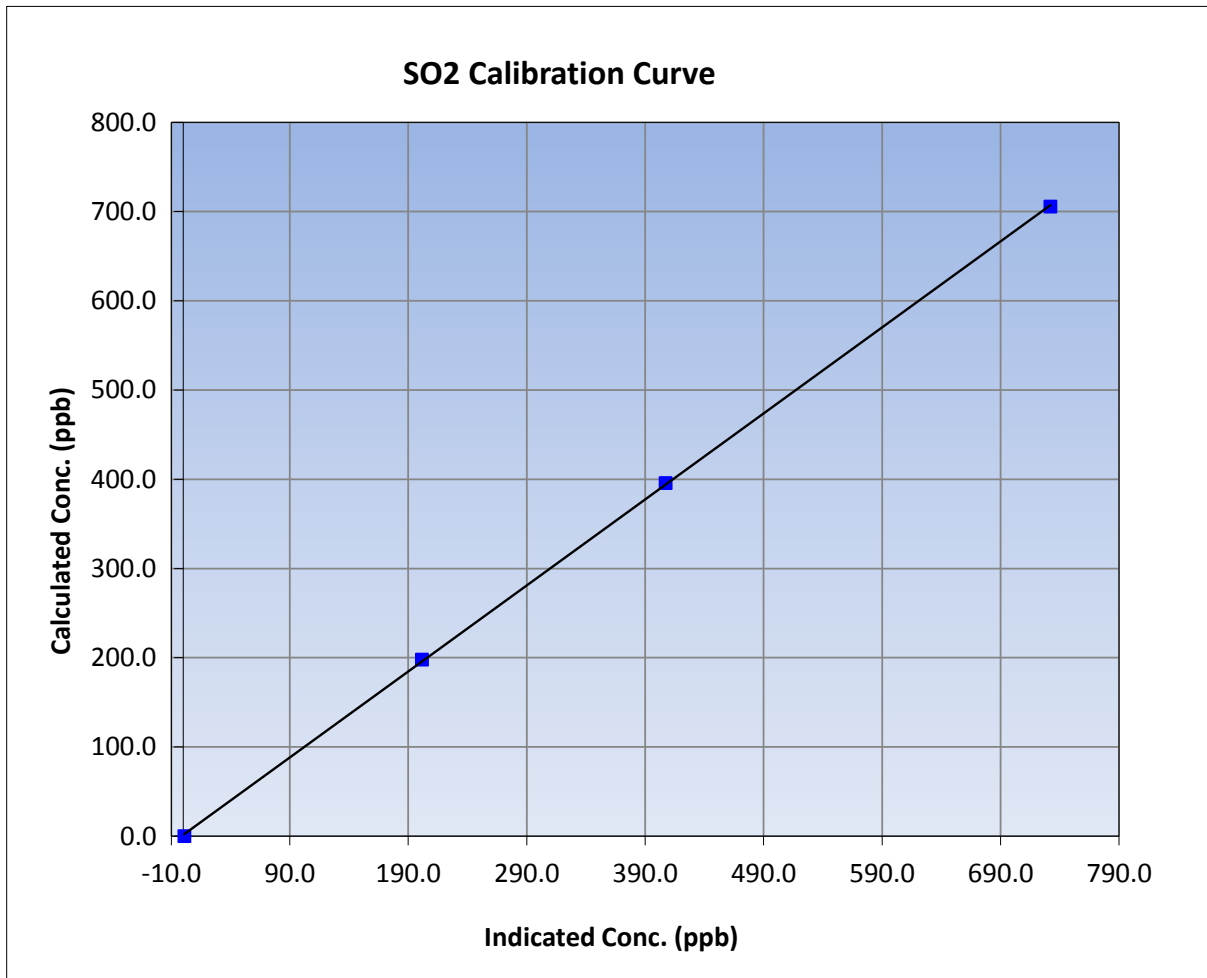
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 14, 2015	Previous Calibration	November 16, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:25	End Time (MST)	13:05
Analyzer make	Thermo 43i	Analyzer serial #	JC1501301448

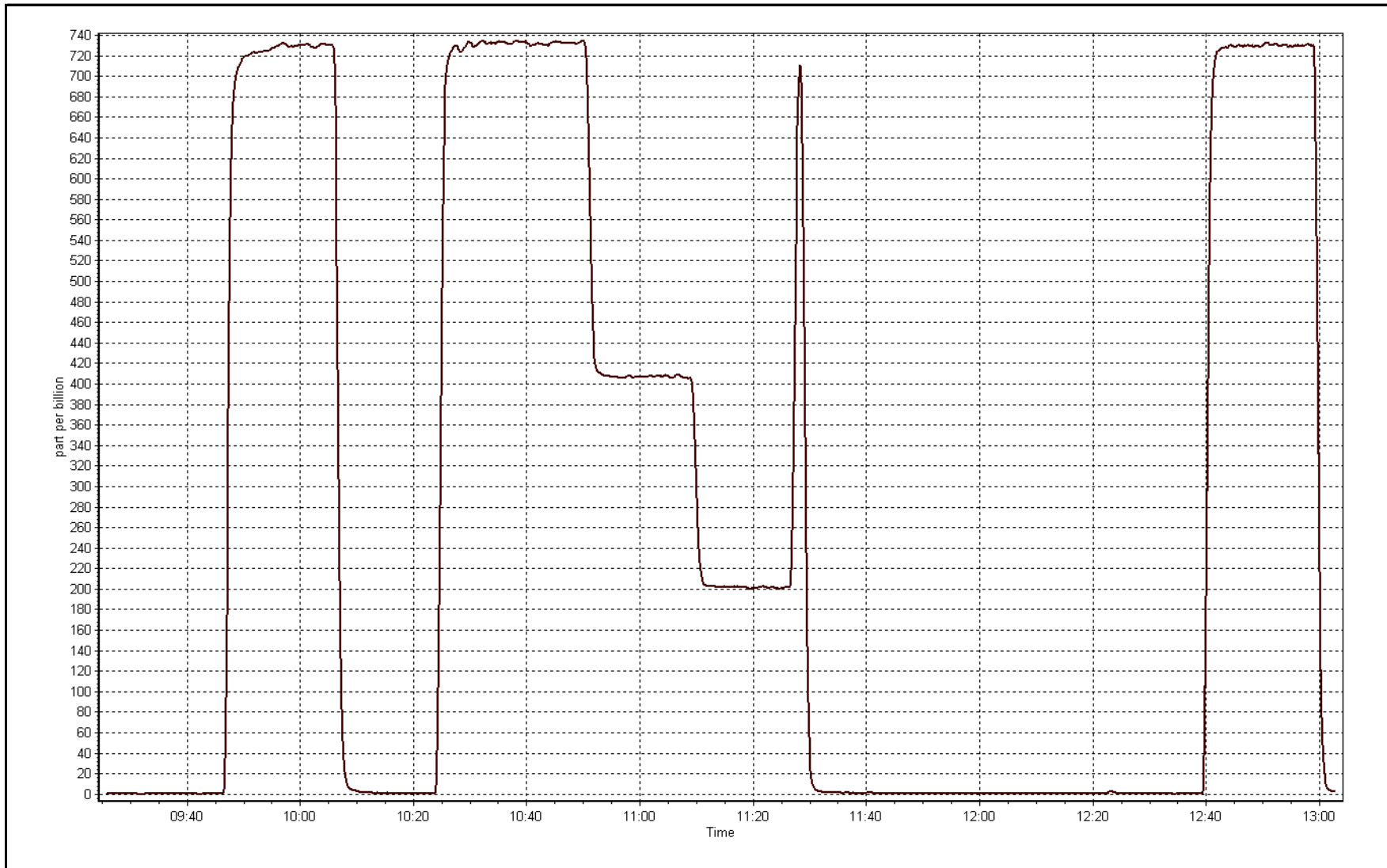
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.9	----	Correlation Coefficient	0.999943
705.7	732.2	0.9639		
395.8	407.2	0.9720	Slope	0.964090
197.9	201.6	0.9817		
			Intercept	1.424436



SO2 Calibration Plot

Date: December 14, 2015





# Wood Buffalo Environmental Association TRS Calibration Report

### Station Information

Calibration Date	December 18, 2015	Last Calibration	November 3, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	10:15	End Time (MST)	12:45
Gas Cert Reference	LL27480	Station temp.	21 Deg C
Cal Gas Concentration	10.6 ppm	Cal Gas Exp Date	21/12/2012
Calibrator Make/Model	Sabio 4010	Serial Number	1730512
Dil air Make/Model	API 701	Serial Number	587
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2582
SO2 gas concentration	49.7 ppm	SO2 gas cert/exp	SA140071A 26/Sep/17

### Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-859	-859
Analyzer IP address	192.168.1.42		Lamp voltage	1144	1157
Calculated slope	0.994130	0.998917	Chamber temp	45	45
Calculated intercept	0.305450	0.166653	Pressure	678.7	682.0
Analyzer Background	1.86	1.84	Flow	0.415	0.415
Analyzer Coefficient	1.015	1.015	Intensity	80	80
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1218153461	
Converter make/model	CDN-101		Converter serial #	470	

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	-0.2	----
as found span	6500	46.0	75.0	74.9	1.001
SO2 scrubber check	5500	22.8	206.0	0.6	----
calibrator zero	6500	0.0	0.0	-0.2	----
high point	6500	46.0	75.0	74.9	1.001
second point	6500	24.6	40.1	40.0	1.003
third point	6500	12.3	20.1	19.9	1.009
as left zero	6000	0.0	0.0	0.0	----
as left span	6500	46.0	75.0	75.2	0.998
Average Correction Factor					1.004

Corrected As found	75.1	Previous response	75.2	% change	0.1%
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**Notes:**

Filter changed after as founds. Scrubber check completed after as founds. No adjustments.

Calibration Performed By:

Asad Hidayat





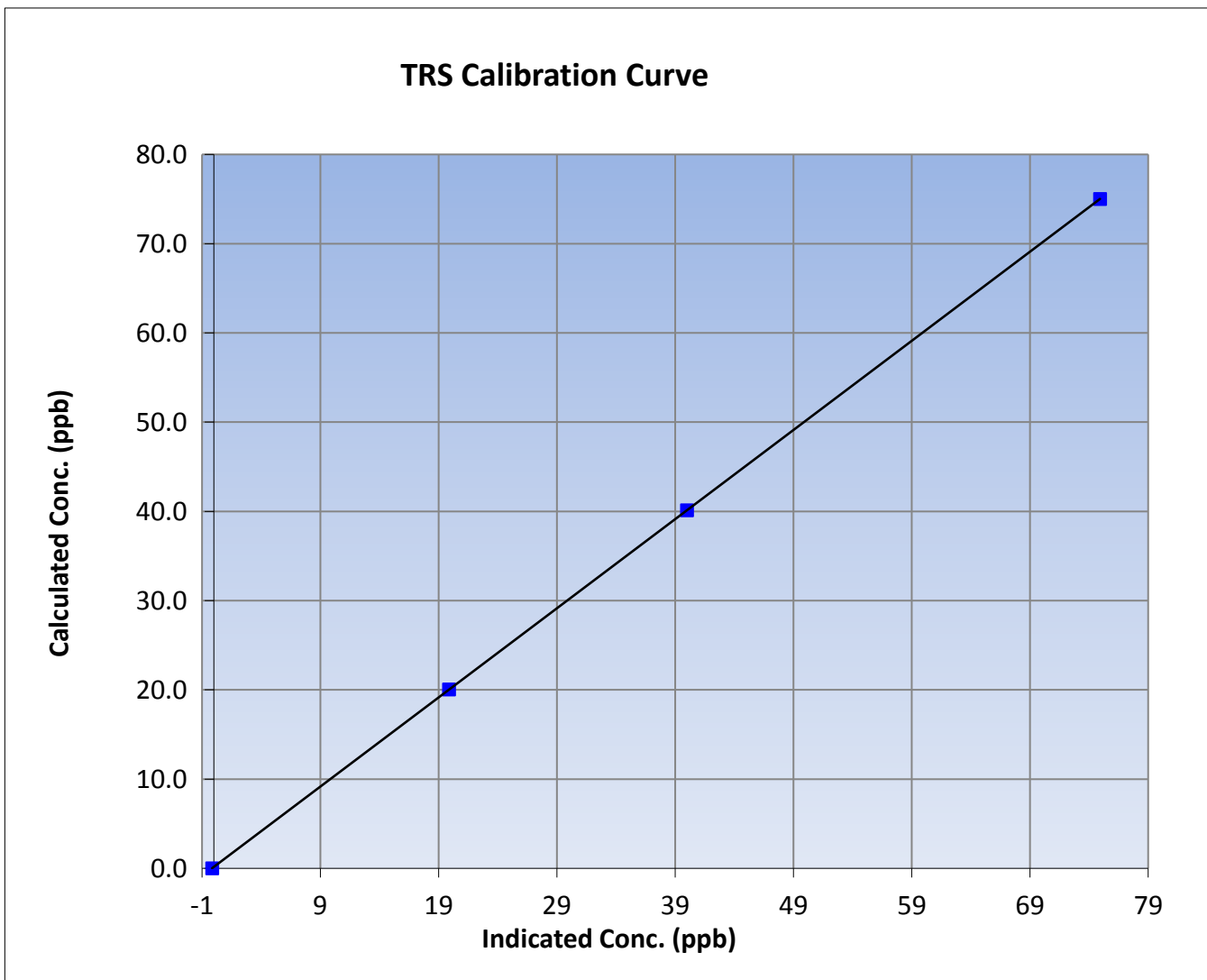
# Wood Buffalo Environmental Association TRS Calibration Report

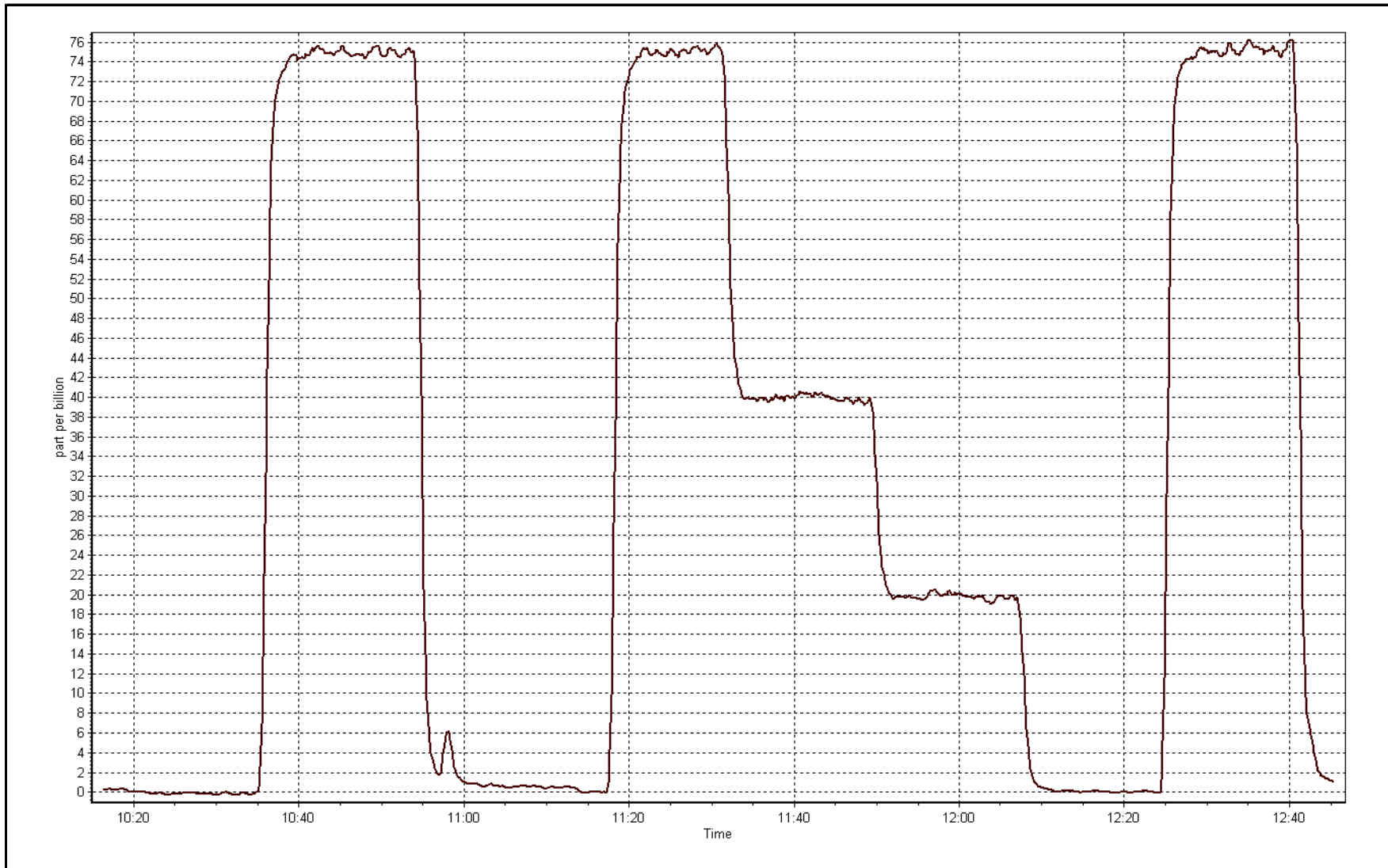
## Station Information

Calibration Date	December 18, 2015	Previous Calibration	November 3, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	10:15	End Time (MST)	12:45
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1218153461

## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999999
75.0	74.9	1.0011		
40.1	40.0	1.0027	Slope	0.998917
20.1	19.9	1.0090		
			Intercept	0.166653







## Wood Buffalo Environmental Association THC / NMHC Calibration Report

### Station Information

Calibration Date	December 14, 2015	Last Calibration	November 25, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	9:25	End Time (MST)	13:05
Gas Cert Reference	SA140071A	Cal Gas Expiry Date	September-26-17
CH4 Cal Gas Conc.	515.0 ppm	CH4 Equiv Conc.	1065.0 ppm
C3H8 Cal Gas Conc.	200.0 ppm	Station temp.	21 Deg C
Calibrator Model	Sabio 4010	Serial Number	1730512
ZAG make/model	Teledyne API 701	Serial Number	587
DACS make/model	Campbell Scientific CR3000	Serial Number	2582

### Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.1	75.0
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	1.003184	0.998948	Carrier Pressure	37.3	37.3
THC Calc intercept	0.084108	0.079388	Fuel Pressure	42.3	42.3
NMHC Calc slope	1.006882	0.997804	Air Pressure	35.0	35.0
NMHC Calc intercept	0.027105	0.023186			

Analyzer make Thermo 55i Analyzer serial # 1152430012

### THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0.0	0.00	0.00	----
as found span	5500	81.3	15.74	15.90	0.990
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	15.74	15.74	1.000
second point	5500	45.6	8.83	8.68	1.017
third point	5500	22.8	4.41	4.28	1.032
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	15.74	15.73	1.001
Average Correction Factor					1.016

Corrected As found 15.90 Previous response 15.61 % change -1.8%

**Notes:**

Inlet filter changed after as founds. Span adjusted. Third point over 5% out. Adjusted span again and calibration passed.

Calibration Performed By: Devin Russell



## Wood Buffalo Environmental Association THC / NMHC Calibration Report

### NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0	0.00	0.00	----
as found span	5500	81.3	8.13	8.12	1.001
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	8.13	8.14	0.999
second point	5500	45.6	4.56	4.53	1.007
third point	5500	22.8	2.28	2.24	1.018
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	8.13	8.14	0.999
Average Correction Factor					1.008

Corrected As found      8.12      Previous response      8.05      % change      -0.9%

### CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0	0.00	0.00	----
as found span	5500	81.3	7.61	7.78	0.978
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	7.61	7.60	1.002
second point	5500	45.6	4.27	4.16	1.026
third point	5500	22.8	2.13	2.04	1.047
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	7.61	7.60	1.002
Average Correction Factor					1.025

Corrected As found      7.78      Previous response      7.56      % change      -2.8%



# Wood Buffalo Environmental Association

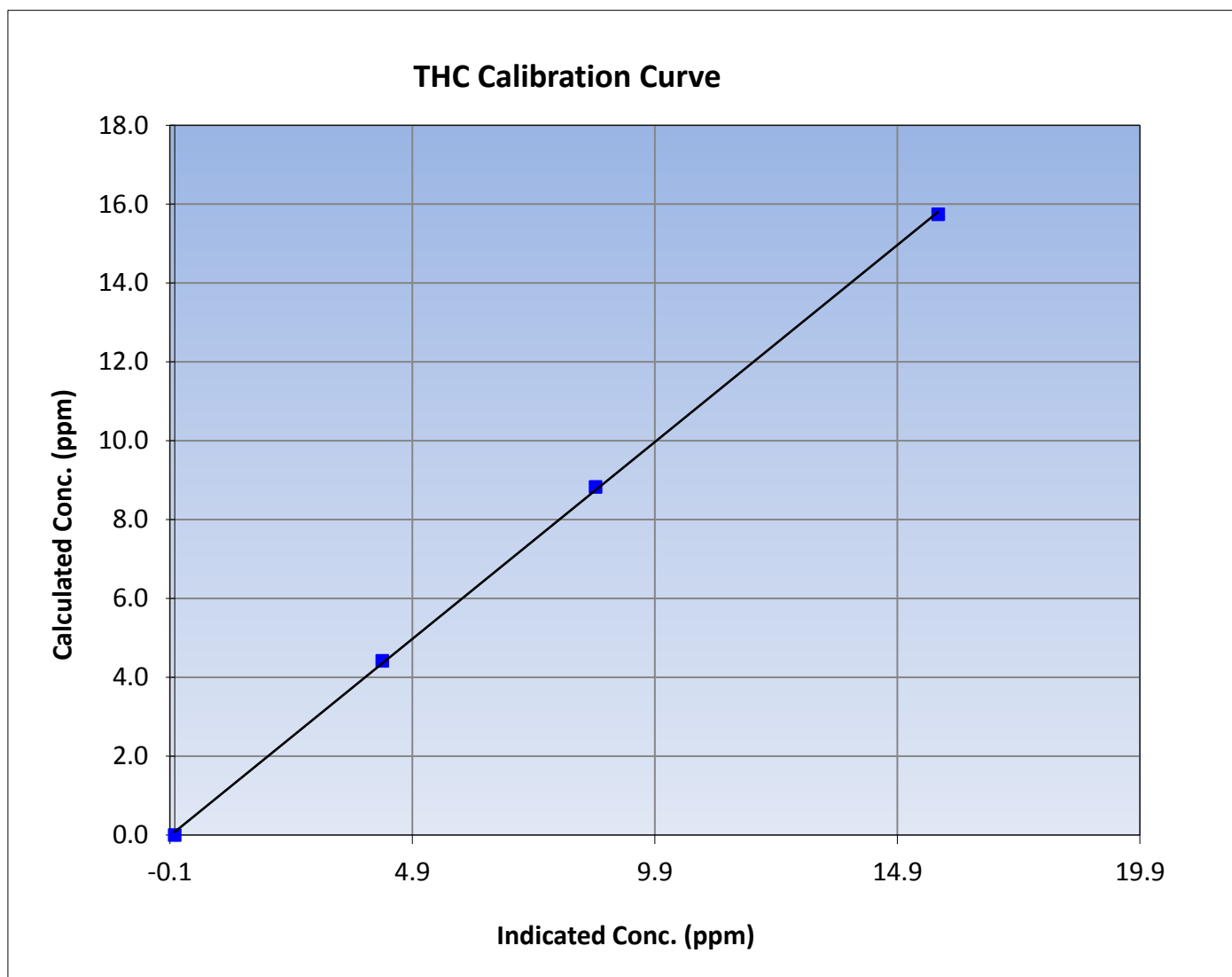
## THC Calibration Summary

### Station Information

Calibration Date	December 14, 2015	Previous Calibration	November 25, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:25	End Time (MST)	13:05
Analyzer make	Thermo 55i	Analyzer serial #	1152430012

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999853
15.74	15.74	1.0002		
8.83	8.68	1.0173	Slope	0.998948
4.41	4.28	1.0315		
			Intercept	0.079388





# Wood Buffalo Environmental Association

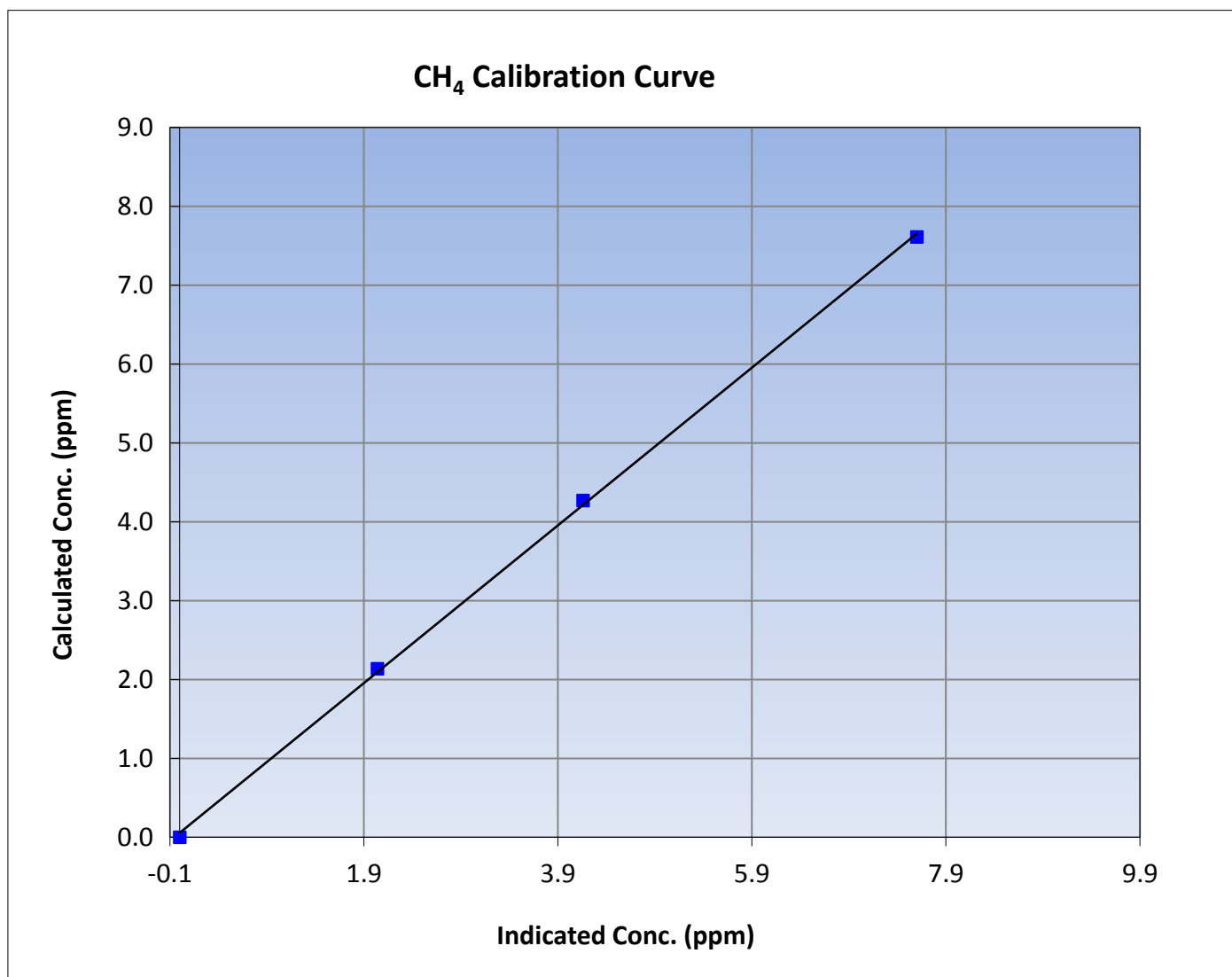
## CH<sub>4</sub> Calibration Summary

### Station Information

Calibration Date	December 14, 2015	Previous Calibration	November 25, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:25	End Time (MST)	13:05
Analyzer make	Thermo 55i	Analyzer serial #	1152430012

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999702
7.61	7.60	1.0017		
4.27	4.16	1.0264	Slope	0.999892
2.13	2.04	1.0465		
			Intercept	0.054713





# Wood Buffalo Environmental Association

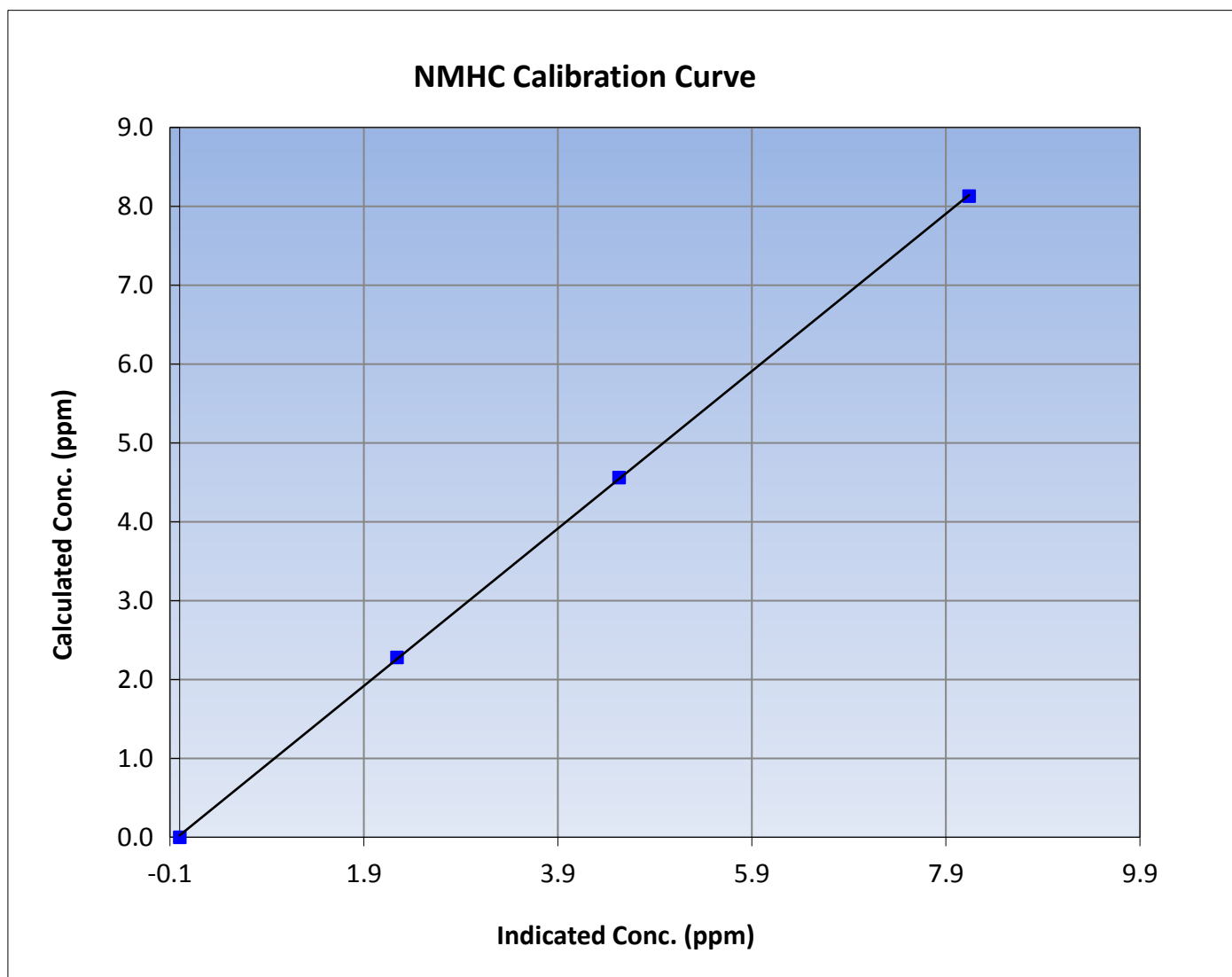
## NMHC Calibration Summary

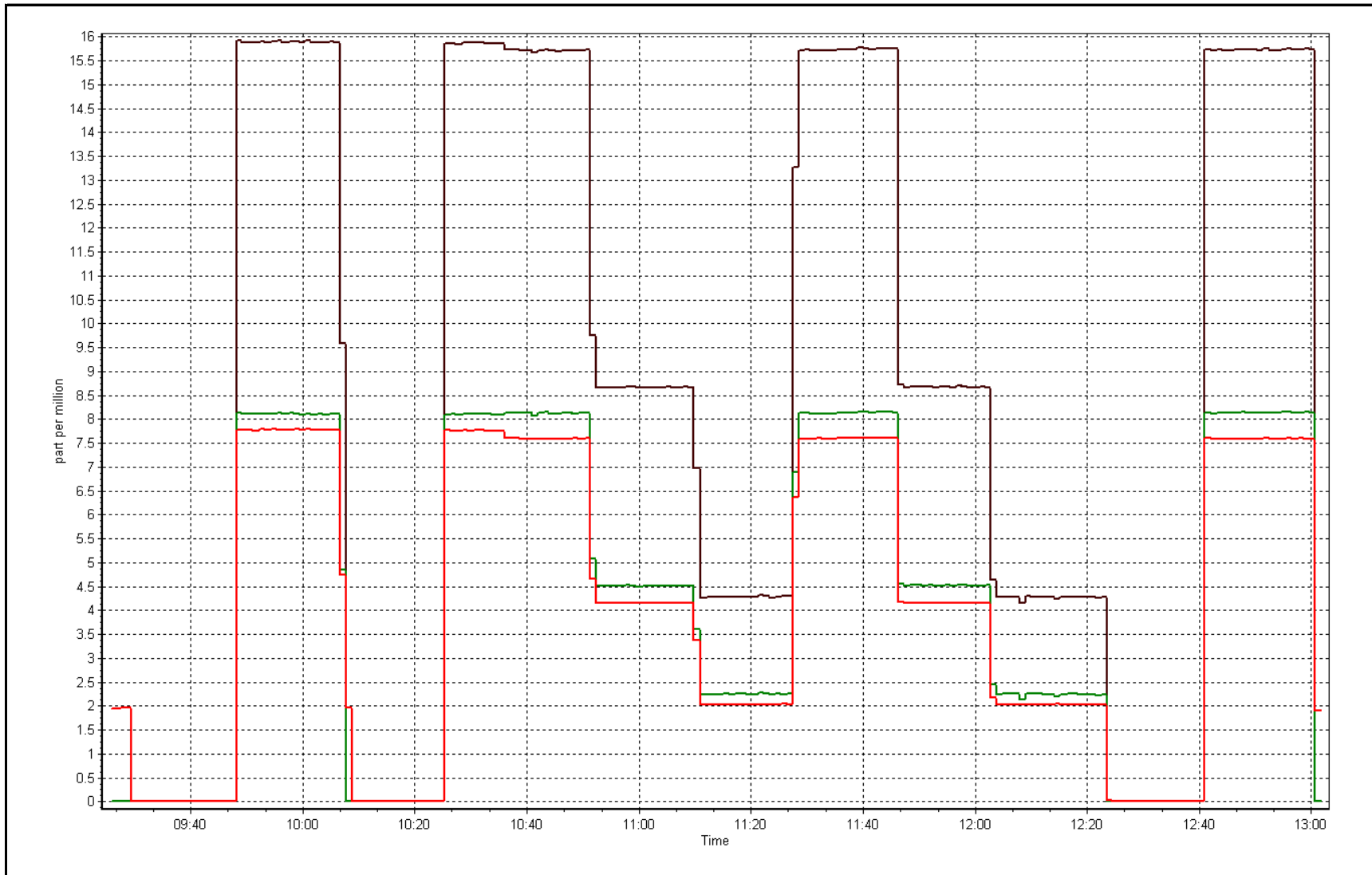
### Station Information

Calibration Date	December 14, 2015	Previous Calibration	November 25, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:25	End Time (MST)	13:05
Analyzer make	Thermo 55i	Analyzer serial #	1152430012

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999958
8.13	8.14	0.9988		
4.56	4.53	1.0066	Slope	0.997804
2.28	2.24	1.0179		
			Intercept	0.023186









# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Report

### Station Information

Calibration Date	December 17, 2015	Previous Calibration	November 17, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	10:00	End Time (MST)	14:05
NO2 GPT Ref date	December-16-15	Transfer Standard	N/A
Calibrator Make/Model	Sabio 4010	Station temp.	23 Deg C
ZAG make/model	Teledyne API 701	Serial Number	1730512
DACS make/model	Campbell Scientific CR3000	Serial Number	587
		Serial Number	2582

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	27.1	28.1
Analyzer IP address	192.168.1.49		Lamp temp.	53.5	53.6
Calculated slope	1.004782	1.001740	Pressure	703.5	725.6
Calculated intercept	-2.721993	-0.193501	Flow cell A	0.751	0.767
Analyzer Background	-2.6	-2.5	Flow cell B	0.755	0.769
Analyzer Coefficient	1.056	1.032	Cell A Intensity	72000	73414
			Cell B Intensity	68000	69066

Analyzer make	Thermo 49i	Analyzer serial #	1300156233
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### Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.00	0.0	0.6	----
as found span	5000	0.98	442.0	453.2	0.975
calibrator zero	5000	0.00	0.0	0.6	----
high point	5000	0.98	442.0	441.9	1.000
second point	5000	0.56	232.9	231.8	1.005
third point	5000	0.34	121.2	121.3	1.000
as left zero	5500	0.00	0.0	0.8	----
as left span	5000	0.98	442.0	454.3	0.973
Average Correction Factor					1.002

Corrected As found	452.6	Previous response	442.6	% change	-2.2%
--------------------	-------	-------------------	-------	----------	-------

**Notes:**

Sample inlet filter replaced after as founds. Cleaned out sample tube inside analyzer and peaked lamp a bit to bring lamp intensities higher. Slightly adjusted span.

Calibration Performed By: Asad Hidayat



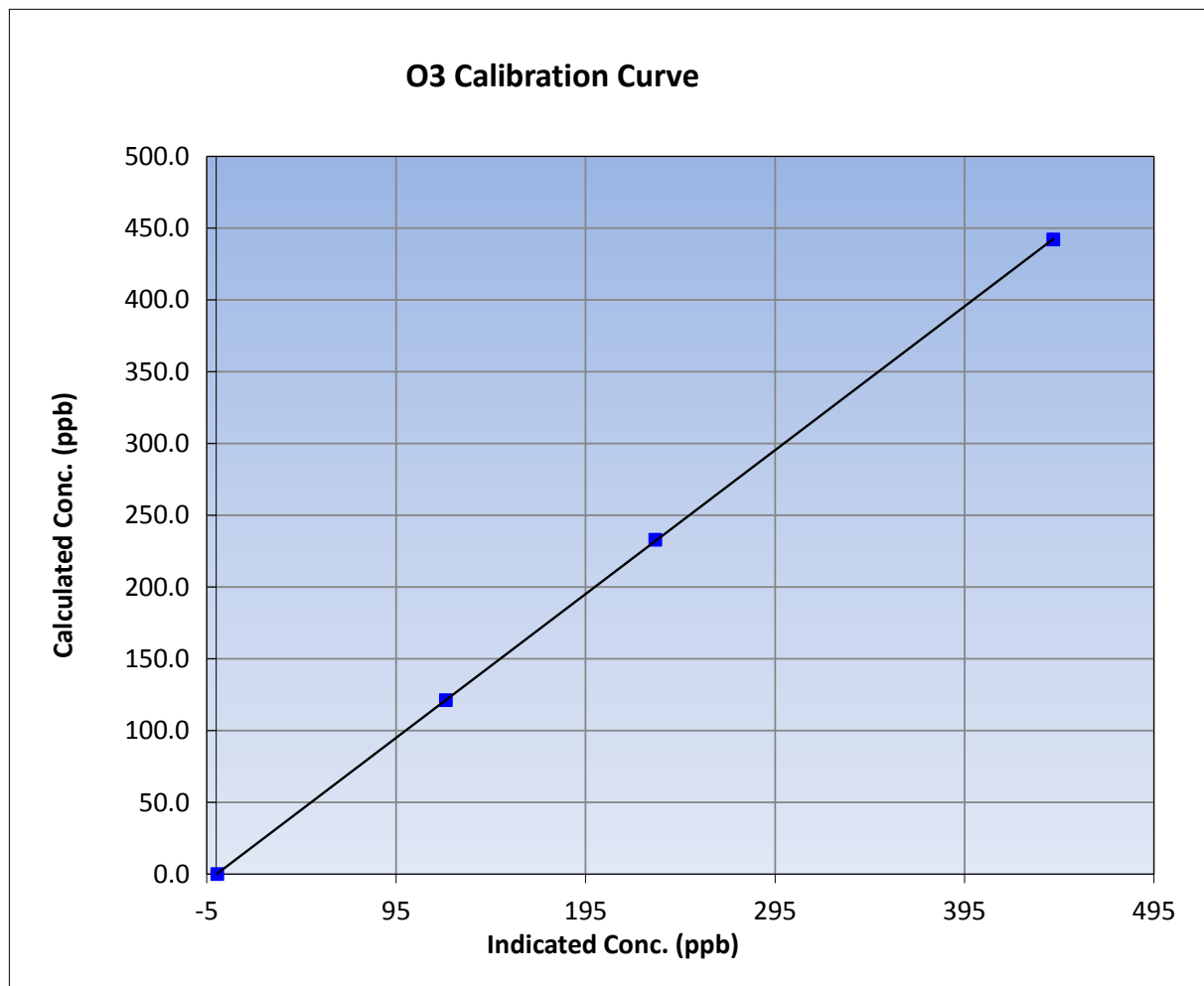
# Wood Buffalo Environmental Association O3 Calibration Report

## Station Information

Calibration Date	December-17-15	Previous Calibration	November 17, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	10:00	End Time (MST)	14:05
Analyzer make	Thermo 49i	Analyzer serial #	1300156233

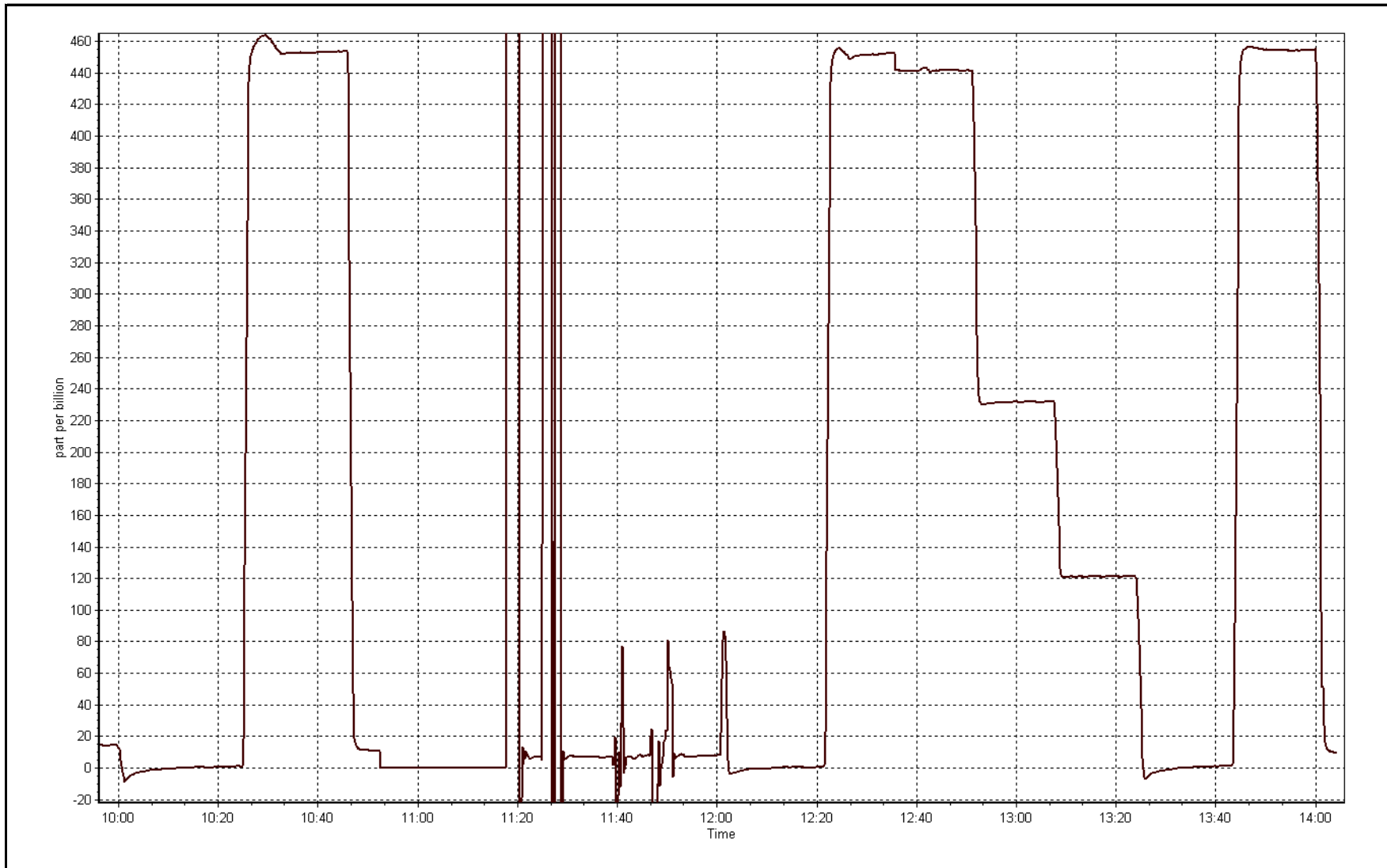
## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.6	----	Correlation Coefficient	0.999989
442.0	441.9	1.0003		
232.9	231.8	1.0047	Slope	1.001740
121.2	121.3	0.9995		
			Intercept	-0.193501



O3 Calibration Plot

Date: December 17, 2015





## Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

### Station Information

Calibration Date	December 16, 2015	Previous Calibration	November 16, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	9:20	End Time (MST)	14:05
NO Cal Gas Conc	50.7 ppm	Gas Cert Reference	LL107945
NOX Cal Gas Conc	50.7 ppm	Cal Gas Expiry Date	09/08/2018
Calibrator	Sabio 4010	Serial Number	1730512
Zero air Generator	Teledyne API T701	Serial Number	587

### DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	2582
-------------------	----------------------------	-----------------	------

### Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	1.000518	1.000445	1.000777
	Data Offset	2.097907	2.180531	-0.175531
Current Calibration	Data Slope	1.000024	0.999379	1.002860
	Data Offset	1.780278	2.049139	0.729530

### Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153357
---------------------	------------	-------------------	------------

Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	0.763		0.587	
NOX coefficient	0.998		0.999	
NO2 coefficient	1.000		1.000	
NO bkgrnd	5.7		4.7	
NOX bkgrnd	5.8		4.8	
Chamber Temp	50.6	Deg C	50.5	Deg C
Moly Temp	327.6	Deg C	324.7	Deg C
PMT voltage	-849.5	V	-849.5	V
PMT Temp	-3.1	Deg C	-3.1	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	183.6	mmHg	153.6	mmHg
R Cell Press Nox	183.6	mmHg	153.6	mmHg
NO sample flow	0.539	lpm	0.685	lpm
Nox sample Flow	0.539	lpm	0.685	lpm

**Notes:**

Inlet filter changed after as founds. Pump changed after as founds. One scrubber removed between analyzer and pump because there were 2 scrubbers there. Span adjusted.



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

### Station Information

Calibration Date: December 16, 2015 Station Number: AMS 1

### Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	0.4	0.3	0.0	----	----
as found span	5500	81.4	750.4	750.4	0.0	744.7	744.0	0.7	1.0077	1.0086
calibrator zero	5500	0.0	0.0	0.0	0.0	0.5	0.3	0.2	----	----
high point	5500	81.4	750.4	750.4	0.0	750.0	750.3	-0.3	1.0005	1.0001
second point	5500	45.6	420.3	420.3	0.0	417.0	416.9	0.1	1.0080	1.0083
third point	5500	22.8	210.2	210.2	0.0	206.2	206.1	0.2	1.0191	1.0200
as left zero	5500	0.0	0.0	0.0	0.0	0.5	0.3	0.2	----	----
as left span	5500	81.4	750.4	308.2	442.2	744.4	294.5	449.9	1.0080	1.0465
Average Correction Factor									1.0092	1.0094

Corrected As found NO<sub>x</sub>= 744.3 NO= 743.6 Percent Change NO<sub>x</sub>= 0.5% NO= 0.6%  
 Previous Response NO<sub>x</sub>= 747.9 NO= 747.8

### GPT Calibration Data

Dilution Flow 5500 ccm Source Gas Flow 81.40 ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero			0.0			0.2			N/A	
1st NO2 (300)	----	308.2	442.0	748.5	308.2	440.3	0.9879	1.0000	1.0038	99.6%
2nd NO2 (200)	----	517.2	232.9	748.7	517.2	231.6	0.9875	1.0000	1.0058	99.4%
3rd NO2 (100)	----	628.9	121.2	747.8	628.9	118.9	0.9888	1.0000	1.0199	98.0%
4th NO2 (0)	750.1	----	-0.5	749.7	750.1	-0.4	0.9863	1.0000	N/A	----
Average Correction Factor							0.9877	1.0000	1.0098	99.0%

Calibration Performed By: Devin Russell



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

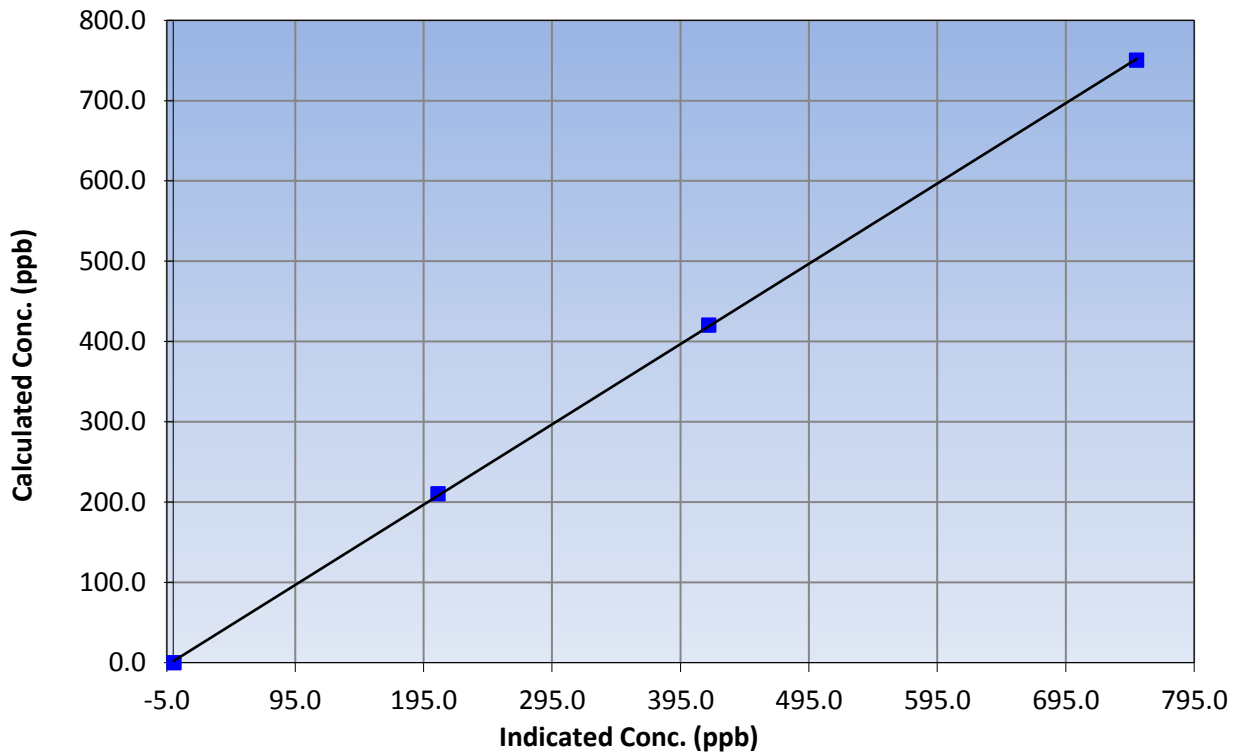
### Station Information

Calibration Date	December 16, 2015	Previous Calibration	November 16, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:20	End Time (MST)	14:05
Analyzer make	Thermo 42i	Analyzer serial #	1218153357

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.5	----	Correlation Coefficient	0.999954
750.4	750.0	1.0005		
420.3	417.0	1.0080	Slope	1.000024
210.2	206.2	1.0191		
			Intercept	1.780278

### NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

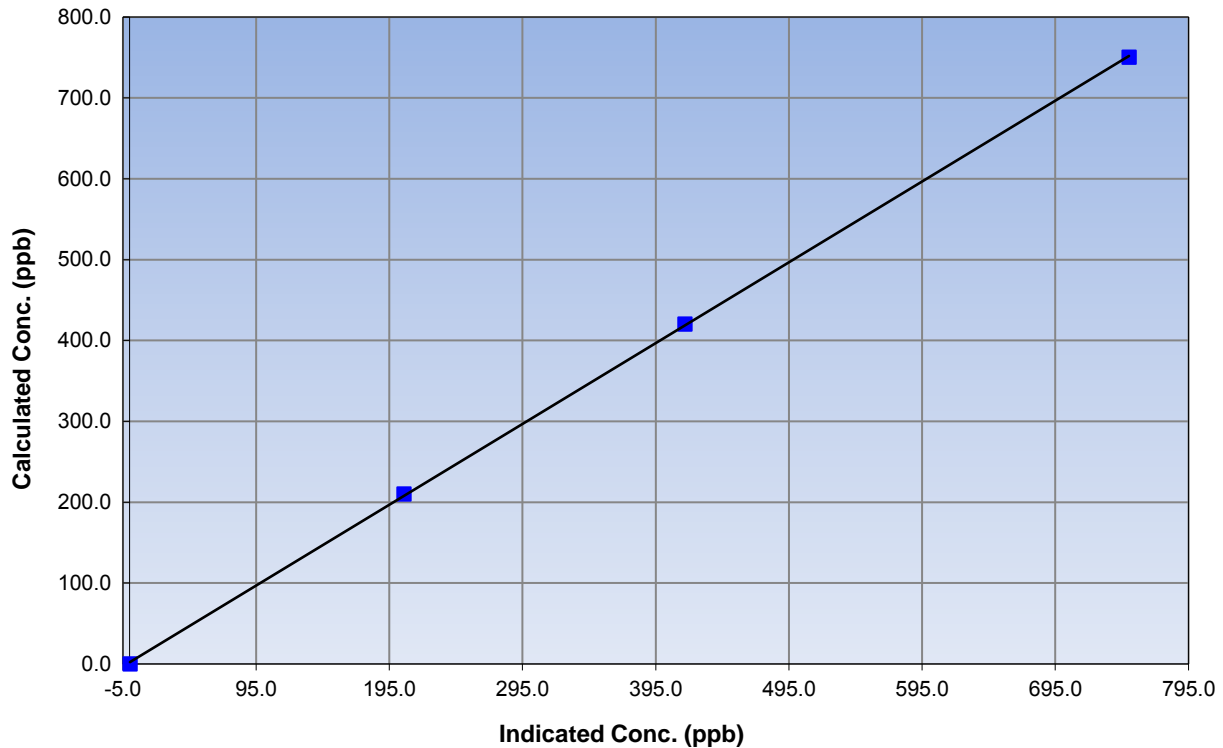
### Station Information

Calibration Date	December 16, 2015	Previous Calibration	November 16, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:20	End Time (MST)	14:05
Analyzer make	Thermo 42i	Analyzer serial #	1218153357

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	N/A	Correlation Coefficient	0.999950
750.4	750.3	1.0001		
420.3	416.9	1.0083	Slope	0.999379
210.2	206.1	1.0200		
			Intercept	2.049139

### NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

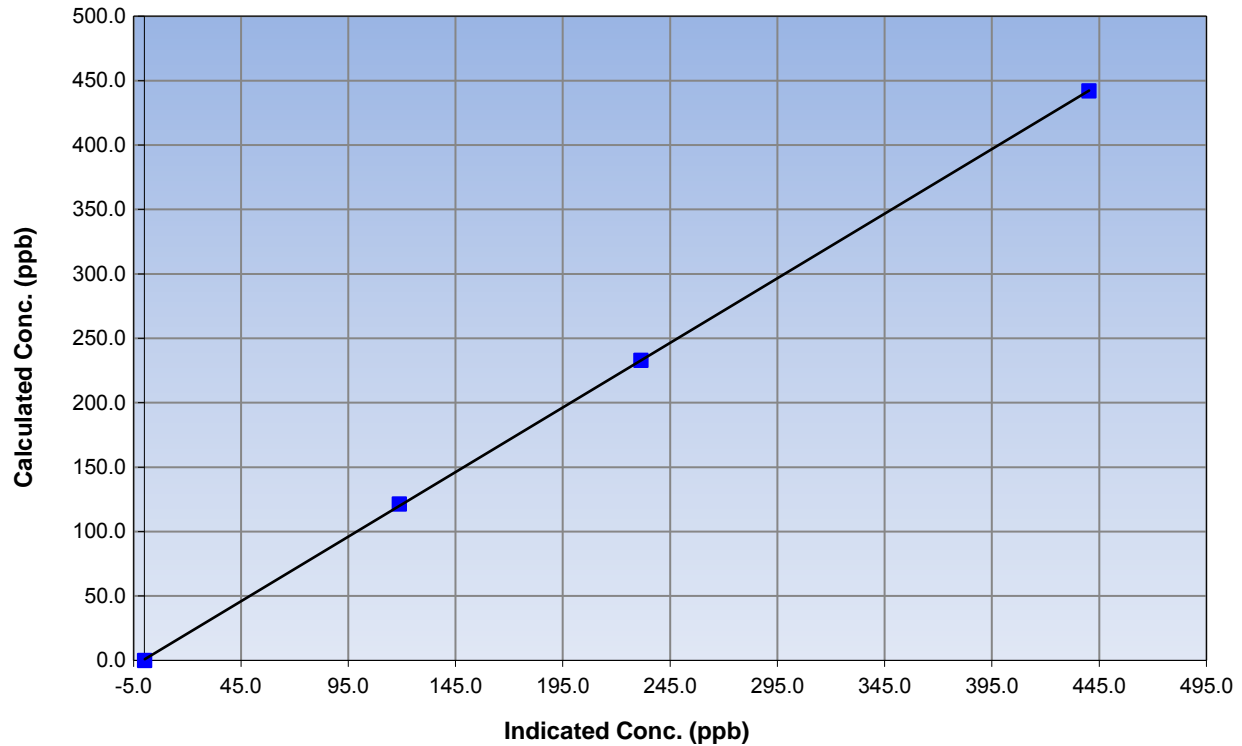
### Station Information

Calibration Date	December 16, 2015	Previous Calibration	November 16, 2015
Station Number	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:20	End Time (MST)	14:05
Analyzer make	Thermo 42i	Analyzer serial #	1218153357

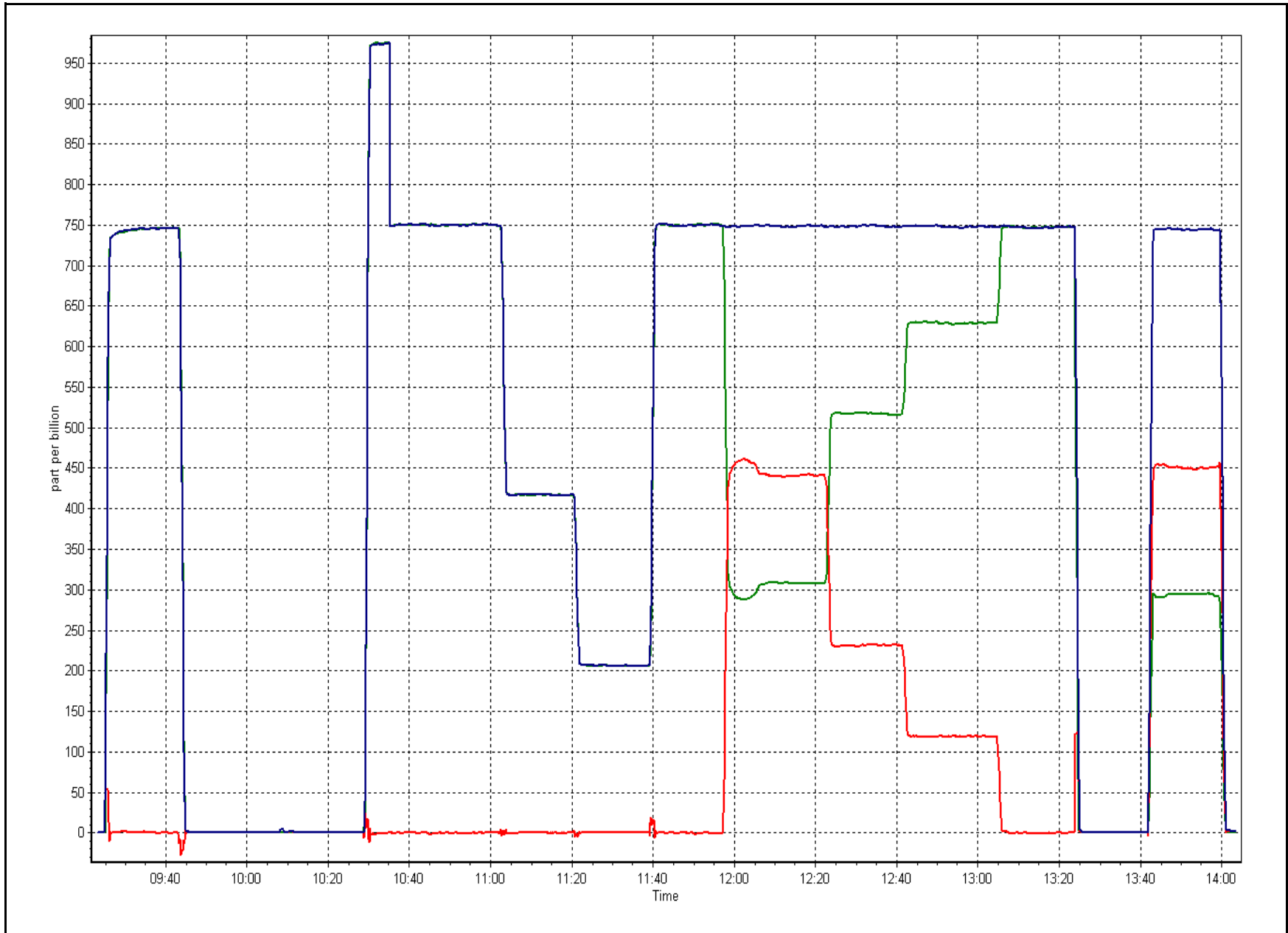
### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	N/A	Correlation Coefficient	0.999975
442.0	440.3	1.0038		
232.9	231.6	1.0058	Slope	1.002860
121.2	118.9	1.0199		
			Intercept	0.729530

### NO<sub>2</sub> Calibration Curve









# Wood Buffalo Environmental Association

## N<sub>t</sub>-NO<sub>x</sub>-NH<sub>3</sub> Calibration Report

### Station Information

Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
NOX Calibration Date	December 16, 2015	NOX Previous Cal Date	November 16, 2015
NH3 Calibration Date	December 16, 2015	NH3 Previous Cal Date	November 17, 2015
Reason:	Routine		
Start Time (MST)	9:20	End Time (MST)	16:30
Calibrator	Sabio 4010	Station Temperature	21.0 Deg C
NH3 Cal Gas Conc	192 ppm	Serial Number	14300410
NOx Cal Gas Conc	50.9 ppm	NH3 Expiry Date / SN	3/Mar/2012 LL156612
NO Cal Gas Conc	50.7 ppm	NO Expiry Date / SN	14/Jan/2016 3222140

### DACs Information

DACS make & model Campbell Scientific CR3000      DACS serial No. 2582

Parameter		NH3	Nt	NOx	NO	NO2
Cal Stats As Found	Data Slope	1.003270	0.991251	1.006746	0.998143	1.012732
	Data Offset	-0.698909	-2.113604	0.727747	1.032948	2.301444
Cal Stats After	Data Slope	1.000149	0.987806	1.005290	1.002862	1.005711
	Data Offset	3.015158	0.673222	0.152261	0.752901	-4.205814
IP address		192.168.1.17				

### Analyzer Information

Analyzer make/model	API T201	Analyzer serial #	152	
Converter	API 501 NH3	Converter serial #	147	
Test Point	before		after	
NH3 Conc range	0-2500	ppb	2500	ppb
NOX Conc range	0-1000	ppb	1000	ppb
NO BKG	-0.3	ppb	-0.3	ppb
NOx BKG	-0.1	ppb	-0.1	ppb
Nt BKG	0.1		0.1	
NO coefficient	1.212		1.166	
NO2 coefficient	1.000	ppb	1.000	ppb
NOx coefficient	1.322		1.296	
NH3 coefficient	0.951		0.951	
Nt coefficient	1.350		1.307	
NH3 conv temp	825	DegC	825	Deg C
Chamber Temp	50.0	Deg C	50.0	Deg C
Moly Temp	316.1	Deg C	316.3	Deg C
PMT Temp	7.0	Deg C	7.0	Deg C
O3 flow	84.0	ccm	85.0	ccm
R Cell Press	5.0	mmHg	5.3	mmHg
PMT Voltage	645.0	v	645.0	v
Sample Flow 1 NO	519.0	ccm	519.0	ccm
Sample Flow 2 Nox	519.0	ccm	519.0	ccm
Sample Flow 3 Nt	525.0	ccm	519.0	ccm

Notes:

Inlet filter changed after as founds. NO/NOx Span adjusted.



# Wood Buffalo Environmental Association

## Nt-NO<sub>x</sub>-NH<sub>3</sub> Calibration Report

### Station Information

Calibration Date:

December 16, 2015

Station Number:

AMS 1

### NH<sub>3</sub> Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated Nt conc (ppb)	Calculated NOx conc (ppb)	Calculated NH <sub>3</sub> conc (ppb)	Indicated Nt conc (ppb)	Indicated NOx conc (ppb)	Indicated NH <sub>3</sub> conc (ppb)	Nt Correction factor	NH <sub>3</sub> Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	1.3	1.3	0.0	----	----
as found NO	5500	81.3	752.4	752.4	----	783.9	770.5	13.3	0.960	----
calibrator zero	5500	0.0	0.0	0.0	0.0	1.6	1.7	-0.1	----	----
high NO point	5500	81.3	752.4	752.4	----	748.7	750.1	-1.4	1.005	----
NO/O <sub>3</sub> point	5500	81.3	752.4	752.4	----	751.5	752.6	-1.2	1.001	----
as found NH <sub>3</sub>	6500	67.7	1999.8	NA	1999.8	2024.5	26.5	1998.1	0.988	1.001
first NH <sub>3</sub>	6500	67.7	1999.8	NA	1999.8	2024.5	26.5	1998.1	0.988	1.001
second NH <sub>3</sub>	6500	33.9	1001.4	NA	1001.4	1013.1	16.8	996.3	0.988	1.005
third NH <sub>3</sub>	6500	17.0	502.2	NA	502.2	504.6	8.2	496.4	0.995	1.012
Average Correction Factor									1.0031	1.0058

NH<sub>3</sub> Corrected As Found  
 Nt Corrected As Found  
 NO<sub>x</sub> Corrected As Found

NH<sub>3</sub> = 1998.0 ppb  
 Nt = 782.6 ppb  
 NO<sub>x</sub> = 769.2 ppb

Previous Response  
 Previous Response  
 Previous Response

NH<sub>3</sub> = 1993.9 ppb  
 Nt = 761.1 ppb  
 NO<sub>x</sub> = 746.6 ppb

NH<sub>3</sub> percent change -0.2%  
 Nt percent change -2.7%  
 NO<sub>x</sub> percent change -2.9%

Converter efficiency 95.1%



# Wood Buffalo Environmental Association

## NO<sub>x</sub>(NH<sub>3</sub>) Calibration Report

### Station Information

Calibration Date:

December 16, 2015

Station Number:

AMS 1

### NO<sub>x</sub> / NO / Nt Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NO <sub>x</sub> conc (ppb)	Calculated NO conc (ppb)	Calculated Nt conc (ppb)	Indicated NO <sub>x</sub> conc (ppb)	Indicated NO conc (ppb)	Indicated Nt conc (ppb)	NO <sub>x</sub> Correction factor	NO Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	1.3	1.4	1.3	----	----
as found span	5500	81.4	753.3	750.4	753.3	770.5	770.5	783.9	0.9778	0.9739
calibrator zero	5500	0.0	0.0	0.0	0.0	1.7	2.0	1.6	----	----
high point	5500	81.4	753.3	750.4	753.3	750.1	749.4	748.7	1.0043	1.0013
second point	5500	45.6	422.0	420.3	422.0	419.1	416.2	418.7	1.0069	1.0100
third point	5500	22.8	211.0	210.2	211.0	207.5	206.5	206.1	1.0168	1.0180
as left zero	5500	0.0	0.0	0.0	0.0	2.4	2.0	2.3	----	----
as left span	5500	81.4	753.3	304.7	753.3	748.6	293.5	749.0	1.0063	1.0378
Average Correction Factor									1.0093	1.0098

	<u>Nt</u>	<u>NOX</u>	<u>NO</u>	<u>NO2</u>
Corrected As found	782.6	769.2	769.1	439.8
Previous Response	762.1	747.5	750.7	434.8
Percent Change	-2.6%	-2.8%	-2.4%	-1.1%

### GPT Calibration Data

Total Flow 5500 ccm Source Gas Flow 81.40 ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO <sub>2</sub> conc (ppb)	Indicated NO <sub>x</sub> conc (ppb)	Indicated NO conc (ppb)	Indicated NO <sub>2</sub> conc (ppb)	NO <sub>x</sub> Correction factor	NO Correction factor	NO <sub>2</sub> Correction factor	Converter Efficiency
Cal zero			0.0			5.4			----	
1st NO <sub>2</sub> (300)	----	304.7	442.7	749.8	304.7	445.2	1.0047	1.0000	0.9944	100.6%
2nd NO <sub>2</sub> (200)	----	515.5	231.9	749.1	515.5	233.6	1.0056	1.0000	0.9924	100.8%
3rd NO <sub>2</sub> (100)	----	626.3	121.1	749.9	626.3	123.7	1.0046	1.0000	0.9791	102.1%
4th NO <sub>2</sub> (0)	747.3	----	5.3	752.6	747.3	5.4	1.0009	1.0000	----	----
Average Correction Factor							1.0039	1.0000	0.9886	101.2%

Calibration Performed By: Devin Russell



# Wood Buffalo Environmental Association

## NH3 Calibration Summary

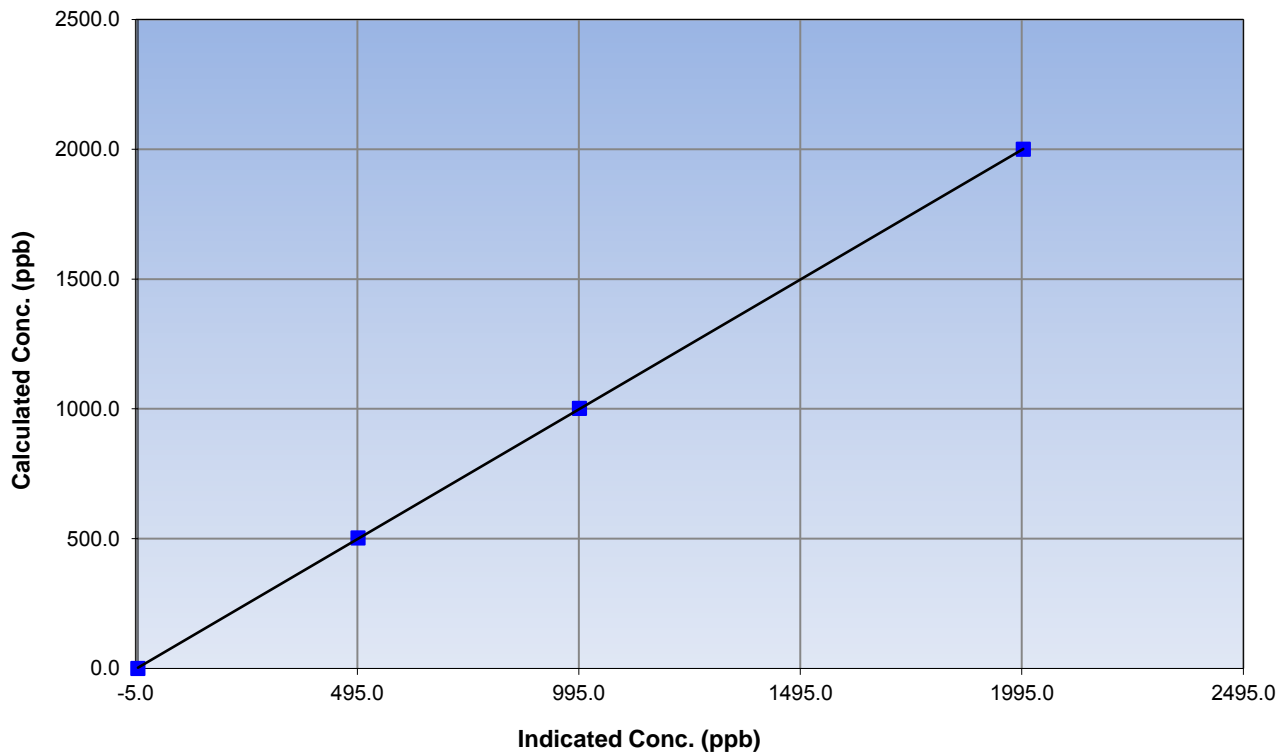
### Station Information

Calibration Date	December 16, 2015	Previous Calibration	November 16, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:20	End Time (MST)	16:30
Analyzer make	API T201	Analyzer serial #	152

### NH3 Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999990
1999.8	1998.1	1.0008		
1001.4	996.3	1.0051	Slope	1.000149
502.2	496.4	1.0116		
			Intercept	3.015158

### NH3 Calibration Curve





# Wood Buffalo Environmental Association

## Nt Calibration Summary

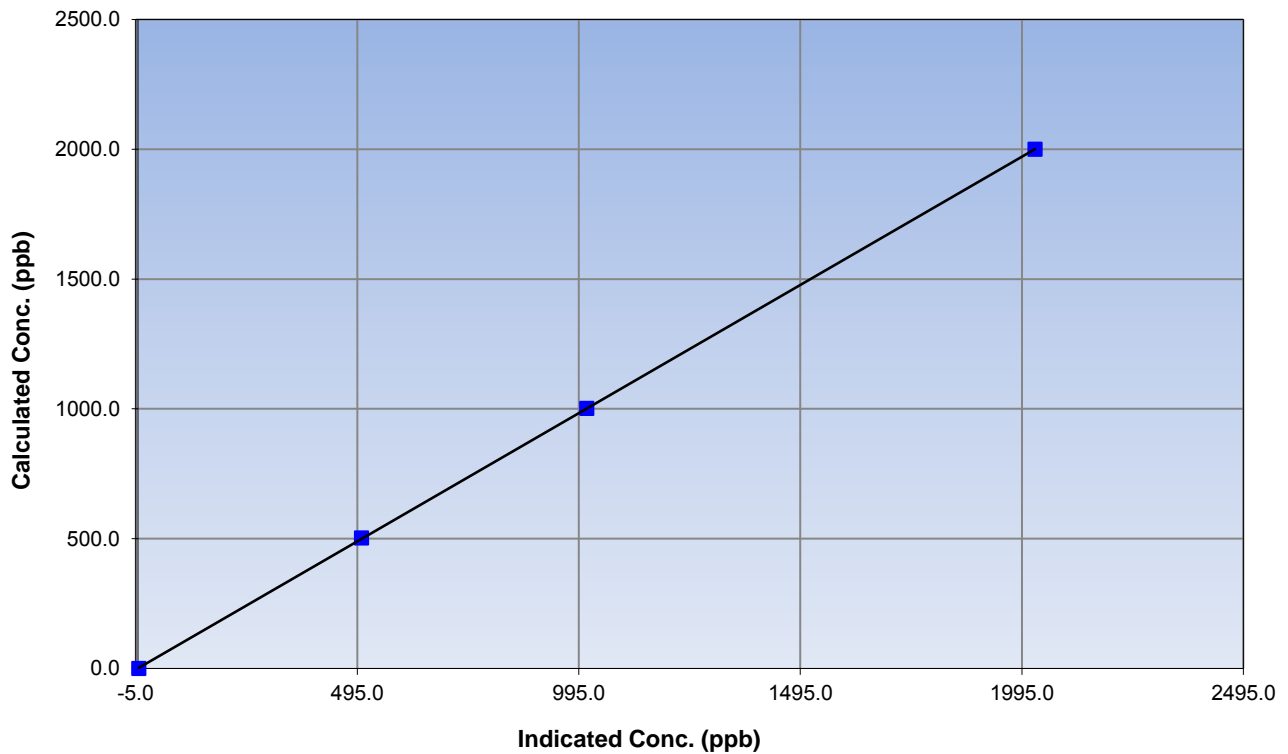
### Station Information

Calibration Date	December 16, 2015	Previous Calibration	November 16, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:20	End Time (MST)	16:30
Analyzer make	API T201	Analyzer serial #	152

### Nt (NH<sub>3</sub>) Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	1.6	----	Correlation Coefficient	0.999993
1999.8	2024.5	0.9878		
1001.4	1013.1	0.9884	Slope	0.987806
502.2	504.6	0.9952		
			Intercept	0.673222

### Nt Calibration Curve





# Wood Buffalo Environmental Association

## NOx Calibration Summary

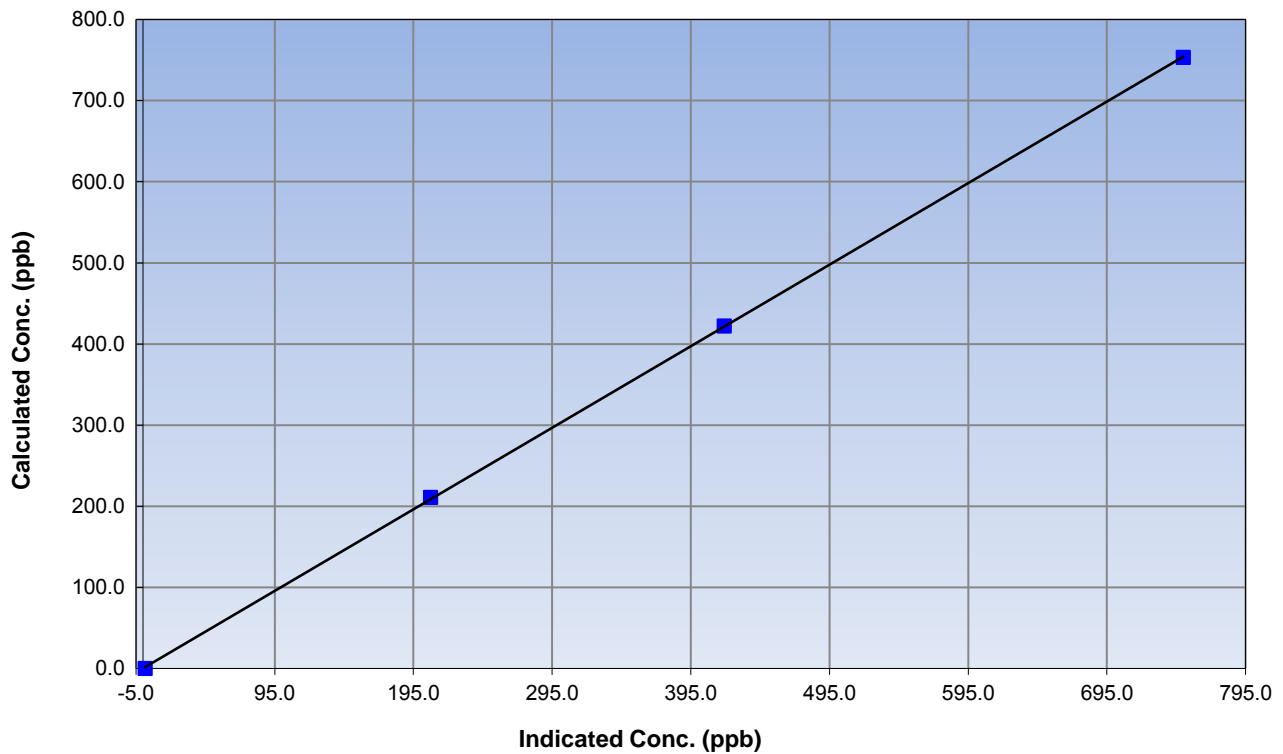
### Station Information

Calibration Date	December 16, 2015	Previous Calibration	November 16, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:20	End Time (MST)	16:30
Analyzer make	API T201	Analyzer serial #	152

### NO<sub>x</sub> Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	1.7	----	Correlation Coefficient	0.999969
753.3	750.1	1.0043		
422.0	419.1	1.0069	Slope	1.005290
211.0	207.5	1.0168		
			Intercept	0.152261

### NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

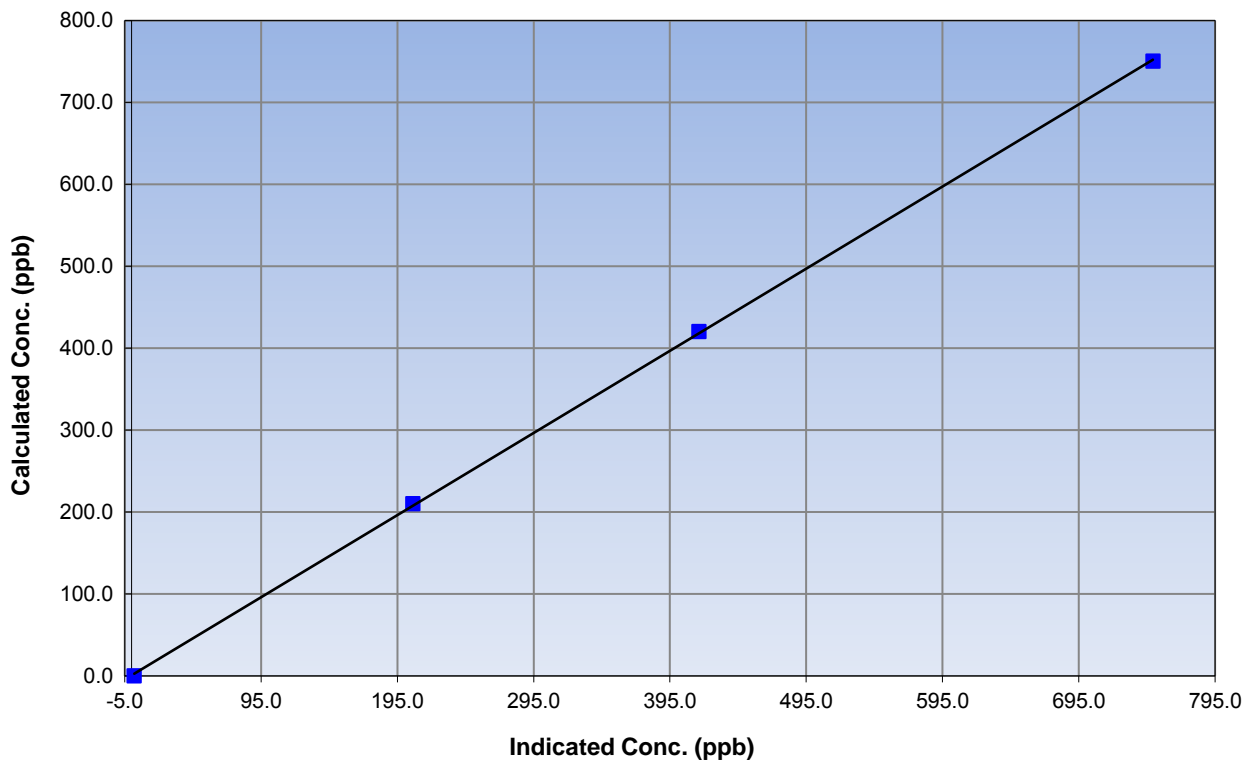
### Station Information

Calibration Date	December 16, 2015	Previous Calibration	November 16, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:20	End Time (MST)	16:30
Analyzer make	API T201	Analyzer serial #	152

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	2.0	----	Correlation Coefficient	0.999930
750.4	749.4	1.0013		
420.3	416.2	1.0100	Slope	1.002862
210.2	206.5	1.0180		
			Intercept	0.752901

### NO Calibration Curve







# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

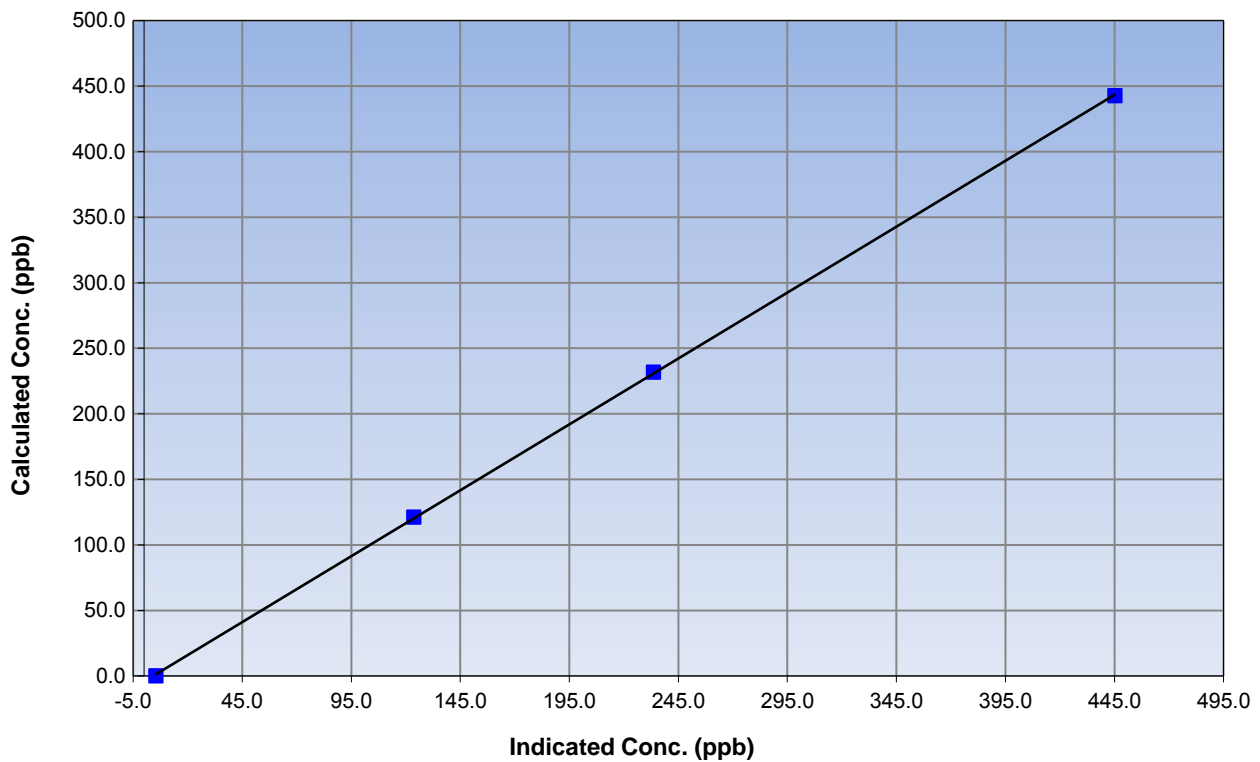
### Station Information

Calibration Date	December 16, 2015	Previous Calibration	November 16, 2015
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:20	End Time (MST)	16:30
Analyzer make	API T201	Analyzer serial #	152

### Calibration Information

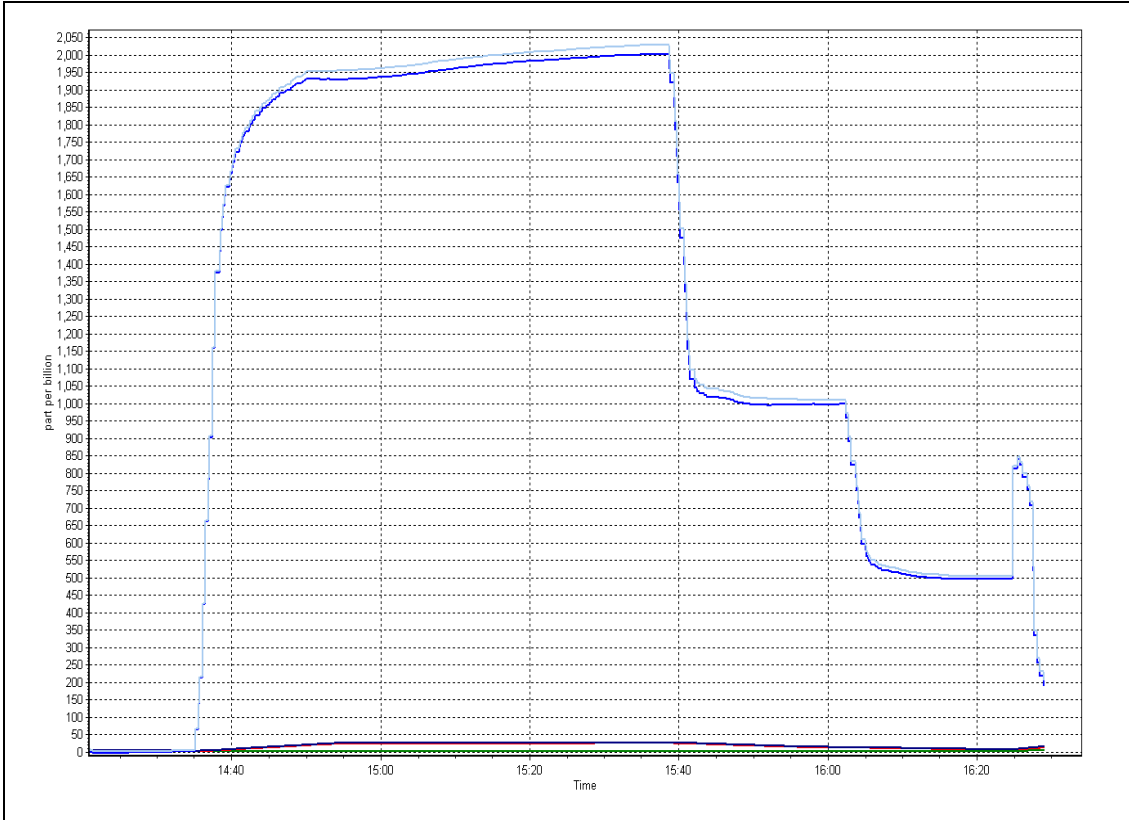
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	5.4	----	Correlation Coefficient	0.999961
442.7	445.2	0.9944		
231.9	233.6	0.9924	Slope	1.005711
121.1	123.7	0.9791		
			Intercept	-4.205814

### NO<sub>2</sub> Calibration Curve



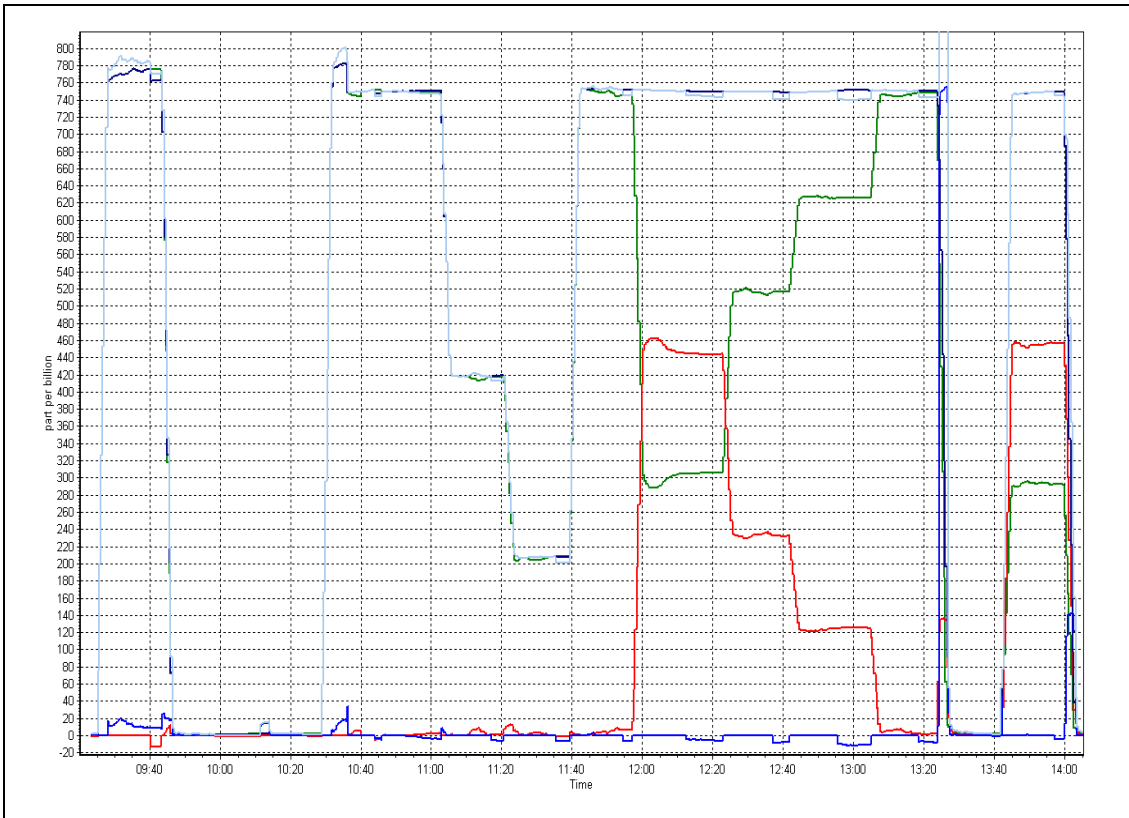
NH<sub>3</sub> Calibration Plot

Date: December 16, 2015



NO<sub>x</sub> Calibration Plot

Date: December 16, 2015





# Wood Buffalo Environmental Association

## SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	December 14, 2015	Previous Calibration:	November 16, 2015
Station Name:	Bertha Ganter - Fort McKay	Station Number:	AMS 1
Start Time (MST):	13:25	End Time (MST):	14:20
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	141228

SHARP INFORMATION			
Particulate Fraction:	PM2.5		
Make/Model:	Thermo / SHARP 5030		
Serial Number:			
C <sub>14</sub> Source SN:			
Confirmation of Time settings:	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Parameters Checked:	T1 <input checked="" type="checkbox"/>	T2 <input type="checkbox"/>	T3 <input type="checkbox"/> T4 <input type="checkbox"/> P3 <input checked="" type="checkbox"/> Main Flow <input checked="" type="checkbox"/> Beta <input type="checkbox"/> Neph <input checked="" type="checkbox"/>

### CALIBRATION DATA

Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	-5.0	-4.0	1.0	-5.0
T2	21.0	na	na	
T3	23.0	na	na	
T4	18.0	na	na	
RH (%)	13.0	na	na	

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	981	978.2	-2.8	981

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1006	6	1006	1000

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	221		221
Neph	0.1		0.1
C14	3.3		3.3
Indicated Concentration (ug/m3)	0	no	0
Offset 1	220.2		220.2
Offset 2	34.5		34.5

Leak Check (Quarterly)			
Leak Check Date:		Previous Leak Check Date:	April 20, 2015

Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):		0.00
*Flow with adaptor (LPM):		
<i>*Note - do not attach adaptor without shutting off the pump first</i>		

Mass Foil Calibration (Annually)	
Foil Calibration Date:	Previous Foil Calibration:
Zeroed?:	
Foil Mass:	Mass foil set S/N:
Previous Correction Factor:	
New Correction Factor:	

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	14/12/2015
Pump	Good	
Filter Tape	Good	
Mass Foil Cal Set	na	
HEPA filter	Good	

### NOTES:

Status code showing 4000.FC+Z performed after calibration. Status code went back to 0000. Cyclone head cleaned. No adjustments made.

Calibration Performed By: Devin Russell



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## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

**CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT**

**AMS 2  
MILDRED LAKE  
DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MILDRED LAKE (AMS 2)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	709	35	35	100.00	120	0	13	0
H2S (ppb) Average	709	35	35	100.00	8	0	2	0
THC (ppm) Average	709	35	35	100.00	5.2	-	3.3	-
Temperature (C) Average	744	0	0	100.00	5.9	-	-1.2	-
Relative Humidity (%) Average	744	0	0	100.00	98	-	96	-
Wind Speed 10 m (km/h) Average	743	0	1	99.87	21	-	15	-
Wind Direction 10 m (deg) Average	743	0	1	99.87	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MILDRED LAKE (AMS 2)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	709	2.2	7	-	0	0	0	0	2	7	120
H2S (ppb) Average	709	0.4	1	-	0	0	0	0	0	1	8
THC (ppm) Average	709	2.48	0.3	-	2.1	2.2	2.3	2.4	2.6	2.9	5.2
Temperature 2 m (C) Average	744	-10.59	6.3	-	-25.1	-19	-15.5	-10.5	-5.3	-3.6	5.9
Relative Humidity (%) Average	744	83.3	7	-	57	75	80	83	88	94	98
Wind Speed 10 m (km/h) Average	743	7.8	4	-	0	3	5	7	10	13	21
Wind Direction 10 m (deg) Average	743	-	-	-	-	-	-	-	-	-	-



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MILDRED LAKE (AMS 2)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed, Wind Direction	26 Dec 2015 05:00	26 Dec 2015 05:00	1	Flat line in sensor output signal - Sensor frozen

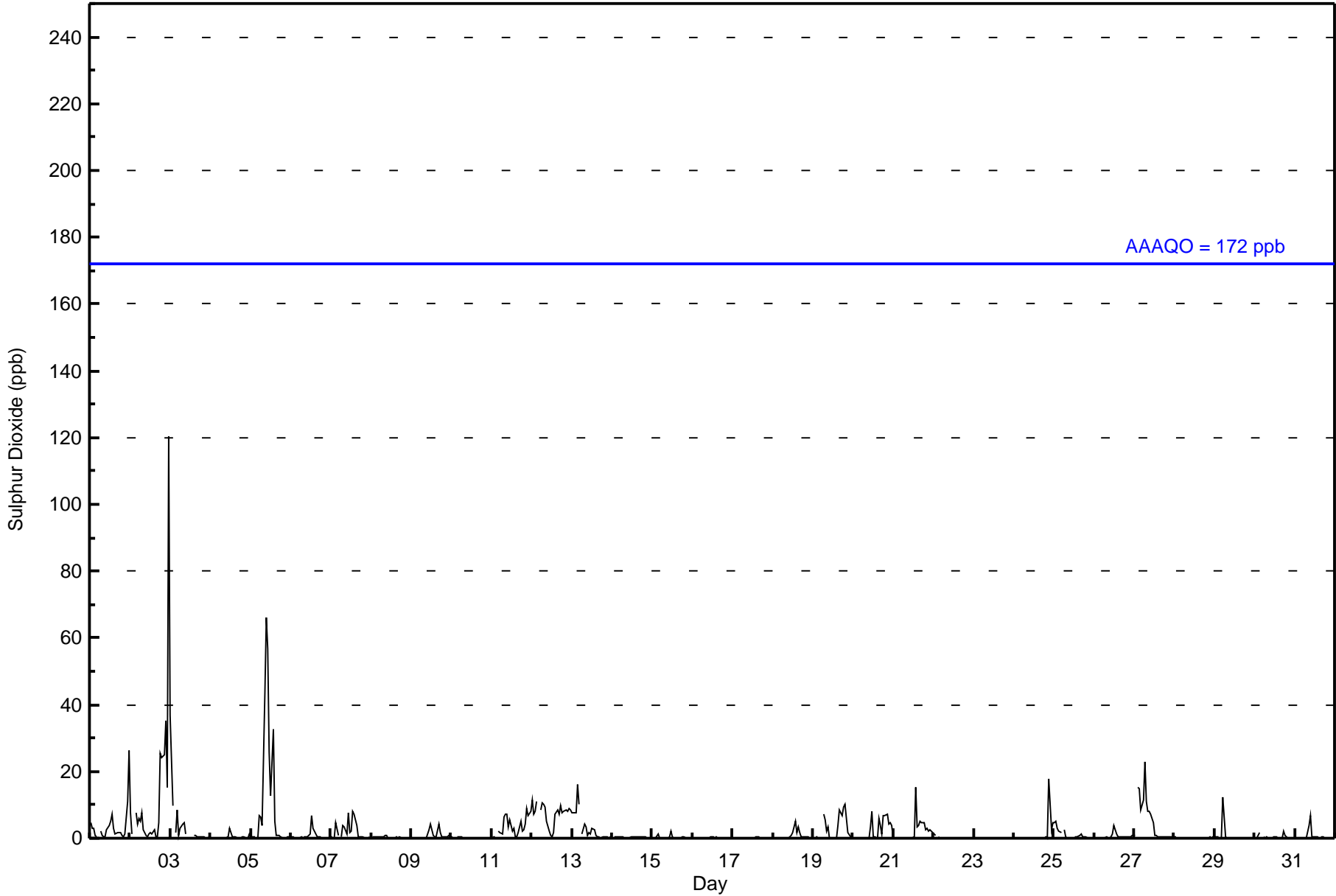


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 120 ppb on Dec 3 00:00	Maximum Daily Average: 13.1 ppb on Dec 2		Hours of Data:	709
Minimum Value: 0 ppb on Dec 4 02:00	Minimum Daily Average: 0.0 ppb on Dec 23		Hours of Missing Data:	35
Maximum Diurnal Average: 5.8 ppb at hour 24	Minimum Diurnal Average: 1.2 ppb at hour 16		Hours of Calibration:	35
Monthly Average: 2.2 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 2 P <sub>90</sub> = 7 P <sub>99</sub> = 31		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	5	3	3	1	0	Z	2	1	0	1	2	4	5	7	3	1	2	2	2	1	0	1	11	26	3.6	26
2-Dec	8	1	Z	8	4	6	5	8	3	1	0	1	2	1	2	0	0	5	25	24	25	35	15	120	13.1	120
3-Dec	37	10	Z	2	8	1	3	4	5	1	C	C	C	C	1	1	1	0	0	0	0	0	0	0	4.0	37
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	1	0	0	0	0	1	0.4	3
5-Dec	0	1	1	Z	0	7	6	4	43	66	57	26	13	33	5	1	1	1	0	0	0	0	1	1	11.5	66
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	7	3	2	1	0	0	0	0	0	0	0	0	0.8	7
7-Dec	0	0	0	5	1	Z	0	4	3	1	8	2	2	8	7	4	0	0	0	0	0	0	0	0	2.1	8
8-Dec	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
9-Dec	0	Z	0	0	0	0	0	0	0	0	2	4	3	1	0	0	4	2	1	0	0	0	1	0	0.9	4
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
11-Dec	0	0	0	Z	2	2	1	6	7	7	3	5	2	3	0	0	2	5	2	3	4	9	7	8	3.5	9
12-Dec	11	7	8	11	Z	9	11	10	9	5	2	1	0	2	7	9	7	10	8	8	9	8	9	8	7.3	11
13-Dec	7	7	8	16	10	Z	1	4	3	1	2	1	3	2	1	0	0	0	0	0	0	0	0	0	3.1	16
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.3	1
15-Dec	0	Z	0	1	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	2	5	2	4	2	1	0	0	0	0	0	0	0.8	5
19-Dec	0	0	1	0	0	Z	7	5	2	3	0	0	0	0	0	4	8	7	9	10	6	2	0	0	2.9	10
20-Dec	Z	0	0	0	0	0	0	0	0	0	3	8	0	0	0	6	4	1	7	7	7	4	5	4	2.5	8
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	15	4	4	5	5	4	3	3	2	3	2	2	2.2	15
22-Dec	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	3	5	1.1	18	
25-Dec	5	5	3	2	2	Z	3	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1.1	5
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	4	1	1	0	0	0	0	0	0	0	0	1	0.5	4
27-Dec	1	Z	15	15	8	11	23	11	8	8	7	5	1	1	1	0	0	0	0	0	0	0	0	0	5.1	23
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
29-Dec	1	0	0	Z	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	12
30-Dec	0	0	1	2	Z	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0.4	2
31-Dec	0	0	0	0	0	Z	0	0	4	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	7

2.9	1.4	1.7	2.4	1.5	2.0	2.1	2.0	2.9	3.4	3.0	2.2	1.6	2.8	1.3	1.2	1.3	1.4	2.0	1.9	1.9	2.6	1.8	5.8	Diurnal Average
37	10	15	16	10	12	23	11	43	66	57	26	13	33	7	9	8	10	25	24	25	35	15	120	Diurnal Maximum

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb      24-hr 48 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Mildred Lake - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	682	96.19	96.19
11 - 20	14	1.97	98.17
21 - 60	11	1.55	99.72
61 - 110	1	0.14	99.86
111 - 172	1	0.14	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Mildred Lake - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	95	87	28	18	17	20	27	97	89	65	34	36	19	27	12	10	681
11 - 20	0	0	0	0	0	1	2	8	1	0	0	0	2	0	0	0	14
21 - 60	0	0	0	0	0	0	1	1	0	0	0	0	6	3	0	0	11
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	95	87	28	18	17	21	30	106	90	65	34	36	29	30	12	10	708

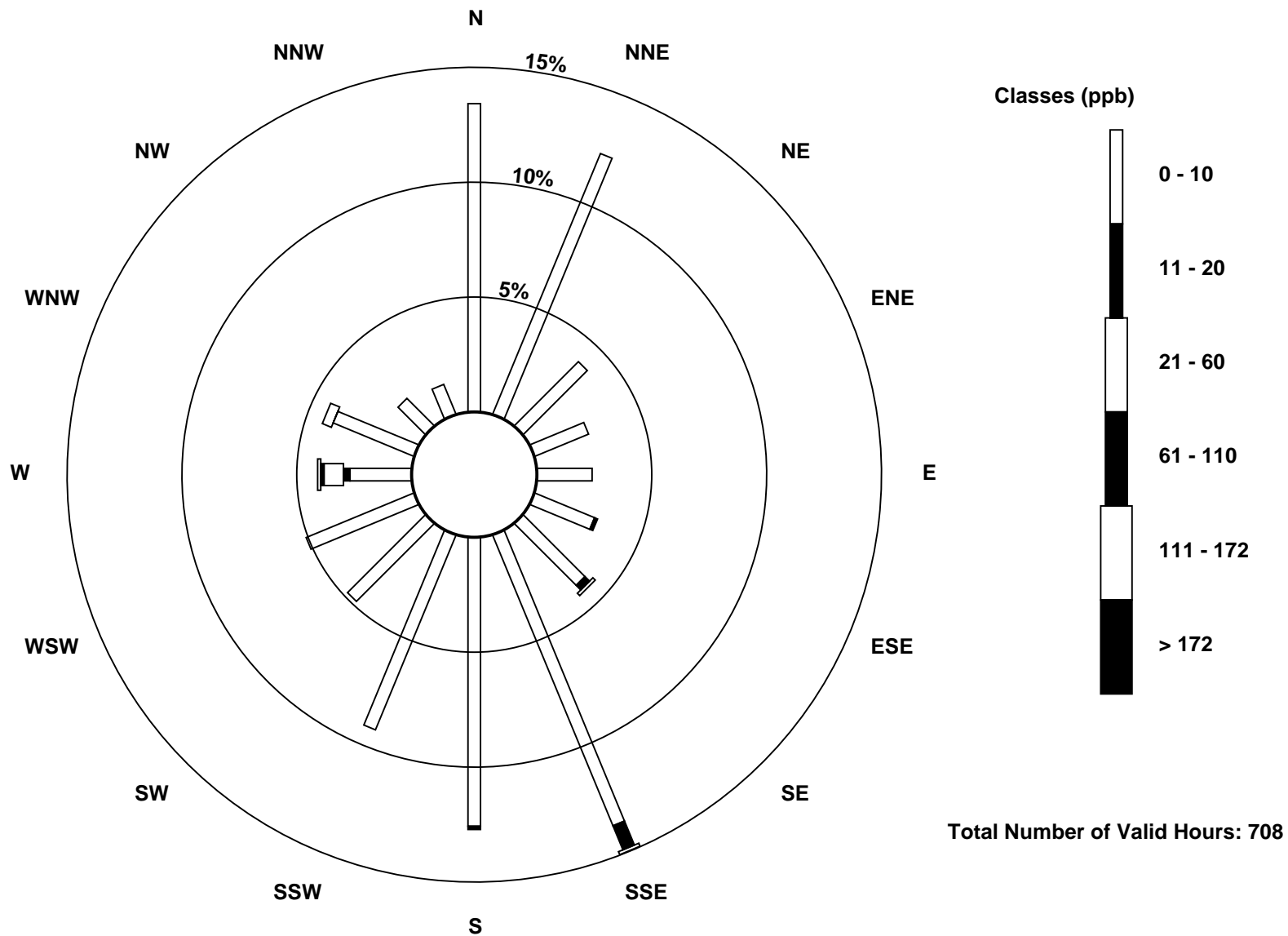
Total Number of Valid Hours: 708

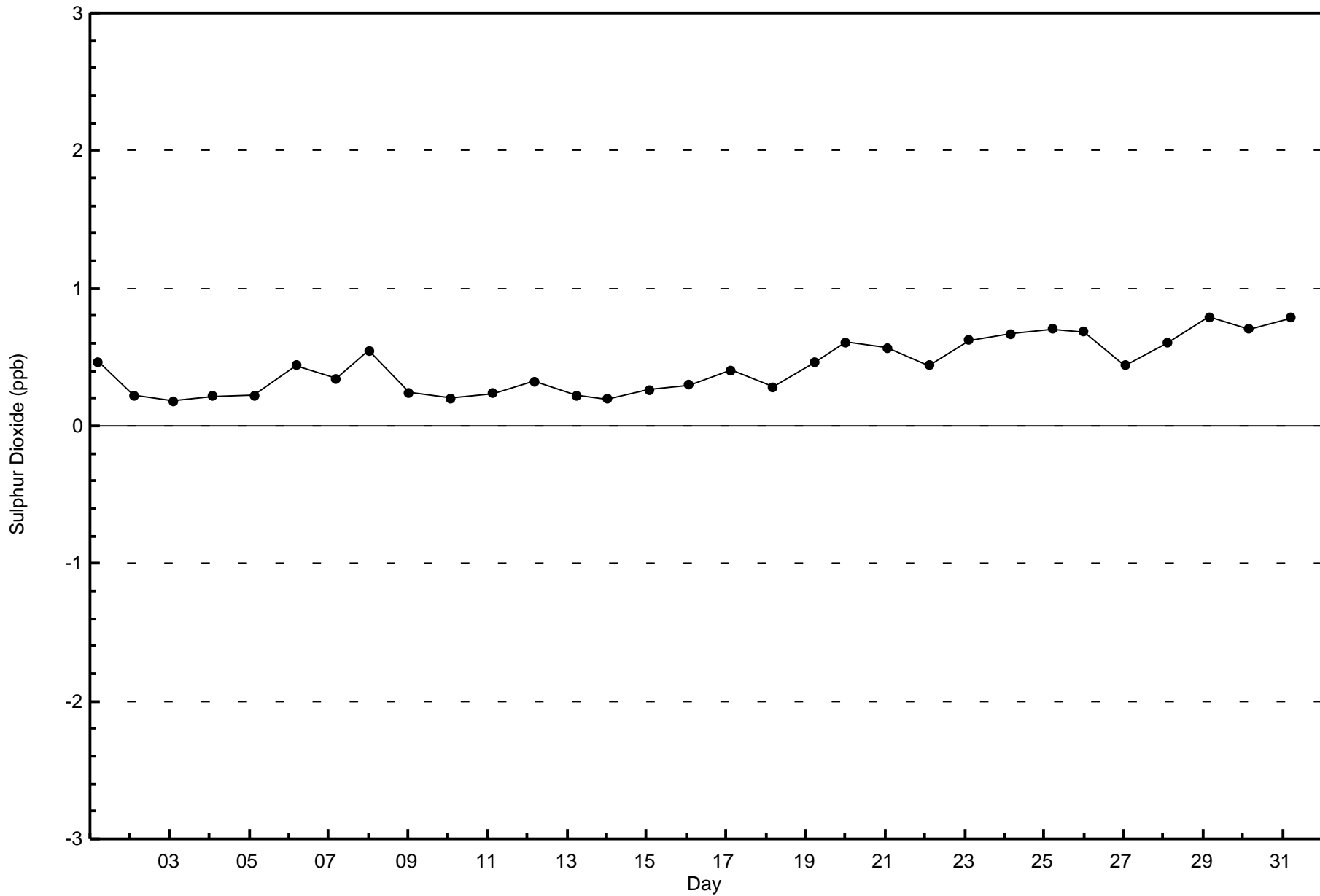
Total Number of Hours: 744

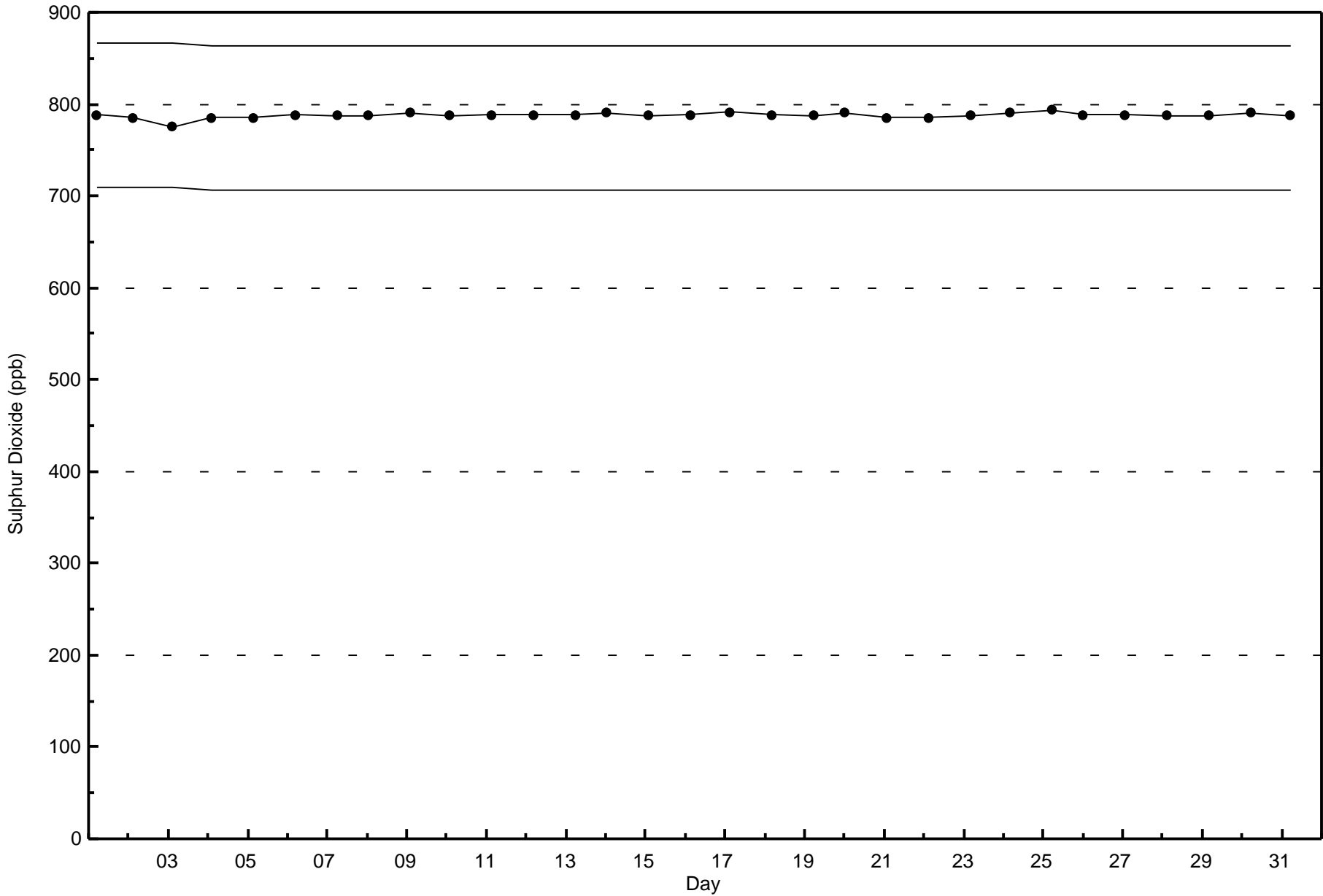


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Mildred Lake (AMS 2)



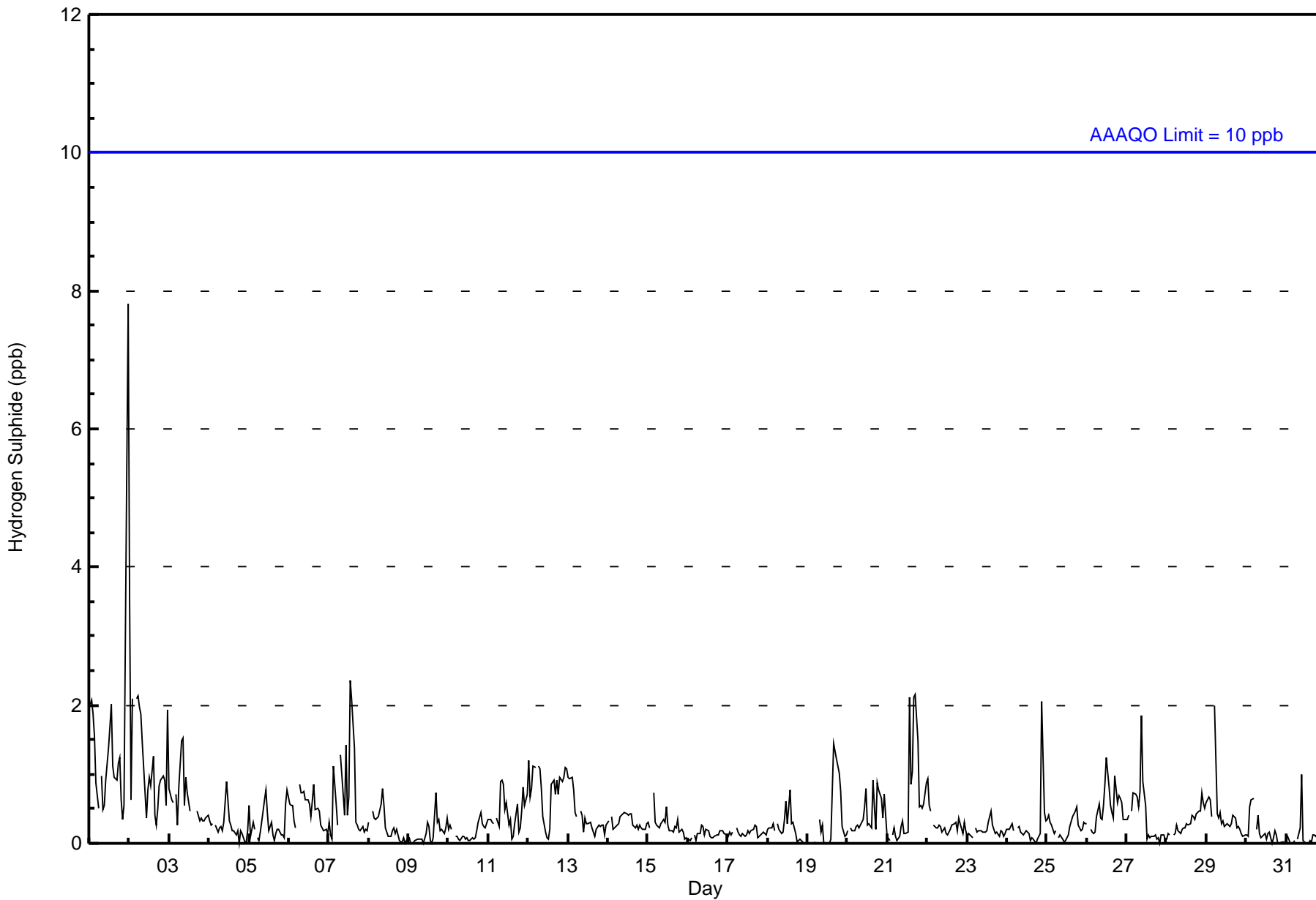








Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744																			
Maximum Value: 8 ppb on Dec 2 00:00														Maximum Daily Average: 1.6 ppb on Dec 1										Hours of Data: 709									
Minimum Value: 0 ppb on Dec 8 23:00														Minimum Daily Average: 0.1 ppb on Dec 31										Hours of Missing Data: 35									
Maximum Diurnal Average: 0.6 ppb at hour 24														Minimum Diurnal Average: 0.3 ppb at hour 21										Hours of Calibration: 35									
Monthly Average: 0.4 ppb														Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 2										Percent Operational Time: 100.0									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24									
1-Dec	2	2	2	2	1	1	Z	1	0	1	1	1	2	2	1	1	1	1	1	1	0	1	5	8	1.6	8							
2-Dec	4	1	2	Z	2	2	2	2	1	1	0	1	1	1	0	0	0	0	1	1	1	1	1	2	1.2	4							
3-Dec	1	1	1	Z	1	0	1	1	2	1	1	1	0	C	C	C	C	0	0	0	0	0	0	0	0.6	2							
4-Dec	0	0	0	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1							
5-Dec	1	0	0	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	1							
6-Dec	1	1	1	0	0	Z	1	1	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0	0	0.5	1							
7-Dec	0	0	0	1	1	0	Z	1	1	0	1	0	1	2	2	1	0	0	0	0	0	0	0	0	0.7	2							
8-Dec	0	Z	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1							
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.2	1							
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0							
11-Dec	0	0	0	0	Z	0	0	1	1	1	0	1	0	0	0	0	0	1	0	0	0	1	1	1	0.4	1							
12-Dec	1	1	1	1	1	Z	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0.8	1							
13-Dec	1	1	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1							
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0							
15-Dec	0	0	Z	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1							
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0							
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0							
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0.2	1							
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0.3	1							
20-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1	1	1	1	0	1	0.4	1							
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	2	1	1	2	2	1	1	1	0	1	1	0.6	2							
22-Dec	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1							
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0							
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0.3	2							
25-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.2	1							
26-Dec	0	Z	0	0	0	0	0	1	0	0	1	1	1	1	0	0	0	1	1	1	1	1	0	0	0.5	1							
27-Dec	0	0	Z	0	1	1	1	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2							
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.3	1							
29-Dec	1	1	1	0	Z	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2							
30-Dec	0	0	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1							
31-Dec	0	0	0	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1							
0.5 0.4 0.5 0.4 0.4 0.4 0.4 0.5 0.4 0.4 0.4 0.4 0.3 0.5 0.4 0.4 0.4 0.4 0.4 0.3 0.3 0.3 0.5 0.6																								Diurnal Average									
4 2 2 2 2 2 2 2 2 2 2 1 1 2 2 2 1 2 2 2 1 1 1 2 5 8																								Diurnal Maximum									
Z - zerospan C - Calibration																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb																																	





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Mildred Lake - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	706	99.58	99.58
3 - 4	1	0.14	99.72
5 - 7	1	0.14	99.86
8 - 11	1	0.14	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



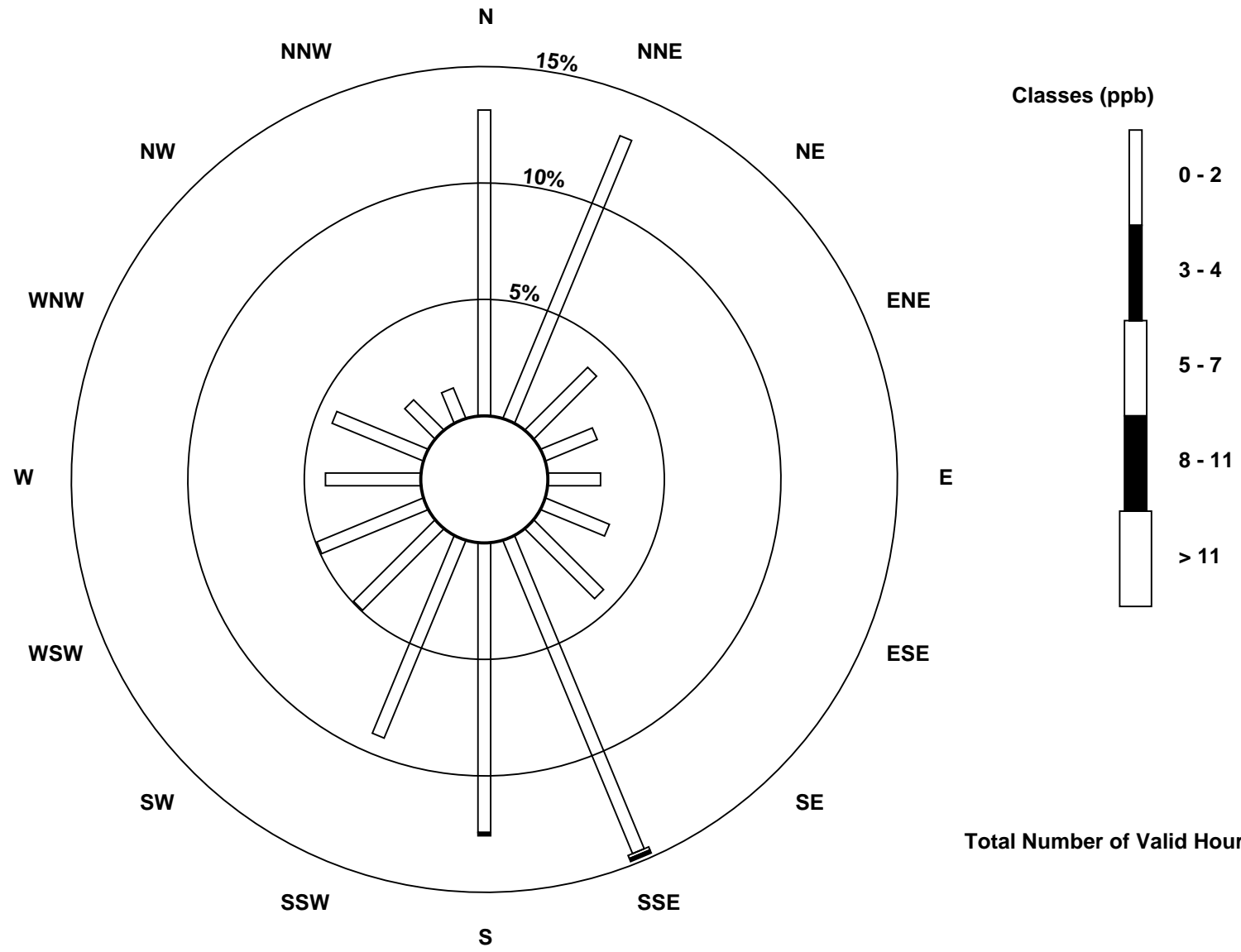
**Wood Buffalo Environmental Association  
Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Mildred Lake - December 2015**

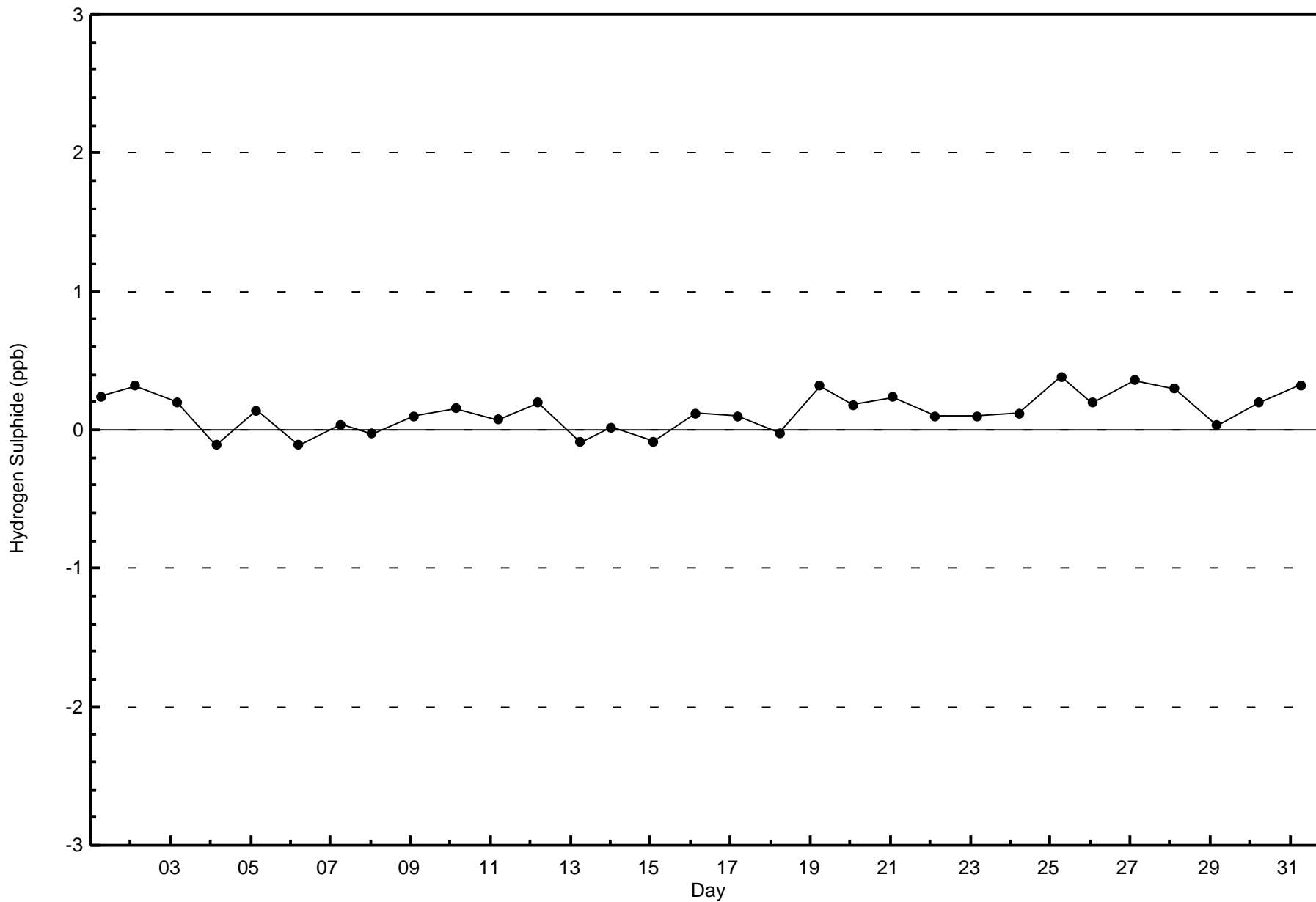
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	93	93	27	17	16	21	30	103	88	65	35	35	29	30	13	10	705
3 - 4	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
5 - 7	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
8 - 11	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	93	93	27	17	16	21	30	105	89	65	35	35	29	30	13	10	708

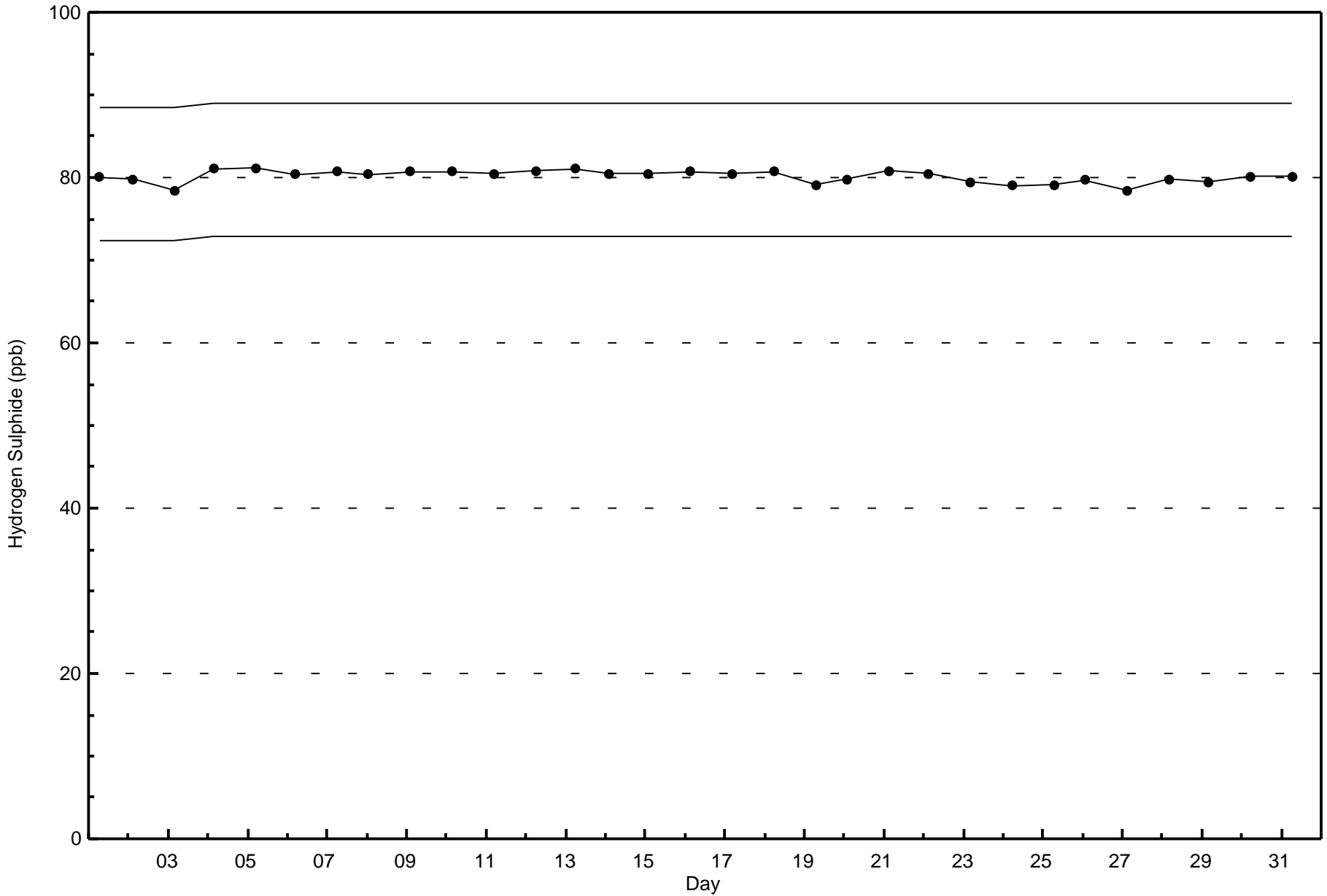
Total Number of Valid Hours: 708

Total Number of Hours: 744



Total Number of Valid Hours: 708

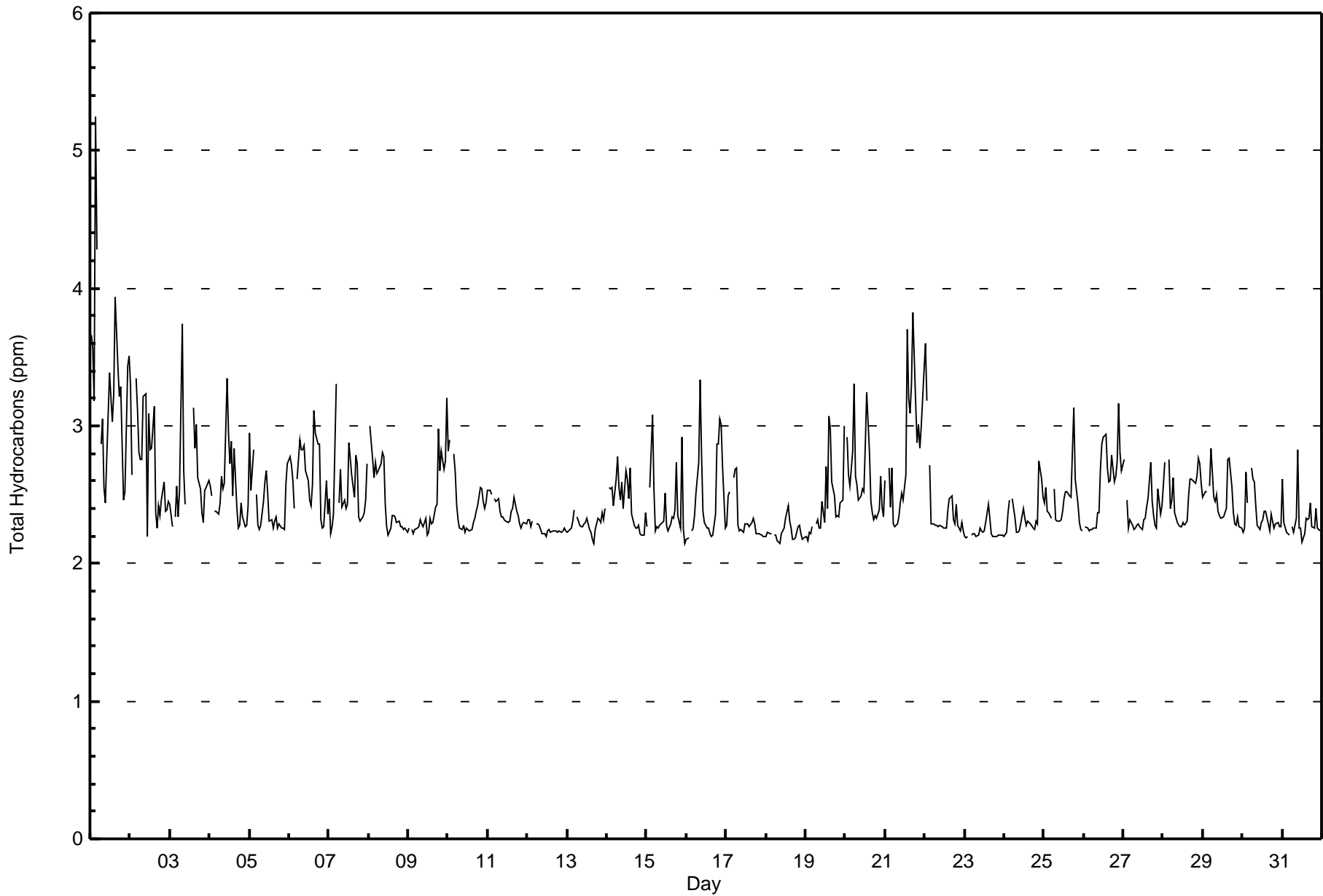






Maximum Value: 5.2 ppm on Dec 1 04:00		Maximum Daily Average: 3.3 ppm on Dec 1		Hours in Service: 744																						
Minimum Value: 2.1 ppm on Dec 16 00:00		Minimum Daily Average: 2.2 ppm on Dec 23		Hours of Data: 709																						
Maximum Diurnal Average: 2.6 ppm at hour 4		Minimum Diurnal Average: 2.4 ppm at hour 21		Hours of Missing Data: 35																						
Monthly Average: 2.48 ppm		Percentiles: P <sub>1</sub> = 2.2 P <sub>10</sub> = 2.2 Q <sub>1</sub> = 2.3 Median = 2.4 Q <sub>3</sub> = 2.6 P <sub>90</sub> = 2.9 P <sub>99</sub> = 3.6		Hours of Calibration: 35																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3.7	3.6	3.2	5.2	4.3	Z	2.9	3.1	2.5	2.4	2.8	3.4	3.2	3.0	3.2	3.9	3.4	3.2	3.3	2.9	2.5	2.5	3.4	3.5	3.3	5.2
2-Dec	3.3	2.6	Z	3.3	3.1	2.8	2.8	2.8	3.2	3.2	2.2	3.1	2.8	2.8	3.1	2.4	2.3	2.4	2.3	2.5	2.6	2.4	2.4	2.5	2.7	3.3
3-Dec	2.4	2.3	Z	2.3	2.6	2.3	2.5	3.7	2.7	2.4	C	C	C	C	3.1	2.8	3.0	2.6	2.5	2.4	2.3	2.5	2.5	2.6	2.6	3.7
4-Dec	2.6	2.5	Z	2.4	2.4	2.4	2.4	2.6	2.5	2.6	3.3	2.9	2.7	2.9	2.5	2.8	2.4	2.3	2.3	2.4	2.3	2.3	2.3	2.4	2.5	3.3
5-Dec	3.0	2.5	2.8	Z	2.5	2.3	2.2	2.3	2.4	2.6	2.7	2.5	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.6	2.7	2.4	3.0
6-Dec	2.8	2.7	2.6	2.4	Z	2.6	2.9	2.8	2.8	2.9	2.7	2.6	2.5	2.4	2.6	3.1	2.9	2.9	2.9	2.3	2.3	2.3	2.6	2.4	2.6	3.1
7-Dec	2.5	2.2	2.3	2.4	3.3	Z	2.4	2.7	2.4	2.5	2.4	2.4	2.9	2.8	2.6	2.5	2.8	2.7	2.3	2.3	2.3	2.4	2.5	2.7	2.5	3.3
8-Dec	Z	3.0	2.8	2.6	2.7	2.7	2.7	2.7	2.8	2.8	2.4	2.3	2.2	2.3	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.5	3.0
9-Dec	2.3	Z	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.3	2.3	2.3	2.4	2.4	3.0	2.7	2.8	2.7	2.7	3.2	2.4	3.2
10-Dec	2.8	2.9	Z	2.8	2.7	2.4	2.3	2.3	2.2	2.3	2.2	2.3	2.2	2.2	2.2	2.3	2.3	2.4	2.4	2.6	2.5	2.5	2.4	2.4	2.4	2.9
11-Dec	2.5	2.5	2.5	Z	2.5	2.4	2.5	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.5	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.5
12-Dec	2.3	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.3
13-Dec	2.2	2.2	2.3	2.3	2.4	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.1	2.2	2.3	2.3	2.3	2.4	2.3	2.4	2.3	2.4
14-Dec	Z	2.5	2.5	2.6	2.4	2.6	2.8	2.6	2.5	2.6	2.4	2.7	2.6	2.5	2.7	2.4	2.3	2.3	2.3	2.2	2.2	2.2	2.4	2.4	2.4	2.8
15-Dec	2.3	Z	2.6	3.1	2.5	2.2	2.3	2.3	2.3	2.3	2.3	2.5	2.3	2.2	2.3	2.3	2.3	2.4	2.7	2.4	2.3	2.9	2.2	2.1	2.4	3.1
16-Dec	2.2	2.2	Z	2.2	2.3	2.4	2.5	2.7	3.3	2.8	2.4	2.3	2.3	2.3	2.2	2.2	2.2	2.4	2.9	2.9	3.0	3.0	2.7	2.3	2.5	3.3
17-Dec	2.3	2.5	2.5	Z	2.6	2.7	2.7	2.3	2.2	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.7
18-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.3	2.3	2.2	2.2	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.4
19-Dec	2.2	2.2	2.2	2.2	2.3	Z	2.3	2.3	2.3	2.3	2.5	2.3	2.7	2.4	3.1	3.0	2.6	2.5	2.3	2.3	2.3	2.4	2.5	3.0	2.4	3.1
20-Dec	Z	2.9	2.6	2.6	2.8	3.3	2.6	2.6	2.5	2.5	2.5	2.5	2.9	3.2	2.8	2.5	2.4	2.3	2.4	2.3	2.4	2.6	2.4	2.3	2.6	3.3
21-Dec	2.6	Z	2.7	2.4	2.7	2.3	2.3	2.3	2.3	2.4	2.5	2.5	2.6	3.7	3.2	3.1	3.3	3.8	3.2	2.9	3.0	2.8	3.0	3.4	2.8	3.8
22-Dec	3.6	3.2	Z	2.7	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.5	2.5	2.3	2.3	2.4	2.3	2.2	2.3	2.2	2.4	3.6
23-Dec	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.3	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4
24-Dec	2.2	2.2	2.4	2.5	Z	2.5	2.3	2.2	2.2	2.2	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.7	2.6	2.5	2.3	2.7
25-Dec	2.4	2.5	2.4	2.4	2.3	Z	2.5	2.3	2.3	2.3	2.3	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.8	3.1	2.6	2.4	2.3	2.2	2.2	3.1
26-Dec	Z	2.3	2.3	2.2	2.3	2.2	2.3	2.3	2.4	2.4	2.7	2.9	2.9	2.9	2.7	2.6	2.6	2.8	2.6	2.6	2.7	3.2	2.8	2.7	2.6	3.2
27-Dec	2.8	Z	2.5	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.4	2.5	2.7	2.4	2.3	2.3	2.3	2.5	2.4	2.4	2.4	2.8
28-Dec	2.6	2.7	Z	2.8	2.4	2.5	2.6	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.5	2.6	2.6	2.6	2.6	2.6	2.8	2.7	2.6	2.5	2.8
29-Dec	2.5	2.5	2.5	Z	2.6	2.8	2.5	2.5	2.5	2.4	2.4	2.3	2.3	2.4	2.4	2.8	2.8	2.6	2.4	2.3	2.3	2.3	2.3	2.3	2.5	2.8
30-Dec	2.2	2.3	2.7	2.4	Z	2.7	2.6	2.6	2.4	2.3	2.2	2.3	2.3	2.4	2.4	2.3	2.2	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.7
31-Dec	2.6	2.3	2.2	2.2	2.2	Z	2.3	2.2	2.3	2.8	2.3	2.3	2.2	2.2	2.3	2.3	2.3	2.4	2.3	2.3	2.4	2.3	2.2	2.2	2.3	2.8
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration																										







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Mildred Lake - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	0	0.00	0.00
2.1 - 3.0	665	93.79	93.79
3.1 - 10.0	44	6.21	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Mildred Lake - December 2015**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.1 - 3.0	89	86	27	18	17	21	26	94	79	61	32	36	29	27	12	10	664
3.1 - 10.0	6	1	1	0	0	0	4	12	11	4	2	0	0	3	0	0	44
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	95	87	28	18	17	21	30	106	90	65	34	36	29	30	12	10	708

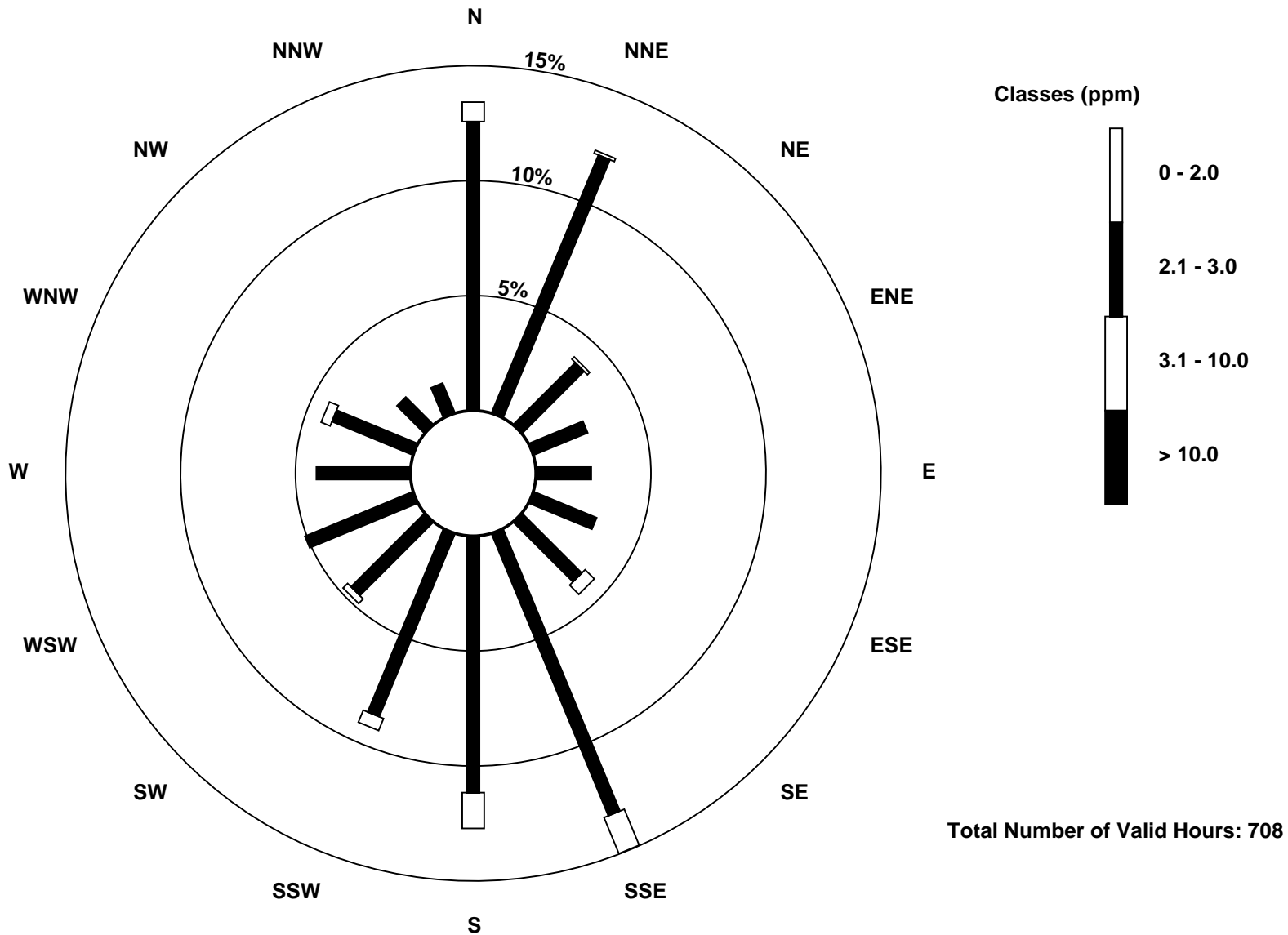
Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Wind Rose Dec 2015**

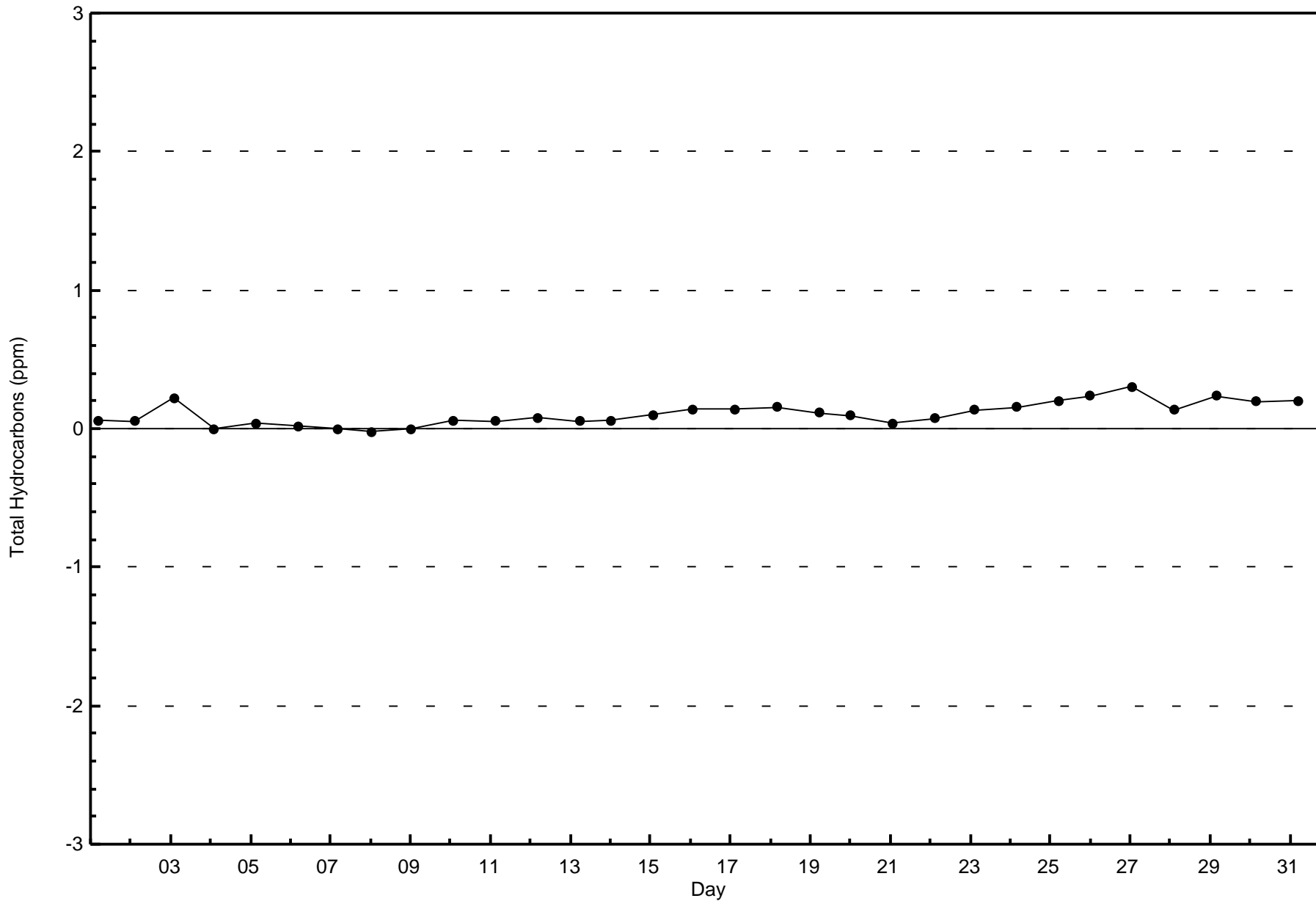
**Total Hydrocarbons (THC) - ppm  
Mildred Lake (AMS 2)**

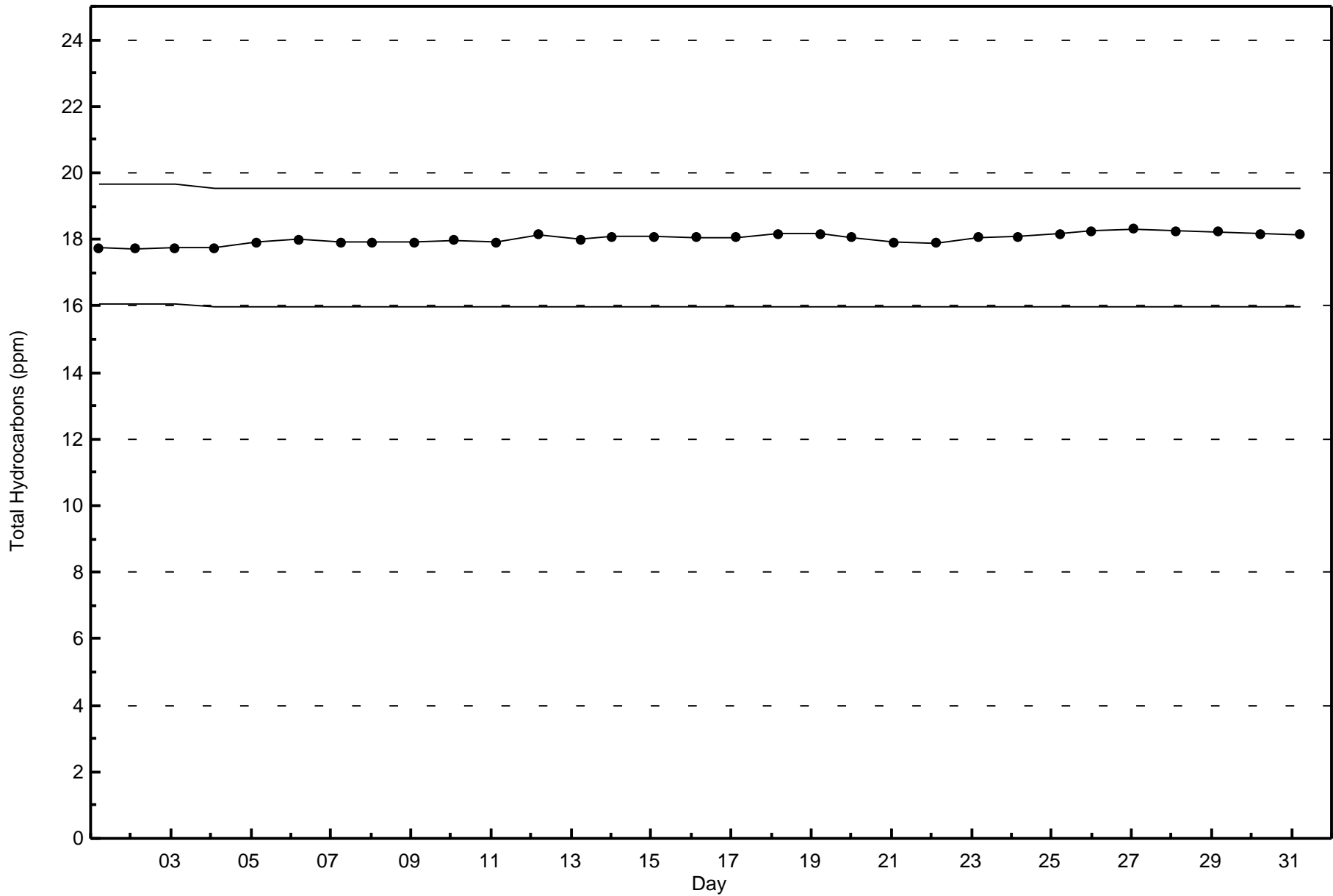




Wood Buffalo Environmental Association  
Zero Responses

Total Hydrocarbons (THC) - ppm  
Mildred Lake - December 2015





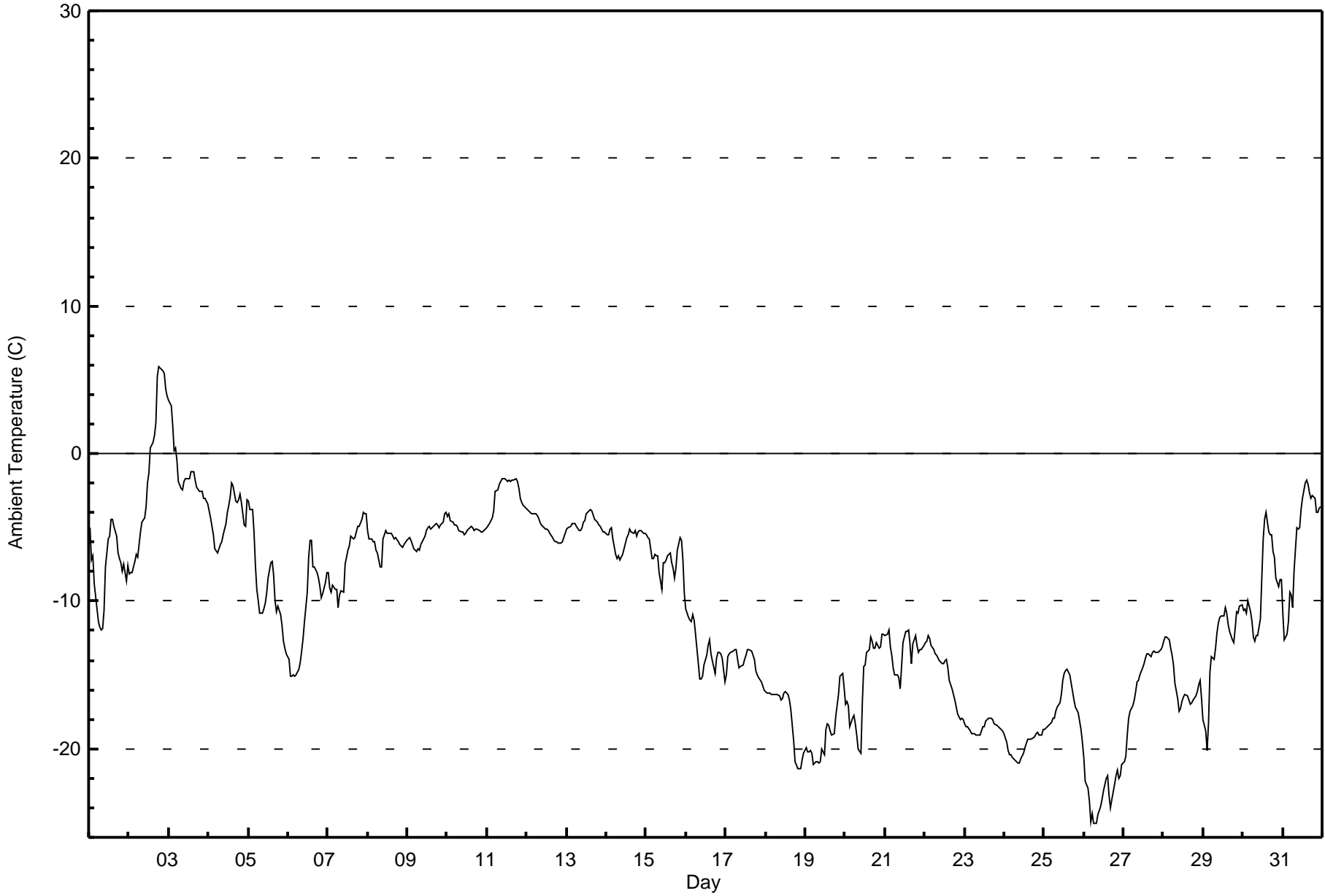


Maximum Value: 5.9 C on Dec 2 19:00		Maximum Daily Average: -1.2 C on Dec 3		Hours in Service: 744																						
Minimum Value: -25.1 C on Dec 26 08:00		Minimum Daily Average: -23.0 C on Dec 26		Hours of Data: 744																						
Maximum Diurnal Average: -9.2 C at hour 15		Minimum Diurnal Average: -11.8 C at hour 8		Hours of Missing Data: 0																						
Monthly Average: -10.59 C		Percentiles: P <sub>1</sub> = -24.0 P <sub>10</sub> = -19.0 Q <sub>1</sub> = -15.5 Median = -10.5 Q <sub>3</sub> = -5.3 P <sub>90</sub> = -3.6 P <sub>99</sub> = 3.5		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-5.0	-7.3	-6.9	-8.8	-9.7	-11.4	-11.7	-12.0	-11.8	-10.6	-7.7	-5.8	-5.6	-4.4	-4.5	-4.9	-5.6	-6.8	-7.1	-7.3	-7.9	-7.5	-8.6	-7.6	-7.8	-4.4
2-Dec	-8.2	-8.1	-8.1	-7.3	-6.8	-7.0	-6.2	-5.3	-4.7	-4.4	-3.6	-2.0	-1.3	0.4	0.7	1.2	2.1	5.2	5.9	5.8	5.6	5.4	4.3	3.9	-1.3	5.9
3-Dec	3.6	3.2	1.9	0.2	0.4	-0.5	-1.9	-2.4	-2.4	-1.9	-1.7	-1.7	-1.2	-1.2	-1.2	-1.8	-2.2	-2.6	-2.5	-2.6	-3.0	-3.0	-3.4	-1.2	3.6	
4-Dec	-3.9	-4.4	-5.0	-5.5	-6.5	-6.7	-6.4	-6.2	-6.0	-5.5	-4.7	-4.0	-3.5	-2.9	-2.0	-2.1	-3.3	-3.3	-3.1	-2.8	-3.3	-4.8	-4.9	-3.1	-4.3	-2.0
5-Dec	-3.2	-3.8	-3.8	-5.3	-7.5	-9.2	-10.0	-10.8	-10.8	-10.5	-10.1	-9.5	-8.5	-7.4	-7.3	-8.2	-9.9	-10.7	-10.4	-10.9	-11.7	-12.7	-13.2	-13.5	-9.1	-3.2
6-Dec	-13.9	-15.1	-15.0	-15.0	-15.1	-15.0	-14.6	-14.1	-13.4	-12.5	-11.4	-9.4	-7.0	-5.9	-5.9	-7.7	-7.7	-8.0	-8.4	-9.0	-9.7	-9.5	-8.8	-8.1	-10.8	-5.9
7-Dec	-8.0	-9.1	-9.4	-8.9	-9.2	-9.2	-10.4	-9.6	-9.3	-9.3	-7.5	-7.0	-6.5	-6.2	-5.6	-5.8	-5.7	-5.3	-5.0	-4.9	-4.4	-4.0	-4.0	-4.1	-7.0	-4.0
8-Dec	-5.2	-5.8	-5.8	-6.0	-6.0	-6.6	-6.7	-7.6	-7.6	-5.8	-5.5	-5.3	-5.4	-5.4	-5.4	-5.6	-5.8	-5.7	-5.9	-6.2	-6.3	-6.3	-6.2	-5.9	-6.0	-5.2
9-Dec	-5.8	-5.7	-5.9	-6.2	-6.5	-6.6	-6.5	-6.5	-6.1	-6.0	-5.6	-5.2	-5.0	-4.9	-5.1	-5.0	-4.8	-4.7	-4.8	-5.0	-4.9	-4.6	-4.1	-4.0	-5.4	-4.0
10-Dec	-4.2	-4.1	-4.5	-4.6	-4.8	-4.8	-5.0	-5.2	-5.3	-5.4	-5.5	-5.4	-5.2	-5.2	-4.9	-5.1	-5.2	-5.1	-5.1	-5.2	-5.4	-5.3	-5.3	-5.1	-5.0	-4.1
11-Dec	-5.0	-4.8	-4.6	-4.3	-3.9	-2.6	-2.5	-2.1	-1.9	-1.7	-1.7	-1.7	-1.9	-1.8	-1.9	-1.8	-1.8	-1.7	-1.9	-2.4	-3.0	-3.3	-3.5	-3.7	-2.7	-1.7
12-Dec	-3.8	-3.9	-4.0	-4.0	-4.1	-4.1	-4.2	-4.3	-4.7	-4.9	-5.0	-5.1	-5.1	-5.2	-5.4	-5.7	-5.9	-6.0	-6.0	-6.0	-6.1	-6.0	-5.7	-5.4	-5.0	-3.8
13-Dec	-5.2	-5.0	-4.9	-4.8	-4.7	-4.8	-5.0	-5.2	-5.2	-5.0	-4.7	-4.5	-4.1	-3.9	-3.8	-3.9	-4.1	-4.5	-4.6	-4.8	-5.0	-5.1	-5.3	-5.4	-4.7	-3.8
14-Dec	-5.5	-5.5	-5.1	-5.0	-5.8	-6.8	-7.1	-6.9	-7.2	-7.0	-6.8	-6.1	-5.7	-5.5	-5.1	-5.3	-5.4	-5.2	-5.6	-5.3	-5.2	-5.2	-5.4	-5.4	-5.8	-5.0
15-Dec	-5.5	-5.7	-5.8	-7.2	-7.1	-6.8	-6.9	-6.9	-8.1	-9.2	-7.4	-7.4	-7.2	-6.9	-6.7	-7.4	-7.8	-8.4	-7.7	-6.6	-5.7	-5.9	-7.2	-9.5	-7.1	-5.5
16-Dec	-10.5	-11.1	-11.3	-11.4	-10.9	-11.2	-12.2	-14.2	-15.2	-15.3	-15.1	-14.3	-13.7	-13.0	-12.6	-13.6	-14.1	-14.9	-13.8	-13.5	-13.5	-13.8	-15.5	-13.3	-10.5	
17-Dec	-15.0	-13.7	-13.6	-13.5	-13.4	-13.3	-13.3	-13.9	-14.5	-14.4	-14.3	-14.0	-13.6	-13.3	-13.3	-13.4	-13.6	-14.0	-14.7	-15.0	-15.2	-15.5	-15.8	-16.0	-14.2	-13.3
18-Dec	-16.1	-16.3	-16.3	-16.3	-16.3	-16.4	-16.4	-16.4	-16.4	-16.7	-16.6	-16.2	-16.2	-16.3	-16.7	-17.4	-18.4	-19.5	-20.9	-21.4	-21.3	-21.3	-20.8	-20.3	-17.8	-16.1
19-Dec	-19.9	-20.2	-20.2	-20.1	-20.3	-21.1	-20.8	-20.9	-21.0	-20.8	-20.1	-20.4	-18.7	-18.3	-18.4	-18.8	-19.1	-19.0	-17.8	-17.1	-16.3	-15.1	-14.9	-15.9	-19.0	-14.9
20-Dec	-16.9	-16.8	-17.1	-18.5	-17.9	-17.7	-18.3	-19.1	-20.0	-20.3	-16.8	-14.4	-14.3	-13.4	-13.3	-12.5	-12.7	-13.2	-13.2	-12.8	-13.2	-13.1	-12.2	-12.3	-15.4	-12.2
21-Dec	-12.3	-12.3	-11.9	-13.1	-13.6	-14.5	-15.0	-15.0	-15.2	-15.9	-14.4	-12.8	-12.1	-12.1	-12.0	-12.9	-14.2	-12.9	-12.3	-13.0	-13.4	-13.3	-13.3	-13.0	-13.4	-11.9
22-Dec	-12.8	-12.7	-12.3	-12.5	-13.0	-13.3	-13.5	-13.6	-13.8	-14.0	-14.2	-14.2	-14.0	-14.0	-14.5	-15.4	-15.9	-16.3	-16.7	-17.1	-17.6	-18.0	-17.9	-18.0	-14.8	-12.3
23-Dec	-18.3	-18.5	-18.5	-18.7	-18.9	-18.9	-19.0	-19.0	-19.1	-19.1	-18.7	-18.5	-18.1	-17.9	-17.9	-18.0	-18.1	-18.3	-18.4	-18.5	-18.6	-18.7	-18.8	-18.8	-18.5	-17.9
24-Dec	-19.0	-19.5	-20.1	-20.4	-20.4	-20.6	-20.8	-20.9	-20.9	-20.7	-20.3	-19.9	-19.6	-19.3	-19.4	-19.4	-19.2	-19.2	-19.0	-18.9	-19.0	-19.1	-18.7	-18.7	-19.8	-18.7
25-Dec	-18.7	-18.6	-18.5	-18.4	-18.2	-17.9	-17.9	-17.5	-17.2	-16.9	-16.3	-15.4	-14.9	-14.7	-14.6	-15.0	-15.5	-16.2	-16.7	-17.2	-17.6	-18.1	-18.7	-19.5	-17.1	-14.6
26-Dec	-20.5	-22.2	-22.7	-23.5	-24.9	-24.4	-25.0	-25.1	-24.5	-24.2	-24.0	-23.4	-22.9	-22.0	-21.8	-23.2	-24.0	-23.5	-22.4	-21.8	-21.4	-22.0	-21.9	-21.1	-23.0	-20.5
27-Dec	-20.9	-20.5	-19.1	-18.0	-17.5	-17.1	-16.7	-16.1	-15.5	-15.4	-15.0	-14.5	-14.2	-13.8	-13.6	-13.6	-13.8	-13.5	-13.4	-13.4	-13.5	-13.5	-13.3	-13.1	-15.4	-13.1
28-Dec	-12.7	-12.4	-12.4	-12.6	-13.2	-13.7	-14.3	-15.6	-16.6	-17.4	-17.3	-16.8	-16.5	-16.4	-16.4	-16.7	-17.0	-16.9	-16.7	-16.4	-16.1	-15.7	-15.3	-16.6	-15.5	-12.4
29-Dec	-18.0	-18.8	-20.2	-18.3	-14.8	-13.7	-14.0	-13.1	-12.1	-11.5	-11.1	-11.0	-11.0	-10.5	-10.8	-11.6	-12.0	-12.7	-12.8	-11.9	-10.7	-10.8	-10.3	-10.3	-13.0	-10.3
30-Dec	-10.6	-10.6	-10.8	-10.0	-10.8	-11.3	-12.4	-12.7	-12.3	-12.3	-11.2	-8.5	-5.8	-4.5	-4.0	-5.3	-5.5	-5.5	-6.6	-7.0	-8.4	-9.0	-8.5	-8.5	-8.8	-4.0
31-Dec	-10.8	-12.7	-12.2	-11.4	-9.4	-9.6	-10.4	-8.0	-5.0	-5.2	-5.0	-3.8	-3.1	-2.0	-1.8	-2.1	-2.6	-3.0	-2.8	-3.1	-4.0	-4.0	-3.7	-3.6	-5.8	-1.8
																								Diurnal Average		
																								Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature (AT) - C**  
**Mildred Lake - December 2015**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Mildred Lake - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	56	7.53	7.53
-20 - 0	672	90.32	97.85
0 - 10	16	2.15	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

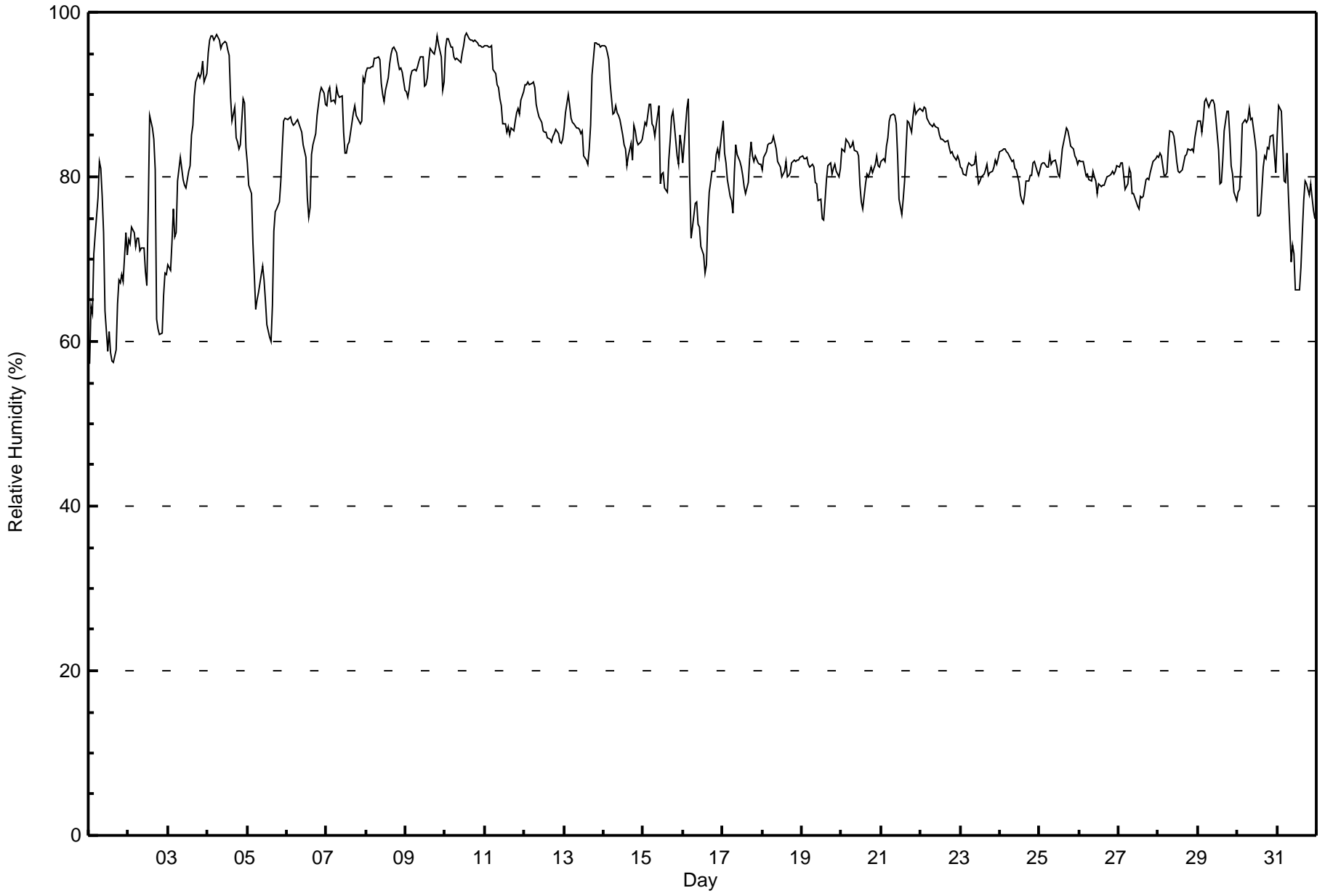
**Relative Humidity (RH) - %  
Mildred Lake - December 2015**

Maximum Value: 98 % on Dec 10 14:00																			Maximum Daily Average: 95.8 % on Dec 10						Hours in Service: 744	
Minimum Value: 57 % on Dec 1 01:00																			Minimum Daily Average: 67.3 % on Dec 1						Hours of Data: 744	
Maximum Diurnal Average: 85.2 % at hour 4																			Minimum Diurnal Average: 79.8 % at hour 13						Hours of Missing Data: 0	
Monthly Average: 83.3 %																			Percentiles: P <sub>1</sub> = 60 P <sub>10</sub> = 75 Q <sub>1</sub> = 80 Median = 83 Q <sub>3</sub> = 88 P <sub>90</sub> = 94 P <sub>99</sub> = 97						Hours of Calibration: 0	
																									Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	57	64	63	71	73	78	82	81	78	73	64	59	61	59	58	58	59	65	67	67	68	67	73	70	67.3	82
2-Dec	72	72	74	73	71	72	73	71	71	71	69	67	76	87	86	85	81	63	62	61	61	66	68	68	71.6	87
3-Dec	69	69	72	76	73	73	80	82	81	80	79	79	81	81	85	86	90	91	92	92	93	94	91	93	82.6	94
4-Dec	95	97	97	97	97	97	97	97	96	96	96	96	95	95	90	87	88	85	84	83	84	90	89	84	92.1	97
5-Dec	82	79	78	72	68	64	65	66	68	69	67	65	62	60	60	64	73	76	76	77	80	83	87	87	72.1	87
6-Dec	87	87	87	87	86	86	87	87	86	85	84	82	78	75	76	83	84	85	87	89	90	91	90	89	85.4	91
7-Dec	89	90	91	89	89	89	91	90	90	90	85	83	83	84	84	87	88	89	87	87	86	87	92	92	88.0	92
8-Dec	93	93	93	93	93	94	94	95	94	91	90	89	90	92	94	95	96	96	95	94	93	93	93	91	93.1	96
9-Dec	90	90	91	92	93	93	93	93	94	95	95	91	91	92	94	96	95	95	96	97	96	95	90	92	93.2	97
10-Dec	96	97	97	96	96	95	94	94	94	94	95	96	97	98	97	97	97	96	97	96	96	96	96	96	95.8	98
11-Dec	96	96	96	96	96	93	93	91	91	90	89	86	86	85	86	85	86	86	87	88	88	88	89	90	89.8	96
12-Dec	91	91	92	91	91	92	91	89	88	87	87	86	86	85	85	85	84	85	85	86	85	84	84	85	87.3	92
13-Dec	86	88	90	89	87	87	86	86	86	86	85	86	83	82	82	83	86	92	96	96	96	96	96	96	88.6	96
14-Dec	96	96	95	94	91	88	88	89	88	88	87	85	84	83	81	83	84	82	86	86	84	84	84	85	87.1	96
15-Dec	86	87	86	89	89	87	86	85	86	89	79	80	81	79	78	82	84	87	88	86	83	81	85	84	84.4	89
16-Dec	82	86	88	89	80	73	74	77	77	74	74	72	71	68	69	75	78	81	81	81	83	83	82	85	78.4	89
17-Dec	87	83	82	80	78	77	76	81	84	83	82	81	80	79	78	79	82	84	83	82	83	82	81	82	81.1	87
18-Dec	81	82	83	84	84	84	84	85	83	82	82	81	80	81	82	80	80	80	82	82	82	82	82	82	82.1	85
19-Dec	83	82	82	82	81	81	82	81	79	79	77	77	75	75	77	80	81	82	80	81	81	81	80	81	80.1	83
20-Dec	83	83	83	85	84	84	84	84	83	83	83	79	77	76	79	80	80	81	81	80	82	82	81	81	81.6	85
21-Dec	82	82	82	84	85	87	88	88	87	86	82	77	75	77	79	83	87	87	85	87	89	88	88	88	84.3	89
22-Dec	88	88	88	88	87	86	86	86	86	86	86	85	85	85	84	84	84	84	83	83	82	82	83	82	85.1	88
23-Dec	81	81	80	80	81	82	81	81	81	83	81	79	79	80	80	81	82	80	81	81	81	82	82	82	81.0	83
24-Dec	83	83	83	83	83	83	82	82	82	81	81	79	78	77	77	78	79	79	80	80	82	82	81	80	80.8	83
25-Dec	81	82	82	82	81	81	83	82	82	82	81	80	80	82	83	85	86	86	85	84	83	83	82	81	82.4	86
26-Dec	82	82	82	81	80	80	80	79	81	80	80	78	79	79	79	79	80	80	80	80	81	80	81	81	80.1	82
27-Dec	81	82	82	80	78	79	81	81	78	78	77	76	76	78	77	78	80	80	80	81	81	82	82	83	79.6	83
28-Dec	82	83	83	80	80	81	83	86	85	85	84	82	81	80	81	82	82	83	83	83	83	83	85	86	82.8	86
29-Dec	87	87	85	87	89	89	88	89	89	89	89	87	83	79	79	82	86	88	88	85	81	80	78	77	85.2	89
30-Dec	78	78	81	87	87	87	87	88	87	87	85	83	75	75	76	81	83	82	83	83	85	85	83	80	82.8	88
31-Dec	85	89	88	84	80	79	83	78	70	72	71	66	66	66	69	73	77	79	79	78	79	77	76	75	76.6	89
	84.2	84.8	85.1	85.2	84.3	83.9	84.5	84.6	84.1	83.7	82.0	80.5	79.8	79.8	80.2	81.7	83.3	83.5	83.9	83.8	83.9	84.2	84.3	84.1	Diurnal Average	
	96	97	97	97	97	97	97	97	96	96	96	96	96	97	98	97	97	97	96	97	97	96	96	96	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Mildred Lake - December 2015**





Maximum Speed: 21 km/h on Dec 27 13:00	Maximum Daily Speed Average: 15.4 km/h on Dec 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 8 09:00	Minimum Daily Speed Average: 1.0 km/h on Dec 25	Hours of Data: 743
Maximum Diurnal Speed Average: 2.8 km/h at hour 12	Minimum Diurnal Speed Average: 0.2 km/h at hour 4	Hours of Missing Data: 1
Monthly Average Velocity: 1.4 km/h 183.3 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 5 Median = 7 Q <sub>3</sub> = 10 P <sub>90</sub> = 13 P <sub>99</sub> = 18	Percent Operational Time: 99.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	S5	SW1	SSW5	S6	SSW7	S4	S5	SSW4	SSW8	SSW7	S8	S9	SE5	SSE8	SSE9	SSE8	SSE8	S6	S7	SSW7	SSW9	S8	SSE7	SSE8	S6.3	SSE9
2-Dec	S7	SSW7	SSE5	SSE8	SSE7	SSE6	S6	SSE8	S11	SW8	S8	S8	S10	SSW8	SSE7	SSW7	SW7	W14WNNW16	W16	W17	W15	W9	W9	SW6.3	W17	
3-Dec	WNNW7WNNW10	W7	WSW6	W6	WSW6	S7	SSE8	SE7	ESE1	SW3	NNE8	NNE10	N11	N10	N10	N11	N7	N10	N8	N10	N10	NNE6	N9	N4.1	N11	
4-Dec	N10	N10	N10	N9	N9	N8	NNE9	NNE7	N5	N2	WNNW3	W2	SW6	SW7	WSW8	SW7	SW6	SW6WSW13	WSW7	SSW4	SSW5	SW4	W6	WNNW2.7	WSW13	
5-Dec	NNW8	NNW5	NW9	NW17WNNW17	WNNW17	WNNW17	WNNW18	WNNW17	W16	W14	W12	W14	W11	W8	WSW7	WSW2	SE2	SSW6	SSW7	S4	SE1	SE4	ESE5	WNNW7.8	WNNW18	
6-Dec	ENE3	N4	N7	N10	N7	N7	N6	N5	N6	N9	NNE6	NE3	ESE8	SE9	SSW5	SSE4	S6	S6	S5	S5	S7	S7	S7	S8	E1.1	N10
7-Dec	S7	SSW7	S8	SSE8	S7	SSW5	SSW4	SSE4	S5	SSE6	SSE9	SW4	S4	SSE5	S5	SSW3	SSW3	SSW7	SSW7	SSW5	SSW8	SSW8	WSW3	NNW12	S4.7	NNW12
8-Dec	N11	N11	N9	N7	N6	NE2	S1	SE1	NNE0	W3	SSW6	SSW10	S7	S7	SSE7	SSE9	SSE8	SE6	ESE9	E9	E5	NE4	E5	ESE8	ESE1.8	N11
9-Dec	ESE6	ESE6	ENE5	NE4	NNE5	NE5	NNE4	NE4	E5	E5	SE8	SSE10	SE5	NE3	NE3	ESE3	ESE1	SSW1	N5	NNE2	S4	SSW5	WNNW5	WNNW1	E2.1	SSE10
10-Dec	NE1	NNW2	NNE5	N4	NNE6	NNE6	NNE5	NNE5	NNE5	N6	NNE6	NNE5	N4	NNE7	N2	NNE5	N2	N6	N5	NNE6	N7	N7	N6	N7	NNE4.9	N7
11-Dec	N7	N7	N6	NNE3	E3	SE7	SE6	SSE8	SE9	SSE9	SE8	SSE13	SSE11	SSE9	S8	S7	SSE6	SSE8	SSE11	SSE14	SSE13	SSE11	SSE11	SSE11	SSE6.8	SSE14
12-Dec	SSE11	SSE10	SSE12	SSE12	SSE15	SSE14	SSE13	SSE15	SSE16	SSE18	SSE20	SSE20	SSE17	SSE16	SSE16	SSE19	SSE18	SSE16	SSE17	SSE17	SSE14	SSE12	SSE17	SSE18	SSE15.4	SSE20
13-Dec	SSE19	SSE18	SSE17	SE11	SE13	SE14	SE12	SSE12	SSE12	SSE11	SSE10	SE10	SE10	SSE8	NE4	NNE5	NNE5	NNE6	NNE6	NNE5	NNE5	NNE4	NNE5	N5	SE6.0	SSE19
14-Dec	NNE3	SSE1	NNW2	N7	NNW9	NW8	NW7	WNNW6	WNNW7	WNNW8	WNNW6	WNNW4	WNNW8	NW8	SW6	SW7	WSW7	S6	S10	S13	S13	S12	S11	WSW3.6	S13	
15-Dec	SSW13	S11	S12	SSE11	S10	S12	S11	S10	SSW9	SW7WSW10	W8WSW11	WSW12	WSW9	WSW9	WSW8	WSW4	W6	W7WNNW13	NW12	N11	NNE13			SW5.3	WNNW13	
16-Dec	NNE9	NNE6	NNE4	SSE2	NW12	NW15	NW12	NW11WNNW11	WNNW8	W6	W8WNNW12	W8	SW5	WSW6	W5	NW8	WNNW8	WNNW8	NW8	NNW7	ENE3			NW6.4	NW15	
17-Dec	N1	WNNW9	WNNW9	WNNW9WNNW10	NW8	NW9	N6	NE5	NNE5	NNE5	NNE5	N5	N6	NNE6	NNE6	NNE5	NE7	NE8	NE7	NE6	NE7	NE5	ENE5	N4.7	WNNW10	
18-Dec	ENE5	E4	ENE3	NNE4	N3	NE3	E3	ENE4	ENE6	ENE6	ENE5	ENE4	ESE4	SE5	ESE7	ESE7	ESE10	E9	ESE9	ESE8	ESE9	E8	E7	E6	E5.2	ESE10
19-Dec	ENE4	ENE3	ENE4	E4	SE10	SE8	SE7	SSE8	SE8	SE5	SSE3	SSW2	S8	SSW6	S5	SSE7	SSE4	SSE7	SSE11	SSE11	SSE12	SSE15	SSE16	S11	SSE6.7	SSE16
20-Dec	S10	S13	S9	SSW8	S8	S7	S6	SSW6	SW4	SW4	SSE5	SSE10	SSW4	SSW4	S6	SSE15	SSE18	SSE18	SSE18	SSE19	SSE13	S11	SSE15	SSE14	S10.0	SSE19
21-Dec	S11	SSE14	S16	S10	S11	SSW6	S7	S6	SSW7	SSW7	SW8	SSW7	SSW6	SSE5	SE5	SE3	SE1	NE3	NNE4	N8	NNE8	N5	N7	N7	S3.5	S16
22-Dec	N9	N9	N9	N10	NNE12	NNE12	NNE12	NNE11	NNE12	NNE11	NNE10	NNE9	NNE9	N10	N13	N14	N12	NNE14	N14	N11	N11	NNE11	N11	NNE9	NNE11.1	N14
23-Dec	NNE9	N9	N10	N10	N9	N7	N7	N8	NNE7	NNE7	NNE8	NNE8	N9	NNE9	NNE9	NNE8	NNE7	NNE9	NNE8	NNE9	NNE7	N8	N7	N7	NNE8.2	N10
24-Dec	N7	NNE6	N6	N6	N4	NNE4	NNE5	NNE5	NNE5	NNE5	NNE4	N6	N4	NE3	E1	S2	SSE2	ESE3	ESE4	SE3	SE4	S6	S5	S7	NNE1.9	S7
25-Dec	S6	S7	S8	S8	S7	SSE5	SSE4	SSW7	S6	S6	S4	ENE0	N3	E2	ESE3	E3	NNE6	N9	N12	N10	N10	NNE7	NNE6	NE6	ESE1.0	N12
26-Dec	NNE6	NE3	NNE5	NE2	AF	N0	NNE3	NNE4	NE2	ENE1	ENE3	S1	E4	E4	NNE4	N7	N9	NNE5	NNE3	NE3	NE4	N5	NNE5	NE3	NNE3.3	N9
27-Dec	N3	NE3	SE6	SE10	SSE15	SSE14	SE14	SSE16	SSE19	SSE19	SSE17	SSE20	SSE21	SSE16	S13	SSE13	S7	S8	S10	S8	SSE8	SSE6	SSW5	SW5	SSE10.6	SSE21
28-Dec	WSW4	WSW4	NNW5	NNW13	NNW11	NNW9	N8	N11	NNE11	NNE9	NNE10	NNE8	N8	N8	N7	N7	N5	NNE4	NE2	ENE1	SSW2	SSW5	SSW6	S6	N4.4	NNW13
29-Dec	S5	S5	SSW6	SSW7	S7	SSE7	SSW7	S7	S10	SSW12	SSW12	SSW13	SW12	SSW9	SSW8	S9	S10	S8	SSW8	SSW10	SSW11	SSW10	SW13WSW13	SSW8.6	WSW13	
30-Dec	SW10WSW13	W8	WNNW8	WNNW7	W6	WSW5	WSW5	SW8	SSW6	SW9	SSW6	SW7	SW3	W3	SSW4	WSW8	WSW9	WSW9WSW10	SW9	SW11	SW11	SW12			WSW7.3	WSW13
31-Dec	SSW9	SSW8	SSW8	SSW9	S10	S10	SSW8	SW8	W13	W11WSW10	SW10	SW11	SW8	WSW8	WSW9	WSW8	WSW9WSW12	W9	WSW8WSW10WSW14	SW11					SW8.7	WSW14

SSE0.9SSW0.8 SSE0.5	W0.2SSW0.4 SSE0.6	S0.8 SSE1.3	S1.8SSW1.6	S2.4	S2.8	S2.7	S1.9	S1.4	S2.2	S1.8	S1.3SSW1.3	S1.6	S1.8SSW1.6	S1.7	S1.3	Diurnal Average												
SSE19	SSE18	SSE17	NW17WNNW17	WNNW17	WNNW17	WNNW18	SSE19	SSE19	SSE20	SSE20	SSE21	SSE16	SSE16	SSE19	SSE18	SSE18	SSE18	SSE19	W17	SSE15	SSE17	SSE18	Diurnal Maximum					

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



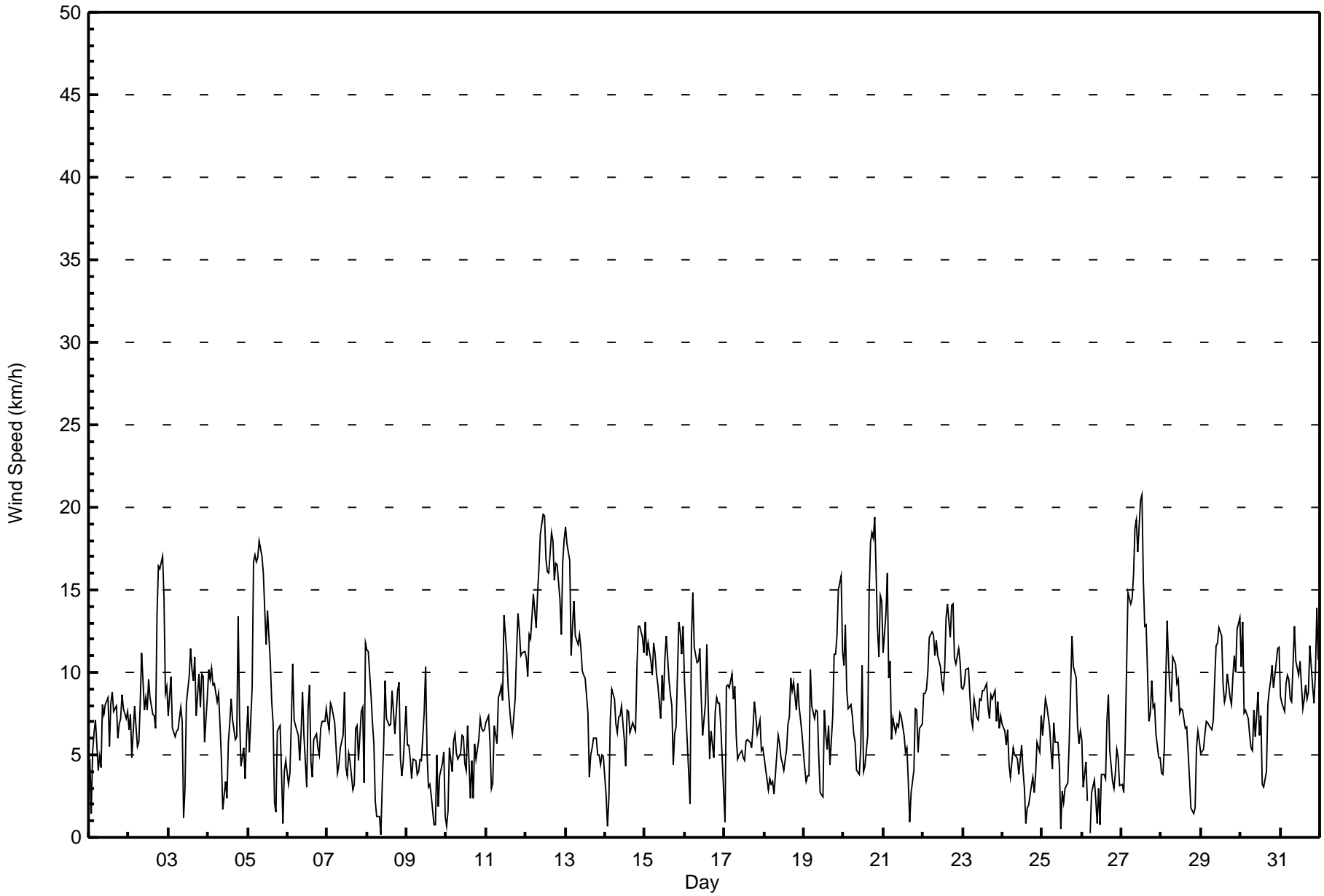
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed (WS) - km/h

Mildred Lake - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 km/h on Dec 2 21:00 Minimum Value: 0 km/h on Dec 11 04:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 3 P <sub>99</sub> = 5																	Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9									
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	1	1	1	1	2	1	1	1	1	2	3	3	2	2	2	1	2	1	1	2	2	1	1	3	
2-Dec	1	1	1	1	2	1	2	3	2	2	3	2	2	2	2	2	2	5	6	6	6	6	3	3	6	
3-Dec	3	3	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	3	2	2	1	2	1	1	3	
4-Dec	1	1	1	1	1	2	2	2	1	2	2	2	2	2	3	2	2	3	5	3	2	2	3	2	5	
5-Dec	3	4	3	5	5	5	5	5	5	6	5	4	5	4	3	2	3	1	1	2	2	2	1	1	6	
6-Dec	1	1	2	1	2	1	1	1	2	2	2	2	3	2	3	1	1	1	1	1	1	1	1	2	3	
7-Dec	1	1	2	3	2	3	2	2	3	2	2	1	1	2	2	2	1	2	2	1	2	2	2	2	3	
8-Dec	2	2	1	2	2	2	2	1	1	2	2	2	2	2	1	2	2	1	2	2	2	1	2	2	2	
9-Dec	1	1	1	1	1	1	1	1	2	1	2	3	1	1	1	1	1	1	1	1	1	2	3	2	3	
10-Dec	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	2	2	
11-Dec	1	1	2	0	1	2	1	2	2	2	3	4	3	2	2	1	1	2	4	3	3	3	3	3	4	
12-Dec	3	3	3	4	3	3	2	3	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	4	4	
13-Dec	4	3	4	3	3	3	3	3	3	3	3	2	2	3	1	2	1	1	1	1	1	1	1	1	4	
14-Dec	2	1	2	2	1	2	2	2	2	2	3	2	2	3	2	2	2	3	1	3	2	2	2	3	3	
15-Dec	3	3	2	2	2	3	3	2	2	3	3	4	3	3	3	3	3	1	2	3	3	3	2	4	4	
16-Dec	2	1	1	1	6	4	3	3	3	3	3	2	2	3	3	3	3	2	2	2	2	2	2	1	6	
17-Dec	2	2	2	3	3	2	2	2	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	2	3	
18-Dec	1	1	1	1	1	1	2	1	1	2	1	1	1	2	1	1	2	2	2	1	3	1	2	1	3	
19-Dec	1	1	2	2	3	2	2	3	2	2	1	1	2	2	1	2	2	3	2	3	4	3	3	2	4	
20-Dec	2	2	3	1	1	2	1	1	1	1	2	2	2	2	3	4	3	3	3	4	3	3	3	3	4	
21-Dec	3	3	4	2	2	2	2	2	2	1	1	1	2	1	1	1	1	1	1	2	1	2	2	1	4	
22-Dec	2	1	1	2	3	3	3	3	3	2	2	2	2	3	3	3	3	3	3	2	2	3	2	2	3	
23-Dec	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2	2	
24-Dec	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	
25-Dec	2	2	1	1	1	1	2	2	1	1	1	2	1	1	0	1	2	2	2	2	2	2	1	1	2	
26-Dec	1	1	1	2	AF	1	1	2	2	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	2	
27-Dec	1	1	3	3	3	5	4	4	4	5	4	4	4	3	3	4	1	2	3	2	2	2	1	1	5	
28-Dec	2	1	3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	2	1	1	2	1	1	3	
29-Dec	1	1	2	2	2	1	1	2	2	2	2	2	3	2	1	2	1	2	2	2	2	2	4	4	4	
30-Dec	3	4	4	4	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	2	2	3	4	4	
31-Dec	2	1	2	2	2	2	2	2	4	5	3	3	3	2	3	3	2	3	3	3	3	3	4	3	5	
																	Diurnal Maximum									
AF - Analyzer Failure																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Mildred Lake - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	212	28.53	28.53
6 - 11	419	56.39	84.93
12 - 19	108	14.54	99.46
20 - 28	4	0.54	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Mildred Lake - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	22	39	23	16	12	9	13	13	18	19	9	7	4	4	0	4	212
6 - 11	76	49	6	2	5	13	15	45	68	44	23	23	17	20	8	5	419
12 - 19	5	6	0	0	0	0	4	48	8	4	3	6	9	8	5	2	108
20 - 28	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	103	94	29	18	17	22	32	110	94	67	35	36	30	32	13	11	743

Total Number of Valid Hours: 743

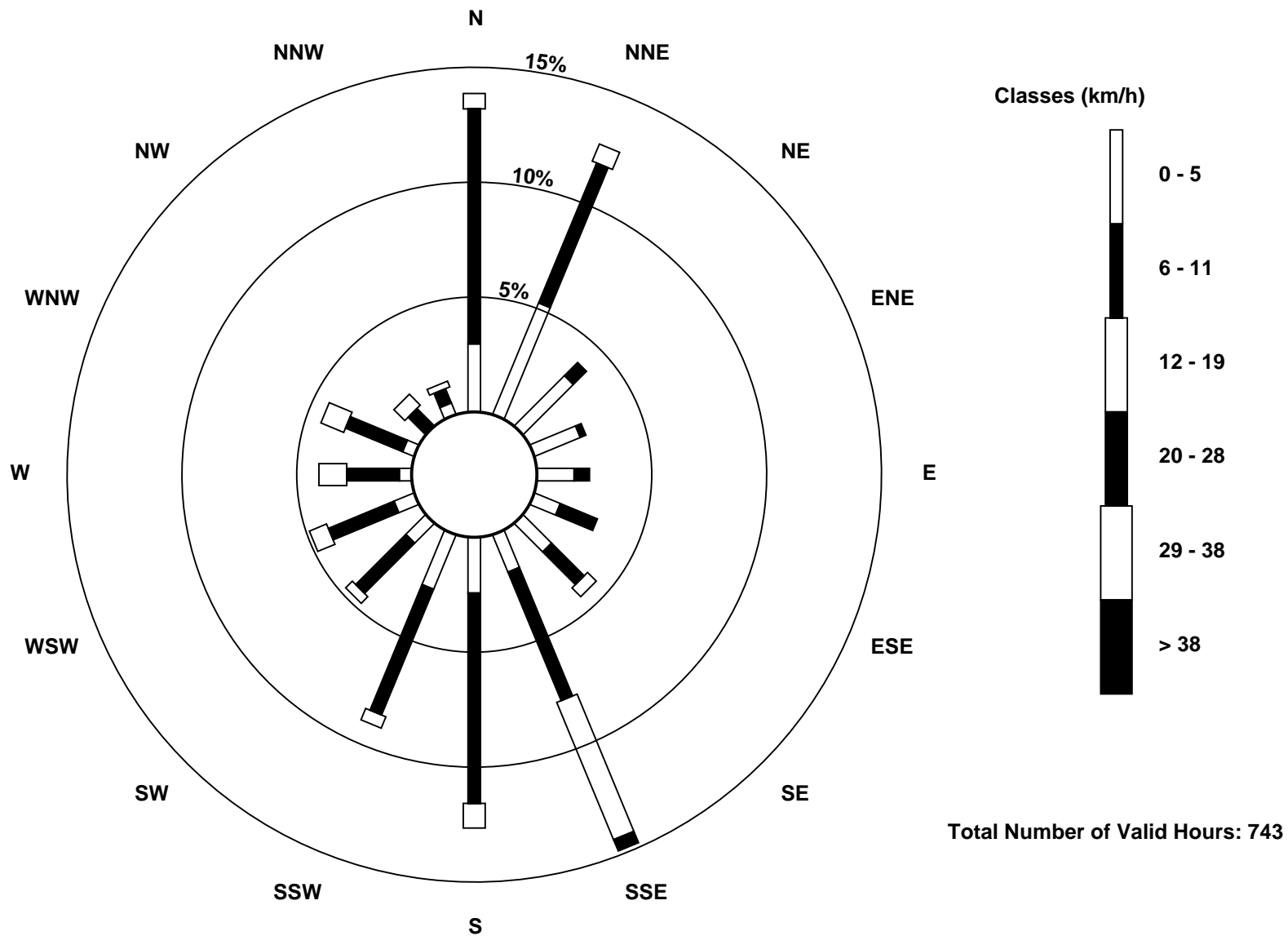
Total Number of Hours: 744





Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
Mildred Lake (AMS 2)





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Mildred Lake - December 2015**

Direction of Maximum Speed: 167 deg on Dec 27 13:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 155.5 deg on Dec 12	Hours of Data: 743
Direction of Minimum Speed: 16 deg on Dec 8 09:00	Hours of Missing Data: 1
Direction of Minimum Daily Speed Average: 1.0 deg on Dec 25	Percent Operational Time: 99.9
Monthly Average Direction: 213.0 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	186	216	196	174	199	177	188	208	208	201	181	170	135	164	158	159	165	188	185	195	202	174	160	159	179.3
2-Dec	184	201	160	166	161	149	189	156	185	214	186	187	185	194	167	200	223	264	282	281	276	280	261	275	222.4
3-Dec	283	294	269	245	271	247	180	151	132	107	227	12	12	9	5	1	5	0	359	11	5	8	31	9	349.9
4-Dec	2	7	4	9	7	11	12	12	355	350	289	267	230	219	241	225	222	226	244	243	211	196	219	272	299.1
5-Dec	331	331	315	307	303	294	297	297	284	279	276	263	267	277	264	240	238	141	208	207	186	137	144	123	281.9
6-Dec	75	7	7	6	6	11	9	9	6	10	22	46	113	136	206	168	181	181	190	187	177	186	180	186	88.0
7-Dec	185	196	179	166	182	196	192	154	174	162	158	215	181	161	182	209	206	197	207	197	197	201	255	333	189.7
8-Dec	357	355	357	357	5	40	173	130	16	265	200	202	172	169	162	164	166	133	102	90	79	38	86	103	104.8
9-Dec	110	103	72	40	25	35	26	45	96	84	129	153	130	56	35	119	116	208	349	22	190	203	296	301	87.8
10-Dec	51	346	20	360	20	32	24	31	23	6	21	29	9	32	6	16	6	3	5	15	11	8	6	5	15.1
11-Dec	7	5	6	19	94	134	124	149	145	150	145	150	156	166	180	170	153	155	153	156	154	149	155	150	147.1
12-Dec	147	148	147	152	155	156	156	156	159	159	160	161	157	156	150	155	156	153	158	155	152	156	157	158	155.5
13-Dec	160	162	160	142	135	134	140	152	154	157	154	127	137	156	54	12	13	19	19	16	21	15	13	359	134.2
14-Dec	24	163	332	356	346	314	312	295	295	294	282	295	302	305	215	231	238	182	184	190	187	187	173	173	253.5
15-Dec	193	188	169	155	174	173	180	179	192	228	251	279	254	249	249	240	247	242	259	274	299	324	358	26	228.3
16-Dec	29	19	30	158	325	317	315	304	301	300	300	272	274	299	277	222	238	271	321	299	303	309	331	60	307.1
17-Dec	11	299	301	296	298	316	318	9	34	17	24	33	5	353	13	18	17	42	46	44	37	43	54	68	1.5
18-Dec	59	90	73	27	3	46	83	70	61	68	75	74	120	126	105	104	109	100	113	118	116	99	83	98	92.1
19-Dec	74	57	69	95	126	132	141	155	138	145	159	205	186	196	171	162	155	149	156	152	158	168	166	176	153.3
20-Dec	181	175	187	193	187	177	186	195	218	214	168	162	198	194	170	158	166	166	161	163	158	169	161	162	171.5
21-Dec	171	168	169	181	179	195	189	184	203	203	219	205	193	159	133	143	134	55	14	355	17	9	5	0	176.5
22-Dec	5	1	9	6	17	20	15	16	16	17	14	18	18	10	6	6	11	12	9	7	8	12	11	13	11.7
23-Dec	14	4	6	6	9	9	1	11	20	23	23	15	8	12	12	21	28	16	21	26	12	9	11	9	13.4
24-Dec	11	13	350	356	356	17	20	24	22	17	28	352	357	37	89	170	154	120	112	126	143	178	181	185	32.5
25-Dec	179	183	190	185	173	161	168	192	174	182	191	72	11	101	122	99	16	8	4	5	3	25	33	37	102.3
26-Dec	29	39	33	47	AF	355	21	23	42	66	76	173	94	98	21	8	8	21	32	48	44	7	23	46	32.6
27-Dec	10	35	124	137	154	151	145	149	156	154	158	162	167	166	172	168	184	181	191	169	163	167	195	227	160.8
28-Dec	237	242	339	335	345	343	359	8	12	16	13	22	10	358	3	359	358	29	37	78	208	198	200	183	355.7
29-Dec	185	191	204	206	180	167	202	176	186	192	197	201	214	208	197	175	175	175	195	195	198	204	234	245	198.2
30-Dec	233	243	263	293	283	269	240	251	214	206	215	203	219	231	259	208	251	254	241	239	218	224	235	229	237.8
31-Dec	198	202	206	201	188	188	194	216	261	263	244	235	221	235	244	257	258	258	248	262	240	240	248	235	232.7

146.7	202.5	168.6	270.9	207.3	166.4	183.0	160.2	180.0	196.7	189.0	181.9	186.4	188.9	190.9	171.6	181.4	175.8	194.4	182.0	187.5	194.7	186.3	170.5
Diurnal Average																							

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods

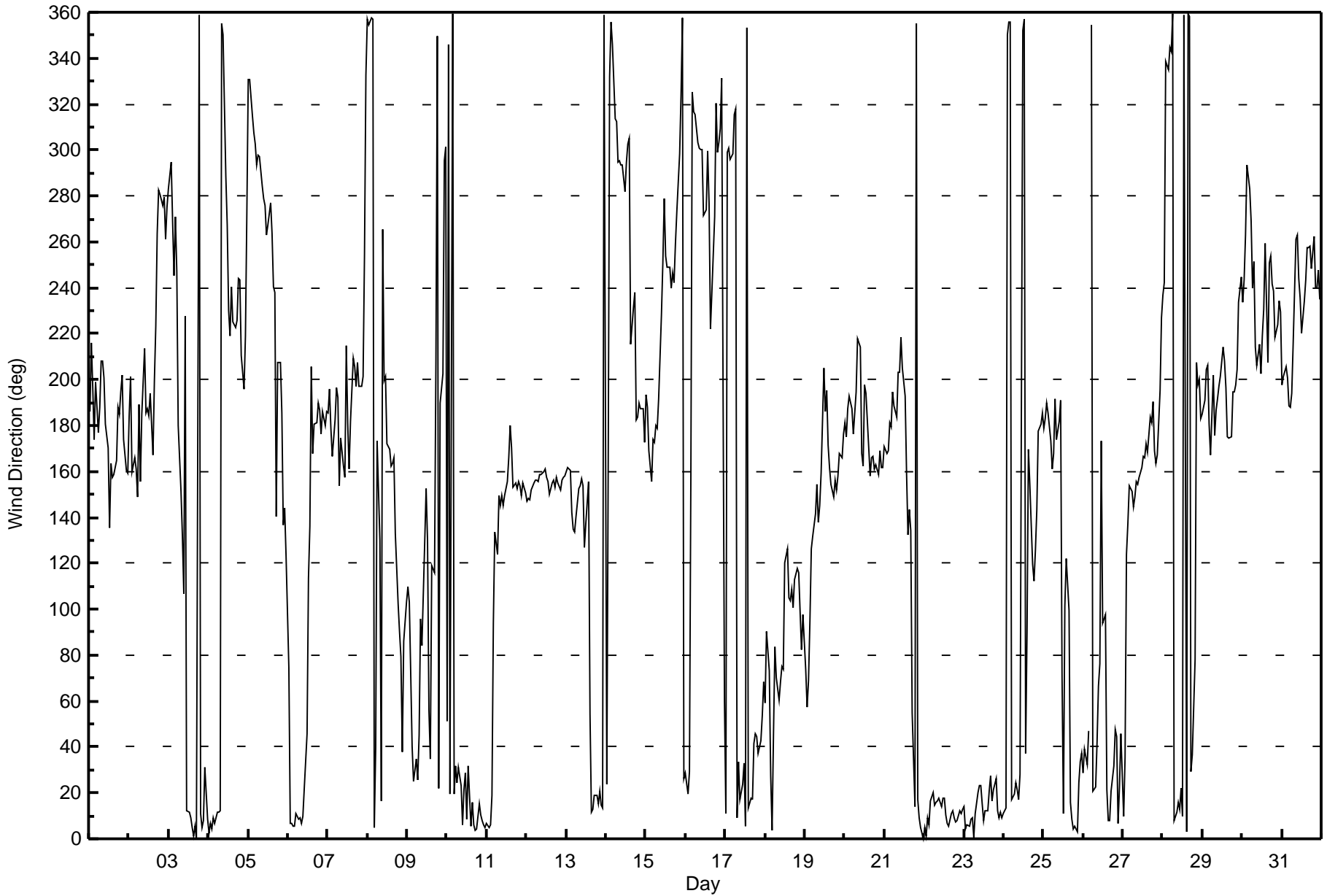


Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Direction (WD) - deg  
Mildred Lake - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 97 deg on Dec 8 09:00 Minimum Value: 8 deg on Dec 2 02:00 Percentiles: P <sub>1</sub> = 9 P <sub>10</sub> = 12 Q <sub>1</sub> = 14 Median = 17 Q <sub>3</sub> = 23 P <sub>90</sub> = 35 P <sub>99</sub> = 78																	Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	54	68	28	15	14	30	19	16	8	9	21	27	45	26	16	15	12	20	15	12	12	21	10	12	68
2-Dec	14	8	24	10	17	16	26	20	14	24	21	18	12	25	18	24	19	23	20	20	18	22	21	22	26
3-Dec	21	18	24	23	29	23	27	16	22	93	44	17	15	14	13	12	11	14	10	13	10	13	16	8	93
4-Dec	10	10	11	9	11	13	13	21	34	45	28	45	27	19	25	24	28	32	23	33	51	45	71	29	71
5-Dec	24	70	20	17	16	18	18	17	20	21	21	23	24	25	23	26	62	60	18	15	35	89	14	20	89
6-Dec	39	11	10	10	11	14	18	14	16	15	29	48	23	19	40	30	11	10	15	14	8	10	10	22	48
7-Dec	19	16	21	21	16	45	37	45	35	22	24	38	32	33	24	40	27	17	15	13	16	26	42	14	45
8-Dec	12	12	11	20	28	70	69	82	97	53	35	16	21	21	16	16	19	20	17	14	18	27	33	13	97
9-Dec	12	19	24	20	16	19	26	20	24	23	16	18	25	33	30	31	79	71	17	52	21	20	44	80	80
10-Dec	85	79	15	24	14	16	16	15	15	12	16	18	15	18	47	17	27	10	19	16	11	10	9	12	85
11-Dec	10	11	14	23	36	14	17	14	16	17	21	18	15	16	16	15	15	16	15	17	17	15	16	16	36
12-Dec	18	18	17	17	16	15	14	15	14	13	14	13	15	15	17	14	14	16	13	15	15	15	14	14	18
13-Dec	13	13	13	17	17	16	17	17	17	16	21	16	20	24	18	19	13	15	17	12	19	11	10	15	24
14-Dec	23	73	63	11	17	17	17	18	27	16	21	22	47	19	16	41	26	26	15	15	12	13	14	14	73
15-Dec	15	16	13	15	18	14	16	19	14	27	25	33	23	20	22	22	24	18	25	16	26	16	18	33	
16-Dec	17	17	20	68	15	15	18	16	15	16	22	28	21	16	39	52	28	43	17	16	16	16	30	24	68
17-Dec	70	18	18	16	16	16	14	23	16	14	17	23	22	17	15	11	13	19	15	15	15	18	20	19	70
18-Dec	18	26	25	24	22	17	20	18	17	16	12	14	24	18	13	10	10	10	12	11	12	13	18	16	26
19-Dec	26	38	48	33	15	16	17	20	18	24	36	40	22	16	19	14	26	20	15	16	20	13	13	14	48
20-Dec	12	12	19	13	14	14	13	13	16	16	26	18	31	24	24	13	12	11	12	13	12	15	12	13	31
21-Dec	15	12	12	15	17	19	14	18	19	17	14	17	19	23	19	25	53	23	18	19	15	37	18	15	53
22-Dec	12	11	12	12	14	14	14	14	15	17	16	17	18	15	15	13	14	12	13	12	12	14	14	16	18
23-Dec	15	13	13	14	13	14	13	15	14	14	16	15	15	16	15	15	16	16	16	15	13	12	14	13	16
24-Dec	13	15	12	9	18	19	15	16	21	14	22	19	30	39	40	24	27	10	14	23	32	13	18	14	40
25-Dec	19	19	11	14	15	18	27	13	18	16	20	64	30	46	20	20	21	11	11	12	11	17	14	13	64
26-Dec	15	24	16	23	AF	73	31	16	61	33	27	84	17	17	28	9	11	29	33	39	29	15	16	26	84
27-Dec	24	28	43	17	16	18	18	19	15	15	14	13	11	12	14	13	17	17	16	15	13	16	25	22	43
28-Dec	34	39	47	9	11	18	17	11	13	14	15	17	15	14	15	13	12	34	58	37	40	22	18	18	58
29-Dec	12	15	16	22	16	17	15	15	12	12	12	16	15	20	12	12	11	12	15	14	15	14	22	21	22
30-Dec	21	20	58	31	16	22	25	32	22	24	20	36	25	78	72	67	23	23	21	22	20	17	20	26	78
31-Dec	17	11	15	15	15	18	16	31	23	26	25	24	15	26	27	22	18	19	23	21	23	22	20	20	31
85 79 63 68 36 73 69 82 97 93 44 84 47 78 72 67 79 71 58 52 51 89 71 80																									
Diurnal Maximum																									
AF - Analyzer Failure																									





# Wood Buffalo Environmental Association

## SO2 Calibration Report

### Station Information

Calibration Date	December 3, 2015	Last Calibration	November 3, 2015
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	Routine		
Start Time (MST)	10:40	End Time (MST)	13:25
Gas Cert Reference	SA1301009	Station temp.	22 Deg C
Cal Gas Concentration	47.2 ppm	Cal Gas Exp Date	12/12/2016
Calibrator Make/Model	API T700	Serial Number	1185
ZAG Make/Model	API 701	Serial Number	825
DACS make/model	Campbell Scientific CR3000	DACS serial No.	8346

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-653	-653
Analyzer IP address	192.168.1.43		Lamp voltage	789	792
Calculated slope	0.996477	0.998497	Chamber temp	44.9	45.0
Calculated intercept	1.157659	0.410876	Pressure	691.7	682.5
Analyzer Background	21.3	21.5	Flow	0.488	0.482
Analyzer Coefficient	0.980	0.980	Intensity	90	90

Analyzer make TEI 43i Analyzer serial # JC1404901075

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.1	----
as found span	5000	82.7	780.7	781.6	0.999
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	82.7	780.7	781.6	0.999
second point	5000	41.6	392.7	393.0	0.999
third point	5000	20.8	196.4	195.6	1.004
as left zero	5000	0.0	0.0	0.3	----
as left span	5000	82.7	780.7	782.4	0.998
Average Correction Factor					1.001

Corrected As found 781.5 Previous response 782.3 % change 0.1%

**Notes:**

Changed inlet filter after as founds. No adjustments.

Calibration Performed By: Evan Magill



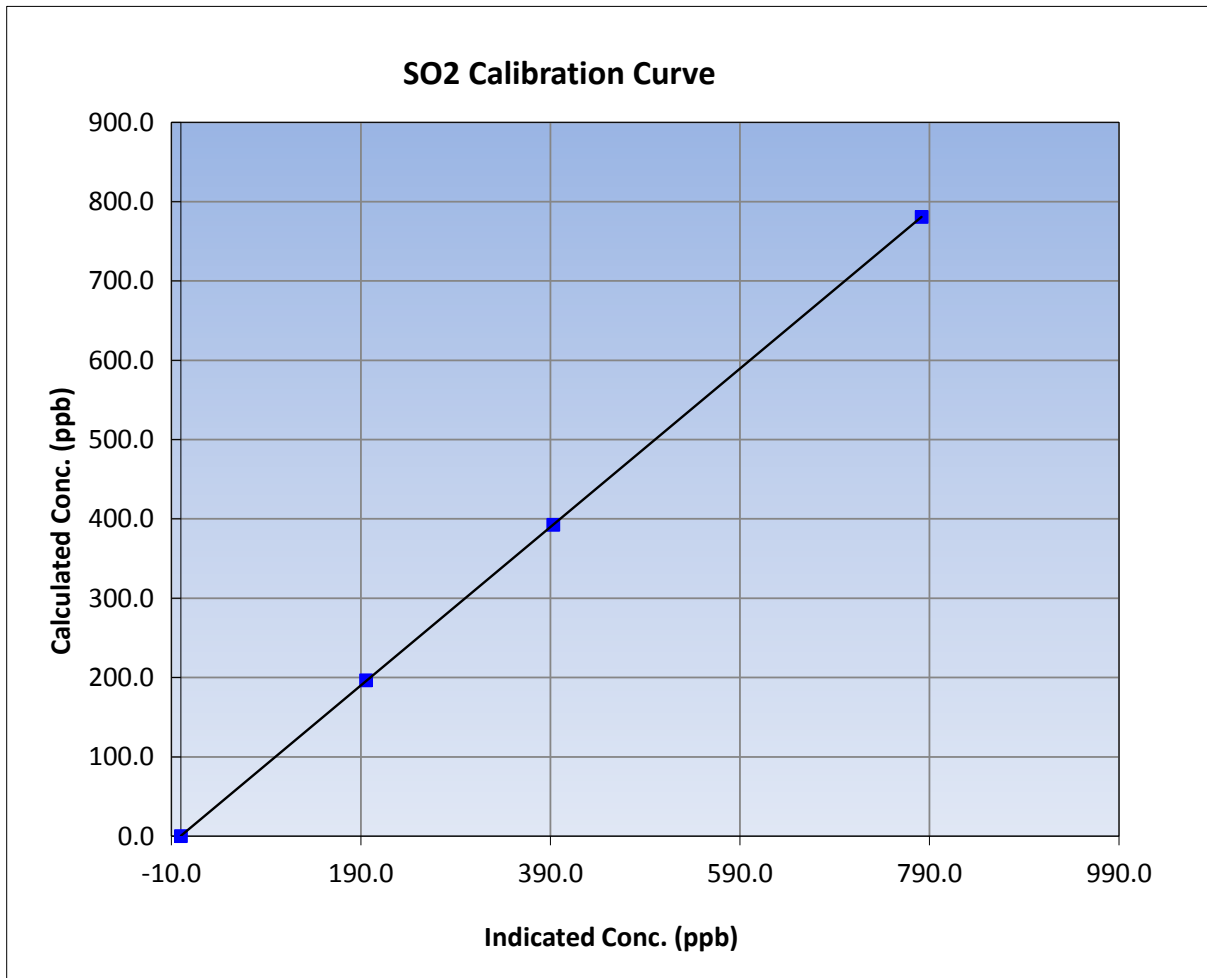
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 3, 2015
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	10:40	End Time (MST)	13:25
Analyzer make	TEI 43i	Analyzer serial #	JC1404901075

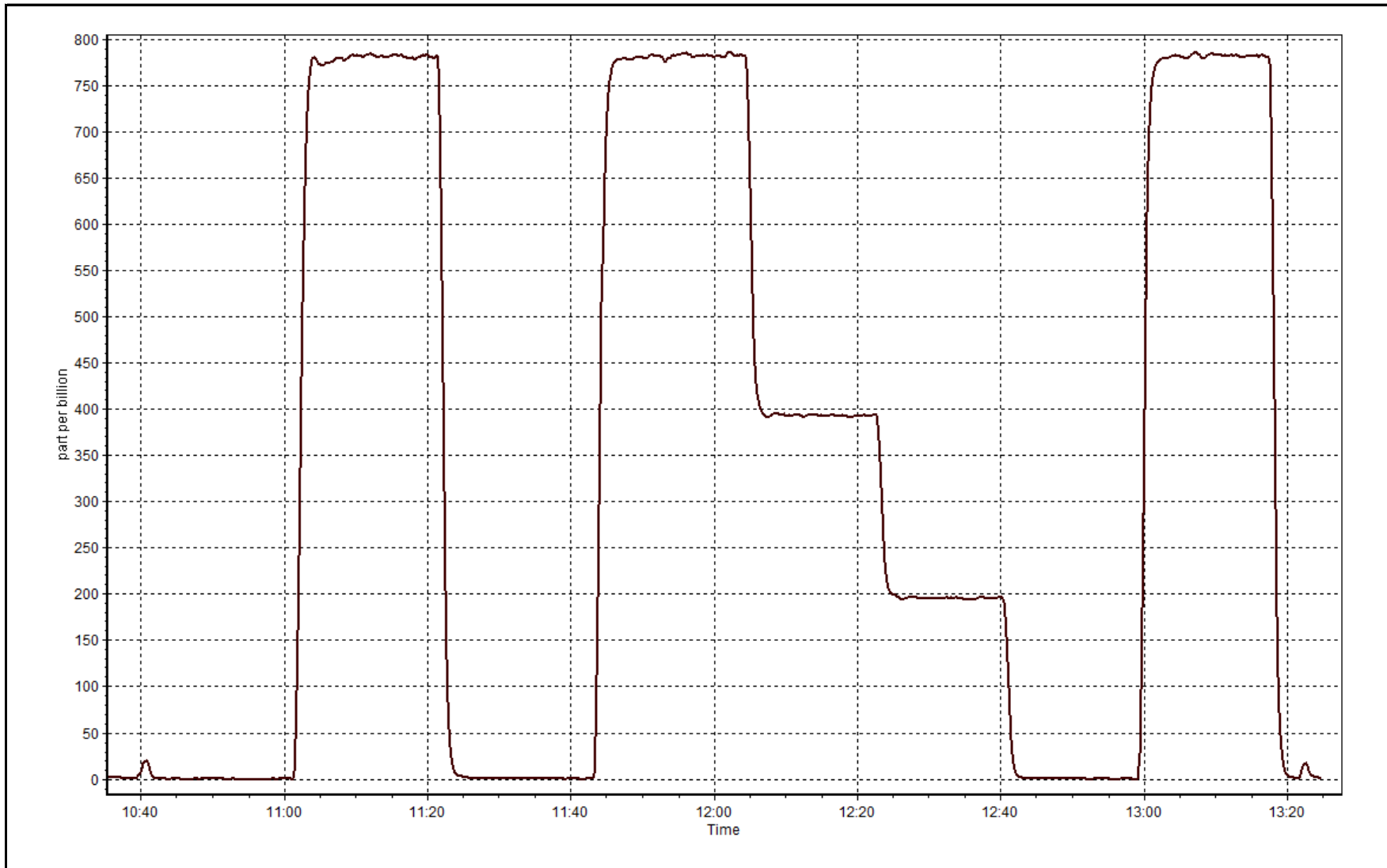
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999998
780.7	781.6	0.9988		
392.7	393.0	0.9994	Slope	0.998497
196.4	195.6	1.0041		
			Intercept	0.410876



SO2 Calibration Plot

Date: December 3, 2015





# Wood Buffalo Environmental Association H2S Calibration Report

## Station Information

Calibration Date	December 3, 2015	Last Calibration	November 3, 2015
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	Routine		
Start Time (MST)	13:25	End Time (MST)	16:30
Gas Cert Reference	ALM028262	Station temp.	22 Deg C
Cal Gas Concentration	5.04 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	API T700	Serial Number	1185
ZAG air Make/Model	API 701	Serial Number	825
DACS make/model	Campbell Scientific CR3000	Serial Number	8346
SO2 gas concentration	47.2 ppm	SO2 gas cert/exp	SA1301009 12-Dec-16

## Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-601	-601
Analyzer IP address	192.168.1.42		Lamp voltage	784	781
Calculated slope	1.011366	0.992494	Chamber temp	45	45
Calculated intercept	-0.028384	0.135986	Pressure	607.2	616.6
Analyzer Background	14	14.4	Flow	0.725	0.644
Analyzer Coefficient	0.955	0.971	Intensity	87	88
			Converter temp.	328	327

Analyzer make/model	TEI 450i	Analyzer serial #	815129107
Converter make/model	NA	Converter serial #	NA

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	4000	0.0	0.0	0.3	----
as found span	4000	64.1	80.8	79.5	1.016
SO2 scrubber check	5000	21.2	200.1	1.6	----
calibrator zero	4000	0.0	0.0	0.0	----
high point	4000	64.1	80.8	81.3	0.994
second point	4000	32.1	40.4	40.6	0.996
third point	4000	16.1	20.3	20.2	1.007
as left zero	5000	0.0	0.0	0.1	----
as left span	4000	64.1	80.8	81.8	0.987
Average Correction Factor					0.999

Corrected As found	79.2	Previous response	79.9	% change	0.9%
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**Notes:**

Changed inlet filter and scrubber check done after as founds. Adjusted zero and span.

Calibration Performed By: Evan Magill





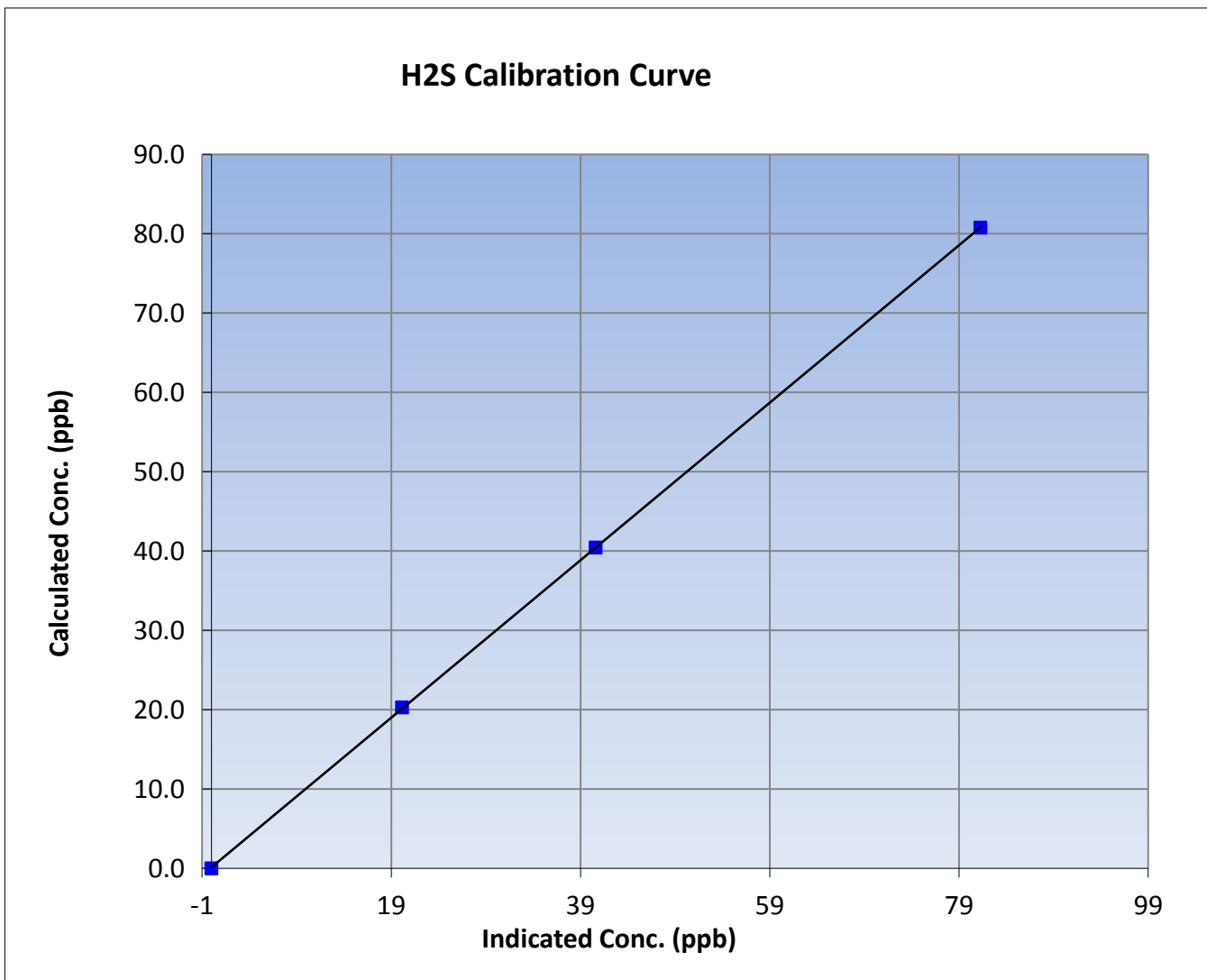
# Wood Buffalo Environmental Association H2S Calibration Report

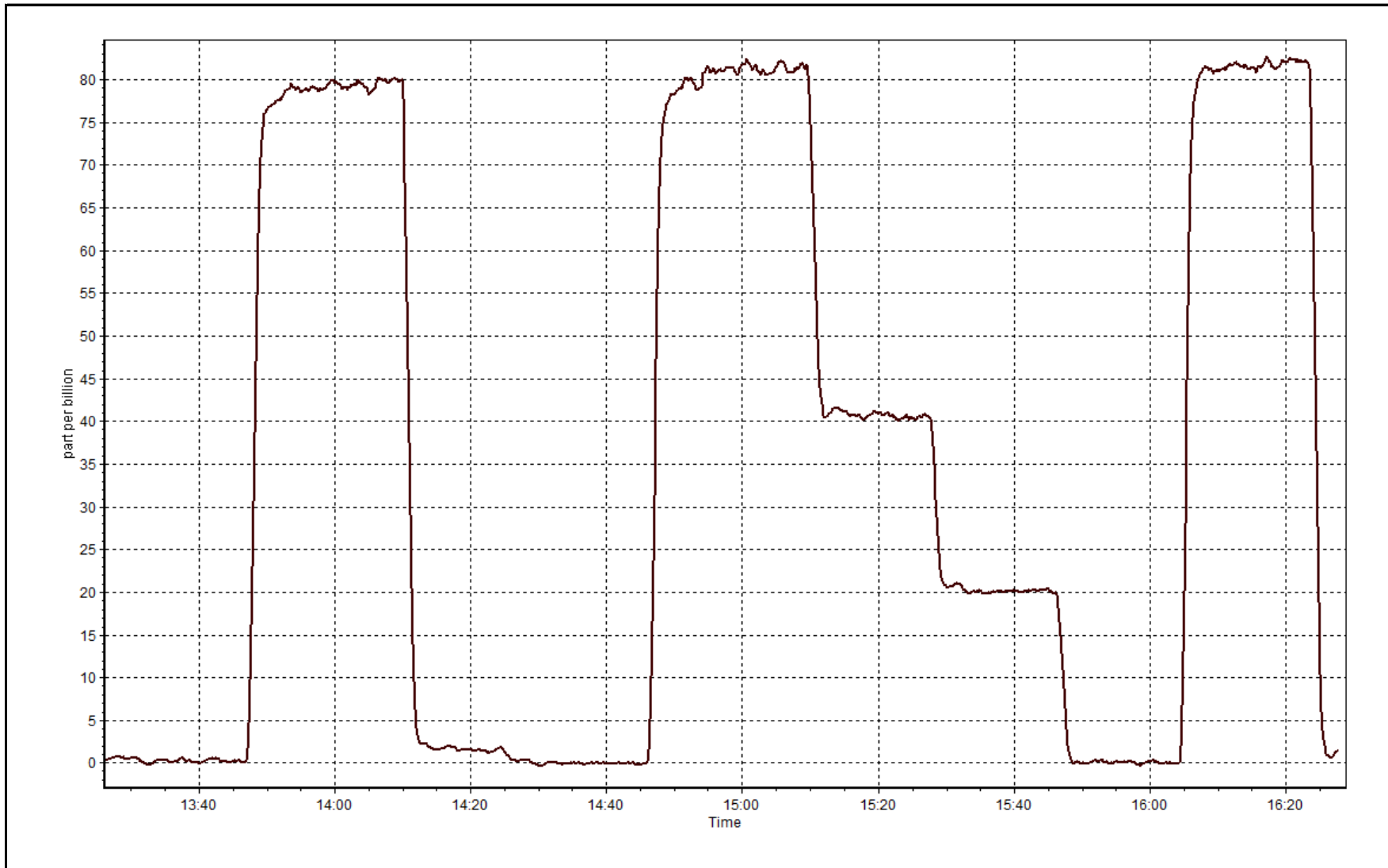
## Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 3, 2015
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	13:25	End Time (MST)	16:30
Analyzer make	TEI 450i	Analyzer serial #	815129107

## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999989
80.8	81.3	0.9937		
40.4	40.6	0.9960	Slope	0.992494
20.3	20.2	1.0067		
			Intercept	0.135986







# Wood Buffalo Environmental Association THC Calibration Report

## Station Information

Calibration Date	December-03-15	Last Calibration	November-03-15
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	Routine		
Start Time (MST)	10:40	End Time (MST)	13:25
Gas Cert Reference	SA1301009	Cal Gas Expiry Date	12/12/2016
CH4 Cal Gas Conc.	510 ppm	CH4 Equiv Conc.	1087.5 ppm
C3H8 Cal Gas Conc.	210 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	1185
ZAG make/model	Teledyne API 701	Serial Number	825
DACS make/model	Campbell Scientific CR3000	Serial Number	8346

## Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	8.2	8.2
Analyzer IP address	192.168.1.51		Air or Bypass Press	39.8	39.8
Calculated slope	1.000708	0.997475	Fuel Pressure	25.6	25.6
Calculated intercept	0.001730	0.009760	Analyzer Coeff	4.6	4.7
			Analyzer BKG	2.100	2.370

Analyzer make: Thermo 51i-LT      Analyzer serial #: 1300156231

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.18	----
as found span	5000	82.7	17.99	17.65	1.019
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	82.7	17.99	18.03	0.998
second point	5000	41.6	9.05	9.05	1.000
third point	5000	20.8	4.52	4.52	1.001
as left zero	5000	0.0	0.00	0.03	----
as left span	5000	82.7	17.99	17.83	1.009
Average Correction Factor					0.999

Corrected As found: 17.47      Previous response: 17.97      % change: 2.9%

**Notes:**

Changed inlet filter after as founds. Adjusted zero and span.

Calibration Performed By:

Evan Magill



# Wood Buffalo Environmental Association THC Calibration Report

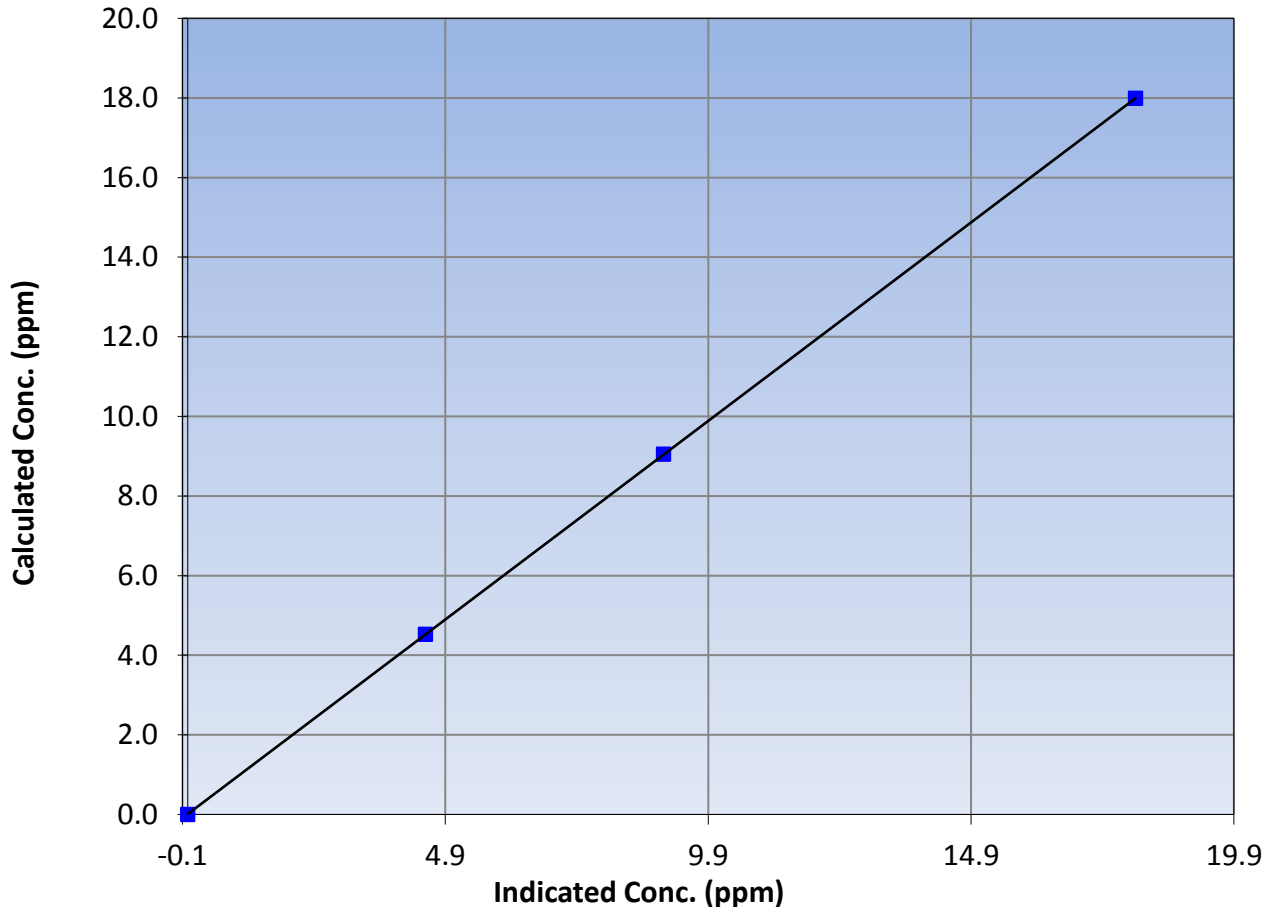
## Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 3, 2015
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	10:40	End Time (MST)	13:25
Analyzer make	Thermo 51i-LT	Analyzer serial #	1300156231

## Calibration Data

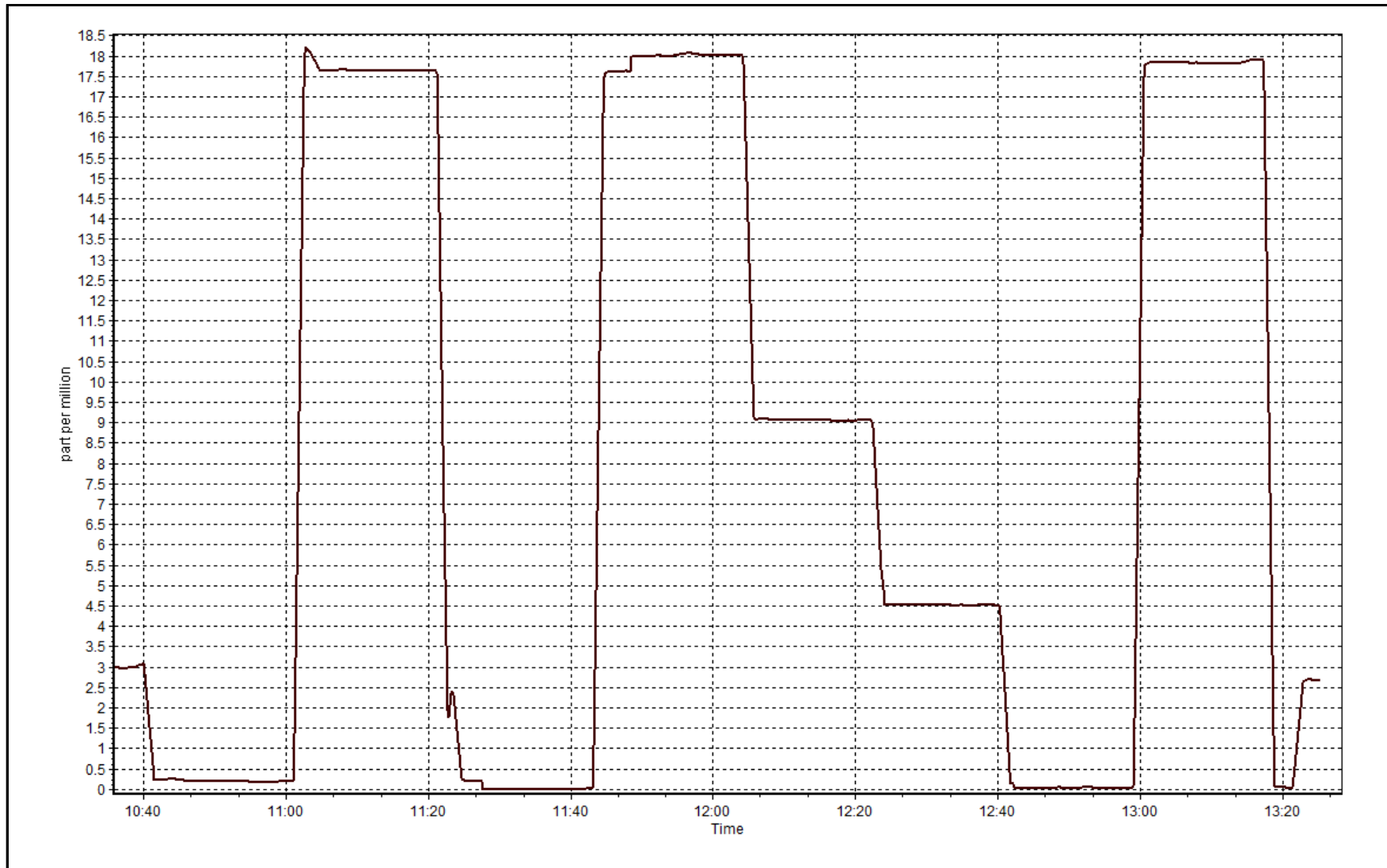
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999998
17.99	18.03	0.9976		
9.05	9.05	0.9998	Slope	0.997475
4.52	4.52	1.0009		
			Intercept	0.009760

**THC Calibration Curve**



THC Calibration Plot

Date: December 3, 2015





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## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

### **AMS 3 LOWER CAMP METEOROLOGY DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP MET TOWER (AMS 3)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
Temperature 20 m (C) Average	744	0	0	100.00	6	-	-1.0	-
Temperature 45 m (C) Average	744	0	0	100.00	6.2	-	-0.9	-
Temperature 100 m (C) Average	744	0	0	100.00	6.4	-	-0.1	-
Temperature 167 m (C) Average	744	0	0	100.00	6.4	-	1.7	-
Relative Humidity 20 m (%) Average	744	0	0	100.00	96	-	93.0	-
Relative Humidity 45 m (%) Average	744	0	0	100.00	95	-	93.0	-
Relative Humidity 100 m (%) Average	744	0	0	100.00	95	-	94.0	-
Relative Humidity 167 m (%) Average	744	0	0	100.00	95	-	94.0	-
Wind Speed 20 m (km/h) Average	742	0	2	99.73	21	-	16.0	-
Wind Speed 45 m (km/h) Average	742	0	2	99.73	29	-	20.0	-
Wind Speed 100 m (km/h) Average	744	0	0	100.00	41	-	29.0	-
Wind Speed 167 m (km/h) Average	714	0	30	95.97	43	-	31.0	-
Wind Direction 20 m (deg) Average	742	0	2	99.73	-	-	-	-
Wind Direction 45 m (deg) Average	742	0	2	99.73	-	-	-	-
Wind Direction 100 m (deg) Average	744	0	0	100.00	-	-	-	-
Wind Direction 167 m (deg) Average	714	0	30	95.97	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	742	0	2	99.73	0.5	-	0.2	-
Vertical Wind Speed 45 m (km/h) Average	742	0	2	99.73	2.2	-	1.0	-
Vertical Wind Speed 100 m (km/h) Average	744	0	0	100.00	4.3	-	2.2	-
Vertical Wind Speed 167 m (km/h) Average	714	0	30	95.97	5.8	-	2.7	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP MET TOWER (AMS 3)  
DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
Temperature 20 m (C) Average	744	-10.54	6.3	-	-27.3	-18.5	-15.7	-10.7	-4.9	-3.3	6
Temperature 45 m (C) Average	744	-10.41	6.3	-	-26.9	-18.5	-15.6	-10.4	-5	-3.3	6.2
Temperature 100 m (C) Average	744	-10.06	6.4	-	-24.7	-18.9	-15.3	-8.9	-5	-2.7	6.4
Temperature 167 m (C) Average	744	-9.93	6.6	-	-22.9	-19.3	-15.2	-8.1	-5.1	-1.8	6.4
Relative Humidity 20 m (%) Average	744	81	7	-	56	73	77	80	85	91	96
Relative Humidity 45 m (%) Average	744	79.6	7	-	54	72	76	79	84	90	95
Relative Humidity 100 m (%) Average	744	79.4	9	-	48	67	77	80	84	90	95
Relative Humidity 167 m (%) Average	744	79.2	11	-	34	65	77	81	85	91	95
Wind Speed 20 m (km/h) Average	742	7	5	-	0	2	3	5	10	14	21
Wind Speed 45 m (km/h) Average	742	9.2	6	-	0	3	5	7	13	18	29
Wind Speed 100 m (km/h) Average	744	13	8	-	1	4	7	11	17	25	41
Wind Speed 167 m (km/h) Average	714	16.5	9	-	0	6	10	15	22	30	43
Wind Direction 20 m (deg) Average	742	-	-	-	-	-	-	-	-	-	-
Wind Direction 45 m (deg) Average	742	-	-	-	-	-	-	-	-	-	-
Wind Direction 100 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Wind Direction 167 m (deg) Average	714	-	-	-	-	-	-	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	742	-0.02	0.2	-	-0.7	-0.2	-0.1	0	0.1	0.2	0.5
Vertical Wind Speed 45 m (km/h) Average	742	0.2	0.5	-	-1.2	-0.3	-0.1	0.1	0.5	1	2.2
Vertical Wind Speed 100 m (km/h) Average	744	0.42	0.8	-	-2.7	-0.2	0	0.1	0.6	1.5	4.3
Vertical Wind Speed 167 m (km/h) Average	714	0.86	1	-	-2.7	0	0.2	0.6	1.3	2.1	5.8

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP MET TOWER (AMS 3)  
 DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed. Wind Direction, Vertical Wind Speed 20 m	02 Dec 2015 14:00	02 Dec 2015 15:00	2	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 45 m	01 Dec 2015 14:00	01 Dec 2015 14:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 45 m	02 Dec 2015 14:00	02 Dec 2015 14:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed. Wind Direction, Vertical Wind Speed 167 m	10 Dec 2015 02:00	11 Dec 2015 07:00	30	Flat line in sensor output signal - Sensor frozen

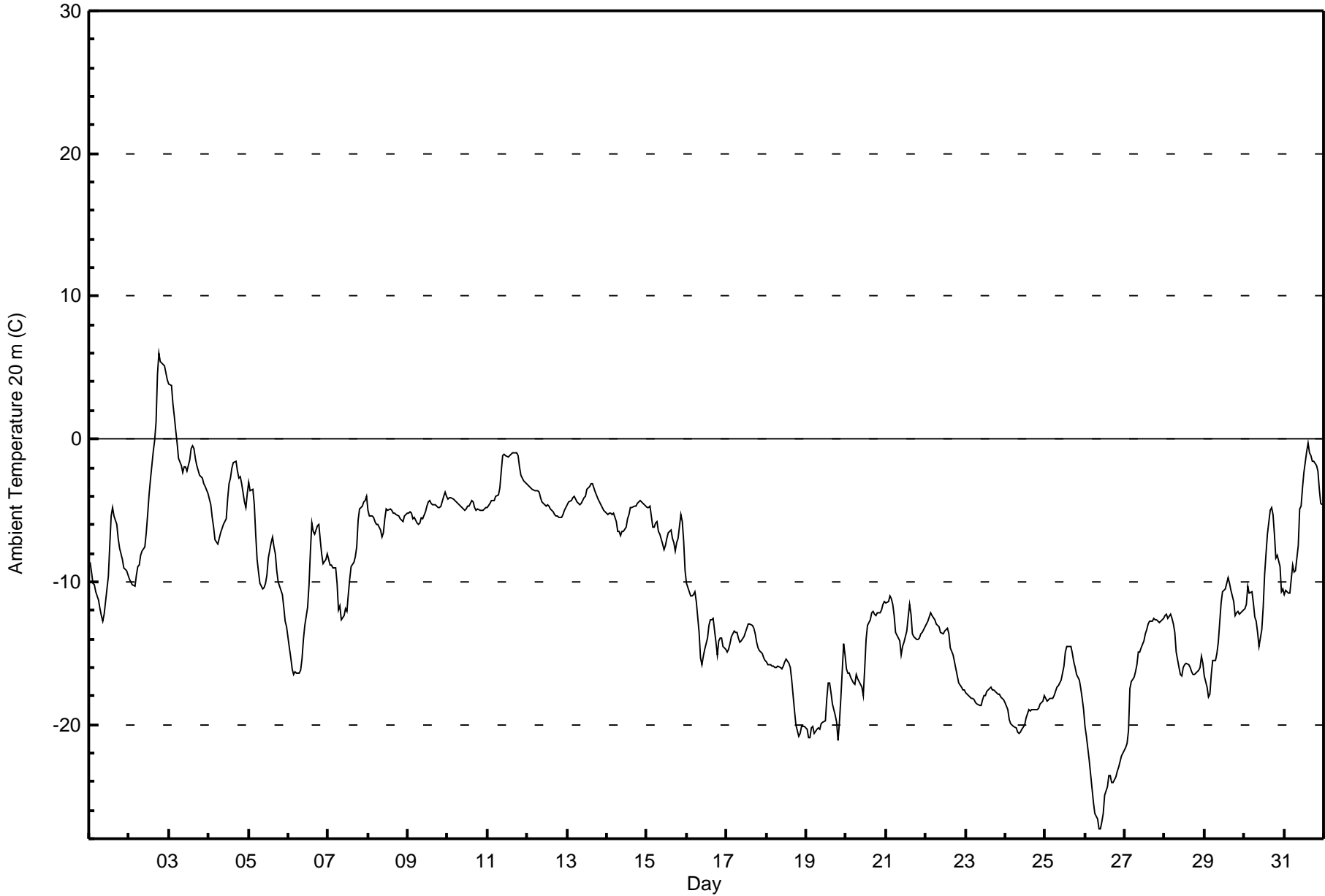


Maximum Value: 6.0 C on Dec 2 19:00      Maximum Daily Average: -1.0 C on Dec 3																								Hours in Service: 744		
Minimum Value: -27.3 C on Dec 26 10:00      Minimum Daily Average: -24.1 C on Dec 26																								Hours of Data: 744		
Maximum Diurnal Average: -9.0 C at hour 15      Minimum Diurnal Average: -11.9 C at hour 9																								Hours of Missing Data: 0		
Monthly Average: -10.54 C      Percentiles: P <sub>1</sub> = -25.0 P <sub>10</sub> = -18.5 Q <sub>1</sub> = -15.7 Median = -10.7 Q <sub>3</sub> = -4.9 P <sub>90</sub> = -3.3 P <sub>99</sub> = 3.8																								Hours of Calibration: 0		
Percent Operational Time: 100.0																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-8.6	-9.3	-10.1	-10.2	-10.7	-11.3	-11.9	-12.4	-12.7	-12.2	-11.4	-9.7	-7.4	-5.4	-4.8	-5.4	-6.0	-6.9	-7.6	-8.0	-8.4	-9.0	-9.2	-9.5	-9.1	-4.8
2-Dec	-9.8	-10.0	-10.2	-10.3	-9.6	-8.9	-8.8	-8.1	-7.9	-7.5	-6.5	-5.2	-4.0	-2.8	-0.8	-0.1	1.2	4.5	6.0	5.4	5.2	5.1	4.6	4.2	-3.1	6.0
3-Dec	3.9	3.7	2.5	1.6	0.6	-0.2	-1.3	-1.8	-2.4	-1.9	-2.0	-2.2	-1.4	-0.7	-0.4	-0.6	-1.4	-1.8	-2.5	-2.6	-2.7	-3.1	-3.3	-3.8	-1.0	3.9
4-Dec	-4.2	-4.7	-5.5	-6.2	-7.1	-7.4	-7.0	-6.6	-6.3	-6.0	-5.6	-4.2	-3.1	-2.7	-2.0	-1.6	-1.5	-2.3	-2.7	-2.7	-3.2	-4.4	-4.8	-3.9	-4.4	-1.5
5-Dec	-3.0	-3.6	-3.5	-4.6	-6.7	-8.5	-9.3	-10.1	-10.5	-10.4	-10.2	-9.5	-8.3	-7.3	-6.8	-7.5	-8.0	-9.3	-10.0	-10.6	-10.8	-11.7	-12.7	-13.2	-8.6	-3.0
6-Dec	-14.6	-15.4	-16.1	-16.5	-16.3	-16.4	-16.4	-16.2	-15.4	-14.1	-13.0	-11.8	-10.2	-7.9	-5.9	-6.5	-6.6	-6.1	-6.0	-7.1	-8.0	-8.7	-8.4	-8.1	-11.3	-5.9
7-Dec	-8.5	-8.8	-8.9	-9.1	-9.1	-10.1	-12.0	-11.7	-12.7	-12.4	-11.9	-12.1	-10.9	-9.9	-8.9	-8.6	-8.2	-7.5	-5.7	-4.9	-4.7	-4.4	-4.3	-4.0	-8.7	-4.0
8-Dec	-5.0	-5.4	-5.4	-5.5	-5.7	-6.0	-6.0	-6.4	-6.9	-6.6	-5.6	-4.9	-5.0	-4.9	-5.0	-5.2	-5.2	-5.3	-5.4	-5.6	-5.6	-5.8	-5.4	-5.2	-5.5	-4.9
9-Dec	-5.2	-5.1	-5.1	-5.6	-5.5	-5.9	-6.0	-5.8	-5.5	-5.6	-5.1	-4.7	-4.4	-4.3	-4.5	-4.6	-4.6	-4.7	-4.8	-4.8	-4.7	-4.0	-3.8	-4.0	-4.9	-3.8
10-Dec	-4.2	-4.1	-4.1	-4.2	-4.4	-4.4	-4.5	-4.6	-4.8	-4.9	-5.0	-4.9	-4.7	-4.7	-4.3	-4.4	-4.8	-5.0	-4.9	-5.0	-5.0	-5.0	-4.9	-4.8	-4.6	-4.1
11-Dec	-4.8	-4.6	-4.4	-4.3	-4.3	-4.0	-3.9	-3.5	-2.3	-1.2	-1.0	-1.1	-1.3	-1.2	-1.1	-1.0	-0.9	-0.9	-1.2	-1.9	-2.5	-2.7	-2.9	-3.1	-2.5	-0.9
12-Dec	-3.3	-3.3	-3.5	-3.6	-3.6	-3.6	-3.6	-3.7	-4.1	-4.4	-4.6	-4.7	-4.6	-4.7	-4.9	-5.1	-5.3	-5.4	-5.4	-5.5	-5.5	-5.3	-5.0	-4.8	-4.5	-3.3
13-Dec	-4.6	-4.4	-4.4	-4.1	-4.0	-4.2	-4.4	-4.6	-4.5	-4.3	-4.1	-4.0	-3.5	-3.3	-3.1	-3.1	-3.4	-3.7	-4.2	-4.4	-4.6	-4.8	-5.0	-5.1	-4.2	-3.1
14-Dec	-5.2	-5.2	-5.2	-5.3	-5.2	-5.8	-6.4	-6.5	-6.8	-6.5	-6.5	-6.2	-5.6	-5.3	-4.8	-4.8	-4.7	-4.7	-4.5	-4.4	-4.3	-4.4	-4.6	-4.7	-5.3	-4.3
15-Dec	-4.8	-4.8	-4.7	-6.1	-6.2	-5.9	-5.8	-6.5	-6.7	-7.4	-7.8	-7.5	-6.9	-6.6	-6.4	-7.0	-7.2	-7.9	-7.3	-6.9	-5.3	-5.8	-7.2	-9.2	-6.6	-4.7
16-Dec	-10.1	-10.7	-11.0	-11.0	-10.9	-10.7	-11.3	-13.6	-15.3	-15.8	-15.3	-14.7	-14.0	-13.1	-12.6	-12.7	-12.6	-14.2	-15.1	-14.2	-14.0	-14.0	-14.5	-14.7	-13.2	-10.1
17-Dec	-14.9	-14.8	-14.4	-13.9	-13.5	-13.5	-13.6	-13.9	-14.2	-14.1	-13.9	-13.6	-13.3	-13.0	-13.0	-13.1	-13.3	-13.7	-14.3	-14.6	-14.8	-15.0	-15.3	-15.5	-14.0	-13.0
18-Dec	-15.7	-15.8	-15.8	-15.9	-15.9	-16.0	-16.0	-15.9	-16.0	-16.1	-16.0	-15.6	-15.4	-15.7	-16.0	-16.9	-17.9	-19.0	-20.0	-20.9	-20.6	-20.1	-20.1	-20.1	-17.2	-15.4
19-Dec	-20.4	-21.0	-20.9	-20.2	-20.1	-20.6	-20.4	-20.2	-20.3	-19.9	-19.8	-19.7	-18.2	-17.1	-17.1	-17.8	-18.5	-19.3	-19.9	-21.1	-19.9	-18.1	-14.3	-15.1	-19.2	-14.3
20-Dec	-16.1	-16.4	-16.4	-16.7	-17.1	-17.2	-16.5	-16.8	-17.0	-17.4	-18.0	-16.1	-14.0	-13.1	-12.7	-12.1	-12.0	-12.3	-12.4	-12.2	-12.2	-12.0	-11.6	-11.4	-14.6	-11.4
21-Dec	-11.5	-11.4	-11.0	-11.2	-11.5	-12.3	-13.6	-13.9	-14.2	-15.1	-14.6	-14.3	-13.4	-12.5	-11.6	-12.3	-13.7	-13.8	-14.1	-14.0	-13.9	-13.7	-13.5	-13.1	-13.1	-11.0
22-Dec	-13.0	-12.7	-12.5	-12.2	-12.3	-12.7	-12.9	-13.1	-13.2	-13.6	-13.7	-13.5	-13.4	-13.2	-13.6	-14.6	-15.1	-15.6	-16.1	-16.6	-17.0	-17.4	-17.6	-17.6	-14.3	-12.2
23-Dec	-17.8	-17.9	-18.0	-18.1	-18.2	-18.3	-18.5	-18.6	-18.7	-18.6	-18.3	-18.0	-17.9	-17.7	-17.4	-17.4	-17.6	-17.6	-17.7	-17.9	-17.9	-18.0	-18.2	-18.3	-18.0	-17.4
24-Dec	-18.5	-19.0	-19.6	-20.0	-20.0	-20.1	-20.3	-20.6	-20.6	-20.5	-20.3	-20.0	-19.6	-19.2	-19.0	-19.0	-19.0	-18.9	-19.0	-19.0	-18.9	-18.5	-18.4	-18.0	-19.4	-18.0
25-Dec	-18.1	-18.4	-18.3	-18.1	-18.2	-18.0	-17.7	-17.4	-17.3	-16.9	-16.4	-15.9	-15.0	-14.5	-14.5	-14.5	-15.0	-15.6	-16.0	-16.5	-16.9	-17.5	-18.2	-19.0	-16.8	-14.5
26-Dec	-20.2	-20.8	-22.5	-23.5	-24.5	-25.5	-26.2	-26.7	-27.3	-27.3	-26.9	-26.2	-25.0	-24.4	-23.6	-23.5	-24.0	-24.0	-23.6	-23.2	-23.0	-22.6	-22.2	-22.0	-24.1	-20.2
27-Dec	-21.6	-21.3	-20.4	-17.5	-17.0	-16.7	-16.3	-15.8	-15.0	-14.9	-14.6	-14.1	-13.6	-13.4	-13.0	-12.8	-12.7	-12.6	-12.6	-12.7	-12.7	-12.8	-12.7	-12.5	-15.0	-12.5
28-Dec	-12.4	-12.2	-12.6	-12.3	-12.6	-12.9	-13.5	-15.0	-16.0	-16.5	-16.6	-16.0	-15.9	-15.7	-15.8	-16.0	-16.3	-16.5	-16.5	-16.3	-16.3	-16.0	-15.2	-15.7	-15.0	-12.2
29-Dec	-16.6	-17.4	-18.1	-17.8	-16.5	-15.5	-15.5	-15.0	-14.2	-12.9	-11.5	-10.7	-10.5	-10.1	-9.7	-10.1	-10.6	-11.4	-12.4	-12.2	-12.0	-12.3	-12.2	-11.9	-13.2	-9.7
30-Dec	-11.9	-11.6	-10.3	-10.8	-10.7	-11.5	-12.5	-12.8	-13.6	-14.6	-13.4	-11.7	-9.5	-8.1	-6.7	-5.0	-4.8	-5.3	-6.6	-8.4	-8.2	-8.9	-10.7	-10.5	-9.9	-4.8
31-Dec	-10.9	-10.6	-10.8	-10.8	-9.8	-8.8	-9.4	-9.3	-7.4	-4.9	-4.7	-3.4	-2.4	-0.9	-0.3	-1.0	-1.2	-1.6	-1.5	-1.8	-2.2	-3.6	-4.5	-4.6	-5.3	-0.3
																								Diurnal Average		
																								Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature 20 m (AT20m) - C**  
**Lower Camp Met Tower - December 2015**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 20 m (AT20m) - C  
Lower Camp Met Tower - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	50	6.72	6.72
-20 - 0	681	91.53	98.25
0 - 10	13	1.75	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

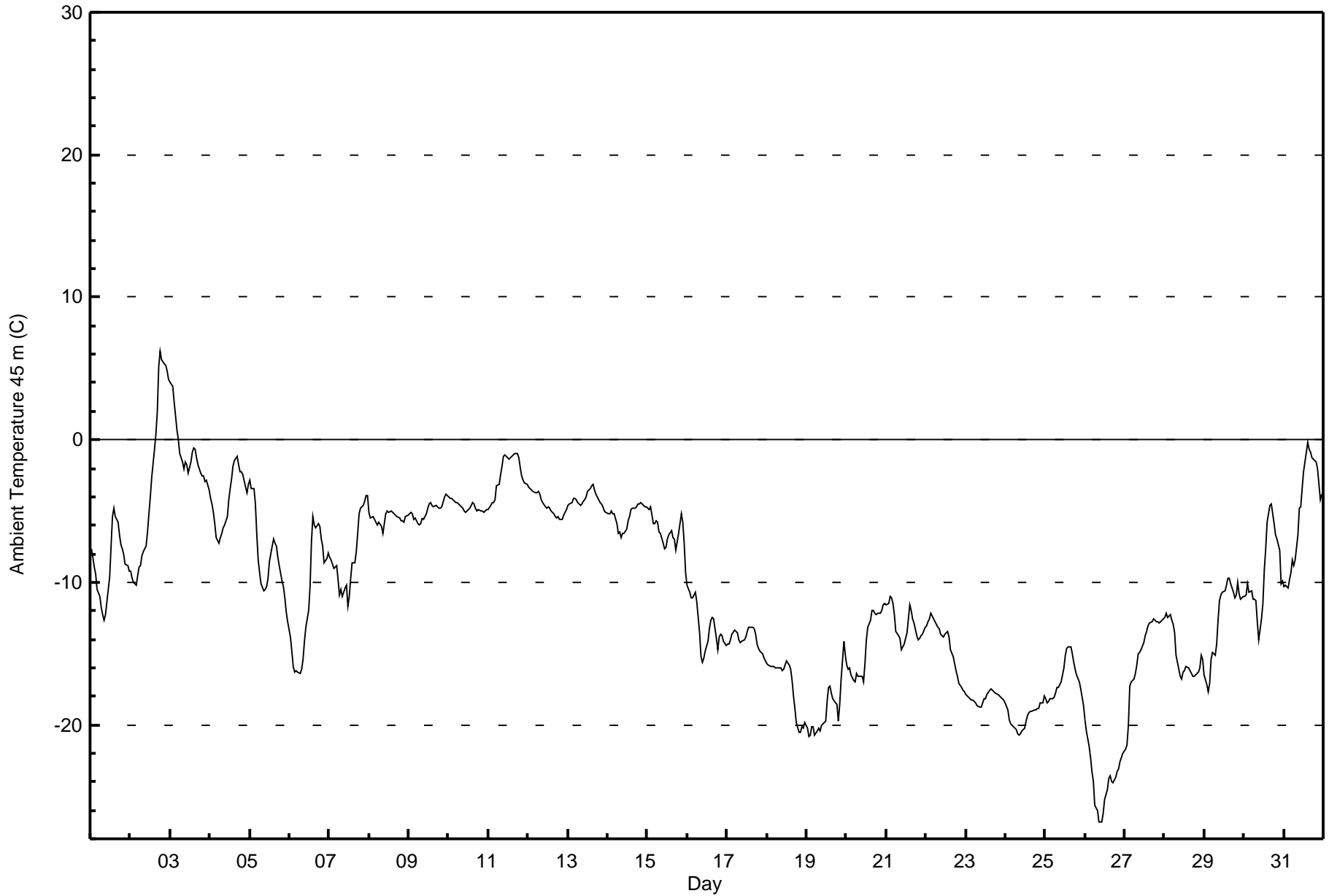


Maximum Value: 6.2 C on Dec 2 19:00		Maximum Daily Average: -0.9 C on Dec 3		Hours in Service: 744																						
Minimum Value: -26.9 C on Dec 26 09:00		Minimum Daily Average: -23.8 C on Dec 26		Hours of Data: 744																						
Maximum Diurnal Average: -9.1 C at hour 15		Minimum Diurnal Average: -11.7 C at hour 9		Hours of Missing Data: 0																						
Monthly Average: -10.41 C		Percentiles: P <sub>1</sub> = -24.6 P <sub>10</sub> = -18.5 Q <sub>1</sub> = -15.6 Median = -10.4 Q <sub>3</sub> = -5.0 P <sub>90</sub> = -3.3 P <sub>99</sub> = 3.8		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-7.6	-8.3	-9.0	-9.4	-10.5	-11.0	-11.8	-12.3	-12.6	-12.3	-11.4	-9.6	-7.5	-5.4	-4.8	-5.4	-5.8	-6.6	-7.4	-7.7	-8.0	-8.7	-8.8	-9.2	-8.8	-4.8
2-Dec	-9.2	-9.7	-10.0	-10.2	-9.5	-9.0	-8.8	-8.1	-7.9	-7.5	-6.5	-5.2	-4.0	-2.7	-0.7	0.4	2.0	5.1	6.2	5.6	5.4	5.2	4.8	4.3	-2.9	6.2
3-Dec	4.0	3.7	2.7	1.7	0.7	0.0	-1.0	-1.6	-2.0	-1.6	-1.7	-2.3	-1.6	-0.9	-0.6	-0.6	-1.3	-1.7	-2.3	-2.6	-2.5	-2.9	-2.8	-3.5	-0.9	4.0
4-Dec	-4.1	-4.5	-5.1	-5.9	-6.9	-7.2	-6.9	-6.5	-6.2	-6.0	-5.4	-4.2	-3.4	-2.7	-1.9	-1.4	-1.1	-1.7	-2.2	-2.4	-3.3	-3.8	-3.1	-4.1	-1.1	-1.1
5-Dec	-2.8	-3.4	-3.4	-4.5	-6.6	-8.4	-9.3	-10.1	-10.6	-10.5	-10.3	-9.7	-8.5	-7.5	-6.9	-7.3	-7.4	-8.2	-8.8	-10.0	-10.4	-11.1	-12.1	-12.8	-8.4	-2.8
6-Dec	-13.9	-14.8	-15.9	-16.3	-16.2	-16.3	-16.4	-16.1	-15.4	-14.2	-13.2	-12.0	-10.3	-7.1	-5.4	-6.0	-6.2	-5.9	-6.0	-6.9	-7.4	-8.6	-8.4	-8.0	-11.1	-5.4
7-Dec	-8.2	-8.5	-8.7	-9.0	-8.8	-9.8	-10.9	-10.5	-11.0	-10.4	-10.3	-11.7	-11.0	-9.7	-8.6	-8.6	-7.8	-6.6	-5.2	-4.8	-4.6	-4.4	-4.0	-3.9	-8.2	-3.9
8-Dec	-5.1	-5.5	-5.4	-5.6	-5.8	-5.9	-5.8	-6.1	-6.5	-5.9	-5.2	-5.0	-5.1	-5.0	-5.1	-5.2	-5.3	-5.3	-5.5	-5.6	-5.7	-5.8	-5.4	-5.3	-5.5	-5.0
9-Dec	-5.2	-5.1	-5.2	-5.6	-5.5	-5.9	-6.0	-5.8	-5.5	-5.6	-5.2	-4.8	-4.5	-4.4	-4.6	-4.7	-4.6	-4.7	-4.8	-4.8	-4.7	-4.0	-3.8	-3.9	-5.0	-3.8
10-Dec	-4.0	-4.1	-4.1	-4.3	-4.4	-4.4	-4.5	-4.7	-4.8	-5.0	-5.1	-5.0	-4.9	-4.8	-4.5	-4.5	-4.8	-5.0	-4.9	-5.0	-5.0	-5.1	-5.0	-4.9	-4.7	-4.0
11-Dec	-4.9	-4.6	-4.4	-4.4	-4.2	-3.2	-3.2	-2.5	-1.8	-1.1	-1.1	-1.2	-1.3	-1.2	-1.2	-1.0	-1.0	-1.0	-1.3	-2.0	-2.6	-2.8	-3.0	-3.2	-2.4	-1.0
12-Dec	-3.3	-3.4	-3.5	-3.6	-3.7	-3.7	-3.7	-3.8	-4.2	-4.4	-4.7	-4.8	-4.7	-4.8	-5.0	-5.2	-5.4	-5.4	-5.4	-5.5	-5.6	-5.3	-5.1	-4.9	-4.5	-3.3
13-Dec	-4.6	-4.5	-4.4	-4.1	-4.1	-4.2	-4.4	-4.6	-4.5	-4.4	-4.2	-4.1	-3.6	-3.4	-3.2	-3.2	-3.5	-3.8	-4.3	-4.4	-4.5	-4.7	-4.9	-5.1	-4.2	-3.2
14-Dec	-5.2	-5.2	-5.0	-5.2	-5.2	-5.8	-6.5	-6.5	-6.8	-6.6	-6.6	-6.3	-5.7	-5.4	-4.9	-4.8	-4.8	-4.7	-4.5	-4.5	-4.4	-4.5	-4.7	-4.7	-5.4	-4.4
15-Dec	-4.8	-4.9	-4.7	-5.9	-5.8	-5.7	-5.8	-6.4	-6.6	-7.3	-7.7	-7.5	-7.0	-6.6	-6.4	-6.8	-6.9	-7.7	-7.1	-6.6	-5.2	-5.8	-7.2	-9.3	-6.5	-4.7
16-Dec	-10.2	-10.7	-11.1	-11.0	-10.9	-10.7	-11.4	-13.5	-15.3	-15.6	-15.3	-14.8	-14.1	-13.2	-12.7	-12.5	-12.5	-14.0	-14.7	-13.8	-13.6	-13.7	-14.2	-14.4	-13.1	-10.2
17-Dec	-14.4	-14.4	-14.0	-13.7	-13.4	-13.4	-13.5	-14.0	-14.3	-14.1	-14.0	-13.8	-13.5	-13.2	-13.1	-13.1	-13.3	-13.7	-14.3	-14.6	-14.8	-15.1	-15.3	-15.6	-14.0	-13.1
18-Dec	-15.7	-15.9	-15.9	-15.9	-15.9	-16.0	-16.0	-16.0	-16.0	-16.2	-16.1	-15.9	-15.6	-15.8	-16.1	-16.9	-17.9	-18.9	-19.9	-20.5	-20.5	-20.1	-20.2	-19.9	-17.2	-15.6
19-Dec	-20.2	-20.9	-20.7	-20.1	-20.2	-20.7	-20.4	-20.3	-20.4	-20.0	-19.9	-19.7	-18.4	-17.4	-17.3	-17.8	-18.1	-18.4	-18.5	-19.7	-18.6	-16.8	-14.2	-15.1	-18.9	-14.2
20-Dec	-15.8	-16.1	-16.0	-16.5	-16.9	-17.0	-16.4	-16.6	-16.6	-16.6	-17.0	-15.7	-14.1	-13.2	-12.6	-11.9	-11.9	-12.1	-12.3	-12.2	-12.2	-12.0	-11.6	-11.5	-14.4	-11.5
21-Dec	-11.6	-11.5	-11.0	-11.1	-11.5	-12.3	-13.4	-13.8	-13.9	-14.8	-14.6	-14.4	-13.6	-12.6	-11.6	-12.0	-12.6	-12.9	-13.8	-14.1	-14.0	-13.7	-13.6	-13.2	-13.0	-11.0
22-Dec	-13.1	-12.8	-12.5	-12.2	-12.4	-12.8	-13.0	-13.2	-13.3	-13.7	-13.8	-13.7	-13.6	-13.4	-13.8	-14.7	-15.2	-15.7	-16.2	-16.6	-17.1	-17.4	-17.6	-17.7	-14.4	-12.2
23-Dec	-17.9	-17.9	-18.1	-18.2	-18.3	-18.3	-18.5	-18.7	-18.7	-18.7	-18.4	-18.2	-18.2	-17.9	-17.6	-17.5	-17.6	-17.7	-17.8	-17.9	-18.0	-18.1	-18.2	-18.3	-18.1	-17.5
24-Dec	-18.5	-18.9	-19.6	-19.9	-20.0	-20.1	-20.3	-20.6	-20.7	-20.6	-20.4	-20.2	-19.8	-19.3	-19.2	-19.1	-19.0	-18.9	-19.0	-18.9	-18.8	-18.4	-18.4	-18.0	-19.5	-18.0
25-Dec	-18.2	-18.4	-18.3	-18.2	-18.2	-18.1	-17.8	-17.4	-17.4	-17.0	-16.5	-16.0	-15.1	-14.7	-14.5	-14.5	-15.0	-15.6	-16.1	-16.5	-17.0	-17.5	-18.0	-18.7	-16.9	-14.5
26-Dec	-19.7	-20.4	-21.5	-22.3	-23.3	-24.0	-25.6	-26.1	-26.9	-26.8	-26.9	-26.3	-25.3	-24.6	-23.8	-23.6	-24.0	-24.1	-23.7	-23.3	-23.1	-22.6	-22.3	-22.0	-23.8	-19.7
27-Dec	-21.7	-21.4	-20.1	-17.3	-17.0	-16.8	-16.4	-15.8	-15.0	-15.0	-14.7	-14.2	-13.7	-13.5	-13.1	-12.9	-12.8	-12.6	-12.7	-12.8	-12.8	-12.9	-12.7	-12.5	-15.0	-12.5
28-Dec	-12.4	-12.2	-12.4	-12.3	-12.7	-13.0	-13.6	-15.1	-16.1	-16.6	-16.8	-16.3	-16.2	-15.9	-16.0	-16.2	-16.4	-16.6	-16.6	-16.4	-16.3	-16.0	-15.1	-15.5	-15.1	-12.2
29-Dec	-16.5	-17.2	-17.6	-17.1	-15.5	-15.0	-15.1	-14.4	-12.7	-11.3	-10.8	-10.7	-10.6	-10.2	-9.7	-9.7	-10.1	-10.7	-11.1	-10.9	-10.0	-10.8	-11.2	-11.0	-12.5	-9.7
30-Dec	-11.0	-10.9	-10.1	-10.7	-10.6	-11.2	-11.2	-11.3	-12.8	-14.0	-12.6	-11.5	-9.1	-7.6	-5.8	-4.6	-4.6	-5.2	-5.9	-6.7	-6.9	-7.8	-10.1	-9.9	-9.2	-4.6
31-Dec	-10.3	-10.3	-10.4	-9.8	-9.4	-8.5	-8.8	-8.4	-6.7	-4.8	-4.7	-3.4	-2.3	-0.9	-0.1	-0.7	-0.8	-1.3	-1.3	-1.6	-2.1	-3.2	-4.2	-3.8	-4.9	-0.1
																								Diurnal Average		
																								Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature 45 m (AT45m) - C**  
**Lower Camp Met Tower - December 2015**







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 45 m (AT45m) - C  
Lower Camp Met Tower - December 2015**

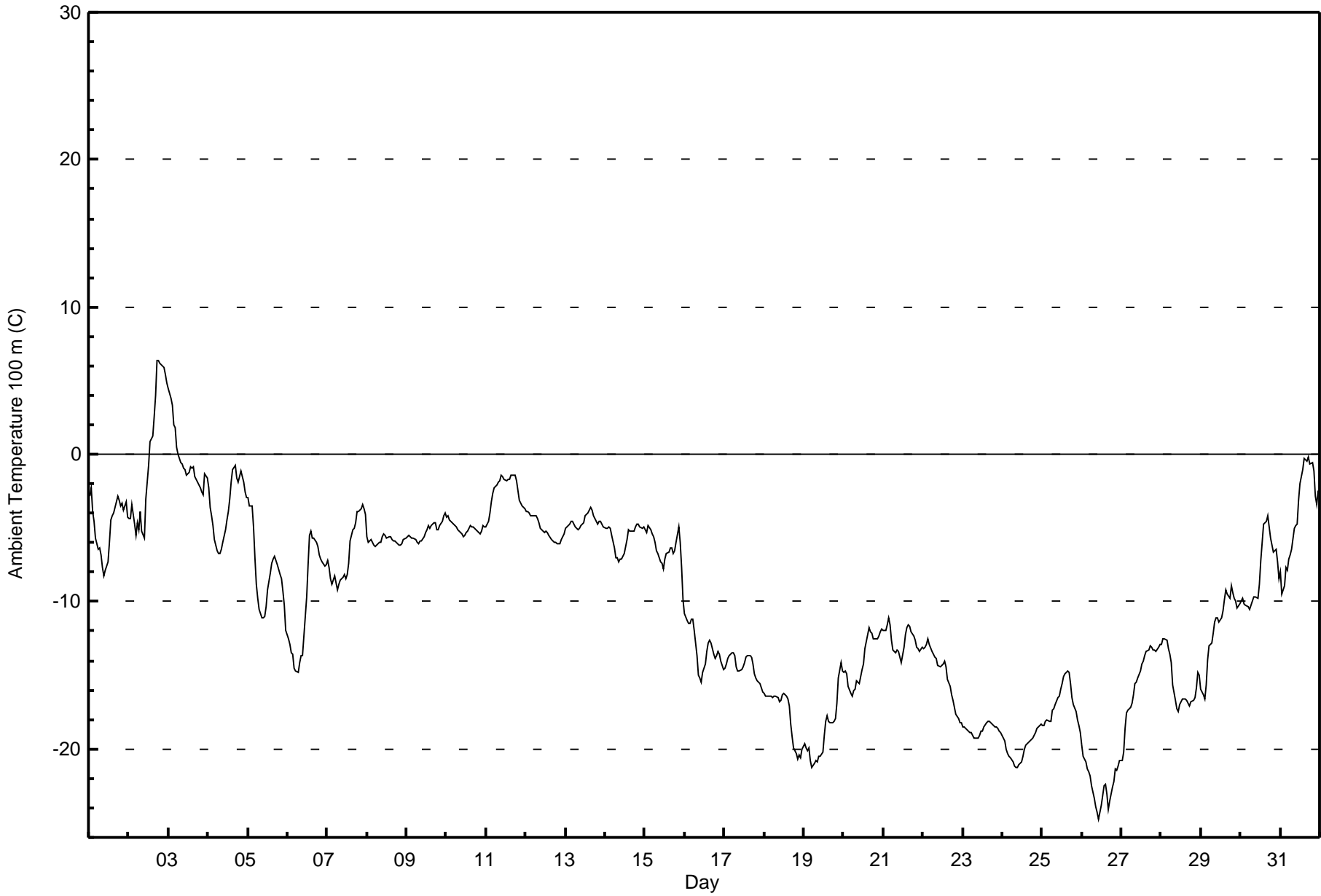
<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	47	6.32	6.32
-20 - 0	683	91.80	98.12
0 - 10	14	1.88	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 6.4 C on Dec 2 19:00		Maximum Daily Average: -0.1 C on Dec 2		Hours in Service: 744																																												
Minimum Value: -24.7 C on Dec 26 11:00		Minimum Daily Average: -22.4 C on Dec 26		Hours of Data: 744																																												
Maximum Diurnal Average: -9.0 C at hour 16		Minimum Diurnal Average: -11.2 C at hour 10		Hours of Missing Data: 0																																												
Monthly Average: -10.06 C		Percentiles: P <sub>1</sub> = -23.4 P <sub>10</sub> = -18.9 Q <sub>1</sub> = -15.3 Median = -8.9 Q <sub>3</sub> = -5.0 P <sub>90</sub> = -2.7 P <sub>99</sub> = 4.3		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-2.8	-2.3	-3.9	-4.5	-5.7	-6.5	-6.4	-6.8	-7.7	-8.3	-7.9	-7.3	-6.0	-4.5	-4.2	-4.0	-3.2	-2.9	-3.2	-3.5	-3.4	-3.8	-3.2	-4.2	-4.8	-2.3																						
2-Dec	-4.4	-4.4	-3.4	-4.8	-5.5	-4.7	-5.1	-3.9	-5.2	-5.7	-3.0	-1.9	-0.8	0.9	1.2	2.6	4.0	6.3	6.4	6.2	6.0	5.9	5.4	4.9	-0.1	6.4																						
3-Dec	4.4	3.8	3.3	2.0	1.9	0.5	0.0	-0.6	-0.6	-0.9	-1.1	-1.4	-1.2	-0.9	-0.9	-0.8	-1.5	-1.7	-2.1	-2.3	-2.5	-2.7	-1.3	-1.6	-0.3	4.4																						
4-Dec	-2.3	-3.6	-4.1	-4.9	-5.7	-6.6	-6.7	-6.7	-6.4	-5.9	-5.1	-4.5	-3.9	-3.0	-1.9	-1.1	-0.7	-1.6	-1.9	-1.5	-1.2	-1.9	-2.5	-2.9	-3.6	-0.7																						
5-Dec	-2.9	-3.5	-3.5	-4.9	-7.1	-8.9	-9.8	-10.6	-11.1	-11.1	-11.0	-10.4	-9.2	-8.1	-7.4	-7.1	-6.9	-7.2	-7.5	-8.1	-8.4	-9.3	-10.3	-12.0	-8.2	-2.9																						
6-Dec	-12.6	-12.9	-13.5	-13.6	-14.5	-14.7	-14.8	-14.1	-13.6	-13.6	-12.4	-9.7	-7.5	-5.5	-5.2	-5.7	-5.7	-5.9	-6.3	-6.9	-7.1	-7.3	-7.6	-7.5	-9.9	-5.2																						
7-Dec	-7.2	-7.7	-8.5	-8.9	-8.3	-8.7	-9.2	-8.8	-8.5	-8.3	-8.1	-8.5	-8.1	-7.4	-5.9	-5.1	-5.0	-4.6	-3.9	-3.9	-3.7	-3.4	-3.7	-4.1	-6.6	-3.4																						
8-Dec	-5.6	-5.9	-5.8	-6.0	-6.2	-6.3	-6.2	-6.0	-6.0	-5.6	-5.4	-5.5	-5.7	-5.6	-5.6	-5.8	-5.8	-5.9	-6.0	-6.2	-6.2	-6.0	-5.8	-5.7	-5.9	-5.4																						
9-Dec	-5.6	-5.5	-5.6	-5.7	-5.6	-5.8	-5.9	-6.0	-5.9	-5.9	-5.6	-5.3	-5.1	-4.9	-5.0	-4.9	-4.7	-4.6	-5.1	-5.1	-4.8	-4.6	-4.2	-4.0	-5.2	-4.0																						
10-Dec	-4.2	-4.1	-4.5	-4.6	-4.8	-4.9	-5.0	-5.1	-5.3	-5.4	-5.6	-5.5	-5.3	-5.2	-4.9	-4.9	-4.9	-5.0	-5.1	-5.3	-5.4	-5.2	-4.9	-4.9	-5.0	-4.1																						
11-Dec	-5.0	-4.6	-4.0	-3.2	-2.7	-2.2	-2.1	-1.9	-1.8	-1.4	-1.6	-1.7	-1.8	-1.7	-1.7	-1.5	-1.4	-1.4	-1.8	-2.5	-3.1	-3.3	-3.5	-3.7	-2.5	-1.4																						
12-Dec	-3.8	-3.9	-4.0	-4.1	-4.2	-4.2	-4.2	-4.3	-4.7	-5.0	-5.2	-5.3	-5.2	-5.3	-5.5	-5.7	-5.9	-6.0	-6.0	-6.1	-6.1	-5.8	-5.6	-5.4	-5.1	-3.8																						
13-Dec	-5.1	-4.9	-4.8	-4.6	-4.6	-4.7	-4.9	-5.1	-5.0	-4.9	-4.7	-4.6	-4.2	-3.9	-3.8	-3.6	-3.8	-4.1	-4.6	-4.7	-4.5	-4.5	-4.7	-5.0	-4.6	-3.6																						
14-Dec	-5.0	-5.0	-4.9	-5.0	-5.5	-6.3	-7.0	-7.0	-7.3	-7.1	-7.1	-6.8	-6.2	-5.8	-5.2	-5.2	-5.2	-5.2	-4.9	-4.7	-4.8	-4.9	-5.1	-5.0	-5.7	-4.7																						
15-Dec	-5.1	-5.3	-4.8	-5.1	-5.4	-5.6	-6.0	-6.5	-6.7	-7.3	-7.4	-7.8	-7.2	-6.7	-6.6	-6.3	-6.3	-6.7	-6.5	-6.0	-5.0	-5.9	-7.6	-9.9	-6.4	-4.8																						
16-Dec	-10.8	-11.3	-11.5	-11.5	-11.2	-11.2	-11.9	-13.7	-15.0	-15.2	-15.4	-14.8	-14.2	-13.4	-12.8	-12.6	-12.8	-13.5	-13.8	-13.6	-13.4	-13.6	-14.1	-14.6	-13.2	-10.8																						
17-Dec	-14.5	-14.2	-13.8	-13.7	-13.4	-13.5	-13.7	-14.4	-14.7	-14.7	-14.6	-14.4	-14.1	-13.8	-13.7	-13.7	-13.8	-14.2	-14.9	-15.1	-15.4	-15.6	-15.9	-16.1	-14.4	-13.4																						
18-Dec	-16.3	-16.4	-16.4	-16.4	-16.4	-16.5	-16.4	-16.4	-16.5	-16.8	-16.7	-16.3	-16.2	-16.4	-16.6	-17.1	-18.3	-19.1	-19.9	-20.4	-20.7	-20.4	-20.6	-20.0	-17.6	-16.2																						
19-Dec	-19.7	-19.9	-20.1	-20.0	-20.7	-21.3	-21.0	-20.8	-20.9	-20.5	-20.5	-20.2	-19.0	-18.1	-17.8	-18.1	-18.2	-18.2	-18.1	-18.0	-16.9	-15.2	-14.2	-14.7	-18.8	-14.2																						
20-Dec	-14.8	-14.7	-14.9	-15.8	-16.2	-16.4	-16.0	-15.9	-15.4	-15.6	-15.1	-14.6	-14.3	-13.2	-12.2	-11.8	-12.0	-12.1	-12.5	-12.6	-12.5	-12.3	-12.1	-11.8	-14.0	-11.8																						
21-Dec	-12.0	-12.0	-11.5	-11.1	-11.6	-12.6	-13.2	-13.4	-13.3	-13.4	-13.7	-14.1	-13.1	-12.3	-11.8	-11.6	-11.6	-12.1	-12.3	-12.6	-13.1	-13.2	-13.4	-13.1	-12.6	-11.1																						
22-Dec	-13.2	-13.0	-12.9	-12.5	-12.9	-13.3	-13.6	-13.7	-13.8	-14.3	-14.4	-14.3	-14.2	-14.0	-14.4	-15.3	-15.8	-16.3	-16.7	-17.2	-17.7	-18.0	-18.2	-18.2	-14.9	-12.5																						
23-Dec	-18.5	-18.5	-18.6	-18.8	-18.9	-18.9	-19.0	-19.2	-19.3	-19.3	-19.1	-18.8	-18.8	-18.5	-18.2	-18.1	-18.2	-18.2	-18.3	-18.5	-18.5	-18.6	-18.8	-18.8	-18.7	-18.1																						
24-Dec	-19.0	-19.4	-20.0	-20.3	-20.5	-20.6	-20.9	-21.2	-21.2	-21.2	-21.1	-20.9	-20.4	-20.0	-19.7	-19.6	-19.5	-19.4	-19.2	-19.1	-18.9	-18.6	-18.4	-18.3	-19.9	-18.3																						
25-Dec	-18.4	-18.4	-18.1	-18.0	-18.1	-18.1	-17.4	-17.2	-17.0	-16.5	-16.4	-15.9	-15.5	-15.1	-14.9	-14.7	-14.8	-15.5	-16.5	-17.0	-17.5	-18.0	-18.4	-18.9	-16.9	-14.7																						
26-Dec	-19.8	-20.5	-20.9	-21.3	-21.5	-21.8	-22.5	-23.4	-23.9	-24.3	-24.7	-24.3	-23.8	-22.5	-22.4	-23.0	-24.1	-23.5	-22.6	-22.2	-21.4	-21.4	-21.1	-20.8	-22.4	-19.8																						
27-Dec	-20.8	-20.2	-18.6	-17.5	-17.3	-17.2	-16.9	-16.3	-15.5	-15.5	-15.2	-14.8	-14.3	-14.0	-13.6	-13.4	-13.2	-13.0	-13.1	-13.3	-13.3	-13.3	-13.1	-12.9	-15.3	-12.9																						
28-Dec	-12.9	-12.6	-12.5	-12.6	-13.2	-13.6	-14.2	-15.7	-16.7	-17.2	-17.4	-17.0	-16.8	-16.6	-16.6	-16.7	-16.9	-17.1	-16.8	-16.7	-16.5	-15.8	-14.8	-15.0	-15.5	-12.5																						
29-Dec	-15.9	-16.3	-16.6	-15.7	-14.0	-13.0	-12.8	-12.1	-11.3	-11.1	-11.1	-11.4	-11.1	-10.6	-9.9	-9.2	-9.5	-9.7	-8.9	-9.4	-9.7	-10.0	-10.4	-10.1	-11.7	-8.9																						
30-Dec	-10.0	-9.7	-10.1	-10.3	-10.3	-10.6	-10.2	-10.0	-9.7	-9.7	-9.8	-8.9	-7.2	-5.9	-4.8	-4.5	-4.2	-4.9	-5.7	-6.1	-6.6	-6.4	-7.3	-8.4	-8.0	-4.2																						
31-Dec	-7.9	-9.5	-8.9	-7.7	-7.9	-7.1	-6.8	-6.4	-5.0	-4.9	-4.7	-3.1	-1.9	-1.1	-0.3	-0.4	-0.5	-0.2	-0.7	-0.5	-1.1	-2.8	-3.4	-2.5	-4.0	-0.2																						
																								-10.1	-10.2	-10.2	-10.4	-10.6	-10.8	-11.0	-11.1	-11.1	-11.2	-11.0	-10.6	-10.1	-9.5	-9.1	-9.0	-9.1	-9.2	-9.3	-9.4	-9.5	-9.6	-9.6	-9.9	Diurnal Average
																								4.4	3.8	3.3	2.0	1.9	0.5	0.0	-0.6	-0.6	-0.9	-1.1	-1.4	-0.8	0.9	1.2	2.6	4.0	6.3	6.4	6.2	6.0	5.9	5.4	4.9	Diurnal Maximum





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 100 m (AT100m) - C  
Lower Camp Met Tower - December 2015**

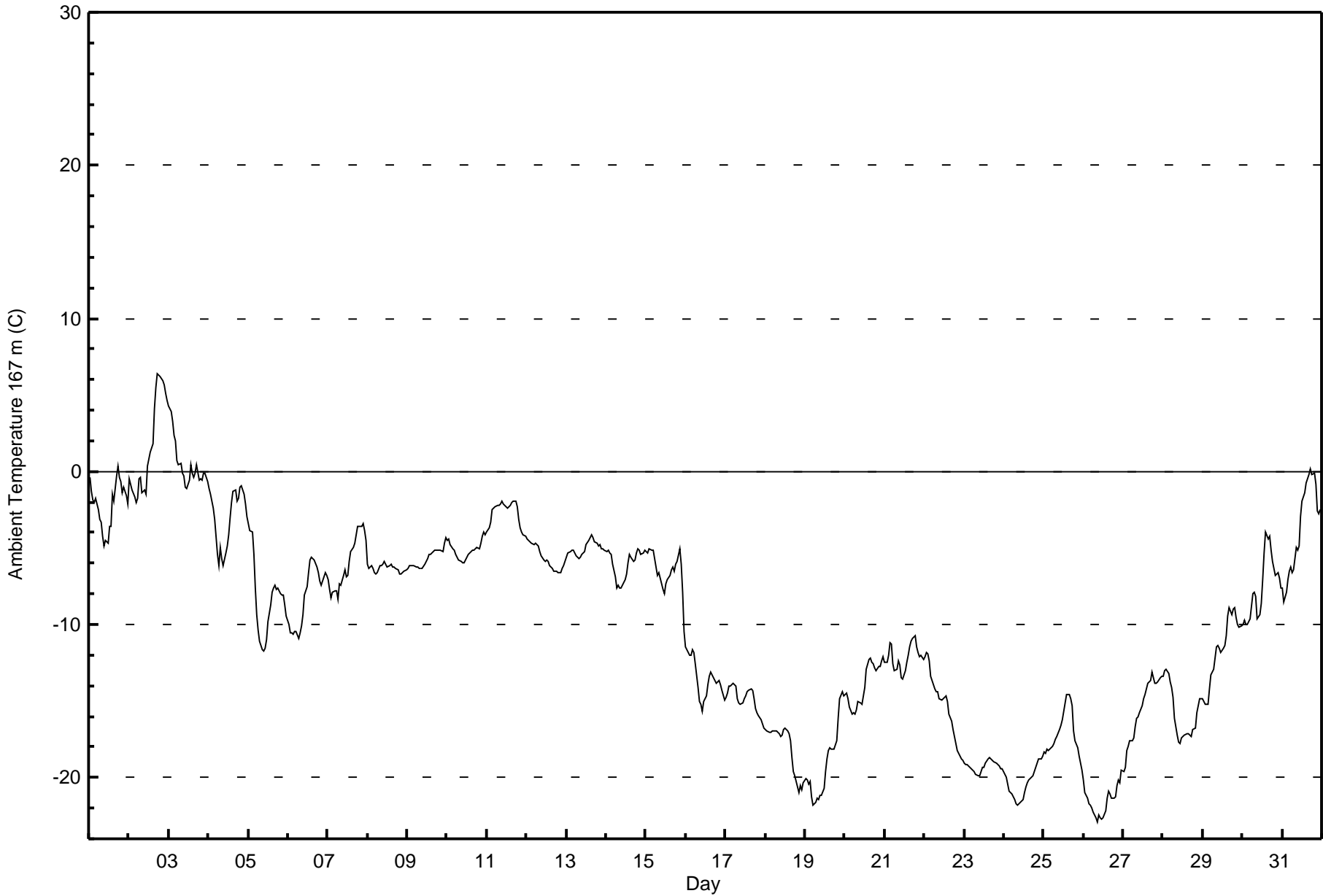
<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	50	6.72	6.72
-20 - 0	677	90.99	97.72
0 - 10	17	2.28	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 6.4 C on Dec 2 18:00		Maximum Daily Average: 1.7 C on Dec 2		Hours in Service: 744																																												
Minimum Value: -22.9 C on Dec 26 09:00		Minimum Daily Average: -21.5 C on Dec 26		Hours of Data: 744																																												
Maximum Diurnal Average: -9.0 C at hour 17		Minimum Diurnal Average: -10.9 C at hour 10		Hours of Missing Data: 0																																												
Monthly Average: -9.93 C		Percentiles: P <sub>1</sub> = -22.2 P <sub>10</sub> = -19.3 Q <sub>1</sub> = -15.2 Median = -8.1 Q <sub>3</sub> = -5.1 P <sub>90</sub> = -1.8 P <sub>99</sub> = 4.7		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-0.4	-1.3	-1.8	-2.0	-1.8	-2.5	-3.1	-3.3	-4.3	-4.9	-4.5	-4.7	-3.6	-3.6	-1.5	-1.9	-0.3	0.4	-0.4	-0.7	-1.4	-1.0	-1.6	-2.1	-2.2	0.4																						
2-Dec	-0.5	-0.9	-1.2	-1.7	-2.1	-1.7	-0.5	-0.4	-1.4	-1.2	-1.5	0.3	0.8	1.3	1.8	4.1	5.5	6.4	6.3	6.2	5.9	5.6	5.1	4.7	1.7	6.4																						
3-Dec	4.3	3.9	3.3	2.4	2.0	0.7	0.5	0.6	-0.1	-0.3	-1.0	-1.1	-0.5	0.5	-0.1	-0.4	-0.2	0.4	-0.6	-0.5	-0.6	-0.1	-0.1	-0.7	0.5	4.3																						
4-Dec	-1.1	-1.4	-1.9	-2.4	-3.2	-5.4	-6.2	-5.0	-5.7	-6.1	-5.3	-4.9	-4.1	-3.0	-2.0	-1.3	-1.2	-2.0	-1.8	-1.0	-0.9	-1.5	-2.1	-2.9	-3.0	-0.9																						
5-Dec	-3.4	-3.9	-4.0	-5.4	-7.6	-9.4	-10.3	-11.1	-11.7	-11.7	-11.6	-11.0	-9.8	-8.7	-7.9	-7.6	-7.4	-7.7	-7.6	-7.9	-8.1	-8.1	-8.7	-9.4	-8.3	-3.4																						
6-Dec	-10.0	-10.5	-10.6	-10.6	-10.5	-10.4	-10.9	-10.6	-10.1	-9.4	-8.1	-7.6	-6.6	-5.8	-5.6	-5.7	-5.8	-6.2	-6.6	-7.2	-7.4	-7.2	-6.6	-6.8	-8.2	-5.6																						
7-Dec	-7.0	-7.7	-8.2	-7.9	-7.8	-7.8	-8.4	-7.3	-7.4	-6.8	-6.4	-6.9	-6.8	-5.9	-5.3	-5.0	-4.7	-4.1	-3.6	-3.6	-3.6	-3.4	-3.9	-4.5	-6.0	-3.4																						
8-Dec	-6.0	-6.3	-6.2	-6.4	-6.6	-6.7	-6.6	-6.2	-6.1	-6.0	-5.9	-6.1	-6.3	-6.2	-6.1	-6.3	-6.3	-6.3	-6.5	-6.7	-6.7	-6.6	-6.5	-6.5	-6.3	-5.9																						
9-Dec	-6.3	-6.2	-6.1	-6.1	-6.2	-6.3	-6.3	-6.4	-6.3	-6.3	-6.1	-5.9	-5.7	-5.4	-5.4	-5.3	-5.1	-5.1	-5.1	-5.2	-5.2	-5.2	-4.7	-4.3	-5.7	-4.3																						
10-Dec	-4.5	-4.4	-4.8	-5.0	-5.2	-5.4	-5.6	-5.8	-5.9	-5.9	-6.0	-5.7	-5.6	-5.4	-5.2	-5.2	-5.2	-5.1	-5.0	-5.0	-4.7	-4.2	-4.0	-4.2	-5.1	-4.0																						
11-Dec	-3.9	-3.7	-3.3	-2.5	-2.4	-2.3	-2.3	-2.2	-2.1	-1.9	-2.1	-2.3	-2.4	-2.3	-2.3	-2.0	-1.9	-1.9	-2.3	-3.1	-3.7	-3.9	-4.1	-4.2	-2.7	-1.9																						
12-Dec	-4.4	-4.5	-4.6	-4.7	-4.7	-4.7	-4.8	-4.9	-5.2	-5.5	-5.8	-5.8	-5.8	-5.9	-6.1	-6.3	-6.5	-6.5	-6.5	-6.6	-6.6	-6.3	-6.1	-5.9	-5.6	-4.4																						
13-Dec	-5.6	-5.4	-5.2	-5.1	-5.1	-5.3	-5.5	-5.7	-5.6	-5.4	-5.3	-5.2	-4.8	-4.5	-4.4	-4.2	-4.3	-4.6	-4.7	-4.9	-4.8	-5.0	-5.0	-5.1	-5.0	-4.2																						
14-Dec	-5.2	-5.1	-5.3	-5.4	-6.0	-6.8	-7.6	-7.5	-7.6	-7.6	-7.5	-7.1	-6.7	-6.0	-5.4	-5.6	-5.8	-5.8	-5.3	-5.0	-5.2	-5.4	-5.3	-5.2	-6.1	-5.0																						
15-Dec	-5.3	-5.3	-5.0	-5.2	-5.1	-5.7	-6.2	-6.8	-6.6	-6.6	-7.4	-7.7	-8.0	-7.4	-7.1	-6.8	-6.4	-6.3	-6.5	-6.0	-5.9	-5.1	-6.1	-7.9	-10.5	-6.5																						
16-Dec	-11.4	-11.8	-12.0	-12.0	-11.7	-11.8	-12.5	-14.1	-15.0	-15.2	-15.6	-15.0	-14.7	-13.9	-13.3	-13.1	-13.3	-13.7	-13.9	-13.7	-13.6	-14.0	-14.3	-14.9	-13.5	-11.4																						
17-Dec	-14.8	-14.5	-14.0	-14.1	-13.8	-13.9	-14.0	-14.9	-15.1	-15.2	-15.1	-14.9	-14.7	-14.4	-14.3	-14.2	-14.3	-14.8	-15.5	-15.8	-16.0	-16.2	-16.5	-16.7	-14.9	-13.8																						
18-Dec	-16.9	-17.0	-17.0	-17.0	-17.0	-16.9	-16.9	-16.9	-17.1	-17.3	-17.2	-16.8	-16.8	-17.0	-17.2	-17.6	-18.7	-19.6	-19.9	-20.6	-21.0	-20.5	-20.8	-20.3	-18.1	-16.8																						
19-Dec	-20.1	-20.2	-20.4	-20.3	-21.3	-21.8	-21.6	-21.3	-21.4	-21.1	-21.1	-20.7	-19.6	-18.8	-18.2	-18.1	-18.1	-18.1	-17.9	-17.6	-16.1	-14.9	-14.4	-14.7	-19.1	-14.4																						
20-Dec	-14.5	-14.5	-14.9	-15.4	-15.9	-15.8	-15.8	-15.6	-15.0	-15.2	-15.2	-14.7	-14.1	-12.9	-12.3	-12.2	-12.4	-12.5	-12.9	-13.0	-12.8	-12.7	-12.4	-12.1	-14.0	-12.1																						
21-Dec	-12.5	-12.5	-12.1	-11.2	-11.3	-12.5	-13.1	-13.0	-12.4	-12.7	-13.4	-13.6	-13.0	-12.4	-12.1	-11.5	-11.1	-10.9	-10.7	-11.4	-11.8	-12.1	-12.0	-12.3	-12.1	-10.7																						
22-Dec	-12.1	-11.8	-11.9	-12.4	-13.4	-13.9	-14.2	-14.4	-14.4	-14.8	-15.0	-14.9	-14.8	-14.6	-15.0	-15.9	-16.3	-16.8	-17.3	-17.8	-18.3	-18.6	-18.8	-18.8	-15.3	-11.8																						
23-Dec	-19.1	-19.1	-19.2	-19.3	-19.4	-19.5	-19.6	-19.8	-19.9	-19.9	-19.6	-19.3	-19.3	-19.0	-18.8	-18.7	-18.8	-18.8	-18.9	-19.1	-19.1	-19.3	-19.4	-19.5	-19.3	-18.7																						
24-Dec	-19.6	-20.0	-20.4	-20.9	-21.0	-21.1	-21.5	-21.7	-21.8	-21.7	-21.6	-21.4	-21.0	-20.6	-20.3	-20.2	-20.1	-19.9	-19.6	-19.3	-19.0	-18.8	-18.8	-18.6	-20.4	-18.6																						
25-Dec	-18.3	-18.4	-18.1	-18.2	-18.0	-18.0	-17.8	-17.5	-17.3	-16.9	-16.6	-16.2	-15.7	-15.2	-14.6	-14.5	-14.8	-15.3	-16.9	-17.6	-18.1	-18.6	-19.0	-19.5	-17.1	-14.5																						
26-Dec	-20.2	-21.0	-21.4	-21.7	-21.8	-22.0	-22.2	-22.6	-22.9	-22.4	-22.6	-22.7	-22.6	-22.2	-21.4	-20.9	-21.0	-21.4	-21.4	-21.2	-20.6	-20.2	-20.4	-19.5	-21.5	-19.5																						
27-Dec	-19.6	-19.3	-18.3	-17.9	-17.6	-17.6	-17.4	-16.7	-16.1	-16.1	-15.8	-15.3	-14.8	-14.6	-14.2	-13.9	-13.7	-13.2	-13.4	-13.9	-13.8	-13.8	-13.5	-13.4	-15.6	-13.2																						
28-Dec	-13.4	-13.0	-13.0	-13.2	-13.8	-14.1	-14.7	-16.1	-17.2	-17.7	-17.8	-17.4	-17.3	-17.2	-17.1	-17.2	-17.2	-17.3	-16.9	-16.8	-15.7	-15.3	-14.8	-14.9	-15.8	-13.0																						
29-Dec	-14.9	-15.2	-15.2	-15.2	-14.2	-13.3	-12.9	-12.2	-11.5	-11.3	-11.5	-11.9	-11.5	-11.4	-10.7	-9.4	-8.9	-9.3	-9.0	-8.9	-9.5	-10.0	-10.2	-10.1	-11.6	-8.9																						
30-Dec	-10.0	-9.7	-10.0	-10.0	-9.6	-8.8	-8.0	-7.9	-8.2	-9.6	-9.4	-8.6	-7.0	-5.4	-4.0	-4.5	-4.2	-5.1	-5.9	-6.3	-6.8	-6.6	-7.0	-7.6	-7.5	-4.0																						
31-Dec	-7.6	-8.5	-7.9	-7.0	-6.5	-6.2	-6.6	-6.4	-5.0	-5.1	-4.9	-2.9	-1.9	-1.4	-0.8	-0.4	-0.2	0.2	-0.2	-0.1	-0.9	-2.6	-2.8	-2.5	-3.7	0.2																						
																								-9.8	-10.0	-10.0	-10.1	-10.3	-10.5	-10.7	-10.8	-10.9	-10.9	-10.9	-10.6	-10.1	-9.6	-9.2	-9.1	-9.0	-9.1	-9.2	-9.4	-9.4	-9.4	-9.6	-9.8	Diurnal Average
																								4.3	3.9	3.3	2.4	2.0	0.7	0.5	0.6	-0.1	-0.3	-1.0	0.3	0.8	1.3	1.8	4.1	5.5	6.4	6.3	6.2	5.9	5.6	5.1	4.7	Diurnal Maximum





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 167 m (AT167m) - C  
Lower Camp Met Tower - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	55	7.39	7.39
-20 - 0	664	89.25	96.64
0 - 10	25	3.36	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



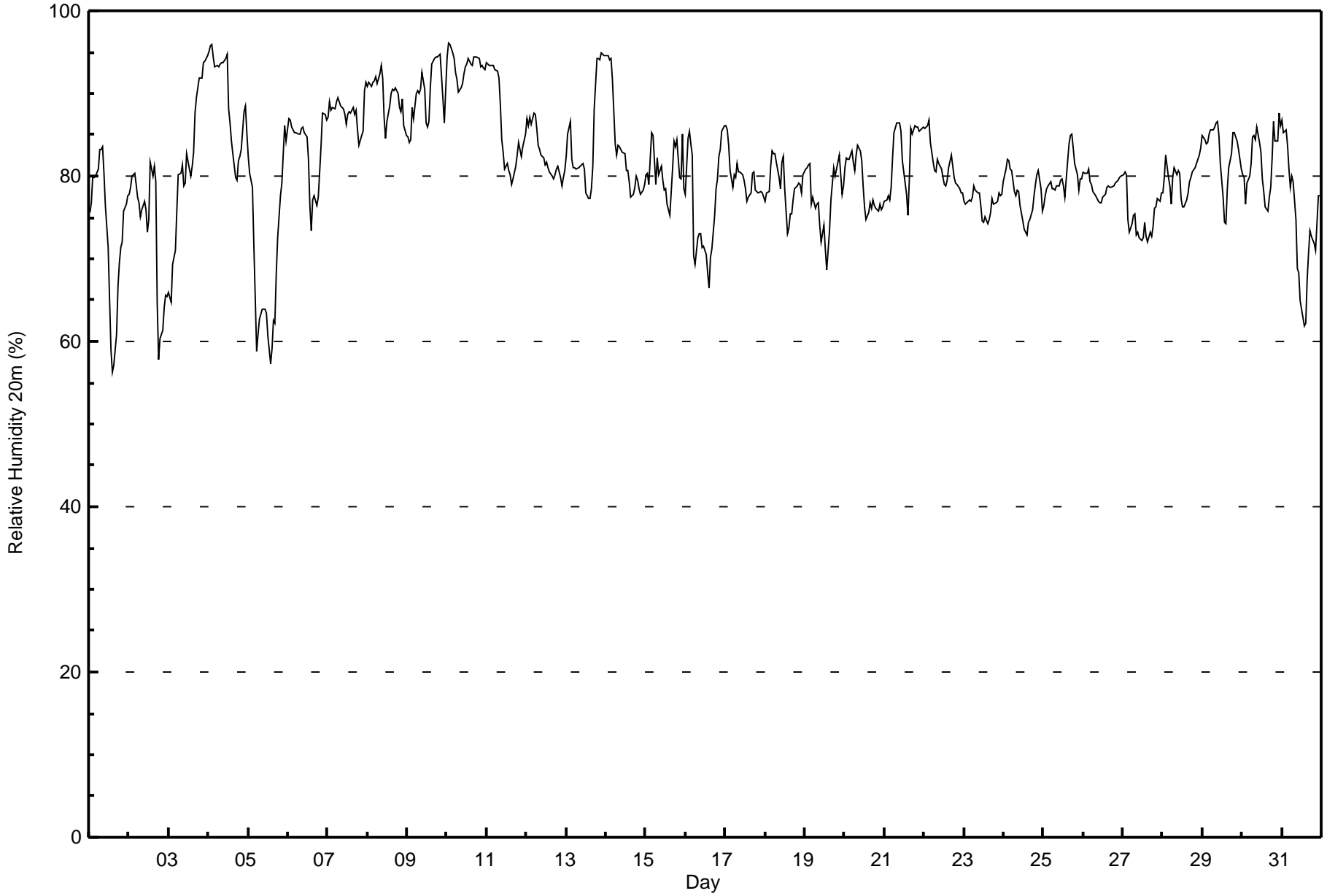
Maximum Value: 96 % on Dec 10 02:00																			Maximum Daily Average: 93.4 % on Dec 10						Hours in Service: 744																																									
Minimum Value: 56 % on Dec 1 15:00																			Minimum Daily Average: 69.5 % on Dec 5						Hours of Data: 744																																									
Maximum Diurnal Average: 83.5 % at hour 3																			Minimum Diurnal Average: 76.6 % at hour 15						Hours of Missing Data: 0																																									
Monthly Average: 81.0 %																			Percentiles: P <sub>1</sub> = 60 P <sub>10</sub> = 73 Q <sub>1</sub> = 77 Median = 80 O <sub>3</sub> = 85 P <sub>90</sub> = 91 P <sub>99</sub> = 95						Hours of Calibration: 0																																									
																			Percent Operational Time: 100.0																																															
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																																										
1-Dec	76	77	80	80	80	81	83	83	84	80	76	71	65	59	56	57	61	67	70	71	72	76	77	78	73.3	84																																								
2-Dec	78	79	80	80	79	77	77	75	76	77	76	73	75	82	80	81	79	65	58	60	61	64	66	65	73.5	82																																								
3-Dec	66	65	69	70	71	76	80	80	81	79	79	83	81	80	81	83	88	90	92	92	92	94	94	95	81.6	95																																								
4-Dec	95	96	96	94	93	93	93	93	94	94	94	95	88	86	84	83	80	79	82	82	83	88	88	85	89.2	96																																								
5-Dec	82	80	79	72	65	59	61	63	64	64	64	63	61	57	59	63	62	68	73	78	79	83	86	84	69.5	86																																								
6-Dec	87	87	86	86	85	85	85	85	86	86	85	85	82	76	73	77	78	76	77	80	84	88	88	87	83.1	88																																								
7-Dec	87	89	88	88	88	89	89	89	89	88	88	86	87	88	88	88	87	88	86	84	85	85	90	91	87.8	91																																								
8-Dec	91	91	91	91	92	92	91	92	93	92	87	85	87	88	90	90	90	91	90	88	88	89	86	85	89.6	93																																								
9-Dec	85	84	84	88	87	90	90	90	91	92	91	87	86	87	91	94	94	94	94	95	95	89	86	90	89.8	95																																								
10-Dec	94	96	96	95	94	93	92	90	91	91	92	93	94	94	94	93	94	94	94	94	93	93	93	93	93.4	96																																								
11-Dec	94	93	93	93	93	93	93	92	89	84	83	81	82	81	80	79	80	81	83	84	83	82	83	85	86.0	94																																								
12-Dec	87	86	87	86	88	88	86	84	83	83	82	81	82	81	81	80	80	80	81	81	80	79	80	81	82.7	88																																								
13-Dec	82	85	87	82	81	81	81	81	81	81	81	81	78	77	77	79	81	88	94	94	94	95	95	95	84.7	95																																								
14-Dec	95	95	94	94	92	84	83	84	84	83	83	83	81	81	79	78	78	79	80	80	78	78	78	79	83.3	95																																								
15-Dec	80	80	79	85	85	82	79	82	80	81	79	78	78	77	75	78	81	84	83	84	80	80	85	79	80.7	85																																								
16-Dec	78	85	85	84	83	70	69	73	73	73	71	72	71	68	66	70	71	75	79	80	82	83	85	86	76.4	86																																								
17-Dec	86	86	84	81	79	80	80	82	80	80	80	80	78	77	77	78	80	81	78	78	78	78	78	78	79.9	86																																								
18-Dec	77	78	78	81	83	83	83	82	80	78	82	82	78	73	74	75	76	77	78	79	79	79	78	80	78.9	83																																								
19-Dec	81	81	81	82	77	77	76	77	77	74	72	74	71	69	71	73	77	81	80	81	82	82	78	79	77.2	82																																								
20-Dec	81	82	82	82	83	82	81	83	84	83	82	79	76	75	76	77	76	77	76	76	76	77	76	76	79.0	84																																								
21-Dec	77	77	78	77	79	82	85	87	86	87	85	82	79	78	75	80	86	85	86	86	86	85	86	86	82.5	87																																								
22-Dec	86	86	86	87	84	82	81	81	82	82	81	80	79	79	79	81	82	81	80	79	79	78	78	78	81.3	87																																								
23-Dec	77	77	77	77	77	77	79	78	78	78	76	75	74	75	74	75	76	77	77	77	77	78	78	78	76.7	79																																								
24-Dec	79	81	82	82	81	81	78	78	78	78	76	75	74	73	73	74	75	76	78	79	80	81	78	76	77.7	82																																								
25-Dec	76	78	79	79	79	78	78	78	79	79	80	80	79	77	80	84	85	85	83	82	80	78	80	80	79.8	85																																								
26-Dec	80	80	80	81	79	79	78	78	77	77	77	77	77	78	79	79	79	79	79	79	79	80	80	80	78.8	81																																								
27-Dec	80	81	80	75	73	74	75	75	73	73	73	72	73	74	73	72	73	73	74	76	76	77	77	78	75.1	81																																								
28-Dec	78	80	83	80	79	77	80	81	80	81	80	77	76	76	77	78	79	80	80	81	81	82	83	83	79.7	83																																								
29-Dec	85	84	84	84	85	86	86	86	86	87	85	81	77	74	74	78	81	83	85	85	85	84	83	81	82.9	87																																								
30-Dec	80	80	77	79	80	81	85	85	84	86	84	83	80	78	76	76	78	79	82	87	84	84	88	86	81.7	88																																								
31-Dec	87	85	86	84	81	79	80	79	75	69	68	65	64	62	62	68	71	73	73	72	71	74	78	78	74.2	87																																								
82.8																			83.3		83.5		83.2		82.4		81.6		81.8		82.1		81.9		81.3		80.4		79.3		77.8		76.8		76.6		78.1		79.3		80.2		80.8		81.4		81.4		82.1		82.5		82.4		Diurnal Average	
95																			96		96		95		94		93		93		93		94		94		94		94		94		94		94		94		94		94		94		94		95		95		95		95		Diurnal Maximum	





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity 20m (RH20m) - %**  
**Lower Camp Met Tower - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity 20m (RH20m) - %**  
**Lower Camp Met Tower - December 2015**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	7	0.94	0.94
60 - 80	335	45.03	45.97
80 - 100	402	54.03	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

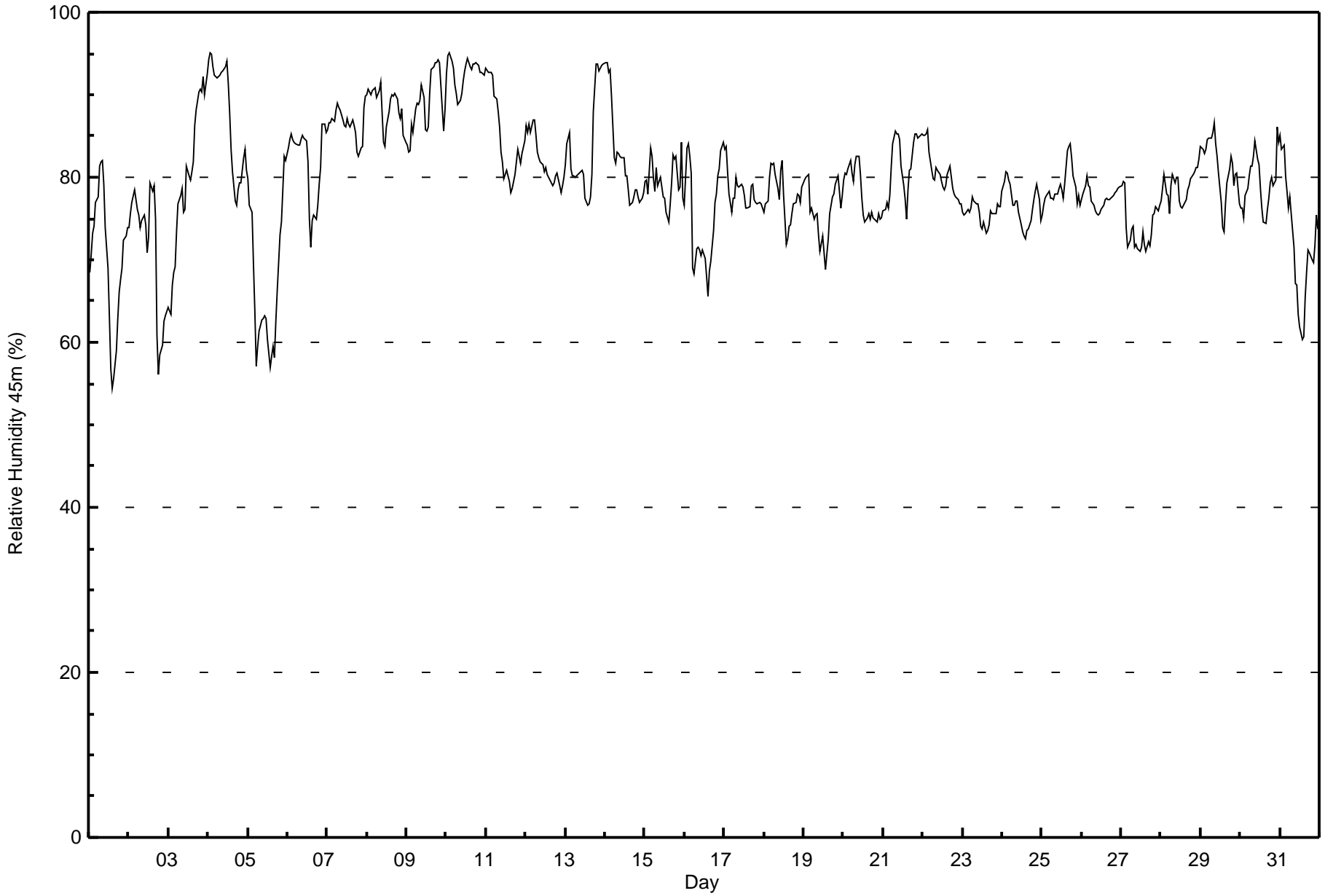


Maximum Value: 95 % on Dec 4 02:00																	Maximum Daily Average: 92.7 % on Dec 10																	Hours in Service: 744	
Minimum Value: 54 % on Dec 1 15:00																	Minimum Daily Average: 67.0 % on Dec 5																	Hours of Data: 744	
Maximum Diurnal Average: 82.0 % at hour 3																	Minimum Diurnal Average: 75.8 % at hour 15																	Hours of Missing Data: 0	
Monthly Average: 79.6 %																	Percentiles: P <sub>1</sub> = 58 P <sub>10</sub> = 72 Q <sub>1</sub> = 76 Median = 79 Q <sub>3</sub> = 84 P <sub>90</sub> = 90 P <sub>99</sub> = 94																	Hours of Calibration: 0	
																																		Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	69	71	73	74	77	78	81	82	82	79	74	69	63	57	54	56	59	63	66	68	69	72	73	74	70.1	82									
2-Dec	74	76	77	78	77	76	75	74	75	75	74	71	73	79	78	79	75	61	56	59	60	63	63	64	71.3	79									
3-Dec	64	63	67	69	69	73	77	78	79	76	76	81	80	80	81	82	86	88	90	91	90	92	90	93	79.8	93									
4-Dec	94	95	95	93	92	92	92	92	93	93	93	94	91	88	83	81	77	77	78	79	79	82	83	81	87.5	95									
5-Dec	80	77	76	70	64	57	60	61	63	63	63	63	60	57	58	59	58	63	66	73	75	78	82	82	67.0	82									
6-Dec	84	85	85	85	84	84	84	84	85	85	85	84	82	75	72	75	75	75	77	79	81	86	86	85	81.7	86									
7-Dec	86	87	87	87	87	88	89	89	88	87	86	86	87	86	86	87	86	85	83	83	84	84	89	90	86.5	90									
8-Dec	90	91	90	90	91	91	90	91	92	88	84	84	86	88	89	90	90	90	90	88	87	88	85	84	88.6	92									
9-Dec	84	83	83	86	86	88	89	89	89	91	90	86	86	86	90	93	93	94	94	94	94	88	86	88	88.8	94									
10-Dec	93	95	95	94	93	91	90	89	89	90	92	93	94	94	93	93	94	94	94	94	93	93	93	92	92.7	95									
11-Dec	93	93	93	93	92	90	90	88	86	83	82	80	81	80	79	78	79	80	82	83	83	82	83	84	84.8	93									
12-Dec	86	85	86	86	87	87	85	83	82	82	82	81	81	80	80	79	79	79	80	80	79	78	79	80	82.0	87									
13-Dec	81	84	85	81	80	80	80	80	81	81	81	80	77	77	77	78	80	88	94	94	93	93	94	94	83.9	94									
14-Dec	94	94	93	93	90	82	82	83	83	83	82	82	80	80	79	77	77	78	78	79	78	77	78	78	82.4	94									
15-Dec	79	80	78	84	83	80	78	81	79	80	79	78	78	76	75	77	79	83	82	83	78	79	84	77	79.5	84									
16-Dec	77	84	84	83	81	69	68	71	72	71	71	71	70	68	66	69	70	74	77	78	80	81	83	84	75.0	84									
17-Dec	83	84	81	78	76	77	77	80	79	79	79	79	78	76	76	77	79	79	77	77	77	77	77	76	78.3	84									
18-Dec	76	77	77	80	82	82	82	80	79	77	81	82	78	72	73	74	74	76	77	77	78	78	77	79	77.7	82									
19-Dec	80	80	80	80	76	76	75	75	76	73	71	73	71	69	71	73	76	78	78	79	80	80	76	78	75.9	80									
20-Dec	80	81	80	81	82	80	80	82	83	83	80	77	75	75	75	76	75	76	75	75	75	76	75	75	77.9	83									
21-Dec	76	76	77	76	78	81	84	86	85	85	85	81	79	77	75	78	81	81	84	85	85	85	85	85	81.3	86									
22-Dec	85	85	85	86	83	81	80	80	81	81	80	79	79	78	79	80	81	80	79	78	78	77	77	77	80.4	86									
23-Dec	76	75	76	76	76	76	78	77	77	77	76	74	74	75	73	74	74	76	76	76	76	77	76	77	75.6	78									
24-Dec	78	80	81	80	80	79	77	77	77	77	76	74	73	73	74	74	75	76	77	78	79	77	75	75	76.6	81									
25-Dec	75	77	77	78	78	77	77	77	78	78	79	79	78	77	79	83	84	84	82	80	79	77	78	77	78.8	84									
26-Dec	77	78	79	80	79	79	77	77	76	76	75	76	76	77	77	78	77	77	78	78	78	78	79	79	77.5	80									
27-Dec	79	79	79	74	72	72	74	74	71	72	71	71	71	73	72	71	72	72	73	75	76	77	76	77	73.9	79									
28-Dec	77	79	80	78	78	76	79	80	79	80	80	77	76	76	77	77	78	79	80	80	81	81	81	82	78.9	82									
29-Dec	84	83	83	83	85	85	85	85	87	84	83	81	77	74	73	77	79	81	82	82	79	80	81	77	81.2	87									
30-Dec	76	76	75	78	79	80	81	81	83	84	82	82	79	76	74	74	76	77	79	80	79	80	86	84	79.3	86									
31-Dec	85	83	84	80	78	76	78	76	72	67	67	63	62	60	61	65	68	71	71	70	70	72	75	74	72.0	85									
	81.1	81.7	82.0	81.7	81.0	80.2	80.4	80.7	80.6	80.0	79.3	78.4	77.3	76.1	75.8	76.8	77.7	78.5	79.2	79.8	79.6	80.3	80.9	80.7	Diurnal Average										
	94	95	95	94	93	92	92	92	92	93	93	93	94	94	93	93	94	94	94	94	94	94	93	94	94	Diurnal Maximum									



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity 45m (RH45m) - %**  
**Lower Camp Met Tower - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity 45m (RH45m) - %**  
**Lower Camp Met Tower - December 2015**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	13	1.75	1.75
60 - 80	400	53.76	55.51
80 - 100	331	44.49	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

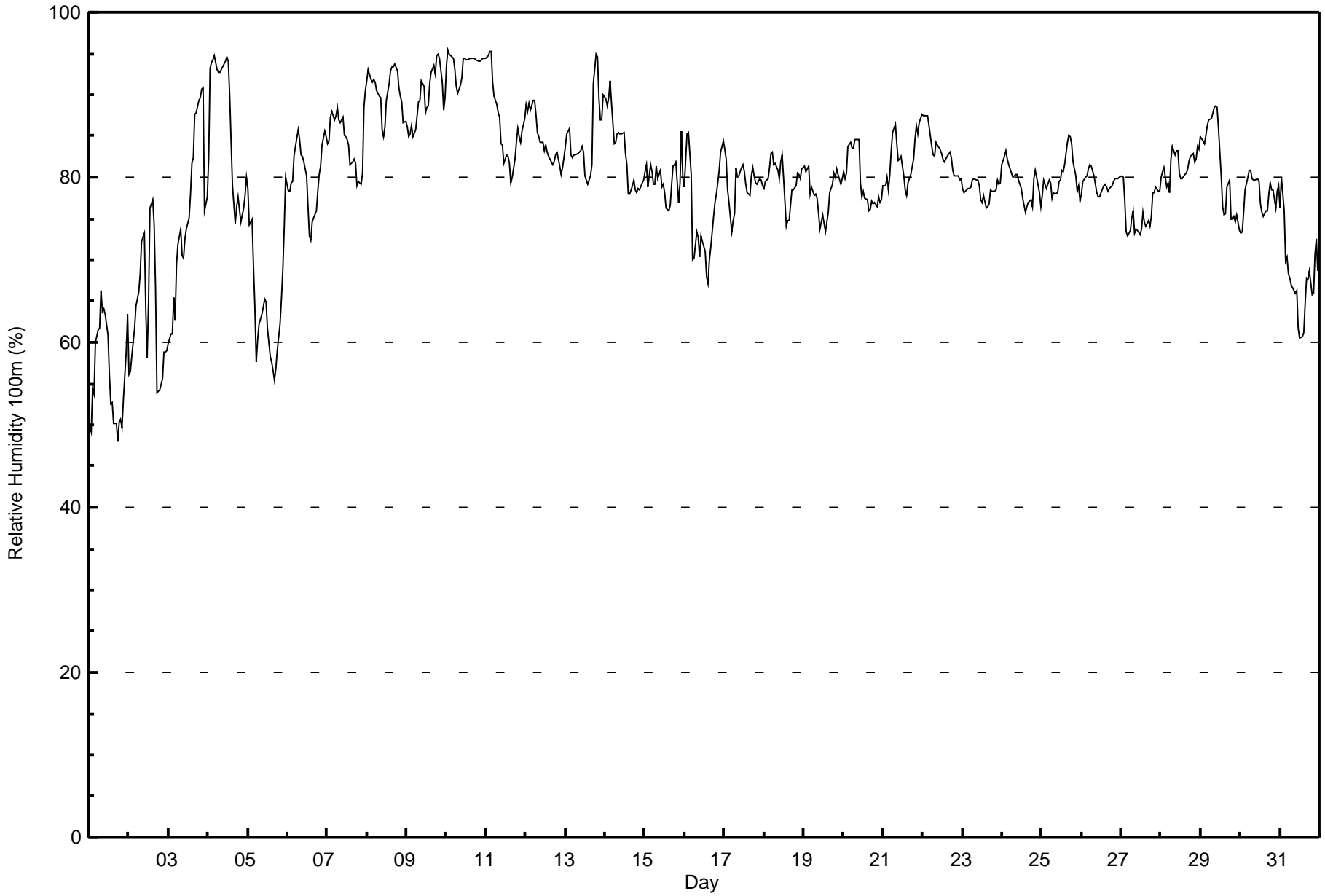


Maximum Value: 95 % on Dec 10 02:00																	Maximum Daily Average: 93.8 % on Dec 10										Hours in Service: 744															
Minimum Value: 48 % on Dec 1 18:00																	Minimum Daily Average: 56.0 % on Dec 1										Hours of Data: 744															
Maximum Diurnal Average: 80.9 % at hour 8																	Minimum Diurnal Average: 77.3 % at hour 15										Hours of Missing Data: 0															
Monthly Average: 79.4 %																	Percentiles: P <sub>1</sub> = 51 P <sub>10</sub> = 67 Q <sub>1</sub> = 77 Median = 80 O <sub>3</sub> = 84 P <sub>90</sub> = 90 P <sub>99</sub> = 95										Hours of Calibration: 0															
																											Percent Operational Time: 100.0															
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																		
1-Dec	50	49	54	54	60	62	62	66	64	64	63	61	56	53	53	50	50	48	50	51	50	53	59	63	56.0	66																
2-Dec	56	56	58	62	64	65	66	68	72	73	64	58	65	76	77	74	66	54	54	54	56	59	59	59	63.2	77																
3-Dec	60	61	61	65	63	69	72	74	70	70	73	74	75	78	82	82	88	88	89	90	91	91	76	78	75.8	91																
4-Dec	82	93	94	94	95	93	93	93	93	94	95	94	90	84	79	74	76	78	78	76	75	76	78	80	86.4	95																
5-Dec	79	74	75	69	64	58	60	62	63	64	65	65	62	58	58	57	55	57	59	62	65	69	74	80	64.8	80																
6-Dec	78	78	79	80	83	84	86	85	83	83	82	80	76	73	72	75	75	76	78	80	81	84	86	85	80.0	86																
7-Dec	84	84	87	88	87	87	88	87	87	87	85	85	85	84	81	82	82	82	79	80	79	81	88	91	84.6	91																
8-Dec	92	93	92	92	92	92	91	90	90	86	85	86	89	91	93	93	93	94	93	91	90	89	87	87	90.4	94																
9-Dec	86	85	85	86	85	86	87	89	89	92	91	88	88	89	91	93	94	93	95	95	94	92	88	90	89.6	95																
10-Dec	94	95	95	95	94	93	91	90	91	92	94	94	94	94	94	94	94	94	94	94	94	94	94	94	93.8	95																
11-Dec	94	95	95	95	92	90	89	88	87	84	84	82	83	83	82	79	80	82	84	86	85	84	86	87	86.5	95																
12-Dec	89	88	89	88	89	89	88	85	85	84	84	83	84	83	83	82	81	82	83	83	81	80	81	82	84.5	89																
13-Dec	84	85	86	83	82	83	83	83	83	83	84	83	80	79	80	80	81	91	95	95	90	87	87	90	84.8	95																
14-Dec	89	89	90	92	89	84	84	85	85	85	85	83	82	78	78	79	80	78	78	79	78	79	80	80	83.1	92																
15-Dec	81	82	79	81	81	79	79	81	80	81	79	79	78	76	76	77	79	81	82	82	77	79	86	80	79.8	86																
16-Dec	79	85	85	83	80	70	70	73	73	70	73	72	71	68	67	70	72	75	77	78	79	81	83	84	75.8	85																
17-Dec	83	82	78	77	73	75	76	81	80	80	81	81	81	79	78	78	80	81	80	79	79	80	80	79	79.3	83																
18-Dec	79	79	80	81	83	83	82	82	81	80	82	83	80	74	75	75	77	78	78	79	81	80	80	81	79.6	83																
19-Dec	81	81	81	81	78	79	78	78	77	76	74	75	74	73	75	76	78	79	81	80	81	80	79	80	78.1	81																
20-Dec	81	80	80	84	84	84	84	85	85	85	79	78	78	78	77	76	76	77	77	77	77	78	77	77	79.6	85																
21-Dec	79	79	80	79	80	83	85	86	84	82	82	83	80	78	78	79	80	80	82	85	86	85	87	88	82.1	88																
22-Dec	87	87	87	88	86	84	83	83	84	84	83	83	82	82	82	83	83	82	81	80	80	80	80	80	83.1	88																
23-Dec	79	78	78	79	79	79	80	80	80	80	79	77	77	78	76	76	77	78	78	78	80	79	79	79	78.4	80																
24-Dec	81	83	83	82	82	81	80	80	80	80	80	79	77	77	76	76	77	77	77	80	81	80	78	76	79.3	83																
25-Dec	78	80	79	79	80	79	77	78	78	78	79	80	81	81	82	84	85	85	84	82	80	78	79	77	80.1	85																
26-Dec	78	79	80	80	81	82	81	80	79	78	78	78	78	79	79	79	78	79	79	79	80	80	80	80	79.3	82																
27-Dec	80	80	77	73	73	74	75	76	73	74	74	73	74	76	75	74	75	74	75	78	78	79	78	78	75.7	80																
28-Dec	80	81	81	79	79	78	82	84	83	83	83	83	81	80	80	80	81	81	82	82	83	82	82	84	83	81.4	84															
29-Dec	85	84	84	85	86	87	87	88	88	89	89	86	80	76	75	76	79	80	75	75	75	75	75	74	81.4	89																
30-Dec	73	73	76	79	80	81	81	80	80	80	80	79	77	76	75	76	76	78	79	79	78	76	78	79	77.9	81																
31-Dec	76	80	76	70	70	68	68	67	66	66	66	62	61	61	61	65	68	68	69	66	66	71	72	69	67.9	80																
																	79.9	80.7	80.9	80.7	80.5	80.0	80.2	80.9	80.4	80.2	79.8	78.9	78.2	77.5	77.3	77.4	77.9	78.4	78.9	79.2	79.0	79.4	79.9	80.3	Diurnal Average	
																	94	95	95	95	95	93	93	93	93	93	94	95	94	94	94	94	94	94	95	95	94	94	94	94	Diurnal Maximum	



Wood Buffalo Environmental Association  
Hourly Averages

Relative Humidity 100m (RH100m) - %  
Lower Camp Met Tower - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity 100m (RH100m) - %**  
**Lower Camp Met Tower - December 2015**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	35	4.70	4.70
60 - 80	342	45.97	50.67
80 - 100	367	49.33	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity 167m (RH167m) - %**

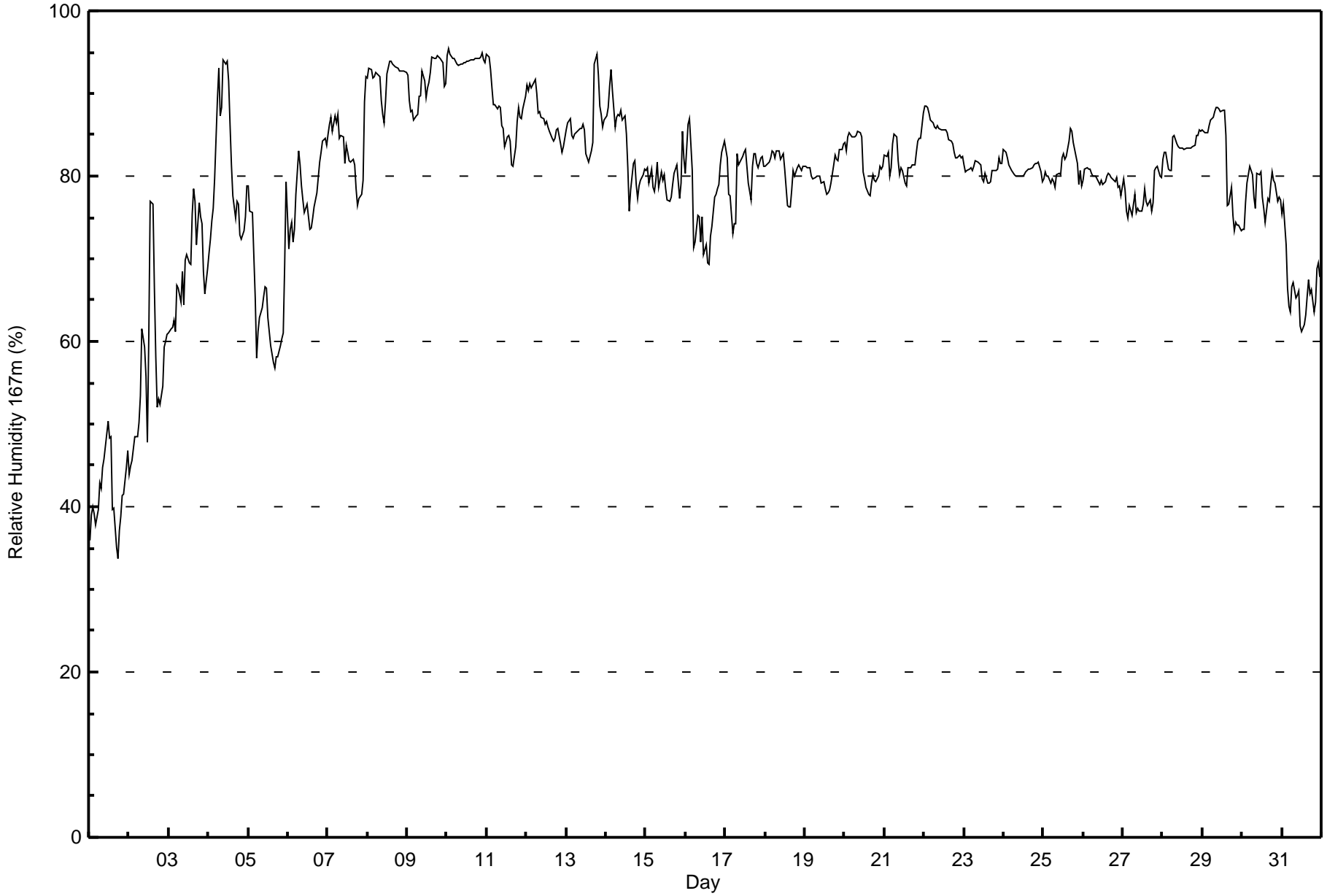
**Lower Camp Met Tower - December 2015**

Maximum Value: 95 % on Dec 10 02:00																		Maximum Daily Average: 94.1 % on Dec 10						Hours in Service: 744		
Minimum Value: 34 % on Dec 1 18:00																		Minimum Daily Average: 41.7 % on Dec 1						Hours of Data: 744		
Maximum Diurnal Average: 80.5 % at hour 24																		Minimum Diurnal Average: 77.9 % at hour 16						Hours of Missing Data: 0		
Monthly Average: 79.2 %																		Percentiles: P <sub>1</sub> = 39 P <sub>10</sub> = 65 Q <sub>1</sub> = 77 Median = 81 Q <sub>3</sub> = 85 P <sub>90</sub> = 91 P <sub>99</sub> = 94						Hours of Calibration: 0		
																		Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	36	39	40	39	38	40	43	42	45	46	47	50	48	49	40	40	35	34	37	39	41	42	45	47	41.7	50
2-Dec	44	45	46	48	48	48	50	53	62	59	56	48	60	77	77	67	58	52	53	52	55	59	60	61	55.8	77
3-Dec	61	62	62	63	61	67	66	65	69	64	70	70	70	69	75	78	77	72	77	75	74	68	66	69	68.7	78
4-Dec	71	72	75	76	80	89	93	87	88	94	94	94	92	86	81	78	75	77	77	73	72	73	75	79	81.3	94
5-Dec	79	76	76	70	65	58	61	63	64	65	67	66	63	60	58	57	57	58	58	59	60	61	69	79	64.6	79
6-Dec	71	74	74	72	74	78	83	81	79	77	76	77	75	74	74	75	76	78	80	82	83	84	85	84	77.6	85
7-Dec	85	86	87	85	87	86	87	85	85	85	82	84	83	82	82	82	81	79	76	77	78	80	89	92	83.5	92
8-Dec	92	93	93	92	92	93	92	92	89	88	86	89	92	94	94	94	93	93	93	93	93	93	93	93	92.0	94
9-Dec	92	89	88	88	87	87	87	90	90	93	91	90	91	91	93	94	94	94	95	94	94	94	91	91	91.2	95
10-Dec	95	95	95	94	94	94	94	93	93	94	94	94	94	94	94	94	94	94	94	94	94	95	94	94	94.1	95
11-Dec	95	94	93	91	89	89	88	88	88	86	86	84	85	85	84	81	81	84	87	88	87	87	88	90	87.4	95
12-Dec	91	90	91	91	91	92	90	88	88	87	87	86	87	86	85	85	84	85	86	86	84	83	84	85	87.1	92
13-Dec	86	86	87	85	85	85	85	86	86	86	86	86	83	82	83	84	93	95	92	89	87	86	87	87	86.3	95
14-Dec	87	88	91	93	90	86	87	88	87	88	87	87	85	81	76	78	82	82	79	77	79	79	80	81	84.1	93
15-Dec	81	81	79	81	79	78	79	82	79	81	80	80	78	77	77	77	79	80	81	81	77	79	85	82	79.7	85
16-Dec	80	86	87	84	81	71	72	75	75	72	75	71	72	69	69	73	74	77	78	78	79	81	83	84	77.0	87
17-Dec	83	82	78	78	73	74	74	83	81	82	82	83	83	81	79	77	81	83	83	81	81	82	82	81	80.4	83
18-Dec	81	81	82	82	83	83	82	83	83	82	82	83	81	76	76	76	78	81	80	81	81	81	81	81	80.9	83
19-Dec	81	81	81	81	80	80	80	80	80	80	79	79	78	78	78	78	79	81	83	82	82	83	83	84	80.5	84
20-Dec	84	83	85	85	85	85	85	85	85	85	85	81	80	79	78	78	79	80	80	79	80	81	81	81	82.0	85
21-Dec	83	82	83	80	81	84	85	85	82	80	81	81	79	79	81	81	81	81	81	83	84	85	85	88	82.3	88
22-Dec	88	89	88	88	87	86	86	86	86	86	86	86	86	86	85	84	84	84	83	82	82	83	82	82	85.2	89
23-Dec	81	80	81	81	81	81	81	82	82	82	81	80	79	80	79	79	81	81	81	81	81	82	81	81	80.7	82
24-Dec	83	83	82	81	81	81	80	80	80	80	80	80	80	81	81	81	81	81	81	82	82	82	80	79	80.9	83
25-Dec	80	81	80	80	79	80	79	79	80	80	80	82	83	82	82	84	86	85	84	83	82	79	81	79	81.2	86
26-Dec	80	81	81	81	81	80	80	80	80	79	79	79	79	79	80	80	80	80	79	79	80	79	79	78	79.7	81
27-Dec	80	78	76	75	76	75	77	78	76	76	76	76	77	79	77	77	77	76	77	81	81	81	80	80	77.4	81
28-Dec	82	83	83	81	81	81	85	85	84	83	83	83	83	83	83	83	83	83	84	84	85	85	86	85	83.4	86
29-Dec	86	85	85	85	86	87	87	88	88	88	88	88	88	88	88	85	76	77	79	75	73	74	74	73	82.5	88
30-Dec	73	73	77	79	81	81	80	78	76	80	80	80	77	76	74	77	77	79	80	80	79	77	77	77	78.0	81
31-Dec	75	77	72	66	64	64	67	67	65	66	66	62	61	62	63	65	67	66	66	64	65	69	69	68	66.5	77
	79.5	79.9	79.8	79.2	78.7	78.8	79.6	79.8	79.8	79.8	79.7	79.3	79.1	78.8	78.2	77.9	77.9	78.4	78.7	78.6	78.7	79.0	79.8	80.5	Diurnal Average	
	95	95	95	94	94	94	94	93	93	94	94	94	94	94	94	94	94	94	95	94	94	95	94	94	Diurnal Maximum	



Wood Buffalo Environmental Association  
Hourly Averages

Relative Humidity 167m (RH167m) - %  
Lower Camp Met Tower - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity 167m (RH167m) - %**  
**Lower Camp Met Tower - December 2015**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	11	1.48	1.48
40 - 60	38	5.11	6.59
60 - 80	253	34.01	40.59
80 - 100	442	59.41	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Speed: 21 km/h on Dec 29 20:00	Maximum Daily Speed Average: 15.4 km/h on Dec 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 17 01:00	Minimum Daily Speed Average: 0.7 km/h on Dec 7	Hours of Data: 742
Maximum Diurnal Speed Average: 3.6 km/h at hour 23	Minimum Diurnal Speed Average: 1.9 km/h at hour 6	Hours of Missing Data: 2
Monthly Average Velocity: 2.3 km/h 161.3 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 3 Median = 5 Q <sub>3</sub> = 10 P <sub>90</sub> = 14 P <sub>99</sub> = 19	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	SSE9	SSE5	SSE9	SSE12	SSE11	SSE11	SSE9	SSE9	SSE10	SSE9	SSE13	SSE13	SE9	SSE10	SSE9	SE6	SE8	SSE12	SSE13	SSE13	SSE12	SSE14	SSE15	SSE14	SSE10.6	SSE15	
2-Dec	SSE15	SSE14	SSE16	SSE11	SSE9	SE7	SSE10	SSE10	SSE8	SSE10	SE8	SSE15	SE15	AF	AF	SE10	SE8	W9	W14	W10	W12	W14	W13	W14	S6.3	SSE16	
3-Dec	W11	W14	W10	W5	WSW5	SSE5	SSE8	SSE10	SSE7	NW2	N2	N7	N5	N5	NNW4	N5	N4	NW3	NNW3	N3	NNW3	NNW4	NW2	NNW4	WNW2.1	W14	
4-Dec	NNW3	NNW3	NNW3	NNW4	NNW4	N4	N3	NNW2	NW2	NNE0	N1	WSW3	SW5	SSE9	S8	SSW6	WSW8	SW5	SSE5	SE7	SSE8	SE8	SE9	SSW1	S1.6	SSE9	
5-Dec	WNW4	NNW3	WNW4	NW13	NW13	WNW17	WNW16	WNW15	W18	W16	W14	W11	W14	W11	W7	SW4	SW3	NE1	SE4	SE5	SSE7	SE1	SE2	E2	W6.6	W18	
6-Dec	N4	NNW4	NNW4	NW3	NNW2	N3	NW3	WNW3	NW3	N4	NNW3	N4	N6	NNW4	SW2	WSW2	S3	S11	S7	SW2	SW3	SSE4	E2	SE5	NW0.8	SSE11	
7-Dec	SSE2	SSE3	SE3	SSW1	SSE3	ENE2	NNW2	N3	N6	NNW5	N4	NNW5	NNW3	NNW4	NNW5	NNW4	N2	SSW1	SSE3	SSE3	SE4	SSE9	SE4	NNW4	NNE0.7	SSE9	
8-Dec	NNW7	NNW6	NNW6	NNW5	N4	WNW1	SSW1	NE1	N1	SE2	S2	SW10	S6	S5	SSE7	SSE8	SSE8	SSE5	ESE5	E8	ENE3	NE2	ESE7	ESE5	SE1.3	SW10	
9-Dec	ESE5	E5	E5	NNE2	ENE3	NNE4	NNW2	NE3	E4	ESE1	SE7	SE9	SE2	NNE2	N2	NW1	NNW2	N2	NNW3	NNW2	S1	SSW3	SW2	E1	E1.5	SE9	
10-Dec	NNW1	NNE1	NNW3	NNW3	NNW3	NNW2	N2	N3	NNW2	NNW4	N3	NNW2	N2	N4	NW2	NNW3	NW2	N3	N3	NNW4	NNW3	NNW3	NNW4	NNW4	NNW2.7	N4	
11-Dec	NNW3	NNW3	N3	N5	N4	N5	N5	NNE3	ESE2	SE9	SE13	SE15	SE11	S6	S7	S8	SSE8	SE8	SSE11	SSE13	SE13	SE12	SE10	SE10	SE5.2	SE15	
12-Dec	SE10	SE12	SE12	SE14	SE14	SSE12	SSE15	SSE15	SSE18	SSE18	SSE19	SSE17	SSE20	SSE19	SE18	SE18	SE17	SE17	SSE15	SE15	SE14	SE14	SSE15	SE15	SSE15.4	SSE20	
13-Dec	SE13	SE14	SE13	SE14	SE14	SE14	SE13	SE12	SE11	SE11	SE10	SE10	SE10	SE7	N1	NNW3	NNW3	N4	NNW4	NNW3	N4	N5	NNW3	NNW2	SE6.0	SSE14	
14-Dec	NNW1	SW1	N2	NNW3	N3	WNW6	WNW5	WNW5	WNW6	WNW5	W6	WNW2	W4	W5	WSW6	SW7	SW6	SSW4	S7	SSE12	S11	S12	S13	SSE17	SW3.5	SSE17	
15-Dec	S15	S14	SSE18	SSE15	SSE19	SSE18	SSE13	SSE8	S9	S4	WSW6	WSW8	W16	WSW16	WSW6	WSW6	W10	W4	WSW6	SSW4	W13	N9	N7	NNE10	SSW5.5	SSE19	
16-Dec	NNE6	NNW3	NNE1	W1	NNW3	NW11	NW10	W7	WNW5	WNW4	W7	W5	WSW9	W9	WSW10	SSW5	SW11	WSW9	W2	WNW1	N4	N3	NNW2	WSW1	WNW4.0	NW11	
17-Dec	ESE0	E1	N2	NW2	N3	NNW4	N5	NNE3	NNE3	NNW3	N2	N3	N2	N3	N4	N2	NNW2	NNE4	NE3	NNE3	N4	N2	NNE2	NE3	N2.5	N5	
18-Dec	NNE3	NE2	NNE2	NNW2	NW2	NNE2	N1	SSE1	ENE3	NNE2	N2	NNW3	S1	SSE6	ESE5	E6	ESE5	ESE4	ESE8	ESE5	SE9	SE7	E5	NE3	E2.5	SE9	
19-Dec	NNW5	N4	NNW4	NNE2	SE11	SE9	SE8	SE7	SE5	SSE6	SSE9	S4	SSE7	S2	SSE3	SSE3	N2	N3	NNW6	NNW6	NNW6	NNW1	SSE11	SSE8	SE2.4	SE11	
20-Dec	SSE9	SSE9	SSE9	SE7	SE4	SE5	SSE11	SSE5	SSE4	W1	SSE2	SE3	S4	S4	S5	SSE10	SE13	SE14	SE17	SSE18	SSE15	SSE15	SE17	SSE14	SSE8.7	SSE18	
21-Dec	SSE14	SSE15	SSE13	S13	S12	S7	ESE3	ESE3	SE8	SSE10	SSE4	SSE6	SSE6	SSE5	S2	SW2	NE0	NNW3	NNW3	N5	N4	NNW3	NNW4	N4	SSE3.9	SSE15	
22-Dec	NNW4	N5	NNW4	NNW5	N7	N9	N9	N9	N8	N10	N7	N6	N7	N7	NNW9	NNW9	N7	N7	N9	N8	NNW6	N8	N7	N7	N7.3	N10	
23-Dec	N7	NNW6	NNW6	NNW7	N6	NNW5	NNW5	NNW5	N5	N6	N6	N7	N6	N6	N7	N7	N7	NNW5	N6	N6	N5	NNW5	N6	NNW5	N5.8	N7	
24-Dec	N6	NNW5	N4	NNW3	NNW5	NNW4	N5	N5	N3	NNW3	N4	N4	NNW2	NW2	NW2	WSW2	N1	NE1	N1	NNW1	SE1	SSE6	SSE6	SSE10	N1.5	SSE10	
25-Dec	SSE9	SSE9	SSE8	SSE7	SE7	SE7	SSE8	SSE8	SSE9	SE9	SE5	SE3	N1	NNW1	ESE1	SE0	N4	N5	NNW7	NNW6	NNW7	N6	N2	N3	SE2.3	SSE9	
26-Dec	N3	NW2	NNW2	NW2	N1	NNW3	NW3	NNW3	NW2	NW2	NW2	NNW2	N2	N4	N4	N4	N4	N4	N4	N4	N4	N4	N4	N4	N6	NNW3.1	N6
27-Dec	N5	N5	NNE5	SE13	SE18	SSE18	SSE17	SE17	SSE19	SSE21	SE18	SSE18	SSE20	SSE15	S13	S13	S9	S14	SSE13	S5	SSE7	SSE5	S2	SSE3	SSE10.7	SSE21	
28-Dec	S2	SSE5	ESE2	NW3	NNW2	NW6	NNW6	N9	N6	NNW5	NNW3	N5	NNW5	NNW4	NNW5	NNW5	NNW4	N2	NNW2	N2	N2	E1	SE7	SSE10	N2.1	SSE10	
29-Dec	SSE7	SE6	SE5	SE7	SSE13	SE9	SE11	SSE14	SSE16	SSE16	SSE12	S11	SW7	SSW6	S8	SSE15	SSE18	SSE17	SSE18	SSE21	SSE20	SSE15	SSE16	SSE15	SSE12.2	SSE21	
30-Dec	SSE11	S8	W6	NNW4	WNW5	WSW1	SE3	SE5	SE13	SSE12	SE13	SE15	SE14	SSE13	SE8	SSE4	SSW5	S3	SSE8	SSE10	SSE10	SSE10	SE14	SSE17	SSE7.8	SSE17	
31-Dec	SSE17	SSE11	SSE11	SSE19	SSE20	SSE13	SSE10	SSE14	S8	W15	WSW12	WSW15	WSW18	WSW14	SW18	WSW14	WSW14	WSW13	WSW16	WSW10	SW6	S6	SSE7	S6	SSW8.8	SSE20	

SSE2.4 SSE2.2 SSE2.0 SSE2.1 SE3.0 SSE1.9 SSE2.2 SE2.5 SSE3.1 SSE2.3 SSE2.6 S2.8 S3.0SSW2.4SSW2.1 S2.3 S2.1 S2.0 SSE2.2 SSE2.4 SSE2.3 SSE2.6 SE3.6 SE3.1	Diurnal Average
SSE17 SSE15 SSE18 SSE19 SSE20 SSE18 SSE17 SE17 SSE19 SSE21 SSE19 SSE18 SSE20 SSE19 SE18 SE18 SSE18 SE17 SSE18 SSE21 SSE20 SSE15 SE17 SSE17	Diurnal Maximum

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



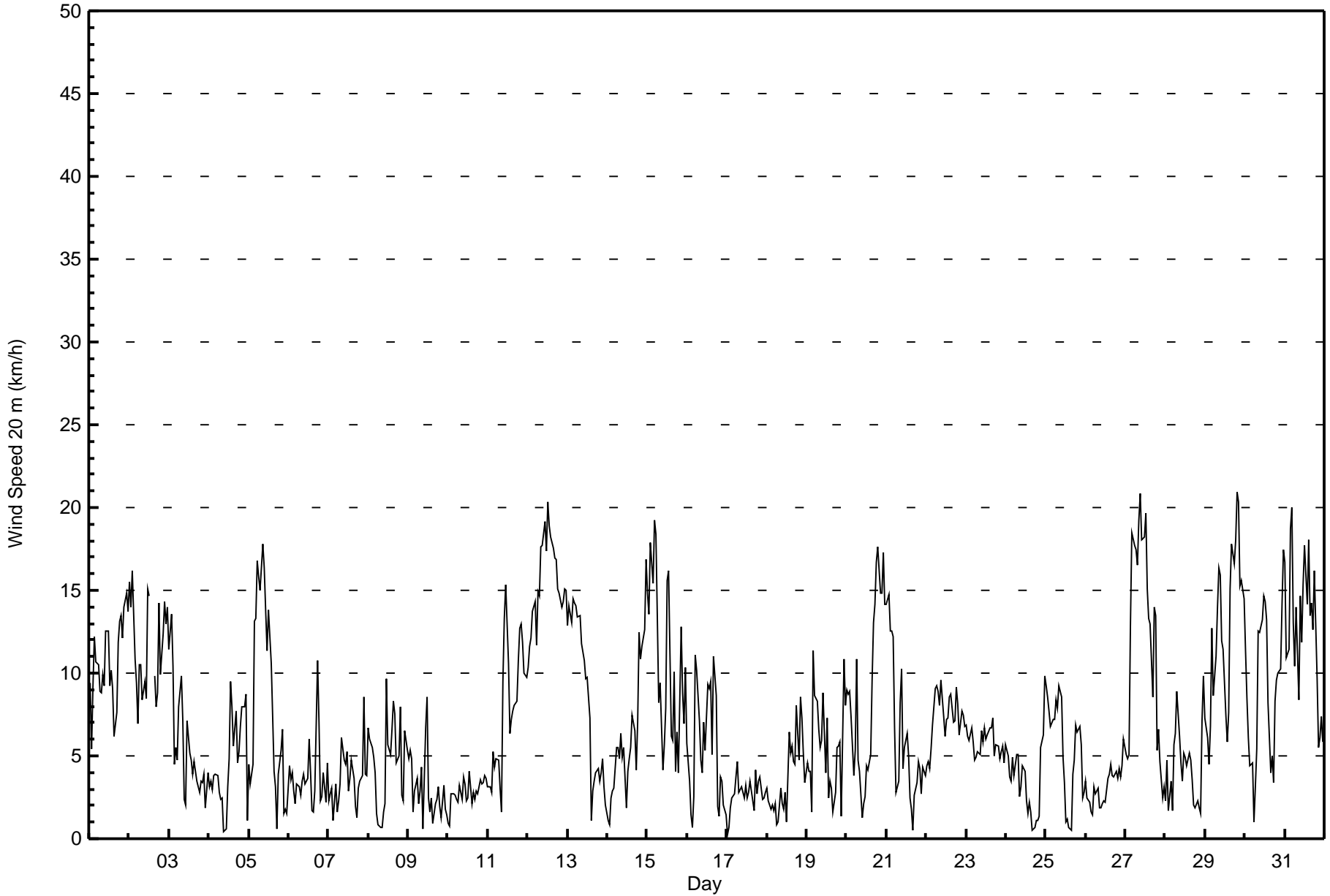
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed 20 m (WS20m) - km/h

Lower Camp Met Tower - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744											
Maximum Value: 7 km/h on Dec 27 10:00														Hours of Data: 742											
Minimum Value: 0 km/h on Dec 24 18:00														Hours of Missing Data: 2											
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 6														Hours of Calibration: 0											
														Percent Operational Time: 99.7											
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	3	1	3	2	3	2	3	2	3	3	3	4	5	3	4	2	3	3	3	2	2	3	3	3	5
2-Dec	3	2	3	3	3	3	4	3	2	3	4	4	3	AF	AF	2	3	4	6	3	5	5	3	4	6
3-Dec	3	4	5	6	3	2	2	4	4	2	1	3	2	2	2	2	2	1	2	2	1	2	1	2	6
4-Dec	2	1	2	1	2	1	2	2	2	1	1	3	2	3	3	3	2	2	2	4	4	3	2	3	4
5-Dec	2	1	2	6	5	6	6	6	6	6	5	5	5	5	2	2	2	1	2	2	2	2	1	1	6
6-Dec	2	1	1	2	1	1	1	1	2	2	2	2	3	2	2	1	2	4	3	1	1	3	2	3	4
7-Dec	1	1	3	2	2	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	3	2	3	3
8-Dec	2	2	2	2	2	2	2	1	1	1	2	3	2	2	3	3	3	2	3	3	1	1	3	2	3
9-Dec	2	2	2	1	2	1	2	2	2	2	3	4	1	1	1	1	1	1	1	1	1	1	1	1	4
10-Dec	1	2	1	1	1	1	1	1	1	1	2	1	1	2	1	2	1	2	1	1	2	1	2	1	2
11-Dec	2	1	2	2	1	1	1	1	2	5	5	5	4	2	2	2	2	3	4	4	4	5	4	3	5
12-Dec	3	4	4	4	5	4	4	5	5	6	6	5	5	6	6	6	6	6	5	5	5	5	5	5	6
13-Dec	4	4	4	5	4	4	4	5	4	4	4	4	4	1	1	2	1	1	1	1	1	1	1	1	5
14-Dec	1	1	1	1	2	2	2	3	2	2	3	2	2	3	2	2	2	1	4	3	2	3	3	4	4
15-Dec	3	3	3	3	3	4	5	4	4	2	3	4	4	4	6	3	4	3	4	3	4	4	3	4	6
16-Dec	3	2	1	1	3	4	4	3	3	3	3	2	3	3	3	2	4	4	1	1	2	1	1	1	4
17-Dec	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	2
18-Dec	2	1	1	1	1	1	1	0	2	1	1	1	2	2	2	2	2	2	2	3	3	3	3	2	3
19-Dec	1	1	1	1	5	4	3	3	3	4	3	2	3	2	1	1	1	1	2	2	2	1	4	3	5
20-Dec	2	2	3	3	2	3	4	3	2	1	2	3	2	2	2	4	4	4	5	5	5	5	5	5	5
21-Dec	4	4	4	3	4	3	2	2	3	3	2	2	2	2	1	1	1	1	1	3	2	2	2	2	4
22-Dec	2	2	2	2	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3	3	2	3	3	2	3
23-Dec	3	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	3
24-Dec	2	2	1	1	2	1	2	2	1	1	2	2	2	2	1	1	0	0	1	1	1	1	2	5	5
25-Dec	3	3	2	2	2	2	2	2	3	3	2	1	1	1	0	1	1	2	2	2	2	2	1	1	3
26-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	2	2	2	1	2	2	2
27-Dec	2	2	3	5	6	6	6	5	7	7	6	6	5	5	4	4	3	3	3	2	2	2	2	1	7
28-Dec	1	2	1	2	1	2	2	3	3	2	2	2	2	2	2	2	1	1	1	1	1	1	3	2	3
29-Dec	1	1	3	3	4	2	2	4	3	4	3	3	4	2	2	3	2	3	3	4	3	4	3	3	4
30-Dec	3	4	5	3	3	2	2	3	5	3	3	3	4	3	5	3	2	2	2	2	3	3	2	3	5
31-Dec	4	5	4	4	5	5	5	4	4	6	4	4	4	3	4	3	4	4	5	5	3	3	3	2	6
Diurnal Maximum																									
AF - Analyzer Failure																									





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed 20 m (WS20m) - km/h**  
**Lower Camp Met Tower - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	374	50.40	50.40
6 - 11	222	29.92	80.32
12 - 19	140	18.87	99.19
20 - 28	6	0.81	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

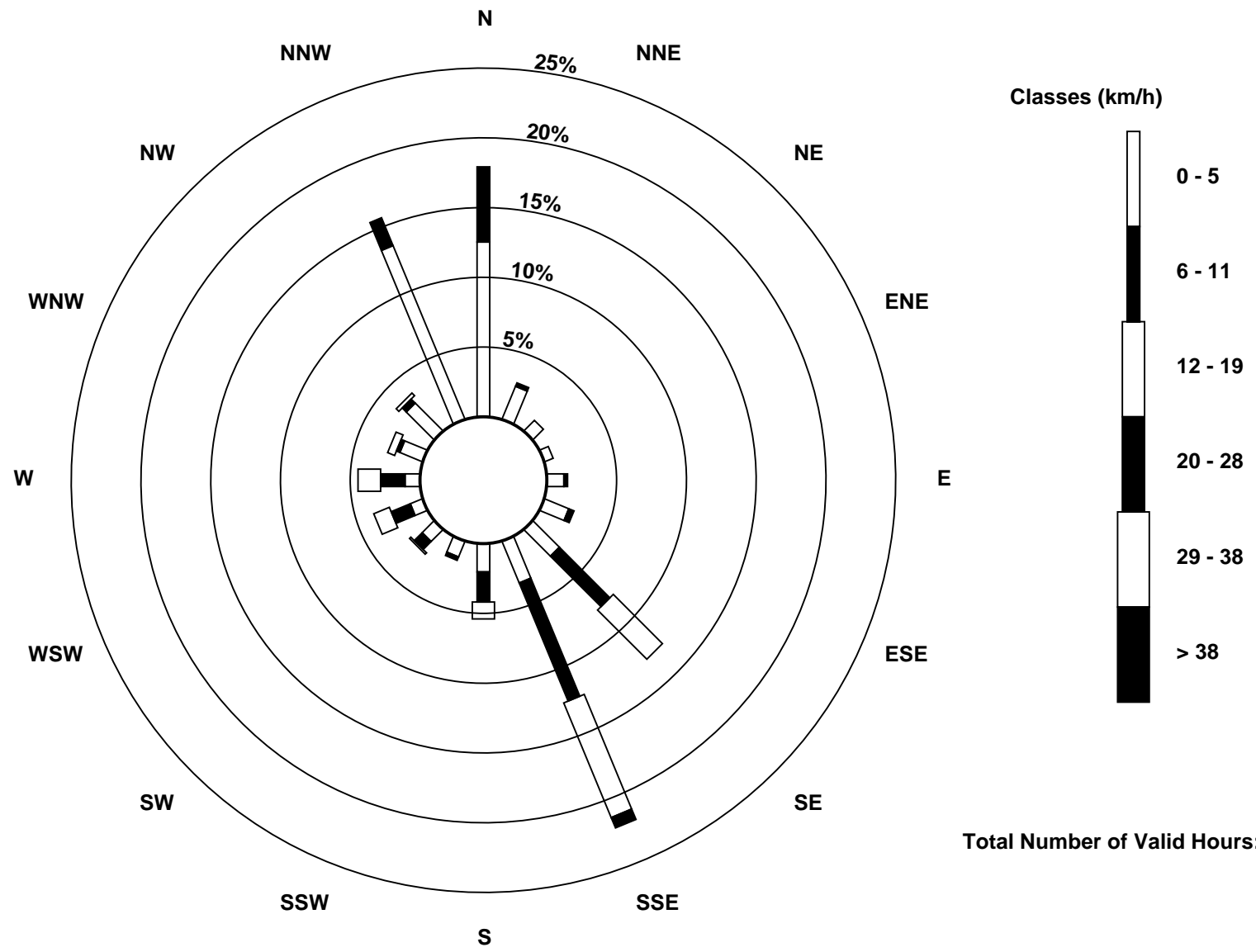
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed 20 m (WS20m) - km/h  
Lower Camp Met Tower (AMS 3)







Maximum Speed: 29 km/h on Dec 27 10:00	Maximum Daily Speed Average: 20.2 km/h on Dec 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 8 09:00	Minimum Daily Speed Average: 0.6 km/h on Dec 7	Hours of Data: 742
Maximum Diurnal Speed Average: 4.1 km/h at hour 23	Minimum Diurnal Speed Average: 2.1 km/h at hour 3	Hours of Missing Data: 2
Monthly Average Velocity: 2.7 km/h 162.5 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 5 Median = 7 Q <sub>3</sub> = 13 P <sub>90</sub> = 18 P <sub>99</sub> = 25	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	SSE12	SSE10	SSE13	SSE15	SSE14	SSE13	SSE12	SSE11	SSE13	SSE12	SSE15	SSE14	SSE13	SSE12	SSE12	SE8	SE10	SSE15	SSE17	SSE17	SSE14	SSE18	SSE18	SSE17	SSE13.5	SSE18	
2-Dec	SSE18	SSE17	SSE20	SSE14	SSE11	SE9	SSE13	SSE13	SSE9	SSE11	SE11	SSE19	SE18	AF	AF16	SE12	SE10	W14	W19	W14	W17	W20	W19	W19	S7.8	SSE20	
3-Dec	W16	W18	W16	W8	WSW8	SSE6	SSE11	SSE15	SSE11	NW2	N3	N10	N7	N7	NNW6	N7	N7	NW5	NNW5	N6	NNW6	NNW7	NW4	NNW7	WNW3.2	W18	
4-Dec	NNW5	NNW6	NNW5	NNW6	NNW6	N5	N5	NNW3	NW4	NNE1	N2	WSW5	SW7	SSE9	S9	SSW8	WSW11	SW6	SSE5	SE7	SSE8	SE8	SE10	SSW3	SSW1.6	WSW11	
5-Dec	WNW7	NNW6	WNW6	NW16	NW17	WNW22	WNW21	WNW20	W24	W22	W18	W15	W18	W14	W10	SW5	SW5	SW5	NE2	SE6	SE9	SSE9	SE5	SE4	E4	W8.5	W24
6-Dec	N4	NNW5	NNW6	NW4	NNW3	N5	NW4	WNW3	NW5	N5	NNW5	N5	N7	NNW2	SW4	WSW3	S5	S14	S9	SW3	SW4	SSE7	E4	SE7	WNW0.9	SSE14	
7-Dec	SSE5	SSE5	SE5	SSW2	SSE5	ENE2	NNW3	N2	N5	NNW2	N3	NNW7	NNW4	NNW5	NNW6	NNW5	N1	SSW3	SSE6	SSE5	SE6	SSE11	SE5	NNW6	ESE0.6	SSE11	
8-Dec	NNW9	NNW9	NNW8	NNW7	N6	WNW2	SSW2	NE1	N0	SE2	S3	SW12	S6	S6	SSE8	SSE10	SSE9	SSE6	ESE8	E11	ENE4	NE4	ESE9	ESE7	SE1.6	SW12	
9-Dec	ESE7	E8	E7	NNE3	ENE5	NNE5	NNW3	NE4	E6	ESE4	SE9	SE11	SE3	NNE2	N4	NW1	NNW2	N4	NNW5	NNW3	S1	SSW4	SW3	E2	E2.3	SE11	
10-Dec	NNW2	NNE2	NNW4	NNW4	NNW5	NNW4	N4	N5	NNW4	NNW5	N5	NNW3	N3	N6	NW3	NNW4	NW4	N4	N4	NNW6	NNW5	NNW5	NNW5	NNW5	NNW4.1	NNW6	
11-Dec	NNW4	NNW5	N4	N7	N6	N4	N4	NNE2	ESE4	SE14	SE18	SE21	SE14	S7	S9	S9	SSE10	SE10	SSE14	SSE18	SE17	SE16	SE13	SE13	SE7.0	SE21	
12-Dec	SE13	SE15	SE15	SE18	SE19	SSE14	SSE18	SSE19	SSE24	SSE25	SSE26	SSE23	SSE24	SSE23	SE25	SE24	SE24	SE23	SSE20	SE19	SE18	SE19	SSE20	SE20	SSE20.2	SSE26	
13-Dec	SE17	SE19	SE18	SE19	SE19	SE18	SE17	SE17	SE16	SE15	SE14	SE13	SE13	SE10	N2	NNW4	NNW5	N6	NNW6	NNW5	N6	N6	NNW5	NNW4	SE7.7	SSE19	
14-Dec	NNW2	SW0	N4	NNW5	N5	WNW7	WNW7	WNW7	WNW8	WNW7	W7	WNW3	W5	W7	WSW8	SW9	SW8	SSW5	S8	SSE13	S12	S13	S13	SSE19	SW4.0	SSE19	
15-Dec	S15	S14	SSE20	SSE19	SSE22	SSE21	SSE16	SSE11	S11	S5	WSW9	WSW12	W22	WSW23	WSW11	WSW11	W17	W8	WSW13	SSW6	W18	N12	N10	NNE16	SW7.1	WSW23	
16-Dec	NNE9	NNW5	NNE3	W1	NNW4	NW14	NW12	W9	WNW7	WNW7	W9	W9	WSW13	W12	WSW13	SSW7	SW14	WSW13	W3	WNW4	N6	N6	NNW4	WSW1	WNW5.6	SW14	
17-Dec	ESE1	E1	N5	NW4	N5	NNW6	N7	NNE5	NNE5	NNW4	N3	N4	N3	N4	N5	N4	NNW3	NNE7	NE4	NNE5	N5	N4	NNE4	NE4	N3.8	N7	
18-Dec	NNE4	NE3	NNE3	NNW3	NW3	NNE3	N1	SSE1	ENE4	NNE3	N2	NNW3	S1	SSE8	ESE8	E9	ESE7	ESE7	ESE12	ESE10	SE12	SE9	E7	NE5	E3.7	ESE12	
19-Dec	NNW5	N4	NNW4	NNE2	SE15	SE12	SE11	SE9	SE7	SSE7	SSE10	S5	SSE8	S3	SSE4	SSE4	N1	N1	NNW4	NNW5	NNW5	NNW4	SSE15	SSE11	SE3.5	SE15	
20-Dec	SSE12	SSE12	SSE13	SE10	SE6	SE8	SSE14	SSE8	SSE7	W3	SSE7	SE7	S6	S5	S6	SSE15	SE18	SE20	SE23	SSE24	SSE20	SSE19	SE24	SSE20	SSE12.4	SE24	
21-Dec	SSE18	SSE18	SSE15	S14	S14	S9	ESE5	ESE6	SE12	SSE13	SSE6	SSE7	SSE8	SSE6	S3	SW2	NE2	NNW2	NNW5	N7	N6	NNW4	NNW6	N5	SSE4.7	SSE18	
22-Dec	NNW6	N7	NNW6	NNW8	N10	N13	N13	N13	N11	N13	N10	N8	N10	N10	NNW12	NNW12	N10	N10	N13	N11	NNW9	N11	N11	N10	N10.3	N13	
23-Dec	N10	NNW9	NNW9	NNW9	N8	NNW7	NNW6	NNW8	N7	N9	N8	N9	N9	N9	N10	N10	N10	NNW7	N8	N8	N7	NNW8	N8	NNW7	N8.2	N10	
24-Dec	N8	NNW7	N6	NNW5	NNW7	NNW6	N7	N7	N3	NNW4	N6	N6	NNW3	NW2	NW2	WSW2	N1	NE1	N1	NNW1	SE2	SSE7	SSE8	SSE11	N2.3	SSE11	
25-Dec	SSE12	SSE11	SSE10	SSE9	SE9	SE9	SSE11	SSE10	SSE12	SE11	SE6	SE4	N1	NNW1	ESE1	SE2	N6	N7	NNW10	NNW10	NNW10	N8	N4	N5	ESE2.7	SSE12	
26-Dec	N6	NW3	NNW4	NW1	N2	NNW4	NW4	NNW5	NW3	NW3	NW3	NNW3	N3	N5	N5	N7	N5	N5	N5	N5	N5	NNW6	N5	N6	N8	N4.3	N8
27-Dec	N7	N7	NNE5	SE19	SE25	SSE26	SSE25	SE21	SSE26	SSE29	SE24	SSE25	SSE24	SSE19	S15	S14	S10	S15	SSE14	S6	SSE9	SSE6	S3	SSE4	SSE13.8	SSE29	
28-Dec	S3	SSE5	ESE1	NW5	NNW3	NW7	NNW8	N12	N9	NNW6	NNW5	N7	NNW7	NNW5	NNW6	NNW7	NNW5	N3	NNW2	N3	N3	E1	SE9	SSE11	NNW3.0	N12	
29-Dec	SSE8	SE7	SE6	SE8	SSE16	SE12	SE13	SSE17	SSE16	SSE14	SSE11	S12	SW9	SSW7	S9	SSE17	SSE20	SSE21	SSE23	SSE24	SSE21	SSE17	SSE17	SSE14	SSE13.7	SSE24	
30-Dec	SSE11	S9	W11	WNW8	WNW6	WSW4	SE2	SE3	SE12	SSE15	SE15	SE17	SE15	SSE14	SE8	SSE4	SSW7	S4	SSE6	SSE7	SSE8	SSE10	SE16	SSE20	SSE7.8	SSE20	
31-Dec	SSE22	SSE12	SSE13	SSE21	SSE26	SSE17	SSE14	SSE17	S9	W20	WSW18	WSW23	WSW23	WSW18	SW22	WSW18	WSW21	WSW21	WSW26	WSW18	SW8	S7	SSE8	S7	SSW11.9	SSE26	

SE2.7 SSE2.4 SSE2.1 SSE2.3 SE3.6 SSE2.3 SSE2.7 SE3.1 SSE3.7 SSE2.8 SSE3.2 S3.5 SSW3.6 SW2.6 SSW2.5 S2.7 S2.7 S2.5 S2.6 SSE2.7 SSE2.4 SE2.8 SE4.1 SE3.4	Diurnal Average
SSE22 SE19 SSE20 SSE21 SSE26 SSE26 SSE25 SE21 SSE26 SSE29 SSE26 SSE25 SSE24 WSW23 SE25 SE24 SE24 SE23 WSW26 SSE24 SSE21 W20 SE24 SSE20	Diurnal Maximum

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



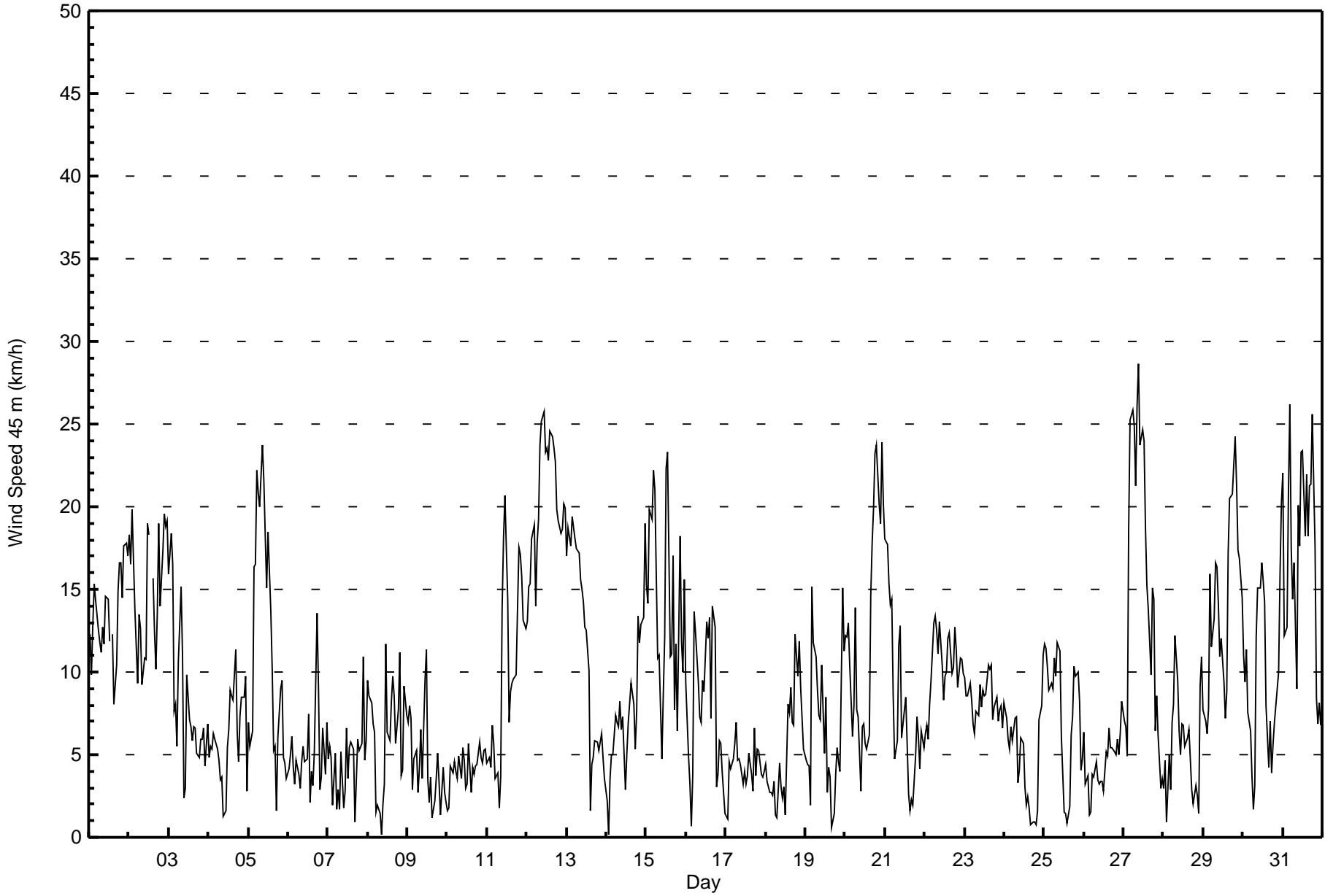
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed 45 m (WS45m) - km/h

Lower Camp Met Tower - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744													
Maximum Value: 9 km/h on Dec 15 15:00														Hours of Data: 742													
Minimum Value: 0 km/h on Dec 24 19:00														Hours of Missing Data: 2													
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 5 P <sub>99</sub> = 7														Hours of Calibration: 0													
														Percent Operational Time: 99.7													
Day	Hourly Period Ending At (MST)																								Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	3	2	3	1	2	2	2	2	2	3	2	3	5	AF	5	3	3	3	3	2	2	2	2	2	5		
2-Dec	1	1	2	3	3	4	3	3	2	2	4	3	2	AF	2	2	2	6	7	3	6	5	3	4	7		
3-Dec	3	4	5	8	4	2	3	3	5	2	2	3	3	2	2	2	2	2	2	1	2	2	2	2	8		
4-Dec	2	2	2	2	3	2	2	2	3	2	2	3	3	2	3	4	2	2	2	4	3	2	2	4	4		
5-Dec	2	2	3	6	6	6	6	6	5	5	5	4	5	5	2	2	2	1	4	2	1	3	2	2	6		
6-Dec	2	1	1	3	2	1	1	1	2	3	2	2	3	2	3	2	2	4	4	1	2	3	2	4	4		
7-Dec	1	1	3	2	2	1	2	2	2	2	2	2	2	2	2	1	3	3	2	3	3	2	3	3	3		
8-Dec	3	3	2	2	2	1	2	1	1	1	2	3	2	2	3	3	3	2	4	3	2	2	3	2	4		
9-Dec	2	2	2	2	2	1	2	2	3	2	3	5	2	2	1	1	1	1	1	1	1	1	1	1	5		
10-Dec	1	3	1	1	1	2	1	1	1	1	2	1	1	2	1	2	1	2	1	1	2	1	2	2	3		
11-Dec	3	2	2	2	2	2	2	2	2	6	5	5	5	2	2	2	2	3	6	5	4	5	4	4	6		
12-Dec	3	4	4	5	5	5	4	5	6	6	6	6	5	6	6	6	5	6	5	5	5	5	6	4	6		
13-Dec	4	4	4	4	4	4	4	5	4	4	4	4	5	4	1	1	2	2	1	1	1	2	2	1	5		
14-Dec	1	1	2	1	3	2	2	4	3	2	3	2	3	2	3	2	1	2	1	4	3	2	3	4	4		
15-Dec	3	3	4	3	4	4	6	4	4	2	3	5	4	3	9	3	4	4	7	5	4	4	4	5	9		
16-Dec	4	2	2	1	4	3	4	3	3	4	3	3	2	2	3	2	4	4	2	2	2	1	2	1	4		
17-Dec	1	2	2	2	3	1	2	2	1	1	1	1	1	1	2	2	1	2	2	2	1	2	2	2	3		
18-Dec	1	2	1	1	1	1	1	1	2	2	1	1	2	2	2	3	2	2	2	4	3	3	3	2	4		
19-Dec	1	1	2	2	5	4	3	4	3	4	3	2	3	2	2	2	1	2	2	2	2	4	4	4	5		
20-Dec	2	3	3	4	2	3	4	3	3	2	4	5	2	2	3	5	4	5	5	5	6	6	5	5	6		
21-Dec	5	5	4	3	4	3	3	4	3	2	2	2	2	2	1	1	1	2	1	4	2	2	2	2	5		
22-Dec	2	3	2	3	3	3	3	3	3	3	3	2	2	2	4	3	3	3	4	3	2	3	3	3	4		
23-Dec	3	3	3	3	3	2	2	2	2	2	2	2	2	3	3	3	2	2	2	3	2	2	2	2	3		
24-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	0	1	1	1	2	5	5		
25-Dec	2	2	2	2	2	2	2	2	3	3	2	1	1	1	1	1	1	2	3	3	3	2	1	2	3		
26-Dec	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	2	2	2	1	2	3	3		
27-Dec	2	2	3	6	6	6	6	5	7	7	6	7	6	6	4	3	3	3	3	2	3	2	2	2	7		
28-Dec	1	2	1	2	2	2	2	3	3	2	2	2	2	2	2	2	2	1	1	1	1	1	3	2	3		
29-Dec	1	1	3	4	3	2	2	3	2	3	2	3	4	2	2	3	1	1	2	2	2	3	2	2	4		
30-Dec	3	5	8	4	3	3	2	2	6	2	3	2	4	2	4	3	4	2	2	2	2	4	2	4	8		
31-Dec	3	4	5	4	2	5	5	4	5	6	4	4	3	2	4	2	3	3	3	5	4	3	3	3	6		
														Diurnal Maximum													
														5 5 8 8 6 6 6 6 7 7 6 7 6 6 9 6 5 6 7 5 6 6 6 5													
AF - Analyzer Failure																											





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed 45 m (WS45m) - km/h**  
**Lower Camp Met Tower - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	254	34.23	34.23
6 - 11	268	36.12	70.35
12 - 19	163	21.97	92.32
20 - 28	56	7.55	99.87
29 - 38	1	0.13	100.00
> 38	0	0.00	100.00

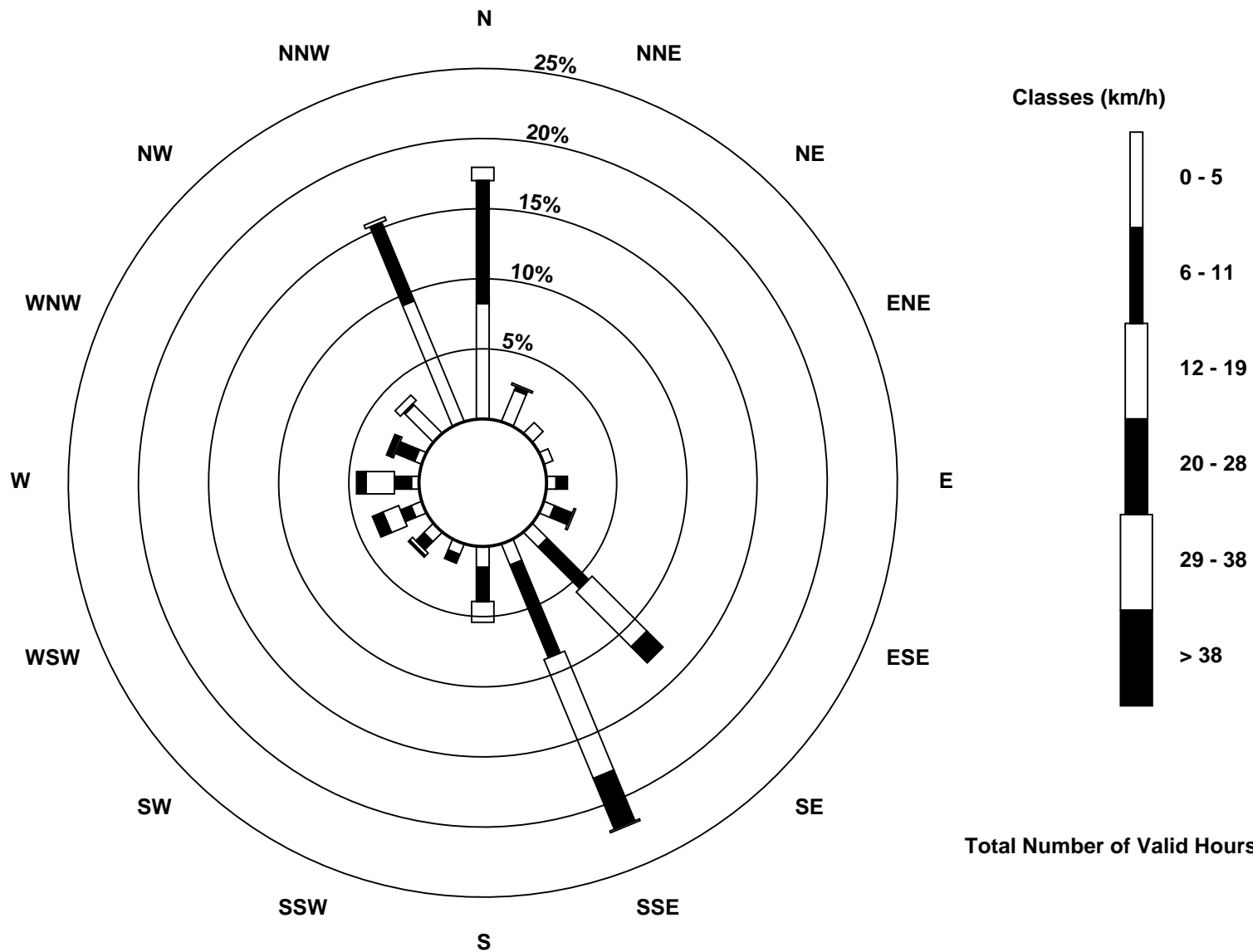
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed 45 m (WS45m) - km/h  
Lower Camp Met Tower (AMS 3)





Maximum Speed: 41 km/h on Dec 27 10:00	Maximum Daily Speed Average: 29.0 km/h on Dec 12	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 24 17:00	Minimum Daily Speed Average: 1.3 km/h on Dec 25	Hours of Data: 744
Maximum Diurnal Speed Average: 5.6 km/h at hour 12	Minimum Diurnal Speed Average: 2.7 km/h at hour 3	Hours of Missing Data: 0
Monthly Average Velocity: 4.0 km/h 171.0 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 4 Q <sub>1</sub> = 7 Median = 11 Q <sub>3</sub> = 17 P <sub>90</sub> = 25 P <sub>99</sub> = 35	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SSE9	SSE9	SSE10	SSE12	SSE13	SSE12	SSE14	SSE13	SSE11	SSE11	SSE14	SSE13	SE13	SSE11	SE15	SSE14	SSE20	SSE14	SSE13	S9	S7	SSE8	SSE14	SSE18	SSE12.3	SSE20
2-Dec	SSE12	SSE10	SSE12	SSE18	SSE16	SSE16	SSE13	SSE16	SSE8	S8	S13	SSE18	S10	S11	SSE14	S12	SW12WSW28	W31	W28	W33	W34WSW29WSW31			SSW12.2	W34	
3-Dec	W25	W29	W25WSW16WSW15	SW3	SSE10	SSE18	SE19	SE7	SSW1	NNE9	N11	N10	NNW9	NNW10	NNW12	NNW9	NNW12	NNW11	NNW11	N11	ENE8	NNE9	WNW4.4	W29		
4-Dec	N9	N12	N11	N11	N11	NNW12	NNW12	N7	NW6	NNW5	W8	WSW8	SW10	SW11	SW15	SW18WSW18WSW12	SW12	SW11	SSW8	SSW10	SW8WSW10		W5.7	SW18		
5-Dec	W10	NW11	WNW12	WNW25	WNW25	W32	W30	W29	W32	W30	W25WSW20WSW25	W20WSW15	SW12	SW12	SW11	SSW9	SSW7	S6	SSE6	SE14	SE12		W14.4	W32		
6-Dec	ESE5	NNW2	NNW7	N12	N6	NNW7	NNW13	NNW8	N9	NNW13	N7	E4	SE10	SE19	SSE12	SSE9	SSE14	SSE19	SSE16	SSE6	SSE6	SSE15	SSE16	SSE10	SE3.4	SE19
7-Dec	SSE11	SSE9	SE13	SE13	SSE13	SSE9	S3	SE13	SSE10	SSE15	SE15	SE3	NNE3	SSE2	SE9	S4	S3	S6	S10	SSE9	S12	SSW8	SW6	NW12	SSE7.1	SSE15
8-Dec	NNW16	NNW15	NNW14	NNW12	N11	NNE3	SW1	SSW2	WSW4	WSW6	SW10	SW13	S7	SSE7	SE11	SSE12	SSE12	SE10	ESE13	E17	ESE7	E8	ESE15	ESE12	ESE2.6	E17
9-Dec	ESE12	ESE13	ESE12	ESE9	ESE12	ESE8	ESE5	ESE9	ESE12	ESE13	SE16	SE19	SE7	ESE2	NNE3	SE3	SSE4	SW2	NNW6	NNW4	SW3	SW8	WSW7	NNW2	SE5.6	SE19
10-Dec	ENE1	WNW2	N8	N6	N8	NNE8	NNE7	NNE8	N6	N8	N7	N4	NNW3	N7	N2	N6	N4	NNW6	NNW9	NNW9	N8	NNE6	N6	NNW7	N5.9	NNW9
11-Dec	N7	N6	N2	SE5	SE7	SE9	SE7	SSE10	SE13	SE24	SE26	SE29	SE21	SSE9	S12	S13	SSE11	SE13	SE20	SE25	SE25	SE22	SE20	SE19	SE13.5	SE29
12-Dec	SE19	SE21	SE22	SE26	SE28	SE22	SE24	SE27	SE33	SE37	SE35	SE35	SSE30	SE32	SE34	SE34	SE34	SE34	SE29	SE28	SE28	SE28	SE29	SE28	SE29.0	SE37
13-Dec	SE25	SE27	SE27	SE28	SE27	SE25	SE24	SE24	SE22	SE22	SE20	SE18	SE17	SE13	ENE3	NNE5	N6	NNE5	N7	N7	E4	E4	NE3	N4	SE12.8	SE28
14-Dec	NE3	SE2	W2	NNW10	NNW10	WNW9	WNW9	W12	W12	W9	W11	W7	W8	W11WSW11	SW11	SW10	SSW8	SSW8	S17	S17	S19	S16	SSE21	SW6.5	SSE21	
15-Dec	S22	S19	S18	SSE24	SSE26	SSE24	SSE22	SSE15	S15	SW11	WSW18	WSW19	WSW29	WSW28	WSW19	WSW22	WSW25	WSW21	WSW23	WSW17	W28	NW17	N16	N22	SW12.6	WSW29
16-Dec	NNE13	N8	NNE6	N3	NW8	NW20	NNW18	NNW15	W16	W19	W14	WSW16	WSW18	W18	WSW18	SW15	SW18	W17	NW10	NNW11	WNW16	NNW13	NNW8	N3	WNW10.8	NW20
17-Dec	NW3	NW6	NW13	WNW10	NNW13	NW13	NW10	NNE8	NNE7	N6	N5	N5	N4	NNW5	N7	N6	N6	NE10	NE6	NNE8	NNE8	NNE6	NNE5	NE5	N6.1	NW13
18-Dec	NNE6	NE5	NNE3	N3	NNW3	N3	NE2	NE3	NE6	ENE5	NE3	N2	SSE3	SE9	ESE11	E18	ESE12	SE8	SE18	SE21	SE20	ESE15	E12	ESE12	ESE6.9	SE21
19-Dec	ESE7	SE6	ESE4	ESE10	SE23	SE17	SE16	SE15	SE13	SE11	SSE14	SSE10	SSE11	SE4	SSE5	SSE8	SE7	SE9	SE7	SE6	SE13	SSE20	SE25	SE24	SE11.6	SSE25
20-Dec	SE26	SE30	SE26	SSE20	SSE15	SE19	SE24	SE20	SE22	SSE15	SE26	SE24	SE12	SE16	SE20	SE28	SE31	SE34	SE36	SE34	SE33	SE30	SE33	SE30	SE25.2	SE36
21-Dec	SE27	SSE25	SSE21	SSE24	SSE22	SSE10	SSE14	SSE14	S10	S10	S6	SSE7	SSE8	SE9	SE8	SE5	SE5	ESE4	NNE3	NNW8	N8	NNW6	N8	NNW8	SSE7.8	SE27
22-Dec	NNW10	NNW11	NNW11	NNW14	N15	N18	N18	N17	N16	N18	N13	N12	N12	N13	NNW17	NNW18	N15	N15	N18	N16	N14	N15	N15	N14	N14.7	NNW18
23-Dec	N14	NNW12	NNW13	NNW15	N13	N10	NNW9	N11	N10	N12	N10	N11	N11	N11	N13	N13	N14	N10	N11	NNE12	N10	N12	N11	N10	N11.5	NNW15
24-Dec	N13	N12	N10	NNW10	NNW11	N10	N11	N10	N5	NNW5	N8	N7	NNW3	NW2	NW2	NNW1	N1	E2	ESE4	ESE4	SE6	SSE10	SSE9	SSE12	N3.5	N13
25-Dec	SSE12	SSE10	S7	SSE6	SSE8	SE10	SSE7	S6	S7	S7	S5	SSE2	NNE2	NE1	SE1	SE5	NNE4	N10	N17	N16	NNW16	N13	NNE7	N9	ENE1.3	N17
26-Dec	NNE10	NNE6	N5	NNE4	N2	NNW2	N4	NE3	NE3	ESE4	ESE3	SSE1	ESE5	ENE2	NNW4	NNW9	NNW11	N5	ENE2	N1	ENE3	NNE4	NE4	ENE5	NNE3.1	NNW11
27-Dec	N5	ESE5	SE16	SE29	SE37	SE36	SE35	SE31	SE37	SE41	SE34	SE37	SE32	SE27	SSE18	SSE16	SSE14	SSE21	SSE19	SSE10	SSE13	SSE11	SSW6	SW6	SE21.4	SE41
28-Dec	SW5	SSW5	W5	NW8	NNW7	NNW9	NNW11	N14	N13	N11	NNW9	N8	NNW8	NNW7	NNW6	NNW8	NNW6	N4	ENE3	WNW2	W3	SW5	S8	S10	NNW4.4	N14
29-Dec	S9	S10	S9	SSW10	SSE12	SSE9	S8	S11	S11	S12	S12	S14	SW14	SSW12	S11	SSE17	SSE18	S16	S16	S17	S16	S13	S11	SSW10	S12.0	SSE18
30-Dec	SW13	SW19	WSW23	WSW20	WSW17	WSW17	WSW15	WSW18	SW13	SSW8	SW11	SSW8	SSW9	SSW7	SW7	SW10	WSW16	WSW16	SW12	SW14	SW14	SW18	S10	S13	SW12.8	WSW23
31-Dec	S17	SSE11	S12	SSW13	S19	S18	S13	SSW11	WSW20	WSW33	WSW26	WSW28	WSW23	WSW20	WSW24	WSW24	WSW25	WSW26	WSW33	WSW28	WSW24	SW15	SW10	WSW20	SW18.0	WSW33

SE3.2 SSE3.1 SSE2.7 SSE3.1 SSE4.2 SSE3.5 SSE3.4 SSE4.3 SSE4.7 S4.4 S5.4 SSE5.6 S4.8 S4.3 S4.1 S4.7 S4.7SSW4.6 S3.8 S3.2 S3.8 S4.1 SSE4.9 SSE3.9	Diurnal Average
SE27 SE30 SE27 SE29 SE37 SE36 SE35 SE31 SE37 SE41 SE35 SE37 SE32 SSE32 SE34 SE34 SE34 SE34 SE36 SE34 W33 W34 SE33WSW31	Diurnal Maximum

All monthly, daily, and diurnal averages have been calculated using vector methods

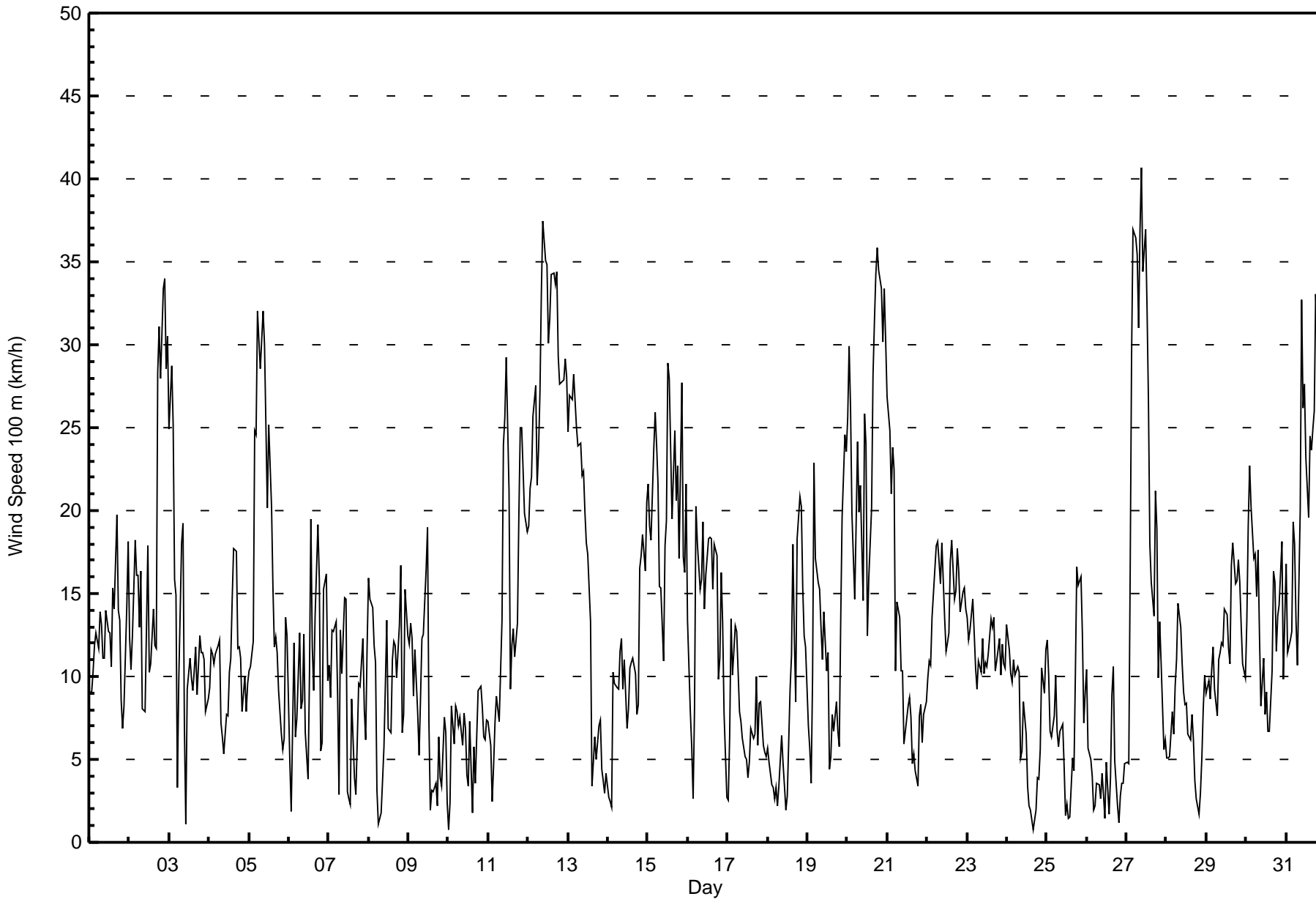


Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed 100 m (WS100m) - km/h  
Lower Camp Met Tower - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 10 km/h on Dec 3 04:00 Minimum Value: 0 km/h on Dec 10 01:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 3 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 7																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	3	3	3	2	2	3	1	1	2	3	4	5	9	3	3	4	3	3	3	2	2	2	3	2	9
2-Dec	2	2	4	3	4	2	3	4	4	4	5	4	2	3	3	3	4	5	8	4	8	5	2	3	8
3-Dec	2	3	3	10	3	4	4	2	3	4	2	3	2	2	2	1	2	2	2	1	2	2	1	10	
4-Dec	3	2	3	1	2	1	1	3	3	1	2	2	3	4	4	2	2	3	4	4	3	3	4	4	4
5-Dec	3	2	4	6	6	6	6	5	4	4	4	4	6	5	2	2	1	1	3	2	2	3	1	2	6
6-Dec	4	1	3	2	2	2	1	2	3	2	2	3	5	4	5	2	4	5	5	2	2	4	4	4	5
7-Dec	3	2	3	4	3	3	2	4	4	3	4	4	1	1	3	2	2	3	3	2	3	2	2	3	4
8-Dec	2	2	2	1	1	2	1	1	1	2	4	3	2	2	3	3	3	3	5	3	2	3	3	2	5
9-Dec	2	2	3	3	3	1	3	5	3	2	3	4	2	1	1	2	2	1	1	1	1	2	2	2	5
10-Dec	0	2	1	1	1	1	1	1	1	1	2	1	1	1	2	2	1	1	1	1	2	1	1	1	2
11-Dec	1	2	2	3	3	2	2	3	5	4	4	4	4	3	3	3	3	3	7	3	3	5	3	3	7
12-Dec	3	3	3	3	4	4	3	5	3	3	5	3	5	5	4	4	3	4	4	4	4	4	4	3	5
13-Dec	3	3	4	4	3	4	4	4	3	3	3	4	5	5	2	1	2	3	1	1	1	2	1	2	5
14-Dec	1	2	2	2	4	2	2	4	3	2	3	3	4	2	2	2	2	2	3	3	3	3	3	4	4
15-Dec	4	3	3	4	5	5	5	4	4	3	5	4	3	2	8	2	2	2	3	5	3	4	4	4	8
16-Dec	3	2	1	1	7	3	4	4	2	4	3	1	1	2	4	2	2	2	3	3	2	3	2	2	7
17-Dec	1	4	3	2	3	2	2	2	1	1	1	1	1	1	1	2	3	2	2	2	2	2	2	2	4
18-Dec	1	1	1	1	1	1	1	1	2	2	1	1	3	1	2	2	2	2	2	2	4	3	4	3	4
19-Dec	3	3	2	4	4	3	3	3	3	4	3	2	3	2	2	3	3	4	4	3	4	3	4	4	4
20-Dec	4	3	3	3	3	3	4	3	4	4	4	6	3	4	5	4	3	3	3	4	4	7	3	3	7
21-Dec	4	4	5	5	5	3	3	4	4	2	2	2	2	1	1	1	1	2	1	2	3	3	1	2	5
22-Dec	1	2	2	3	2	2	2	2	2	2	2	2	2	2	4	2	3	2	3	2	2	2	2	2	4
23-Dec	3	2	2	2	2	2	1	1	1	1	1	1	2	2	1	1	2	2	2	1	2	2	1	3	4
24-Dec	2	2	2	2	1	2	2	2	2	1	2	2	1	1	1	1	1	1	1	1	2	2	2	4	4
25-Dec	2	3	2	2	3	2	2	2	2	2	2	1	2	1	1	1	2	2	2	2	2	1	2	3	3
26-Dec	2	2	1	1	0	1	1	1	1	1	1	1	1	1	2	2	1	3	3	2	1	2	2	3	3
27-Dec	3	3	7	4	4	3	4	3	5	5	5	4	5	5	4	4	4	3	4	2	3	3	2	3	7
28-Dec	3	3	1	2	2	2	2	1	2	2	1	2	2	2	2	1	1	1	1	1	2	2	3	2	3
29-Dec	2	2	3	3	3	2	2	3	3	3	3	3	4	3	2	4	3	3	3	3	3	3	3	3	4
30-Dec	5	8	7	4	3	3	3	3	5	2	3	2	4	3	4	6	2	3	2	3	4	3	4	3	8
31-Dec	3	3	3	4	4	4	3	3	6	6	2	2	3	2	3	3	2	2	2	3	2	7	5	4	7
Diurnal Maximum																									
5 8 7 10 7 6 6 5 6 6 5 6 9 5 8 6 4 5 8 5 8 7 5 4																									







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed 100 m (WS100m) - km/h**  
**Lower Camp Met Tower - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	117	15.73	15.73
6 - 11	262	35.22	50.94
12 - 19	227	30.51	81.45
20 - 28	92	12.37	93.82
29 - 38	45	6.05	99.87
> 38	1	0.13	100.00

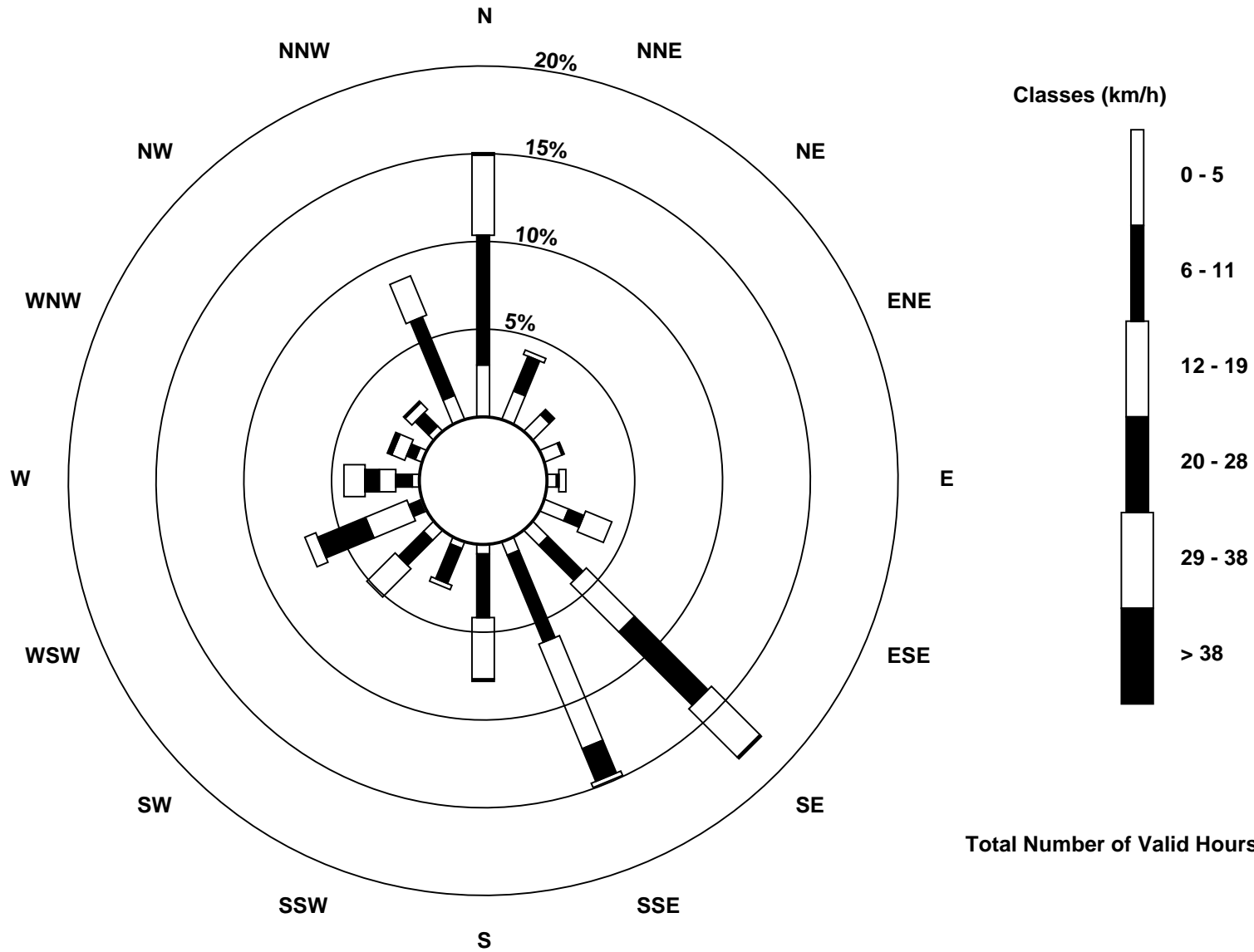
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed 100 m (WS100m) - km/h  
Lower Camp Met Tower (AMS 3)





Maximum Speed: 43 km/h on Dec 27 10:00	Maximum Daily Speed Average: 31.3 km/h on Dec 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 14 00:00	Minimum Daily Speed Average: 1.5 km/h on Dec 3	Hours of Data: 714
Maximum Diurnal Speed Average: 7.6 km/h at hour 11	Minimum Diurnal Speed Average: 3.8 km/h at hour 1	Hours of Missing Data: 30
Monthly Average Velocity: 6.0 km/h 185.8 deg	Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 6 Q <sub>1</sub> = 10 Median = 15 Q <sub>3</sub> = 22 P <sub>90</sub> = 30 P <sub>99</sub> = 40	Percent Operational Time: 96.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	SW11	SW9	SW7	SSW11	SSW11	SSW11	S10	SSW8	S10	S15	S16	SSE18	SSE10	SSE14	S18	S22	S20	SSW15	SSW15	SW16	SW11	SW11	SSW14	SSW13	SSW12.4	S22	
2-Dec	SSW16	SW17	SSW13	S20	S27	S23	SSE23	SSE24	SSE23	SSE22	S21	SSW19	SW19	SW16	SSW18	SW28	SW29	WSW40	W41	W38	W42	W40	W34	W36	SW19.6	W42	
3-Dec	W29	W31	W27	WSW20	WSW17	WSW7	S7	SSE12	SSE17	SSE13	S5	E6	NE12	ENE11	NNE9	N6	NNE8	ESE7	NNW3	E3	NE3	ENE11	E14	E10	WSW1.5	W31	
4-Dec	E10	E9	E10	E10	ENE10	NE8	NNE10	ENE11	NNE5	NNW8	NNW10	WSW10	WSW16	WSW18	WSW23	WSW24	WSW24	WSW20	WSW24	WSW24	SW17	SW16	WSW18	WSW18	WSW7.5	WSW24	
5-Dec	WNW12	WNW12	WNW16	WNW29	WNW29	W38	W35	W34	W37	W33	W28	W25	W30	W24	WSW19	WSW16	WSW15	SW12	SW14	SW15	SW14	SW17	SSE7	SSE10	W19.1	W38	
6-Dec	SE11	SE8	ESE7	ESE11	E8	SE6	SE3	ESE4	SE12	N3	ESE7	SE18	SE24	SE26	SSE16	SSE14	SSE17	SSE19	SSE18	S9	SSE10	SSE18	SSE20	SSE18	SE11.8	SE26	
7-Dec	SSE14	SSE11	SSE17	SE24	SSE16	SSE15	SSE10	SE26	SSE22	SSE25	SE28	SSE15	SSE8	SE16	SSE18	S8	S7	S13	S18	S19	S17	SW14	WSW11	NW15	SSE13.7	SE28	
8-Dec	NNW20	N17	N14	N12	N12	NNE4	W3	WSW4	W6	W8	SW12	SW13	S7	S7	SE12	SSE12	SSE13	SE12	ESE16	ESE19	ESE9	ESE10	ESE18	ESE15	ESE2.7	NNW20	
9-Dec	SE14	SE16	ESE15	SE13	ESE15	ESE11	ESE11	ESE13	ESE16	SE16	SE21	SE22	SE9	SE4	ESE3	SSE5	SSE5	WSW4	WNW5	W4	SW6	SW10	W12	W7	SE7.5	SE22	
10-Dec	WNW4	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	---	WNW4
11-Dec	AF	AF	AF	AF	AF	AF	AF	SE18	SE21	SE27	SE28	SE31	SE23	SSE10	S13	S15	SSE13	SSE14	SE23	SE27	SE28	SE25	SE22	SE20	---	SE31	
12-Dec	SE22	SE24	SE25	SE29	SE31	SE25	SSE26	SE30	SE35	SE39	SE37	SE36	SSE29	SSE32	SE36	SE36	SE35	SE37	SE32	SE31	SE31	SE32	SE33	SE32	SE31.3	SE39	
13-Dec	SE29	SE31	SE31	SE33	SE30	SE29	SE26	SE24	SE25	SE23	SE20	SE20	SE13	E4	NE5	NE6	NE4	ENE5	ENE8	ESE7	ESE6	SE4	SSE0	SE16.0	SE33		
14-Dec	ESE2	S3	WSW4	NNW12	NNW11	WNW10	NNW10	W13	WNW13	WNW8	W14	WNW11	W9	W15	W17	WSW12	WSW12	SW10	SSW14	SSW17	SSW20	SSW20	SSW18	S20	WSW8.7	S20	
15-Dec	SSW24	SSW22	S20	S27	S32	S31	S25	S19	SSW25	SW18	WSW26	W26	W35	WSW33	WSW27	WSW28	W33	W28	W28	W25	WNW30	NW23	NNW21	NNE22	WSW18.1	W35	
16-Dec	NNE15	N9	N6	N4	NW13	NW24	WNW22	WNW21	WNW17	WNW21	W17	W19	W20	W19	W21	SW17	WSW21	W21	NW17	WNW18	WNW22	WNW17	NW13	NNW6	WNW14.4	NW24	
17-Dec	NW7	WNW13	WNW19	WNW14	WNW18	NW17	NW15	N9	NNE9	NNE8	NNE8	NNE7	NNW4	NW6	NNW8	N10	N10	NE13	NE7	NE11	NE12	NNE8	NNE7	NE6	NNW7.8	WNW19	
18-Dec	NE6	ENE6	NE4	NNE4	NNE3	NE3	NE5	NNE7	NE7	ENE6	ENE4	E2	SSE4	SE8	ESE12	ESE17	ESE17	SE11	SE22	SE24	SE26	SE20	ESE15	ESE15	ESE8.7	SE26	
19-Dec	ESE10	SE11	ESE9	SE15	SE24	SE19	SE17	SE18	SE17	SE14	SSE14	SSE12	SSE11	SSE6	SSE7	SE17	SE16	SE19	SE18	SE18	SE26	SSE24	SSE25	SSE26	SE16.1	SSE26	
20-Dec	SSE28	SSE32	SSE27	SSE23	SSE20	SSE28	SSE28	SSE25	SSE27	SSE20	SE33	SE31	SE23	SE25	SE28	SE32	SE35	SSE37	SSE40	SE38	SE36	SSE30	SSE34	SSE29	SSE29.4	SSE40	
21-Dec	SSE23	SSE23	SSE21	SSE25	SSE26	SSE17	S20	S21	S20	SSW13	SSW10	SSW7	S5	SSE5	SE9	SE10	SE10	SE10	ESE9	W3	N5	NE4	ENE11	NNE9	SSE10.5	SSE26	
22-Dec	NNE16	NNE10	NNE12	N12	NNE16	NNE18	N18	N17	N17	N18	N14	N12	N12	N13	N18	N21	N17	N16	N19	N17	N16	N16	N17	N15	N15.6	N21	
23-Dec	N16	N15	N14	N16	N14	N12	N10	N12	NNE12	NNE14	NNE11	N10	N11	N12	N14	N13	N13	N11	NNE11	NNE14	NNE11	N13	N12	N12	N12.6	N16	
24-Dec	N15	N13	N13	N11	N13	N13	N12	N10	N6	NNW7	N9	NNW6	NW3	NNW2	NNW2	N2	E2	ESE3	SE5	SE4	SSE6	SSE9	SSE13	S14	N3.7	N15	
25-Dec	S9	SSW7	SW9	SSW9	SSW8	SSW6	SSW6	SW10	SW8	SSW9	SW9	WSW7	W5	W5	SW6	SSW4	E2	E2	NE6	N18	N16	N18	NNE15	NNE8	NNE12	W2.0	N18
26-Dec	NE15	NNE9	NNE8	NE7	E4	ESE2	N3	NNE6	ENE4	SE4	SE7	S6	SE9	SE7	ESE9	E7	E6	ESE11	ESE15	ESE12	SE12	ESE11	SE12	SE19	ESE6.4	SE19	
27-Dec	SE9	SE19	SE28	SE34	SE39	SE41	SE40	SE36	SE40	SE43	SE39	SE39	SSE32	SSE28	SSE20	SSE19	SSE16	SSE19	SSE21	SSE9	SSE13	SSE10	SW8	WSW11	SSE24.5	SE43	
28-Dec	WSW11	WSW8	WNW9	NW10	NNW11	NW11	NNW12	N13	N13	N12	N11	NNE8	N8	NNW7	N6	N7	N4	N1	SE3	SW2	SSW7	SSW11	SSW10	S9	NW4.2	N13	
29-Dec	S12	S16	SSW20	SW18	SSW12	SSW10	SW14	SSW14	SSW20	SSW20	SSW15	SSW15	SW16	SSW15	SSW14	SSW17	SSW20	SSW23	SW25	SW27	SSW23	SSW18	SW20	SW18	SSW17.3	SW27	
30-Dec	WSW23	WSW28	WSW30	W25	W21	W21	WNW19	W24	WSW17	SW15	WSW20	SW17	WSW17	WSW17	W20	WSW19	WSW23	WSW23	WSW20	WSW23	WSW25	SW26	SW14	SW21	WSW20.3	WSW30	
31-Dec	SSW20	SSW16	SW19	SW24	SSW28	SW22	SW17	SW18	WSW33	W40	WSW35	W30	W27	W23	WSW27	WSW31	W29	W25	WSW28	W29	WSW29	WSW30	WSW28	WSW31	WSW25.0	W40	

S3.8	S4.9	S4.7	S5.4	S5.7	S5.3	S5.0	S5.9	S7.2	S6.8	S7.6	S7.6	SSW6.5	SSW6.0	SSW6.0	SSW6.9	SSW6.6	SSW6.7	SSW6.8	SSW6.3	SSW6.7	SSW6.5	S6.0	S5.3	Diurnal Average	
SE29	SSE32	SE31	SE34	SE39	SE41	SE40	SE36	SE40	SE43	SE39	SE39	W35	WSW33	SE36	SE36	SE35	WSW40	W41	W38	W42	W40	W34	W36	Diurnal Maximum	

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods

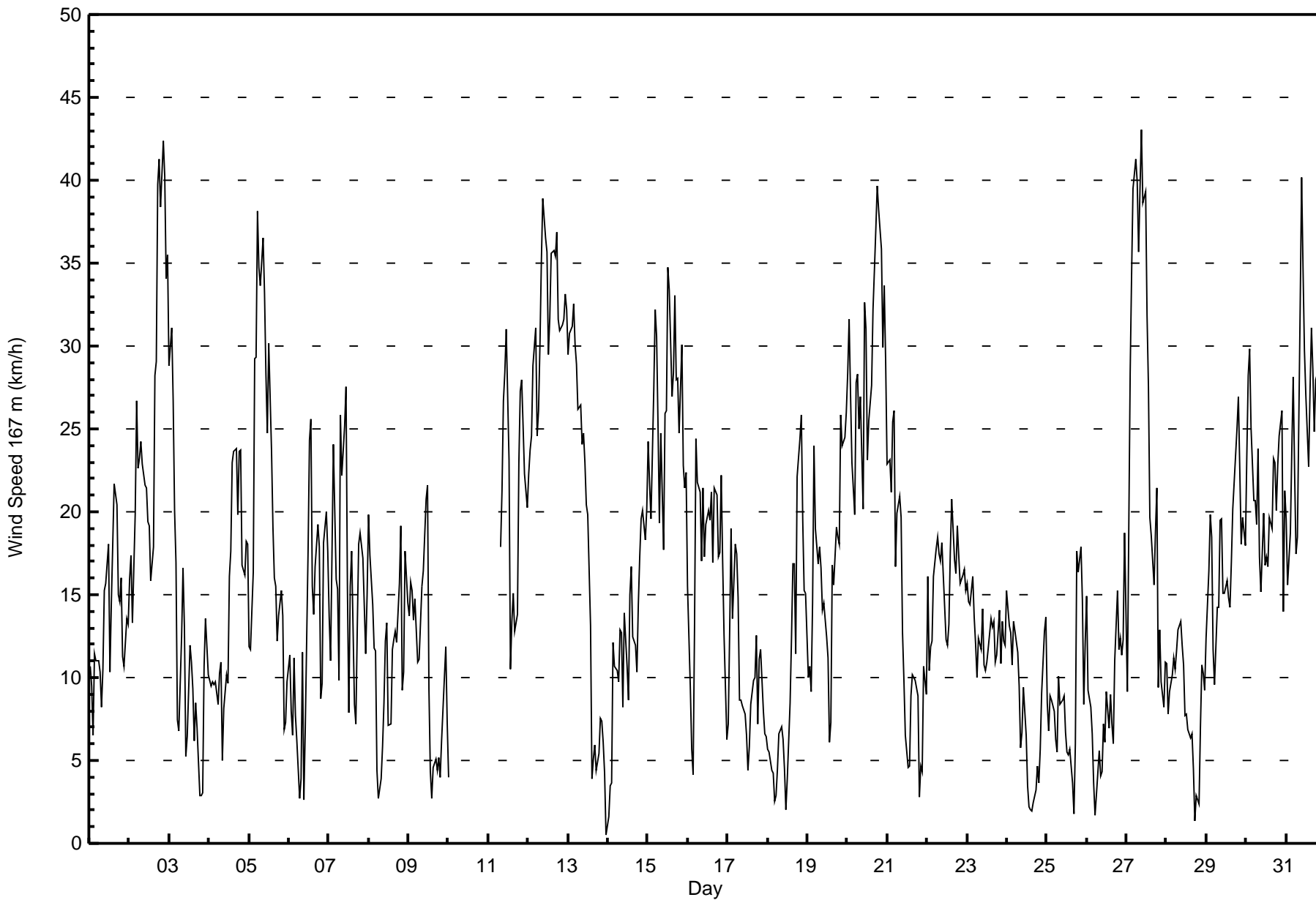


Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed 167 m (WS167m) - km/h  
Lower Camp Met Tower - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Dec 7 12:00 Minimum Value: 1 km/h on Dec 14 00:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 7																	Hours in Service: 744 Hours of Data: 714 Hours of Missing Data: 30 Hours of Calibration: 0 Percent Operational Time: 96.0									
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3	2	3	3	2	1	2	2	2	3	2	2	4	3	5	2	3	2	2	3	2	2	2	2	5	
2-Dec	3	2	3	5	5	3	3	3	2	4	6	4	2	5	4	4	2	4	7	3	6	5	3	3	7	
3-Dec	3	4	2	7	6	4	3	3	2	4	2	2	2	2	1	1	3	2	3	1	4	2	1	7		
4-Dec	2	1	1	1	1	1	1	2	2	1	2	2	4	3	3	2	2	3	5	4	4	4	2	5		
5-Dec	3	3	4	7	7	5	5	4	3	3	3	4	5	4	2	2	3	1	2	2	2	4	3	7		
6-Dec	1	1	1	2	2	2	2	3	5	2	3	4	4	3	6	2	3	6	6	2	3	3	2	6		
7-Dec	3	3	4	3	3	5	3	3	6	5	3	8	2	5	6	3	2	4	3	4	4	2	1	8		
8-Dec	2	1	2	1	1	3	2	1	1	2	2	3	1	2	3	3	2	3	4	3	2	3	2	4		
9-Dec	2	2	2	2	2	1	3	5	3	2	3	5	2	1	1	2	2	1	1	1	2	1	2	5		
10-Dec	1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	1		
11-Dec	AF	AF	AF	AF	AF	AF	AF	4	5	3	4	3	4	3	3	3	3	3	7	3	3	4	3	7		
12-Dec	3	3	3	3	3	4	3	5	3	3	4	3	5	5	3	3	3	3	4	3	3	3	3	5		
13-Dec	3	3	4	3	3	3	4	3	3	3	2	4	4	5	2	1	2	3	2	2	2	1	1	5		
14-Dec	1	1	2	3	3	2	2	2	2	2	2	3	2	5	2	2	2	2	4	2	2	2	3	5		
15-Dec	2	3	3	4	2	2	4	3	3	2	4	4	3	2	4	2	2	2	2	3	2	4	3	4		
16-Dec	3	2	1	1	7	3	5	4	3	2	3	1	2	2	4	1	3	3	3	5	2	2	3	7		
17-Dec	1	4	3	2	3	3	3	3	1	1	1	1	1	1	2	2	3	2	3	3	2	2	2	4		
18-Dec	1	1	1	1	1	1	2	1	1	2	1	1	3	1	3	2	3	2	3	2	2	4	4	4		
19-Dec	3	4	3	3	3	2	3	3	4	3	3	2	3	2	3	3	3	6	4	5	3	3	3	6		
20-Dec	3	3	3	3	4	3	4	3	5	5	3	3	2	2	2	4	3	3	3	3	3	7	3	7		
21-Dec	4	4	4	4	5	4	4	4	2	3	1	2	1	1	1	1	1	2	1	2	2	1	2	5		
22-Dec	2	2	1	2	2	2	2	2	2	2	2	1	2	2	4	2	2	2	3	2	2	1	2	4		
23-Dec	3	2	2	2	2	2	1	1	2	2	2	1	1	1	2	2	2	1	2	2	1	1	2	3		
24-Dec	1	1	2	2	2	2	2	3	1	2	2	2	1	1	1	1	1	1	1	1	2	1	3	3		
25-Dec	2	2	2	2	2	2	2	1	1	1	1	2	3	2	1	1	1	4	2	2	2	2	2	4		
26-Dec	2	4	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	3	3	3	3	3	4	5		
27-Dec	5	6	5	4	3	3	3	4	4	4	5	4	5	6	4	5	3	2	3	2	2	2	2	6		
28-Dec	3	4	2	3	2	2	2	1	2	2	1	1	2	1	1	1	1	1	1	1	2	2	2	4		
29-Dec	2	2	3	4	3	2	2	3	3	4	3	2	4	2	2	2	3	4	2	2	4	4	2	4		
30-Dec	6	5	4	2	2	3	1	3	3	2	2	4	4	3	4	4	2	2	3	3	4	3	4	6		
31-Dec	3	3	2	3	3	4	3	4	5	5	2	2	2	2	3	3	3	3	3	1	3	4	4	5		
																	Diurnal Maximum									
AF - Analyzer Failure																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed 167 m (WS167m) - km/h**  
**Lower Camp Met Tower - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	64	8.96	8.96
6 - 11	181	25.35	34.31
12 - 19	235	32.91	67.23
20 - 28	151	21.15	88.38
29 - 38	69	9.66	98.04
> 38	14	1.96	100.00

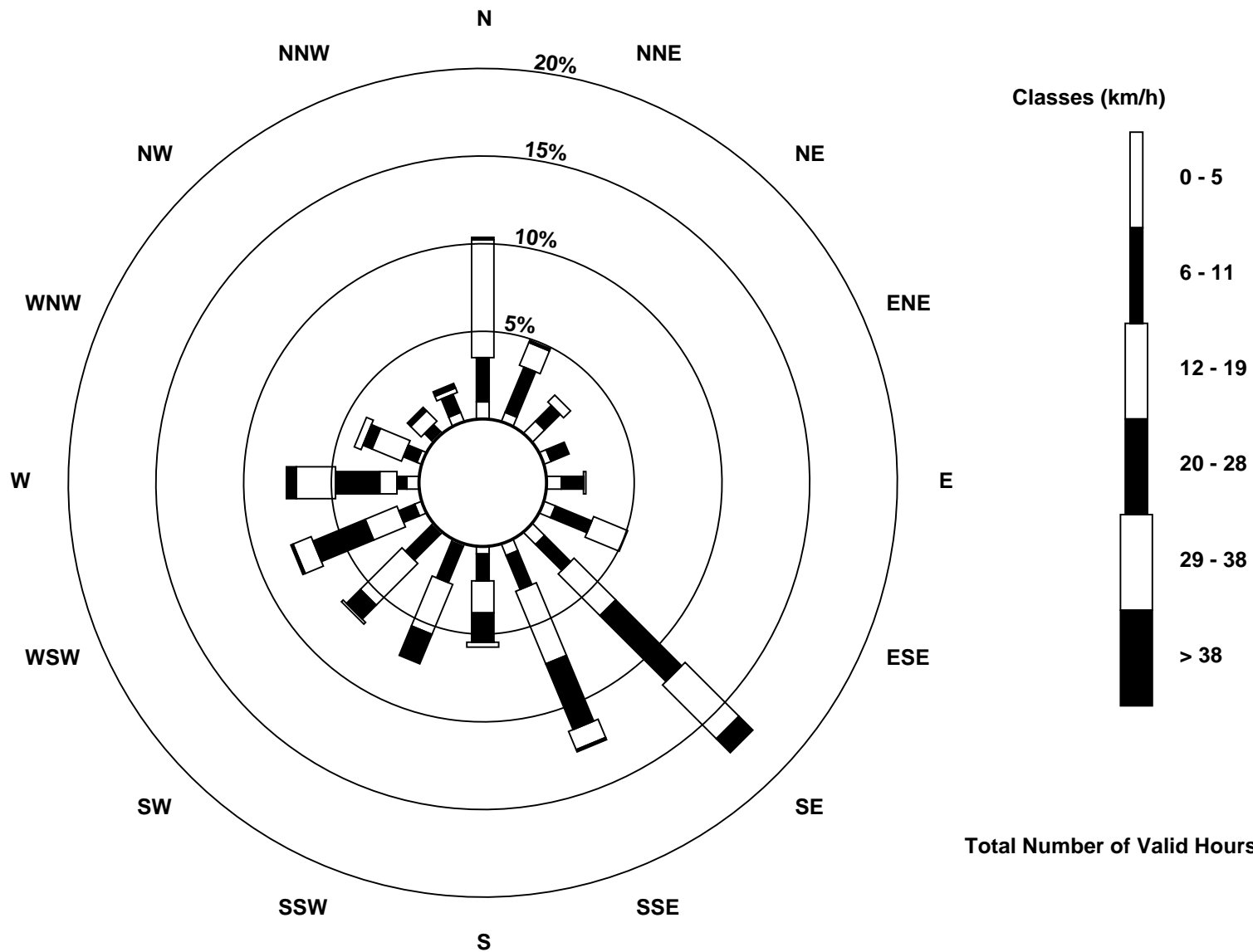
Total Number of Valid Hours: 714

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed 167 m (WS167m) - km/h  
Lower Camp Met Tower (AMS 3)





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Wind Direction 20 m (WD20m) - deg  
Lower Camp Met Tower - December 2015**

Direction of Maximum Speed: 150 deg on Dec 29 20:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 148.6 deg on Dec 12	Hours of Data: 742
Direction of Minimum Speed: 114 deg on Dec 17 01:00	Hours of Missing Data: 2
Direction of Minimum Daily Speed Average: 0.7 deg on Dec 7	Percent Operational Time: 99.7
Monthly Average Direction: 324.6 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	152	156	156	149	153	152	154	162	156	160	152	153	145	152	150	134	141	152	153	152	156	153	156	154	152.6
2-Dec	156	158	153	148	149	145	147	147	155	159	146	154	145	AF	AF	132	126	265	281	276	272	275	262	269	180.4
3-Dec	272	274	263	261	248	149	150	151	153	321	9	359	355	354	336	349	355	325	337	2	343	346	322	341	300.8
4-Dec	330	339	332	343	347	359	350	330	313	26	1	246	215	165	190	206	243	223	156	146	148	140	144	206	189.8
5-Dec	285	327	302	319	311	286	282	282	273	276	276	270	271	279	262	236	217	45	135	145	147	137	141	90	277.8
6-Dec	351	342	330	316	333	350	317	286	322	350	346	353	356	334	225	254	188	169	182	224	228	156	83	138	307.3
7-Dec	150	162	140	206	150	67	347	354	353	341	350	346	332	341	342	342	351	198	150	167	138	147	140	339	22.6
8-Dec	347	337	342	334	351	288	212	40	359	136	173	228	186	178	153	162	164	148	103	96	70	39	113	115	136.5
9-Dec	109	97	90	14	62	23	340	53	91	115	124	138	137	19	3	321	339	358	342	343	173	192	230	101	84.1
10-Dec	348	21	342	332	346	346	349	2	336	344	352	339	351	359	310	348	325	359	351	348	338	335	336	348	344.8
11-Dec	339	344	355	357	351	358	351	17	105	146	137	140	145	175	189	183	155	143	155	150	142	142	145	143	143.3
12-Dec	143	146	144	145	138	158	159	154	153	149	151	152	161	159	141	144	145	144	155	144	144	144	147	139	148.6
13-Dec	137	142	144	146	143	140	138	140	138	140	134	129	134	136	6	342	334	353	334	340	7	9	344	346	132.6
14-Dec	345	228	356	342	354	302	296	293	286	285	272	283	265	267	250	228	231	210	169	167	178	182	171	165	217.5
15-Dec	172	170	165	154	159	161	163	152	169	170	253	257	261	257	257	243	264	267	250	212	276	350	358	12	202.8
16-Dec	17	347	14	262	331	320	312	281	292	302	275	263	258	268	258	202	227	253	274	283	356	1	342	238	283.6
17-Dec	114	87	354	307	350	348	1	17	25	347	357	351	6	349	10	3	341	31	34	25	10	358	32	40	6.6
18-Dec	25	39	18	344	313	17	6	150	74	32	6	327	185	152	110	95	112	107	114	104	130	125	84	39	94.8
19-Dec	346	357	335	20	127	130	135	138	141	161	167	183	154	185	147	150	356	350	344	345	341	340	156	160	137.9
20-Dec	151	155	155	144	129	146	160	153	168	281	150	145	187	179	182	150	142	146	145	148	152	157	146	150	151.9
21-Dec	164	164	165	180	173	169	123	123	146	147	156	164	155	154	169	221	56	342	333	358	349	343	347	351	160.3
22-Dec	343	349	346	337	353	2	360	357	353	356	354	356	353	354	347	348	359	352	353	356	345	352	354	351	352.8
23-Dec	357	339	341	340	351	344	331	347	1	2	2	359	353	357	11	6	1	345	356	9	359	348	356	347	354.0
24-Dec	349	347	351	341	329	344	350	6	359	346	4	7	328	313	312	258	354	37	359	346	144	147	153	164	353.6
25-Dec	151	150	147	147	143	138	148	149	150	146	135	142	9	327	103	129	352	359	345	344	339	354	7	350	128.6
26-Dec	9	322	341	314	351	335	320	334	325	324	326	344	1	11	0	358	353	356	0	356	347	350	353	355	348.6
27-Dec	355	352	15	139	141	148	150	137	147	148	145	150	160	158	179	185	174	169	167	173	167	167	179	151	153.9
28-Dec	184	155	107	321	345	318	330	359	8	347	335	350	339	335	330	334	331	355	346	1	349	97	145	151	348.9
29-Dec	151	142	139	136	150	139	142	147	149	154	164	178	216	199	175	156	153	154	151	150	151	154	155	154	154.6
30-Dec	154	174	259	284	284	255	129	146	146	149	145	145	146	149	135	165	197	181	153	147	151	152	146	152	154.8
31-Dec	152	155	153	150	154	158	152	148	179	270	254	249	244	240	235	243	246	250	254	254	221	170	163	175	205.7

147.6 155.9 153.5 153.6 145.6 148.3 154.0 142.3 152.8 164.2 162.0 173.8 191.1 200.1 200.3 179.5 185.4 175.3 167.6 146.6 159.0 147.3 145.6 145.9

Diurnal Average

AF - Analyzer Failure

All monthly, daily, and diurnal averages have been calculated using vector methods



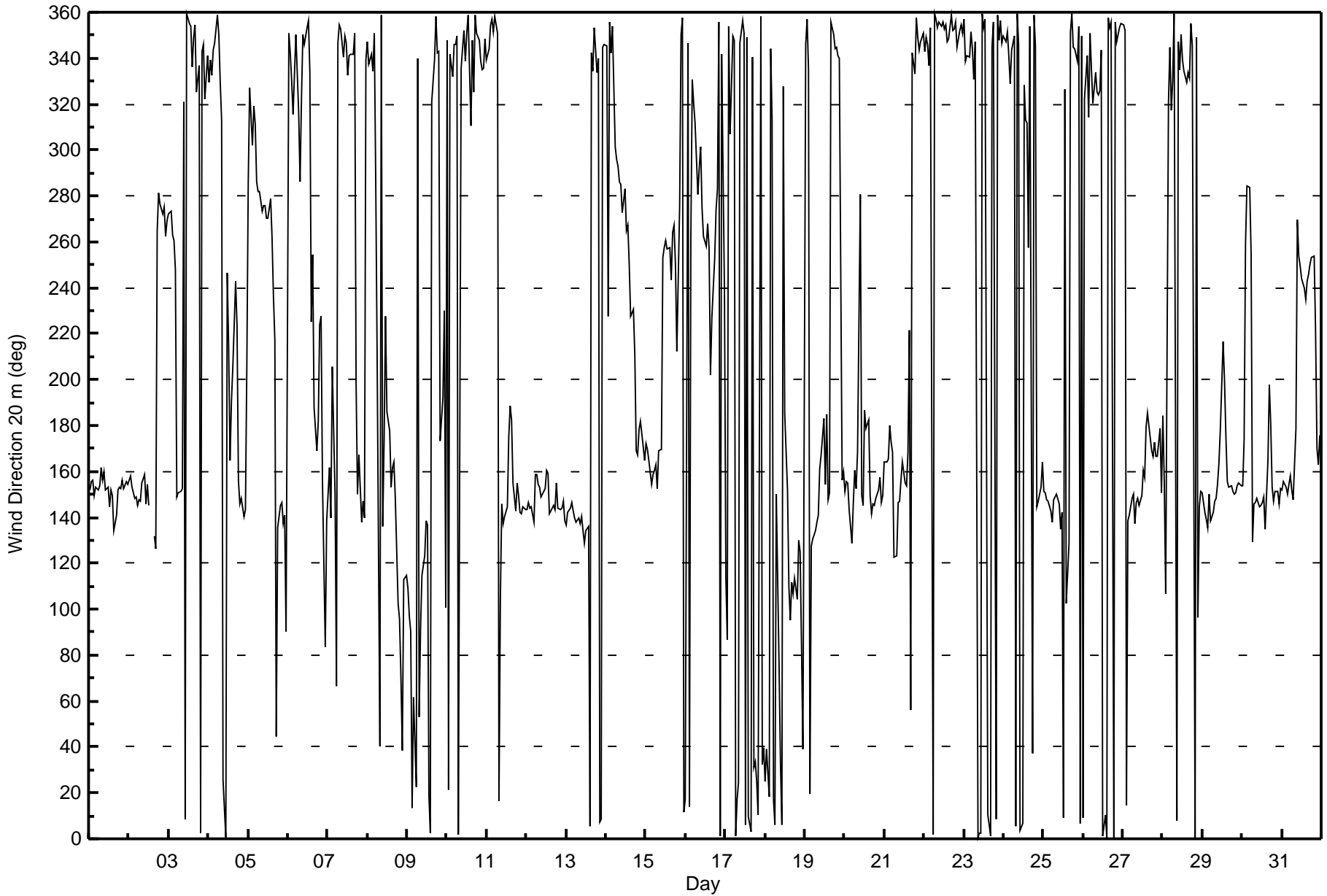


Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Direction 20 m (WD20m) - deg  
Lower Camp Met Tower - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0																			Hours in Service: 744						
Maximum Value: 106 deg on Dec 9 10:00																			Hours of Data: 742						
Minimum Value: 4 deg on Dec 29 17:00																			Hours of Missing Data: 2						
Percentiles: P <sub>1</sub> = 7 P <sub>10</sub> = 11 Q <sub>1</sub> = 16 Median = 20 Q <sub>3</sub> = 33 P <sub>90</sub> = 54 P <sub>99</sub> = 94																			Hours of Calibration: 0						
																			Percent Operational Time: 99.7						
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	9	10	8	7	10	9	12	9	11	13	10	11	22	13	15	16	16	10	8	7	7	8	7	9	22
2-Dec	7	7	7	11	12	21	14	13	11	13	19	12	10	AF	AF	10	11	54	16	17	18	14	11	13	54
3-Dec	13	15	37	91	35	32	11	14	21	60	41	18	26	21	27	23	19	30	50	51	33	33	70	19	91
4-Dec	23	22	26	26	28	20	31	47	58	79	71	58	15	20	31	30	12	39	27	46	28	18	12	99	99
5-Dec	35	25	35	16	20	18	18	17	15	17	20	22	20	20	18	12	41	81	43	15	13	87	51	38	87
6-Dec	19	35	17	39	34	20	18	28	33	36	47	33	28	48	83	64	24	13	24	40	41	35	67	43	83
7-Dec	41	42	52	79	40	73	84	50	25	24	24	21	42	35	22	30	48	61	54	18	27	14	32	67	84
8-Dec	19	18	17	18	29	59	83	97	75	37	54	12	18	25	22	14	18	32	38	21	35	44	19	20	97
9-Dec	20	20	26	65	52	13	67	55	47	106	27	22	41	67	26	49	20	17	14	23	70	24	48	62	106
10-Dec	65	91	23	21	21	30	29	20	21	23	24	35	29	23	49	32	16	24	27	26	21	20	30	26	91
11-Dec	29	30	47	18	16	13	15	36	74	39	16	16	20	14	17	18	14	20	17	16	16	17	17	16	74
12-Dec	17	15	14	16	16	17	10	14	14	16	15	16	11	15	17	17	16	18	16	17	17	16	16	16	18
13-Dec	14	15	14	15	15	14	15	15	16	16	17	17	18	24	62	17	52	14	18	16	12	15	21	29	62
14-Dec	75	47	47	21	38	29	21	29	19	22	22	75	40	35	22	10	13	16	21	8	11	11	11	8	75
15-Dec	10	10	6	10	8	9	26	31	16	28	26	22	14	13	90	23	20	57	60	47	17	31	20	21	90
16-Dec	25	29	84	73	80	15	19	25	37	48	20	24	14	16	20	13	14	20	48	77	26	22	38	39	84
17-Dec	80	97	74	36	52	18	16	36	16	23	27	25	37	27	24	49	60	34	49	30	20	53	38	28	97
18-Dec	28	30	32	41	37	28	69	32	25	34	32	23	86	17	25	26	28	29	17	56	16	22	44	43	86
19-Dec	22	25	23	64	26	22	20	26	27	34	20	32	18	46	33	29	79	50	20	18	21	94	18	17	94
20-Dec	11	12	12	16	33	22	15	30	27	75	83	79	22	20	20	21	16	16	14	14	18	17	14	17	83
21-Dec	14	12	13	12	14	22	57	59	16	11	24	13	13	11	20	47	73	33	26	42	30	41	26	31	73
22-Dec	20	23	22	16	18	18	17	19	17	16	19	23	18	18	19	17	21	19	17	17	18	18	18	21	23
23-Dec	20	19	19	19	22	21	18	21	17	16	19	18	19	22	22	19	17	17	17	23	20	19	18	18	23
24-Dec	18	18	19	17	17	20	19	21	40	25	29	28	52	61	41	26	59	47	44	25	65	11	13	16	65
25-Dec	14	13	13	12	14	13	13	11	11	13	16	20	95	68	63	72	17	18	16	17	18	16	25	29	95
26-Dec	25	39	30	33	32	26	32	25	39	29	30	33	30	23	22	20	18	35	32	33	25	23	30	24	39
27-Dec	25	26	44	26	15	16	15	15	16	16	16	17	12	14	16	11	14	9	10	17	16	24	59	33	59
28-Dec	33	28	62	36	72	17	17	16	25	21	22	20	19	23	21	18	17	34	49	31	29	64	10	7	72
29-Dec	6	11	66	21	10	14	11	11	8	7	12	12	15	16	13	6	4	7	8	7	6	9	7	8	66
30-Dec	12	40	66	61	40	101	51	48	20	8	9	9	12	9	29	47	22	34	15	11	15	20	7	7	101
31-Dec	11	24	10	6	10	18	32	10	42	19	15	11	9	11	8	9	11	15	14	26	53	28	20	21	53
80 97 84 91 80 101 84 97 75 106 83 79 95 68 90 72 79 81 60 77 70 94 70 99																									
Diurnal Maximum																									
AF - Analyzer Failure																									





Direction of Maximum Speed: 139 deg on Dec 27 10:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 138.0 deg on Dec 12		Hours of Data:	742
Direction of Minimum Speed: 98 deg on Dec 8 09:00		Hours of Missing Data:	2
Direction of Minimum Daily Speed Average: 0.3 deg on Dec 6		Percent Operational Time:	99.7
Monthly Average Direction: 326.3 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	136	147	145	136	140	137	140	147	142	145	138	140	134	AF	138	130	132	137	140	138	141	139	141	140	139.5
2-Dec	141	142	140	137	137	136	138	138	142	145	134	142	138	AF	130	123	123	253	271	266	264	265	252	258	170.2
3-Dec	262	264	254	249	245	139	140	140	140	303	355	351	347	344	331	339	346	329	339	356	342	345	333	346	299.2
4-Dec	337	342	341	348	346	352	346	334	309	21	279	240	208	168	195	210	230	221	170	152	140	144	136	218	211.2
5-Dec	274	319	295	310	302	276	273	272	264	265	265	260	261	268	254	225	209	191	143	141	135	140	137	122	264.1
6-Dec	351	331	342	339	338	342	327	297	330	345	342	345	349	60	173	190	166	157	167	209	199	144	100	133	351.5
7-Dec	136	144	131	161	142	92	351	1	347	28	358	342	325	331	338	336	347	159	142	147	138	139	142	329	93.6
8-Dec	340	332	335	331	346	316	229	90	98	192	182	219	177	169	142	150	153	135	95	92	72	47	109	110	118.8
9-Dec	108	98	89	39	69	31	349	57	91	103	119	130	125	11	355	326	340	353	341	341	179	193	228	102	82.0
10-Dec	65	38	342	333	343	346	351	359	342	343	349	336	343	352	310	347	324	342	343	347	335	334	334	345	343.8
11-Dec	335	336	349	349	347	4	347	97	132	136	129	132	131	162	175	172	145	136	142	139	134	133	132	133	133.3
12-Dec	133	135	135	134	129	144	146	142	141	138	140	141	149	148	133	136	136	136	141	134	133	135	137	132	138.0
13-Dec	128	134	135	137	133	132	130	132	130	132	128	123	125	128	31	344	334	346	331	335	356	1	347	340	122.8
14-Dec	359	201	337	340	343	294	288	279	274	275	262	275	256	257	244	220	224	203	166	161	171	173	164	157	218.4
15-Dec	166	163	158	146	154	156	156	145	164	177	244	249	251	247	248	239	253	260	247	228	267	341	353	7	208.0
16-Dec	13	346	16	292	321	309	304	274	275	283	264	252	250	259	249	197	220	244	285	276	332	344	2	218	276.4
17-Dec	234	49	335	303	330	333	353	16	17	344	350	347	1	341	2	360	343	25	28	22	8	2	25	33	358.7
18-Dec	18	30	19	342	317	9	14	123	67	35	1	330	168	141	103	90	103	108	115	111	123	118	80	65	91.1
19-Dec	355	338	327	55	119	123	125	128	127	150	156	162	145	173	136	145	35	66	4	347	341	149	144	142	128.4
20-Dec	141	144	145	137	128	142	145	143	153	178	138	136	171	165	155	136	136	139	138	139	138	143	137	139	141.2
21-Dec	147	150	151	168	162	156	123	131	141	139	143	150	142	137	149	189	147	0	338	352	342	342	341	347	143.9
22-Dec	339	341	341	332	349	358	357	353	349	350	351	351	350	351	342	343	356	347	348	351	342	346	349	347	348.3
23-Dec	352	335	336	336	347	341	330	344	358	358	0	356	348	352	7	3	356	338	351	6	355	345	352	342	350.2
24-Dec	345	342	350	334	327	341	345	5	357	340	1	1	332	308	308	256	340	23	12	325	140	142	142	156	352.0
25-Dec	142	142	140	139	136	131	139	141	141	138	129	130	360	323	124	132	345	349	339	339	335	349	2	345	114.0
26-Dec	13	334	340	297	326	322	328	324	312	308	316	330	336	353	347	348	338	352	351	346	345	340	346	350	340.5
27-Dec	347	346	26	133	135	139	140	130	138	139	136	139	146	143	167	173	164	162	158	156	152	153	180	153	142.9
28-Dec	184	156	92	314	339	311	324	356	2	341	333	347	335	330	325	330	329	349	341	354	340	100	139	144	342.3
29-Dec	137	134	144	141	144	135	135	139	147	157	168	171	209	193	167	149	146	143	145	143	145	147	149	149	149.1
30-Dec	152	183	247	268	262	263	213	192	138	134	137	135	140	137	126	174	210	204	164	163	160	156	137	144	157.3
31-Dec	145	147	148	144	145	150	144	141	186	260	245	240	233	230	227	232	235	239	245	243	223	173	157	201	203.7

128.5	139.9	141.0	138.9	134.2	136.9	138.7	132.0	143.0	153.7	154.2	163.8	183.3	200.3	181.2	169.4	180.5	171.2	161.1	138.9	149.7	136.9	132.2	133.0
Diurnal Average																							

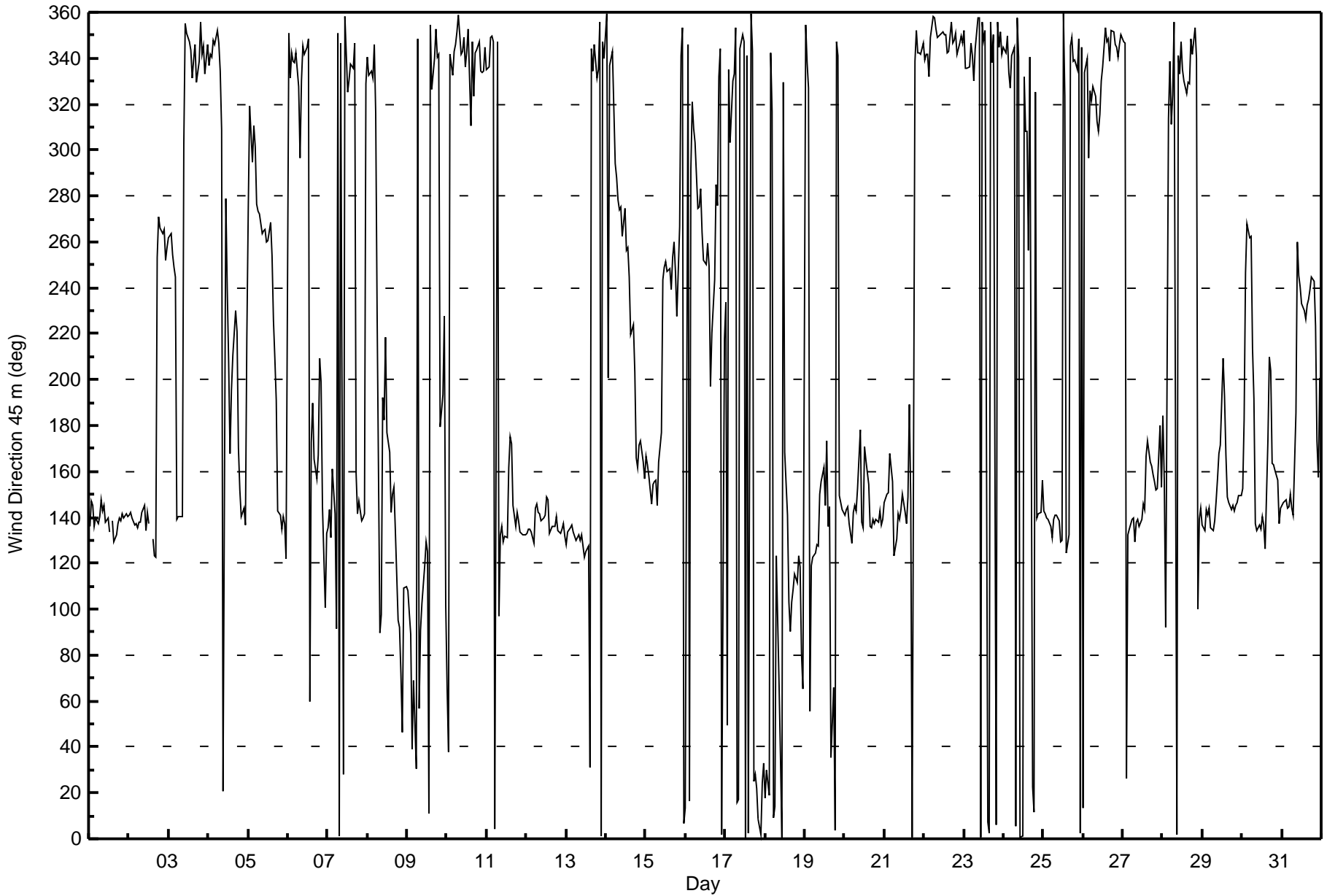
AF - Analyzer Failure  
All monthly, daily, and diurnal averages have been calculated using vector methods



Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 102 deg on Dec 19 17:00	Hours of Data: 742
Minimum Value: 3 deg on Dec 2 01:00	Hours of Missing Data: 2
Percentiles: P <sub>1</sub> = 4 P <sub>10</sub> = 7 Q <sub>1</sub> = 11 Median = 15 Q <sub>3</sub> = 26 P <sub>90</sub> = 46 P <sub>99</sub> = 83	Hours of Calibration: 0
	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	5	5	6	4	5	5	7	6	6	8	6	7	13	AF	10	12	10	6	5	3	4	4	4	4	13
2-Dec	3	4	3	6	8	13	9	10	9	10	11	7	5	AF	8	7	9	38	12	12	13	9	7	8	38
3-Dec	9	9	17	74	32	34	7	6	13	84	44	11	18	14	21	18	13	24	31	23	20	23	30	11	84
4-Dec	17	16	17	16	25	21	18	35	45	60	65	24	15	17	32	27	10	24	32	41	27	15	12	65	65
5-Dec	28	15	30	15	17	13	13	12	10	11	12	15	14	15	12	15	20	44	41	10	5	42	18	17	44
6-Dec	45	24	10	27	29	13	15	25	23	23	34	32	27	82	66	35	13	10	19	35	34	20	51	30	82
7-Dec	19	13	35	74	23	74	80	79	38	69	60	15	43	24	20	20	85	57	30	13	28	11	14	52	85
8-Dec	15	14	13	15	23	54	64	62	95	35	34	11	16	24	19	14	15	28	29	14	28	44	14	14	95
9-Dec	13	13	23	61	46	12	72	54	38	57	16	16	25	63	18	63	52	12	11	13	69	20	37	62	72
10-Dec	28	74	17	15	13	21	19	15	20	20	17	27	22	16	44	27	11	19	14	12	14	15	26	19	74
11-Dec	22	16	26	12	13	37	34	70	44	29	10	11	14	13	15	14	13	15	15	11	12	12	13	12	70
12-Dec	12	12	11	11	11	16	8	10	10	11	10	12	11	13	11	11	11	12	13	12	12	12	11	10	16
13-Dec	9	9	9	10	11	10	10	11	11	11	13	12	13	19	59	14	45	12	14	13	7	12	14	18	59
14-Dec	38	94	41	13	21	27	18	26	15	19	18	55	37	27	15	8	11	15	20	8	8	8	9	7	94
15-Dec	8	8	6	9	7	8	20	22	13	29	19	13	7	6	76	11	10	36	60	42	12	27	18	15	76
16-Dec	16	25	60	79	71	13	16	19	25	32	16	13	8	11	15	12	13	14	46	36	20	18	30	41	79
17-Dec	63	68	27	20	31	16	16	26	9	18	21	18	26	22	18	40	45	25	38	19	16	32	30	20	68
18-Dec	18	21	16	31	19	22	46	47	15	26	24	21	85	12	17	15	20	15	9	22	12	18	31	34	85
19-Dec	36	22	31	66	18	14	14	20	21	25	15	25	16	49	27	25	102	96	38	20	32	79	15	13	102
20-Dec	8	10	8	11	18	14	12	17	15	36	24	50	17	18	23	13	11	11	9	9	13	13	9	11	50
21-Dec	13	11	12	10	12	20	47	48	10	6	17	10	9	9	14	28	25	81	16	34	22	29	18	22	81
22-Dec	14	18	16	12	14	14	13	13	13	13	13	19	15	13	15	13	18	13	13	13	15	12	13	15	19
23-Dec	16	14	15	14	16	15	15	16	12	11	14	12	14	16	14	12	12	13	13	17	15	15	13	14	17
24-Dec	14	14	12	13	14	14	15	15	31	21	19	18	43	49	32	25	49	43	39	68	70	8	10	14	70
25-Dec	10	7	7	8	10	9	7	6	6	8	10	16	75	53	78	34	14	12	11	13	14	12	19	20	78
26-Dec	14	30	13	50	38	16	27	14	20	20	20	24	19	12	14	13	14	29	26	25	19	15	17	17	50
27-Dec	20	17	51	18	9	9	10	11	11	10	12	12	11	12	14	8	13	7	10	16	15	19	44	33	51
28-Dec	34	33	70	30	51	13	16	13	17	16	18	15	13	19	17	13	12	22	50	24	23	82	7	6	82
29-Dec	7	8	60	25	6	7	7	7	6	9	12	9	14	15	11	5	4	3	5	3	4	6	5	8	60
30-Dec	19	39	41	42	28	55	80	62	36	5	8	7	11	6	22	50	18	34	21	15	18	28	7	5	80
31-Dec	6	13	10	5	4	12	19	7	44	12	9	5	4	6	6	5	4	6	6	11	38	30	19	30	44
	63	94	70	79	71	74	80	79	95	84	65	55	85	82	78	63	102	96	60	68	70	82	51	65	
	Diurnal Maximum																								

AF - Analyzer Failure





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Wind Direction 100 m (WD100m) - deg**

**Lower Camp Met Tower - December 2015**

Direction of Maximum Speed: 141 deg on Dec 27 10:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 139.4 deg on Dec 12		Hours of Data:	744
Direction of Minimum Speed: 4 deg on Dec 24 17:00		Hours of Missing Data:	0
Direction of Minimum Daily Speed Average: 1.3 deg on Dec 25		Percent Operational Time:	100.0
Monthly Average Direction: 261.5 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	159	157	156	160	159	158	156	151	157	158	155	157	146	160	146	155	155	162	162	170	174	165	155	152	156.8
2-Dec	164	164	159	158	158	155	159	153	162	171	177	161	180	178	161	186	214	252	266	262	261	262	256	256	213.1
3-Dec	260	265	261	246	258	229	151	149	137	129	208	17	5	359	348	339	345	342	335	342	343	358	66	25	303.3
4-Dec	3	349	351	356	350	338	345	355	320	335	265	241	226	214	236	234	241	240	227	220	209	202	214	245	268.7
5-Dec	280	312	288	303	296	274	270	270	262	262	262	258	263	253	235	232	220	209	199	188	148	138	133	260.7	
6-Dec	115	344	346	349	349	329	338	348	349	339	355	97	127	133	152	150	149	150	151	165	167	156	147	155	128.2
7-Dec	157	159	144	140	147	149	174	143	150	148	142	140	13	153	145	178	185	174	180	163	169	193	224	320	157.5
8-Dec	340	337	342	344	351	29	218	192	241	243	217	218	182	166	140	148	147	128	105	99	103	96	120	118	117.3
9-Dec	121	120	113	111	117	106	103	105	113	118	129	134	130	104	23	143	159	233	337	329	216	216	249	295	124.1
10-Dec	67	297	0	360	7	13	17	14	4	354	6	358	341	10	355	358	11	336	338	346	350	12	9	340	358.4
11-Dec	1	350	352	125	138	139	144	150	137	138	134	136	133	147	170	172	155	142	139	138	136	134	133	134	138.4
12-Dec	134	137	135	136	133	140	145	142	142	140	141	141	149	146	137	139	139	139	142	137	136	138	138	136	139.4
13-Dec	135	138	139	139	136	134	132	135	134	135	132	129	129	127	65	14	6	16	5	8	80	86	47	355	126.8
14-Dec	48	135	279	338	336	287	286	271	268	275	261	274	264	261	256	230	229	212	192	179	181	181	178	163	230.4
15-Dec	177	177	172	159	166	168	166	160	184	218	250	253	253	248	246	242	251	254	252	250	275	323	349	9	225.8
16-Dec	13	357	17	8	313	305	302	287	273	274	270	253	254	262	255	217	233	261	307	288	297	296	341	6	281.7
17-Dec	306	314	307	299	303	307	324	16	22	359	7	9	349	330	349	358	6	35	37	30	23	17	27	35	349.2
18-Dec	24	45	31	356	348	8	49	47	56	58	40	0	151	138	109	99	112	130	127	125	131	122	98	108	104.2
19-Dec	103	138	116	116	126	127	131	132	132	145	148	149	149	141	153	148	133	140	138	139	140	147	146	145	137.8
20-Dec	145	143	144	147	151	145	146	145	145	151	139	137	141	135	133	139	142	144	142	142	139	144	141	142	142.4
21-Dec	146	148	148	156	155	157	147	150	171	178	178	147	148	143	129	130	132	109	20	329	356	348	1	329	147.1
22-Dec	348	340	344	339	359	4	2	358	356	355	0	360	357	355	348	347	360	353	352	355	353	354	357	354	354.1
23-Dec	360	348	347	348	358	356	346	352	5	5	6	358	352	355	6	5	2	350	360	14	4	353	0	353	357.7
24-Dec	352	353	353	340	348	358	356	5	0	341	358	354	334	316	315	330	4	86	114	114	139	150	156	162	5.0
25-Dec	152	153	169	164	154	144	160	182	173	174	170	151	31	34	132	125	20	356	351	351	345	1	15	9	71.5
26-Dec	26	15	9	14	356	328	351	35	35	116	114	153	109	74	347	341	339	352	59	1	69	15	36	65	20.8
27-Dec	349	104	135	138	139	140	140	135	141	141	139	141	146	145	162	164	160	159	158	148	148	150	207	214	144.8
28-Dec	231	212	281	305	333	315	329	360	2	351	348	357	346	334	338	337	345	354	70	302	261	219	180	175	329.5
29-Dec	173	172	185	206	167	167	191	180	188	189	185	180	214	208	183	166	168	175	190	181	171	172	183	208	182.5
30-Dec	228	233	245	253	250	250	248	250	233	209	214	192	202	205	232	235	237	241	228	232	232	223	183	179	231.2
31-Dec	171	166	177	198	171	173	183	198	248	258	245	249	246	240	237	240	246	251	249	251	238	230	222	240	231.2

145.8 161.3 166.6 162.9 151.5 164.2 163.5 151.6 164.3 174.3 171.6 168.3 186.1 186.1 183.8 181.5 187.9 191.5 188.4 181.1 185.0 171.6 148.6 154.1  
 Diurnal Average

All monthly, daily, and diurnal averages have been calculated using vector methods



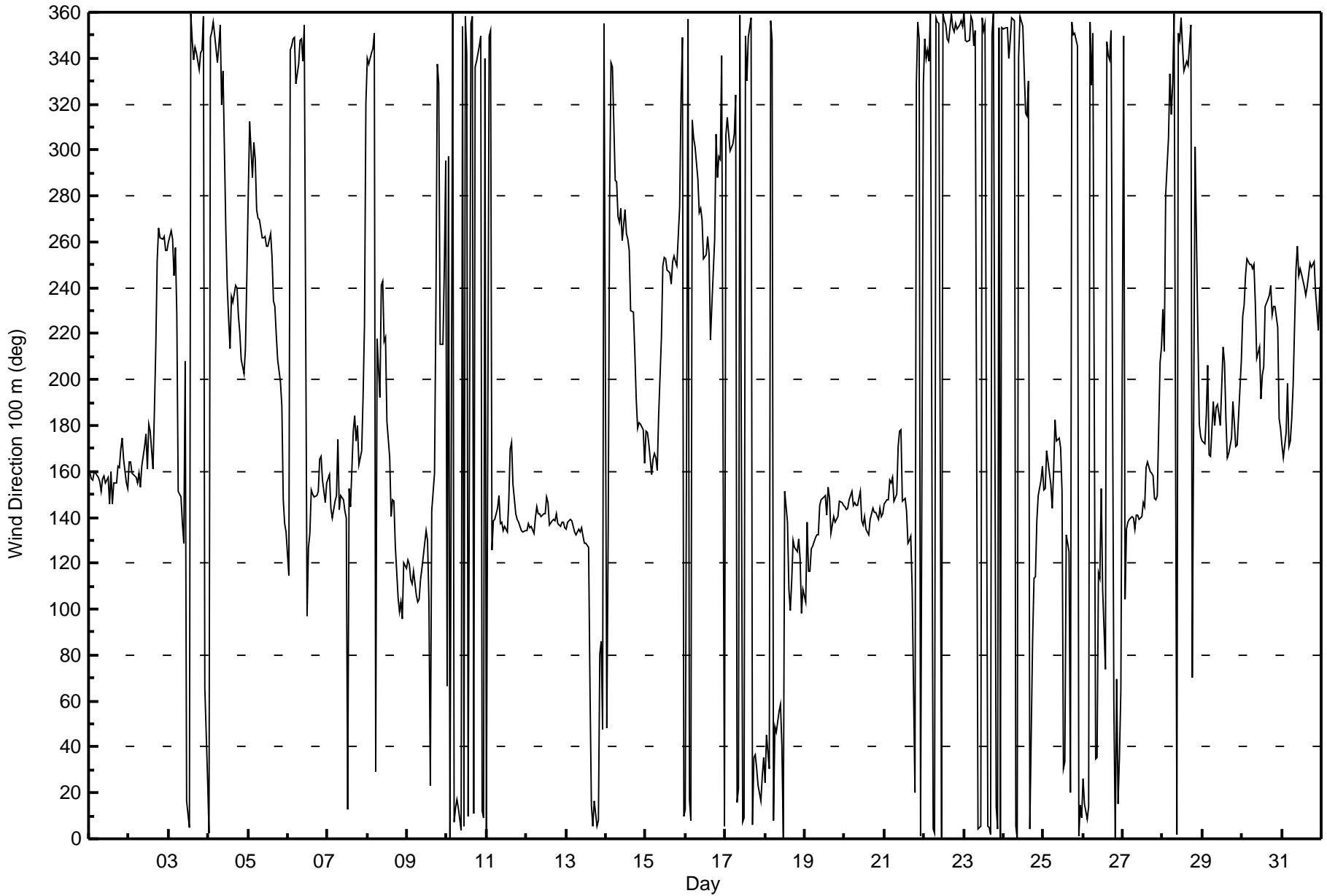
**Wood Buffalo Environmental Association**

**Summary of Hour Standard Deviations**

**Wind Direction 100 m (WD100m) - deg**

**Lower Camp Met Tower - December 2015**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744											
Maximum Value: 89 deg on Dec 26 20:00														Hours of Data: 744											
Minimum Value: 3 deg on Dec 15 13:00														Hours of Missing Data: 0											
Percentiles: P <sub>1</sub> = 3 P <sub>10</sub> = 5 Q <sub>1</sub> = 7 Median = 10 Q <sub>3</sub> = 16 P <sub>90</sub> = 29 P <sub>99</sub> = 68														Hours of Calibration: 0											
														Percent Operational Time: 100.0											
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	13	8	5	5	9	8	3	5	10	8	12	17	29	13	11	9	5	8	7	10	10	10	5	5	29
2-Dec	7	8	10	6	10	7	11	8	10	24	25	6	10	17	14	23	14	7	8	6	5	3	4	3	25
3-Dec	4	4	5	26	7	66	13	6	9	28	82	8	11	15	14	10	6	9	4	10	7	12	15	21	82
4-Dec	28	10	7	7	13	4	7	18	30	27	16	10	9	13	9	5	6	15	13	25	25	15	18	23	30
5-Dec	23	8	23	11	13	8	7	8	6	5	7	10	9	8	7	7	7	7	16	16	16	15	4	6	23
6-Dec	39	53	7	11	14	12	6	16	19	8	34	51	22	7	15	12	7	7	8	21	13	7	10	26	53
7-Dec	9	11	13	10	8	12	28	14	16	9	8	78	45	63	16	32	32	24	13	11	9	20	17	28	78
8-Dec	7	8	8	8	13	77	85	29	19	20	13	7	14	22	12	13	11	17	16	7	11	34	8	7	85
9-Dec	6	6	7	11	8	8	45	39	10	10	7	6	9	54	40	19	19	27	9	10	32	12	21	51	54
10-Dec	67	60	7	11	7	11	11	9	11	12	10	18	18	14	58	14	15	5	4	7	6	19	26	10	67
11-Dec	14	14	80	48	15	11	16	11	14	6	4	4	7	14	15	10	12	9	8	5	5	6	6	6	80
12-Dec	7	6	6	5	5	10	5	5	4	3	3	4	8	9	4	4	4	4	6	5	5	5	4	5	10
13-Dec	5	4	4	5	5	5	6	6	5	5	7	7	8	12	28	14	28	28	14	10	24	33	41	13	41
14-Dec	39	56	61	5	13	21	12	16	10	12	10	17	16	11	9	11	8	11	14	6	7	6	9	7	61
15-Dec	6	6	8	7	7	7	11	14	14	16	6	5	3	3	17	4	4	4	4	8	7	21	19	8	21
16-Dec	8	15	17	24	27	9	10	13	10	8	11	5	3	5	12	5	10	17	22	16	7	6	22	35	35
17-Dec	63	24	10	12	11	8	23	13	7	14	14	12	22	17	10	23	31	18	21	13	11	21	17	17	63
18-Dec	12	15	19	23	26	22	31	25	12	19	15	60	73	7	9	5	8	12	6	4	6	13	12	11	73
19-Dec	13	24	42	19	6	7	6	8	9	13	7	9	10	29	17	14	23	20	30	35	13	7	6	5	42
20-Dec	4	4	4	6	9	6	5	6	7	9	5	7	11	7	6	4	3	3	3	3	4	7	3	4	11
21-Dec	5	6	8	7	7	12	8	11	14	8	13	11	8	8	5	16	10	50	19	26	26	28	25	11	50
22-Dec	13	7	7	8	8	7	6	7	7	6	10	12	9	8	10	7	10	8	6	6	8	6	6	9	13
23-Dec	10	10	8	11	9	10	13	11	6	7	9	7	8	9	6	6	5	9	10	10	9	8	7	8	13
24-Dec	8	7	8	8	8	6	8	6	16	14	9	12	34	47	40	37	43	24	5	10	12	7	12	10	47
25-Dec	10	11	14	14	17	9	16	17	15	13	17	61	34	68	43	7	36	5	6	7	8	8	12	14	68
26-Dec	11	19	15	8	14	26	16	20	45	31	21	39	7	27	37	6	5	40	68	89	41	46	57	64	89
27-Dec	52	53	21	4	3	3	4	5	4	4	6	4	6	6	13	8	9	4	8	11	9	11	26	22	53
28-Dec	36	35	23	19	20	11	15	6	9	8	9	11	11	13	11	10	8	14	46	27	25	30	12	10	46
29-Dec	11	7	18	21	12	10	14	9	12	12	12	10	8	11	13	7	6	8	10	12	11	11	15	14	21
30-Dec	12	15	7	9	7	9	9	10	16	13	12	19	21	30	48	30	5	6	10	9	9	7	15	11	48
31-Dec	9	12	10	12	10	12	14	15	13	5	5	6	6	6	4	5	6	10	3	9	5	18	28	8	28
														67 60 80 48 27 77 85 39 45 31 82 78 73 68 58 37 43 50 68 89 41 46 57 64											
														Diurnal Maximum											







Maximum Value: 0.5 km/h on Dec 30 22:00																				Maximum Daily Average: 0.2 km/h on Dec 29					Hours in Service: 744				
Minimum Value: -0.7 km/h on Dec 5 10:00																				Minimum Daily Average: -0.2 km/h on Dec 5					Hours of Data: 742				
Maximum Diurnal Average: 0.0 km/h at hour 16																				Minimum Diurnal Average: -0.1 km/h at hour 8					Hours of Missing Data: 2				
Monthly Average: -0.02 km/h																				Percentiles: P <sub>1</sub> = -0.6 P <sub>10</sub> = -0.2 Q <sub>1</sub> = -0.1 Median = 0.0 Q <sub>3</sub> = 0.1 P <sub>90</sub> = 0.2 P <sub>99</sub> = 0.4					Hours of Calibration: 0				
																				Percent Operational Time: 99.7									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	0.2	0.1	0.1	0.2	0.1	0.1	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	-0.2	-0.1	-0.1	0.2	0.0	0.0	0.0	0.0	0.2			
2-Dec	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.1	-0.1	-0.2	-0.5	-0.1	AF	AF	0.2	0.3	-0.3	-0.6	-0.4	-0.3	-0.4	-0.3	-0.6	-0.1	0.3			
3-Dec	-0.4	-0.4	-0.2	-0.2	-0.1	0.1	0.0	-0.3	-0.3	-0.1	0.0	-0.5	-0.3	-0.2	0.0	0.0	0.1	-0.1	0.0	0.0	-0.1	0.0	-0.1	0.2	-0.1	0.2			
4-Dec	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	0.0	-0.1	0.0	-0.1	0.0	0.0	0.2	0.2	0.2	-0.1	0.0	0.2	-0.1	0.3	0.2	0.3	0.0	0.0	0.3			
5-Dec	-0.1	0.0	-0.2	-0.3	-0.4	-0.6	-0.6	-0.5	-0.7	-0.7	-0.5	-0.4	0.0	-0.4	-0.2	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	-0.2	0.1			
6-Dec	-0.2	-0.1	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	-0.2	-0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	-0.1	0.1			
7-Dec	0.1	0.1	-0.1	0.0	0.2	0.1	-0.1	-0.1	-0.2	-0.1	0.1	-0.2	-0.1	-0.1	-0.1	0.0	0.0	0.0	-0.1	0.0	-0.2	0.1	0.1	0.0	0.0	0.2			
8-Dec	0.0	0.0	0.1	0.1	0.0	-0.1	0.0	0.0	0.1	0.1	0.2	-0.1	0.1	0.2	0.1	0.0	0.1	0.0	-0.1	-0.2	0.0	0.0	-0.2	-0.2	0.0	0.2			
9-Dec	-0.1	-0.2	-0.1	0.0	-0.1	-0.2	-0.1	-0.2	-0.2	0.2	-0.1	-0.1	0.2	0.0	0.0	0.0	0.0	-0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.0	0.2			
10-Dec	0.0	-0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.1			
11-Dec	0.0	0.0	-0.1	-0.2	-0.1	-0.1	-0.1	0.0	0.1	0.0	-0.3	0.0	0.0	0.1	0.1	0.1	0.0	-0.2	0.0	0.0	-0.1	-0.1	0.0	0.1	0.0	0.1			
12-Dec	0.0	-0.2	-0.1	-0.1	-0.3	0.1	-0.2	0.0	0.1	0.3	-0.1	0.3	0.0	0.1	-0.4	-0.1	-0.2	0.1	0.1	-0.2	-0.1	-0.1	-0.1	-0.3	-0.1	0.3			
13-Dec	-0.3	-0.1	-0.1	-0.1	-0.3	-0.4	-0.3	-0.2	-0.1	-0.2	-0.3	-0.2	-0.3	-0.1	0.0	0.0	0.1	0.0	0.0	-0.2	-0.3	-0.1	0.0	-0.1	0.1				
14-Dec	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.3	-0.1	-0.3	-0.2	-0.1	-0.1	0.0	0.1	0.0	0.1	0.2	0.3	0.2	0.2	0.2	0.0	0.3				
15-Dec	0.4	0.3	0.2	0.0	0.1	0.1	0.3	-0.1	0.4	0.1	0.0	-0.1	-0.3	-0.2	0.1	0.1	-0.1	-0.1	0.0	0.0	-0.3	-0.3	0.0	0.0	0.0	0.4			
16-Dec	0.0	0.1	0.0	0.0	-0.1	-0.2	-0.3	-0.3	-0.1	0.0	-0.2	0.0	-0.3	-0.4	-0.3	0.1	0.0	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.1	-0.1	0.1			
17-Dec	0.1	0.1	0.1	-0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	-0.1	0.2	0.1	-0.1	0.0	0.1	0.0	-0.1	0.0	-0.1	0.0	0.0	-0.2	0.0	0.2			
18-Dec	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.0	0.0	0.0	-0.2	-0.1	-0.1	-0.1	-0.2	-0.1	0.0	0.0	-0.1	-0.1	-0.1	0.1			
19-Dec	-0.2	-0.1	-0.2	0.1	-0.3	-0.2	-0.2	0.1	0.0	0.2	0.1	0.2	0.1	0.1	0.0	0.0	0.1	0.0	-0.2	-0.1	-0.2	0.1	0.1	0.0	0.0	0.2			
20-Dec	-0.2	-0.1	0.2	0.0	0.0	0.1	-0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.0	-0.1	-0.2	-0.2	-0.1	0.1	0.0	-0.2	0.0	0.0	0.2			
21-Dec	-0.1	-0.3	-0.1	0.4	0.2	-0.1	0.0	-0.3	-0.4	0.0	0.0	0.1	-0.1	0.1	0.1	0.1	0.1	0.0	-0.1	-0.1	-0.1	0.0	0.0	-0.1	0.0	0.4			
22-Dec	0.0	0.0	-0.1	0.1	-0.1	-0.3	-0.3	-0.3	-0.2	-0.3	-0.3	-0.2	-0.3	-0.3	-0.1	-0.2	-0.2	-0.1	-0.2	-0.2	0.1	-0.2	-0.2	0.0	-0.2	0.1			
23-Dec	-0.2	0.0	0.1	0.1	-0.1	0.1	0.0	0.0	0.0	-0.2	-0.2	-0.3	-0.1	-0.1	-0.1	-0.2	-0.2	0.0	-0.1	0.0	-0.2	0.0	-0.2	0.0	-0.1	0.1			
24-Dec	0.0	0.1	0.0	0.1	0.1	0.1	0.0	-0.1	0.0	0.0	-0.1	-0.1	0.1	0.2	-0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.0	0.0	0.2			
25-Dec	-0.2	-0.1	-0.1	0.1	0.0	-0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.2	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.2	-0.1	0.0	-0.2	0.0	0.2			
26-Dec	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	-0.2	-0.1	-0.1	-0.1	0.0	-0.2	0.0	0.1			
27-Dec	-0.3	-0.2	-0.1	-0.1	-0.3	-0.1	-0.2	-0.5	-0.2	-0.3	-0.2	0.2	-0.1	-0.1	0.0	0.3	0.4	0.4	0.2	0.0	0.2	0.0	0.2	0.2	0.0	0.4			
28-Dec	0.2	0.2	0.0	-0.1	0.0	-0.1	0.0	-0.3	-0.1	0.1	0.4	0.0	0.2	0.2	-0.2	0.1	0.1	0.1	-0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.4			
29-Dec	0.1	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.4	0.5	0.4	0.2	0.0	0.0	0.2	0.2	0.0	0.0	0.4	0.3	0.3	0.1	0.4	0.3	0.2	0.5			
30-Dec	0.4	0.2	0.0	-0.2	-0.5	0.1	0.2	0.1	0.3	0.4	0.3	0.0	0.2	0.1	0.1	0.1	0.2	0.1	0.4	0.3	0.5	0.5	0.3	0.1	0.2	0.5			
31-Dec	0.0	-0.2	0.3	0.3	-0.1	0.1	0.2	0.3	0.1	-0.6	-0.1	0.1	0.1	-0.1	-0.2	0.0	0.2	0.1	0.0	0.0	-0.2	0.3	0.4	0.4	0.1	0.4			
																								Diurnal Average					
																								Diurnal Maximum					
AF - Analyzer Failure																													



Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Vertical Wind Speed 20 m (VW20m) - km/h

Lower Camp Met Tower - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 4.2 km/h on Dec 27 10:00 Minimum Value: 0.1 km/h on Dec 24 19:00 Percentiles: P <sub>1</sub> = 0.1 P <sub>10</sub> = 0.4 Q <sub>1</sub> = 0.7 Median = 1.0 Q <sub>3</sub> = 1.5 P <sub>90</sub> = 2.2 P <sub>99</sub> = 3.5																						Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 0 Percent Operational Time: 99.7			
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	0.9	0.5	0.7	1.0	1.4	1.3	1.3	0.8	1.1	1.3	1.7	1.7	1.5	1.5	1.6	1.0	1.2	1.5	1.4	1.4	1.0	1.6	1.6	1.5	1.7
2-Dec	1.5	1.2	1.7	1.5	1.5	1.4	1.6	1.3	1.0	1.1	1.5	2.1	1.9	AF	AF	0.9	0.7	1.6	2.5	1.7	2.2	2.2	1.6	1.9	2.5
3-Dec	1.6	2.2	1.6	1.4	1.0	0.6	0.7	1.6	1.4	0.3	0.4	1.2	1.1	1.1	0.8	0.8	0.8	0.6	0.7	0.7	0.6	0.6	0.3	0.8	2.2
4-Dec	0.6	0.6	0.5	0.6	0.8	0.7	0.6	0.5	0.3	0.3	0.8	0.9	1.2	1.1	1.0	0.7	0.4	0.9	1.0	0.7	1.0	1.0	0.8	1.2	1.2
5-Dec	0.5	0.4	0.8	2.3	2.5	3.1	2.8	2.6	3.0	2.9	2.7	2.2	2.6	2.1	1.3	0.4	0.5	0.2	0.5	0.7	0.6	0.3	0.2	0.3	3.1
6-Dec	0.4	0.4	0.4	0.6	0.4	0.5	0.3	0.3	0.7	0.9	1.1	0.9	1.3	0.9	0.9	0.5	0.6	1.4	1.4	0.4	0.4	1.1	1.1	1.1	1.4
7-Dec	0.5	0.4	0.9	0.7	0.6	0.5	0.4	0.5	0.8	0.8	0.7	0.8	0.7	0.7	0.6	0.6	0.2	0.3	0.6	0.7	1.0	1.2	0.5	1.0	1.2
8-Dec	1.5	1.2	1.1	1.0	0.9	0.2	0.2	0.1	0.1	0.3	0.6	1.1	0.8	0.9	1.2	1.3	1.1	1.1	1.5	1.8	0.5	0.6	1.4	1.2	1.8
9-Dec	1.1	1.0	0.9	0.6	1.0	0.6	0.6	1.1	1.0	0.9	1.6	1.9	0.8	0.6	0.6	0.3	0.3	0.4	0.5	0.5	0.2	0.6	0.5	0.3	1.9
10-Dec	0.1	0.6	0.5	0.5	0.6	0.5	0.5	0.6	0.4	0.7	0.8	0.6	0.7	0.9	0.7	0.7	0.3	0.5	0.5	0.7	0.6	0.6	0.8	0.7	0.9
11-Dec	0.7	0.6	0.6	0.7	0.6	0.6	0.5	0.6	0.9	2.2	2.5	2.8	2.3	1.0	1.1	1.1	1.1	1.3	2.0	2.5	2.5	2.3	2.0	2.0	2.8
12-Dec	1.9	2.2	2.2	2.6	2.7	2.0	2.1	2.6	3.1	3.7	3.6	3.4	2.9	3.1	3.5	3.6	3.5	3.5	2.9	2.9	2.8	2.8	3.0	2.8	3.7
13-Dec	2.3	2.5	2.4	2.7	2.5	2.4	2.4	2.3	2.2	2.2	1.9	1.9	1.6	0.5	0.4	0.6	0.7	0.7	0.6	0.6	0.8	0.5	0.3	2.7	2.7
14-Dec	0.3	0.1	0.4	0.4	0.7	1.0	1.0	1.2	1.3	1.0	1.2	0.8	1.0	1.1	1.0	0.7	0.7	0.6	0.6	1.3	1.3	1.3	1.4	1.7	1.7
15-Dec	1.7	1.5	1.6	1.6	2.0	2.1	2.2	1.6	1.5	0.8	1.1	1.5	2.4	2.2	1.8	1.2	1.8	1.3	1.5	1.1	2.2	1.8	1.5	2.6	2.6
16-Dec	1.6	0.9	0.5	0.2	0.9	2.1	2.0	1.5	1.2	1.1	1.3	1.2	1.4	1.6	1.4	0.8	1.2	1.0	0.5	0.4	0.7	0.5	0.3	0.1	2.1
17-Dec	0.1	0.4	0.6	0.5	0.8	0.6	0.8	0.7	0.6	0.5	0.7	0.8	0.9	0.8	0.9	0.6	0.4	1.1	0.8	1.0	0.8	0.7	0.7	0.7	1.1
18-Dec	0.8	0.6	0.4	0.3	0.3	0.4	0.2	0.2	0.7	0.6	0.6	0.8	0.9	1.1	1.2	1.3	1.2	0.8	1.3	1.2	1.4	1.2	1.2	0.9	1.4
19-Dec	0.7	0.7	0.6	0.8	2.7	1.9	1.8	1.7	1.4	1.3	1.3	0.9	1.5	1.0	0.8	0.7	0.7	0.7	0.6	0.6	0.8	0.9	2.2	1.7	2.7
20-Dec	1.1	1.3	1.3	1.2	0.7	1.0	1.6	1.1	0.8	0.4	0.9	1.2	0.9	1.0	0.9	2.1	2.5	2.8	3.0	3.1	3.0	2.6	3.1	3.0	3.1
21-Dec	2.5	2.4	2.1	1.5	1.7	1.2	1.0	1.1	1.5	1.3	0.8	0.9	1.0	0.8	0.3	0.2	0.1	0.3	0.4	1.1	0.9	0.6	0.9	0.8	2.5
22-Dec	0.9	1.0	0.9	1.1	1.4	1.9	1.9	1.9	1.7	1.9	1.6	1.5	1.6	1.5	1.9	1.8	1.6	1.6	1.8	1.6	1.4	1.5	1.5	1.4	1.9
23-Dec	1.5	1.3	1.3	1.4	1.2	1.0	0.9	1.2	1.1	1.3	1.3	1.3	1.4	1.4	1.6	1.5	1.4	1.1	1.1	1.4	1.0	1.1	1.1	0.9	1.6
24-Dec	1.1	1.0	0.7	0.6	0.9	0.8	1.1	1.1	0.6	0.7	1.2	1.2	1.0	0.9	0.7	0.4	0.1	0.1	0.1	0.1	0.2	0.5	0.8	1.3	1.3
25-Dec	1.4	1.3	1.2	1.0	1.1	1.1	1.2	1.0	1.3	1.2	0.8	0.7	0.7	0.6	0.3	0.2	0.6	0.9	1.4	1.3	1.4	1.1	0.4	0.6	1.4
26-Dec	0.6	0.5	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.5	0.7	1.0	0.9	0.9	0.7	0.9	0.9	0.9	0.9	0.7	0.9	1.1	1.1
27-Dec	1.0	1.0	1.5	2.6	3.5	3.5	3.5	2.9	3.8	4.2	3.5	3.7	3.2	2.6	1.6	1.5	1.2	1.5	1.6	1.0	1.4	1.1	0.6	0.6	4.2
28-Dec	0.6	0.7	0.3	0.7	0.7	1.0	1.2	1.7	1.5	1.1	1.0	1.3	1.1	1.1	1.0	1.0	0.7	0.6	0.5	0.5	0.4	0.4	0.8	0.8	1.7
29-Dec	0.4	0.5	0.6	0.9	1.6	1.2	1.4	1.9	1.9	1.5	1.2	1.4	1.0	0.8	0.8	1.0	1.0	1.4	1.8	1.9	1.5	1.4	1.4	1.4	1.9
30-Dec	1.4	1.6	1.9	1.3	1.5	1.2	0.7	1.2	1.2	1.2	1.5	1.6	1.8	1.5	1.2	1.1	0.8	0.8	0.8	1.0	1.3	1.1	0.9	1.5	1.9
31-Dec	2.1	1.3	1.2	1.6	2.4	2.1	1.6	1.4	1.9	2.7	1.9	2.1	1.9	1.5	1.6	1.3	1.8	2.0	2.5	2.0	1.2	1.3	1.5	1.2	2.7
2.5 2.5 2.4 2.7 3.5 3.5 3.5 2.9 3.8 4.2 3.6 3.7 3.2 3.1 3.5 3.6 3.5 3.5 3.0 3.1 3.0 2.8 3.1 3.0																									
Diurnal Maximum																									
AF - Analyzer Failure																									



Maximum Value: 2.2 km/h on Dec 29 19:00		Maximum Daily Average: 1.0 km/h on Dec 29		Hours in Service: 744																							
Minimum Value: -1.2 km/h on Dec 5 07:00		Minimum Daily Average: -0.4 km/h on Dec 5		Hours of Data: 742																							
Maximum Diurnal Average: 0.3 km/h at hour 23		Minimum Diurnal Average: 0.1 km/h at hour 15		Hours of Missing Data: 2																							
Monthly Average: 0.20 km/h		Percentiles: P <sub>1</sub> = -1.0 P <sub>10</sub> = -0.3 Q <sub>1</sub> = -0.1 Median = 0.1 Q <sub>3</sub> = 0.5 P <sub>90</sub> = 1.0 P <sub>99</sub> = 1.6		Hours of Calibration: 0																							
				Percent Operational Time: 99.7																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	1.0	0.6	1.0	1.3	1.0	1.0	0.8	0.9	0.9	0.7	0.7	0.8	0.8	AF	0.4	0.4	0.5	0.6	0.9	1.0	1.3	1.2	1.1	0.9	0.9	1.3	
2-Dec	1.2	1.2	1.5	1.0	0.5	0.6	0.9	0.6	0.7	0.3	0.3	0.4	1.0	AF	0.9	1.1	1.1	-0.6	-1.1	-0.8	-0.8	-1.0	-0.6	-0.7	0.3	1.5	
3-Dec	-0.7	-0.7	-0.1	-0.2	-0.3	0.4	0.7	0.4	0.2	-0.2	0.0	-0.5	-0.3	-0.2	-0.1	-0.1	-0.1	-0.2	0.0	-0.1	-0.1	-0.1	-0.2	0.0	-0.1	0.7	
4-Dec	-0.2	-0.2	-0.2	-0.2	-0.3	-0.2	-0.1	-0.1	-0.2	-0.1	-0.1	-0.1	-0.1	0.4	0.4	0.0	-0.1	-0.1	-0.1	0.1	0.3	0.8	0.7	1.0	0.0	1.0	
5-Dec	-0.3	-0.2	-0.4	-0.7	-0.9	-1.1	-1.2	-1.1	-1.1	-1.2	-1.0	-0.6	-0.7	-0.8	-0.2	-0.1	-0.1	0.1	0.5	0.6	0.9	0.5	0.3	0.3	-0.4	0.9	
6-Dec	-0.2	-0.2	-0.3	-0.1	-0.2	-0.3	-0.2	-0.2	-0.2	-0.1	-0.2	-0.2	-0.4	0.1	0.2	0.1	0.0	0.2	0.1	0.0	0.1	0.2	0.0	0.4	-0.1	0.4	
7-Dec	0.4	0.4	0.0	0.1	0.4	0.2	-0.1	0.0	-0.2	0.0	0.0	-0.3	-0.2	-0.4	-0.1	-0.3	0.0	0.1	0.1	0.1	0.0	0.8	0.4	-0.2	0.0	0.8	
8-Dec	-0.2	-0.2	-0.1	-0.1	-0.1	0.0	0.0	0.1	0.1	0.1	0.1	-0.1	0.1	0.2	0.4	0.4	0.5	0.3	0.4	0.4	0.0	0.1	0.3	0.3	0.1	0.5	
9-Dec	0.2	0.2	0.2	0.1	0.2	-0.2	-0.2	0.0	0.2	0.7	0.4	0.5	0.3	0.0	-0.1	0.0	-0.1	-0.2	-0.1	0.0	0.0	0.2	-0.1	0.2	0.1	0.7	
10-Dec	0.1	0.0	0.0	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	0.0	0.0	-0.1	-0.2	0.0	0.0	-0.1	0.0	-0.1	-0.2	-0.1	-0.1	0.1	
11-Dec	-0.2	-0.2	-0.2	-0.5	-0.3	0.0	-0.1	0.2	0.3	0.8	0.8	1.0	0.8	0.3	0.0	0.1	0.5	0.1	0.5	0.9	0.7	0.7	0.6	0.7	0.3	1.0	
12-Dec	0.8	0.7	0.7	0.9	0.8	0.9	0.7	0.9	1.3	1.4	1.3	1.5	1.3	1.3	0.9	0.9	1.0	1.3	1.1	1.0	0.8	0.9	0.9	0.8	1.0	1.5	
13-Dec	0.6	0.7	0.6	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.4	0.3	0.3	0.1	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.4	-0.4	-0.2	-0.1	0.3	0.8	
14-Dec	0.0	0.0	-0.1	-0.1	0.0	-0.5	-0.3	-0.2	-0.6	-0.4	-0.3	-0.1	-0.1	-0.1	0.1	0.1	0.0	0.0	0.4	0.5	0.1	-0.1	0.3	0.8	0.0	0.8	
15-Dec	0.6	0.5	0.7	0.9	1.1	1.0	0.9	0.4	0.7	0.1	-0.1	-0.1	-0.3	-0.2	0.2	0.6	0.2	0.0	0.3	0.2	-0.6	-0.4	0.0	-0.3	0.3	1.1	
16-Dec	0.0	0.1	0.0	0.0	-0.2	-0.6	-0.7	-0.5	-0.4	0.0	-0.4	0.0	-0.3	-0.5	-0.4	0.0	0.0	0.0	-0.2	-0.1	-0.3	-0.3	-0.1	0.0	-0.2	0.1	
17-Dec	0.1	0.1	-0.1	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.1	-0.1	0.2	0.1	-0.1	0.0	0.0	0.2	0.0	0.0	-0.1	0.1	0.0	0.2	
18-Dec	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.5	0.3	0.3	0.3	0.2	0.5	0.5	0.4	0.2	0.1	0.1	0.1	0.5	
19-Dec	-0.2	-0.1	-0.3	0.1	0.6	0.3	0.4	0.7	0.5	0.4	0.4	0.4	0.5	0.3	0.3	0.0	0.0	0.1	-0.2	-0.1	-0.2	0.3	1.0	0.6	0.2	1.0	
20-Dec	0.2	0.2	1.0	0.6	0.3	0.4	0.5	0.4	0.4	0.1	0.5	0.4	0.1	0.2	0.4	0.8	0.7	0.7	0.9	1.0	1.1	1.1	1.1	0.9	0.6	1.1	
21-Dec	0.9	0.5	0.5	0.8	0.8	0.1	0.2	-0.1	0.0	0.7	0.4	0.5	0.5	0.4	0.2	0.1	0.2	0.0	-0.3	-0.3	-0.2	-0.1	-0.3	-0.2	0.2	0.9	
22-Dec	-0.1	-0.2	-0.3	-0.2	-0.1	-0.2	-0.3	-0.4	-0.4	-0.4	-0.3	-0.2	-0.3	-0.3	-0.3	-0.4	-0.1	-0.3	-0.3	-0.3	-0.1	-0.3	-0.3	-0.1	-0.3	-0.1	
23-Dec	-0.2	-0.1	-0.1	-0.2	-0.1	0.0	-0.1	-0.1	0.0	-0.2	-0.3	-0.4	-0.2	-0.1	-0.2	-0.2	-0.2	-0.1	-0.2	0.0	-0.1	-0.1	-0.3	0.0	-0.1	0.0	
24-Dec	-0.1	-0.1	-0.2	0.0	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	-0.1	0.2	0.2	-0.3	0.1	0.0	0.0	0.0	0.1	0.3	0.3	0.2	0.2	0.0	0.3	
25-Dec	0.5	0.4	0.5	0.6	0.5	0.3	0.7	0.7	0.7	0.6	0.5	0.3	0.3	0.2	0.1	0.1	-0.2	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	-0.2	0.2	0.7	
26-Dec	-0.1	-0.1	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	-0.2	-0.1	-0.2	-0.4	-0.2	-0.2	-0.3	-0.2	-0.4	-0.1	0.0	
27-Dec	-0.5	-0.4	0.0	0.9	0.9	1.0	1.0	0.6	1.1	1.1	1.1	1.3	1.2	1.0	0.2	0.5	0.6	0.9	0.5	0.2	0.6	0.2	0.2	0.5	0.6	1.3	
28-Dec	0.3	0.5	0.1	-0.3	-0.1	-0.4	-0.3	-0.4	-0.2	-0.1	0.3	0.0	0.0	0.2	-0.2	-0.1	0.1	0.1	-0.1	-0.1	0.0	0.1	0.5	0.8	0.0	0.8	
29-Dec	0.4	0.7	0.8	0.7	1.6	1.2	1.2	1.7	1.6	1.0	0.4	0.1	-0.2	-0.2	0.2	1.2	1.1	1.4	2.2	1.9	1.6	1.3	1.4	1.2	1.0	2.2	
30-Dec	0.9	0.8	0.4	-0.4	-1.1	-0.2	0.0	-0.1	1.0	1.5	1.3	1.0	1.3	1.0	0.8	0.2	0.0	0.0	0.4	0.5	0.6	0.7	1.2	1.3	0.5	1.5	
31-Dec	1.6	0.3	1.1	1.6	1.4	1.3	1.3	1.6	0.5	-0.9	-0.1	0.2	0.4	0.3	0.3	0.2	0.8	0.5	0.2	0.4	0.0	0.6	0.8	0.6	0.6	1.6	
		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	Diurnal Average		
		1.6	1.2	1.5	1.6	1.6	1.3	1.3	1.7	1.6	1.5	1.3	1.5	1.3	1.3	0.9	1.2	1.1	1.4	2.2	1.9	1.6	1.3	1.4	1.3	Diurnal Maximum	
AF - Analyzer Failure																											



Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Vertical Wind Speed 45 m (VW45m) - km/h

Lower Camp Met Tower - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.6 km/h on Dec 27 10:00 Minimum Value: 0.1 km/h on Dec 26 05:00 Percentiles: P <sub>1</sub> = 0.2 P <sub>10</sub> = 0.5 Q <sub>1</sub> = 0.7 Median = 1.1 Q <sub>3</sub> = 1.5 P <sub>90</sub> = 2.2 P <sub>99</sub> = 3.3																								Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 0 Percent Operational Time: 99.7	
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	0.6	0.6	0.6	0.7	1.0	0.8	1.0	0.7	0.9	1.2	1.3	1.3	1.2	AF	1.3	1.1	1.3	1.1	1.1	0.8	0.7	0.9	1.0	1.0	1.3
2-Dec	0.8	0.8	1.0	1.2	1.3	1.2	1.3	1.4	1.1	1.0	1.3	1.8	1.3	AF	1.0	0.8	1.0	1.8	2.9	2.0	2.5	2.4	1.3	1.9	2.9
3-Dec	1.5	2.2	1.4	1.5	1.1	0.8	0.6	1.1	1.2	0.4	0.3	0.9	1.0	1.0	0.9	0.8	0.7	0.6	0.8	0.7	0.7	0.6	0.4	0.8	2.2
4-Dec	0.6	0.6	0.6	0.6	0.7	0.6	0.7	0.5	0.5	0.3	0.4	0.9	0.9	1.4	1.3	1.2	0.7	0.5	1.1	1.3	0.8	1.2	0.9	1.0	1.4
5-Dec	0.5	0.5	1.1	2.9	2.8	3.5	3.3	3.0	3.1	3.1	2.9	2.5	2.9	2.3	1.3	0.4	0.7	0.4	0.7	0.8	0.5	0.5	0.3	0.5	3.5
6-Dec	0.3	0.3	0.5	0.7	0.5	0.5	0.4	0.3	0.7	1.0	1.1	0.8	1.3	1.2	1.0	0.7	0.8	1.6	1.4	0.6	0.5	1.3	1.3	1.2	1.6
7-Dec	0.5	0.5	1.1	0.9	0.8	0.6	0.4	0.8	0.8	0.9	0.8	0.8	0.6	0.6	0.7	0.5	0.3	0.4	0.8	0.8	1.2	1.1	0.7	1.1	1.2
8-Dec	1.7	1.4	1.2	1.1	1.0	0.3	0.3	0.2	0.2	0.4	0.8	1.1	0.9	1.1	1.3	1.3	1.2	1.3	1.6	1.8	0.7	0.6	1.4	1.1	1.8
9-Dec	1.0	1.1	0.9	0.7	1.2	0.5	0.7	1.1	0.9	1.1	1.7	1.9	0.8	0.6	0.5	0.2	0.3	0.3	0.6	0.5	0.3	0.7	0.6	0.4	1.9
10-Dec	0.1	0.5	0.6	0.5	0.6	0.6	0.6	0.8	0.5	0.8	0.8	0.6	0.7	0.9	0.7	0.7	0.4	0.4	0.6	0.7	0.7	0.6	0.8	0.7	0.9
11-Dec	0.7	0.7	0.6	0.6	0.7	0.7	0.7	0.8	1.3	2.3	2.2	2.6	2.2	1.1	1.3	1.3	1.1	1.4	2.0	2.3	2.3	2.1	2.0	1.8	2.6
12-Dec	1.8	2.0	2.1	2.4	2.5	2.1	2.0	2.5	3.0	3.4	3.2	3.5	2.9	3.1	3.2	3.1	3.1	3.4	3.0	2.7	2.6	2.6	2.8	2.4	3.5
13-Dec	2.1	2.3	2.1	2.5	2.3	2.2	2.1	2.1	2.0	2.0	2.1	1.8	1.8	1.5	0.5	0.5	0.8	0.7	0.7	0.6	0.5	0.6	0.6	0.4	2.5
14-Dec	0.3	0.2	0.4	0.4	0.8	1.0	1.0	1.3	1.4	1.1	1.3	1.0	1.1	1.1	0.8	0.8	0.8	0.7	0.8	1.3	1.4	1.6	1.6	1.6	1.6
15-Dec	1.9	1.6	1.4	1.4	2.0	2.2	2.3	1.8	1.7	1.0	1.4	1.4	2.1	1.7	1.8	1.3	1.6	1.7	1.6	1.2	2.5	1.8	1.8	2.6	2.6
16-Dec	1.7	1.0	0.6	0.2	1.0	2.4	2.2	1.8	1.3	1.6	1.4	1.2	1.2	1.5	1.3	0.9	1.3	1.0	0.6	0.7	1.0	0.7	0.4	0.2	2.4
17-Dec	0.2	0.6	0.8	0.6	1.1	0.8	0.9	0.7	0.5	0.6	0.8	0.8	0.9	0.9	0.8	0.6	0.5	1.2	0.9	1.0	0.9	1.0	0.8	0.7	1.2
18-Dec	0.8	0.6	0.5	0.3	0.4	0.4	0.2	0.3	0.7	0.6	0.7	0.8	1.0	1.0	1.2	1.4	1.3	0.8	1.1	1.2	1.4	1.3	1.3	1.1	1.4
19-Dec	0.8	0.8	0.6	1.1	2.6	1.9	1.8	1.7	1.5	1.3	1.4	1.0	1.6	1.1	0.9	0.8	0.7	0.8	0.7	0.8	1.0	1.3	2.2	1.8	2.6
20-Dec	1.3	1.6	1.3	1.2	0.9	1.1	1.9	1.4	1.1	0.5	1.3	1.6	1.0	1.1	1.3	2.2	2.5	2.6	2.5	2.8	3.2	2.8	2.7	2.7	3.2
21-Dec	2.7	2.5	2.2	1.7	1.8	1.3	1.2	1.2	1.4	1.0	0.9	0.7	0.8	0.5	0.2	0.2	0.2	0.3	0.4	1.0	1.0	0.7	0.8	0.8	2.7
22-Dec	0.9	0.9	0.9	1.3	1.5	2.0	2.0	1.8	1.6	1.9	1.6	1.5	1.5	1.5	2.0	2.0	1.7	1.7	1.9	1.7	1.6	1.5	1.6	1.6	2.0
23-Dec	1.6	1.4	1.5	1.6	1.3	1.2	1.0	1.2	1.1	1.3	1.3	1.3	1.3	1.4	1.6	1.4	1.4	1.2	1.2	1.4	1.1	1.3	1.1	1.0	1.6
24-Dec	1.3	1.1	0.8	0.9	1.0	0.9	1.2	1.2	0.7	0.8	1.2	1.1	1.1	1.0	0.8	0.4	0.2	0.1	0.1	0.1	0.2	0.5	0.8	1.4	1.4
25-Dec	1.2	1.1	0.9	0.8	0.9	0.9	0.9	0.8	1.0	1.0	0.7	0.6	0.7	0.6	0.3	0.3	0.7	0.8	1.7	1.6	1.7	1.2	0.5	0.8	1.7
26-Dec	0.7	0.6	0.2	0.1	0.1	0.2	0.3	0.2	0.2	0.2	0.2	0.4	0.6	0.8	0.8	0.8	0.7	0.8	1.0	0.8	0.9	0.7	1.1	1.3	1.3
27-Dec	1.0	1.1	1.9	2.6	2.9	2.9	3.1	2.8	3.6	3.6	3.3	3.6	3.1	2.7	1.9	1.6	1.3	1.6	1.6	1.2	1.5	1.2	0.8	0.8	3.6
28-Dec	0.8	0.8	0.4	0.9	0.8	1.1	1.4	1.6	1.5	1.2	1.2	1.2	1.3	1.2	1.1	1.1	0.8	0.6	0.5	0.4	0.5	0.5	0.7	0.7	1.6
29-Dec	0.5	0.6	0.8	1.1	1.0	1.0	1.0	1.1	1.1	1.2	1.2	1.6	1.2	1.0	0.9	0.9	0.8	0.9	1.0	1.1	1.2	1.2	1.1	1.3	1.6
30-Dec	1.5	2.0	2.1	1.6	1.9	1.5	0.9	1.5	1.4	0.6	1.2	1.1	1.6	1.1	1.5	1.6	1.0	1.1	1.0	1.2	1.5	1.5	0.7	1.3	2.1
31-Dec	1.4	1.4	1.1	1.2	1.7	2.0	1.5	1.2	2.3	3.0	1.8	1.5	1.2	1.4	1.8	1.1	1.3	1.5	2.0	1.9	1.4	1.6	1.7	1.5	3.0
Diurnal Maximum																									
AF - Analyzer Failure																									



Maximum Value: 4.3 km/h on Dec 27 13:00		Maximum Daily Average: 2.2 km/h on Dec 12		Hours in Service: 744																						
Minimum Value: -2.7 km/h on Dec 30 05:00		Minimum Daily Average: -0.1 km/h on Dec 5		Hours of Data: 744																						
Maximum Diurnal Average: 0.6 km/h at hour 13		Minimum Diurnal Average: 0.3 km/h at hour 2		Hours of Missing Data: 0																						
Monthly Average: 0.42 km/h		Percentiles: P <sub>1</sub> = -0.6 P <sub>10</sub> = -0.2 Q <sub>1</sub> = 0.0 Median = 0.1 Q <sub>3</sub> = 0.6 P <sub>90</sub> = 1.5 P <sub>99</sub> = 3.2		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0.3	0.3	0.4	0.3	0.3	0.5	0.5	1.0	0.6	0.5	0.1	0.6	0.7	0.3	0.3	0.6	0.7	0.2	0.1	0.0	-0.1	0.2	0.8	1.0	0.4	1.0
2-Dec	0.0	0.0	0.3	0.5	0.1	1.1	0.5	0.2	0.0	-0.2	0.3	0.3	-0.2	0.1	0.0	0.2	-0.3	0.1	-0.6	-0.2	0.0	-0.1	0.0	-0.1	0.1	1.1
3-Dec	-0.1	-0.1	0.9	0.6	0.6	0.1	0.5	0.7	0.9	0.3	0.1	-0.3	0.0	-0.3	-0.1	-0.1	-0.2	0.0	-0.2	-0.2	-0.1	0.1	0.0	0.2	0.1	0.9
4-Dec	0.1	-0.1	0.0	0.0	-0.1	-0.2	-0.1	0.0	-0.2	-0.2	-0.2	0.6	0.4	0.2	0.8	1.1	0.4	0.0	0.2	-0.1	0.0	-0.2	-0.1	-0.2	0.1	1.1
5-Dec	0.0	-0.2	-0.1	-0.9	-0.5	-1.1	-1.1	-0.6	-0.4	-0.4	-0.4	0.0	0.3	-0.5	0.1	0.2	0.2	0.1	0.2	-0.1	0.0	0.4	0.9	0.8	-0.1	0.9
6-Dec	0.2	0.1	0.0	0.0	-0.1	-0.2	-0.3	0.0	0.0	-0.3	0.0	0.1	0.3	1.1	0.8	0.4	0.7	0.5	0.6	0.1	0.0	1.3	0.8	0.1	0.2	1.3
7-Dec	0.2	0.1	0.1	0.5	0.6	0.5	0.0	0.5	0.5	0.8	0.8	0.1	0.1	0.0	0.1	0.0	0.1	0.1	-0.2	0.2	0.1	0.1	-0.1	-0.2	0.2	0.8
8-Dec	-0.4	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.5	0.4	0.0	0.4	0.9	0.9	0.9	0.3	0.9	0.5	0.0	0.9	0.6	0.4	0.3	0.9
9-Dec	0.0	0.1	0.3	1.0	0.8	0.3	0.5	0.3	0.3	1.9	1.0	1.2	0.5	0.1	-0.1	0.1	0.1	0.1	0.0	0.0	-0.1	0.2	-0.1	0.0	0.3	1.9
10-Dec	0.0	0.0	0.1	0.0	0.3	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-0.1	0.0	0.1	0.0	0.0	-0.1	-0.1	0.1	0.1	0.0	0.0	-0.1	0.0	0.3
11-Dec	-0.2	-0.1	0.0	0.1	0.3	0.4	0.4	0.6	1.3	2.2	1.4	1.7	1.9	0.9	0.4	-0.2	0.6	-0.3	1.5	1.8	1.4	1.2	1.8	1.4	0.9	2.2
12-Dec	1.4	1.6	1.6	1.7	2.1	2.4	1.6	2.1	3.0	3.0	2.8	3.6	3.8	3.2	2.1	1.7	1.7	2.2	3.2	2.0	1.9	1.6	1.6	1.1	2.2	3.8
13-Dec	0.9	0.7	0.8	1.2	1.1	0.9	0.8	0.9	0.8	1.1	1.0	0.5	0.6	0.4	0.4	-0.1	-0.1	-0.1	0.1	-0.2	-0.2	-0.2	0.0	0.0	0.5	1.2
14-Dec	0.1	0.1	0.1	-0.1	0.1	-0.6	-0.6	0.2	-0.3	-0.2	-0.3	-0.6	0.2	0.4	0.4	0.4	0.2	0.0	0.0	-0.5	-0.4	-0.6	-0.3	0.1	-0.1	0.4
15-Dec	-0.1	-0.3	-0.2	0.8	0.7	1.1	1.4	1.2	0.7	0.4	0.7	0.5	0.9	0.8	2.5	3.9	2.7	3.4	3.1	1.8	-0.1	0.1	-0.1	0.0	1.1	3.9
16-Dec	0.4	0.2	0.1	-0.1	-0.1	-0.5	-0.4	0.6	-0.1	0.6	0.0	1.3	0.6	0.5	0.0	0.3	0.5	0.1	-0.4	-0.1	-0.6	-0.7	-0.1	0.0	0.1	1.3
17-Dec	-0.2	-0.3	-0.1	0.0	0.4	-0.2	-0.2	0.1	-0.2	-0.1	0.0	0.0	0.2	0.1	0.0	0.1	0.2	0.1	0.2	0.4	0.1	0.1	0.2	0.0	0.0	0.4
18-Dec	0.2	0.0	0.1	-0.2	0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.8	0.5	0.4	0.3	1.3	0.7	-0.4	-0.4	0.7	0.2	1.3
19-Dec	0.2	0.2	0.3	0.7	1.7	1.0	1.1	1.6	1.1	0.9	0.9	1.0	0.6	1.0	0.3	-0.3	0.2	0.5	0.2	0.0	0.7	1.5	2.5	2.2	0.8	2.5
20-Dec	0.9	1.0	2.0	1.7	0.5	1.3	2.5	1.5	1.5	0.8	1.8	2.5	0.2	0.7	1.8	2.1	1.1	1.7	1.2	1.1	3.3	3.6	1.7	2.1	1.6	3.6
21-Dec	4.0	3.0	3.3	2.7	2.9	1.2	1.5	1.0	0.1	-0.2	0.1	0.5	0.6	0.5	0.2	0.2	0.2	0.1	0.1	-0.2	-0.2	0.0	-0.2	-0.2	0.9	4.0
22-Dec	-0.2	-0.3	-0.3	-0.2	0.4	0.1	0.2	0.0	0.2	0.0	0.0	0.2	0.0	0.2	0.0	-0.1	0.2	0.1	0.0	0.2	0.0	0.2	0.2	0.1	0.0	0.4
23-Dec	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.0	-0.1	-0.2	-0.2	0.0	0.2	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.0	0.1	0.1	0.3
24-Dec	0.1	0.2	0.0	-0.1	0.1	0.0	0.3	0.0	0.1	-0.1	-0.1	-0.2	0.5	0.3	-0.1	0.5	-0.1	0.0	0.2	0.1	0.3	0.3	0.1	0.0	0.1	0.5
25-Dec	0.5	0.3	0.1	0.1	0.4	0.4	0.2	0.0	0.1	0.0	0.2	0.1	0.3	0.0	0.1	0.3	0.0	-0.2	0.1	0.1	-0.2	0.1	0.2	0.0	0.1	0.5
26-Dec	0.0	-0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.0	0.0	-0.3	-0.3	-0.1	-0.1	0.0	0.1	0.1	0.2	0.1	0.0	0.2
27-Dec	-0.3	0.0	0.8	1.6	1.8	1.4	1.5	1.3	1.7	1.9	2.2	3.0	4.3	3.2	1.7	1.5	2.1	1.2	1.1	1.6	2.0	1.2	0.0	0.4	1.5	4.3
28-Dec	0.7	0.6	-0.1	-0.2	0.0	-0.1	-0.2	-0.2	0.0	0.1	0.1	0.1	0.1	0.7	0.2	-0.2	0.0	0.0	0.0	-0.1	0.0	0.2	-0.1	0.3	0.1	0.7
29-Dec	0.0	0.1	-0.1	-0.1	0.5	0.6	0.2	-0.1	0.0	-0.2	0.1	-0.2	0.4	0.2	0.1	0.2	0.1	-0.2	0.1	0.0	-0.1	-0.1	0.3	0.3	0.1	0.6
30-Dec	0.8	1.5	2.4	0.5	-2.7	-1.7	0.5	-1.0	-0.4	-0.1	-0.1	-0.3	0.0	0.0	-0.1	0.0	0.3	0.4	0.3	0.6	0.6	0.5	0.0	-0.2	0.1	2.4
31-Dec	0.9	0.3	0.3	0.0	0.5	1.2	0.3	0.0	0.9	0.3	0.7	0.5	0.3	0.7	1.3	0.6	1.1	1.3	1.6	2.7	3.0	1.9	1.5	1.8	1.0	3.0
		0.4	0.3	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.6	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	Diurnal Average
		4.0	3.0	3.3	2.7	2.9	2.4	2.5	2.1	3.0	3.0	2.8	3.6	4.3	3.2	2.5	3.9	2.7	3.4	3.2	2.7	3.3	3.6	2.5	2.2	Diurnal Maximum



Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.4 km/h on Dec 5 06:00		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																							
Minimum Value: 0.1 km/h on Dec 26 05:00																									
Percentiles: P <sub>1</sub> = 0.2 P <sub>10</sub> = 0.4 Q <sub>1</sub> = 0.7 Median = 1.1 Q <sub>3</sub> = 1.6 P <sub>90</sub> = 2.0 P <sub>99</sub> = 2.8																									
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	0.9	0.8	0.6	0.7	0.7	0.7	0.6	0.7	0.9	0.9	0.8	1.2	1.0	1.0	1.1	1.3	1.4	0.9	0.9	0.8	0.7	0.9	0.9	0.8	1.4
2-Dec	0.8	0.8	0.8	1.0	1.2	1.1	1.1	1.1	0.8	0.9	1.2	1.3	1.0	1.3	1.7	1.5	1.7	1.7	3.0	1.9	1.7	1.4	1.0	1.2	3.0
3-Dec	1.1	1.3	1.0	1.9	0.8	1.1	0.7	0.9	0.8	0.5	0.3	0.5	0.5	0.8	0.8	0.5	0.5	0.7	1.1	1.1	0.5	0.6	0.4	0.7	1.9
4-Dec	1.0	0.3	0.5	0.4	0.4	0.4	0.5	0.4	0.4	0.3	0.5	1.2	1.2	1.4	1.4	0.9	1.0	1.2	1.6	1.9	0.9	1.3	1.1	1.4	1.9
5-Dec	0.8	0.6	1.6	2.8	3.0	3.4	2.8	2.8	2.4	2.1	2.3	2.3	2.6	1.6	1.0	0.4	0.5	0.9	1.0	1.0	0.7	0.5	0.4	0.7	3.4
6-Dec	0.3	0.4	0.3	0.9	0.3	0.5	0.3	0.7	1.2	1.0	1.7	1.0	2.0	1.7	1.7	1.0	1.3	2.1	1.9	0.9	0.9	1.5	1.8	1.6	2.1
7-Dec	0.9	0.9	1.4	1.5	1.3	1.1	0.5	1.7	1.6	1.6	1.5	0.9	0.6	0.7	1.1	0.6	0.5	0.7	1.2	1.0	1.3	1.0	0.7	1.0	1.7
8-Dec	1.5	1.3	0.8	0.7	0.4	0.2	0.3	0.2	0.4	0.5	1.0	1.3	1.1	1.2	1.3	1.6	1.5	1.5	1.5	1.6	0.9	0.8	1.4	1.2	1.6
9-Dec	0.8	0.9	0.9	1.2	1.1	0.6	1.0	1.3	1.1	1.4	1.6	1.7	0.9	0.6	0.5	0.3	0.4	0.2	0.3	0.3	0.4	0.9	0.9	0.6	1.7
10-Dec	0.2	0.4	0.3	0.3	0.6	0.9	0.8	0.8	0.5	0.4	0.5	0.5	0.7	0.5	0.5	0.3	0.2	0.2	0.3	0.6	0.6	0.5	0.6	0.4	0.9
11-Dec	0.5	0.8	1.1	1.2	1.1	1.3	1.2	1.6	2.3	2.1	1.8	2.0	1.8	1.6	1.6	1.4	1.4	2.0	2.0	1.9	1.9	2.0	1.8	1.6	2.3
12-Dec	1.9	1.9	2.0	2.1	2.1	2.0	1.9	2.0	2.1	2.1	2.3	2.2	2.9	2.7	2.3	2.3	2.2	2.4	2.5	2.4	2.3	2.2	2.2	2.0	2.9
13-Dec	1.8	1.8	1.7	2.0	2.0	2.2	2.0	2.1	1.7	1.7	1.8	1.9	1.8	1.4	0.8	0.5	1.1	0.7	0.5	0.5	0.7	0.6	0.4	0.2	2.2
14-Dec	0.4	0.3	0.5	0.3	0.9	1.0	1.0	1.1	1.3	1.0	1.4	1.2	1.1	1.0	1.0	0.7	1.0	0.8	1.0	1.2	1.4	1.5	1.4	1.4	1.5
15-Dec	1.6	1.5	1.3	1.6	2.0	2.3	2.2	2.1	1.6	1.3	1.3	1.2	1.3	0.8	2.2	1.0	1.2	0.9	1.5	1.3	1.6	2.2	1.9	2.5	2.5
16-Dec	1.7	1.0	0.4	0.4	1.5	2.2	2.1	1.9	1.0	1.4	1.4	0.7	0.7	0.9	1.1	0.8	1.3	0.8	0.9	1.0	1.2	0.9	0.7	0.4	2.2
17-Dec	0.4	1.0	1.2	0.9	1.5	1.0	1.1	0.7	0.5	0.5	0.7	0.7	0.8	1.0	0.6	0.6	0.7	1.6	1.4	1.4	1.2	1.3	1.1	1.0	1.6
18-Dec	0.9	0.7	0.5	0.4	0.3	0.2	0.2	0.6	0.8	0.8	0.4	0.7	1.2	0.9	1.1	0.9	1.2	1.0	0.7	1.0	1.5	1.6	1.6	1.5	1.6
19-Dec	0.9	1.4	1.2	1.9	1.9	1.6	1.6	1.7	1.6	1.6	1.7	1.3	1.8	1.2	1.0	1.3	1.3	1.8	1.6	1.5	1.8	2.0	1.8	1.8	2.0
20-Dec	1.7	2.1	1.7	1.6	1.3	1.7	1.8	1.7	2.0	1.2	1.9	2.0	1.7	1.5	1.6	1.4	1.9	2.1	1.8	1.9	2.3	2.3	2.0	1.9	2.3
21-Dec	2.3	2.3	2.1	2.2	2.3	1.7	1.6	1.6	1.5	1.1	0.8	0.6	0.6	0.5	0.3	0.2	0.3	0.3	0.4	0.5	0.5	0.3	0.4	0.5	2.3
22-Dec	0.5	0.6	0.6	0.8	1.1	1.4	1.4	1.4	1.4	1.2	1.4	1.4	1.3	1.4	1.7	1.9	1.5	1.4	1.6	1.3	1.4	1.3	1.3	1.4	1.9
23-Dec	1.7	1.3	1.2	1.3	1.2	1.0	0.8	0.9	0.8	0.9	1.1	0.9	1.2	1.2	1.1	1.1	0.8	1.0	1.1	1.3	0.7	0.9	0.8	0.9	1.7
24-Dec	1.2	0.9	0.5	0.7	0.9	0.7	1.1	0.8	0.8	0.7	0.8	0.9	1.2	1.1	0.8	0.5	0.3	0.2	0.2	0.2	0.2	0.7	1.0	1.6	1.6
25-Dec	1.3	0.8	0.8	0.7	0.7	0.8	0.8	0.7	0.9	1.1	0.8	0.4	0.6	0.4	0.2	0.3	0.2	0.4	1.1	1.1	1.4	0.9	0.9	1.4	1.4
26-Dec	1.2	1.1	0.6	0.2	0.1	0.1	0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.4	0.4	0.4	1.2	0.7	0.6	1.1	1.6	2.0	2.0
27-Dec	1.1	1.7	2.7	1.8	1.8	1.8	2.1	2.4	2.7	2.6	3.1	2.8	2.7	2.2	2.5	2.0	1.6	1.5	1.8	1.3	1.3	1.2	1.0	1.3	3.1
28-Dec	1.2	1.3	0.6	1.4	1.3	0.9	1.1	1.0	1.1	1.0	1.0	1.0	1.1	1.6	1.2	0.8	0.4	0.3	0.3	0.2	0.3	0.7	0.8	1.1	1.6
29-Dec	0.8	1.1	1.5	1.5	1.3	1.1	0.9	0.9	1.3	1.3	1.3	1.5	1.2	1.0	1.1	1.2	1.2	1.4	1.5	1.7	1.9	1.8	1.4	1.3	1.9
30-Dec	1.6	2.0	2.2	1.8	2.0	2.5	1.8	2.5	2.1	0.8	1.2	1.2	1.6	1.6	2.1	2.2	1.3	1.3	1.3	1.8	2.0	1.7	1.1	1.5	2.5
31-Dec	1.8	1.8	1.3	1.3	1.7	2.0	1.6	1.4	2.9	2.1	1.3	0.9	0.9	1.5	1.9	1.3	1.1	1.2	1.0	1.5	1.3	2.5	2.6	2.2	2.9
	2.3	2.3	2.7	2.8	3.0	3.4	2.8	2.8	2.9	2.6	3.1	2.8	2.9	2.7	2.5	2.3	2.2	2.4	3.0	2.4	2.3	2.5	2.6	2.5	
	Diurnal Maximum																								



Maximum Value: 5.8 km/h on Dec 31 23:00      Maximum Daily Average: 2.7 km/h on Dec 12																							Hours in Service:	744			
Minimum Value: -2.7 km/h on Dec 30 05:00      Minimum Daily Average: 0.1 km/h on Dec 23																							Hours of Data:	714			
Maximum Diurnal Average: 1.0 km/h at hour 22      Minimum Diurnal Average: 0.6 km/h at hour 6																							Hours of Missing Data:	30			
Monthly Average: 0.86 km/h      Percentiles: P <sub>1</sub> = -0.5 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.2 Median = 0.6 Q <sub>3</sub> = 1.3 P <sub>90</sub> = 2.1 P <sub>99</sub> = 4.1																							Hours of Calibration:	0			
																							Percent Operational Time:	96.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0.6	0.5	0.5	0.9	0.9	0.8	0.4	0.6	0.6	0.3	0.3	0.8	0.5	0.5	0.3	0.2	0.2	1.1	0.9	0.9	0.8	0.7	1.1	0.7	0.6	1.1	
2-Dec	1.0	0.9	0.5	0.2	-0.1	0.8	1.0	0.6	0.6	0.3	0.4	1.0	1.1	1.0	0.7	1.9	1.5	1.1	0.2	0.6	0.6	0.2	0.5	0.3	0.7	1.9	
3-Dec	0.2	0.1	1.0	1.0	1.1	0.5	0.4	0.4	1.0	0.9	0.3	0.2	0.1	0.2	0.1	0.1	0.2	0.3	0.2	0.2	0.2	0.4	0.6	0.4	0.4	1.1	
4-Dec	0.7	0.4	0.6	0.5	0.5	0.2	0.1	0.3	0.1	-0.1	0.1	0.8	1.1	1.1	1.5	1.8	0.9	0.3	1.2	0.9	1.1	0.9	0.6	0.3	0.7	1.8	
5-Dec	0.2	0.0	0.3	-0.4	0.3	-0.5	-0.6	0.0	0.4	0.2	0.5	0.7	1.1	0.0	0.5	0.8	0.5	0.7	1.3	0.8	1.1	0.5	0.5	0.6	0.4	1.3	
6-Dec	0.8	0.5	0.3	0.7	0.4	0.3	0.2	0.2	0.4	0.0	0.3	0.8	0.7	1.4	1.2	0.8	1.1	0.5	0.6	0.4	0.2	1.5	1.1	0.8	0.6	1.5	
7-Dec	0.6	0.3	0.5	1.8	1.2	1.2	0.4	1.6	1.4	1.9	1.8	1.0	0.2	1.0	0.7	0.2	0.4	0.7	0.1	0.3	0.3	1.2	0.3	-0.2	0.8	1.9	
8-Dec	-0.3	0.2	0.0	0.1	0.1	0.2	0.0	0.1	0.1	0.2	1.4	1.0	0.4	0.8	1.2	0.9	1.1	0.9	2.0	1.1	0.3	1.7	0.8	0.4	0.6	2.0	
9-Dec	0.0	0.2	0.4	1.5	1.1	0.8	1.5	0.9	0.6	2.1	1.9	1.7	1.0	0.4	0.3	0.2	0.3	0.3	0.0	0.0	0.2	0.7	0.3	0.0	0.7	2.1	
10-Dec	0.1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0.1
11-Dec	AF	AF	AF	AF	AF	AF	AF	1.1	2.7	2.9	1.9	2.1	2.5	1.9	0.7	0.0	0.7	-0.8	2.5	2.1	1.5	1.6	2.5	2.2	--	2.9	
12-Dec	2.3	2.5	2.4	2.4	3.0	3.5	2.2	2.8	3.4	3.3	3.1	4.3	4.6	3.7	2.4	1.8	1.3	2.5	4.3	2.5	2.7	2.1	1.7	1.2	2.7	4.6	
13-Dec	1.1	0.7	0.7	1.4	1.3	1.2	1.3	1.1	0.9	1.4	1.6	0.8	1.0	0.4	0.5	-0.1	0.0	-0.2	0.1	0.2	0.2	0.1	0.3	0.2	0.7	1.6	
14-Dec	0.2	0.2	0.4	-0.1	0.2	-0.6	-0.2	0.5	0.0	0.0	0.0	-0.7	0.6	0.9	0.7	0.5	0.6	0.7	1.1	1.4	1.7	1.6	1.4	0.1	0.5	1.7	
15-Dec	2.0	1.9	0.5	0.5	0.6	0.9	1.2	1.3	3.4	1.4	1.5	1.0	1.5	1.1	4.7	5.2	3.8	4.2	3.6	2.5	0.2	0.9	0.0	0.1	1.8	5.2	
16-Dec	0.3	0.3	0.2	0.0	-0.1	-0.4	0.0	1.7	0.4	1.1	0.8	1.4	0.8	0.9	0.4	0.8	0.9	0.4	-0.2	0.4	-0.4	-0.5	-0.3	0.1	0.4	1.7	
17-Dec	0.0	-0.2	0.2	0.7	1.2	-0.1	0.0	0.0	-0.1	-0.2	-0.1	0.0	0.1	0.1	-0.1	0.2	0.4	0.3	0.4	0.4	0.2	0.3	0.0	0.2	0.2	1.2	
18-Dec	0.0	0.1	0.2	-0.2	0.1	0.0	0.0	0.2	0.2	0.2	0.1	0.2	0.9	0.4	0.8	1.3	1.4	0.6	0.6	2.1	1.2	-0.4	-0.1	1.5	0.5	2.1	
19-Dec	0.6	0.4	0.5	1.0	2.5	1.4	1.6	2.1	2.1	1.3	0.9	1.1	0.4	1.4	0.2	0.4	1.7	1.5	1.6	1.4	2.2	1.6	1.9	2.0	1.3	2.5	
20-Dec	1.5	1.3	2.0	2.1	1.2	2.8	3.6	2.8	2.2	1.5	2.3	3.5	1.2	1.6	2.6	1.9	1.0	1.5	0.9	0.5	3.6	3.6	1.7	2.2	2.0	3.6	
21-Dec	3.4	3.0	3.5	3.0	3.1	1.6	1.6	1.4	0.9	1.0	0.9	0.6	0.3	0.3	0.5	0.8	0.8	0.8	0.6	0.1	0.1	0.2	0.4	0.1	1.2	3.5	
22-Dec	0.0	0.2	-0.1	0.2	0.5	0.1	0.2	0.1	0.3	-0.1	0.1	0.2	0.0	0.4	0.1	0.0	0.3	0.3	0.1	0.4	0.2	0.3	0.0	0.3	0.2	0.5	
23-Dec	0.3	0.2	0.1	0.0	0.2	0.1	0.1	0.0	0.1	0.0	-0.1	-0.2	-0.1	0.0	0.2	0.0	0.0	0.1	0.1	0.3	0.3	0.3	0.1	0.1	0.1	0.3	
24-Dec	0.2	0.2	0.2	0.0	0.1	0.0	0.3	0.1	0.0	-0.1	0.0	-0.2	0.3	0.3	0.0	0.4	0.0	0.2	0.3	0.2	0.3	0.3	0.1	0.0	0.1	0.4	
25-Dec	0.4	0.4	0.6	0.8	0.8	0.5	0.5	0.8	0.6	0.6	0.6	0.2	0.1	0.1	0.4	0.2	0.2	0.1	0.1	0.1	0.0	0.3	0.3	0.2	0.4	0.8	
26-Dec	0.4	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.5	0.3	0.8	0.4	0.4	0.4	0.3	0.6	1.0	0.8	0.7	0.8	0.5	1.8	0.5	1.8	
27-Dec	0.5	1.0	1.7	1.7	2.1	1.2	1.5	1.7	1.5	1.8	2.4	3.6	4.8	3.9	1.9	2.1	2.3	1.5	1.5	1.8	2.2	1.3	0.6	1.3	1.9	4.8	
28-Dec	1.4	0.9	0.0	-0.3	0.3	-0.1	-0.1	-0.2	0.0	0.3	0.2	0.1	0.0	0.6	0.3	-0.1	0.0	0.0	0.3	0.1	0.8	0.5	0.8	0.7	0.3	1.4	
29-Dec	0.5	-0.4	0.7	1.2	0.5	0.5	0.9	1.1	1.0	1.1	0.9	0.7	1.3	1.3	1.4	1.2	1.9	1.8	1.5	2.3	1.2	0.8	2.6	1.5	1.2	2.6	
30-Dec	1.8	2.8	3.2	1.3	-2.7	-1.1	0.6	-0.7	0.1	0.6	0.5	0.7	1.0	0.7	0.7	0.6	0.7	1.2	1.1	1.8	2.2	1.6	0.7	1.5	0.9	3.2	
31-Dec	2.3	1.3	1.6	1.9	3.1	2.9	1.6	1.4	1.9	1.6	1.5	0.3	0.1	0.6	1.1	1.3	1.2	0.7	1.5	2.6	3.9	5.2	5.8	3.5	2.0	5.8	
																							Diurnal Average		0.8		
																							Diurnal Maximum		3.5		
AF - Analyzer Failure																											



Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 3.3 km/h on Dec 5 05:00	Hours of Data: 714
Minimum Value: 0.1 km/h on Dec 28 18:00	Hours of Missing Data: 30
Percentiles: P <sub>1</sub> = 0.2 P <sub>10</sub> = 0.5 Q <sub>1</sub> = 0.7 Median = 1.1 Q <sub>3</sub> = 1.6 P <sub>90</sub> = 2.0 P <sub>99</sub> = 2.8	Hours of Calibration: 0
	Percent Operational Time: 96.0

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	1.1	1.0	0.7	0.9	0.8	0.8	0.7	0.7	0.7	0.7	0.8	1.1	0.7	0.8	0.9	1.0	1.2	0.9	1.0	0.8	0.7	1.0	0.7	0.9	1.2
2-Dec	0.7	0.5	0.7	0.7	0.9	0.7	0.9	1.4	1.0	1.2	1.1	1.5	1.2	1.2	1.6	1.4	1.3	1.8	2.2	1.6	1.4	1.2	1.2	1.3	2.2
3-Dec	1.5	1.1	1.2	2.2	1.1	1.1	0.7	0.9	0.9	0.8	0.5	0.7	0.6	0.4	0.6	0.6	0.7	1.0	1.4	1.4	0.6	0.9	0.6	0.5	2.2
4-Dec	0.5	0.4	0.6	0.4	0.5	0.4	0.4	0.4	0.5	0.4	0.5	0.9	1.1	1.2	1.0	0.8	1.0	1.4	1.8	1.7	0.8	1.7	1.2	1.1	1.8
5-Dec	1.0	0.8	1.9	2.7	3.3	2.6	2.1	2.4	2.1	1.9	2.0	1.9	2.1	1.3	0.9	0.5	0.5	0.9	1.2	1.1	1.2	0.7	0.4	0.5	3.3
6-Dec	0.5	0.5	0.5	0.8	0.4	0.7	0.4	0.8	1.5	0.9	2.2	1.7	2.0	1.5	1.8	1.4	1.5	1.9	1.8	1.0	0.8	1.0	1.4	1.2	2.2
7-Dec	0.9	0.8	1.3	1.7	1.2	1.3	0.9	1.8	2.2	1.4	1.1	1.4	0.6	1.0	1.4	0.7	0.6	0.7	0.8	0.5	0.9	1.1	0.5	1.0	2.2
8-Dec	0.8	0.6	0.4	0.3	0.4	0.4	0.4	0.4	0.5	0.7	1.1	1.5	0.8	1.2	1.4	1.7	1.6	1.4	1.7	1.4	0.9	1.1	1.4	1.1	1.7
9-Dec	1.0	1.1	0.9	1.1	1.0	0.8	1.1	1.5	1.3	1.2	1.4	1.4	1.1	0.9	0.6	0.4	0.4	0.3	0.3	0.2	0.4	0.7	0.7	0.6	1.5
10-Dec	0.4	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.4
11-Dec	AF	AF	AF	AF	AF	AF	AF	2.1	2.1	2.6	1.4	1.9	2.1	1.8	1.8	1.0	1.3	2.4	2.2	1.6	1.8	1.7	1.6	1.5	2.6
12-Dec	1.7	1.6	1.6	1.8	1.7	2.0	1.8	2.0	2.4	2.4	2.6	2.8	3.0	2.8	2.2	2.3	2.4	2.4	2.6	2.6	2.4	2.4	2.1	1.9	3.0
13-Dec	2.0	1.7	1.7	1.8	1.8	2.0	1.9	2.0	1.6	1.4	1.7	1.7	1.7	1.6	0.9	0.5	1.3	0.9	0.6	0.8	0.7	0.6	0.5	0.3	2.0
14-Dec	0.5	0.3	0.6	0.4	0.8	0.8	0.9	0.9	0.9	0.8	1.1	1.2	1.2	1.1	1.1	0.7	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.2
15-Dec	1.1	1.0	1.3	1.0	1.1	1.2	1.3	1.4	1.4	1.3	1.4	0.8	0.9	0.7	2.6	0.9	1.3	0.7	1.9	0.9	1.5	3.0	1.7	2.6	3.0
16-Dec	1.8	0.9	0.4	0.6	1.7	2.1	2.1	2.1	1.0	1.4	1.6	0.9	1.0	1.0	1.1	0.7	1.1	0.9	0.9	1.3	0.9	0.8	0.8	0.5	2.1
17-Dec	0.6	1.0	1.0	1.3	1.5	1.1	1.3	0.6	0.5	0.5	0.6	0.6	0.8	0.9	0.5	0.8	0.7	1.3	1.5	1.3	1.1	1.6	1.3	1.2	1.6
18-Dec	0.8	0.5	0.4	0.4	0.3	0.2	0.3	0.6	0.8	0.6	0.5	0.8	1.3	1.0	0.9	0.6	1.0	1.3	1.0	1.0	1.5	1.7	1.8	1.6	1.8
19-Dec	1.1	1.8	1.5	1.9	1.5	1.4	1.6	1.7	1.8	1.7	1.7	1.4	1.5	1.6	1.2	1.5	1.5	2.3	2.1	2.1	1.9	1.8	1.8	2.0	2.3
20-Dec	1.8	1.9	1.8	1.6	1.2	1.8	2.0	1.9	2.1	1.6	1.6	1.5	1.5	1.2	1.4	1.7	2.3	2.5	2.2	2.2	2.5	2.6	2.1	2.2	2.6
21-Dec	2.6	2.5	2.4	2.2	2.2	1.6	1.3	1.1	1.2	0.8	0.7	0.5	0.5	0.4	0.3	0.3	0.6	0.6	0.6	0.6	0.5	0.4	0.5	0.4	2.6
22-Dec	0.4	0.3	0.3	0.5	1.2	1.4	1.6	1.4	1.2	1.3	1.4	1.3	1.2	1.4	1.3	1.4	1.5	1.2	1.4	1.3	1.4	1.1	1.2	1.3	1.6
23-Dec	1.6	1.2	0.9	1.1	1.2	1.1	0.8	0.9	0.9	0.9	1.1	0.9	1.0	1.1	1.2	1.1	0.9	0.9	1.1	1.5	0.7	0.8	0.9	0.9	1.6
24-Dec	0.9	0.9	0.5	0.8	0.9	0.6	1.1	0.7	1.0	0.7	0.8	1.0	1.2	1.1	0.6	0.6	0.2	0.2	0.3	0.2	0.4	0.5	0.8	1.1	1.2
25-Dec	0.8	0.5	0.8	0.6	0.7	0.6	0.5	0.7	0.8	0.8	0.7	0.5	0.7	0.6	0.5	0.3	0.3	0.3	0.7	1.0	1.1	0.8	1.3	1.6	1.6
26-Dec	1.2	1.2	0.7	0.4	0.2	0.2	0.3	0.4	0.3	0.3	0.5	0.4	0.5	0.4	0.4	0.3	0.4	0.7	1.5	1.3	1.0	1.6	1.9	2.4	2.4
27-Dec	1.6	2.6	2.3	1.9	2.5	1.9	2.0	2.1	2.8	2.8	3.1	2.9	2.9	2.6	2.4	1.8	1.3	1.0	1.2	1.4	1.4	1.0	0.6	0.9	3.1
28-Dec	1.1	1.6	0.9	1.9	1.4	0.9	0.9	0.8	1.0	0.7	0.7	0.9	0.9	1.4	0.9	0.4	0.2	0.1	0.3	0.3	0.7	1.0	0.9	0.7	1.9
29-Dec	1.0	0.7	1.4	1.2	1.1	0.8	0.9	0.8	1.2	1.1	1.1	1.0	1.1	0.9	0.9	1.0	0.9	1.1	1.5	1.8	1.4	1.5	1.4	1.7	1.8
30-Dec	1.7	1.5	1.4	1.1	1.5	1.3	0.8	1.2	1.4	0.8	0.6	1.3	1.3	1.7	2.4	2.6	1.1	1.0	1.4	1.8	1.5	1.4	1.5	1.5	2.6
31-Dec	2.0	1.7	1.4	1.7	1.9	2.2	1.8	2.0	2.0	1.4	0.8	1.1	0.9	1.2	1.6	1.1	1.3	1.4	0.7	1.4	0.7	1.7	2.2	1.9	2.2
	2.6	2.6	2.4	2.7	3.3	2.6	2.1	2.4	2.8	2.8	3.1	2.9	3.0	2.8	2.6	2.6	2.4	2.5	2.6	2.6	2.5	3.0	2.2	2.6	
	Diurnal Maximum																								

AF - Analyzer Failure





## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

**CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT**

**AMS 4  
BUFFALO VIEWPOINT  
DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	674	33	70	95.03	12	0	2	0
H2S (ppb) Average	705	35	39	99.46	3	0	1	0
THC (ppm) Average	706	34	38	99.46	4	-	2.8	-
Temperature (C) Average	744	0	0	100.00	6	-	-1.6	-
Relative Humidity (%) Average	744	0	0	100.00	96	-	94	-
Wind Speed 10 m (km/h) Average	744	0	0	100.00	25	-	14	-
Wind Direction 10 m (deg) Average	744	0	0	100.00	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	674	0.4	1	-	0	0	0	0	0	1	12
H2S (ppb) Average	705	0.3	0	-	0	0	0	0	0	1	3
THC (ppm) Average	706	2.39	0.2	-	2.2	2.2	2.3	2.3	2.4	2.6	4
Temperature 2 m (C) Average	744	-10.77	6.3	-	-26.1	-19.4	-16	-10.7	-5.4	-3.7	6
Relative Humidity (%) Average	744	82.8	8	-	54	73	80	83	88	93	96
Wind Speed 10 m (km/h) Average	744	8.5	4	-	0	4	6	8	11	14	25
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2	19 Dec 2015 09:00	20 Dec 2015 21:00	37	Unstable Operation - baseline drift
H2S, THC	19 Dec 2015 13:00	19 Dec 2015 16:00	4	Maintenance - calibrated daily zero and span system

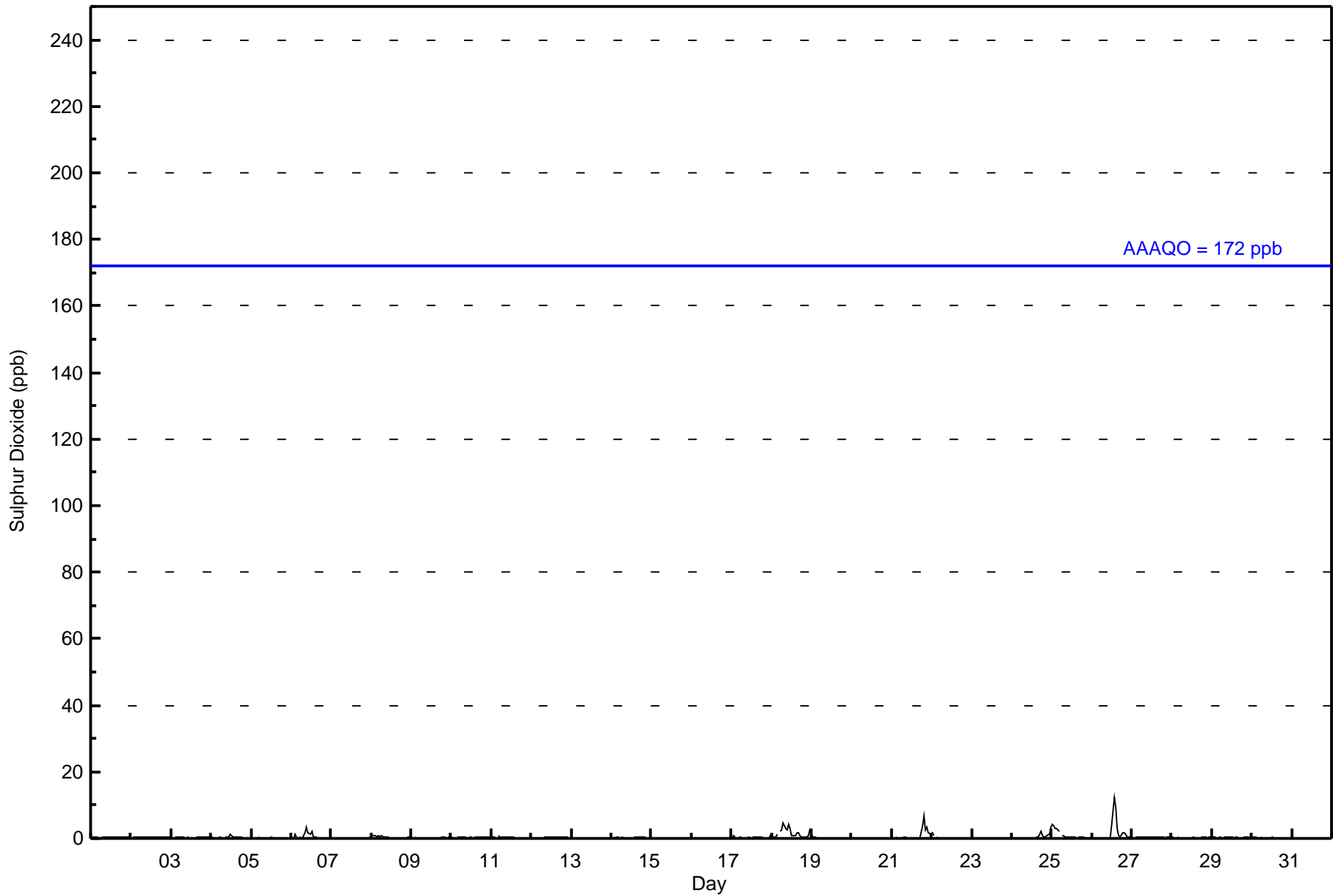


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 12 ppb on Dec 26 14:00	Maximum Daily Average: 1.6 ppb on Dec 18		Hours of Data:	674
Minimum Value: 0 ppb on Dec 7 02:00	Minimum Daily Average: 0.0 ppb on Dec 23		Hours of Missing Data:	70
Maximum Diurnal Average: 0.7 ppb at hour 14	Minimum Diurnal Average: 0.3 ppb at hour 17		Hours of Calibration:	33
Monthly Average: 0.4 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 4		Percent Operational Time:	95.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
2-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	1	0	0.3	1	
4-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
6-Dec	0	0	1	1	Z	0	0	1	2	4	2	1	2	0	0	0	0	0	0	0	0	0	0	0.7	4	
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
8-Dec	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
11-Dec	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
14-Dec	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
17-Dec	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1	
18-Dec	0	0	1	1	Z	2	2	5	3	3	4	3	1	1	1	2	2	1	0	0	1	0	1	1.6	5	
19-Dec	0	0	0	0	0	Z	0	0	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	0	
20-Dec	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	0	
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	7	3	3	2	0.9	7	
22-Dec	2	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2	
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	1	1	3	0.5	3	
25-Dec	4	4	3	3	2	Z	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1.0	4	
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	4	12	9	3	1	1	2	2	1	0	0	0	1.5	12	
27-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
29-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	

0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.4	0.3	0.4	0.4	0.4	0.4	0.5	0.7	0.6	0.4	0.3	0.3	0.4	0.5	0.3	0.3	0.4	Diurnal Average	
4	4	3	3	2	2	2	5	3	4	4	4	3	4	12	9	3	2	2	4	7	3	3	2	3	Diurnal Maximum

Z - zerospan                      C - Calibration                      UO - Unstable Operation  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Buffalo Viewpoint - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	673	99.85	99.85
11 - 20	1	0.15	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 674

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Buffalo Viewpoint - December 2015**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	94	40	14	7	16	30	125	125	35	23	22	51	34	13	18	26	673
11 - 20	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	94	41	14	7	16	30	125	125	35	23	22	51	34	13	18	26	674

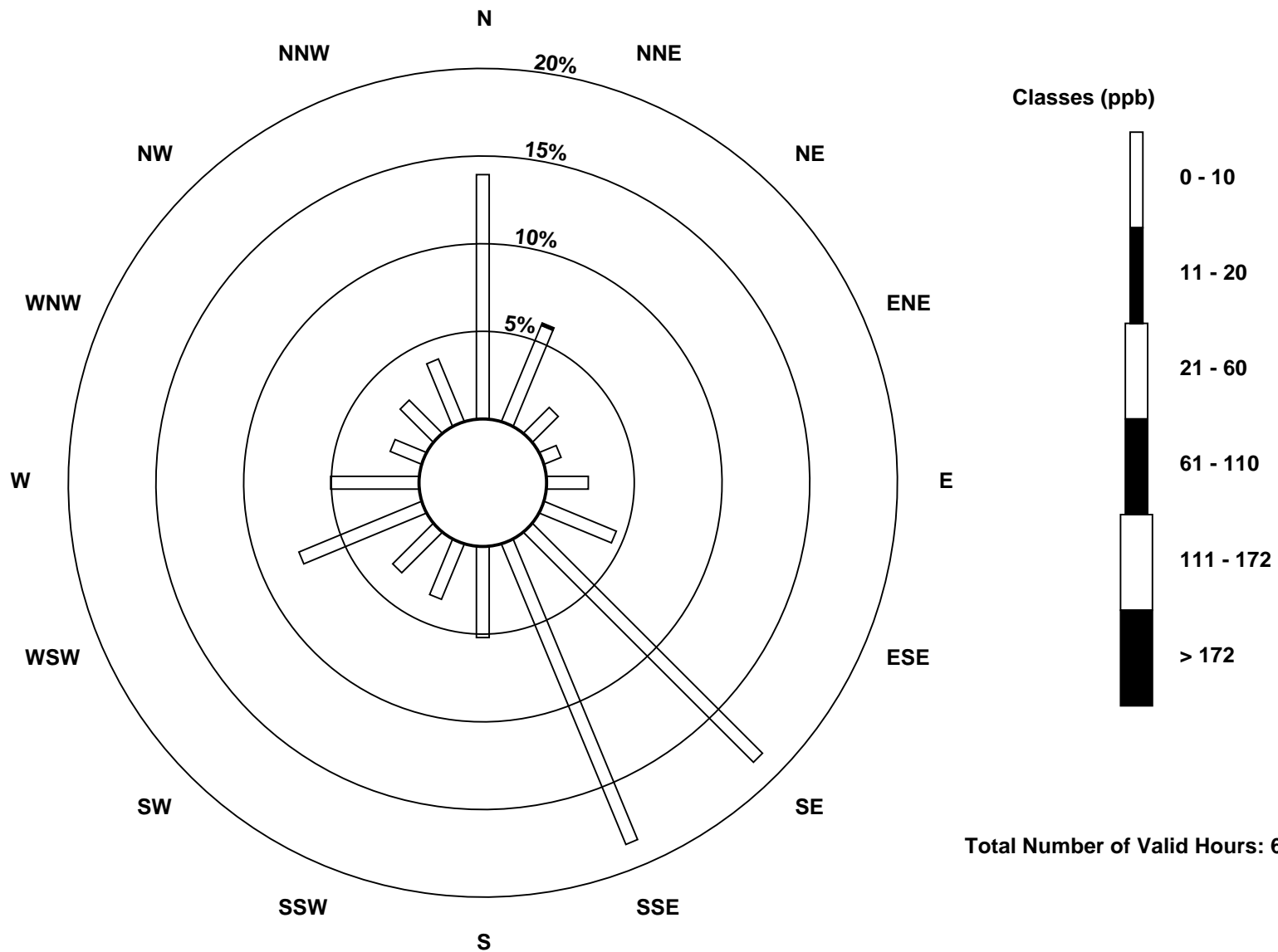
Total Number of Valid Hours: 674

Total Number of Hours: 744

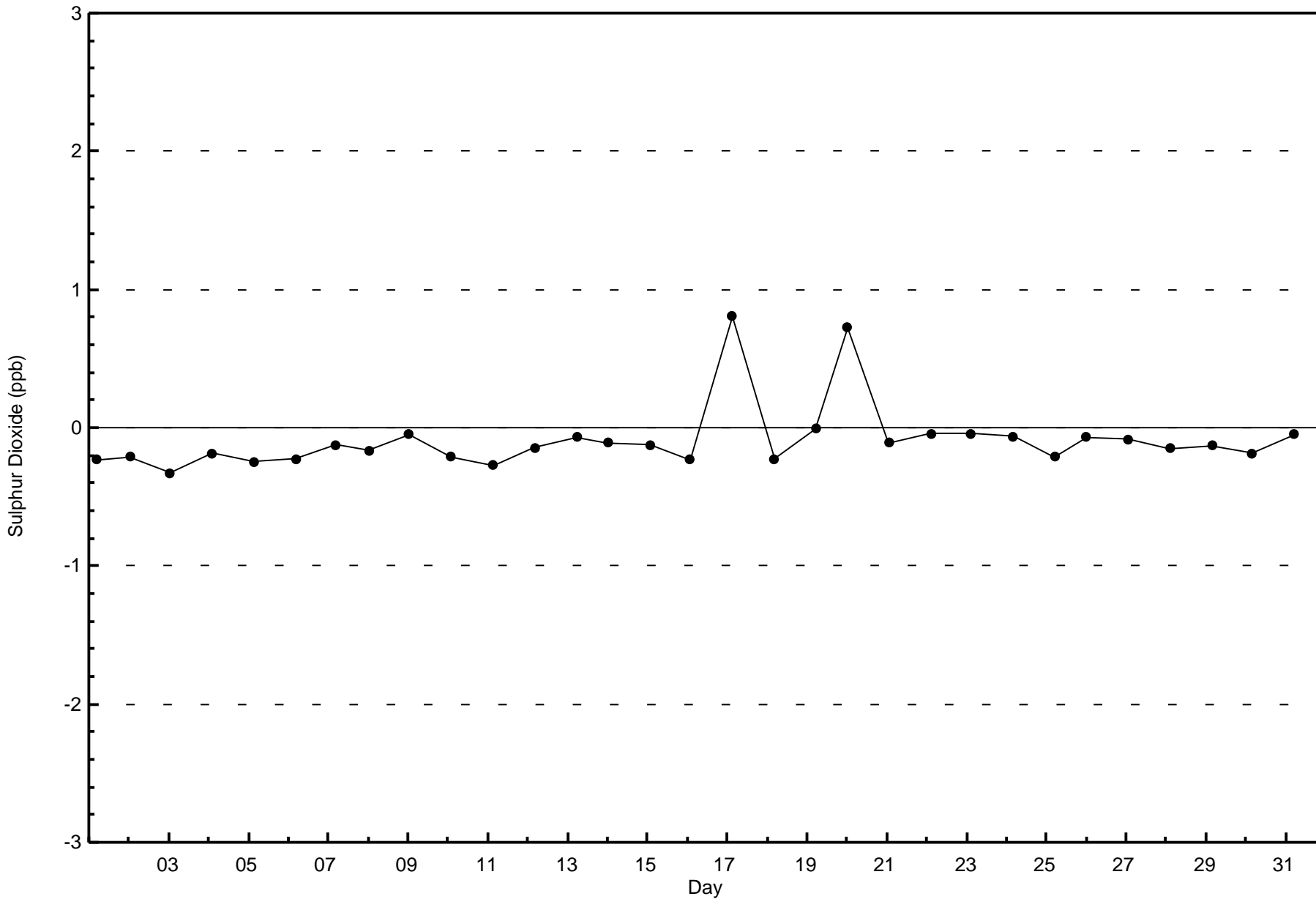


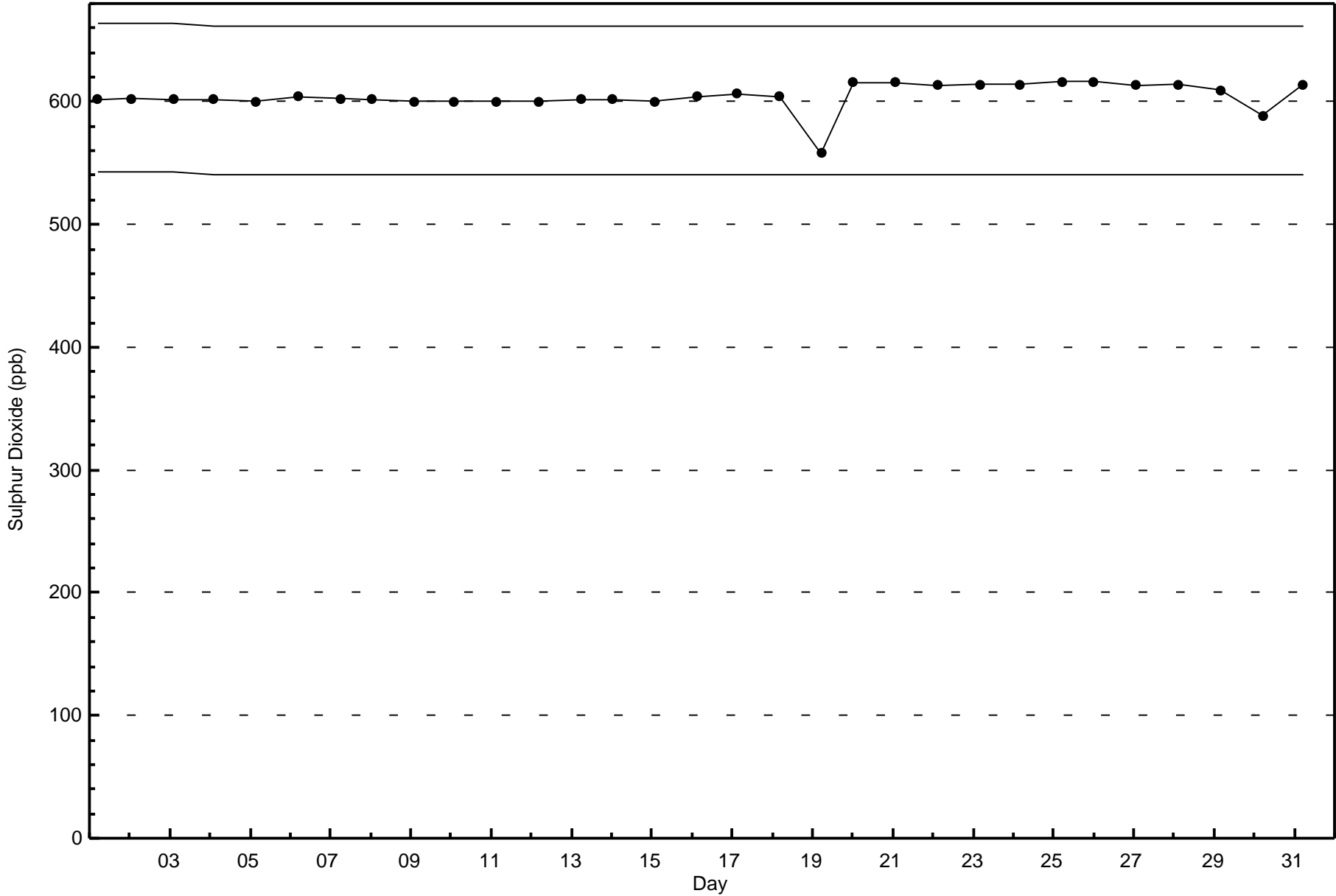
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Buffalo Viewpoint (AMS 4)



Total Number of Valid Hours: 674





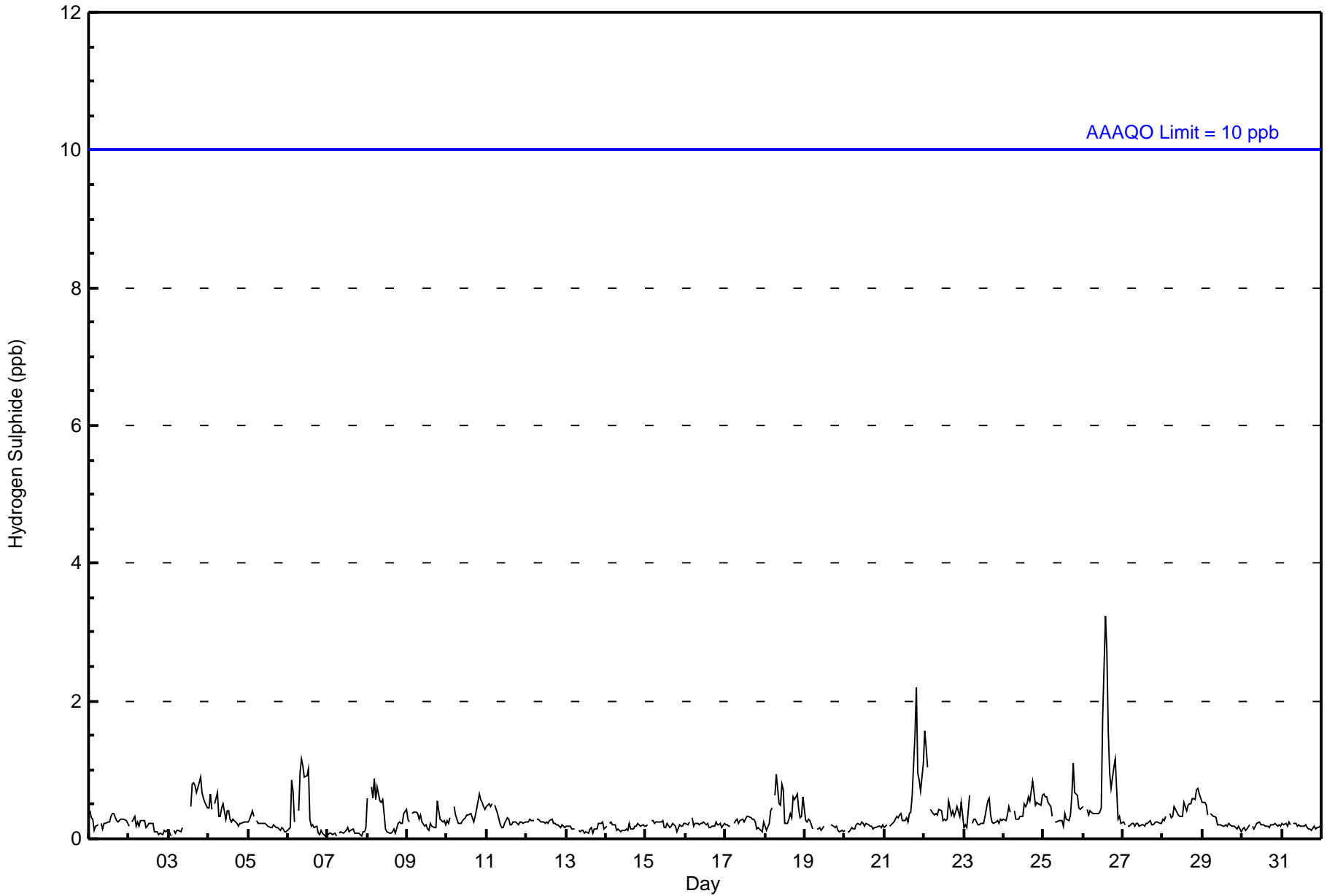


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 3 ppb on Dec 26 14:00	Maximum Daily Average: 0.8 ppb on Dec 26		Hours of Data:	705
Minimum Value: 0 ppb on Dec 7 21:00	Minimum Daily Average: 0.1 ppb on Dec 7		Hours of Missing Data:	39
Maximum Diurnal Average: 0.4 ppb at hour 20	Minimum Diurnal Average: 0.3 ppb at hour 12		Hours of Calibration:	35
Monthly Average: 0.3 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 1		Percent Operational Time:	99.5

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Dec	0	0	Z	0	0	0	0	0	0	C	C	C	C	0	1	1	1	1	1	1	1	1	1	1	0	0.4	1
4-Dec	0	1	0	Z	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
6-Dec	0	0	1	1	0	Z	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
8-Dec	1	Z	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.3	1
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0.4	1
11-Dec	0	1	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	0	Z	1	1	1	0	1	1	0	0	0	0	0	0	1	1	1	0	0	0	1	0.5	1
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	M	M	M	M	0	0	0	0	0	0	0	0	0	0.2	0
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1	1	1	1	0.5	2
22-Dec	2	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0.5	2
23-Dec	0	0	0	1	Z	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.3	1
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	1	1	0	1	0.5	1
25-Dec	1	1	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0.4	1
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	2	3	3	2	1	1	1	1	1	1	0	0	0	0.8	3
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	0.4	1
29-Dec	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
30-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0

0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	Diurnal Average
2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	3	2	1	1	2	2	1	1	1	1	1	Diurnal Maximum

Z - zerospan      C - Calibration      M - Maintenance  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb      24-hr 3 ppb





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Buffalo Viewpoint - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	703	99.72	99.72
3 - 4	2	0.28	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Buffalo Viewpoint - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	95	40	15	7	15	32	135	144	34	22	22	51	35	12	18	26	703
3 - 4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	95	42	15	7	15	32	135	144	34	22	22	51	35	12	18	26	705

Total Number of Valid Hours: 705

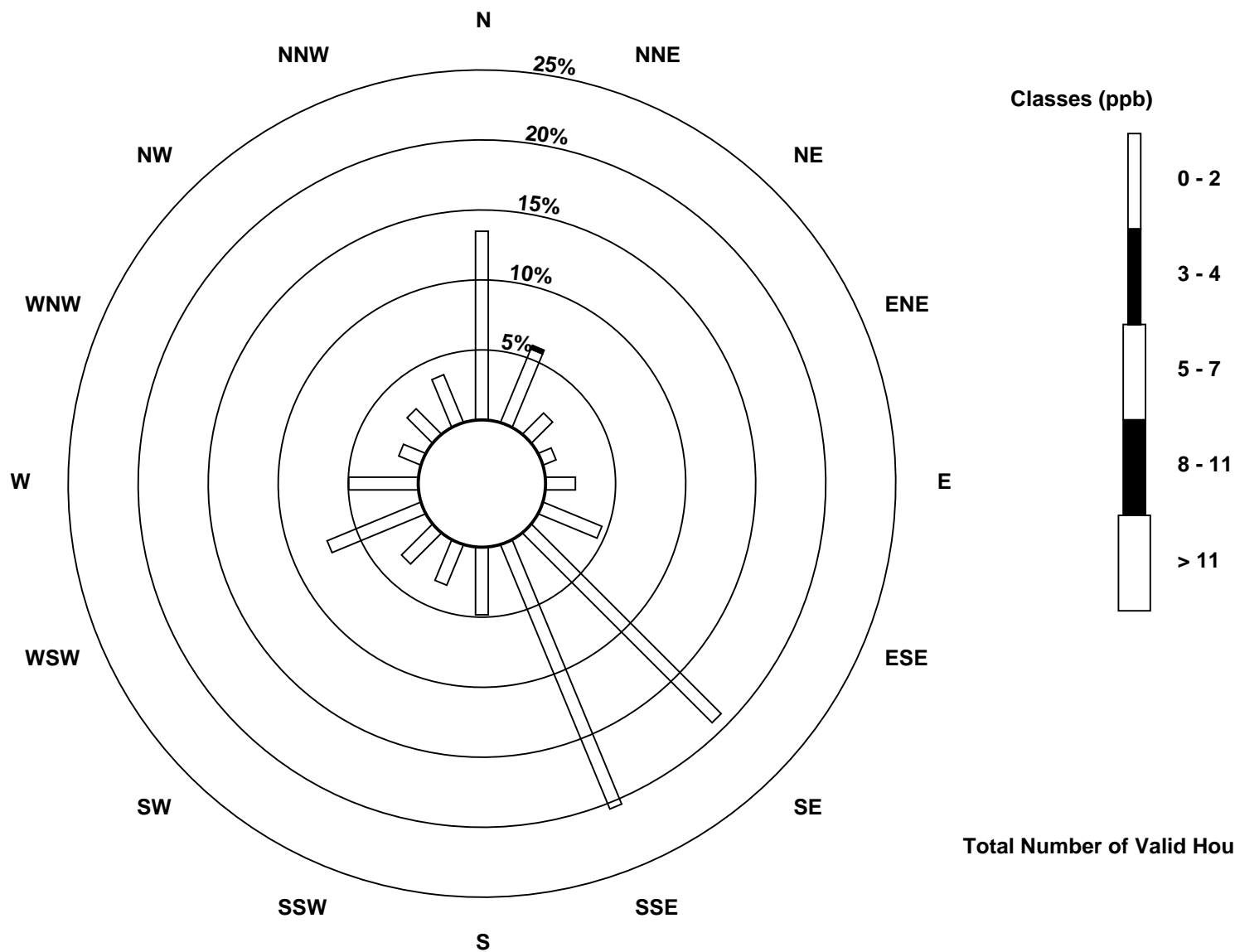
Total Number of Hours: 744



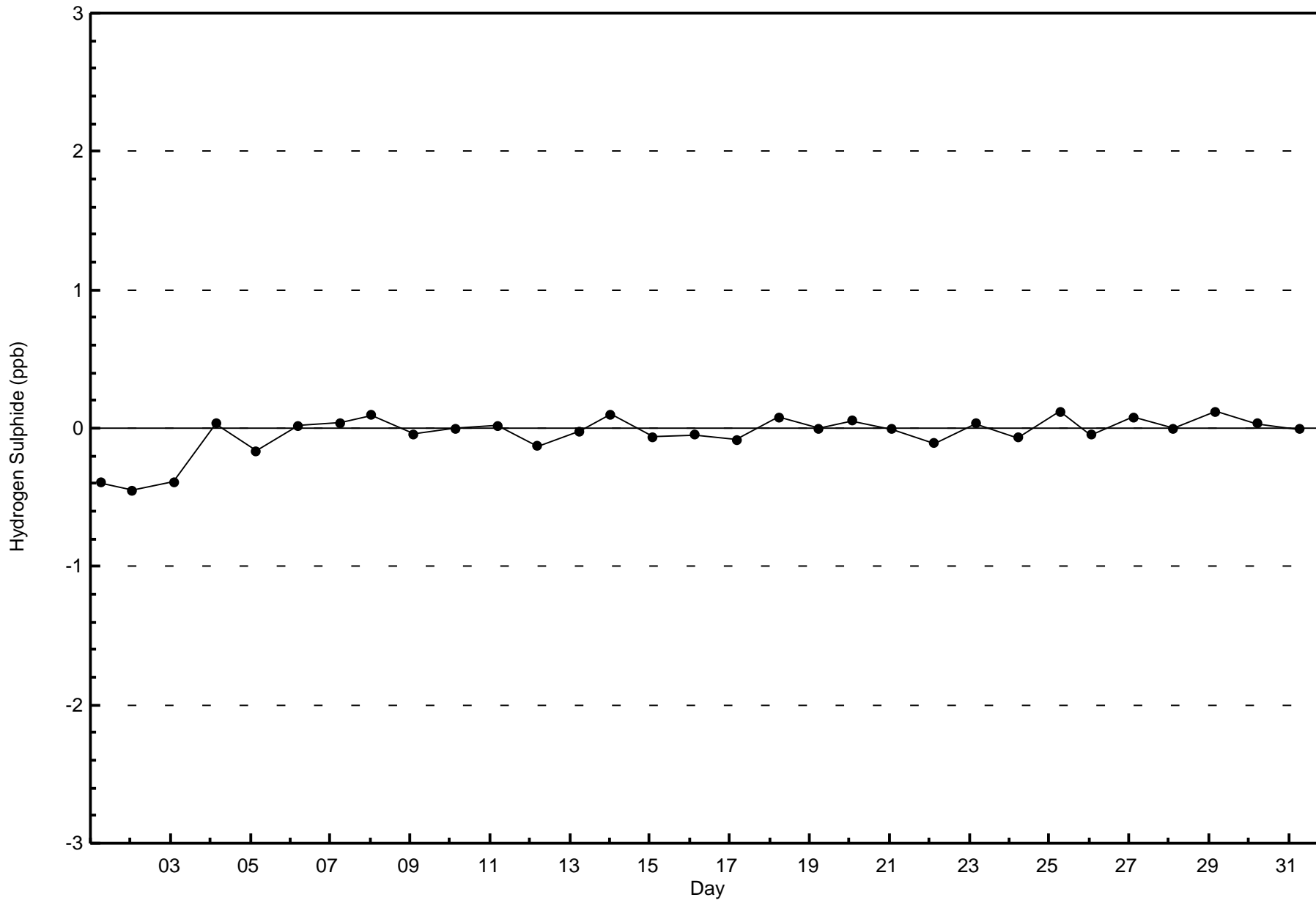


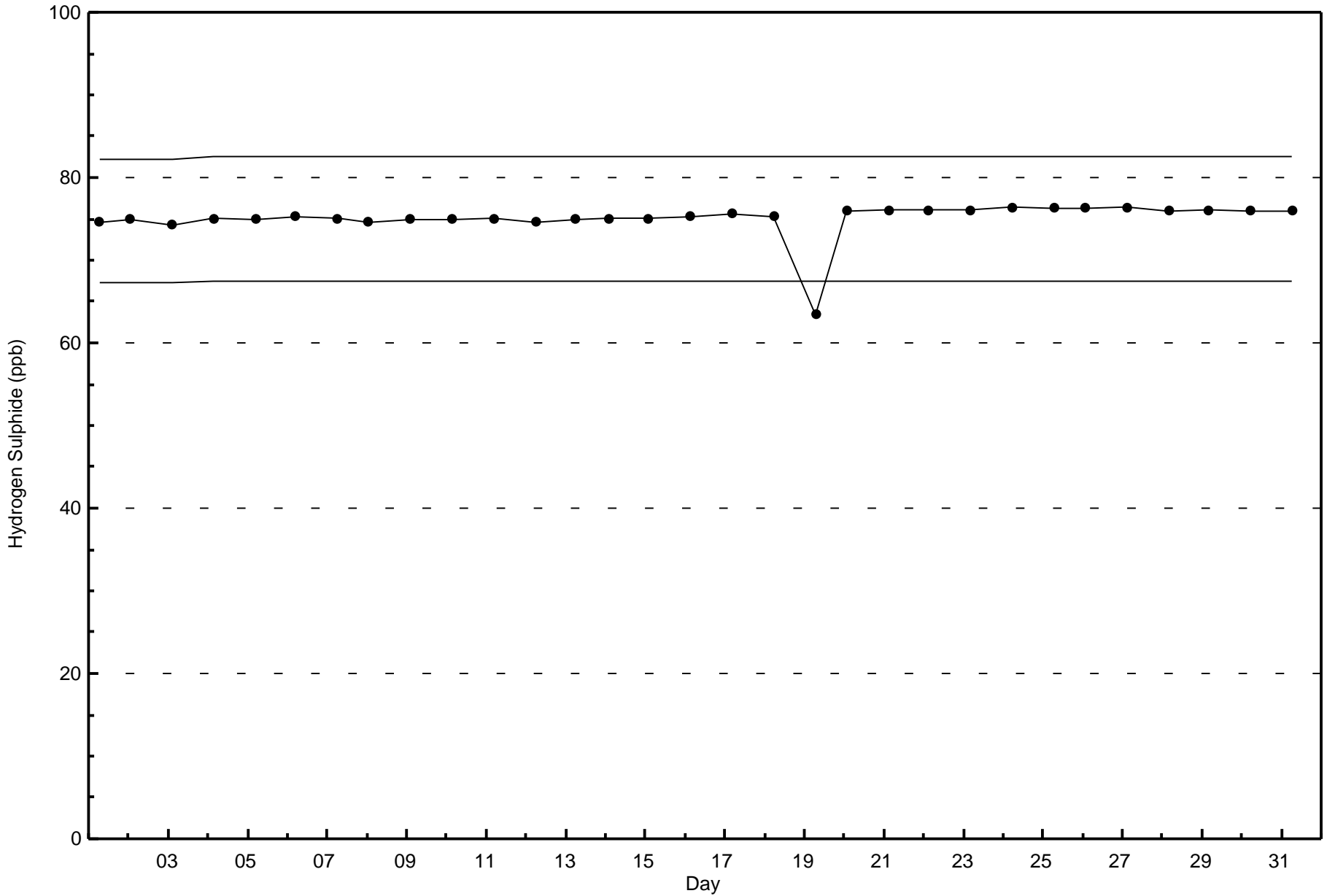
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Buffalo Viewpoint (AMS 4)



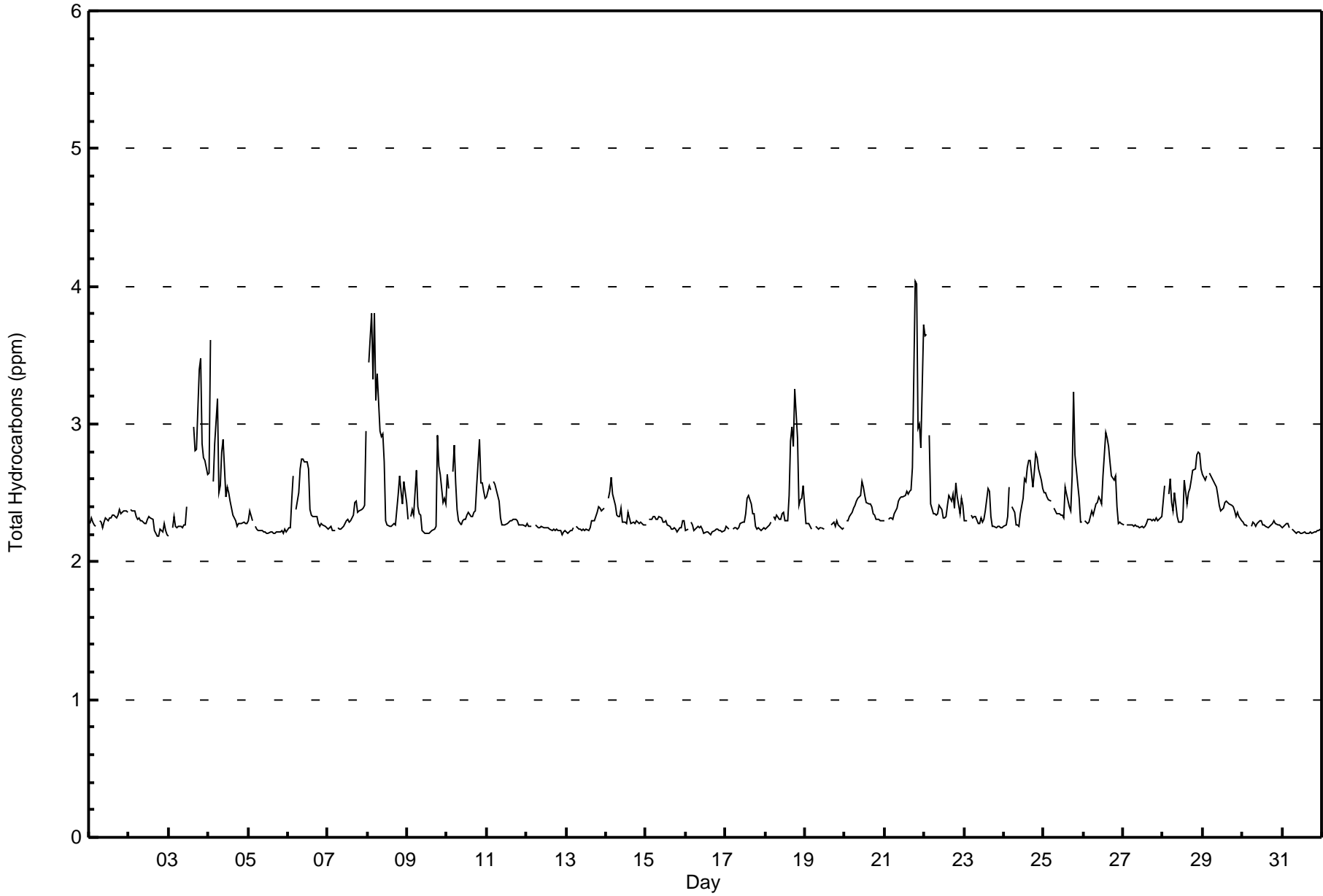
Total Number of Valid Hours: 705







Maximum Value: 4.0 ppm on Dec 21 19:00		Maximum Daily Average: 2.8 ppm on Dec 8		Hours in Service:	744																					
Minimum Value: 2.2 ppm on Dec 2 18:00		Minimum Daily Average: 2.2 ppm on Dec 31		Hours of Data:	706																					
Maximum Diurnal Average: 2.5 ppm at hour 19		Minimum Diurnal Average: 2.3 ppm at hour 12		Hours of Missing Data:	38																					
Monthly Average: 2.39 ppm		Percentiles: P <sub>1</sub> = 2.2 P <sub>10</sub> = 2.2 Q <sub>1</sub> = 2.3 Median = 2.3 Q <sub>3</sub> = 2.4 P <sub>90</sub> = 2.6 P <sub>99</sub> = 3.6		Hours of Calibration:	34																					
				Percent Operational Time:	99.5																					
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.3	2.3	2.3	2.3	2.3	Z	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.4
2-Dec	Z	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.3	2.4
3-Dec	2.2	Z	2.2	2.3	2.3	2.2	2.3	2.3	2.2	2.3	2.3	2.4	C	C	C	3.0	2.8	2.8	3.4	3.5	2.9	2.8	2.7	2.6	2.6	3.5
4-Dec	2.6	3.6	Z	2.6	2.9	3.2	2.5	2.6	2.8	2.9	2.5	2.5	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.5	3.6
5-Dec	2.3	2.4	2.3	Z	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4
6-Dec	2.2	2.2	2.5	2.6	Z	2.4	2.5	2.7	2.7	2.7	2.7	2.7	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.4	2.7
7-Dec	2.2	2.2	2.3	2.2	2.2	Z	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.9	2.3	2.9
8-Dec	Z	3.4	3.8	3.3	3.8	3.2	3.4	3.0	2.9	2.9	2.7	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.5	2.6	2.5	2.4	2.6	2.4	2.8	3.8
9-Dec	2.3	Z	2.3	2.4	2.3	2.7	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.9	2.7	2.6	2.4	2.5	2.4	2.4	2.9
10-Dec	2.6	2.5	Z	2.7	2.8	2.6	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.4	2.4	2.6	2.9	2.6	2.6	2.5	2.5	2.5	2.9
11-Dec	2.5	2.6	2.5	Z	2.6	2.6	2.5	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.6
12-Dec	2.3	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3
13-Dec	2.2	2.2	2.2	2.2	2.2	Z	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.4
14-Dec	Z	2.5	2.5	2.6	2.5	2.4	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.6
15-Dec	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3
16-Dec	2.2	2.2	Z	2.3	2.3	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3
17-Dec	2.3	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.5	2.5	2.4	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.5
18-Dec	2.2	2.2	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.3	2.3	2.5	2.9	3.0	2.8	3.3	2.9	2.4	2.5	2.5	2.6	2.5	3.3
19-Dec	2.3	2.3	2.3	2.3	2.2	Z	2.3	2.2	2.2	2.2	2.2	2.2	M	M	M	M	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.3	2.3
20-Dec	Z	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.5	2.5	2.6	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.6
21-Dec	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.7	4.0	4.0	3.0	3.0	2.8	3.7	2.7	4.0
22-Dec	3.6	3.7	Z	2.9	2.4	2.3	2.4	2.3	2.4	2.4	2.4	2.3	2.3	2.3	2.4	2.5	2.4	2.5	2.4	2.6	2.5	2.3	2.5	2.4	2.5	3.7
23-Dec	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.5	2.5	2.3	2.3	2.3	2.2	2.3	2.3	2.2	2.2	2.3	2.5
24-Dec	2.3	2.3	2.3	2.5	Z	2.4	2.4	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.7	2.7	2.5	2.7	2.8	2.8	2.7	2.6	2.5	2.5	2.8
25-Dec	2.5	2.5	2.5	2.4	2.4	Z	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.5	2.5	2.4	2.4	2.6	3.2	2.8	2.6	2.5	2.3	2.3	2.5	3.2
26-Dec	Z	2.3	2.3	2.3	2.3	2.4	2.3	2.4	2.4	2.5	2.5	2.4	2.6	2.9	2.9	2.8	2.7	2.6	2.6	2.6	2.4	2.3	2.3	2.3	2.5	2.9
27-Dec	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
28-Dec	2.4	2.5	Z	2.5	2.6	2.4	2.4	2.5	2.3	2.3	2.3	2.3	2.3	2.6	2.4	2.5	2.5	2.6	2.7	2.7	2.8	2.8	2.8	2.7	2.5	2.8
29-Dec	2.6	2.6	2.6	Z	2.6	2.6	2.6	2.6	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.4	2.3	2.3	2.5	2.6
30-Dec	2.3	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
31-Dec	2.2	2.3	2.3	2.3	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan      C - Calibration      M - Maintenance																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Buffalo Viewpoint - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	0	0.00	0.00
2.1 - 3.0	689	97.59	97.59
3.1 - 10.0	17	2.41	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Buffalo Viewpoint - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.1 - 3.0	88	41	14	7	14	32	134	145	35	23	22	51	34	13	15	21	689
3.1 - 10.0	6	0	0	0	2	0	0	0	1	0	0	0	0	0	3	5	17
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	<b>94</b>	<b>41</b>	<b>14</b>	<b>7</b>	<b>16</b>	<b>32</b>	<b>134</b>	<b>145</b>	<b>36</b>	<b>23</b>	<b>22</b>	<b>51</b>	<b>34</b>	<b>13</b>	<b>18</b>	<b>26</b>	<b>706</b>

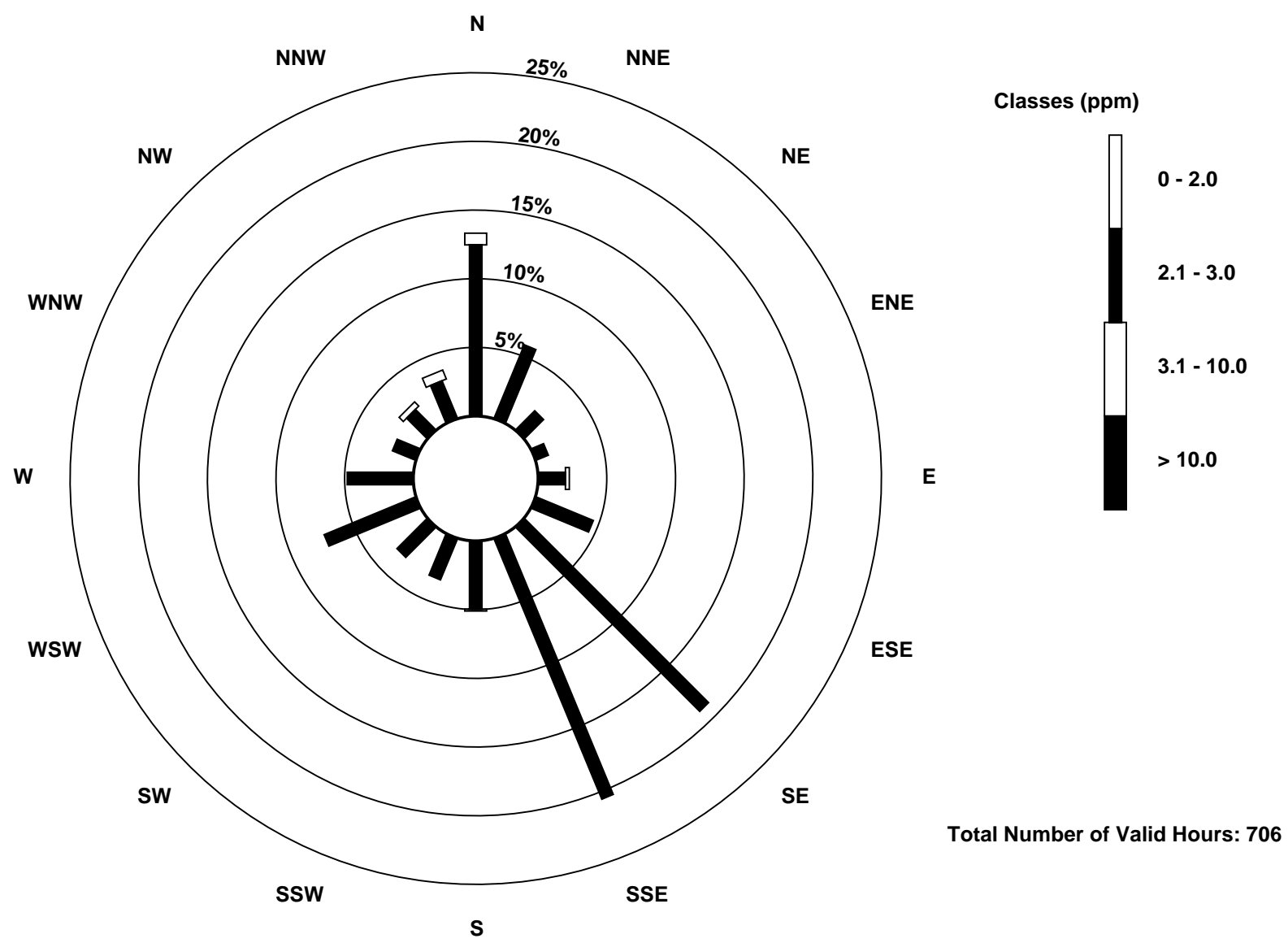
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Total Hydrocarbons (THC) - ppm  
Buffalo Viewpoint (AMS 4)

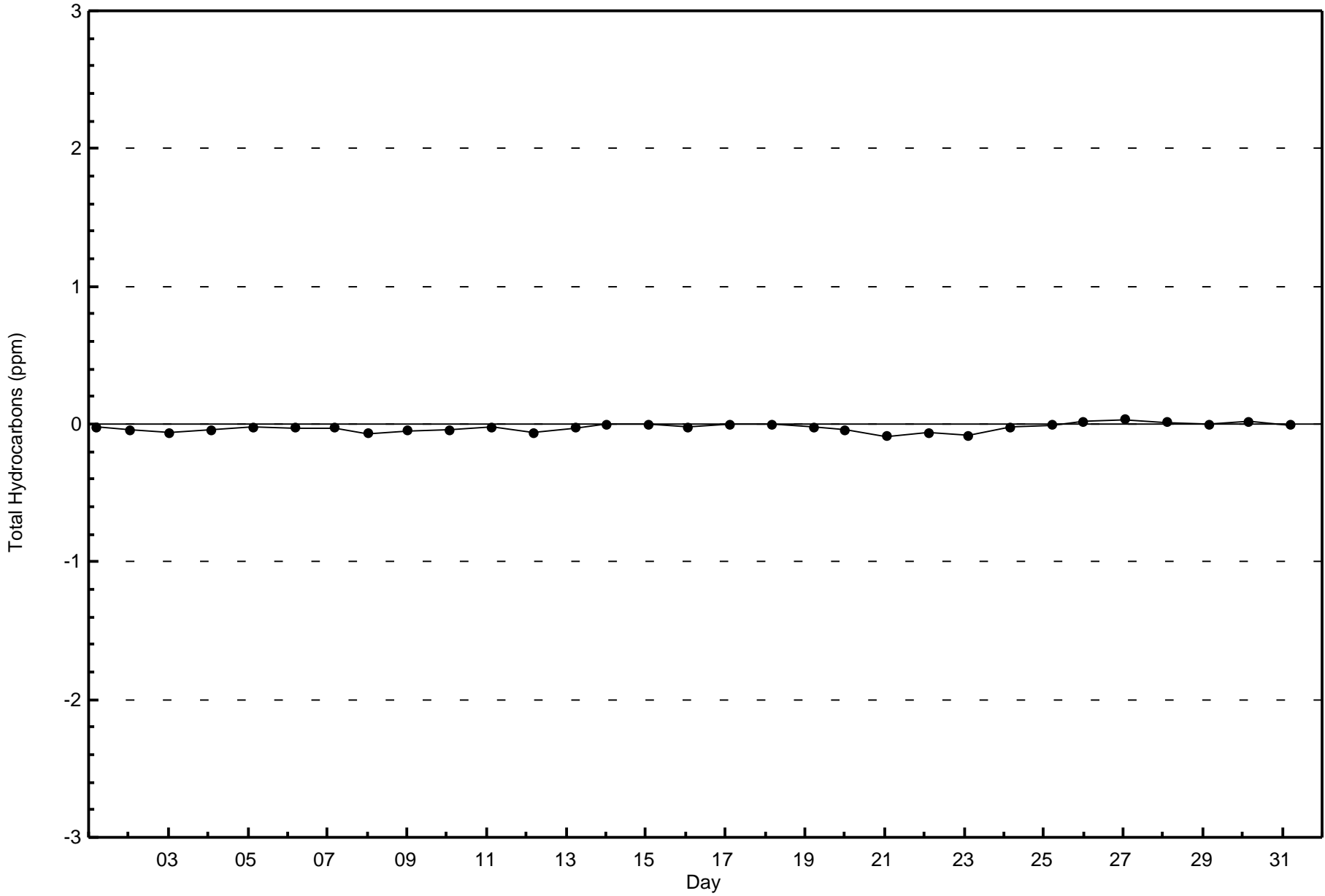


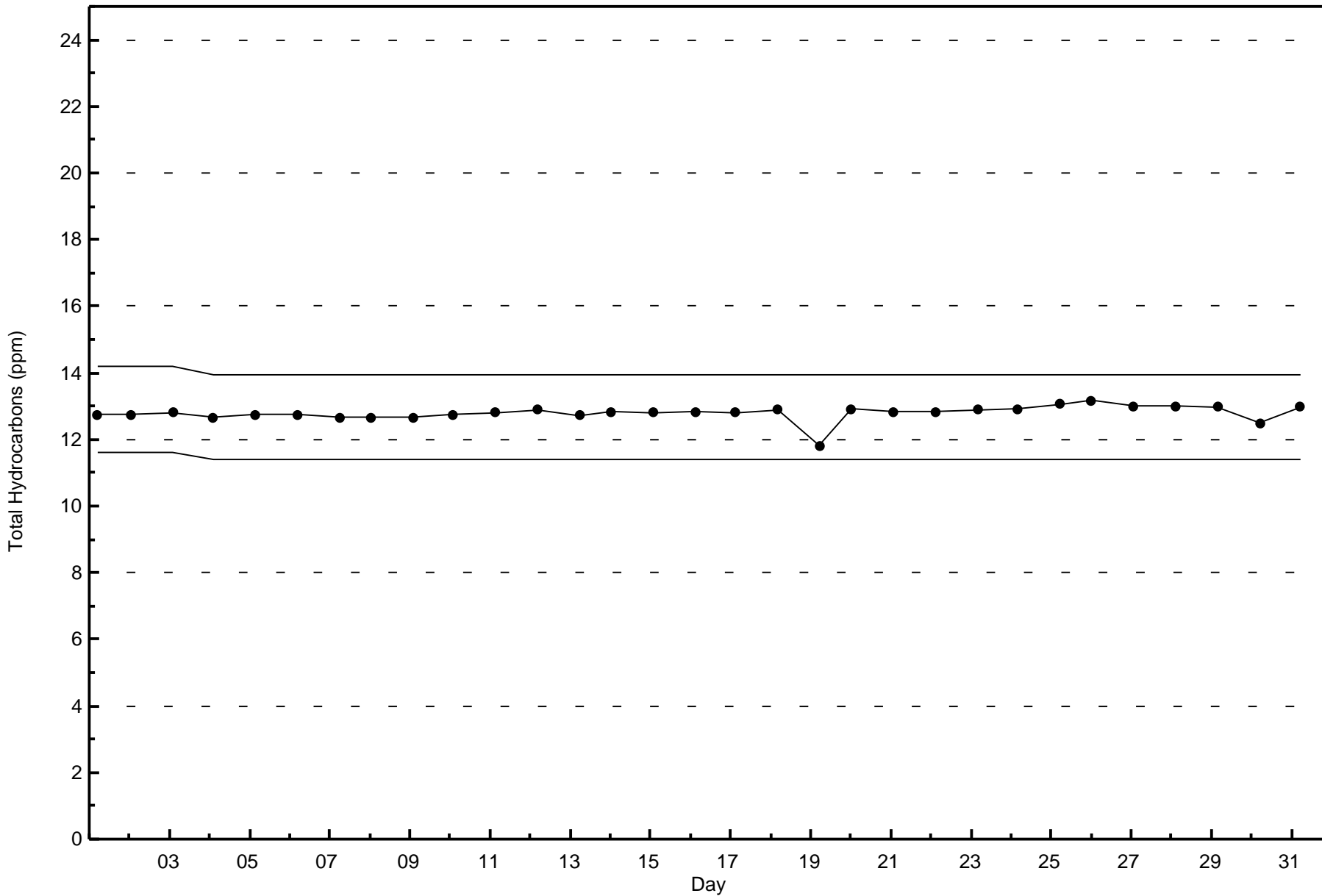




Wood Buffalo Environmental Association  
Zero Responses

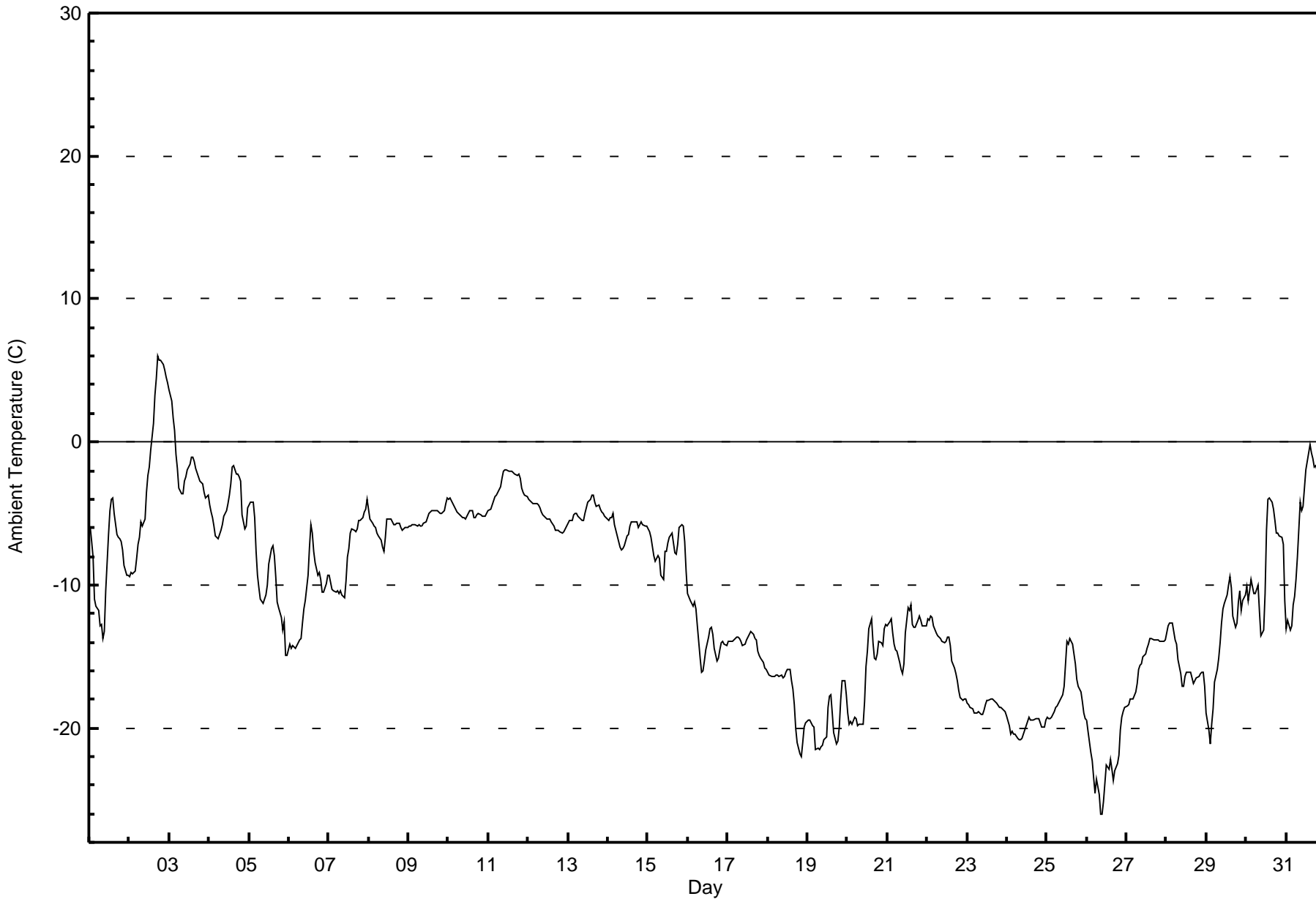
Total Hydrocarbons (THC) - ppm  
Buffalo Viewpoint - December 2015







Maximum Value: 6.0 C on Dec 2 18:00		Maximum Daily Average: -1.6 C on Dec 2		Hours in Service: 744																							
Minimum Value: -26.1 C on Dec 26 09:00		Minimum Daily Average: -22.5 C on Dec 26		Hours of Data: 744																							
Maximum Diurnal Average: -9.0 C at hour 15		Minimum Diurnal Average: -12.1 C at hour 9		Hours of Missing Data: 0																							
Monthly Average: -10.77 C		Percentiles: P <sub>1</sub> = -23.6 P <sub>10</sub> = -19.4 Q <sub>1</sub> = -16.0 Median = -10.7 Q <sub>3</sub> = -5.4 P <sub>90</sub> = -3.7 P <sub>99</sub> = 4.3		Hours of Calibration: 0																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	-6.0	-7.0	-8.0	-11.0	-11.5	-11.8	-12.8	-12.7	-13.7	-13.2	-10.4	-6.5	-4.8	-4.0	-3.9	-5.0	-6.5	-6.7	-6.8	-7.0	-7.6	-8.6	-9.3	-9.3	-8.5	-3.9	
2-Dec	-9.4	-9.1	-9.2	-9.0	-8.2	-7.2	-6.7	-5.6	-5.9	-5.4	-3.5	-2.3	-1.8	-0.6	1.3	3.3	4.4	6.0	5.8	5.7	5.5	5.0	4.5	4.2	-1.6	6.0	
3-Dec	3.6	2.9	1.7	0.8	-0.9	-1.9	-3.2	-3.6	-3.6	-2.7	-2.5	-1.9	-1.5	-1.0	-1.1	-1.4	-1.9	-2.2	-2.7	-2.9	-3.0	-3.5	-3.9	-3.7	-1.7	3.6	
4-Dec	-4.4	-4.9	-5.3	-5.9	-6.6	-6.8	-6.5	-6.2	-5.8	-5.2	-4.8	-4.3	-3.7	-2.9	-1.7	-1.6	-2.2	-2.3	-2.5	-2.7	-5.1	-6.1	-5.9	-4.6	-4.5	-1.6	
5-Dec	-4.4	-4.2	-4.2	-5.3	-7.7	-9.3	-10.2	-11.0	-11.3	-11.0	-10.7	-10.0	-8.5	-7.5	-7.2	-8.0	-9.5	-11.2	-11.6	-12.3	-13.2	-12.5	-14.9	-14.9	-9.6	-4.2	
6-Dec	-14.1	-14.5	-14.3	-14.3	-14.4	-14.2	-13.9	-13.7	-12.7	-11.6	-11.1	-9.3	-7.4	-5.8	-6.4	-7.6	-8.4	-9.3	-9.1	-9.6	-10.5	-10.5	-10.0	-9.3	-10.9	-5.8	
7-Dec	-9.3	-9.8	-10.3	-10.4	-10.5	-10.4	-10.6	-10.4	-10.7	-10.9	-9.7	-8.0	-7.5	-6.4	-6.0	-6.2	-6.2	-6.0	-5.5	-5.4	-5.3	-4.9	-4.7	-4.0	-7.9	-4.0	
8-Dec	-4.7	-5.4	-5.7	-5.9	-6.0	-6.4	-6.6	-6.9	-7.3	-7.6	-6.7	-5.4	-5.4	-5.4	-5.6	-5.7	-5.8	-5.7	-5.7	-5.9	-6.2	-6.1	-6.0	-6.0	-6.0	-4.7	
9-Dec	-5.9	-5.8	-5.8	-5.8	-5.8	-5.9	-5.8	-5.9	-5.8	-5.7	-5.6	-5.3	-5.0	-4.9	-4.8	-4.8	-4.8	-4.8	-4.9	-5.0	-5.0	-4.8	-4.3	-3.9	-5.3	-3.9	
10-Dec	-4.0	-3.9	-4.1	-4.5	-4.7	-4.9	-5.0	-5.1	-5.3	-5.3	-5.4	-5.2	-5.0	-4.8	-4.8	-5.3	-5.3	-5.1	-5.0	-5.1	-5.1	-5.2	-5.1	-5.0	-4.9	-3.9	
11-Dec	-4.8	-4.7	-4.4	-4.2	-3.8	-3.7	-3.3	-3.1	-2.5	-2.1	-2.0	-1.9	-2.0	-2.0	-2.1	-2.2	-2.3	-2.4	-2.3	-2.5	-3.2	-3.5	-3.7	-3.8	-3.0	-1.9	
12-Dec	-4.0	-4.1	-4.2	-4.3	-4.3	-4.3	-4.4	-4.6	-4.9	-5.1	-5.3	-5.3	-5.4	-5.4	-5.6	-5.9	-6.1	-6.2	-6.2	-6.3	-6.3	-6.3	-6.1	-5.9	-5.3	-4.0	
13-Dec	-5.6	-5.5	-5.5	-5.1	-5.0	-5.0	-5.2	-5.4	-5.5	-5.4	-5.0	-4.6	-4.2	-4.0	-3.8	-3.8	-4.2	-4.5	-4.5	-4.7	-4.9	-5.0	-5.2	-5.3	-4.9	-3.8	
14-Dec	-5.5	-5.3	-5.3	-5.0	-5.8	-6.6	-6.9	-7.4	-7.6	-7.4	-7.3	-6.6	-6.5	-5.9	-5.6	-5.6	-5.6	-5.6	-5.9	-5.8	-5.6	-5.7	-5.9	-5.9	-6.1	-5.0	
15-Dec	-6.1	-6.3	-6.7	-7.9	-8.3	-8.1	-7.9	-8.2	-9.3	-9.6	-7.7	-7.7	-7.1	-6.7	-6.4	-7.1	-7.7	-7.8	-7.2	-6.0	-5.8	-5.8	-7.0	-9.0	-7.4	-5.8	
16-Dec	-10.6	-11.1	-11.3	-11.4	-11.2	-11.7	-12.9	-15.1	-16.1	-16.0	-15.3	-14.5	-13.6	-13.0	-12.9	-13.4	-14.5	-15.4	-15.2	-14.5	-14.0	-13.9	-14.1	-14.2	-13.6	-10.6	
17-Dec	-13.9	-13.9	-14.0	-13.9	-13.8	-13.7	-13.7	-13.8	-13.9	-14.2	-14.2	-13.8	-13.7	-13.4	-13.3	-13.5	-13.7	-13.8	-14.6	-15.0	-15.1	-15.4	-15.8	-16.0	-14.2	-13.3	
18-Dec	-16.1	-16.3	-16.4	-16.4	-16.4	-16.3	-16.3	-16.4	-16.3	-16.5	-16.4	-16.1	-15.9	-16.0	-16.7	-17.3	-18.4	-20.0	-21.0	-21.8	-22.0	-21.0	-20.0	-19.6	-17.7	-15.9	
19-Dec	-19.4	-19.5	-19.7	-19.8	-20.0	-21.6	-21.4	-21.5	-21.3	-21.2	-20.8	-20.7	-18.6	-17.8	-17.7	-19.0	-20.4	-21.2	-20.9	-19.9	-18.1	-16.7	-16.7	-17.7	-19.6	-16.7	
20-Dec	-19.0	-19.7	-19.5	-19.7	-19.3	-19.3	-19.8	-19.8	-19.7	-19.7	-18.1	-15.8	-14.6	-13.1	-12.3	-14.1	-15.1	-15.2	-14.8	-13.9	-14.0	-14.3	-13.0	-12.7	-16.5	-12.3	
21-Dec	-12.8	-12.6	-12.4	-13.4	-14.1	-14.5	-14.7	-15.4	-15.9	-16.2	-15.5	-13.4	-11.6	-11.8	-11.4	-12.8	-13.0	-13.0	-12.4	-12.2	-12.5	-12.8	-12.8	-12.8	-13.3	-11.4	
22-Dec	-12.4	-12.4	-12.2	-12.2	-12.9	-13.3	-13.5	-13.6	-13.7	-13.9	-14.0	-13.9	-13.7	-13.7	-14.3	-15.3	-15.8	-16.2	-16.7	-17.4	-17.8	-18.1	-18.0	-18.0	-14.7	-12.2	
23-Dec	-18.3	-18.4	-18.5	-18.7	-19.0	-18.9	-19.0	-18.9	-19.1	-19.0	-18.8	-18.4	-18.1	-18.1	-18.0	-18.0	-18.1	-18.1	-18.3	-18.6	-18.6	-18.6	-18.8	-18.9	-18.5	-18.0	
24-Dec	-19.1	-19.9	-20.5	-20.2	-20.4	-20.5	-20.7	-20.8	-20.8	-20.4	-19.9	-19.5	-19.3	-19.5	-19.5	-19.4	-19.3	-19.3	-19.3	-19.7	-19.9	-19.9	-19.9	-19.4	-19.9	-19.1	
25-Dec	-19.3	-19.4	-19.4	-19.2	-18.9	-18.6	-18.5	-18.3	-18.0	-17.7	-17.1	-15.5	-14.0	-14.1	-13.8	-14.2	-14.8	-15.6	-16.6	-17.1	-17.5	-18.2	-18.9	-19.3	-17.2	-13.8	
26-Dec	-19.5	-20.3	-21.8	-22.3	-23.4	-24.5	-23.6	-24.6	-26.1	-26.1	-25.1	-23.9	-22.6	-22.9	-22.2	-22.9	-23.6	-23.0	-22.5	-21.9	-20.1	-19.2	-18.9	-18.6	-22.5	-18.6	
27-Dec	-18.4	-18.4	-18.0	-17.9	-18.0	-17.5	-16.9	-15.9	-15.7	-15.5	-15.1	-14.8	-14.4	-14.1	-13.7	-13.7	-13.8	-13.8	-13.8	-13.8	-13.9	-13.9	-13.9	-13.9	-15.4	-13.7	
28-Dec	-13.3	-12.9	-12.7	-12.7	-13.3	-13.9	-14.1	-15.2	-16.2	-17.0	-17.1	-16.4	-16.1	-16.1	-16.2	-16.5	-16.9	-16.7	-16.5	-16.4	-16.2	-16.1	-16.1	-17.1	-15.5	-12.7	
29-Dec	-18.9	-20.1	-21.1	-19.8	-18.7	-16.8	-15.9	-15.1	-14.1	-12.6	-11.7	-11.3	-10.7	-10.0	-9.4	-10.2	-12.1	-13.0	-12.6	-11.2	-10.4	-11.8	-11.1	-10.7	-13.7	-9.4	
30-Dec	-10.1	-11.1	-10.4	-9.7	-10.6	-10.6	-10.3	-10.0	-11.9	-13.6	-13.1	-10.6	-6.1	-4.0	-3.9	-4.2	-4.7	-5.4	-6.4	-6.4	-6.5	-6.7	-7.2	-11.1	-8.5	-3.9	
31-Dec	-13.1	-12.5	-13.2	-12.8	-11.4	-10.8	-9.6	-8.1	-4.2	-4.8	-4.5	-3.2	-2.0	-0.7	-0.2	-0.8	-1.1	-1.7	-1.7	-2.3	-2.6	-2.8	-2.5	-2.4	-5.4	-0.2	
		-10.9	-11.2	-11.4	-11.6	-11.8	-11.9	-11.9	-12.0	-12.1	-12.0	-11.4	-10.5	-9.7	-9.2	-9.0	-9.4	-9.9	-10.2	-10.2	-10.2	-10.3	-10.4	-10.5	-10.6	Diurnal Average	
		3.6	2.9	1.7	0.8	-0.9	-1.9	-3.2	-3.1	-2.5	-2.1	-2.0	-1.9	-1.5	-0.6	1.3	3.3	4.4	6.0	5.8	5.7	5.5	5.0	4.5	4.2	Diurnal Maximum	





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Buffalo Viewpoint - December 2015**

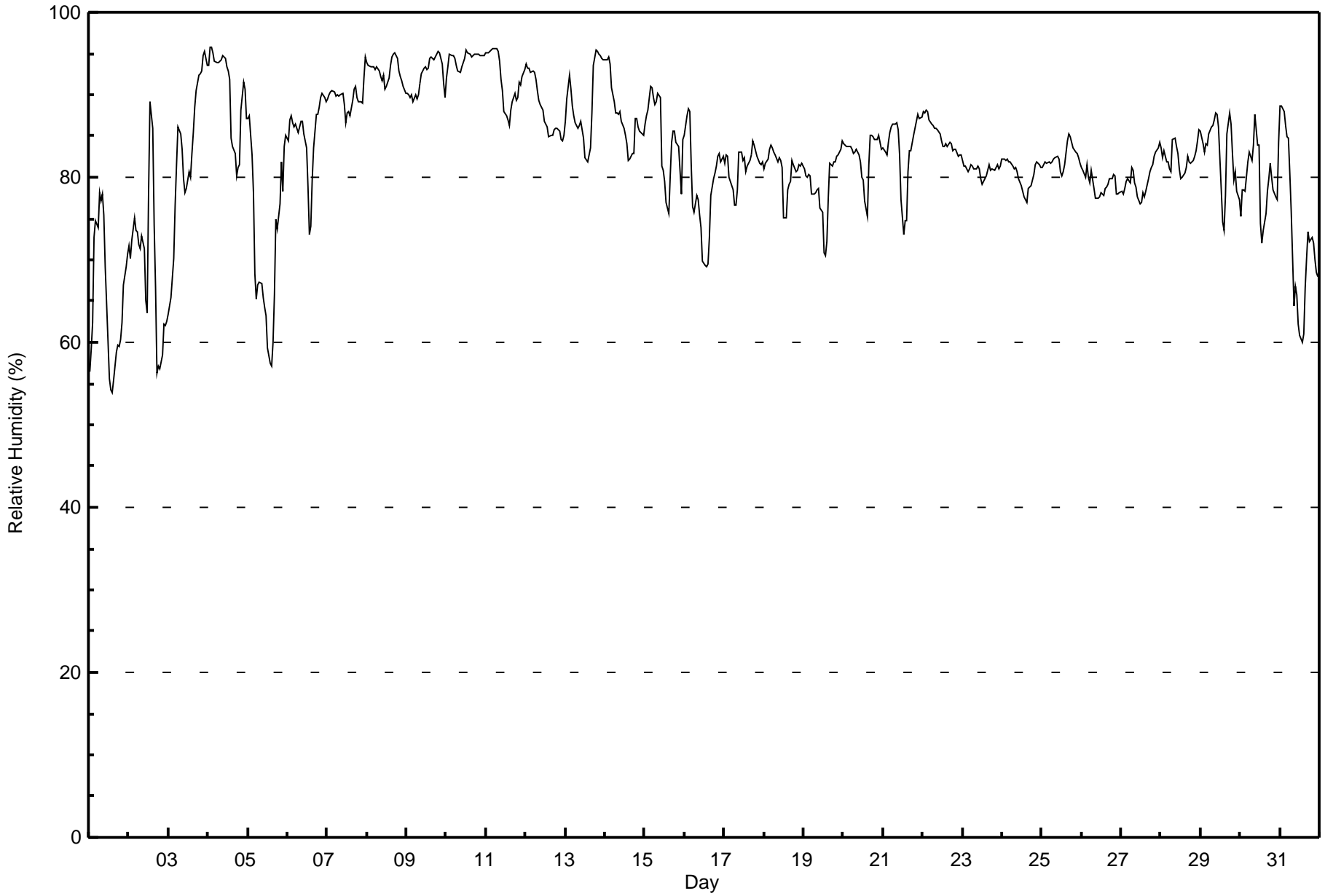
<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	46	6.18	6.18
-20 - 0	684	91.94	98.12
0 - 10	14	1.88	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 96 % on Dec 4 03:00																		Maximum Daily Average: 94.3 % on Dec 10																		Hours in Service: 744													
Minimum Value: 54 % on Dec 1 15:00																		Minimum Daily Average: 65.2 % on Dec 1																		Hours of Data: 744													
Maximum Diurnal Average: 85.0 % at hour 4																		Minimum Diurnal Average: 78.7 % at hour 15																		Hours of Missing Data: 0													
Monthly Average: 82.8 %																		Percentiles: P <sub>1</sub> = 57 P <sub>10</sub> = 73 Q <sub>1</sub> = 80 Median = 83 Q <sub>3</sub> = 88 P <sub>90</sub> = 93 P <sub>99</sub> = 95																		Hours of Calibration: 0													
																																				Percent Operational Time: 100.0													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	56	59	62	73	75	74	78	77	78	75	69	60	56	54	54	55	59	60	59	60	62	67	69	71	65.2	78																							
2-Dec	72	70	72	75	74	73	72	71	73	71	65	64	78	89	86	74	67	56	57	57	58	62	62	63	69.2	89																							
3-Dec	63	65	68	70	77	82	86	85	83	80	78	79	81	80	83	85	89	91	92	93	93	95	95	94	82.7	95																							
4-Dec	93	96	96	95	94	94	94	94	94	95	94	93	93	92	85	84	83	80	81	82	88	92	91	87	90.4	96																							
5-Dec	87	88	83	78	68	65	67	67	67	65	64	63	59	58	57	60	66	75	74	77	82	78	84	85	71.6	88																							
6-Dec	84	87	87	87	86	86	85	86	87	87	85	84	79	73	74	80	84	88	88	89	90	90	90	89	85.2	90																							
7-Dec	90	90	90	90	90	90	90	90	90	90	89	87	88	88	87	89	91	91	90	89	89	89	92	95	89.7	95																							
8-Dec	94	94	93	93	93	93	93	93	92	92	92	91	91	92	94	95	95	95	94	93	92	92	91	90	92.8	95																							
9-Dec	90	90	90	90	89	90	90	90	91	93	93	93	93	93	94	95	94	95	95	95	95	94	91	90	92.2	95																							
10-Dec	92	93	95	95	95	94	94	93	93	93	94	94	95	95	95	95	95	95	95	95	95	95	95	95	94.3	95																							
11-Dec	95	95	95	95	96	96	96	95	94	92	91	88	88	87	86	88	89	90	89	90	91	91	92	93	91.8	96																							
12-Dec	94	93	93	93	93	93	92	91	89	89	88	87	86	86	85	85	85	86	86	86	86	85	84	85	88.3	94																							
13-Dec	87	89	92	91	89	88	87	86	86	87	86	85	82	82	83	84	88	94	95	95	95	94	94	88.8	95																								
14-Dec	94	94	95	94	91	89	88	88	88	88	87	86	85	84	82	82	83	83	87	87	86	86	85	85	87.4	95																							
15-Dec	86	88	88	91	91	90	89	89	90	90	81	81	79	77	76	80	84	86	86	84	84	81	78	85	84.7	91																							
16-Dec	85	87	88	88	81	76	76	78	77	75	74	70	69	69	73	78	80	81	81	82	83	82	83	78.6	88																								
17-Dec	82	83	83	80	79	78	77	77	79	83	83	82	82	81	81	82	83	84	84	83	83	82	82	82	81.4	84																							
18-Dec	81	82	82	83	84	84	83	83	82	82	82	81	75	75	78	79	80	82	81	81	81	82	81	82	81.1	84																							
19-Dec	81	80	80	80	80	78	78	78	79	79	76	76	71	71	72	78	82	81	82	82	83	83	83	84	79.0	84																							
20-Dec	84	84	84	84	84	83	83	83	83	83	82	80	80	77	75	82	85	85	85	85	85	85	84	83	82.8	85																							
21-Dec	84	83	83	84	86	86	86	86	87	86	83	77	73	75	75	81	83	83	85	86	87	88	87	87	83.3	88																							
22-Dec	88	88	88	88	87	86	86	86	86	86	85	84	84	84	84	84	84	84	83	83	83	83	83	83	85.0	88																							
23-Dec	82	81	81	81	81	82	81	81	81	81	81	80	79	79	80	81	82	81	81	81	81	82	81	81	80.9	82																							
24-Dec	82	82	82	82	82	82	81	81	81	81	80	79	78	78	77	79	79	80	80	80	82	82	82	81	80.4	82																							
25-Dec	81	82	82	82	82	82	82	82	82	82	82	81	80	81	82	84	85	85	84	84	83	83	82	82	82.3	85																							
26-Dec	81	81	80	82	80	79	81	79	77	77	77	78	78	78	79	79	79	80	80	80	80	78	78	78	79.1	82																							
27-Dec	78	78	79	80	80	79	81	81	79	79	78	77	77	78	78	78	80	81	81	82	83	83	84	79.8	84																								
28-Dec	84	82	83	82	82	81	81	85	85	84	83	81	80	80	81	81	83	82	82	82	83	83	84	86	82.4	86																							
29-Dec	86	84	83	84	84	85	86	86	87	88	88	86	79	75	74	78	85	88	86	83	80	81	78	77	82.9	88																							
30-Dec	75	78	78	78	82	83	83	82	84	88	84	84	74	72	74	76	78	80	82	80	78	78	77	84	79.7	88																							
31-Dec	89	89	88	86	85	85	81	76	64	67	66	62	61	60	61	67	70	73	72	73	72	70	68	68	73.0	89																							
																								83.9	84.4	84.7	85.0	84.4	84.1	84.0	83.8	83.5	83.5	82.0	80.4	79.1	78.7	78.7	80.3	82.1	82.9	83.2	83.1	83.6	83.6	83.6	84.0	Diurnal Average	
																								95	96	96	95	96	96	96	95	94	95	94	94	95	95	95	95	95	95	95	95	95	95	95	95	95	Diurnal Maximum





Maximum Speed: 25 km/h on Dec 5 05:00	Maximum Daily Speed Average: 13.8 km/h on Dec 22	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 6 13:00	Minimum Daily Speed Average: 1.3 km/h on Dec 25	Hours of Data: 744
Maximum Diurnal Speed Average: 2.6 km/h at hour 16	Minimum Diurnal Speed Average: 0.5 km/h at hour 5	Hours of Missing Data: 0
Monthly Average Velocity: 1.7 km/h 163.0 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 4 Q <sub>1</sub> = 6 Median = 8 Q <sub>3</sub> = 11 P <sub>90</sub> = 14 P <sub>99</sub> = 19	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SE9	SE8	SE9	SSE10	SSE11	SE11	SE11	SSE9	SSE11	SSE10	SE11	SSE8	SE9	SE9	SE10	SE11	SSE11	SE11	SSE10	SE11	SSE10	SE10	SSE12	SE12	SE10.0	SE12
2-Dec	SSE12	SSE11	SE10	SE10	SSE8	SE9	SSE8	SE11	SE8	SSE9	SSE12	SSE11	SE10	SE10	SSE9	S11	SSW12	WSW18	WSW18	WSW18	WSW21	WSW17	WSW13	WSW16	SSW7.9	WSW21
3-Dec	WSW12	WSW16	W10	WSW7	SSE3	SE5	SE7	SE9	SE11	SSE7	S4	NNE7	N11	N10	N9	N8	NNE10	NNE9	NW5	N6	N6	NNE9	NE7	NNE7	N2.0	WSW16
4-Dec	N6	N7	N7	N8	NNW7	NNW7	N9	N6	NNW6	NW5	WSW5	WSW5	S4	SSW5	SW10	SSW8	SW9	SW12	SW10	SSW9	SSE8	SE9	SSE9	SW8	WSW2.4	WSW12
5-Dec	W4	WSW5	W10	WNN18	WNN25	W18	W18	W18	WSW18	WSW21	WSW19	WSW16	WSW17	WSW13	WSW11	SSW7	SSE7	SSE7	SSE8	SSE8	SSE8	SE7	SSE9	SSE8	WSW8.9	WNN25
6-Dec	SE3	SSW1	N6	NNE7	NNE8	N7	NNE7	NE7	NE6	NNE9	NNE6	NNE2	WNN0	S3	SW3	SE5	SSE6	SSE7	S8	S6	SSE6	SSE8	SSE8	SSE8	E1.9	NNE9
7-Dec	SSE7	SSE8	SSE10	SSE10	SSE11	SSE9	SE7	SSE7	SSE6	SE7	SE6	SSE6	SSE6	S5	S5	SSW2	S2	S4	SSE6	SSE6	SSE7	S7	S5	NW10	SSE5.7	SSE11
8-Dec	NNW13	NNW11	NW10	NNW8	NNW6	E2	S3	SW4	WSW3	S5	SE5	S7	SSE5	SSE5	SE7	SE8	SE6	ESE6	E9	E10	E7	E5	E6	ESE6	ESE1.8	NNW13
9-Dec	ESE6	ESE7	ESE7	ESE6	E7	E6	ESE5	ESE8	ESE7	ESE8	ESE8	SE6	SE5	ESE3	ESE3	SSE3	SSW2	SW3	NW4	WNN3	S3	S4	W6	WSW5	SE3.3	ESE8
10-Dec	NW5	W6	N7	N5	N7	N9	NNE7	NNE8	N6	NNW5	N7	N4	NNW3	NNE7	NNE3	N3	NNW3	NNW4	NNW4	NNE5	NNE7	NNE6	N5	N5	N4.9	N9
11-Dec	NNE6	NNE6	NNE4	ENE1	E2	SSE2	SE3	SE5	SE8	SE11	SE10	SE14	ESE9	SE7	SE7	SE5	ESE5	SE6	SE9	SE10	SE10	SE10	SE10	SE10	SE6.0	SE14
12-Dec	SE10	SE9	SE10	SE11	SE10	SE11	SE11	SE11	SE14	SE15	SE16	SE15	SE17	SE17	SE18	SE18	SE17	SE17	SE17	SE14	SE12	SE12	SE12	SE12	SE13.5	SE18
13-Dec	SE11	SE10	SE8	SE10	SE11	SE14	SE13	SE11	SE9	SE7	SE7	SE8	ESE9	ESE8	ESE5	E5	NNE4	N6	N5	NNE5	NNE4	N4	NNE3	NNE4	ESE5.6	SE14
14-Dec	NNE2	SE2	W4	NW10	NW10	NW11	W8	WSW8	WSW7	W7	WSW6	W8	W8	WSW6	SSW5	SW6	SSW5	SSE7	SSE10	SSE9	SSE11	SSE11	SSE11	SW3.6	NW11	
15-Dec	SSE11	SSE10	SSE12	SSE13	SSE14	SSE15	SSE15	SSE13	SSE10	SSE8	WSW9	W14	WSW14	WSW14	SW8	SSW6	WSW6	W8	W7	W9	W13	WNN17	NW20	N17	SW5.0	NW20
16-Dec	NNE12	NNE7	NE2	SSW2	NW15	NW18	W12	W12	W11	W12	W12	WSW11	WSW13	W12	WSW7	S7	SSW8	WSW7	W8	W10	WNN11	WNN12	WNN11	W8	W8.0	NW18
17-Dec	W11	W10	W12	W12	W13	WNN12	WNN13	WNN13	NW9	N6	NNE3	NNE4	NNE3	NNW3	NE3	NE2	NE3	NNE6	NE10	NE7	NE4	NNE9	NNE9	ENE4	NW4.5	WNN13
18-Dec	NE5	NE4	SE1	NE2	ESE0	ENE2	ENE3	ESE4	ENE5	ENE6	NE4	NE5	SSE4	SE5	ESE6	E6	E7	E3	E4	ESE3	SE6	ESE5	ENE5	ESE6	E3.7	E7
19-Dec	SE8	ESE8	ESE9	SE11	SE12	SE13	ESE10	SE7	ESE4	SE3	SSE4	SSE4	SSE8	SSE7	SSE7	SE6	SE6	SSE7	SSE6	SSE5	SSE7	SSE9	SSE6	SSE6	SE6.9	SE13
20-Dec	SSE7	SSE6	SSE7	SSE9	SSE9	SSE7	SSE8	S6	SSE6	SSE5	SE5	SSE4	SE5	SE6	SE5	ESE7	SE7	SE9	SE9	SE8	SSE9	SSE8	SE10	SSE11	SSE7.0	SSE11
21-Dec	SSE10	SSE13	SSE13	SSE12	SSE12	SSE11	SSE11	SSE9	SSE9	SSE8	S6	SE4	SE3	SE5	SE5	SE7	SE6	SE5	N3	N5	NNE5	N6	NNW6	NW7	SSE5.0	SSE13
22-Dec	N10	NNW8	NNW7	NNW11	N16	N17	N17	N17	N17	N16	N13	N12	NNW11	N13	N18	N20	N14	N14	N15	NNW12	NNW13	N15	N14	N14	N13.8	N20
23-Dec	N13	N13	N15	N16	N13	N12	N12	N13	N10	N11	N10	N11	N10	N12	N14	N12	N11	N13	N14	N13	N9	N11	N12	N13	N12.2	N16
24-Dec	N12	N11	N8	N11	N11	N8	N8	N7	N7	N5	N4	NNW4	N4	WNN2	SW1	E1	ESE3	SE3	SSE2	SE5	SSE8	SSE9	SSE9	SSE9	NNE3.3	N12
25-Dec	SSE8	SSE7	SSE8	SSE7	SSE6	SE7	SSE6	S7	SSE7	SSE8	SSE6	SSW2	W6	N3	SSE2	SE4	SE4	NNE7	N15	NNW15	N15	N9	NNE7	NNE6	E1.3	N15
26-Dec	NNE8	NNE6	NNW5	NNW2	WSW1	S3	NW2	NE1	SE3	SE4	SE4	SSE2	ENE3	NNE4	NNE4	N5	N7	N5	N4	N3	ESE6	ESE8	ESE8	ESE9	ENE2.2	ESE9
27-Dec	SE10	SE10	SE8	SE8	SE10	SE13	SE11	SE15	SE16	SE18	SE17	SE18	SSE16	SSE13	SSE12	SSE11	SSE7	SSE8	SSE8	SSE6	SSE7	SE7	SSE7	SSE6	SE10.7	SE18
28-Dec	SW5	S4	W7	NW11	NW10	WNN8	NW9	N13	N13	N13	N11	N8	NNW7	NW6	N6	NNW4	NNW3	E1	SW2	SSW2	SSW3	SSE4	SSE5	SSE5	NNW3.8	N13
29-Dec	SE8	SSE9	SSE9	SSE7	SSE4	SSE5	SSE6	SSE5	S4	SSE6	SSE7	S10	SSW10	S8	S7	SSE10	SSE11	SSE10	SSE10	S10	S10	S9	S8	SSW10	S7.7	SSE11
30-Dec	SW8	SW7	WSW15	WSW19	W10	WSW8	WSW9	W9	S10	SE10	SSE9	SSE8	SW9	WSW13	WSW16	WSW14	WSW10	WSW10	S7	SW13	SW16	SW12	SSW9	SSE9	SW8.6	WSW19
31-Dec	SE9	SSE8	SE9	SSE11	SSE9	SSE9	S8	S8	WSW19	WSW22	WSW16	SW10	SSW9	SSW7	S8	WSW13	WSW12	WSW10	WSW16	SSW7	SSW8	SW10	SW13	SW12	SW8.6	WSW22

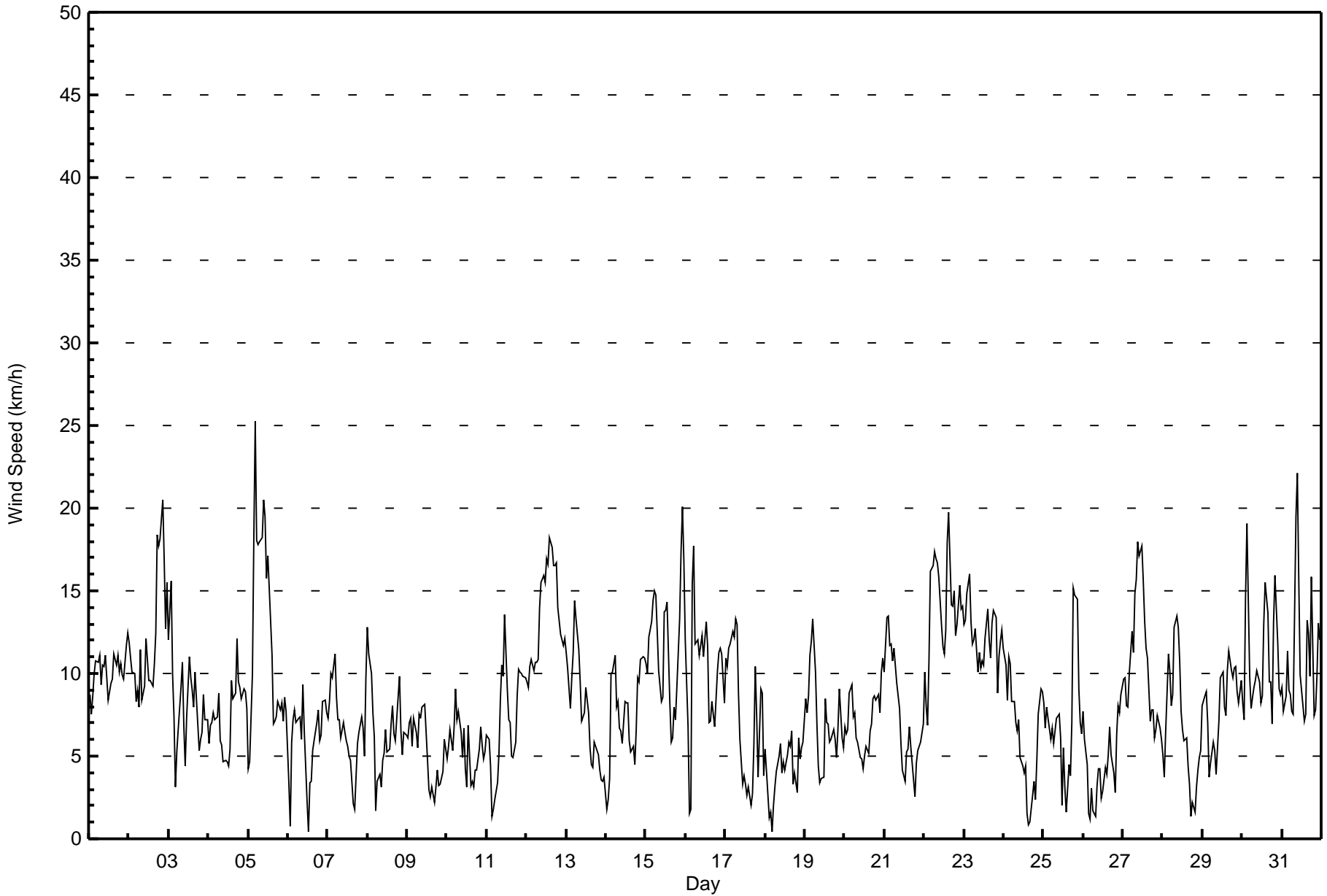
ENE1.8 SE1.8 SSE1.3 S1.0 S0.5 SE1.2 SSE1.4 SE1.7 SSE2.1 SSE2.2 SSE2.6 S2.3 S2.2 S1.7 S2.0 SSE2.6 SSE2.3 S1.7 S1.4 S1.4 S2.2 SSE2.0 SSE1.9 SSE1.8	Diurnal Average
N13 WSW16 N15 WSW19 WNN25 W18 W18 W18 WSW19 WSW22 WSW19 SE18 WSW17 SE17 SE18 N20 SE17 WSW18 WSW18 WSW18 WSW21 WNN17 NW20 N17	Diurnal Maximum

All monthly, daily, and diurnal averages have been calculated using vector methods





Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744											
Maximum Value: 6 km/h on Dec 30 04:00														Hours of Data: 744											
Minimum Value: 0 km/h on Dec 14 02:00														Hours of Missing Data: 0											
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 5														Hours of Calibration: 0											
														Percent Operational Time: 100.0											
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	2	1	2	1	1	1	1	1	1	1	3	3	2	2	2	2	2	2	2	1	1	2	1	1	3
2-Dec	1	1	2	2	2	1	2	2	2	2	3	2	2	1	2	2	4	5	5	4	4	4	3	4	5
3-Dec	3	3	3	2	2	2	1	1	1	2	2	2	1	2	1	1	2	1	1	1	2	1	1	3	3
4-Dec	1	1	1	1	1	2	1	2	2	1	1	1	1	1	2	1	2	3	2	2	1	1	2	2	3
5-Dec	2	1	3	5	5	5	5	5	4	4	5	4	5	3	3	1	1	1	1	1	1	1	1	5	5
6-Dec	2	1	1	1	1	1	1	1	1	2	1	1	2	1	2	1	2	1	1	1	1	1	1	2	2
7-Dec	2	1	2	2	2	2	2	2	1	1	1	2	2	1	1	2	2	2	1	1	1	1	1	3	3
8-Dec	2	2	2	2	3	1	1	1	1	1	1	2	1	2	2	2	2	2	2	3	2	1	2	2	3
9-Dec	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	0	1	1	1	1	3	2	3
10-Dec	1	2	1	1	1	2	1	2	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	2
11-Dec	1	1	1	1	1	1	1	1	2	2	3	4	2	2	2	1	1	1	2	2	3	2	2	2	4
12-Dec	2	2	3	3	3	2	3	3	4	4	4	4	4	4	4	5	4	4	4	4	3	3	3	3	5
13-Dec	3	3	2	3	3	3	3	3	3	2	2	2	2	3	2	2	1	2	1	1	1	1	1	3	3
14-Dec	1	0	2	2	2	2	3	3	2	2	2	2	2	3	1	1	2	2	2	2	2	2	2	3	3
15-Dec	3	2	2	3	3	3	3	3	3	1	2	5	3	3	3	2	1	2	2	2	3	3	4	4	5
16-Dec	3	2	1	2	3	4	3	2	2	3	3	2	2	2	3	1	1	2	2	2	2	3	2	2	4
17-Dec	3	3	3	3	3	3	2	3	2	2	1	1	1	1	1	1	1	2	2	2	1	2	3	1	3
18-Dec	1	2	1	1	1	1	2	1	1	2	1	1	2	2	1	2	2	1	2	1	1	1	2	3	3
19-Dec	2	2	2	3	4	3	3	2	1	1	1	2	2	2	2	1	1	1	1	2	2	2	1	1	4
20-Dec	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	2	2	2	1	3	3	3
21-Dec	3	3	3	2	3	2	2	2	1	1	1	1	1	1	2	1	1	2	1	2	3	2	1	2	3
22-Dec	2	1	1	2	2	3	2	2	2	2	3	3	2	3	3	3	2	2	2	2	2	3	2	3	3
23-Dec	3	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	3	2	2	2	2	3
24-Dec	2	2	2	2	2	2	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	3	3	2	3	2	1	1	3
26-Dec	2	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	3	2	2	2	3
27-Dec	2	3	2	2	2	3	3	4	4	5	5	5	4	4	3	4	2	2	2	2	1	1	1	1	5
28-Dec	3	1	3	2	2	3	2	2	2	2	2	1	1	1	1	1	2	2	1	1	1	2	1	1	3
29-Dec	1	1	1	2	2	1	1	1	1	2	2	3	3	2	2	2	2	1	2	2	2	2	2	4	4
30-Dec	3	3	5	6	2	2	2	3	1	1	1	2	4	5	4	6	3	3	3	6	4	3	3	2	6
31-Dec	2	2	2	2	3	3	2	3	6	5	5	2	2	2	2	3	4	3	3	2	2	3	4	4	6
														Diurnal Maximum											





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Buffalo Viewpoint - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	175	23.52	23.52
6 - 11	421	56.59	80.11
12 - 19	142	19.09	99.19
20 - 28	6	0.81	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Buffalo Viewpoint - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	17	17	10	7	8	11	27	20	15	10	6	6	2	3	5	11	175
6 - 11	44	26	5	1	8	23	86	119	21	12	11	16	22	4	10	13	421
12 - 19	39	1	0	0	0	0	28	16	0	1	5	27	13	6	2	4	142
20 - 28	1	0	0	0	0	0	0	0	0	0	0	3	0	1	1	0	6
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	101	44	15	8	16	34	141	155	36	23	22	52	37	14	18	28	744

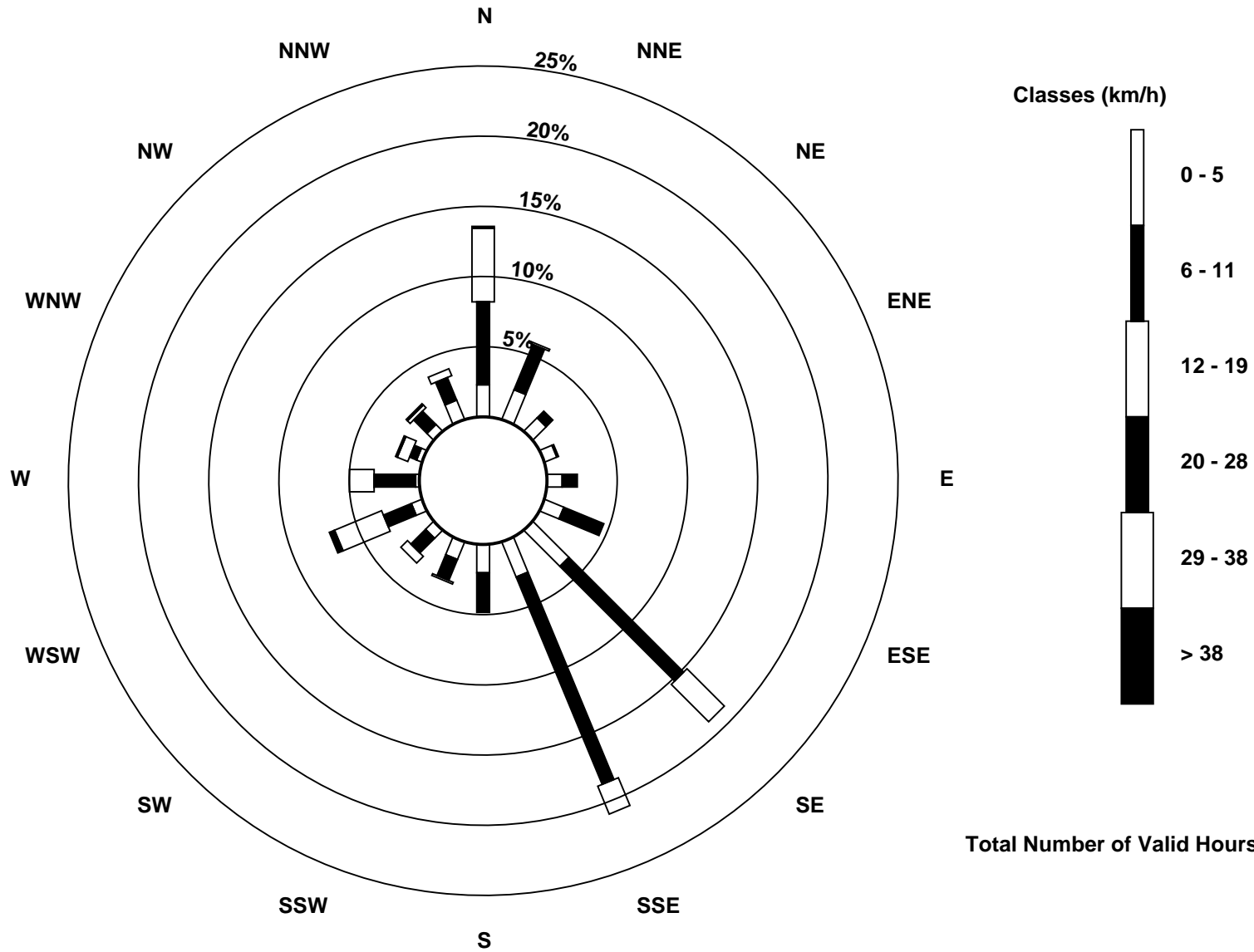
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
Buffalo Viewpoint (AMS 4)





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Wind Direction (WD) - deg**

**Buffalo Viewpoint - December 2015**

Direction of Maximum Speed: 289 deg on Dec 5 05:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 353.8 deg on Dec 22	Hours of Data: 744
Direction of Minimum Speed: 299 deg on Dec 6 13:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 1.3 deg on Dec 25	Percent Operational Time: 100.0
Monthly Average Direction: 204.5 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	124	127	134	152	154	145	141	147	160	152	141	153	134	141	133	133	147	139	150	144	153	143	152	143	143.8
2-Dec	149	156	141	138	150	139	160	138	135	153	151	150	139	143	148	183	212	243	254	250	253	253	245	247	191.3
3-Dec	246	254	264	246	150	137	141	135	136	163	170	17	9	352	358	8	25	18	321	2	358	23	35	32	1.9
4-Dec	4	2	3	358	335	341	359	355	328	305	255	242	185	192	223	201	222	236	214	210	151	143	168	219	245.3
5-Dec	268	251	273	297	289	276	276	263	253	251	250	246	254	258	247	203	167	156	152	150	149	143	162	148	247.5
6-Dec	139	202	9	14	12	1	21	38	37	32	29	30	299	189	232	129	166	156	169	173	157	161	158	158	97.4
7-Dec	166	154	153	157	155	148	146	152	160	140	141	162	156	174	171	206	178	185	167	147	155	172	170	318	159.3
8-Dec	327	334	317	339	339	87	177	223	238	174	146	185	164	167	134	138	143	120	99	83	88	98	95	112	111.0
9-Dec	119	116	107	108	100	97	112	102	113	114	123	130	125	112	109	155	209	235	323	294	178	189	261	257	125.2
10-Dec	314	264	350	4	353	3	13	29	11	342	8	1	335	17	25	354	338	337	332	16	29	17	357	9	359.9
11-Dec	15	13	16	57	99	159	138	145	142	143	139	137	123	137	145	140	123	130	143	130	129	131	130	126	128.4
12-Dec	132	141	133	137	137	140	137	138	143	140	142	143	141	143	142	138	142	141	143	139	138	141	140	140	140.0
13-Dec	138	138	132	132	129	128	129	130	137	136	134	124	121	117	105	85	27	7	7	16	13	358	14	15	114.8
14-Dec	24	145	273	311	314	305	275	255	248	264	240	275	273	272	246	201	222	195	148	151	154	156	150	153	231.9
15-Dec	157	150	149	150	153	150	150	148	149	149	252	263	254	248	231	207	237	263	265	261	268	290	316	7	214.6
16-Dec	15	16	51	211	306	306	280	274	267	263	263	249	251	268	237	184	205	248	268	273	283	284	287	276	275.0
17-Dec	267	274	275	267	275	289	295	297	319	10	19	29	20	346	38	55	54	33	35	35	34	21	23	62	324.6
18-Dec	49	55	145	44	122	68	77	104	75	63	55	40	147	125	102	95	92	99	101	106	133	117	73	106	90.4
19-Dec	125	115	122	130	132	124	121	127	118	144	155	156	148	153	157	144	145	147	161	153	163	159	160	164	140.0
20-Dec	151	158	162	161	160	164	161	171	164	156	131	162	145	146	133	123	133	143	138	142	151	168	145	150	150.9
21-Dec	158	153	153	157	161	160	158	148	155	163	179	146	138	129	126	135	131	128	6	1	16	358	344	316	147.4
22-Dec	4	341	348	344	359	2	357	355	356	353	357	357	348	353	354	351	352	350	354	347	347	356	358	356	353.8
23-Dec	357	352	351	349	357	354	349	355	5	5	2	356	351	357	358	1	5	4	7	8	5	1	2	4	358.6
24-Dec	2	2	3	353	1	11	8	11	8	360	10	4	347	351	289	217	98	119	126	160	143	160	148	148	18.1
25-Dec	149	158	151	160	155	135	165	171	153	157	157	205	278	8	152	126	145	13	353	348	353	3	13	24	91.5
26-Dec	25	28	346	342	247	184	322	34	133	142	144	155	66	12	13	9	6	358	10	354	108	114	113	123	60.2
27-Dec	130	125	135	136	141	133	132	138	139	139	143	145	149	149	151	148	147	153	160	162	155	143	150	165	143.3
28-Dec	224	171	275	304	310	293	311	357	359	1	354	349	340	321	356	328	348	87	234	201	196	156	159	150	327.6
29-Dec	146	157	158	151	166	166	161	159	171	166	167	188	205	191	169	156	153	150	159	170	184	182	185	211	170.1
30-Dec	220	215	242	251	264	258	245	260	183	135	147	156	234	255	251	256	243	239	175	223	230	220	194	148	226.2
31-Dec	138	157	141	150	147	155	176	186	249	257	246	228	209	197	191	237	245	238	243	203	211	218	223	236	214.6

123.4 144.1 158.8 184.7 190.5 141.4 154.3 146.1 160.4 157.3 164.7 175.9 187.4 190.8 169.5 156.6 164.5 174.8 173.8 170.0 171.8 162.8 154.6 148.2  
Diurnal Average

All monthly, daily, and diurnal averages have been calculated using vector methods



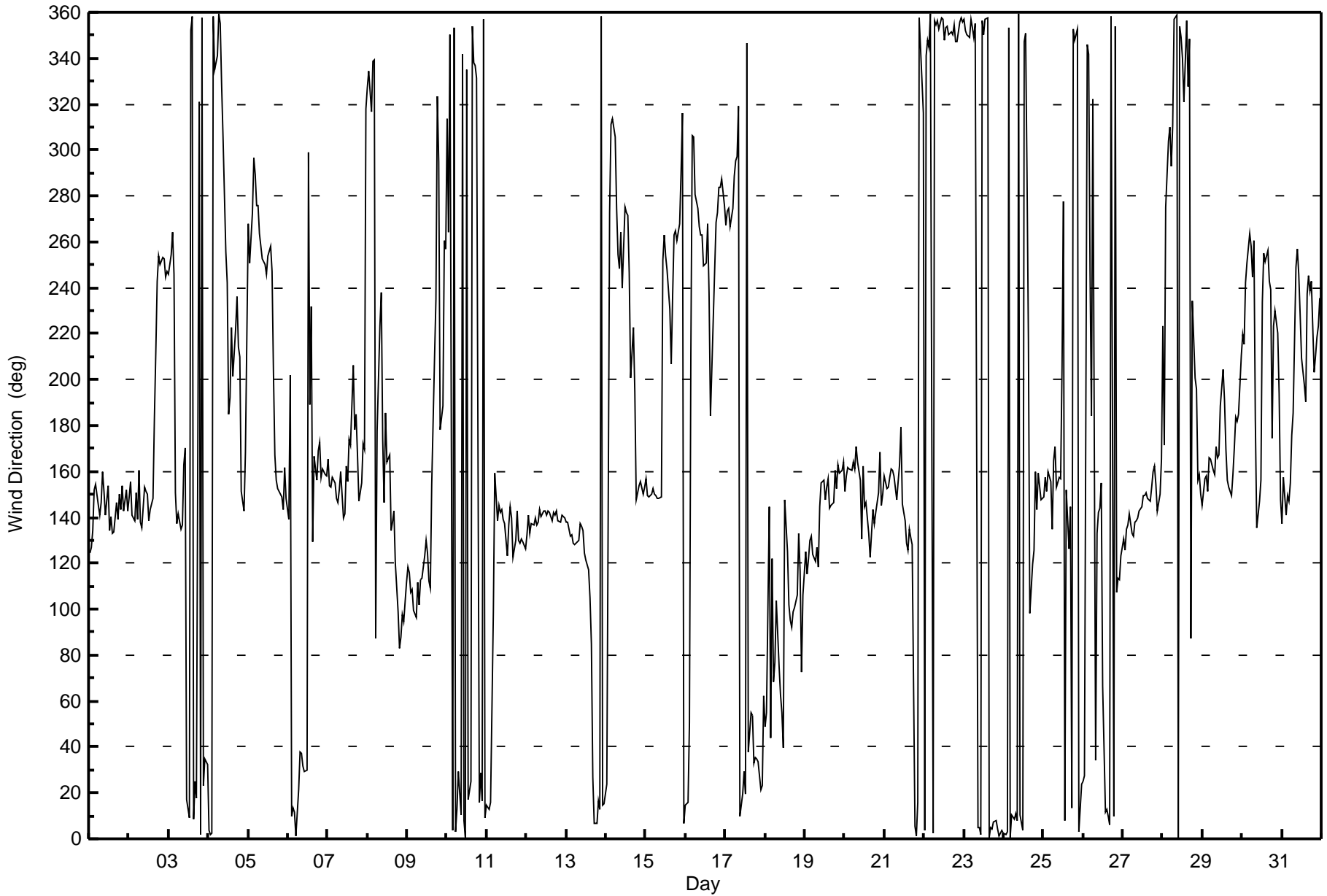
**Wood Buffalo Environmental Association**

**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**

**Buffalo Viewpoint - December 2015**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 100 deg on Dec 26 08:00 Minimum Value: 4 deg on Dec 5 21:00 Percentiles: P <sub>1</sub> = 6 P <sub>10</sub> = 11 Q <sub>1</sub> = 13 Median = 17 Q <sub>3</sub> = 21 P <sub>90</sub> = 33 P <sub>99</sub> = 72																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	10	8	13	10	5	9	5	13	7	6	12	25	17	13	13	9	14	14	11	7	8	14	5	8	25
2-Dec	9	6	9	10	11	9	19	16	16	22	16	12	15	14	21	15	20	14	15	11	12	12	14	13	22
3-Dec	14	12	23	23	63	24	13	9	9	30	38	12	14	12	18	16	13	10	29	29	18	11	12	7	63
4-Dec	24	13	13	11	20	22	12	23	28	18	23	19	35	34	17	11	20	14	18	20	18	8	15	20	35
5-Dec	41	26	24	15	15	18	16	15	13	13	14	16	17	17	13	13	29	9	9	7	4	10	10	13	41
6-Dec	52	75	9	10	5	9	9	6	17	11	19	81	98	37	35	11	18	12	11	10	9	12	13	17	98
7-Dec	15	11	12	12	13	13	18	18	18	15	15	22	22	28	17	67	61	33	15	10	12	14	33	19	67
8-Dec	12	14	10	15	25	62	34	38	32	24	23	26	25	33	21	19	21	21	17	19	18	18	20	19	62
9-Dec	18	17	17	18	19	16	23	19	19	17	16	20	21	29	38	22	20	21	19	23	34	21	24	22	38
10-Dec	30	23	29	14	13	12	14	14	18	21	13	18	37	22	26	39	16	13	14	17	10	10	14	12	39
11-Dec	13	12	15	74	43	27	12	10	16	15	18	17	17	22	18	19	21	14	19	17	17	16	16	17	74
12-Dec	17	18	16	17	19	18	18	17	18	18	18	19	18	17	17	18	18	18	18	18	19	18	18	18	19
13-Dec	17	17	17	17	18	16	17	17	17	17	19	17	18	18	22	30	20	17	16	12	14	18	17	13	30
14-Dec	51	36	47	12	11	14	22	18	19	18	25	17	18	19	31	20	13	33	13	15	17	16	15	18	51
15-Dec	16	16	14	14	15	16	16	14	11	22	24	15	12	11	20	18	23	23	29	22	15	16	12	20	29
16-Dec	15	12	53	58	12	13	18	13	11	15	17	12	12	17	31	11	15	45	17	14	14	15	15	17	58
17-Dec	16	17	17	16	16	14	13	13	25	22	22	25	21	56	26	39	34	17	15	16	27	16	16	30	56
18-Dec	18	26	61	41	89	55	29	23	20	20	24	24	41	30	18	20	19	46	45	50	16	34	29	36	89
19-Dec	17	16	21	15	17	16	17	17	20	17	23	29	21	19	16	17	19	14	14	21	19	20	17	14	29
20-Dec	10	16	12	13	13	12	11	13	12	12	14	21	24	20	18	10	12	17	16	21	14	19	18	17	24
21-Dec	18	18	17	16	16	15	14	12	9	11	13	21	26	30	18	10	12	31	61	46	51	28	27	23	61
22-Dec	11	16	19	13	14	15	15	14	14	14	17	15	13	15	16	14	14	14	14	11	12	14	14	13	19
23-Dec	14	12	13	12	13	13	12	14	13	13	14	13	13	14	14	14	13	14	13	13	12	13	13	13	14
24-Dec	12	11	12	11	13	13	12	14	15	14	17	20	34	22	59	47	59	18	14	22	20	14	10	10	59
25-Dec	9	11	9	10	13	10	17	14	15	10	20	55	24	53	55	11	26	17	14	13	14	12	19	13	55
26-Dec	14	15	26	56	44	46	63	100	41	25	26	35	53	18	17	11	20	31	21	32	40	17	18	18	100
27-Dec	18	18	16	17	15	16	16	18	18	18	18	18	18	19	19	18	19	18	18	17	12	8	9	13	19
28-Dec	43	40	26	12	14	20	20	13	13	12	14	14	18	22	14	24	54	73	45	34	27	40	19	10	73
29-Dec	5	4	10	31	43	28	19	15	24	29	18	24	16	18	17	13	10	9	12	12	14	23	24	32	43
30-Dec	23	34	16	15	14	17	15	25	19	8	18	29	44	19	13	20	23	22	33	37	16	15	26	24	44
31-Dec	11	14	20	13	24	25	27	44	18	15	15	16	15	21	15	15	14	16	13	31	27	17	16	21	44
52 75 61 74 89 62 63 100 41 30 38 81 98 56 59 67 61 73 61 50 51 40 33 36																									
Diurnal Maximum																									







# Wood Buffalo Environmental Association

## SO2 Calibration Report

### Station Information

Calibration Date	December 3, 2015	Last Calibration	November 4, 2015
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	12:25	End Time (MST)	14:20
Gas Cert Reference	LL107924	Station temp.	21 Deg C
Cal Gas Concentration	49.8 ppm	Cal Gas Exp Date	08-Spet-2018
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG Make/Model	API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2635

### Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	-593	-593
Analyzer IP address	192.168.1.43		Lamp voltage	836	839
Calculated slope	0.988402	0.987853	Chamber temp	45.0	45.0
Calculated intercept	0.625824	0.847746	Pressure	699.1	686.1
Analyzer Background	10.8	10.9	Flow	0.497	0.488
Analyzer Coefficient	0.856	0.856	Intensity	85	85

Analyzer make TEI 43i Analyzer serial # JC1327300932

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.2	----
as found span	5000	60.2	599.6	604.5	0.992
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	60.2	599.6	605.8	0.990
second point	5000	30.1	299.8	304.3	0.985
third point	5000	15.1	150.4	149.3	1.007
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	60.2	599.6	605.1	0.991
Average Correction Factor					0.994

Corrected As found 604.7 Previous response 606.0 % change 0.2%

**Notes:**

Inlet filter replaced after as founds. No adjustments.

Calibration Performed By: Asad Hidayat



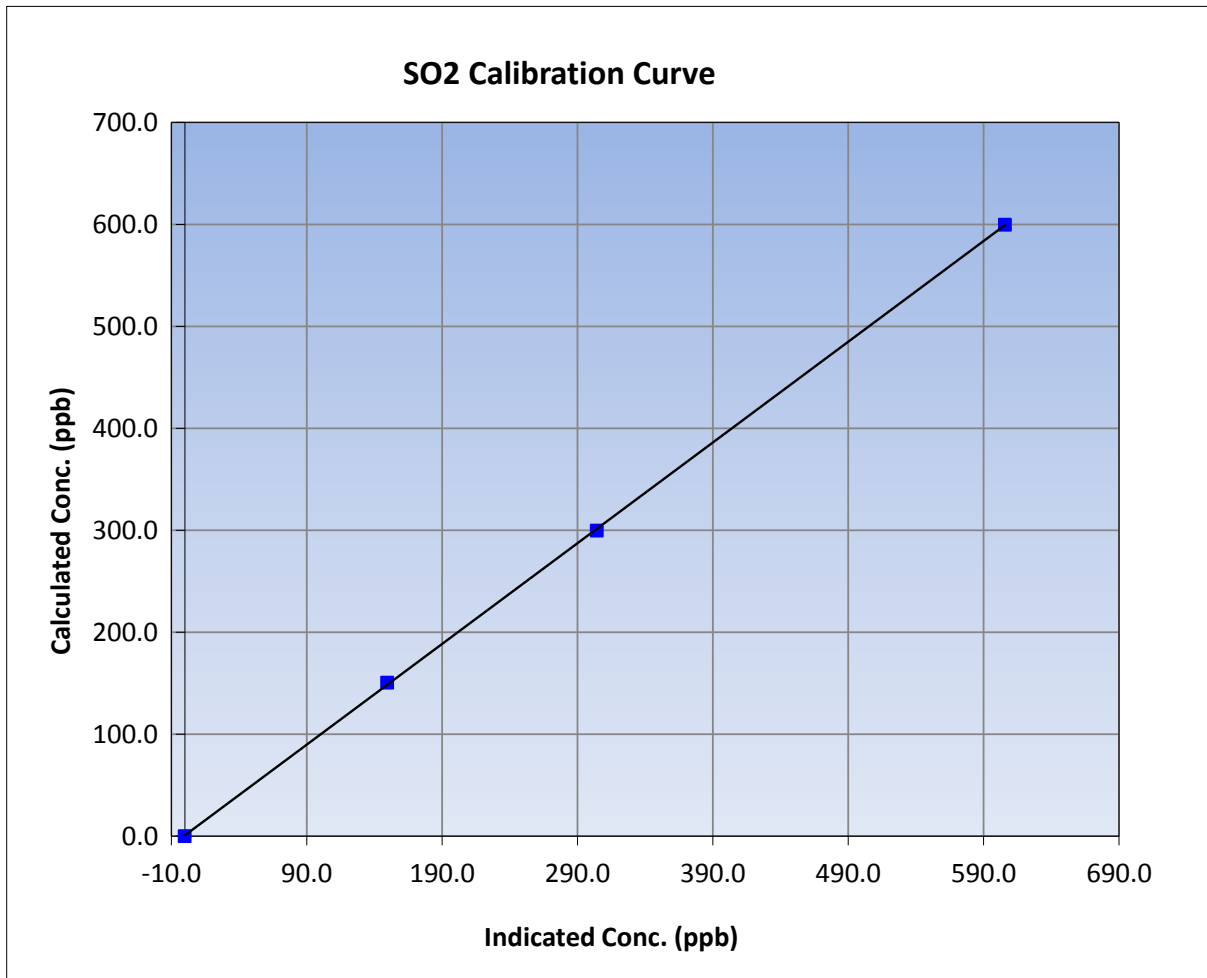
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 4, 2015
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	12:25	End Time (MST)	14:20
Analyzer make	TEI 43i	Analyzer serial #	JC1327300932

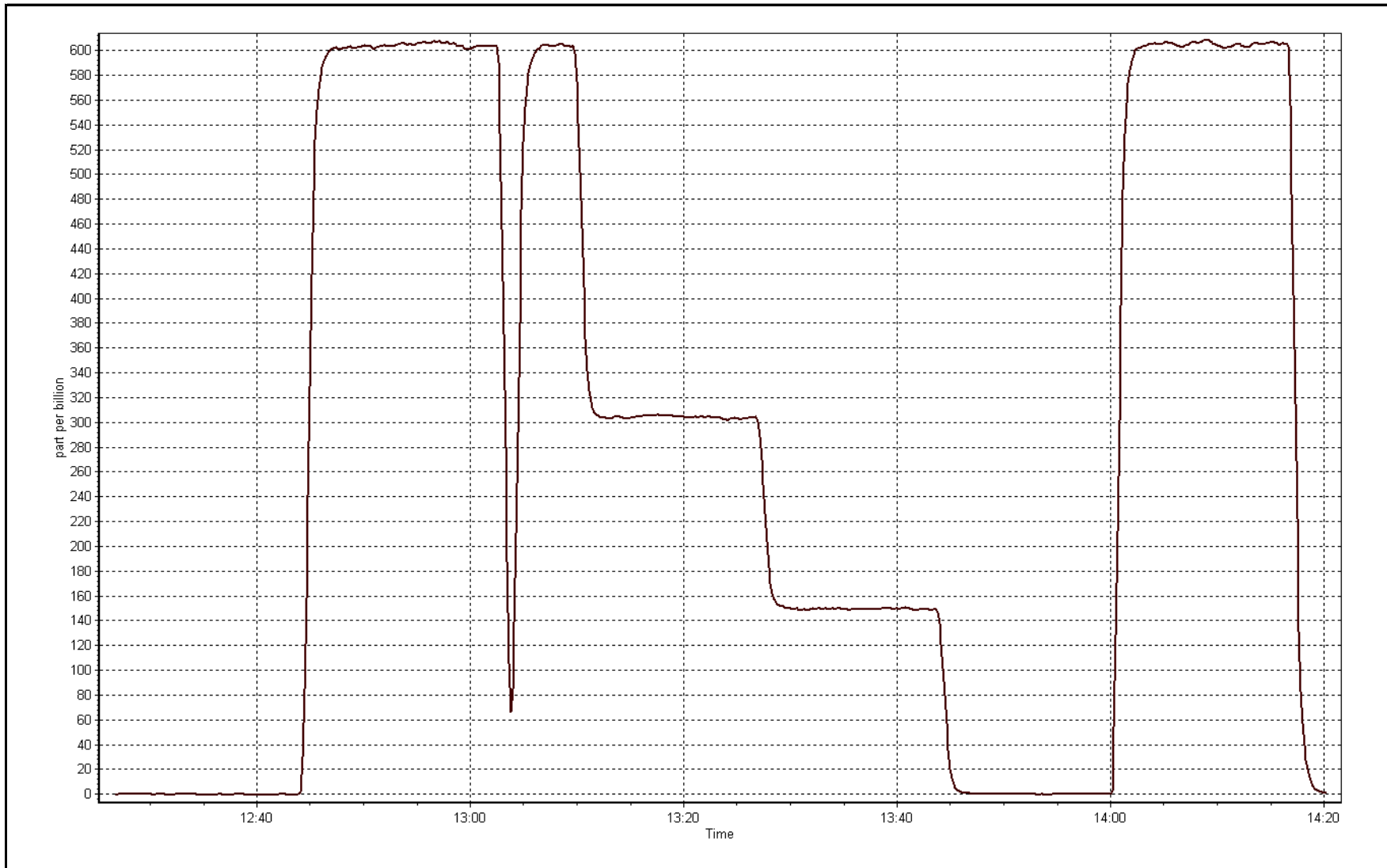
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999963
599.6	605.8	0.9898		
299.8	304.3	0.9853	Slope	0.987853
150.4	149.3	1.0071		
			Intercept	0.847746



SO2 Calibration Plot

Date: December 3, 2015





# Wood Buffalo Environmental Association H2S Calibration Report

## Station Information

Calibration Date	December 3, 2015	Last Calibration	November 10, 2015
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	9:10	End Time (MST)	12:30
Gas Cert Reference	LL101590	Station temp.	22 Deg C
Cal Gas Concentration	9.75 ppm	Cal Gas Exp Date	2/22/2016
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG air Make/Model	API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	Serial Number	2635
SO2 gas concentration	49.8 ppm	SO2 gas cert/exp	LL107924 29-May-14

## Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-616	-616
Analyzer IP address	192.168.1.42		Lamp voltage	875	876
Calculated slope	0.992587	0.994351	Chamber temp	45	45
Calculated intercept	0.179159	-0.072488	Pressure	546.0	541.8
Analyzer Background	14.6	14.2	Flow	1.039	1.031
Analyzer Coefficient	0.870	0.87	Intensity	94	95
			Converter temp.	331	331

Analyzer make/model	TEI 450i	Analyzer serial #	1336160094
Converter make/model	na	Converter serial #	na

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	-0.4	----
as found span	6000	46.1	74.9	74.8	1.001
SO2 scrubber check	5000	15.1	150.4	1.2	----
calibrator zero	6000	0.0	0.0	0.1	----
high point	6000	46.1	74.9	75.3	0.994
second point	6000	25.8	41.9	42.5	0.987
third point	6000	15.4	25.0	25.1	0.998
as left zero	5000	0.0	0.0	0.0	----
as left span	6000	46.1	74.9	75.5	0.992
Average Correction Factor					0.993

Corrected As found	75.3	Previous response	75.3	% change	0.0%
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**Notes:**

Inlet filter replaced after as founds. Sox scrubber beads replaced due to elevated response during last months calibration. Slightly adjusted zero.

Calibration Performed By: Asad Hidayat



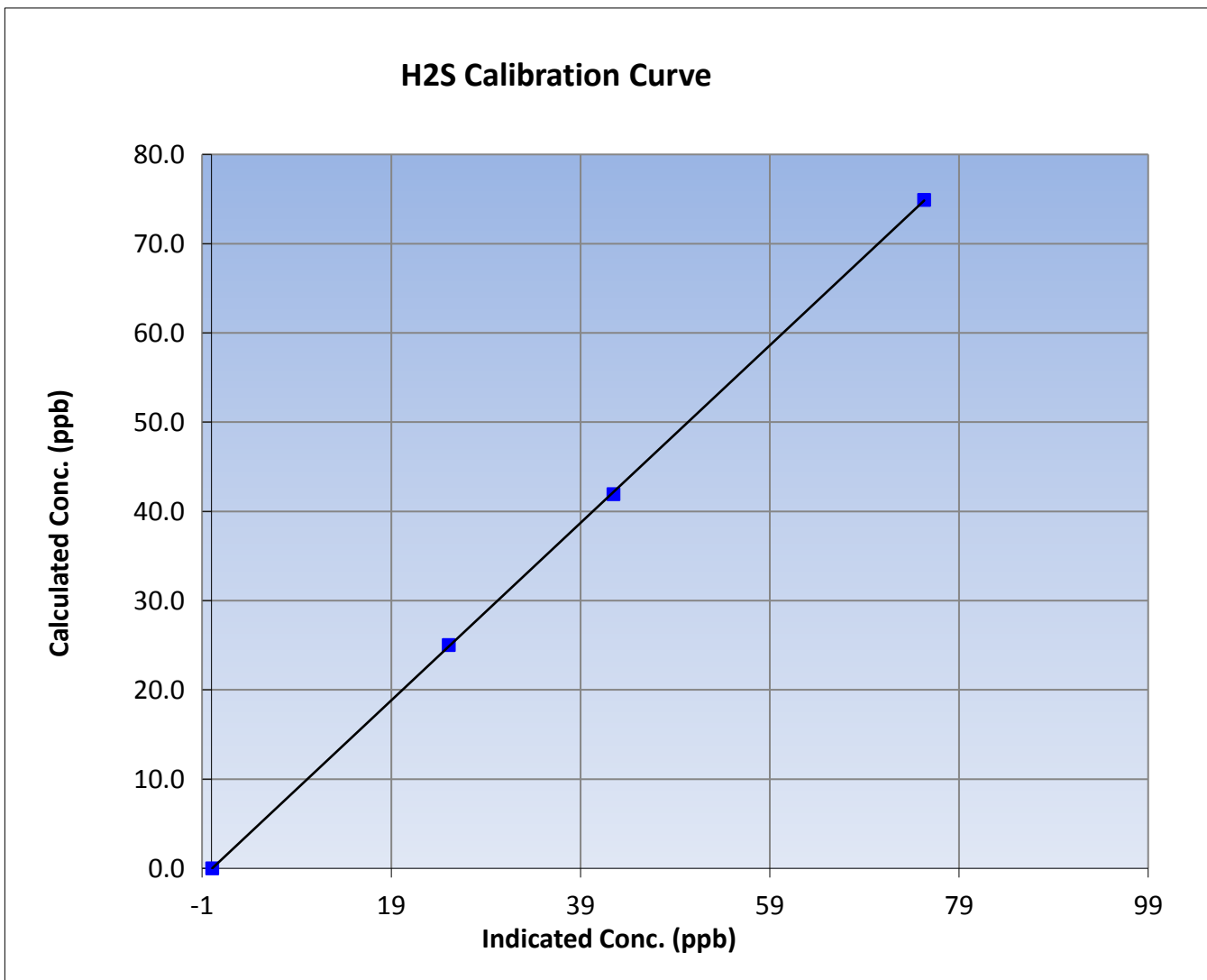
# Wood Buffalo Environmental Association H2S Calibration Report

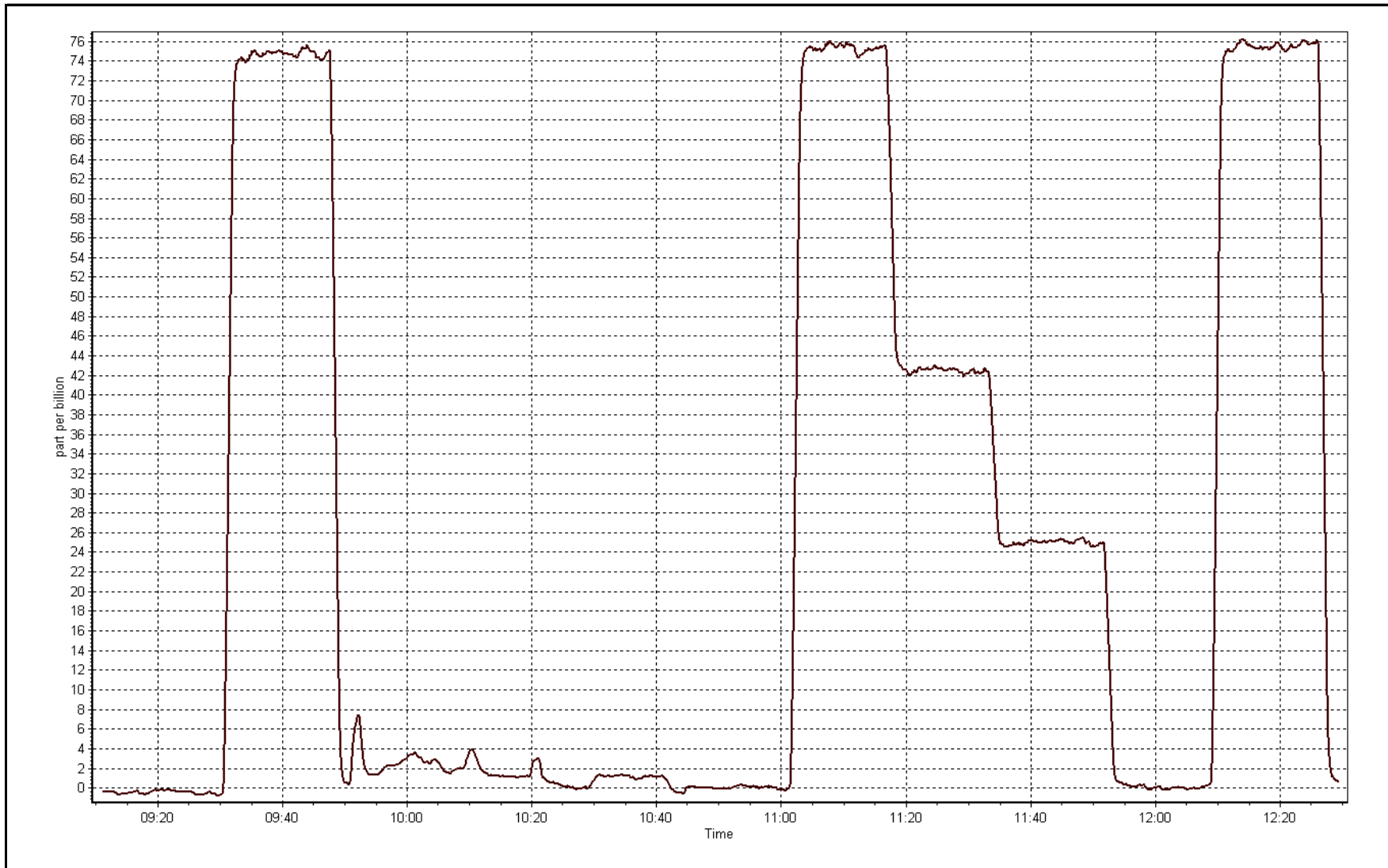
## Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 10, 2015
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	9:10	End Time (MST)	12:30
Analyzer make	TEI 450i	Analyzer serial #	1336160094

## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999968
74.9	75.3	0.9945		
41.9	42.5	0.9869	Slope	0.994351
25.0	25.1	0.9982		
			Intercept	-0.072488







# Wood Buffalo Environmental Association THC Calibration Report

### Station Information

Calibration Date	December-03-15	Last Calibration	November-04-15
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	12:25	End Time (MST)	14:20
Gas Cert Reference	LL107924	Cal Gas Expiry Date	08-Sep-18
CH4 Cal Gas Conc.	511 ppm	CH4 Equiv Conc.	1058.3 ppm
C3H8 Cal Gas Conc.	199 ppm	Station temp.	21 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11551008
ZAG make/model	Teledyne API 701	Serial Number	4297
DACS make/model	Campbell Scientific CR3000	Serial Number	2635

### Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	8.5	8.5
Analyzer IP address	192.168.1.51		Air or Bypass Press	30.4	30.4
Calculated slope	0.998294	1.003422	Fuel Pressure	19.9	19.9
Calculated intercept	-0.033436	0.010493	Analyzer Coeff	4.2	4.2
			Analyzer BKG	0.880	0.880

Analyzer make	TEI 51i-LT	Analyzer serial #	1201650671
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### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.01	----
as found span	5000	60.2	12.74	12.67	1.006
calibrator zero	5000	0.0	0.00	-0.01	----
high point	5000	60.2	12.74	12.67	1.006
second point	5000	30.1	6.37	6.39	0.997
third point	5000	15.1	3.20	3.14	1.018
as left zero	5000	0.0	0.00	-0.03	----
as left span	5000	60.2	12.74	12.70	1.003
Average Correction Factor					1.007

Corrected As found	12.68	Previous response	12.80	% change	0.9%
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**Notes:**

Inlet filter replaced after as founds. No adjustments.

Calibration Performed By:

Asad Hidayat



# Wood Buffalo Environmental Association THC Calibration Report

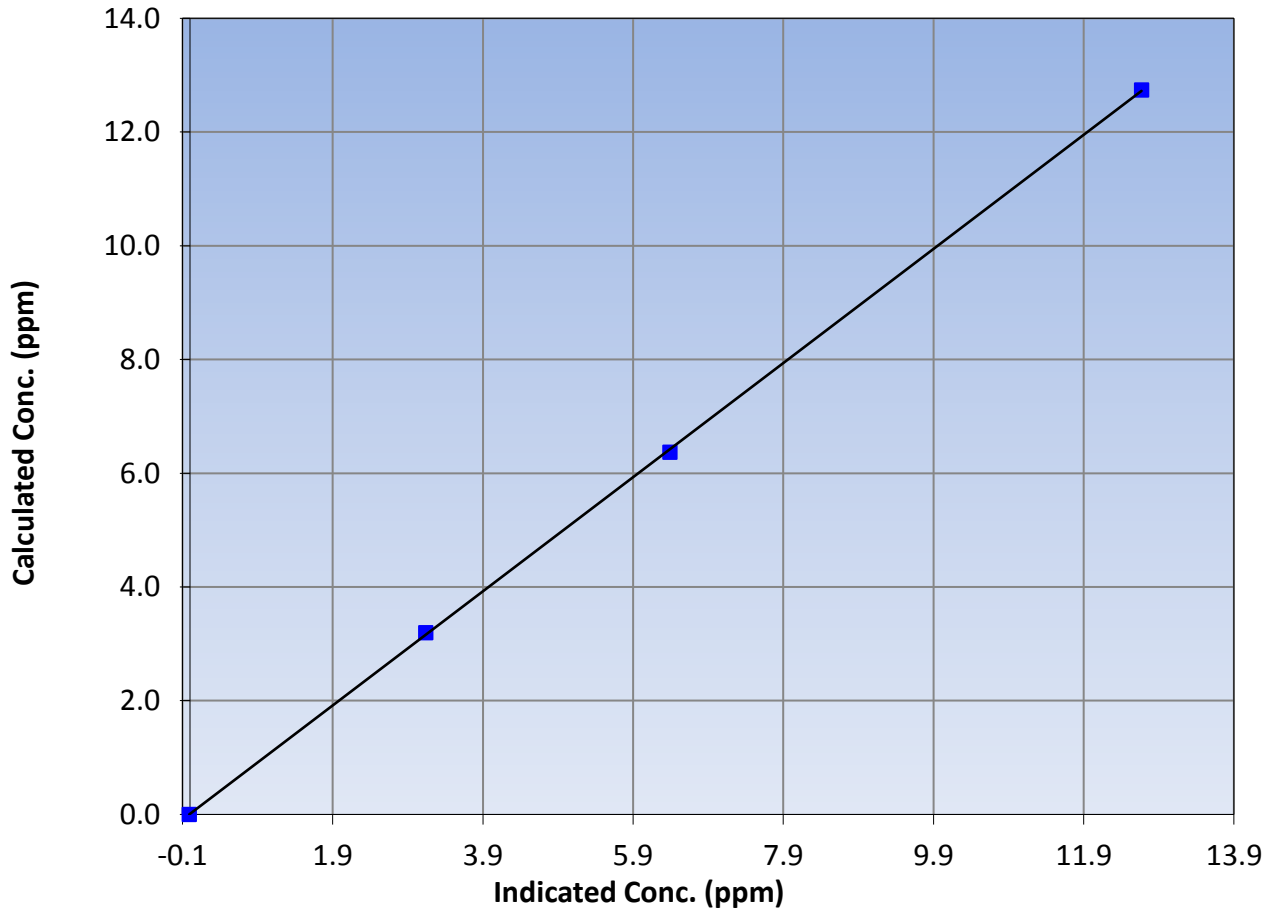
## Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 4, 2015
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	12:25	End Time (MST)	14:20
Analyzer make	TEI 51i-LT	Analyzer serial #	1201650671

## Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.01	----	Correlation Coefficient	0.999953
12.74	12.67	1.0056		
6.37	6.39	0.9970	Slope	1.003422
3.20	3.14	1.0178		
			Intercept	0.010493

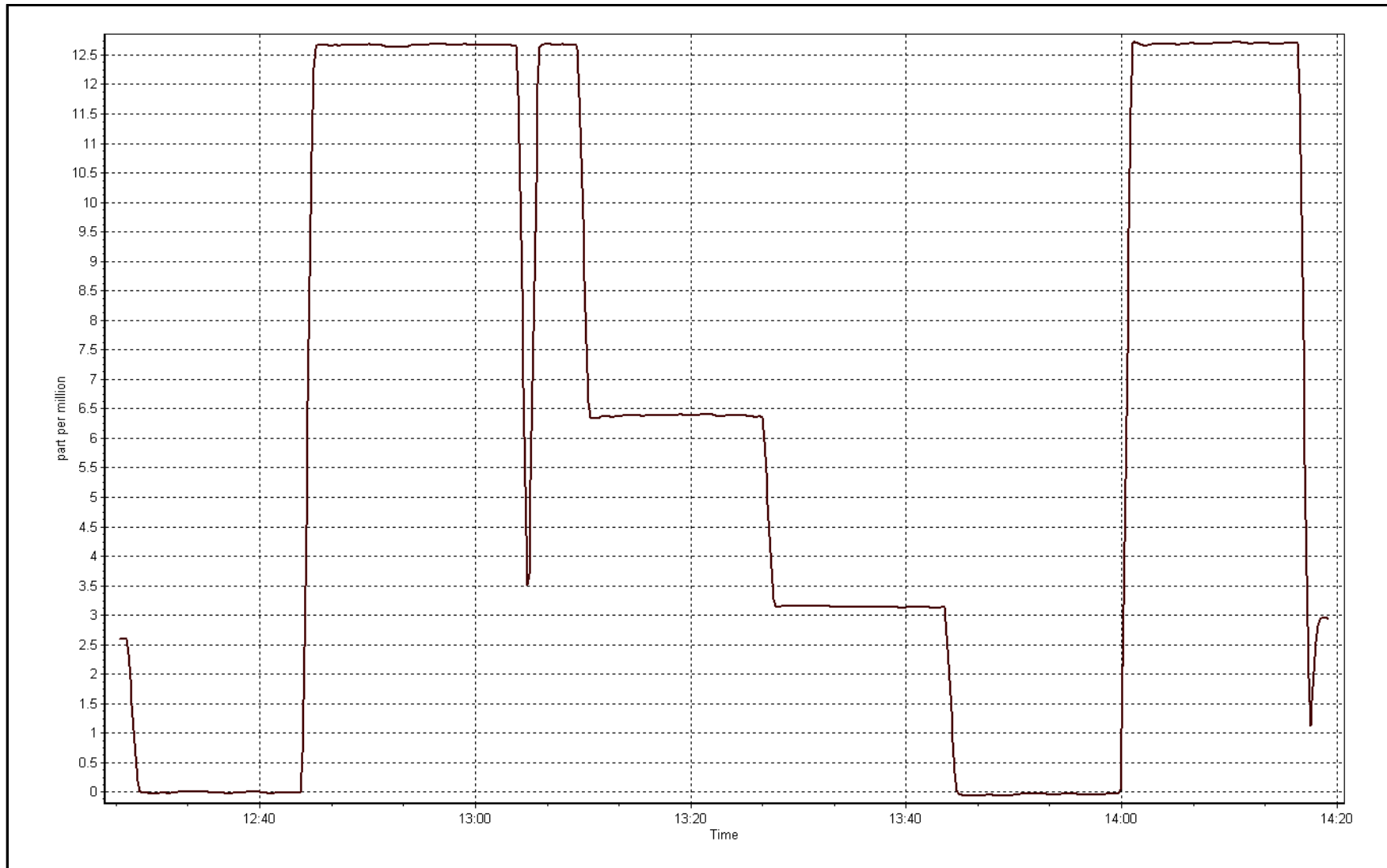
**THC Calibration Curve**





THC Calibration Plot

Date: December 3, 2015





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## WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

### CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

#### **AMS 5 MANNIX DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MANNIX (AMS 5)  
DECEMBER 2015

MONTHLY SUMMARY for  
AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	710	34	34	100.00	136	0	23	0
H2S (ppb) Average	709	34	35	99.87	5	0	2	0
THC (ppm) Average	709	34	35	99.87	7.5	-	2.9	-
Temperature 2 m (C) Average	744	0	0	100.00	5.3	-	-0.6	-
Temperature 20 m (C) Average	744	0	0	100.00	6.1	-	0.2	-
Temperature 45 m (C) Average	744	0	0	100.00	6.2	-	0.6	-
Temperature 75 m (C) Average	744	0	0	100.00	6.1	-	1.3	-
Temperature 90 m (C) Average	744	0	0	100.00	6.1	-	1.8	-
Relative Humidity 2 m (%) Average	744	0	0	100.00	95	-	93	-
Relative Humidity 20 m (%) Average	744	0	0	100.00	95	-	93	-
Relative Humidity 45 m (%) Average	744	0	0	100.00	96	-	94	-
Relative Humidity 75 m (%) Average	744	0	0	100.00	97	-	94	-
Relative Humidity 90 m (%) Average	744	0	0	100.00	97	-	94	-
Wind Speed 20 m (km/h) Average	741	0	3	99.60	23	-	16	-
Wind Speed 45 m (km/h) Average	739	0	5	99.33	29	-	22	-
Wind Speed 75 m (km/h) Average	712	0	32	95.70	33	-	25	-
Wind Speed 90 m (km/h) Average	743	0	1	99.87	36	-	27	-
Wind Direction 20 m (deg) Average	741	0	3	99.60	-	-	-	-
Wind Direction 45 m (deg) Average	739	0	5	99.33	-	-	-	-
Wind Direction 75 m (deg) Average	712	0	32	95.70	-	-	-	-
Wind Direction 90 m (deg) Average	743	0	1	99.87	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	741	0	3	99.60	0.9	-	0.5	-
Vertical Wind Speed 45 m (km/h) Average	739	0	5	99.33	1.8	-	1	-
Vertical Wind Speed 75 m (km/h) Average	712	0	32	95.70	1.5	-	0.5	-
Vertical Wind Speed 90 m (km/h) Average	743	0	1	99.87	3.1	-	1.3	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MANNIX (AMS 5)  
DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	710	2	8	-	0	0	0	0	1	4	136
H2S (ppb) Average	709	0.6	1	-	0	0	0	0	1	1	5
THC (ppm) Average	709	2.41	0.4	-	2.1	2.2	2.2	2.3	2.4	2.7	7.5
Temperature 2 m (C) Average	744	-10.5	6.1	-	-25	-18.8	-15.7	-10.9	-5.3	-3.6	5.3
Temperature 20 m (C) Average	744	-10.17	6.3	-	-23.4	-19	-15.7	-9.6	-5.2	-2.9	6.1
Temperature 45 m (C) Average	744	-10.1	6.4	-	-23	-19.1	-15.6	-9.1	-5.1	-2.3	6.2
Temperature 75 m (C) Average	744	-10.02	6.6	-	-22.7	-19.3	-15.7	-8.3	-5.2	-1.9	6.1
Temperature 90 m (C) Average	744	-10	6.6	-	-22.5	-19.3	-15.7	-8.3	-5.2	-1.6	6.1
Relative Humidity 2 m (%) Average	744	81.6	7	-	51	72	78	82	87	91	95
Relative Humidity 20 m (%) Average	744	79.7	9	-	45	68	77	81	85	89	95
Relative Humidity 45 m (%) Average	744	79.5	10	-	35	65	77	81	85	90	96
Relative Humidity 75 m (%) Average	744	79.2	11	-	33	64	77	82	86	91	97
Relative Humidity 90 m (%) Average	744	79.3	12	-	33	64	77	82	86	92	97
Wind Speed 20 m (km/h) Average	741	8.9	4	-	1	4	6	9	12	14	23
Wind Speed 45 m (km/h) Average	739	12.6	6	-	1	5	8	12	17	20	29
Wind Speed 75 m (km/h) Average	712	14.3	7	-	1	6	9	14	19	24	33
Wind Speed 90 m (km/h) Average	743	15.5	7	-	1	7	10	15	21	26	36
Wind Direction 20 m (deg) Average	741	-	-	-	-	-	-	-	-	-	-
Wind Direction 45 m (deg) Average	739	-	-	-	-	-	-	-	-	-	-
Wind Direction 75 m (deg) Average	712	-	-	-	-	-	-	-	-	-	-
Wind Direction 90 m (deg) Average	743	-	-	-	-	-	-	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	741	0.16	0.3	-	-0.9	-0.2	-0.1	0.2	0.4	0.5	0.9
Vertical Wind Speed 45 m (km/h) Average	739	0.29	0.6	-	-1.2	-0.4	-0.2	0.3	0.7	1	1.8
Vertical Wind Speed 75 m (km/h) Average	712	0.11	0.4	-	-1.1	-0.3	-0.1	0.1	0.3	0.6	1.5
Vertical Wind Speed 90 m (km/h) Average	743	0.39	0.7	-	-1.6	-0.3	0	0.3	0.8	1.2	3.1

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MANNIX (AMS 5)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
H2S	02 Dec 2015 12:00	02 Dec 2015 12:00	1	Maintenance - cleaned glass manifold
THC	21 Dec 2015 14:00	21 Dec 2015 14:00	1	Maintenance - replaced fuel cylinder
Wind Speed, Wind Direction, Vertical Wind Speed 20 m	12 Dec 2015 05:00	12 Dec 2015 07:00	3	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 45 m	02 Dec 2015 14:00	02 Dec 2015 14:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 45 m	12 Dec 2015 05:00	12 Dec 2015 08:00	4	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 75 m	08 Dec 2015 19:00	08 Dec 2015 19:00	1	Unstable Operation
Wind Speed, Wind Direction, Vertical Wind Speed 75 m	10 Dec 2015 03:00	11 Dec 2015 04:00	26	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 75 m	12 Dec 2015 05:00	12 Dec 2015 09:00	5	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction, Vertical Wind Speed 90 m	10 Dec 2015 22:00	10 Dec 2015 22:00	1	Flat line in sensor output signal - Sensor frozen

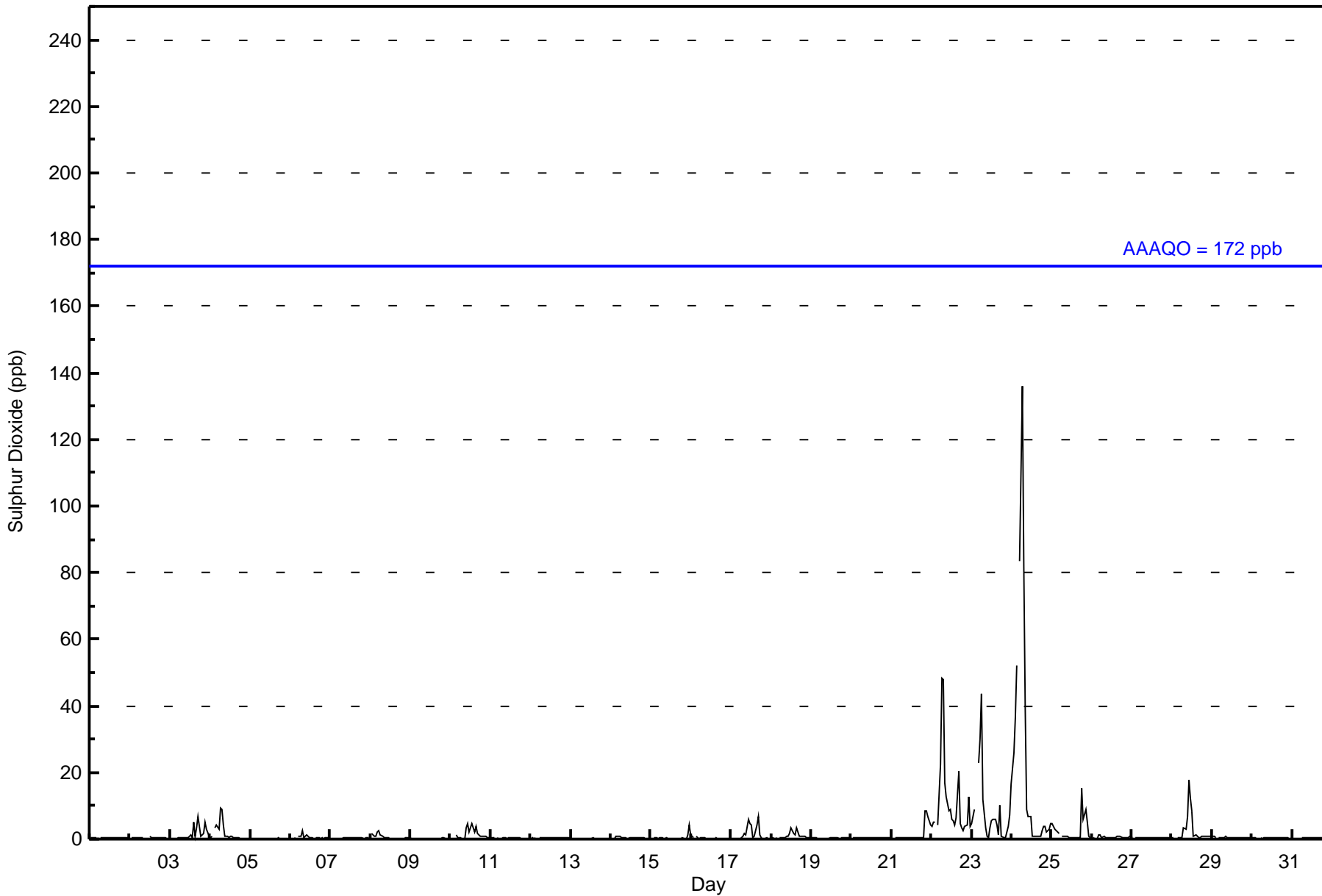


Summary of Hour Averages

Mannix - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 136 ppb on Dec 24 07:00 Maximum Daily Average: 22.6 ppb on Dec 24																	Hours in Service: 744 Hours of Data: 710									
Minimum Value: 0 ppb on Dec 9 23:00 Minimum Daily Average: 0.1 ppb on Dec 5 Maximum Diurnal Average: 8.0 ppb at hour 7 Minimum Diurnal Average: 0.7 ppb at hour 20 Monthly Average: 2.0 ppb Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 4 P <sub>99</sub> = 42																	Hours of Missing Data: 34 Hours of Calibration: 34 Percent Operational Time: 100.0									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
2-Dec	Z	0	0	0	0	0	0	0	0	C	C	C	1	1	0	0	0	0	0	0	0	0	0	0.4	1	
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	5	1	4	7	1	1	2	5	3	1.5	7	
4-Dec	1	1	Z	4	4	3	9	9	4	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1.8	9	
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
6-Dec	0	0	0	0	Z	1	1	3	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.5	3	
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
8-Dec	Z	2	1	1	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	2	
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
10-Dec	0	0	Z	1	0	0	0	0	0	3	5	2	3	5	2	4	2	1	1	1	1	1	0	1.4	5	
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.2	1	
12-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
14-Dec	Z	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4	4	
16-Dec	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
17-Dec	0	0	0	Z	0	0	0	1	2	1	6	5	4	1	1	4	7	1	0	0	0	0	0	1.5	7	
18-Dec	0	0	0	0	Z	0	0	0	0	1	1	2	3	2	1	3	2	1	1	1	1	0	0	0.9	3	
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
20-Dec	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	9	9	7	1.5	9	
22-Dec	4	5	5	Z	4	23	48	48	17	13	8	9	6	5	4	7	20	4	4	3	4	4	13	11.4	48	
23-Dec	5	7	9	Z	23	30	44	12	4	1	0	3	6	6	6	4	1	10	1	0	0	2	4	8.0	44	
24-Dec	17	26	37	Z	84	136	82	39	9	7	7	1	1	1	1	1	1	1	3	4	4	2	3	22.6	136	
25-Dec	5	4	3	3	Z	1	1	1	1	1	1	1	1	1	1	1	1	15	6	9	5	1	0	2.6	15	
26-Dec	Z	0	0	0	1	1	0	1	0	1	0	0	0	0	1	1	1	0	0	0	0	1	1	0.5	1	
27-Dec	1	Z	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0.5	1	
28-Dec	0	1	Z	1	0	1	1	3	3	7	18	12	9	1	1	1	0	0	1	1	1	1	1	2.8	18	
29-Dec	1	1	1	Z	1	0	0	1	1	0	0	0	1	0	0	1	0	0	0	1	1	0	0	0.5	1	
30-Dec	0	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
1.4 1.9 2.2 2.7 1.6 6.0 8.0 5.4 2.5 1.5 1.8 1.6 1.3 0.9 0.9 1.0 1.4 1.1 1.0 0.7 1.1 1.1 1.2 1.0																								Diurnal Average		
17 26 37 52 23 84 136 82 39 13 18 12 9 6 6 7 20 10 15 6 9 9 13 7																								Diurnal Maximum		
Z - zerospan C - Calibration Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																										







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Mannix - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	688	96.90	96.90
11 - 20	9	1.27	98.17
21 - 60	10	1.41	99.58
61 - 110	2	0.28	99.86
111 - 172	1	0.14	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



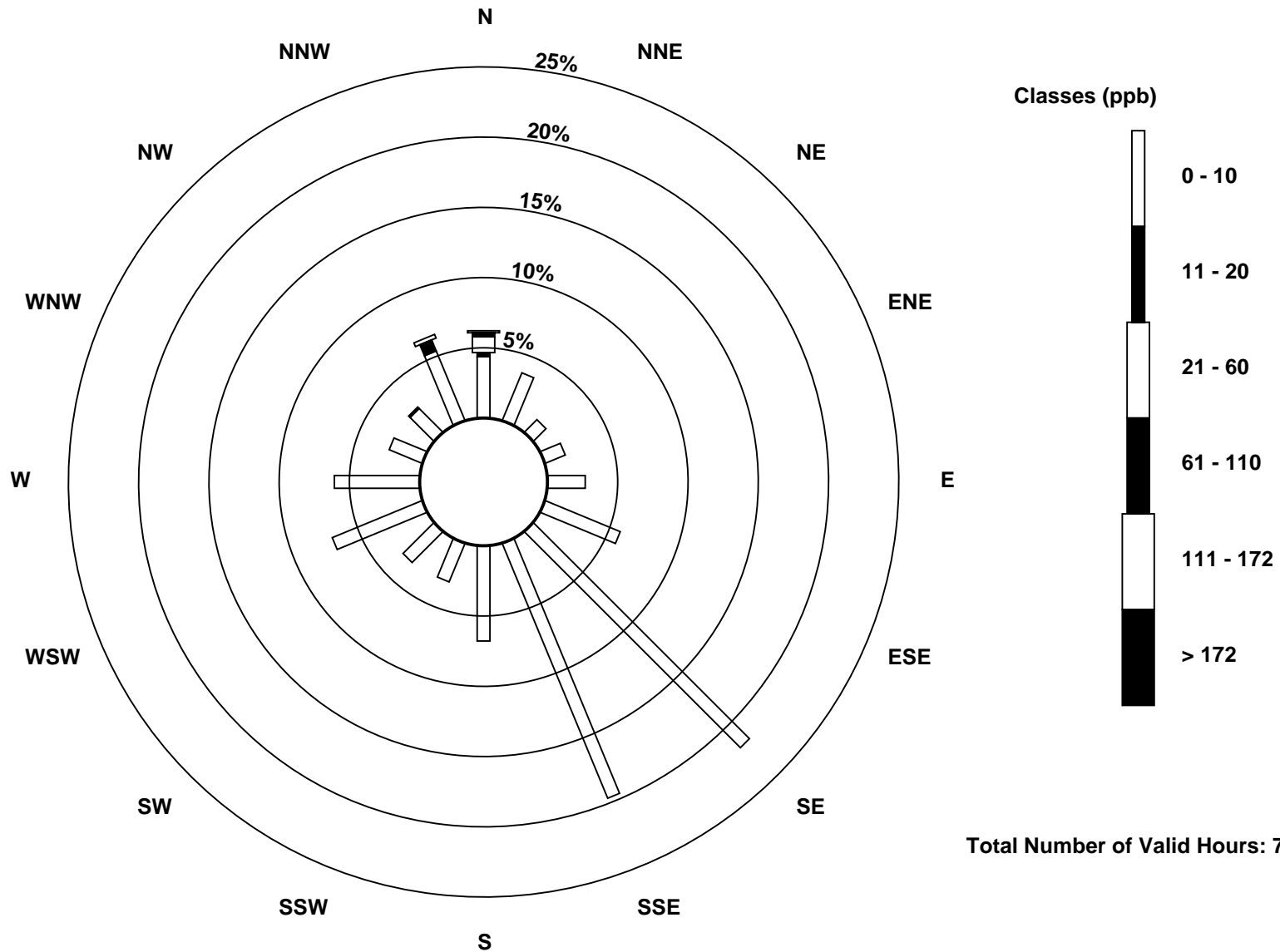
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Mannix - December 2015**

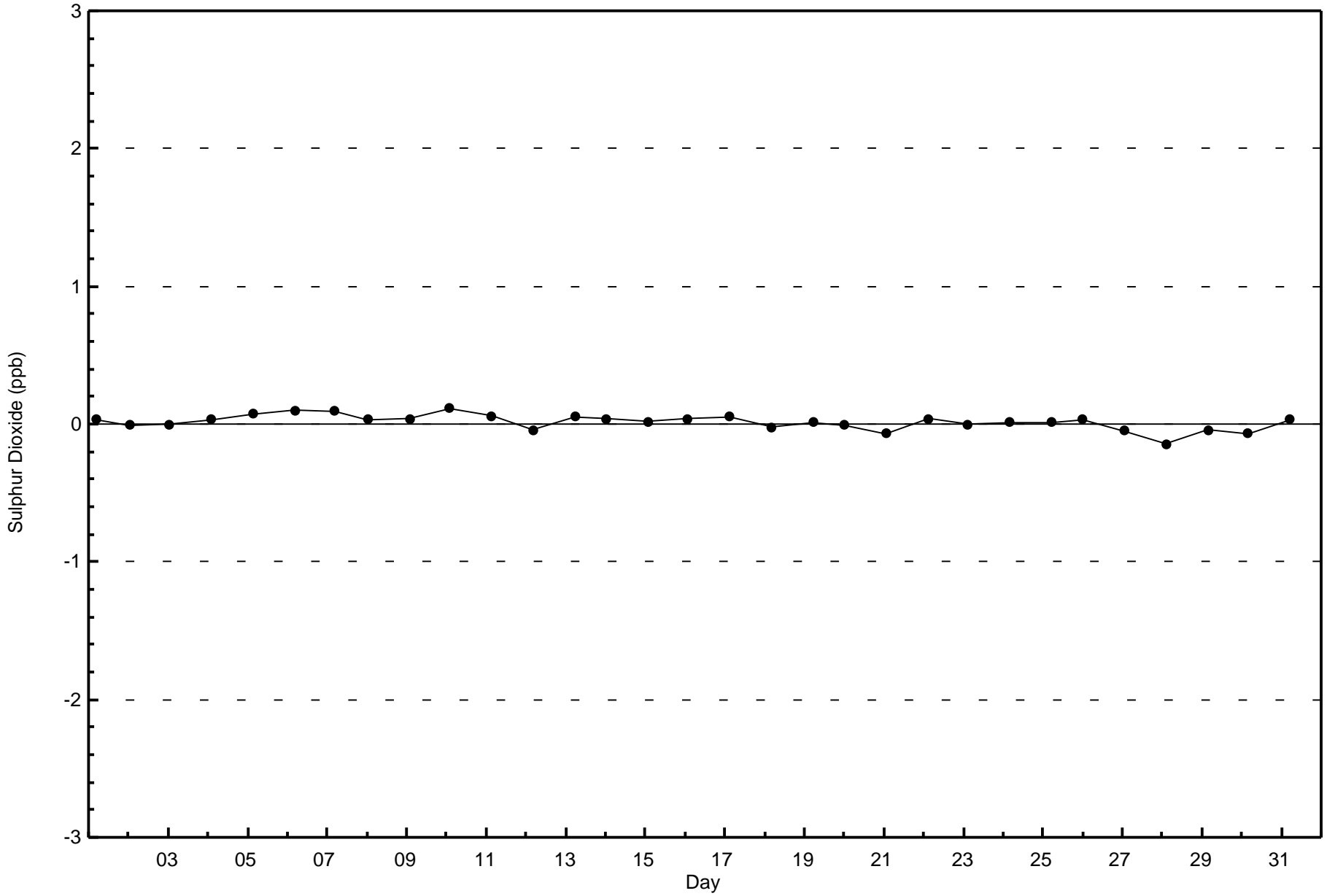
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	31	26	9	11	19	41	154	139	48	21	22	49	43	18	17	38	686
11 - 20	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	9
21 - 60	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	10
61 - 110	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
111 - 172	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	44	26	9	11	19	41	154	139	48	21	22	49	43	18	18	46	708

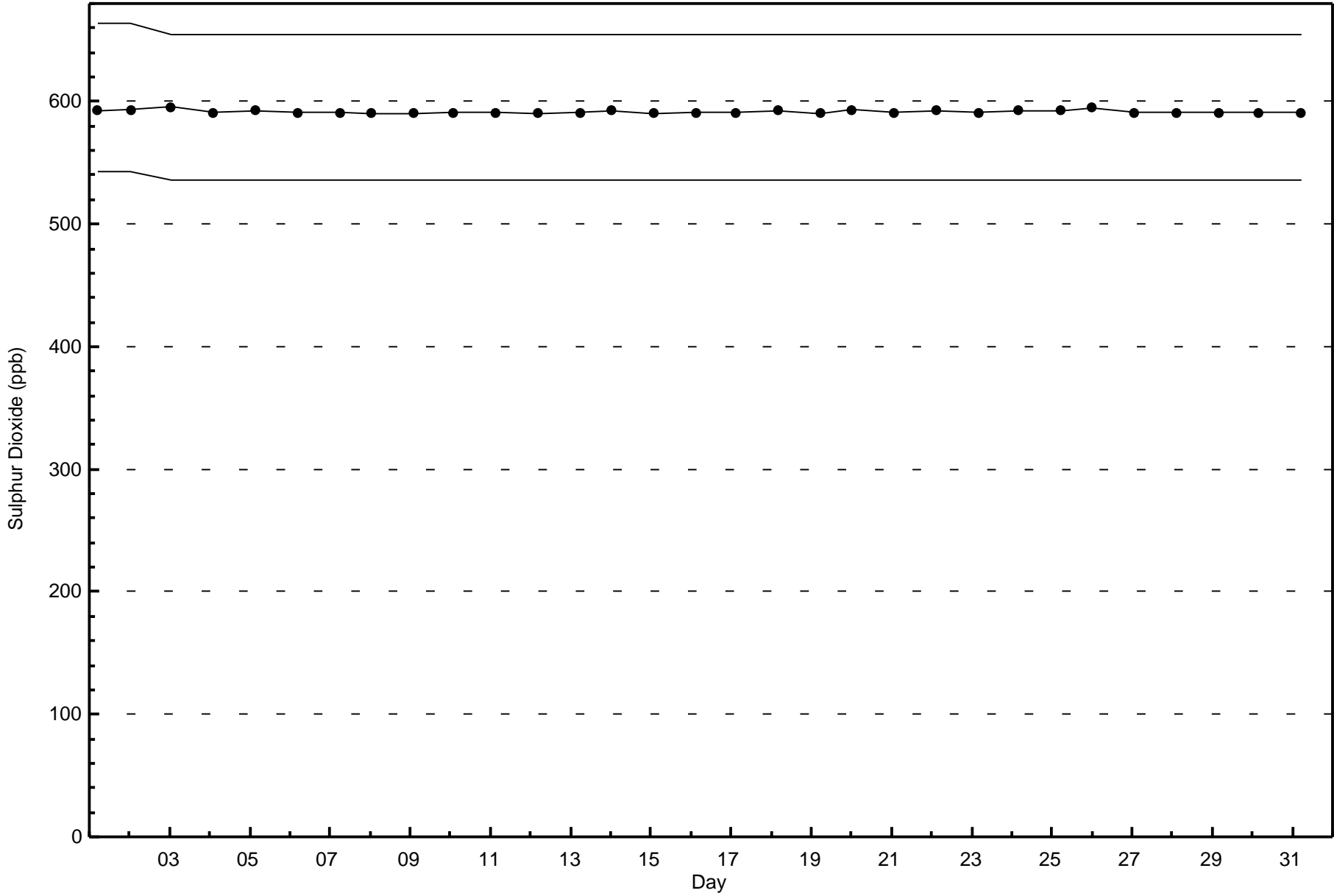
Total Number of Valid Hours: 708

Total Number of Hours: 744



Total Number of Valid Hours: 708



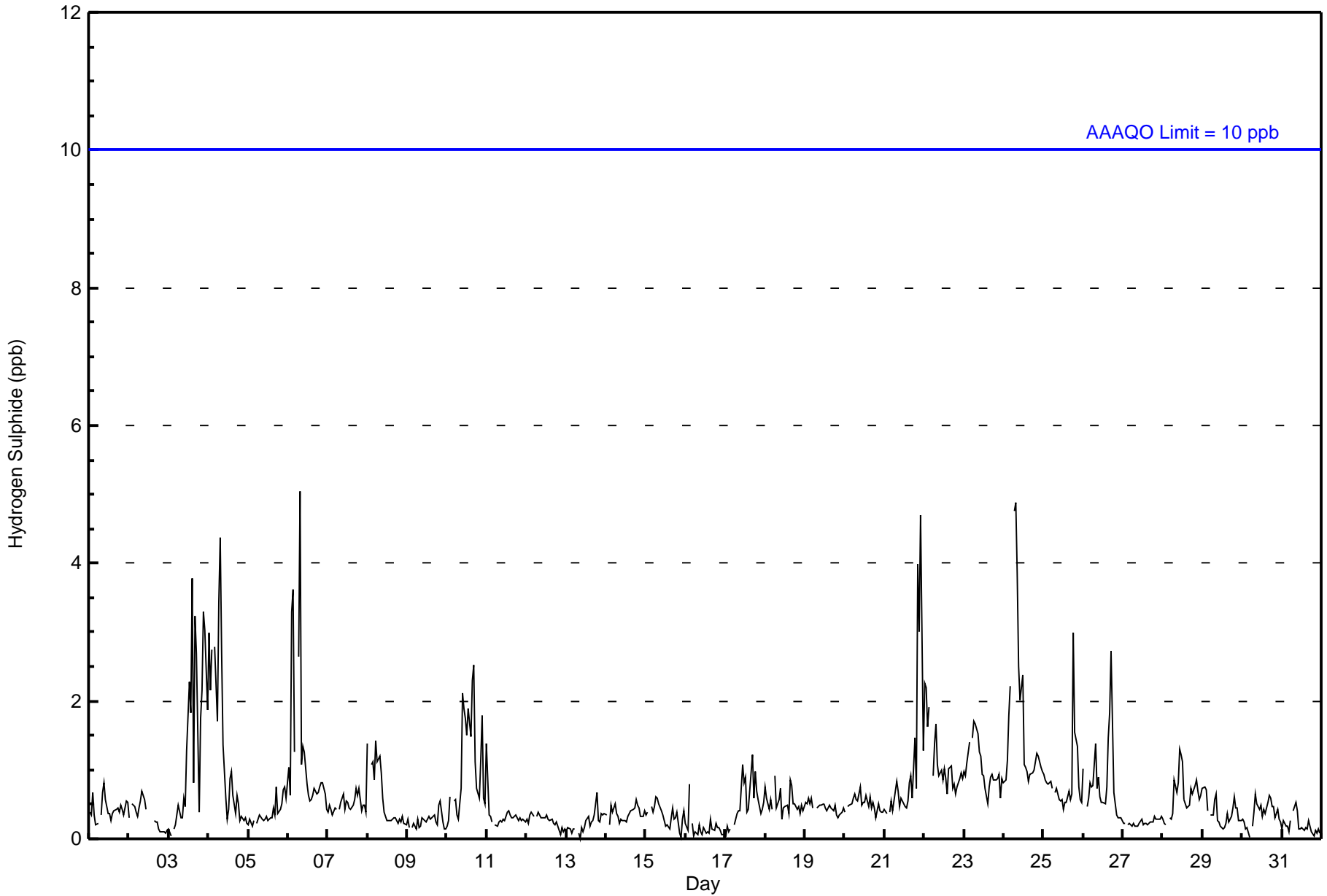




Summary of Hour Averages

Mannix - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 5 ppb on Dec 6 08:00      Maximum Daily Average: 1.7 ppb on Dec 24																	Hours in Service: 744 Hours of Data: 709									
Minimum Value: 0 ppb on Dec 13 09:00      Minimum Daily Average: 0.2 ppb on Dec 16 Maximum Diurnal Average: 1.0 ppb at hour 8      Minimum Diurnal Average: 0.5 ppb at hour 24 Monthly Average: 0.6 ppb      Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 4																	Hours of Missing Data: 35 Hours of Calibration: 34 Percent Operational Time: 99.9									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	1	0	0	0	Z	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0.4	1
2-Dec	0	Z	1	0	0	0	0	1	1	1	0	M	C	C	C	0	0	0	0	0	0	0	0	0	0.3	1
3-Dec	0	0	Z	0	0	0	0	0	0	1	0	1	2	2	4	1	3	3	0	2	2	3	3	2	1.4	4
4-Dec	3	2	3	Z	3	2	3	4	3	1	1	0	0	1	1	1	0	1	1	0	0	0	0	0	1.3	4
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0.4	1
6-Dec	1	1	3	4	1	Z	3	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1.3	5
7-Dec	0	0	0	0	0	0	Z	0	1	1	0	1	1	0	0	0	1	1	1	1	0	0	0	0	0.5	1
8-Dec	1	Z	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	1
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.3	1
10-Dec	0	0	1	Z	1	1	0	0	1	2	2	2	2	2	1	2	3	1	1	1	1	2	1	1	1.1	3
11-Dec	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.2	1
14-Dec	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.4	1
15-Dec	0	0	Z	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
16-Dec	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
17-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	1	0	0	1	1	1	1	1	1	1	0	1	0.5	1
18-Dec	1	1	0	1	0	Z	1	0	1	1	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0.5	1
19-Dec	1	0	1	1	1	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
20-Dec	0	Z	0	0	0	1	1	1	1	1	0	1	1	1	0	1	0	1	0	0	1	0	0	0	0.5	1
21-Dec	0	0	Z	0	1	0	1	1	1	0	1	1	0	0	1	1	1	1	1	1	1	4	3	5	1.1	5
22-Dec	2	2	2	2	Z	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	2
23-Dec	1	1	1	1	Z	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	2
24-Dec	1	1	1	2	2	Z	5	5	4	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1.7	5
25-Dec	1	1	1	1	1	1	Z	1	1	1	1	1	0	1	1	1	1	1	1	3	2	1	1	1	0.8	3
26-Dec	1	Z	0	1	1	1	1	1	1	1	1	1	1	1	1	2	3	1	1	0	0	0	0	0	0.8	3
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
28-Dec	0	0	0	Z	0	0	0	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	0.6	1
29-Dec	1	1	1	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.4	1
30-Dec	0	0	0	0	0	Z	0	0	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0.4	1
31-Dec	0	0	0	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
0.6 0.5 0.7 0.7 0.6 0.5 0.9 1.0 0.7 0.7 0.6 0.6 0.6 0.5 0.6 0.6 0.7 0.7 0.6 0.5 0.7 0.6 0.6 0.5																								Diurnal Average		
3 2 3 4 3 2 5 5 4 2 2 2 2 2 4 2 3 3 3 2 4 3 5 2																								Diurnal Maximum		
Z - zerospan      C - Calibration      M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb      24-hr 3 ppb																										







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Mannix - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	685	96.61	96.62
3 - 4	20	2.82	99.44
5 - 7	4	0.56	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



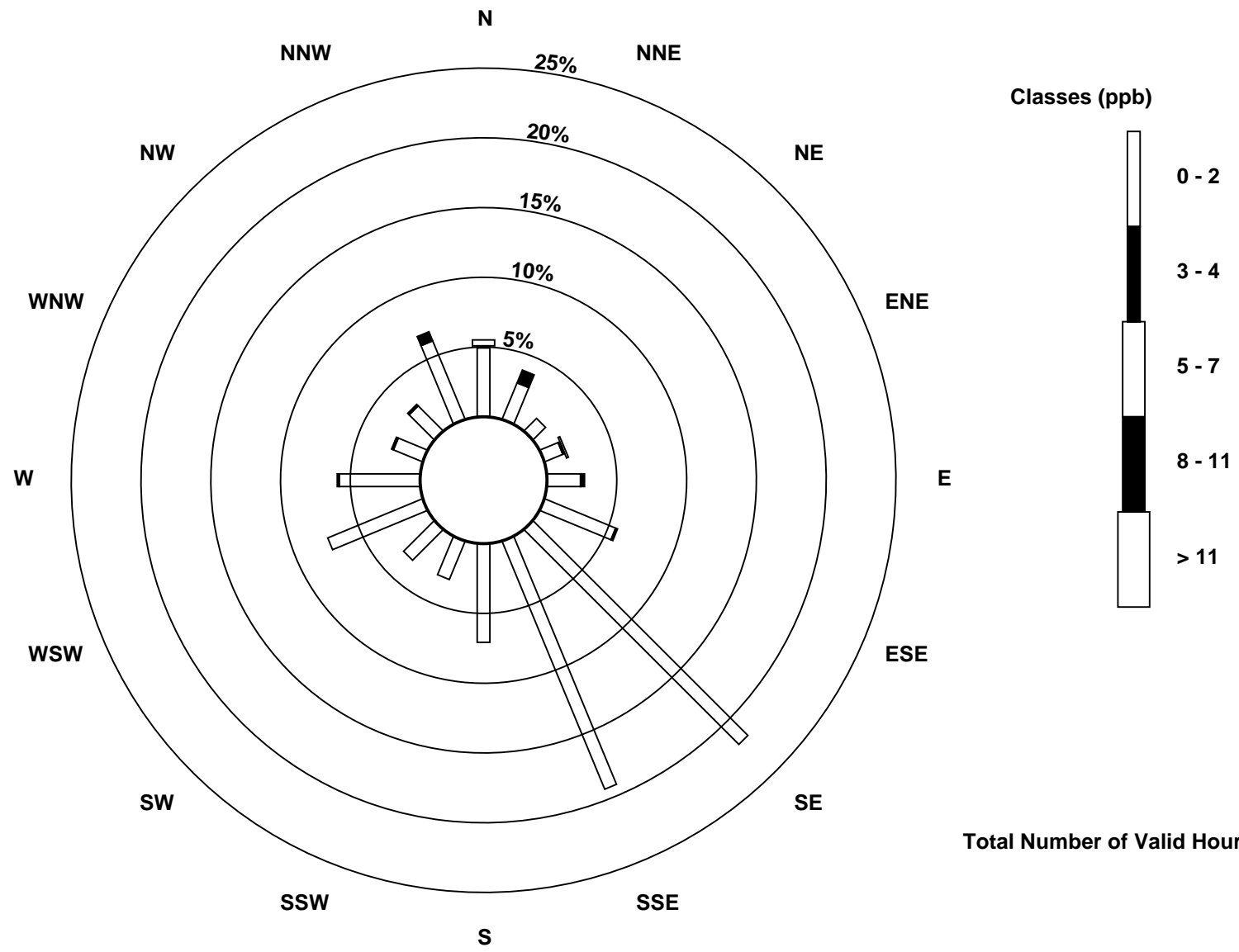
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Mannix - December 2015**

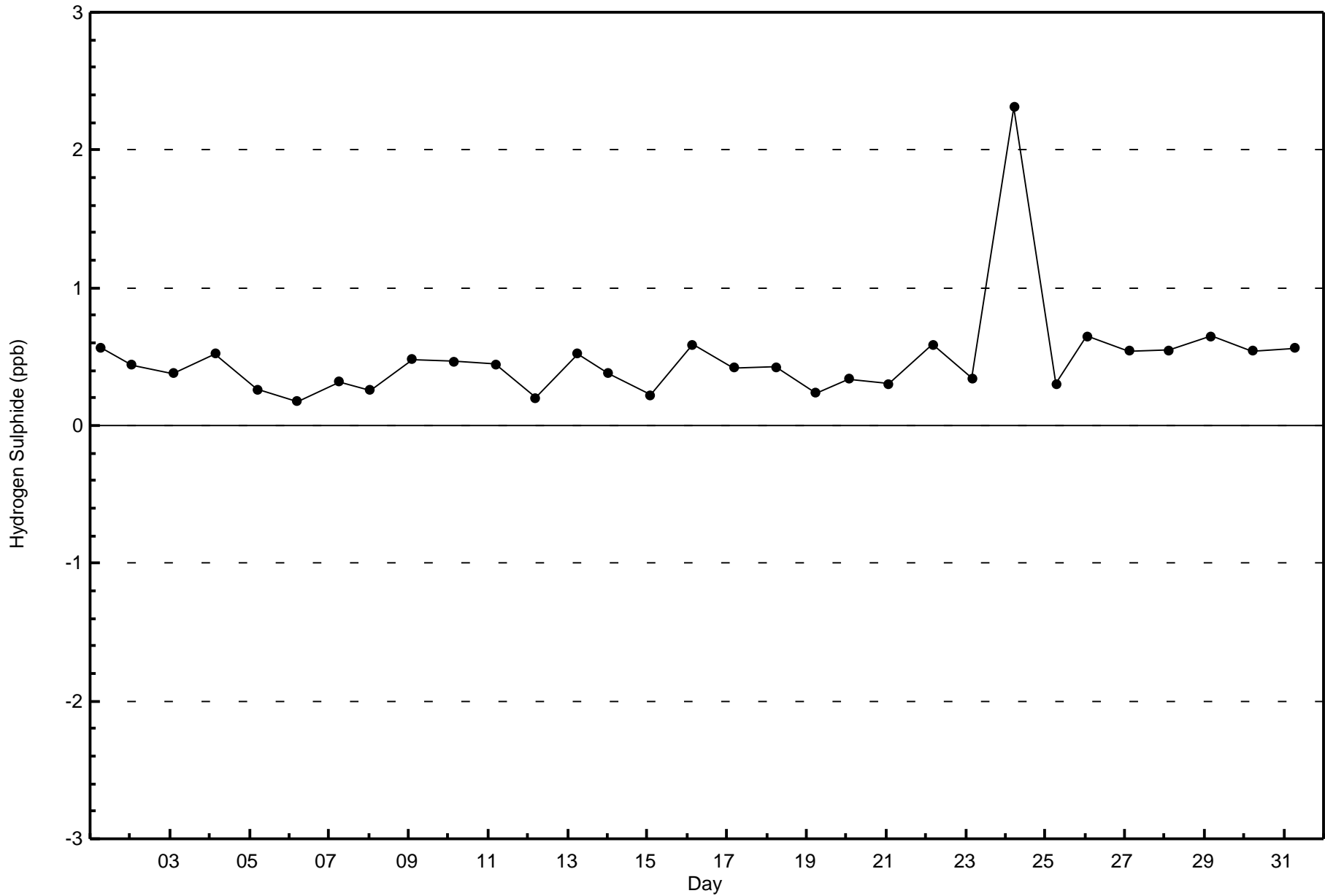
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	35	20	9	10	17	39	154	136	50	21	22	52	41	16	18	43	683
3 - 4	1	7	0	1	2	1	0	0	0	0	0	0	1	1	1	5	20
5 - 7	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	39	27	9	12	19	40	154	136	50	21	22	52	42	17	19	48	707

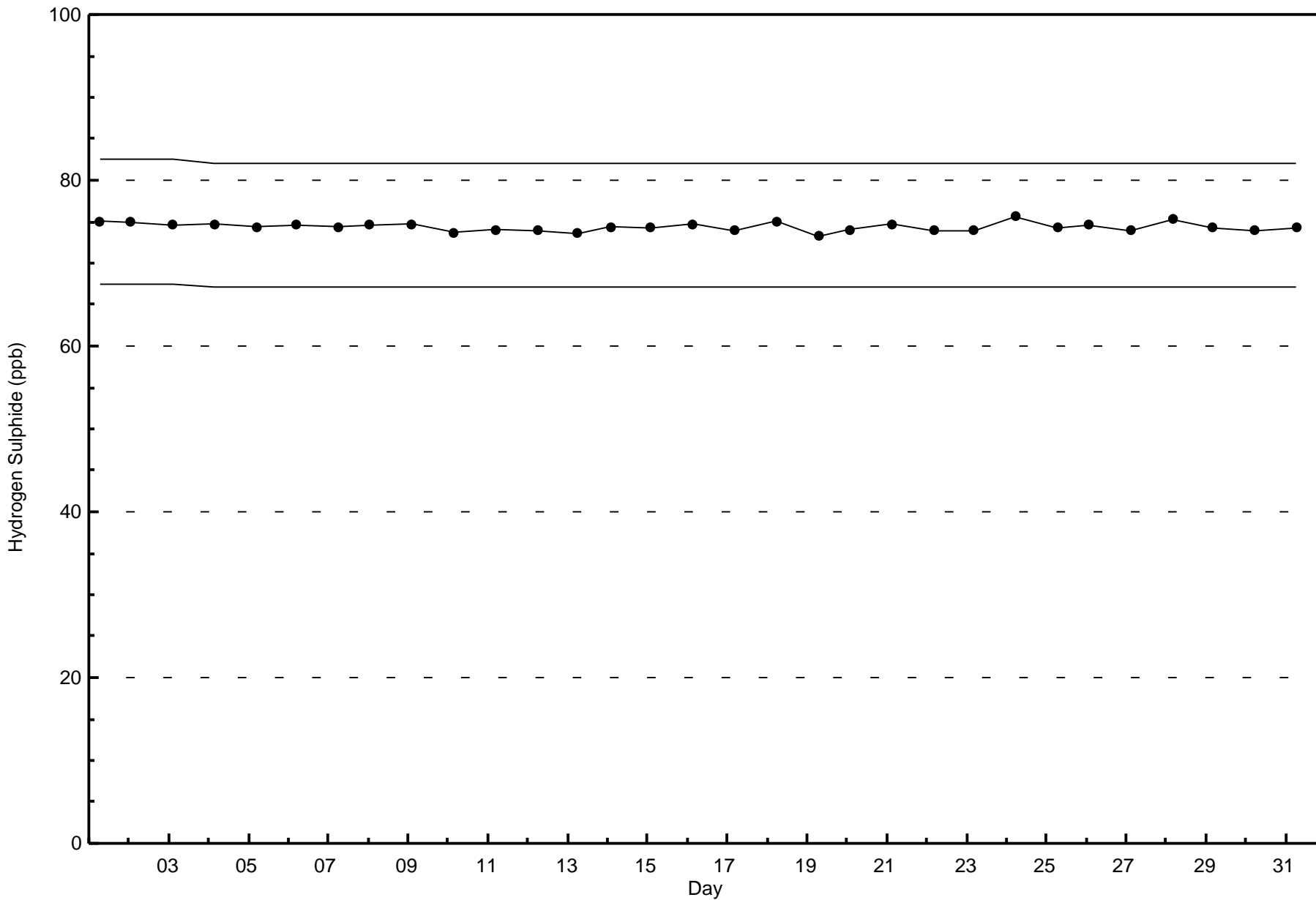
Total Number of Valid Hours: 707

Total Number of Hours: 744



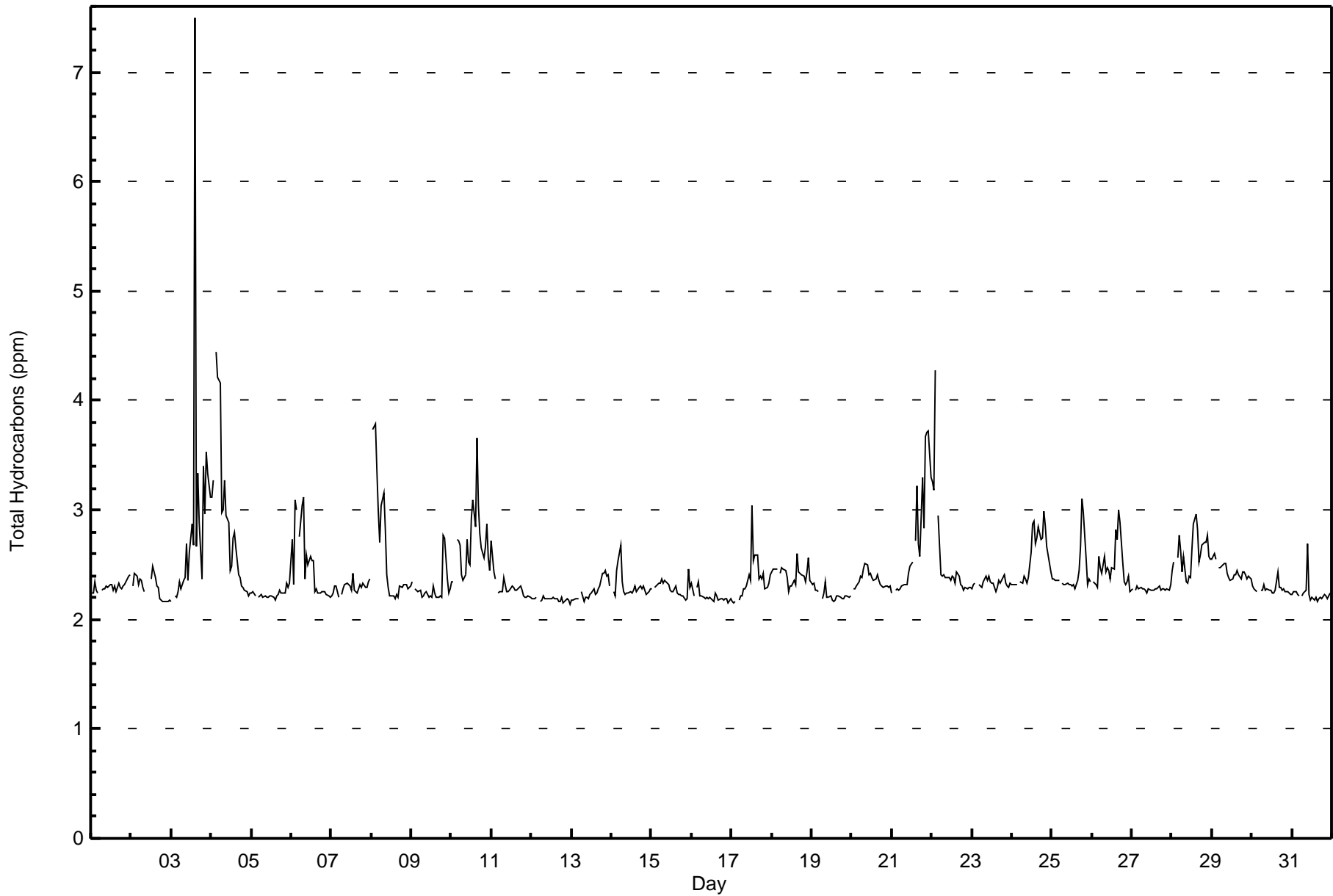
Total Number of Valid Hours: 707







Maximum Value: 7.5 ppm on Dec 3 15:00		Maximum Daily Average: 2.9 ppm on Dec 3		Hours in Service:	744																						
Minimum Value: 2.1 ppm on Dec 13 00:00		Minimum Daily Average: 2.2 ppm on Dec 12		Hours of Data:	709																						
Maximum Diurnal Average: 2.6 ppm at hour 15		Minimum Diurnal Average: 2.3 ppm at hour 12		Hours of Missing Data:	35																						
Monthly Average: 2.41 ppm		Percentiles: P <sub>1</sub> = 2.2 P <sub>10</sub> = 2.2 Q <sub>1</sub> = 2.2 Median = 2.3 Q <sub>3</sub> = 2.4 P <sub>90</sub> = 2.7 P <sub>99</sub> = 3.7		Hours of Calibration:	34																						
				Percent Operational Time:	99.9																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	2.2	2.2	2.3	2.3	2.2	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.3	2.4	
2-Dec	Z	2.3	2.4	2.4	2.3	2.4	2.4	2.3	2.3	C	C	C	2.4	2.5	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.5	
3-Dec	2.2	Z	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.7	2.4	2.6	2.9	2.7	7.5	2.7	3.3	2.9	2.4	3.4	3.0	3.5	3.3	3.1	2.9	7.5	
4-Dec	3.1	3.3	Z	4.4	4.2	4.2	3.0	3.0	3.3	3.0	2.9	2.4	2.5	2.7	2.8	2.6	2.4	2.4	2.3	2.3	2.3	2.2	2.2	2.2	2.9	4.4	
5-Dec	2.2	2.3	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.3	2.3	2.3	2.2	2.3	
6-Dec	2.7	2.3	3.1	3.0	Z	2.8	3.0	3.1	2.4	2.6	2.5	2.6	2.5	2.5	2.3	2.3	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.5	3.1	
7-Dec	2.2	2.2	2.3	2.3	2.2	Z	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.4
8-Dec	Z	3.7	3.8	3.4	3.0	2.7	3.0	3.2	2.8	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.6	3.8
9-Dec	2.3	Z	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.8	2.7	2.4	2.2	2.3	2.3	2.8
10-Dec	2.3	2.4	Z	2.7	2.7	2.7	2.4	2.4	2.4	2.7	2.5	2.5	2.9	3.1	2.9	3.7	3.0	2.8	2.7	2.6	2.7	2.9	2.6	2.4	2.7	3.7	
11-Dec	2.7	2.4	2.4	Z	2.2	2.3	2.2	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.7	
12-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.2
13-Dec	2.2	2.2	2.2	2.2	2.2	Z	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.4	
14-Dec	Z	2.2	2.2	2.4	2.5	2.7	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.7	
15-Dec	2.3	Z	2.3	2.3	2.3	2.3	2.4	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.5	2.3	2.3	2.5	
16-Dec	2.3	2.2	Z	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	
17-Dec	2.2	2.1	2.2	Z	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.4	3.0	2.5	2.6	2.6	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.4	2.4	3.0
18-Dec	2.4	2.5	2.5	2.5	Z	2.4	2.5	2.5	2.5	2.4	2.3	2.3	2.3	2.4	2.3	2.6	2.4	2.4	2.4	2.4	2.4	2.4	2.6	2.4	2.4	2.6	
19-Dec	2.3	2.3	2.3	2.3	2.3	Z	2.2	2.2	2.4	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4	
20-Dec	Z	2.3	2.3	2.3	2.3	2.4	2.4	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.5	
21-Dec	2.2	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.5	2.5	M	2.7	3.2	2.7	2.6	3.3	2.8	3.7	3.7	3.7	3.3	2.7	3.7	
22-Dec	3.3	3.2	4.3	Z	2.9	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.5	4.3
23-Dec	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.4	2.3	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.4
24-Dec	2.3	2.3	2.3	2.3	Z	2.3	2.3	2.4	2.4	2.3	2.4	2.6	2.9	2.9	2.7	2.7	2.8	2.7	2.7	2.7	3.0	2.9	2.7	2.5	2.4	2.6	3.0
25-Dec	2.4	2.4	2.4	2.4	2.4	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.7	3.1	3.0	2.5	2.3	2.4	2.3	2.4	3.1	
26-Dec	Z	2.3	2.3	2.3	2.6	2.5	2.4	2.6	2.4	2.5	2.5	2.4	2.5	2.5	2.8	2.7	3.0	2.9	2.5	2.4	2.3	2.3	2.4	2.3	2.5	3.0	
27-Dec	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
28-Dec	2.4	2.5	Z	2.6	2.8	2.6	2.4	2.6	2.3	2.3	2.4	2.4	2.6	2.9	3.0	2.8	2.5	2.6	2.7	2.7	2.7	2.8	2.6	2.5	2.6	3.0	
29-Dec	2.5	2.6	2.6	Z	2.5	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.6	
30-Dec	2.3	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.3	2.4	2.3	2.3	2.3	2.3	2.2	2.3	2.2	2.2	2.3	2.4	
31-Dec	2.2	2.3	2.3	2.2	2.2	Z	2.2	2.2	2.3	2.7	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.7	
																								Diurnal Average			
																								Diurnal Maximum			
																								Z - zerospan C - Calibration M - Maintenance			





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Mannix - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	0	0.00	0.00
2.1 - 3.0	679	95.77	95.77
3.1 - 10.0	30	4.23	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744





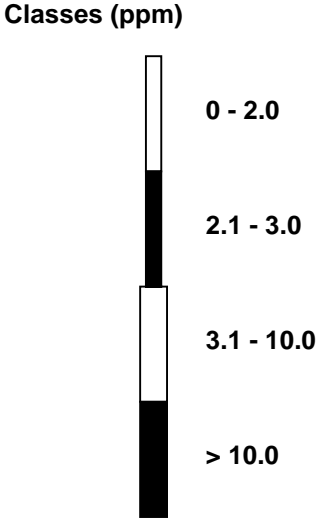
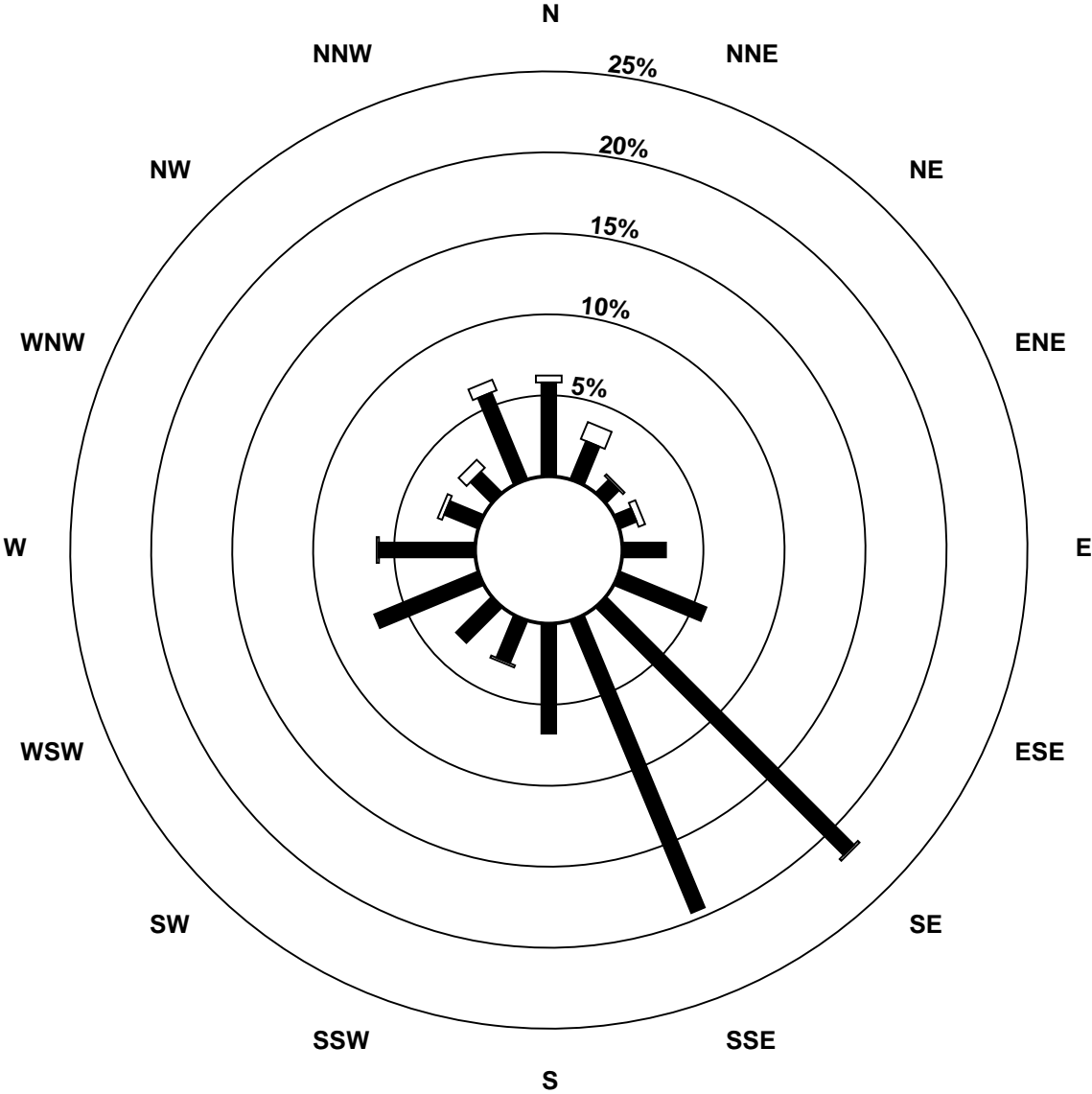
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Mannix - December 2015**

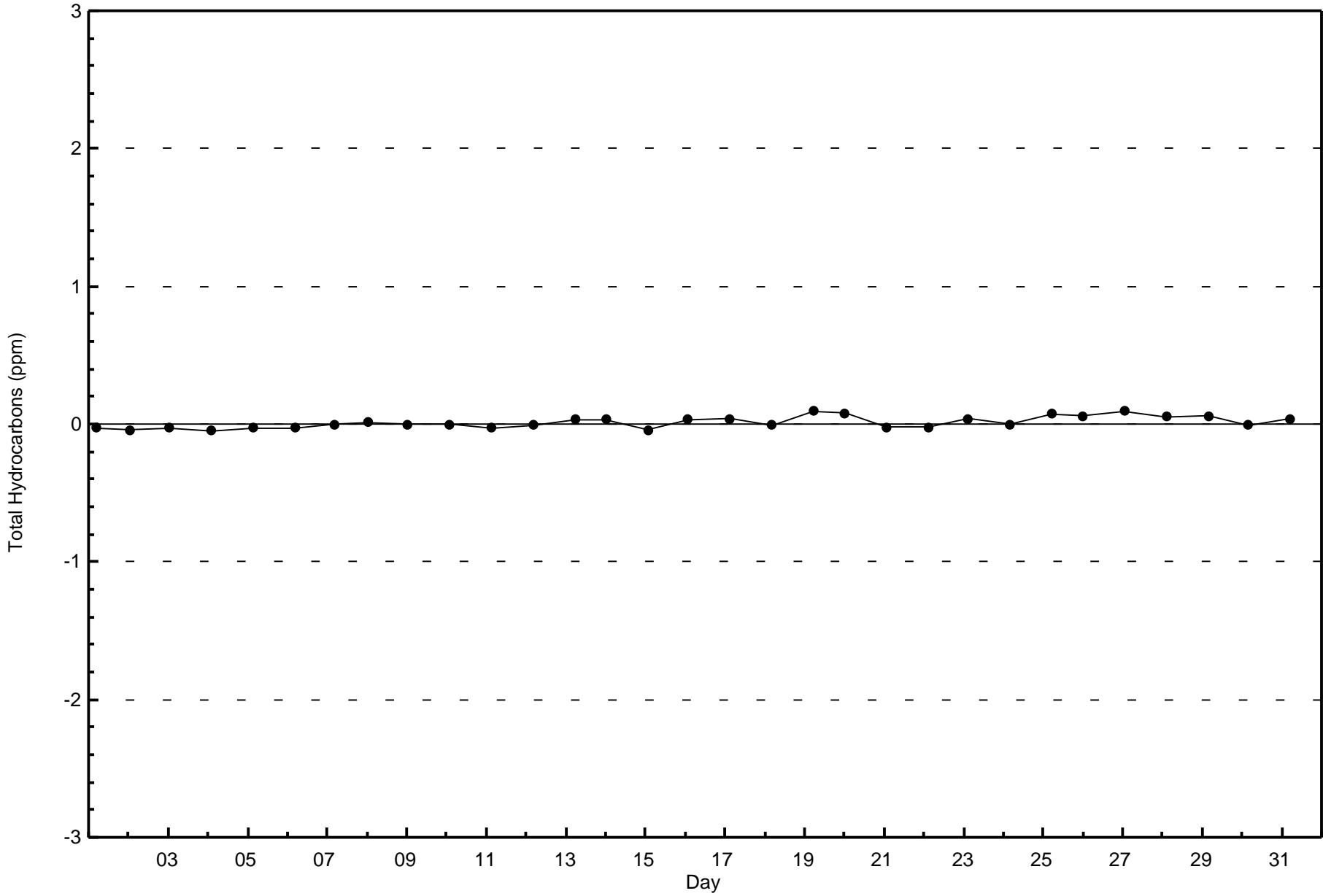
Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.1 - 3.0	41	18	8	8	19	41	153	138	48	20	22	49	42	16	13	41	677
3.1 - 10.0	3	8	1	3	0	0	1	0	0	1	0	0	1	2	5	5	30
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	44	26	9	11	19	41	154	138	48	21	22	49	43	18	18	46	707

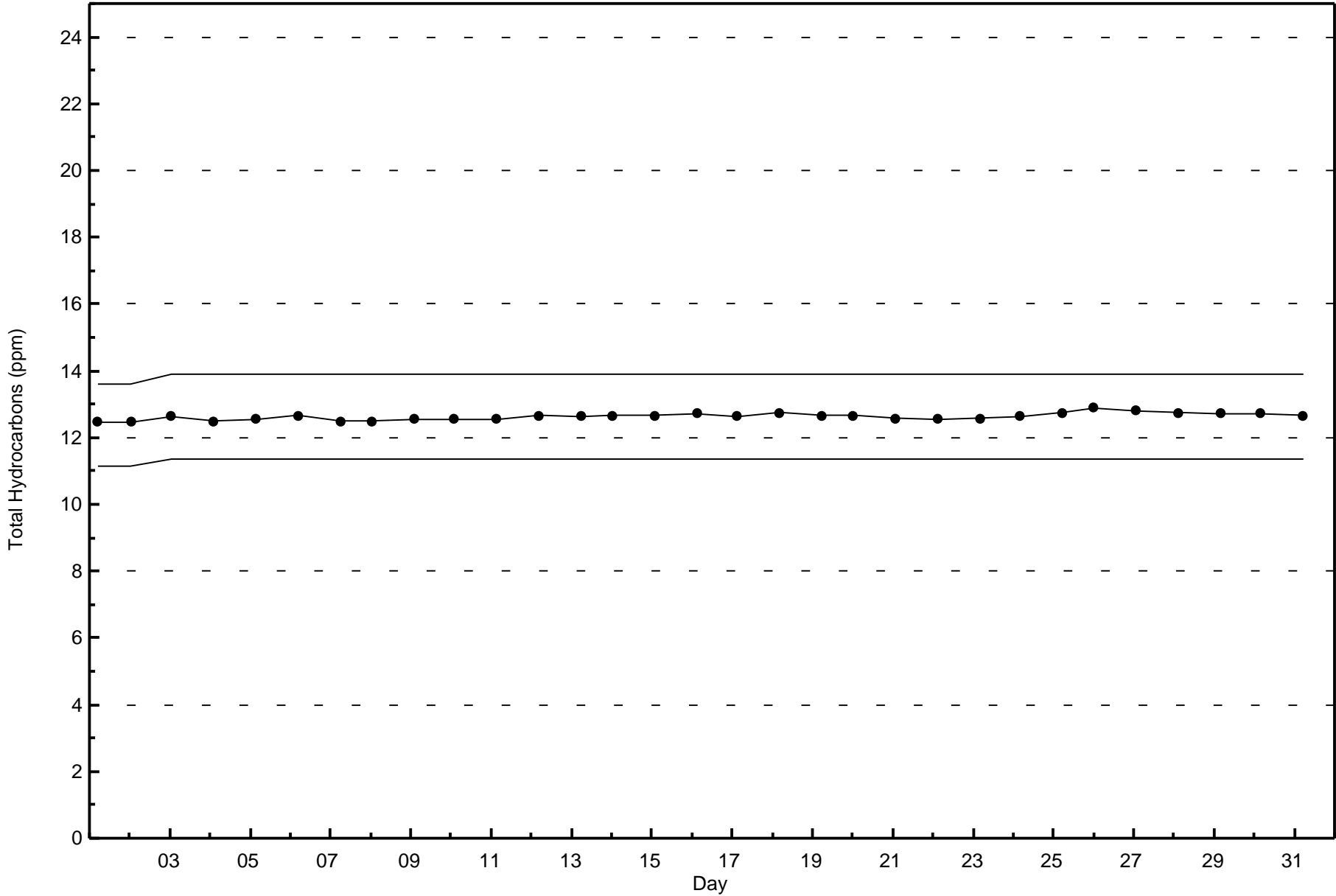
Total Number of Valid Hours: 707

Total Number of Hours: 744



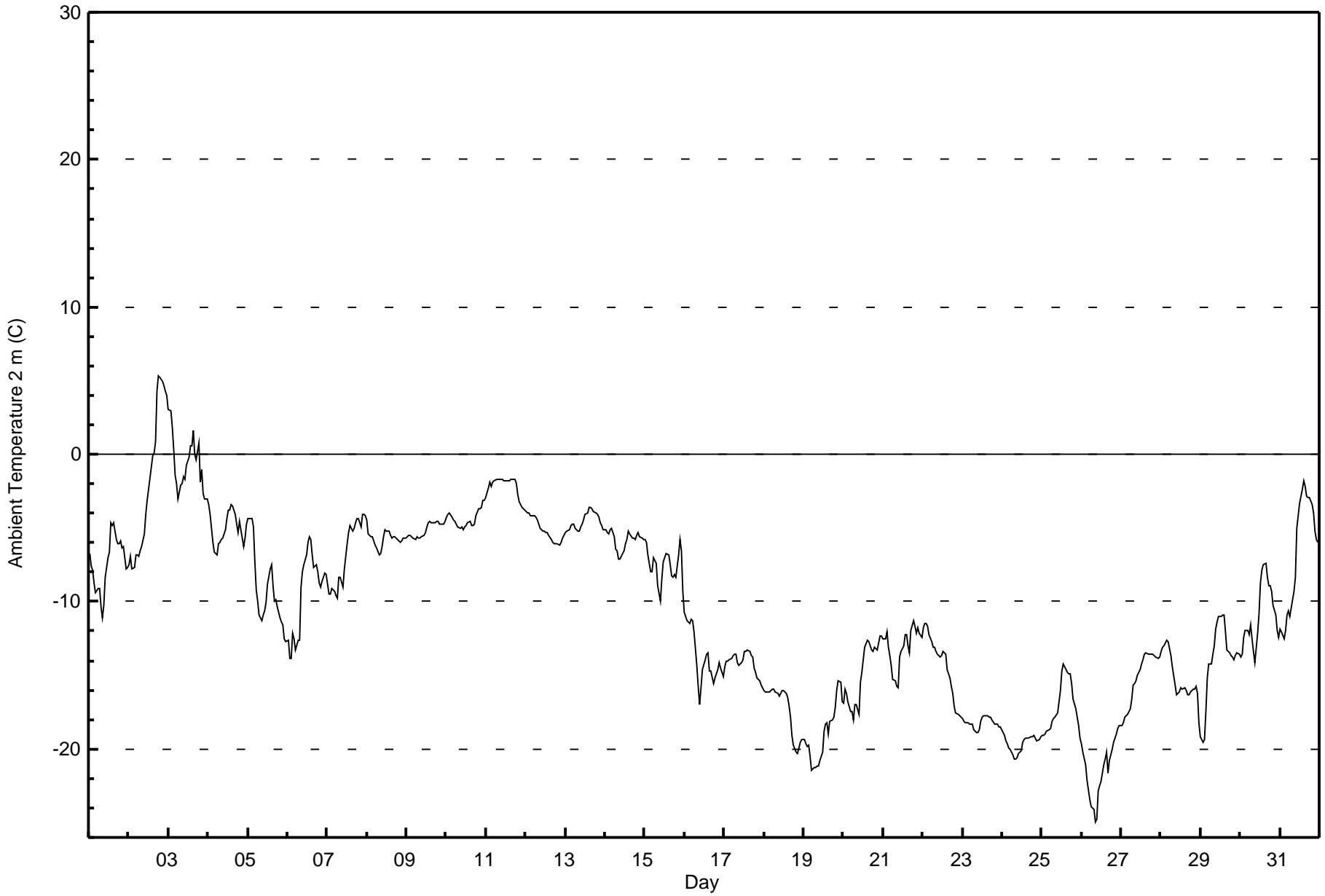
Total Number of Valid Hours: 707







Maximum Value: 5.3 C on Dec 2 19:00      Maximum Daily Average: -0.6 C on Dec 3																								Hours in Service:	744	
Minimum Value: -25.0 C on Dec 26 09:00      Minimum Daily Average: -21.4 C on Dec 26																								Hours of Data:	744	
Maximum Diurnal Average: -9.2 C at hour 15      Minimum Diurnal Average: -11.7 C at hour 9																								Hours of Missing Data:	0	
Monthly Average: -10.50 C      Percentiles: P <sub>1</sub> = -22.5 P <sub>10</sub> = -18.8 Q <sub>1</sub> = -15.7 Median = -10.9 Q <sub>3</sub> = -5.3 P <sub>90</sub> = -3.6 P <sub>99</sub> = 3.6																								Hours of Calibration:	0	
																								Percent Operational Time:	100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-6.8	-7.6	-7.9	-8.8	-9.4	-9.1	-9.1	-10.3	-11.1	-10.2	-8.3	-7.0	-6.6	-4.7	-4.9	-4.7	-5.8	-6.0	-6.1	-5.9	-6.4	-6.3	-7.8	-7.7	-7.4	-4.7
2-Dec	-7.5	-6.9	-7.8	-7.7	-6.8	-6.8	-6.9	-6.6	-6.3	-5.4	-4.0	-3.1	-2.4	-1.6	-0.1	0.1	0.8	4.3	5.3	5.2	5.0	4.7	4.3	3.9	-1.9	5.3
3-Dec	3.1	2.9	1.8	0.3	-1.4	-2.0	-3.0	-2.1	-2.0	-1.5	-1.7	-0.7	-0.2	0.6	0.6	1.6	0.0	-0.4	0.8	-1.8	-1.1	-2.7	-3.0	-3.1	-0.6	3.1
4-Dec	-3.4	-4.0	-5.1	-5.9	-6.6	-6.8	-6.1	-5.9	-5.8	-5.7	-5.1	-4.4	-3.8	-3.8	-3.4	-3.5	-4.1	-4.8	-5.3	-4.6	-5.1	-6.3	-5.7	-4.7	-5.0	-3.4
5-Dec	-4.3	-4.4	-4.4	-5.0	-7.3	-9.2	-9.9	-10.9	-11.3	-11.0	-10.6	-10.0	-8.8	-7.8	-7.5	-9.0	-10.0	-9.9	-10.3	-11.1	-11.4	-11.6	-12.5	-12.7	-9.2	-4.3
6-Dec	-12.6	-13.9	-13.8	-12.1	-12.5	-13.2	-12.6	-12.6	-9.0	-8.0	-7.5	-6.8	-6.0	-5.6	-5.8	-6.8	-7.7	-7.5	-8.0	-8.7	-9.0	-8.6	-8.1	-8.1	-9.4	-5.6
7-Dec	-8.8	-9.5	-9.5	-9.1	-9.3	-9.6	-9.8	-8.3	-8.3	-9.0	-7.8	-6.9	-6.1	-5.3	-4.9	-5.3	-5.0	-4.7	-4.4	-4.4	-4.9	-4.1	-4.0	-4.1	-6.8	-4.0
8-Dec	-4.5	-5.4	-5.6	-5.6	-5.9	-6.2	-6.4	-6.9	-6.7	-6.3	-5.6	-5.2	-5.2	-5.2	-5.5	-5.7	-5.6	-5.6	-5.8	-5.9	-6.0	-5.8	-5.7	-5.7	-5.7	-4.5
9-Dec	-5.6	-5.5	-5.5	-5.6	-5.7	-5.7	-5.6	-5.6	-5.7	-5.6	-5.5	-5.3	-4.9	-4.6	-4.6	-4.6	-4.6	-4.6	-4.6	-4.6	-4.7	-4.7	-4.7	-4.5	-5.1	-4.5
10-Dec	-4.3	-4.0	-4.0	-4.3	-4.5	-4.6	-4.7	-4.9	-5.0	-4.9	-5.1	-4.9	-4.8	-4.7	-4.6	-4.8	-4.9	-4.8	-4.2	-3.7	-3.7	-3.6	-3.2	-3.1	-4.4	-3.1
11-Dec	-2.9	-2.3	-1.9	-2.1	-1.9	-1.8	-1.7	-1.7	-1.7	-1.7	-1.7	-1.8	-1.8	-1.8	-1.8	-1.7	-1.7	-1.7	-2.0	-2.8	-3.3	-3.4	-3.6	-3.8	-2.2	-1.7
12-Dec	-3.9	-4.0	-4.0	-4.1	-4.2	-4.2	-4.3	-4.4	-4.8	-5.1	-5.2	-5.2	-5.3	-5.3	-5.5	-5.8	-5.9	-6.0	-6.1	-6.1	-6.1	-6.0	-5.7	-5.5	-5.1	-3.9
13-Dec	-5.3	-5.2	-5.1	-4.9	-4.7	-4.8	-5.0	-5.2	-5.2	-5.0	-4.7	-4.5	-4.1	-4.0	-3.6	-3.6	-3.7	-3.9	-4.0	-4.0	-4.3	-4.6	-4.9	-5.1	-4.5	-3.6
14-Dec	-5.1	-5.3	-5.4	-5.1	-5.0	-5.6	-6.4	-6.6	-7.1	-7.1	-6.9	-6.6	-6.1	-5.8	-5.2	-5.4	-5.7	-5.7	-5.7	-5.5	-5.3	-5.6	-5.7	-5.8	-5.8	-5.0
15-Dec	-5.8	-6.0	-6.9	-7.9	-8.0	-7.0	-7.2	-7.4	-8.9	-9.9	-8.4	-7.3	-7.0	-6.8	-6.8	-7.5	-8.2	-8.3	-8.1	-8.3	-6.8	-5.8	-6.5	-9.3	-7.5	-5.8
16-Dec	-10.8	-11.3	-11.3	-11.4	-11.2	-11.2	-12.0	-14.3	-15.8	-16.9	-15.8	-14.7	-14.0	-13.5	-13.4	-14.7	-14.7	-15.5	-15.2	-14.9	-14.6	-14.2	-14.5	-15.1	-13.8	-10.8
17-Dec	-14.4	-14.1	-14.0	-13.9	-13.8	-13.6	-13.5	-13.6	-14.2	-14.3	-14.1	-13.9	-13.4	-13.3	-13.3	-13.4	-13.6	-13.8	-14.5	-14.8	-15.1	-15.4	-15.7	-15.8	-14.2	-13.3
18-Dec	-16.0	-16.1	-16.1	-16.1	-16.0	-15.9	-15.9	-16.1	-16.3	-16.4	-16.2	-16.1	-16.1	-16.2	-16.5	-17.0	-17.8	-19.0	-19.8	-20.2	-20.3	-19.9	-19.5	-19.4	-17.3	-15.9
19-Dec	-19.4	-19.6	-19.8	-19.8	-20.5	-21.5	-21.2	-21.3	-21.1	-21.1	-20.8	-20.2	-18.8	-18.3	-18.2	-19.0	-18.2	-18.1	-17.8	-17.1	-16.0	-15.4	-15.5	-16.8	-19.0	-15.4
20-Dec	-16.9	-15.9	-16.3	-16.7	-17.4	-17.4	-18.0	-17.0	-17.0	-17.7	-15.4	-14.8	-13.9	-13.1	-12.6	-12.7	-13.0	-13.3	-13.3	-13.1	-13.2	-12.8	-12.4	-12.4	-14.8	-12.4
21-Dec	-12.5	-12.5	-12.0	-13.1	-13.7	-14.3	-15.3	-15.4	-15.8	-15.8	-13.7	-13.4	-13.0	-12.3	-12.2	-13.0	-13.5	-12.0	-11.3	-11.6	-12.1	-11.8	-12.1	-12.4	-13.1	-11.3
22-Dec	-11.8	-11.5	-11.5	-11.7	-12.2	-12.7	-13.1	-13.1	-13.3	-13.5	-13.7	-13.7	-13.3	-13.5	-13.6	-14.6	-15.2	-15.7	-16.3	-17.0	-17.5	-17.7	-17.7	-17.9	-14.2	-11.5
23-Dec	-18.0	-18.1	-18.2	-18.2	-18.3	-18.3	-18.3	-18.7	-18.8	-18.8	-18.7	-18.2	-17.8	-17.7	-17.8	-17.8	-17.8	-17.9	-18.0	-18.3	-18.4	-18.3	-18.5	-18.5	-18.2	-17.7
24-Dec	-18.7	-19.1	-19.4	-19.6	-19.9	-20.1	-20.4	-20.6	-20.7	-20.6	-20.3	-20.1	-19.6	-19.4	-19.2	-19.2	-19.2	-19.2	-19.1	-19.1	-19.2	-19.4	-19.4	-19.2	-19.6	-18.7
25-Dec	-19.1	-19.1	-18.9	-18.7	-18.7	-18.6	-18.2	-17.9	-17.8	-17.5	-16.8	-16.0	-14.7	-14.2	-14.4	-14.8	-14.9	-14.9	-15.6	-16.6	-17.2	-17.8	-18.4	-19.3	-17.1	-14.2
26-Dec	-19.7	-20.2	-21.1	-22.1	-22.7	-23.4	-24.0	-24.1	-25.0	-24.7	-22.9	-22.4	-22.2	-21.1	-20.6	-20.2	-21.7	-20.8	-20.1	-19.6	-19.3	-19.0	-18.6	-18.4	-21.4	-18.4
27-Dec	-18.4	-18.2	-17.8	-17.7	-17.6	-17.3	-16.6	-15.7	-15.5	-15.4	-15.0	-14.6	-14.2	-14.0	-13.5	-13.4	-13.6	-13.6	-13.5	-13.6	-13.7	-13.7	-13.8	-13.7	-15.2	-13.4
28-Dec	-13.4	-13.1	-13.0	-12.6	-12.7	-13.2	-13.6	-14.4	-15.6	-16.4	-16.2	-16.1	-15.8	-15.9	-15.8	-16.0	-16.3	-16.4	-16.2	-16.0	-15.9	-15.8	-16.2	-18.2	-15.2	-12.6
29-Dec	-19.1	-19.6	-19.4	-17.5	-15.2	-14.3	-14.2	-13.6	-13.0	-11.9	-11.4	-11.0	-11.0	-10.9	-10.9	-12.1	-13.3	-13.4	-13.7	-13.8	-13.9	-13.6	-13.5	-13.5	-13.9	-10.9
30-Dec	-13.8	-13.6	-12.4	-12.0	-11.9	-12.2	-11.6	-12.6	-13.4	-14.1	-12.1	-10.8	-8.7	-7.8	-7.5	-7.4	-8.4	-8.9	-9.0	-9.3	-10.2	-10.9	-12.0	-12.4	-11.0	-7.4
31-Dec	-11.8	-12.0	-12.5	-11.9	-10.9	-10.6	-11.0	-10.4	-9.3	-8.4	-5.0	-4.2	-3.3	-2.3	-1.8	-2.1	-2.9	-3.0	-3.0	-3.4	-4.0	-5.2	-5.8	-6.0	-6.7	-1.8
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ambient Temperature 2 m (AT2m) - C**  
**Mannix - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	35	4.70	4.70
-20 - 0	692	93.01	97.72
0 - 10	17	2.28	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

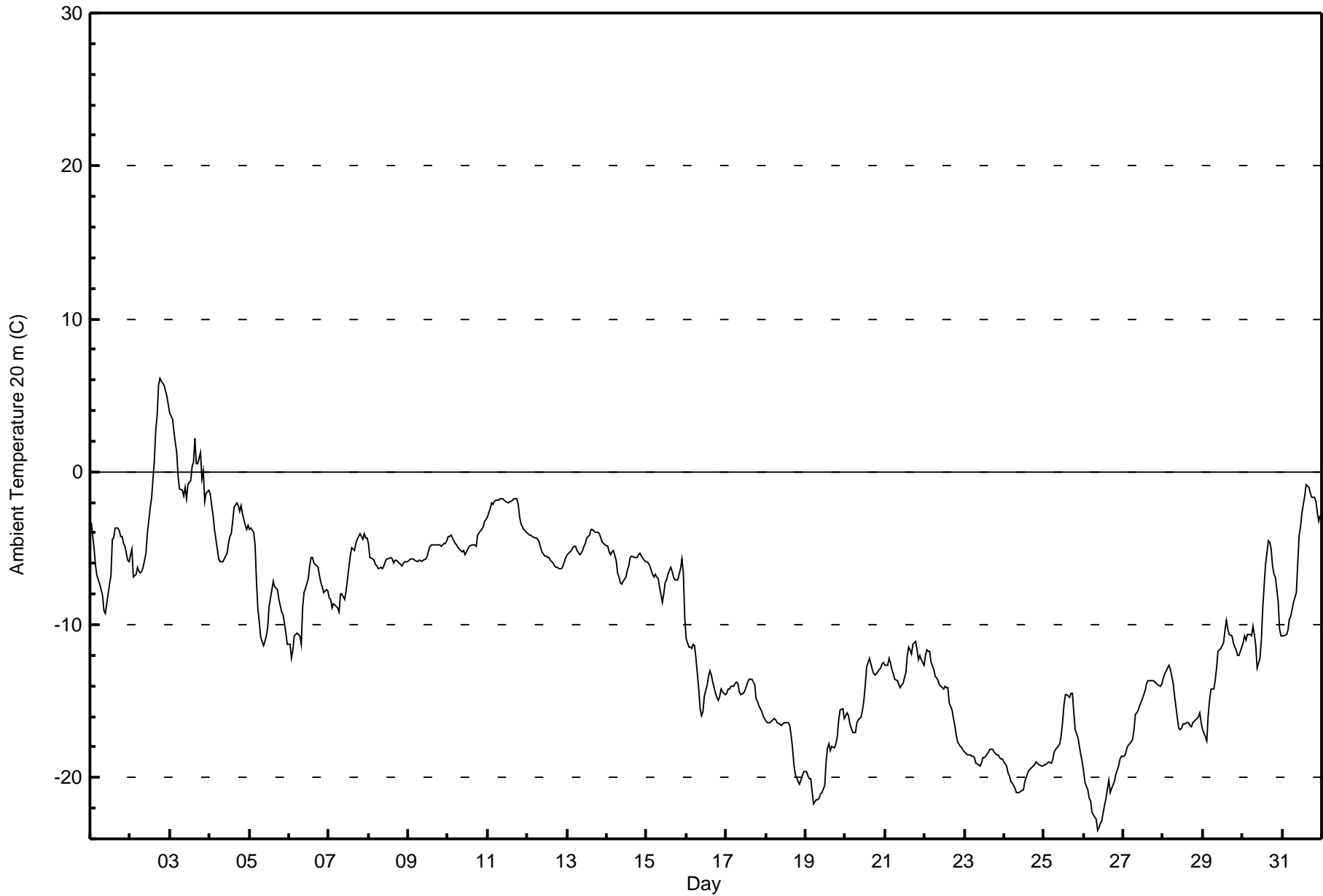


Summary of Hour Averages

Mannix - December 2015

Maximum Value: 6.1 C on Dec 2 19:00      Maximum Daily Average: 0.2 C on Dec 3																				Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Minimum Value: -23.4 C on Dec 26 09:00      Minimum Daily Average: -21.1 C on Dec 26 Maximum Diurnal Average: -9.0 C at hour 16      Minimum Diurnal Average: -11.4 C at hour 9 Monthly Average: -10.17 C      Percentiles: P <sub>1</sub> = -22.3 P <sub>10</sub> = -19.0 Q <sub>1</sub> = -15.7 Median = -9.6 Q <sub>3</sub> = -5.2 P <sub>90</sub> = -2.9 P <sub>99</sub> = 3.9																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-3.3	-4.2	-5.0	-6.2	-6.8	-7.3	-7.7	-8.1	-9.1	-9.3	-8.6	-7.3	-6.8	-4.4	-4.3	-3.7	-3.7	-3.8	-4.2	-4.2	-4.7	-4.9	-5.8	-5.9	-5.8	-3.3
2-Dec	-5.4	-5.1	-6.8	-6.7	-6.3	-6.5	-6.6	-6.6	-6.2	-5.3	-4.0	-3.2	-2.4	-1.8	0.7	2.8	3.7	5.7	6.1	5.9	5.6	5.3	4.9	4.4	-1.2	6.1
3-Dec	3.8	3.4	2.7	1.9	1.3	-0.3	-1.1	-1.2	-1.6	-1.0	-1.8	-0.9	-0.5	0.4	0.7	2.1	0.5	0.5	1.2	-0.5	0.1	-1.9	-1.4	-1.2	0.2	3.8
4-Dec	-1.4	-2.2	-2.8	-3.8	-4.4	-5.7	-5.9	-5.9	-5.8	-5.7	-5.3	-4.7	-4.2	-4.0	-3.2	-2.3	-2.0	-2.2	-2.6	-2.2	-2.7	-3.5	-3.8	-3.5	-3.8	-1.4
5-Dec	-3.8	-3.7	-3.9	-4.8	-7.2	-9.0	-9.8	-10.8	-11.4	-11.1	-10.8	-10.1	-8.8	-7.7	-7.2	-7.5	-7.7	-7.7	-8.3	-9.2	-9.4	-9.9	-10.6	-11.3	-8.4	-3.7
6-Dec	-11.3	-12.2	-11.6	-10.7	-10.7	-10.6	-10.8	-11.3	-8.8	-7.9	-7.6	-7.0	-6.1	-5.6	-5.6	-6.0	-6.1	-6.3	-6.8	-7.3	-7.5	-7.9	-7.7	-7.8	-8.4	-5.6
7-Dec	-8.3	-8.3	-8.9	-8.7	-8.8	-8.9	-9.1	-8.0	-8.0	-8.4	-7.8	-7.1	-6.2	-5.5	-4.9	-5.2	-4.7	-4.4	-4.2	-4.1	-4.4	-4.1	-4.3	-4.3	-6.5	-4.1
8-Dec	-4.7	-5.6	-5.7	-5.8	-6.0	-6.2	-6.4	-6.2	-6.3	-6.2	-5.9	-5.7	-5.7	-5.6	-5.7	-5.9	-5.8	-5.8	-6.0	-6.1	-6.2	-6.0	-5.9	-5.9	-5.9	-4.7
9-Dec	-5.8	-5.7	-5.7	-5.7	-5.8	-5.9	-5.8	-5.8	-5.9	-5.8	-5.7	-5.5	-5.2	-4.9	-4.8	-4.8	-4.8	-4.7	-4.7	-4.8	-4.9	-4.7	-4.7	-4.5	-5.3	-4.5
10-Dec	-4.3	-4.2	-4.2	-4.5	-4.7	-4.7	-4.9	-5.1	-5.2	-5.2	-5.4	-5.3	-5.1	-4.9	-4.8	-4.8	-4.8	-4.8	-4.1	-3.9	-3.8	-3.6	-3.2	-3.1	-4.5	-3.1
11-Dec	-3.0	-2.4	-2.0	-2.1	-1.9	-1.9	-1.8	-1.8	-1.8	-1.8	-1.8	-2.0	-2.0	-2.0	-1.9	-1.8	-1.8	-1.8	-2.1	-2.9	-3.4	-3.6	-3.7	-3.9	-2.3	-1.8
12-Dec	-4.1	-4.1	-4.2	-4.3	-4.3	-4.3	-4.4	-4.6	-4.9	-5.3	-5.5	-5.5	-5.6	-5.6	-5.8	-6.0	-6.1	-6.2	-6.2	-6.3	-6.3	-6.1	-5.9	-5.6	-5.3	-4.1
13-Dec	-5.4	-5.3	-5.2	-4.9	-4.8	-4.9	-5.2	-5.4	-5.3	-5.1	-4.9	-4.7	-4.3	-4.2	-3.8	-3.7	-3.9	-4.0	-3.9	-4.0	-4.3	-4.6	-4.7	-4.8	-4.6	-3.7
14-Dec	-4.8	-5.2	-5.4	-5.3	-5.2	-5.8	-6.6	-6.8	-7.3	-7.3	-7.2	-6.9	-6.4	-6.1	-5.6	-5.5	-5.6	-5.6	-5.6	-5.4	-5.3	-5.5	-5.7	-5.9	-5.9	-4.8
15-Dec	-5.8	-6.0	-6.2	-6.7	-6.9	-6.7	-6.9	-6.9	-7.5	-8.6	-8.0	-7.3	-7.1	-6.7	-6.3	-6.5	-6.9	-7.0	-7.1	-7.0	-6.3	-5.7	-6.6	-9.5	-6.9	-5.7
16-Dec	-10.9	-11.5	-11.5	-11.6	-11.3	-11.4	-12.2	-14.2	-15.4	-16.0	-15.6	-14.7	-13.9	-13.4	-13.0	-13.3	-13.7	-14.5	-14.7	-14.9	-14.6	-14.2	-14.4	-14.6	-13.6	-10.9
17-Dec	-14.5	-14.2	-14.2	-14.0	-14.0	-13.8	-13.7	-13.8	-14.4	-14.5	-14.5	-14.3	-14.0	-13.7	-13.6	-13.6	-13.8	-13.9	-14.9	-15.1	-15.3	-15.6	-15.9	-16.1	-14.4	-13.6
18-Dec	-16.3	-16.4	-16.4	-16.3	-16.2	-16.2	-16.2	-16.4	-16.5	-16.6	-16.5	-16.4	-16.4	-16.4	-16.6	-17.2	-18.1	-19.1	-19.8	-20.2	-20.4	-20.2	-19.9	-19.6	-17.5	-16.2
19-Dec	-19.6	-19.9	-20.0	-20.0	-20.9	-21.7	-21.5	-21.5	-21.3	-21.1	-21.0	-20.6	-19.0	-18.0	-17.8	-18.3	-18.0	-18.1	-17.8	-17.3	-16.2	-15.6	-15.5	-16.1	-19.0	-15.5
20-Dec	-15.9	-15.7	-16.0	-16.5	-17.0	-17.0	-17.1	-16.4	-16.2	-16.0	-15.5	-15.0	-13.9	-12.8	-12.2	-12.5	-12.9	-13.2	-13.3	-13.2	-13.0	-12.9	-12.6	-12.4	-14.6	-12.2
21-Dec	-12.7	-12.7	-12.2	-12.5	-12.9	-13.2	-13.5	-13.7	-14.0	-14.1	-14.0	-13.9	-13.1	-12.0	-11.5	-11.7	-11.9	-11.3	-11.1	-11.7	-12.3	-12.0	-12.3	-12.6	-12.6	-11.1
22-Dec	-12.0	-11.7	-11.7	-11.8	-12.4	-13.0	-13.3	-13.4	-13.7	-14.0	-14.2	-14.2	-14.1	-14.1	-14.1	-15.1	-15.6	-16.1	-16.6	-17.2	-17.7	-18.0	-18.1	-18.3	-14.6	-11.7
23-Dec	-18.3	-18.5	-18.5	-18.5	-18.6	-18.6	-18.6	-19.1	-19.1	-19.2	-19.1	-18.7	-18.7	-18.6	-18.3	-18.2	-18.1	-18.2	-18.3	-18.5	-18.6	-18.6	-18.8	-18.8	-18.6	-18.1
24-Dec	-19.0	-19.3	-19.7	-19.9	-20.2	-20.3	-20.7	-20.9	-21.0	-21.0	-20.9	-20.8	-20.2	-19.9	-19.7	-19.5	-19.4	-19.3	-19.2	-19.0	-19.0	-19.1	-19.3	-19.2	-19.9	-19.0
25-Dec	-19.2	-19.2	-19.0	-19.0	-19.0	-18.8	-18.4	-18.2	-18.0	-17.8	-17.2	-16.4	-15.2	-14.6	-14.6	-14.8	-14.4	-14.4	-15.8	-16.9	-17.4	-18.0	-18.5	-19.0	-17.2	-14.4
26-Dec	-19.6	-20.3	-20.8	-21.3	-21.5	-22.3	-22.5	-22.7	-23.4	-23.3	-22.9	-22.8	-22.3	-21.4	-20.7	-20.1	-21.0	-20.7	-20.3	-19.8	-19.6	-19.2	-18.8	-18.6	-21.1	-18.6
27-Dec	-18.6	-18.4	-18.0	-17.9	-17.8	-17.5	-16.8	-15.9	-15.7	-15.6	-15.3	-14.9	-14.5	-14.3	-13.9	-13.7	-13.6	-13.6	-13.7	-13.7	-13.8	-13.9	-14.0	-13.9	-15.4	-13.6
28-Dec	-13.5	-13.2	-13.1	-12.7	-12.9	-13.3	-13.9	-14.7	-16.1	-16.8	-16.8	-16.8	-16.5	-16.5	-16.4	-16.4	-16.6	-16.7	-16.4	-16.2	-16.2	-16.0	-15.7	-16.4	-15.4	-12.7
29-Dec	-16.9	-17.3	-17.6	-16.0	-14.9	-14.2	-14.2	-13.7	-12.9	-11.8	-11.6	-11.6	-11.2	-10.3	-9.8	-10.3	-10.6	-10.7	-11.2	-11.4	-11.7	-12.0	-12.0	-11.5	-12.7	-9.8
30-Dec	-11.2	-10.7	-11.0	-10.6	-10.6	-10.7	-10.1	-10.6	-11.4	-12.8	-12.2	-11.0	-8.9	-7.4	-6.1	-4.5	-4.6	-5.0	-6.2	-6.7	-6.9	-8.4	-10.2	-10.7	-9.1	-4.5
31-Dec	-10.7	-10.7	-10.7	-10.3	-9.7	-9.4	-9.0	-8.5	-7.9	-5.9	-4.2	-3.6	-2.7	-1.6	-0.9	-1.0	-1.1	-1.4	-1.7	-1.7	-1.9	-2.7	-3.2	-2.9	-5.1	-0.9
																								Diurnal Average		
																								Diurnal Maximum		







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 20 m (AT20m) - C  
Mannix - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	40	5.38	5.38
-20 - 0	682	91.67	97.04
0 - 10	22	2.96	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

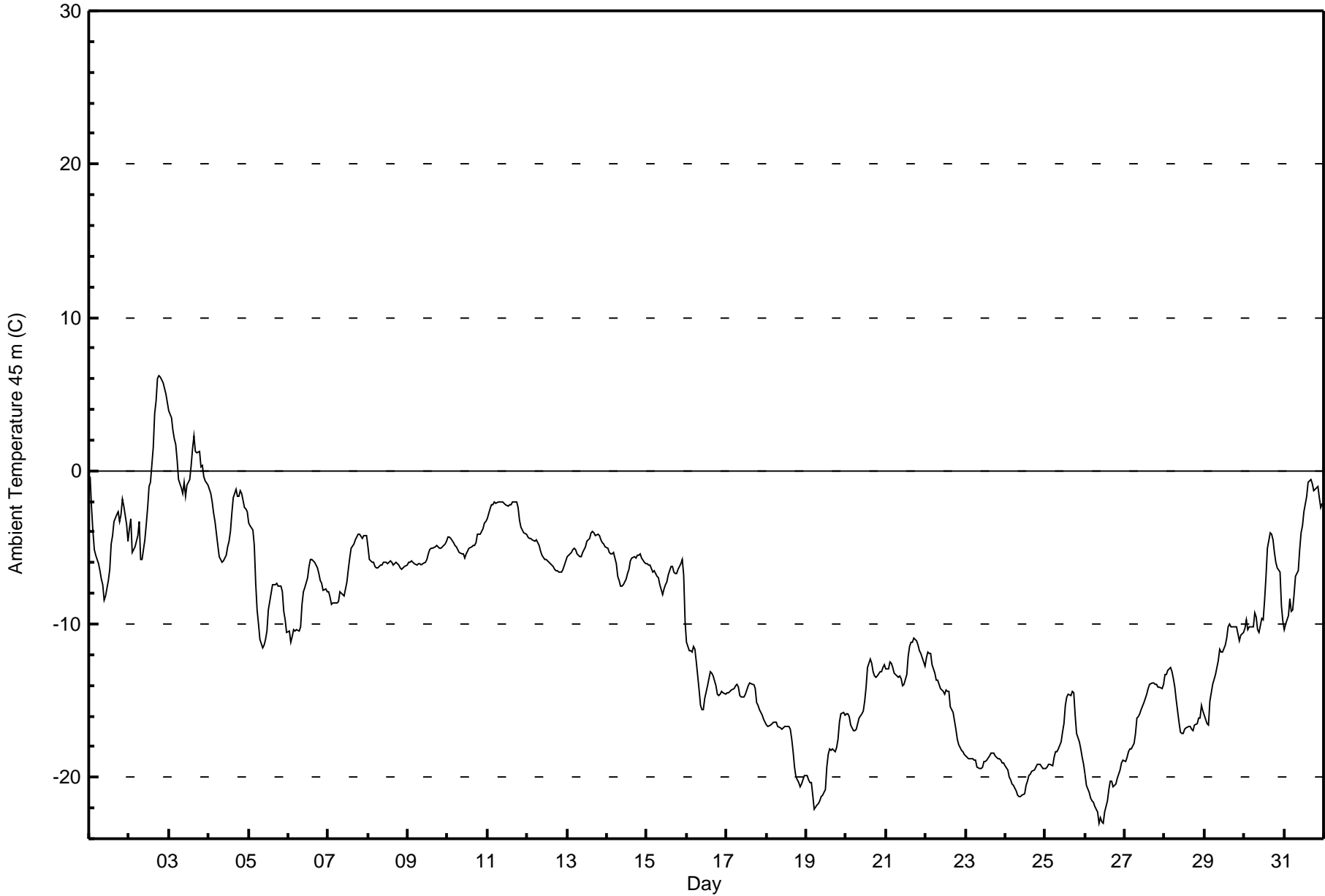
Total Number of Hours: 744



Summary of Hour Averages

Mannix - December 2015

Maximum Value: 6.2 C on Dec 2 19:00		Maximum Daily Average: 0.6 C on Dec 3		Hours in Service: 744																																												
Minimum Value: -23.0 C on Dec 26 09:00		Minimum Daily Average: -21.0 C on Dec 26		Hours of Data: 744																																												
Maximum Diurnal Average: -9.0 C at hour 16		Minimum Diurnal Average: -11.3 C at hour 9		Hours of Missing Data: 0																																												
Monthly Average: -10.10 C		Percentiles: P <sub>1</sub> = -21.9 P <sub>10</sub> = -19.1 Q <sub>1</sub> = -15.6 Median = -9.1 Q <sub>3</sub> = -5.1 P <sub>90</sub> = -2.3 P <sub>99</sub> = 4.1		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-0.4	-2.4	-4.0	-5.1	-5.6	-6.1	-6.6	-7.1	-7.4	-8.4	-8.2	-7.2	-6.4	-4.7	-4.2	-3.3	-2.9	-2.7	-3.3	-2.9	-1.8	-2.3	-3.5	-4.6	-4.6	-0.4																						
2-Dec	-3.8	-3.1	-5.3	-5.0	-4.6	-4.2	-3.3	-5.8	-5.8	-4.5	-3.5	-2.4	-1.0	-0.7	1.5	3.7	4.5	6.0	6.2	6.1	5.7	5.4	5.0	4.4	-0.2	6.2																						
3-Dec	3.9	3.5	2.7	2.1	1.7	0.7	-0.5	-1.1	-1.5	-0.8	-1.6	-1.0	-0.6	0.4	1.4	2.2	1.3	1.1	1.3	0.3	0.4	-0.4	-0.7	-0.9	0.6	3.9																						
4-Dec	-1.2	-1.5	-2.1	-2.7	-3.3	-4.9	-5.6	-5.8	-5.9	-5.8	-5.5	-5.0	-4.6	-4.0	-2.8	-1.8	-1.2	-1.7	-1.6	-1.3	-1.5	-2.4	-2.5	-2.7	-3.2	-1.2																						
5-Dec	-3.4	-3.6	-3.9	-4.9	-7.3	-9.1	-10.0	-11.0	-11.6	-11.4	-11.0	-10.4	-9.1	-8.0	-7.4	-7.5	-7.4	-7.4	-7.5	-7.5	-7.9	-9.1	-9.7	-10.6	-8.2	-3.4																						
6-Dec	-10.5	-11.2	-10.8	-10.4	-10.5	-10.3	-10.4	-10.2	-8.8	-7.9	-7.6	-7.0	-6.2	-5.8	-5.8	-5.9	-6.0	-6.3	-6.7	-7.2	-7.4	-7.8	-7.7	-7.9	-8.2	-5.8																						
7-Dec	-7.9	-8.3	-8.7	-8.6	-8.7	-8.7	-8.6	-7.9	-8.0	-8.2	-7.7	-7.2	-6.4	-5.7	-5.1	-4.8	-4.5	-4.3	-4.2	-4.1	-4.4	-4.2	-4.2	-4.2	-6.4	-4.1																						
8-Dec	-4.9	-5.8	-5.9	-6.0	-6.2	-6.4	-6.4	-6.2	-6.2	-6.0	-6.0	-6.0	-6.0	-5.9	-6.0	-6.2	-6.0	-6.0	-6.2	-6.3	-6.4	-6.3	-6.2	-6.2	-6.1	-4.9																						
9-Dec	-6.0	-6.0	-5.9	-6.0	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-5.9	-5.8	-5.4	-5.1	-5.0	-5.1	-4.9	-4.9	-5.0	-5.0	-5.1	-4.9	-4.8	-4.6	-5.5	-4.6																						
10-Dec	-4.3	-4.3	-4.4	-4.7	-4.9	-5.0	-5.2	-5.3	-5.4	-5.4	-5.7	-5.5	-5.2	-5.1	-5.0	-4.9	-4.8	-4.7	-4.2	-4.1	-4.0	-3.8	-3.4	-3.3	-4.7	-3.3																						
11-Dec	-3.1	-2.5	-2.2	-2.3	-2.1	-2.1	-2.1	-2.0	-2.0	-2.0	-2.1	-2.2	-2.3	-2.2	-2.2	-2.1	-2.0	-2.0	-2.4	-3.2	-3.7	-3.9	-4.0	-4.2	-2.5	-2.0																						
12-Dec	-4.3	-4.4	-4.4	-4.5	-4.6	-4.5	-4.7	-4.8	-5.2	-5.5	-5.8	-5.8	-5.9	-5.9	-6.1	-6.3	-6.4	-6.5	-6.5	-6.6	-6.6	-6.4	-6.2	-5.9	-5.6	-4.3																						
13-Dec	-5.6	-5.5	-5.3	-5.2	-5.1	-5.1	-5.4	-5.6	-5.6	-5.4	-5.2	-5.0	-4.6	-4.4	-4.1	-4.0	-4.1	-4.2	-4.1	-4.2	-4.5	-4.7	-4.8	-5.0	-4.9	-4.0																						
14-Dec	-5.0	-5.3	-5.4	-5.4	-5.4	-6.0	-6.9	-7.1	-7.5	-7.6	-7.5	-7.1	-6.7	-6.4	-5.9	-5.7	-5.6	-5.7	-5.5	-5.6	-5.4	-5.7	-5.9	-6.1	-6.1	-5.0																						
15-Dec	-6.0	-6.2	-6.2	-6.6	-6.5	-6.7	-6.9	-7.0	-7.5	-8.0	-7.7	-7.4	-7.2	-6.8	-6.3	-6.2	-6.6	-6.7	-6.7	-6.4	-6.0	-5.8	-6.8	-9.8	-6.8	-5.8																						
16-Dec	-11.2	-11.7	-11.7	-11.8	-11.5	-11.6	-12.5	-14.3	-15.3	-15.6	-15.6	-14.9	-14.0	-13.6	-13.1	-13.2	-13.4	-14.1	-14.6	-14.6	-14.5	-14.4	-14.5	-14.6	-13.6	-11.2																						
17-Dec	-14.5	-14.4	-14.4	-14.3	-14.2	-14.0	-14.0	-14.1	-14.7	-14.8	-14.7	-14.6	-14.3	-14.0	-13.9	-13.9	-13.9	-14.2	-15.1	-15.3	-15.6	-15.9	-16.2	-16.4	-14.6	-13.9																						
18-Dec	-16.6	-16.6	-16.6	-16.5	-16.4	-16.4	-16.4	-16.7	-16.8	-16.9	-16.8	-16.6	-16.6	-16.7	-16.9	-17.5	-18.3	-19.3	-20.0	-20.4	-20.6	-20.4	-20.1	-19.9	-17.8	-16.4																						
19-Dec	-19.9	-20.2	-20.3	-20.3	-21.2	-22.0	-21.8	-21.8	-21.6	-21.3	-21.2	-20.8	-19.4	-18.5	-18.1	-18.2	-18.1	-18.3	-18.0	-17.5	-16.4	-15.9	-15.7	-15.9	-19.3	-15.7																						
20-Dec	-15.8	-15.9	-16.1	-16.6	-17.0	-17.0	-16.9	-16.5	-16.1	-15.8	-15.6	-15.0	-14.1	-12.8	-12.3	-12.6	-13.1	-13.3	-13.5	-13.4	-13.1	-13.1	-12.8	-12.7	-14.6	-12.3																						
21-Dec	-12.9	-12.9	-12.5	-12.5	-12.9	-13.2	-13.3	-13.4	-13.3	-13.6	-14.0	-13.9	-13.3	-12.1	-11.5	-11.2	-11.2	-10.9	-11.1	-11.4	-11.8	-11.9	-12.2	-12.8	-12.5	-10.9																						
22-Dec	-12.2	-11.9	-11.9	-11.9	-12.7	-13.2	-13.6	-13.7	-13.9	-14.2	-14.4	-14.5	-14.3	-14.4	-14.4	-15.4	-15.8	-16.3	-16.9	-17.5	-17.9	-18.2	-18.3	-18.5	-14.8	-11.9																						
23-Dec	-18.6	-18.7	-18.8	-18.8	-18.8	-18.9	-18.9	-19.3	-19.4	-19.4	-19.4	-19.0	-18.9	-18.9	-18.6	-18.4	-18.4	-18.4	-18.6	-18.8	-18.8	-18.9	-19.0	-19.1	-18.9	-18.4																						
24-Dec	-19.2	-19.5	-19.9	-20.2	-20.5	-20.5	-20.9	-21.2	-21.3	-21.3	-21.2	-21.1	-20.5	-20.2	-19.9	-19.8	-19.6	-19.5	-19.4	-19.1	-19.1	-19.1	-19.4	-19.4	-20.1	-19.1																						
25-Dec	-19.4	-19.4	-19.1	-19.2	-19.2	-18.7	-18.3	-18.4	-18.1	-17.7	-17.0	-16.5	-15.3	-14.7	-14.6	-14.7	-14.4	-14.4	-16.0	-17.1	-17.7	-18.2	-18.7	-19.2	-17.3	-14.4																						
26-Dec	-19.8	-20.5	-20.9	-21.3	-21.5	-21.6	-21.9	-22.3	-23.0	-22.7	-22.9	-23.0	-22.3	-21.5	-20.8	-20.2	-20.2	-20.6	-20.4	-20.1	-19.8	-19.5	-19.1	-18.9	-21.0	-18.9																						
27-Dec	-18.9	-18.7	-18.3	-18.1	-18.1	-17.7	-17.1	-16.1	-16.0	-15.9	-15.6	-15.2	-14.9	-14.6	-14.2	-14.0	-13.9	-13.9	-13.9	-14.0	-14.1	-14.2	-14.2	-13.9	-15.6	-13.9																						
28-Dec	-13.3	-13.3	-13.0	-12.8	-13.1	-13.6	-14.1	-15.0	-16.4	-17.0	-17.1	-17.1	-16.8	-16.8	-16.7	-16.7	-16.9	-16.9	-16.6	-16.5	-16.1	-16.1	-15.3	-15.6	-15.5	-12.8																						
29-Dec	-16.0	-16.5	-16.5	-15.1	-14.5	-14.0	-13.3	-12.9	-12.4	-11.7	-11.8	-11.8	-11.4	-10.9	-10.2	-10.0	-10.1	-10.2	-10.2	-10.2	-10.6	-11.1	-10.7	-10.6	-12.2	-10.0																						
30-Dec	-10.3	-9.7	-10.4	-10.2	-10.1	-10.1	-9.2	-9.6	-10.4	-10.6	-9.6	-9.8	-8.5	-6.9	-5.0	-4.1	-4.1	-4.5	-5.3	-6.0	-6.4	-6.6	-8.9	-9.8	-8.2	-4.1																						
31-Dec	-10.3	-10.0	-9.5	-8.4	-9.2	-9.1	-8.0	-6.9	-6.5	-5.2	-4.1	-3.6	-2.7	-1.6	-0.8	-0.6	-0.5	-0.9	-1.3	-1.1	-1.1	-1.7	-2.4	-2.1	-4.5	-0.5																						
																								-10.1	-10.2	-10.4	-10.4	-10.6	-10.8	-10.9	-11.1	-11.3	-11.2	-11.0	-10.7	-10.2	-9.6	-9.1	-9.0	-9.0	-9.1	-9.3	-9.4	-9.4	-9.6	-9.8	-10.0	Diurnal Average
																								3.9	3.5	2.7	2.1	1.7	0.7	-0.5	-1.1	-1.5	-0.8	-1.6	-1.0	-0.6	0.4	1.5	3.7	4.5	6.0	6.2	6.1	5.7	5.4	5.0	4.4	Diurnal Maximum





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ambient Temperature 45 m (AT45m) - C**  
**Mannix - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	45	6.05	6.05
-20 - 0	675	90.73	96.77
0 - 10	24	3.23	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

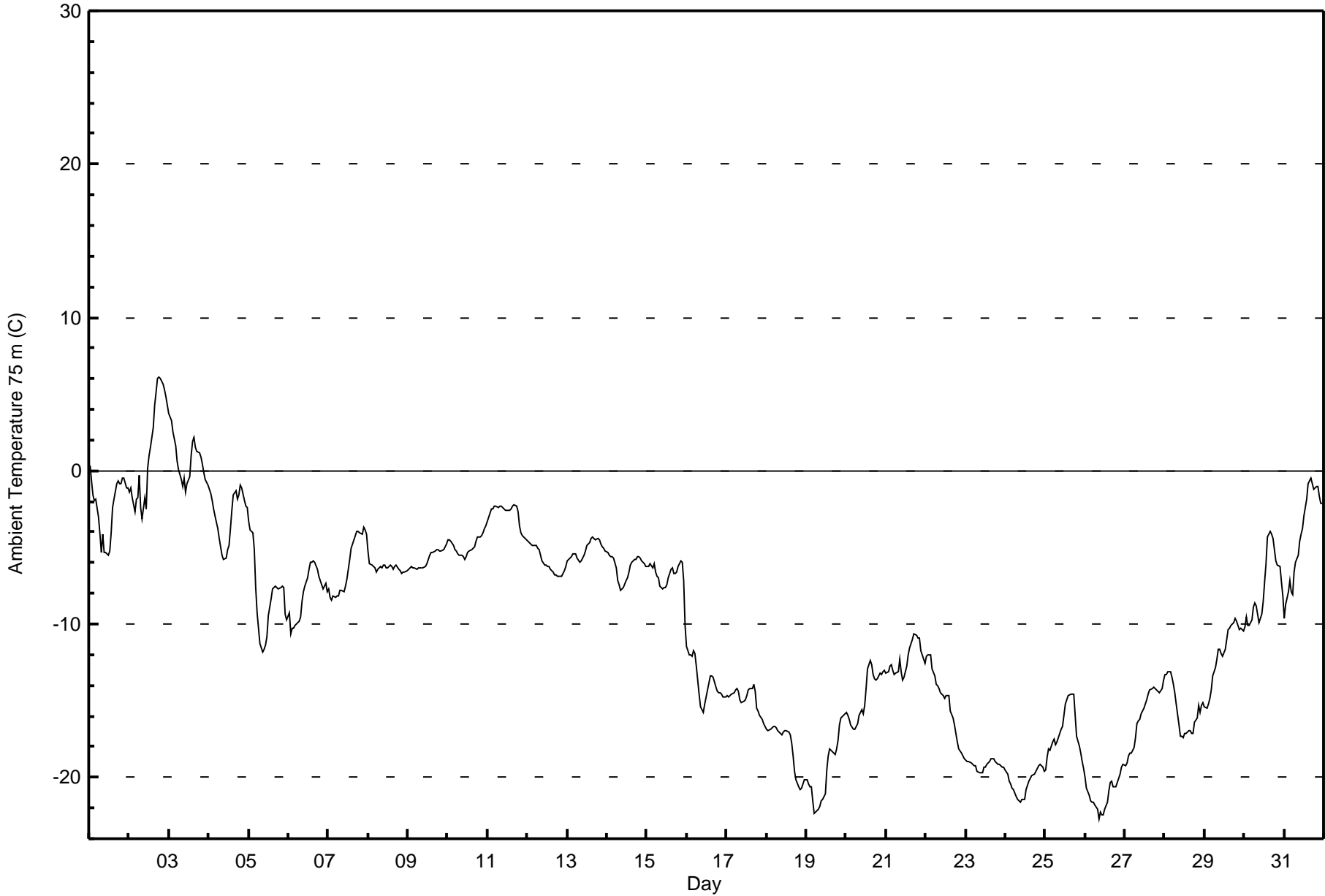
Total Number of Hours: 744



Summary of Hour Averages

Mannix - December 2015

Maximum Value: 6.1 C on Dec 2 19:00		Maximum Daily Average: 1.3 C on Dec 2		Hours in Service: 744																																												
Minimum Value: -22.7 C on Dec 26 09:00		Minimum Daily Average: -21.1 C on Dec 26		Hours of Data: 744																																												
Maximum Diurnal Average: -9.0 C at hour 17		Minimum Diurnal Average: -11.0 C at hour 9		Hours of Missing Data: 0																																												
Monthly Average: -10.02 C		Percentiles: P <sub>1</sub> = -22.1 P <sub>10</sub> = -19.3 Q <sub>1</sub> = -15.7 Median = -8.3 Q <sub>3</sub> = -5.2 P <sub>90</sub> = -1.9 P <sub>99</sub> = 4.6		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	0.3	-0.7	-1.6	-2.0	-1.8	-3.0	-4.2	-5.3	-4.1	-5.3	-5.3	-5.5	-5.3	-4.1	-2.4	-1.8	-0.8	-0.6	-0.8	-0.8	-0.5	-0.5	-1.1	-1.1	-2.4	0.3																						
2-Dec	-1.4	-1.1	-1.8	-2.6	-1.9	-1.7	-0.3	-2.4	-3.1	-1.8	-2.5	0.1	1.0	1.5	2.8	4.3	5.1	6.1	6.1	6.0	5.7	5.3	4.8	4.3	1.3	6.1																						
3-Dec	3.7	3.3	2.5	2.1	1.7	0.7	0.1	-0.5	-1.0	-0.4	-1.4	-0.9	-0.4	1.0	1.9	2.2	1.5	1.3	1.2	0.9	0.4	-0.1	-0.6	-0.9	0.8	3.7																						
4-Dec	-1.2	-1.5	-1.9	-2.5	-3.0	-3.8	-4.4	-5.0	-5.5	-5.8	-5.7	-5.2	-4.8	-3.7	-2.5	-1.5	-1.3	-1.8	-1.5	-0.9	-1.1	-2.0	-2.3	-2.4	-3.0	-0.9																						
5-Dec	-3.3	-3.8	-4.0	-5.1	-7.6	-9.3	-10.3	-11.3	-11.9	-11.7	-11.4	-10.8	-9.5	-8.3	-7.7	-7.6	-7.5	-7.6	-7.7	-7.6	-7.6	-7.6	-9.4	-9.7	-8.3	-3.3																						
6-Dec	-9.3	-10.6	-10.3	-10.2	-10.1	-10.0	-9.8	-9.5	-8.5	-7.9	-7.5	-7.0	-6.4	-6.0	-5.9	-5.9	-6.0	-6.4	-6.9	-7.1	-7.4	-7.7	-7.4	-7.8	-8.0	-5.9																						
7-Dec	-7.7	-8.3	-8.5	-8.2	-8.2	-8.2	-8.2	-7.8	-7.8	-7.9	-7.5	-7.1	-6.5	-5.8	-5.1	-4.5	-4.2	-3.9	-3.9	-4.0	-4.2	-3.7	-3.9	-4.1	-6.2	-3.7																						
8-Dec	-5.2	-6.1	-6.2	-6.3	-6.4	-6.6	-6.4	-6.3	-6.3	-6.1	-6.1	-6.3	-6.3	-6.2	-6.2	-6.4	-6.3	-6.2	-6.4	-6.6	-6.7	-6.6	-6.6	-6.5	-6.3	-5.2																						
9-Dec	-6.4	-6.4	-6.3	-6.3	-6.3	-6.4	-6.4	-6.4	-6.4	-6.3	-6.2	-6.1	-5.8	-5.5	-5.3	-5.3	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.0	-4.7	-5.8	-4.7																						
10-Dec	-4.5	-4.5	-4.6	-4.9	-5.1	-5.2	-5.4	-5.5	-5.5	-5.6	-5.8	-5.6	-5.4	-5.3	-5.2	-5.0	-4.9	-4.6	-4.3	-4.4	-4.2	-4.0	-3.8	-3.6	-4.9	-3.6																						
11-Dec	-3.3	-2.8	-2.5	-2.4	-2.3	-2.3	-2.4	-2.3	-2.3	-2.4	-2.4	-2.6	-2.6	-2.6	-2.5	-2.3	-2.3	-2.3	-2.7	-3.6	-4.0	-4.2	-4.3	-4.5	-2.8	-2.3																						
12-Dec	-4.6	-4.7	-4.7	-4.8	-4.9	-4.9	-5.0	-5.2	-5.6	-5.9	-6.1	-6.2	-6.2	-6.3	-6.4	-6.6	-6.8	-6.8	-6.9	-6.9	-6.9	-6.7	-6.5	-6.2	-5.9	-4.6																						
13-Dec	-5.9	-5.8	-5.6	-5.5	-5.4	-5.4	-5.7	-5.9	-5.9	-5.7	-5.5	-5.3	-4.9	-4.7	-4.4	-4.3	-4.4	-4.5	-4.4	-4.5	-4.8	-5.0	-5.1	-5.2	-5.2	-4.3																						
14-Dec	-5.3	-5.5	-5.6	-5.6	-5.7	-6.3	-7.2	-7.4	-7.8	-7.7	-7.6	-7.2	-7.0	-6.6	-6.1	-5.9	-5.8	-5.8	-5.6	-5.6	-5.7	-5.8	-6.1	-6.3	-6.3	-5.3																						
15-Dec	-6.2	-6.3	-6.0	-6.3	-6.1	-6.6	-6.9	-7.0	-7.5	-7.7	-7.6	-7.6	-7.4	-7.0	-6.4	-6.4	-6.7	-6.7	-6.6	-6.2	-5.9	-6.0	-7.1	-10.1	-6.9	-5.9																						
16-Dec	-11.5	-12.0	-12.0	-12.1	-11.7	-11.9	-12.7	-14.5	-15.4	-15.6	-15.8	-15.2	-14.3	-13.8	-13.4	-13.4	-13.5	-14.1	-14.4	-14.4	-14.5	-14.5	-14.7	-14.8	-13.8	-11.5																						
17-Dec	-14.7	-14.7	-14.7	-14.6	-14.5	-14.3	-14.3	-14.4	-15.0	-15.1	-15.1	-14.9	-14.6	-14.3	-14.2	-14.2	-13.9	-14.4	-15.5	-15.7	-15.9	-16.2	-16.5	-16.7	-14.9	-13.9																						
18-Dec	-16.9	-17.0	-16.9	-16.8	-16.7	-16.7	-16.8	-17.0	-17.1	-17.2	-17.0	-16.9	-17.0	-17.0	-17.2	-17.8	-18.6	-19.6	-20.2	-20.6	-20.8	-20.7	-20.4	-20.2	-18.0	-16.7																						
19-Dec	-20.2	-20.5	-20.6	-20.6	-21.5	-22.4	-22.2	-22.1	-21.9	-21.6	-21.5	-21.1	-19.6	-18.6	-18.1	-18.2	-18.3	-18.5	-18.2	-17.6	-16.6	-16.1	-15.9	-15.8	-19.5	-15.8																						
20-Dec	-15.8	-16.0	-16.2	-16.6	-16.9	-16.8	-16.7	-16.5	-15.9	-15.6	-15.9	-15.3	-14.2	-12.9	-12.4	-12.6	-13.3	-13.5	-13.7	-13.6	-13.2	-13.3	-13.1	-13.0	-14.7	-12.4																						
21-Dec	-13.2	-13.1	-12.8	-12.7	-13.0	-13.3	-13.2	-13.1	-12.3	-13.1	-13.7	-13.5	-12.8	-12.0	-11.6	-11.2	-11.0	-10.7	-10.7	-11.0	-10.9	-11.7	-12.0	-12.6	-12.3	-10.7																						
22-Dec	-12.1	-12.0	-12.0	-12.0	-12.9	-13.4	-13.9	-14.0	-14.2	-14.5	-14.7	-14.8	-14.7	-14.7	-14.7	-15.7	-16.1	-16.6	-17.1	-17.7	-18.1	-18.5	-18.6	-18.8	-15.1	-12.0																						
23-Dec	-18.9	-19.0	-19.0	-19.0	-19.1	-19.2	-19.3	-19.6	-19.7	-19.7	-19.7	-19.3	-19.3	-19.2	-18.9	-18.8	-18.7	-18.8	-19.0	-19.1	-19.1	-19.2	-19.3	-19.4	-19.2	-18.7																						
24-Dec	-19.5	-19.8	-20.2	-20.5	-20.7	-20.8	-21.2	-21.5	-21.6	-21.6	-21.5	-21.4	-20.8	-20.5	-20.2	-20.1	-19.9	-19.7	-19.6	-19.4	-19.2	-19.1	-19.4	-19.6	-20.3	-19.1																						
25-Dec	-19.5	-18.7	-18.2	-18.2	-17.7	-17.5	-17.9	-17.7	-17.4	-16.9	-16.7	-16.0	-15.2	-14.9	-14.7	-14.6	-14.5	-14.6	-15.9	-17.3	-18.0	-18.4	-19.0	-19.4	-17.0	-14.5																						
26-Dec	-20.0	-20.7	-21.2	-21.5	-21.7	-21.7	-21.8	-22.1	-22.7	-22.2	-22.5	-22.5	-22.1	-21.7	-20.9	-20.4	-20.3	-20.6	-20.6	-20.3	-20.1	-19.8	-19.4	-19.2	-21.1	-19.2																						
27-Dec	-19.2	-19.0	-18.6	-18.4	-18.4	-18.0	-17.4	-16.5	-16.3	-16.2	-15.9	-15.5	-15.2	-14.9	-14.5	-14.3	-14.2	-14.1	-14.2	-14.3	-14.4	-14.5	-14.2	-13.7	-15.9	-13.7																						
28-Dec	-13.3	-13.3	-13.1	-13.1	-13.4	-13.9	-14.5	-15.2	-16.6	-17.3	-17.4	-17.4	-17.1	-17.1	-17.0	-17.0	-17.1	-17.2	-16.4	-16.2	-15.3	-15.8	-15.3	-15.1	-15.6	-13.1																						
29-Dec	-15.4	-15.5	-15.2	-14.8	-14.3	-13.4	-12.9	-12.3	-11.6	-11.6	-11.9	-12.1	-11.7	-11.0	-10.4	-10.3	-10.1	-9.9	-9.6	-9.8	-10.1	-10.4	-10.3	-10.4	-11.9	-9.6																						
30-Dec	-10.2	-9.5	-10.1	-10.1	-9.7	-8.9	-8.6	-8.8	-9.4	-9.9	-9.3	-8.6	-7.2	-6.1	-4.3	-4.0	-4.1	-4.4	-5.1	-5.9	-6.2	-6.3	-7.3	-8.2	-7.6	-4.0																						
31-Dec	-9.6	-8.7	-7.9	-7.2	-7.9	-8.1	-6.6	-6.0	-5.5	-4.6	-4.2	-3.8	-2.9	-1.8	-0.9	-0.7	-0.5	-0.8	-1.2	-1.0	-1.0	-1.6	-2.1	-2.1	-4.0	-0.5																						
																								-10.0	-10.1	-10.2	-10.3	-10.4	-10.6	-10.7	-10.9	-11.0	-11.0	-11.0	-10.7	-10.2	-9.7	-9.2	-9.0	-9.0	-9.1	-9.3	-9.4	-9.4	-9.5	-9.7	-9.9	Diurnal Average
																								3.7	3.3	2.5	2.1	1.7	0.7	0.1	-0.5	-1.0	-0.4	-1.4	0.1	1.0	1.5	2.8	4.3	5.1	6.1	6.1	6.0	5.7	5.3	4.8	4.3	Diurnal Maximum





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ambient Temperature 75 m (AT75m) - C**  
**Mannix - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	52	6.99	6.99
-20 - 0	663	89.11	96.10
0 - 10	29	3.90	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

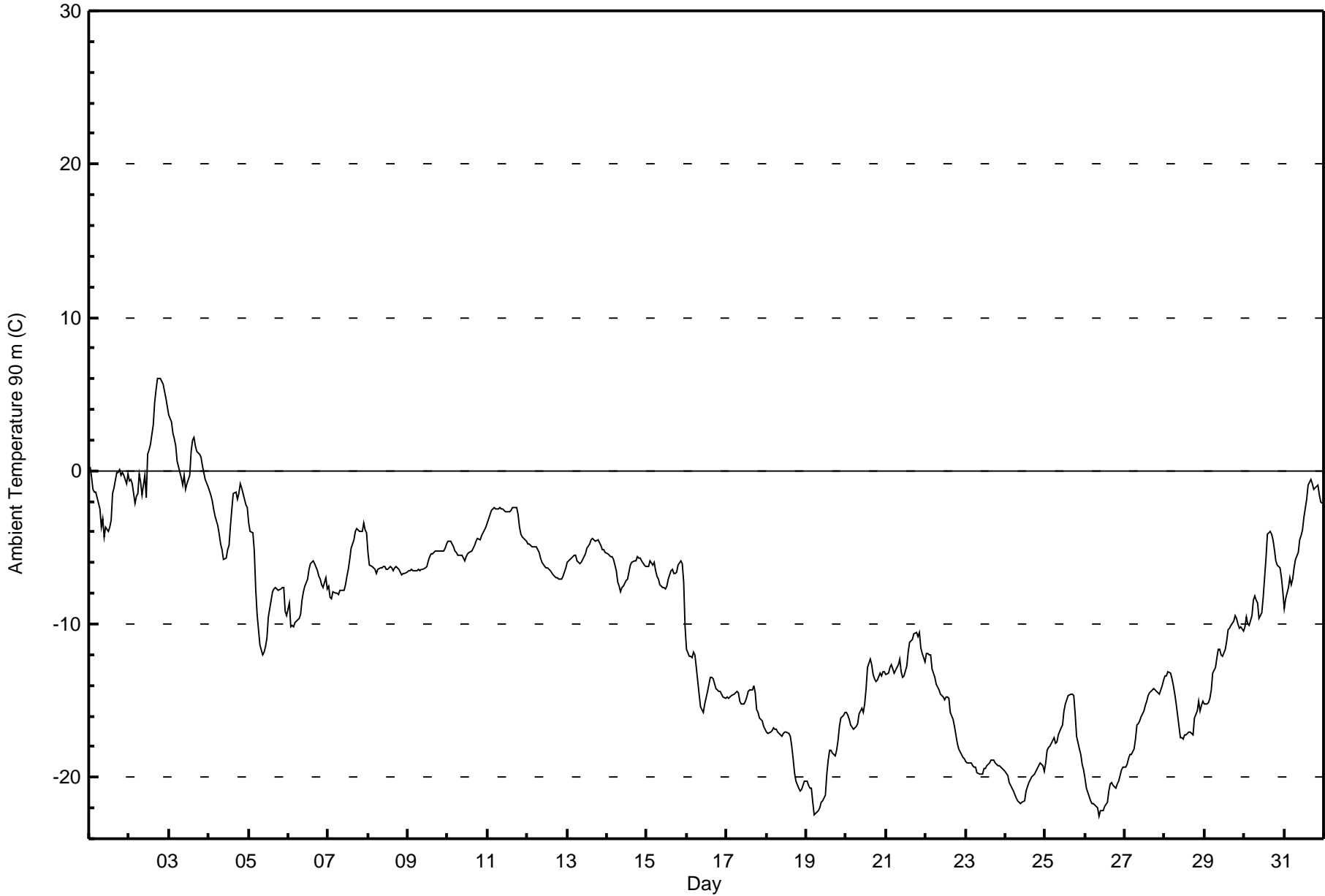




Summary of Hour Averages

Mannix - December 2015

Maximum Value: 6.1 C on Dec 2 19:00		Maximum Daily Average: 1.8 C on Dec 2		Hours in Service: 744																						
Minimum Value: -22.5 C on Dec 26 09:00		Minimum Daily Average: -21.1 C on Dec 26		Hours of Data: 744																						
Maximum Diurnal Average: -9.0 C at hour 17		Minimum Diurnal Average: -11.0 C at hour 11		Hours of Missing Data: 0																						
Monthly Average: -10.00 C		Percentiles: P <sub>1</sub> = -22.0 P <sub>10</sub> = -19.3 Q <sub>1</sub> = -15.7 Median = -8.3 Q <sub>3</sub> = -5.2 P <sub>90</sub> = -1.6 P <sub>99</sub> = 4.3		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0.3	-0.4	-1.2	-1.4	-1.4	-2.1	-2.5	-3.7	-3.2	-4.3	-3.7	-4.0	-3.7	-3.2	-1.5	-1.1	-0.1	-0.1	0.0	-0.3	-0.1	-0.3	-0.8	-0.2	-1.6	0.3
2-Dec	-0.7	-0.6	-0.8	-2.2	-1.6	-1.5	-0.2	-0.8	-1.6	-0.3	-1.7	1.0	1.4	1.7	3.0	4.4	5.3	6.0	6.1	6.0	5.6	5.2	4.8	4.2	1.8	6.1
3-Dec	3.7	3.2	2.5	2.1	1.6	0.6	0.3	-0.5	-0.9	-0.3	-1.2	-0.8	-0.3	1.2	2.0	2.2	1.6	1.2	1.1	0.9	0.4	-0.1	-0.6	-1.0	0.8	3.7
4-Dec	-1.3	-1.6	-1.9	-2.5	-3.0	-3.6	-4.2	-4.8	-5.1	-5.8	-5.7	-5.2	-4.9	-3.6	-2.5	-1.5	-1.4	-1.9	-1.5	-0.9	-1.1	-1.9	-2.2	-2.4	-2.9	-0.9
5-Dec	-3.4	-3.9	-4.0	-5.2	-7.7	-9.4	-10.4	-11.4	-12.0	-11.8	-11.5	-10.9	-9.6	-8.4	-7.9	-7.7	-7.6	-7.7	-7.8	-7.7	-7.7	-7.6	-9.2	-9.4	-8.3	-3.4
6-Dec	-8.6	-10.2	-10.1	-10.1	-9.9	-9.8	-9.7	-9.4	-8.4	-7.9	-7.5	-7.0	-6.5	-6.0	-6.0	-5.9	-6.1	-6.5	-6.9	-7.1	-7.5	-7.6	-7.0	-7.7	-7.9	-5.9
7-Dec	-7.5	-8.2	-8.4	-7.9	-7.9	-8.0	-8.1	-7.8	-7.8	-7.8	-7.4	-6.9	-6.4	-5.8	-5.0	-4.5	-4.0	-3.8	-3.8	-3.9	-4.0	-3.4	-3.9	-4.0	-6.1	-3.4
8-Dec	-5.3	-6.1	-6.2	-6.4	-6.5	-6.7	-6.5	-6.3	-6.4	-6.2	-6.2	-6.5	-6.4	-6.2	-6.3	-6.5	-6.3	-6.3	-6.5	-6.6	-6.8	-6.7	-6.7	-6.6	-6.4	-5.3
9-Dec	-6.5	-6.5	-6.4	-6.5	-6.5	-6.5	-6.5	-6.5	-6.5	-6.4	-6.3	-6.2	-5.9	-5.6	-5.4	-5.4	-5.3	-5.2	-5.2	-5.3	-5.3	-5.2	-5.1	-4.8	-5.9	-4.8
10-Dec	-4.6	-4.6	-4.6	-4.9	-5.2	-5.3	-5.5	-5.5	-5.5	-5.7	-5.9	-5.6	-5.4	-5.3	-5.2	-5.1	-4.9	-4.6	-4.4	-4.5	-4.3	-4.1	-3.8	-3.7	-4.9	-3.7
11-Dec	-3.4	-2.9	-2.6	-2.5	-2.4	-2.5	-2.5	-2.4	-2.5	-2.5	-2.6	-2.7	-2.7	-2.7	-2.6	-2.4	-2.4	-2.4	-2.8	-3.7	-4.2	-4.3	-4.4	-4.6	-2.9	-2.4
12-Dec	-4.7	-4.8	-4.9	-5.0	-5.0	-5.0	-5.1	-5.3	-5.7	-6.0	-6.2	-6.3	-6.3	-6.4	-6.5	-6.8	-6.9	-7.0	-7.0	-7.0	-7.1	-6.9	-6.6	-6.3	-6.0	-4.7
13-Dec	-6.0	-5.9	-5.7	-5.6	-5.5	-5.5	-5.8	-6.0	-6.0	-5.8	-5.6	-5.4	-5.0	-4.8	-4.5	-4.4	-4.5	-4.6	-4.5	-4.7	-4.9	-5.1	-5.2	-5.3	-5.3	-4.4
14-Dec	-5.4	-5.5	-5.6	-5.6	-5.8	-6.5	-7.3	-7.5	-7.9	-7.6	-7.6	-7.2	-7.1	-6.6	-6.2	-6.0	-5.9	-5.9	-5.6	-5.7	-5.7	-5.9	-6.1	-6.2	-6.3	-5.4
15-Dec	-6.2	-6.3	-5.9	-6.1	-5.9	-6.5	-6.9	-7.0	-7.5	-7.6	-7.7	-7.7	-7.5	-7.1	-6.5	-6.4	-6.7	-6.7	-6.6	-6.2	-5.9	-6.0	-7.2	-10.2	-6.8	-5.9
16-Dec	-11.6	-12.1	-12.1	-12.2	-11.8	-12.1	-12.9	-14.6	-15.4	-15.6	-15.8	-15.2	-14.4	-13.9	-13.5	-13.4	-13.6	-14.2	-14.3	-14.4	-14.4	-14.6	-14.8	-14.8	-13.8	-11.6
17-Dec	-14.7	-14.8	-14.8	-14.6	-14.6	-14.4	-14.4	-14.5	-15.0	-15.2	-15.2	-15.0	-14.8	-14.4	-14.3	-14.3	-14.0	-14.5	-15.6	-15.8	-16.1	-16.4	-16.6	-16.8	-15.0	-14.0
18-Dec	-17.0	-17.1	-17.0	-16.9	-16.8	-16.8	-16.9	-17.1	-17.2	-17.3	-17.1	-17.0	-17.1	-17.1	-17.3	-17.9	-18.8	-19.7	-20.3	-20.7	-20.9	-20.8	-20.5	-20.3	-18.1	-16.8
19-Dec	-20.2	-20.6	-20.7	-20.7	-21.6	-22.5	-22.3	-22.2	-22.0	-21.6	-21.5	-21.2	-19.8	-18.8	-18.3	-18.3	-18.4	-18.6	-18.2	-17.5	-16.6	-16.2	-16.0	-15.8	-19.6	-15.8
20-Dec	-15.7	-16.0	-16.2	-16.6	-16.8	-16.8	-16.7	-16.5	-15.9	-15.5	-15.8	-15.2	-14.2	-12.8	-12.3	-12.6	-13.3	-13.6	-13.7	-13.7	-13.2	-13.4	-13.1	-13.1	-14.7	-12.3
21-Dec	-13.3	-13.2	-12.9	-12.7	-13.0	-13.2	-13.0	-12.7	-12.3	-13.1	-13.5	-13.4	-12.7	-11.8	-11.2	-11.1	-11.0	-10.7	-10.6	-10.8	-10.6	-11.6	-11.9	-12.4	-12.2	-10.6
22-Dec	-11.9	-12.0	-12.0	-12.1	-12.9	-13.5	-14.0	-14.1	-14.3	-14.6	-14.8	-14.9	-14.8	-14.8	-14.8	-15.8	-16.2	-16.7	-17.2	-17.8	-18.2	-18.5	-18.7	-18.8	-15.1	-11.9
23-Dec	-18.9	-19.1	-19.1	-19.0	-19.2	-19.3	-19.4	-19.7	-19.8	-19.8	-19.8	-19.4	-19.4	-19.3	-19.0	-18.9	-18.9	-18.9	-19.1	-19.2	-19.2	-19.3	-19.4	-19.5	-19.3	-18.9
24-Dec	-19.6	-19.9	-20.3	-20.6	-20.7	-20.9	-21.3	-21.5	-21.7	-21.7	-21.6	-21.5	-20.9	-20.6	-20.3	-20.2	-20.0	-19.8	-19.6	-19.5	-19.2	-19.1	-19.2	-19.6	-20.4	-19.1
25-Dec	-19.1	-18.2	-18.0	-18.0	-17.6	-17.4	-17.8	-17.7	-17.3	-16.8	-16.6	-15.7	-15.2	-14.9	-14.7	-14.6	-14.6	-14.7	-15.9	-17.4	-18.1	-18.5	-19.1	-19.5	-17.0	-14.6
26-Dec	-20.1	-20.7	-21.2	-21.6	-21.7	-21.7	-21.8	-22.0	-22.5	-22.1	-22.2	-22.2	-21.9	-21.6	-20.9	-20.4	-20.3	-20.6	-20.7	-20.4	-20.2	-19.9	-19.5	-19.3	-21.1	-19.3
27-Dec	-19.3	-19.2	-18.7	-18.5	-18.5	-18.1	-17.5	-16.6	-16.5	-16.3	-16.0	-15.6	-15.3	-15.0	-14.7	-14.5	-14.3	-14.2	-14.3	-14.4	-14.5	-14.6	-14.0	-13.7	-16.0	-13.7
28-Dec	-13.4	-13.4	-13.1	-13.2	-13.6	-14.0	-14.6	-15.2	-16.7	-17.4	-17.4	-17.5	-17.2	-17.2	-17.1	-17.0	-17.2	-17.2	-16.1	-15.7	-15.0	-15.7	-15.3	-15.0	-15.6	-13.1
29-Dec	-15.2	-15.2	-15.1	-14.9	-14.3	-13.2	-12.8	-12.2	-11.6	-11.7	-12.0	-12.1	-11.7	-11.1	-10.4	-10.3	-10.1	-9.8	-9.5	-9.6	-10.0	-10.3	-10.2	-10.4	-11.8	-9.5
30-Dec	-10.1	-9.5	-10.0	-10.1	-9.4	-8.5	-8.2	-8.4	-8.6	-9.7	-9.2	-8.3	-7.0	-5.7	-4.2	-4.0	-4.1	-4.5	-5.1	-5.9	-6.2	-6.3	-7.0	-7.9	-7.4	-4.0
31-Dec	-9.0	-8.4	-7.6	-7.0	-7.4	-7.1	-6.3	-5.8	-5.3	-4.5	-4.2	-3.9	-3.0	-1.9	-0.9	-0.7	-0.5	-0.8	-1.2	-1.0	-1.0	-1.6	-2.1	-2.1	-3.9	-0.5
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ambient Temperature 90 m (AT90m) - C**  
**Mannix - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	53	7.12	7.12
-20 - 0	661	88.84	95.97
0 - 10	30	4.03	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

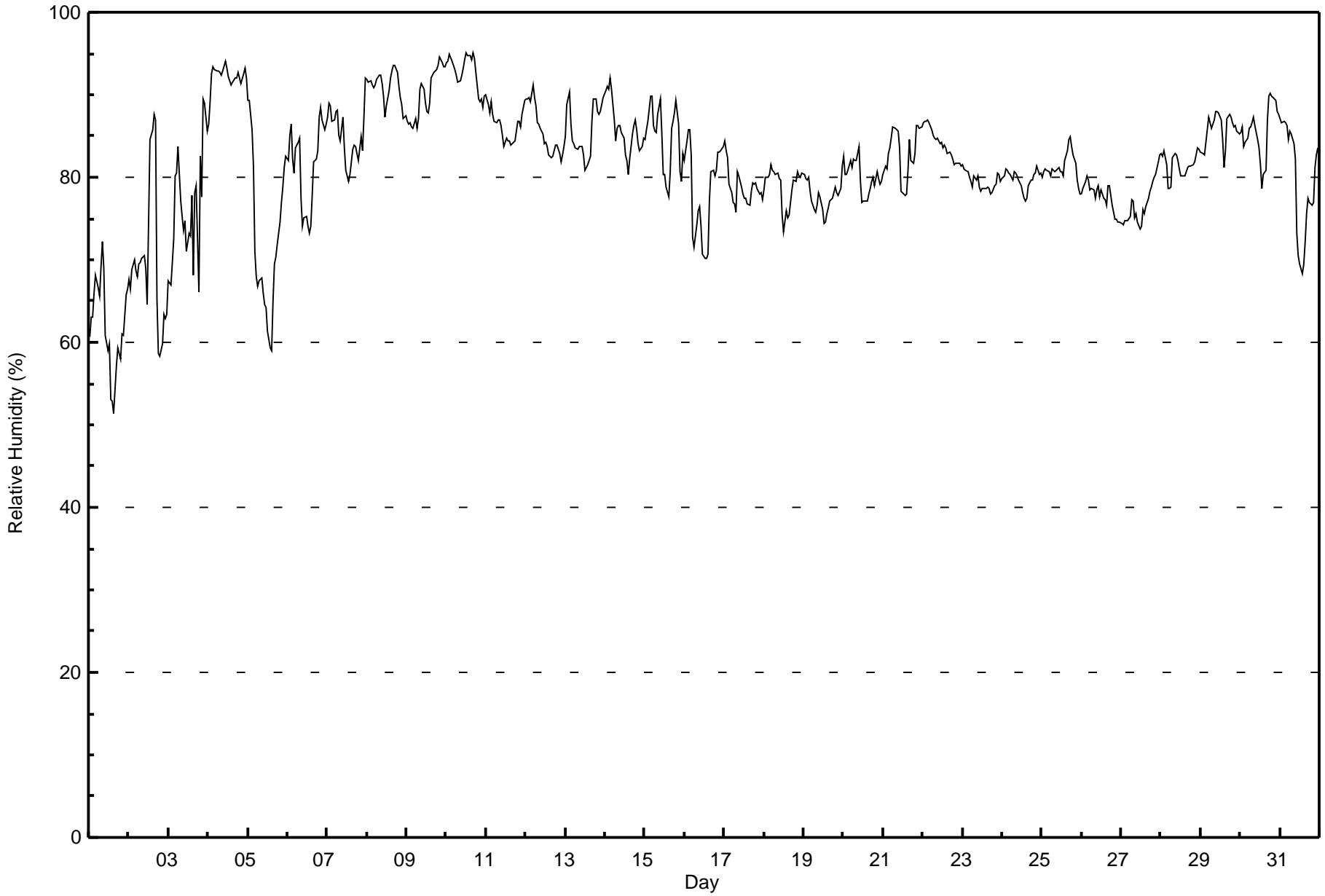
**Mannix - December 2015**

Maximum Value: 95 % on Dec 10 13:00														Maximum Daily Average: 92.8 % on Dec 10														Hours in Service: 744	
Minimum Value: 51 % on Dec 1 16:00														Minimum Daily Average: 62.0 % on Dec 1														Hours of Data: 744	
Maximum Diurnal Average: 83.3 % at hour 3														Minimum Diurnal Average: 78.6 % at hour 14														Hours of Missing Data: 0	
Monthly Average: 81.6 %														Percentiles: P <sub>1</sub> = 59 P <sub>10</sub> = 72 Q <sub>1</sub> = 78 Median = 82 O <sub>3</sub> = 87 P <sub>90</sub> = 91 P <sub>99</sub> = 94														Hours of Calibration: 0	
																												Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	61	63	63	66	68	67	66	69	72	69	61	59	60	53	53	51	57	59	59	58	61	61	66	66	62.0	72			
2-Dec	68	66	69	70	69	68	69	70	70	71	69	65	74	85	86	88	87	65	59	58	60	63	63	63	69.8	88			
3-Dec	68	67	70	72	80	80	84	77	75	74	75	71	73	73	78	68	78	79	66	82	78	89	89	86	76.3	89			
4-Dec	87	89	92	93	93	93	93	93	92	93	94	93	92	92	91	92	92	92	93	92	91	93	93	92	92.1	94			
5-Dec	89	89	86	81	71	68	67	67	68	66	65	64	61	59	59	65	69	70	72	75	77	79	81	83	72.2	89			
6-Dec	82	85	86	82	80	84	84	85	77	74	75	75	74	73	74	78	82	82	83	87	88	87	86	86	81.3	88			
7-Dec	87	89	89	87	87	88	88	85	84	87	84	81	80	79	80	83	84	84	83	82	85	83	87	92	85.0	92			
8-Dec	92	91	92	91	91	91	92	92	92	91	90	87	89	91	92	93	94	94	93	91	90	89	87	87	90.9	94			
9-Dec	87	86	87	86	86	87	86	87	91	91	91	89	88	88	89	92	93	93	93	94	95	94	93	93	89.9	95			
10-Dec	94	94	95	94	94	93	92	91	92	92	93	94	95	95	95	94	95	94	93	90	89	89	88	90	92.8	95			
11-Dec	90	89	88	89	88	87	87	87	87	86	85	84	85	84	84	84	84	84	86	87	87	86	88	89	86.4	90			
12-Dec	90	90	90	89	91	90	89	87	86	86	85	84	84	84	83	82	83	83	84	84	83	82	83	84	85.5	91			
13-Dec	85	89	90	86	84	84	84	83	84	84	84	83	81	82	82	83	87	90	89	88	88	88	89	90	85.6	90			
14-Dec	91	91	91	92	91	87	84	86	86	86	85	85	83	82	80	82	85	86	87	86	84	83	84	85	85.9	92			
15-Dec	85	86	87	90	90	86	86	85	88	89	85	80	80	79	78	81	86	87	88	89	86	81	79	83	84.7	90			
16-Dec	82	84	86	86	83	73	71	74	76	76	74	71	70	70	71	77	81	81	80	81	83	83	83	84	78.3	86			
17-Dec	84	83	82	79	78	77	77	76	81	80	79	78	77	77	77	77	78	79	79	79	79	78	78	77	78.8	84			
18-Dec	78	80	80	80	82	81	81	80	81	80	80	75	73	76	75	75	77	79	80	80	81	80	80	81	78.9	82			
19-Dec	80	80	80	80	78	77	76	76	77	78	78	76	74	75	76	76	77	77	78	79	78	78	79	81	77.7	81			
20-Dec	82	80	80	81	82	81	82	82	82	84	80	77	77	77	77	78	79	80	80	79	81	80	79	79	80.0	84			
21-Dec	80	81	81	83	84	85	86	86	86	86	83	78	78	78	78	81	85	82	82	83	86	86	86	86	82.9	86			
22-Dec	87	87	87	87	87	86	85	85	85	85	84	84	84	84	84	83	83	83	82	82	82	82	81	81	84.0	87			
23-Dec	81	81	81	81	80	79	79	80	80	80	79	78	79	79	79	79	79	78	78	79	79	80	79	79	79.5	81			
24-Dec	80	80	81	81	81	80	80	81	81	80	80	79	78	77	77	79	80	80	80	80	81	81	80	81	79.7	81			
25-Dec	80	81	81	81	81	80	81	81	81	81	81	81	81	80	82	83	85	85	84	83	82	80	79	78	81.2	85			
26-Dec	78	79	79	80	80	78	79	78	77	79	79	78	78	77	77	77	79	79	77	76	75	75	75	75	77.6	80			
27-Dec	74	74	75	75	75	75	77	77	75	76	75	74	74	76	76	76	77	78	79	80	80	80	82	83	76.8	83			
28-Dec	83	83	83	81	79	79	79	82	83	83	82	81	80	80	80	81	81	81	81	81	82	83	83	83	81.5	83			
29-Dec	83	83	83	84	86	87	86	86	87	88	88	88	87	85	81	83	87	88	87	87	86	86	86	85	85.7	88			
30-Dec	85	86	84	84	85	86	86	87	87	86	85	84	82	79	80	81	87	90	90	90	90	89	88	88	85.7	90			
31-Dec	87	87	87	87	86	85	86	85	84	82	73	71	70	68	69	72	76	77	77	77	77	81	83	84	79.5	87			
														82.6 83.0 83.3 83.2 82.8 82.0 81.9 82.0 82.1 82.0 80.6 78.9 78.8 78.6 78.8 79.8 82.1 81.9 81.3 81.8 82.0 82.3 82.5 83.0														Diurnal Average	
														94 94 95 94 94 93 93 93 92 93 94 94 95 95 95 94 95 94 93 94 95 94 93 93														Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Mannix - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Mannix - December 2015**

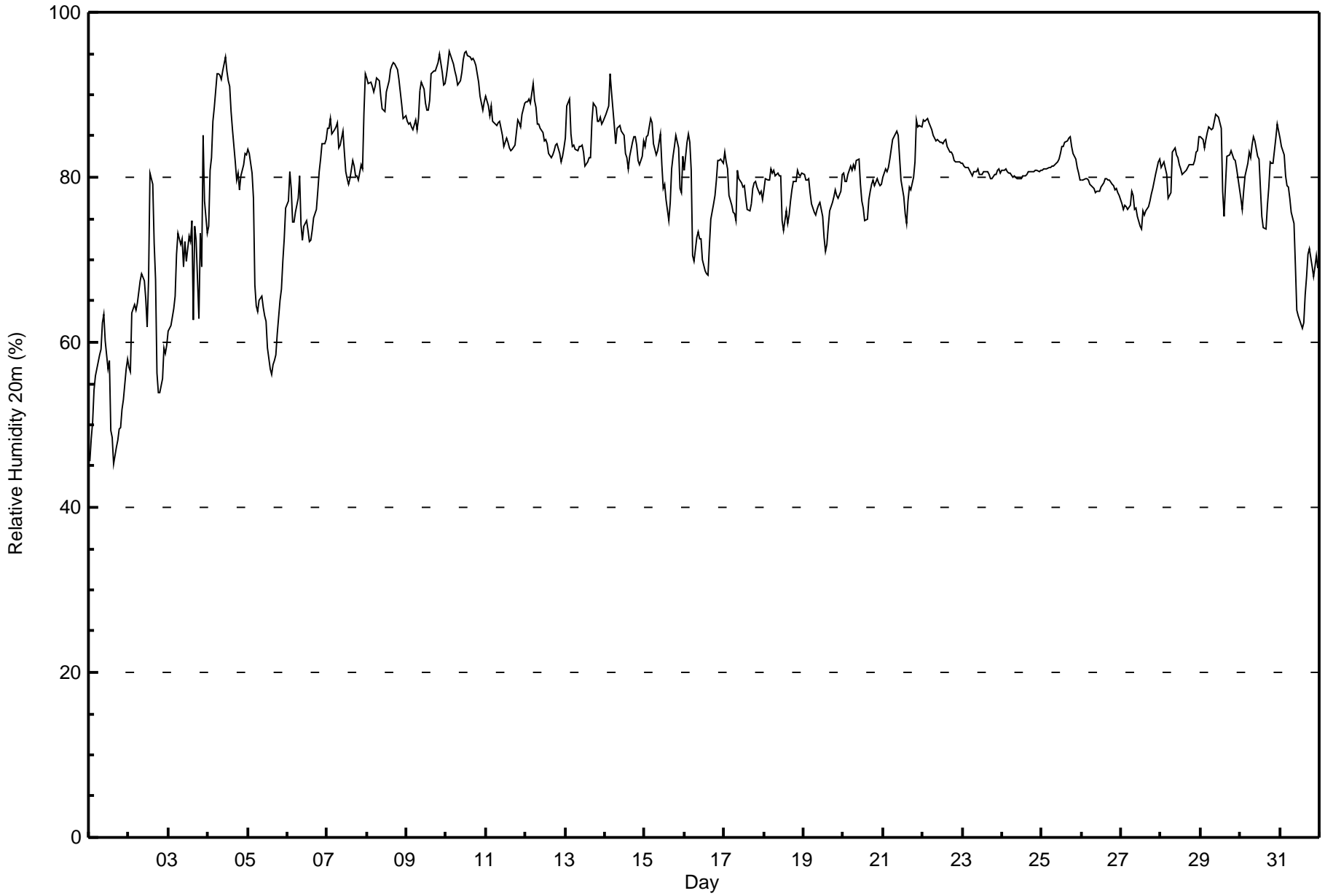
<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	14	1.88	1.88
60 - 80	247	33.20	35.08
80 - 100	483	64.92	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 95 % on Dec 10 03:00																	Maximum Daily Average: 92.8 % on Dec 10																	Hours in Service: 744	
Minimum Value: 45 % on Dec 1 16:00																	Minimum Daily Average: 53.6 % on Dec 1																	Hours of Data: 744	
Maximum Diurnal Average: 81.2 % at hour 3																	Minimum Diurnal Average: 77.3 % at hour 15																	Hours of Missing Data: 0	
Monthly Average: 79.7 %																	Percentiles: P <sub>1</sub> = 50 P <sub>10</sub> = 68 Q <sub>1</sub> = 77 Median = 81 O <sub>3</sub> = 85 P <sub>90</sub> = 89 P <sub>99</sub> = 94																	Hours of Calibration: 0	
																																		Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	46	48	50	54	56	58	58	59	62	63	60	57	58	49	48	45	47	48	50	50	52	53	57	58	53.6	63									
2-Dec	57	57	64	65	64	65	66	67	68	68	65	62	68	80	79	72	68	56	54	54	56	59	59	60	63.8	80									
3-Dec	61	62	63	64	66	71	73	72	73	69	72	70	73	72	75	63	74	72	63	73	69	85	77	73	70.2	85									
4-Dec	74	81	82	87	88	93	92	92	92	93	95	93	92	91	88	86	82	80	81	79	80	82	83	83	86.1	95									
5-Dec	83	83	81	77	67	64	64	65	66	64	63	63	59	57	56	57	58	59	61	65	66	70	73	76	66.5	83									
6-Dec	77	81	79	75	75	76	77	80	74	72	74	75	74	72	73	75	76	78	81	82	84	84	85	77.1	85										
7-Dec	86	86	87	85	86	86	87	83	84	86	83	81	80	79	80	82	81	80	80	80	81	81	88	93	83.5	93									
8-Dec	92	91	91	91	90	91	92	92	90	88	88	88	90	92	93	94	94	94	93	92	90	89	87	88	90.8	94									
9-Dec	87	86	87	86	86	87	86	87	91	91	91	89	88	88	89	93	93	93	93	94	95	93	91	91	89.8	95									
10-Dec	92	94	95	94	94	93	92	91	92	93	94	95	95	95	94	94	94	94	94	92	90	89	88	89	92.8	95									
11-Dec	90	89	87	89	87	87	86	87	87	86	85	84	85	84	84	83	83	84	85	87	87	86	88	89	86.1	90									
12-Dec	89	89	89	89	91	89	88	86	86	86	85	84	85	84	83	82	83	83	84	84	83	82	83	84	85.6	91									
13-Dec	85	89	89	85	84	84	83	83	84	84	84	83	81	82	82	87	89	89	87	87	87	86	87	85.1	89										
14-Dec	88	88	89	92	90	86	84	86	86	86	86	85	83	82	81	83	84	85	85	84	82	82	83	84	85.2	92									
15-Dec	84	85	85	87	87	84	83	83	83	85	81	79	79	77	75	77	81	83	84	85	84	79	78	83	82.1	87									
16-Dec	81	84	85	84	81	71	70	73	73	72	73	70	69	68	68	72	75	77	78	80	82	82	82	82	76.3	85									
17-Dec	83	82	81	78	77	76	76	75	81	80	79	79	79	77	76	76	77	79	79	79	79	78	78	77	78.3	83									
18-Dec	78	80	80	80	81	81	81	80	81	80	80	80	75	74	76	74	75	77	78	79	79	81	80	81	78.8	81									
19-Dec	80	80	80	80	78	77	76	75	76	77	77	75	73	71	72	74	76	77	78	79	78	77	78	80	76.8	80									
20-Dec	81	79	80	80	81	81	81	81	82	82	79	77	76	75	75	77	78	79	80	79	80	79	79	79	79.2	82									
21-Dec	80	81	81	81	82	83	84	85	86	85	82	80	78	76	74	77	79	78	80	82	87	86	86	86	81.7	87									
22-Dec	87	87	87	87	87	86	85	85	84	85	84	84	84	84	85	84	83	83	83	82	82	82	82	82	84.2	87									
23-Dec	82	81	81	81	81	81	80	81	81	81	80	80	80	81	81	81	80	80	80	80	80	81	81	80	80.6	82									
24-Dec	81	81	81	81	81	80	80	80	80	80	80	80	80	80	80	80	81	81	81	81	81	81	81	81	80.5	81									
25-Dec	81	81	81	81	81	81	81	81	82	82	82	83	84	84	84	84	85	85	84	83	82	81	81	80	82.2	85									
26-Dec	80	80	80	80	80	79	79	79	78	78	78	78	79	79	80	80	80	80	79	79	78	79	78	78	79.0	80									
27-Dec	77	76	77	76	76	77	78	78	76	76	75	74	74	76	75	76	76	77	78	79	79	80	82	82	77.1	82									
28-Dec	81	82	82	80	77	78	78	83	84	83	82	82	81	80	81	81	81	82	82	82	82	83	83	85	81.4	85									
29-Dec	85	85	84	85	85	86	86	86	87	88	87	87	86	78	75	79	83	83	83	83	82	82	81	79	83.5	88									
30-Dec	77	76	78	80	82	83	82	84	85	84	82	82	79	75	74	74	77	79	82	82	82	85	86	86	80.7	86									
31-Dec	85	84	83	80	79	79	77	76	74	69	64	63	63	62	62	66	68	71	71	69	68	69	71	69	71.7	85									
80.3																	80.8																	Diurnal Average	
92																	94																	Diurnal Maximum	







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity 20m (RH20m) - %**  
**Mannix - December 2015**

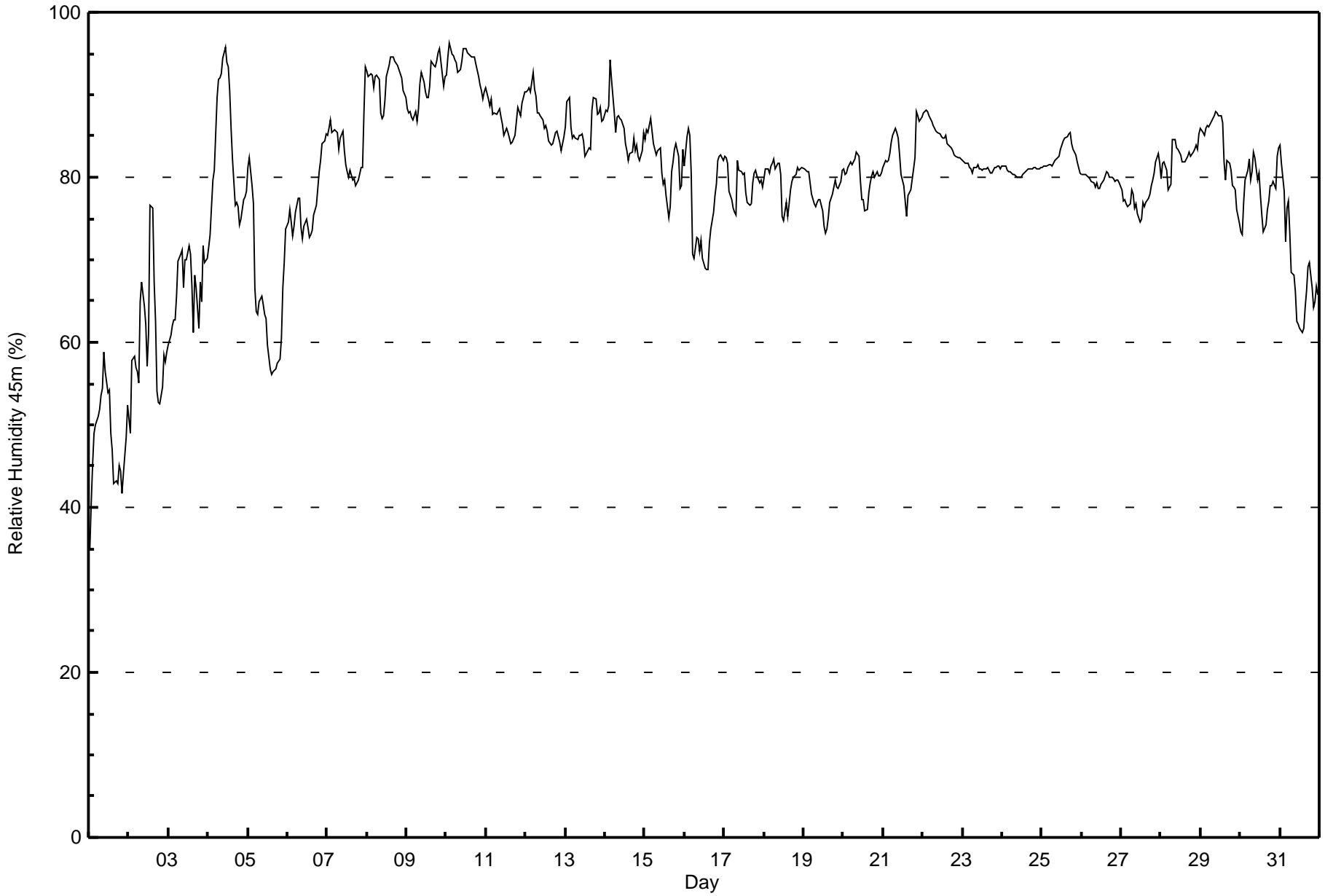
<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	36	4.84	4.84
60 - 80	267	35.89	40.73
80 - 100	441	59.27	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 96 % on Dec 10 03:00																			Maximum Daily Average: 93.7 % on Dec 10						Hours in Service: 744																							
Minimum Value: 35 % on Dec 1 01:00																			Minimum Daily Average: 48.1 % on Dec 1						Hours of Data: 744																							
Maximum Diurnal Average: 80.8 % at hour 3																			Minimum Diurnal Average: 77.5 % at hour 16						Hours of Missing Data: 0																							
Monthly Average: 79.5 %																			Percentiles: P <sub>1</sub> = 44 P <sub>10</sub> = 65 Q <sub>1</sub> = 77 Median = 81 O <sub>3</sub> = 85 P <sub>90</sub> = 90 P <sub>99</sub> = 95						Hours of Calibration: 0																							
																									Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	35	41	45	49	50	51	52	54	54	59	57	54	54	49	47	43	43	43	45	44	42	44	48	52	48.1	59																						
2-Dec	51	49	58	58	57	56	55	65	67	64	62	57	61	77	76	67	63	54	53	52	55	58	58	59	59.7	77																						
3-Dec	60	61	62	63	63	66	70	71	71	67	70	70	72	71	67	61	68	67	62	67	65	72	70	70	66.8	72																						
4-Dec	71	73	77	80	81	90	92	92	92	94	96	94	93	90	86	82	77	77	76	74	75	77	78	78	83.2	96																						
5-Dec	81	82	79	77	67	64	63	65	66	65	63	63	60	57	56	56	57	57	57	58	61	67	70	74	65.1	82																						
6-Dec	75	76	75	73	74	76	77	77	74	73	74	75	74	73	74	75	77	79	81	82	84	84	85	85	76.6	85																						
7-Dec	85	86	87	85	86	86	85	83	85	86	83	81	81	80	81	80	80	79	79	80	81	81	88	93	83.4	93																						
8-Dec	93	92	93	92	91	92	92	92	88	87	87	89	92	94	94	95	95	94	94	93	92	92	91	90	91.8	95																						
9-Dec	88	88	88	87	87	88	87	88	91	93	92	90	90	90	91	94	94	93	94	95	96	92	91	92	90.8	96																						
10-Dec	92	95	96	95	95	94	94	93	93	94	96	96	96	95	95	95	95	95	94	92	91	90	89	90	93.7	96																						
11-Dec	91	90	89	89	88	88	88	88	88	87	86	85	86	85	85	84	84	85	87	88	88	87	89	90	87.3	91																						
12-Dec	90	91	91	90	93	91	90	88	88	87	87	86	86	86	84	84	84	85	85	86	84	83	84	85	87.0	93																						
13-Dec	86	89	90	86	85	85	85	85	85	85	85	84	83	83	84	83	88	90	89	88	88	88	87	87	86.1	90																						
14-Dec	88	88	89	94	92	88	85	87	88	87	87	86	84	83	82	83	83	85	83	84	82	82	83	85	85.8	94																						
15-Dec	85	86	85	87	86	84	83	83	83	84	80	79	80	78	75	77	81	82	83	84	83	79	79	83	82.0	87																						
16-Dec	81	85	86	85	80	71	70	73	73	71	72	70	69	69	69	72	74	76	78	79	82	83	83	82	76.3	86																						
17-Dec	83	82	82	78	77	76	76	75	82	81	81	80	80	78	77	77	77	79	81	81	80	79	80	79	79.2	83																						
18-Dec	80	81	81	80	81	82	82	81	82	82	80	75	75	77	75	77	78	79	80	80	81	81	81	81	79.7	82																						
19-Dec	81	81	81	81	79	78	77	76	77	77	77	76	74	73	74	75	77	78	79	80	79	79	80	81	77.8	81																						
20-Dec	81	80	80	81	82	82	82	82	83	83	80	77	77	76	76	78	79	80	81	80	81	80	80	81	80.1	83																						
21-Dec	81	82	82	82	83	84	85	86	85	85	83	80	79	77	75	78	78	78	81	82	88	87	87	87	82.4	88																						
22-Dec	88	88	88	88	87	87	86	86	86	85	85	85	85	85	85	84	84	84	83	83	82	82	82	82	85.0	88																						
23-Dec	82	82	82	82	81	81	81	81	81	82	81	81	81	81	81	81	81	80	81	81	81	81	81	81	81.2	82																						
24-Dec	81	81	81	81	81	81	80	80	80	80	80	80	80	81	81	81	81	81	81	81	81	81	81	81	80.8	81																						
25-Dec	81	81	81	81	82	81	81	82	82	82	82	83	84	84	85	85	85	85	84	83	83	82	81	80	82.7	85																						
26-Dec	80	80	80	80	80	80	80	79	79	79	79	79	79	80	80	81	80	80	80	80	80	80	79	79	79.7	81																						
27-Dec	78	77	77	77	76	77	79	78	76	77	76	75	75	77	77	77	77	78	79	80	81	82	83	82	77.9	83																						
28-Dec	80	82	82	81	79	79	79	85	85	84	83	83	83	83	82	82	82	83	83	83	83	84	83	85	82.3	85																						
29-Dec	86	85	85	86	86	86	87	87	87	88	88	88	87	87	82	80	82	82	81	79	79	79	76	74	83.6	88																						
30-Dec	73	73	77	80	81	82	80	81	83	82	80	81	78	75	73	74	76	77	79	79	80	79	83	84	78.7	84																						
31-Dec	84	82	78	72	76	77	73	69	68	66	63	62	62	61	62	64	66	69	70	67	64	65	67	66	68.9	84																						
																								79.7	80.3	80.8	80.7	80.1	80.0	79.9	80.4	80.7	80.5	79.8	78.9	78.7	78.5	77.7	77.5	78.2	78.5	78.7	78.9	79.0	79.4	79.8	80.7	Diurnal Average
																								93	95	96	95	95	94	94	93	93	94	96	96	96	95	95	95	95	95	94	95	96	92	91	93	Diurnal Maximum





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity 45m (RH45m) - %**  
**Mannix - December 2015**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	1	0.13	0.13
40 - 60	47	6.32	6.45
60 - 80	245	32.93	39.38
80 - 100	451	60.62	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

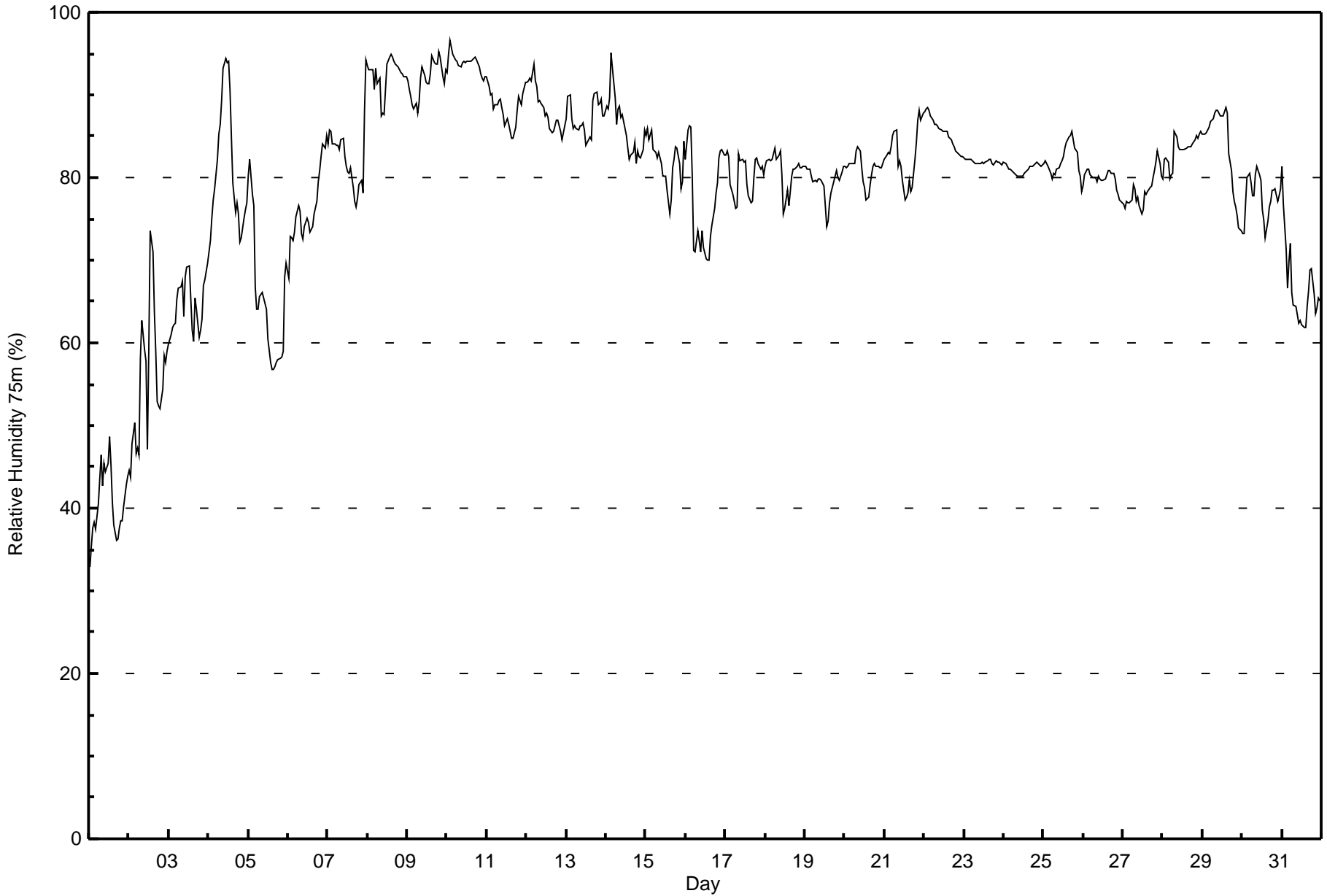


Maximum Value: 97 % on Dec 10 03:00																		Maximum Daily Average: 93.9 % on Dec 10																		Hours in Service: 744													
Minimum Value: 33 % on Dec 1 01:00																		Minimum Daily Average: 40.7 % on Dec 1																		Hours of Data: 744													
Maximum Diurnal Average: 80.3 % at hour 24																		Minimum Diurnal Average: 77.9 % at hour 16																		Hours of Missing Data: 0													
Monthly Average: 79.2 %																		Percentiles: P <sub>1</sub> = 38 P <sub>10</sub> = 64 Q <sub>1</sub> = 77 Median = 82 O <sub>3</sub> = 86 P <sub>90</sub> = 91 P <sub>99</sub> = 94																		Hours of Calibration: 0													
																																				Percent Operational Time: 100.0													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	33	35	38	38	37	41	44	46	43	45	44	45	49	45	41	38	36	36	38	38	38	40	43	44	40.7	49																							
2-Dec	45	44	48	50	47	47	46	58	63	59	58	47	59	74	71	64	59	53	52	52	54	58	58	59	55.2	74																							
3-Dec	60	61	62	62	62	65	67	67	68	63	68	69	69	65	62	60	65	64	61	62	63	67	68	70	64.5	70																							
4-Dec	71	72	75	77	79	82	85	87	89	93	94	94	94	90	85	79	76	77	76	72	73	75	76	77	81.2	94																							
5-Dec	80	82	78	77	67	64	64	66	66	65	65	64	61	58	57	57	57	58	58	58	58	59	68	70	64.8	82																							
6-Dec	68	73	73	72	73	75	77	76	73	73	74	75	75	73	74	74	76	77	79	81	83	84	83	85	76.1	85																							
7-Dec	84	86	86	84	84	84	84	83	84	85	82	81	81	81	81	79	77	77	78	79	80	78	88	94	82.5	94																							
8-Dec	94	93	93	93	91	93	91	92	88	88	88	91	94	95	95	95	94	94	93	93	93	93	92	92	92.3	95																							
9-Dec	92	91	90	89	88	89	88	89	92	93	92	92	91	91	93	95	94	94	94	95	95	92	91	93	91.8	95																							
10-Dec	93	95	97	95	95	94	94	94	93	94	94	94	94	94	94	94	94	95	94	93	93	92	92	92	93.9	97																							
11-Dec	92	91	90	90	88	89	89	89	90	89	88	86	87	86	86	85	85	86	88	90	89	89	90	91	88.5	92																							
12-Dec	91	92	92	92	94	92	91	89	89	89	89	88	88	87	86	85	86	86	87	87	86	85	85	86	88.4	94																							
13-Dec	87	90	90	87	86	86	86	86	86	86	87	86	84	85	85	85	89	90	90	89	89	90	88	87	87.2	90																							
14-Dec	89	88	90	95	93	90	86	88	89	87	88	86	85	84	82	83	83	84	82	83	83	82	83	86	86.2	95																							
15-Dec	85	86	85	86	83	83	83	82	83	82	80	80	80	78	76	77	81	82	84	84	82	79	80	84	81.9	86																							
16-Dec	82	86	86	86	80	71	71	74	72	71	74	72	70	70	70	73	74	76	78	79	82	83	83	83	77.0	86																							
17-Dec	83	83	82	79	78	77	76	76	83	82	82	82	82	79	78	77	77	80	82	82	82	81	81	80	80.3	83																							
18-Dec	81	82	82	82	82	83	84	82	83	83	80	76	76	78	77	78	80	81	81	81	82	81	81	81	80.8	84																							
19-Dec	81	81	81	81	80	80	80	80	80	80	80	79	77	74	75	77	78	79	80	81	80	80	81	81	79.3	81																							
20-Dec	81	81	81	82	82	82	82	83	84	83	81	80	79	77	78	79	80	81	82	81	81	81	81	82	81.0	84																							
21-Dec	82	83	83	83	84	85	86	86	81	82	81	80	77	78	78	80	78	79	82	84	87	88	87	88	82.6	88																							
22-Dec	88	88	88	88	87	87	87	86	86	86	86	86	86	86	86	85	85	84	84	83	83	83	83	82	85.5	88																							
23-Dec	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	81.9	82																							
24-Dec	82	82	81	81	81	81	81	80	80	80	80	80	80	81	81	81	81	81	82	82	82	82	81	81	81.0	82																							
25-Dec	82	82	82	81	80	80	80	80	81	81	82	82	83	84	84	85	85	86	85	84	83	81	80	78	82.1	86																							
26-Dec	79	80	81	81	80	80	80	80	80	80	80	80	80	80	80	81	81	81	80	80	78	78	77	77	79.8	81																							
27-Dec	77	76	77	77	77	77	79	79	77	78	77	76	76	78	78	78	79	79	80	81	82	83	82	80	78.4	83																							
28-Dec	80	82	82	82	80	80	81	86	85	84	83	83	83	83	84	84	84	84	84	85	85	85	85	86	83.3	86																							
29-Dec	85	85	85	86	86	87	87	88	88	88	88	88	88	88	88	88	88	83	81	78	77	76	74	74	83.8	88																							
30-Dec	73	73	77	80	80	79	78	78	80	81	80	80	76	75	73	75	76	77	78	78	79	77	78	79	77.6	81																							
31-Dec	81	77	71	67	70	72	66	65	64	63	62	63	62	62	62	64	66	69	69	66	64	64	65	65	66.7	81																							
																								79.5	80.1	80.3	80.2	79.3	79.3	79.1	79.9	80.1	79.9	79.6	78.8	78.9	78.7	78.0	77.9	78.2	78.5	78.7	78.8	78.9	78.9	79.6	80.3	Diurnal Average	
																								94	95	97	95	95	94	94	94	94	93	94	94	94	94	95	95	95	94	95	94	95	95	93	92	94	Diurnal Maximum



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity 75m (RH75m) - %**  
**Mannix - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity 75m (RH75m) - %**  
**Mannix - December 2015**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	11	1.48	1.48
40 - 60	43	5.78	7.26
60 - 80	223	29.97	37.23
80 - 100	467	62.77	100.00

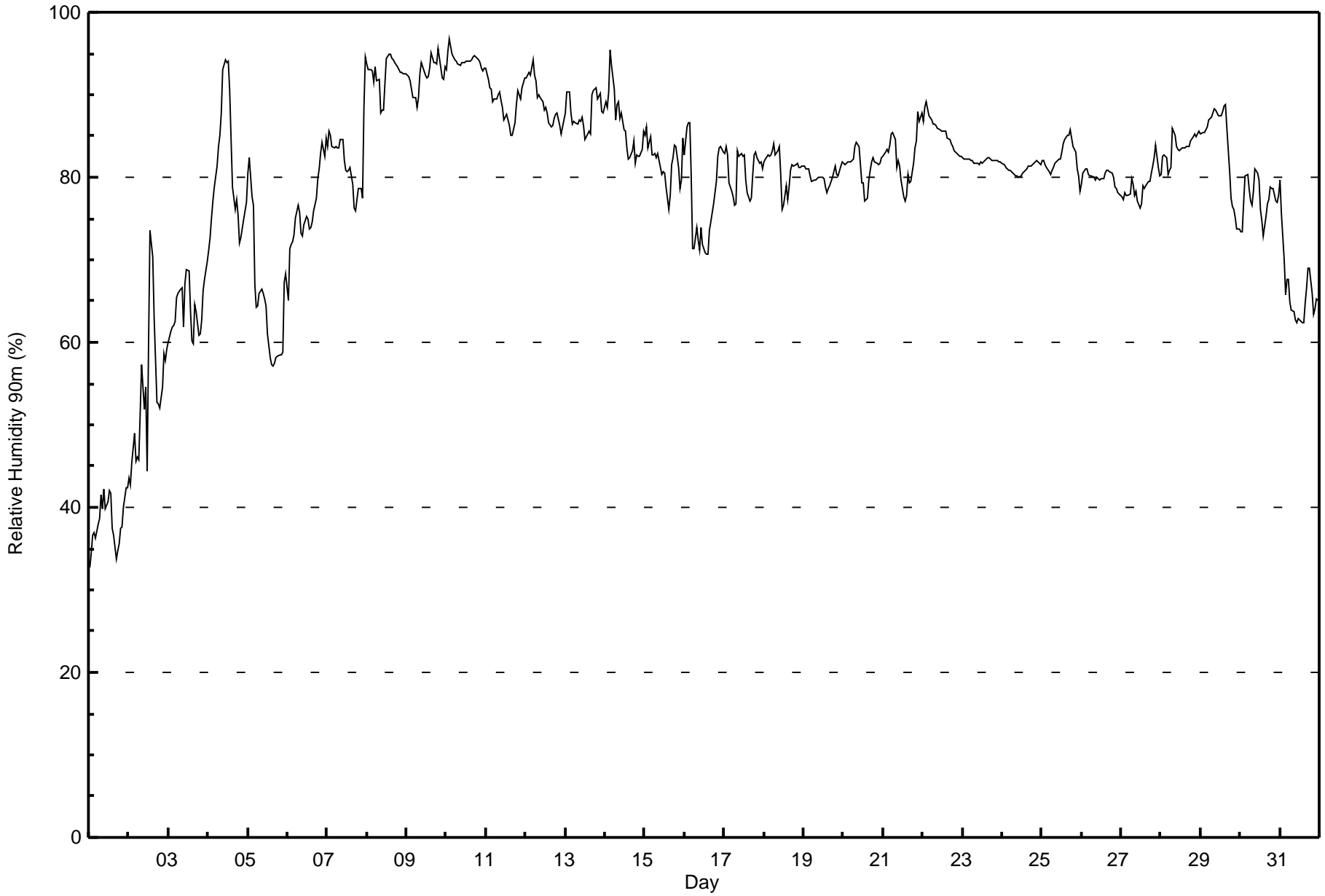
Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 97 % on Dec 10 03:00																			Maximum Daily Average: 94.1 % on Dec 10						Hours in Service: 744																			
Minimum Value: 33 % on Dec 1 01:00																			Minimum Daily Average: 38.3 % on Dec 1						Hours of Data: 744																			
Maximum Diurnal Average: 80.5 % at hour 24																			Minimum Diurnal Average: 78.2 % at hour 15						Hours of Missing Data: 0																			
Monthly Average: 79.3 %																			Percentiles: P <sub>1</sub> = 37 P <sub>10</sub> = 64 Q <sub>1</sub> = 77 Median = 82 O <sub>3</sub> = 86 P <sub>90</sub> = 92 P <sub>99</sub> = 95						Hours of Calibration: 0																			
																									Percent Operational Time: 100.0																			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																				
1-Dec	33	34	37	37	36	38	39	41	40	42	40	41	42	42	37	37	34	35	36	37	38	40	42	42	38.3	42																		
2-Dec	43	43	45	49	46	46	46	51	57	52	55	44	60	73	70	63	58	53	52	52	55	59	58	59	53.7	73																		
3-Dec	60	61	62	62	63	65	66	66	67	62	67	69	69	64	60	60	65	64	61	61	63	66	68	70	64.1	70																		
4-Dec	71	73	75	77	79	81	84	85	88	93	94	94	91	85	79	76	77	75	75	72	73	75	76	77	81.0	94																		
5-Dec	81	82	78	77	67	64	64	66	67	66	65	64	61	58	57	57	58	58	59	58	59	67	68	65.0	82																			
6-Dec	65	71	72	72	73	75	77	76	73	73	74	75	75	74	74	74	76	77	80	81	83	84	83	85	75.9	85																		
7-Dec	84	86	85	84	83	84	83	84	85	85	82	81	81	81	81	79	76	76	77	79	79	77	88	95	82.2	95																		
8-Dec	94	93	93	93	91	93	92	92	88	88	88	91	94	95	95	94	94	94	93	93	93	93	93	93	92.5	95																		
9-Dec	92	92	92	91	90	90	88	90	93	94	93	92	92	92	93	95	94	94	94	96	94	92	92	93	92.4	96																		
10-Dec	93	95	97	95	95	94	94	94	94	94	94	94	94	94	94	94	95	95	95	94	94	93	93	93	94.1	97																		
11-Dec	93	92	91	91	89	90	90	90	90	89	88	87	88	87	86	85	85	87	89	91	90	90	91	92	89.1	93																		
12-Dec	92	92	93	92	94	92	92	90	90	90	89	88	88	88	87	86	86	87	88	88	86	85	86	87	89.0	94																		
13-Dec	88	90	90	88	86	87	87	86	87	87	87	86	85	85	86	85	90	90	91	89	90	90	88	88	87.8	91																		
14-Dec	89	88	90	95	94	91	87	89	89	87	88	86	86	84	82	82	83	84	82	83	83	83	83	86	86.4	95																		
15-Dec	85	86	84	85	83	83	83	82	83	81	80	81	81	79	76	78	81	82	84	84	81	79	80	85	81.8	86																		
16-Dec	83	86	87	87	80	71	71	74	72	71	74	72	71	71	71	74	75	77	78	79	83	84	84	83	77.3	87																		
17-Dec	83	84	83	79	78	78	77	77	83	83	83	83	83	80	78	77	77	80	83	83	82	82	82	81	80.7	84																		
18-Dec	82	82	83	82	83	83	84	83	83	84	80	76	77	79	77	79	81	82	81	82	82	81	81	81	81.2	84																		
19-Dec	81	81	81	81	80	80	80	80	80	80	80	80	80	79	78	79	79	80	81	81	80	80	81	82	80.1	82																		
20-Dec	82	82	82	82	82	82	82	84	84	84	82	79	79	77	78	80	81	82	82	82	82	81	82	82	81.4	84																		
21-Dec	83	83	83	83	84	85	85	85	81	82	81	80	78	77	78	80	79	80	82	84	84	88	87	88	82.5	88																		
22-Dec	87	89	89	88	87	87	87	86	86	86	86	86	86	86	86	85	85	84	84	83	83	83	83	82	85.5	89																		
23-Dec	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82.0	82																		
24-Dec	82	82	81	81	81	81	80	80	80	80	80	80	80	81	81	81	81	81	82	82	82	82	82	82	81.0	82																		
25-Dec	82	82	82	81	81	80	81	81	81	82	82	82	83	84	85	85	85	86	85	84	83	81	80	78	82.4	86																		
26-Dec	79	80	81	81	80	80	80	80	80	80	80	80	80	80	80	81	81	81	81	80	79	79	78	78	79.9	81																		
27-Dec	78	77	78	78	78	78	80	79	78	78	77	76	77	79	79	79	79	79	81	81	82	84	81	80	79.0	84																		
28-Dec	80	83	83	82	80	81	81	86	85	84	83	83	83	83	84	84	84	84	84	85	85	85	85	86	83.5	86																		
29-Dec	85	85	85	86	86	87	87	88	88	88	88	87	88	88	89	89	86	81	77	76	76	75	74	74	83.9	89																		
30-Dec	73	73	77	80	80	79	77	77	78	81	81	80	76	75	73	75	77	77	79	79	79	77	77	78	77.4	81																		
31-Dec	80	76	70	66	68	68	65	64	64	63	62	63	63	62	62	65	67	69	69	66	63	64	65	65	66.1	80																		
																			79.5	80.2	80.3	80.2	79.3	79.2	79.0	79.6	79.8	79.7	79.5	78.8	79.1	79.0	78.2	78.2	78.4	78.6	78.8	78.9	78.9	79.1	79.7	80.5	Diurnal Average	
																			94	95	97	95	95	94	94	94	94	94	94	94	94	95	95	95	95	95	95	96	94	93	93	95	Diurnal Maximum	







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity 90m (RH90m) - %**  
**Mannix - December 2015**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	17	2.28	2.28
40 - 60	38	5.11	7.39
60 - 80	216	29.03	36.42
80 - 100	473	63.58	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Speed: 23 km/h on Dec 5 05:00	Maximum Daily Speed Average: 16.1 km/h on Dec 12	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 24 17:00	Minimum Daily Speed Average: 0.6 km/h on Dec 3	Hours of Data: 741
Maximum Diurnal Speed Average: 4.4 km/h at hour 12	Minimum Diurnal Speed Average: 2.3 km/h at hour 6	Hours of Missing Data: 3
Monthly Average Velocity: 3.4 km/h 159.8 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 4 Q <sub>1</sub> = 6 Median = 9 Q <sub>3</sub> = 12 P <sub>90</sub> = 14 P <sub>99</sub> = 20	Percent Operational Time: 99.6

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	SSE9	SE6	SE6	SSE8	SSE10	SE7	SE9	SE8	SSE8	SSE8	SSE8	SSE10	SE7	SSE9	SSE12	SSE12	SSE15	SSE14	SSE12	SSE13	SSE15	SSE15	SSE8	SSE11	SSE9.9	SSE15	
2-Dec	SSE13	SSE11	SE8	SSE13	SSE12	SE9	SE11	SSE12	SSE11	SSE13	SSE7	SSE13	SSE12	SSE9	SSE10	S10	SSW10	SW16	WSW19	WSW17	WSW19	WSW19	WSW17	WSW15	S8.8	WSW19	
3-Dec	W12	W13	W13	W9	SSW7	SSE8	SSE10	SE10	ESE6	SE5	S3	NE6	NNE9	NNE6	NW1	SE7	NNE6	E3	SE7	ENE2	E4	NNE9	NNE5	NE4	SSE0.6	W13	
4-Dec	NNE4	NNE6	NNE4	N3	NNW4	NW3	NNW4	NNW3	W7	W3	WSW7	WSW5	S5	S6	S6	SSW7	SW9	SSW7	SSW10	SSW12	S9	S9	S9	SW7	SW3.2	SSW12	
5-Dec	WSW5	WSW6	W10	NNW14	NNW23	W19	W22	W22	WSW20	WSW17	WSW14	WSW14	WSW16	WSW8	WSW8	SSW7	SSW7	SSW7	S9	S8	S8	SE5	SE7	SE6	WSW9.6	WNNW23	
6-Dec	E3	W1	NNE5	E8	ENE2	SSE2	ESE3	ENE1	SE9	ESE9	E11	ESE9	ESE8	SE10	SSE6	SSE6	SE8	SE9	SE8	SSE8	SSE9	SSE11	SSE11	SSE10	SE6.1	SSE11	
7-Dec	SSE9	SSE10	SSE11	SE11	SSE13	SSE12	SSE9	SE15	SE11	SE11	SE14	SE15	SE12	SE12	SE9	SSW4	S4	SSE6	SSE8	SSE9	S8	S8	S4	W5	SSE8.9	SE15	
8-Dec	NNW10	NW9	NW11	NNW4	NNW7	NNW1	SW4	SSW3	SW6	SW6	S6	S8	S6	SSE7	SE8	SE9	SE8	ESE8	E12	E12	ESE8	ESE8	ESE10	ESE7	SE2.4	E12	
9-Dec	ESE8	SE9	ESE8	ESE9	ESE9	E9	SE8	ESE9	ESE8	ESE8	SE10	SE13	SE9	ESE4	ESE4	SE5	SSE5	SW4	W4	W5	WSW5	SSW5	S4	S2	SE5.2	SE13	
10-Dec	WSW2	WSW4	NW5	N5	N6	N7	N7	N8	N6	NNW3	N4	NW2	W4	NNE5	W3	NNW3	NNW3	W3	SE3	ESE4	ESE3	ESE4	ESE6	ESE4	N2.1	N8	
11-Dec	ENE5	ESE7	SE8	SSE7	SE9	SE9	SE10	SE7	SE9	SE12	SE14	SE14	SE9	SE7	SSE8	SE8	SE8	SE9	SE12	SE12	SE13	SE13	SE13	SE12	SE9.6	SE14	
12-Dec	SE13	SE13	SE12	SE15	AF	AF	AF	SE15	SE18	SE18	SE19	SE16	SE16	SE18	SE17	SE19	SE20	SE16	SE16	SE16	SE16	SE17	SE14	SE14	SE16.1	SE20	
13-Dec	SE11	SE11	SE13	SE15	SE16	SE13	SE14	SE13	SE12	SE12	SE14	SE12	SE11	ESE8	SE7	SE5	E5	E5	ENE3	E5	E5	ENE1	S2	SW2	SE8.5	SE16	
14-Dec	S2	SSE5	SSW4	NW5	NW6	NNW7	W9	W10	W8	W7	WSW9	W8	W8	WSW5	SSW3	S4	S4	SSE5	S7	SSE9	SSE11	S11	SSE11	SSE14	SW4.2	SE14	
15-Dec	SSE14	SSE12	SSE13	SSE12	SSE18	SSE19	SSE16	SE13	S10	S8	SW9	WSW11	WSW14	WSW12	WSW9	WSW11	WSW11	WSW11	WSW8	SW5	W13	NNW18	NW16	NNE20	SSW6.6	NNE20	
16-Dec	NNE13	N6	NNW4	NNW1	NNW9	NNW17	NNW17	W17	W12	W13	WSW11	WSW7	W11	W12	WSW10	S7	SSW7	WSW10	W9	W10	W10	W11	W11	W10	W8.5	NNW17	
17-Dec	W9	W12	W14	W14	W13	W12	W11	NNW11	N4	N4	N4	N3	NW4	W8	NW6	NNW6	NNW6	NNE8	NE10	NE7	NNE6	NNE8	NNE7	NE7	NW5.1	W14	
18-Dec	NE7	NE6	NNE2	NE3	WSW1	NNE2	NE4	ENE7	ENE7	NE4	S4	SSE6	SE5	E5	E8	E9	E9	E11	ESE9	ESE9	ESE9	E11	ENE10	SE9	E5.6	E11	
19-Dec	ESE9	ESE9	ESE8	ESE9	SE11	SE12	SE13	SE13	SE7	SSE5	SSE2	SSE5	SSE8	SSE7	SSE8	SE10	SE12	SE11	SE11	SE9	SE14	SE14	SE13	SE12	SE9.3	SE14	
20-Dec	SE12	SE14	SE13	SE14	SE12	SE11	SE10	SE12	SE10	SE9	SE11	SE10	SE6	SSE8	SE10	SE13	SE15	SE15	SE13	SE13	SE11	SE14	SE14	SE14	SE11.8	SE15	
21-Dec	SE13	SSE12	SSE13	SSE12	SSE13	SSE12	SSE12	SSE11	S10	SSE11	SSE9	SSE8	SSE7	SSE7	SE4	SE4	SE3	SE3	ENE3	WNN3	NNE3	WNN3	N4	NNW7	SSE6.1	SSE13	
22-Dec	N8	NNW5	NW4	NW5	N10	N12	N10	N9	NNW9	NNW10	N10	NNW8	NNW8	NNW9	NNW10	NNW14	N10	NNW9	NNW10	NNW10	NNW10	NNW10	NNW10	NNW10	NNW10	NNW9.0	NNW14
23-Dec	NNW8	NNW9	NNW11	NNW10	N9	N9	NNW9	NNW8	N9	N10	N10	N6	NNW9	NNW10	N10	N8	N9	NNE12	NNE12	N6	NNW7	N7	N9	N9	N8.8	NNE12	
24-Dec	N8	N12	N9	NNW7	N10	N12	N11	N10	N7	NNW6	NNW6	NW7	NNW6	NNW6	WSW4	W2	NNW1	SW2	SSE3	SSE3	S3	SSE7	SSE9	SSE8	N3.1	N12	
25-Dec	SSE7	SSE7	SSE8	SSE7	SSE7	SE5	SSE8	SSE7	SSE7	SSE7	SSE6	SSE2	WSW3	SSW1	SSE3	SE2	SSE2	ESE1	NNW10	NNW13	NNW11	N11	NNE11	NNE9	SE1.2	NNW13	
26-Dec	NNE10	N7	N6	N5	NW2	W4	NNW2	NNE2	S2	SE3	SE2	SSE3	SE5	SE3	E4	ENE5	NNE4	ENE5	ESE7	SE9	ESE10	ESE8	ESE10	SE11	E3.0	SE11	
27-Dec	SE14	SE15	SE13	SE14	SE15	ESE14	SE14	SE18	SE19	SE21	SE21	SE22	SE19	SE15	SE11	SSE11	SSE6	SSE9	SSE9	SSE7	SSE7	SE5	S4	S4	SE12.6	SE22	
28-Dec	SW7	SSW4	WSW4	WNN7	NW8	WNN8	WNN8	NW9	NNW8	NNW7	NNW6	NW5	NW7	WNN7	NW7	WNN6	W7	WSW4	ESE3	WSW3	WSW3	S5	SSE8	SSE10	WNN3.5	SSE10	
29-Dec	SSE9	SSE10	S9	S7	SE8	SSE7	S6	SSE7	SSE8	S8	S8	S8	S7	SSW7	SSE7	SSE12	SSE14	S11	SSE12	SSE14	SSE12	SSE12	SSE11	S9	SSE9.1	SSE14	
30-Dec	S9	SSW12	WSW14	WSW12	WSW13	W12	WSW13	WSW6	SSW5	SSE9	SSE8	SSE6	SSE8	SE5	S5	SSW1	SSE5	S6	S7	SSW7	S6	SSE10	SSE14	SSE11	SSW6.4	SSE14	
31-Dec	SSE15	SSE12	SSE13	SSE13	SSE16	SSE15	SSE12	SSE11	SSE6	SW6	WSW12	SW11	SW13	SW12	SW15	SW13	WSW14	WSW10	WSW16	WSW15	SW12	SW11	SSW12	SW13	SSW9.9	WSW16	

SE3.5 SSE3.3 SSE2.6 SSE2.8 SSE2.6 SSE2.3 S2.6 SSE3.4 SSE3.7 SSE3.9 SSE4.0 SSE4.4 S3.6 S3.1 SSE3.5 SSE4.0 SSE3.8 SSE3.6 SSE3.7 SSE3.7 SSE4.1 SSE3.8 SSE3.9 SSE3.6	Diurnal Average
SSE15 SE15 W14 SE15WNNW23 W19 W22WSW22WSW20 SE21 SE21 SE22 SE19 SE18 SE17 SE19 SE20 SW16WSW19WSW17WSW19WSW19WSW17 NNE20	Diurnal Maximum

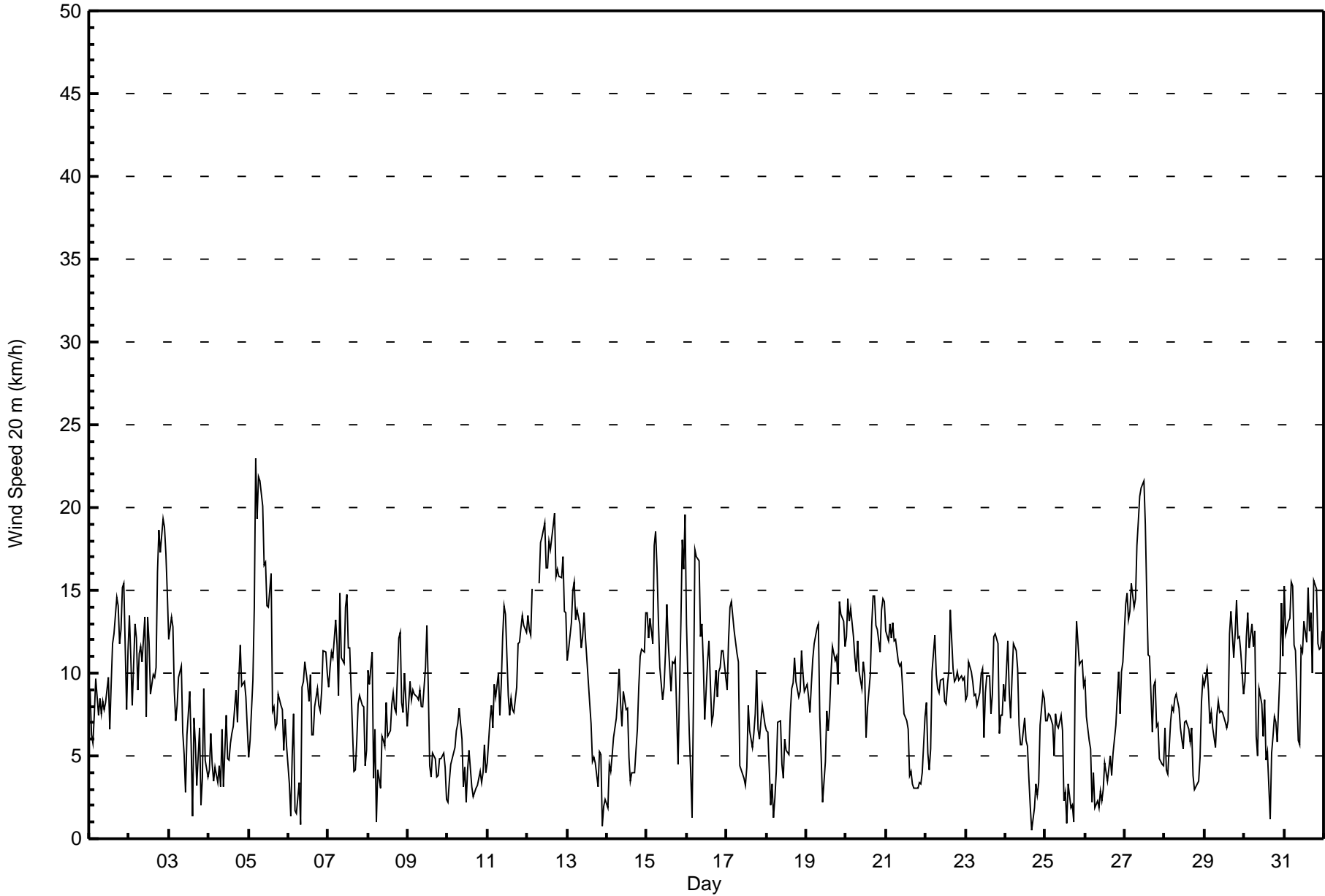
AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



Summary of Hour Standard Deviations

Mannix - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 km/h on Dec 27 12:00 Minimum Value: 1 km/h on Dec 29 00:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 6																	Hours in Service: 744 Hours of Data: 741 Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	3	2	2	2	3	2	2	1	2	3	4	4	4	3	4	3	3	3	3	3	2	3	3	3	4
2-Dec	3	2	3	3	3	3	3	3	3	3	3	4	4	3	2	3	3	4	5	4	5	4	4	4	5
3-Dec	2	3	2	2	3	1	2	2	2	2	2	2	2	2	2	3	3	3	2	2	2	1	2	1	3
4-Dec	1	1	2	2	1	1	2	2	5	2	1	2	2	2	1	2	2	2	2	3	2	2	2	2	5
5-Dec	2	2	3	4	5	4	6	5	4	4	4	4	4	4	3	1	1	1	2	2	2	2	3	2	6
6-Dec	2	1	1	2	2	2	2	2	3	3	4	3	4	4	3	2	2	2	2	1	2	2	2	2	4
7-Dec	2	2	2	3	3	3	4	4	4	3	4	4	4	4	3	2	2	2	2	2	2	2	1	2	4
8-Dec	3	4	2	2	2	1	3	1	1	2	2	3	2	2	3	3	3	3	4	3	3	3	3	3	4
9-Dec	3	4	3	3	3	3	3	4	3	3	4	4	4	2	2	2	2	1	1	1	1	1	1	1	4
10-Dec	1	1	2	2	2	2	2	2	2	1	2	1	1	2	1	1	1	1	2	2	2	2	2	2	2
11-Dec	2	3	3	1	3	3	3	3	3	4	4	4	3	3	2	2	2	3	4	3	5	4	4	4	5
12-Dec	4	4	4	5	AF	AF	AF	4	5	5	6	5	5	5	6	6	6	5	5	5	4	5	4	4	6
13-Dec	3	4	5	5	5	5	5	4	3	4	4	4	4	3	3	2	3	3	2	2	2	2	2	1	5
14-Dec	1	2	1	3	3	4	3	2	3	2	2	2	2	1	1	1	1	1	2	2	3	3	3	3	4
15-Dec	3	3	2	2	3	4	4	3	2	2	2	3	3	3	2	2	1	2	3	2	2	3	4	5	5
16-Dec	4	3	2	1	6	4	3	2	2	2	3	2	2	2	3	2	2	2	2	2	2	1	1	1	6
17-Dec	1	2	2	2	2	2	2	3	2	2	1	1	1	1	2	2	2	3	2	2	2	2	2	2	3
18-Dec	1	2	2	2	1	2	2	1	2	3	2	2	2	3	2	2	2	3	3	3	3	3	2	3	3
19-Dec	3	4	3	4	4	3	4	5	4	2	2	2	3	2	3	2	3	4	4	3	4	4	4	2	5
20-Dec	3	4	3	3	3	2	2	3	2	2	3	4	2	2	3	5	5	4	4	5	3	4	4	3	5
21-Dec	3	3	3	3	3	2	2	2	2	2	2	1	1	2	2	2	2	2	1	2	2	2	2	3	3
22-Dec	2	2	1	3	3	4	3	3	3	3	3	3	2	3	3	4	3	3	3	3	3	3	3	3	4
23-Dec	2	2	3	3	4	3	3	2	3	3	3	2	3	3	3	2	4	3	3	3	2	2	2	3	4
24-Dec	3	4	2	2	3	3	3	3	2	2	2	3	2	1	1	1	1	1	1	1	2	2	2	3	4
25-Dec	2	2	2	2	2	1	2	2	2	2	2	1	1	1	1	1	1	1	4	4	3	3	3	2	4
26-Dec	2	2	2	2	1	2	1	1	1	1	1	1	2	1	2	2	2	2	3	3	4	3	4	5	5
27-Dec	5	5	5	5	6	5	5	5	6	6	6	6	5	5	3	4	2	2	2	3	2	2	1	1	6
28-Dec	2	2	1	2	2	2	2	2	2	3	2	2	3	2	1	1	1	1	2	1	1	1	1	1	3
29-Dec	1	2	3	2	2	2	2	2	2	2	3	3	2	2	2	2	2	2	2	2	2	2	3	2	3
30-Dec	2	2	2	2	2	2	2	3	2	4	2	2	3	2	2	2	1	1	2	2	1	4	2	2	4
31-Dec	3	3	2	3	3	3	2	2	2	4	3	2	2	2	2	3	2	3	2	2	3	2	2	2	4
Diurnal Maximum																								5	
AF - Analyzer Failure																									





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed 20 m (WS20m) - km/h**  
**Mannix - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	161	21.73	21.73
6 - 11	384	51.82	73.55
12 - 19	187	25.24	98.79
20 - 28	9	1.21	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 741

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed 20 m (WS20m) - km/h**  
**Mannix - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	9	11	3	9	9	9	18	14	17	9	5	13	10	2	10	13	161
6 - 11	33	12	6	3	8	31	61	88	33	9	10	16	19	12	9	34	384
12 - 19	3	4	0	0	2	1	78	46	0	3	7	21	15	4	1	2	187
20 - 28	0	1	0	0	0	0	4	0	0	0	0	2	1	1	0	0	9
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	45	28	9	12	19	41	161	148	50	21	22	52	45	19	20	49	741

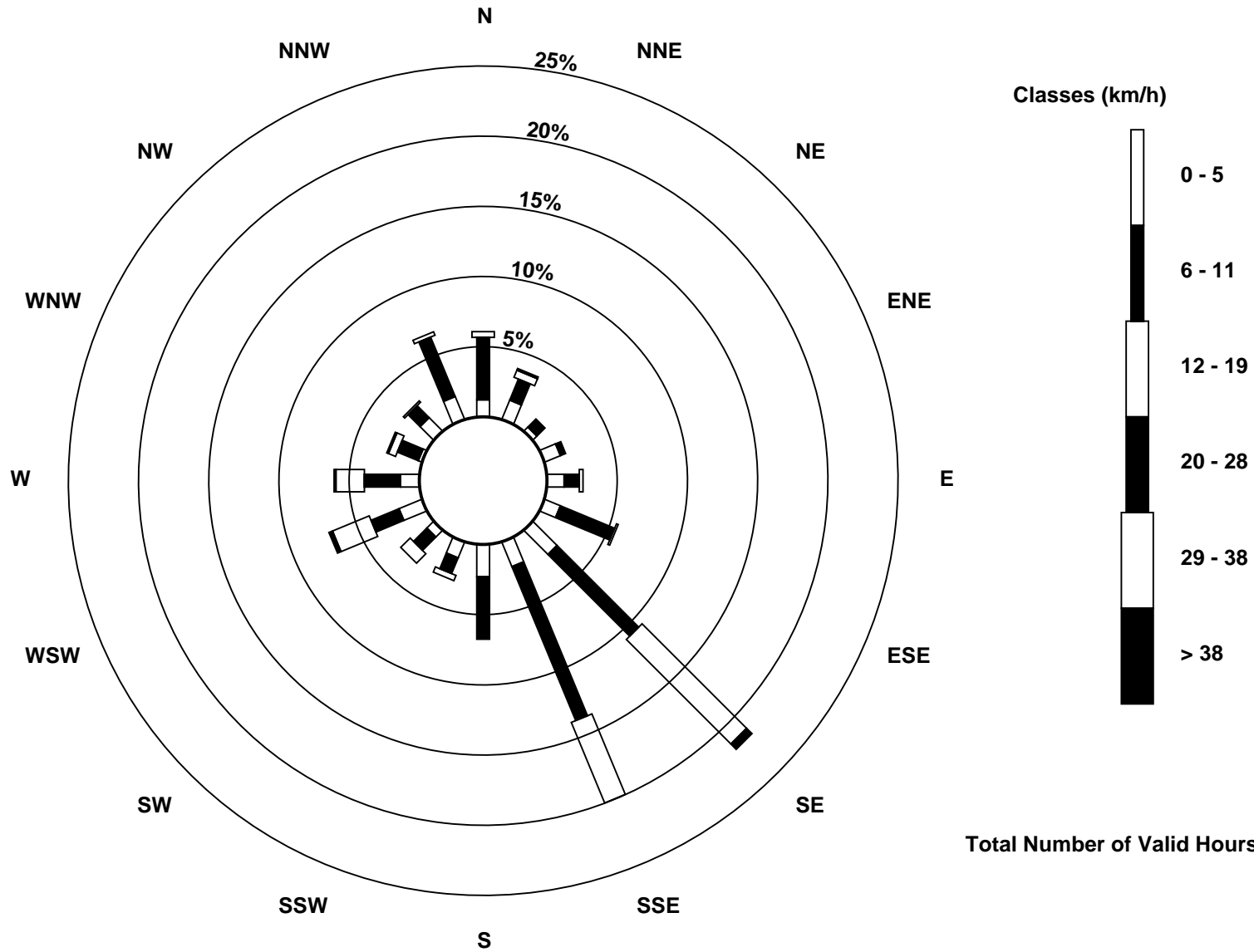
Total Number of Valid Hours: 741

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed 20 m (WS20m) - km/h  
Mannix (AMS 5)







Maximum Speed: 29 km/h on Dec 5 05:00	Maximum Daily Speed Average: 20.4 km/h on Dec 12	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 24 17:00	Minimum Daily Speed Average: 1.6 km/h on Dec 25	Hours of Data: 739
Maximum Diurnal Speed Average: 6.0 km/h at hour 16	Minimum Diurnal Speed Average: 3.6 km/h at hour 14	Hours of Missing Data: 5
Monthly Average Velocity: 4.9 km/h 158.2 deg	Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 5 Q <sub>1</sub> = 8 Median = 12 Q <sub>3</sub> = 17 P <sub>90</sub> = 20 P <sub>99</sub> = 26	Percent Operational Time: 99.3

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	S12	SSE13	SE15	SSE16	SSE18	SE16	SE15	SE15	SSE17	SSE17	SSE17	SSE16	SE10	SSE13	SE18	SSE21	SSE24	SSE24	SSE22	SSE20	SSE18	SSE17	SSE17	SSE21	SSE16.9	SSE24	
2-Dec	SSE22	S16	SSE18	SSE26	SE25	SE21	SSE23	SE19	SE18	SSE23	SSE15	SSE22	SSE19	AF	S18	S22	SSW20	SW24	WSW25	WSW24	WSW27	WSW25	WSW23	WSW20	S15.7	WSW27	
3-Dec	WSW16	W17	W16	WSW12	SSW11	S8	SSE15	SE17	ESE10	ESE8	SSE6	NE8	NNE12	NNE8	ENE4	SE13	ENE6	ESE8	SE12	E7	ESE7	NE11	NE8	NE6	SE2.8	W17	
4-Dec	NE5	NE7	NE7	NNE7	NNE8	N6	N9	N6	WNW8	W5	WSW9	WSW6	S6	S9	S10	SW14	SW17	SSW11	SSW17	SSW21	SSW18	SSW17	SSW14	SW13	SW5.4	SSW21	
5-Dec	WSW11	W8	W14	W19	W29	W23	W25	WSW26	WSW25	WSW20	WSW19	WSW17	WSW17	WSW19	WSW11	SW12	SSW10	S10	S14	S16	S16	SSE10	SE10	ESE9	WSW12.8	W29	
6-Dec	E8	ESE4	ENE7	E12	E4	SE5	ESE7	SE7	ESE14	ESE14	E14	ESE13	ESE11	ESE13	SE9	SE10	SE12	SE13	SE12	SSE13	SSE14	SE17	SE16	SE15	SE10.3	SE17	
7-Dec	SE13	SE15	SE17	SE16	SE19	SE18	SE15	SE21	SE17	SE17	SE20	SE16	ESE16	SE13	S10	S10	SSE11	SSE15	SSE14	SSE15	S13	SSW8	W10	SE13.7	SE21		
8-Dec	NW14	NW13	NW15	NW5	NW10	N2	SW5	WSW4	WSW8	WSW9	S9	S12	S9	SSE8	SE9	SE11	SE10	ESE9	E14	E15	ESE10	E9	E13	ESE9	SE2.3	E15	
9-Dec	ESE10	ESE12	E11	E12	E11	E11	ESE11	E12	ESE11	ESE11	ESE12	ESE16	SE11	ESE5	ESE4	SE6	SE5	SW5	W5	W6	WSW7	SW8	SSW7	SW3	SE6.2	ESE16	
10-Dec	W5	WSW6	NW7	N7	N8	N9	N8	N10	N8	NNW4	N5	NW3	W4	N6	W3	NNW3	N4	NNW2	ESE6	ESE6	ESE5	E6	E8	ESE6	N2.8	N10	
11-Dec	E6	E10	ESE11	SE10	ESE13	ESE11	SE13	SE11	SE13	SE16	SE18	SE16	SE11	SE10	SSE11	SE10	SE10	SE12	SE15	SE15	SE16	ESE17	ESE16	SE16	SE12.6	SE18	
12-Dec	ESE17	SE16	SE15	SE20	AF	AF	AF	AF	SE23	SE24	SE24	SE20	SE20	SE22	SE22	SE23	SE25	SE20	SE20	SE20	SE20	SE21	SE18	SE18	SE20.4	SE25	
13-Dec	SE14	SE15	SE18	SE20	ESE20	ESE16	ESE17	ESE17	SE15	SE15	ESE17	ESE14	ESE13	ESE11	ESE9	ESE6	ENE6	E6	ENE4	ENE7	E7	E2	SSE3	S3	ESE11.0	ESE20	
14-Dec	S2	SSE8	SSW7	NW8	NW9	WNW9	W11	WSW12	WSW10	W9	WSW10	W10	W9	WSW6	SW5	S6	SSW7	SSW7	S11	SSE14	SSE16	SSE17	SSE16	SSE19	SSW6.0	SSE19	
15-Dec	SSE19	SSE17	SSE19	SE18	SSE26	SSE26	SSE23	SSE19	S18	SSW16	SW16	WSW15	WSW17	WSW17	WSW13	WSW16	WSW15	WSW16	WSW16	WSW14	WSW10	W19	W24	NW22	N25	SSW9.9	SSE26
16-Dec	N17	N9	NNW5	NNW1	WNW13	WNW23	W21	W21	W17	W18	W15	WSW10	WSW13	WSW14	WSW13	S12	SSW14	WSW16	W14	W15	W15	W14	W14	W13	W11.7	WNW23	
17-Dec	W12	W14	W17	W16	W15	W15	WNW14	WNW14	NNW6	NNW5	NNW4	N4	NW5	W9	NW8	NW8	NNW10	N10	NE11	NNE8	NNE7	NNE10	NNE9	NE8	NW6.8	W17	
18-Dec	NE7	NE7	NNE2	NE4	W1	NNE3	NE4	ENE7	NE8	NE5	SSE5	SE7	ESE6	E6	E9	ENE11	E11	E13	E12	ESE11	ESE11	E13	ENE12	ESE10	E6.6	E13	
19-Dec	ESE12	ESE11	ESE9	ESE11	ESE13	ESE14	ESE15	ESE15	ESE8	SSE7	SSE4	SE6	SSE9	SSE7	SSE10	SE13	SE16	SE15	SE16	SE13	SE19	SE18	SE18	SE17	SE12.2	SE19	
20-Dec	SE17	SE21	SE19	SE20	SE18	SE16	SE16	SE17	SE16	SE14	ESE15	ESE13	SE7	SE10	SE13	ESE17	ESE20	SE21	ESE18	ESE17	SE17	SE20	SE20	SE19	SE16.7	SE21	
21-Dec	SE17	SE17	SE17	SE18	SE18	SSE18	SSE18	SSE17	SSE20	SSE18	SSE13	SSE9	SE9	SE7	SE5	SE8	SE8	ESE6	ENE4	WNW3	NNE6	WNW4	N6	WNW9	SE9.1	SSE20	
22-Dec	N12	N8	NNW6	NW8	N14	N17	N14	N13	NNW12	NNW13	N12	NNW11	NW10	NW11	NNW13	NNW18	N14	NNW12	NNW13	NNW14	NNW13	NNW13	NNW13	NNW13	NNW12.3	NNW18	
23-Dec	NNW12	NNW11	NNW14	NNW14	N14	NNW12	NNW12	NNW11	N11	N14	N13	N8	NW10	NNW13	NNW13	N10	N12	N16	N15	N15	N8	NNW10	N10	N12	N11.7	N16	
24-Dec	N12	N16	N11	NNW10	N13	N15	N14	N13	N9	NNW7	NNW7	NW9	WNW7	WNW6	W4	W2	NW1	SSW2	SE3	SE3	SSE6	SE11	SSE13	SSE13	N3.9	N16	
25-Dec	SSE10	SSE11	SSE12	SSE11	SSE9	SE6	SSE11	SSE10	SSE9	SSE11	S8	SSW3	WSW6	WSW2	SE2	SE5	SE3	ESE2	NNW13	NNW17	NNW14	N15	N14	N12	SE1.6	NNW17	
26-Dec	NNE14	N11	N9	N6	N3	W1	N3	NNE5	SE2	SE5	SE4	SE5	SE7	SE4	E6	ENE7	E4	E8	E8	ESE11	ESE12	ESE10	ESE12	ESE13	E4.8	NNE14	
27-Dec	SE18	ESE19	ESE17	ESE18	ESE19	ESE18	ESE19	SE22	SE25	SE26	SE27	SE27	SE23	SE18	SE14	SE14	SE8	SE12	SSE13	SSE10	SE9	SE6	S7	SSW8	SE16.0	SE27	
28-Dec	SW12	SSW7	WSW8	WNW11	NW10	WNW10	WNW11	NW11	NNW11	NNW9	NNW7	NW6	NW8	WNW8	NW7	WNW6	W7	WSW4	ESE3	WSW3	SSW4	S10	SSE13	SSE15	W4.5	SSE15	
29-Dec	SSE16	SSE17	S17	S14	SE12	SE11	S11	SSE13	SSE14	S12	S12	S11	S10	SSW10	SSE10	SSE19	SSE21	S20	SSE19	SSE19	SSE19	SSE17	S17	SSW14	SSE14.4	SSE21	
30-Dec	SSW13	SW18	WSW22	WSW19	WSW19	W18	W18	W15	SW11	SSE10	S12	S9	S12	SSE5	SW8	WSW6	SSW6	SSW8	SSW13	SW14	SSW10	S14	SSE19	SSE18	SW10.7	WSW22	
31-Dec	SSE23	SSE19	SSE20	S23	SSE25	SSE23	SSE19	SSE17	S10	WSW12	WSW17	SW16	SW17	SW15	SW20	SW20	WSW20	WSW17	WSW22	WSW21	WSW20	SW19	SSW20	SW18	SSW15.3	SSE25	

SE4.5 SSE4.8 SSE4.4 SSE4.6 SSE4.0 SSE3.7 SSE4.3 SSE4.6 SSE5.3 SSE5.5 SSE5.7 SSE5.8 S4.7 S3.6 SSE4.6 SSE6.0 SSE5.6 SSE5.2 SSE5.4 SSE5.1 SSE5.9 SSE5.4 SSE5.4 SSE4.8	Diurnal Average
SSE23 SE21 WSW22 SSE26 W29 SSE26 W25 WSW26 WSW25 SE26 SE27 SE27 SE23 SE22 SE22 SE23 SE25 SSE24 WSW25 WSW24 WSW27 WSW25 WSW23 N25	Diurnal Maximum

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods

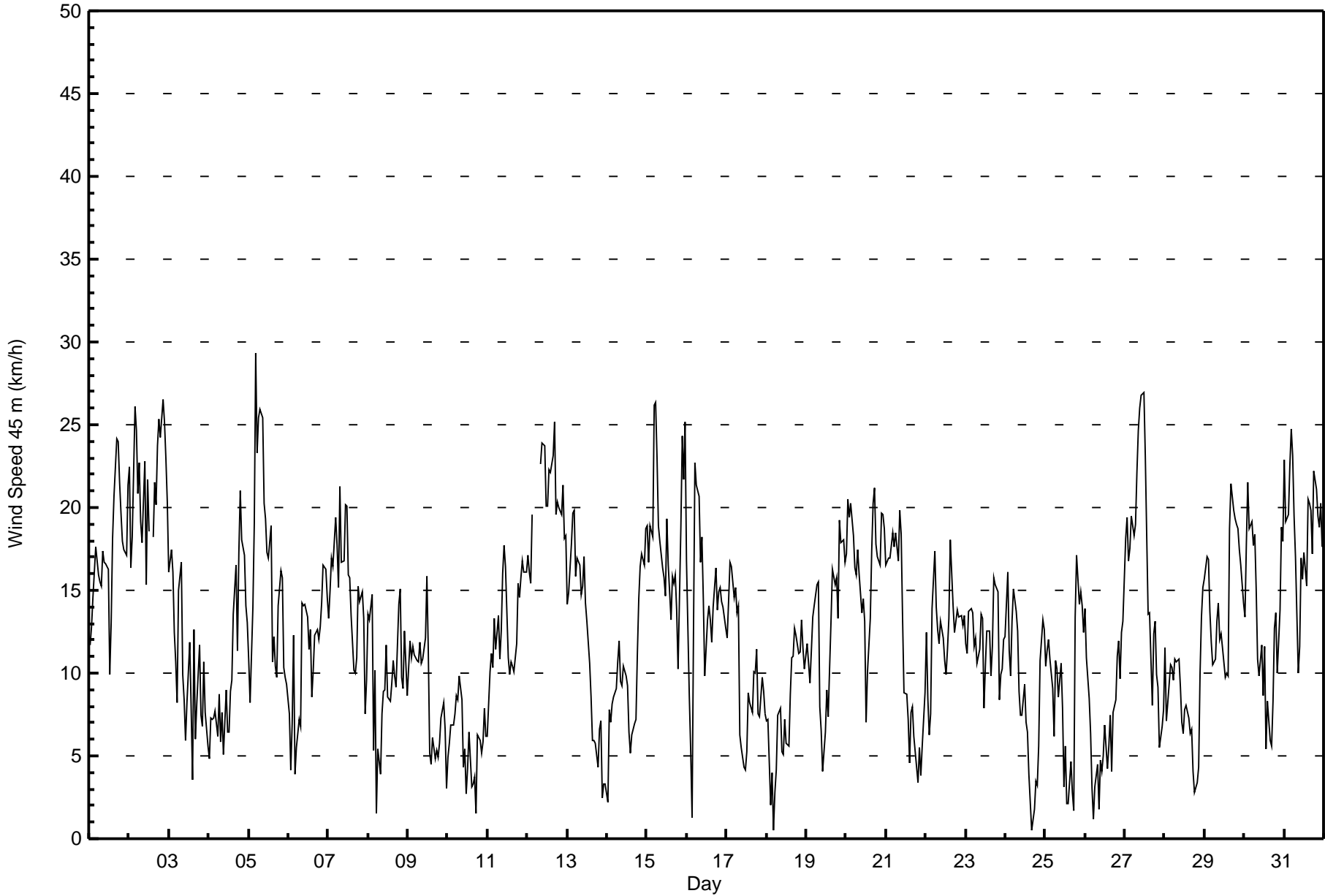


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 7 km/h on Dec 16 05:00			Hours of Data:	739
Minimum Value: 1 km/h on Dec 9 19:00			Hours of Missing Data:	5
			Hours of Calibration:	0
			Percent Operational Time:	99.3
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 6				

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	3	2	3	2	3	1	1	1	2	2	3	3	6	3	6	3	2	3	2	2	3	2	3	2	6
2-Dec	2	2	4	3	4	3	3	3	3	3	4	4	3	AF	3	2	3	4	5	4	5	5	4	4	5
3-Dec	3	3	2	1	2	2	2	2	3	2	2	3	2	2	4	3	3	4	3	3	2	2	3	2	4
4-Dec	1	1	1	1	2	2	2	3	5	3	2	2	2	2	2	1	2	2	2	4	2	3	2	2	5
5-Dec	2	2	3	4	4	4	5	4	4	5	4	3	4	4	4	2	1	2	1	2	2	2	3	3	5
6-Dec	2	1	3	2	3	3	3	3	3	4	4	4	4	4	5	3	2	3	2	1	2	2	2	2	5
7-Dec	2	2	2	3	3	3	4	4	4	3	4	4	4	5	3	1	2	2	3	2	2	2	2	3	5
8-Dec	3	4	2	3	2	2	3	2	1	1	2	3	2	2	3	3	3	3	4	3	3	3	3	3	4
9-Dec	3	3	3	3	3	3	3	4	3	3	4	4	4	2	2	2	2	1	1	1	1	1	1	1	4
10-Dec	1	1	1	1	2	2	2	1	2	1	2	1	1	2	1	1	1	1	3	3	2	3	3	3	3
11-Dec	2	3	3	2	3	3	3	3	3	4	4	4	3	3	3	2	3	3	4	3	4	4	4	3	4
12-Dec	4	4	4	4	AF	AF	AF	AF	4	5	5	5	5	5	6	6	6	5	4	5	4	5	4	4	6
13-Dec	3	3	5	4	4	5	5	4	3	3	4	4	4	4	4	2	2	4	2	1	2	3	3	2	5
14-Dec	2	1	1	4	3	3	2	2	2	2	2	2	1	1	1	1	1	1	2	2	2	2	2	3	4
15-Dec	2	2	2	2	3	3	3	2	2	1	1	3	3	3	3	2	1	2	2	3	2	3	4	4	4
16-Dec	4	3	3	1	7	3	3	2	2	2	3	2	2	2	2	2	1	2	2	2	2	2	1	1	7
17-Dec	2	2	2	2	2	2	2	3	2	1	1	1	1	1	2	2	1	2	2	2	3	2	2	2	3
18-Dec	1	2	2	2	1	2	2	1	1	3	2	2	3	3	2	2	2	2	3	3	4	3	3	3	4
19-Dec	3	3	3	3	4	3	4	4	4	1	2	2	3	2	2	3	3	3	4	3	4	4	4	3	4
20-Dec	3	4	3	3	3	2	2	2	2	2	3	4	3	3	4	4	4	4	4	4	4	4	4	3	4
21-Dec	3	3	3	3	2	2	2	2	1	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	3
22-Dec	2	3	1	3	3	3	3	3	2	3	3	3	2	2	3	3	3	2	3	3	2	2	2	3	3
23-Dec	2	2	2	3	4	3	3	2	2	2	2	2	2	2	2	2	4	3	3	3	2	3	2	3	4
24-Dec	2	3	2	2	3	2	3	2	2	2	2	2	1	1	1	1	1	1	1	1	3	2	2	2	3
25-Dec	2	1	1	2	1	1	1	2	2	1	2	2	2	1	2	1	1	1	5	4	3	3	2	2	5
26-Dec	2	3	2	2	1	1	2	1	1	2	2	2	2	1	1	2	1	3	3	3	4	3	4	5	5
27-Dec	5	5	4	5	5	5	5	5	6	6	6	6	5	5	3	3	3	2	2	2	2	2	1	1	6
28-Dec	2	2	2	2	2	1	2	2	2	3	2	1	3	1	1	1	1	1	2	1	2	2	1	1	3
29-Dec	1	2	2	3	2	2	2	3	2	2	2	3	2	2	2	3	1	2	2	1	2	2	1	2	3
30-Dec	2	2	2	2	1	1	1	2	3	4	2	2	2	2	2	3	1	1	2	2	2	2	1	2	4
31-Dec	2	3	1	2	2	2	2	2	4	7	3	2	2	3	1	2	2	3	2	2	2	1	2	2	7
	5	5	5	5	7	5	5	5	6	7	6	6	6	5	6	6	6	5	5	5	5	5	4	5	

Diurnal Maximum

AF - Analyzer Failure





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed 45 m (WS45m) - km/h**  
**Mannix - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	77	10.42	10.42
6 - 11	255	34.51	44.93
12 - 19	321	43.44	88.36
20 - 28	85	11.50	99.86
29 - 38	1	0.14	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 739

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed 45 m (WS45m) - km/h**  
**Mannix - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	6	3	4	3	3	6	12	5	2	3	4	4	9	2	4	7	77
6 - 11	24	8	11	8	16	34	30	25	19	13	3	16	9	10	16	13	255
12 - 19	25	2	0	1	9	41	75	56	16	9	13	25	22	3	3	21	321
20 - 28	1	0	0	0	0	2	31	21	3	3	3	14	5	1	1	0	85
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	56	13	15	12	28	83	148	107	40	28	23	59	46	16	24	41	739

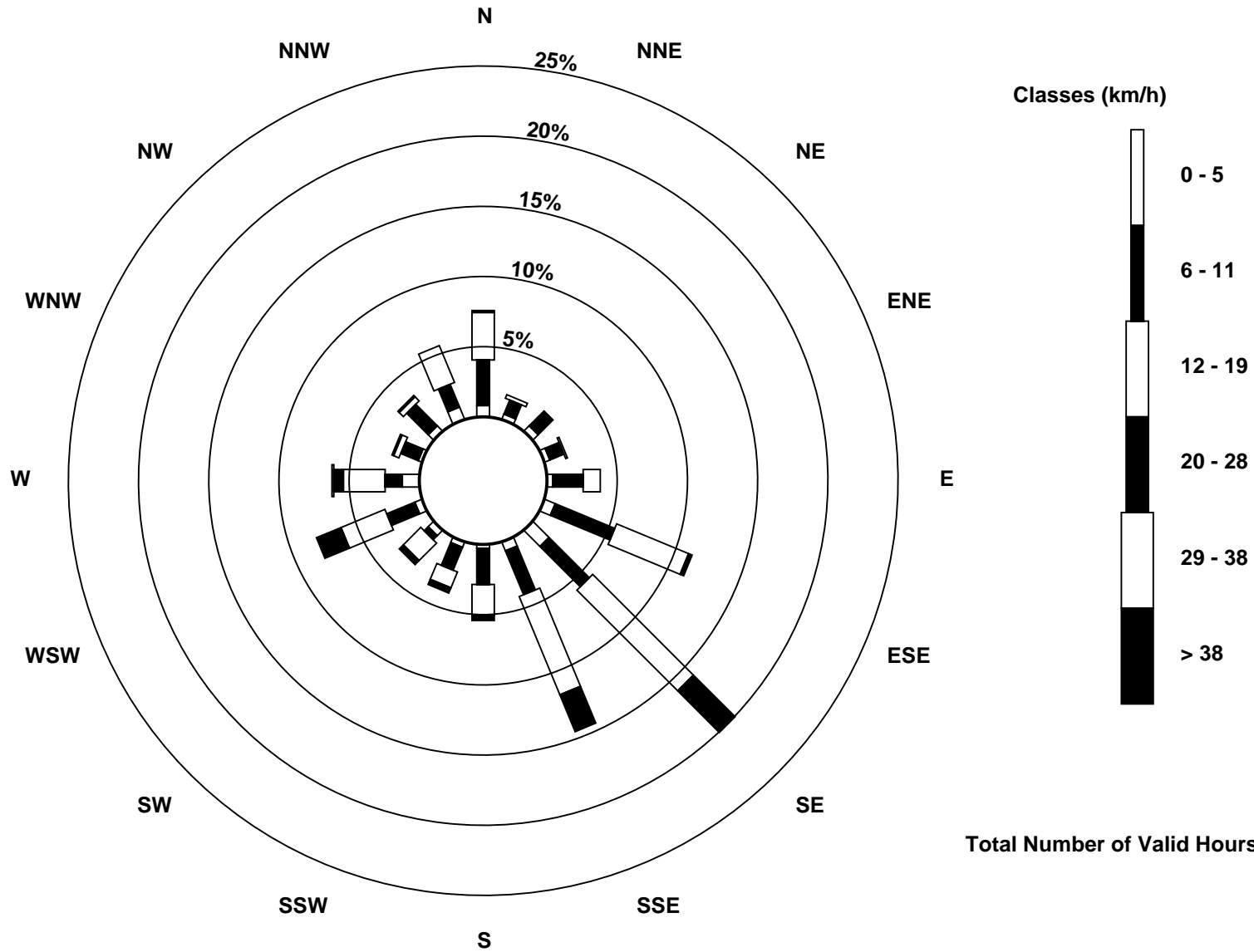
Total Number of Valid Hours: 739

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed 45 m (WS45m) - km/h  
Mannix (AMS 5)



Total Number of Valid Hours: 739



Maximum Speed: 33 km/h on Dec 15 05:00	Maximum Daily Speed Average: 21.5 km/h on Dec 12	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 21 20:00	Minimum Daily Speed Average: 0.8 km/h on Dec 8	Hours of Data: 712
Maximum Diurnal Speed Average: 6.9 km/h at hour 16	Minimum Diurnal Speed Average: 4.1 km/h at hour 6	Hours of Missing Data: 32
Monthly Average Velocity: 5.3 km/h 170.5 deg	Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 6 Q <sub>1</sub> = 9 Median = 14 Q <sub>3</sub> = 19 P <sub>90</sub> = 24 P <sub>99</sub> = 29	Percent Operational Time: 95.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SW12	S8	SSE8	SSE13	SSE12	SSE12	SE14	SE15	SSE12	SSE21	SSE22	SSE24	SSE9	SSE18	SSE23	SSE28	SSE30	SSE26	S22	S15	SSW12	SSW15	S15	S20	SSE16.0	SSE30
2-Dec	S20	SSW16	SSE17	SSE32	SSE31	SSE26	SE26	SE17	SE18	SE26	SSE24	S29	SSW20	SSW21	S25	SSW28	SW28	WSW29	WSW30	WSW29	WSW32	WSW30	WSW27	WSW24	SSW18.7	WSW32
3-Dec	WSW19	W20	W20	WSW14	SW11	SSW8	SSE12	SSE20	SE12	SE9	SSE10	ENE11	NE13	ENE9	ESE7	SE16	ESE8	ESE11	SE15	ESE7	ESE8	ENE11	ENE9	E6	SE4.6	SSE20
4-Dec	E5	ENE7	ENE7	ENE6	NE7	NE7	NNE8	NE7	NW5	NNW5	W11	WSW9	SSW6	SW12	SW11	SW18	SW19	SW13	SW21	SW26	SSW20	SSW19	SW17	WSW17	SW6.8	SW26
5-Dec	WSW15	W9	W17	W22	W33	W26	W28	WSW29	WSW23	WSW21	WSW19	WSW19	WSW19	WSW20	WSW12	SW15	SW13	S10	SSW13	SSW14	S14	S7	SE13	ESE9	WSW15.0	W33
6-Dec	ESE6	SE7	E9	E11	ESE4	SE7	ESE8	SE10	ESE12	ESE11	ESE11	ESE11	ESE9	ESE10	SE10	SE14	SE16	SE16	SE14	SSE18	SE16	SE20	SE21	SE18	SE11.5	SE21
7-Dec	SE16	SE18	SE22	SE18	SE25	SE21	SE21	SE24	SE21	SE19	SE23	SE20	SE18	SE15	SE17	SSE13	SSE16	SSE17	SSE22	SSE20	SSE22	S16	SW10	NNW14	SE16.5	SE25
8-Dec	NNW15	NW15	NW16	NNW6	NNW12	N2	W5	W5	W9	WSW10	SSW9	S13	SSE9	SSE8	SE9	SE11	SE10	ESE7	UO	E12	ESE8	E8	ESE9	ESE7	SSE0.8	NW16
9-Dec	ESE8	ESE10	ESE9	ESE9	E8	E8	ESE9	ESE9	ESE8	ESE8	ESE10	ESE13	SE11	ESE5	ESE4	SE6	SSE5	SW6	W6	W6	WSW9	SW10	SW8	W5	SE4.6	ESE13
10-Dec	W8	W9	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	----	W9
11-Dec	AF	AF	AF	AF	SE14	SE11	SE15	SE12	SE15	SE18	SE18	SE18	SE10	SE12	SSE12	SE13	SE12	SE13	SE16	SE15	SE15	SE15	SE15	SE15	SE14.1	SE18
12-Dec	SE16	SE17	SE15	SE19	AF	AF	AF	AF	AF	SE28	SE26	SE22	SE22	SE24	SE23	SE24	SE27	SE21	SE23	SE22	SE21	SE23	SE18	SE18	SE21.5	SE28
13-Dec	SE14	SE14	SE18	SE18	ESE16	ESE12	ESE13	ESE14	ESE12	SE13	ESE14	ESE11	ESE11	ESE9	ESE8	ESE6	E6	E6	ENE5	E7	E6	E4	SE4	SSE4	ESE9.8	SE18
14-Dec	S2	SSE8	SSW6	NW11	NW10	NNW9	W12	W13	W11	W12	W12	W13	W10	WSW8	SW7	SSW6	SSW8	S8	S13	S19	SSE20	S22	SSE21	SSE23	SW7.1	SSE23
15-Dec	SSE23	SSE20	SSE24	SSE26	SSE33	SSE32	SSE28	SSE24	S23	SSW21	WSW20	WSW18	WSW23	WSW19	WSW16	WSW18	WSW19	WSW21	WSW19	WSW16	W24	W28	NW25	N28	SSW12.7	SSE33
16-Dec	N19	N10	NNW7	NNW1	NNW15	NNW25	W23	W23	W20	W22	W19	WSW12	W14	WSW15	WSW15	SSW13	SW16	WSW20	W18	W18	W19	W17	W16	W15	W14.0	NNW25
17-Dec	W14	W16	W19	W18	W17	W17	NNW15	NNW16	NNW8	NNW7	NNW5	NNW4	NW5	NNW9	NNW9	NNW9	NNW11	N11	NE12	NNE9	NNE9	NNE10	NNE9	NE8	NW7.6	W19
18-Dec	NE8	NE9	NE3	NE4	NE1	NNE3	NE5	ENE8	NE9	ENE6	SSE6	SE7	ESE5	E5	E8	ENE12	E10	E10	E10	ESE8	ESE9	E11	ENE11	ESE8	E6.3	ENE12
19-Dec	ESE8	ESE8	ESE8	ESE9	ESE11	ESE12	ESE12	ESE12	ESE6	SE8	SE5	SE8	SE9	SSE8	SSE13	SE14	SE18	SE19	SE20	SE17	SE23	SE21	SE19	SE20	SE12.7	SE23
20-Dec	SE23	SE26	SE25	SE26	SE24	SE22	SE22	SE23	SE21	SE18	SE14	SE13	SE9	SE12	SE15	ESE16	SE21	SE25	SE18	SE18	SE22	SE25	SE23	SE21	SE20.0	SE26
21-Dec	SE20	SE22	SE20	SE22	SE23	SSE22	SSE24	SSE23	SSE27	S22	S13	SSE6	SE7	SE7	SE7	SE8	SE10	SE7	E6	SW1	NE7	NNW4	NE7	NW9	SE11.1	SSE27
22-Dec	NNE15	NNE11	N9	NNW9	N17	N21	N17	N15	NNW14	NNW15	N13	NNW12	NNW10	NNW12	NNW14	NNW21	N16	NNW15	NNW16	NNW16	NNW16	NNW16	N15	NNW16	NNW14.3	NNW21
23-Dec	NNW14	NNW13	NNW16	NNW16	N16	N14	N14	NNW12	N13	N16	N15	N9	NNW11	NNW13	N14	N11	N14	N18	NNE17	NNE17	N10	NNW11	N12	N13	N13.4	N18
24-Dec	N14	N18	N13	N11	N15	N16	N15	N13	N10	NNW8	NNW8	NW10	NNW7	NNW6	W3	NNW2	NE1	SSE2	ESE2	SE2	SE5	SE3	SSE18	SSE17	N4.3	SSE18
25-Dec	SSE15	S14	S8	S9	S10	SSW5	SSE6	S10	S8	S9	SSW9	WSW9	W10	W4	SSW2	SSE2	SE2	ESE2	NNW14	NNW20	NNW17	N17	NNE16	NNE15	WSW1.2	NNW20
26-Dec	NNE18	NNE15	NNE11	NNE8	NE4	E2	NE2	NE3	E2	SE5	SE8	SE10	SE11	SE6	E5	E9	ESE4	E7	ESE7	ESE9	ESE9	ESE8	ESE10	ESE11	E5.4	NNE18
27-Dec	SE17	ESE17	SE15	ESE16	SE19	ESE15	ESE17	SE22	SE26	SE28	SE29	SE29	SE25	SE20	SE15	SE15	SE9	SE15	SSE16	SSE12	SSE11	SE6	SSW8	SW9	SE16.2	SE29
28-Dec	WSW15	SW10	W12	NNW12	NW11	NNW9	NNW11	NNW11	N12	N11	NNW7	NNW6	NW7	NNW8	NW7	NNW6	NNW6	WSW3	SE5	S4	S7	S14	S14	SSE16	W4.5	SSE16
29-Dec	SSE17	SSE21	S22	SSW16	SSE12	SSE13	SSW13	S10	S14	S16	S18	S15	S14	SSW12	S12	SSE22	S26	S26	S22	S20	S19	S18	SSW18	SSW19	S16.8	S26
30-Dec	SW16	SW20	WSW28	WSW24	W24	W25	W23	W22	WSW18	SW8	SW12	SW10	SW11	SW8	WSW14	W11	SW9	SW9	SW13	SW17	SW15	SSW16	SSW19	SSW19	WSW14.9	WSW28
31-Dec	SSE26	S19	S16	SSW23	S28	S27	S19	SSW18	SW14	WSW19	WSW21	WSW18	SW19	WSW17	WSW22	SW23	WSW24	WSW22	WSW28	WSW25	WSW24	SW21	SW23	SW21	SW18.9	S28

SSE4.2 SSE4.4 S4.3 SSE4.8 SSE4.5 SSE4.1 SSE4.5 SSE5.0 SSE4.9 SSE5.8 S6.5 SSE6.4 S5.1 S4.7 S5.3 SSE6.9 S6.7 S6.2 S6.1 S5.5 S6.0 S5.6 SSE5.2 S4.4	Diurnal Average
SSE26 SE26 WSW28 SSE32 SSE33 SSE32 W28 WSW29 WSW29 SE28 SE29 SE29 SE25 SE24 S25 SSW28 SSE30 WSW29 WSW30 WSW29 WSW32 WSW30 WSW27	Diurnal Maximum

AF - Analyzer Failure UO - Unstable Operation  
 All monthly, daily, and diurnal averages have been calculated using vector methods



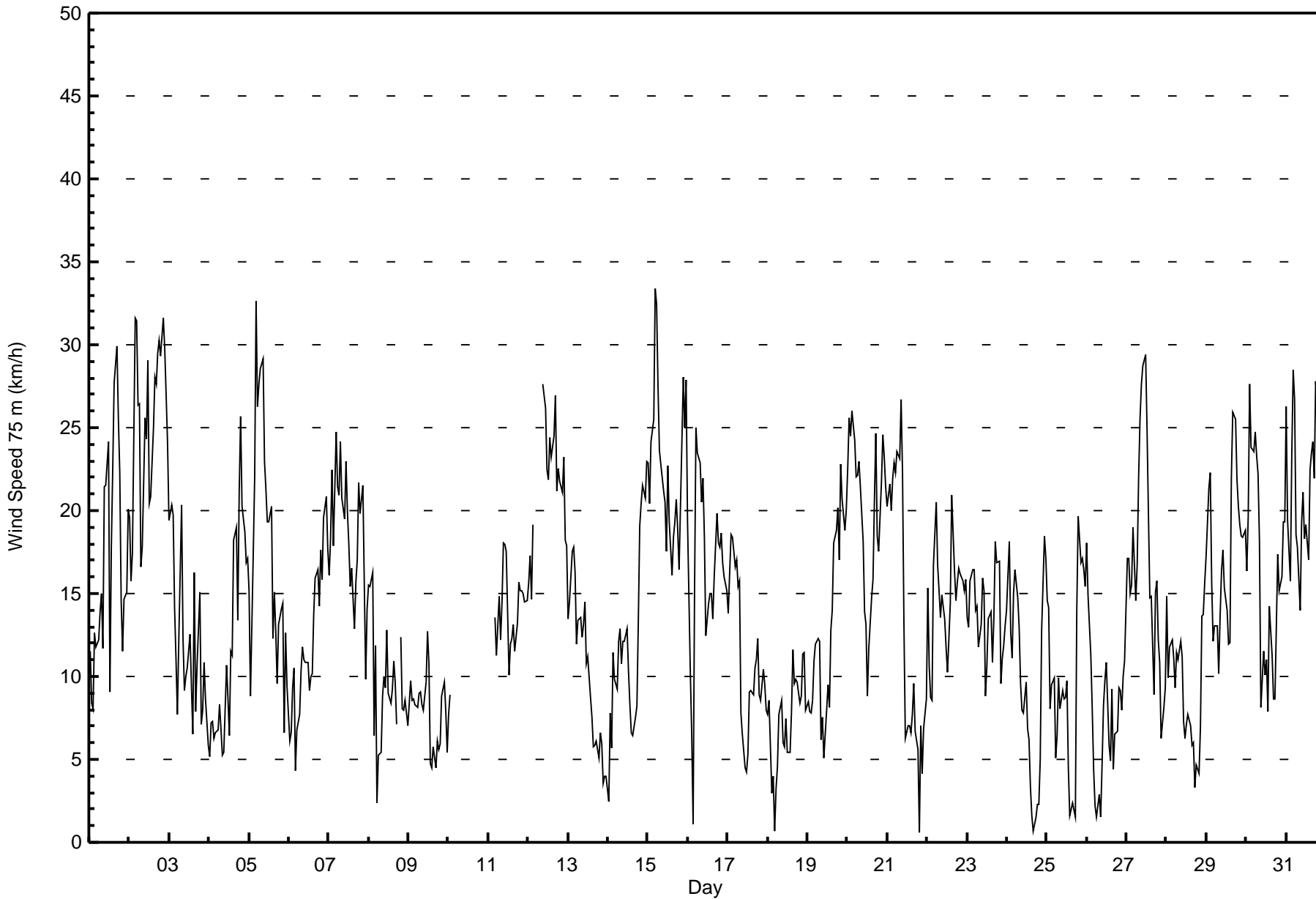
Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 8 km/h on Dec 16 05:00	Hours of Data: 712
Minimum Value: 1 km/h on Dec 9 19:00	Hours of Missing Data: 32
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 4 P <sub>90</sub> = 5 P <sub>99</sub> = 7	Hours of Calibration: 0
	Percent Operational Time: 95.7

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	2	2	2	2	3	3	2	4	4	3	2	2	6	3	6	2	2	3	3	3	2	2	3	3	6
2-Dec	3	3	5	2	3	2	2	5	5	4	4	4	2	3	2	2	2	4	5	4	5	5	4	5	5
3-Dec	3	4	3	2	3	3	3	1	5	4	3	3	2	3	4	4	3	5	4	3	3	3	4	2	5
4-Dec	2	2	1	1	1	1	2	3	4	3	2	3	2	2	3	2	3	3	3	4	3	3	1	3	4
5-Dec	4	2	3	4	4	4	6	4	4	5	4	3	4	4	4	2	2	2	1	1	1	3	2	4	6
6-Dec	2	3	4	3	3	3	3	4	5	4	4	4	3	4	4	3	2	2	3	1	1	1	2	3	5
7-Dec	3	2	2	5	3	5	4	6	5	5	5	5	5	6	3	2	1	2	3	1	2	2	1	2	6
8-Dec	3	3	2	3	3	2	2	2	1	2	2	3	2	3	3	3	4	3	UO	4	3	3	3	3	4
9-Dec	3	4	3	3	3	3	4	3	3	3	4	4	4	2	2	2	1	1	1	2	1	1	2	1	4
10-Dec	1	1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	1
11-Dec	AF	AF	AF	AF	5	4	4	4	4	4	6	5	4	3	3	2	3	4	5	4	5	6	5	5	6
12-Dec	5	5	6	6	AF	AF	AF	AF	AF	5	6	5	5	5	7	7	6	5	5	5	5	5	5	5	7
13-Dec	4	4	6	6	6	5	5	5	4	5	5	4	5	4	3	2	2	3	2	2	2	2	3	2	6
14-Dec	2	1	1	4	4	3	2	2	2	2	2	2	2	2	1	1	1	1	2	2	2	2	2	3	4
15-Dec	2	2	2	2	2	2	3	2	2	1	1	4	3	3	2	2	2	2	2	2	2	2	4	4	4
16-Dec	4	4	4	1	8	3	2	2	2	2	3	2	2	2	2	1	2	2	2	3	2	2	1	1	8
17-Dec	2	2	2	2	2	2	2	3	2	1	1	1	1	1	2	2	1	2	2	2	3	3	2	2	3
18-Dec	2	2	3	1	1	2	2	1	1	4	2	2	3	3	2	2	3	3	3	3	3	3	3	3	4
19-Dec	3	3	3	3	4	4	5	5	3	2	2	3	2	2	3	4	4	4	5	3	5	4	5	4	5
20-Dec	4	5	4	3	3	3	3	2	2	3	4	4	3	3	4	5	6	5	6	6	4	3	4	4	6
21-Dec	3	2	3	3	2	2	2	2	1	2	4	2	1	1	2	2	1	3	2	2	2	1	2	2	4
22-Dec	2	2	2	2	3	3	4	3	2	3	4	3	2	2	3	3	3	3	3	2	2	2	2	3	4
23-Dec	2	2	2	3	4	3	3	2	2	2	2	2	2	2	2	2	3	2	3	3	2	2	2	3	4
24-Dec	2	3	2	2	3	2	3	2	2	2	2	2	1	1	1	1	1	1	1	1	3	2	1	2	3
25-Dec	2	2	2	1	1	2	1	2	1	1	1	2	3	2	1	1	1	1	6	5	4	2	2	2	6
26-Dec	2	3	2	1	1	2	1	1	1	2	2	3	2	2	2	2	2	3	2	4	4	3	4	5	5
27-Dec	6	7	5	6	6	5	6	7	8	8	7	7	5	6	3	4	3	2	2	2	2	2	1	2	8
28-Dec	2	3	2	3	2	1	1	2	2	3	2	1	2	1	1	1	1	1	3	2	2	2	2	2	3
29-Dec	2	2	3	4	1	2	2	2	3	2	2	2	2	2	2	4	1	2	2	2	2	2	2	2	4
30-Dec	2	3	3	2	1	2	1	2	3	2	2	4	3	3	4	3	2	1	2	1	2	2	2	3	4
31-Dec	2	3	2	3	2	2	3	2	5	7	3	2	2	3	2	2	2	3	2	2	2	1	1	3	7
	6	7	6	6	8	5	6	7	8	8	7	7	6	6	7	7	6	5	6	6	5	6	5	5	

Diurnal Maximum

AF - Analyzer Failure UO - Unstable Operation







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed 75 m (WS75m) - km/h**  
**Mannix - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	54	7.58	7.58
6 - 11	223	31.32	38.90
12 - 19	270	37.92	76.83
20 - 28	149	20.93	97.75
29 - 38	16	2.25	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 712

Total Number of Hours: 744



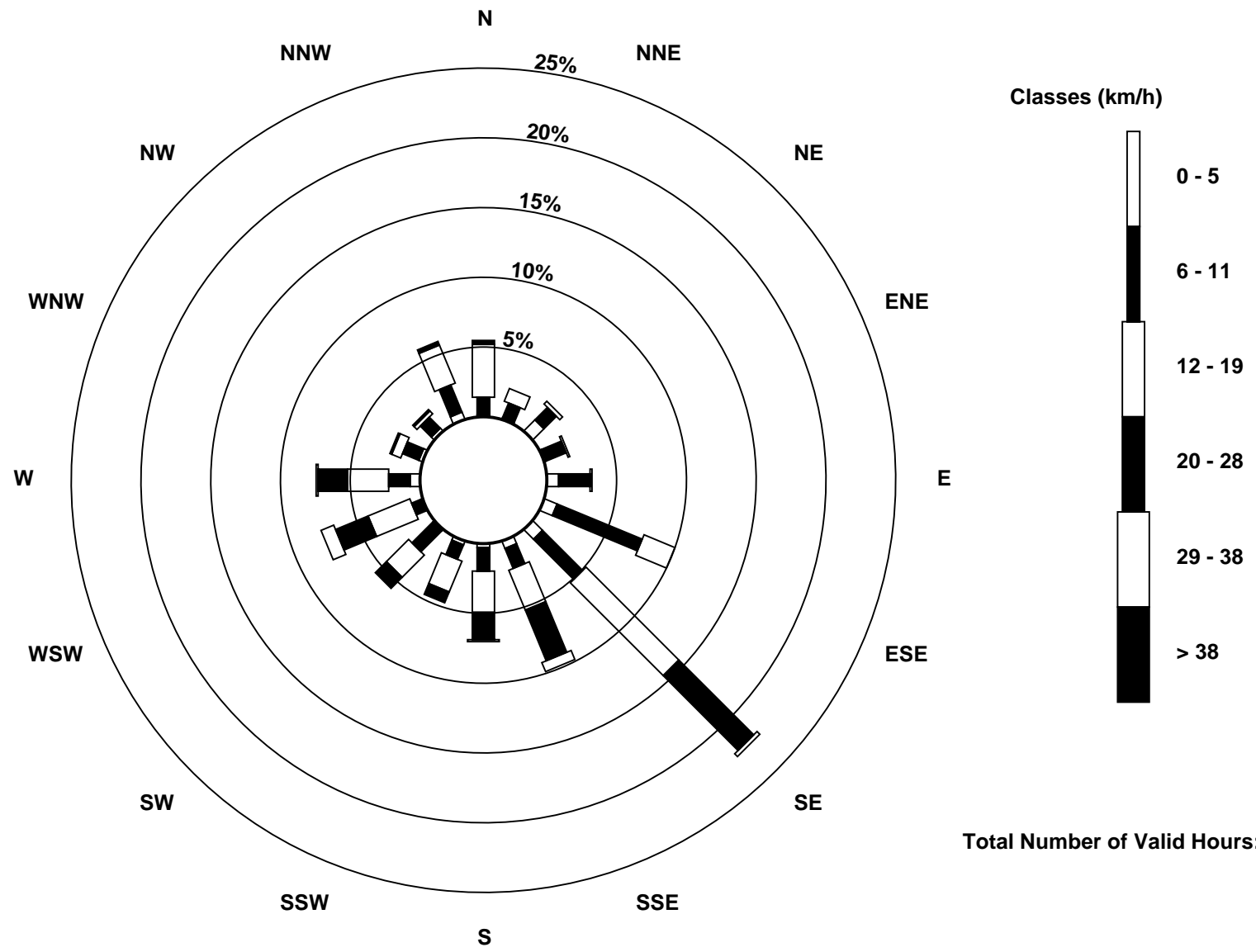
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed 75 m (WS75m) - km/h**  
**Mannix - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	1	1	8	1	6	7	7	4	2	2	1	1	5	2	2	4	54
6 - 11	9	8	9	11	16	47	29	11	12	8	15	5	11	9	8	15	223
12 - 19	27	7	2	1	1	17	67	22	21	17	16	23	21	5	2	21	270
20 - 28	2	0	0	0	0	0	54	28	14	6	8	18	15	1	1	2	149
29 - 38	0	0	0	0	0	0	2	5	1	0	0	7	1	0	0	0	16
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	39	16	19	13	23	71	159	70	50	33	40	54	53	17	13	42	712

Total Number of Valid Hours: 712

Total Number of Hours: 744





Maximum Speed: 36 km/h on Dec 15 05:00	Maximum Daily Speed Average: 23.6 km/h on Dec 20	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 24 17:00	Minimum Daily Speed Average: 2.2 km/h on Dec 25	Hours of Data: 743
Maximum Diurnal Speed Average: 7.2 km/h at hour 16	Minimum Diurnal Speed Average: 4.4 km/h at hour 3	Hours of Missing Data: 1
Monthly Average Velocity: 5.6 km/h 167.0 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 7 Q <sub>1</sub> = 10 Median = 15 Q <sub>3</sub> = 21 P <sub>90</sub> = 26 P <sub>99</sub> = 32	Percent Operational Time: 99.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SW13	SW8	S5	S9	S10	S8	SE8	SE10	SSE7	SSE17	SSE16	SSE21	S9	SSE17	SSE21	SSE28	S29	S23	S19	SSW13	SW13	SW16	SSW15	SSW16	S13.3	S29
2-Dec	SSW17	SSW18	S16	SSE29	SSE31	SSE27	SSE28	SE26	SE24	SE32	SSE29	S29	SSW21	SSW22	SSW27	SSW31	SW31	WSW32	WSW32	WSW31	WSW33	WSW31	WSW28	WSW25	SSW20.0	WSW33
3-Dec	W21	W22	W21	WSW15	SW12	SW9	S10	SSE20	SE15	SE13	SE13	E13	NE12	E11	ESE11	SE19	ESE12	ESE14	SE18	ESE12	ESE11	ENE12	E10	E8	SE6.4	W22
4-Dec	E7	ENE8	E8	E6	ENE5	ENE6	NE7	ENE7	NW3	WNW5	W11	WSW10	SSW7	SW14	SW13	SW20	SW20	SW15	SW23	SSW27	SSW21	SW20	SW18	WSW19	SW7.7	SW27
5-Dec	W16	WNW9	W19	WNW23	WNW33	W27	W28	WSW29	WSW30	WSW24	WSW22	WSW20	WSW20	WSW20	WSW13	SW16	SW14	SSW10	SSW13	SSW14	SSW14	SSW6	SE13	SE15	WSW15.5	WNW33
6-Dec	ESE13	SE10	E14	ESE17	ESE9	ESE9	ESE11	ESE13	ESE19	ESE18	ESE21	ESE18	ESE15	ESE16	SE12	SE16	SE18	SE19	SE17	SSE20	SE17	SE22	SE25	SE19	SE15.5	SE25
7-Dec	SE18	SE20	SE26	SE23	SE27	SE24	SE24	SE28	SE25	SE23	SE25	SE19	SE20	ESE20	SE19	SSE14	SSE17	SSE18	SSE24	SSE23	SSE24	S15	WSW11	WNW16	SE18.3	SE28
8-Dec	NNW16	NNW16	NW17	NNW7	NNW12	N3	W6	W7	W9	WSW11	SSW10	S13	S10	SSE9	SE11	SE13	SE11	ESE11	E17	E18	ESE11	ESE11	ESE15	ESE10	ESE2.2	E18
9-Dec	ESE12	ESE13	ESE14	ESE15	ESE14	ESE13	ESE13	ESE15	ESE12	ESE12	ESE14	ESE15	SE13	ESE6	ESE6	SE7	SSE5	SW7	WSW6	W6	WSW9	SW10	WSW9	W7	SE6.9	ESE15
10-Dec	W9	W10	NW9	N8	NNE8	NNE10	NNE10	NNE14	NNE11	N5	N7	NNW2	WNW3	NNE7	NW1	NNE3	NE3	ESE4	ESE8	ESE7	ESE9	AF	ESE11	ESE9	NNE3.6	NNE14
11-Dec	ESE9	ESE13	SE14	SE17	SE17	SE14	SE17	SE15	SE17	SE20	SE21	SE20	SE13	SE14	SSE14	SE15	SE14	SE16	SE18	SE17	SE19	SE19	SE18	SE18	SE15.9	SE21
12-Dec	SE19	SE20	SE17	SE21	SE19	SE21	SE23	SE22	SE27	SE27	SE30	SE23	SE21	SE25	SE26	SE28	SE31	SE24	SE25	SE25	SE24	SE26	SE21	SE21	SE23.5	SE31
13-Dec	SE16	SE17	SE21	SE22	ESE21	ESE18	ESE19	ESE18	ESE15	ESE16	ESE18	ESE14	ESE14	ESE12	ESE10	ESE7	E7	E8	E6	E8	E8	E4	SE5	SSE5	ESE12.6	ESE22
14-Dec	S3	S8	SSW6	NW13	NW10	WNW9	W13	W13	W11	W13	W13	W15	W11	W10	WSW8	SSW7	SW8	S9	S14	S21	S22	S23	S23	SSE26	SW7.9	SSE26
15-Dec	SSE25	S22	SSE26	SSE30	SSE36	SSE35	SSE30	S26	S25	SW23	WSW22	WSW18	WSW24	WSW21	WSW17	WSW19	WSW21	WSW23	WSW21	W19	W26	WNW29	NW26	N29	SW14.3	SSE36
16-Dec	NNE20	N11	NNW7	NW1	WNW16	WNW25	WNW24	W24	W22	W23	W20	WSW13	W15	W15	WSW16	SSW14	SW17	W21	WNW20	W19	WNW20	W18	W17	W16	W14.8	WNW25
17-Dec	W14	W17	W19	W19	W17	WNW17	WNW16	WNW16	NNW8	NNW7	NNW5	NNW4	NW5	WNW9	NW9	NNW9	NNW10	NNE11	NE12	NNE9	NNE9	NNE10	NNE10	NE8	NW7.9	W19
18-Dec	NE8	NE9	NE3	ENE4	E1	NE3	NE4	ENE8	ENE9	ENE6	SSE7	SE8	SE6	E6	E10	E13	E13	E14	ESE16	ESE14	ESE14	E15	E13	ESE11	E8.0	ESE16
19-Dec	ESE15	ESE12	ESE11	ESE13	ESE14	ESE15	ESE16	ESE16	ESE9	SE9	SE6	SE10	SSE10	SSE10	SSE14	SE15	SE20	SE23	SE25	SE22	SE27	SE24	SE22	SE24	SE15.7	SE27
20-Dec	SE28	SE31	SE28	SE30	SE28	SE26	SE26	SE27	SE26	SE21	ESE17	SE16	SE11	SE15	SE17	ESE19	SE24	SE29	SE23	SE22	SE25	SE28	SE27	SE25	SE23.6	SE31
21-Dec	SE23	SE24	SE23	SE25	SE26	SSE25	SSE27	SSE27	S27	S22	S12	S5	SE6	SE7	SE7	SE9	SE10	SE8	E7	S1	NE6	N4	NE7	NNW7	SSE12.2	S27
22-Dec	NNE16	NNE11	N10	N9	N18	N22	N18	N16	N14	N16	N14	NNW12	NNW10	NNW12	NNW15	NNW22	N17	NNW15	NNW17	NNW17	N17	N17	N16	NNW17	N15.0	NNW22
23-Dec	N14	NNW14	N16	N18	N18	N15	N15	N12	N14	N17	N16	N9	NNW10	N14	N14	N11	N14	N19	NNE17	NNE17	NNE10	NNW11	N12	N13	N14.0	N19
24-Dec	N14	N19	N13	N11	N16	N17	N15	N13	N10	NNW8	NNW8	NW9	WNW7	WNW6	WNW3	NW1	E1	SE2	ESE3	SE3	SE5	SE13	SSE20	SSE20	N4.2	SSE20
25-Dec	S16	S12	SSW7	S8	S9	SSW5	S5	S9	S7	SSW9	SW10	W12	W11	W6	SW3	SSW1	SE2	SE2	NNW13	NNW20	NNW18	N18	NNE17	NNE16	W2.2	NNW20
26-Dec	NNE20	NNE17	NNE12	NNE9	NE5	E4	E1	ENE2	ESE2	SE7	SE11	SSE13	SE13	SE8	ESE8	E12	ESE8	ESE12	ESE12	ESE13	ESE13	ESE12	ESE15	ESE16	E7.5	NNE20
27-Dec	SE21	ESE22	ESE18	ESE20	SE23	ESE22	ESE23	SE26	SE30	SE32	SE32	SE32	SE27	SE22	SE16	SE16	SE10	SE17	SSE18	SSE14	SSE12	SSE7	SW9	WSW11	SE18.9	SE32
28-Dec	WSW16	WSW11	W13	WNW13	NW11	WNW9	WNW11	NNW11	N12	N12	NNW7	NNW6	NW7	WNW7	NW7	WNW5	WNW6	WSW3	SE8	SSE7	S9	S14	S13	S14	W4.4	WSW16
29-Dec	SSE16	SSE21	S22	SSW16	SSE12	S13	SSW15	SSW10	SSW14	SSW15	S12	S12	SSW12	SSW12	S11	S23	S27	SSW28	SSW23	SSW22	SSW20	SSW19	SSW20	SW21	S16.7	SSW28
30-Dec	SW18	WSW21	WSW30	W26	W26	W25	WNW25	W25	WSW20	SW11	SW13	WSW13	SW13	WSW11	W16	W13	SW10	WSW9	SW13	SW19	SW17	SW17	SSW20	SSW20	WSW16.7	WSW30
31-Dec	S24	SSW19	SSW17	SSW25	S28	S24	SSW19	SSW19	SW16	WSW23	WSW23	WSW20	WSW20	WSW18	WSW23	WSW25	WSW26	W23	WSW30	WSW27	WSW26	WSW22	SW24	WSW22	SW20.4	WSW30

SSE4.8 SSE4.8 S4.4 SSE5.4 SSE5.0 SSE4.7 SSE5.0 SSE5.8 SSE5.7 SSE5.9 SSE6.4 S6.3 S5.2 S4.9 S5.5 S7.2 S7.0 S6.7 S6.6 S6.1 S6.6 S6.0 SSE5.7 SSE4.9 SE28 SE31 WSW30 SSE30 SSE36 SSE35 SSE30 WSW29 WSW30 SE32 SE32 SE32 SE27 SE25 SSW27 SSW31 SE31 WSW32 WSW32 WSW31 WSW33 WSW31 WSW28 N29	Diurnal Average	Diurnal Maximum
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AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods

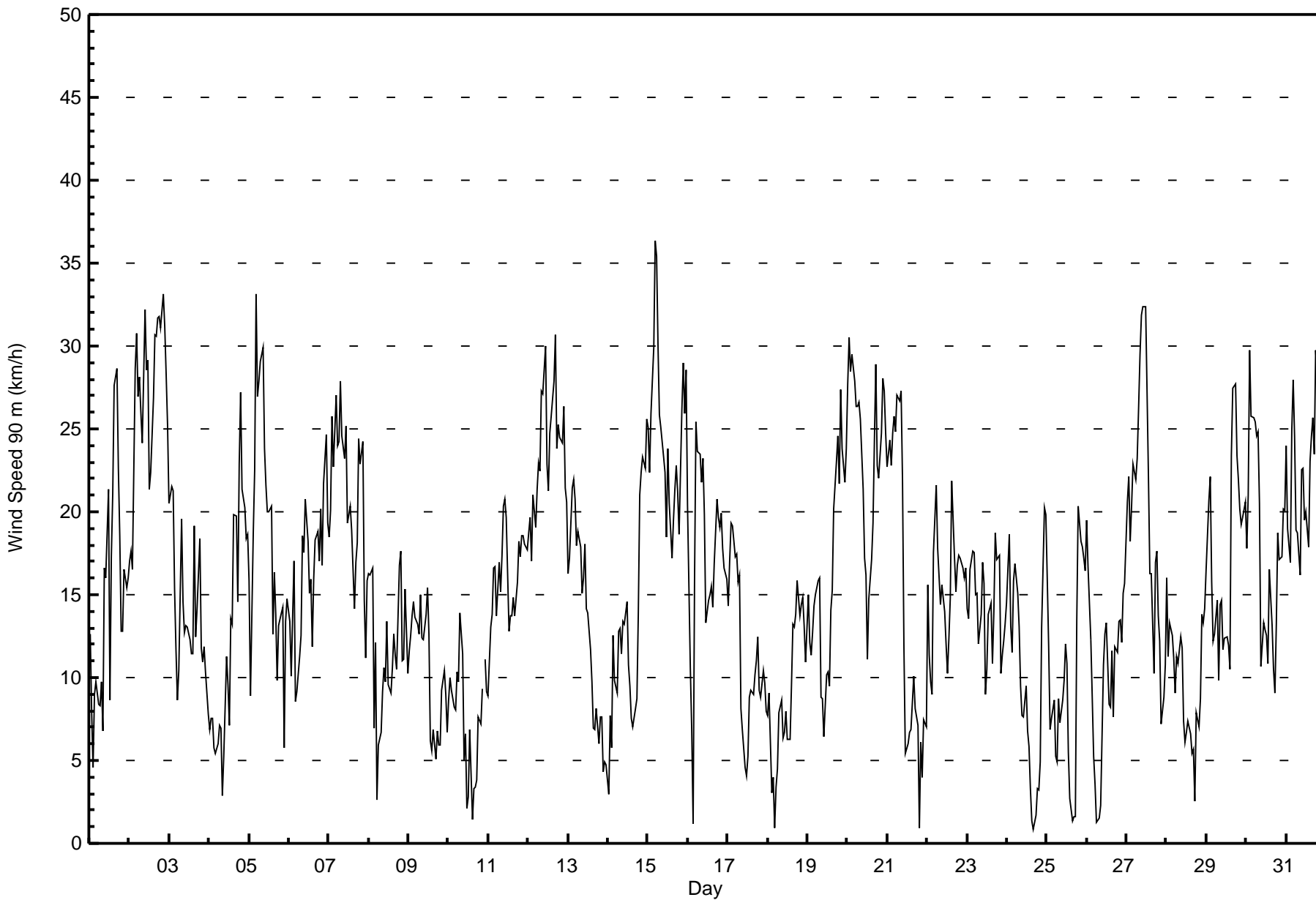


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Dec 16 05:00	Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9
Minimum Value: 1 km/h on Dec 27 23:00	
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 6	

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	2	1	2	2	2	2	1	3	3	3	2	2	6	2	6	2	2	4	3	3	2	2	2	2	6
2-Dec	2	3	3	3	3	2	2	3	5	4	4	6	2	3	2	2	2	4	5	4	5	5	4	5	6
3-Dec	3	4	3	2	3	3	3	1	3	3	3	2	2	3	4	4	3	5	3	4	3	3	4	2	5
4-Dec	2	2	2	1	1	1	2	3	4	3	3	3	2	2	3	2	3	3	3	4	3	3	2	3	4
5-Dec	4	2	3	4	4	4	6	4	4	5	4	3	4	4	3	2	3	2	1	1	1	3	3	3	6
6-Dec	2	3	3	2	4	3	2	3	4	4	5	4	3	3	4	3	2	2	3	1	1	1	2	4	5
7-Dec	3	2	2	5	5	5	4	6	4	4	5	4	5	5	3	2	1	1	2	1	2	4	1	2	6
8-Dec	3	3	2	3	2	2	2	2	1	2	2	3	2	2	3	2	3	3	4	3	3	3	3	3	4
9-Dec	3	3	3	3	3	3	3	5	3	3	3	3	4	2	2	2	2	1	1	2	1	1	2	1	5
10-Dec	1	1	2	1	2	1	2	1	3	1	2	1	1	2	2	2	1	2	3	4	4	AF	3	4	4
11-Dec	3	3	3	2	3	3	3	3	3	4	5	4	4	3	3	2	2	3	4	4	4	4	4	4	5
12-Dec	4	4	4	5	5	5	3	4	4	6	4	5	5	6	6	5	6	5	5	5	4	4	4	4	6
13-Dec	3	4	5	5	4	4	4	4	3	4	3	4	4	4	4	3	2	4	2	2	2	2	4	3	5
14-Dec	2	1	1	3	4	3	2	2	2	2	2	2	2	1	1	1	1	2	1	1	1	2	1	2	4
15-Dec	2	2	2	2	2	2	3	2	2	1	2	4	3	3	2	2	2	2	2	2	2	2	4	4	4
16-Dec	4	4	4	1	8	3	2	2	2	2	3	2	2	2	2	1	2	2	2	3	1	2	2	1	8
17-Dec	2	2	2	2	2	2	2	3	2	1	1	1	1	1	2	2	1	2	2	2	3	3	2	2	3
18-Dec	1	2	3	1	1	2	2	1	1	4	2	2	3	3	2	2	3	2	3	4	4	3	3	3	4
19-Dec	3	4	3	3	4	3	3	3	3	2	2	3	2	2	2	3	4	4	5	3	4	4	4	3	5
20-Dec	4	3	3	2	3	2	2	2	1	3	3	3	2	3	4	3	4	4	5	4	4	3	3	3	5
21-Dec	2	2	3	3	2	2	2	2	1	3	3	2	1	1	2	2	1	2	2	2	2	1	2	2	3
22-Dec	2	2	2	2	3	3	3	3	2	3	4	3	2	2	3	3	3	3	3	2	2	2	2	2	4
23-Dec	2	2	2	3	4	3	3	2	3	2	2	2	2	2	2	2	4	2	3	2	3	3	2	3	4
24-Dec	2	3	2	2	3	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2	2	2	3
25-Dec	2	1	2	1	1	2	1	2	1	1	1	1	3	2	1	1	1	1	7	5	4	2	2	2	7
26-Dec	2	3	2	1	1	3	1	1	1	2	1	2	2	2	1	1	2	3	3	3	4	3	4	4	4
27-Dec	4	4	4	4	5	4	4	6	6	7	6	6	5	5	3	4	3	2	2	2	2	2	1	2	7
28-Dec	1	3	2	3	2	1	1	1	1	3	2	1	2	1	1	1	1	1	3	2	2	2	2	1	3
29-Dec	2	2	2	4	2	2	2	2	4	4	2	3	2	2	2	4	1	3	2	2	2	2	2	2	4
30-Dec	2	3	3	2	1	1	1	1	3	2	3	5	4	3	4	3	2	2	2	2	2	2	2	3	5
31-Dec	4	3	2	3	2	2	2	2	5	7	3	2	2	2	2	2	2	2	2	2	2	1	1	3	7
	4	4	5	5	8	5	6	6	6	7	6	6	6	6	6	5	6	5	7	5	5	5	4	5	

Diurnal Maximum

AF - Analyzer Failure





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed 90 m (WS90m) - km/h**  
**Mannix - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	49	6.59	6.59
6 - 11	189	25.44	32.03
12 - 19	284	38.22	70.26
20 - 28	188	25.30	95.56
29 - 38	33	4.44	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed 90 m (WS90m) - km/h**  
**Mannix - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	3	1	5	3	5	3	6	2	5	2	1	1	0	4	5	3	49
6 - 11	9	13	6	6	14	24	23	8	13	9	7	13	13	9	7	15	189
12 - 19	35	8	2	1	10	54	49	16	14	20	18	12	23	6	2	14	284
20 - 28	1	2	0	0	0	8	71	19	15	13	8	26	16	6	1	2	188
29 - 38	1	0	0	0	0	0	10	7	2	1	1	9	0	2	0	0	33
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	49	24	13	10	29	89	159	52	49	45	35	61	52	27	15	34	743

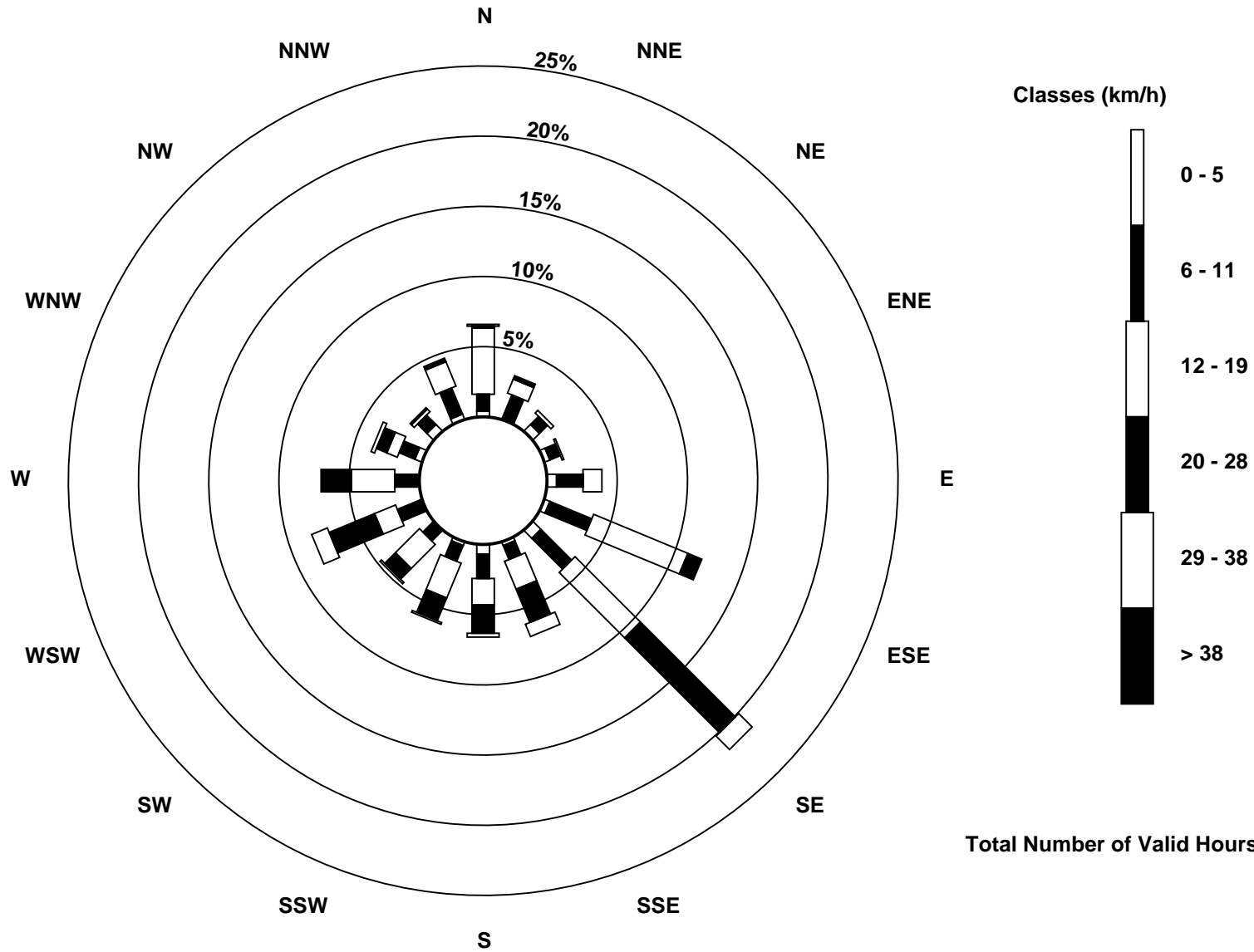
Total Number of Valid Hours: 743

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed 90 m (WS90m) - km/h  
Mannix (AMS 5)





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Direction 20 m (WD20m) - deg

Mannix - December 2015

Direction of Maximum Speed: 283 deg on Dec 5 05:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 136.5 deg on Dec 12	Hours of Data: 741
Direction of Minimum Speed: 340 deg on Dec 24 17:00	Hours of Missing Data: 3
Direction of Minimum Daily Speed Average: 0.6 deg on Dec 3	Percent Operational Time: 99.6
Monthly Average Direction: 206.5 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	148	138	136	148	152	138	133	137	150	153	150	156	144	158	147	153	156	155	156	157	163	159	150	152	151.2
2-Dec	156	154	142	148	150	142	144	150	147	155	166	151	158	152	164	182	198	236	251	246	248	254	254	253	190.9
3-Dec	263	268	270	259	206	159	151	145	116	136	183	47	16	12	307	142	32	87	129	68	84	15	30	39	146.9
4-Dec	28	22	14	350	338	324	348	337	275	267	257	242	182	170	169	205	216	195	195	203	184	187	187	216	215.4
5-Dec	257	254	269	283	283	269	268	259	252	253	253	243	249	255	244	216	195	168	187	179	170	144	149	131	246.2
6-Dec	91	281	30	83	59	151	110	65	131	109	99	114	122	127	159	150	144	145	146	159	156	150	147	153	131.0
7-Dec	161	152	148	145	151	152	160	138	142	142	138	144	144	132	140	199	174	166	165	156	172	177	187	268	152.5
8-Dec	331	322	305	337	327	348	225	211	232	224	187	185	173	152	139	136	135	116	92	93	112	104	104	116	132.9
9-Dec	123	128	106	107	106	99	125	107	112	108	127	127	132	121	118	139	154	236	276	275	243	212	191	179	129.1
10-Dec	252	243	312	356	360	8	7	11	1	339	355	318	273	17	277	331	345	278	133	114	104	107	106	118	3.3
11-Dec	75	102	129	150	128	128	132	132	133	140	135	138	134	143	155	142	134	138	136	141	133	131	129	130	133.5
12-Dec	130	137	131	132	AF	AF	AF	138	137	136	138	140	142	141	137	135	136	139	140	137	137	137	132	131	136.5
13-Dec	131	131	131	130	129	125	128	128	131	132	131	131	132	122	128	130	81	93	69	85	97	58	179	216	126.1
14-Dec	190	168	203	311	326	297	277	262	263	265	254	264	274	258	209	181	190	162	171	165	166	169	166	155	217.2
15-Dec	165	162	157	150	161	158	158	163	170	186	226	256	253	246	238	240	242	257	244	223	263	283	324	12	211.4
16-Dec	13	8	348	336	287	290	283	271	268	276	257	239	265	261	251	181	203	255	270	264	270	273	270	270	272.4
17-Dec	267	268	271	270	269	280	281	299	352	356	359	3	316	277	311	332	337	18	53	37	25	21	21	45	314.4
18-Dec	53	43	13	34	254	15	38	74	63	53	170	153	129	100	90	80	96	93	103	115	106	88	77	127	89.0
19-Dec	114	118	118	116	124	129	128	129	128	159	153	160	156	166	159	145	136	130	135	130	136	140	135	142	134.6
20-Dec	141	140	145	146	146	143	143	142	143	146	129	131	146	148	137	127	128	135	128	128	140	143	136	138	138.3
21-Dec	145	147	147	151	155	157	162	157	170	166	164	154	150	148	125	137	136	133	66	294	31	289	350	287	154.1
22-Dec	3	348	321	309	354	1	356	350	340	339	355	338	329	327	343	336	354	338	336	338	338	342	344	338	342.7
23-Dec	339	331	334	336	351	349	347	340	7	2	9	356	329	343	351	356	9	12	16	17	7	345	355	5	354.4
24-Dec	358	3	359	345	351	8	6	10	359	337	339	326	303	289	258	267	340	216	157	160	170	157	156	160	350.8
25-Dec	156	163	166	165	161	145	163	166	153	156	160	168	239	209	153	133	147	115	333	336	331	4	17	14	138.3
26-Dec	23	6	5	359	304	259	347	32	184	130	133	152	128	145	95	75	22	77	102	124	122	119	121	126	92.2
27-Dec	132	128	127	127	128	123	125	132	133	135	139	139	142	139	145	149	148	151	159	166	155	145	171	185	138.1
28-Dec	216	196	250	301	308	289	292	325	345	342	332	326	310	295	316	284	267	250	102	252	243	191	164	163	284.6
29-Dec	163	161	180	188	142	147	170	152	160	169	176	182	190	198	159	157	161	170	161	158	155	158	164	171	165.1
30-Dec	177	206	243	253	257	268	257	253	194	156	164	147	164	142	177	194	159	180	182	194	173	161	159	159	196.8
31-Dec	152	161	158	168	165	161	156	155	150	219	244	233	232	235	232	224	240	244	249	239	234	216	203	215	204.7

138.6 150.2 163.7 157.7 168.3 163.4 169.7 153.5 152.7 156.7 163.2 161.9 178.7 178.0 167.2 159.6 157.6 160.9 154.6 162.2 164.3 161.2 147.7 150.9

Diurnal Average

AF - Analyzer Failure

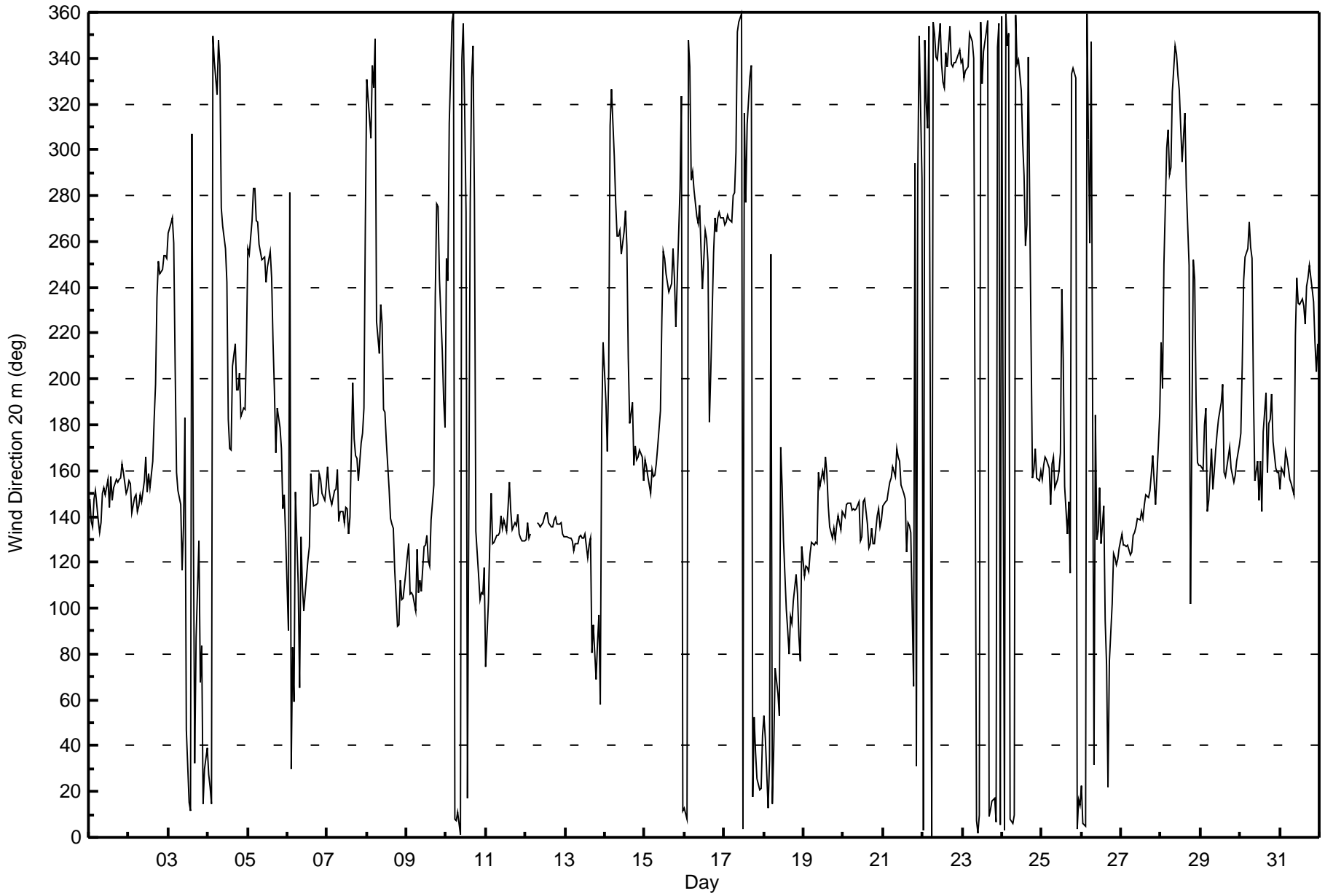
All monthly, daily, and diurnal averages have been calculated using vector methods



Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 93 deg on Dec 6 08:00	Hours of Data: 741
Minimum Value: 3 deg on Dec 29 00:00	Hours of Missing Data: 3
Percentiles: P <sub>1</sub> = 6 P <sub>10</sub> = 8 Q <sub>1</sub> = 10 Median = 13 Q <sub>3</sub> = 18 P <sub>90</sub> = 31 P <sub>99</sub> = 83	Hours of Calibration: 0
	Percent Operational Time: 99.6

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	9	10	13	11	10	10	7	10	8	12	18	19	34	18	13	9	8	7	10	8	5	6	12	9	34
2-Dec	6	6	10	8	10	12	13	11	13	10	20	10	8	13	11	10	15	11	12	10	11	10	9	10	20
3-Dec	7	8	6	24	17	18	7	9	17	35	56	33	13	20	83	29	31	62	13	84	44	9	26	17	84
4-Dec	15	9	24	41	30	35	20	50	41	85	12	17	25	14	19	15	11	11	9	14	10	7	8	19	85
5-Dec	26	17	9	11	9	10	9	9	10	13	12	15	15	11	14	8	17	13	9	9	13	17	16	20	26
6-Dec	55	66	12	15	75	73	43	93	14	28	15	17	17	14	39	24	8	9	9	7	7	8	9	13	93
7-Dec	14	8	11	13	11	10	21	12	15	13	12	10	16	13	20	16	18	11	14	11	12	12	18	27	27
8-Dec	13	18	9	37	25	69	34	12	14	20	15	19	20	20	14	15	15	18	12	11	21	20	14	18	69
9-Dec	15	13	15	15	14	14	19	16	17	16	13	10	13	21	21	14	21	14	14	10	24	11	13	26	26
10-Dec	57	26	33	17	13	11	13	9	12	28	16	30	34	21	43	29	28	18	55	25	26	37	33	39	57
11-Dec	27	18	14	12	10	11	11	12	12	11	11	11	15	14	11	13	11	11	12	13	13	10	10	11	27
12-Dec	11	10	11	11	AF	AF	AF	9	9	11	10	10	10	11	10	10	10	11	10	10	9	10	11	10	11
13-Dec	10	10	11	10	11	14	13	12	10	10	11	12	13	18	17	23	35	42	44	18	21	90	62	54	90
14-Dec	54	13	31	39	23	15	14	10	12	14	12	10	9	16	22	15	21	13	13	11	11	10	10	10	54
15-Dec	9	8	7	10	7	8	8	9	10	17	11	11	9	9	9	9	8	6	18	30	6	10	15	10	30
16-Dec	12	20	29	56	27	10	10	6	7	7	12	13	10	8	14	14	13	20	16	8	7	7	4	4	56
17-Dec	8	7	7	6	8	8	10	20	17	27	23	25	25	11	19	13	12	33	12	15	17	16	15	17	33
18-Dec	16	16	56	35	86	59	18	10	20	53	23	15	26	39	15	15	14	9	16	16	16	17	16	16	86
19-Dec	17	18	19	18	15	11	12	11	13	20	71	23	16	14	16	8	12	11	13	11	11	11	11	8	71
20-Dec	8	10	10	9	10	8	10	9	10	11	11	12	12	11	11	12	11	11	11	12	9	11	10	10	12
21-Dec	9	10	9	9	8	9	6	7	9	6	9	8	9	10	21	20	19	29	38	54	62	42	42	25	62
22-Dec	12	23	20	26	16	14	14	17	15	14	21	18	14	13	16	13	19	13	12	12	13	12	13	15	26
23-Dec	14	14	11	17	18	16	16	14	12	13	12	20	14	13	13	17	18	12	11	12	16	15	15	14	20
24-Dec	15	14	13	19	19	10	11	12	19	19	19	16	21	17	24	28	79	31	11	29	31	7	9	10	79
25-Dec	11	9	8	11	10	13	10	14	8	9	9	39	28	71	13	32	45	76	11	14	14	15	10	9	76
26-Dec	11	16	17	18	24	61	53	38	52	22	25	37	16	34	17	24	22	25	17	18	16	17	16	15	61
27-Dec	13	13	12	12	12	13	12	10	11	11	11	10	10	11	12	11	13	9	11	15	13	14	17	14	17
28-Dec	18	32	15	15	14	12	11	18	14	18	21	18	16	13	14	19	9	16	70	20	23	18	6	3	70
29-Dec	4	4	17	15	8	10	13	10	9	13	14	17	15	17	13	6	6	8	5	6	6	6	8	10	17
30-Dec	11	15	9	9	6	7	6	13	34	16	13	26	16	23	25	83	12	11	15	12	19	8	6	9	83
31-Dec	7	10	6	10	7	8	8	7	44	57	11	10	7	6	9	8	10	14	7	8	13	9	10	8	57
	57	66	56	56	86	73	53	93	52	85	71	39	34	71	83	83	79	76	70	84	62	90	62	54	
	Diurnal Maximum																								

AF - Analyzer Failure





Direction of Maximum Speed: 278 deg on Dec 5 05:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 129.9 deg on Dec 12	Hours of Data: 739
Direction of Minimum Speed: 318 deg on Dec 24 17:00	Hours of Missing Data: 5
Direction of Minimum Daily Speed Average: 1.6 deg on Dec 25	Percent Operational Time: 99.3
Monthly Average Direction: 212.2 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	176	147	142	148	151	139	131	131	149	155	153	156	144	153	144	150	153	151	153	153	167	167	158	155	151.3
2-Dec	157	169	148	147	146	144	150	143	140	148	165	154	167	AF	173	187	204	234	247	243	245	250	249	248	185.6
3-Dec	257	260	262	254	212	181	149	145	119	122	163	51	15	20	73	131	77	113	125	90	106	34	55	51	135.6
4-Dec	54	43	38	24	12	357	351	349	284	281	258	241	182	182	191	215	221	212	208	212	192	194	202	225	218.5
5-Dec	251	266	265	278	278	264	262	254	248	248	247	239	244	250	241	220	208	178	191	187	174	150	128	116	239.3
6-Dec	99	119	68	86	88	133	120	124	122	110	99	110	114	117	144	143	135	138	139	154	149	144	137	145	125.4
7-Dec	142	142	139	133	139	137	142	127	132	129	129	134	136	123	131	177	170	168	163	152	166	169	198	274	144.4
8-Dec	325	316	305	326	323	357	234	239	254	239	190	182	170	147	132	130	129	109	88	87	106	98	100	108	128.7
9-Dec	113	121	100	101	100	94	117	100	107	103	118	121	125	113	114	130	145	232	268	277	243	218	212	230	123.8
10-Dec	273	258	306	353	357	5	3	10	360	337	351	317	280	9	275	347	359	331	123	107	110	101	101	113	6.9
11-Dec	79	99	122	141	123	123	125	126	127	134	129	130	126	138	148	137	127	129	130	134	125	123	122	124	127.0
12-Dec	123	130	125	127	AF	AF	AF	AF	131	130	131	133	136	135	130	128	128	132	134	130	130	130	125	124	129.9
13-Dec	124	124	124	124	122	117	120	121	124	124	123	122	123	114	119	122	75	85	63	77	91	81	157	180	118.2
14-Dec	185	166	192	310	320	297	271	258	263	252	263	270	254	214	183	193	168	175	164	164	167	163	150	150	209.3
15-Dec	160	159	150	145	154	152	154	161	169	193	230	251	249	243	238	238	240	252	249	251	265	278	319	6	209.6
16-Dec	8	1	340	328	286	286	278	266	266	270	259	241	258	256	247	189	211	253	266	265	271	271	269	269	268.2
17-Dec	266	265	267	265	265	277	282	294	345	346	346	350	309	279	307	325	332	7	42	26	17	15	17	37	310.2
18-Dec	43	35	17	41	272	12	35	64	54	49	161	146	122	92	84	72	90	88	98	110	102	83	72	119	83.9
19-Dec	107	110	109	108	116	123	120	120	119	151	150	140	149	158	154	135	127	126	128	125	130	131	126	128	126.9
20-Dec	130	131	136	137	135	133	132	133	133	132	122	123	136	129	126	118	122	128	122	122	135	136	129	131	129.7
21-Dec	137	141	140	143	146	150	155	153	162	162	163	152	140	135	124	127	130	122	66	283	26	293	4	295	146.0
22-Dec	359	353	331	319	351	357	354	350	340	337	350	335	325	324	339	331	349	335	333	335	335	339	342	335	340.7
23-Dec	335	330	333	335	351	348	346	336	1	358	4	353	324	341	347	353	4	6	9	10	4	339	350	358	350.5
24-Dec	353	357	354	344	349	0	359	1	352	331	332	318	296	286	261	266	318	205	143	140	147	145	151	156	349.3
25-Dec	154	159	162	161	161	141	157	160	149	156	169	204	257	257	141	140	134	103	331	334	327	357	11	11	145.2
26-Dec	19	10	8	9	2	260	6	22	127	133	128	146	128	125	93	77	98	86	101	115	113	111	113	117	86.5
27-Dec	124	120	120	119	121	116	117	125	127	129	132	132	135	134	139	141	139	143	152	160	149	136	171	196	131.7
28-Dec	231	211	256	294	304	286	289	322	342	340	331	324	307	290	309	284	269	248	113	237	211	180	165	160	274.0
29-Dec	155	152	177	185	142	144	174	155	159	171	173	176	187	196	161	159	164	175	168	165	161	163	178	195	167.7
30-Dec	202	216	246	252	258	262	262	260	234	162	191	170	171	165	224	258	201	205	203	216	209	190	166	166	216.8
31-Dec	152	161	159	176	163	160	161	166	183	244	243	234	231	234	230	227	245	251	247	240	237	220	212	224	207.4

140.2 147.2 156.9 150.6 154.1 150.6 158.6 150.2 149.2 154.6 162.0 158.5 174.4 173.8 166.6 161.5 161.4 163.0 160.8 166.6 167.4 163.5 150.4 152.7  
Diurnal Average

AF - Analyzer Failure  
All monthly, daily, and diurnal averages have been calculated using vector methods



Summary of Hour Standard Deviations

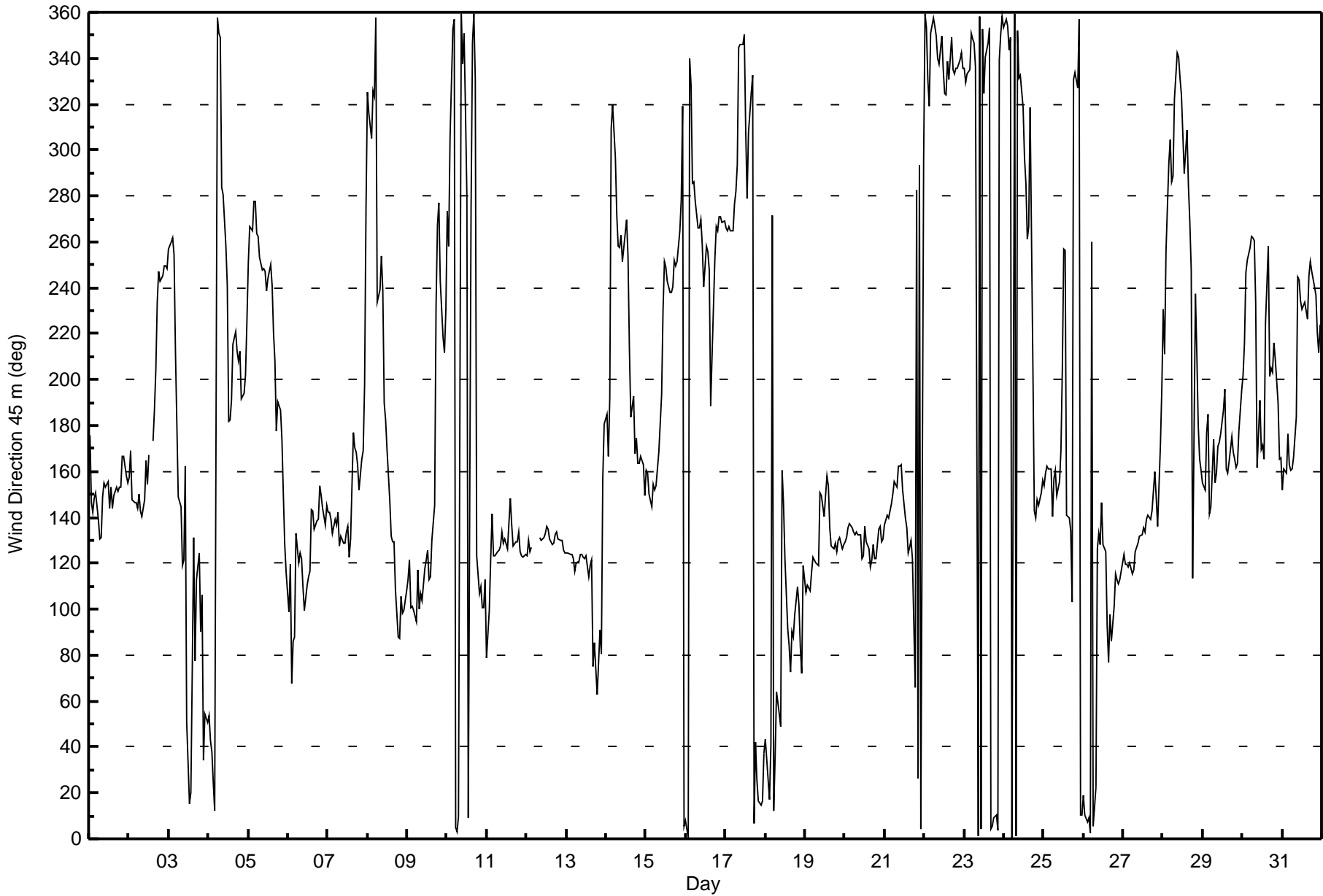
Mannix - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 89 deg on Dec 18 05:00			Hours of Data:	739
Minimum Value: 2 deg on Dec 29 02:00			Hours of Missing Data:	5
			Hours of Calibration:	0
			Percent Operational Time:	99.3
Percentiles: P <sub>1</sub> = 3 P <sub>10</sub> = 5 Q <sub>1</sub> = 7 Median = 9 Q <sub>3</sub> = 14 P <sub>90</sub> = 23 P <sub>99</sub> = 64				

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	11	11	7	3	5	7	4	7	5	4	11	13	32	14	8	5	4	4	5	4	7	5	9	4	32
2-Dec	3	11	7	3	4	4	6	8	8	7	13	6	8	AF	8	5	11	9	9	7	8	7	7	7	13
3-Dec	6	7	5	20	11	24	5	6	14	20	36	33	12	16	72	11	30	35	7	23	24	8	18	14	72
4-Dec	15	8	9	12	18	9	9	36	36	65	13	16	23	18	20	7	6	9	5	11	11	6	6	13	65
5-Dec	17	11	7	9	8	9	8	6	7	11	9	11	12	9	10	6	13	9	7	5	9	8	5	16	17
6-Dec	19	19	12	8	50	29	22	22	9	19	12	12	12	10	25	17	5	7	9	4	5	5	6	10	50
7-Dec	8	5	8	9	7	6	11	7	10	8	7	6	12	10	13	8	9	8	10	7	6	8	17	24	24
8-Dec	10	11	7	28	21	63	18	11	8	16	8	15	16	19	13	11	12	15	9	9	18	18	9	15	63
9-Dec	14	9	11	9	9	11	14	11	13	11	10	7	9	18	20	11	25	9	12	7	20	6	9	25	25
10-Dec	21	21	29	12	9	8	11	6	8	22	12	22	32	18	33	27	14	80	17	24	19	22	25	29	80
11-Dec	21	13	13	8	6	6	7	7	9	9	8	8	12	11	9	10	9	8	8	11	11	8	7	7	21
12-Dec	7	8	7	7	AF	AF	AF	AF	7	8	7	9	8	8	7	8	6	9	8	7	7	7	7	6	9
13-Dec	6	7	7	7	6	11	9	8	6	7	7	9	11	15	14	19	30	45	23	13	17	75	54	51	75
14-Dec	56	10	29	29	17	13	11	7	9	8	10	7	7	16	18	11	16	15	12	7	7	5	5	7	56
15-Dec	6	5	5	6	4	5	5	6	5	17	8	8	5	6	6	5	7	5	5	10	4	8	12	7	17
16-Dec	9	17	28	57	21	7	8	5	4	5	8	8	8	7	11	13	9	15	7	3	4	5	4	3	57
17-Dec	7	6	5	5	7	6	7	15	17	21	18	18	20	10	15	9	6	29	9	12	14	13	13	15	29
18-Dec	12	12	60	27	89	56	14	9	14	48	20	13	24	34	14	13	12	7	13	14	13	14	13	14	89
19-Dec	12	14	15	13	12	7	9	8	11	18	31	17	16	11	10	9	8	7	9	7	8	8	7	5	31
20-Dec	6	7	7	6	7	5	6	5	6	9	7	8	11	9	7	7	7	7	7	8	7	8	6	7	11
21-Dec	7	7	7	7	5	6	4	4	5	3	5	6	7	7	12	9	5	14	44	54	52	41	28	24	54
22-Dec	8	14	18	27	13	8	9	12	10	10	19	15	11	9	14	10	17	9	9	9	9	8	10	11	27
23-Dec	11	10	10	14	13	12	12	10	9	7	8	17	10	10	10	12	8	7	7	12	10	10	9	17	17
24-Dec	11	10	9	14	13	6	8	8	13	11	12	12	17	12	23	25	83	42	14	27	18	4	5	6	83
25-Dec	8	4	3	7	6	11	5	9	7	9	8	35	19	51	31	8	32	68	9	12	11	12	7	7	68
26-Dec	7	11	11	7	18	85	23	12	49	14	14	23	10	31	11	12	17	15	12	13	13	15	13	12	85
27-Dec	9	9	7	8	8	9	9	8	7	8	8	7	8	8	10	9	11	8	9	8	11	13	13	7	13
28-Dec	10	26	12	10	11	10	8	16	10	16	18	15	14	10	12	17	9	14	54	17	20	13	4	2	54
29-Dec	3	2	19	15	8	7	10	7	7	10	8	12	10	12	11	4	4	5	4	6	4	4	9	8	19
30-Dec	7	14	6	5	3	4	5	4	21	11	10	32	22	31	25	52	18	10	9	6	11	11	9	9	52
31-Dec	4	8	4	10	4	4	5	9	49	41	7	7	4	4	6	4	8	7	4	5	5	4	4	6	49
	56	26	60	57	89	85	23	36	49	65	36	35	32	51	72	52	83	80	54	54	52	75	54	51	

Diurnal Maximum

AF - Analyzer Failure







Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Direction 75 m (WD75m) - deg

Mannix - December 2015

Direction of Maximum Speed: 158 deg on Dec 15 05:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 131.0 deg on Dec 12	Hours of Data: 712
Direction of Minimum Speed: 229 deg on Dec 21 20:00	Hours of Missing Data: 32
Direction of Minimum Daily Speed Average: 0.8 deg on Dec 8	Percent Operational Time: 95.7
Monthly Average Direction: 213.8 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	214	184	157	158	168	157	138	136	152	154	150	154	156	155	152	158	168	168	171	178	202	205	187	177	164.8
2-Dec	179	199	168	156	157	149	146	128	128	132	160	169	196	192	190	199	216	237	249	245	248	252	251	250	194.5
3-Dec	257	260	260	246	226	211	160	155	135	130	147	66	38	64	103	130	104	120	128	106	119	65	76	79	146.1
4-Dec	80	65	68	59	47	44	30	36	306	294	266	251	194	216	223	226	228	225	218	225	206	211	218	241	224.7
5-Dec	257	279	267	280	279	264	263	255	250	250	248	241	246	251	243	225	219	189	201	196	191	179	141	120	244.6
6-Dec	107	128	84	92	105	126	116	124	119	113	106	114	115	117	141	141	135	137	142	152	143	139	132	141	127.9
7-Dec	134	137	138	128	131	129	134	128	129	127	128	128	133	124	131	163	167	165	159	152	164	179	234	286	142.7
8-Dec	327	323	316	328	328	359	260	265	270	247	203	182	168	147	132	131	130	113	UO	88	107	100	103	109	158.8
9-Dec	114	121	103	104	101	98	117	104	109	110	119	123	126	117	117	127	151	227	261	279	245	228	231	264	133.0
10-Dec	279	269	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
11-Dec	AF	AF	AF	AF	127	127	127	127	129	133	130	131	126	137	148	138	129	129	129	133	127	124	124	124	129.8
12-Dec	125	131	126	127	AF	AF	AF	AF	AF	133	132	134	136	135	131	130	130	133	134	131	130	131	127	127	131.0
13-Dec	125	126	126	125	123	116	120	121	123	124	123	121	121	113	119	118	79	88	71	81	93	86	138	158	118.0
14-Dec	178	168	203	316	322	301	270	261	263	268	261	271	273	257	231	200	209	179	185	170	167	170	167	152	215.1
15-Dec	162	164	155	149	158	155	157	166	176	209	237	253	251	246	242	241	245	253	253	256	270	281	321	9	213.4
16-Dec	11	2	344	330	290	289	280	269	269	270	265	247	259	258	250	199	224	258	276	275	278	277	275	274	273.1
17-Dec	270	269	270	267	268	281	287	295	341	345	347	346	310	289	313	330	332	10	43	29	22	20	22	40	312.8
18-Dec	45	37	34	54	55	28	43	64	55	58	152	141	121	91	86	76	90	90	99	108	107	86	77	116	83.2
19-Dec	109	110	112	111	120	123	121	121	119	143	130	135	145	147	148	129	128	129	131	129	130	130	127	128	128.0
20-Dec	129	130	133	135	133	131	130	132	130	131	125	125	136	127	126	123	126	130	126	126	135	136	130	131	130.1
21-Dec	136	140	139	141	144	149	152	153	167	169	174	166	138	132	131	129	129	126	85	229	36	348	35	321	144.3
22-Dec	14	12	353	341	356	1	359	356	348	345	355	343	329	329	343	335	354	341	341	343	344	347	351	342	348.6
23-Dec	344	337	342	345	358	356	354	345	6	3	8	358	333	348	352	359	8	9	12	12	9	344	356	3	356.5
24-Dec	358	0	359	351	355	2	2	2	355	332	334	320	298	292	276	298	51	154	119	125	132	141	153	157	359.3
25-Dec	160	175	187	169	183	194	165	176	172	184	209	253	269	276	194	150	131	120	342	341	333	0	14	16	240.8
26-Dec	25	18	17	23	35	98	40	35	93	130	133	145	132	125	98	84	112	100	105	117	115	114	116	118	88.6
27-Dec	125	123	124	123	125	119	122	127	129	130	132	133	136	134	139	139	137	142	150	156	148	139	198	229	134.7
28-Dec	244	231	261	293	310	290	293	327	351	349	343	333	313	296	312	297	285	248	132	185	172	178	170	168	274.9
29-Dec	158	159	183	192	151	166	202	180	186	184	176	180	189	198	169	167	173	185	188	186	183	187	202	209	181.2
30-Dec	218	230	251	255	266	271	273	267	246	216	222	223	214	228	254	261	227	229	222	229	225	210	195	195	238.6
31-Dec	164	184	191	200	177	173	189	195	222	253	246	240	235	240	238	235	253	256	250	245	244	231	225	234	222.1

153.2 161.1 171.4 162.7 164.3 163.3 166.8 161.6 164.7 163.4 169.2 168.3 182.8 182.6 174.9 168.4 172.4 173.0 178.0 181.8 181.1 177.7 168.3 169.6

Diurnal Average

AF - Analyzer Failure UO - Unstable Operation  
 All monthly, daily, and diurnal averages have been calculated using vector methods



Summary of Hour Standard Deviations

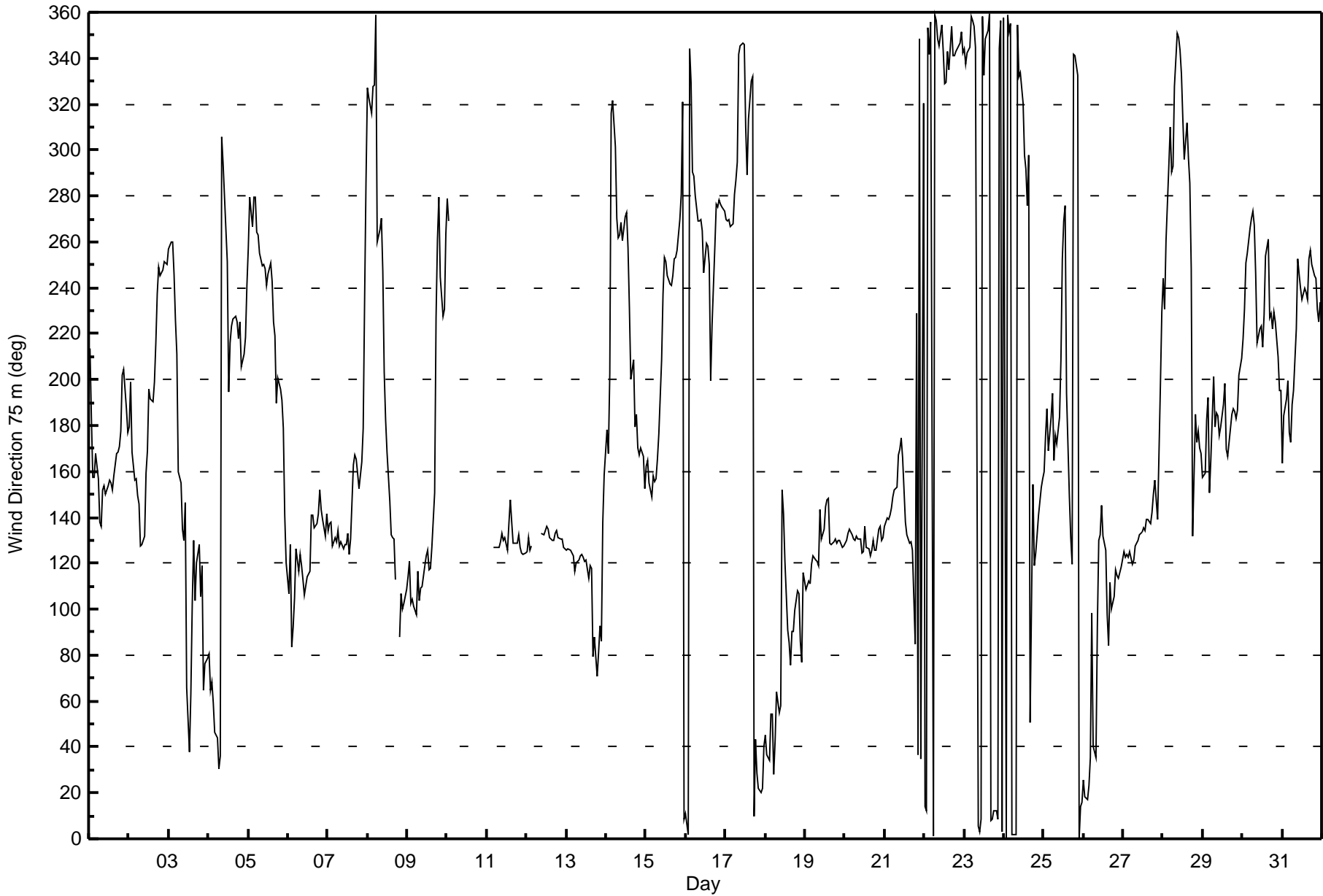
Mannix - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 95 deg on Dec 21 20:00			Hours of Data:	712
Minimum Value: 2 deg on Dec 29 02:00			Hours of Missing Data:	32
			Hours of Calibration:	0
			Percent Operational Time:	95.7
Percentiles: P <sub>1</sub> = 3 P <sub>10</sub> = 5 Q <sub>1</sub> = 6 Median = 9 Q <sub>3</sub> = 14 P <sub>90</sub> = 19 P <sub>99</sub> = 64				

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	8	16	10	7	13	15	5	9	9	5	7	9	35	12	4	3	5	4	7	10	17	8	15	5	35
2-Dec	7	12	17	3	3	4	5	7	7	7	8	9	14	10	5	5	8	7	8	6	7	6	6	6	17
3-Dec	6	6	5	22	10	20	9	3	15	17	22	26	13	15	20	8	22	20	7	18	16	10	19	15	26
4-Dec	16	8	10	8	13	10	8	16	54	48	14	14	25	18	17	4	5	10	5	11	11	8	6	9	54
5-Dec	14	14	6	8	7	8	7	6	6	9	8	11	10	8	9	8	11	11	8	6	6	13	8	19	19
6-Dec	16	15	14	12	27	15	17	12	13	15	15	14	14	13	22	17	5	6	9	3	3	4	5	9	27
7-Dec	7	6	8	8	5	6	7	7	6	7	6	7	9	10	9	11	4	6	5	4	3	13	14	18	18
8-Dec	8	9	8	23	17	51	14	14	5	13	8	14	14	17	12	10	12	16	UO	12	19	20	15	17	51
9-Dec	16	12	15	14	14	15	16	14	15	15	12	9	9	17	19	12	31	8	13	12	16	6	10	18	31
10-Dec	11	14	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	14
11-Dec	AF	AF	AF	AF	12	5	7	8	8	8	9	8	13	9	8	8	9	9	9	10	11	10	10	9	13
12-Dec	8	8	9	8	AF	AF	AF	AF	AF	5	7	7	8	7	8	8	6	8	7	7	8	6	8	7	9
13-Dec	9	8	9	9	10	13	12	11	9	9	10	12	13	16	14	19	26	17	18	12	17	35	56	47	56
14-Dec	55	14	30	22	14	16	10	5	8	5	9	6	6	13	16	12	12	15	13	5	6	4	4	6	55
15-Dec	5	5	4	4	3	4	4	6	6	16	8	7	5	5	5	4	6	4	5	8	4	8	11	5	16
16-Dec	7	20	25	65	18	6	7	5	3	5	7	6	8	7	10	12	9	12	6	4	4	4	4	3	65
17-Dec	6	6	5	5	6	6	6	13	19	20	20	19	19	10	12	8	3	27	9	10	12	11	11	14	27
18-Dec	10	8	55	22	93	53	12	8	10	40	20	12	22	26	15	11	14	13	16	16	16	16	13	15	93
19-Dec	15	16	15	16	13	10	11	11	14	13	24	14	10	11	6	9	7	6	7	6	7	7	8	6	24
20-Dec	5	6	5	5	5	5	5	4	4	7	8	9	11	8	7	8	7	6	8	10	5	6	5	6	11
21-Dec	5	5	6	6	5	5	4	4	7	2	8	14	8	7	10	7	6	13	17	95	21	44	18	23	95
22-Dec	9	10	16	30	9	6	8	9	8	9	17	14	9	8	14	8	15	8	8	7	6	7	8	9	30
23-Dec	9	9	9	13	10	9	10	9	7	6	6	14	9	9	8	9	10	6	6	6	11	10	8	8	14
24-Dec	8	8	8	10	9	5	7	7	9	11	12	11	16	12	26	38	80	70	17	21	12	5	3	4	80
25-Dec	4	7	12	8	12	25	9	6	8	16	8	16	11	23	48	21	38	64	10	10	9	12	5	6	64
26-Dec	5	7	8	6	17	55	80	14	45	14	9	11	8	21	17	9	17	16	16	16	15	15	14	13	80
27-Dec	10	10	9	10	8	11	10	8	7	7	7	6	7	8	9	9	10	6	7	6	8	13	15	9	15
28-Dec	5	17	10	8	11	10	7	16	8	13	16	14	15	9	11	13	11	36	36	27	21	7	6	2	36
29-Dec	4	2	23	13	11	13	8	16	11	8	6	12	8	10	8	4	4	4	5	6	6	6	8	7	23
30-Dec	5	13	4	4	3	3	6	5	10	17	9	28	20	31	7	14	15	9	7	5	6	7	9	14	31
31-Dec	5	11	9	9	8	8	8	11	25	11	7	6	4	5	8	5	7	6	3	5	4	4	3	5	25
	55	20	55	65	93	55	80	16	54	48	24	28	35	31	48	38	80	70	36	95	21	44	56	47	

Diurnal Maximum

AF - Analyzer Failure UO - Unstable Operation





Summary of Hour Standard Deviations

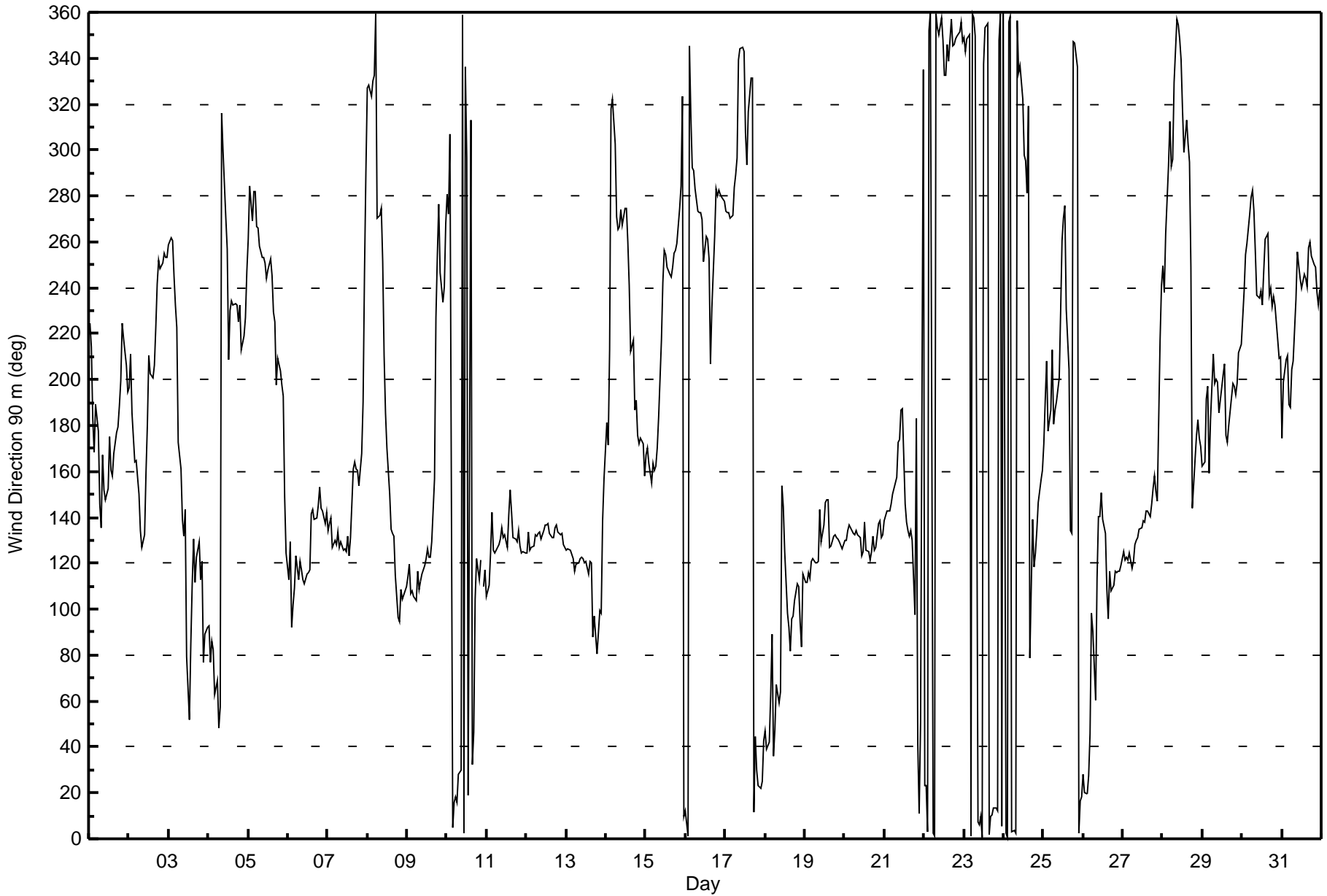
Mannix - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 85 deg on Dec 21 20:00			Hours of Data:	743
Minimum Value: 2 deg on Dec 20 01:00			Hours of Missing Data:	1
			Hours of Calibration:	0
			Percent Operational Time:	99.9
Percentiles: P <sub>1</sub> = 3 P <sub>10</sub> = 4 Q <sub>1</sub> = 6 Median = 8 Q <sub>3</sub> = 12 P <sub>90</sub> = 18 P <sub>99</sub> = 66				

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	8	11	21	13	15	23	9	13	26	4	8	10	39	15	7	4	4	7	11	11	15	7	13	7	39
2-Dec	10	7	19	4	4	5	4	7	4	3	8	11	12	12	4	4	7	7	7	6	7	6	5	5	19
3-Dec	5	6	5	22	9	15	11	3	16	14	18	23	14	14	11	7	14	13	5	11	9	12	18	12	23
4-Dec	12	9	10	13	18	12	10	15	69	45	12	12	22	13	13	3	5	10	4	11	11	7	6	8	69
5-Dec	15	16	6	7	6	8	7	6	6	9	8	10	10	8	9	7	11	13	9	7	6	15	10	13	16
6-Dec	5	11	11	4	14	11	8	6	7	8	7	7	7	7	24	16	4	6	8	3	3	4	4	10	24
7-Dec	6	5	8	6	5	4	6	4	5	4	4	5	9	6	8	9	5	5	4	3	4	18	12	16	18
8-Dec	8	8	8	20	15	47	12	13	5	12	9	13	14	16	12	8	11	12	8	7	15	14	8	14	47
9-Dec	14	10	10	8	8	8	12	11	12	11	7	5	7	19	18	10	31	6	13	11	13	6	10	15	31
10-Dec	9	12	24	13	7	6	9	4	8	12	8	26	29	13	49	23	25	30	14	16	15	AF	18	18	49
11-Dec	14	11	11	8	5	6	6	6	6	7	7	8	11	9	7	7	8	7	7	10	9	7	6	6	14
12-Dec	6	7	6	6	6	7	4	5	4	6	5	7	6	7	7	7	5	7	7	6	6	6	6	5	7
13-Dec	6	6	6	6	5	9	9	7	6	6	6	10	13	16	16	20	23	16	19	11	15	28	36	37	37
14-Dec	37	16	26	20	14	17	9	5	7	5	7	5	6	11	15	9	12	13	14	5	5	4	3	5	37
15-Dec	4	5	4	4	3	3	4	5	7	14	7	6	5	5	5	4	5	4	4	8	4	7	11	5	14
16-Dec	7	20	25	65	17	5	7	5	3	5	6	6	8	7	9	11	9	12	6	5	4	4	4	3	65
17-Dec	5	6	5	4	6	5	6	12	20	20	21	20	18	10	12	7	3	27	9	9	12	11	10	13	27
18-Dec	10	8	68	22	84	52	15	9	11	37	19	12	21	25	14	10	9	8	11	11	11	13	12	13	84
19-Dec	10	13	12	11	10	7	7	6	10	11	23	12	9	10	6	6	6	4	5	5	4	5	5	3	23
20-Dec	2	3	4	4	5	3	3	2	3	6	4	7	11	6	5	4	4	5	5	8	4	5	4	5	11
21-Dec	4	4	5	5	4	4	3	6	6	3	13	16	12	9	7	6	6	9	12	85	16	41	19	23	85
22-Dec	11	8	12	28	7	5	7	9	7	9	16	14	9	7	13	7	13	7	7	6	5	6	7	7	28
23-Dec	8	8	9	11	9	8	9	9	7	5	6	12	9	8	7	8	8	6	5	5	10	9	7	7	12
24-Dec	7	8	7	8	7	5	7	6	8	11	13	11	15	12	27	45	71	75	10	11	11	4	3	4	75
25-Dec	7	7	15	13	13	19	14	7	11	17	8	10	8	14	32	57	64	63	13	9	8	10	5	6	64
26-Dec	3	5	6	6	18	38	78	53	43	7	8	7	5	13	10	5	10	8	9	9	11	13	10	10	78
27-Dec	7	6	5	6	5	5	6	7	6	6	7	6	6	7	9	8	9	6	6	5	7	14	16	6	16
28-Dec	5	13	9	8	11	10	8	17	7	12	15	15	15	9	11	11	9	42	22	17	23	5	8	3	42
29-Dec	5	2	22	12	11	15	6	12	9	8	8	14	7	10	8	4	4	5	5	5	6	6	7	6	22
30-Dec	6	12	4	4	3	3	6	5	8	12	7	15	16	17	5	9	12	8	7	5	5	7	7	13	17
31-Dec	7	12	9	8	8	10	8	9	16	9	6	5	4	6	8	5	7	5	3	5	4	4	2	4	16
	37	20	68	65	84	52	78	53	69	45	23	26	39	25	49	57	71	75	22	85	23	41	36	37	

Diurnal Maximum

AF - Analyzer Failure





Summary of Hour Averages

Mannix - December 2015

Maximum Value: 0.9 km/h on Dec 19 03:00      Maximum Daily Average: 0.5 km/h on Dec 12																								Hours in Service: 744 Hours of Data: 741		
Minimum Value: -0.9 km/h on Dec 2 21:00      Minimum Daily Average: -0.2 km/h on Dec 5 Maximum Diurnal Average: 0.2 km/h at hour 2      Minimum Diurnal Average: 0.1 km/h at hour 11 Monthly Average: 0.16 km/h      Percentiles: P <sub>1</sub> = -0.6 P <sub>10</sub> = -0.2 Q <sub>1</sub> = -0.1 Median = 0.2 Q <sub>3</sub> = 0.4 P <sub>90</sub> = 0.5 P <sub>99</sub> = 0.7																								Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0.2	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.5	0.4	0.3	0.4	0.5	0.5	0.8	0.7	0.4	0.4	0.2	0.3	0.3	0.4	0.4	0.8
2-Dec	0.5	0.3	0.5	0.8	0.5	0.5	0.6	0.4	0.4	0.5	0.3	0.8	0.4	0.4	0.3	-0.1	-0.2	-0.5	-0.7	-0.7	-0.9	-0.6	-0.5	-0.5	0.1	0.8
3-Dec	-0.1	-0.2	-0.1	-0.2	-0.2	0.1	0.6	0.6	0.3	0.2	0.1	0.4	0.1	0.0	0.1	0.3	0.2	0.1	0.3	0.1	0.3	0.0	0.1	0.1	0.1	0.6
4-Dec	0.2	0.1	0.0	-0.1	-0.1	-0.1	-0.1	0.1	0.0	0.0	-0.2	0.0	0.1	0.2	0.1	-0.2	-0.3	-0.1	-0.3	-0.4	-0.1	-0.1	-0.2	-0.2	-0.1	0.2
5-Dec	-0.1	-0.1	0.0	-0.2	-0.5	-0.3	-0.2	-0.5	-0.5	-0.3	-0.6	-0.2	-0.4	-0.5	-0.1	-0.3	-0.2	0.0	-0.2	-0.1	0.0	0.3	0.4	0.3	-0.2	0.4
6-Dec	0.2	0.0	0.1	0.4	0.2	0.1	0.3	0.1	0.5	0.6	0.6	0.5	0.4	0.5	0.1	0.3	0.4	0.5	0.5	0.3	0.4	0.5	0.5	0.4	0.4	0.6
7-Dec	0.2	0.4	0.5	0.5	0.5	0.5	0.2	0.4	0.4	0.5	0.3	0.5	0.5	0.4	0.3	-0.1	0.1	0.2	0.3	0.5	0.1	-0.1	0.0	0.0	0.3	0.5
8-Dec	-0.1	0.1	-0.1	0.2	0.1	0.0	-0.1	-0.1	-0.2	-0.2	-0.1	0.0	0.2	0.3	0.4	0.3	0.4	0.6	0.6	0.4	0.5	0.5	0.5	0.4	0.2	0.6
9-Dec	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.6	0.5	0.7	0.2	0.0	0.4	0.5	0.5	0.4	0.2	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.3	0.7
10-Dec	0.0	0.0	0.1	0.0	-0.1	0.1	0.0	-0.1	-0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4	0.3	0.4	0.4	0.4	0.5	0.1	0.5
11-Dec	0.6	0.5	0.3	0.3	0.2	0.2	0.4	0.6	0.4	0.4	0.5	0.4	0.3	0.4	0.4	0.4	0.3	0.6	0.5	0.4	0.4	0.3	0.3	0.4	0.4	0.6
12-Dec	0.4	0.6	0.4	0.5	AF	AF	AF	-0.2	0.5	0.6	0.8	0.7	0.6	0.7	0.7	0.5	0.6	0.5	0.7	0.5	0.4	0.7	0.6	0.5	0.5	0.8
13-Dec	0.3	0.2	0.4	0.4	0.1	0.4	0.5	0.4	0.1	0.2	0.3	0.6	0.8	0.7	0.6	0.4	0.5	0.3	0.6	0.7	0.4	0.3	0.2	0.1	0.4	0.8
14-Dec	0.0	0.2	0.0	0.0	0.0	0.0	-0.1	-0.2	0.0	0.0	-0.1	-0.2	0.0	0.1	0.1	0.0	0.2	0.1	0.3	0.3	0.2	0.3	0.5	0.5	0.1	0.5
15-Dec	0.3	0.5	0.5	0.6	0.6	0.7	0.7	0.6	0.1	-0.1	-0.4	-0.2	-0.4	-0.5	-0.3	-0.4	-0.3	-0.3	-0.3	-0.1	-0.3	-0.4	-0.4	-0.2	0.0	0.7
16-Dec	-0.1	0.1	0.1	0.0	-0.1	-0.5	-0.4	-0.3	-0.2	-0.2	-0.4	-0.2	-0.3	-0.2	-0.2	0.0	-0.2	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1	0.0	-0.2	0.1
17-Dec	-0.1	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	0.1	0.0	0.1	0.2	0.1	-0.1	-0.1	-0.1	-0.1	0.1	0.5	0.8	0.3	0.1	0.3	0.5	0.1	0.8
18-Dec	0.4	0.4	0.1	0.2	0.1	0.3	0.4	0.3	0.4	0.2	0.1	0.2	0.2	0.4	0.5	0.7	0.2	0.5	0.4	0.6	0.6	0.6	0.7	0.6	0.4	0.7
19-Dec	0.6	0.5	0.9	0.5	0.6	0.1	0.2	0.2	0.4	0.1	0.3	0.0	0.2	-0.1	0.3	0.4	0.3	0.3	0.6	0.3	0.5	0.7	0.5	0.4	0.4	0.9
20-Dec	0.4	0.6	0.6	0.5	0.4	0.4	0.4	0.4	0.5	0.4	0.1	0.3	0.3	0.4	0.3	0.3	0.4	0.6	0.2	0.3	0.5	0.6	0.6	0.6	0.4	0.6
21-Dec	0.4	0.6	0.4	0.5	0.6	0.5	0.5	0.5	0.1	0.3	0.2	0.2	0.1	0.3	0.3	0.2	0.2	0.2	0.4	0.0	0.1	0.0	0.1	0.1	0.3	0.6
22-Dec	-0.1	0.0	0.1	0.0	-0.2	-0.2	-0.2	-0.1	-0.2	-0.1	-0.1	-0.1	0.0	-0.1	-0.2	-0.4	-0.1	-0.2	-0.1	-0.2	-0.1	-0.1	-0.1	0.0	-0.1	0.1
23-Dec	-0.1	-0.1	-0.2	-0.1	-0.1	-0.1	-0.1	-0.2	0.0	0.0	-0.1	0.1	-0.1	-0.2	-0.2	0.0	0.1	0.2	0.0	0.1	-0.1	-0.1	0.0	-0.1	-0.1	0.2
24-Dec	0.1	0.1	-0.1	0.1	-0.1	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.3	0.1	0.3	0.4	0.4	0.1	0.4
25-Dec	0.3	0.3	0.1	0.2	0.3	0.1	0.3	0.2	0.3	0.3	0.2	0.1	-0.1	0.0	0.2	0.1	0.2	0.1	0.0	-0.5	-0.1	-0.1	0.0	0.0	0.1	0.3
26-Dec	0.2	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.0	0.2	0.2	0.2	0.5	0.1	0.2	0.6	0.2	0.4	0.4	0.3	0.6	0.8	0.5	0.6	0.2	0.8
27-Dec	0.3	0.3	0.0	0.5	0.4	0.2	0.4	0.4	0.7	0.8	0.9	0.7	0.6	0.5	0.5	0.4	0.4	0.4	0.4	0.2	0.4	0.3	0.1	0.0	0.4	0.9
28-Dec	-0.3	-0.1	0.0	0.0	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.3	0.4	0.0	0.4
29-Dec	0.4	0.5	0.1	-0.1	0.4	0.3	0.1	0.3	0.3	0.1	0.1	0.1	0.0	0.0	0.3	0.6	0.7	0.1	0.5	0.6	0.6	0.6	0.2	-0.1	0.3	0.7
30-Dec	-0.2	-0.4	-0.6	-0.2	-0.4	-0.1	-0.4	0.0	-0.1	0.1	0.0	0.2	0.1	0.3	-0.1	0.1	0.0	-0.1	-0.1	-0.2	0.0	0.2	0.4	0.3	0.0	0.4
31-Dec	0.8	0.4	0.5	0.1	0.4	0.6	0.4	0.3	0.1	-0.1	-0.4	-0.4	-0.4	-0.5	-0.6	-0.5	-0.6	-0.5	-0.8	-0.6	-0.4	-0.5	-0.3	-0.6	-0.1	0.8
																								Diurnal Average		
																								Diurnal Maximum		
AF - Analyzer Failure																										



Summary of Hour Standard Deviations

Mannix - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.0 km/h on Dec 27 10:00 Minimum Value: 0.1 km/h on Dec 14 01:00 Percentiles: P <sub>1</sub> = 0.3 P <sub>10</sub> = 0.5 Q <sub>1</sub> = 0.7 Median = 1.0 Q <sub>3</sub> = 1.4 P <sub>90</sub> = 2.0 P <sub>99</sub> = 2.7																								Hours in Service: 744 Hours of Data: 741 Hours of Missing Data: 3 Hours of Calibration: 0 Percent Operational Time: 99.6	
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.7	0.6	1.0	1.2	1.3	1.1	1.2	1.4	1.3	1.4	1.2	1.2	1.1	0.7	1.0	0.7	1.3	1.4
2-Dec	0.9	0.8	1.0	1.3	1.4	1.2	1.2	1.3	1.4	1.3	1.0	1.6	1.0	1.0	0.9	1.2	1.2	2.0	2.3	2.2	2.5	2.1	1.9	1.8	2.5
3-Dec	0.8	1.1	0.8	0.4	0.5	0.5	0.7	1.1	1.0	0.6	0.5	1.0	1.0	0.8	0.7	1.2	0.6	0.9	1.1	0.6	0.7	0.5	0.4	0.3	1.2
4-Dec	0.2	0.3	0.3	0.3	0.3	0.3	0.6	0.7	0.6	0.6	0.8	0.8	0.7	0.6	0.7	0.8	0.6	0.7	1.4	0.9	0.7	0.6	0.7	1.4	
5-Dec	0.6	0.4	0.7	1.5	2.3	1.6	1.9	2.0	2.5	2.3	2.0	1.9	2.0	1.8	1.2	0.6	0.4	0.4	0.6	0.8	0.8	0.5	0.4	0.6	2.5
6-Dec	0.4	0.3	0.4	1.0	0.5	0.5	0.6	0.5	1.6	1.8	1.8	1.9	1.7	2.0	1.0	0.7	0.7	0.8	0.7	0.5	0.7	1.0	1.1	1.1	2.0
7-Dec	0.7	0.7	1.0	1.2	1.4	1.2	1.0	2.0	1.5	1.3	1.9	1.9	1.6	2.0	1.4	0.5	0.6	0.5	1.1	1.0	1.0	1.0	0.5	0.7	2.0
8-Dec	1.4	1.4	1.1	0.8	1.0	0.4	0.5	0.3	0.3	0.5	0.8	1.2	1.1	1.1	1.2	1.3	1.2	1.7	1.6	1.6	1.3	1.3	1.9	1.4	1.9
9-Dec	1.5	1.7	1.5	1.8	1.5	1.3	1.6	1.7	1.6	1.7	1.9	2.1	1.5	1.0	0.9	0.9	0.7	0.4	0.4	0.5	0.5	0.6	0.4	0.3	2.1
10-Dec	0.4	0.4	0.6	0.6	0.8	0.9	0.8	0.8	0.7	0.6	0.7	0.5	0.6	0.8	0.6	0.3	0.3	0.4	0.8	0.9	0.9	0.9	1.0	0.9	1.0
11-Dec	0.9	1.3	1.3	0.8	1.4	1.3	1.6	1.3	1.6	1.8	1.9	1.9	1.5	1.1	1.1	1.1	1.2	1.4	1.7	1.7	2.1	2.0	2.0	1.9	2.1
12-Dec	2.1	1.8	1.9	2.2	AF	AF	AF	2.2	2.2	2.6	2.5	2.2	2.1	2.4	2.3	2.6	2.7	2.2	2.1	2.2	2.0	2.3	2.1	2.1	2.7
13-Dec	1.6	1.7	2.1	2.2	2.4	2.5	2.4	2.3	1.6	1.6	2.2	2.0	1.9	1.6	1.4	0.9	0.9	0.9	0.7	0.8	0.8	0.7	0.5	0.3	2.5
14-Dec	0.1	0.4	0.4	0.9	0.9	0.9	0.9	0.9	0.7	0.8	0.9	0.6	0.8	0.6	0.6	0.5	0.5	0.6	1.0	1.2	1.4	1.3	1.5	1.5	1.5
15-Dec	1.4	1.2	1.1	1.1	1.5	1.9	1.5	1.3	1.2	1.0	0.9	1.4	1.6	1.3	0.9	0.8	0.6	0.6	0.7	0.3	0.8	1.9	2.2	2.4	2.4
16-Dec	1.8	1.1	0.6	0.3	1.4	2.0	1.6	1.1	0.7	0.6	1.0	0.9	0.9	1.0	1.0	0.6	0.9	0.7	0.7	0.6	0.6	0.7	0.6	0.3	2.0
17-Dec	0.5	0.9	1.0	1.0	1.0	1.2	1.1	1.3	0.8	0.6	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.2	1.1	1.1	1.2	1.1	1.1	1.3
18-Dec	1.0	1.0	0.6	0.6	0.4	0.7	0.7	0.8	1.0	0.9	0.6	0.8	1.1	1.0	1.1	1.2	1.3	1.0	1.4	1.5	1.7	1.5	1.4	1.5	1.7
19-Dec	1.9	1.7	1.7	1.8	2.0	1.8	2.2	2.2	1.4	0.6	0.6	1.0	1.1	0.8	0.8	0.9	1.7	1.7	1.8	1.4	2.1	2.0	1.9	1.2	2.2
20-Dec	1.3	2.1	1.8	1.6	1.4	1.3	1.1	1.4	1.1	0.9	1.6	1.6	0.9	1.0	1.3	2.3	2.5	2.1	2.0	2.2	1.3	1.9	2.1	1.9	2.5
21-Dec	1.5	1.5	1.6	1.3	1.2	1.0	0.8	0.8	1.0	0.7	0.9	0.7	0.8	0.7	0.5	0.4	0.3	0.4	0.4	0.5	0.6	0.3	0.6	0.6	1.6
22-Dec	1.1	0.8	0.5	0.6	1.5	1.9	1.7	1.6	1.4	1.5	1.5	1.3	1.1	1.1	1.5	2.0	1.5	1.4	1.4	1.5	1.4	1.4	1.4	1.4	2.0
23-Dec	1.2	1.2	1.3	1.5	1.6	1.4	1.4	1.1	1.2	1.5	1.4	1.1	1.1	1.2	1.3	1.2	1.4	1.5	1.5	1.5	0.9	1.0	1.1	1.2	1.6
24-Dec	1.4	1.6	1.2	1.1	1.3	1.4	1.3	1.2	0.9	0.8	0.9	0.9	0.8	0.7	0.5	0.2	0.4	0.4	0.4	0.4	0.3	0.5	1.0	1.0	1.6
25-Dec	0.9	0.8	0.7	0.8	0.7	0.6	0.7	0.9	0.7	0.8	0.6	0.5	0.6	0.4	0.3	0.3	0.3	0.3	1.3	1.7	1.6	1.4	1.2	1.0	1.7
26-Dec	1.3	1.1	0.8	0.4	0.2	0.3	0.3	0.2	0.2	0.2	0.4	0.6	0.9	0.7	0.6	0.9	0.4	0.9	1.2	1.5	2.1	1.7	2.1	2.1	2.1
27-Dec	2.4	2.8	2.3	2.5	2.7	2.8	2.7	2.6	2.9	3.0	2.8	2.9	2.4	1.9	1.5	1.4	0.8	1.0	1.1	1.0	0.9	0.7	0.6	0.5	3.0
28-Dec	0.6	0.5	0.3	0.9	0.9	0.7	0.9	1.0	1.1	1.2	0.8	0.8	0.8	0.8	0.7	0.6	0.5	0.5	0.5	0.5	0.5	0.7	0.5	0.3	1.2
29-Dec	0.3	0.5	0.8	0.7	0.8	0.7	0.8	0.8	0.8	1.0	1.4	1.4	1.2	1.1	0.7	1.0	0.9	1.0	0.7	1.0	0.9	0.9	0.8	0.7	1.4
30-Dec	0.5	0.9	1.2	1.1	0.9	0.5	0.7	0.6	0.4	0.5	0.7	0.7	1.0	0.6	0.6	0.8	0.4	0.4	0.5	0.6	0.5	0.5	0.8	0.8	1.2
31-Dec	1.3	1.2	0.9	1.3	1.4	1.3	0.8	0.8	0.7	1.2	1.5	1.1	1.1	0.8	1.2	1.3	0.9	1.1	1.2	0.8	0.8	0.8	1.1	0.7	1.5
2.4 2.8 2.3 2.5 2.7 2.8 2.7 2.6 2.9 3.0 2.8 2.9 2.4 2.4 2.3 2.6 2.7 2.2 2.3 2.2 2.5 2.3 2.2 2.4																									
Diurnal Maximum																									
AF - Analyzer Failure																									



Summary of Hour Averages

Mannix - December 2015

Maximum Value: 1.8 km/h on Dec 2 04:00		Maximum Daily Average: 1.0 km/h on Dec 12		Hours in Service: 744																							
Minimum Value: -1.2 km/h on Dec 15 23:00		Minimum Daily Average: -0.5 km/h on Dec 22		Hours of Data: 739																							
Maximum Diurnal Average: 0.3 km/h at hour 2		Minimum Diurnal Average: 0.2 km/h at hour 11		Hours of Missing Data: 5																							
Monthly Average: 0.29 km/h		Percentiles: P <sub>1</sub> = -0.8 P <sub>10</sub> = -0.4 Q <sub>1</sub> = -0.2 Median = 0.3 Q <sub>3</sub> = 0.7 P <sub>90</sub> = 1.0 P <sub>99</sub> = 1.5		Hours of Calibration: 0																							
				Percent Operational Time: 99.3																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0.2	0.8	0.9	1.0	1.0	0.9	0.8	0.9	0.9	0.9	1.2	1.0	0.6	0.8	1.2	1.3	1.7	1.8	1.3	1.0	0.3	0.3	0.8	1.2	0.9	1.8	
2-Dec	1.2	0.5	1.2	1.8	1.4	1.2	1.7	1.2	1.2	1.6	0.8	1.8	0.5	AF	0.6	0.3	-0.1	-0.3	-0.5	-0.5	-0.6	-0.6	-0.4	-0.5	0.6	1.8	
3-Dec	-0.2	-0.2	-0.3	-0.3	0.0	0.2	1.1	1.1	0.5	0.4	0.3	0.3	-0.2	-0.1	0.3	0.8	0.2	0.4	0.6	0.3	0.4	0.0	0.1	0.2	0.2	1.1	
4-Dec	0.1	0.0	0.1	0.0	-0.1	-0.2	-0.4	-0.4	-0.2	-0.1	-0.1	-0.1	0.4	0.2	0.1	-0.2	-0.2	-0.1	-0.2	-0.2	-0.3	0.2	0.1	-0.1	-0.2	-0.1	0.4
5-Dec	-0.2	-0.1	-0.2	-0.5	-0.8	-0.4	-0.5	-0.6	-0.6	-0.6	-0.1	-0.6	-0.1	-0.3	-0.4	0.0	-0.2	-0.1	0.2	0.1	0.2	0.4	0.5	0.7	0.5	-0.1	0.7
6-Dec	0.2	0.3	0.1	0.3	0.3	0.2	0.4	0.4	0.7	0.8	0.6	0.4	0.6	0.9	0.4	0.7	0.9	0.8	1.0	0.7	0.9	1.0	1.0	0.8	0.6	1.0	
7-Dec	0.7	0.8	0.9	1.0	1.2	1.2	0.9	0.9	0.9	0.9	1.0	1.0	1.0	0.6	0.7	0.3	0.4	0.3	1.0	1.0	0.6	0.2	0.1	-0.2	0.7	1.2	
8-Dec	-0.6	-0.1	-0.3	0.1	-0.3	0.1	0.0	-0.1	-0.2	-0.2	0.1	0.3	0.5	0.6	0.7	0.5	0.4	0.7	0.2	-0.1	0.5	0.5	0.5	0.8	0.2	0.8	
9-Dec	0.9	0.8	0.6	0.6	0.5	0.4	0.6	0.9	0.9	1.0	0.4	0.2	0.5	0.9	0.8	0.5	0.2	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	0.4	1.0	
10-Dec	-0.1	-0.1	-0.1	-0.2	-0.4	-0.2	-0.3	-0.4	-0.3	-0.1	-0.3	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.8	0.8	0.9	0.9	0.7	0.9	0.1	0.9	
11-Dec	0.9	0.9	0.7	0.7	0.4	0.2	0.5	0.6	0.9	0.8	0.8	0.9	0.6	0.7	0.8	0.7	0.4	0.8	0.7	0.6	0.7	0.4	0.3	0.4	0.6	0.9	
12-Dec	0.4	0.9	0.7	0.6	AF	AF	AF	AF	0.7	1.2	1.4	1.3	1.3	1.5	1.3	1.2	1.5	1.0	1.2	0.9	1.0	1.0	0.7	0.7	1.0	1.5	
13-Dec	0.4	0.5	0.5	0.6	0.4	0.9	0.9	0.6	0.3	0.4	0.3	1.1	1.2	1.3	1.3	1.2	0.5	0.6	0.9	0.9	0.5	0.6	0.2	0.2	0.7	1.3	
14-Dec	0.0	0.4	0.1	-0.3	-0.2	-0.2	-0.3	-0.2	-0.3	0.1	0.1	-0.2	-0.3	-0.1	0.1	0.2	0.1	0.3	0.3	0.7	0.9	0.8	0.8	1.2	0.2	1.2	
15-Dec	1.1	1.0	1.1	1.2	1.6	1.5	1.6	1.2	0.7	0.2	-0.3	-0.2	-0.4	-0.4	-0.1	-0.2	-0.3	-0.4	-0.3	-0.3	-0.5	-0.7	-1.2	-1.1	0.2	1.6	
16-Dec	-0.5	-0.2	0.0	0.0	-0.3	-0.9	-0.5	-0.4	-0.4	-0.5	-0.6	-0.3	-0.2	-0.1	-0.2	0.2	-0.2	-0.3	-0.4	-0.3	-0.4	-0.3	-0.3	-0.2	-0.3	0.2	
17-Dec	-0.2	-0.4	-0.4	-0.3	-0.3	-0.3	-0.2	-0.4	-0.2	-0.2	-0.1	-0.1	-0.2	-0.2	-0.2	-0.4	-0.4	-0.2	0.0	0.6	-0.1	-0.2	0.0	0.4	-0.2	0.6	
18-Dec	0.3	0.0	0.0	0.2	0.3	0.3	0.4	-0.1	0.1	0.2	0.3	0.3	0.3	0.6	0.6	0.6	-0.2	0.4	0.7	0.9	0.6	0.5	0.4	1.0	0.4	1.0	
19-Dec	1.1	1.0	1.5	0.6	0.9	0.0	0.3	0.3	0.8	0.2	0.4	0.1	0.6	0.2	0.4	0.7	0.8	0.7	0.8	0.7	1.0	1.1	0.8	0.8	0.7	1.5	
20-Dec	0.8	1.1	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.8	0.5	0.5	0.6	0.7	0.6	0.4	0.6	1.0	0.6	0.6	1.0	1.1	1.1	1.0	0.8	1.1	
21-Dec	0.9	1.1	1.0	1.1	1.2	1.1	1.2	1.0	1.0	1.1	0.6	0.4	0.4	0.5	0.4	0.5	0.5	0.3	0.3	-0.1	-0.1	0.0	0.0	-0.1	0.6	1.2	
22-Dec	-0.6	-0.3	-0.1	-0.2	-0.7	-0.4	-0.3	-0.2	-0.6	-0.7	-0.4	-0.5	-0.1	-0.4	-0.5	-1.0	-0.5	-0.6	-0.6	-0.7	-0.6	-0.8	-0.5	-0.7	-0.5	-0.1	
23-Dec	-0.5	-0.6	-0.7	-0.6	-0.6	-0.5	-0.6	-0.7	-0.5	-0.5	-0.6	-0.2	-0.4	-0.6	-0.5	-0.2	-0.1	-0.5	-0.7	-0.7	-0.4	-0.5	-0.4	-0.5	-0.5	-0.1	
24-Dec	-0.3	-0.5	-0.4	-0.1	-0.4	-0.7	-0.6	-0.6	-0.2	-0.2	-0.2	-0.2	-0.1	0.0	0.0	0.1	0.1	0.4	0.4	0.4	0.6	0.8	0.9	0.9	0.0	0.9	
25-Dec	0.6	0.6	0.3	0.3	0.2	0.2	0.5	0.4	0.5	0.4	0.1	0.0	-0.1	0.0	0.3	0.3	0.2	0.1	-0.4	-1.0	-0.3	-0.6	-0.4	-0.4	0.1	0.6	
26-Dec	-0.3	-0.4	-0.4	-0.1	-0.1	0.0	0.0	0.0	0.1	0.3	0.3	0.3	0.7	0.2	0.1	0.6	0.2	0.3	0.5	0.4	0.9	1.6	0.7	0.9	0.3	1.6	
27-Dec	0.6	0.6	0.3	0.6	0.6	0.3	0.5	1.0	1.0	1.5	1.5	1.6	1.3	1.2	1.0	0.7	0.5	0.6	0.8	0.5	0.6	0.4	0.2	0.0	0.8	1.6	
28-Dec	-0.3	0.0	-0.2	0.1	-0.3	-0.2	-0.3	-0.4	-0.4	-0.3	-0.2	-0.1	-0.1	0.0	-0.3	0.0	-0.1	0.0	0.2	0.0	0.1	0.4	0.5	0.9	0.0	0.9	
29-Dec	1.2	1.4	0.5	0.3	0.8	0.7	0.7	0.8	0.7	0.4	0.7	0.6	0.4	0.2	0.5	1.2	1.1	0.6	0.7	0.9	1.1	1.0	0.5	0.1	0.7	1.4	
30-Dec	-0.1	-0.2	-0.6	-0.2	-0.5	-0.3	-0.4	-0.1	-0.1	0.3	0.0	0.2	0.3	0.3	-0.2	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.2	0.7	0.7	0.0	0.7	
31-Dec	1.8	1.0	1.0	0.5	1.3	1.3	0.9	0.6	0.2	-0.2	-0.5	-0.5	-0.3	-0.3	-0.4	-0.3	-0.5	-0.5	-0.8	-0.6	-0.4	-0.3	-0.1	-0.4	0.1	1.8	
		0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	Diurnal Average	
		1.8	1.4	1.5	1.8	1.6	1.5	1.7	1.2	1.2	1.6	1.5	1.8	1.3	1.5	1.3	1.3	1.7	1.8	1.3	1.0	1.1	1.6	1.1	1.2	Diurnal Maximum	
AF - Analyzer Failure																											





Summary of Hour Standard Deviations

Mannix - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.3 km/h on Dec 27 11:00 Minimum Value: 0.2 km/h on Dec 14 01:00 Percentiles: P <sub>1</sub> = 0.2 P <sub>10</sub> = 0.5 Q <sub>1</sub> = 0.6 Median = 1.0 Q <sub>3</sub> = 1.5 P <sub>90</sub> = 2.0 P <sub>99</sub> = 2.7																						Hours in Service: 744 Hours of Data: 739 Hours of Missing Data: 5 Hours of Calibration: 0 Percent Operational Time: 99.3			
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	0.5	0.5	0.7	0.7	0.5	0.6	0.6	0.6	0.6	0.7	1.2	1.3	1.0	1.2	1.3	1.4	1.1	1.2	1.1	1.0	0.7	0.6	0.9	0.9	1.4
2-Dec	0.5	0.5	1.1	1.2	1.3	1.1	1.0	1.2	1.5	1.2	1.0	1.3	0.7	AF	0.7	0.9	1.1	2.1	2.5	2.2	2.4	2.1	1.9	1.7	2.5
3-Dec	1.0	1.3	1.1	0.4	0.5	0.6	0.6	1.1	1.0	0.7	0.6	1.0	0.8	0.6	0.9	1.3	0.9	1.1	1.2	0.7	1.0	0.5	0.5	0.5	1.3
4-Dec	0.4	0.2	0.2	0.3	0.3	0.2	0.5	0.5	0.5	0.5	0.7	0.8	0.8	0.7	0.5	0.4	0.6	0.7	0.5	1.0	0.5	0.4	0.4	0.8	1.0
5-Dec	0.6	0.3	0.8	1.5	2.4	1.9	2.2	2.0	2.3	2.7	2.2	2.1	2.2	1.9	1.2	0.6	0.5	0.6	0.4	0.5	0.5	0.5	0.5	0.8	2.7
6-Dec	0.6	0.5	0.6	1.1	0.7	0.8	1.1	0.8	1.6	1.9	1.9	2.0	1.7	2.1	1.0	0.9	0.8	1.0	0.6	0.6	0.5	0.8	1.1	1.0	2.1
7-Dec	0.6	0.7	1.1	1.2	1.4	1.3	1.2	2.0	1.5	1.4	1.8	1.9	1.8	2.0	1.4	0.3	0.6	0.6	1.1	1.0	0.9	0.8	0.5	0.8	2.0
8-Dec	1.6	1.7	1.2	0.9	1.1	0.6	0.2	0.3	0.3	0.2	0.7	1.2	1.3	1.4	1.5	1.5	1.3	1.6	1.7	1.5	1.3	1.4	1.8	1.7	1.8
9-Dec	1.7	1.8	1.7	1.6	1.5	1.3	1.7	1.8	1.7	1.7	1.9	1.8	1.7	1.2	1.1	1.0	0.8	0.2	0.2	0.3	0.4	0.5	0.5	0.5	1.9
10-Dec	0.5	0.4	0.7	0.6	0.7	0.9	0.8	0.9	0.6	0.6	0.8	0.6	0.5	0.9	0.5	0.3	0.3	0.6	1.2	1.1	1.1	1.1	1.2	1.1	1.2
11-Dec	1.2	1.6	1.4	1.0	1.3	1.2	1.6	1.4	1.7	2.2	2.1	1.9	1.7	1.4	1.2	1.3	1.2	1.6	1.9	2.1	2.2	2.0	1.9	1.9	2.2
12-Dec	1.9	1.9	1.9	2.2	AF	AF	AF	AF	2.5	2.7	2.7	2.6	2.5	2.6	2.6	2.7	2.6	2.6	2.5	2.3	2.2	2.4	1.9	1.8	2.7
13-Dec	1.4	1.4	1.9	2.2	2.0	2.5	2.3	2.2	1.5	1.7	2.0	2.0	2.1	1.8	1.6	1.1	1.0	1.1	0.8	1.0	0.8	0.9	0.6	0.4	2.5
14-Dec	0.2	0.3	0.2	1.1	1.1	1.0	0.8	0.7	0.7	0.5	0.8	0.6	0.8	0.5	0.6	0.4	0.5	0.5	0.5	1.0	1.1	1.2	1.1	1.5	1.5
15-Dec	1.3	1.0	1.1	1.2	1.1	1.7	1.2	1.3	1.0	0.7	0.7	1.5	1.4	1.1	0.9	0.6	0.4	0.7	0.6	0.5	0.9	1.6	2.3	2.1	2.3
16-Dec	2.0	1.3	0.9	0.3	1.5	1.8	1.6	1.1	0.7	0.5	1.0	1.0	1.1	1.0	1.0	0.4	0.6	0.6	0.6	0.3	0.4	0.6	0.6	0.3	2.0
17-Dec	0.5	1.0	1.0	1.1	1.1	1.1	1.1	1.3	0.8	0.8	0.8	0.8	0.8	0.9	1.1	0.8	0.7	1.1	1.2	1.4	1.4	1.4	1.4	1.3	1.4
18-Dec	1.2	1.2	0.8	0.8	0.5	0.9	0.9	0.7	1.1	0.9	0.7	1.0	1.3	1.2	1.3	1.5	1.4	1.1	1.4	1.8	1.8	1.5	1.4	1.8	1.8
19-Dec	2.0	1.8	1.9	1.6	2.0	1.8	2.2	2.0	1.5	0.7	0.9	1.1	1.4	0.9	0.8	1.1	1.6	1.6	1.8	1.2	2.2	2.2	1.9	1.3	2.2
20-Dec	1.7	2.2	2.0	1.8	1.5	1.3	1.3	1.4	1.1	1.3	1.5	1.6	1.1	1.4	1.4	2.0	2.1	2.2	1.8	1.8	1.5	2.1	2.0	2.0	2.2
21-Dec	1.6	1.6	1.8	1.4	1.3	1.1	0.7	0.7	0.6	0.5	0.6	0.6	0.7	0.8	0.7	0.5	0.5	0.6	0.5	0.4	0.6	0.3	0.5	0.5	1.8
22-Dec	0.8	0.6	0.6	0.6	1.3	1.6	1.8	1.8	1.5	1.6	1.5	1.3	1.4	1.4	1.7	2.2	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.6	2.2
23-Dec	1.4	1.3	1.4	1.8	1.7	1.6	1.6	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.5	1.3	1.4	1.5	1.5	1.6	1.0	1.1	1.1	1.0	1.8
24-Dec	1.4	1.5	1.2	1.0	1.2	1.2	1.4	1.1	0.9	0.8	1.0	1.2	1.1	1.0	0.9	0.6	0.3	0.4	0.5	0.6	0.4	0.4	0.9	1.0	1.5
25-Dec	0.9	0.6	0.5	0.6	0.5	0.5	0.5	0.7	0.6	0.7	0.5	0.4	0.5	0.4	0.4	0.4	0.3	0.3	1.3	1.7	2.0	1.3	1.3	1.1	2.0
26-Dec	1.3	1.3	1.0	0.6	0.3	0.2	0.2	0.2	0.2	0.4	0.6	0.6	1.0	0.8	0.7	1.1	0.6	1.1	1.2	1.4	2.1	2.0	2.2	2.3	2.3
27-Dec	2.4	2.6	2.1	2.3	2.4	2.6	2.6	2.6	2.8	3.2	3.3	3.1	2.7	2.4	1.8	1.8	1.0	1.1	1.2	0.8	0.9	1.0	0.4	0.4	3.3
28-Dec	0.4	0.5	0.2	1.2	1.1	0.6	0.8	1.1	1.1	1.3	1.0	1.0	1.0	0.9	0.8	0.6	0.4	0.5	0.5	0.4	0.4	0.5	0.4	0.2	1.3
29-Dec	0.2	0.2	0.9	0.9	0.8	0.7	0.7	0.5	0.7	1.1	1.3	1.4	1.0	1.0	0.8	0.6	0.8	0.9	0.7	0.9	0.9	0.8	0.8	1.0	1.4
30-Dec	0.6	0.5	1.0	0.8	0.4	0.4	0.2	0.3	0.5	0.5	0.6	0.7	0.9	0.6	0.7	1.1	0.8	0.5	0.4	0.6	0.9	0.6	0.8	0.7	1.1
31-Dec	1.1	1.3	0.7	1.0	1.2	1.0	0.7	1.0	0.9	1.6	1.6	1.0	0.8	0.7	0.7	0.9	1.0	0.9	1.0	0.6	0.5	0.4	0.6	0.8	1.6
2.4 2.6 2.1 2.3 2.4 2.6 2.6 2.6 2.8 3.2 3.3 3.1 2.7 2.6 2.6 2.7 2.6 2.6 2.5 2.3 2.4 2.4 2.3 2.3																									
Diurnal Maximum																									
AF - Analyzer Failure																									



Summary of Hour Averages

Mannix - December 2015

Maximum Value: 1.5 km/h on Dec 29 09:00      Maximum Daily Average: 0.5 km/h on Dec 29																								Hours in Service: 744 Hours of Data: 712			
Minimum Value: -1.1 km/h on Dec 12 10:00      Minimum Daily Average: -0.3 km/h on Dec 12 Maximum Diurnal Average: 0.2 km/h at hour 4      Minimum Diurnal Average: 0.0 km/h at hour 17 Monthly Average: 0.11 km/h      Percentiles: $P_1 = -0.7$ $P_{10} = -0.3$ $Q_1 = -0.1$ Median = 0.1 $Q_3 = 0.3$ $P_{90} = 0.6$ $P_{99} = 1.2$																								Hours of Missing Data: 32 Hours of Calibration: 0 Percent Operational Time: 95.7			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	-0.1	0.2	0.4	0.5	0.3	0.4	0.2	0.3	0.5	0.9	1.2	0.8	0.2	0.6	1.0	1.0	0.8	0.6	0.5	0.1	-0.2	-0.2	0.2	0.4	0.4	1.2	
2-Dec	0.2	0.0	0.6	1.5	1.1	0.9	0.8	-0.3	0.0	0.3	0.8	1.0	-0.1	0.1	0.1	-0.1	-0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.2	0.3	1.5	
3-Dec	0.2	0.3	0.0	0.0	0.0	0.0	0.6	0.9	0.2	0.1	0.1	0.4	0.1	0.1	0.2	0.1	0.3	0.0	0.0	0.3	0.2	0.1	0.2	0.2	0.2	0.9	
4-Dec	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	0.1	0.0	0.2	
5-Dec	0.2	0.2	0.4	0.3	0.4	0.3	0.3	-0.1	-0.2	0.7	-0.1	0.3	0.1	0.0	0.2	-0.1	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.1	0.7	
6-Dec	0.0	0.1	-0.1	0.2	0.4	-0.1	-0.1	0.0	0.0	0.2	0.5	-0.2	0.1	0.0	0.0	0.2	0.1	0.2	0.5	0.7	0.4	0.1	-0.1	0.4	0.1	0.7	
7-Dec	-0.1	0.0	0.0	-0.2	-0.1	-0.1	0.1	-0.5	-0.2	-0.3	-0.2	-0.2	0.1	-0.3	-0.2	0.4	0.3	0.4	1.1	1.0	0.5	-0.1	0.0	0.3	0.1	1.1	
8-Dec	-0.2	0.5	0.4	0.5	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.4	0.3	-0.1	-0.1	0.8	UO	-0.6	0.2	0.3	0.3	0.7	0.2	0.8	
9-Dec	1.0	0.1	0.7	0.9	0.6	0.3	0.2	1.1	0.8	1.1	-0.1	-0.7	-0.2	0.9	0.8	0.1	0.0	0.0	0.1	0.2	0.0	-0.1	0.0	0.0	0.3	1.1	
10-Dec	0.1	0.1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0.1
11-Dec	AF	AF	AF	AF	-0.2	-0.9	-0.6	-0.3	0.0	-0.1	-0.4	-0.1	0.0	0.1	0.4	0.0	-0.4	-0.2	-0.4	-0.3	-0.2	-0.7	-0.6	-0.6	-0.3	0.4	
12-Dec	-0.6	-0.1	-0.3	-0.7	AF	AF	AF	AF	AF	-1.1	-0.7	0.3	0.4	0.3	-0.1	-0.2	-0.2	-0.1	0.0	-0.5	-0.3	-0.3	-0.3	-0.5	-0.3	0.4	
13-Dec	-0.5	-0.5	-0.6	-0.5	-0.7	0.3	0.0	-0.5	-0.7	-0.5	-0.7	0.4	0.4	1.3	1.0	1.3	0.5	0.7	1.0	0.8	0.5	0.7	0.3	0.2	0.2	1.3	
14-Dec	0.0	0.2	0.1	0.1	0.2	0.2	0.0	0.2	0.0	0.5	0.5	0.1	0.2	0.1	0.1	0.0	0.0	0.2	0.1	0.4	0.5	0.3	0.4	0.8	0.2	0.8	
15-Dec	0.7	0.5	0.8	0.8	1.2	1.1	1.1	0.6	0.2	0.0	0.0	0.1	0.1	-0.1	0.0	-0.1	-0.1	0.1	0.1	0.0	0.1	0.3	-0.4	-0.5	0.3	1.2	
16-Dec	0.0	0.1	0.2	0.1	0.1	0.0	0.3	0.2	0.1	0.1	-0.2	-0.1	0.3	0.3	0.2	0.0	0.0	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.3	
17-Dec	0.1	0.0	0.1	0.1	0.1	0.2	0.3	0.2	0.0	-0.1	0.1	0.3	0.2	0.0	0.1	-0.2	0.0	0.1	0.0	0.6	0.0	-0.1	0.2	0.4	0.1	0.6	
18-Dec	0.3	0.0	0.1	0.2	0.4	0.3	0.5	-0.2	0.0	0.2	0.1	0.1	0.1	0.6	0.5	0.3	-0.6	0.2	0.5	0.7	0.4	0.3	0.0	0.6	0.2	0.7	
19-Dec	1.0	1.2	1.4	0.7	0.4	-0.9	-0.5	-0.7	0.1	0.0	0.5	-0.1	0.3	0.1	0.3	-0.2	-0.2	-0.3	-0.2	-0.2	-0.1	0.0	-0.4	-0.5	0.1	1.4	
20-Dec	-0.5	-0.2	-0.2	-0.3	-0.3	-0.3	-0.2	-0.2	-0.3	-0.1	-0.3	-0.4	0.1	-0.2	-0.3	-0.9	-0.6	-0.2	-0.5	-0.4	0.0	-0.1	-0.2	-0.1	-0.3	0.1	
21-Dec	-0.1	0.1	0.2	0.2	0.5	0.7	0.9	0.9	0.7	0.4	0.2	0.2	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.2	0.0	0.0	0.1	0.2	0.3	0.2	0.9	
22-Dec	-0.2	0.1	0.1	0.1	-0.1	0.2	0.4	0.3	0.0	-0.2	0.0	-0.2	0.1	-0.1	-0.1	-0.5	-0.1	-0.1	-0.2	-0.1	0.0	-0.3	0.0	-0.2	0.0	0.4	
23-Dec	-0.2	-0.2	-0.2	-0.3	-0.3	-0.2	-0.1	-0.4	0.0	-0.1	-0.2	0.0	-0.1	-0.1	0.0	0.2	0.3	-0.2	-0.6	-0.6	-0.1	-0.3	-0.1	-0.2	-0.2	0.3	
24-Dec	0.1	0.0	0.0	0.3	0.0	-0.4	-0.3	-0.3	0.1	0.1	0.1	0.3	0.1	0.2	0.1	0.0	0.0	0.2	0.3	0.2	0.1	0.3	0.7	0.7	0.1	0.7	
25-Dec	0.3	0.2	0.0	0.1	-0.1	0.1	0.1	0.1	0.1	0.0	-0.2	0.0	0.1	0.2	0.1	0.2	0.1	0.2	0.1	-0.3	0.4	-0.1	-0.2	-0.1	0.1	0.4	
26-Dec	0.0	-0.1	-0.2	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.3	0.2	0.0	0.1	0.2	0.1	0.6	0.7	0.1	0.5	1.3	0.2	0.3	0.2	1.3	
27-Dec	-0.5	-0.6	-0.8	-0.5	-0.8	-0.5	-0.7	-0.4	-0.6	0.1	-0.1	0.1	0.4	0.3	0.4	0.1	0.1	0.1	0.6	0.4	0.5	0.1	0.0	-0.1	-0.1	0.6	
28-Dec	-0.1	0.1	0.1	0.7	0.2	0.3	0.3	0.0	0.1	-0.1	0.0	0.0	0.2	0.4	0.0	0.3	0.1	0.1	-0.1	0.1	0.2	0.4	0.2	0.3	0.2	0.7	
29-Dec	0.9	1.1	0.3	0.1	0.5	0.9	0.4	0.5	1.5	1.0	1.1	1.0	0.5	0.2	0.4	0.5	0.4	0.1	0.1	0.1	0.3	0.2	0.0	0.0	0.5	1.5	
30-Dec	-0.1	0.0	-0.2	0.4	0.1	0.3	0.1	0.6	0.2	-0.1	-0.1	0.0	0.0	0.1	0.0	-0.1	-0.1	0.1	0.0	0.2	0.1	0.0	-0.1	0.1	0.1	0.6	
31-Dec	1.0	0.3	0.0	-0.2	0.5	0.4	0.1	0.0	0.1	0.3	-0.2	-0.1	-0.1	-0.1	-0.3	0.0	0.0	0.0	-0.5	-0.4	-0.1	0.0	0.1	-0.2	0.0	1.0	
																								Diurnal Average			
																								Diurnal Maximum			
AF - Analyzer Failure      UO - Unstable Operation																											



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 3.3 km/h on Dec 27 11:00			Hours of Data:	712
Minimum Value: 0.1 km/h on Dec 9 18:00			Hours of Missing Data:	32
			Hours of Calibration:	0
			Percent Operational Time:	95.7
Percentiles: P <sub>1</sub> = 0.2 P <sub>10</sub> = 0.4 Q <sub>1</sub> = 0.6 Median = 1.0 Q <sub>3</sub> = 1.6 P <sub>90</sub> = 2.2 P <sub>99</sub> = 2.8				

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	0.6	0.4	0.4	0.4	0.5	0.5	0.4	0.8	0.6	0.5	0.6	1.0	0.5	0.8	0.6	0.7	0.5	1.1	0.9	1.0	0.9	0.9	1.1	0.6	1.1
2-Dec	0.5	0.4	0.7	0.8	0.6	0.6	0.6	1.4	1.8	1.4	1.0	1.2	0.8	0.6	0.7	0.9	1.2	2.3	2.4	2.2	2.3	2.1	1.8	1.6	2.4
3-Dec	1.2	1.6	1.2	0.5	0.7	0.6	0.5	0.5	1.1	1.1	0.9	1.3	0.7	0.8	1.6	1.5	1.6	1.5	1.5	1.7	1.4	0.7	0.9	1.0	1.7
4-Dec	0.9	0.5	0.6	0.3	0.3	0.2	0.4	0.3	0.4	0.5	0.5	0.6	0.7	0.8	0.7	0.3	0.7	0.9	0.7	1.1	0.5	0.5	0.5	1.0	1.1
5-Dec	0.6	0.5	0.9	1.4	2.1	1.9	2.4	2.0	2.1	2.7	2.4	2.1	2.1	1.7	1.2	0.6	0.5	0.8	0.4	0.5	0.6	0.3	0.5	1.5	2.7
6-Dec	1.7	0.9	1.3	2.4	1.2	1.1	1.4	1.4	2.3	2.5	2.9	2.5	2.1	2.3	1.1	0.7	0.6	0.7	0.6	0.4	0.3	0.4	0.8	0.9	2.9
7-Dec	0.8	0.5	1.0	1.4	1.3	1.4	1.2	2.1	1.5	1.8	2.0	1.7	1.5	2.1	1.4	0.3	0.4	0.4	1.0	0.9	0.6	0.8	0.6	0.7	2.1
8-Dec	1.3	1.6	1.2	1.2	0.9	0.8	0.3	0.4	0.3	0.3	0.6	1.4	1.4	1.6	1.8	1.6	1.4	2.0	UO	2.1	1.9	1.8	2.5	2.0	2.5
9-Dec	2.2	2.0	2.6	2.5	2.4	2.2	2.2	2.7	2.3	2.3	2.1	1.8	1.7	1.4	1.2	1.1	0.7	0.1	0.1	0.2	0.3	0.4	0.5	0.5	2.7
10-Dec	0.5	0.4	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0.5
11-Dec	AF	AF	AF	AF	1.2	1.4	1.7	1.6	1.7	2.1	2.3	2.1	2.0	1.3	1.2	1.0	1.3	1.7	2.1	2.4	2.3	2.2	2.0	2.0	2.4
12-Dec	2.1	1.8	2.0	2.3	AF	AF	AF	AF	AF	2.0	2.4	2.6	2.6	2.4	2.5	2.8	2.6	2.6	2.5	2.3	2.3	2.3	2.1	2.0	2.8
13-Dec	1.8	1.7	2.1	2.4	2.4	2.8	2.6	2.4	1.8	1.9	2.0	2.3	2.4	2.2	1.9	1.2	1.3	1.6	1.2	1.3	1.2	1.1	0.6	0.3	2.8
14-Dec	0.2	0.2	0.2	0.8	1.0	1.0	0.8	0.6	0.7	0.5	0.6	0.7	0.6	0.5	0.6	0.4	0.5	0.5	0.2	0.8	1.0	1.0	0.9	1.3	1.3
15-Dec	1.1	1.1	0.8	1.0	0.9	1.3	1.0	1.2	1.1	0.6	0.7	1.5	1.1	1.0	1.0	0.8	0.5	0.9	0.7	0.6	1.0	1.4	2.0	1.7	2.0
16-Dec	1.9	1.3	0.9	0.4	1.5	1.8	1.4	1.2	0.7	0.6	1.0	0.8	1.2	1.2	1.1	0.4	0.9	0.7	0.7	0.4	0.5	0.6	0.6	0.4	1.9
17-Dec	0.6	1.1	1.1	1.2	1.1	1.0	1.1	1.3	0.7	0.8	0.8	0.7	0.9	1.0	1.1	0.6	0.3	0.8	1.1	1.4	1.4	1.6	1.6	1.3	1.6
18-Dec	1.1	0.9	0.8	0.9	0.6	1.0	1.0	0.8	1.1	0.9	0.8	1.0	1.4	1.4	1.8	1.8	2.1	2.0	2.3	2.4	2.5	2.2	1.7	2.2	2.5
19-Dec	2.5	2.3	2.2	2.2	2.4	1.9	2.1	2.1	1.5	0.7	1.1	1.2	1.4	0.8	0.6	1.3	1.8	1.7	1.7	1.3	2.0	2.1	2.1	1.6	2.5
20-Dec	1.6	2.0	1.8	1.3	1.3	1.2	1.3	1.1	1.0	1.3	1.7	1.7	1.2	1.5	1.7	2.1	2.2	2.1	2.1	2.0	1.2	1.8	1.9	1.9	2.2
21-Dec	1.4	1.3	1.7	1.2	1.1	1.0	0.7	0.6	0.5	0.5	0.4	0.3	0.4	0.6	0.7	0.6	0.6	0.7	0.9	0.4	0.5	0.4	0.4	0.4	1.7
22-Dec	0.6	0.5	0.5	0.6	1.0	1.3	1.7	1.6	1.4	1.4	1.4	1.1	1.3	1.2	1.6	1.8	1.5	1.4	1.5	1.4	1.2	1.2	1.4	1.4	1.8
23-Dec	1.2	1.1	1.3	1.7	1.5	1.5	1.5	1.0	1.2	1.1	1.1	1.2	1.2	1.1	1.4	1.2	1.5	1.4	1.2	1.4	1.1	0.9	1.0	1.0	1.7
24-Dec	1.3	1.3	1.2	1.0	1.0	1.1	1.3	1.0	0.9	0.7	0.9	1.1	1.1	1.0	0.8	0.6	0.3	0.4	0.7	0.5	0.4	0.3	0.6	0.8	1.3
25-Dec	0.7	0.4	0.3	0.3	0.4	0.5	0.5	0.4	0.4	0.5	0.5	0.4	0.4	0.3	0.2	0.2	0.4	0.3	1.0	1.4	1.9	1.3	1.1	1.0	1.9
26-Dec	1.0	1.2	0.9	0.7	0.4	0.4	0.2	0.2	0.4	0.4	0.7	0.6	0.9	0.9	1.3	1.4	1.1	1.7	1.8	1.9	2.5	2.3	2.5	2.7	2.7
27-Dec	2.4	2.6	2.0	2.4	2.4	2.7	2.6	2.7	3.0	3.3	3.3	3.0	2.8	2.4	1.8	1.6	1.0	0.9	1.1	0.8	0.8	0.9	0.3	0.3	3.3
28-Dec	0.4	0.4	0.3	1.4	1.2	0.5	0.6	0.9	1.0	1.2	0.9	0.9	0.9	1.0	0.8	0.6	0.3	0.3	0.7	0.6	0.5	0.4	0.4	0.2	1.4
29-Dec	0.3	0.2	0.9	1.2	0.6	0.9	1.0	0.9	1.4	1.0	0.9	1.1	1.0	1.0	0.7	0.5	0.7	0.9	0.9	1.0	1.1	0.9	1.1	1.2	1.4
30-Dec	0.7	0.6	0.9	0.9	0.3	0.5	0.2	0.4	0.4	0.7	0.6	0.8	0.8	0.6	0.6	1.2	1.0	0.7	0.6	0.9	0.9	0.8	0.9	0.8	1.2
31-Dec	0.9	1.7	1.2	1.1	1.2	0.9	0.8	1.0	1.1	1.9	1.7	1.2	0.9	0.8	0.7	1.0	1.2	1.0	0.9	0.7	0.5	0.4	0.4	1.0	1.9
	2.5	2.6	2.6	2.5	2.4	2.8	2.6	2.7	3.0	3.3	3.3	3.0	2.8	2.4	2.5	2.8	2.6	2.6	2.5	2.4	2.5	2.3	2.5	2.7	
	Diurnal Maximum																								

AF - Analyzer Failure      UO - Unstable Operation



Summary of Hour Averages

Mannix - December 2015

Maximum Value: 3.1 km/h on Dec 5 05:00		Maximum Daily Average: 1.3 km/h on Dec 16		Hours in Service:	744																					
Minimum Value: -1.6 km/h on Dec 20 16:00		Minimum Daily Average: -0.3 km/h on Dec 20		Hours of Data:	743																					
Maximum Diurnal Average: 0.5 km/h at hour 6		Minimum Diurnal Average: 0.2 km/h at hour 17		Hours of Missing Data:	1																					
Monthly Average: 0.39 km/h		Percentiles: P <sub>1</sub> = -1.3 P <sub>10</sub> = -0.3 Q <sub>1</sub> = 0.0 Median = 0.3 Q <sub>3</sub> = 0.8 P <sub>90</sub> = 1.2 P <sub>99</sub> = 2.2		Hours of Calibration:	0																					
				Percent Operational Time:	99.9																					
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0.0	0.1	0.2	0.3	0.1	0.2	0.1	0.0	0.2	0.6	0.8	0.7	0.2	0.7	0.7	0.6	0.8	0.6	0.3	-0.1	0.0	-0.2	0.0	0.1	0.3	0.8
2-Dec	-0.1	-0.1	0.3	1.0	0.8	0.8	0.9	0.0	-0.5	0.3	1.0	0.8	-0.2	-0.1	-0.2	-0.4	0.2	0.6	1.4	1.0	1.3	1.5	1.2	1.2	0.5	1.5
3-Dec	1.2	1.5	1.0	0.5	0.2	0.0	0.3	0.6	0.2	0.0	0.1	0.4	0.3	0.0	-0.1	0.0	-0.1	-0.2	0.0	-0.1	-0.1	0.1	0.1	0.1	0.3	1.5
4-Dec	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.6	0.7	0.9	0.6	0.1	0.2	0.2	0.2	0.3	0.2	0.2	0.3	-0.2	-0.1	0.0	0.8	0.3	0.9
5-Dec	1.2	1.0	1.8	2.3	3.1	2.1	2.0	1.4	1.1	1.7	0.8	1.1	0.9	0.8	0.6	0.1	0.0	-0.1	-0.1	-0.2	0.0	0.1	0.3	-0.1	0.9	3.1
6-Dec	-0.3	-0.1	-0.1	-0.2	0.1	-0.4	-0.3	-0.3	-0.4	-0.2	0.1	-0.5	-0.3	-0.4	-0.2	0.3	0.4	0.3	0.6	0.7	0.5	0.5	0.3	0.3	0.0	0.7
7-Dec	0.0	0.2	0.2	-0.5	-0.3	-0.5	0.2	-1.2	-0.4	-0.8	-0.8	-0.9	0.0	-0.7	-0.3	0.4	0.5	0.6	1.1	1.2	0.5	-0.1	0.4	1.8	0.0	1.8
8-Dec	1.3	2.0	1.9	1.2	1.3	0.4	0.6	0.5	0.8	0.5	-0.1	0.0	0.3	0.5	0.2	-0.1	-0.2	0.4	0.0	-0.4	0.1	0.2	-0.2	0.5	0.5	2.0
9-Dec	0.5	-0.3	0.0	0.1	-0.2	-0.2	-0.3	0.2	0.3	0.6	-0.7	-1.3	-0.5	0.6	0.7	0.0	0.0	0.1	0.4	0.7	0.3	0.0	0.2	0.5	0.1	0.7
10-Dec	0.8	0.9	1.5	0.5	0.0	0.7	0.3	0.1	0.3	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.0	0.1	0.3	0.5	1.0	AF	0.6	0.4	0.4	1.5
11-Dec	0.5	0.4	0.2	0.3	-0.8	-0.9	-0.8	-0.3	-0.2	0.0	-0.6	-0.1	-0.3	0.0	0.5	0.1	-0.5	-0.3	-0.6	-0.5	-0.6	-1.2	-1.2	-1.2	-0.3	0.5
12-Dec	-1.2	-0.2	-0.4	-0.3	0.2	0.9	0.2	1.5	0.0	-0.7	0.7	0.1	2.6	1.3	0.3	-0.2	-0.3	-0.2	0.2	-0.5	-0.3	-0.4	-0.6	-0.8	0.1	2.6
13-Dec	-0.8	-0.8	-1.0	-1.2	-1.4	-0.3	-0.6	-1.1	-1.3	-1.1	-1.4	0.0	-0.1	0.8	0.7	1.0	0.4	0.4	0.9	0.6	0.5	0.5	0.3	0.2	-0.2	1.0
14-Dec	0.0	0.2	0.1	1.4	1.1	1.2	0.9	1.0	0.7	1.9	1.5	1.3	1.0	0.7	0.4	0.0	0.1	0.1	0.1	0.5	0.4	0.4	0.4	0.7	0.7	1.9
15-Dec	0.5	0.4	0.7	0.8	1.0	1.1	1.0	0.6	0.2	0.1	0.5	1.0	1.1	0.6	0.6	0.4	0.6	0.8	1.2	1.1	2.0	2.7	2.0	1.1	0.9	2.7
16-Dec	1.2	0.9	0.8	0.2	1.5	2.5	2.3	1.9	1.7	1.8	1.2	0.4	1.3	1.2	0.8	-0.1	0.2	1.4	1.7	1.7	1.8	1.7	1.5	1.5	1.3	2.5
17-Dec	1.2	1.2	1.4	1.4	1.3	1.8	1.7	1.8	0.9	0.5	0.5	0.6	0.8	0.8	0.9	0.6	0.9	0.8	0.2	0.8	0.4	0.4	0.6	0.5	0.9	1.8
18-Dec	0.5	0.1	0.2	0.3	0.4	0.4	0.6	0.0	0.2	0.3	0.1	0.1	0.1	0.5	0.3	0.3	-0.7	-0.1	0.2	0.0	-0.2	0.1	0.0	0.0	0.2	0.6
19-Dec	0.3	0.2	0.7	0.2	-0.2	-1.4	-1.2	-1.4	-0.2	0.0	0.2	-0.1	0.3	0.1	0.3	-0.5	-0.6	-0.2	-0.1	-0.1	-0.2	-0.3	-0.8	-0.8	-0.2	0.7
20-Dec	-0.4	-0.3	0.0	0.1	-0.1	0.0	0.0	0.1	-0.1	-0.1	-0.9	-0.8	0.1	-0.5	-0.7	-1.6	-1.3	-0.2	-0.8	-0.7	0.2	0.2	-0.1	0.0	-0.3	0.2
21-Dec	0.1	0.3	0.3	0.4	0.6	0.7	0.9	0.7	0.6	0.5	0.1	0.1	0.1	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.2	0.4	0.3	1.0	0.3	1.0
22-Dec	0.5	0.6	0.8	0.9	1.3	1.7	1.9	1.6	1.2	1.2	1.0	0.7	1.0	0.8	1.1	1.4	1.2	1.2	1.2	1.4	1.4	1.1	1.2	1.1	1.1	1.9
23-Dec	1.0	1.0	1.2	1.2	0.9	0.8	1.0	0.6	0.9	1.1	0.8	0.7	0.8	1.0	1.0	1.0	1.3	0.9	0.3	0.4	0.5	0.5	0.8	0.6	0.8	1.3
24-Dec	1.2	1.4	1.0	1.3	1.1	0.5	0.7	0.5	0.8	0.9	0.8	1.3	0.9	0.6	0.3	0.2	0.1	0.2	0.2	0.1	0.1	0.4	0.7	0.8	0.7	1.4
25-Dec	0.3	0.1	0.0	0.0	-0.1	0.2	0.1	0.1	0.1	0.0	-0.1	0.7	1.0	0.7	0.2	0.1	0.2	0.2	1.4	1.4	2.1	1.1	0.8	0.7	0.5	2.1
26-Dec	0.6	0.7	0.4	0.4	0.2	0.1	0.1	0.2	0.1	0.2	0.2	0.5	0.5	0.1	-0.1	0.2	-0.2	0.1	0.1	-0.4	-0.1	0.5	-0.4	-0.2	0.2	0.7
27-Dec	-0.9	-1.2	-1.2	-1.3	-1.3	-1.2	-1.4	-0.6	-0.6	-0.1	-0.2	0.3	0.5	0.4	0.5	0.3	0.1	0.2	0.5	0.5	0.6	0.1	0.0	0.1	-0.3	0.6
28-Dec	0.4	0.3	1.0	1.9	1.2	1.1	1.4	1.0	1.2	0.9	0.6	0.6	0.9	1.0	0.7	0.8	0.7	0.2	0.1	0.3	0.1	0.4	0.2	0.3	0.7	1.9
29-Dec	0.6	0.8	0.3	0.1	0.6	1.1	0.3	0.6	0.7	0.8	1.5	1.2	0.5	0.3	0.2	0.5	0.7	0.2	0.0	-0.1	0.2	0.0	-0.1	0.0	0.5	1.5
30-Dec	0.1	0.4	1.1	1.9	2.0	2.5	2.3	2.7	1.4	0.2	0.1	0.3	0.2	0.6	1.1	0.7	0.1	0.3	0.2	0.5	0.5	0.0	-0.2	0.0	0.8	2.7
31-Dec	0.7	0.0	-0.1	-0.2	0.3	0.2	-0.2	-0.1	0.6	1.4	0.7	0.5	0.2	0.5	0.3	0.5	1.2	1.2	0.8	0.5	0.8	0.4	0.4	0.2	0.5	1.4
																								Diurnal Average		
																								Diurnal Maximum		
AF - Analyzer Failure																										



Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 3.1 km/h on Dec 27 11:00 Minimum Value: 0.1 km/h on Dec 9 18:00 Percentiles: P <sub>1</sub> = 0.2 P <sub>10</sub> = 0.4 Q <sub>1</sub> = 0.6 Median = 1.0 Q <sub>3</sub> = 1.4 P <sub>90</sub> = 1.9 P <sub>99</sub> = 2.6																								Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9	
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	0.6	0.3	0.5	0.5	0.5	0.4	0.3	0.8	0.5	0.5	0.5	0.7	0.4	0.7	0.5	0.6	0.5	1.3	1.1	1.0	1.0	1.0	1.2	0.7	1.3
2-Dec	0.5	0.4	0.6	0.8	0.6	0.6	0.5	0.9	1.5	1.0	1.2	1.2	0.8	0.6	0.9	0.9	1.3	2.5	2.6	2.3	2.7	2.2	1.8	1.6	2.7
3-Dec	1.3	1.6	1.2	0.7	0.8	0.6	0.5	0.4	0.9	0.9	0.9	1.2	0.8	0.8	1.4	1.4	1.2	1.4	1.2	0.9	1.1	0.6	0.7	0.8	1.6
4-Dec	0.7	0.5	0.5	0.4	0.4	0.3	0.3	0.6	0.6	0.6	0.5	0.7	0.7	0.8	0.8	0.4	0.8	1.1	0.8	1.1	0.6	0.6	0.5	1.2	1.2
5-Dec	0.8	0.7	1.1	1.4	2.1	2.1	2.4	2.2	2.1	2.8	2.5	2.2	2.3	1.9	1.4	0.6	0.6	0.8	0.5	0.5	0.7	0.3	0.4	0.7	2.8
6-Dec	1.0	0.8	0.8	1.1	0.7	1.1	1.0	1.2	2.0	1.8	1.9	1.9	1.9	2.1	1.1	0.6	0.5	0.5	0.5	0.4	0.3	0.4	0.6	0.8	2.1
7-Dec	0.7	0.5	0.6	1.0	1.1	1.1	1.1	1.6	1.3	1.4	1.4	1.3	1.4	1.7	1.0	0.3	0.3	0.3	1.0	0.8	0.6	0.8	0.6	0.8	1.7
8-Dec	1.3	1.6	1.2	1.5	1.0	0.8	0.4	0.4	0.4	0.4	0.7	1.5	1.4	1.7	1.7	1.5	1.3	1.7	1.4	1.3	1.4	1.3	1.7	1.6	1.7
9-Dec	1.8	1.8	1.8	1.7	1.7	1.4	1.8	1.9	1.9	1.8	1.9	1.5	1.4	1.2	1.1	0.8	0.5	0.1	0.3	0.3	0.3	0.4	0.6	0.5	1.9
10-Dec	0.6	0.4	0.7	0.5	0.8	1.0	0.5	0.5	0.5	0.6	0.5	0.3	0.4	0.5	0.3	0.4	0.3	0.7	1.4	1.4	1.2	AF	1.2	1.3	1.4
11-Dec	1.3	1.7	1.7	0.9	1.2	1.3	1.5	1.3	1.5	2.1	2.2	2.0	1.8	1.2	1.2	0.9	1.1	1.5	2.0	2.4	2.2	2.0	1.8	1.7	2.4
12-Dec	1.8	1.8	1.8	2.3	2.1	1.3	1.6	2.1	2.1	2.5	2.9	2.5	2.9	2.0	2.5	2.5	2.3	2.6	2.4	2.1	2.0	2.1	1.9	1.6	2.9
13-Dec	1.5	1.4	2.0	2.2	2.1	2.5	2.4	2.2	1.6	1.8	1.9	2.2	2.1	1.9	1.6	1.0	1.1	1.2	0.9	1.0	0.8	0.9	0.6	0.3	2.5
14-Dec	0.2	0.2	0.3	0.8	0.9	1.0	0.7	0.7	0.8	0.6	0.7	0.9	0.8	0.7	0.6	0.4	0.6	0.5	0.3	0.7	0.9	1.0	0.8	1.1	1.1
15-Dec	1.1	1.0	0.8	0.9	0.9	1.2	1.1	1.2	1.1	0.6	0.8	1.5	1.2	1.1	1.1	0.9	0.6	1.0	0.8	0.8	1.1	1.4	1.8	1.7	1.8
16-Dec	1.9	1.3	1.2	0.4	1.8	1.7	1.5	1.2	0.8	0.7	1.1	0.8	1.3	1.2	1.3	0.4	0.9	0.9	0.8	0.6	0.7	0.7	0.6	0.4	1.9
17-Dec	0.8	1.1	1.2	1.2	1.1	1.0	1.2	1.4	0.8	1.0	0.8	0.7	0.8	1.0	1.1	0.7	0.4	0.9	1.0	1.4	1.4	1.6	1.8	1.3	1.8
18-Dec	1.1	0.8	0.8	0.8	0.6	0.8	0.9	0.8	1.0	0.7	0.7	1.1	1.4	1.2	1.3	1.4	1.4	1.2	1.5	2.0	1.9	1.4	1.4	1.9	2.0
19-Dec	1.8	1.7	1.7	1.8	2.0	1.7	1.9	1.8	1.4	0.6	1.0	1.1	1.5	0.9	0.6	1.1	1.5	1.2	1.3	0.9	1.6	1.7	1.9	1.1	2.0
20-Dec	0.9	1.4	1.4	1.1	1.1	0.8	0.8	0.8	0.6	1.1	1.5	1.3	1.0	1.2	1.3	1.6	1.8	1.7	1.6	1.8	1.0	1.5	1.4	1.5	1.8
21-Dec	1.3	1.3	1.6	1.1	1.0	0.9	0.7	0.6	0.5	0.5	0.5	0.3	0.3	0.5	0.4	0.4	0.5	0.5	0.6	0.4	0.5	0.5	0.5	0.5	1.6
22-Dec	0.7	0.4	0.5	0.8	0.9	1.4	1.7	1.7	1.4	1.4	1.4	1.2	1.2	1.2	1.7	1.7	1.4	1.5	1.4	1.3	1.2	1.2	1.4	1.3	1.7
23-Dec	1.1	1.2	1.4	1.8	1.6	1.5	1.5	1.0	1.3	1.0	1.2	1.2	1.2	1.2	1.5	1.3	1.6	1.5	1.2	1.4	1.1	0.9	1.0	1.1	1.8
24-Dec	1.4	1.4	1.3	1.1	1.0	1.1	1.4	1.0	1.0	0.7	1.0	1.1	1.1	1.0	0.8	0.6	0.4	0.4	0.5	0.4	0.3	0.5	0.7	1.4	1.4
25-Dec	0.7	0.3	0.2	0.3	0.3	0.6	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.4	0.2	0.2	0.3	0.2	1.0	1.5	1.7	1.5	1.0	1.0	1.7
26-Dec	0.8	1.1	0.9	0.7	0.4	0.4	0.2	0.3	0.2	0.2	0.5	0.6	0.6	0.8	0.9	0.7	0.9	1.1	1.3	1.6	2.0	2.0	2.4	2.3	2.4
27-Dec	2.2	2.3	1.7	2.0	2.0	2.4	2.3	2.5	2.6	3.0	3.1	2.8	2.7	2.3	1.8	1.5	0.9	0.7	1.0	0.7	0.7	0.8	0.4	0.3	3.1
28-Dec	0.5	0.4	0.5	1.3	1.3	0.6	0.6	1.0	1.0	1.2	1.0	0.8	0.9	1.0	0.9	0.6	0.4	0.3	0.6	0.7	0.5	0.5	0.5	0.2	1.3
29-Dec	0.3	0.2	0.8	1.2	0.6	1.0	0.7	0.7	0.9	1.0	0.9	1.2	0.9	0.9	0.7	0.5	0.8	0.9	1.0	1.0	1.1	0.8	1.1	1.2	1.2
30-Dec	0.8	0.8	1.0	1.0	0.4	0.6	0.4	0.5	0.7	0.8	0.7	1.0	0.9	0.8	0.9	1.3	1.1	0.9	0.7	1.0	1.0	0.9	1.0	0.9	1.3
31-Dec	1.0	1.8	1.4	1.2	1.3	1.0	0.9	1.1	1.3	2.2	1.8	1.3	0.9	0.9	0.9	1.1	1.3	1.1	0.9	0.8	0.5	0.5	0.5	1.1	2.2
2.2 2.3 2.0 2.3 2.1 2.5 2.4 2.5 2.6 3.0 3.1 2.8 2.9 2.3 2.5 2.5 2.3 2.6 2.6 2.4 2.7 2.2 2.4 2.3																									
Diurnal Maximum																									
AF - Analyzer Failure																									



# Wood Buffalo Environmental Association SO2 Calibration Report

## Station Information

Calibration Date	December 2, 2015	Last Calibration	November 10, 2015
Station Name	Mannix	Station Number	AMS 5
Reason:	Routine		
Start Time (MST)	9:25	End Time (MST)	11:55
Gas Cert Reference	S9610161A	Station temp.	22 Deg C
Cal Gas Concentration	50 ppm	Cal Gas Exp Date	26/09/2017
Calibrator Make/Model	Sabio 4010	Serial Number	11061107
ZAG Make/Model	API 701	Serial Number	1083
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2633

## Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	-635	-634
Analyzer IP address	192.168.1.43		Lamp voltage	823	823
Calculated slope	0.994045	1.001811	Chamber temp	45.2	44.8
Calculated intercept	0.628816	0.481454	Pressure	691.3	682.7
Analyzer Background	7.5	7.5	Flow	0.485	0.487
Analyzer Coefficient	0.995	0.995	Intensity	90	90

Analyzer make TEI 43i Analyzer serial # 1008841399

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.0	----
as found span	5000	60.0	600.0	598.0	1.003
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	60.0	600.0	598.0	1.003
second point	5000	30.0	300.0	300.7	0.998
third point	5000	15.0	150.0	147.5	1.017
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	60.0	600.0	601.3	0.998
Average Correction Factor					1.006

Corrected As found 598.0 Previous response 603.0 % change 0.8%

Notes:

Changed inlet filter after as founds. No adjustments.

Calibration Performed By: Evan Magill



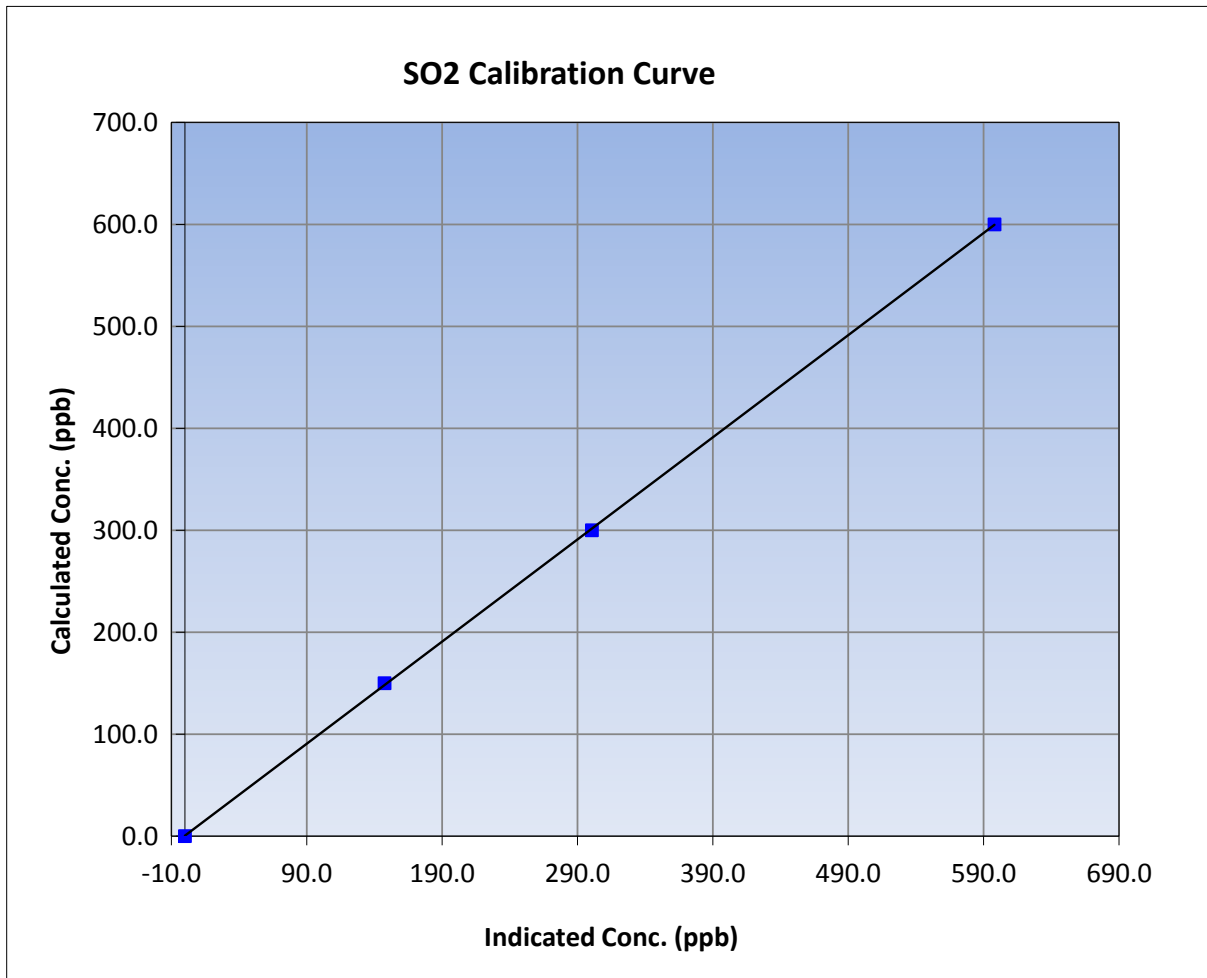
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 10, 2015
Station Name	Mannix	Station Number	AMS 5
Start Time (MST)	9:25	End Time (MST)	11:55
Analyzer make	TEI 43i	Analyzer serial #	1008841399

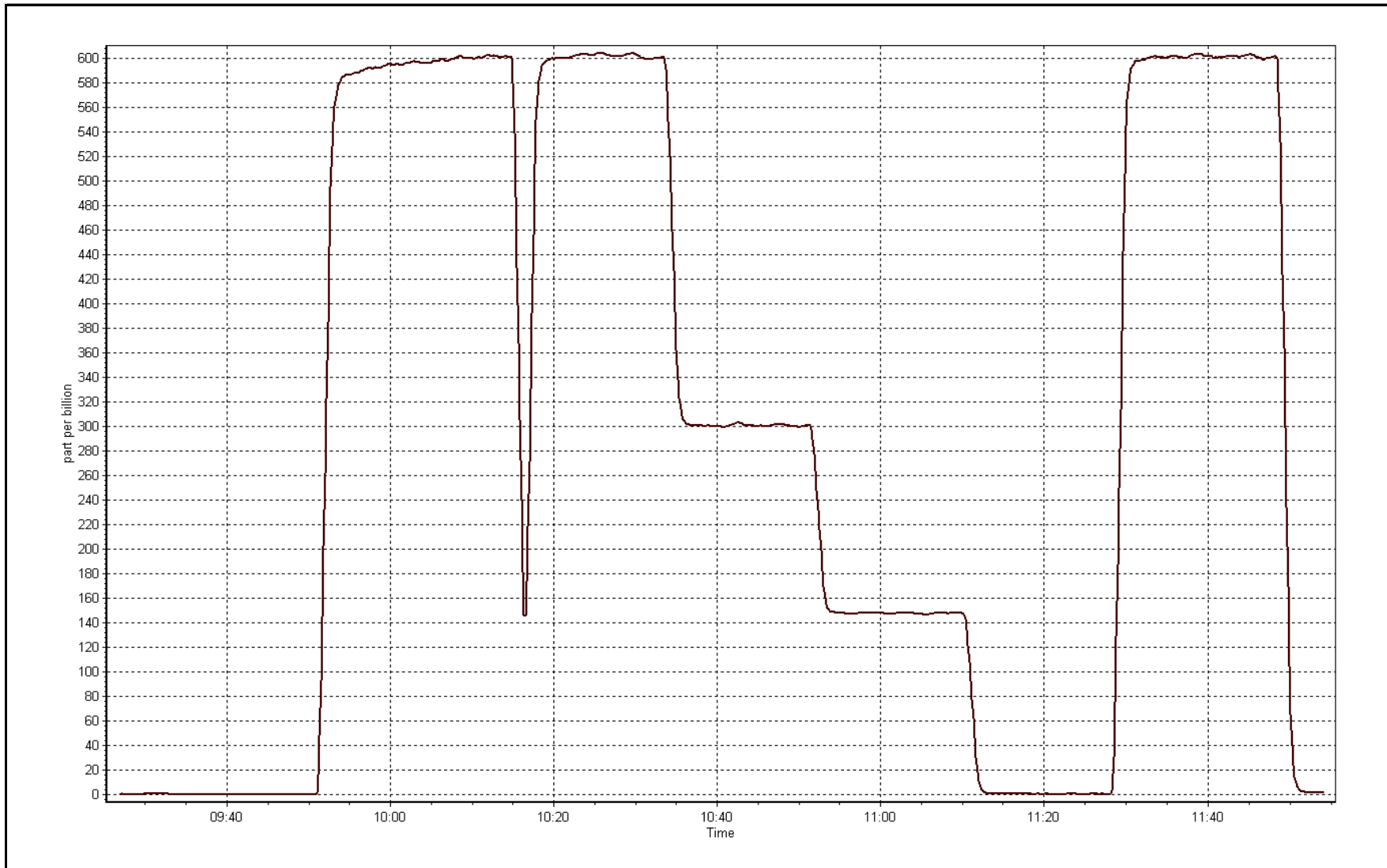
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999967
600.0	598.0	1.0033		
300.0	300.7	0.9977	Slope	1.001811
150.0	147.5	1.0169		
			Intercept	0.481454



SO2 Calibration Plot

Date: December 2, 2015







# Wood Buffalo Environmental Association H2S Calibration Report

### Station Information

Calibration Date	December 2, 2015	Last Calibration	November 10, 2015
Station Name	Mannix	Station Number	AMS 5
Reason:	Routine		
Start Time (MST)	12:00	End Time (MST)	14:25
Gas Cert Reference	CC62844	Station temp.	21 Deg C
Cal Gas Concentration	5.04 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	Sabio 4010	Serial Number	11061107
ZAG air Make/Model	API 701	Serial Number	138
DACS make/model	Campbell Scientific CR3000	Serial Number	2633
SO2 gas concentration	50 ppm	SO2 gas cert/exp	S960161A 09-Sep-17

### Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-658	-657
Analyzer IP address	192.168.1.45		Lamp voltage	806	812
Calculated slope	0.993138	1.003028	Chamber temp	45	45
Calculated intercept	-0.186598	-0.494372	Pressure	514.4	511.0
Analyzer Background	19.1	19.2	Flow	1.061	1.057
Analyzer Coefficient	1.254	1.254	Intensity	91	90
			Converter temp.	326	323

Analyzer make/model	Thermo 450i	Analyzer serial #	815129108
Converter make/model	NA	Converter serial #	NA

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.3	----
as found span	5000	74.4	75.0	75.0	0.999
SO2 scrubber check	5000	15.0	150.0	1.7	----
calibrator zero	5000	0.0	0.0	0.3	----
high point	5000	74.4	75.0	75.0	0.999
second point	5000	41.7	42.0	42.7	0.983
third point	5000	24.8	25.0	25.5	0.980
as left zero	5000	0.0	0.0	0.4	----
as left span	5000	74.4	75.0	75.5	0.993
Average Correction Factor					0.988

Corrected As found	74.8	Previous response	75.7	% change	1.3%
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**Notes:**

Changed inlet filter and scrubber check done after as founds. No adjustments.

Calibration Performed By: Evan Magill



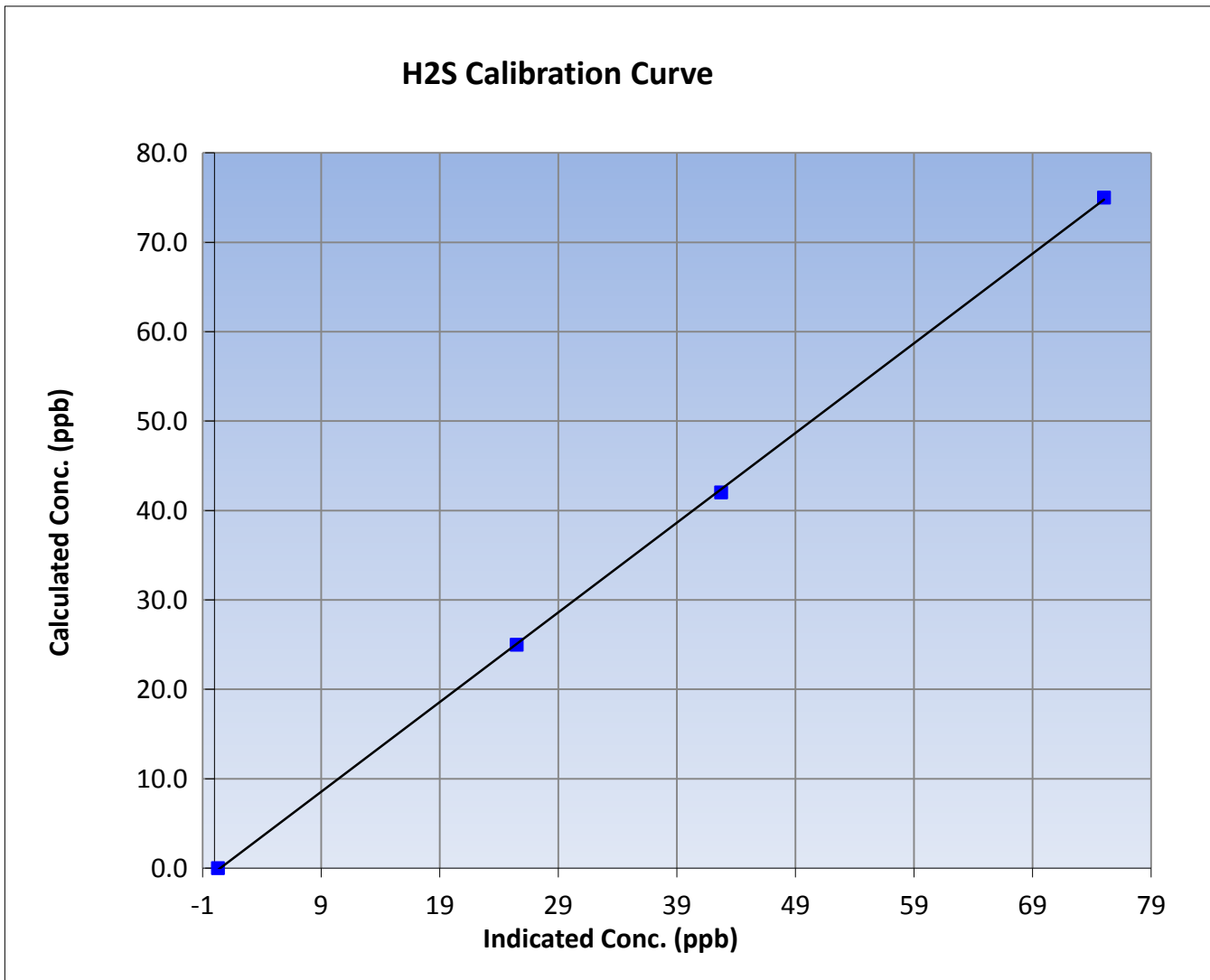
# Wood Buffalo Environmental Association H2S Calibration Report

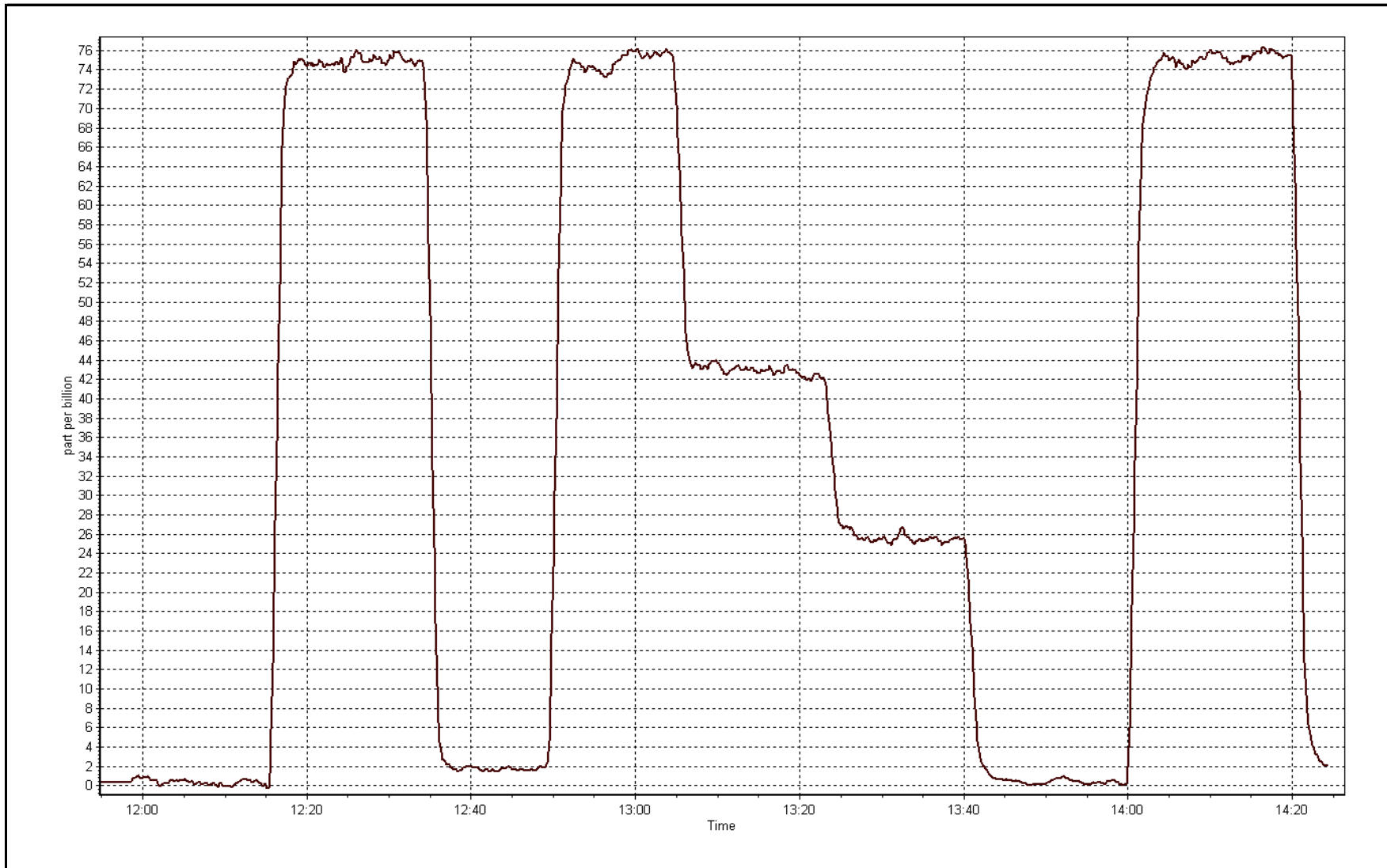
## Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 10, 2015
Station Name	Mannix	Station Number	AMS 5
Start Time (MST)	12:00	End Time (MST)	14:25
Analyzer make	Thermo 450i	Analyzer serial #	815129108

## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999928
75.0	75.0	0.9994		
42.0	42.7	0.9835	Slope	1.003028
25.0	25.5	0.9803		
			Intercept	-0.494372







# Wood Buffalo Environmental Association THC Calibration Report

### Station Information

Calibration Date	December-02-15	Last Calibration	November-10-15
Station Name	Mannix	Station Number	AMS 5
Reason:	Routine		
Start Time (MST)	9:25	End Time (MST)	11:55
Gas Cert Reference	S961061A	Cal Gas Expiry Date	Sept-26-2017
CH4 Cal Gas Conc.	499 ppm	CH4 Equiv Conc.	1038.0 ppm
C3H8 Cal Gas Conc.	196 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11061107
ZAG make/model	Teledyne API 701	Serial Number	1083
DACS make/model	Campbell Scientific CR3000	Serial Number	2633

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	9.4	9.4
Analyzer IP address	192.168.1.51		Air or Bypass Press	42.3	42.3
Calculated slope	1.009697	0.992752	Fuel Pressure	20.2	20.2
Calculated intercept	0.002187	0.053893	Analyzer Coeff	3.8	3.9
			Analyzer BKG	3.200	3.240

Analyzer make Thermo 51i-LT Analyzer serial # 1317958295

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.02	----
as found span	5000	60.0	12.46	12.30	1.013
calibrator zero	5000	0.0	0.00	-0.02	----
high point	5000	60.0	12.46	12.52	0.995
second point	5000	30.0	6.23	6.17	1.009
third point	5000	15.0	3.11	3.07	1.014
as left zero	5000	0.0	0.00	0.01	----
as left span	5000	60.0	12.46	12.48	0.998
Average Correction Factor					1.006

Corrected As found 12.32 Previous response 12.33 % change 0.1%

**Notes:**

Changed inlet filter after as founds. Adjusted span.

Calibration Performed By:

Evan Magill



# Wood Buffalo Environmental Association THC Calibration Report

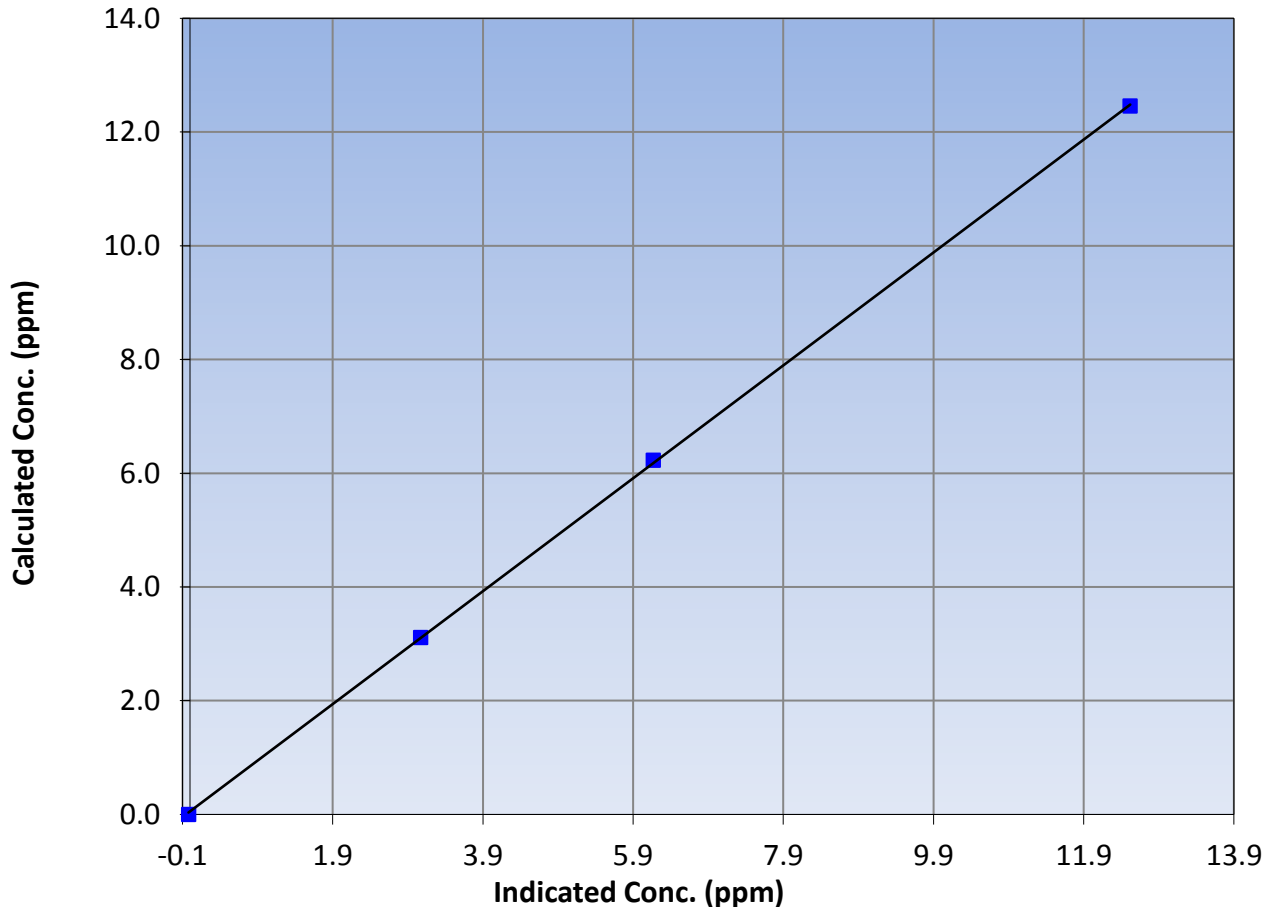
## Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 10, 2015
Station Name	Mannix	Station Number	AMS 5
Start Time (MST)	9:25	End Time (MST)	11:55
Analyzer make	Thermo 51i-LT	Analyzer serial #	1317958295

## Calibration Data

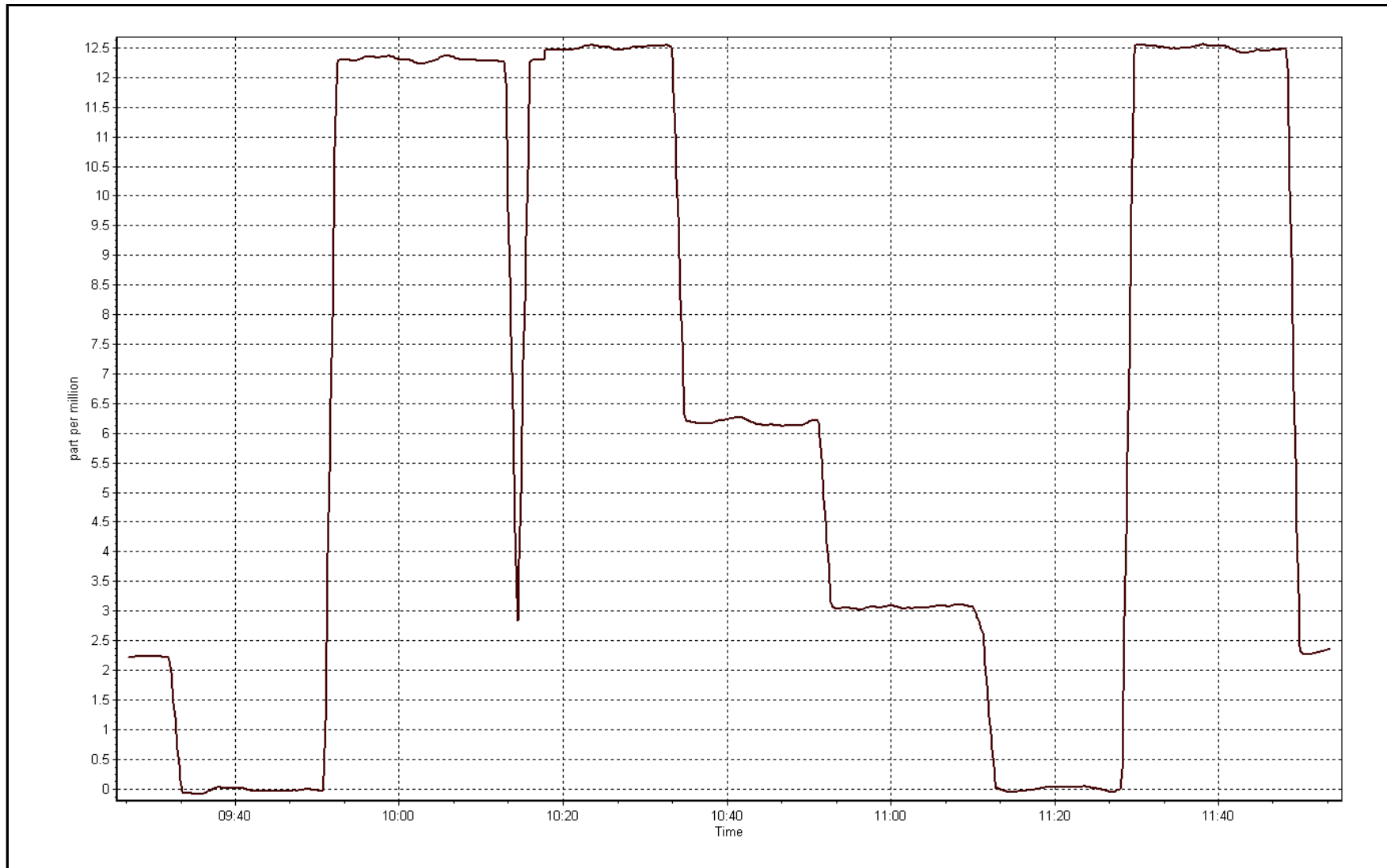
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.02	----	Correlation Coefficient	0.999948
12.46	12.52	0.9949		
6.23	6.17	1.0094	Slope	0.992752
3.11	3.07	1.0143		
			Intercept	0.053893

**THC Calibration Curve**



THC Calibration Plot

Date: December 2, 2015





## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 6**  
**PATRICIA MCINNES**  
**DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - PATRICIA McINNES (AMS 6)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	707	37	37	100.00	21	0	7	0
TRS (ppb) Average	709	35	35	100.00	1	0	0	0
THC (ppm) Average	705	37	39	99.73	2.9	-	2.3	-
NMHC(ppm) Average	705	37	39	99.73	0.261	-	0.02	-
CH4(ppm) Average	705	37	39	99.73	2.8	-	2.3	-
O3 (ppb) Average	709	35	35	100.00	40	0	32	-
NO2 (ppb) Average	707	37	37	100.00	42	0	17	-
NO (ppb) Average	707	37	37	100.00	88	-	14	-
NOX (ppb) Average	707	37	37	100.00	130	-	31	-
NH3 (ppb) Average	672	42	72	95.97	11	0	0	-
PM2.5 (ug/m3) Average	741	3	3	100.00	37.9	-	12.9	0
Temperature 2 m (C) Average	744	0	0	100.00	5.7	-	-0.9	-
Relative Humidity (%) Average	744	0	0	100.00	95	-	92	-
Wind Speed 10 m (km/h) Average	744	0	0	100.00	23	-	14	-
Wind Direction 10 m (deg) Average	744	0	0	100.00	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - PATRICIA McINNES (AMS 6)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	707	0.9	2	-	0	0	0	0	0	2	21
TRS (ppb) Average	709	0.2	0	-	0	0	0	0	0	0	1
THC (ppm) Average	705	2.09	0.1	-	2	2	2	2	2.1	2.2	2.9
NMHC(ppm) Average	705	0.002	0.017	-	0	0	0	0	0	0	0.261
CH4(ppm) Average	705	2.08	0.1	-	2	2	2	2	2.1	2.2	2.8
O3 (ppb) Average	709	18.8	8	-	3	6	13	19	24	31	40
NO2 (ppb) Average	707	8	7	-	0	2	3	6	10	18	42
NO (ppb) Average	707	3.8	7	-	0	0	1	2	4	9	88
NOX (ppb) Average	707	11.8	13	-	0	2	4	8	14	28	130
NH3 (ppb) Average	672	0	0	-	0	0	0	0	0	0	11
PM2.5 (ug/m3) Average	741	4.99	4.3	-	0.2	1.2	2	3.8	6.5	10.9	37.9
Temperature 2 m (C) Average	744	-10.25	6.2	-	-24.2	-18.6	-15.5	-9.5	-5.1	-3.4	5.7
Relative Humidity (%) Average	744	80	9	-	44	70	77	80	86	91	95
Wind Speed 10 m (km/h) Average	744	8.6	4	-	0	3	5	9	11	14	23
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - PATRICIA McINNES (AMS 6)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
NMHC, CH4, THC	22 Dec 2015 10:00	22 Dec 2015 11:00	2	Maintenance - replaced fuel cylinder
NH3	01 Dec 2015 09:00	31 Dec 2015 09:00	30	Stabilization after daily span

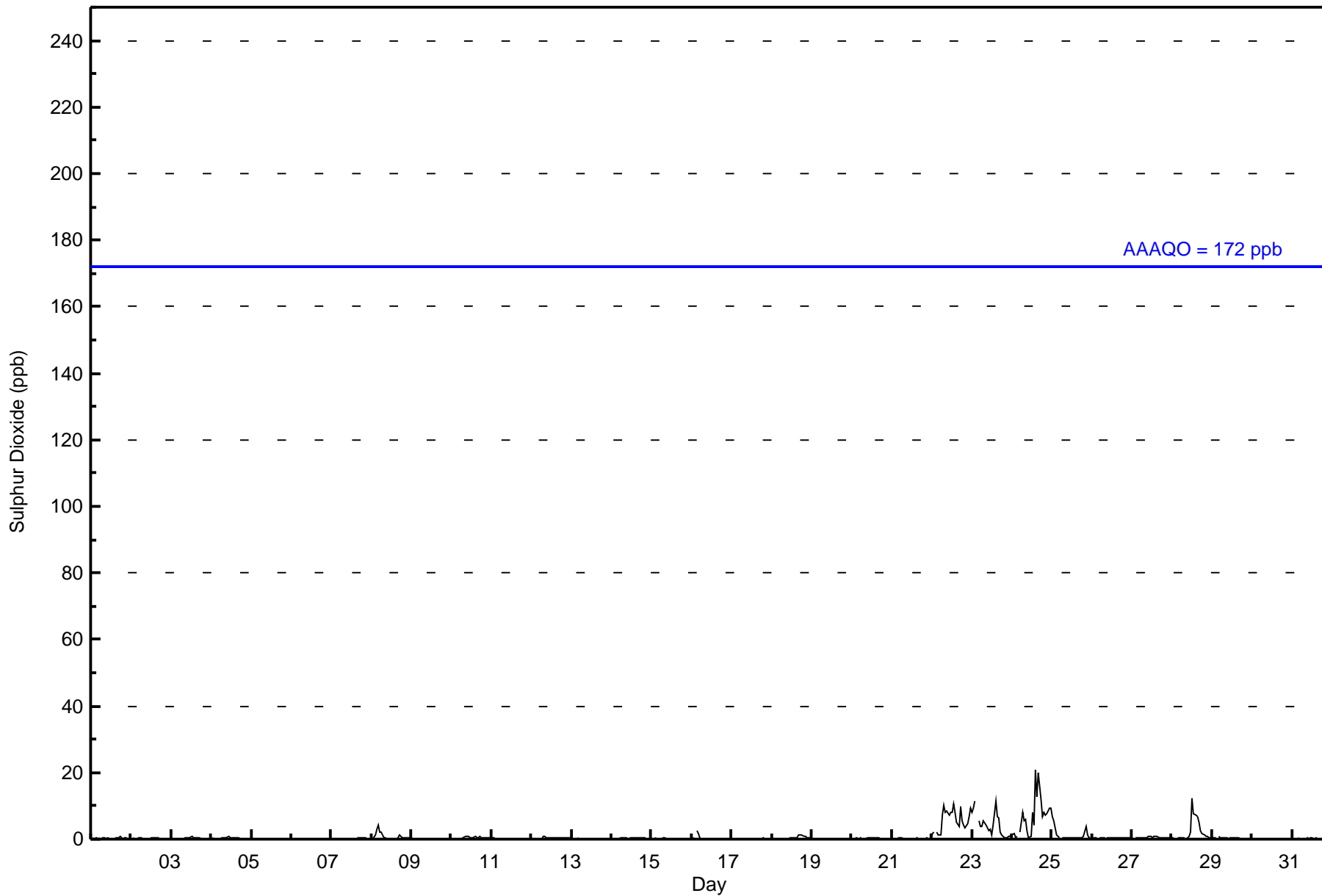


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 21 ppb on Dec 24 15:00	Maximum Daily Average: 6.8 ppb on Dec 24		Hours of Data:	707
Minimum Value: 0 ppb on Dec 5 23:00	Minimum Daily Average: 0.0 ppb on Dec 6		Hours of Missing Data:	37
Maximum Diurnal Average: 1.8 ppb at hour 15	Minimum Diurnal Average: 0.5 ppb at hour 4		Hours of Calibration:	37
Monthly Average: 0.9 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 2 P <sub>99</sub> = 11		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0.3	1
2-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0.2	1
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1
4-Dec	0	0	Z	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
7-Dec	0	0	0	0	0	Z	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	--	0
8-Dec	Z	0	1	3	4	2	2	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0.8	4
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
10-Dec	0	0	Z	0	0	0	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	0	0	0	0.4	1
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
12-Dec	0	0	0	0	Z	0	0	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.3	1
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Dec	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0.3	1
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Dec	0	1	Z	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	3
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	0	0.4	1
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
20-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
22-Dec	2	2	Z	2	1	1	7	10	8	8	7	8	8	10	8	5	4	10	5	4	4	5	7	9	5.9	10
23-Dec	8	9	11	Z	5	4	4	5	4	3	3	3	1	4	11	7	6	2	1	1	0	0	1	1	4.2	11
24-Dec	1	2	0	1	Z	2	8	6	6	3	1	1	8	4	21	13	20	12	7	8	7	8	9	9	6.8	21
25-Dec	7	5	3	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	1	0	0	1.2	7
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0.3	1
27-Dec	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	0.5	1
28-Dec	1	0	Z	1	0	0	0	0	0	0	1	2	12	8	7	7	5	3	2	1	1	1	1	0	2.3	12
29-Dec	0	0	0	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0

0.8	0.9	0.7	0.5	0.7	0.6	0.9	0.9	0.8	0.7	0.6	0.7	1.2	1.1	1.8	1.2	1.4	1.1	0.7	0.6	0.7	0.6	0.7	0.8	Diurnal Average
8	9	11	3	5	4	8	10	8	8	7	8	12	10	21	13	20	12	7	8	7	8	9	9	Diurnal Maximum

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Patricia McInnes - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	700	99.01	99.01
11 - 20	6	0.85	99.86
21 - 60	1	0.14	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



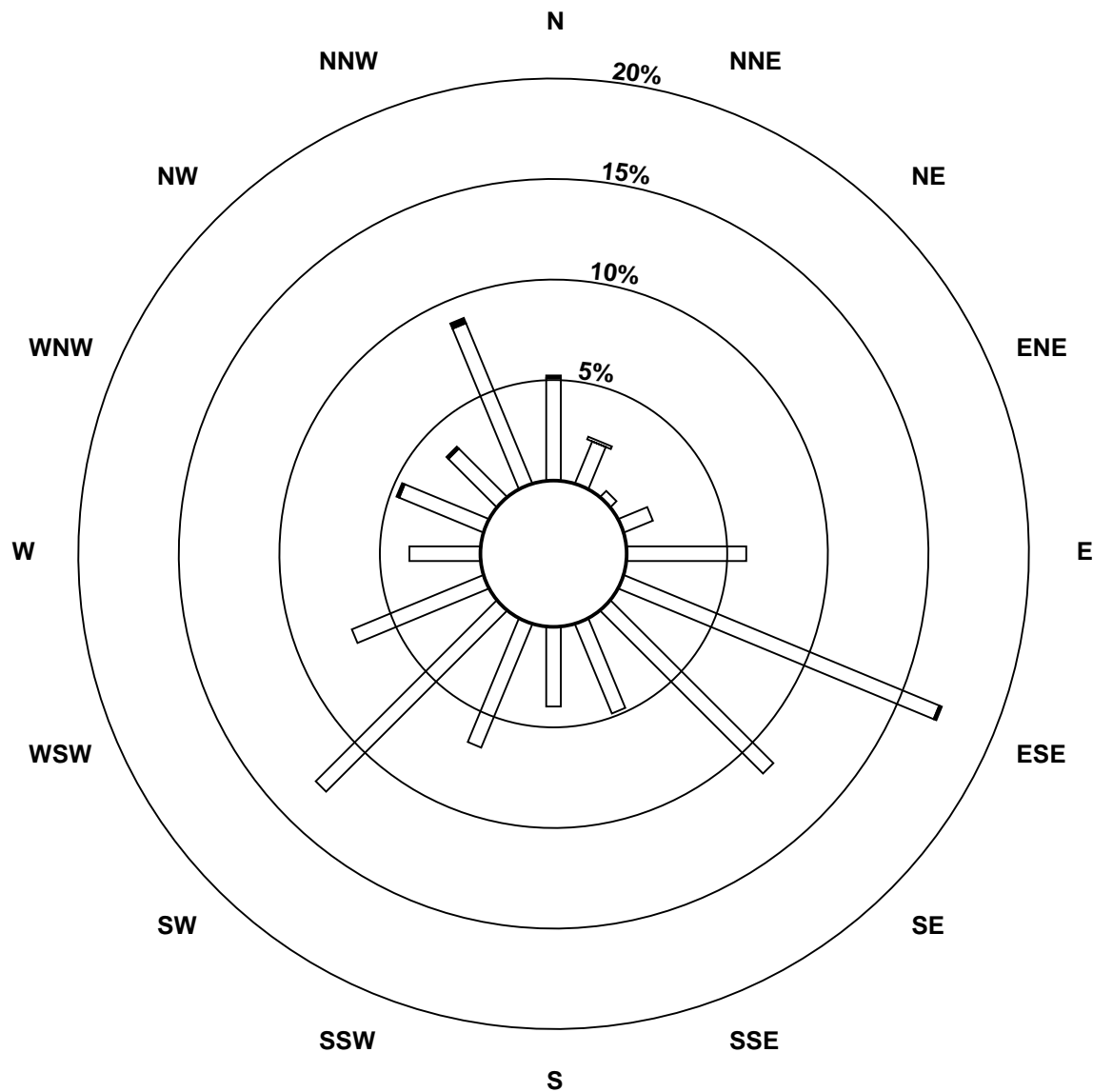
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Patricia McInnes - December 2015**

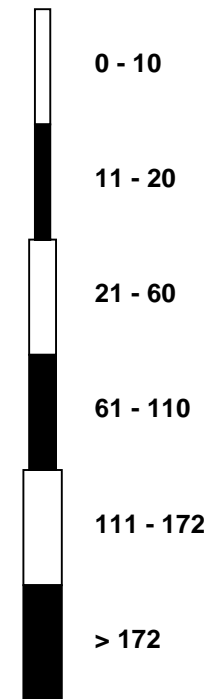
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	36	16	3	11	42	120	81	34	28	47	90	50	25	32	24	61	700
11 - 20	1	0	0	0	0	1	0	0	0	0	0	0	0	1	1	2	6
21 - 60	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	<b>37</b>	<b>17</b>	<b>3</b>	<b>11</b>	<b>42</b>	<b>121</b>	<b>81</b>	<b>34</b>	<b>28</b>	<b>47</b>	<b>90</b>	<b>50</b>	<b>25</b>	<b>33</b>	<b>25</b>	<b>63</b>	<b>707</b>

Total Number of Valid Hours: 707

Total Number of Hours: 744

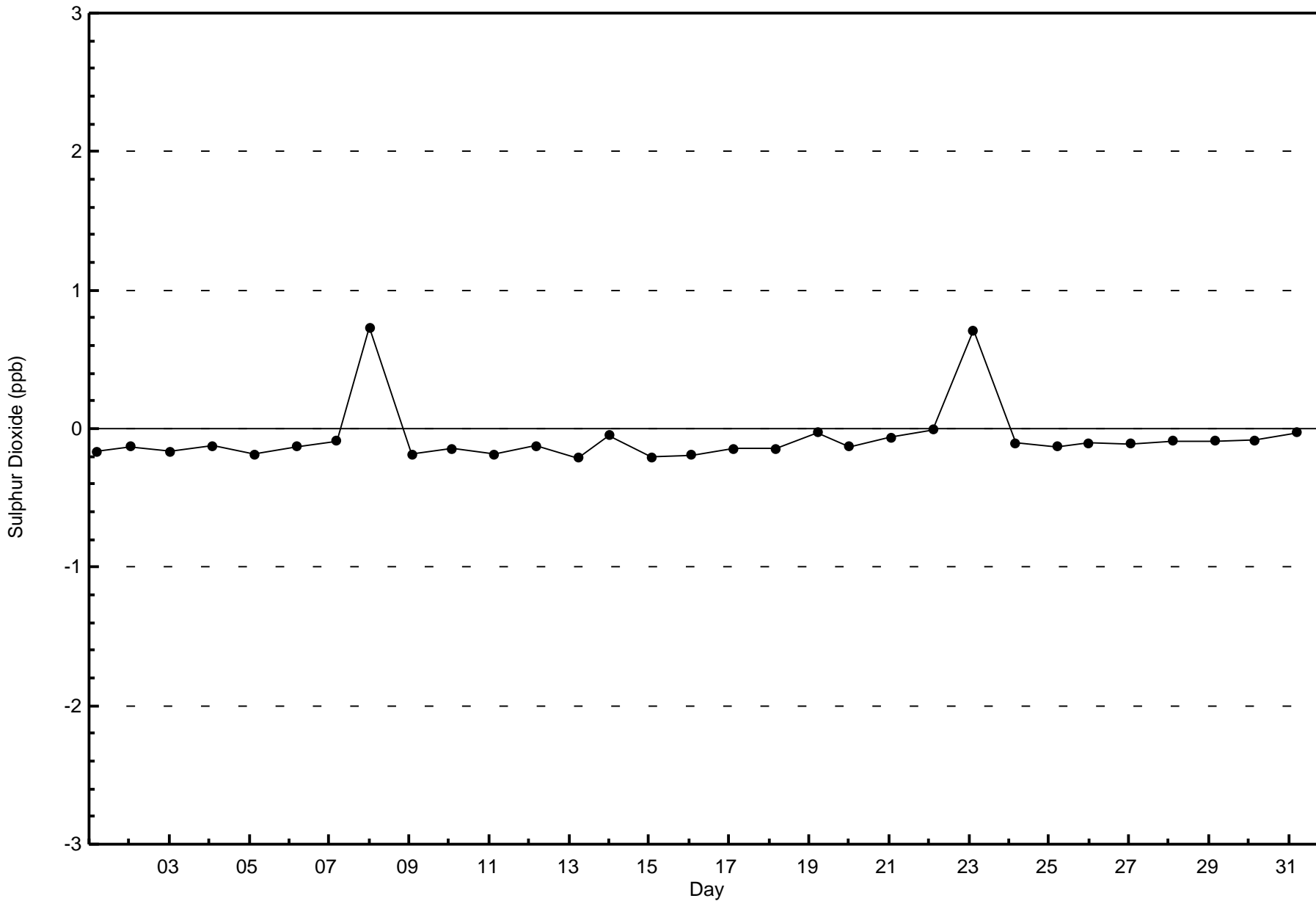


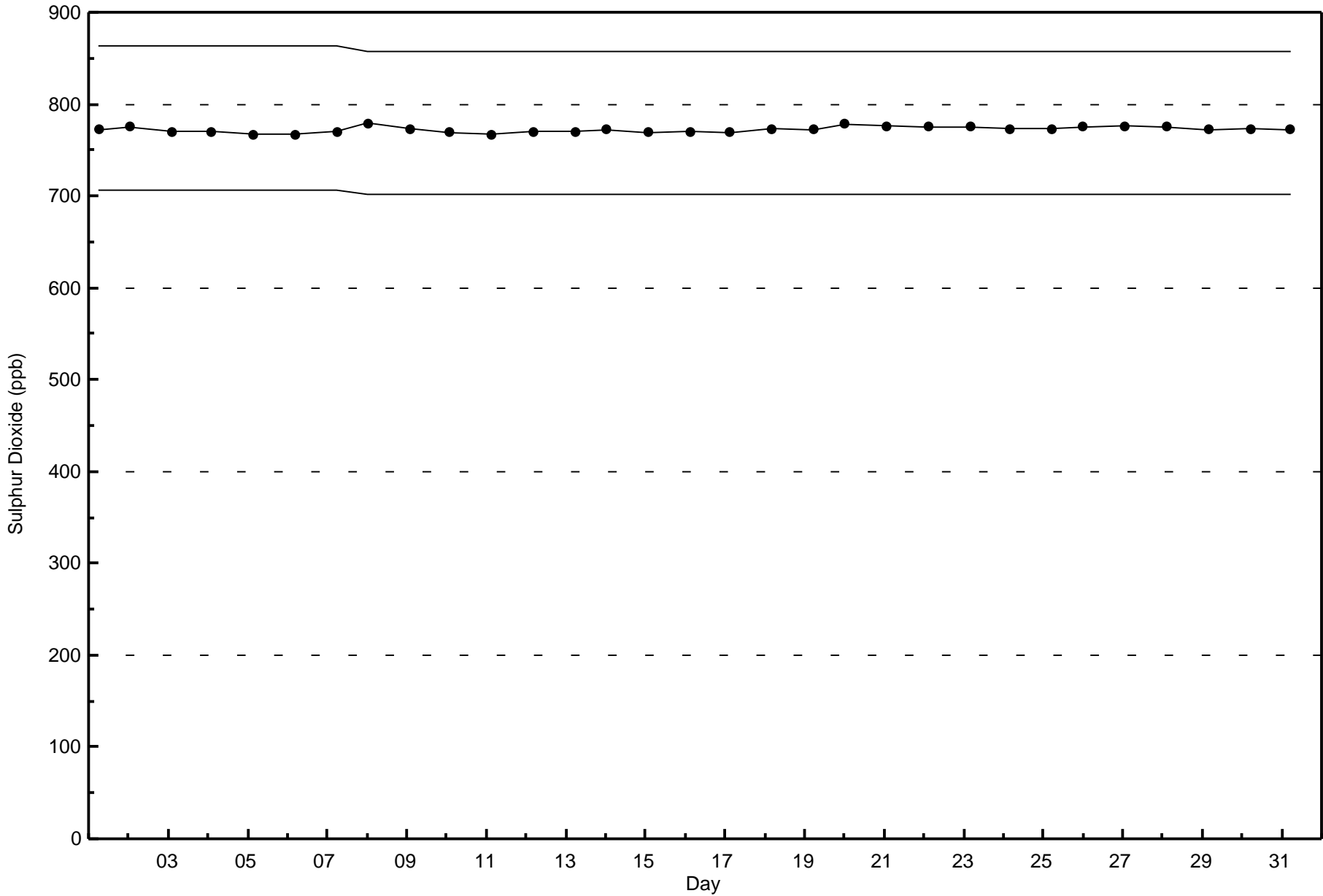
Classes (ppb)



Total Number of Valid Hours: 707









Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

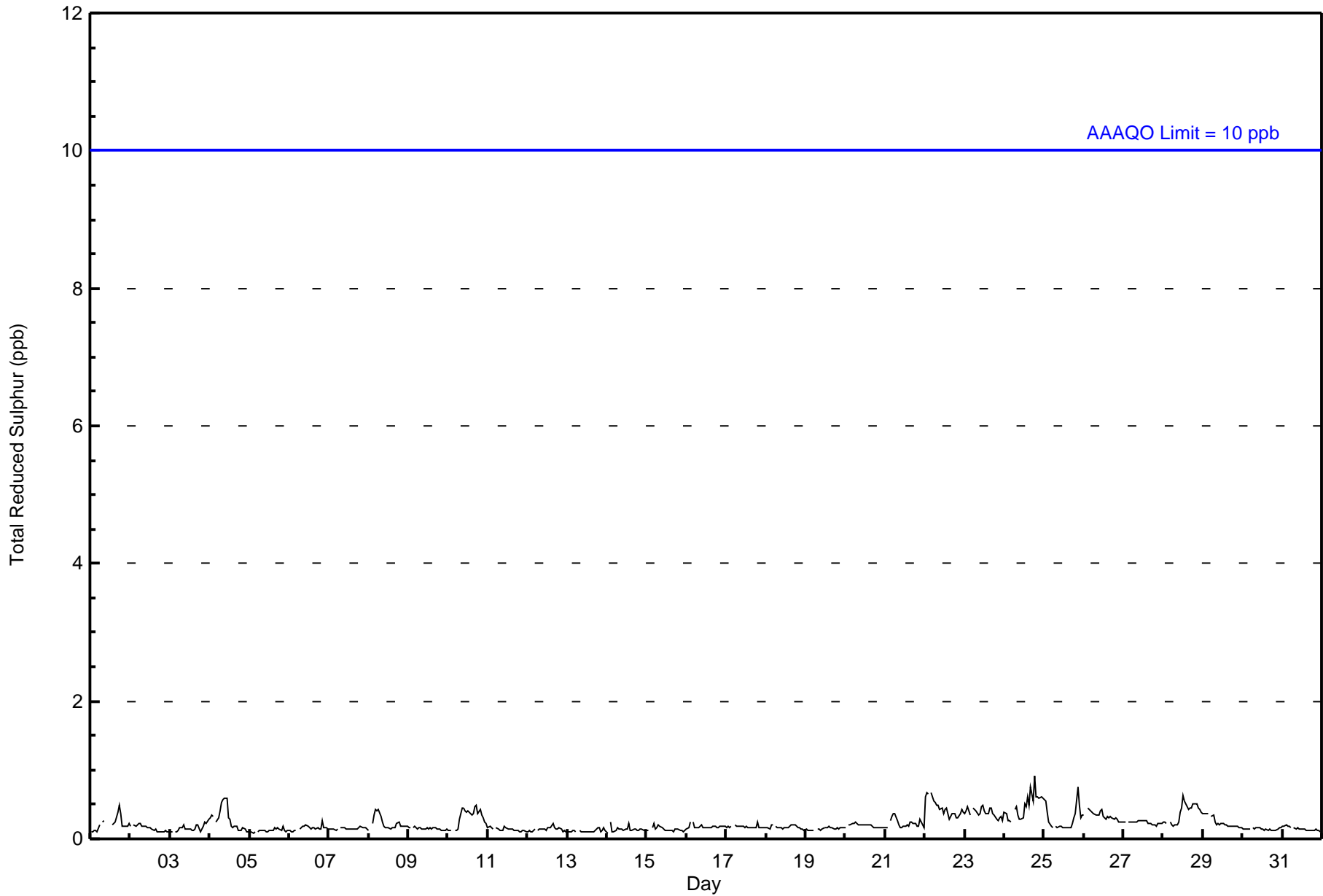
Patricia McInnes - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 1 ppb on Dec 24 19:00	Maximum Daily Average: 0.5 ppb on Dec 24		Hours of Data:	709
Minimum Value: 0 ppb on Dec 14 01:00	Minimum Daily Average: 0.1 ppb on Dec 13		Hours of Missing Data:	35
Maximum Diurnal Average: 0.2 ppb at hour 7	Minimum Diurnal Average: 0.2 ppb at hour 4		Hours of Calibration:	35
Monthly Average: 0.2 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 1		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	0	Z	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.2	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	0	0	Z	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
22-Dec	1	1	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	0.5	1
25-Dec	1	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	1	0	0	0	0	0.4	1
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
30-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0

0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	Diurnal Average
1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	Diurnal Maximum

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb    24-hr 3 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Patricia McInnes - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	709	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Patricia McInnes - December 2015**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 2	35	17	3	11	42	120	86	32	28	47	89	53	26	31	25	64	709
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	35	17	3	11	42	120	86	32	28	47	89	53	26	31	25	64	709

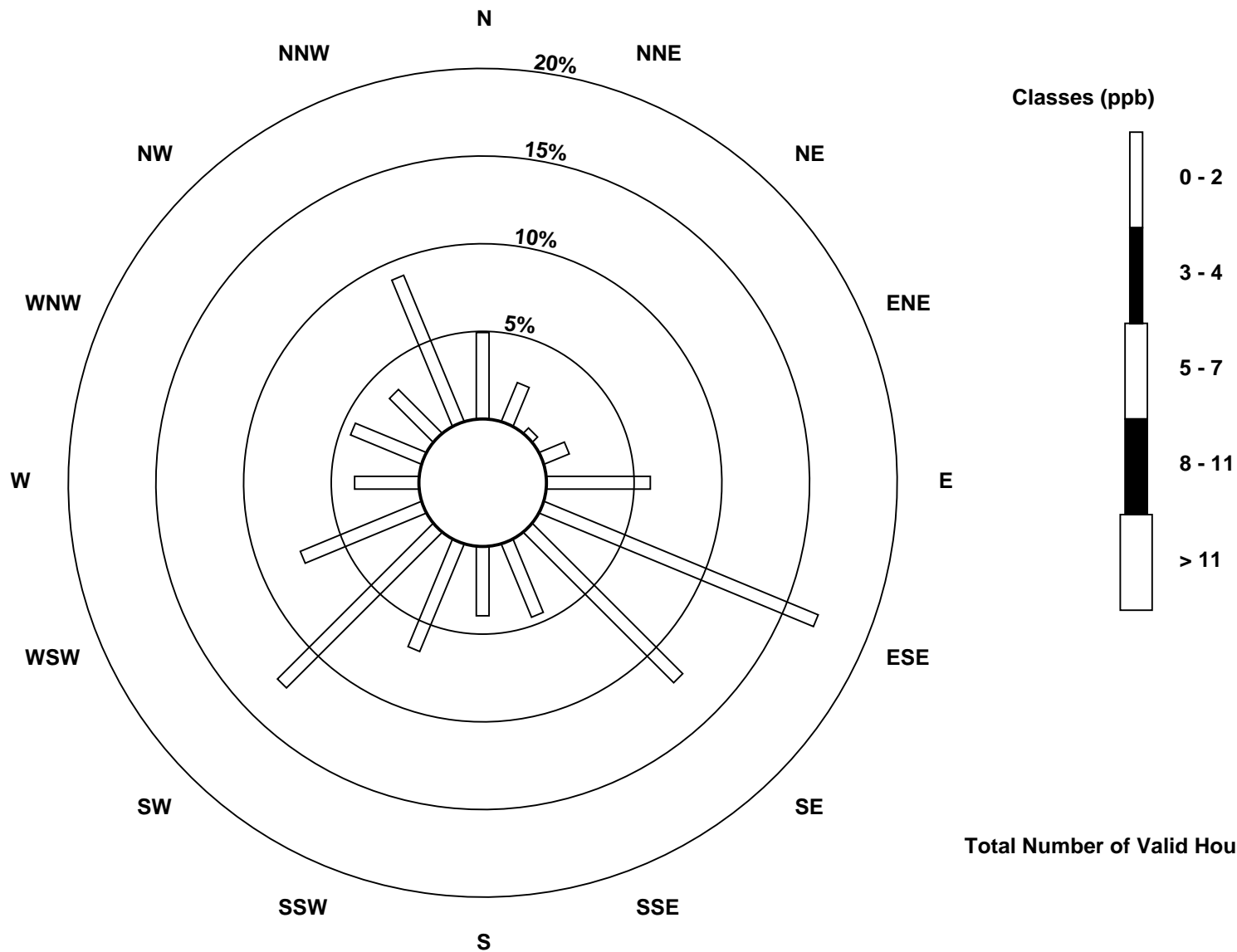
Total Number of Valid Hours: 709

Total Number of Hours: 744

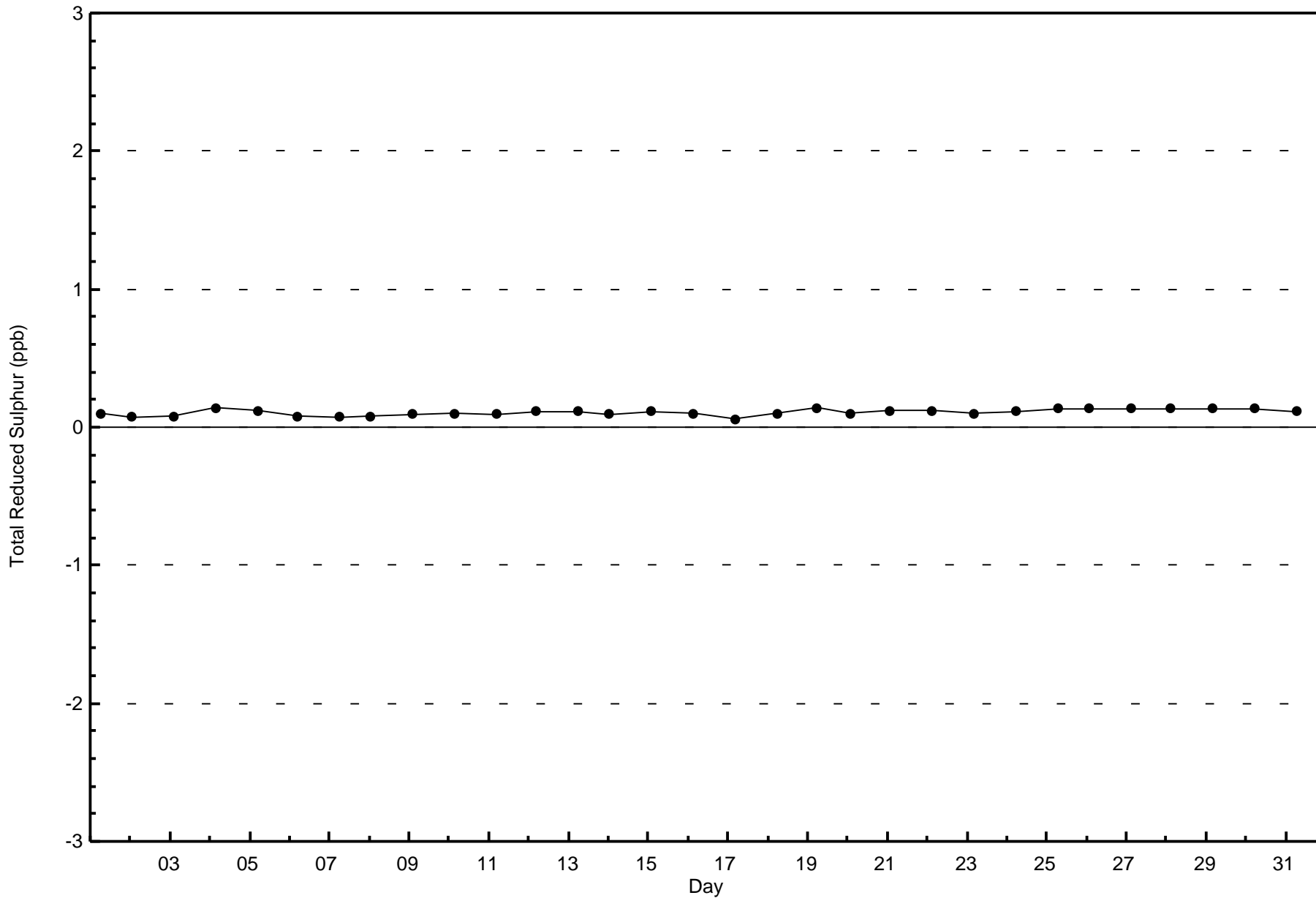


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

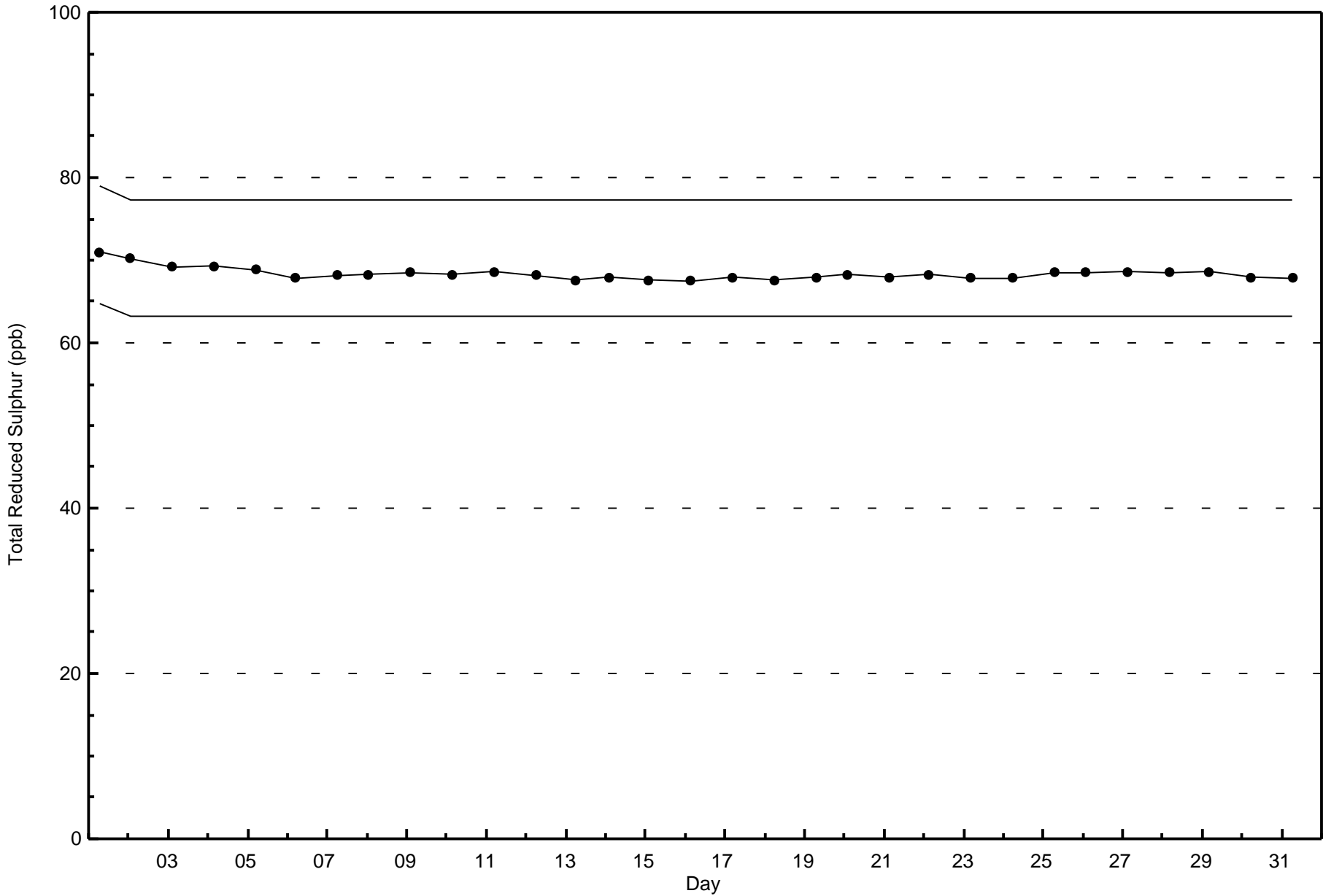
Total Reduced Sulphur (TRS) - ppb  
Patricia McInnes (AMS 6)



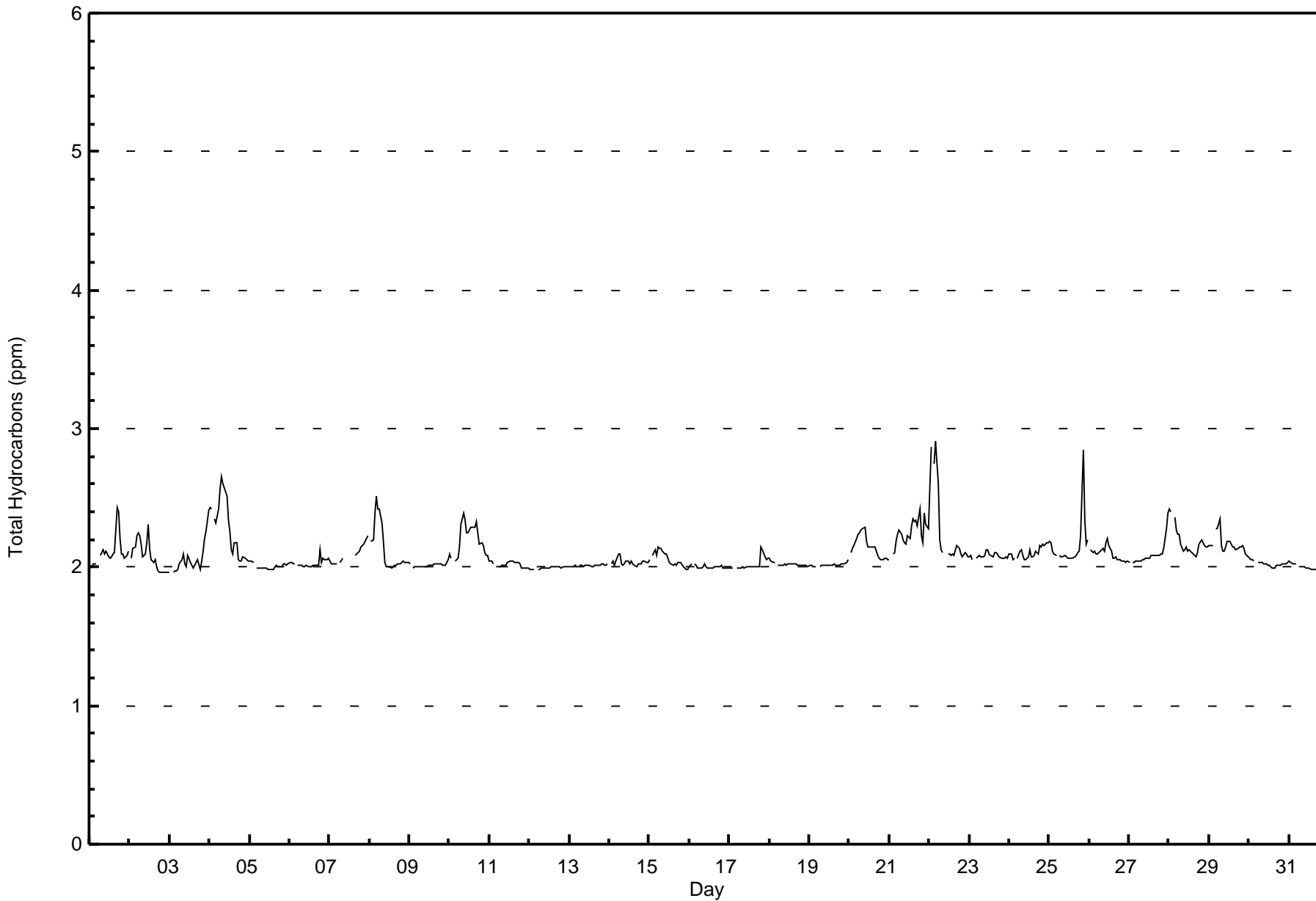
Total Number of Valid Hours: 709













**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Patricia McInnes - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	362	51.35	51.35
2.1 - 3.0	343	48.65	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 705

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Patricia McInnes - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 2.0	4	4	2	10	34	91	40	6	12	16	49	35	21	28	9	1	362
2.1 - 3.0	33	13	1	1	8	30	41	28	16	31	41	15	4	5	16	60	343
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	<b>37</b>	<b>17</b>	<b>3</b>	<b>11</b>	<b>42</b>	<b>121</b>	<b>81</b>	<b>34</b>	<b>28</b>	<b>47</b>	<b>90</b>	<b>50</b>	<b>25</b>	<b>33</b>	<b>25</b>	<b>61</b>	<b>705</b>

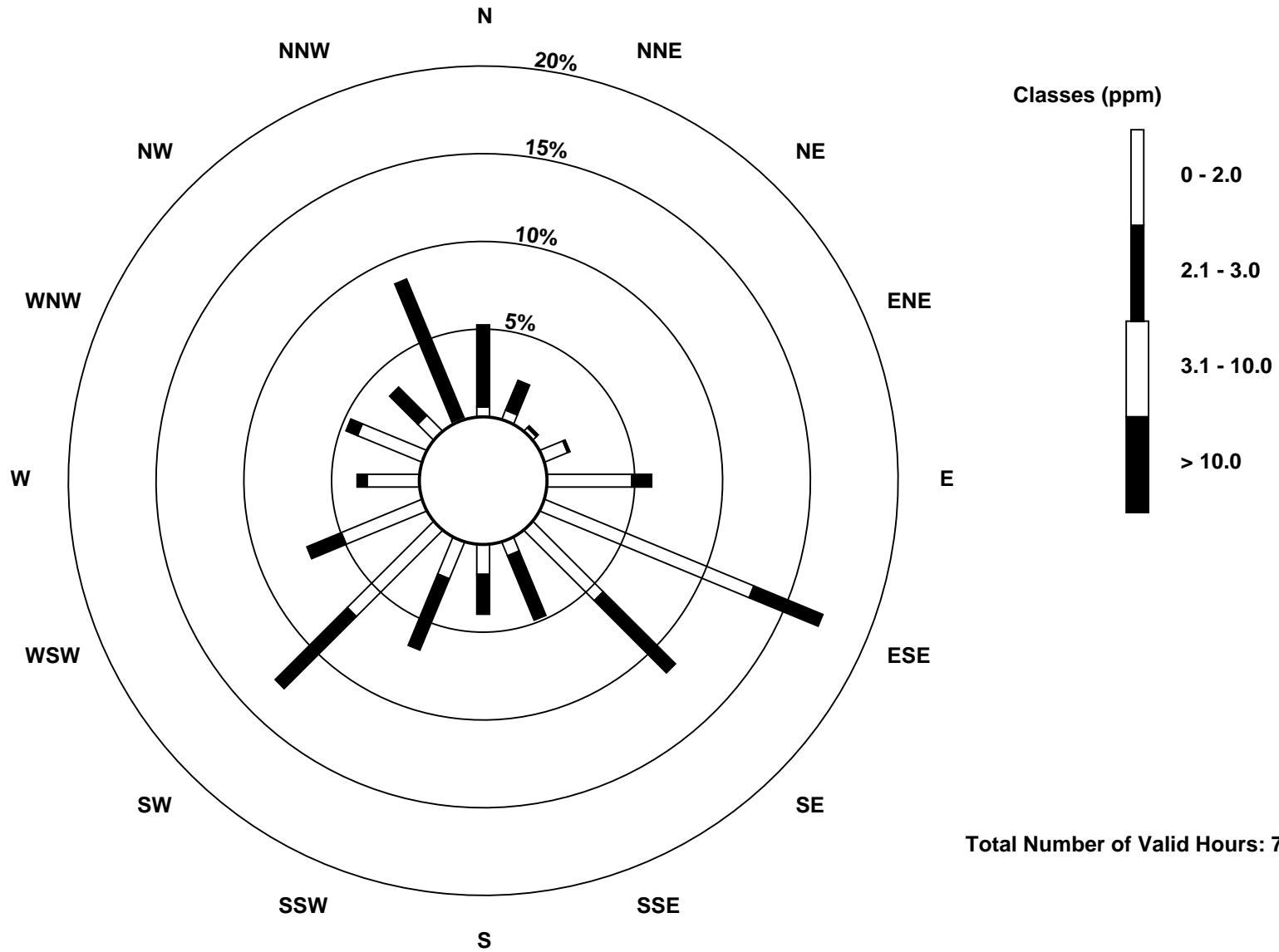
Total Number of Valid Hours: 705

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

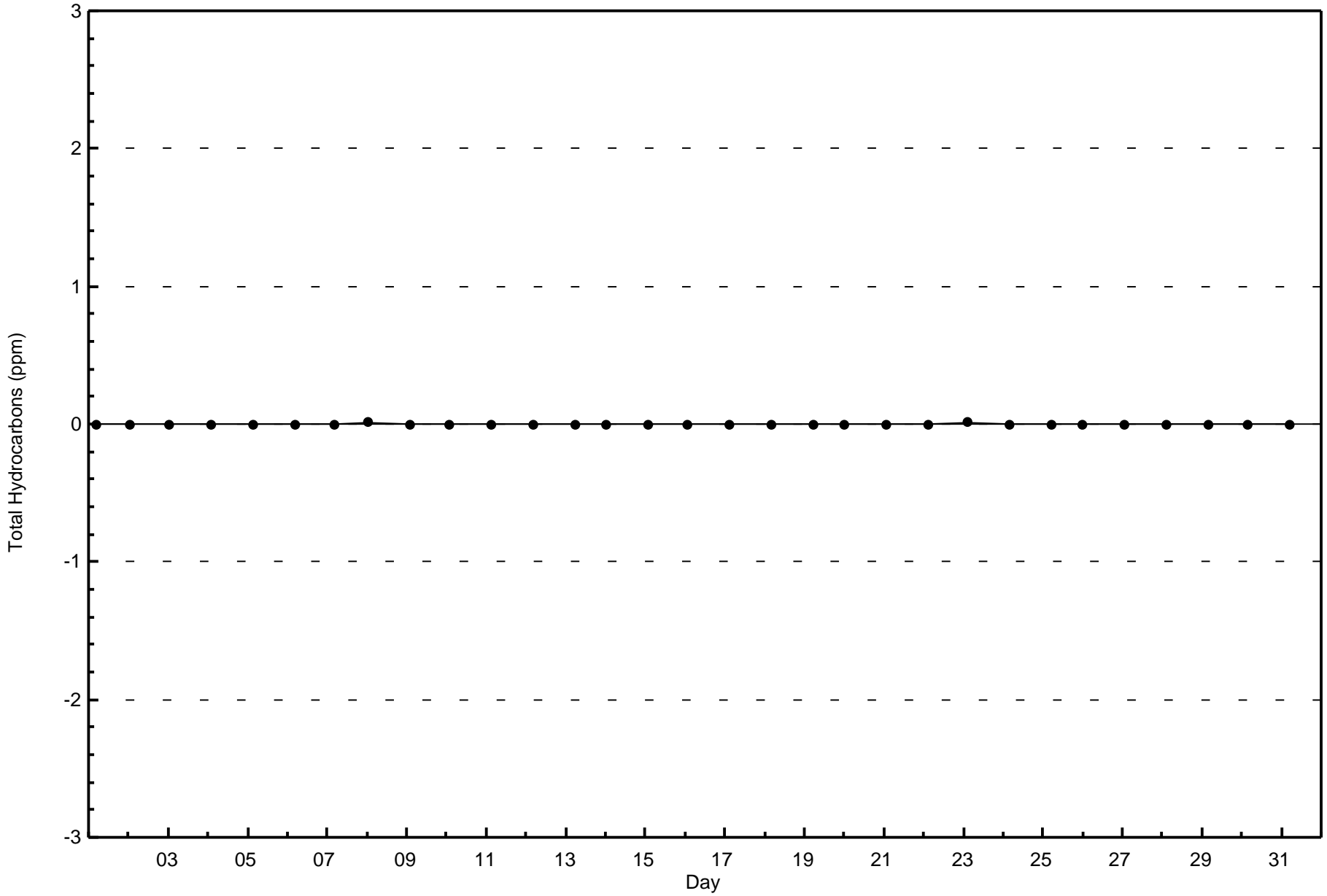
Total Hydrocarbons (THC) - ppm  
Patricia McInnes (AMS 6)

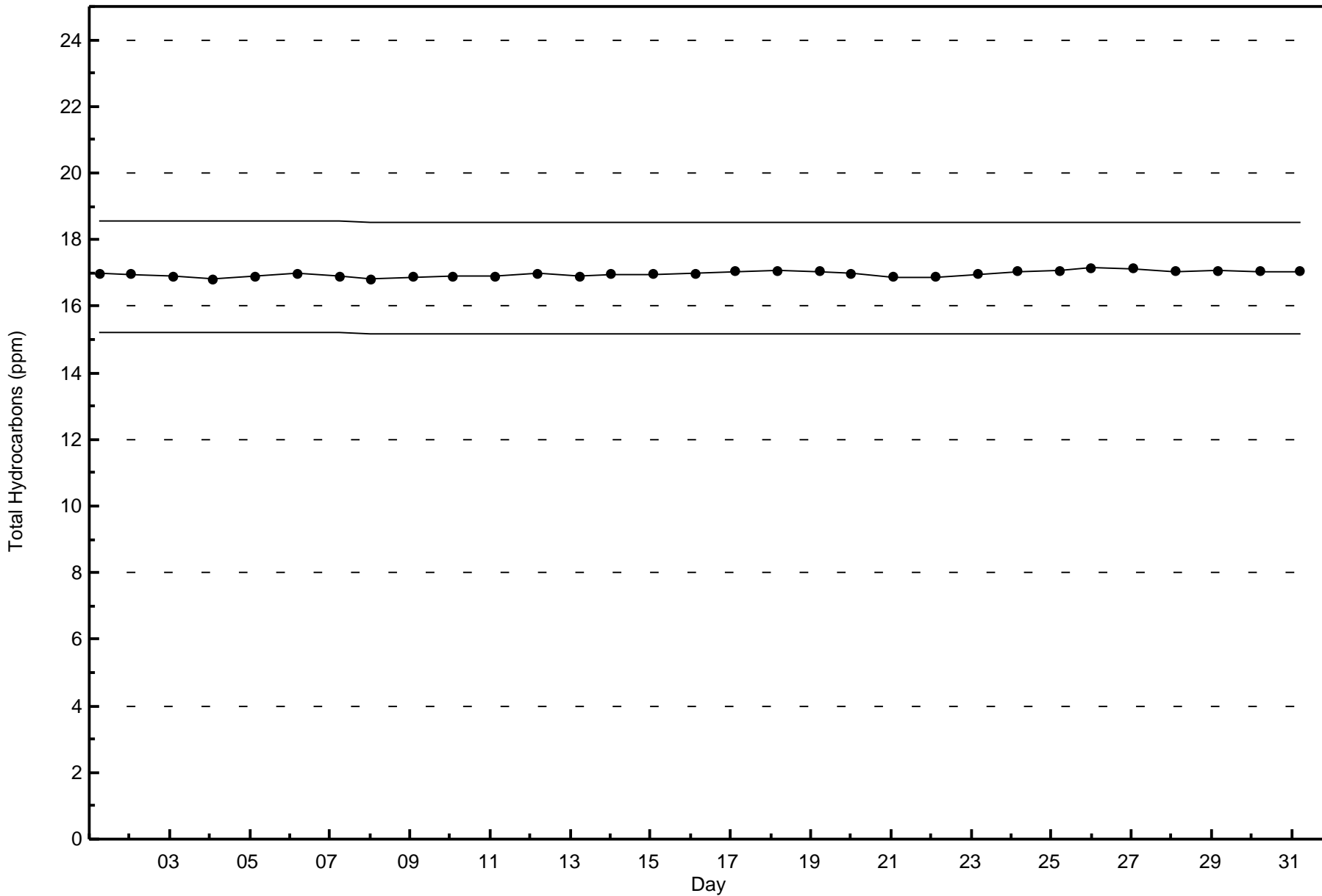




Wood Buffalo Environmental Association  
Zero Responses

Total Hydrocarbons (THC) - ppm  
Patricia McInnes - December 2015

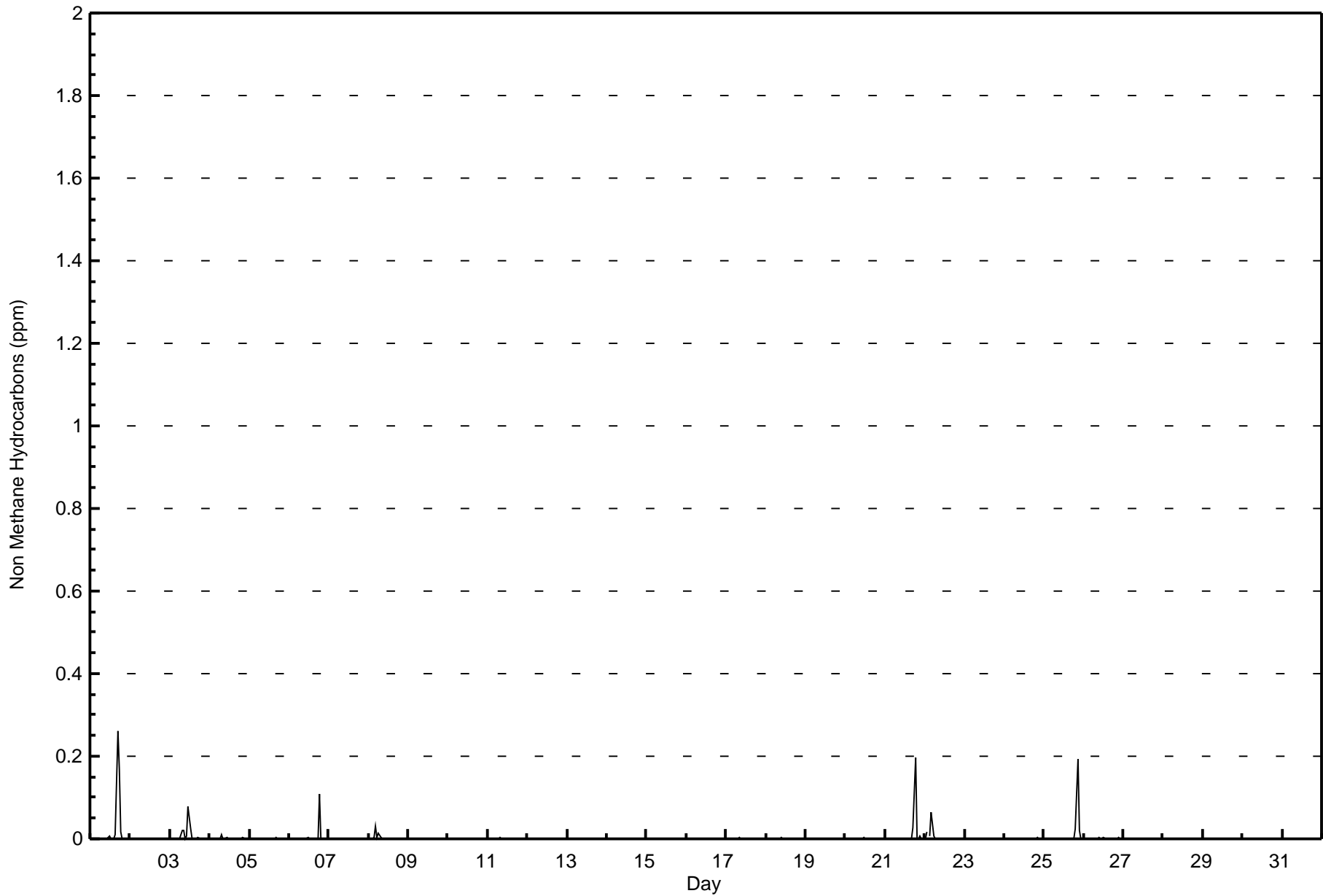








Maximum Value: 0.261 ppm on Dec 1 17:00		Maximum Daily Average: 0.020 ppm on Dec 1		Hours in Service: 744																							
Minimum Value: 0.000 ppm on Dec 1 01:00		Minimum Daily Average: 0.000 ppm on Dec 2		Hours of Data: 705																							
Maximum Diurnal Average: 0.010 ppm at hour 19		Minimum Diurnal Average: 0.000 ppm at hour 1		Hours of Missing Data: 39																							
Monthly Average: 0.002 ppm		Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.1		Hours of Calibration: 37																							
				Percent Operational Time: 99.7																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.000	0.000	0.011	0.261	0.168	0.018	0.000	0.000	0.000	0.000	0.000	0.020	0.261	
2-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.021	0.019	0.000	0.008	0.079	0.024	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.079	
4-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.001	0.010	0.002	0.001	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.003	0.000	0.000	0.000	0.001	0.010	
5-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	
6-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.109	0.001	0.000	0.002	0.000	0.000	0.005	0.109	
7-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	C	C	C	C	C	C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	--	0.000	
8-Dec	Z	0.000	0.000	0.002	0.030	0.005	0.015	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.030	
9-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
10-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	
11-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	
12-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
13-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
14-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
15-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
16-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
17-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	
18-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	
19-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
20-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	
21-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.027	0.196	0.002	0.000	0.008	0.000	0.000	0.010	0.196	
22-Dec	0.000	0.016	Z	0.006	0.063	0.008	0.000	0.000	0.000	0.000	M	M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.063	
23-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
24-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.003	
25-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.024	0.192	0.022	0.000	0.000	0.010	0.192	
26-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.004	
27-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
28-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
29-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
30-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
31-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan                      C - Calibration                      M - Maintenance																											





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm**  
**Patricia McInnes - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.005	681	96.60	96.60
0.006 - 0.05	17	2.41	99.01
0.06 - 0.1	3	0.43	99.43
> 0.1	4	0.57	100.00

Total Number of Valid Hours: 705

Total Number of Hours: 744



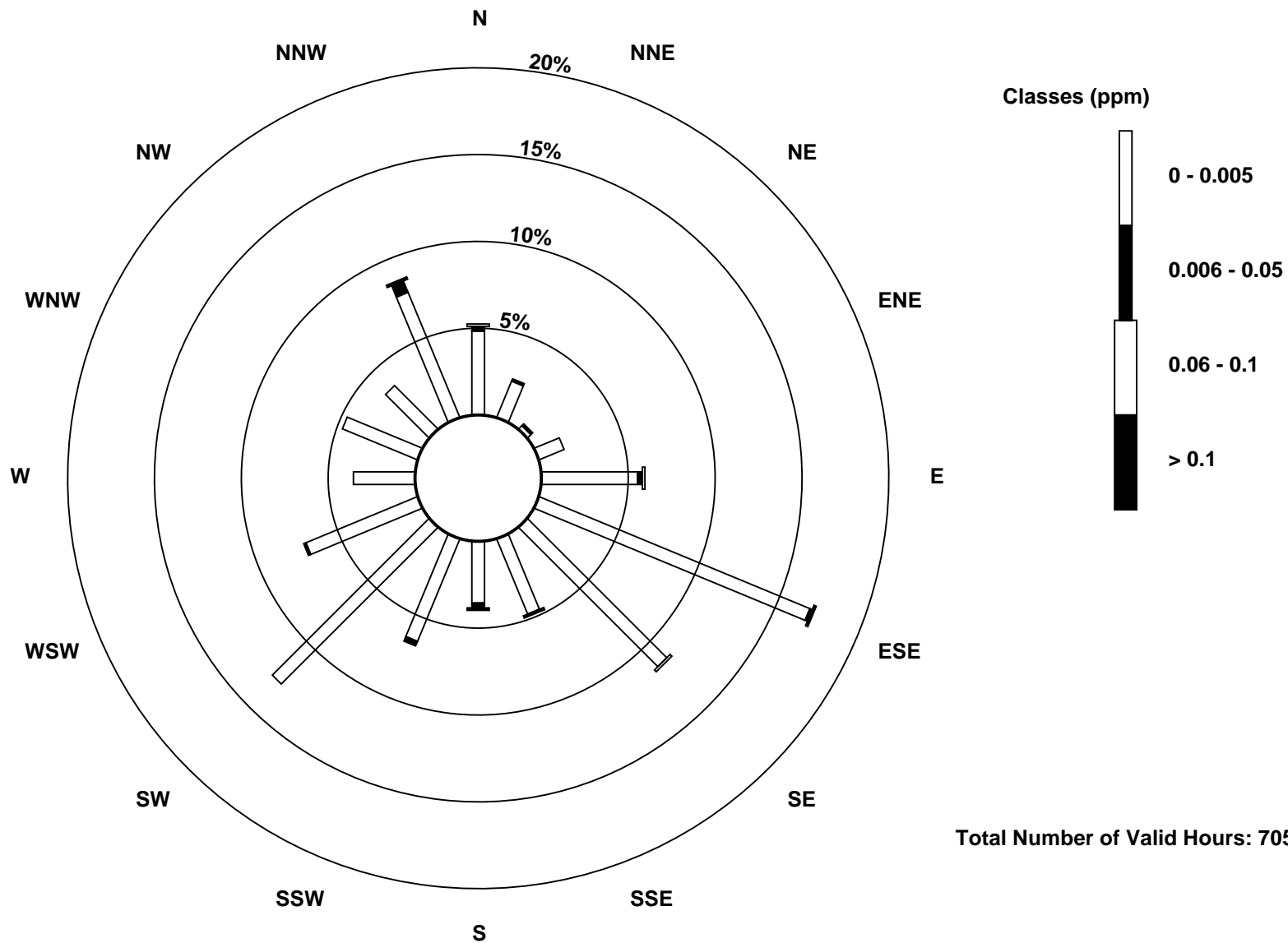
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

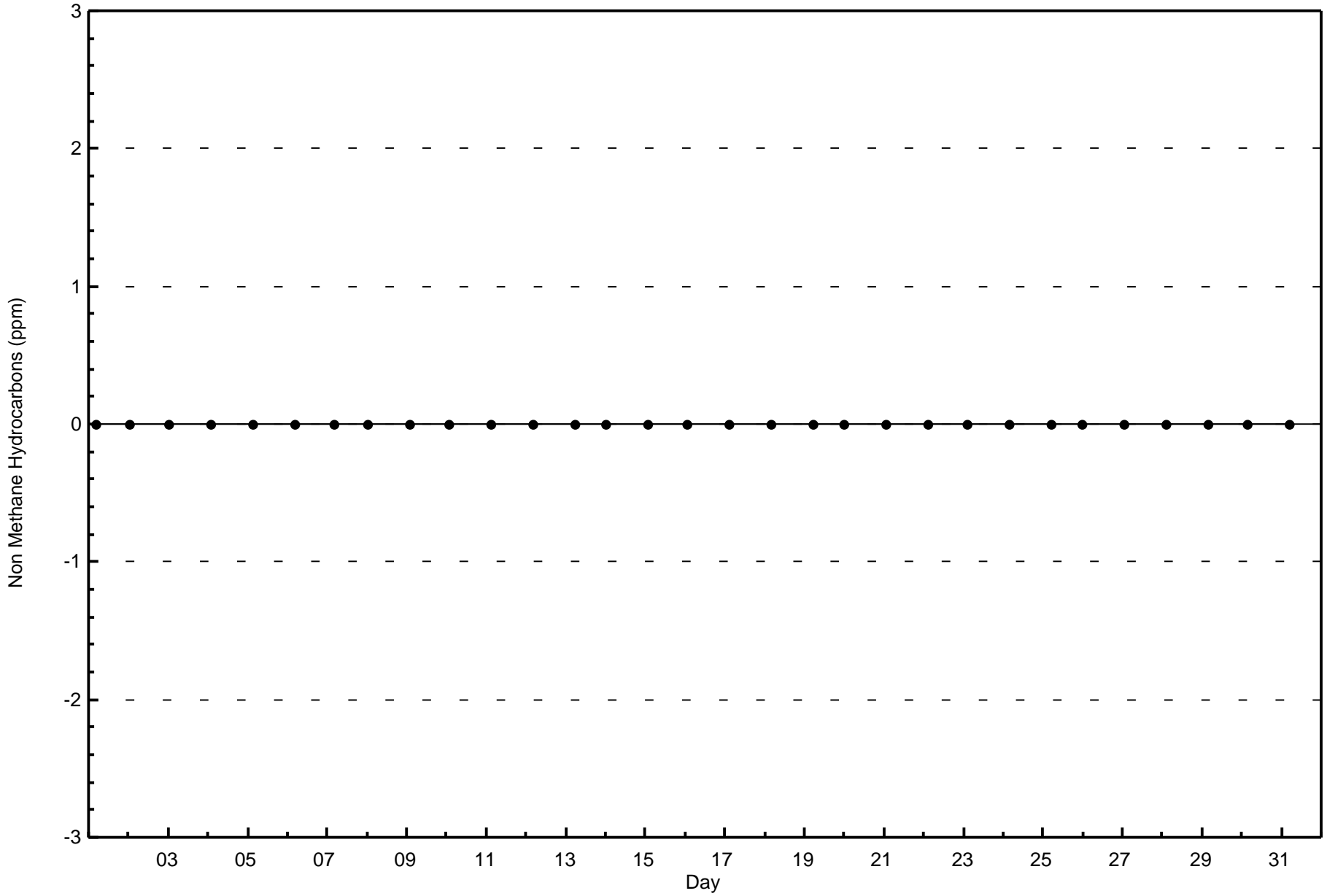
**Non Methane Hydrocarbons (NMHC) - ppm**  
**Patricia McInnes - December 2015**

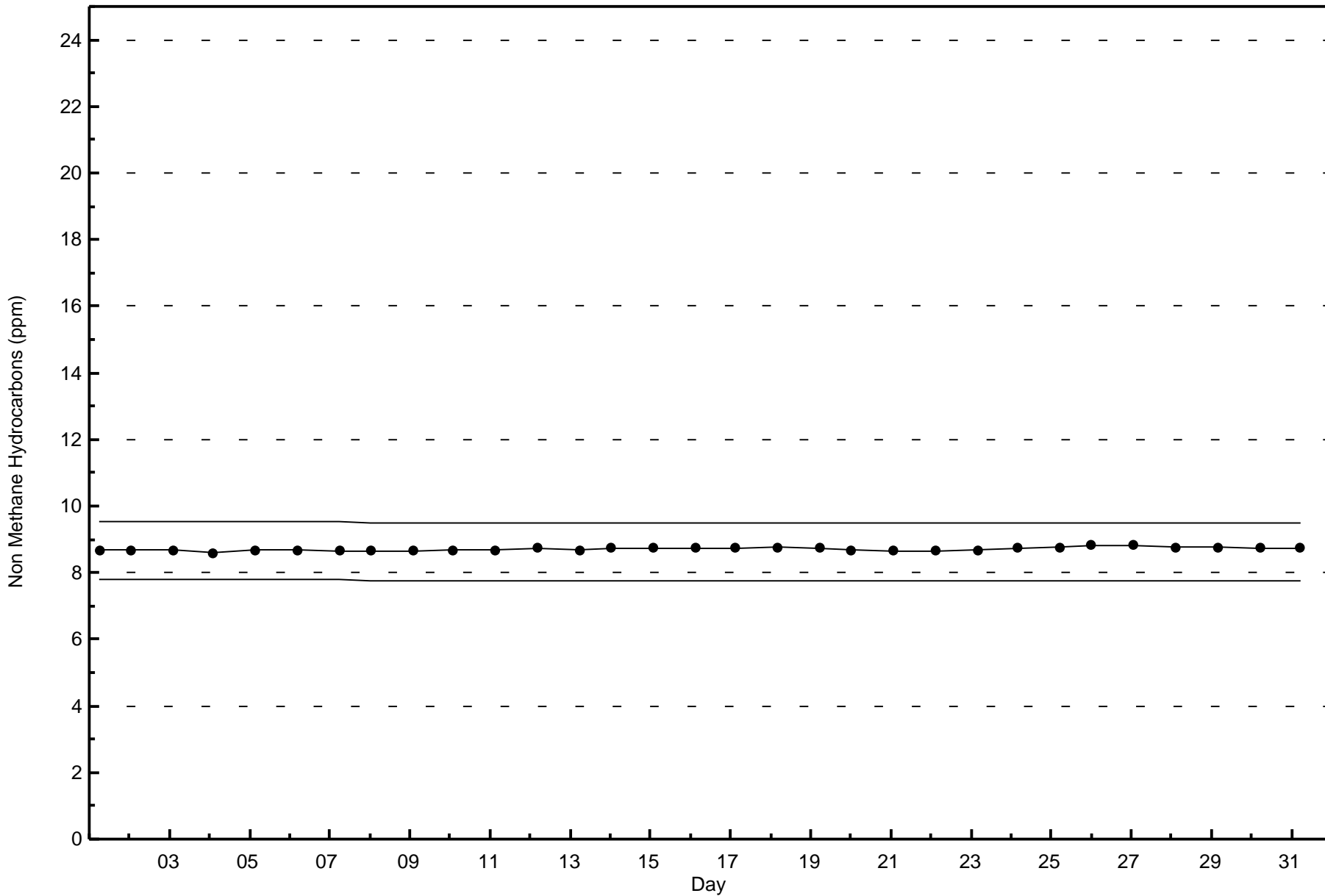
<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 0.005	34	16	2	11	39	119	80	33	25	45	90	49	25	33	25	55	681
0.006 - 0.05	2	1	1	0	2	1	0	0	2	2	0	1	0	0	0	5	17
0.06 - 0.1	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	3
> 0.1	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	1	4
<b>Totals</b>	<b>37</b>	<b>17</b>	<b>3</b>	<b>11</b>	<b>42</b>	<b>121</b>	<b>81</b>	<b>34</b>	<b>28</b>	<b>47</b>	<b>90</b>	<b>50</b>	<b>25</b>	<b>33</b>	<b>25</b>	<b>61</b>	<b>705</b>

Total Number of Valid Hours: 705

Total Number of Hours: 744

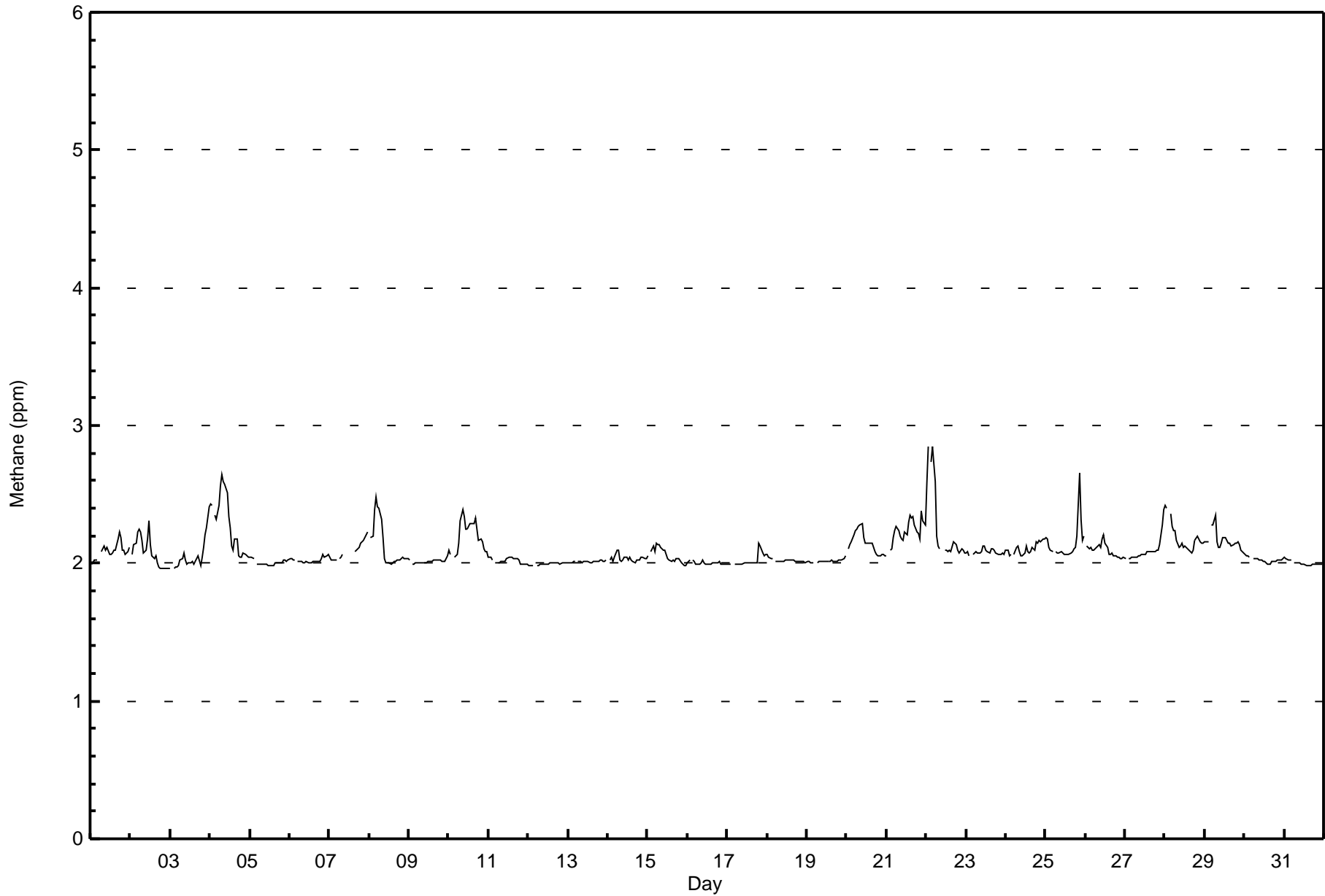














**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm**  
**Patricia McInnes - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	365	51.77	51.77
2.1 - 3.0	340	48.23	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 705

Total Number of Hours: 744



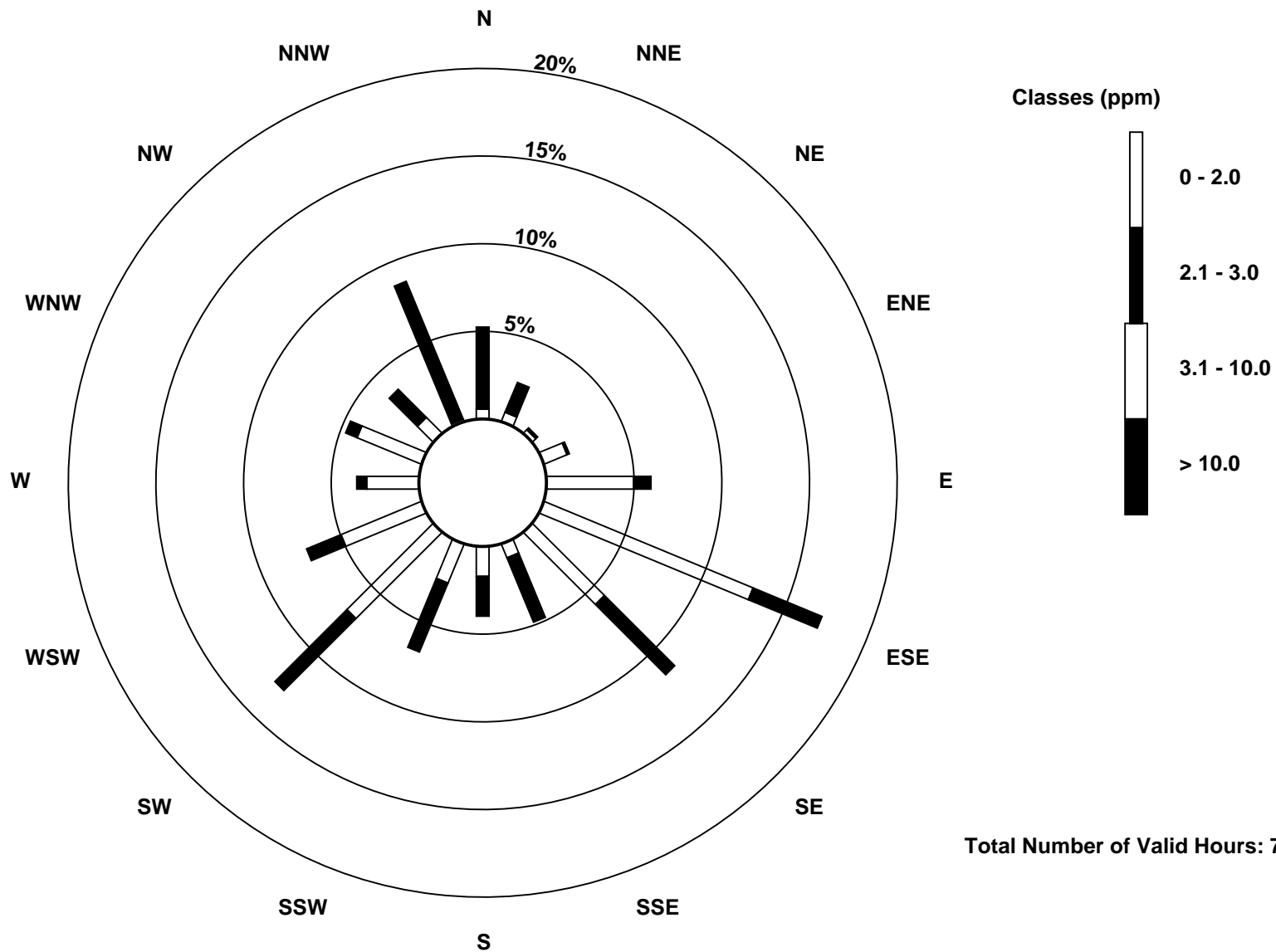
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

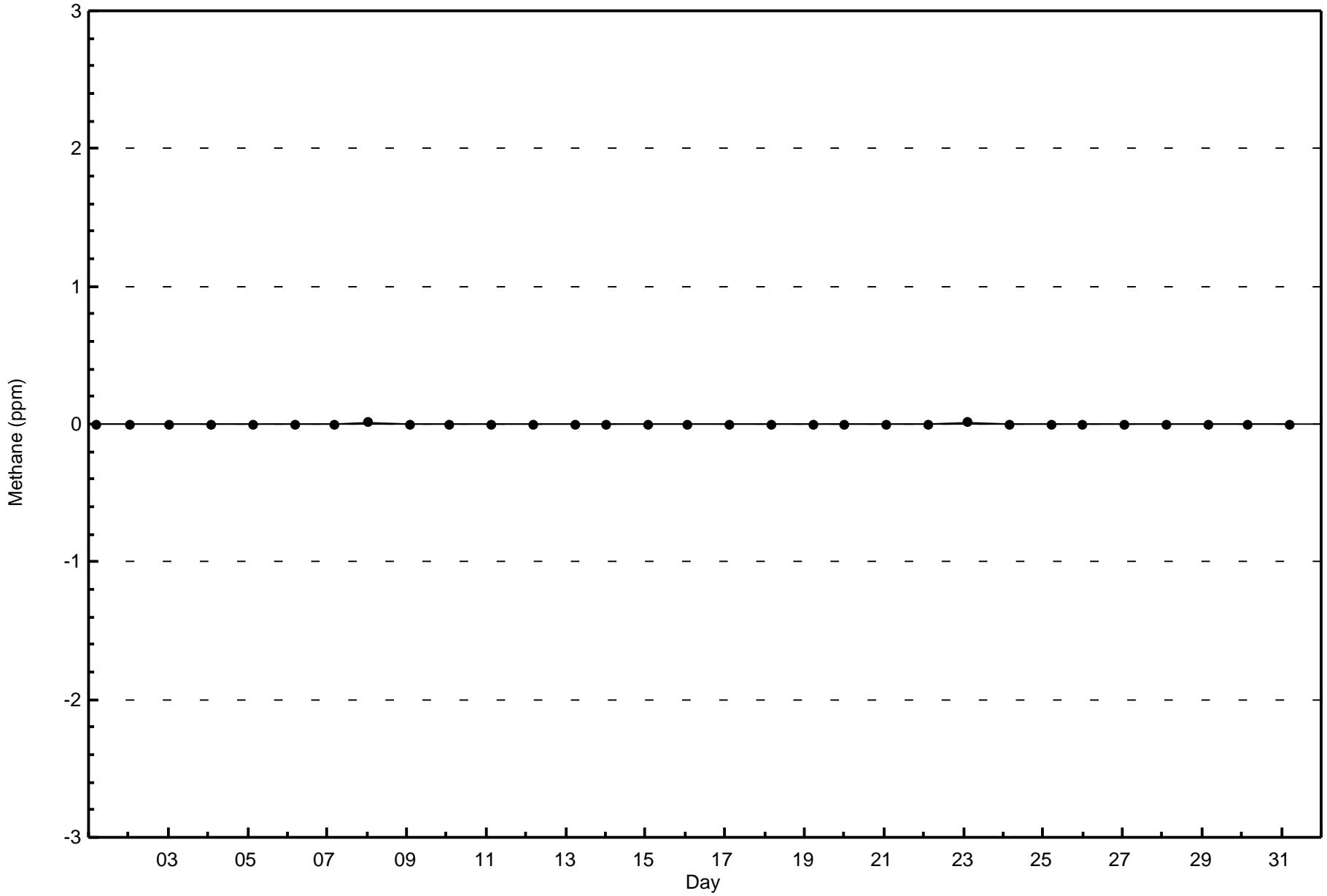
**Methane (CH<sub>4</sub>) - ppm**  
**Patricia McInnes - December 2015**

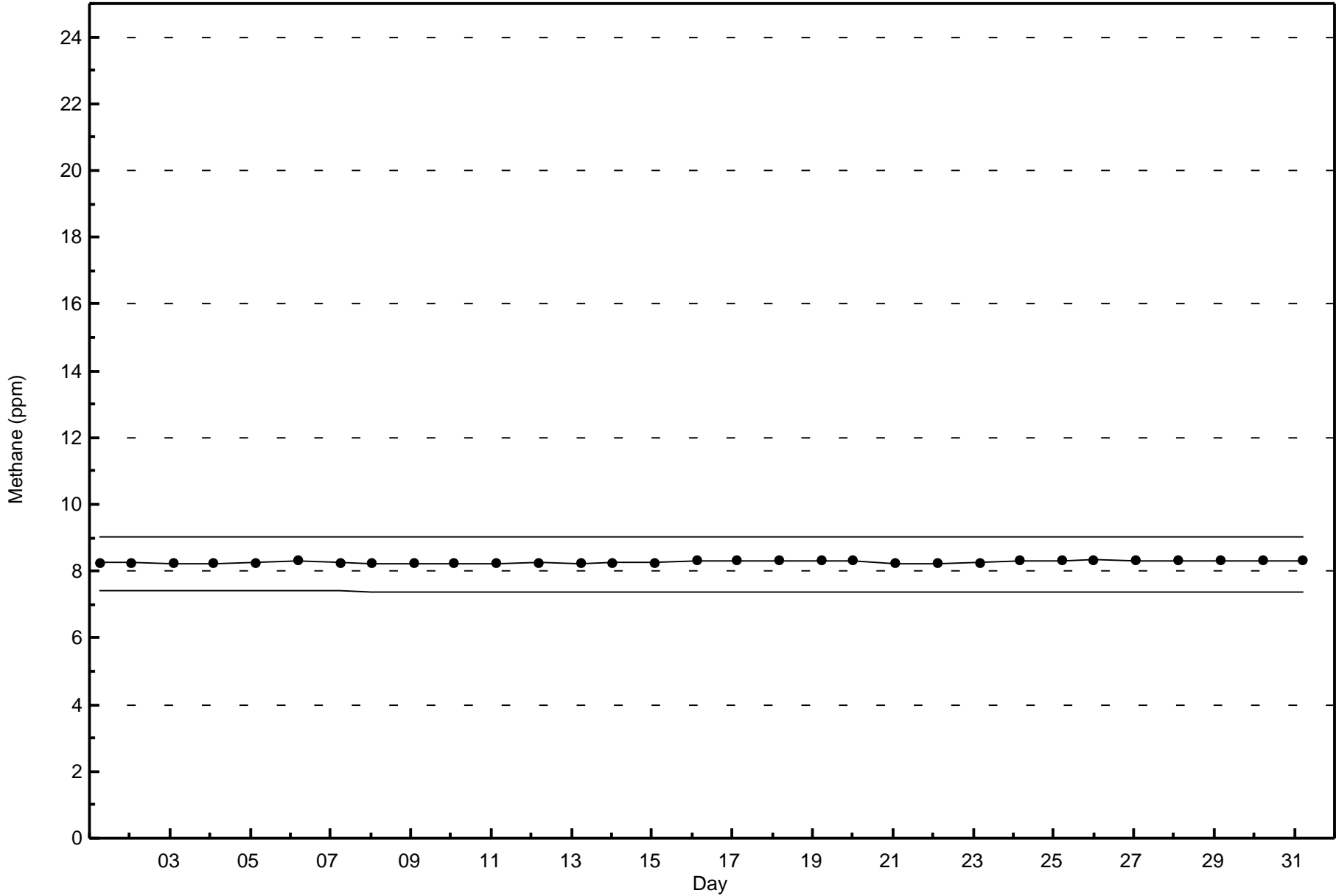
Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	4	4	2	10	35	91	41	6	12	17	49	35	21	28	9	1	365
2.1 - 3.0	33	13	1	1	7	30	40	28	16	30	41	15	4	5	16	60	340
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	37	17	3	11	42	121	81	34	28	47	90	50	25	33	25	61	705

Total Number of Valid Hours: 705

Total Number of Hours: 744





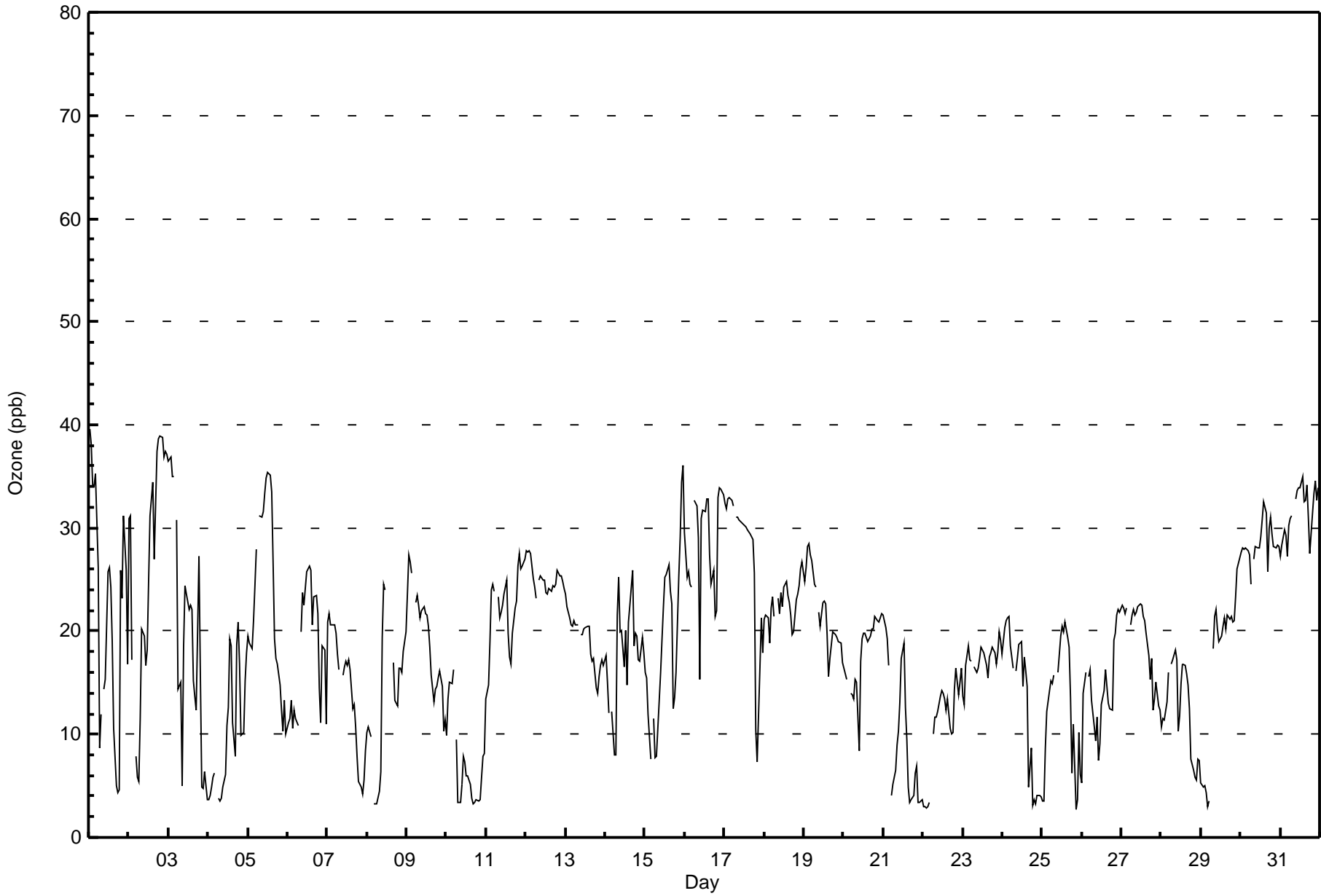




Summary of Hour Averages

Patricia McInnes - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																																							
Maximum Value: 40 ppb on Dec 1 01:00										Maximum Daily Average: 31.6 ppb on Dec 31										Hours of Data: 709																													
Minimum Value: 3 ppb on Dec 25 21:00										Minimum Daily Average: 7.2 ppb on Dec 10										Hours of Missing Data: 35																													
Maximum Diurnal Average: 21.9 ppb at hour 14										Minimum Diurnal Average: 15.5 ppb at hour 7										Hours of Calibration: 35																													
Monthly Average: 18.8 ppb										Percentiles: P <sub>1</sub> = 3 P <sub>10</sub> = 6 Q <sub>1</sub> = 13 Median = 19 Q <sub>3</sub> = 24 P <sub>90</sub> = 31 P <sub>99</sub> = 37										Percent Operational Time: 100.0																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	40	38	34	34	35	26	9	12	Z	14	15	26	26	24	19	11	5	4	5	26	23	31	26	17	21.8	40																							
2-Dec	31	31	17	Z	8	6	5	12	20	20	17	18	25	31	34	27	32	37	39	39	39	37	37	37	26.1	39																							
3-Dec	37	37	35	35	Z	31	14	15	5	18	24	24	22	23	22	15	14	12	27	16	5	5	6	4	19.4	37																							
4-Dec	4	4	5	6	6	Z	4	4	4	5	6	11	13	19	19	11	8	19	21	17	10	10	15	18	10.3	21																							
5-Dec	20	19	18	21	24	28	Z	31	31	32	33	35	35	35	34	27	19	17	17	15	12	10	13	10	23.3	35																							
6-Dec	11	11	13	11	12	12	11	Z	20	24	23	26	26	26	26	21	23	23	22	15	11	19	18	11	18.0	26																							
7-Dec	21	22	21	21	21	20	18	16	Z	16	17	17	17	17	16	13	13	11	8	5	5	4	6	8	14.4	22																							
8-Dec	10	11	10	Z	3	3	3	4	6	19	25	24	C	C	C	C	17	13	13	16	16	16	18	20	13.1	25																							
9-Dec	24	27	27	26	Z	23	24	22	21	22	22	22	22	20	18	16	13	14	15	15	16	15	10	11	19.4	27																							
10-Dec	10	13	15	15	16	Z	10	3	3	5	8	7	6	6	5	4	3	3	4	3	4	6	8	8	7.2	16																							
11-Dec	13	15	19	24	25	24	Z	23	21	22	22	24	25	20	17	17	20	22	23	26	28	26	26	27	22.1	28																							
12-Dec	28	28	28	28	25	24	23	Z	25	25	25	25	24	24	24	24	24	24	25	26	25	25	25	24	25.1	28																							
13-Dec	24	22	21	21	20	21	21	Z	20	20	20	20	20	20	18	17	17	15	14	16	17	17	17	17	19.1	24																							
14-Dec	18	15	12	Z	12	8	8	22	25	20	20	17	20	15	21	22	26	19	20	20	17	17	19	18	17.8	26																							
15-Dec	16	15	12	8	Z	11	8	8	11	16	19	22	25	26	26	24	23	12	14	16	25	29	34	36	19.0	36																							
16-Dec	30	25	26	24	24	Z	33	32	29	15	31	32	32	33	33	27	25	26	21	22	33	34	34	33	28.4	34																							
17-Dec	32	32	33	33	33	32	Z	31	31	31	30	30	30	30	30	29	29	29	26	11	7	17	21	18	27.2	33																							
18-Dec	21	21	21	19	22	23	21	Z	23	22	24	22	24	25	23	23	22	20	20	23	24	24	26	27	22.7	27																							
19-Dec	25	26	28	29	27	27	24	24	Z	22	20	23	23	23	20	16	17	20	20	20	19	19	19	17	22.1	29																							
20-Dec	16	16	15	Z	14	14	13	15	15	8	17	19	20	20	19	19	20	20	20	21	21	21	21	22	17.7	22																							
21-Dec	22	20	19	17	Z	4	5	6	9	10	13	17	19	13	10	5	3	4	4	6	7	3	3	4	9.7	22																							
22-Dec	3	3	3	3	3	Z	10	12	12	12	14	14	14	13	12	13	11	10	10	14	16	14	15	16	10.8	16																							
23-Dec	14	13	17	19	17	17	Z	16	16	16	17	18	18	18	17	15	17	18	18	17	18	20	19	19	17.2	20																							
24-Dec	18	20	21	21	21	19	16	Z	16	17	19	19	15	17	16	15	5	9	3	4	3	4	4	4	13.3	21																							
25-Dec	4	3	9	12	14	15	15	16	Z	16	18	20	20	20	21	19	18	14	6	11	3	4	10	6	12.8	21																							
26-Dec	5	14	16	Z	16	16	13	11	9	12	7	9	13	14	16	15	13	12	12	19	20	22	22	22	14.3	22																							
27-Dec	23	22	22	22	Z	21	22	22	22	22	22	23	23	21	21	20	18	15	17	12	13	15	13	12	19.2	23																							
28-Dec	11	12	11	13	16	Z	17	17	18	17	10	12	15	17	17	16	15	12	8	6	6	6	8	7	12.5	18																							
29-Dec	5	5	5	4	3	4	Z	18	21	22	20	19	19	20	21	20	22	21	21	21	21	23	26	27	17.0	27																							
30-Dec	28	28	28	28	28	27	25	Z	27	28	28	28	29	31	32	31	26	30	31	29	28	28	28	28	28.5	32																							
31-Dec	27	28	30	29	27	30	31	31	Z	33	34	34	34	35	33	33	34	31	28	31	33	35	33	34	31.6	35																							
																								18.9	19.3	19.1	20.0	18.3	18.7	15.5	17.2	17.7	18.8	20.0	21.2	21.8	21.9	21.5	18.8	17.8	17.5	17.1	17.4	16.9	17.8	18.8	18.2	Diurnal Average	
																								40	38	35	35	35	32	33	32	31	33	34	35	35	35	34	33	34	37	39	39	39	37	37	37	Diurnal Maximum	
Z - zerospan C - Calibration																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																																																	







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Patricia McInnes - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	411	57.97	57.97
21 - 50	298	42.03	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



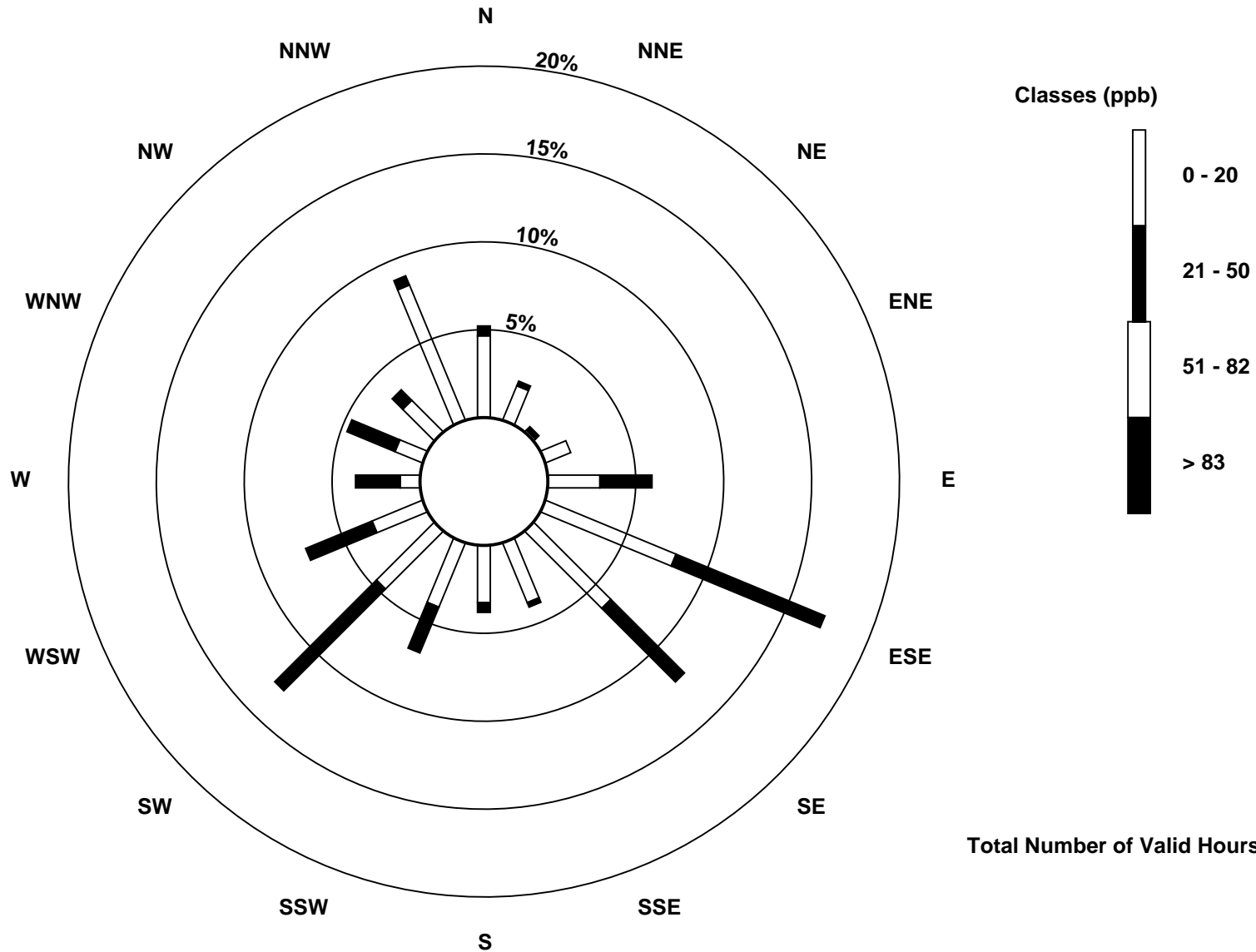
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

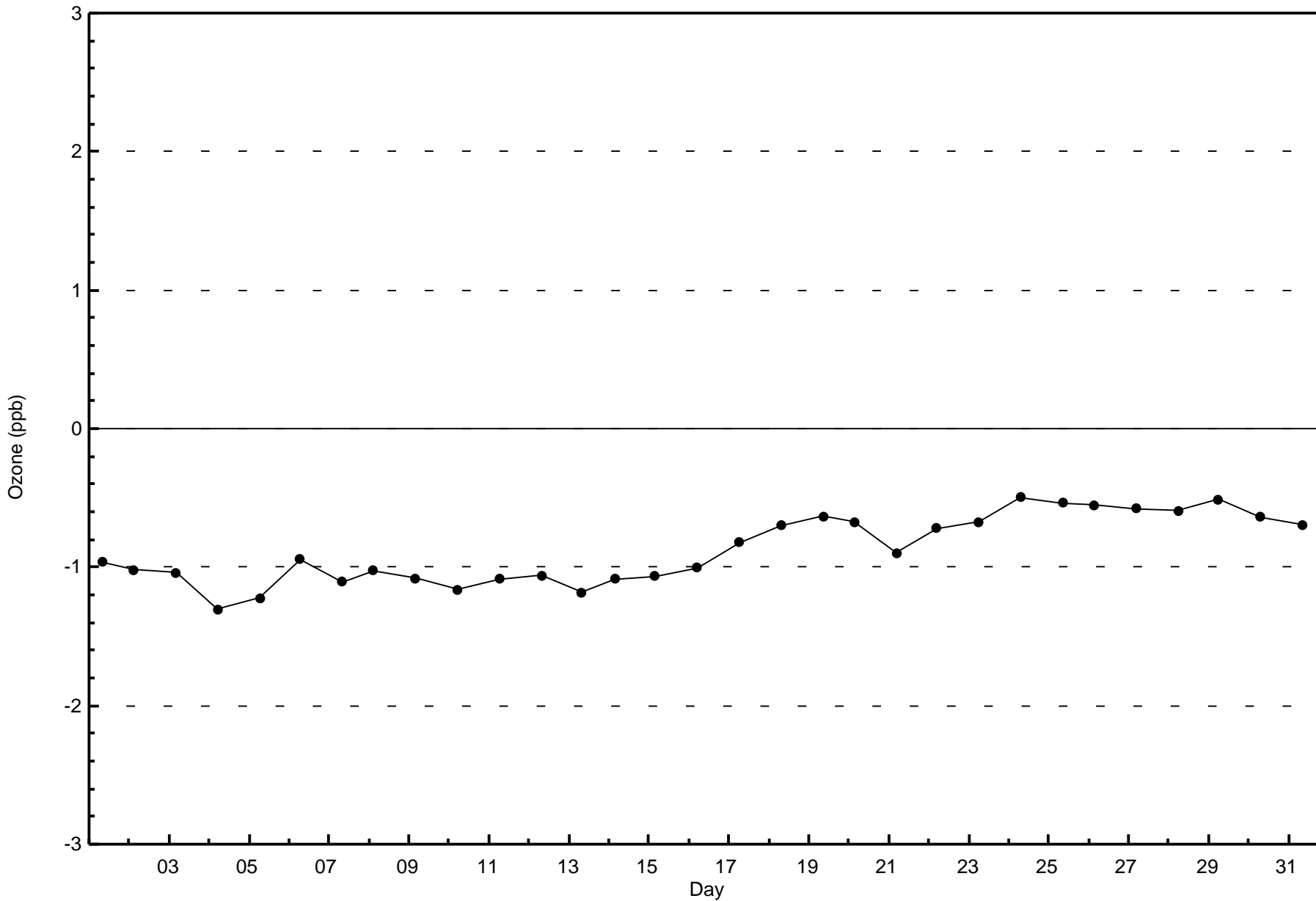
**Ozone (O<sub>3</sub>) - ppb**  
**Patricia McInnes - December 2015**

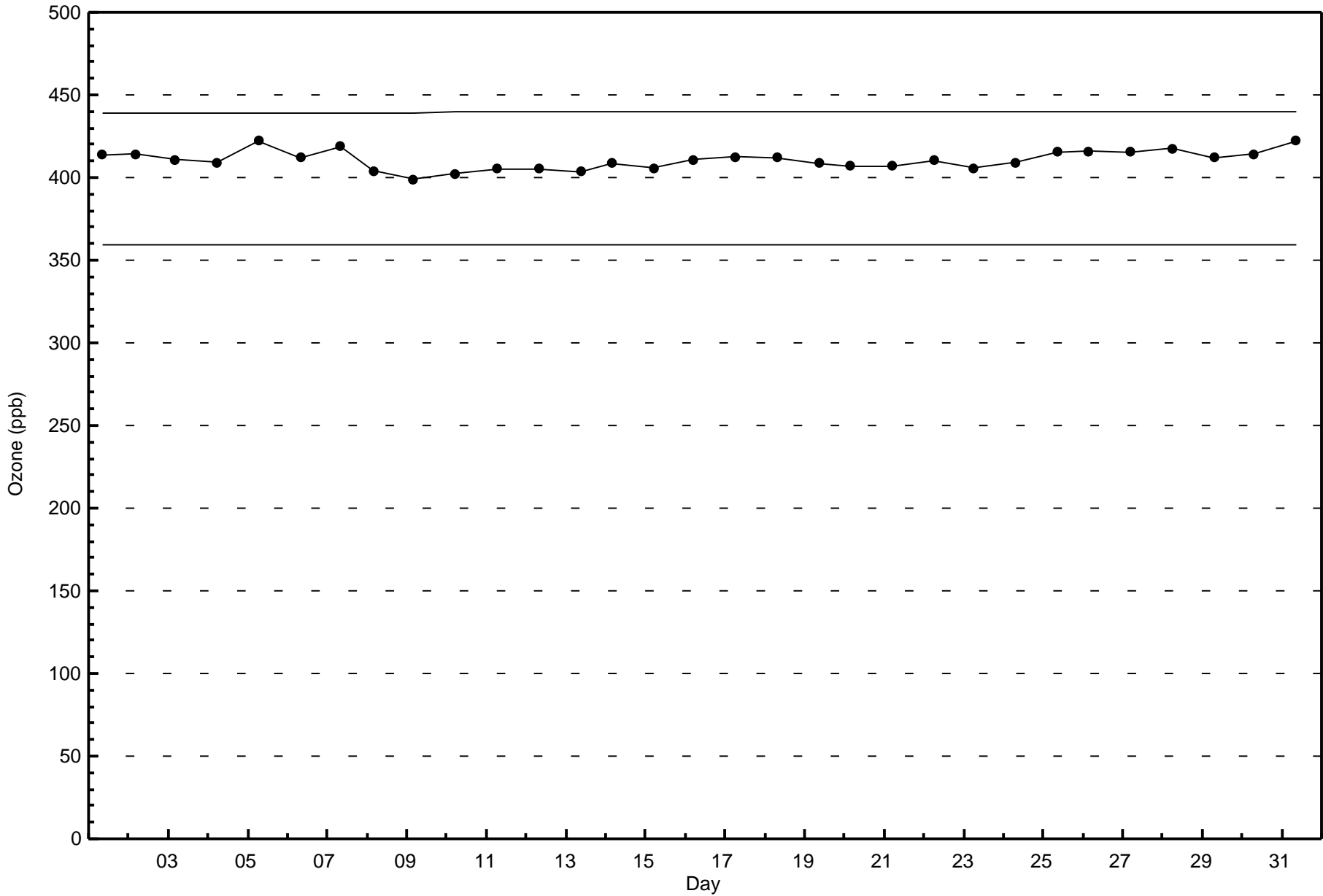
<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	33	15	1	11	21	57	44	26	23	28	33	22	8	12	18	59	411
21 - 50	4	2	2	0	21	65	42	2	4	20	58	29	18	21	6	4	298
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	37	17	3	11	42	122	86	28	27	48	91	51	26	33	24	63	709

Total Number of Valid Hours: 709

Total Number of Hours: 744

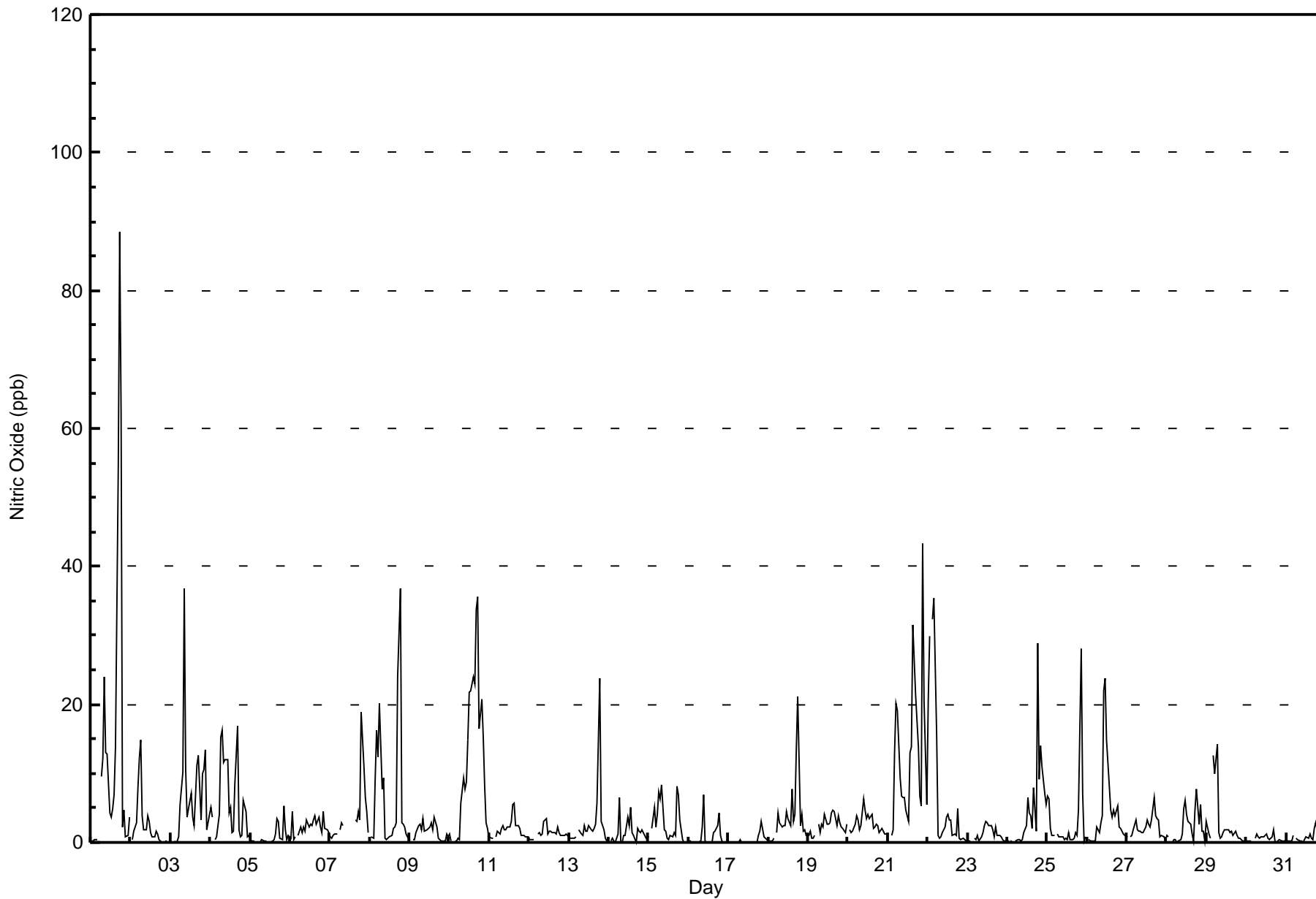








Maximum Value: 88 ppb on Dec 1 18:00																		Maximum Daily Average: 14.1 ppb on Dec 1						Hours in Service: 744		
Minimum Value: 0 ppb on Dec 15 23:00																		Minimum Daily Average: 0.4 ppb on Dec 17						Hours of Data: 707		
Maximum Diurnal Average: 8.5 ppb at hour 19																		Minimum Diurnal Average: 0.6 ppb at hour 3						Hours of Missing Data: 37		
Monthly Average: 3.8 ppb																		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 4 P <sub>90</sub> = 9 P <sub>99</sub> = 35						Hours of Calibration: 37		
																		Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	9	12	24	13	13	4	4	5	7	14	55	88	62	2	5	1	1	4	14.1	88
2-Dec	Z	0	2	3	8	12	15	4	2	2	4	3	2	1	1	2	1	0	0	0	0	0	0	0	2.7	15
3-Dec	0	Z	0	0	0	1	5	10	37	11	4	5	7	4	2	7	11	13	3	10	11	13	2	4	6.9	37
4-Dec	5	4	Z	0	1	4	15	16	12	12	12	4	5	1	2	8	17	2	1	1	6	4	1	1	5.9	17
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	3	3	1	0	5	2	0	1	0.8	5
6-Dec	1	5	0	1	Z	1	2	2	2	2	3	2	3	2	3	4	3	4	2	2	4	2	2	1	2.3	5
7-Dec	1	1	1	1	1	Z	2	3	3	C	C	C	C	C	C	3	3	4	3	19	11	7	5	1	--	19
8-Dec	Z	1	1	9	16	12	20	8	9	1	0	1	1	1	2	2	3	24	37	3	3	2	1	0	6.8	37
9-Dec	0	Z	0	0	1	3	3	2	3	2	2	2	2	3	2	4	2	1	0	0	0	0	1	1	1.5	4
10-Dec	1	0	Z	0	0	1	0	6	9	8	9	15	22	22	24	23	34	35	16	21	15	8	3	2	11.9	35
11-Dec	1	1	1	Z	1	2	1	2	3	2	2	2	2	3	5	6	2	2	2	1	1	1	1	1	1.9	6
12-Dec	0	0	0	0	Z	1	1	1	1	3	3	1	2	2	1	2	1	2	2	1	1	1	1	1	1.3	3
13-Dec	1	1	1	1	1	Z	2	1	1	2	2	2	2	2	2	2	3	6	24	3	2	2	1	0	2.7	24
14-Dec	Z	0	1	0	0	1	7	0	0	1	1	4	2	5	1	1	0	2	2	1	2	1	1	1	1.5	7
15-Dec	1	Z	2	5	2	4	7	6	8	2	2	1	0	1	1	1	1	8	7	3	0	0	0	0	2.8	8
16-Dec	0	0	Z	0	0	0	0	0	2	7	0	0	0	0	0	1	2	2	4	1	0	0	0	0	0.9	7
17-Dec	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	2	3	1	1	0	0.4	3
18-Dec	0	0	0	1	Z	1	4	3	2	2	2	5	3	3	8	3	4	14	21	2	4	2	2	1	3.8	21
19-Dec	1	2	1	1	1	Z	3	1	3	2	4	3	3	3	4	5	5	3	4	3	2	2	1	3	2.5	5
20-Dec	Z	2	1	2	3	4	3	2	2	6	5	4	4	3	4	2	2	3	3	1	2	2	1	1	2.7	6
21-Dec	1	Z	1	2	13	20	19	9	7	6	6	5	3	13	14	31	26	21	14	7	5	43	20	5	12.8	43
22-Dec	21	30	Z	32	35	15	1	1	1	1	2	4	4	3	3	1	1	1	5	1	0	1	0	0	7.1	35
23-Dec	0	0	0	Z	1	0	1	0	1	1	2	3	3	2	2	2	1	2	1	1	1	0	0	0	1.2	3
24-Dec	0	0	0	0	Z	0	0	0	0	0	2	3	7	4	4	2	8	2	29	9	14	11	7	5	4.7	29
25-Dec	7	6	2	1	1	Z	1	1	1	1	0	1	0	1	0	0	1	2	1	5	28	7	0	1	3.0	28
26-Dec	Z	0	0	0	0	0	2	1	3	4	22	24	15	8	5	4	5	4	5	2	2	2	1	1	4.8	24
27-Dec	1	Z	1	1	2	3	2	2	2	1	1	2	3	3	2	3	6	4	3	3	1	1	1	0	2.1	6
28-Dec	1	1	Z	0	0	0	0	0	0	1	5	6	4	3	3	1	0	5	8	3	5	2	2	0	2.2	8
29-Dec	3	1	1	Z	13	10	14	2	1	1	1	2	2	2	1	2	1	2	1	1	1	0	0	0	2.6	14
30-Dec	0	0	0	0	Z	1	1	1	1	1	1	1	1	1	0	1	2	0	0	0	0	0	0	0	0.6	2
31-Dec	0	0	0	0	1	Z	1	0	0	0	0	0	1	1	1	1	0	2	3	1	0	0	0	0	0.6	3
1.8 2.1 0.6 2.4 3.9 3.9 4.6 3.1 4.5 3.2 3.7 3.6 3.6 3.4 3.6 4.5 6.6 8.4 8.5 3.5 4.4 3.8 1.9 1.2																		Diurnal Average								
21 30 2 32 35 20 20 16 37 13 22 24 22 22 24 31 55 88 62 21 28 43 20 5																		Diurnal Maximum								
Z - zerospan		C - Calibration																								





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Patricia McInnes - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	679	96.04	96.04
21 - 40	24	3.39	99.43
41 - 80	3	0.42	99.86
81 - 159	1	0.14	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744





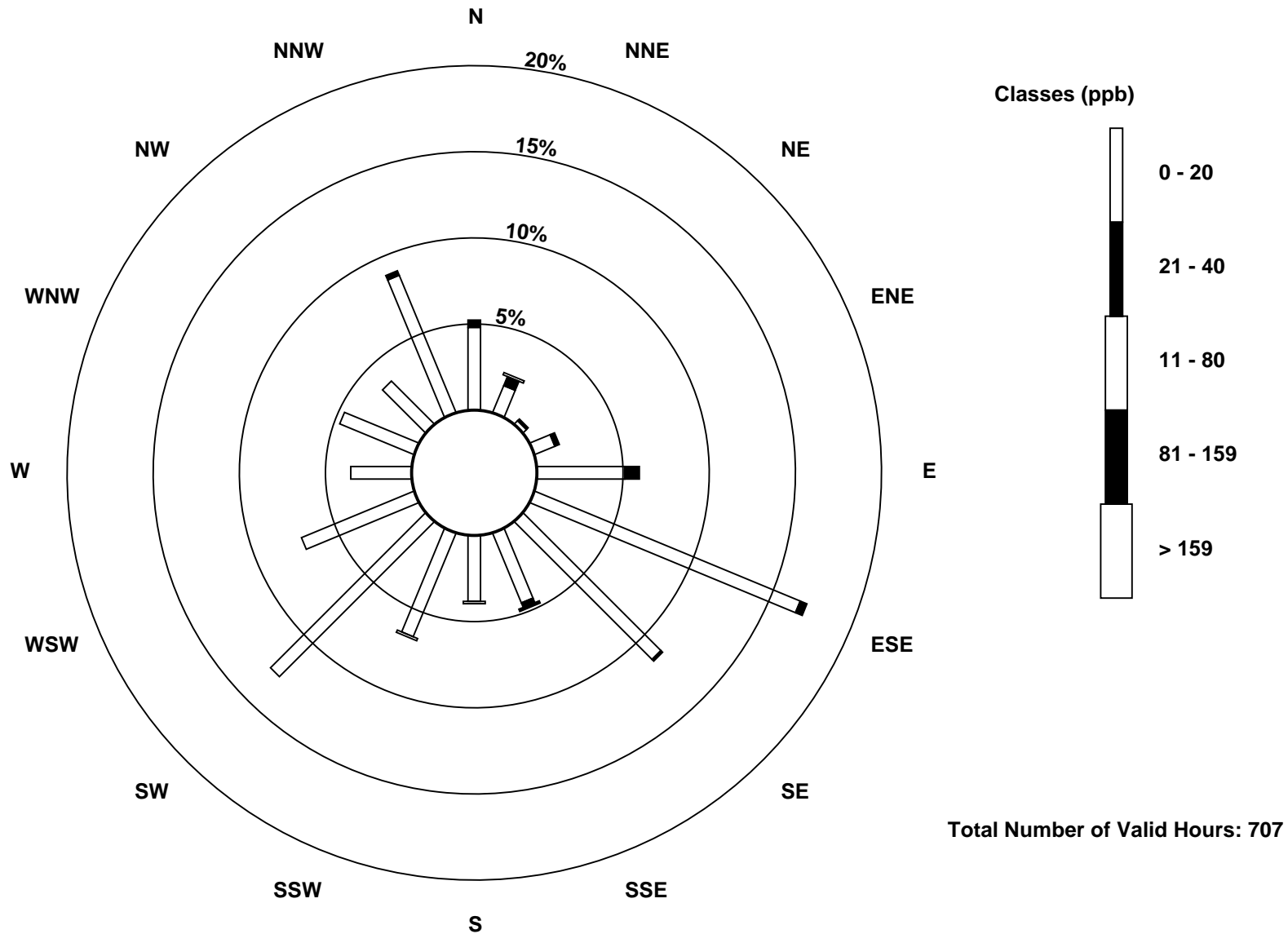
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

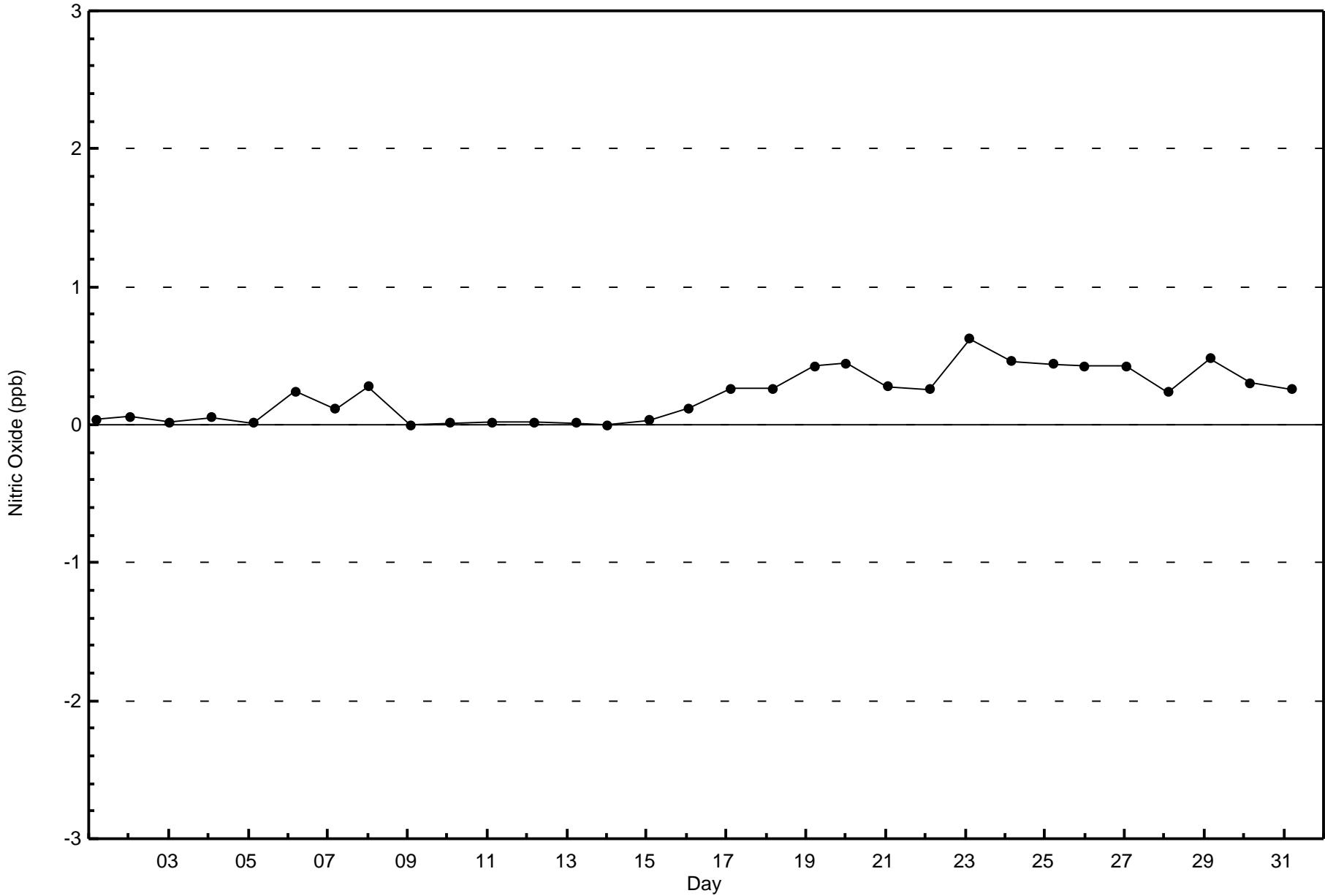
**Nitric Oxide (NO) - ppb**  
**Patricia McInnes - December 2015**

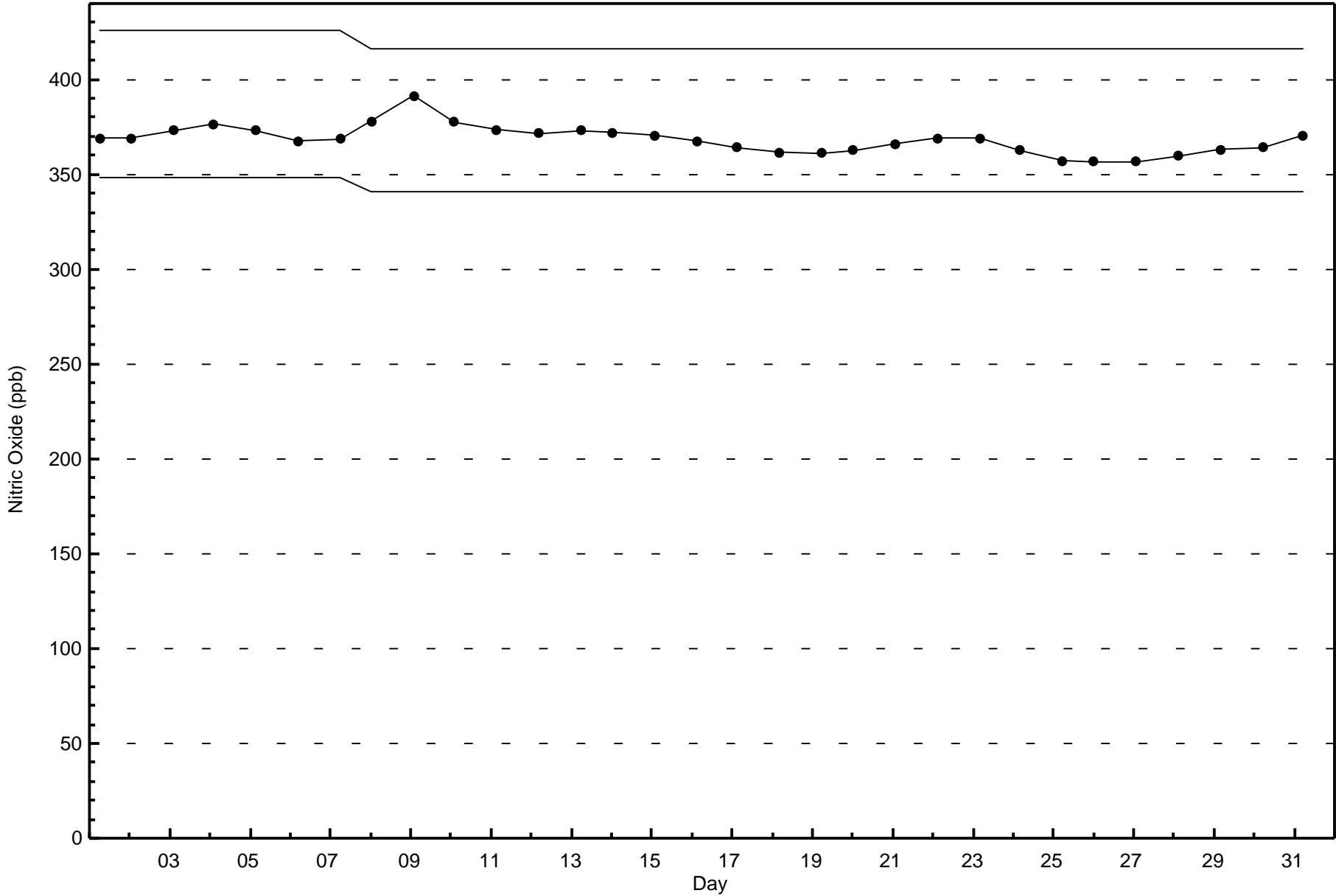
<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	34	12	2	9	36	118	80	31	27	46	90	50	25	33	25	61	679
21 - 40	3	4	1	2	6	3	1	2	0	0	0	0	0	0	0	2	24
11 - 80	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	3
81 - 159	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	37	17	3	11	42	121	81	34	28	47	90	50	25	33	25	63	707

Total Number of Valid Hours: 707

Total Number of Hours: 744









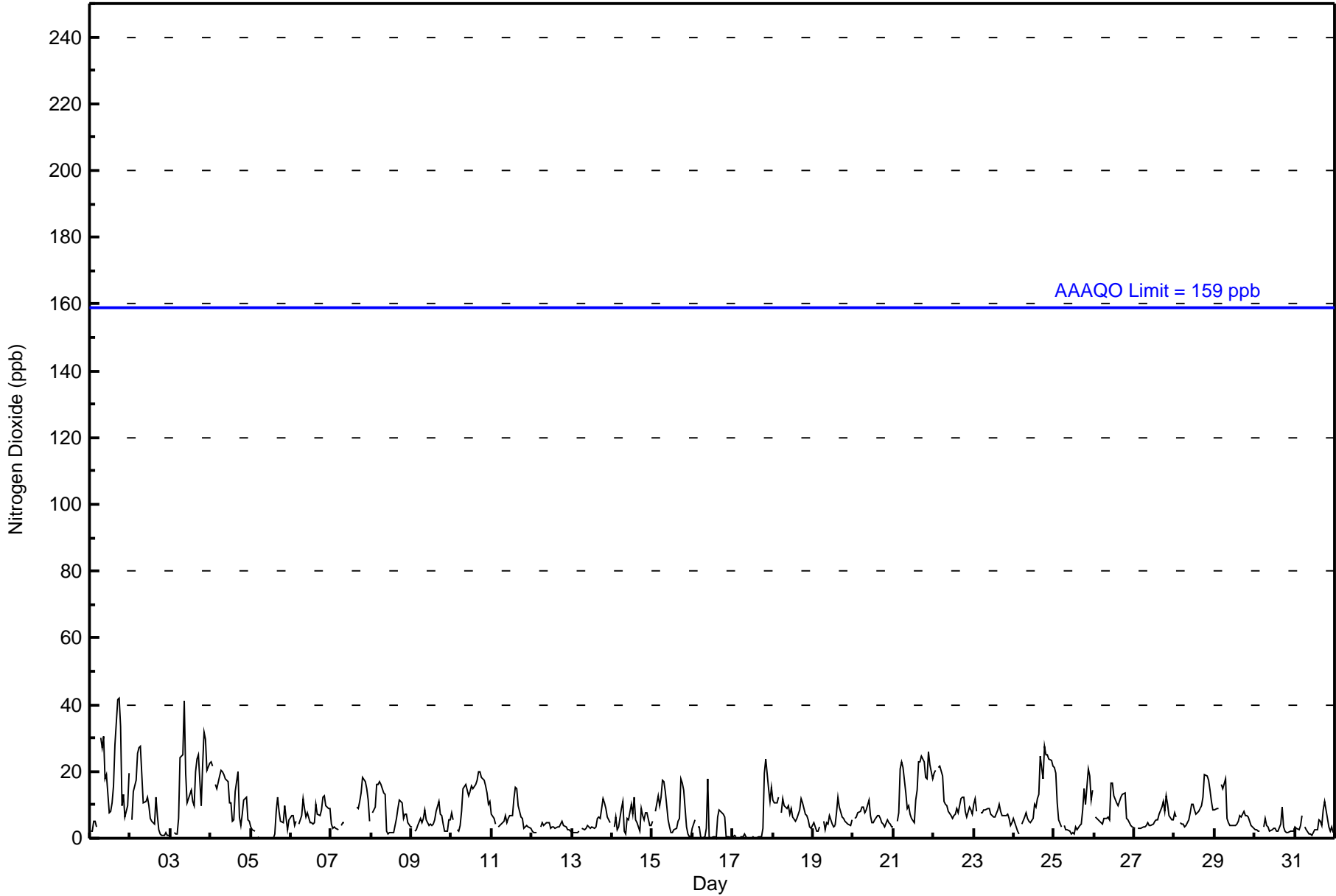
Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb

Patricia McInnes - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 42 ppb on Dec 1 18:00										Maximum Daily Average: 16.9 ppb on Dec 1										Hours of Data: 707						
Minimum Value: 0 ppb on Dec 5 09:00										Minimum Daily Average: 3.0 ppb on Dec 30										Hours of Missing Data: 37						
Maximum Diurnal Average: 11.0 ppb at hour 17										Minimum Diurnal Average: 5.1 ppb at hour 3										Hours of Calibration: 37						
Monthly Average: 8.0 ppb										Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 2 Q <sub>1</sub> = 3 Median = 6 O <sub>3</sub> = 10 P <sub>90</sub> = 18 P <sub>99</sub> = 30										Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	2	5	5	4	Z	30	27	31	18	19	8	8	11	16	28	42	42	34	10	13	6	10	20	16.9	42
2-Dec	Z	6	14	17	26	27	28	19	10	11	12	10	6	5	4	12	7	3	1	1	1	2	1	1	9.7	28
3-Dec	1	Z	2	1	1	6	24	25	41	20	11	12	14	11	10	20	24	25	10	22	32	30	21	23	16.7	41
4-Dec	23	21	Z	16	15	19	21	20	19	18	17	11	11	5	5	14	20	6	4	7	12	12	5	5	13.3	23
5-Dec	3	2	2	Z	0	0	0	0	0	0	0	0	0	0	1	8	12	8	5	5	10	6	3	6	3.1	12
6-Dec	7	7	4	5	Z	4	7	12	9	7	8	5	5	4	5	10	7	7	8	12	13	10	9	9	7.4	13
7-Dec	4	3	4	3	3	Z	4	5	5	C	C	C	C	C	C	9	9	11	14	18	17	15	12	5	--	18
8-Dec	Z	8	10	16	16	17	16	14	13	2	1	2	2	2	4	6	9	12	10	6	7	7	5	3	8.1	17
9-Dec	3	Z	2	2	4	6	5	6	8	5	4	4	4	4	6	8	11	7	7	4	2	2	5	6	5.1	11
10-Dec	8	6	Z	3	2	4	8	15	16	15	13	14	16	15	16	17	20	20	18	18	16	14	10	11	12.7	20
11-Dec	7	6	4	Z	3	4	5	5	7	5	6	7	7	12	15	15	10	7	6	3	3	4	4	3	6.3	15
12-Dec	2	2	2	2	Z	4	5	4	4	5	5	3	4	3	3	3	4	4	5	4	3	3	3	2	3.3	5
13-Dec	2	2	2	2	2	Z	3	2	3	4	3	3	4	3	3	6	6	6	12	11	9	6	5	5	4.5	12
14-Dec	Z	3	6	2	3	9	11	2	1	6	6	10	7	12	6	5	2	9	7	5	8	8	4	4	6.0	12
15-Dec	5	Z	8	13	10	12	17	17	14	6	4	2	2	3	3	5	6	18	17	15	3	1	1	0	7.8	18
16-Dec	3	5	Z	3	3	0	0	0	3	18	0	0	1	0	0	6	9	8	7	6	0	0	0	0	3.3	18
17-Dec	1	1	0	Z	0	0	0	1	0	0	0	0	0	0	0	1	0	0	3	19	24	15	11	15	4.1	24
18-Dec	11	10	10	12	Z	8	12	10	9	10	7	9	6	5	6	7	9	12	11	7	7	6	4	3	8.3	12
19-Dec	5	3	2	2	3	Z	5	3	5	4	7	4	4	4	8	12	10	6	6	5	5	4	4	6	5.0	12
20-Dec	Z	6	6	8	8	9	9	8	9	11	7	5	5	6	7	7	6	5	4	4	5	5	4	3	6.3	11
21-Dec	3	Z	5	8	21	23	21	14	9	10	7	6	5	11	15	23	23	25	23	18	18	26	22	18	15.3	26
22-Dec	19	20	Z	21	22	19	11	10	10	8	7	6	7	7	9	8	12	12	12	8	7	9	8	7	11.3	22
23-Dec	10	12	8	Z	8	8	9	8	9	9	7	7	6	6	8	10	8	7	7	7	7	6	4	5	7.6	12
24-Dec	6	3	2	1	Z	4	6	8	6	5	5	6	10	9	12	13	25	18	28	25	25	24	23	22	12.4	28
25-Dec	21	20	11	6	4	Z	4	3	2	2	1	2	1	3	3	4	4	9	15	10	21	19	12	15	8.2	21
26-Dec	Z	6	6	5	5	4	6	6	6	6	17	17	13	11	10	11	12	13	14	6	6	5	4	3	8.2	17
27-Dec	3	Z	3	3	3	3	3	4	5	4	4	4	5	5	6	7	9	11	8	13	10	7	6	6	5.7	13
28-Dec	8	6	Z	5	4	4	4	4	6	8	10	10	8	7	8	9	10	12	19	19	18	15	11	9	9.2	19
29-Dec	9	9	9	Z	16	15	18	6	5	4	4	4	4	4	5	7	7	8	7	7	6	5	4	3	7.1	18
30-Dec	3	2	2	2	Z	4	6	4	3	2	3	3	3	2	2	4	9	3	2	2	2	2	2	2	3.0	9
31-Dec	4	3	2	4	7	Z	3	3	1	1	1	2	2	3	6	5	4	8	11	6	3	2	3	2	3.8	11
6.6 6.7 5.1 6.4 7.4 8.5 9.7 8.5 8.6 7.4 6.5 5.8 5.6 5.8 6.7 9.7 11.0 11.0 10.8 9.7 10.0 8.8 7.0 7.1																								Diurnal Average		
23 21 14 21 26 27 30 27 41 20 19 17 16 15 16 28 42 42 34 25 32 30 23 23																								Diurnal Maximum		
Z - zerospan C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Patricia McInnes - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	663	93.78	93.78
21 - 40	41	5.80	99.58
41 - 80	3	0.42	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

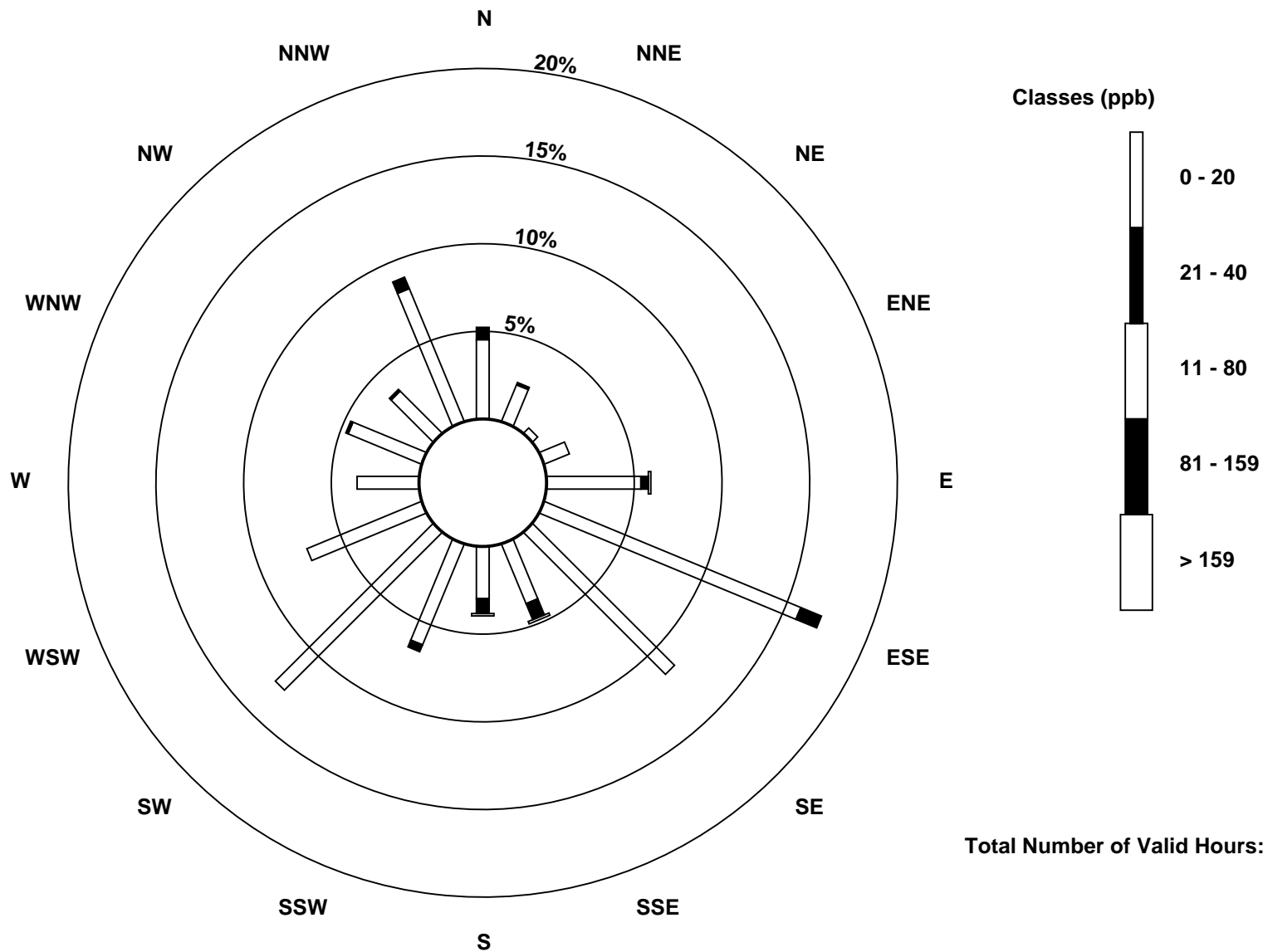
**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Patricia McInnes - December 2015**

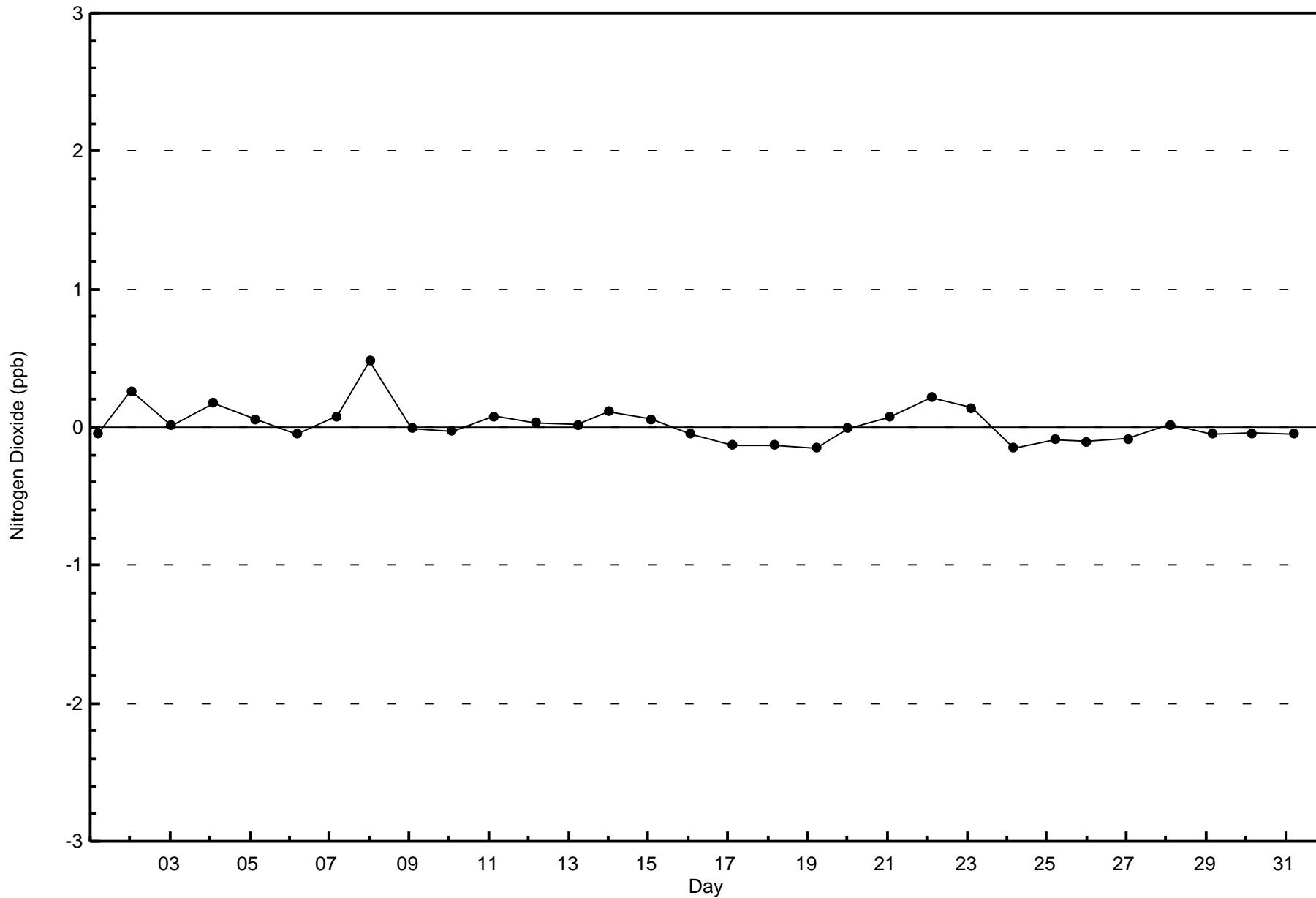
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	32	16	3	11	38	112	81	26	21	44	90	50	25	32	24	58	663
21 - 40	5	1	0	0	3	9	0	7	6	3	0	0	0	1	1	5	41
11 - 80	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	3
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	<b>37</b>	<b>17</b>	<b>3</b>	<b>11</b>	<b>42</b>	<b>121</b>	<b>81</b>	<b>34</b>	<b>28</b>	<b>47</b>	<b>90</b>	<b>50</b>	<b>25</b>	<b>33</b>	<b>25</b>	<b>63</b>	<b>707</b>

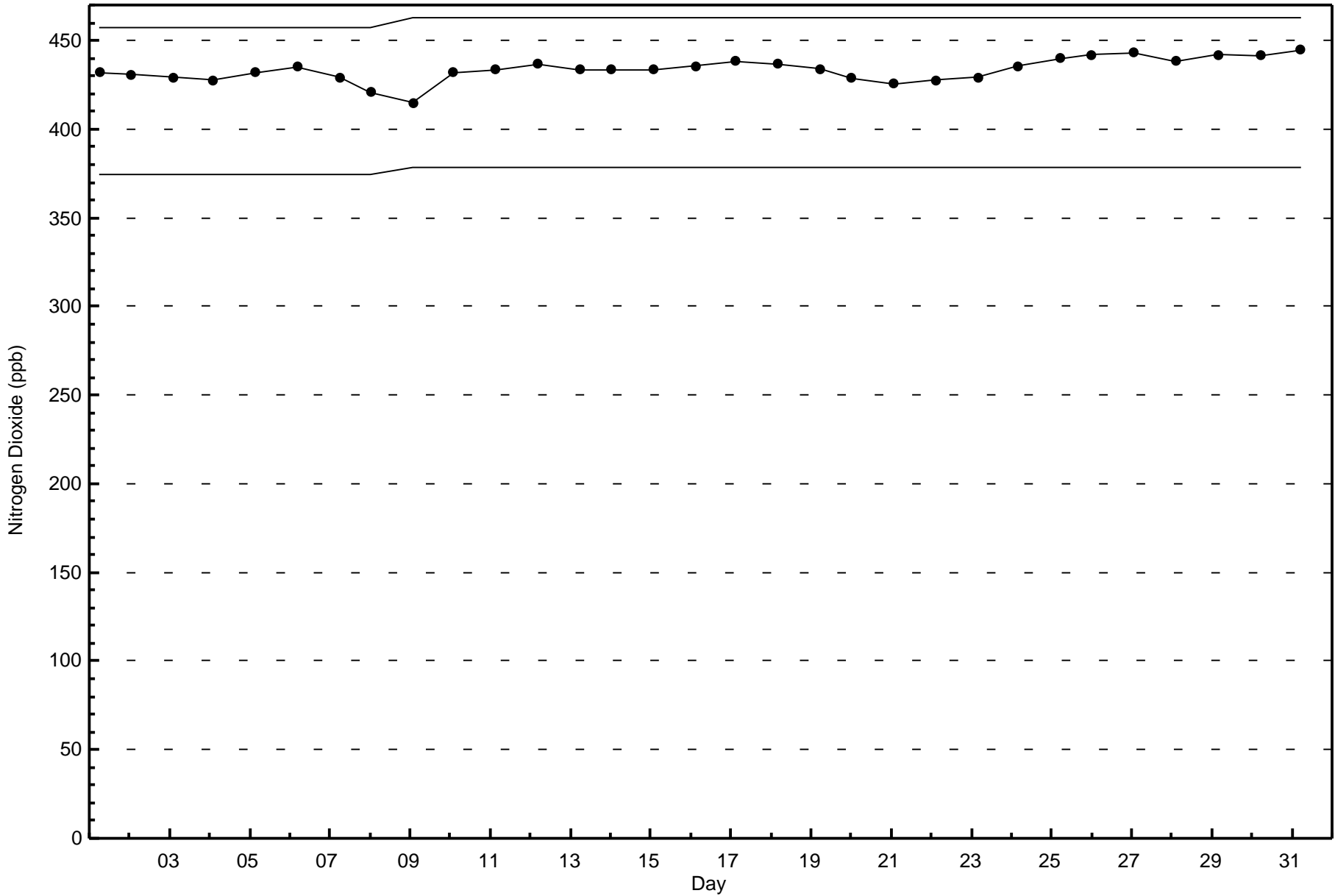
Total Number of Valid Hours: 707

Total Number of Hours: 744



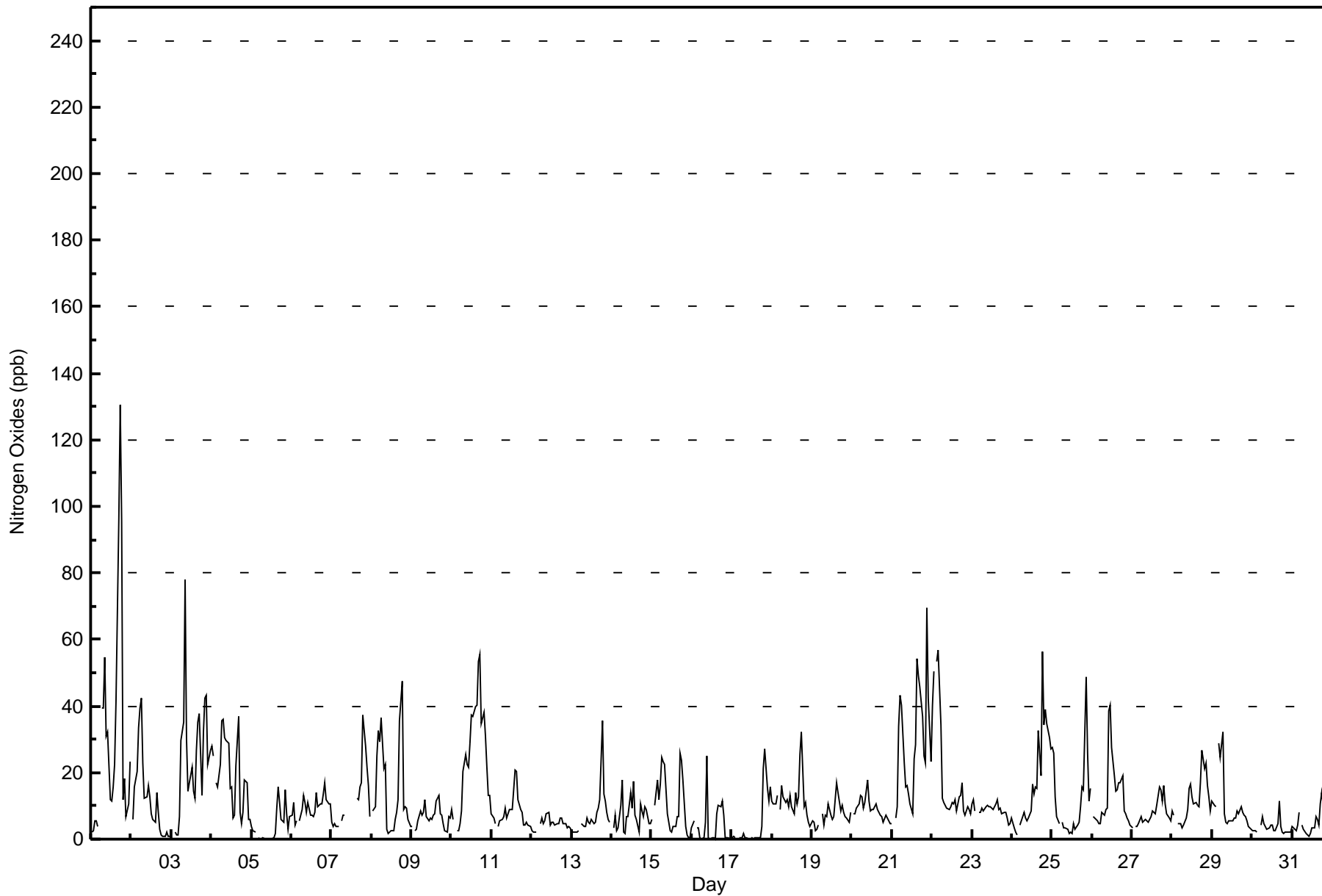








Maximum Value: 130 ppb on Dec 1 18:00																			Maximum Daily Average: 31.0 ppb on Dec 1						Hours in Service: 744																			
Minimum Value: 0 ppb on Dec 16 12:00																			Minimum Daily Average: 3.6 ppb on Dec 30						Hours of Data: 707																			
Maximum Diurnal Average: 19.4 ppb at hour 18																			Minimum Diurnal Average: 5.7 ppb at hour 3						Hours of Missing Data: 37																			
Monthly Average: 11.8 ppb																			Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 2 Q <sub>1</sub> = 4 Median = 8 Q <sub>3</sub> = 14 P <sub>90</sub> = 28 P <sub>99</sub> = 56						Hours of Calibration: 37																			
																									Percent Operational Time: 100.0																			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																				
1-Dec	2	2	5	5	4	Z	39	40	55	31	32	12	12	15	23	42	96	130	96	12	18	7	11	23	31.0	130																		
2-Dec	Z	6	16	20	33	39	42	23	12	13	16	13	8	6	5	14	8	3	1	1	1	2	1	1	12.3	42																		
3-Dec	1	Z	2	1	1	7	30	35	78	30	14	17	21	15	12	27	35	38	13	32	42	43	22	27	23.6	78																		
4-Dec	28	25	Z	17	15	22	36	36	31	29	29	15	16	6	7	22	37	8	5	8	18	17	6	6	19.1	37																		
5-Dec	4	3	2	Z	0	0	0	1	0	0	0	0	0	0	2	9	16	11	6	5	15	8	3	7	4.0	16																		
6-Dec	7	11	4	6	Z	5	9	13	11	8	11	7	7	7	8	14	10	11	11	14	17	12	10	10	9.7	17																		
7-Dec	5	4	5	4	4	Z	6	7	7	C	C	C	C	C	C	12	12	16	17	37	28	22	16	7	--	37																		
8-Dec	Z	8	10	25	32	29	36	21	23	3	2	2	3	3	6	8	12	35	47	9	10	9	6	4	14.9	47																		
9-Dec	4	Z	2	3	5	8	7	8	12	7	6	6	6	7	7	12	13	8	7	5	2	2	7	6	6.6	13																		
10-Dec	9	6	Z	3	3	5	8	21	25	22	21	29	37	37	40	40	54	56	35	38	31	22	13	13	24.6	56																		
11-Dec	8	7	5	Z	4	5	6	7	9	7	8	9	9	15	21	21	12	9	8	4	4	5	4	4	8.2	21																		
12-Dec	3	2	2	2	Z	5	6	5	5	7	8	4	5	5	4	5	5	6	7	5	4	3	4	3	4.6	8																		
13-Dec	2	2	2	2	3	Z	5	4	4	6	5	5	6	5	5	8	9	12	36	13	11	8	6	5	7.1	36																		
14-Dec	Z	4	7	3	3	10	18	2	2	7	7	14	9	17	7	6	2	11	9	7	10	9	5	5	7.5	18																		
15-Dec	6	Z	10	18	12	16	24	23	22	8	5	3	2	4	4	7	7	26	24	18	4	1	0	0	10.6	26																		
16-Dec	3	5	Z	3	4	0	0	1	5	25	1	0	0	0	0	8	10	10	12	7	1	0	1	0	4.2	25																		
17-Dec	1	1	0	Z	0	0	0	2	1	0	0	0	0	0	0	1	0	0	4	21	27	15	11	16	4.4	27																		
18-Dec	12	11	11	13	Z	9	16	13	11	12	10	13	10	8	14	10	13	25	32	10	11	7	5	4	12.1	32																		
19-Dec	6	5	3	3	4	Z	8	4	7	7	11	7	6	7	12	17	14	9	10	8	7	6	5	8	7.5	17																		
20-Dec	Z	8	8	9	11	13	13	10	11	18	11	8	9	9	11	9	8	7	7	5	7	6	5	5	9.0	18																		
21-Dec	5	Z	6	10	34	43	40	23	16	16	14	11	8	24	28	54	49	46	37	25	23	69	43	23	28.1	69																		
22-Dec	40	50	Z	54	57	34	12	11	10	9	9	10	11	11	12	9	13	13	17	9	7	10	9	8	18.4	57																		
23-Dec	11	12	8	Z	8	8	9	9	10	10	10	10	9	9	11	12	9	9	8	8	8	6	4	5	8.8	12																		
24-Dec	6	3	2	1	Z	4	7	8	6	5	6	8	17	14	16	15	33	19	56	34	39	35	30	27	17.1	56																		
25-Dec	28	26	13	7	5	Z	5	4	3	3	2	2	2	5	3	4	5	10	16	15	49	26	12	15	11.1	49																		
26-Dec	Z	7	6	5	5	4	8	7	9	9	39	40	27	19	14	15	17	17	19	8	8	6	5	4	13.0	40																		
27-Dec	4	Z	4	4	5	7	5	6	6	5	5	7	8	8	8	10	16	15	11	16	11	8	6	6	7.8	16																		
28-Dec	9	7	Z	5	5	5	4	4	6	9	15	17	13	10	11	10	10	17	27	21	23	16	13	9	11.4	27																		
29-Dec	11	10	10	Z	29	25	32	8	5	5	5	6	6	6	6	8	8	10	8	7	7	5	4	3	9.7	32																		
30-Dec	3	3	2	2	Z	4	7	5	4	3	4	4	4	3	3	5	11	4	2	2	2	2	2	2	3.6	11																		
31-Dec	4	3	3	4	8	Z	4	3	1	1	1	2	3	3	7	6	4	10	14	7	4	2	4	2	4.4	14																		
																			8.4	8.9	5.7	8.8	11.3	12.4	14.3	11.6	13.1	10.5	10.2	9.3	9.2	9.3	10.2	14.1	17.6	19.4	19.3	13.3	14.4	12.6	8.8	8.3	Diurnal Average	
																			40	50	16	54	57	43	42	40	78	31	39	40	37	37	40	54	96	130	96	38	49	69	43	27	Diurnal Maximum	
Z - zerospan		C - Calibration																																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Patricia McInnes - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	590	83.45	83.45
21 - 40	94	13.30	96.75
41 - 80	20	2.83	99.58
81 - 159	3	0.42	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



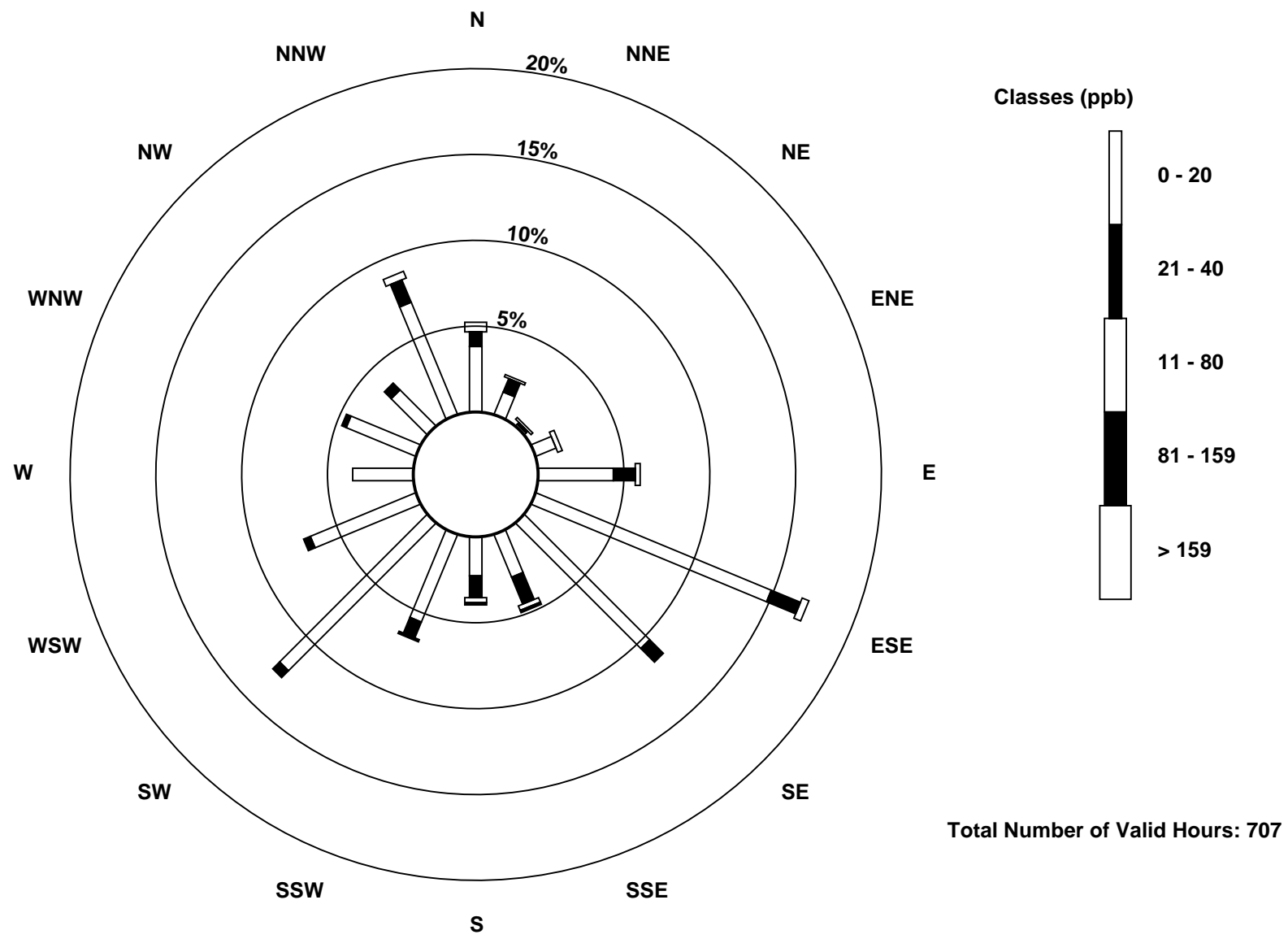
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Patricia McInnes - December 2015**

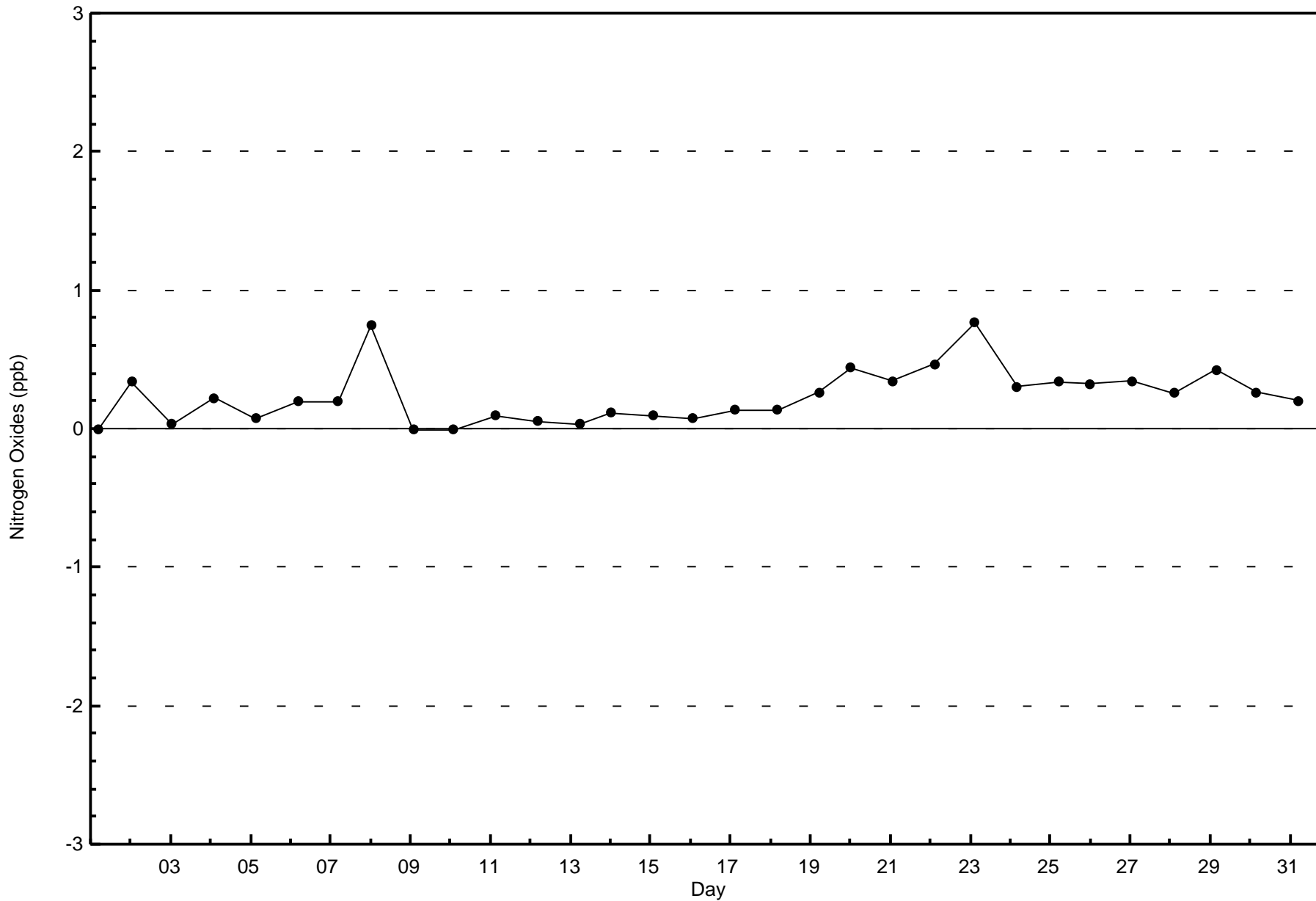
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	27	10	1	9	31	105	73	19	16	39	86	47	25	31	21	50	590
21 - 40	6	6	1	0	9	13	8	12	9	7	4	3	0	2	4	10	94
11 - 80	4	1	1	2	2	3	0	2	2	0	0	0	0	0	0	3	20
81 - 159	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	3
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	<b>37</b>	<b>17</b>	<b>3</b>	<b>11</b>	<b>42</b>	<b>121</b>	<b>81</b>	<b>34</b>	<b>28</b>	<b>47</b>	<b>90</b>	<b>50</b>	<b>25</b>	<b>33</b>	<b>25</b>	<b>63</b>	<b>707</b>

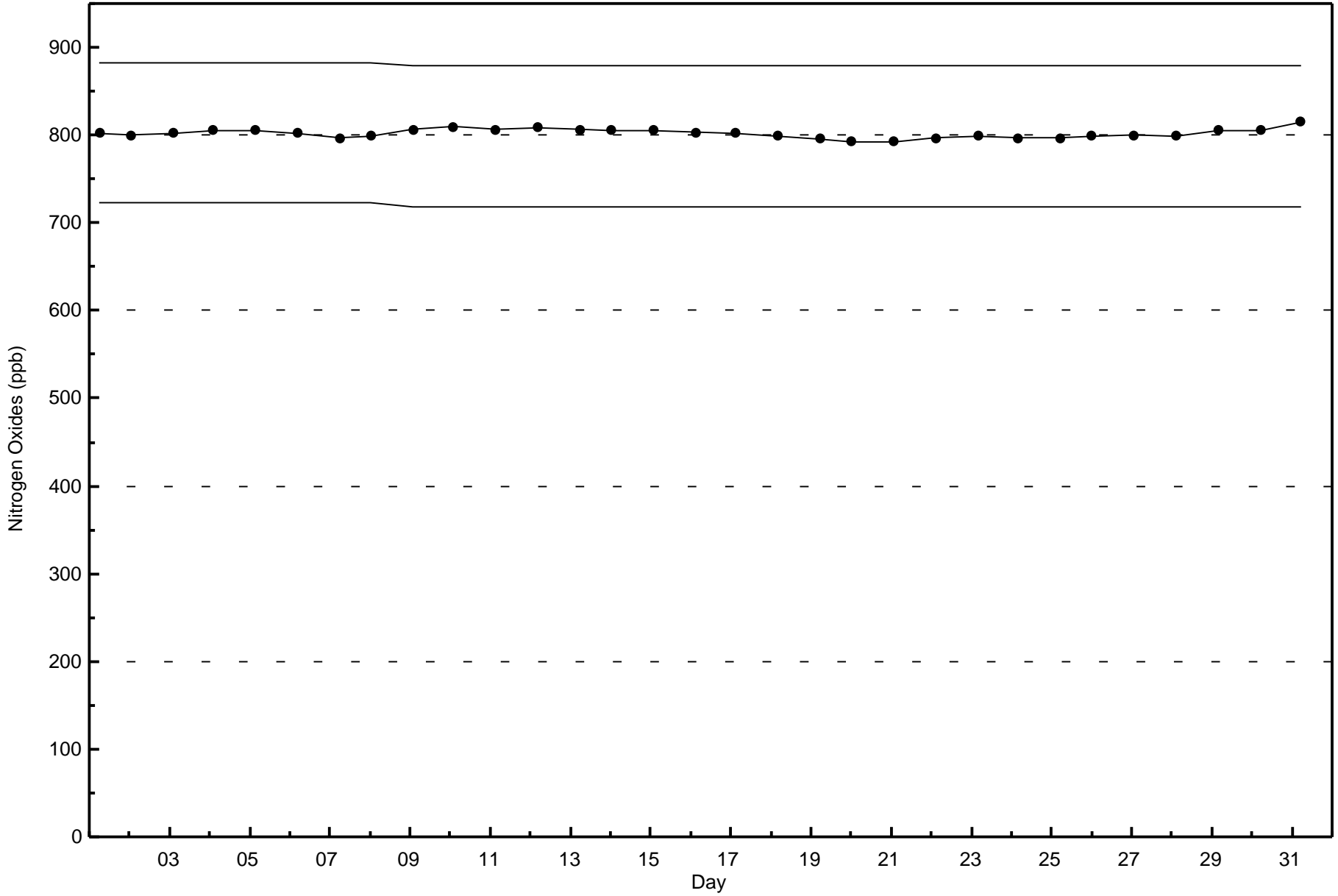
Total Number of Valid Hours: 707

Total Number of Hours: 744











Summary of Hour Averages

Patricia McInnes - December 2015

Number of Exceedences (AAAQO): 1-hr: 0	Maximum Value: 11 ppb on Dec 7 09:00	Maximum Daily Average: 0.0 ppb on Dec 1	Hours in Service: 744
Minimum Value: 0 ppb on Dec 1 01:00	Maximum Diurnal Average: 0.4 ppb at hour 9	Minimum Daily Average: 0.0 ppb on Dec 1	Hours of Data: 672
Monthly Average: 0.0 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 0		Hours of Missing Data: 72
			Hours of Calibration: 42
			Percent Operational Time: 96.0

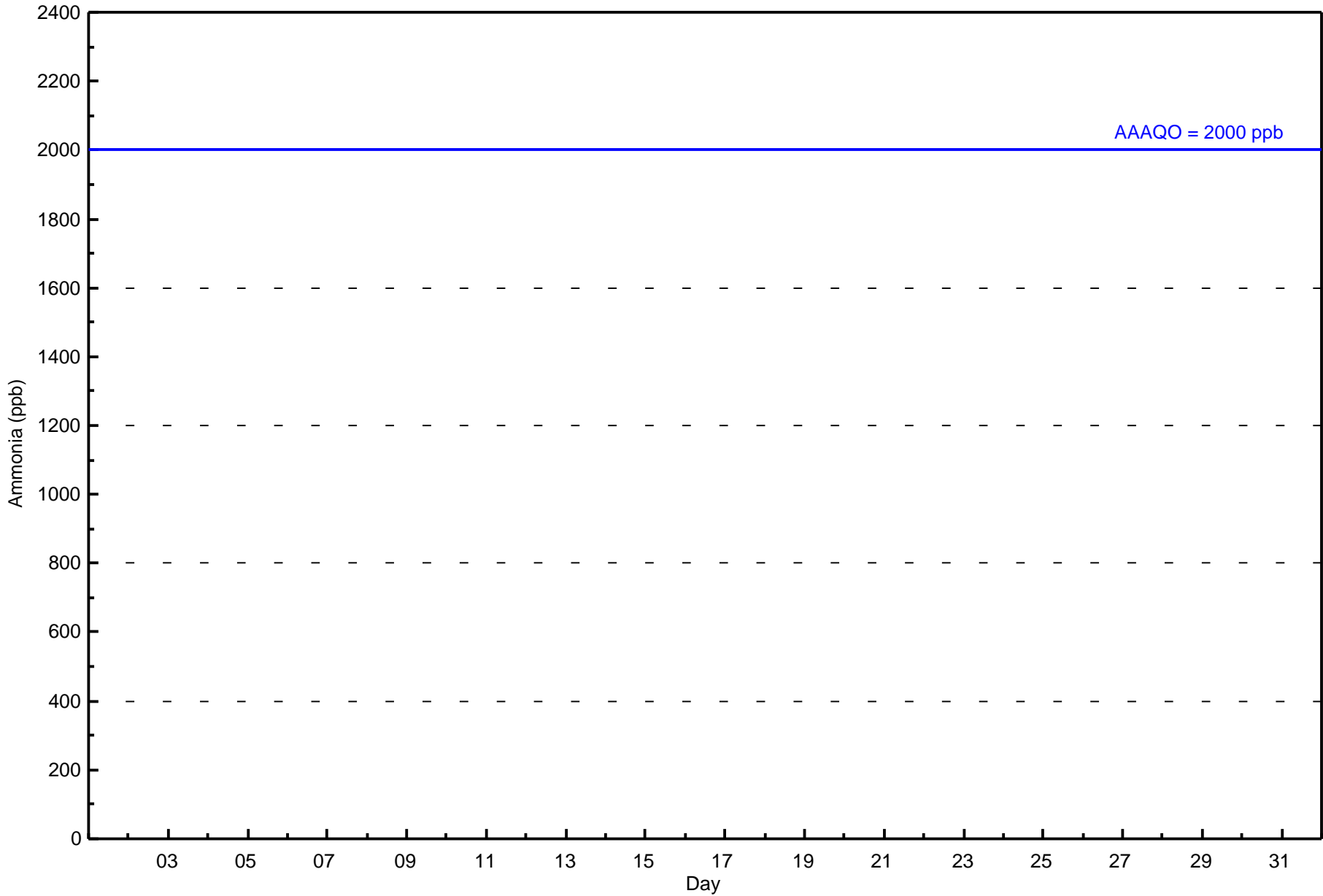
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2-Dec	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
3-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
4-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
5-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Dec	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
7-Dec	0	0	0	0	0	0	0	Z	11	C	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	--	11
8-Dec	0	0	Z	RE	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	--	0
9-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
10-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
11-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
12-Dec	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
13-Dec	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
14-Dec	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
15-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
16-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
17-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
18-Dec	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
19-Dec	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
20-Dec	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
21-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
22-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
23-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
24-Dec	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
25-Dec	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
26-Dec	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
27-Dec	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
28-Dec	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
29-Dec	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
30-Dec	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
31-Dec	0	0	0	0	0	0	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0

Z - zerospan    C - Calibration    RE - Recovery  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 2000 ppb



Wood Buffalo Environmental Association  
Hourly Averages

Ammonia (NH<sub>3</sub>) - ppb  
Patricia McInnes - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ammonia (NH<sub>3</sub>) - ppb**  
**Patricia McInnes - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	671	99.85	99.85
6 - 10	0	0.00	99.85
11 - 15	1	0.15	100.00
16 - 20	0	0.00	100.00
21 - 25	0	0.00	100.00
> 26	0	0.00	100.00

Total Number of Valid Hours: 672

Total Number of Hours: 744



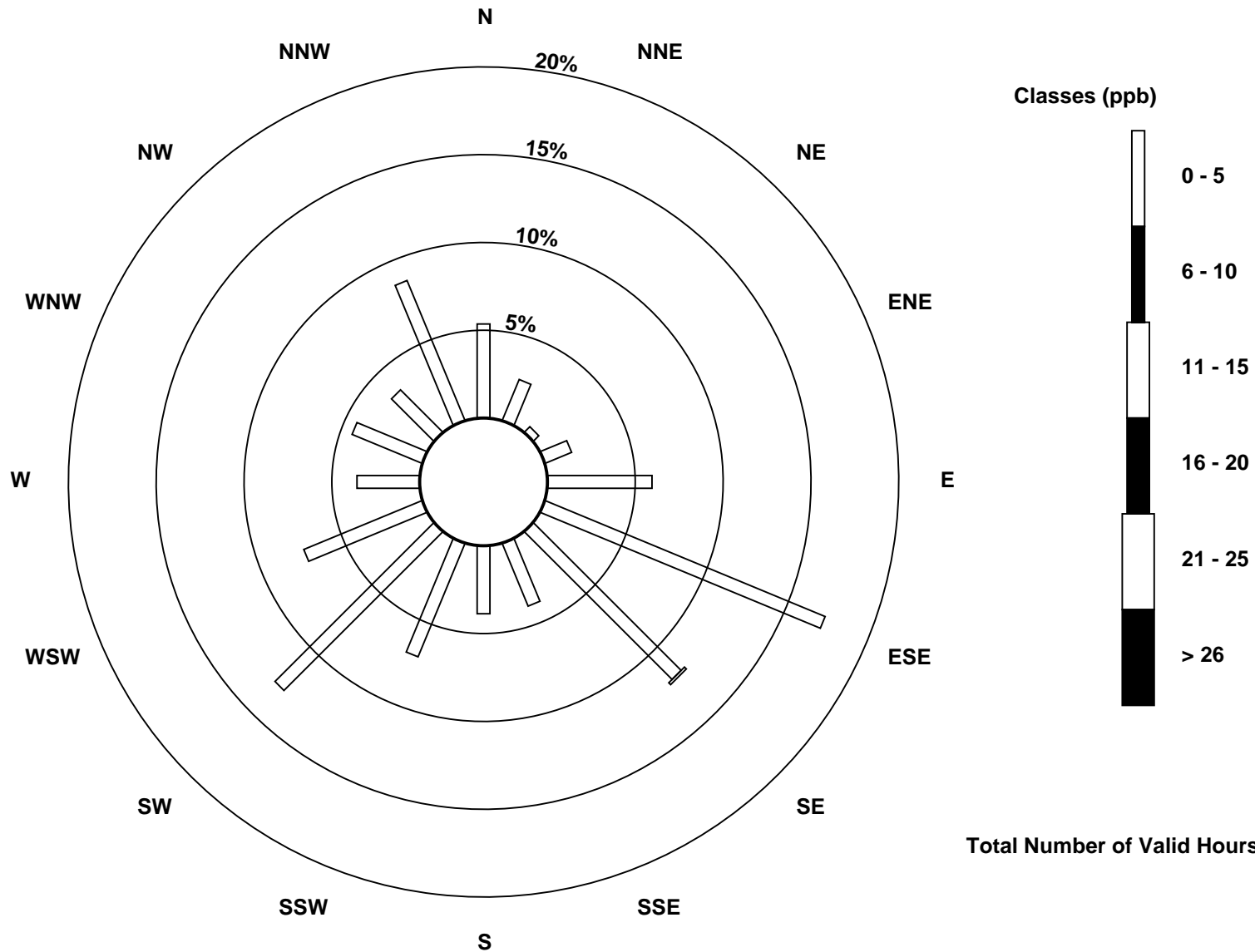
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

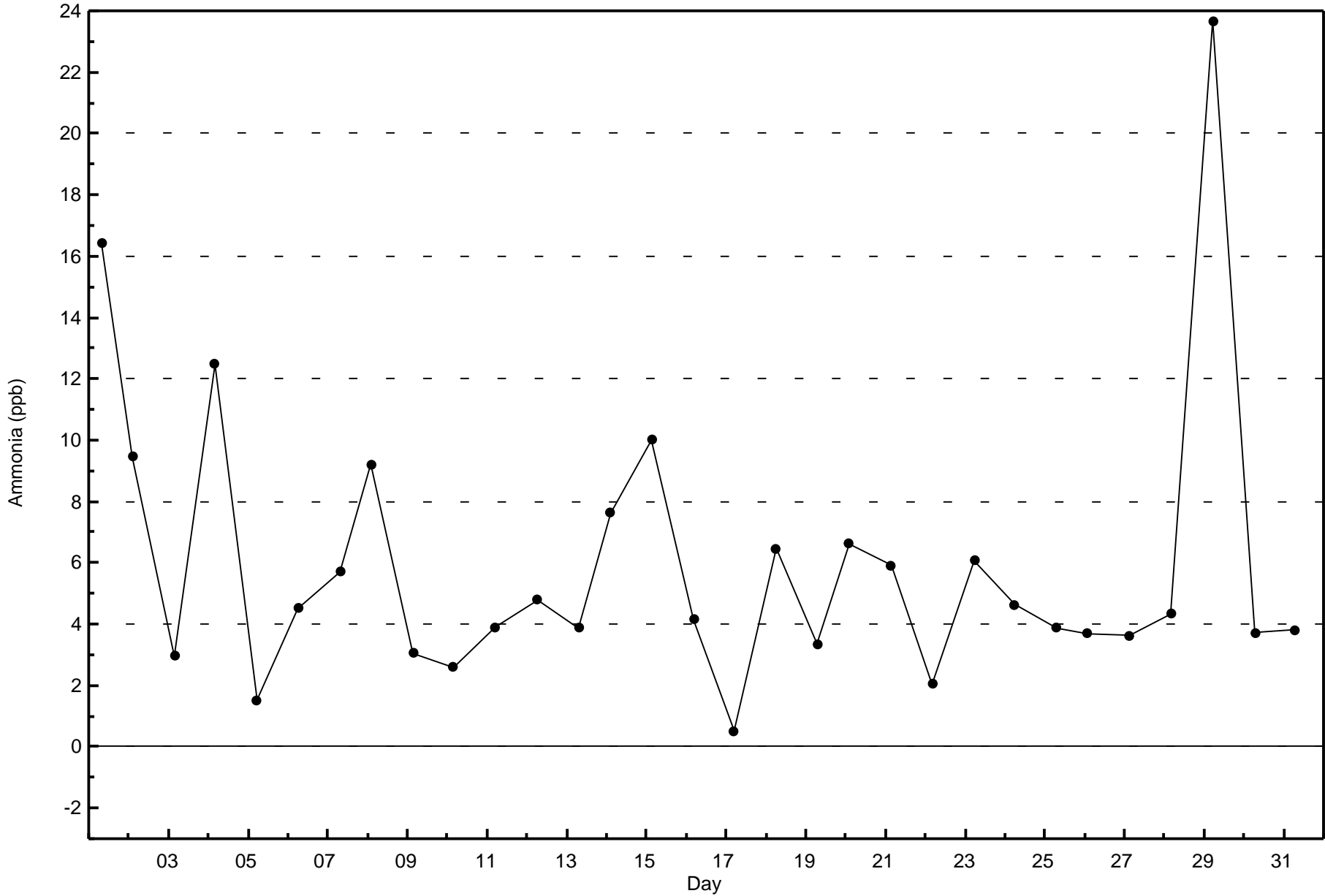
**Ammonia (NH<sub>3</sub>) - ppb**  
**Patricia McInnes - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 5	36	17	3	11	40	116	80	26	26	47	86	49	24	29	23	58	671
6 - 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 15	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
16 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	<b>36</b>	<b>17</b>	<b>3</b>	<b>11</b>	<b>40</b>	<b>116</b>	<b>81</b>	<b>26</b>	<b>26</b>	<b>47</b>	<b>86</b>	<b>49</b>	<b>24</b>	<b>29</b>	<b>23</b>	<b>58</b>	<b>672</b>

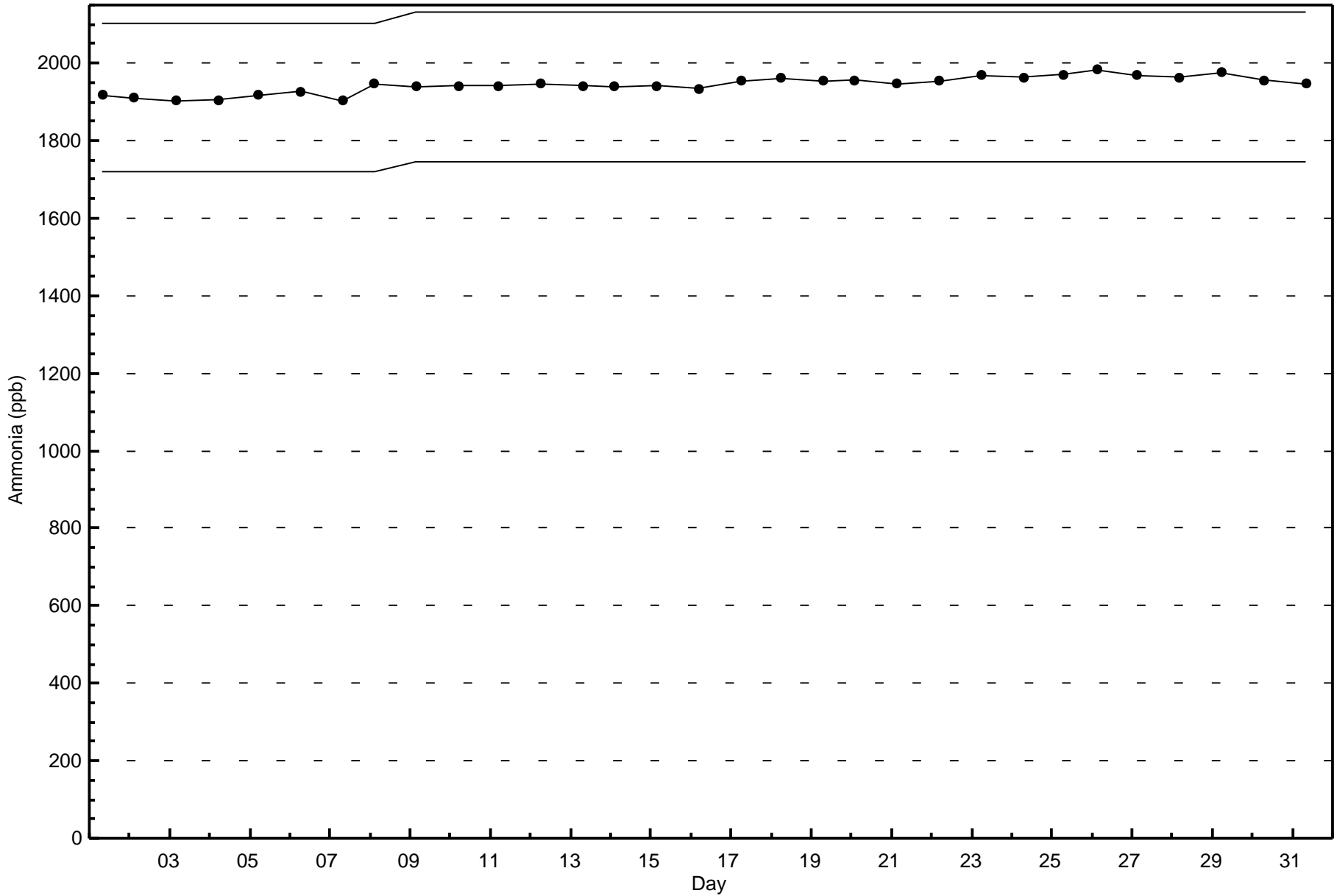
Total Number of Valid Hours: 672

Total Number of Hours: 744



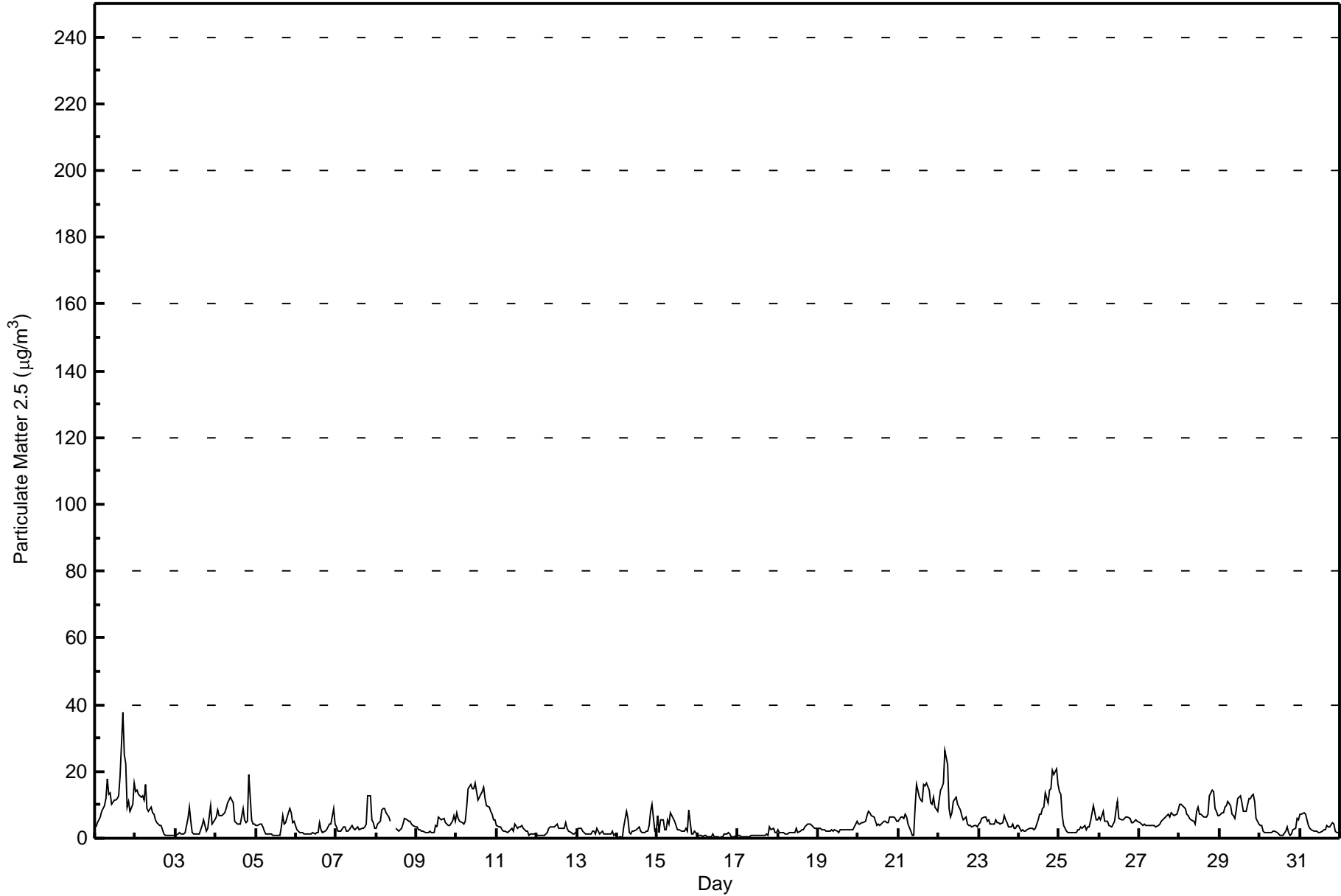








Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 37.9 µg/m <sup>3</sup> on Dec 1 17:00 Minimum Value: 0.2 µg/m <sup>3</sup> on Dec 14 01:00 Maximum Diurnal Average: 6.5 µg/m <sup>3</sup> at hour 21 Monthly Average: 4.99 µg/m <sup>3</sup>		Maximum Daily Average: 12.9 µg/m <sup>3</sup> on Dec 1 Minimum Daily Average: 0.7 µg/m <sup>3</sup> on Dec 16 Minimum Diurnal Average: 4.4 µg/m <sup>3</sup> at hour 14 Percentiles: P <sub>1</sub> = 0.3 P <sub>10</sub> = 1.2 Q <sub>1</sub> = 2.0 Median = 3.8 Q <sub>3</sub> = 6.5 P <sub>90</sub> = 10.9 P <sub>99</sub> = 19.6		Hours in Service: 744 Hours of Data: 741 Hours of Missing Data: 3 Hours of Calibration: 3 Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	3.4	4.6	5.7	6.4	8.1	9.9	11.7	17.6	13.1	13.5	10.0	11.6	11.3	11.9	12.9	18.6	37.9	25.0	22.3	9.5	10.9	8.1	10.1	16.5	12.9	37.9																						
2-Dec	14.0	14.3	13.1	12.4	12.5	11.4	16.2	8.8	8.1	9.4	7.8	7.3	5.7	4.8	3.7	3.8	2.5	1.2	0.9	0.9	1.0	1.0	1.0	1.0	6.8	16.2																						
3-Dec	1.0	1.2	1.5	1.2	1.2	1.3	1.8	5.9	9.3	5.0	1.7	1.4	1.2	1.4	1.3	2.3	3.6	5.4	2.2	3.2	6.3	9.7	4.2	5.5	3.3	9.7																						
4-Dec	6.5	8.3	7.0	6.9	6.9	7.5	9.0	10.5	11.4	12.1	10.8	5.2	4.8	4.2	4.2	4.3	8.9	5.4	4.7	5.3	19.3	5.6	4.4	4.3	7.4	19.3																						
5-Dec	3.8	4.0	4.2	4.4	3.4	2.2	1.5	1.4	1.3	1.1	1.0	0.9	0.8	0.8	1.0	3.6	6.7	4.1	4.6	7.6	8.9	7.5	4.5	4.9	3.5	8.9																						
6-Dec	2.7	2.0	1.7	1.6	1.8	1.3	1.3	1.2	1.2	1.2	1.7	1.3	1.9	1.7	4.6	2.7	1.9	2.0	2.5	3.5	4.2	4.3	8.8	4.3	2.6	8.8																						
7-Dec	3.4	2.1	2.2	2.1	3.2	3.6	2.1	2.2	2.5	3.7	2.9	2.7	3.0	3.2	2.7	3.2	3.1	3.2	4.1	12.5	12.7	5.7	4.5	3.0	3.9	12.7																						
8-Dec	3.0	4.3	5.2	8.5	8.9	8.8	7.7	6.3	5.2	C	C	C	3.0	2.0	2.5	2.8	4.3	6.1	5.5	5.2	5.0	4.1	3.7	3.4	5.0	8.9																						
9-Dec	3.3	2.5	2.3	2.3	2.1	1.9	1.7	1.6	2.2	1.7	1.7	3.7	3.5	6.5	6.0	5.5	5.8	4.7	4.4	4.0	3.6	5.2	6.8	5.1	3.7	6.8																						
10-Dec	7.5	5.8	5.0	4.5	4.2	5.3	9.2	14.7	16.1	14.7	14.7	16.5	14.2	11.6	13.0	14.2	15.1	11.7	9.8	9.3	8.1	7.1	5.6	5.5	10.1	16.5																						
11-Dec	3.7	3.4	3.2	2.5	2.2	2.0	1.8	1.9	2.4	2.9	2.3	4.1	2.8	3.4	3.4	3.6	2.9	2.3	2.0	0.9	1.1	1.5	1.4	1.2	2.4	4.1																						
12-Dec	0.8	1.0	0.8	0.9	1.0	1.3	1.9	2.8	3.2	3.5	3.3	3.6	4.2	2.9	2.9	3.1	2.8	4.6	3.2	2.3	1.9	1.3	1.2	1.6	2.3	4.6																						
13-Dec	2.1	2.9	2.8	2.2	1.6	1.3	1.5	1.1	1.4	2.1	2.1	1.5	3.1	1.4	1.5	1.9	1.4	1.1	1.4	1.1	1.3	2.2	0.9	1.4	1.7	3.1																						
14-Dec	0.2	0.3	0.4	0.2	3.5	8.2	5.8	1.8	1.1	2.1	1.9	2.4	2.8	3.3	2.0	1.8	1.5	2.0	2.0	3.8	8.1	10.1	2.2	1.6	2.9	10.1																						
15-Dec	7.0	1.7	5.7	5.6	2.7	2.7	5.6	4.2	7.5	5.9	5.3	4.0	2.4	2.3	2.3	2.1	2.2	2.9	2.1	8.5	1.4	1.3	2.1	1.7	3.7	8.5																						
16-Dec	0.8	0.7	0.8	0.6	0.7	0.7	0.4	0.4	0.5	1.3	0.3	0.2	0.3	0.2	0.2	0.6	1.2	1.3	1.9	1.2	0.6	0.5	0.6	0.7	0.7	1.9																						
17-Dec	0.8	0.7	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.7	0.7	0.7	0.9	1.0	1.0	1.0	1.0	1.1	1.0	3.4	2.7	2.9	1.8	1.8	1.1	3.4																						
18-Dec	2.3	1.8	1.8	1.7	1.4	1.5	1.4	1.7	1.6	1.8	1.9	3.0	1.8	2.1	2.7	2.7	3.5	4.0	4.3	4.1	3.7	3.2	3.1	2.9	2.5	4.3																						
19-Dec	2.8	2.9	2.7	2.6	2.4	2.0	2.0	2.3	2.4	2.2	2.5	1.9	1.6	2.4	2.5	2.5	2.6	2.7	2.5	2.3	2.4	2.7	4.3	4.9	2.6	4.9																						
20-Dec	4.1	4.4	4.7	4.7	5.3	6.9	7.9	7.8	6.7	6.2	5.2	4.0	4.0	3.8	4.5	5.1	4.9	4.8	4.7	6.2	6.2	6.4	5.9	5.2	5.4	7.9																						
21-Dec	5.0	6.3	6.3	5.8	7.1	6.2	4.1	2.2	1.0	0.9	9.4	16.2	12.4	11.3	11.2	16.3	15.8	16.3	14.5	10.7	10.1	12.2	9.5	8.2	9.1	16.3																						
22-Dec	11.4	14.4	15.2	16.4	26.2	22.1	8.9	6.3	7.6	11.2	12.3	10.3	9.2	8.5	6.7	5.6	6.5	4.3	4.0	3.9	3.5	3.7	4.0	3.4	9.4	26.2																						
23-Dec	4.1	4.7	6.1	6.2	6.4	5.2	5.3	4.4	4.3	4.3	5.4	4.8	4.5	4.3	4.7	6.7	5.6	4.7	3.6	3.4	4.0	3.1	3.0	3.6	4.7	6.7																						
24-Dec	4.0	2.2	2.4	2.0	1.9	2.5	3.0	3.2	3.1	2.6	3.1	5.7	7.4	7.3	8.8	9.5	13.4	10.4	14.6	14.7	20.1	19.2	20.7	16.0	8.2	20.7																						
25-Dec	14.1	13.0	6.7	3.6	2.0	1.8	1.7	1.6	1.7	1.8	1.8	2.6	2.7	3.5	3.2	3.9	2.5	3.2	3.6	5.1	9.9	7.8	5.6	5.7	4.5	14.1																						
26-Dec	6.3	5.7	8.0	5.0	5.1	5.2	3.8	3.3	4.3	4.9	8.5	11.0	6.0	5.5	5.5	5.9	6.4	6.5	5.9	4.8	4.6	5.1	5.7	5.1	5.8	11.0																						
27-Dec	4.8	4.3	4.0	4.1	3.7	3.8	3.7	3.8	3.7	3.8	3.6	3.6	4.4	5.2	5.4	5.7	6.8	7.3	6.4	7.6	7.0	6.9	7.0	8.6	5.2	8.6																						
28-Dec	10.0	10.1	9.9	8.9	7.0	6.7	6.1	5.6	5.0	4.0	7.9	9.2	7.3	7.2	6.5	6.3	6.2	7.2	12.8	14.3	14.1	8.9	8.1	6.7	8.2	14.3																						
29-Dec	6.6	7.7	7.5	9.3	9.9	11.0	9.6	7.3	7.0	6.1	8.6	11.7	12.5	10.4	8.1	8.1	8.1	11.8	11.8	12.9	13.0	11.2	5.7	4.2	9.2	13.0																						
30-Dec	3.6	3.7	2.3	1.9	1.7	1.8	1.8	1.8	2.0	2.0	1.5	1.1	1.0	1.0	0.9	2.0	3.4	1.6	0.9	1.2	2.7	3.0	5.8	5.6	2.3	5.8																						
31-Dec	7.0	7.1	7.7	7.1	5.3	3.9	2.9	2.5	2.1	2.0	2.0	1.6	1.8	1.9	2.7	2.4	3.7	3.4	3.4	4.8	4.2	1.9	1.9	1.8	3.6	7.7																						
																								4.8	4.8	4.8	4.6	4.8	4.8	4.6	4.4	4.5	4.5	4.7	5.1	4.6	4.4	4.5	5.1	6.2	5.6	5.4	5.8	6.5	5.6	5.0	4.7	Diurnal Average
																								14.1	14.4	15.2	16.4	26.2	22.1	16.2	17.6	16.1	14.7	14.7	16.5	14.2	11.9	13.0	18.6	37.9	25.0	22.3	14.7	20.1	19.2	20.7	16.5	Diurnal Maximum
C - Calibration																																																
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																																																





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Patricia McInnes - December 2015**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	441	59.51	59.51
6 - 15	226	30.50	90.01
16 - 25	19	2.56	92.58
26 - 80	2	0.27	92.85
> 81.0	0	0.00	92.85

Total Number of Valid Hours: 741

Total Number of Hours: 744



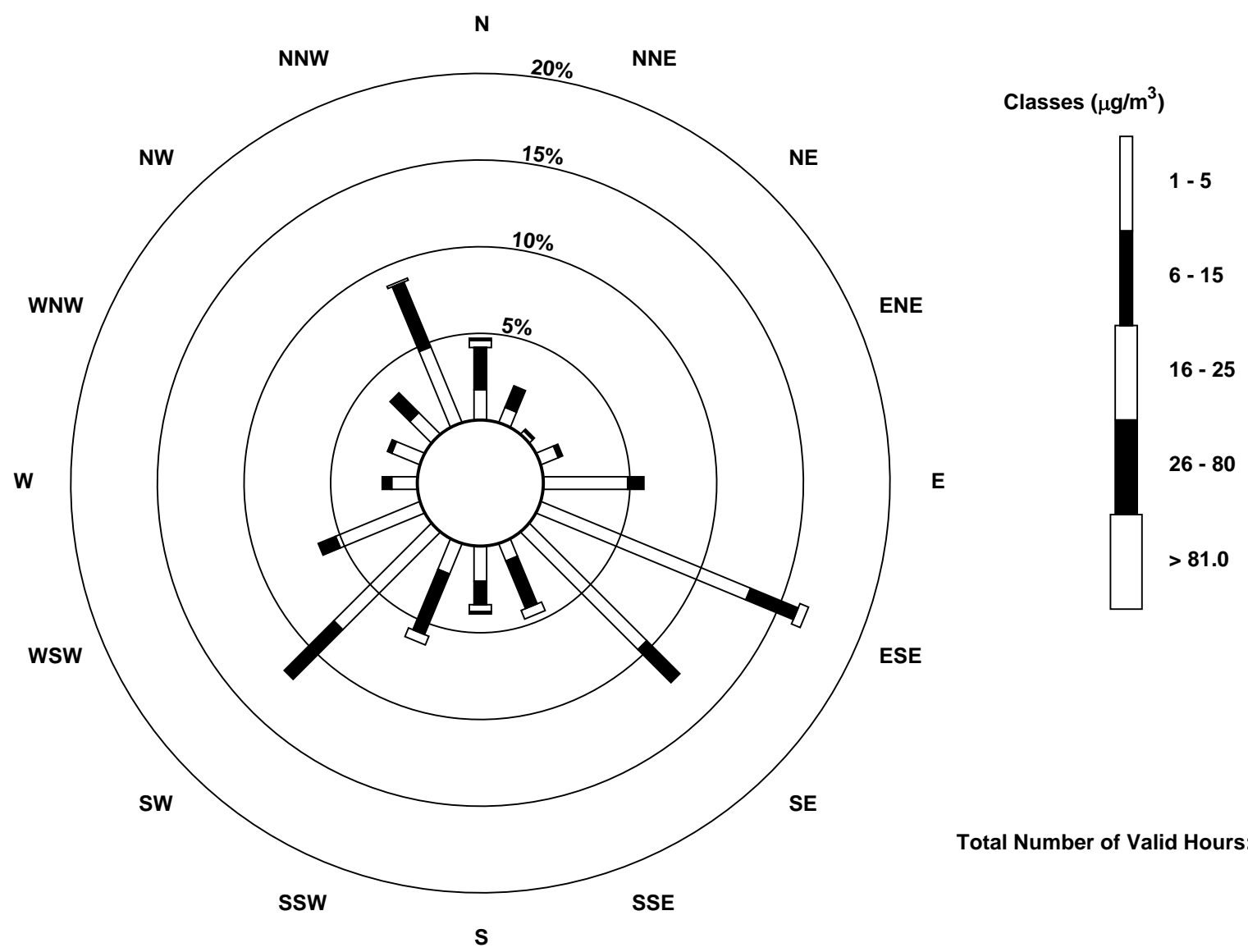
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Patricia McInnes - December 2015**

Concentration Ranges ( $\mu\text{g}/\text{m}^3$ )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	13	7	2	8	36	97	71	8	15	14	59	39	11	13	13	35	441
6 - 15	18	10	1	2	7	22	20	22	10	28	30	8	4	2	12	30	226
16 - 25	3	0	0	0	0	4	0	4	3	4	0	0	0	0	0	1	19
26 - 80	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	35	17	3	10	43	123	91	34	29	46	89	47	15	15	25	66	688

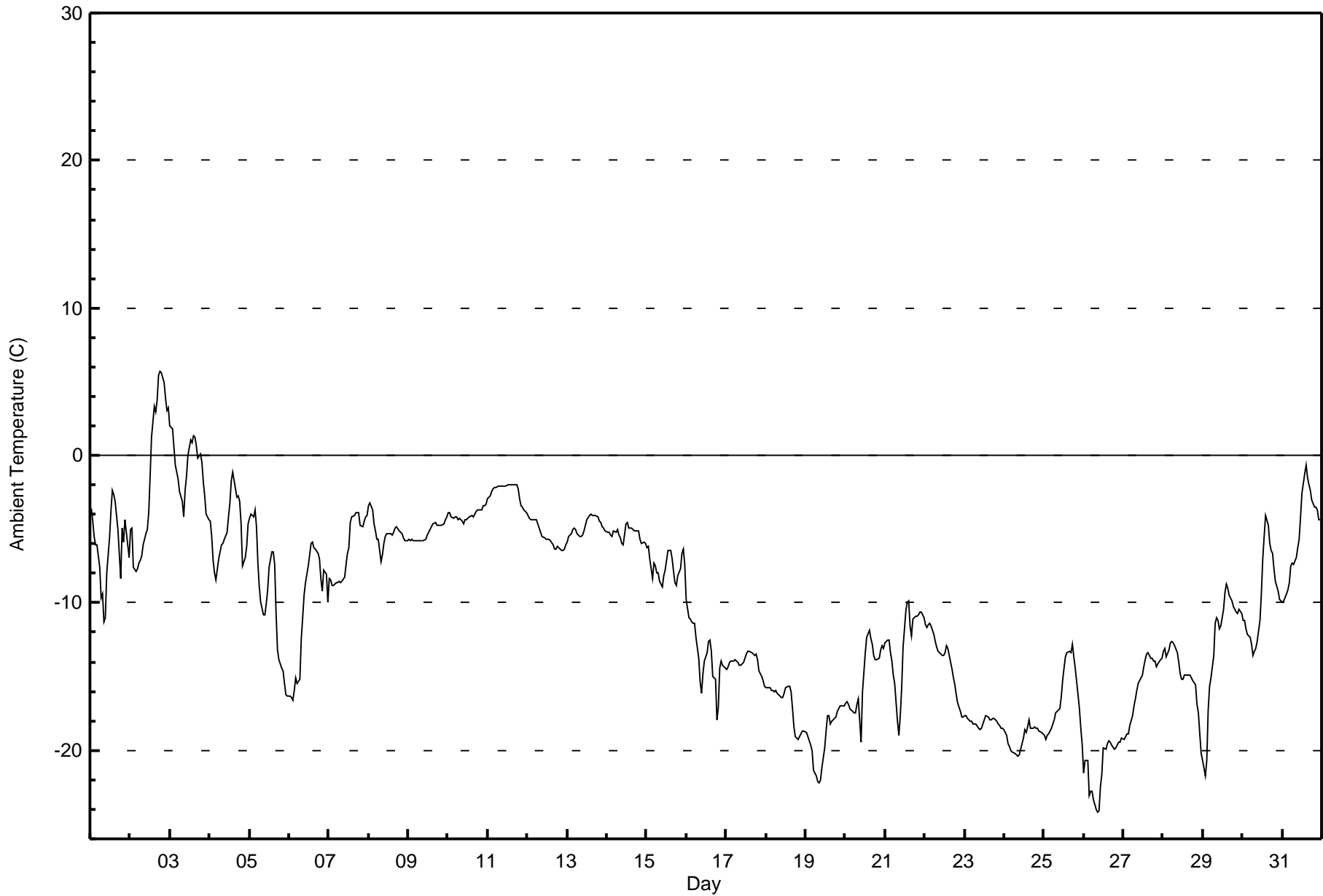
Total Number of Valid Hours: 741

Total Number of Hours: 744





Maximum Value: 5.7 C on Dec 2 19:00		Maximum Daily Average: -0.9 C on Dec 3		Hours in Service: 744																																												
Minimum Value: -24.2 C on Dec 26 09:00		Minimum Daily Average: -21.1 C on Dec 26		Hours of Data: 744																																												
Maximum Diurnal Average: -8.3 C at hour 15		Minimum Diurnal Average: -11.6 C at hour 9		Hours of Missing Data: 0																																												
Monthly Average: -10.25 C		Percentiles: P <sub>1</sub> = -22.6 P <sub>10</sub> = -18.6 Q <sub>1</sub> = -15.5 Median = -9.5 Q <sub>3</sub> = -5.1 P <sub>90</sub> = -3.4 P <sub>99</sub> = 2.9		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-3.6	-4.5	-5.5	-6.1	-6.0	-7.6	-9.7	-9.4	-11.3	-11.0	-8.0	-5.6	-3.8	-2.4	-2.6	-3.1	-5.0	-6.8	-8.3	-4.9	-5.9	-4.4	-6.1	-6.9	-6.2	-2.4																						
2-Dec	-5.1	-5.0	-7.6	-7.9	-7.7	-7.3	-7.1	-6.8	-6.1	-5.3	-5.0	-3.8	-1.5	1.2	3.3	3.0	3.7	5.4	5.7	5.6	4.9	3.9	3.1	3.2	-1.4	5.7																						
3-Dec	2.0	1.8	0.5	-0.6	-1.2	-1.6	-2.5	-3.1	-4.2	-2.4	-1.4	0.0	1.1	0.9	1.3	1.3	0.7	-0.1	0.1	-0.5	-1.8	-2.8	-4.0	-4.3	-0.9	2.0																						
4-Dec	-4.4	-5.5	-7.1	-8.0	-8.4	-7.1	-6.5	-6.1	-6.0	-5.7	-5.2	-4.2	-3.2	-1.7	-1.1	-1.7	-2.9	-2.8	-3.1	-4.6	-7.5	-7.0	-6.2	-4.6	-5.0	-1.1																						
5-Dec	-4.3	-4.0	-4.1	-3.7	-4.8	-7.3	-8.9	-10.0	-10.8	-10.7	-10.1	-9.1	-7.6	-6.6	-6.5	-7.4	-10.7	-13.2	-13.8	-14.4	-14.7	-15.5	-16.3	-16.4	-9.6	-3.7																						
6-Dec	-16.3	-16.4	-16.6	-16.0	-15.1	-15.5	-15.2	-12.4	-11.0	-9.5	-8.6	-7.5	-6.8	-6.0	-5.9	-6.3	-6.4	-6.6	-7.0	-8.3	-9.2	-7.8	-8.1	-10.0	-10.3	-5.9																						
7-Dec	-8.4	-8.5	-8.8	-8.8	-8.7	-8.6	-8.6	-8.6	-8.5	-8.3	-7.4	-6.6	-6.3	-4.6	-4.2	-4.0	-3.9	-3.8	-3.9	-4.7	-4.8	-4.5	-4.2	-4.1	-6.4	-3.8																						
8-Dec	-3.4	-3.2	-3.7	-4.6	-5.1	-5.7	-5.7	-7.2	-6.8	-5.9	-5.5	-5.3	-5.3	-5.3	-5.4	-5.3	-5.0	-4.9	-5.1	-5.2	-5.3	-5.6	-5.8	-5.8	-5.2	-3.2																						
9-Dec	-5.7	-5.7	-5.7	-5.8	-5.8	-5.7	-5.8	-5.8	-5.8	-5.7	-5.7	-5.4	-5.2	-5.0	-4.8	-4.7	-4.6	-4.7	-4.7	-4.7	-4.7	-4.6	-4.4	-4.2	-5.2	-4.2																						
10-Dec	-3.9	-3.9	-4.1	-4.3	-4.2	-4.2	-4.4	-4.3	-4.5	-4.6	-4.3	-4.3	-4.3	-4.2	-4.1	-4.2	-4.0	-3.8	-3.7	-3.7	-3.7	-3.5	-3.4	-3.3	-4.0	-3.3																						
11-Dec	-2.9	-2.7	-2.5	-2.3	-2.2	-2.2	-2.1	-2.1	-2.1	-2.1	-2.0	-2.1	-2.0	-2.0	-2.0	-1.9	-2.0	-2.0	-2.3	-2.9	-3.4	-3.5	-3.7	-3.8	-2.4	-1.9																						
12-Dec	-4.0	-4.2	-4.3	-4.4	-4.4	-4.4	-4.6	-4.9	-5.2	-5.5	-5.6	-5.6	-5.7	-5.7	-5.8	-6.1	-6.3	-6.3	-6.2	-6.2	-6.4	-6.5	-6.4	-6.1	-5.5	-4.0																						
13-Dec	-5.8	-5.5	-5.3	-5.0	-4.9	-5.1	-5.3	-5.5	-5.5	-5.4	-5.1	-4.8	-4.4	-4.1	-4.0	-4.1	-4.1	-4.1	-4.1	-4.5	-4.6	-4.9	-4.9	-5.1	-4.8	-4.0																						
14-Dec	-5.2	-5.2	-5.4	-5.5	-5.1	-5.2	-5.0	-5.4	-5.6	-6.0	-6.1	-4.7	-4.6	-4.9	-5.0	-4.9	-5.1	-5.1	-5.1	-5.2	-5.7	-6.0	-5.9	-6.0	-5.3	-4.6																						
15-Dec	-6.3	-6.2	-7.0	-8.3	-7.3	-7.5	-8.0	-8.0	-8.6	-8.9	-8.2	-7.8	-7.1	-6.5	-6.5	-7.0	-7.9	-8.6	-8.9	-8.2	-7.7	-6.7	-6.3	-7.4	-7.5	-6.2																						
16-Dec	-9.8	-11.0	-11.1	-11.3	-11.4	-11.4	-12.3	-13.8	-15.4	-16.1	-14.8	-14.0	-13.4	-12.6	-12.6	-13.3	-15.0	-15.1	-17.9	-17.1	-14.4	-14.0	-14.2	-14.4	-13.6	-9.8																						
17-Dec	-14.5	-14.4	-14.0	-13.9	-13.9	-13.9	-13.9	-14.1	-14.2	-14.2	-14.0	-13.8	-13.5	-13.3	-13.2	-13.3	-13.4	-13.5	-13.5	-13.8	-14.6	-15.0	-15.3	-15.6	-14.0	-13.2																						
18-Dec	-15.7	-15.7	-15.8	-15.9	-15.9	-16.0	-16.0	-16.2	-16.3	-16.4	-16.4	-16.2	-15.8	-15.6	-15.6	-16.0	-17.2	-18.5	-19.1	-19.3	-19.1	-18.9	-18.7	-18.7	-16.9	-15.6																						
19-Dec	-18.8	-19.1	-19.4	-19.7	-20.0	-21.4	-21.7	-22.1	-22.2	-22.0	-21.2	-19.8	-18.7	-17.6	-17.6	-18.2	-18.0	-17.9	-17.8	-17.3	-17.1	-17.0	-17.0	-17.0	-19.1	-17.0																						
20-Dec	-16.8	-16.7	-16.9	-17.2	-17.4	-17.5	-17.4	-16.9	-16.6	-19.4	-16.0	-14.7	-13.4	-12.3	-11.9	-12.4	-12.9	-13.5	-13.8	-13.8	-13.8	-13.2	-12.9	-13.1	-15.0	-11.9																						
21-Dec	-12.7	-12.6	-12.5	-13.3	-14.0	-14.9	-15.5	-18.0	-18.9	-17.6	-15.7	-13.0	-10.6	-10.0	-9.8	-11.6	-12.2	-11.1	-10.9	-10.9	-10.8	-10.6	-10.6	-11.0	-12.9	-9.8																						
22-Dec	-11.4	-11.6	-11.5	-11.3	-11.6	-12.2	-12.6	-13.0	-13.2	-13.4	-13.5	-13.5	-13.3	-12.9	-13.1	-13.6	-14.5	-15.1	-15.5	-16.3	-16.8	-17.4	-17.7	-17.7	-13.9	-11.3																						
23-Dec	-17.6	-17.6	-17.9	-18.0	-18.1	-18.2	-18.2	-18.2	-18.5	-18.6	-18.5	-18.2	-17.9	-17.6	-17.8	-17.9	-17.9	-17.9	-17.9	-18.0	-18.2	-18.3	-18.5	-18.5	-18.1	-17.6																						
24-Dec	-18.6	-19.0	-19.5	-19.8	-20.0	-20.1	-20.2	-20.3	-20.4	-20.3	-19.9	-19.2	-18.6	-18.7	-18.4	-18.0	-18.5	-18.5	-18.4	-18.5	-18.5	-18.7	-18.8	-18.9	-19.2	-18.0																						
25-Dec	-19.0	-19.3	-18.9	-18.9	-18.5	-18.2	-17.9	-17.5	-17.4	-17.2	-16.4	-15.3	-14.5	-13.7	-13.4	-13.3	-13.4	-12.8	-13.7	-14.4	-16.2	-17.2	-18.5	-19.7	-16.5	-12.8																						
26-Dec	-21.5	-20.7	-20.7	-23.1	-22.8	-22.8	-23.4	-24.0	-24.2	-24.1	-22.5	-21.6	-19.8	-19.9	-19.5	-19.4	-19.5	-19.6	-20.0	-19.8	-19.6	-19.5	-19.4	-19.2	-21.1	-19.2																						
27-Dec	-19.3	-19.1	-18.9	-18.9	-18.3	-17.7	-17.0	-16.5	-15.9	-15.5	-15.2	-14.9	-14.3	-13.9	-13.5	-13.4	-13.7	-13.8	-13.9	-13.9	-14.3	-14.1	-13.9	-13.7	-15.6	-13.4																						
28-Dec	-13.3	-13.1	-13.6	-13.2	-12.7	-12.6	-12.7	-12.9	-13.4	-14.1	-14.8	-15.2	-15.1	-14.9	-14.9	-14.9	-14.9	-15.1	-15.3	-15.6	-16.9	-17.5	-18.9	-20.2	-14.8	-12.6																						
29-Dec	-20.7	-21.7	-20.6	-17.3	-15.7	-15.1	-13.6	-11.4	-11.0	-11.2	-11.8	-11.5	-10.4	-9.3	-8.7	-9.1	-9.5	-9.9	-10.2	-10.4	-10.6	-10.7	-10.4	-10.7	-12.6	-8.7																						
30-Dec	-11.2	-11.2	-11.8	-12.1	-12.3	-12.8	-13.6	-13.3	-13.1	-12.6	-11.2	-9.4	-7.0	-5.5	-4.1	-4.7	-6.0	-6.5	-6.6	-7.7	-8.6	-9.2	-9.8	-9.9	-9.6	-4.1																						
31-Dec	-9.9	-9.8	-9.4	-9.1	-8.6	-7.5	-7.3	-7.4	-6.9	-6.2	-5.7	-4.1	-2.5	-1.2	-0.7	-1.5	-2.0	-2.4	-3.0	-3.5	-3.6	-3.7	-4.3	-4.4	-5.2	-0.7																						
																								-10.6	-10.7	-11.0	-11.1	-11.0	-11.2	-11.4	-11.5	-11.6	-11.5	-10.8	-10.0	-9.2	-8.6	-8.3	-8.6	-9.1	-9.3	-9.6	-9.8	-10.1	-10.1	-10.4	-10.6	Diurnal Average
																								2.0	1.8	0.5	-0.6	-1.2	-1.6	-2.1	-2.1	-2.1	-2.1	-1.4	0.0	1.1	1.2	3.3	3.0	3.7	5.4	5.7	5.6	4.9	3.9	3.1	3.2	Diurnal Maximum







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C**  
**Patricia McInnes - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	28	3.76	3.76
-20 - 0	696	93.55	97.31
0 - 10	20	2.69	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



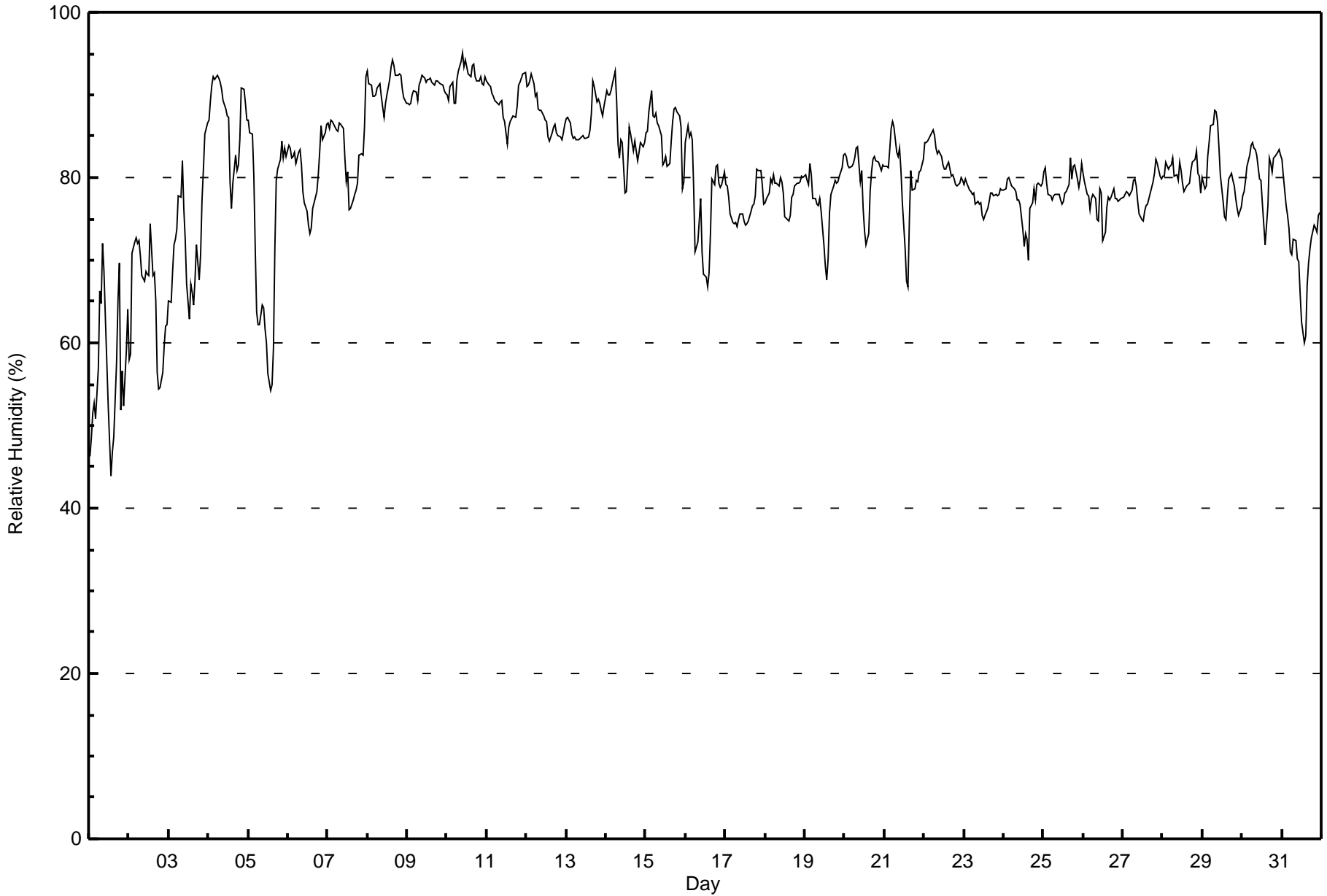
**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

**Patricia McInnes - December 2015**

Maximum Value: 95 % on Dec 10 10:00																			Maximum Daily Average: 92.1 % on Dec 10						Hours in Service: 744																			
Minimum Value: 44 % on Dec 1 14:00																			Minimum Daily Average: 56.6 % on Dec 1						Hours of Data: 744																			
Maximum Diurnal Average: 82.0 % at hour 4																			Minimum Diurnal Average: 75.2 % at hour 14						Hours of Missing Data: 0																			
Monthly Average: 80.0 %																			Percentiles: P <sub>1</sub> = 51 P <sub>10</sub> = 70 Q <sub>1</sub> = 77 Median = 80 O <sub>3</sub> = 86 P <sub>90</sub> = 91 P <sub>99</sub> = 93						Hours of Calibration: 0																			
																									Percent Operational Time: 100.0																			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																				
1-Dec	46	48	51	53	51	57	66	65	72	69	63	53	48	44	47	49	58	65	70	52	57	52	59	64	56.6	72																		
2-Dec	58	59	71	72	73	72	72	70	68	68	69	68	68	74	68	69	65	56	54	55	56	60	62	62	65.4	74																		
3-Dec	65	65	69	72	73	74	78	78	82	76	72	67	63	67	66	65	68	72	68	71	77	81	85	87	72.5	87																		
4-Dec	87	89	91	92	92	92	92	91	91	89	88	87	87	79	76	79	83	81	82	85	91	91	89	87	87.2	92																		
5-Dec	87	85	85	80	71	64	62	62	65	64	62	60	56	54	55	59	71	80	81	82	84	82	84	83	71.7	87																		
6-Dec	84	84	82	83	83	82	83	83	81	78	77	76	74	73	74	76	77	78	80	83	86	85	85	86	80.6	86																		
7-Dec	87	86	87	87	86	86	86	87	87	86	82	80	81	76	76	77	78	78	79	83	83	83	86	92	83.2	92																		
8-Dec	93	91	91	90	90	90	91	91	90	88	87	89	90	92	93	94	93	92	92	93	92	91	90	89	91.0	94																		
9-Dec	89	89	89	90	91	90	89	91	92	92	92	91	92	92	92	92	91	92	92	92	91	91	91	90	90.9	92																		
10-Dec	90	89	91	91	89	89	92	93	94	95	93	94	93	93	92	94	94	92	92	92	92	91	91	92	92.1	95																		
11-Dec	92	91	91	90	90	89	89	89	89	89	87	87	84	86	87	87	87	87	89	91	92	92	93	93	89.2	93																		
12-Dec	91	91	92	93	91	90	90	88	88	88	87	87	87	85	84	85	86	86	85	85	85	85	86	86	87.6	93																		
13-Dec	87	87	87	85	85	85	85	85	85	85	85	85	85	85	86	88	92	91	89	89	89	88	88	89	86.8	92																		
14-Dec	91	90	90	90	91	93	89	84	82	85	84	78	78	82	86	85	83	84	83	82	83	84	84	84	85.3	93																		
15-Dec	85	86	88	91	88	87	88	87	86	85	82	82	83	81	82	84	87	88	89	88	88	86	79	79	85.3	91																		
16-Dec	84	86	85	86	85	79	71	72	75	77	71	68	68	67	68	73	80	79	81	82	79	79	79	81	77.3	86																		
17-Dec	79	79	78	76	74	74	75	74	75	76	76	75	74	74	75	76	77	77	78	81	81	81	79	77	76.6	81																		
18-Dec	77	77	78	80	79	80	79	79	79	80	80	78	75	75	75	75	78	78	79	79	79	80	80	80	78.4	80																		
19-Dec	80	80	79	82	80	77	78	77	77	77	76	72	69	68	70	76	78	79	80	79	80	80	81	83	77.4	83																		
20-Dec	83	83	82	81	81	82	82	84	84	80	81	76	74	72	73	78	81	82	83	82	82	81	81	81	80.3	84																		
21-Dec	81	81	81	83	86	87	86	83	83	84	81	77	71	67	67	75	81	78	79	80	79	81	81	82	79.7	87																		
22-Dec	84	84	84	85	85	86	85	84	83	83	82	81	81	81	82	82	80	80	80	79	79	79	80	80	82.1	86																		
23-Dec	79	80	79	78	78	78	78	77	77	77	77	75	75	75	76	77	78	78	78	78	78	79	79	79	77.6	80																		
24-Dec	78	79	80	80	79	79	79	78	77	77	74	72	73	70	76	77	79	77	79	79	79	79	79	79	77.1	80																		
25-Dec	81	81	79	78	78	77	78	78	78	78	77	77	77	78	78	79	82	80	81	81	80	79	80	82	79.1	82																		
26-Dec	81	79	78	78	76	78	78	78	75	75	79	78	72	73	76	78	77	78	79	77	78	77	77	77	77.2	81																		
27-Dec	78	78	78	78	78	78	80	80	79	77	76	75	75	76	77	77	78	79	80	80	82	82	80	80	78.3	82																		
28-Dec	80	80	82	81	81	81	82	80	80	80	82	81	79	78	79	79	79	81	82	82	83	81	80	78	80.5	83																		
29-Dec	80	79	79	83	84	86	86	88	88	87	84	80	77	75	75	78	80	80	80	79	77	76	75	76	80.5	88																		
30-Dec	78	78	80	81	83	84	84	83	83	83	80	80	77	74	72	77	82	82	81	82	83	83	83	83	80.6	84																		
31-Dec	82	80	77	75	74	71	71	72	72	70	70	66	63	60	61	67	70	71	73	74	74	73	75	76	71.6	82																		
																			81.2	81.1	81.7	82.0	81.5	81.2	81.4	81.0	81.2	80.6	79.3	77.3	75.8	75.2	75.5	77.4	79.7	80.1	80.5	80.5	81.3	81.0	81.3	81.9	Diurnal Average	
																			93	91	92	93	92	93	92	93	94	95	93	94	93	93	93	94	94	92	92	93	92	92	93	93	Diurnal Maximum	





Maximum Speed: 23 km/h on Dec 31 10:00	Maximum Daily Speed Average: 14.0 km/h on Dec 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 6 07:00	Minimum Daily Speed Average: 1.8 km/h on Dec 14	Hours of Data: 744
Maximum Diurnal Speed Average: 3.1 km/h at hour 19	Minimum Diurnal Speed Average: 1.0 km/h at hour 6	Hours of Missing Data: 0
Monthly Average Velocity: 2.0 km/h 169.4 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 5 Median = 9 Q <sub>3</sub> = 11 P <sub>90</sub> = 14 P <sub>99</sub> = 19	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SW12	SW9	SSW7	SSW11	SW12	SW7	SSW5	S7	SSE2	ESE4	SE6	S9	SSE8	SSE7	SSE8	S8	S6	SSE6	SSW5	SW9	SW9	SSW11	SSW7	SSW6	SSW6.6	SW12
2-Dec	SW9	SW7	SSE7	SSE8	SSE6	SSE3	SSE6	SSE8	SSE9	SSE8	SSW7	S7	SSW10	SSW11	SSW11	S7	SW10	SW13	WSW14	WSW17	WSW15	SW13	WSW13	WSW14	SSW8.2	WSW17
3-Dec	WSW13	WSW17	SW11	WSW12	WSW12	SW8	S5	SSW4	E6	SE7	E6	E4	NE4	N6	NNW3	ESE5	E7	ESE7	SE9	E6	N2	N4	NNW4	NW6	SSW1.8	WSW17
4-Dec	NNW5	NNW6	NNW6	NNW5	NW6	NNW5	NNW7	NNW6	NW7	NNW3	SW5	SSW6	SSW8	WSW11	SW7	S5	SSW6	SW9	SW9	SW5	SSW5	SSW7	SW7	SW7	WSW3.7	WSW11
5-Dec	WSW6	W6	W5	W11	NNW18	NNW19	W19	W19	W16	WSW18	W18	WSW16	W16	WSW13	WSW10	SW5	SSE3	WSW1	SW3	WSW2	SSW2	NW3	W1	E2	W8.9	W19
6-Dec	NW4	NW3	WNW2	SSW1	W1	NNW1	NNW0	S1	SE6	SE6	SE7	ESE11	ESE11	ESE11	SE9	ESE7	SE8	SE8	SE8	SSE3	SE4	SE7	SSE7	SSE4	SE4.3	ESE11
7-Dec	SE6	SE8	SE8	SE11	SE12	SE13	SE14	SE13	SE14	SE13	SE15	SE15	SE12	SE11	ESE9	SSE6	SSE7	SE6	S5	SSE4	SE3	SE4	SSW4	SW4	SE8.6	SE15
8-Dec	W3	NNW6	NNW10	NNW10	NNW7	NW5	WSW3	WSW3	SW3	WSW7	SW6	SW6	S8	SSE7	SE8	SE7	ESE7	E8	ENE11	E12	ENE11	ENE10	E11	E9	E1.9	E12
9-Dec	ESE10	ESE13	E11	E9	E8	E8	ESE10	E10	ESE10	ESE11	ESE11	ESE10	ESE9	ESE7	ESE3	ESE3	SSE3	WSW3	SW2	WSW4	WSW5	WSW3	SSW4	SW4	ESE5.5	ESE13
10-Dec	S3	WSW3	WSW3	WNW3	NNW6	NW5	NW4	NW3	NNW4	NNW5	N3	N5	NE4	NNE5	NNE4	NNE5	ENE4	NE4	ESE5	E8	E7	E6	E6	E5	NNE2.2	E8
11-Dec	ENE5	E4	ESE8	ESE10	ESE10	ESE11	ESE12	ESE12	ESE13	SE10	ESE11	SE9	SE7	ESE5	ESE5	ESE7	ESE9	ESE11	ESE12	ESE14	ESE13	ESE11	ESE10	ESE11	ESE9.6	ESE14
12-Dec	ESE13	ESE13	ESE14	ESE13	SE12	ESE11	ESE12	SE15	SE16	SE17	ESE17	SE15	SE14	SE15	SE17	SE16	SE15	SE13	SE13	SE14	SE14	ESE14	ESE13	ESE12	SE14.0	SE17
13-Dec	ESE12	ESE13	ESE13	ESE13	ESE13	ESE15	ESE15	ESE13	ESE11	ESE9	E9	E9	ESE10	ESE11	ESE10	ESE7	E6	E7	E7	ENE6	ENE5	ESE4	ENE4	ENE1	ESE8.9	ESE15
14-Dec	WNW2	N2	WNW0	W1	NW3	NNW3	NNE4	NNW5	W5	NNE5	NNE4	ENE0	NNE0	SE3	S5	SSW5	WSW5	S6	S7	S9	S7	S7	SSE9	SSE9	S1.8	S9
15-Dec	S6	SE8	SE6	SSE7	SSE8	SE7	SSE7	S7	SSW6	SW8	WSW10	WSW13	WSW11	SW9	WSW9	SW9	SW8	S7	SSW7	SSW6	WSW8	W11	NNW15	NW14	SW5.7	NNW15
16-Dec	N14	N8	NNW5	W2	W5	NNW10	NNW14	NNW12	NNW7	WSW2	NNW11	W11	W11	W12	W12	SW6	SW6	SW8	SSW3	WSW3	NNW11	NNW11	W12	W11	W7.1	NNW14
17-Dec	W10	W11	NNW13	NNW13	NNW12	NNW12	NNW13	NNW12	NNW11	NNW8	NNW8	NNW9	NNW10	NNW9	NNW9	NNW7	NNW6	W5	NW4	N9	N10	N11	NNE11	NNE9	NW8.1	NNW13
18-Dec	N7	NE4	NNE5	ENE4	E5	ESE5	E5	ESE6	ESE6	ESE8	ESE9	ESE7	E6	E7	E9	E10	E12	E11	E11	E10	E10	E10	E11	E11	E7.1	E12
19-Dec	E11	E10	E12	ESE11	ESE11	ESE13	ESE10	ESE13	ESE9	SE10	ESE8	SE10	SE9	ESE9	ESE6	ESE6	ESE10	SE13	ESE13	ESE13	SE13	SE11	SE11	SE8	ESE10.2	SE13
20-Dec	SE9	SE9	SE10	SE9	SE9	SE9	SE9	SE10	SE10	SSE5	SE11	SE9	ESE9	ESE10	ESE12	ESE13	ESE15	SE15	SE16	SE15	SE12	SE12	ESE14	SE12	SE11.0	SE16
21-Dec	SE11	SE10	SE11	SE7	SSE5	S5	S5	S5	SSW4	SSW6	S5	SSW7	SSW4	SE4	ESE4	ESE3	ESE2	ESE4	ESE2	SE2	SE2	NNE2	NNW2	N7	SSE3.3	SE11
22-Dec	N9	NNW9	N7	N7	N10	N12	NNW13	NNW13	NNW13	NNW12	N14	NNW11	N9	N8	N10	NNW15	NNW14	NNW11	NNW11	NNW13	NNW13	NNW12	NNW11	NNW12	NNW11.1	NNW15
23-Dec	NNW9	NNW10	NNW12	NNW13	N13	NNW11	NNW10	NNW10	NNW14	NNW11	NNW13	N13	NNW11	N11	NNW13	N12	NNW11	N11	N11	N13	NNW11	NNW10	NNW10	NNW11	NNW11.4	NNW14
24-Dec	N12	NNW11	NNW9	NW7	NNW8	NNW7	NNW8	NNW9	NNW8	NNW7	NW7	NW5	NNW5	N6	NNE3	NW1	ESE2	NNW1	E5	ESE4	ESE4	SSE6	S5	SSE4	NNW3.5	N12
25-Dec	ESE4	S5	SSW10	SW13	SW10	SW7	SW8	SW8	SW12	SW11	WSW11	WSW9	WSW7	SW6	SW6	SW4	WSW4	NNW2	NW4	NNW10	NNW14	NNW13	NW8	NW6	WSW5.2	NNW14
26-Dec	NW7	NW8	NNW6	NW6	NW5	N3	NNW3	SW3	NNW2	ESE1	SE4	SSE3	ESE5	ESE5	ESE5	ESE5	ESE6	ESE7	ESE8	ESE10	ESE9	ESE12	ESE13	ESE14	ESE3.1	ESE14
27-Dec	ESE13	ESE12	ESE13	ESE15	ESE16	ESE14	ESE18	ESE17	ESE16	SE18	SE20	SE19	SE17	SE14	SE11	ESE10	ESE8	ESE7	SE7	SE4	SW3	SSW5	SW8	WSW5	SE10.8	SE20
28-Dec	SW6	SW8	WSW9	W8	W6	WSW6	W5	N7	N8	N10	N9	N9	N7	N8	NNE6	N5	NNW5	NNE5	NNE5	SW2	SW1	SW2	SW2	SW1	NW3.2	N10
29-Dec	W2	SW2	WSW3	S2	SSE3	SSW3	SSE5	SSW10	SSW11	SSW12	SSW13	SW14	SSW13	SW14	SW12	SSW10	SSW13	SSW13	SW13	SW16	SW19	SW17	SW14	SW15	SSW10.1	SW19
30-Dec	WSW17	SW15	WSW14	WSW13	WSW11	WSW10	SW9	SW10	SW11	SW12	SW9	SSW11	SW10	SW14	SW12	SW11	SW7	WSW10	WSW12	WSW12	SW15	SW12	SW15	SW15	SW11.8	WSW17
31-Dec	SSW10	SW11	SW13	SSW8	S7	SSW8	SW12	SW14	WSW21	WSW23	WSW19	WSW11	SW10	SW10	SW8	SW11	SW12	SW9	SSW9	SSW11	SW14	SW14	SSW10	SW14	SW11.8	WSW23

S1.1	S1.1	S1.3	S1.8	S1.2	S1.0	SSE1.8	S2.1	S2.1	S2.5	S2.3	S3.0	S2.7	SSE2.5	SSE2.4	SSE2.7	SSE2.8	SSE2.9	SSE3.1	SSE2.4	S1.7	S1.8	S2.0	SSW1.7	Diurnal Average
WSW17	WSW17	WSW14	ESE15	WNW18	NNW19	W19	W19	WSW21	WSW23	SE20	SE19	SE17	SE15	SE17	SE16	ESE15	SE15	SE16	WSW17	SW19	SW17	NNW15	SW15	Diurnal Maximum

All monthly, daily, and diurnal averages have been calculated using vector methods



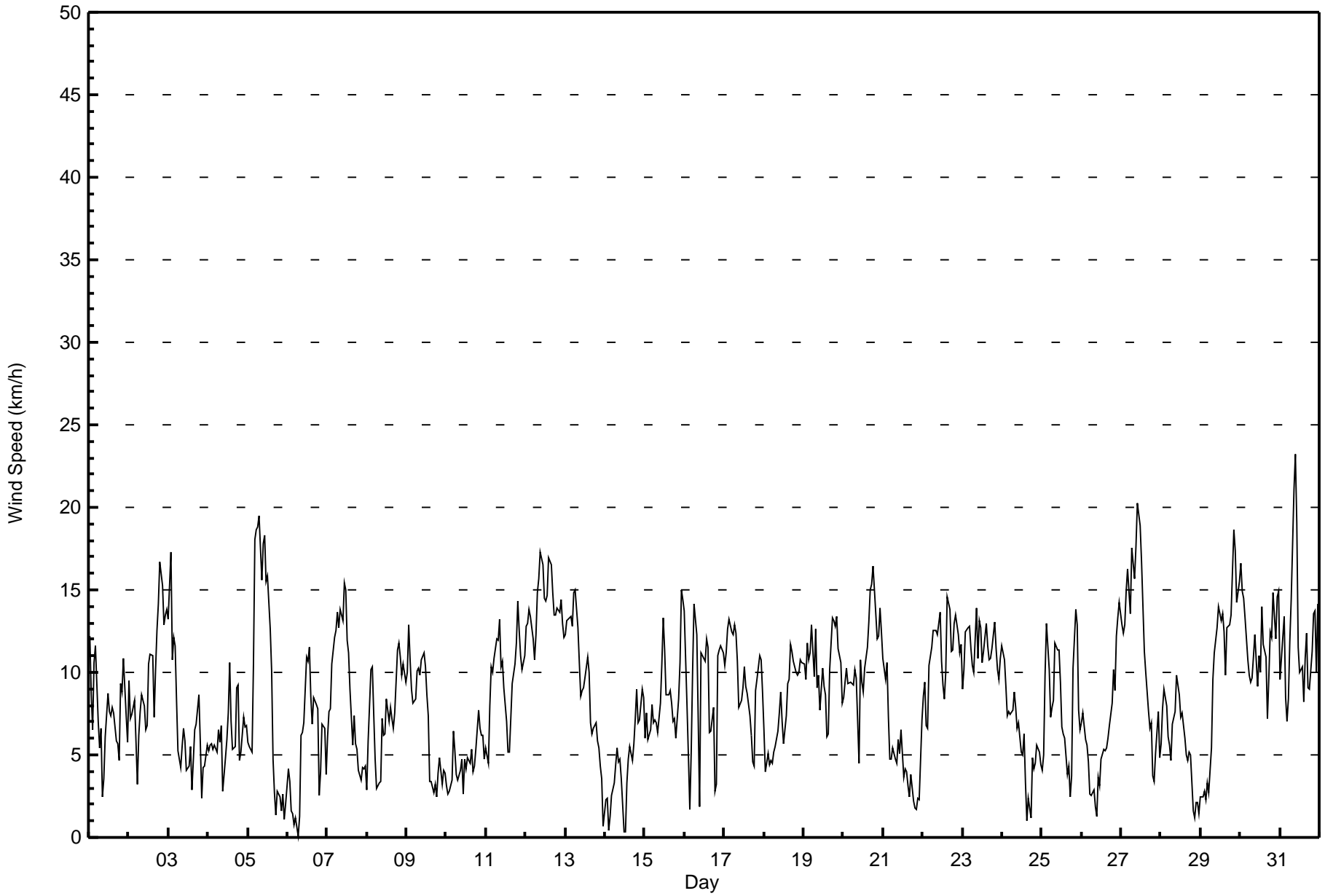
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed (WS) - km/h

Patricia McInnes - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 km/h on Dec 31 09:00																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																							
Minimum Value: 1 km/h on Dec 10 04:00																																									
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 5																																									
Day	Hourly Period Ending At (MST)																							Daily Maximum																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24																
1-Dec	2	3	2	3	3	2	1	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2	2	1	3																
2-Dec	1	2	1	1	1	1	2	2	2	2	1	2	2	2	3	1	2	2	3	3	3	2	2	3	3																
3-Dec	3	3	3	2	1	2	1	1	1	3	1	1	2	1	2	2	2	3	3	2	1	1	1	1	3																
4-Dec	1	1	1	1	1	1	2	1	2	2	2	2	2	3	2	1	2	1	2	1	2	1	2	1	3																
5-Dec	1	1	1	3	6	5	5	5	3	4	4	4	4	4	3	1	1	1	1	1	2	1	1	1	6																
6-Dec	1	1	1	1	1	1	1	2	2	2	2	3	2	3	3	2	2	2	2	3	2	2	2	1	3																
7-Dec	2	2	2	2	3	4	4	3	3	4	4	4	3	3	2	1	2	1	2	1	1	1	1	1	4																
8-Dec	1	2	2	2	2	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2																
9-Dec	2	3	2	2	2	2	3	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	3																
10-Dec	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	2	2	1	1	2	2	2																
11-Dec	1	2	2	2	2	2	2	3	3	3	2	2	2	1	1	1	2	3	3	3	3	2	2	2	3																
12-Dec	3	3	2	3	2	3	3	3	4	4	4	3	4	3	4	4	4	3	3	3	3	3	3	3	4																
13-Dec	3	3	3	4	3	3	3	3	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	4																
14-Dec	1	1	2	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	2	1	1	1	2	2																
15-Dec	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	2	1	2	1	2	2	4	4																
16-Dec	4	2	1	1	2	2	3	2	4	2	3	2	2	3	3	1	1	2	2	2	2	2	2	2	4																
17-Dec	2	2	2	2	2	2	2	2	2	1	2	2	2	1	1	1	1	1	1	2	2	2	2	2	2																
18-Dec	1	1	1	1	1	1	1	1	1	2	1	1	1	2	2	2	3	2	2	2	2	2	2	3	3																
19-Dec	3	2	2	2	2	3	3	3	3	2	2	2	2	2	1	1	2	3	3	3	3	3	2	2	3																
20-Dec	2	2	2	2	2	2	2	2	2	1	3	2	3	2	3	3	3	4	4	4	3	3	3	3	4																
21-Dec	3	2	2	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	2	2	3																
22-Dec	2	2	1	2	2	2	2	2	2	3	2	2	2	2	2	3	3	2	2	2	2	2	2	2	3																
23-Dec	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3																
24-Dec	2	2	2	1	1	1	1	2	1	1	2	2	1	1	2	1	1	1	1	1	1	1	1	2	2																
25-Dec	1	2	2	2	3	1	1	2	3	3	2	2	1	2	2	2	1	1	1	6	2	3	2	1	6																
26-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	3	3	2	3	3	4	4	4																
27-Dec	3	3	3	4	4	3	4	4	4	4	5	4	4	4	4	2	3	2	2	3	1	1	1	1	5																
28-Dec	2	2	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2																
29-Dec	1	1	1	1	2	1	2	3	3	2	3	3	3	3	3	2	2	2	2	4	4	5	4	3	5																
30-Dec	3	4	3	3	2	1	2	3	3	3	3	2	3	3	2	2	2	3	2	3	3	3	3	3	4																
31-Dec	3	2	3	3	2	2	3	4	6	5	4	2	2	2	1	2	2	2	2	2	2	2	2	3	6																
Diurnal Maximum																		4	4	3	4	6	5	5	5	6	5	5	4	4	4	4	4	4	4	4	6	4	5	4	4





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Patricia McInnes - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	190	25.54	25.54
6 - 11	370	49.73	75.27
12 - 19	181	24.33	99.60
20 - 28	3	0.40	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Patricia McInnes - December 2015**

<b>Wind Speed</b> <b>Ranges (km/h)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	7	13	3	7	7	24	8	13	13	14	17	16	10	13	13	12	190
6 - 11	24	4	0	4	33	58	48	21	16	29	46	17	10	11	12	37	370
12 - 19	7	0	0	0	3	45	34	0	0	5	30	19	8	11	1	18	181
20 - 28	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	3
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	<b>38</b>	<b>17</b>	<b>3</b>	<b>11</b>	<b>43</b>	<b>127</b>	<b>91</b>	<b>34</b>	<b>29</b>	<b>48</b>	<b>93</b>	<b>54</b>	<b>28</b>	<b>35</b>	<b>26</b>	<b>67</b>	<b>744</b>

Total Number of Valid Hours: 744

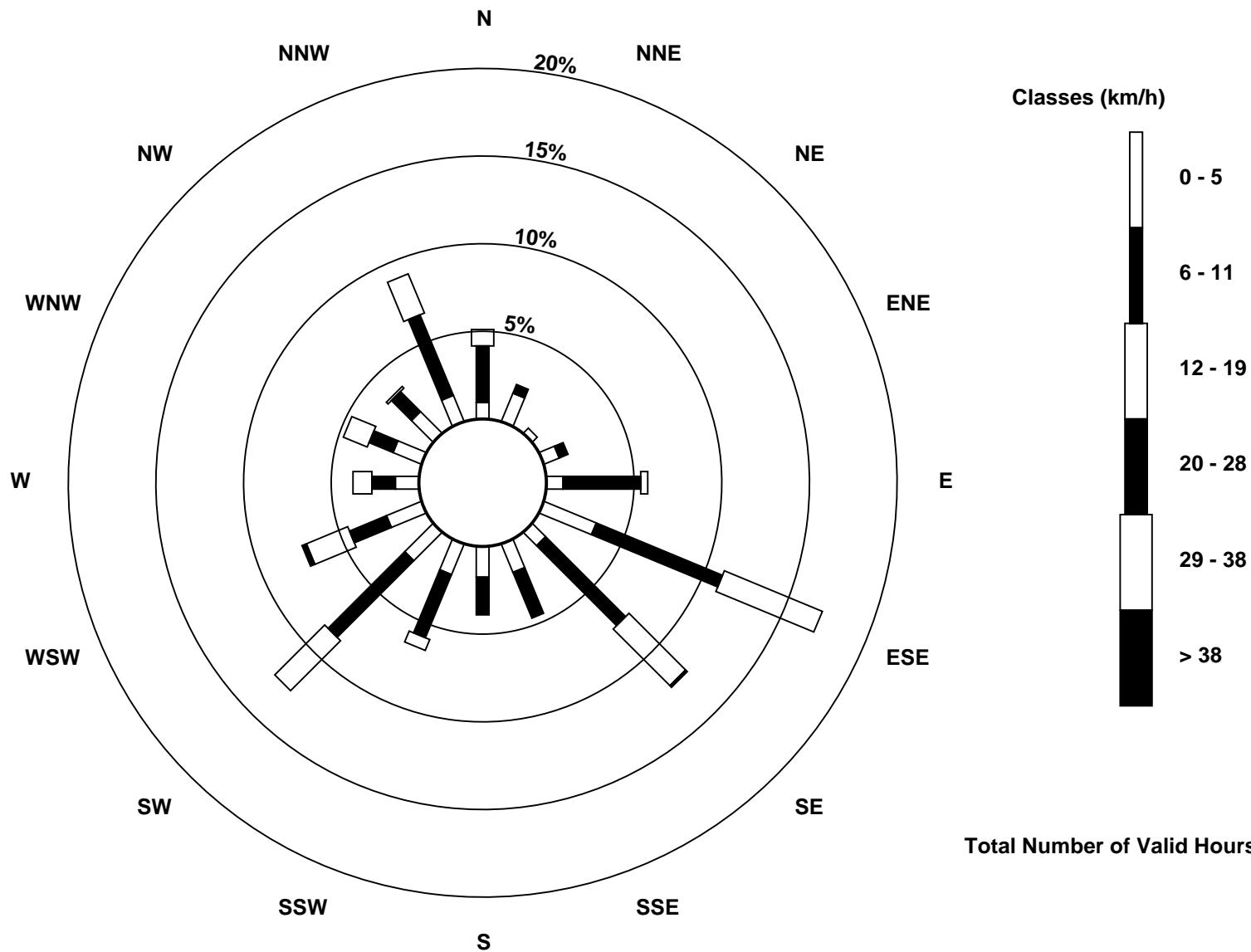
Total Number of Hours: 744





Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
Patricia McInnes (AMS 6)





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Wind Direction (WD) - deg**

**Patricia McInnes - December 2015**

Direction of Maximum Speed: 244 deg on Dec 31 10:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 124.5 deg on Dec 12		Hours of Data:	744
Direction of Minimum Speed: 283 deg on Dec 6 07:00		Hours of Missing Data:	0
Direction of Minimum Daily Speed Average: 1.8 deg on Dec 14		Percent Operational Time:	100.0
Monthly Average Direction: 247.2 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	222	220	198	205	225	221	196	179	160	121	145	176	168	162	156	170	172	168	193	229	231	211	204	193	195.0
2-Dec	225	224	149	162	162	167	165	156	153	153	195	180	213	211	209	190	224	232	241	242	247	234	243	241	211.6
3-Dec	242	251	235	237	237	223	185	197	95	126	94	98	55	6	348	106	97	122	129	88	358	10	295	319	204.1
4-Dec	333	339	337	332	320	345	348	333	307	303	223	213	213	249	234	181	198	226	236	233	212	205	215	226	255.4
5-Dec	253	261	277	275	290	285	269	271	263	256	260	257	262	255	241	218	163	238	226	246	197	311	281	82	263.9
6-Dec	325	325	286	212	273	287	283	183	142	133	131	120	118	116	130	114	125	127	138	149	143	138	153	158	131.1
7-Dec	139	131	127	133	130	129	127	129	127	126	129	128	130	131	123	155	148	144	174	161	139	141	198	221	135.1
8-Dec	265	341	332	338	338	325	241	252	235	242	233	214	181	162	131	142	102	91	75	81	78	76	81	91	88.1
9-Dec	104	103	93	95	97	98	113	101	109	110	117	113	122	111	108	114	147	238	222	250	250	252	201	223	115.6
10-Dec	184	237	241	289	334	326	305	320	327	334	353	359	34	24	22	24	64	51	104	91	90	84	95	88	31.3
11-Dec	76	97	118	120	117	113	123	120	116	125	107	125	130	122	120	106	113	119	115	117	119	120	119	115	116.6
12-Dec	118	122	117	117	127	122	117	125	131	127	123	125	132	127	128	125	128	125	131	128	126	121	119	122	124.5
13-Dec	120	123	118	118	111	105	112	115	112	111	95	101	107	113	121	113	94	85	79	60	59	103	61	76	106.9
14-Dec	292	0	294	273	313	340	15	288	279	13	19	66	16	124	171	213	244	178	177	179	173	170	162	155	189.7
15-Dec	171	141	145	155	152	143	154	170	202	227	237	243	250	233	237	222	229	189	193	207	237	276	297	309	220.5
16-Dec	4	10	337	276	263	288	301	290	287	237	287	265	260	271	263	217	230	224	213	247	288	283	276	270	280.0
17-Dec	272	274	284	283	285	286	290	289	290	293	295	299	306	311	315	299	285	276	322	11	7	5	17	19	305.2
18-Dec	7	35	15	74	92	119	97	118	113	116	116	102	88	87	85	93	85	84	83	90	89	82	92	96	88.8
19-Dec	98	84	93	106	108	114	115	120	120	125	112	125	133	117	119	105	117	124	122	121	127	124	132	136	116.8
20-Dec	138	134	139	144	133	131	131	135	136	163	127	132	119	120	122	121	123	130	125	128	126	129	122	128	129.2
21-Dec	129	129	131	132	158	184	183	184	206	205	172	206	204	145	111	105	113	116	121	141	125	22	336	3	148.5
22-Dec	356	342	354	353	352	352	344	341	343	346	349	342	349	350	358	339	346	340	339	343	343	342	341	339	345.3
23-Dec	333	338	348	344	350	344	339	339	348	347	345	353	348	350	346	352	348	350	355	356	348	344	338	344	346.4
24-Dec	349	337	341	325	327	337	330	337	335	334	317	318	328	11	16	307	107	284	96	108	123	152	169	162	342.7
25-Dec	121	175	208	223	222	217	215	221	227	232	246	242	241	215	225	219	237	339	315	338	331	337	326	306	248.8
26-Dec	307	324	332	319	317	349	286	228	300	116	140	152	109	108	103	122	116	104	105	119	111	116	112	117	105.0
27-Dec	119	121	119	118	115	115	121	118	121	124	132	131	131	132	125	113	115	114	129	128	225	211	229	250	126.8
28-Dec	220	230	243	266	262	251	262	352	359	1	1	359	352	349	13	2	339	18	22	232	218	227	234	231	320.7
29-Dec	271	236	238	180	155	193	150	201	199	206	207	215	213	216	218	204	206	208	215	217	218	219	224	228	212.1
30-Dec	239	232	237	241	239	237	221	219	219	226	221	212	215	221	234	231	223	237	239	237	229	216	221	218	228.0
31-Dec	200	219	223	204	191	201	222	224	239	244	249	241	232	235	223	234	235	225	213	208	219	227	213	226	226.1

189.4 189.6 169.5 182.2 187.3 175.8 168.6 180.8 178.5 177.6 174.4 176.3 176.6 167.2 161.4 151.1 148.6 149.3 146.9 150.5 179.3 174.1 183.4 194.4  
Diurnal Average

All monthly, daily, and diurnal averages have been calculated using vector methods



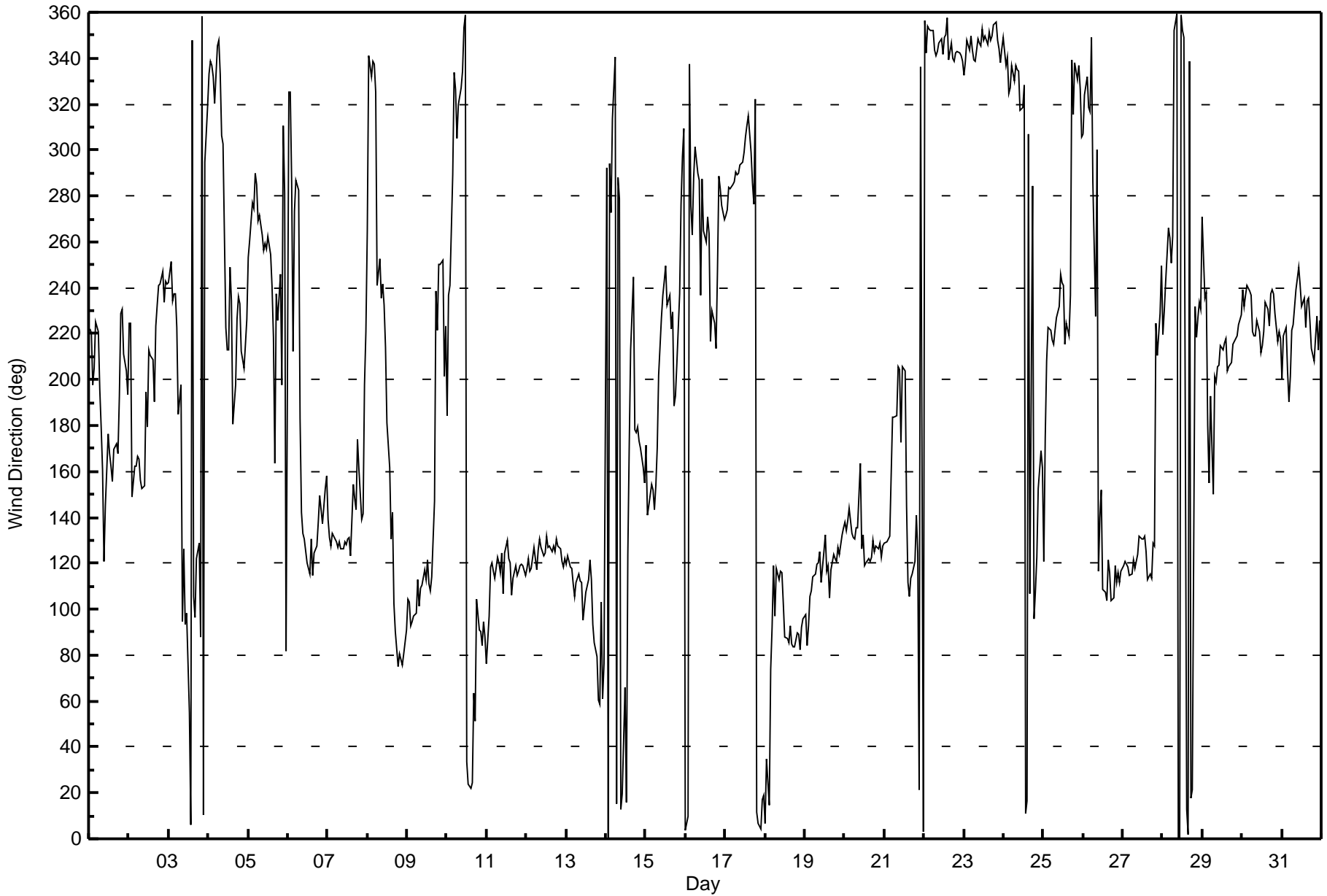
**Wood Buffalo Environmental Association**

**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**

**Patricia McInnes - December 2015**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 100 deg on Dec 6 07:00 Minimum Value: 7 deg on Dec 4 22:00 Percentiles: P <sub>1</sub> = 8 P <sub>10</sub> = 10 Q <sub>1</sub> = 12 Median = 14 Q <sub>3</sub> = 19 P <sub>90</sub> = 31 P <sub>99</sub> = 68																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	11	13	16	12	8	9	12	12	48	61	16	15	27	22	14	15	13	24	27	8	7	12	13	11	61
2-Dec	12	31	16	11	13	21	19	13	13	16	16	19	15	11	12	10	13	11	10	9	10	9	9	10	31
3-Dec	9	9	11	8	8	21	19	33	10	32	19	38	24	27	49	49	32	21	14	39	49	31	23	17	49
4-Dec	20	17	16	21	23	19	16	25	22	63	22	24	22	16	18	18	32	10	10	10	15	7	10	11	63
5-Dec	31	19	20	12	14	14	14	12	13	12	13	14	14	15	13	17	44	55	18	28	70	34	63	55	70
6-Dec	12	14	59	62	82	73	100	85	19	26	19	15	13	13	18	17	14	14	14	66	47	13	20	22	100
7-Dec	23	16	14	13	14	15	16	15	16	15	14	16	22	17	15	25	14	14	14	22	19	21	23	18	25
8-Dec	31	35	13	14	13	40	25	19	25	16	23	29	17	28	23	22	24	16	11	13	11	11	12	12	40
9-Dec	14	12	12	12	13	15	17	13	14	13	13	15	16	13	27	26	22	23	36	17	11	13	18	18	36
10-Dec	30	40	16	24	10	12	30	14	14	28	27	24	26	21	17	10	26	42	22	14	15	13	16	27	42
11-Dec	16	34	16	12	12	11	12	13	13	14	13	18	26	18	19	15	12	13	12	13	14	12	13	14	34
12-Dec	13	12	10	12	12	13	10	13	14	14	14	13	15	14	14	14	14	14	14	14	13	13	13	14	15
13-Dec	14	13	12	13	14	12	13	14	14	16	13	14	14	13	13	15	12	13	13	17	18	34	28	88	88
14-Dec	35	52	93	74	25	47	27	28	28	39	25	84	36	41	18	25	22	12	12	13	12	13	18	18	93
15-Dec	16	18	17	12	11	10	11	12	21	12	11	12	15	11	14	9	10	13	9	19	14	21	10	13	21
16-Dec	25	15	12	41	28	11	10	10	60	68	13	11	14	12	12	24	10	14	47	65	9	9	10	9	68
17-Dec	10	10	10	10	10	10	9	9	10	10	11	11	9	12	15	10	11	13	9	16	12	11	13	12	16
18-Dec	17	27	26	28	18	20	16	16	16	15	13	20	16	18	14	15	11	11	12	13	14	12	15	12	28
19-Dec	12	14	13	14	14	14	18	14	15	14	17	16	15	14	17	11	16	13	13	14	14	13	13	14	18
20-Dec	14	13	13	13	13	12	12	13	15	21	14	16	17	13	14	12	13	13	13	14	14	13	12	13	21
21-Dec	15	15	15	12	17	29	14	10	14	10	30	22	32	29	33	18	27	26	50	71	75	57	62	19	75
22-Dec	16	11	15	18	10	12	12	10	11	10	12	12	13	13	13	12	12	10	11	10	10	10	10	11	18
23-Dec	12	11	12	12	12	11	12	15	11	12	10	13	13	15	12	13	13	13	13	13	12	11	11	11	15
24-Dec	12	9	9	9	9	10	11	12	10	11	15	19	27	16	35	62	59	66	11	16	14	18	14	26	66
25-Dec	23	23	11	9	12	15	13	12	10	11	9	10	14	13	20	35	27	30	21	14	9	10	13	10	35
26-Dec	8	7	13	19	21	30	43	13	26	61	23	28	23	20	26	28	23	17	22	14	17	16	15	14	61
27-Dec	16	15	13	14	12	13	13	12	13	13	13	13	13	14	21	14	15	14	18	39	30	22	12	16	39
28-Dec	13	16	12	18	17	18	27	16	17	13	14	14	14	11	20	15	15	22	14	45	68	38	13	52	68
29-Dec	30	21	35	57	61	46	20	20	13	14	15	13	12	13	14	13	11	11	10	12	12	15	15	13	61
30-Dec	10	13	10	9	13	10	11	14	12	13	12	11	24	10	12	11	18	19	12	13	12	15	11	11	24
31-Dec	17	13	13	17	17	23	13	13	12	11	10	12	12	11	11	8	9	14	20	9	10	9	12	11	23
	35	52	93	74	82	73	100	85	60	68	30	84	36	41	49	62	59	66	50	71	75	57	63	88	
	Diurnal Maximum																								





# Wood Buffalo Environmental Association SO2 Calibration Report

## Station Information

Calibration Date	December 7, 2015	Last Calibration	November 4, 2015
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	9:05	End Time (MST)	14:30
Gas Cert Reference	EY0000355	Station temp.	21 Deg C
Cal Gas Concentration	49.8 ppm	Cal Gas Exp Date	18/09/2018
Calibrator Make/Model	Sabio 4010	Serial Number	14300410
ZAG Make/Model	API 701	Serial Number	60
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9036

## Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-678	-678
Analyzer IP address	192.168.1.43		Lamp voltage	760	764
Calculated slope	0.994414	1.003140	Chamber temp	45.2	45.0
Calculated intercept	1.095133	1.024317	Pressure	693.1	680.7
Analyzer Background	5.8	5.9	Flow	0.442	0.434
Analyzer Coefficient	1.101	1.101	Intensity	91	91

Analyzer make Thermo 43i Analyzer serial # 1008841397

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	0.0	----
as found span	6000	94.7	786.0	778.7	1.009
calibrator zero	6000	0.0	0.0	0.1	----
high point	6000	94.7	786.0	782.7	1.004
second point	6000	47.3	392.6	391.0	1.004
third point	6000	23.7	196.7	193.1	1.019
as left zero	6000	0.0	0.0	0.5	----
as left span	6000	94.7	786.0	778.7	1.009
Average Correction Factor					1.009

Corrected As found 778.7 Previous response 789.3 % change 1.4%

**Notes:**

Inlet filter changed after as founds. No adjustments made.

Calibration Performed By: Devin Russell



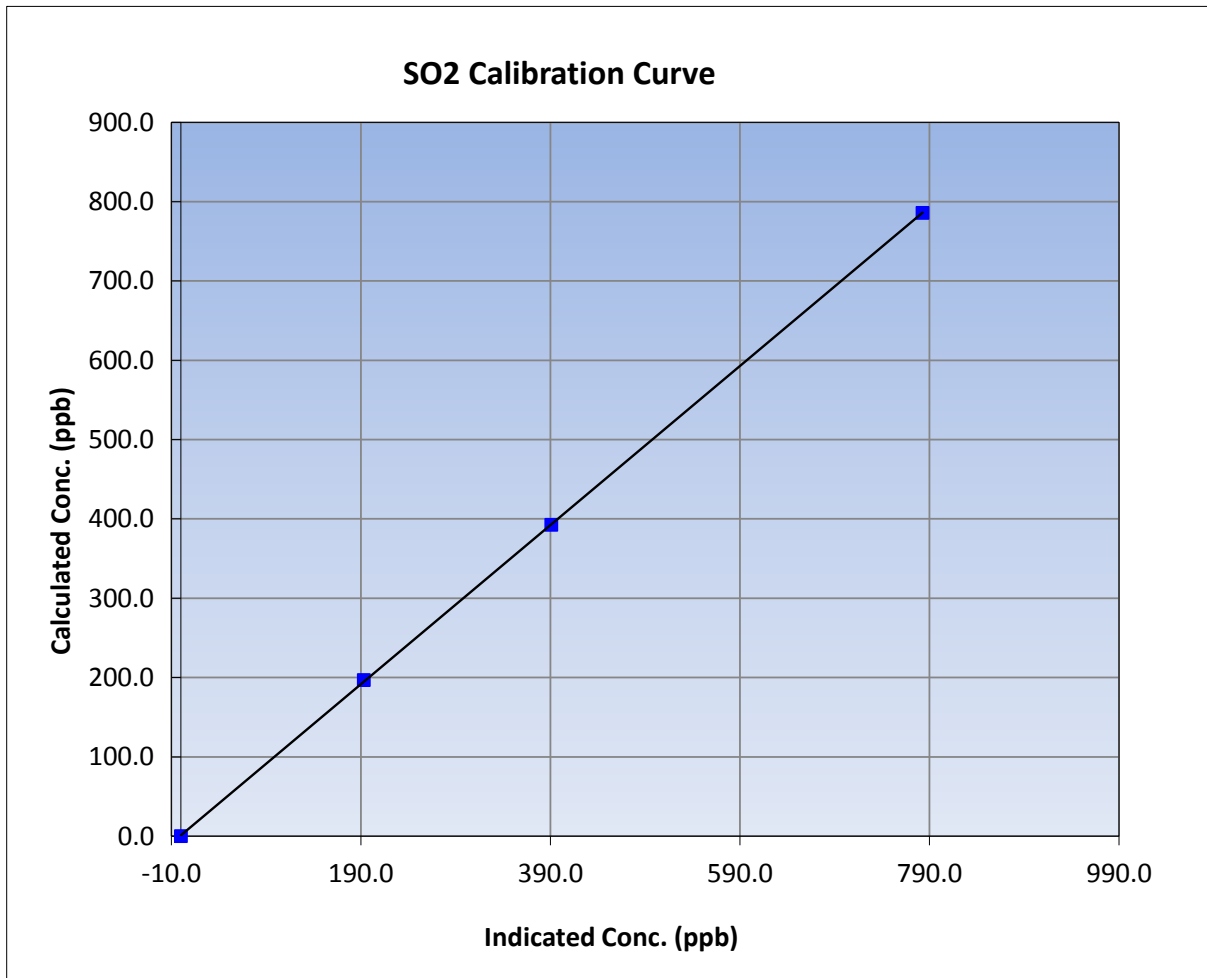
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 4, 2015
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	14:30
Analyzer make	Thermo 43i	Analyzer serial #	1008841397

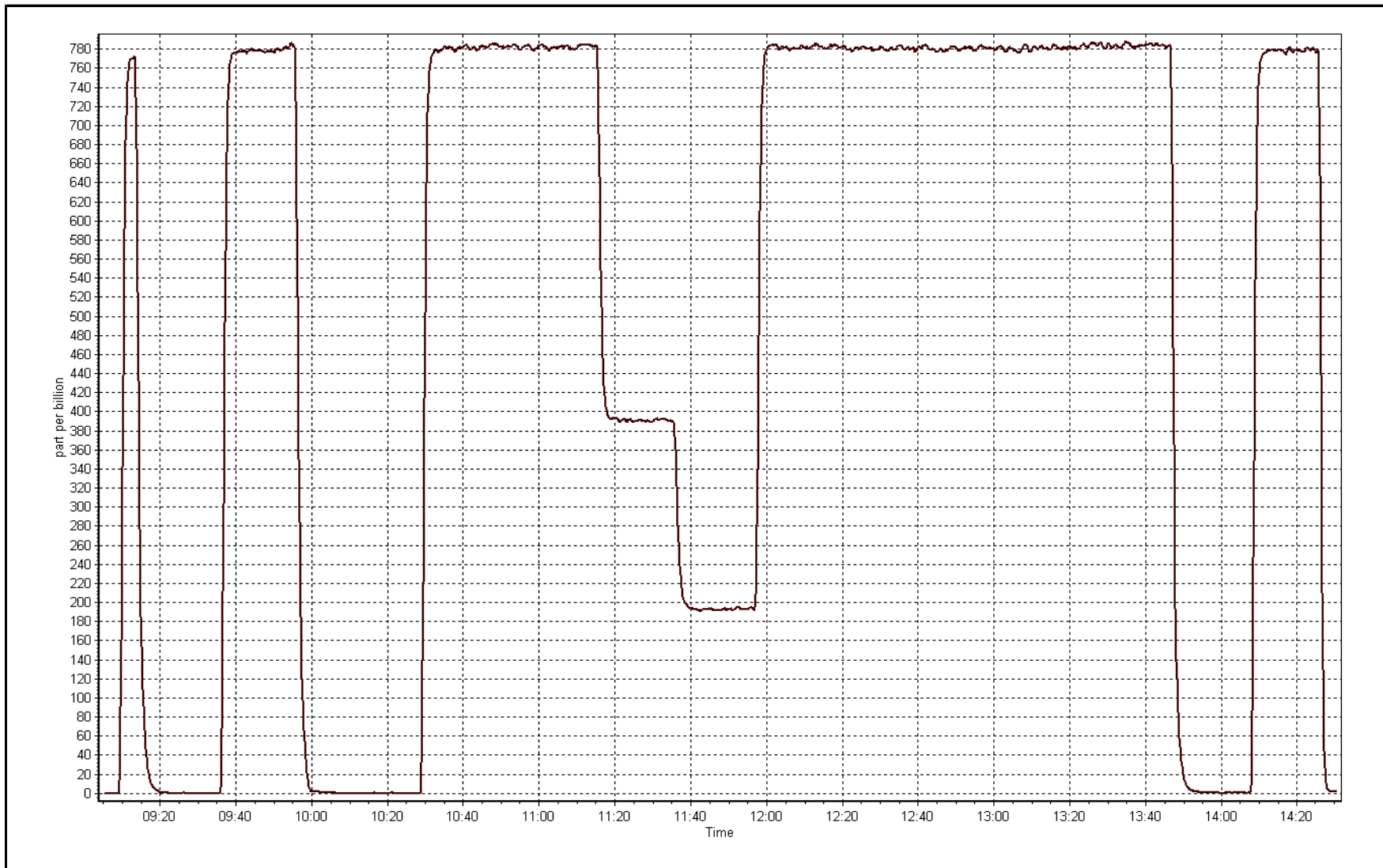
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999983
786.0	782.7	1.0043		
392.6	391.0	1.0040	Slope	1.003140
196.7	193.1	1.0187		
			Intercept	1.024317



SO2 Calibration Plot

Date: December 7, 2015





# Wood Buffalo Environmental Association

## TRS Calibration Report

### Station Information

Calibration Date	December 1, 2015	Last Calibration	November 13, 2015
Station Name	Patricia McInnis	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	9:20	End Time (MST)	12:50
Gas Cert Reference	SA5551	Station temp.	22 Deg C
Cal Gas Concentration	5.28 ppm	Cal Gas Exp Date	13/02/2018
Calibrator Make/Model	Sabio 4010	Serial Number	14300410
Dil air Make/Model	API 701	Serial Number	60
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9036
SO2 gas concentration	49.8 ppm	SO2 gas cert/exp	SA130110A 12/Dec/16

### Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-720	-720
Analyzer IP address	192.168.1.45		Lamp voltage	997	1003
Calculated slope	0.996740	0.997310	Chamber temp	45	45
Calculated intercept	-0.427013	-0.227938	Pressure	662.1	683.9
Analyzer Background	2.15	2.01	Flow	0.421	0.433
Analyzer Coefficient	1.155	1.105	Intensity	91	90
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1218153358	
Converter make/model	CDN-101		Converter serial #	520	

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	0.1	----
as found span	6000	79.5	70.0	71.8	0.974
SO2 scrubber check	6000	21.7	180.1	0.3	----
calibrator zero	6000	0.0	0.0	0.1	----
high point	6000	79.5	70.0	70.2	0.997
second point	6000	39.8	35.0	35.8	0.980
third point	6000	20.5	18.0	18.2	0.991
as left zero	6000	0.0	0.0	0.2	----
as left span	6000	79.5	70.0	70.8	0.988
Average Correction Factor					0.989

Corrected As found	71.8	Previous response	70.6	% change	-1.6%
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Notes:

Filter changed after scrubber check. Span adjusted.

Calibration Performed By:

Devin Russell





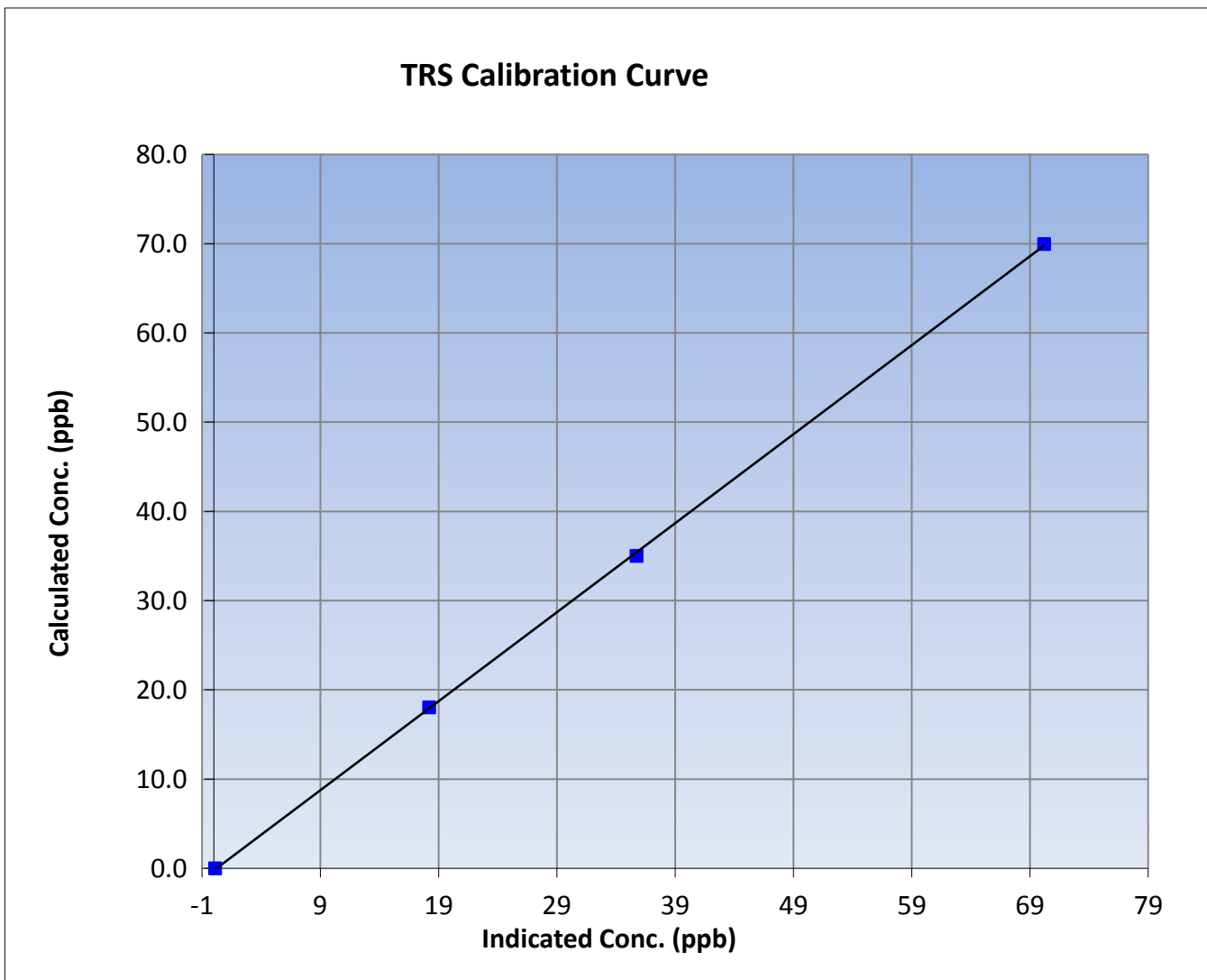
# Wood Buffalo Environmental Association TRS Calibration Report

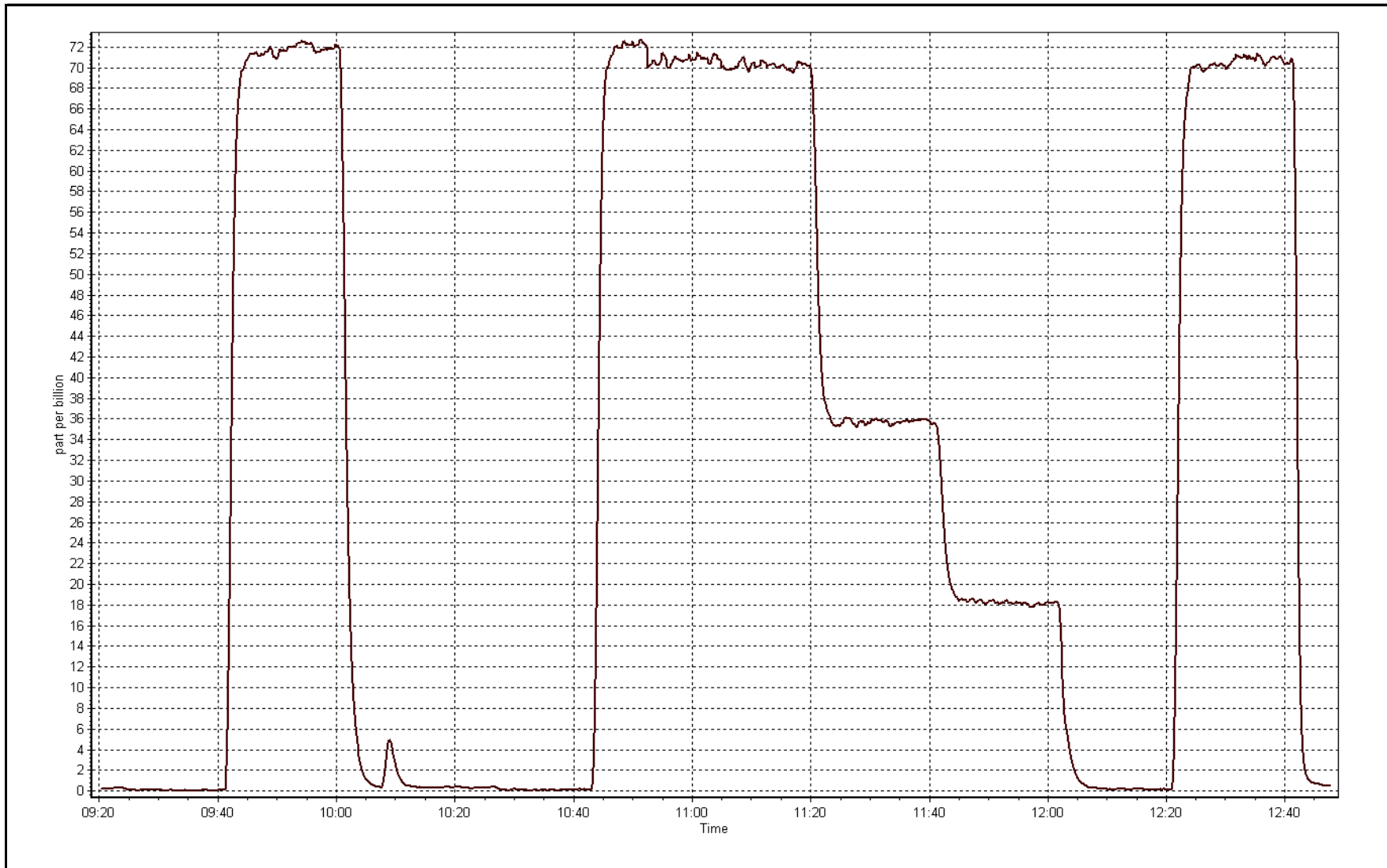
## Station Information

Calibration Date	December 1, 2015	Previous Calibration	November 13, 2015
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	9:20	End Time (MST)	12:50
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1218153358

## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999918
70.0	70.2	0.9966		
35.0	35.8	0.9797	Slope	0.997310
18.0	18.2	0.9907		
			Intercept	-0.227938







## Wood Buffalo Environmental Association THC / NMHC Calibration Report

### Station Information

Calibration Date	December-07-15	Last Calibration	November-04-15
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	9:05	End Time (MST)	14:30
Gas Cert Reference	EY0000355	Cal Gas Expiry Date	September-18-18
CH4 Cal Gas Conc.	518.0 ppm	CH4 Equiv Conc.	1068.0 ppm
C3H8 Cal Gas Conc.	200.0 ppm	Station temp.	21 Deg C
Calibrator Model	Sabio 4010	Serial Number	14300410
ZAG make/model	Teledyne API 701	Serial Number	60
DACS make/model	Campbell Scientific CR3000	Serial Number	9036

### Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.3	75.3
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
Analyzer IP address	192.168.1.55		Flame Temp	405.0	395.4
THC Calc slope	0.997836	1.000743	Carrier Pressure	34.5	34.5
THC Calc intercept	0.032071	0.038207	Fuel Pressure	42.3	42.3
NMHC Calc slope	0.997291	1.006820	Air Pressure	32.4	32.4
NMHC Calc intercept	0.020053	0.014164			

Analyzer make Thermo 55i Analyzer serial # 1331259521

### THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.00	0.00	----
as found span	6000	94.7	16.86	16.84	1.001
calibrator zero	6000	0.0	0.00	0.00	----
high point	6000	94.7	16.86	16.82	1.002
second point	6000	47.3	8.42	8.37	1.006
third point	6000	23.7	4.22	4.13	1.021
as left zero	6000	0.0	0.00	0.00	----
as left span	6000	94.7	16.86	16.74	1.007
Average Correction Factor					1.010

Corrected As found 16.84 Previous response 16.86 % change 0.1%

**Notes:**

Inlet filter changed after as founds. No adjustments made.

Calibration Performed By: Devin Russell



## Wood Buffalo Environmental Association THC / NMHC Calibration Report

### NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0	0.00	0.00	----
as found span	6000	94.7	8.68	8.62	1.007
calibrator zero	6000	0.0	0.00	0.00	----
high point	6000	94.7	8.68	8.61	1.008
second point	6000	47.3	4.34	4.30	1.008
third point	6000	23.7	2.17	2.12	1.025
as left zero	6000	0.0	0.00	0.00	----
as left span	6000	94.7	8.68	8.59	1.011
Average Correction Factor					1.014

Corrected As found      8.62      Previous response      8.68      % change      0.7%

### CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0	0.00	0.00	----
as found span	6000	94.7	8.18	8.22	0.995
calibrator zero	6000	0.0	0.00	0.00	----
high point	6000	94.7	8.18	8.21	0.996
second point	6000	47.3	4.08	4.08	1.001
third point	6000	23.7	2.05	2.01	1.018
as left zero	6000	0.0	0.00	0.00	----
as left span	6000	94.7	8.18	8.16	1.002
Average Correction Factor					1.005

Corrected As found      8.22      Previous response      8.18      % change      -0.5%



# Wood Buffalo Environmental Association

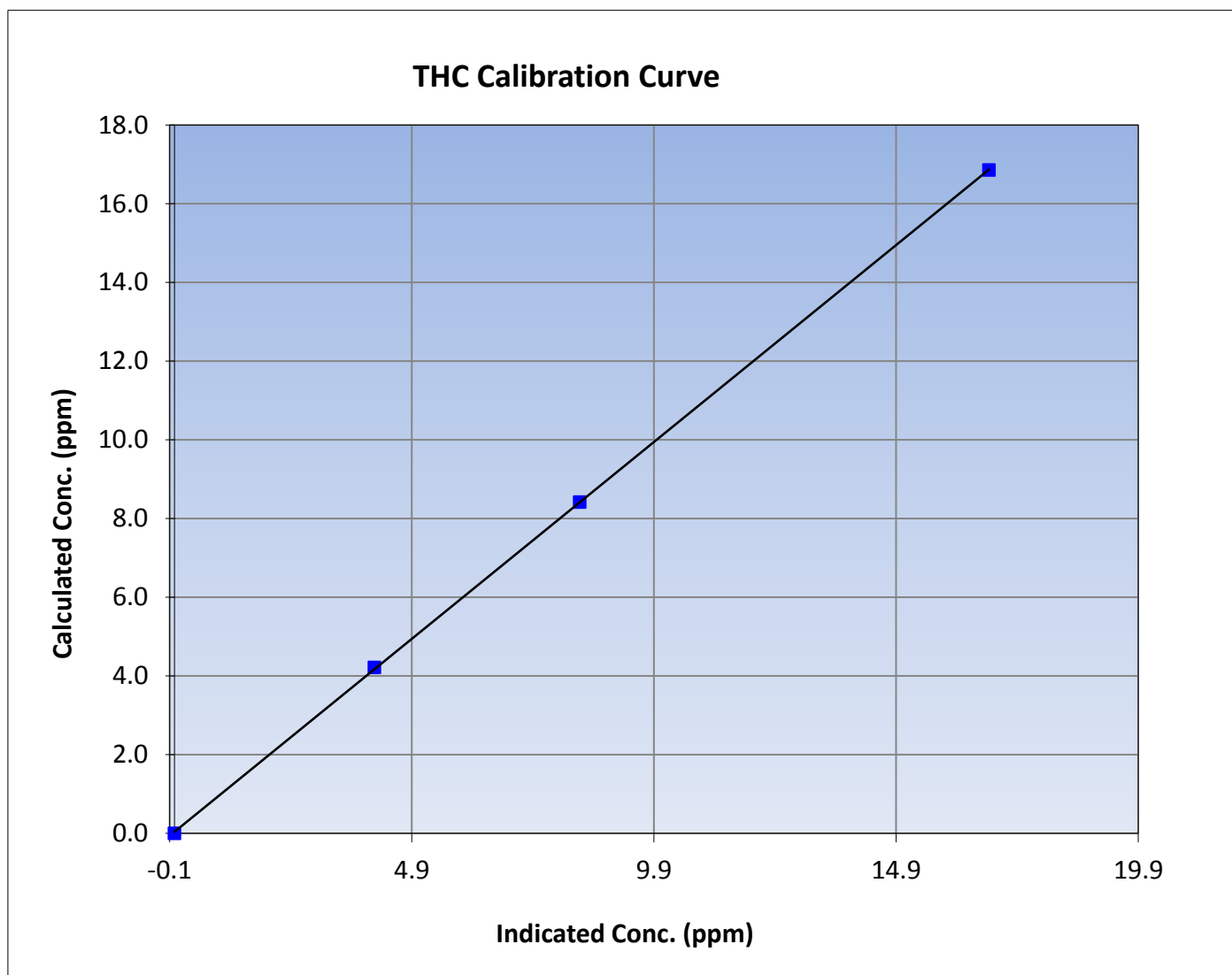
## THC Calibration Summary

### Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 4, 2015
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	14:30
Analyzer make	Thermo 55i	Analyzer serial #	1331259521

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999975
16.86	16.82	1.0022		
8.42	8.37	1.0059	Slope	1.000743
4.22	4.13	1.0215		
			Intercept	0.038207





# Wood Buffalo Environmental Association

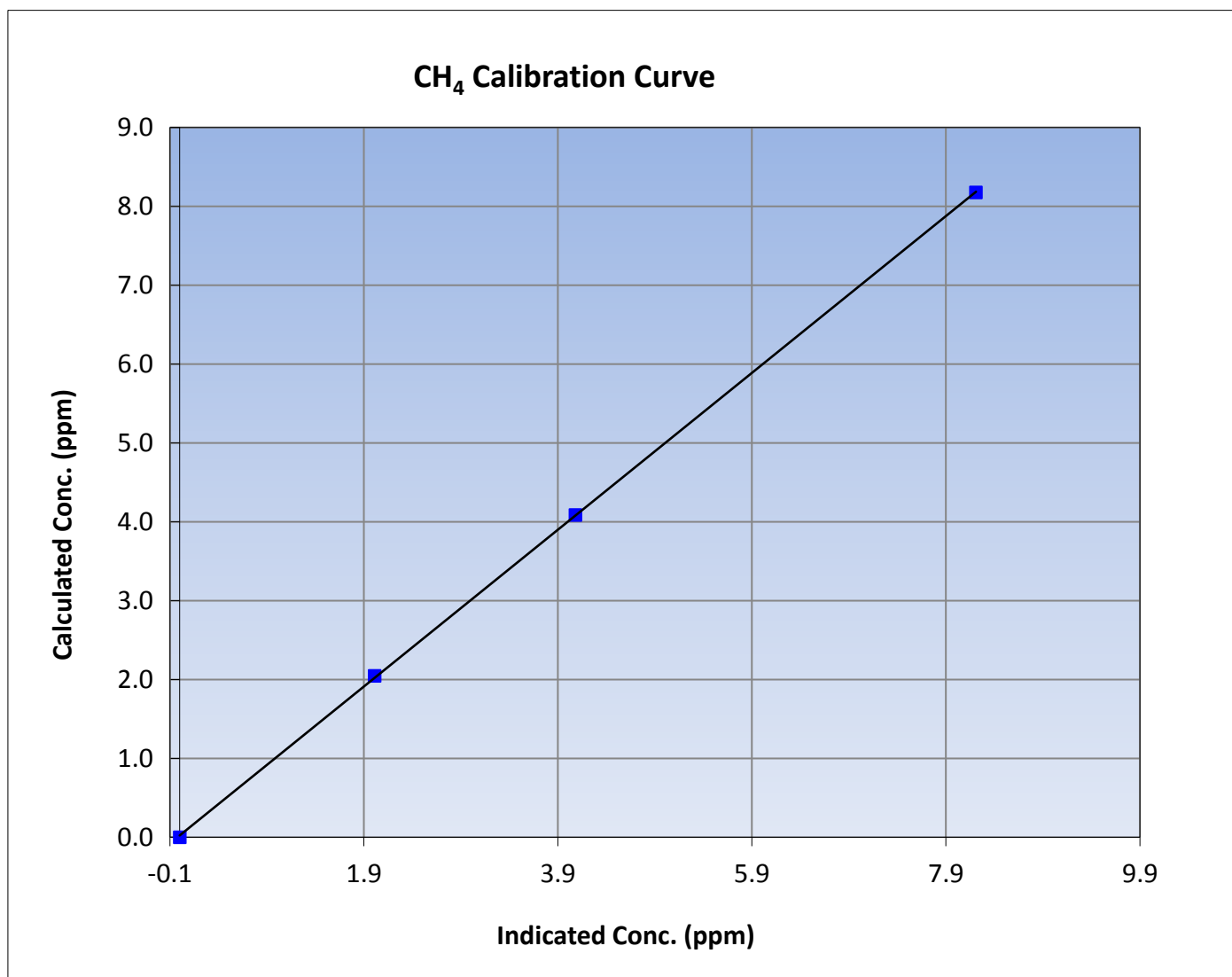
## CH<sub>4</sub> Calibration Summary

### Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 4, 2015
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	14:30
Analyzer make	Thermo 55i	Analyzer serial #	1331259521

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999966
8.18	8.21	0.9958		
4.08	4.08	1.0009	Slope	0.994228
2.05	2.01	1.0180		
			Intercept	0.021992





# Wood Buffalo Environmental Association

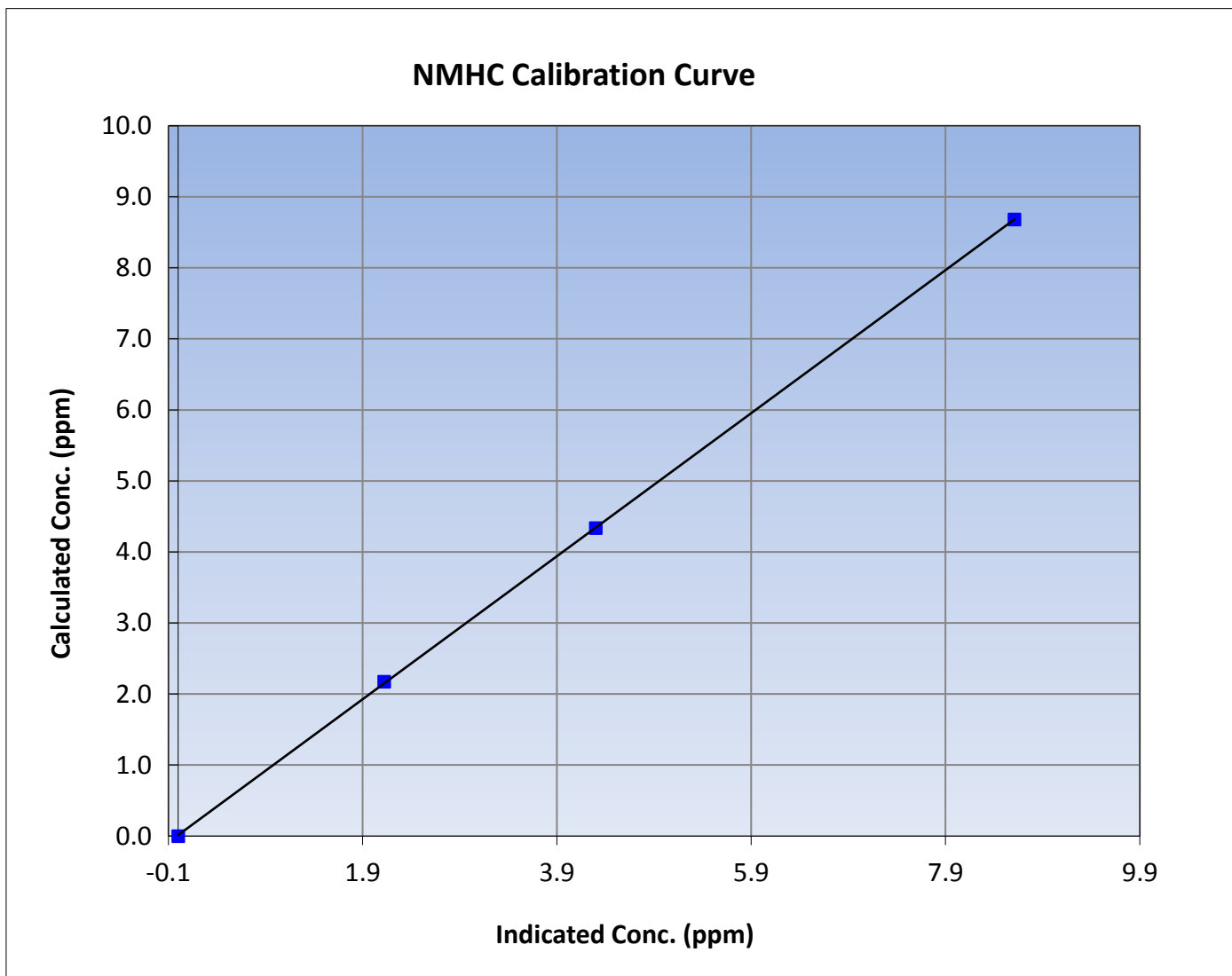
## NMHC Calibration Summary

### Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 4, 2015
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	14:30
Analyzer make	Thermo 55i	Analyzer serial #	1331259521

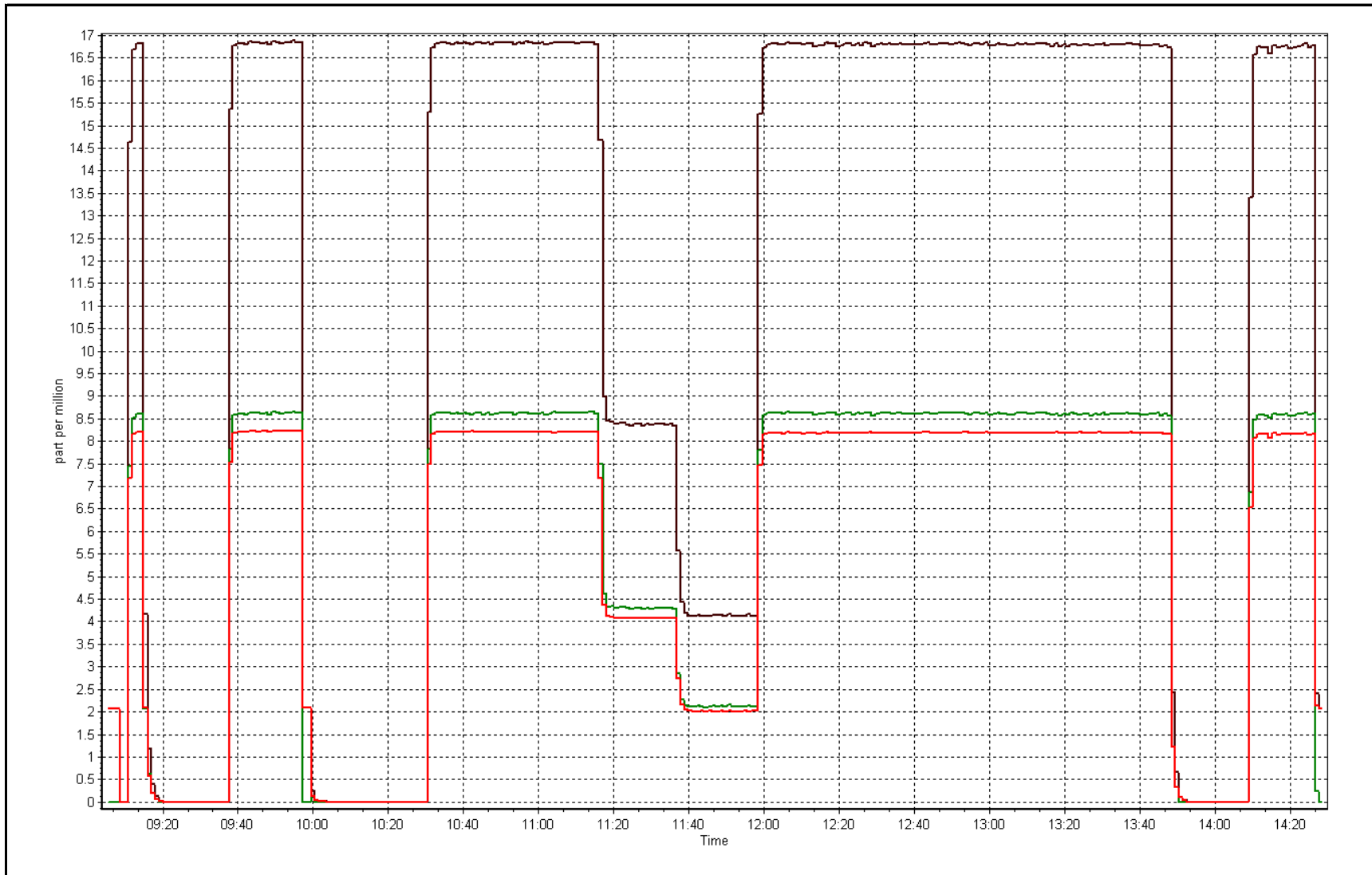
### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999980
8.68	8.61	1.0082		
4.34	4.30	1.0083	Slope	1.006820
2.17	2.12	1.0248		
			Intercept	0.014164



THC Calibration Plot

Date: December 7, 2015







# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Report

### Station Information

Calibration Date	December 8, 2015	Previous Calibration	November 12, 2015
Station Name	Patricia McInnis	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	11:45	End Time (MST)	15:05
NO2 GPT Ref date	September-23-15	Transfer Standard	23
		Station temp.	23 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	14300410
ZAG make/model	Teledyne API 701	Serial Number	60
DACS make/model	Campbell Scientific CR3000	Serial Number	9036

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	26.1	28.5
Analyzer IP address	192.168.1.49		Lamp temp.	53.4	53.5
Calculated slope	1.000828	0.997467	Pressure	665.6	661.4
Calculated intercept	-1.457132	-0.550124	Flow cell A	0.706	0.702
Analyzer Background	-1.7	-1.7	Flow cell B	0.728	0.725
Analyzer Coefficient	1.045	1.034	Cell A Intensity	77603	77389
			Cell B Intensity	73063	72542

Analyzer make	Thermo 49i	Analyzer serial #	1300156234
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### Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	0.00	0.0	0.1	----
as found span	5500	0.78	403.9	408.4	0.989
calibrator zero	5500	0.00	0.0	0.0	----
high point	5500	0.78	403.9	404.8	0.998
second point	5500	0.52	250.5	252.8	0.991
third point	5500	0.26	103.2	104.1	0.991
as left zero	5500	0.00	0.0	0.5	----
as left span	5500	0.78	406.8	399.9	1.017
Average Correction Factor					0.993

Corrected As found	408.3	Previous response	405.0	% change	-0.8%
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**Notes:**

Filter changed after as founds. Span adjusted.

Calibration Performed By: Devin Russell



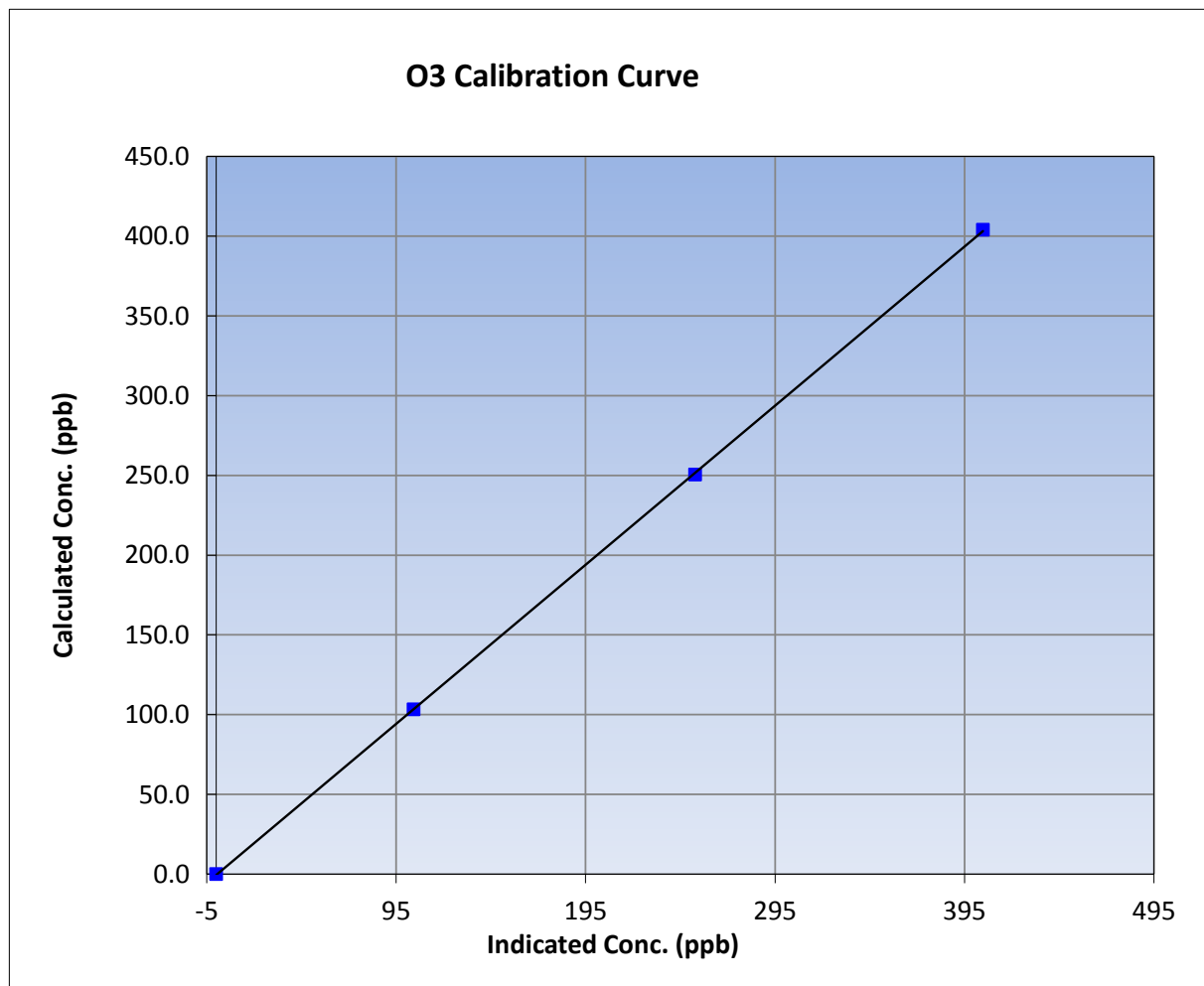
## Wood Buffalo Environmental Association O3 Calibration Report

### Station Information

Calibration Date	December-08-15	Previous Calibration	November 12, 2015
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	11:45	End Time (MST)	15:05
Analyzer make	Thermo 49i	Analyzer serial #	1300156234

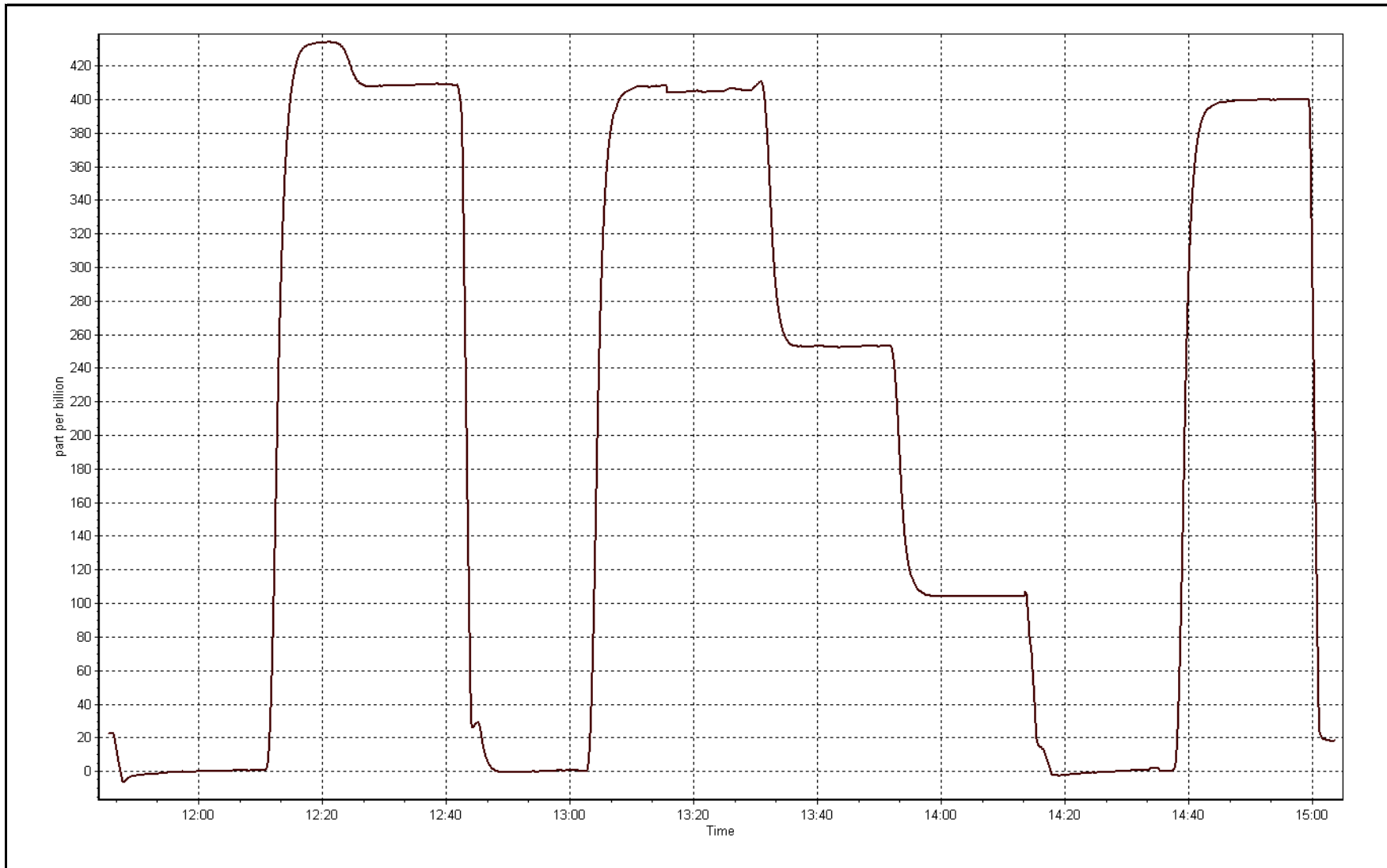
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999978
403.9	404.8	0.9979		
250.5	252.8	0.9909	Slope	0.997467
103.2	104.1	0.9910		
			Intercept	-0.550124



O3 Calibration Plot

Date: December 8, 2015





# Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

## Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 9, 2015
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	9:05	End Time (MST)	14:30
NO Cal Gas Conc	50.7 ppm	Gas Cert Reference	EY0000355
NOx Cal Gas Conc	50.7 ppm	Cal Gas Expiry Date	18/09/2018
Calibrator	Sabio 4010	Serial Number	14300410
Zero air Generator	Teledyne API T701	Serial Number	60

## DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	9036
-------------------	----------------------------	-----------------	------

## Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.998184	0.999473	0.998614
	Data Offset	0.287446	0.562896	-0.397298
Current Calibration	Data Slope	0.996602	0.997261	1.000654
	Data Offset	0.475656	0.783165	0.163873

## Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153460
---------------------	------------	-------------------	------------

Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.43		192.168.1.43	
NO coefficient	1.036		1.036	
NOx coefficient	1.000		1.000	
NO2 coefficient	1.000		1.000	
NO bkgrnd	2.6		2.6	
NOx bkgrnd	2.9		2.9	
Chamber Temp	50.5	Deg C	50.6	Deg C
Moly Temp	322.6	Deg C	324.7	Deg C
PMT voltage	-761.1	V	-760.7	V
PMT Temp	-3	Deg C	-3.0	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	164.7	mmHg	162.9	mmHg
R Cell Press Nox	164.7	mmHg	162.9	mmHg
NO sample flow	0.871	lpm	0.862	lpm
Nox sample Flow	0.871	lpm	0.862	lpm

**Notes:**

Inlter filter changed after as founds. No adjustments made.



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

### Station Information

Calibration Date: December 7, 2015 Station Number: AMS 6

### Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	6000	0.0	0.0	0.0	0.0	0.4	0.2	0.2	----	----
as found span	6000	94.7	800.2	800.2	0.0	799.8	798.1	1.6	1.0006	1.0026
calibrator zero	6000	0.0	0.0	0.0	0.0	0.2	0.1	0.2	----	----
high point	6000	94.7	800.2	800.2	0.0	802.0	801.4	0.7	0.9978	0.9986
second point	6000	47.3	399.7	399.7	0.0	402.7	401.7	1.0	0.9925	0.9951
third point	6000	23.7	200.3	200.3	0.0	198.1	197.8	0.3	1.0108	1.0125
as left zero	6000	0.0	0.0	0.0	0.0	0.3	0.1	0.1	----	----
as left span	6000	94.7	800.2	399.5	400.7	801.2	410.2	391.0	0.9988	0.9739
Average Correction Factor									1.0004	1.0021

Corrected As found NO<sub>x</sub>= 799.4 NO= 797.9 Percent Change NO<sub>x</sub>= 0.3% NO= 0.3%  
 Previous Response NO<sub>x</sub>= 801.4 NO= 800.1

### GPT Calibration Data

Dilution Flow 6000 ccm Source Gas Flow 94.70 ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero			0.0			0.2			N/A	
1st NO2 (300)	----	399.5	403.9	803.1	399.5	403.6	0.9810	1.0000	1.0007	99.9%
2nd NO2 (200)	----	552.9	250.5	802.9	552.9	250.1	0.9811	1.0000	1.0015	99.9%
3rd NO2 (100)	----	700.2	103.2	802.7	700.2	102.6	0.9814	1.0000	1.0061	99.4%
4th NO2 (0)	803.4	----	0.4	803.8	803.4	0.4	0.9801	1.0000	N/A	----
Average Correction Factor							0.9809	1.0000	1.0028	99.7%

Calibration Performed By: Devin Russell



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

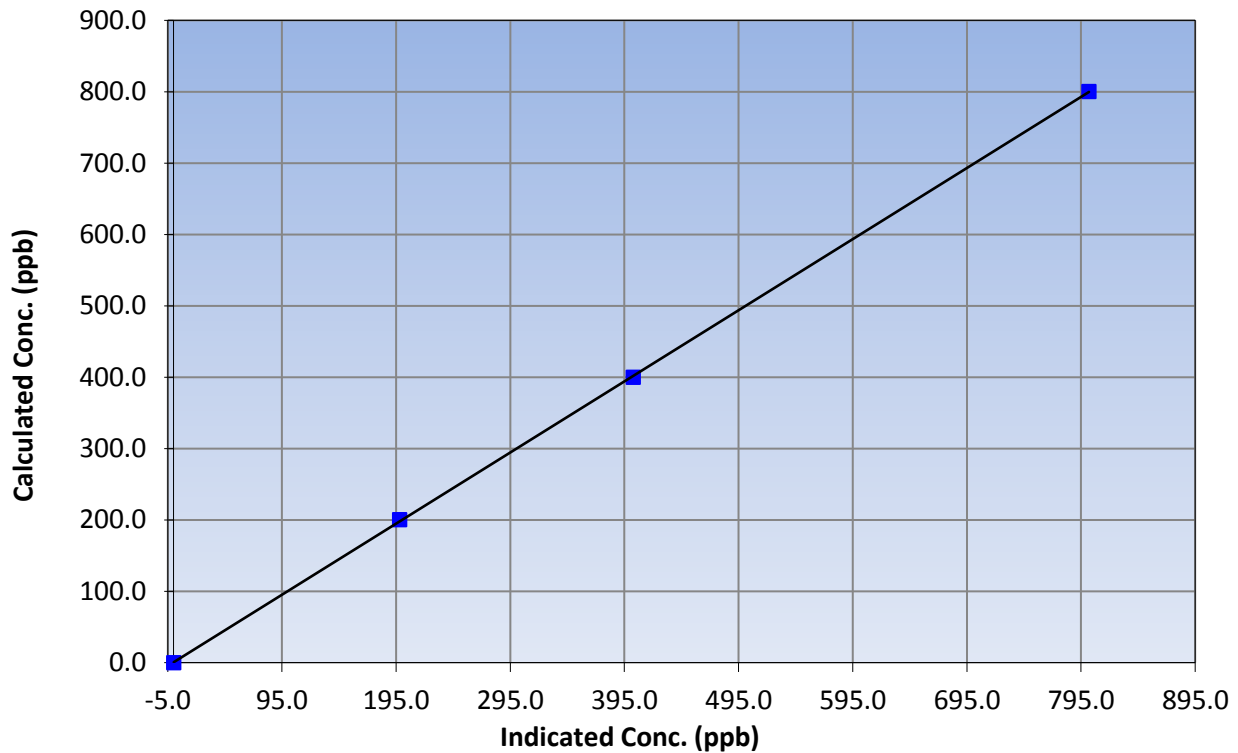
### Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 9, 2015
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	14:30
Analyzer make	Thermo 42i	Analyzer serial #	1218153460

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999970
800.2	802.0	0.9978		
399.7	402.7	0.9925	Slope	0.996602
200.3	198.1	1.0108		
			Intercept	0.475656

### NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

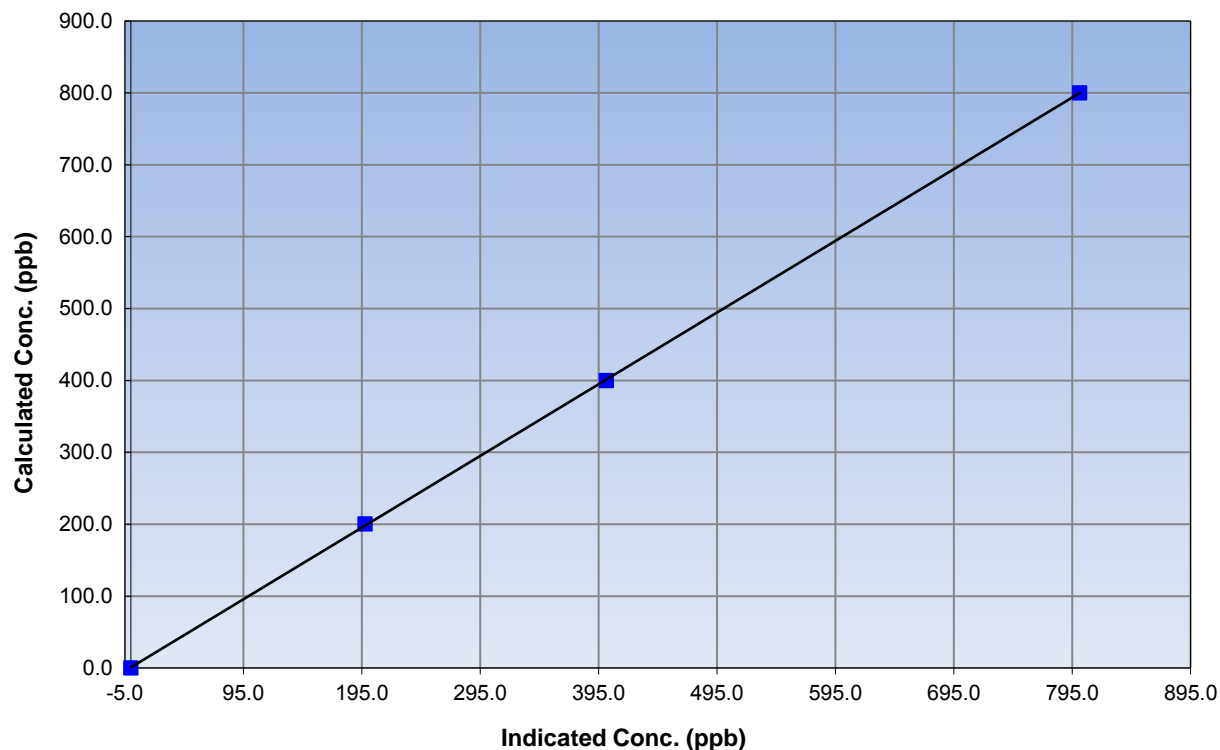
### Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 9, 2015
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	14:30
Analyzer make	Thermo 42i	Analyzer serial #	1218153460

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999976
800.2	801.4	0.9986		
399.7	401.7	0.9951	Slope	0.997261
200.3	197.8	1.0125		
			Intercept	0.783165

### NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

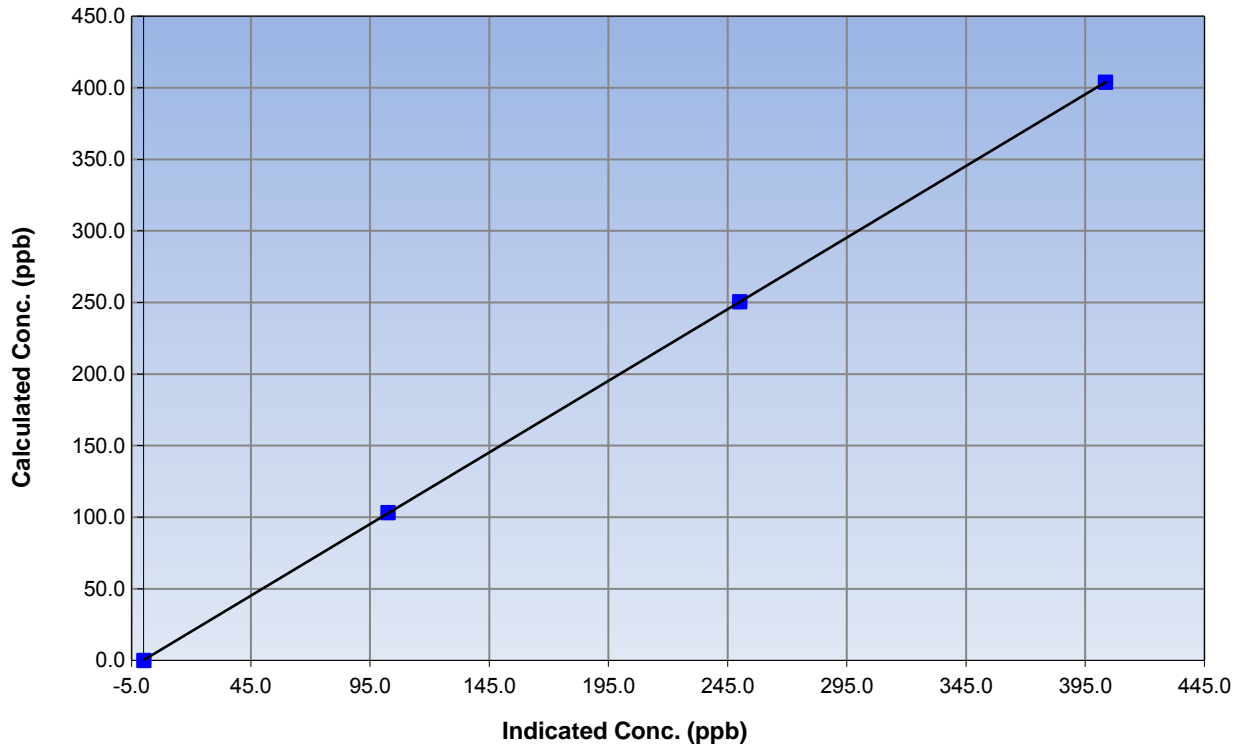
### Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 9, 2015
Station Number	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	14:30
Analyzer make	Thermo 42i	Analyzer serial #	1218153460

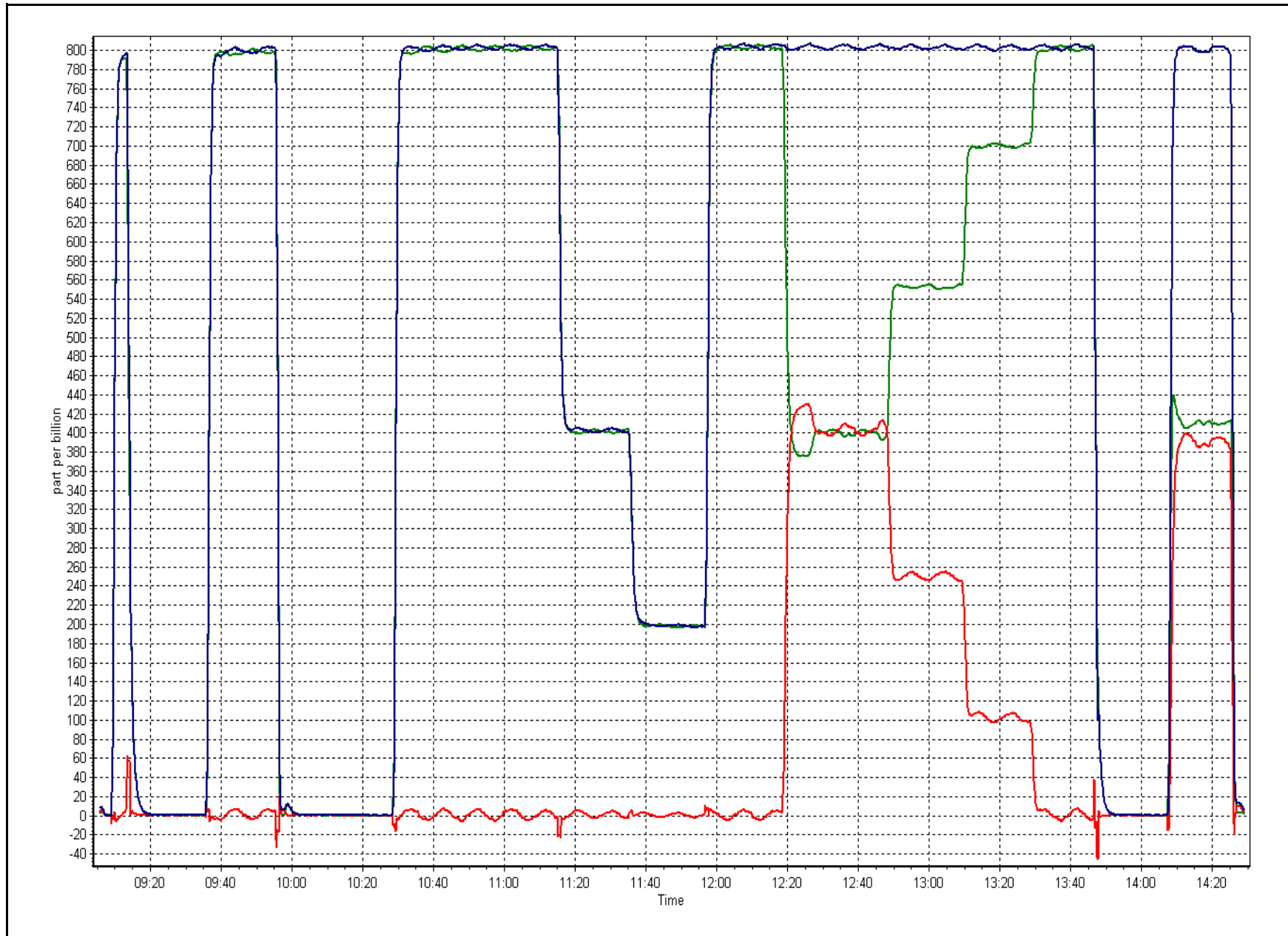
### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	N/A	Correlation Coefficient	0.999997
403.9	403.6	1.0007		
250.5	250.1	1.0015	Slope	1.000654
103.2	102.6	1.0061		
			Intercept	0.163873

### NO<sub>2</sub> Calibration Curve









# Wood Buffalo Environmental Association

## N<sub>t</sub>-NO<sub>x</sub>-NH<sub>3</sub> Calibration Report

### Station Information

Station Name	Patricia McInnis	Station Number	AMS 6
NOX Calibration Date	December 7, 2015	NOX Previous Cal Date	November 10, 2015
NH3 Calibration Date	December 8, 2015	NH3 Previous Cal Date	November 10, 2015
Reason:	Routine		
Start Time (MST)	9:05	End Time (MST)	14:30
Calibrator	Sabio 4010	Station Temperature	21.0 Deg C
NH3 Cal Gas Conc	75.1 ppm	Serial Number	14300410
NOx Cal Gas Conc	50.7 ppm	NH3 Expiry Date / SN	4/Aug/2012 SGAL-3617
NO Cal Gas Conc	50.7 ppm	NO Expiry Date / SN	18/Sep/2018 EY0000355

### DACs Information

DACS make & model Campbell Scientific CR3000      DACS serial No. 9036

Parameter		NH3	Nt	NOx	NO	NO2
Cal Stats As Found	Data Slope	1.002926	0.986725	0.997724	0.998232	1.005796
	Data Offset	-2.970816	-3.936473	4.196831	5.263725	-0.401030
Cal Stats After	Data Slope	0.999531	0.983176	0.996361	0.999734	1.003299
	Data Offset	-3.400261	-4.668922	2.699165	3.660072	0.670149
IP address		192.168.1.17				

### Analyzer Information

Analyzer make/model API T201      Analyzer serial # 215  
 Converter API 501 NH#      Converter serial # 217

Test Point	before		after	
NH3 Conc range	2500	ppb	2500	ppb
NOX Conc range	1000	ppb	1000	ppb
NO BKG	-0.2	ppb	-0.2	ppb
NOx BKG	-0.2	ppb	-0.2	ppb
Nt BKG	-0.4		-0.4	
NO coefficient	1.069		1.125	
NO2 coefficient	1.000	ppb	1.000	ppb
NOx coefficient	1.072		1.142	
NH3 coefficient	0.964		0.974	
Nt coefficient	1.066		1.138	
NH3 conv temp	825	DegC	825	Deg C
Chamber Temp	49.9	Deg C	50.0	Deg C
Moly Temp	316.0	Deg C	316.1	Deg C
PMT Temp	7.1	Deg C	7.1	Deg C
O3 flow	85.0	ccm	84.0	ccm
R Cell Press	4.9	mmHg	4.6	mmHg
PMT Voltage	693.0	v	693.0	v
Sample Flow 1 NO	563.0	ccm	540.0	ccm
Sample Flow 2 Nox	563.0	ccm	540.0	ccm
Sample Flow 3 Nt	563.0	ccm	540.0	ccm

Notes:

Inlet filter changed after as founds. NO/Nox span adjusted. NH3 span adjusted.



# Wood Buffalo Environmental Association

## Nt-NO<sub>x</sub>-NH<sub>3</sub> Calibration Report

### Station Information

Calibration Date:

December 8, 2015

Station Number:

AMS 6

### NH<sub>3</sub> Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated Nt conc (ppb)	Calculated NO <sub>x</sub> conc (ppb)	Calculated NH <sub>3</sub> conc (ppb)	Indicated Nt conc (ppb)	Indicated NO <sub>x</sub> conc (ppb)	Indicated NH <sub>3</sub> conc (ppb)	Nt Correction factor	NH <sub>3</sub> Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	-1.5	-2.6	1.1	----	----
as found NO	5500	86.8	800.1	800.1	----	799.6	799.3	0.3	1.001	----
calibrator zero	5500	0.0	0.0	0.0	0.0	0.1	-0.9	1.0	----	----
high NO point	5500	86.8	800.1	800.1	----	799.0	800.5	-1.5	1.001	----
NO/O <sub>3</sub> point	5500	86.8	800.1	800.1	----	799.8	799.8	0.0	1.000	----
as found NH <sub>3</sub>	3500	93.2	1999.8	NA	1999.8	2047.7	32.6	2015.1	0.977	0.992
first NH <sub>3</sub>	3500	93.2	1999.8	NA	1999.8	2035.2	32.9	2002.3	0.983	0.999
second NH <sub>3</sub>	3500	46.6	999.9	NA	999.9	1027.7	20.6	1007.0	0.973	0.993
third NH <sub>3</sub>	3500	23.3	500.0	NA	500.0	515.5	10.9	504.6	0.970	0.991
Average Correction Factor									1.0009	0.9942

NH<sub>3</sub> Corrected As Found  
 Nt Corrected As Found  
 NO<sub>x</sub> Corrected As Found

NH<sub>3</sub> = 2014.0 ppb  
 Nt = 801.1 ppb  
 NO<sub>x</sub> = 802.0 ppb

Previous Response  
 Previous Response  
 Previous Response

NH<sub>3</sub> = 1996.9 ppb  
 Nt = 814.8 ppb  
 NO<sub>x</sub> = 797.8 ppb

NH<sub>3</sub> percent change -0.8%  
 Nt percent change 1.7%  
 NO<sub>x</sub> percent change -0.5%



# Wood Buffalo Environmental Association

## NO<sub>x</sub>(NH<sub>3</sub>) Calibration Report

### Station Information

Calibration Date:

December 7, 2015

Station Number:

AMS 6

### NO<sub>x</sub> / NO / Nt Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NO <sub>x</sub> conc (ppb)	Calculated NO conc (ppb)	Calculated Nt conc (ppb)	Indicated NO <sub>x</sub> conc (ppb)	Indicated NO conc (ppb)	Indicated Nt conc (ppb)	NO <sub>x</sub> Correction factor	NO Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	-1.1	-1.0	0.2	----	----
as found span	5500	86.8	800.1	800.1	800.1	778.8	778.1	783.8	1.0274	1.0283
calibrator zero	5500	0.0	0.0	0.0	0.0	-0.9	-1.0	0.1	----	----
high point	5500	86.8	800.1	800.1	800.1	800.5	797.7	799.0	0.9995	1.0030
second point	5500	43.4	400.1	400.1	400.1	400.0	396.0	399.1	1.0001	1.0103
third point	5500	21.7	200.0	200.0	200.0	194.9	193.2	195.2	1.0266	1.0354
as left zero	5500	0.0	0.0	0.0	0.0	-2.4	-2.5	0.7	----	----
as left span	5500	86.8	800.1	398.9	800.1	794.8	410.2	800.8	1.0068	0.9724
Average Correction Factor									1.0087	1.0162

	<u>Nt</u>	<u>NOX</u>	<u>NO</u>	<u>NO2</u>
Corrected As found	783.6	779.8	779.1	398.4
Previous Response	814.8	797.8	796.3	398.2
Percent Change	4.0%	2.3%	2.2%	-0.1%

### GPT Calibration Data

Total Flow 6000 ccm Source Gas Flow 86.80 ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO <sub>2</sub> conc (ppb)	Indicated NO <sub>x</sub> conc (ppb)	Indicated NO conc (ppb)	Indicated NO <sub>2</sub> conc (ppb)	NO <sub>x</sub> Correction factor	NO Correction factor	NO <sub>2</sub> Correction factor	Converter Efficiency
Cal zero			0.0			0.5			----	
1st NO <sub>2</sub> (300)	----	398.9	400.1	797.8	398.9	398.9	0.9193	1.0000	1.0029	99.7%
2nd NO <sub>2</sub> (200)	----	550.4	248.5	796.6	550.4	246.2	0.9207	1.0000	1.0096	99.0%
3rd NO <sub>2</sub> (100)	----	697.0	101.9	796.8	697.0	99.8	0.9205	1.0000	1.0216	97.9%
4th NO <sub>2</sub> (0)	799.0	----	0.8	799.8	799.0	0.5	0.9171	1.0000	----	----
Average Correction Factor							0.9194	1.0000	1.0114	98.9%

Calibration Performed By: Devin Russell



# Wood Buffalo Environmental Association

## NH3 Calibration Summary

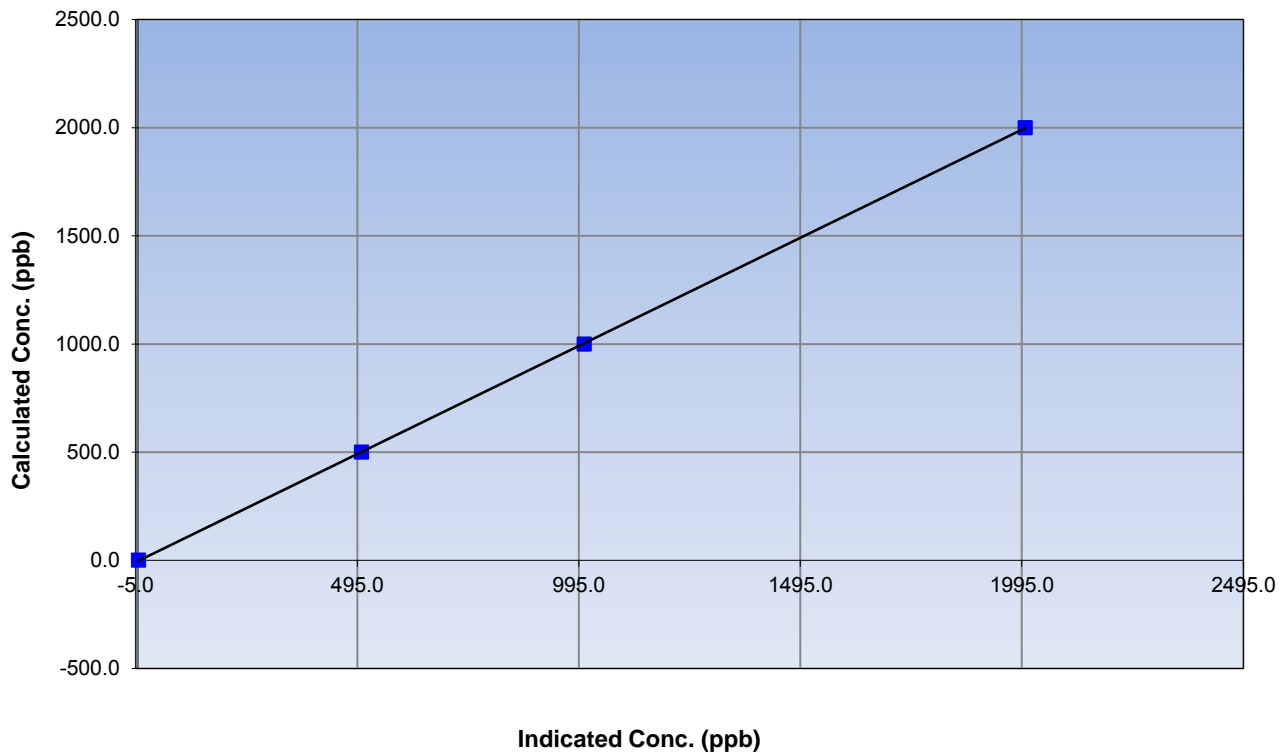
### Station Information

Calibration Date	December 8, 2015	Previous Calibration	November 10, 2015
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	14:30
Analyzer make	API T201	Analyzer serial #	215

### NH3 Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	1.0	----	Correlation Coefficient	0.999991
1999.8	2002.3	0.9988		
999.9	1007.0	0.9930	Slope	0.999531
500.0	504.6	0.9907		
			Intercept	-3.400261

### NH3 Calibration Curve





# Wood Buffalo Environmental Association

## Nt Calibration Summary

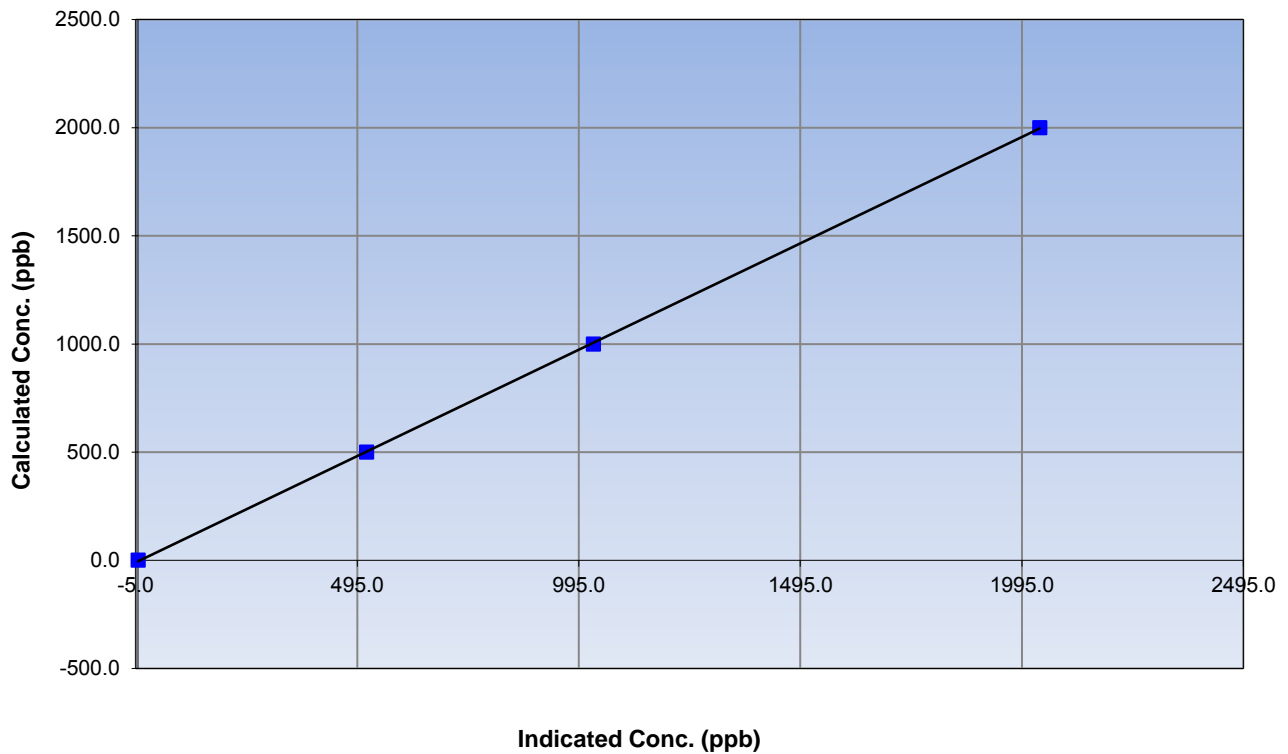
### Station Information

Calibration Date	December 8, 2015	Previous Calibration	November 10, 2015
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	14:30
Analyzer make	API T201	Analyzer serial #	215

### Nt (NH<sub>3</sub>) Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999967
1999.8	2035.2	0.9826		
999.9	1027.7	0.9730		
500.0	515.5	0.9699	Slope	0.983176
			Intercept	-4.668922

### Nt Calibration Curve





# Wood Buffalo Environmental Association

## NOx Calibration Summary

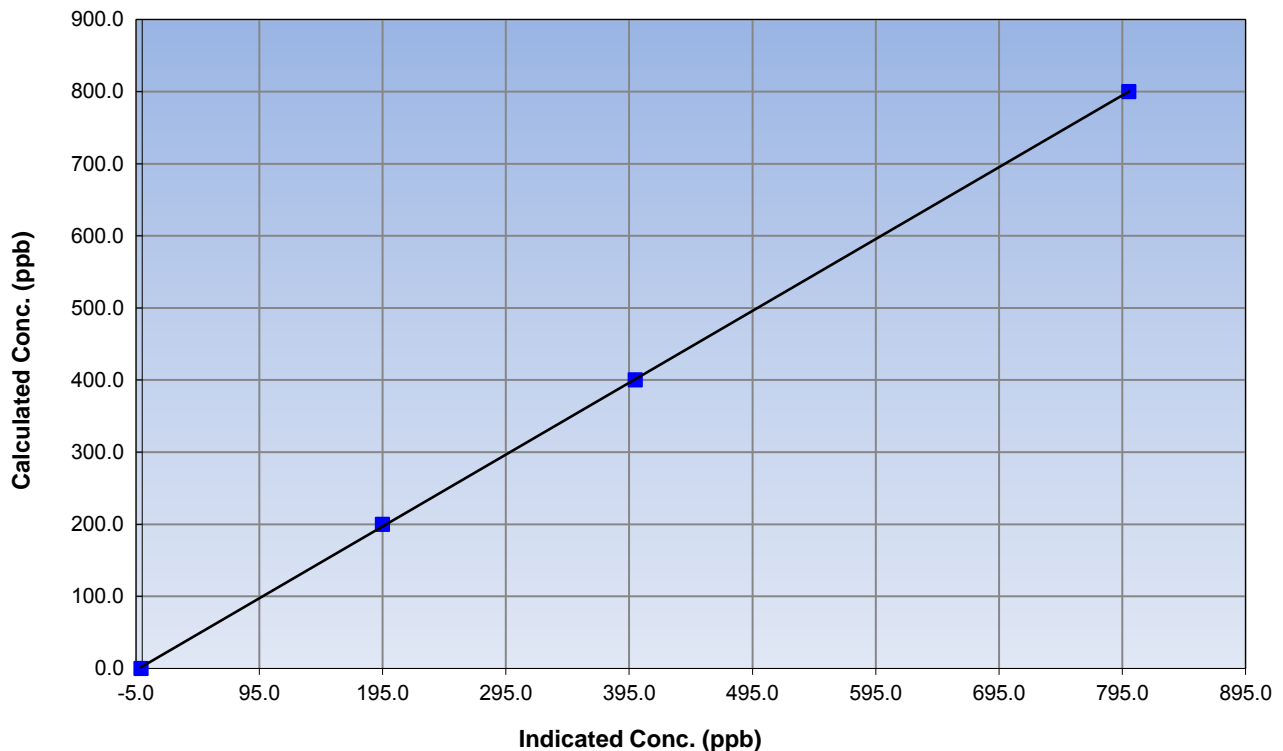
### Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 10, 2015
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	14:30
Analyzer make	API T201	Analyzer serial #	215

### NO<sub>x</sub> Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.9	----	Correlation Coefficient	0.999957
800.1	800.5	0.9995		
400.1	400.0	1.0001	Slope	0.996361
200.0	194.9	1.0266		
			Intercept	2.699165

### NOx Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

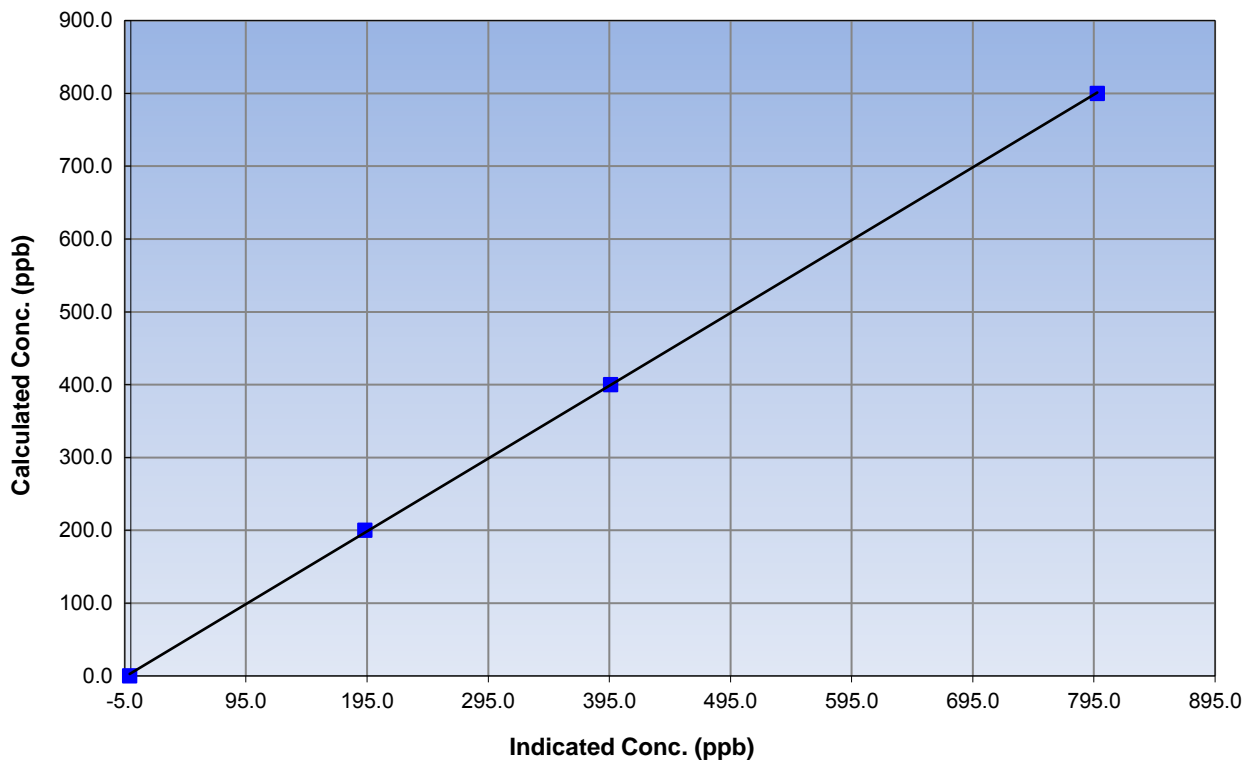
### Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 10, 2015
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	14:30
Analyzer make	API T201	Analyzer serial #	215

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-1.0	----	Correlation Coefficient	0.999946
800.1	797.7	1.0030		
400.1	396.0	1.0103	Slope	0.999734
200.0	193.2	1.0354		
			Intercept	3.660072

### NO Calibration Curve







# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

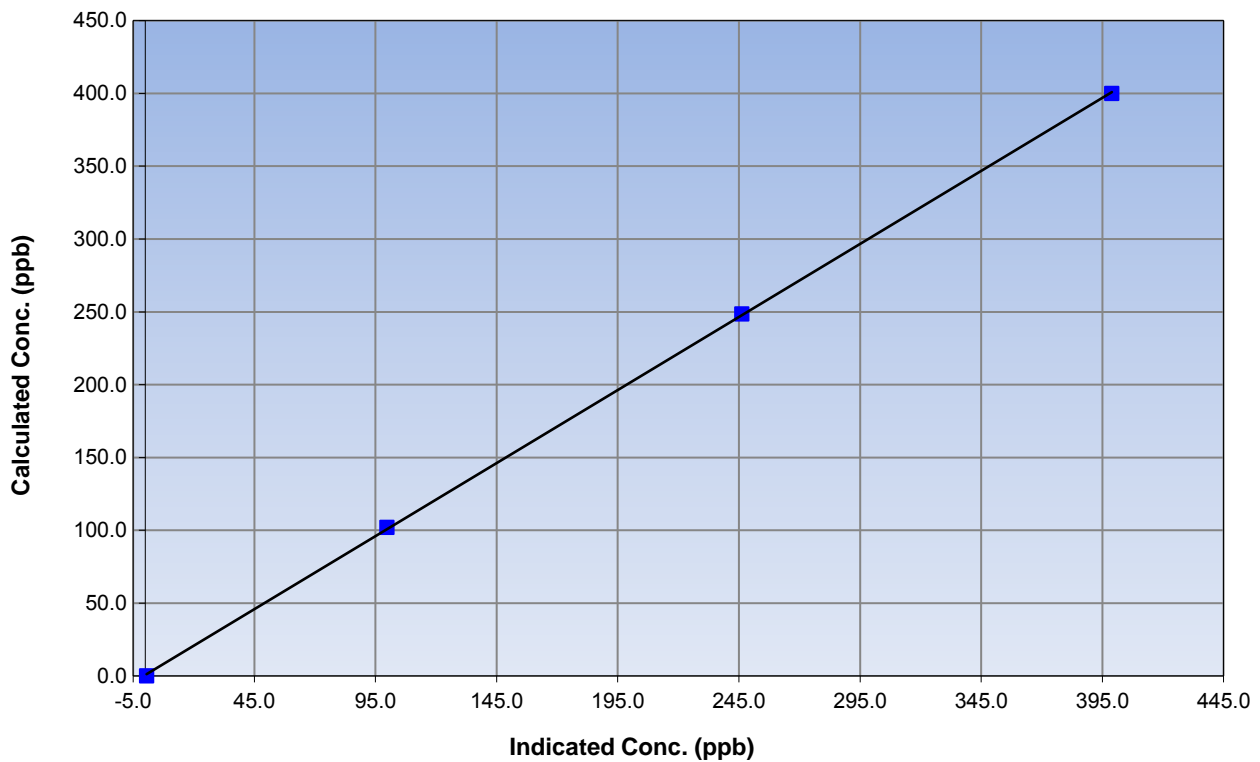
### Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 10, 2015
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	9:05	End Time (MST)	14:30
Analyzer make	API T201	Analyzer serial #	215

### Calibration Information

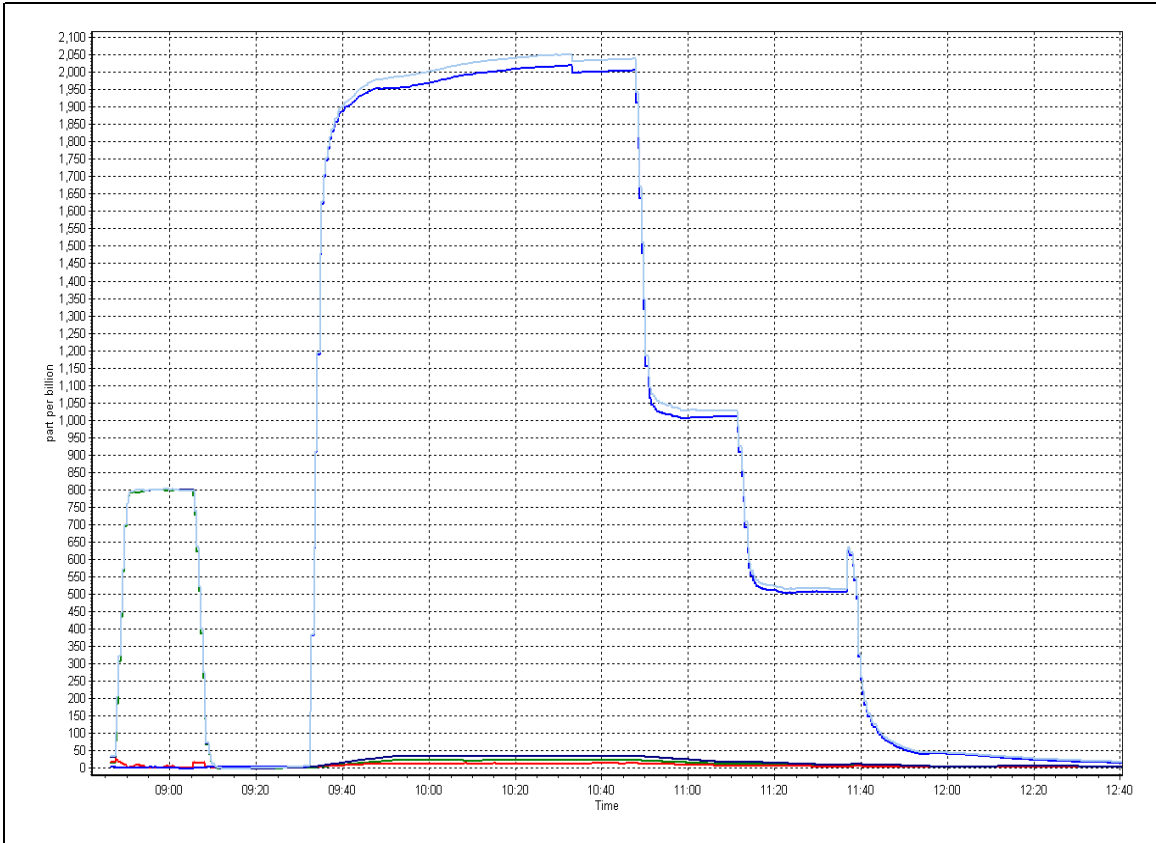
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.5	----	Correlation Coefficient	0.999953
400.1	398.9	1.0029		
248.5	246.2	1.0096	Slope	1.003299
101.9	99.8	1.0216		
			Intercept	0.670149

### NO<sub>2</sub> Calibration Curve



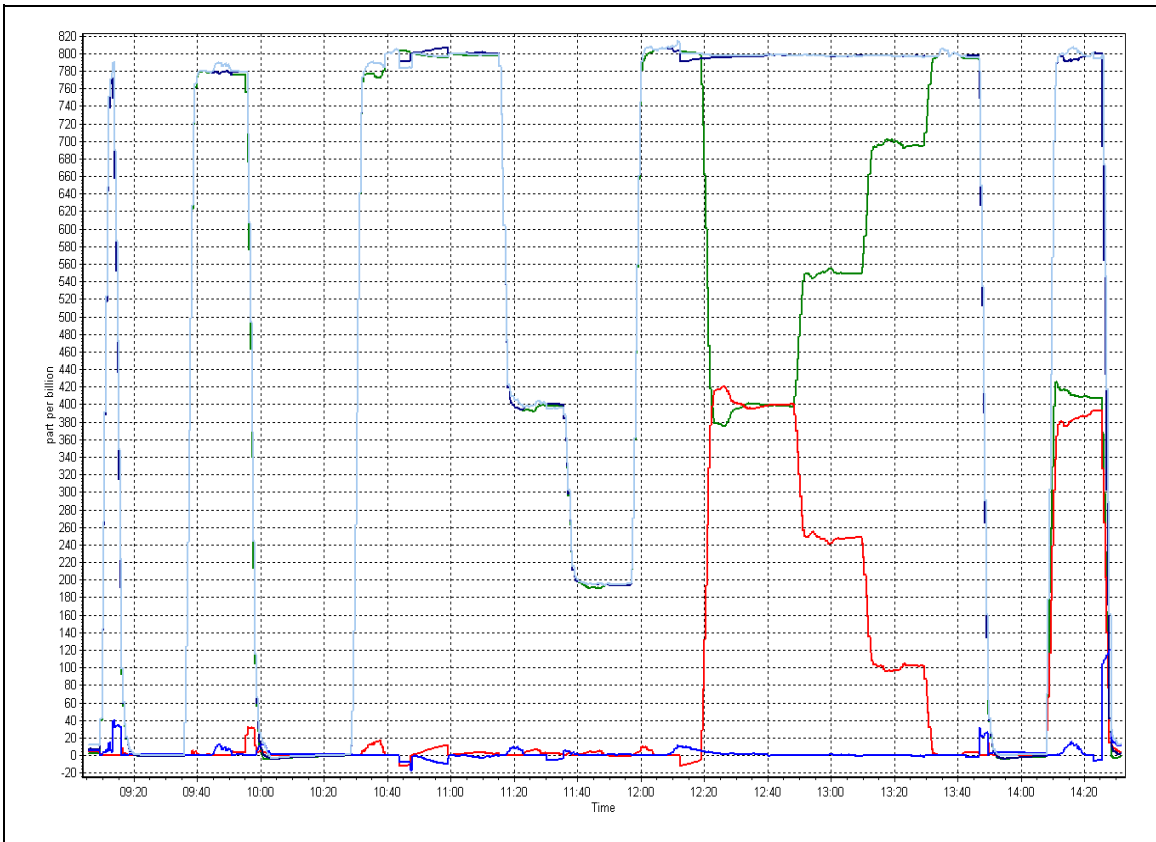
NH<sub>3</sub> Calibration Plot

Date: December 8, 2015



NO<sub>x</sub> Calibration Plot

Date: December 7, 2015





# Wood Buffalo Environmental Association

## SHARP CALIBRATION

### STATION INFORMATION

Calibration Date: December 8, 2015 Previous Calibration: November 13, 2015  
 Station Name: Patricia McInnis Station Number: AMS 6  
 Start Time (MST): 9:26 End Time (MST): 11:30  
 Calibrator Make/Model: Delta Cal Calibrator Serial Number: 141228

### SHARP INFORMATION

Particulate Fraction: PM2.5  
 Make/Model: Thermo / SHARP 5030  
 Serial Number:  
 C<sub>14</sub> Source SN:  
 Confirmation of Time settings: Yes  No   
 Parameters Checked: T1  T2  T3  T4  P3  Main Flow  Beta  Neph

### CALIBRATION DATA

#### Temperature (°C)

Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	-4.0	-5.8	-1.8	-5.8
T2	17.0	na	na	17.0
T3	20.0	na	na	20.0
T4	10.0	na	na	10.0
RH (%)	20.0	na	na	20.0

#### Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	960	953.7	-6.4	960

#### Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	997	-3	997	1000

### Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	204		204
Neph	0.6		0.2
C14	2.9		0.1
Indicated Concentration (ug/m3)	<b>0.6</b>	<b>yes</b>	<b>0.1</b>
Offset 1	202.2		204.1
Offset 2	32		32.5

### Leak Check (Quarterly)

Leak Check Date: September 28, 2015 Previous Leak Check Date:

	Measured	Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	17.10	
*Flow with adaptor (LPM):	16.73	0.37

\*Note - do not attach adaptor without shutting off the pump first

### Mass Foil Calibration (Annually)

Foil Calibration Date: Previous Foil Calibration: May 20, 2015  
 Zeroed?:  
 Foil Mass: Mass foil set S/N:  
 Previous Correction Factor:  
 New Correction Factor:

### INSPECTION DATA

Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	
Pump	Good	
Filter Tape	Good	
Mass Foil Cal Set	na	
HEPA filter	Good	

### NOTES:

Cyclone head cleaned. Nephelometer zeroed. Zero stabilized at -0.5 ug/m3. Nephelometer was zeroed again, with the same result of stabilization at -0.5 ug/m3. Hepa filter removed and cyclone head put back in place for 5 minutes. When hepa filter was put back on zero showed 0.1 ug/m3.

Calibration Performed By: Devin Russell



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## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 7  
ATHABASCA VALLEY  
DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ATHABASCA VALLEY (AMS 7)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	709	35	35	100.00	51	0	8	0
TRS (ppb) Average	710	34	34	100.00	1	0	1	0
THC (ppm) Average	706	35	38	99.60	3.1	-	2.4	-
NMHC (ppm) Average	706	35	38	99.60	0.376	-	0.144	-
CH4(ppm) Average	706	35	38	99.60	2.7	-	2.3	-
O3 (ppb) Average	710	34	34	100.00	32	0	21	-
NO2 (ppb) Average	709	35	35	100.00	31	0	19	-
NO (ppb) Average	709	35	35	100.00	65	-	25	-
NOX (ppb) Average	709	35	35	100.00	94	-	40	-
PM2.5 (ug/m3) Average	742	2	2	100.00	36.4	-	11.4	0
CO(ppm) Average	711	33	33	100.00	0.6	0	0.3	-
Temperature 2 m (C) Average	744	0	0	100.00	5.2	-	-1.8	-
Barometric Pressure (inHg) Average	744	0	0	100.00	29.6	-	29.5	-
Relative Humidity (%) Average	744	0	0	100.00	96	-	93	-
Wind Speed 10 m (km/h) Average	744	0	0	100.00	22	-	15	-
Wind Direction 10 m (deg) Average	744	0	0	100.00	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ATHABASCA VALLEY (AMS 7)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	709	0.9	3	-	0	0	0	0	0	1	51
TRS (ppb) Average	710	0.4	0	-	0	0	0	0	0	1	1
THC (ppm) Average	706	2.04	0.2	-	1.9	1.9	1.9	2	2.1	2.3	3.1
NMHC (ppm) Average	706	0.022	0.065	-	0	0	0	0	0	0.1	0.376
CH4(ppm) Average	706	2.02	0.1	-	1.9	1.9	1.9	2	2.1	2.2	2.7
O3 (ppb) Average	710	11	7	-	0	1	5	11	16	22	32
NO2 (ppb) Average	709	10.2	6	-	1	4	6	9	14	19	31
NO (ppb) Average	709	6.4	9	-	0	0	1	3	8	19	65
NOX (ppb) Average	709	16.7	14	-	1	4	7	12	21	37	94
PM2.5 (ug/m3) Average	742	5.45	4.2	-	0.3	1.6	2.4	4.8	7	10.8	36.4
CO(ppm) Average	711	0.11	0.1	-	0	0	0.1	0.1	0.1	0.2	0.6
Temperature 2 m (C) Average	744	-10.66	6	-	-24.8	-18.6	-15.2	-11.5	-4.9	-3.7	5.2
Barometric Pressure (inHg) Average	744	28.85	0.3	-	28.4	28.5	28.6	28.8	29	29.2	29.6
Relative Humidity (%) Average	744	81.2	7	-	54	74	77	81	86	90	96
Wind Speed 10 m (km/h) Average	744	7	4	-	0	2	4	6	9	12	22
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ATHABASCA VALLEY (AMS 7)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
NMHC, CH4, THC	23 Dec 2015 10:00	23 Dec 2015 12:00	3	Maintenance - replaced fuel cylinder

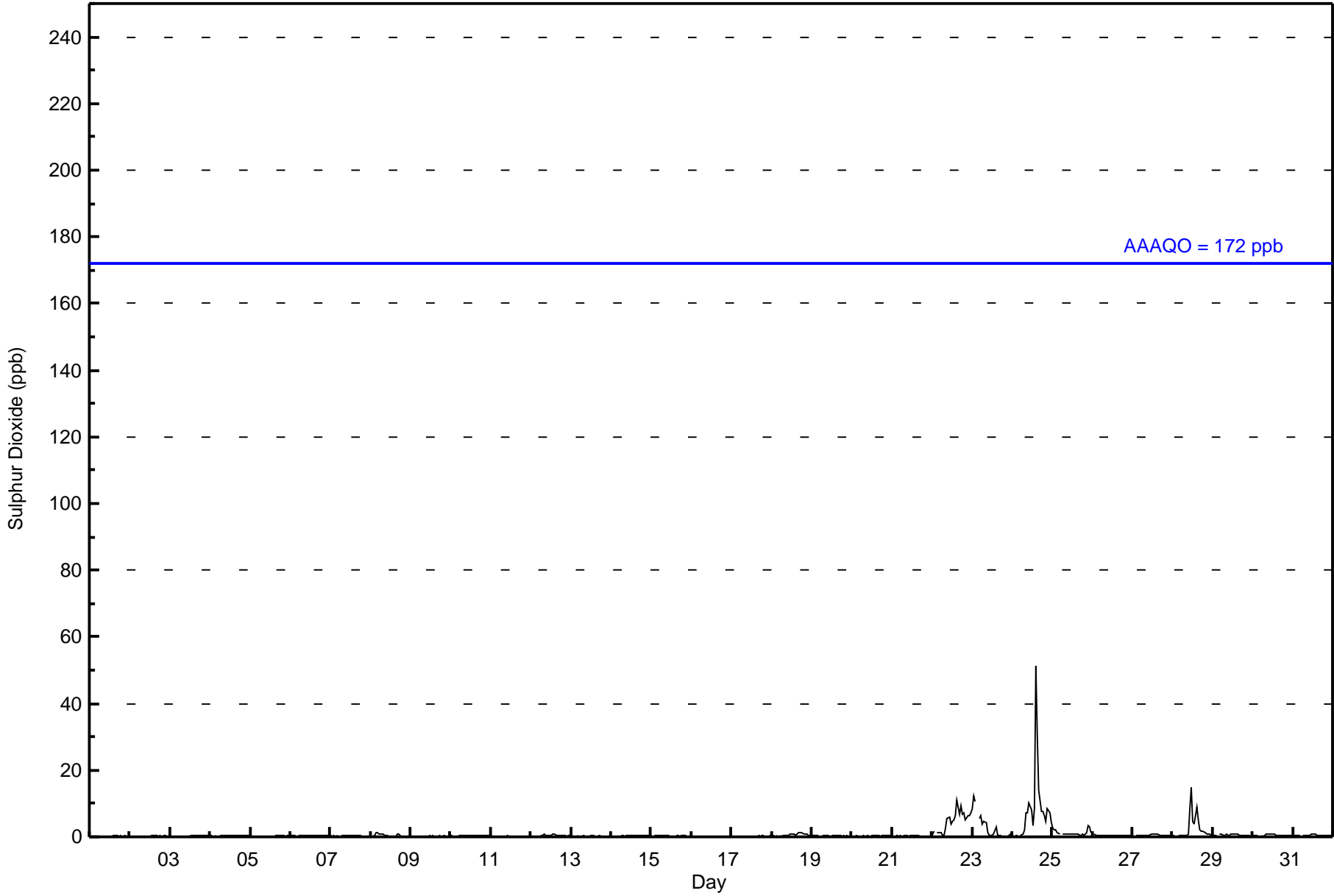


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 51 ppb on Dec 24 15:00	Maximum Daily Average: 8.3 ppb on Dec 24		Hours of Data:	709
Minimum Value: 0 ppb on Dec 12 00:00	Minimum Daily Average: 0.1 ppb on Dec 16		Hours of Missing Data:	35
Maximum Diurnal Average: 2.6 ppb at hour 15	Minimum Diurnal Average: 0.3 ppb at hour 4		Hours of Calibration:	35
Monthly Average: 0.9 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 11		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
2-Dec	Z	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0.3	1
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.3	1
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
8-Dec	Z	0	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0.4	1
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
10-Dec	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0.3	1
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
12-Dec	0	0	0	0	Z	0	0	0	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0.4	1
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.2	1
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0.6	1
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
20-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
22-Dec	1	2	Z	1	1	1	0	1	3	5	6	4	5	5	6	11	7	9	7	7	5	6	6	7	4.7	11
23-Dec	9	12	11	Z	5	6	4	4	4	1	0	0	1	3	0	0	0	0	0	0	0	0	1	1	2.8	12
24-Dec	0	0	0	0	Z	1	1	2	7	7	10	8	4	9	51	30	14	8	8	6	5	9	7	4	8.3	51
25-Dec	3	2	2	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	3	3	1	1.2	3
26-Dec	Z	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
27-Dec	0	Z	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.5	1
28-Dec	0	0	Z	0	0	0	0	0	0	1	9	15	5	4	9	5	2	2	2	1	1	1	1	1	2.6	15
29-Dec	1	1	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.5	1
30-Dec	0	0	0	0	Z	0	0	0	1	1	1	1	1	1	0	0	0	1	1	0	0	0	0	0	0.5	1
31-Dec	0	0	0	0	0	Z	1	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	1

0.7	0.8	0.7	0.3	0.5	0.6	0.4	0.5	0.8	0.8	1.1	1.2	0.8	0.9	2.6	1.8	1.1	0.9	0.8	0.8	0.6	0.8	0.8	0.6	Diurnal Average
9	12	11	1	5	6	4	4	7	7	10	15	5	9	51	30	14	9	8	7	5	9	7	7	Diurnal Maximum

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb      24-hr 48 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Athabasca Valley - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	702	99.01	99.01
11 - 20	5	0.71	99.72
21 - 60	2	0.28	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



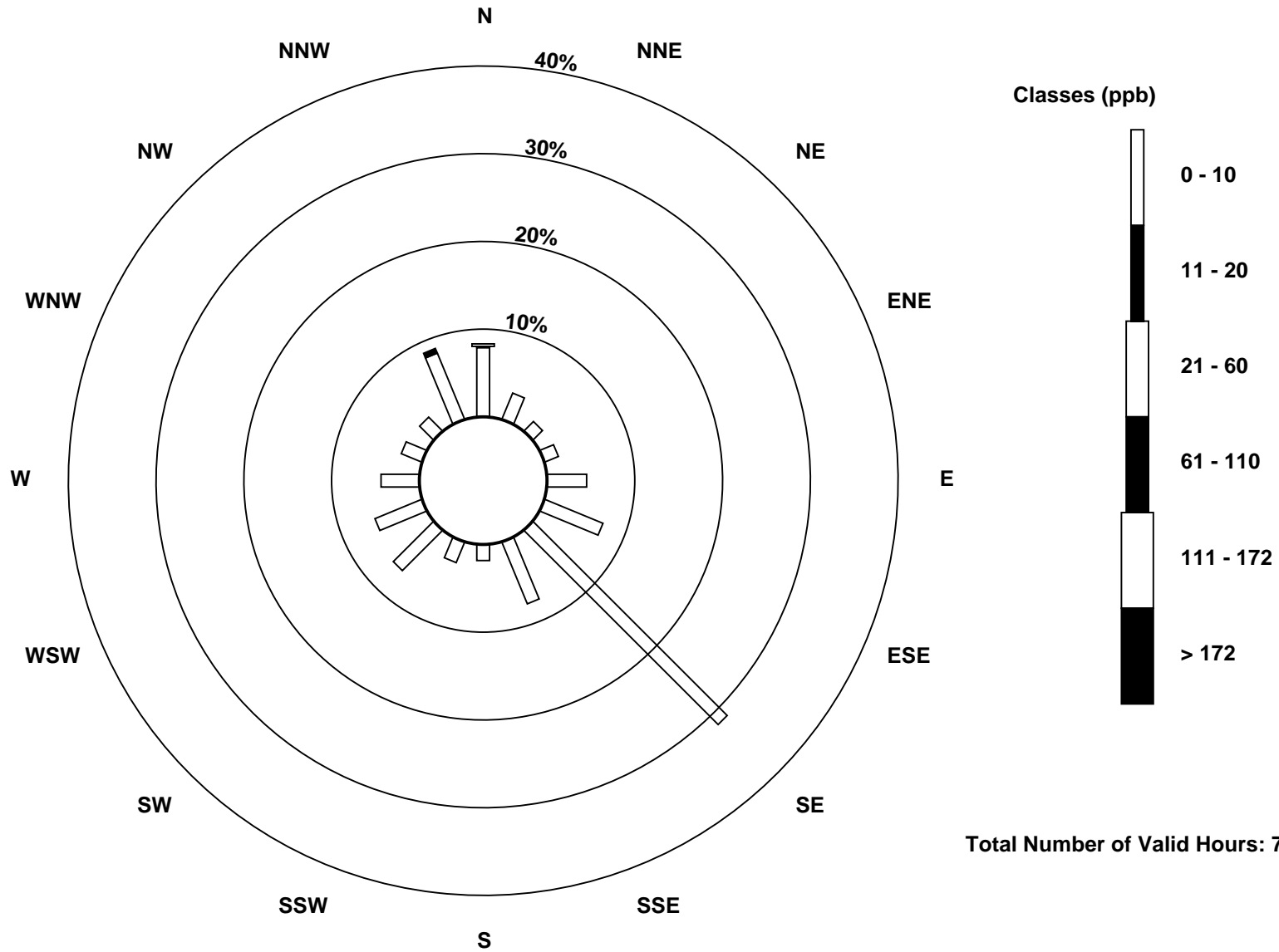
**Wood Buffalo Environmental Association  
Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Athabasca Valley - December 2015**

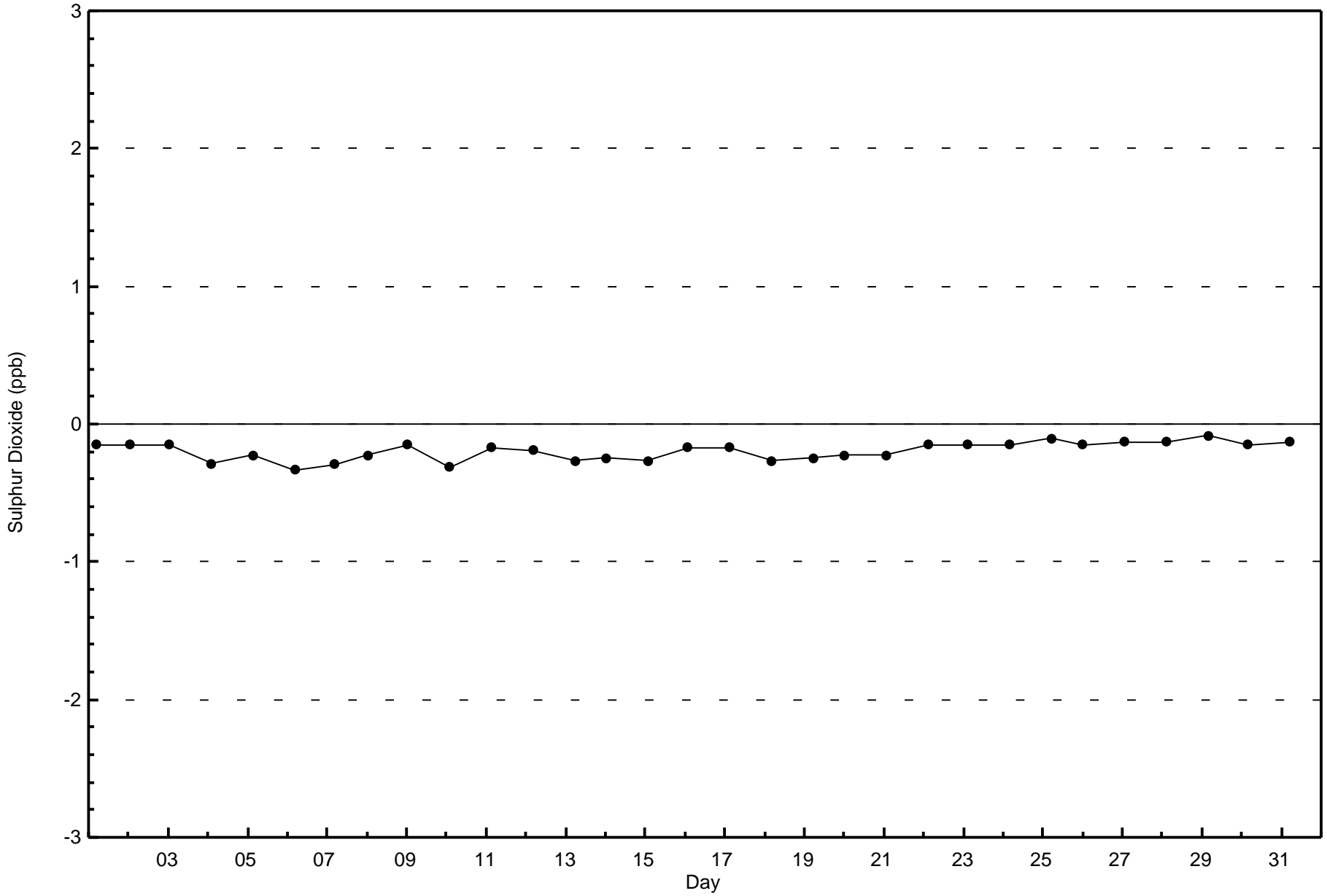
<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	56	23	11	12	32	51	222	54	13	18	46	41	31	18	16	58	702
11 - 20	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5
21 - 60	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	59	23	11	12	32	51	222	54	13	18	46	41	31	18	16	62	709

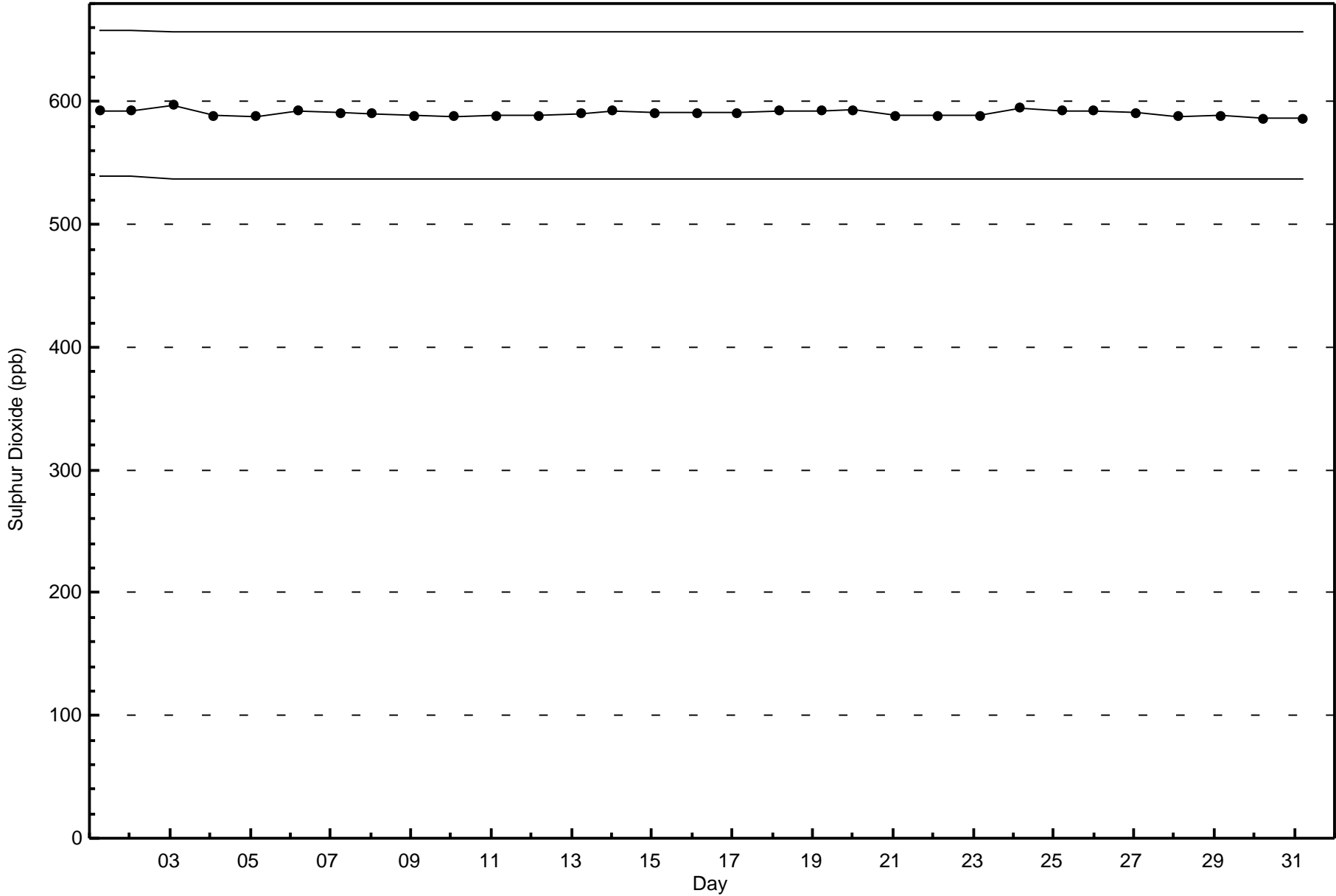
Total Number of Valid Hours: 709

Total Number of Hours: 744



Total Number of Valid Hours: 709







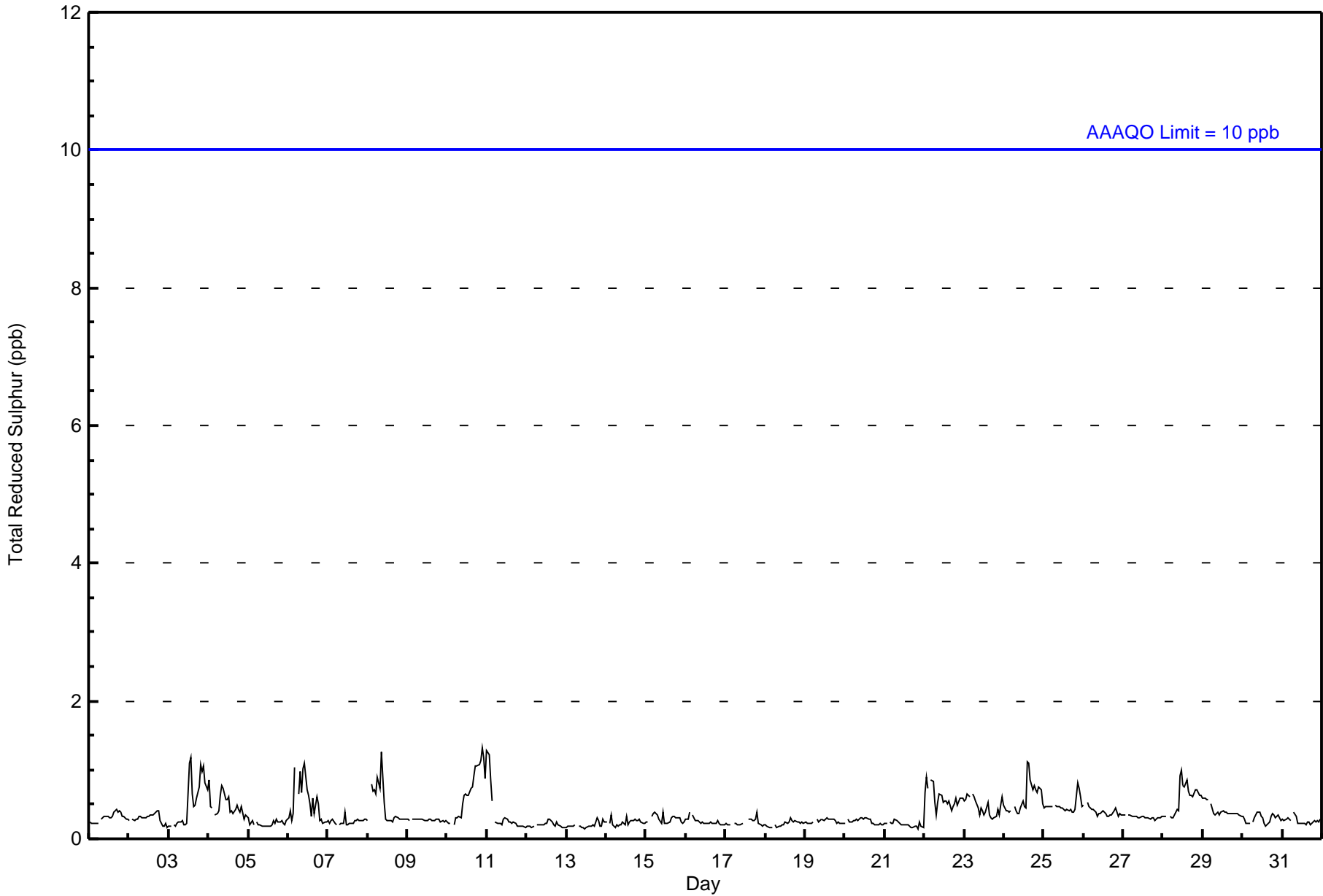


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 1 ppb on Dec 10 22:00	Maximum Daily Average: 0.7 ppb on Dec 10		Hours of Data:	710
Minimum Value: 0 ppb on Dec 21 21:00	Minimum Daily Average: 0.2 ppb on Dec 13		Hours of Missing Data:	34
Maximum Diurnal Average: 0.4 ppb at hour 11	Minimum Diurnal Average: 0.3 ppb at hour 4		Hours of Calibration:	34
Monthly Average: 0.4 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 1		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	1	1	1	1	1	1	0.5	1
4-Dec	1	0	0	Z	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
6-Dec	0	0	0	0	1	Z	1	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0.5	1
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
8-Dec	0	Z	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
10-Dec	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
11-Dec	1	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
22-Dec	1	1	1	Z	1	1	1	0	1	1	1	1	1	1	1	1	0	0	0	1	0	1	1	1	1	0.6	1
23-Dec	1	1	1	1	Z	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0.5	1	
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0.6	1
25-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0.5	1
26-Dec	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
28-Dec	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1
29-Dec	1	1	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
30-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0

0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	Diurnal Average		
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Diurnal Maximum	

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb    24-hr 3 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Athabasca Valley - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	710	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb  
Athabasca Valley - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	56	23	10	12	33	53	226	53	13	18	44	41	32	18	15	63	710
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	56	23	10	12	33	53	226	53	13	18	44	41	32	18	15	63	710

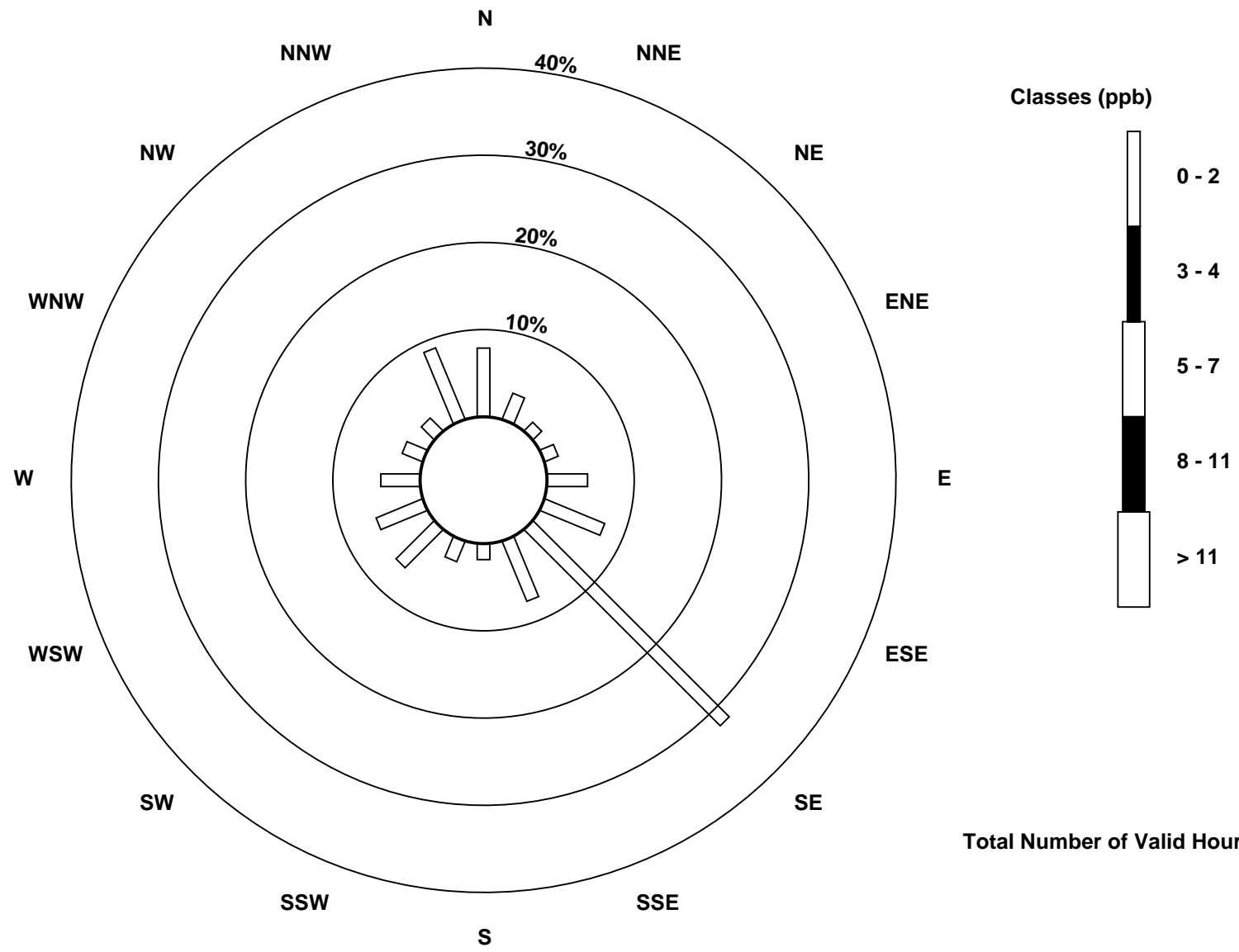
Total Number of Valid Hours: 710

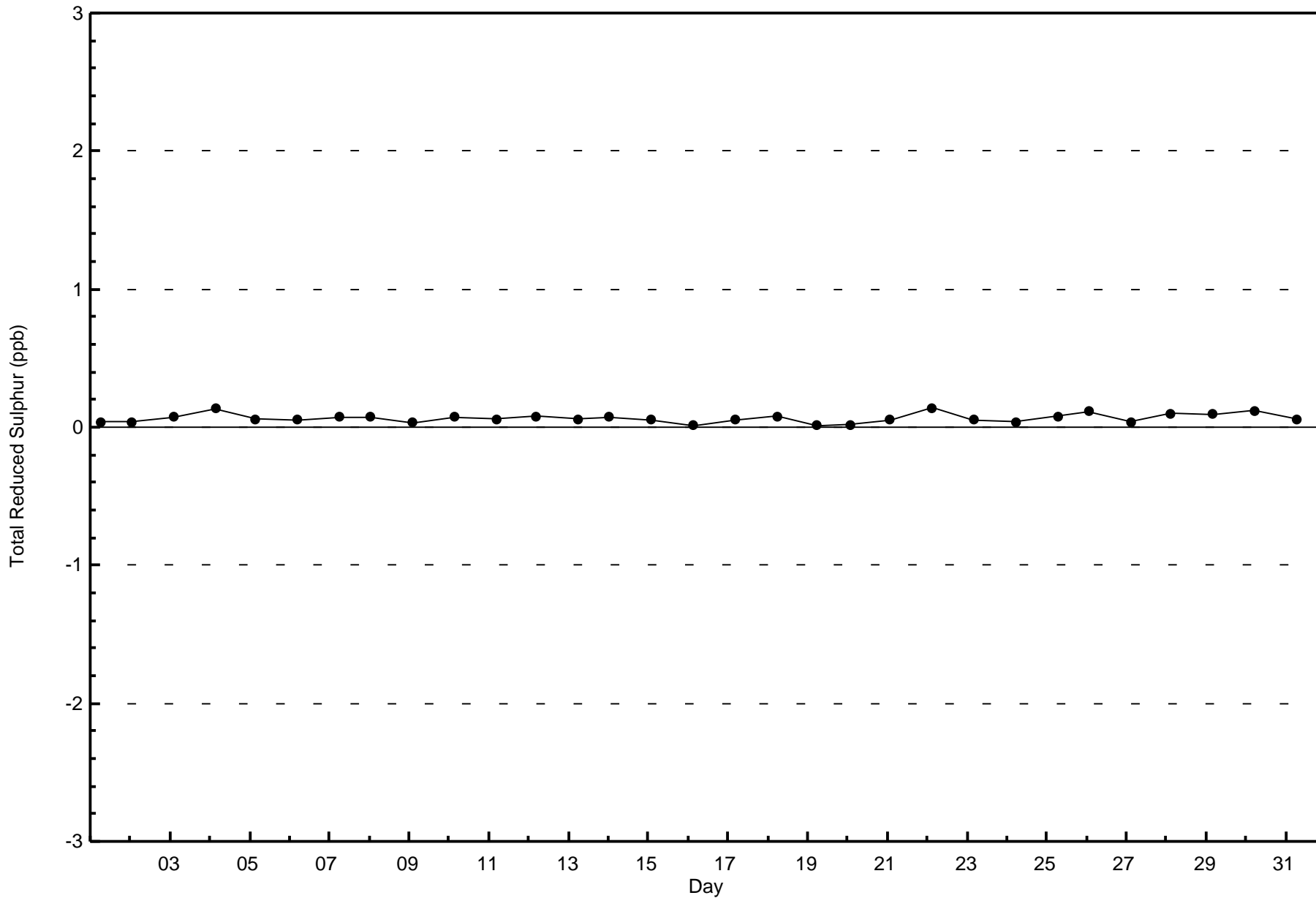
Total Number of Hours: 744

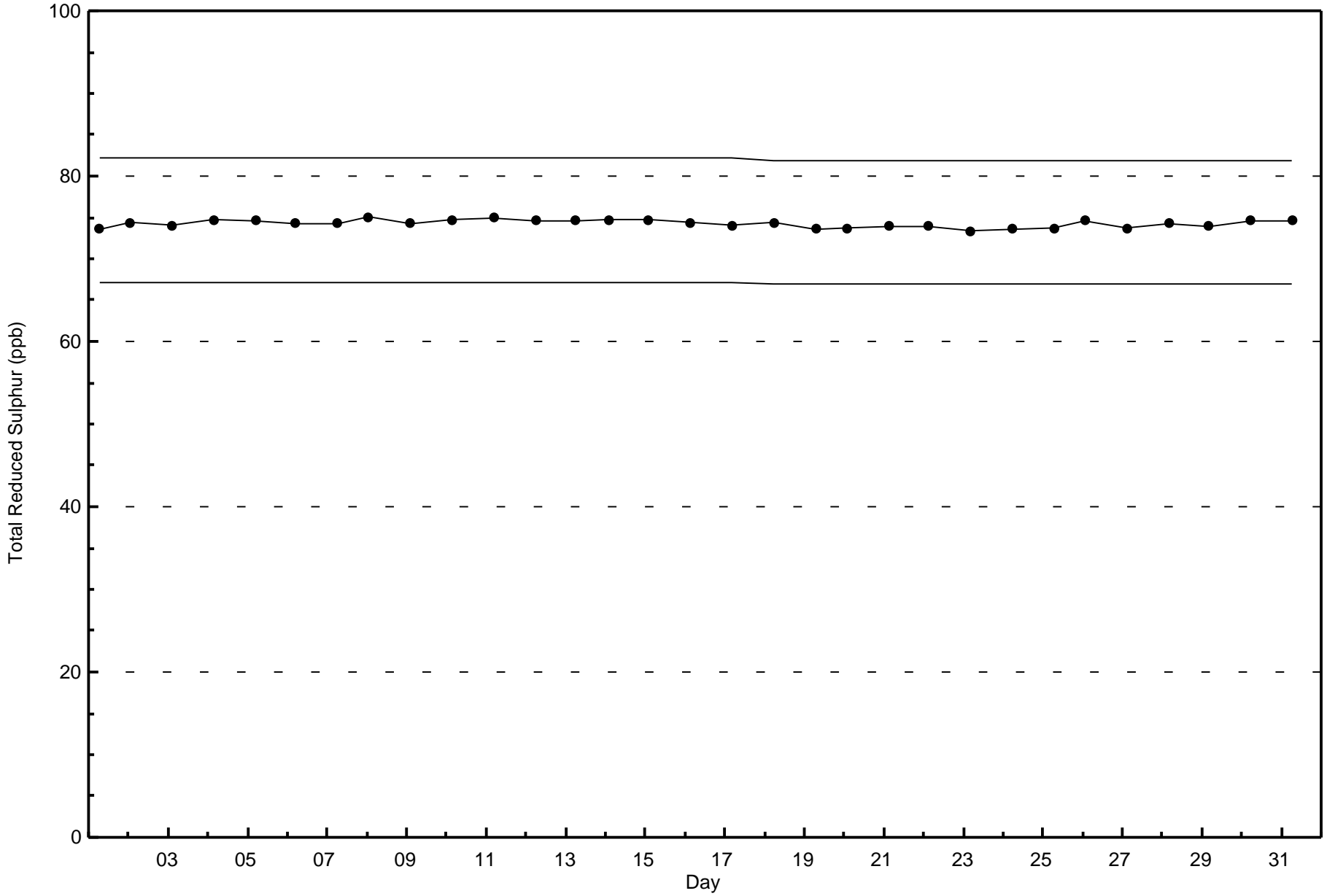


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Total Reduced Sulphur (TRS) - ppb  
Athabasca Valley (AMS 7)



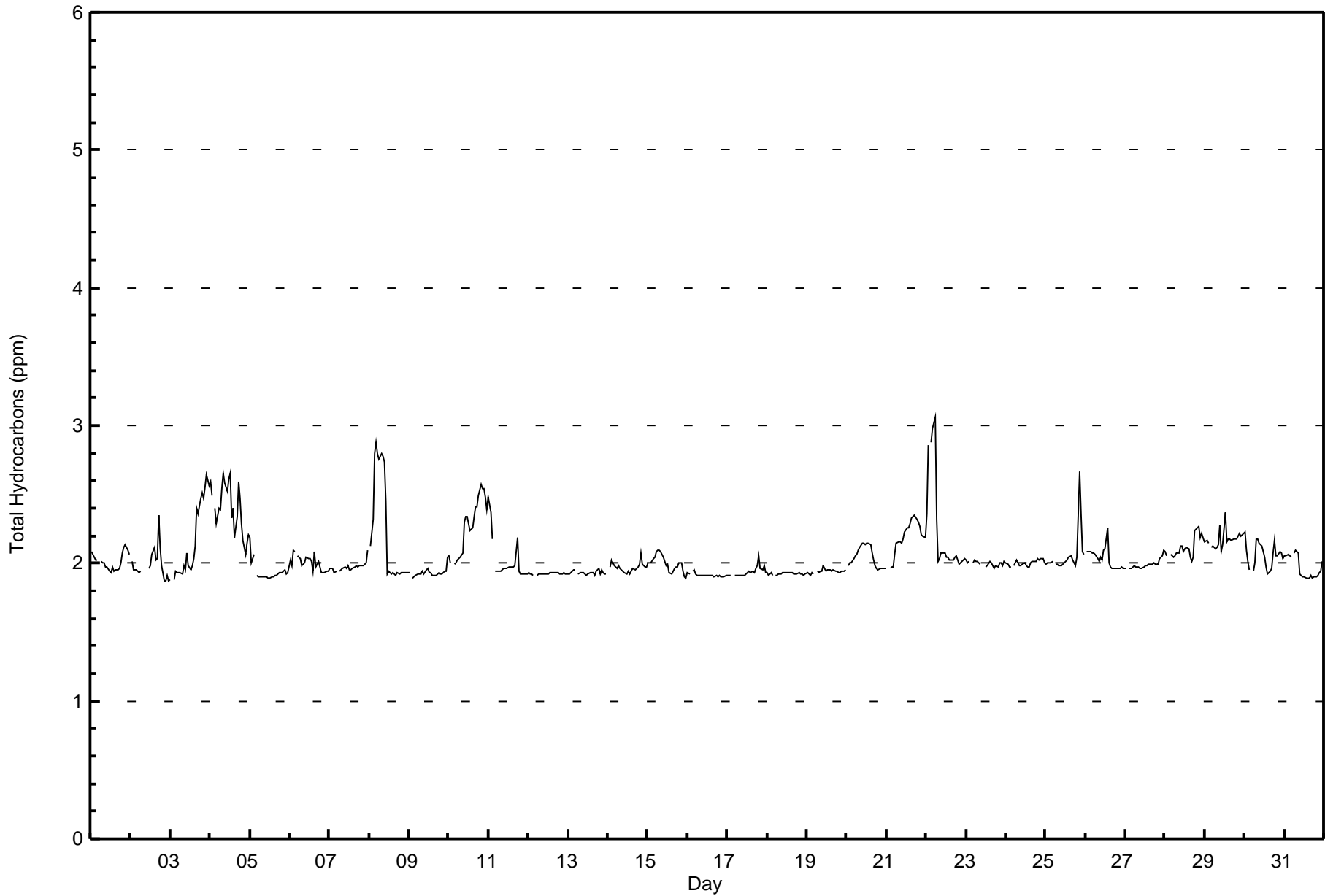






Maximum Value: 3.1 ppm on Dec 22 06:00		Maximum Daily Average: 2.4 ppm on Dec 4		Hours in Service: 744																						
Minimum Value: 1.9 ppm on Dec 2 22:00		Minimum Daily Average: 1.9 ppm on Dec 16		Hours of Data: 706																						
Maximum Diurnal Average: 2.1 ppm at hour 6		Minimum Diurnal Average: 2.0 ppm at hour 3		Hours of Missing Data: 38																						
Monthly Average: 2.04 ppm		Percentiles: P <sub>1</sub> = 1.9 P <sub>10</sub> = 1.9 Q <sub>1</sub> = 1.9 Median = 2.0 Q <sub>3</sub> = 2.1 P <sub>90</sub> = 2.3 P <sub>99</sub> = 2.8		Hours of Calibration: 35																						
				Percent Operational Time: 99.6																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.1	2.1	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	1.9	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.0	2.1
2-Dec	Z	2.0	2.0	2.0	1.9	1.9	1.9	C	C	C	C	2.0	2.0	2.1	2.1	2.0	2.0	2.4	2.1	2.0	1.9	1.9	1.9	1.9	2.0	2.4
3-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.0	2.0	2.0	2.1	2.4	2.4	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.2	2.6
4-Dec	2.6	2.5	Z	2.4	2.3	2.4	2.4	2.5	2.7	2.6	2.5	2.6	2.7	2.3	2.4	2.2	2.3	2.6	2.5	2.3	2.2	2.1	2.1	2.2	2.4	2.7
5-Dec	2.2	2.0	2.1	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	2.2
6-Dec	2.0	2.0	2.1	2.1	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.1
7-Dec	2.0	2.0	2.0	1.9	1.9	Z	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.1
8-Dec	Z	2.1	2.3	2.8	2.9	Z	2.8	2.8	2.8	2.8	2.7	2.5	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.2	2.9
9-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0
10-Dec	2.1	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.1	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.5	2.5	2.5	2.4	2.3	2.6
11-Dec	2.5	2.4	2.2	Z	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.5
12-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
13-Dec	1.9	1.9	1.9	2.0	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	1.9	1.9	1.9	1.9	2.0
14-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.1
15-Dec	2.0	Z	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.1
16-Dec	1.9	1.9	Z	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
17-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0
18-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
19-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0
20-Dec	Z	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1
21-Dec	2.0	Z	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.1	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.3
22-Dec	2.4	2.9	Z	2.9	3.0	3.1	2.3	2.0	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.2	3.1
23-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	M	M	M	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
24-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
25-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.7	2.4	2.1	2.1	2.1	2.7
26-Dec	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.3	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.3
27-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.1
28-Dec	2.1	2.1	Z	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.2	2.3	2.3	2.2	2.2	2.2	2.1	2.3
29-Dec	2.2	2.2	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.1	2.1	2.4	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4
30-Dec	2.2	2.1	2.0	2.0	Z	1.9	2.0	2.2	2.2	2.1	2.1	2.1	2.0	2.0	1.9	1.9	2.0	2.1	2.2	2.1	2.1	2.1	2.1	2.0	2.1	2.2
31-Dec	2.0	2.1	2.1	2.1	2.0	Z	2.1	2.1	2.1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan      C - Calibration      M - Maintenance																										







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Athabasca Valley - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	504	71.39	71.39
2.1 - 3.0	201	28.47	99.86
3.1 - 10.0	1	0.14	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Athabasca Valley - December 2015**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	38	12	6	7	31	41	179	38	8	10	25	29	19	11	9	41	504
2.1 - 3.0	19	11	5	5	1	10	43	16	5	8	21	12	12	7	7	19	201
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	57	23	11	12	32	51	222	54	13	18	46	41	31	18	16	61	706

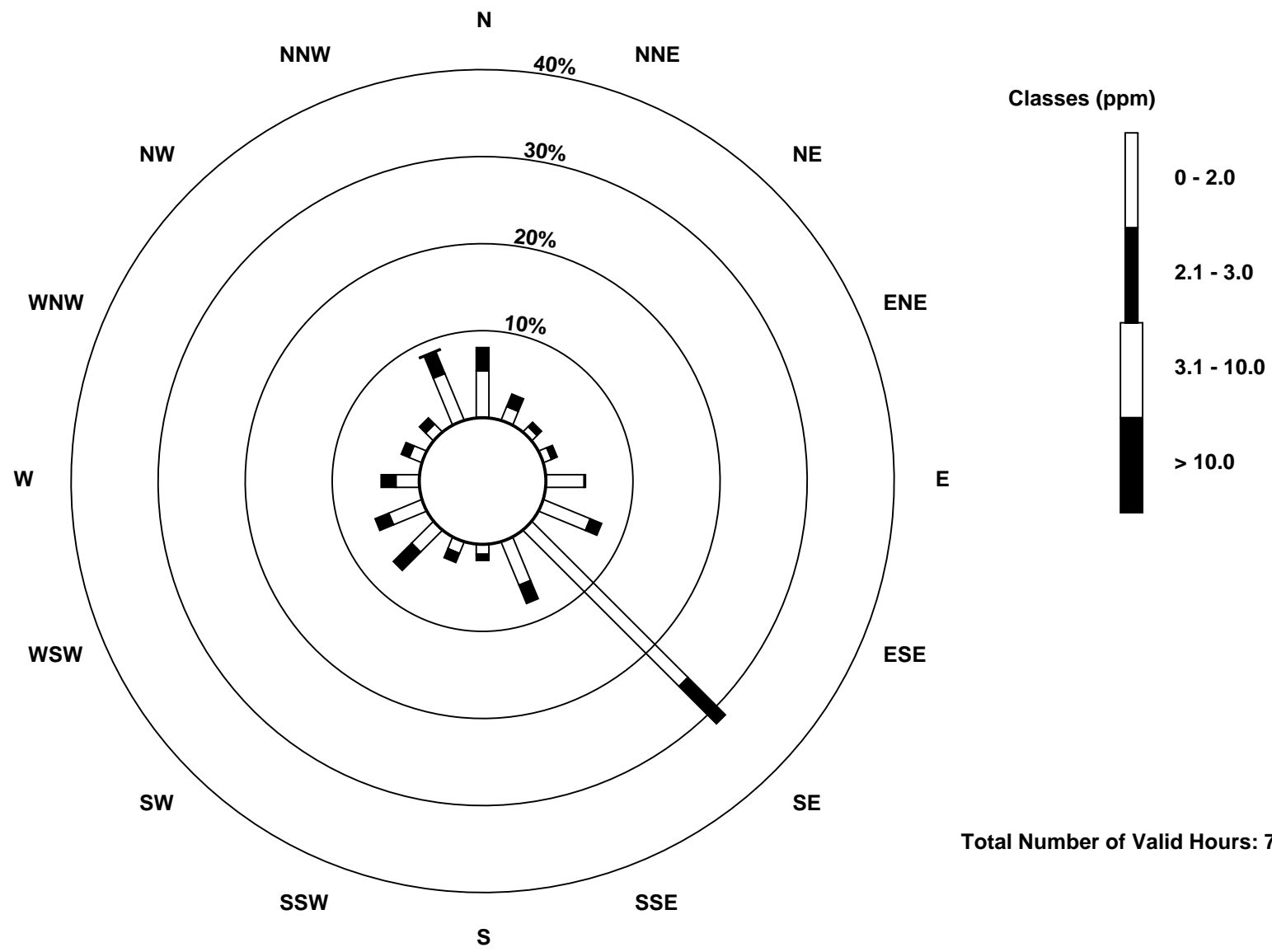
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

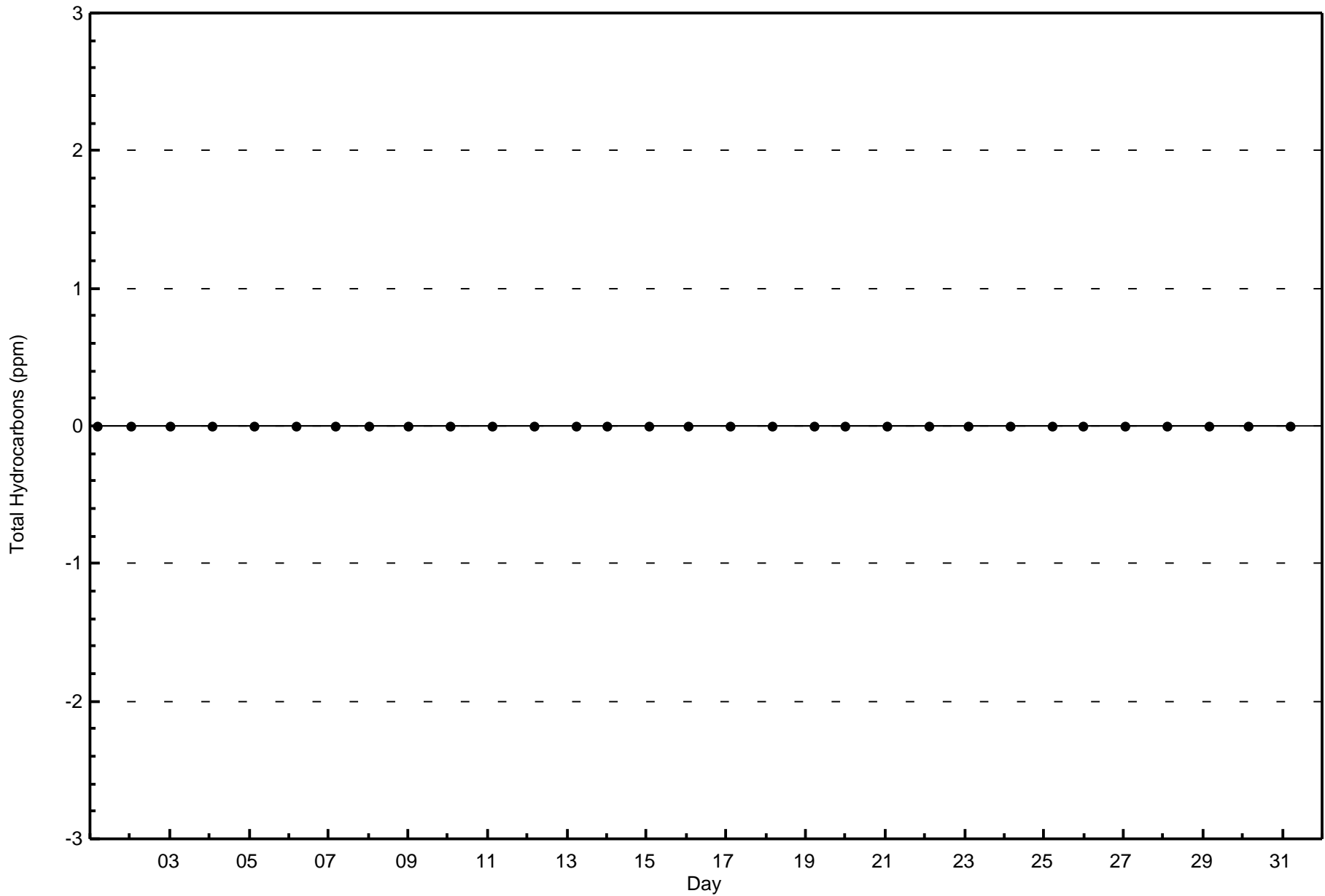
Total Hydrocarbons (THC) - ppm  
Athabasca Valley (AMS 7)

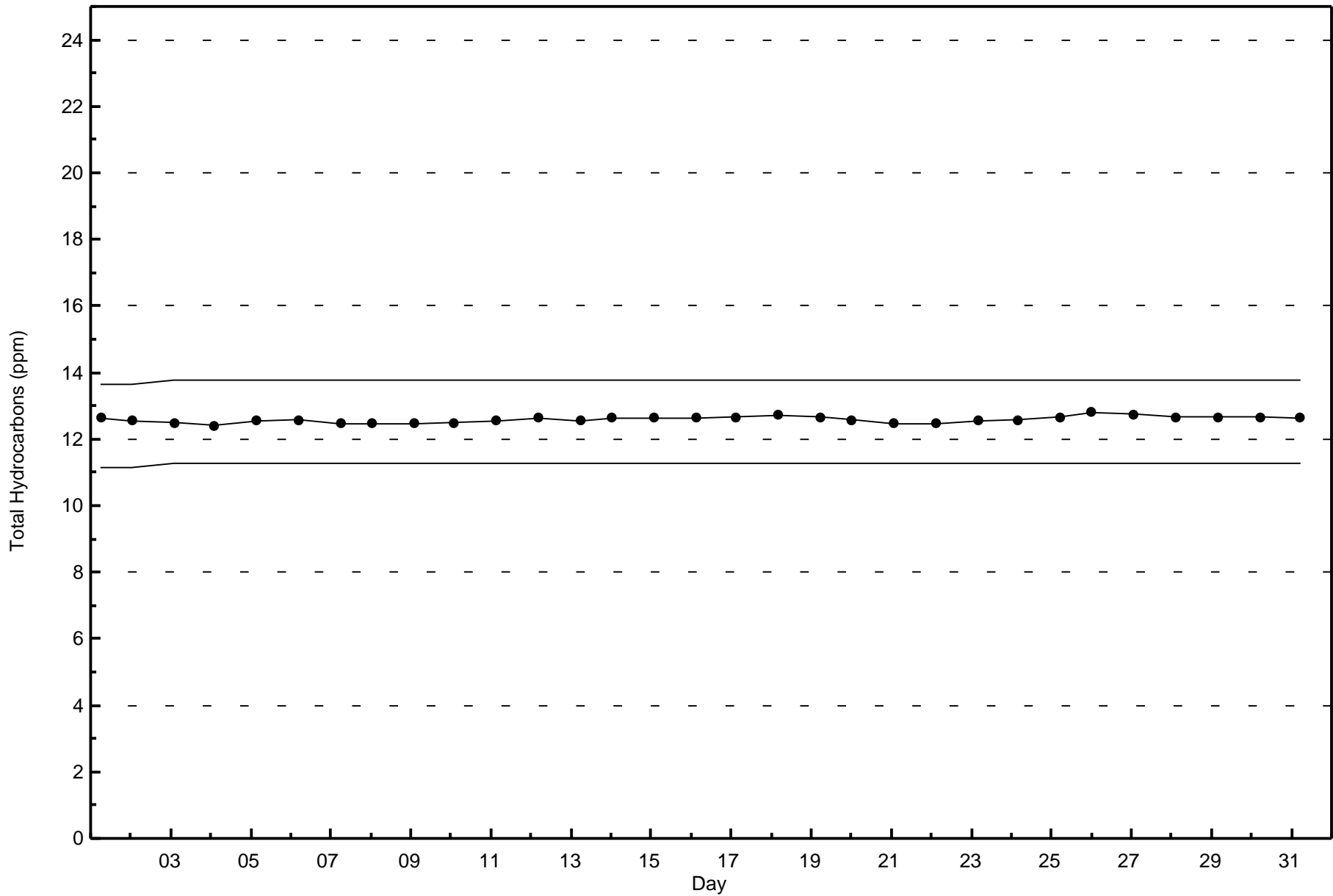




Wood Buffalo Environmental Association  
Zero Responses

Total Hydrocarbons (THC) - ppm  
Athabasca Valley - December 2015



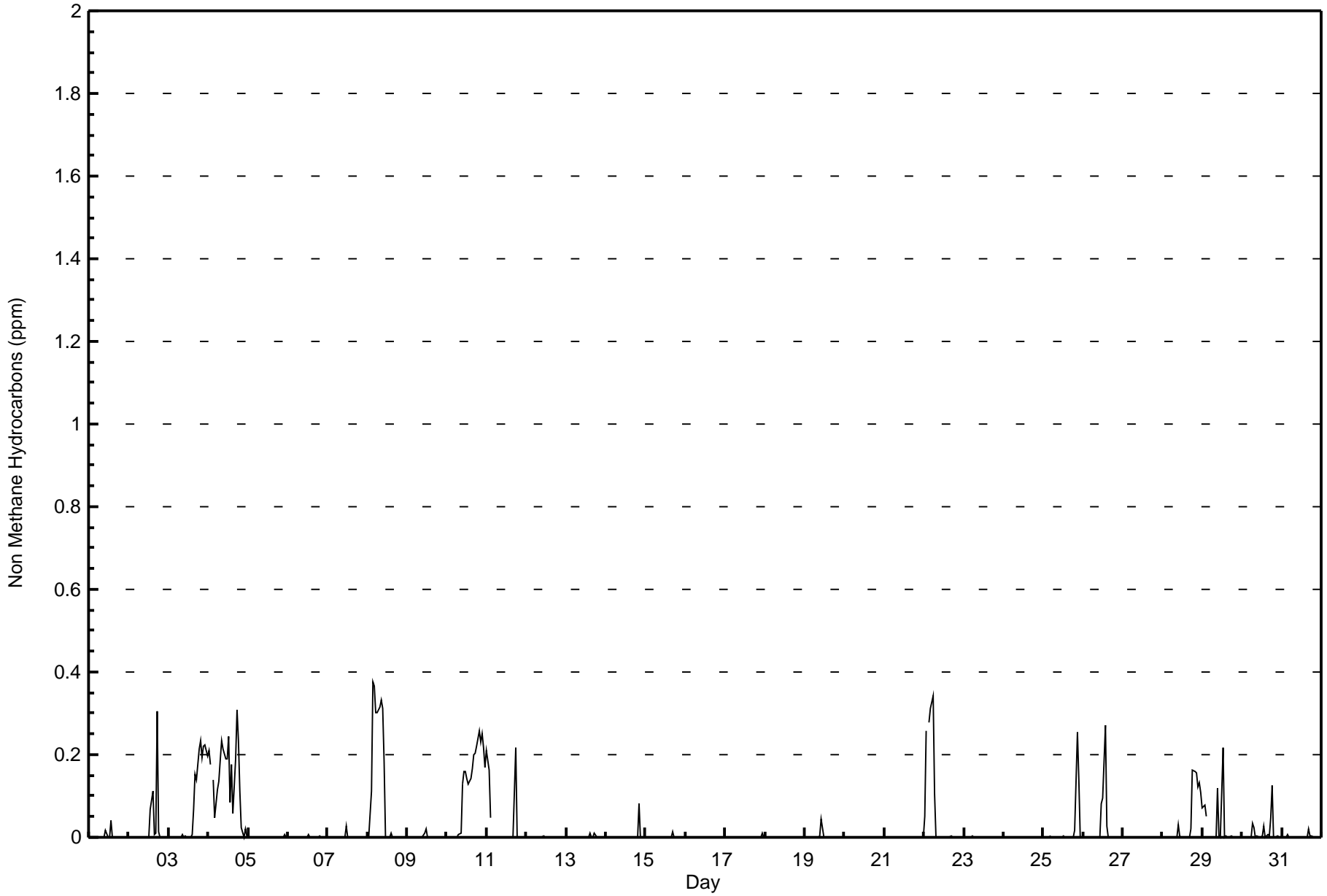




Summary of Hour Averages

Athabasca Valley - December 2015

Maximum Value: 0.376 ppm on Dec 8 04:00		Maximum Daily Average: 0.144 ppm on Dec 4		Hours in Service: 744																						
Minimum Value: 0.000 ppm on Dec 1 01:00		Minimum Daily Average: 0.000 ppm on Dec 21		Hours of Data: 706																						
Maximum Diurnal Average: 0.040 ppm at hour 18		Minimum Diurnal Average: 0.008 ppm at hour 3		Hours of Missing Data: 38																						
Monthly Average: 0.022 ppm		Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.1 P <sub>99</sub> = 0.3		Hours of Calibration: 35																						
				Percent Operational Time: 99.6																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.017	0.000	0.000	0.041	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.041
2-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	C	C	C	C	0.000	0.000	0.067	0.111	0.007	0.010	0.306	0.015	0.000	0.000	0.000	0.000	0.000	0.027	0.306
3-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.004	0.000	0.000	0.000	0.007	0.067	0.152	0.139	0.213	0.233	0.192	0.221	0.225	0.196	0.072	0.233
4-Dec	0.211	0.177	Z	0.141	0.048	0.116	0.137	0.188	0.233	0.215	0.189	0.190	0.245	0.086	0.175	0.059	0.190	0.308	0.235	0.112	0.025	0.000	0.019	0.003	0.144	0.308
5-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
6-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.005
7-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.027
8-Dec	Z	0.000	0.113	0.376	0.365	0.303	0.301	0.314	0.332	0.311	0.185	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.114	0.376
9-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.011	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.022
10-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.006	0.009	0.130	0.158	0.159	0.144	0.129	0.143	0.167	0.200	0.203	0.221	0.257	0.232	0.251	0.218	0.170	0.122	0.257
11-Dec	0.211	0.164	0.049	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.216	0.000	0.000	0.000	0.000	0.000	0.000	0.028	0.216
12-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
13-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.011
14-Dec	Z	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080	0.000	0.000	0.000	0.004	0.080
15-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.014
16-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.010
18-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.003	0.045	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.045
20-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
22-Dec	0.052	0.259	Z	0.277	0.312	0.341	0.106	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.059	0.341
23-Dec	0.000	0.000	0.000	Z	0.000	0.002	0.000	0.000	0.000	M	M	M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
24-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25-Dec	0.000	0.000	0.000	0.000	0.004	Z	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.253	0.138	0.000	0.000	0.018	0.253
26-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.081	0.095	0.271	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.271
27-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
28-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.032	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.163	0.160	0.156	0.121	0.134	0.108	0.039	0.163
29-Dec	0.073	0.077	0.050	Z	0.000	0.000	0.000	0.000	0.000	0.119	0.002	0.001	0.217	0.000	0.003	0.000	0.000	0.002	0.000	0.000	0.000	0.001	0.002	0.001	0.024	0.217
30-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.032	0.025	0.000	0.002	0.000	0.000	0.003	0.026	0.000	0.005	0.004	0.048	0.126	0.000	0.000	0.003	0.000	0.000	0.012	0.126
31-Dec	0.003	0.000	0.000	0.007	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.002	0.002	0.000	0.002	0.000	0.000	0.000	0.002	0.021
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan                      C - Calibration                      M - Maintenance																										







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm**  
**Athabasca Valley - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.005	593	83.99	83.99
0.006 - 0.05	34	4.82	88.81
0.06 - 0.1	27	3.82	92.63
> 0.1	52	7.37	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



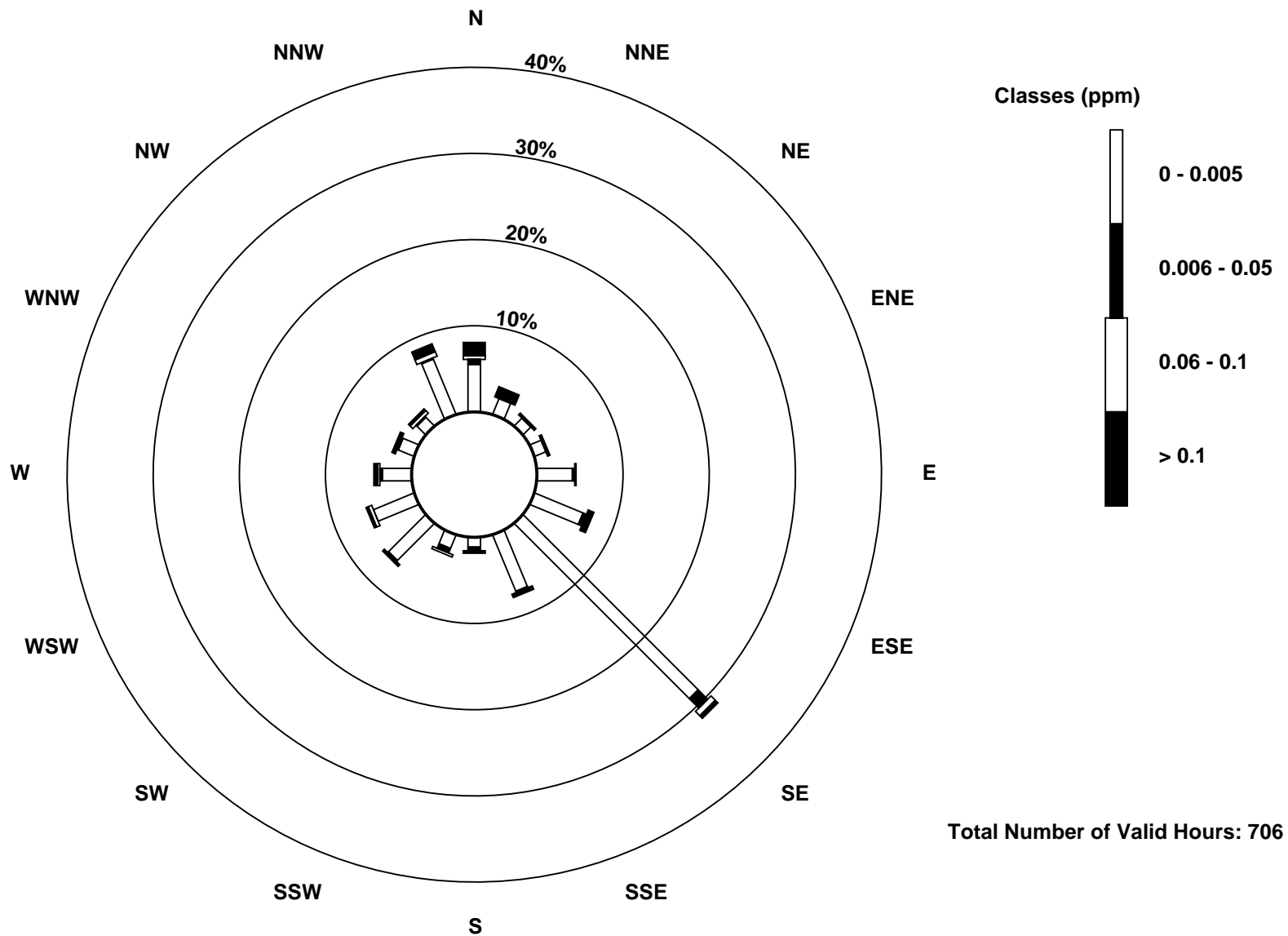
**Wood Buffalo Environmental Association  
Frequency Distribution**

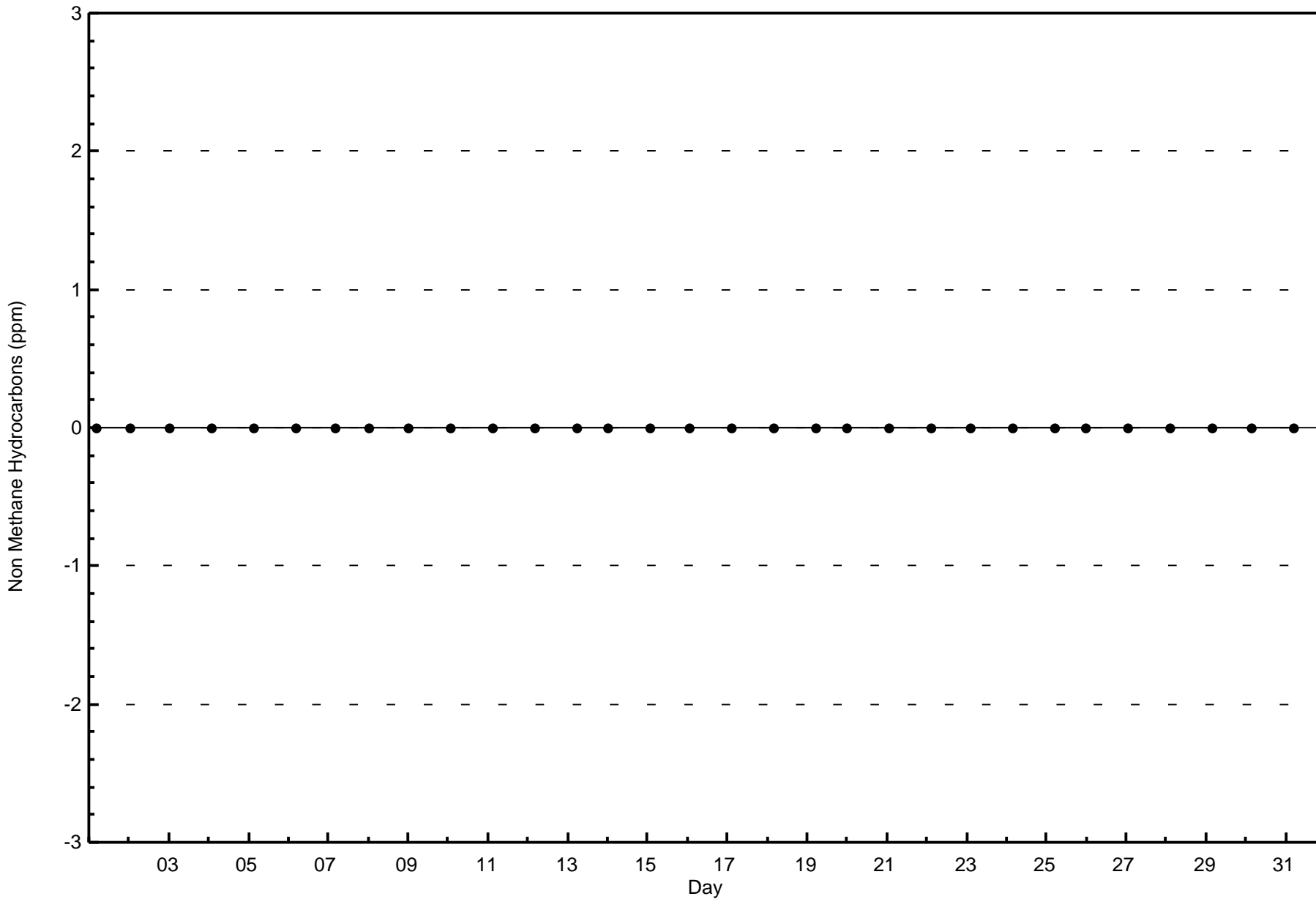
**Non Methane Hydrocarbons (NMHC) - ppm  
Athabasca Valley - December 2015**

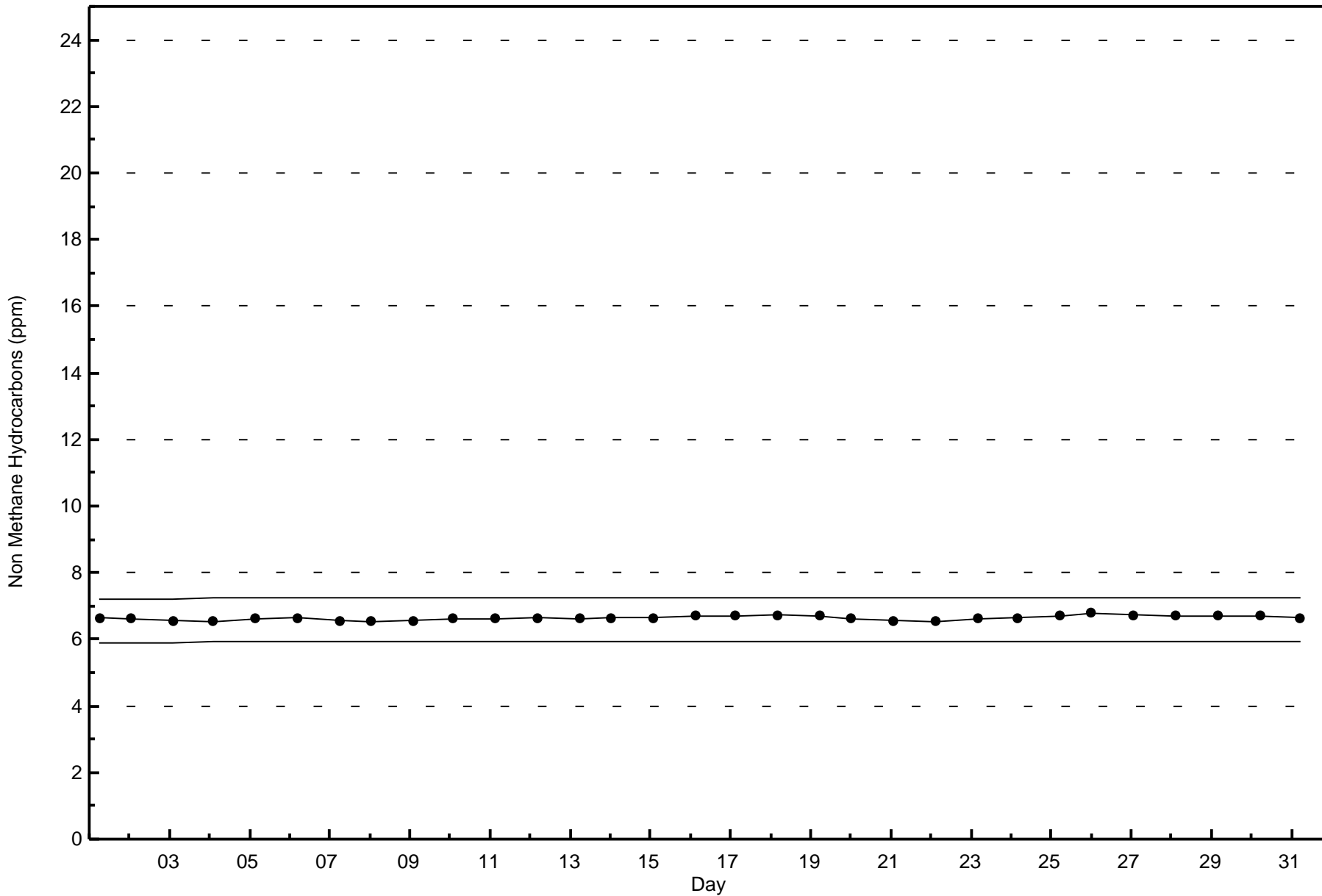
Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	39	14	9	10	29	43	203	50	8	12	43	36	24	14	10	49	593
0.006 - 0.05	4	0	0	0	2	3	11	1	3	4	1	0	2	1	1	1	34
0.06 - 0.1	3	0	1	0	1	1	5	1	0	2	0	3	2	1	3	4	27
> 0.1	11	9	1	2	0	4	3	2	2	0	2	2	3	2	2	7	52
<b>Totals</b>	57	23	11	12	32	51	222	54	13	18	46	41	31	18	16	61	706

Total Number of Valid Hours: 706

Total Number of Hours: 744

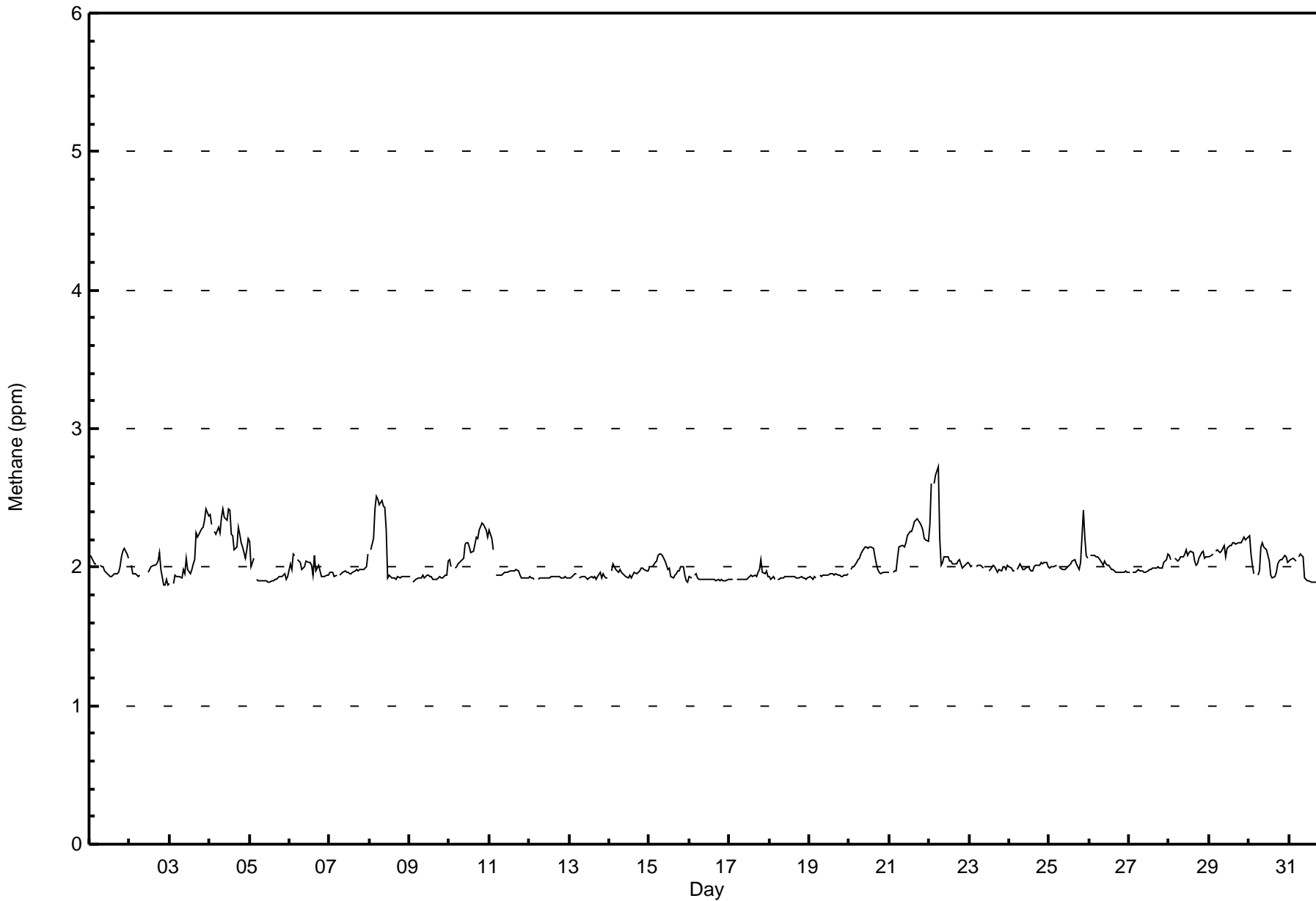








Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744												
Maximum Value: 2.7 ppm on Dec 22 06:00														Maximum Daily Average: 2.3 ppm on Dec 4												
Minimum Value: 1.9 ppm on Dec 2 22:00														Minimum Daily Average: 1.9 ppm on Dec 16												
Maximum Diurnal Average: 2.0 ppm at hour 6														Minimum Diurnal Average: 2.0 ppm at hour 15												
Monthly Average: 2.02 ppm														Percentiles: P <sub>1</sub> = 1.9 P <sub>10</sub> = 1.9 Q <sub>1</sub> = 1.9 Median = 2.0 Q <sub>3</sub> = 2.1 P <sub>90</sub> = 2.2 P <sub>99</sub> = 2.5												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.1	2.1	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.0	2.1
2-Dec	Z	2.0	2.0	2.0	1.9	1.9	1.9	C	C	C	C	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	1.9	1.9	1.9	1.9	2.0	2.1
3-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.1	2.3	2.2	2.3	2.3	2.3	2.3	2.4	2.4	2.1	2.4
4-Dec	2.4	2.3	Z	2.3	2.2	2.3	2.2	2.4	2.4	2.4	2.3	2.4	2.4	2.2	2.2	2.1	2.1	2.3	2.2	2.2	2.1	2.1	2.1	2.2	2.3	2.4
5-Dec	2.2	2.0	2.1	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	2.2
6-Dec	2.0	2.0	2.1	2.1	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.1
7-Dec	2.0	2.0	2.0	1.9	1.9	Z	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.1
8-Dec	Z	2.1	2.2	2.4	2.5	2.5	2.4	2.5	2.4	2.4	2.3	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	2.5
9-Dec	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0
10-Dec	2.1	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.2	2.1	2.3
11-Dec	2.3	2.2	2.1	Z	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.3
12-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
13-Dec	1.9	1.9	1.9	2.0	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	1.9	1.9	1.9	1.9	2.0
14-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
15-Dec	2.0	Z	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.1
16-Dec	1.9	1.9	Z	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
17-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0
18-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
19-Dec	1.9	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.0
20-Dec	Z	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1
21-Dec	2.0	Z	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.1	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.3
22-Dec	2.3	2.6	Z	2.6	2.7	2.7	2.2	2.0	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.2	2.7
23-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	M	M	M	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
24-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
25-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.4	2.2	2.1	2.1	2.0	2.4
26-Dec	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1
27-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.1
28-Dec	2.1	2.1	Z	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
29-Dec	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2
30-Dec	2.2	2.1	2.0	2.0	Z	1.9	2.0	2.2	2.2	2.1	2.1	2.1	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.0	2.2
31-Dec	2.0	2.1	2.1	2.1	2.0	Z	2.1	2.1	2.1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.1
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm**  
**Athabasca Valley - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	514	72.80	72.80
2.1 - 3.0	192	27.20	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744





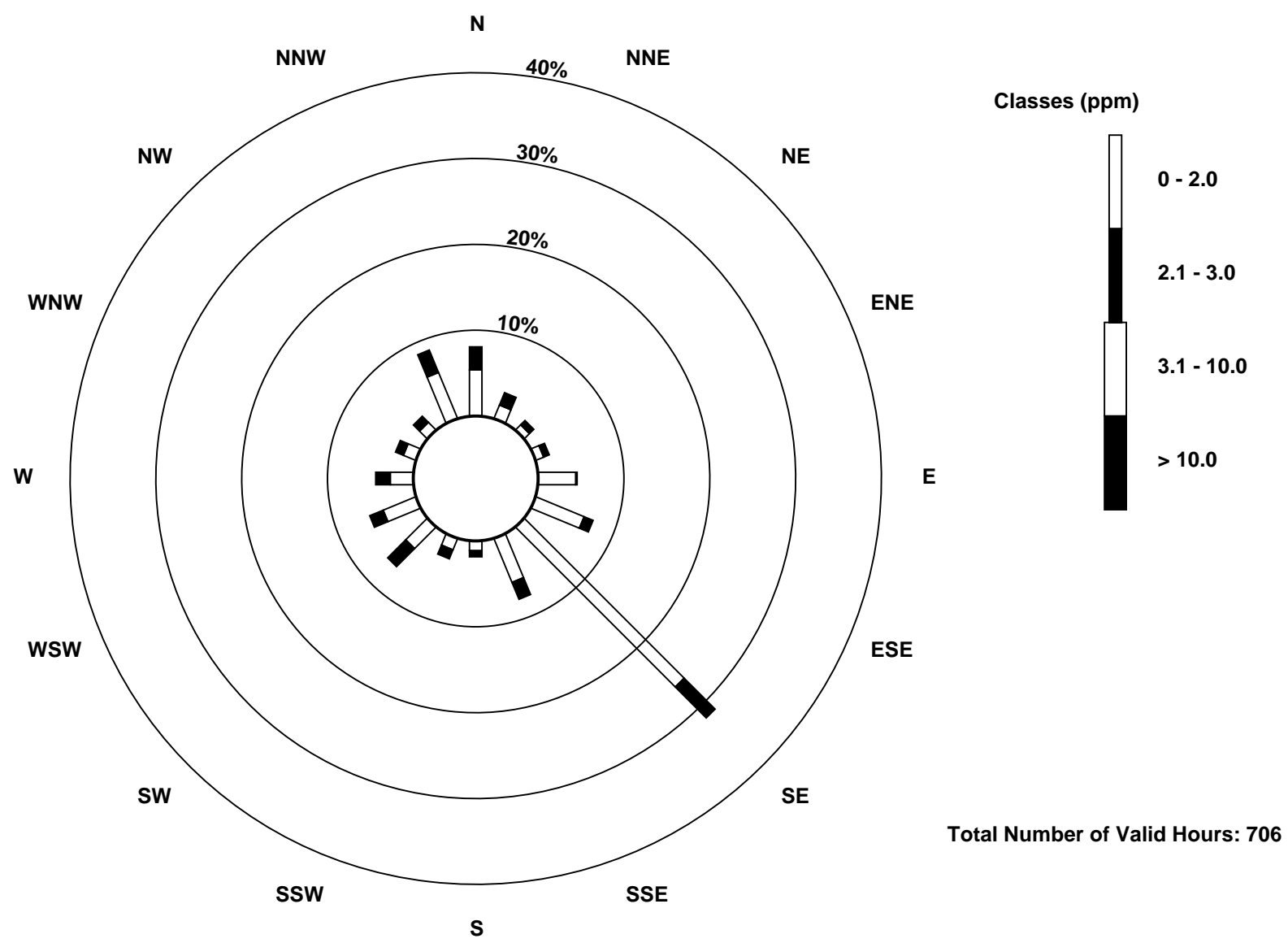
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

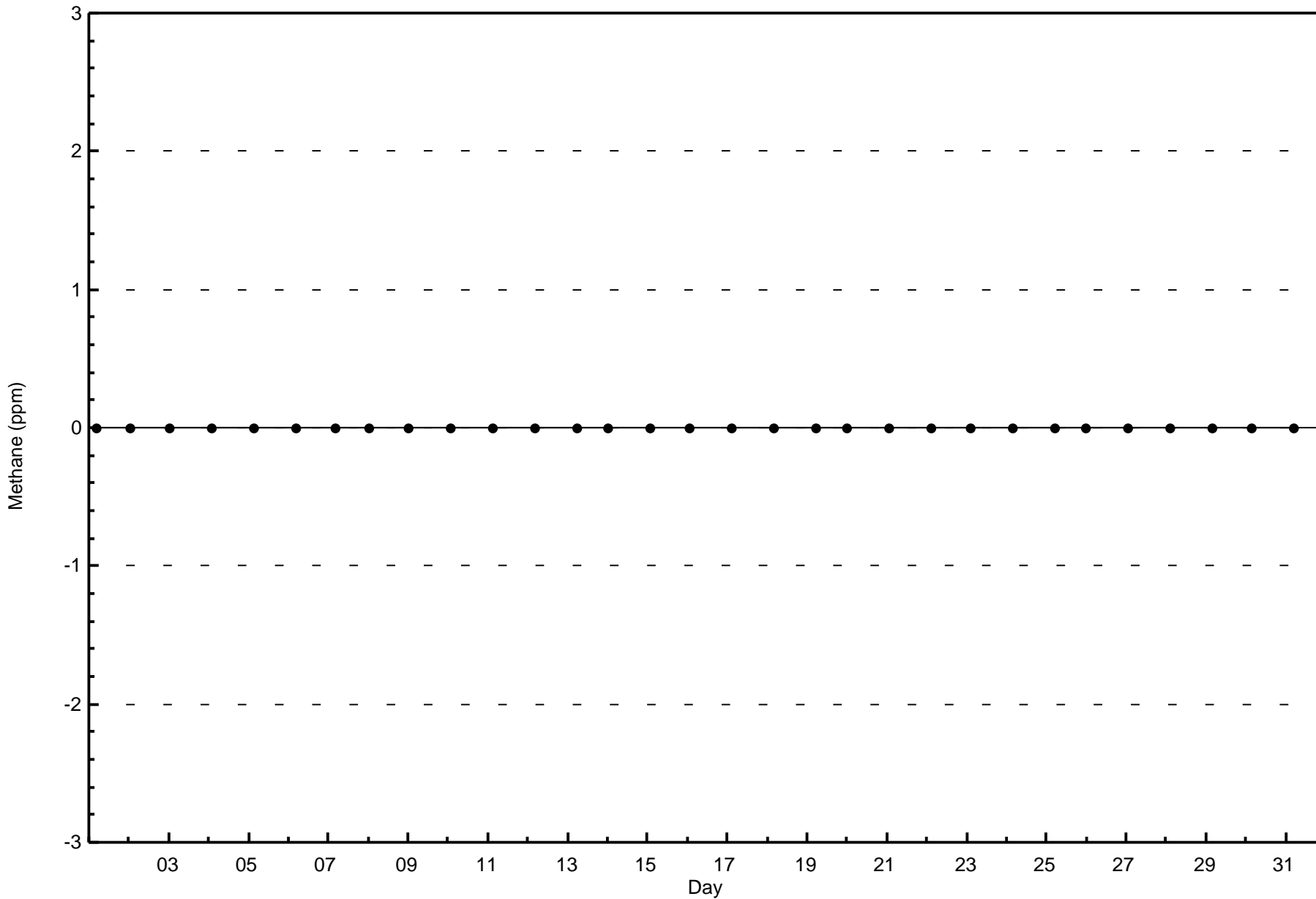
**Methane (CH<sub>4</sub>) - ppm**  
**Athabasca Valley - December 2015**

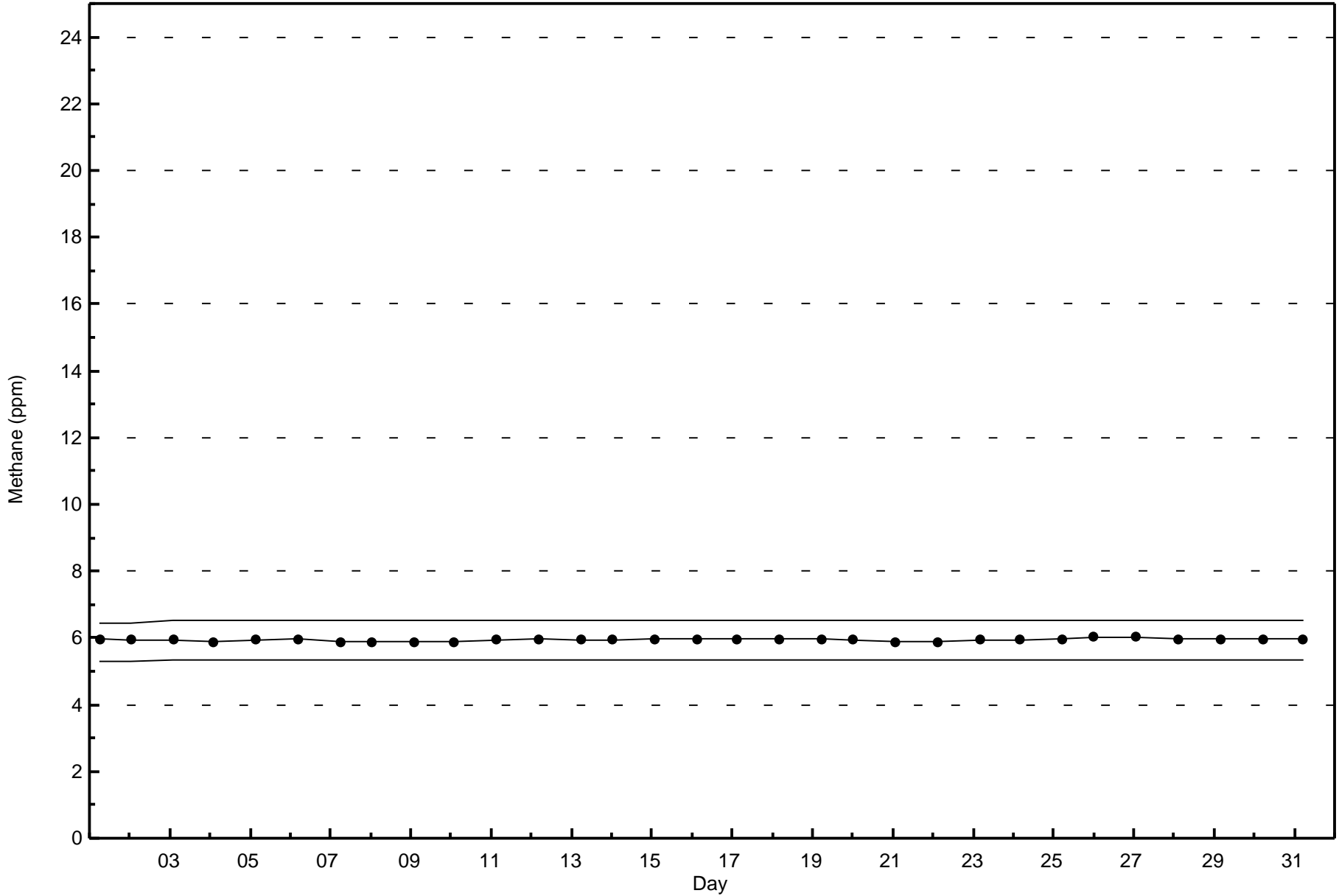
Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	38	12	6	7	31	43	186	39	8	10	25	29	19	11	9	41	514
2.1 - 3.0	19	11	5	5	1	8	36	15	5	8	21	12	12	7	7	20	192
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	57	23	11	12	32	51	222	54	13	18	46	41	31	18	16	61	706

Total Number of Valid Hours: 706

Total Number of Hours: 744









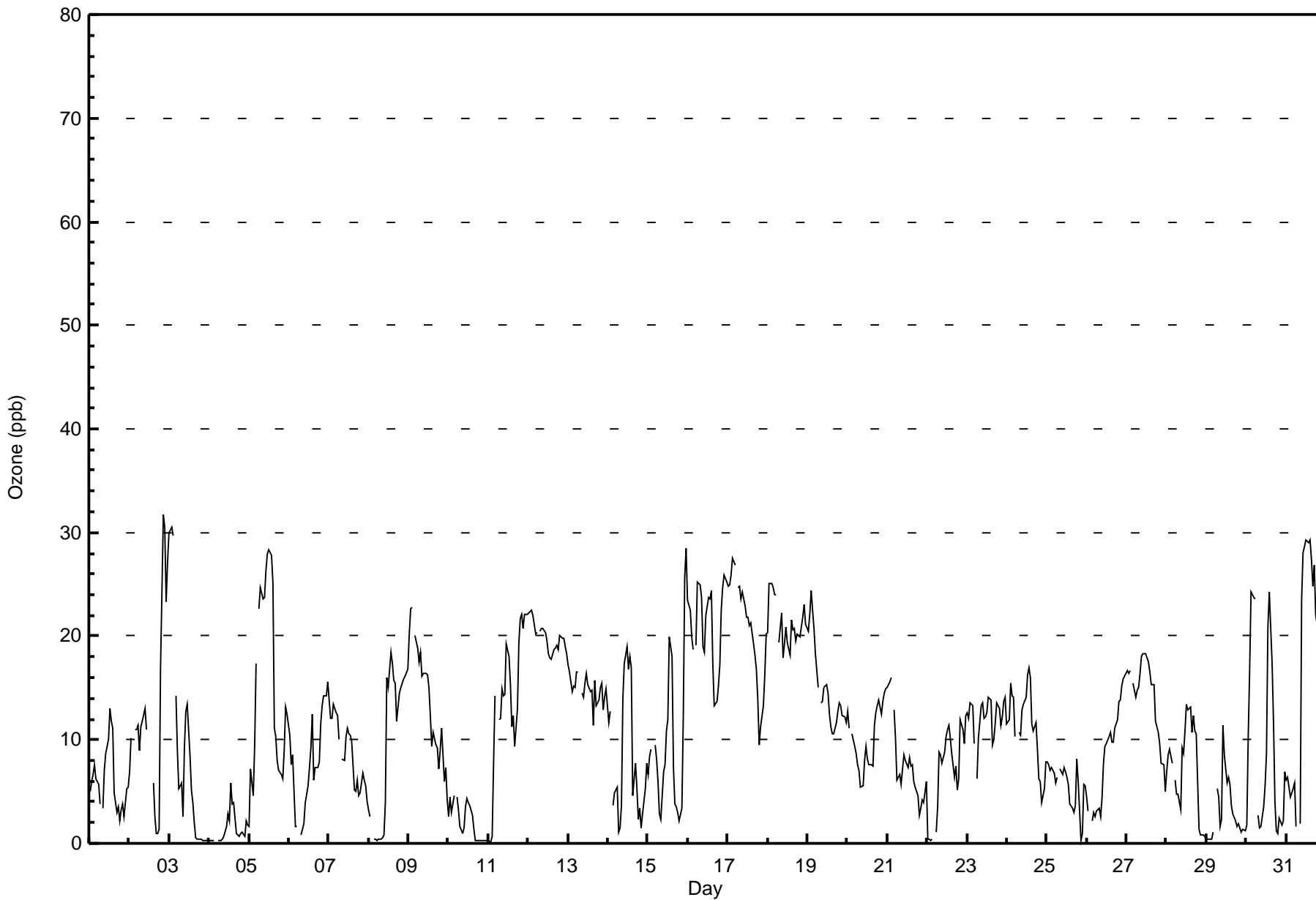
Summary of Hour Averages

Athabasca Valley - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 32 ppb on Dec 2 21:00	Maximum Daily Average: 21.3 ppb on Dec 18		Hours of Data:	710
Minimum Value: 0 ppb on Dec 11 02:00	Minimum Daily Average: 1.4 ppb on Dec 4		Hours of Missing Data:	34
Maximum Diurnal Average: 14.2 ppb at hour 14	Minimum Diurnal Average: 8.9 ppb at hour 7		Hours of Calibration:	34
Monthly Average: 11.0 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 5 Median = 11 Q <sub>3</sub> = 16 P <sub>90</sub> = 22 P <sub>99</sub> = 29		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	5	6	7	8	6	6	4	Z	3	7	9	10	13	12	11	5	3	4	2	3	4	3	5	5	6.1	13
2-Dec	7	10	Z	11	11	11	9	11	12	13	11	C	C	C	6	3	1	1	1	17	32	30	23	27	12.4	32
3-Dec	30	31	30	Z	14	9	5	6	3	9	13	13	8	5	4	2	0	0	0	0	0	0	0	0	8.0	31
4-Dec	0	0	0	0	Z	0	0	0	0	1	2	3	2	6	4	4	1	1	1	1	1	1	2	2	1.4	6
5-Dec	2	7	5	9	17	Z	23	25	24	24	26	28	28	28	25	11	10	8	7	7	6	9	13	13	15.4	28
6-Dec	11	8	9	5	2	2	Z	1	1	2	4	6	7	9	12	6	7	7	8	12	13	14	14	16	7.6	16
7-Dec	14	12	12	13	13	12	10	Z	8	8	10	11	11	10	10	5	5	6	5	5	7	6	6	4	8.8	14
8-Dec	3	3	Z	0	0	0	0	0	0	1	4	16	15	18	17	16	15	12	15	15	15	16	16	17	9.4	18
9-Dec	20	23	23	Z	20	19	17	18	16	16	16	16	15	12	9	11	9	9	7	9	11	6	7	4	13.8	23
10-Dec	3	4	3	5	Z	4	3	2	1	2	4	4	4	4	3	1	0	0	0	0	0	0	0	0	2.1	5
11-Dec	0	0	1	8	14	Z	12	12	15	14	14	19	18	15	11	12	9	13	19	22	22	21	22	22	13.8	22
12-Dec	22	22	23	22	20	20	Z	20	21	21	20	19	18	18	18	19	19	19	19	20	20	20	19	18	19.9	23
13-Dec	17	16	15	15	15	17	17	Z	15	14	15	16	15	15	15	11	16	13	14	15	15	13	14	15	14.9	17
14-Dec	12	13	Z	4	5	5	1	1	4	14	17	19	17	18	17	5	8	5	2	3	1	3	5	8	8.1	19
15-Dec	7	8	9	Z	10	8	6	3	2	7	8	11	12	20	18	7	4	4	3	2	3	12	26	28	9.5	28
16-Dec	24	23	20	19	Z	19	25	25	24	19	18	22	24	24	24	17	13	14	15	17	22	25	26	25	21.0	26
17-Dec	25	25	26	27	27	Z	25	25	24	24	23	22	22	21	21	19	18	17	14	10	11	13	16	20	20.7	27
18-Dec	20	25	25	25	24	24	Z	19	22	18	19	21	19	18	22	21	21	20	20	20	21	22	23	21	21.3	25
19-Dec	21	22	24	23	21	18	15	Z	14	14	15	15	15	12	11	11	11	12	13	14	13	12	12	12	15.1	24
20-Dec	13	11	Z	11	9	9	8	7	5	6	8	9	8	8	8	8	11	13	13	14	13	14	15	15	10.1	15
21-Dec	15	16	16	Z	13	10	6	7	6	7	9	8	7	8	7	8	6	5	5	3	3	4	4	6	7.8	16
22-Dec	0	0	0	0	Z	1	4	9	9	8	9	10	11	11	10	9	6	7	5	6	12	11	10	12	7.0	12
23-Dec	13	12	14	13	10	Z	6	10	13	14	12	12	13	14	14	9	10	12	14	13	11	12	14	14	12.1	14
24-Dec	12	12	15	14	14	10	Z	11	10	13	13	14	16	17	16	12	11	12	9	6	6	4	5	8	11.3	17
25-Dec	8	8	7	7	7	6	6	Z	7	7	7	7	6	6	4	3	3	4	8	6	0	1	6	6	5.6	8
26-Dec	4	3	Z	2	3	3	3	3	3	4	8	9	10	10	11	10	10	11	12	14	14	15	16	16	8.4	16
27-Dec	17	16	17	Z	15	14	15	15	16	18	18	18	18	18	17	15	15	12	11	11	10	8	8	5	14.2	18
28-Dec	7	9	9	8	Z	6	5	5	3	9	9	11	13	13	13	11	12	11	11	1	1	1	1	1	7.3	13
29-Dec	0	0	0	0	1	Z	5	4	2	2	11	9	6	6	6	4	3	2	2	2	1	1	1	1	3.1	11
30-Dec	2	10	17	24	24	24	Z	3	2	2	4	6	9	21	24	17	12	4	1	1	2	2	7	9.5	24	
31-Dec	6	6	4	5	5	6	2	Z	2	24	28	29	29	29	29	27	25	27	22	20	20	17	15	5	16.6	29
	10.9	11.7	12.7	10.7	12.3	10.2	8.9	9.7	9.2	11.0	12.4	13.8	13.7	14.2	13.5	10.3	9.5	9.1	9.0	9.3	10.1	10.2	11.2	11.4		Diurnal Average
	30	31	30	27	27	24	25	25	24	24	28	29	29	29	29	27	25	27	22	22	32	30	26	28		Diurnal Maximum

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Athabasca Valley - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	618	87.04	87.04
21 - 50	92	12.96	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Athabasca Valley - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	55	24	9	11	21	49	208	52	13	15	38	25	16	11	11	60	618
21 - 50	5	0	1	1	11	5	14	0	0	1	8	16	16	7	4	3	92
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	60	24	10	12	32	54	222	52	13	16	46	41	32	18	15	63	710

Total Number of Valid Hours: 710

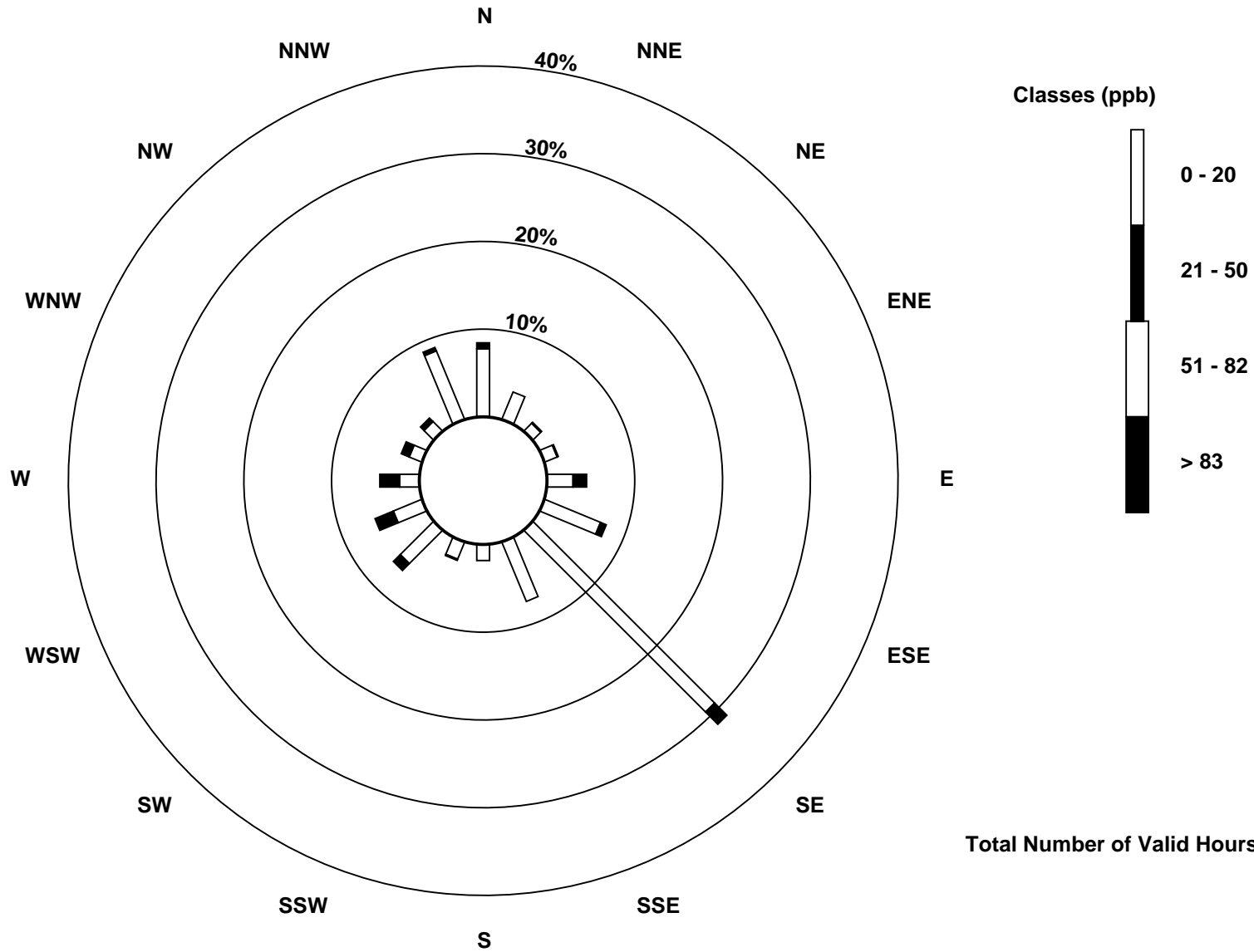
Total Number of Hours: 744

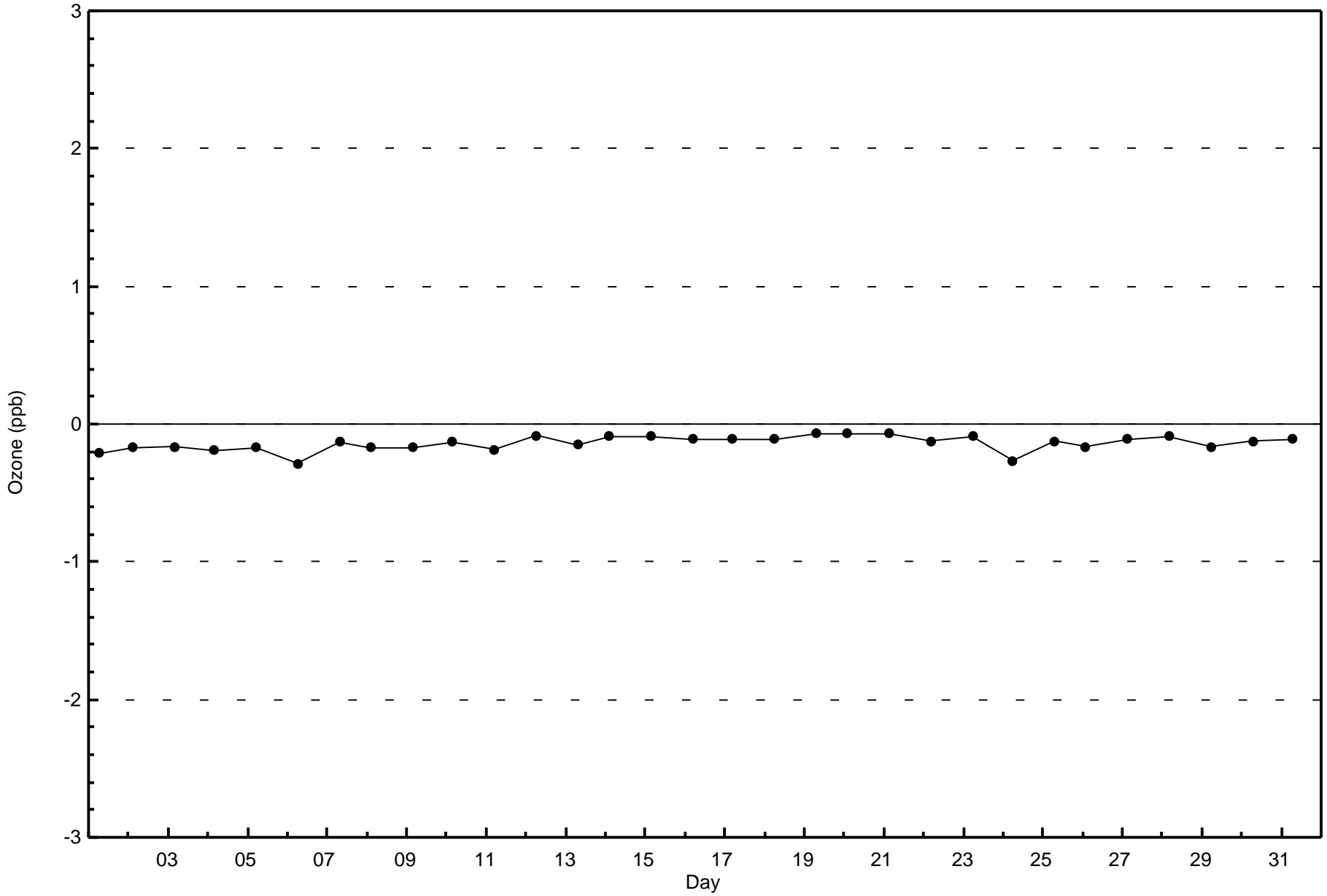


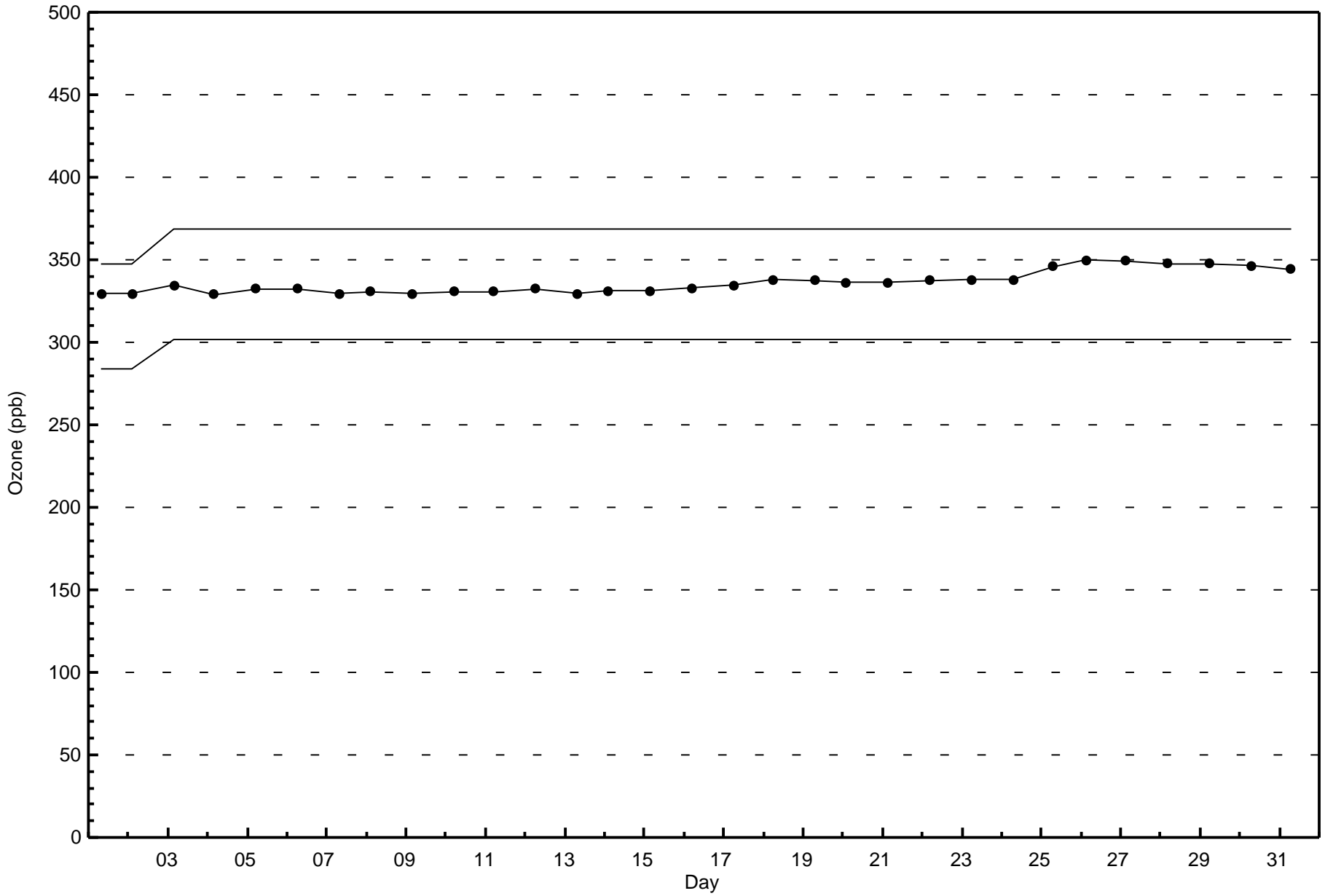


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Ozone (O<sub>3</sub>) - ppb  
Athabasca Valley (AMS 7)

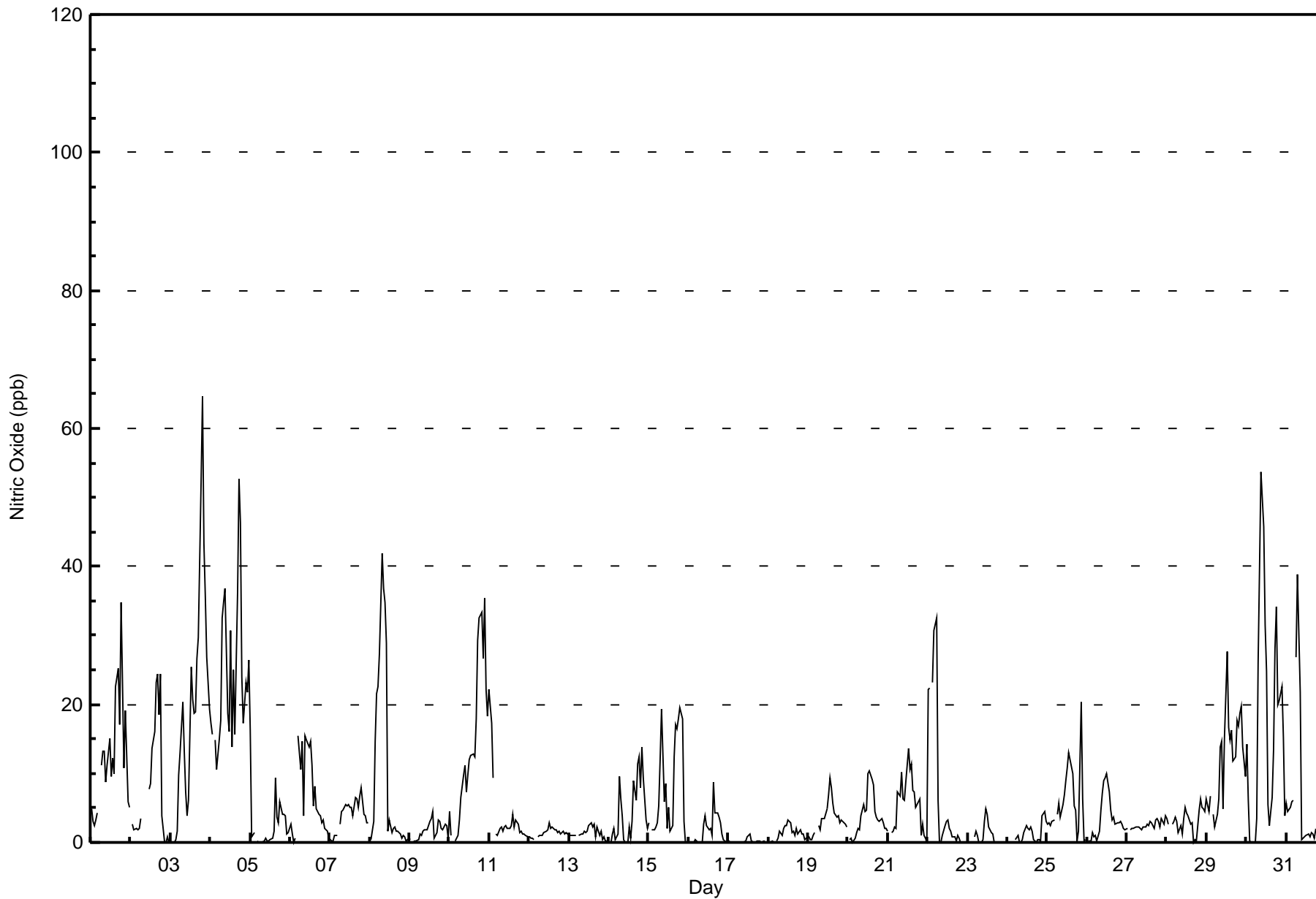








Maximum Value: 65 ppb on Dec 3 20:00														Maximum Daily Average: 24.5 ppb on Dec 4														Hours in Service: 744	
Minimum Value: 0 ppb on Dec 5 06:00														Minimum Daily Average: 0.2 ppb on Dec 17														Hours of Data: 709	
Maximum Diurnal Average: 10.5 ppb at hour 19														Minimum Diurnal Average: 1.6 ppb at hour 3														Hours of Missing Data: 35	
Monthly Average: 6.4 ppb														Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 3 O <sub>3</sub> = 8 P <sub>90</sub> = 19 P <sub>99</sub> = 42														Hours of Calibration: 35	
																												Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	5	3	3	3	4	Z	11	13	13	9	11	15	10	12	10	22	25	17	35	23	11	19	6	5	12.4	35			
2-Dec	Z	3	2	2	2	2	4	C	C	C	C	8	8	14	16	23	24	19	24	4	0	0	1	0	8.1	24			
3-Dec	0	Z	0	0	2	10	13	20	13	7	4	6	25	21	19	19	27	30	52	65	43	36	27	19	19.9	65			
4-Dec	17	16	Z	15	11	15	18	33	35	37	19	16	31	14	25	16	36	53	46	24	17	23	22	27	24.5	53			
5-Dec	16	1	1	Z	0	0	0	0	0	1	0	0	0	1	2	9	4	3	6	4	4	4	1	2	2.6	16			
6-Dec	3	1	0	1	Z	15	11	15	4	15	15	14	15	11	5	8	5	4	4	3	3	2	2	1	6.8	15			
7-Dec	0	0	0	1	1	Z	3	4	5	5	5	6	5	5	4	7	6	5	7	8	4	4	3	3	4.0	8			
8-Dec	Z	0	3	15	22	23	27	42	37	35	29	2	3	1	2	2	2	2	1	1	1	1	0	1	10.9	42			
9-Dec	0	Z	0	0	0	1	1	1	2	2	2	3	3	4	5	1	1	3	3	2	2	3	2	1	1.8	5			
10-Dec	4	1	Z	0	1	1	3	7	10	11	7	10	12	13	13	12	18	29	32	33	27	35	22	18	13.9	35			
11-Dec	22	17	9	Z	1	1	2	2	2	2	2	2	2	2	4	2	3	3	1	2	1	1	1	1	3.8	22			
12-Dec	1	1	1	0	Z	1	1	1	1	2	2	2	3	2	2	2	2	1	2	1	2	1	1	1	1.4	3			
13-Dec	1	1	1	1	1	Z	1	1	1	2	1	2	2	3	2	3	1	2	1	2	0	1	0	0	1.3	3			
14-Dec	Z	0	1	2	0	1	10	6	4	0	0	0	2	1	3	9	6	11	12	8	14	9	3	2	4.6	14			
15-Dec	3	Z	2	2	2	3	5	12	19	6	8	2	5	2	2	12	17	17	18	20	18	3	0	0	7.7	20			
16-Dec	0	0	Z	0	0	0	0	0	0	3	4	2	2	2	1	9	4	4	4	3	1	0	0	0	1.7	9			
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1			
18-Dec	0	0	0	0	Z	0	1	2	1	2	2	2	3	3	1	2	1	2	1	2	1	1	0	1	1.3	3			
19-Dec	1	0	0	1	1	Z	2	2	3	4	3	5	7	9	8	6	4	4	4	3	3	3	3	2	3.5	9			
20-Dec	Z	0	1	0	1	1	2	2	4	5	5	5	10	10	9	8	5	4	3	3	4	3	2	2	3.8	10			
21-Dec	2	Z	1	2	2	2	7	7	10	6	6	9	14	11	11	8	7	5	6	6	1	3	1	0	5.5	14			
22-Dec	22	22	Z	23	31	33	6	0	0	1	2	3	3	2	2	1	1	0	1	1	0	0	0	0	6.7	33			
23-Dec	0	0	0	Z	1	2	1	0	0	0	3	5	4	2	1	1	0	0	0	0	0	0	0	0	0.9	5			
24-Dec	0	0	0	0	Z	0	1	0	0	0	1	2	2	2	2	2	0	0	0	0	0	4	5	3	1.1	5			
25-Dec	3	3	2	3	3	Z	4	6	4	5	7	9	11	13	12	10	5	5	0	2	20	6	0	0	5.8	20			
26-Dec	Z	0	0	1	1	1	0	2	5	7	9	9	10	7	5	3	4	3	3	3	3	3	2	2	3.6	10			
27-Dec	2	Z	2	2	2	2	2	2	2	2	2	2	3	3	3	3	2	3	3	3	2	4	3	4	2.5	4			
28-Dec	4	3	Z	3	3	4	3	1	2	1	4	5	4	4	3	3	0	0	0	5	6	5	5	5	3.1	6			
29-Dec	6	4	7	Z	4	2	4	6	14	15	5	15	28	17	15	16	12	12	18	17	19	20	14	9	12.1	28			
30-Dec	14	6	0	0	Z	0	3	26	40	54	46	31	25	6	2	6	14	28	34	20	21	23	15	4	18.2	54			
31-Dec	6	4	5	6	6	Z	27	39	22	0	1	1	1	1	1	1	1	1	1	2	1	4	2	2	10	6.2	39		
5.1														3.4														Diurnal Average	
22														9														Diurnal Maximum	
Z - zerospan														C - Calibration															





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Athabasca Valley - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	648	91.40	91.40
21 - 40	53	7.48	98.87
41 - 80	8	1.13	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



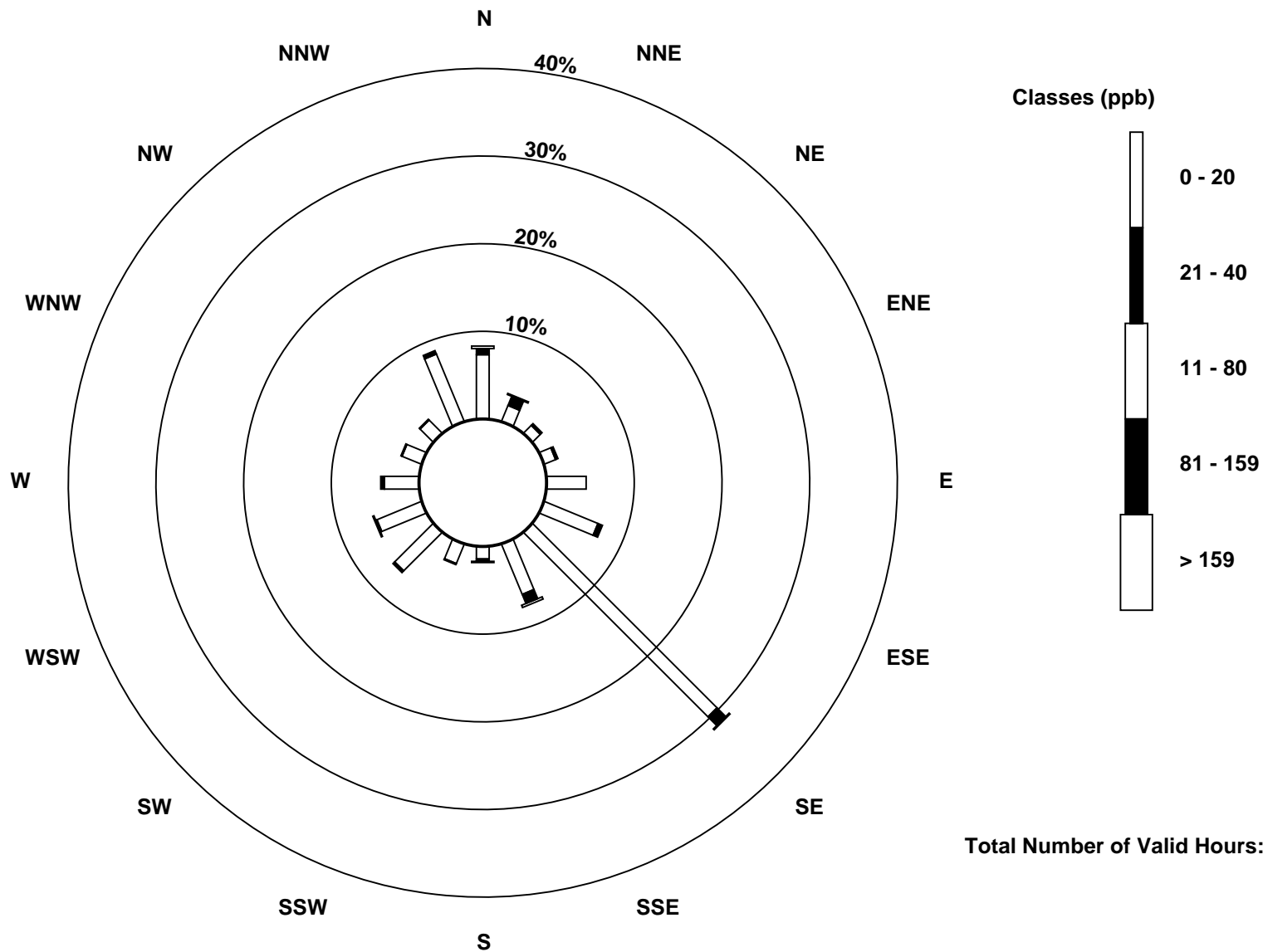
**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Athabasca Valley - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	52	14	9	10	32	47	211	44	10	17	44	39	28	17	15	59	648
21 - 40	5	8	2	2	0	4	10	8	2	1	2	1	3	1	1	3	53
11 - 80	2	1	0	0	0	0	1	2	1	0	0	1	0	0	0	0	8
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	59	23	11	12	32	51	222	54	13	18	46	41	31	18	16	62	709

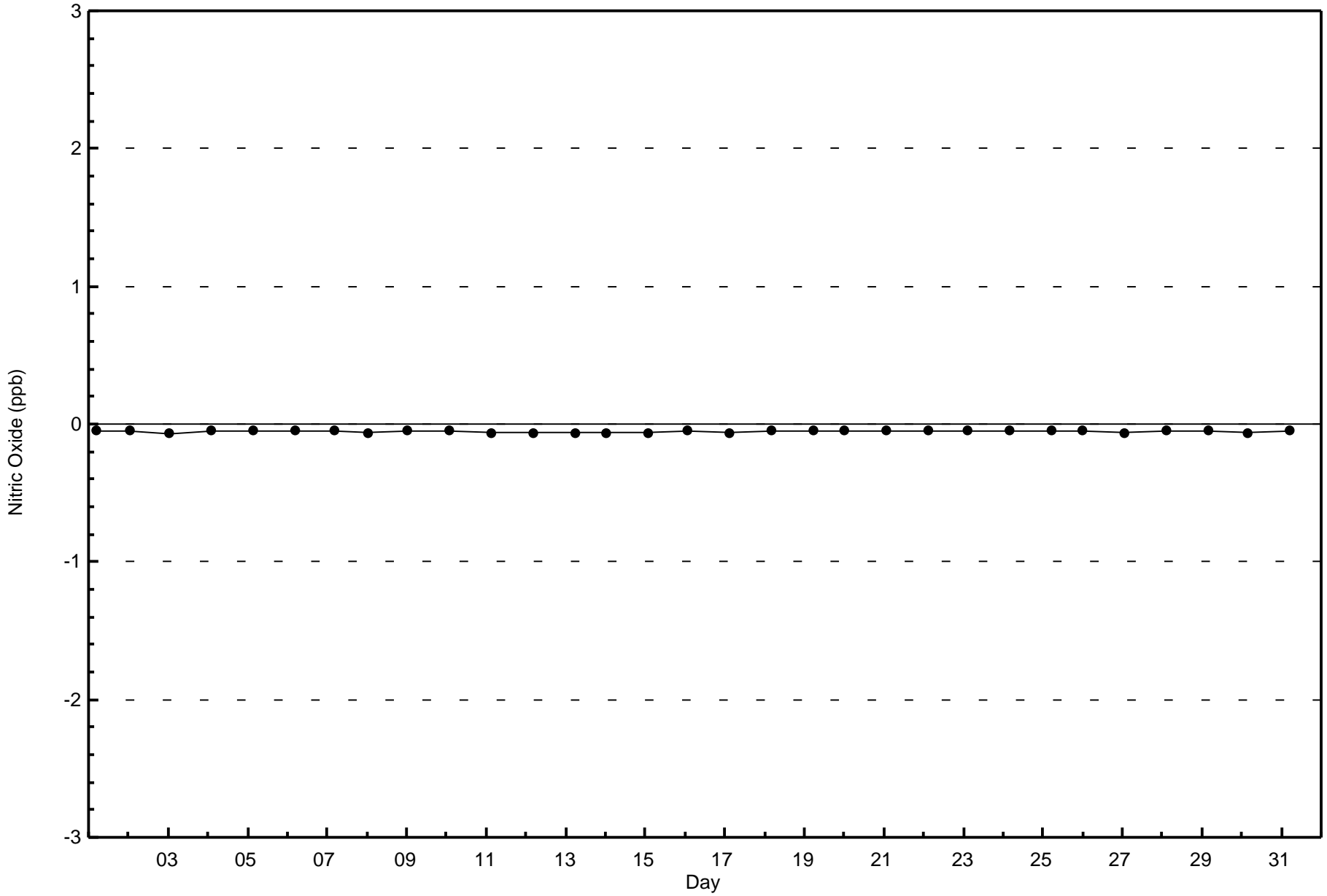
Total Number of Valid Hours: 709

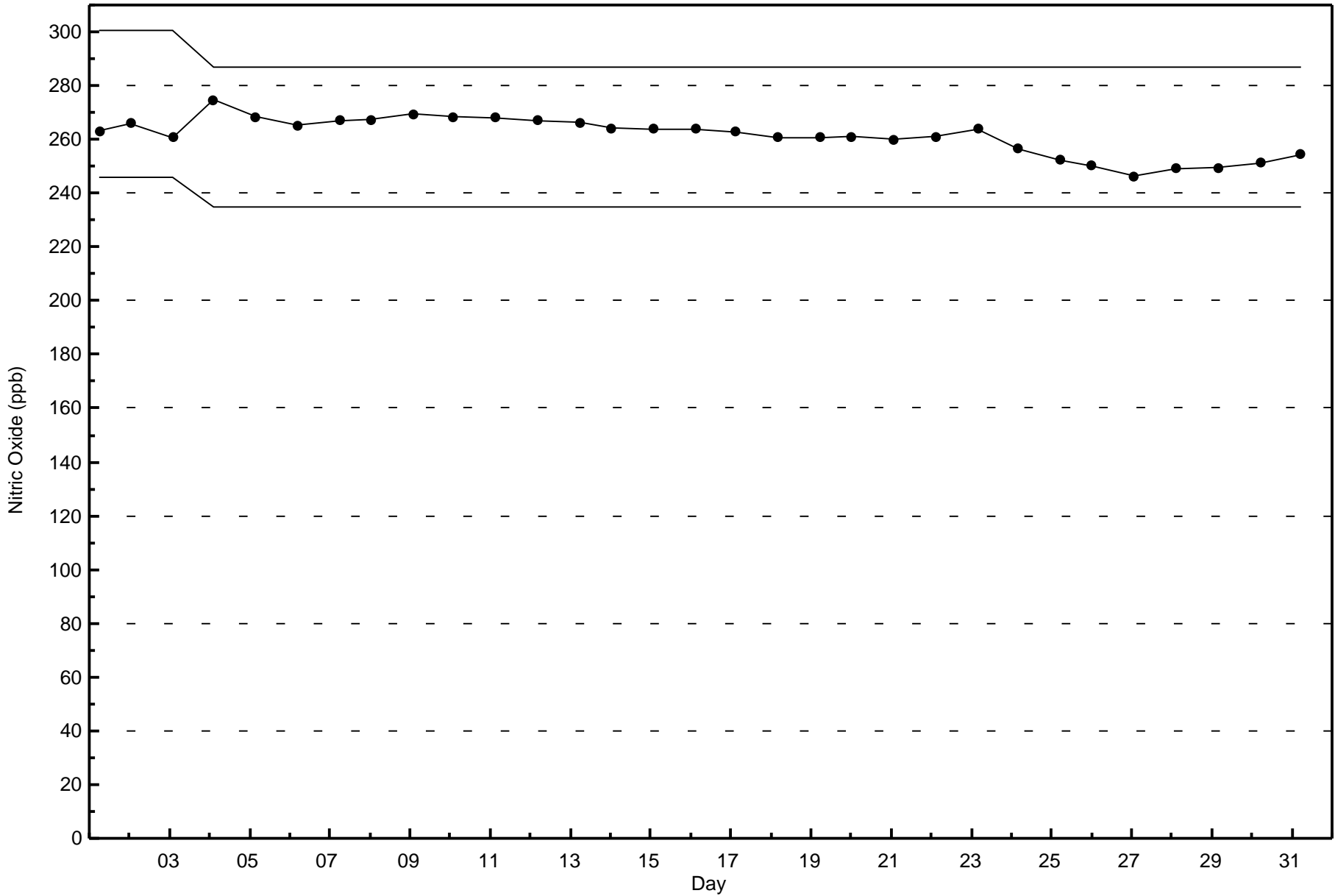
Total Number of Hours: 744



Total Number of Valid Hours: 709









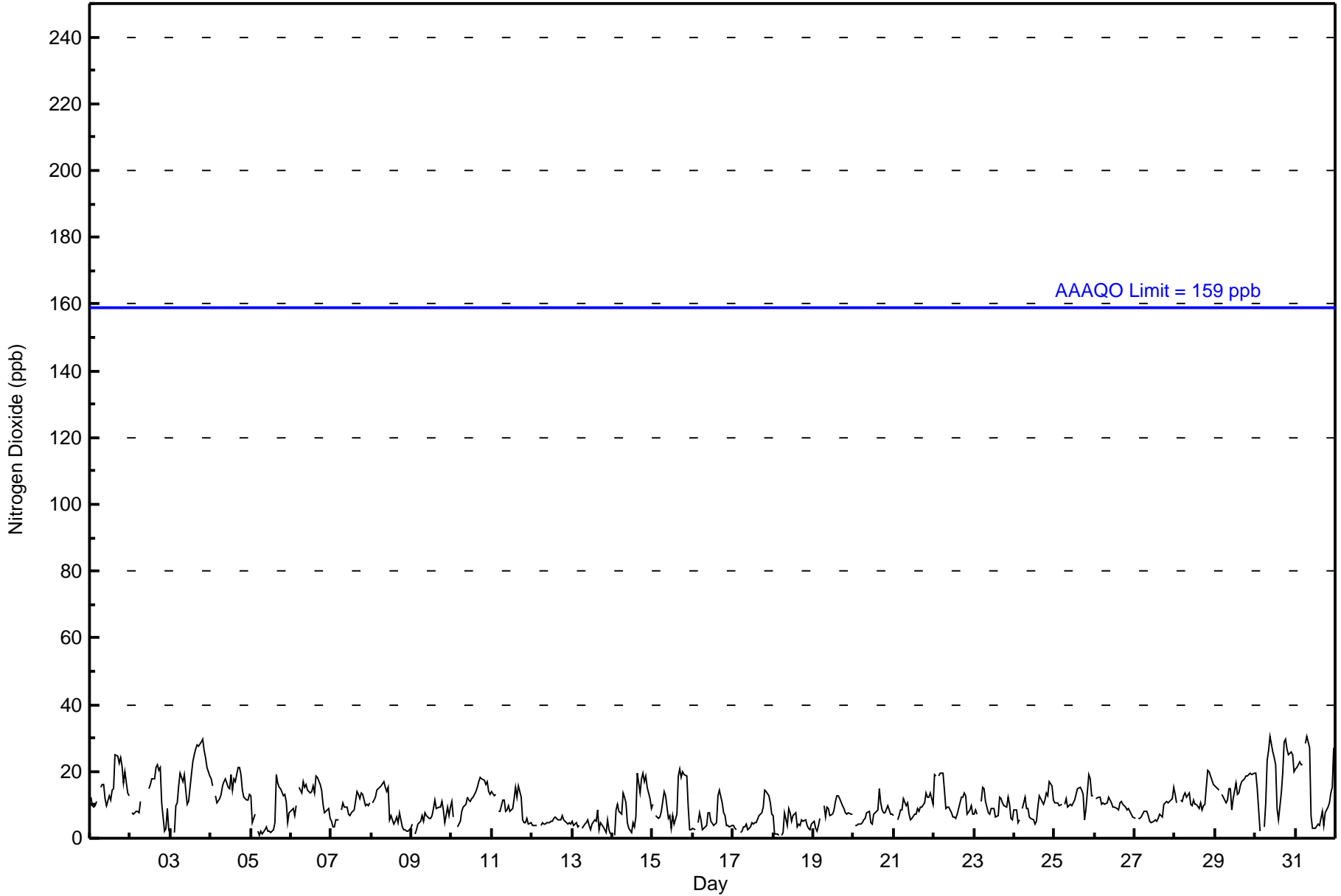
Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb

Athabasca Valley - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 31 ppb on Dec 31 08:00										Maximum Daily Average: 19.1 ppb on Dec 30										Hours of Data: 709						
Minimum Value: 1 ppb on Dec 18 06:00										Minimum Daily Average: 4.0 ppb on Dec 13										Hours of Missing Data: 35						
Maximum Diurnal Average: 13.2 ppb at hour 17										Minimum Diurnal Average: 7.2 ppb at hour 3										Hours of Calibration: 35						
Monthly Average: 10.2 ppb										Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 4 Q <sub>1</sub> = 6 Median = 9 Q <sub>3</sub> = 14 P <sub>90</sub> = 19 P <sub>99</sub> = 28										Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	12	10	10	10	11	Z	15	16	16	12	10	13	12	14	15	25	25	22	24	22	17	20	14	13	15.5	25
2-Dec	Z	8	7	8	8	8	11	C	C	C	C	15	16	18	18	21	22	20	21	11	2	3	9	3	12.0	22
3-Dec	1	Z	2	10	11	16	20	17	19	15	10	11	19	23	25	27	28	28	29	30	26	24	21	19	18.6	30
4-Dec	18	16	Z	13	11	12	13	16	17	18	15	15	19	14	18	17	21	21	19	15	12	12	11	13	15.4	21
5-Dec	13	5	7	Z	2	1	2	1	3	3	2	2	2	3	5	19	17	15	15	13	13	11	5	8	7.2	19
6-Dec	8	9	7	10	Z	15	14	17	15	16	14	14	14	16	14	19	18	16	14	10	8	8	9	6	12.6	19
7-Dec	5	3	3	5	6	Z	9	10	9	9	7	7	8	8	8	14	13	12	14	13	10	10	10	11	8.9	14
8-Dec	Z	11	12	14	15	15	16	17	15	14	15	6	7	4	5	6	5	8	3	3	3	2	2	3	8.7	17
9-Dec	4	Z	1	3	4	5	7	5	8	7	6	6	7	9	11	9	10	9	11	9	5	9	7	9	7.0	11
10-Dec	11	7	Z	3	4	5	8	9	10	12	12	11	12	12	14	15	17	18	18	17	16	17	14	13	12.0	18
11-Dec	14	13	13	Z	8	8	11	12	8	8	10	8	9	12	15	12	16	12	5	5	5	6	4	5	9.5	16
12-Dec	4	4	4	4	Z	4	5	4	4	5	5	5	5	6	6	5	6	5	7	6	5	4	5	4	4.8	7
13-Dec	5	4	5	3	4	Z	3	4	5	5	4	3	4	5	5	9	3	5	4	3	2	5	3	1	4.0	9
14-Dec	Z	1	9	10	8	7	14	12	11	5	3	2	5	4	6	19	14	18	20	17	19	15	12	9	10.3	20
15-Dec	10	Z	7	6	6	8	11	14	13	6	7	3	7	4	7	19	21	18	20	19	19	9	2	2	10.3	21
16-Dec	3	3	Z	5	8	5	3	4	4	8	8	5	4	4	5	13	14	10	8	7	4	4	3	4	5.7	14
17-Dec	4	3	2	Z	2	2	3	3	4	3	4	5	4	5	5	7	7	8	10	15	14	13	11	7	6.0	15
18-Dec	7	1	1	1	Z	1	2	8	4	9	8	5	7	8	4	4	4	6	5	5	4	3	2	4	4.4	9
19-Dec	5	3	2	4	6	Z	10	6	9	9	7	7	9	11	13	13	12	10	9	8	7	8	7	7	7.9	13
20-Dec	Z	4	4	4	4	5	5	6	8	8	5	4	7	8	8	15	11	8	8	8	10	8	7	7	7.0	15
21-Dec	7	Z	6	7	9	8	12	10	11	7	6	6	7	7	9	8	9	9	11	14	12	12	14	10	9.1	14
22-Dec	19	19	Z	19	20	19	15	9	9	10	8	7	6	6	7	9	12	12	13	13	7	9	10	7	11.5	20
23-Dec	7	8	7	Z	11	15	15	11	8	7	9	9	9	6	7	12	12	11	10	9	12	10	6	5	9.4	15
24-Dec	8	9	5	5	Z	9	12	9	9	6	6	5	4	5	9	13	12	10	12	14	13	17	16	12	9.5	17
25-Dec	11	10	10	10	10	Z	10	12	9	10	10	11	12	13	15	15	14	13	6	9	19	18	13	13	11.8	19
26-Dec	Z	12	12	12	10	11	10	10	12	12	10	10	9	9	9	10	11	10	9	8	9	8	7	7	9.9	12
27-Dec	6	Z	6	6	6	8	8	8	7	5	5	5	5	5	6	7	6	10	11	11	11	11	12	15	7.8	15
28-Dec	13	11	Z	11	11	13	14	12	14	10	10	11	10	10	9	11	8	10	10	21	20	19	17	16	12.6	21
29-Dec	16	15	14	Z	13	12	10	12	15	15	9	12	17	13	13	16	17	18	19	19	19	20	19	19	15.2	20
30-Dec	20	15	9	2	Z	3	10	23	26	30	26	24	22	9	6	14	20	29	30	27	25	26	25	20	19.1	30
31-Dec	21	21	23	22	22	Z	29	31	27	7	3	3	3	4	4	6	8	4	8	10	10	14	15	27	13.9	31
9.6 8.5 7.2 8.0 8.8 8.6 10.5 11.0 10.9 9.7 8.3 7.9 9.0 8.9 9.7 13.2 13.2 13.1 12.9 12.4 11.4 11.4 10.0 9.7																								Diurnal Average		
21 21 23 22 22 19 29 31 27 30 26 24 22 23 25 27 28 29 30 30 26 26 25 27																								Diurnal Maximum		
Z - zerospan C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																										





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Athabasca Valley - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	666	93.94	93.94
21 - 40	43	6.06	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Athabasca Valley - December 2015**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	57	18	10	12	30	51	205	42	11	17	46	41	30	18	16	62	666
21 - 40	2	5	1	0	2	0	17	12	2	1	0	0	1	0	0	0	43
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	59	23	11	12	32	51	222	54	13	18	46	41	31	18	16	62	709

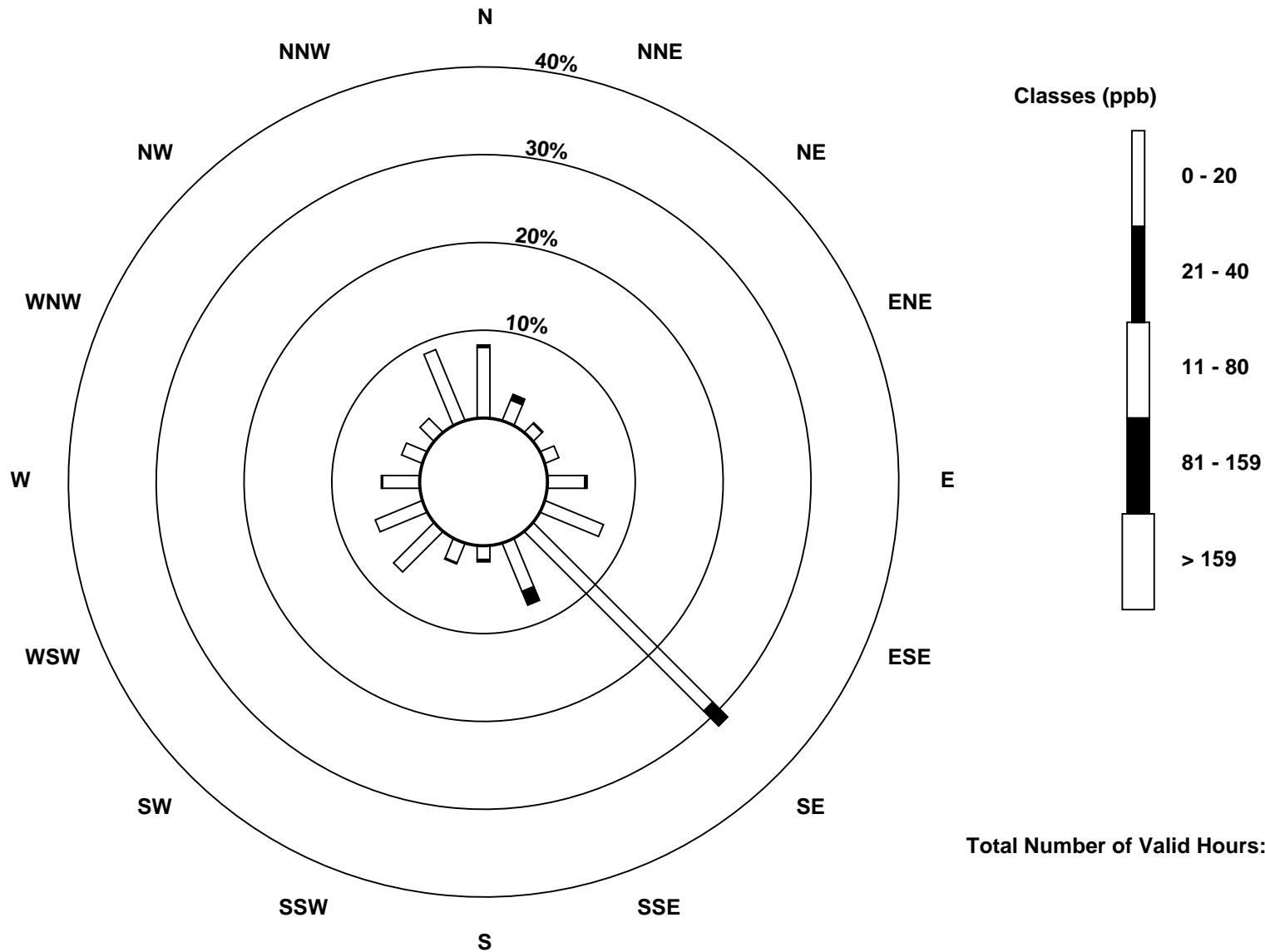
Total Number of Valid Hours: 709

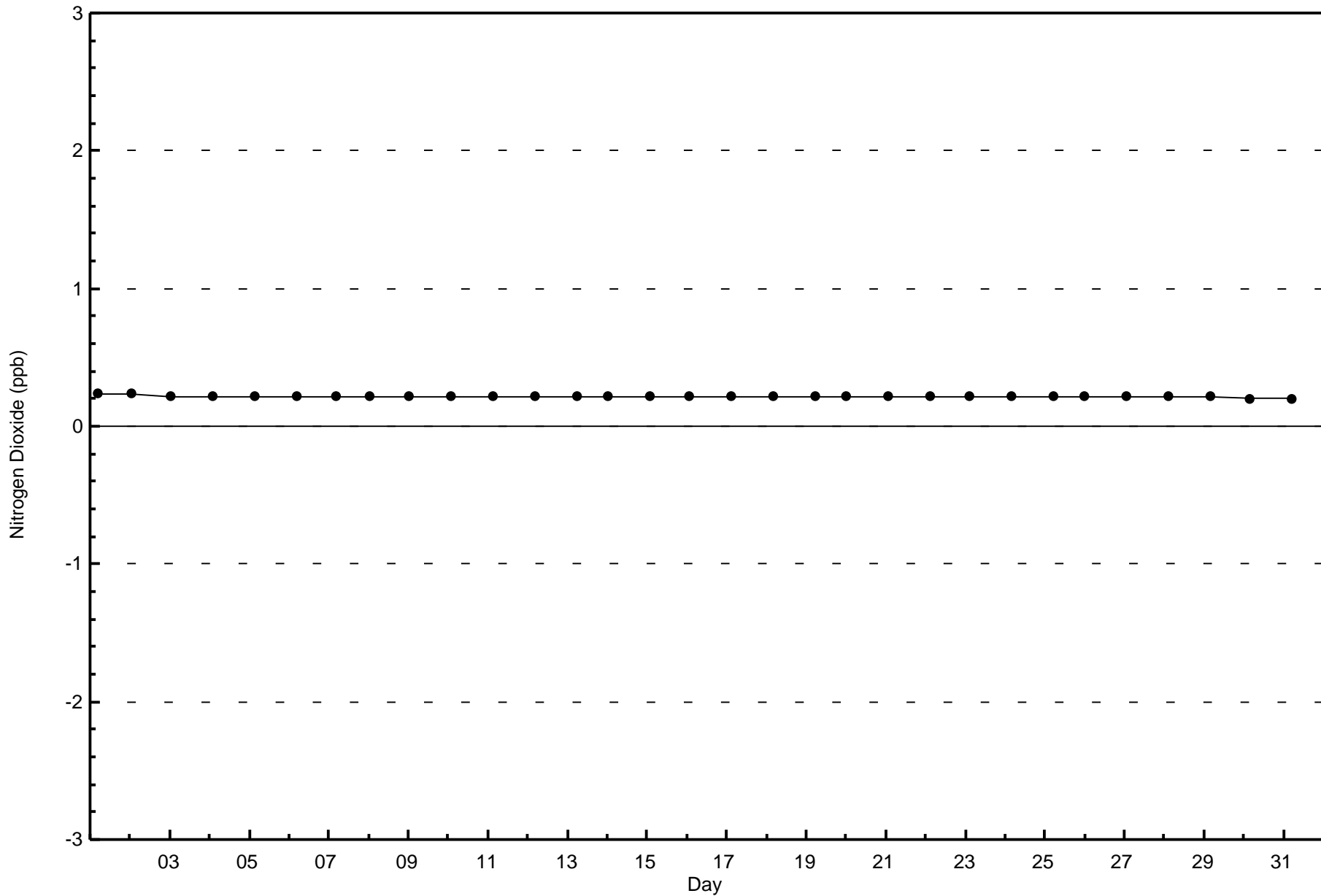
Total Number of Hours: 744



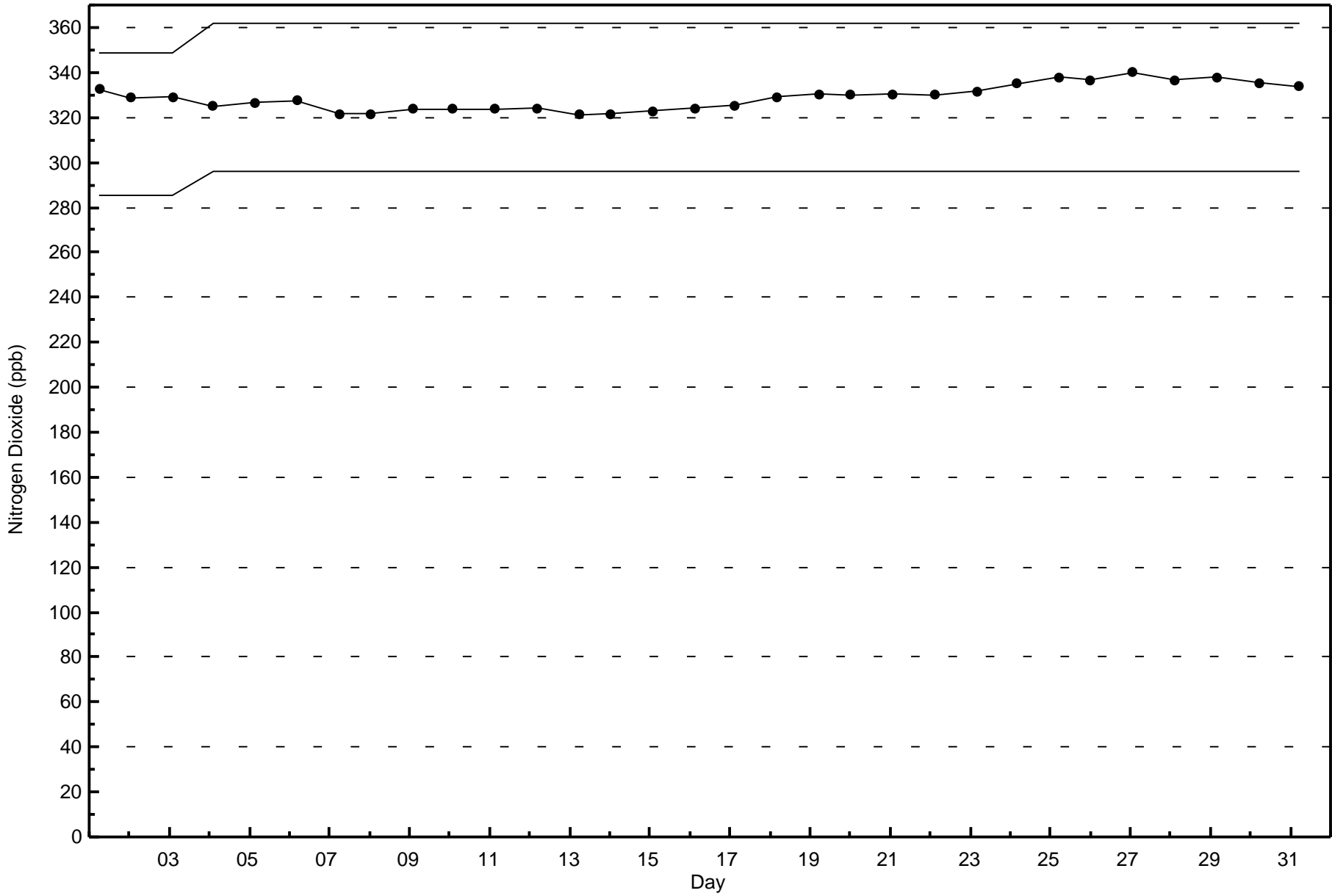
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Athabasca Valley (AMS 7)



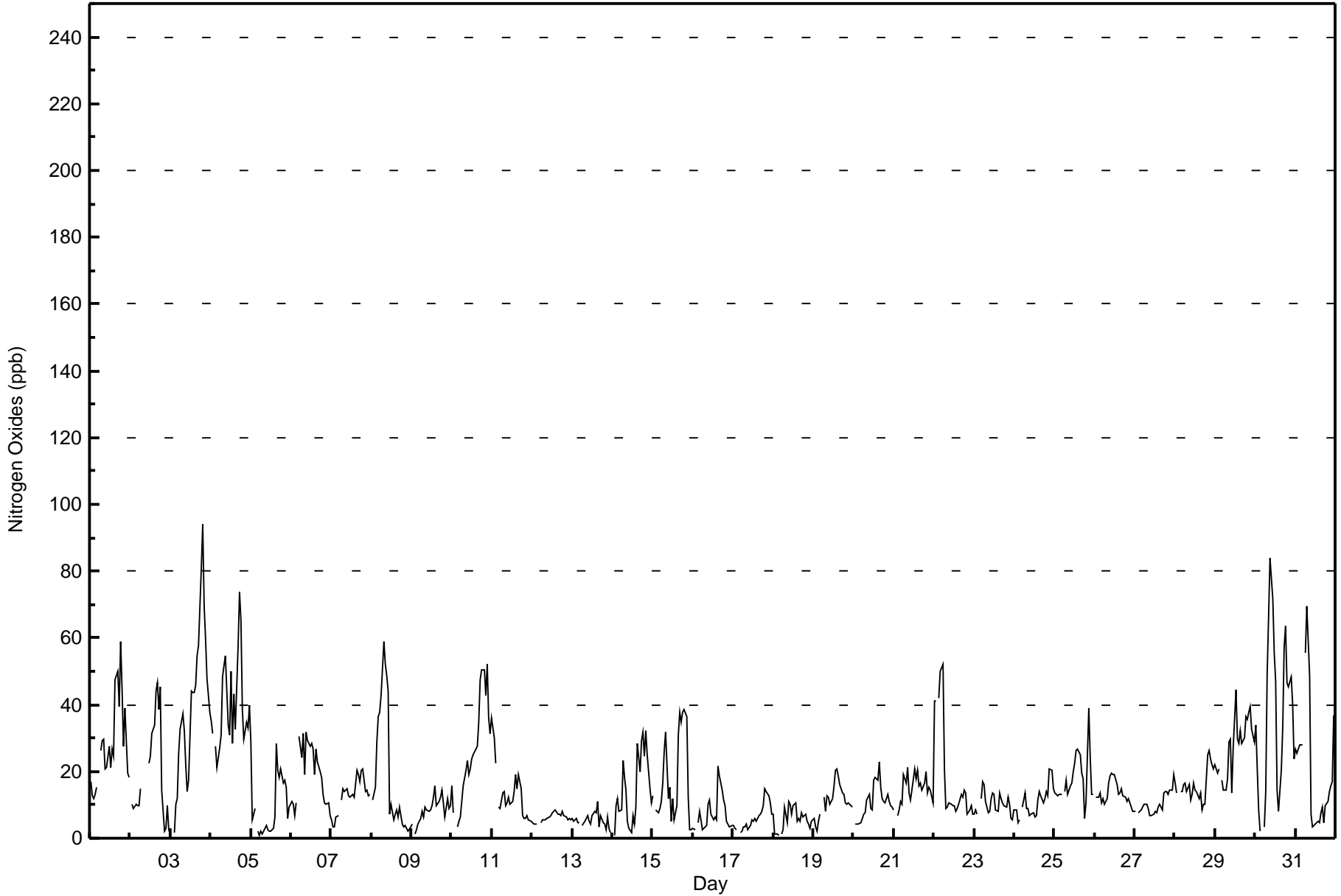








Maximum Value: 94 ppb on Dec 3 20:00																	Maximum Daily Average: 39.9 ppb on Dec 4																	Hours in Service: 744	
Minimum Value: 1 ppb on Dec 5 06:00																	Minimum Daily Average: 5.4 ppb on Dec 13																	Hours of Data: 709	
Maximum Diurnal Average: 23.4 ppb at hour 19																	Minimum Diurnal Average: 8.8 ppb at hour 3																	Hours of Missing Data: 35	
Monthly Average: 16.7 ppb																	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 4 Q <sub>1</sub> = 7 Median = 12 Q <sub>3</sub> = 21 P <sub>90</sub> = 37 P <sub>99</sub> = 69																	Hours of Calibration: 35	
																																		Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	17	13	12	13	15	Z	26	29	30	21	21	28	21	27	25	47	50	40	59	45	27	39	20	18	27.9	59									
2-Dec	Z	10	9	10	10	10	15	C	C	C	C	22	25	31	34	44	47	39	46	15	2	3	10	3	20.1	47									
3-Dec	1	Z	2	10	12	25	33	37	32	22	14	17	44	44	43	46	55	58	81	94	70	60	48	38	38.5	94									
4-Dec	35	31	Z	28	21	27	31	48	52	55	34	31	50	28	43	33	58	74	65	38	30	35	33	40	39.9	74									
5-Dec	29	6	9	Z	2	1	2	1	3	4	2	2	2	3	6	28	20	18	21	17	17	15	6	9	9.8	29									
6-Dec	11	10	7	10	Z	31	24	32	19	32	29	27	28	27	19	27	23	20	18	13	11	10	11	7	19.3	32									
7-Dec	5	4	3	6	7	Z	11	15	14	15	13	12	13	13	12	21	19	17	20	21	14	14	13	13	12.8	21									
8-Dec	Z	11	15	29	36	38	43	59	52	49	44	7	10	5	7	9	6	9	4	3	4	3	2	4	19.6	59									
9-Dec	4	Z	1	3	4	6	8	6	9	8	8	8	10	12	16	10	11	12	14	11	6	12	9	10	8.7	16									
10-Dec	16	8	Z	3	5	6	11	16	20	23	19	21	24	25	27	28	35	48	50	51	43	52	36	31	26.0	52									
11-Dec	36	30	23	Z	9	9	13	14	10	11	12	10	11	14	19	15	19	15	7	6	6	7	5	5	13.3	36									
12-Dec	5	4	4	4	Z	5	6	5	6	6	6	7	8	8	8	7	7	7	8	7	6	6	6	6	6.1	8									
13-Dec	6	5	6	4	5	Z	4	5	6	7	5	4	7	8	7	11	3	7	5	4	2	6	3	2	5.4	11									
14-Dec	Z	1	10	12	8	9	23	18	14	5	3	2	7	4	9	28	20	29	32	25	32	25	15	11	14.9	32									
15-Dec	13	Z	8	8	9	11	16	26	32	12	15	5	12	6	10	31	38	35	38	39	37	12	2	2	18.1	39									
16-Dec	3	3	Z	5	8	5	3	4	4	10	11	7	6	6	5	21	19	15	11	10	5	4	3	4	7.5	21									
17-Dec	4	3	2	Z	2	2	3	3	4	3	4	5	5	6	5	7	7	8	10	15	14	13	11	7	6.2	15									
18-Dec	7	1	1	1	Z	1	2	9	5	11	10	7	10	11	5	6	5	8	6	7	5	4	3	5	5.7	11									
19-Dec	6	3	2	5	7	Z	12	8	13	12	10	12	16	20	21	19	16	14	13	10	10	11	10	10	11.3	21									
20-Dec	Z	4	4	4	5	6	7	8	11	13	9	9	17	18	17	23	15	12	11	11	13	11	10	9	10.8	23									
21-Dec	8	Z	7	8	11	10	19	16	21	14	11	15	21	18	20	16	17	14	17	20	14	15	15	11	14.7	21									
22-Dec	41	41	Z	42	50	52	21	9	9	11	10	10	10	8	9	10	13	12	14	14	7	8	10	7	18.2	52									
23-Dec	7	8	7	Z	12	17	16	11	8	8	12	14	13	9	8	13	12	11	10	9	12	10	6	5	10.3	17									
24-Dec	8	8	5	5	Z	9	13	9	9	7	7	8	6	7	12	14	13	10	12	14	13	21	20	15	10.7	21									
25-Dec	13	13	13	13	13	Z	14	18	13	16	17	20	22	26	27	25	19	18	6	11	39	24	13	13	17.6	39									
26-Dec	Z	12	12	14	11	12	10	12	17	19	19	19	19	16	13	14	15	13	12	11	12	11	9	8	13.5	19									
27-Dec	8	Z	8	8	8	10	10	10	9	7	7	7	8	8	9	10	8	13	14	14	13	14	15	19	10.3	19									
28-Dec	17	13	Z	14	14	16	17	14	16	11	13	16	15	14	12	14	8	10	10	25	26	24	22	21	15.7	26									
29-Dec	22	19	21	Z	17	14	15	18	29	29	13	27	44	30	28	32	29	30	36	35	38	39	33	29	27.3	44									
30-Dec	34	21	9	2	Z	3	14	49	66	84	72	56	47	14	8	20	33	57	64	46	45	48	40	24	37.3	84									
31-Dec	27	25	28	28	28	Z	55	69	49	7	4	4	4	5	5	7	9	5	10	11	14	16	17	37	20.1	69									
14.7																	11.9																	Diurnal Average	
41																	28																	Diurnal Maximum	
Z - zerospan																	C - Calibration																		





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Athabasca Valley - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	525	74.05	74.05
21 - 40	128	18.05	92.10
41 - 80	53	7.48	99.58
81 - 159	2	0.28	99.86
> 159	0	0.00	99.86

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Athabasca Valley - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	41	11	6	10	29	41	164	30	6	10	39	36	26	13	10	53	525
21 - 40	11	4	3	1	1	7	46	14	5	7	6	3	3	4	6	7	128
41 - 80	5	8	2	1	2	3	12	9	2	1	1	2	2	1	0	2	53
81 - 159	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	58	23	11	12	32	51	222	54	13	18	46	41	31	18	16	62	708

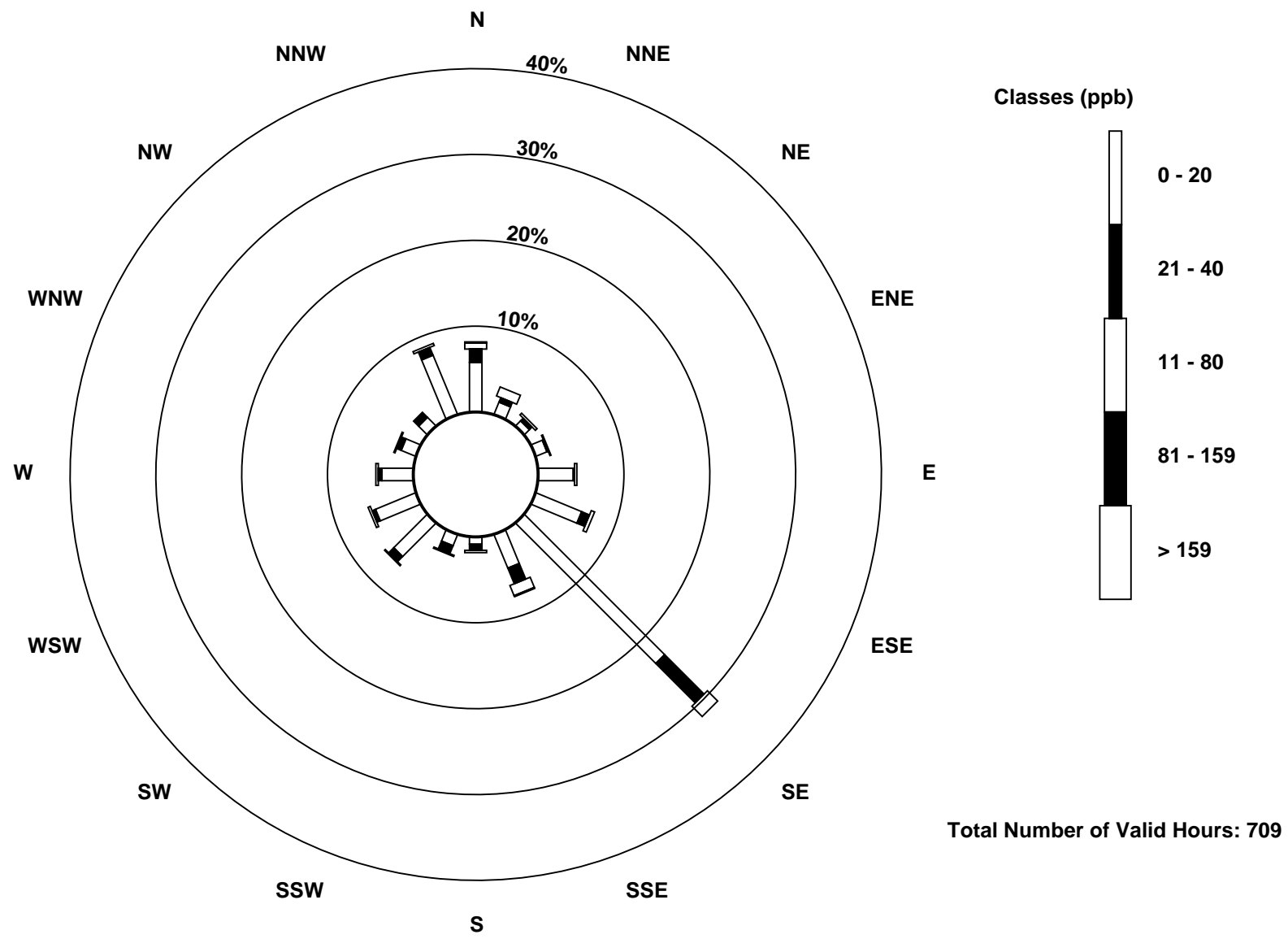
Total Number of Valid Hours: 709

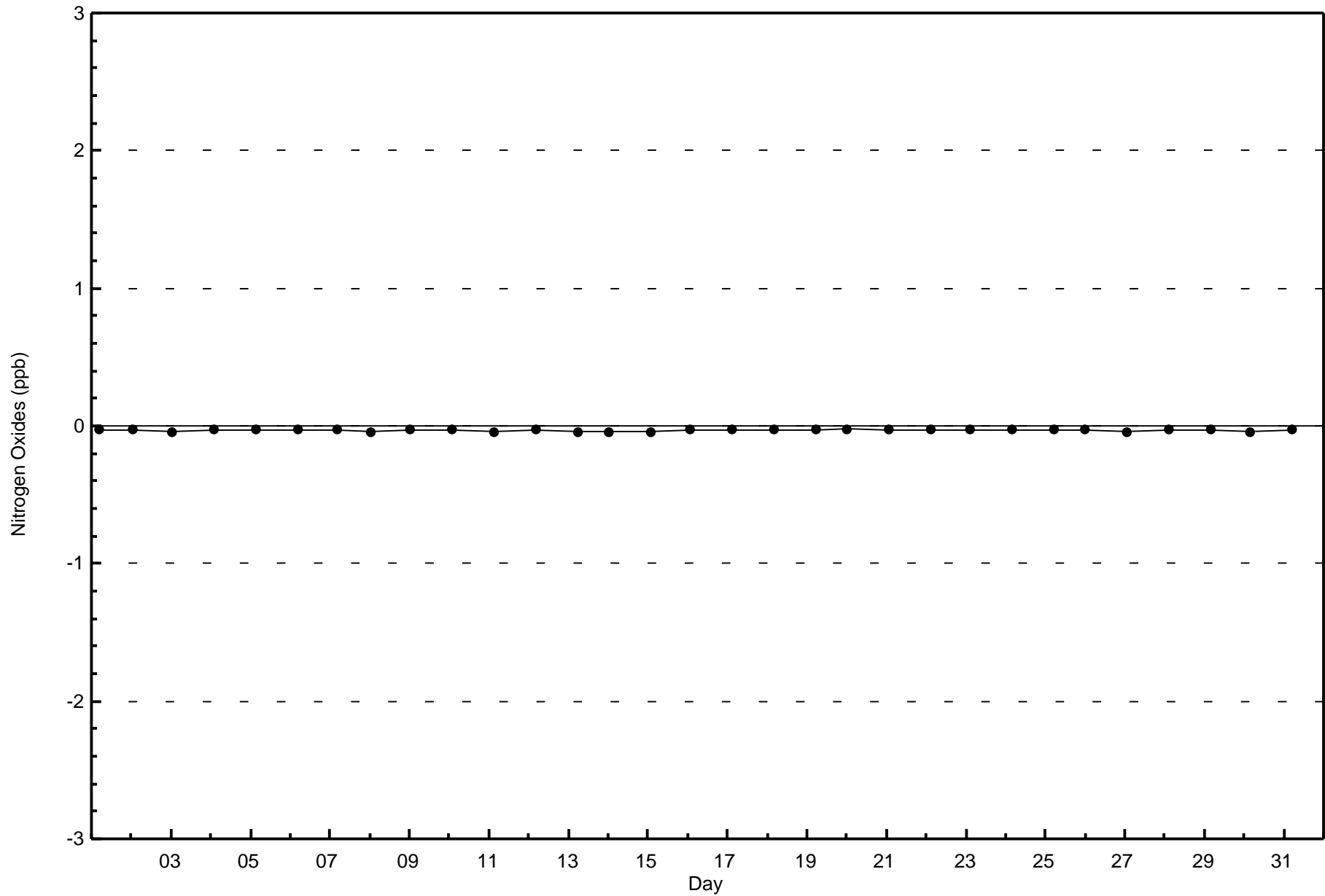
Total Number of Hours: 744

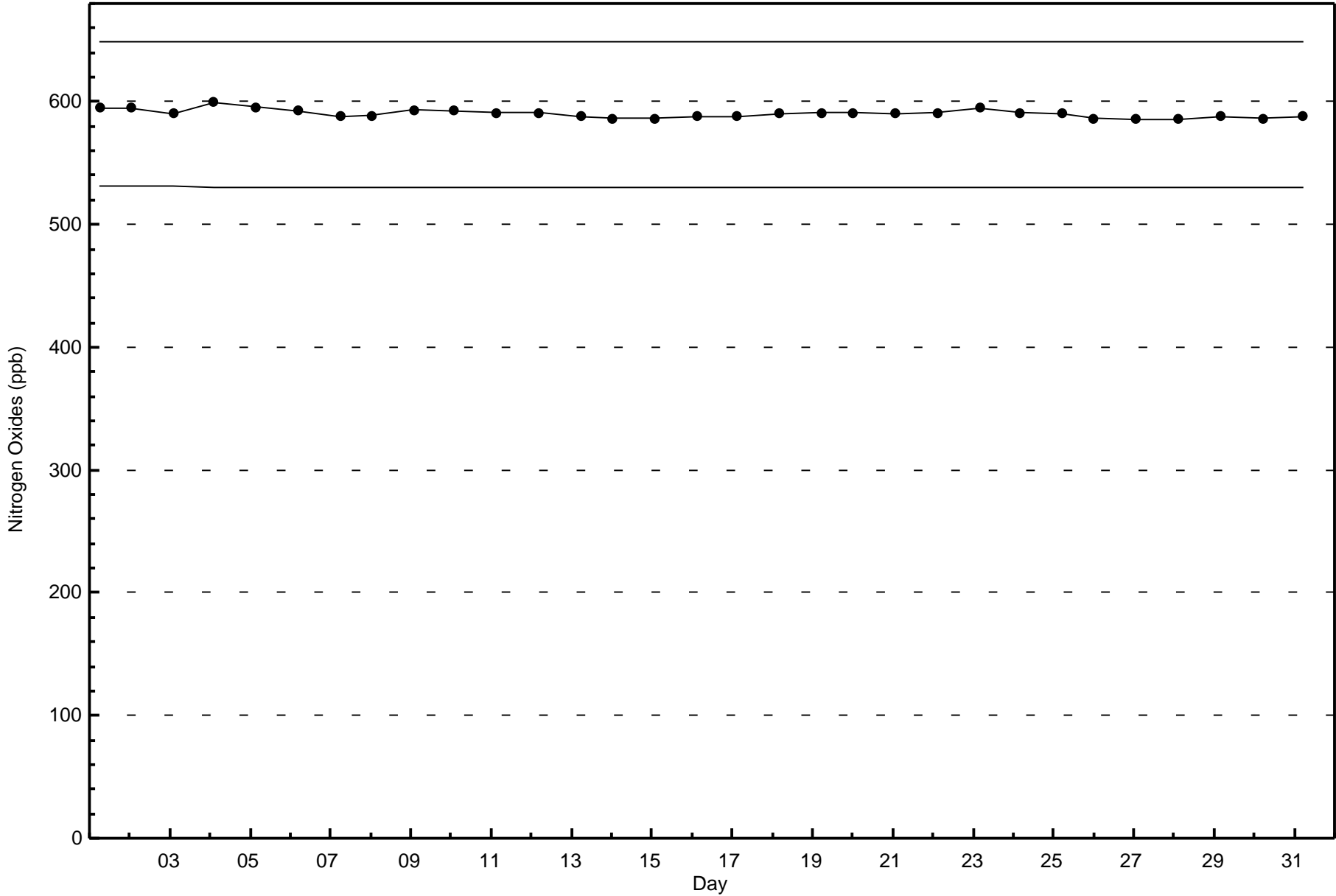


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Athabasca Valley (AMS 7)









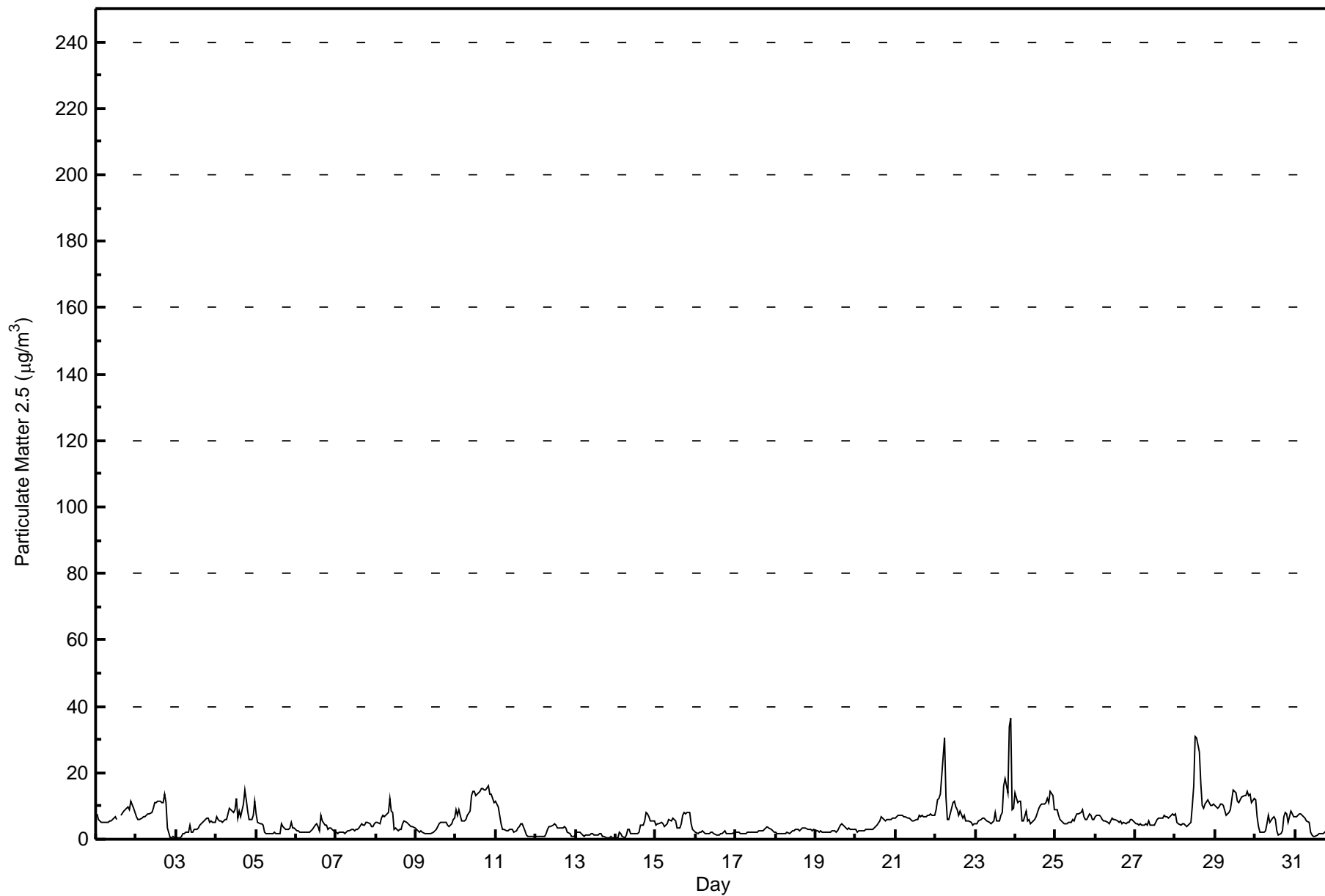


Number of Exceedences (AAAQO):		24-hr: 0		Hours in Service:		744																																										
Maximum Value: 36.4 µg/m <sup>3</sup> on Dec 23 22:00		Maximum Daily Average: 11.4 µg/m <sup>3</sup> on Dec 10		Hours of Data:		742																																										
Minimum Value: 0.3 µg/m <sup>3</sup> on Dec 13 21:00		Minimum Daily Average: 1.2 µg/m <sup>3</sup> on Dec 13		Hours of Missing Data:		2																																										
Maximum Diurnal Average: 6.8 µg/m <sup>3</sup> at hour 18		Minimum Diurnal Average: 4.2 µg/m <sup>3</sup> at hour 8		Hours of Calibration:		2																																										
Monthly Average: 5.45 µg/m <sup>3</sup>		Percentiles: P <sub>1</sub> = 0.5 P <sub>10</sub> = 1.6 Q <sub>1</sub> = 2.4 Median = 4.8 Q <sub>3</sub> = 7.0 P <sub>90</sub> = 10.8 P <sub>99</sub> = 12.3		Percent Operational Time:		100.0																																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	7.7	6.0	5.6	4.9	4.9	5.2	5.2	5.2	5.7	5.6	5.7	6.6	6.1	C	C	7.1	8.5	8.8	9.4	9.6	8.8	11.3	9.2	8.1	7.1	11.3																						
2-Dec	6.8	5.7	6.1	6.4	6.8	6.8	7.2	7.5	7.7	8.0	9.1	10.9	11.0	11.2	11.4	11.0	11.0	13.5	11.2	3.2	0.6	0.4	0.7	0.4	7.3	13.5																						
3-Dec	0.4	0.5	0.5	1.1	1.6	1.5	2.1	2.0	4.2	2.3	2.1	3.0	2.9	3.6	4.4	4.6	5.2	5.4	6.4	6.2	5.3	5.6	5.2	5.1	3.4	6.4																						
4-Dec	6.6	5.8	5.5	5.4	5.0	5.8	5.8	7.5	9.4	8.9	8.0	9.0	12.2	6.2	8.6	6.8	10.7	14.6	11.8	8.3	6.1	5.9	7.1	11.4	8.0	14.6																						
5-Dec	7.8	4.9	4.8	4.8	4.2	2.1	1.6	1.6	1.8	1.8	1.7	1.9	1.9	1.5	1.7	4.5	4.0	3.2	3.1	3.0	3.2	4.9	3.2	3.3	3.2	7.8																						
6-Dec	2.5	2.3	2.0	2.0	2.1	2.1	2.0	2.3	2.1	2.4	2.9	4.1	4.6	3.7	2.6	7.4	5.4	4.2	4.0	3.0	3.5	3.2	2.4	2.3	3.1	7.4																						
7-Dec	2.0	1.7	1.9	1.9	2.3	1.8	2.0	2.5	2.6	3.0	2.8	2.4	3.1	3.2	3.2	4.5	4.4	4.4	5.0	4.9	4.6	3.8	3.8	4.6	3.2	5.0																						
8-Dec	5.0	5.0	4.7	6.4	7.2	6.7	7.1	8.0	12.4	8.4	7.9	3.1	3.5	2.7	2.8	2.8	4.5	5.6	5.0	4.7	4.3	3.9	3.6	3.6	5.4	12.4																						
9-Dec	2.9	2.5	2.1	2.4	2.1	1.7	1.7	1.6	1.9	1.7	1.9	2.3	3.1	4.0	4.6	5.2	5.1	5.1	5.1	4.2	3.8	4.7	5.8	6.2	3.4	6.2																						
10-Dec	9.0	7.4	9.0	5.6	5.4	5.4	5.8	7.0	8.4	13.1	14.3	14.5	13.0	13.5	14.3	15.4	15.4	14.8	14.8	16.3	13.6	13.4	12.3	10.8	11.4	16.3																						
11-Dec	11.3	9.9	7.3	4.7	2.9	3.0	2.4	2.5	2.8	2.9	2.8	2.1	2.7	3.4	3.8	4.7	4.6	2.7	1.2	0.8	0.9	0.9	0.8	0.8	3.4	11.3																						
12-Dec	1.0	0.8	0.7	0.7	1.0	1.0	1.8	3.1	3.8	3.9	4.4	4.8	4.1	3.3	3.2	3.3	3.3	3.6	3.4	2.3	1.6	0.8	0.7	1.0	2.4	4.8																						
13-Dec	1.5	2.0	2.2	1.5	1.1	1.0	1.2	1.1	1.2	1.8	1.6	1.2	1.4	1.4	1.5	1.7	0.7	0.8	0.5	0.5	0.3	0.9	0.4	0.3	1.2	2.2																						
14-Dec	0.5	0.3	2.2	1.6	1.0	0.6	1.4	3.0	3.0	1.6	1.6	1.5	1.8	1.6	2.2	4.1	4.2	5.5	7.9	7.4	6.8	5.5	5.5	5.6	3.2	7.9																						
15-Dec	4.2	4.8	4.7	5.0	4.6	4.0	4.1	4.8	5.8	5.4	6.5	6.1	5.6	3.5	3.4	4.6	7.3	8.2	7.5	8.0	8.3	4.6	3.0	2.6	5.3	8.3																						
16-Dec	2.2	1.8	2.0	2.2	2.5	2.1	1.6	1.6	1.6	1.9	2.0	1.5	1.4	1.3	1.4	1.7	1.7	2.7	1.9	1.8	1.6	1.8	1.9	2.3	1.9	2.7																						
17-Dec	2.3	2.1	2.0	1.8	1.8	1.8	1.9	1.9	2.0	2.0	2.1	2.0	2.2	2.3	2.4	2.5	2.7	3.0	3.3	4.0	3.4	3.0	2.4	2.0	2.4	4.0																						
18-Dec	2.0	1.8	1.8	1.8	1.8	1.8	1.8	2.0	1.9	2.1	2.5	2.7	2.9	3.1	2.5	2.9	3.4	3.6	3.4	3.1	3.0	3.1	2.6	2.8	2.5	3.6																						
19-Dec	2.5	2.4	2.2	2.4	2.2	2.1	2.2	2.2	2.2	2.3	2.7	2.5	2.3	2.7	3.2	4.0	4.8	3.7	3.3	3.1	3.2	3.1	3.1	3.1	2.8	4.8																						
20-Dec	2.8	2.2	2.5	2.6	2.4	2.7	2.8	3.0	3.1	3.1	3.0	3.4	3.9	4.2	5.3	6.9	6.5	6.1	5.6	5.7	6.0	5.9	6.4	6.1	4.3	6.9																						
21-Dec	6.4	7.0	7.3	7.2	7.1	7.0	7.0	6.6	6.5	5.9	5.7	5.7	5.8	5.9	7.2	6.9	7.0	6.6	6.7	7.1	7.2	7.7	7.3	7.4	6.8	7.7																						
22-Dec	8.7	12.0	12.2	13.8	19.0	30.4	12.5	6.0	5.8	7.5	10.9	11.6	9.9	8.9	7.2	8.6	6.3	7.3	5.7	5.5	5.3	5.0	4.2	4.8	9.5	30.4																						
23-Dec	4.7	4.8	5.5	6.1	6.5	6.2	5.8	5.5	5.0	4.8	5.0	5.5	7.8	5.5	5.6	7.1	8.0	16.0	18.4	14.1	33.7	36.4	8.8	9.2	9.8	36.4																						
24-Dec	14.0	11.0	11.4	11.2	5.4	5.7	8.4	5.5	5.7	4.6	5.3	6.0	6.8	8.1	9.2	10.3	10.6	10.5	11.2	12.4	11.1	14.4	13.2	8.8	9.2	14.4																						
25-Dec	8.8	8.9	7.1	5.8	5.1	4.6	4.7	4.7	5.2	5.0	5.7	5.6	6.8	7.6	7.7	7.9	9.0	6.9	6.0	5.8	7.8	7.1	6.0	5.8	6.5	9.0																						
26-Dec	6.7	7.1	7.1	6.7	6.0	5.5	5.3	5.2	4.5	5.3	6.3	5.8	5.8	5.3	5.2	5.4	4.8	5.2	4.6	5.2	4.9	5.9	5.9	5.5	5.6	7.1																						
27-Dec	4.5	4.5	4.4	4.5	4.4	4.4	4.5	4.4	5.3	4.4	4.0	4.3	5.2	5.9	6.4	6.5	6.5	7.1	6.9	6.9	6.4	6.9	7.5	7.4	5.5	7.5																						
28-Dec	7.8	5.2	4.6	4.4	4.6	4.6	4.3	4.0	4.8	5.1	10.1	16.0	30.8	30.6	26.3	17.0	10.1	9.1	10.6	12.0	11.1	10.1	10.1	10.4	11.0	30.8																						
29-Dec	10.3	9.5	9.9	10.7	10.7	10.1	7.4	7.6	8.1	9.0	12.0	14.8	14.0	11.5	10.8	11.7	12.7	13.0	13.1	14.3	13.1	13.5	11.1	12.3	11.3	14.8																						
30-Dec	11.7	6.6	3.6	2.2	2.1	2.1	2.5	4.8	7.0	5.2	6.3	6.6	6.0	2.4	1.2	1.7	2.5	6.6	8.1	7.5	5.3	8.4	7.6	7.0	5.2	11.7																						
31-Dec	6.6	6.6	7.7	7.8	7.2	6.9	6.5	5.6	5.2	2.3	1.2	1.0	0.9	1.2	1.7	1.6	1.6	1.7	2.2	2.8	3.1	3.3	2.7	4.8	3.8	7.8																						
																								5.5	4.9	4.9	4.7	4.6	4.7	4.2	4.2	4.7	4.6	5.1	5.4	6.1	5.6	5.7	6.1	6.2	6.8	6.7	6.2	6.4	6.6	5.3	5.3	Diurnal Average
																								14.0	12.0	12.2	13.8	19.0	30.4	12.5	8.0	12.4	13.1	14.3	16.0	30.8	30.6	26.3	17.0	15.4	16.0	18.4	16.3	33.7	36.4	13.2	12.3	Diurnal Maximum
C - Calibration																																																
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																																																



Wood Buffalo Environmental Association  
Hourly Averages

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Athabasca Valley - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Athabasca Valley - December 2015**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	405	54.58	54.58
6 - 15	292	39.35	93.94
16 - 25	6	0.81	94.74
26 - 80	6	0.81	95.55
> 81.0	0	0.00	95.55

Total Number of Valid Hours: 742

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Athabasca Valley - December 2015**

Concentration Ranges ( $\mu\text{g}/\text{m}^3$ )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	31	13	7	4	28	39	128	27	7	10	26	28	18	12	9	18	405
6 - 15	27	11	3	3	3	14	93	28	6	8	19	9	13	9	6	40	292
16 - 25	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	6
26 - 80	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	6
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	61	24	10	8	31	53	221	55	13	18	45	37	31	21	15	66	709

Total Number of Valid Hours: 742

Total Number of Hours: 744

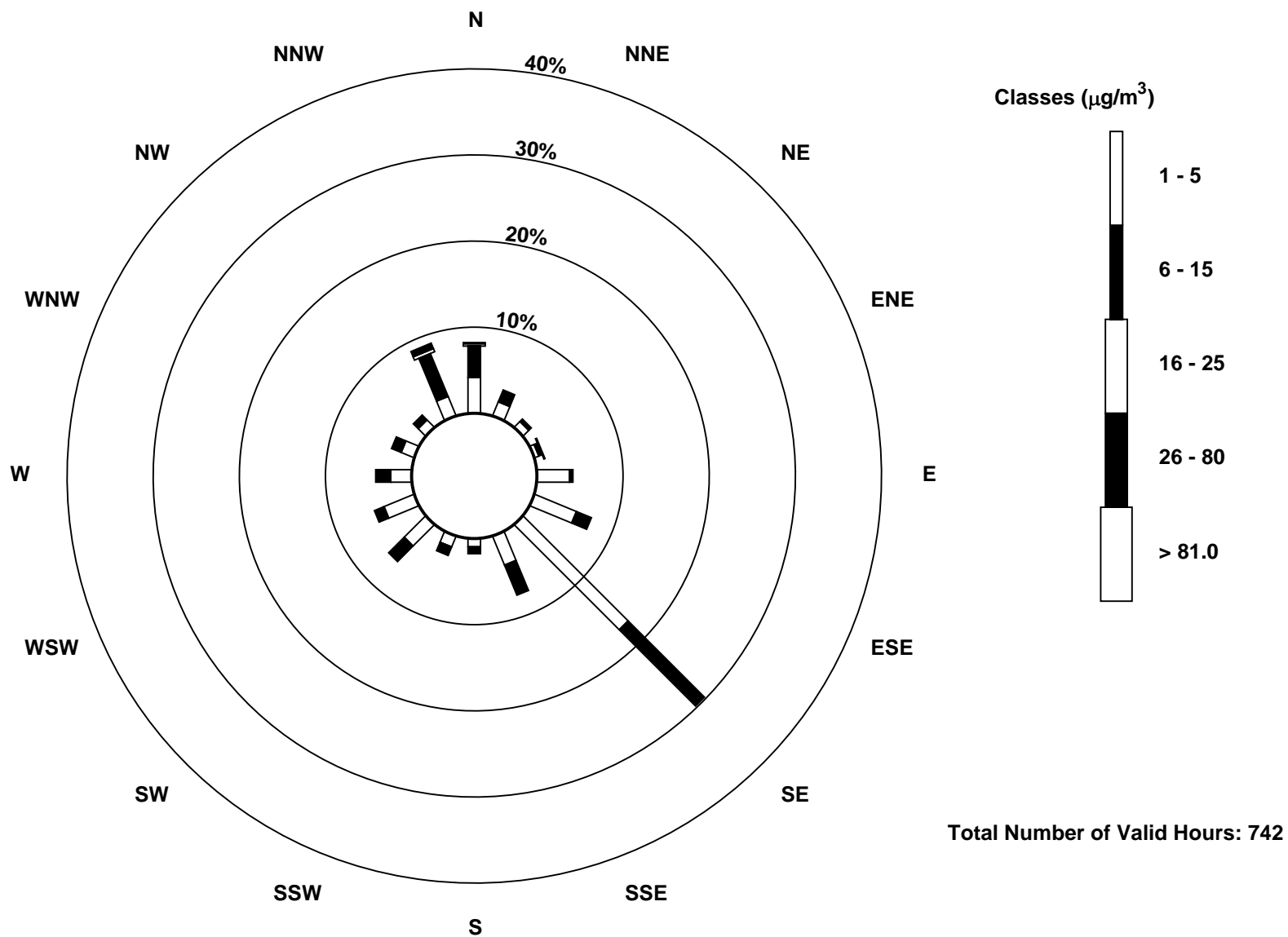


Wood Buffalo Environmental Association

Wind Rose Dec 2015

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$

Athabasca Valley (AMS 7)





Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 0.6 ppm on Dec 4 18:00	Maximum Daily Average: 0.3 ppm on Dec 30		Hours of Data:	711
Minimum Value: 0.0 ppm on Dec 18 04:00	Minimum Daily Average: 0.0 ppm on Dec 17		Hours of Missing Data:	33
Maximum Diurnal Average: 0.2 ppm at hour 18	Minimum Diurnal Average: 0.1 ppm at hour 4		Hours of Calibration:	33
Monthly Average: 0.11 ppm	Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.1 Median = 0.1 Q <sub>3</sub> = 0.1 P <sub>90</sub> = 0.2 P <sub>99</sub> = 0.4		Percent Operational Time:	100.0

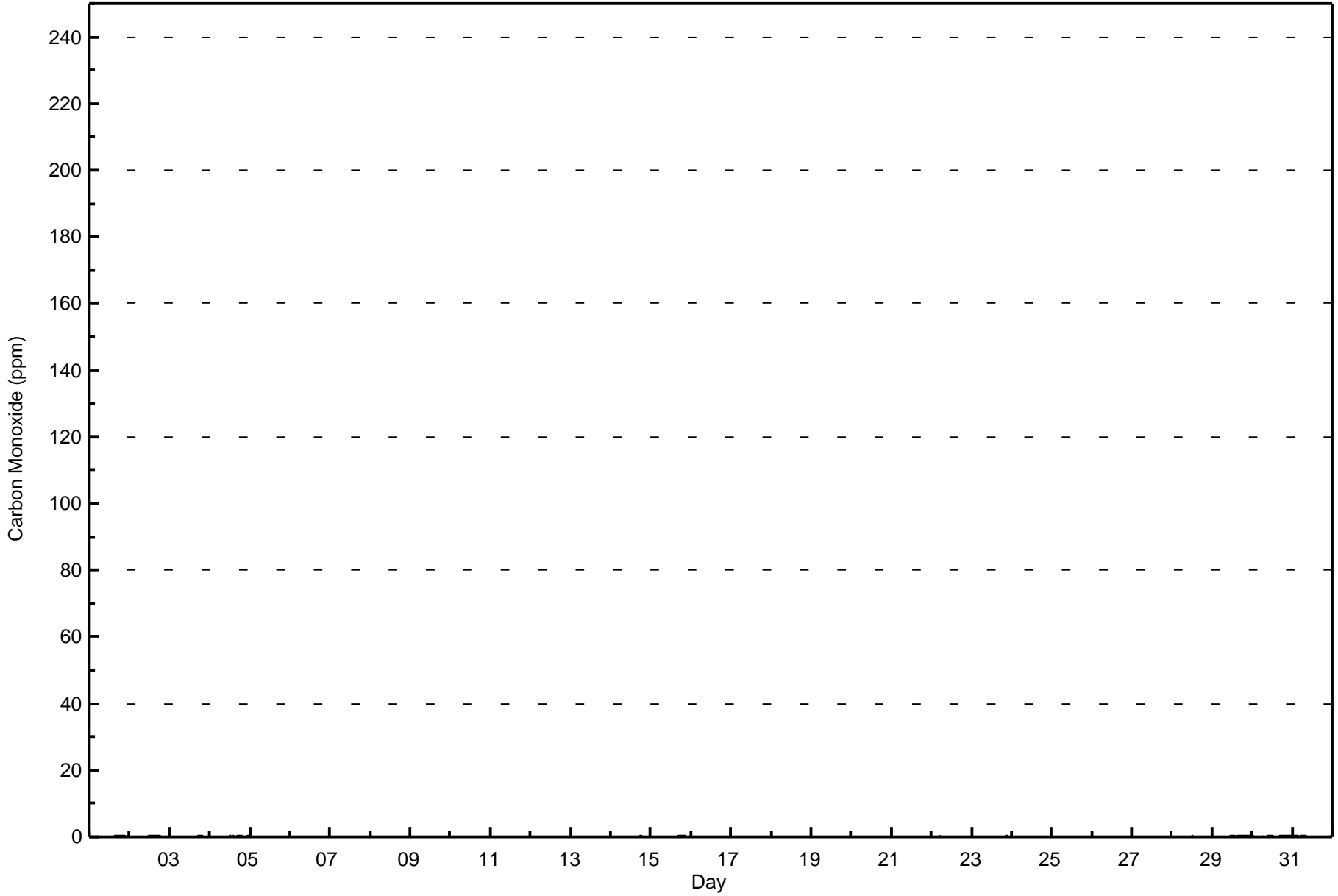
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	C	C	C	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.1	0.2	0.3
2-Dec	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.4	0.3	0.3	0.4	0.4	0.4	0.2	0.1	0.1	0.1	0.1	0.2	0.4
3-Dec	0.1	0.0	0.0	0.1	0.1	Z	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.3
4-Dec	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.3	0.2	0.4	0.6	0.4	0.3	0.2	0.2	0.3	0.3	0.2
5-Dec	0.2	0.1	0.1	0.1	0.1	0.0	0.0	Z	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
6-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
7-Dec	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
8-Dec	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
9-Dec	0.1	0.0	0.0	0.0	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
10-Dec	0.1	0.1	0.1	0.1	0.0	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2
11-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
12-Dec	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
13-Dec	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.1
14-Dec	0.0	0.0	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
15-Dec	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.2	0.3	0.2	0.1	0.1	0.1	0.1	0.3
16-Dec	0.0	0.0	0.0	0.0	0.0	0.0	Z	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1
17-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Z	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	Z	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
19-Dec	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
20-Dec	0.1	0.0	0.0	0.0	Z	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
21-Dec	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
22-Dec	0.2	0.1	0.1	0.1	0.2	0.3	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3
23-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.1	0.1	0.1
24-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
25-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
26-Dec	0.1	0.1	0.1	0.1	Z	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
27-Dec	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2
28-Dec	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.3
29-Dec	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.2	0.2	0.1	0.2	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3
30-Dec	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.3	Z	0.4	0.4	0.3	0.3	0.1	0.1	0.2	0.3	0.5	0.5	0.4	0.3	0.4	0.3	0.3	0.3	0.5
31-Dec	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.3	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.3	0.2	0.4
																								Diurnal Average		
																								Diurnal Maximum		

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 13 ppm



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Carbon Monoxide (CO) - ppm**  
**Athabasca Valley - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Carbon Monoxide (CO) - ppm**  
**Athabasca Valley - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	697	98.03	98.03
0.4 - 0.5	13	1.83	99.86
0.6 - 0.7	1	0.14	100.00
0.8 - 1.4	0	0.00	100.00
1.5 - 10	0	0.00	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 711

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Carbon Monoxide (CO) - ppm  
Athabasca Valley - December 2015**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.3	60	24	11	11	35	50	214	52	12	15	46	42	30	19	14	62	697
0.4 - 0.5	0	0	0	0	0	1	7	3	1	1	0	0	0	0	0	0	13
0.6 - 0.7	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
0.8 - 1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.5 - 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	60	24	11	11	35	51	222	55	13	16	46	42	30	19	14	62	711

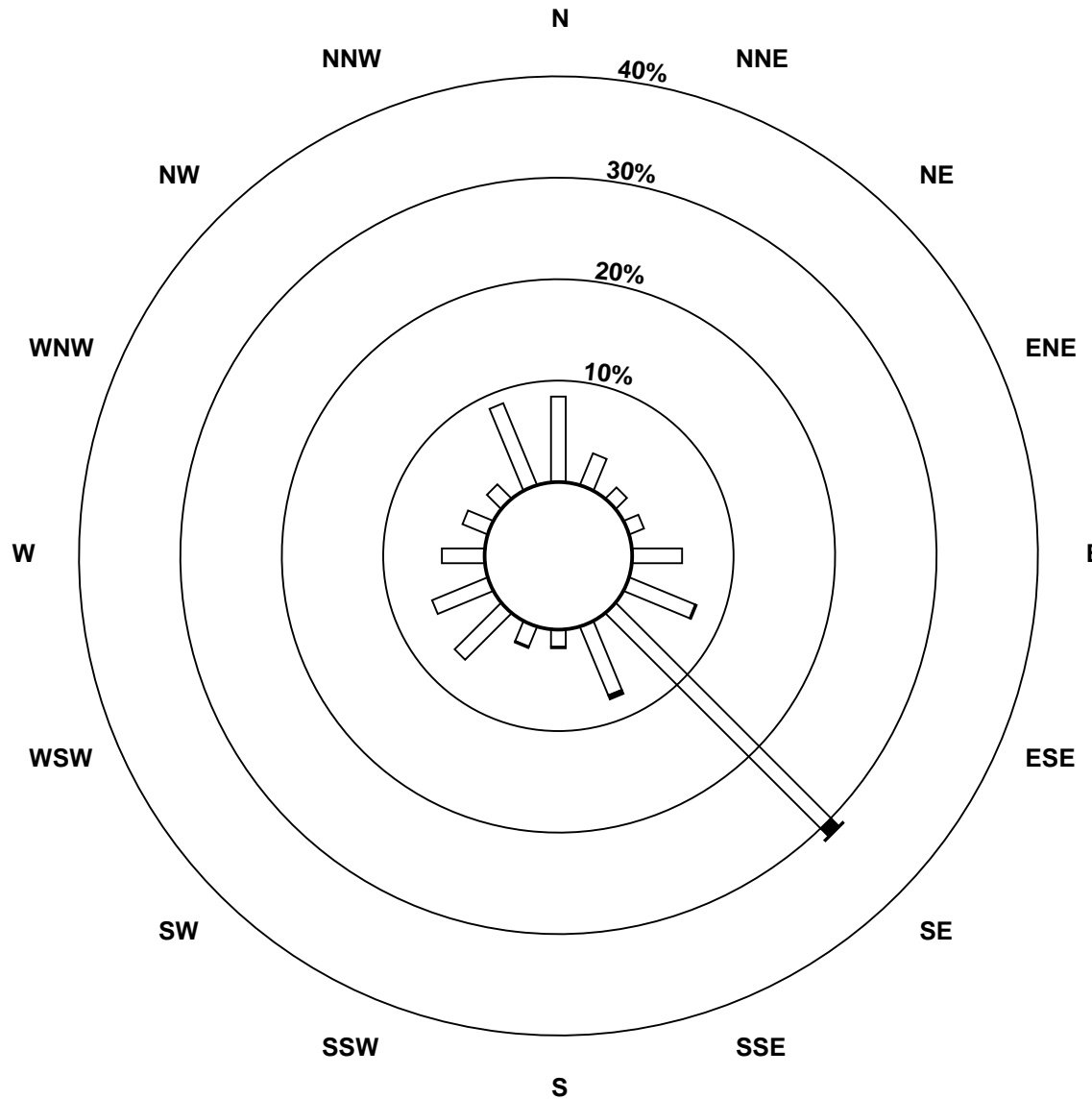
Total Number of Valid Hours: 711

Total Number of Hours: 744

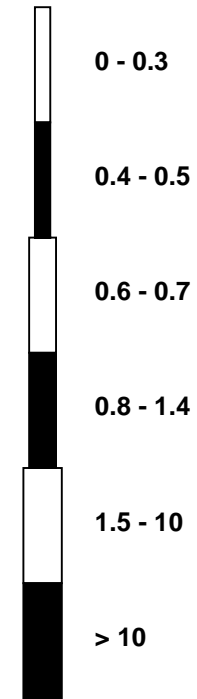


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

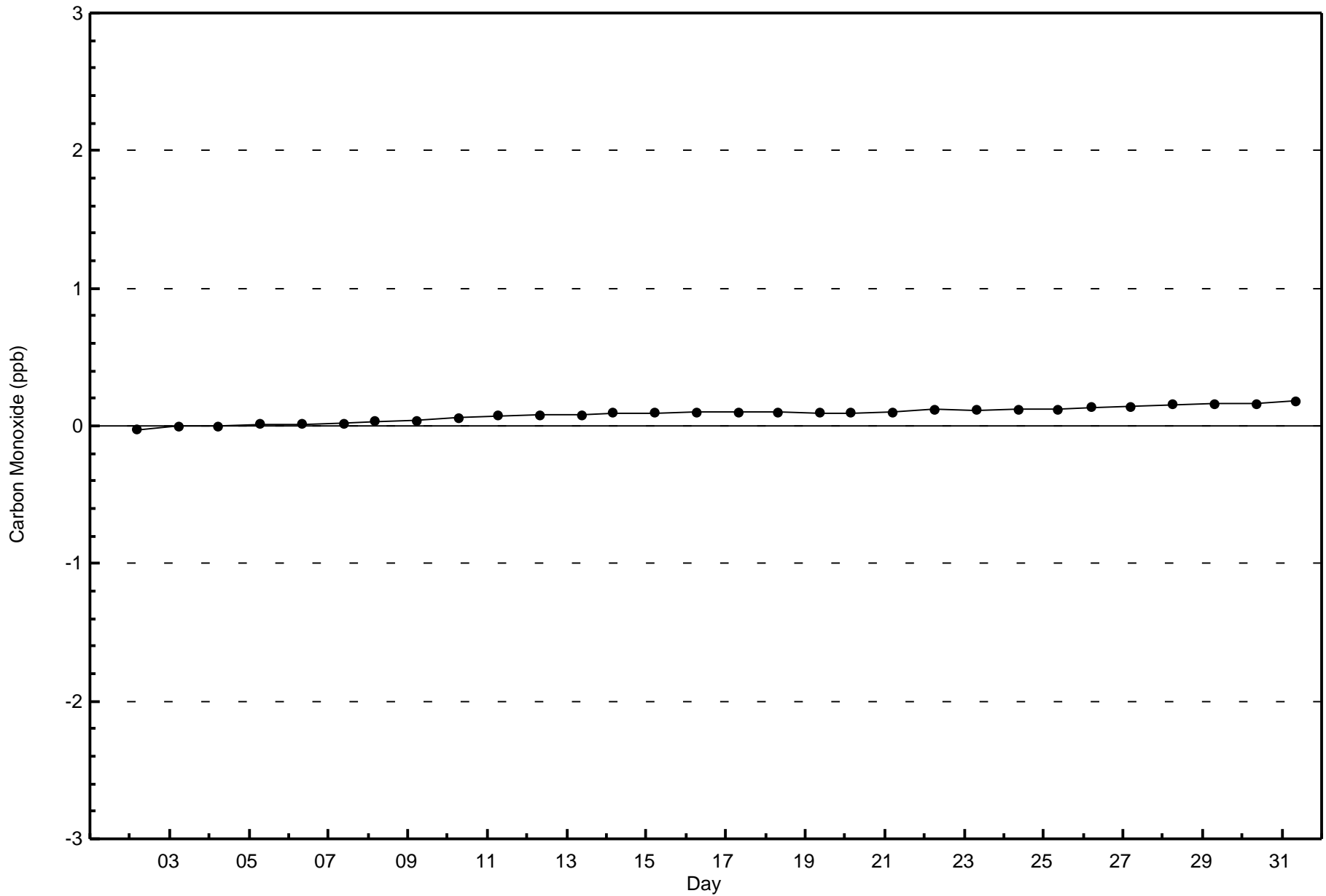
Carbon Monoxide (CO) - ppm  
Athabasca Valley (AMS 7)

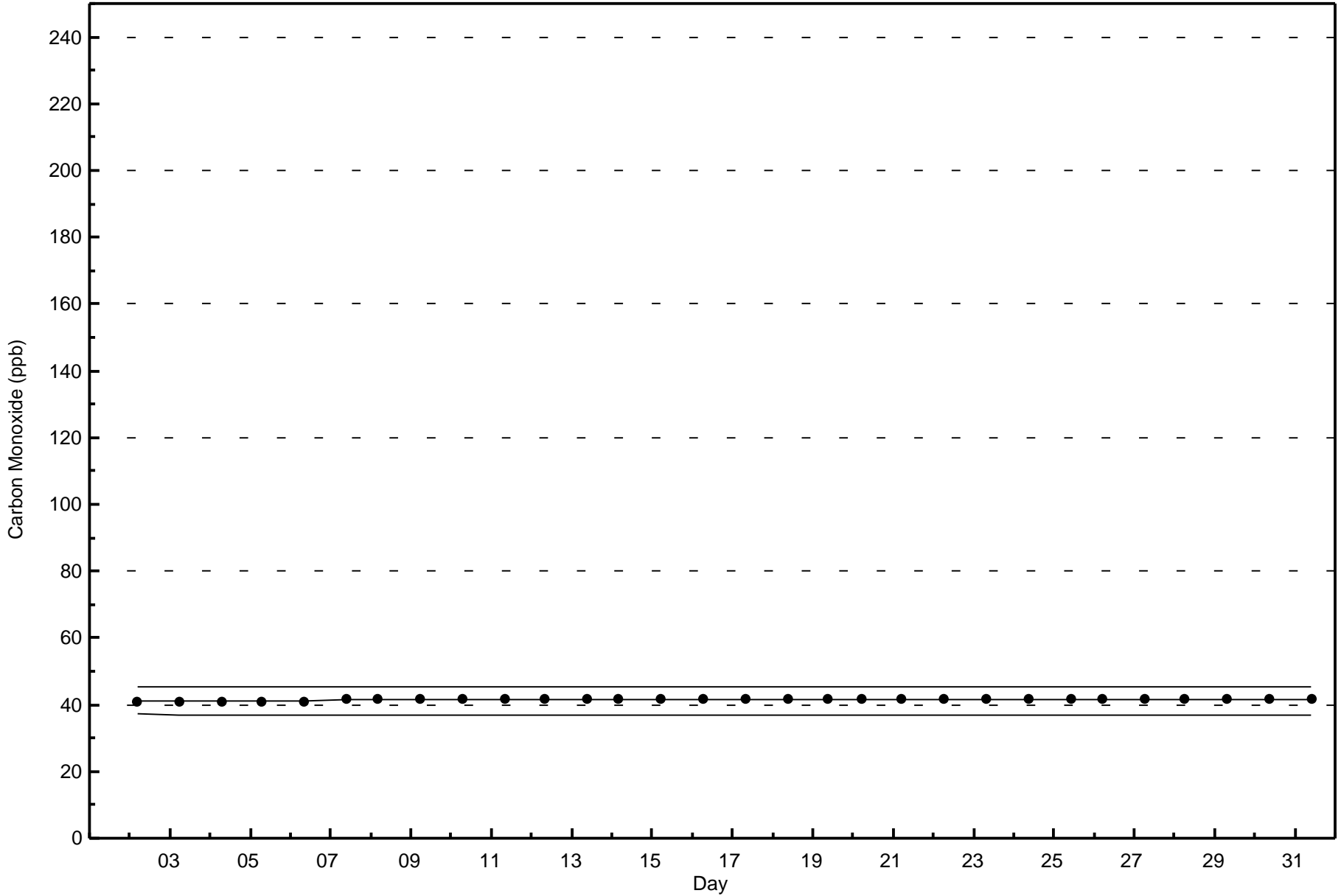


Classes (ppm)



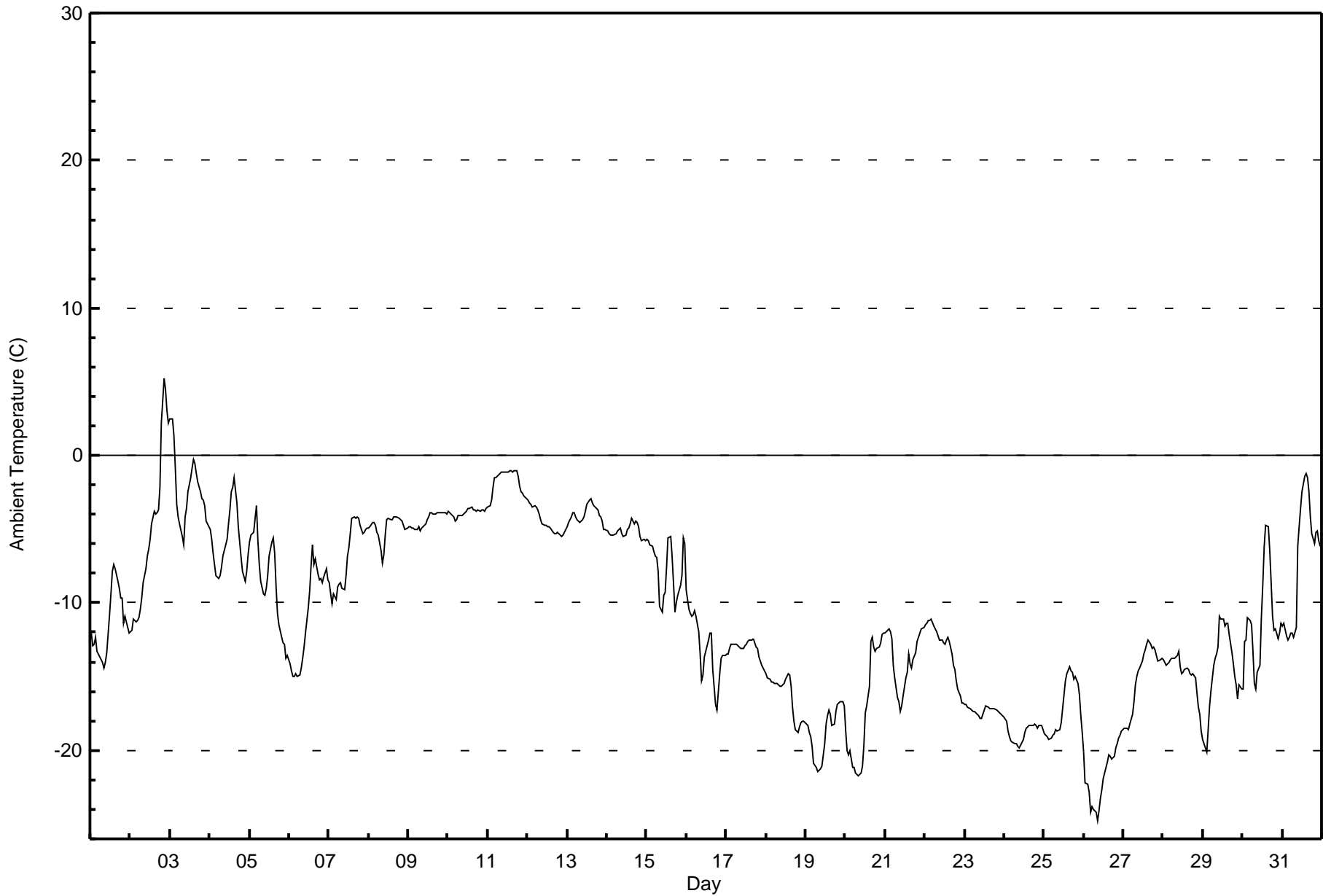
Total Number of Valid Hours: 711







Maximum Value: 5.2 C on Dec 2 21:00		Maximum Daily Average: -1.8 C on Dec 11		Hours in Service: 744																								
Minimum Value: -24.8 C on Dec 26 09:00		Minimum Daily Average: -21.7 C on Dec 26		Hours of Data: 744																								
Maximum Diurnal Average: -8.9 C at hour 15		Minimum Diurnal Average: -12.1 C at hour 9		Hours of Missing Data: 0																								
Monthly Average: -10.66 C		Percentiles: P <sub>1</sub> = -22.9 P <sub>10</sub> = -18.6 Q <sub>1</sub> = -15.2 Median = -11.5 Q <sub>3</sub> = -4.9 P <sub>90</sub> = -3.7 P <sub>99</sub> = 2.1		Hours of Calibration: 0																								
				Percent Operational Time: 100.0																								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Dec	-12.1	-12.9	-12.8	-12.4	-13.3	-13.7	-13.9	-14.0	-14.5	-14.0	-13.4	-10.8	-9.4	-7.9	-7.4	-7.7	-8.6	-9.1	-9.7	-9.7	-11.3	-10.9	-11.7	-12.1	-11.4	-7.4		
2-Dec	-12.0	-11.8	-11.1	-11.3	-11.2	-11.0	-10.5	-9.7	-8.7	-7.7	-6.8	-6.4	-5.7	-4.6	-3.8	-3.9	-3.8	-3.7	-2.2	2.1	5.2	4.5	3.0	2.2	-5.4	5.2		
3-Dec	2.5	2.5	1.3	-0.9	-3.3	-4.2	-4.6	-5.5	-6.0	-4.2	-3.6	-2.4	-1.5	-0.8	-0.3	-0.6	-1.2	-1.8	-2.5	-2.9	-3.0	-3.4	-4.5	-4.9	-2.3	2.5		
4-Dec	-5.0	-5.7	-6.7	-7.4	-8.2	-8.3	-8.1	-7.6	-6.9	-6.4	-5.7	-4.7	-3.7	-2.4	-2.1	-1.5	-3.2	-4.8	-5.9	-7.9	-8.6	-7.9	-6.7	-5.9	-1.5	-1.5		
5-Dec	-5.9	-5.4	-5.2	-4.3	-3.5	-5.7	-7.4	-8.5	-9.4	-9.5	-9.0	-8.1	-6.8	-5.9	-5.6	-6.7	-8.9	-10.7	-11.5	-12.3	-12.7	-12.8	-13.7	-13.5	-8.5	-3.5		
6-Dec	-14.1	-14.6	-15.0	-15.0	-14.8	-15.0	-14.9	-14.4	-13.8	-13.0	-12.0	-10.4	-9.2	-7.5	-6.1	-7.4	-7.1	-8.1	-8.4	-8.3	-8.7	-8.3	-7.7	-8.5	-10.9	-6.1		
7-Dec	-8.6	-9.4	-10.0	-9.4	-9.7	-8.9	-8.7	-8.6	-9.0	-9.1	-8.2	-6.8	-6.2	-5.3	-4.3	-4.2	-4.3	-4.2	-4.3	-4.8	-5.3	-5.2	-5.0	-5.0	-6.9	-4.2		
8-Dec	-4.9	-4.8	-4.6	-4.6	-4.8	-5.2	-5.4	-6.5	-7.3	-6.7	-5.4	-4.4	-4.2	-4.3	-4.4	-4.2	-4.2	-4.1	-4.3	-4.4	-4.4	-4.8	-5.0	-4.9	-4.9	-4.1		
9-Dec	-4.8	-4.8	-4.9	-4.9	-5.0	-5.0	-4.8	-5.1	-4.9	-4.8	-4.6	-4.4	-4.2	-3.9	-3.9	-4.0	-4.0	-3.9	-3.9	-3.9	-3.9	-3.9	-3.8	-4.0	-4.4	-3.8		
10-Dec	-3.8	-3.9	-4.0	-4.2	-4.4	-4.3	-4.1	-4.1	-4.1	-3.9	-3.9	-3.8	-3.6	-3.6	-3.5	-3.7	-3.7	-3.8	-3.7	-3.8	-3.7	-3.7	-3.8	-3.6	-3.9	-3.5		
11-Dec	-3.5	-3.4	-3.0	-2.2	-1.5	-1.5	-1.4	-1.2	-1.1	-1.1	-1.1	-1.1	-1.1	-1.0	-1.0	-1.2	-1.0	-1.0	-1.4	-2.1	-2.5	-2.6	-2.8	-2.9	-1.8	-1.0		
12-Dec	-3.0	-3.2	-3.3	-3.5	-3.4	-3.5	-3.7	-4.0	-4.3	-4.6	-4.7	-4.8	-4.8	-4.8	-5.0	-5.2	-5.3	-5.3	-5.2	-5.3	-5.5	-5.4	-5.2	-5.0	-4.5	-3.0		
13-Dec	-4.8	-4.6	-4.2	-3.9	-3.9	-4.1	-4.3	-4.5	-4.5	-4.3	-4.2	-3.8	-3.4	-3.0	-3.0	-3.2	-3.4	-3.5	-3.7	-4.1	-4.1	-4.5	-5.0	-5.0	-4.1	-3.0		
14-Dec	-5.2	-5.3	-5.4	-5.4	-5.4	-5.3	-5.2	-5.1	-4.9	-5.3	-5.5	-5.4	-5.0	-5.0	-4.6	-4.3	-4.6	-4.4	-4.6	-4.8	-5.5	-5.8	-5.7	-5.7	-5.1	-4.3		
15-Dec	-5.7	-5.8	-6.1	-6.2	-6.5	-6.8	-6.9	-7.9	-10.3	-10.7	-9.5	-9.3	-7.6	-5.6	-5.5	-7.0	-8.7	-10.6	-10.0	-9.5	-8.9	-8.1	-5.6	-6.0	-7.7	-5.5		
16-Dec	-9.1	-10.4	-10.7	-10.9	-10.8	-10.5	-10.9	-12.0	-13.5	-15.2	-14.9	-13.6	-12.9	-12.6	-12.0	-12.0	-14.5	-16.8	-17.3	-16.0	-14.8	-13.8	-13.6	-13.6	-13.0	-9.1		
17-Dec	-13.5	-13.4	-13.1	-12.8	-12.8	-12.8	-12.8	-12.9	-13.0	-13.1	-13.1	-12.9	-12.8	-12.6	-12.6	-12.5	-12.5	-12.7	-13.0	-13.1	-13.6	-14.2	-14.4	-14.7	-13.1	-12.5		
18-Dec	-14.8	-15.0	-15.2	-15.4	-15.4	-15.4	-15.5	-15.5	-15.6	-15.6	-15.6	-15.4	-15.2	-14.8	-14.9	-15.6	-17.1	-18.1	-18.6	-18.7	-18.4	-18.1	-18.0	-18.0	-16.3	-14.8		
19-Dec	-18.3	-18.3	-18.8	-19.0	-19.7	-20.9	-21.2	-21.4	-21.4	-21.2	-21.1	-19.6	-18.2	-17.6	-17.3	-17.5	-18.3	-18.2	-17.4	-16.9	-16.7	-16.7	-16.7	-17.0	-18.7	-16.7		
20-Dec	-18.7	-20.0	-20.3	-20.0	-21.2	-21.2	-21.5	-21.6	-21.7	-21.6	-21.1	-19.7	-17.5	-17.0	-15.7	-12.6	-12.3	-13.0	-13.3	-13.1	-13.0	-12.7	-12.2	-12.1	-17.2	-12.1		
21-Dec	-12.1	-11.8	-11.7	-11.9	-12.4	-14.2	-15.1	-16.4	-16.7	-17.4	-17.0	-16.3	-15.1	-14.7	-13.4	-14.1	-14.4	-13.9	-13.3	-12.6	-12.3	-12.0	-11.7	-11.7	-13.9	-11.7		
22-Dec	-11.5	-11.4	-11.2	-11.2	-11.1	-11.6	-11.8	-12.0	-12.2	-12.6	-12.5	-12.7	-12.8	-12.5	-12.3	-12.6	-13.4	-14.2	-14.5	-15.3	-15.9	-16.4	-16.8	-16.8	-13.1	-11.1		
23-Dec	-16.9	-16.9	-17.1	-17.1	-17.2	-17.3	-17.4	-17.4	-17.6	-17.8	-17.8	-17.5	-17.3	-17.0	-17.1	-17.2	-17.2	-17.2	-17.2	-17.3	-17.4	-17.5	-17.6	-17.7	-17.3	-16.9		
24-Dec	-17.8	-18.0	-18.7	-19.1	-19.4	-19.5	-19.5	-19.5	-19.7	-19.9	-19.6	-19.2	-18.8	-18.5	-18.4	-18.3	-18.4	-18.3	-18.2	-18.3	-18.5	-18.3	-18.3	-18.6	-18.8	-17.8		
25-Dec	-18.8	-18.9	-19.1	-19.3	-19.2	-18.9	-18.9	-18.6	-18.7	-18.6	-18.1	-17.2	-16.3	-15.3	-14.8	-14.3	-14.6	-14.7	-15.2	-15.0	-15.4	-16.2	-17.7	-18.8	-17.2	-14.3		
26-Dec	-20.1	-22.2	-22.3	-22.9	-24.2	-23.9	-24.0	-24.2	-24.8	-24.1	-23.2	-22.7	-21.9	-21.2	-20.8	-20.3	-20.4	-20.6	-20.4	-19.8	-19.5	-19.1	-19.0	-18.7	-21.7	-18.7		
27-Dec	-18.5	-18.5	-18.5	-18.6	-18.2	-17.5	-16.7	-15.5	-15.0	-14.6	-14.4	-14.0	-13.5	-13.2	-12.8	-12.5	-12.8	-13.0	-13.0	-13.2	-13.6	-14.0	-13.8	-13.8	-15.0	-12.5		
28-Dec	-13.8	-14.1	-14.3	-14.0	-13.9	-13.8	-13.7	-13.8	-13.5	-13.3	-14.3	-14.8	-14.7	-14.5	-14.4	-14.5	-14.8	-14.9	-14.8	-15.1	-16.1	-17.1	-17.6	-18.6	-14.8	-13.3		
29-Dec	-19.2	-19.8	-20.1	-18.6	-17.0	-15.9	-14.2	-13.8	-13.5	-13.0	-10.9	-11.1	-11.1	-11.6	-11.3	-11.4	-12.2	-13.4	-14.1	-15.0	-15.6	-16.5	-15.6	-15.8	-14.6	-10.9		
30-Dec	-15.9	-12.6	-12.5	-11.0	-11.2	-11.5	-13.3	-15.4	-15.8	-14.7	-14.2	-11.0	-8.8	-6.3	-4.8	-4.9	-6.4	-8.7	-11.0	-11.9	-11.7	-12.5	-12.0	-11.4	-11.2	-4.8		
31-Dec	-11.5	-11.4	-12.2	-12.5	-12.3	-12.1	-12.0	-12.4	-11.7	-6.2	-4.8	-3.6	-2.5	-1.4	-1.2	-1.5	-2.5	-4.2	-5.3	-6.0	-5.2	-5.2	-5.8	-6.2	-7.1	-1.2		
		-11.0	-11.2	-11.3	-11.3	-11.5	-11.6	-11.7	-11.9	-12.1	-11.8	-11.3	-10.6	-9.9	-9.2	-8.9	-8.9	-9.5	-10.0	-10.3	-10.3	-10.3	-10.4	-10.5	-10.6	Diurnal Average		
		2.5	2.5	1.3	-0.9	-1.5	-1.5	-1.4	-1.2	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-0.8	-0.3	-0.6	-1.0	-1.0	-1.4	2.1	5.2	4.5	3.0	2.2	Diurnal Maximum	





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Athabasca Valley - December 2015**

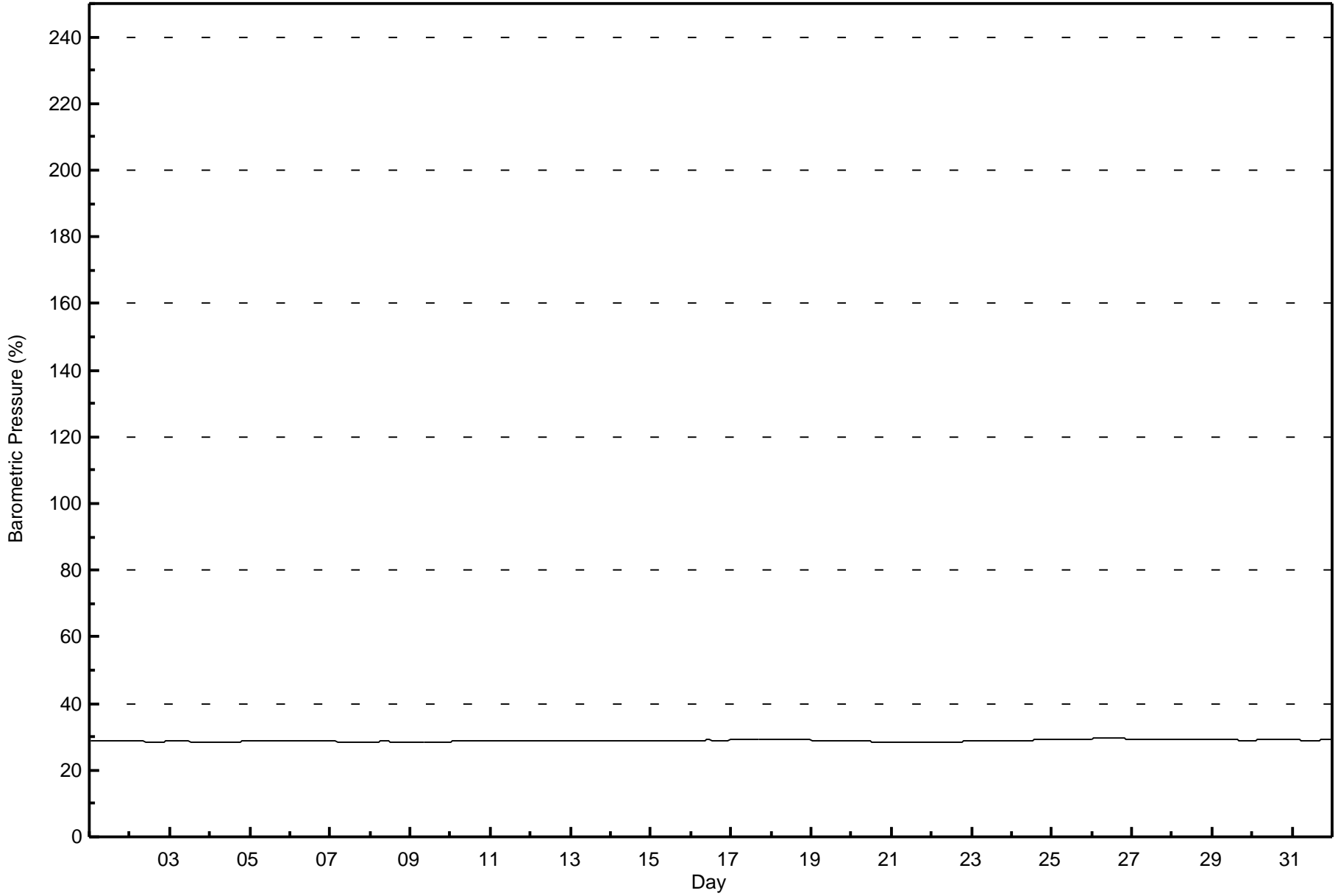
<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	36	4.84	4.84
-20 - 0	700	94.09	98.92
0 - 10	8	1.08	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744









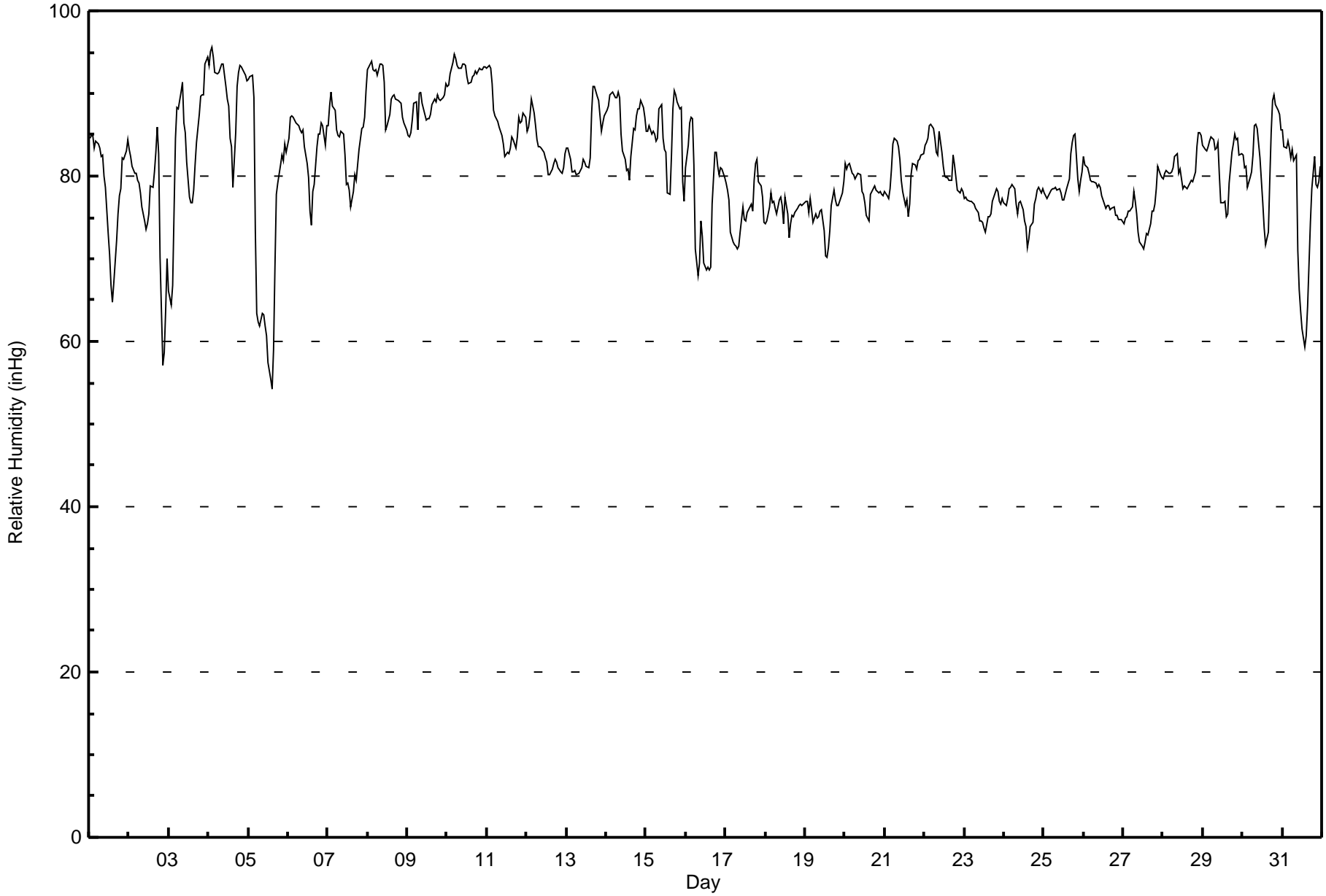
**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - inHg**

**Athabasca Valley - December 2015**

Maximum Value: 96 inHg on Dec 4 03:00																			Maximum Daily Average: 92.8 inHg on Dec 10																			Hours in Service: 744	
Minimum Value: 54 inHg on Dec 5 15:00																			Minimum Daily Average: 72.5 inHg on Dec 5																			Hours of Data: 744	
Maximum Diurnal Average: 83.4 inHg at hour 4																			Minimum Diurnal Average: 76.1 inHg at hour 15																			Hours of Missing Data: 0	
Monthly Average: 81.2 inHg																			Percentiles: P <sub>1</sub> = 61 P <sub>10</sub> = 74 Q <sub>1</sub> = 77 Median = 81 Q <sub>3</sub> = 86 P <sub>90</sub> = 90 P <sub>99</sub> = 94																			Hours of Calibration: 0	
																																						Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24															
1-Dec	85	85	85	83	84	84	83	82	82	80	79	73	71	67	65	67	72	75	78	78	82	82	83	84	78.8	85													
2-Dec	83	82	81	80	80	79	79	78	76	75	74	74	75	79	79	81	83	86	83	70	57	59	64	70	76.1	86													
3-Dec	66	64	67	76	85	88	88	90	91	87	85	82	77	77	77	78	81	84	87	90	90	90	94	94	82.9	94													
4-Dec	93	95	96	94	93	92	93	93	94	93	91	89	89	85	84	79	85	91	93	93	93	92	92	92	91.0	96													
5-Dec	92	92	92	89	73	63	62	62	63	63	62	61	57	55	54	59	69	78	79	81	83	82	84	83	72.5	92													
6-Dec	85	87	87	87	87	86	86	86	85	86	84	81	80	76	74	78	79	84	85	85	86	86	84	86	83.7	87													
7-Dec	86	88	90	88	88	86	85	85	85	85	83	79	79	78	76	78	80	80	81	83	86	86	87	90	83.9	90													
8-Dec	93	93	94	93	93	93	92	94	93	93	91	86	86	88	89	90	90	89	89	89	89	87	87	86	90.2	94													
9-Dec	85	85	85	87	89	89	86	90	90	89	87	87	87	87	87	89	89	89	90	89	89	89	90	91	88.1	91													
10-Dec	91	91	92	94	95	94	93	93	93	93	94	93	92	91	91	92	92	93	92	93	93	93	93	93	92.8	95													
11-Dec	93	93	93	91	88	87	87	86	85	85	84	82	83	83	83	85	84	83	85	87	86	87	88	87	86.5	93													
12-Dec	85	86	87	89	88	86	84	84	83	83	83	82	82	80	80	81	82	82	82	81	80	80	81	83	83.2	89													
13-Dec	83	83	82	81	80	81	80	80	81	81	82	82	81	81	82	88	91	91	90	89	87	85	86	87	84.0	91													
14-Dec	88	88	90	90	90	89	89	90	90	85	83	82	81	81	80	82	86	86	87	88	88	89	88	87	86.6	90													
15-Dec	85	85	86	85	85	85	84	85	88	89	85	83	83	78	78	83	88	90	90	89	88	88	79	77	84.9	90													
16-Dec	81	84	86	87	87	81	71	68	69	75	73	69	69	69	69	69	77	83	83	81	80	81	81	80	77.2	87													
17-Dec	79	78	77	73	72	72	72	71	72	73	76	75	75	76	76	77	76	80	81	82	79	79	77	74	75.9	82													
18-Dec	74	74	76	78	77	77	76	75	77	78	76	74	78	75	73	74	75	75	76	76	76	77	76	77	75.9	78													
19-Dec	77	77	76	77	76	74	75	75	75	76	76	73	70	70	71	73	76	78	77	76	76	77	78	79	75.5	79													
20-Dec	82	81	81	81	80	80	80	80	80	80	78	78	77	75	75	78	78	79	79	78	78	78	78	78	78.8	82													
21-Dec	78	78	77	78	81	84	85	84	83	82	79	78	76	77	75	77	80	81	81	81	82	82	83	83	80.3	85													
22-Dec	84	84	85	86	86	86	85	83	83	85	83	81	80	80	80	80	79	82	81	80	78	78	79	78	81.9	86													
23-Dec	77	77	77	77	77	77	77	76	76	75	75	74	74	73	75	75	77	77	77	78	78	77	77	77	76.2	78													
24-Dec	77	76	77	78	79	79	78	77	75	77	77	76	75	74	71	72	74	74	77	77	78	79	78	78	76.4	79													
25-Dec	78	78	77	78	78	78	78	79	78	78	78	77	77	78	79	80	83	84	85	85	80	78	79	80	79.3	85													
26-Dec	82	81	81	80	79	79	79	79	79	79	79	78	77	76	76	76	76	76	76	75	75	75	75	75	77.7	82													
27-Dec	74	75	75	76	76	76	78	77	75	73	72	71	71	72	73	73	74	76	76	77	78	81	80	80	75.4	81													
28-Dec	80	80	81	80	80	81	81	82	83	80	81	80	79	79	78	79	79	79	79	80	84	85	85	85	80.9	85													
29-Dec	84	83	83	84	84	85	84	83	83	84	80	77	77	77	75	75	79	83	84	85	84	85	83	83	81.8	85													
30-Dec	83	81	81	79	80	81	83	86	86	86	82	80	77	74	72	73	79	85	89	90	89	88	87	86	82.3	90													
31-Dec	86	84	83	84	83	82	83	82	83	71	66	64	61	59	61	64	69	74	78	82	79	79	79	81	75.8	86													
	82.9	82.9	83.3	83.4	83.0	82.5	81.9	81.8	81.9	81.3	79.9	78.1	77.2	76.4	76.1	77.5	80.1	82.2	82.9	83.0	82.4	82.4	82.4	82.7	Diurnal Average														
	93	95	96	94	95	94	93	94	94	93	94	93	92	91	91	92	92	93	93	93	93	93	94	94	Diurnal Maximum														





Maximum Speed: 22 km/h on Dec 5 06:00	Maximum Daily Speed Average: 14.7 km/h on Dec 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 10 03:00	Minimum Daily Speed Average: 0.9 km/h on Dec 4	Hours of Data: 744
Maximum Diurnal Speed Average: 2.8 km/h at hour 18	Minimum Diurnal Speed Average: 1.5 km/h at hour 21	Hours of Missing Data: 0
Monthly Average Velocity: 2.1 km/h 137.7 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 4 Median = 6 Q <sub>3</sub> = 9 P <sub>90</sub> = 12 P <sub>99</sub> = 17	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SE7	SE6	SE6	SE7	SE5	SE6	SE7	SE7	SE7	SE7	SE5	SE7	SE11	SE9	SSE12	SSE9	SSE5	SSE6	SSE5	SSE7	SSE3	SSE5	SE4	SE4	SE6.4	SSE12
2-Dec	SE7	SE11	SE9	SE8	SE9	SE9	SE9	SE11	SE13	SE13	SE8	SE8	SE8	SE8	SE8	SE5	SE3	ESE3	SSW1	WSW6	W9	WSW8	W2	WSW9	SSE5.7	SE13
3-Dec	WSW13	WSW18	WSW13	SSE2	S1	SSW2	S3	SSW2	SE4	ESE4	NE3	N2	N6	NNE3	E2	E2	NNE4	NE2	N4	N3	NNE4	NNE4	NNE1	N3	WNW1.0	WSW18
4-Dec	N2	NW2	WNW2	NW2	WNW2	NW2	NW1	WNW1	W5	WSW3	SW6	S2	ESE4	S4	ESE3	SSW4	SSE2	SE2	S1	W1	SSW1	SW1	S2	ESE2	SW0.9	SW6
5-Dec	WNW3	SW2	WNW2	W7	WNW21	NW22	WNW21	WNW22	W20	W18	W16	W14	W16	W13	WSW8	SSW2	SW1	N1	SW1	ESE1	SE1	ESE4	ESE3	ESE5	W7.8	NW22
6-Dec	NNE4	NE2	N2	NNE3	N3	NNE4	NE3	N5	N4	N7	NNE4	N2	NE3	NE1	SSE4	ESE2	SE2	ESE3	SE4	ESE3	E3	ESE5	SE7	SE5	ENE2.0	N7
7-Dec	SE3	SE0	SE2	SE7	SE7	SSE9	SSE9	SSE9	SSE8	SE7	SE11	SSE12	SE9	SE10	ESE3	SE4	SSE5	SE8	SE6	SE6	SE7	SE7	SE5	SE4	SE6.6	SSE12
8-Dec	E3	N3	NNW8	NNW9	NNW6	NW4	NNE1	WSW3	SW1	ESE2	W1	SSW2	S5	S7	SE7	ESE6	E6	ESE6	E5	E10	E10	E9	E8	E7	E2.6	E10
9-Dec	ESE7	ESE9	E9	E7	ESE6	ESE6	SE8	ESE7	SE7	ESE8	SE10	SE9	SE9	SE5	SW3	NW2	WSW3	SSW1	ENE1	SW2	SW5	SSW1	SW3	E2	SE4.1	SE10
10-Dec	SE3	SW1	NNW0	WNW1	WNW2	WSW3	W3	W1	W2	N2	NNW4	N5	NNW5	N6	N5	N5	NNE4	N4	NNE3	ENE3	NE3	NNE2	ENE3	N3	N2.0	N6
11-Dec	NNE2	NNW3	NW0	ESE5	SE7	SE9	SE8	SE8	SE9	SE9	SE8	SE10	SE8	SE7	SE7	ESE6	SE8	SE9	SE11	ESE12	SE11	SE12	SE14	SE12	SE7.8	SE14
12-Dec	SE14	SE15	SE14	SE12	SE12	SE14	SE15	SE17	SE18	SE17	SE18	SE18	SE16	SE14	SE15	SE18	SE15	SE15	SE13	SE13	SE13	SE14	SE12	SE12	SE14.7	SE18
13-Dec	SE11	SE12	SE10	SE12	SE9	ESE11	ESE11	SE9	ESE7	SE8	ESE6	ESE7	ESE8	SE7	SE9	ESE4	ENE2	E3	ENE4	E4	ENE5	SE4	ENE3	NW1	ESE6.6	SE12
14-Dec	E1	NE2	E1	SE2	ENE2	E3	SE3	SW6	WSW3	NNW7	NNW7	N5	NNE3	NNW3	E3	SSE5	ESE2	SSE4	SE5	SE4	SSE4	SE6	SE8	SE8	ESE1.6	SE8
15-Dec	SSE7	SE10	SSE9	SE11	SE12	SE13	SE12	SSE7	SW5	SW7	SW5	WSW4	WSW3	SW6	WSW4	SSE1	S2	SE2	ESE2	E2	SE1	WSW6	W13	NW14	S3.4	NW14
16-Dec	N15	N9	NNW7	N3	WSW3	W9	NW15	NW10	NNW12	WSW7	SW3	WSW7	WSW10	WSW9	W10	SW5	SW4	SW2	SW6	SW4	SW8	WSW9	WSW6	W4	W5.6	NW15
17-Dec	W9	W9	W12	W17	WNW16	WNW13	NW9	WNW14	WNW13	NNW7	NNW6	NNW7	N6	N5	N6	NNW5	NNW6	N5	N4	N6	NNW9	N6	N6	NNE5	NW6.8	W17
18-Dec	NNE4	E4	NE4	E6	E6	E5	E6	SE6	ESE7	SE8	ESE8	ESE6	E4	E4	E9	E9	E10	ESE8	ESE7	E6	E6	ENE5	ESE8	SE7	E6.0	E10
19-Dec	SE11	E9	E9	SE9	SE11	SSE9	SSE8	SSE10	SSE7	SE8	ESE5	SE4	SSE8	SSE7	SSE7	SE7	SE7	SE8	SE11	SE12	SE14	SE10	SE9	SE7	SE8.4	SE14
20-Dec	NNE0	WSW4	WSW4	N3	WSW4	WSW5	WSW6	WSW6	SW4	SW3	SW6	SW7	WSW4	WSW4	SW3	SE9	SE15	SSE16	SE16	SSE12	SSE11	SE13	SE14	SE12	S5.2	SE16
21-Dec	SE10	SE12	SE16	SSE10	SSE8	SSW4	SW5	SW6	SW6	SW7	SW6	SW6	SW5	SW5	SW6	SW7	SW5	SW2	WSW3	NE1	N2	ENE3	NE2	ENE4	S3.8	SE16
22-Dec	NNW8	N8	N6	N4	N7	NNW13	NNW15	N11	N10	NNW9	NNW10	NNW10	NNW11	N8	N9	NNW12	NNW14	NNW12	NNW11	NNW13	NNW13	NNW11	NW10	NNW9	NNW10.0	NNW15
23-Dec	NW10	NNW10	NNW12	NNW13	NNW12	NNW10	NNW10	NNW11	N14	N10	N11	NNW12	NNW11	N10	N12	NNW12	NNW13	NNW10	N10	NNW12	NNW11	NNW10	N10	NNW11	NNW11.1	N14
24-Dec	NNW12	NNW12	NNW8	NNW7	NNW7	NNW6	NNW8	NNW10	NNW9	N7	N5	NNE5	NNE5	NNE6	N5	N3	N2	N3	N1	NNE2	NNE1	SE5	SE7	SE9	N4.1	NNW12
25-Dec	SE9	SE8	SSE7	SE7	SSE7	SE8	SE9	SE9	SE10	SE10	SE9	SE8	SE6	SE6	SE6	SE6	ESE6	ESE5	E5	N5	NNW18	NNW14	NW8	WNW4	SE3.9	NNW18
26-Dec	WNW3	W5	W2	WSW2	W4	W1	W1	SE1	ESE2	SE5	SE8	SE8	ESE5	SE6	ESE5	ESE6	SE8	ESE6	SE8	SE10	SSE9	SSE10	SSE9	SSE11	SE4.3	SSE11
27-Dec	SSE12	SE11	SE14	SE14	SE12	SSE10	SE12	SE11	SE14	SE18	SE19	SE17	SE17	SE17	SE14	SE8	ESE5	SE7	SE8	SE7	SSE3	S4	SSE5	SSE5	SE10.9	SE19
28-Dec	SE7	SE8	SE9	SE7	SE8	SE7	ESE5	ENE2	NNE2	N8	NNW12	NNW11	NNW10	N7	NNW8	N7	N7	N6	NNW5	W2	WNW2	WSW3	WSW1	WSW2	NNE1.8	NNW12
29-Dec	NW2	W3	W3	WNW1	SW2	SSW2	SE8	SE7	SSE5	SE2	SSW6	SE4	SSE7	SSE10	SE11	SE11	SE9	SE8	SE8	SE9	SE7	SE8	ESE8	SE6	SE5.1	SE11
30-Dec	ESE5	S4	W5	WSW8	WSW4	SW6	SW4	S4	SE4	SSE4	SSE4	SSE4	SE8	SSW8	SW12	SSW6	SE4	SE5	SE5	SE4	SSE5	SE6	SE8	SE6	S4.0	SW12
31-Dec	SE7	SE7	SSE6	SE9	SE9	SE8	SE6	SE6	SE5	W6	WNW4	WSW6	SW10	SW8	WSW10	SW10	SW8	WSW10	SW8	SW4	SSW5	S4	S3	SSE5	SSW4.5	WSW10

SE1.9	SE1.9	SE1.6	SE2.3	SSE1.7	SSE1.7	SSE1.9	SSE1.9	SSE1.7	SE2.0	SE1.7	SE1.9	SE2.1	SSE2.4	SSE2.3	SE2.6	ESE2.2	ESE2.8	SE2.8	ESE2.6	SE1.5	SE2.5	SE2.8	SE2.5	Diurnal Average	
N15	WSW18	SE16	W17	WNW21	NW22	WNW21	WNW22	W20	W18	SE19	SE18	SE17	SE17	SE15	SE18	SE15	SSE16	SE16	SE13	NNW18	NNW14	SE14	NW14	Diurnal Maximum	

All monthly, daily, and diurnal averages have been calculated using vector methods



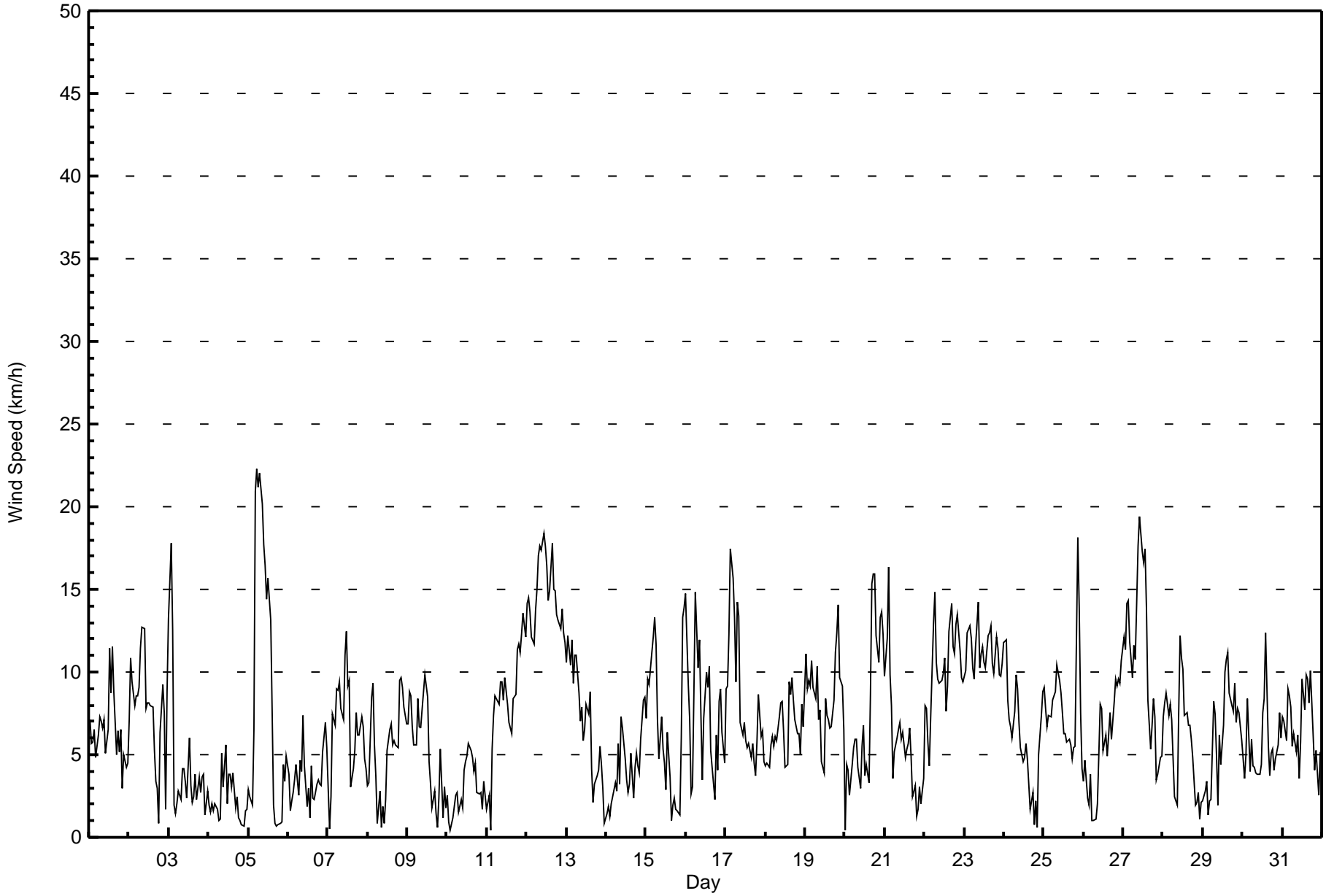
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed (WS) - km/h

Athabasca Valley - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 km/h on Dec 25 20:00																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 0 km/h on Dec 14 14:00																										
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 5																										
Day	Hourly Period Ending At (MST)																							Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24	
1-Dec	2	2	2	3	2	2	2	2	2	2	2	4	4	3	3	3	2	2	2	3	2	2	2	2	4	
2-Dec	3	2	2	2	2	2	2	2	3	3	2	2	2	3	2	2	1	1	2	2	2	2	2	2	4	
3-Dec	4	3	6	1	2	2	2	2	2	3	1	1	2	2	2	1	2	1	2	2	1	2	1	2	6	
4-Dec	2	1	1	1	2	1	1	2	2	2	1	2	2	2	1	2	1	1	1	1	1	1	2	2	2	
5-Dec	1	2	2	3	6	6	4	4	4	4	4	3	4	3	4	1	1	1	1	1	2	2	2	2	6	
6-Dec	1	1	1	1	2	1	1	1	1	3	2	1	2	1	2	2	2	2	2	2	2	2	2	2	3	
7-Dec	2	2	2	2	3	3	3	2	3	2	3	4	3	3	3	2	3	2	2	3	1	1	1	1	4	
8-Dec	1	1	2	2	2	1	1	2	1	1	2	2	2	2	2	2	2	1	1	2	2	2	1	2	2	
9-Dec	2	2	2	2	2	2	2	2	2	3	3	3	2	2	1	1	2	1	1	2	1	2	1	2	3	
10-Dec	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	2	3	1	2	2	2	1	1	3	
11-Dec	1	2	1	2	1	1	2	1	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	2	3	
12-Dec	3	3	3	2	2	3	3	4	4	4	4	4	4	3	4	4	4	4	3	3	3	3	3	3	4	
13-Dec	2	2	2	3	3	3	3	3	2	3	2	2	3	2	2	2	1	1	1	1	2	2	1	2	3	
14-Dec	1	1	1	1	1	2	1	1	1	2	2	1	1	0	2	1	1	1	1	1	2	3	2	2	3	
15-Dec	2	2	2	3	3	2	3	3	2	3	3	3	2	1	2	2	2	1	1	2	2	6	4	5	6	
16-Dec	4	2	2	1	2	2	3	2	2	2	2	2	3	2	4	2	2	1	2	2	3	2	1	1	4	
17-Dec	3	2	3	2	2	3	2	2	2	2	1	2	1	1	1	1	2	1	1	2	2	2	2	1	3	
18-Dec	1	1	1	1	2	1	1	2	1	2	2	1	1	2	2	2	2	2	2	2	2	2	3	2	3	
19-Dec	2	2	3	2	2	2	2	3	2	2	2	2	2	1	2	2	2	3	3	3	3	3	2	3	3	
20-Dec	1	2	3	1	2	1	2	2	2	2	4	3	2	1	1	3	4	4	3	3	3	3	3	3	4	
21-Dec	3	4	3	4	3	2	2	2	2	2	3	2	2	2	1	2	2	2	1	2	1	1	2	2	4	
22-Dec	3	2	2	1	3	2	3	2	2	2	2	2	2	1	2	3	3	3	2	2	2	2	2	2	3	
23-Dec	2	2	2	2	3	3	2	2	3	3	2	2	2	2	3	3	2	2	2	3	2	2	2	3	3	
24-Dec	2	3	2	2	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	3	
25-Dec	2	2	2	1	1	1	1	2	2	2	1	1	1	1	1	2	1	1	1	1	6	4	3	1	1	6
26-Dec	1	1	2	1	1	1	2	2	2	3	2	1	1	2	2	3	2	2	3	2	2	3	2	3	3	
27-Dec	3	3	3	3	3	2	3	3	3	5	4	4	4	4	4	2	3	3	2	2	3	2	1	1	5	
28-Dec	1	2	2	1	1	1	1	1	1	2	2	2	2	1	1	1	1	2	2	2	1	1	1	1	2	
29-Dec	1	1	1	1	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2	3	2	2	2	1	3	
30-Dec	2	3	5	2	2	2	2	1	1	1	1	2	2	4	3	3	1	2	1	1	1	2	1	2	5	
31-Dec	1	1	2	2	2	3	1	2	2	4	2	2	2	2	2	3	3	2	3	2	2	2	2	1	4	
																		Diurnal Maximum								
																		4 4 6 4 6 6 4 4 4 5 4 4 4 4 4 4 4 4 3 6 4 6 4 5								





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Athabasca Valley - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	303	40.73	40.73
6 - 11	335	45.03	85.75
12 - 19	101	13.58	99.33
20 - 28	5	0.67	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Athabasca Valley - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	33	23	11	12	18	27	39	21	12	15	25	22	17	13	8	7	303
6 - 11	25	1	0	0	17	26	142	30	1	3	20	18	7	0	5	40	335
12 - 19	3	0	0	0	0	1	54	5	0	0	1	3	8	5	2	19	101
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	0	5
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	61	24	11	12	35	54	235	56	13	18	46	43	33	21	16	66	744

Total Number of Valid Hours: 744

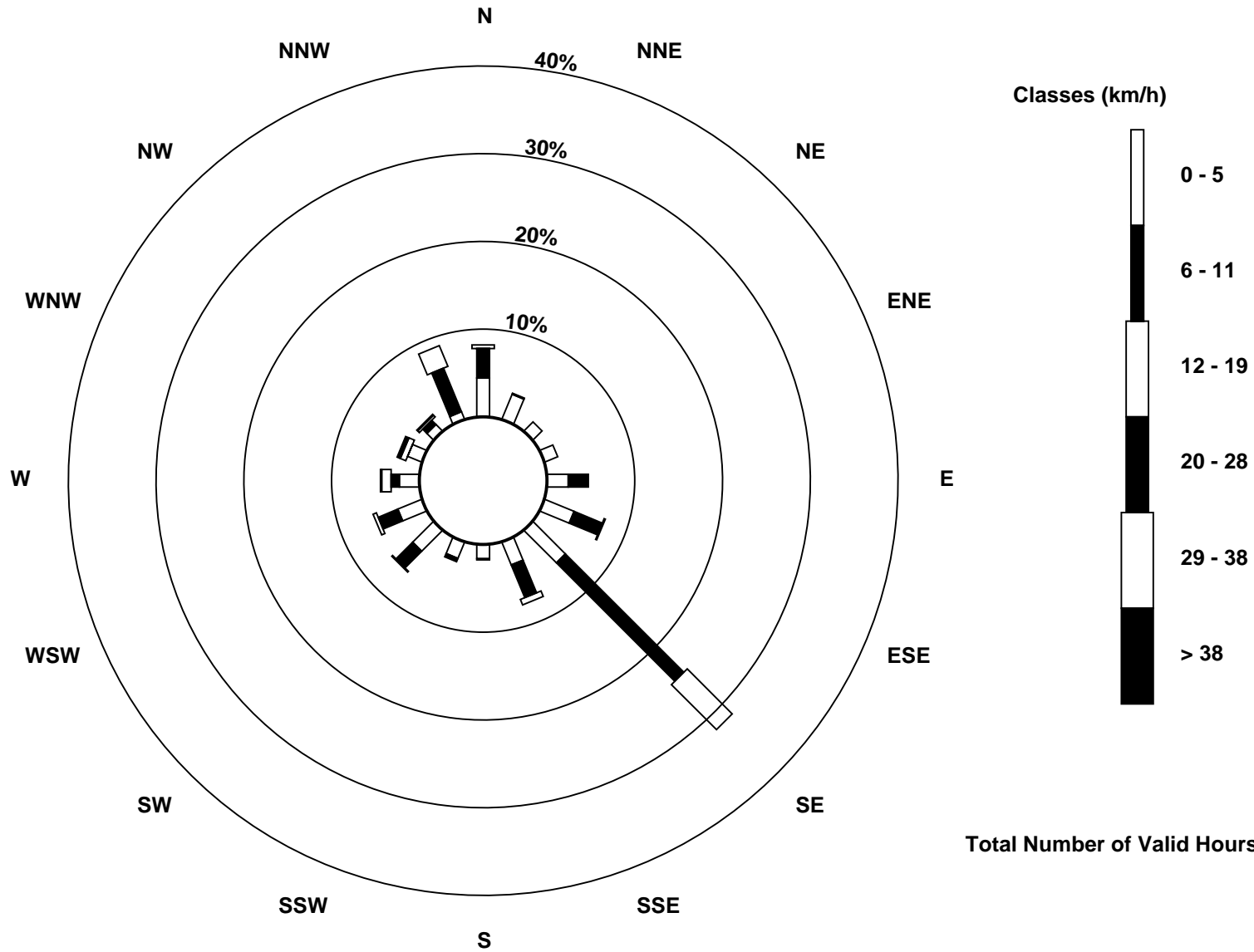
Total Number of Hours: 744





Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
Athabasca Valley (AMS 7)





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Athabasca Valley - December 2015**

Direction of Maximum Speed: 307 deg on Dec 5 06:00 Direction of Maximum Daily Speed Average: 132.1 deg on Dec 12	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0
Direction of Minimum Speed: 345 deg on Dec 10 03:00 Direction of Minimum Daily Speed Average: 0.9 deg on Dec 4	Percent Operational Time: 100.0
Monthly Average Direction: 233.0 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	137	142	143	142	146	137	141	144	137	129	126	140	145	142	147	150	154	151	164	156	157	153	136	145	144.1
2-Dec	140	144	140	136	130	133	135	137	137	137	135	134	135	141	139	142	130	115	201	251	260	245	264	255	149.4
3-Dec	254	256	248	164	177	193	176	207	126	112	36	6	357	15	83	96	27	56	357	10	22	14	12	350	293.9
4-Dec	355	314	302	311	289	305	322	302	276	245	228	179	108	191	120	195	158	127	172	263	213	214	182	123	220.4
5-Dec	284	229	297	269	298	307	286	288	279	273	277	274	272	268	248	198	236	352	230	111	146	122	104	122	279.5
6-Dec	29	36	2	19	7	17	37	360	359	358	16	357	47	38	154	109	126	113	138	116	99	111	139	127	62.1
7-Dec	133	128	126	140	140	149	147	154	150	144	146	152	144	146	113	127	147	139	141	142	130	133	134	131	142.3
8-Dec	101	0	341	347	346	326	20	253	232	110	276	204	174	176	127	118	93	104	84	90	90	85	84	101	84.3
9-Dec	118	108	96	101	103	110	134	111	131	119	131	128	138	142	214	306	248	209	72	225	221	206	214	92	129.6
10-Dec	137	216	345	296	283	239	266	261	265	10	346	359	348	350	1	351	16	351	30	57	34	28	66	10	355.1
11-Dec	25	342	308	121	134	131	135	132	127	132	131	134	135	138	144	116	133	132	126	122	128	132	132	132	129.7
12-Dec	127	130	129	134	133	135	130	131	132	134	130	134	132	133	130	133	132	132	133	133	132	132	135	139	132.1
13-Dec	139	140	134	131	125	119	122	129	120	130	109	107	123	125	130	117	74	98	70	82	72	133	69	316	120.8
14-Dec	94	55	92	130	68	94	141	236	246	346	337	349	18	336	86	155	104	153	130	139	155	144	130	136	117.6
15-Dec	149	131	147	146	144	144	145	161	214	230	232	254	238	236	243	148	189	141	107	92	138	238	277	325	181.2
16-Dec	355	349	331	352	238	272	306	318	287	237	221	242	255	249	275	217	236	224	232	233	232	249	249	268	274.6
17-Dec	268	265	276	280	282	287	315	286	287	331	340	345	356	10	351	345	327	3	358	354	346	2	2	13	311.9
18-Dec	20	84	45	90	93	86	89	146	103	135	120	106	79	92	96	100	95	103	107	99	91	78	105	131	99.4
19-Dec	135	101	99	129	142	150	152	148	161	140	106	144	160	158	148	132	132	128	144	138	142	142	138	138	138.3
20-Dec	29	244	238	3	254	240	245	239	233	221	235	235	244	242	220	139	144	148	145	149	152	142	135	140	171.7
21-Dec	145	144	139	150	152	197	220	231	223	219	223	226	222	217	223	229	228	230	251	34	2	73	53	67	185.9
22-Dec	336	351	354	359	357	345	345	355	353	346	347	347	338	349	353	341	339	344	333	340	336	342	326	332	343.5
23-Dec	317	337	344	341	343	344	337	330	349	352	353	344	344	354	350	348	344	347	349	348	341	346	349	344	344.2
24-Dec	345	343	343	341	331	348	342	340	347	356	359	30	18	18	355	10	2	6	9	32	26	141	143	143	357.8
25-Dec	140	146	148	140	148	142	142	142	136	137	137	133	129	130	130	143	121	113	82	357	335	341	316	283	127.0
26-Dec	290	264	280	254	261	270	269	128	115	129	137	140	118	124	112	120	131	119	131	140	147	148	149	149	142.4
27-Dec	147	145	143	145	140	152	145	141	139	134	135	133	134	134	132	127	108	131	144	140	162	188	150	147	139.2
28-Dec	141	138	138	138	141	133	113	69	22	357	343	346	342	353	342	349	357	356	345	275	285	244	240	246	17.2
29-Dec	304	273	272	300	229	209	135	138	156	136	193	131	147	155	145	142	135	134	137	143	134	129	118	125	145.2
30-Dec	121	177	264	253	252	231	214	171	138	164	158	148	146	202	220	192	143	142	140	127	148	136	135	137	175.0
31-Dec	134	140	150	143	140	137	141	142	130	261	285	245	228	231	245	235	236	239	229	222	213	177	170	156	195.3

128.1 141.9 138.3 137.4 150.1 152.6 149.8 168.4 160.4 142.5 136.2 140.8 142.4 156.9 147.4 133.7 120.3 121.9 128.2 120.9 124.0 130.5 128.8 130.8  
 Diurnal Average

All monthly, daily, and diurnal averages have been calculated using vector methods



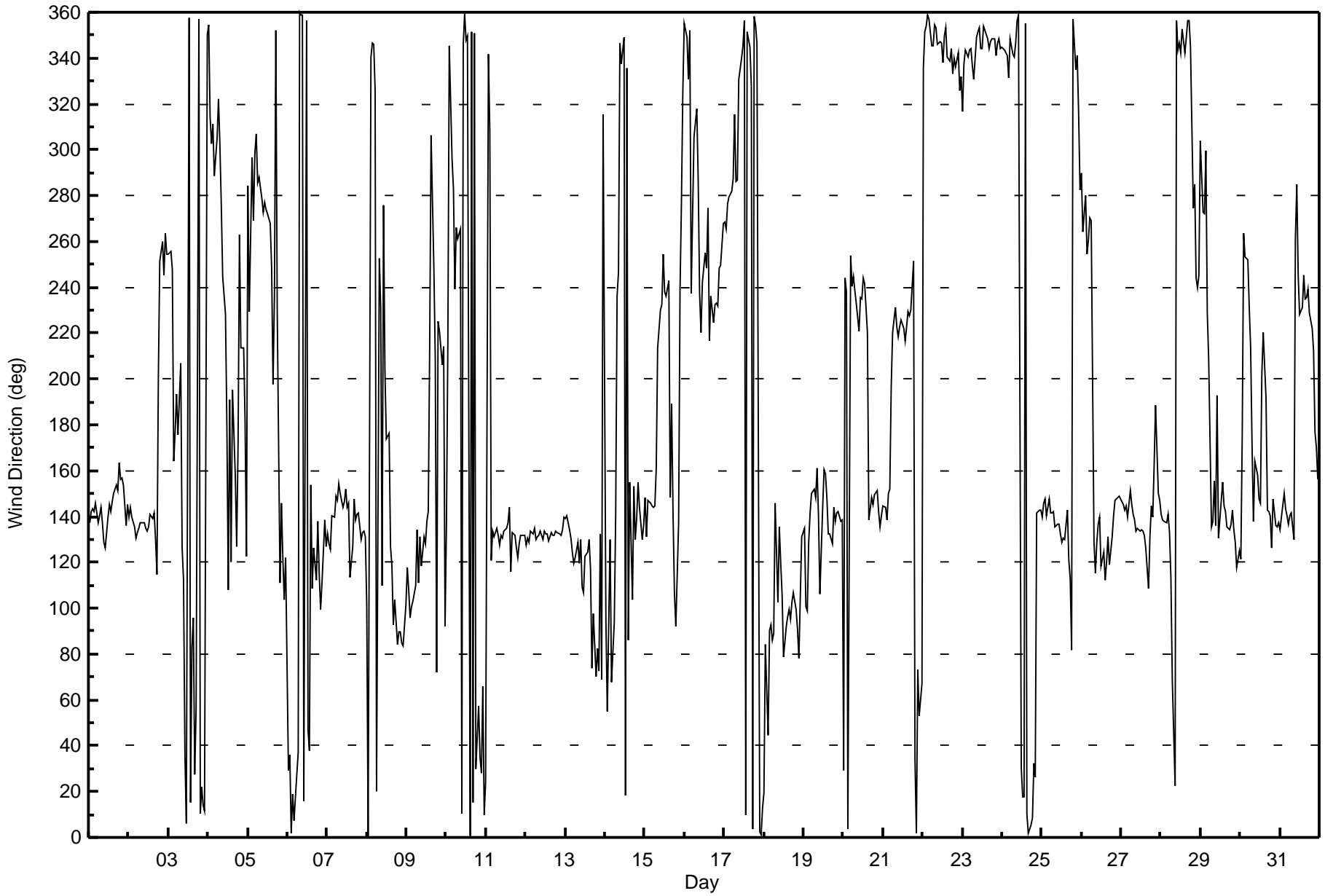
**Wood Buffalo Environmental Association**

**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**

**Athabasca Valley - December 2015**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 99 deg on Dec 20 01:00																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Minimum Value: 7 deg on Dec 25 21:00																									
Percentiles: P <sub>1</sub> = 9 P <sub>10</sub> = 12 Q <sub>1</sub> = 15 Median = 20 Q <sub>3</sub> = 40 P <sub>90</sub> = 64 P <sub>99</sub> = 92																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	16	20	21	18	30	18	14	15	19	21	50	41	20	31	14	20	28	22	27	20	53	29	43	34	53
2-Dec	20	15	16	16	14	14	20	13	14	15	19	20	15	23	18	19	26	43	89	28	19	30	93	18	93
3-Dec	10	9	73	79	72	73	55	68	36	57	33	54	22	53	45	39	57	54	35	51	39	40	71	49	79
4-Dec	61	38	43	75	51	53	69	59	31	50	14	69	55	49	54	54	64	60	76	75	69	79	84	72	84
5-Dec	58	62	66	32	13	12	11	10	12	12	13	14	12	14	28	51	88	69	95	85	95	57	63	37	95
6-Dec	27	46	40	24	48	22	33	26	25	18	38	51	49	83	43	57	86	68	68	72	55	31	22	29	86
7-Dec	71	99	81	23	33	20	22	22	32	32	22	20	32	24	83	34	40	17	18	30	16	14	33	29	99
8-Dec	25	45	15	14	23	45	76	53	85	78	86	80	44	33	30	29	22	24	21	16	13	13	11	22	86
9-Dec	25	20	16	18	22	25	24	22	23	23	16	20	18	37	36	42	40	81	30	66	12	82	28	58	82
10-Dec	61	79	76	44	25	62	44	51	24	66	17	21	23	15	15	22	22	57	34	57	49	57	16	44	79
11-Dec	50	49	85	33	15	10	13	12	15	15	18	14	16	17	18	21	16	16	16	16	15	14	13	14	85
12-Dec	13	13	13	13	14	13	13	13	13	13	13	15	15	16	15	14	15	14	14	16	16	15	16	16	16
13-Dec	14	14	14	17	19	20	18	20	24	21	26	22	21	19	15	32	45	30	22	25	30	46	43	77	77
14-Dec	72	51	88	60	48	40	48	14	69	16	15	15	20	16	31	18	65	29	17	28	30	25	11	17	88
15-Dec	16	14	16	16	13	13	13	32	24	50	32	59	75	17	33	87	67	74	88	80	88	97	27	11	97
16-Dec	18	14	11	21	35	25	19	21	10	22	62	20	13	17	18	29	16	68	24	73	45	11	17	27	73
17-Dec	16	12	11	8	9	14	18	9	9	23	20	16	16	18	15	19	32	15	18	19	12	17	20	22	32
18-Dec	32	12	21	8	24	13	16	32	19	18	21	22	24	42	15	17	14	20	25	23	20	25	22	37	42
19-Dec	14	19	19	21	15	17	19	16	26	20	35	72	18	17	18	18	34	22	15	17	13	18	18	55	72
20-Dec	99	45	60	45	33	24	25	14	50	58	34	35	53	11	50	16	12	14	13	19	19	13	13	13	99
21-Dec	19	17	13	18	22	52	17	12	14	15	18	10	18	17	10	10	26	75	55	77	60	37	67	39	77
22-Dec	13	19	18	20	20	10	11	17	17	13	16	14	10	14	16	17	11	12	12	9	9	13	10	13	20
23-Dec	12	11	12	10	12	12	13	12	14	15	17	13	13	16	15	14	11	14	14	14	9	12	14	11	17
24-Dec	12	10	15	14	15	14	14	16	12	14	17	14	19	19	18	22	35	19	60	38	62	33	17	16	62
25-Dec	14	20	25	15	15	12	13	11	9	11	11	12	16	22	31	33	22	21	13	46	7	11	13	24	46
26-Dec	32	18	35	54	44	82	96	86	62	41	17	16	29	22	46	43	19	32	27	15	19	17	19	18	96
27-Dec	15	14	13	12	15	14	14	18	16	14	13	14	14	12	17	22	33	18	24	18	40	40	29	21	40
28-Dec	13	14	11	12	12	9	33	43	32	17	9	10	9	14	10	15	15	21	25	61	59	31	66	25	66
29-Dec	31	23	29	75	74	81	15	21	37	77	32	40	18	11	9	12	15	16	15	19	19	19	25	28	81
30-Dec	50	78	58	20	42	20	57	45	50	32	38	39	21	51	16	51	39	28	26	29	39	25	11	19	78
31-Dec	14	14	21	9	11	19	18	37	41	65	72	31	12	13	8	15	12	13	25	45	49	41	49	18	72
Diurnal Maximum																									
99 99 88 79 74 82 96 86 85 78 86 80 75 83 83 87 88 81 95 85 95 97 93 77																									





# Wood Buffalo Environmental Association SO2 Calibration Report

## Station Information

Calibration Date	December 2, 2015	Last Calibration	November 12, 2015
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	7:15	End Time (MST)	10:45
Gas Cert Reference	S970259A	Station temp.	18 Deg C
Cal Gas Concentration	50 ppm	Cal Gas Exp Date	26/09/2017
Calibrator Make/Model	Sabio 4010	Serial Number	11021107
ZAG Make/Model	API 701	Serial Number	1864
DACS make/model	Campbell Scientific CR3000	DACS serial No.	5564

## Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	-619	-619
Analyzer IP address	192.168.1.103		Lamp voltage	804	803
Calculated slope	1.000245	1.008011	Chamber temp	43.9	43.9
Calculated intercept	1.740311	1.101819	Pressure	684.9	689.0
Analyzer Background	18.4	18.4	Flow	0.473	0.474
Analyzer Coefficient	1.084	1.084	Intensity	43592	43668

Analyzer make Thermo 45C Analyzer serial # 630718530

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.1	----
as found span	5000	60.7	607.0	601.5	1.009
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	60.7	607.0	601.5	1.009
second point	5000	30.4	304.0	300.2	1.013
third point	5000	15.2	152.0	148.6	1.023
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	60.7	607.0	601.9	1.008
Average Correction Factor					1.015

Corrected As found 601.6 Previous response 605.1 % change 0.6%

**Notes:**

filter changed out, no maintenance or adjustments done,

Calibration Performed By: Melissa Lemay



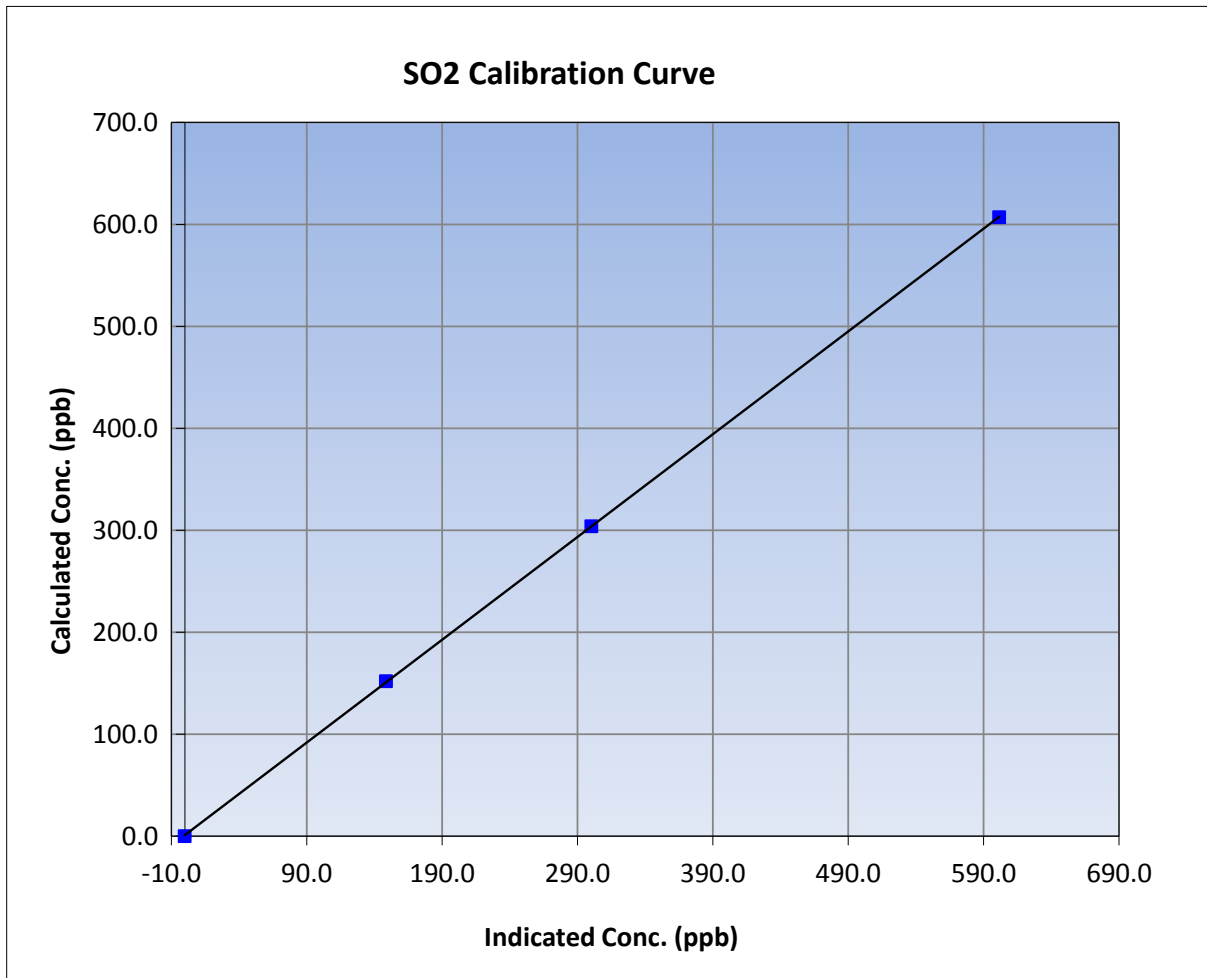
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 12, 2015
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	7:15	End Time (MST)	10:45
Analyzer make	Thermo 45C	Analyzer serial #	630718530

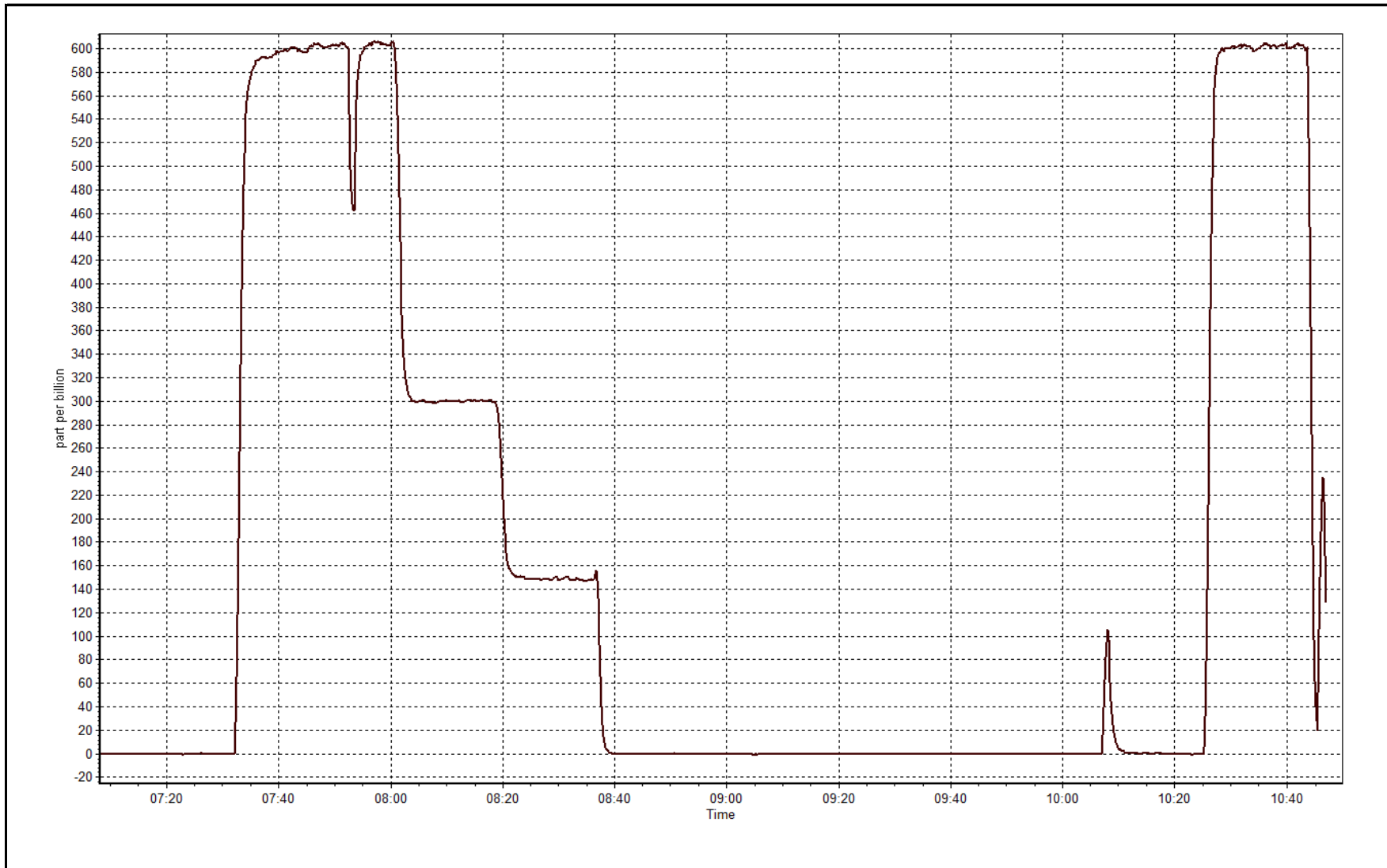
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999988
607.0	601.5	1.0091		
304.0	300.2	1.0127	Slope	1.008011
152.0	148.6	1.0229		
			Intercept	1.101819



SO2 Calibration Plot

Date: December 2, 2015





# Wood Buffalo Environmental Association

## TRS Calibration Report

### Station Information

Calibration Date	December 17, 2015	Last Calibration	November 9, 2015
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	11:20	End Time (MST)	13:47
Gas Cert Reference	ALM052589	Station temp.	22 Deg C
Cal Gas Concentration	5.02 ppm	Cal Gas Exp Date	21/12/2012
Calibrator Make/Model	Sabio 4010	Serial Number	8400311
Dil air Make/Model	API 701	Serial Number	1864
DACS make/model	Campbell Scientific CR3000	DACS serial No.	5564
SO2 gas concentration	50.8 ppm	SO2 gas cert/exp	8400311 9/Sep/17

### Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-699	-699
Analyzer IP address	192.168.1.44		Lamp voltage	1096	1102
Calculated slope	1.003902	0.992369	Chamber temp	45	45
Calculated intercept	-0.067652	-0.192492	Pressure	702.5	705.9
Analyzer Background	2.42	2.42	Flow	0.435	0.435
Analyzer Coefficient	1.118	1.118	Intensity	72	72
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-LTE		Analyzer serial #	1507864683	
Converter make/model	CDN-101		Converter serial #	503	

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	0.1	----
as found span	6000	89.6	75.0	75.6	0.992
SO2 scrubber check	5000	15.2	154.4	0.6	----
calibrator zero	6000	0.0	0.0	0.1	----
high point	6000	89.6	75.0	75.6	0.992
second point	6000	50.2	42.0	42.7	0.984
third point	6000	29.9	25.0	25.5	0.981
as left zero	6000	0.0	0.0	0.2	----
as left span	6000	89.6	75.0	76.3	0.983
Average Correction Factor					0.985

Corrected As found	75.6	Previous response	74.7	% change	-1.1%
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Notes:

no adjustments or maintenance done, filter changed out

Calibration Performed By:

Melissa Lemay





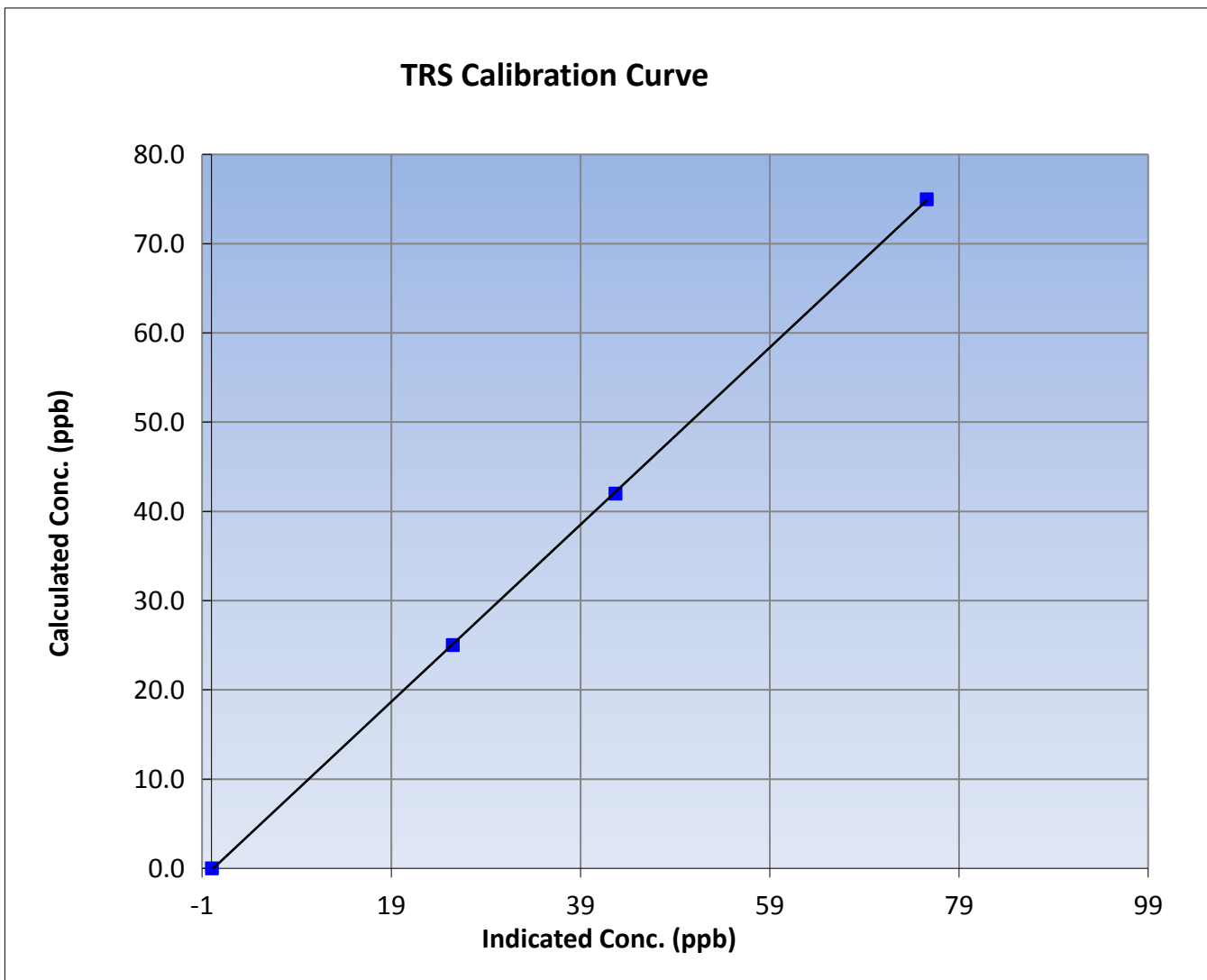
# Wood Buffalo Environmental Association TRS Calibration Report

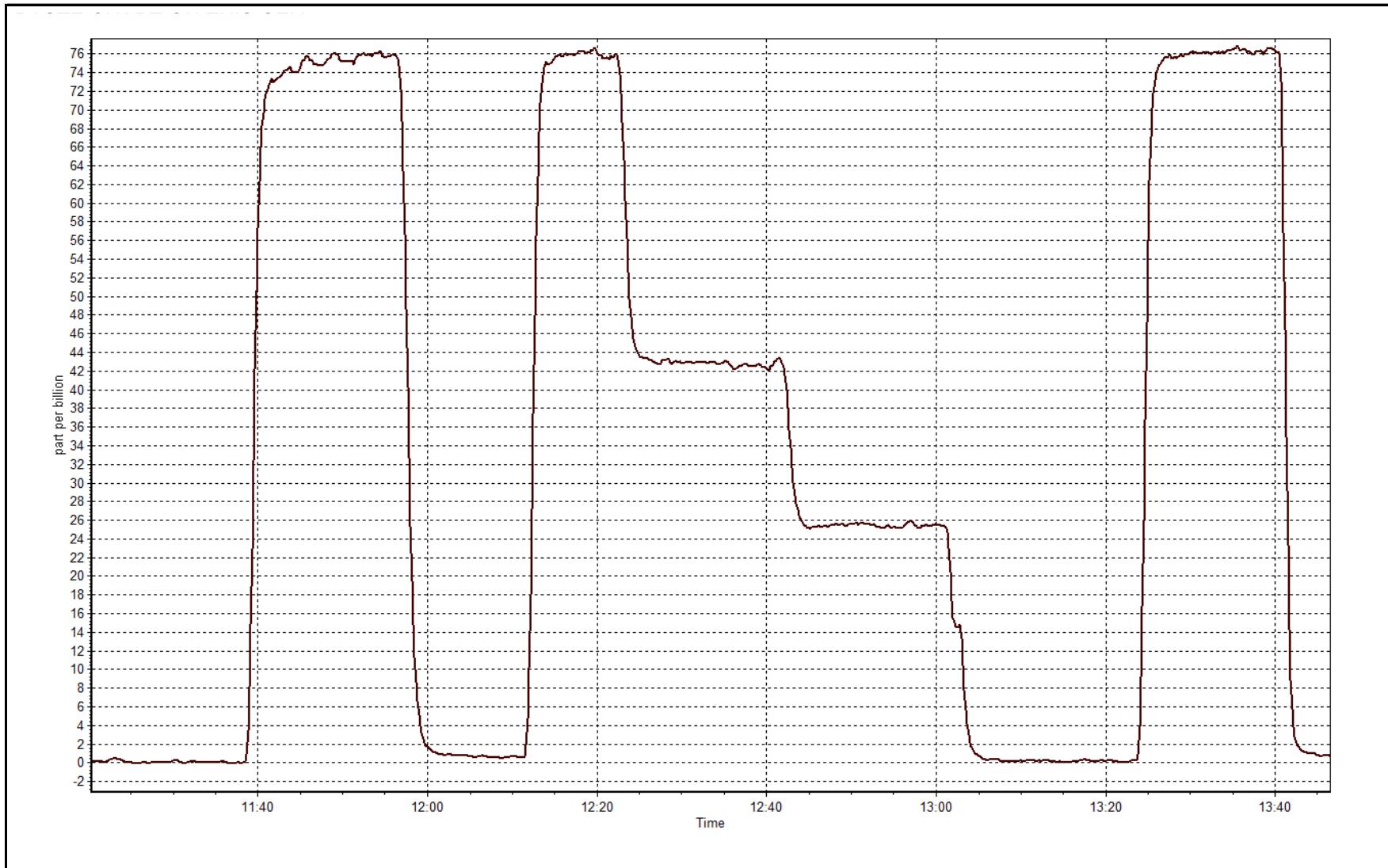
## Station Information

Calibration Date	December 17, 2015	Previous Calibration	November 9, 2015
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	11:20	End Time (MST)	13:47
Analyzer make	Thermo 43i-LTE	Analyzer serial #	1507864683

## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999973
75.0	75.6	0.9916		
42.0	42.7	0.9836	Slope	0.992369
25.0	25.5	0.9810		
			Intercept	-0.192492







## Wood Buffalo Environmental Association THC / NMHC Calibration Report

### Station Information

Calibration Date	December-02-15	Last Calibration	November-12-15
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	7:15	End Time (MST)	10:45
Gas Cert Reference	S970259A	Cal Gas Expiry Date	9/26/2017
CH4 Cal Gas Conc.	490.0 ppm	CH4 Equiv Conc.	1040.0 ppm
C3H8 Cal Gas Conc.	200.0 ppm	Station temp.	22 Deg C
Calibrator Model	Sabio 4010	Serial Number	11021107
ZAG make/model	Teledyne API 701	Serial Number	1864
DACS make/model	Campbell Scientific CR3000	Serial Number	5564

### Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.0	75.0
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
Analyzer IP address	192.168.1.55		Flame Temp	286.9	283.5
THC Calc slope	1.001557	1.007320	Carrier Pressure	36.8	36.8
THC Calc intercept	0.046579	0.042741	Fuel Pressure	42.1	42.1
NMHC Calc slope	1.002353	1.010684	Air Pressure	32.2	32.2
NMHC Calc intercept	0.026451	0.022587			

Analyzer make Thermo 55i Analyzer serial # 1426262594

### THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	60.7	12.63	12.52	1.008
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	60.7	12.63	12.52	1.008
second point	5000	30.4	6.32	6.19	1.022
third point	5000	15.2	3.16	3.07	1.030
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	60.7	12.63	12.44	1.015
Average Correction Factor					1.020

Corrected As found 12.52 Previous response 12.56 % change 0.3%

**Notes:**

No maintenance or adjustments done, filter changed out,

Calibration Performed By: Melissa Lemay



## Wood Buffalo Environmental Association THC / NMHC Calibration Report

### NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	60.7	6.68	6.60	1.012
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	60.7	6.68	6.60	1.012
second point	5000	30.4	3.34	3.26	1.026
third point	5000	15.2	1.67	1.62	1.032
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	60.7	6.68	6.54	1.021
Average Correction Factor					1.023

Corrected As found      6.60      Previous response      6.63      % change      0.5%

### CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	60.7	5.95	5.93	1.003
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	60.7	5.95	5.93	1.003
second point	5000	30.4	2.98	2.93	1.017
third point	5000	15.2	1.49	1.45	1.027
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	60.7	5.95	5.90	1.008
Average Correction Factor					1.016

Corrected As found      5.93      Previous response      5.92      % change      -0.1%



# Wood Buffalo Environmental Association

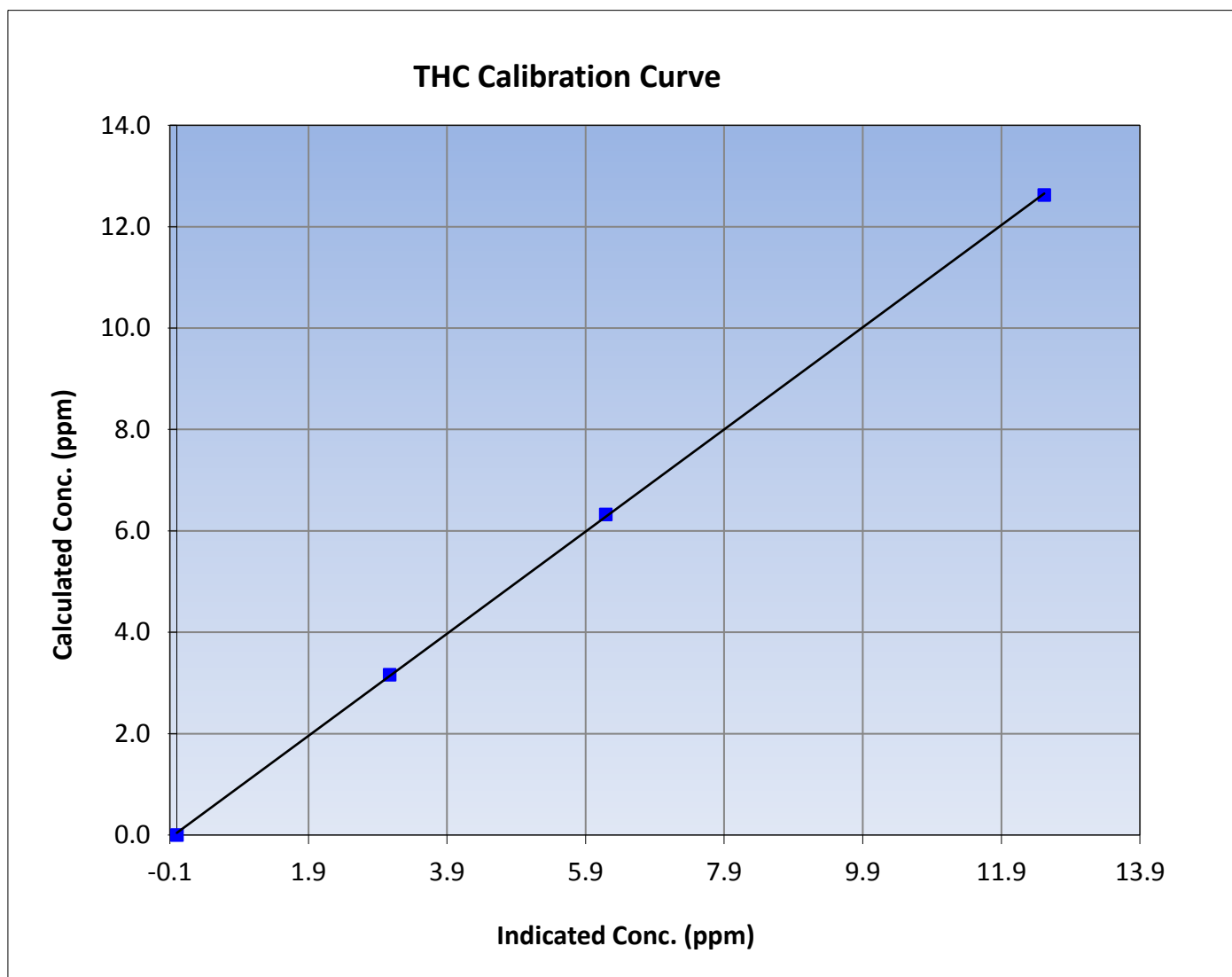
## THC Calibration Summary

### Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 12, 2015
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	7:15	End Time (MST)	10:45
Analyzer make	Thermo 55i	Analyzer serial #	1426262594

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999938
12.63	12.52	1.0084		
6.32	6.19	1.0215	Slope	1.007320
3.16	3.07	1.0298		
			Intercept	0.042741





# Wood Buffalo Environmental Association

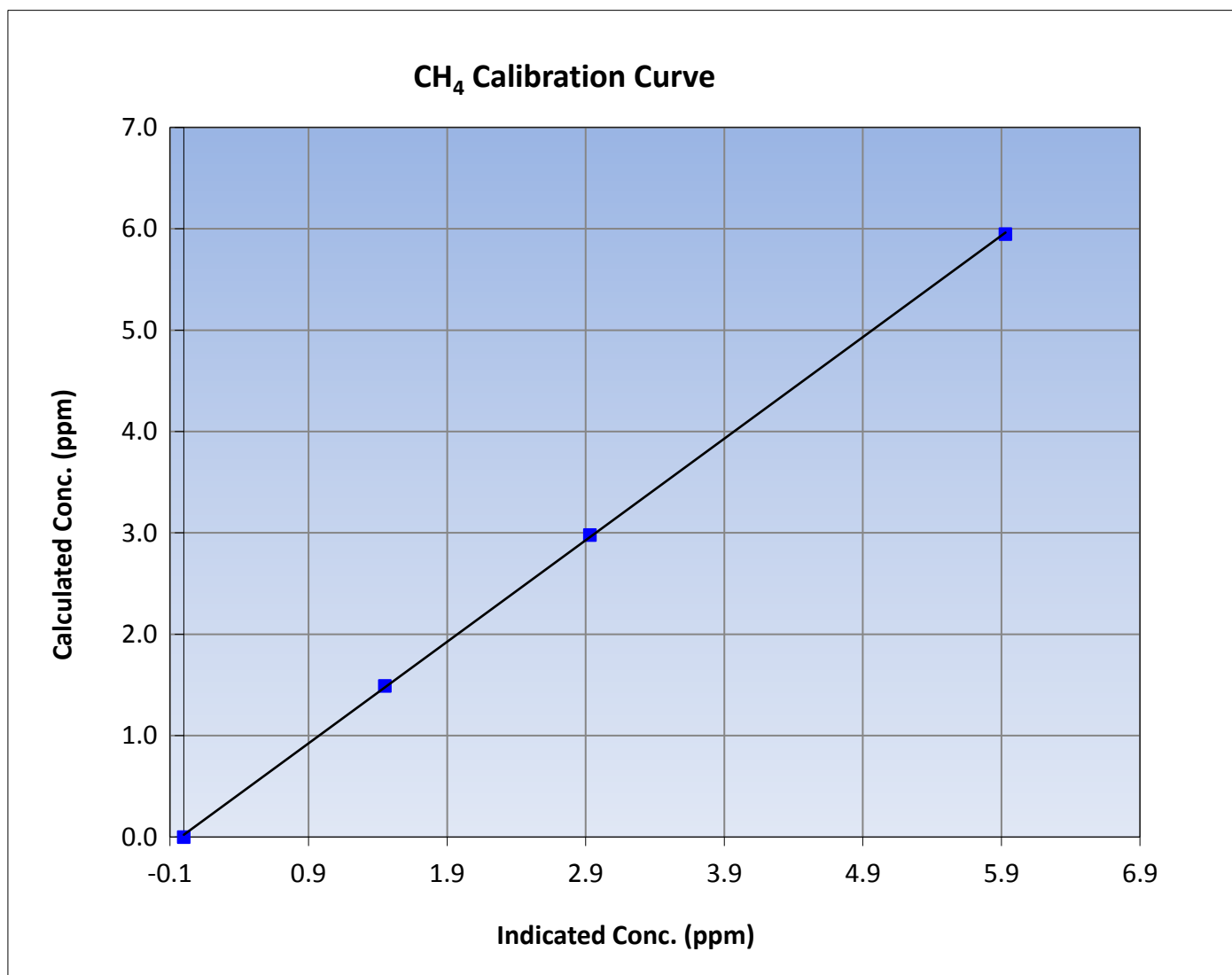
## CH<sub>4</sub> Calibration Summary

### Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 12, 2015
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	7:15	End Time (MST)	10:45
Analyzer make	Thermo 55i	Analyzer serial #	1426262594

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999928
5.95	5.93	1.0031		
2.98	2.93	1.0168	Slope	1.001818
1.49	1.45	1.0273		
			Intercept	0.022164





# Wood Buffalo Environmental Association

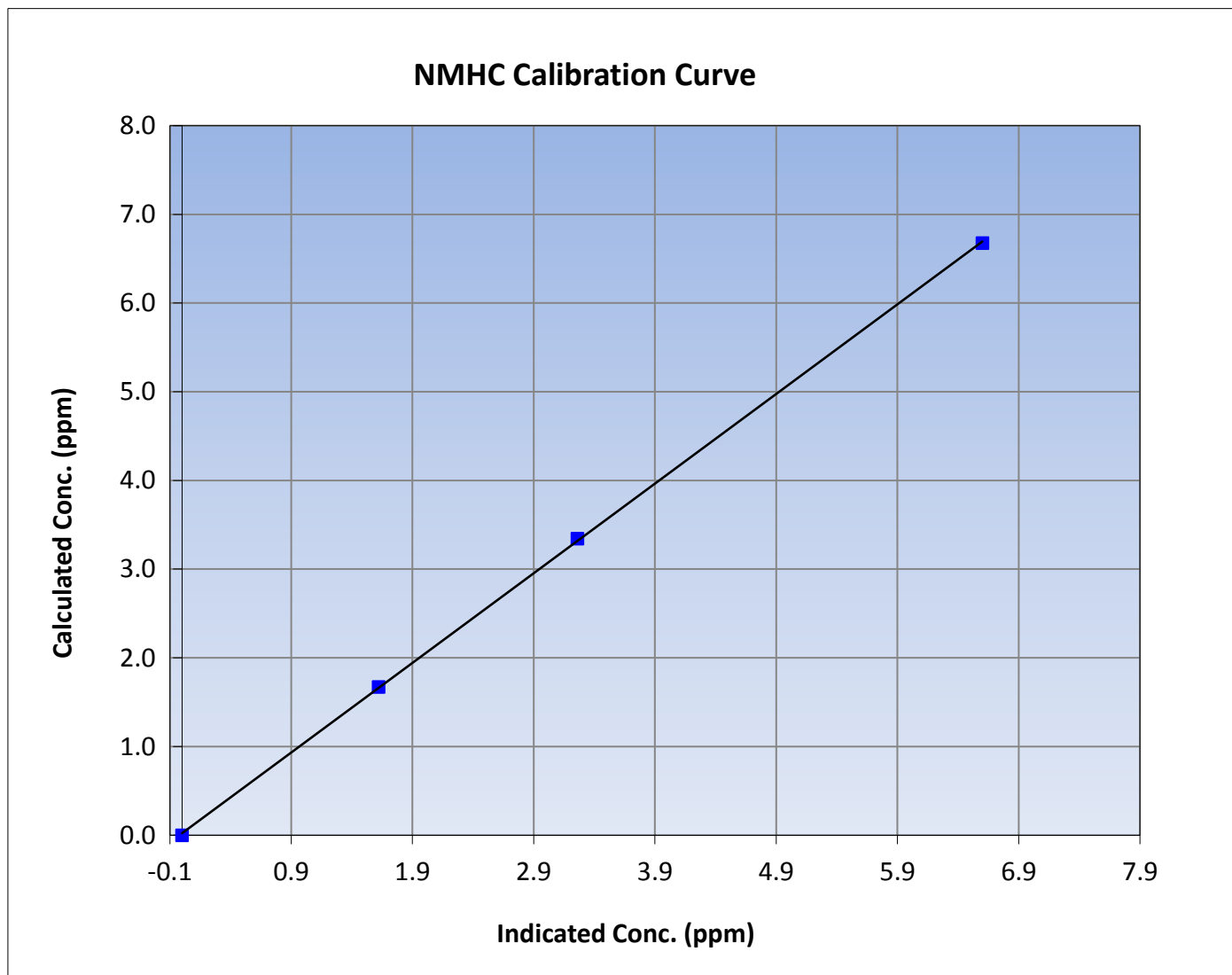
## NMHC Calibration Summary

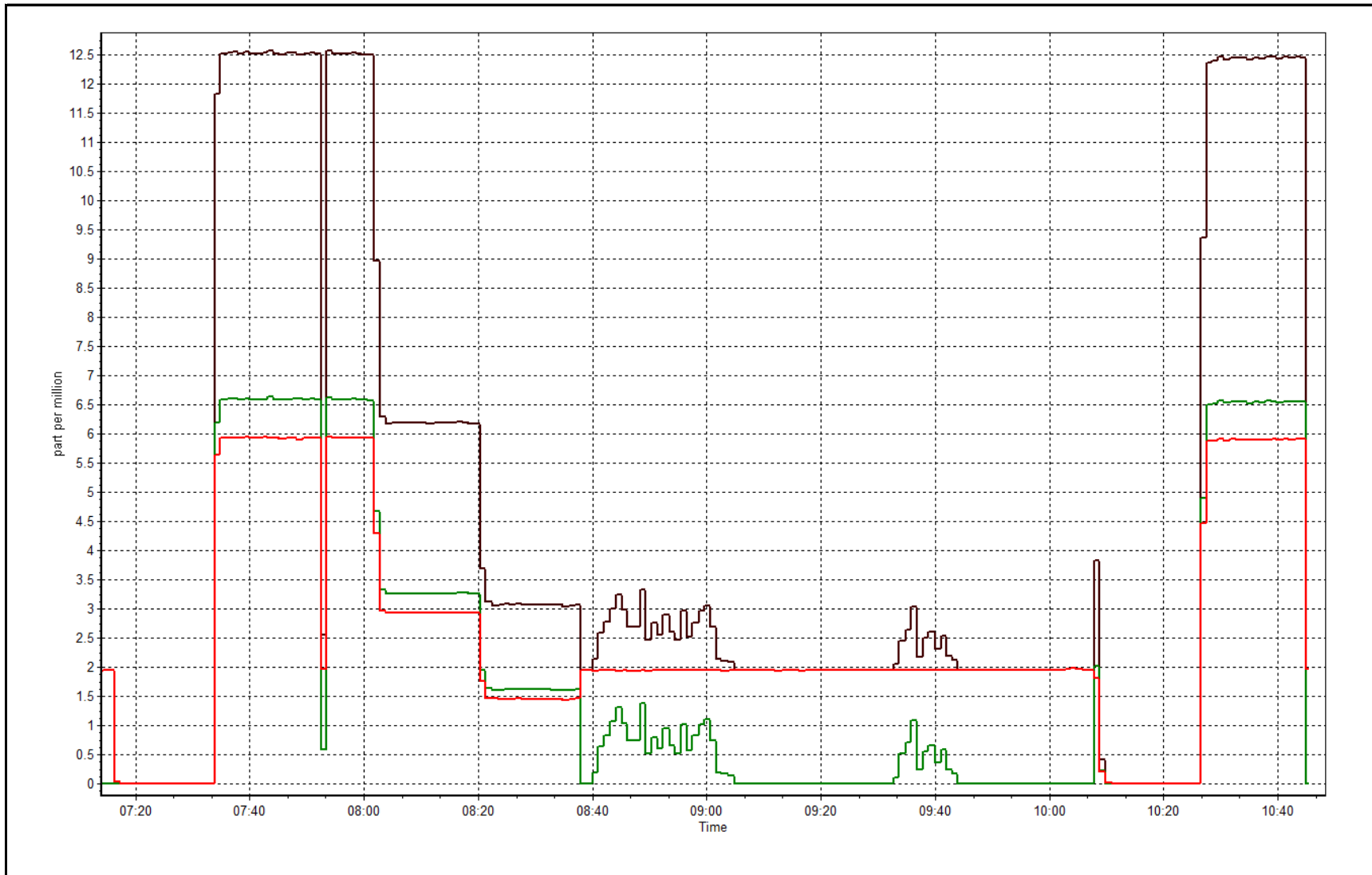
### Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 12, 2015
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	7:15	End Time (MST)	10:45
Analyzer make	Thermo 55i	Analyzer serial #	1426262594

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999933
6.68	6.60	1.0117		
3.34	3.26	1.0258	Slope	1.010684
1.67	1.62	1.0321		
			Intercept	0.022587









# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Report

### Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 12, 2015
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	10:45	End Time (MST)	13:11
NO2 GPT Ref date	December-02-15	Transfer Standard	GPT
Calibrator Make/Model	Sabio 4010	Station temp.	22 Deg C
ZAG make/model	Teledyne API 701	Serial Number	11021107
DACS make/model	Campbell Scientific CR3000	Serial Number	1864
		Serial Number	5564

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	27.1	28.2
Analyzer IP address	192.168.1.49		Lamp temp.	67.9	67.9
Calculated slope	1.014090	0.998100	Pressure	715.6	703.5
Calculated intercept	0.581497	0.392220	Flow cell A	0.738	0.731
Analyzer Background	0.2	0.2	Flow cell B	0.748	0.742
Analyzer Coefficient	0.939	0.958	Cell A Intensity	89831	88282
			Cell B Intensity	84561	81071

Analyzer make	TEI 49i	Analyzer serial #	1507964700
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### Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.00	0.0	-0.2	----
as found span	5000	1.22	344.2	337.0	1.021
calibrator zero	5000	0.00	0.0	-0.2	----
high point	5000	1.22	344.2	344.6	0.999
second point	5000	0.70	173.3	173.0	1.002
third point	5000	0.43	87.6	87.3	1.003
as left zero	5000	0.00	0.0	-0.2	----
as left span	5000	1.22	344.2	333.0	1.034
Average Correction Factor					1.001

Corrected As found	337.2	Previous response	338.8	% change	0.5%
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**Notes:**

Filter changed out, no maintenance done, span adjusted

Calibration Performed By:

Melissa Lemay



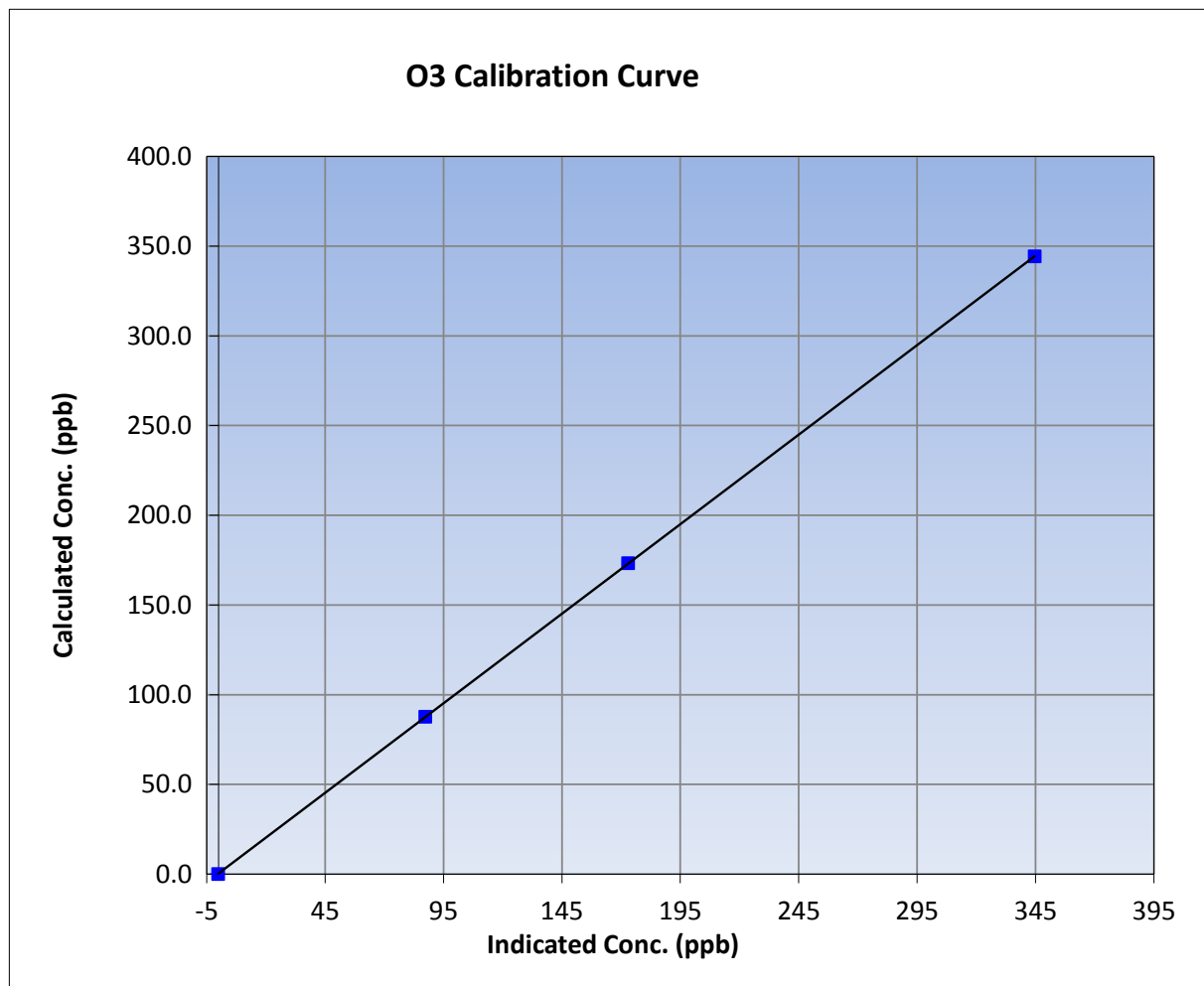
## Wood Buffalo Environmental Association O3 Calibration Report

### Station Information

Calibration Date	December-02-15	Previous Calibration	November 12, 2015
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	10:45	End Time (MST)	13:11
Analyzer make	TEI 49i	Analyzer serial #	1507964700

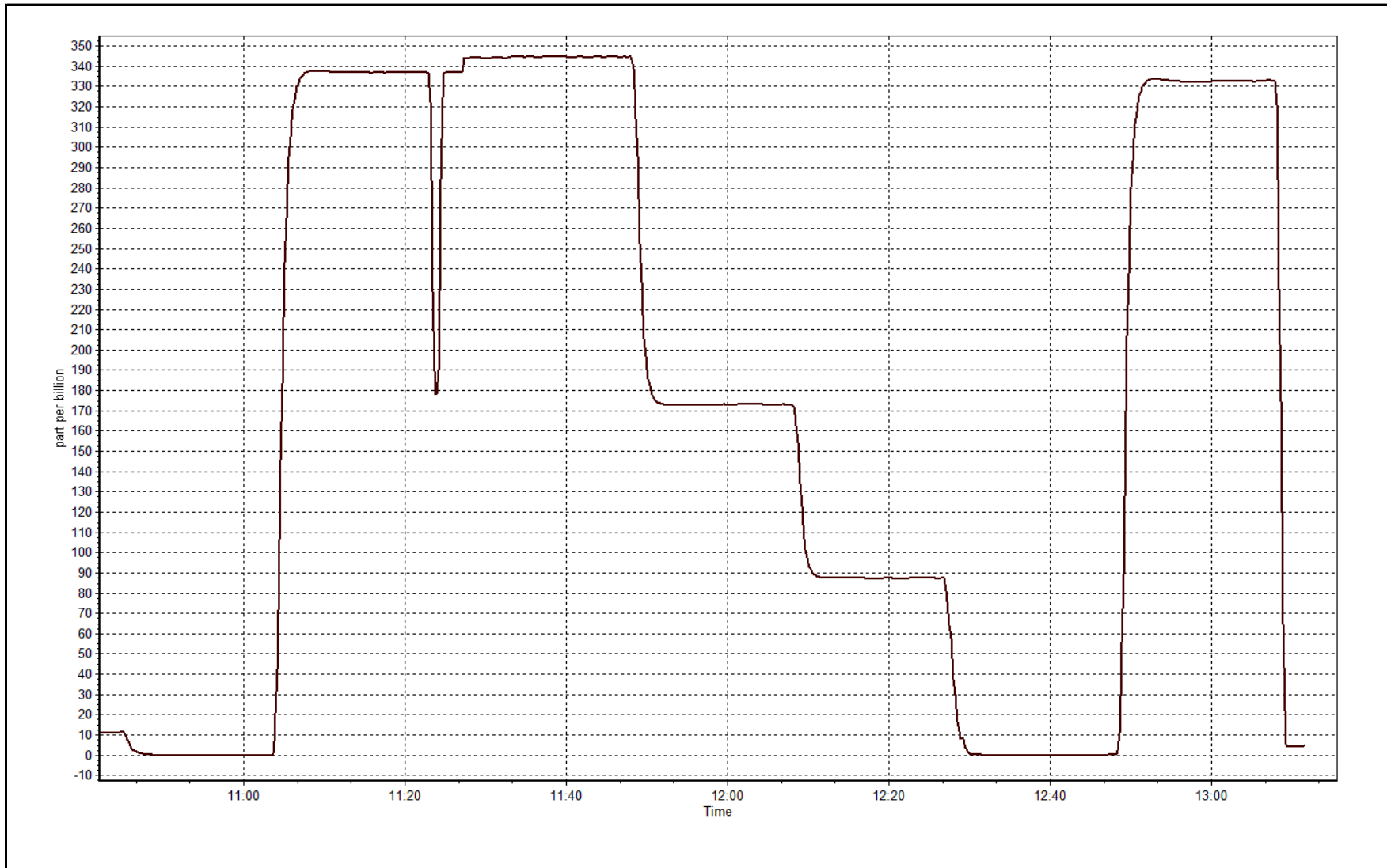
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999998
344.2	344.6	0.9988		
173.3	173.0	1.0017	Slope	0.998100
87.6	87.3	1.0034		
			Intercept	0.392220



O3 Calibration Plot

Date: December 2, 2015





# Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

## Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 12, 2015
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	7:15	End Time (MST)	10:45
NO Cal Gas Conc	49.4 ppm	Gas Cert Reference	S970259A
NOX Cal Gas Conc	49.4 ppm	Cal Gas Expiry Date	9/26/2017
Calibrator	Sabio 4010	Serial Number	11021107
Zero air Generator	Teledyne API T701	Serial Number	1864

## DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	5564
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## Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	1.003063	0.999178	1.005267
	Data Offset	1.674227	1.868076	0.478337
Current Calibration	Data Slope	0.995512	0.993118	1.007005
	Data Offset	2.045482	1.932206	0.418163

## Analyzer Information

Analyzer make/model	Thermo 42C	Analyzer serial #	601114773
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.103		192.168.1.103	
NO coefficient	0.786		0.786	
NOX coefficient	0.996		0.996	
NO2 coefficient	1.000		1.000	
NO bkgrnd	2.7		2.7	
NOX bkgrnd	2.7		2.7	
Chamber Temp	49.5	Deg C	49.8	Deg C
Moly Temp	323	Deg C	323	Deg C
PMT voltage	-805	V	-805	V
PMT Temp	-3.6	Deg C	-3.5	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	134.9	mmHg	136.9	mmHg
R Cell Press Nox	134.9	mmHg	136.9	mmHg
NO sample flow	0.904	lpm	0.908	lpm
Nox sample Flow	0.904	lpm	0.908	lpm

**Notes:**

No maintenance or adjustments done, filter changed out,



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

### Station Information

Calibration Date: December 2, 2015 Station Number: AMS 7

### Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	0.0	-0.1	0.2	----	----
as found span	5000	60.7	599.7	599.7	0.0	601.5	603.0	-1.2	0.9970	0.9946
calibrator zero	5000	0.0	0.0	0.0	0.0	0.0	-0.1	0.2	----	----
high point	5000	60.7	599.7	599.7	0.0	601.5	603.0	-1.2	0.9970	0.9946
second point	5000	30.4	300.4	300.4	0.0	298.2	299.1	-0.8	1.0072	1.0042
third point	5000	15.2	150.2	150.2	0.0	147.1	147.7	-0.2	1.0209	1.0168
as left zero	5000	0.0	0.0	0.0	0.0	0.0	-0.1	0.2	----	----
as left span	5000	60.7	599.7	257.4	342.3	592.7	265.5	327.4	1.0118	0.9695
Average Correction Factor									1.0084	1.0052

Corrected As found NO<sub>x</sub>= 601.5 NO= 603.1 Percent Change NO<sub>x</sub>= -0.9% NO= -0.8%  
 Previous Response NO<sub>x</sub>= 596.2 NO= 598.3

### GPT Calibration Data

Dilution Flow 5000 ccm Source Gas Flow 60.70 ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero			0.0			0.2			N/A	
1st NO2 (300)	----	257.4	344.2	599.0	257.4	341.7	0.9892	1.0000	1.0073	99.3%
2nd NO2 (200)	----	428.3	173.3	599.4	428.3	171.4	0.9885	1.0000	1.0111	98.9%
3rd NO2 (100)	----	514.0	87.6	599.5	514.0	85.9	0.9884	1.0000	1.0198	98.1%
4th NO2 (0)	601.6	----	-2.1	599.5	601.6	-1.7	0.9884	1.0000	N/A	----
Average Correction Factor							0.9886	1.0000	1.0127	98.7%

Calibration Performed By: Melissa Lemay



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

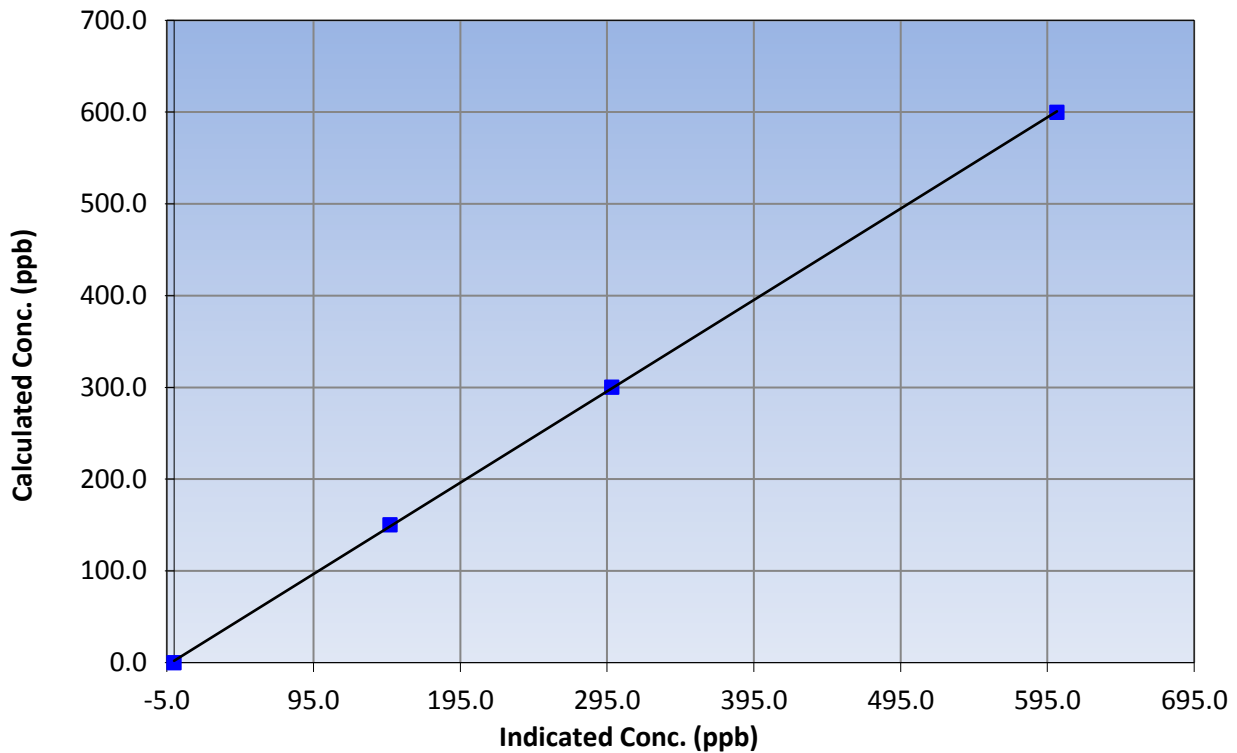
### Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 12, 2015
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	7:15	End Time (MST)	10:45
Analyzer make	Thermo 42C	Analyzer serial #	601114773

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999948
599.7	601.5	0.9970		
300.4	298.2	1.0072	Slope	0.995512
150.2	147.1	1.0209		
			Intercept	2.045482

### NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

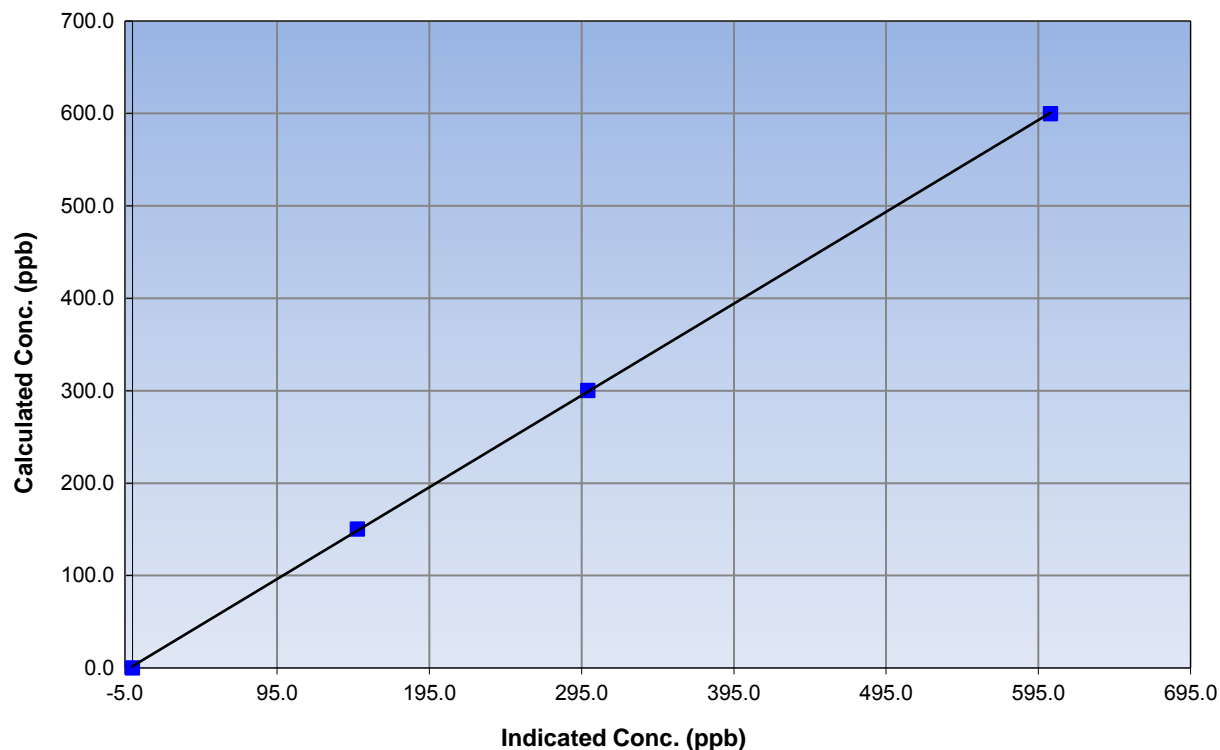
### Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 12, 2015
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	7:15	End Time (MST)	10:45
Analyzer make	Thermo 42C	Analyzer serial #	601114773

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999954
599.7	603.0	0.9946		
300.4	299.1	1.0042	Slope	0.993118
150.2	147.7	1.0168		
			Intercept	1.932206

### NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

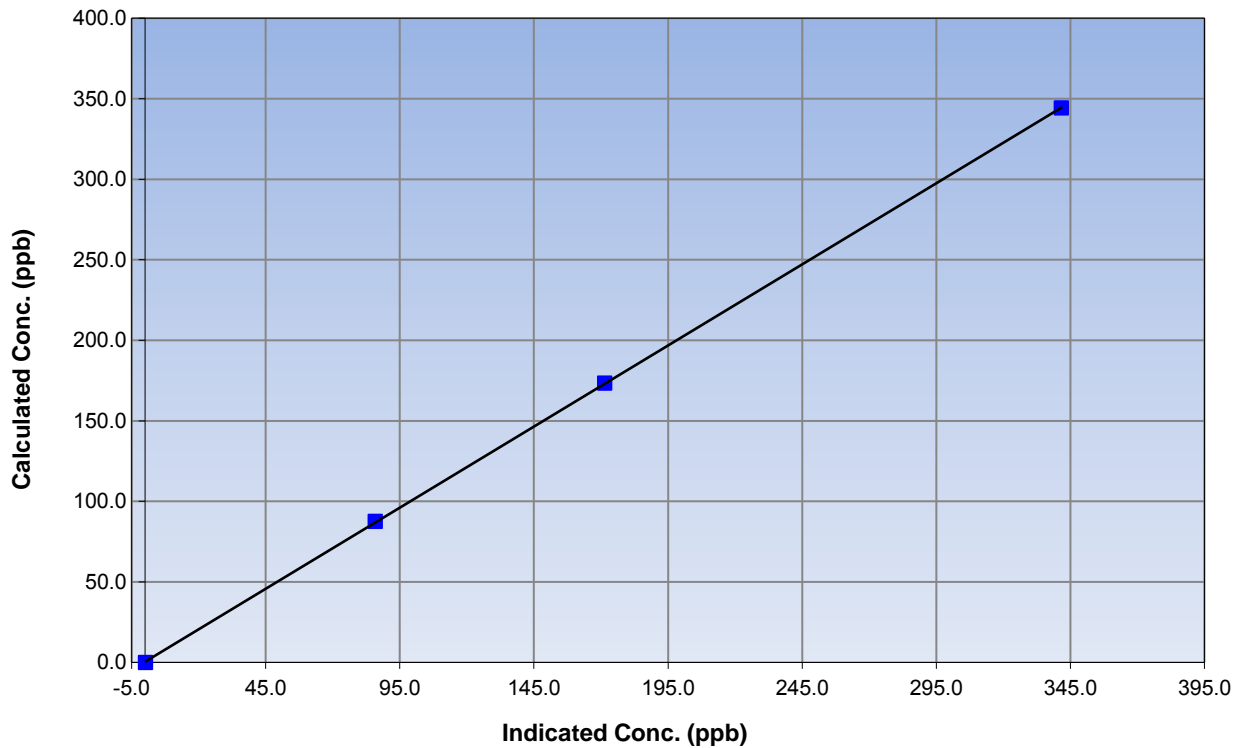
### Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 12, 2015
Station Number	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	7:15	End Time (MST)	10:45
Analyzer make	Thermo 42C	Analyzer serial #	601114773

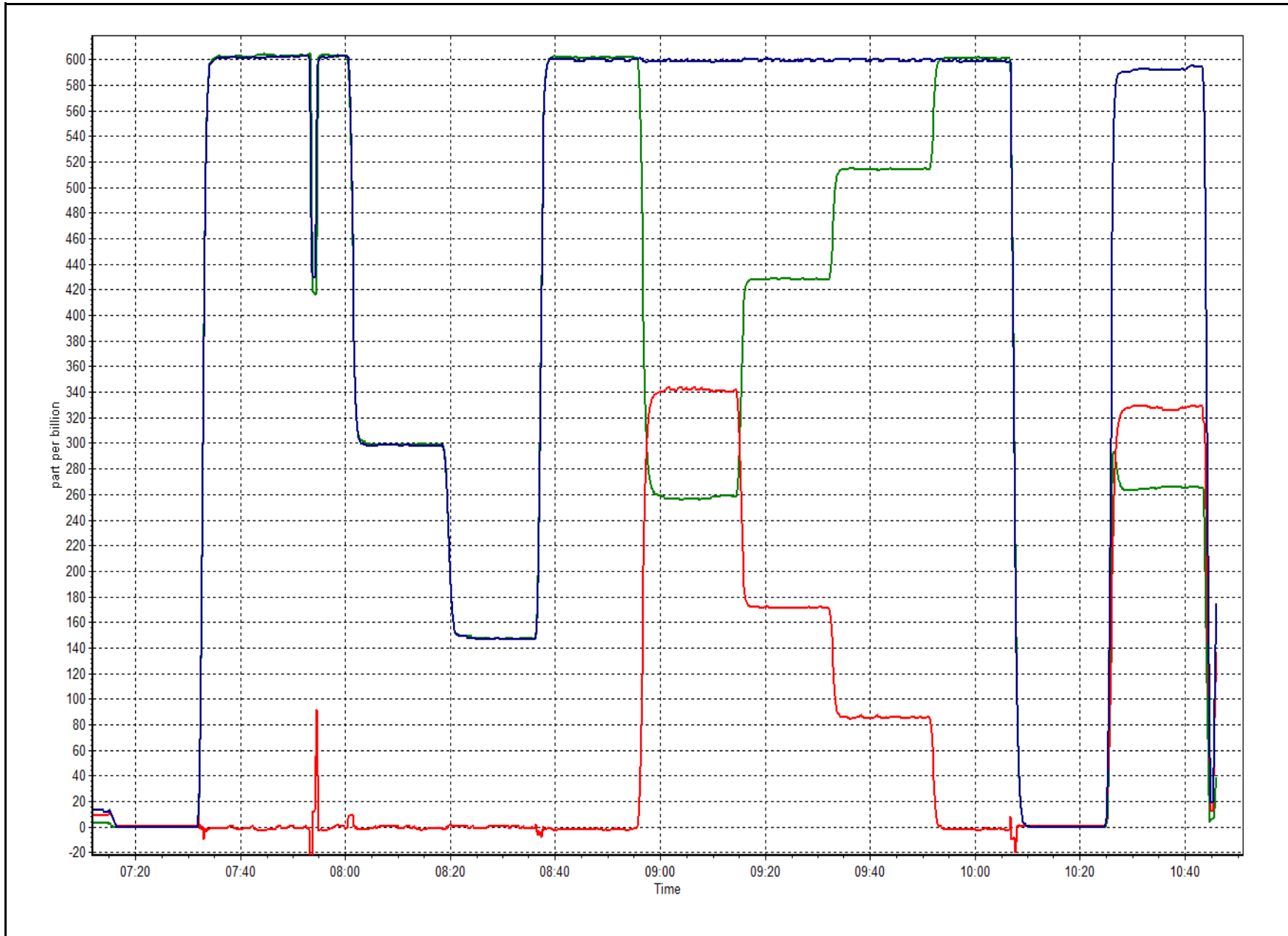
### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	N/A	Correlation Coefficient	0.999984
344.2	341.7	1.0073		
173.3	171.4	1.0111	Slope	1.007005
87.6	85.9	1.0198		
			Intercept	0.418163

### NO<sub>2</sub> Calibration Curve









# Wood Buffalo Environmental Association

## SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	<u>December 1, 2015</u>	Previous Calibration:	<u>11/12/15</u>
Station Name:	<u>Athabasca Valley</u>	Station Number:	<u>AMS 7</u>
Start Time (MST):	<u>13:04</u>	End Time (MST):	<u>14:11</u>
Calibrator Make/Model:	<u>Delta Cal</u>	Calibrator Serial Number:	<u>1097</u>

SHARP INFORMATION			
Particulate Fraction:		PM2.5	
Make/Model:		Thermo / SHARP 5030	
Serial Number		E515	
C <sub>14</sub> Source SN:		3256	
Confirmation of Time settings:		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Parameters Checked:	T1 <input checked="" type="checkbox"/> T2 <input type="checkbox"/> T3 <input type="checkbox"/> T4 <input type="checkbox"/> P3 <input checked="" type="checkbox"/> Main Flow <input checked="" type="checkbox"/> Beta <input type="checkbox"/> Neph <input checked="" type="checkbox"/>		

### CALIBRATION DATA

Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	-7.0	-8.0	-1.0	-7.0
T2	13.0	na	na	13.0
T3	17.0	na	na	17.0
T4	19.0	na	na	19.0
RH (%)	8.0	na	na	8.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	981	975.0	-6.0	981

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1012	12	1012	1000

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	249		246
Neph	2.1		-0.5
C14	160.9		119.3
Indicated Concentration (ug/m3)	1	Yes	-0.3
Offset 1	248		247.1
Offset 2	36		35.7

Leak Check (Quarterly)			
Leak Check Date:	<u>December 1, 2015</u>	Previous Leak Check Date:	September 23, 2015

	Measured	Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.90	
*Flow with adaptor (LPM):	16.77	0.13

\*Note - do not attach adaptor without shutting off the pump first

Mass Foil Calibration (Annually)	
Foil Calibration Date:	Previous Foil Calibration:
Zeroed?:	
Foil Mass:	<u>Mass foil set S/N:</u>
Previous Correction Factor:	
New Correction Factor:	

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	
Pump	Good	
Filter Tape	Good	
Mass Foil Cal Set	na	
HEPA filter	Good	

### NOTES:

sample head cleaned. Nephelometer adjusted

Calibration Performed By:	<u>Melissa Lemay</u>
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# Wood Buffalo Environmental Association CO Calibration Report

## Station Information

Calibration Date	December 1, 2015	Last Calibration	November 9, 2015
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	8:45	End Time (MST)	12:03
Gas Cert Reference	CC101396	Station temp.	22 Deg C
Cal Gas Concentration	2970 ppm	Cal Gas Exp Date	02/02/2023
Calibrator Make/Model	Sabio 4010	Serial Number	11021107
ZAG Make/Model	API 701	Serial Number	5564
DACS make/model	Campbell Scientific CR3000	Serial Number	1864

## Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		Chamber temp.	48.5	48.5
Analyzer IP address	192.168.1.48		Pressure	733.7	730.1
Calculated slope	0.998427	1.000670	Flow	0.486	0.485
Calculated intercept	0.065349	0.050438	Intensity	199542	199588
Analyzer Background	4.015	4.150	S/R ratio	1.175416	1.175122
Analyzer Coefficient	1.065	1.065			

Analyzer make Thermo 48i-TLE      Analyzer serial # 1408761381

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.1	----
as found span	5000	69.7	41.4	41.7	0.993
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	69.7	41.4	41.3	1.002
second point	5000	35.2	20.9	20.9	1.003
third point	5000	15.2	9.0	8.9	1.011
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	69.7	41.4	41.0	1.009
Average Correction Factor					1.005

Corrected As found    41.6      Previous response    41.4      % change    -0.4%

**Notes:**

zero adjusted, No Maintenance done, Filter changed out

Calibration Performed By:

Melissa Lemay



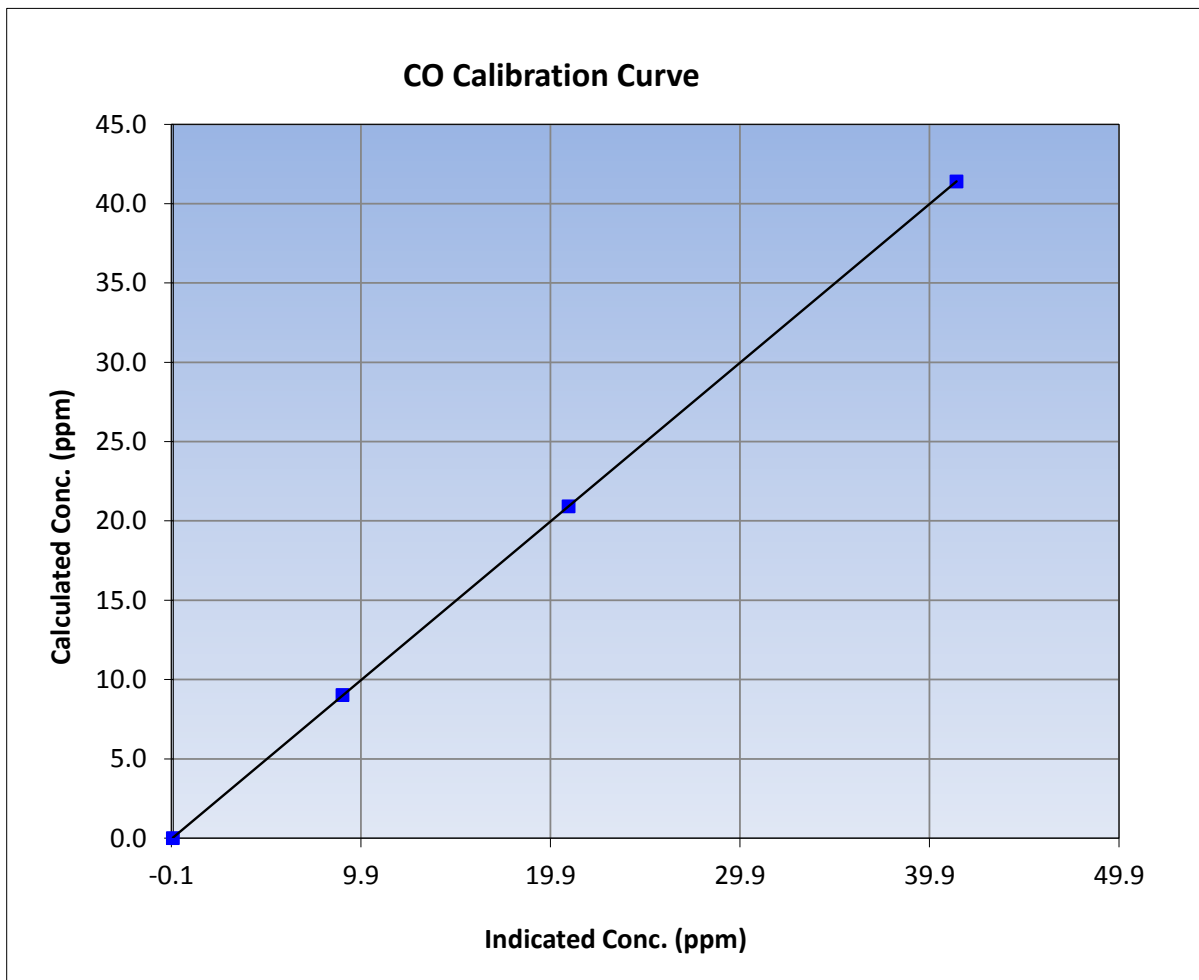
## Wood Buffalo Environmental Association CO Calibration Report

### Station Information

Calibration Date	December 1, 2015	Previous Calibration	November 9, 2015
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:45	End Time (MST)	12:03
Analyzer make	Thermo 48i-TLE	Analyzer serial #	1408761381

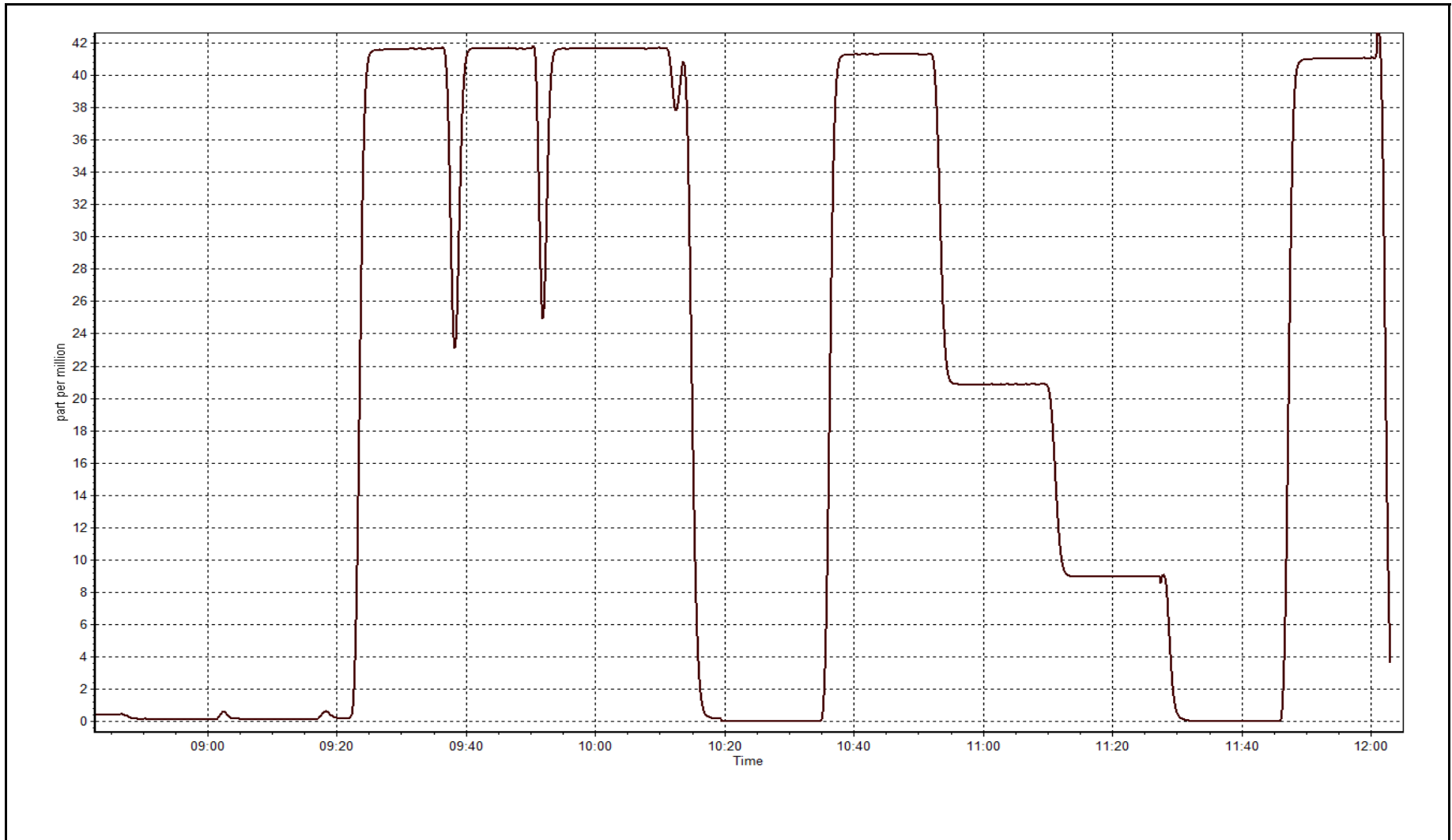
### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999997
41.4	41.3	1.0017		
20.9	20.9	1.0028	Slope	1.000670
9.0	8.9	1.0111		
			Intercept	0.050438



CO Calibration Plot

Date: December 1, 2015





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## WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 8  
FORT CHIPEWYAN  
DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	708	36	36	100.00	4	0	1	0
O3(ppb) Average	710	34	34	100.00	39	0	35	-
NO2(ppb) Average	708	36	36	100.00	19	0	6	-
NO(ppb) Average	708	36	36	100.00	6	-	1	-
NOX(ppb) Average	708	36	36	100.00	25	-	6	-
PM2.5(ug/m3) Average	743	1	1	100.00	32.6	-	8.4	0
Wind Speed 10 m (km/h) Average	742	0	2	99.73	34	-	22	-
Wind Direction 10 m (deg) Average	742	0	2	99.73	-	-	-	-
Temperature 2 m (C) Average	744	0	0	100.00	-0.4	-	-3.5	-
Relative Humidity (%) Average	744	0	0	100.00	98	-	93	-
Precipitation (mm) Total	744	0	0	100.00	0	-	0	-
Leaf Wetness (% of range) Average	744	0	0	100.00	8	-	8	-
Global Solar Radiation (W/m2) Average	744	0	0	100.00	235	-	40	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile							
					Min	P10	Q1	Median	Q3	P90	Max	
SO2(ppb) Average	708	0.1	0	-	0	0	0	0	0	0	0	4
O3(ppb) Average	710	23.7	5	-	2	17	20	24	27	30	30	39
NO2(ppb) Average	708	1.5	2	-	0	0	0	1	2	3	3	19
NO(ppb) Average	708	0.1	0	-	0	0	0	0	0	0	0	6
NOX(ppb) Average	708	1.7	2	-	0	0	0	1	2	4	4	25
PM2.5(ug/m3) Average	743	4.33	2.8	-	0.3	1.5	2.4	3.9	5.5	7.8	7.8	32.6
Wind Speed 10 m (km/h) Average	742	13.5	7	-	0	4	7	14	19	23	23	34
Wind Direction 10 m (deg) Average	742	-	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	744	-12.71	7.3	-	-30.6	-23.4	-18.9	-11.3	-6.4	-4.6	-4.6	-0.4
Relative Humidity (%) Average	744	83.8	6	-	59	78	80	83	88	92	92	98
Precipitation (mm) Total	744	-	-	0	-	-	-	-	-	-	-	-
Leaf Wetness (% of range) Average	744	2.4	2	-	1	2	2	2	2	5	5	8
Global Solar Radiation (W/m2) Average	744	13.9	34	-	0	0	0	0	9	48	48	235

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed, Wind Direction	02 Dec 2015 04:00	02 Dec 2015 04:00	1	Flat line in sensor output signal - Sensor frozen
Wind Speed, Wind Direction	24 Dec 2015 18:00	24 Dec 2015 18:00	1	Flat line in sensor output signal - Sensor frozen

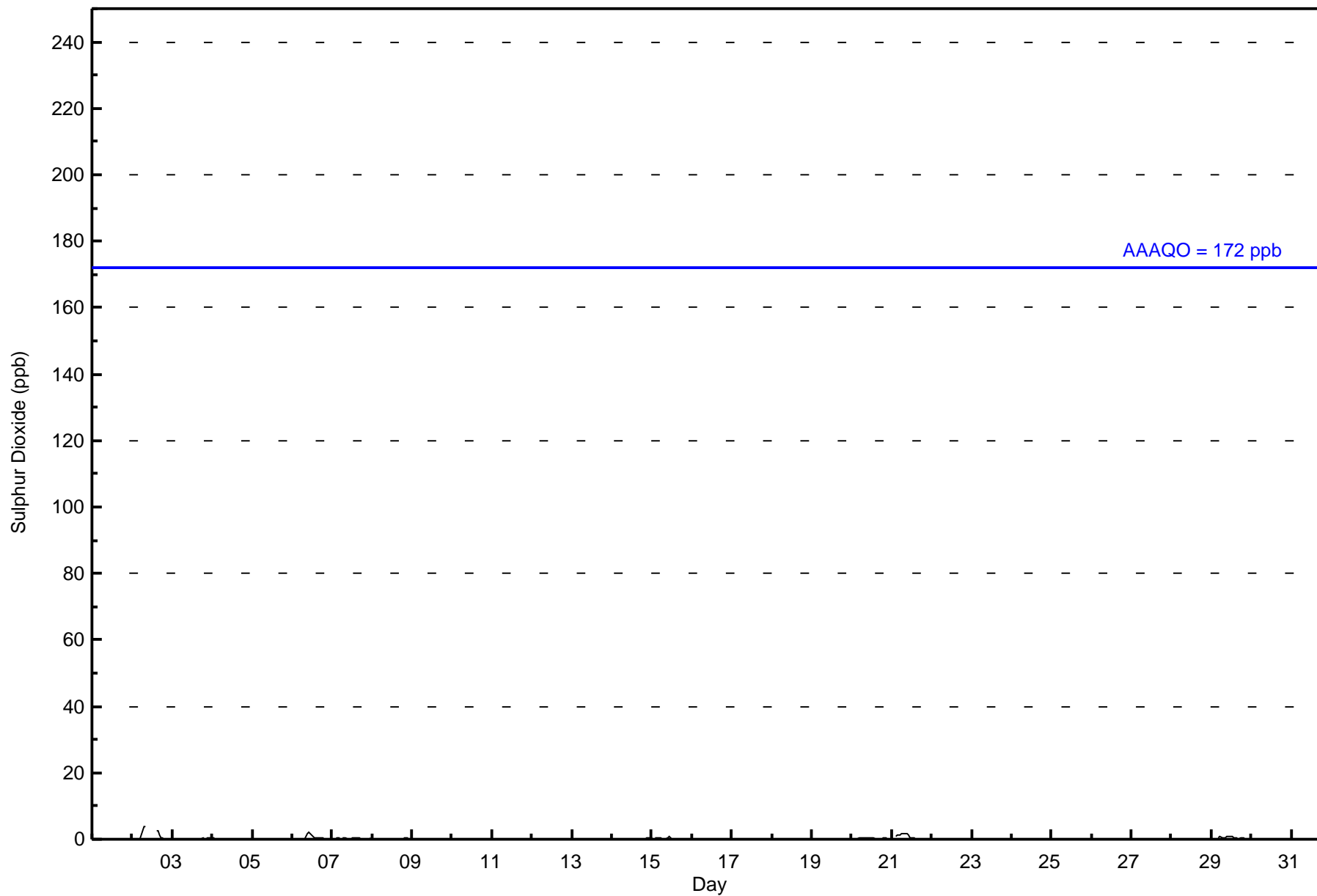


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 4 ppb on Dec 2 09:00	Maximum Daily Average: 1.1 ppb on Dec 2		Hours of Data:	708
Minimum Value: 0 ppb on Dec 5 12:00	Minimum Daily Average: 0.0 ppb on Dec 18		Hours of Missing Data:	36
Maximum Diurnal Average: 0.3 ppb at hour 9	Minimum Diurnal Average: 0.0 ppb at hour 2		Hours of Calibration:	36
Monthly Average: 0.1 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 2		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Dec	Z	0	0	0	0	1	3	4	4	C	C	C	C	C	3	2	1	0	0	0	0	0	0	0	0	1.1	4
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Dec	0	0	0	0	Z	0	0	0	1	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1	1	
15-Dec	1	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
20-Dec	Z	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
21-Dec	0	Z	1	1	1	1	2	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	2
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
27-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
29-Dec	0	0	0	Z	1	1	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0

0.1	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Diurnal Average
1	0	1	1	1	1	1	3	4	4	2	2	1	1	1	3	2	1	0	0	0	0	0	0	0	0	0	1	Diurnal Maximum

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Fort Chipewyan - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	708	100.00	100.00
11 - 20	0	0.00	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Fort Chipewyan - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	7	6	15	82	146	48	37	21	14	20	25	22	92	76	56	39	706
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	7	6	15	82	146	48	37	21	14	20	25	22	92	76	56	39	706

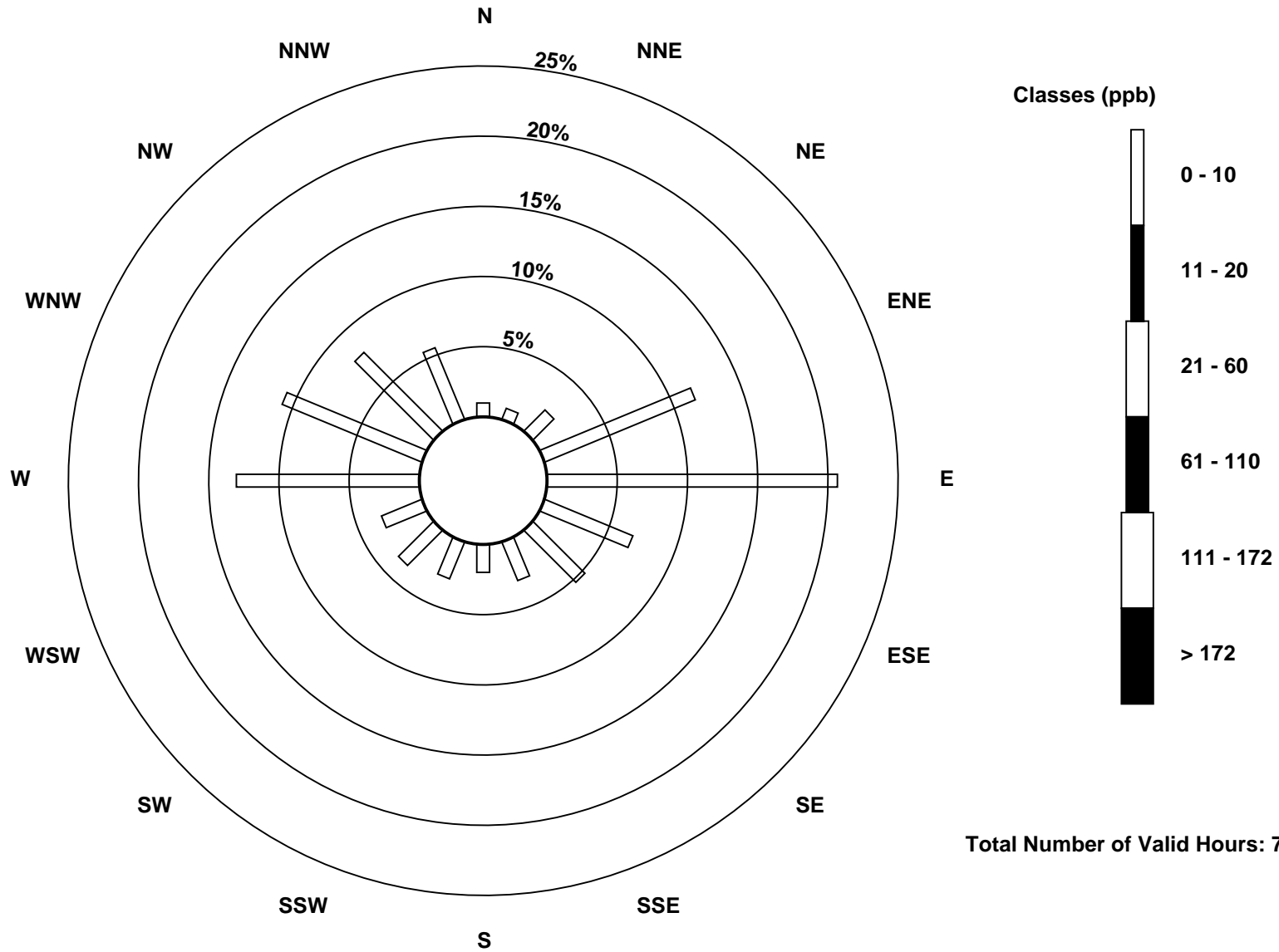
Total Number of Valid Hours: 706

Total Number of Hours: 744

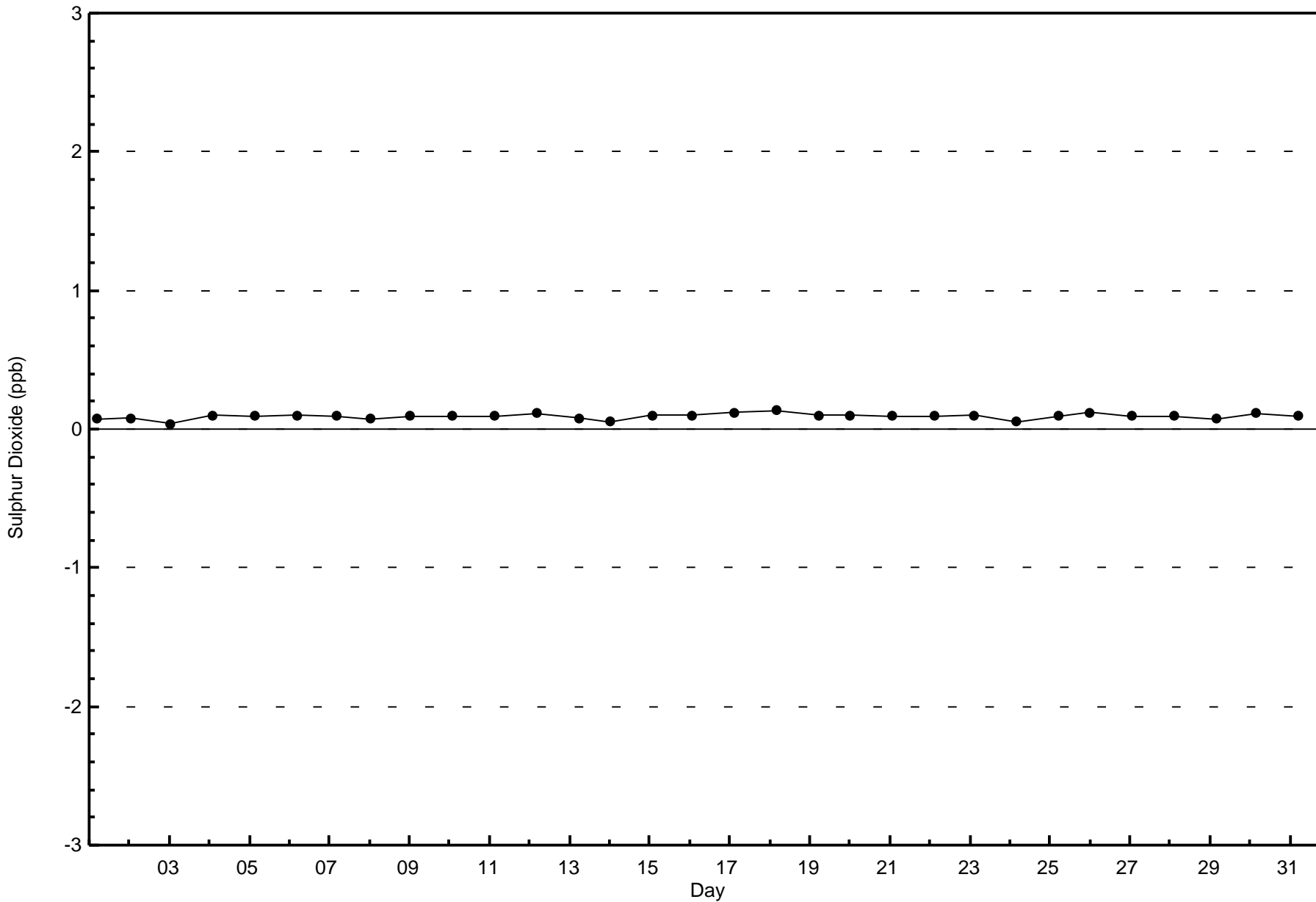


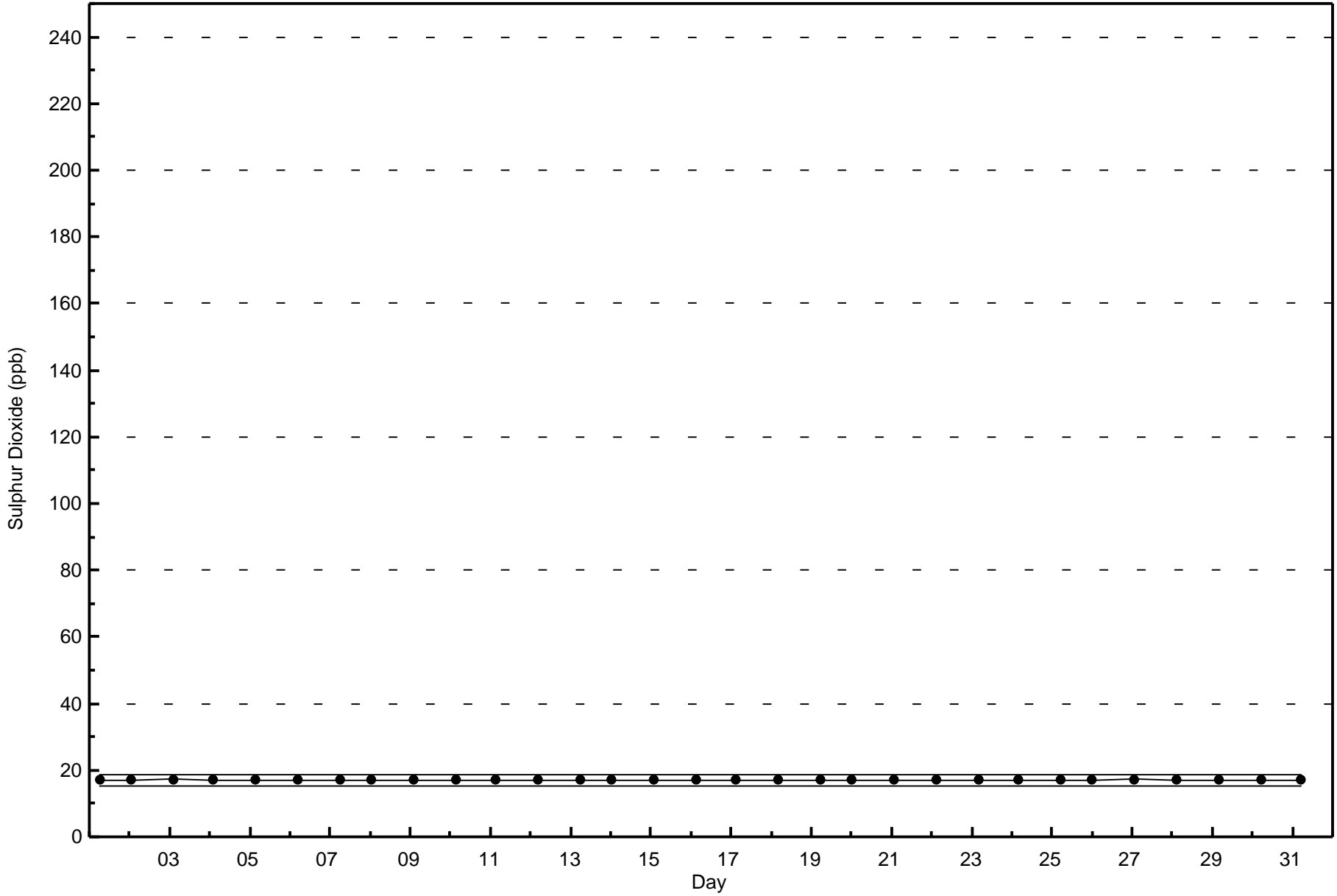
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Fort Chipewyan (AMS 8)











Maximum Value: 6 ppb on Dec 23 21:00																	Maximum Daily Average: 0.6 ppb on Dec 23																	Hours in Service: 744																
Minimum Value: 0 ppb on Dec 1 01:00																	Minimum Daily Average: 0.0 ppb on Dec 13																	Hours of Data: 708																
Maximum Diurnal Average: 0.3 ppb at hour 21																	Minimum Diurnal Average: 0.1 ppb at hour 1																	Hours of Missing Data: 36																
Monthly Average: 0.1 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 1																	Hours of Calibration: 36																
																	Percent Operational Time: 100.0																																	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																										
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
2-Dec	Z	0	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.1	0																								
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																								
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																								
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																								
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																								
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																								
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																								
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																								
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0																								
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
20-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1																								
21-Dec	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																								
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	6	3	0	0	0.6	6																								
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0.3	1																								
27-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0																								
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.2	1																								
29-Dec	0	0	0	Z	0	0	0	0	0	3	3	1	1	1	1	0	0	0	0	0	0	0	0	0	0.5	3																								
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																								
																								0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.3	0.2	0.1	0.1	Diurnal Average	
																								0	0	0	0	0	0	0	0	0	1	3	3	1	1	1	1	1	1	0	0	1	1	6	3	0	0	Diurnal Maximum
Z - zerospan C - Calibration																																																		

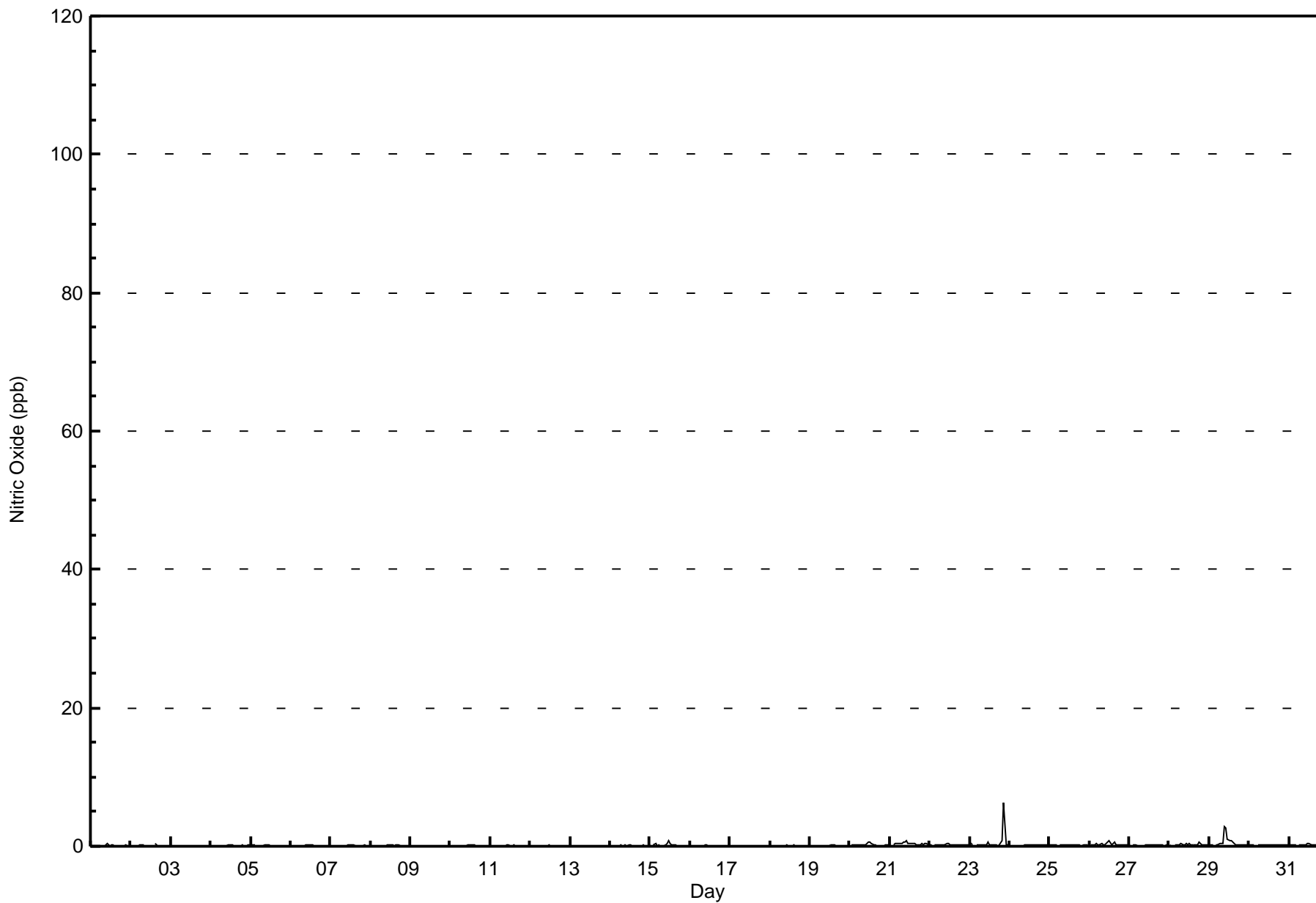


Wood Buffalo Environmental Association

Hourly Averages

Nitric Oxide (NO) - ppb

Fort Chipewyan - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Fort Chipewyan - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



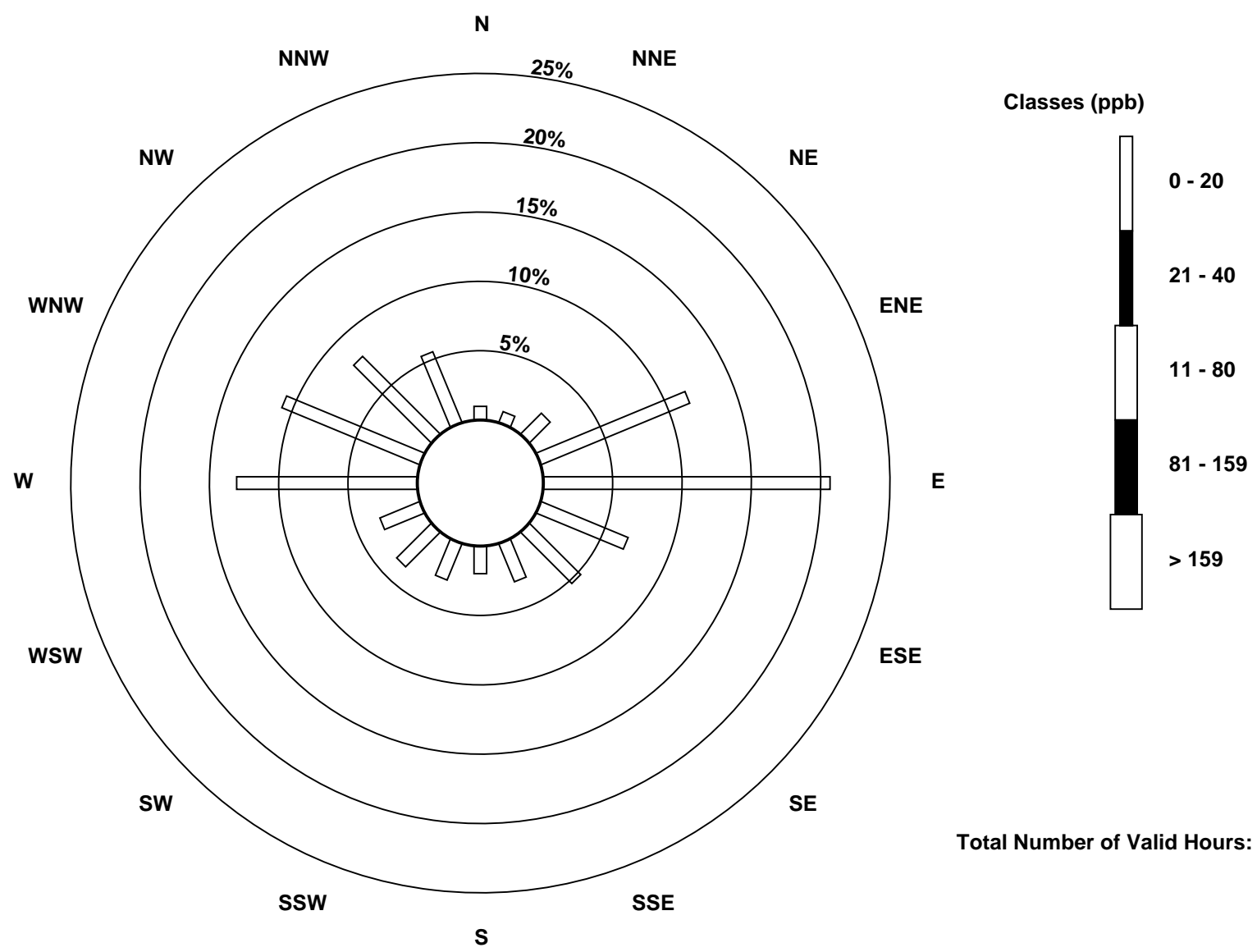
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

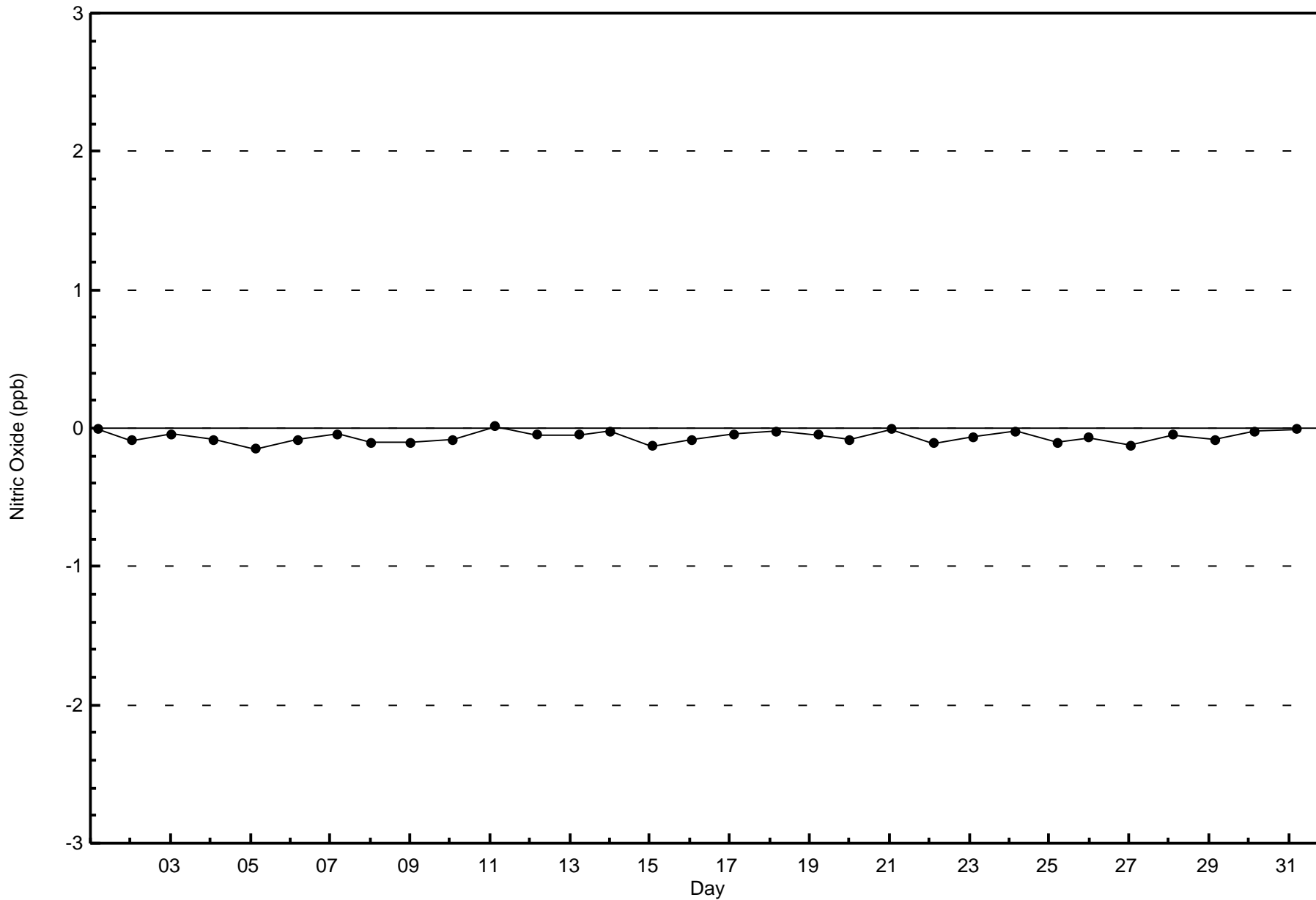
**Nitric Oxide (NO) - ppb**  
**Fort Chipewyan - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	7	6	15	82	146	48	37	21	14	20	25	22	92	76	56	39	706
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	7	6	15	82	146	48	37	21	14	20	25	22	92	76	56	39	706

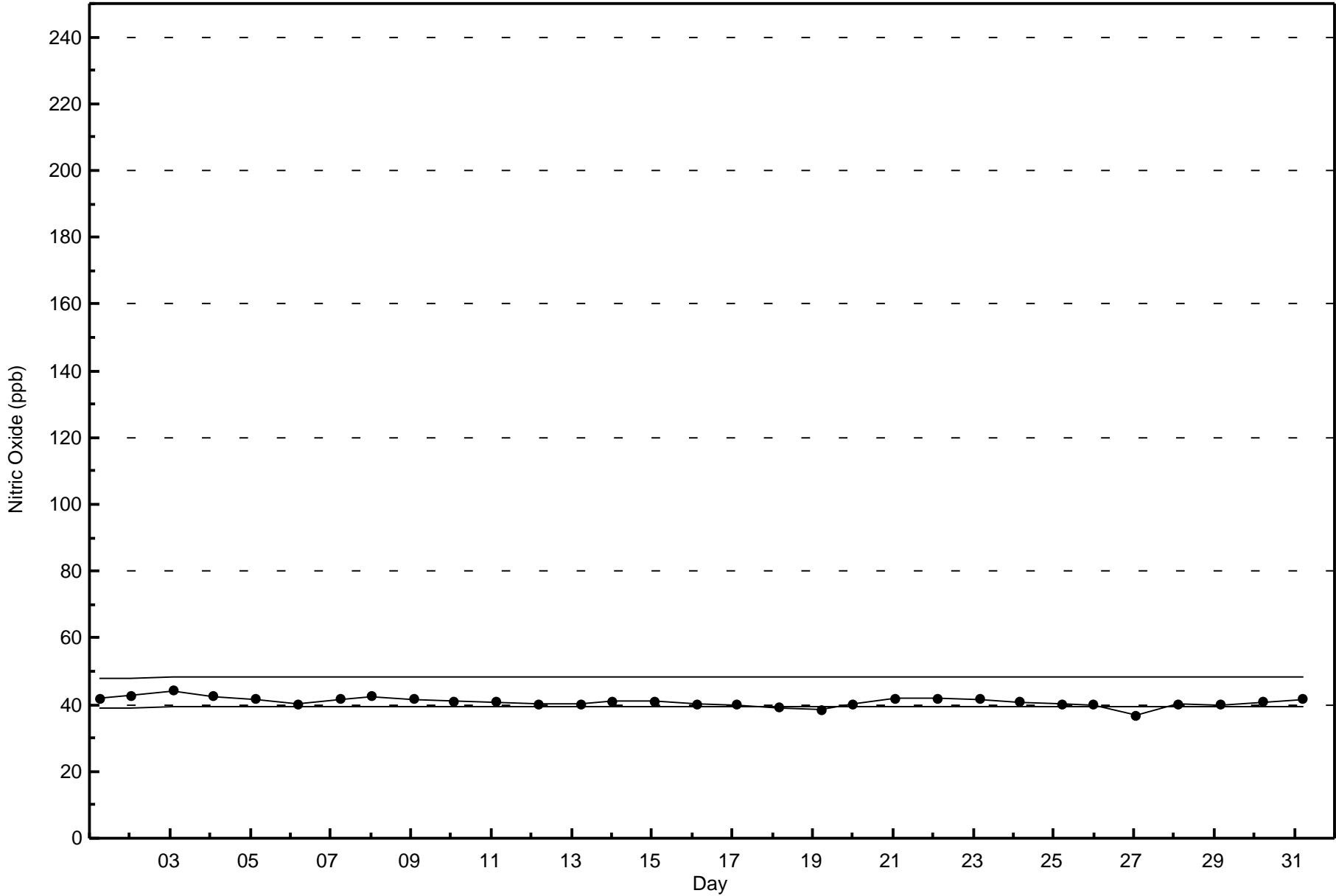
Total Number of Valid Hours: 706

Total Number of Hours: 744







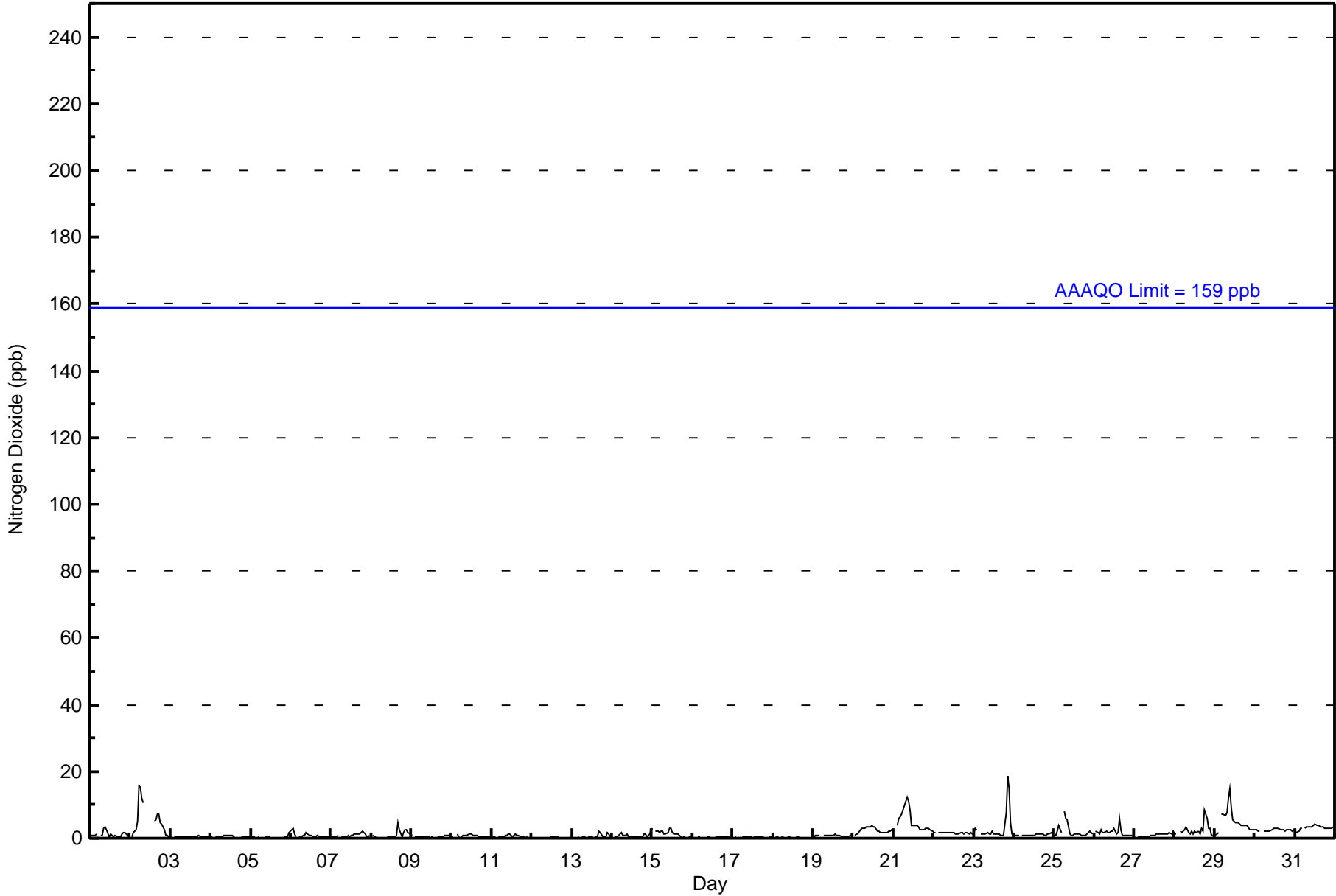




Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 19 ppb on Dec 23 21:00	Maximum Daily Average: 5.7 ppb on Dec 2		Hours of Data:	708
Minimum Value: 0 ppb on Dec 4 18:00	Minimum Daily Average: 0.2 ppb on Dec 12		Hours of Missing Data:	36
Maximum Diurnal Average: 2.2 ppb at hour 9	Minimum Diurnal Average: 1.0 ppb at hour 1		Hours of Calibration:	36
Monthly Average: 1.5 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 12		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	1	1	1	Z	1	1	3	4	3	0	1	1	1	1	1	1	1	1	2	2	1	1	1.2	4
2-Dec	Z	0	2	3	5	16	15	12	11	C	C	C	C	C	5	6	7	7	5	4	3	1	1	1	5.7	16
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0.5	1
4-Dec	1	1	Z	0	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.4	1
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2
6-Dec	3	3	1	0	Z	0	0	1	1	2	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0.9	3
7-Dec	0	0	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	0.9	2
8-Dec	Z	1	1	0	0	0	0	0	0	0	1	0	0	0	0	1	5	3	1	2	3	3	2	1	1.0	5
9-Dec	1	Z	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0	0.4	1
10-Dec	0	0	Z	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	0	0.7	1
11-Dec	0	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.6	1
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.2	1
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	2	2	1	0	1	2	1	0	0.5	2
14-Dec	Z	1	0	0	1	2	1	1	1	1	1	1	0	0	0	0	0	0	1	1	0	1	3	0	0.8	3
15-Dec	3	Z	2	2	2	2	2	1	1	2	3	3	2	1	1	1	1	1	0	0	0	0	0	0	1.3	3
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0.3	1
18-Dec	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
19-Dec	0	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
20-Dec	Z	1	1	1	3	3	3	3	3	3	3	4	4	3	2	2	2	2	2	2	2	2	2	2	2.4	4
21-Dec	2	Z	4	6	6	7	9	11	12	11	8	4	4	4	4	4	3	3	3	3	3	3	3	2	5.1	12
22-Dec	2	2	Z	2	2	2	2	2	2	2	2	2	2	1	1	1	2	2	1	2	2	1	2	1	1.6	2
23-Dec	1	3	3	Z	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	8	19	15	5	1	3.2	19
24-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1.0	2
25-Dec	1	1	2	4	2	Z	8	6	6	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	2.1	8
26-Dec	Z	2	2	1	3	2	2	2	2	2	2	2	3	1	2	6	3	1	1	1	1	1	1	1	1.8	6
27-Dec	1	Z	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1.0	2
28-Dec	1	1	Z	2	2	2	3	3	2	1	2	1	2	2	2	1	3	2	9	6	3	3	1	1	2.4	9
29-Dec	1	1	2	Z	7	7	7	8	12	15	10	6	5	5	5	4	4	4	4	4	3	3	3	3	5.2	15
30-Dec	3	2	2	2	Z	2	2	2	2	2	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2.4	3
31-Dec	2	2	2	3	3	Z	3	3	4	3	3	4	4	4	4	4	3	3	3	3	3	3	3	4	3.2	4
	1.0	1.0	1.1	1.3	1.6	2.0	2.1	2.1	2.2	1.9	1.7	1.4	1.4	1.2	1.4	1.5	1.6	1.3	1.3	1.5	1.8	1.6	1.2	1.1	Diurnal Average	
	3	3	4	6	7	16	15	12	12	15	10	6	5	5	5	6	7	7	9	8	19	15	5	4	Diurnal Maximum	

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Fort Chipewyan - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort Chipewyan - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	7	6	15	82	146	48	37	21	14	20	25	22	92	76	56	39	706
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	7	6	15	82	146	48	37	21	14	20	25	22	92	76	56	39	706

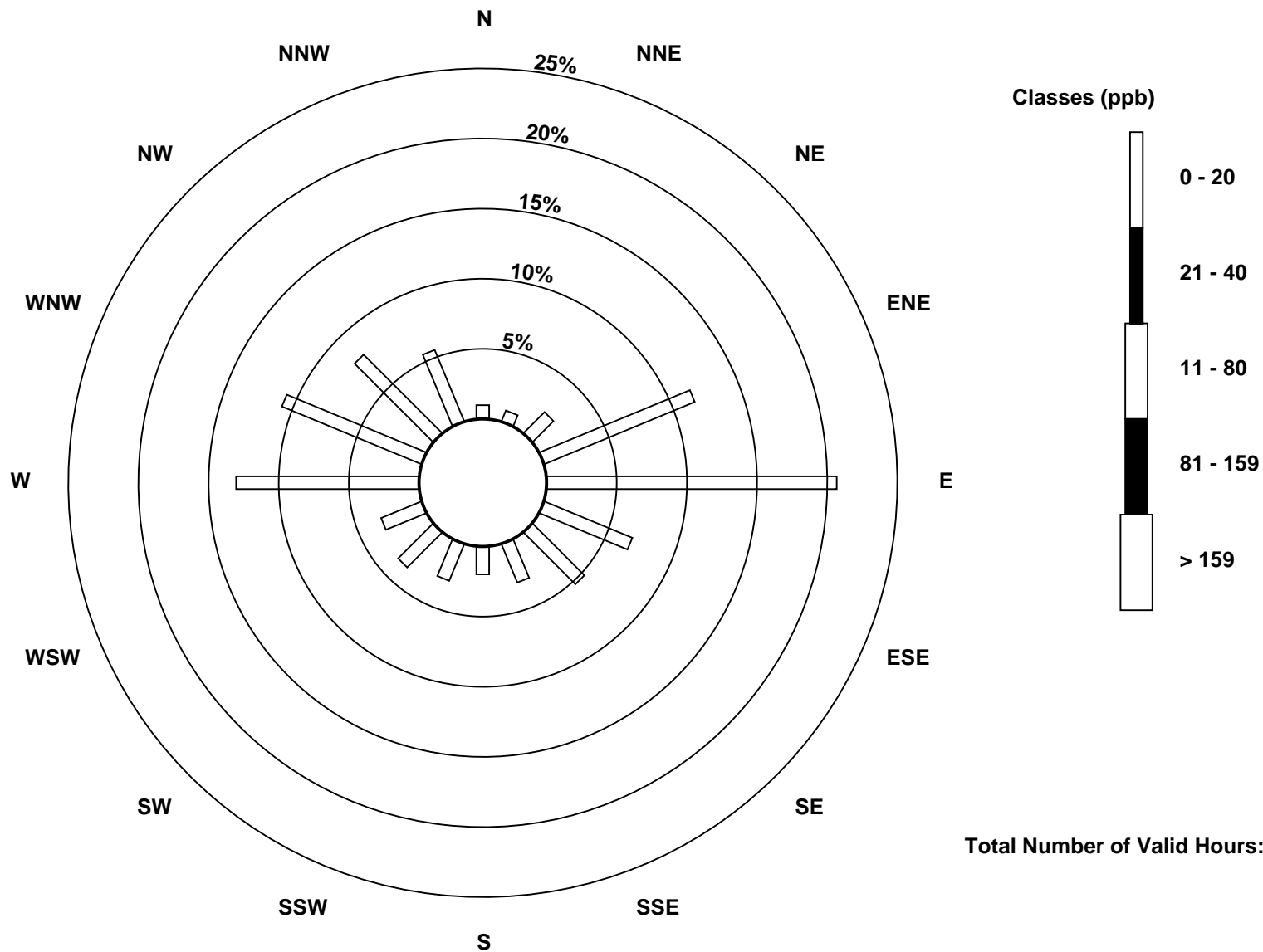
Total Number of Valid Hours: 706

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

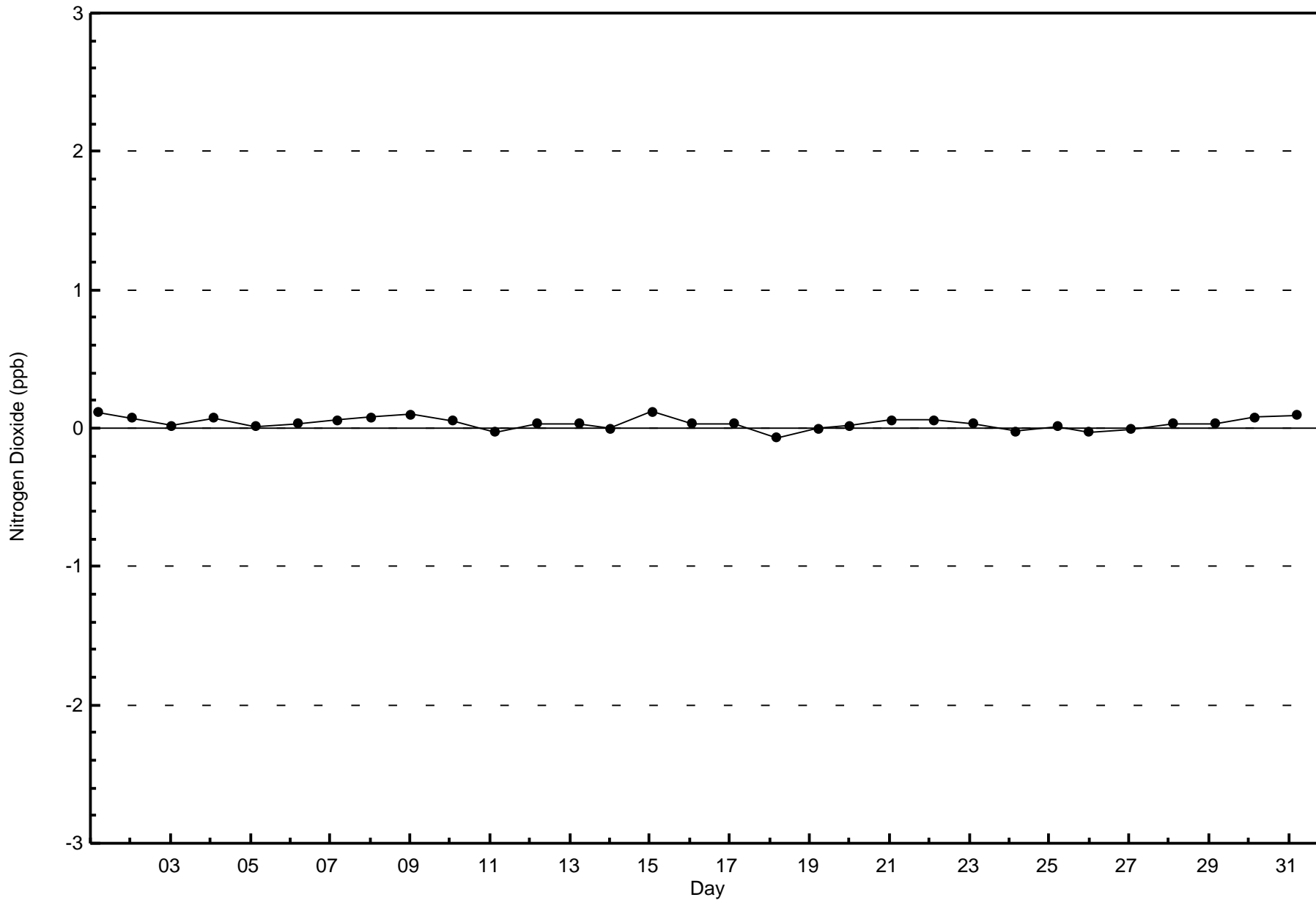
Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort Chipewyan (AMS 8)

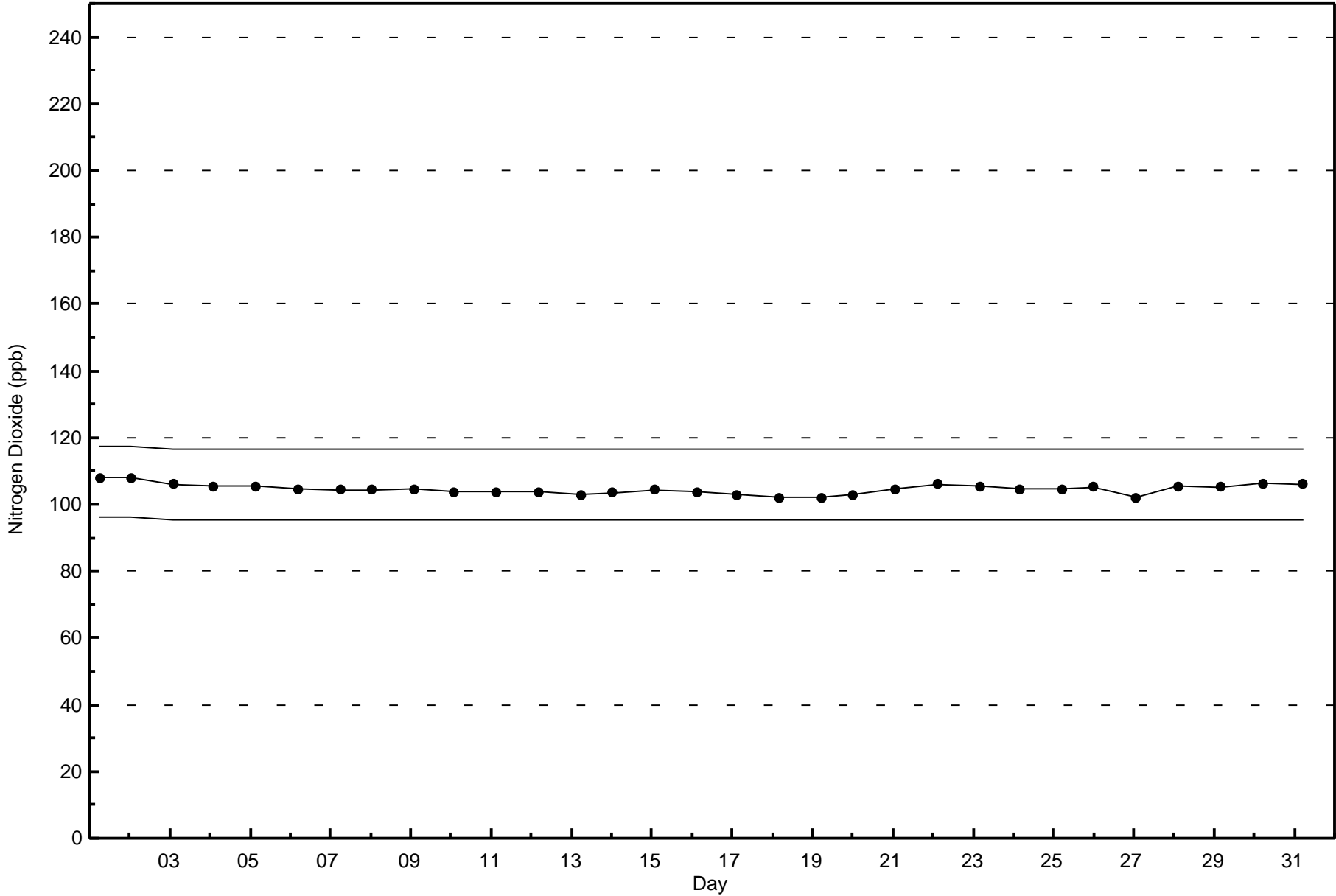




Wood Buffalo Environmental Association  
Zero Responses

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort Chipewyan - December 2015

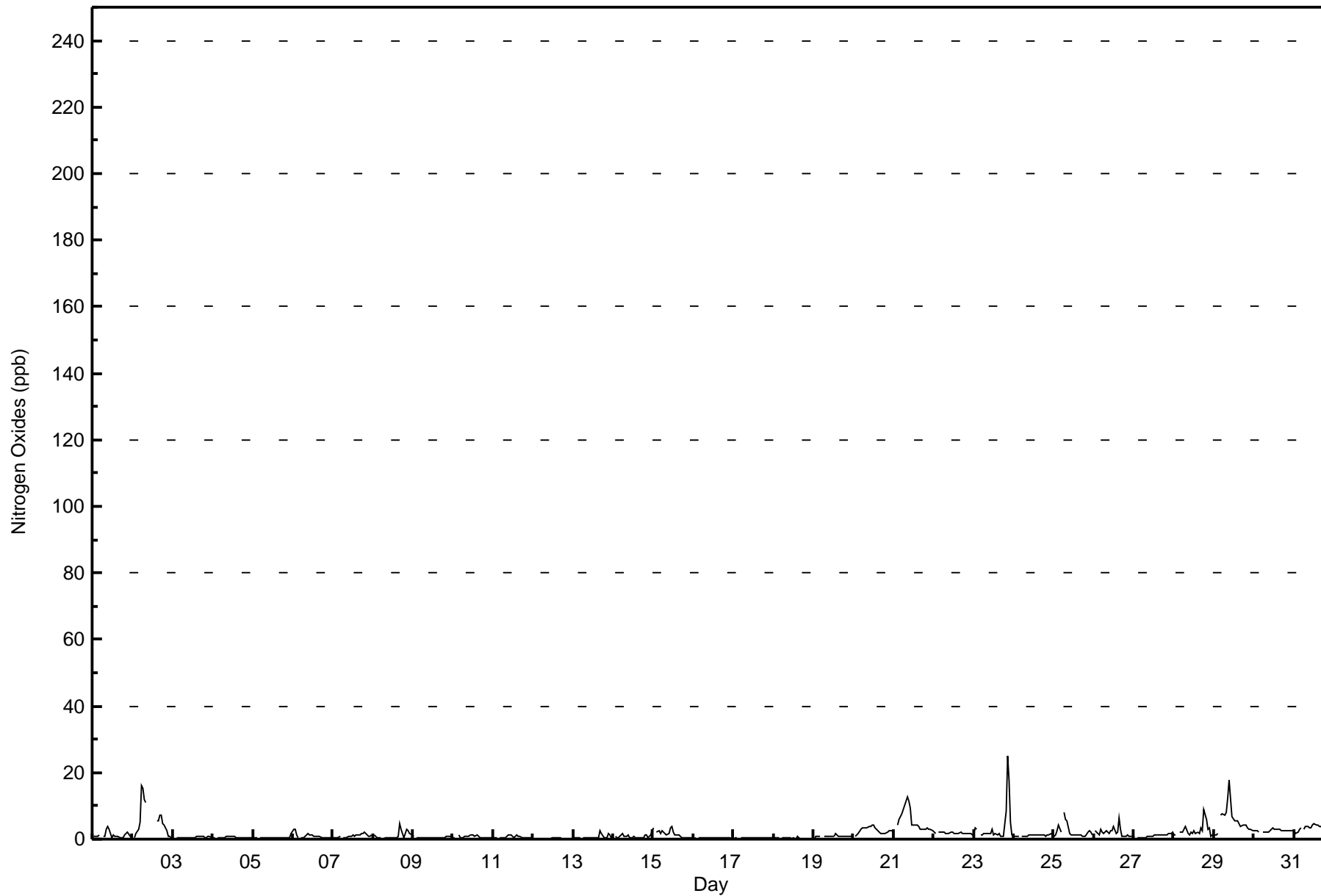








Maximum Value: 25 ppb on Dec 23 21:00		Maximum Daily Average: 5.8 ppb on Dec 2		Hours in Service: 744																																												
Minimum Value: 0 ppb on Dec 12 19:00		Minimum Daily Average: 0.2 ppb on Dec 12		Hours of Data: 708																																												
Maximum Diurnal Average: 2.3 ppb at hour 9		Minimum Diurnal Average: 1.0 ppb at hour 1		Hours of Missing Data: 36																																												
Monthly Average: 1.7 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 2 P <sub>90</sub> = 4 P <sub>99</sub> = 12		Hours of Calibration: 36																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	1	1	1	1	1	Z	1	1	3	4	3	0	1	1	1	1	1	1	1	1	2	2	1	1	1.3	4																						
2-Dec	Z	1	2	3	5	16	15	12	11	C	C	C	C	C	5	6	7	7	5	4	3	1	1	1	5.8	16																						
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0.5	1																						
4-Dec	1	1	Z	1	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.5	1																						
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.4	2																						
6-Dec	3	3	1	0	Z	0	0	1	1	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.9	3																						
7-Dec	0	0	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1.0	2																						
8-Dec	Z	1	1	0	0	0	0	0	0	0	1	1	0	0	0	1	5	3	1	2	3	2	2	1	1.1	5																						
9-Dec	1	Z	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0.5	1																						
10-Dec	0	0	Z	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	0	0.7	1																						
11-Dec	0	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0.6	1																						
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0																						
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	2	2	1	0	0	2	1	0	0.6	2																						
14-Dec	Z	1	0	0	1	2	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	3	0.8	3																						
15-Dec	3	Z	2	2	2	2	2	2	2	3	4	2	1	1	1	1	1	1	0	0	0	0	0	0	1.5	4																						
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																						
17-Dec	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0.3	1																						
18-Dec	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1																						
19-Dec	0	1	1	1	1	Z	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	0.8	2																						
20-Dec	Z	1	1	2	3	3	3	3	3	4	4	4	4	4	2	2	2	2	2	2	2	2	3	2	2.7	4																						
21-Dec	2	Z	4	6	7	7	9	12	13	12	9	4	4	4	4	4	3	3	3	3	3	3	3	2	5.4	13																						
22-Dec	2	2	Z	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1.8	2																						
23-Dec	2	3	3	Z	1	1	2	1	2	2	1	3	1	1	1	2	1	1	1	8	25	18	5	1	3.8	25																						
24-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1.1	2																						
25-Dec	1	1	2	4	2	Z	8	6	6	2	1	1	1	1	1	1	1	1	1	1	2	2	2	1	2.3	8																						
26-Dec	Z	2	2	1	3	2	2	3	2	2	2	3	4	2	2	7	3	1	1	1	1	1	1	1	2.0	7																						
27-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1.1	2																						
28-Dec	1	1	Z	2	2	2	3	4	2	1	2	2	3	2	2	2	3	2	9	6	3	3	1	1	2.6	9																						
29-Dec	1	1	2	Z	7	8	7	8	12	18	12	7	5	5	5	5	4	4	4	4	4	3	3	3	5.7	18																						
30-Dec	3	2	2	2	Z	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2.6	3																						
31-Dec	2	2	2	3	3	Z	3	4	4	3	3	4	5	4	4	4	4	3	3	3	3	3	3	4	3.4	5																						
																								1.0	1.1	1.2	1.4	1.7	2.2	2.2	2.2	2.3	2.1	2.0	1.6	1.6	1.4	1.5	1.6	1.7	1.4	1.4	1.7	2.1	1.8	1.3	1.2	Diurnal Average
																								3	3	4	6	7	16	15	12	13	18	12	7	5	5	5	7	7	7	9	8	25	18	5	4	Diurnal Maximum
Z - zerospan      C - Calibration																																																





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Fort Chipewyan - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	707	99.86	99.86
21 - 40	1	0.14	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Fort Chipewyan - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	7	5	15	82	146	48	37	21	14	20	25	22	92	76	56	39	705
21 - 40	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	7	6	15	82	146	48	37	21	14	20	25	22	92	76	56	39	706

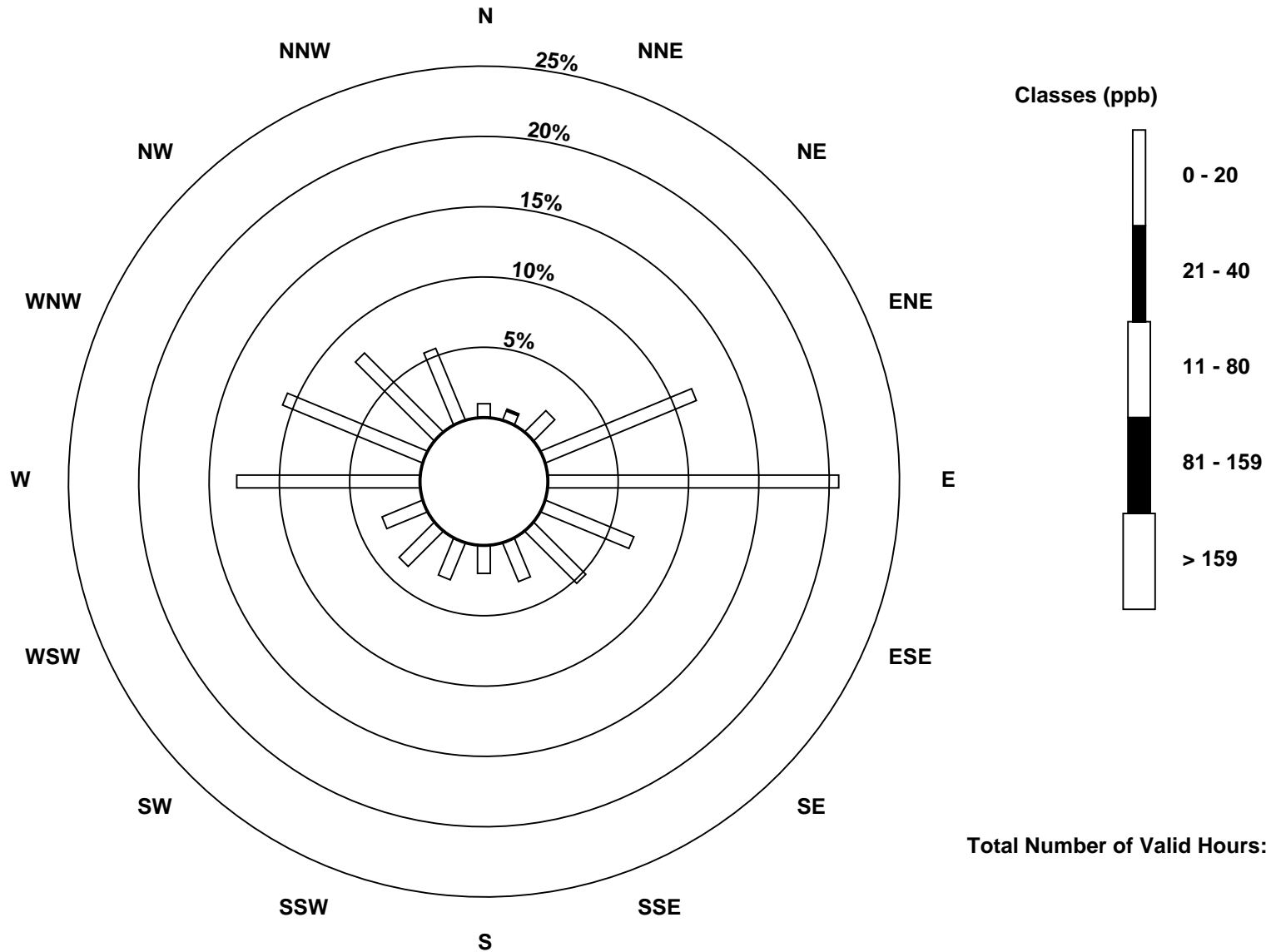
Total Number of Valid Hours: 706

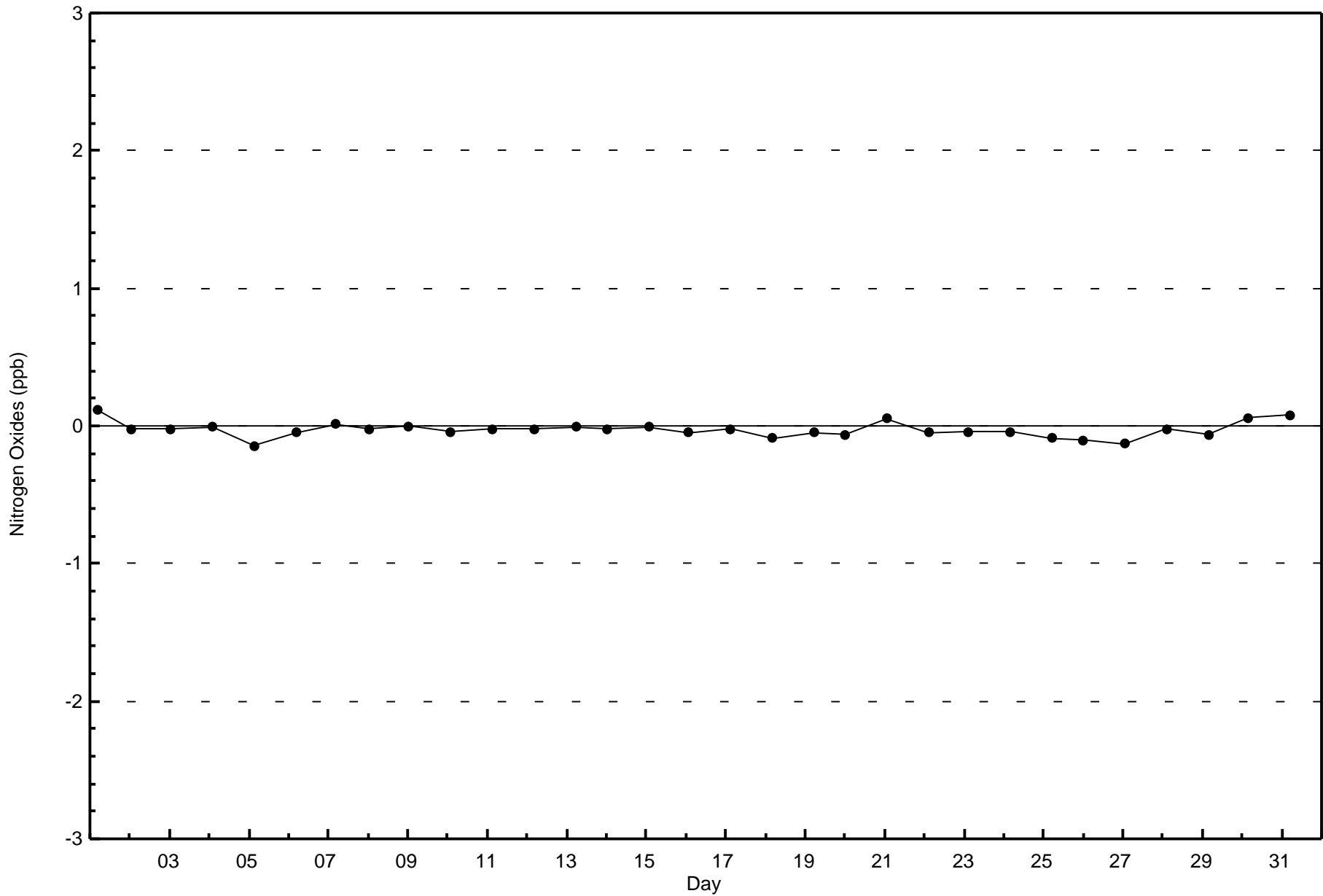
Total Number of Hours: 744

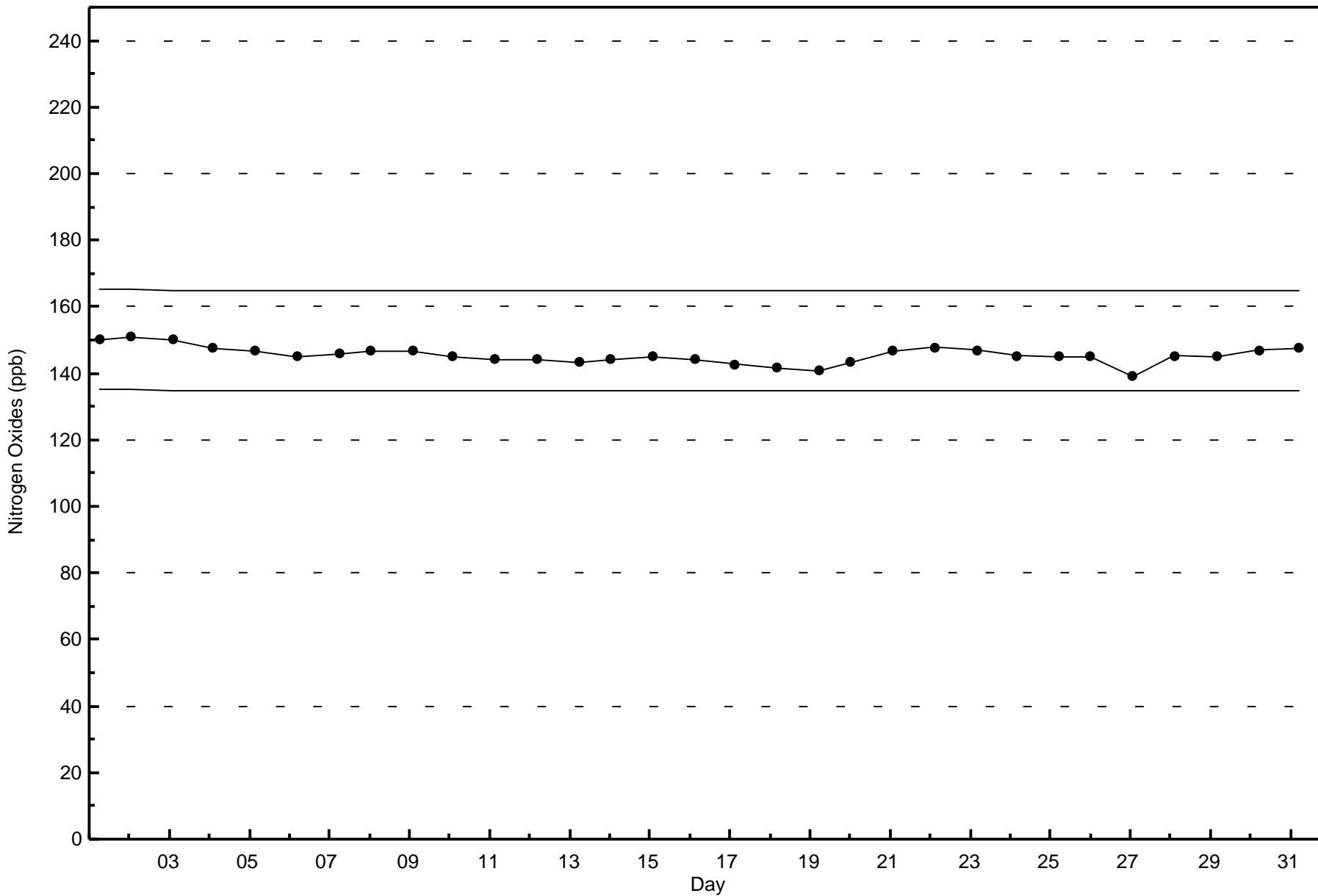


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Fort Chipewyan (AMS 8)









Summary of Hour Averages

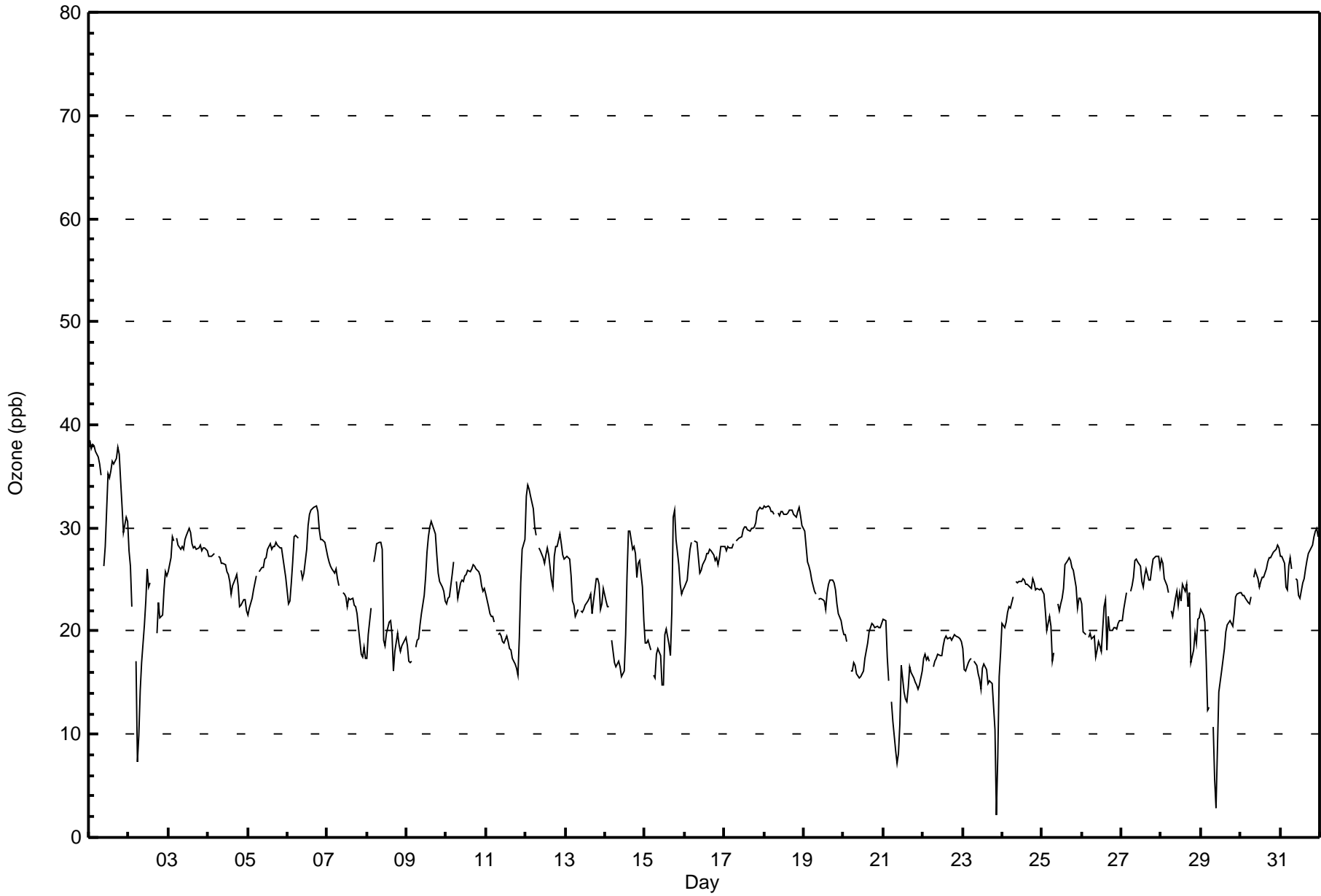
Fort Chipewyan - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 39 ppb on Dec 1 01:00	Maximum Daily Average: 34.8 ppb on Dec 1		Hours of Data:	710
Minimum Value: 2 ppb on Dec 23 21:00	Minimum Daily Average: 14.3 ppb on Dec 21		Hours of Missing Data:	34
Maximum Diurnal Average: 25.0 ppb at hour 18	Minimum Diurnal Average: 21.7 ppb at hour 8		Hours of Calibration:	34
Monthly Average: 23.7 ppb	Percentiles: P <sub>1</sub> = 8 P <sub>10</sub> = 17 O <sub>1</sub> = 20 Median = 24 O <sub>3</sub> = 27 P <sub>90</sub> = 30 P <sub>99</sub> = 37		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	39	38	38	38	37	37	36	35	Z	26	28	35	35	36	37	36	37	38	37	35	32	30	31	31	34.8	39	
2-Dec	28	26	22	Z	17	7	10	14	17	21	23	26	24	25	C	C	C	20	23	21	22	24	26	25	21.1	28	
3-Dec	26	27	29	29	Z	29	28	28	28	28	29	29	30	30	29	28	28	28	28	28	28	28	28	28	28.3	30	
4-Dec	27	27	27	27	28	Z	27	27	27	27	26	26	26	25	24	24	25	25	24	22	23	23	23	22	25.3	28	
5-Dec	22	22	23	24	25	25	Z	26	26	26	27	27	28	28	28	28	28	29	28	28	28	27	26	25	26.3	29	
6-Dec	23	23	25	27	29	29	29	Z	26	25	26	28	30	31	32	32	32	32	32	30	29	29	29	28	28.4	32	
7-Dec	27	27	26	26	26	26	25	24	Z	24	24	23	22	23	23	23	23	22	22	20	18	17	18	17	23.0	27	
8-Dec	17	20	22	Z	27	28	28	29	29	28	19	19	20	21	21	20	16	18	20	19	18	19	19	19	21.5	29	
9-Dec	19	17	17	17	Z	18	19	19	21	22	23	25	28	29	30	31	30	29	27	26	25	24	24	23	23.6	31	
10-Dec	23	23	23	25	27	Z	25	23	25	25	25	25	26	26	26	26	26	26	26	26	25	24	24	24	25.0	27	
11-Dec	24	22	22	21	21	21	Z	20	20	20	19	19	19	19	18	18	17	17	16	16	19	25	28	29	20.5	29	
12-Dec	33	34	34	33	32	30	29	Z	28	28	27	27	27	28	27	25	24	27	28	28	29	28	27	27	28.8	34	
13-Dec	27	27	27	25	23	23	21	22	Z	22	22	22	23	23	23	24	22	23	25	25	25	22	23	24	23.6	27	
14-Dec	23	22	22	Z	19	17	17	17	17	17	16	16	20	25	30	30	28	28	28	25	27	27	24	21	22.4	30	
15-Dec	19	19	19	18	Z	16	16	16	18	18	18	15	15	20	20	19	18	22	31	32	29	26	25	24	24	20.8	32
16-Dec	24	25	27	28	29	Z	29	29	27	26	26	26	27	27	28	28	28	27	27	27	26	27	28	28	27.1	29	
17-Dec	28	28	28	28	28	28	Z	29	29	29	29	30	30	30	30	30	30	30	30	31	32	32	32	32	29.7	32	
18-Dec	32	32	32	32	32	32	31	Z	32	31	32	32	31	31	31	32	32	32	31	31	32	32	31	30	31.6	32	
19-Dec	30	28	27	26	26	25	24	24	Z	23	23	23	23	22	24	25	25	25	25	24	23	22	21	20	24.2	30	
20-Dec	20	20	19	Z	16	16	17	17	16	15	16	16	16	17	19	20	20	21	21	20	21	20	20	21	18.4	21	
21-Dec	21	21	17	15	Z	13	11	8	7	8	11	17	14	13	13	15	17	16	15	15	15	14	15	16	14.3	21	
22-Dec	17	18	17	17	17	Z	17	17	17	18	18	18	19	19	19	19	19	19	19	19	20	19	19	19	18.4	20	
23-Dec	18	16	16	17	17	17	Z	17	17	16	15	14	16	17	16	15	15	15	15	10	2	8	16	18	15.0	18	
24-Dec	21	20	21	22	22	22	23	Z	25	25	25	25	25	25	25	25	24	24	25	25	24	24	24	24	23.7	25	
25-Dec	24	24	22	20	21	20	17	18	Z	23	22	23	23	24	26	27	27	27	26	26	24	22	23	23	23.2	27	
26-Dec	23	20	20	Z	19	20	19	20	18	19	19	18	22	23	18	21	20	20	20	20	20	20	21	21	20.0	23	
27-Dec	21	22	23	24	Z	24	24	25	27	27	27	26	25	24	25	26	25	25	26	27	27	27	27	26	25.3	27	
28-Dec	27	27	25	24	24	Z	22	21	23	24	22	24	23	24	24	25	22	24	17	18	20	19	21	21	22.7	27	
29-Dec	22	22	21	17	12	13	Z	11	6	3	9	14	16	17	18	20	21	21	21	20	22	23	24	24	17.2	24	
30-Dec	24	23	24	23	23	23	23	Z	25	26	25	24	25	25	25	26	27	27	27	27	28	28	28	28	25.4	28	
31-Dec	27	27	27	24	24	26	27	26	Z	25	25	24	23	25	25	26	27	28	28	28	29	30	30	29	26.5	30	
24.3 24.1 24.0 24.2 23.9 22.5 22.9 21.7 21.9 22.3 22.3 23.1 23.6 24.3 24.6 24.6 24.6 25.0 24.8 24.1 23.8 23.9 24.3 24.1																								Diurnal Average			
39 38 38 38 37 37 36 35 32 31 32 35 35 36 37 36 37 38 37 35 32 32 32 32																								Diurnal Maximum			

Z - zerospan C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Fort Chipewyan - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	196	27.61	27.61
21 - 50	514	72.39	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Fort Chipewyan - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	3	4	3	10	32	18	9	8	7	13	7	6	13	21	24	18	196
21 - 50	4	2	11	73	116	30	30	11	8	5	19	17	77	56	31	23	513
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	7	6	14	83	148	48	39	19	15	18	26	23	90	77	55	41	709

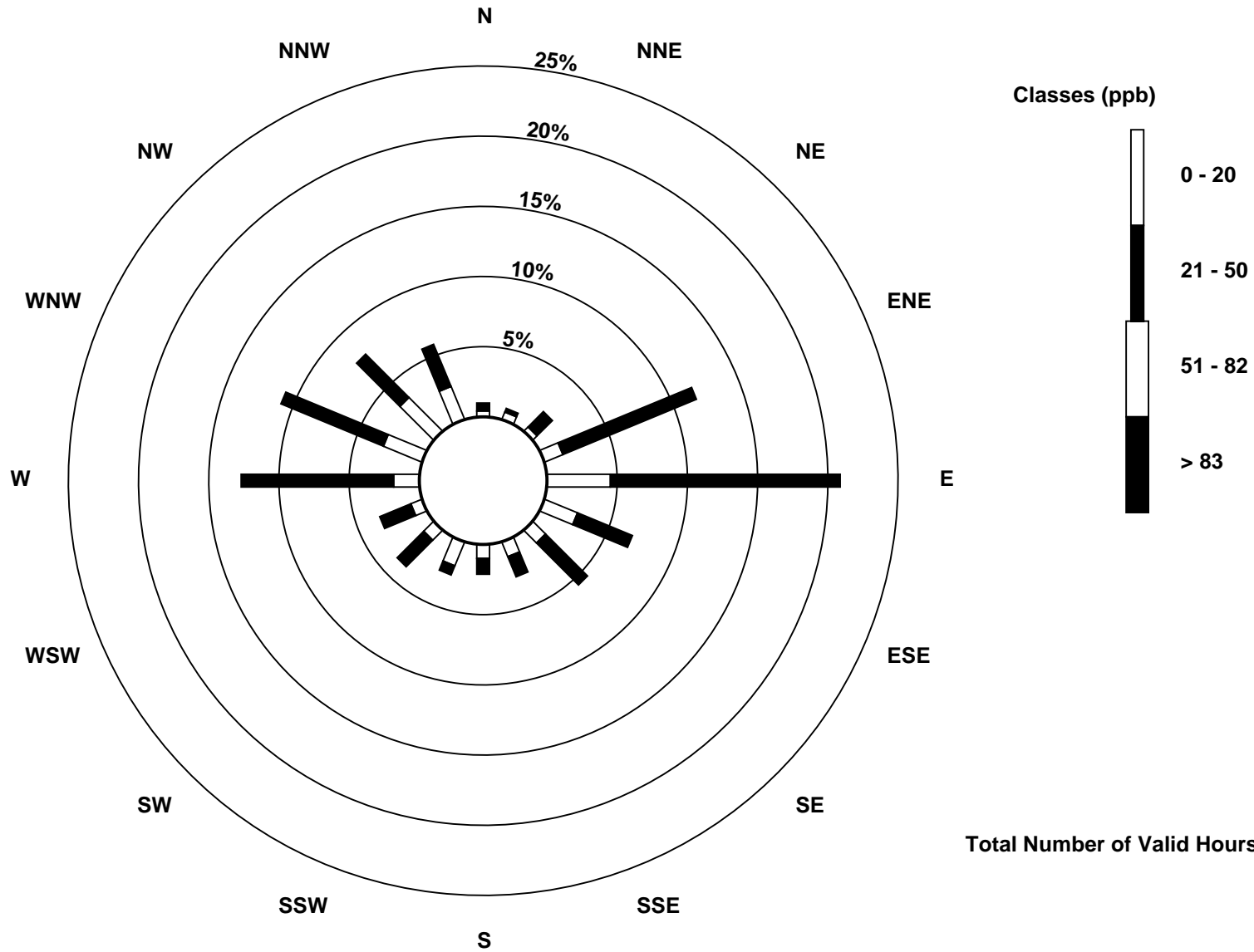
Total Number of Valid Hours: 709

Total Number of Hours: 744

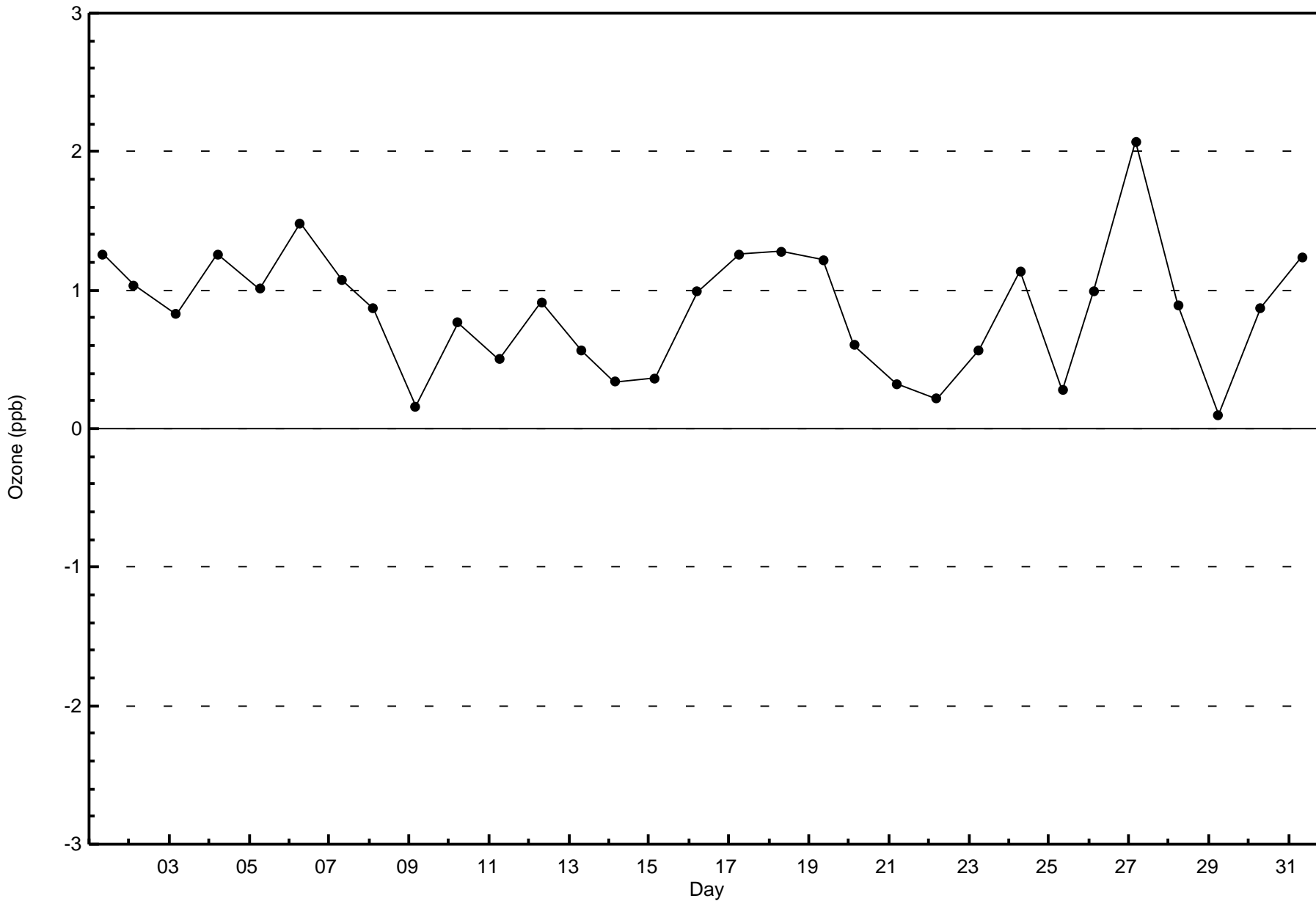


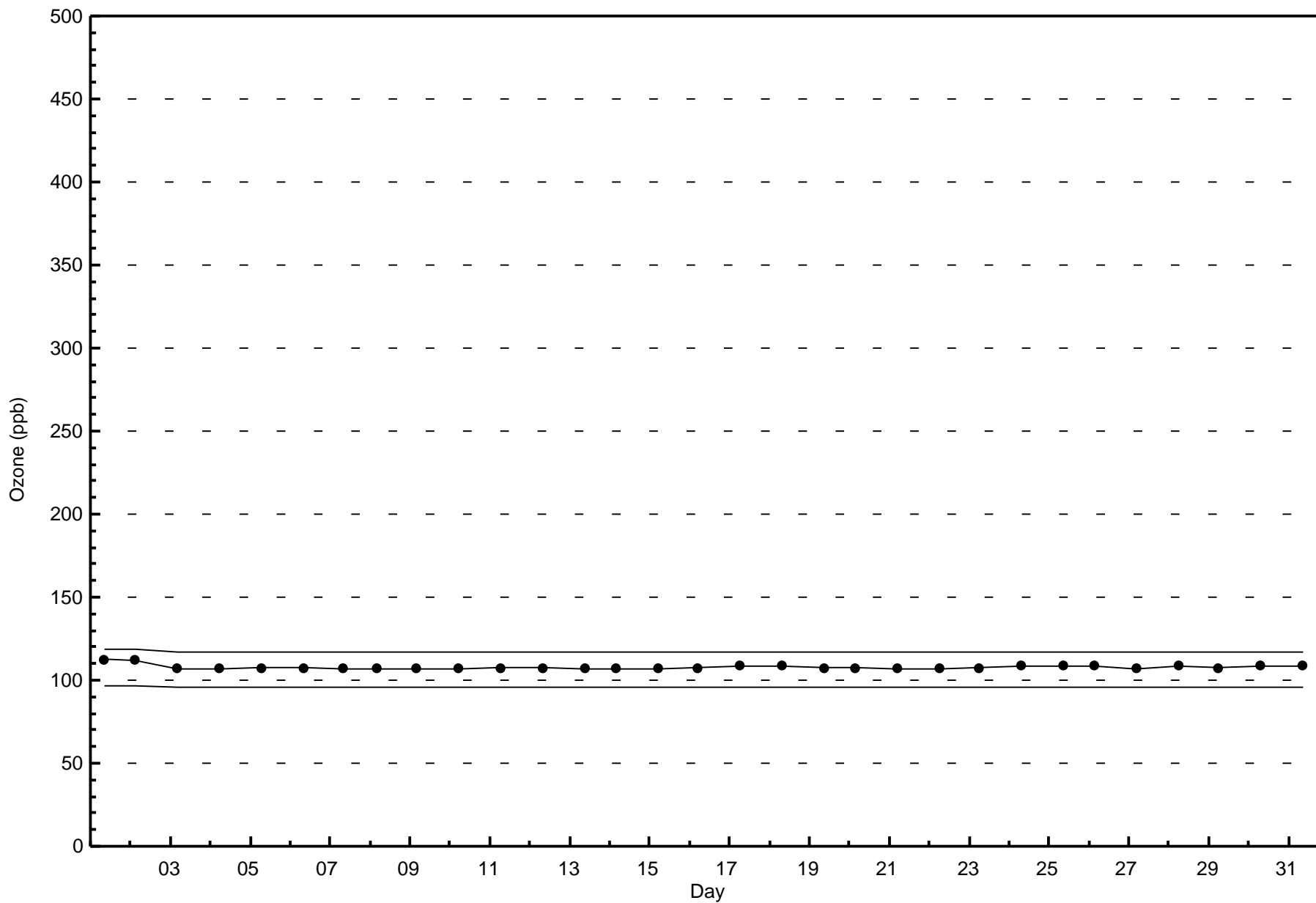
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Ozone (O<sub>3</sub>) - ppb  
Fort Chipewyan (AMS 8)



Total Number of Valid Hours: 709







Summary of Hour Averages

Fort Chipewyan - December 2015

Number of Exceedences (AAAQO):	24-hr: 0	Hours in Service:	744
Maximum Value: 32.6 µg/m <sup>3</sup> on Dec 26 08:00	Maximum Daily Average: 8.4 µg/m <sup>3</sup> on Dec 26	Hours of Data:	743
Minimum Value: 0.3 µg/m <sup>3</sup> on Dec 1 12:00	Minimum Daily Average: 1.1 µg/m <sup>3</sup> on Dec 5	Hours of Missing Data:	1
Maximum Diurnal Average: 5.9 µg/m <sup>3</sup> at hour 8	Minimum Diurnal Average: 3.3 µg/m <sup>3</sup> at hour 24	Hours of Calibration:	1
Monthly Average: 4.33 µg/m <sup>3</sup>	Percentiles: P <sub>1</sub> = 0.9 P <sub>10</sub> = 1.5 Q <sub>1</sub> = 2.4 Median = 3.9 Q <sub>3</sub> = 5.5 P <sub>90</sub> = 7.8 P <sub>99</sub> = 12.5	Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	10.7	6.3	5.8	7.3	6.9	8.7	11.6	13.1	8.7	6.6	4.0	0.3	2.3	1.8	2.2	3.3	2.3	2.2	2.8	5.0	6.8	8.3	3.0	1.1	5.5	13.1																						
2-Dec	1.1	1.6	2.8	4.0	3.9	7.9	10.8	11.5	11.3	10.7	10.7	11.0	12.9	10.3	C	9.9	10.5	8.7	7.0	6.2	5.6	5.1	5.6	4.8	7.6	12.9																						
3-Dec	4.4	4.5	3.8	4.3	4.4	4.5	4.2	4.5	5.1	5.2	5.4	5.4	4.7	4.4	5.2	5.0	4.4	4.9	5.1	5.1	5.5	5.6	5.4	5.6	4.8	5.6																						
4-Dec	6.0	6.8	7.7	8.3	7.5	7.1	6.8	6.7	6.7	7.5	7.5	7.7	7.5	7.8	10.6	9.0	4.6	3.8	5.3	4.9	3.0	1.9	1.6	1.2	6.2	10.6																						
5-Dec	1.3	1.2	1.2	1.3	1.2	1.1	1.0	1.1	1.1	1.1	1.1	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.8	0.7	1.1	1.3	0.8	1.7	1.1	1.7																						
6-Dec	2.7	2.9	1.2	1.0	1.0	0.8	1.0	1.2	1.4	2.1	1.5	1.6	1.5	1.7	1.9	2.8	2.1	2.0	1.9	1.8	2.0	2.0	2.0	2.0	1.8	2.9																						
7-Dec	2.1	2.2	2.2	2.3	2.4	2.5	2.6	2.7	2.7	2.8	2.7	2.7	2.9	2.9	3.2	3.8	4.4	4.4	4.5	7.3	13.8	3.0	3.0	3.0	3.6	13.8																						
8-Dec	2.5	3.0	2.6	2.3	2.8	3.5	2.8	2.4	2.2	2.8	9.4	9.3	5.8	5.1	4.2	4.3	7.7	5.2	4.3	4.7	4.4	4.6	4.4	4.6	4.4	9.4																						
9-Dec	6.5	7.8	7.6	7.9	7.9	6.9	5.8	5.4	4.3	3.5	2.6	2.1	1.8	1.5	1.3	1.2	1.7	1.7	1.3	1.5	2.0	2.1	2.7	3.2	3.8	7.9																						
10-Dec	3.7	4.9	3.9	4.2	3.4	4.0	6.8	8.4	8.4	6.5	6.6	5.8	5.0	5.0	4.5	4.1	4.1	3.2	3.4	3.7	4.6	5.4	4.0	3.8	4.9	8.4																						
11-Dec	4.1	4.8	5.1	5.0	5.8	6.2	6.7	8.0	8.8	8.4	8.0	7.5	6.9	6.1	5.9	5.3	4.8	4.8	4.4	4.3	4.0	2.5	1.5	1.4	5.4	8.8																						
12-Dec	1.4	1.2	1.4	1.4	1.4	1.5	1.7	1.7	1.8	2.0	2.4	2.2	2.3	3.3	5.5	4.8	4.9	2.3	1.6	1.5	1.3	1.1	1.2	1.3	2.1	5.5																						
13-Dec	1.4	1.3	1.1	1.2	1.8	1.9	1.8	1.6	1.5	1.8	2.3	2.1	1.8	1.8	1.7	1.7	1.4	1.3	1.1	1.3	1.1	1.9	1.5	1.6	1.6	2.3																						
14-Dec	1.7	1.8	1.6	2.2	3.3	2.2	1.2	1.5	2.0	2.6	3.9	2.4	3.0	2.9	3.6	4.1	3.5	3.1	3.1	3.2	2.9	2.5	3.5	2.5	2.7	4.1																						
15-Dec	2.2	2.1	1.9	2.1	3.2	3.9	3.9	4.4	4.6	5.8	7.3	6.8	7.0	6.9	7.8	6.3	5.2	2.4	1.8	2.1	3.1	2.1	2.1	2.0	4.0	7.8																						
16-Dec	1.8	1.6	1.5	1.4	1.3	1.2	1.2	1.2	1.1	1.1	1.2	1.3	1.2	1.2	1.2	1.3	1.6	1.8	1.8	1.8	3.2	2.1	2.9	1.8	1.6	3.2																						
17-Dec	2.1	3.0	4.0	3.5	2.3	2.2	2.2	2.4	4.5	4.7	2.6	2.2	2.5	2.7	2.2	3.6	2.3	2.1	2.1	2.2	2.6	2.1	4.5	2.3	2.8	4.7																						
18-Dec	2.8	2.4	2.6	2.8	2.8	3.0	3.0	3.1	2.8	3.2	3.1	2.9	2.6	2.7	4.3	4.3	2.7	2.8	2.5	2.6	2.5	2.5	2.9	3.2	2.9	4.3																						
19-Dec	3.0	3.3	3.3	3.3	3.1	2.9	2.6	2.5	2.5	2.5	2.7	2.7	3.0	3.2	3.7	3.0	3.0	2.5	2.3	2.3	2.4	2.4	2.5	2.6	2.8	3.7																						
20-Dec	2.6	2.7	3.2	4.3	10.3	13.0	11.0	7.7	6.9	7.0	6.8	6.8	5.9	5.6	4.7	4.3	4.3	4.3	4.3	4.5	4.4	4.2	4.0	4.2	5.7	13.0																						
21-Dec	4.0	4.3	6.3	7.7	7.2	7.6	8.0	8.4	9.0	9.4	8.8	6.5	10.1	9.9	9.1	5.8	4.4	4.7	3.6	4.9	5.6	4.6	4.0	3.5	6.6	10.1																						
22-Dec	2.6	2.4	2.5	3.1	3.3	2.9	2.6	2.3	2.3	2.7	3.2	2.9	2.6	2.3	2.5	3.0	3.7	3.0	2.9	3.0	2.7	3.7	3.3	3.5	2.9	3.7																						
23-Dec	3.3	9.9	7.6	2.9	1.9	1.9	1.9	2.0	2.8	2.2	2.5	3.1	2.0	2.2	3.5	2.5	2.8	2.7	3.8	5.0	5.1	6.4	5.0	5.9	3.7	9.9																						
24-Dec	5.5	5.8	5.2	5.4	5.0	4.9	4.8	4.4	4.3	4.1	5.2	4.3	3.9	6.7	5.6	5.7	4.6	6.1	7.7	6.5	6.1	4.5	4.8	4.4	5.2	7.7																						
25-Dec	4.9	5.3	6.4	7.4	5.2	5.3	5.3	5.3	5.0	4.6	4.1	3.9	3.9	4.0	4.5	5.9	5.3	6.3	6.4	7.7	10.5	9.6	24.8	6.9	6.6	24.8																						
26-Dec	6.4	14.3	5.9	5.4	5.5	6.0	11.0	32.6	9.5	7.4	7.9	8.5	8.9	7.4	8.4	11.2	7.6	5.6	5.7	5.3	5.1	5.2	5.3	5.3	8.4	32.6																						
27-Dec	4.8	4.9	4.6	4.8	4.2	4.2	3.9	3.9	4.1	3.8	3.6	3.4	3.2	3.3	3.4	3.5	3.9	4.2	4.3	4.0	4.3	4.1	4.0	3.7	4.0	4.9																						
28-Dec	5.3	7.9	15.1	6.9	5.1	4.6	6.4	15.7	9.0	8.4	8.4	5.1	4.7	3.9	5.8	4.2	5.4	5.5	9.8	5.7	4.6	5.4	4.1	3.9	6.7	15.7																						
29-Dec	3.6	4.0	3.9	4.8	6.0	6.4	5.9	6.7	7.7	8.2	8.2	8.5	8.2	7.3	5.7	4.7	4.4	7.0	7.8	6.4	4.6	3.5	4.2	5.5	6.0	8.5																						
30-Dec	6.7	7.4	8.2	8.9	8.9	9.2	8.3	6.7	5.0	3.9	3.7	3.6	3.1	2.9	2.5	2.4	2.7	3.2	6.2	5.7	4.8	4.3	3.6	3.3	5.2	9.2																						
31-Dec	4.6	5.6	5.6	5.1	4.6	4.5	4.1	3.8	4.2	4.5	4.1	4.1	3.4	3.4	3.3	3.2	3.3	3.4	3.3	3.2	3.1	2.8	2.7	2.8	3.9	5.6																						
																								3.7	4.4	4.4	4.3	4.3	4.6	4.9	5.9	4.9	4.7	4.9	4.4	4.4	4.2	4.3	4.4	4.0	3.7	4.0	4.0	4.3	3.8	4.0	3.3	Diurnal Average
																								10.7	14.3	15.1	8.9	10.3	13.0	11.6	32.6	11.3	10.7	10.7	11.0	12.9	10.3	10.6	11.2	10.5	8.7	9.8	7.7	13.8	9.6	24.8	6.9	Diurnal Maximum

C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m<sup>3</sup>

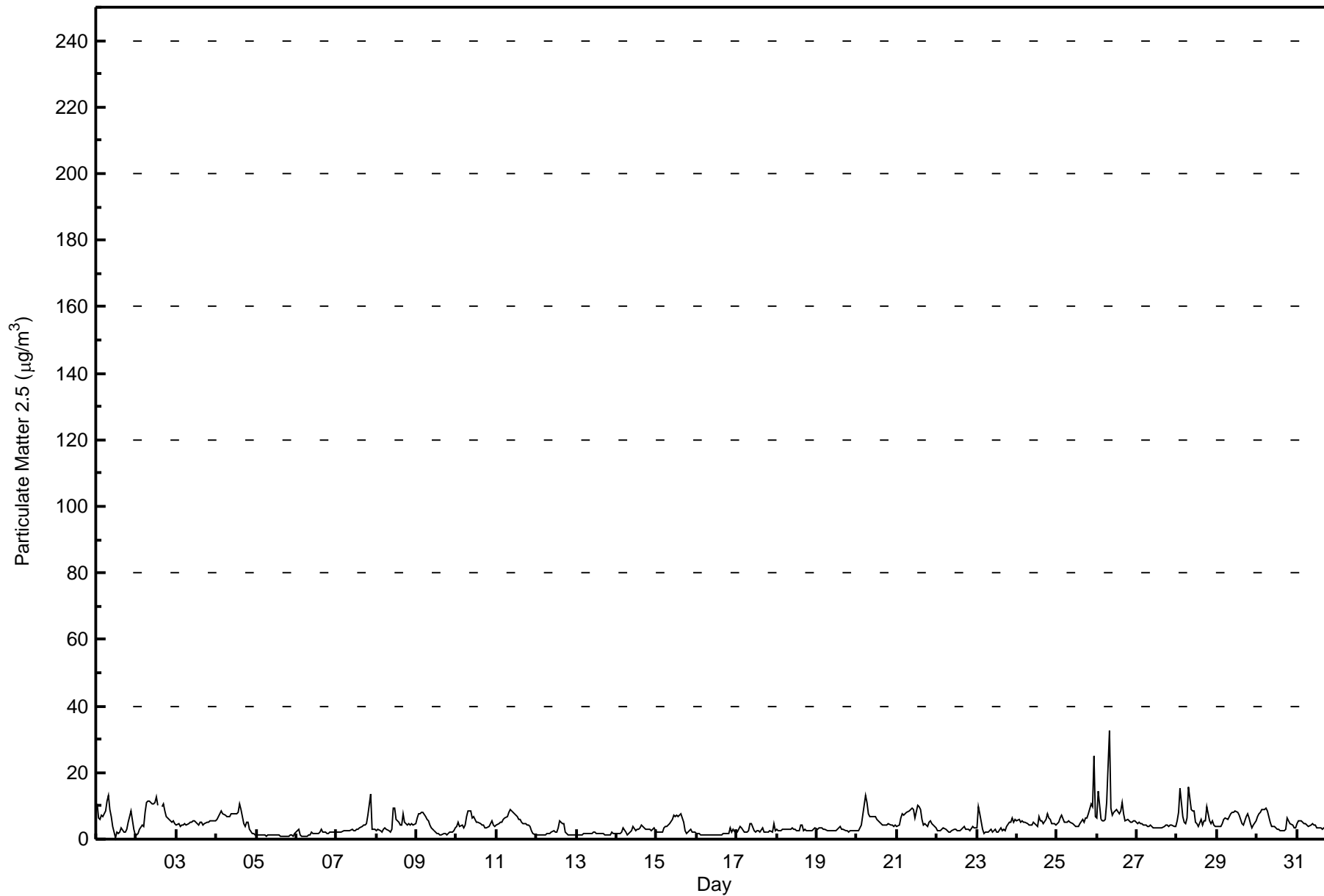


Wood Buffalo Environmental Association

Hourly Averages

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$

Fort Chipewyan - December 2015







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Fort Chipewyan - December 2015**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	544	73.22	73.22
6 - 15	184	24.76	97.98
16 - 25	2	0.27	98.25
26 - 80	1	0.13	98.39
> 81.0	0	0.00	98.39

Total Number of Valid Hours: 743

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Fort Chipewyan - December 2015**

Concentration Ranges ( $\mu\text{g}/\text{m}^3$ )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	8	3	10	54	130	38	30	17	10	4	17	14	64	67	41	36	543
6 - 15	0	3	5	32	20	12	10	4	5	16	8	9	24	14	15	6	183
16 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	8	6	15	86	150	50	40	21	15	20	25	23	88	81	59	42	729

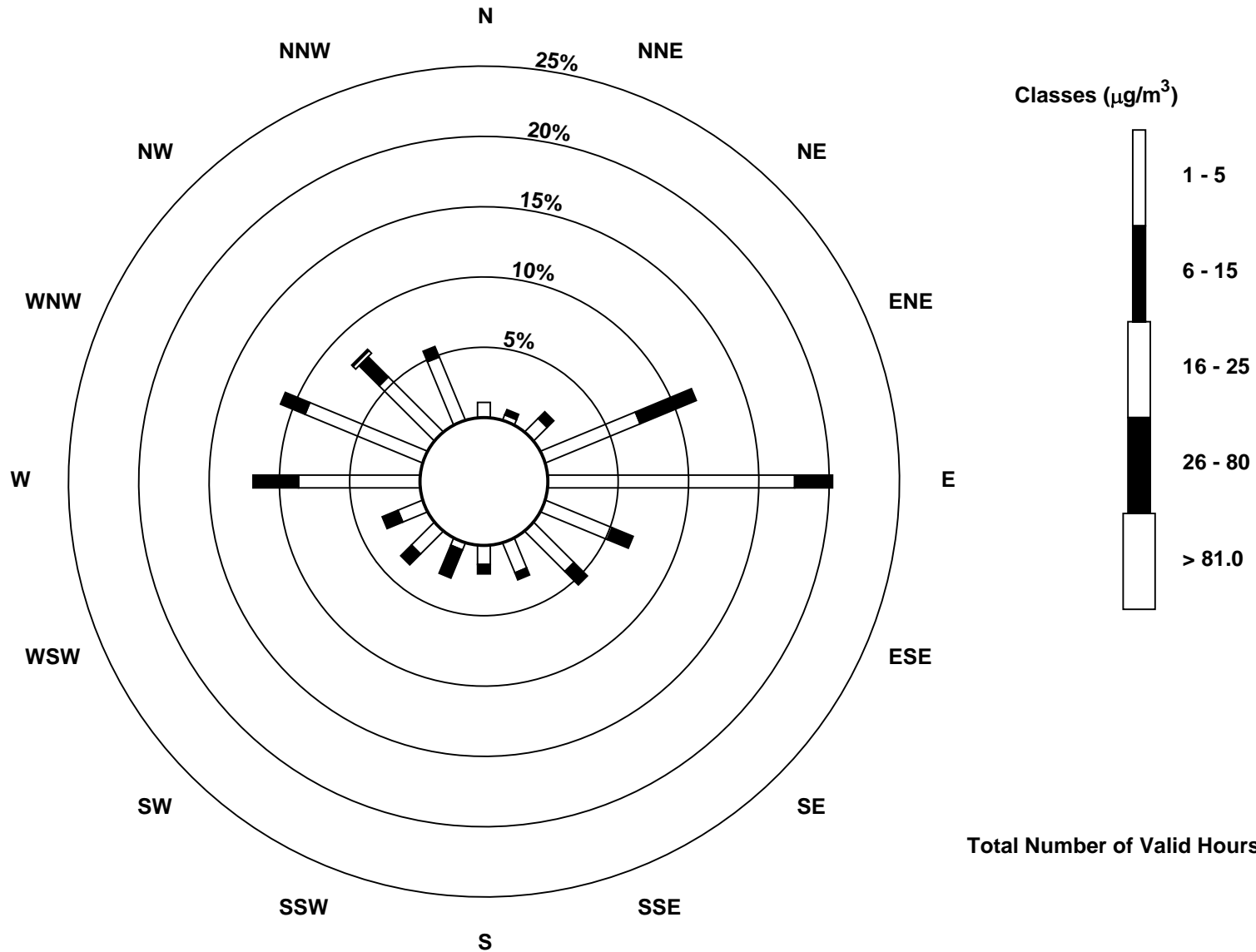
Total Number of Valid Hours: 741

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Fort Chipewyan (AMS 8)



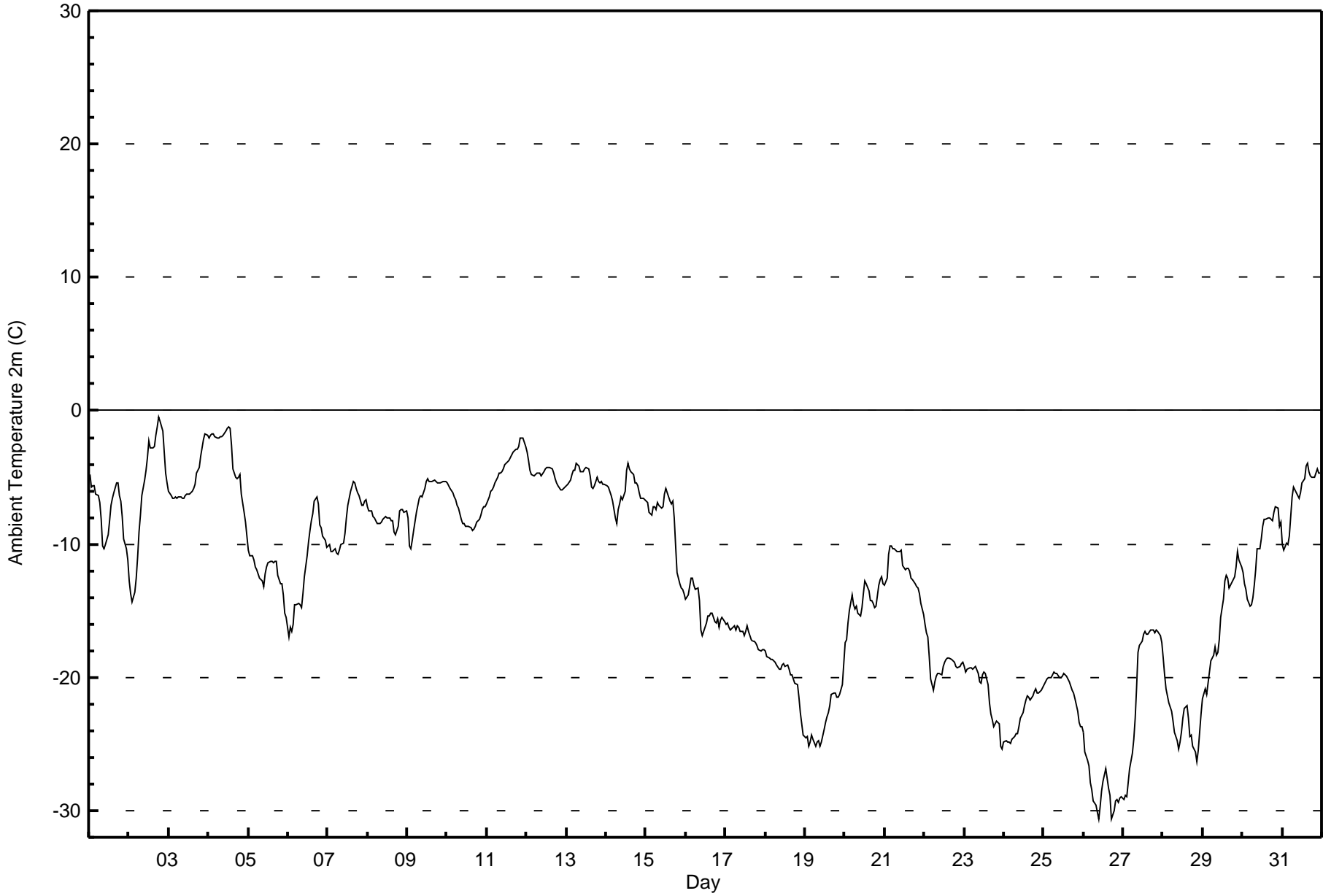


Maximum Value: -0.4 C on Dec 2 19:00      Maximum Daily Average: -3.5 C on Dec 4																						Hours in Service:	744			
Minimum Value: -30.6 C on Dec 26 10:00      Minimum Daily Average: -28.4 C on Dec 26																						Hours of Data:	744			
Maximum Diurnal Average: -11.6 C at hour 14      Minimum Diurnal Average: -13.6 C at hour 3																						Hours of Missing Data:	0			
Monthly Average: -12.71 C      Percentiles: P <sub>1</sub> = -29.3 P <sub>10</sub> = -23.4 Q <sub>1</sub> = -18.9 Median = -11.3 Q <sub>3</sub> = -6.4 P <sub>90</sub> = -4.6 P <sub>99</sub> = -1.6																						Hours of Calibration:	0			
																						Percent Operational Time:	100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-4.8	-5.8	-5.6	-5.6	-6.3	-6.3	-6.9	-8.2	-10.1	-10.3	-10.0	-9.3	-8.3	-7.1	-6.5	-6.2	-5.4	-5.4	-6.4	-6.8	-7.9	-9.6	-10.4	-11.2	-7.5	-4.8
2-Dec	-12.7	-13.7	-14.3	-13.6	-12.5	-10.9	-9.1	-7.8	-6.3	-5.2	-4.5	-3.5	-2.3	-2.8	-2.8	-2.7	-1.8	-1.2	-0.4	-0.8	-1.5	-3.1	-4.7	-5.4	-6.0	-0.4
3-Dec	-6.0	-6.4	-6.6	-6.6	-6.5	-6.6	-6.5	-6.5	-6.6	-6.5	-6.4	-6.2	-6.2	-6.2	-6.0	-5.9	-5.5	-4.7	-4.2	-3.4	-2.8	-2.1	-1.7	-1.9	-5.3	-1.7
4-Dec	-2.0	-1.8	-1.7	-1.8	-2.0	-2.1	-2.0	-1.9	-1.9	-1.9	-1.6	-1.3	-1.2	-1.3	-2.6	-4.3	-5.0	-5.1	-5.0	-4.8	-6.3	-7.7	-8.4	-9.4	-3.5	-1.2
5-Dec	-10.5	-10.9	-10.9	-11.2	-11.7	-11.9	-12.2	-12.5	-12.8	-13.2	-12.3	-11.7	-11.4	-11.3	-11.3	-11.4	-11.3	-11.3	-12.4	-13.0	-12.9	-13.9	-15.2	-15.5	-12.2	-10.5
6-Dec	-17.0	-16.2	-16.6	-16.0	-14.6	-14.5	-14.5	-14.6	-14.7	-13.7	-12.5	-10.9	-9.8	-9.0	-8.3	-7.7	-6.8	-6.4	-7.0	-8.6	-8.8	-9.4	-9.7	-10.2	-11.6	-6.4
7-Dec	-10.2	-10.0	-10.6	-10.6	-10.4	-10.7	-10.8	-10.5	-10.0	-9.9	-9.2	-8.1	-7.1	-6.6	-6.0	-5.4	-5.4	-5.9	-6.2	-6.4	-7.0	-7.1	-6.8	-6.7	-8.2	-5.4
8-Dec	-7.2	-7.5	-7.6	-7.9	-8.1	-8.3	-8.5	-8.4	-8.3	-8.1	-8.0	-8.0	-8.1	-8.1	-8.2	-8.2	-9.1	-9.4	-8.7	-7.5	-7.4	-7.4	-7.6	-7.5	-8.0	-7.2
9-Dec	-8.1	-10.2	-10.4	-9.7	-9.0	-7.6	-7.1	-6.6	-6.4	-6.5	-5.9	-5.3	-5.1	-5.3	-5.4	-5.4	-5.2	-5.3	-5.4	-5.4	-5.4	-5.3	-5.3	-5.3	-6.5	-5.1
10-Dec	-5.4	-5.6	-5.8	-6.2	-6.4	-6.7	-7.0	-7.3	-8.1	-8.5	-8.5	-8.7	-8.6	-8.7	-8.7	-9.0	-8.9	-8.6	-8.3	-8.1	-7.8	-7.4	-7.2	-7.2	-7.6	-5.4
11-Dec	-6.9	-6.5	-6.1	-5.9	-5.7	-5.4	-5.0	-4.7	-4.6	-4.5	-4.4	-4.1	-3.9	-3.7	-3.5	-3.3	-3.1	-2.9	-2.9	-2.7	-2.0	-2.1	-2.1	-2.7	-4.1	-2.0
12-Dec	-3.1	-3.7	-4.5	-4.7	-4.9	-4.8	-4.7	-4.7	-4.7	-4.9	-4.6	-4.4	-4.3	-4.3	-4.3	-4.4	-4.7	-5.1	-5.5	-5.6	-5.9	-6.0	-5.8	-5.8	-4.8	-3.1
13-Dec	-5.6	-5.5	-5.3	-4.8	-4.5	-4.5	-3.9	-4.1	-4.5	-4.6	-4.6	-4.4	-4.3	-4.4	-4.9	-5.8	-5.9	-5.6	-5.0	-5.3	-5.4	-5.3	-5.5	-5.6	-5.0	-3.9
14-Dec	-5.6	-5.7	-6.0	-6.4	-6.8	-8.0	-8.4	-7.4	-7.0	-6.4	-6.7	-6.0	-4.5	-4.0	-4.3	-4.6	-4.8	-5.4	-5.4	-5.6	-6.2	-6.5	-6.6	-6.7	-6.0	-4.0
15-Dec	-6.8	-6.9	-7.6	-7.9	-7.2	-7.2	-7.4	-6.9	-7.1	-7.3	-7.2	-6.3	-5.9	-6.2	-6.8	-7.0	-6.8	-8.1	-10.1	-12.1	-13.0	-13.3	-13.3	-13.7	-8.4	-5.9
16-Dec	-14.1	-13.9	-13.2	-12.6	-12.6	-13.1	-13.4	-13.3	-14.3	-16.5	-16.8	-16.5	-15.9	-15.4	-15.4	-15.1	-15.2	-15.9	-15.9	-15.6	-16.2	-15.7	-15.5	-15.9	-14.9	-12.6
17-Dec	-16.1	-16.0	-16.2	-16.5	-16.3	-16.1	-16.5	-16.2	-16.2	-16.6	-16.6	-16.8	-16.5	-16.1	-16.6	-17.2	-17.3	-17.3	-17.4	-17.6	-17.9	-18.1	-17.9	-18.0	-16.8	-16.0
18-Dec	-18.0	-18.4	-18.5	-18.6	-18.6	-18.8	-18.9	-19.1	-19.4	-19.3	-19.1	-19.0	-19.1	-19.1	-19.4	-19.8	-19.8	-20.1	-20.4	-20.6	-21.5	-22.6	-23.4	-24.4	-19.8	-18.0
19-Dec	-24.5	-24.5	-25.2	-24.9	-24.3	-24.7	-25.2	-24.9	-24.7	-25.2	-24.8	-23.9	-23.4	-23.0	-22.6	-22.1	-21.3	-21.1	-21.2	-21.5	-21.5	-21.3	-20.5	-18.9	-23.1	-18.9
20-Dec	-17.4	-17.2	-15.9	-14.9	-13.8	-14.6	-14.8	-14.6	-15.1	-15.4	-14.8	-13.7	-12.8	-13.0	-13.5	-14.3	-14.2	-14.5	-14.8	-14.6	-13.1	-12.6	-12.5	-13.0	-14.4	-12.5
21-Dec	-13.1	-12.5	-10.8	-10.1	-10.1	-10.3	-10.4	-10.5	-10.6	-10.6	-10.4	-11.6	-11.9	-11.8	-11.8	-12.1	-12.6	-12.7	-13.0	-13.2	-13.3	-13.7	-14.4	-15.3	-11.9	-10.1
22-Dec	-16.1	-16.7	-17.0	-18.5	-20.2	-21.0	-20.3	-19.9	-19.7	-19.7	-19.8	-19.1	-18.8	-18.7	-18.6	-18.5	-18.7	-18.8	-18.9	-19.2	-19.2	-19.2	-19.0	-18.8	-18.9	-16.1
23-Dec	-19.2	-19.6	-19.4	-19.2	-19.3	-19.4	-19.3	-19.2	-19.7	-20.3	-20.4	-19.8	-19.6	-19.7	-20.6	-21.9	-22.7	-23.2	-23.7	-23.3	-23.4	-23.5	-25.2	-25.4	-21.1	-19.2
24-Dec	-24.8	-24.7	-24.8	-24.9	-25.0	-24.7	-24.4	-24.2	-24.2	-23.7	-23.1	-22.6	-22.1	-21.7	-21.4	-21.5	-21.7	-21.4	-21.1	-20.9	-21.2	-21.2	-20.9	-20.7	-22.8	-20.7
25-Dec	-20.5	-20.3	-20.1	-20.0	-20.0	-19.8	-19.6	-19.7	-19.8	-20.0	-20.0	-19.9	-19.7	-19.8	-19.9	-20.3	-20.6	-21.0	-21.1	-21.6	-22.5	-23.4	-23.7	-23.7	-20.7	-19.6
26-Dec	-24.1	-25.5	-26.2	-26.6	-27.9	-28.4	-29.2	-29.5	-30.1	-30.6	-29.7	-28.6	-27.8	-26.9	-27.6	-28.3	-28.8	-30.6	-30.0	-29.3	-29.2	-29.4	-29.0	-29.0	-28.4	-24.1
27-Dec	-29.1	-28.9	-28.9	-27.9	-26.8	-25.7	-24.6	-23.1	-20.8	-18.2	-17.6	-17.2	-16.8	-16.6	-16.8	-16.8	-16.4	-16.5	-16.5	-16.7	-16.5	-16.6	-16.8	-17.4	-20.4	-16.4
28-Dec	-18.5	-19.8	-20.9	-21.9	-22.2	-22.5	-23.3	-24.1	-24.8	-25.4	-24.9	-24.1	-23.0	-22.4	-22.1	-23.1	-24.4	-24.4	-25.2	-25.6	-26.3	-25.5	-24.1	-22.7	-23.4	-18.5
29-Dec	-21.6	-20.8	-21.3	-20.5	-19.6	-18.8	-18.3	-17.7	-18.3	-18.1	-17.2	-15.5	-14.2	-12.8	-12.4	-12.6	-13.3	-12.9	-12.7	-12.5	-11.7	-10.6	-11.1	-11.7	-15.7	-10.6
30-Dec	-12.1	-13.0	-13.4	-14.1	-14.6	-14.6	-14.0	-13.1	-12.0	-10.4	-10.3	-9.6	-8.7	-8.1	-8.1	-8.0	-8.0	-8.2	-8.2	-7.6	-7.2	-7.3	-8.7	-8.3	-10.3	-7.2
31-Dec	-10.0	-10.5	-9.9	-10.0	-9.4	-7.9	-6.5	-5.8	-6.1	-6.4	-6.5	-6.2	-5.4	-5.1	-4.2	-4.0	-4.6	-4.9	-5.0	-5.0	-4.7	-4.4	-4.7	-4.6	-6.3	-4.0
																								Diurnal Average		
																								Diurnal Maximum		



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ambient Temperature 2m (AT 2m) - C**  
**Fort Chipewyan - December 2015**





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C  
Fort Chipewyan - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	143	19.22	19.22
-20 - 0	601	80.78	100.00
0 - 10	0	0.00	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

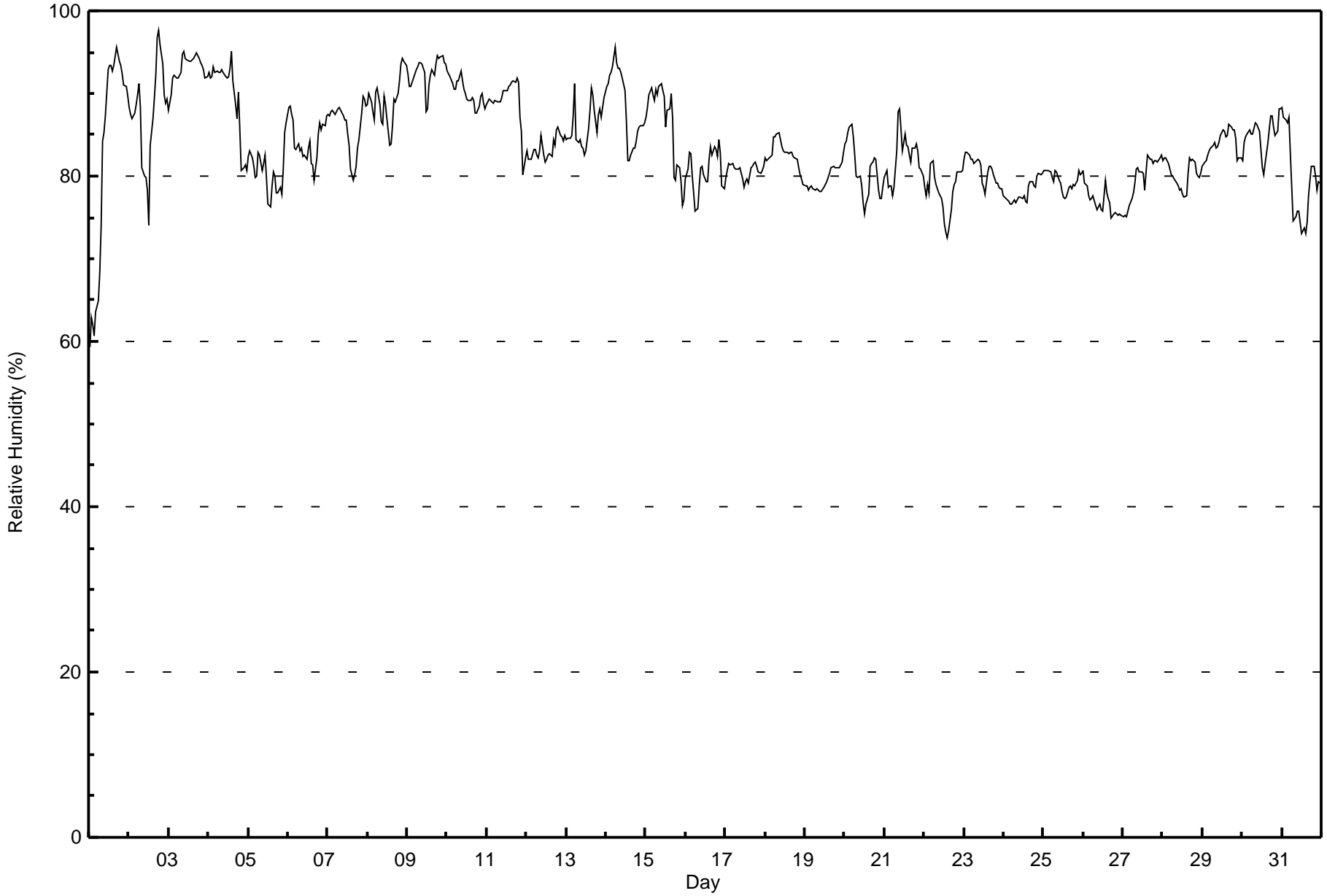
**Fort Chipewyan - December 2015**

Maximum Value: 98 % on Dec 2 19:00      Maximum Daily Average: 93.0 % on Dec 3																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																			
Minimum Value: 59 % on Dec 1 01:00      Minimum Daily Average: 76.8 % on Dec 26 Maximum Diurnal Average: 84.7 % at hour 19      Minimum Diurnal Average: 82.4 % at hour 13 Monthly Average: 83.8 %      Percentiles: P <sub>1</sub> = 72 P <sub>10</sub> = 78 Q <sub>1</sub> = 80 Median = 83 Q <sub>3</sub> = 88 P <sub>90</sub> = 92 P <sub>99</sub> = 95																																					
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	59	63	62	61	64	65	68	74	84	85	87	93	93	93	93	93	96	95	94	93	92	91	91	90	82.5	96											
2-Dec	88	87	87	88	89	90	91	88	81	80	80	78	74	84	87	89	92	97	98	96	94	90	89	89	87.7	98											
3-Dec	88	90	92	92	92	92	92	93	95	95	94	94	94	94	94	95	95	94	94	93	93	92	92	92	93.0	95											
4-Dec	93	92	92	93	93	93	93	93	93	93	92	92	92	93	95	91	89	87	90	86	81	81	81	81	89.8	95											
5-Dec	82	83	82	81	80	80	83	83	81	82	82	80	77	76	79	81	80	78	78	79	78	81	85	86	80.7	86											
6-Dec	88	89	87	87	83	83	84	83	83	82	82	82	83	84	82	81	79	82	85	86	86	86	86	87	84.3	89											
7-Dec	87	87	88	88	88	88	88	88	88	87	87	87	85	84	81	79	80	81	83	84	88	90	89	89	86.0	90											
8-Dec	89	90	89	88	87	90	91	89	87	86	90	89	87	84	84	86	89	89	90	92	94	94	94	93	89.1	94											
9-Dec	92	91	91	91	92	93	93	94	94	94	93	88	88	91	92	93	92	94	95	94	94	95	94	94	92.5	95											
10-Dec	93	92	92	91	91	90	92	92	93	92	91	90	89	89	89	90	89	88	88	89	90	90	89	88	90.2	93											
11-Dec	89	89	89	89	89	89	89	89	89	90	90	90	90	91	91	91	92	91	92	91	87	85	80	82	89.0	92											
12-Dec	83	82	82	82	83	83	83	82	83	85	83	82	82	83	83	82	84	84	86	86	85	85	84	85	83.4	86											
13-Dec	84	85	85	85	87	91	84	84	84	84	83	83	83	86	88	91	90	88	85	87	88	87	88	90	86.3	91											
14-Dec	91	91	92	93	93	96	94	93	93	93	92	90	87	82	82	83	83	83	84	86	86	86	86	86	88.5	96											
15-Dec	87	88	90	91	90	89	91	90	91	91	90	90	86	88	88	90	87	80	80	81	81	79	76	77	86.3	91											
16-Dec	80	81	83	83	80	78	76	76	79	81	81	80	79	79	82	84	83	83	83	82	84	83	79	79	80.7	84											
17-Dec	80	81	82	81	81	81	81	81	81	81	80	79	79	80	79	81	81	82	82	81	80	80	81	81	80.6	82											
18-Dec	82	82	82	82	83	85	85	85	85	84	84	83	83	83	83	83	83	82	82	82	81	80	80	79	82.6	85											
19-Dec	79	79	78	79	79	79	78	78	78	78	78	79	79	79	80	80	81	81	81	81	81	81	82	83	79.6	83											
20-Dec	84	84	85	86	86	85	83	80	80	80	79	77	75	77	78	81	81	82	82	82	78	77	77	79	80.8	86											
21-Dec	80	81	79	79	79	78	79	83	88	88	86	83	85	84	84	83	82	83	83	84	83	81	81	80	82.2	88											
22-Dec	79	78	79	78	82	82	80	79	78	78	77	76	74	73	72	73	76	78	79	79	80	81	80	81	78.1	82											
23-Dec	82	83	83	83	82	82	82	82	82	81	79	79	78	81	81	81	81	80	79	79	79	79	78	78	80.7	83											
24-Dec	78	77	77	77	77	77	77	77	77	78	77	77	78	77	77	79	79	79	79	79	80	80	80	80	78.0	80											
25-Dec	81	81	81	81	80	80	79	81	81	80	79	78	78	77	77	79	79	79	79	79	79	81	80	80	79.5	81											
26-Dec	81	79	79	78	77	77	78	76	76	76	77	76	76	80	78	77	77	75	75	76	75	75	75	75	76.8	81											
27-Dec	75	75	75	76	76	77	78	79	81	81	81	80	80	78	81	82	82	82	81	82	82	82	82	83	79.7	83											
28-Dec	82	82	82	82	81	80	80	80	79	79	78	78	78	77	78	80	82	82	82	82	80	80	80	80	80.2	82											
29-Dec	81	82	82	83	83	83	84	84	83	84	84	85	86	85	85	85	86	86	86	86	85	82	82	82	83.8	86											
30-Dec	82	84	85	85	86	85	85	86	86	86	85	83	81	80	81	84	86	87	87	86	85	85	88	88	84.9	88											
31-Dec	88	87	87	87	87	83	79	75	75	76	76	74	73	74	73	74	78	79	81	81	80	78	79	79	79.3	88											
83.4																		83.7						83.8						83.8						Diurnal Average	
93																		92						92						93						Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Fort Chipewyan - December 2015**







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Fort Chipewyan - December 2015**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	1	0.13	0.13
60 - 80	198	26.61	26.75
80 - 100	545	73.25	100.00

Total Number of Valid Hours: 744

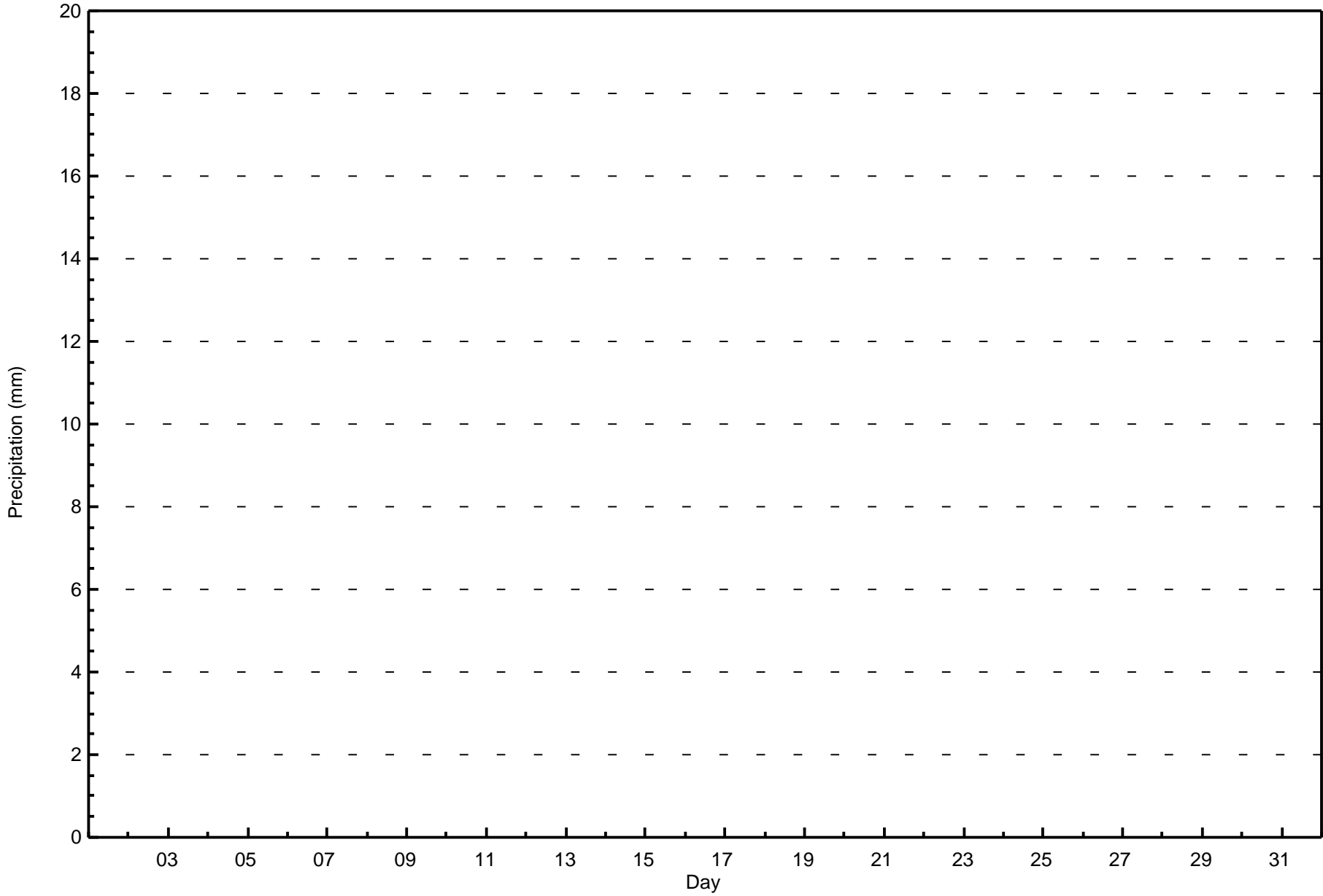
Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Precipitation (PC) - mm**  
**Fort Chipewyan - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Precipitation (PC) - mm**  
**Fort Chipewyan - December 2015**

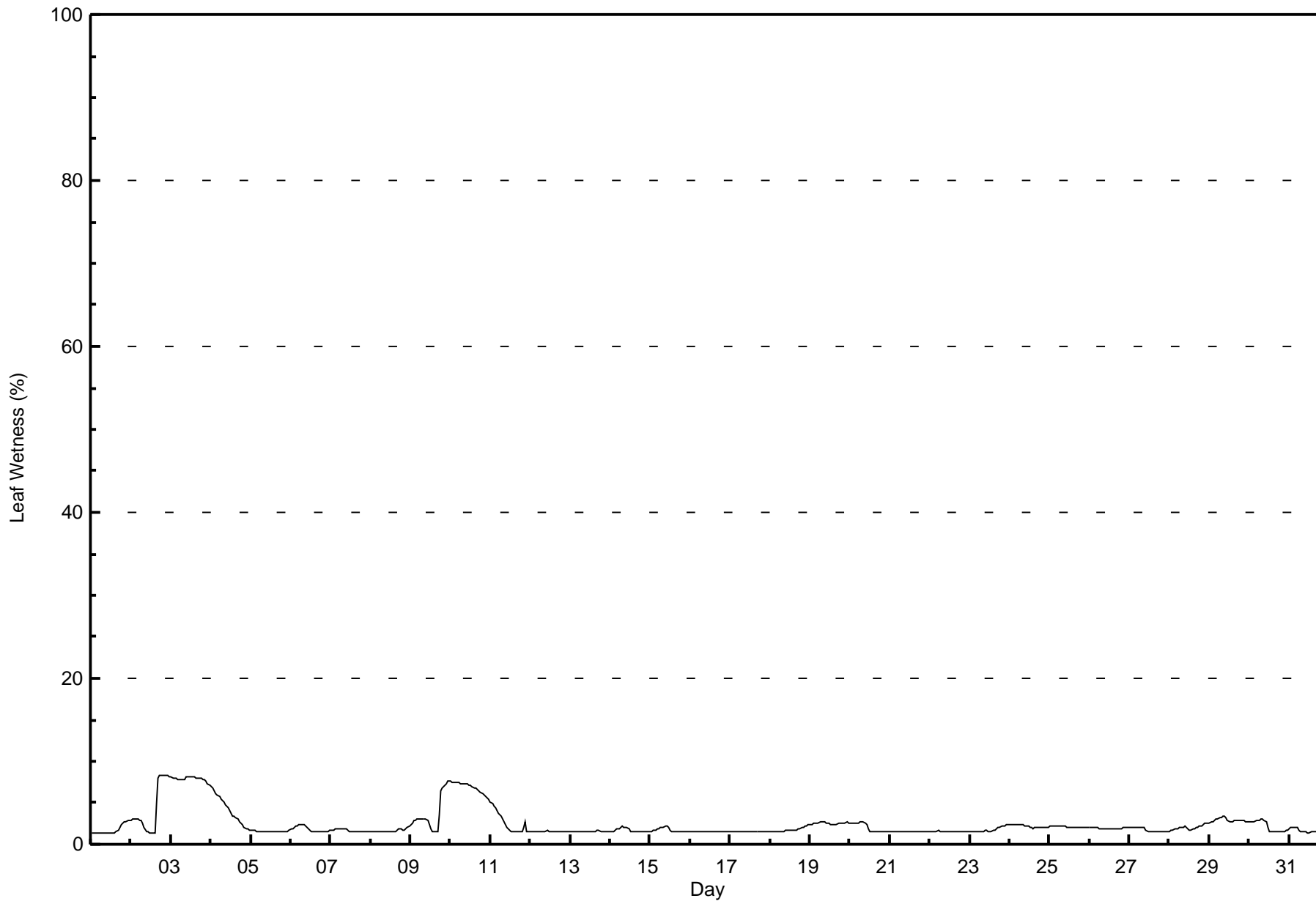
<b>Concentration Ranges (mm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	744	100.00	100.00
0.4 - 0.5	0	0.00	100.00
0.6 - 0.7	0	0.00	100.00
0.8 - 1.4	0	0.00	100.00
1.5 - 10	0	0.00	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 8 % on Dec 2 19:00																	Maximum Daily Average: 7.9 % on Dec 3																	Hours in Service: 744			
Minimum Value: 1 % on Dec 1 01:00																	Minimum Daily Average: 1.5 % on Dec 21																	Hours of Data: 744			
Maximum Diurnal Average: 2.6 % at hour 22																	Minimum Diurnal Average: 2.1 % at hour 14																	Hours of Missing Data: 0			
Monthly Average: 2.4 %																	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 2 P <sub>90</sub> = 5 P <sub>99</sub> = 8																	Hours of Calibration: 0			
																																		Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	3	3	3	3	3	1.7	3											
2-Dec	3	3	3	3	3	3	3	3	2	2	1	1	1	1	1	5	8	8	8	8	8	8	8	8	4.4	8											
3-Dec	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	7	7	7.9	8											
4-Dec	7	7	6	6	6	6	5	5	5	5	4	4	4	3	3	3	3	3	3	2	2	2	2	2	4.1	7											
5-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.6	2											
6-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.8	2											
7-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.7	2											
8-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2	2	2	2	1.6	2											
9-Dec	2	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	4	6	7	7	7	8	8	3.7	8											
10-Dec	8	8	8	7	7	7	7	7	7	7	7	7	7	7	7	7	7	6	6	6	6	6	6	5	6.9	8											
11-Dec	5	5	5	4	4	4	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2.6	5											
12-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.5	2											
13-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.6	2											
14-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.7	2											
15-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.7	2											
16-Dec	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2	2	2	2	2	1.5	2											
17-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.5	2											
18-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.8	2											
19-Dec	2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	3	3	3	3	3	3	2.5	3											
20-Dec	3	3	2	2	3	3	3	3	3	3	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2.0	3											
21-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.5	2											
22-Dec	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	2	2	1.5	2											
23-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.8	2											
24-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.1	2											
25-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.1	2											
26-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.9	2											
27-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1.8	2											
28-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	2.0	3											
29-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.9	3											
30-Dec	3	3	3	3	3	3	3	3	3	3	3	2	1	2	2	2	2	2	2	2	2	2	2	2	2.2	3											
31-Dec	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	2	2	2	2	2	2	2	2	1.6	2											
2.5																	2.5																	Diurnal Average			
8																	8																	Diurnal Maximum			





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Leaf Wetness (SW) - %**  
**Fort Chipewyan - December 2015**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	0	0.00	0.00
0.4 - 0.5	0	0.00	0.00
0.6 - 0.7	0	0.00	0.00
0.8 - 1.4	23	3.09	3.09
1.5 - 10	706	94.89	97.98
> 10	0	0.00	97.98

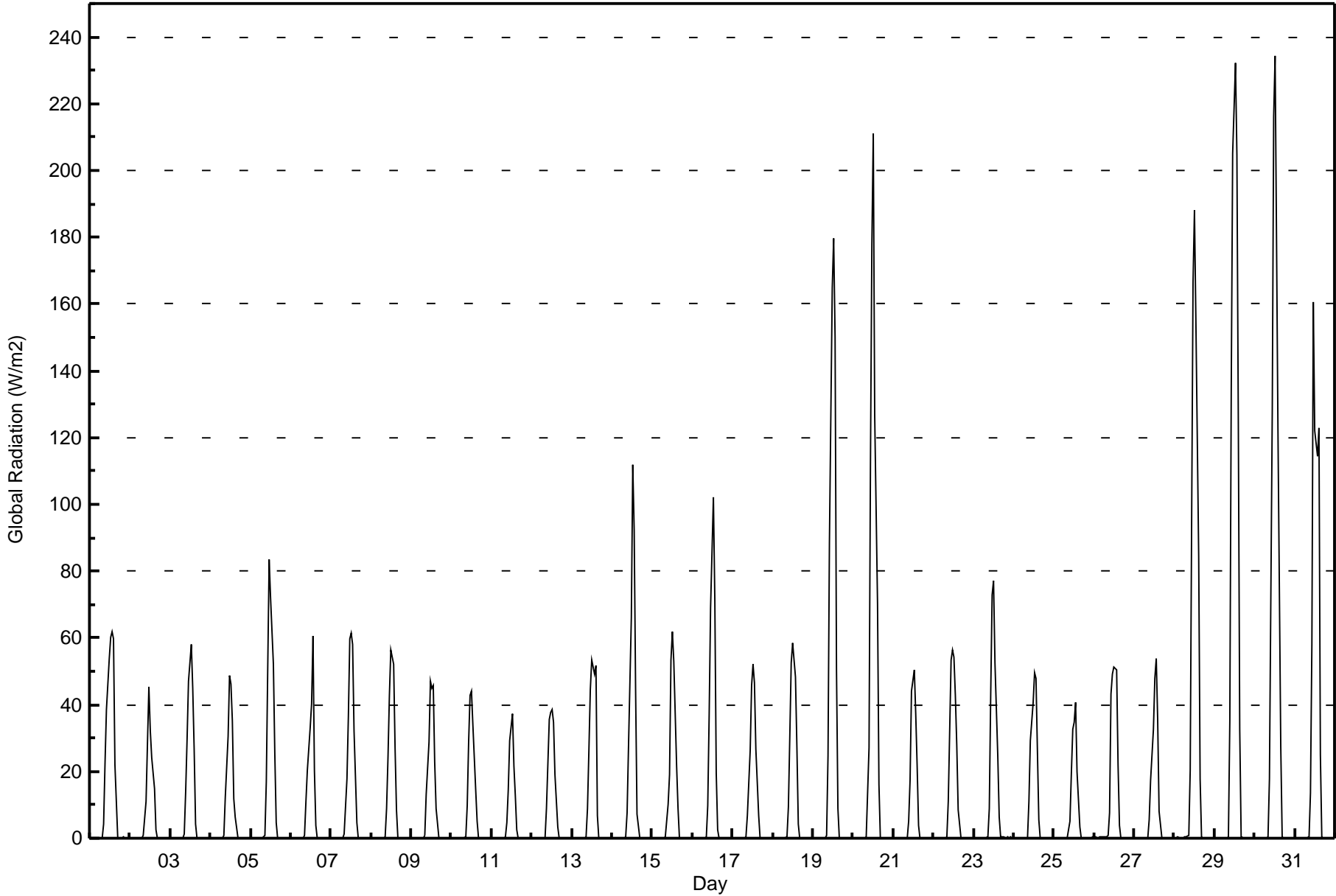
Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 235 W/m2 on Dec 30 13:00																			Maximum Daily Average: 40.4 W/m2 on Dec 29						Hours in Service: 744																								
Minimum Value: 0 W/m2 on Dec 1 01:00																			Minimum Daily Average: 5.1 W/m2 on Dec 11						Hours of Data: 744																								
Maximum Diurnal Average: 82.7 W/m2 at hour 13																			Minimum Diurnal Average: 0.0 W/m2 at hour 22						Hours of Missing Data: 0																								
Monthly Average: 13.9 W/m2																			Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 9 P <sub>90</sub> = 48 P <sub>99</sub> = 173						Hours of Calibration: 0																								
																			Percent Operational Time: 100.0																														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	0	0	0	0	0	0	0	0	4	22	39	54	60	62	60	22	0	0	0	0	0	0	0	0	0	13.5	62																						
2-Dec	0	0	0	0	0	0	0	0	1	11	29	46	32	24	15	2	0	0	0	0	0	0	0	0	0	6.7	46																						
3-Dec	0	0	0	0	0	0	0	0	1	14	29	47	58	45	27	4	0	0	0	0	0	0	0	0	0	9.4	58																						
4-Dec	0	0	0	0	0	0	0	0	1	12	30	49	46	35	12	6	0	0	0	0	0	0	0	0	0	8.0	49																						
5-Dec	0	0	0	0	0	0	0	0	1	17	51	84	72	52	25	5	0	0	0	0	0	0	0	0	0	12.8	84																						
6-Dec	0	0	0	0	0	0	0	0	1	11	20	33	40	61	20	4	0	0	0	0	0	0	0	0	0	7.9	61																						
7-Dec	0	0	0	0	0	0	0	0	1	18	37	60	61	58	32	5	0	0	0	0	0	0	0	0	0	11.3	61																						
8-Dec	0	0	0	0	0	0	0	0	1	9	24	43	56	52	27	8	0	0	0	0	0	0	0	0	0	9.2	56																						
9-Dec	0	0	0	0	0	0	0	0	1	13	29	47	45	46	23	9	0	0	0	0	0	0	0	0	0	8.8	47																						
10-Dec	0	0	0	0	0	0	0	0	0	10	29	43	44	34	14	5	0	0	0	0	0	0	0	0	0	7.5	44																						
11-Dec	0	0	0	0	0	0	0	0	0	5	14	29	37	22	13	3	0	0	0	0	0	0	0	0	0	5.1	37																						
12-Dec	0	0	0	0	0	0	0	0	0	9	36	38	39	35	19	4	0	0	0	0	0	0	0	0	0	7.4	39																						
13-Dec	0	0	0	0	0	0	0	0	0	9	26	44	53	49	52	7	0	0	0	0	0	0	0	0	0	10.0	53																						
14-Dec	0	0	0	0	0	0	0	0	0	8	27	66	112	92	45	7	0	0	0	0	0	0	0	0	0	14.9	112																						
15-Dec	0	0	0	0	0	0	0	0	0	10	19	53	62	53	22	9	0	0	0	0	0	0	0	0	0	9.5	62																						
16-Dec	0	0	0	0	0	0	0	0	0	10	37	69	102	72	20	3	0	0	0	0	0	0	0	0	0	13.0	102																						
17-Dec	0	0	0	0	0	0	0	0	0	7	26	46	52	47	27	7	0	0	0	0	0	0	0	0	0	8.8	52																						
18-Dec	0	0	0	0	0	0	0	0	0	9	30	52	58	48	27	4	0	0	0	0	0	0	0	0	0	9.6	58																						
19-Dec	0	0	0	0	0	0	0	0	1	25	89	165	180	150	51	9	0	0	0	0	0	0	0	0	0	27.8	180																						
20-Dec	0	0	0	0	0	0	0	0	0	27	112	178	211	127	70	16	0	0	0	0	0	0	0	0	0	30.9	211																						
21-Dec	0	0	0	0	0	0	0	0	0	5	17	44	50	37	22	4	0	0	0	0	0	0	0	0	0	7.5	50																						
22-Dec	0	0	0	0	0	0	0	0	0	11	53	56	54	43	28	8	0	0	0	0	0	0	0	0	0	10.6	56																						
23-Dec	0	0	0	0	0	0	0	0	0	9	43	73	77	53	25	6	1	0	0	0	0	0	0	0	0	12.0	77																						
24-Dec	0	0	0	0	0	0	0	0	0	11	29	41	50	48	26	6	0	0	0	0	0	0	0	0	0	8.8	50																						
25-Dec	0	0	0	0	0	0	0	0	0	5	19	33	35	41	20	3	0	0	0	0	0	0	0	0	0	6.5	41																						
26-Dec	1	0	0	0	1	0	0	1	1	8	43	49	51	50	22	4	0	0	0	0	0	0	0	0	0	9.7	51																						
27-Dec	0	0	0	0	0	0	0	0	0	5	17	33	48	54	36	8	0	0	0	0	0	0	0	0	0	8.4	54																						
28-Dec	0	0	0	0	0	0	0	0	1	20	94	167	188	155	84	18	1	0	0	0	0	0	0	0	0	30.4	188																						
29-Dec	0	0	0	0	0	0	0	0	1	35	134	205	232	204	125	33	1	0	0	0	0	0	0	0	0	40.4	232																						
30-Dec	0	0	0	0	0	0	0	0	0	18	128	216	235	180	123	27	0	0	0	0	0	0	0	0	0	38.6	235																						
31-Dec	0	0	0	0	0	0	0	0	1	13	58	161	122	114	123	25	0	0	0	0	0	0	0	0	0	25.7	161																						
																								0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	12.8	44.2	74.9	82.7	69.1	39.8	9.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Diurnal Average
																								1	0	0	0	1	0	0	1	4	35	134	216	235	204	125	33	1	0	0	0	0	0	0	0	0	Diurnal Maximum







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Global Radiation (GR) - W/m2**  
**Fort Chipewyan - December 2015**

<b>Concentration Ranges (W/m2)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	595	79.97	79.97
21 - 100	123	16.53	96.51
101 - 300	26	3.49	100.00
301 - 600	0	0.00	100.00
601 - 900	0	0.00	100.00
> 900	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Speed: 34 km/h on Dec 6 14:00	Maximum Daily Speed Average: 21.3 km/h on Dec 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 26 14:00	Minimum Daily Speed Average: 0.4 km/h on Dec 2	Hours of Data: 742
Maximum Diurnal Speed Average: 4.3 km/h at hour 10	Minimum Diurnal Speed Average: 1.4 km/h at hour 5	Hours of Missing Data: 2
Monthly Average Velocity: 2.8 km/h 95.9 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 4 Q <sub>1</sub> = 7 Median = 14 Q <sub>3</sub> = 19 P <sub>90</sub> = 23 P <sub>99</sub> = 31	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	W7	W8WNW11WNW10	WNW9	NNW4	NNE2	NE6	ENE7	E9	E8	E17	ENE15	ENE15	ENE20	ENE14	ENE19	ENE20	E10	NE7	NE2	W5	WNW5	SW1	ENE5.2	ENE20		
2-Dec	SW3	SW3	SW1	AF	E4	ESE5	ESE8	ESE11	ESE16	ESE18	E14	E13	ENE5	SE4	SE3	E4	SSW3	SW8WSW12WNW17WNW18	NW19	NW16WNW12	ENE0.4	NW19				
3-Dec	WNW14WNW12WNW15	WNW9	NW7	NW5	W3	ESE3	SE10	ESE16	ESE17	E16	E21	E22	ENE19	ENE20	ENE21	ENE22	ENE29	ENE31	ENE27	ENE28	ENE28	ENE28	ENE12.4	ENE31		
4-Dec	ENE29	ENE27	ENE27	ENE30	ENE28	ENE27	ENE27	ENE25	ENE22	ENE19	ENE17	ENE16	E13	E8WSW14	W18	W21	W22	W17WSW21WSW25WSW25WSW23	W20	NE5.0	ENE30					
5-Dec	WSW18WSW20	W25	W27	W28	W29	W26	W27	W26	W22	W24	W22	W23	W17	W18	W17	W15	W15	W14	W12	W8	WSW7	SW7	ENE3	W18.5	W29	
6-Dec	E7	E8	E10	E10	E14	E21	E20	E25	E25	E24	E24	E26	E29	E34	E31	ENE28	ENE21	E25	E23	ESE13	E14	E17	E18	E16	E20.0	E34
7-Dec	ESE14	E17	E18	E23	E23	E23	E22	E26	E28	E26	E27	E25	E24	E26	E23	E24	ENE15	ENE11	E8	ENE2	WNW6	W10WNW12WNW13	E15.2	E28		
8-Dec	WNW14WNW14WNW14WNW13WNW12WNW12	W13	W11	W13	W12	W12	W11	WSW8	SW8	SW8	SE3	ENE8	E8	E11	ESE15	ESE17	E19	ESE17	ESE16	W2.4	E19					
9-Dec	ESE11	ESE9	E7	E9	E11	E13	E16	E19	E22	E22	E26	E29	E25	E23	E24	E22	ENE21	ENE19	ENE16	ENE15	ENE14	ENE12	NE8	NNE6	E16.0	E29
10-Dec	NE8	NE5	N5	NE7	ENE7	NE7	NE6	NE6	ENE13	ENE14	ENE11	ENE14	ENE14	ENE13	ENE13	ENE15	ENE20	ENE20	ENE19	ENE20	ENE19	ENE16	ENE17	ENE20	ENE12.7	ENE20
11-Dec	ENE17	ENE15	ENE16	ENE15	ENE15	ENE15	ENE14	ENE17	ENE18	ENE17	ENE14	ENE12	E15	E15	E16	E16	E16	E16	E14	ESE13	SE17	SSE17	SSE17	SE15	E13.6	ENE18
12-Dec	SSE22	SE20	SE20	SE20	SE20	SE19	SE17	SE20	SE20	SE20	SE21	SSE21	SSE20	SSE21	SE21	SE22	SE24	SE24	SE26	SE24	SE25	SE23	SE23	SE22	SE21.3	SE26
13-Dec	ESE22	ESE21	E20	E20	ESE20	E20	ESE22	ESE22	ESE20	ESE20	ESE19	ESE18	ESE18	ESE16	E13	ENE11	ENE11	E17	E10	E8	E6	E8	E10	ESE15.6	ESE22	
14-Dec	E7	E6	E6	E6	NE2	W3	NW7	NW4	ENE5	E1	WSW5	SW4	SW9	SW17	SW21	SSW16	SSW16	S20	S22	S22	S19	S19	S20	S18	S8.3	S22
15-Dec	S15	S14	S14	SSE14	S18	SSE15	SSE9	SSE9	ESE6	SE6	SW7WSW10WSW12	W12	W14	WNW11WNW14WNW16	NW20	NW18	NW20	NW18	NW20	NW18	NW20	NW18	NW20	NW18	WSW6.2	NW20
16-Dec	WNW15WNW14WNW15WNW15WNW19	NW20	NW17WNW18	W14	W15	W16	W18	W17	W15	W16	W14WNW14WNW13WNW12WNW10	W9WNW10WNW11WNW12	WNW14.0	NW20												
17-Dec	WNW12WNW10WNW11WNW12WNW13WNW15WNW12WNW12WNW11	NW13	NW16	NW14WNW14	NW15	NW10WNW10WNW11WNW11	NW8	NNW5	NNW9	NNW9	NW8	NW8	WNW10.8	NW16												
18-Dec	NW8	N4	NW5	NW5	WNW4	WNW6	WNW4	W5	ESE4	E5	SE9	SSE10	SSE7	SSE6	SE9	ESE8	ESE13	ESE15	ESE17	ESE18	E18	E16	E16	E12	ESE5.4	E18
19-Dec	E14	E13	E13	E13	E10	E12	E14	E14	E12	E11	E13	E13	E13	ENE11	ENE17	E17	E18	E19	E19	E19	E20	E20	E20	E20	E15.2	E20
20-Dec	E20	E20	E20	ESE14	SSE12	ESE13	SE13	SE14	SE16	SE17	SE20	SE17	ESE17	ESE20	E23	E22	E28	E26	E24	ESE24	SSE21	SSE25	SSE23	SE19	ESE17.9	E28
21-Dec	SE16	SE13	SSE13	S20	S20	SSW21	SSW18	SSW17	SSW14	SSW13WSW13WSW18	W14	W11	W10	W10WNW10	NW7	NNW6	WNW5	W7	WNW9	NW9	NNW8	SW7.6	SSW21			
22-Dec	NNW8	NNW8	NNW6	NW7	NW6	WNW3	NW9	WNW8	W7	WNW8	WNW8	NW7	NW6	NNW5	NW4	WNW5	NW5	NW6	NW6	NW8	NW6	WNW5	WNW4	WNW3	NW5.9	NW9
23-Dec	W3	WNW5	WNW5	NW5	NNW5	NNW4	NNW3	NNW5	NW3	NW2	W1	NNW1	NNW4	NNW3	N2	NNW5	NNW5	NNW6	N4	NNE8	NNE5	NNE7	NNW5	NNW6	NNW3.8	NNE8
24-Dec	NNW6	NNW6	NNW8	NNW8	NNW8	WNW2	NNW5	NW3	NNW4	NNW4	N3	NNW3	NNW3	SE2	WSW2	NW3	N1	AF	SE3	SSE3	E5	E5	E3	E3	N2.4	NNW8
25-Dec	E5	E4	ENE4	NE3	NE3	ENE4	NE2	N3	N4	NNW4	NNW3	NNW4	NW5	NNW6	NW6	NNW6	NNW5	NNW4	NNW6	NW6	WNW8	NW6	NW5	NNW3.5	WNW8	
26-Dec	NW5	WNW8	NW10	NW7	NW7	NW3	NW3	NW4	SW2	WNW3	NNE1	SSW2	SSW0	SE2	E7	E11	E10	E12	E16	E15	E14	E15	E15	NE3.6	E16	
27-Dec	E20	E19	E20	ENE21	E23	E22	E25	E27	E27	ESE27	ESE32	ESE32	ESE32	ESE33	E27	E26	E22	E19	ENE20	ENE19	ENE16	ENE12	NE6	NNW5	E20.9	ESE33
28-Dec	NNW6	NW6	NW6	NW7	NW6	WNW5	NW5	NW6	NW6	WSW3	WNW4	NW5	WNW4	W5	W4	SW4	SSW3	S2	ESE4	E6	E8	E7	E9	E10	NNW1.7	E10
29-Dec	E15	ESE11	ESE10	SE8	S9	S8	SSE8	S9	SSW9	SSW11	SSW10	SSW12	SSW11	SSW13	SSW12	SW14	SSW14	SW13	SW9	SW13WSW15WSW18WSW16	W18	SSW8.3	WSW18			
30-Dec	W18	W19	W18	W15	W15	W14	W13	W17	W21	W19	W17	W17	WNW17	W14	W15	W14	W16	W17	W17	W21	W21WSW16	SW11	SW8	W15.9	W21	
31-Dec	SW14	SW15	SW15	SW13	SW12WSW15WSW19	W23	W24	W23	W20	W18	W23	W22	W19	W18	W19	W17	W17	W18	W18	W18	W19	W15	W14	W17.1	W24	

E2.6	E2.0	ENE1.6	ENE2.1	E1.4	E1.9	E2.2	E2.4	ESE3.7	ESE4.3	ESE3.8	ESE3.9	ESE3.2	ESE3.8	ESE3.3	E3.4	E3.8	E3.9	E4.2	E3.2	E2.2	ESE1.7	ESE1.7	E2.2	Diurnal Average
ENE29	ENE27	ENE27	ENE30	ENE28	W29	ENE27	E27	E28	ESE27	ESE32	ESE32	ESE32	E34	E31	ENE28	E28	E26	ENE29	ENE31	ENE27	ENE28	ENE28	ENE28	Diurnal Maximum

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



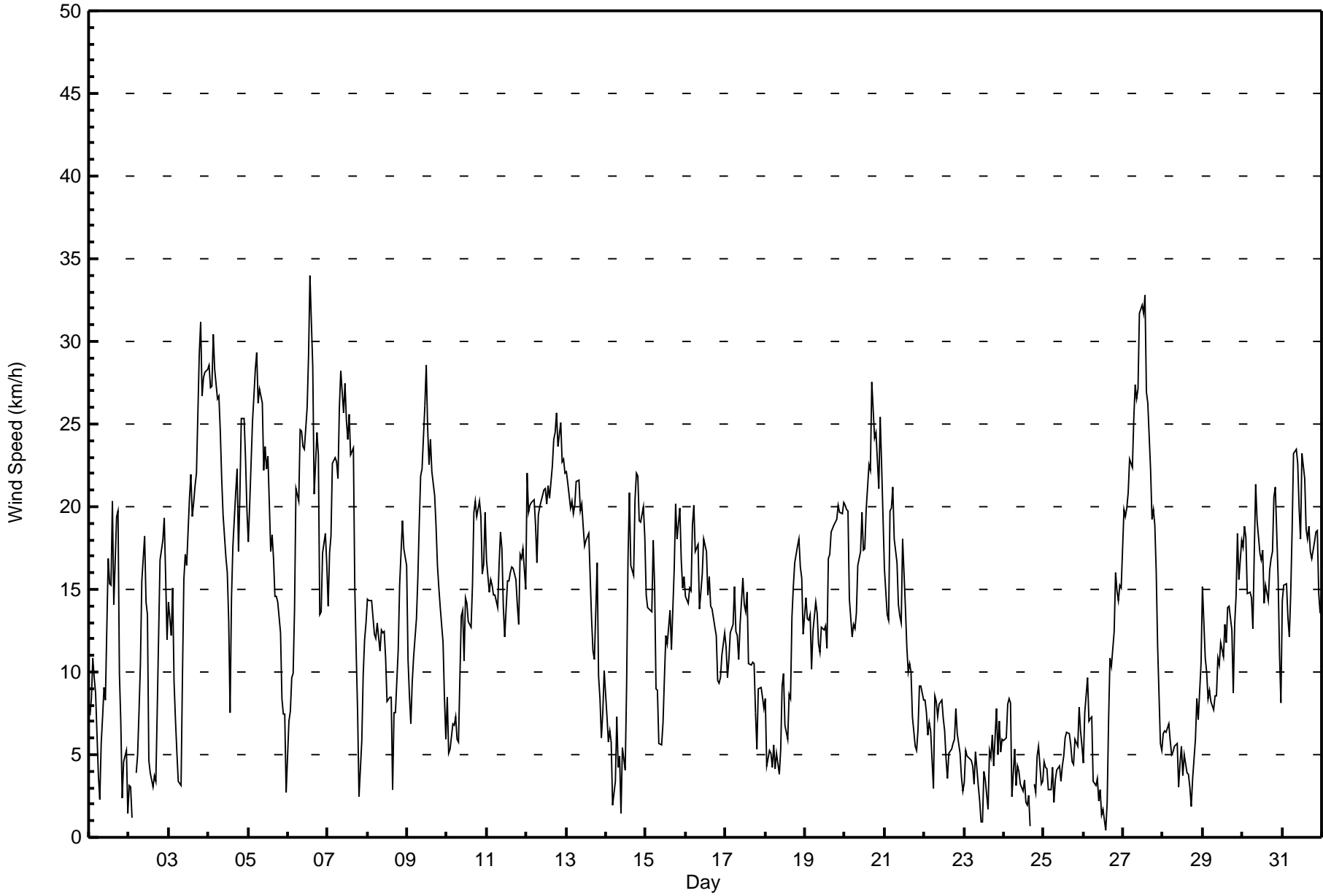
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed (WS) - km/h

Fort Chipewyan - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744													
Maximum Value: 7 km/h on Dec 4 15:00														Hours of Data: 742													
Minimum Value: 0 km/h on Dec 2 05:00														Hours of Missing Data: 2													
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 6														Hours of Calibration: 0													
														Percent Operational Time: 99.7													
Day	Hourly Period Ending At (MST)																								Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	1	2	1	1	2	2	2	2	1	1	2	2	2	3	5	3	4	3	2	2	1	2	2	1	5		
2-Dec	2	1	1	AF	0	1	2	1	2	2	3	4	1	1	1	2	1	2	3	4	4	5	6	3	6		
3-Dec	3	3	6	3	2	2	1	2	2	1	1	2	2	2	3	3	3	4	5	5	4	5	5	5	6		
4-Dec	5	5	5	5	5	4	4	3	4	3	4	2	2	2	7	4	5	5	4	7	6	6	5	5	7		
5-Dec	5	5	6	7	7	7	6	6	6	5	6	5	5	4	5	5	3	3	3	3	2	2	2	2	7		
6-Dec	1	1	2	1	2	2	4	2	2	3	2	2	3	4	4	5	5	3	3	2	1	3	2	2	5		
7-Dec	1	2	1	2	2	2	2	2	3	3	3	2	2	3	3	6	2	3	1	2	1	2	3	3	6		
8-Dec	4	3	4	3	3	3	3	3	3	3	3	2	2	2	1	1	1	1	2	2	2	2	2	3	4		
9-Dec	1	1	0	1	1	2	1	2	2	2	2	2	2	2	2	2	3	3	2	2	2	2	2	2	3		
10-Dec	2	2	2	2	2	2	3	3	2	3	3	3	3	2	2	2	3	3	3	3	2	2	3	3	3		
11-Dec	2	2	2	2	3	2	3	3	2	3	3	2	2	2	2	2	2	1	2	3	2	2	3	2	3		
12-Dec	3	3	2	2	2	2	1	2	1	1	2	3	3	2	2	2	3	3	2	2	2	2	2	2	3		
13-Dec	2	2	1	1	1	1	2	2	1	1	1	1	1	2	2	1	1	1	2	2	2	1	1	1	2		
14-Dec	2	1	1	1	2	3	2	2	1	2	2	1	2	3	3	4	3	3	3	2	3	2	2	2	4		
15-Dec	3	2	2	4	2	4	3	2	1	1	2	2	3	3	3	2	4	4	6	5	5	5	4	4	6		
16-Dec	3	3	4	4	5	6	5	6	3	4	4	4	4	3	4	3	3	3	3	2	1	3	3	3	6		
17-Dec	2	2	3	3	3	4	3	3	3	3	4	4	4	4	3	2	2	2	2	2	3	3	3	3	4		
18-Dec	3	2	1	2	2	2	2	2	2	2	2	2	3	3	2	2	2	2	2	2	1	1	1	1	3		
19-Dec	1	1	2	1	1	1	1	1	2	2	1	1	1	3	1	1	2	1	2	2	1	1	1	2	3		
20-Dec	2	1	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	4	4	3	3	4		
21-Dec	2	1	3	3	3	3	3	3	2	2	4	5	3	3	2	2	2	2	2	2	2	2	3	3	5		
22-Dec	3	3	2	2	2	2	3	2	2	2	2	2	2	2	1	1	1	1	2	2	2	1	1	1	3		
23-Dec	1	0	1	1	1	1	2	1	1	1	1	2	2	2	1	2	2	2	2	2	2	3	1	2	3		
24-Dec	2	2	2	1	2	1	2	2	1	2	1	1	1	1	1	1	1	AF	1	1	0	1	1	1	2		
25-Dec	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	1	2	1	1	1	1	2		
26-Dec	1	1	1	2	1	2	1	2	2	1	2	1	2	1	1	2	2	1	2	1	2	1	1	2	2		
27-Dec	2	2	2	2	3	2	2	2	3	3	3	3	3	3	2	2	2	1	2	3	2	2	2	2	3		
28-Dec	2	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2		
29-Dec	2	2	1	2	2	1	2	1	1	2	2	2	2	2	2	2	2	2	2	2	4	4	3	5	5		
30-Dec	4	4	4	3	3	3	3	5	4	4	4	4	4	3	3	3	3	3	3	4	4	3	1	3	5		
31-Dec	4	2	2	2	2	3	4	5	5	5	4	4	5	4	4	4	4	3	3	3	3	3	4	3	5		
														Diurnal Maximum													
AF - Analyzer Failure																											





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Fort Chipewyan - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	126	16.98	16.98
6 - 11	176	23.72	40.70
12 - 19	272	36.66	77.36
20 - 28	155	20.89	98.25
29 - 38	13	1.75	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Fort Chipewyan - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	8	3	6	6	10	4	6	1	1	4	7	3	8	17	18	24	126
6 - 11	0	3	9	10	31	8	5	6	3	4	9	3	11	25	31	18	176
12 - 19	0	0	0	41	54	24	11	7	6	10	9	12	52	39	7	0	272
20 - 28	0	0	0	25	56	10	19	7	5	2	1	5	22	0	3	0	155
29 - 38	0	0	0	4	4	4	0	0	0	0	0	0	1	0	0	0	13
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	8	6	15	86	155	50	41	21	15	20	26	23	94	81	59	42	742

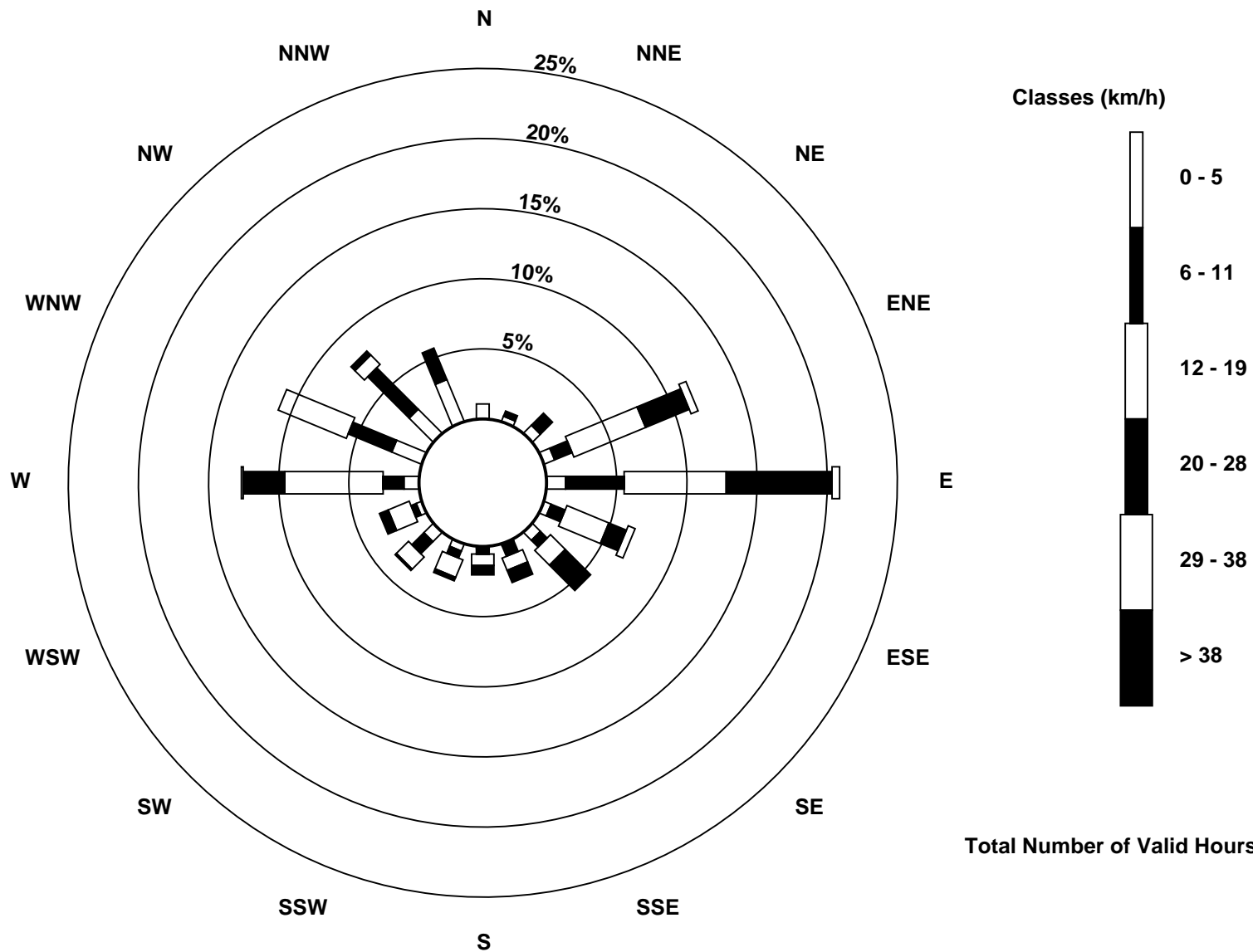
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
Fort Chipewyan (AMS 8)



Total Number of Valid Hours: 742





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Fort Chipewyan - December 2015**

Direction of Maximum Speed: 80 deg on Dec 6 14:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 135.9 deg on Dec 12	Hours of Data: 742
Direction of Minimum Speed: 206 deg on Dec 26 14:00	Hours of Missing Data: 2
Direction of Minimum Daily Speed Average: 0.4 deg on Dec 2	Percent Operational Time: 99.7
Monthly Average Direction: 292.1 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	269	275	292	285	292	329	30	42	62	88	82	84	66	74	78	64	75	77	84	55	38	270	302	221	58.5
2-Dec	215	225	230	AF	96	105	107	106	106	102	96	94	67	134	145	84	201	222	254	288	298	306	317	300	57.4
3-Dec	290	289	297	296	311	321	277	106	137	102	102	95	87	80	72	70	67	63	61	58	60	66	61	63	63.9
4-Dec	60	59	60	61	61	61	62	63	57	68	73	72	79	89	249	261	263	264	262	251	251	249	249	259	42.7
5-Dec	255	253	264	265	265	264	264	264	263	264	269	274	272	268	262	268	268	267	272	261	279	244	233	77	264.5
6-Dec	88	79	86	86	85	86	89	82	86	80	82	83	81	80	79	78	76	84	87	106	98	96	93	99	84.9
7-Dec	102	98	97	93	88	90	90	91	87	89	88	90	86	83	79	84	77	77	84	74	291	281	284	288	86.2
8-Dec	292	289	292	295	297	289	281	277	275	273	270	261	254	232	223	127	78	79	93	119	114	101	105	110	263.1
9-Dec	121	103	96	87	90	94	92	89	93	95	96	95	100	99	91	83	77	75	69	64	65	66	47	30	86.9
10-Dec	55	39	10	48	63	41	38	36	57	58	60	63	69	67	65	66	66	64	68	73	78	72	71	74	63.7
11-Dec	72	66	70	70	73	69	69	71	75	68	61	77	85	82	83	84	83	85	89	121	141	147	165	139	88.1
12-Dec	150	139	136	135	130	131	132	134	133	125	137	150	148	148	140	136	134	138	133	136	131	134	127	124	135.9
13-Dec	114	108	100	97	109	97	113	119	121	113	116	115	112	112	110	85	67	63	79	88	85	80	86	82	103.0
14-Dec	81	84	89	79	46	278	312	312	78	93	239	215	224	226	219	213	198	181	191	186	175	174	177	185	190.2
15-Dec	183	179	171	163	169	162	151	165	114	139	222	237	254	271	281	287	301	303	314	310	308	303	301	289	253.5
16-Dec	282	284	287	295	300	305	304	302	270	261	261	264	267	261	264	274	285	286	291	287	281	292	301	289	283.1
17-Dec	282	289	298	301	301	303	299	290	298	304	308	314	301	307	304	289	288	284	304	330	334	341	318	326	303.3
18-Dec	320	350	318	323	294	285	282	280	114	86	141	163	163	167	132	104	105	110	111	109	98	90	87	90	106.1
19-Dec	89	86	96	93	90	89	88	88	94	94	90	90	84	71	78	84	83	85	86	86	92	92	93	96	88.1
20-Dec	99	90	93	103	150	122	132	133	128	124	128	133	121	110	99	88	88	88	97	105	157	154	152	141	116.1
21-Dec	128	125	160	182	191	197	199	206	213	209	244	249	262	267	271	272	285	309	328	292	279	295	316	340	226.2
22-Dec	344	343	340	325	317	291	311	300	279	289	295	318	325	337	308	283	304	316	322	315	312	295	297	294	312.1
23-Dec	279	286	295	305	339	332	332	330	315	322	278	348	348	338	352	341	343	346	358	21	28	29	332	334	338.5
24-Dec	343	344	348	340	329	296	334	326	338	334	355	334	347	133	242	314	9	AF	143	164	98	83	90	91	353.4
25-Dec	86	85	68	53	54	75	44	356	358	345	339	331	314	332	321	323	333	345	333	340	318	299	313	324	344.6
26-Dec	322	299	304	314	316	312	324	311	305	234	286	15	204	206	133	81	83	87	82	82	83	81	79	83	56.2
27-Dec	82	82	83	78	79	82	83	79	84	108	117	118	119	118	99	88	97	89	77	77	68	64	43	337	91.7
28-Dec	329	321	307	316	307	295	312	314	321	258	284	304	289	265	280	234	194	176	111	86	90	80	86	91	328.5
29-Dec	92	105	105	125	178	177	158	174	197	194	193	195	195	195	201	215	212	216	223	225	243	256	249	266	202.3
30-Dec	260	270	277	281	277	278	266	262	259	273	273	279	282	277	273	270	273	274	275	270	268	257	233	215	269.3
31-Dec	217	225	224	234	233	246	251	263	263	264	264	262	264	266	273	273	273	275	275	276	276	274	274	269	260.9

99.1	86.8	67.1	70.5	87.0	87.7	89.0	92.8	101.6	105.3	115.1	113.9	110.1	112.0	107.8	84.8	80.5	81.6	80.9	90.2	100.6	105.9	104.6	93.1
Diurnal Average																							

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

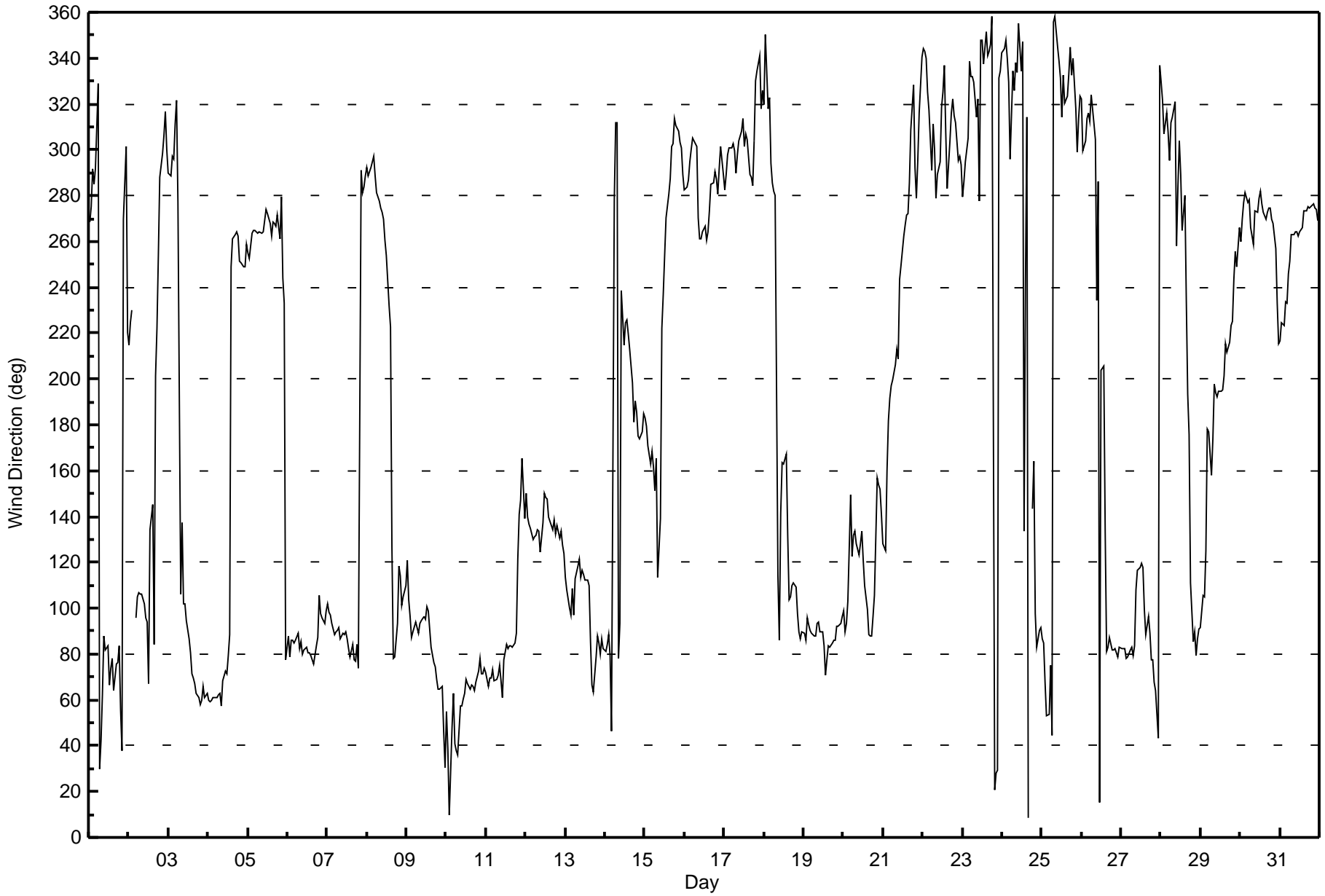
Wind Direction (WD) - deg

Fort Chipewyan - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 96 deg on Dec 23 12:00			Hours of Data:	742
Minimum Value: 3 deg on Dec 19 06:00			Hours of Missing Data:	2
Percentiles: P <sub>1</sub> = 4 P <sub>10</sub> = 5 Q <sub>1</sub> = 7 Median = 12 Q <sub>3</sub> = 17 P <sub>90</sub> = 30 P <sub>99</sub> = 81			Hours of Calibration:	0
			Percent Operational Time:	99.7

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	11	11	10	9	14	60	83	35	18	20	14	11	9	9	8	17	9	8	11	8	53	67	27	83	83
2-Dec	51	19	57	AF	10	6	8	11	13	6	6	11	17	31	31	35	61	12	17	15	15	15	20	20	61
3-Dec	14	17	19	25	24	44	35	62	14	12	6	6	5	7	8	8	9	9	8	8	10	9	8	8	62
4-Dec	9	9	9	8	8	8	8	8	8	9	8	8	7	17	34	14	14	13	14	13	14	13	14	15	34
5-Dec	15	14	15	14	14	14	13	14	13	13	14	14	14	15	14	14	13	13	14	13	29	14	9	77	77
6-Dec	11	8	8	6	8	5	8	4	5	6	5	6	5	5	6	6	9	5	6	9	6	6	5	7	11
7-Dec	6	5	6	4	5	4	4	4	5	5	5	5	5	5	7	8	8	9	12	71	13	12	14	13	71
8-Dec	14	14	15	14	15	15	13	14	15	13	15	19	19	12	14	58	8	15	9	13	9	9	11	14	58
9-Dec	11	10	12	6	6	8	6	5	4	4	4	4	4	6	4	6	6	7	8	8	8	8	13	14	14
10-Dec	13	22	21	20	20	16	20	22	11	10	12	9	9	10	9	8	8	8	8	7	6	8	8	7	22
11-Dec	8	8	8	8	8	9	10	9	7	9	8	11	7	6	6	5	5	5	6	16	6	7	12	15	16
12-Dec	8	9	6	6	4	6	5	5	5	4	8	7	8	7	7	6	7	6	6	6	6	6	6	4	9
13-Dec	5	5	7	5	5	7	5	6	4	4	3	3	4	5	11	6	9	7	6	13	10	15	7	6	15
14-Dec	9	16	7	22	68	77	20	37	28	82	19	18	10	10	8	7	8	6	6	7	9	7	7	7	82
15-Dec	7	10	10	23	8	22	25	23	19	26	19	14	16	16	15	13	16	16	16	16	14	15	16	15	26
16-Dec	14	14	14	15	15	15	16	15	19	15	14	14	14	14	14	14	14	12	14	13	10	18	14	15	19
17-Dec	13	16	15	14	14	14	15	15	17	14	17	17	15	16	15	12	15	14	20	29	24	22	18	21	29
18-Dec	23	28	24	34	36	30	40	44	48	23	17	21	42	31	20	20	12	13	11	7	7	4	4	4	48
19-Dec	3	6	6	3	7	3	4	6	7	4	3	4	5	10	5	5	6	4	5	4	4	5	5	5	10
20-Dec	11	4	4	13	10	11	12	11	7	8	7	8	8	8	5	5	4	4	6	8	18	8	8	10	18
21-Dec	11	13	15	8	8	7	7	9	7	8	20	17	13	14	13	12	14	17	22	17	21	18	17	23	23
22-Dec	22	24	26	22	15	41	21	14	16	15	22	22	29	31	29	17	19	15	16	14	19	13	23	28	41
23-Dec	12	10	13	21	16	19	78	20	41	53	74	96	29	35	70	34	42	32	51	16	23	30	29	31	96
24-Dec	30	16	13	12	28	95	39	82	28	42	35	36	35	40	34	34	29	AF	17	25	14	6	21	20	95
25-Dec	10	12	11	23	23	15	40	28	28	24	31	32	26	24	23	19	24	33	28	23	20	7	12	13	40
26-Dec	15	14	11	10	13	20	40	56	39	56	40	64	67	90	58	11	7	5	5	5	4	5	4	5	90
27-Dec	6	5	5	5	6	6	5	6	8	6	5	5	6	5	10	4	8	8	7	7	9	10	36	24	36
28-Dec	32	17	10	12	11	16	18	17	32	64	24	14	19	13	15	30	33	73	19	12	6	10	8	9	73
29-Dec	9	12	8	16	13	11	15	10	13	8	9	7	7	10	7	13	7	16	10	11	13	13	13	13	16
30-Dec	12	13	12	13	14	16	18	14	12	13	13	13	13	14	12	13	11	12	11	12	12	12	10	35	35
31-Dec	11	8	8	7	11	12	12	12	12	12	13	14	13	13	12	13	12	11	12	12	11	11	13	13	14
	51	28	57	34	68	95	83	82	48	82	74	96	67	90	70	58	61	73	51	71	53	67	36	83	
	Diurnal Maximum																								

AF - Analyzer Failure





# Wood Buffalo Environmental Association

## SO2 Calibration Report

### Station Information

Calibration Date	December 2, 2015	Last Calibration	November 5, 2015
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	Routine		
Start Time (MST)	9:35	End Time (MST)	14:10
Gas Cert Reference	LL103809	Station temp.	22 Deg C
Cal Gas Concentration	2.45 ppm	Cal Gas Exp Date	16/09/2015
Calibrator Make/Model	Teledyne API T700	Serial Number	747
ZAG Make/Model	Teledyne API T701	Serial Number	4698
DACS make/model	Campbell Scientific CR3000	DACS serial No.	8205

### Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	-826	-826
Analyzer IP address	192.168.1.43		Lamp voltage	988	998
Calculated slope	1.009428	1.009380	Chamber temp	44.9	45.1
Calculated intercept	-0.075569	-0.054985	Pressure	717.3	693.4
Analyzer Background	1.13	1.15	Flow	0.437	0.423
Analyzer Coefficient	1.013	1.017	Intensity	93	92

Analyzer make Thermo 43i-TLE Analyzer serial # 1136451241

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.0	0.0	0.0	----
as found span	6000	44.6	18.2	17.8	1.024
calibrator zero	6000	0.0	0.0	0.1	----
high point	6000	44.6	18.2	18.1	1.006
second point	6000	23.8	9.7	9.7	1.004
third point	6000	11.9	4.9	4.8	1.005
as left zero	6000	0.0	0.0	0.1	----
as left span	6000	44.6	18.2	17.7	1.029
Average Correction Factor					1.005

Corrected As found      17.8      Previous response      18.1      % change      2.1%

**Notes:**

Filter change after As Finds. Elevated readings after as finds due to analyzer sampling room air while calibrator was purged. Span adjusted.

Calibration Performed By:

Devin Russell



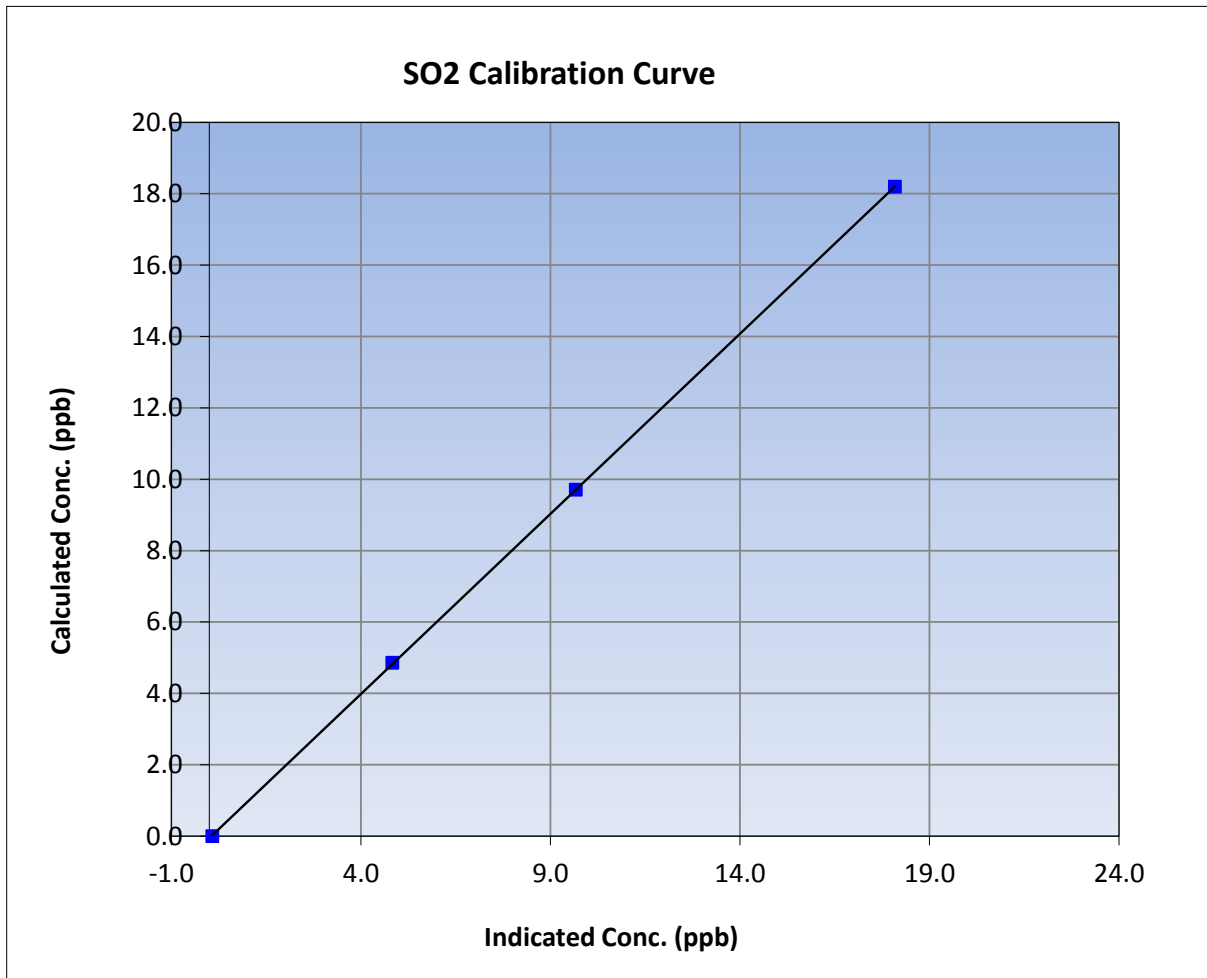
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 5, 2015
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	9:35	End Time (MST)	14:10
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1136451241

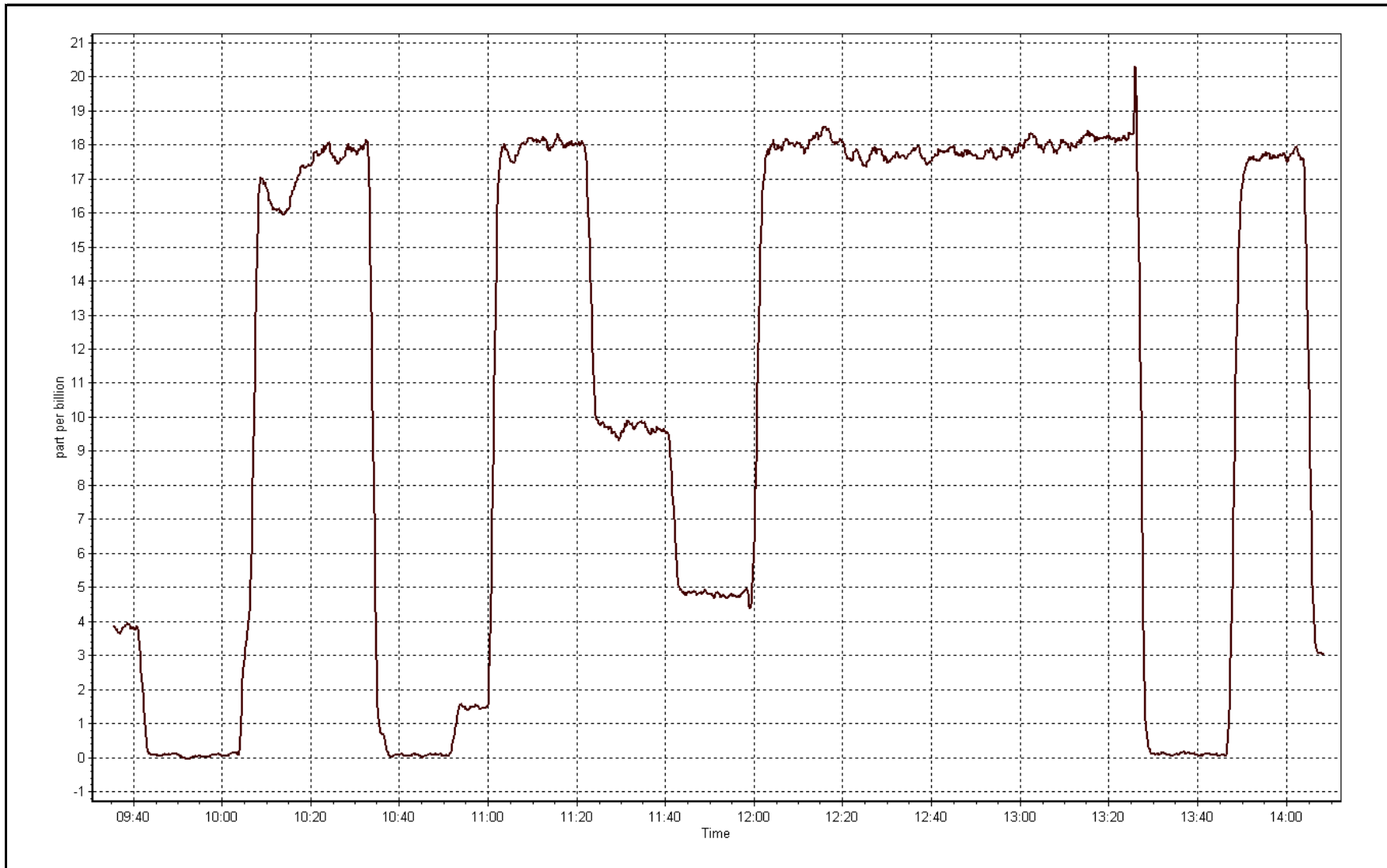
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999989
18.2	18.1	1.0058		
9.7	9.7	1.0037	Slope	1.009380
4.9	4.8	1.0052		
			Intercept	-0.054985



SO2 Calibration Plot

Date: December 2, 2015





# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Report

### Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 6, 2015
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	Routine		
Start Time (MST)	14:05	End Time (MST)	16:45
NO2 GPT Ref date	October-07-15	Transfer Standard	NO2
		Station temp.	23 Deg C
Calibrator Make/Model	Teledyne API 700	Serial Number	735
ZAG make/model	Teledyne API 701	Serial Number	4698
DACS make/model	Campbell Scientific CR3000	Serial Number	8205

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	36.8	36.6
Analyzer IP address	192.168.1.48		Lamp temp.	58.0	58.0
Calculated slope	0.995504	0.996302	Pressure	27.1	26.7
Calculated intercept	0.157276	0.245047	Flow cell A	0.793	771.000
Analyzer Background	0.8	0.7	Flow cell B	0.793	771.000
Analyzer Coefficient	1.167	1.108	Cell A Intensity	NA	NA
			Cell B Intensity	NA	NA

Analyzer make	Teledyne API T400	Analyzer serial #	1107
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### Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	6000	0.00	0.0	-0.4	----
as found span	6000	235.0 - 832.2	103.9	109.2	0.951
calibrator zero	6000	0.00	0.0	-0.2	----
high point	6000	235.0 - 832.2	103.9	104.0	1.000
second point	6000	178.2 - 792.9	83.8	84.1	0.997
third point	6000	114.1 - 736.9	53.1	52.9	1.004
as left zero	6000	0.00	0.0	-0.6	----
as left span	6000	235.0 - 832.2	103.9	104.8	0.992
Average Correction Factor					1.000

Corrected As found	109.6	Previous response	104.2	% change	-4.9%
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**Notes:**

Filter changed after as founds. Span adjusted.

Calibration Performed By: Devin Russell



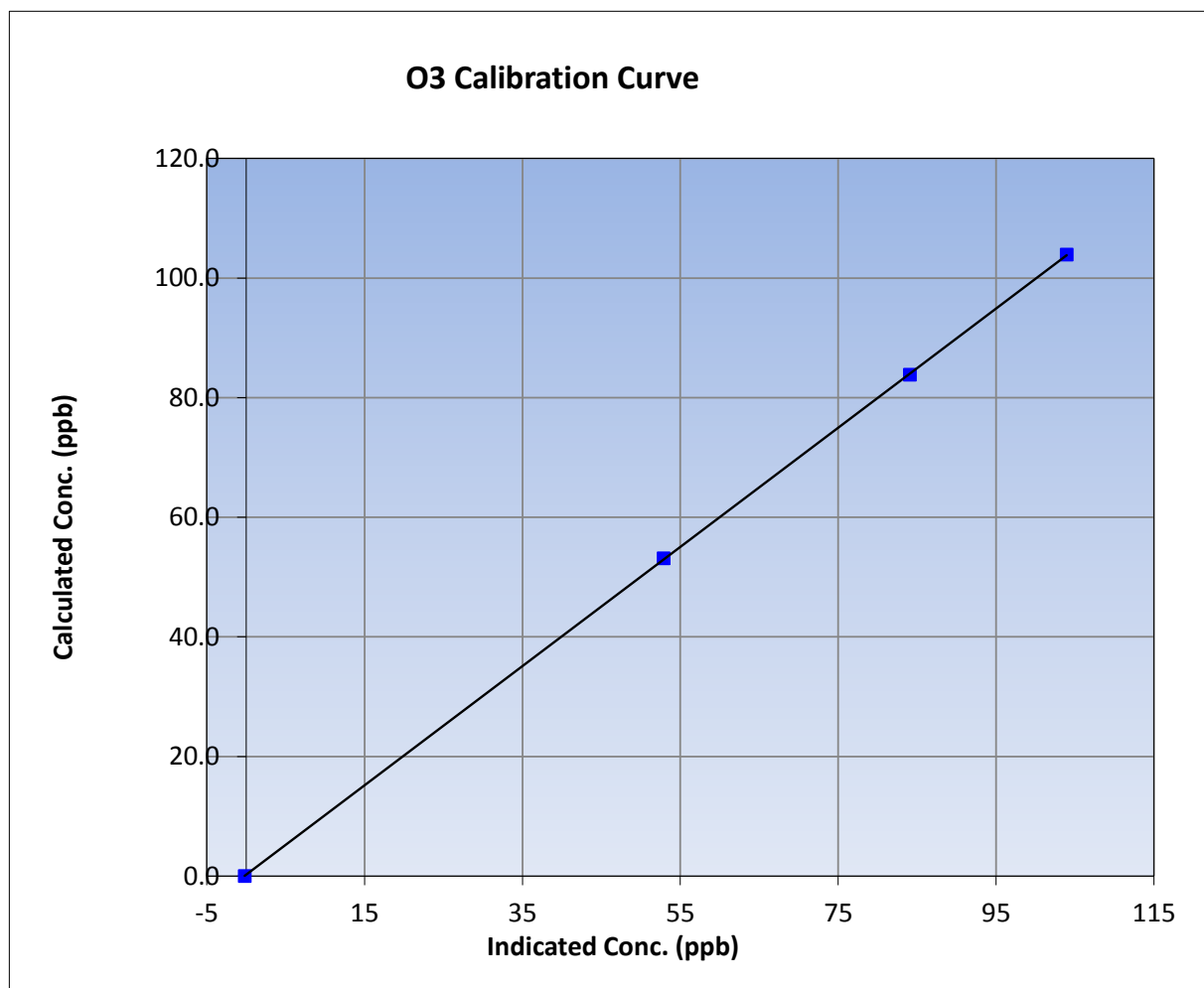
## Wood Buffalo Environmental Association O3 Calibration Report

### Station Information

Calibration Date	December-02-15	Previous Calibration	November 6, 2015
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	14:05	End Time (MST)	16:45
Analyzer make	Teledyne API T400	Analyzer serial #	1107

### Calibration Data

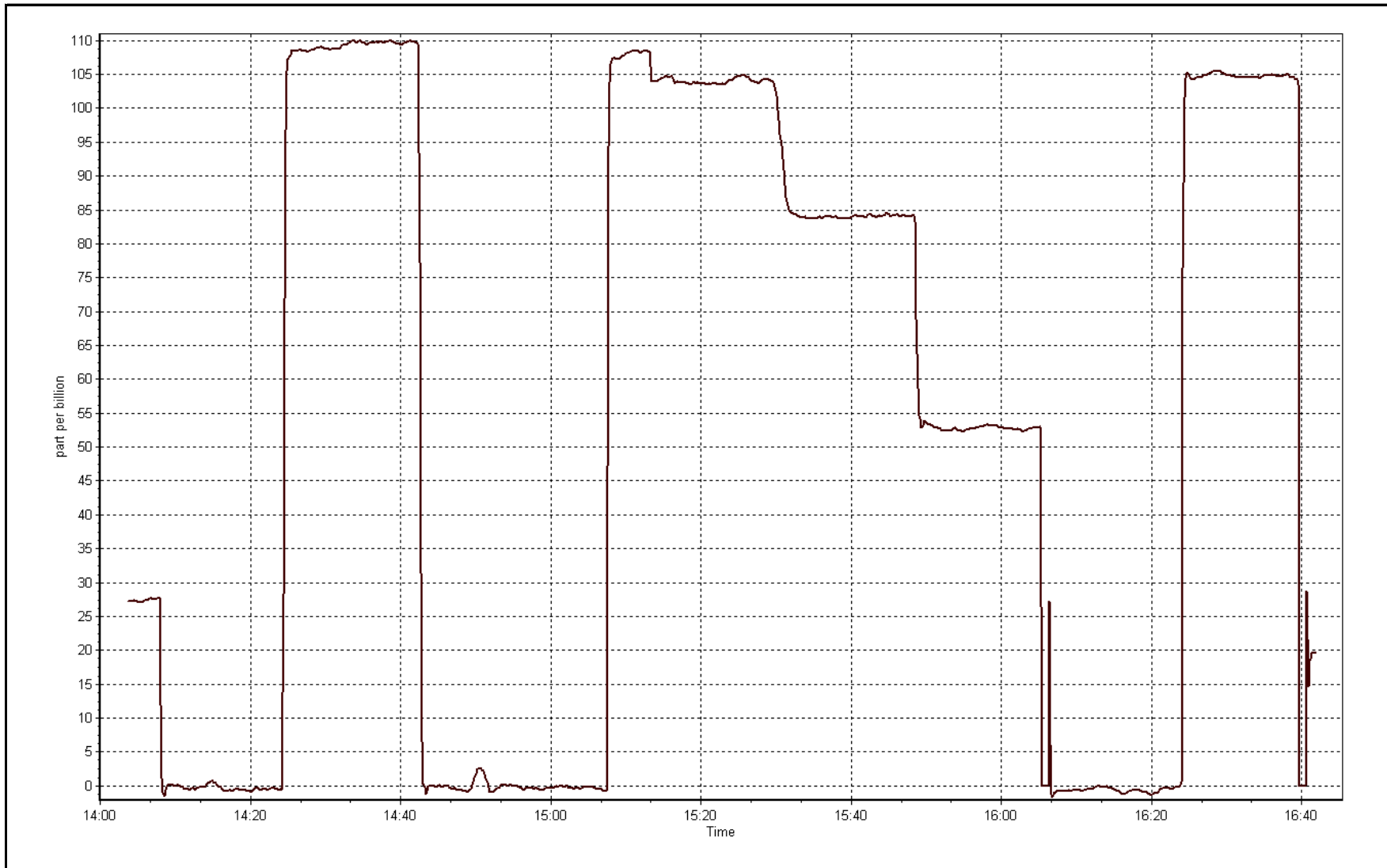
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999985
103.9	104.0	0.9995		
83.8	84.1	0.9966	Slope	0.996302
53.1	52.9	1.0044		
			Intercept	0.245047





O3 Calibration Plot

Date: December 2, 2015





# Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

## Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 5, 2015
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	Routine		
Start Time (MST)	9:35	End Time (MST)	14:10
NO Cal Gas Conc	20.2 ppm	Gas Cert Reference	LL103809
NOx Cal Gas Conc	20.2 ppm	Cal Gas Expiry Date	16/09/2016
Calibrator	Teledyne API T700	Serial Number	747
Zero air Generator	Teledyne API T701	Serial Number	4698

## DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	8205
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## Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	1.003222	1.000367	1.002420
	Data Offset	0.269622	0.483696	-0.054925
Current Calibration	Data Slope	1.000181	1.002270	0.995750
	Data Offset	0.393666	0.609162	-0.060364

## Analyzer Information

Analyzer make/model	Teledyne API T200u	Analyzer serial #	172
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Test Point	before		after	
		ppb		ppb
Concentration range	0-200		0-200	
Analyzer IP	192.168.1.72		192.168.1.72	
NO coefficient	1.173		1.147	
NOx coefficient	1.183		1.161	
NO2 coefficient	1.000		1.000	
NO bkgnd	0.1		0.1	
NOx bkgnd	0.2		0.2	
Chamber Temp	40	Deg C	40	Deg C
Moly Temp	315.7	Deg C	314	Deg C
HVPS	502	V	502	V
PMT Temp	5.1	Deg C	5.1	Deg C
O3 flow	89	ccm	87	ccm
R Cell press NO	3.8	"Hg	3.7	"Hg
R Cell Press Nox	3.8	"Hg	3.7	"Hg
NO sample flow	1116	ccm	1074	ccm
Nox sample Flow	1116	ccm	1074	ccm

**Notes:**

Filter changed after As Finds. Elevated readings after as finds due to analyzer sampling room air while calibrator was purged. Span adjusted.



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

### Station Information

Calibration Date:

December 2, 2015

Station Number:

AMS 8

### Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	6000	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	----	----
as found span	6000	44.6	150.2	150.2	0.0	152.5	152.2	0.3	0.9846	0.9866
calibrator zero	6000	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	----	----
high point	6000	44.6	150.2	150.2	0.0	150.1	149.7	0.4	1.0006	1.0032
second point	6000	23.8	80.1	80.1	0.0	79.1	78.6	0.6	1.0126	1.0197
third point	6000	11.9	40.1	40.1	0.0	39.6	39.1	0.4	1.0127	1.0244
as left zero	6000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
as left span	6000	44.6	150.2	45.0	105.1	149.9	45.3	104.6	1.0016	0.9945
Average Correction Factor									1.0086	1.0158

Corrected As found

NO<sub>x</sub>= 152.5

NO= 152.3

Percent Change

NO<sub>x</sub>= -2.0%

NO= -1.7%

Previous Response

NO<sub>x</sub>= 149.4

NO= 149.6

### GPT Calibration Data

Dilution Flow

6000

ccm

Source Gas Flow

44.60

ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero			0.0			0.0			N/A	
1st NO2 (300)	----	45.0	103.9	149.4	45.0	104.3	0.9979	1.0000	0.9959	100.4%
2nd NO2 (200)	----	65.1	83.8	149.4	65.1	84.3	0.9977	1.0000	0.9944	100.6%
3rd NO2 (100)	----	95.8	53.1	149.3	95.8	53.4	0.9986	1.0000	0.9934	100.7%
4th NO2 (0)	148.9	----	0.5	149.4	148.9	0.5	0.9974	1.0000	N/A	----
Average Correction Factor							0.9979	1.0000	0.9946	100.5%

Calibration Performed By:

Devin Russell



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

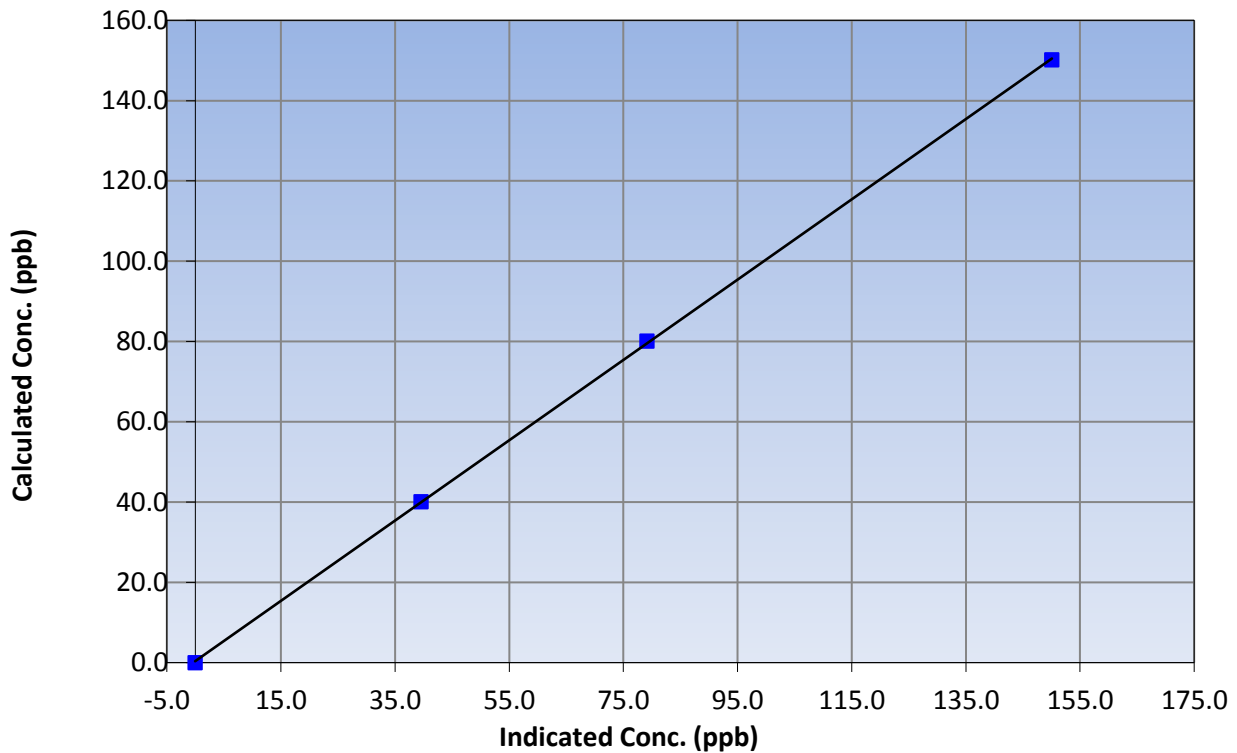
### Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 5, 2015
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	9:35	End Time (MST)	14:10
Analyzer make	Teledyne API T200u	Analyzer serial #	172

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999952
150.2	150.1	1.0006		
80.1	79.1	1.0126	Slope	1.000181
40.1	39.6	1.0127		
			Intercept	0.393666

### NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

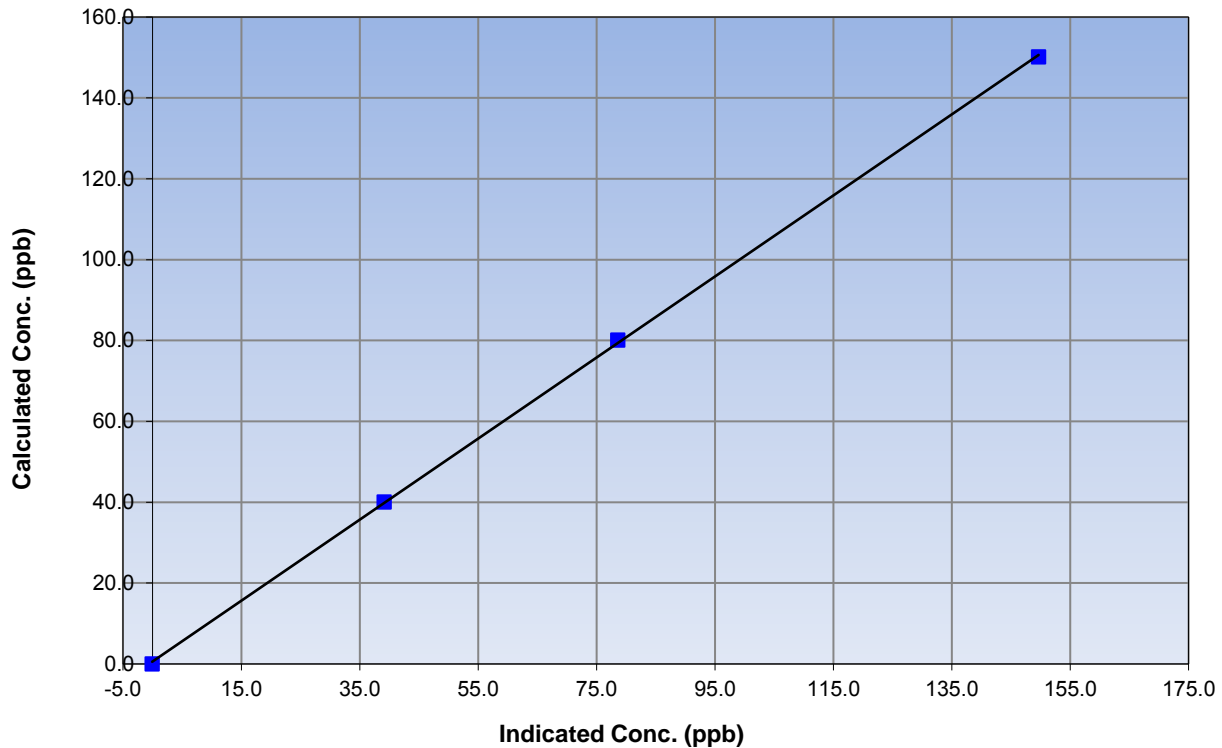
### Station Information

Calibration Date	December 2, 2015	Previous Calibration	November 5, 2015
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	9:35	End Time (MST)	14:10
Analyzer make	Teledyne API T200u	Analyzer serial #	172

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999906
150.2	149.7	1.0032		
80.1	78.6	1.0197	Slope	1.002270
40.1	39.1	1.0244		
			Intercept	0.609162

### NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

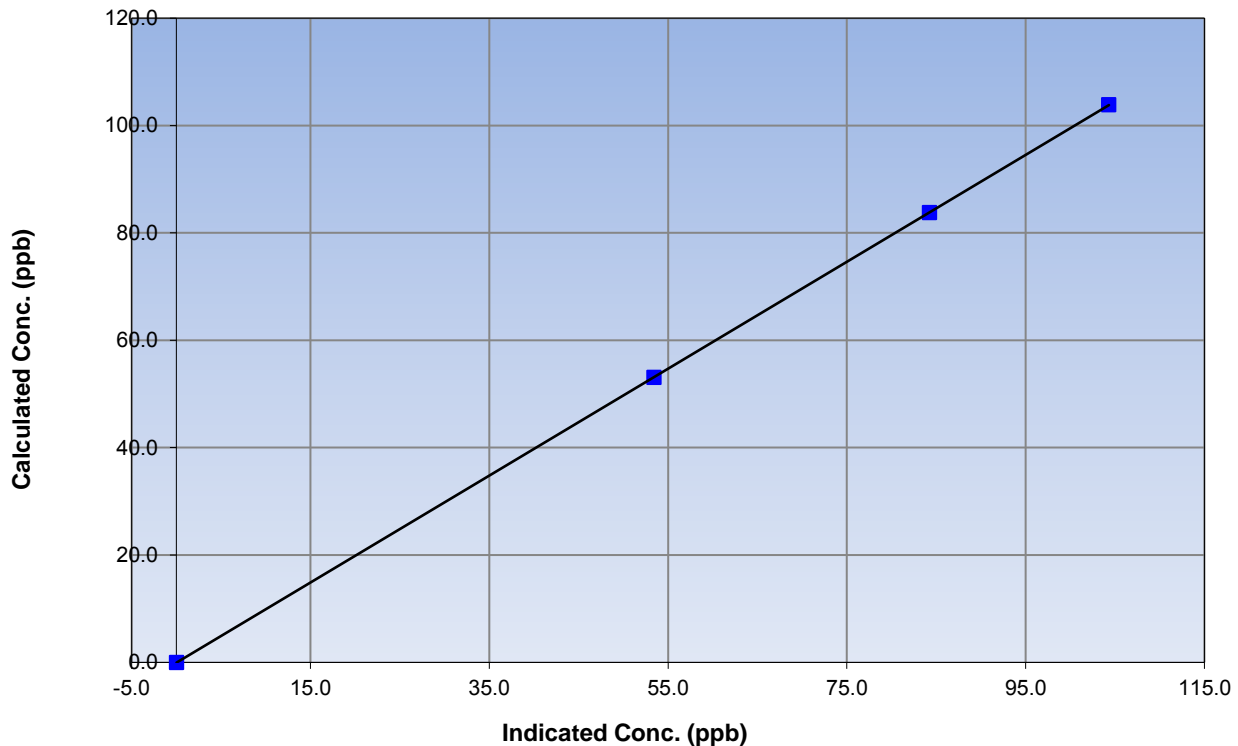
### Station Information

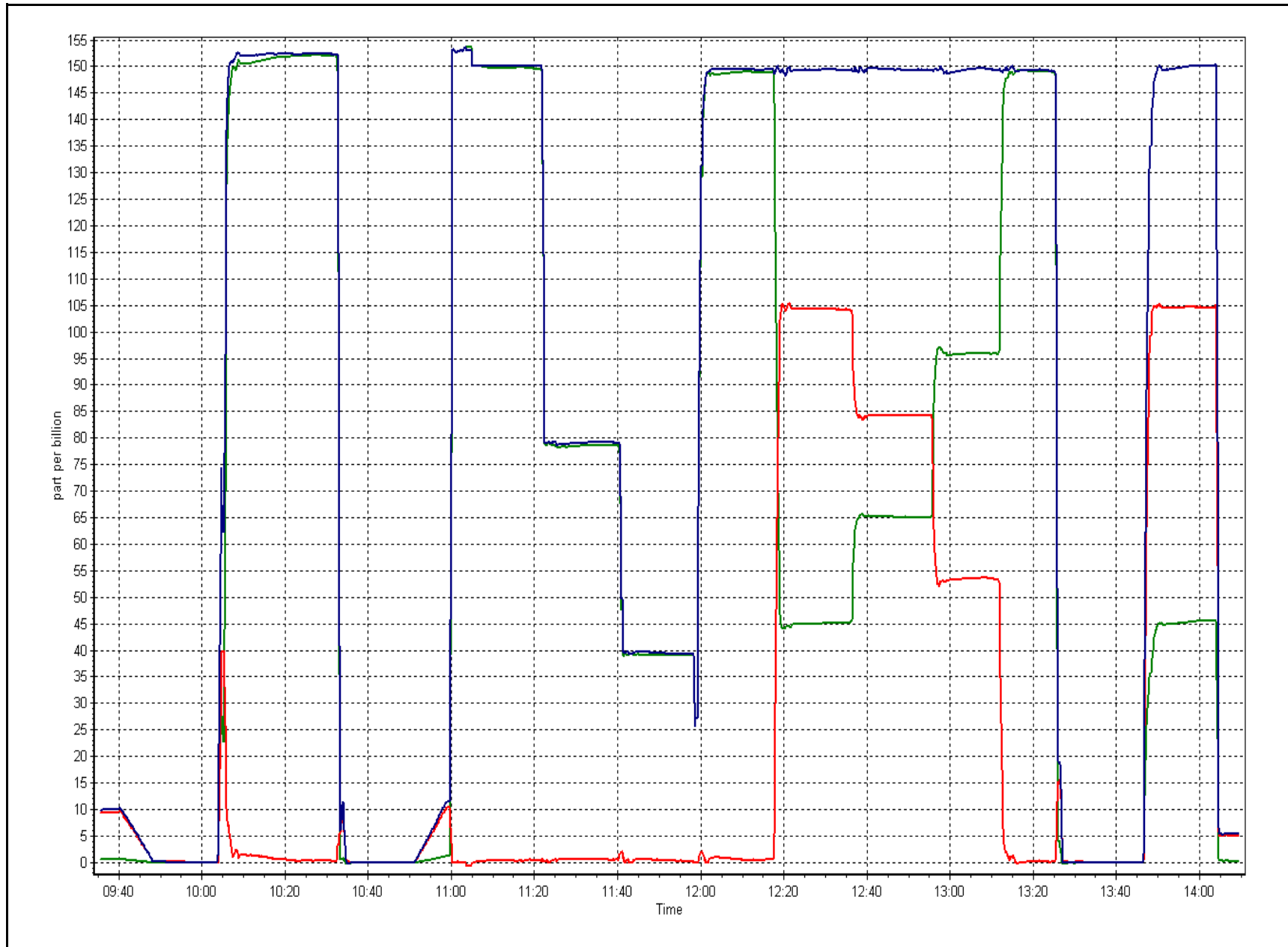
Calibration Date	December 2, 2015	Previous Calibration	November 5, 2015
Station Number	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	9:35	End Time (MST)	14:10
Analyzer make	Teledyne API T200u	Analyzer serial #	172

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999998
103.9	104.3	0.9959		
83.8	84.3	0.9944	Slope	0.995750
53.1	53.4	0.9934		
			Intercept	-0.060364

### NO<sub>2</sub> Calibration Curve







# Wood Buffalo Environmental Association

## SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	<u>December 2, 2015</u>	Previous Calibration:	<u>November 5, 2015</u>
Station Name:	<u>Fort Chipewyan</u>	Station Number:	<u>AMS 8</u>
Start Time (MST):	<u>13:50</u>	End Time (MST):	<u>14:53</u>
Calibrator Make/Model:	<u>Delta Cal</u>	Calibrator Serial Number:	<u>954</u>

SHARP INFORMATION			
Particulate Fraction:		PM2.5	
Make/Model:		Thermo / SHARP 5030	
Serial Number		E-2025	
C <sub>14</sub> Source SN:		7414	
Confirmation of Time settings:		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Parameters Checked:	T1 <input checked="" type="checkbox"/> T2 <input type="checkbox"/> T3 <input type="checkbox"/> T4 <input type="checkbox"/> P3 <input type="checkbox"/> Main Flow <input checked="" type="checkbox"/> Beta <input type="checkbox"/> Neph <input checked="" type="checkbox"/>		

### CALIBRATION DATA

Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	-2.0	-2.6	-0.6	-2.0
T2	18.0	na	na	18.0
T3	19.0	na	na	19.0
T4	22.0	na	na	22.0
RH (%)	20.0	na	na	20.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	969	963.8	-5.2	969

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1010	10	1010	1000

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	184		184
Neph	-0.2		-0.2
C14	13.9		13.9
Indicated Concentration (ug/m3)	-0.1	no	-0.1
Offset 1	194		194
Offset 2	32		32

Leak Check (Quarterly)			
Leak Check Date:	<u>October 7, 2015</u>	Previous Leak Check Date:	<u>August 5, 2015</u>

	Measured	Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.72	
*Flow with adaptor (LPM):	16.63	0.09

*\*Note - do not attach adaptor without shutting off the pump first*

Mass Foil Calibration (Annually)			
Foil Calibration Date:	<u>May 6, 2015</u>	Previous Foil Calibration:	NA
Zeroed?:			
Foil Mass:	<u>1324</u>		<u>Mass foil set S/N:</u>
Previous Correction Factor:	<u>7081</u>		
New Correction Factor:	<u>7022</u>		

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	02/09/2015
Pump	Good	NA
Filter Tape	Good	NA
Mass Foil Cal Set	na	NA
HEPA filter	Good	NA

### NOTES:

Cyclone head cleaned. No adjustments performed.

Calibration Performed By:	<u>Devin Russell</u>
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## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 9  
BARGE LANDING  
DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
TRS(ppb) Average	709	35	35	100.00	3	0	1	0
THC(ppm) Average	709	35	35	100.00	4.3	-	2.9	-
Temperature (C) Average	744	0	0	100.00	4	-	-1.6	-
Relative Humidity (%) Average	744	0	0	100.00	96	-	94	-
Wind Speed 10 m (km/h) Average	743	0	1	99.87	13	-	10	-
Wind Direction 10 m (deg) Average	743	0	1	99.87	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
TRS(ppb) Average	709	0.4	0	-	0	0	0	0	0	1	3
THC(ppm) Average	709	2.45	0.3	-	2.1	2.2	2.2	2.4	2.6	2.8	4.3
Temperature (C) Average	744	-11.18	6.5	-	-30	-19.8	-16.3	-11	-5.2	-4	4
Relative Humidity (%) Average	744	83.4	7	-	53	76	80	83	88	93	96
Wind Speed 10 m (km/h) Average	743	4.5	3	-	0	2	3	4	6	8	13
Wind Direction 10 m (deg) Average	743	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)  
DECEMBER 2015

OPERATIONAL NOTES

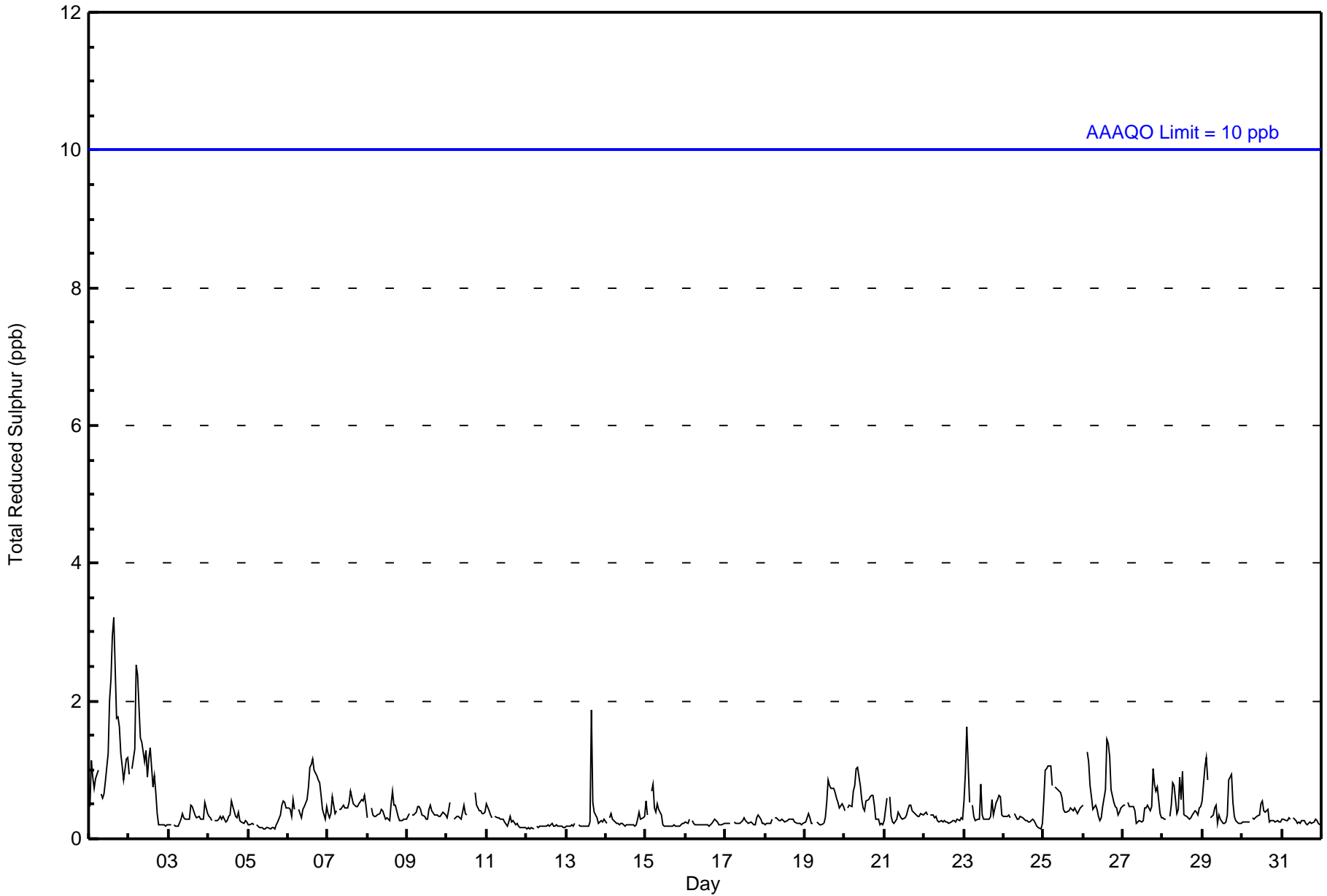
Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed, Wind Direction	07 Dec 2015 10:00	07 Dec 2015 10:00	1	Flat line in sensor output signal -sensor frozen



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 3 ppb on Dec 1 16:00	Maximum Daily Average: 1.3 ppb on Dec 1		Hours of Data:	709
Minimum Value: 0 ppb on Dec 12 03:00	Minimum Daily Average: 0.2 ppb on Dec 12		Hours of Missing Data:	35
Maximum Diurnal Average: 0.6 ppb at hour 16	Minimum Diurnal Average: 0.3 ppb at hour 24		Hours of Calibration:	35
Monthly Average: 0.4 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 2		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	1	1	1	1	1	Z	1	1	1	1	1	2	2	3	3	2	2	2	1	1	1	1	1	1.3	3
2-Dec	1	Z	1	1	3	2	2	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1.0	3
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.2	1
6-Dec	0	0	0	1	0	Z	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0.6	1
7-Dec	0	0	0	1	0	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	1	1	1	1	0	0.5	1
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.4	1
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
10-Dec	0	0	1	Z	0	0	0	0	0	0	0	0	C	C	C	C	1	0	0	0	0	0	0	0	0.4	1
11-Dec	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0.3	2
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
15-Dec	1	0	Z	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	0.4	1
20-Dec	0	Z	0	0	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0.5	1
21-Dec	0	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
23-Dec	1	1	2	1	Z	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	1	1	1	0	0.5	2
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
25-Dec	1	1	1	1	1	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.6	1
26-Dec	0	Z	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0.7	1
27-Dec	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0.5	1
28-Dec	0	0	0	Z	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.5	1
29-Dec	1	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0.5	1
30-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
	0.4	0.4	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	Diurnal Average	
	1	1	2	1	3	2	2	1	1	1	1	1	1	2	2	3	3	2	2	2	1	1	1	1	Diurnal Maximum	

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb    24-hr 3 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Barge Landing - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	706	99.58	99.58
3 - 4	3	0.42	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Barge Landing - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	63	45	17	27	30	15	40	68	108	60	48	40	16	12	22	94	705
3 - 4	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	63	45	17	27	30	15	40	68	111	60	48	40	16	12	22	94	708

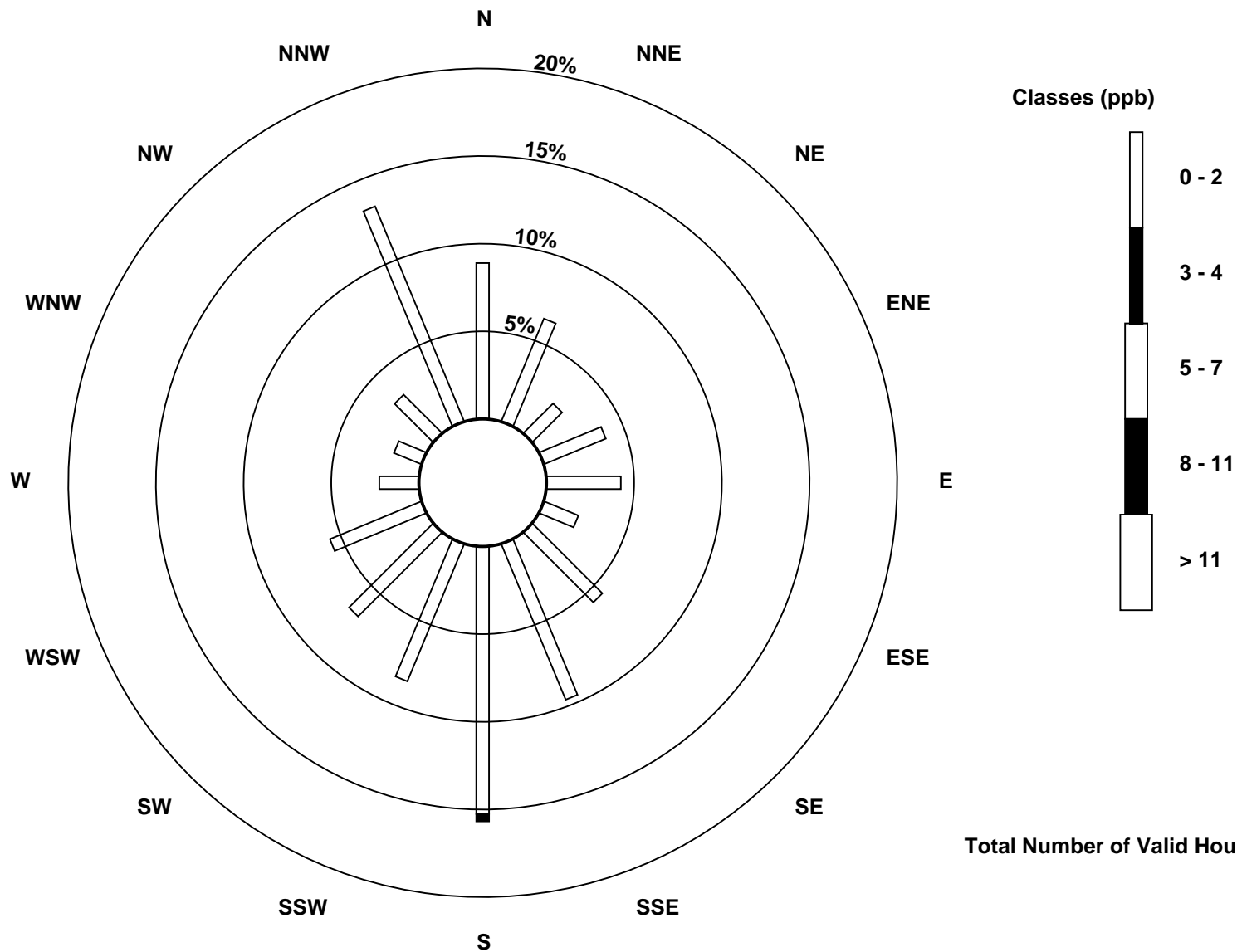
Total Number of Valid Hours: 708

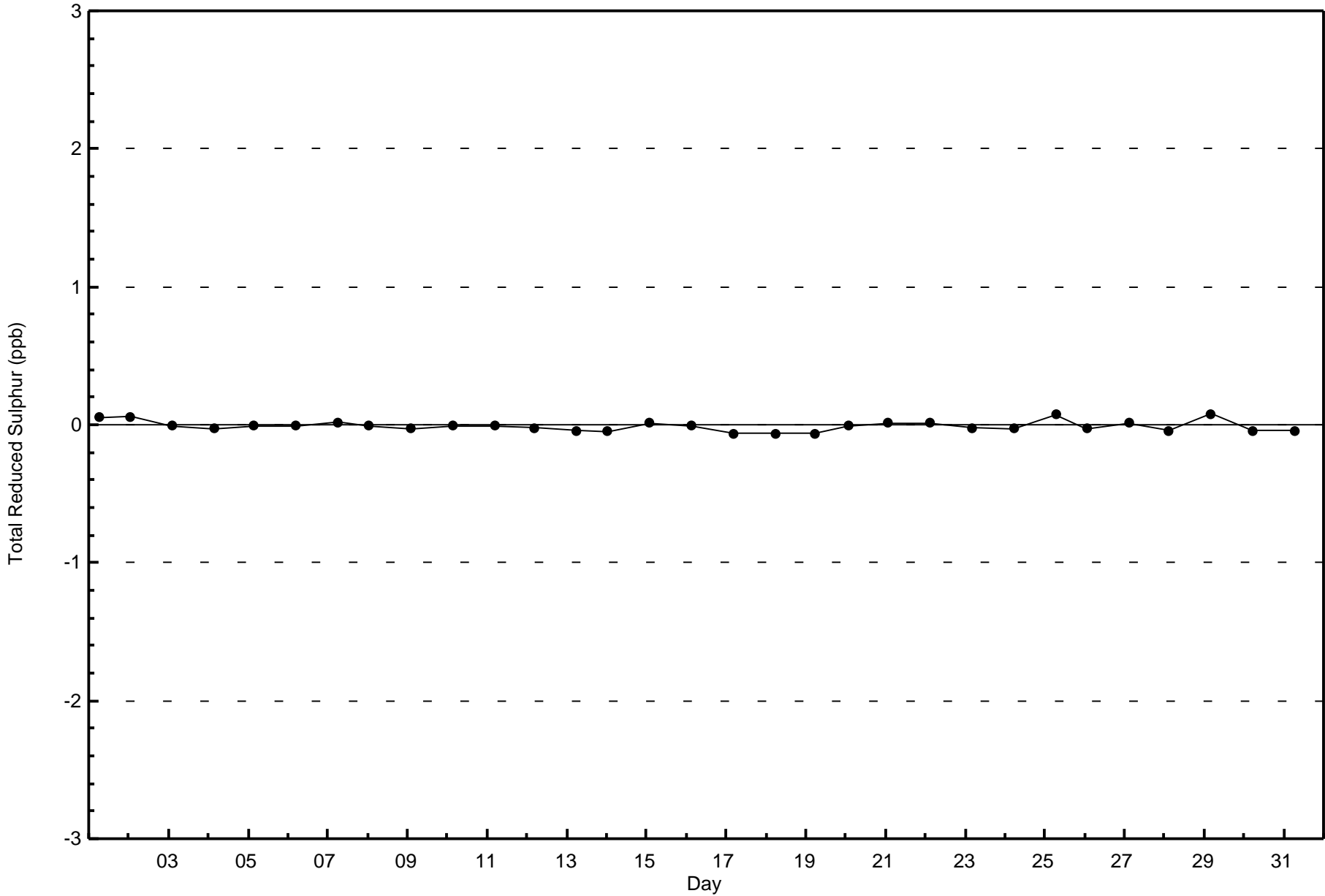
Total Number of Hours: 744

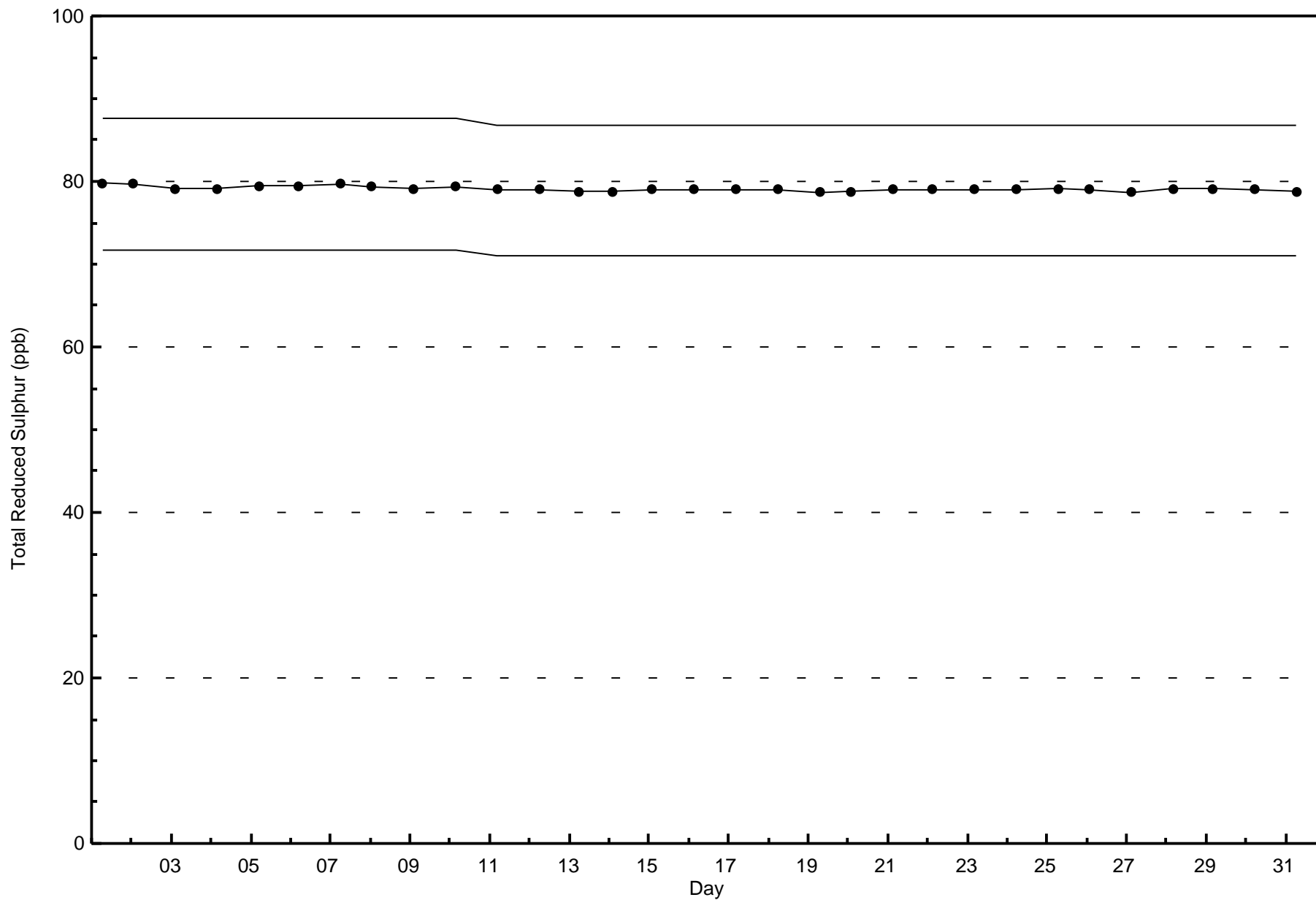


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Total Reduced Sulphur (TRS) - ppb  
Barge Landing (AMS 9)









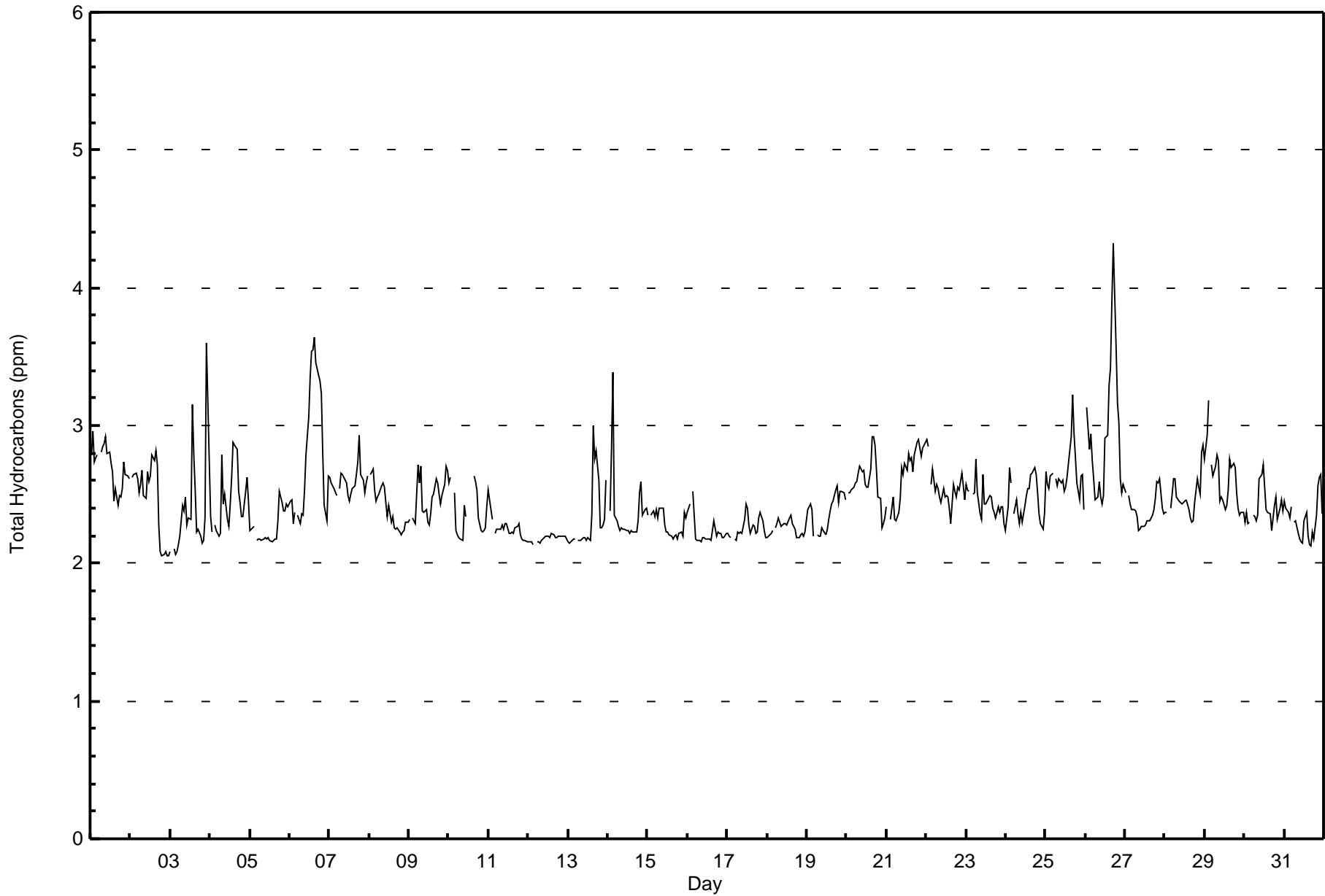
Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

Barge Landing - December 2015

Maximum Value: 4.3 ppm on Dec 26 18:00																				Maximum Daily Average: 2.9 ppm on Dec 26					Hours in Service: 744	
Minimum Value: 2.1 ppm on Dec 3 00:00																				Minimum Daily Average: 2.2 ppm on Dec 12					Hours of Data: 709	
Maximum Diurnal Average: 2.5 ppm at hour 16																				Minimum Diurnal Average: 2.4 ppm at hour 6					Hours of Missing Data: 35	
Monthly Average: 2.45 ppm																				Percentiles: P <sub>1</sub> = 2.1 P <sub>10</sub> = 2.2 Q <sub>1</sub> = 2.2 Median = 2.4 Q <sub>3</sub> = 2.6 P <sub>90</sub> = 2.8 P <sub>99</sub> = 3.5					Hours of Calibration: 35	
																									Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.8	3.0	2.7	2.8	2.8	Z	2.8	2.8	2.9	2.9	2.8	2.8	2.7	2.7	2.5	2.5	2.4	2.5	2.5	2.5	2.7	2.6	2.6	2.6	2.7	3.0
2-Dec	Z	2.6	2.6	2.6	2.6	2.5	2.6	2.7	2.5	2.5	2.7	2.6	2.6	2.8	2.7	2.8	2.7	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.5	2.8
3-Dec	2.1	Z	2.1	2.1	2.1	2.1	2.2	2.4	2.4	2.5	2.3	2.3	2.3	3.2	2.8	2.5	2.2	2.2	2.2	2.1	2.2	2.3	3.6	2.8	2.4	3.6
4-Dec	2.3	2.2	Z	2.3	2.2	2.2	2.2	2.8	2.4	2.5	2.3	2.3	2.4	2.6	2.9	2.9	2.8	2.5	2.4	2.3	2.3	2.5	2.6	2.5	2.5	2.9
5-Dec	2.2	2.2	2.3	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.5	2.4	2.4	2.4	2.4	2.4	2.3	2.5
6-Dec	2.5	2.5	2.3	2.4	Z	2.4	2.3	2.4	2.3	2.5	2.8	3.1	3.3	3.5	3.6	3.6	3.5	3.4	3.3	3.2	2.8	2.4	2.3	2.6	2.8	3.6
7-Dec	2.6	2.6	2.6	2.5	2.5	Z	2.5	2.6	2.6	2.6	2.6	2.5	2.4	2.5	2.5	2.6	2.6	2.7	2.9	2.6	2.6	2.5	2.6	2.6	2.6	2.9
8-Dec	Z	2.6	2.7	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.4	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.7
9-Dec	2.3	Z	2.3	2.3	2.3	2.7	2.6	2.7	2.4	2.4	2.4	2.3	2.3	2.4	2.5	2.5	2.6	2.6	2.5	2.4	2.5	2.6	2.7	2.7	2.5	2.7
10-Dec	2.6	2.6	Z	2.5	2.2	2.2	2.2	2.2	2.2	2.4	2.3	C	C	C	C	2.6	2.6	2.5	2.3	2.2	2.2	2.2	2.3	2.4	2.4	2.6
11-Dec	2.5	2.4	2.3	Z	2.2	2.2	2.3	2.2	2.3	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.5
12-Dec	2.2	2.2	2.2	2.1	Z	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
13-Dec	2.2	2.1	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4	3.0	2.8	2.8	2.6	2.3	2.3	2.3	2.3	2.6	2.3	3.0
14-Dec	Z	2.4	2.8	3.4	2.3	2.3	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.5	2.6	2.3	2.4	2.4	3.4
15-Dec	2.4	Z	2.3	2.4	2.3	2.4	2.3	2.4	2.4	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4	2.3	2.3	2.4
16-Dec	2.4	2.4	Z	2.5	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.5
17-Dec	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.4	2.3	2.2	2.3	2.3	2.2	2.2	2.3	2.4	2.3	2.2	2.2	2.3	2.4
18-Dec	2.2	2.2	2.2	2.2	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3
19-Dec	2.4	2.4	2.4	2.4	2.2	Z	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.3	2.4	2.4	2.5	2.5	2.6	2.4	2.5	2.5	2.5	2.5	2.4	2.6
20-Dec	Z	2.5	2.5	2.5	2.6	2.6	2.6	2.7	2.7	2.7	2.7	2.6	2.5	2.5	2.7	2.9	2.9	2.9	2.7	2.5	2.5	2.3	2.3	2.3	2.6	2.9
21-Dec	2.4	Z	2.3	2.4	2.5	2.3	2.3	2.4	2.5	2.7	2.6	2.7	2.7	2.8	2.7	2.8	2.7	2.8	2.9	2.9	2.8	2.8	2.8	2.9	2.6	2.9
22-Dec	2.9	2.8	Z	2.6	2.7	2.5	2.6	2.5	2.5	2.4	2.5	2.5	2.5	2.5	2.4	2.3	2.6	2.5	2.5	2.6	2.5	2.6	2.6	2.5	2.5	2.9
23-Dec	2.6	2.5	2.5	Z	2.5	2.5	2.8	2.5	2.4	2.3	2.6	2.4	2.4	2.4	2.5	2.5	2.4	2.4	2.3	2.4	2.4	2.4	2.4	2.3	2.5	2.8
24-Dec	2.2	2.4	2.7	2.6	Z	2.4	2.5	2.4	2.3	2.4	2.3	2.4	2.5	2.5	2.5	2.6	2.6	2.6	2.7	2.6	2.5	2.4	2.3	2.2	2.4	2.7
25-Dec	2.7	2.6	2.5	2.6	2.7	Z	2.6	2.6	2.6	2.6	2.6	2.5	2.5	2.6	2.7	2.9	3.2	2.9	2.8	2.6	2.5	2.6	2.6	2.4	2.7	3.2
26-Dec	Z	3.1	2.8	2.9	2.7	2.6	2.5	2.5	2.6	2.5	2.4	2.5	2.9	2.9	3.3	3.4	3.9	4.3	3.6	3.2	3.0	2.6	2.5	2.6	2.9	4.3
27-Dec	2.5	Z	2.5	2.4	2.4	2.4	2.4	2.3	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.5	2.6	2.6	2.6	2.4	2.4	2.4	2.6
28-Dec	2.4	2.4	Z	2.4	2.5	2.6	2.6	2.5	2.5	2.4	2.4	2.4	2.5	2.5	2.4	2.3	2.3	2.3	2.4	2.6	2.6	2.5	2.8	2.9	2.5	2.9
29-Dec	2.8	2.9	3.2	Z	2.7	2.6	2.7	2.8	2.7	2.5	2.5	2.5	2.4	2.4	2.5	2.8	2.7	2.7	2.7	2.5	2.4	2.3	2.4	2.4	2.6	3.2
30-Dec	2.3	2.4	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.6	2.6	2.7	2.5	2.4	2.4	2.4	2.4	2.2	2.3	2.4	2.5	2.3	2.4	2.5	2.4	2.7
31-Dec	2.4	2.4	2.4	2.3	2.4	Z	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.4	2.2	2.1	2.1	2.2	2.2	2.4	2.6	2.6	2.6	2.4	2.3	2.6
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Barge Landing - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	0	0.00	0.00
2.1 - 3.0	688	97.04	97.04
3.1 - 10.0	21	2.96	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Barge Landing - December 2015**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.1 - 3.0	62	45	15	27	27	16	41	65	109	62	47	38	15	14	21	83	687
3.1 - 10.0	3	1	0	1	0	0	0	2	2	1	1	0	0	1	2	7	21
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	65	46	15	28	27	16	41	67	111	63	48	38	15	15	23	90	708

Total Number of Valid Hours: 708

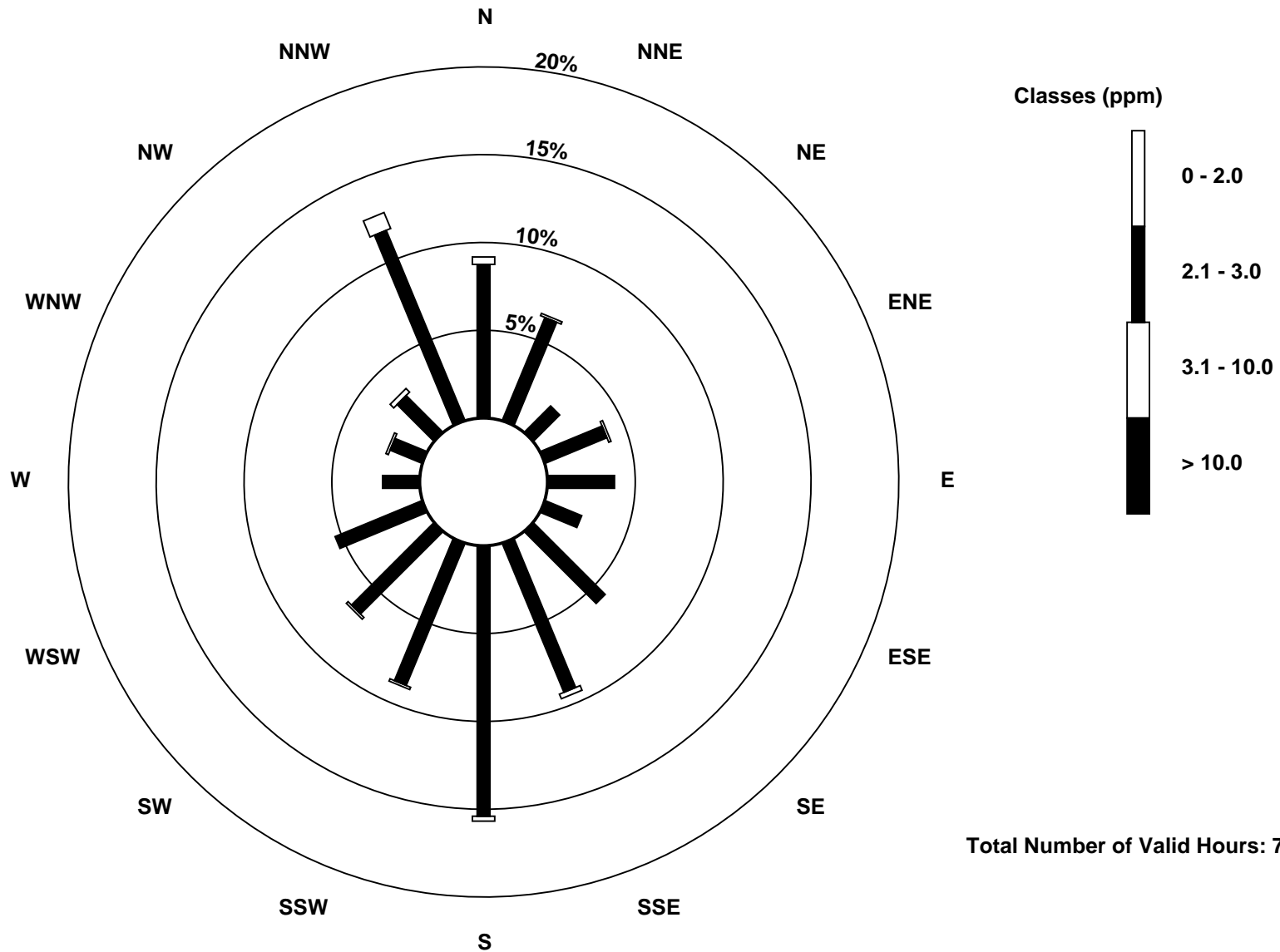
Total Number of Hours: 744



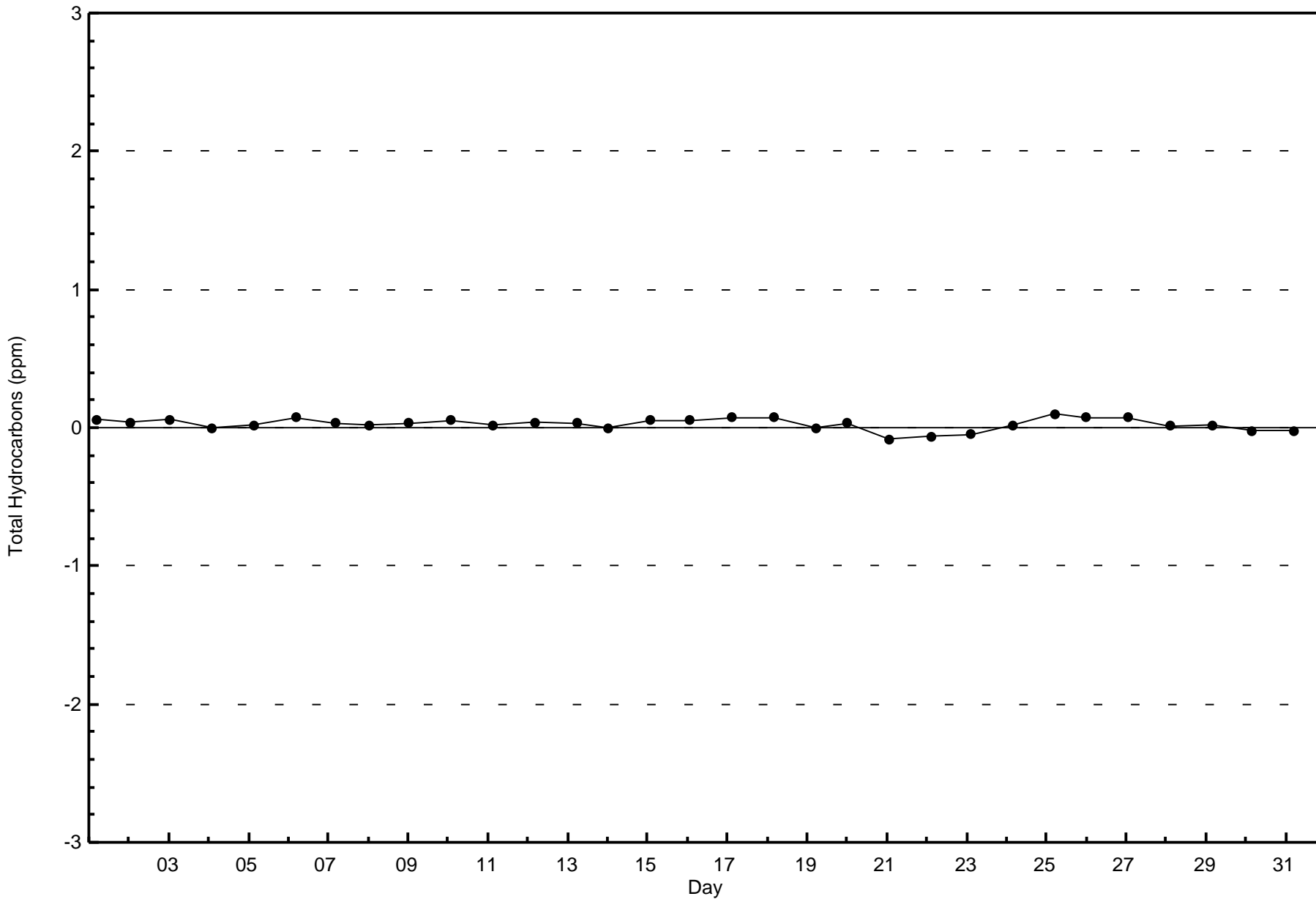


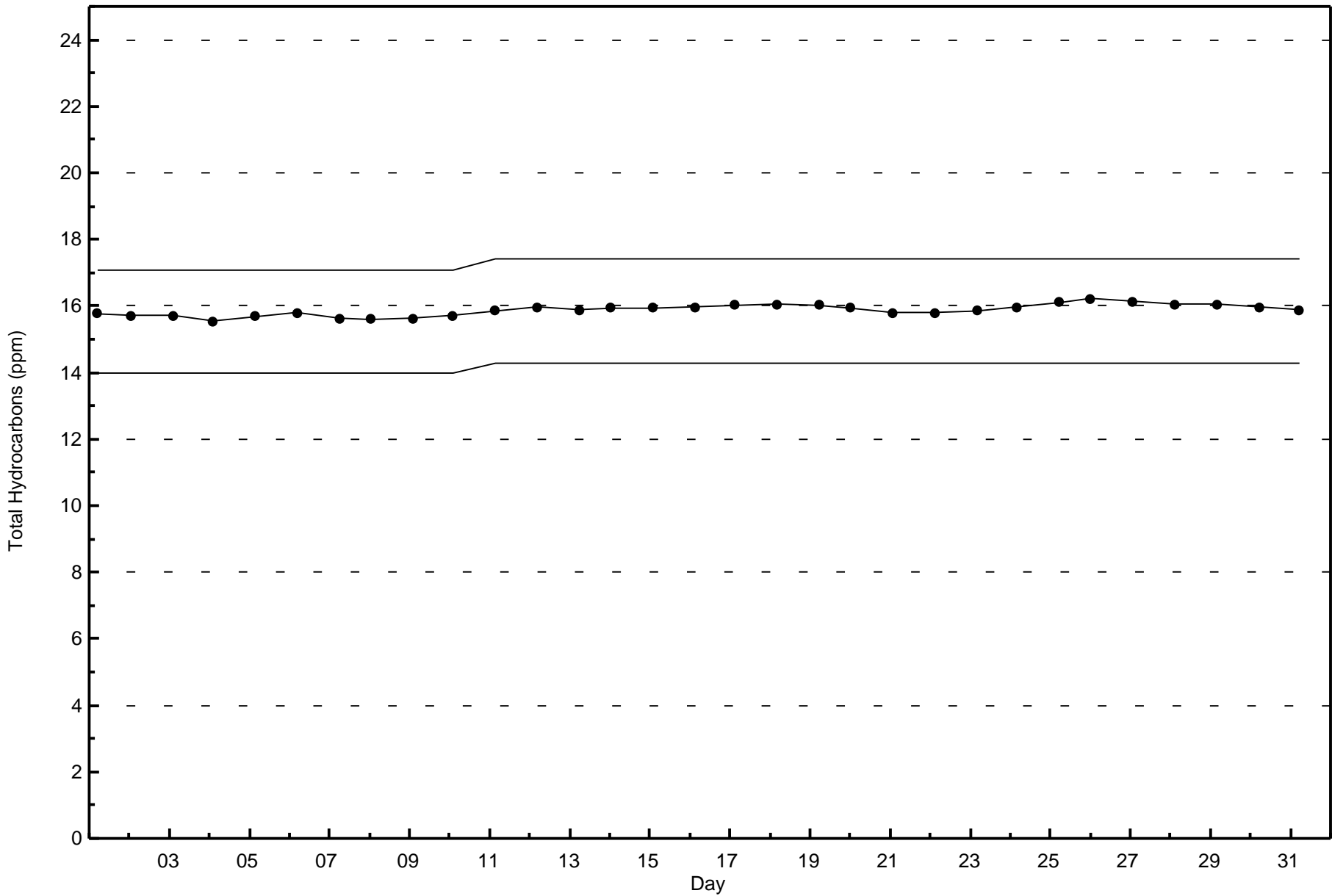
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Total Hydrocarbons (THC) - ppm  
Barge Landing (AMS 9)



Total Number of Valid Hours: 708







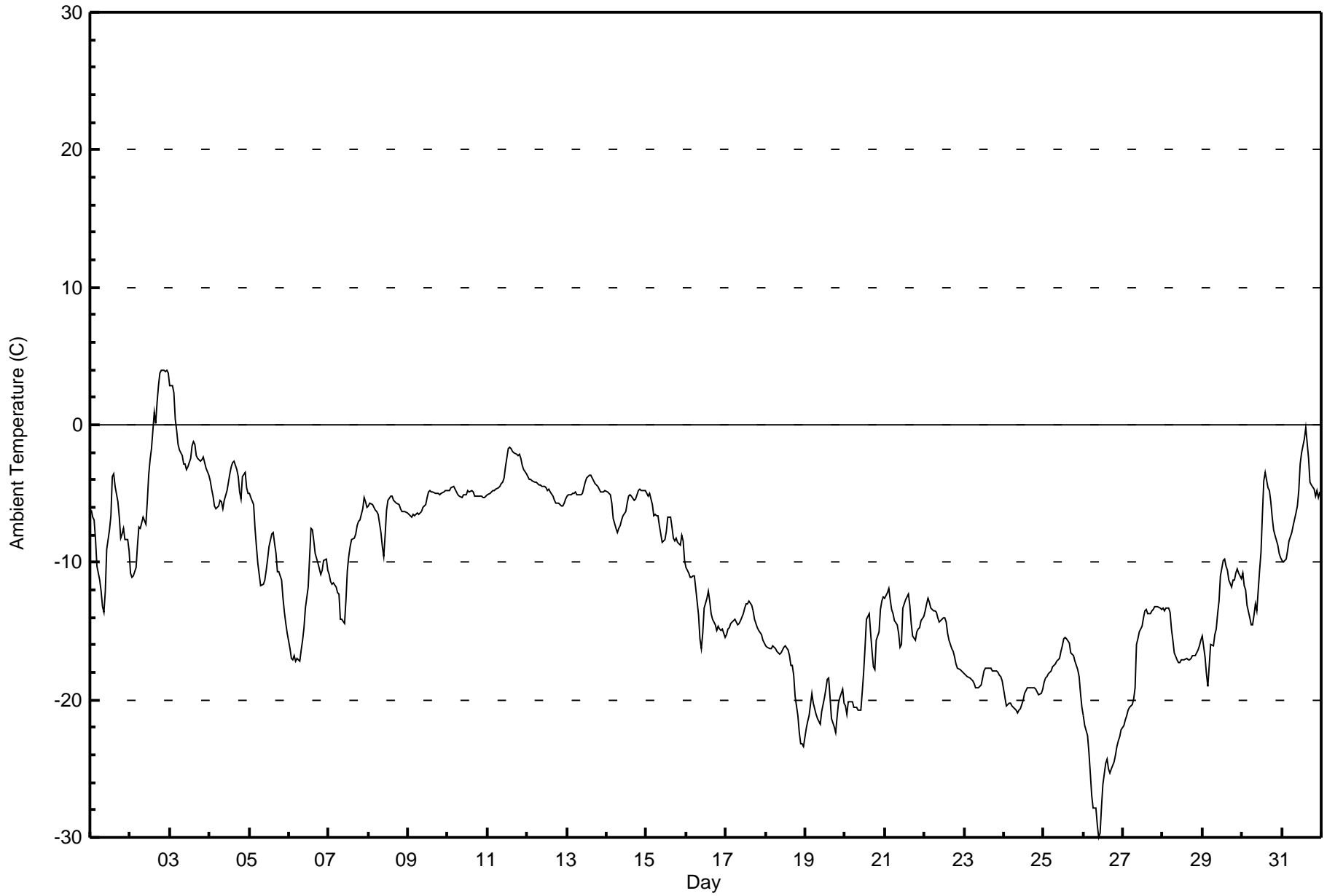
**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ambient Temperature (AT) - C**

**Barge Landing - December 2015**

Maximum Value: 4.0 C on Dec 2 20:00		Maximum Daily Average: -1.6 C on Dec 3		Hours in Service: 744																							
Minimum Value: -30.0 C on Dec 26 10:00		Minimum Daily Average: -25.2 C on Dec 26		Hours of Data: 744																							
Maximum Diurnal Average: -9.4 C at hour 15		Minimum Diurnal Average: -12.6 C at hour 9		Hours of Missing Data: 0																							
Monthly Average: -11.18 C		Percentiles: P <sub>1</sub> = -26.1 P <sub>10</sub> = -19.8 Q <sub>1</sub> = -16.3 Median = -11.0 Q <sub>3</sub> = -5.2 P <sub>90</sub> = -4.0 P <sub>99</sub> = 1.9		Hours of Calibration: 0																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	-6.2	-6.7	-6.9	-8.3	-10.3	-11.3	-12.1	-13.2	-13.6	-12.1	-9.1	-7.7	-6.7	-3.7	-3.6	-4.4	-5.6	-6.7	-8.3	-7.9	-7.5	-8.3	-8.4	-9.1	-8.2	-3.6	
2-Dec	-10.7	-11.1	-11.0	-10.3	-8.8	-7.4	-7.5	-7.1	-6.7	-7.2	-5.6	-3.7	-2.6	-1.7	0.9	0.1	1.6	2.8	3.8	4.0	4.0	3.9	4.0	3.8	-3.0	4.0	
3-Dec	2.8	2.8	2.4	0.5	-0.4	-1.5	-1.9	-2.2	-2.9	-2.9	-3.2	-3.1	-2.4	-1.5	-1.2	-1.4	-2.2	-2.5	-2.7	-2.5	-2.4	-2.7	-3.2	-3.7	-1.6	2.8	
4-Dec	-4.1	-4.7	-5.2	-5.9	-6.1	-5.9	-5.5	-5.6	-6.1	-5.5	-4.8	-4.1	-3.6	-3.0	-2.7	-2.7	-3.3	-3.8	-4.9	-5.4	-3.8	-3.5	-4.6	-5.0	-4.6	-2.7	
5-Dec	-5.0	-5.3	-5.8	-7.6	-8.9	-10.1	-10.8	-11.7	-11.6	-11.3	-10.6	-9.7	-8.8	-7.9	-7.8	-8.6	-9.3	-10.6	-10.7	-11.3	-12.6	-13.6	-14.5	-15.2	-10.0	-5.0	
6-Dec	-16.3	-17.0	-17.0	-16.8	-17.2	-17.0	-17.2	-16.4	-15.6	-14.8	-13.3	-11.8	-9.7	-7.5	-7.7	-8.5	-9.4	-10.0	-10.5	-10.9	-10.5	-9.9	-9.8	-10.5	-12.7	-7.5	
7-Dec	-10.9	-11.4	-11.6	-11.5	-11.8	-12.2	-12.3	-14.2	-14.1	-14.4	-12.7	-10.6	-9.6	-8.8	-8.4	-8.2	-8.0	-7.3	-7.0	-6.9	-6.1	-5.3	-5.6	-6.0	-9.8	-5.3	
8-Dec	-5.9	-5.7	-5.8	-6.0	-6.2	-6.3	-6.5	-7.9	-8.9	-9.5	-8.1	-6.2	-5.5	-5.2	-5.2	-5.5	-5.6	-5.7	-5.8	-6.1	-6.3	-6.3	-6.3	-6.4	-6.4	-5.2	
9-Dec	-6.5	-6.6	-6.7	-6.5	-6.6	-6.4	-6.5	-6.4	-6.3	-6.0	-5.7	-5.3	-4.9	-4.8	-4.9	-4.9	-5.0	-5.0	-5.0	-5.1	-5.0	-4.9	-4.8	-4.8	-5.6	-4.8	
10-Dec	-4.7	-4.8	-4.6	-4.5	-4.7	-4.9	-5.0	-5.2	-5.3	-5.1	-5.1	-5.1	-4.8	-4.9	-4.8	-4.9	-5.2	-5.1	-5.1	-5.2	-5.2	-5.2	-5.3	-5.2	-5.0	-4.5	
11-Dec	-5.1	-5.0	-4.9	-4.8	-4.8	-4.7	-4.5	-4.4	-4.3	-4.1	-3.8	-3.1	-1.8	-1.6	-1.7	-1.9	-2.1	-2.1	-2.2	-2.1	-2.5	-3.0	-3.3	-3.5	-3.4	-1.6	
12-Dec	-3.8	-4.0	-4.0	-4.1	-4.2	-4.2	-4.2	-4.3	-4.4	-4.5	-4.5	-4.6	-4.8	-4.7	-4.8	-5.2	-5.5	-5.6	-5.7	-5.7	-5.9	-5.8	-5.7	-5.4	-4.8	-3.8	
13-Dec	-5.2	-5.1	-5.1	-5.0	-5.0	-4.9	-5.0	-5.1	-5.1	-5.0	-4.6	-4.2	-3.8	-3.6	-3.7	-3.9	-4.0	-4.2	-4.4	-4.7	-4.9	-4.9	-4.9	-4.8	-4.6	-3.6	
14-Dec	-4.8	-5.0	-5.1	-5.7	-6.8	-7.5	-7.8	-7.5	-7.3	-6.9	-6.6	-6.3	-5.7	-5.2	-5.1	-5.2	-5.5	-5.4	-5.0	-4.7	-4.7	-4.8	-4.7	-4.8	-5.8	-4.7	
15-Dec	-5.0	-5.2	-5.0	-5.8	-6.6	-6.5	-6.6	-6.6	-7.3	-8.6	-8.4	-8.4	-7.7	-6.7	-6.7	-7.5	-8.2	-8.5	-8.3	-8.5	-8.7	-8.1	-8.4	-9.9	-7.4	-5.0	
16-Dec	-10.3	-10.8	-11.0	-11.1	-11.0	-11.0	-11.9	-13.8	-15.5	-16.3	-15.2	-13.3	-12.6	-12.1	-12.8	-13.7	-14.1	-14.6	-15.0	-14.6	-14.9	-14.9	-14.8	-15.4	-13.4	-10.3	
17-Dec	-15.3	-14.9	-14.8	-14.4	-14.2	-14.1	-14.3	-14.5	-14.5	-14.2	-13.8	-13.4	-13.0	-13.0	-12.9	-13.1	-13.5	-14.2	-14.5	-14.7	-14.9	-15.2	-15.6	-15.9	-14.3	-12.9	
18-Dec	-16.0	-16.2	-16.3	-16.3	-16.1	-16.2	-16.3	-16.5	-16.7	-16.6	-16.4	-16.2	-16.1	-16.4	-16.8	-17.5	-17.5	-18.2	-19.7	-21.1	-22.4	-23.2	-23.2	-23.4	-18.0	-16.0	
19-Dec	-22.1	-21.6	-21.1	-20.3	-19.5	-20.2	-21.1	-21.4	-21.6	-21.8	-20.8	-19.8	-19.2	-18.5	-18.4	-19.8	-21.3	-21.9	-22.4	-21.2	-20.3	-19.8	-19.2	-20.3	-20.6	-18.4	
20-Dec	-20.5	-21.0	-20.1	-20.1	-20.1	-20.5	-20.5	-20.5	-20.8	-20.7	-19.5	-18.0	-16.1	-14.2	-13.8	-15.2	-16.5	-17.6	-17.8	-15.7	-15.1	-13.4	-12.8	-12.6	-17.6	-12.6	
21-Dec	-12.6	-12.2	-11.9	-12.8	-13.5	-13.8	-14.2	-14.5	-15.2	-16.2	-15.9	-13.4	-12.7	-12.5	-12.3	-13.1	-14.4	-15.4	-15.7	-15.1	-14.8	-14.8	-14.3	-13.9	-14.0	-11.9	
22-Dec	-13.5	-13.0	-12.6	-12.9	-13.4	-13.5	-13.5	-13.6	-14.0	-14.3	-14.2	-14.0	-14.0	-14.3	-15.1	-15.7	-16.2	-16.5	-16.9	-17.4	-17.6	-17.8	-17.9	-18.0	-15.0	-12.6	
23-Dec	-18.1	-18.2	-18.3	-18.5	-18.5	-18.6	-18.8	-19.1	-19.1	-19.0	-19.0	-18.4	-17.9	-17.7	-17.7	-17.7	-17.9	-17.9	-17.9	-17.9	-18.0	-18.2	-18.3	-18.6	-18.3	-17.7	
24-Dec	-19.2	-20.4	-20.3	-20.2	-20.3	-20.4	-20.6	-20.8	-20.9	-20.7	-20.6	-20.0	-19.5	-19.3	-19.1	-19.2	-19.1	-19.1	-19.1	-19.3	-19.4	-19.6	-19.5	-19.2	-19.8	-19.1	
25-Dec	-18.7	-18.4	-18.3	-18.1	-17.9	-17.6	-17.5	-17.4	-17.2	-17.0	-16.4	-16.1	-15.6	-15.5	-15.5	-15.9	-16.6	-16.7	-16.8	-17.2	-17.8	-18.3	-19.5	-20.6	-17.4	-15.5	
26-Dec	-21.2	-21.9	-22.6	-23.8	-25.4	-27.0	-27.9	-27.9	-29.1	-30.0	-29.7	-27.8	-26.1	-24.6	-24.3	-25.0	-25.3	-25.0	-24.5	-24.0	-23.4	-23.0	-22.7	-22.2	-25.2	-21.2	
27-Dec	-21.9	-21.4	-21.1	-20.8	-20.6	-20.3	-19.9	-19.1	-16.0	-15.6	-15.0	-14.6	-14.0	-13.5	-13.4	-13.7	-13.8	-13.5	-13.5	-13.2	-13.2	-13.2	-13.3	-13.4	-16.2	-13.2	
28-Dec	-13.3	-13.5	-13.3	-13.3	-13.6	-14.9	-15.7	-16.6	-17.1	-17.2	-17.3	-17.1	-17.1	-17.1	-17.0	-17.1	-17.1	-17.0	-16.8	-16.7	-16.6	-16.4	-16.1	-15.6	-16.0	-13.3	
29-Dec	-15.4	-16.9	-18.1	-19.0	-17.5	-16.0	-16.1	-15.3	-14.9	-13.7	-12.8	-11.0	-9.9	-9.8	-10.2	-10.6	-11.3	-11.8	-11.3	-11.2	-10.7	-10.5	-10.7	-11.2	-13.2	-9.8	
30-Dec	-10.7	-11.7	-12.0	-13.2	-14.0	-14.6	-14.5	-13.8	-13.0	-13.6	-10.6	-9.2	-6.5	-4.1	-3.4	-4.6	-4.8	-5.6	-6.7	-7.7	-8.0	-8.7	-9.4	-9.7	-9.6	-3.4	
31-Dec	-9.9	-9.9	-9.8	-9.1	-8.5	-8.2	-7.8	-7.4	-6.4	-5.9	-4.8	-2.9	-2.0	-1.0	-0.2	-1.3	-2.4	-4.2	-4.3	-4.7	-5.2	-4.8	-5.2	-4.9	-5.4	-0.2	
		-11.3	-11.5	-11.5	-11.8	-12.0	-12.2	-12.4	-12.6	-12.6	-12.6	-11.9	-10.9	-10.2	-9.5	-9.4	-9.9	-10.3	-10.6	-10.8	-10.8	-10.8	-10.8	-10.9	-11.1	Diurnal Average	
		2.8	2.8	2.4	0.5	-0.4	-1.5	-1.9	-2.2	-2.9	-2.9	-3.2	-2.9	-1.8	-1.0	0.9	0.1	1.6	2.8	3.8	4.0	4.0	3.9	4.0	3.8	Diurnal Maximum	





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C**  
**Barge Landing - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	72	9.68	9.68
-20 - 0	658	88.44	98.12
0 - 10	14	1.88	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

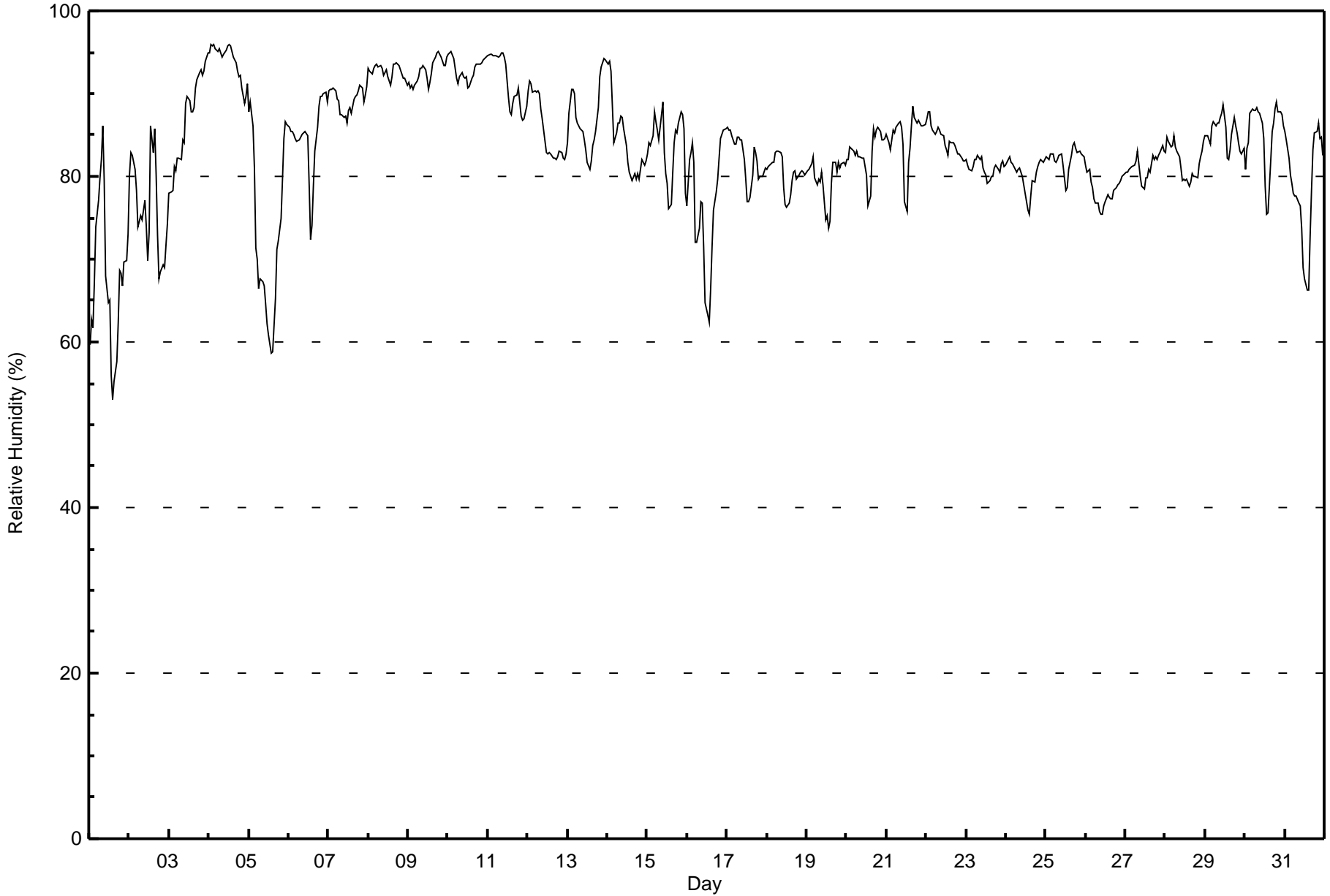
**Barge Landing - December 2015**

Maximum Value: 96 % on Dec 4 04:00																		Maximum Daily Average: 94.0 % on Dec 4																		Hours in Service: 744														
Minimum Value: 53 % on Dec 1 15:00																		Minimum Daily Average: 67.8 % on Dec 1																		Hours of Data: 744														
Maximum Diurnal Average: 85.2 % at hour 2																		Minimum Diurnal Average: 79.1 % at hour 14																		Hours of Missing Data: 0														
Monthly Average: 83.4 %																		Percentiles: P <sub>1</sub> = 61 P <sub>10</sub> = 76 Q <sub>1</sub> = 80 Median = 83 Q <sub>3</sub> = 88 P <sub>90</sub> = 93 P <sub>99</sub> = 95																		Hours of Calibration: 0														
																																				Percent Operational Time: 100.0														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																										
1-Dec	60	63	62	67	74	77	80	82	86	79	68	65	65	56	53	55	58	62	69	68	67	70	70	73	67.8	86																								
2-Dec	80	83	83	81	78	74	75	75	75	77	74	70	73	86	83	86	80	73	68	68	69	69	72	74	76.1	86																								
3-Dec	78	78	78	81	81	82	82	82	84	84	89	90	89	88	88	88	91	92	92	93	92	93	94	95	86.8	95																								
4-Dec	95	96	96	96	96	95	95	95	94	95	95	96	96	96	95	94	94	93	92	92	91	89	90	91	94.0	96																								
5-Dec	88	89	86	81	71	70	66	68	67	67	65	62	61	59	59	62	65	71	72	75	80	85	87	86	72.5	89																								
6-Dec	86	86	85	85	85	84	84	85	85	85	85	85	79	72	74	79	83	86	88	90	90	90	90	89	84.6	90																								
7-Dec	90	91	90	91	90	89	89	87	87	87	87	87	88	88	88	89	90	90	90	91	91	89	90	91	89.2	91																								
8-Dec	93	93	92	93	93	93	93	93	93	92	92	93	92	91	92	94	94	94	93	93	92	92	92	91	92.7	94																								
9-Dec	91	91	91	90	91	91	92	93	93	93	93	92	91	91	92	94	94	95	95	95	94	93	93	94	92.7	95																								
10-Dec	95	95	95	94	93	92	91	92	93	92	92	92	91	91	92	92	93	94	94	94	94	94	94	94	93.0	95																								
11-Dec	95	95	95	95	95	95	94	95	95	95	94	94	89	88	87	89	90	90	91	89	87	87	87	89	91.5	95																								
12-Dec	90	91	91	90	90	90	90	90	88	87	84	83	83	83	83	82	82	82	82	83	83	82	82	83	85.7	91																								
13-Dec	84	88	90	90	90	87	86	86	86	85	84	83	82	81	82	84	85	88	92	93	94	94	94	94	87.3	94																								
14-Dec	94	94	93	88	84	85	86	86	87	87	86	84	82	80	79	80	80	80	80	80	81	82	81	82	84.2	94																								
15-Dec	83	84	84	85	88	87	86	84	86	89	83	80	79	76	77	81	84	86	85	86	88	87	86	78	83.8	89																								
16-Dec	76	82	83	84	82	72	72	74	77	77	71	65	63	62	66	72	76	78	80	82	85	85	86	86	76.5	86																								
17-Dec	86	86	86	85	84	84	85	85	84	84	82	80	77	77	77	80	84	83	82	80	80	80	80	81	82.1	86																								
18-Dec	81	81	82	82	82	83	83	83	83	82	79	77	76	77	78	79	81	81	80	80	80	81	80	80	80.4	83																								
19-Dec	81	81	81	82	82	80	79	80	79	81	79	75	75	74	75	79	82	82	80	82	81	82	82	81	79.7	82																								
20-Dec	82	82	84	83	83	83	83	82	82	82	82	81	80	76	78	83	86	85	86	86	85	84	84	85	82.8	86																								
21-Dec	85	84	83	84	86	85	86	86	87	86	84	77	76	82	83	86	88	87	86	87	86	86	86	86	84.8	88																								
22-Dec	87	88	88	86	86	85	85	86	86	85	85	84	83	82	84	84	84	84	83	83	83	82	82	82	84.4	88																								
23-Dec	82	81	81	81	81	82	82	82	82	81	80	80	79	79	80	80	81	81	81	81	81	82	82	81	81.1	82																								
24-Dec	81	82	82	82	81	81	81	81	81	80	80	78	77	76	75	78	79	79	81	81	81	82	82	82	80.2	82																								
25-Dec	82	82	82	83	83	82	82	82	83	83	81	80	78	79	81	82	84	84	83	83	83	83	83	82	82.0	84																								
26-Dec	81	80	81	79	79	77	77	77	76	75	75	76	77	78	78	77	77	78	79	79	79	80	80	80	78.2	81																								
27-Dec	80	81	81	81	81	81	82	83	82	80	79	79	80	80	81	81	83	82	82	82	83	83	84	83	81.3	84																								
28-Dec	83	85	84	84	84	85	84	83	82	81	79	80	80	80	79	79	80	80	80	80	82	82	83	84	81.8	85																								
29-Dec	85	85	84	84	86	87	86	86	86	87	88	89	86	82	82	83	85	87	86	85	84	83	83	83	85.2	89																								
30-Dec	81	83	84	88	88	88	88	88	88	88	86	85	79	75	76	82	85	86	88	89	88	88	87	86	85.2	89																								
31-Dec	85	84	82	80	79	78	78	78	77	76	74	69	68	66	66	73	78	83	85	85	86	85	85	83	78.5	86																								
	84.5		85.2		85.2		85.0		84.7		84.0		84.0		84.2		84.3		84.1		82.5		80.9		79.8		79.1		79.4		81.5		83.0		83.6		84.0		84.3		84.5		84.6		84.8		84.9		Diurnal Average	
	95		96		96		96		95		95		95		95		95		95		95		96		96		96		95		94		94		95		95		95		94		94		95		Diurnal Maximum			



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Barge Landing - December 2015**







Maximum Speed: 13 km/h on Dec 31 04:00	Maximum Daily Speed Average: 9.8 km/h on Dec 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 8 05:00	Minimum Daily Speed Average: 0.3 km/h on Dec 25	Hours of Data: 743
Maximum Diurnal Speed Average: 1.9 km/h at hour 21	Minimum Diurnal Speed Average: 0.7 km/h at hour 3	Hours of Missing Data: 1
Monthly Average Velocity: 1.3 km/h 188.9 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 3 Median = 4 Q <sub>3</sub> = 6 P <sub>90</sub> = 8 P <sub>99</sub> = 12	Percent Operational Time: 99.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SSE7	SSE5	S6	S6	S4	SSE5	SSE4	SSW2	SSW2	S4	SSW4	SSW5	S4	SSW5	S6	S8	S5	S4	SW4	S6	S6	SSE6	S5	S4	S4.7	S8
2-Dec	SW2	SSW2	WSW3	S4	S5	S5	S5	SSW3	SSW5	WSW4	SW3	SSW5	SSW8	S6	S7	S7	SSW6	WSW10	WSW11	WSW12	WSW10	WSW8	WSW7	W4	SW5.1	WSW12
3-Dec	NW2	WSW4	SW3	SSW4	SW4	SSW4	SSW6	SSE6	ESE5	N2	NNW5	NNW5	NNW4	NNE4	N4	NNW4	NNW4	N5	NW4	NNW5	N5	N3	ENE2	NNW3	NNW1.5	SSE6
4-Dec	NNW5	N4	N5	N4	N4	N3	N3	NE2	SW1	SSW1	SW3	SSW4	SSW5	SSW5	SSW6	SSW5	SW4	SW5	SSE5	S5	SSW5	SSW6	SSW4	W2	SW1.6	SSW6
5-Dec	WNW2	SW3	WNW5	NW6	WNW10	W9	W11	WSW10	WSW11	WSW10	WSW12	WSW10	WSW12	WSW11	SW7	SW7	SW5	SSE5	S4	S5	SSE3	NW1	E2	SE3	WSW5.5	WSW12
6-Dec	N2	NNW2	NNW4	NNW4	NNW2	NNW3	NW2	WNW2	NNW3	NNW3	NW1	NW2	NNW2	NW1	WNW1	SSE4	SSE2	S2	SW3	S4	SSE7	S5	S4	WSW3	W0.6	SSE7
7-Dec	SW1	SSW4	SSE5	SE3	SSE1	NNW2	NNW2	NNW1	NNW2	AF	NNW2	NNW2	NNE1	NE0	SSW1	S2	SSE2	S4	S4	SSE3	S5	SW2	NW2	NNW5	S0.7	S5
8-Dec	NNW6	N5	NNW3	NW3	WNW0	ESE1	S3	SSE4	S3	SSE4	SSE4	S2	S2	SSE3	SE5	SSE5	SE6	SE6	ESE5	E6	E3	NE2	ENE2	E3	ESE1.8	SE6
9-Dec	ENE2	E3	ENE3	E3	E2	ENE2	NNE1	NE2	E3	E3	E3	NE2	NNE2	NNW4	NNW1	NW1	WNW2	WNW3	WSW2	S3	S4	S3	S2	E1	ENE0.9	NNW4
10-Dec	SSW1	NNW1	NE3	ENE4	ENE5	ENE4	NE4	ENE4	NE3	NW2	N3	NNW3	NNW3	N3	NNE2	N3	NW2	NNW3	NNW3	N3	N3	NNW2	NNW3	N3	NNE2.4	ENE5
11-Dec	N3	N4	NNW4	NNW3	NNW3	NNW3	NNW3	NNW3	NNW3	NNW3	N2	SE2	SSE8	SSE6	SSE5	SE4	ESE3	ESE3	SSE3	SE8	SE11	SE8	SE8	SE7	SE2.0	SE11
12-Dec	SE8	SE8	SE9	SSE9	SSE9	SE10	SE10	SE11	SE10	SE10	SSE13	SSE10	SSE11	SSE11	SSE12	SSE12	SSE10	SSE11	SSE10	SSE11	SSE8	SSE8	SSE7	SSE7	SSE9.8	SSE13
13-Dec	SSE8	SE7	SE6	SE4	SE4	SE9	SE10	SSE8	SSE7	SSE5	SE5	SE6	E3	NE3	NNE3	NNE3	N3	N3	NNW2	NNW4	NNW3	NNW2	NNW3	NNW2	SE2.6	SE10
14-Dec	NNW1	WNW1	NNW3	NNW4	NW3	WNW4	SSW3	SW3	SW3	WSW4	WSW5	SW4	SW4	SW5	WSW7	W8	WSW9	SSW7	SSW7	SSW7	S7	S8	S9	S8	SW3.7	WSW9
15-Dec	S9	S8	S8	SSE8	S8	S9	S9	S8	S5	SSW6	WSW10	SW8	WSW9	WSW8	WSW8	SW8	SW8	WSW8	SW7	SSW3	NNW3	N5	NNE8	NNE7	SSW4.7	WSW10
16-Dec	NNE5	NNE4	ENE2	SSW2	W5	NW8	NW6	WNW6	W6	W4	W4	WSW4	WSW6	SW6	SW7	SSW7	WSW8	W4	SSW2	SW1	S1	WNW1	NNE1	SSE3	W2.6	NW8
17-Dec	SSE2	S1	SE2	WSW2	WNW3	NNW2	E3	ESE3	SE2	SW1	W2	WNW2	NNW2	WNW2	NW1	W1	ENE3	ENE4	ENE3	NE4	NE4	NE4	ENE4	E4	ENE1.1	E4
18-Dec	E4	E4	E3	ENE3	E1	ESE3	ESE4	ENE4	ENE4	ESE3	E3	ENE4	NNE3	ENE4	ENE3	ENE4	E4	ESE5	ESE5	ESE4	ESE4	E3	ENE4	ENE2	E3.2	ESE5
19-Dec	NNW3	NNW3	N1	SE1	SE4	SE8	SE4	ENE1	NNE1	E1	E2	S1	WSW3	W2	SW2	N1	ENE1	NNE1	N2	N2	NNW2	NNW3	NNW2	NNW3	NE0.4	SE8
20-Dec	E2	SSW2	SW2	S3	SSE2	S3	S3	SSW3	SW2	NW2	NW2	NW3	S1	WSW3	SW2	SSE1	N2	N2	SE3	SSE4	S5	S8	SSE7	S5	S1.9	S8
21-Dec	S6	S7	S8	S6	SSW6	SSW8	S8	S7	SSW4	SW3	WSW3	SSW4	S4	S3	SSE4	SSE3	E1	NNW3	NNW3	NNW4	N3	NNW5	NNW5	NNW5	SSW2.4	S8
22-Dec	NNW5	NNW4	N5	N6	N6	N7	NNE5	N5	N6	NNE6	NNE5	NNE6	NNE6	N7	N7	N7	N6	N7	N6	N5	N4	N5	N5	NNE5	N5.7	N7
23-Dec	NNE4	NNE4	NNE5	NNE6	NNE4	N4	NNW4	NNW4	NNW3	N3	NNE3	NNW3	N5	NNE6	N5	N5	NNE5	NNE5	NNE5	NE5	NNE5	NNE4	N4	NNE7	NNE4.3	NNE7
24-Dec	NNE6	N4	N5	N4	N4	NNE5	NNE4	NE2	E1	ENE1	ESE3	NNE2	E2	E1	ESE2	ESE1	SE2	SE2	SE1	SSE2	SE4	SE3	SSE3	SSE2	ENE1.4	NNE6
25-Dec	S4	S5	S3	SE3	SSE2	SSW4	S4	S4	SSE4	W0	NW1	NW2	NW1	NE2	NE2	N3	N4	N5	N5	N5	NNW4	N3	ENE2	ENE4	NE0.3	N5
26-Dec	NE3	N2	N1	E1	WSW2	NNE1	N0	NNW2	NNW2	ENE1	E2	NNW1	NNE1	N1	NNW2	NNW3	NNW3	N3	NNW3	NNW4	NNW2	NNW3	NNW3	NNW3	N1.8	NNW4
27-Dec	NNW3	NNW3	NNW3	NNW3	NNW3	NNW4	NNW3	SE1	SE9	SSE9	SSE10	SSE11	SSE9	S9	SSE8	SSE4	SSE3	S4	S4	SSW3	S4	SSW4	SW4	SW5	S3.1	SSE11
28-Dec	SW3	S1	W2	NW4	NNW4	N4	NNE5	NNE5	NNE5	NNE5	NNE6	NNE5	NNE5	NNW6	NNW4	NNW3	NNW2	NNW1	W2	SW0	SSW2	S3	S5	S2	N1.9	NNE6
29-Dec	S4	S6	SSW5	S6	SSW7	SW2	WSW2	S3	WSW4	WSW3	SW4	SSW7	SSW10	SSW10	S11	S11	S9	S9	S10	S10	S10	S9	S9	SSW8	SSW6.8	S11
30-Dec	SW10	S4	SW5	WSW4	SSW4	S3	S3	SSW4	SSW5	S5	S6	S5	S5	SW5	SSE4	S5	SW7	SW8	SSW7	SSW7	SSW8	S10	SSW10	S11	SSW5.7	S11
31-Dec	S10	SSW9	SSW10	SSW13	S12	S12	SSW9	S9	SW7	WSW11	SW7	SSW7	S6	S5	SW7	SSW7	SW6	SSE5	S6	S6	S6	S7	S6	S7	SSW7.3	SSW13

SSE0.7	S0.9	S0.7	S0.8	SSW0.9	S1.1	S1.2	S1.5	SSW1.2	SW1.1	SSW1.2	SSW1.5	SSW1.8	SSW1.6	SSW1.8	S1.8	SSW1.3	SSW1.1	SSW1.6	S1.6	S1.9	S1.5	S1.4	SSE0.8	Diurnal Average
S10	SSW9	SSW10	SSW13	S12	S12	W11	SE11	WSW11	WSW11	SSE13	SSE11	WSW12	SSE11	SSE12	SSE12	SSE10	SSE11	WSW11	WSW12	SE11	S10	SSW10	S11	Diurnal Maximum

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



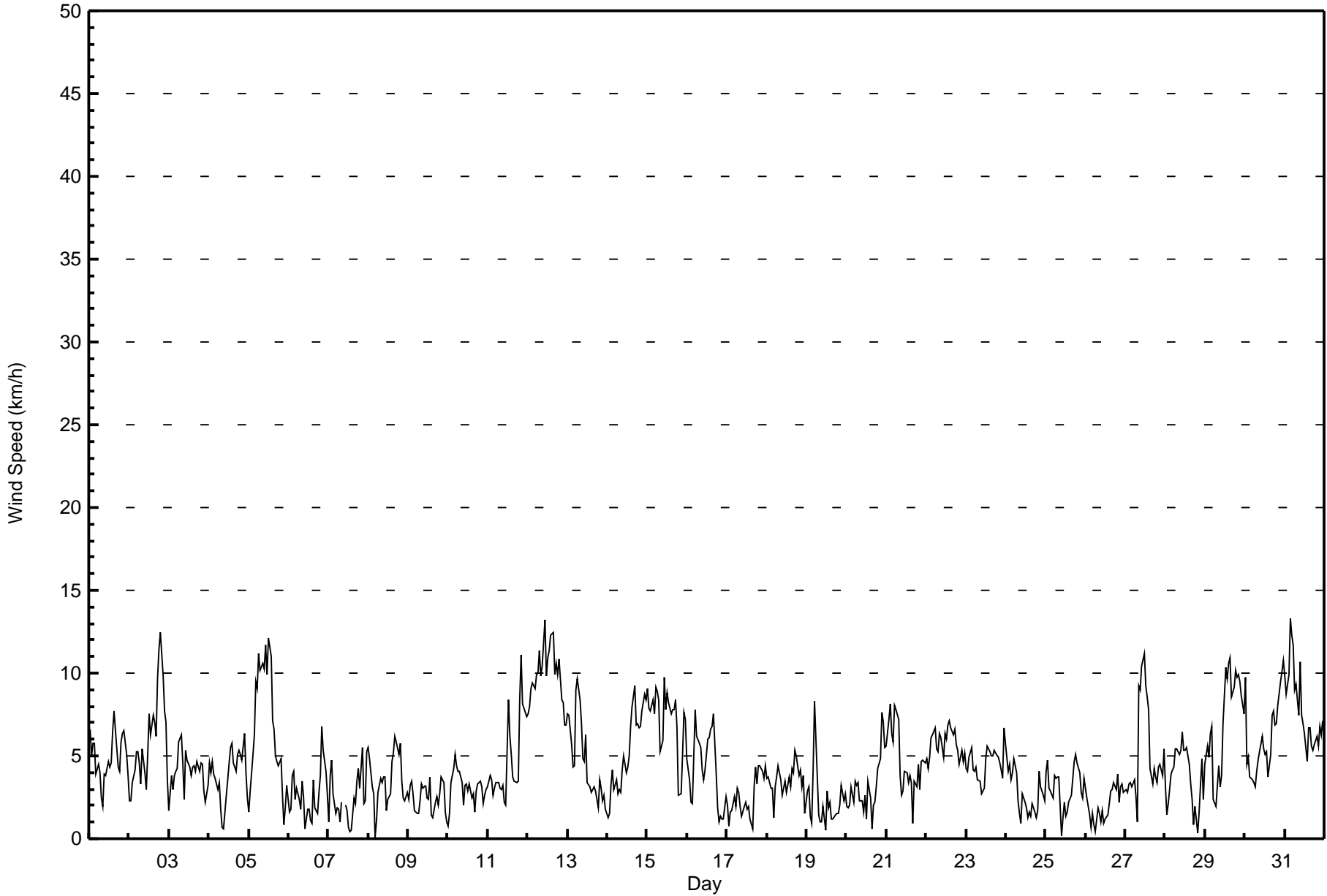
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed (WS) - km/h

Barge Landing - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 5 km/h on Dec 2 18:00  Minimum Value: 0 km/h on Dec 20 17:00  Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 1 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 4																	Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9									
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	2	1	2	1	1	1	1	1	2	2	2	2	2	2	2	1	1	1	2	1	1	1	2	
2-Dec	1	1	1	1	2	2	2	2	2	2	1	2	2	2	2	2	2	5	3	4	2	2	2	3	5	
3-Dec	1	2	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	
4-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2
5-Dec	1	1	2	2	4	4	3	3	3	3	3	3	3	3	2	1	1	1	1	1	2	1	1	1	4	
6-Dec	1	1	1	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	
7-Dec	1	1	1	2	1	1	1	1	1	AF	1	1	1	1	1	1	1	2	1	1	1	2	2	1	2	
8-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	2	
9-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
10-Dec	1	1	1	2	2	2	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	
11-Dec	1	1	1	1	1	1	1	1	1	1	1	3	3	2	2	1	1	1	1	3	3	2	2	2	3	
12-Dec	2	2	2	3	3	3	3	3	3	3	4	3	4	3	4	4	3	4	3	3	3	2	2	3	4	
13-Dec	2	2	2	2	2	2	3	3	3	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	3	
14-Dec	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	3	3	2	2	2	2	3	3	3	3	
15-Dec	3	2	3	3	3	3	3	3	2	2	2	2	3	3	2	2	2	2	3	1	1	1	3	2	3	
16-Dec	2	1	1	1	3	3	2	2	2	2	1	1	2	2	2	2	2	1	1	1	1	1	1	1	3	
17-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	2	
18-Dec	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	2	
19-Dec	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	
20-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	2	3	3	2	2	3	
21-Dec	2	3	3	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	3	
22-Dec	1	1	1	2	2	2	2	1	2	2	1	2	2	2	2	2	2	2	1	2	1	1	1	2	2	
23-Dec	1	2	1	2	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	2	2	
24-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
26-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	
27-Dec	1	1	1	1	1	1	1	2	3	3	4	4	3	3	3	3	1	1	1	1	1	1	1	2	4	
28-Dec	1	1	1	1	1	1	2	1	1	1	2	2	1	1	2	1	1	1	1	1	1	1	1	1	2	
29-Dec	1	1	2	2	3	1	1	1	1	1	1	3	3	3	3	3	2	3	3	3	3	3	2	2	3	
30-Dec	3	2	2	1	1	1	1	1	1	1	2	2	2	2	1	1	2	2	2	2	2	3	3	3	3	
31-Dec	3	3	3	4	4	4	2	3	4	3	2	2	2	1	2	3	2	1	1	1	1	2	1	2	4	
																	Diurnal Maximum									
AF - Analyzer Failure																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Barge Landing - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	539	72.54	72.54
6 - 11	195	26.24	98.79
12 - 19	9	1.21	100.00
20 - 28	0	0.00	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Barge Landing - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	59	38	17	29	29	16	21	36	63	38	34	17	12	13	21	96	539
6 - 11	10	10	0	0	1	0	22	30	50	26	15	20	4	2	3	2	195
12 - 19	0	0	0	0	0	0	0	3	2	1	0	3	0	0	0	0	9
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	69	48	17	29	30	16	43	69	115	65	49	40	16	15	24	98	743

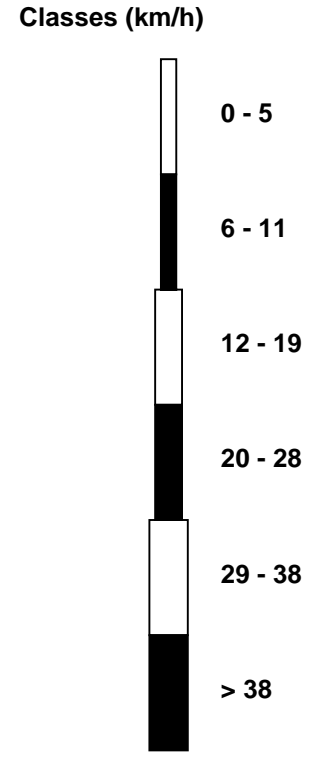
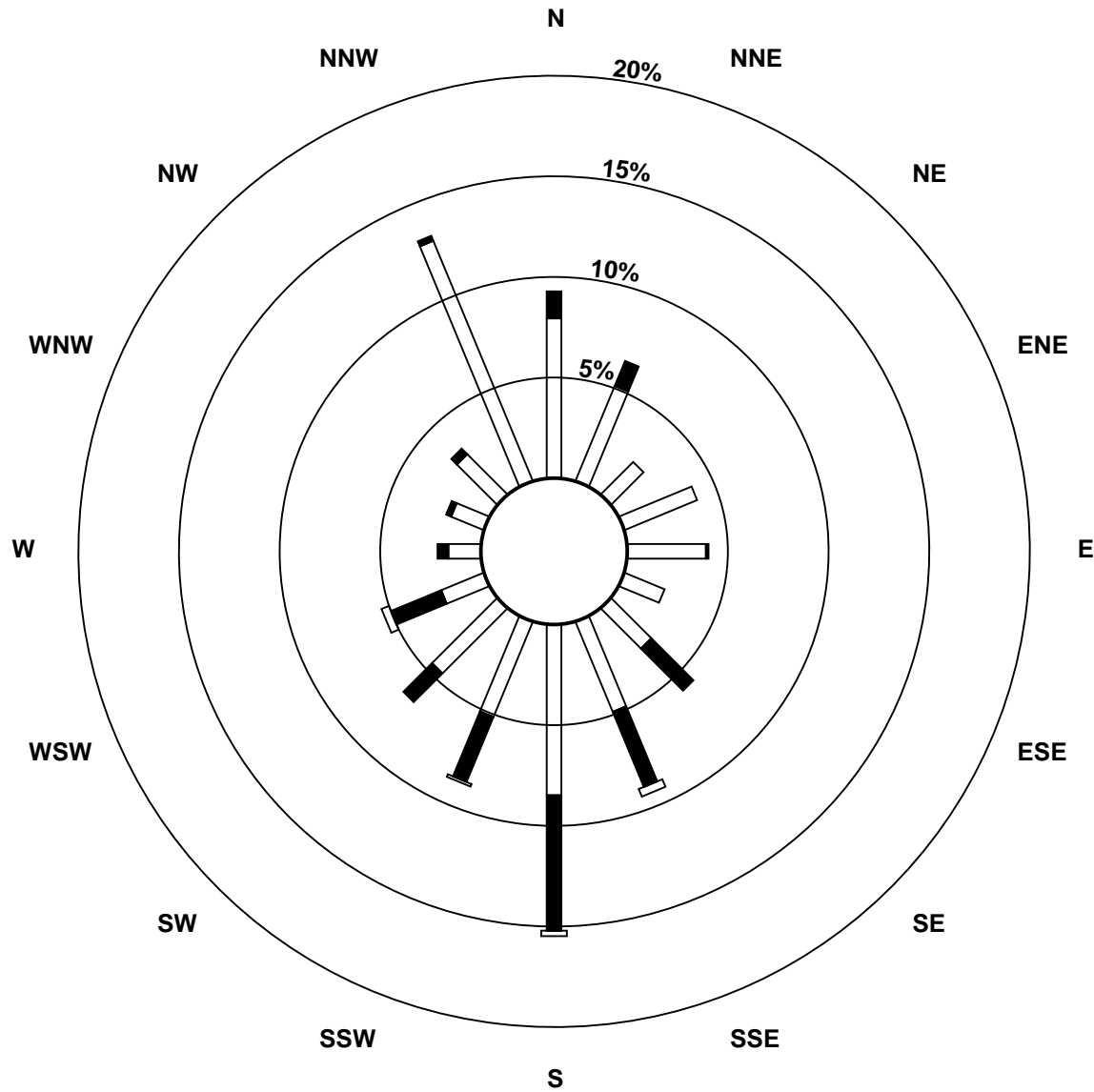
Total Number of Valid Hours: 743

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
Barge Landing (AMS 9)



Total Number of Valid Hours: 743



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Wind Direction (WD) - deg  
Barge Landing - December 2015**

Direction of Maximum Speed: 198 deg on Dec 31 04:00															Hours in Service: 744											
Direction of Maximum Daily Speed Average: 148.7 deg on Dec 12															Hours of Data: 743											
Direction of Minimum Speed: 294 deg on Dec 8 05:00										Direction of Minimum Daily Speed Average: 0.3 deg on Dec 25										Hours of Missing Data: 1						
Monthly Average Direction: 261.2 deg																									Percent Operational Time: 99.9	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	158	161	182	169	180	157	161	200	196	182	193	196	175	202	186	174	186	180	217	176	170	149	176	187	177.5
2-Dec	215	212	244	186	181	186	185	200	207	249	216	200	194	177	184	182	197	248	253	257	255	253	244	277	221.2
3-Dec	310	253	232	199	230	202	195	156	117	11	343	344	346	12	350	337	347	349	317	342	352	10	62	341	328.3
4-Dec	345	358	353	358	352	5	10	46	214	206	216	207	197	204	203	203	218	218	161	184	207	197	210	261	220.5
5-Dec	296	227	282	314	292	261	262	258	252	254	251	240	242	246	234	234	227	151	186	174	154	320	95	140	246.8
6-Dec	354	334	344	345	340	336	324	285	331	337	312	308	345	305	299	148	160	170	222	185	159	175	175	241	264.5
7-Dec	227	208	158	139	159	342	348	347	327	AF	341	342	33	50	209	169	165	176	174	153	177	218	313	344	188.5
8-Dec	343	355	338	325	294	107	188	165	172	163	150	172	169	155	146	151	138	128	109	91	83	35	63	79	121.8
9-Dec	76	91	70	90	95	59	22	54	81	86	95	50	15	338	346	307	302	293	258	182	175	176	183	85	76.3
10-Dec	203	341	35	61	62	58	48	75	50	315	353	346	335	356	13	3	313	329	333	352	357	348	343	356	13.3
11-Dec	351	350	344	334	348	341	345	343	347	345	355	146	155	159	157	140	107	111	149	145	140	138	140	140	126.0
12-Dec	138	140	144	148	150	145	143	140	144	143	149	159	157	153	148	151	153	153	153	151	149	152	151	151	148.7
13-Dec	150	142	134	136	139	142	141	149	155	156	124	132	100	55	21	25	8	353	330	340	344	341	342	336	125.1
14-Dec	347	299	344	329	326	283	206	218	221	254	237	231	231	234	254	269	257	201	192	194	186	184	190	178	226.2
15-Dec	179	182	176	167	178	181	174	184	187	209	240	234	243	243	246	230	234	238	232	210	343	349	22	25	211.6
16-Dec	15	20	70	198	277	307	310	298	276	267	279	244	253	236	226	195	243	269	203	228	185	296	15	148	264.3
17-Dec	155	173	134	258	294	337	96	113	129	234	261	294	336	301	308	260	65	75	67	39	50	54	71	84	60.3
18-Dec	81	88	85	67	100	103	104	73	77	102	93	71	24	71	71	62	86	118	122	113	120	83	76	57	87.6
19-Dec	336	343	355	142	132	136	124	69	31	80	99	183	243	266	222	356	66	21	349	358	332	338	328	339	35.0
20-Dec	97	193	225	184	161	191	179	202	236	325	312	319	189	240	228	151	7	356	132	162	170	175	167	170	185.3
21-Dec	184	177	178	185	204	195	190	186	209	221	242	202	187	184	148	149	83	344	340	334	351	339	341	335	201.1
22-Dec	345	346	7	3	3	11	12	360	1	13	23	21	20	6	4	357	4	9	5	5	6	359	10	13	6.1
23-Dec	24	25	20	22	23	8	347	345	345	7	28	341	356	12	11	3	19	33	29	34	27	32	2	15	14.2
24-Dec	14	4	9	350	9	16	14	45	96	77	108	25	91	89	107	102	137	139	145	150	144	139	159	160	59.6
25-Dec	173	179	176	145	156	193	185	177	158	267	315	314	319	36	40	5	350	356	7	351	345	3	63	57	48.4
26-Dec	43	8	352	91	254	23	354	340	344	60	94	348	28	354	343	348	346	352	334	347	345	336	345	343	353.8
27-Dec	339	344	337	335	342	348	343	141	144	149	157	160	160	172	168	162	165	190	185	197	188	207	231	228	173.7
28-Dec	222	171	274	315	343	7	29	33	13	30	28	21	21	342	343	345	336	330	275	216	196	171	179	185	1.7
29-Dec	180	176	192	183	198	231	247	189	253	237	218	209	201	195	190	191	181	184	187	183	184	191	188	193	193.4
30-Dec	229	191	228	257	203	178	187	207	210	191	190	181	183	224	160	180	227	227	203	204	203	191	197	187	202.4
31-Dec	183	199	196	198	184	189	194	188	223	248	234	210	185	172	230	209	236	147	190	181	179	189	175	187	197.6

168.3	173.5	183.2	182.0	201.3	180.8	174.9	172.4	191.6	214.2	203.5	207.9	200.0	210.4	198.8	189.6	210.4	191.8	194.8	177.8	170.1	178.1	169.4	162.1	
Diurnal Average																								

AF - Analyzer Failure  
All monthly, daily, and diurnal averages have been calculated using vector methods



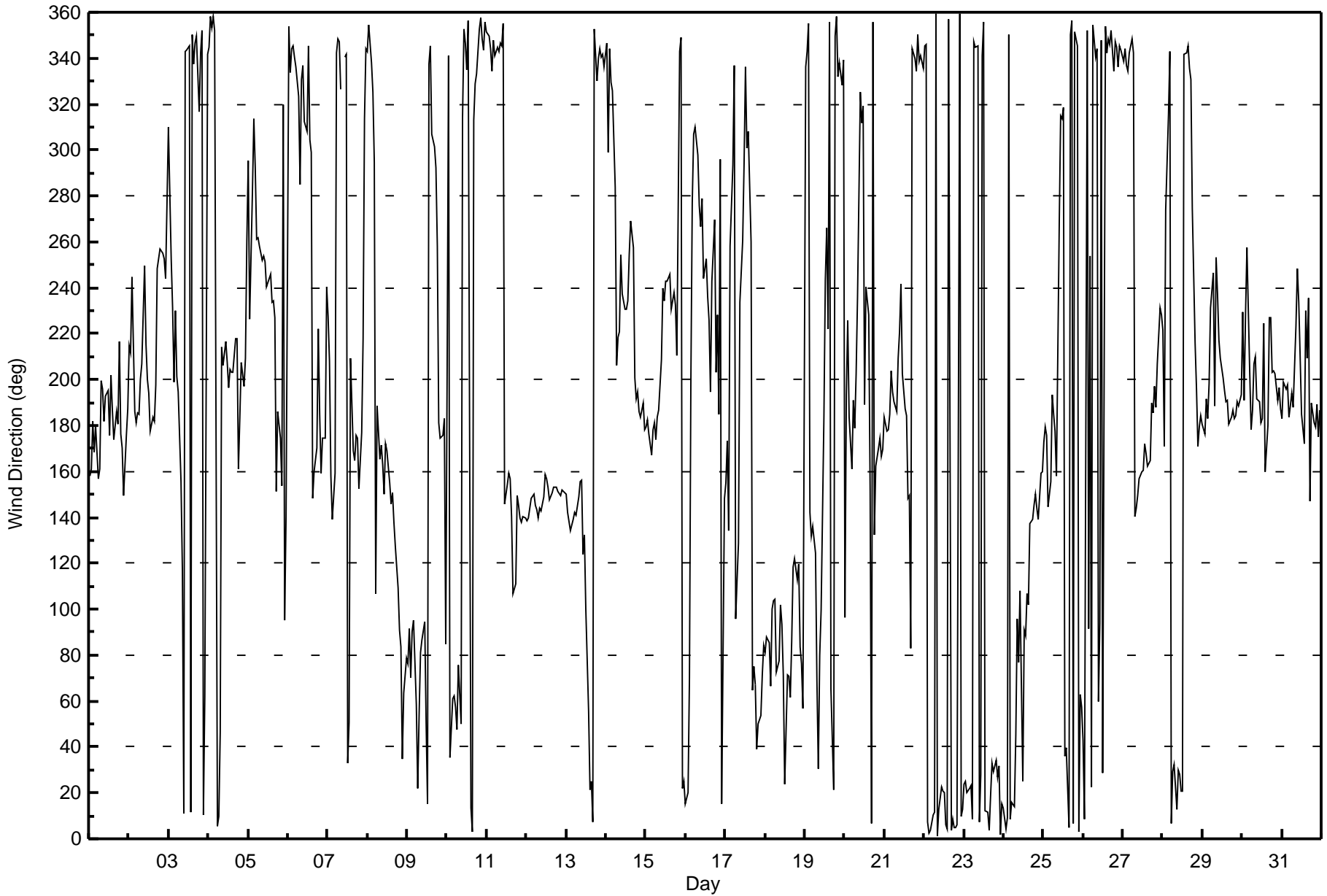
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Direction (WD) - deg  
Barge Landing - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0																	Hours in Service: 744										
Maximum Value: 102 deg on Dec 4 09:00																	Hours of Data: 743										
Minimum Value: 10 deg on Dec 6 04:00																	Hours of Missing Data: 1										
Percentiles: P <sub>1</sub> = 13 P <sub>10</sub> = 17 Q <sub>1</sub> = 19 Median = 23 O <sub>3</sub> = 32 P <sub>90</sub> = 50 P <sub>99</sub> = 89																	Hours of Calibration: 0										
Percent Operational Time: 99.9																											
Day	Hourly Period Ending At (MST)																								Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	13	19	22	15	28	21	18	39	45	30	42	47	51	39	29	21	26	26	25	19	23	16	24	35	51		
2-Dec	48	44	25	33	22	25	28	54	29	22	38	35	25	23	21	23	26	25	16	16	16	14	15	63	63		
3-Dec	63	26	37	41	28	29	21	20	21	55	18	16	20	32	26	23	27	18	53	20	20	26	46	39	63		
4-Dec	16	14	14	15	21	22	27	59	102	98	33	31	25	22	20	27	22	19	17	22	21	22	28	43	102		
5-Dec	70	48	34	24	27	20	20	19	18	17	18	21	18	16	19	16	31	32	23	24	45	83	54	44	83		
6-Dec	47	38	17	10	22	17	52	58	26	58	94	72	53	84	71	22	70	65	40	18	13	18	24	56	94		
7-Dec	79	30	23	28	58	37	45	73	26	AF	43	50	82	82	89	36	48	49	31	25	17	49	57	17	89		
8-Dec	17	22	22	20	90	50	30	25	25	26	20	60	41	36	25	26	17	16	18	22	23	25	29	27	90		
9-Dec	23	20	25	35	44	67	52	33	29	23	24	32	25	15	23	54	24	22	32	25	18	25	61	40	67		
10-Dec	87	19	18	25	21	23	19	22	33	34	21	20	23	25	55	23	42	24	15	19	19	20	22	17	87		
11-Dec	17	16	16	34	16	18	17	15	14	14	21	67	20	22	21	16	13	18	25	19	14	14	14	15	67		
12-Dec	15	15	15	18	21	17	16	15	15	16	18	24	22	20	19	19	21	22	20	18	21	19	22	21	24		
13-Dec	21	15	15	29	30	15	15	21	24	23	14	17	28	29	19	18	19	20	19	16	17	14	18	14	30		
14-Dec	65	53	26	17	33	26	26	30	37	17	18	23	27	18	22	26	25	27	24	23	25	24	23	25	65		
15-Dec	25	24	24	21	22	24	24	24	23	29	17	20	17	19	19	17	16	15	24	52	53	19	23	20	53		
16-Dec	19	21	39	34	45	29	28	28	24	32	42	28	21	18	24	21	17	27	50	68	69	38	63	30	69		
17-Dec	36	82	32	46	27	31	45	19	31	45	21	33	33	41	45	67	28	21	23	20	21	29	25	20	82		
18-Dec	24	25	22	39	70	38	26	24	27	21	32	32	47	22	24	24	29	21	18	16	14	16	22	62	70		
19-Dec	23	17	61	78	18	15	29	22	47	54	24	90	52	63	41	44	21	11	32	38	53	20	27	19	90		
20-Dec	56	45	40	18	41	26	24	21	41	18	33	20	73	27	36	78	16	35	50	41	39	24	25	22	78		
21-Dec	21	26	26	23	27	20	21	19	25	34	19	29	34	40	22	13	62	12	22	25	25	24	16	17	62		
22-Dec	18	17	21	19	19	20	19	22	20	21	20	19	19	20	22	21	20	20	20	23	22	21	22	20	23		
23-Dec	21	28	17	21	21	21	19	16	16	23	26	20	20	20	19	19	20	18	18	16	20	21	23	18	28		
24-Dec	17	17	16	21	19	19	20	39	38	76	26	47	52	70	43	30	27	34	43	46	18	18	19	30	76		
25-Dec	24	23	33	20	37	22	25	24	25	66	30	25	43	49	22	15	15	18	20	18	18	16	24	19	66		
26-Dec	28	22	10	74	60	38	73	35	42	49	58	55	47	29	25	18	13	35	30	20	25	22	19	26	74		
27-Dec	22	21	23	18	21	15	23	89	19	21	22	25	23	25	24	26	23	28	25	24	22	26	21	19	89		
28-Dec	32	55	29	28	19	18	18	17	19	17	17	18	17	19	21	21	26	18	40	90	49	25	24	31	90		
29-Dec	22	17	18	21	24	48	47	31	25	31	25	30	23	24	22	21	21	20	21	21	22	23	21	23	48		
30-Dec	25	46	34	28	30	40	33	33	21	26	27	27	37	32	42	30	16	16	21	22	22	21	21	22	46		
31-Dec	22	23	23	20	20	21	22	22	40	17	26	25	26	26	20	26	32	26	21	15	25	18	17	19	40		
																	87 82 61 78 90 67 73 89 102 98 94 90 82 84 89 78 70 65 53 90 69 83 63 63										
																	Diurnal Maximum										
AF - Analyzer Failure																											







# Wood Buffalo Environmental Association

## TRS Calibration Report

### Station Information

Calibration Date	December 10, 2015	Last Calibration	November 16, 2015
Station Name	Barge Landing	Station Number	AMS 9
Reason:	Routine		
Start Time (MST)	14:07	End Time (MST)	16:45
Gas Cert Reference	CC62993	Station temp.	22 Deg C
Cal Gas Concentration	4.77 ppm	Cal Gas Exp Date	10/06/2014
Calibrator Make/Model	Sabio 4010	Serial Number	11071107
Dil air Make/Model	API 701	Serial Number	4888
DACS make/model	Campbell Scientific CR3000	DACS serial No.	6466
SO2 gas concentration	47.8 ppm	SO2 gas cert/exp	LL104180 12/Feb/18

### Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-690	-689
Analyzer IP address	192.168.1.44		Lamp voltage	1008	1014
Calculated slope	0.989555	0.998618	Chamber temp	45	45
Calculated intercept	-0.113151	-0.193370	Pressure	680.5	683.9
Analyzer Background	2.01	2.01	Flow	0.431	0.431
Analyzer Coefficient	1.051	1.051	Intensity	91	91
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1218153461	
Converter make/model	CDN-101		Converter serial #	519	

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.0	----
as found span	5000	83.8	79.9	79.1	1.011
SO2 scrubber check	5000	15.4	147.2	1.8	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	83.8	79.9	80.1	0.998
second point	5000	41.9	40.0	40.3	0.991
third point	5000	21.0	20.0	20.5	0.979
as left zero	6000	0.0	0.0	0.3	----
as left span	5000	83.8	79.9	79.6	1.005
Average Correction Factor					0.989

Corrected As found	79.1	Previous response	80.9	% change	2.3%
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Notes:

Changed inlet filter and scrubber check done after as founds. No adjustments.

Calibration Performed By:

Evan Magill



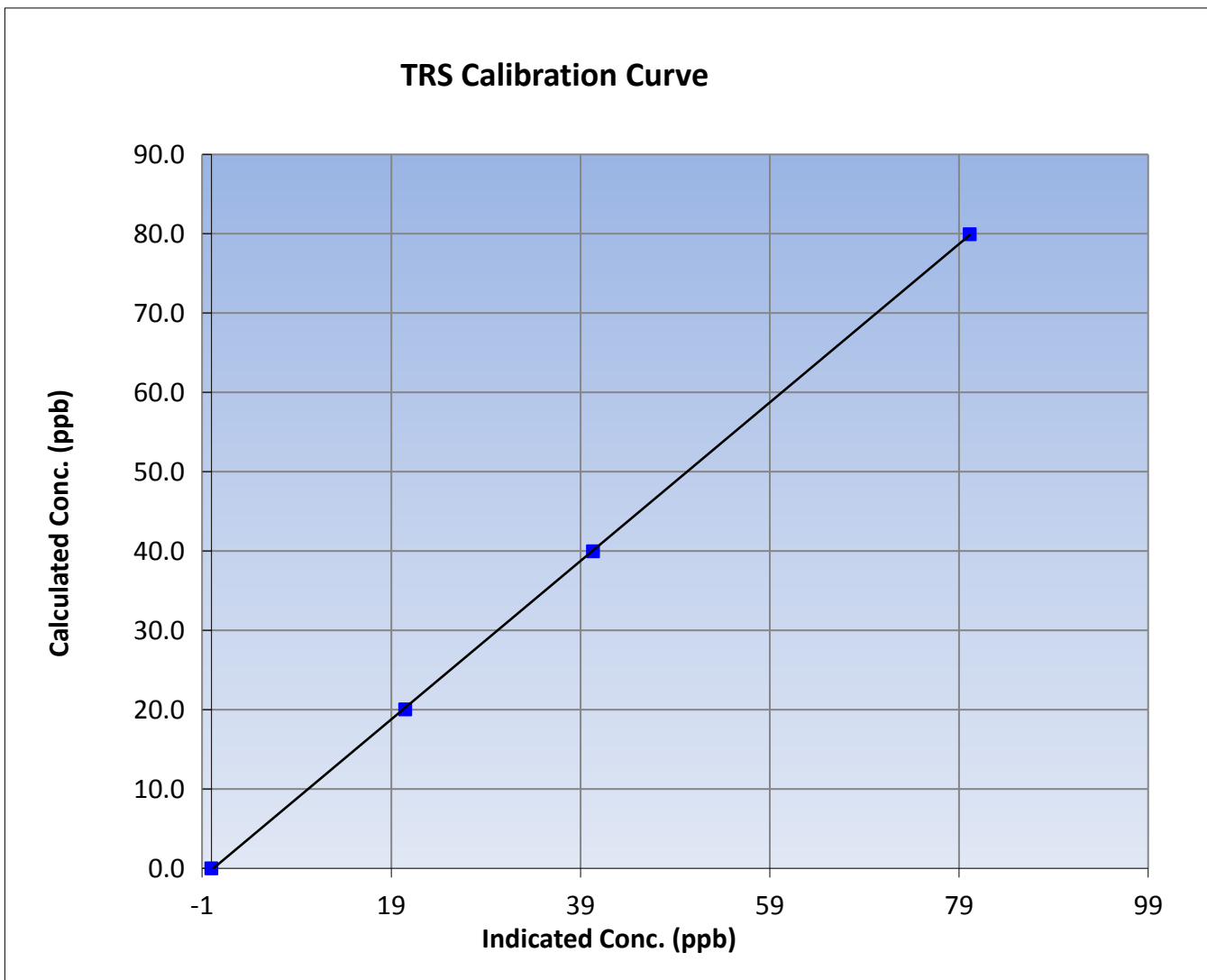
# Wood Buffalo Environmental Association TRS Calibration Report

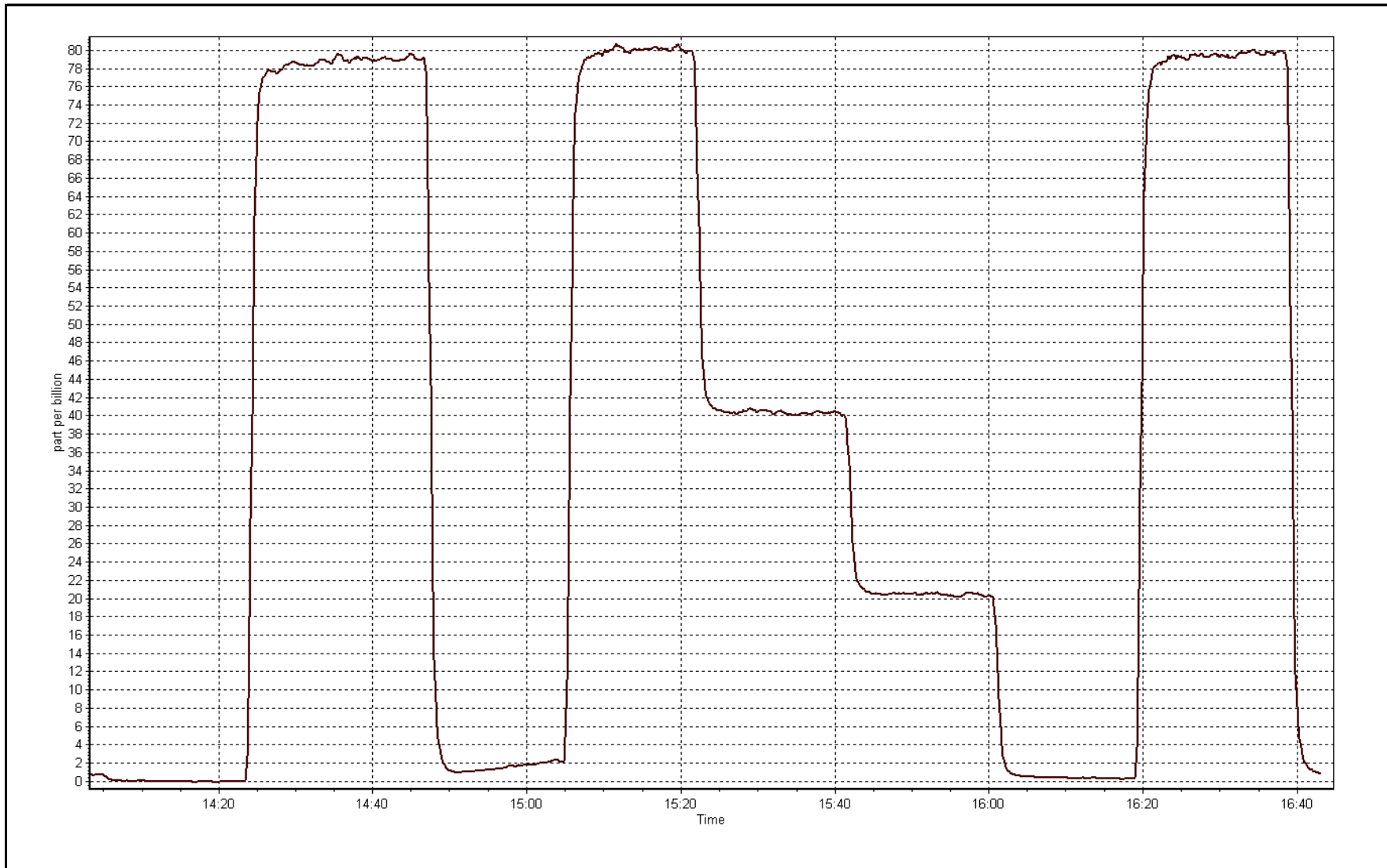
## Station Information

Calibration Date	December 10, 2015	Previous Calibration	November 16, 2015
Station Name	Barge Landing	Station Number	AMS 9
Start Time (MST)	14:07	End Time (MST)	16:45
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1218153461

## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999967
79.9	80.1	0.9976		
40.0	40.3	0.9911	Slope	0.998618
20.0	20.5	0.9787		
			Intercept	-0.193370







# Wood Buffalo Environmental Association THC Calibration Report

### Station Information

Calibration Date	December-10-15	Last Calibration	November-16-15
Station Name	Barge Landing	Station Number	AMS 9
Reason:	Routine		
Start Time (MST)	11:20	End Time (MST)	14:00
Gas Cert Reference	LL104180	Cal Gas Expiry Date	12/02/2018
CH4 Cal Gas Conc.	490 ppm	CH4 Equiv Conc.	1023.5 ppm
C3H8 Cal Gas Conc.	194 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11071107
ZAG make/model	Teledyne API 701	Serial Number	4888
DACS make/model	Campbell Scientific CR3000	Serial Number	6466

### Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	9.1	9.1
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.7	34.7
Calculated slope	1.006689	0.997965	Fuel Pressure	24.1	24.1
Calculated intercept	-0.019077	0.022735	Analyzer Coeff	4.247	4.326
			Analyzer BKG	5.420	5.590

Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059296
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### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.07	----
as found span	5000	76.7	15.70	15.55	1.010
calibrator zero	5000	0.0	0.00	-0.01	----
high point	5000	76.7	15.70	15.72	0.999
second point	5000	41.0	8.39	8.37	1.003
third point	5000	15.4	3.15	3.13	1.007
as left zero	5000	0.0	0.00	-0.06	----
as left span	5000	76.7	15.70	15.71	0.999
Average Correction Factor					1.003

Corrected As found	15.48	Previous response	15.62	% change	0.9%
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**Notes:**

MFC done before calibration. Changed inlet filter after as founds. Adjusted zero and span.

Calibration Performed By:

\_\_\_\_\_ Evan Magill



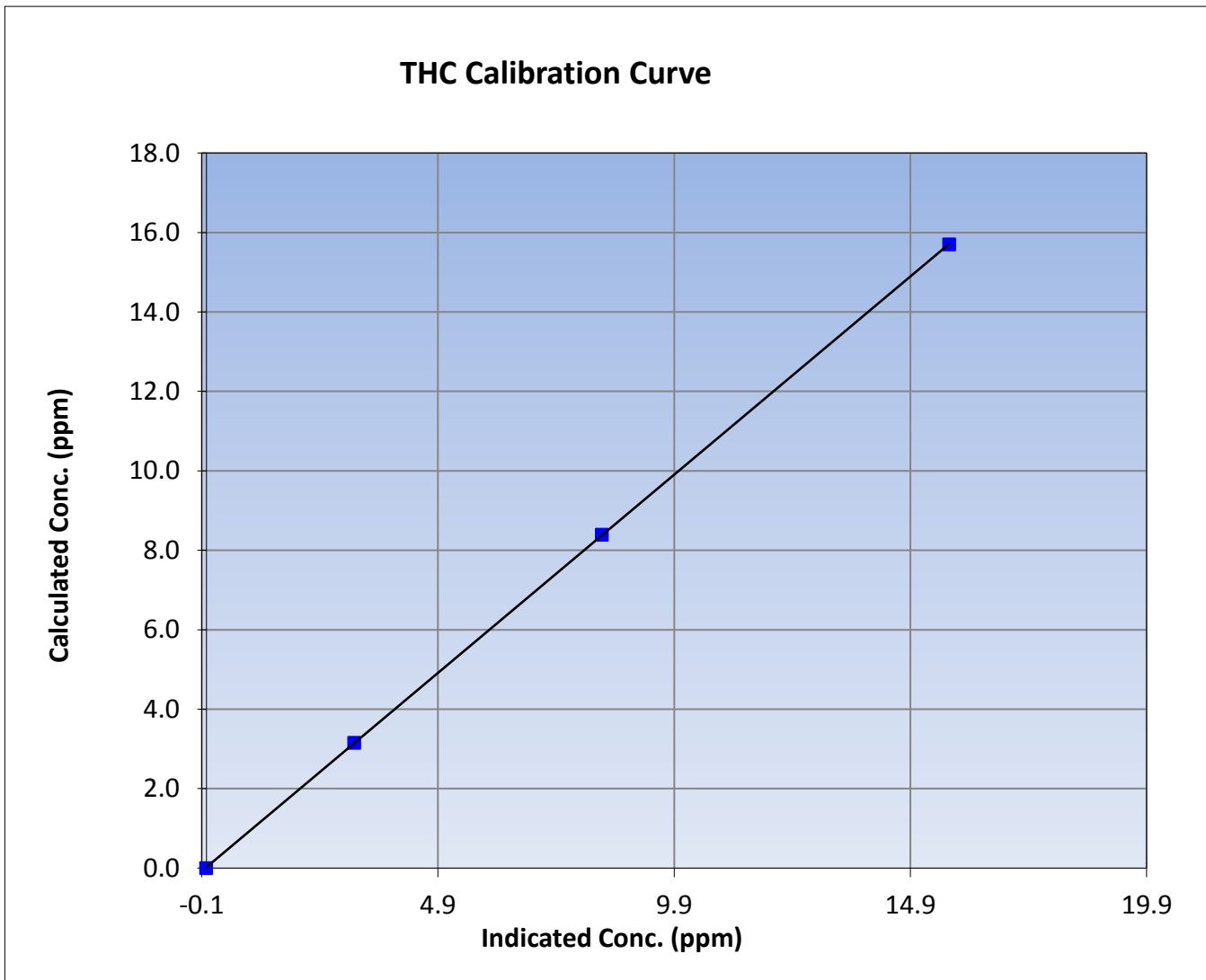
# Wood Buffalo Environmental Association THC Calibration Report

## Station Information

Calibration Date	December 10, 2015	Previous Calibration	November 16, 2015
Station Name	Barge Landing	Station Number	AMS 9
Start Time (MST)	11:20	End Time (MST)	14:00
Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059296

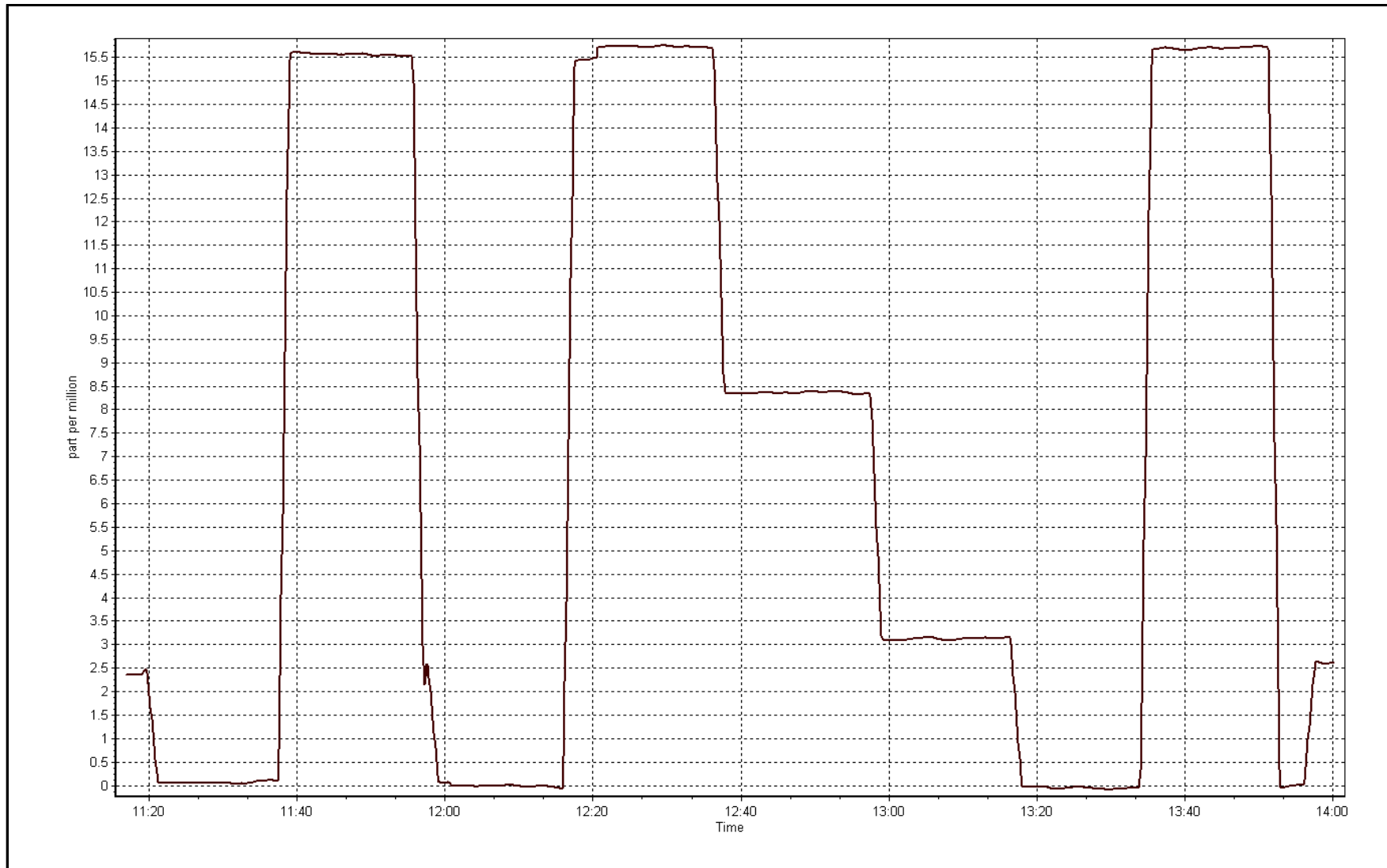
## Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.01	----	Correlation Coefficient	0.999996
15.70	15.72	0.9988		
8.39	8.37	1.0027	Slope	0.997965
3.15	3.13	1.0072		
			Intercept	0.022735



THC Calibration Plot

Date: December 10, 2015





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## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 11  
LOWER CAMP  
DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	709	35	35	100.00	119	0	25	0
H2S (ppb) Average	707	35	37	99.73	9	0	2	0
THC (ppm) Average	709	35	35	100.00	3.6	-	2.7	-
Temperature (C) Average	744	0	0	100.00	5.5	-	-1.3	-
Relative Humidity (%) Average	744	0	0	100.00	96	-	93	-
Wind Speed 10 m (km/h) Average	744	0	0	100.00	30	-	20	-
Wind Direction 10 m (deg) Average	744	0	0	100.00	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	709	2.5	10	-	0	0	0	0	1	4	119
H2S (ppb) Average	707	0.6	1	-	0	0	0	0	1	1	9
THC (ppm) Average	709	2.36	0.2	-	2	2.1	2.2	2.3	2.5	2.7	3.6
Temperature 2 m (C) Average	744	-10.68	6.3	-	-27.9	-18.6	-15.6	-11.3	-4.9	-3.4	5.5
Relative Humidity (%) Average	744	81.8	7	-	59	74	78	81	86	91	96
Wind Speed 10 m (km/h) Average	744	8.3	6	-	0	2	4	7	11	16	30
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)  
DECEMBER 2015

OPERATIONAL NOTES

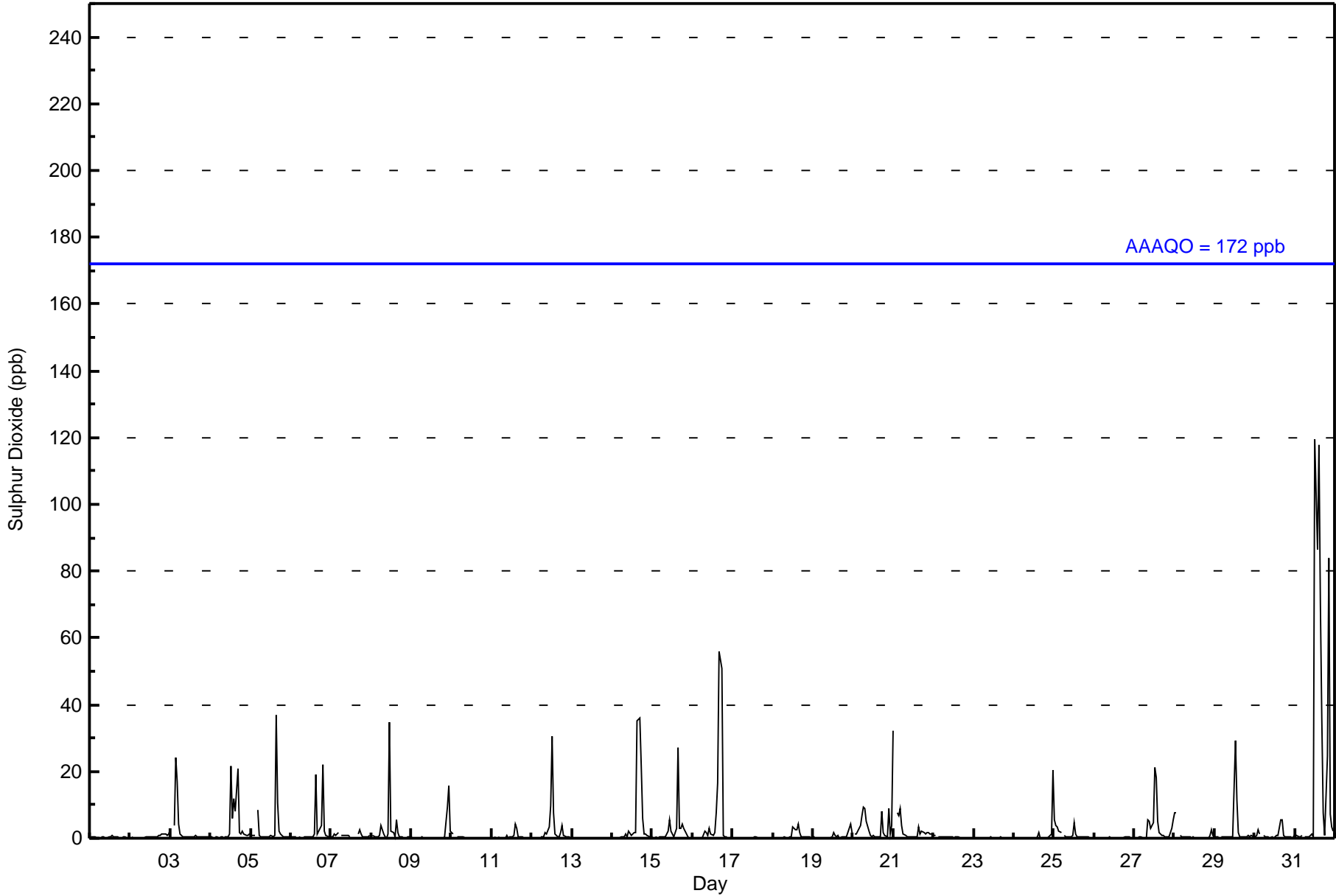
Parameter	Period Start	Period End	Duration (Hours)	Notes
H2S	07 Dec 2015 16:00	07 Dec 2015 16:00	1	Maintenance - sample manifold cleaned
H2S	18 Dec 2015 16:00	18 Dec 2015 16:00	1	Power spike



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 119 ppb on Dec 31 13:00	Maximum Daily Average: 24.6 ppb on Dec 31		Hours of Data:	709
Minimum Value: 0 ppb on Dec 17 19:00	Minimum Daily Average: 0.1 ppb on Dec 17		Hours of Missing Data:	35
Maximum Diurnal Average: 8.1 ppb at hour 16	Minimum Diurnal Average: 0.6 ppb at hour 10		Hours of Calibration:	35
Monthly Average: 2.5 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 4 P <sub>99</sub> = 48		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.2	1
2-Dec	Z	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	1	1	1	1	1	1	0.5	1
3-Dec	3	Z	4	24	17	4	1	0	0	0	0	1	1	0	1	1	1	1	0	0	0	0	0	0	2.7	24
4-Dec	0	0	Z	0	0	0	0	0	0	0	1	22	6	12	8	21	2	1	2	1	1	1	1	1	3.5	22
5-Dec	1	1	1	Z	8	1	0	0	0	0	1	1	0	1	37	10	2	1	1	1	0	0	0	0	3.0	37
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	1	19	1	3	4	22	2	1	1	0	2.5	22
7-Dec	0	0	1	1	2	Z	1	1	1	1	1	1	C	C	C	C	1	3	1	1	0	0	1	1	0.9	3
8-Dec	Z	1	1	0	0	1	4	1	0	0	1	35	2	2	1	6	2	0	0	0	0	0	0	0	2.5	35
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	16	2	1.3	16
10-Dec	2	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2
11-Dec	0	0	0	Z	0	0	0	0	0	1	0	0	0	1	4	3	0	0	0	0	0	0	0	0	0.5	4
12-Dec	0	0	0	0	Z	0	0	0	2	1	3	10	31	8	1	0	1	2	4	1	0	0	0	0	2.8	31
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Dec	Z	0	0	0	0	0	0	1	1	0	2	1	1	2	2	35	36	22	6	1	1	1	1	0	4.9	36
15-Dec	0	Z	0	0	0	0	0	0	1	2	6	2	1	1	3	27	3	3	4	3	1	1	0	0	2.6	27
16-Dec	0	0	Z	0	0	0	0	2	2	1	3	1	1	2	8	16	56	51	1	0	0	0	0	0	6.3	56
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1	1
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	3	2	3	4	2	1	0	0	0	0	0	0	0.8	4
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	2	1	1	1	0	0	1	0	0	2	4	2	0.6	4
20-Dec	Z	1	1	2	4	7	9	9	Z	5	2	1	1	1	0	0	0	8	2	1	1	9	1	4	3.0	9
21-Dec	32	Z	8	7	9	4	1	1	0	1	0	0	0	0	0	3	1	2	2	1	2	2	1	1	3.5	32
22-Dec	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	20	0	1.1	20
25-Dec	5	4	4	2	2	Z	1	1	1	0	0	1	5	1	1	0	0	0	1	1	0	0	0	0	1.3	5
26-Dec	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
27-Dec	0	Z	0	0	0	0	0	0	5	5	3	4	21	18	5	2	1	1	1	1	1	1	3	6	3.4	21
28-Dec	8	8	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	1.0	8
29-Dec	1	0	0	Z	1	0	0	1	0	0	0	1	29	12	2	0	0	0	0	0	1	0	1	0	2.2	29
30-Dec	0	1	2	1	Z	1	0	0	0	0	0	0	0	1	1	6	6	1	1	0	0	0	0	0	1.0	6
31-Dec	1	1	0	0	1	Z	0	0	0	1	1	1	119	87	118	70	36	8	1	24	84	7	3	2	24.6	119
	2.2	0.8	0.9	1.6	1.8	0.9	0.7	0.7	0.7	0.6	0.8	2.0	8.1	4.9	5.5	8.1	5.8	3.6	1.1	2.0	3.2	1.3	1.3	1.5	Diurnal Average	
	32	8	8	24	17	7	9	9	5	5	6	35	119	87	118	70	56	51	6	24	84	9	16	20	Diurnal Maximum	

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Lower Camp - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	678	95.63	95.63
11 - 20	8	1.13	96.76
21 - 60	18	2.54	99.29
61 - 110	3	0.42	99.72
111 - 172	2	0.28	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Lower Camp - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	40	17	11	8	17	54	195	39	4	1	1	25	29	44	89	104	678
11 - 20	0	0	0	0	0	0	4	0	2	0	1	1	0	0	0	0	8
21 - 60	0	0	0	0	0	0	3	0	2	3	6	4	0	0	0	0	18
61 - 110	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	3
111 - 172	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	40	17	11	8	17	54	202	39	9	4	12	30	29	44	89	104	709

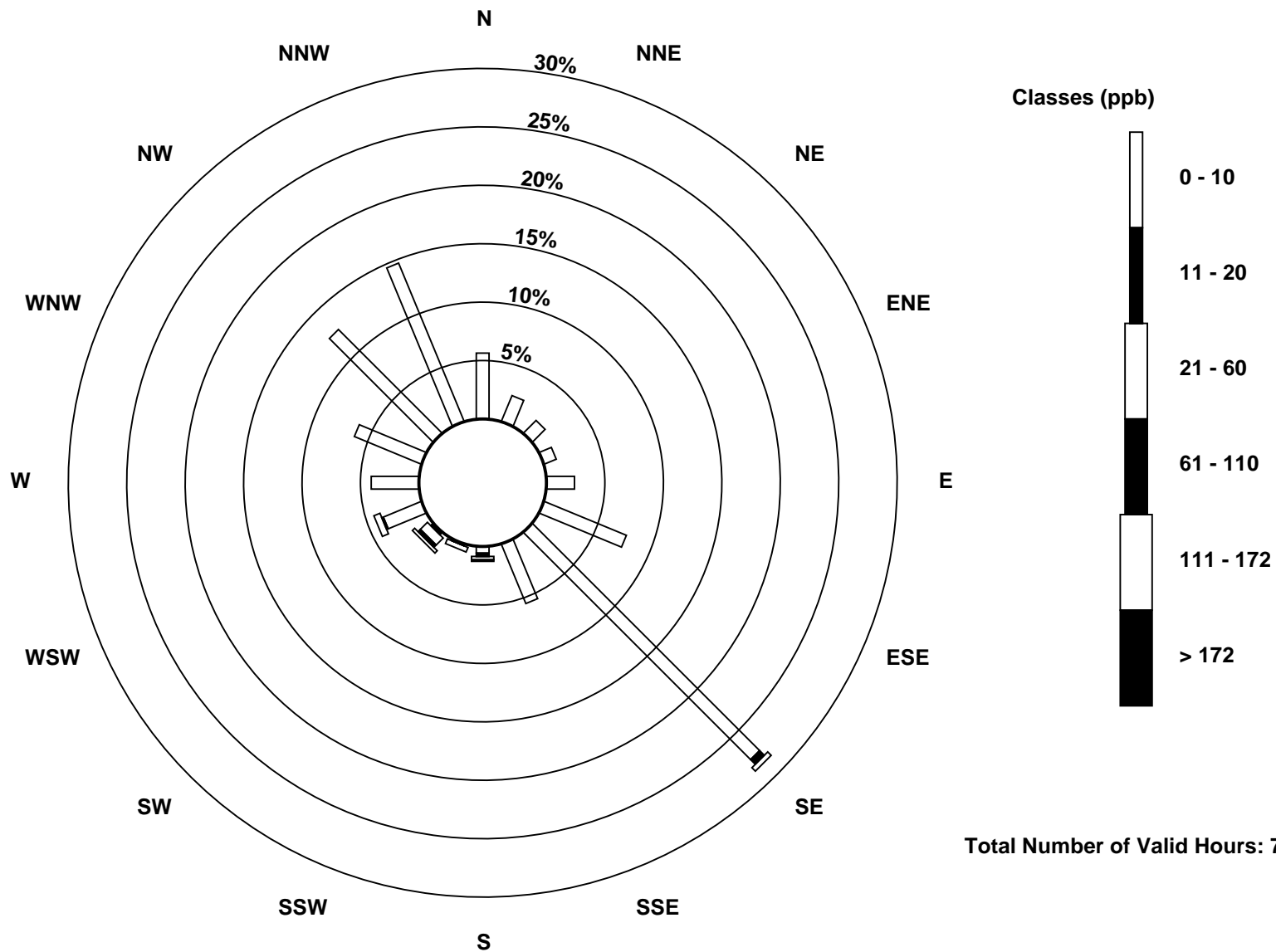
Total Number of Valid Hours: 709

Total Number of Hours: 744

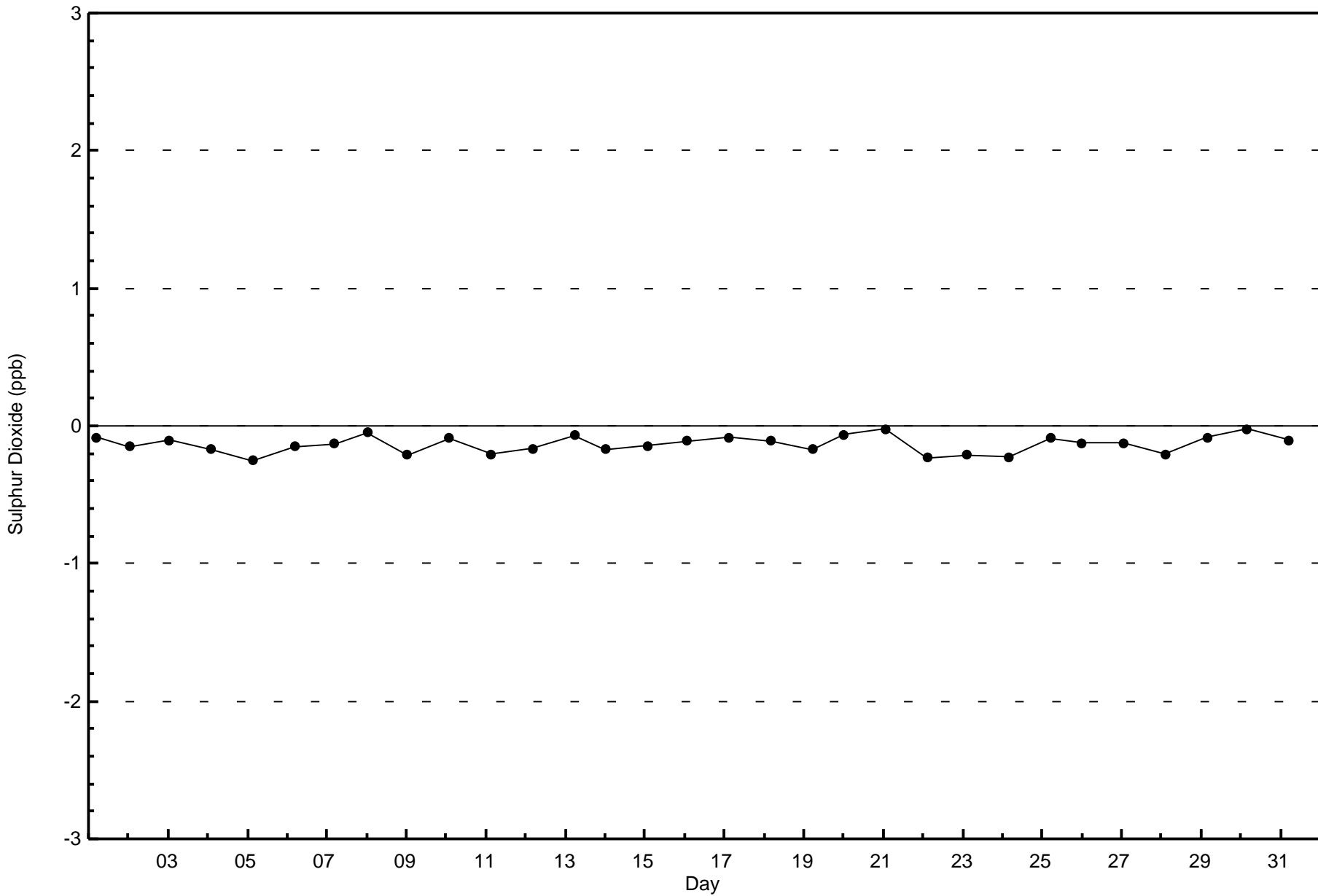


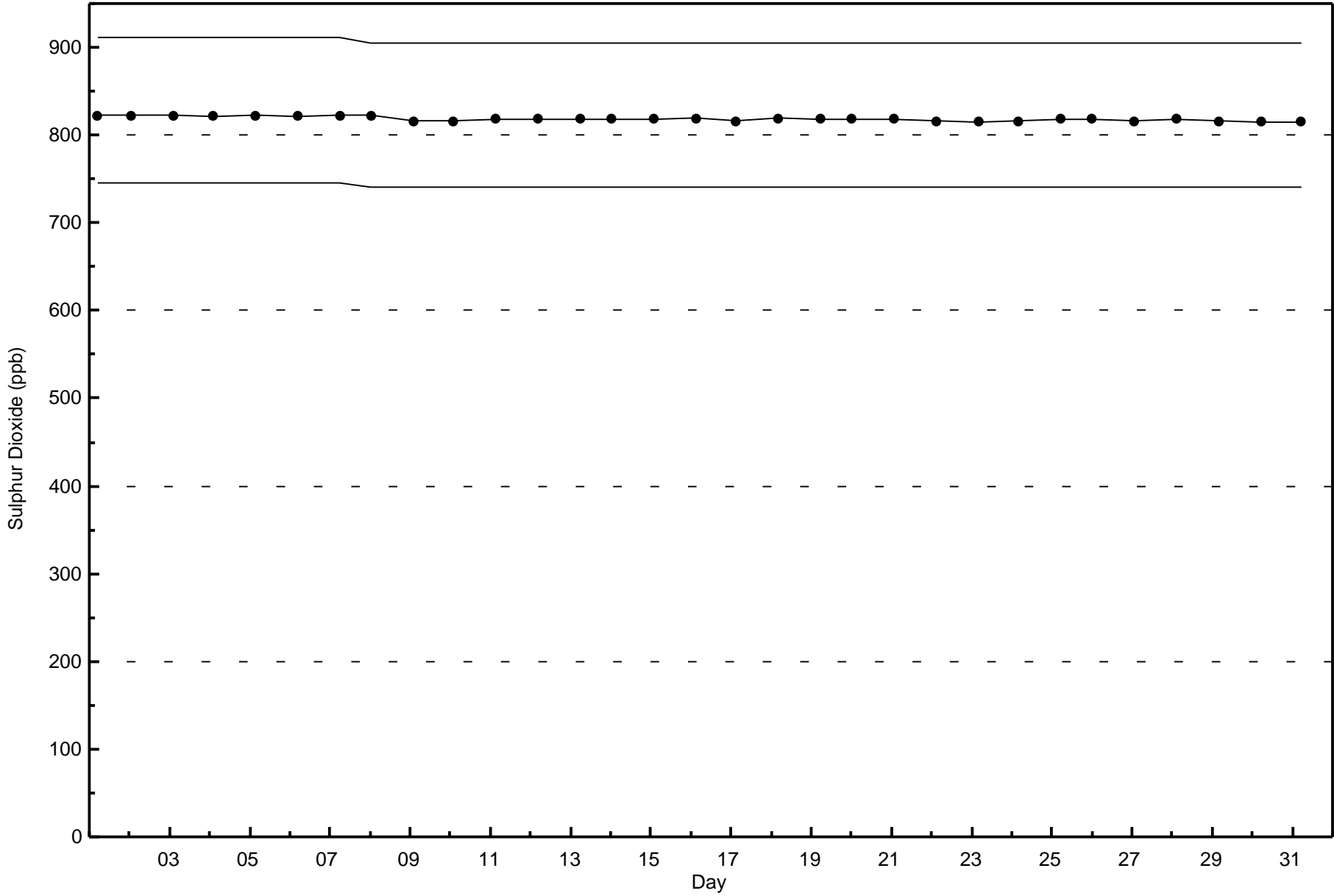
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Lower Camp (AMS 11)



Total Number of Valid Hours: 709







Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 9 ppb on Dec 31 13:00	Maximum Daily Average: 2.5 ppb on Dec 31		Hours of Data:	707
Minimum Value: 0 ppb on Dec 17 20:00	Minimum Daily Average: 0.1 ppb on Dec 18		Hours of Missing Data:	37
Maximum Diurnal Average: 1.3 ppb at hour 16	Minimum Diurnal Average: 0.4 ppb at hour 10		Hours of Calibration:	35
Monthly Average: 0.6 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 6		Percent Operational Time:	99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	1	1	1	0	Z	1	1	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0.5	1
2-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0.4	1
3-Dec	1	0	Z	2	2	1	1	1	0	1	1	1	0	0	1	0	1	0	1	0	0	0	0	0	0.7	2
4-Dec	1	0	0	Z	0	0	0	0	0	0	0	4	1	1	2	3	1	1	1	1	1	1	1	1	0.9	4
5-Dec	1	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	6	3	2	1	1	1	0	0	1	0.9	6
6-Dec	1	1	0	0	0	Z	0	0	0	0	1	1	1	1	1	3	1	2	1	4	1	1	1	0	0.9	4
7-Dec	1	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	M	1	1	1	1	1	1	1	1	0.7	1
8-Dec	1	Z	1	0	0	0	1	1	0	0	1	5	C	C	C	C	0	0	0	0	0	0	0	0	0.7	5
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	1	0.5	3
10-Dec	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
11-Dec	0	0	0	1	Z	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.4	1
12-Dec	0	0	0	0	0	Z	0	0	1	0	1	1	2	1	0	0	0	0	1	0	0	0	0	0	0.5	2
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0.4	1
14-Dec	0	Z	1	1	1	0	0	0	1	1	1	0	0	0	0	4	4	2	1	0	0	0	0	0	0.8	4
15-Dec	0	0	Z	0	1	0	0	0	0	0	1	0	0	0	0	3	1	0	1	1	0	0	0	0	0.5	3
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	2	7	6	0	0	0	1	1	0	1.0	7
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	PF	0	0	0	0	0	0	0	0	0.1	1
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.4	1
20-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0	0	0	1	0	1	0.7	1
21-Dec	2	1	Z	1	1	1	1	1	0	1	1	1	0	0	1	2	1	2	1	1	1	1	0	1	0.9	2
22-Dec	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.3	1
25-Dec	1	1	1	1	1	0	Z	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	0.5	1
26-Dec	0	Z	1	1	0	0	0	1	1	0	1	1	1	1	1	1	1	1	2	2	1	1	1	1	0.8	2
27-Dec	1	1	Z	1	0	0	0	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	1	1	0.5	1
28-Dec	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.4	1
29-Dec	1	1	1	1	Z	1	1	1	1	1	1	0	3	1	0	1	1	1	1	2	3	2	1	1	1.0	3
30-Dec	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0.5	1
31-Dec	2	1	1	2	2	1	Z	1	0	0	0	0	9	7	9	6	4	1	0	2	7	1	0	0	2.5	9

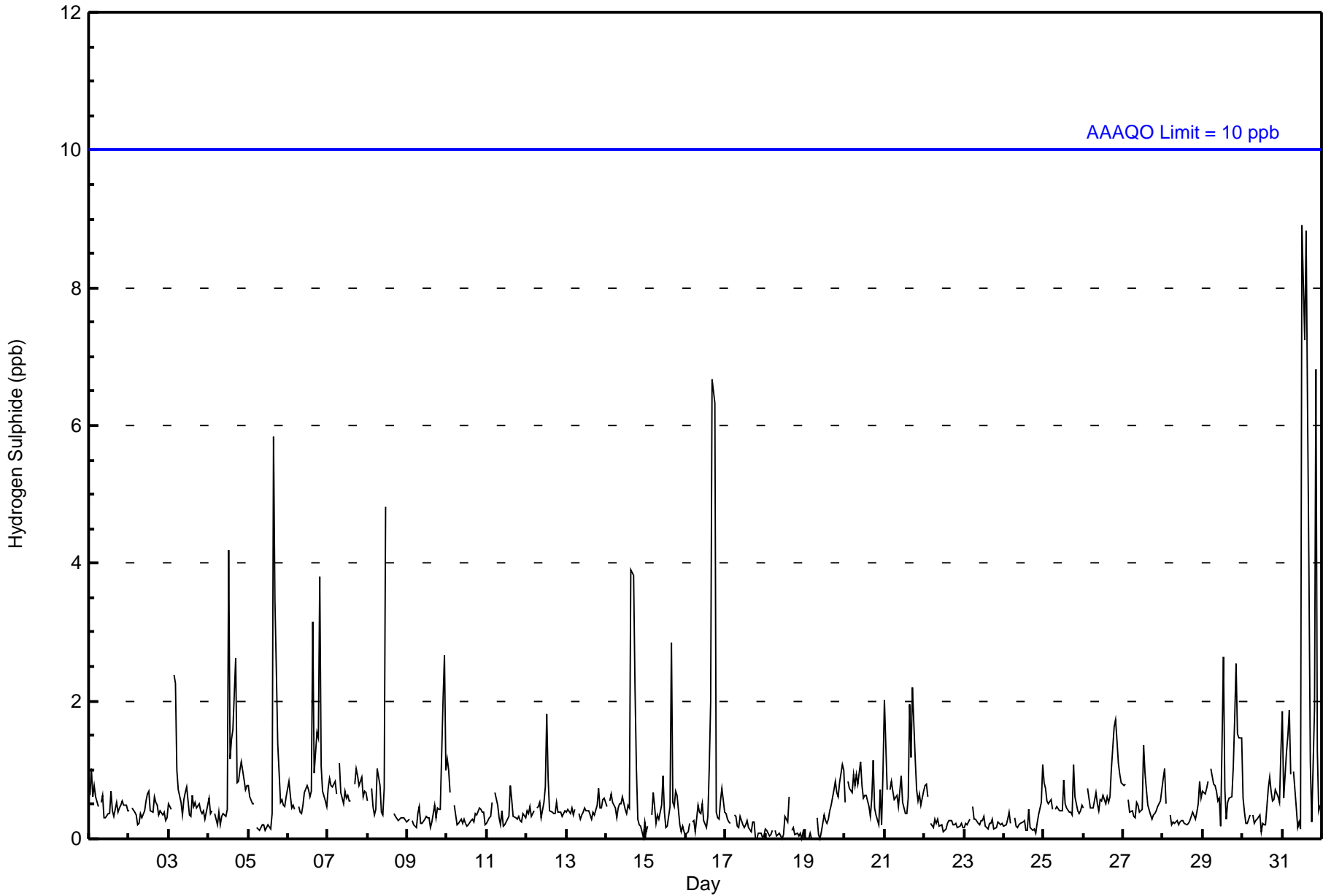
0.6	0.5	0.5	0.6	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.9	0.7	0.7	1.3	1.1	0.9	0.6	0.7	0.7	0.6	0.5	0.6	Diurnal Average
2	1	1	2	2	1	1	1	1	1	1	1	5	9	7	9	6	7	6	2	4	7	2	3	1	Diurnal Maximum

Z - zerospan      C - Calibration      M - Maintenance      PF - Power Failure  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb      24-hr 3 ppb



Wood Buffalo Environmental Association  
Hourly Averages

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Lower Camp - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Lower Camp - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	686	97.03	97.03
3 - 4	12	1.70	98.73
5 - 7	7	0.99	99.72
8 - 11	2	0.28	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

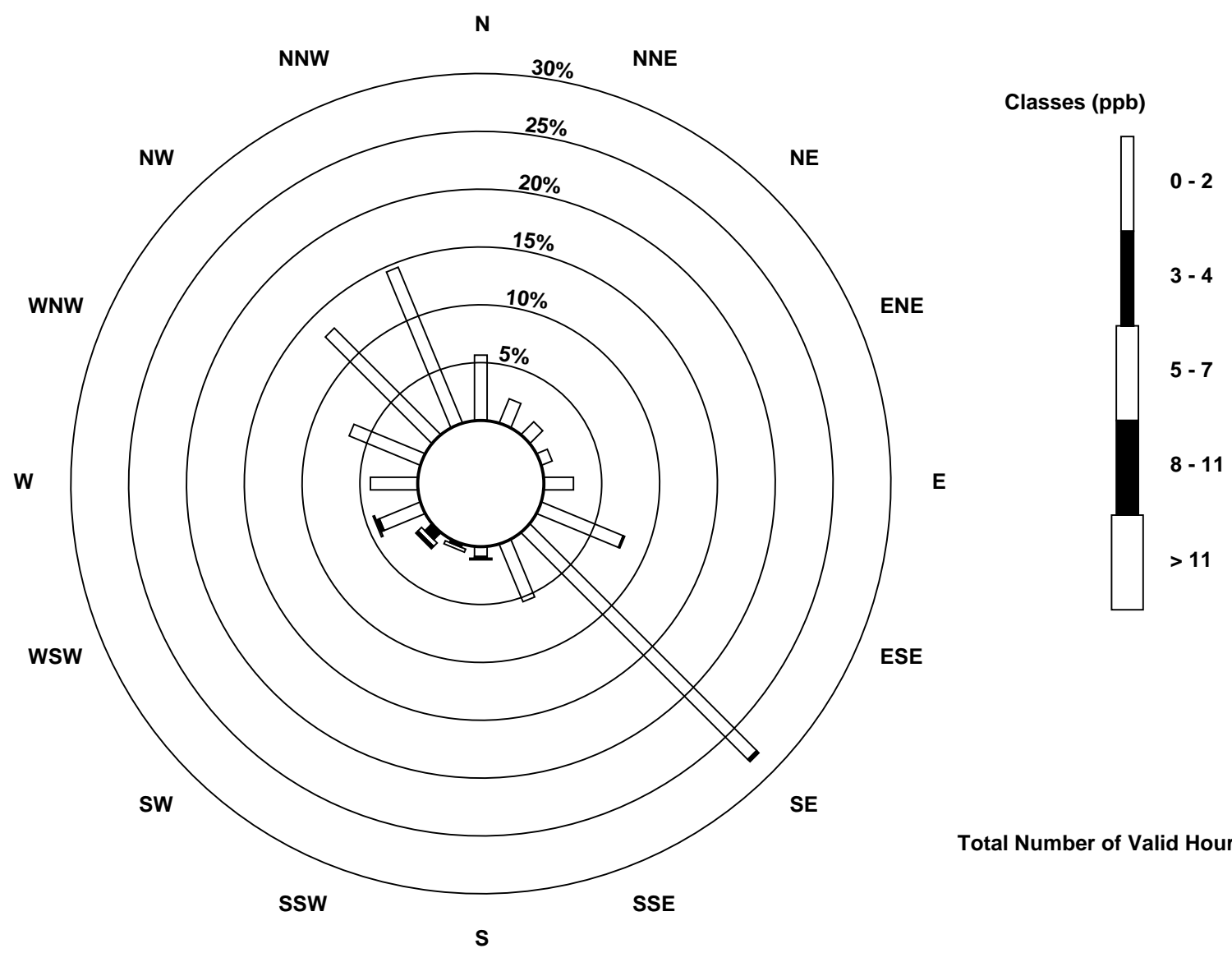
**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Lower Camp - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	40	16	11	7	18	54	196	38	6	1	1	27	29	47	92	103	686
3 - 4	0	0	0	0	0	1	2	0	1	1	5	2	0	0	0	0	12
5 - 7	0	0	0	0	0	0	0	0	1	2	3	1	0	0	0	0	7
8 - 11	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	40	16	11	7	18	55	198	38	8	4	11	30	29	47	92	103	707

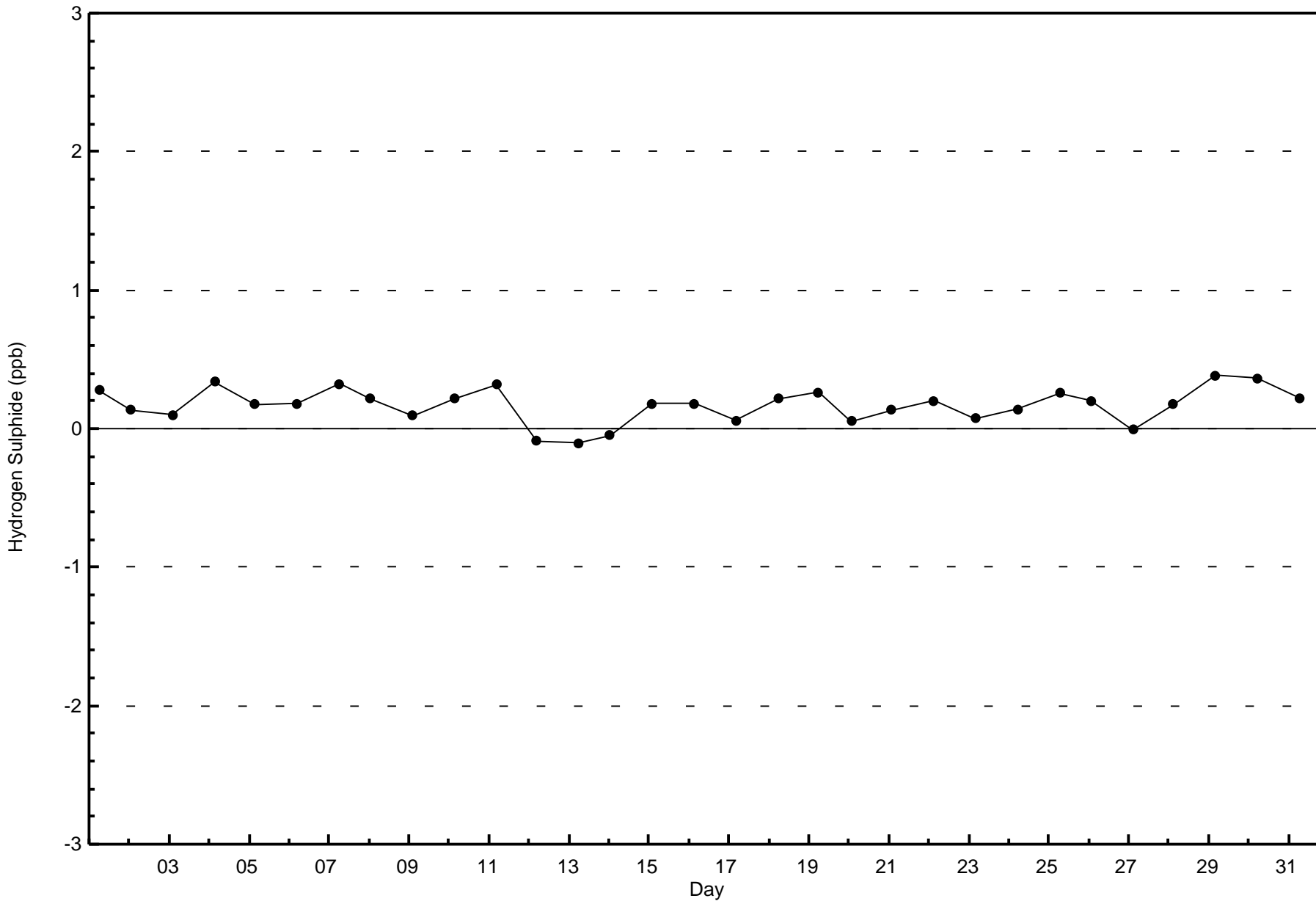
Total Number of Valid Hours: 707

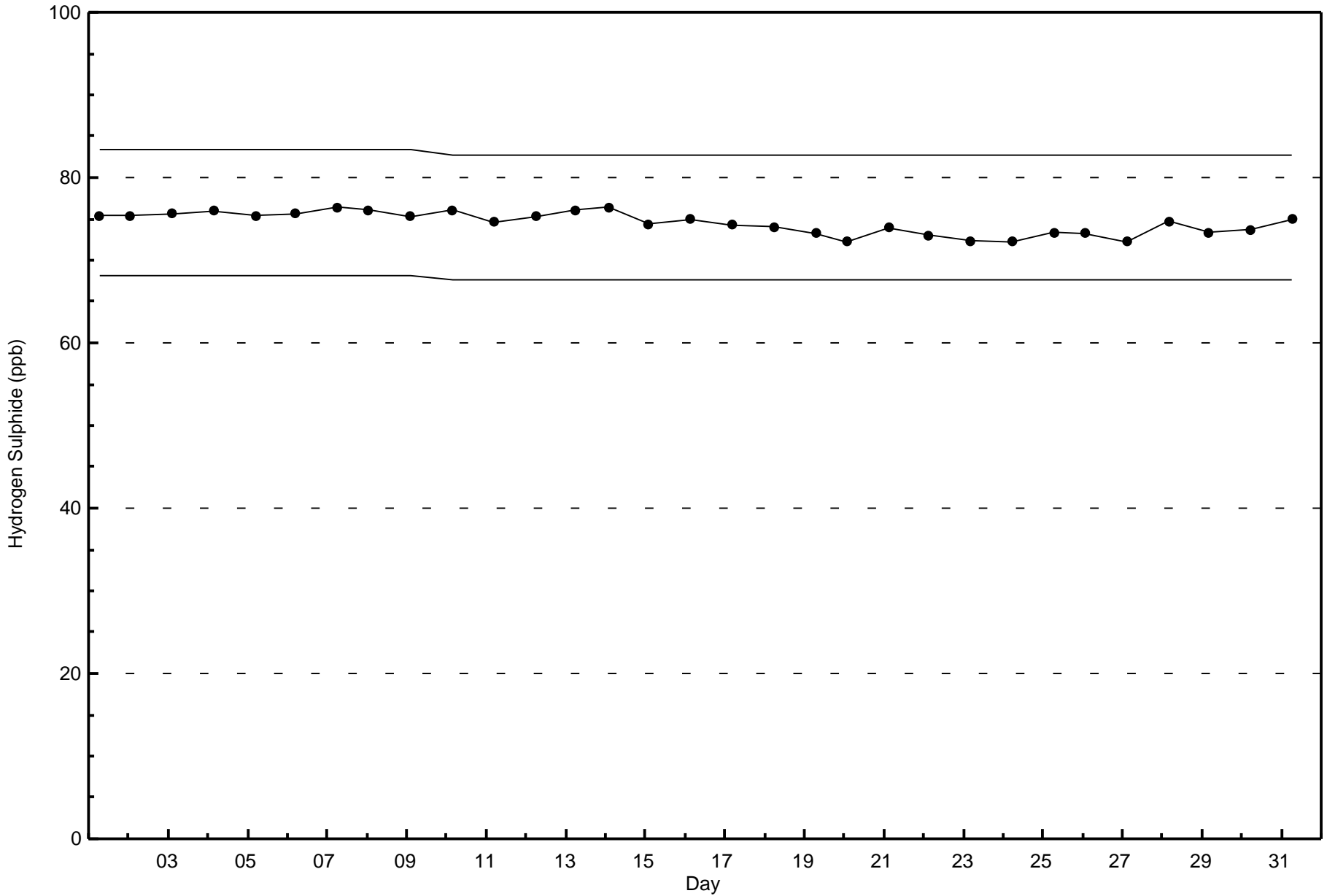
Total Number of Hours: 744





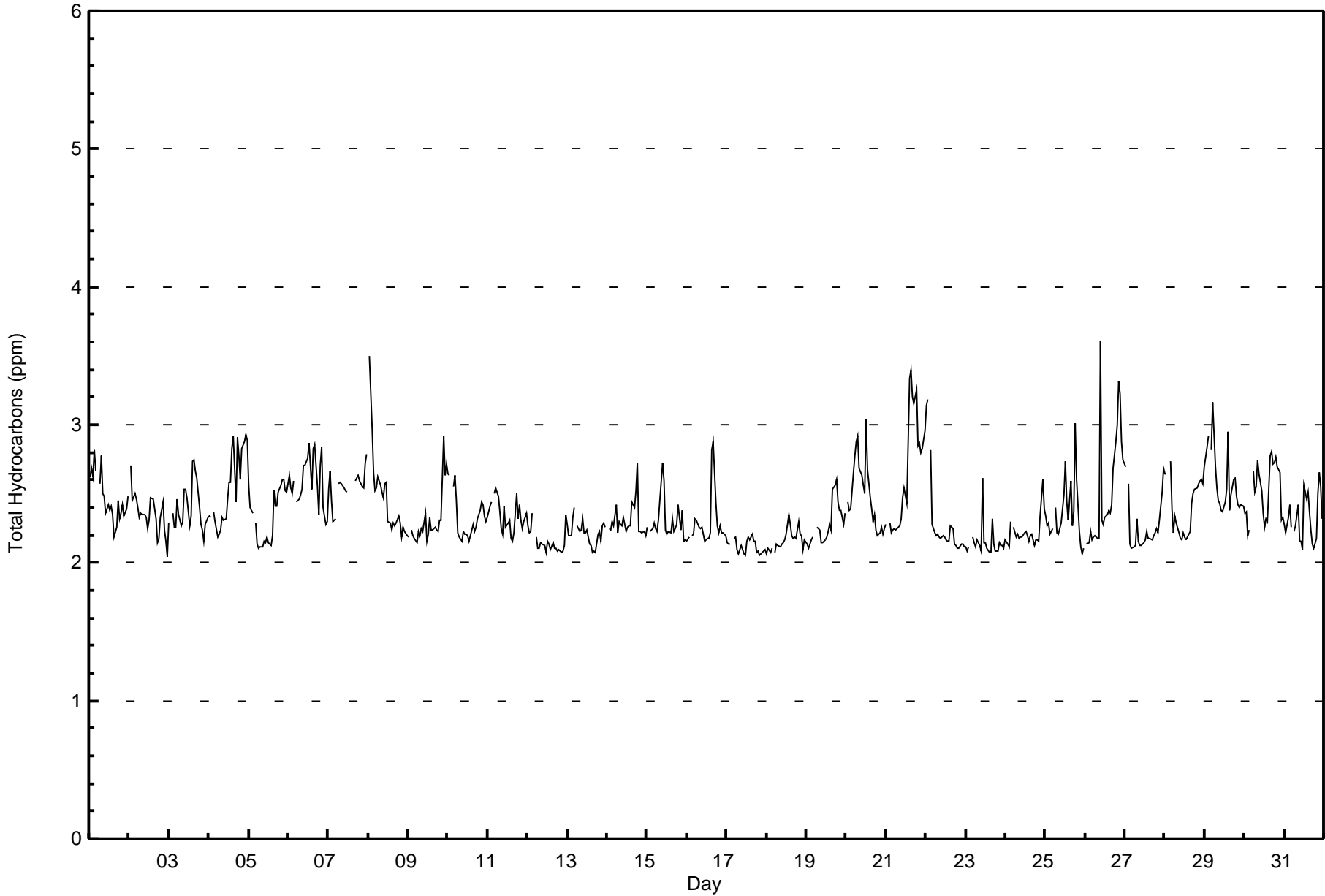
Total Number of Valid Hours: 707







Maximum Value: 3.6 ppm on Dec 26 10:00																				Maximum Daily Average: 2.7 ppm on Dec 21					Hours in Service: 744		
Minimum Value: 2.0 ppm on Dec 3 00:00																				Minimum Daily Average: 2.1 ppm on Dec 17					Hours of Data: 709		
Maximum Diurnal Average: 2.4 ppm at hour 2																				Minimum Diurnal Average: 2.3 ppm at hour 12					Hours of Missing Data: 35		
Monthly Average: 2.36 ppm																				Percentiles: P <sub>1</sub> = 2.1 P <sub>10</sub> = 2.1 Q <sub>1</sub> = 2.2 Median = 2.3 Q <sub>3</sub> = 2.5 P <sub>90</sub> = 2.7 P <sub>99</sub> = 3.2					Hours of Calibration: 35		
																									Percent Operational Time: 100.0		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	2.6	2.7	2.6	2.8	2.7	Z	2.6	2.8	2.5	2.5	2.4	2.4	2.4	2.4	2.3	2.2	2.3	2.4	2.3	2.4	2.4	2.3	2.4	2.5	2.5	2.8	
2-Dec	Z	2.7	2.5	2.5	2.5	2.4	2.3	2.4	2.3	2.3	2.3	2.2	2.3	2.5	2.5	2.4	2.3	2.1	2.2	2.3	2.4	2.2	2.2	2.0	2.3	2.7	
3-Dec	2.3	Z	2.4	2.3	2.3	2.5	2.4	2.3	2.3	2.5	2.5	2.5	2.3	2.3	2.7	2.7	2.6	2.4	2.3	2.2	2.2	2.3	2.3	2.4	2.7		
4-Dec	2.3	2.3	Z	2.4	2.3	2.2	2.2	2.2	2.3	2.3	2.3	2.5	2.6	2.6	2.8	2.9	2.4	2.9	2.8	2.6	2.8	2.9	2.9	2.9	2.5	2.9	
5-Dec	2.6	2.4	2.4	Z	2.3	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.1	2.1	2.2	2.5	2.4	2.4	2.5	2.6	2.6	2.6	2.5	2.5	2.3	2.6	
6-Dec	2.6	2.5	2.5	2.6	Z	2.4	2.5	2.5	2.5	2.7	2.7	2.8	2.9	2.7	2.5	2.8	2.9	2.6	2.4	2.7	2.8	2.4	2.3	2.3	2.6	2.9	
7-Dec	2.5	2.7	2.4	2.3	2.3	Z	2.6	2.6	2.6	2.5	2.5	2.5	C	C	C	C	2.6	2.6	2.6	2.6	2.6	2.5	2.7	2.8	2.6	2.8	
8-Dec	Z	3.5	3.0	2.7	2.5	2.5	2.6	2.6	2.5	2.5	2.6	2.6	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.2	2.2	2.5	3.5	
9-Dec	2.2	Z	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.4	2.2	2.2	2.3	2.2	2.2	2.3	2.2	2.2	2.3	2.3	2.9	2.6	2.7	2.3	2.9	
10-Dec	2.6	2.6	Z	2.6	2.6	2.5	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.3	2.4	2.4	2.4	2.3	2.3	2.3	2.6	
11-Dec	2.3	2.4	2.4	Z	2.5	2.5	2.5	2.4	2.2	2.2	2.4	2.3	2.3	2.3	2.2	2.2	2.2	2.5	2.3	2.4	2.3	2.2	2.3	2.4	2.3	2.5	
12-Dec	2.3	2.2	2.2	2.4	Z	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.2	2.4	
13-Dec	2.3	2.2	2.2	2.3	2.4	Z	2.3	2.2	2.2	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.3	2.3	2.3	2.3	2.2	2.4	
14-Dec	Z	2.2	2.2	2.3	2.3	2.4	2.2	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.4	2.4	2.5	2.7	2.2	2.2	2.2	2.2	2.2	2.3	2.7	
15-Dec	2.3	Z	2.2	2.3	2.3	2.3	2.2	2.3	2.5	2.7	2.6	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.3	2.4	2.2	2.4	2.2	2.2	2.3	2.7	
16-Dec	2.2	2.2	Z	2.2	2.2	2.3	2.3	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.8	2.9	2.4	2.3	2.2	2.3	2.2	2.2	2.2	2.3	2.9	
17-Dec	2.1	2.1	2.1	Z	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.0	2.1	2.1	2.1	2.2	
18-Dec	2.1	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.4	2.3	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.1	2.2	2.2	2.4	
19-Dec	2.1	2.1	2.1	2.2	2.2	Z	2.3	2.3	2.2	2.2	2.1	2.2	2.2	2.2	2.3	2.2	2.5	2.6	2.6	2.4	2.4	2.4	2.3	2.4	2.3	2.6	
20-Dec	Z	2.4	2.4	2.4	2.7	2.8	2.9	2.9	2.7	2.6	2.6	2.5	3.0	2.7	2.5	2.4	2.3	2.3	2.2	2.2	2.2	2.3	2.2	2.3	2.5	3.0	
21-Dec	2.3	Z	2.3	2.2	2.2	2.3	2.2	2.3	2.3	2.3	2.5	2.5	2.4	2.9	3.3	3.4	3.2	3.2	3.2	2.8	2.9	2.8	2.8	3.0	2.7	3.4	
22-Dec	3.1	3.2	Z	2.8	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3	3.2	
23-Dec	2.1	2.1	2.1	Z	2.2	2.2	2.1	2.2	2.1	2.1	2.6	2.1	2.1	2.1	2.1	2.1	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.6	
24-Dec	2.2	2.1	2.1	2.3	Z	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.3	2.6	2.4	2.2	2.6	2.6	
25-Dec	2.3	2.3	2.3	2.2	2.2	Z	2.4	2.2	2.2	2.3	2.4	2.5	2.7	2.4	2.3	2.6	2.3	2.4	3.0	2.6	2.2	2.1	2.1	2.1	2.4	3.0	
26-Dec	Z	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	3.6	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.7	2.9	3.0	3.3	3.2	2.9	2.7	2.5	3.6	
27-Dec	2.7	Z	2.6	2.1	2.1	2.1	2.1	2.3	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.5	2.7	2.3	2.7	
28-Dec	2.6	2.6	Z	2.7	2.4	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.4	2.7	
29-Dec	2.7	2.8	2.9	Z	2.8	3.2	2.7	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.5	3.0	2.4	2.5	2.6	2.6	2.5	2.4	2.4	2.4	2.4	2.6	3.2
30-Dec	2.4	2.4	2.2	2.2	Z	2.7	2.5	2.6	2.8	2.6	2.5	2.4	2.3	2.3	2.3	2.8	2.8	2.7	2.7	2.8	2.7	2.7	2.3	2.3	2.5	2.8	
31-Dec	2.3	2.2	2.3	2.4	2.3	Z	2.2	2.3	2.4	2.2	2.2	2.1	2.6	2.5	2.5	2.4	2.2	2.1	2.1	2.2	2.5	2.7	2.6	2.3	2.3	2.7	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan C - Calibration																											





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Lower Camp - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	2	0.28	0.28
2.1 - 3.0	695	98.03	98.31
3.1 - 10.0	12	1.69	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Lower Camp - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 2.0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2
2.1 - 3.0	39	17	11	8	16	54	200	38	9	4	12	29	29	42	86	101	695
3.1 - 10.0	0	0	0	0	1	0	2	1	0	0	0	0	0	2	3	3	12
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	<b>40</b>	<b>17</b>	<b>11</b>	<b>8</b>	<b>17</b>	<b>54</b>	<b>202</b>	<b>39</b>	<b>9</b>	<b>4</b>	<b>12</b>	<b>30</b>	<b>29</b>	<b>44</b>	<b>89</b>	<b>104</b>	<b>709</b>

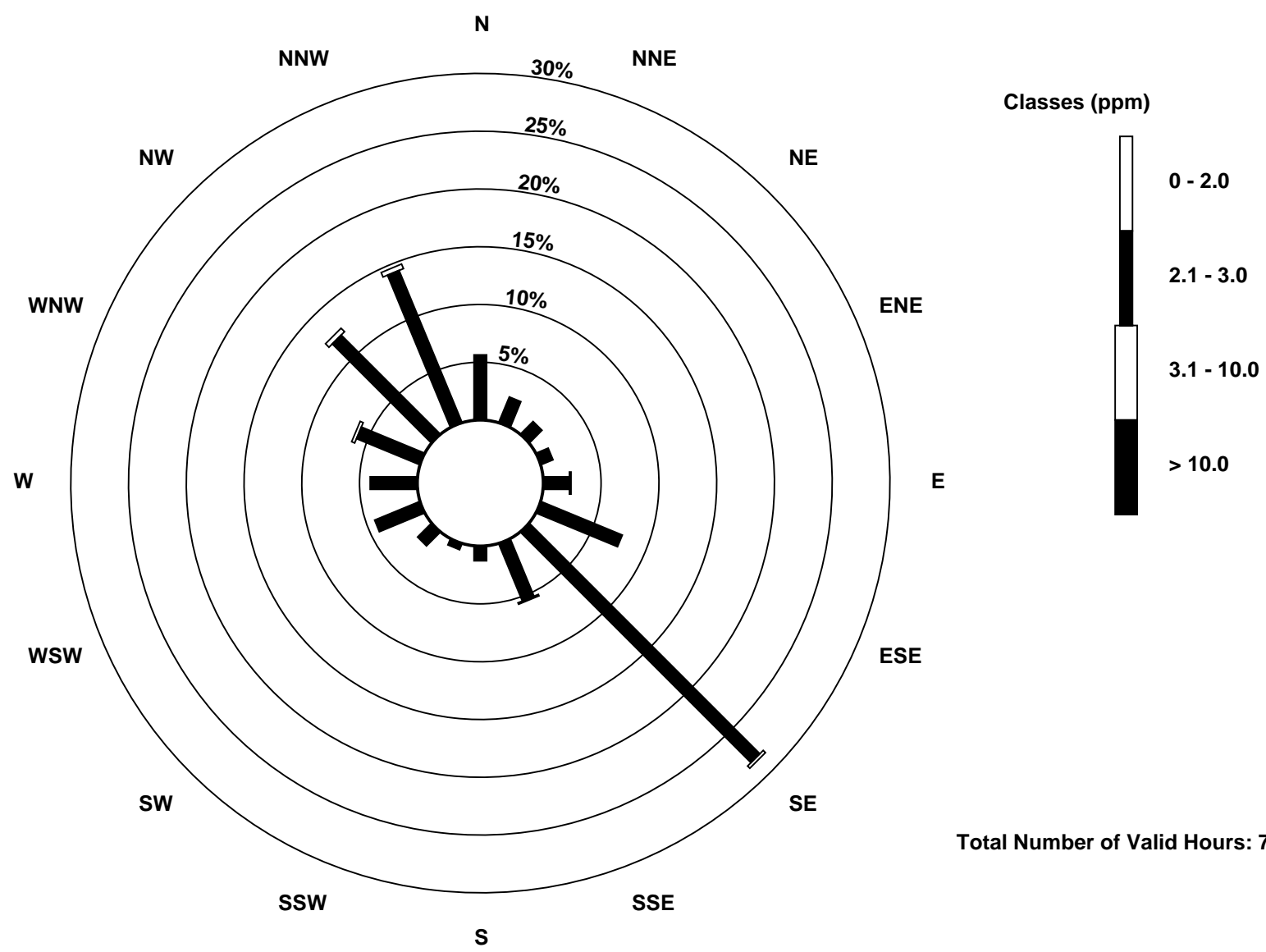
Total Number of Valid Hours: 709

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Total Hydrocarbons (THC) - ppm  
Lower Camp (AMS 11)

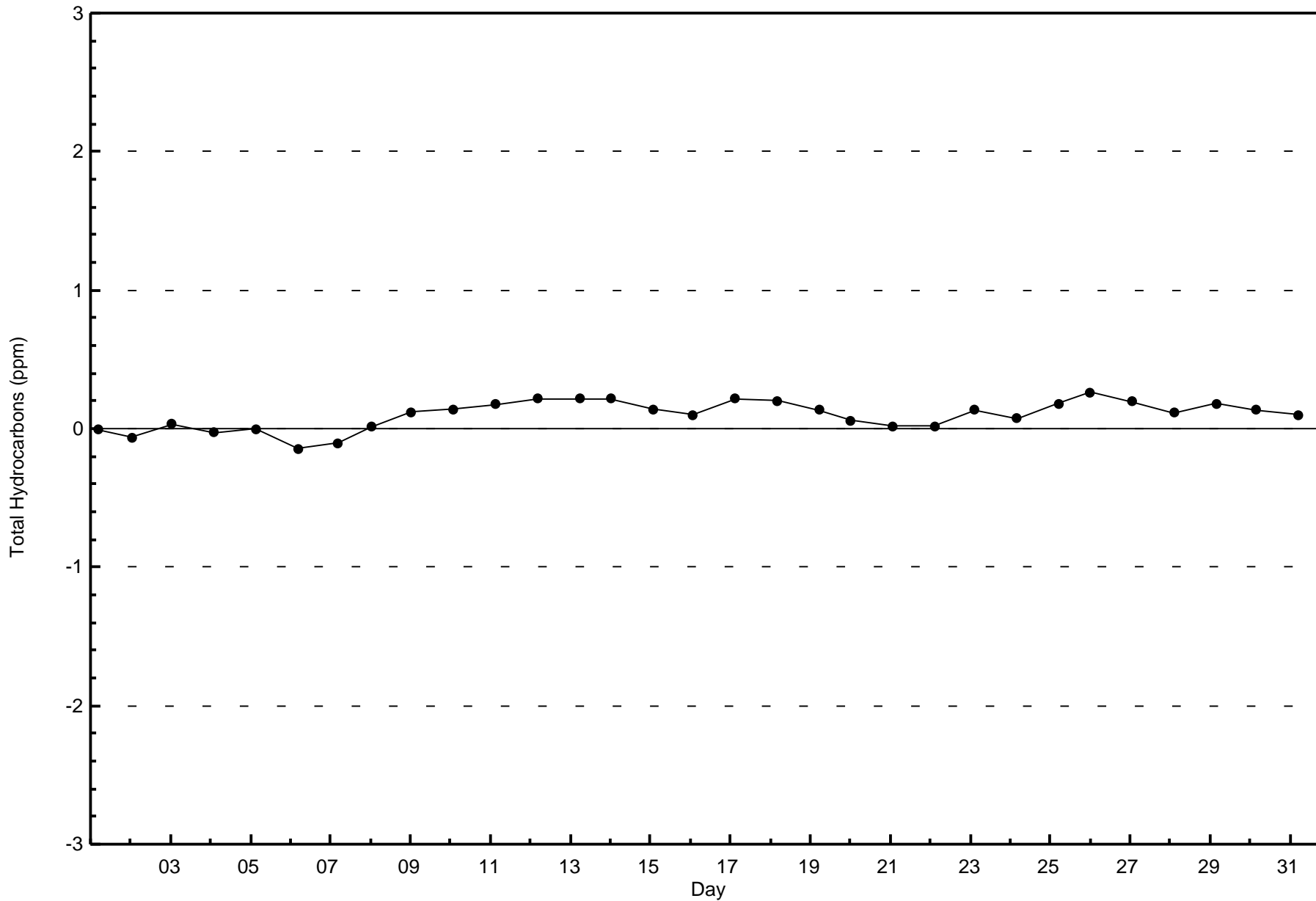


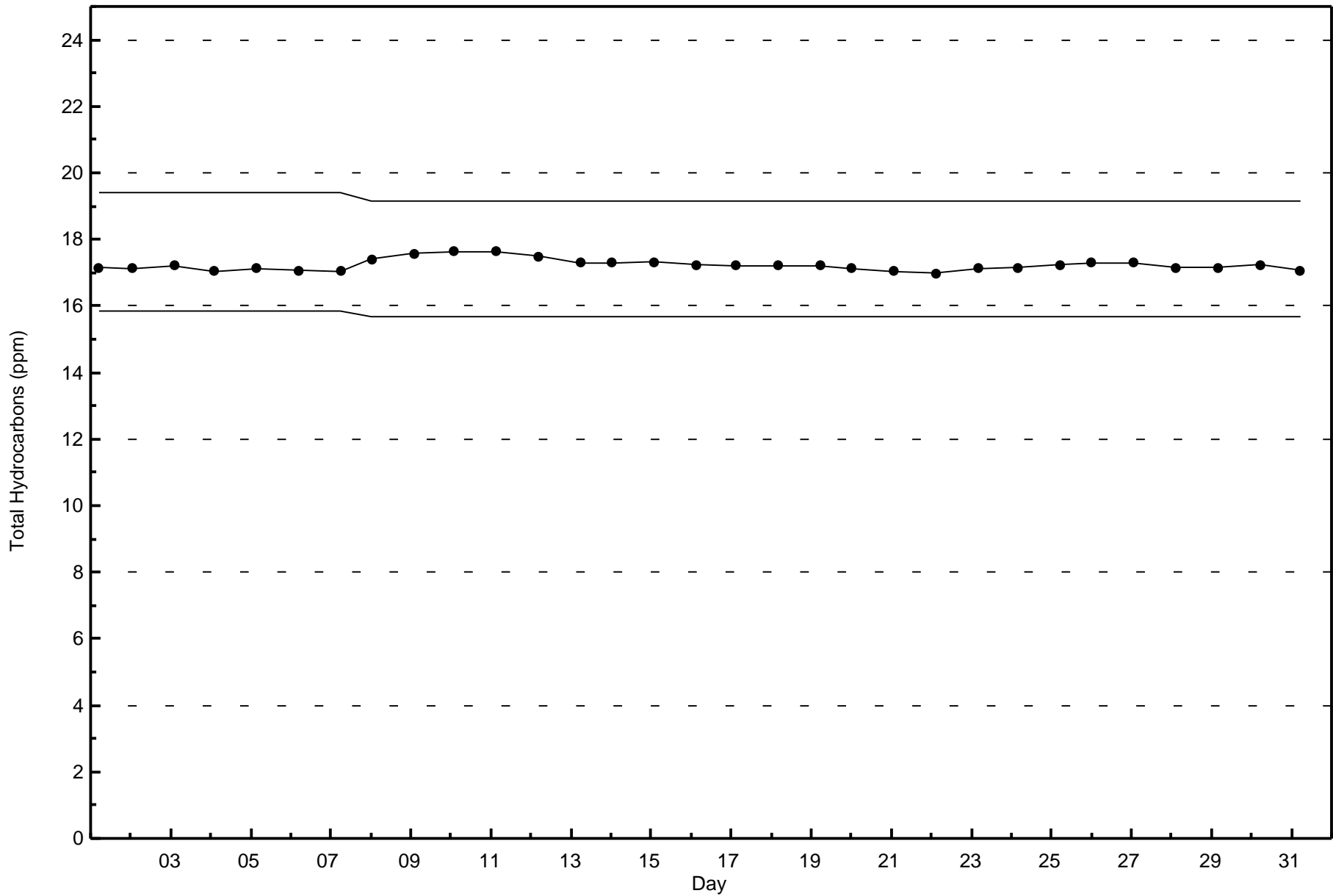




Wood Buffalo Environmental Association  
Zero Responses

Total Hydrocarbons (THC) - ppm  
Lower Camp - December 2015







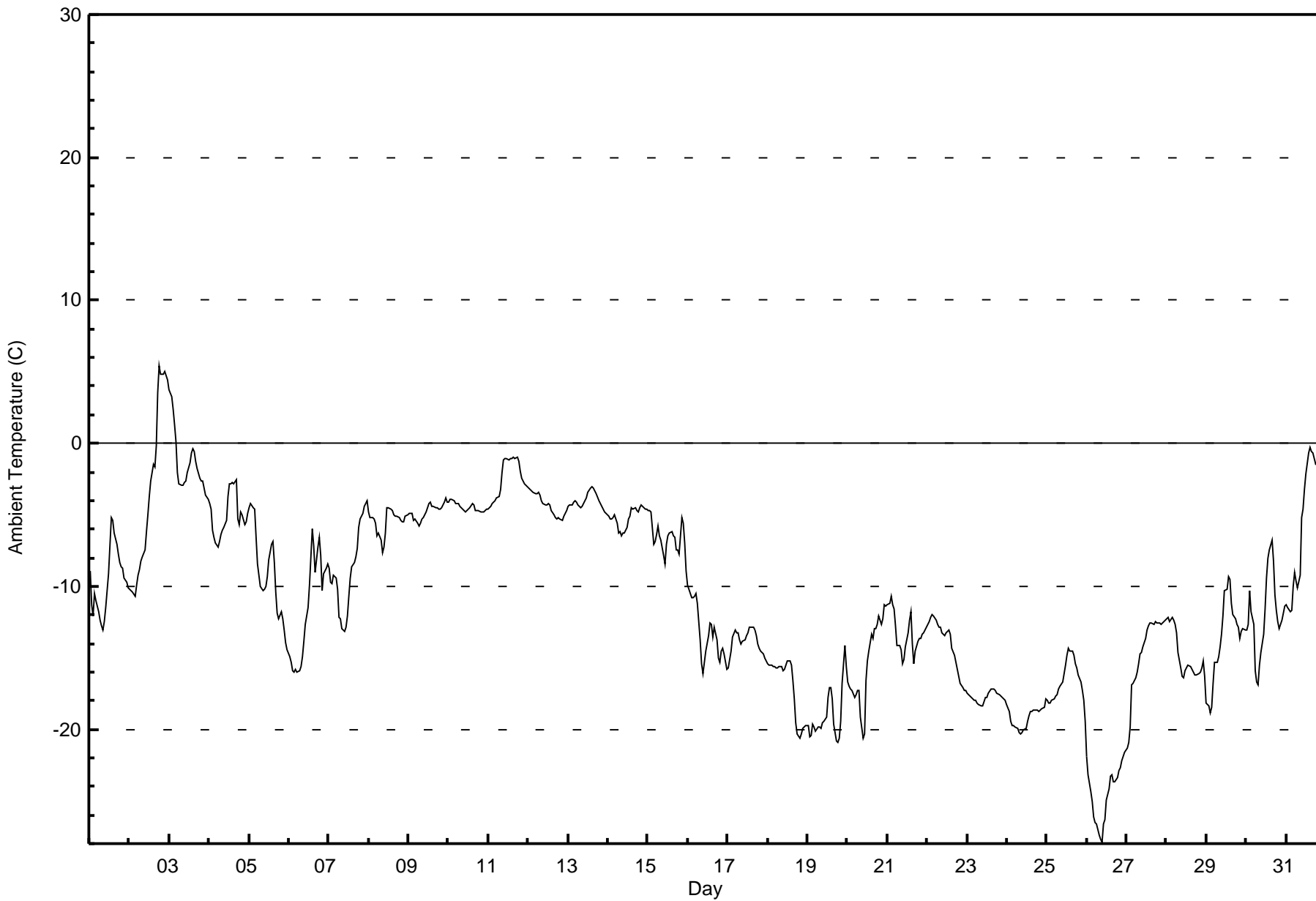
**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ambient Temperature (AT) - C**

**Lower Camp - December 2015**

Maximum Value: 5.5 C on Dec 2 19:00		Maximum Daily Average: -1.3 C on Dec 3		Hours in Service: 744																							
Minimum Value: -27.9 C on Dec 26 10:00		Minimum Daily Average: -24.5 C on Dec 26		Hours of Data: 744																							
Maximum Diurnal Average: -9.0 C at hour 15		Minimum Diurnal Average: -12.1 C at hour 9		Hours of Missing Data: 0																							
Monthly Average: -10.68 C		Percentiles: P <sub>1</sub> = -26.2 P <sub>10</sub> = -18.6 Q <sub>1</sub> = -15.6 Median = -11.3 Q <sub>3</sub> = -4.9 P <sub>90</sub> = -3.4 P <sub>99</sub> = 3.0		Hours of Calibration: 0																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	-8.9	-11.3	-12.1	-10.5	-11.0	-11.7	-12.3	-12.7	-13.1	-12.5	-11.4	-9.1	-7.1	-5.2	-5.4	-6.3	-7.1	-7.8	-8.3	-8.6	-8.8	-9.4	-9.7	-10.1	-9.6	-5.2	
2-Dec	-10.2	-10.3	-10.4	-10.7	-9.9	-9.2	-8.9	-8.2	-7.9	-7.4	-6.2	-5.0	-3.7	-2.6	-1.5	-1.6	-0.2	3.6	5.5	4.9	4.8	5.0	4.8	4.5	-3.4	5.5	
3-Dec	3.7	3.2	2.3	1.3	0.1	-2.0	-2.9	-2.9	-3.0	-2.7	-2.6	-2.1	-1.3	-0.6	-0.4	-0.5	-1.3	-1.7	-2.4	-2.6	-2.7	-3.1	-3.7	-3.9	-1.3	3.7	
4-Dec	-4.2	-4.6	-6.1	-6.6	-6.9	-7.3	-6.8	-6.4	-6.1	-5.9	-5.4	-3.7	-2.9	-2.9	-2.8	-2.8	-2.5	-5.3	-5.7	-4.8	-5.0	-5.7	-5.5	-4.9	-5.0	-2.5	
5-Dec	-4.5	-4.2	-4.5	-4.6	-6.6	-8.5	-9.3	-10.1	-10.3	-10.2	-10.0	-9.3	-8.1	-7.1	-6.9	-8.3	-10.4	-11.9	-12.2	-11.8	-12.2	-13.1	-14.0	-14.4	-9.3	-4.2	
6-Dec	-15.0	-15.3	-15.9	-16.0	-15.8	-16.0	-15.9	-15.6	-14.9	-13.8	-12.7	-11.5	-9.9	-7.9	-6.0	-7.2	-9.0	-7.2	-6.5	-7.8	-10.3	-9.1	-8.7	-8.4	-11.5	-6.0	
7-Dec	-8.7	-9.7	-9.8	-9.2	-9.4	-10.2	-12.2	-12.2	-12.9	-13.2	-12.9	-12.0	-10.7	-9.4	-8.7	-8.3	-7.9	-7.4	-5.9	-5.3	-4.9	-4.4	-4.2	-4.0	-8.9	-4.0	
8-Dec	-4.8	-5.2	-5.2	-5.3	-5.6	-6.4	-6.3	-6.8	-7.6	-7.2	-6.3	-4.5	-4.5	-4.6	-4.7	-5.0	-5.1	-5.0	-5.2	-5.3	-5.4	-5.5	-5.1	-5.0	-5.5	-4.5	
9-Dec	-4.9	-4.9	-4.9	-5.4	-5.3	-5.6	-5.8	-5.6	-5.3	-5.2	-4.8	-4.5	-4.2	-4.1	-4.4	-4.4	-4.5	-4.5	-4.6	-4.6	-4.5	-4.1	-3.9	-4.1	-4.7	-3.9	
10-Dec	-4.1	-3.9	-3.9	-4.0	-4.2	-4.2	-4.2	-4.4	-4.6	-4.7	-4.8	-4.7	-4.6	-4.5	-4.2	-4.3	-4.7	-4.7	-4.7	-4.8	-4.8	-4.8	-4.7	-4.6	-4.5	-3.9	
11-Dec	-4.6	-4.4	-4.2	-4.1	-4.0	-3.8	-3.7	-3.2	-2.0	-1.1	-1.0	-1.1	-1.2	-1.1	-1.0	-1.0	-1.1	-1.0	-1.3	-1.9	-2.4	-2.7	-2.8	-3.0	-2.4	-1.0	
12-Dec	-3.1	-3.2	-3.3	-3.4	-3.5	-3.5	-3.5	-3.6	-4.0	-4.2	-4.3	-4.3	-4.2	-4.3	-4.7	-5.0	-5.2	-5.3	-5.2	-5.3	-5.4	-5.1	-4.9	-4.7	-4.3	-3.1	
13-Dec	-4.4	-4.3	-4.3	-4.1	-4.0	-4.1	-4.3	-4.5	-4.4	-4.2	-4.0	-3.8	-3.4	-3.2	-3.0	-3.1	-3.3	-3.6	-4.1	-4.2	-4.4	-4.6	-4.8	-4.9	-4.0	-3.0	
14-Dec	-5.1	-5.3	-5.3	-5.1	-5.0	-5.6	-6.3	-6.2	-6.5	-6.3	-6.2	-5.9	-5.3	-5.1	-4.5	-4.6	-4.5	-4.7	-4.8	-4.5	-4.3	-4.4	-4.6	-4.6	-5.2	-4.3	
15-Dec	-4.7	-4.7	-4.8	-7.0	-6.9	-6.3	-5.8	-6.5	-6.8	-7.8	-8.4	-7.0	-6.5	-6.3	-6.2	-6.5	-6.6	-7.5	-7.4	-7.8	-5.2	-5.6	-7.0	-9.0	-6.6	-4.7	
16-Dec	-10.0	-10.5	-10.8	-10.8	-10.7	-10.5	-11.2	-13.7	-15.4	-16.1	-15.4	-14.5	-13.5	-12.6	-12.6	-13.6	-12.9	-13.7	-15.0	-15.4	-14.5	-14.4	-14.8	-15.8	-13.3	-10.0	
17-Dec	-15.7	-15.1	-14.6	-13.6	-13.0	-13.2	-13.2	-13.7	-14.0	-13.9	-13.7	-13.5	-13.2	-12.9	-12.8	-12.9	-13.0	-13.4	-14.0	-14.3	-14.5	-14.8	-15.0	-15.3	-13.9	-12.8	
18-Dec	-15.4	-15.5	-15.6	-15.6	-15.6	-15.7	-15.7	-15.6	-15.7	-15.9	-15.8	-15.5	-15.2	-15.2	-15.6	-16.6	-17.9	-19.6	-20.3	-20.6	-20.3	-19.9	-19.9	-19.8	-17.0	-15.2	
19-Dec	-19.7	-20.5	-20.5	-19.6	-19.8	-20.2	-19.9	-19.8	-19.9	-19.5	-19.4	-19.1	-17.7	-17.1	-17.0	-17.9	-19.7	-20.8	-20.9	-20.7	-19.4	-16.8	-14.1	-15.6	-19.0	-14.1	
20-Dec	-16.7	-17.0	-17.2	-17.3	-17.7	-17.6	-17.3	-17.3	-19.2	-20.6	-20.3	-16.6	-15.2	-14.6	-13.4	-13.7	-13.0	-12.9	-12.7	-12.0	-12.6	-12.3	-11.3	-11.4	-15.4	-11.3	
21-Dec	-11.2	-11.2	-10.7	-11.3	-11.6	-12.7	-14.1	-14.2	-14.5	-15.4	-15.1	-14.2	-13.2	-12.4	-11.7	-14.0	-15.4	-14.5	-13.8	-13.6	-13.6	-13.4	-13.3	-12.8	-13.3	-10.7	
22-Dec	-12.7	-12.5	-12.2	-12.0	-12.1	-12.4	-12.7	-12.8	-12.9	-13.3	-13.4	-13.3	-13.2	-13.0	-13.4	-14.3	-14.9	-15.3	-15.8	-16.4	-16.8	-17.1	-17.3	-17.3	-14.0	-12.0	
23-Dec	-17.5	-17.6	-17.7	-17.9	-18.0	-18.0	-18.1	-18.3	-18.4	-18.4	-18.0	-17.7	-17.7	-17.5	-17.2	-17.2	-17.3	-17.3	-17.4	-17.6	-17.6	-17.8	-17.9	-18.0	-17.8	-17.2	
24-Dec	-18.2	-18.8	-19.4	-19.7	-19.8	-19.8	-20.0	-20.2	-20.3	-20.3	-20.1	-19.9	-19.5	-19.1	-18.8	-18.8	-18.7	-18.6	-18.7	-18.6	-18.5	-18.5	-18.5	-17.9	-19.2	-17.9	
25-Dec	-18.0	-18.2	-18.2	-17.9	-17.9	-17.7	-17.5	-17.2	-17.0	-16.7	-16.1	-15.5	-14.9	-14.4	-14.5	-14.5	-14.9	-15.4	-15.7	-16.2	-16.7	-17.3	-18.0	-19.5	-16.7	-14.4	
26-Dec	-21.9	-23.2	-24.3	-25.1	-26.1	-26.5	-26.6	-27.4	-27.7	-27.9	-26.7	-26.3	-24.9	-24.1	-23.3	-23.2	-23.7	-23.3	-22.9	-22.7	-22.2	-21.9	-21.6	-24.5	-21.6		
27-Dec	-21.3	-20.9	-19.8	-16.9	-16.8	-16.4	-16.0	-15.5	-14.7	-14.6	-14.2	-13.6	-13.0	-12.8	-12.6	-12.6	-12.7	-12.5	-12.5	-12.6	-12.6	-12.6	-12.5	-12.4	-14.7	-12.4	
28-Dec	-12.2	-12.2	-12.4	-12.1	-12.4	-12.7	-13.3	-14.7	-15.7	-16.3	-16.4	-15.9	-15.7	-15.6	-15.6	-15.8	-16.1	-16.2	-16.2	-16.1	-16.0	-15.7	-15.2	-16.3	-14.9	-12.1	
29-Dec	-18.2	-18.3	-18.9	-18.4	-16.8	-15.3	-15.3	-14.9	-14.2	-13.4	-12.1	-10.3	-10.2	-9.3	-9.5	-11.2	-12.0	-12.3	-12.6	-12.9	-13.6	-13.1	-13.0	-13.1	-13.7	-9.3	
30-Dec	-13.1	-12.7	-10.3	-11.8	-12.6	-15.9	-16.7	-16.9	-15.5	-14.6	-13.4	-11.6	-9.4	-8.1	-7.5	-6.8	-8.2	-10.6	-11.7	-12.5	-13.0	-12.4	-11.8	-11.4	-12.0	-6.8	
31-Dec	-11.3	-11.5	-11.8	-11.7	-10.0	-9.0	-9.6	-10.2	-9.2	-5.2	-4.6	-3.2	-2.1	-0.6	-0.3	-0.6	-0.7	-1.0	-1.4	-1.4	-2.6	-5.2	-5.3	-5.8	-5.6	-0.3	
		-10.9	-11.1	-11.2	-11.2	-11.3	-11.6	-11.8	-12.0	-12.1	-11.9	-11.5	-10.6	-9.9	-9.3	-9.0	-9.4	-9.8	-10.1	-10.2	-10.3	-10.3	-10.3	-10.3	-10.5	Diurnal Average	
		3.7	3.2	2.3	1.3	0.1	-2.0	-2.9	-2.9	-2.0	-1.1	-1.0	-1.1	-1.2	-0.6	-0.3	-0.5	-0.2	3.6	5.5	4.9	4.8	5.0	4.8	4.5	Diurnal Maximum	





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Lower Camp - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	41	5.51	5.51
-20 - 0	691	92.88	98.39
0 - 10	12	1.61	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

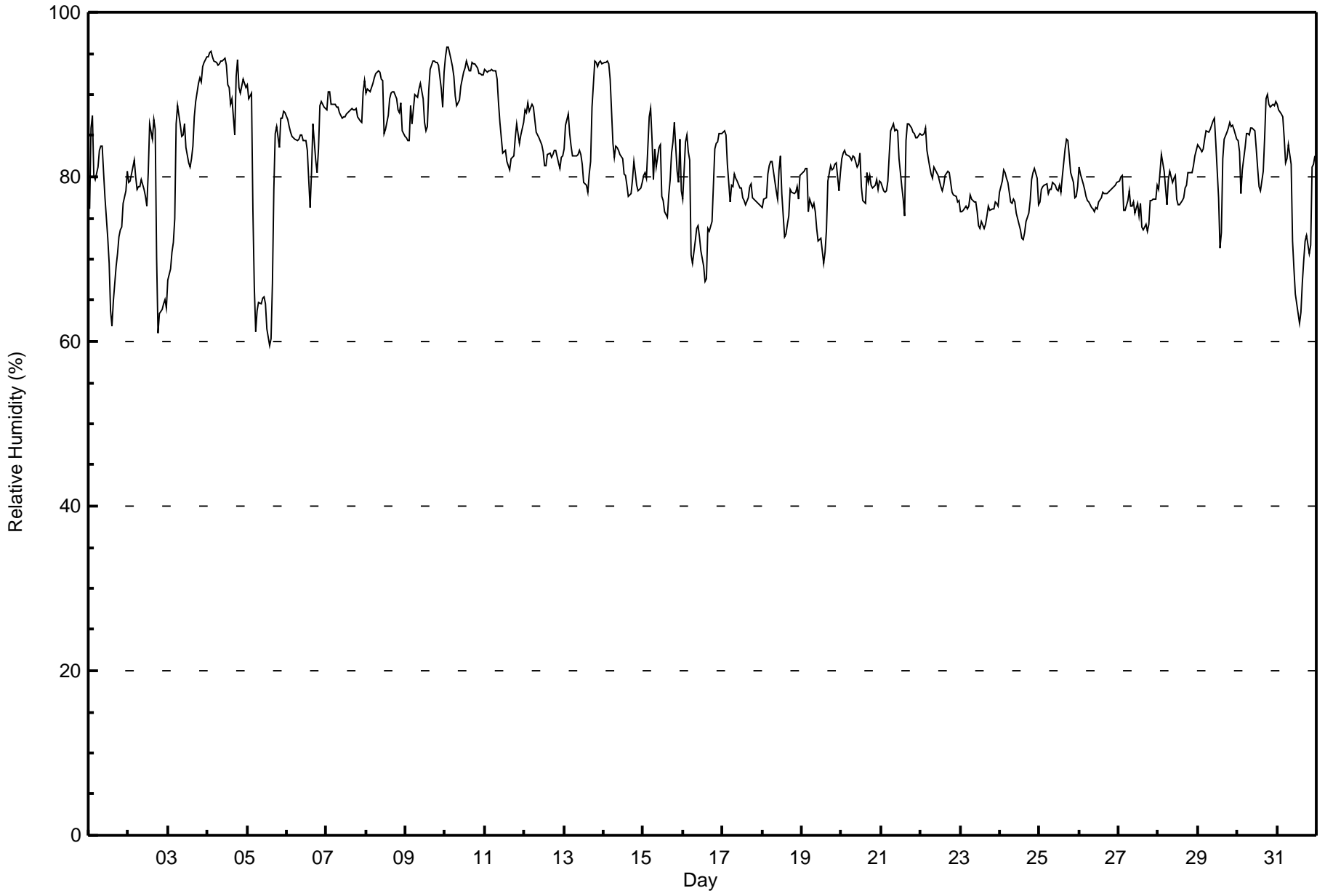
**Relative Humidity (RH) - %  
Lower Camp - December 2015**

Maximum Value: 96 % on Dec 10 03:00																			Maximum Daily Average: 92.8 % on Dec 10						Hours in Service: 744			
Minimum Value: 59 % on Dec 5 14:00																			Minimum Daily Average: 74.8 % on Dec 5						Hours of Data: 744			
Maximum Diurnal Average: 84.4 % at hour 3																			Minimum Diurnal Average: 77.4 % at hour 15						Hours of Missing Data: 0			
Monthly Average: 81.8 %																			Percentiles: P <sub>1</sub> = 63 P <sub>10</sub> = 74 Q <sub>1</sub> = 78 Median = 81 O <sub>3</sub> = 86 P <sub>90</sub> = 91 P <sub>99</sub> = 95						Hours of Calibration: 0			
																			Percent Operational Time: 100.0									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Dec	76	86	87	80	80	81	83	84	84	80	77	73	69	64	62	65	69	71	73	74	74	77	78	81	76.1	87		
2-Dec	79	79	80	82	80	79	79	79	80	78	78	76	80	86	85	87	86	70	61	63	64	65	65	64	76.1	87		
3-Dec	67	69	71	72	75	86	89	86	85	85	86	84	82	81	82	84	87	89	91	92	92	93	94	95	84.1	95		
4-Dec	95	95	95	94	94	94	94	94	94	94	94	91	91	89	90	85	92	94	91	90	92	91	91	91	92.4	95		
5-Dec	91	89	90	76	67	61	64	65	65	65	65	65	61	59	60	67	78	85	86	83	87	87	88	88	74.8	91		
6-Dec	87	86	85	85	85	85	84	85	85	85	84	84	83	80	76	81	86	82	80	83	89	89	88	88	84.5	89		
7-Dec	88	90	90	89	89	89	88	89	88	87	87	87	88	88	88	88	88	88	88	87	87	87	90	92	88.4	92		
8-Dec	90	91	90	91	91	92	93	93	93	92	92	85	86	88	90	90	90	90	90	88	88	89	86	85	89.6	93		
9-Dec	85	84	84	89	86	90	90	90	91	91	90	87	86	86	90	93	94	94	94	94	94	91	88	93	89.7	94		
10-Dec	95	96	96	94	93	92	90	89	89	91	92	93	93	94	93	93	94	94	94	93	93	93	92	92	92.8	96		
11-Dec	93	93	93	93	93	93	93	92	89	87	85	83	83	82	81	81	82	83	85	86	85	84	85	87	87.1	93		
12-Dec	88	88	89	88	89	89	87	85	85	85	84	83	81	81	83	83	82	83	83	83	82	81	82	82	84.4	89		
13-Dec	83	86	88	85	84	83	82	82	83	83	83	82	79	79	78	80	82	89	94	94	93	94	94	94	85.6	94		
14-Dec	94	94	94	94	92	84	82	84	84	83	83	82	80	80	79	78	78	80	82	80	79	78	79	79	83.4	94		
15-Dec	80	81	80	87	88	85	80	83	81	83	84	78	77	76	75	78	80	83	84	87	81	79	85	78	81.3	88		
16-Dec	77	84	85	83	82	71	70	72	74	74	73	71	69	67	68	74	73	75	79	83	84	84	85	85	76.8	85		
17-Dec	85	86	85	81	77	79	79	80	80	79	79	79	78	77	77	77	79	79	77	77	77	77	76	76	79.1	86		
18-Dec	76	77	78	80	81	82	82	81	78	77	81	82	78	73	73	74	75	78	78	78	78	79	77	80	78.3	82		
19-Dec	80	81	81	81	76	77	76	77	76	74	72	73	71	69	71	74	79	81	81	81	81	82	78	81	77.2	82		
20-Dec	82	83	83	83	83	82	82	83	82	81	82	83	79	77	77	80	79	80	79	79	79	80	79	79	80.7	83		
21-Dec	79	78	78	78	80	83	86	86	86	86	86	82	79	77	75	84	86	86	86	85	85	85	85	85	82.8	86		
22-Dec	85	85	85	86	83	81	80	80	81	81	80	79	79	78	79	80	81	80	79	78	78	77	77	77	80.5	86		
23-Dec	76	76	76	76	76	76	78	77	77	77	76	74	74	75	74	74	75	76	76	76	76	77	76	76	75.9	78		
24-Dec	78	79	81	81	80	79	77	77	77	76	74	74	73	72	73	75	76	77	80	81	81	80	77	77	77.2	81		
25-Dec	77	78	79	79	79	78	78	78	79	79	78	78	79	78	80	83	85	84	82	81	79	77	78	79	79.5	85		
26-Dec	81	80	79	78	78	77	77	76	76	76	76	76	77	77	78	78	78	78	78	78	79	79	79	79	77.9	81		
27-Dec	79	80	80	76	76	77	78	77	76	77	76	77	75	77	74	73	74	73	74	77	77	77	77	79	76.6	80		
28-Dec	78	80	83	81	79	77	80	81	79	80	80	77	77	77	77	78	79	79	81	80	81	81	82	83	79.5	83		
29-Dec	84	83	83	83	85	86	85	86	86	87	87	84	77	71	73	82	85	85	86	87	86	86	86	85	83.7	87		
30-Dec	84	83	78	81	84	85	85	85	86	86	86	83	81	79	78	81	85	90	90	89	89	89	89	89	84.7	90		
31-Dec	89	88	88	87	85	82	82	84	82	72	69	66	64	62	63	67	70	72	73	71	72	81	82	83	76.4	89		
	83.4	84.2	84.4	83.7	82.8	82.4	82.3	82.5	82.3	81.7	81.3	79.8	78.4	77.5	77.4	79.7	81.3	82.2	82.5	82.6	82.5	82.9	83.0	83.3	Diurnal Average			
	95	96	96	95	94	94	94	94	94	94	94	94	93	94	93	93	93	94	94	94	94	94	95	Diurnal Maximum				



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Lower Camp - December 2015**





Maximum Speed: 30 km/h on Dec 27 10:00	Maximum Daily Speed Average: 19.7 km/h on Dec 12	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 7 06:00	Minimum Daily Speed Average: 0.2 km/h on Dec 7	Hours of Data: 744
Maximum Diurnal Speed Average: 4.0 km/h at hour 23	Minimum Diurnal Speed Average: 1.4 km/h at hour 3	Hours of Missing Data: 0
Monthly Average Velocity: 2.4 km/h 137.8 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 4 Median = 7 Q <sub>3</sub> = 11 P <sub>90</sub> = 16 P <sub>99</sub> = 25	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	SE9	ESE3	SE6	SE11	SE13	SE11	SE12	SSE8	SE11	SE11	SE15	SE15	SE13	SE11	SE13	SE11	SE14	SE15	SE14	SE13	SE11	SE13	SE15	SE16	SE11.8	SE16	
2-Dec	SE14	SE12	SE16	SE15	SE14	SE13	SE14	SE14	SE11	SE9	SE12	SE17	SE15	SE17	SE13	ESE9	ESE9	W8	W16	W11	W14	W17WSW16	WSW17	SSE7.7	W17		
3-Dec	WSW13	WSW13	WSW14	WSW7	SW5	ESE3	SE8	SE13	SE11	NNW3	NNW1	NW6	NW6	NW5	NW6	NW6	NNW4	WNW5	NW4	NW3	WNW4	NW4	W4	WNW5	W3.0	WSW14	
4-Dec	NW4	NW5	WNW4	NW4	NW5	NNW4	WNW3	WNW3	WNW4	NNE2	N2	WSW5	S3	SE9	SE10	SE4	SW5	SSE1	SE6	ESE4	SE7	ESE5	SE8	ESE3	SSE0.8	SE10	
5-Dec	NW2	WNW2	NW2	WNW16	WNW20	W21	W18	W19	W23	W20	W17	W13	W16	W12	WSW7	SSW2	ESE2	NNW1	E2	ESE4	ESE5	N1	ENE1	NNW2	W8.0	W23	
6-Dec	WNW4	NW4	WNW5	WNW4	NW4	NNW5	NW4	WNW4	WNW5	NNW5	NW5	NNW4	NNW6	NW5	WSW1	WSW2	WSW2	SSE7	S6	WSW3	WNW1	SE11	SE12	SE11	W1.1	SE12	
7-Dec	ESE3	ENE2	SE5	SE8	SSE4	NNW0	W3	NW4	WNW5	WNW7	NW5	NW5	WNW4	NW4	NW5	NW4	NNW2	NNW1	ESE4	ESE3	SE9	SE10	SE5	NW4	SW0.2	SE10	
8-Dec	NNW9	NW9	NW7	NW6	NNW5	WSW2	SE1	N1	N2	ENE1	E1	SSW8	S5	SE5	SE9	SE9	SE7	ESE6	E9	E10	ENE5	NE3	E11	E9	E1.9	E11	
9-Dec	E8	E8	ENE8	NE4	ENE4	NNE5	NNW3	NE3	ENE6	E6	ESE14	ESE17	ESE5	NNE3	NNW5	NW2	NW3	NW3	NW5	NW4	SSW1	S3	SE1	E2	ENE3.0	ESE17	
10-Dec	WNW1	NNE1	NW4	NW4	NW5	NW4	NNW4	NNW5	NW4	NW5	NNW4	NW4	NW4	NNW6	WNW4	NNW5	WNW4	NNW4	NW3	NW5	WNW5	WNW5	WNW5	NW5	NW4.0	NNW6	
11-Dec	NW5	NW4	NW3	NW5	NW4	NW5	NW4	N3	ESE4	SE16	ESE18	ESE20	ESE13	SSE5	S6	SSE6	SE6	SE6	SE13	SE17	SE18	ESE17	SE13	SE11	SE6.3	ESE20	
12-Dec	SE14	SE14	SE14	SE18	ESE20	SE13	SE14	SE18	SE21	SE24	SE23	SE21	SE18	SE19	SE26	SE27	SE26	SE24	SE18	SE21	ESE19	ESE19	SE23	ESE22	SE19.7	SE27	
13-Dec	ESE18	ESE18	ESE18	SE18	ESE20	ESE21	ESE19	ESE19	ESE16	ESE17	ESE18	ESE16	ESE15	ESE10	N2	NW6	NNW4	NNW6	NW6	WNW5	NNW5	NNW5	WNW4	WNW3	ESE8.6	ESE21	
14-Dec	W2	SW1	NNW4	WNW4	NNW3	WNW8	WNW8	W8	W9	W8	W9	WNW5	W6	W6	WSW8	SW7	SW5	S3	SSE5	SSE8	SSE7	SSE8	SSE8	SSE12	SW3.5	SE12	
15-Dec	SSE10	SSE9	SSE12	SE12	SE14	SE15	SE14	SE13	SSE10	SE5	W2	WSW10	WSW19	WSW18	WSW10	SW6	WSW13	W7	WSW6	SE5	W16	NNW10	N10	N16	SSW4.5	WSW19	
16-Dec	N10	NNW5	N3	NNW1	NW3	WNW15	WNW13	W11	WNW5	WNW6	W8	W7	WSW11	WSW10	WSW10	S5	SW8	WSW11	WNW4	NNE2	NNW4	NNW5	WNW2	SSE0	W4.9	WNW15	
17-Dec	NNE1	NE1	N2	NW5	WNW6	NNW6	N6	NNE5	N5	NNW4	N5	NNW4	N4	NNW4	N6	N3	NW3	NNE7	NE5	NNE5	N5	N5	NNE6	NNE4	N3.9	NNE7	
18-Dec	NNE5	NNE4	N4	NNW3	NW3	N4	N2	SSE1	ENE6	NNE4	N4	WNW5	ESE3	SE9	E8	E7	ESE5	E4	ESE13	ESE12	ESE11	ESE2	NE6	NE6	ENE3.5	ESE13	
19-Dec	NW5	NW5	NW5	E4	ESE21	ESE16	ESE16	ESE13	ESE10	SE9	SE8	SE7	SE10	ESE5	SE6	SSE2	NNW3	NW3	NW6	NW4	NW5	E3	SE13	SE10	ESE4.8	ESE21	
20-Dec	SE10	SSE9	SE10	SE11	SE8	SE9	SE12	SE10	E2	NW2	N2	SSE6	SSE3	SSE3	SSE4	SE11	ESE18	SE19	SE23	SE23	SE18	SE15	SE22	SE19	SE10.7	SE23	
21-Dec	SE15	SE14	SE12	SSE10	SSE11	SE9	SE11	SE11	SE13	SE11	SE6	SE7	SE8	SE7	SSE4	SE1	E0	WNW2	WNW4	NNW6	NW5	NW4	NW6	NNW5	SE4.9	SE15	
22-Dec	NW6	NNW6	NNW6	NW7	NNW8	N11	NNW10	NNW10	NNW9	NNW11	NNW9	NNW8	NNW9	N10	NNW11	NNW11	N11	NNW9	NNW9	NNW9	NNW9	NNW8	NNW8	NNW9	NNW9	NNW8.8	NNW11
23-Dec	NNW9	NW8	NW8	NW9	NNW8	NW7	NW7	NNW7	N6	N8	N7	NNW8	NNW8	NNW8	N11	N10	N9	NNW7	NNW8	N9	N6	NNW7	NNW7	NNW6	NNW7.6	N11	
24-Dec	NNW8	NNW7	NNW5	NW5	NW7	NW6	NNW6	N7	N5	NNW5	N7	N7	N4	WNW4	WNW4	W3	NW1	NNE2	NNW2	NNW1	SE1	SE4	SE7	SE9	NNW2.8	SE9	
25-Dec	SE12	SE10	SE9	SE10	SE10	SE11	SE9	SE9	SE10	SE12	SE9	SE6	NE1	WNW2	NE2	NE1	NW5	NW4	NNW9	NNW9	NNW10	NNW7	N4	NW3	ESE3.0	SE12	
26-Dec	WNW2	NW2	NW2	NNW1	NNW1	NW3	WNW3	NW3	NW2	NW2	NW3	NNW3	NW3	NNW5	NNW4	NNW5	NNW4	NNW4	NNW4	NNW4	NNW4	NNW5	NW4	NNW5	NNW5	NNW3.2	NNW5
27-Dec	NNW5	NW5	NNE4	SE22	SE27	SE25	SE25	ESE24	SE27	SE30	SE26	SE24	SE19	SE17	SSE10	SSE8	SSE7	SSE11	SSE10	SE6	SE8	SE7	SE3	SE3	SE13.4	SE30	
28-Dec	SSE3	SE6	E1	NW7	NNW3	WNW7	NW8	NNW10	N10	NNW7	NW7	NNW7	NW8	NW8	NW7	NW7	NW6	NNW4	NNW2	NNW4	NNW3	NE2	SE6	SE9	NNW3.6	NNW10	
29-Dec	SE7	ESE7	E4	SE8	SE11	SE9	SE11	SE13	SE14	SE13	SE10	SSE8	SSW6	S5	SSE6	SE10	SE13	SE15	SE14	SE15	SE13	SE13	SE11	SE12	SE10.0	SE15	
30-Dec	SE11	SE9	WSW11	NNE3	WNW2	SE8	SE8	SE8	SE12	SE12	SE13	SE15	SE14	SE13	SE11	SSE6	SSE6	SE6	SE8	SE9	SE8	SE9	SE11	SE12	SE8.5	SE15	
31-Dec	SE14	SE11	SSE7	SE14	SE18	SE13	SE12	SE13	SE11	W12	WSW14	WSW21	SW18	SW14	SW16	SW15	SW18	WSW19	WSW21	WSW14	S7	SE11	SSE11	SE10	SSW9.4	WSW21	

ESE2.2	SE1.8	SE1.4	SE2.3	SE3.4	SE2.4	SE2.9	SE3.5	SE3.7	SE2.7	SE2.8	SSE3.2	S2.5	S2.1	SSE1.9	SSE1.7	SSE1.8	SSE1.6	SSE1.9	ESE2.4	SE1.9	SE2.5	SE4.0	ESE3.3	Diurnal Average	
ESE18	ESE18	ESE18	SE22	SE27	SE25	SE25	ESE24	SE27	SE30	SE26	SE24	SE19	SE19	SE26	SE27	SE26	SE24	SE23	SE23	ESE19	ESE19	SE23	ESE22	Diurnal Maximum	

All monthly, daily, and diurnal averages have been calculated using vector methods





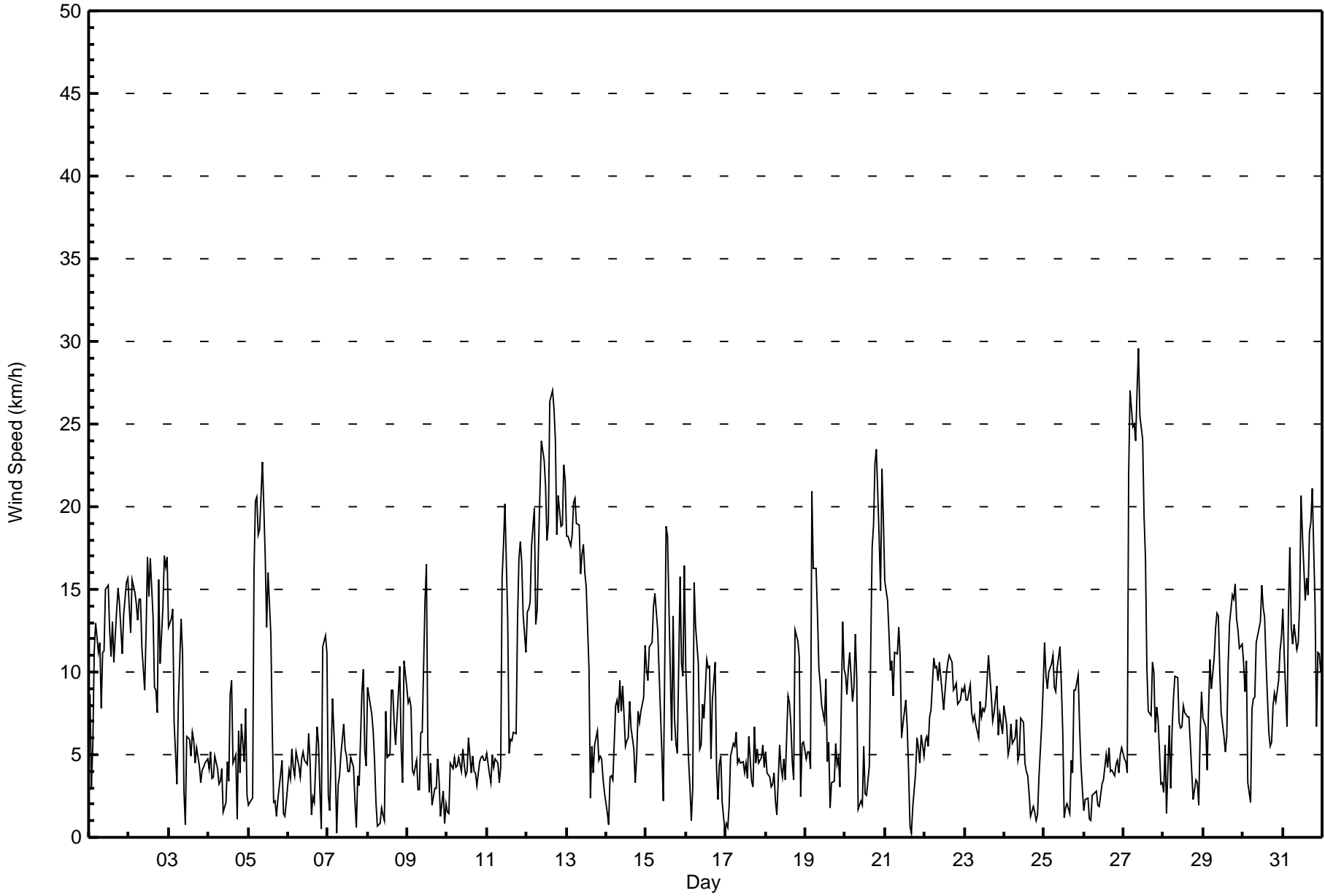
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed (WS) - km/h

Lower Camp - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744											
Maximum Value: 7 km/h on Dec 2 21:00														Hours of Data: 744											
Minimum Value: 0 km/h on Dec 18 07:00														Hours of Missing Data: 0											
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 5														Hours of Calibration: 0											
														Percent Operational Time: 100.0											
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	3	2	3	2	2	2	2	2	2	3	3	4	4	2	3	3	3	3	3	2	2	2	3	2	4
2-Dec	3	2	2	2	3	2	3	3	2	4	6	4	3	3	3	3	2	4	5	3	7	4	3	3	7
3-Dec	3	4	2	6	3	1	4	2	3	2	1	2	2	2	2	2	1	1	1	2	2	1	2	1	6
4-Dec	1	1	1	1	2	1	1	1	2	2	1	2	2	2	3	2	2	2	2	2	3	2	2	3	3
5-Dec	2	1	2	6	5	5	4	4	4	5	4	3	4	3	3	1	1	1	1	2	1	1	1	1	6
6-Dec	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1	3	2	2	1	3	2	2	3
7-Dec	2	1	5	3	2	2	2	2	2	2	2	2	2	2	1	1	1	1	2	2	4	3	2	2	5
8-Dec	2	2	1	1	1	2	1	1	1	1	1	3	2	2	3	3	3	2	3	2	2	2	3	2	3
9-Dec	1	1	2	1	2	1	2	3	2	3	3	4	2	1	1	2	1	1	1	1	1	1	1	1	4
10-Dec	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	3
11-Dec	1	1	1	1	1	1	1	1	4	4	4	4	5	2	3	2	2	2	5	4	4	3	3	3	5
12-Dec	3	3	3	4	4	4	3	4	4	5	5	4	5	6	5	4	4	4	4	4	4	4	3	3	6
13-Dec	3	3	2	3	3	3	3	3	3	3	3	3	3	3	1	1	2	1	1	1	1	2	1	1	3
14-Dec	1	1	1	1	2	3	2	3	2	2	2	2	2	2	1	2	2	1	2	2	2	2	2	3	3
15-Dec	3	2	3	2	3	3	3	3	3	3	2	3	4	4	3	6	3	3	3	2	3	3	4	4	6
16-Dec	3	2	2	1	3	4	3	3	2	2	2	3	2	2	3	1	4	3	1	1	1	1	1	1	4
17-Dec	1	1	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	2	1	1	3
18-Dec	1	1	1	1	1	1	0	1	2	2	1	1	4	2	2	2	3	2	2	2	3	2	1	2	4
19-Dec	2	2	1	6	3	3	2	3	3	3	2	2	2	2	2	1	1	2	2	2	2	4	4	3	6
20-Dec	2	2	2	2	2	3	2	3	1	1	1	2	2	1	2	5	3	4	4	4	5	5	4	5	5
21-Dec	4	4	4	3	4	2	3	3	2	2	3	1	1	1	1	1	1	2	1	2	1	1	2	1	4
22-Dec	1	1	1	2	2	3	2	3	2	2	2	2	2	2	3	2	3	2	3	2	2	2	2	2	3
23-Dec	3	1	2	2	2	1	2	2	1	2	1	2	2	2	2	2	2	1	2	2	1	2	2	1	3
24-Dec	2	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	2	2	4	4
25-Dec	2	2	2	2	3	2	2	2	2	2	1	2	1	1	1	1	1	1	2	2	2	2	1	2	3
26-Dec	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2
27-Dec	2	1	5	3	4	4	4	4	5	5	5	5	5	4	4	4	3	3	3	2	2	2	2	2	5
28-Dec	1	2	1	3	2	2	2	2	2	2	1	1	2	1	2	1	1	1	2	1	1	1	4	1	4
29-Dec	2	1	2	3	3	2	1	2	2	2	2	2	2	2	2	2	1	2	2	2	2	3	2	2	3
30-Dec	2	3	6	2	2	2	2	2	2	2	2	2	3	2	2	2	2	1	1	1	1	2	2	3	6
31-Dec	2	4	4	3	2	3	3	2	3	4	4	3	3	3	4	3	3	3	3	6	3	2	4	2	6
														Diurnal Maximum											





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Lower Camp - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	296	39.78	39.78
6 - 11	272	36.56	76.34
12 - 19	142	19.09	95.43
20 - 28	33	4.44	99.87
29 - 38	1	0.13	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Lower Camp - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	22	15	9	5	10	18	12	12	6	2	4	6	5	39	72	59	296
6 - 11	18	2	2	3	9	8	92	25	3	2	3	11	12	6	29	47	272
12 - 19	1	0	0	0	0	24	84	3	0	0	5	12	10	3	0	0	142
20 - 28	0	0	0	0	0	7	20	0	0	0	0	2	3	1	0	0	33
29 - 38	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	41	17	11	8	19	57	209	40	9	4	12	31	30	49	101	106	744

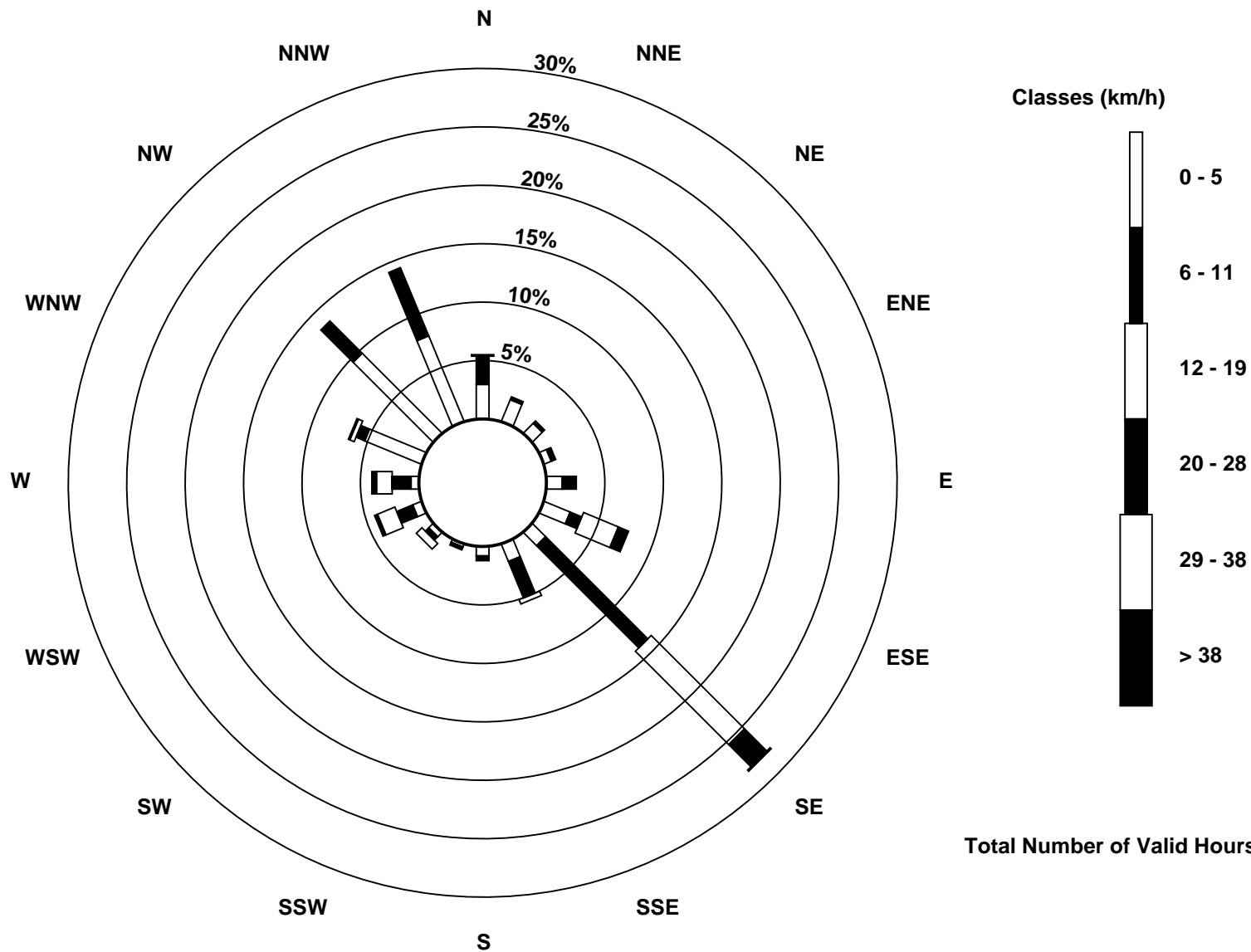
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
Lower Camp (AMS 11)



Total Number of Valid Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Wind Direction (WD) - deg  
Lower Camp - December 2015**

Direction of Maximum Speed: 130 deg on Dec 27 10:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 128.5 deg on Dec 12		Hours of Data:	744
Direction of Minimum Speed: 319 deg on Dec 7 06:00		Hours of Missing Data:	0
Direction of Minimum Daily Speed Average: 0.2 deg on Dec 7		Percent Operational Time:	100.0
Monthly Average Direction: 313.9 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	138	110	125	139	140	141	139	149	142	141	136	136	134	133	132	126	134	136	139	139	146	140	140	137	137.3
2-Dec	143	144	138	135	137	136	134	127	134	141	129	134	133	133	130	121	123	262	268	268	261	260	249	253	159.2
3-Dec	255	256	245	251	224	122	133	133	136	329	341	326	323	319	310	312	328	291	322	324	284	307	273	294	269.8
4-Dec	305	312	294	304	317	330	293	297	297	33	349	242	188	142	141	138	231	147	125	106	125	108	132	113	164.2
5-Dec	318	288	314	301	293	278	273	270	264	265	266	261	262	270	256	210	102	326	93	102	118	5	60	332	273.6
6-Dec	296	305	296	298	316	330	311	283	301	327	320	327	331	324	242	256	250	164	173	243	284	142	138	130	273.8
7-Dec	110	66	129	143	149	319	273	310	302	303	306	304	287	318	307	316	329	342	116	115	138	137	138	325	229.0
8-Dec	333	316	324	313	328	250	144	359	350	57	98	212	172	142	132	138	142	118	101	92	70	46	101	100	98.1
9-Dec	89	81	78	34	75	33	327	55	76	90	111	122	110	15	346	309	322	320	314	311	192	170	126	101	78.2
10-Dec	293	12	316	305	322	312	333	347	324	326	340	321	325	344	289	337	295	334	325	325	302	302	303	319	321.1
11-Dec	305	307	322	314	309	310	317	350	104	126	120	122	121	152	174	168	134	140	133	128	124	123	124	128	126.7
12-Dec	127	130	128	128	123	131	138	134	132	130	132	132	142	139	125	126	125	126	130	124	123	122	125	119	128.5
13-Dec	114	119	120	127	122	119	119	119	118	120	118	113	115	116	4	324	330	346	307	298	340	339	293	285	114.1
14-Dec	277	225	343	301	338	293	289	278	264	276	260	282	260	260	240	217	219	190	149	152	158	165	153	152	235.6
15-Dec	153	150	154	140	144	144	146	138	149	146	275	256	250	246	246	224	244	264	242	142	259	327	352	2	201.8
16-Dec	5	336	7	336	309	300	294	261	290	294	273	259	247	251	246	176	214	243	285	18	336	337	289	151	279.3
17-Dec	22	36	5	308	299	329	352	16	7	338	359	340	352	332	2	353	315	26	51	14	356	5	25	28	356.6
18-Dec	14	19	3	337	313	4	6	148	64	27	358	302	122	128	96	82	104	89	103	106	106	107	46	56	73.4
19-Dec	322	326	324	94	114	116	121	122	114	138	143	130	128	111	133	165	338	316	304	319	320	89	134	132	118.0
20-Dec	142	154	143	139	128	136	140	138	100	304	10	148	156	159	152	125	121	126	125	128	127	132	125	131	131.6
21-Dec	139	142	145	162	155	142	136	140	140	136	133	140	139	141	149	142	79	293	299	329	324	324	323	328	142.7
22-Dec	322	330	330	320	334	352	348	343	343	341	341	345	345	349	335	332	351	341	338	343	331	336	337	338	339.5
23-Dec	343	324	323	321	333	326	315	332	349	351	353	346	341	347	1	356	351	329	345	6	349	339	343	329	341.1
24-Dec	333	330	332	326	305	321	336	357	4	345	352	355	351	301	287	261	322	22	348	346	135	124	128	145	340.1
25-Dec	131	132	134	128	126	128	138	133	134	132	132	135	49	290	35	54	326	323	327	328	323	340	5	317	116.0
26-Dec	299	311	306	338	339	321	293	325	314	326	305	328	323	347	334	337	342	341	335	339	332	324	344	332	329.4
27-Dec	331	324	15	126	126	130	132	118	129	130	126	129	138	134	157	161	156	161	157	143	142	145	131	134	132.5
28-Dec	149	131	85	320	336	303	315	347	353	330	309	337	322	317	316	320	317	344	337	340	331	43	136	136	331.7
29-Dec	124	120	94	128	140	138	137	138	137	140	143	159	203	181	155	141	138	140	141	139	135	137	139	139	140.0
30-Dec	140	144	240	20	297	135	133	132	137	139	139	137	135	139	136	152	148	139	133	132	135	139	136	140	140.1
31-Dec	140	143	147	139	139	144	140	137	144	259	251	238	231	228	224	233	234	237	241	237	187	139	147	144	196.0

121.4	129.5	134.8	134.0	130.1	130.8	138.6	128.0	129.7	133.1	133.7	152.0	172.3	172.8	166.7	150.4	161.9	163.9	148.7	117.4	135.0	124.6	125.7	123.2
Diurnal Average																							

All monthly, daily, and diurnal averages have been calculated using vector methods

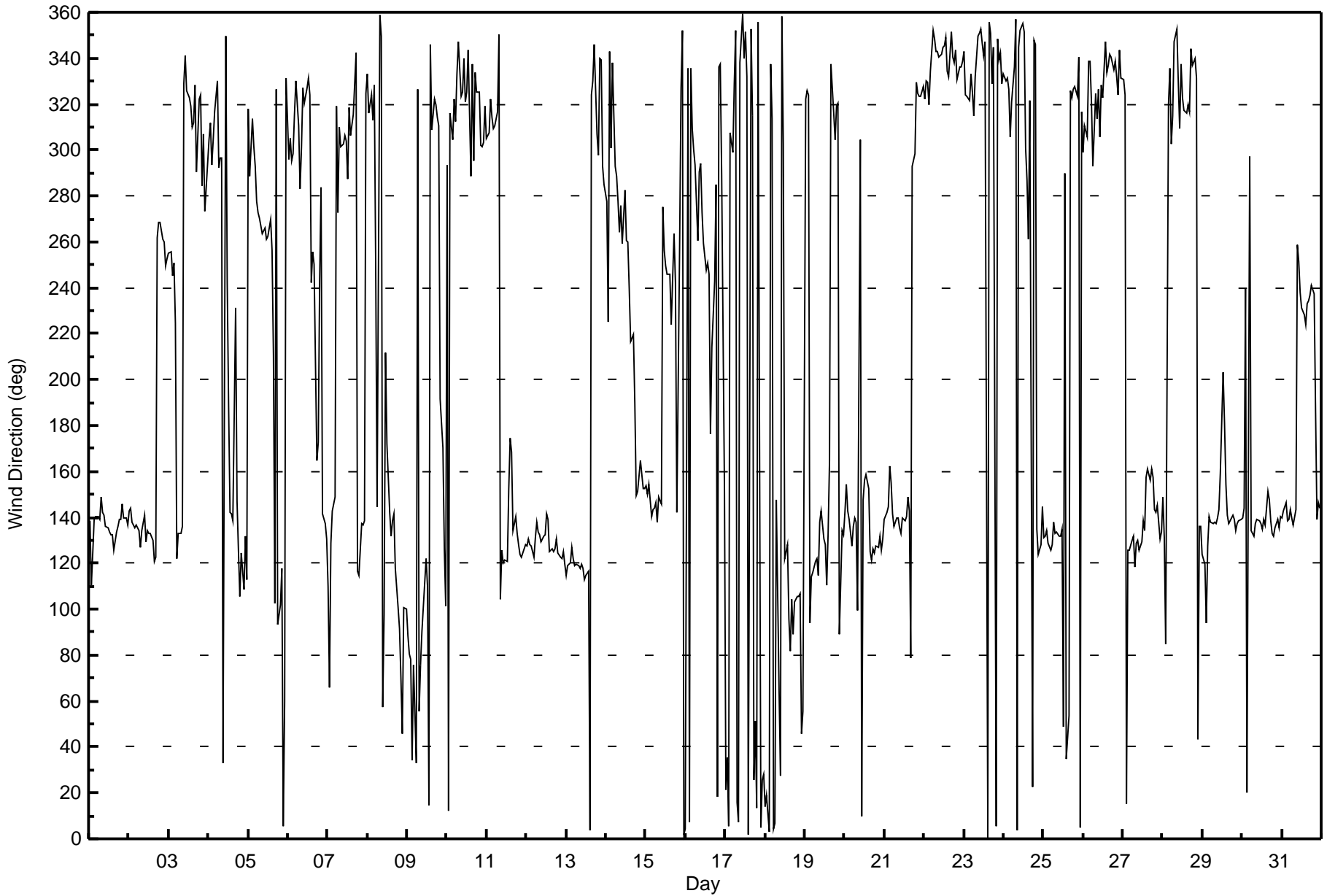


**Wood Buffalo Environmental Association**

**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg  
Lower Camp - December 2015**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 98 deg on Dec 30 05:00		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																							
Minimum Value: 5 deg on Dec 29 07:00																									
Percentiles: P <sub>1</sub> = 7 P <sub>10</sub> = 9 Q <sub>1</sub> = 13 Median = 19 Q <sub>3</sub> = 31 P <sub>90</sub> = 53 P <sub>99</sub> = 88																									
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	13	45	31	12	10	12	9	17	13	12	8	9	10	13	13	19	10	8	11	10	13	11	11	8	45
2-Dec	13	14	8	9	9	8	10	14	12	30	9	10	9	8	8	16	10	74	12	13	12	11	9	11	74
3-Dec	12	11	9	63	42	39	35	8	11	61	79	23	28	30	26	24	23	25	36	43	26	28	36	23	79
4-Dec	19	16	26	23	29	21	33	45	41	53	40	29	34	14	13	43	31	80	13	77	33	44	30	98	98
5-Dec	68	57	52	12	14	11	11	11	11	11	12	13	14	12	24	65	52	76	48	41	20	66	79	48	79
6-Dec	27	38	17	27	31	15	18	21	30	30	41	35	30	44	89	67	56	29	40	48	94	11	10	16	94
7-Dec	78	63	81	15	30	98	46	48	35	21	31	29	43	36	27	27	53	77	61	48	17	15	17	41	98
8-Dec	18	13	16	19	33	54	79	78	38	36	75	29	33	39	19	20	27	32	26	15	27	73	10	11	79
9-Dec	10	13	13	43	83	27	74	79	21	30	9	10	14	49	23	41	23	15	13	13	63	29	66	50	83
10-Dec	43	90	14	17	12	29	19	18	26	26	21	27	25	19	40	25	14	17	25	23	19	14	29	25	90
11-Dec	23	25	39	23	23	20	22	47	82	13	9	10	16	29	32	30	19	24	19	11	11	11	13	14	82
12-Dec	12	13	12	11	10	18	15	13	12	11	11	12	16	18	10	8	8	10	14	10	10	11	8	8	18
13-Dec	8	8	8	9	7	8	9	10	8	8	9	7	9	15	58	18	49	16	15	25	25	38	23	28	58
14-Dec	72	74	34	18	38	29	15	25	16	17	14	27	29	36	12	17	21	27	14	15	18	20	19	19	74
15-Dec	16	16	18	12	13	14	18	16	17	24	89	18	11	9	55	49	14	38	45	48	12	32	21	17	89
16-Dec	13	28	39	51	53	11	19	13	33	29	22	21	11	13	19	21	26	16	29	56	21	21	41	82	82
17-Dec	21	90	45	26	50	19	16	25	10	24	16	23	23	47	14	54	35	32	42	19	20	28	21	18	90
18-Dec	14	16	20	32	21	26	45	67	19	29	16	13	88	13	15	26	60	50	8	9	12	65	30	50	88
19-Dec	48	32	26	78	8	11	10	13	15	23	20	19	14	45	26	83	41	61	32	34	28	79	19	21	83
20-Dec	10	16	11	9	23	27	13	23	82	47	81	40	83	45	38	19	9	11	8	9	15	19	9	13	83
21-Dec	17	16	20	26	26	18	12	12	8	7	29	9	7	9	19	76	81	37	23	33	24	37	25	34	81
22-Dec	18	19	24	13	19	16	18	18	18	17	19	18	18	17	17	15	20	18	18	19	15	17	17	20	24
23-Dec	19	16	15	15	19	16	13	19	19	16	16	17	18	19	14	14	16	14	18	14	19	18	19	16	19
24-Dec	15	14	17	13	13	13	17	20	21	23	18	16	30	16	24	26	30	35	39	25	73	36	19	21	73
25-Dec	11	13	13	11	10	11	9	12	10	8	8	9	61	61	26	54	27	23	13	14	14	17	29	53	61
26-Dec	80	50	52	56	34	29	31	34	49	48	34	28	20	18	20	18	17	35	29	25	25	29	27	36	80
27-Dec	26	26	62	7	7	8	8	8	9	9	10	12	16	15	30	30	27	19	20	21	19	18	54	57	62
28-Dec	47	28	74	24	64	18	17	19	16	17	13	19	17	16	22	13	11	22	55	29	21	60	18	8	74
29-Dec	11	12	39	17	8	8	5	6	6	6	10	22	23	25	17	9	6	7	8	7	6	9	9	9	39
30-Dec	10	39	49	66	98	24	8	14	9	8	8	9	9	7	13	47	28	15	8	6	8	8	8	21	98
31-Dec	8	18	43	7	7	11	10	7	15	21	13	8	9	12	12	12	9	9	9	32	47	12	28	14	47
	80	90	81	78	98	98	79	79	82	61	89	40	88	61	89	83	81	80	61	77	94	79	79	98	
	Diurnal Maximum																								







# Wood Buffalo Environmental Association

## SO2 Calibration Report

### Station Information

Calibration Date	December 7, 2015	Last Calibration	November 4, 2015
Station Name	Lower Camp	Station Number	AMS 11
Reason:	Routine		
Start Time (MST)	12:40	End Time (MST)	15:50
Gas Cert Reference	LL110099	Station temp.	20 Deg C
Cal Gas Concentration	51.3 ppm	Cal Gas Exp Date	25/03/2016
Calibrator Make/Model	Sabio 4010	Serial Number	11051107
ZAG Make/Model	API 701	Serial Number	3411
DACS make/model	Campbell Scientific CR3000	DACS serial No.	3492

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-675	-675
Analyzer IP address	192.168.1.43		Lamp voltage	801	801
Calculated slope	0.998510	1.008953	Chamber temp	44.9	44.9
Calculated intercept	1.734116	0.976944	Pressure	708.7	696.9
Analyzer Background	11.1	11.2	Flow	0.485	0.473
Analyzer Coefficient	1.013	1.013	Intensity	90	90
Analyzer make	TEI 43i		Analyzer serial #	100841398	

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.1	----
as found span	5000	80.9	830.0	824.0	1.007
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	80.9	830.0	822.4	1.009
second point	5000	40.9	419.6	413.8	1.014
third point	5000	20.5	210.3	206.8	1.017
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	80.9	830.0	821.8	1.010
Average Correction Factor					1.013

Corrected As found      824.1      Previous response      829.5      % change      0.7%

**Notes:**

Changed inlet filter after as founds. Relatively heavy loading on filter. No adjustments.

Calibration Performed By:

Evan Magill



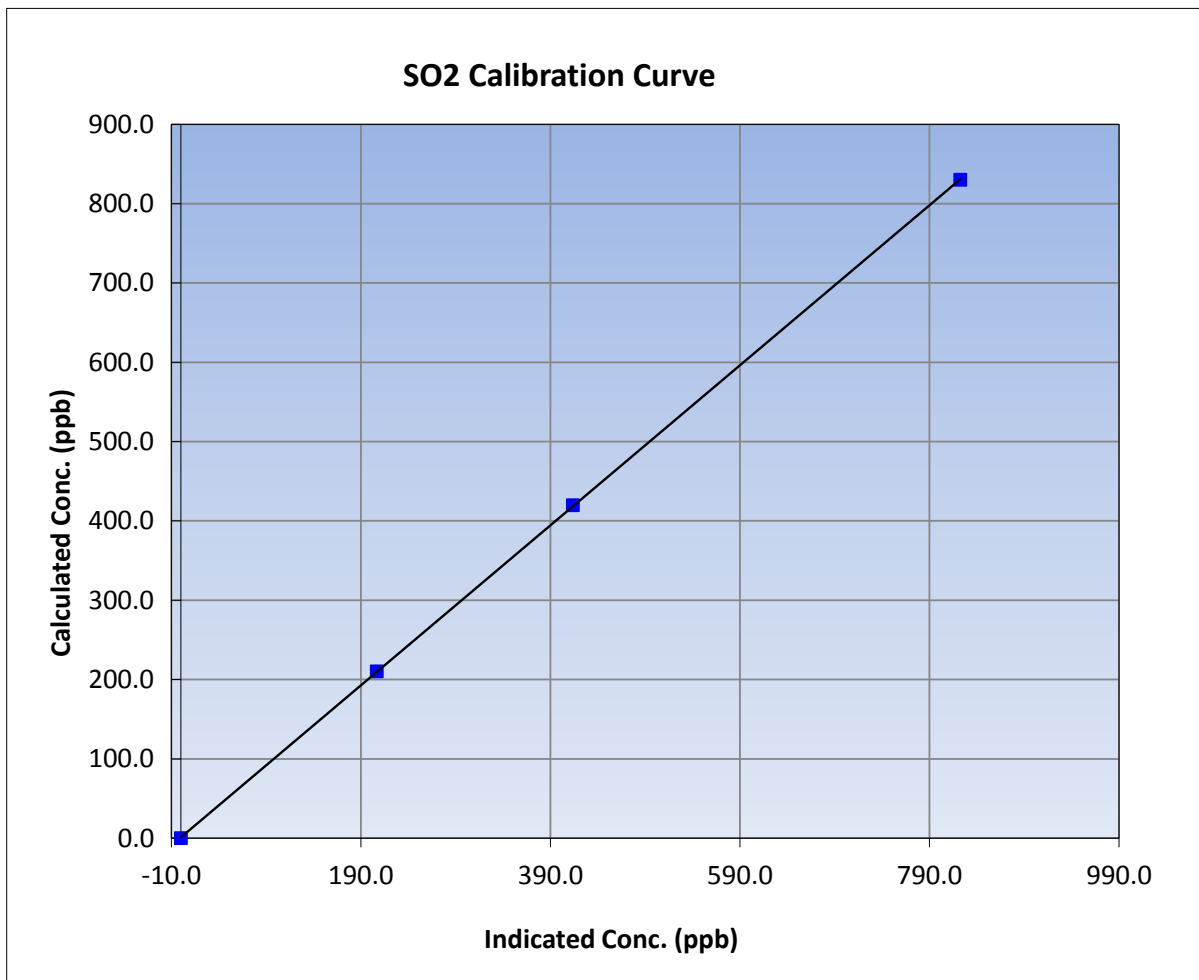
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 4, 2015
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	12:40	End Time (MST)	15:50
Analyzer make	TEI 43i	Analyzer serial #	100841398

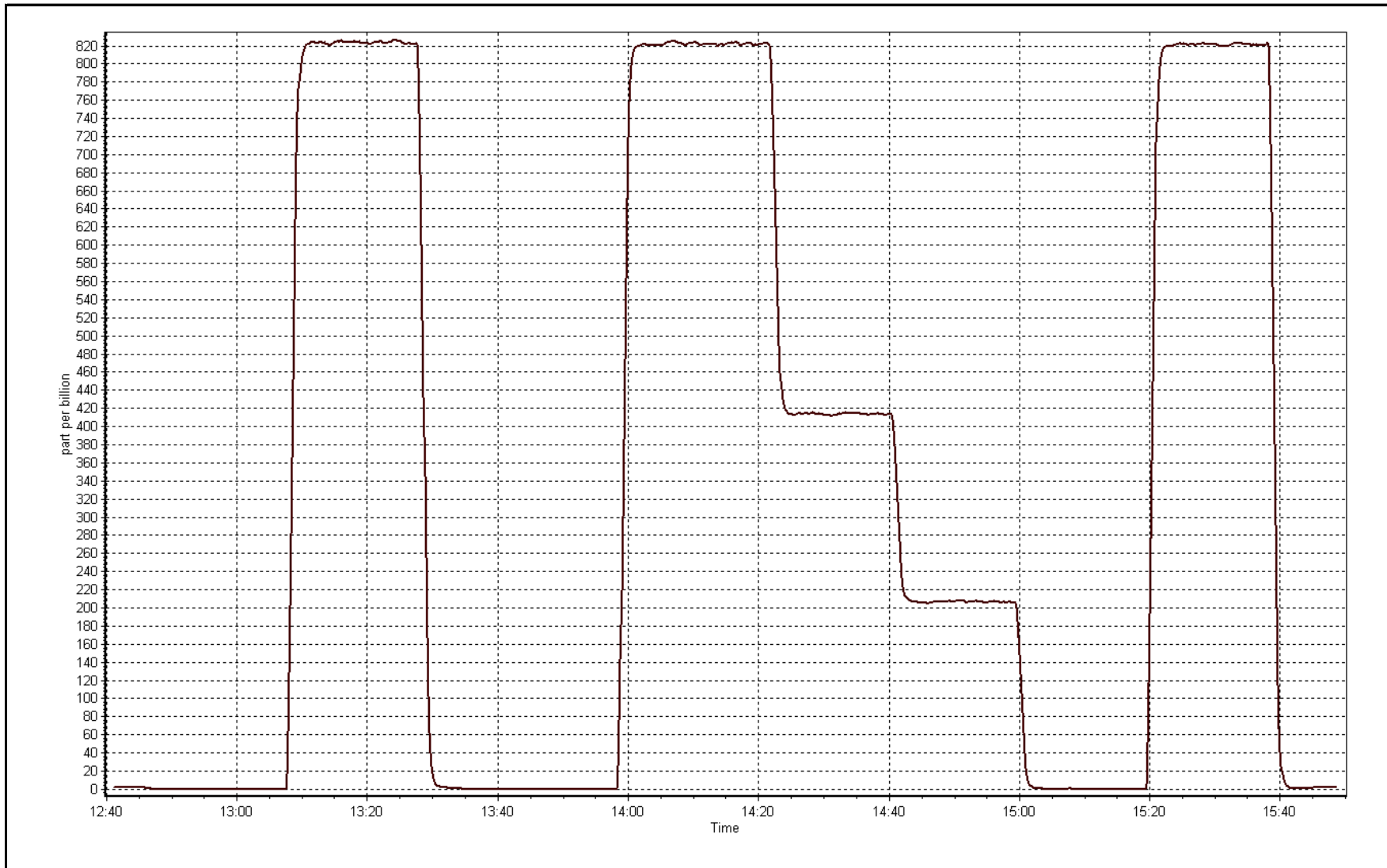
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999991
830.0	822.4	1.0092		
419.6	413.8	1.0140	Slope	1.008953
210.3	206.8	1.0171		
			Intercept	0.976944



SO2 Calibration Plot

Date: December 7, 2015





# Wood Buffalo Environmental Association H2S Calibration Report

## Station Information

Calibration Date	December 8, 2015	Last Calibration	November 4, 2015
Station Name	Lower Camp	Station Number	AMS 11
Reason:	Routine		
Start Time (MST)	12:10	End Time (MST)	14:55
Gas Cert Reference	ALM061435	Station temp.	22 Deg C
Cal Gas Concentration	5.15 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	Sabio 4010	Serial Number	11051107
ZAG air Make/Model	API 701	Serial Number	3411
DACS make/model	Campbell Scientific CR3000	Serial Number	3492
SO2 gas concentration	51.4 ppm	SO2 gas cert/exp	LL110099 25/03/2016

## Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-670	-670
Analyzer IP address	192.168.1.42		Lamp voltage	788	792
Calculated slope	1.000725	0.999813	Chamber temp	45.0	44.9
Calculated intercept	-0.216357	-0.238634	Pressure	590.5	586.3
Analyzer Background	9.8	9.8	Flow	1.041	1.036
Analyzer Coefficient	1.221	1.221	Intensity	91	91
			Converter temp.	322	325

Analyzer make/model	Thermo 450i	Analyzer serial #	1410661328
Converter make/model	NA	Converter serial #	NA

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.1	----
as found span	5000	72.8	75.0	75.1	0.999
SO2 scrubber check	5000	20.5	210.7	1.9	----
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	72.8	75.0	75.1	0.999
second point	5000	38.8	40.0	40.5	0.986
third point	5000	19.4	20.0	20.2	0.987
as left zero	5000	0.0	0.0	0.3	----
as left span	5000	72.8	75.0	74.4	1.007
Average Correction Factor					0.991

Corrected As found	75.0	Previous response	75.1	% change	0.2%
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**Notes:**

Changed inlet filter and scrubber check done after as founds, relatively heavy loading on the filter. No adjustments.

Calibration Performed By: Evan Magill



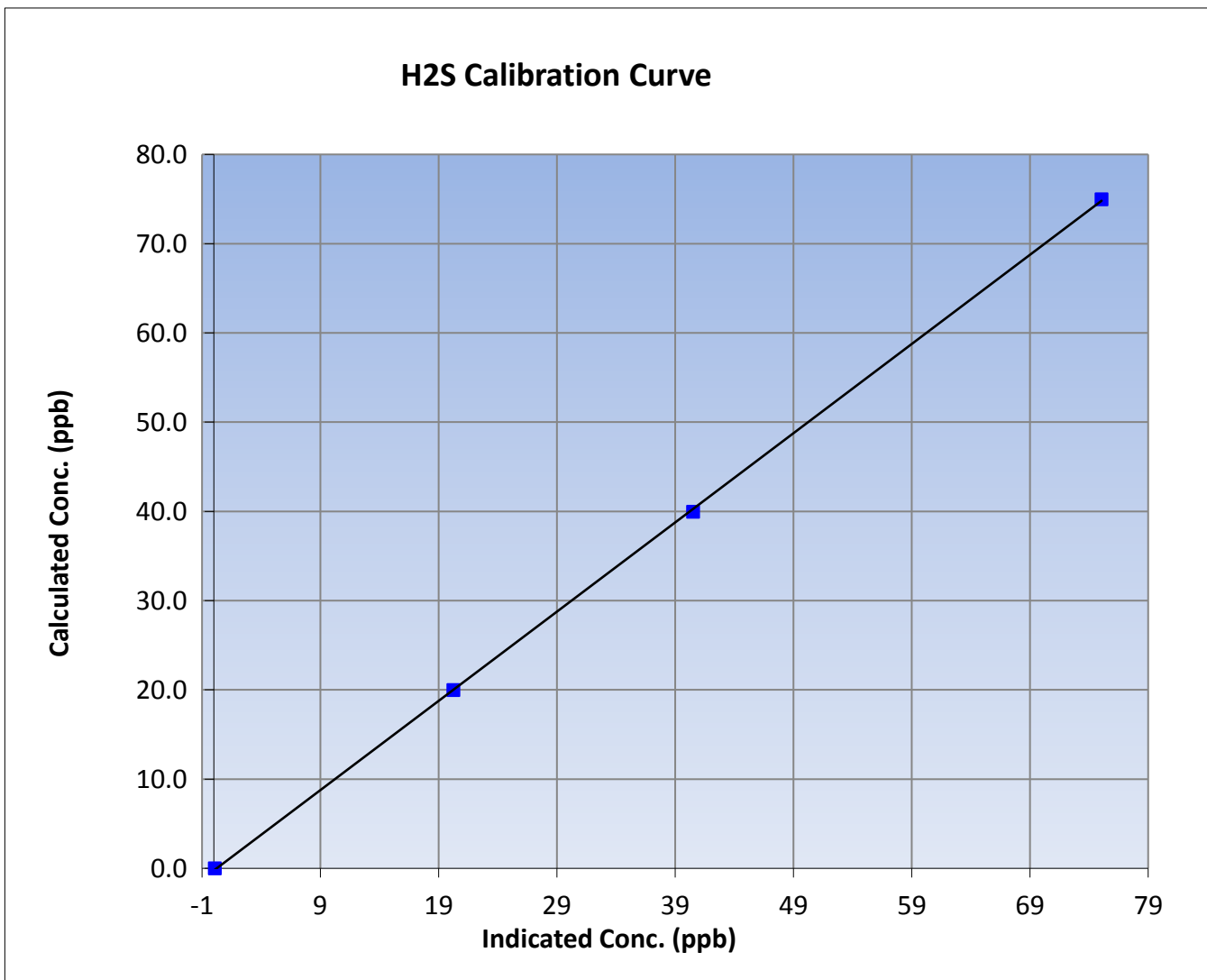
# Wood Buffalo Environmental Association H2S Calibration Report

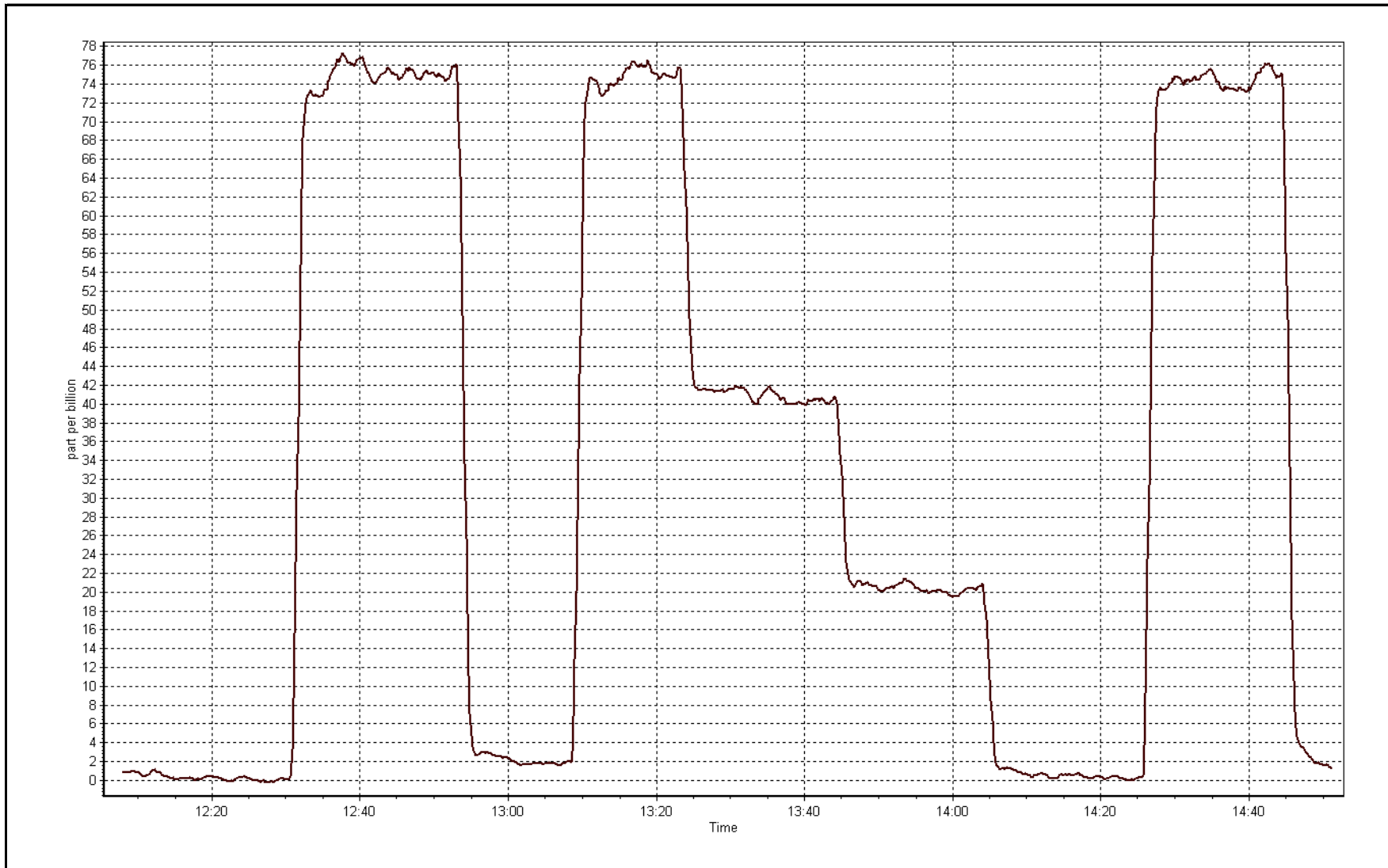
## Station Information

Calibration Date	December 8, 2015	Previous Calibration	November 4, 2015
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	12:10	End Time (MST)	14:55
Analyzer make	Thermo 450i	Analyzer serial #	1410661328

## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999948
75.0	75.1	0.9990		
40.0	40.5	0.9860	Slope	0.999813
20.0	20.2	0.9873		
			Intercept	-0.238634







# Wood Buffalo Environmental Association THC Calibration Report

### Station Information

Calibration Date	December-07-15	Last Calibration	November-04-15
Station Name	Lower Camp	Station Number	AMS 11
Reason:	Routine		
Start Time (MST)	12:40	End Time (MST)	15:50
Gas Cert Reference	LL110099	Cal Gas Expiry Date	25/03/2016
CH4 Cal Gas Conc.	515 ppm	CH4 Equiv Conc.	1070.5 ppm
C3H8 Cal Gas Conc.	202 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11051107
ZAG make/model	Teledyne API 701	Serial Number	3411
DACS make/model	Campbell Scientific CR3000	Serial Number	3492

### Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	8.5	8.5
Analyzer IP address	192.168.1.51		Air or Bypass Press	37.3	37.3
Calculated slope	1.000947	0.999566	Fuel Pressure	24.0	24.0
Calculated intercept	-0.010605	-0.005084	Analyzer Coeff	4.299	4.399
			Analyzer BKG	6.32	6.28

Analyzer make	51i-LT	Analyzer serial #	1410661326
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### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.15	----
as found span	5000	80.9	17.32	16.80	1.031
calibrator zero	5000	0.0	0.00	0.05	----
high point	5000	80.9	17.32	17.35	0.998
second point	5000	40.9	8.76	8.76	1.000
third point	5000	20.5	4.39	4.34	1.011
as left zero	5000	0.0	0.00	0.01	----
as left span	5000	80.9	17.32	17.32	1.000
Average Correction Factor					1.003

Corrected As found	16.95	Previous response	17.31	% change	2.2%
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**Notes:**

Changed inlet filter after as founds, heavy loading on filter. Adjusted zero and span.

Calibration Performed By:

Evan Magill



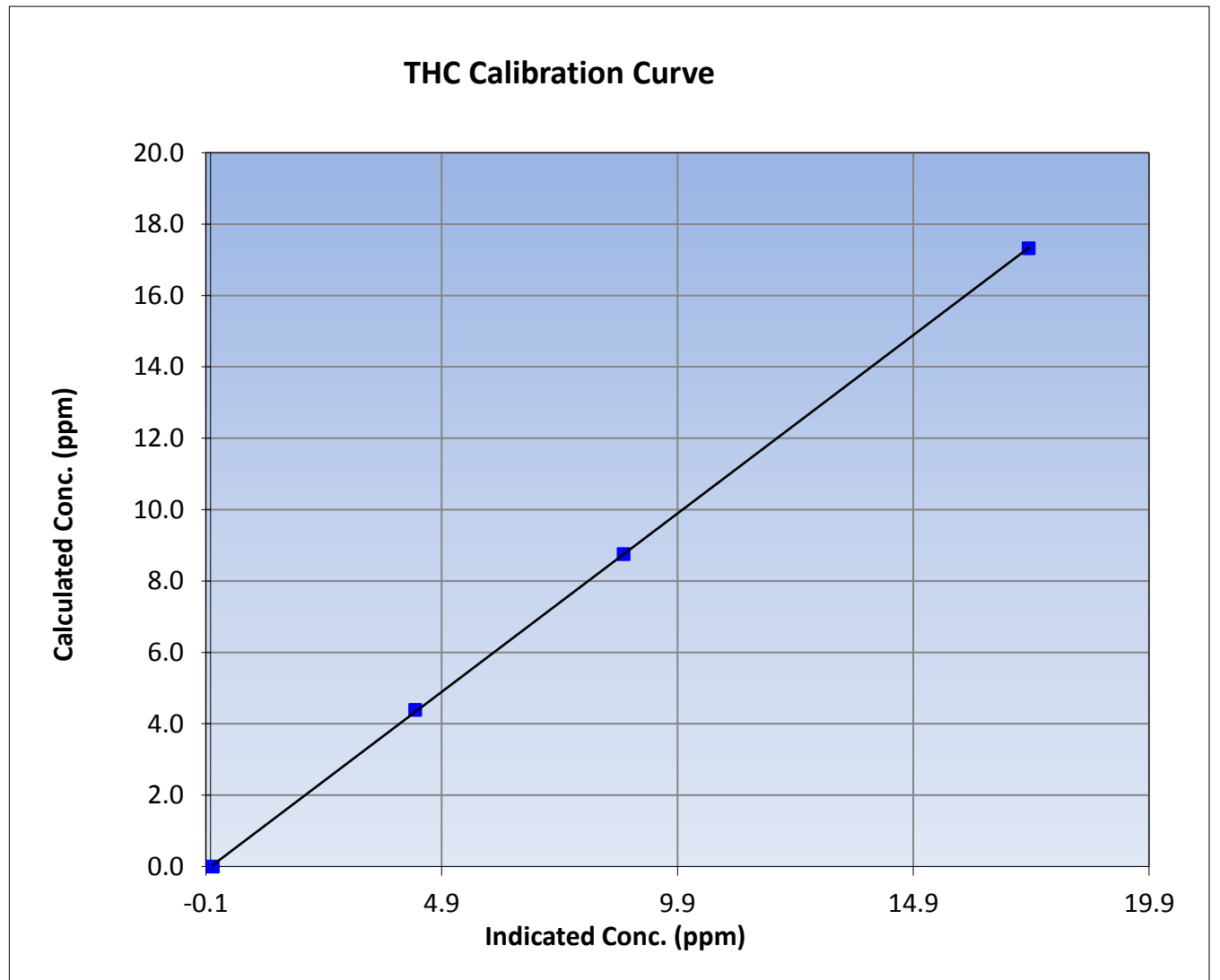
# Wood Buffalo Environmental Association THC Calibration Report

## Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 4, 2015
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	12:40	End Time (MST)	15:50
Analyzer make	51i-LT	Analyzer serial #	1410661326

## Calibration Data

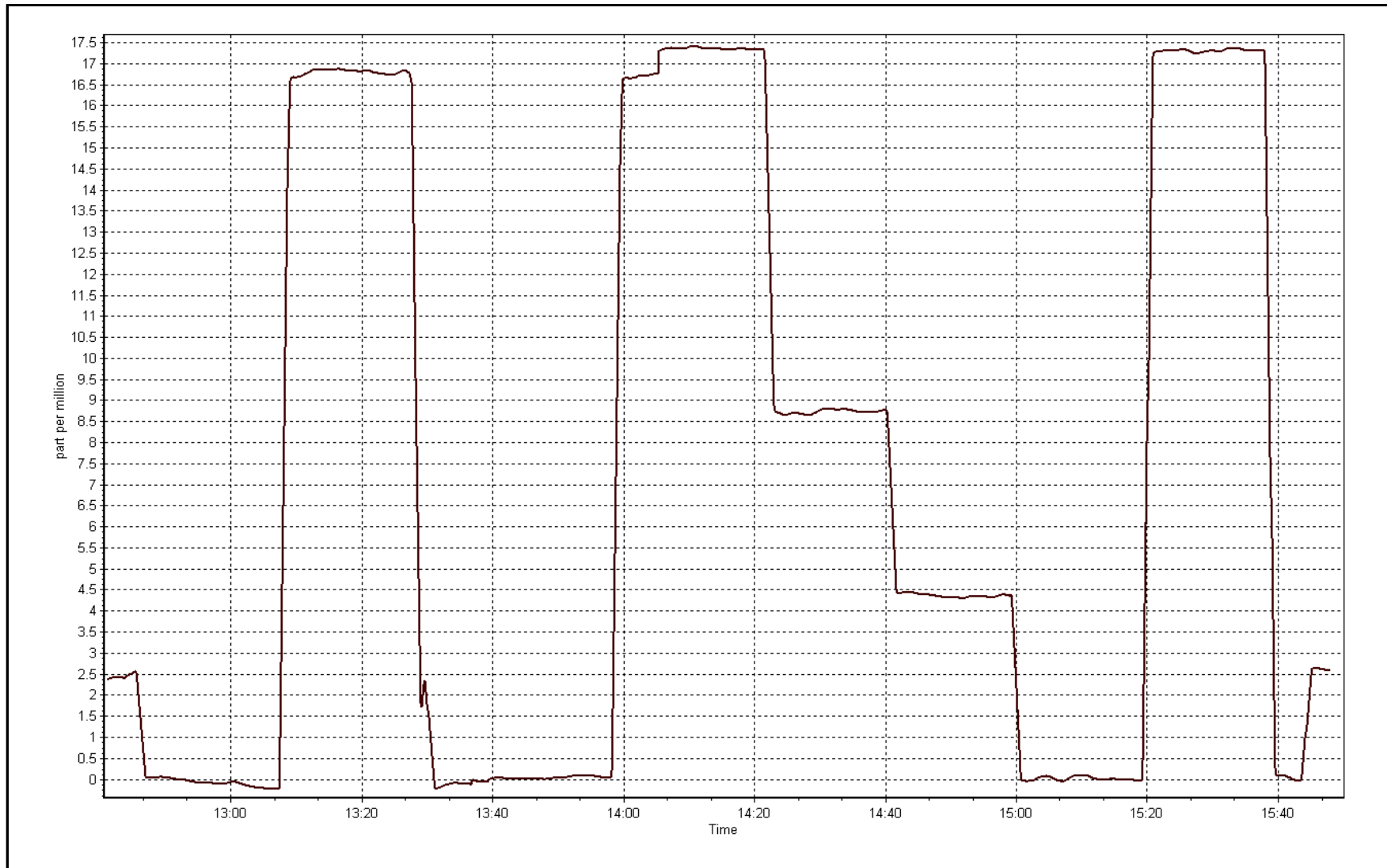
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.05	----	Correlation Coefficient	0.999967
17.32	17.35	0.9983		
8.76	8.76	0.9996	Slope	0.999566
4.39	4.34	1.0113		
			Intercept	-0.005084





THC Calibration Plot

Date: December 7, 2015





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## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 13**  
**FORT MCKAY SOUTH**  
**DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY SOUTH (AMS 13)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	708	36	36	100.00	8	0	3	0
TRS(ppb) Average	709	34	35	99.87	2	0	1	0
THC(ppm) Average	708	36	36	100.00	4.5	-	3.1	-
O3(ppb) Average	709	34	35	99.87	33	0	19	-
NO2(ppb) Average	708	36	36	100.00	30	0	16	-
NO(ppb) Average	708	36	36	100.00	72	-	34	-
NOX(ppb) Average	708	36	36	100.00	99	-	49	-
PM2.5(ug/m3) Average	743	1	1	100.00	47.4	-	10	0
ET(C) Average	744	0	0	100.00	3.3	-	-2.7	-
RH(%) Average	744	0	0	100.00	95	-	93	-
WS(km/h) Average	719	0	25	96.64	9	-	6	-
WD(deg) Average	719	0	25	96.64	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY SOUTH (AMS 13)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2(ppb) Average	708	0.4	1	-	0	0	0	0	0	1	8
TRS(ppb) Average	709	0.3	0	-	0	0	0	0	0	0	2
THC(ppm) Average	708	2.45	0.3	-	2	2.2	2.2	2.4	2.6	2.8	4.5
O3(ppb) Average	709	9.3	8	-	0	1	2	7	15	21	33
NO2(ppb) Average	708	9.5	6	-	0	2	5	9	14	17	30
NO(ppb) Average	708	5.8	11	-	0	0	0	1	6	19	72
NOX(ppb) Average	708	15.3	15	-	0	2	5	11	20	35	99
PM2.5(ug/m3) Average	743	4.61	3.8	-	0.6	1.5	2.4	3.9	5.8	8.3	47.4
Temperature 2 m (C) Average	744	-12.27	6.7	-	-29.6	-20.3	-17.2	-13.4	-5.6	-4.3	3.3
Relative Humidity (%) Average	744	84.6	6	-	60	78	81	84	89	93	95
Wind Speed 10 m (km/h) Average	719	3.2	2	-	0	1	2	3	5	6	9
Wind Direction 10 m (deg) Average	719	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION -FORT McKAY SOUTH (AMS 13)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
TRS, O3	07 Dec 2015 12:00	07 Dec 2015 12:00	1	Maintenance - cleaned glass manifold
Wind Speed, Wind Direction	06 Dec 2015 04:00	06 Dec 2015 04:00	1	Analyzer Failure
Wind Speed, Wind Direction	06 Dec 2015 07:00	06 Dec 2015 08:00	2	Analyzer Failure
Wind Speed, Wind Direction	09 Dec 2015 23:00	09 Dec 2015 23:00	1	Analyzer Failure
Wind Speed, Wind Direction	14 Dec 2015 01:00	14 Dec 2015 01:00	1	Analyzer Failure
Wind Speed, Wind Direction	17 Dec 2015 16:00	17 Dec 2015 17:00	2	Analyzer Failure
Wind Speed, Wind Direction	19 Dec 2015 10:00	19 Dec 2015 11:00	2	Analyzer Failure
Wind Speed, Wind Direction	19 Dec 2015 20:00	19 Dec 2015 20:00	1	Analyzer Failure
Wind Speed, Wind Direction	20 Dec 2015 08:00	20 Dec 2015 10:00	3	Analyzer Failure
Wind Speed, Wind Direction	20 Dec 2015 13:00	20 Dec 2015 13:00	1	Analyzer Failure
Wind Speed, Wind Direction	24 Dec 2015 16:00	24 Dec 2015 19:00	4	Analyzer Failure
Wind Speed, Wind Direction	25 Dec 2015 01:00	25 Dec 2015 01:00	1	Analyzer Failure
Wind Speed, Wind Direction	25 Dec 2015 04:00	25 Dec 2015 05:00	2	Analyzer Failure
Wind Speed, Wind Direction	25 Dec 2015 23:00	25 Dec 2015 23:00	1	Analyzer Failure
Wind Speed, Wind Direction	26 Dec 2015 10:00	26 Dec 2015 10:00	1	Analyzer Failure
Wind Speed, Wind Direction	27 Dec 2015 20:00	27 Dec 2015 20:00	1	Analyzer Failure
Wind Speed, Wind Direction	29 Dec 2015 10:00	29 Dec 2015 10:00	1	Analyzer Failure

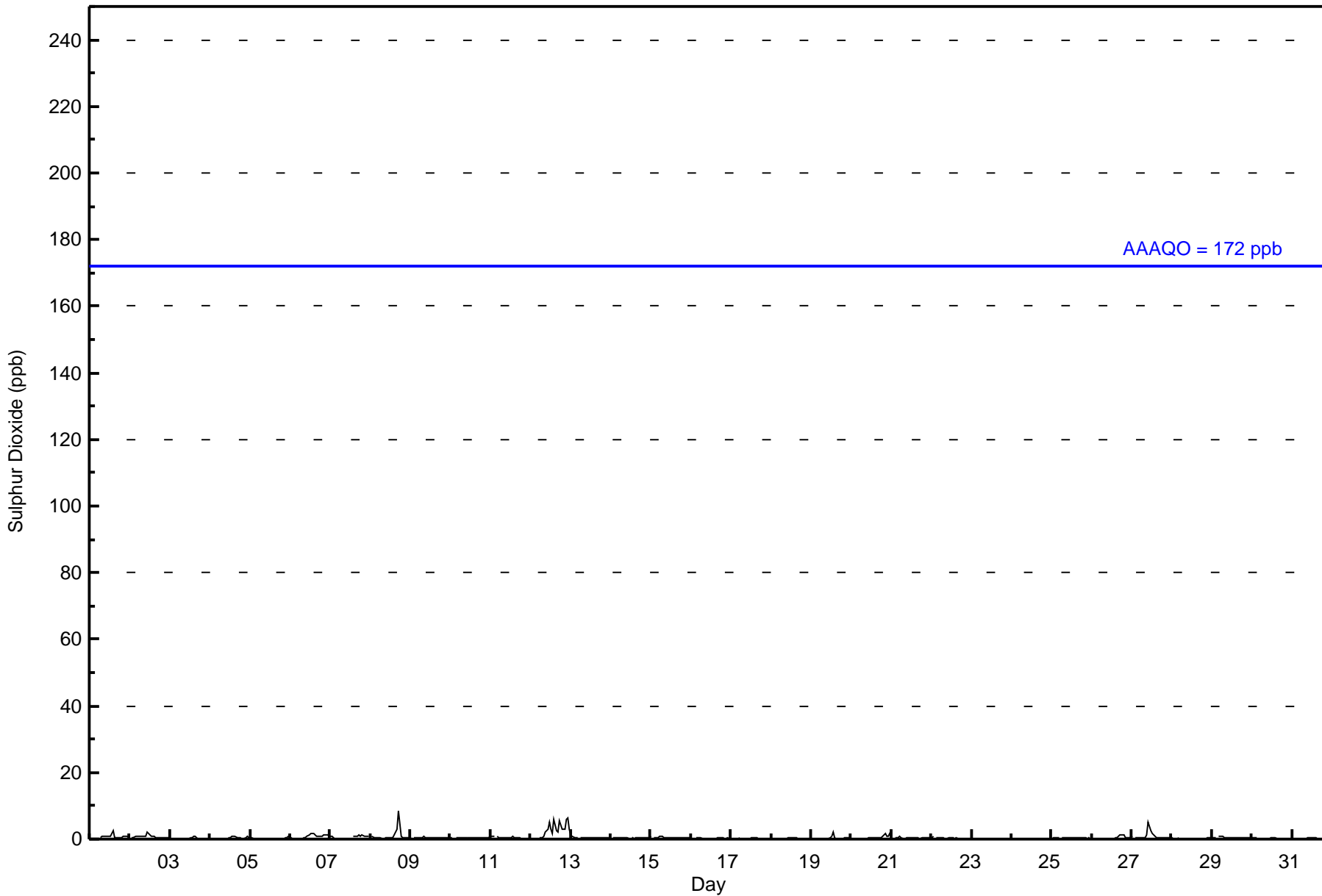


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 8 ppb on Dec 8 18:00	Maximum Daily Average: 2.5 ppb on Dec 12		Hours of Data:	708
Minimum Value: 0 ppb on Dec 1 01:00	Minimum Daily Average: 0.0 ppb on Dec 23		Hours of Missing Data:	36
Maximum Diurnal Average: 0.8 ppb at hour 18	Minimum Diurnal Average: 0.2 ppb at hour 8		Hours of Calibration:	36
Monthly Average: 0.4 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 5		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	1	1	1	1	1	1	1	2	3	0	0	0	0	0	1	1	1	0	0.6	3
2-Dec	Z	0	0	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0.8	2
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.2	1
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	1	1	0.3	1	
5-Dec	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.1	1
6-Dec	0	0	0	0	Z	0	0	0	0	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	0.8	2
7-Dec	1	1	0	0	0	Z	0	0	0	C	C	C	C	C	1	1	1	1	1	1	1	1	1	1	0.7	1
8-Dec	Z	1	1	0	0	0	0	0	0	0	0	0	1	0	1	2	3	8	1	1	0	0	0	0	1.0	8
9-Dec	0	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	1	1	0.4	1
11-Dec	1	1	1	Z	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0.4	1
12-Dec	0	0	0	0	Z	0	0	0	1	2	3	5	3	2	6	2	2	5	4	3	3	6	7	3	2.5	7
13-Dec	1	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
15-Dec	1	Z	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
16-Dec	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2
20-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	2	0.4	2
21-Dec	0	Z	0	0	0	1	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0.4	1
22-Dec	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
25-Dec	0	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0.3	1
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	1	0.4	1
27-Dec	1	Z	1	0	0	0	0	0	0	1	5	3	2	1	1	1	0	0	1	0	0	0	0	0	0.9	5
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
29-Dec	0	0	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
	0.4	0.3	0.3	0.2	0.3	0.3	0.3	0.2	0.3	0.3	0.6	0.6	0.5	0.6	0.7	0.5	0.5	0.8	0.5	0.4	0.4	0.5	0.6	0.5		Diurnal Average
	1	1	1	1	1	1	1	1	1	2	5	5	3	2	6	2	3	8	4	3	3	6	7	3		Diurnal Maximum

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Fort McKay South - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	708	100.00	100.00
11 - 20	0	0.00	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Fort McKay South - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	131	57	17	8	4	4	20	56	94	64	65	63	36	11	17	37	684
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	131	57	17	8	4	4	20	56	94	64	65	63	36	11	17	37	684

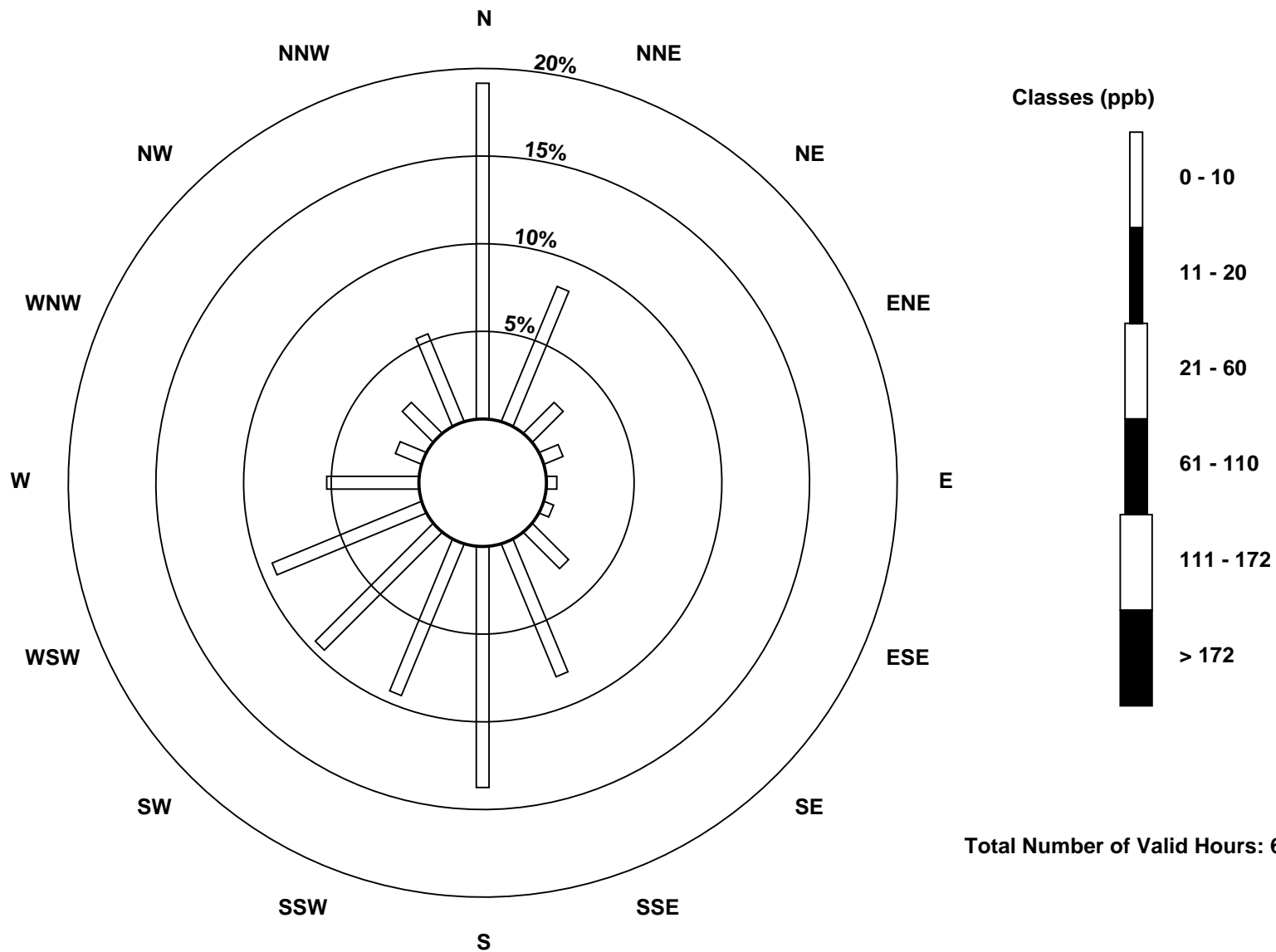
Total Number of Valid Hours: 684

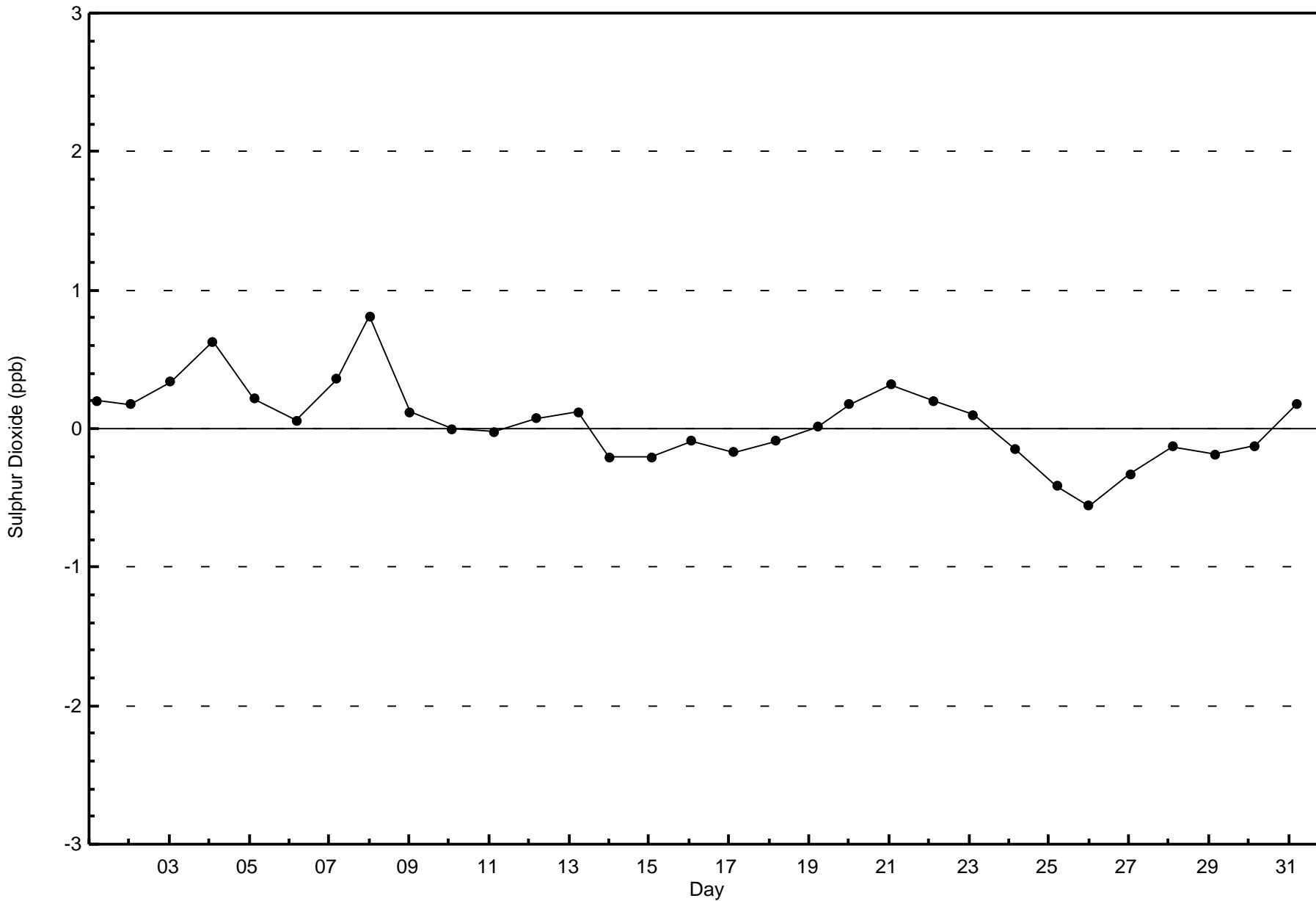
Total Number of Hours: 744

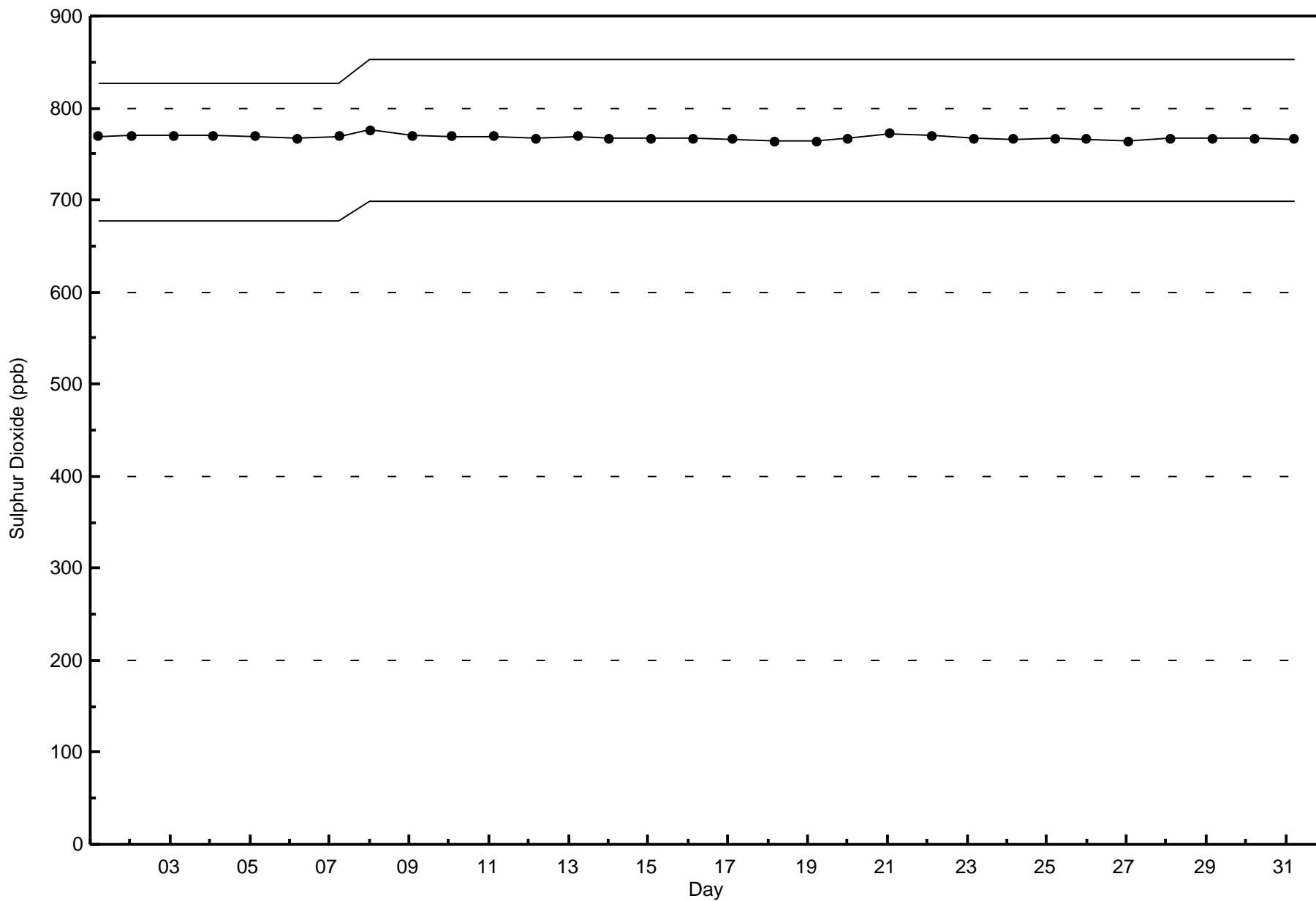


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Fort McKay South (AMS 13)

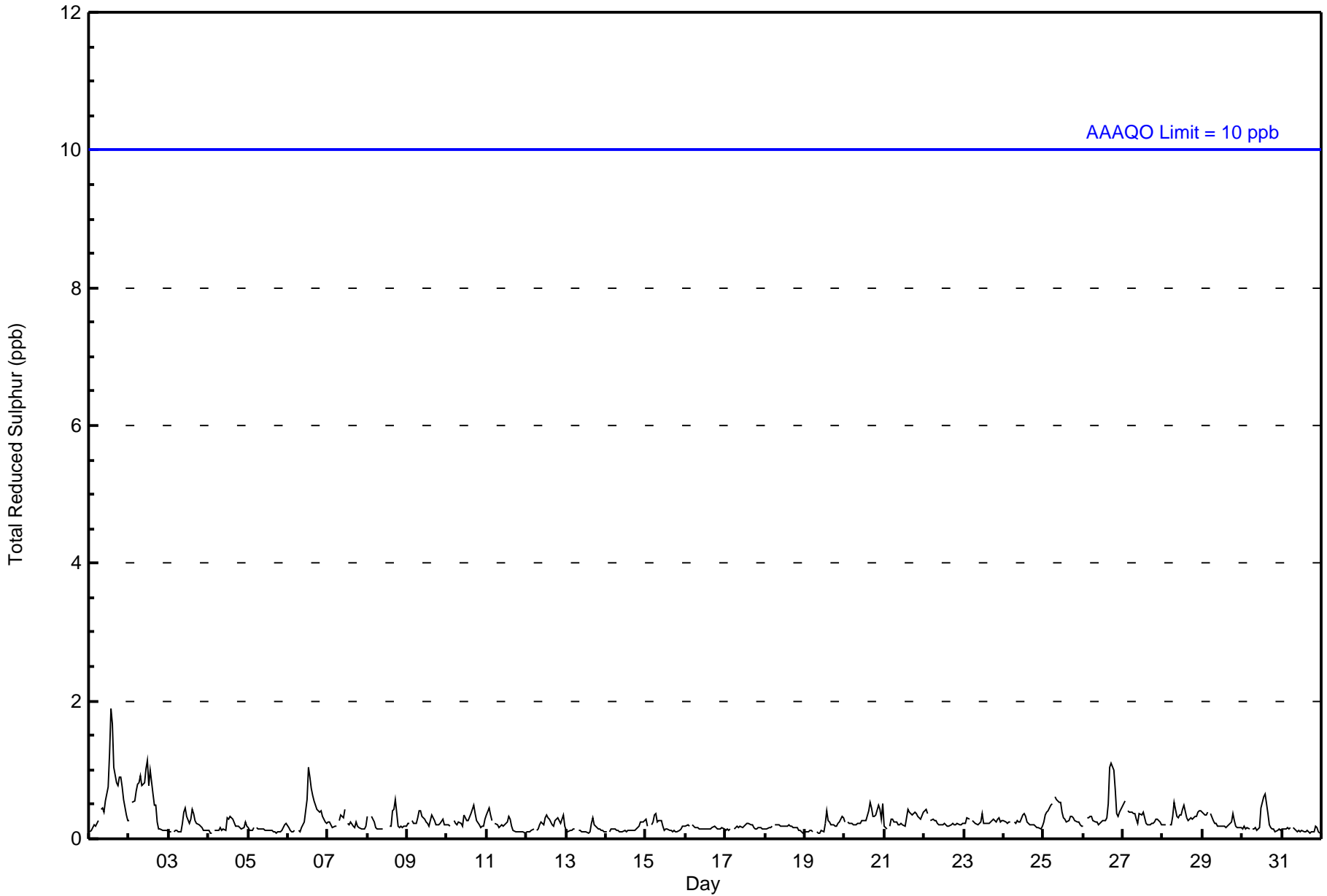








Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 2 ppb on Dec 1 14:00 Maximum Daily Average: 0.6 ppb on Dec 1																	Hours in Service: 744 Hours of Data: 709 Hours of Missing Data: 35 Hours of Calibration: 34 Percent Operational Time: 99.9									
Minimum Value: 0 ppb on Dec 19 10:00 Minimum Daily Average: 0.1 ppb on Dec 31 Maximum Diurnal Average: 0.3 ppb at hour 14 Minimum Diurnal Average: 0.2 ppb at hour 2 Monthly Average: 0.3 ppb Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 1																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	0	Z	0	0	0	1	1	1	2	2	1	1	1	1	1	1	1	0	0	0.6	2
2-Dec	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.6	1
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0.4	1
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
8-Dec	0	Z	0	0	0	0	0	0	0	0	C	C	C	0	0	0	0	1	0	0	0	0	0	0	0.2	1
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0.3	1
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
25-Dec	0	0	0	0	0	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0.4	1
27-Dec	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
28-Dec	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
30-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
																								Diurnal Average	Diurnal Maximum	
																								0.2	0.2	
																								1	1	
Z - zerospan      C - Calibration      M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb      24-hr 3 ppb																										







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Fort McKay South - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	709	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb  
Fort McKay South - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	128	58	17	8	4	4	22	54	94	62	66	60	38	11	17	41	684
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	128	58	17	8	4	4	22	54	94	62	66	60	38	11	17	41	684

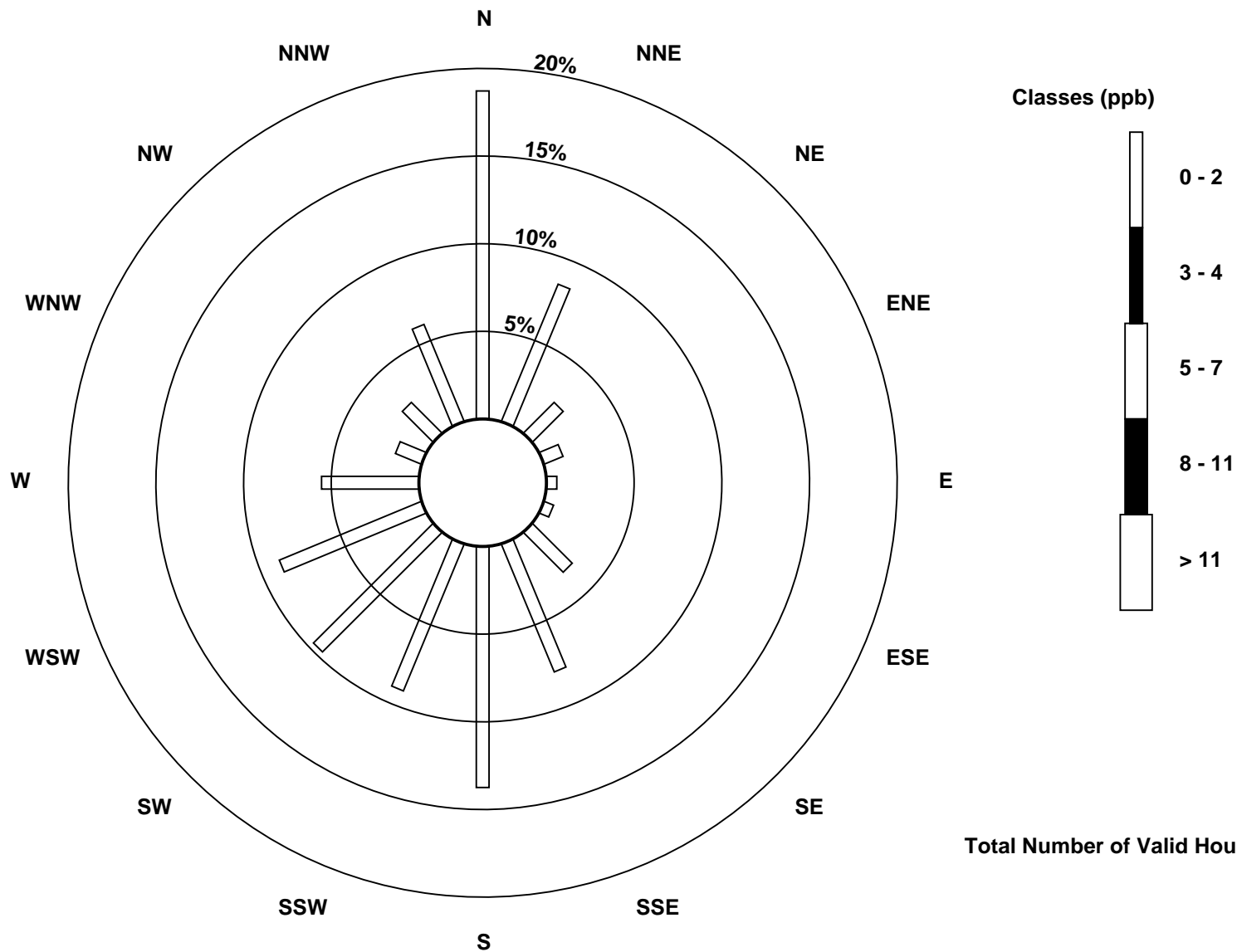
Total Number of Valid Hours: 684

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

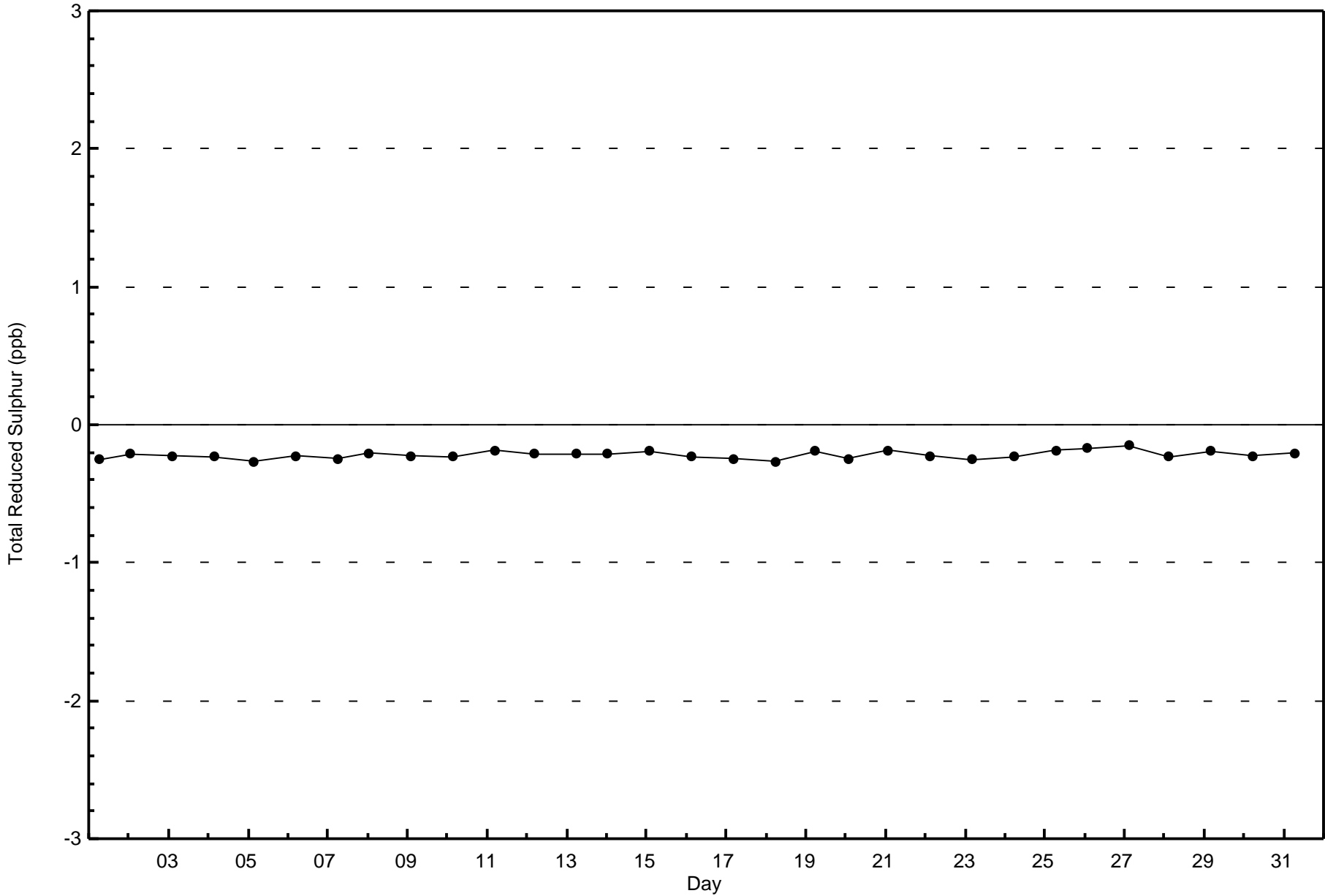
Total Reduced Sulphur (TRS) - ppb  
Fort McKay South (AMS 13)

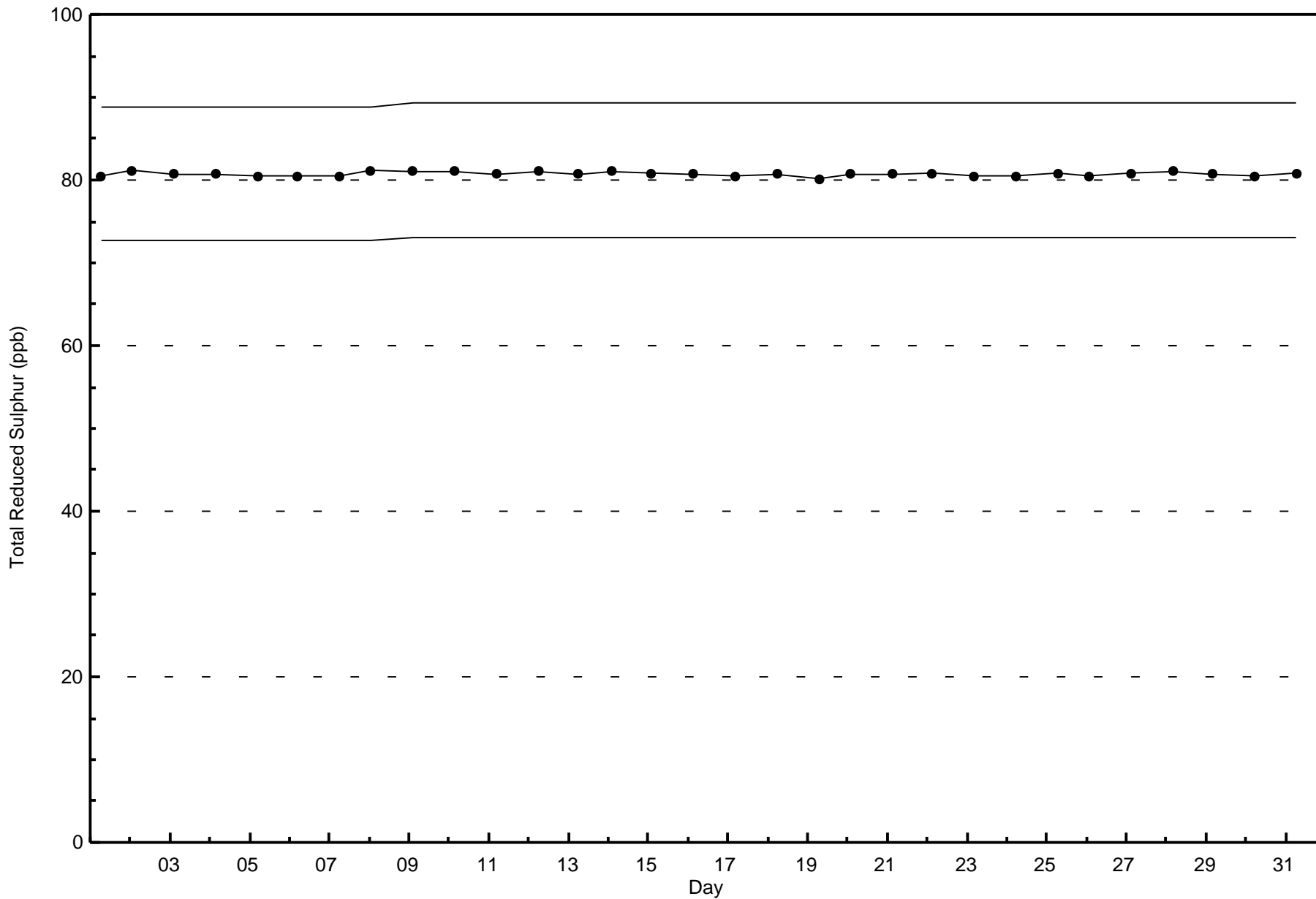




Wood Buffalo Environmental Association  
Zero Responses

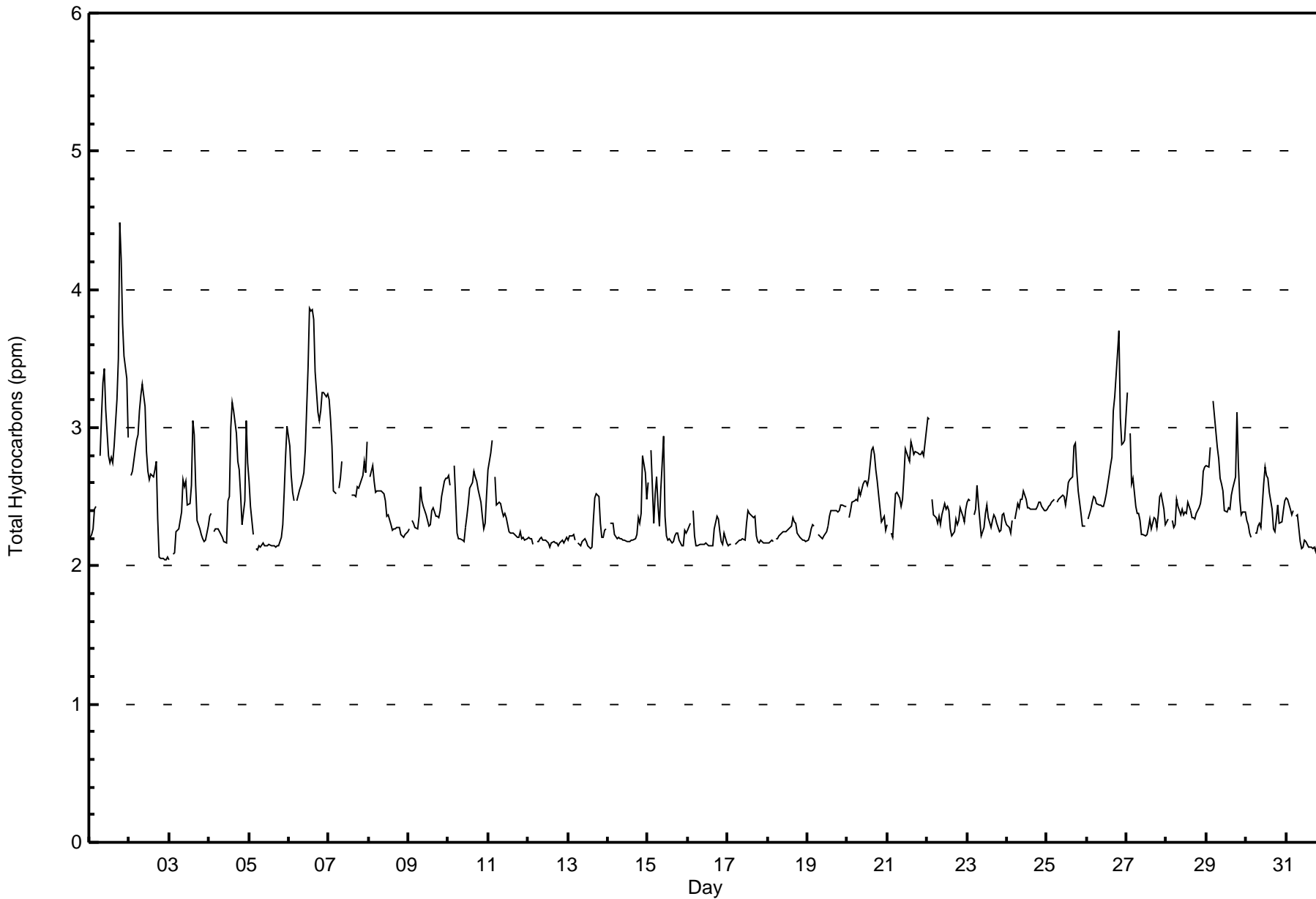
Total Reduced Sulphur (TRS) - ppb  
Fort McKay South - December 2015







Maximum Value: 4.5 ppm on Dec 1 19:00		Maximum Daily Average: 3.1 ppm on Dec 6		Hours in Service: 744																						
Minimum Value: 2.0 ppm on Dec 2 23:00		Minimum Daily Average: 2.2 ppm on Dec 12		Hours of Data: 708																						
Maximum Diurnal Average: 2.5 ppm at hour 19		Minimum Diurnal Average: 2.4 ppm at hour 4		Hours of Missing Data: 36																						
Monthly Average: 2.45 ppm		Percentiles: P <sub>1</sub> = 2.1 P <sub>10</sub> = 2.2 Q <sub>1</sub> = 2.2 Median = 2.4 Q <sub>3</sub> = 2.6 P <sub>90</sub> = 2.8 P <sub>99</sub> = 3.7		Hours of Calibration: 36																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.2	2.2	2.3	2.4	2.4	Z	2.8	3.1	3.3	3.4	3.1	2.8	2.7	2.8	2.7	2.9	3.2	3.5	4.5	4.2	3.7	3.5	3.4	2.9	3.1	4.5
2-Dec	Z	2.7	2.7	2.8	2.9	2.9	3.1	3.2	3.3	3.2	2.8	2.7	2.6	2.7	2.6	2.7	2.8	2.3	2.1	2.1	2.1	2.0	2.0	2.1	2.6	3.3
3-Dec	2.0	Z	2.1	2.1	2.2	2.3	2.3	2.4	2.6	2.6	2.6	2.4	2.4	2.6	3.0	2.9	2.6	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.4	3.0
4-Dec	2.4	2.4	Z	2.2	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.5	2.5	3.0	3.2	3.1	3.0	2.8	2.7	2.5	2.3	2.5	3.1	2.7	2.5	3.2
5-Dec	2.6	2.4	2.2	Z	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.5	2.8	3.0	2.3	3.0
6-Dec	2.9	2.7	2.5	2.5	Z	2.5	2.6	2.6	2.6	2.7	2.8	3.4	3.9	3.8	3.9	3.8	3.4	3.1	3.0	3.1	3.3	3.3	3.2	3.2	3.1	3.9
7-Dec	3.2	3.1	2.9	2.5	2.5	Z	2.6	2.6	2.8	C	C	C	C	C	2.5	2.5	2.5	2.6	2.6	2.6	2.7	2.8	2.7	2.9	2.7	3.2
8-Dec	Z	2.6	2.7	2.6	2.5	2.5	2.5	2.5	2.5	2.5	C	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.4	2.7
9-Dec	2.3	Z	2.3	2.3	2.3	2.3	2.4	2.6	2.5	2.4	2.4	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.3	2.4	2.5	2.6	2.6	2.6	2.4	2.6
10-Dec	2.7	2.6	Z	2.7	2.5	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.4	2.6	2.6	2.7	2.6	2.6	2.6	2.5	2.4	2.3	2.3	2.5	2.4	2.7
11-Dec	2.7	2.8	2.9	Z	2.6	2.4	2.5	2.5	2.4	2.4	2.4	2.4	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4	2.9
12-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2
13-Dec	2.2	2.2	2.2	2.2	2.2	Z	2.2	2.1	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.3	2.5	2.5	2.5	2.3	2.2	2.2	2.3	2.3	2.2	2.5
14-Dec	Z	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.8	2.7	2.5	2.8
15-Dec	2.6	Z	2.8	2.3	2.5	2.6	2.4	2.3	2.6	2.9	2.4	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.3	2.2	2.4	2.9
16-Dec	2.3	2.3	Z	2.4	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.1	2.1	2.3	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.4
17-Dec	2.1	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.4	2.4	2.3	2.4	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4
18-Dec	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3
19-Dec	2.2	2.2	2.3	2.3	2.3	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.4
20-Dec	Z	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.6	2.8	2.9	2.8	2.7	2.6	2.5	2.3	2.3	2.4	2.3	2.5	2.9
21-Dec	2.3	Z	2.2	2.2	2.4	2.5	2.5	2.5	2.4	2.5	2.6	2.8	2.8	2.8	2.9	2.9	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3.0	2.7	3.0
22-Dec	3.1	3.1	Z	2.5	2.4	2.3	2.3	2.4	2.3	2.4	2.4	2.4	2.4	2.4	2.3	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.3	2.4	2.4	3.1
23-Dec	2.5	2.5	2.5	Z	2.4	2.4	2.6	2.4	2.2	2.2	2.3	2.4	2.4	2.3	2.3	2.3	2.4	2.3	2.3	2.2	2.3	2.4	2.4	2.3	2.4	2.6
24-Dec	2.3	2.3	2.2	2.3	Z	2.3	2.4	2.4	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.4	2.4	2.4	2.5
25-Dec	2.4	2.4	2.4	2.5	2.5	Z	2.5	2.5	2.5	2.5	2.5	2.4	2.5	2.6	2.6	2.6	2.6	2.9	2.9	2.7	2.5	2.4	2.3	2.3	2.5	2.9
26-Dec	Z	2.3	2.4	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.5	2.5	2.7	2.7	2.8	3.1	3.2	3.5	3.7	3.1	2.9	2.9	2.9	2.7	3.7
27-Dec	3.3	Z	3.0	2.6	2.6	2.4	2.4	2.4	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.5	2.5	2.4	2.3	2.4	3.3
28-Dec	2.3	2.3	Z	2.3	2.3	2.3	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.4	2.4	2.3	2.3	2.4	2.4	2.5	2.5	2.7	2.7	2.4	2.7
29-Dec	2.7	2.7	2.9	Z	3.2	3.1	2.9	2.8	2.6	2.6	2.5	2.4	2.4	2.4	2.4	2.5	2.6	2.6	3.1	2.7	2.5	2.4	2.4	2.4	2.6	3.2
30-Dec	2.3	2.3	2.2	2.2	Z	2.2	2.2	2.3	2.3	2.3	2.6	2.7	2.7	2.6	2.5	2.4	2.3	2.2	2.3	2.4	2.3	2.3	2.4	2.5	2.4	2.7
31-Dec	2.5	2.5	2.4	2.4	2.4	Z	2.4	2.4	2.2	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.5	2.7	2.2	2.2	2.3	2.7
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Fort McKay South - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	3	0.42	0.42
2.1 - 3.0	662	93.50	93.93
3.1 - 10.0	43	6.07	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Fort McKay South - December 2015**

Concentration Ranges (ppm)	Wind Direction																Totals	
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW		
0 - 2.0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	3
2.1 - 3.0	127	53	17	7	4	4	20	56	90	54	53	56	36	10	17	34	638	
3.1 - 10.0	4	4	0	1	0	0	0	0	4	10	11	5	0	1	0	3	43	
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<b>Totals</b>	131	57	17	8	4	4	20	56	94	64	65	63	36	11	17	37	684	

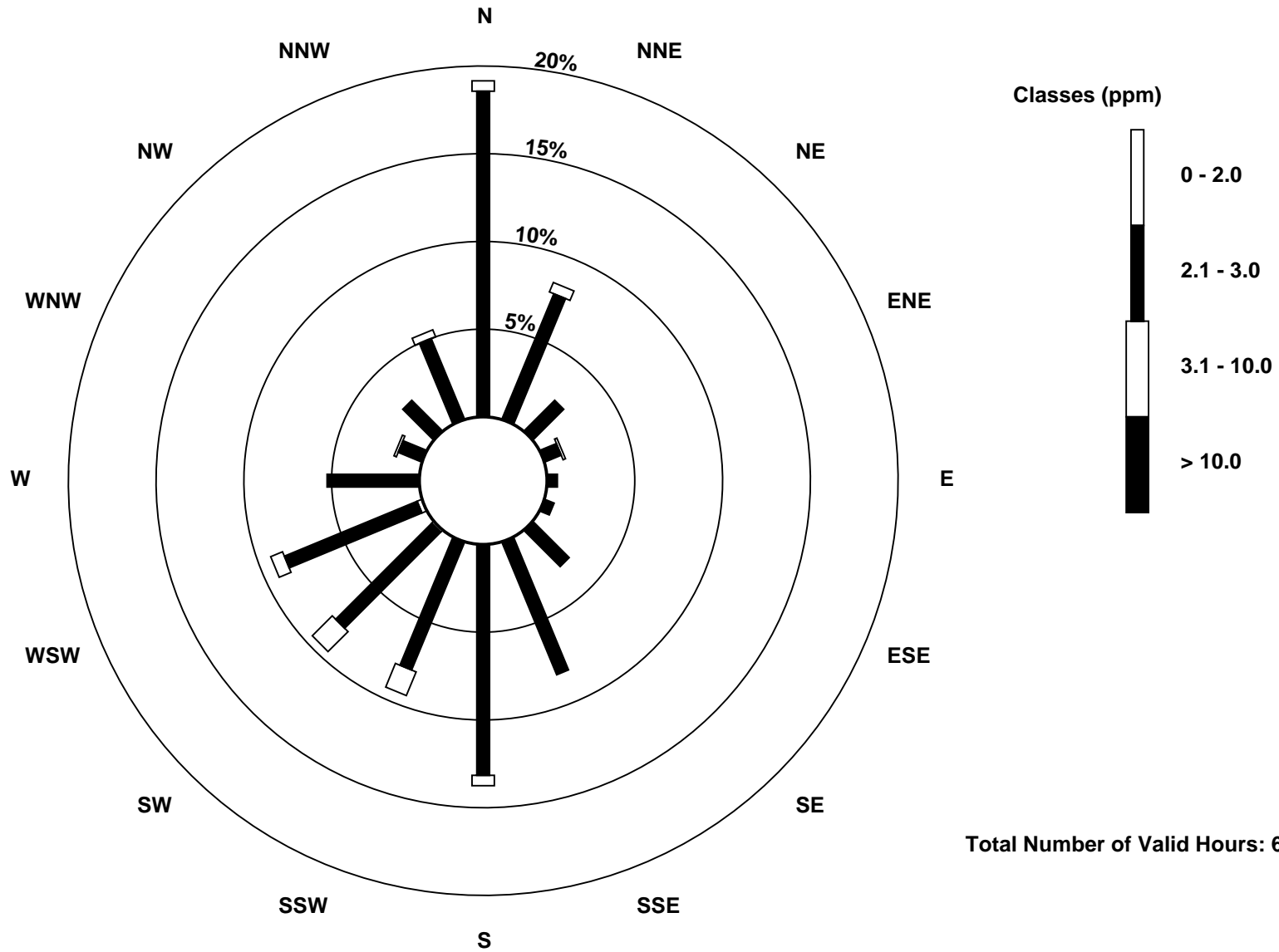
Total Number of Valid Hours: 684

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Total Hydrocarbons (THC) - ppm  
Fort McKay South (AMS 13)

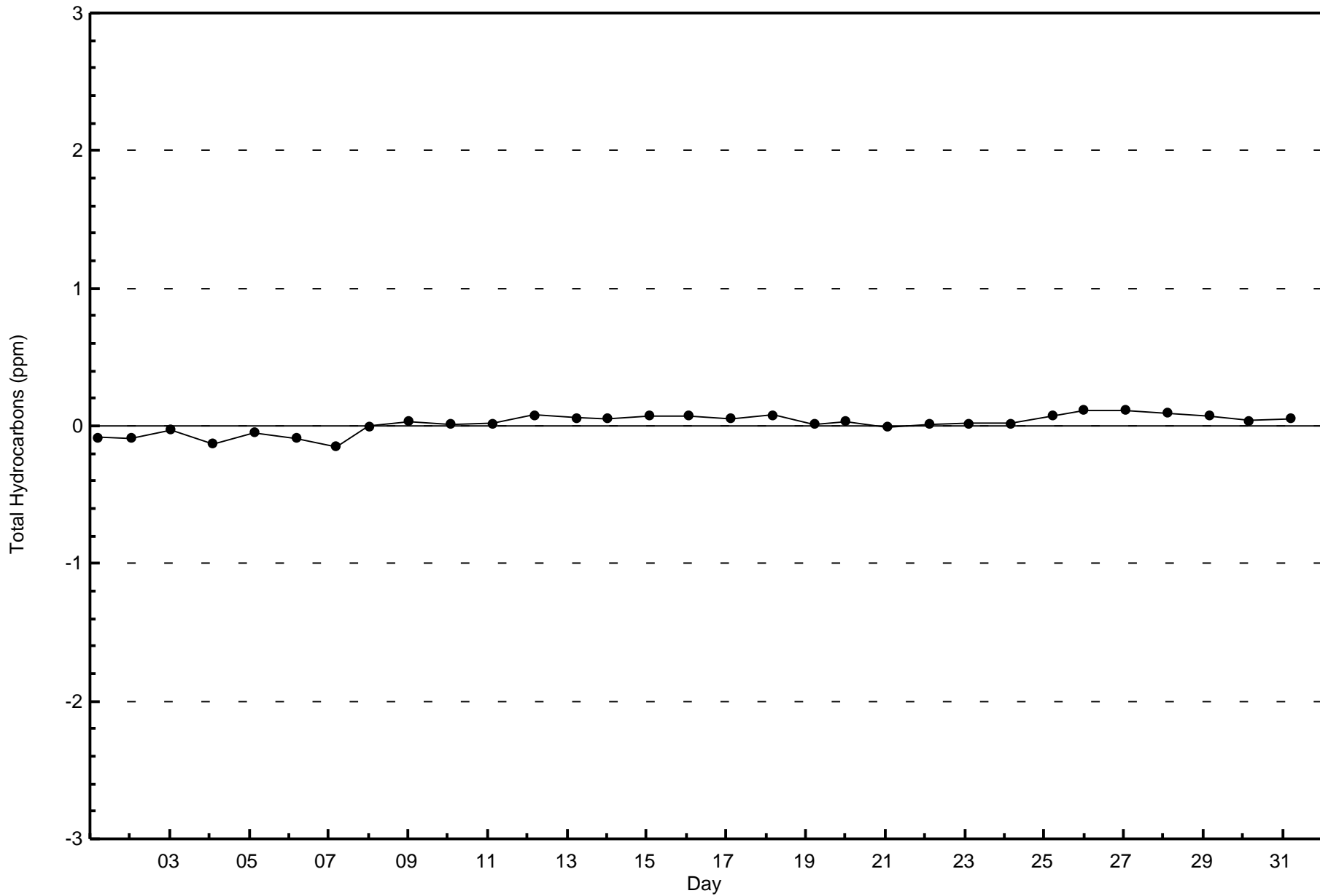


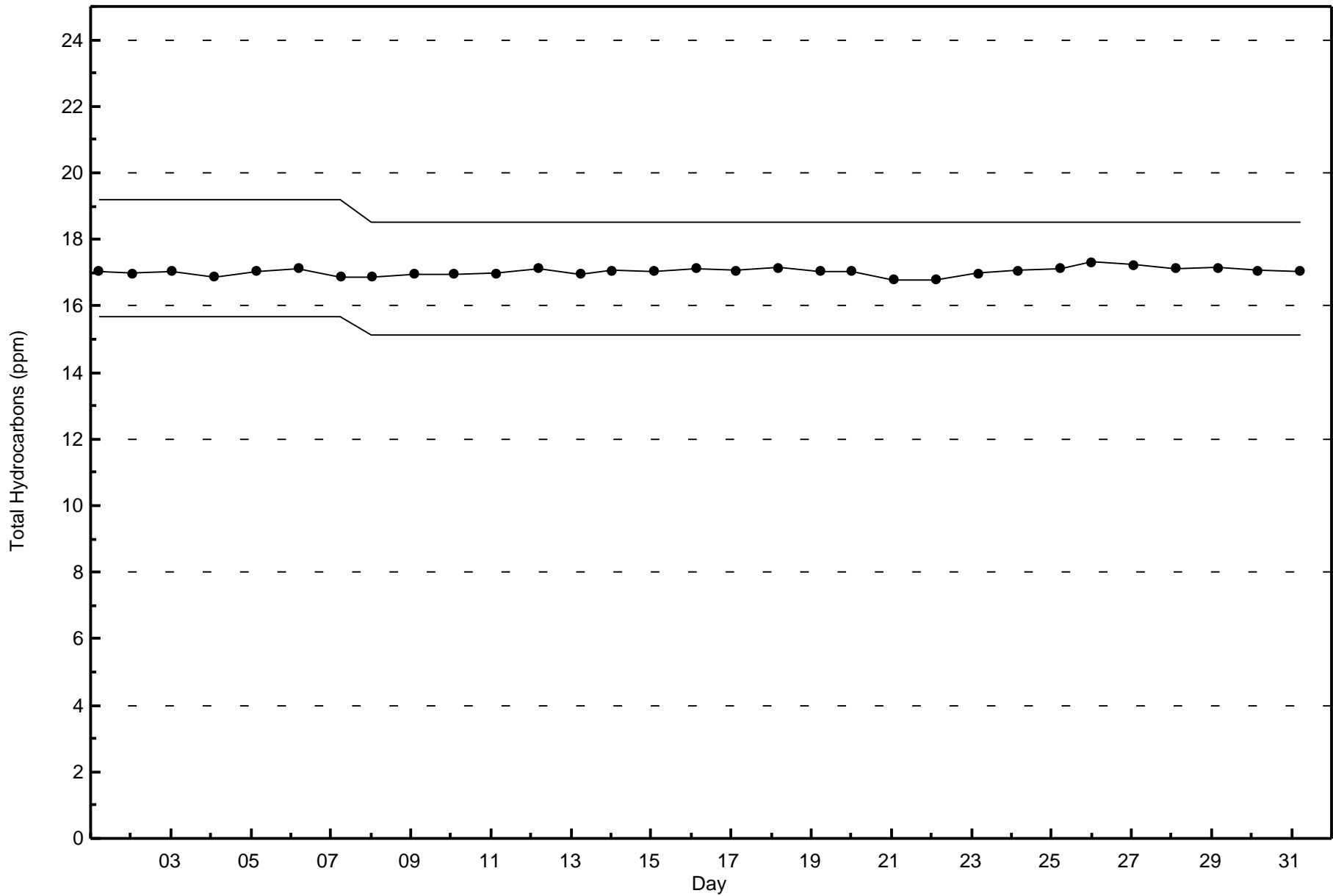
Total Number of Valid Hours: 684



Wood Buffalo Environmental Association  
Zero Responses

Total Hydrocarbons (THC) - ppm  
Fort McKay South - December 2015







Summary of Hour Averages

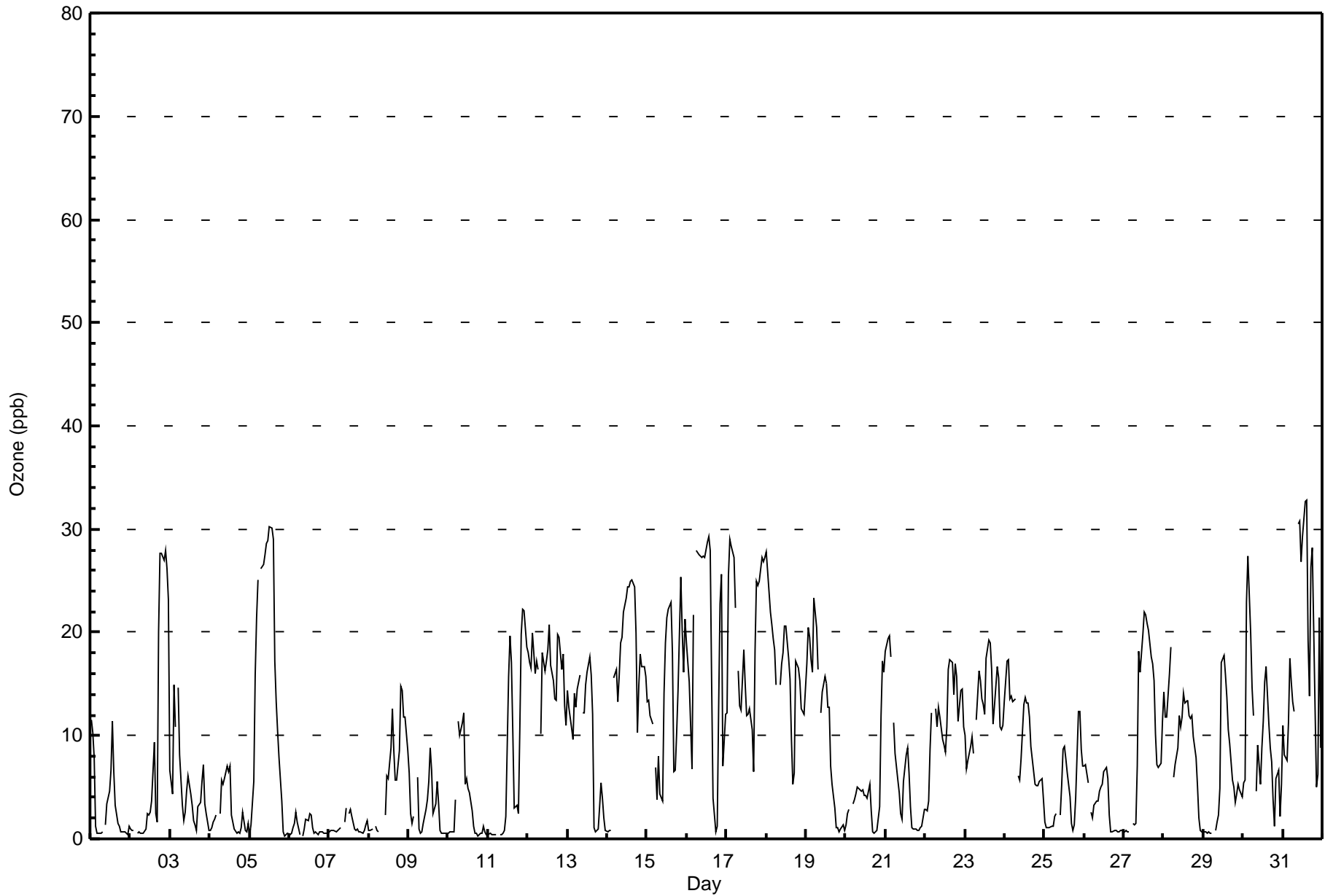
Fort McKay South - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 33 ppb on Dec 31 15:00	Maximum Daily Average: 19.5 ppb on Dec 17		Hours of Data:	709
Minimum Value: 0 ppb on Dec 5 22:00	Minimum Daily Average: 1.0 ppb on Dec 6		Hours of Missing Data:	35
Maximum Diurnal Average: 13.6 ppb at hour 14	Minimum Diurnal Average: 6.6 ppb at hour 17		Hours of Calibration:	34
Monthly Average: 9.3 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 7 Q <sub>3</sub> = 15 P <sub>90</sub> = 21 P <sub>99</sub> = 29		Percent Operational Time:	99.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	12	10	8	1	1	1	0	1	Z	1	3	5	7	11	7	3	2	1	1	1	1	1	0	1	3.4	12
2-Dec	1	1	1	Z	1	1	1	1	1	1	2	2	3	4	9	2	2	20	28	28	27	28	26	23	9.1	28
3-Dec	7	4	15	11	Z	15	8	3	2	3	5	6	4	3	2	1	1	3	4	6	7	3	2	1	5.0	15
4-Dec	1	1	2	2	Z	2	6	5	6	7	7	7	2	2	1	1	1	1	1	3	1	1	1	1	2.6	7
5-Dec	0	1	6	16	21	25	Z	26	27	28	29	29	30	30	29	17	13	10	8	4	1	0	0	15.3	30	
6-Dec	0	0	1	1	3	2	0	Z	0	1	2	2	2	2	1	1	1	0	1	1	1	1	1	1	1.0	3
7-Dec	1	1	1	1	1	1	1	1	Z	2	3	M	2	3	2	1	1	1	1	1	1	1	1	2	1.2	3
8-Dec	1	1	1	Z	1	1	1	C	C	C	2	6	6	9	13	8	6	6	9	15	14	12	12	8	6.5	15
9-Dec	6	2	2	2	Z	6	1	1	1	1	3	4	6	9	7	2	3	6	3	1	0	0	1	0	2.9	9
10-Dec	1	1	1	1	4	Z	11	10	11	12	5	6	5	4	3	1	1	1	0	1	1	1	1	0	3.5	12
11-Dec	0	1	0	0	0	0	Z	0	0	1	1	2	16	20	17	10	3	3	2	11	20	22	22	19	7.5	22
12-Dec	18	17	17	20	16	17	16	Z	10	18	16	17	18	21	17	15	14	13	20	19	16	18	13	11	16.5	21
13-Dec	14	13	11	10	14	13	14	16	Z	12	12	15	16	18	16	12	1	1	1	3	5	4	2	1	9.8	18
14-Dec	1	1	1	Z	16	16	13	16	19	19	22	23	24	24	25	25	24	20	10	15	18	17	17	16	16.6	25
15-Dec	13	13	12	11	Z	7	4	8	4	4	14	19	21	22	23	18	7	7	10	14	25	20	16	21	13.7	25
16-Dec	19	15	11	7	22	Z	28	28	27	27	27	27	29	29	28	15	4	1	1	13	23	26	7	12	18.5	29
17-Dec	12	25	29	28	27	22	Z	16	13	13	18	15	12	12	13	11	7	18	25	25	25	27	27	27	19.5	29
18-Dec	28	26	22	21	19	18	15	Z	15	17	18	21	21	17	15	10	5	6	17	17	15	13	12	12	16.5	28
19-Dec	17	20	19	17	16	23	20	16	Z	12	14	16	15	13	13	7	5	3	1	1	1	1	1	1	11.1	23
20-Dec	1	2	3	Z	3	4	4	5	5	5	5	4	4	4	5	3	1	1	1	1	3	12	17	16	4.7	17
21-Dec	18	19	20	18	Z	11	8	6	4	2	2	6	8	9	6	3	1	1	1	1	1	1	1	3	6.6	20
22-Dec	3	3	4	9	12	Z	13	11	13	12	10	9	8	11	16	17	17	14	17	16	11	14	15	11	11.5	17
23-Dec	10	7	8	9	10	8	Z	12	16	15	14	13	12	18	19	19	16	11	13	17	16	11	11	11	12.8	19
24-Dec	13	17	17	14	14	13	14	Z	6	6	8	13	14	13	13	12	9	6	5	5	5	6	6	4	10.1	17
25-Dec	2	1	1	1	1	1	2	Z	2	5	9	9	8	6	4	1	1	1	4	12	12	9	7	4.5	12	
26-Dec	7	7	5	Z	3	2	3	4	4	5	5	5	6	7	6	2	1	1	1	1	1	1	1	1	3.4	7
27-Dec	1	1	1	1	Z	1	1	1	7	18	16	20	22	22	21	20	18	17	15	10	7	7	7	11	10.7	22
28-Dec	14	12	12	16	19	Z	6	7	9	12	11	12	14	13	13	12	12	12	10	8	5	2	1	1	10.1	19
29-Dec	1	1	1	1	1	1	Z	1	2	2	5	17	18	16	14	11	9	6	5	4	4	5	5	4	5.7	18
30-Dec	5	6	23	27	20	15	12	Z	5	9	5	9	11	15	17	11	9	7	4	1	6	7	2	5	10.1	27
31-Dec	11	8	8	11	18	15	13	12	Z	31	31	27	29	33	33	19	14	26	28	13	5	6	21	9	18.3	33

7.7	7.7	8.4	9.8	10.1	9.2	8.2	8.4	8.6	9.9	10.3	12.1	12.9	13.6	13.2	9.5	6.6	7.2	7.8	8.2	9.0	9.0	8.3	7.8	Diurnal Average
28	26	29	28	27	25	28	28	27	31	31	29	30	33	33	25	24	26	28	28	27	28	27	27	Diurnal Maximum

Z - zerospan      C - Calibration      M - Maintenance  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Fort McKay South - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	634	89.42	89.42
21 - 50	75	10.58	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

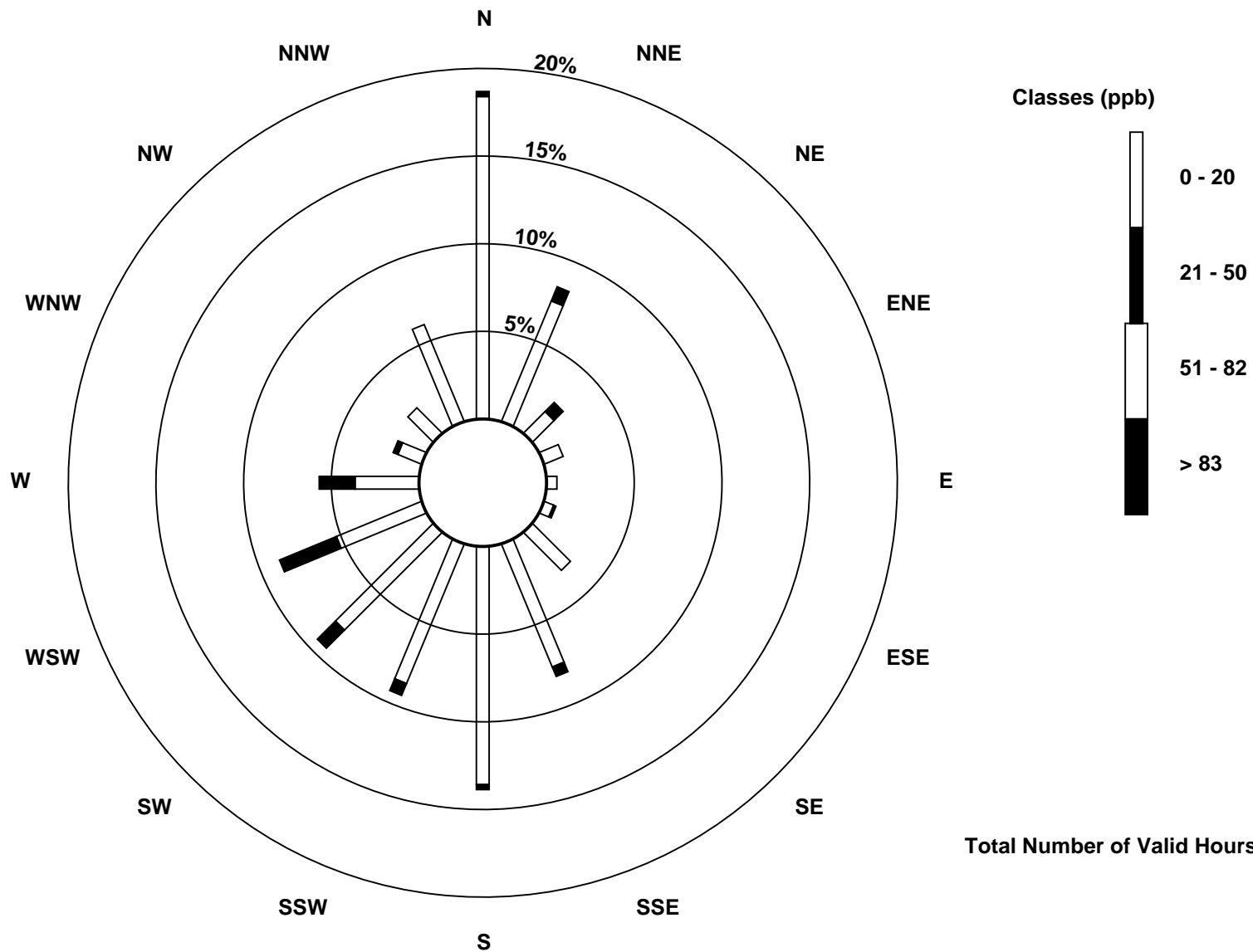
**Ozone (O<sub>3</sub>) - ppb**  
**Fort McKay South - December 2015**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	126	51	12	8	4	4	21	52	93	59	54	36	25	10	14	41	610
21 - 50	2	6	5	0	0	1	0	4	2	5	10	24	14	2	0	0	75
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	128	57	17	8	4	5	21	56	95	64	64	60	39	12	14	41	685

Total Number of Valid Hours: 685

Total Number of Hours: 744





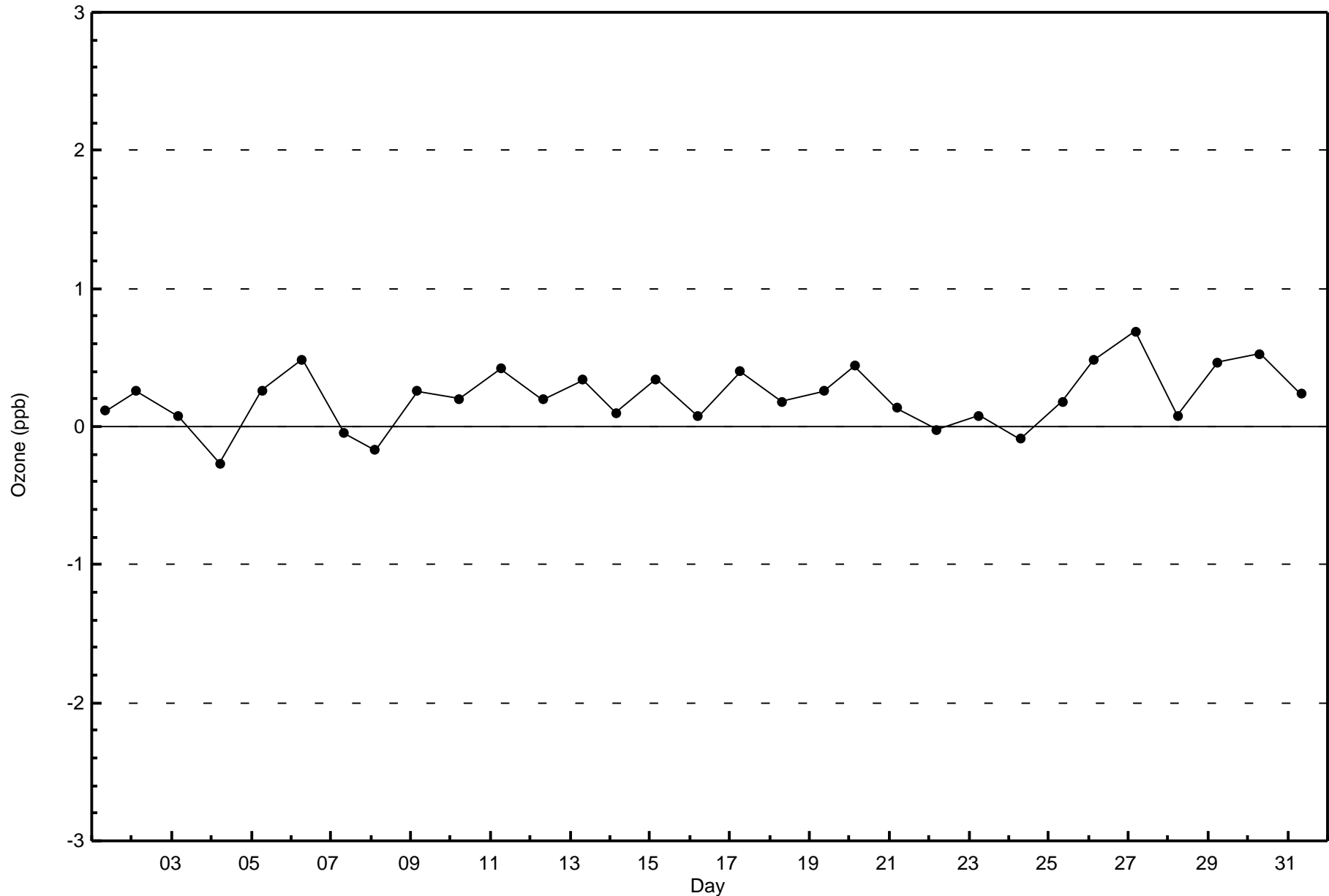


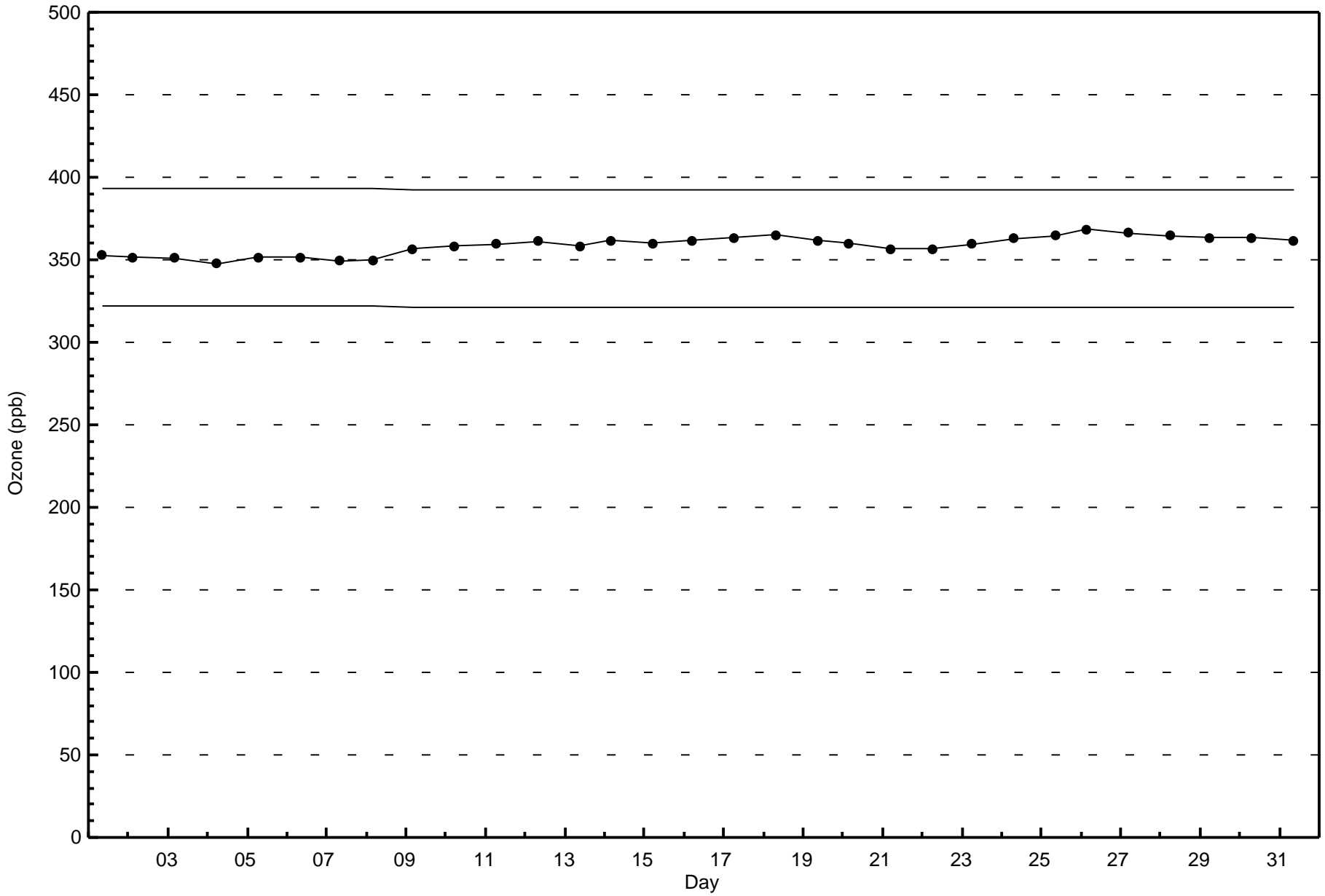
Wood Buffalo Environmental Association

Zero Responses

Ozone (O<sub>3</sub>) - ppb

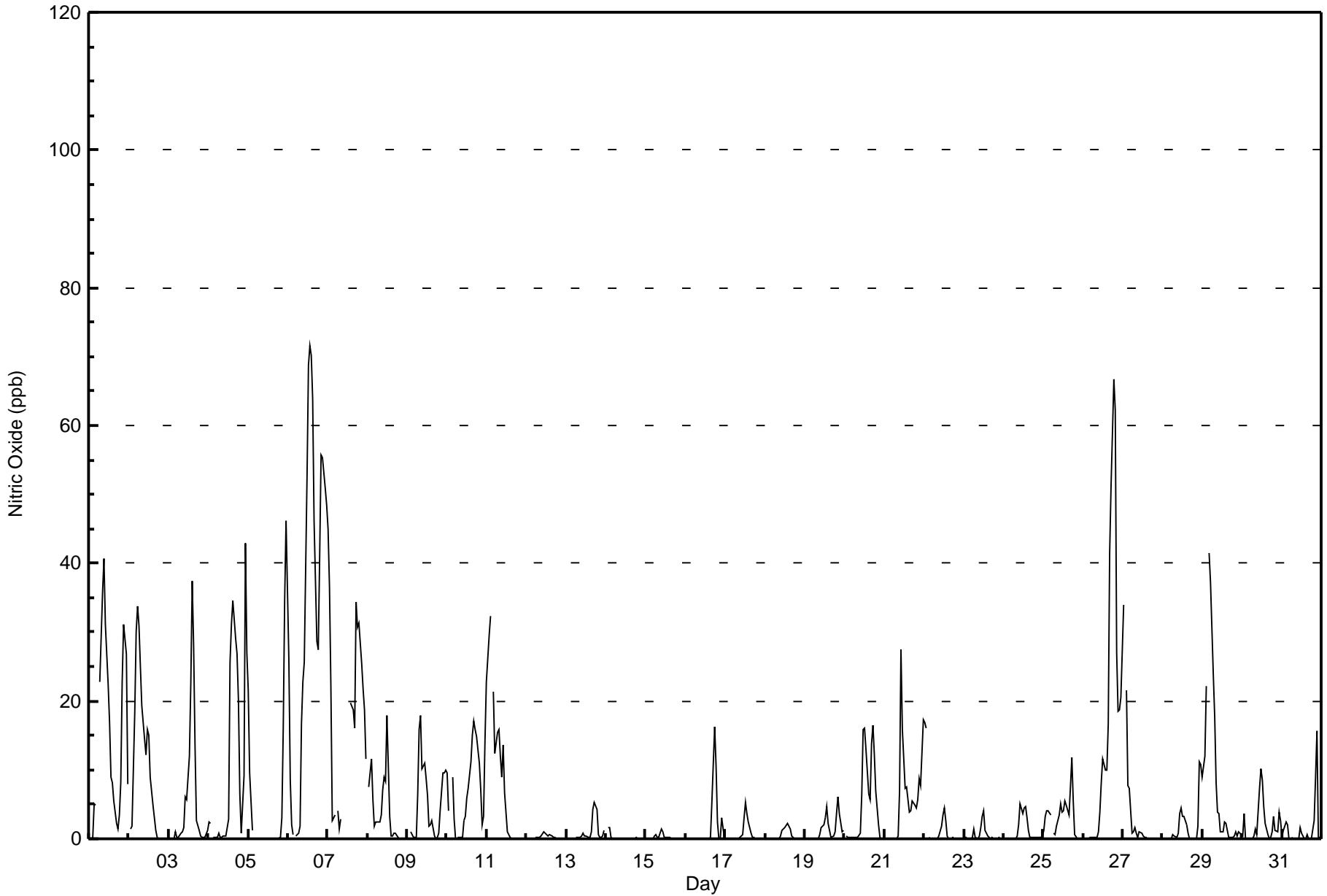
Fort McKay South - December 2015







Maximum Value: 72 ppb on Dec 6 14:00																	Maximum Daily Average: 34.2 ppb on Dec 6																	Hours in Service: 744	
Minimum Value: 0 ppb on Dec 5 05:00																	Minimum Daily Average: 0.2 ppb on Dec 14																	Hours of Data: 708	
Maximum Diurnal Average: 7.6 ppb at hour 23																	Minimum Diurnal Average: 2.2 ppb at hour 4																	Hours of Missing Data: 36	
Monthly Average: 5.8 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 6 P <sub>90</sub> = 19 P <sub>99</sub> = 52																	Hours of Calibration: 36	
																																		Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	0	0	0	5	5	Z	23	29	36	41	31	22	17	9	8	5	2	1	3	8	23	31	27	8	14.6	41									
2-Dec	Z	1	2	19	30	34	31	25	19	14	12	16	15	9	5	3	1	0	0	0	0	0	0	0	10.3	34									
3-Dec	0	Z	0	0	1	0	0	1	1	2	6	6	12	23	37	28	14	3	1	0	0	0	1	5.9	37										
4-Dec	2	2	Z	0	0	0	1	0	0	0	0	2	3	26	31	35	29	27	20	7	1	9	43	27	11.6	43									
5-Dec	22	10	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	16	34	46	5.7	46									
6-Dec	26	9	2	1	Z	0	1	2	17	23	26	53	69	72	70	64	46	29	27	41	56	55	51	48	34.2	72									
7-Dec	45	37	22	3	3	Z	4	2	3	C	C	C	C	C	20	19	16	34	31	31	25	22	19	12	19.3	45									
8-Dec	Z	8	12	6	2	2	2	2	4	7	9	8	18	3	0	1	1	1	0	0	0	0	0	0	3.7	18									
9-Dec	0	Z	1	1	0	0	7	16	18	10	11	9	6	2	2	3	0	0	0	1	4	10	10	10	5.2	18									
10-Dec	10	4	Z	9	3	0	0	0	0	0	3	3	6	7	11	15	17	16	15	11	7	2	3	14	6.8	17									
11-Dec	23	29	32	Z	21	12	15	16	12	9	14	7	1	1	0	0	0	0	0	0	0	0	0	0	8.4	32									
12-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0.3	1									
13-Dec	0	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	1	4	5	4	1	0	0	1	0.9	5										
14-Dec	Z	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2									
15-Dec	0	Z	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1									
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	5	16	11	2	0	0	3	0	1.7	16									
17-Dec	0	0	0	Z	0	0	0	0	0	0	1	3	5	4	2	1	0	0	0	0	0	0	0	0	0.7	5									
18-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	2	2	2	1	0	0	0	0	0	0	0	0	0.5	2									
19-Dec	0	0	0	0	0	Z	0	0	0	1	2	2	3	5	2	1	0	0	1	4	6	4	1	1	1.4	6									
20-Dec	Z	0	0	0	0	0	0	0	0	1	6	16	16	13	6	6	14	16	12	7	2	0	0	0	5.1	16									
21-Dec	0	Z	0	0	0	0	0	0	0	7	28	16	7	8	6	4	4	6	5	4	6	9	8	17	5.8	28									
22-Dec	17	16	Z	0	0	0	0	0	0	0	2	4	4	3	0	0	0	0	0	0	0	0	0	0	2.0	17									
23-Dec	0	0	0	Z	0	0	1	0	0	0	2	3	4	1	0	0	0	0	0	0	0	0	0	0	0.6	4									
24-Dec	0	0	0	0	Z	0	0	0	0	2	5	4	5	5	3	1	0	0	0	0	0	0	0	0	1.1	5									
25-Dec	1	3	4	4	3	Z	1	1	2	3	5	4	4	5	5	3	7	12	6	1	0	0	0	0	3.3	12									
26-Dec	Z	0	0	0	0	0	0	0	0	1	4	8	12	10	10	17	42	51	67	62	27	18	19	21	16.0	67									
27-Dec	34	Z	21	8	7	1	1	2	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	3.4	34									
28-Dec	0	0	Z	0	0	0	1	0	0	1	4	4	3	3	2	1	0	0	0	0	0	2	11	11	1.9	11									
29-Dec	9	12	22	Z	41	37	24	18	8	4	4	1	1	2	2	1	0	0	0	0	1	0	1	1	8.3	41									
30-Dec	0	4	0	0	Z	0	0	0	2	1	7	10	9	5	2	1	0	0	1	3	1	1	4	3	2.3	10									
31-Dec	0	1	2	2	0	Z	0	0	0	0	0	2	1	0	0	1	0	0	0	3	9	16	0	0	1.6	16									
7.3																	5.6																	Diurnal Average	
45																	56																	Diurnal Maximum	
Z - zerospan C - Calibration																																			





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Fort McKay South - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	641	90.54	90.54
21 - 40	47	6.64	97.18
41 - 80	20	2.82	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



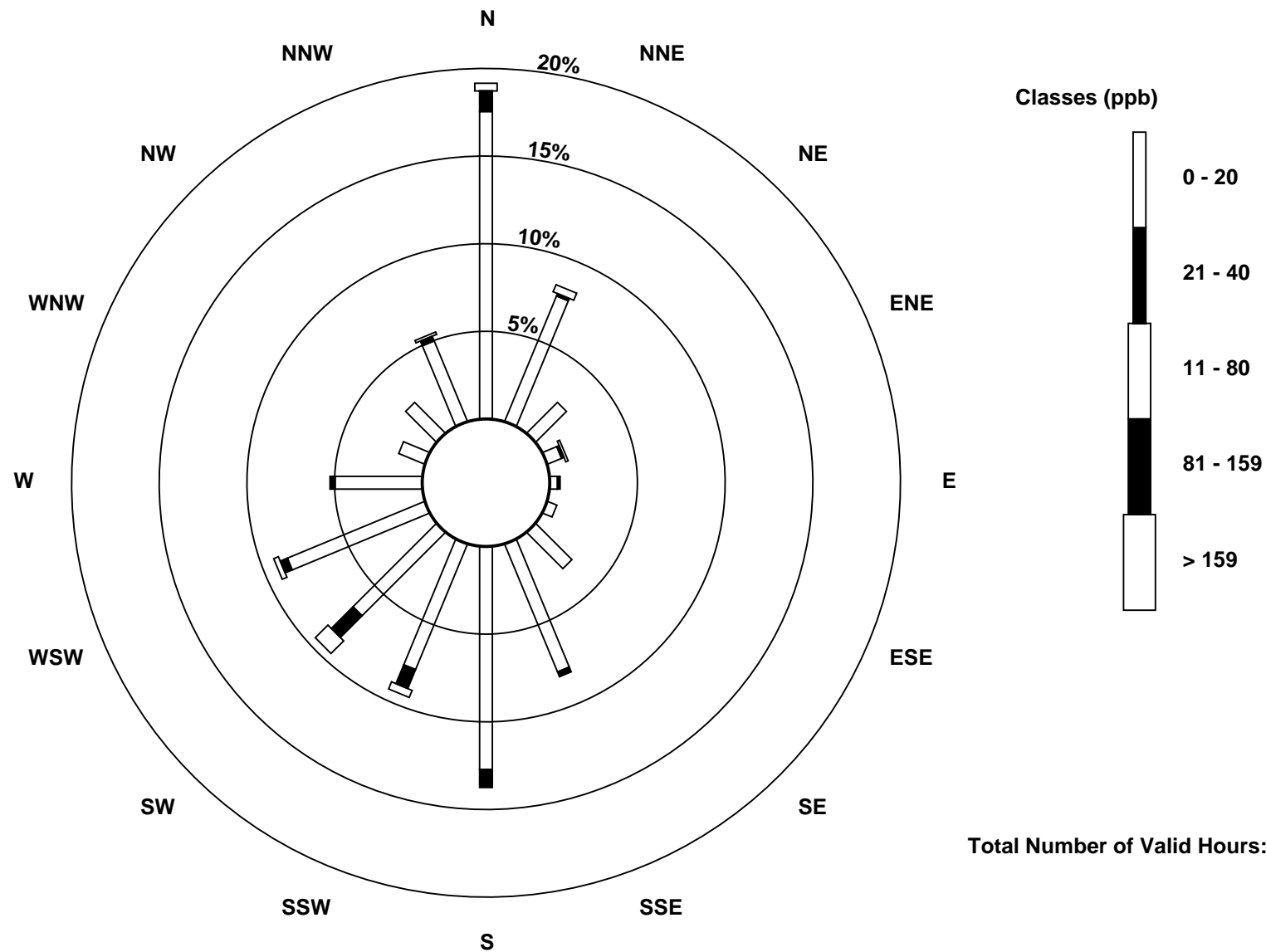
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Fort McKay South - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	120	53	17	6	3	4	20	54	87	53	46	58	34	11	17	34	617
21 - 40	8	1	0	1	1	0	0	2	7	8	12	3	2	0	0	2	47
41 - 80	3	3	0	1	0	0	0	0	0	3	7	2	0	0	0	1	20
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	131	57	17	8	4	4	20	56	94	64	65	63	36	11	17	37	684

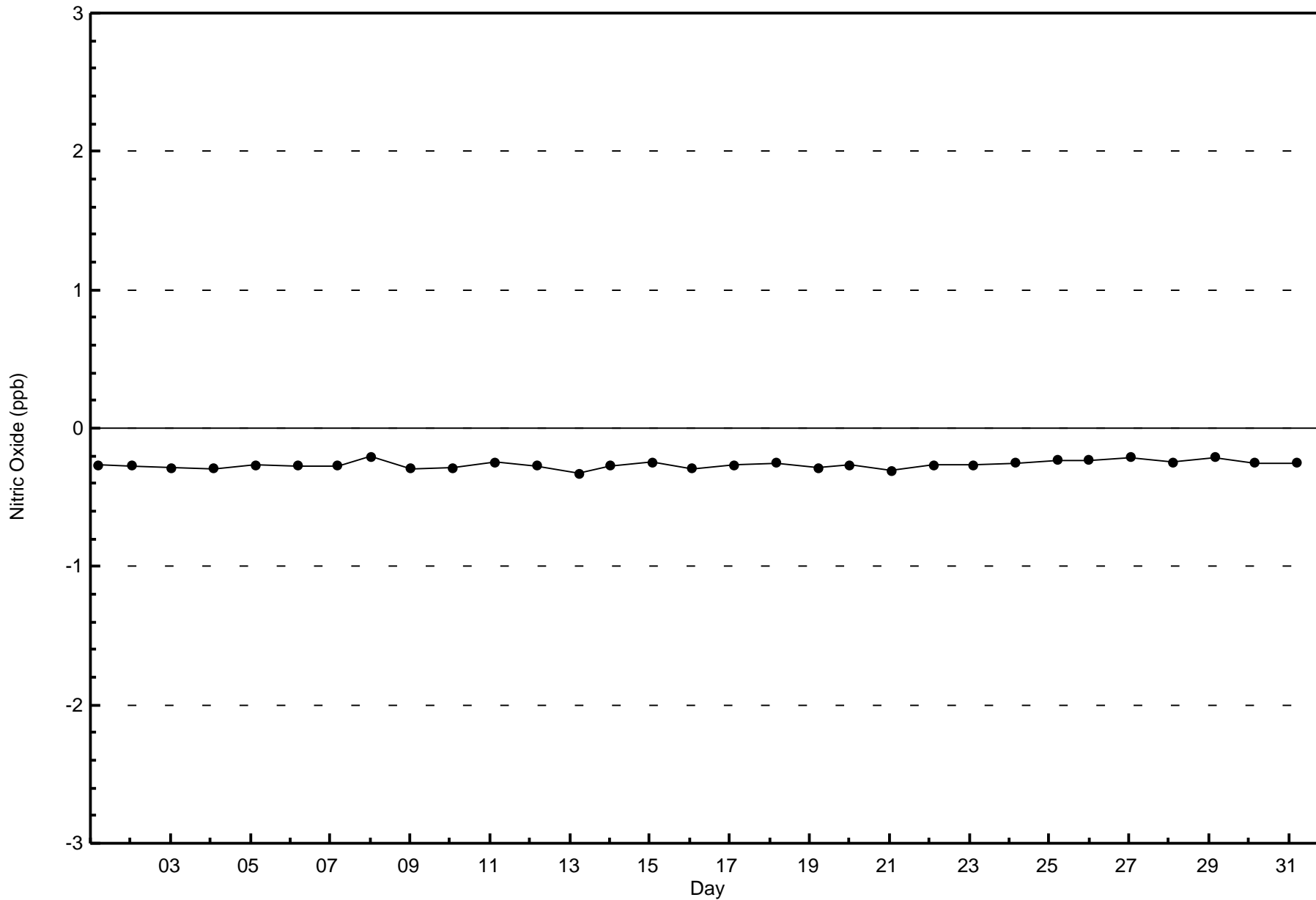
Total Number of Valid Hours: 684

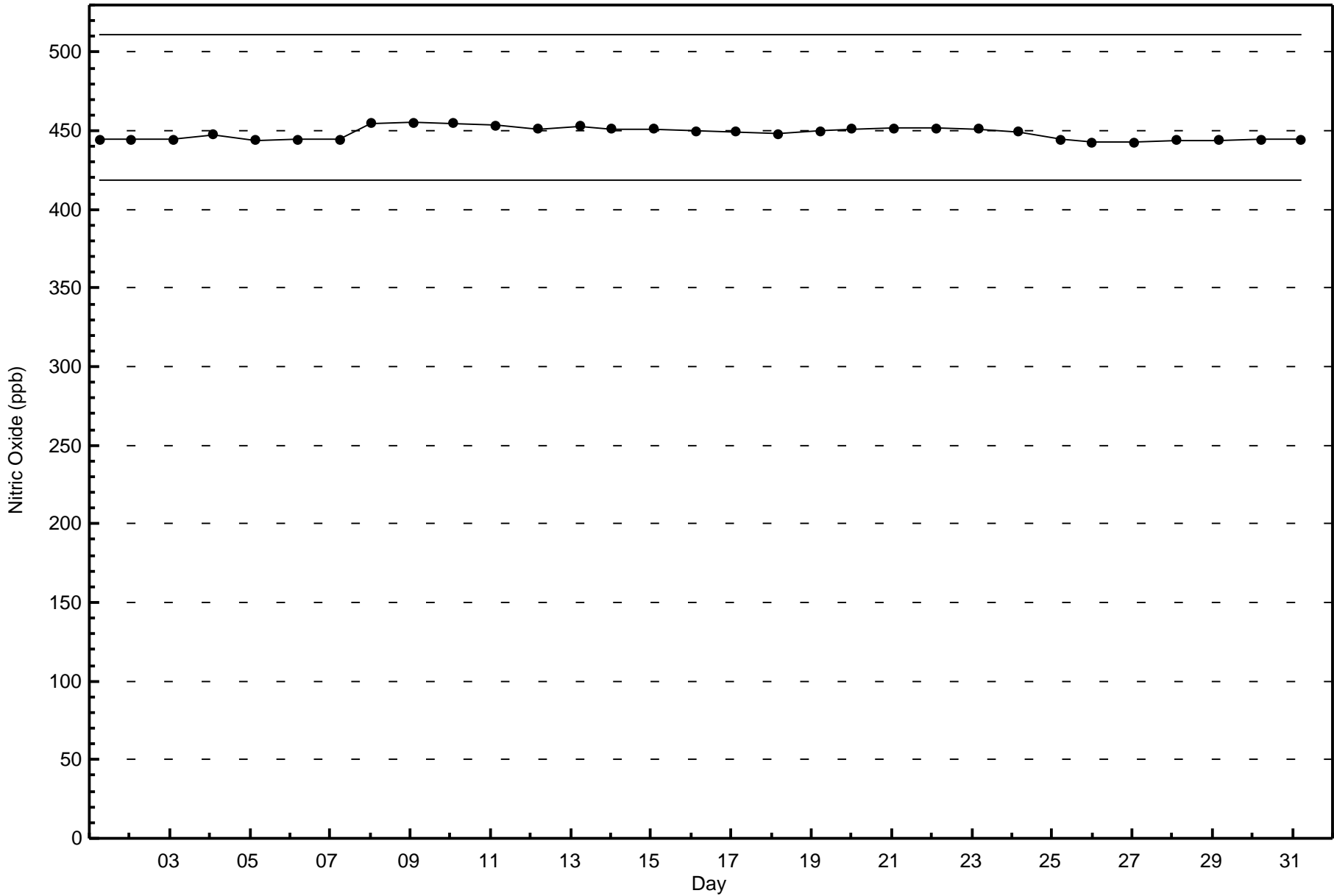
Total Number of Hours: 744



Total Number of Valid Hours: 684









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb

Fort McKay South - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 30 ppb on Dec 31 22:00	Maximum Daily Average: 16.1 ppb on Dec 1		Hours of Data:	708
Minimum Value: 0 ppb on Dec 5 10:00	Minimum Daily Average: 2.8 ppb on Dec 14		Hours of Missing Data:	36
Maximum Diurnal Average: 11.1 ppb at hour 17	Minimum Diurnal Average: 7.3 ppb at hour 6		Hours of Calibration:	36
Monthly Average: 9.5 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 2 Q <sub>1</sub> = 5 Median = 9 Q <sub>3</sub> = 14 P <sub>90</sub> = 17 P <sub>99</sub> = 25		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	3	7	17	18	Z	18	19	20	18	18	21	20	19	18	18	19	17	17	17	17	16	16	15	16.1	21
2-Dec	Z	14	13	15	15	13	12	13	10	10	13	17	17	17	14	9	9	3	1	1	1	1	1	1	9.4	17
3-Dec	1	Z	0	0	10	8	8	9	11	7	11	13	19	21	25	23	18	16	12	7	5	4	4	6	10.2	25
4-Dec	6	5	Z	3	9	9	10	8	6	5	3	10	9	15	16	14	8	7	6	6	5	9	12	11	8.3	16
5-Dec	7	5	2	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	7	12	15	16	17	3.7	17
6-Dec	15	13	11	9	Z	8	11	11	15	16	17	22	27	27	22	16	15	13	12	12	12	12	11	12	14.7	27
7-Dec	11	10	9	9	8	Z	7	8	8	C	C	C	C	C	14	9	8	12	8	6	5	5	6	11	8.4	14
8-Dec	Z	15	15	13	11	7	6	5	5	5	7	7	10	8	6	12	17	17	12	5	4	4	5	8	8.9	17
9-Dec	10	Z	17	16	12	10	17	20	20	19	18	16	15	11	14	17	14	10	12	13	14	12	8	7	14.0	20
10-Dec	8	11	Z	12	13	3	4	7	7	4	11	14	16	16	18	19	19	15	18	16	13	13	12	13	12.2	19
11-Dec	13	13	13	Z	10	10	9	7	8	8	7	7	7	7	7	6	3	3	2	7	6	4	4	7	7.2	13
12-Dec	8	8	8	5	Z	7	8	11	16	8	10	10	7	4	8	10	12	12	5	6	9	7	12	13	8.8	16
13-Dec	8	8	9	8	4	Z	5	4	5	6	6	4	3	2	2	7	18	17	16	14	10	9	9	8	7.8	18
14-Dec	Z	6	5	5	2	2	1	1	1	0	0	0	0	1	1	1	1	4	13	8	4	3	3	4	2.8	13
15-Dec	5	Z	4	5	4	9	13	10	8	6	4	2	1	1	1	2	4	5	4	2	1	2	7	7	4.6	13
16-Dec	8	10	Z	13	4	0	0	0	0	0	0	0	0	0	4	16	20	19	10	1	1	13	2	5.3	20	
17-Dec	1	0	0	Z	0	1	1	7	6	6	6	12	16	16	15	15	13	9	4	4	4	3	3	2	6.2	16
18-Dec	2	3	6	6	Z	7	8	10	10	11	11	8	7	10	13	16	16	14	6	4	3	3	2	2	7.7	16
19-Dec	2	2	3	4	5	Z	4	4	4	6	7	7	9	12	9	10	11	12	13	15	17	18	17	15	8.9	18
20-Dec	Z	9	9	7	7	6	6	7	6	5	6	11	9	9	10	12	14	14	14	14	16	7	4	6	9.0	16
21-Dec	4	Z	2	3	6	9	10	9	8	10	12	12	11	12	12	12	12	11	10	11	15	16	16	18	10.4	18
22-Dec	18	18	Z	10	8	6	6	7	6	8	11	12	13	10	4	3	4	7	5	6	10	7	7	11	8.4	18
23-Dec	12	16	15	Z	12	14	19	10	4	5	7	10	11	5	4	4	7	12	10	5	6	11	11	11	9.6	19
24-Dec	9	4	2	6	Z	4	6	7	15	16	14	11	12	13	13	14	14	13	12	10	9	8	9	9	10.1	16
25-Dec	11	14	16	15	15	Z	13	13	14	12	10	8	8	9	11	12	17	20	19	16	6	4	4	4	11.7	20
26-Dec	Z	5	6	8	9	9	8	7	7	6	6	7	11	12	15	20	24	25	28	28	24	24	24	24	14.6	28
27-Dec	25	Z	24	22	22	20	20	19	14	7	10	5	3	3	3	2	3	4	5	5	6	6	7	5	10.3	25
28-Dec	3	3	Z	2	2	4	12	14	16	13	15	14	11	12	10	11	11	10	11	13	15	19	22	20	11.4	22
29-Dec	18	15	15	Z	16	14	14	13	13	11	9	6	5	8	9	11	10	11	12	13	15	16	18	16	12.5	18
30-Dec	13	20	6	2	Z	2	4	9	17	7	16	18	17	15	11	7	4	4	8	14	11	17	19	17	11.2	20
31-Dec	13	16	21	18	11	Z	14	12	2	1	1	5	4	1	1	13	5	1	3	12	25	30	11	12	10.0	30

8.9	9.3	9.1	9.0	8.9	7.3	8.8	9.0	9.0	9.0	7.8	8.8	9.6	9.9	9.8	9.8	10.5	11.1	10.8	10.2	9.9	9.7	9.8	10.0	10.1	Diurnal Average
25	20	24	22	22	20	20	20	20	20	19	18	22	27	27	25	23	24	25	28	28	25	30	24	24	Diurnal Maximum

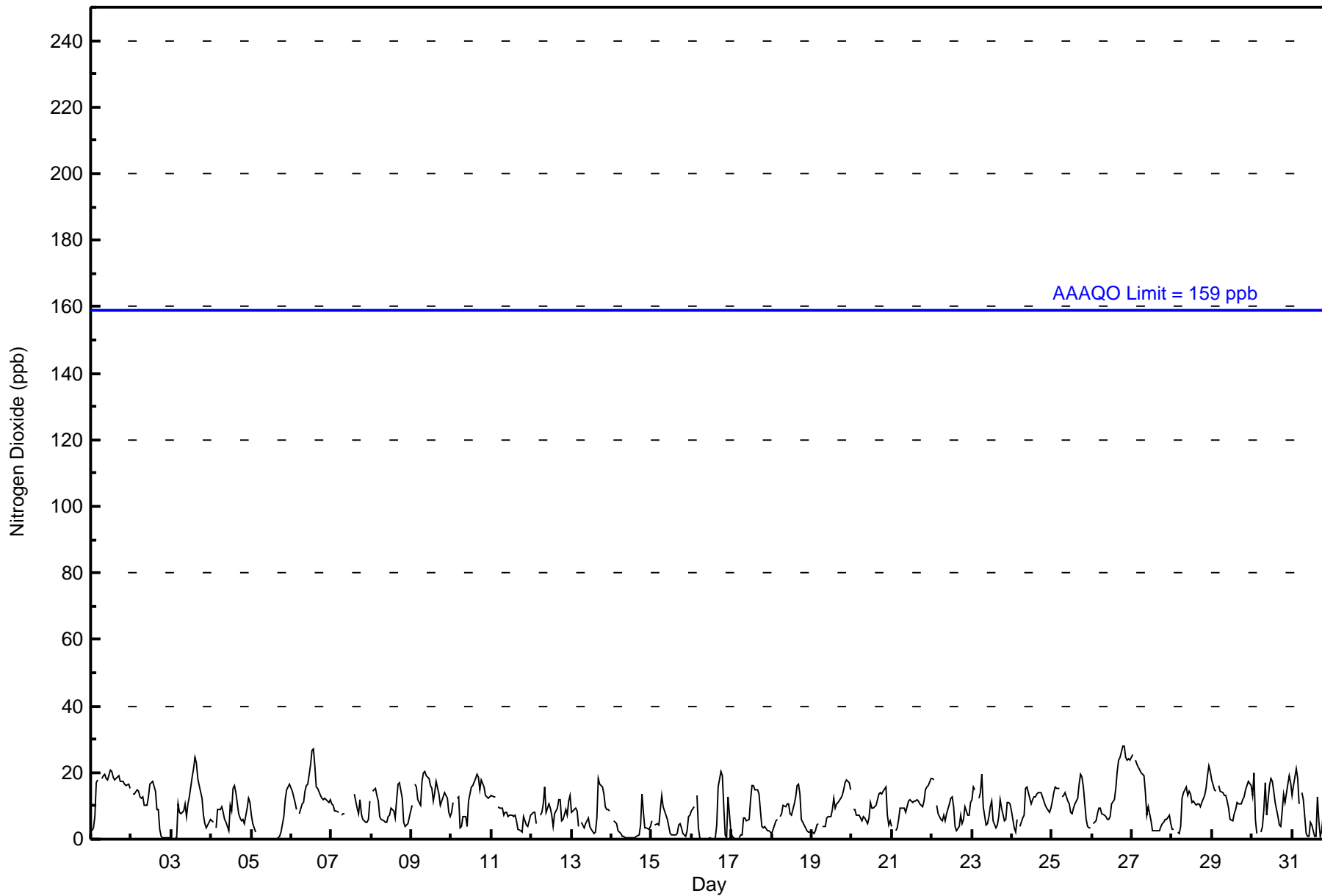
Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association

Hourly Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort McKay South - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Fort McKay South - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	684	96.61	96.61
21 - 40	24	3.39	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort McKay South - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	122	51	17	7	4	4	20	55	92	64	63	63	36	11	17	34	660
21 - 40	9	6	0	1	0	0	0	1	2	0	2	0	0	0	0	3	24
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	131	57	17	8	4	4	20	56	94	64	65	63	36	11	17	37	684

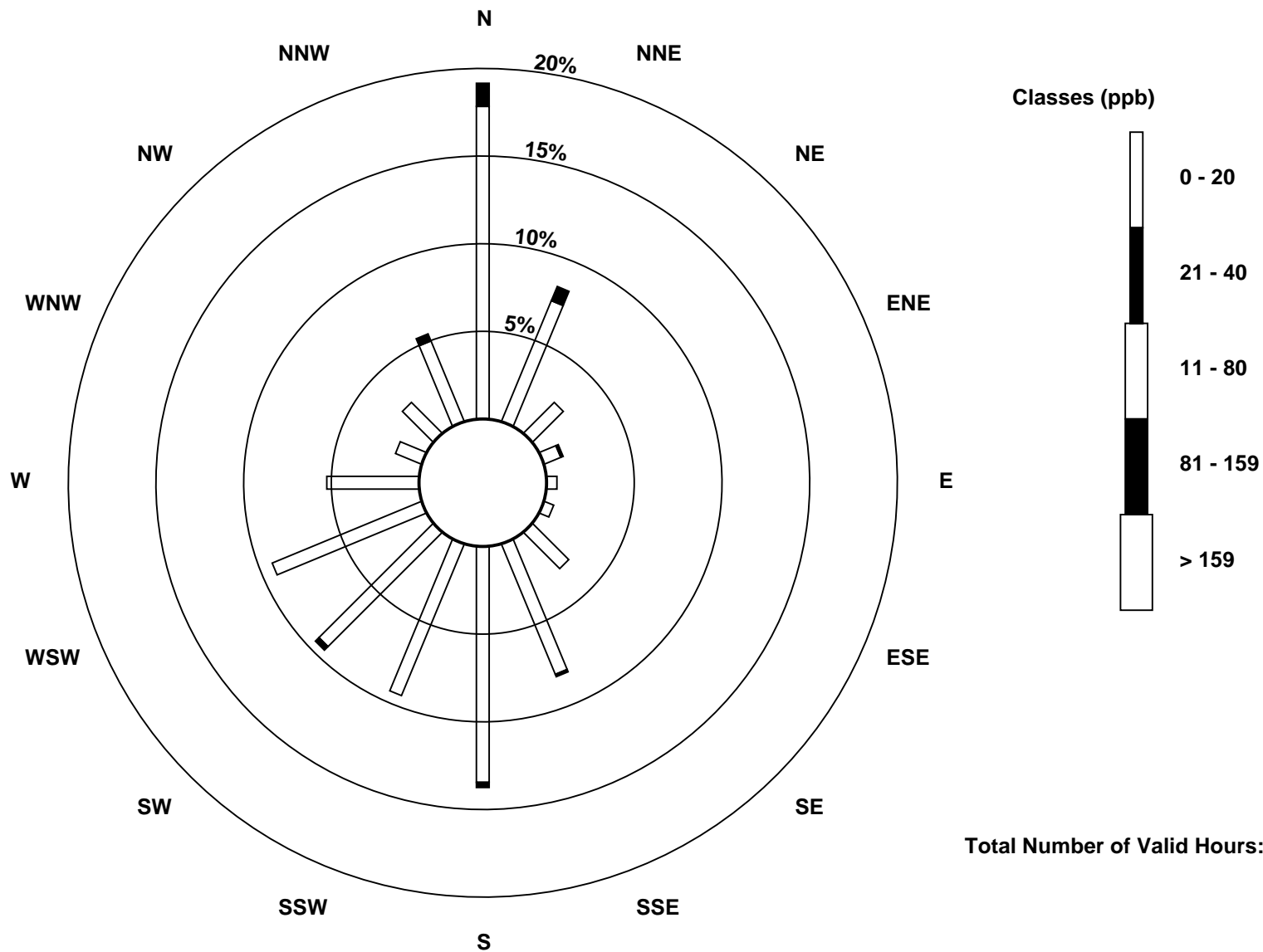
Total Number of Valid Hours: 684

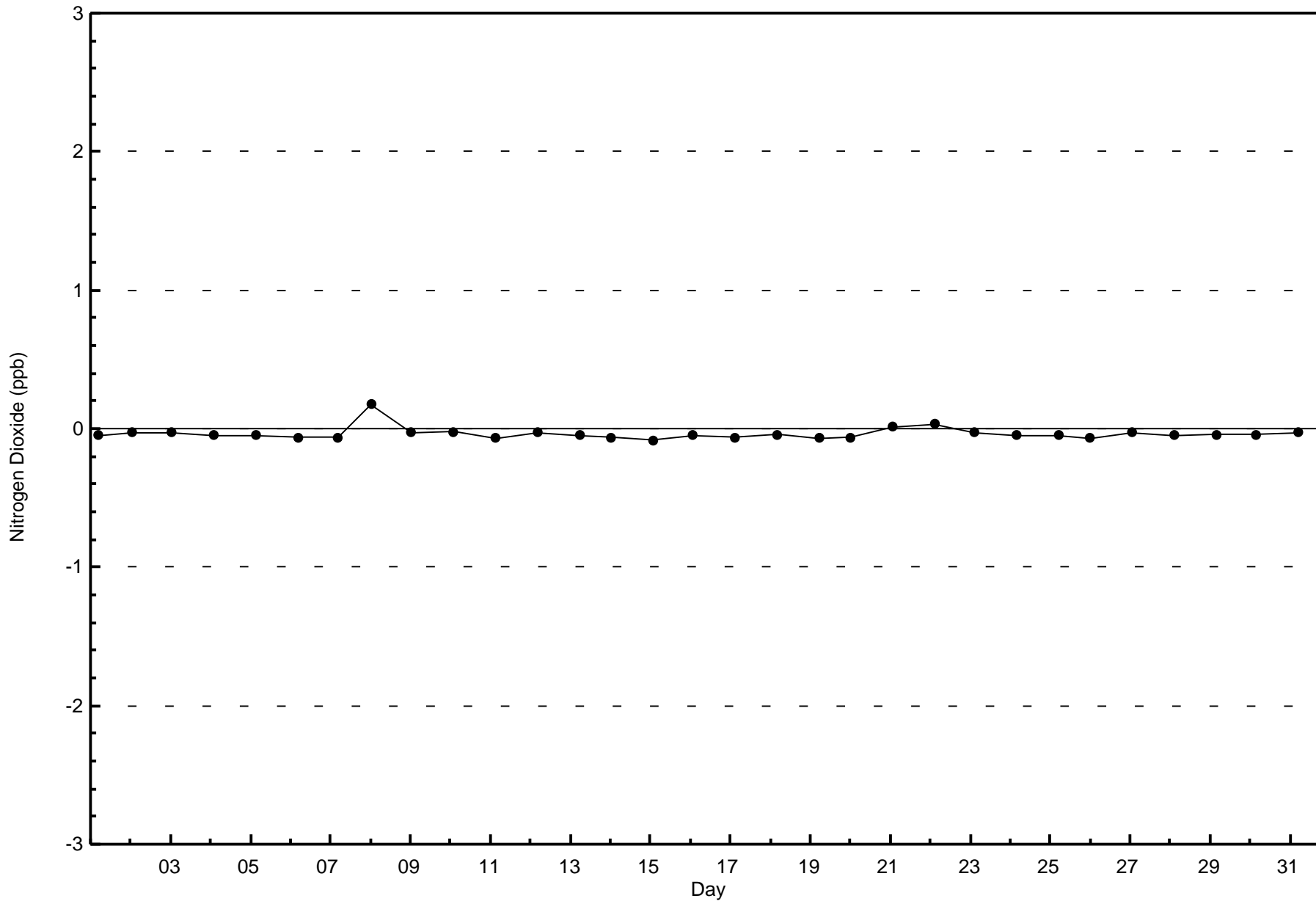
Total Number of Hours: 744



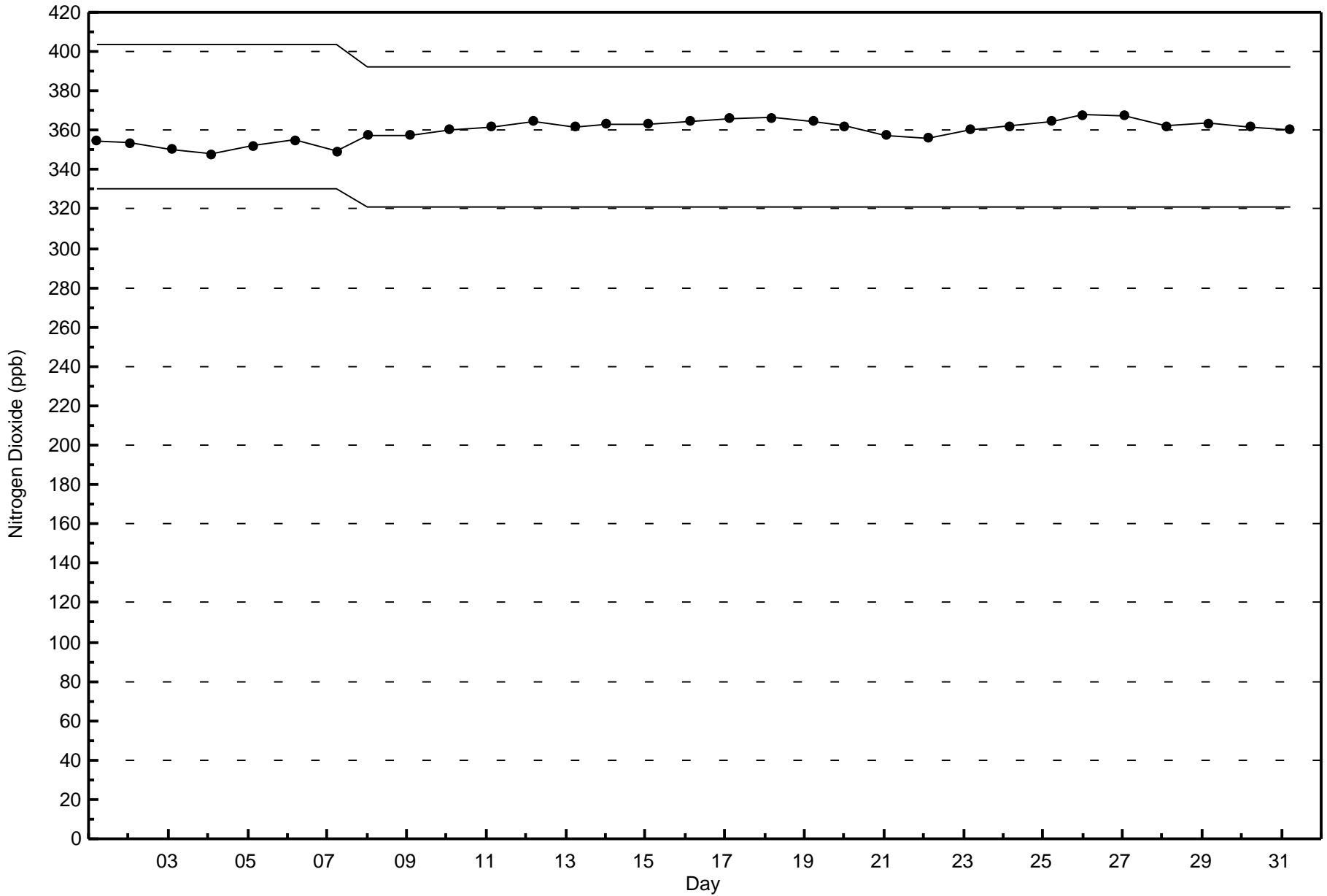
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Fort McKay South (AMS 13)











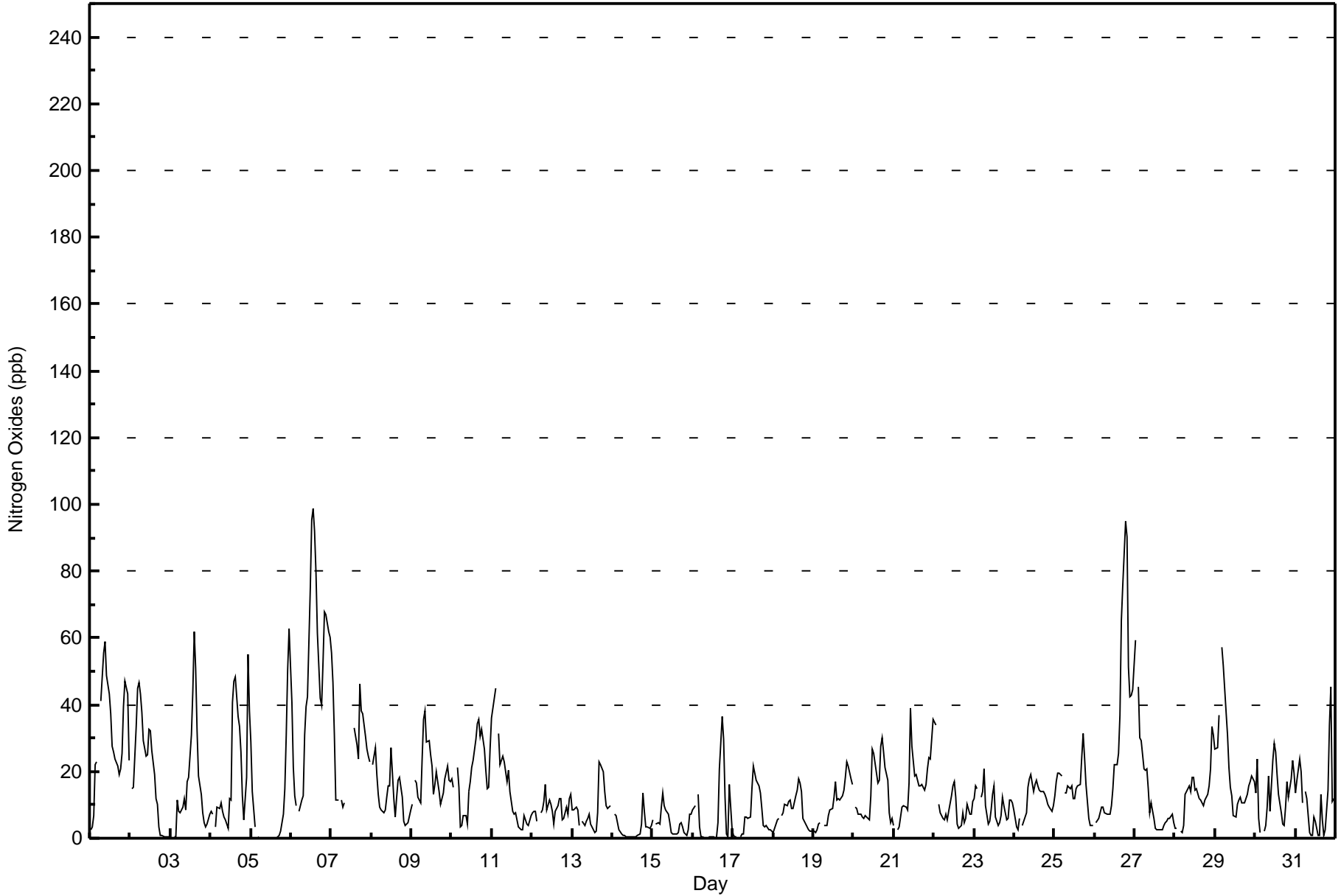
Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO<sub>x</sub>) - ppb

Fort McKay South - December 2015

Maximum Value: 99 ppb on Dec 6 14:00																		Maximum Daily Average: 48.8 ppb on Dec 6																		Hours in Service: 744	
Minimum Value: 0 ppb on Dec 5 10:00																		Minimum Daily Average: 3.0 ppb on Dec 14																		Hours of Data: 708	
Maximum Diurnal Average: 17.9 ppb at hour 18																		Minimum Diurnal Average: 10.8 ppb at hour 6																		Hours of Missing Data: 36	
Monthly Average: 15.3 ppb																		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 2 Q <sub>1</sub> = 5 Median = 11 Q <sub>3</sub> = 20 P <sub>90</sub> = 35 P <sub>99</sub> = 74																		Hours of Calibration: 36	
																																				Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	2	3	7	22	23	Z	41	48	55	59	49	43	37	28	26	24	21	19	21	25	40	47	43	23	30.7	59											
2-Dec	Z	15	15	33	45	47	43	38	29	25	25	33	32	26	19	12	10	3	1	1	1	1	0	1	19.7	47											
3-Dec	0	Z	0	0	11	8	8	9	12	8	17	18	31	44	62	51	32	19	13	7	5	4	4	7	16.2	62											
4-Dec	8	7	Z	4	9	9	11	8	6	6	3	12	11	41	47	48	37	33	26	13	5	18	55	38	19.8	55											
5-Dec	29	14	3	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	7	15	31	50	63	9.4	63											
6-Dec	41	21	13	10	Z	8	11	13	31	39	42	75	95	99	92	80	62	42	40	53	68	67	62	60	48.8	99											
7-Dec	56	47	31	11	12	Z	12	9	10	C	C	C	C	C	33	28	24	46	38	37	30	27	25	23	27.7	56											
8-Dec	Z	22	27	19	13	9	8	8	9	12	16	16	27	12	7	12	17	18	12	5	4	4	4	8	12.6	27											
9-Dec	10	Z	17	16	12	10	24	36	38	29	29	25	22	13	16	20	14	10	12	14	18	22	18	17	19.2	38											
10-Dec	18	15	Z	21	15	3	4	7	7	4	14	17	21	23	29	34	35	31	33	27	20	15	15	27	19.0	35											
11-Dec	36	42	45	Z	31	22	25	23	20	17	21	14	8	7	8	6	3	3	2	7	6	4	4	7	15.6	45											
12-Dec	7	8	8	5	Z	7	8	11	16	8	11	10	8	4	8	10	12	12	5	6	9	7	12	13	9.0	16											
13-Dec	8	8	9	8	4	Z	5	4	5	6	7	4	3	2	2	8	23	22	20	14	10	9	9	10	8.7	23											
14-Dec	Z	7	7	5	2	1	1	1	0	0	0	0	0	1	1	1	1	4	14	8	4	3	3	4	3.0	14											
15-Dec	5	Z	4	5	4	9	14	10	8	7	5	2	1	1	1	2	4	5	4	2	1	2	7	7	4.8	14											
16-Dec	8	10	Z	13	4	0	0	0	0	0	0	0	0	0	4	21	36	30	12	1	1	16	2	7.0	36												
17-Dec	1	0	0	Z	0	1	1	7	6	6	6	15	22	20	17	16	14	9	4	4	4	3	3	2	6.9	22											
18-Dec	2	3	6	6	Z	7	8	10	10	11	12	9	9	13	14	18	17	14	6	4	3	3	2	2	8.1	18											
19-Dec	2	2	3	4	5	Z	4	4	4	7	8	9	12	17	12	12	11	13	14	18	23	21	18	16	10.3	23											
20-Dec	Z	9	9	7	7	7	6	7	6	6	13	27	25	22	17	18	27	30	26	21	18	8	4	6	14.2	30											
21-Dec	4	Z	2	3	6	9	10	9	8	17	39	28	19	19	17	16	16	16	15	16	21	24	24	36	16.2	39											
22-Dec	35	34	Z	10	8	6	5	7	6	8	13	16	17	12	4	3	4	7	5	6	10	7	7	11	10.5	35											
23-Dec	12	16	15	Z	12	14	21	10	4	5	8	13	16	6	4	4	7	12	10	5	6	11	11	11	10.2	21											
24-Dec	9	3	2	6	Z	4	6	7	15	18	19	14	16	17	16	15	14	14	13	12	10	9	8	10	11.3	19											
25-Dec	13	17	20	19	19	Z	14	13	16	15	15	12	12	15	15	16	24	31	24	16	6	4	4	4	14.9	31											
26-Dec	Z	4	6	8	9	10	8	7	7	7	10	15	22	22	25	37	65	76	95	90	51	42	43	44	30.6	95											
27-Dec	59	Z	45	30	29	21	20	21	15	7	11	6	3	3	3	2	3	4	5	5	6	6	7	5	13.7	59											
28-Dec	3	3	Z	2	2	4	13	14	16	14	18	18	14	15	12	12	11	10	11	13	16	21	33	31	13.3	33											
29-Dec	27	27	37	Z	57	52	38	31	21	15	13	7	7	10	11	12	11	11	12	13	16	17	18	17	20.8	57											
30-Dec	13	24	6	2	Z	2	4	9	19	8	23	28	26	19	13	8	4	4	9	17	12	18	23	20	13.5	28											
31-Dec	13	17	24	20	11	Z	14	12	2	1	1	6	5	1	1	13	5	1	3	15	34	45	11	12	11.6	45											
																								Diurnal Average	Diurnal Maximum												
16.2 14.6 13.9 11.2 13.5 10.8 12.4 12.7 13.0 12.2 15.0 16.4 17.4 17.1 17.2 17.4 17.7 17.9 16.9 15.9 15.2 16.1 17.6 17.3																								Diurnal Average	Diurnal Maximum												
59 47 45 33 57 52 43 48 55 59 49 75 95 99 92 80 65 76 95 90 68 67 62 63																								Diurnal Average	Diurnal Maximum												
Z - zerospan C - Calibration																																					





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Fort McKay South - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	537	75.85	75.85
21 - 40	119	16.81	92.66
41 - 80	47	6.64	99.29
81 - 159	5	0.71	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Fort McKay South - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	97	36	16	6	3	4	19	49	72	46	38	54	29	9	14	22	514
21 - 40	24	16	1	1	0	0	1	5	17	11	14	5	6	2	3	12	118
11 - 80	9	3	0	0	1	0	0	2	5	7	13	4	1	0	0	2	47
81 - 159	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	5
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	131	57	17	8	4	4	20	56	94	64	65	63	36	11	17	37	684

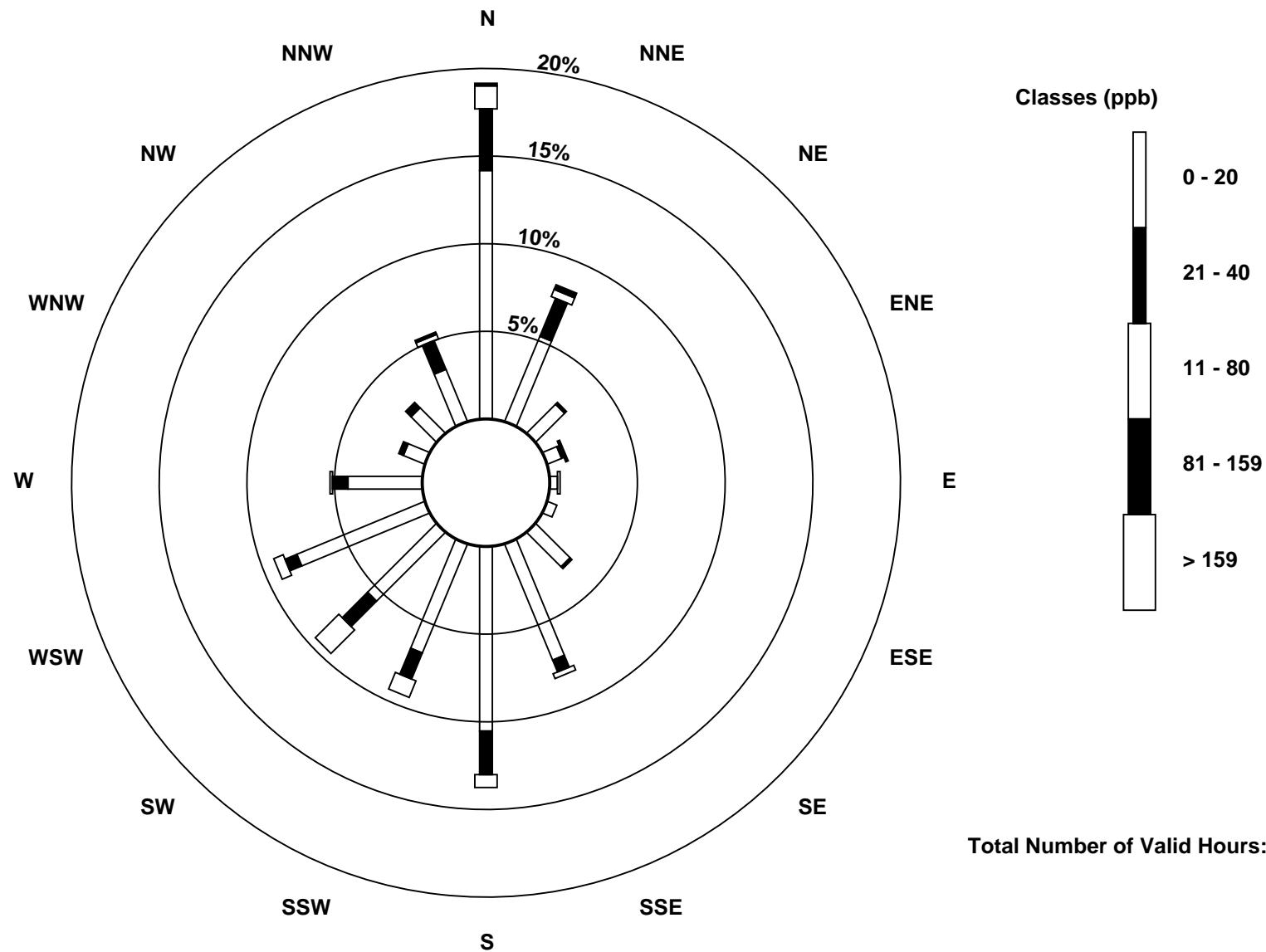
Total Number of Valid Hours: 684

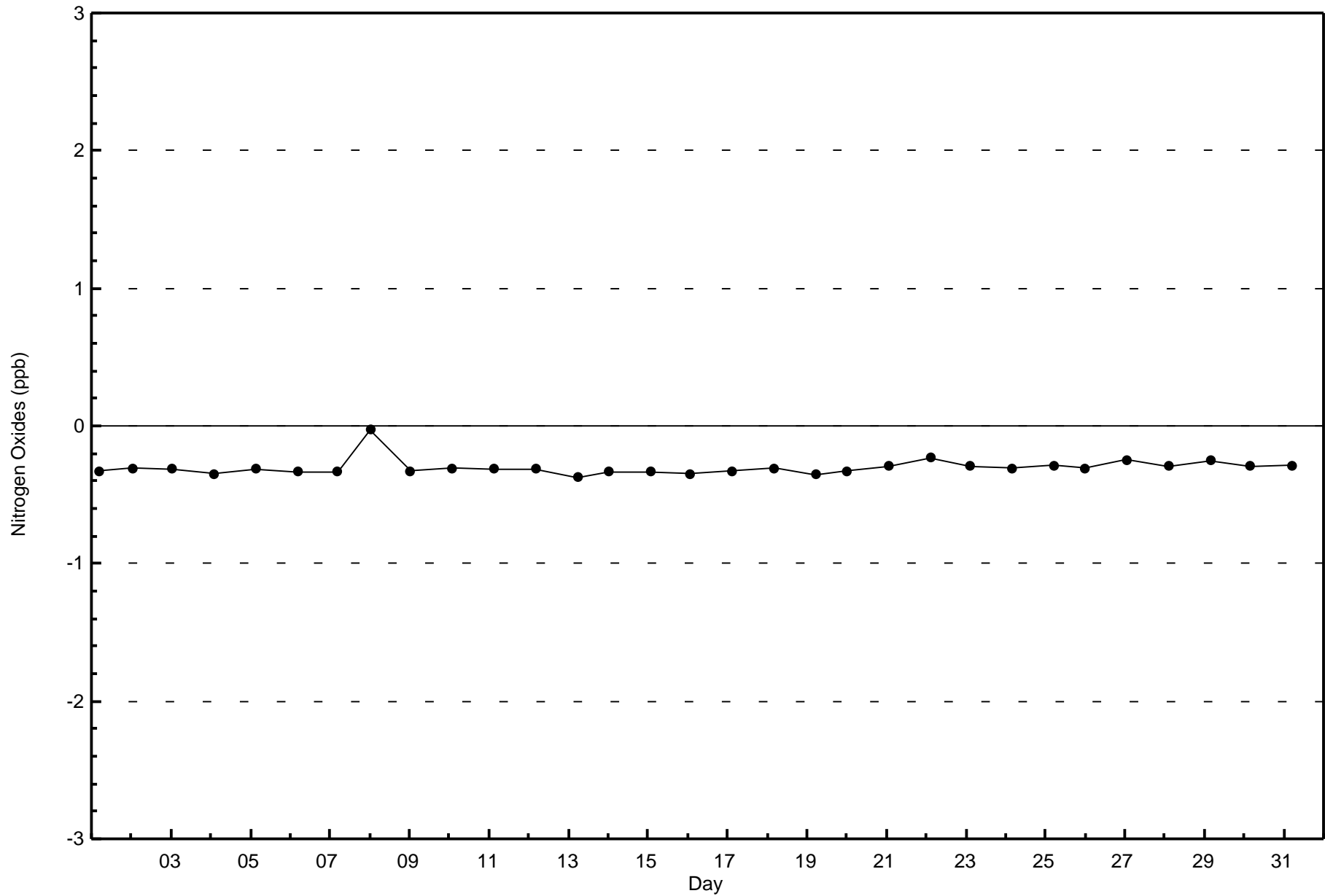
Total Number of Hours: 744

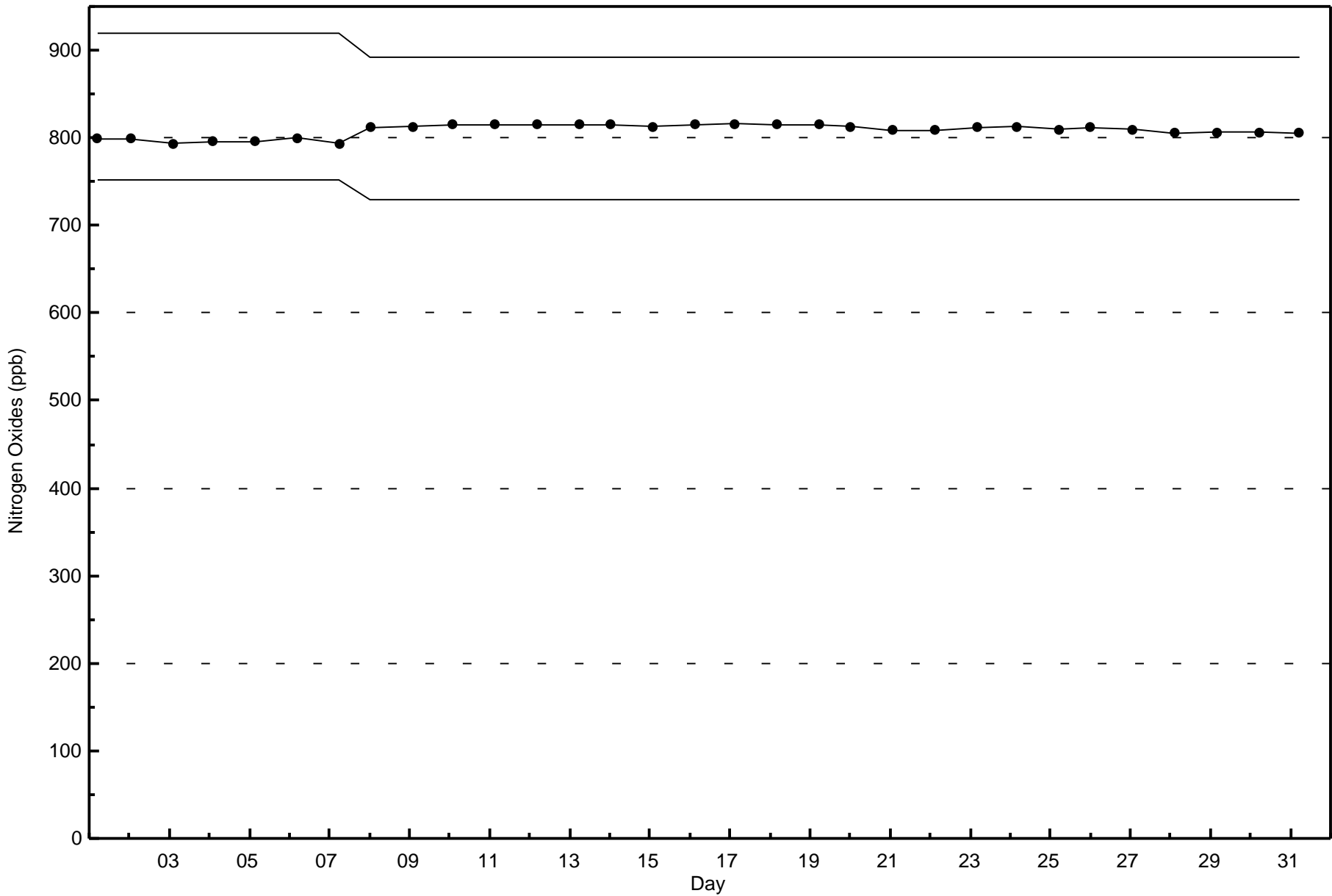


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Fort McKay South (AMS 13)











Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 47.4 µg/m <sup>3</sup> on Dec 22 01:00 Maximum Daily Average: 10.0 µg/m <sup>3</sup> on Dec 1		Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 1 Percent Operational Time: 100.0																																														
Minimum Value: 0.6 µg/m <sup>3</sup> on Dec 5 15:00 Maximum Diurnal Average: 5.1 µg/m <sup>3</sup> at hour 14 Monthly Average: 4.61 µg/m <sup>3</sup>		Minimum Daily Average: 1.7 µg/m <sup>3</sup> on Dec 16 Minimum Diurnal Average: 3.9 µg/m <sup>3</sup> at hour 23 Percentiles: P <sub>1</sub> = 0.8 P <sub>10</sub> = 1.5 Q <sub>1</sub> = 2.4 Median = 3.9 Q <sub>3</sub> = 5.8 P <sub>90</sub> = 8.3 P <sub>99</sub> = 14.5																																														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	4.0	2.8	14.8	12.5	6.2	8.8	7.8	10.1	11.3	13.0	9.7	9.7	9.7	11.7	10.8	10.7	12.8	11.9	16.5	14.4	11.7	11.6	5.2	2.8	10.0	16.5																						
2-Dec	2.2	2.6	4.0	6.4	7.4	9.0	8.8	9.1	9.6	11.0	12.3	13.4	13.1	13.7	9.9	8.0	8.1	4.1	2.0	1.7	1.6	1.5	1.4	1.3	6.8	13.7																						
3-Dec	1.4	2.1	2.1	2.0	2.4	2.5	2.2	2.6	3.7	4.1	5.0	5.4	10.2	14.5	12.9	11.2	10.6	10.2	8.8	9.3	9.1	8.0	7.7	7.2	6.5	14.5																						
4-Dec	8.1	8.8	9.2	9.3	13.6	14.6	13.7	11.6	8.8	7.1	7.2	10.1	8.6	8.3	6.9	5.9	5.1	5.5	8.5	9.1	4.9	5.7	6.3	5.6	8.4	14.6																						
5-Dec	4.8	4.1	3.7	3.4	2.7	1.9	1.5	1.4	1.6	1.2	1.1	1.0	1.0	0.8	0.6	0.9	0.8	1.1	1.7	3.8	2.9	4.1	4.0	2.8	2.2	4.8																						
6-Dec	2.9	2.3	1.9	1.8	1.7	1.4	1.7	1.9	2.7	4.1	5.9	7.4	8.3	7.6	7.0	7.0	6.0	7.2	11.5	10.8	6.6	4.6	4.2	4.0	5.0	11.5																						
7-Dec	3.5	3.9	4.9	4.0	4.5	3.4	2.9	2.8	2.9	2.5	2.4	2.9	2.7	3.0	3.7	3.5	3.6	4.6	4.0	3.6	2.9	2.7	2.2	3.3	3.4	4.9																						
8-Dec	3.3	2.8	3.2	3.7	3.7	3.3	3.4	3.0	3.5	4.3	C	3.8	5.0	5.5	7.1	7.0	6.7	6.6	5.5	4.2	4.1	4.0	3.8	4.4	4.4	7.1																						
9-Dec	3.7	3.9	4.5	5.0	5.2	5.4	6.1	6.2	5.8	5.1	4.6	4.6	4.3	3.6	3.5	3.7	4.9	6.6	7.5	6.5	6.3	6.3	6.2	6.5	5.3	7.5																						
10-Dec	6.9	7.2	6.9	6.2	4.8	4.0	3.6	3.9	4.4	4.3	5.2	4.9	5.4	5.8	6.2	7.0	6.6	5.9	5.3	5.5	4.9	5.0	5.3	6.2	5.5	7.2																						
11-Dec	6.4	8.2	7.5	7.3	6.4	5.6	5.9	5.3	5.5	5.5	5.3	5.2	2.9	2.3	2.5	2.5	2.2	2.0	2.2	2.2	1.0	0.8	0.7	0.9	4.0	8.2																						
12-Dec	0.9	0.9	1.0	0.9	1.2	1.1	1.2	1.8	4.1	4.8	4.7	4.9	4.8	4.2	4.1	4.0	3.5	3.5	3.4	4.0	3.3	2.4	2.1	1.8	2.9	4.9																						
13-Dec	1.9	2.4	2.9	2.8	1.9	1.6	1.3	0.9	1.0	1.3	1.5	1.9	2.0	1.6	1.6	1.7	2.1	2.3	2.7	2.7	2.6	2.8	2.7	2.8	2.0	2.9																						
14-Dec	3.8	3.8	3.4	5.5	4.2	3.3	3.6	3.5	3.7	3.3	2.7	2.2	2.5	2.1	2.6	2.6	2.4	2.4	2.8	2.9	2.8	2.6	2.4	3.4	3.1	5.5																						
15-Dec	4.4	3.6	4.0	3.8	5.8	9.0	10.0	7.4	5.1	5.4	5.6	5.1	5.4	3.9	3.3	3.6	4.0	5.3	5.5	4.6	3.6	3.1	4.5	1.8	4.9	10.0																						
16-Dec	1.9	2.3	2.6	2.7	2.0	1.6	1.2	1.0	1.3	1.3	1.4	1.5	0.9	0.7	0.7	0.8	1.8	2.2	2.1	2.2	2.3	1.9	1.5	2.0	1.7	2.7																						
17-Dec	1.5	1.4	1.4	1.3	0.9	0.8	1.4	1.7	1.7	1.7	1.9	2.2	2.4	2.2	2.3	2.1	2.5	2.5	2.2	2.0	1.8	1.5	1.5	1.5	1.8	2.5																						
18-Dec	1.1	1.2	1.2	1.2	1.3	1.4	1.4	1.5	1.6	1.7	3.4	3.4	4.1	3.3	3.2	3.1	2.7	2.5	2.0	1.6	1.4	1.2	1.2	1.1	2.0	4.1																						
19-Dec	1.5	1.3	1.5	1.7	1.7	1.6	1.7	1.6	1.4	1.5	1.8	2.3	2.7	3.4	2.6	2.3	2.3	3.0	2.9	2.4	2.4	3.2	4.3	3.9	2.3	4.3																						
20-Dec	3.4	3.4	3.8	4.3	4.2	4.6	4.6	5.8	5.6	6.2	7.1	6.2	5.0	4.3	4.3	4.6	4.4	3.9	4.0	4.2	4.2	4.4	3.7	2.9	4.5	7.1																						
21-Dec	3.3	4.1	4.8	5.0	6.8	7.5	6.9	7.0	6.0	5.3	5.3	8.6	8.6	9.2	8.8	8.9	8.2	7.0	6.5	6.8	7.6	8.6	11.8	37.6	8.3	37.6																						
22-Dec	47.4	44.1	23.9	5.4	4.0	3.6	5.1	6.6	8.1	5.8	4.6	3.3	3.0	3.4	5.1	5.8	6.4	4.1	2.9	2.9	3.1	2.9	2.8	2.7	8.6	47.4																						
23-Dec	3.7	4.4	4.4	4.1	3.9	3.9	3.9	3.6	4.1	4.8	4.9	4.1	4.8	3.1	2.6	4.1	4.9	3.3	3.5	3.0	3.1	3.8	4.2	3.3	3.9	4.9																						
24-Dec	2.2	2.0	2.1	2.4	2.5	2.1	1.6	1.9	2.5	2.8	3.3	4.6	5.7	6.4	6.8	7.2	6.4	5.3	4.8	4.5	4.2	4.1	3.9	3.1	3.8	7.2																						
25-Dec	4.6	7.3	8.8	8.7	8.8	8.4	8.3	8.7	7.5	6.6	6.2	5.0	5.2	7.9	7.1	6.8	11.7	9.6	6.9	4.9	3.4	3.3	2.7	2.8	6.7	11.7																						
26-Dec	3.0	3.3	3.2	2.8	2.9	2.7	2.3	2.3	2.2	2.0	2.5	4.5	6.3	7.9	7.9	7.9	7.7	8.6	9.5	7.8	6.1	7.0	8.3	7.5	5.3	9.5																						
27-Dec	6.4	7.6	6.7	5.8	5.1	5.0	5.1	5.4	4.7	4.8	3.6	3.4	3.8	3.8	4.2	4.4	4.7	5.0	5.7	5.5	5.2	5.0	5.0	4.3	5.0	7.6																						
28-Dec	5.6	5.8	6.3	6.0	4.3	4.5	7.3	8.2	7.1	6.2	5.4	5.3	5.1	5.8	5.0	4.4	4.6	5.2	5.0	5.1	5.0	4.8	5.5	5.2	5.5	8.2																						
29-Dec	3.7	3.0	4.0	4.6	4.6	4.0	3.8	4.1	5.9	7.1	7.0	5.0	4.3	4.5	5.5	5.4	6.3	6.0	6.0	4.1	3.6	3.4	2.8	2.2	4.6	7.1																						
30-Dec	2.1	1.8	1.4	1.2	1.1	1.0	1.0	1.5	1.6	1.3	1.7	2.6	3.0	3.0	3.8	3.1	2.0	1.8	2.1	2.2	2.4	2.3	1.5	1.4	2.0	3.8																						
31-Dec	1.3	1.4	1.7	1.7	1.9	2.5	3.1	3.3	2.9	3.0	3.4	4.2	2.9	1.6	1.4	2.0	2.4	2.5	2.3	2.8	3.2	3.5	1.9	2.0	2.4	4.2																						
																								4.9	5.0	4.9	4.3	4.1	4.2	4.3	4.4	4.4	4.5	4.6	4.8	5.0	5.1	5.0	4.9	5.1	4.9	5.0	4.8	4.1	4.1	3.9	4.5	Diurnal Average
																								47.4	44.1	23.9	12.5	13.6	14.6	13.7	11.6	11.3	13.0	12.3	13.4	13.1	14.5	12.9	11.2	12.8	11.9	16.5	14.4	11.7	11.6	11.8	37.6	Diurnal Maximum
C - Calibration																																																
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																																																

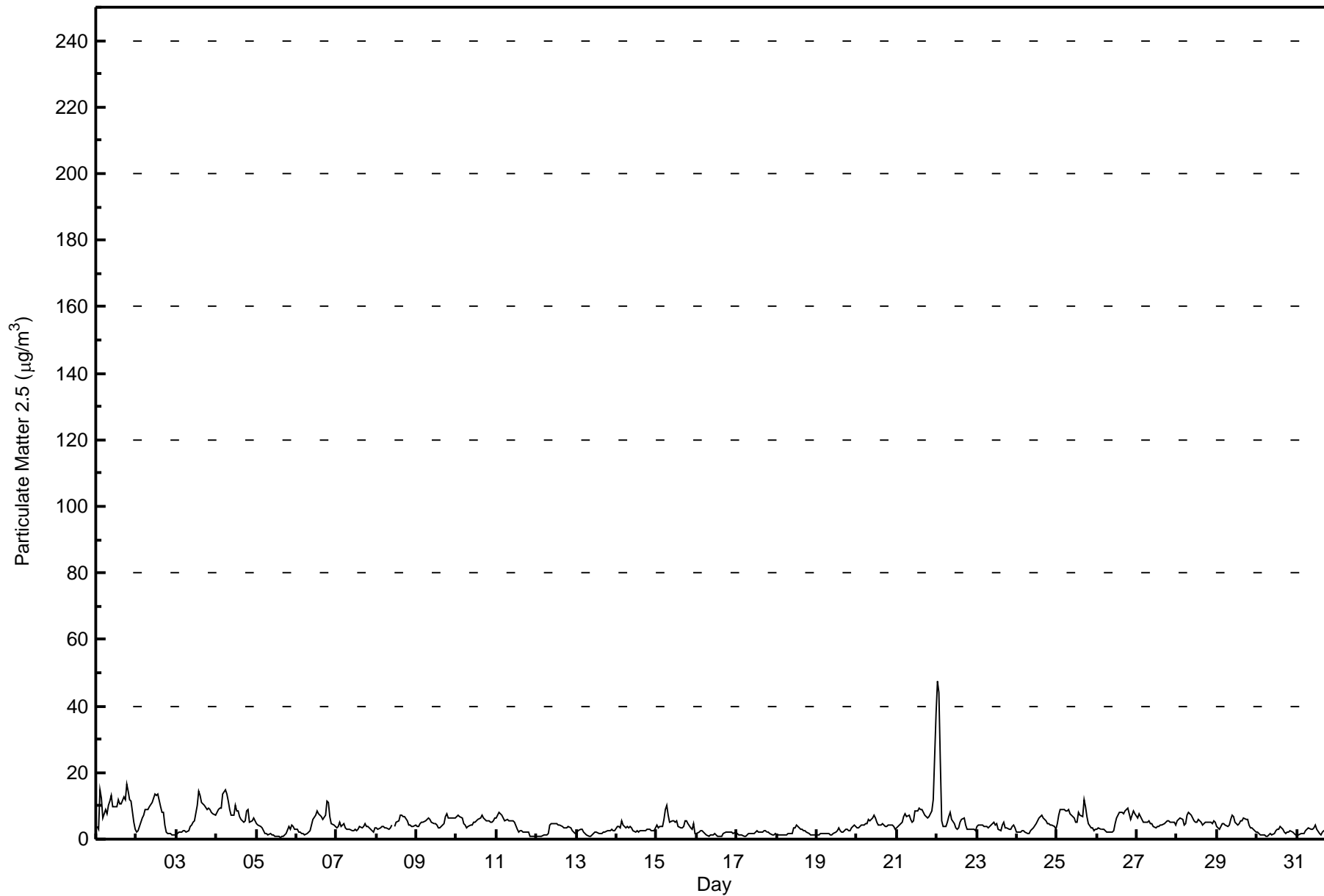


Wood Buffalo Environmental Association

Hourly Averages

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$

Fort McKay South - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Fort McKay South - December 2015**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	519	69.85	69.85
6 - 15	199	26.78	96.64
16 - 25	2	0.27	96.90
26 - 80	3	0.40	97.31
> 81.0	0	0.00	97.31

Total Number of Valid Hours: 743

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Fort McKay South - December 2015**

Concentration Ranges ( $\mu\text{g}/\text{m}^3$ )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	89	43	15	6	2	5	13	46	70	39	47	55	34	6	9	25	504
6 - 15	45	16	2	2	2	0	4	8	28	24	18	6	4	6	8	16	189
16 - 25	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2
26 - 80	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	136	59	17	8	4	5	17	54	98	63	65	62	38	12	17	43	698

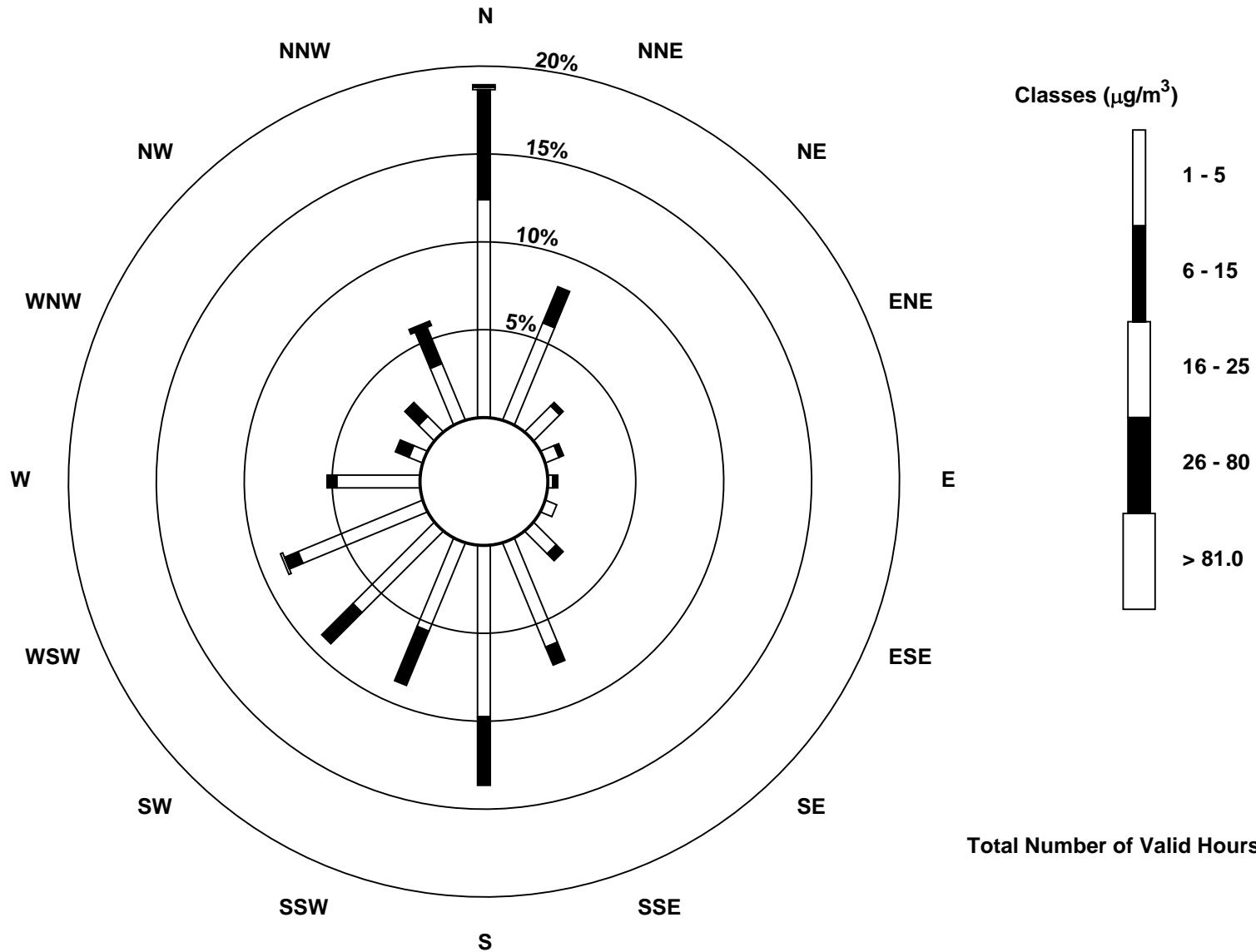
Total Number of Valid Hours: 718

Total Number of Hours: 744



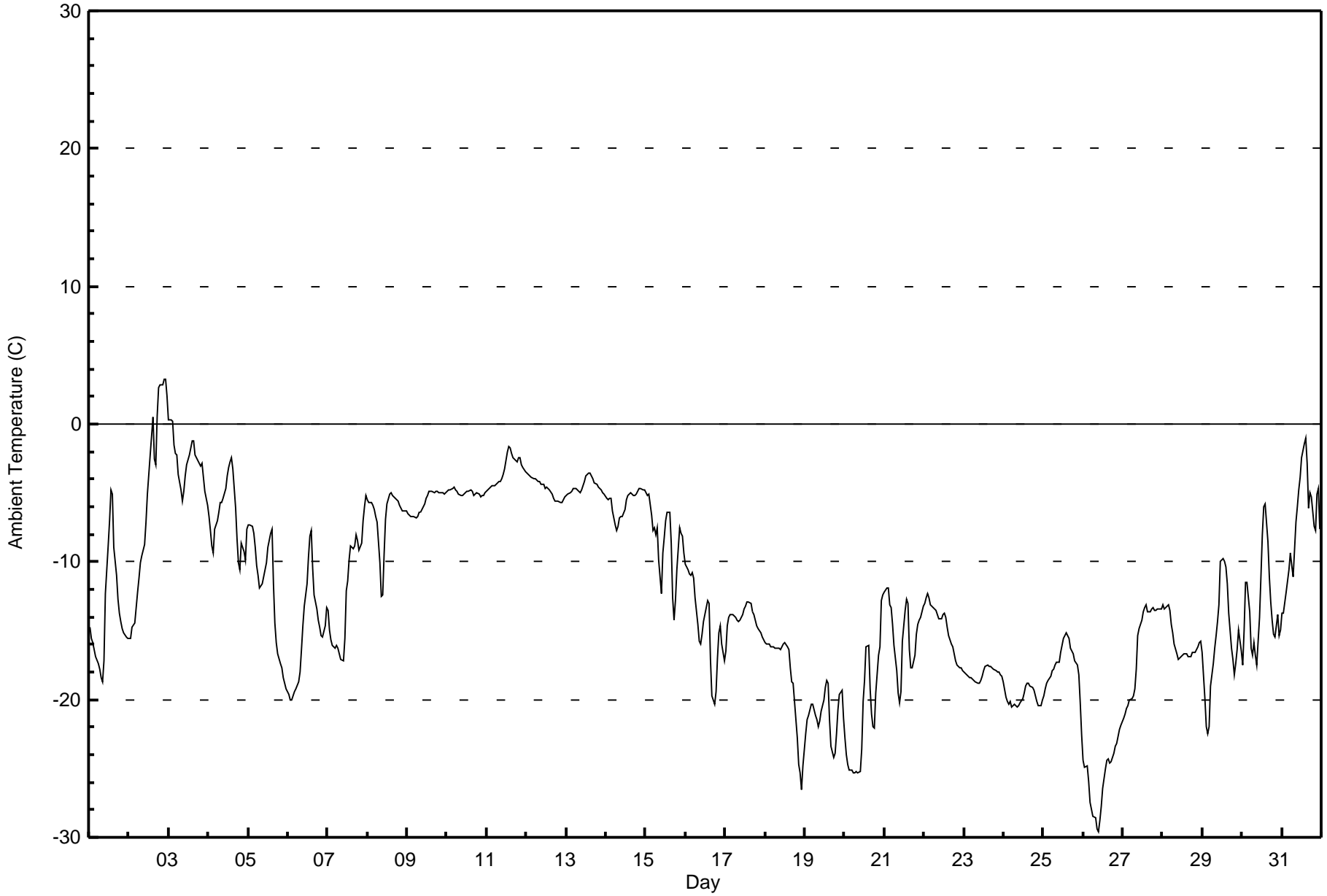
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Fort McKay South (AMS 13)





Maximum Value: 3.3 C on Dec 2 22:00		Maximum Daily Average: -2.7 C on Dec 3		Hours in Service: 744																						
Minimum Value: -29.6 C on Dec 26 10:00		Minimum Daily Average: -25.6 C on Dec 26		Hours of Data: 744																						
Maximum Diurnal Average: -9.6 C at hour 15		Minimum Diurnal Average: -13.7 C at hour 9		Hours of Missing Data: 0																						
Monthly Average: -12.27 C		Percentiles: P <sub>1</sub> = -27.5 P <sub>10</sub> = -20.3 Q <sub>1</sub> = -17.2 Median = -13.4 Q <sub>3</sub> = -5.6 P <sub>90</sub> = -4.3 P <sub>99</sub> = -0.7		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-14.8	-15.5	-15.9	-16.4	-16.9	-17.4	-17.8	-18.4	-18.8	-17.1	-12.3	-8.8	-7.0	-4.7	-5.1	-9.0	-11.0	-12.7	-13.7	-14.3	-14.9	-15.1	-15.5	-15.6	-13.7	-4.7
2-Dec	-15.6	-15.6	-14.7	-14.5	-13.3	-12.2	-11.1	-10.0	-9.5	-8.8	-7.1	-5.1	-3.7	-2.3	0.5	-2.5	-3.0	0.6	2.6	2.8	2.9	3.3	3.2	2.0	-5.5	3.3
3-Dec	0.3	0.3	0.2	-1.6	-2.2	-2.2	-3.7	-4.7	-5.6	-4.9	-3.7	-3.0	-2.3	-1.8	-1.2	-1.2	-2.2	-2.5	-2.9	-3.0	-2.8	-3.8	-4.9	-5.9	-2.7	0.3
4-Dec	-6.7	-7.7	-8.9	-9.4	-7.6	-7.0	-6.4	-5.7	-5.7	-5.4	-4.7	-3.8	-3.1	-2.7	-2.4	-3.3	-6.1	-8.3	-10.1	-10.6	-10.6	-9.3	-9.9	-7.6	-6.7	-2.4
5-Dec	-7.3	-7.3	-7.5	-7.9	-8.9	-10.3	-11.0	-11.9	-11.6	-11.1	-10.5	-10.0	-8.9	-8.0	-7.6	-11.5	-14.5	-15.9	-16.6	-17.4	-17.7	-18.4	-18.8	-19.2	-12.1	-7.3
6-Dec	-19.6	-20.0	-20.1	-19.8	-19.4	-19.3	-18.7	-18.0	-16.3	-14.7	-13.2	-11.6	-9.7	-8.1	-7.7	-10.5	-12.4	-13.4	-14.2	-14.8	-15.3	-15.5	-14.6	-13.3	-15.0	-7.7
7-Dec	-13.6	-14.9	-15.6	-16.0	-16.3	-16.1	-16.3	-16.7	-17.1	-17.1	-15.6	-12.1	-11.4	-9.8	-8.9	-9.0	-8.8	-8.1	-8.4	-9.2	-8.6	-7.0	-6.0	-5.2	-12.0	-5.2
8-Dec	-5.4	-5.7	-5.7	-5.9	-6.2	-6.7	-7.2	-10.1	-12.5	-12.4	-9.4	-6.9	-5.8	-5.1	-5.0	-5.2	-5.3	-5.4	-5.6	-5.9	-6.1	-6.3	-6.3	-6.3	-6.8	-5.0
9-Dec	-6.5	-6.6	-6.7	-6.7	-6.7	-6.8	-6.7	-6.4	-6.4	-6.2	-5.8	-5.4	-5.2	-4.9	-4.9	-4.9	-4.9	-4.9	-4.9	-5.0	-5.0	-5.0	-5.0	-5.0	-5.7	-4.9
10-Dec	-4.9	-4.8	-4.7	-4.7	-4.6	-4.7	-4.9	-5.0	-5.2	-5.2	-5.0	-5.0	-4.9	-4.9	-4.8	-4.9	-5.2	-5.1	-5.0	-5.1	-5.3	-5.2	-5.2	-5.0	-5.0	-4.6
11-Dec	-4.9	-4.7	-4.5	-4.5	-4.5	-4.4	-4.3	-4.1	-4.1	-4.0	-3.7	-3.3	-2.0	-1.6	-1.7	-2.1	-2.4	-2.7	-2.8	-2.5	-2.5	-2.9	-3.2	-3.4	-3.4	-1.6
12-Dec	-3.6	-3.7	-3.8	-3.9	-3.9	-4.0	-4.0	-4.1	-4.2	-4.4	-4.4	-4.6	-4.6	-4.7	-4.8	-5.1	-5.4	-5.5	-5.6	-5.6	-5.7	-5.7	-5.5	-5.3	-4.7	-3.6
13-Dec	-5.1	-5.1	-5.0	-4.9	-4.7	-4.6	-4.7	-4.8	-4.9	-4.8	-4.5	-4.1	-3.8	-3.5	-3.6	-3.8	-4.0	-4.2	-4.4	-4.6	-4.7	-4.8	-5.0	-5.1	-4.5	-3.5
14-Dec	-5.3	-5.5	-5.4	-5.4	-6.3	-7.3	-7.8	-7.5	-6.9	-6.7	-6.2	-5.5	-5.2	-5.1	-5.0	-5.1	-5.0	-5.1	-4.9	-4.7	-4.7	-4.8	-4.8	-4.8	-5.7	-4.7
15-Dec	-5.0	-5.1	-5.0	-6.6	-7.8	-7.5	-8.0	-7.5	-9.9	-12.3	-9.4	-8.2	-7.0	-6.4	-6.4	-8.6	-12.6	-14.2	-12.8	-10.6	-7.6	-7.9	-8.1	-9.4	-8.5	-5.0
16-Dec	-10.1	-10.5	-10.8	-11.0	-10.8	-11.2	-12.6	-14.5	-15.8	-15.9	-15.3	-14.3	-13.3	-12.8	-13.1	-17.0	-19.7	-20.3	-19.4	-17.0	-15.2	-14.7	-15.9	-17.2	-14.5	-10.1
17-Dec	-16.5	-14.6	-14.0	-13.8	-13.8	-14.0	-14.0	-14.2	-14.3	-14.3	-13.8	-13.5	-13.3	-12.9	-12.9	-13.0	-13.6	-13.9	-14.3	-14.6	-14.9	-15.1	-15.5	-15.7	-14.2	-12.9
18-Dec	-15.8	-15.9	-16.0	-16.2	-16.2	-16.2	-16.3	-16.2	-16.3	-16.4	-16.2	-16.0	-15.9	-16.2	-16.4	-17.7	-18.7	-18.8	-20.1	-22.8	-24.7	-25.3	-26.5	-24.8	-18.4	-15.8
19-Dec	-22.5	-21.5	-21.1	-20.8	-20.3	-20.3	-21.2	-21.4	-21.9	-21.5	-20.8	-20.1	-19.1	-18.6	-18.8	-21.4	-23.4	-24.2	-23.9	-22.4	-20.7	-19.6	-19.3	-21.4	-21.1	-18.6
20-Dec	-22.8	-24.0	-24.7	-25.1	-25.1	-25.3	-25.3	-25.2	-25.3	-25.2	-23.6	-20.2	-18.6	-16.1	-16.1	-19.2	-21.0	-21.9	-22.0	-19.5	-16.8	-16.2	-12.8	-12.4	-21.0	-12.4
21-Dec	-12.2	-11.9	-11.9	-13.1	-13.4	-14.6	-16.0	-17.9	-19.5	-20.3	-19.5	-15.8	-13.5	-12.7	-13.1	-16.4	-17.7	-17.7	-16.8	-15.3	-14.5	-14.2	-14.0	-13.2	-15.2	-11.9
22-Dec	-13.0	-12.6	-12.3	-12.6	-13.1	-13.3	-13.4	-13.5	-13.8	-14.1	-14.1	-13.9	-13.7	-14.0	-14.7	-15.3	-15.9	-16.2	-16.7	-17.2	-17.5	-17.6	-17.7	-17.9	-14.8	-12.3
23-Dec	-18.0	-18.1	-18.2	-18.4	-18.4	-18.5	-18.6	-18.7	-18.8	-18.8	-18.6	-18.3	-17.9	-17.6	-17.5	-17.6	-17.6	-17.7	-17.8	-17.9	-18.0	-18.0	-18.2	-18.4	-18.2	-17.5
24-Dec	-18.7	-19.8	-20.1	-20.3	-20.2	-20.5	-20.3	-20.5	-20.6	-20.4	-20.2	-19.9	-19.5	-19.0	-18.9	-18.8	-19.0	-19.1	-19.3	-19.8	-20.1	-20.5	-20.4	-20.0	-19.8	-18.7
25-Dec	-19.7	-19.2	-18.8	-18.6	-18.3	-17.9	-17.8	-17.5	-17.3	-17.3	-16.6	-16.0	-15.5	-15.4	-15.2	-15.6	-16.3	-16.4	-16.7	-17.2	-17.5	-18.2	-20.3	-22.6	-17.6	-15.2
26-Dec	-24.4	-25.0	-24.8	-25.9	-27.4	-28.0	-28.5	-28.5	-29.4	-29.6	-28.7	-27.7	-26.5	-25.1	-24.4	-24.3	-24.6	-24.5	-23.9	-23.4	-23.2	-22.7	-22.2	-21.9	-25.6	-21.9
27-Dec	-21.4	-21.1	-20.7	-20.4	-20.0	-20.0	-19.7	-19.2	-17.8	-15.3	-14.8	-14.2	-13.7	-13.4	-13.2	-13.6	-13.6	-13.4	-13.4	-13.5	-13.6	-13.5	-13.4	-13.5	-16.1	-13.2
28-Dec	-13.1	-13.4	-13.4	-13.1	-13.5	-14.5	-15.1	-16.0	-16.7	-17.1	-17.0	-16.9	-16.7	-16.7	-16.7	-16.9	-16.9	-16.9	-16.6	-16.5	-16.3	-16.1	-15.9	-15.7	-15.7	-13.1
29-Dec	-16.6	-20.0	-22.0	-22.5	-22.0	-19.0	-17.4	-16.3	-15.4	-14.4	-13.1	-10.0	-9.7	-9.9	-10.4	-11.6	-13.8	-16.3	-17.1	-18.2	-17.4	-16.4	-15.0	-16.4	-15.9	-9.7
30-Dec	-17.5	-15.0	-11.5	-11.5	-13.6	-16.3	-16.8	-15.8	-16.7	-17.5	-14.0	-11.1	-8.0	-6.0	-5.8	-8.5	-11.1	-12.9	-14.2	-15.3	-15.5	-13.8	-15.3	-15.0	-13.3	-5.8
31-Dec	-13.7	-13.7	-12.2	-11.4	-10.5	-9.4	-10.3	-11.1	-7.1	-6.0	-4.8	-3.9	-2.4	-1.4	-1.0	-2.8	-6.1	-5.0	-5.3	-7.4	-7.7	-5.1	-4.6	-7.6	-7.1	-1.0
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C  
Fort McKay South - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	91	12.23	12.23
-20 - 0	642	86.29	98.52
0 - 10	11	1.48	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

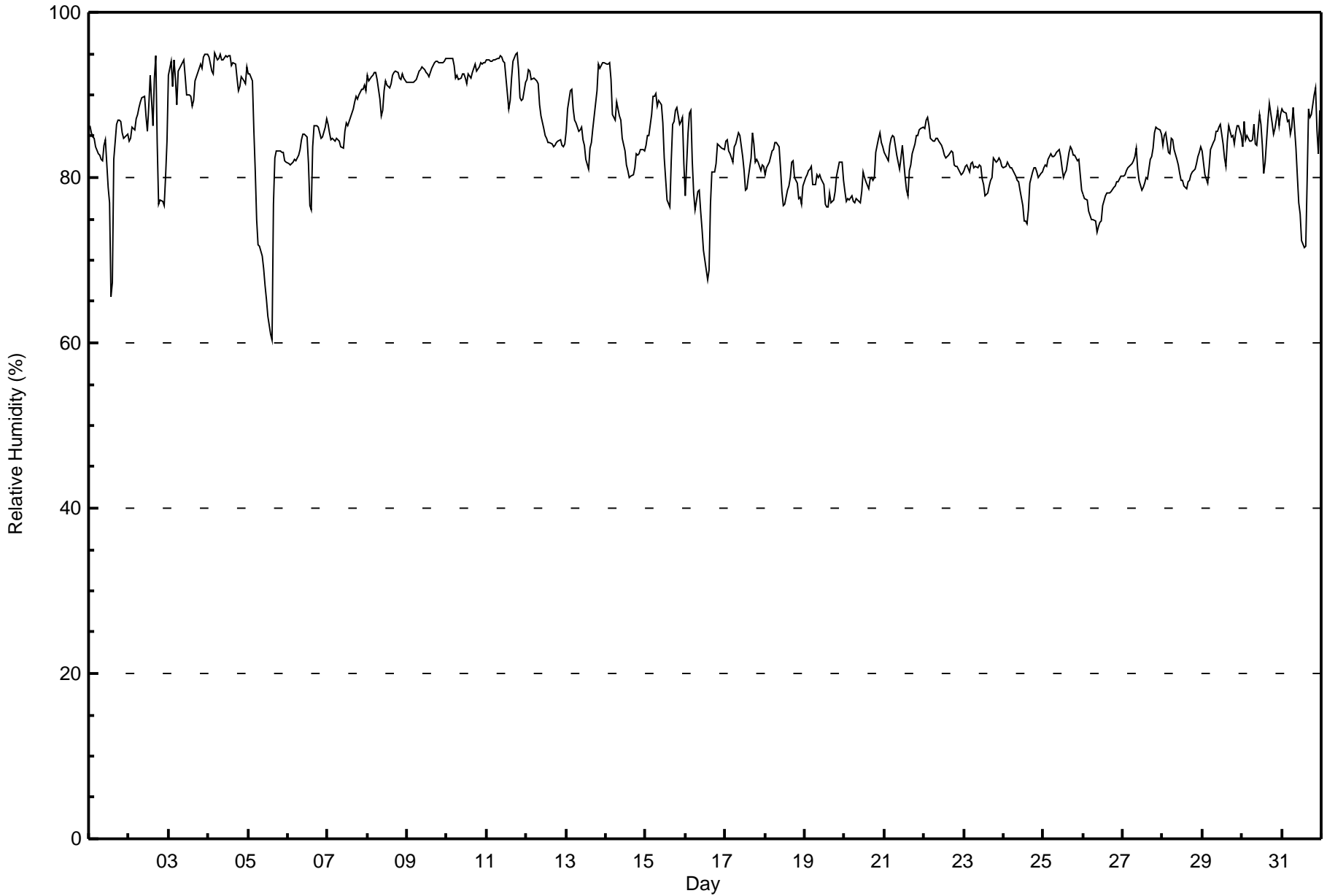
**Fort McKay South - December 2015**

Maximum Value: 95 % on Dec 11 19:00      Maximum Daily Average: 93.5 % on Dec 4																			Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: 60 % on Dec 5 15:00      Minimum Daily Average: 77.0 % on Dec 26 Maximum Diurnal Average: 86.1 % at hour 2      Minimum Diurnal Average: 80.6 % at hour 15 Monthly Average: 84.6 %      Percentiles: P <sub>1</sub> = 68 P <sub>10</sub> = 78 Q <sub>1</sub> = 81 Median = 84 O <sub>3</sub> = 89 P <sub>90</sub> = 93 P <sub>99</sub> = 95																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	86	86	85	85	84	83	83	82	82	84	85	79	77	66	67	82	86	87	87	87	85	85	85	85	82.6	87
2-Dec	84	85	86	86	87	88	88	89	90	90	87	86	89	92	86	92	95	84	77	77	77	77	80	84	85.7	95
3-Dec	92	94	91	94	92	89	93	93	94	94	92	90	90	89	89	92	92	93	94	93	95	95	95	95	92.3	95
4-Dec	95	94	93	92	95	94	94	95	94	94	95	95	95	95	94	94	94	92	90	91	92	92	91	93	93.5	95
5-Dec	92	93	92	86	81	75	72	72	71	69	67	65	63	61	60	77	82	83	83	83	83	82	82	82	77.4	93
6-Dec	82	81	82	82	82	82	83	83	85	85	85	85	82	77	76	84	86	86	86	85	85	85	86	87	83.4	87
7-Dec	86	85	85	85	84	85	85	84	84	84	86	87	86	87	87	88	89	90	89	90	91	91	91	90	87.0	91
8-Dec	92	92	92	92	93	93	92	89	87	88	91	92	91	91	91	92	93	93	93	92	92	93	92	92	91.6	93
9-Dec	91	91	92	91	91	92	92	93	93	93	93	93	92	92	93	93	94	94	94	94	94	94	94	94	92.9	94
10-Dec	94	94	94	94	94	92	92	92	92	92	93	92	91	93	92	93	93	94	93	93	94	94	94	94	93.1	94
11-Dec	94	94	94	94	94	94	94	94	95	95	94	94	90	88	89	92	94	95	95	93	90	89	89	91	92.8	95
12-Dec	92	93	93	92	92	92	92	91	89	87	86	85	85	84	84	84	84	84	84	84	85	84	84	84	87.2	93
13-Dec	86	88	91	91	88	87	87	86	86	86	85	84	82	81	84	84	86	87	90	94	93	94	94	94	87.8	94
14-Dec	94	94	94	92	88	87	89	88	87	87	85	83	82	81	80	80	80	81	83	83	83	83	83	83	85.4	94
15-Dec	84	85	85	88	90	90	90	89	89	89	87	82	80	77	76	82	86	87	88	89	86	87	87	82	85.6	90
16-Dec	78	85	88	88	82	78	76	78	79	76	74	71	69	68	69	77	81	81	82	84	84	84	83	83	79.0	88
17-Dec	84	85	83	83	82	84	84	85	85	85	83	81	79	79	80	82	85	84	82	82	82	81	82	81	82.6	85
18-Dec	80	81	82	83	83	83	84	84	84	81	78	77	77	78	79	80	82	82	80	79	77	78	77	79	80.4	84
19-Dec	80	80	81	81	81	79	79	80	80	80	80	79	77	76	76	78	77	77	78	80	81	82	82	80	79.4	82
20-Dec	78	77	77	77	78	77	77	77	77	77	78	81	80	79	79	80	80	80	80	83	85	86	84	84	79.7	86
21-Dec	83	82	82	84	85	85	85	83	82	81	82	84	80	78	78	81	82	83	84	85	85	86	86	86	83.0	86
22-Dec	86	87	87	86	85	84	84	85	85	84	84	83	83	82	83	83	83	83	81	81	81	81	80	81	83.5	87
23-Dec	81	81	82	81	82	82	81	81	81	82	81	80	79	78	78	79	80	80	82	82	82	82	82	81	80.9	82
24-Dec	81	81	82	82	81	81	80	80	80	79	78	77	75	75	74	76	79	81	81	81	81	80	80	81	79.5	82
25-Dec	81	82	81	82	83	83	83	83	83	83	82	81	80	81	81	83	84	83	83	83	82	82	80	78	81.9	84
26-Dec	78	77	77	76	75	75	75	75	73	74	75	75	77	78	78	78	78	79	79	79	80	80	80	80	77.0	80
27-Dec	80	80	81	81	81	82	82	83	83	81	80	79	79	79	80	80	82	83	84	85	86	86	86	85	82.0	86
28-Dec	84	85	85	83	83	85	85	83	82	82	80	80	80	79	79	79	80	80	81	81	82	82	83	84	81.9	85
29-Dec	83	80	80	79	81	83	84	85	86	86	86	86	84	82	81	84	86	85	85	84	85	86	86	85	84.0	86
30-Dec	84	87	85	85	84	84	85	86	84	84	88	86	84	81	82	87	89	88	87	85	86	88	86	88	85.5	89
31-Dec	88	88	88	87	87	85	86	88	84	80	77	76	72	72	72	80	88	87	88	90	91	86	83	88	83.8	91
																			85.7				Diurnal Average			
																			95				Diurnal Maximum			



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Fort McKay South - December 2015**





Maximum Speed: 9 km/h on Dec 30 03:00	Maximum Daily Speed Average: 6.3 km/h on Dec 22	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 28 20:00	Minimum Daily Speed Average: 0.1 km/h on Dec 19	Hours of Data: 719
Maximum Diurnal Speed Average: 1.1 km/h at hour 21	Minimum Diurnal Speed Average: 0.3 km/h at hour 1	Hours of Missing Data: 25
Monthly Average Velocity: 0.7 km/h 225.6 deg	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 3 Q <sub>3</sub> = 5 P <sub>90</sub> = 6 P <sub>99</sub> = 9	Percent Operational Time: 96.6

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SSW2	WSW2	SSW3	SW2	SW2	SW3	SW2	WSW2	SW1	SSW3	S2	SSE3	SSE3	SE4	SSE3	S4	SSW3	SSW1	SW3	WSW2	SW3	SSW3	S3	SSW2	SSW2.2	S4
2-Dec	SSW2	SSW2	SW1	SSW3	S3	SW1	S2	SSW2	SW1	WNW1	NNW1	S2	S3	S2	S4	SSW3	S5	WSW8	WSW6	WSW8	WSW7	WSW7	SW6	SW5	SSW3.1	WSW8
3-Dec	WSW2	SW2	WSW5	SW4	SW3	SW4	S3	S3	W1	NW1	N2	NNE4	N5	N6	N5	NNW4	NNW3	NNW4	NW3	NNW3	N2	N3	NNW3	NW1	NW1.5	N6
4-Dec	NW3	NNW3	N3	N2	NNW2	NW1	N2	NNE2	WNW1	SSW1	SSW2	SSW3	S3	SSE2	SSW4	SSW4	SW3	SW2	SSW2	SSW3	SSW4	SSW5	SSW3	WSW3	SW1.2	SSW5
5-Dec	SSW1	SW2	W2	W5	W7	WSW7	WSW8	WSW7	WSW8	WSW9	WSW8	SW7	SW8	WSW7	SW5	SSW3	SW2	SW3	SW2	SW2	SW2	W1	SW2	WSW1	WSW4.3	WSW9
6-Dec	W1	W1	NW1	AF	W0	WSW1	AF	AF	NNW1	NE1	E0	N2	NE2	NNW1	ENE0	WSW1	SW2	SW2	SW2	SW1	SW2	SW2	SW1	SW2	W0.6	NNE2
7-Dec	SW1	SSW2	S1	WSW1	WSW1	WNW1	SW1	W1	WSW1	SW1	NNW1	NNE1	SSW0	WNW1	NE1	S1	S0	S2	SW0	SSW1	S2	SW1	NNW2	NNW4	WSW0.6	NNW4
8-Dec	NNW5	NNW5	NW3	NW2	NE1	WSW1	SSW1	SW2	SW2	SW2	SSW2	SSW3	SSW2	SSE2	SSE2	SSE3	SE3	SE4	E4	ENE4	NE2	N3	NNE3	NNE4	ESE0.3	NNW5
9-Dec	NNE3	NNE3	N4	N3	N3	N3	N2	NNE3	N3	NNE3	NNE2	N3	N4	N3	NNE2	W0	WNW1	W1	WSW1	S2	S2	S1	AF	NW1	N1.6	N4
10-Dec	S1	N2	NNW1	NNW3	N3	N3	N3	NE3	N3	N2	N3	N3	NNE2	NNE4	NNW3	N3	NNW2	WNW2	NW2	N2	N2	NNW2	NNW3	NNW3	N2.3	NNE4
11-Dec	N3	N3	N3	N1	N2	N1	N2	N1	NNE2	N1	NNE1	SE1	SE5	SSE6	SSE5	S1	N1	WSW1	S1	SSE4	SSE6	SSE5	SSE4	SE3	SE0.9	SSE6
12-Dec	SE4	SE4	SE4	SSE5	SSE5	SSE5	SSE5	SE5	SSE7	SSE7	SSE9	SSE8	SSE7	SSE8	SSE8	SSE8	SSE8	SSE6	SSE7	SSE7	SSE6	SSE5	SSE5	SSE6	SSW6.2	SSE9
13-Dec	SSE5	SSE4	SE3	SE3	SSE5	SE4	SSE6	SE6	SSE5	SSE3	ESE2	SE3	E2	NNE2	N3	N4	N3	N2	N2	NNW3	N2	NNW1	NNW2	W1	ESE1.4	SSE6
14-Dec	AF	S0	NNW1	NW3	W4	W2	S2	SSW2	WSW3	WSW2	SW3	WSW2	WSW4	WSW5	WSW5	WSW6	SW6	SW6	S5	S5	S6	S6	S6	S6	SW3.2	S6
15-Dec	S7	S6	SSE5	S6	S5	S5	S5	S4	SSW3	SSW3	SW6	WSW7	WSW9	WSW8	WSW8	WSW3	SW3	S2	SW4	WSW6	W7	NNE3	N6	NNE8	WSW3.3	WSW9
16-Dec	NNE4	NE1	SE1	WSW1	WNW5	WNW6	W6	W6	W7	W7	W4	W2	W5	WSW6	SSW5	SSW3	SW4	WSW3	WSW4	WSW5	W5	W4	NNW0	SW2	W3.2	W7
17-Dec	SW2	WSW5	W5	W3	WNW3	W2	N2	NNE2	WSW0	SSW0	SSW1	NNE1	NNE2	ENE1	ENE1	AF	AF	NE4	NNE3	NNE2	NE3	NNE4	NNE3	NE2	NNW0.9	W5
18-Dec	NE3	NE2	NNE1	N1	NNW1	N1	N1	N1	NNE2	ENE2	NE3	NE3	N3	N4	NNE3	N2	N1	SE1	SSE2	SE1	SW0	N2	NNW2	NW1	NNE1.4	N4
19-Dec	NNW2	NNW2	N1	N1	SE0	ESE4	ESE1	N1	NNW0	AF	AF	WSW0	S2	ESE2	SSW1	WSW1	WSW1	W1	WNW1	AF	N1	NNE1	N2	W1	N0.1	ESE4
20-Dec	WSW1	WSW1	NNE0	S0	ENE0	SE1	SSE1	AF	AF	AF	N1	NNE0	AF	SSW2	SW2	WSW2	W1	W1	NW1	S1	S3	S5	S6	S6	SSW1.3	S6
21-Dec	S7	S8	S8	S6	SSW7	SSW5	SSW4	SSW2	SW3	SSW1	SW1	S4	S4	SE2	SSE2	SW1	W1	WNW1	WNW0	NW2	NNE2	N2	N2	NNW2	S2.2	S8
22-Dec	N3	NNW2	N5	N6	N9	N8	N8	N7	N7	N8	N7	N7	N6	N7	N8	N7	N7	N5	N7	N6	N5	N6	N6	N5	N6.3	N9
23-Dec	N4	N4	N4	N5	N3	N4	N5	N4	N3	NNE3	N3	N4	N4	N6	N5	N4	N5	NNE4	NNE3	NNE3	NNE2	N3	N3	N4	N3.7	NNE6
24-Dec	N6	N3	NNW2	N3	NNW2	N2	N5	N3	N3	N1	NNE3	NNE3	NNE2	NNE1	ENE1	AF	AF	AF	AF	W0	SSW1	SSW1	SSW1	SSW0	N1.7	N6
25-Dec	AF	SSW2	SSW1	AF	AF	SSW1	S1	S1	S0	NW0	NNW0	N2	NE2	NE2	NE1	N2	N4	N5	N5	NNW4	NNW4	N2	AF	W1	N1.3	N5
26-Dec	NNW2	W2	SW1	WSW1	SW1	WSW1	WSW1	W1	WSW1	AF	NNW1	NE0	NNE1	NNE2	N2	NNE2	N1	NNE1	N2	NNE2	NNE2	N2	NNE3	N2	N0.9	NNE3
27-Dec	NNW2	N2	N2	N2	NNE2	NNE2	NNE2	NNE1	SE2	SSE6	SSE6	SSE9	SSE8	S7	S6	SSE4	S3	S3	S2	AF	S1	SSW2	SW2	S1	SSE2.0	SSE9
28-Dec	WSW3	NW0	W3	WNW4	NW3	NNW2	N6	NNE7	N6	N5	N6	N6	N6	N5	NNE4	NNE3	NE2	NNE1	W0	ESE0	SSW1	SSE2	S2	S1	N2.2	NNE7
29-Dec	S1	SSW2	SSW4	S4	SSW1	WSW1	W0	SW1	W1	AF	S2	S9	S9	S8	S8	S6	S5	S4	S4	SSE3	S4	S4	SSE3	SSE3	S3.6	S9
30-Dec	SSW3	SW5	WSW9	WSW6	SW1	SW1	S1	SW3	SSE1	S3	S3	SSE3	SSE4	SE2	E2	S3	S3	S3	S3	S3	S3	S3	S3	S3	SSW2.8	WSW9
31-Dec	S5	S5	S7	S6	S7	S7	S4	S5	SSW5	WSW9	SW5	SSW7	SSW7	WSW8	SSW7	SSW6	SW5	SW6	SW6	SSW6	SW6	SW7	SSW5	S3	SSW5.6	WSW9

WSW0.3	SW0.6	WSW0.9	WSW1.0	WSW0.8	WSW0.7	W0.3	W0.4	WSW0.7	WSW0.8	SW0.5	SSW0.7	SSW0.9	SSW0.6	SSW0.9	SSW0.9	SW0.9	SW0.8	SW0.8	SW0.9	SSW1.1	SSW0.8	SSW0.4	SW0.3	Diurnal Average	
S7	S8	WSW9	S6	N9	N8	WSW8	NNE7	WSW8	WSW9	SSE9	S9	WSW9	SSE8	SSE8	SSE8	SSE8	WSW8	N7	WSW8	WSW7	SW7	S6	NNE8	Diurnal Maximum	

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

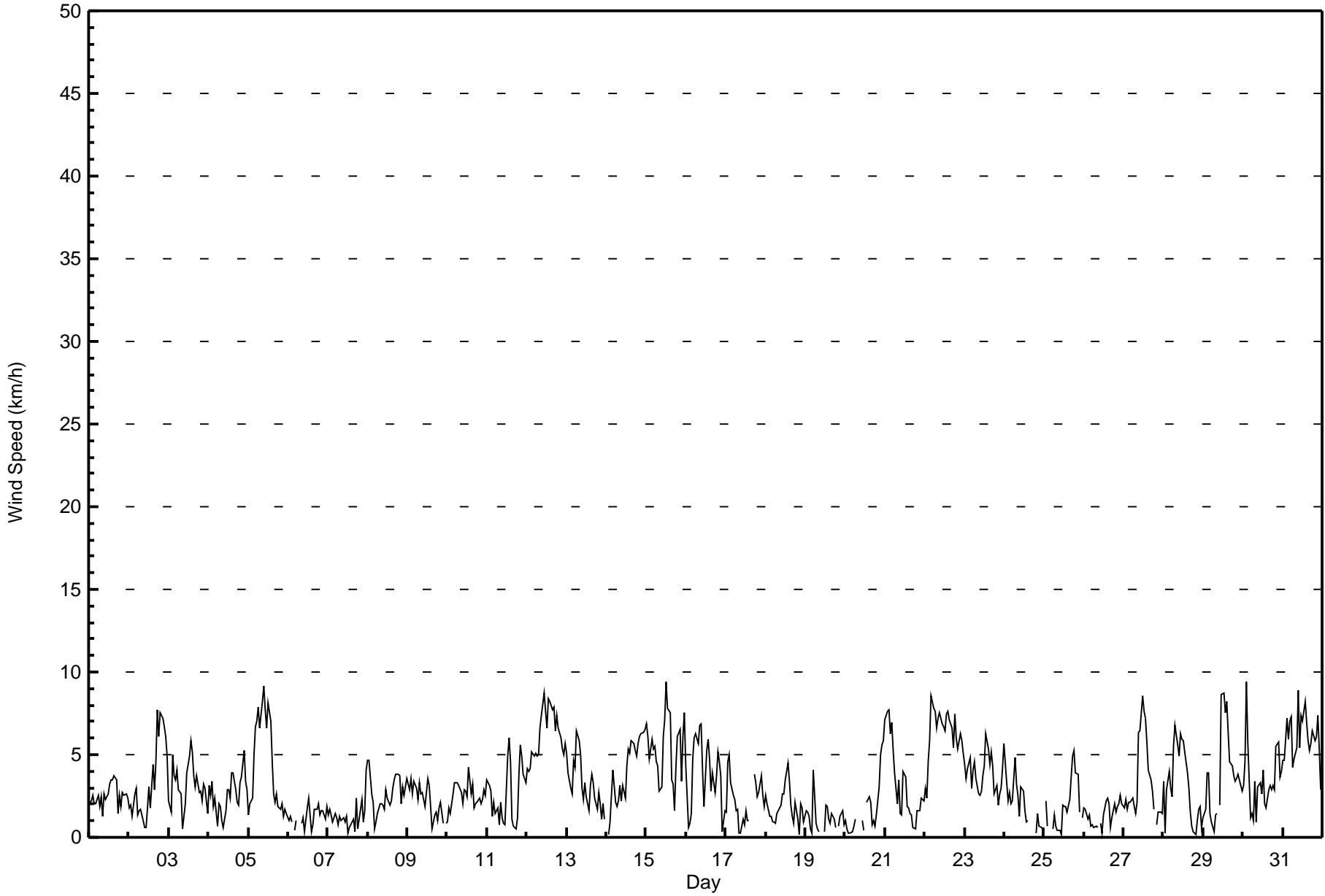
Wind Speed (WS) - km/h

Fort McKay South - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 4 km/h on Dec 2 18:00			Hours of Data:	719
Minimum Value: 0 km/h on Dec 11 09:00			Hours of Missing Data:	25
			Hours of Calibration:	0
			Percent Operational Time:	96.6
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 1 Q <sub>3</sub> = 2 P <sub>90</sub> = 2 P <sub>99</sub> = 3				

Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	4	2	3	2	2	2	2	1	4
3-Dec	1	1	1	2	2	2	1	1	1	1	2	2	2	2	2	1	1	2	1	1	1	1	1	1	1	2
4-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2
5-Dec	1	1	1	2	3	3	3	2	3	4	3	3	3	3	2	1	1	1	1	1	1	1	1	1	1	4
6-Dec	1	1	1	AF	1	1	AF	AF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2
8-Dec	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	2
9-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	AF	1	1
10-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2
11-Dec	1	1	1	1	1	1	1	1	0	1	1	1	2	2	2	1	1	1	1	2	2	2	2	1	1	2
12-Dec	2	1	1	2	2	2	2	2	3	3	4	3	3	3	3	3	3	3	3	3	3	2	2	2	2	4
13-Dec	2	2	1	1	2	2	3	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3
14-Dec	AF	1	1	1	1	2	1	1	2	2	1	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2
15-Dec	3	2	2	2	2	2	1	2	1	2	3	3	3	2	3	2	1	1	1	3	3	2	3	3	3	3
16-Dec	2	1	1	1	2	3	3	2	3	3	2	1	2	3	2	1	1	1	1	1	1	2	1	1	1	3
17-Dec	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	AF	AF	1	1	1	1	1	1	1	1	2
18-Dec	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2
19-Dec	1	1	1	1	1	2	1	1	1	AF	AF	1	2	1	1	1	1	1	1	AF	1	1	1	1	1	2
20-Dec	1	1	1	1	1	1	1	AF	AF	AF	1	1	AF	1	1	1	1	1	1	2	1	2	2	2	2	2
21-Dec	3	3	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3
22-Dec	1	1	2	2	3	3	2	2	2	2	2	2	2	2	3	2	2	2	3	2	2	2	2	2	2	3
23-Dec	2	1	1	2	1	1	2	1	1	1	1	2	2	2	2	2	2	2	1	1	1	1	1	1	2	2
24-Dec	2	2	1	1	1	2	2	1	1	1	2	1	1	1	1	AF	AF	AF	AF	1	1	1	1	1	1	2
25-Dec	AF	1	1	AF	AF	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	AF	1	2
26-Dec	1	1	1	1	1	1	1	1	1	AF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
27-Dec	1	1	1	1	1	1	1	1	2	3	3	3	3	3	2	3	1	1	1	AF	1	1	1	1	1	3
28-Dec	2	1	2	2	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	2
29-Dec	1	1	1	1	1	1	1	1	1	AF	1	3	3	2	3	2	1	1	1	1	1	1	1	1	1	3
30-Dec	2	3	3	2	1	1	1	2	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	3
31-Dec	1	1	2	2	2	2	1	2	3	3	2	2	2	2	2	2	2	2	2	1	1	1	2	2	1	3
	3	3	3	2	3	3	3	3	3	4	4	3	3	3	3	3	3	4	3	3	3	3	2	3	3	
	Diurnal Maximum																									

AF - Analyzer Failure





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Fort McKay South - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	597	83.03	83.03
6 - 11	122	16.97	100.00
12 - 19	0	0.00	100.00
20 - 28	0	0.00	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 719

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Fort McKay South - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	110	56	17	8	4	5	21	36	72	61	60	41	34	12	17	43	597
6 - 11	26	3	0	0	0	0	1	21	26	6	9	23	6	1	0	0	122
12 - 19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	136	59	17	8	4	5	22	57	98	67	69	64	40	13	17	43	719

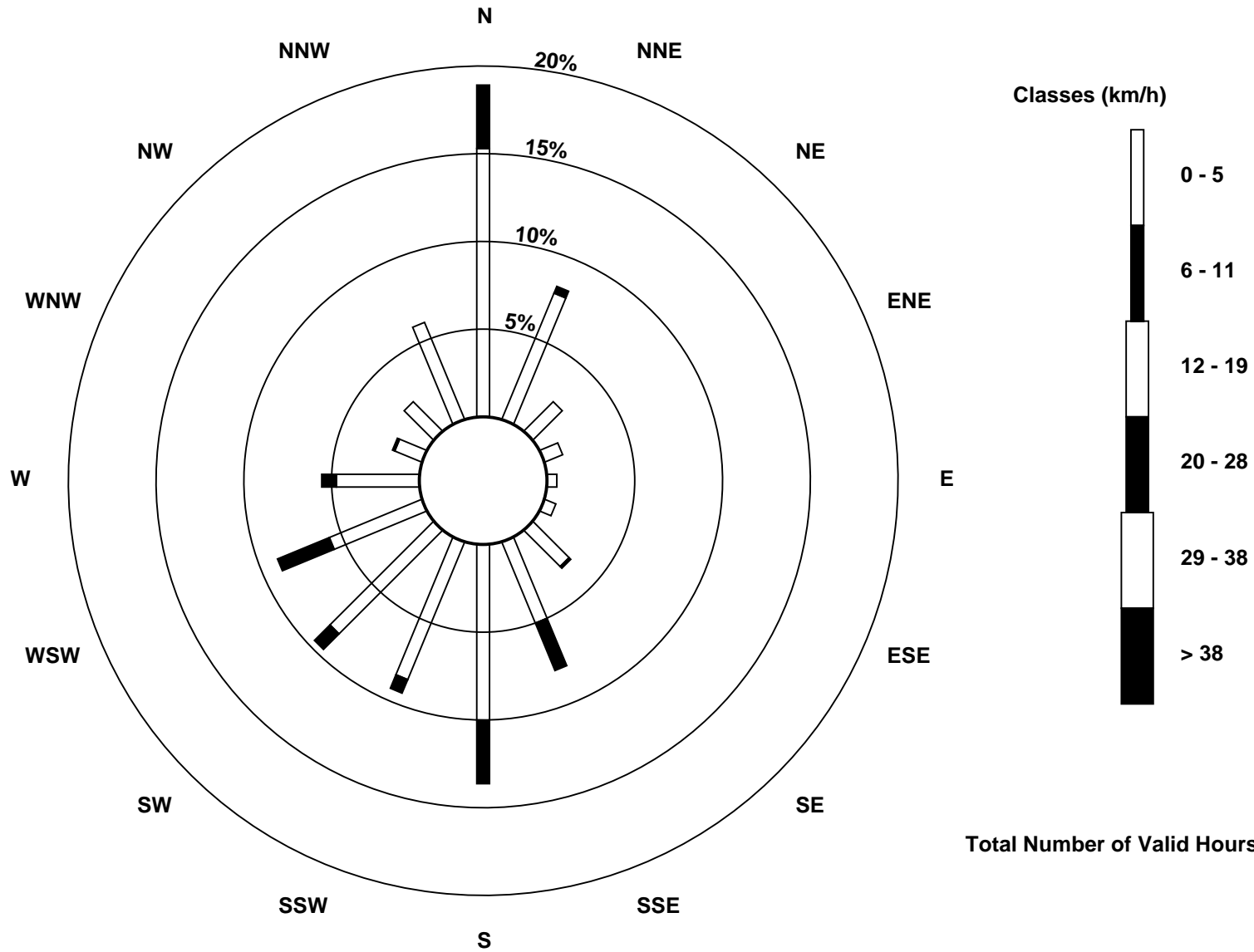
Total Number of Valid Hours: 719

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
Fort McKay South (AMS 13)



Total Number of Valid Hours: 719





**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

**Wind Direction (WD) - deg**  
**Fort McKay South - December 2015**

Direction of Maximum Speed: 252 deg on Dec 30 03:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 1.8 deg on Dec 22	Hours of Data: 719
Direction of Minimum Speed: 118 deg on Dec 28 20:00	Direction of Minimum Daily Speed Average: 0.1 deg on Dec 19
Direction of Minimum Speed: 118 deg on Dec 28 20:00	Hours of Missing Data: 25
Monthly Average Direction: 250.3 deg	Percent Operational Time: 96.6

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	208	241	210	215	232	225	235	241	231	195	173	165	166	146	168	182	194	207	236	249	224	193	180	199	200.5
2-Dec	203	199	231	195	191	223	178	194	225	286	332	184	172	180	172	194	185	237	239	240	240	240	236	220	218.1
3-Dec	257	219	242	224	236	222	177	186	262	314	8	19	9	9	353	339	345	347	325	347	354	3	338	316	322.9
4-Dec	324	333	350	357	336	323	5	19	287	202	207	207	175	164	193	201	222	235	202	192	194	196	212	255	225.1
5-Dec	194	220	277	279	262	250	252	248	239	246	237	227	231	237	223	202	230	235	222	228	236	280	227	257	241.7
6-Dec	266	262	312	AF	264	249	AF	AF	338	56	101	3	34	346	60	245	230	235	232	226	219	232	215	230	259.5
7-Dec	222	193	191	256	251	291	229	275	245	222	332	25	211	284	35	186	173	183	229	207	179	214	336	336	242.6
8-Dec	343	341	317	313	42	241	201	232	224	223	193	209	197	147	158	154	141	135	101	77	50	10	26	30	105.0
9-Dec	16	15	1	5	6	9	357	27	2	13	26	3	11	356	18	270	285	268	241	169	174	178	AF	315	3.7
10-Dec	180	355	343	343	8	7	9	37	7	359	354	4	14	12	339	9	342	296	306	3	352	339	344	347	356.7
11-Dec	357	356	358	3	7	357	350	350	12	5	17	140	146	159	165	184	350	254	188	163	153	152	148	141	132.5
12-Dec	139	141	142	153	153	150	148	142	151	150	150	161	156	164	160	154	154	153	161	155	153	161	156	151	153.4
13-Dec	153	149	134	139	154	137	147	143	152	166	120	126	90	25	357	5	10	354	357	340	352	344	347	281	120.1
14-Dec	AF	171	345	305	270	260	191	204	246	247	232	244	247	244	255	253	235	187	184	185	181	179	178	169	216.4
15-Dec	178	178	168	172	179	173	174	182	197	199	225	240	250	242	242	210	228	186	223	246	268	13	5	14	217.0
16-Dec	24	46	125	237	291	282	274	271	262	265	274	261	269	246	205	200	220	246	255	255	259	263	347	230	260.7
17-Dec	225	258	263	259	282	281	349	23	241	197	205	33	13	71	78	AF	AF	38	32	26	44	32	23	41	345.8
18-Dec	45	53	27	350	348	6	350	359	31	63	52	35	5	3	14	11	10	124	154	136	236	351	339	307	21.6
19-Dec	329	342	358	349	139	123	122	354	334	AF	AF	253	169	115	202	248	247	260	285	AF	352	19	10	277	357.9
20-Dec	237	238	20	186	65	143	152	AF	AF	AF	4	28	AF	211	223	251	267	280	322	189	172	178	171	177	191.6
21-Dec	173	176	173	179	195	198	198	204	217	202	214	178	175	130	153	236	263	293	296	324	12	6	5	345	188.6
22-Dec	351	336	4	354	4	5	7	355	0	6	6	7	6	7	359	2	5	360	1	2	360	359	4	357	1.8
23-Dec	354	357	359	359	4	2	353	351	360	21	4	3	2	11	4	357	6	14	23	32	18	10	358	0	4.1
24-Dec	8	357	339	352	347	1	5	357	7	358	16	21	30	32	69	AF	AF	AF	AF	267	193	199	212	205	4.0
25-Dec	AF	199	195	AF	AF	192	188	180	187	314	333	355	36	42	36	357	358	357	350	342	342	5	AF	266	352.2
26-Dec	330	262	227	240	223	252	252	270	242	AF	334	39	31	17	9	12	356	22	4	29	19	2	13	0	352.0
27-Dec	346	5	354	7	19	32	26	19	143	153	162	164	170	169	166	180	170	174	AF	182	205	214	184	158.1	
28-Dec	239	310	269	289	304	342	3	15	11	5	4	3	5	8	22	30	35	29	266	118	200	159	174	178	356.7
29-Dec	181	205	205	188	204	253	274	215	260	AF	188	185	187	184	183	181	181	181	172	164	171	172	157	164	183.9
30-Dec	199	217	252	258	215	225	176	226	157	186	171	156	157	128	98	191	187	186	179	181	194	186	179	168	195.7
31-Dec	172	175	185	180	178	178	174	181	201	246	216	207	211	238	211	197	226	233	218	204	218	217	209	175	204.7

237.9 228.6 247.3 251.8 255.2 240.8 261.3 259.5 252.3 238.4 218.3 193.5 198.5 212.7 198.5 208.4 223.3 228.4 227.0 218.7 213.7 210.5 210.5 222.0  
 Diurnal Average

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Direction (WD) - deg

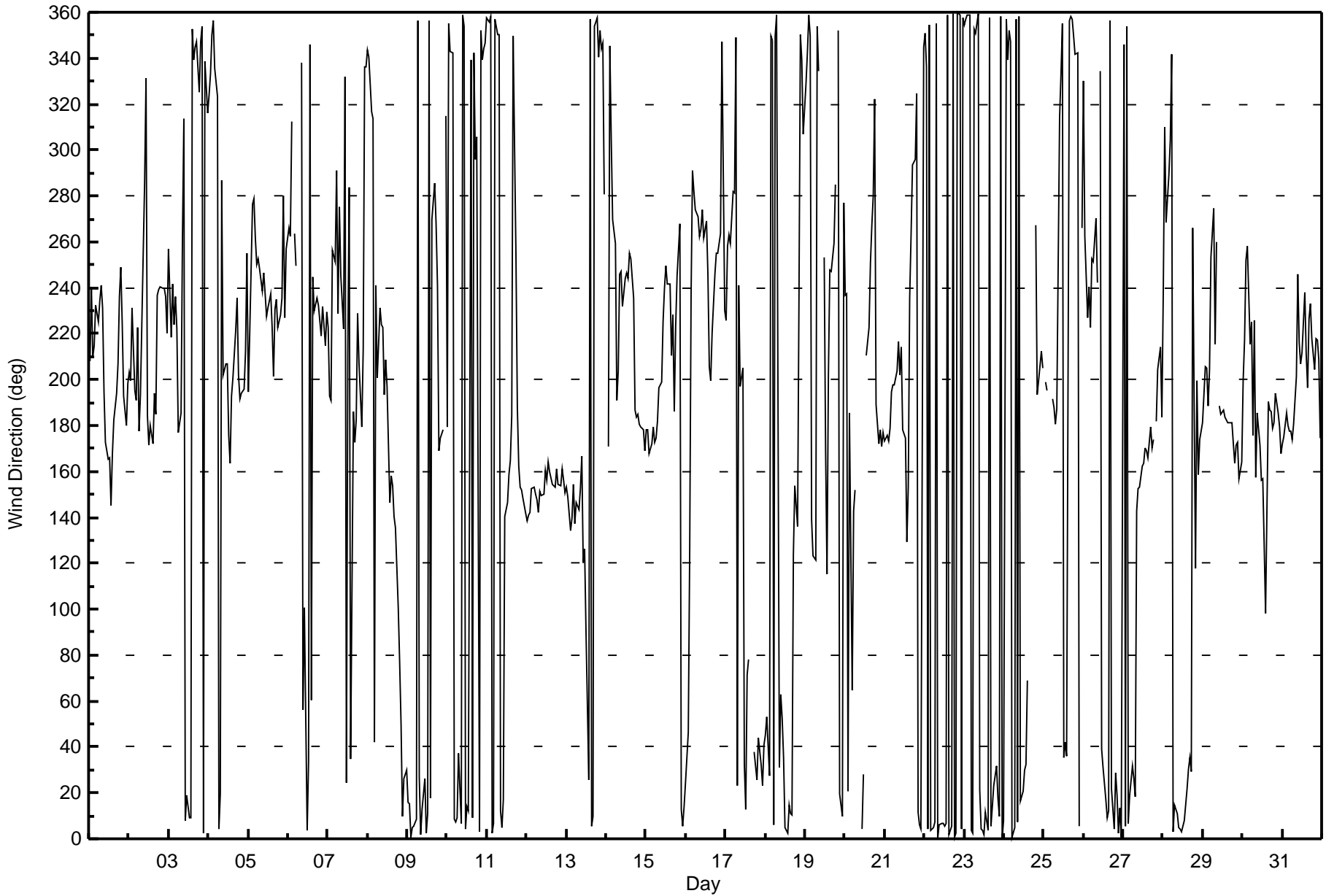
Fort McKay South - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 99 deg on Dec 16 23:00	Hours of Data: 719
Minimum Value: 10 deg on Dec 5 18:00	Hours of Missing Data: 25
Percentiles: P <sub>1</sub> = 12 P <sub>10</sub> = 18 Q <sub>1</sub> = 22 Median = 28 Q <sub>3</sub> = 40 P <sub>90</sub> = 63 P <sub>99</sub> = 86	Hours of Calibration: 0
	Percent Operational Time: 96.6

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	34	13	19	28	32	17	18	11	34	20	24	48	34	35	31	16	19	51	23	27	26	22	17	20	51
2-Dec	29	46	56	22	16	37	62	52	29	78	66	45	33	54	28	16	11	27	25	23	17	20	16	21	78
3-Dec	73	56	15	46	66	41	30	18	84	43	53	23	23	23	29	26	24	24	26	31	38	25	28	24	84
4-Dec	24	22	15	50	41	50	42	48	85	87	37	32	23	23	21	14	13	16	39	24	19	10	18	37	87
5-Dec	40	34	33	30	26	30	25	24	26	29	31	28	28	28	30	23	22	10	18	43	22	44	26	55	55
6-Dec	57	42	48	AF	60	58	AF	AF	50	61	90	48	54	57	84	88	50	29	30	30	19	24	70	57	90
7-Dec	40	31	75	33	48	42	76	66	53	32	36	50	98	51	47	68	85	40	85	25	32	64	72	24	98
8-Dec	26	29	30	26	76	53	59	30	27	47	28	33	39	48	38	28	32	31	30	39	34	20	55	22	76
9-Dec	19	17	19	24	19	24	29	21	29	21	32	22	24	23	27	63	27	28	33	22	15	58	AF	43	63
10-Dec	83	45	25	25	22	23	22	28	32	23	23	23	31	26	43	25	37	29	35	24	21	35	19	22	83
11-Dec	20	20	17	65	20	47	42	32	17	30	43	93	30	28	21	71	61	67	64	33	31	30	30	32	93
12-Dec	33	29	33	28	29	27	29	29	27	31	30	33	29	27	27	32	31	26	27	26	27	28	29	28	33
13-Dec	28	29	41	39	29	27	28	32	29	33	33	35	34	55	19	18	19	19	26	25	24	67	19	46	67
14-Dec	AF	74	64	34	27	71	46	28	52	58	39	61	59	25	30	21	29	21	19	19	21	22	22	23	74
15-Dec	24	21	22	22	18	20	18	18	22	30	26	24	19	19	19	27	13	44	15	16	49	38	24	27	49
16-Dec	23	67	33	33	37	31	28	29	25	27	45	81	37	28	29	20	20	30	16	13	16	25	99	16	99
17-Dec	37	21	22	29	34	49	52	25	94	83	47	83	36	66	71	AF	AF	25	27	25	30	24	24	42	94
18-Dec	31	39	39	59	58	72	67	31	28	39	39	49	33	24	27	24	44	35	20	59	80	17	22	37	80
19-Dec	25	23	22	22	68	30	45	32	13	AF	AF	68	63	46	71	35	18	38	36	AF	49	35	35	32	71
20-Dec	13	76	57	84	83	86	27	AF	AF	AF	28	28	AF	18	27	10	40	44	50	92	19	24	26	24	92
21-Dec	23	25	24	18	18	14	19	27	15	38	30	18	20	56	31	26	41	33	53	42	58	28	27	28	58
22-Dec	26	25	20	24	23	23	21	25	24	25	24	23	24	22	25	24	25	25	26	22	25	26	25	25	26
23-Dec	25	24	25	25	26	24	25	24	22	21	22	26	25	23	26	24	22	22	26	24	36	20	22	25	36
24-Dec	22	26	29	26	24	23	23	25	26	24	28	27	63	61	43	AF	AF	AF	AF	64	12	69	66	62	69
25-Dec	AF	16	75	AF	AF	49	20	20	71	47	84	31	33	35	26	17	20	22	23	25	28	20	AF	40	84
26-Dec	24	22	52	39	45	22	54	54	70	AF	25	71	30	25	25	23	17	31	26	47	30	24	20	24	71
27-Dec	31	22	37	32	28	27	25	31	84	34	32	29	29	27	27	28	21	29	28	AF	72	18	27	27	84
28-Dec	28	77	25	28	30	33	22	20	22	21	22	25	25	26	27	25	26	42	68	75	21	24	21	79	79
29-Dec	26	17	16	11	46	44	82	37	50	AF	27	20	23	21	20	16	13	13	19	17	16	16	19	28	82
30-Dec	38	51	18	27	63	71	78	44	76	19	38	48	40	47	85	42	18	21	12	14	11	12	16	17	85
31-Dec	17	16	14	15	16	18	18	21	39	24	27	19	17	13	17	15	28	21	14	13	13	16	27	25	39
	83	77	75	84	83	86	82	66	94	87	90	93	98	66	85	88	85	67	85	92	80	69	99	79	

Diurnal Maximum

AF - Analyzer Failure





# Wood Buffalo Environmental Association

## SO2 Calibration Report

### Station Information

Calibration Date	December 7, 2015	Last Calibration	November 18, 2015
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	9:40	End Time (MST)	13:43
Gas Cert Reference	LL110515	Station temp.	22 Deg C
Cal Gas Concentration	49.8 ppm	Cal Gas Exp Date	08/09/2018
Calibrator Make/Model	Sabio 4010	Serial Number	11041107
ZAG Make/Model	API 701	Serial Number	5613
DACS make/model	Campbell Scientific CR3000	DACS serial No.	1850

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		HVPS voltage	547	547
Analyzer IP address	192.168.1.73		Lamp voltage	1705	1684
Calculated slope	0.999701	1.001947	Box temp	30.5	30.7
Calculated intercept	2.179682	0.929137	Pressure	26.0	25.7
Analyzer Background	42.1	42.1	Flow	678	667
Analyzer Coefficient	0.953	0.953	Lamp Ratio	58	57

Analyzer make API T100 Analyzer serial # 599

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.5	----
as found span	5000	78.9	785.8	784.2	1.002
calibrator zero	5000	0.0	0.0	0.5	----
high point	5000	78.9	785.8	784.2	1.002
second point	5000	39.4	392.4	389.7	1.007
third point	5000	19.7	196.2	193.7	1.013
as left zero	5000	0.0	0.0	0.7	----
as left span	5000	78.9	785.8	780.1	1.007
Average Correction Factor					1.007

Corrected As found 783.7 Previous response 783.9 % change 0.0%

**Notes:**

No adjustments and maintenance done, filter changed out

Calibration Performed By: Melissa Lemay



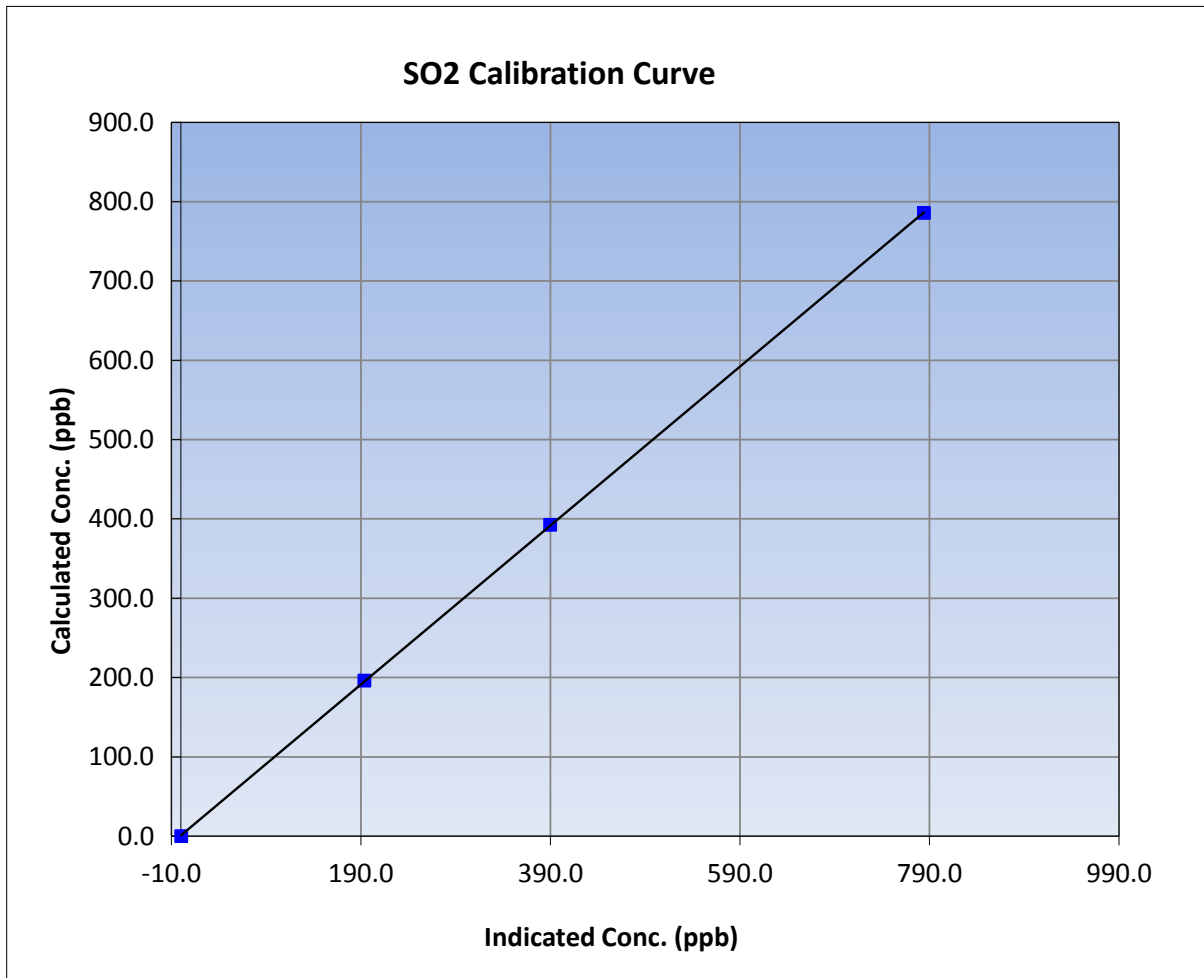
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 18, 2015
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	9:40	End Time (MST)	13:43
Analyzer make	API T100	Analyzer serial #	599

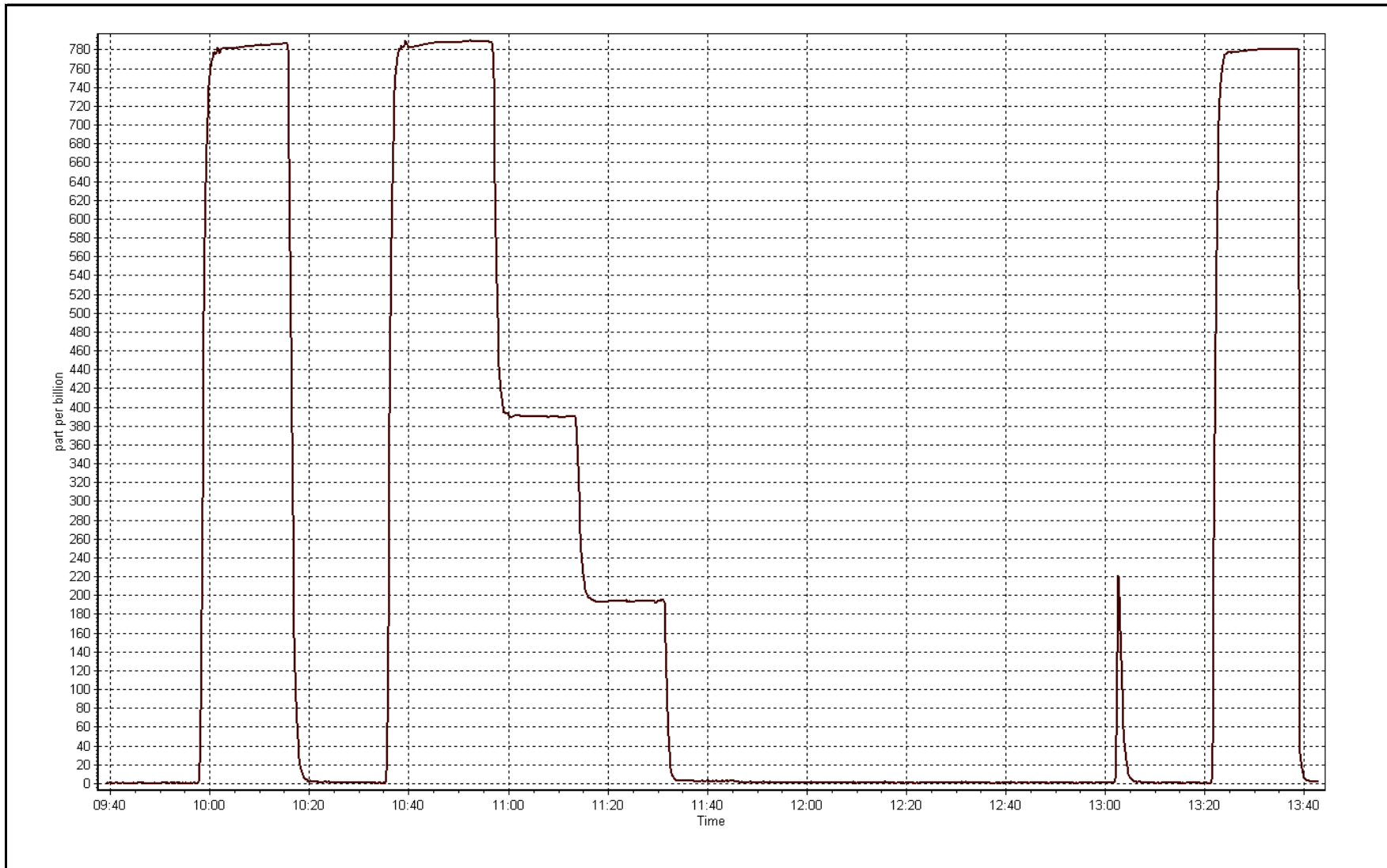
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.5	----	Correlation Coefficient	0.999985
785.8	784.2	1.0021		
392.4	389.7	1.0070	Slope	1.001947
196.2	193.7	1.0130		
			Intercept	0.929137



SO2 Calibration Plot

Date: December 7, 2015





# Wood Buffalo Environmental Association

## TRS Calibration Report

### Station Information

Calibration Date	December 8, 2015	Last Calibration	November 4, 2015
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	9:55	End Time (MST)	12:17
Gas Cert Reference	CC178364	Station temp.	22 Deg C
Cal Gas Concentration	5.07 ppm	Cal Gas Exp Date	30/05/2013
Calibrator Make/Model	Sabio 4010	Serial Number	11041107
Dil air Make/Model	API 701	Serial Number	5613
DACS make/model	Campbell Scientific CR3000	DACS serial No.	1850
SO2 gas concentration	51.1 ppm	SO2 gas cert/exp	S980455A 26/Sep/17

### Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-727	-727
Analyzer IP address	192.168.1.44		Lamp voltage	998	1003
Calculated slope	0.984149	0.983265	Chamber temp	45	45
Calculated intercept	0.429533	0.482703	Pressure	687.5	681.1
Analyzer Background	2.13	2.13	Flow	0.451	0.445
Analyzer Coefficient	1.038	1.038	Intensity	90	90
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1218153359	
Converter make/model	CDN-101		Converter serial #	456	

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.3	----
as found span	5000	78.9	80.0	81.0	0.988
SO2 scrubber check	5000	17.6	179.9	0.2	----
calibrator zero	5000	0.0	0.0	-0.3	----
high point	5000	78.9	80.0	81.0	0.988
second point	5000	39.4	40.0	40.0	0.999
third point	5000	19.7	20.0	19.6	1.019
as left zero	5000	0.0	0.0	-0.2	----
as left span	5000	78.9	80.0	81.2	0.985
Average Correction Factor					1.002

Corrected As found	81.3	Previous response	80.9	% change	-0.5%
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**Notes:**

no adjustments or maintenance done, filter changed out

Calibration Performed By:

Melissa Lemay



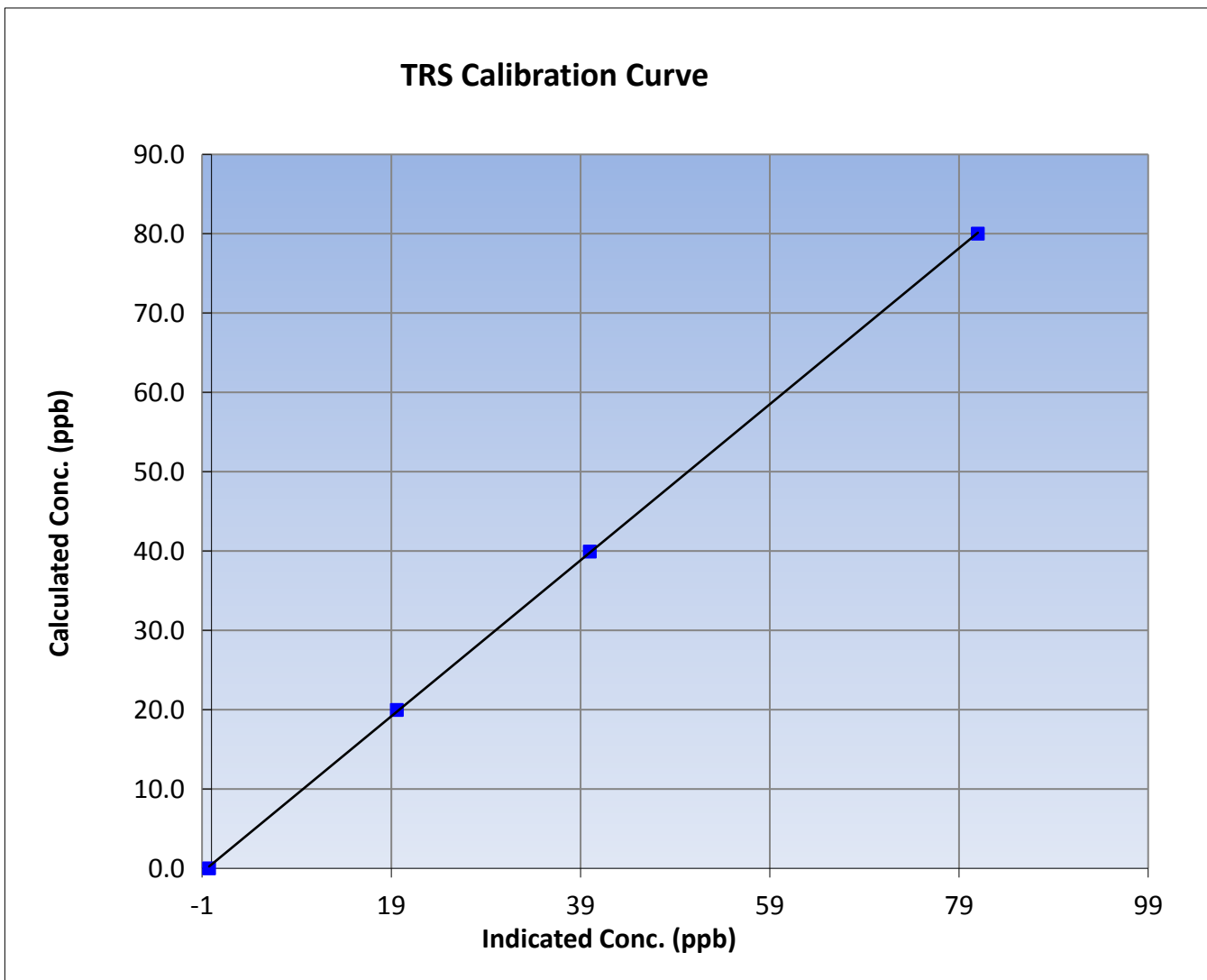
# Wood Buffalo Environmental Association TRS Calibration Report

## Station Information

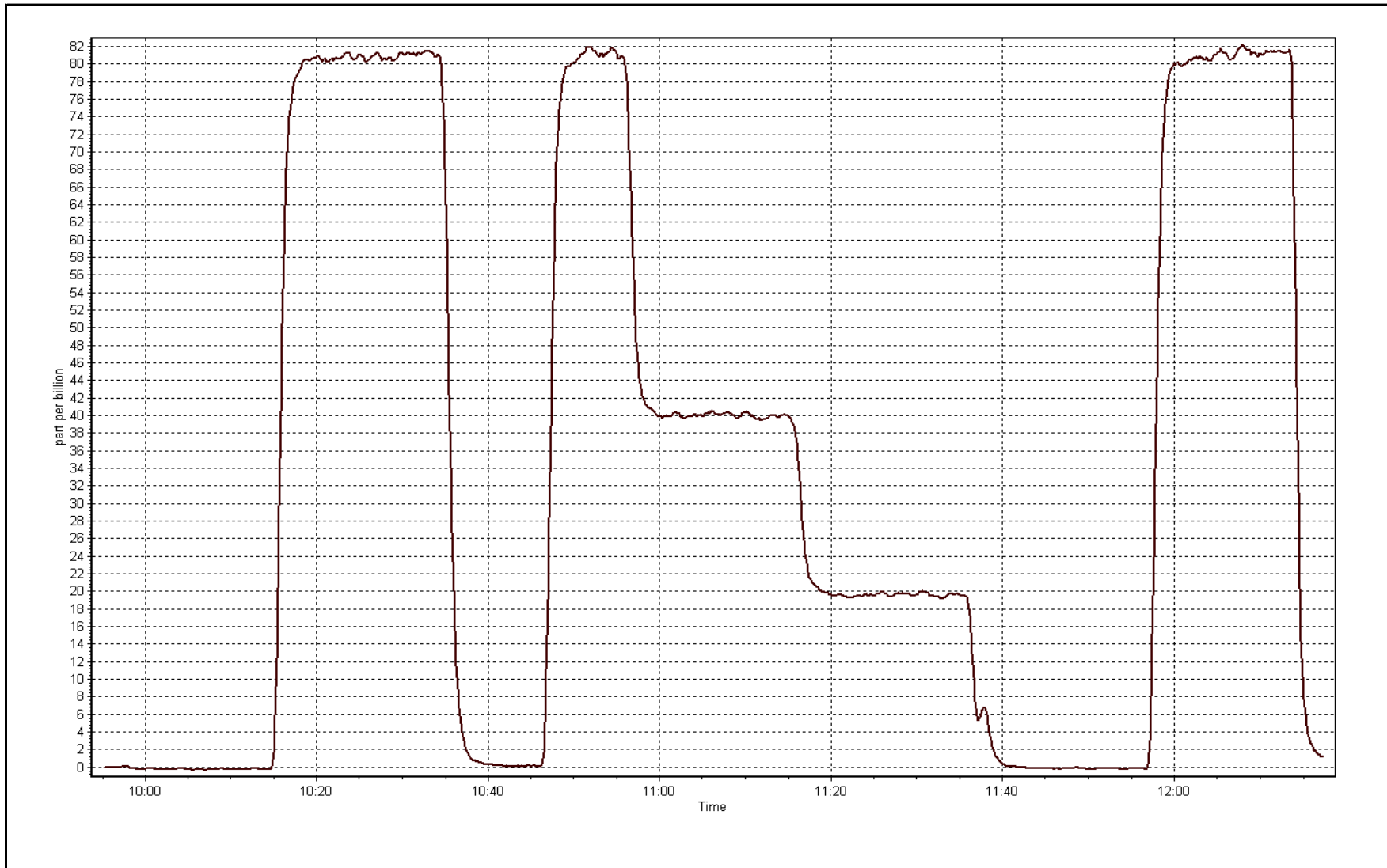
Calibration Date	December 8, 2015	Previous Calibration	November 4, 2015
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	9:55	End Time (MST)	12:17
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1218153359

## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	0.999960
80.0	81.0	0.9877		
40.0	40.0	0.9988	Slope	0.983265
20.0	19.6	1.0192		
			Intercept	0.482703









# Wood Buffalo Environmental Association THC Calibration Report

### Station Information

Calibration Date	December-07-15	Last Calibration	November-18-15
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	9:40	End Time (MST)	13:42
Gas Cert Reference	LL110515	Cal Gas Expiry Date	08/09/2018
CH4 Cal Gas Conc.	517 ppm	CH4 Equiv Conc.	1067.0 ppm
C3H8 Cal Gas Conc.	200 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11041107
ZAG make/model	Teledyne API 701	Serial Number	5613
DACS make/model	Campbell Scientific CR3000	Serial Number	1850

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	9.2	9.2
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.2	34.2
Calculated slope	0.997821	1.014120	Fuel Pressure	23.1	23.1
Calculated intercept	0.055758	0.073312	Analyzer Coeff	3.107	3.085
			Analyzer BKG	1.390	1.260

Analyzer make	51i-LT	Analyzer serial #	1505164380
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### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.16	----
as found span	5000	78.9	16.84	16.61	1.014
calibrator zero	5000	0.0	0.00	-0.02	----
high point	5000	78.9	16.84	16.57	1.016
second point	5000	39.4	8.41	8.15	1.032
third point	5000	19.7	4.20	4.05	1.038
as left zero	5000	0.0	0.00	0.02	----
as left span	5000	78.9	16.84	16.72	1.007
Average Correction Factor					1.029

Corrected As found	16.77	Previous response	16.82	% change	0.3%
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Notes:

hydrogen changed out, filter changed out, zero adjusted

Calibration Performed By:

Melissa Lemay



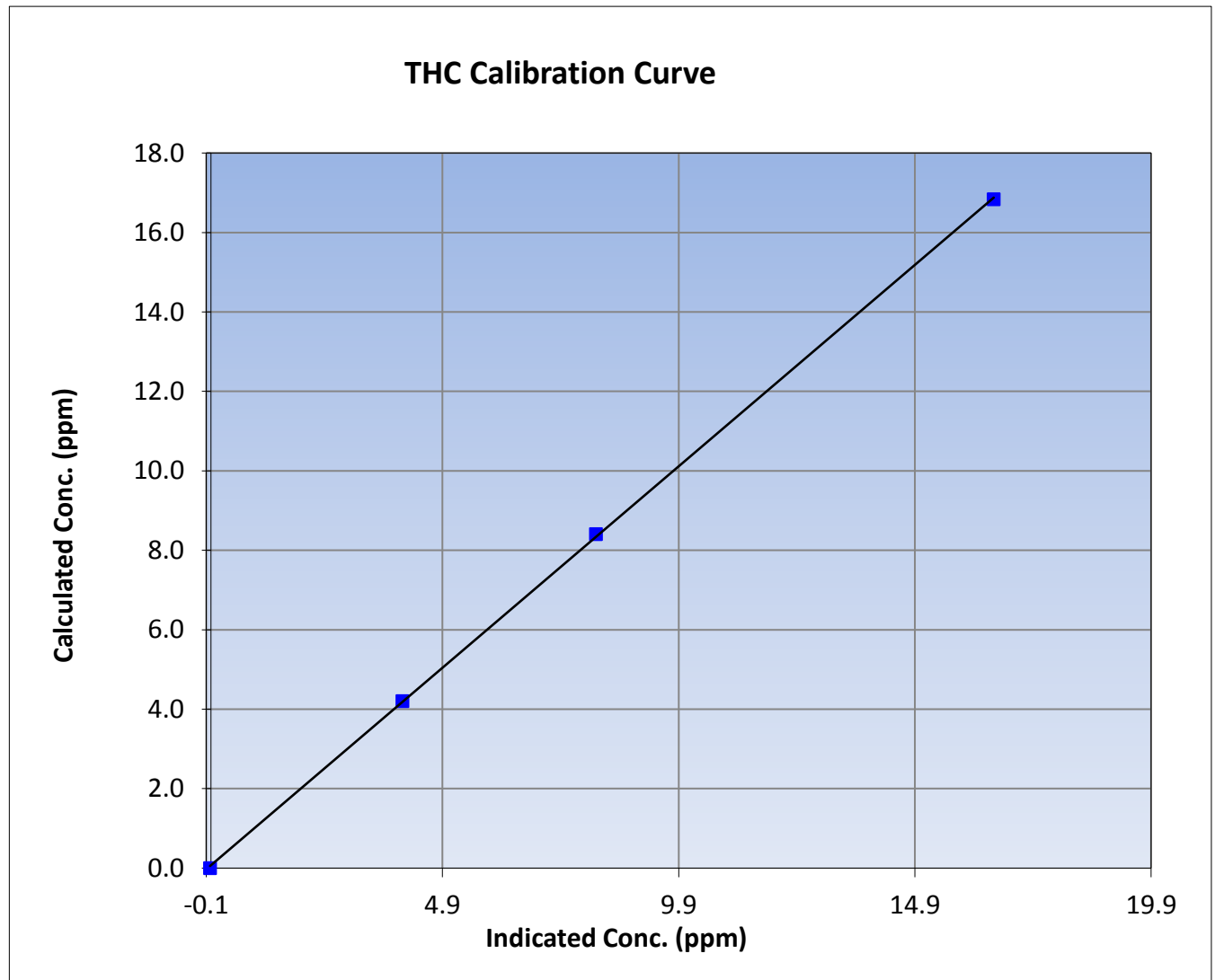
# Wood Buffalo Environmental Association THC Calibration Report

## Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 18, 2015
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	9:40	End Time (MST)	13:42
Analyzer make	51i-LT	Analyzer serial #	1505164380

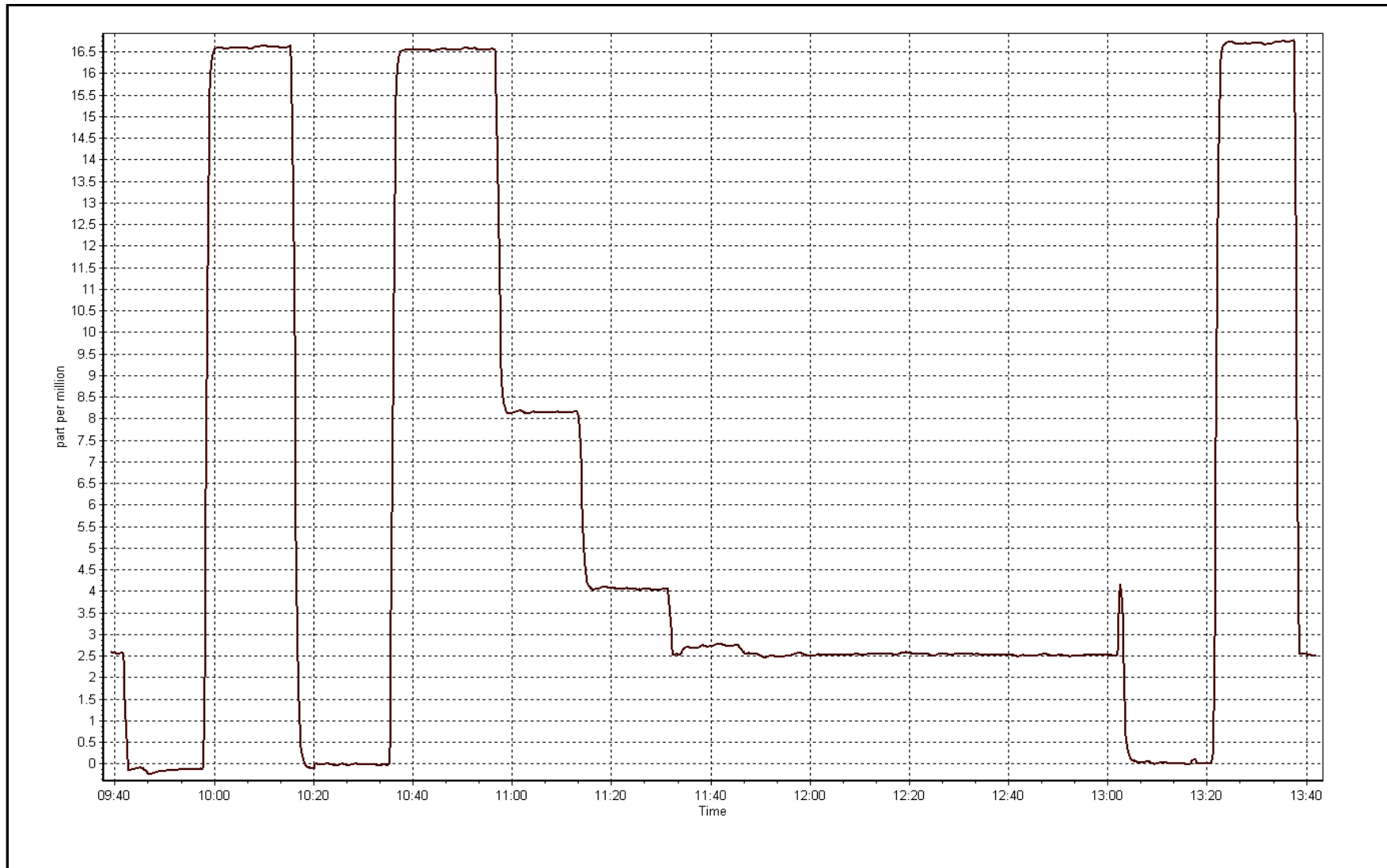
## Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.02	----	Correlation Coefficient	0.999937
16.84	16.57	1.0161		
8.41	8.15	1.0317	Slope	1.014120
4.20	4.05	1.0380		
			Intercept	0.073312



THC Calibration Plot

Date: December 7, 2015





# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Report

### Station Information

Calibration Date	December 8, 2015	Previous Calibration	November 19, 2015
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	7:30	End Time (MST)	9:56
NO2 GPT Ref date	December-07-15	Transfer Standard	Sabio 4010
Calibrator Make/Model	Sabio 4010	Station temp.	22 Deg C
ZAG make/model	Teledyne API 701	Serial Number	11041107
DACS make/model	Campbell Scientific CR3000	Serial Number	3410
		Serial Number	1850

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Box temp.	25.8	24.3
Analyzer IP address	192.168.1.79		Lamp temp.	58.0	58.0
Calculated slope	1.000248	1.000634	Pressure	26.5	26.2
Calculated intercept	-0.336051	-0.150923	Flow	755.0	734.0
Analyzer Background	0.2	0.2	Intensity	2657.7	2650.7
Analyzer Coefficient	0.986	1.009			

Analyzer make	API T400	Analyzer serial #	825
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### Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.00	0.0	0.4	----
as found span	5000	0.89	349.9	341.0	1.026
calibrator zero	5000	0.00	0.0	0.4	----
high point	5000	0.89	349.9	349.9	1.000
second point	5000	0.47	207.9	208.0	1.000
third point	5000	0.36	109.9	109.6	1.003
as left zero	5000	0.00	0.0	0.7	----
as left span	5000	0.89	349.9	358.0	0.977
Average Correction Factor					1.001

Corrected As found	340.6	Previous response	350.1	% change	2.8%
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**Notes:**

Span adjusted, filter changed out, no maintenance done

Calibration Performed By:

Melissa Lemay



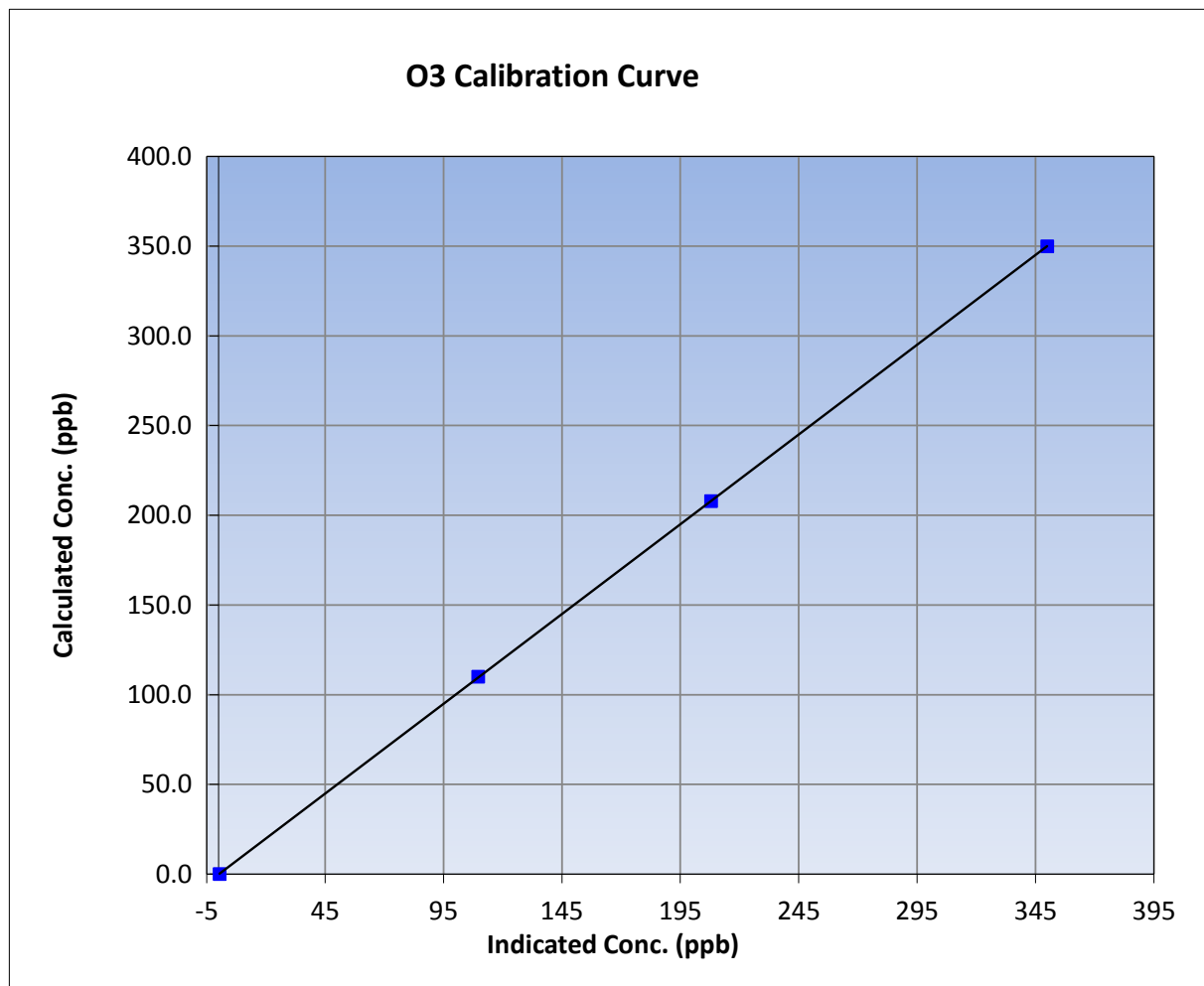
## Wood Buffalo Environmental Association O3 Calibration Report

### Station Information

Calibration Date	December-08-15	Previous Calibration	November 19, 2015
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	7:30	End Time (MST)	9:56
Analyzer make	API T400	Analyzer serial #	825

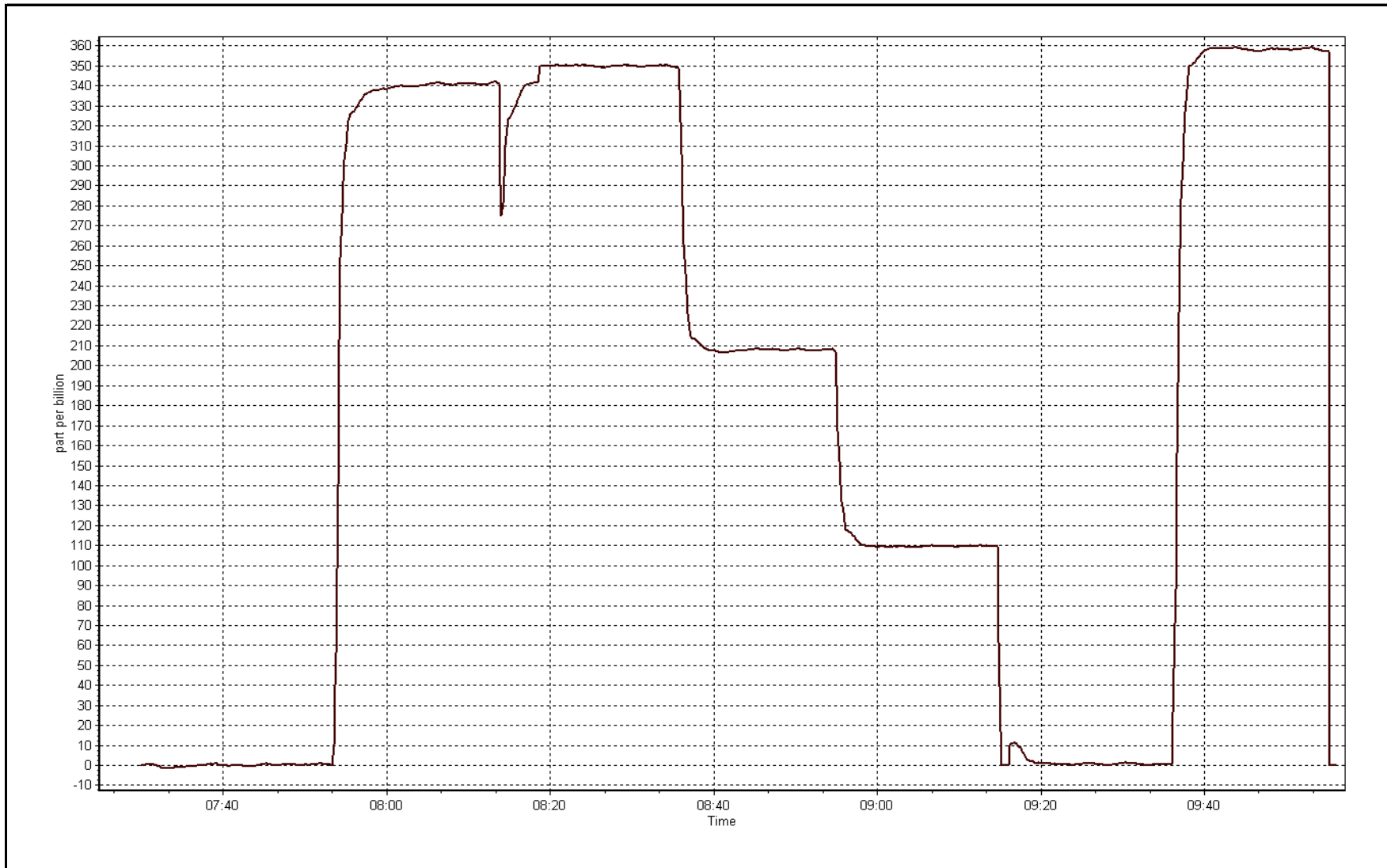
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.4	----	Correlation Coefficient	0.999997
349.9	349.9	1.0000		
207.9	208.0	0.9995	Slope	1.000634
109.9	109.6	1.0027		
			Intercept	-0.150923



O3 Calibration Plot

Date: December 8, 2015





# Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

## Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 18, 2015
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	9:40	End Time (MST)	13:41
NO Cal Gas Conc	50.7 ppm	Gas Cert Reference	LL110515
NOx Cal Gas Conc	50.7 ppm	Cal Gas Expiry Date	08/09/2018
Calibrator	Sabio 4010	Serial Number	11041107
Zero air Generator	Teledyne API T701	Serial Number	5613

## DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	1850
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## Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.996339	0.997450	0.982833
	Data Offset	2.067773	1.505407	-0.286151
Current Calibration	Data Slope	0.999403	0.999509	1.000095
	Data Offset	1.932730	1.798370	0.356743

## Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1410661329
---------------------	------------	-------------------	------------

Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	0.817		0.837	
NOx coefficient	0.995		0.998	
NO2 coefficient	0.998		0.998	
NO bkgrnd	7.3		7.4	
NOx bkgrnd	7.3		7.5	
Chamber Temp	50.4	Deg C	50.2	Deg C
Moly Temp	326	Deg C	325.8	Deg C
PMT voltage	-846.6	V	-846.6	V
PMT Temp	-3.1	Deg C	-3.1	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	177.9	mmHg	177	mmHg
R Cell Press Nox	177.6	mmHg	177	mmHg
NO sample flow	0.89	lpm	0.878	lpm
Nox sample Flow	0.888	lpm	0.876	lpm

**Notes:**

Span adjusted, No maintenance done, filter changed out





# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

### Station Information

Calibration Date:

December 7, 2015

Station Number:

AMS 13

### Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.4	-0.3	-0.1	----	----
as found span	5000	78.9	800.0	800.0	0.0	781.7	783.7	-2.0	1.0235	1.0209
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.4	-0.3	-0.1	----	----
high point	5000	78.9	800.0	800.0	0.0	799.7	799.7	-0.3	1.0004	1.0004
second point	5000	39.4	399.5	399.5	0.0	396.0	396.2	-0.3	1.0089	1.0084
third point	5000	19.7	199.8	199.8	0.0	197.1	197.2	-0.1	1.0135	1.0130
as left zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.2	0.0	----	----
as left span	5000	78.9	800.0	450.0	350.0	805.8	451.8	354.1	0.9929	0.9960
Average Correction Factor									1.0076	1.0073

Corrected As found  
Previous Response

NO<sub>x</sub>= 782.1  
NO<sub>x</sub>= 800.9

NO= 784.0  
NO= 800.6

Percent Change

NO<sub>x</sub>= 2.4%

NO= 2.1%

### GPT Calibration Data

Dilution Flow

5000

ccm

Source Gas Flow

78.90

ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero			0.0			-0.1			N/A	
1st NO2 (300)	----	450.0	349.9	799.6	450.0	349.6	0.9850	1.0000	1.0009	99.9%
2nd NO2 (200)	----	592.0	207.9	799.5	592.0	207.6	0.9851	1.0000	1.0014	99.9%
3rd NO2 (100)	----	690.0	109.9	799.1	690.0	109.1	0.9856	1.0000	1.0073	99.3%
4th NO2 (0)	799.9	----	-0.7	799.2	799.9	-0.7	0.9855	1.0000	N/A	----
Average Correction Factor							0.9853	1.0000	1.0032	99.7%

Calibration Performed By:

Melissa Lemay



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

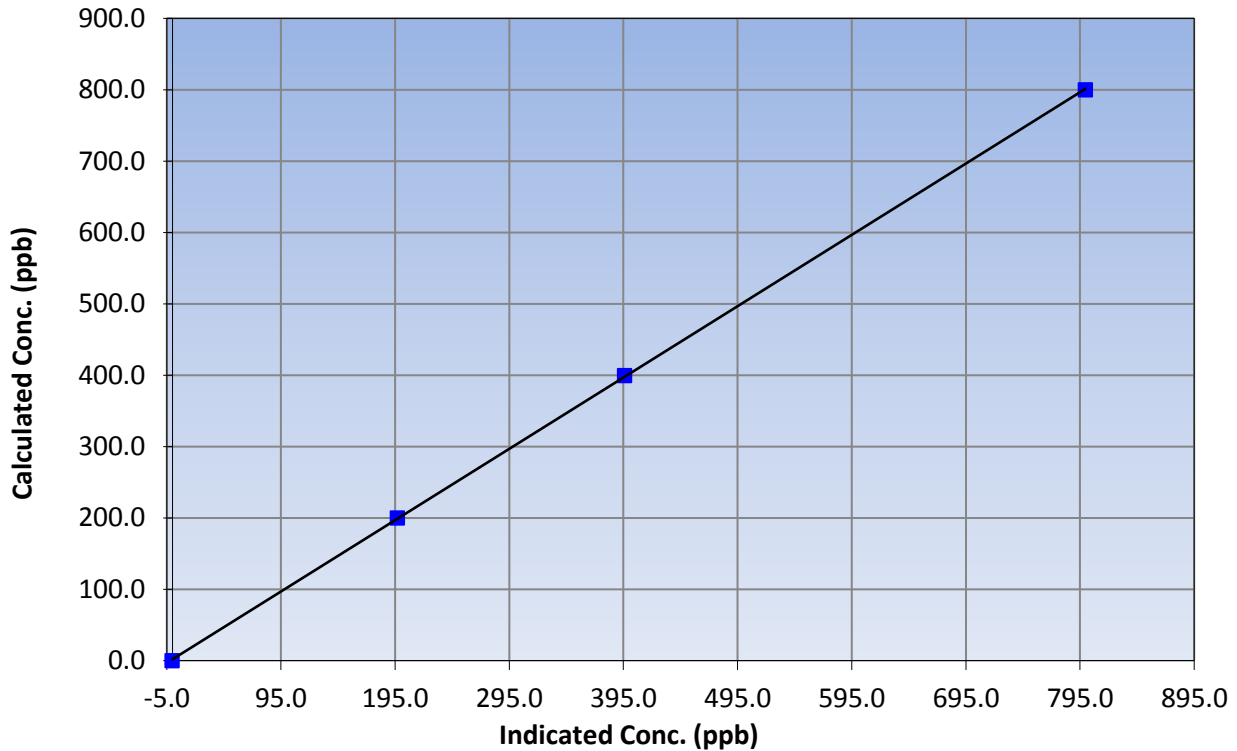
### Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 18, 2015
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	9:40	End Time (MST)	13:41
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	----	Correlation Coefficient	0.999978
800.0	799.7	1.0004		
399.5	396.0	1.0089	Slope	0.999403
199.8	197.1	1.0135		
			Intercept	1.932730

### NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

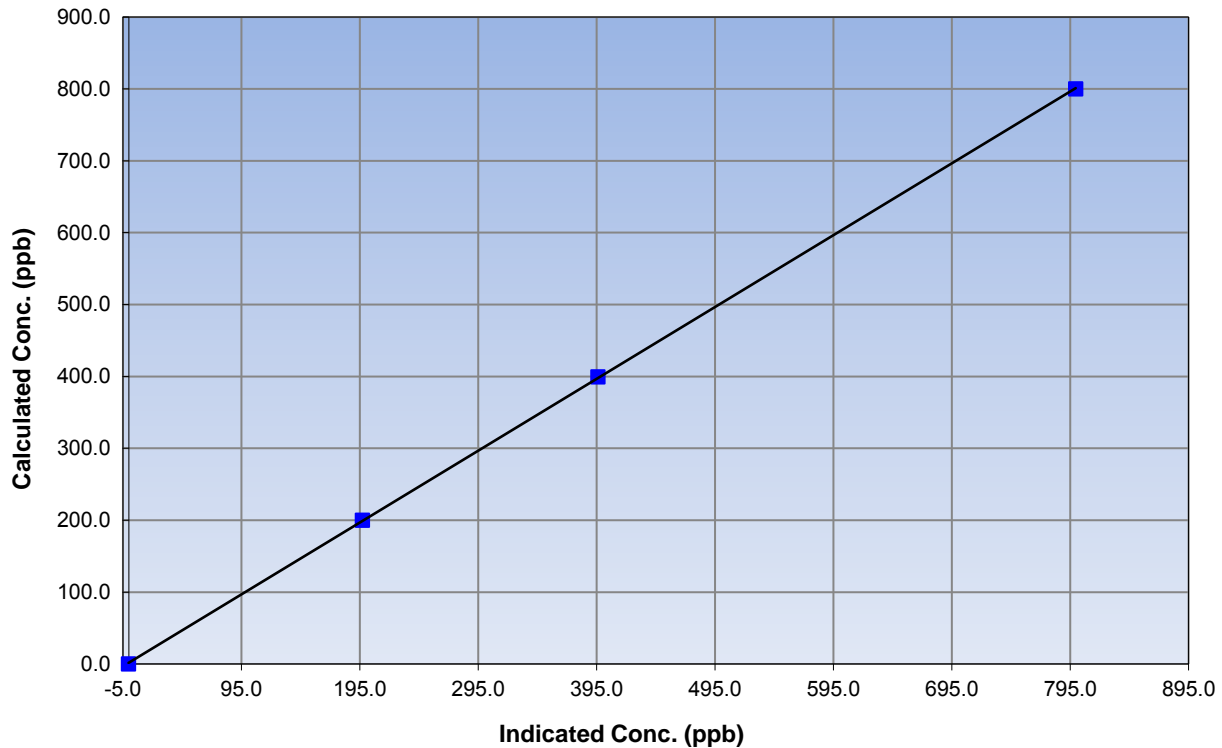
### Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 18, 2015
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	9:40	End Time (MST)	13:41
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	N/A	Correlation Coefficient	0.999980
800.0	799.7	1.0004		
399.5	396.2	1.0084	Slope	0.999509
199.8	197.2	1.0130		
			Intercept	1.798370

### NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

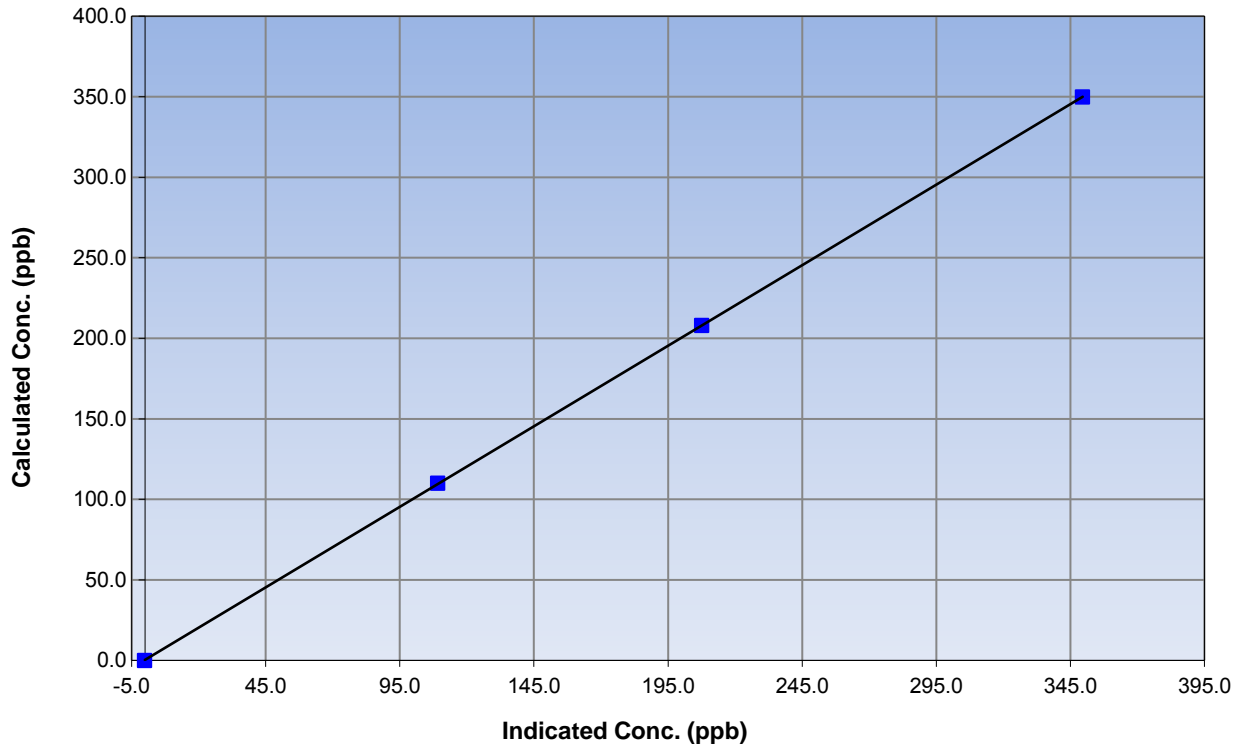
### Station Information

Calibration Date	December 7, 2015	Previous Calibration	November 18, 2015
Station Number	Fort McKay South	Station Number	AMS 13
Start Time (MST)	9:40	End Time (MST)	13:41
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

### Calibration Information

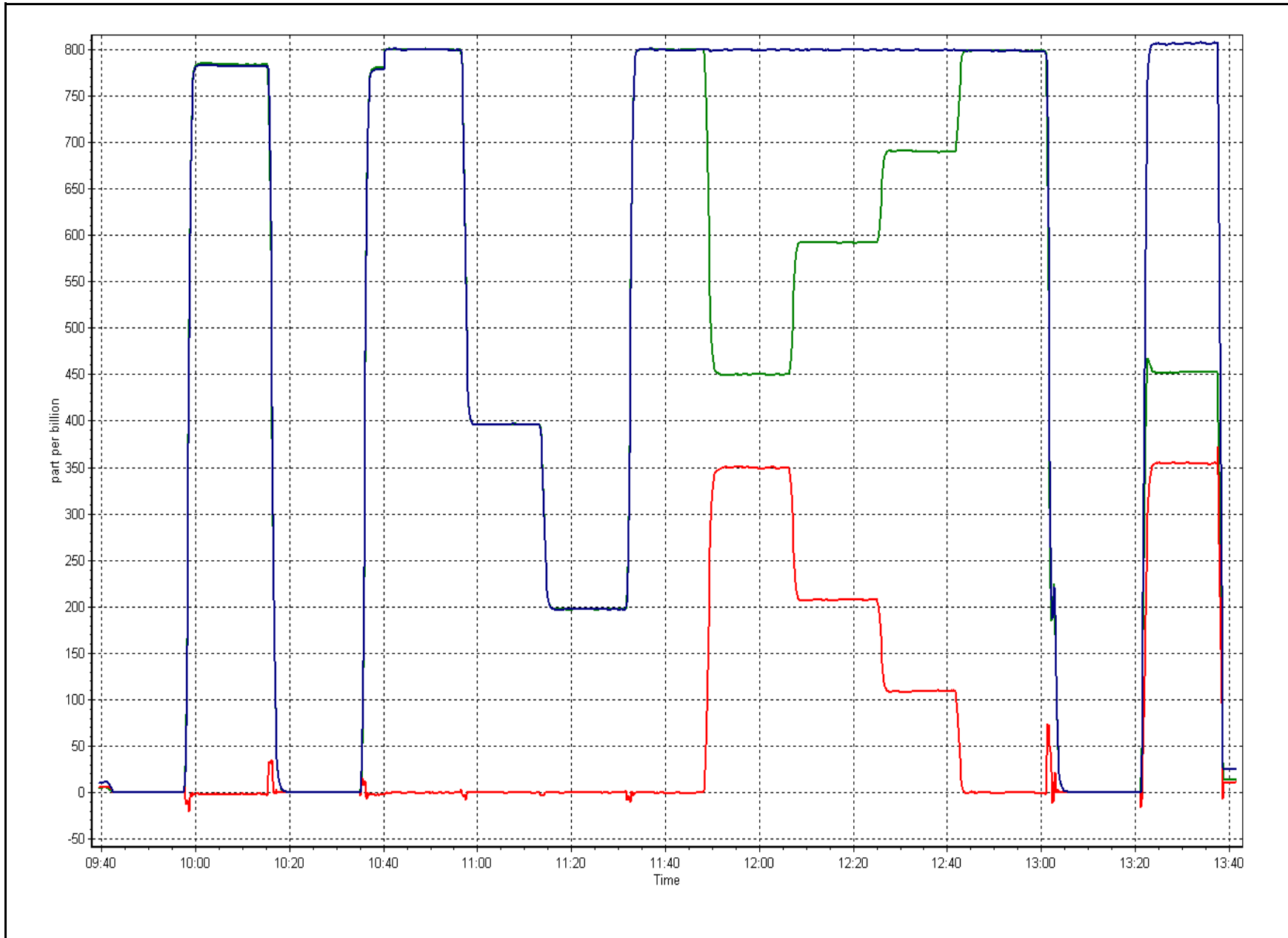
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999996
349.9	349.6	1.0009		
207.9	207.6	1.0014	Slope	1.000095
109.9	109.1	1.0073		
			Intercept	0.356743

### NO<sub>2</sub> Calibration Curve



NOX Calibration Plot

Date: December 7, 2015





Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION

Calibration Date: December 8, 2015 Previous Calibration: November 19, 2015  
 Station Name: Fort McKay South Station Number: AMS 13  
 Start Time (MST): 9:57 End Time (MST): 11:00  
 Calibrator Make/Model: Delta Cal Calibrator Serial Number: 1097

SHARP INFORMATION

Particulate Fraction: PM2.5  
 Make/Model: Thermo / SHARP 5030  
 Serial Number: E-803  
 C<sub>14</sub> Source SN: 4066  
 Confirmation of Time settings: Yes  No   
 Parameters Checked: T1  T2  T3  T4  P3  Main Flow  Beta  Neph

CALIBRATION DATA

Temperature (°C)

Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	-11.0	-10.7	0.3	-11.0
T2	18.0	na	na	18.0
T3	20.0	na	na	20.0
T4	18.0	na	na	18.0
RH (%)	16.0	na	na	16.0

Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	967	967.0	0.0	967

Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1042	42	1000	1000

Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	389		389
Neph	1		1
C14	-3.8		-3.8
Indicated Concentration (ug/m3)	0.6	No	0.6
Offset 1			
Offset 2			

Leak Check (Quarterly)

Leak Check Date: December 8, 2015 Previous Leak Check Date: September 28, 2015

	Measured	Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	17.40	
*Flow with adaptor (LPM):	17.32	0.08

\*Note - do not attach adaptor without shutting off the pump first

Mass Foil Calibration (Annually)

Foil Calibration Date: July 14, 2015 Previous Foil Calibration:  
 Zeroed?: Yes  
 Foil Mass: 1337 Mass foil set S/N:  
 Previous Correction Factor: 6970  
 New Correction Factor: 7080

INSPECTION DATA

Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	
Pump	Good	
Filter Tape	Good	
Mass Foil Cal Set	na	
HEPA filter	Good	

NOTES:

flow adjusted, sample head cleaned

Calibration Performed By: Melissa Lemay



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 14  
ANZAC  
DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)  
DECEMBER 2015

MONTHLY SUMMARY for  
AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	701	36	43	99.06	23	0	6	0
TRS(ppb) Average	710	34	34	100.00	2	0	1	0
THC(ppm) Average	708	36	36	100.00	3.3	-	2.4	-
NMHC(ppm) Average	708	36	36	100.00	0.228	-	0.058	-
CH4(ppm) Average	708	36	36	100.00	3	-	2.3	-
NO2(ppb) Average	707	37	37	100.00	19	0	9	-
NO(ppb) Average	707	37	37	100.00	13	-	1	-
NOX(ppb) Average	707	37	37	100.00	27	-	10	-
O3(ppb) Average	710	34	34	100.00	40	0	37	-
PM2.5(ug/m3) Average	742	2	2	100.00	12.6	-	6.3	0
AT 2m(C) Average	744	0	0	100.00	5.7	-	1.7	-
RH(%) Average	744	0	0	100.00	96	-	94	-
Leaf Wetness (% of range) Average	744	0	0	100.00	7	-	1	-
WS(km/h) Average	720	0	24	96.77	23	-	13	-
WD(deg) Average	720	0	24	96.77	-	-	-	-
PC(mm) Total	744	0	0	100.00	0.3	-	0.3	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)  
DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2(ppb) Average	701	0.7	2	-	0	0	0	0	0	1	23
TRS(ppb) Average	710	0.4	0	-	0	0	0	0	0	1	2
THC(ppm) Average	708	2	0.1	-	1.8	1.9	1.9	2	2	2.1	3.3
NMHC (ppm) Average	708	0.003	0.019	-	0	0	0	0	0	0	0.228
CH4(ppm) Average	708	1.99	0.1	-	1.8	1.9	1.9	2	2	2.1	3
NO2(ppb) Average	707	3.2	3	-	0	1	1	2	4	7	19
NO(ppb) Average	707	0.4	1	-	0	0	0	0	0	1	13
NOX(ppb) Average	707	3.7	4	-	0	1	1	2	5	9	27
O3(ppb) Average	710	22.9	8	-	4	12	17	23	28	33	40
PM2.5(ug/m3) Average	742	3.31	1.9	-	0.4	1.2	1.8	3.1	4.5	5.6	12.6
Temperature 2 m (C) Average	744	-10.04	6.3	-	-25.4	-18.7	-15.2	-8.9	-5.1	-2.8	5.7
Relative Humidity (%) Average	744	82.3	10	-	33	68	80	84	89	93	96
Leaf Wetness (% of range) Average	744	0.8	0	-	0	0	1	1	1	1	7
Wind Speed 20 m (km/h) Average	720	7.5	4	-	0	3	5	7	10	12	23
Wind Direction 20 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-
Precipitation (mm) Total	744	-	-	0.25	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2	14 Dec 2015 18:00	15 Dec 2015 00:00	7	Unstable operation - excessive baseline drift
Wind Speed, Wind Direction	01 Dec 2015 08:00	01 Dec 2015 10:00	3	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	01 Dec 2015 13:00	01 Dec 2015 13:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	01 Dec 2015 17:00	01 Dec 2015 17:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	01 Dec 2015 23:00	01 Dec 2015 23:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	09 Dec 2015 18:00	09 Dec 2015 18:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	10 Dec 2015 10:00	10 Dec 2015 10:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	13 Dec 2015 19:00	13 Dec 2015 21:00	3	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	14 Dec 2015 03:00	14 Dec 2015 06:00	4	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	14 Dec 2015 18:00	14 Dec 2015 18:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	21 Dec 2015 18:00	21 Dec 2015 18:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	26 Dec 2015 08:00	26 Dec 2015 10:00	3	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	27 Dec 2015 21:00	27 Dec 2015 22:00	2	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	29 Dec 2015 05:00	29 Dec 2015 05:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	29 Dec 2015 10:00	29 Dec 2015 10:00	1	Flat line in sensor output signal -sensor frozen



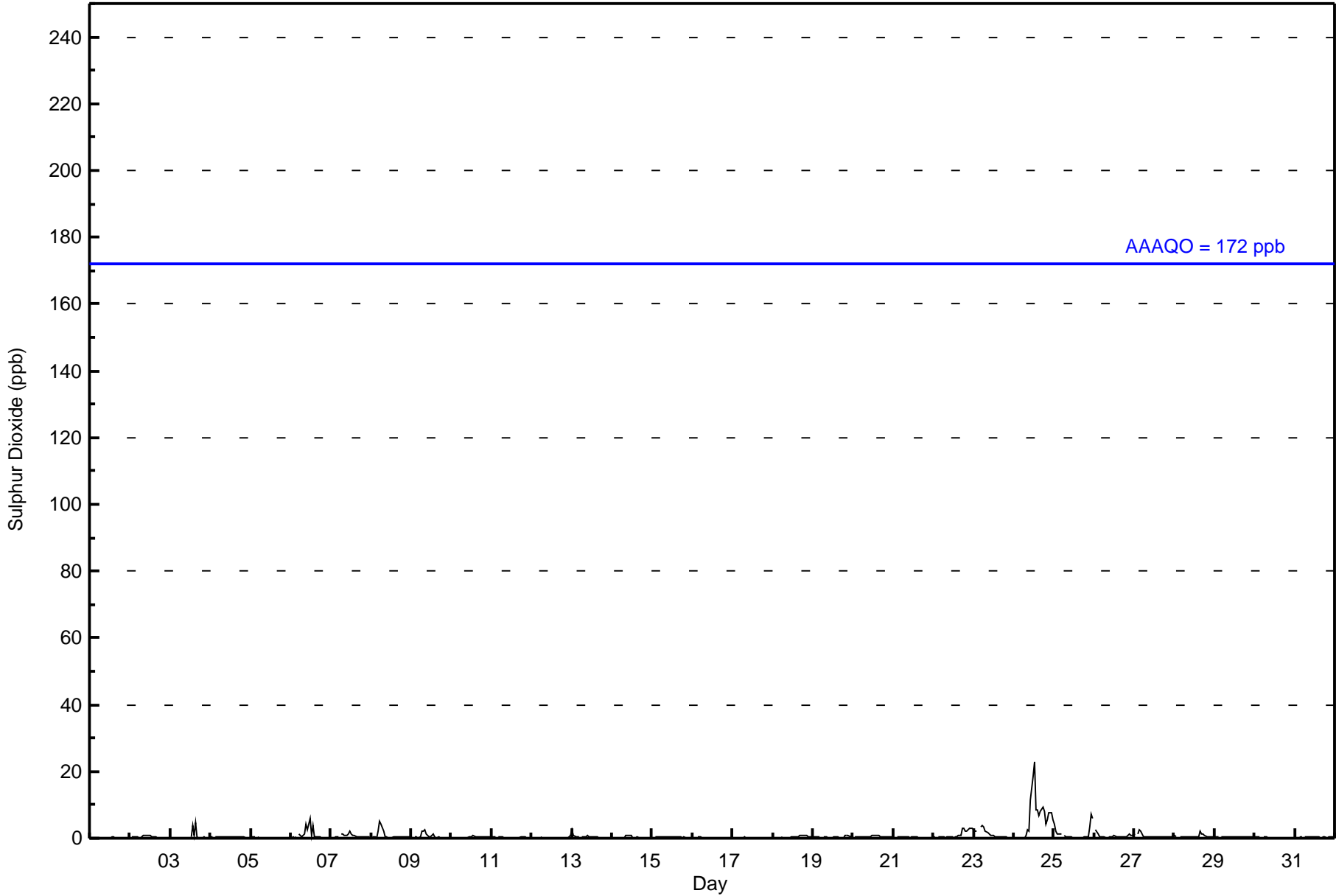
Summary of Hour Averages

Anzac - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 23 ppb on Dec 24 13:00	Maximum Daily Average: 6.1 ppb on Dec 24		Hours of Data:	701
Minimum Value: 0 ppb on Dec 1 09:00	Minimum Daily Average: 0.1 ppb on Dec 16		Hours of Missing Data:	43
Maximum Diurnal Average: 1.2 ppb at hour 12	Minimum Diurnal Average: 0.4 ppb at hour 4		Hours of Calibration:	36
Monthly Average: 0.7 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 8		Percent Operational Time:	99.1

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Dec	Z	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1
3-Dec	0	Z	0	0	0	0	0	C	C	C	C	C	1	4	1	5	1	0	0	0	0	0	0	0.6	5	
4-Dec	0	0	Z	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
6-Dec	0	0	0	0	Z	1	0	1	1	4	2	6	1	4	0	0	0	0	0	0	0	0	0	1.0	6	
7-Dec	0	0	0	0	0	Z	1	1	1	1	1	2	1	1	1	1	0	0	0	0	0	0	0	0.6	2	
8-Dec	Z	0	0	0	2	5	4	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.8	5	
9-Dec	0	Z	0	0	0	0	2	2	3	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0.6	3	
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	1	0.3	1	
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
13-Dec	2	1	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2	
14-Dec	Z	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	UO	UO	UO	UO	UO	UO	UO	--	1
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
16-Dec	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.4	1	
19-Dec	0	0	0	0	0	Z	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0.4	1	
20-Dec	Z	1	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	0	1	1	1	0	0	0.5	1	
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	3	3	2	2	3	3	1.0	3	
23-Dec	3	2	2	Z	3	4	3	2	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1.3	4	
24-Dec	0	0	0	0	Z	0	0	1	3	2	12	19	23	8	8	7	8	9	8	4	6	8	8	6.1	23	
25-Dec	4	2	1	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	7	1.3	7	
26-Dec	Z	2	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1	0.6	2	
27-Dec	1	Z	1	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.7	3	
28-Dec	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	2	1	1	1	1	1	0	0	0	0.6	2	
29-Dec	0	0	0	Z	0	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0.4	1	
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
																								Diurnal Average		
																								Diurnal Maximum		

Z - zerospan                      C - Calibration                      UO - Unstable Operation  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Anzac - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	698	99.57	99.57
11 - 20	2	0.29	99.86
21 - 60	1	0.14	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 701

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Anzac - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	13	2	3	11	17	64	161	69	23	13	20	19	37	110	75	38	675
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	2	3	11	17	64	161	69	23	13	20	19	37	110	78	38	678

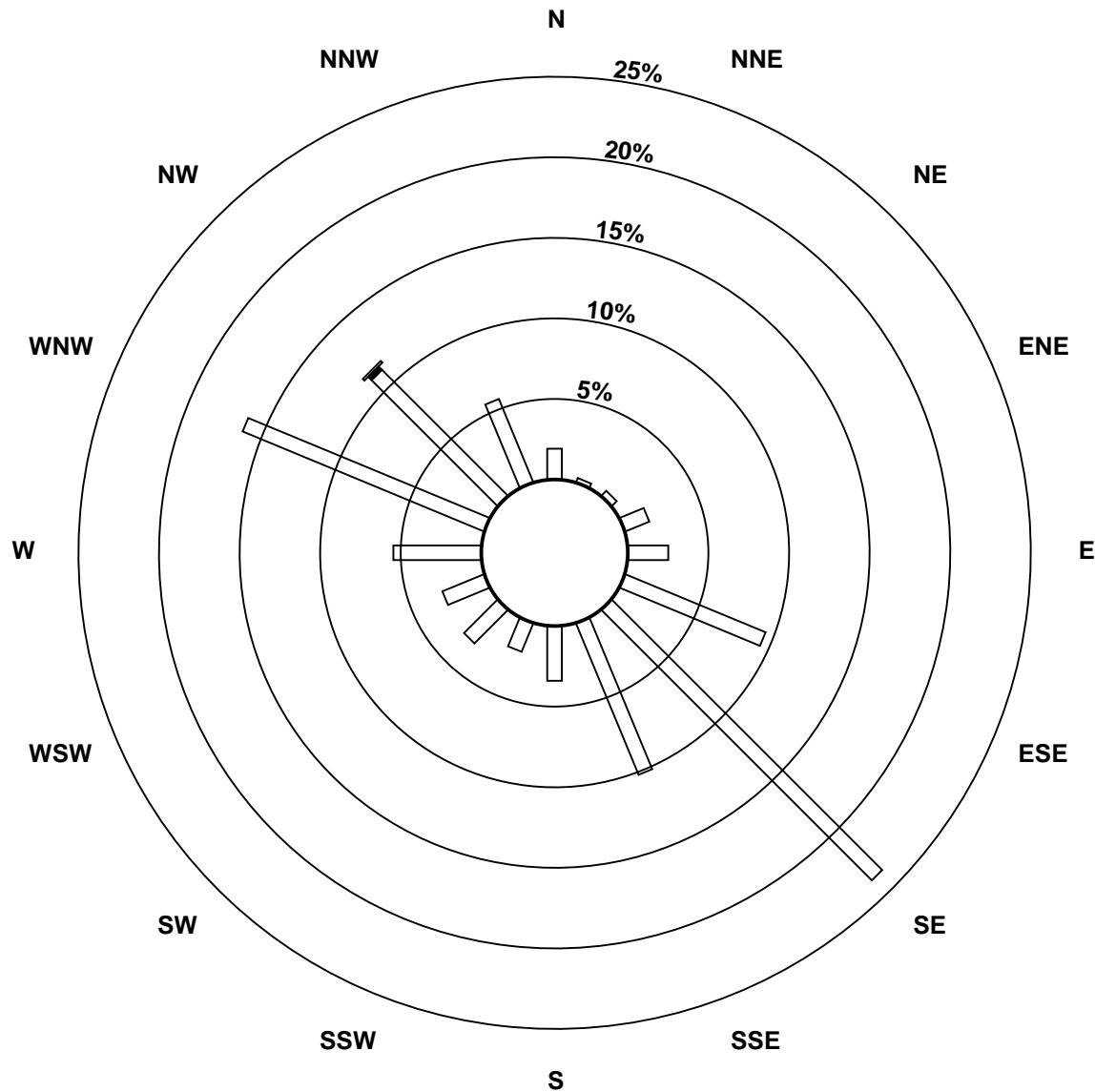
Total Number of Valid Hours: 678

Total Number of Hours: 744

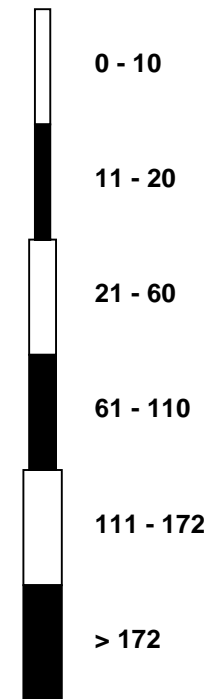


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Anzac (AMS 14)

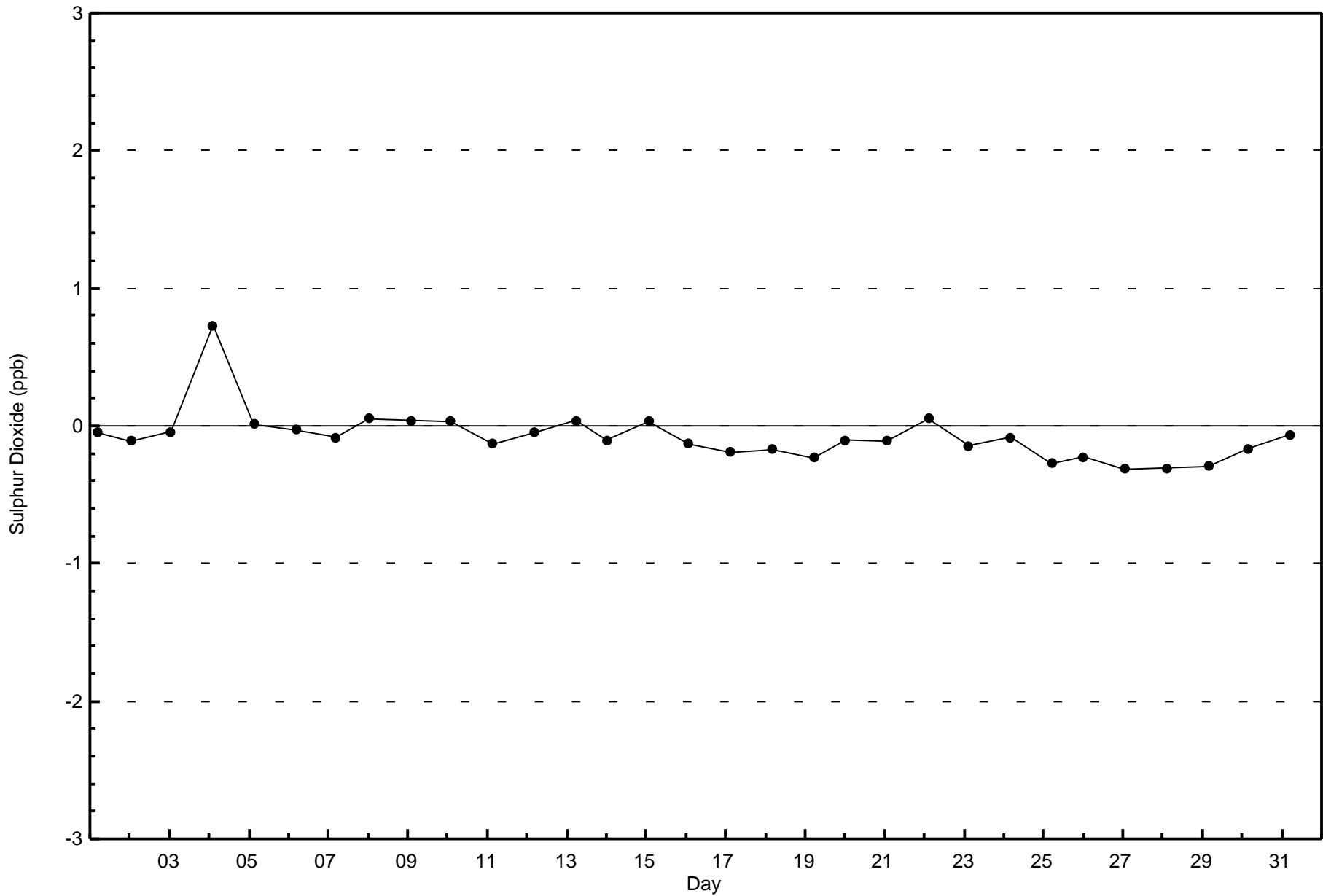


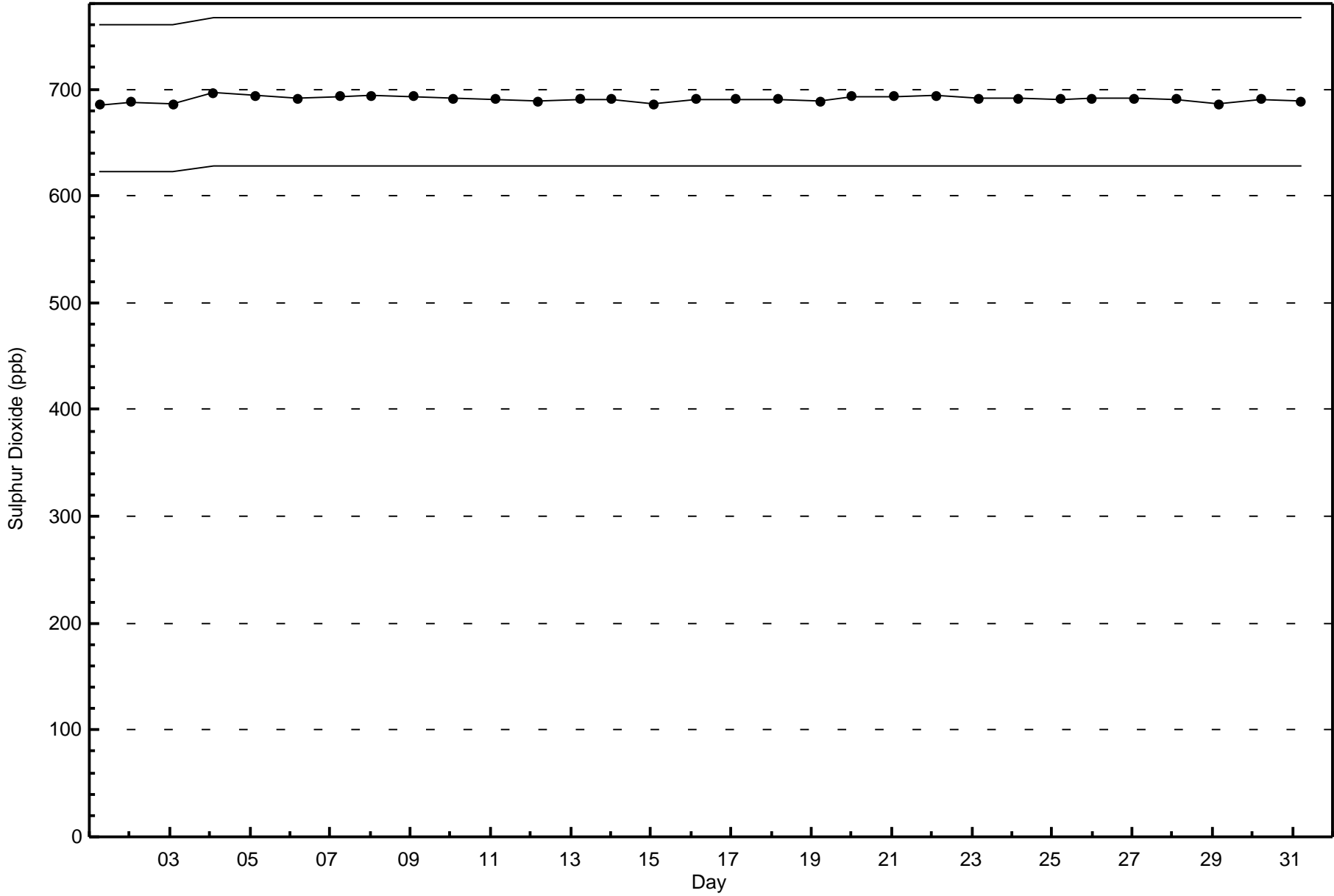
Classes (ppb)



Total Number of Valid Hours: 678









Summary of Hour Averages

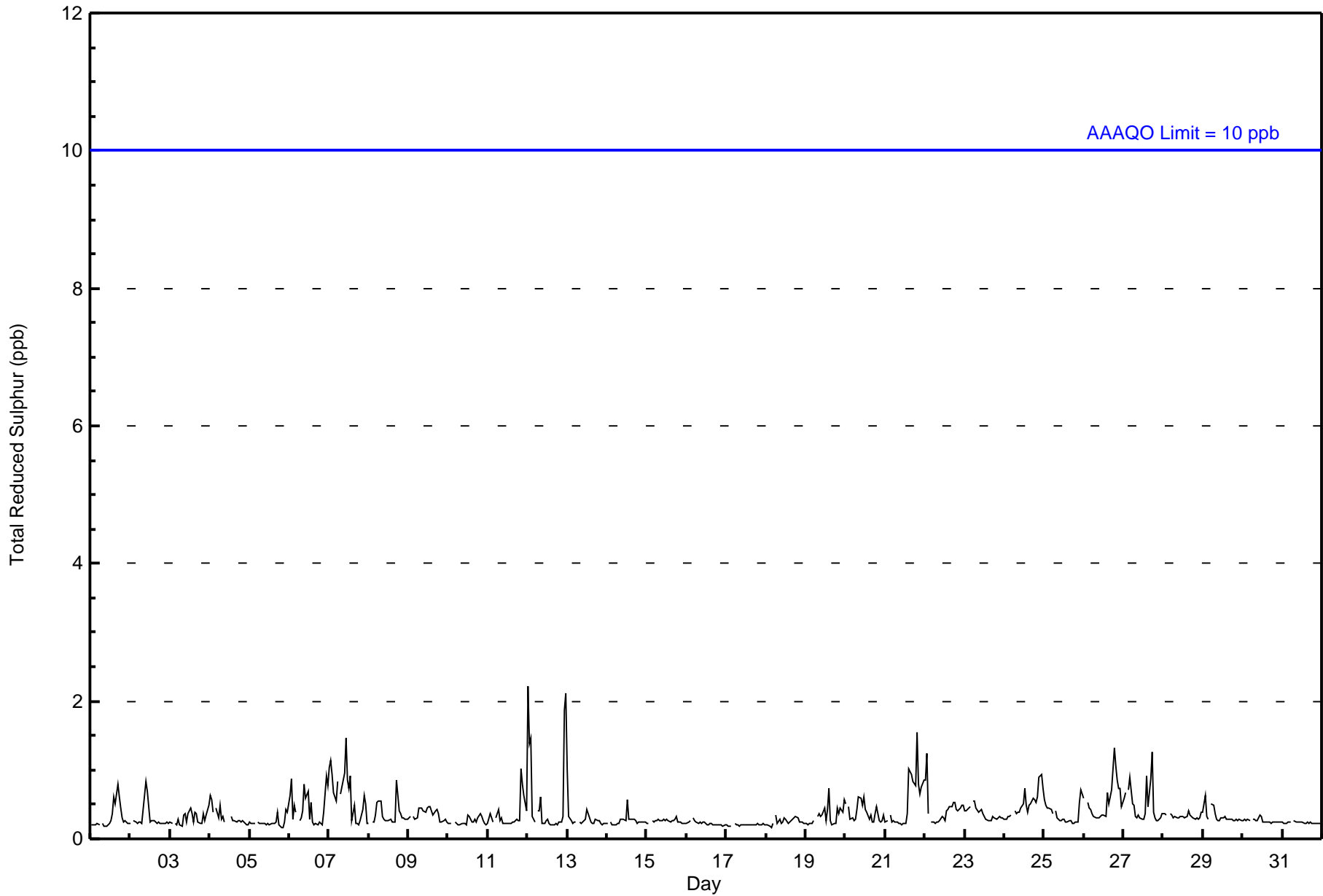
Anzac - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 2 ppb on Dec 12 01:00	Maximum Daily Average: 0.7 ppb on Dec 7		Hours of Data:	710
Minimum Value: 0 ppb on Dec 5 20:00	Minimum Daily Average: 0.2 ppb on Dec 17		Hours of Missing Data:	34
Maximum Diurnal Average: 0.5 ppb at hour 2	Minimum Diurnal Average: 0.3 ppb at hour 8		Hours of Calibration:	34
Monthly Average: 0.4 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 1		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0.3	1
2-Dec	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
4-Dec	1	1	0	Z	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.3	1
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
6-Dec	1	1	0	0	0	Z	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	1	1	0.4	1
7-Dec	1	1	1	1	1	1	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	0	0.7	1
8-Dec	0	Z	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.3	1
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0.3	1
12-Dec	2	1	1	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0.6	2
13-Dec	1	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0.3	1
20-Dec	1	Z	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	1	1	1	0.5	2
22-Dec	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0.4	1
23-Dec	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
24-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0.5	1
25-Dec	1	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.4	1
26-Dec	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0.5	1
27-Dec	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0.5	1
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
29-Dec	0	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
30-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0

0.5	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.4	0.3	0.3	0.4	0.3	0.4	0.3	0.4	0.4	0.4	0.4	Diurnal Average
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	Diurnal Maximum

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb    24-hr 3 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Anzac - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	710	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Anzac - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	12	2	3	12	16	64	165	75	25	14	20	18	38	108	77	38	687
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	12	2	3	12	16	64	165	75	25	14	20	18	38	108	77	38	687

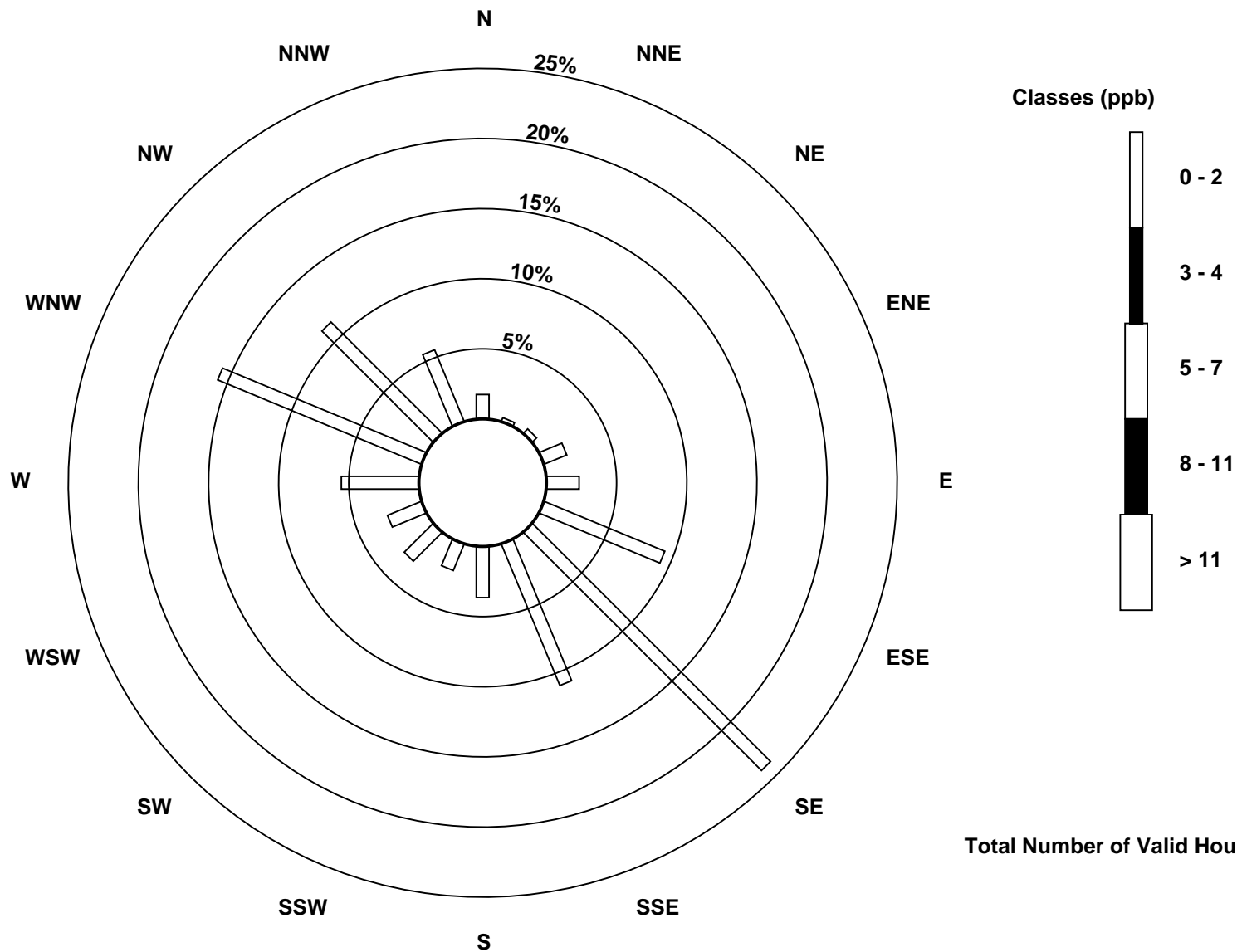
Total Number of Valid Hours: 687

Total Number of Hours: 744

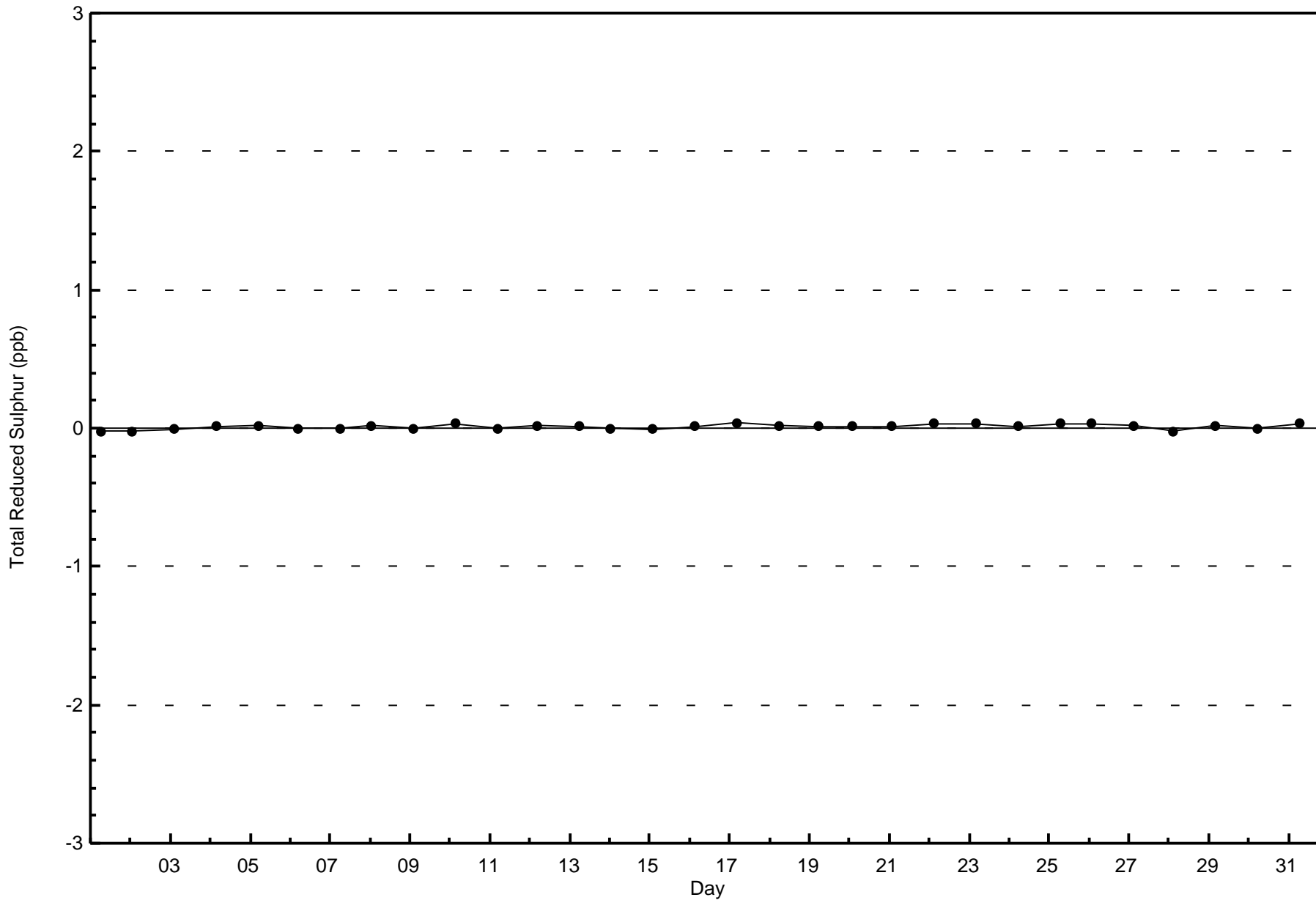


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

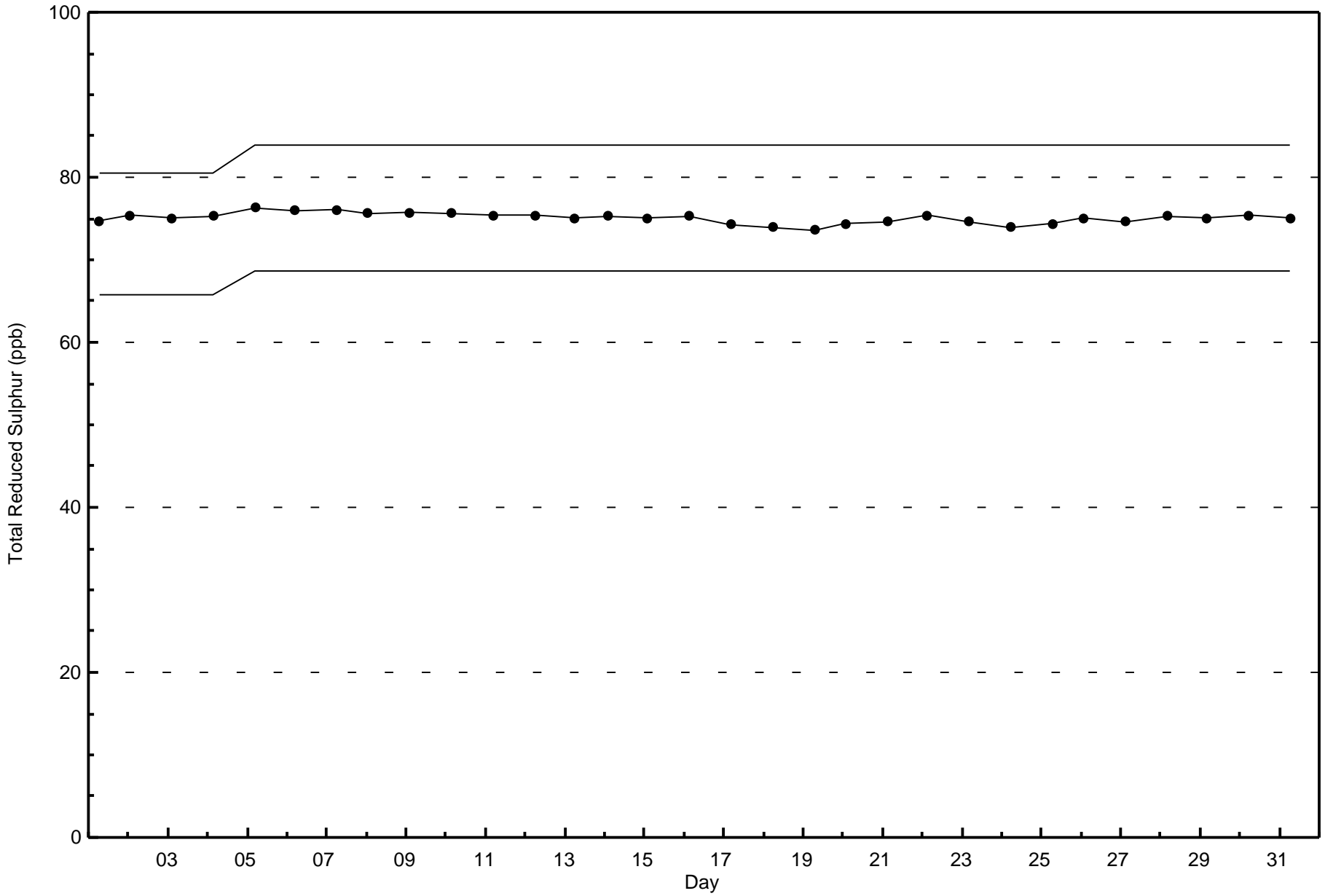
Total Reduced Sulphur (TRS) - ppb  
Anzac (AMS 14)



Total Number of Valid Hours: 687

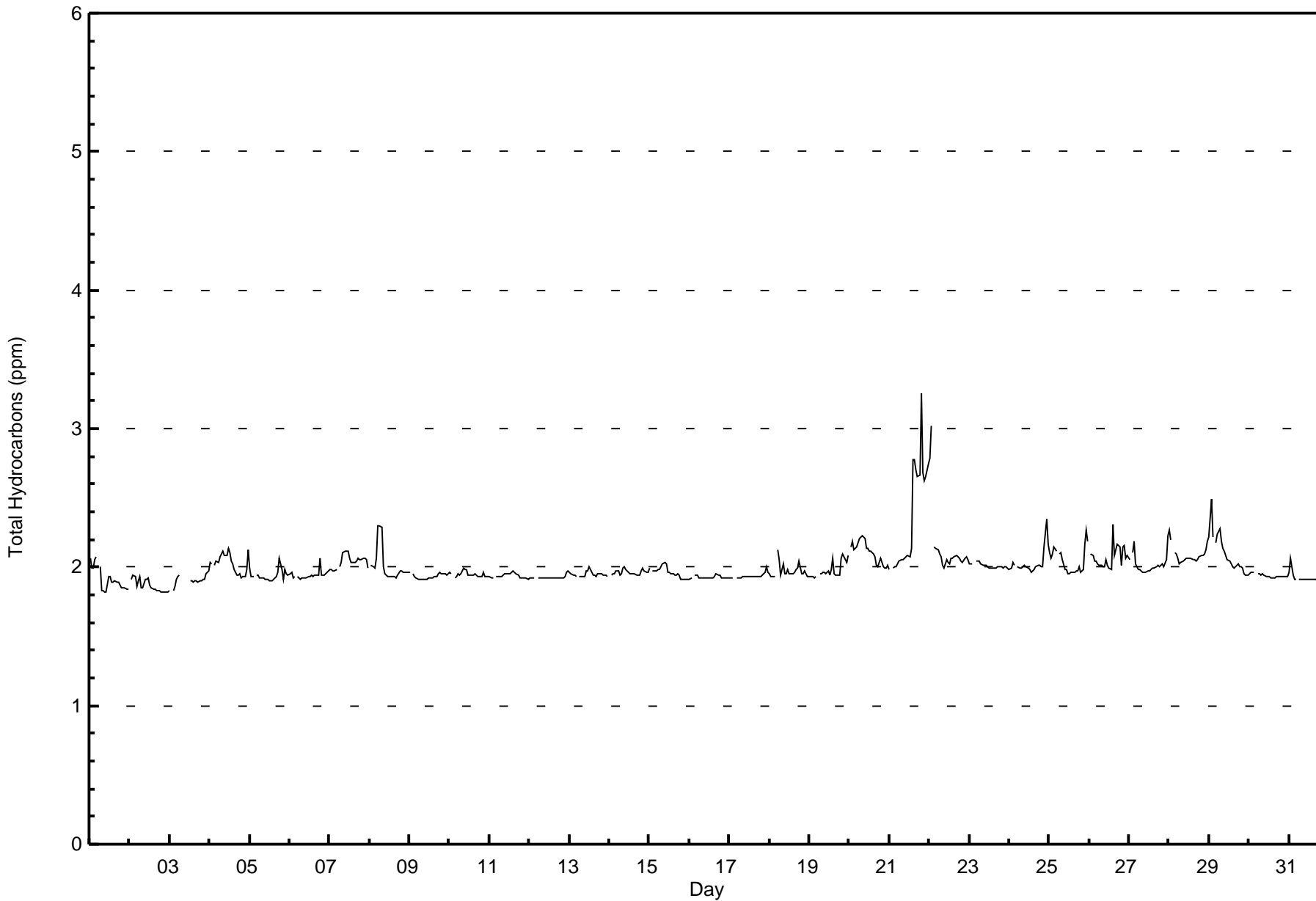








Maximum Value: 3.3 ppm on Dec 21 20:00		Maximum Daily Average: 2.4 ppm on Dec 21		Hours in Service: 744																						
Minimum Value: 1.8 ppm on Dec 1 11:00		Minimum Daily Average: 1.9 ppm on Dec 2		Hours of Data: 708																						
Maximum Diurnal Average: 2.1 ppm at hour 2		Minimum Diurnal Average: 2.0 ppm at hour 14		Hours of Missing Data: 36																						
Monthly Average: 2.00 ppm		Percentiles: P <sub>1</sub> = 1.8 P <sub>10</sub> = 1.9 Q <sub>1</sub> = 1.9 Median = 2.0 Q <sub>3</sub> = 2.0 P <sub>90</sub> = 2.1 P <sub>99</sub> = 2.7		Hours of Calibration: 36																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.1	2.0	2.0	2.1	2.1	Z	2.0	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.9	1.8	1.8	1.9	
2-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	
3-Dec	1.8	Z	1.8	1.9	1.9	1.9	1.9	C	C	C	C	C	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	
4-Dec	2.0	2.0	Z	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.0	2.1	
5-Dec	2.0	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.0	1.9	2.0	1.9	1.9	1.9	
6-Dec	2.0	2.0	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1	1.9	1.9	1.9	2.0	2.0	1.9	
7-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	
8-Dec	Z	2.0	2.0	2.0	2.1	2.3	2.3	2.3	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
9-Dec	2.0	Z	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	1.9	2.0	1.9	
10-Dec	2.0	2.0	Z	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	
11-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
12-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	
13-Dec	2.0	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	
14-Dec	Z	1.9	1.9	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	
15-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	2.0	
16-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
17-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	1.9	
18-Dec	1.9	1.9	1.9	1.9	Z	2.1	2.1	1.9	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	1.9	2.0	
19-Dec	1.9	1.9	1.9	1.9	1.9	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.1	2.0	1.9	1.9	1.9	2.1	2.1	2.1	2.0	2.1	
20-Dec	Z	2.1	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.1	
21-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.8	2.8	2.7	2.7	2.7	3.3	2.7	2.6	2.7	2.7	2.4	
22-Dec	2.8	3.0	Z	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1	
23-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
24-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.3	2.2	2.2	2.0	
25-Dec	2.1	2.1	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2	2.3	2.2	2.0	
26-Dec	Z	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.3	2.1	2.1	2.2	2.1	2.0	2.1	2.2	2.1	2.1	2.1	
27-Dec	2.1	Z	2.1	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.0	
28-Dec	2.3	2.2	Z	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	
29-Dec	2.2	2.5	2.2	Z	2.2	2.2	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.1	
30-Dec	2.0	2.0	2.0	2.0	Z	2.0	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
31-Dec	2.0	2.1	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan      C - Calibration																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Anzac - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	561	79.24	79.24
2.1 - 3.0	146	20.62	99.86
3.1 - 10.0	1	0.14	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Anzac - December 2015**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	11	2	2	5	11	53	128	52	12	9	14	15	32	99	69	26	540
2.1 - 3.0	2	0	1	6	5	11	33	20	14	4	6	4	5	11	9	12	143
3.1 - 10.0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	2	3	11	17	64	161	72	26	13	20	19	37	110	78	38	684

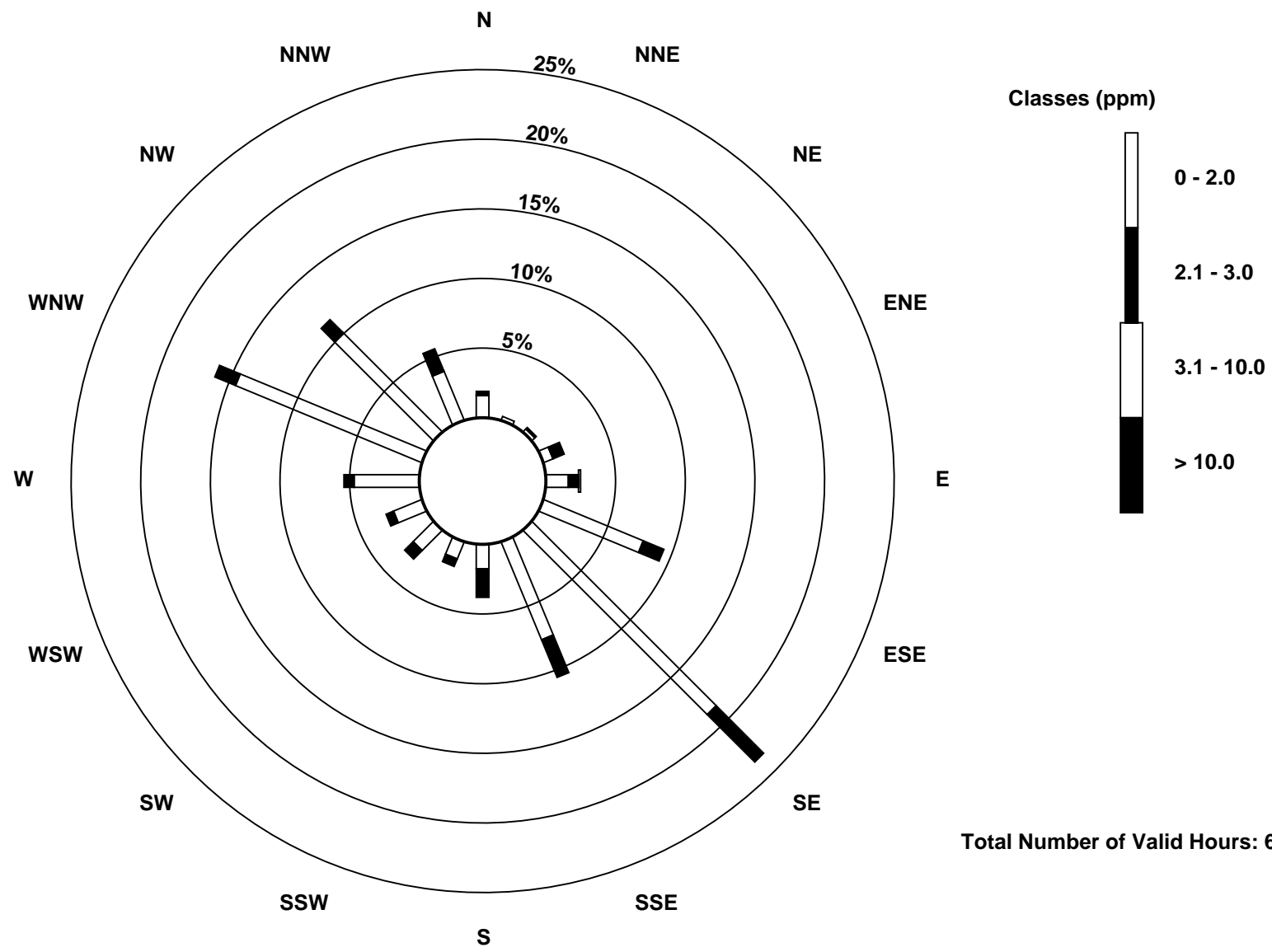
Total Number of Valid Hours: 684

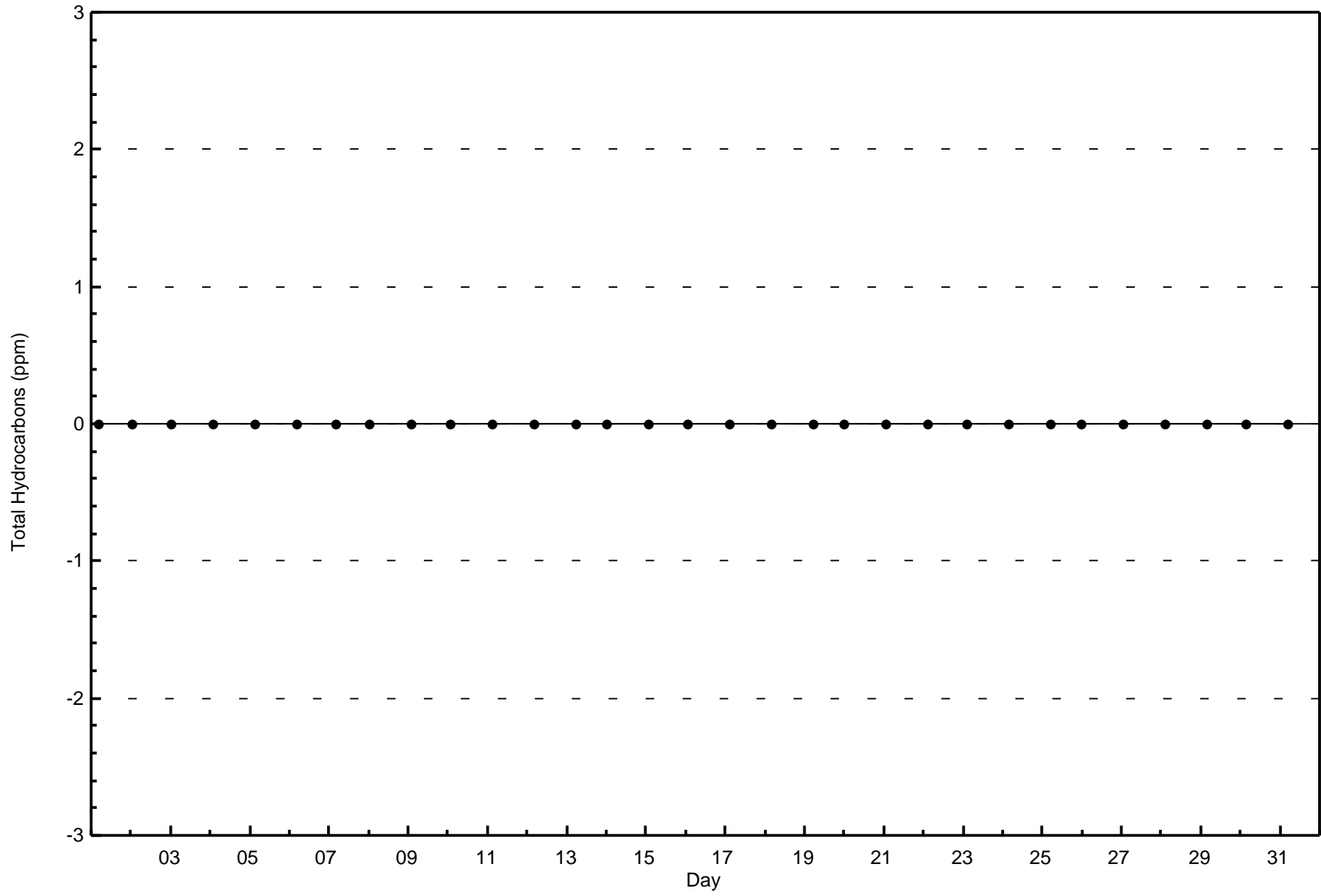
Total Number of Hours: 744

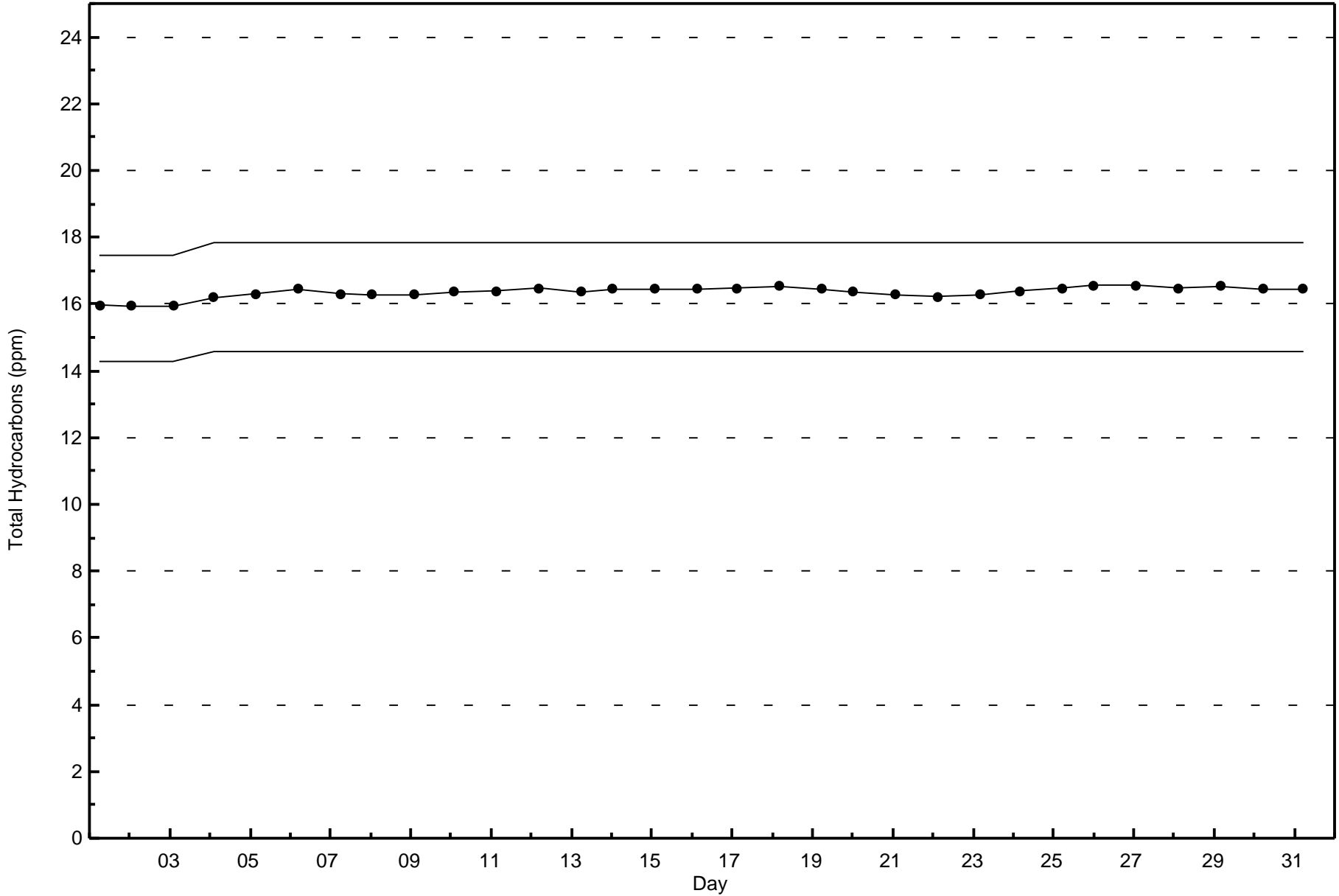


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Total Hydrocarbons (THC) - ppm  
Anzac (AMS 14)







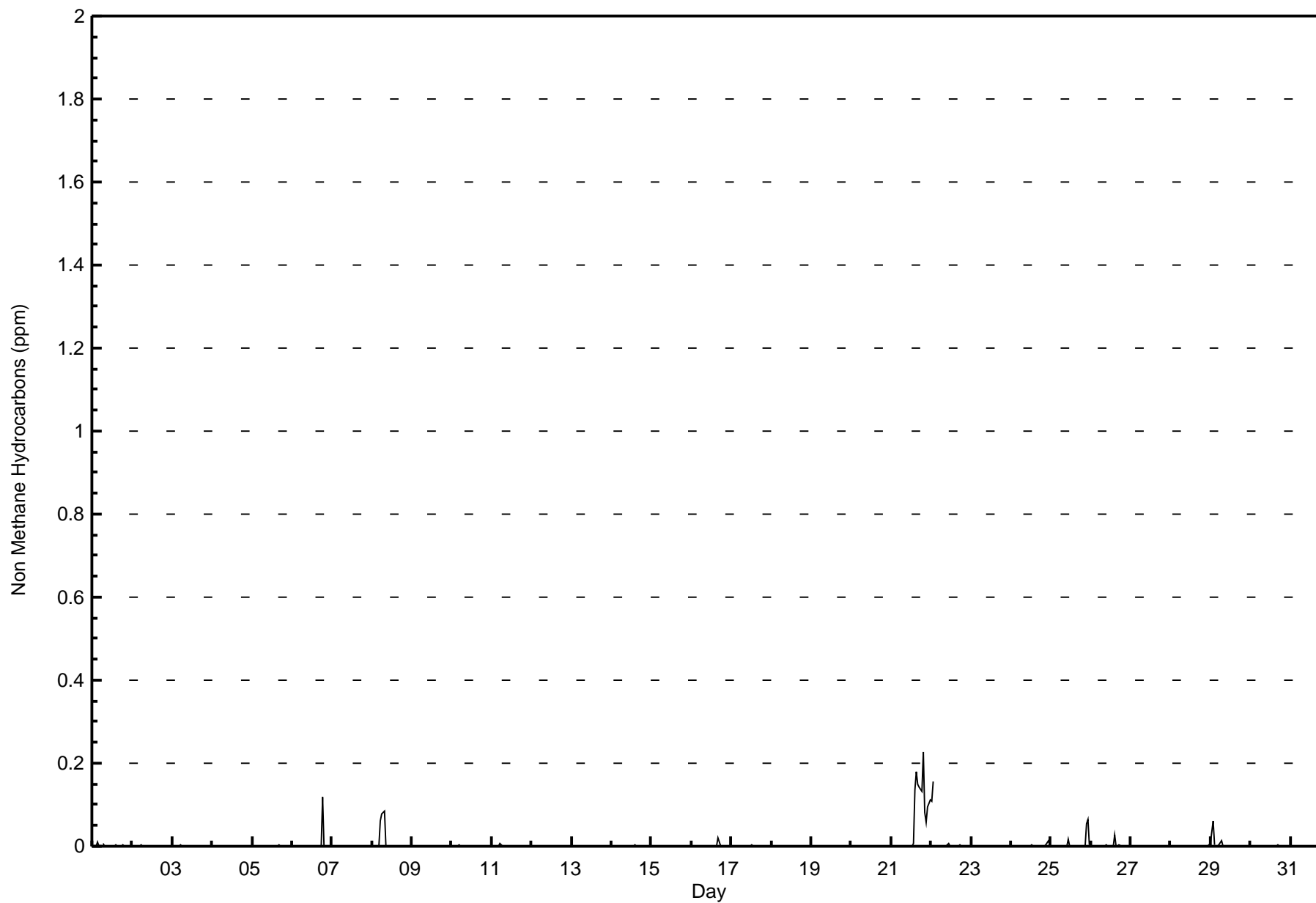




Summary of Hour Averages

Anzac - December 2015

Maximum Value: 0.228 ppm on Dec 21 20:00		Maximum Daily Average: 0.058 ppm on Dec 21		Hours in Service:	744																						
Minimum Value: 0.000 ppm on Dec 1 01:00		Minimum Daily Average: 0.000 ppm on Dec 9		Hours of Data:	708																						
Maximum Diurnal Average: 0.008 ppm at hour 2		Minimum Diurnal Average: 0.000 ppm at hour 12		Hours of Missing Data:	36																						
Monthly Average: 0.003 ppm		Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.1		Hours of Calibration:	36																						
				Percent Operational Time:	100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0.000	0.000	0.000	0.009	0.000	Z	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.001	0.009	
2-Dec	Z	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
3-Dec	0.000	Z	0.000	0.000	0.000	0.003	0.000	C	C	C	C	C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
4-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	
5-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	
6-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.118	0.000	0.000	0.000	0.000	0.000	0.005	0.118	
7-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.001	
8-Dec	Z	0.000	0.000	0.000	0.001	0.062	0.077	0.085	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.085	
9-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
10-Dec	0.000	0.000	Z	0.000	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	
11-Dec	0.000	0.000	0.000	Z	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	
12-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
13-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
14-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	
15-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
16-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.019	
17-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	
18-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
19-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
20-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
21-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.136	0.179	0.150	0.142	0.133	0.228	0.083	0.059	0.095	0.113	0.058	0.228	
22-Dec	0.108	0.155	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.001	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012	0.155	
23-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
24-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.015	0.001	0.015	
25-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.055	0.063	0.003	0.006	0.063	
26-Dec	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.027	0.000	0.000	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.027	
27-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
28-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.002	
29-Dec	0.006	0.062	0.005	Z	0.001	0.002	0.013	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.062	
30-Dec	0.000	0.000	0.000	0.000	Z	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	
31-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan		C - Calibration																									





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm**  
**Anzac - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.005	679	95.90	95.90
0.006 - 0.05	11	1.55	97.46
0.06 - 0.1	15	2.12	99.58
> 0.1	3	0.42	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



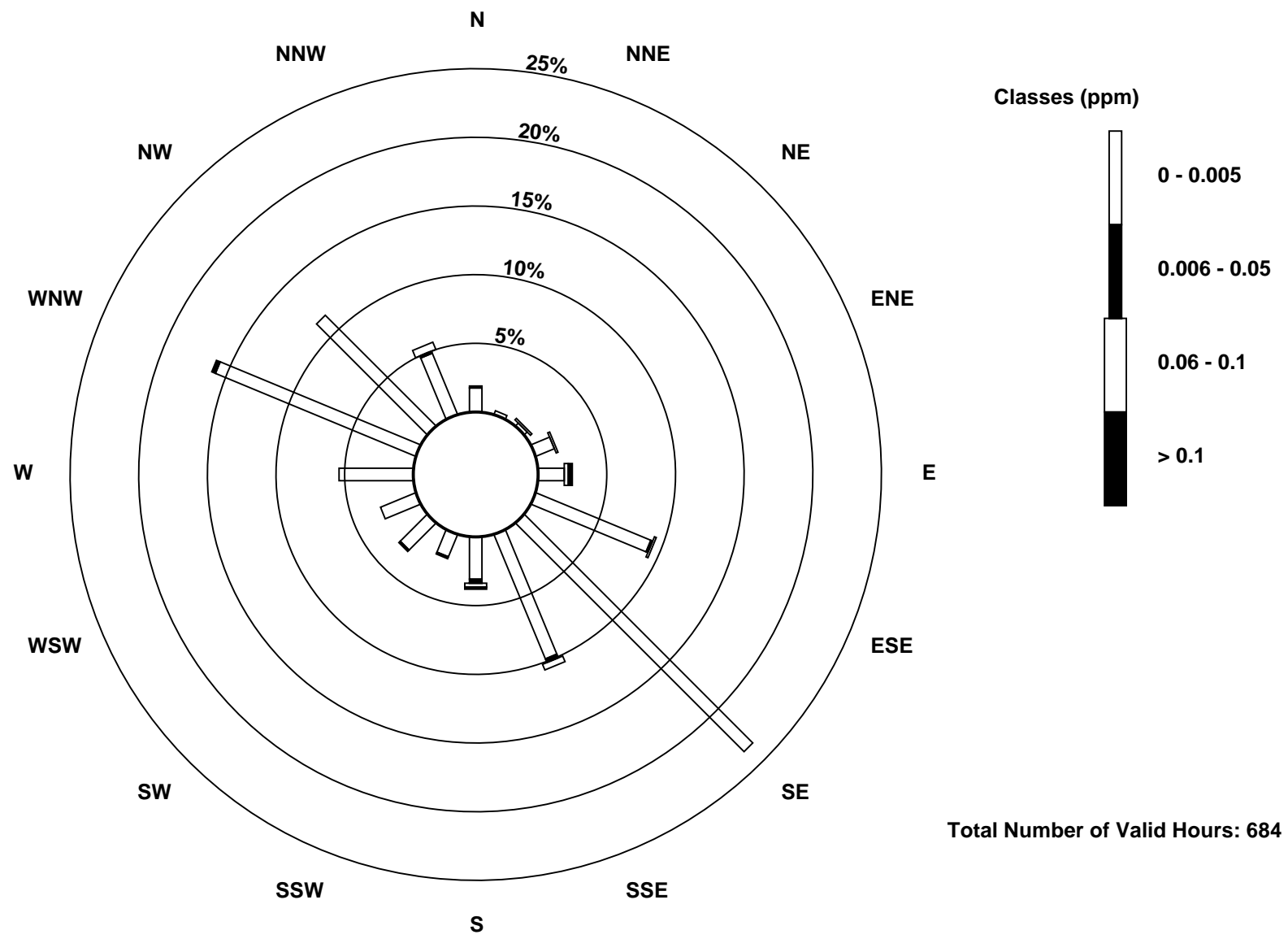
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

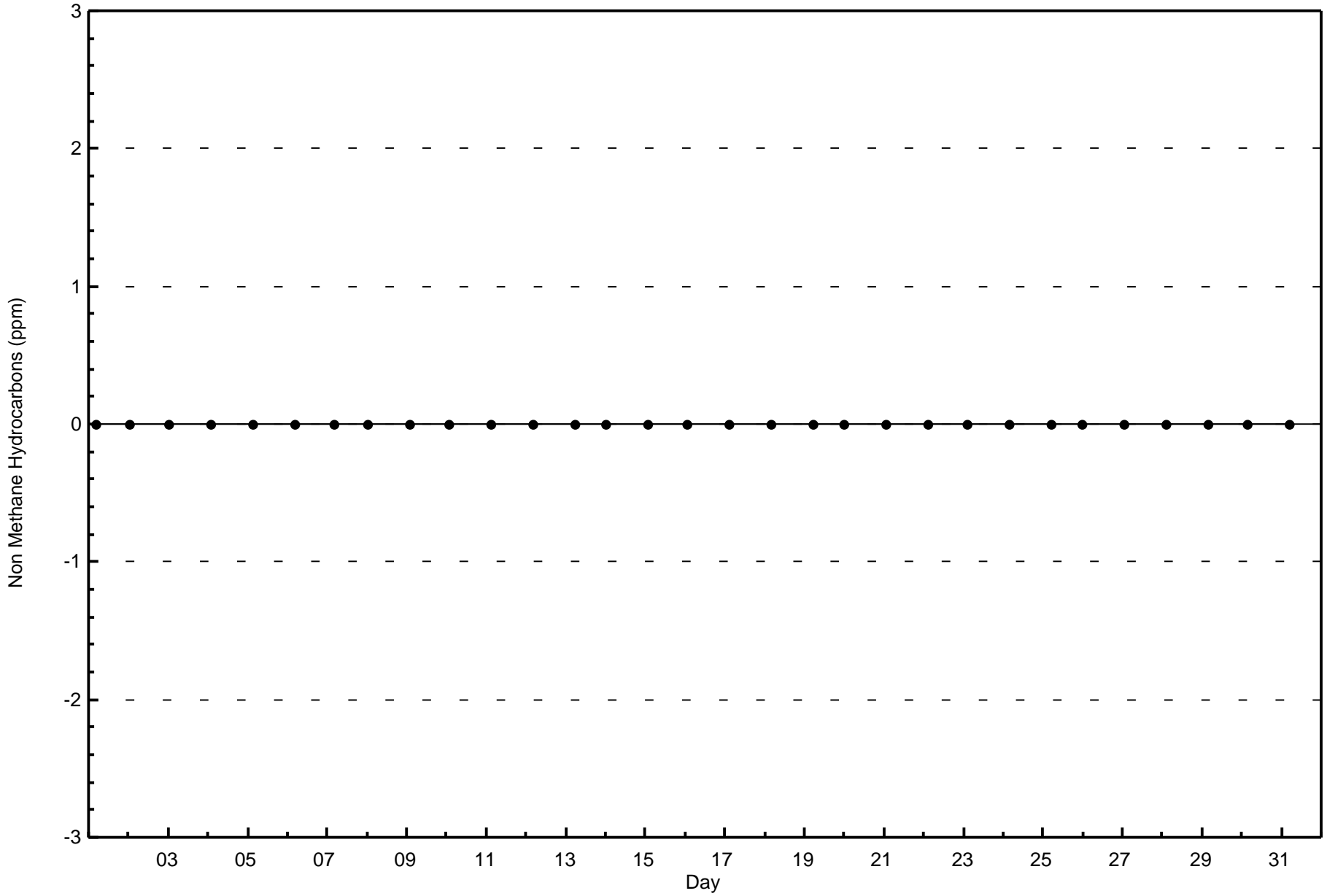
**Non Methane Hydrocarbons (NMHC) - ppm**  
**Anzac - December 2015**

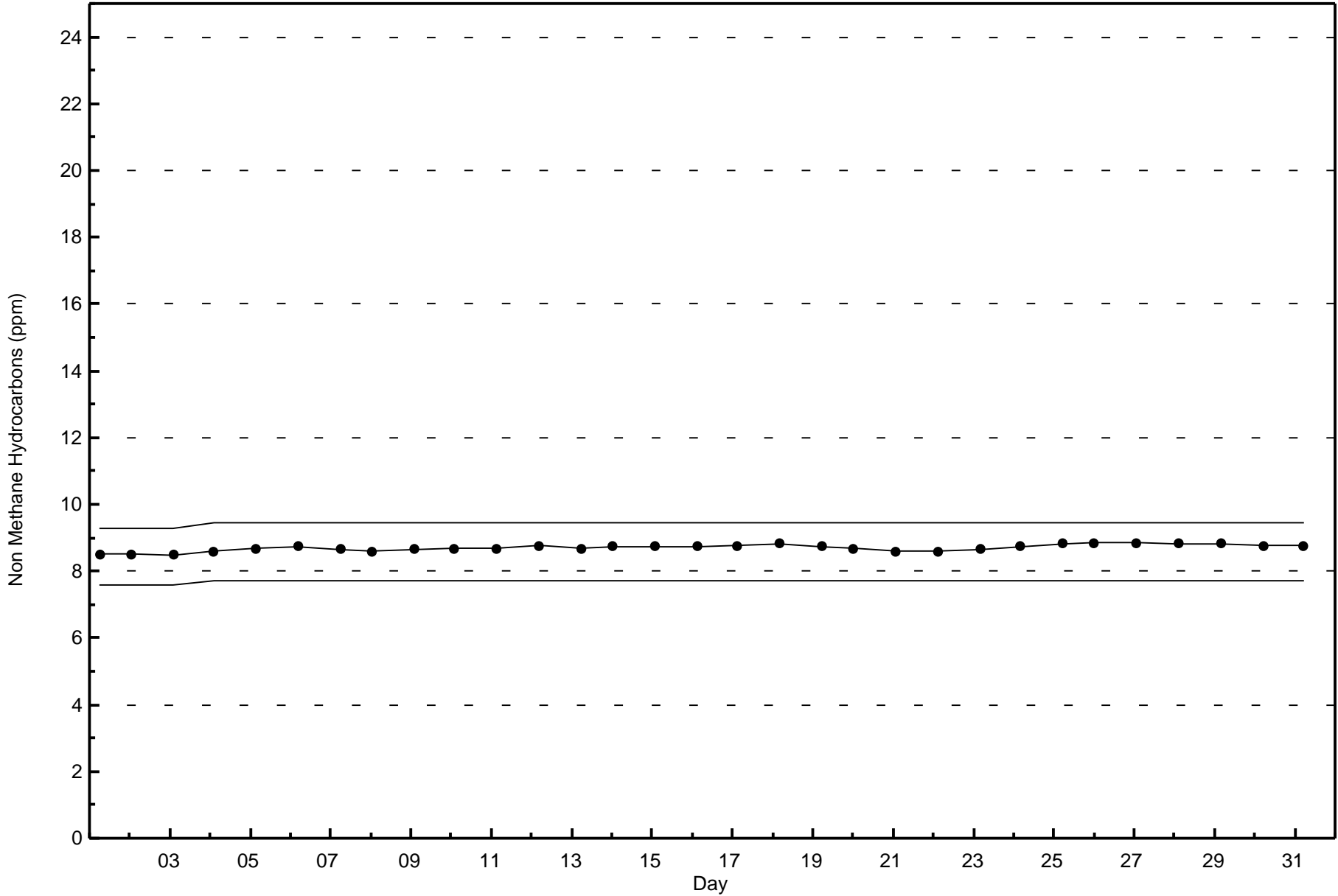
Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	12	2	2	10	13	62	161	67	21	12	19	19	37	108	78	33	656
0.006 - 0.05	1	0	0	0	0	1	0	2	2	1	1	0	0	2	0	1	11
0.06 - 0.1	0	0	1	1	2	1	0	3	2	0	0	0	0	0	0	4	14
> 0.1	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	3
<b>Totals</b>	13	2	3	11	17	64	161	72	26	13	20	19	37	110	78	38	684

Total Number of Valid Hours: 684

Total Number of Hours: 744



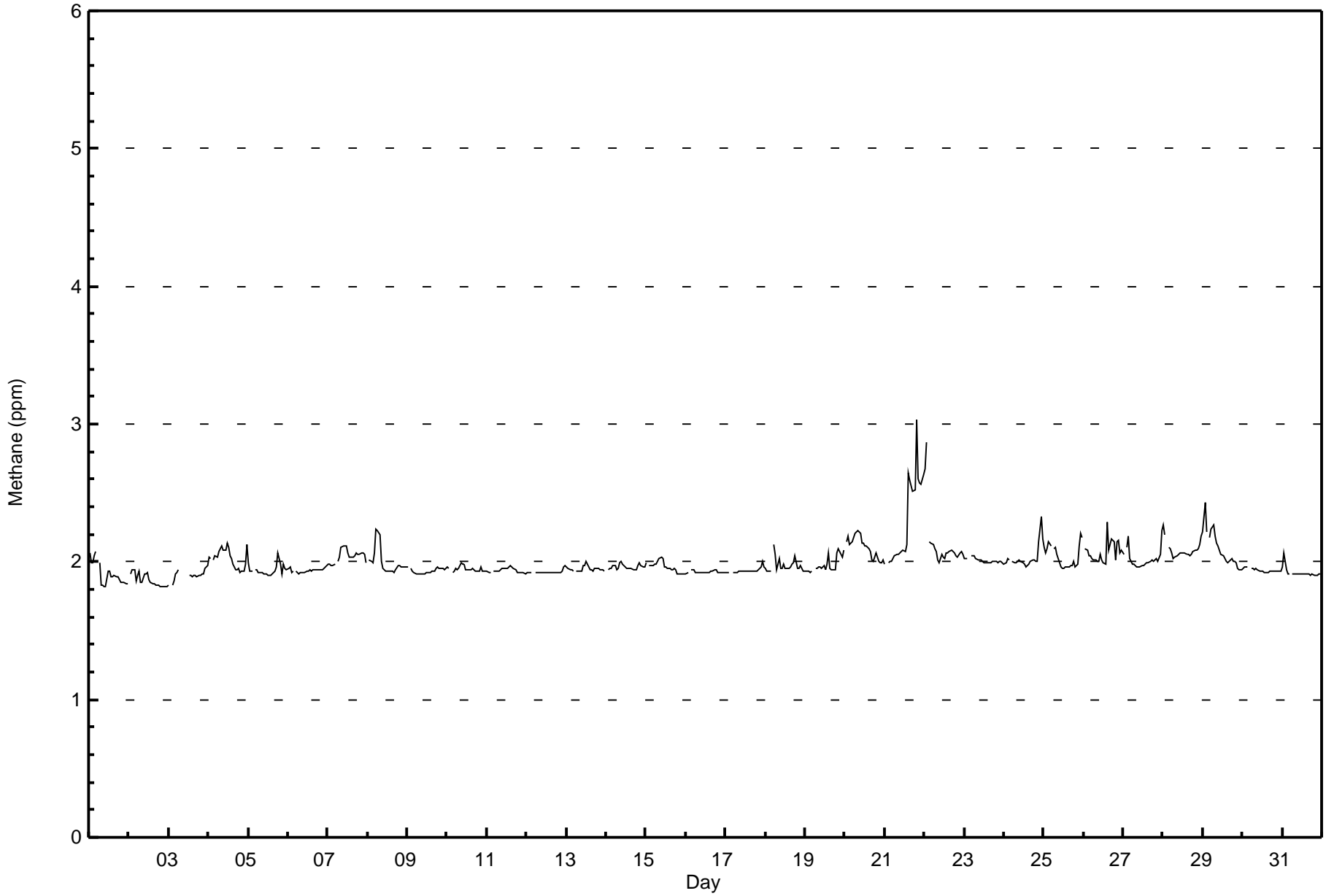






Number of Exceedences (AAAQO):		1-hr: 0	24-hr: 0	Hours in Service: 744																		Daily Average		Daily Maximum																											
Maximum Value: 3.0 ppm on Dec 21 20:00		Maximum Daily Average: 2.3 ppm on Dec 21																		Hours of Data: 708		Hours of Missing Data: 36																													
Minimum Value: 1.8 ppm on Dec 1 11:00		Minimum Daily Average: 1.9 ppm on Dec 2																		Hours of Calibration: 36		Percent Operational Time: 100.0																													
Maximum Diurnal Average: 2.0 ppm at hour 2		Minimum Diurnal Average: 2.0 ppm at hour 14																																																	
Monthly Average: 1.99 ppm		Percentiles: P <sub>1</sub> = 1.8 P <sub>10</sub> = 1.9 Q <sub>1</sub> = 1.9 Median = 2.0 Q <sub>3</sub> = 2.0 P <sub>90</sub> = 2.1 P <sub>99</sub> = 2.6																																																	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																											
1-Dec	2.1	2.0	2.0	2.0	2.1	Z	2.0	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.9	1.8	1.8	1.9	1.9																									
2-Dec	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9																								
3-Dec	1.8	Z	1.8	1.9	1.9	1.9	1.9	C	C	C	C	C	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	2.0	2.0																								
4-Dec	2.0	2.0	Z	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.0	2.1	2.0																								
5-Dec	2.0	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9																								
6-Dec	2.0	2.0	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	2.0	2.0																								
7-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.1																								
8-Dec	Z	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2																								
9-Dec	2.0	Z	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	1.9	2.0	1.9	2.0	2.0																								
10-Dec	2.0	2.0	Z	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	2.0																								
11-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																								
12-Dec	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	2.0	2.0																								
13-Dec	2.0	1.9	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0																								
14-Dec	Z	1.9	1.9	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																								
15-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																								
16-Dec	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9																								
17-Dec	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	1.9	2.0	2.0																								
18-Dec	1.9	1.9	1.9	1.9	Z	2.1	2.1	1.9	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	1.9	2.0	2.1	2.0																								
19-Dec	1.9	1.9	1.9	1.9	1.9	Z	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.1	2.0	1.9	1.9	1.9	2.1	2.1	2.1	2.0	2.1	2.0	2.1	2.0																								
20-Dec	Z	2.1	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.1	2.2	2.1																								
21-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.6	2.6	2.6	2.5	2.5	3.0	2.6	2.6	2.6	2.6	2.3	3.0	2.3																								
22-Dec	2.7	2.9	Z	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.9																								
23-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																								
24-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.3	2.2	2.0	2.3	2.0																								
25-Dec	2.1	2.1	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.2	2.0	2.2	2.0																								
26-Dec	Z	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.3	2.1	2.1	2.2	2.1	2.0	2.1	2.2	2.1	2.1	2.1	2.1	2.3																								
27-Dec	2.1	Z	2.1	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.0	2.2	2.0																								
28-Dec	2.3	2.2	Z	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3																								
29-Dec	2.2	2.4	2.2	Z	2.2	2.2	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.1	2.4	2.1																								
30-Dec	2.0	2.0	2.0	2.0	Z	2.0	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0																								
31-Dec	2.0	2.1	1.9	1.9	1.9	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.1																								
																								2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	Diurnal Average	
																								2.7	2.9	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.6	2.6	2.6	2.5	2.5	3.0	2.6	2.6	2.6	2.6	2.6	2.6	2.6	Diurnal Maximum
Z - zerospan																								C - Calibration																											







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm**  
**Anzac - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	563	79.52	79.52
2.1 - 3.0	145	20.48	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm  
Anzac - December 2015**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	11	2	2	5	11	53	128	53	12	9	14	15	32	100	69	26	542
2.1 - 3.0	2	0	1	6	6	11	33	19	14	4	6	4	5	10	9	12	142
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	2	3	11	17	64	161	72	26	13	20	19	37	110	78	38	684

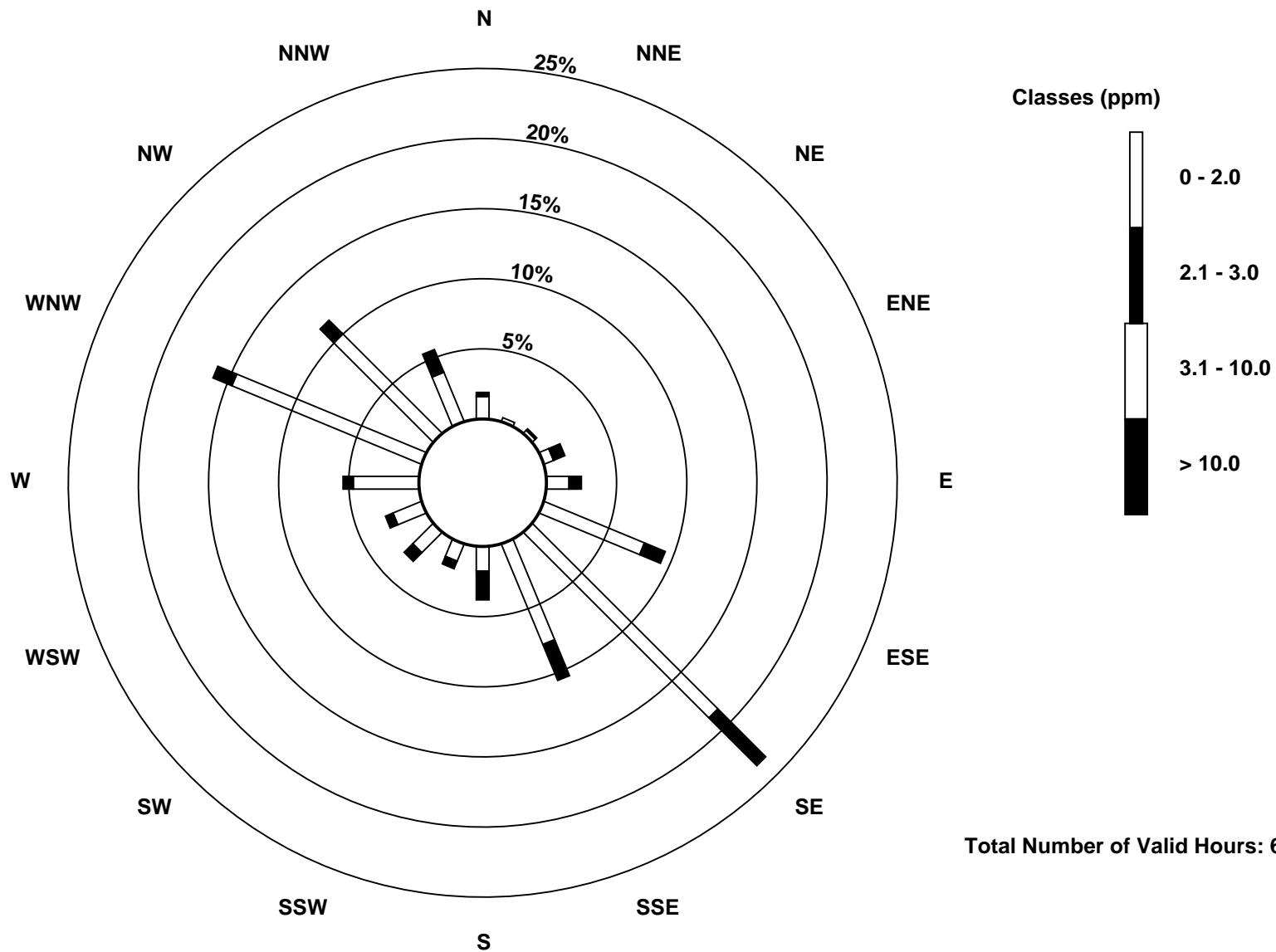
Total Number of Valid Hours: 684

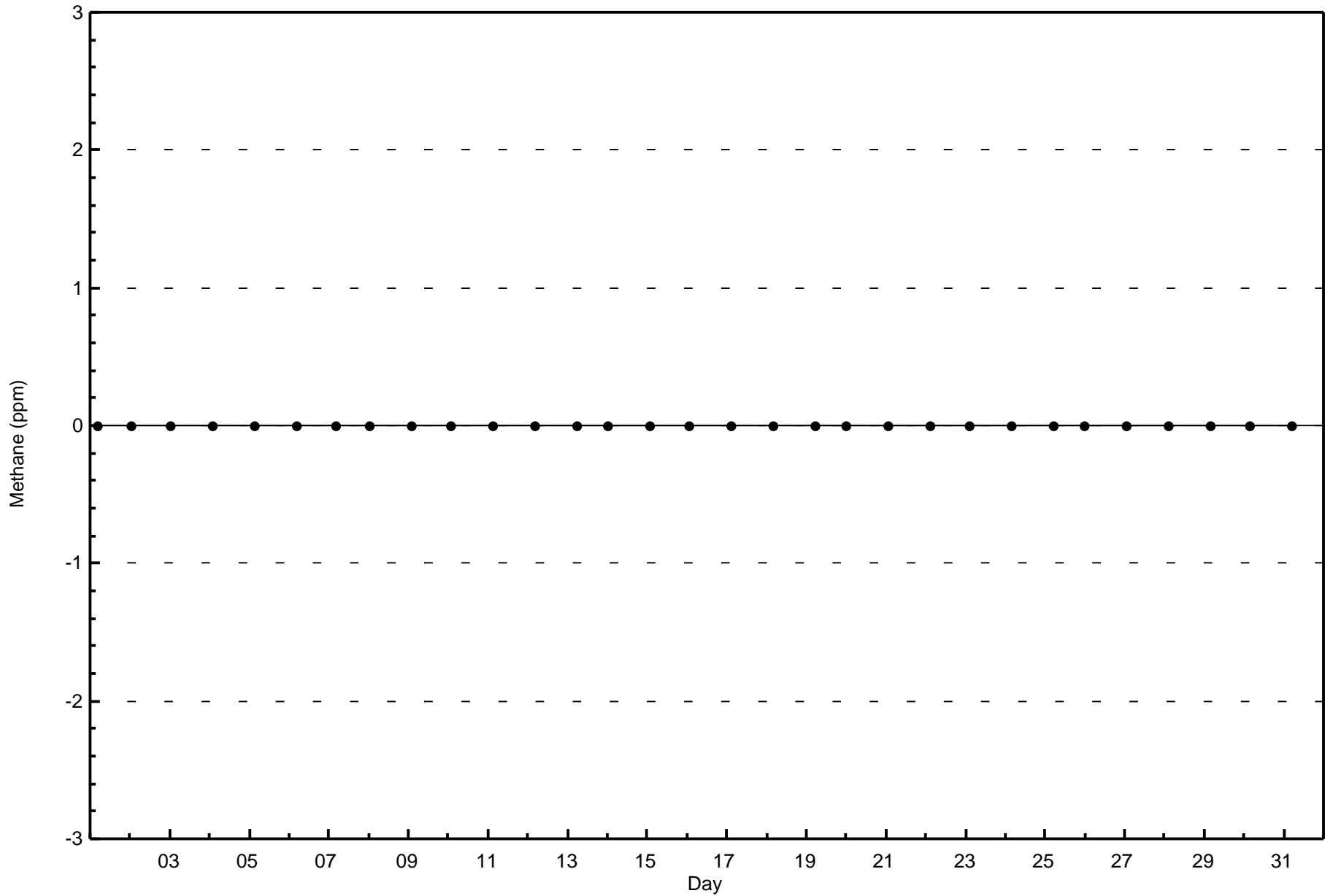
Total Number of Hours: 744

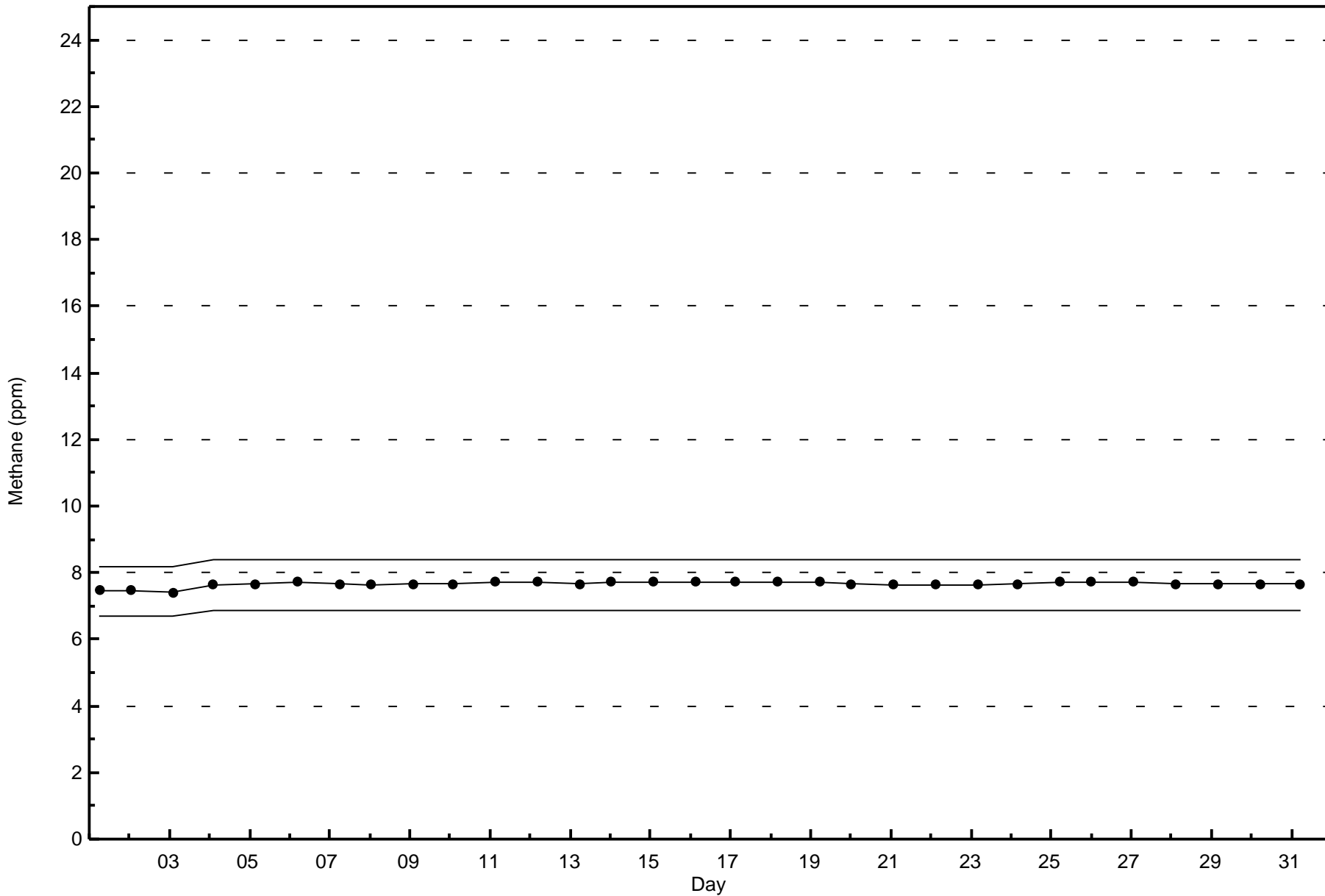


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Methane (CH<sub>4</sub>) - ppm  
Anzac (AMS 14)

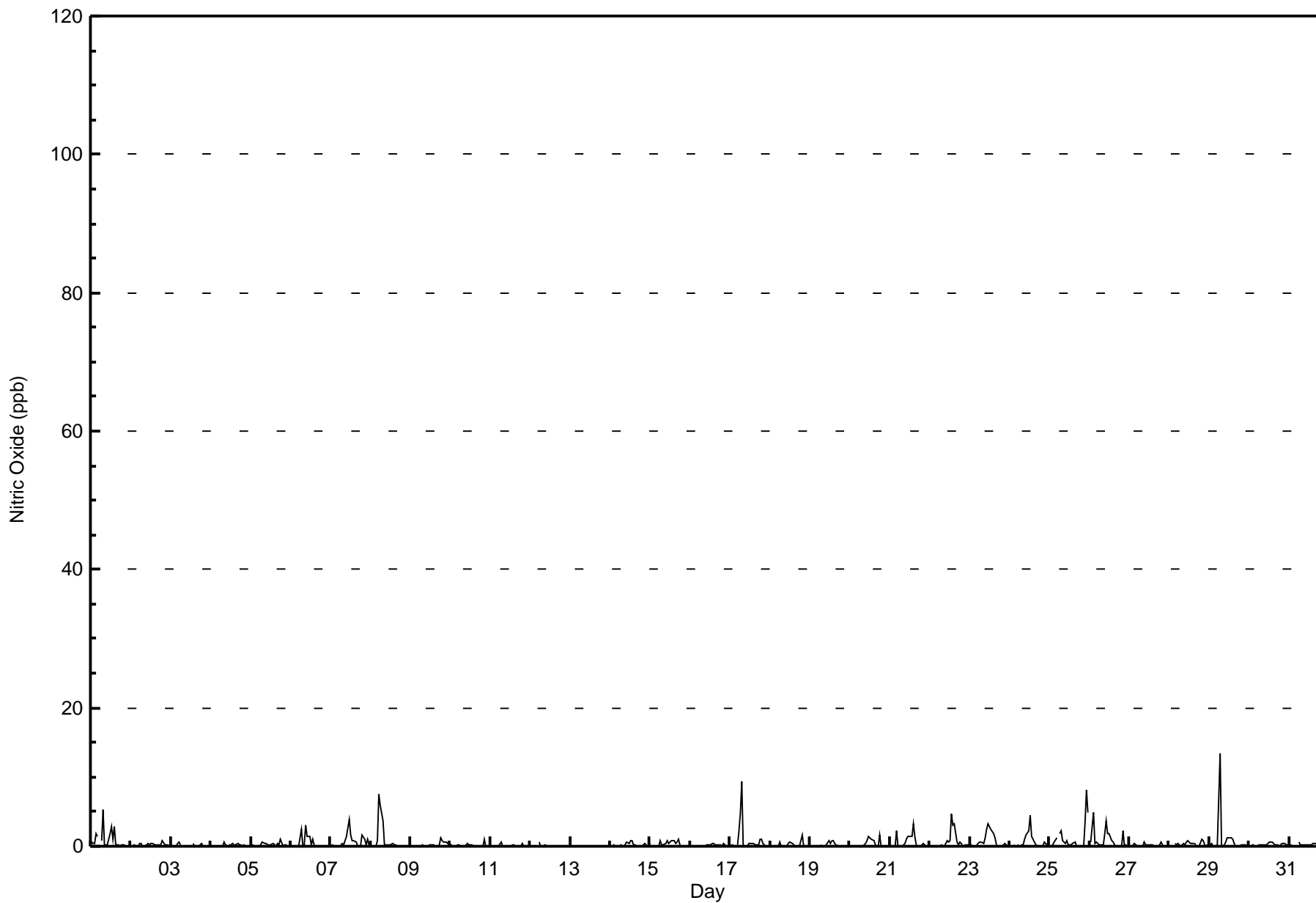








Maximum Value: 13 ppb on Dec 29 07:00      Maximum Daily Average: 1.1 ppb on Dec 25																	Hours in Service: 744 Hours of Data: 707 Hours of Missing Data: 37 Hours of Calibration: 37 Percent Operational Time: 100.0										
Minimum Value: 0 ppb on Dec 3 15:00      Minimum Daily Average: 0.0 ppb on Dec 13 Maximum Diurnal Average: 1.1 ppb at hour 7      Minimum Diurnal Average: 0.1 ppb at hour 1 Monthly Average: 0.4 ppb      Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 5																											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	1	0	0	2	2	Z	1	5	0	0	0	2	3	1	3	0	0	0	0	0	0	0	0	0	0	0.9	5
2-Dec	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.2	1
3-Dec	0	Z	0	0	0	1	0	C	C	C	C	C	C	1	0	0	0	0	0	0	0	0	0	0	--	1	
4-Dec	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	
5-Dec	0	0	0	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.2	1	
6-Dec	0	0	0	0	Z	0	2	0	0	3	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0.5	3	
7-Dec	0	0	0	0	0	Z	0	0	0	1	3	4	2	1	1	1	0	0	0	2	1	0	1	0	0.7	4	
8-Dec	Z	0	0	0	1	7	6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	7	
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0.2	1	
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.1	1	
11-Dec	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.1	1	
12-Dec	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
14-Dec	Z	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1	
15-Dec	0	Z	0	0	0	0	1	0	0	0	1	0	1	1	1	0	1	1	0	0	0	0	0	0	0.4	1	
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
17-Dec	0	0	0	Z	0	2	5	9	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1.0	9	
18-Dec	0	0	0	0	Z	0	1	0	0	0	0	0	1	1	0	0	0	0	0	2	0	0	0	0	0.2	2	
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0.2	1	
20-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	2	0	0	0	0	0	0.4	2	
21-Dec	0	Z	0	0	2	0	0	0	0	0	1	1	1	1	3	1	0	0	0	0	0	0	0	0	0.6	3	
22-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	1	5	3	3	1	0	1	0	0	0	0	0	0.7	5	
23-Dec	0	0	0	Z	0	0	1	1	0	1	3	3	3	2	2	1	0	0	0	0	0	0	0	0	0.8	3	
24-Dec	0	0	0	0	Z	0	0	0	0	1	2	2	4	2	1	1	0	0	0	0	0	1	0	0	0.6	4	
25-Dec	0	0	0	1	1	Z	2	2	1	0	1	0	0	0	1	0	0	0	0	0	0	3	8	5	1.1	8	
26-Dec	Z	1	5	0	1	0	0	0	0	2	4	2	2	1	1	0	0	0	0	0	2	0	0	0	0.9	5	
27-Dec	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.2	1	
28-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0.3	1	
29-Dec	0	0	0	Z	0	0	13	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.9	13	
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0.2	1	
31-Dec	0	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
																								Diurnal Average			
																								Diurnal Maximum			
0.1 0.1 0.3 0.2 0.3 0.6 1.1 0.8 0.2 0.5 0.7 0.8 0.8 0.8 0.7 0.4 0.2 0.1 0.3 0.3 0.3 0.2 0.4 0.2 1 1 5 2 2 7 13 9 1 3 4 4 4 5 3 3 1 1 2 2 2 3 8 5																											
Z - zerospan      C - Calibration																											







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Anzac - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	707	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Anzac - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	13	2	3	11	17	64	160	72	26	13	20	19	37	110	78	38	683
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	2	3	11	17	64	160	72	26	13	20	19	37	110	78	38	683

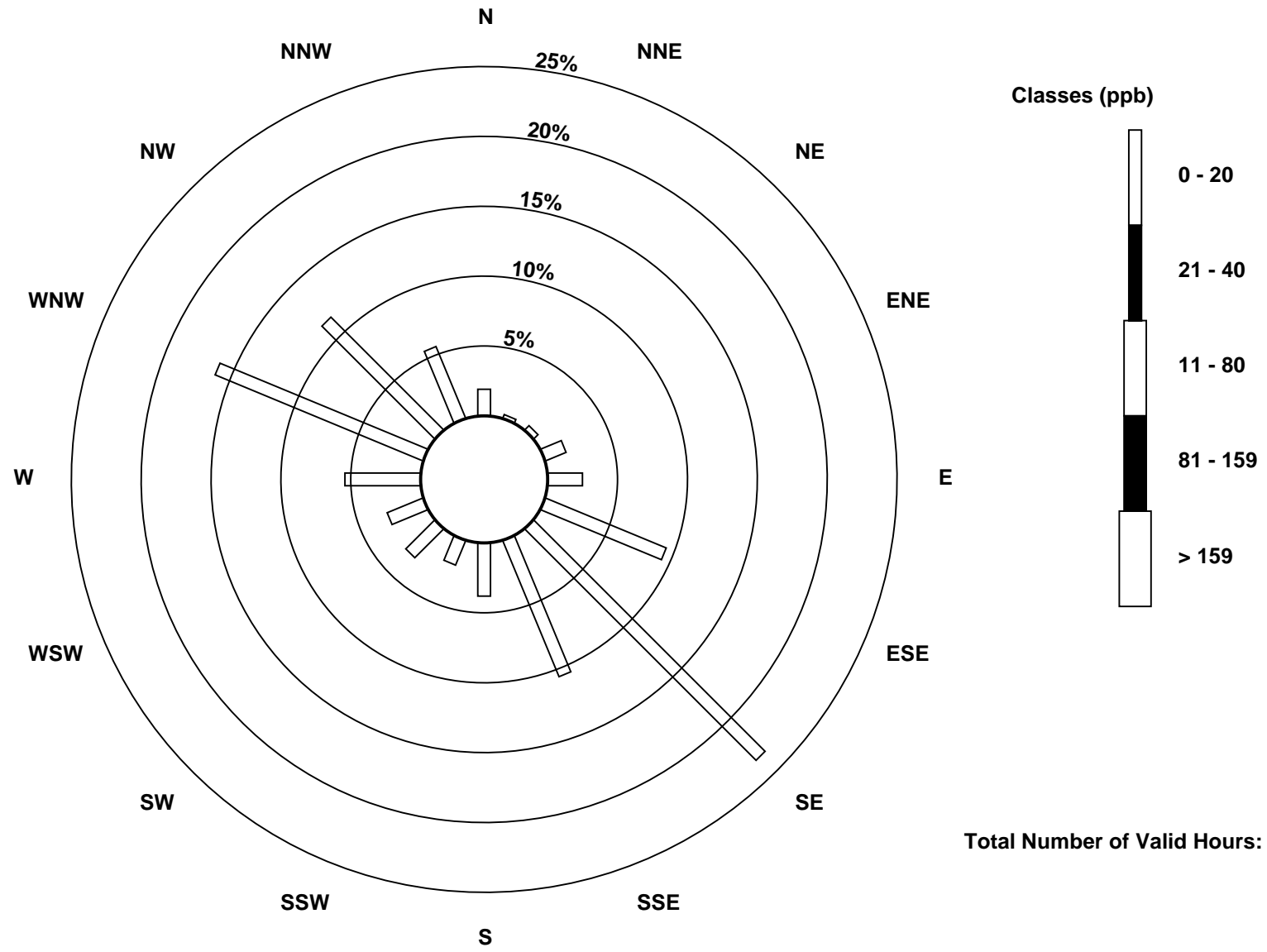
Total Number of Valid Hours: 683

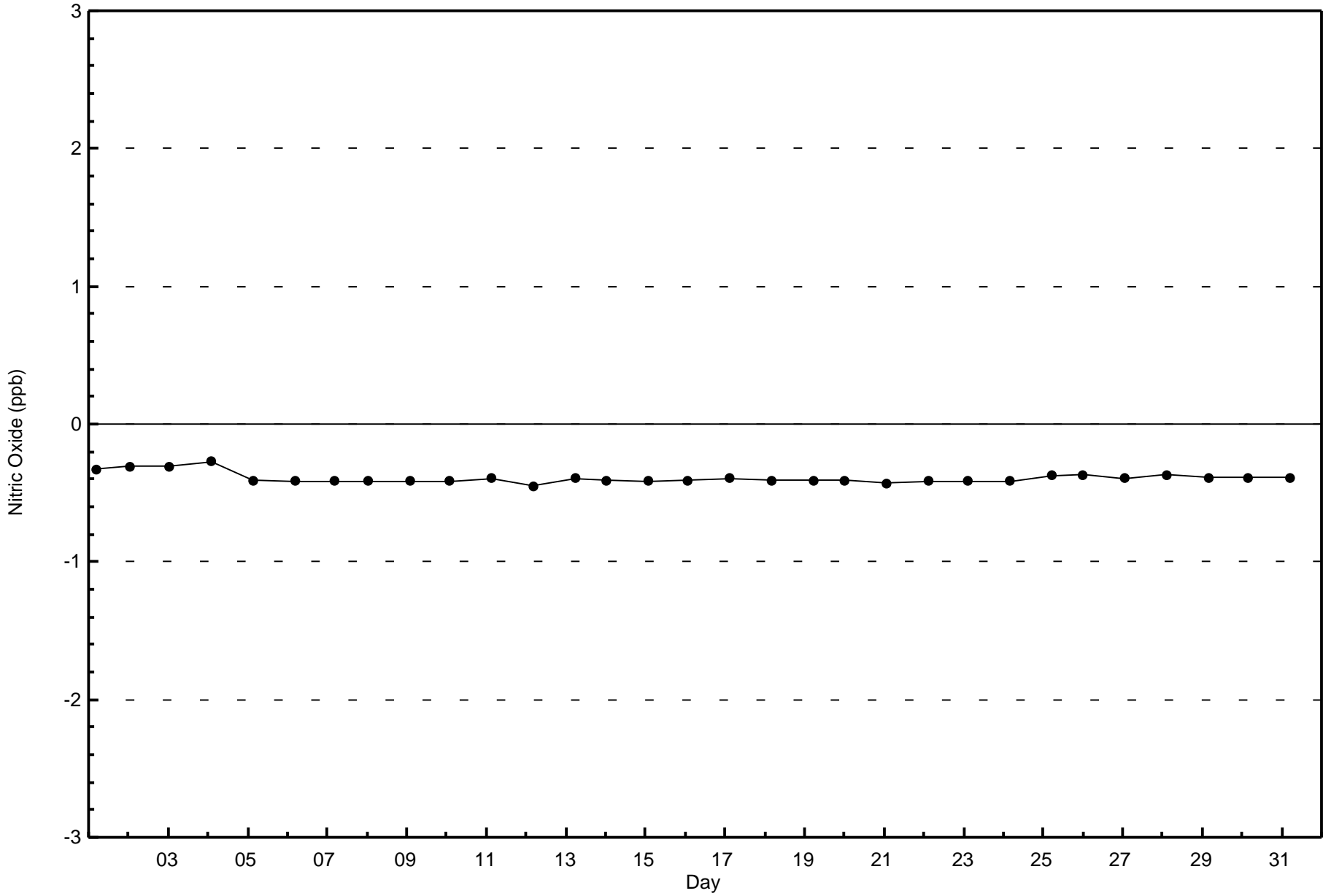
Total Number of Hours: 744

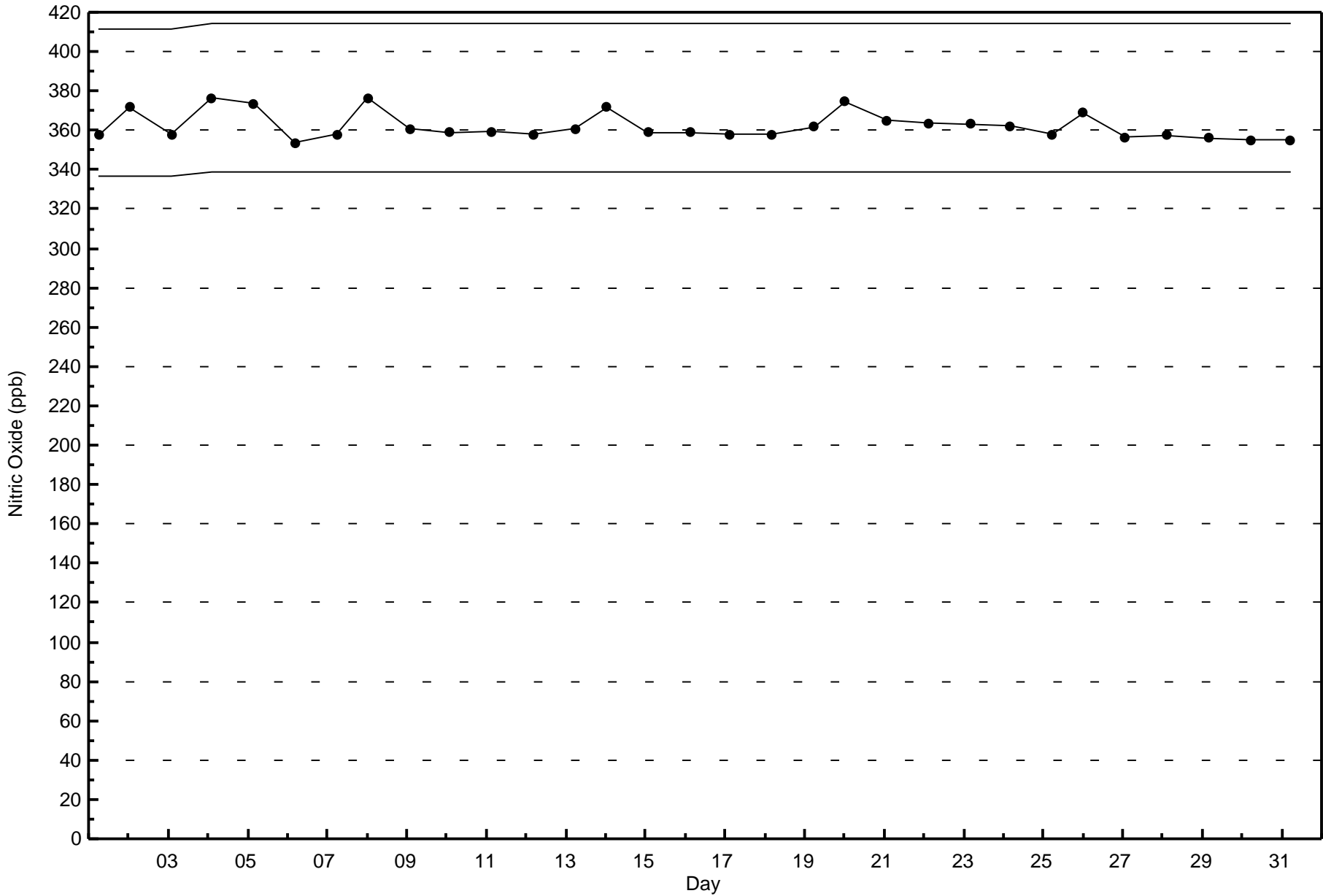


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitric Oxide (NO) - ppb  
Anzac (AMS 14)









Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 19 ppb on Dec 25 23:00	Maximum Daily Average: 9.4 ppb on Dec 24		Hours of Data:	707
Minimum Value: 0 ppb on Dec 13 21:00	Minimum Daily Average: 0.6 ppb on Dec 13		Hours of Missing Data:	37
Maximum Diurnal Average: 3.9 ppb at hour 23	Minimum Diurnal Average: 2.4 ppb at hour 13		Hours of Calibration:	37
Monthly Average: 3.2 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 4 P <sub>90</sub> = 7 P <sub>99</sub> = 14		Percent Operational Time:	100.0

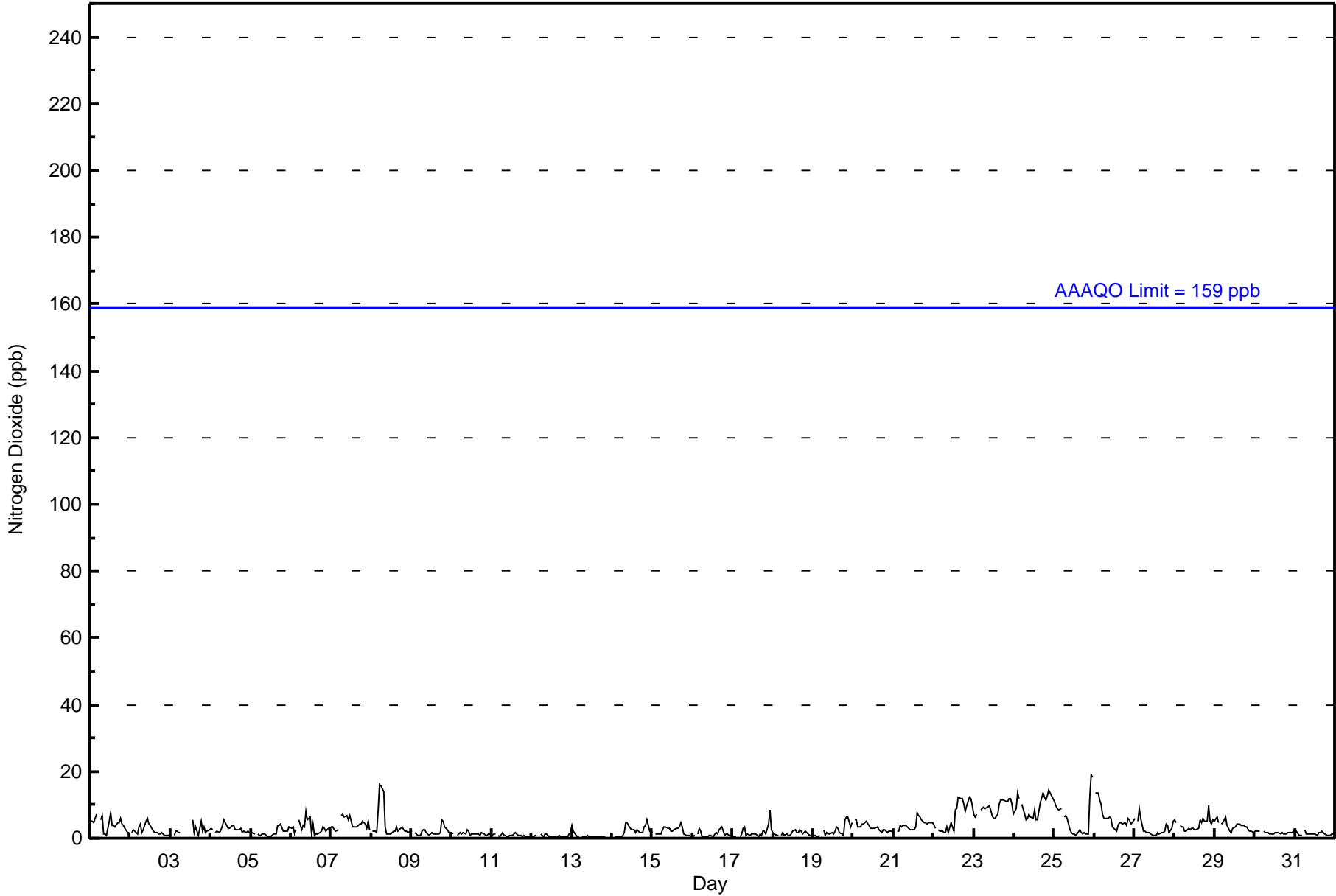
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	5	5	5	6	7	Z	6	7	1	1	1	5	8	4	4	3	5	5	6	4	4	3	2	2	4.2	8																						
2-Dec	Z	2	2	2	1	3	4	2	3	5	6	4	4	3	2	2	2	1	1	2	1	1	1	1	2.3	6																						
3-Dec	1	Z	1	2	2	2	2	C	C	C	C	C	C	5	2	3	2	1	5	2	3	2	2	2	--	5																						
4-Dec	3	3	Z	2	2	2	3	4	6	5	3	3	4	4	4	3	3	3	3	2	2	2	2	2	2.8	6																						
5-Dec	2	2	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	2	2	2	2	3	1.7	4																						
6-Dec	3	3	1	2	Z	6	2	4	4	8	6	6	1	4	1	1	1	2	2	3	3	2	3	3	3.1	8																						
7-Dec	3	3	3	2	3	Z	7	7	7	7	6	7	5	3	4	3	4	4	4	5	4	3	5	3	4.4	7																						
8-Dec	Z	2	2	2	8	16	16	14	3	1	1	1	1	2	2	3	2	3	3	2	2	2	2	2	4.1	16																						
9-Dec	2	Z	2	1	1	1	2	2	3	2	1	1	2	1	1	1	1	2	5	5	4	3	2	2	2.0	5																						
10-Dec	2	1	Z	1	1	2	1	2	1	2	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1.3	2																						
11-Dec	1	1	1	Z	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	0	0.9	2																						
12-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	2	0.8	2																						
13-Dec	4	2	1	0	0	Z	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.6	4																						
14-Dec	Z	0	1	0	0	1	1	2	5	5	4	3	3	2	2	3	2	2	2	3	4	5	2	2	2.2	5																						
15-Dec	2	Z	1	1	1	1	2	3	3	3	3	2	2	2	3	3	4	5	4	1	1	1	1	1	2.2	5																						
16-Dec	0	1	Z	1	3	2	1	1	0	1	1	1	1	1	2	1	3	3	2	1	1	1	1	1	1.3	3																						
17-Dec	1	1	1	Z	1	1	3	4	1	1	1	1	1	1	1	1	1	1	2	2	1	4	9	3	1.8	9																						
18-Dec	2	1	1	1	Z	1	2	1	1	1	1	1	2	3	2	2	2	2	1	2	2	1	1	1	1.4	3																						
19-Dec	1	1	1	1	1	Z	3	1	2	1	1	2	1	2	3	3	2	1	1	5	6	7	3	5	2.2	7																						
20-Dec	Z	6	5	4	4	4	4	5	5	4	3	3	3	3	3	3	2	2	3	3	2	2	2	2	3.2	6																						
21-Dec	2	Z	2	2	4	4	4	4	4	3	3	3	3	4	8	7	6	6	5	5	4	5	5	5	4.0	8																						
22-Dec	4	3	Z	3	2	2	2	2	3	2	5	3	2	9	9	12	12	12	10	8	10	12	12	10	6.4	12																						
23-Dec	7	7	7	Z	8	9	9	9	9	10	8	7	6	6	7	10	11	12	12	11	11	12	12	10	9.1	12																						
24-Dec	7	9	14	12	Z	10	7	6	6	7	6	6	8	5	6	8	11	13	12	11	13	14	13	12	9.4	14																						
25-Dec	11	10	9	8	9	Z	6	7	6	3	2	1	1	1	2	2	1	2	1	1	12	19	18	18	5.8	19																						
26-Dec	Z	14	14	12	10	7	6	6	6	6	6	3	3	2	4	5	5	4	5	4	6	6	4	5	6.1	14																						
27-Dec	6	Z	5	9	6	2	2	2	2	2	1	1	1	1	2	1	2	2	2	4	4	2	3	5	2.8	9																						
28-Dec	5	5	Z	4	4	3	2	2	3	3	3	3	3	3	6	5	6	5	5	10	5	4	6	6	4.2	10																						
29-Dec	5	6	5	Z	4	5	6	4	3	2	2	3	3	4	4	4	4	4	4	4	3	2	2	2	3.7	6																						
30-Dec	2	2	2	2	Z	2	2	2	2	1	1	1	2	2	2	1	2	1	1	1	2	2	2	2	1.7	2																						
31-Dec	1	2	1	1	1	Z	3	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1.3	3																						
																								3.1	3.5	3.3	3.1	3.3	3.5	3.6	3.5	3.0	3.0	2.6	2.5	2.4	2.7	2.8	3.2	3.3	3.4	3.5	3.3	3.5	3.7	3.9	3.6	Diurnal Average
																								11	14	14	12	10	16	16	14	9	10	8	7	8	9	9	12	12	13	12	11	13	14	19	18	Diurnal Maximum

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association  
Hourly Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Anzac - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Anzac - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	707	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744





**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Anzac - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	13	2	3	11	17	64	160	72	26	13	20	19	37	110	78	38	683
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	2	3	11	17	64	160	72	26	13	20	19	37	110	78	38	683

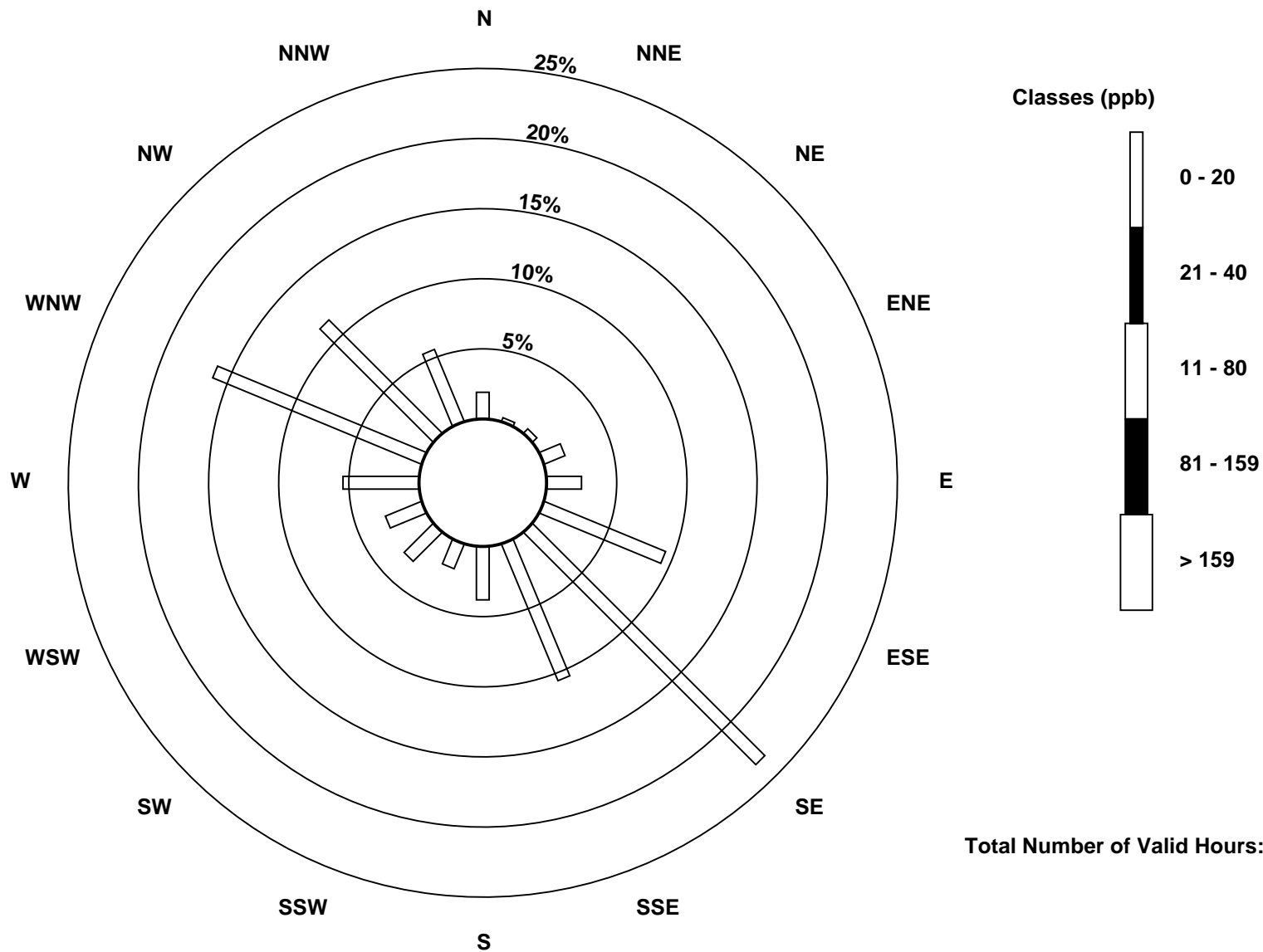
Total Number of Valid Hours: 683

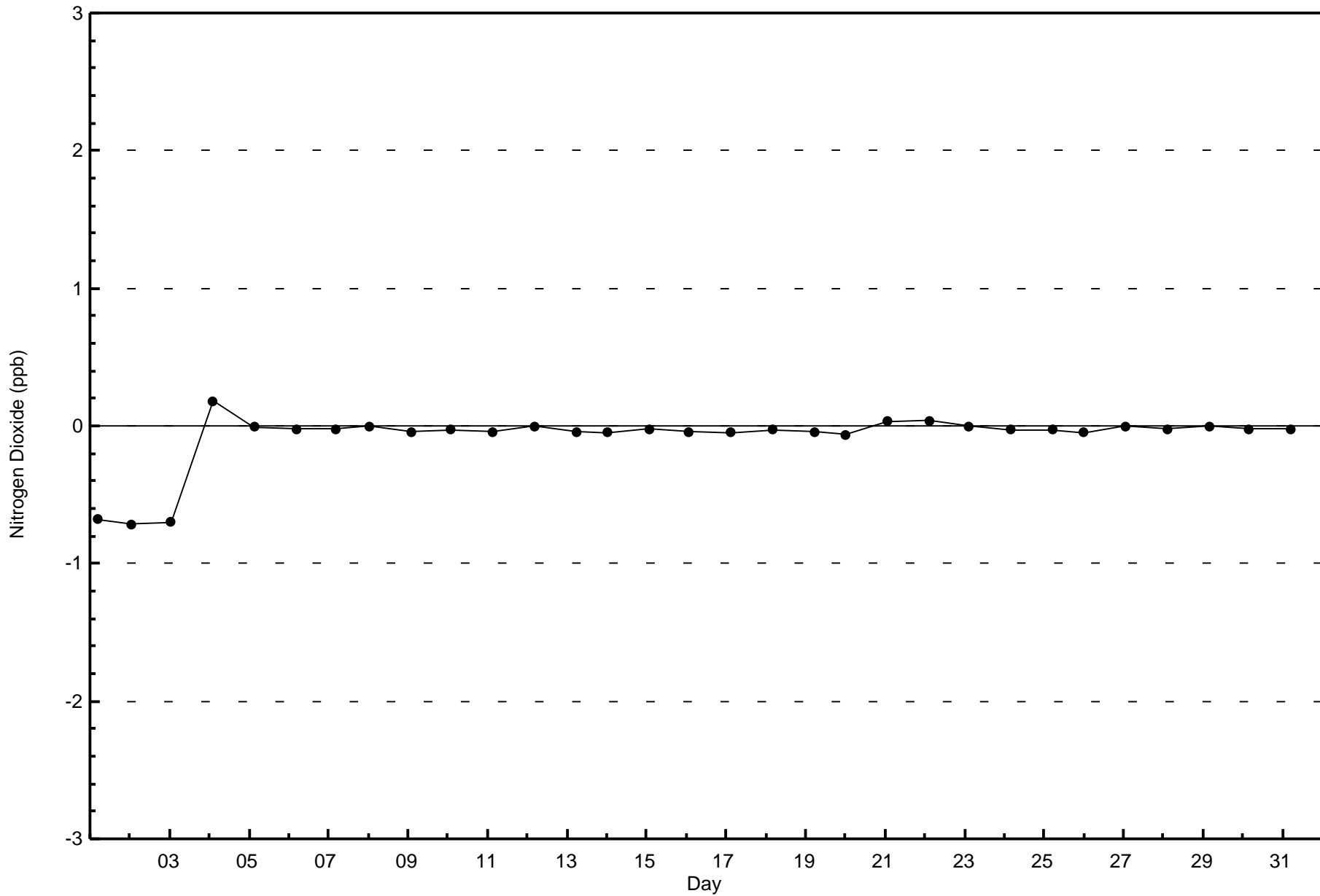
Total Number of Hours: 744

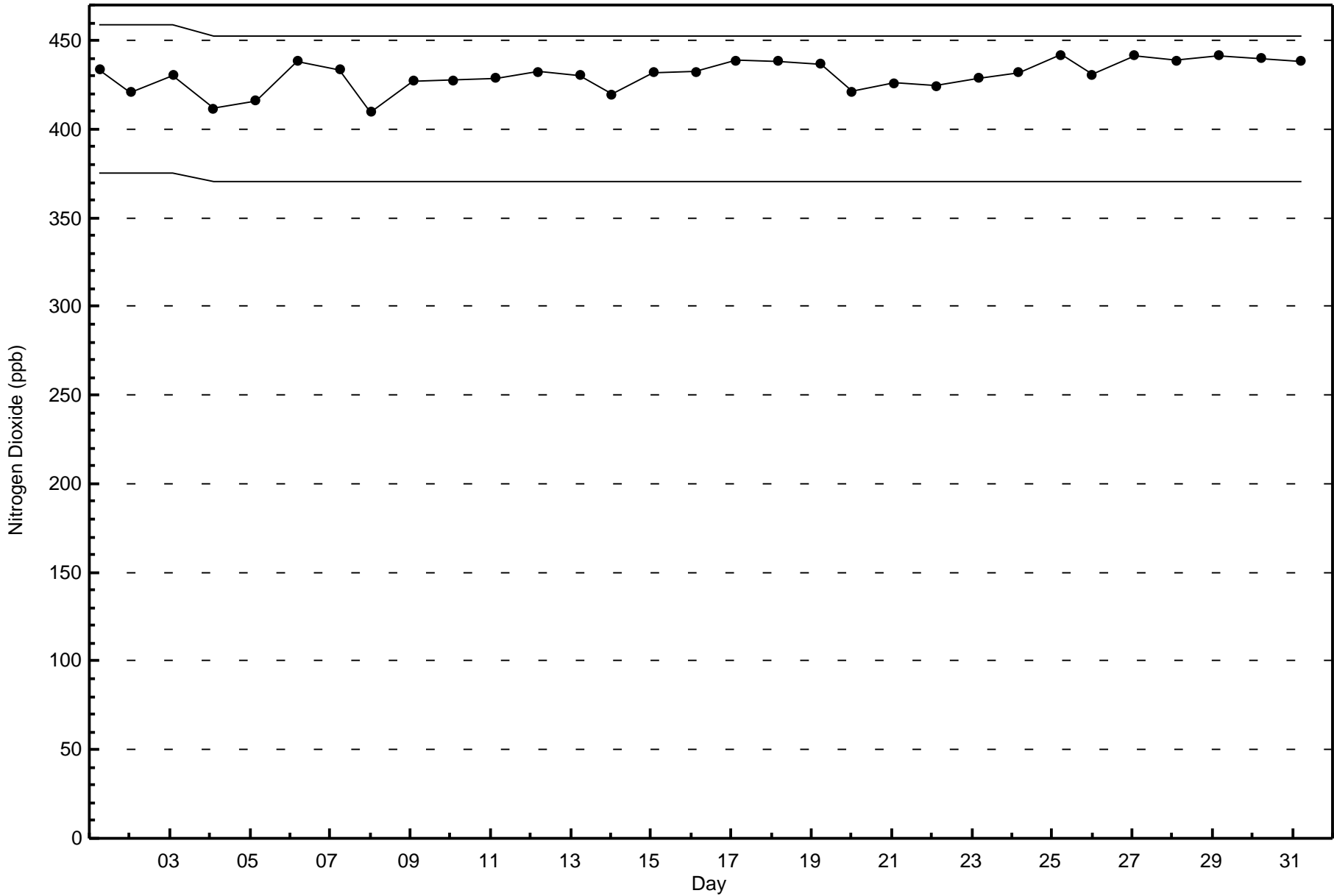


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Anzac (AMS 14)









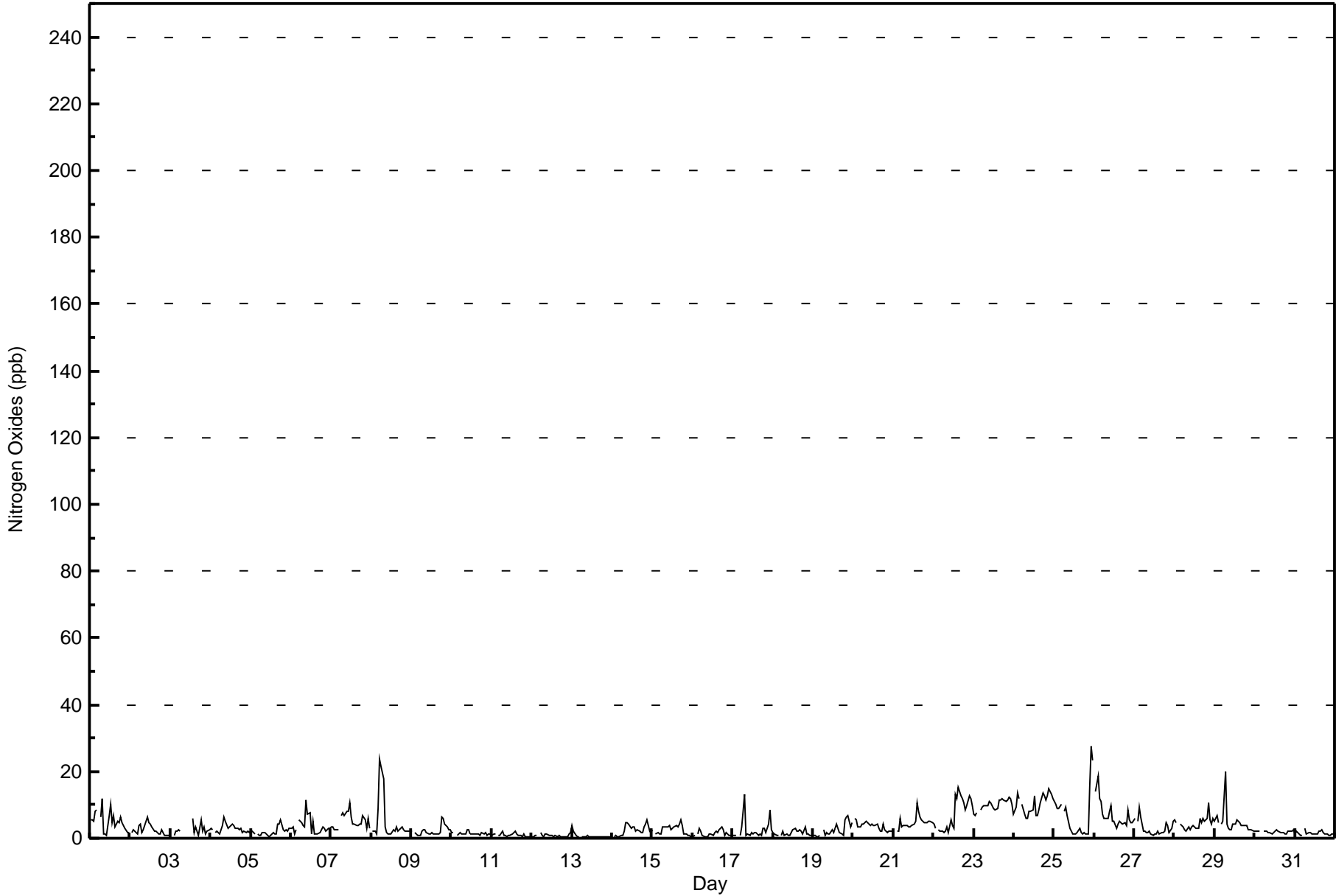
Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO<sub>x</sub>) - ppb

Anzac - December 2015

Maximum Value: 27 ppb on Dec 25 23:00																Maximum Daily Average: 10.0 ppb on Dec 24																Hours in Service: 744			
Minimum Value: 0 ppb on Dec 14 00:00																Minimum Daily Average: 0.6 ppb on Dec 13																Hours of Data: 707			
Maximum Diurnal Average: 4.7 ppb at hour 7																Minimum Diurnal Average: 3.2 ppb at hour 9																Hours of Missing Data: 37			
Monthly Average: 3.7 ppb																Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 5 P <sub>90</sub> = 9 P <sub>99</sub> = 17																Hours of Calibration: 37			
																																Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	6	6	5	8	9	Z	6	12	1	1	1	7	10	5	7	3	5	4	6	5	4	3	2	2	5.1	12									
2-Dec	Z	2	3	2	1	4	4	2	2	5	6	5	4	3	2	2	2	1	1	2	1	1	1	1	2.5	6									
3-Dec	1	Z	1	2	2	2	2	C	C	C	C	C	C	6	2	3	2	1	6	2	3	1	2	2	--	6									
4-Dec	3	3	Z	2	2	1	3	4	6	5	3	3	4	4	4	3	3	3	2	2	2	2	2	2	3.0	6									
5-Dec	2	2	1	Z	1	1	1	2	2	1	1	1	1	2	1	1	4	4	6	2	2	3	2	3	2.0	6									
6-Dec	3	3	1	2	Z	6	5	4	4	11	7	7	1	5	1	1	1	2	2	3	3	2	3	3	3.6	11									
7-Dec	3	3	3	2	3	Z	7	8	7	8	8	11	6	4	4	4	4	4	4	7	5	3	6	3	5.1	11									
8-Dec	Z	2	2	1	9	24	22	18	4	2	1	1	1	3	2	3	2	3	3	2	2	2	2	2	4.9	24									
9-Dec	2	Z	2	1	1	1	2	3	3	2	1	1	2	1	1	1	1	2	6	6	4	3	2	2	2.2	6									
10-Dec	2	1	Z	1	1	2	1	1	1	3	2	1	1	1	1	1	1	1	2	1	2	1	1	1	1.4	3									
11-Dec	1	1	1	Z	1	1	2	1	1	1	1	1	1	2	2	1	1	1	1	1	0	0	1	0	1.0	2									
12-Dec	1	1	1	1	Z	2	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	2	0.8	2									
13-Dec	4	2	1	0	0	Z	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.6	4									
14-Dec	Z	0	1	0	0	1	1	2	5	5	4	3	3	3	2	3	2	2	2	3	4	6	2	2	2.5	6									
15-Dec	2	Z	1	2	1	1	3	4	3	3	4	3	3	3	4	3	4	6	4	1	1	1	1	1	2.6	6									
16-Dec	0	1	Z	1	3	2	1	1	0	1	1	1	1	2	2	2	3	4	3	1	2	1	1	1	1.4	4									
17-Dec	1	1	1	Z	1	3	8	13	1	1	1	2	1	2	2	1	1	1	3	3	2	4	9	3	2.8	13									
18-Dec	2	1	1	1	Z	1	2	1	1	1	1	2	3	3	2	2	2	2	2	1	3	1	1	1	1.6	3									
19-Dec	1	1	1	1	1	Z	3	1	2	1	1	2	2	3	4	3	2	1	1	5	6	7	3	5	2.4	7									
20-Dec	Z	6	5	4	4	4	4	4	5	4	4	4	4	4	4	3	2	2	4	3	2	2	2	2	3.6	6									
21-Dec	2	Z	2	2	6	3	4	4	4	3	4	4	4	5	11	8	6	6	5	5	5	5	5	4	4.7	11									
22-Dec	4	3	Z	2	2	2	2	2	3	2	5	4	3	13	12	15	13	12	11	8	10	13	12	10	7.1	15									
23-Dec	7	7	7	Z	8	9	10	10	10	11	11	10	9	8	9	12	12	12	12	11	11	12	12	10	10.0	12									
24-Dec	7	9	14	12	Z	10	7	6	6	8	8	8	13	7	7	9	11	14	13	11	13	15	13	12	10.0	15									
25-Dec	11	10	9	9	10	Z	8	9	7	3	2	1	1	2	3	2	1	2	1	1	16	27	23	27	7.0	27									
26-Dec	Z	14	18	12	11	7	6	6	6	8	10	5	5	3	4	5	5	4	5	4	8	6	4	5	7.0	18									
27-Dec	6	Z	5	9	6	2	2	2	2	2	1	1	1	1	2	1	2	2	2	5	4	2	3	5	3.0	9									
28-Dec	6	5	Z	4	4	3	2	2	3	3	4	4	3	3	3	6	5	6	5	6	11	5	4	6	4.5	11									
29-Dec	5	7	5	Z	4	5	20	4	3	3	3	4	4	5	5	5	4	4	4	4	3	2	2	2	4.6	20									
30-Dec	2	2	2	2	Z	2	2	2	2	1	1	2	2	2	2	2	2	2	1	1	1	2	2	2	1.9	2									
31-Dec	1	2	1	1	1	Z	3	1	2	2	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1.5	3									
3.2 3.6 3.6 3.3 3.6 4.0 4.7 4.3 3.2 3.5 3.3 3.4 3.3 3.5 3.5 3.5 3.4 3.5 3.8 3.6 3.8 4.0 4.2 3.8																								Diurnal Average											
11 14 18 12 11 24 22 18 10 11 11 11 13 13 12 15 13 14 13 11 13 16 27 23																								Diurnal Maximum											
Z - zerospan		C - Calibration																																	





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Anzac - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	703	99.43	99.43
21 - 40	4	0.57	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Anzac - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	13	2	3	11	17	64	160	72	26	13	20	19	37	110	78	34	679
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	2	3	11	17	64	160	72	26	13	20	19	37	110	78	38	683

Total Number of Valid Hours: 683

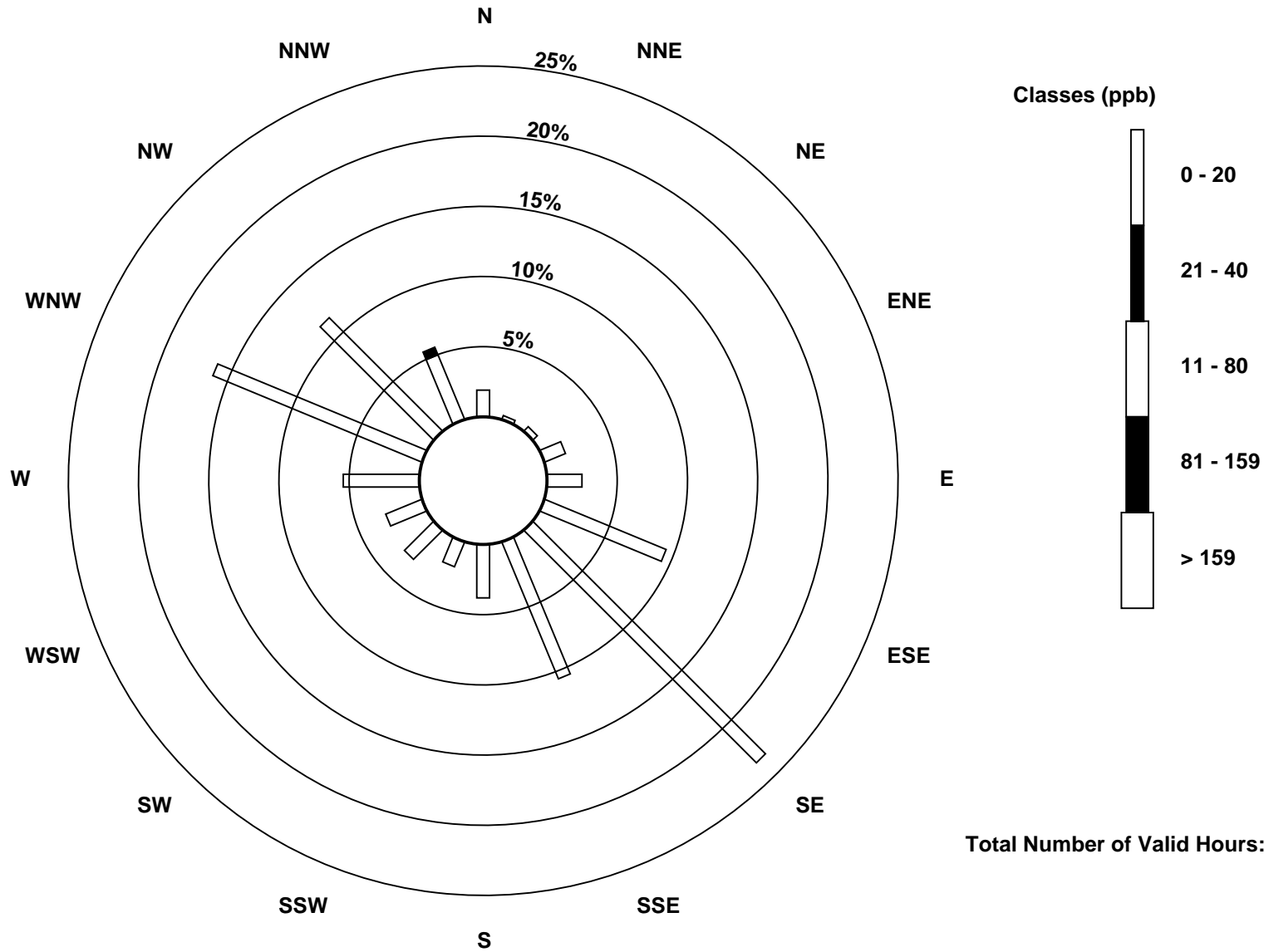
Total Number of Hours: 744



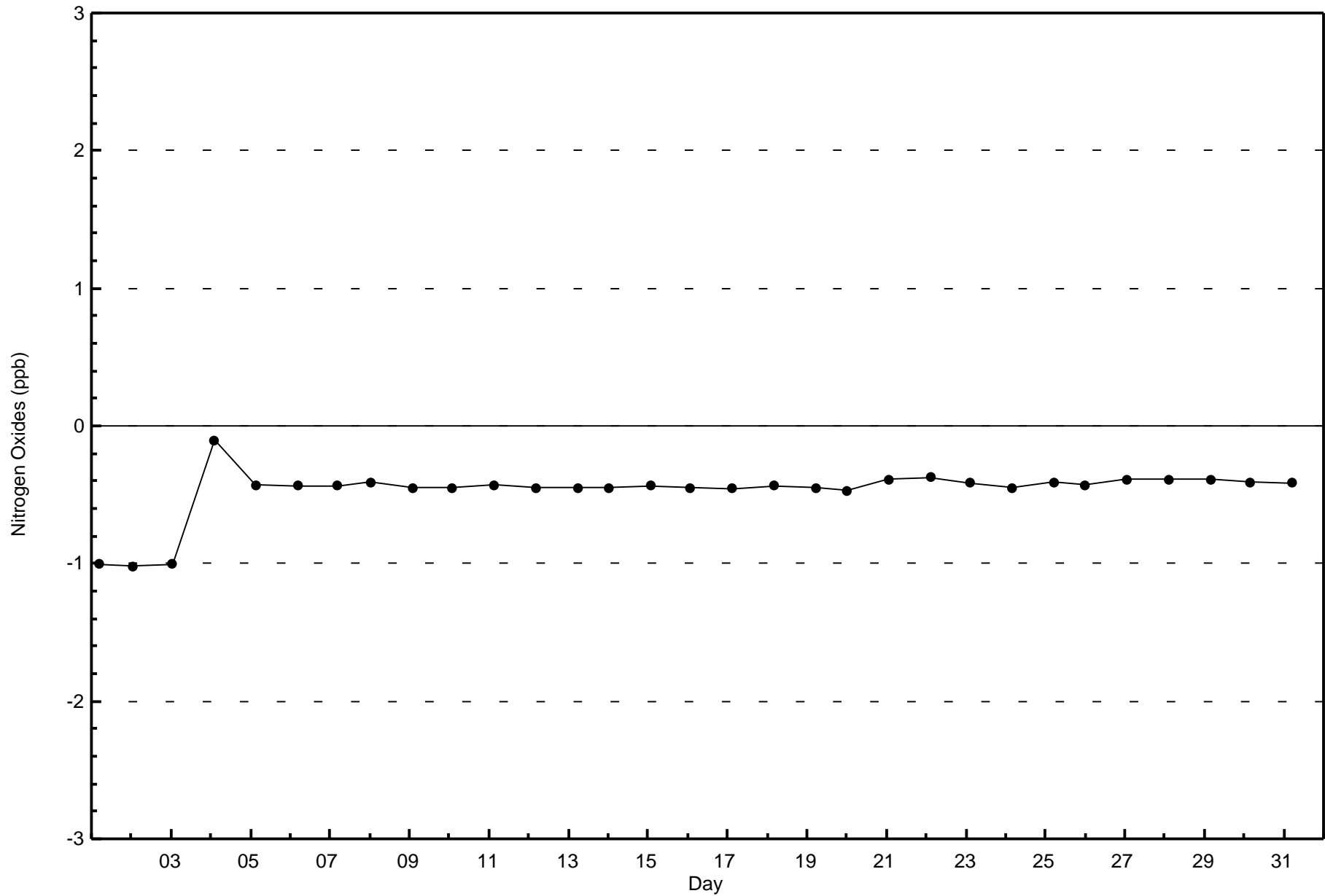


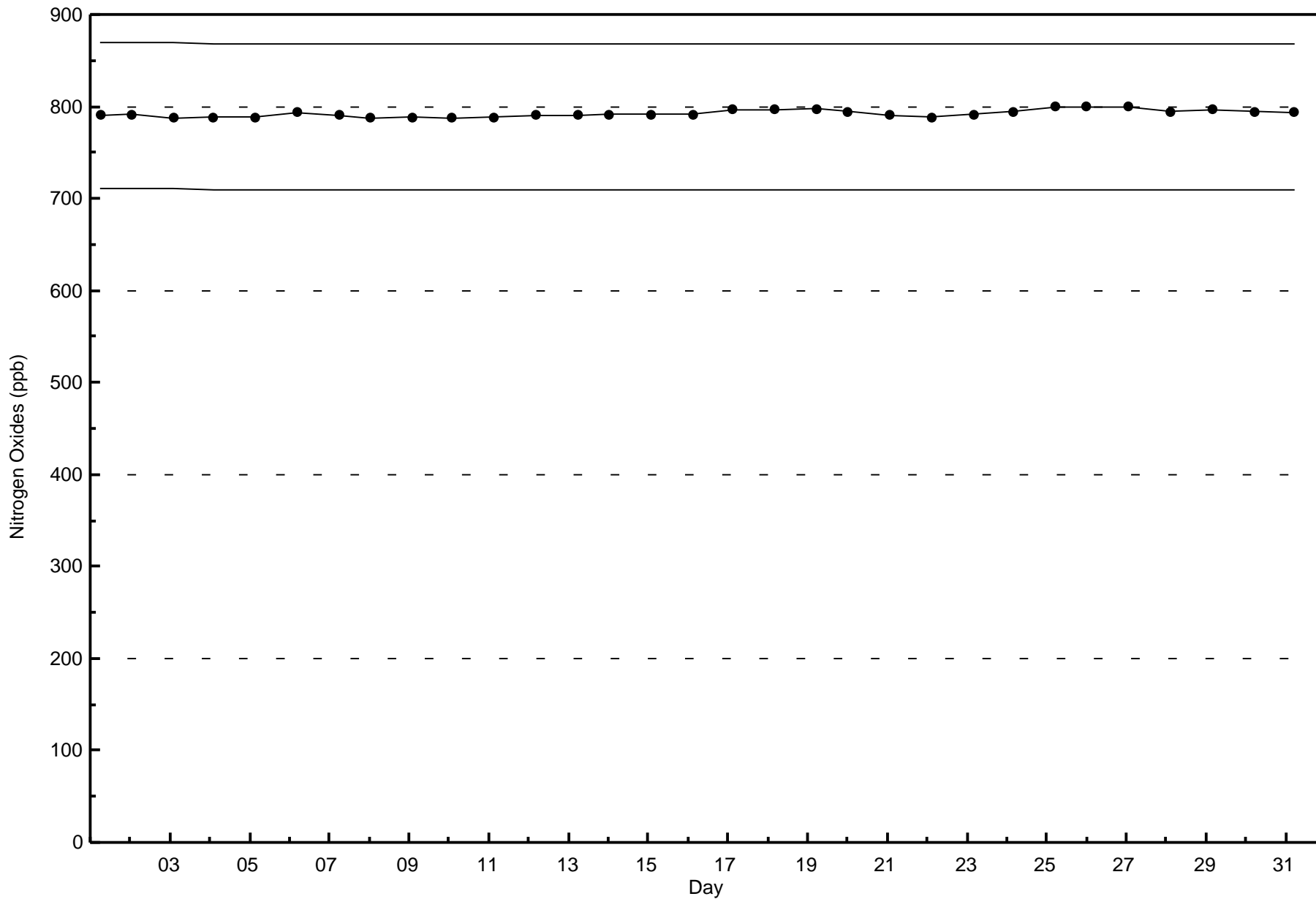
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Anzac (AMS 14)



Total Number of Valid Hours: 683







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O<sub>3</sub>) - ppb

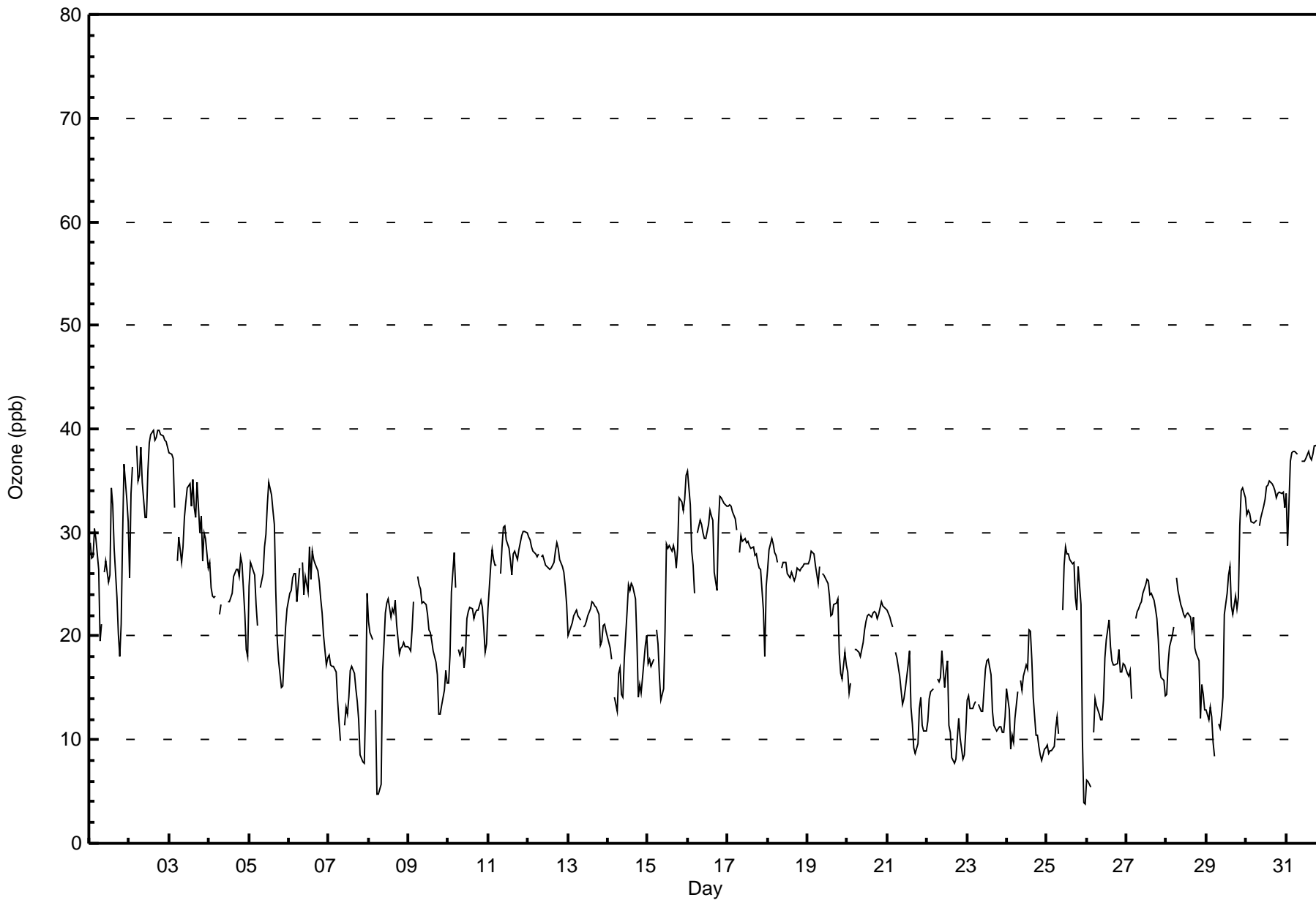
Anzac - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 40 ppb on Dec 2 15:00										Maximum Daily Average: 37.3 ppb on Dec 31										Hours of Data: 710						
Minimum Value: 4 ppb on Dec 26 00:00										Minimum Daily Average: 12.7 ppb on Dec 22										Hours of Missing Data: 34						
Maximum Diurnal Average: 25.7 ppb at hour 14										Minimum Diurnal Average: 20.8 ppb at hour 8										Hours of Calibration: 34						
Monthly Average: 22.9 ppb										Percentiles: P <sub>1</sub> = 5 P <sub>10</sub> = 12 Q <sub>1</sub> = 17 Median = 23 Q <sub>3</sub> = 28 P <sub>90</sub> = 33 P <sub>99</sub> = 39										Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	29	28	28	30	29	26	20	21	Z	26	27	25	26	34	33	28	24	20	18	21	30	37	33	31	27.2	37
2-Dec	26	34	36	Z	38	35	36	38	35	32	31	36	39	39	40	39	39	40	40	39	39	39	39	38	36.8	40
3-Dec	38	37	37	32	Z	27	30	27	29	31	33	34	35	33	35	32	31	35	30	32	27	30	29	27	31.8	38
4-Dec	27	25	24	24	24	Z	22	23	C	C	C	23	23	24	24	26	26	27	26	28	27	22	19	18	24.0	28
5-Dec	25	27	26	26	23	21	Z	25	26	29	30	33	35	34	32	31	24	20	18	15	15	18	21	23	25.0	35
6-Dec	24	24	26	26	26	23	27	Z	27	24	26	24	29	26	28	27	27	26	25	24	22	20	17	18	24.6	29
7-Dec	18	17	17	17	17	14	12	10	Z	11	13	12	14	17	17	16	15	14	12	9	8	8	14	24	14.1	24
8-Dec	21	20	20	Z	13	5	5	6	17	19	22	23	24	22	23	22	23	21	18	19	19	19	19	19	18.2	24
9-Dec	19	19	21	23	Z	26	25	25	23	23	23	22	21	20	20	19	17	16	12	12	13	15	17	16	19.4	26
10-Dec	15	18	24	28	25	Z	19	18	19	17	18	22	22	23	23	22	22	23	22	23	23	21	18	19	21.1	28
11-Dec	23	27	28	27	27	27	Z	26	29	30	31	29	28	27	26	28	28	27	28	29	30	30	30	30	28.1	31
12-Dec	30	29	29	28	28	28	28	Z	28	28	27	27	27	26	27	27	28	29	28	27	27	26	25	23	27.3	30
13-Dec	20	20	21	22	22	22	22	22	Z	21	21	21	22	23	23	23	23	23	22	19	19	21	21	21	21.5	23
14-Dec	19	19	18	Z	14	13	16	17	14	14	18	22	25	24	25	25	24	20	14	15	15	16	19	20	18.6	25
15-Dec	17	18	17	18	Z	21	19	16	14	15	21	29	28	29	28	29	28	27	28	33	33	32	33	35	24.7	35
16-Dec	36	33	28	27	24	Z	30	31	31	30	29	29	31	32	32	31	26	24	31	33	33	33	33	33	30.5	36
17-Dec	33	33	33	32	31	30	Z	28	30	29	29	29	29	29	28	29	28	28	27	27	26	23	18	25	28.4	33
18-Dec	26	28	29	29	28	28	27	Z	27	27	27	27	26	26	26	26	25	26	27	26	27	27	27	27	26.9	29
19-Dec	27	27	28	28	28	27	25	27	Z	26	26	25	25	24	22	22	23	23	24	18	16	16	19	17	23.6	28
20-Dec	17	14	15	Z	19	19	19	18	18	19	21	21	22	22	22	22	22	22	22	22	23	23	23	23	20.4	23
21-Dec	23	22	21	21	Z	18	18	16	15	13	14	15	17	19	13	12	9	9	10	13	14	11	11	11	15.0	23
22-Dec	12	14	15	15	15	Z	16	16	16	19	15	17	18	11	11	8	8	8	10	12	10	8	9	11	12.7	19
23-Dec	14	14	13	13	13	14	Z	13	13	13	15	17	18	18	16	13	11	11	11	11	11	11	11	12	13.3	18
24-Dec	15	13	9	10	10	12	15	Z	16	15	16	17	17	21	20	18	14	10	10	9	9	8	9	9	13.2	21
25-Dec	10	9	9	9	9	11	12	11	Z	23	27	29	28	28	27	27	27	24	22	27	23	10	4	4	17.8	29
26-Dec	6	6	5	Z	11	14	13	12	12	12	14	18	20	22	19	18	17	17	17	19	17	17	17	17	14.8	22
27-Dec	16	16	17	14	Z	22	22	23	23	23	24	25	25	25	24	24	23	23	22	20	17	16	16	14	20.6	25
28-Dec	14	17	19	20	21	Z	26	24	23	23	22	22	22	22	22	21	22	19	18	18	12	15	14	13	19.5	26
29-Dec	13	12	13	12	10	8	Z	12	11	12	14	22	24	26	27	23	22	24	23	24	31	34	34	33	20.2	34
30-Dec	32	32	32	31	31	31	31	Z	31	32	33	33	34	35	35	35	34	34	33	34	34	34	34	32	32.9	35
31-Dec	34	29	37	38	38	38	38	38	Z	37	37	37	37	38	37	37	38	38	38	39	39	39	39	40	37.3	40
21.9 22.0 22.4 23.1 22.1 21.5 21.9 20.8 21.8 22.4 23.5 24.8 25.5 25.7 25.3 24.5 23.6 22.8 22.2 22.5 22.2 21.9 21.7 22.0																								Diurnal Average		
38 37 37 38 38 38 38 38 38 35 37 37 37 39 39 40 39 39 40 40 39 39 39 39 40																								Diurnal Maximum		
Z - zerospan C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																										



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Ozone (O<sub>3</sub>) - ppb**  
**Anzac - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Anzac - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	265	37.32	37.32
21 - 50	445	62.68	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb  
Anzac - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	11	0	2	7	6	22	46	36	21	1	6	6	4	18	30	33	249
21 - 50	1	2	1	5	11	44	116	40	5	10	13	13	34	91	46	7	439
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	12	2	3	12	17	66	162	76	26	11	19	19	38	109	76	40	688

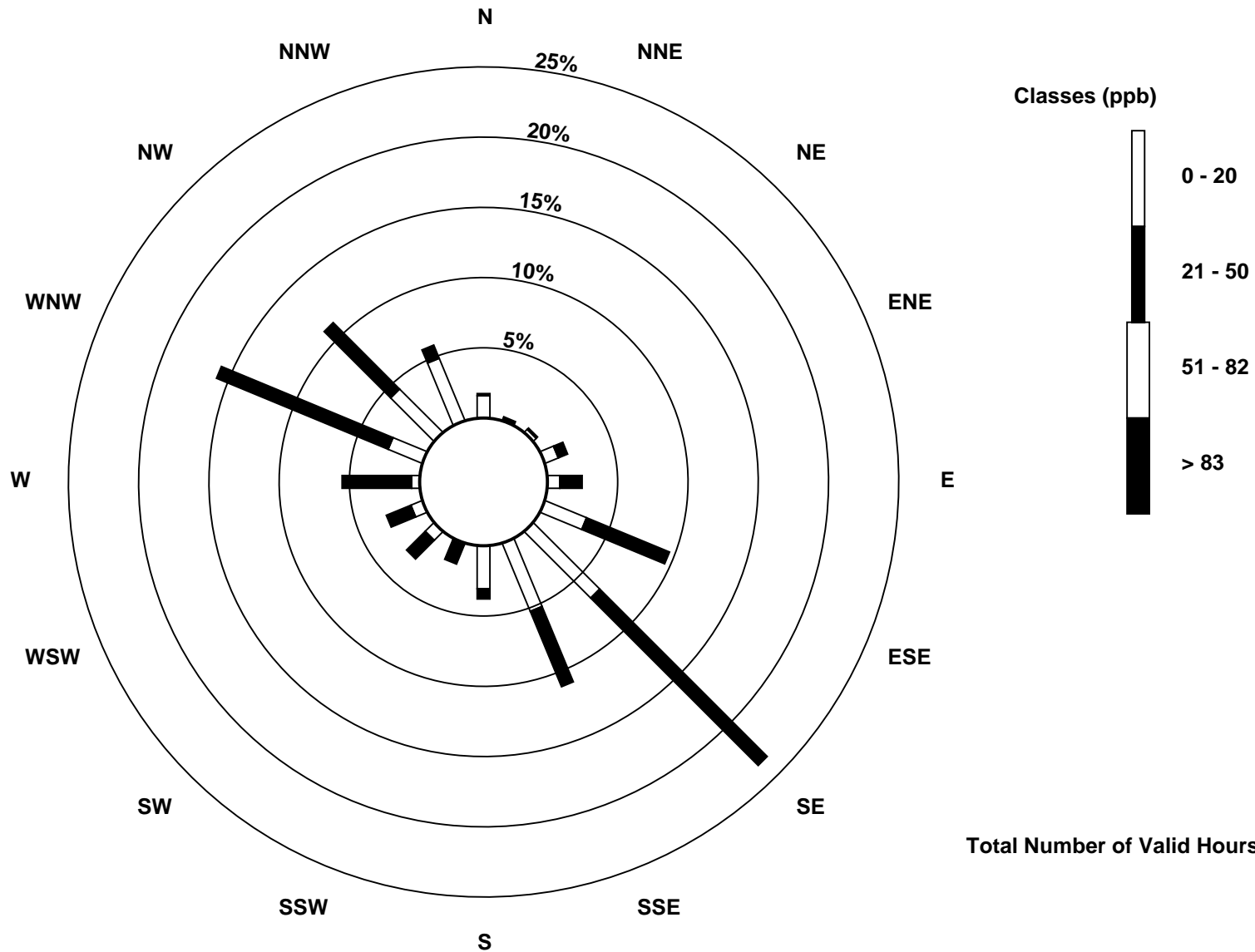
Total Number of Valid Hours: 688

Total Number of Hours: 744



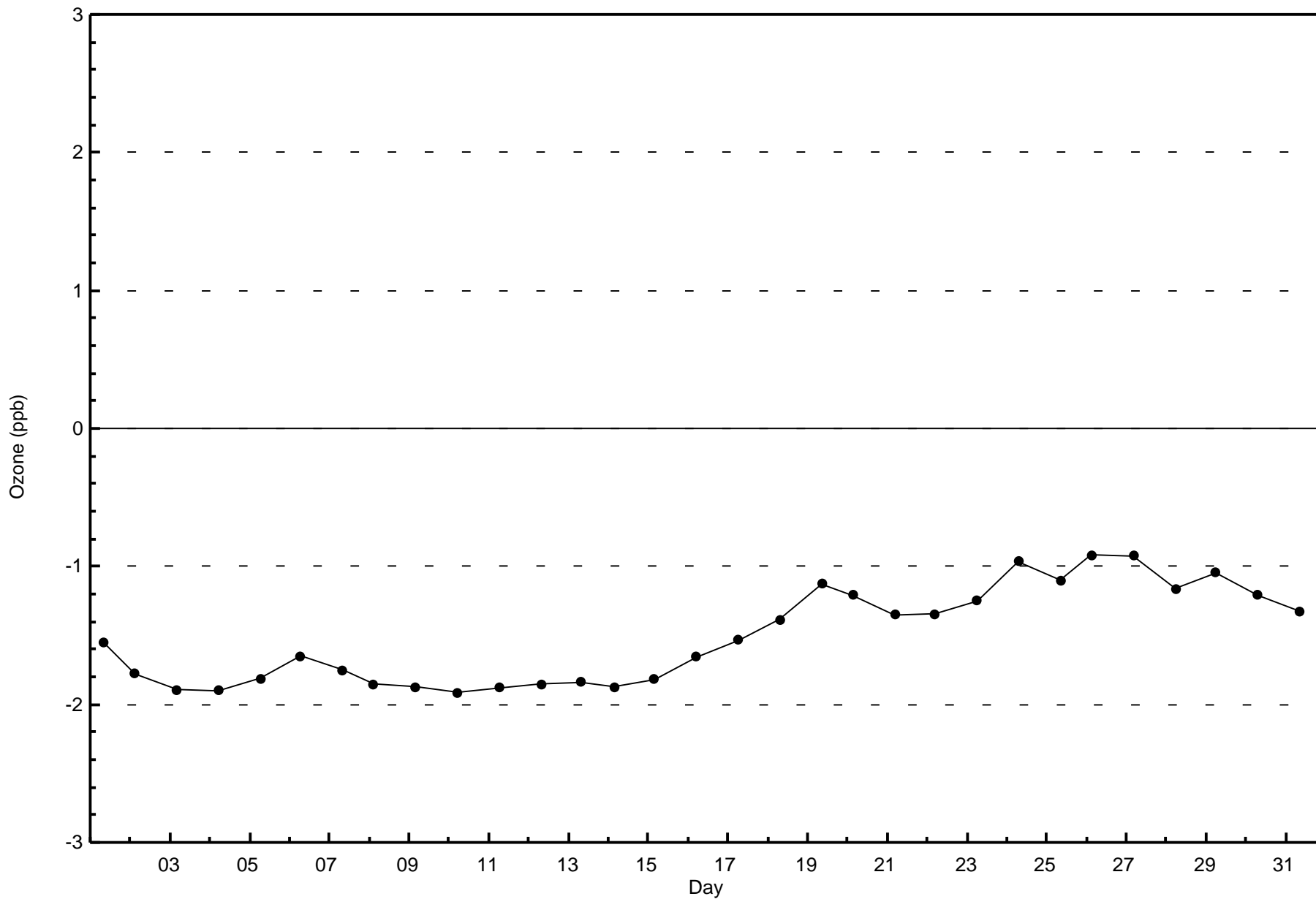
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

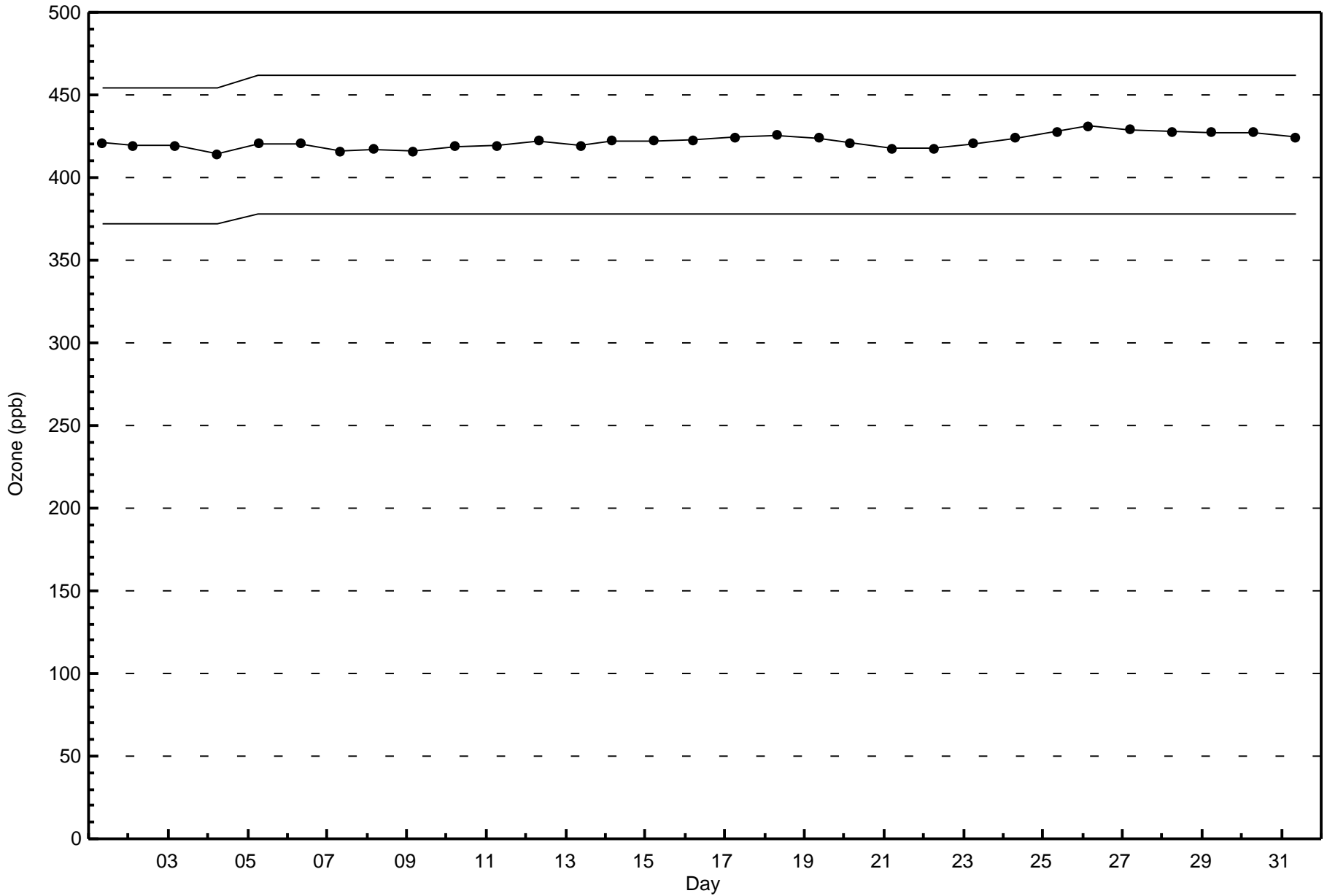
Ozone (O<sub>3</sub>) - ppb  
Anzac (AMS 14)



Total Number of Valid Hours: 688









Summary of Hour Averages

Anzac - December 2015

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 12.6 µg/m <sup>3</sup> on Dec 14 13:00 Maximum Daily Average: 6.3 µg/m <sup>3</sup> on Dec 29		Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 2 Percent Operational Time: 100.0																									
Minimum Value: 0.4 µg/m <sup>3</sup> on Dec 13 22:00 Maximum Diurnal Average: 3.6 µg/m <sup>3</sup> at hour 11 Monthly Average: 3.31 µg/m <sup>3</sup>		Minimum Daily Average: 1.0 µg/m <sup>3</sup> on Dec 13 Minimum Diurnal Average: 2.9 µg/m <sup>3</sup> at hour 14 Percentiles: P <sub>1</sub> = 0.5 P <sub>10</sub> = 1.2 Q <sub>1</sub> = 1.8 Median = 3.1 Q <sub>3</sub> = 4.5 P <sub>90</sub> = 5.6 P <sub>99</sub> = 8.9																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	6.1	6.1	6.6	6.6	6.3	5.9	5.5	5.9	5.3	5.1	4.4	4.5	3.9	3.4	4.4	5.3	6.6	9.2	6.7	4.9	7.3	7.6	7.3	7.0	5.9	9.2	
2-Dec	6.1	5.3	4.2	3.5	3.0	3.2	3.3	3.4	3.8	6.6	7.3	5.0	3.7	3.5	2.0	1.5	1.5	1.3	0.9	0.9	0.9	0.9	1.0	1.0	3.1	7.3	
3-Dec	0.9	1.0	1.0	1.3	1.5	1.8	2.2	2.0	1.6	1.7	1.7	C	C	2.1	1.8	1.9	2.2	2.0	2.4	2.2	2.3	2.3	2.9	2.6	1.9	2.9	
4-Dec	2.9	3.7	3.9	3.9	4.1	3.5	3.8	3.2	3.6	5.1	7.2	6.5	6.1	5.4	5.3	4.7	4.0	4.1	4.8	4.8	4.6	4.6	4.4	4.1	4.5	7.2	
5-Dec	4.1	3.8	3.8	4.3	5.3	5.5	4.2	3.3	2.4	2.1	2.5	1.7	1.0	1.1	1.4	5.4	5.1	3.2	2.6	2.4	2.7	2.3	2.6	2.8	3.1	5.5	
6-Dec	2.9	2.7	2.0	2.5	2.3	2.0	1.6	1.7	2.0	1.5	1.4	1.6	1.4	1.7	1.4	1.4	1.5	1.7	1.9	1.7	1.9	2.1	2.0	1.9	2.9	2.9	
7-Dec	2.1	2.1	2.1	2.1	2.1	2.3	2.5	3.5	6.4	6.3	4.8	4.5	4.8	4.3	3.1	2.8	2.6	2.9	2.6	2.5	2.3	2.0	2.8	2.5	3.2	6.4	
8-Dec	2.8	3.0	2.9	3.0	6.7	7.7	9.1	9.9	4.9	5.4	4.2	3.5	3.2	3.0	3.4	3.1	2.5	3.1	4.5	5.4	5.6	5.3	4.9	4.2	4.6	9.9	
9-Dec	4.3	4.7	4.0	3.2	2.4	1.9	1.9	2.1	2.8	2.4	2.5	2.9	2.9	4.1	3.7	3.1	3.2	3.4	3.6	5.0	4.0	3.5	3.4	4.4	3.3	5.0	
10-Dec	4.4	4.2	2.7	2.0	2.2	2.5	2.5	3.2	2.6	2.9	2.9	2.3	2.6	3.1	3.1	3.3	3.4	3.6	3.1	3.5	2.7	2.9	3.1	3.0	3.0	4.4	
11-Dec	3.1	3.3	3.0	2.8	2.9	2.6	3.0	2.4	1.9	2.0	2.7	2.8	2.5	2.2	1.7	1.3	1.5	1.3	0.7	0.6	0.7	0.7	0.7	0.6	2.0	3.3	
12-Dec	0.8	0.8	0.9	0.9	1.2	2.6	3.8	3.7	3.3	2.6	3.6	2.6	2.5	2.6	2.4	2.3	2.3	1.9	1.3	0.8	0.6	0.6	1.1	2.2	2.0	3.8	
13-Dec	2.6	2.3	1.6	1.2	0.9	0.8	0.8	0.9	1.2	1.4	1.2	1.2	1.3	1.0	0.7	0.6	0.6	0.6	0.5	0.6	0.4	0.4	0.4	0.5	1.0	2.6	
14-Dec	0.4	0.5	0.5	0.5	0.5	0.7	0.8	2.3	3.5	4.0	4.3	1.8	12.6	1.3	1.1	1.1	1.4	1.4	1.4	1.7	1.8	1.6	1.2	1.0	2.0	12.6	
15-Dec	1.3	2.0	2.3	2.5	2.8	3.6	4.6	6.8	7.5	8.2	7.0	3.2	3.1	2.9	3.1	4.3	4.2	2.8	2.8	1.8	1.2	1.2	1.4	1.4	3.4	8.2	
16-Dec	2.0	2.2	1.5	1.5	2.5	1.7	1.6	1.1	1.1	1.4	1.5	1.2	0.8	1.0	0.9	0.9	1.6	3.5	2.3	1.2	1.1	1.3	1.2	1.2	1.5	3.5	
17-Dec	1.0	0.9	0.8	0.8	0.8	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.2	1.2	1.3	1.3	1.3	1.3	1.4	1.4	1.5	1.8	1.9	1.4	1.2	1.9	
18-Dec	1.2	1.1	1.1	1.1	1.2	1.4	1.3	1.2	1.3	1.2	1.2	1.4	1.6	1.7	1.8	1.9	2.3	2.2	2.1	2.1	2.3	2.3	2.1	2.1	1.6	2.3	
19-Dec	2.3	2.5	2.4	2.1	1.9	1.7	1.7	1.5	2.5	1.8	1.6	1.5	1.5	1.5	1.7	1.5	1.5	1.6	1.7	1.9	1.9	2.6	3.4	4.2	2.0	4.2	
20-Dec	3.8	3.3	3.3	3.9	4.9	5.4	5.6	4.8	4.2	4.0	3.7	3.3	3.2	3.2	3.5	3.6	3.8	3.8	4.3	4.7	4.8	4.9	4.9	5.0	4.2	5.6	
21-Dec	4.2	3.9	4.5	4.7	4.8	5.4	5.9	5.3	5.1	4.6	4.0	3.8	3.2	2.9	4.2	4.6	4.6	4.8	4.3	5.5	5.2	4.6	4.7	4.7	4.6	5.9	
22-Dec	4.9	4.8	4.5	4.3	4.5	4.4	4.2	4.0	4.0	4.8	5.0	5.0	5.0	4.5	5.7	7.2	7.7	6.8	6.3	5.5	5.2	5.0	5.1	5.6	5.2	7.7	
23-Dec	4.7	3.6	3.3	3.2	3.7	3.7	4.1	4.3	4.1	4.2	4.2	3.6	2.8	2.5	2.7	3.4	3.6	3.5	3.5	3.4	3.3	3.1	3.6	2.8	3.5	4.7	
24-Dec	2.6	3.1	3.8	3.4	4.2	4.8	3.9	3.2	3.2	3.4	3.7	4.0	4.5	4.8	5.3	5.7	7.2	7.6	6.9	6.3	6.6	8.1	7.7	7.0	5.0	8.1	
25-Dec	6.1	5.0	4.4	4.3	4.3	4.0	3.4	4.0	4.1	3.0	3.5	4.5	4.1	3.5	4.1	3.9	5.2	5.2	4.7	3.2	2.8	4.2	6.1	6.4	4.3	6.4	
26-Dec	6.0	6.0	5.7	5.1	4.8	3.8	3.2	3.0	2.9	3.4	3.0	3.2	2.4	1.9	2.6	3.1	2.7	2.9	2.8	3.1	3.5	3.7	3.3	3.7	3.6	6.0	
27-Dec	4.0	4.1	4.0	4.4	4.6	4.4	4.8	4.5	3.9	3.3	3.5	4.1	4.8	5.2	5.1	5.2	5.5	5.5	4.8	4.9	4.1	4.0	5.4	8.3	4.7	8.3	
28-Dec	7.8	6.5	5.7	5.8	5.6	5.0	3.6	4.2	4.8	4.8	5.3	5.4	5.5	5.1	4.9	4.6	4.1	3.8	4.1	4.2	4.2	4.3	4.7	5.7	5.0	7.8	
29-Dec	5.5	5.4	5.5	5.0	4.6	4.6	4.7	5.2	6.7	7.7	8.3	11.2	9.4	7.3	5.9	5.0	8.5	9.4	8.8	7.1	5.4	3.4	3.3	3.3	6.3	11.2	
30-Dec	3.8	5.7	4.8	5.2	4.5	4.1	3.8	3.5	3.4	3.3	3.4	1.9	1.2	0.9	1.0	1.6	2.4	2.3	2.2	2.5	3.0	3.6	3.5	3.1	3.1	5.7	
31-Dec	2.4	2.9	2.9	2.7	2.0	1.9	1.7	2.4	2.5	3.0	2.2	1.7	1.5	1.3	1.3	1.5	1.4	1.4	1.4	1.5	1.9	1.4	1.8	2.8	2.0	3.0	
3.5 3.4 3.2 3.2 3.3 3.3 3.4 3.5 3.5 3.6 3.6 3.4 3.5 2.9 2.9 3.1 3.4 3.5 3.3 3.1 3.1 3.1 3.3 3.4																								Diurnal Average			
7.8 6.5 6.6 6.6 6.7 7.7 9.1 9.9 7.5 8.2 8.3 11.2 12.6 7.3 5.9 7.2 8.5 9.4 8.8 7.1 7.3 8.1 7.7 8.3																								Diurnal Maximum			
C - Calibration																											
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																											

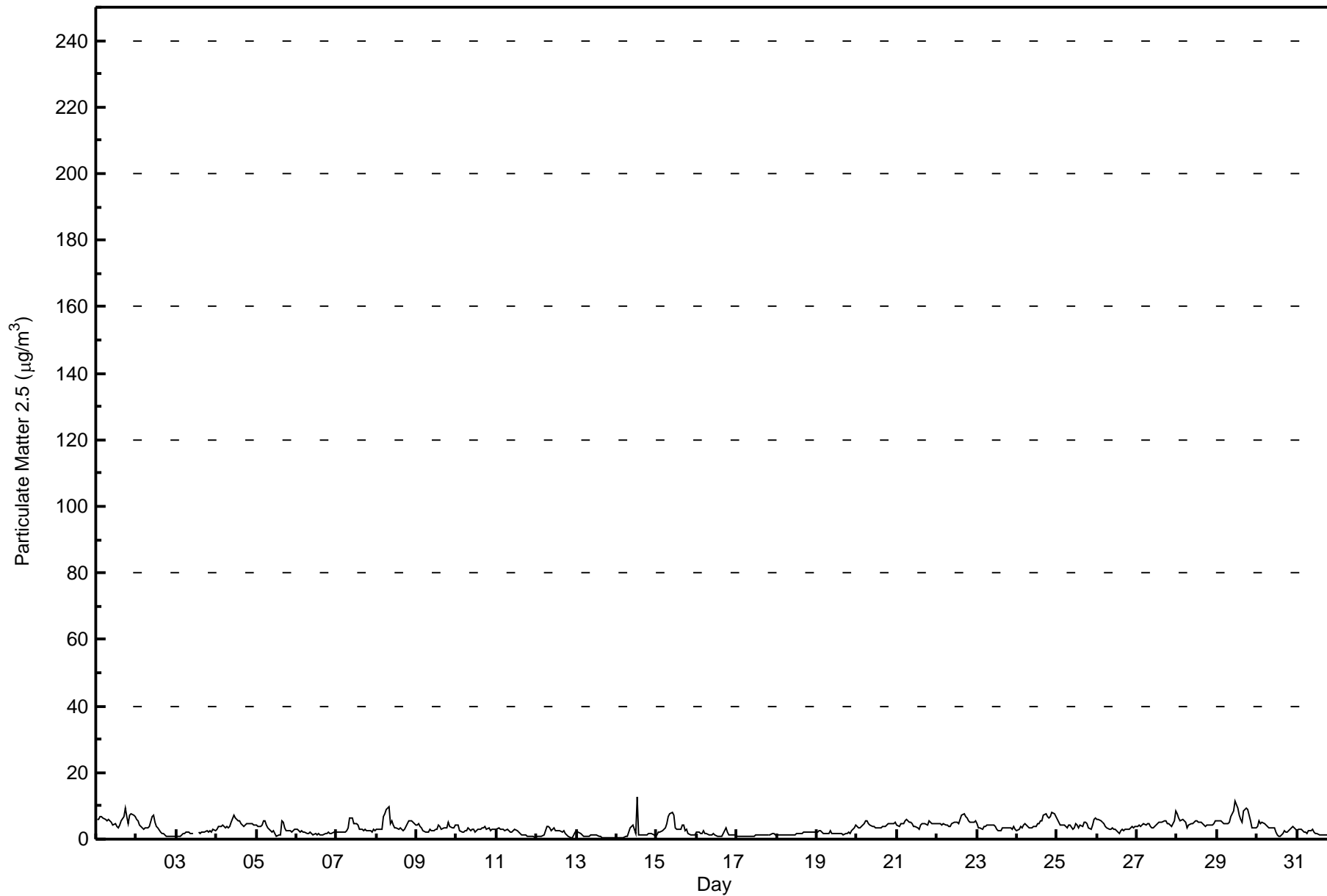


Wood Buffalo Environmental Association

Hourly Averages

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$

Anzac - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Anzac - December 2015**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	607	81.81	81.81
6 - 15	79	10.65	92.45
16 - 25	0	0.00	92.45
26 - 80	0	0.00	92.45
> 81.0	0	0.00	92.45

Total Number of Valid Hours: 742

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Anzac - December 2015**

Concentration Ranges ( $\mu\text{g}/\text{m}^3$ )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	11	2	2	11	13	60	151	68	21	10	12	18	30	91	65	29	594
6 - 15	1	0	1	0	1	2	4	10	5	4	8	1	5	12	10	11	75
16 - 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	12	2	3	11	14	62	155	78	26	14	20	19	35	103	75	40	669

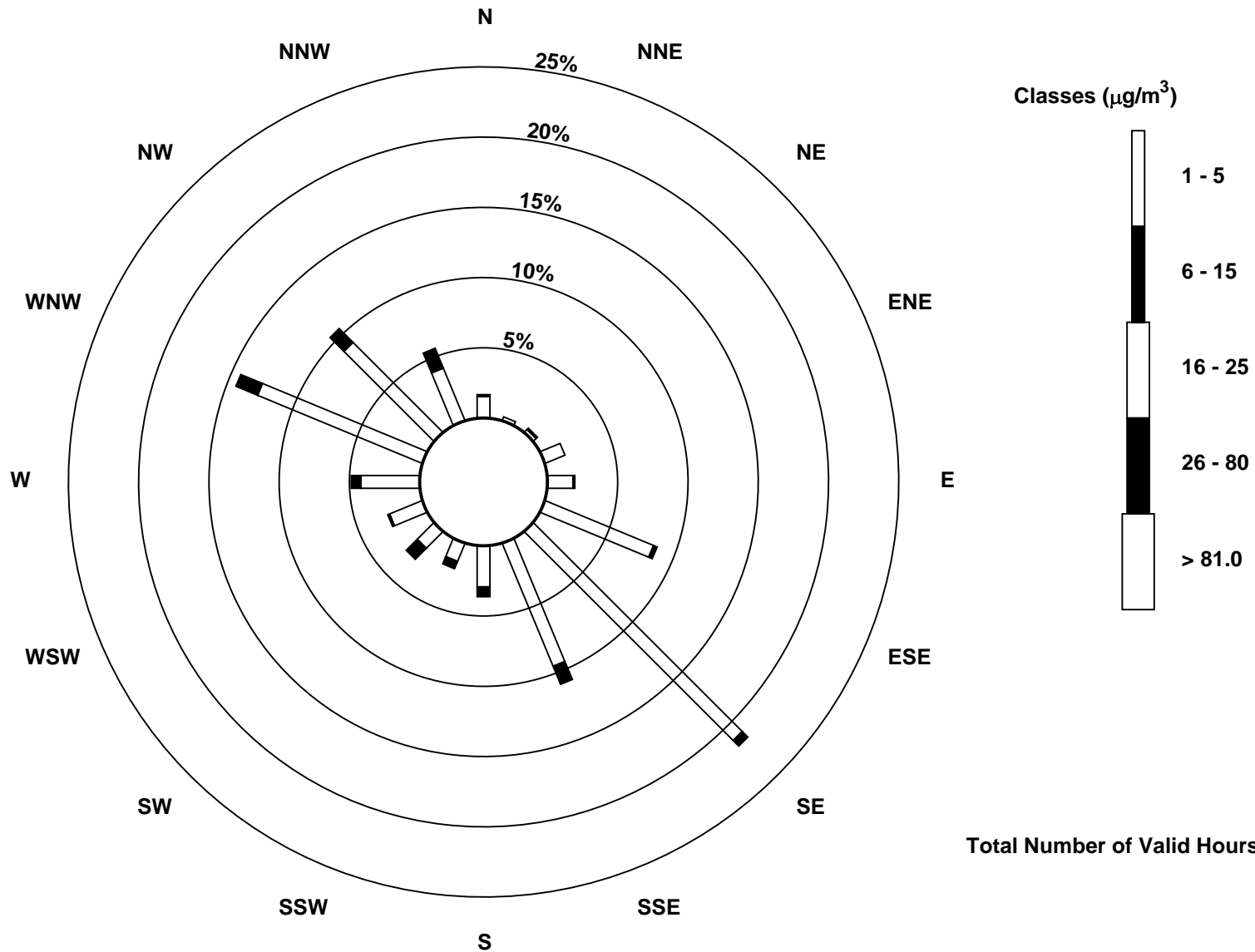
Total Number of Valid Hours: 718

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

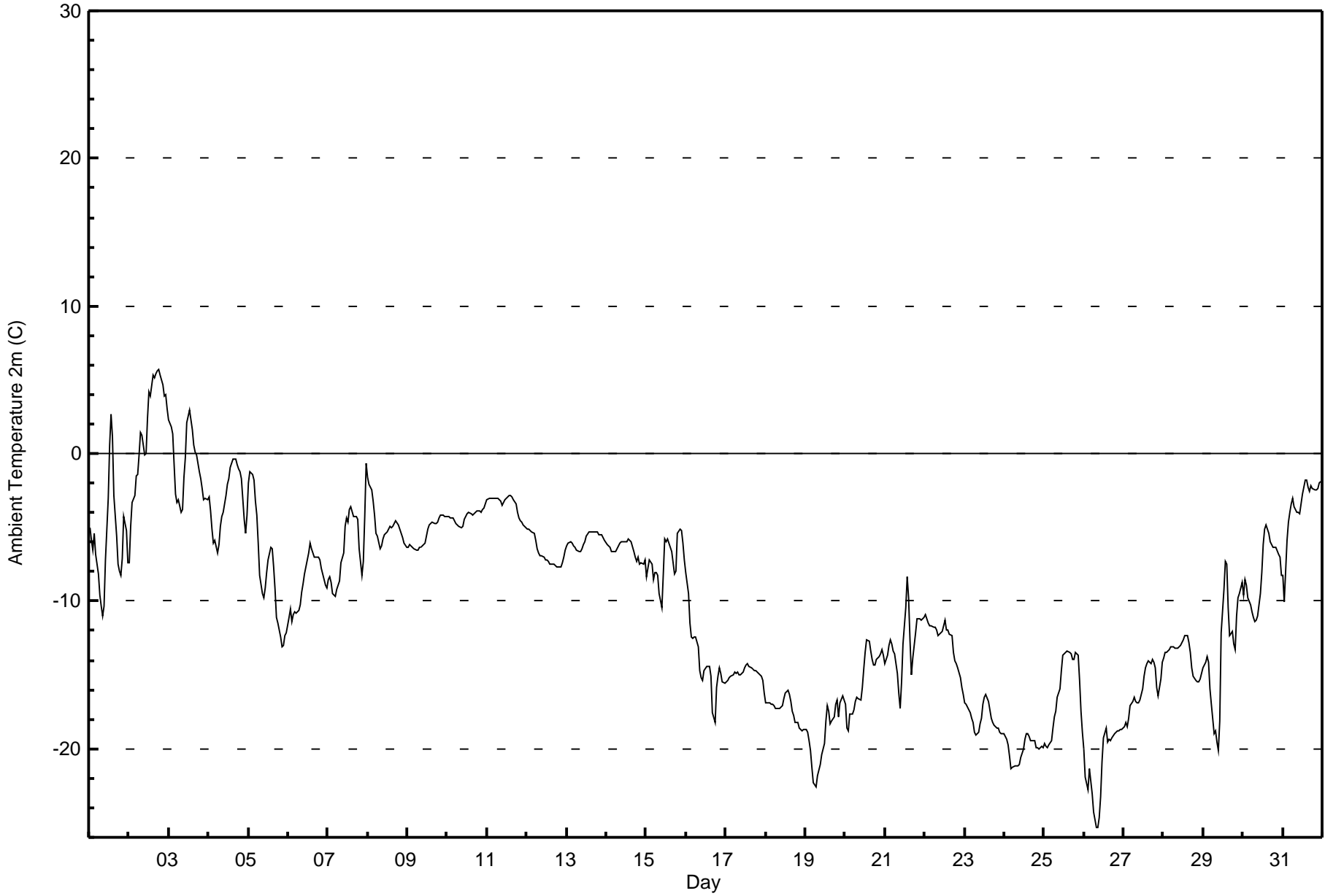
Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Anzac (AMS 14)





Maximum Value: 5.7 C on Dec 2 19:00		Maximum Daily Average: 1.7 C on Dec 2		Hours in Service: 744																																												
Minimum Value: -25.4 C on Dec 26 08:00		Minimum Daily Average: -21.0 C on Dec 26		Hours of Data: 744																																												
Maximum Diurnal Average: -8.1 C at hour 14		Minimum Diurnal Average: -11.4 C at hour 9		Hours of Missing Data: 0																																												
Monthly Average: -10.04 C		Percentiles: P <sub>1</sub> = -22.6 P <sub>10</sub> = -18.7 Q <sub>1</sub> = -15.2 Median = -8.9 Q <sub>3</sub> = -5.1 P <sub>90</sub> = -2.8 P <sub>99</sub> = 4.3		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-5.0	-5.9	-6.6	-5.4	-6.8	-8.2	-9.5	-10.3	-11.0	-10.3	-7.2	-3.0	0.5	2.7	1.2	-2.8	-5.6	-7.5	-8.0	-8.2	-7.1	-4.3	-5.3	-7.4	-5.9	2.7																						
2-Dec	-7.4	-4.9	-3.3	-2.8	-1.5	-1.4	-0.1	1.4	1.2	-0.1	0.0	2.4	4.2	3.9	5.3	5.1	5.4	5.6	5.7	5.3	4.7	3.9	4.0	3.0	1.7	5.7																						
3-Dec	2.2	1.8	1.4	-0.7	-2.8	-3.3	-3.1	-4.0	-3.8	-1.6	-0.3	2.1	2.9	2.3	1.6	0.6	0.1	-0.1	-1.2	-1.7	-2.4	-3.1	-3.0	-3.1	-0.8	2.9																						
4-Dec	-2.9	-3.9	-5.1	-6.1	-5.9	-6.8	-6.1	-4.9	-4.3	-4.0	-2.8	-2.1	-1.7	-1.0	-0.6	-0.4	-0.4	-0.7	-1.1	-1.2	-1.7	-4.5	-5.4	-4.2	-3.2	-0.4																						
5-Dec	-2.0	-1.2	-1.4	-1.8	-3.2	-4.2	-6.1	-8.3	-9.5	-9.8	-9.1	-8.1	-7.2	-6.4	-6.4	-7.7	-9.2	-11.1	-11.4	-12.4	-13.1	-13.0	-12.3	-12.2	-7.8	-1.2																						
6-Dec	-11.1	-10.5	-11.4	-10.9	-10.7	-10.8	-10.6	-10.2	-9.4	-8.8	-8.2	-7.2	-6.8	-6.1	-6.4	-6.7	-7.0	-7.0	-7.0	-7.2	-7.7	-8.2	-8.9	-9.1	-8.7	-6.1																						
7-Dec	-8.5	-8.4	-8.7	-9.5	-9.6	-9.2	-8.9	-8.7	-7.4	-6.8	-5.0	-4.4	-4.7	-3.8	-3.6	-4.2	-4.3	-4.3	-4.4	-6.4	-8.2	-7.3	-4.3	-0.7	-6.3	-0.7																						
8-Dec	-1.6	-2.0	-2.5	-3.2	-4.1	-5.4	-5.6	-6.4	-6.3	-5.8	-5.5	-5.4	-5.3	-4.9	-5.0	-4.9	-4.7	-4.6	-4.8	-5.1	-5.4	-5.7	-6.1	-6.3	-4.9	-1.6																						
9-Dec	-6.3	-6.2	-6.2	-6.4	-6.5	-6.6	-6.6	-6.4	-6.3	-6.3	-6.1	-5.6	-5.1	-4.9	-4.7	-4.7	-4.7	-4.7	-4.6	-4.3	-4.1	-4.2	-4.3	-4.3	-5.4	-4.1																						
10-Dec	-4.3	-4.2	-4.3	-4.4	-4.5	-4.7	-4.8	-4.9	-5.0	-4.9	-4.5	-4.3	-4.1	-4.0	-4.1	-4.2	-4.1	-4.0	-3.9	-3.9	-4.0	-3.8	-3.6	-3.4	-4.3	-3.4																						
11-Dec	-3.2	-3.0	-3.0	-3.1	-3.0	-3.0	-3.0	-3.1	-3.3	-3.5	-3.3	-3.1	-2.9	-2.8	-2.8	-2.9	-3.1	-3.4	-4.0	-4.3	-4.5	-4.7	-4.9	-5.0	-3.5	-2.8																						
12-Dec	-5.1	-5.2	-5.2	-5.3	-5.4	-5.9	-6.4	-6.7	-6.9	-6.9	-7.0	-7.2	-7.2	-7.3	-7.5	-7.5	-7.5	-7.6	-7.7	-7.7	-7.6	-7.4	-7.0	-6.5	-6.7	-5.1																						
13-Dec	-6.2	-6.1	-6.0	-6.1	-6.2	-6.4	-6.5	-6.6	-6.7	-6.5	-6.2	-5.9	-5.6	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.5	-5.5	-5.5	-5.7	-5.9	-5.9	-5.3																						
14-Dec	-6.1	-6.3	-6.3	-6.6	-6.6	-6.7	-6.5	-6.2	-6.1	-6.0	-6.0	-5.9	-5.8	-5.8	-5.8	-5.9	-6.6	-7.0	-7.3	-7.0	-7.5	-7.4	-7.5	-7.2	-6.5	-5.8																						
15-Dec	-8.4	-7.8	-7.2	-7.5	-8.5	-8.1	-8.1	-8.3	-9.5	-10.4	-8.1	-5.8	-6.0	-5.8	-6.3	-6.6	-7.4	-8.2	-7.9	-5.4	-5.1	-5.2	-6.0	-7.2	-7.3	-5.1																						
16-Dec	-8.0	-9.5	-11.4	-12.4	-12.6	-12.4	-12.5	-13.1	-14.7	-15.1	-15.3	-14.7	-14.4	-14.4	-14.4	-15.1	-17.6	-18.3	-15.9	-15.0	-14.5	-14.9	-15.5	-15.5	-14.1	-8.0																						
17-Dec	-15.4	-15.4	-15.2	-15.1	-15.0	-14.8	-14.9	-14.8	-14.9	-14.9	-14.8	-14.5	-14.4	-14.3	-14.4	-14.5	-14.6	-14.7	-14.7	-14.8	-14.9	-15.1	-15.3	-16.2	-14.9	-14.3																						
18-Dec	-16.9	-16.9	-16.9	-17.0	-16.9	-17.1	-17.3	-17.2	-17.2	-17.2	-17.1	-16.6	-16.2	-16.0	-16.3	-16.8	-17.5	-17.7	-18.2	-18.2	-18.6	-18.7	-18.8	-18.7	-17.3	-16.0																						
19-Dec	-18.7	-18.9	-19.5	-20.1	-21.2	-22.3	-22.6	-21.8	-21.5	-21.1	-20.4	-19.6	-18.2	-17.0	-17.5	-18.3	-18.1	-17.8	-17.0	-16.7	-17.8	-16.8	-16.4	-16.7	-19.0	-16.4																						
20-Dec	-17.0	-18.6	-18.8	-17.7	-17.7	-17.4	-16.8	-16.5	-16.6	-16.7	-15.8	-14.6	-13.4	-12.6	-12.7	-13.3	-14.0	-14.4	-14.3	-14.0	-13.8	-13.5	-13.3	-13.7	-15.3	-12.6																						
21-Dec	-14.2	-13.6	-12.9	-12.6	-12.9	-13.4	-13.6	-14.9	-16.2	-17.3	-15.5	-12.9	-10.4	-8.4	-9.8	-12.6	-15.0	-13.8	-12.2	-11.2	-11.2	-11.2	-11.3	-11.1	-12.8	-8.4																						
22-Dec	-10.9	-11.2	-11.5	-11.7	-11.6	-11.8	-11.7	-11.9	-12.3	-12.3	-12.1	-11.7	-11.3	-12.0	-12.0	-12.2	-12.3	-13.5	-14.1	-14.2	-14.6	-15.2	-15.9	-16.4	-12.7	-10.9																						
23-Dec	-16.9	-17.0	-17.2	-17.6	-18.0	-18.2	-18.9	-19.1	-18.9	-18.4	-17.9	-17.0	-16.5	-16.3	-16.8	-17.4	-17.9	-18.2	-18.4	-18.6	-18.6	-18.9	-19.0	-19.0	-17.9	-16.3																						
24-Dec	-19.0	-19.4	-19.8	-20.5	-21.3	-21.3	-21.2	-21.2	-21.2	-21.1	-20.6	-20.0	-19.4	-19.0	-19.0	-19.1	-19.5	-19.4	-19.5	-19.9	-20.0	-20.0	-19.8	-19.9	-20.0	-19.0																						
25-Dec	-19.6	-19.8	-19.9	-19.7	-19.4	-18.6	-17.8	-17.4	-16.5	-15.9	-14.7	-13.7	-13.5	-13.5	-13.4	-13.5	-13.5	-14.0	-13.9	-13.4	-13.6	-15.3	-17.4	-18.9	-16.1	-13.4																						
26-Dec	-20.0	-21.9	-22.8	-21.3	-22.2	-23.0	-24.3	-25.4	-25.3	-24.7	-23.3	-20.8	-19.2	-18.5	-19.5	-19.4	-19.4	-19.3	-19.0	-18.8	-18.7	-18.8	-18.7	-18.7	-21.0	-18.5																						
27-Dec	-18.5	-18.3	-18.5	-17.9	-17.1	-16.8	-16.5	-16.8	-16.9	-16.9	-16.7	-15.9	-15.1	-14.5	-14.2	-14.0	-14.2	-13.9	-14.2	-14.5	-15.8	-16.4	-15.3	-14.1	-16.0	-13.9																						
28-Dec	-13.8	-13.5	-13.5	-13.3	-13.1	-13.1	-13.1	-13.2	-13.2	-13.1	-13.0	-12.8	-12.7	-12.3	-12.3	-12.8	-13.5	-14.5	-15.1	-15.4	-15.4	-15.4	-15.3	-14.9	-13.7	-12.3																						
29-Dec	-14.5	-14.1	-13.7	-14.1	-15.9	-16.9	-18.9	-18.8	-19.6	-20.2	-18.1	-12.1	-9.2	-7.3	-7.5	-10.4	-12.4	-12.1	-12.9	-13.3	-11.0	-9.8	-9.4	-8.7	-13.4	-7.3																						
30-Dec	-9.6	-8.5	-8.9	-9.8	-10.2	-10.7	-11.1	-11.4	-11.3	-11.0	-9.5	-8.1	-6.2	-5.1	-4.8	-5.4	-5.9	-6.1	-6.4	-6.4	-6.4	-6.8	-7.0	-8.2	-8.1	-4.8																						
31-Dec	-8.3	-10.1	-5.8	-4.7	-4.0	-3.4	-3.0	-3.6	-4.0	-4.0	-4.0	-3.5	-2.7	-1.8	-1.8	-2.3	-2.6	-2.2	-2.4	-2.5	-2.5	-2.4	-1.9	-1.9	-3.6	-1.8																						
																								-10.2	-10.3	-10.4	-10.5	-10.8	-11.0	-11.2	-11.3	-11.4	-11.3	-10.6	-9.4	-8.6	-8.1	-8.3	-8.9	-9.4	-9.7	-9.7	-9.7	-9.9	-10.0	-10.0	-10.1	Diurnal Average
																								2.2	1.8	1.4	-0.7	-1.5	-1.4	-0.1	1.4	1.2	-0.1	0.0	2.4	4.2	3.9	5.3	5.1	5.4	5.6	5.7	5.3	4.7	3.9	4.0	3.0	Diurnal Maximum







**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C  
Anzac - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	30	4.03	4.03
-20 - 0	687	92.34	96.37
0 - 10	27	3.63	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

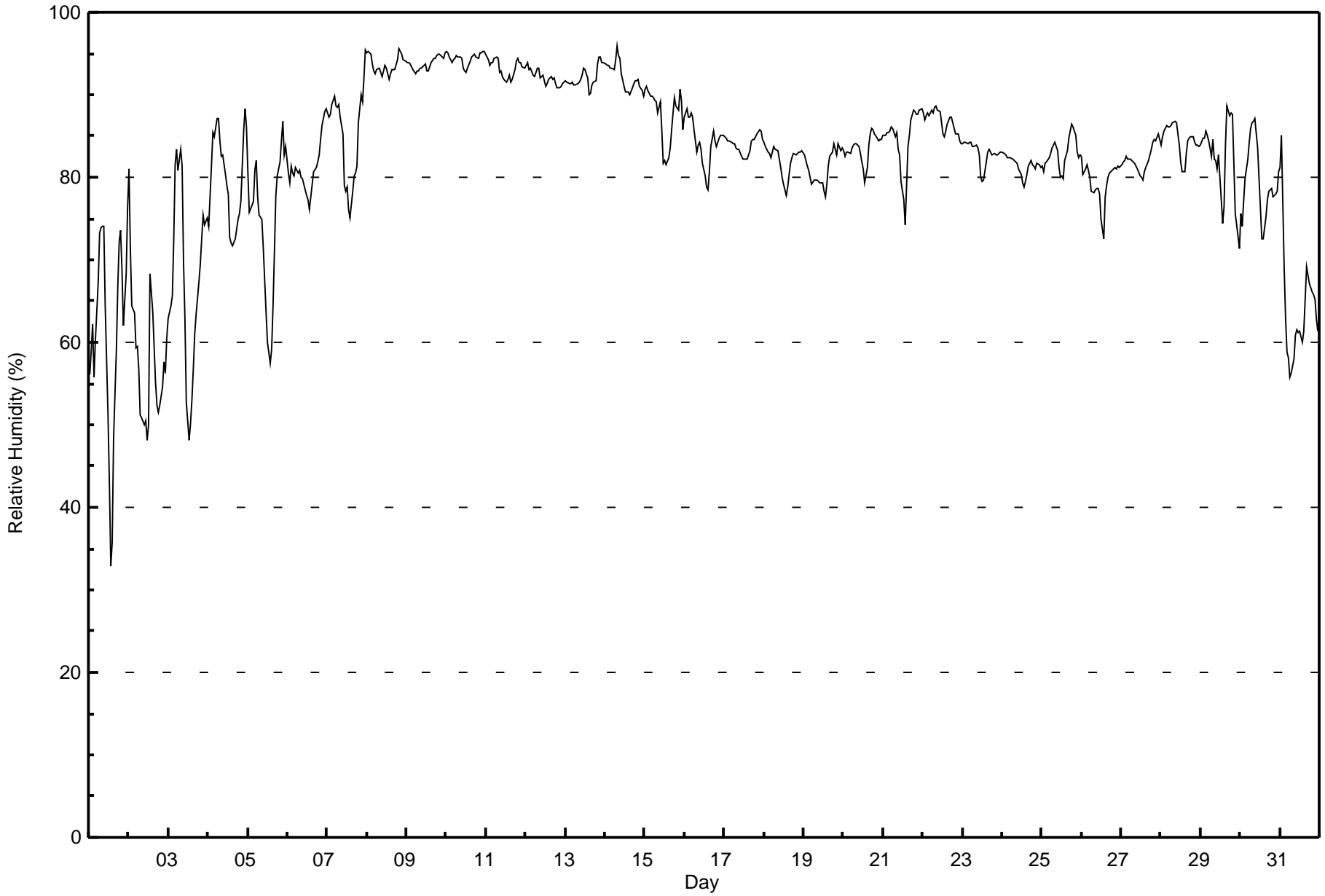


Maximum Value: 96 % on Dec 14 08:00																	Maximum Daily Average: 94.4 % on Dec 10																	Hours in Service: 744	
Minimum Value: 33 % on Dec 1 14:00																	Minimum Daily Average: 57.8 % on Dec 2																	Hours of Data: 744	
Maximum Diurnal Average: 84.1 % at hour 24																	Minimum Diurnal Average: 77.1 % at hour 14																	Hours of Missing Data: 0	
Monthly Average: 82.3 %																	Percentiles: P <sub>1</sub> = 50 P <sub>10</sub> = 68 Q <sub>1</sub> = 80 Median = 84 O <sub>3</sub> = 89 P <sub>90</sub> = 93 P <sub>99</sub> = 95																	Hours of Calibration: 0	
																																		Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	56	59	62	56	60	67	73	74	74	74	64	51	43	33	36	48	59	67	72	73	69	62	68	76	61.6	76									
2-Dec	81	71	64	64	59	59	57	51	51	50	50	48	50	68	64	59	55	52	52	52	54	58	56	60	57.8	81									
3-Dec	63	64	66	72	81	83	81	83	81	70	63	53	48	50	53	57	61	63	67	69	72	75	74	75	67.8	83									
4-Dec	74	78	82	85	85	87	87	84	82	83	80	79	78	73	72	72	73	74	75	76	77	86	88	86	79.8	88									
5-Dec	81	76	77	77	81	82	78	75	75	72	68	64	60	57	59	64	71	78	80	82	84	87	83	84	74.7	87									
6-Dec	80	79	81	80	80	81	80	81	80	80	79	78	77	76	78	79	81	81	82	83	85	86	88	88	81.0	88									
7-Dec	88	87	88	89	90	89	88	89	87	85	79	78	79	76	75	78	80	81	81	87	90	89	92	95	85.0	95									
8-Dec	95	95	95	94	93	92	93	93	93	92	93	93	93	92	92	93	93	93	94	96	95	95	94	94	93.6	96									
9-Dec	94	94	94	93	93	93	93	93	93	93	94	94	93	93	93	94	94	94	95	95	95	95	94	95	93.8	95									
10-Dec	95	95	95	94	94	94	95	95	95	94	93	93	93	93	94	95	95	95	95	94	95	95	95	95	94.4	95									
11-Dec	95	94	94	94	94	94	95	94	93	93	92	92	92	92	92	92	92	93	94	94	94	94	93	93	93.3	95									
12-Dec	94	94	93	93	92	92	93	93	93	92	92	92	91	91	92	92	92	92	91	91	91	91	91	92	92.1	94									
13-Dec	92	92	91	91	92	91	91	91	92	92	92	93	92	93	90	90	91	92	92	94	95	95	94	94	92.1	95									
14-Dec	94	94	93	93	93	93	91	94	96	95	94	93	91	90	90	90	91	91	92	92	92	91	91	90	92.2	96									
15-Dec	91	91	90	90	90	90	89	89	88	89	86	82	82	81	82	84	86	88	90	89	88	91	89	86	87.5	91									
16-Dec	87	88	87	87	88	87	86	83	84	84	83	82	80	79	78	81	84	86	84	84	84	85	85	85	84.3	88									
17-Dec	85	85	84	84	84	84	84	84	83	83	83	82	82	82	82	83	84	85	85	85	85	86	86	85	84.0	86									
18-Dec	84	84	83	83	82	83	84	83	83	82	81	80	79	78	79	80	82	82	83	83	83	83	83	83	82.1	84									
19-Dec	83	82	81	81	80	79	80	80	80	80	79	79	78	78	79	81	83	83	84	83	83	84	83	84	81.1	84									
20-Dec	83	82	83	83	83	83	84	84	84	84	83	82	81	79	81	84	85	86	86	85	85	84	85	85	83.5	86									
21-Dec	85	85	85	85	86	86	86	85	85	83	83	80	77	74	79	84	85	87	88	88	88	88	88	88	84.6	88									
22-Dec	88	87	87	88	87	88	88	88	89	88	88	87	85	85	86	86	87	87	87	86	85	85	84	84	86.7	89									
23-Dec	84	84	84	84	84	84	84	84	84	84	83	80	80	80	82	83	83	83	83	83	83	83	83	83	82.9	84									
24-Dec	83	83	83	82	82	82	82	82	82	82	81	80	79	79	79	80	81	82	82	82	81	81	82	81	81.4	83									
25-Dec	81	81	82	82	82	83	84	84	84	83	81	80	80	80	82	83	85	86	86	86	85	83	82	83	82.8	86									
26-Dec	82	80	81	82	81	80	78	78	79	79	79	78	75	73	78	79	80	81	81	81	81	81	81	81	79.5	82									
27-Dec	82	82	82	83	82	82	82	82	82	81	81	80	80	80	81	81	82	83	83	84	85	84	85	85	82.2	85									
28-Dec	84	85	86	86	86	86	86	87	87	87	85	84	82	81	81	83	84	85	85	85	84	84	84	84	84.5	87									
29-Dec	84	85	85	86	85	84	82	85	82	82	81	83	77	74	76	84	89	87	88	88	82	76	74	71	82.1	89									
30-Dec	76	74	77	80	82	84	86	87	87	87	84	80	76	72	73	75	77	78	78	79	78	78	78	81	79.4	87									
31-Dec	81	85	69	63	59	58	56	56	58	61	62	61	61	60	61	65	69	68	67	66	66	65	63	61	64.3	85									
																	84.0 83.7 83.4 83.4 83.6 84.0 83.8 83.7 83.3 82.7 81.1 79.3 77.9 77.1 78.1 80.0 81.8 82.6 83.3 83.6 83.6 83.8 83.8 84.1																	Diurnal Average	
																	95 95 95 94 94 94 95 96 95 94 94 94 93 93 94 95 95 95 95 95 96 95 95 95 95																	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Anzac - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Anzac - December 2015**

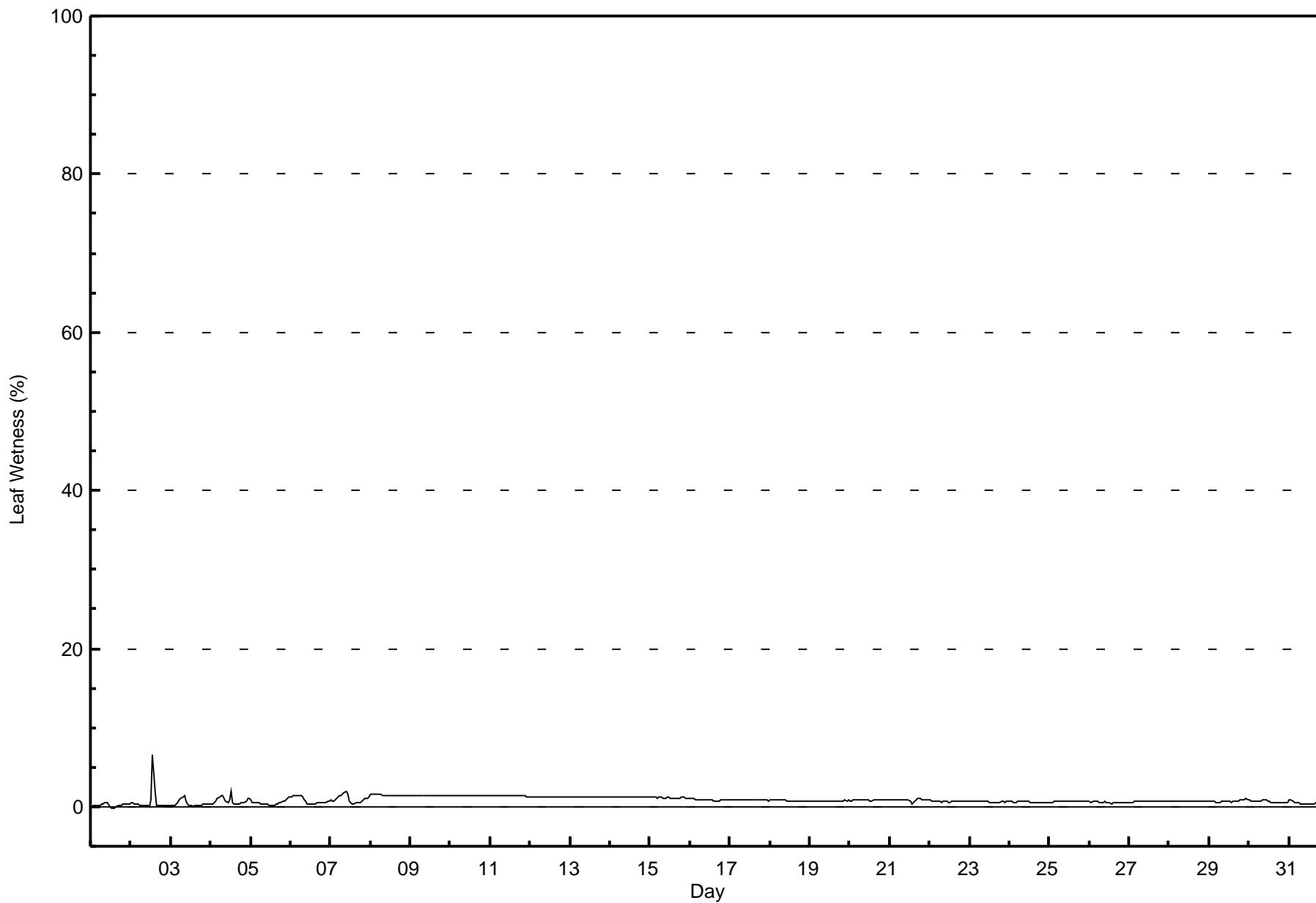
<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	2	0.27	0.27
40 - 60	38	5.11	5.38
60 - 80	152	20.43	25.81
80 - 100	552	74.19	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 7 % on Dec 2 14:00      Maximum Daily Average: 1.4 % on Dec 8																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0									
Minimum Value: 0 % on Dec 1 14:00      Minimum Daily Average: 0.2 % on Dec 1 Maximum Diurnal Average: 0.9 % at hour 8      Minimum Diurnal Average: 0.7 % at hour 16 Monthly Average: 0.8 %      Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 1 Q <sub>3</sub> = 1 P <sub>90</sub> = 1 P <sub>99</sub> = 2																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
2-Dec	1	1	0	0	0	0	0	0	0	0	0	0	1	7	2	0	0	0	0	0	0	0	0	0	0.6	7
3-Dec	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
4-Dec	0	0	1	1	1	1	1	1	1	1	0	1	2	1	0	0	0	0	0	0	1	1	1	0.8	2	
5-Dec	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.5	1	
6-Dec	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	0.8	1	
7-Dec	1	1	1	1	1	1	1	2	2	2	1	1	0	0	0	0	0	0	0	1	1	1	1	0.9	2	
8-Dec	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.4	2	
9-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.3	1	
10-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.4	1	
11-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.4	1	
12-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	1	
13-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	1	
14-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	1	
15-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	1	
16-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	
17-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1	
18-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	
19-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1	
20-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	
21-Dec	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0.8	1	
22-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1	
23-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1	
24-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1	
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1	
26-Dec	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0.6	1	
27-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1	
28-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1	
29-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1	
30-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1	
31-Dec	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1	
0.9 0.8 0.8 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.8 0.8 0.8 0.9 0.8 0.7 0.7 0.7 0.8 0.8 0.8 0.8 0.8 0.9																								Diurnal Average		
2 2 2 2 2 2 1 2 2 2 1 1 2 7 2 1 1 1 1 1 1 1 1 1 1																								Diurnal Maximum		





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Leaf Wetness (SW) - %**  
**Anzac - December 2015**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	63	8.53	8.53
0.4 - 0.5	66	8.93	17.46
0.6 - 0.7	237	32.07	49.53
0.8 - 1.4	356	48.17	97.70
1.5 - 10	12	1.62	99.32
> 10	0	0.00	99.32

Total Number of Valid Hours: 739

Total Number of Hours: 744





# Wood Buffalo Environmental Association

## Summary of Hour Averages

# Wind Speed (WS) - km/h

## Anzac - December 2015

Maximum Speed: 23 km/h on Dec 2 23:00	Maximum Daily Speed Average: 12.9 km/h on Dec 31	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 24 20:00	Minimum Daily Speed Average: 0.6 km/h on Dec 8	Hours of Data: 720
Maximum Diurnal Speed Average: 2.3 km/h at hour 18	Minimum Diurnal Speed Average: 0.5 km/h at hour 3	Hours of Missing Data: 24
Monthly Average Velocity: 1.4 km/h 197.4 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 5 Median = 7 Q <sub>3</sub> = 10 P <sub>90</sub> = 12 P <sub>99</sub> = 18	Percent Operational Time: 96.8

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	W4	WNW5	NW6	WNW7	W5	SSW3	SSE2	AF	AF	AF	NNW1	SSW2	AF	ENE5	SE3	SSW5	AF	S2	S3	WSW4	W5	W5	AF	WNW1	WSW2.0	WNW7
2-Dec	SSE6	S8	SSW8	SW9	SSW7	S8	SSW7	SSE8	SE8	SE10	SSE6	WSW10	W15	W12	W15	WSW16	WSW18	W18	W17	W19	W22	WNW20	W23	WNW18	WSW9.3	W23
3-Dec	WNW12	WNW10	WNW8	SW5	SSW6	SW6	SW6	SSE5	SE8	SSE9	SSE11	SE13	SE13	ESE12	SE11	SE6	ESE6	SE10	SE6	SE8	ESE5	SE6	SE6	SE6	SSE5.0	SE13
4-Dec	SE5	SE5	ESE6	SE6	ESE6	SE5	SSE7	SSE6	SSW4	WNW7	NW12	WNW15	WNW14	WNW14	WNW11	NW10	WNW11	W10	W9	WNW8	W7	WSW3	S5	WSW5	W3.8	WNW15
5-Dec	WNW7	W6	NW5	NW9	NW10	NW13	NW12	WNW13	WNW16	WNW15	WNW14	WNW15	WNW13	W12	W8	WNW6	W5	WSW4	SW6	SW4	S4	SSE6	SSE6	SE9	WNW6.7	WNW16
6-Dec	SE10	SE10	SE8	SE9	SE7	SSE8	SE9	SE9	SE12	SE11	SE10	SE9	SE13	SE12	SSE10	SSE8	SSE10	SSE8	SSE8	SSE7	SE5	SE4	SE4	SE5	SE8.5	SE13
7-Dec	SE6	SE3	SE5	SE5	SE8	SE8	SE11	SE12	SE12	SE12	SSE15	SE14	SE13	SE14	SSE14	SSE9	SE7	SSE6	ESE3	SE3	SSE3	SE1	WNW7	WNW12	SE6.7	SSE15
8-Dec	WNW10	WNW11	NW11	NW12	NNW11	NNW9	NNW8	NNW6	NW6	NW7	WNW7	WNW4	SW3	SSE8	SSE10	SSE7	SE7	SE7	ESE8	ESE10	ESE10	ESE10	ESE9	ESE8	NNW0.6	NW12
9-Dec	ESE9	ESE7	ESE8	ESE9	ESE10	SE9	SE7	SE9	SE8	SE8	SE9	SE8	SE6	ESE6	SE5	SE3	E1	AF	WSW4	W5	WNW5	WNW5	WNW5	WNW5	SE4.3	ESE10
10-Dec	WNW4	WNW4	NW6	NW6	WNW3	W2	NW2	N3	S1	AF	ESE1	ENE3	E3	E5	ENE6	E6	ESE7	ESE7	SE5	SE4	E6	ESE6	SE7	SE8	E1.8	SE8
11-Dec	SE9	SE10	SE9	SE7	SE7	SE8	SE8	SE7	SE9	SSE9	SSE7	SSE5	SE5	SSE4	SSE4	SE6	SE6	SE7	SE9	SE8	SE10	SE9	SE9	SE8	SE7.4	SE10
12-Dec	SE7	SE8	SE8	SE7	SSE7	SE9	SE10	SE10	SE10	SE10	SE10	SE11	SSE12	SE11	SE12	SSE12	SSE13	SSE12	SE10	SE9	SE9	SE8	SE9	SE10	SE9.7	SSE13
13-Dec	SE9	SE10	ESE11	ESE11	ESE13	ESE12	ESE9	ESE12	ESE11	SE10	ESE7	E7	ESE8	ESE8	SE7	ESE5	ESE4	E4	AF	AF	AF	ENE5	E5	E5	ESE8.1	ESE13
14-Dec	ENE2	N1	AF	AF	AF	AF	WNW3	NW3	NNW4	NW4	WNW6	WNW7	NW6	NW5	WNW4	WNW4	NW4	AF	SSE2	SSE3	SSE4	S5	S4	S5	WNW1.9	WNW7
15-Dec	SSE5	SSE5	SSE6	SSE6	SSE8	SSE9	SSE9	SSE6	SSE5	S6	WSW6	WNW10	W11	WNW9	WNW8	WNW9	W6	W7	W8	WNW10	WNW9	WNW9	NW12	NW13	WSW4.2	NW13
16-Dec	NW12	NW11	WNW9	WNW6	NNW4	NW8	NW9	NW9	NW7	NNW7	NW7	WNW9	WNW11	WNW10	WNW7	WNW6	SW4	W5	WNW9	NW12	NW11	NW9	NW8	NW8	NW7.8	NW12
17-Dec	NW8	NW9	WNW9	NW9	NW10	NW8	NW8	NW9	NW9	NW9	NW8	NW10	NW9	NW8	NW8	NW8	NW6	NW6	NW6	NW5	NW5	NNW4	N4	N3	NW7.3	NW10
18-Dec	NNE2	NNE3	NE3	E3	SE2	E2	ENE5	ESE2	ESE4	ESE6	E5	ESE5	SE6	SE5	ESE6	ESE6	ESE7	ESE7	ESE7	ESE8	ESE8	ESE8	ESE9	ESE9	ESE4.9	ESE9
19-Dec	ESE8	ESE8	ESE9	ESE9	ESE8	ESE8	ESE9	SE9	SE10	SE9	SE9	SE8	SE8	SE7	SE7	SE9	SE12	SE10	SE11	SE9	ESE8	SE10	SE10	SE11	SE8.8	SSE12
20-Dec	SE7	ESE6	SE9	SE10	SE10	SE11	SE11	SE11	SE11	SE10	SE10	SE12	SE11	SE12	SE14	SE13	SE11	SE10	SE11	SE13	SSE13	SSE11	SE10	SE10	SE10.7	SE14
21-Dec	SSE10	SE9	SE9	SSE9	SSE9	SSE8	SSE7	SSE6	SSE6	S5	SSE4	S1	SE1	S0	S2	S4	SSE2	AF	E3	E1	ESE2	SSE1	ENE1	NE1	SSE4.2	SSE10
22-Dec	E2	E3	ENE4	ENE4	ENE3	ENE4	ENE2	N4	N5	N4	N2	NE2	N2	NNW5	NNW4	W4	NW4	NNW7	NW5	WNW5	NNW4	NNW4	NW4	WNW5	N2.6	NNW7
23-Dec	NW6	NW4	NNW4	N5	NNW5	WNW5	NW4	WNW4	NW4	NW3	NW2	NNW3	N6	N6	NNW6	NNW6	NNW5	NNW5	NNW5	NNW5	NNW5	NNW5	NNW4	NNW5	NNW4.5	NNW6
24-Dec	NNW6	NNW7	NNW7	NW5	NW5	NW6	NW5	NW5	NW5	NW5	NW6	NW6	NW5	NNW6	NW6	NW5	NNW4	NNW4	N2	NE0	ESE1	S3	S5	SSE4	NW3.6	NNW7
25-Dec	SSE4	E1	S1	SSW3	SW3	W5	WSW4	WSW4	WNW4	WNW5	WNW6	WNW7	WNW7	WNW7	WNW6	W5	SW4	S2	WSW2	WNW6	NW8	NNW11	NNW9	NNW7	WNW3.8	NNW11
26-Dec	NW6	NW4	NNW5	N5	WNW4	W2	WSW2	AF	AF	AF	SSE3	SSE4	SSE5	SE5	ESE6	ESE6	ESE6	ESE7	SE8	SE8	SE9	SE9	SE9	ESE8	SE3.1	SE9
27-Dec	SE9	ESE9	ESE11	SE10	SE12	SE13	SE14	SE15	SE13	SE15	SSE18	SE12	SE12	SE9	SE10	SE9	SE8	SSE8	SSE7	SSE4	AF	AF	NW2	NW7	SE9.3	SSE18
28-Dec	WNW7	NW7	WNW4	WNW6	WNW6	WNW6	WNW6	WNW4	W3	NW3	W3	W3	SW2	ESE1	S3	S7	SSW7	S6	SSE7	SSE4	S5	S2	SSE3	SSE2	WSW2.2	NW7
29-Dec	SSE3	S4	SE4	SE2	AF	S3	SSW2	SW5	SW3	AF	SW5	SSW7	SSW7	SW9	SW8	SW6	SW7	SW9	SSW7	SW9	WSW10	WSW10	WSW9	W8	SW5.7	WSW10
30-Dec	WNW8	W12	WNW13	WNW14	WNW12	WNW11	WNW10	WNW11	WNW12	WNW12	WNW11	WNW11	WNW12	WNW10	WNW12	WNW12	WNW11	WNW11	WNW13	WNW13	WNW12	W10	W9	WSW7	WNW11.2	WNW14
31-Dec	WSW8	WSW6	WNW12	WNW15	W16	W11	W13	WNW16	WNW15	WNW16	WNW19	WNW18	WNW15	WNW15	WNW13	WNW12	WNW13	WNW12	WNW13	WNW13	WNW13	WNW11	W11	WNW12	WNW12.9	WNW19

SSW1.0	SSW0.7	SSE0.5	S0.7	S1.5	S1.7	S1.6	S1.9	S1.8	S1.8	SSW1.7	SW1.6	SW1.8	SSW1.2	SSW1.8	SSW2.1	SSW2.2	S2.3	SSW2.1	SW1.7	SW1.4	SSW1.1	SSW1.1	SW0.9	Diurnal Average
NNW12	WNW12	WNW13	WNW15	W16	NW13	SE14	WNW16	WNW16	WNW16	WNW19	WNW18	W15	WNW15	W15	WSW16	WSW18	W18	W17	W19	W22	WNW20	W23	WNW18	Diurnal Maximum

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

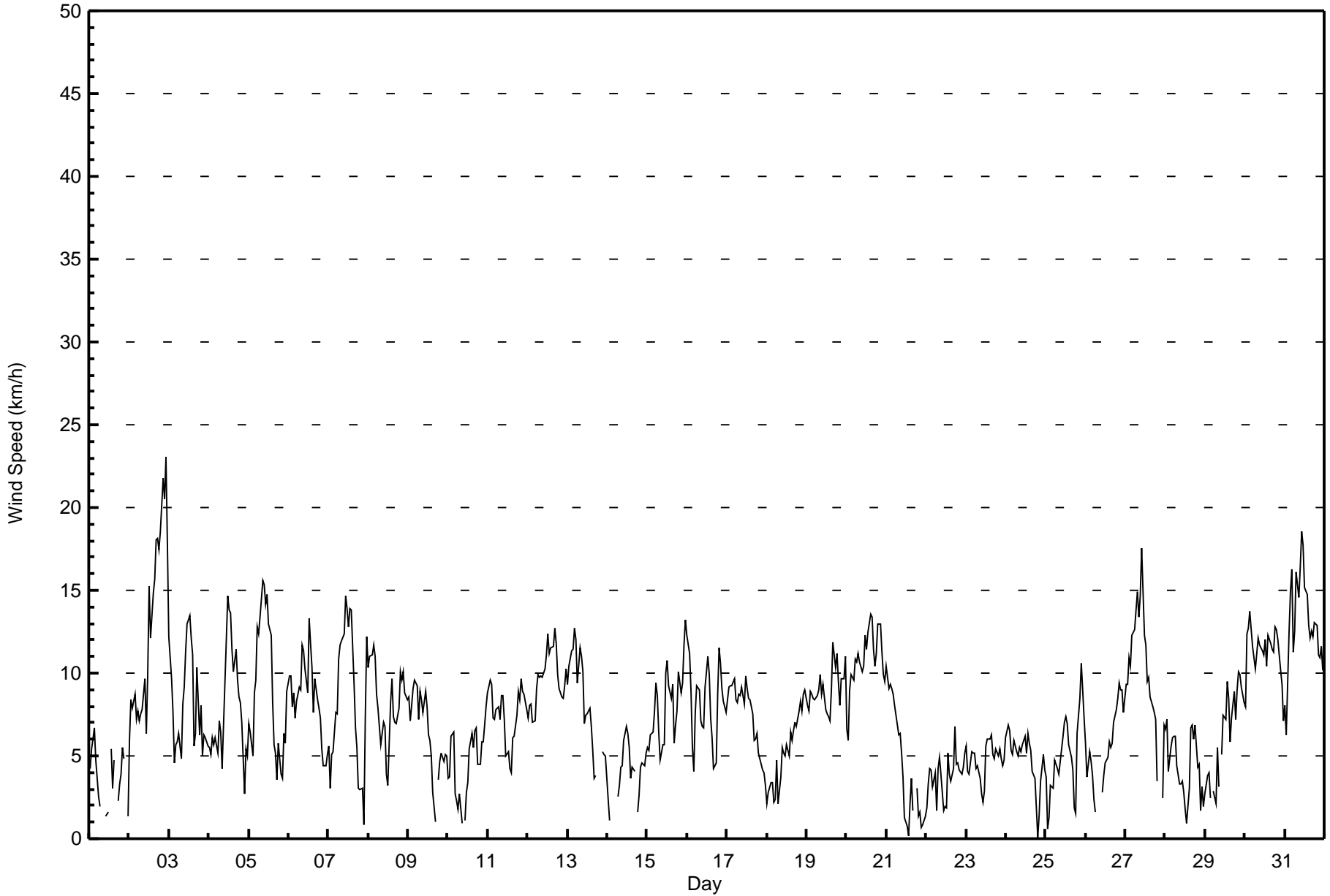
**Wind Speed (WS) - km/h**  
**Anzac - December 2015**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Dec 2 23:00 Minimum Value: 0 km/h on Dec 24 20:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 O <sub>1</sub> = 2 Median = 2 O <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 7																	Hours in Service: 744 Hours of Data: 720 Hours of Missing Data: 24 Hours of Calibration: 0 Percent Operational Time: 96.8																														
Day	Hourly Period Ending At (MST)																								Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																							
1-Dec	1	1	1	2	1	2	1	AF	AF	AF	1	2	AF	2	1	1	AF	2	1	1	2	2	AF	2	2																						
2-Dec	2	2	2	2	2	3	3	2	2	2	4	4	6	5	6	6	7	6	6	7	7	8	8	7	8																						
3-Dec	5	3	3	2	1	1	2	2	2	2	3	3	3	4	3	2	3	3	2	2	1	2	2	2	5																						
4-Dec	2	2	2	2	2	1	2	2	3	3	4	6	5	5	4	4	4	4	3	3	3	2	1	1	6																						
5-Dec	2	2	2	3	3	4	5	5	6	5	5	6	5	5	3	2	2	1	2	1	1	2	2	2	6																						
6-Dec	2	2	2	2	2	3	3	2	4	4	3	3	4	3	3	2	2	2	3	2	2	2	2	2	4																						
7-Dec	2	2	2	2	3	2	2	3	3	3	3	3	4	4	4	3	3	2	1	1	1	1	3	5	5																						
8-Dec	4	4	4	4	3	3	2	1	2	3	3	2	2	2	3	2	2	2	2	3	3	3	3	3	4																						
9-Dec	3	2	2	2	2	3	3	3	2	2	2	2	2	2	1	2	1	AF	1	1	2	2	2	2	3																						
10-Dec	2	2	2	2	1	2	1	1	2	AF	2	1	1	2	2	2	2	2	2	2	2	1	2	2	2																						
11-Dec	3	3	3	2	2	3	2	2	2	3	2	2	2	1	2	2	2	3	3	2	3	3	3	2	3																						
12-Dec	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	4	4	3	3	3	2	3	3	4																						
13-Dec	3	3	3	4	4	4	3	3	3	3	2	2	2	3	3	2	2	2	AF	AF	AF	2	1	1	4																						
14-Dec	2	1	AF	AF	AF	AF	2	2	1	2	2	2	2	2	2	2	1	AF	1	2	2	1	1	2	2																						
15-Dec	2	2	2	2	2	2	2	2	1	2	3	4	4	4	3	3	2	2	3	3	3	3	5	4	5																						
16-Dec	4	3	3	2	1	3	3	4	2	2	2	3	4	3	2	2	1	2	3	4	4	3	3	3	4																						
17-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	1	1	1	1	3																						
18-Dec	2	1	2	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	2	2	2	2	3	3	3																						
19-Dec	3	3	3	3	2	3	2	3	3	2	3	2	2	2	2	2	3	3	3	3	2	3	3	3	3																						
20-Dec	3	2	2	2	2	3	3	3	3	3	3	3	3	3	4	3	3	3	3	4	4	3	3	3	4																						
21-Dec	3	3	2	2	2	2	2	2	1	1	1	2	1	1	1	1	2	AF	2	1	2	1	2	2	3																						
22-Dec	2	2	1	1	1	1	2	2	2	2	2	2	1	2	1	1	2	2	3	2	2	1	2	2	3																						
23-Dec	2	1	1	2	2	2	2	2	2	1	1	2	2	2	2	2	2	1	1	1	1	1	2	1	2																						
24-Dec	2	2	2	2	1	2	1	2	2	2	2	2	2	2	2	2	1	1	1	0	1	2	1	1	2																						
25-Dec	2	1	1	2	1	1	1	1	1	2	2	2	2	2	2	2	1	2	1	2	3	4	3	2	4																						
26-Dec	2	1	2	1	1	1	1	AF	AF	AF	1	1	1	1	2	1	2	2	2	2	3	3	3	3	3																						
27-Dec	3	2	3	3	4	4	4	4	4	4	5	4	3	3	3	3	2	2	2	2	AF	AF	2	2	5																						
28-Dec	2	2	2	2	2	2	2	2	2	2	1	2	1	1	1	2	2	1	2	1	1	2	1	1	2																						
29-Dec	1	2	2	2	AF	1	2	2	2	AF	2	2	2	3	2	2	2	2	2	2	3	2	2	4	4																						
30-Dec	4	5	5	5	4	3	3	3	4	3	3	4	4	4	5	4	4	4	4	4	4	3	3	2	5																						
31-Dec	2	2	4	5	5	3	6	6	5	6	7	6	5	5	4	4	4	4	4	4	4	3	3	3	7																						
Diurnal Maximum																								5	5	5	5	5	4	6	6	6	6	7	6	6	5	6	6	7	6	6	7	7	8	8	7
AF - Analyzer Failure																																															



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed (WS) - km/h**  
**Anzac - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Anzac - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	236	32.78	32.78
6 - 11	384	53.33	86.11
12 - 19	97	13.47	99.58
20 - 28	3	0.42	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Anzac - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	11	2	3	12	14	12	22	27	21	6	10	9	15	22	27	23	236
6 - 11	2	0	0	1	3	53	123	42	5	8	10	8	13	51	48	17	384
12 - 19	0	0	0	0	0	4	25	9	0	0	0	2	9	40	8	0	97
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	3
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	2	3	13	17	69	170	78	26	14	20	19	39	114	83	40	720

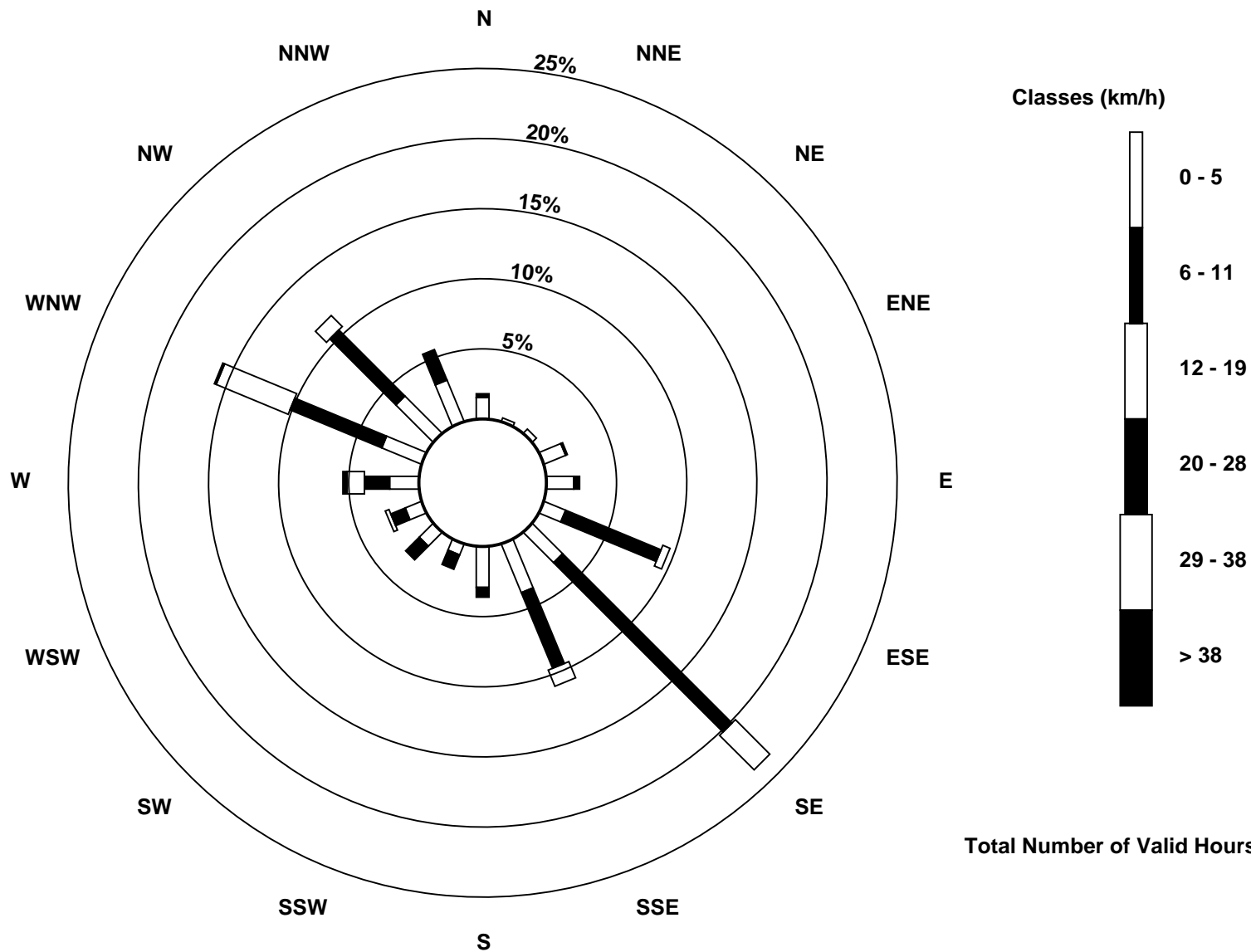
Total Number of Valid Hours: 720

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
Anzac (AMS 14)





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Direction (WD) - deg

Anzac - December 2015

Direction of Maximum Speed: 276 deg on Dec 2 23:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 286.5 deg on Dec 31	Hours of Data: 720
Direction of Minimum Speed: 52 deg on Dec 24 20:00	Hours of Missing Data: 24
Direction of Minimum Daily Speed Average: 0.6 deg on Dec 8	Percent Operational Time: 96.8
Monthly Average Direction: 273.9 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	281	303	305	295	259	202	162	AF	AF	AF	345	210	AF	78	146	192	AF	187	173	242	272	260	AF	286	255.7
2-Dec	163	171	192	226	210	188	194	162	144	140	150	248	267	273	268	258	258	265	271	275	279	283	276	295	252.4
3-Dec	294	290	293	223	204	215	218	151	134	147	151	137	134	115	125	138	115	125	145	127	119	128	146	130	148.7
4-Dec	140	125	118	124	116	128	150	151	209	303	307	292	293	295	296	307	292	273	263	284	272	248	180	237	270.5
5-Dec	288	266	305	316	315	315	318	293	291	292	299	291	285	274	280	290	270	252	224	224	170	155	152	132	285.7
6-Dec	134	129	131	133	138	148	143	141	126	139	137	134	137	142	147	160	160	158	152	150	140	131	141	145	141.1
7-Dec	132	128	124	130	140	128	128	132	144	142	148	134	145	144	152	149	142	168	118	145	151	142	285	300	143.6
8-Dec	300	300	305	314	329	335	330	330	317	304	299	293	221	164	159	163	144	126	103	106	106	110	106	114	344.9
9-Dec	122	120	120	121	120	130	131	131	135	142	135	133	124	123	139	125	94	AF	240	265	285	288	291	284	135.7
10-Dec	295	300	317	317	290	276	325	352	186	AF	122	77	86	81	71	87	113	119	132	124	99	122	140	144	98.9
11-Dec	145	141	144	141	140	139	134	138	140	154	149	158	146	163	153	144	135	129	124	124	141	138	140	138	140.5
12-Dec	138	133	144	144	156	139	139	139	141	146	139	140	148	143	146	149	153	151	144	139	145	141	135	137	143.2
13-Dec	127	127	122	119	120	123	117	123	123	127	112	98	103	107	127	115	111	100	AF	AF	AF	76	83	87	115.4
14-Dec	64	5	AF	AF	AF	AF	300	322	331	314	297	298	304	304	296	285	312	AF	162	158	167	177	175	179	283.5
15-Dec	161	168	157	164	162	164	157	165	163	179	242	285	280	285	291	288	268	262	271	294	294	297	314	312	255.4
16-Dec	313	322	345	343	331	317	313	317	325	329	320	309	298	301	293	284	235	267	299	307	309	311	313	311	310.8
17-Dec	306	304	302	305	309	313	314	316	313	314	316	314	322	313	310	316	313	315	310	313	321	348	1	0	314.6
18-Dec	13	16	48	91	124	82	71	119	108	118	98	108	135	134	113	117	105	112	115	117	102	103	102	111	105.5
19-Dec	118	111	117	116	116	115	120	138	136	144	140	140	135	130	139	140	146	143	139	130	111	125	135	130	130.5
20-Dec	127	108	129	142	138	136	139	135	136	142	138	140	138	142	141	136	143	143	133	133	147	151	137	138	138.1
21-Dec	149	142	145	148	151	150	157	158	165	172	156	176	141	186	178	175	162	AF	92	100	103	164	74	53	150.0
22-Dec	100	86	57	63	70	70	61	355	354	357	349	56	353	337	327	264	318	346	309	303	329	328	323	302	350.7
23-Dec	305	320	337	349	331	301	315	286	309	316	325	340	351	350	347	347	337	330	335	339	335	334	329	333	330.7
24-Dec	332	335	333	323	315	322	322	309	315	307	306	318	317	329	326	324	332	341	3	52	102	179	170	157	320.5
25-Dec	163	91	169	192	217	265	258	253	287	288	297	299	300	294	301	270	226	191	243	298	310	333	340	327	290.8
26-Dec	322	318	330	353	285	279	256	AF	AF	AF	168	162	153	129	110	120	119	118	132	137	130	139	127	123	128.8
27-Dec	126	123	122	131	140	139	142	145	144	142	153	145	142	134	135	142	135	148	153	164	AF	AF	309	308	140.6
28-Dec	300	305	297	298	290	289	298	297	272	307	272	281	221	122	184	180	192	171	156	167	178	187	151	148	245.8
29-Dec	159	169	140	145	AF	181	212	220	219	AF	219	213	206	227	230	221	215	225	211	221	237	252	257	265	222.2
30-Dec	285	281	287	291	289	287	287	290	296	295	293	286	287	293	289	295	292	291	285	282	283	279	281	249	287.2
31-Dec	256	251	291	287	281	272	280	286	282	289	295	297	295	291	292	287	290	294	295	287	286	281	283	284	286.5

194.1 192.9 150.0 186.0 185.1 175.2 174.2 177.1 172.0 185.8 201.0 228.3 221.4 210.8 199.8 204.5 196.3 189.8 195.5 215.0 226.7 210.7 209.5 217.2

Diurnal Average

AF - Analyzer Failure

All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Direction (WD) - deg

Anzac - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 90 deg on Dec 21 22:00			Hours of Data:	720
Minimum Value: 11 deg on Dec 3 06:00			Hours of Missing Data:	24
Percentiles: P <sub>1</sub> = 13 P <sub>10</sub> = 16 Q <sub>1</sub> = 19 Median = 22 Q <sub>3</sub> = 25 P <sub>90</sub> = 31 P <sub>99</sub> = 73			Hours of Calibration:	0
			Percent Operational Time:	96.8

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	38	13	13	18	17	54	21	AF	AF	AF	45	75	AF	29	51	19	AF	19	22	28	21	23	AF	79	
2-Dec	16	16	18	12	20	22	29	23	15	16	51	30	27	30	29	28	27	26	27	27	27	28	28	27	51
3-Dec	27	27	22	37	15	11	15	32	19	17	20	19	20	22	19	21	27	21	23	22	19	23	23	23	37
4-Dec	27	25	18	26	21	20	21	26	52	25	23	29	27	25	24	24	25	25	24	25	25	42	15	30	52
5-Dec	22	26	25	26	22	21	22	27	26	26	26	28	31	28	30	21	20	35	12	12	29	15	28	12	35
6-Dec	14	13	13	15	20	23	20	20	19	22	22	25	20	21	21	20	16	18	19	17	19	20	22	21	25
7-Dec	22	56	27	27	21	24	15	14	16	15	17	17	22	19	18	22	24	25	25	26	28	84	22	26	84
8-Dec	25	27	24	20	22	18	17	16	19	28	28	39	49	23	20	24	24	26	23	23	22	23	24	22	49
9-Dec	22	23	20	19	18	19	30	18	17	19	19	19	22	22	22	27	47	AF	18	20	25	22	25	26	47
10-Dec	22	25	21	19	47	48	22	19	74	AF	73	32	33	16	17	21	22	25	25	32	24	19	19	21	74
11-Dec	22	24	22	22	28	23	20	22	21	20	20	21	21	23	27	19	20	22	20	20	19	20	20	19	28
12-Dec	21	20	19	21	18	21	21	20	23	21	22	21	18	21	20	20	20	20	21	25	23	22	22	21	25
13-Dec	21	21	20	21	21	20	22	16	17	18	23	23	26	25	23	24	25	21	AF	AF	AF	19	23	16	26
14-Dec	25	34	AF	AF	AF	AF	28	23	16	21	25	23	22	23	25	26	19	AF	49	17	22	22	24	23	49
15-Dec	18	20	16	21	17	16	18	20	21	20	43	30	28	31	28	27	24	17	24	24	26	25	23	21	43
16-Dec	20	26	15	18	17	22	21	22	17	15	21	20	26	21	23	22	17	19	23	21	21	21	20	21	26
17-Dec	21	24	25	25	21	22	20	21	19	20	22	20	20	21	21	20	21	19	19	20	17	16	18	14	25
18-Dec	37	24	21	27	34	33	21	50	23	18	26	25	36	24	26	23	23	28	25	26	22	24	23	22	50
19-Dec	25	22	21	23	23	20	20	19	18	19	20	22	21	17	16	17	16	18	19	21	19	18	20	16	25
20-Dec	34	22	15	17	18	18	19	20	20	21	21	20	19	18	18	19	18	20	19	19	21	18	17	20	34
21-Dec	19	19	19	19	18	16	17	15	14	12	18	85	71	81	55	28	72	AF	40	86	63	90	75	54	90
22-Dec	57	27	18	24	25	27	32	19	15	26	35	27	48	20	20	31	23	16	26	22	20	18	19	25	57
23-Dec	26	23	22	20	26	39	36	30	26	27	19	31	20	23	18	17	21	16	16	16	14	17	16	17	39
24-Dec	15	15	16	17	18	16	18	21	19	22	23	23	25	18	18	16	14	18	15	24	44	14	18	19	44
25-Dec	29	64	65	19	27	16	12	17	19	20	25	23	24	25	24	28	18	66	36	24	24	18	16	16	66
26-Dec	23	16	16	23	22	32	41	AF	AF	AF	23	22	22	28	23	22	25	19	19	18	17	20	20	23	41
27-Dec	18	19	18	21	23	21	20	21	24	20	20	23	23	23	21	23	16	19	15	32	AF	AF	26	21	32
28-Dec	26	23	29	25	26	26	28	33	31	25	35	41	55	50	27	20	24	19	16	22	19	66	23	27	66
29-Dec	21	33	30	55	AF	28	61	22	21	AF	22	19	20	16	13	14	16	13	16	14	19	16	20	27	61
30-Dec	30	30	28	28	25	23	22	22	21	20	21	26	26	27	27	26	25	26	26	25	26	23	23	19	30
31-Dec	17	25	23	24	23	20	24	28	27	28	26	23	24	24	24	22	22	25	24	24	23	21	22	25	28
Diurnal Maximum																									

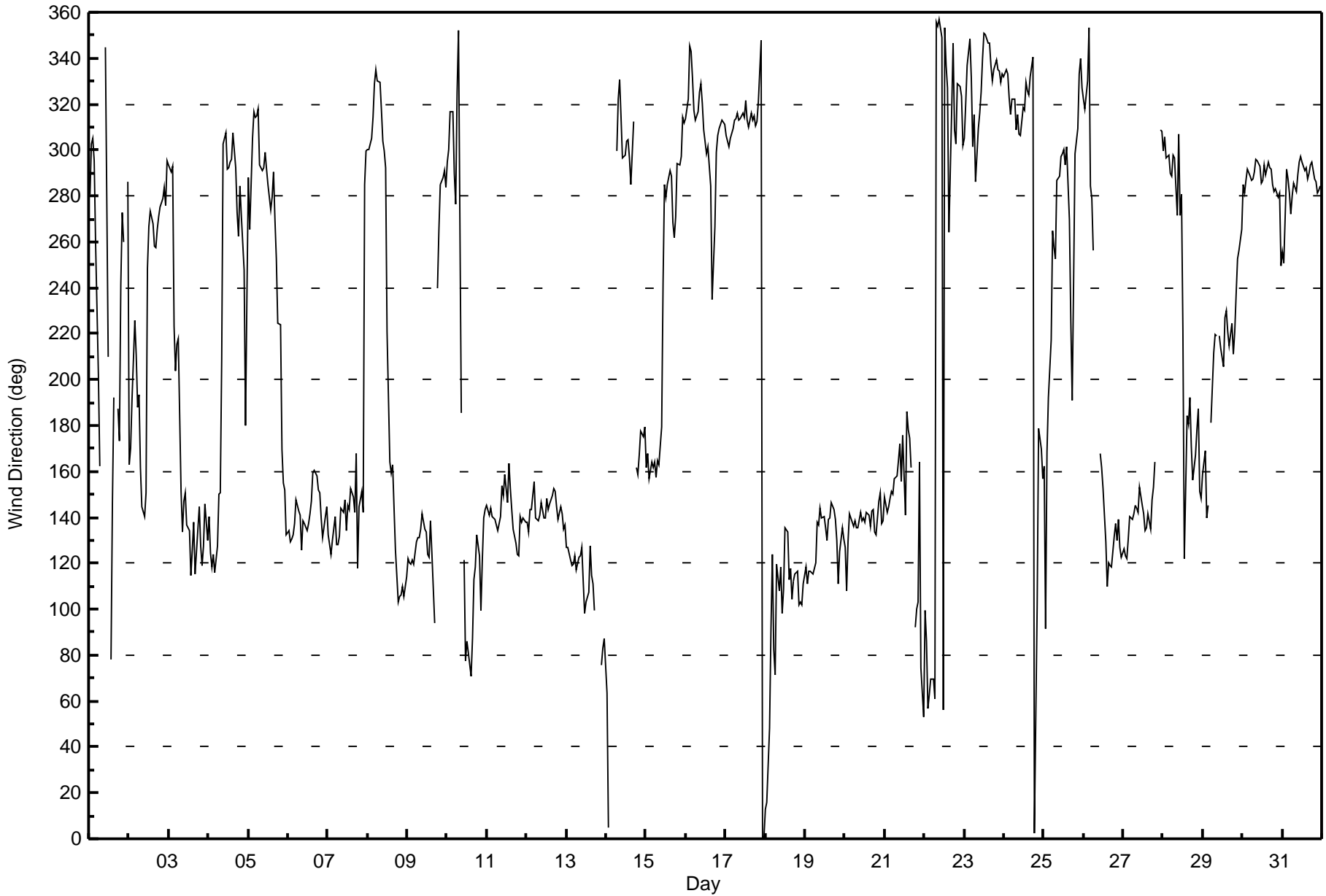
AF - Analyzer Failure





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Direction (WD) - deg**  
**Anzac - December 2015**





Maximum Value: 0.3 mm on Dec 9 05:00		Maximum Daily Total: 0.3 mm on Dec 9		Hours in Service: 744																									
Minimum Value: 0.0 mm on Dec 1 01:00		Minimum Daily Total: 0.0 mm on Dec 1		Hours of Data: 744																									
Maximum Diurnal Total: 0.3 mm at hour 5		Minimum Diurnal Total: 0.0 mm at hour 1		Hours of Missing Data: 0																									
Monthly Total: 0.25 mm		Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.0		Hours of Calibration: 0																									
				Percent Operational Time: 100.0																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
2-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
3-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
4-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
5-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
6-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
7-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
8-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
9-Dec	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	
10-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
11-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
12-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
13-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
14-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
15-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
16-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
17-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
18-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
19-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
20-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
21-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
22-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
23-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
24-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
25-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
26-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
27-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
28-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
29-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
30-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
31-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
		0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Diurnal Average
		0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Diurnal Maximum

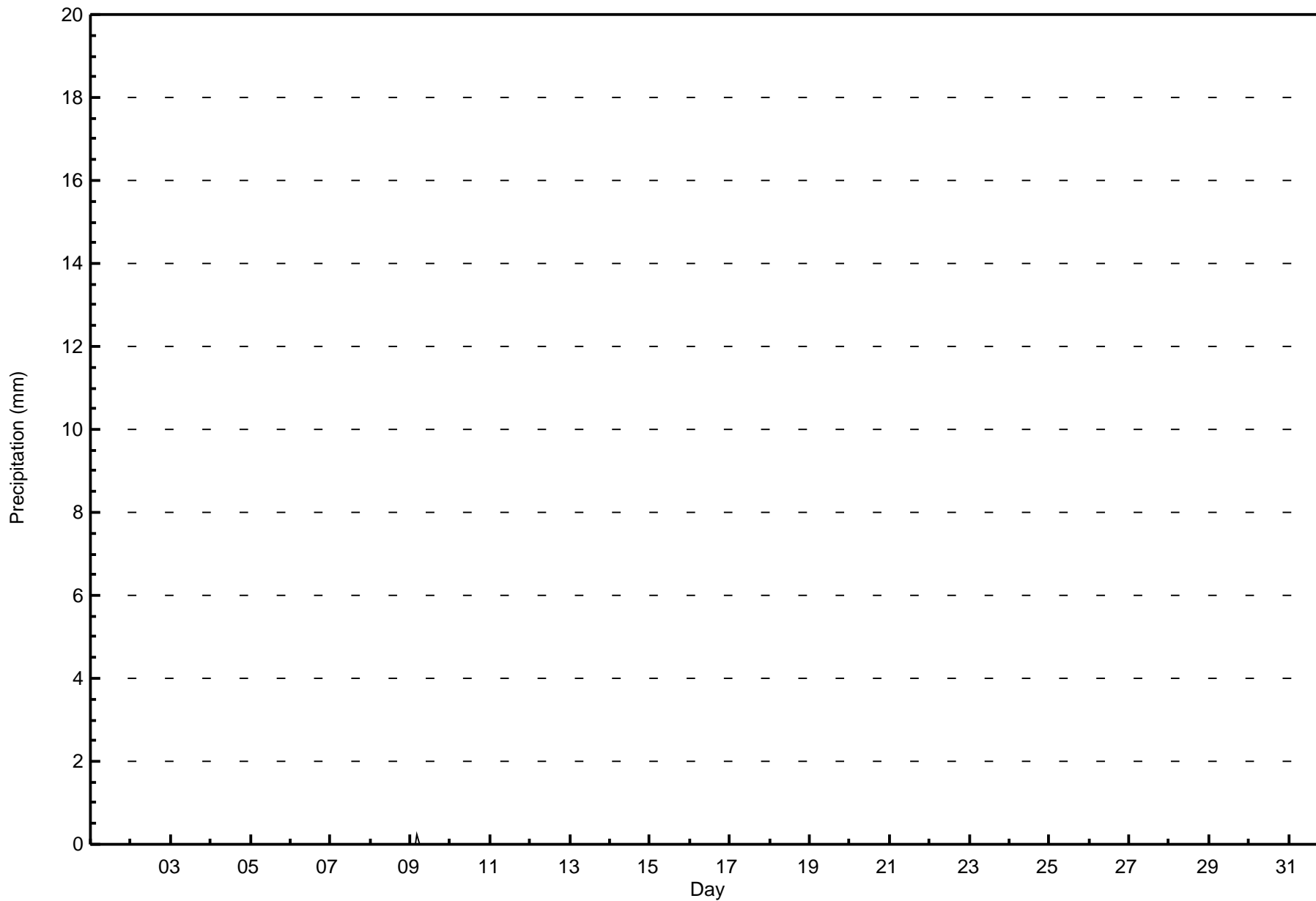


Wood Buffalo Environmental Association

Hourly Averages

Precipitation (PC) - mm

Anzac - December 2015





# Wood Buffalo Environmental Association

## SO2 Calibration Report

### Station Information

Calibration Date	December 3, 2015	Last Calibration	November 5, 2015
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	7:40	End Time (MST)	11:59
Gas Cert Reference	SA130026A	Station temp.	22 Deg C
Cal Gas Concentration	47.2 ppm	Cal Gas Exp Date	12/12/2016
Calibrator Make/Model	Sabio 4010	Serial Number	8400311
ZAG Make/Model	API 701	Serial Number	764
DACS make/model	Campbell Scientific CR3000	DACS serial No.	8790

### Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	524	524
Analyzer IP address	192.168.1.43		Lamp voltage	2673	2639
Calculated slope	1.001775	0.997143	Chamber temp	50.0	50.0
Calculated intercept	-0.147380	1.857119	Pressure	25.1	25.0
Analyzer Background	19.4	19.4	Flow	655	651
Analyzer Coefficient	1.011	1.021	Intensity	66	65

Analyzer make API T100 Analyzer serial # 723

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.2	----
as found span	5000	74.9	707.1	700.0	1.010
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	74.9	707.1	708.5	0.998
second point	5000	37.5	354.0	351.0	1.009
third point	5000	18.7	176.5	174.3	1.013
as left zero	5000	0.0	0.0	0.4	----
as left span	5000	74.9	707.1	700.5	1.009
Average Correction Factor					1.006

Corrected As found 700.2 Previous response 706.0 % change 0.8%

**Notes:**

span adjusted, Filter changed No maintenance done.

Calibration Performed By: Melissa Lemay



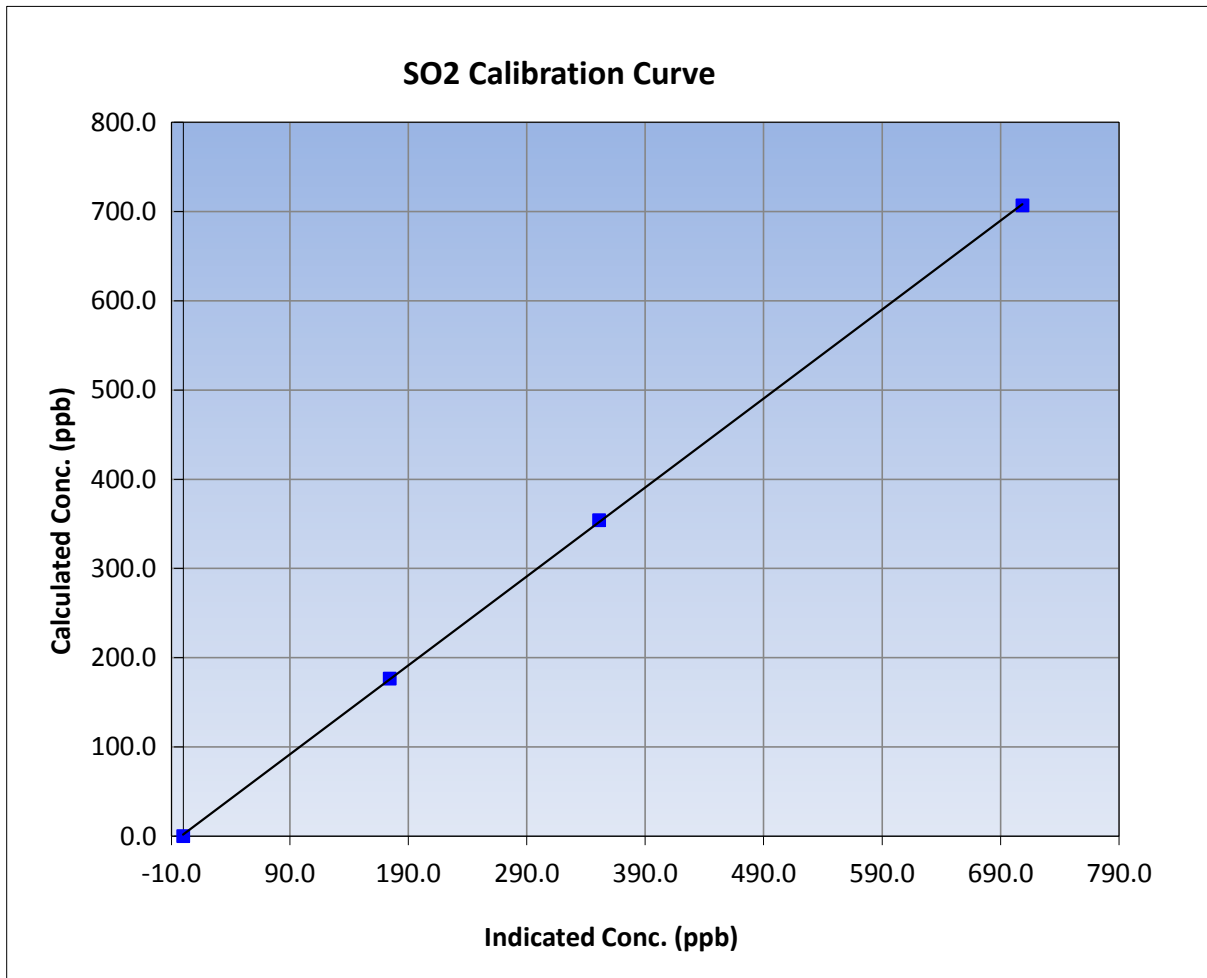
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 5, 2015
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:40	End Time (MST)	11:59
Analyzer make	API T100	Analyzer serial #	723

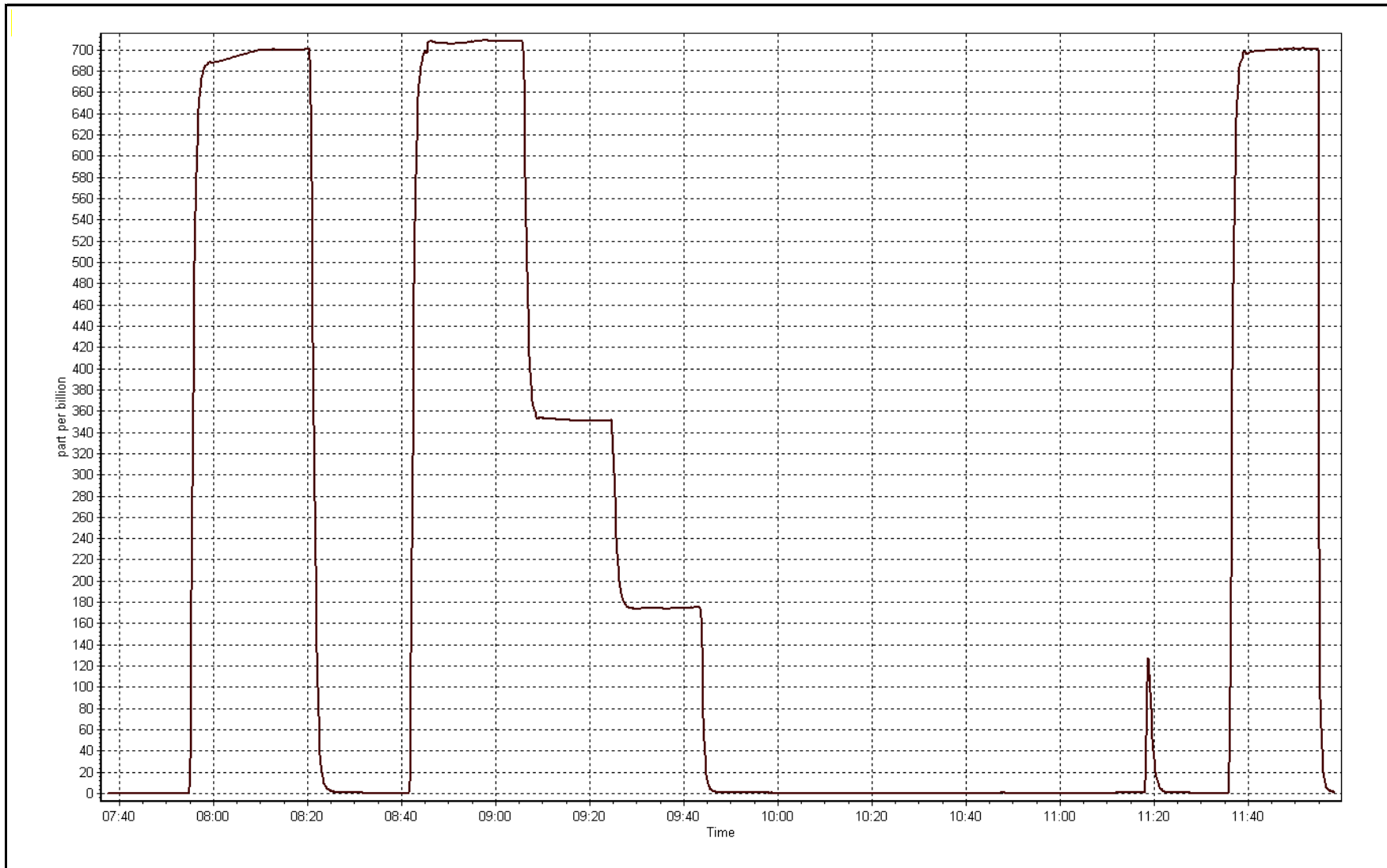
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999963
707.1	708.5	0.9980		
354.0	351.0	1.0085	Slope	0.997143
176.5	174.3	1.0128		
			Intercept	1.857119



SO2 Calibration Plot

Date: December 3, 2015





# Wood Buffalo Environmental Association

## TRS Calibration Report

### Station Information

Calibration Date	December 4, 2015	Last Calibration	November 16, 2015
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	10:20	End Time (MST)	12:52
Gas Cert Reference	ALM033528	Station temp.	22 Deg C
Cal Gas Concentration	5.05 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	Sabio 4010	Serial Number	8400311
Dil air Make/Model	API 701	Serial Number	4764
DACS make/model	Campbell Scientific CR3000	DACS serial No.	8790
SO2 gas concentration	47.2 ppm	SO2 gas cert/exp	SA130026A 12/Dec/16

### Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-732	-731
Analyzer IP address	192.168.1.42		Lamp voltage	989	996
Calculated slope	0.993938	0.995268	Chamber temp	45	45
Calculated intercept	0.015038	-0.005219	Pressure	653.2	646.8
Analyzer Background	1.17	1.17	Flow	0.380	0.376
Analyzer Coefficient	1.168	1.168	Intensity	98	98
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1300156232	
Converter make/model	CDN-101		Converter serial #	510	

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.0	----
as found span	5000	74.3	75.0	75.4	0.995
SO2 scrubber check	5000	18.7	176.5	0.5	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	74.3	75.0	75.4	0.995
second point	5000	39.6	40.0	40.2	0.995
third point	5000	19.8	20.0	20.1	0.995
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	74.3	75.0	74.7	1.005
Average Correction Factor					0.995

Corrected As found	75.4	Previous response	75.5	% change	0.1%
--------------------	------	-------------------	------	----------	------

Notes:

filter changed out, no adjustments or maintenance done

Calibration Performed By:

Melissa Lemay



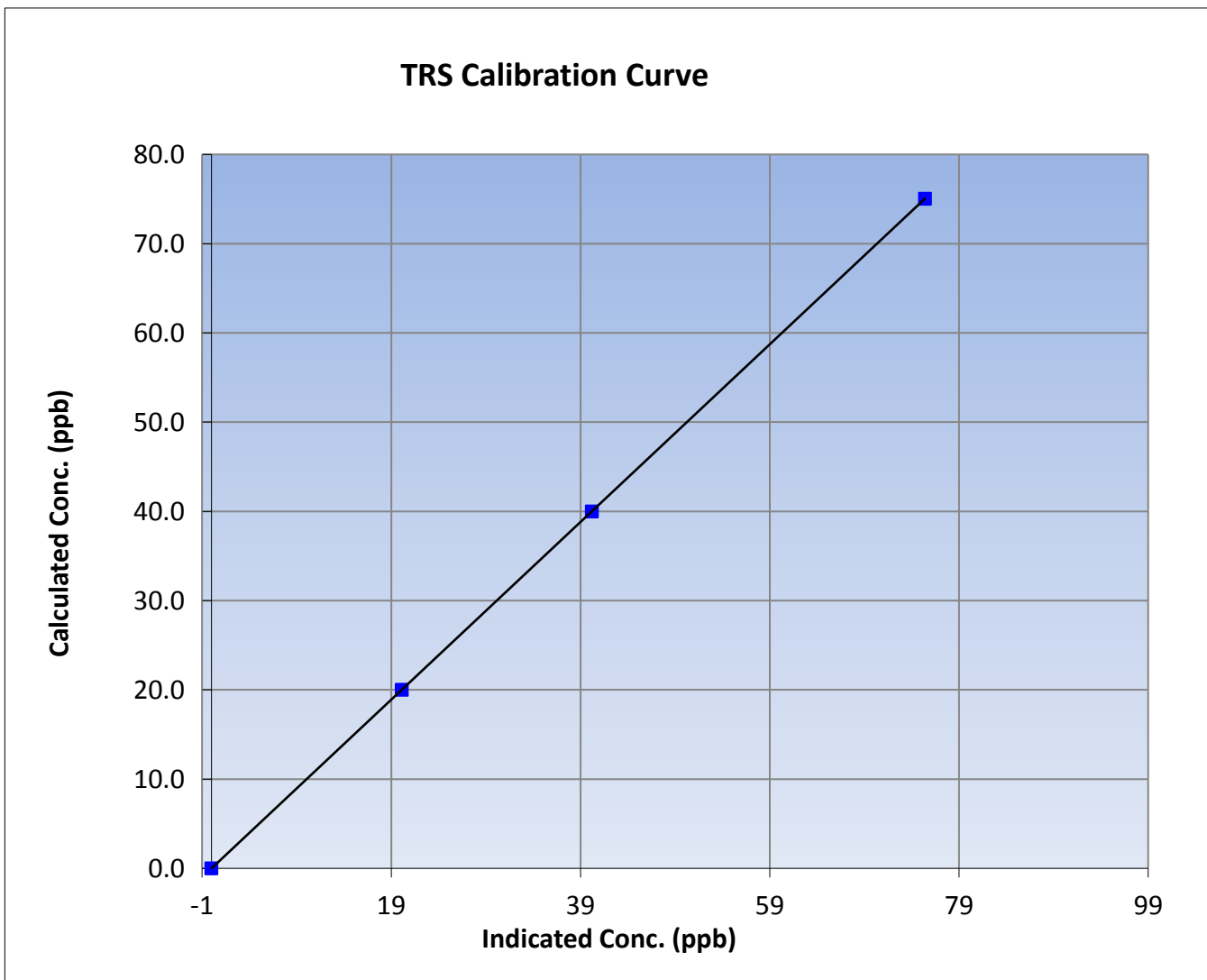
# Wood Buffalo Environmental Association TRS Calibration Report

## Station Information

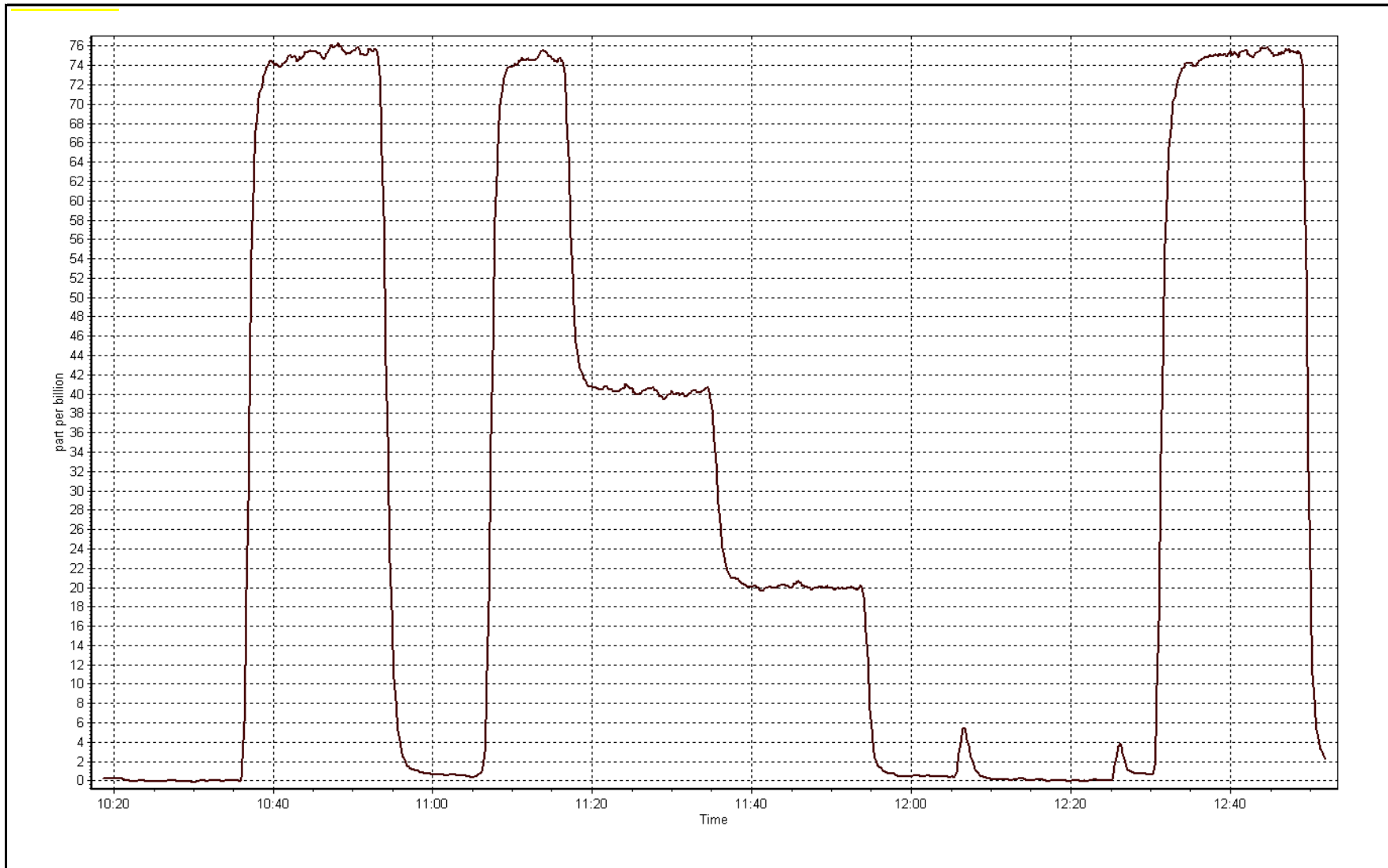
Calibration Date	December 4, 2015	Previous Calibration	November 16, 2015
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	10:20	End Time (MST)	12:52
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1300156232

## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	1.000000
75.0	75.4	0.9953		
40.0	40.2	0.9949	Slope	0.995268
20.0	20.1	0.9949		
			Intercept	-0.005219









## Wood Buffalo Environmental Association THC / NMHC Calibration Report

### Station Information

Calibration Date	December-03-15	Last Calibration	November-05-15
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	7:40	End Time (MST)	11:57
Gas Cert Reference	SA130026A	Cal Gas Expiry Date	December-12-16
CH4 Cal Gas Conc.	512.0 ppm	CH4 Equiv Conc.	1092.3 ppm
C3H8 Cal Gas Conc.	211.0 ppm	Station temp.	22 Deg C
Calibrator Model	Sabio 4010	Serial Number	8400311
ZAG make/model	Teledyne API 701	Serial Number	4764
DACS make/model	Campbell Scientific CR3000	Serial Number	8790

### Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.0	75.1
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.1
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	1.005119	0.997700	Carrier Pressure	31.8	31.8
THC Calc intercept	0.028382	0.068546	Fuel Pressure	41.4	41.4
NMHC Calc slope	1.002887	0.999306	Air Pressure	32.5	32.6
NMHC Calc intercept	0.010119	0.026161			

Analyzer make Thermo 55i Analyzer serial # 1218153355

### THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	74.9	16.36	15.90	1.029
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	74.9	16.36	16.38	0.999
second point	5000	37.5	8.19	8.06	1.016
third point	5000	18.7	4.09	3.99	1.024
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	74.9	16.36	16.29	1.004
Average Correction Factor					1.013

Corrected As found 15.90 Previous response 16.25 % change 2.2%

**Notes:**

No maintenance done, filter change out, span adjusted

Calibration Performed By: Melissa Lemay



## Wood Buffalo Environmental Association THC / NMHC Calibration Report

### NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	74.9	8.69	8.49	1.024
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	74.9	8.69	8.69	1.000
second point	5000	37.5	4.35	4.30	1.012
third point	5000	18.7	2.17	2.13	1.019
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	74.9	8.69	8.65	1.005
Average Correction Factor					1.010

Corrected As found      8.49      Previous response      8.66      % change      2.0%

### CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	74.9	7.67	7.42	1.034
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	74.9	7.67	7.68	0.999
second point	5000	37.5	3.84	3.76	1.021
third point	5000	18.7	1.91	1.86	1.030
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	74.9	7.67	7.64	1.004
Average Correction Factor					1.016

Corrected As found      7.42      Previous response      7.59      % change      2.3%



# Wood Buffalo Environmental Association

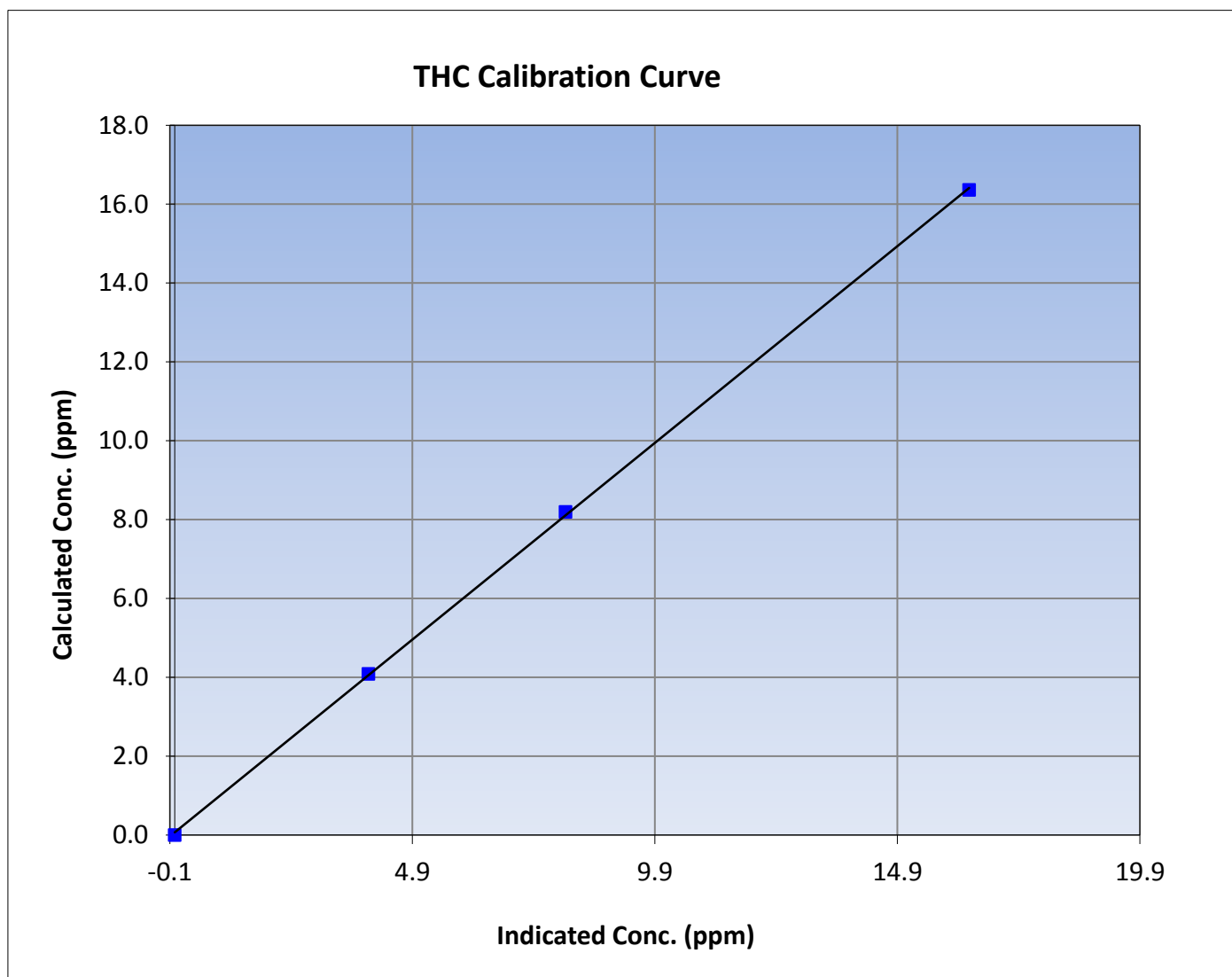
## THC Calibration Summary

### Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 5, 2015
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:40	End Time (MST)	11:57
Analyzer make	Thermo 55i	Analyzer serial #	1218153355

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999897
16.36	16.38	0.9989		
8.19	8.06	1.0164	Slope	0.997700
4.09	3.99	1.0238		
			Intercept	0.068546





# Wood Buffalo Environmental Association

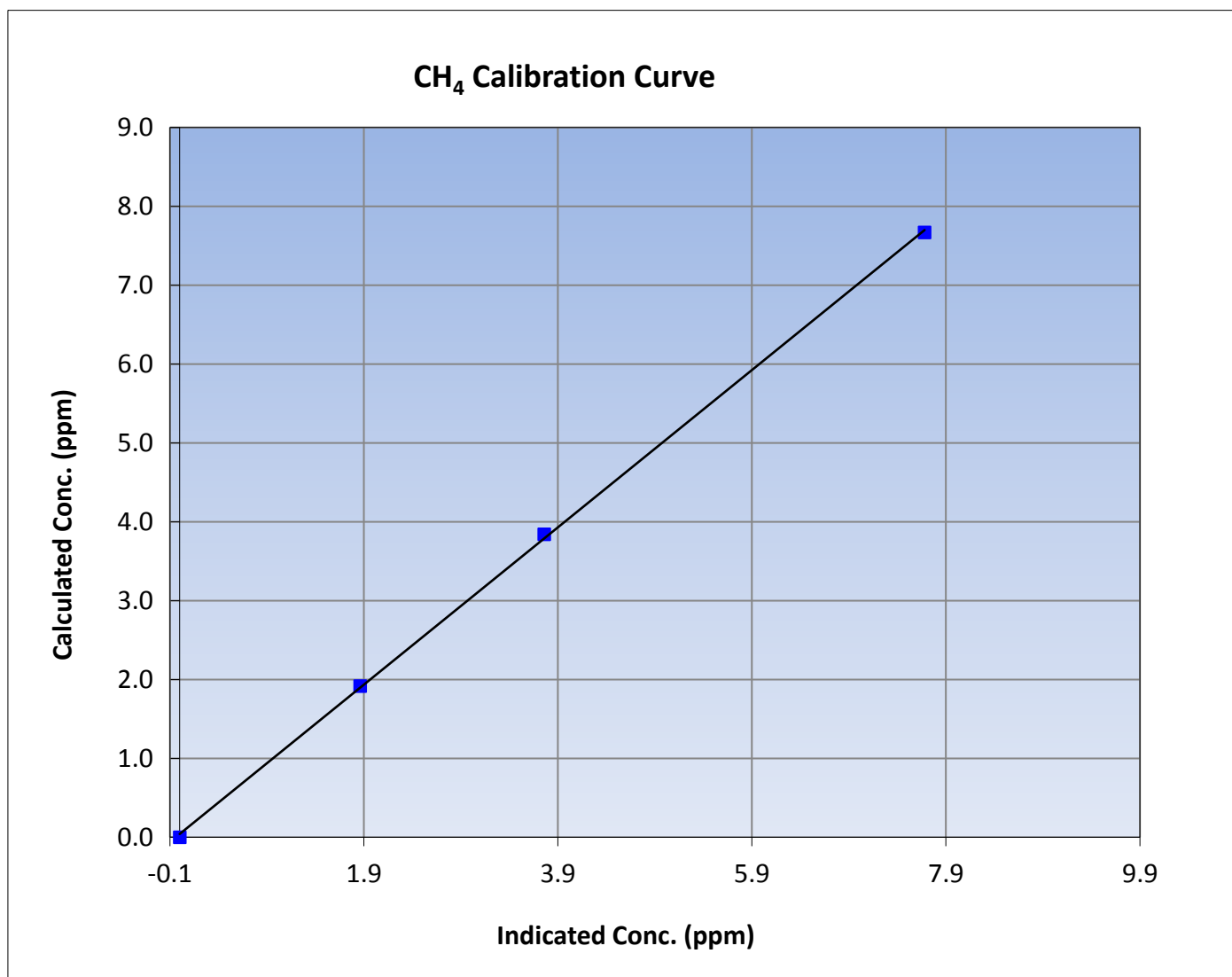
## CH<sub>4</sub> Calibration Summary

### Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 5, 2015
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:40	End Time (MST)	11:57
Analyzer make	Thermo 55i	Analyzer serial #	1218153355

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999833
7.67	7.68	0.9987		
3.84	3.76	1.0213	Slope	0.997213
1.91	1.86	1.0295		
			Intercept	0.040428





# Wood Buffalo Environmental Association

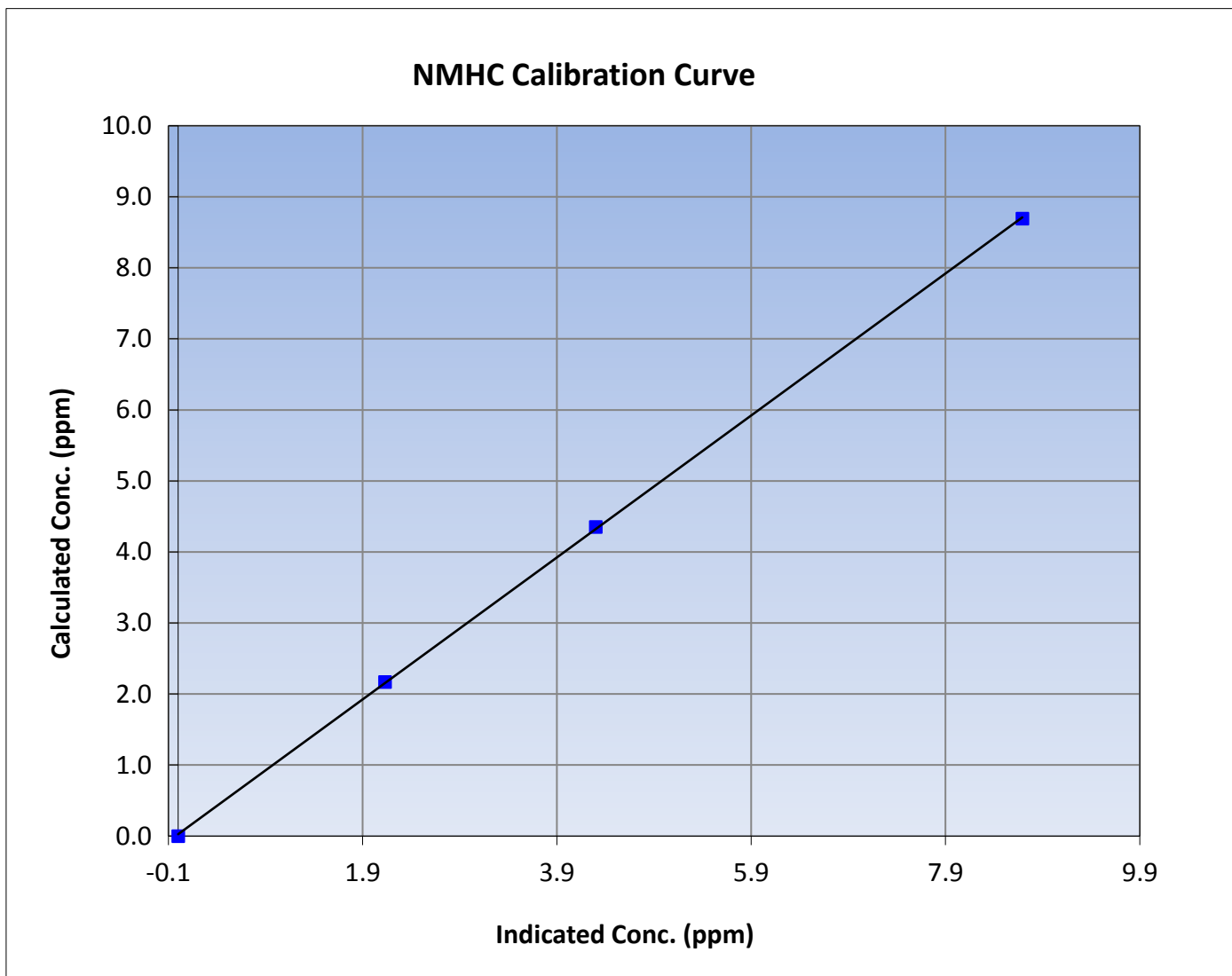
## NMHC Calibration Summary

### Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 5, 2015
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:40	End Time (MST)	11:57
Analyzer make	Thermo 55i	Analyzer serial #	1218153355

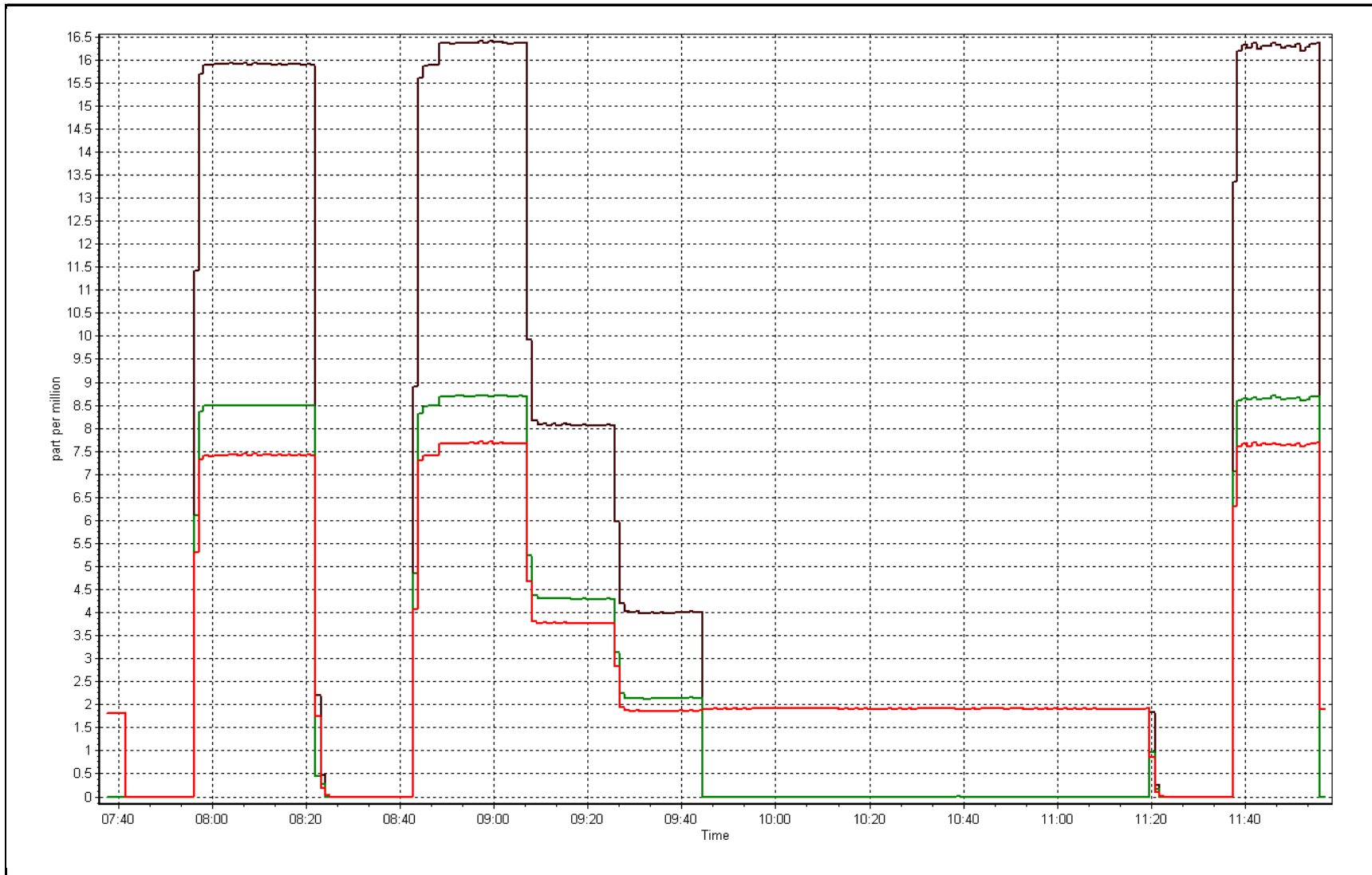
### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999950
8.69	8.69	1.0002		
4.35	4.30	1.0121	Slope	0.999306
2.17	2.13	1.0188		
			Intercept	0.026161



THC Calibration Plot

Date: December 3, 2015





# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Report

### Station Information

Calibration Date	December 4, 2015	Previous Calibration	November 16, 2015
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	7:50	End Time (MST)	10:20
NO2 GPT Ref date	December-03-15	Transfer Standard	NO2
		Station temp.	23 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	8400311
ZAG make/model	Teledyne API 701	Serial Number	4764
DACS make/model	Campbell Scientific CR3000	Serial Number	8790

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	26.0	26.5
Analyzer IP address	192.168.1.49		Lamp temp.	53.8	53.8
Calculated slope	0.999271	0.992371	Pressure	646.7	638.5
Calculated intercept	0.492807	-0.580702	Flow cell A	0.698	0.694
Analyzer Background	-2.0	-2.0	Flow cell B	0.700	0.695
Analyzer Coefficient	0.980	0.980	Cell A Intensity	120661	119373
			Cell B Intensity	123716	122741

Analyzer make Thermo 49i      Analyzer serial # 1426262596

### Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.00	0.0	-0.1	----
as found span	5000	1.19	415.2	418.5	0.992
calibrator zero	5000	0.00	0.0	-0.1	----
high point	5000	1.19	415.2	418.5	0.992
second point	5000	0.85	283.4	286.4	0.990
third point	5000	0.51	148.1	150.7	0.983
as left zero	5000	0.00	0.0	0.5	----
as left span	5000	1.19	415.2	416.9	0.996
Average Correction Factor					0.988

Corrected As found    418.6      Previous response    415.0      % change    -0.8%

**Notes:**

no adjustments or maintenance done, filter changed out

Calibration Performed By:

Melissa Lemay





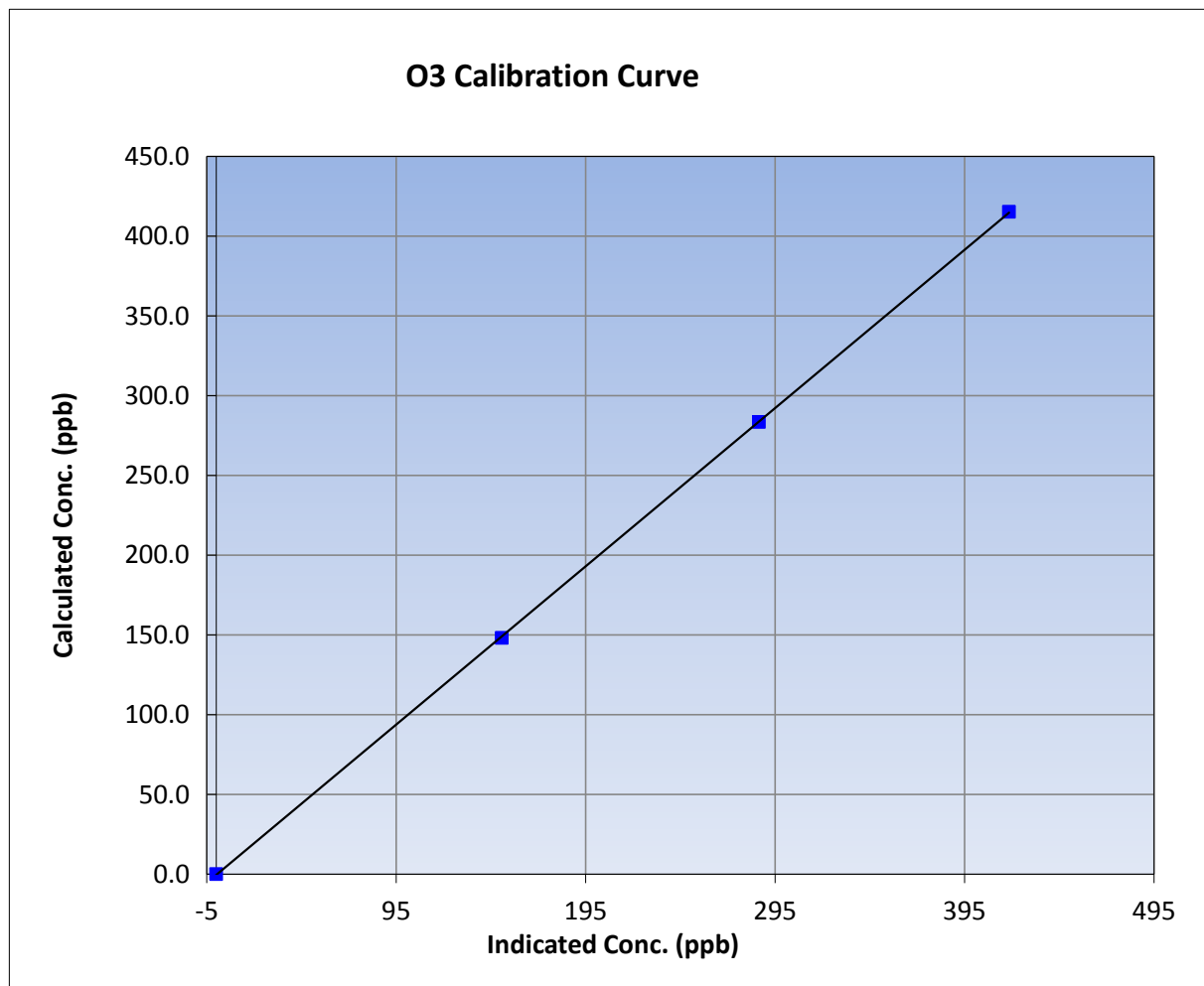
## Wood Buffalo Environmental Association O3 Calibration Report

### Station Information

Calibration Date	December-04-15	Previous Calibration	November 16, 2015
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:50	End Time (MST)	10:20
Analyzer make	Thermo 49i	Analyzer serial #	1426262596

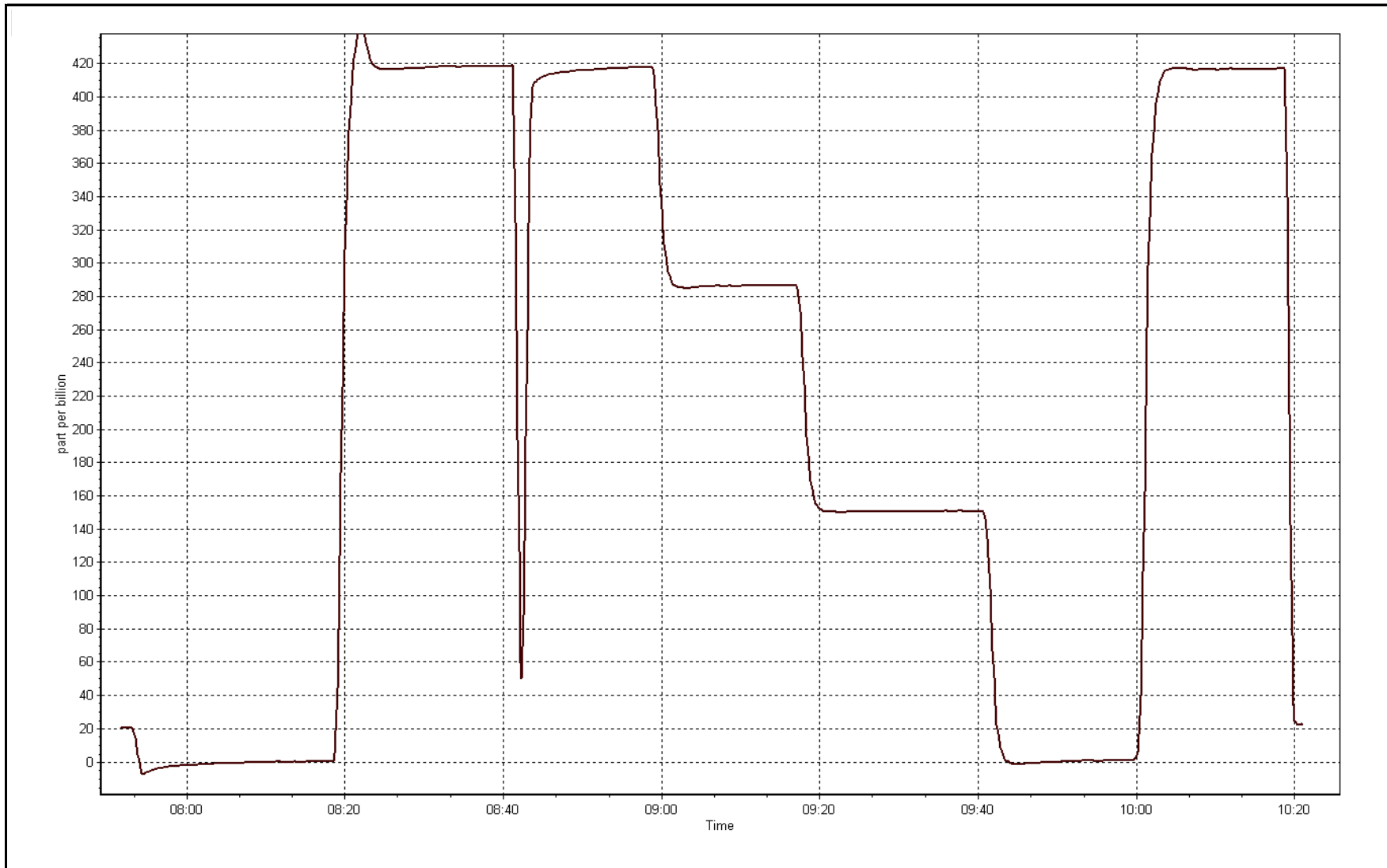
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999985
415.2	418.5	0.9921		
283.4	286.4	0.9895	Slope	0.992371
148.1	150.7	0.9827		
			Intercept	-0.580702



O3 Calibration Plot

Date: December 4, 2015





# Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

## Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 5, 2015
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	7:40	End Time (MST)	11:58
NO Cal Gas Conc	53.4 ppm	Gas Cert Reference	SA130026A
NOX Cal Gas Conc	53.4 ppm	Cal Gas Expiry Date	12/12/2016
Calibrator	Sabio 4010	Serial Number	8400311
Zero air Generator	Teledyne API T701	Serial Number	4764

## DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	8790
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## Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.998202	0.997682	1.002775
	Data Offset	2.033946	1.960696	0.195802
Current Calibration	Data Slope	1.006227	1.005729	1.000755
	Data Offset	2.071061	2.122784	-0.114684

## Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1426262592
---------------------	------------	-------------------	------------

Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	0.966		0.966	
NOX coefficient	0.998		0.998	
NO2 coefficient	1.000		1.000	
NO bkgrnd	3.5		3.7	
NOX bkgrnd	4.3		3.8	
Chamber Temp	50.2	Deg C	49.8	Deg C
Moly Temp	322.6	Deg C	322.9	Deg C
PMT voltage	-802.9	V	-802.2	V
PMT Temp	-3	Deg C	-2.7	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	158.5	mmHg	136	mmHg
R Cell Press Nox	158.5	mmHg	136	mmHg
NO sample flow	0.843	lpm	0.82	lpm
Nox sample Flow	0.843	lpm	0.823	lpm

**Notes:**

Zero adjusted. Filter changed out. no maintenance done.



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

### Station Information

Calibration Date:

December 3, 2015

Station Number:

AMS 14

### Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-1.0	-0.3	-0.7	----	----
as found span	5000	74.9	799.9	799.9	0.0	794.5	795.0	-0.5	1.0068	1.0062
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.3	0.0	----	----
high point	5000	74.9	799.9	799.9	0.0	794.0	794.4	-0.4	1.0075	1.0070
second point	5000	37.5	400.5	400.5	0.0	394.5	394.5	0.0	1.0152	1.0152
third point	5000	18.7	199.7	199.7	0.0	195.0	195.1	-0.1	1.0242	1.0237
as left zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.3	0.0	----	----
as left span	5000	74.9	799.9	377.5	422.4	790.9	379.4	411.5	1.0114	0.9950
Average Correction Factor									1.0156	1.0153

Corrected As found

NO<sub>x</sub>= 795.5

NO= 795.3

Percent Change

NO<sub>x</sub>= 0.5%

NO= 0.6%

Previous Response

NO<sub>x</sub>= 799.3

NO= 799.8

### GPT Calibration Data

Dilution Flow

5000

ccm

Source Gas Flow

74.90

ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero			0.0			0.0			N/A	
1st NO2 (300)	----	377.5	415.2	792.5	377.5	415.0	0.9945	1.0000	1.0005	100.0%
2nd NO2 (200)	----	509.3	283.4	792.4	509.3	283.2	0.9946	1.0000	1.0007	99.9%
3rd NO2 (100)	----	644.6	148.1	793.0	644.6	148.3	0.9939	1.0000	0.9987	100.1%
4th NO2 (0)	792.7	----	-0.3	792.4	792.7	-0.3	0.9946	1.0000	N/A	----
Average Correction Factor							0.9944	1.0000	0.9999	100.0%

Calibration Performed By:

Melissa Lemay



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

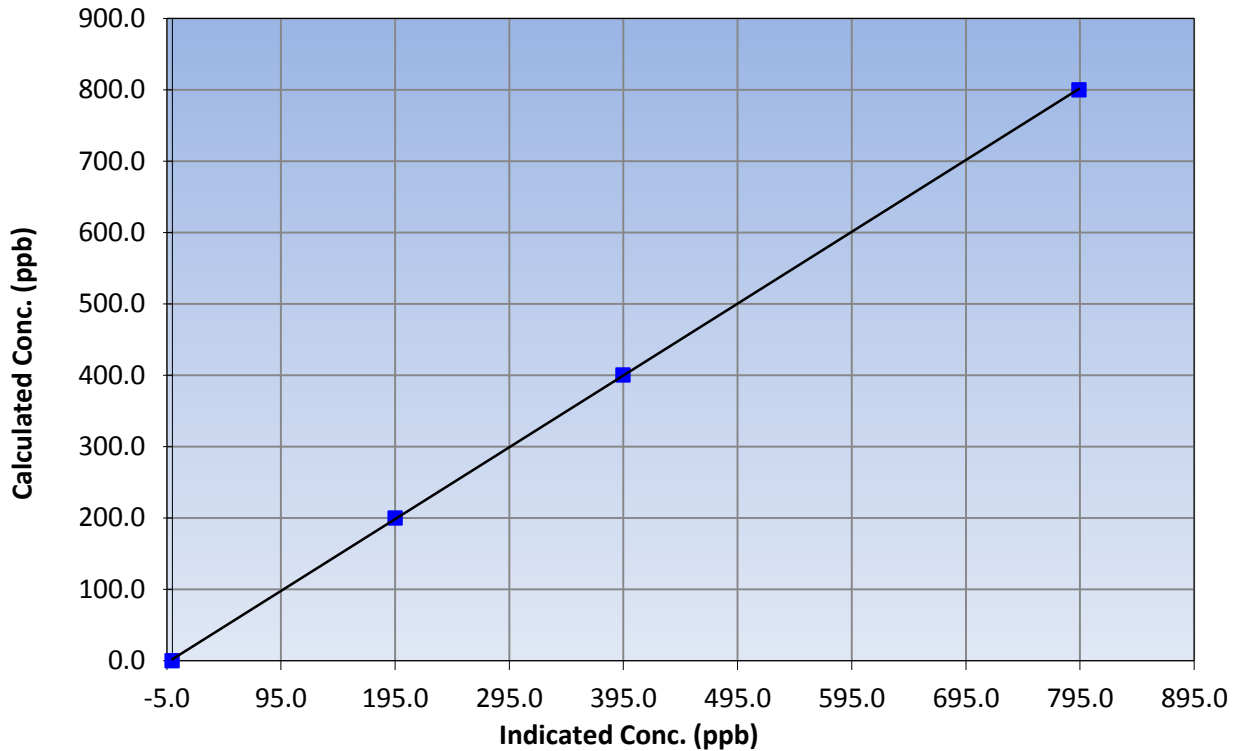
### Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 5, 2015
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:40	End Time (MST)	11:58
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	0.999975
799.9	794.0	1.0075		
400.5	394.5	1.0152	Slope	1.006227
199.7	195.0	1.0242		
			Intercept	2.071061

### NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

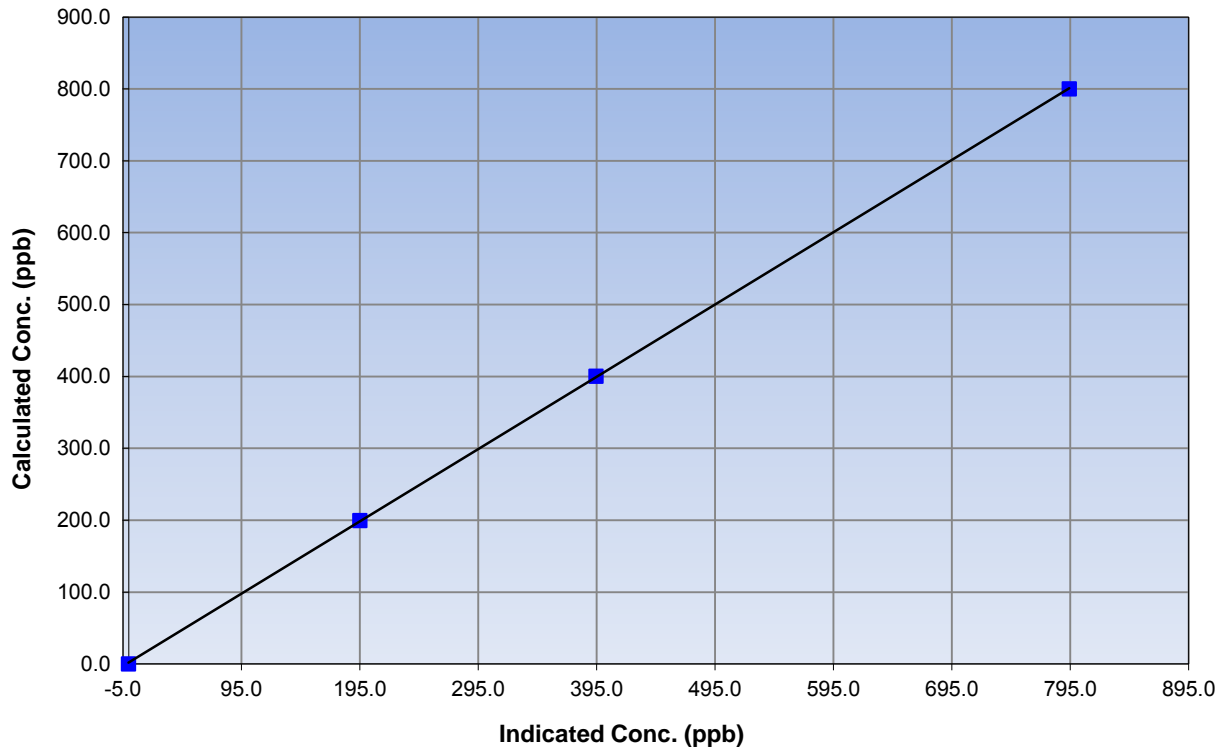
### Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 5, 2015
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:40	End Time (MST)	11:58
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	N/A	Correlation Coefficient	0.999974
799.9	794.4	1.0070		
400.5	394.5	1.0152	Slope	1.005729
199.7	195.1	1.0237		
			Intercept	2.122784

### NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

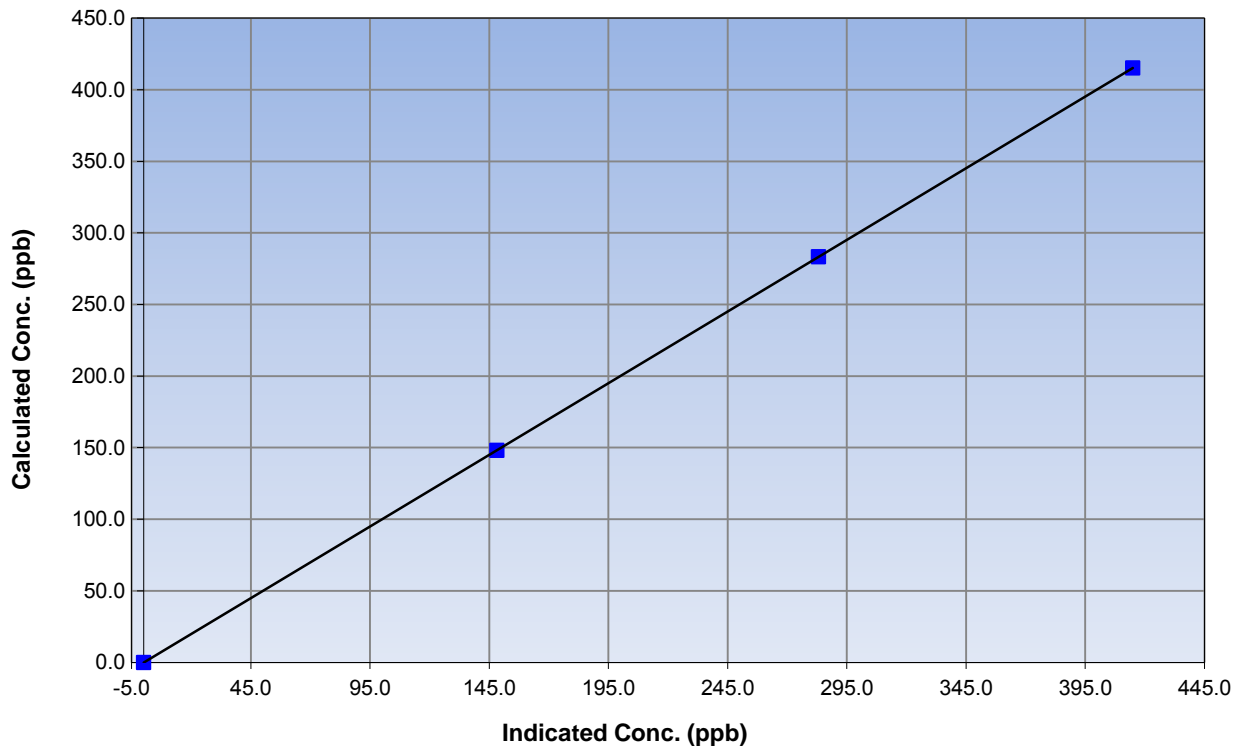
### Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 5, 2015
Station Number	Anzac	Station Number	AMS 14
Start Time (MST)	7:40	End Time (MST)	11:58
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

### Calibration Information

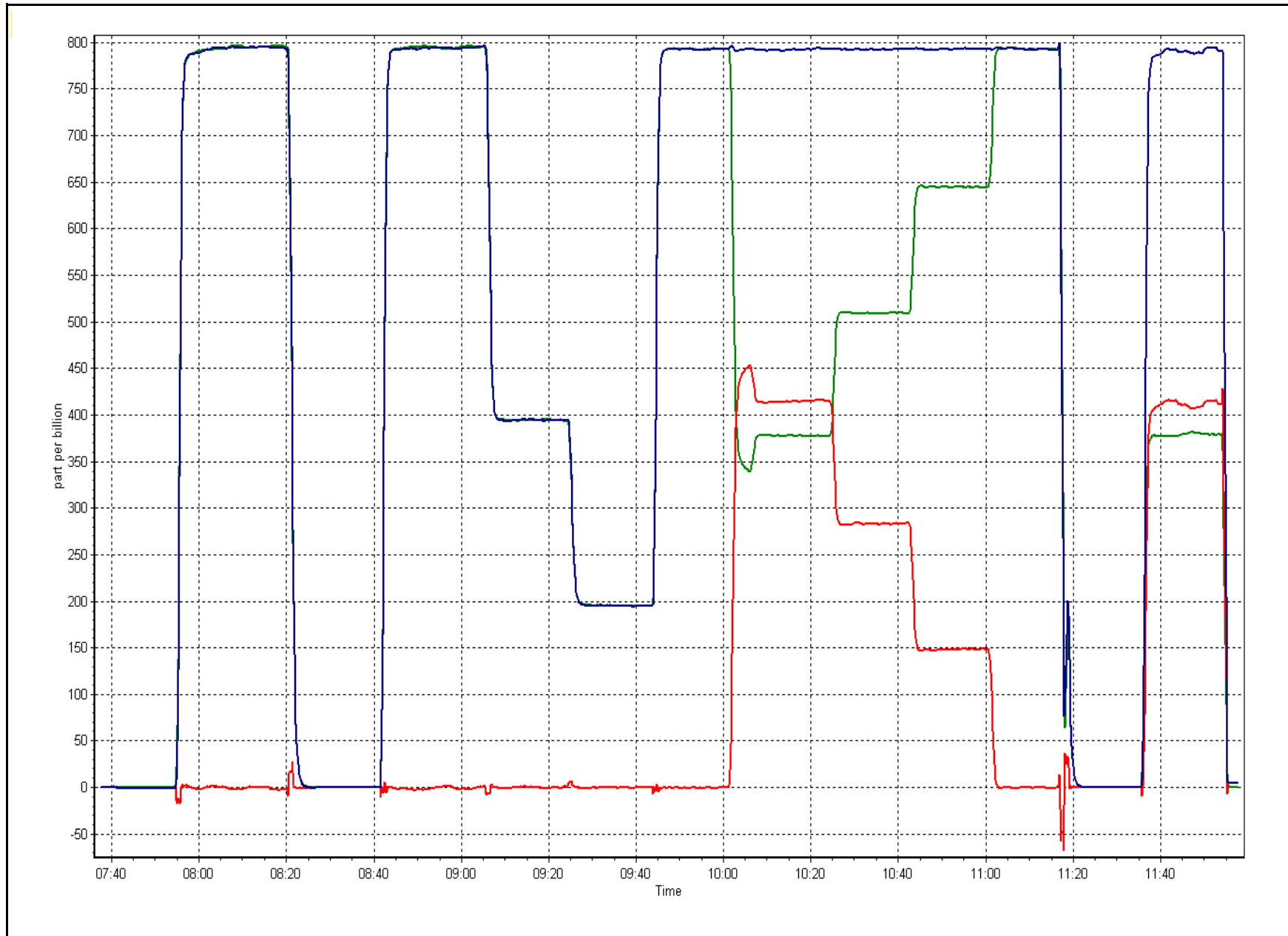
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999999
415.2	415.0	1.0005		
283.4	283.2	1.0007	Slope	1.000755
148.1	148.3	0.9987		
			Intercept	-0.114684

### NO<sub>2</sub> Calibration Curve



NOX Calibration Plot

Date: December 3, 2015







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	December 3, 2015	Previous Calibration:	November 16, 2015
Station Name:	Anzac	Station Number:	AMS 14
Start Time (MST):	11:27	End Time (MST):	12:27
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	1451

SHARP INFORMATION			
Particulate Fraction:		PM2.5	
Make/Model:		Thermo / SHARP 5030	
Serial Number		E1093	
C <sub>14</sub> Source SN:		4933	
Confirmation of Time settings:		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Parameters Checked:	T1 <input checked="" type="checkbox"/> T2 <input type="checkbox"/> T3 <input type="checkbox"/> T4 <input type="checkbox"/> P3 <input checked="" type="checkbox"/>	Main Flow <input checked="" type="checkbox"/> Beta <input type="checkbox"/> Neph <input checked="" type="checkbox"/>	

CALIBRATION DATA				
Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	2.0	2.2	0.2	2.0
T2	24.0	na	na	24.0
T3	23.0	na	na	23.0
T4	18.0	na	na	18.0
RH (%)	13.0	na	na	13.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	941	940.0	-1.0	941

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1025	25	1000	1000

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	191		1911
Neph	0.3		0.3
C14	2.4		2.4
Indicated Concentration (ug/m3)	0.2	No	0.2
Offset 1			
Offset 2			

Leak Check (Quarterly)			
Leak Check Date:	November 16, 2015	Previous Leak Check Date:	August 18, 2015
	Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	17.18		0.03
*Flow with adaptor (LPM):	17.15		
<i>*Note - do not attach adaptor without shutting off the pump first</i>			

Mass Foil Calibration (Annually)			
Foil Calibration Date:	June 17, 2015	Previous Foil Calibration:	
Zeroed?:			
Foil Mass:	1278	Mass foil set S/N:	2520
Previous Correction Factor:	7020		
New Correction Factor:	6936		

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	06/10/2015
Pump	Good	
Filter Tape	Good	
Mass Foil Cal Set	na	
HEPA filter	Good	

NOTES:

Flow adjusted. Cyclone head cleaned.

Melissa Lemay



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## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 15  
CNRL HORIZON  
DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CNRL HORIZON (AMS 15)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	708	36	36	100.00	15	0	4	0
TRS (ppb) Average	710	34	34	100.00	1	0	0	0
THC (ppm) Average	701	36	43	99.06	5.4	-	2.5	-
NO2 (ppb) Average	707	36	37	99.87	30	0	19	-
NO (ppb) Average	707	36	37	99.87	79	-	14	-
NOX (ppb) Average	707	36	37	99.87	101	-	29	-
PM2.5 (ug/m3) Average	742	2	2	100.00	22.2	-	9.1	0
Temperature 2 m (C) Average	744	0	0	100.00	4.2	-	-1.9	-
Wind Speed 10 m (km/h) Average	737	0	7	99.06	21	-	12	-
Wind Direction 10 m (deg) Average	737	0	7	99.06	-	-	-	-
Precipitation (mm) Total	744	0	0	100.00	0.3	-	0.5	-
Relative Humidity (%) Average	744	0	0	100.00	97	-	94	-
Global Solar Radiation (W/m2) Average	744	0	0	100.00	214	-	31	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CNRL HORIZON (AMS 15)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	708	0.6	2	-	0	0	0	0	0	1	15
TRS (ppb) Average	710	0.3	0	-	0	0	0	0	0	0	1
THC (ppm) Average	701	2.13	0.3	-	1.8	1.9	2	2.1	2.2	2.4	5.4
NO2 (ppb) Average	707	6.9	6	-	0	1	2	5	10	17	30
NO (ppb) Average	707	1.8	6	-	0	0	0	0	1	4	79
NOX (ppb) Average	707	8.7	11	-	0	1	2	5	12	20	101
PM2.5 (ug/m3) Average	742	4.76	2.9	-	0.4	1.5	2.4	4.5	6.5	8.2	22.2
Temperature 2 m (C) Average	744	-11.44	6.7	-	-30.1	-20.2	-17.2	-11.3	-5.4	-4	4.2
Wind Speed 10 m (km/h) Average	737	6.3	3	-	0	2	4	6	8	11	21
Wind Direction 10 m (deg) Average	737	-	-	-	-	-	-	-	-	-	-
Precipitation (mm) Total	744	-	-	1.27	-	-	-	-	-	-	-
Relative Humidity (%) Average	744	82.7	8	-	50	74	79	83	88	93	97
Global Solar Radiation (W/m2) Average	744	11.6	28	-	0	0	0	0	7	41	214

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CNRL HORIZON (AMS 15)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
THC	16 Dec 2015 01:00	16 Dec 2015 01:00	1	Data collection to analyzer interrupted
THC	21 Dec 2015 11:00	21 Dec 2015 16:00	6	Maintenance - input board calibration
NO2, NO, NOX	16 Dec 2015 01:00	16 Dec 2015 01:00	1	Data collection to analyzer interrupted
Wind Speed, Wind Direction	03 Dec 2015 07:00	03 Dec 2015 07:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	06 Dec 2015 00:00	06 Dec 2015 00:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	13 Dec 2015 22:00	13 Dec 2015 22:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	14 Dec 2015 00:00	14 Dec 2015 00:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	17 Dec 2015 08:00	17 Dec 2015 08:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	17 Dec 2015 10:00	17 Dec 2015 10:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	21 Dec 2015 17:00	21 Dec 2015 17:00	1	Flat line in sensor output signal -sensor frozen



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 15 ppb on Dec 8 20:00	Maximum Daily Average: 3.7 ppb on Dec 12		Hours of Data:	708
Minimum Value: 0 ppb on Dec 1 04:00	Minimum Daily Average: 0.0 ppb on Dec 5		Hours of Missing Data:	36
Maximum Diurnal Average: 1.4 ppb at hour 14	Minimum Diurnal Average: 0.2 ppb at hour 9		Hours of Calibration:	36
Monthly Average: 0.6 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 9		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1
7-Dec	1	1	1	0	1	Z	0	0	0	0	2	4	8	13	3	1	1	0	0	0	0	0	1	4	1.8	13	
8-Dec	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	1	5	9	14	12	15	3	1	1	0	2.8	15	
9-Dec	0	Z	1	1	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
11-Dec	0	0	0	Z	0	0	0	0	0	0	C	C	C	C	C	1	1	0	0	0	0	1	0	0	0.3	1	
12-Dec	0	0	0	0	Z	1	1	1	1	3	5	8	13	9	10	4	2	4	6	6	4	5	3	1	3.7	13	
13-Dec	1	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
14-Dec	Z	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0.5	2	
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
16-Dec	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.1	1	
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	2	9	7	4	4	4	4	3	2	1	2	1	2.0	9	
20-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	2	1	0	1	2	0.6	2	
21-Dec	3	Z	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.6	5	
22-Dec	1	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
25-Dec	1	1	1	1	1	Z	0	0	0	0	1	1	1	2	1	0	0	0	0	0	0	0	0	0	0.6	2	
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
27-Dec	0	Z	1	1	1	1	1	1	1	1	1	3	3	3	3	3	3	2	1	1	0	0	0	0	1.4	3	
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	2	1	0	0	0	0.7	2	
29-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
	0.4	0.3	0.5	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.5	0.7	1.1	1.4	1.1	0.8	0.8	1.0	1.0	1.0	0.5	0.4	0.4	0.5		Diurnal Average	
	3	2	5	1	1	1	1	1	1	3	5	8	13	13	10	5	9	14	12	15	4	5	3	4		Diurnal Maximum	

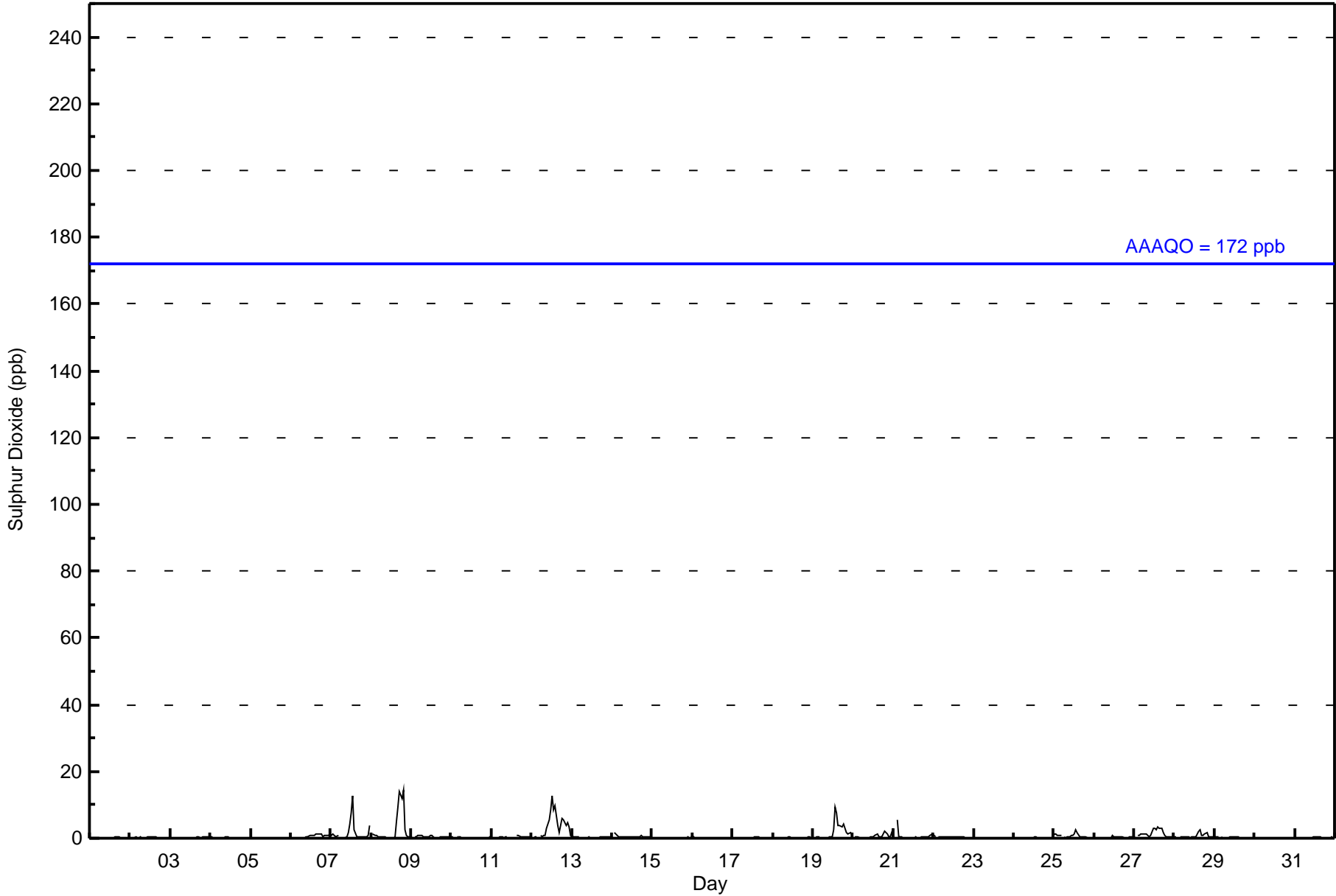
Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb





Wood Buffalo Environmental Association  
Hourly Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
CNRL Horizon - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**CNRL Horizon - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	703	99.29	99.29
11 - 20	5	0.71	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



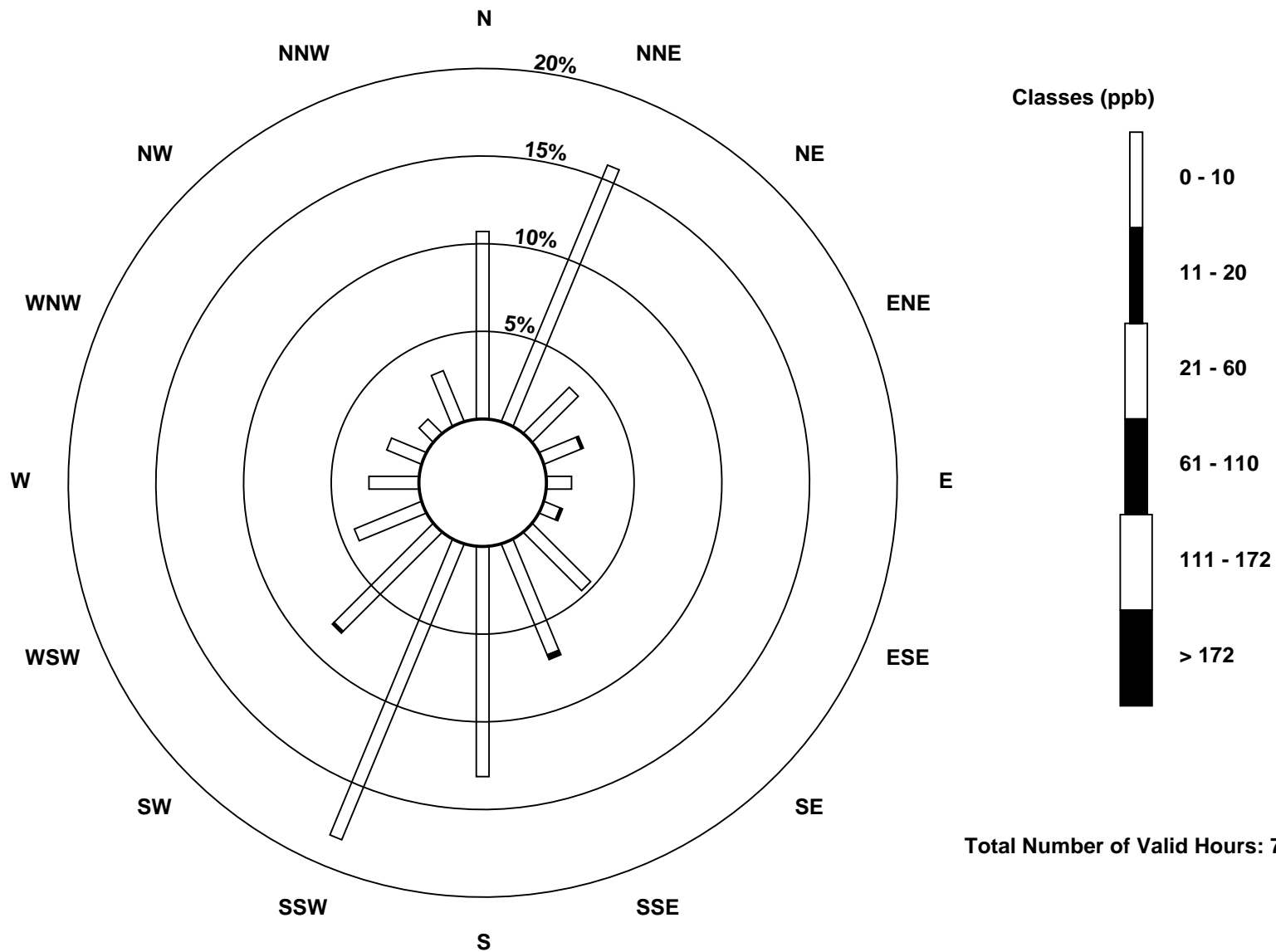
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**CNRL Horizon - December 2015**

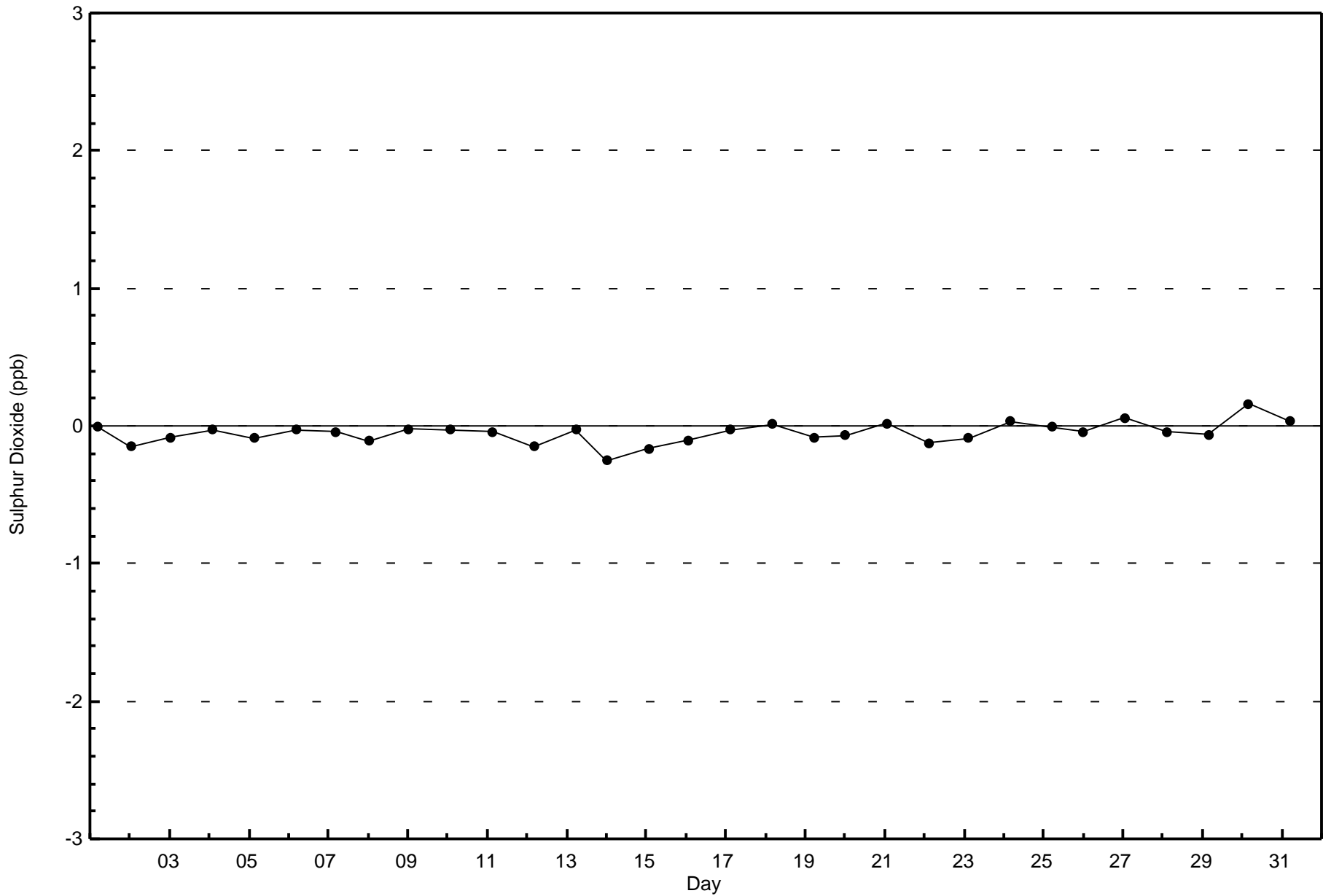
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	75	111	26	16	10	7	33	48	92	128	56	29	20	15	8	22	696
11 - 20	0	0	0	1	0	1	0	2	0	0	1	0	0	0	0	0	5
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	75	111	26	17	10	8	33	50	92	128	57	29	20	15	8	22	701

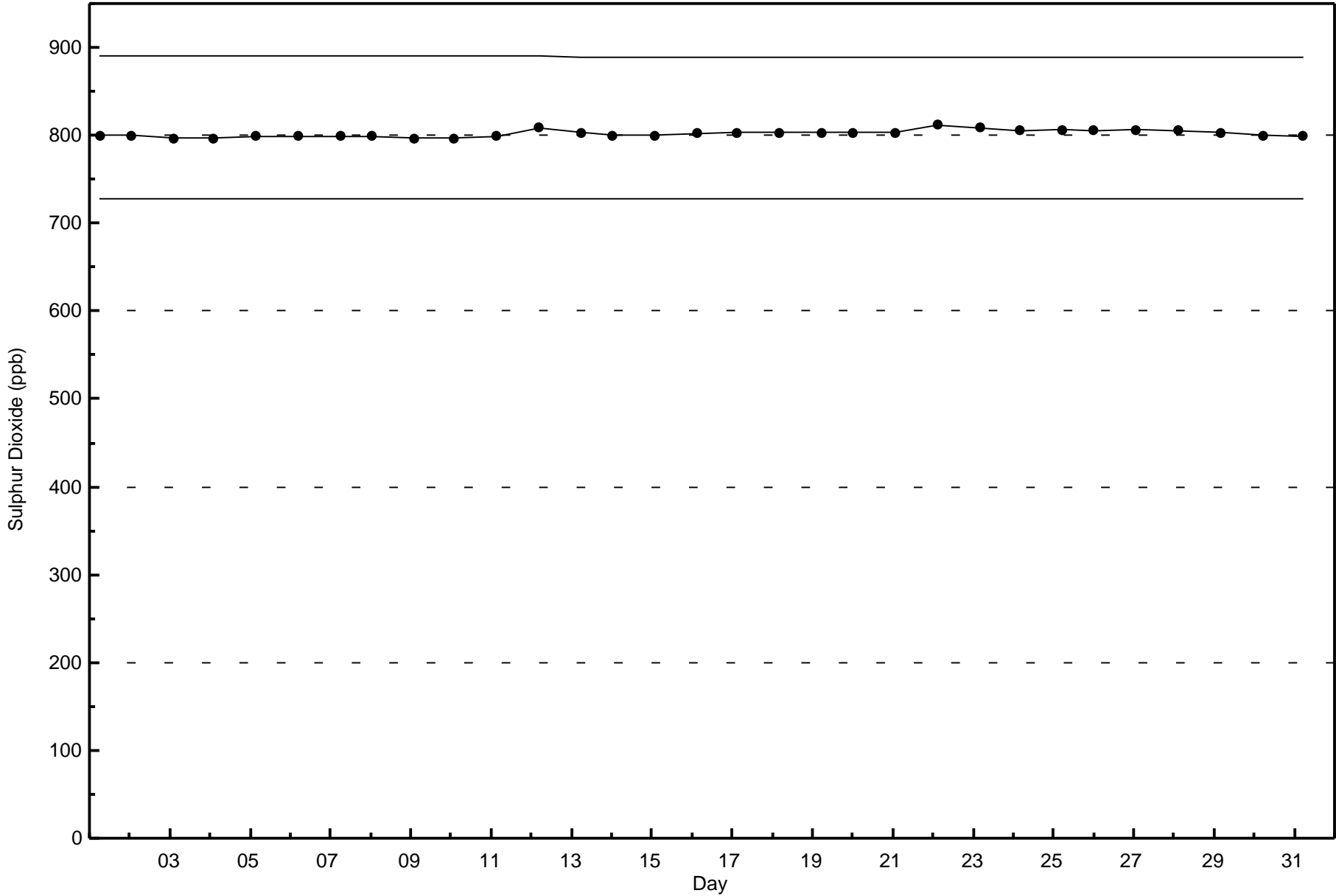
Total Number of Valid Hours: 701

Total Number of Hours: 744



Total Number of Valid Hours: 701





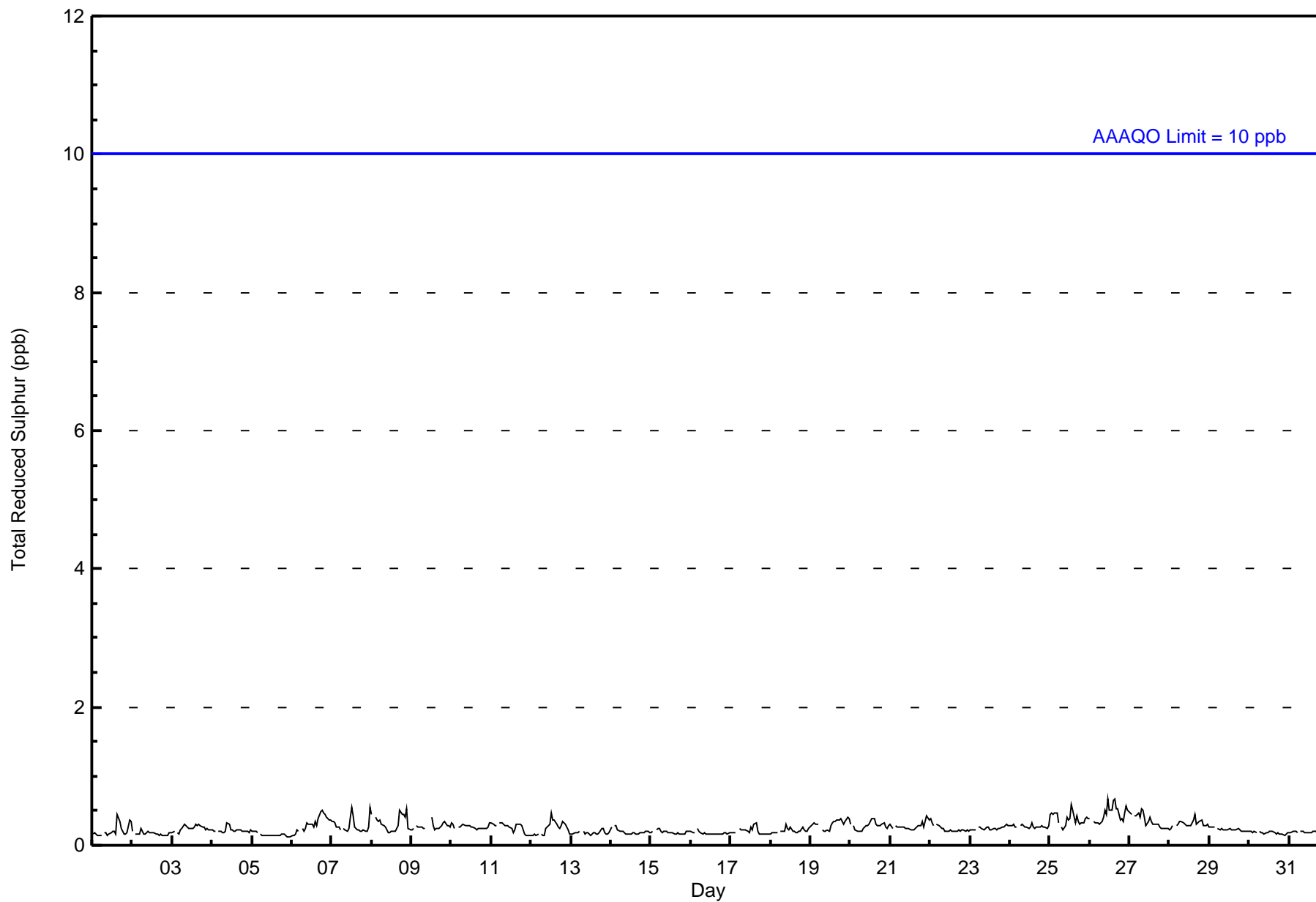


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 1 ppb on Dec 26 12:00	Maximum Daily Average: 0.5 ppb on Dec 26		Hours of Data:	710
Minimum Value: 0 ppb on Dec 5 22:00	Minimum Daily Average: 0.2 ppb on Dec 5		Hours of Missing Data:	34
Maximum Diurnal Average: 0.3 ppb at hour 13	Minimum Diurnal Average: 0.2 ppb at hour 9		Hours of Calibration:	34
Monthly Average: 0.3 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 1		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.3	1
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0.3	1
9-Dec	0	0	Z	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
10-Dec	0	0	0	Z	0	0	0	0	0	0	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
25-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.4	1
26-Dec	0	Z	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0.5	1
27-Dec	0	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
30-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0

0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	Diurnal Average
0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	0	0	1	1	1	Diurnal Maximum

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb    24-hr 3 ppb







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**CNRL Horizon - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	710	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**CNRL Horizon - December 2015**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	75	111	29	18	11	9	31	52	91	127	57	30	21	14	7	20	703
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	75	111	29	18	11	9	31	52	91	127	57	30	21	14	7	20	703

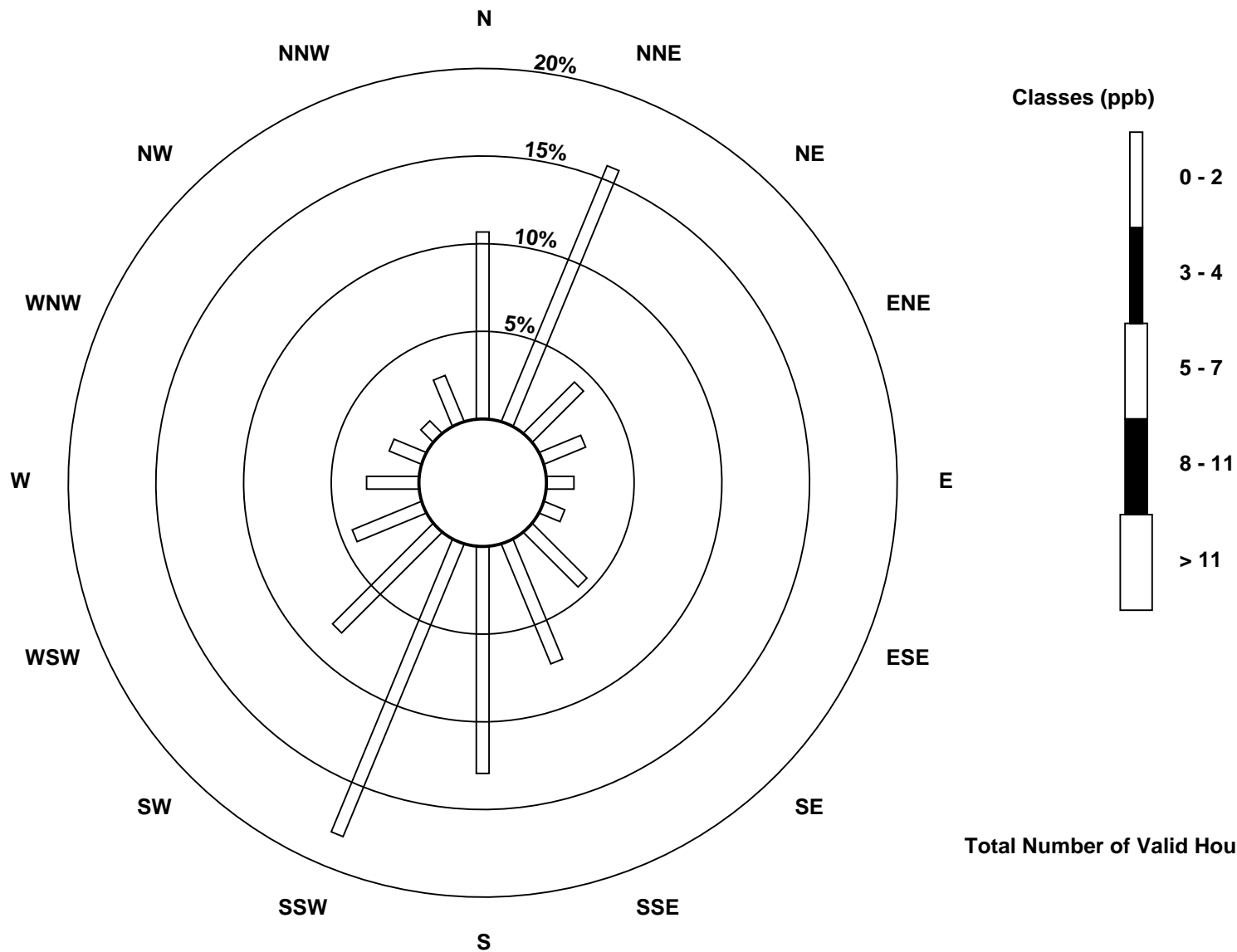
Total Number of Valid Hours: 703

Total Number of Hours: 744

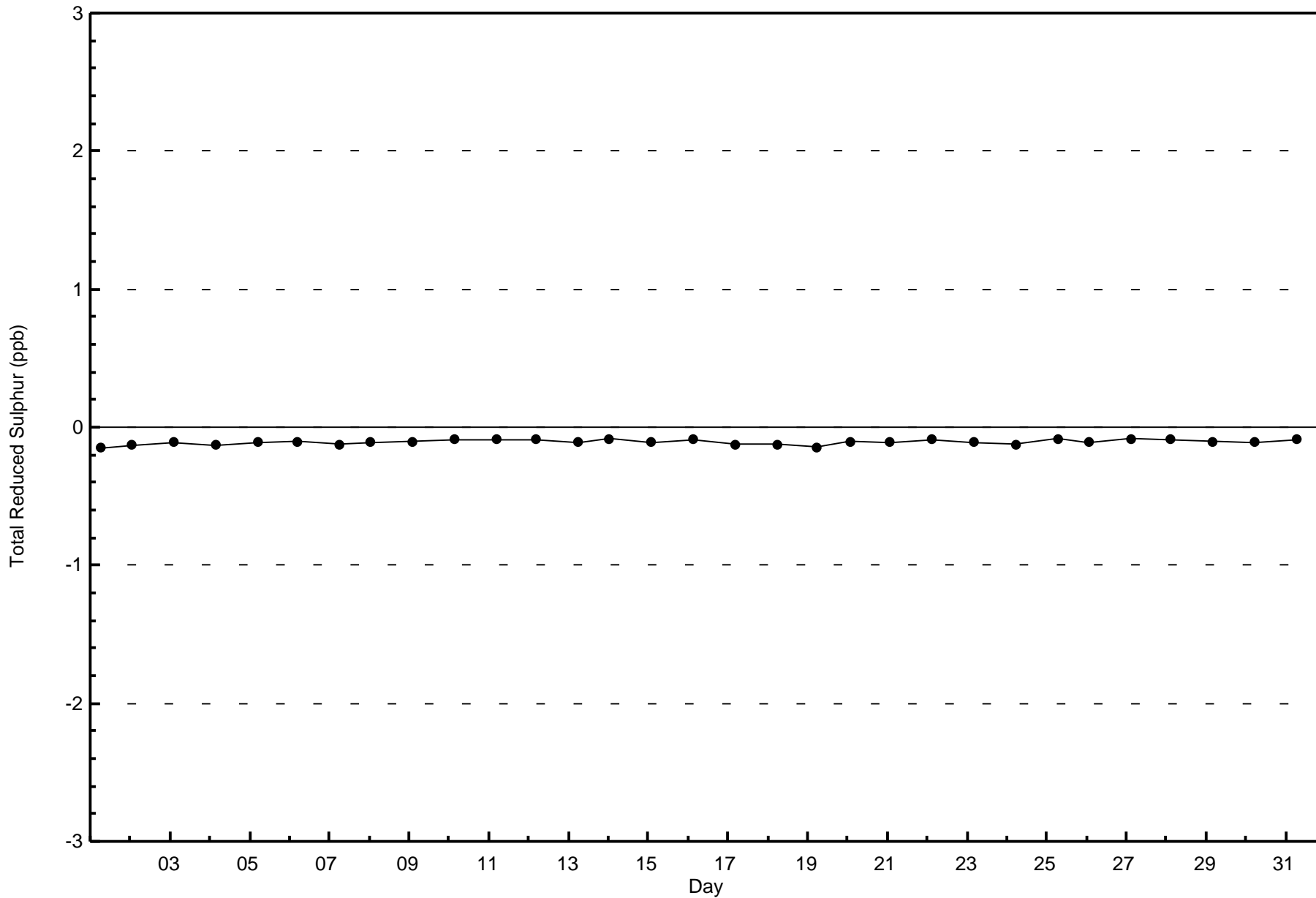


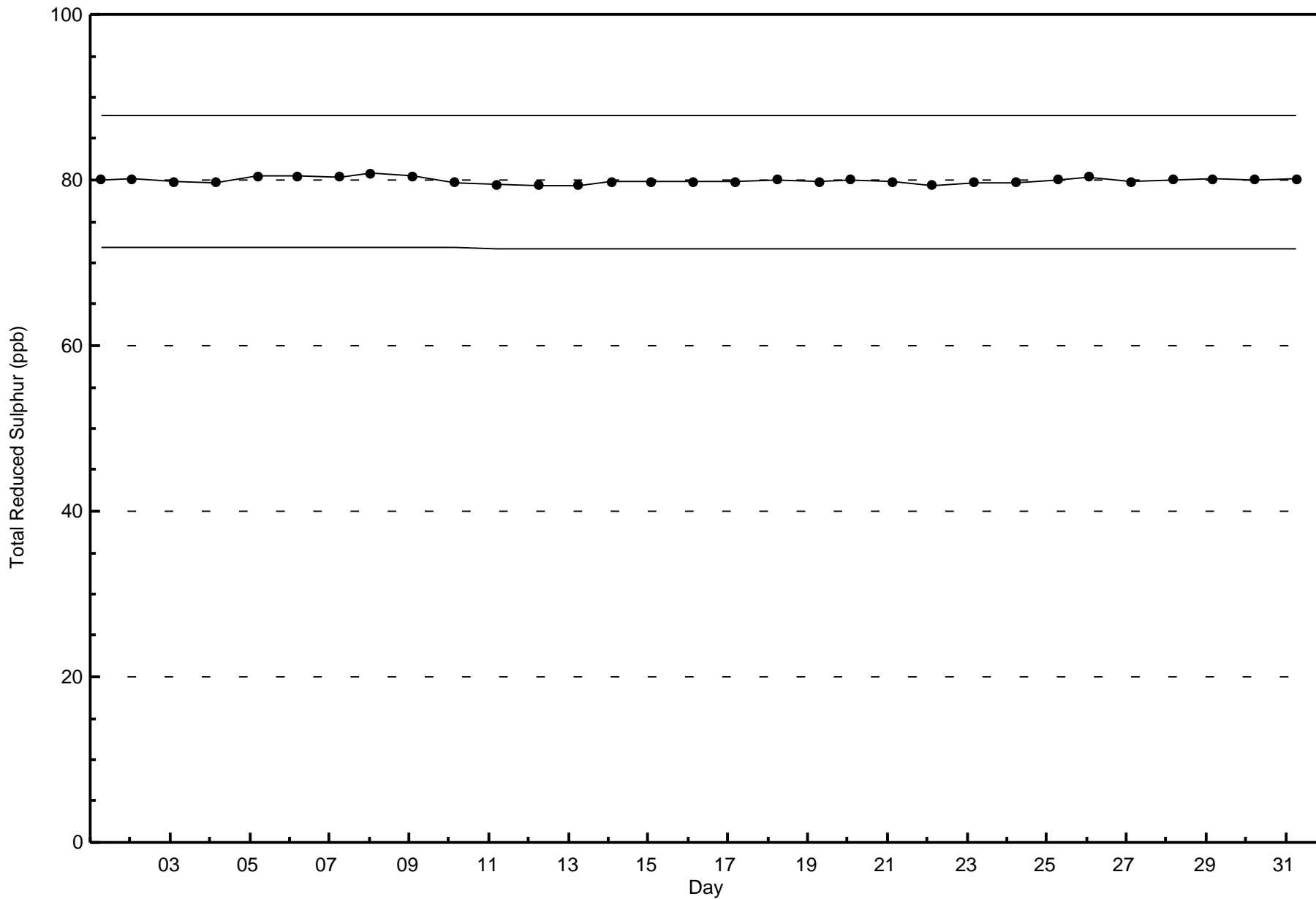
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Total Reduced Sulphur (TRS) - ppb  
CNRL Horizon (AMS 15)

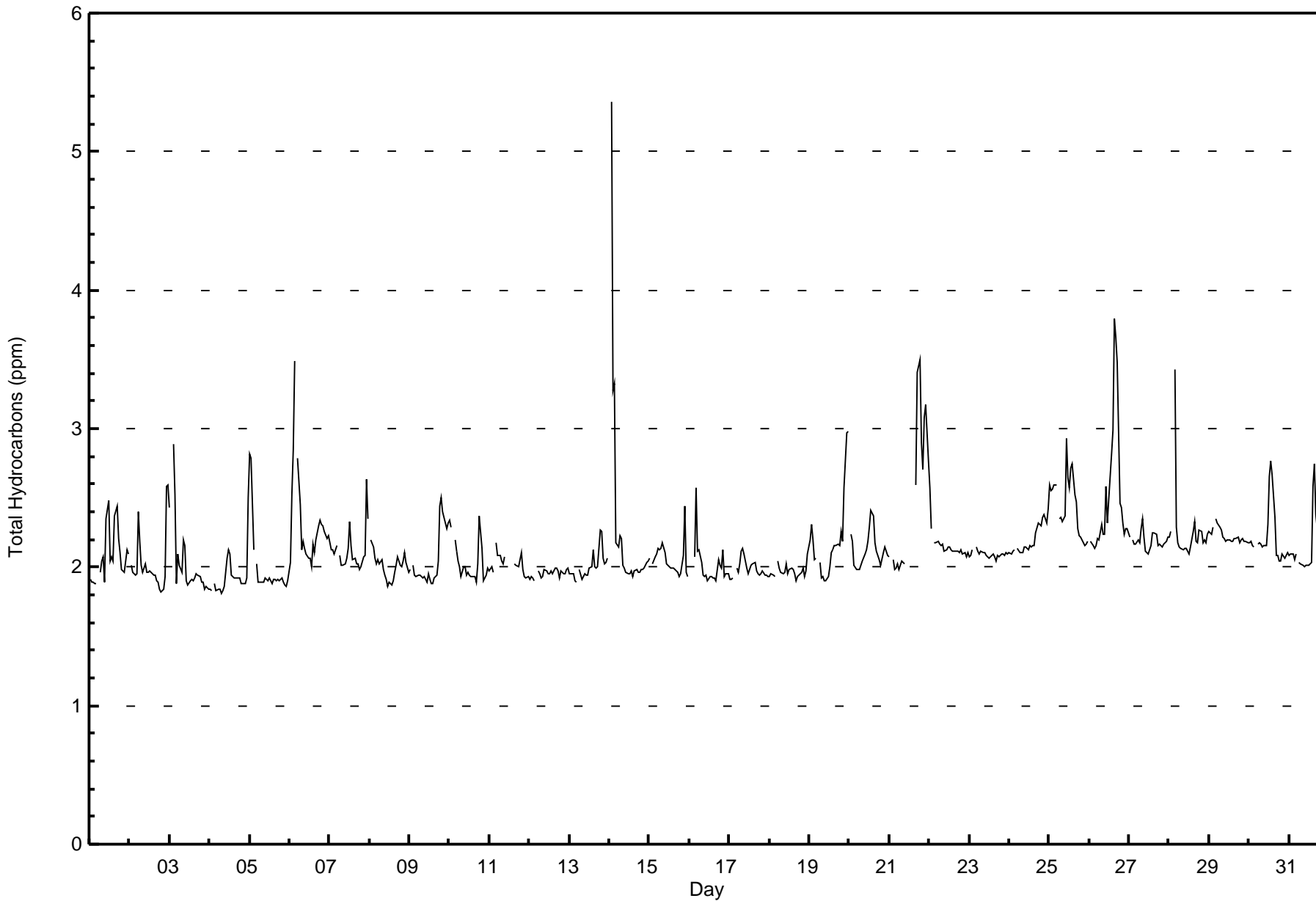


Total Number of Valid Hours: 703











**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**CNRL Horizon - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	323	46.08	46.08
2.1 - 3.0	366	52.21	98.29
3.1 - 10.0	12	1.71	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 701

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**CNRL Horizon - December 2015**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	29	45	13	9	6	5	22	27	30	72	30	18	6	1	1	6	320
2.1 - 3.0	44	66	12	8	4	3	9	21	60	56	27	10	14	12	6	10	362
3.1 - 10.0	2	0	1	0	0	0	0	0	0	0	0	1	0	2	1	5	12
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	75	111	26	17	10	8	31	48	90	128	57	29	20	15	8	21	694

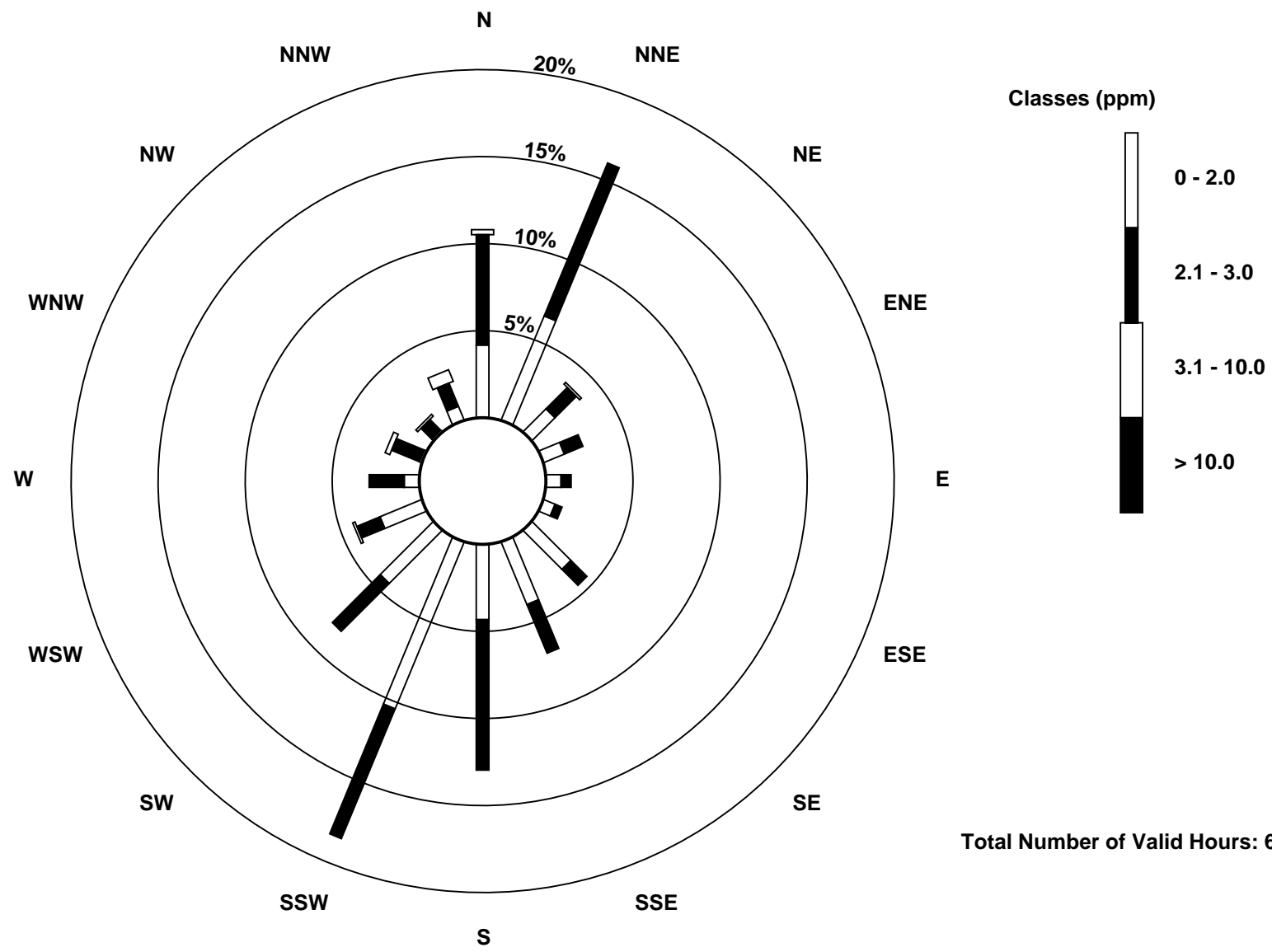
Total Number of Valid Hours: 694

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Total Hydrocarbons (THC) - ppm  
CNRL Horizon (AMS 15)

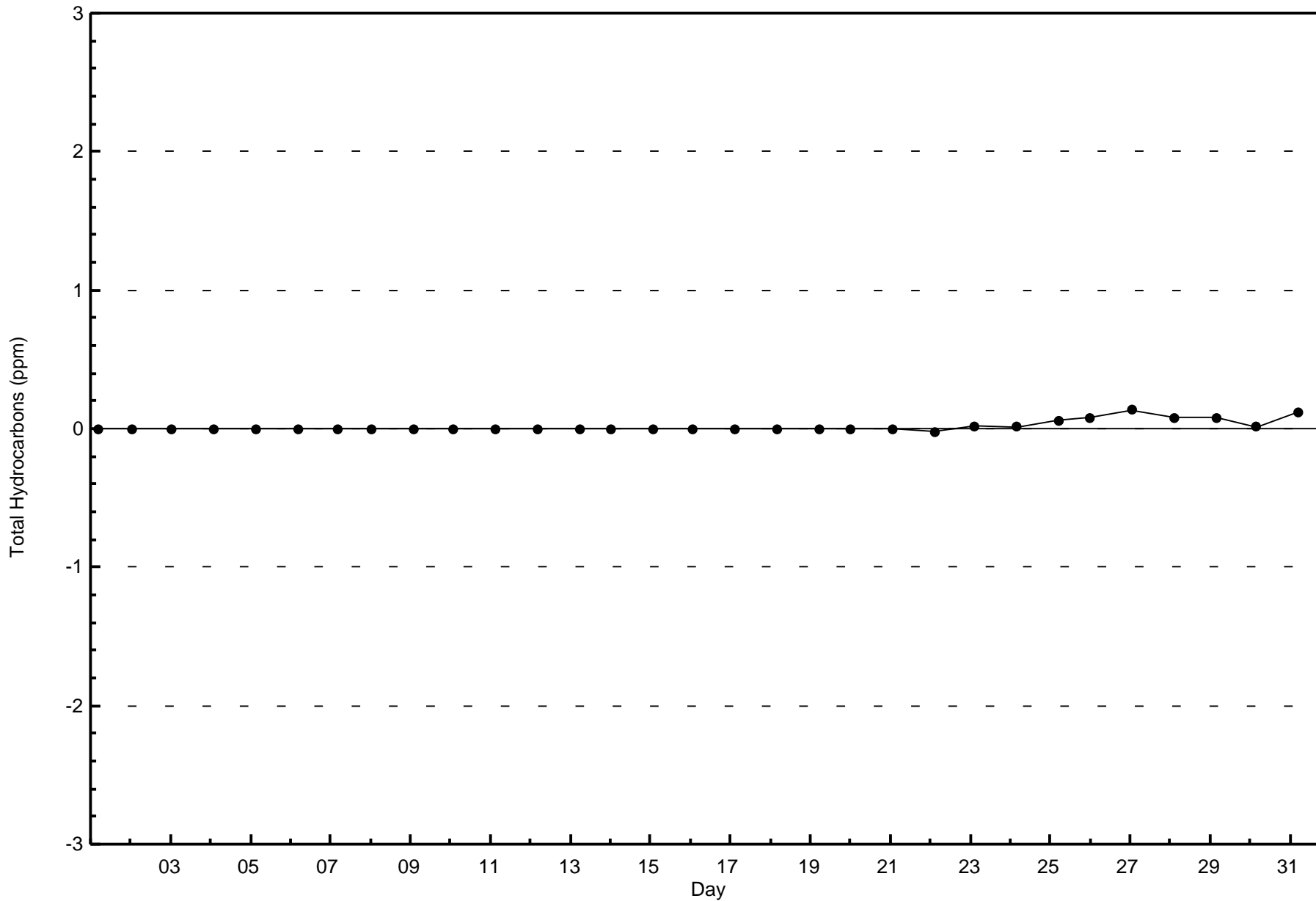


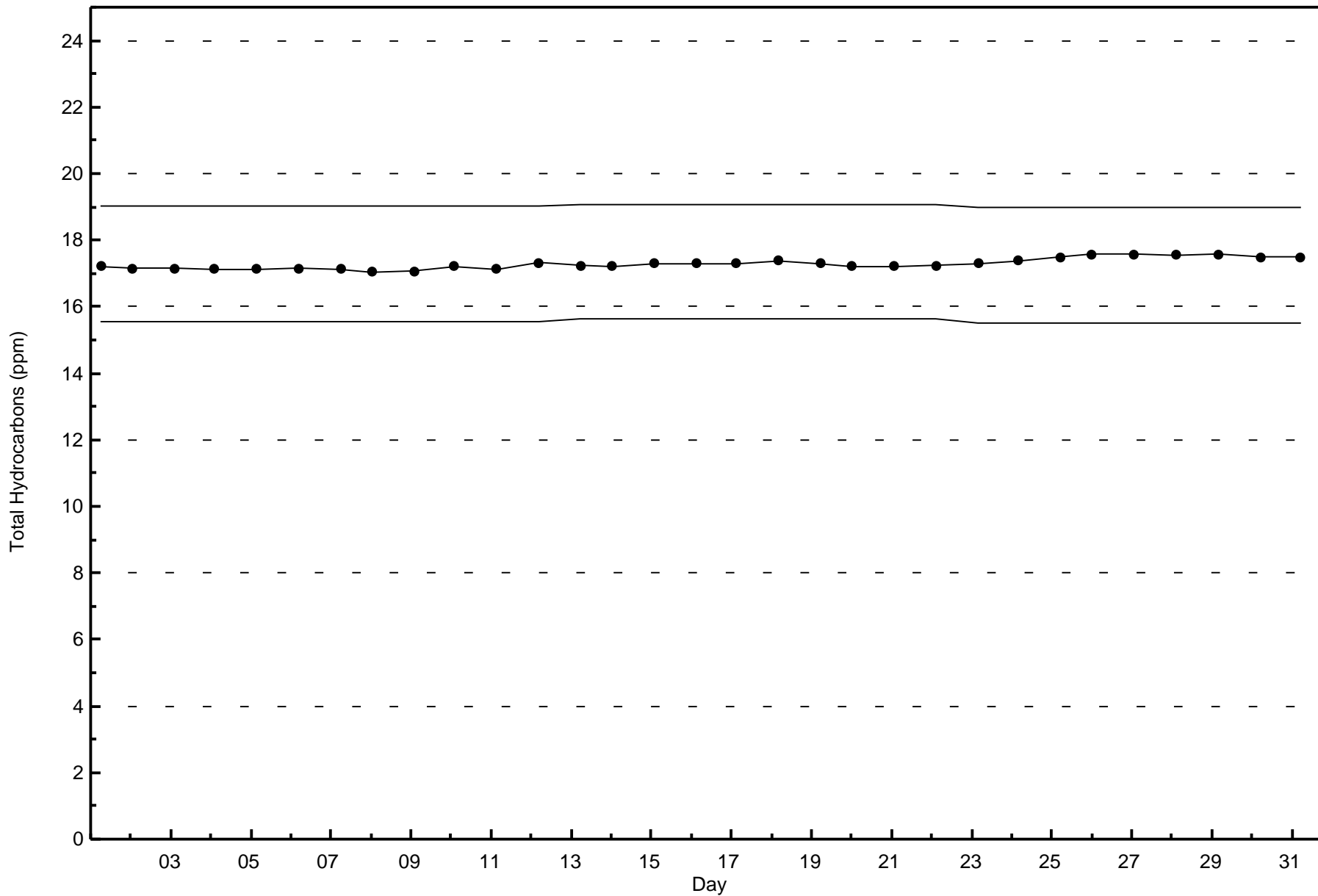
Total Number of Valid Hours: 694



Wood Buffalo Environmental Association  
Zero Responses

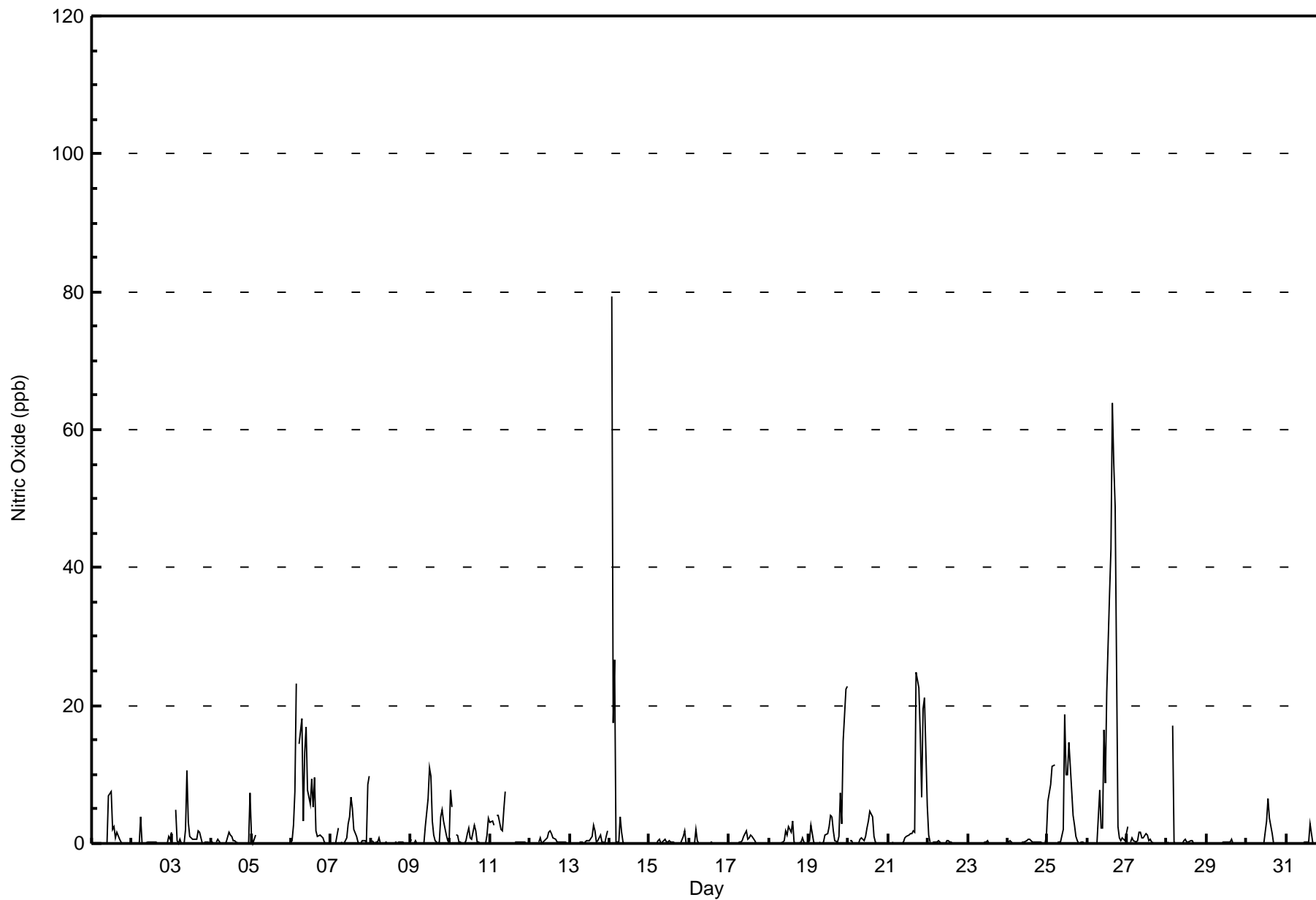
Total Hydrocarbons (THC) - ppm  
CNRL Horizon - December 2015







Maximum Value: 79 ppb on Dec 14 02:00		Maximum Daily Average: 13.5 ppb on Dec 26		Hours in Service: 744																									
Minimum Value: 0 ppb on Dec 1 01:00		Minimum Daily Average: 0.1 ppb on Dec 23		Hours of Data: 707																									
Maximum Diurnal Average: 3.9 ppb at hour 2		Minimum Diurnal Average: 0.5 ppb at hour 21		Hours of Missing Data: 37																									
Monthly Average: 1.8 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 4 P <sub>99</sub> = 21		Hours of Calibration: 36																									
				Percent Operational Time: 99.9																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	0	0	0	0	0	Z	0	0	0	0	7	8	2	2	1	2	1	0	0	0	0	0	0	0	1.0	8			
2-Dec	Z	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	4			
3-Dec	2	Z	5	0	0	1	0	0	2	10	3	1	1	1	1	2	2	0	0	0	0	0	0	1.3	10				
4-Dec	0	0	Z	0	1	0	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	7	0.6	7			
5-Dec	1	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1			
6-Dec	0	3	8	23	Z	14	18	3	13	17	8	6	9	5	10	2	1	1	1	1	0	0	0	6.3	23				
7-Dec	0	0	0	0	2	Z	0	0	0	1	3	4	7	5	2	1	0	0	0	1	0	0	9	10	1.9	10			
8-Dec	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1			
9-Dec	1	Z	0	0	0	0	0	0	0	2	7	11	10	3	1	0	0	0	4	5	3	1	0	0	2.2	11			
10-Dec	8	5	Z	1	1	0	0	0	0	0	1	2	1	1	3	2	0	0	0	0	0	0	1	4	1.4	8			
11-Dec	3	3	3	Z	4	4	2	2	5	8	C	C	C	C	C	0	0	0	0	0	0	0	0	1.9	8				
12-Dec	0	0	0	0	Z	0	1	0	0	0	1	2	2	1	1	1	0	0	0	0	0	0	0	0	0.4	2			
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	0	1	3	2	0	0	1	0	0	0	1	2	0.6	3			
14-Dec	Z	79	18	27	0	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.7	79			
15-Dec	0	Z	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0.3	2			
16-Dec	DF	0	Z	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2			
17-Dec	0	0	0	Z	0	0	0	0	0	1	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	2			
18-Dec	0	0	0	0	Z	0	0	0	0	0	2	1	2	2	3	0	0	0	0	0	1	0	0	0	0.6	3			
19-Dec	0	3	1	0	0	Z	0	0	0	0	1	1	2	4	4	2	0	0	1	7	3	15	22	23	4.0	23			
20-Dec	Z	0	0	0	0	0	0	1	1	0	1	2	3	5	4	1	0	0	0	0	0	0	0	0	0.8	5			
21-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	2	2	2	25	23	16	7	20	21	6	5.5	25			
22-Dec	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1			
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1			
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0.2	1			
25-Dec	6	7	9	11	11	Z	0	0	0	2	19	10	10	15	11	4	3	1	0	0	0	0	0	0	5.2	19			
26-Dec	Z	0	0	0	0	0	8	2	2	16	9	22	36	43	64	55	49	2	1	0	1	1	0	13.5	64				
27-Dec	2	Z	0	1	0	0	0	2	2	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0.6	2			
28-Dec	0	0	Z	17	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.9	17			
29-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.1	1			
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	2	3	7	4	1	0	0	0	0	0	0	0	0	0.7	7			
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0.2	3			
		1.0	3.9	1.7	3.2	0.9	1.0	0.9	0.6	0.9	1.6	2.5	2.2	2.7	3.1	3.2	2.9	2.1	2.6	1.1	1.0	0.5	1.3	1.8	1.7	Diurnal Average			
		8	79	18	27	11	14	18	8	13	17	19	11	22	36	43	64	55	49	23	16	7	20	22	23	Diurnal Maximum			
Z - zerspan		C - Calibration				DF - DAS Failure																							





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**CNRL Horizon - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	693	98.02	98.02
21 - 40	9	1.27	99.29
41 - 80	5	0.71	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

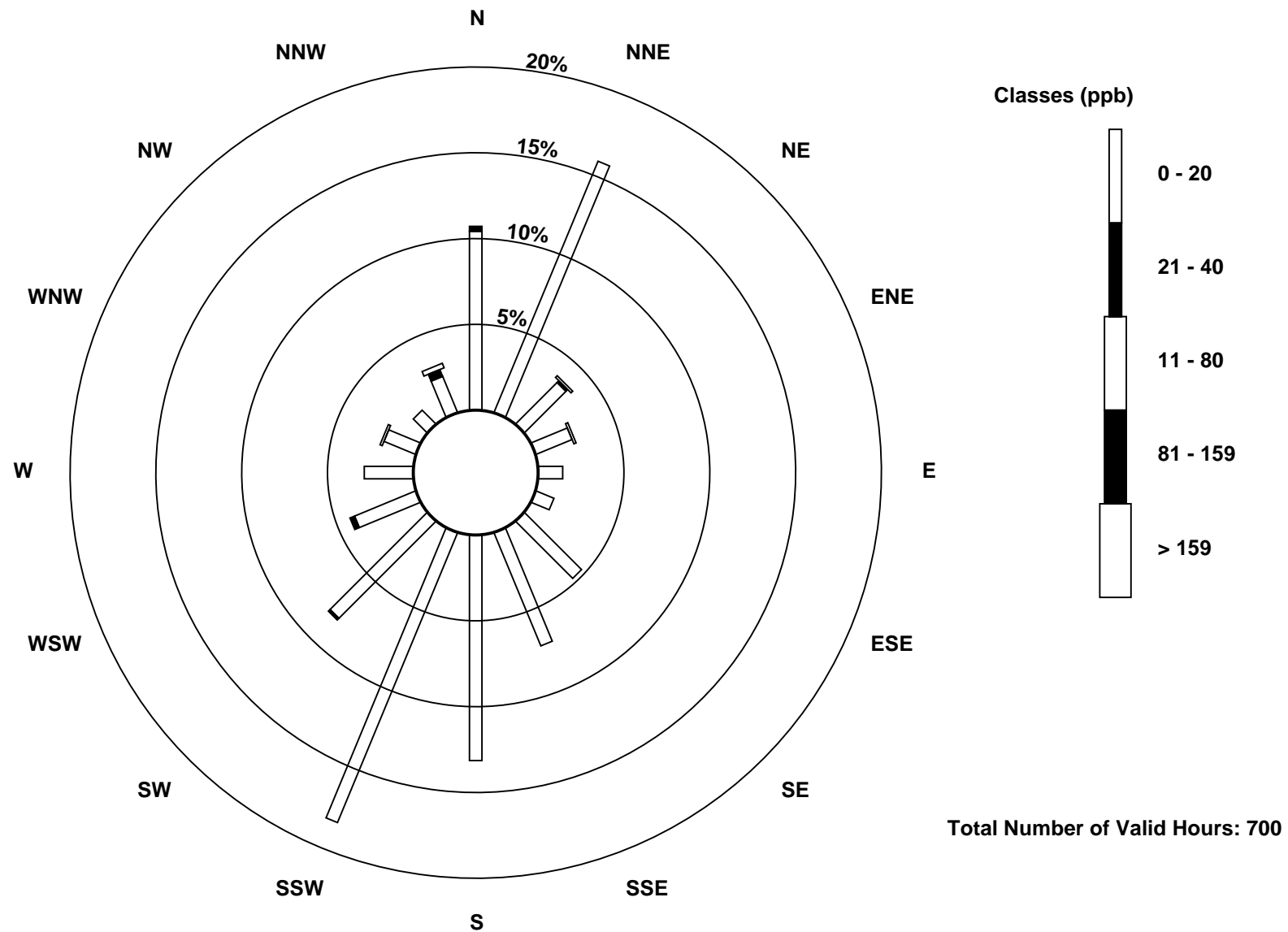
**Nitric Oxide (NO) - ppb**  
**CNRL Horizon - December 2015**

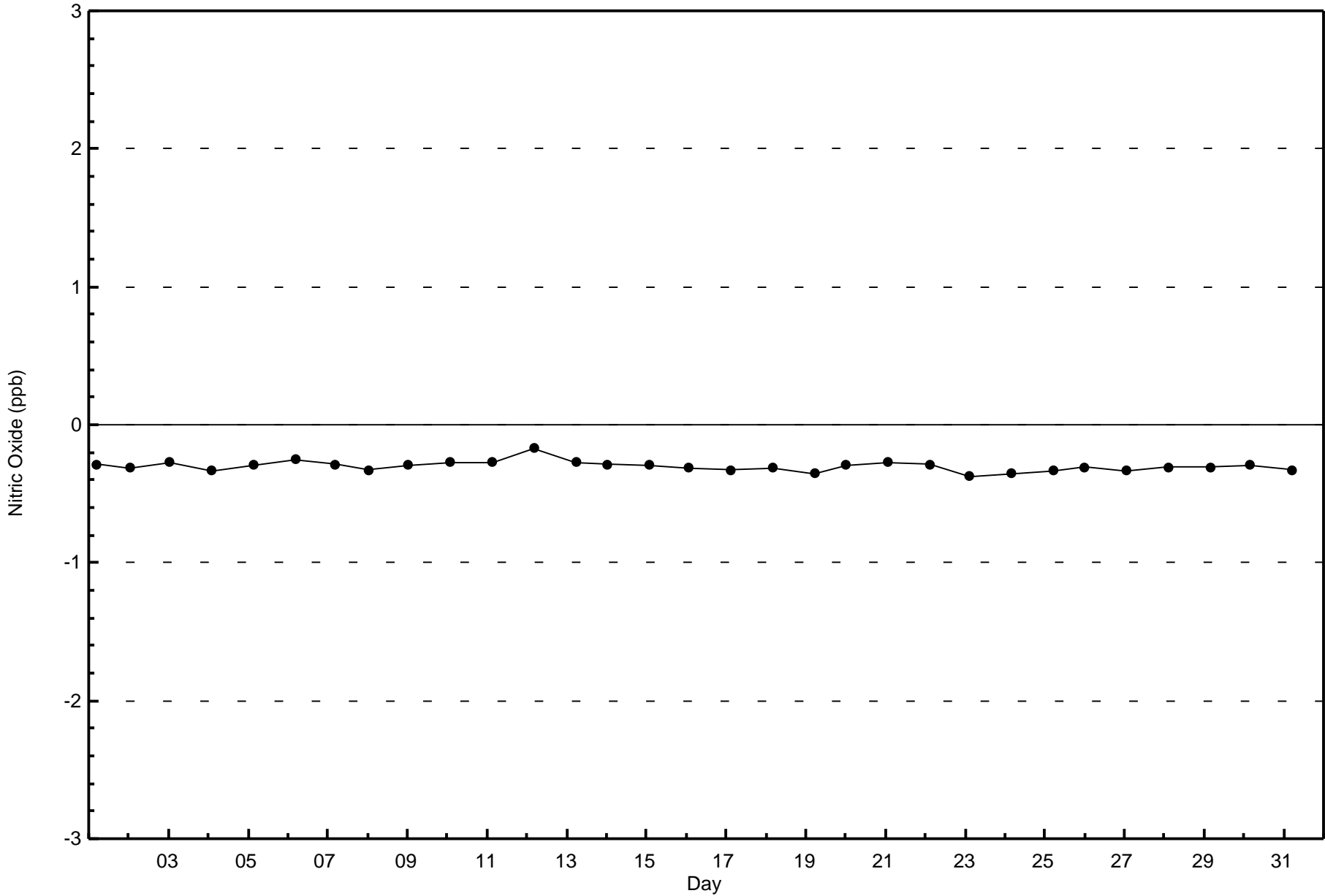
<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	73	111	24	16	10	8	33	50	92	128	56	27	20	14	8	16	686
21 - 40	2	0	1	0	0	0	0	0	0	0	1	2	0	0	0	3	9
11 - 80	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	2	5
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	75	111	26	17	10	8	33	50	92	128	57	29	20	15	8	21	700

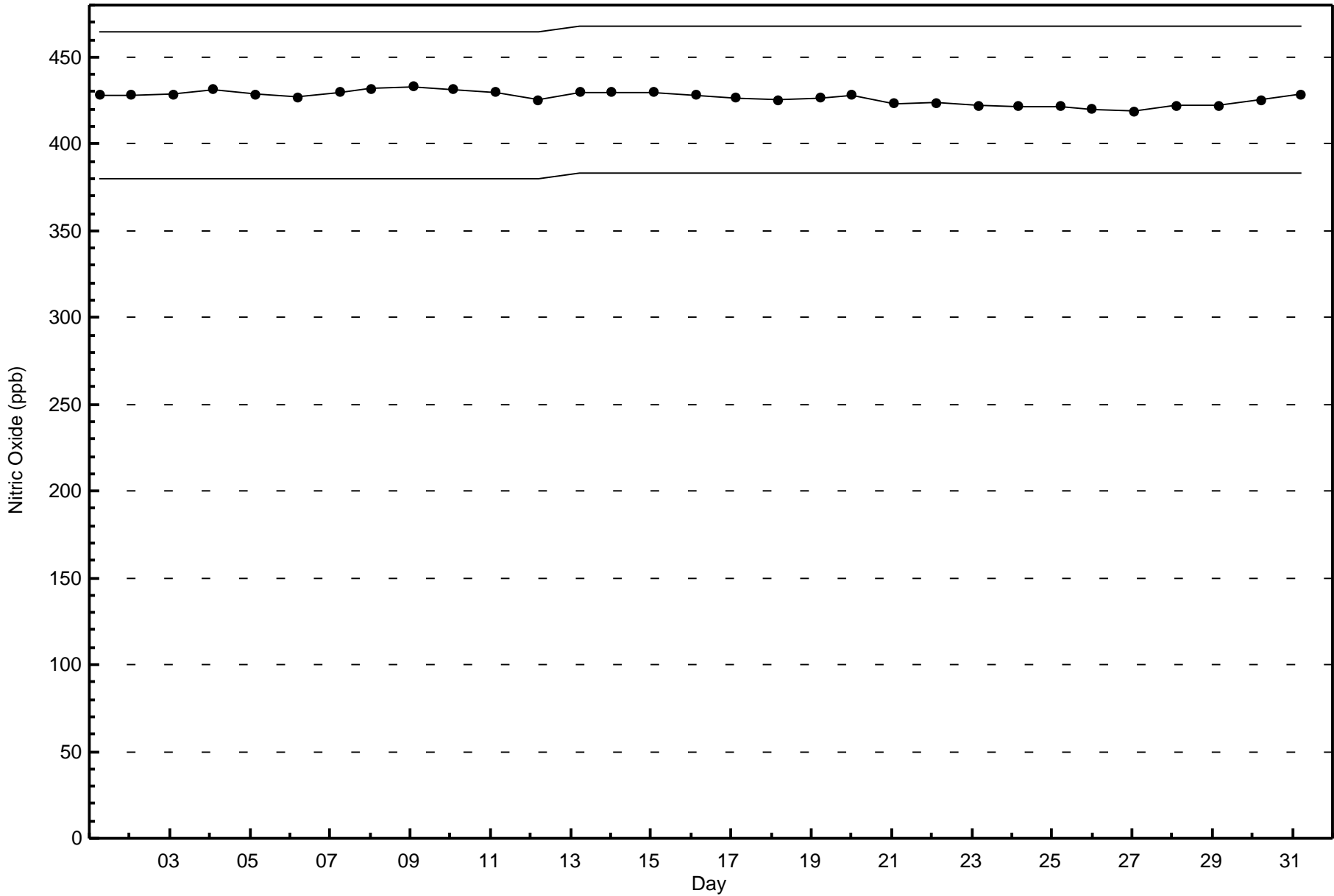
Total Number of Valid Hours: 700

Total Number of Hours: 744











Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 30 ppb on Dec 3 03:00	Maximum Daily Average: 19.0 ppb on Dec 6
Minimum Value: 0 ppb on Dec 5 09:00	Hours of Data: 707
Maximum Diurnal Average: 8.4 ppb at hour 4	Hours of Missing Data: 37
Monthly Average: 6.9 ppb	Hours of Calibration: 36
Minimum Daily Average: 1.0 ppb on Dec 23	Percent Operational Time: 99.9
Minimum Diurnal Average: 5.4 ppb at hour 12	
Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 5 O <sub>3</sub> = 10 P <sub>90</sub> = 17 P <sub>99</sub> = 24	

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	2	1	1	Z	1	1	2	1	13	17	8	7	5	17	19	15	10	3	3	3	10	8	6.5	19
2-Dec	Z	3	2	2	3	27	12	3	2	5	4	3	2	2	2	2	2	2	1	1	1	2	18	14	5.0	27
3-Dec	19	Z	30	21	1	12	10	6	9	18	9	5	4	4	5	7	10	10	7	5	4	3	2	1	8.8	30
4-Dec	2	1	Z	1	2	2	1	1	2	5	8	7	4	2	2	2	2	1	1	1	1	1	1	12	2.7	12
5-Dec	15	7	6	Z	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.4	15
6-Dec	5	16	21	25	Z	24	25	21	25	25	18	14	15	12	20	18	22	23	22	20	20	19	15	14	19.0	25
7-Dec	12	10	9	11	17	Z	9	6	5	5	6	7	10	10	7	8	7	5	4	6	6	7	13	15	8.5	17
8-Dec	Z	14	11	7	7	8	6	4	3	2	1	0	0	0	1	7	9	13	17	14	13	16	11	13	7.8	17
9-Dec	12	Z	9	8	5	6	8	9	8	13	15	17	17	12	10	10	13	14	20	20	18	17	14	12	12.5	20
10-Dec	16	16	Z	14	14	10	11	9	6	6	8	9	5	4	10	13	5	10	9	7	3	4	7	14	9.0	16
11-Dec	11	7	6	Z	10	10	8	7	10	11	C	C	C	C	C	6	6	7	8	10	3	1	1	1	6.8	11
12-Dec	1	1	2	2	Z	6	6	4	5	7	8	10	11	9	8	11	9	8	9	7	8	8	6	7	6.5	11
13-Dec	6	5	3	2	1	Z	2	2	2	3	3	3	2	5	12	10	7	9	15	12	8	7	11	15	6.1	15
14-Dec	Z	22	19	20	7	7	7	8	4	2	1	0	0	0	0	1	1	1	1	1	1	3	5	5	5.1	22
15-Dec	7	Z	2	6	5	11	13	10	11	7	1	1	1	1	1	1	1	1	1	1	5	18	2	0	4.6	18
16-Dec	DF	6	Z	2	17	6	3	2	0	1	0	0	0	1	0	0	2	4	3	4	6	4	2	2	3.0	17
17-Dec	1	0	0	Z	2	4	10	14	15	14	11	4	5	8	9	9	6	3	1	2	3	2	1	1	5.4	15
18-Dec	2	5	3	3	Z	7	9	9	10	4	10	4	7	7	13	5	3	8	7	10	7	3	2	9	6.3	13
19-Dec	17	25	23	18	16	Z	8	1	2	2	5	4	7	9	12	14	17	17	20	22	20	22	22	20	14.0	25
20-Dec	Z	13	12	8	6	7	6	7	7	5	4	5	7	9	11	9	11	10	10	9	10	11	12	12	8.6	13
21-Dec	16	Z	13	8	8	7	7	3	3	3	2	2	2	3	4	9	14	19	17	17	15	17	17	16	9.6	19
22-Dec	13	5	Z	3	2	2	2	2	1	1	1	2	2	1	1	2	1	1	1	1	1	1	1	1	2.0	13
23-Dec	1	1	1	Z	2	2	3	2	2	1	1	1	1	0	1	0	1	0	0	1	1	1	0	0	1.0	3
24-Dec	0	2	1	1	Z	1	0	2	2	1	2	1	2	2	3	4	7	12	13	13	14	13	10	14	5.2	14
25-Dec	20	19	18	18	18	Z	8	9	7	9	15	13	13	16	15	14	16	10	6	6	3	3	3	3	11.4	20
26-Dec	Z	3	3	3	3	4	7	19	15	13	16	11	19	24	26	28	28	28	20	17	15	17	19	15	15.3	28
27-Dec	16	Z	14	12	13	13	11	16	18	12	6	6	5	3	4	5	6	5	5	5	5	5	3	3	8.3	18
28-Dec	3	3	Z	22	6	3	2	2	2	2	3	3	1	1	3	5	3	3	5	5	5	5	4	7	4.1	22
29-Dec	5	3	5	Z	3	3	3	2	2	2	2	1	1	1	1	2	2	2	2	2	2	2	2	2	2.2	5
30-Dec	1	1	1	1	Z	1	1	1	1	1	1	7	13	19	16	10	2	2	0	1	0	0	1	1	3.5	19
31-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	13	16	7	6	8	1	1	1	1	1	2.8	16

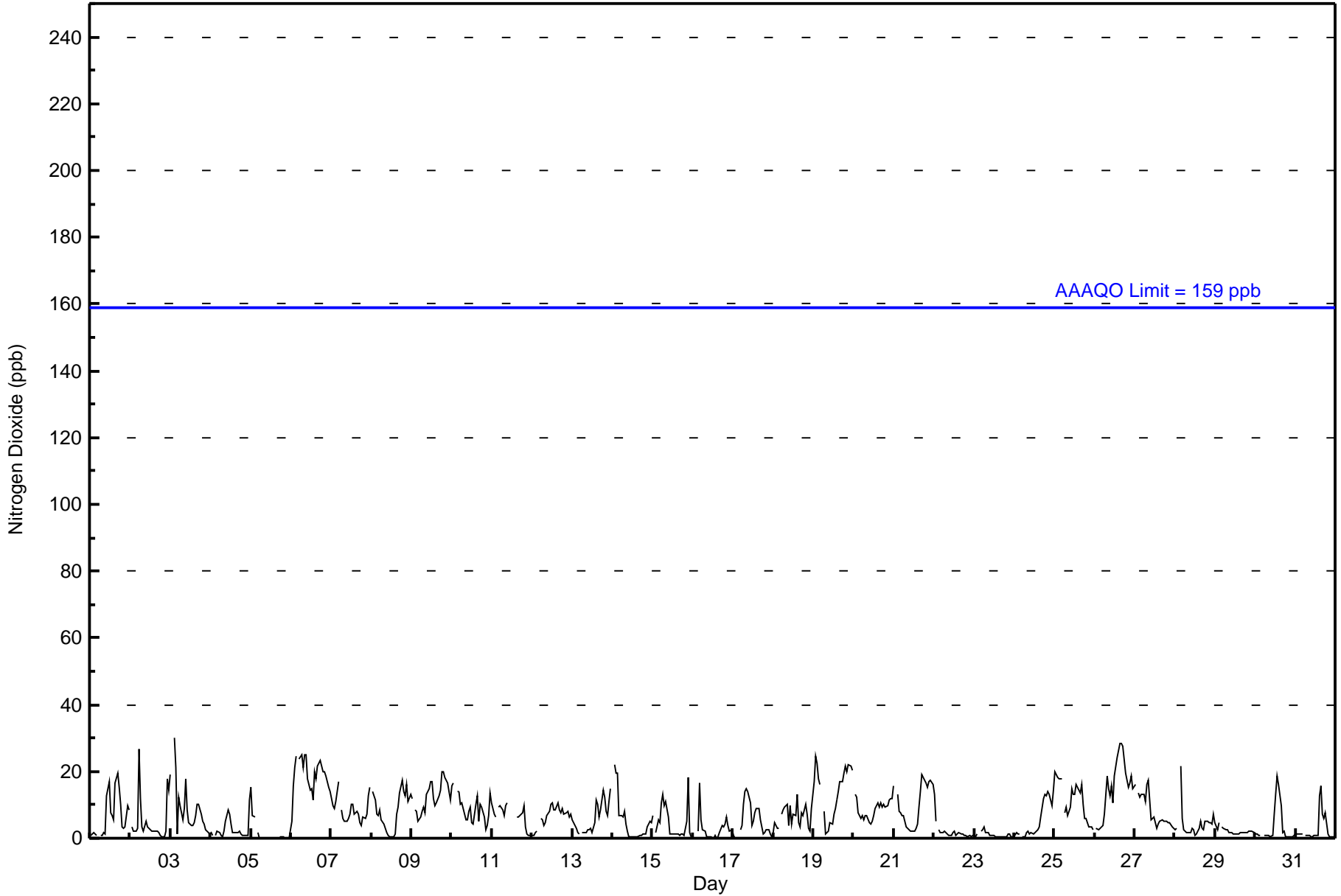
8.0	7.3	8.3	8.4	6.6	7.2	6.3	5.9	5.8	5.7	5.7	5.4	5.5	5.7	7.2	7.8	7.7	8.0	7.8	7.2	6.5	7.0	6.9	7.6	Diurnal Average
20	25	30	25	18	27	25	21	25	25	18	17	19	24	26	28	28	28	22	22	20	22	22	20	Diurnal Maximum

Z - zerospan      C - Calibration      DF - DAS Failure  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association  
Hourly Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
CNRL Horizon - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**CNRL Horizon - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	682	96.46	96.46
21 - 40	25	3.54	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**CNRL Horizon - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	69	109	25	16	10	8	32	50	91	126	56	27	19	13	7	17	675
21 - 40	6	2	1	1	0	0	1	0	1	2	1	2	1	2	1	4	25
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	75	111	26	17	10	8	33	50	92	128	57	29	20	15	8	21	700

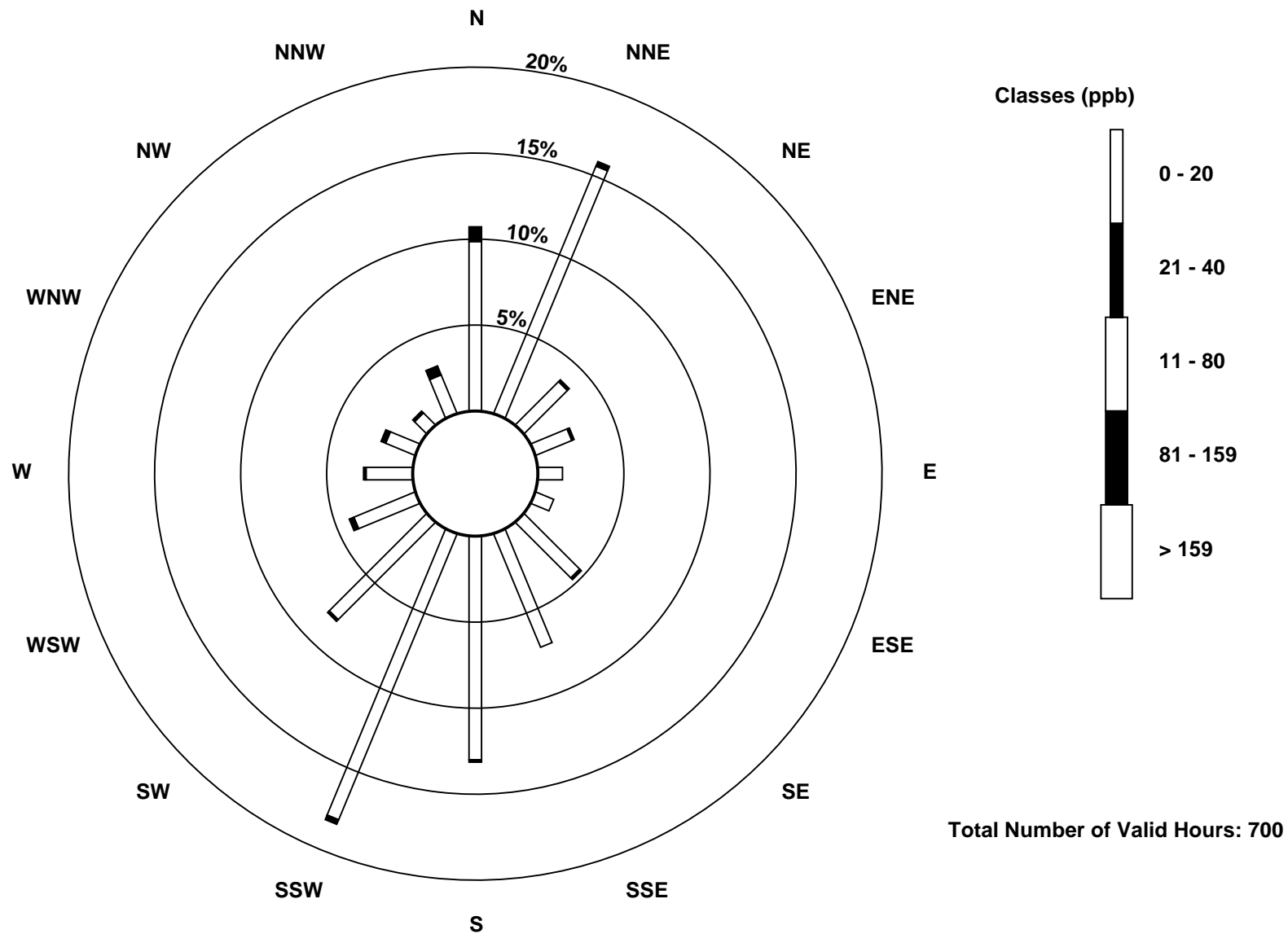
Total Number of Valid Hours: 700

Total Number of Hours: 744

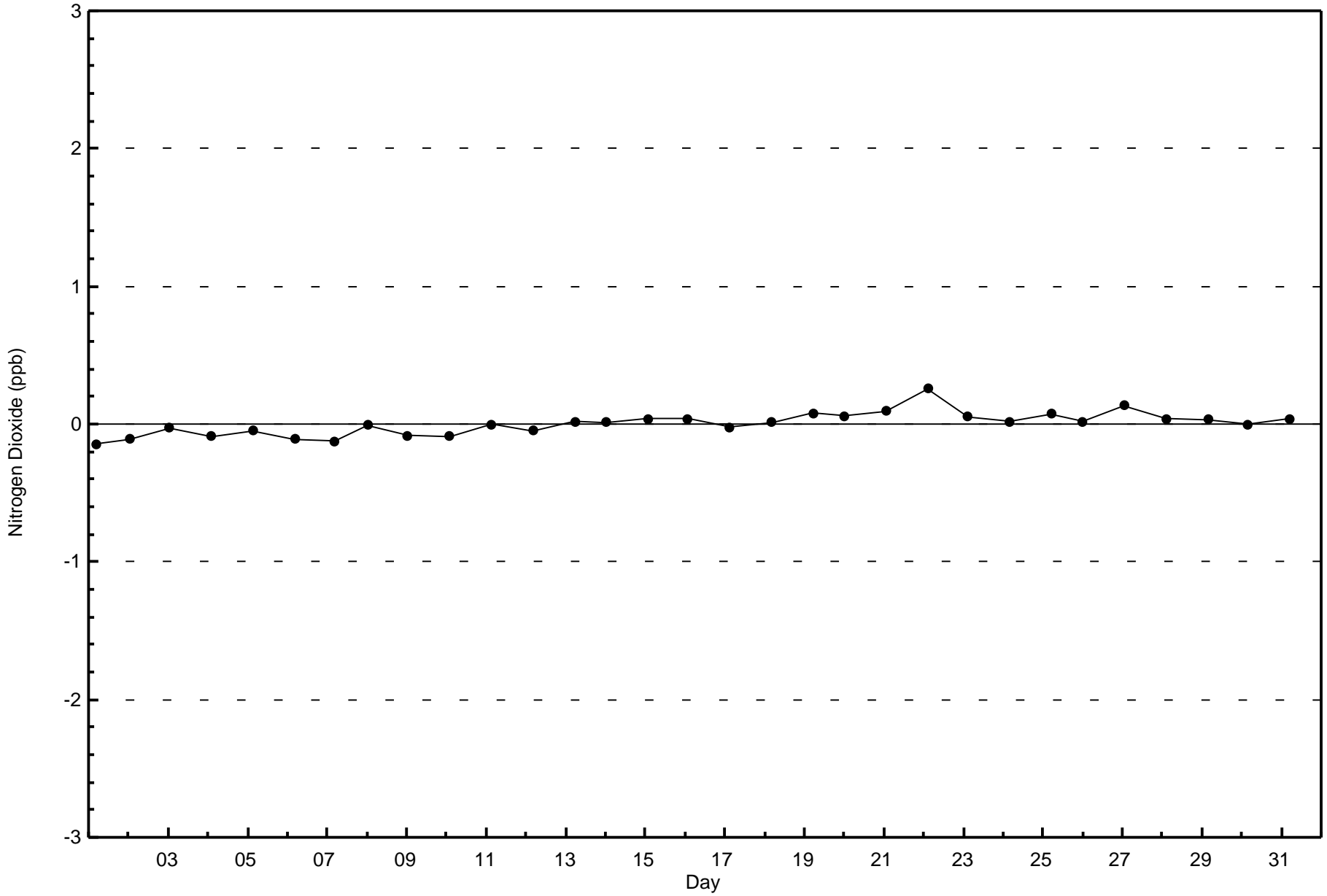


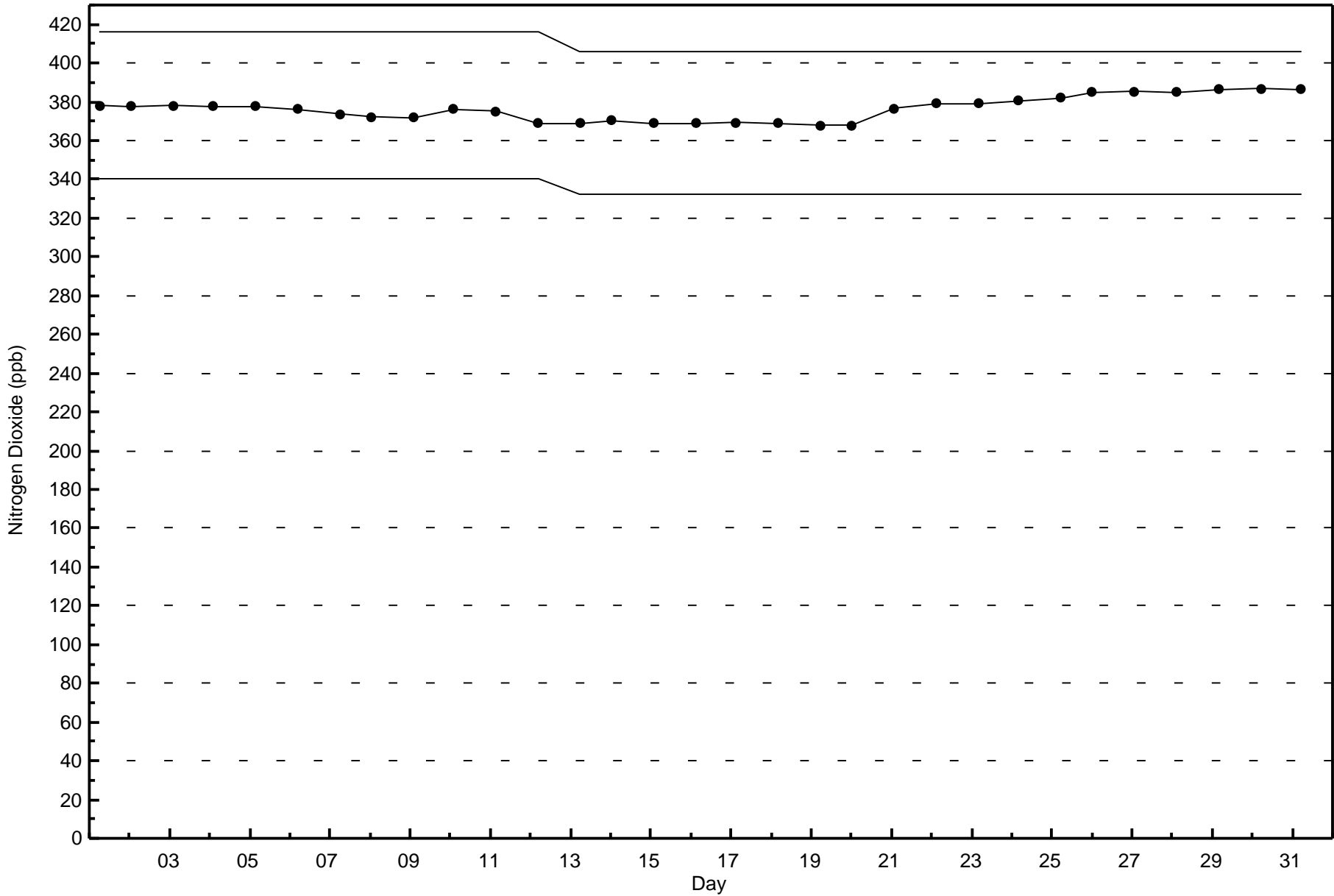
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
CNRL Horizon (AMS 15)



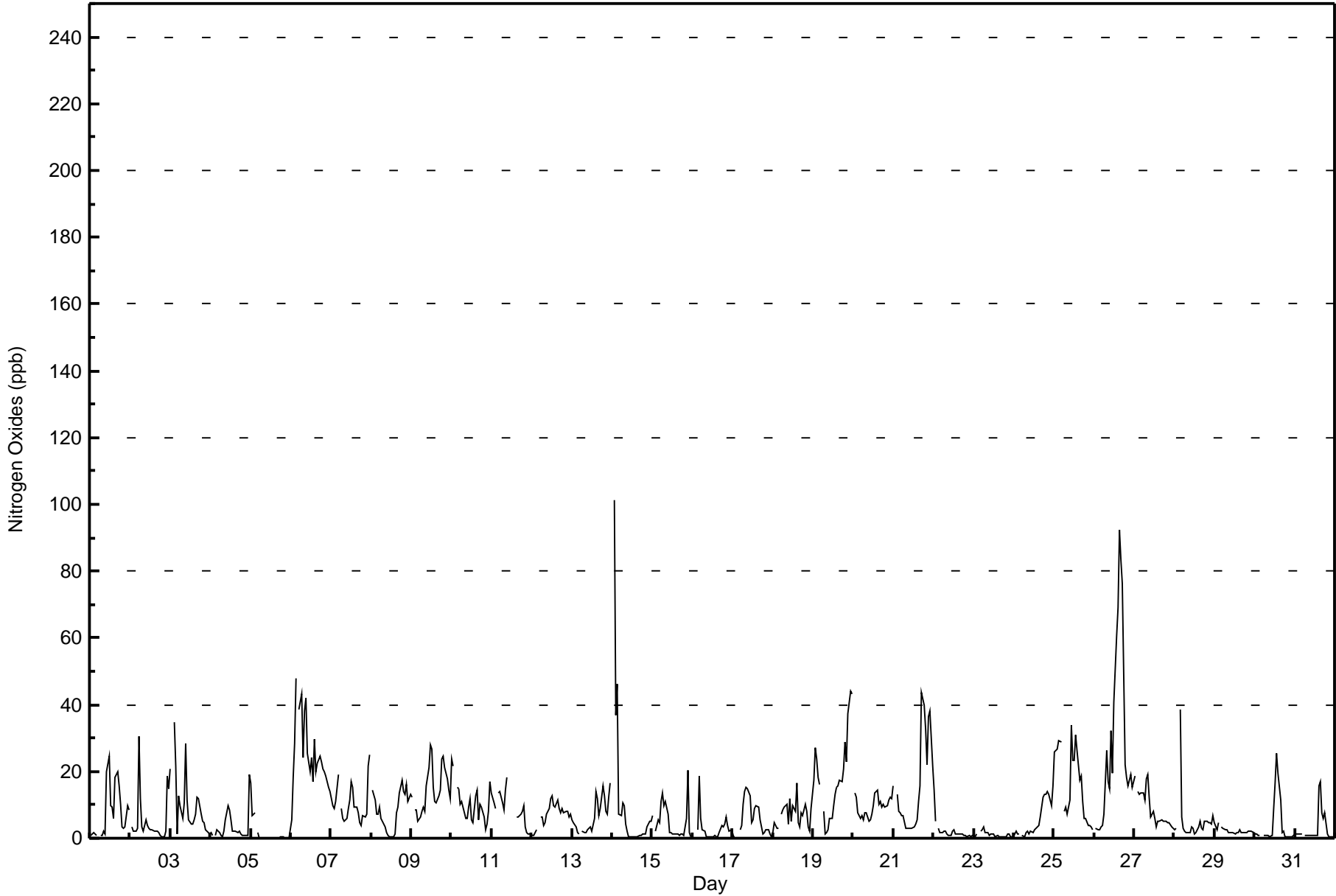








Maximum Value: 101 ppb on Dec 14 02:00		Maximum Daily Average: 28.8 ppb on Dec 26		Hours in Service: 744																																													
Minimum Value: 0 ppb on Dec 5 09:00		Minimum Daily Average: 1.1 ppb on Dec 23		Hours of Data: 707																																													
Maximum Diurnal Average: 11.6 ppb at hour 4		Minimum Diurnal Average: 6.5 ppb at hour 8		Hours of Missing Data: 37																																													
Monthly Average: 8.7 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 5 Q <sub>3</sub> = 12 P <sub>90</sub> = 20 P <sub>99</sub> = 41		Hours of Calibration: 36																																													
				Percent Operational Time: 99.9																																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	1	1	2	1	1	Z	1	1	2	1	20	24	10	9	6	18	20	16	10	3	3	3	10	8	7.5	24																							
2-Dec	Z	3	2	2	3	30	12	3	2	5	4	3	3	2	2	2	2	2	1	1	0	2	19	15	5.3	30																							
3-Dec	21	Z	35	21	1	13	10	6	11	28	12	6	4	4	5	7	12	12	7	5	5	3	2	1	10.1	35																							
4-Dec	2	1	Z	1	3	2	1	1	2	5	10	9	5	2	2	2	2	1	1	1	1	1	1	19	3.2	19																							
5-Dec	17	7	8	Z	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.5	17																							
6-Dec	5	18	29	48	Z	38	43	24	38	42	25	20	24	17	30	20	23	25	23	21	20	19	15	14	25.3	48																							
7-Dec	12	10	9	11	19	Z	9	6	5	6	9	11	17	15	9	9	7	5	4	7	6	7	21	25	10.4	25																							
8-Dec	Z	14	11	7	7	9	6	4	3	2	1	0	1	1	1	8	9	14	17	14	13	16	11	13	8.0	17																							
9-Dec	12	Z	9	9	5	6	8	10	8	16	21	28	27	15	11	11	13	14	24	25	21	18	14	12	14.6	28																							
10-Dec	24	22	Z	15	15	10	11	9	6	6	9	12	5	5	13	14	5	10	9	7	3	4	8	17	10.4	24																							
11-Dec	14	11	9	Z	14	14	10	9	15	18	C	C	C	C	C	6	6	7	8	10	3	2	1	1	8.8	18																							
12-Dec	1	1	2	2	Z	6	6	4	5	7	9	12	13	10	9	11	9	8	9	8	8	8	7	7	7.0	13																							
13-Dec	6	5	3	2	1	Z	2	2	2	3	3	3	2	6	14	12	7	9	16	13	8	7	12	17	6.7	17																							
14-Dec	Z	101	37	46	7	7	11	10	4	2	1	0	0	0	0	1	1	1	1	1	1	3	5	5	10.7	101																							
15-Dec	7	Z	2	6	5	11	14	10	11	7	2	2	1	1	1	1	1	1	1	1	6	20	2	0	4.9	20																							
16-Dec	DF	6	Z	2	19	6	3	2	0	1	0	0	0	1	0	0	2	4	4	4	6	4	2	2	3.2	19																							
17-Dec	1	0	0	Z	2	4	10	14	15	15	13	5	6	9	10	9	6	3	1	2	3	2	1	0	5.7	15																							
18-Dec	2	5	3	3	Z	7	9	9	10	4	12	5	10	8	17	5	3	8	7	10	8	3	2	9	6.9	17																							
19-Dec	17	27	24	18	16	Z	8	1	2	2	6	6	10	13	15	16	17	17	21	29	23	37	44	43	18.0	44																							
20-Dec	Z	14	12	8	6	7	6	7	8	5	5	7	10	14	14	10	11	10	10	10	10	11	12	12	9.5	14																							
21-Dec	16	Z	13	8	8	7	7	3	3	3	3	3	3	4	6	11	16	44	40	33	22	37	38	21	15.1	44																							
22-Dec	15	5	Z	3	2	2	2	2	1	1	1	2	3	1	1	1	1	1	1	1	1	1	1	1	2.1	15																							
23-Dec	1	1	1	Z	2	2	3	2	2	1	1	1	1	0	1	0	1	0	0	1	1	1	0	0	1.1	3																							
24-Dec	0	2	1	1	Z	1	1	2	2	1	2	2	3	3	4	7	12	13	13	14	13	10	16	5.4	16																								
25-Dec	26	26	27	29	29	Z	8	9	7	11	34	23	23	31	26	17	19	11	6	6	4	4	4	3	16.6	34																							
26-Dec	Z	3	3	3	3	4	7	26	17	15	32	20	41	60	69	92	83	76	22	18	16	17	19	15	28.8	92																							
27-Dec	19	Z	14	13	14	13	11	18	19	12	6	8	6	4	5	5	6	5	5	5	5	5	3	3	8.9	19																							
28-Dec	2	3	Z	39	6	3	2	2	2	2	3	3	1	2	3	5	3	3	5	5	5	5	4	7	5.0	39																							
29-Dec	5	3	5	Z	3	3	3	2	2	2	2	2	1	2	2	3	2	2	2	2	2	2	2	2	2.3	5																							
30-Dec	1	1	1	1	Z	1	1	1	1	1	1	9	16	25	20	11	2	2	0	0	0	0	1	1	4.3	25																							
31-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	15	17	7	6	8	1	1	0	0	1	3.0	17																							
																								9.0	11.2	10.1	11.6	7.5	8.2	7.2	6.5	6.6	7.3	8.2	7.6	8.3	8.9	10.4	10.7	9.8	10.6	8.9	8.2	7.0	8.3	8.8	9.4	Diurnal Average	
																								26	101	37	48	29	38	43	26	38	42	34	28	41	60	69	92	83	76	40	33	23	37	44	43	Diurnal Maximum	
Z - zerospan																								C - Calibration				DF - DAS Failure																					





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**CNRL Horizon - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	638	90.24	90.24
21 - 40	55	7.78	98.02
41 - 80	11	1.56	99.58
81 - 159	3	0.42	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**CNRL Horizon - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	57	102	23	16	9	8	32	48	84	125	54	26	18	10	6	13	631
21 - 40	15	9	1	0	1	0	1	2	8	3	2	1	2	4	2	4	55
11 - 80	3	0	1	1	0	0	0	0	0	0	1	2	0	0	0	3	11
81 - 159	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	3
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	75	111	26	17	10	8	33	50	92	128	57	29	20	15	8	21	700

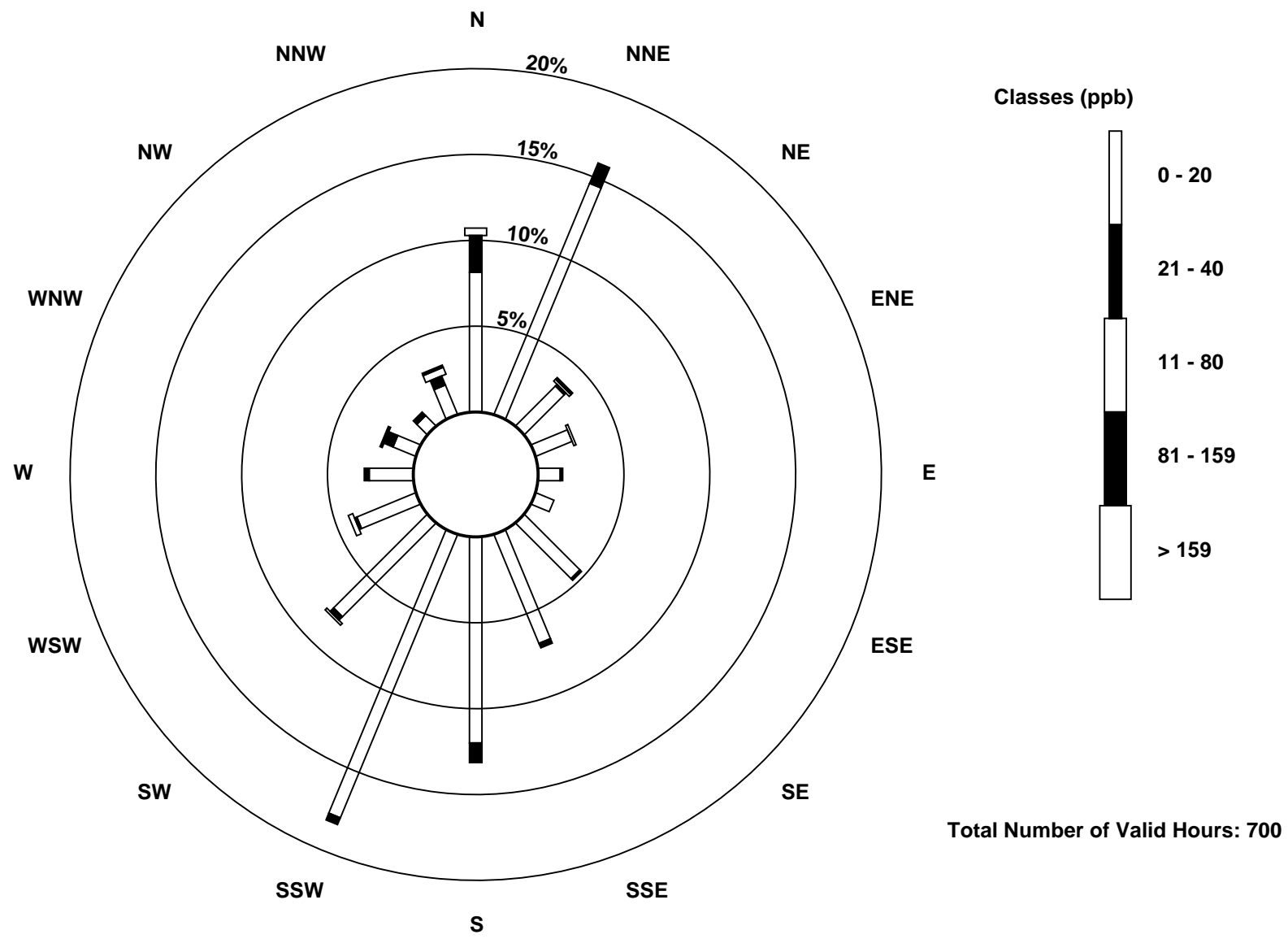
Total Number of Valid Hours: 700

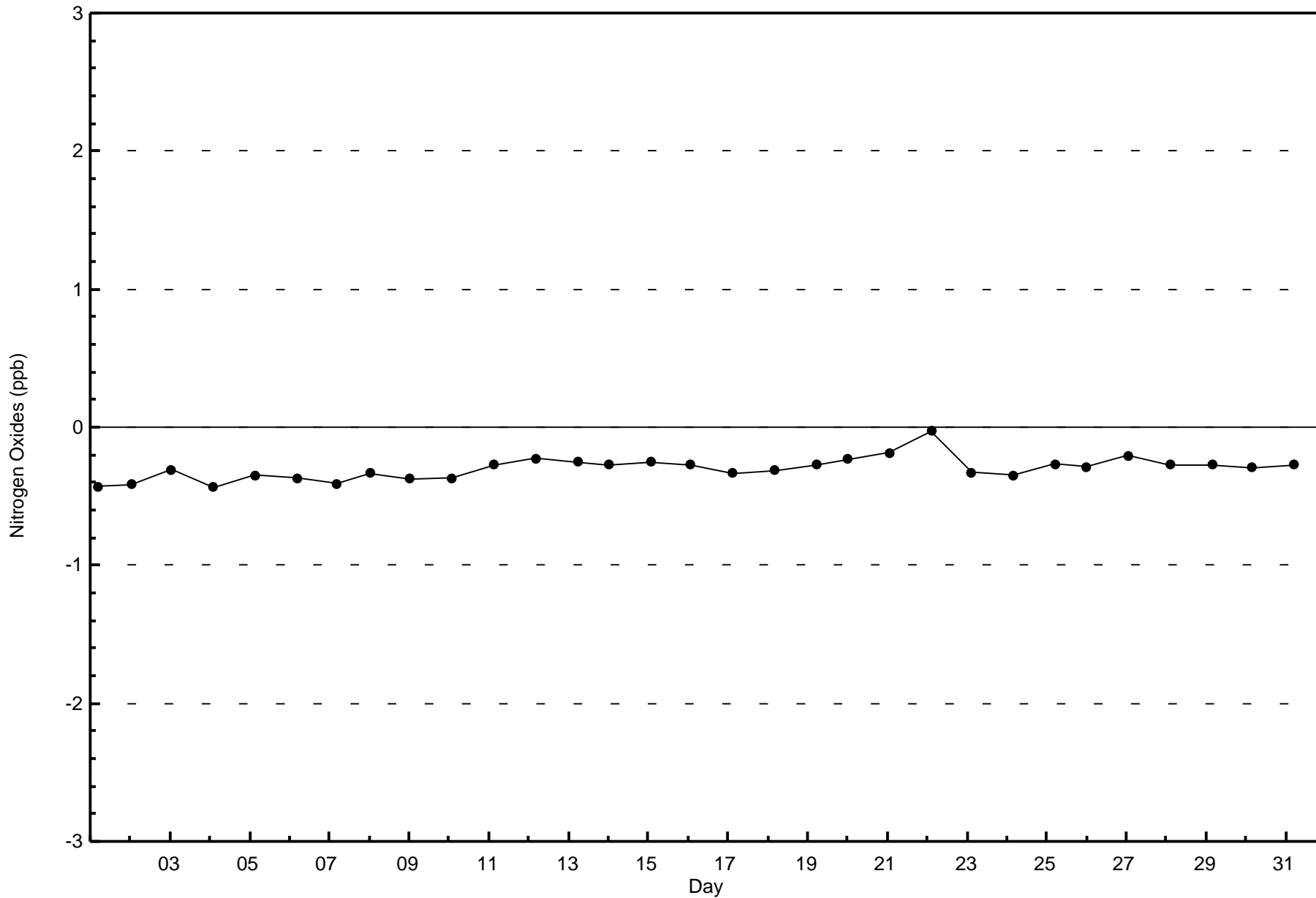
Total Number of Hours: 744



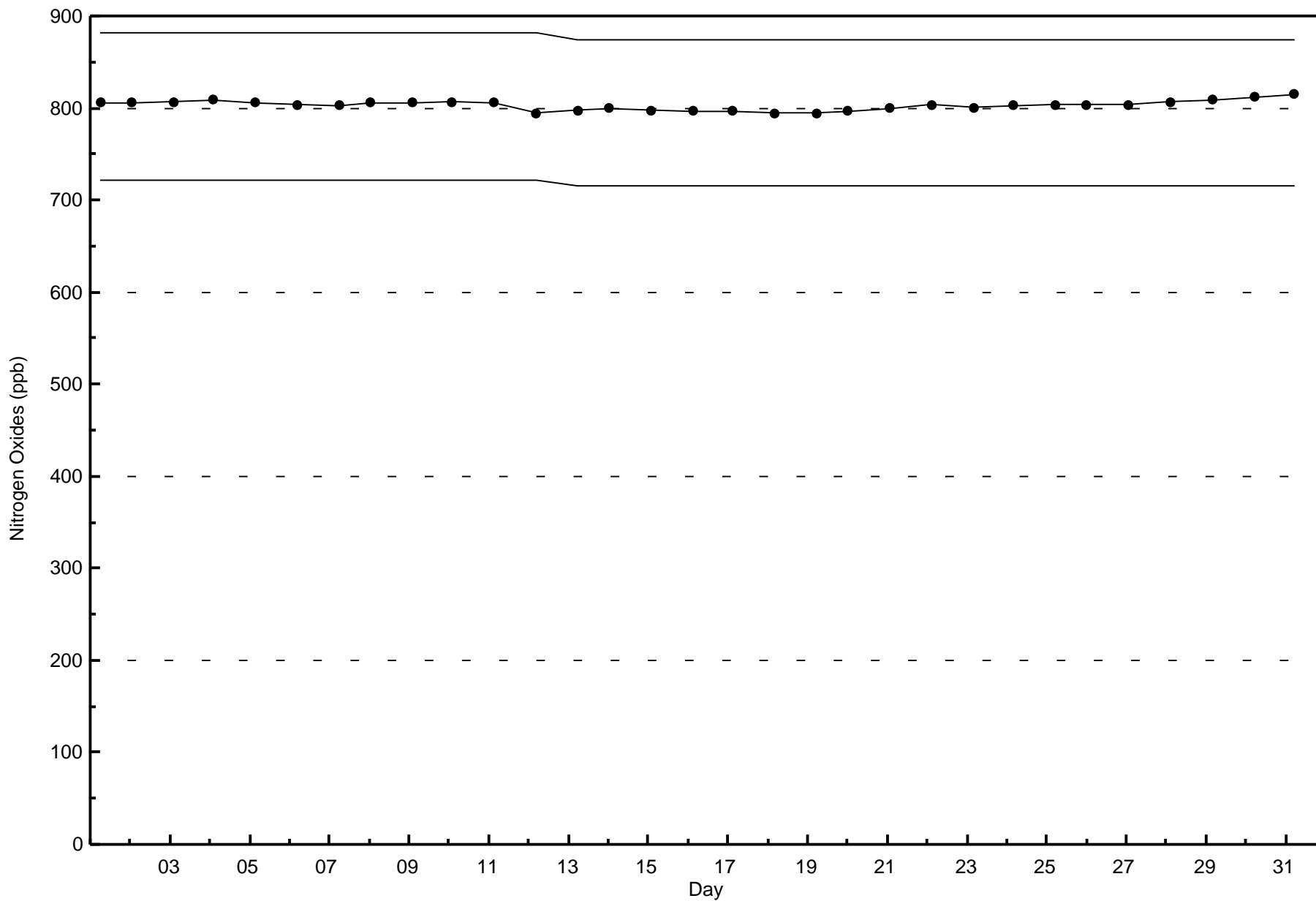
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
CNRL Horizon (AMS 15)











Summary of Hour Averages

CNRL Horizon - December 2015

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 22.2 µg/m <sup>3</sup> on Dec 26 18:00 Maximum Daily Average: 9.1 µg/m <sup>3</sup> on Dec 3		Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 2 Percent Operational Time: 100.0																									
Minimum Value: 0.4 µg/m <sup>3</sup> on Dec 12 01:00 Maximum Diurnal Average: 5.5 µg/m <sup>3</sup> at hour 18 Monthly Average: 4.76 µg/m <sup>3</sup>		Minimum Daily Average: 1.3 µg/m <sup>3</sup> on Dec 16 Minimum Diurnal Average: 3.9 µg/m <sup>3</sup> at hour 23 Percentiles: P <sub>1</sub> = 0.7 P <sub>10</sub> = 1.5 Q <sub>1</sub> = 2.4 Median = 4.5 Q <sub>3</sub> = 6.5 P <sub>90</sub> = 8.2 P <sub>99</sub> = 15.6																									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	3.1	2.9	3.1	3.3	3.5	3.6	3.8	4.1	4.7	4.0	4.5	4.1	4.0	4.2	3.5	6.7	8.2	6.9	6.2	5.1	5.1	5.6	7.7	7.3	4.8	8.2	
2-Dec	8.1	9.1	9.0	8.6	9.0	13.0	12.8	11.4	10.1	10.0	8.8	8.7	8.1	7.3	5.9	5.3	5.7	4.4	2.8	2.2	2.0	2.0	2.5	2.8	7.1	13.0	
3-Dec	4.6	6.3	7.0	6.6	2.8	7.1	10.8	8.7	8.2	18.9	15.7	15.8	17.9	12.8	9.7	8.6	8.3	8.2	7.5	6.7	6.6	6.4	6.3	6.6	9.1	18.9	
4-Dec	7.6	8.8	8.9	7.5	7.0	7.2	6.7	6.6	7.1	8.0	8.7	9.2	7.5	4.3	3.7	4.1	4.9	4.7	5.6	6.0	6.0	5.7	5.7	5.6	6.5	9.2	
5-Dec	5.5	5.7	5.0	4.4	2.8	2.6	2.4	2.3	2.2	2.2	2.2	2.1	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	2.0	2.0	2.6	5.7	
6-Dec	2.8	4.4	5.2	6.9	7.5	6.5	6.5	5.4	6.5	5.6	4.7	4.5	5.6	4.3	5.2	5.3	7.6	8.9	8.4	7.3	6.5	5.8	5.3	4.8	5.9	8.9	
7-Dec	5.2	5.6	5.5	5.5	5.6	4.9	4.7	4.9	5.6	5.4	5.4	4.9	9.0	7.3	5.4	5.8	5.2	4.3	3.9	3.9	4.0	4.0	5.1	7.4	5.3	9.0	
8-Dec	6.2	5.9	5.7	5.6	5.7	5.8	6.0	6.1	5.8	5.5	4.5	4.0	4.0	4.0	5.0	8.7	13.4	15.6	9.9	8.4	4.8	4.9	4.7	5.0	6.5	15.6	
9-Dec	6.5	7.1	10.2	13.2	10.1	9.0	7.5	6.4	5.2	5.2	4.9	6.7	8.9	4.5	2.8	2.9	3.8	5.1	6.6	7.0	6.6	6.7	6.6	6.4	6.7	13.2	
10-Dec	7.6	7.6	6.3	6.0	6.3	6.3	6.7	6.7	6.4	6.3	6.5	6.8	5.4	6.7	5.7	5.2	3.9	4.5	4.8	4.8	4.6	4.8	5.4	7.5	6.0	7.6	
11-Dec	8.6	8.3	7.1	7.9	7.7	8.5	8.4	7.8	8.1	8.0	7.4	7.7	C	C	3.3	3.4	3.8	3.9	3.9	3.3	1.3	0.6	0.4	0.4	5.4	8.6	
12-Dec	0.4	0.5	0.6	0.8	1.0	1.1	1.0	1.3	1.7	2.6	3.4	3.7	4.1	4.2	4.4	6.7	4.2	3.0	4.5	4.8	3.2	2.4	1.7	1.4	2.6	6.7	
13-Dec	1.3	1.7	2.3	2.5	3.1	3.0	1.7	1.2	1.1	1.5	1.8	2.2	2.7	2.7	3.0	2.8	2.4	2.6	3.4	3.3	2.9	2.8	4.2	3.6	2.5	4.2	
14-Dec	7.5	11.5	6.7	6.3	3.5	3.2	3.4	3.0	2.4	2.4	2.1	1.9	1.7	2.0	1.9	1.5	1.2	1.5	1.6	1.5	1.6	1.7	1.6	1.8	3.1	11.5	
15-Dec	2.3	2.2	2.8	4.2	5.5	5.0	4.5	4.9	5.2	5.2	5.3	4.5	4.2	4.4	3.9	3.7	4.1	7.7	10.8	7.4	7.0	8.7	2.9	1.3	4.9	10.8	
16-Dec	1.4	1.7	1.4	1.4	2.5	1.6	1.3	1.2	1.1	1.0	1.1	1.2	1.1	1.1	1.1	1.0	1.0	1.2	1.3	1.4	1.8	1.3	1.4	1.5	1.3	2.5	
17-Dec	1.4	1.4	1.3	1.3	1.4	1.8	2.6	2.7	2.8	2.6	4.5	2.5	2.4	2.5	2.7	2.9	2.5	2.2	1.5	1.3	1.3	1.3	1.3	1.2	2.1	4.5	
18-Dec	1.4	1.8	1.7	1.8	1.6	1.8	1.8	1.8	2.4	3.4	1.9	1.4	1.9	1.9	2.2	1.9	2.3	3.2	3.5	3.5	2.1	1.8	1.7	2.3	2.1	3.5	
19-Dec	2.9	3.3	3.6	3.7	4.1	4.1	3.4	1.7	1.8	2.0	2.4	2.0	2.4	4.9	7.0	8.0	13.9	8.7	6.9	7.5	6.6	6.1	5.5	5.0	4.9	13.9	
20-Dec	3.7	3.4	3.5	4.2	4.4	5.0	5.2	5.3	4.8	5.7	6.4	6.4	6.5	6.8	6.9	6.4	6.5	6.6	5.8	5.1	5.1	5.7	4.8	6.8	5.5	6.9	
21-Dec	5.3	5.1	5.7	6.0	6.6	6.7	6.4	5.4	4.8	4.8	6.1	5.7	4.8	5.2	5.2	7.9	9.9	11.0	8.5	7.8	7.1	7.8	8.2	9.3	6.7	11.0	
22-Dec	7.6	3.9	3.5	5.8	4.0	5.0	7.2	6.6	5.8	4.8	3.5	4.1	7.8	4.4	4.6	4.0	3.5	2.9	2.7	2.7	2.6	2.5	2.7	2.8	4.4	7.8	
23-Dec	2.9	3.0	5.7	4.7	6.7	6.5	3.1	2.6	2.6	2.3	2.7	2.7	1.8	1.9	1.8	1.6	1.9	1.9	1.8	2.2	2.4	2.5	2.3	2.2	2.9	6.7	
24-Dec	2.5	3.3	3.6	3.3	3.3	3.0	3.0	3.4	3.5	3.4	3.4	3.1	3.3	3.9	4.5	5.1	5.2	5.8	6.2	7.5	7.4	6.8	6.7	7.9	4.5	7.9	
25-Dec	11.3	11.0	10.6	10.7	10.1	6.3	3.8	3.7	3.1	4.2	7.7	8.2	8.0	9.5	8.9	6.8	7.1	6.1	4.8	4.7	3.8	3.4	3.4	3.7	6.7	11.3	
26-Dec	5.5	6.5	6.4	6.0	5.7	5.5	6.5	10.1	7.9	19.2	9.3	18.1	13.9	7.7	8.2	8.2	8.4	22.2	5.9	5.8	5.0	5.5	5.8	5.4	8.7	22.2	
27-Dec	5.8	5.6	5.2	5.3	6.7	5.7	4.9	5.5	5.4	5.2	5.2	5.1	5.1	6.0	7.2	7.1	7.2	6.1	5.3	4.5	4.3	4.4	4.0	4.0	5.5	7.2	
28-Dec	4.2	4.8	5.3	4.1	5.5	5.0	5.9	5.6	4.1	4.4	7.0	7.3	4.4	4.3	4.8	4.9	5.7	4.8	5.0	5.6	5.5	5.6	5.2	4.9	5.2	7.3	
29-Dec	5.0	5.3	5.8	7.0	7.3	7.9	10.7	11.3	10.6	7.9	7.4	6.4	4.5	3.2	3.0	3.1	3.5	3.7	2.9	2.5	3.4	3.2	2.7	2.0	5.4	11.3	
30-Dec	1.9	2.0	1.8	1.9	2.1	2.2	2.2	2.2	1.7	1.6	1.2	1.0	0.9	1.1	1.0	0.8	0.7	0.7	0.6	0.8	0.8	0.9	1.1	2.0	1.4	2.2	
31-Dec	2.1	2.1	1.8	2.2	1.8	1.5	1.6	1.7	1.6	1.5	1.4	1.4	1.3	1.3	1.7	1.7	1.3	1.3	1.5	1.1	1.1	1.2	1.4	1.4	1.5	2.2	
4.6 4.9 4.9 5.1 5.0 5.0 5.0 4.9 4.7 5.3 5.1 5.3 5.2 4.5 4.4 4.7 5.1 5.5 4.7 4.4 4.0 4.0 3.9 4.1																								Diurnal Average			
11.3 11.5 10.6 13.2 10.1 13.0 12.8 11.4 10.6 19.2 15.7 18.1 17.9 12.8 9.7 8.7 13.9 22.2 10.8 8.4 7.4 8.7 8.2 9.3																								Diurnal Maximum			
C - Calibration																											
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																											

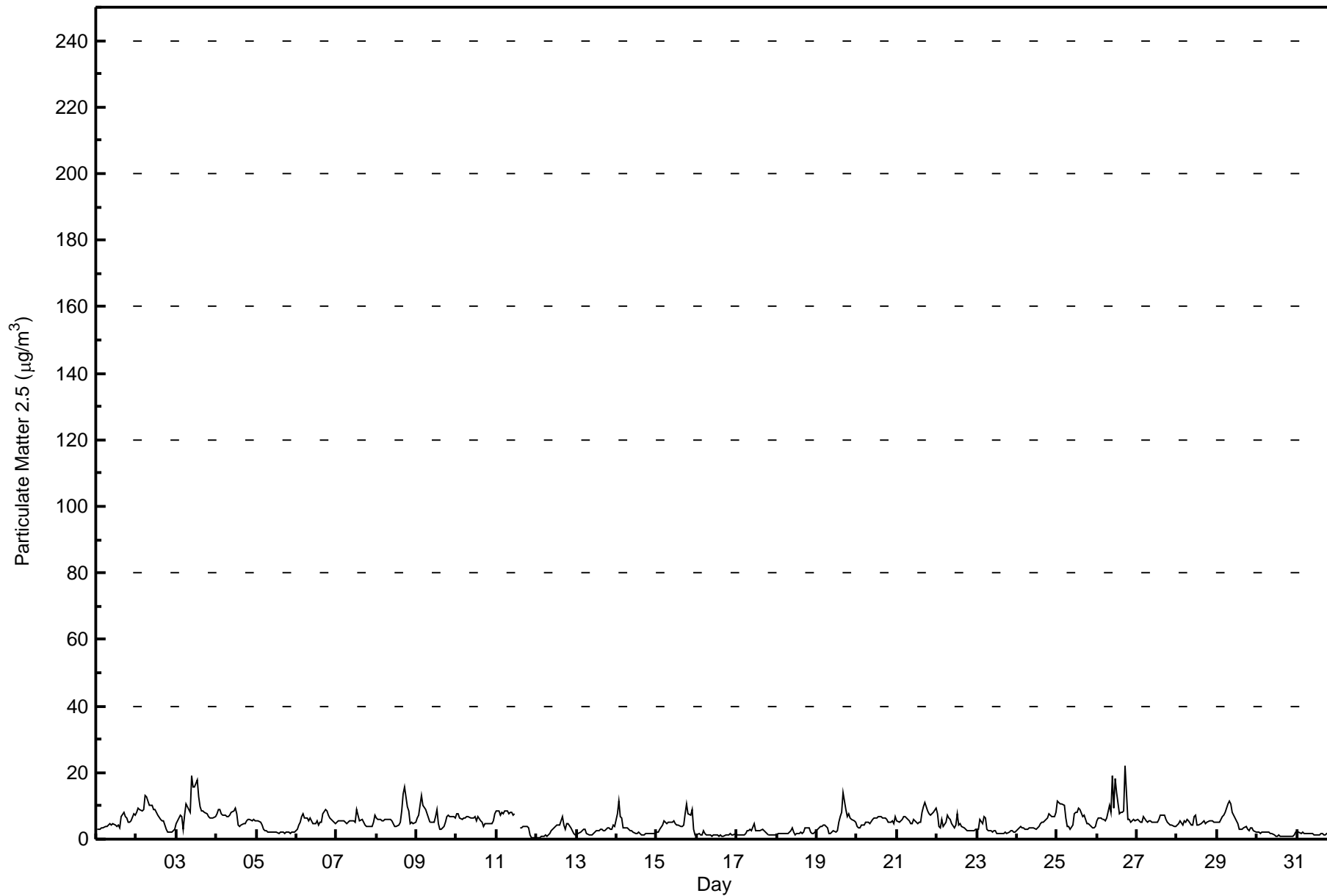


Wood Buffalo Environmental Association

Hourly Averages

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$

CNRL Horizon - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**CNRL Horizon - December 2015**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	459	61.86	61.86
6 - 15	258	34.77	96.63
16 - 25	8	1.08	97.71
26 - 80	0	0.00	97.71
> 81.0	0	0.00	97.71

Total Number of Valid Hours: 742

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) - μg/m<sup>3</sup>**  
**CNRL Horizon - December 2015**

Concentration Ranges (μg/m <sup>3</sup> )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	27	76	19	13	9	8	25	31	52	94	39	21	15	10	4	11	454
6 - 15	49	41	10	5	2	2	5	15	43	33	18	9	5	6	3	10	256
16 - 25	3	1	0	0	0	0	0	1	0	0	0	0	0	1	1	1	8
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	79	118	29	18	11	10	30	47	95	127	57	30	20	17	8	22	718

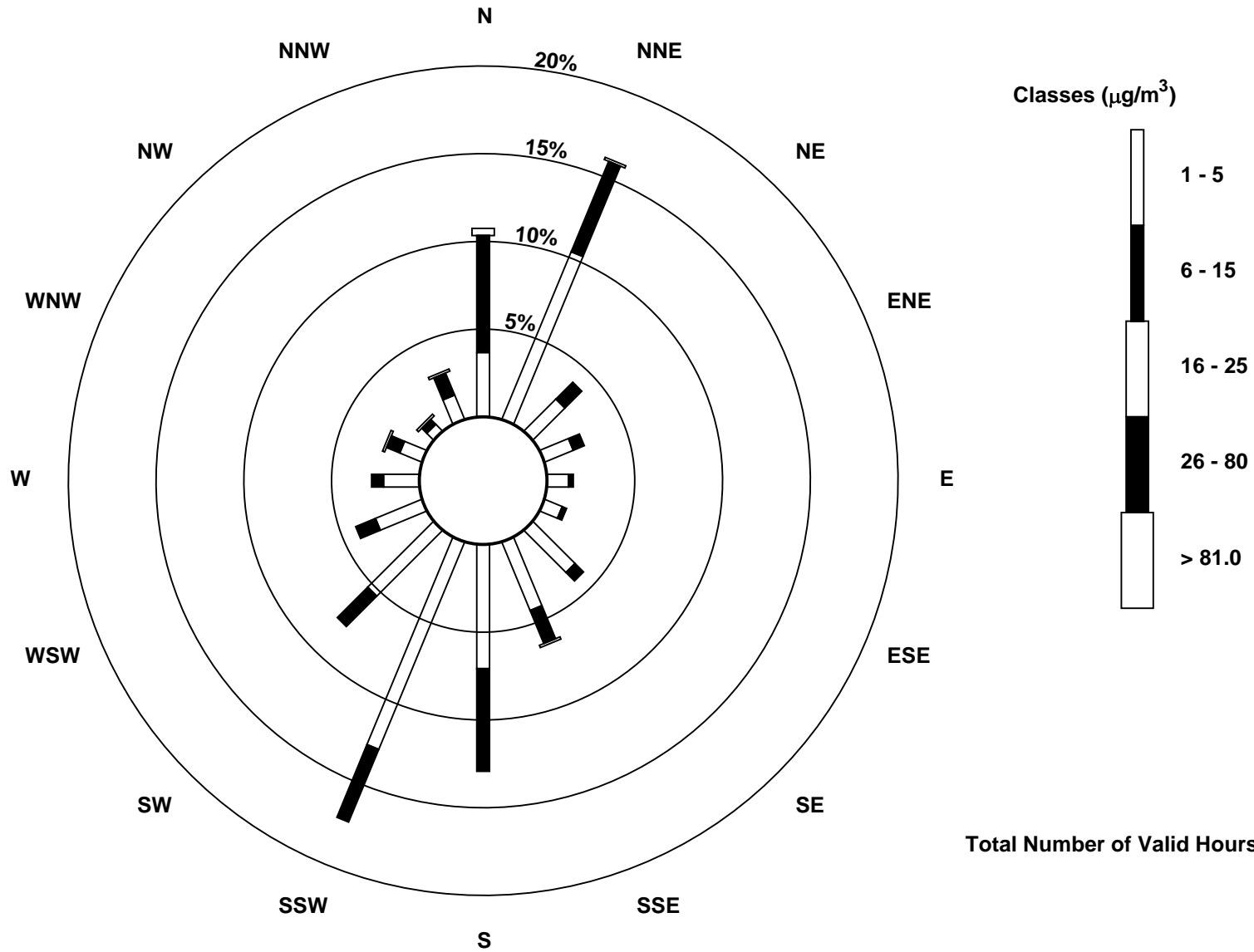
Total Number of Valid Hours: 735

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
CNRL Horizon (AMS 15)





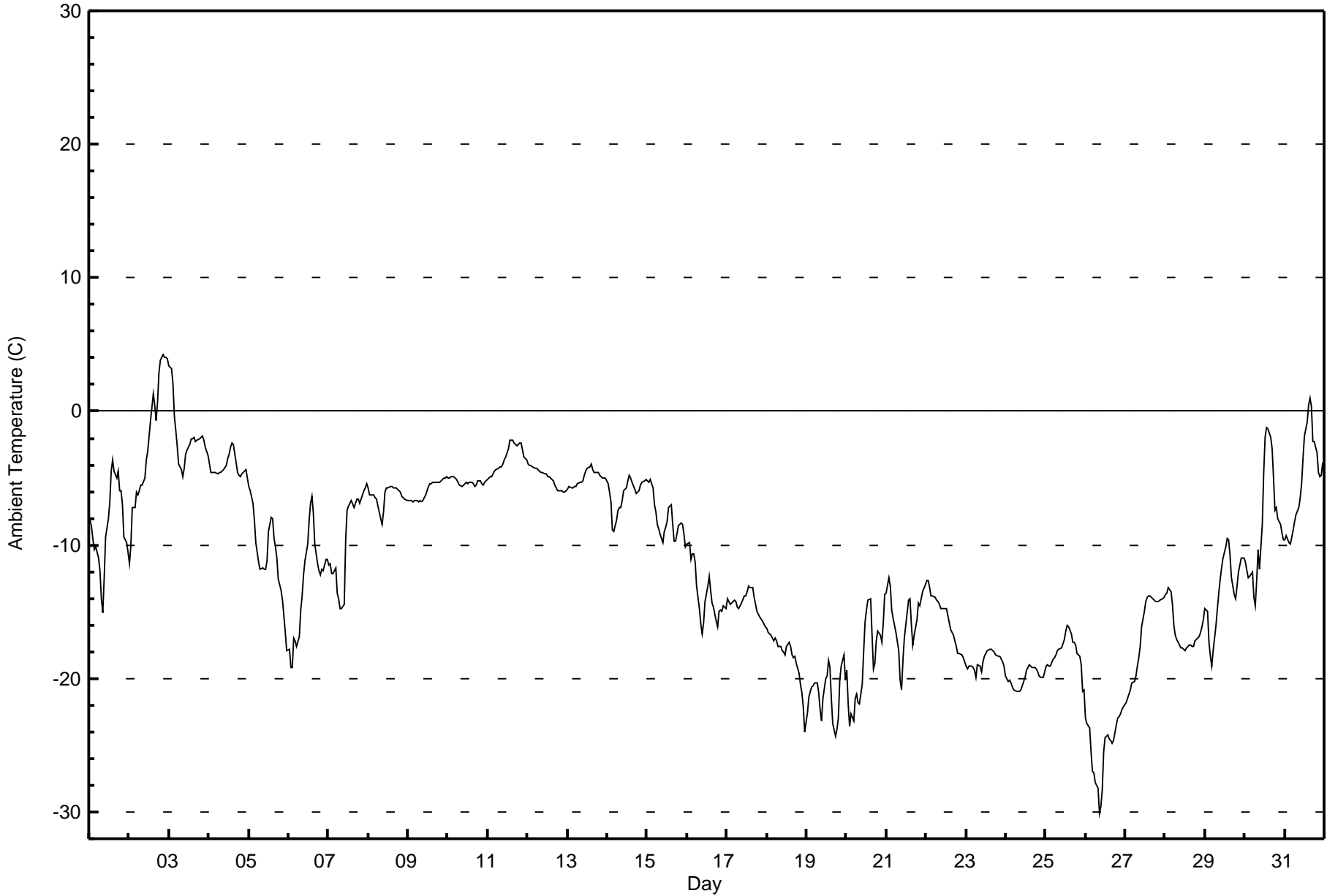
**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ambient Temperature (AT) - C**

**CNRL Horizon - December 2015**

Maximum Value: 4.2 C on Dec 2 21:00		Maximum Daily Average: -1.9 C on Dec 3		Hours in Service: 744																						
Minimum Value: -30.1 C on Dec 26 09:00		Minimum Daily Average: -25.1 C on Dec 26		Hours of Data: 744																						
Maximum Diurnal Average: -9.5 C at hour 15		Minimum Diurnal Average: -13.0 C at hour 9		Hours of Missing Data: 0																						
Monthly Average: -11.44 C		Percentiles: P <sub>1</sub> = -25.5 P <sub>10</sub> = -20.2 Q <sub>1</sub> = -17.2 Median = -11.3 Q <sub>3</sub> = -5.4 P <sub>90</sub> = -4.0 P <sub>99</sub> = 3.1		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-8.2	-8.7	-9.7	-10.4	-10.1	-11.0	-11.9	-14.1	-15.1	-12.4	-9.5	-8.1	-6.7	-4.5	-3.6	-4.5	-5.0	-4.5	-6.0	-6.0	-7.0	-9.4	-9.9	-10.6	-8.6	-3.6
2-Dec	-11.4	-10.1	-7.2	-7.2	-6.1	-6.2	-6.0	-5.5	-5.6	-5.0	-3.6	-3.0	-1.9	-0.7	1.3	0.5	-0.7	0.7	2.9	3.8	4.2	4.1	4.0	3.9	-2.3	4.2
3-Dec	3.4	3.2	2.0	-0.4	-1.4	-2.5	-4.0	-4.4	-4.8	-4.3	-3.2	-2.9	-2.5	-2.1	-2.0	-2.0	-2.2	-2.1	-2.1	-2.0	-1.9	-2.1	-2.7	-3.3	-1.9	3.4
4-Dec	-3.9	-4.5	-4.6	-4.6	-4.6	-4.6	-4.6	-4.6	-4.5	-4.4	-4.0	-3.5	-3.2	-2.7	-2.3	-2.5	-3.8	-4.6	-4.8	-4.8	-4.7	-4.5	-4.4	-5.0	-4.2	-2.3
5-Dec	-5.6	-6.0	-6.9	-8.2	-9.8	-10.6	-11.3	-11.8	-11.8	-11.8	-11.2	-9.0	-7.9	-8.1	-9.5	-10.2	-11.0	-12.5	-13.4	-14.2	-15.3	-16.6	-17.9	-10.9	-5.6	
6-Dec	-17.9	-19.1	-19.2	-17.0	-17.2	-17.6	-16.8	-14.9	-13.8	-12.2	-11.2	-9.9	-8.2	-6.9	-6.3	-7.7	-9.9	-11.4	-11.9	-12.2	-11.9	-12.0	-11.1	-11.0	-12.8	-6.3
7-Dec	-11.5	-11.4	-12.1	-12.1	-11.8	-13.6	-14.0	-14.8	-14.8	-14.5	-9.7	-7.4	-7.1	-6.9	-6.7	-7.2	-6.9	-6.6	-6.6	-6.9	-6.3	-5.9	-5.7	-5.4	-9.4	-5.4
8-Dec	-5.8	-6.2	-6.3	-6.3	-6.4	-6.6	-7.1	-8.1	-8.5	-7.5	-6.0	-5.8	-5.7	-5.6	-5.7	-5.7	-5.8	-5.7	-5.9	-6.1	-6.3	-6.5	-6.6	-6.7	-6.4	-5.6
9-Dec	-6.7	-6.6	-6.7	-6.8	-6.7	-6.7	-6.7	-6.7	-6.8	-6.7	-6.3	-6.0	-5.6	-5.4	-5.4	-5.3	-5.3	-5.3	-5.4	-5.3	-5.2	-5.0	-4.9	-4.9	-5.9	-4.9
10-Dec	-5.0	-5.0	-4.9	-4.9	-5.0	-5.1	-5.3	-5.5	-5.7	-5.6	-5.5	-5.4	-5.4	-5.3	-5.3	-5.4	-5.7	-5.5	-5.3	-5.2	-5.4	-5.5	-5.4	-5.2	-5.3	-4.9
11-Dec	-5.1	-4.9	-4.9	-4.7	-4.5	-4.4	-4.3	-4.2	-4.1	-3.9	-3.7	-3.4	-2.8	-2.1	-2.1	-2.1	-2.3	-2.5	-2.5	-2.4	-2.4	-2.9	-3.4	-3.7	-3.5	-2.1
12-Dec	-3.9	-4.0	-4.1	-4.2	-4.3	-4.3	-4.4	-4.4	-4.5	-4.6	-4.7	-4.7	-4.9	-4.9	-5.0	-5.2	-5.6	-5.8	-5.9	-5.9	-6.0	-6.0	-6.0	-5.9	-5.0	-3.9
13-Dec	-5.8	-5.6	-5.7	-5.7	-5.6	-5.6	-5.4	-5.3	-5.3	-5.2	-4.8	-4.5	-4.3	-4.1	-4.0	-4.3	-4.6	-4.6	-4.6	-4.8	-4.9	-5.0	-5.0	-4.9	-5.0	-4.0
14-Dec	-5.4	-6.0	-6.8	-8.9	-9.0	-8.2	-7.4	-7.2	-7.2	-6.6	-6.0	-5.7	-5.2	-4.8	-5.0	-5.3	-5.8	-6.1	-6.0	-5.9	-5.5	-5.4	-5.2	-5.1	-6.2	-4.8
15-Dec	-5.2	-5.3	-5.1	-5.8	-7.0	-7.5	-8.4	-8.8	-9.2	-9.9	-9.0	-8.6	-8.3	-7.2	-7.0	-8.5	-9.7	-9.7	-9.2	-8.6	-8.4	-8.4	-9.2	-10.2	-8.1	-5.1
16-Dec	-9.9	-9.8	-11.0	-10.6	-10.7	-11.3	-13.0	-14.8	-15.9	-16.6	-15.8	-14.3	-13.1	-12.4	-13.4	-14.3	-14.7	-15.7	-16.2	-15.0	-14.9	-14.9	-14.6	-14.8	-13.7	-9.8
17-Dec	-14.1	-14.3	-14.4	-14.3	-14.1	-14.2	-14.7	-14.7	-14.6	-14.4	-13.9	-13.8	-13.5	-13.1	-13.2	-13.2	-13.9	-14.5	-14.9	-15.2	-15.4	-15.7	-16.0	-16.1	-14.4	-13.1
18-Dec	-16.2	-16.6	-16.8	-16.9	-17.1	-17.0	-17.2	-17.6	-17.6	-17.9	-18.0	-18.2	-17.6	-17.3	-17.6	-18.2	-18.4	-18.3	-18.8	-19.5	-20.5	-21.0	-22.2	-24.0	-18.4	-16.2
19-Dec	-22.6	-21.4	-21.0	-20.7	-20.5	-20.3	-20.4	-21.1	-22.3	-23.2	-21.5	-20.0	-19.8	-18.6	-19.1	-21.5	-23.4	-24.3	-23.8	-23.0	-20.1	-19.0	-18.2	-20.2	-21.1	-18.2
20-Dec	-19.3	-21.9	-23.6	-22.6	-23.1	-21.4	-21.2	-21.8	-21.9	-20.4	-18.1	-15.8	-14.9	-14.1	-14.1	-16.7	-19.3	-18.8	-17.2	-16.5	-16.8	-17.3	-15.8	-13.7	-18.6	-13.7
21-Dec	-13.6	-12.4	-13.0	-14.8	-15.6	-16.0	-16.5	-17.9	-20.1	-20.9	-18.7	-16.9	-15.0	-14.2	-14.0	-15.9	-17.5	-16.7	-15.6	-14.3	-14.5	-14.0	-13.5	-13.0	-15.6	-12.4
22-Dec	-12.7	-12.6	-13.2	-13.8	-13.8	-13.9	-14.2	-14.3	-14.5	-14.8	-14.8	-14.7	-14.8	-15.3	-15.8	-16.4	-16.7	-17.2	-17.6	-18.1	-18.1	-18.3	-18.5	-18.7	-15.5	-12.6
23-Dec	-19.1	-19.2	-19.1	-19.0	-19.2	-19.4	-19.9	-19.0	-19.1	-19.5	-18.8	-18.3	-18.2	-17.9	-17.8	-17.8	-17.9	-18.0	-18.2	-18.3	-18.4	-18.5	-18.7	-19.0	-18.7	-17.8
24-Dec	-19.8	-20.2	-20.2	-20.4	-20.7	-20.9	-21.0	-21.0	-20.9	-20.8	-20.5	-19.9	-19.4	-19.2	-19.0	-19.1	-19.1	-19.2	-19.3	-19.5	-19.8	-19.9	-19.9	-19.5	-20.0	-19.0
25-Dec	-19.1	-18.9	-19.1	-19.0	-18.6	-18.4	-18.3	-18.0	-17.8	-17.7	-17.4	-17.1	-16.5	-16.0	-16.1	-16.7	-17.2	-17.3	-17.5	-18.2	-18.3	-18.9	-20.9	-20.9	-18.1	-16.0
26-Dec	-22.9	-23.4	-23.7	-25.5	-26.9	-27.0	-27.8	-28.2	-30.1	-29.6	-28.3	-25.5	-24.5	-24.2	-24.6	-24.7	-24.8	-24.6	-23.4	-22.9	-22.9	-22.7	-22.3	-22.1	-25.1	-22.1
27-Dec	-21.9	-21.5	-21.2	-20.9	-20.4	-20.2	-19.8	-19.1	-18.5	-17.6	-16.1	-15.0	-14.2	-13.9	-13.8	-13.8	-14.1	-14.1	-14.3	-14.3	-14.2	-14.1	-14.0	-13.9	-16.7	-13.8
28-Dec	-13.7	-13.6	-13.2	-13.5	-14.5	-16.0	-16.7	-17.1	-17.5	-17.7	-17.7	-17.8	-17.9	-17.7	-17.5	-17.5	-17.6	-17.6	-17.2	-17.0	-16.8	-16.5	-16.1	-15.6	-16.4	-13.2
29-Dec	-14.7	-14.9	-17.3	-18.3	-19.1	-17.9	-16.0	-14.8	-13.6	-12.6	-11.7	-11.0	-10.2	-9.6	-9.6	-10.8	-12.4	-13.8	-14.0	-13.1	-12.0	-11.6	-11.0	-11.0	-13.4	-9.6
30-Dec	-11.3	-12.0	-12.5	-12.3	-12.0	-14.0	-14.6	-12.7	-10.4	-11.8	-8.5	-4.6	-1.9	-1.2	-1.3	-1.9	-2.8	-5.0	-7.4	-7.2	-8.0	-8.5	-9.1	-9.7	-8.4	-1.2
31-Dec	-9.6	-9.3	-9.8	-9.9	-9.4	-8.9	-8.2	-7.7	-7.2	-6.4	-5.4	-3.6	-1.9	-0.8	0.5	1.0	0.4	-2.3	-2.3	-3.1	-4.6	-4.9	-4.8	-3.8	-5.1	1.0
																								Diurnal Average		
																								Diurnal Maximum		







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C**  
**CNRL Horizon - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	75	10.08	10.08
-20 - 0	654	87.90	97.98
0 - 10	15	2.02	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

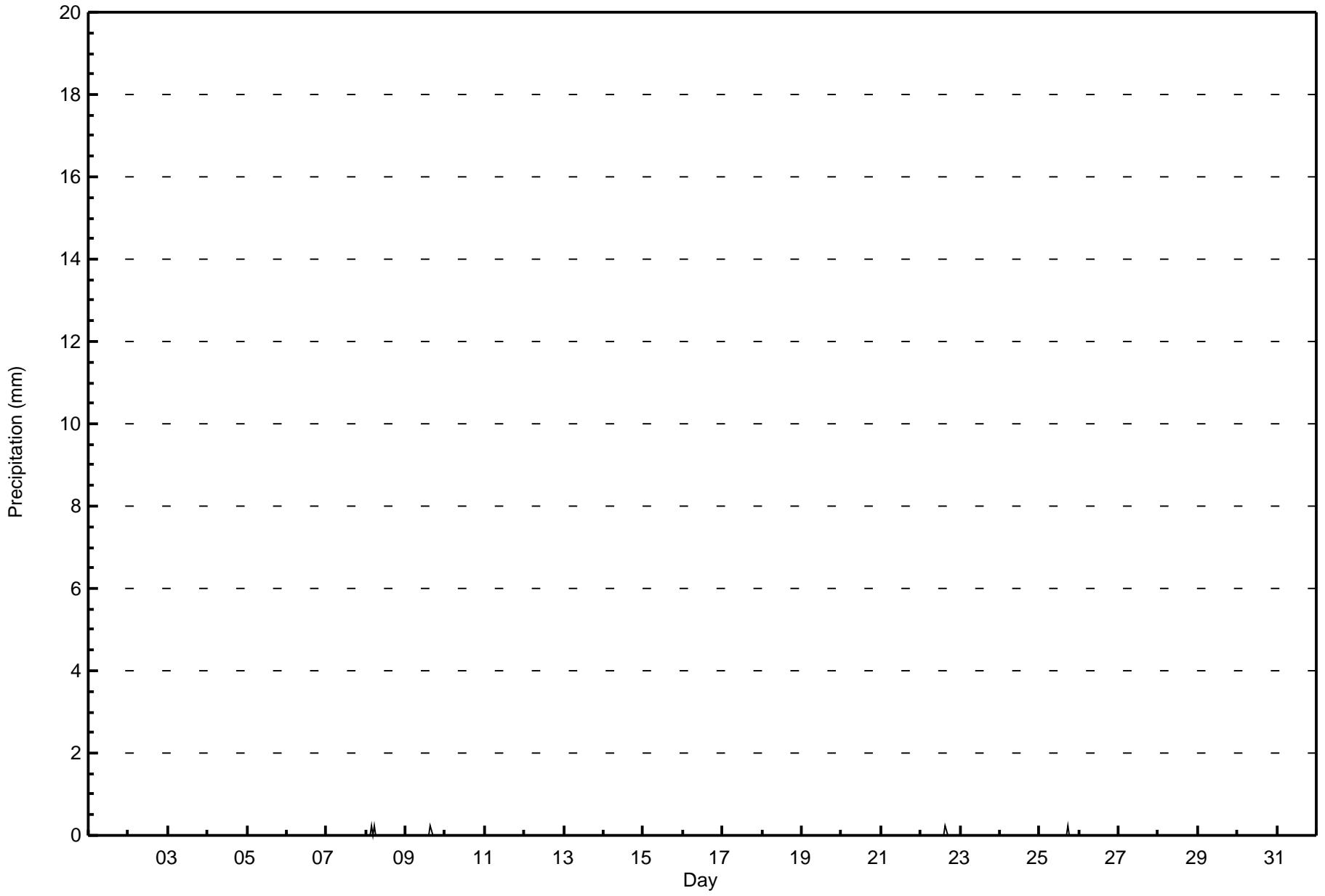


Maximum Value: 0.3 mm on Dec 8 04:00		Maximum Daily Total: 0.5 mm on Dec 8		Hours in Service: 744																								
Minimum Value: 0.0 mm on Dec 1 01:00		Minimum Daily Total: 0.0 mm on Dec 1		Hours of Data: 744																								
Maximum Diurnal Total: 0.5 mm at hour 16		Minimum Diurnal Total: 0.0 mm at hour 1		Hours of Missing Data: 0																								
Monthly Total: 1.27 mm		Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.0		Hours of Calibration: 0																								
				Percent Operational Time: 100.0																								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
1-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8-Dec	0.0	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.3
9-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
10-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
23-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
26-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Diurnal Average	
		0.0	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Precipitation (PC) - mm**  
**CNRL Horizon - December 2015**



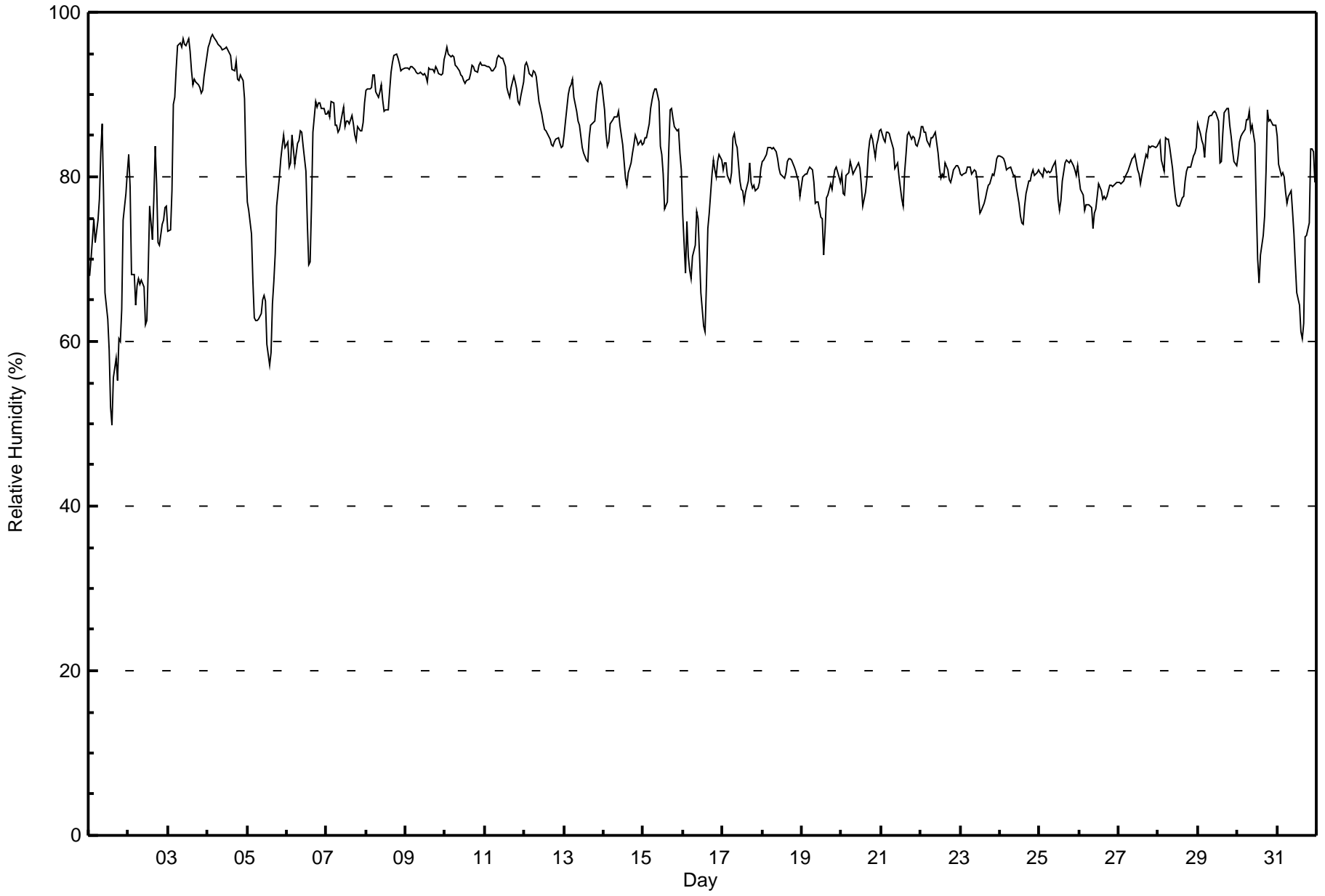


Maximum Value: 97 % on Dec 4 04:00																		Maximum Daily Average: 94.1 % on Dec 4																		Hours in Service: 744												
Minimum Value: 50 % on Dec 1 15:00																		Minimum Daily Average: 68.0 % on Dec 1																		Hours of Data: 744												
Maximum Diurnal Average: 84.5 % at hour 23																		Minimum Diurnal Average: 77.9 % at hour 14																		Hours of Missing Data: 0												
Monthly Average: 82.7 %																		Percentiles: P <sub>1</sub> = 59 P <sub>10</sub> = 74 Q <sub>1</sub> = 79 Median = 83 Q <sub>3</sub> = 88 P <sub>90</sub> = 93 P <sub>99</sub> = 96																		Hours of Calibration: 0												
																																				Percent Operational Time: 100.0												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	68	70	72	75	72	75	77	83	86	78	66	63	59	52	50	56	58	55	60	60	64	75	78	80	68.0	86																						
2-Dec	83	79	68	68	64	67	68	67	68	67	62	63	69	76	72	77	84	79	72	72	74	75	76	76	71.9	84																						
3-Dec	73	74	78	89	90	93	96	96	96	97	96	96	97	95	93	91	92	91	91	91	90	91	92	95	90.9	97																						
4-Dec	96	96	97	97	97	97	96	96	96	95	96	96	95	95	95	93	93	94	92	92	92	92	90	81	94.1	97																						
5-Dec	77	76	73	67	63	62	62	63	63	65	66	65	60	57	59	65	67	71	76	80	82	84	85	84	69.7	85																						
6-Dec	84	81	82	85	83	81	84	84	86	85	84	81	74	69	70	77	85	89	88	89	89	88	88	88	83.2	89																						
7-Dec	88	88	87	89	89	86	86	85	86	88	88	86	87	87	86	88	86	85	84	86	86	86	87	89	86.8	89																						
8-Dec	90	91	91	91	92	92	90	90	90	91	89	88	88	88	90	93	94	95	95	94	94	93	93	93	91.5	95																						
9-Dec	93	93	93	93	93	93	93	93	93	93	92	92	92	91	93	93	93	93	93	93	92	92	93	94	92.9	94																						
10-Dec	95	96	95	95	95	95	94	93	93	92	92	92	91	92	92	93	94	93	93	93	94	94	94	94	93.3	96																						
11-Dec	94	93	93	93	93	93	93	94	95	95	94	94	93	91	90	90	91	92	91	91	89	89	90	92	92.2	95																						
12-Dec	94	94	93	93	92	93	93	92	91	89	88	87	86	86	85	85	84	84	84	85	85	84	84	84	88.0	94																						
13-Dec	85	87	90	91	91	92	90	88	87	86	85	84	83	82	82	85	86	86	87	89	90	91	92	91	87.4	92																						
14-Dec	88	85	84	84	86	87	87	87	87	88	86	84	82	80	79	81	82	83	84	85	85	84	84	84	84.4	88																						
15-Dec	84	85	85	86	88	89	90	91	91	89	84	83	80	76	77	83	88	88	87	86	86	86	83	81	85.3	91																						
16-Dec	75	68	75	70	69	68	70	72	76	75	71	66	62	61	67	74	76	80	82	81	80	82	83	82	73.5	83																						
17-Dec	81	82	82	80	79	81	85	85	84	84	80	78	78	77	78	79	82	79	79	79	78	79	79	81	80.4	85																						
18-Dec	82	82	83	83	84	84	83	84	83	82	81	80	80	80	81	82	82	82	82	81	81	80	80	78	81.6	84																						
19-Dec	80	80	80	80	81	81	81	79	77	77	77	75	75	71	74	77	78	79	78	80	81	81	80	79	78.4	81																						
20-Dec	80	78	78	80	81	82	81	80	81	81	82	81	79	76	78	80	83	84	85	85	82	84	85	86	81.3	86																						
21-Dec	86	85	84	86	85	85	84	83	81	81	82	80	77	77	80	83	85	85	85	85	85	84	84	85	83.2	86																						
22-Dec	86	86	85	86	84	84	85	85	85	85	83	81	80	80	80	82	81	80	79	80	81	81	81	81	82.6	86																						
23-Dec	80	80	80	81	81	81	81	80	81	81	80	77	76	76	77	77	78	79	79	80	80	81	82	83	79.7	83																						
24-Dec	83	82	82	82	81	81	81	81	80	80	79	77	75	74	74	76	78	79	80	80	81	80	80	81	79.5	83																						
25-Dec	81	80	80	81	80	81	81	81	81	81	82	80	77	76	77	80	82	82	82	82	82	81	80	81	80.4	82																						
26-Dec	80	78	78	76	77	77	77	76	74	76	76	78	79	78	77	78	77	78	79	79	79	79	79	79	77.6	80																						
27-Dec	79	79	79	80	80	81	81	82	82	82	83	81	80	79	80	81	83	82	84	84	84	84	84	84	81.5	84																						
28-Dec	84	84	82	81	85	85	85	84	81	79	78	77	76	76	77	78	80	81	81	81	82	83	83	84	81.0	85																						
29-Dec	87	85	84	84	82	85	87	87	87	88	88	88	87	82	82	85	88	88	88	88	86	85	83	82	81	85.5	88																					
30-Dec	83	84	85	85	86	87	87	88	86	86	84	77	70	67	71	73	75	81	88	87	87	86	86	86	82.3	88																						
31-Dec	85	82	80	80	80	78	77	78	78	76	73	69	66	64	61	60	62	73	73	74	83	83	83	79	75.0	85																						
																								84.0	83.4	83.2	83.6	83.4	83.7	84.1	84.1	84.0	83.7	82.0	80.5	79.1	77.9	78.4	80.5	82.1	83.0	83.3	83.5	83.9	84.3	84.5	84.4	Diurnal Average
																								96	96	97	97	97	97	96	96	96	97	96	96	96	95	95	93	94	95	95	94	94	94	94	95	Diurnal Maximum



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**CNRL Horizon - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**CNRL Horizon - December 2015**

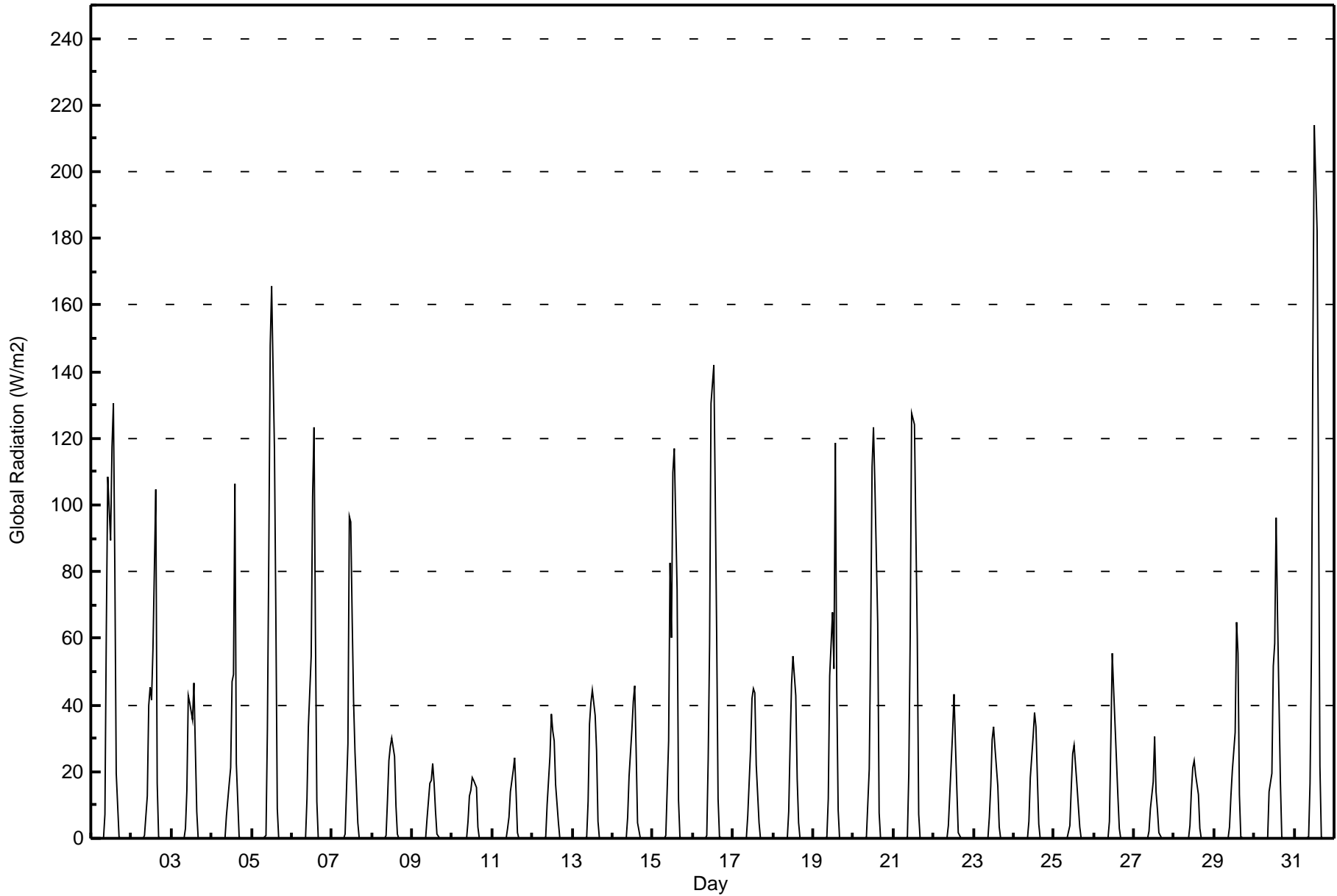
<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	9	1.21	1.21
60 - 80	208	27.96	29.17
80 - 100	527	70.83	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 214 W/m2 on Dec 31 13:00														Maximum Daily Average: 31.1 W/m2 on Dec 31														Hours in Service: 744	
Minimum Value: 0 W/m2 on Dec 1 01:00														Minimum Daily Average: 3.5 W/m2 on Dec 27														Hours of Data: 744	
Maximum Diurnal Average: 63.9 W/m2 at hour 13														Minimum Diurnal Average: 0.0 W/m2 at hour 1														Hours of Missing Data: 0	
Monthly Average: 11.6 W/m2														Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 7 P <sub>90</sub> = 41 P <sub>99</sub> = 120														Hours of Calibration: 0	
																												Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	0	0	0	0	0	0	0	0	7	63	108	89	117	131	81	20	0	0	0	0	0	0	0	0	25.7	131			
2-Dec	0	0	0	0	0	0	0	0	1	13	40	46	42	57	104	16	0	0	0	0	0	0	0	0	13.3	104			
3-Dec	0	0	0	0	0	0	0	0	3	15	43	41	35	46	27	8	0	0	0	0	0	0	0	0	9.1	46			
4-Dec	0	0	0	0	0	0	0	0	0	7	16	21	47	49	106	22	1	0	0	0	0	0	0	0	11.2	106			
5-Dec	0	0	0	0	0	0	0	0	1	33	86	148	166	117	67	9	0	0	0	0	0	0	0	0	26.1	166			
6-Dec	0	0	0	0	0	0	0	0	0	12	34	55	103	123	62	11	0	0	0	0	0	0	0	0	16.6	123			
7-Dec	0	0	0	0	0	0	0	0	1	28	97	95	66	41	26	5	0	0	0	0	0	0	0	0	14.9	97			
8-Dec	0	0	0	0	0	0	0	0	1	11	23	27	30	24	10	1	0	0	0	0	0	0	0	0	5.3	30			
9-Dec	0	0	0	0	0	0	0	0	0	6	16	17	23	16	8	1	0	0	0	0	0	0	0	0	3.7	23			
10-Dec	0	0	0	0	0	0	0	0	0	5	13	15	18	18	15	3	0	0	0	0	0	0	0	0	3.6	18			
11-Dec	0	0	0	0	0	0	0	0	0	3	6	14	20	24	14	2	0	0	0	0	0	0	0	0	3.5	24			
12-Dec	0	0	0	0	0	0	0	0	0	10	25	37	32	29	16	5	0	0	0	0	0	0	0	0	6.4	37			
13-Dec	0	0	0	0	0	0	0	0	0	11	34	41	44	37	26	5	0	0	0	0	0	0	0	0	8.3	44			
14-Dec	0	0	0	0	0	0	0	0	0	6	18	33	41	46	26	5	0	0	0	0	0	0	0	0	7.3	46			
15-Dec	0	0	0	0	0	0	0	0	1	29	83	60	110	117	74	11	0	0	0	0	0	0	0	0	20.3	117			
16-Dec	0	0	0	0	0	0	0	0	1	24	58	130	142	103	61	12	0	0	0	0	0	0	0	0	22.2	142			
17-Dec	0	0	0	0	0	0	0	0	0	7	27	42	45	44	22	5	0	0	0	0	0	0	0	0	8.0	45			
18-Dec	0	0	0	0	0	0	0	0	0	8	28	46	55	43	18	5	0	0	0	0	0	0	0	0	8.4	55			
19-Dec	0	0	0	0	0	0	0	0	0	12	49	68	51	119	45	9	0	0	0	0	0	0	0	0	14.7	119			
20-Dec	0	0	0	0	0	0	0	0	1	21	59	112	123	106	64	8	0	0	0	0	0	0	0	0	20.6	123			
21-Dec	0	0	0	0	0	0	0	0	0	20	61	128	124	92	61	7	0	0	0	0	0	0	0	0	20.5	128			
22-Dec	0	0	0	0	0	0	0	0	0	4	22	32	43	28	15	2	0	0	0	0	0	0	0	0	6.1	43			
23-Dec	0	0	0	0	0	0	0	0	0	6	16	30	34	27	16	3	0	0	0	0	0	0	0	0	5.5	34			
24-Dec	0	0	0	0	0	0	0	0	0	5	18	31	38	34	18	4	0	0	0	0	0	0	0	0	6.1	38			
25-Dec	0	0	0	0	0	0	0	0	0	4	15	25	28	22	16	3	0	0	0	0	0	0	0	0	4.7	28			
26-Dec	0	0	0	0	0	0	0	0	0	5	29	55	44	23	13	3	0	0	0	0	0	0	0	0	7.2	55			
27-Dec	0	0	0	0	0	0	0	0	0	2	9	17	31	14	9	2	0	0	0	0	0	0	0	0	3.5	31			
28-Dec	0	0	0	0	0	0	0	0	0	4	14	21	23	19	13	3	0	0	0	0	0	0	0	0	4.1	23			
29-Dec	0	0	0	0	0	0	0	0	0	3	13	20	32	65	55	13	0	0	0	0	0	0	0	0	8.4	65			
30-Dec	0	0	0	0	0	0	0	0	0	14	20	52	59	96	66	18	0	0	0	0	0	0	0	0	13.5	96			
31-Dec	0	0	0	0	0	0	0	0	1	16	57	146	214	182	108	22	1	0	0	0	0	0	0	0	31.1	214			
														0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.7 13.1 36.7 54.6 63.9 61.0 40.8 7.8 0.1 0.0 0.0 0.0 0.0 0.0 0.0 0.0														Diurnal Average	
														0 0 0 0 0 0 0 0 7 63 108 148 214 182 108 22 1 0 0 0 0 0 0 0														Diurnal Maximum	







Maximum Speed: 21 km/h on Dec 31 07:00	Maximum Daily Speed Average: 10.8 km/h on Dec 31	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 26 03:00	Minimum Daily Speed Average: 0.2 km/h on Dec 19	Hours of Data: 737
Maximum Diurnal Speed Average: 2.6 km/h at hour 20	Minimum Diurnal Speed Average: 1.1 km/h at hour 6	Hours of Missing Data: 7
Monthly Average Velocity: 1.9 km/h 200.5 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 4 Median = 6 Q <sub>3</sub> = 8 P <sub>90</sub> = 11 P <sub>99</sub> = 14	Percent Operational Time: 99.1

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	S7	S6	SSE5	S7	S9	S8	S7	SSW2	S5	SSW5	SSW6	S4	SSE4	SSE7	S8	SSE8	S13	SSE11	S12	SSW12	SSW6	SSE2	SE6	S5	S6.7	S13
2-Dec	SSE6	S9	S13	S11	S13	S12	S10	S8	SSW6	SSW7	SSW9	S11	SSW10	SSW11	SSW12	SSW9	SSW10	SW11	SW12	SSW10	SW10	SW6	W4	NW10	SSW8.6	S13
3-Dec	WNW10	WNW9	WNW3	SE2	SW5	NW2	AF	SE4	NW3	N6	N4	N6	NNE6	NNE7	N7	N8	N7	N7	N5	N5	N6	NNE7	NNE9	NNE8	N4.4	WNW10
4-Dec	N8	NNE7	N8	NNE7	N7	N6	NNE6	NNE6	NNW2	SSW1	SW4	SSW6	S7	S6	SSW6	SW6	SSW6	SSW8	SW10	SSW7	SSW6	SSW7	WSW8	W8	WSW16.0	SW10
5-Dec	W7	W7	W11	W13	W12	W11	WSW12	WSW14	WSW13	SW9	SW12	S10	SSW12	SSW10	SSW9	SSW10	SSW8	SSW8	SSW6	S6	SSW7	SSW6	SW3	AF	SW8.0	WSW14
6-Dec	WSW4	WNW2	W4	NNW6	NE3	NNW3	N2	N1	N3	N2	N2	NNE2	NNE2	NW2	SW2	SSW6	SW5	SSW6	SSW7	SSW7	S8	SSW9	SSW8	SSW8	SW2.1	SSW9
7-Dec	SSW7	S9	SSW9	S11	S7	WSW4	SW4	WSW5	WSW4	WSW5	W4	SW4	WSW3	SW5	SSW5	S7	S9	S10	S7	SE5	SSE3	N1	NW7	NNW11	SSW4.1	NNW11
8-Dec	NNE8	NNE7	N4	S1	SSE3	SSE3	SW4	SW5	SSW4	SSW5	SSW6	SW7	SW6	SW3	SSW3	SSE5	S4	SSE5	ESE5	ENE6	E5	E3	NE4	NNE5	SSE1.3	NNE8
9-Dec	N4	NNE3	NNE4	NNE5	NNE5	NNE5	N5	NNE5	NNE4	NNE4	NNE3	N5	NNE5	NNE4	NE3	W1	W3	SSW3	S6	S6	SSE4	S4	W1	ESE1	NNE1.7	S6
10-Dec	N4	NNE5	NNE2	NNW3	N2	NE2	NE4	ENE3	ENE2	NE0	N3	NNW4	NNE3	NE3	NNE4	NNE4	N3	WNW4	WNW4	NNE2	NNE4	NNE4	N4	N5	NNE2.8	N5
11-Dec	N6	N6	N5	N6	N6	N6	N6	N6	N5	N5	N4	NNE3	ENE2	E4	ESE4	SE4	SE2	E4	ESE5	SE6	SSE10	SSE11	SSE9	SE9	ENE2.1	SSE11
12-Dec	SE7	SE8	SSE8	SSE10	SSE10	SE9	SE9	SE10	SE10	SE11	SSE13	SSE12	SSE13	SSE11	SSE11	SSE11	SSE10	SSE11	SSE9	SSE9	SE9	SSE9	SE7	SE5	SSE9.7	SSE13
13-Dec	SSE4	SE3	E2	ENE2	E2	ESE4	ESE5	SE7	SSE8	SSE6	SE5	ESE5	E4	NE5	NE4	NNE6	NNE6	NNW4	NNW3	N1	NNE2	AF	NNW2	AF	E2.2	SSE8
14-Dec	W5	WNW5	WNW6	WSW6	SW4	SSW2	SW3	ESE3	SSE5	SSW6	SSW7	SW7	SW7	WSW8	SW8	SSW9	SSW8	S8	SSW6	SSW6	S8	S9	S10	S9	SSW5.3	S10
15-Dec	S11	S11	S8	SSE9	S10	S8	SSW5	SSW5	S7	SSW7	SSW10	SW10	SSW11	SSW10	SSW10	SSW10	SSW10	SSW10	SSW10	SSW9	WNW4	NE6	NNE12	NNE7	SSW6.4	NNE12
16-Dec	NNW7	NNW11	E1	WNW9	WNW13	WNW13	W9	W8	WSW10	WSW9	WSW8	SW8	SW7	WSW6	S9	SSW8	SW6	WSW4	SSW4	WSW5	WSW2	SSW4	WSW4	WSW6	WSW5.4	WNW13
17-Dec	WSW7	SW7	SW7	SW5	WSW3	NNW2	NE2	AF	SE2	AF	ESE1	ENE3	ESE2	S4	SSE3	SSW3	NE7	NNE5	NNE7	NNE5	NNE6	NE6	NNE5	NNE3	NNE0.7	WSW7
18-Dec	NE4	ENE4	ENE2	NE3	NE3	NNE2	NNE3	NNE4	N5	N5	N5	N3	N4	NNE4	NNE4	NNE5	NNE4	NNE3	NE4	ENE4	SE6	SE5	NE4	NE3	NE3.1	SE6
19-Dec	NNW3	NNE4	N4	N4	NNE3	NNE3	E4	E3	SSW3	W2	SE2	S4	SSW4	S5	S3	WSW1	SW3	SSW0	NNW2	NNE2	WNW1	WSW2	WSW2	SW4	WSW0.2	S5
20-Dec	SSW4	SSW4	SW6	SW6	SW6	SSW8	SW8	SW7	SW8	SW8	SW8	SW7	SSW7	SSW7	SW5	SW5	WSW5	SW6	SSW6	SSW5	SW4	SW6	S7	S7	SW6.1	SW8
21-Dec	SSW8	S10	S9	SSW7	SSW8	SSW9	SW7	SSW7	SSW5	SSW6	S9	S7	SSE6	SSE5	SE5	SE3	AF	NNW4	NNW4	N4	NNE3	N5	N6	N6	SSW3.3	S10
22-Dec	NNE6	N10	NNE8	NNE8	N11	N12	N11	NNE8	NNE7	NNE9	NNE8	NNE9	NNE10	NNE10	N10	NNE9	N10	N10	NNE9	NNE6	NNE6	NNE7	NNE6	NNE6	NNE8.6	N12
23-Dec	N7	NNE6	NNE4	NNE4	N3	N3	NNW4	NNE4	NNE4	NNE4	NNE5	N6	NNE9	NNE7	NNE7	NNE7	NNE7	NNE8	NNE8	NNE6	NNE6	NNE6	NNE5	NE8	NNE5.7	NNE9
24-Dec	NE7	NNE4	NNE6	NNE5	NE3	ENE4	NE4	ENE3	E4	SE2	E2	SSW1	SSE2	SE3	SSE2	SE3	SSE3	SSE4	S4	SSE4	SSE6	S5	S5	S5	ESE1.7	NE7
25-Dec	SSE7	S4	S3	E1	S2	SSW5	S5	SSE3	NE2	NNE4	N4	NNE3	S1	NNE1	NE4	NNE5	N8	N9	NNE6	N4	NNE5	NNE4	NE3	ENE4	NE1.6	N9
26-Dec	ENE3	SE2	NW0	SSW1	SSW3	ENE3	N3	N3	WSW2	NW3	N2	WNW1	NE2	N2	ENE2	NE2	NNW3	NNW4	N4	NNE4	NNE3	N4	NNE4	NNE4	NNE1.6	NNE4
27-Dec	N5	N5	N4	N4	NNE2	NNE4	N4	N4	ENE3	ENE2	SE5	SSE9	SSE9	SSE10	SSE8	S4	SSW4	SW2	SSW3	S2	S4	S7	SSW8	SSW6	SSE1.7	SSE10
28-Dec	SW6	SW5	WNW6	NW5	NNE7	NNE8	NNE7	NNE7	NNE7	NE6	NNE8	NE7	NNE5	NNW3	NNW4	N2	E3	SSE4	S4	S4	S5	S7	S7	S7	NNE1.0	NNE8
29-Dec	SSW8	SSW7	S8	S11	S10	S10	S8	S8	SSW10	SW9	SSW7	SSW8	SSW9	SSW11	SSW11	S10	S11	S9	S11	SSW12	SSW14	SSW15	SSW16	SSW12	SSW10.0	SSW16
30-Dec	SSW13	SSW11	SSW8	SW11	WSW9	SSW5	SSW6	SW10	SW8	SSW9	SSW9	W10	W13	W13	WNW12	W9	WSW9	S6	S8	SSW12	SSW15	SSW14	SSW15	S16	SW8.8	S16
31-Dec	S13	SSW15	S20	S19	S20	S18	SSW21	SSW18	SW14	SSW12	SSW11	S10	SSE7	SE5	WSW6	W10	WNW11	SSW1	SW8	SSW9	SSW10	SSW10	SSW11	SSW12	SSW10.8	SSW21

SW1.3 SSW15	SW1.2SSW1.6	SW1.8SSW2.0	SSW1.1	SW1.5SSW1.4	SSW1.9	SW1.9SSW2.2	SSW2.4	SSW2.1	SSW2.2	SSW2.2	SSW2.2	SSW2.1	SSW2.0	SSW2.5	S2.6	S2.6	S2.5	SSW1.4	SSW1.1					Diurnal Average				
S13	SSW15	S20	S19	S20	S18	SSW21	SSW18	SW14	SSW12	SSE13	SSE12	W13	W13	SSW12	SSE11	S13	SW11	SW12	SSW12	SSW15	SSW15	SSW16	S16					Diurnal Maximum

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



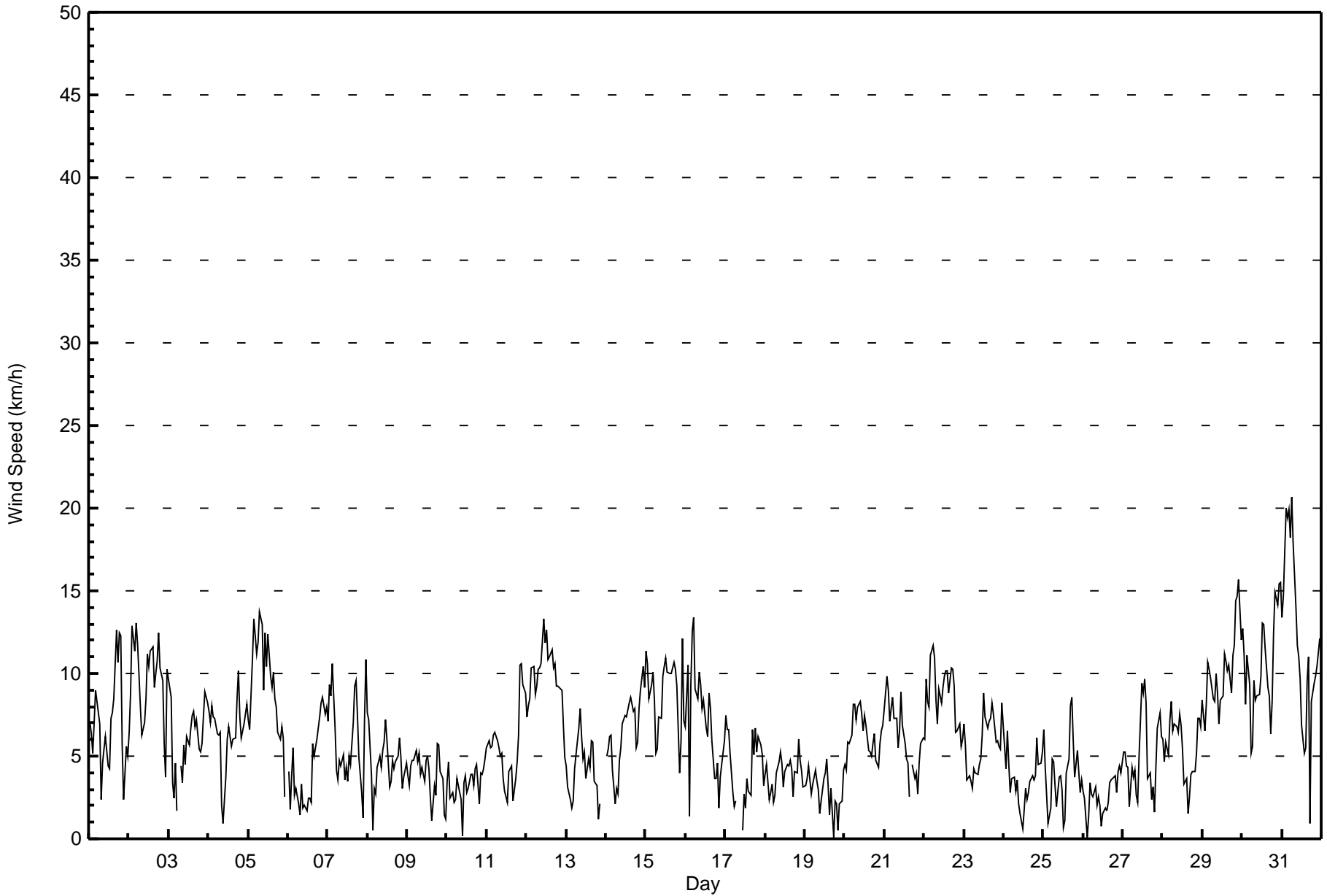
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed (WS) - km/h

CNRL Horizon - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 744													
Maximum Value: 7 km/h on Dec 31 15:00														Hours of Data: 737													
Minimum Value: 0 km/h on Dec 26 14:00														Hours of Missing Data: 7													
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 4														Hours of Calibration: 0													
														Percent Operational Time: 99.1													
Day	Hourly Period Ending At (MST)																								Daily Maximum		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	1	1	1	2	1	1	1	2	1	1	2	1	2	2	3	1	4	2	4	3	2	2	1	1	4		
2-Dec	1	2	2	2	2	2	2	2	1	2	2	3	3	4	3	2	2	3	3	3	2	2	3	3	4		
3-Dec	3	3	3	3	2	2	AF	1	2	1	2	2	1	2	2	1	2	1	2	1	2	2	2	3			
4-Dec	2	2	2	2	2	2	3	2	2	1	1	1	1	2	2	2	1	1	2	1	1	1	3	2	3		
5-Dec	2	2	3	5	5	4	4	4	5	3	4	2	4	3	3	2	2	2	2	2	1	1	2	AF	5		
6-Dec	1	1	1	1	1	1	1	2	2	2	1	2	2	1	2	1	1	1	1	1	1	1	1	1	2		
7-Dec	1	2	2	1	2	2	1	1	1	1	1	2	1	2	1	1	2	2	2	1	2	2	2	3	3		
8-Dec	2	2	1	1	1	1	1	1	1	1	3	3	2	2	3	2	1	1	1	2	2	1	1	1	3		
9-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
10-Dec	1	1	2	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	2	1	1	1	1	2		
11-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	3	3	2	2	3			
12-Dec	2	2	2	3	3	2	2	2	2	3	4	4	4	3	3	3	3	3	2	2	2	2	2	1	4		
13-Dec	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	2	2	1	AF	1	AF	2		
14-Dec	2	1	2	1	2	1	1	1	1	1	2	2	2	2	3	3	3	2	1	2	2	2	2	2	3		
15-Dec	3	2	2	2	2	2	1	1	1	2	3	2	2	3	2	2	2	2	2	2	2	3	3	2	3		
16-Dec	3	3	2	5	3	3	3	3	3	2	2	3	3	3	2	2	2	2	2	1	2	1	1	2	5		
17-Dec	2	1	1	2	1	1	2	AF	1	AF	1	2	1	1	1	2	3	1	2	2	2	2	1	2	3		
18-Dec	1	2	1	1	1	1	1	2	2	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	2		
19-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2		
20-Dec	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	2	1	2		
21-Dec	2	2	2	1	1	1	1	2	1	1	2	2	1	1	1	AF	1	1	1	2	1	1	1	1	2		
22-Dec	2	3	2	2	3	3	3	3	2	2	2	2	3	3	2	2	2	3	2	1	2	2	1	2	3		
23-Dec	2	2	1	2	1	1	1	2	1	1	2	2	2	2	2	2	2	2	2	1	1	2	2	2	2		
24-Dec	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2		
25-Dec	2	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	2	2	2	1	1	1	1	1	2		
26-Dec	1	1	1	2	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	2	2	1	1	1	2		
27-Dec	1	1	1	1	2	1	1	1	1	1	3	3	2	3	2	1	1	1	2	1	1	1	2	2	3		
28-Dec	1	1	1	2	2	2	2	2	2	1	2	2	2	1	1	1	1	1	1	1	1	1	1	2	2		
29-Dec	2	2	2	2	2	2	2	2	4	3	2	3	3	3	2	2	2	1	2	3	4	4	4	3	4		
30-Dec	3	3	2	2	3	2	2	1	2	2	3	3	4	4	6	3	3	2	2	3	3	3	3	3	6		
31-Dec	3	6	4	4	5	4	5	5	4	3	2	2	1	2	7	4	4	2	2	3	2	2	2	3	7		
														Diurnal Maximum													
AF - Analyzer Failure																											





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**CNRL Horizon - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	345	46.81	46.81
6 - 11	345	46.81	93.62
12 - 19	44	5.97	99.59
20 - 28	3	0.41	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 737

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed (WS) - km/h**  
**CNRL Horizon - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	49	63	23	18	12	10	19	20	25	29	21	16	8	8	6	18	345
6 - 11	29	54	6	1	0	0	14	29	61	83	34	12	10	6	2	4	345
12 - 19	1	1	0	0	0	0	0	3	9	17	3	3	4	3	0	0	44
20 - 28	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	3
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	79	118	29	19	12	10	33	52	97	130	58	31	22	17	8	22	737

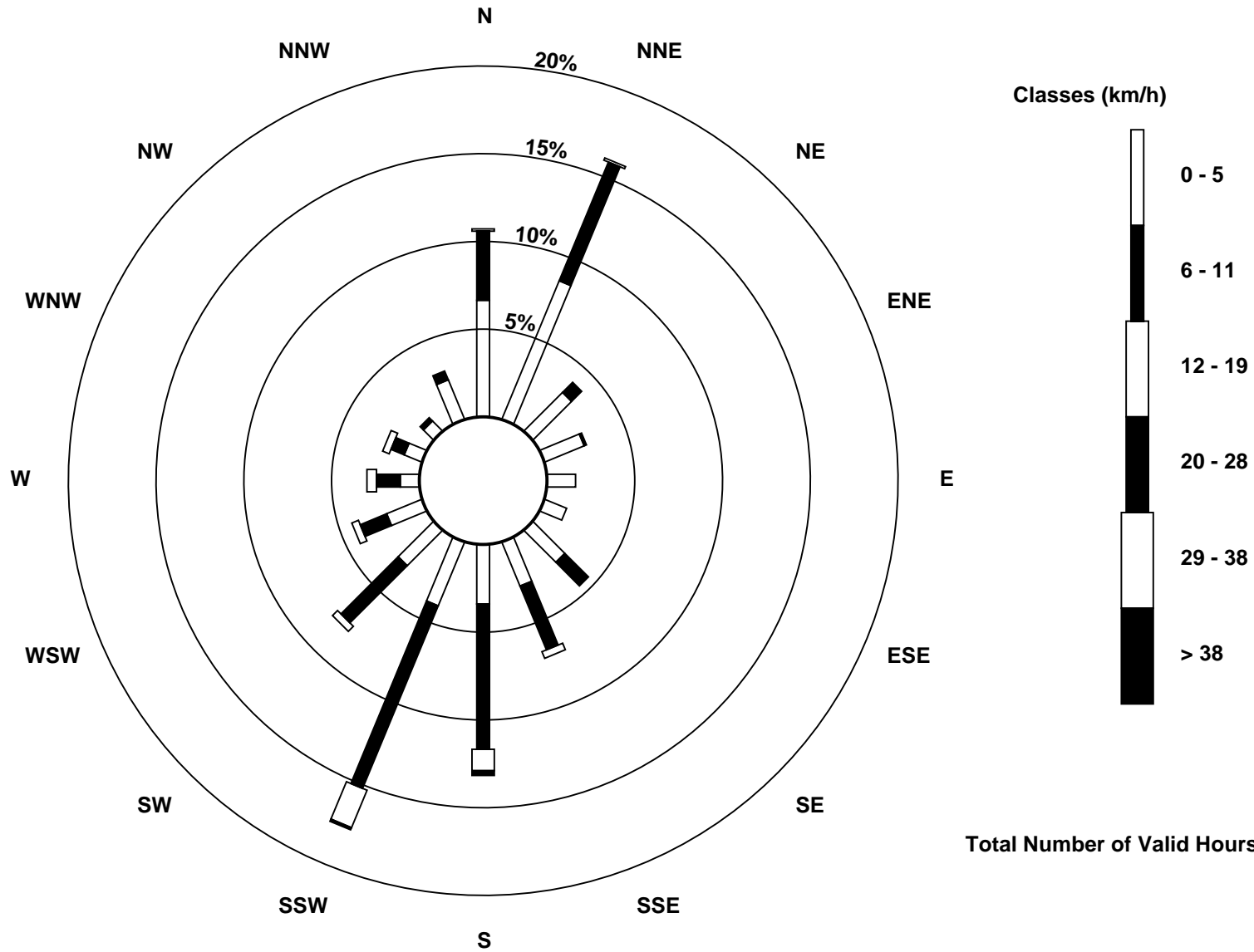
Total Number of Valid Hours: 737

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
CNRL Horizon (AMS 15)





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Wind Direction (WD) - deg  
CNRL Horizon - December 2015**

Direction of Maximum Speed: 211 deg on Dec 31 07:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 202.4 deg on Dec 31	Hours of Data: 737
Direction of Minimum Speed: 308 deg on Dec 26 03:00	Direction of Minimum Daily Speed Average: 0.2 deg on Dec 19
Direction of Minimum Speed: 308 deg on Dec 26 03:00	Hours of Missing Data: 7
Monthly Average Direction: 216.9 deg	Percent Operational Time: 99.1

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	176	172	164	180	179	174	181	202	189	197	194	182	154	168	177	161	183	165	180	202	194	154	131	174	177.4
2-Dec	167	179	187	188	179	178	183	190	194	213	192	184	193	196	204	202	194	215	224	212	229	235	279	305	200.3
3-Dec	288	292	299	142	220	318	AF	135	321	357	5	8	12	19	9	6	3	358	353	3	4	12	12	20	354.7
4-Dec	7	13	11	17	7	3	16	16	338	195	216	194	188	182	193	230	210	210	215	202	195	199	255	279	246.3
5-Dec	279	276	280	275	271	261	258	258	250	222	217	190	208	208	202	192	194	208	203	187	202	213	224	AF	232.6
6-Dec	253	284	261	330	36	333	8	349	356	7	9	15	12	323	233	198	221	210	199	201	190	200	194	202	225.9
7-Dec	197	191	195	182	191	243	236	247	246	254	267	233	247	226	198	185	189	188	176	145	153	349	310	344	210.4
8-Dec	14	25	6	179	157	165	232	227	212	207	200	215	214	217	193	161	185	151	106	78	79	79	41	30	161.3
9-Dec	8	18	32	25	19	20	6	20	21	16	20	3	13	20	49	276	259	201	184	177	163	187	265	123	21.8
10-Dec	1	27	28	348	8	53	55	64	77	35	6	343	26	45	28	32	10	302	300	15	27	19	5	1	14.7
11-Dec	4	2	5	1	353	353	355	355	6	354	3	19	58	101	104	131	133	99	123	136	147	148	148	144	70.1
12-Dec	142	143	150	149	149	145	140	136	140	146	148	158	157	156	153	149	153	152	153	147	146	150	145	140	148.3
13-Dec	148	133	88	76	98	119	121	143	148	156	136	115	79	54	39	15	12	344	327	2	32	AF	340	AF	94.8
14-Dec	280	296	282	257	228	200	235	121	158	196	208	214	227	237	222	206	201	184	203	195	182	177	181	173	208.2
15-Dec	174	186	180	166	180	171	196	198	190	202	213	215	206	209	211	196	207	207	205	228	293	42	27	22	196.9
16-Dec	343	328	81	293	289	301	273	268	249	256	244	225	229	239	187	199	218	240	211	245	237	202	241	241	256.8
17-Dec	245	226	227	234	239	337	51	AF	125	AF	118	57	103	185	164	199	34	30	22	27	33	42	32	29	22.7
18-Dec	43	75	57	52	45	28	27	19	7	355	1	355	349	32	32	21	25	32	40	76	135	137	35	54	37.3
19-Dec	340	15	10	7	28	27	83	98	208	281	144	175	195	182	191	241	233	197	338	13	285	250	251	230	237.7
20-Dec	199	201	218	220	216	213	216	217	227	228	225	220	207	205	217	230	245	229	201	192	232	220	185	189	214.8
21-Dec	193	178	184	194	205	199	215	197	196	203	183	183	168	156	142	143	AF	331	338	353	15	351	357	355	193.9
22-Dec	14	11	18	12	11	11	8	12	22	19	18	14	16	14	6	13	10	8	12	20	16	13	20	16	13.4
23-Dec	8	23	19	21	349	3	348	16	27	20	17	11	25	27	21	19	23	27	27	32	12	19	25	41	20.2
24-Dec	45	16	29	12	45	57	52	65	85	137	87	204	156	143	164	139	155	157	175	165	164	188	178	175	114.8
25-Dec	168	186	176	90	172	207	188	155	56	17	358	25	174	33	35	30	11	9	17	358	19	18	39	57	36.1
26-Dec	72	128	308	197	199	71	353	351	243	310	6	287	55	356	60	49	334	345	359	24	15	11	22	18	12.3
27-Dec	11	10	9	10	12	33	4	355	63	70	143	155	159	167	166	185	206	234	193	189	186	191	211	207	164.1
28-Dec	225	227	282	316	19	12	14	23	30	39	33	34	26	331	332	5	92	150	178	174	183	183	186	185	22.0
29-Dec	204	195	188	186	184	183	188	189	210	216	204	205	213	203	192	186	183	189	185	196	204	195	197	204	195.7
30-Dec	203	212	205	234	238	198	210	231	226	196	192	261	274	277	284	270	251	187	190	201	200	200	196	180	220.6
31-Dec	190	194	190	188	187	187	211	212	225	195	194	176	153	127	256	276	290	210	233	211	202	198	202	206	202.4

219.4 215.6 210.3 219.2 209.1 204.0 220.7 212.2 212.4 215.4 197.4 196.2 195.2 193.4 194.0 195.0 212.0 196.6 196.6 186.2 181.3 181.4 194.3 199.6  
Diurnal Average

AF - Analyzer Failure  
All monthly, daily, and diurnal averages have been calculated using vector methods



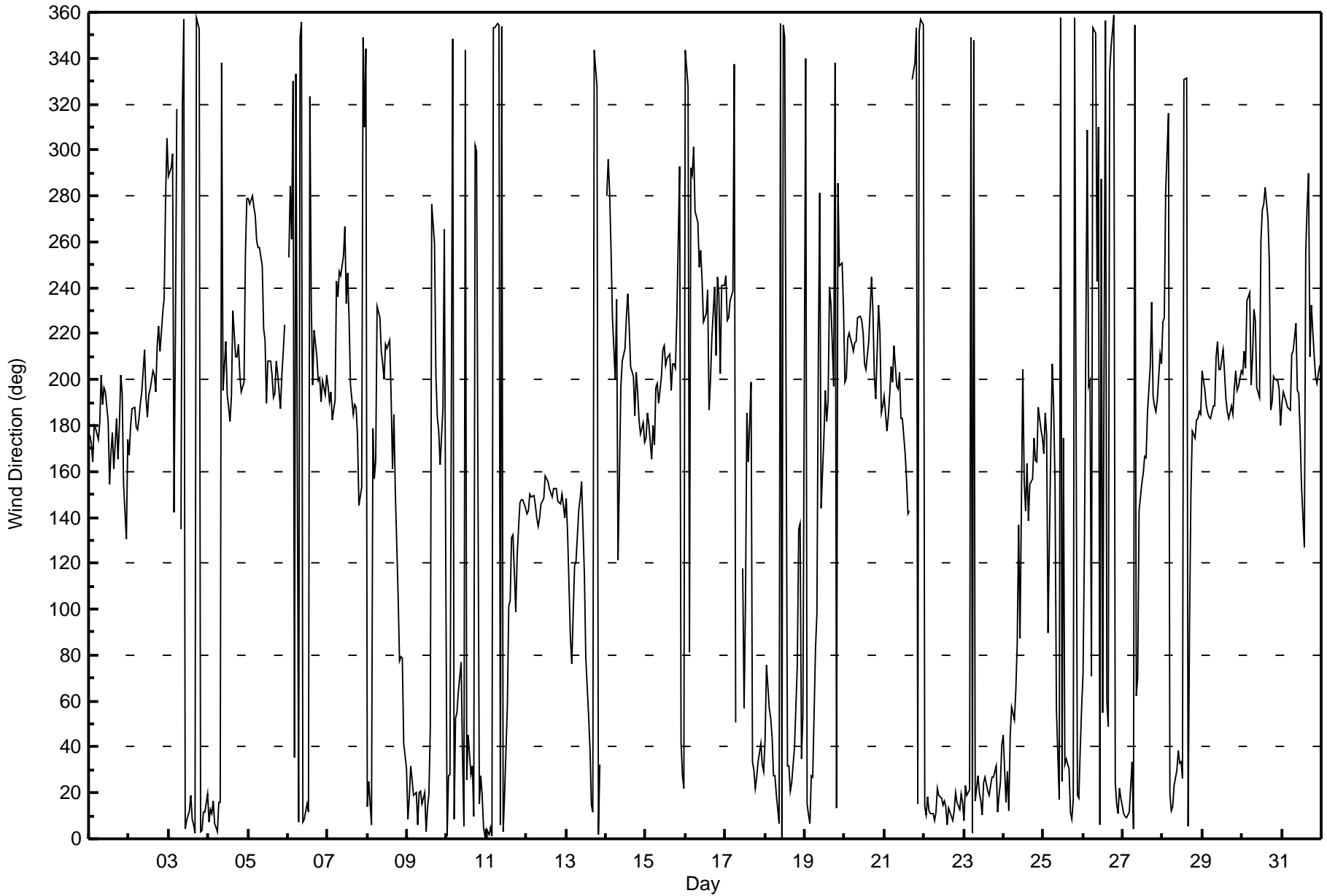
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Direction (WD) - deg  
CNRL Horizon - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 94 deg on Dec 19 18:00 Minimum Value: 5 deg on Dec 1 07:00		Hours in Service: 744 Hours of Data: 737 Hours of Missing Data: 7 Hours of Calibration: 0 Percent Operational Time: 99.1																							
Percentiles: P <sub>1</sub> = 9 P <sub>10</sub> = 13 Q <sub>1</sub> = 16 Median = 19 Q <sub>3</sub> = 25 P <sub>90</sub> = 39 P <sub>99</sub> = 88																									
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	15	26	23	9	8	6	5	56	13	15	19	27	41	21	19	16	11	12	13	12	33	44	11	14	56
2-Dec	15	10	15	15	12	14	15	20	19	18	16	15	20	20	19	17	16	19	18	18	20	35	50	20	50
3-Dec	18	25	57	75	45	90	AF	21	58	16	25	17	20	18	17	17	15	16	15	15	21	20	18	19	90
4-Dec	18	15	17	19	19	19	18	20	62	81	25	15	18	19	24	32	20	11	14	15	11	11	29	16	81
5-Dec	15	16	17	19	19	22	21	21	24	25	20	21	21	24	20	15	14	11	31	32	11	13	78	AF	78
6-Dec	36	61	39	9	21	39	52	67	30	82	41	72	39	35	59	15	22	13	10	10	13	13	14	12	82
7-Dec	14	14	16	8	25	35	38	25	14	18	24	39	38	19	20	13	14	16	17	15	45	50	14	19	50
8-Dec	20	18	24	94	33	26	18	25	13	14	22	26	27	49	58	25	28	25	27	18	24	26	20	15	94
9-Dec	13	14	12	18	18	17	17	16	18	15	20	22	18	20	32	70	17	22	14	15	15	22	56	66	70
10-Dec	38	18	23	13	16	19	13	25	20	86	22	20	25	19	26	17	24	9	15	44	16	13	28	15	86
11-Dec	17	18	16	17	14	15	14	13	15	14	16	18	35	20	18	16	51	17	15	17	17	17	16	18	51
12-Dec	18	18	18	18	17	18	18	18	17	17	19	17	18	18	18	18	19	18	19	19	18	18	18	18	19
13-Dec	19	22	34	32	26	19	23	19	19	20	23	24	38	24	22	24	19	21	22	32	28	AF	34	AF	38
14-Dec	15	17	20	22	28	39	40	63	31	19	18	20	22	22	22	22	28	15	17	15	16	15	16	19	63
15-Dec	16	15	17	14	14	13	16	13	13	18	20	15	16	18	16	13	11	13	14	16	56	30	18	17	56
16-Dec	28	16	76	42	17	17	18	16	16	16	17	20	32	42	19	25	26	45	15	11	76	38	22	16	76
17-Dec	15	15	12	57	57	61	36	AF	30	AF	90	37	47	22	23	21	19	20	17	15	16	16	18	31	90
18-Dec	24	22	23	23	20	63	50	15	19	23	22	30	27	19	14	13	14	48	14	20	13	23	32	19	63
19-Dec	34	17	17	23	17	16	29	24	31	52	38	23	24	23	14	49	10	94	38	40	88	31	25	13	94
20-Dec	18	10	10	8	9	9	9	9	9	11	13	16	19	19	15	10	14	15	13	17	11	18	11	17	19
21-Dec	16	16	17	14	14	13	13	15	9	11	14	17	15	19	21	33	AF	18	22	22	32	16	16	18	33
22-Dec	19	18	18	17	18	18	19	19	19	18	21	19	20	20	19	19	17	18	17	18	19	18	17	19	21
23-Dec	18	19	27	22	20	31	12	25	16	10	21	23	18	18	19	17	16	18	18	18	19	18	19	14	31
24-Dec	14	25	14	23	28	24	20	25	32	33	55	88	77	24	31	24	15	16	16	23	10	17	11	10	88
25-Dec	13	14	15	53	71	21	21	20	33	16	20	30	89	82	37	19	16	17	17	15	18	16	28	33	89
26-Dec	27	33	69	83	24	31	37	22	46	24	26	45	43	40	58	34	20	31	18	39	33	19	17	22	83
27-Dec	17	18	21	22	29	17	22	16	38	46	34	19	19	18	16	21	22	35	21	43	17	15	15	20	46
28-Dec	15	21	24	36	18	17	18	19	16	18	21	19	21	27	25	43	42	16	14	19	14	14	15	15	43
29-Dec	22	17	12	12	14	15	16	18	25	25	22	22	21	20	17	14	11	13	13	16	18	18	17	21	25
30-Dec	17	18	28	14	19	37	16	13	20	16	29	29	19	20	35	23	22	45	18	17	14	16	16	15	45
31-Dec	17	28	14	15	16	17	18	17	20	20	15	15	25	37	75	25	21	78	16	25	13	12	14	18	78
38 61 76 94 71 90 52 67 62 86 90 88 89 82 75 70 51 94 38 44 88 50 78 66																									
Diurnal Maximum																									
AF - Analyzer Failure																									







# Wood Buffalo Environmental Association

## SO2 Calibration Report

### Station Information

Calibration Date	December 11, 2015	Last Calibration	November 23, 2015
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	9:50	End Time (MST)	14:55
Gas Cert Reference	S0002486	Station temp.	21 Deg C
Cal Gas Concentration	50 ppm	Cal Gas Exp Date	26/09/2017
Calibrator Make/Model	Teledyne API T700	Serial Number	1223
ZAG Make/Model	Teledyne API 701	Serial Number	1004
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2580

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-622	-622
Analyzer IP address	192.168.1.43		Lamp voltage	848	849
Calculated slope	1.002128	0.997227	Chamber temp	45.2	45.0
Calculated intercept	-0.023089	0.383294	Pressure	713.0	706.3
Analyzer Background	18.0	18.0	Flow	0.433	0.431
Analyzer Coefficient	0.973	0.978	Intensity	91	91

Analyzer make Thermo 43i Analyzer serial # 710321322

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.1	----
as found span	5000	81.5	815.0	806.3	1.011
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	81.5	815.0	816.9	0.998
second point	5000	40.6	406.0	406.9	0.998
third point	5000	20.2	202.0	201.6	1.002
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	81.5	815.0	816.0	0.999
Average Correction Factor					0.999

Corrected As found 806.4 Previous response 813.3 % change 0.9%

**Notes:**

Inlet filter replaced after as founds. Adjusted span. As left zero began at 14:16 MST.

Calibration Performed By: Asad Hidayat



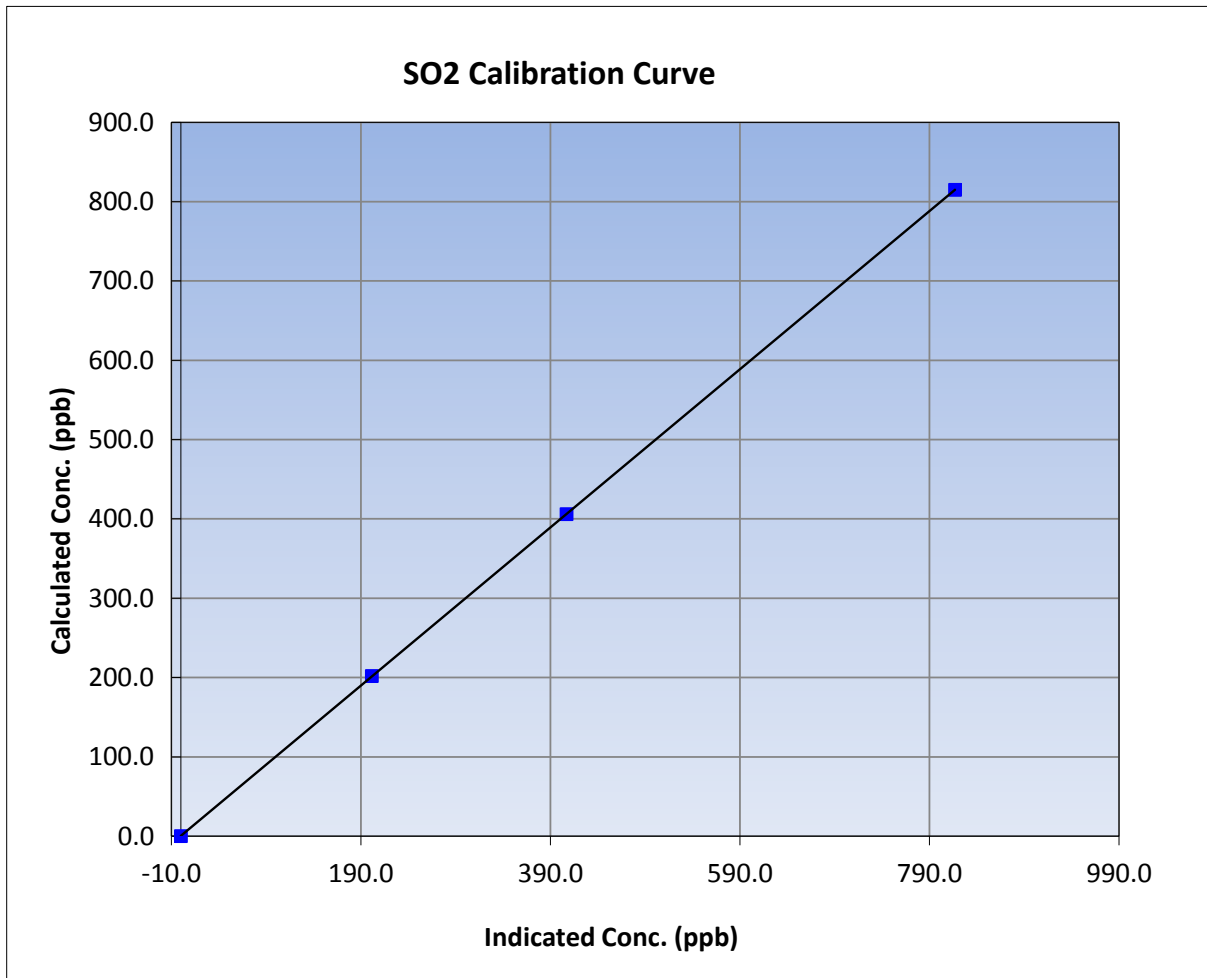
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 11, 2015	Previous Calibration	November 23, 2015
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:50	End Time (MST)	14:55
Analyzer make	Thermo 43i	Analyzer serial #	710321322

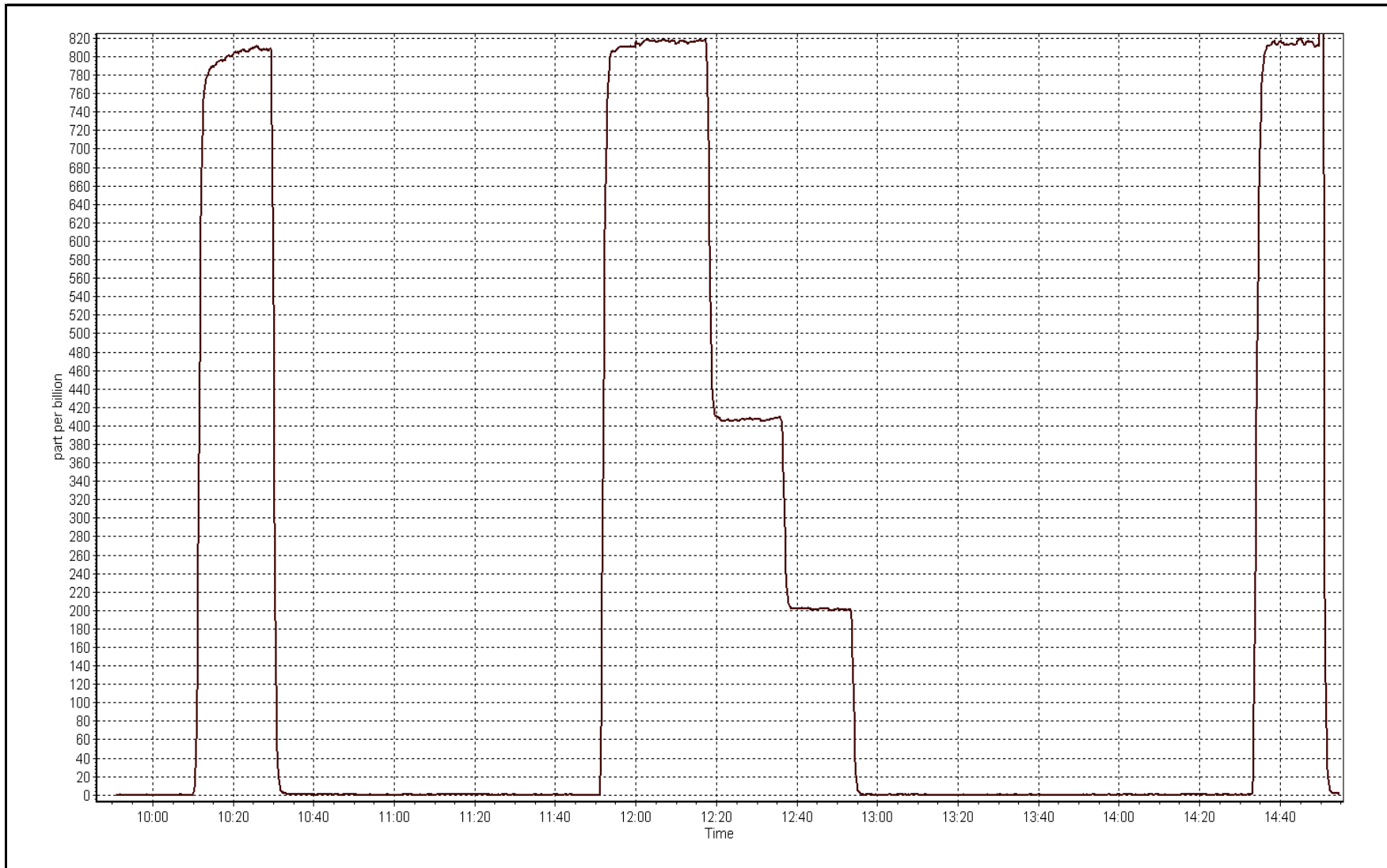
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999999
815.0	816.9	0.9976		
406.0	406.9	0.9978	Slope	0.997227
202.0	201.6	1.0018		
			Intercept	0.383294



SO2 Calibration Plot

Date: December 11, 2015





# Wood Buffalo Environmental Association TRS Calibration Report

## Station Information

Calibration Date	December 9, 2015	Last Calibration	November 12, 2015
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	9:23	End Time (MST)	11:57
Gas Cert Reference	LL82745	Station temp.	22 Deg C
Cal Gas Concentration	9.6 ppm	Cal Gas Exp Date	22/02/2016
Calibrator Make/Model	API T700	Serial Number	1223
Dil air Make/Model	API 701	Serial Number	1005
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2580
SO2 gas concentration	50 ppm	SO2 gas cert/exp	S0002486 26/Sep/17

## Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-694	-694
Analyzer IP address	192.168.1.44		Lamp voltage	974	980
Calculated slope	0.990713	0.990354	Chamber temp	45	45
Calculated intercept	0.068062	0.115331	Pressure	688.7	690.8
Analyzer Background	1.34	1.33	Flow	0.431	0.433
Analyzer Coefficient	0.989	0.976	Intensity	90	91
			Converter temp.	809	809
Analyzer make/model	Thermo 43i TLE		Analyzer serial #	1150840012	
Converter make/model	CDN-101		Converter serial #	363	

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.1	----
as found span	5000	41.5	79.7	81.0	0.984
SO2 scrubber check	5000	19.8	198.0	0.1	----
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	41.5	79.7	80.3	0.992
second point	5000	20.7	39.7	40.0	0.993
third point	5000	10.3	19.8	19.8	0.997
as left zero	5000	0.0	0.0	-0.1	----
as left span	5000	41.5	79.7	80.3	0.992
Average Correction Factor					0.994

Corrected As found	81.1	Previous response	80.4	% change	-0.9%
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**Notes:**

Scrubber check and inlet filter replaced after as founds. Adjusted span.

Calibration Performed By:

Asad Hidayat



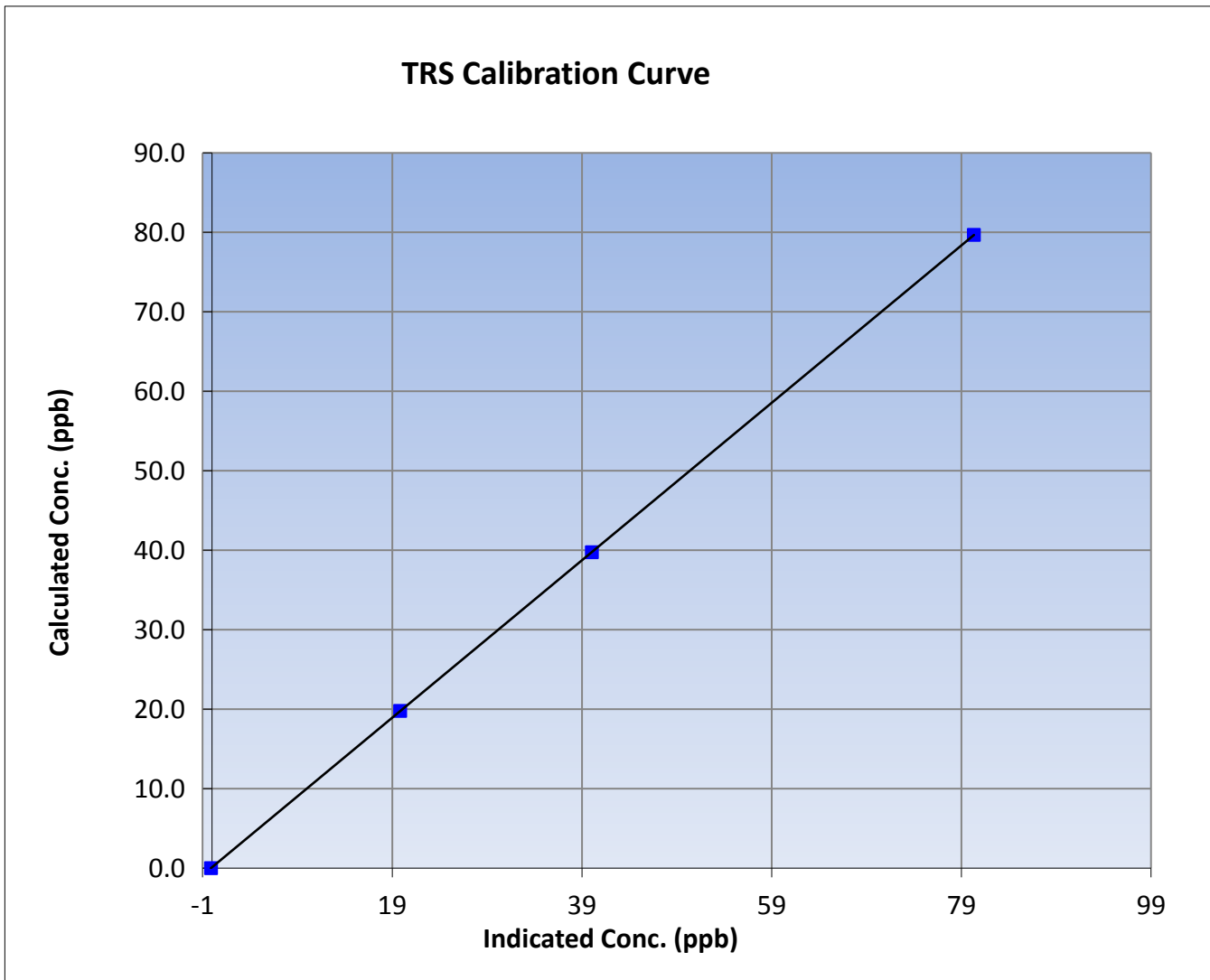
# Wood Buffalo Environmental Association TRS Calibration Report

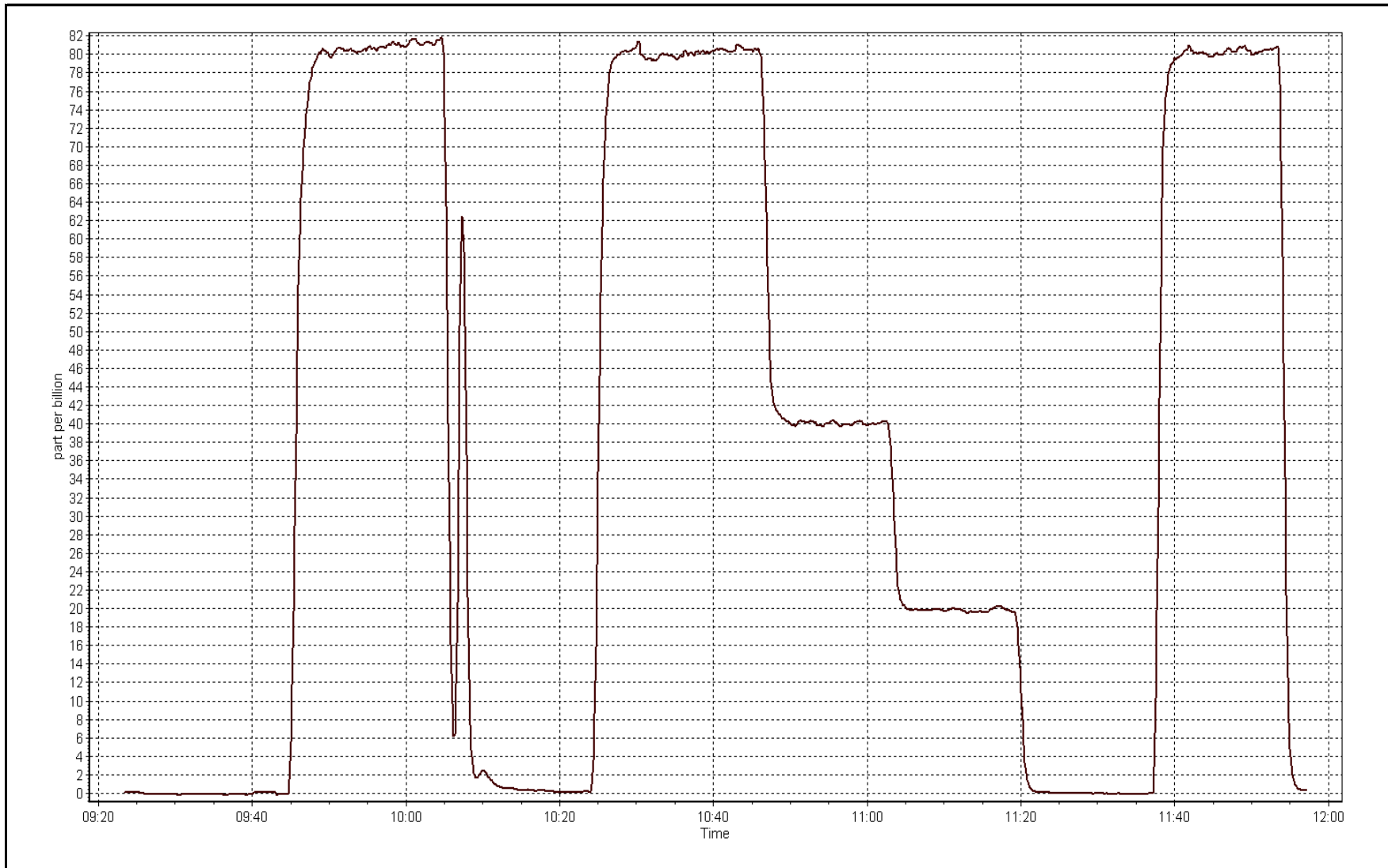
## Station Information

Calibration Date	December 9, 2015	Previous Calibration	November 12, 2015
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:23	End Time (MST)	11:57
Analyzer make	Thermo 43i TLE	Analyzer serial #	1150840012

## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	1.000000
79.7	80.3	0.9919		
39.7	40.0	0.9926	Slope	0.990354
19.8	19.8	0.9968		
			Intercept	0.115331







# Wood Buffalo Environmental Association THC Calibration Report

### Station Information

Calibration Date	December-11-15	Last Calibration	November-23-15
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	9:50	End Time (MST)	14:55
Gas Cert Reference	S0002486	Cal Gas Expiry Date	26-Sep-17
CH4 Cal Gas Conc.	505 ppm	CH4 Equiv Conc.	1046.8 ppm
C3H8 Cal Gas Conc.	197 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Teledyne API T700	Serial Number	1223
ZAG make/model	Teledyne API 701	Serial Number	1004
DACS make/model	Campbell Scientific CR3000	Serial Number	2580

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.8	8.7
Analyzer IP address	192.168.1.51		Air or Bypass Press	38.0	37.6
Calculated slope	0.997840	0.996792	Fuel Pressure	26.3	26.3
Calculated intercept	0.031180	0.019033	Analyzer Coeff	3.1	3.1
			Analyzer BKG	0.000	0.000

Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059295
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### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	81.5	17.06	17.13	0.996
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	81.5	17.06	17.11	0.997
second point	5000	40.6	8.50	8.49	1.001
third point	5000	20.2	4.23	4.21	1.004
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	81.5	17.06	17.20	0.992
Average Correction Factor					1.001

Corrected As found	17.13	Previous response	17.07	% change	-0.4%
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**Notes:**

Inlet filter replaced after as founds. THC pump replaced after as founds for preventative maintenance. Adjusted span.

Calibration Performed By:

\_\_\_\_\_ Asad Hidayat





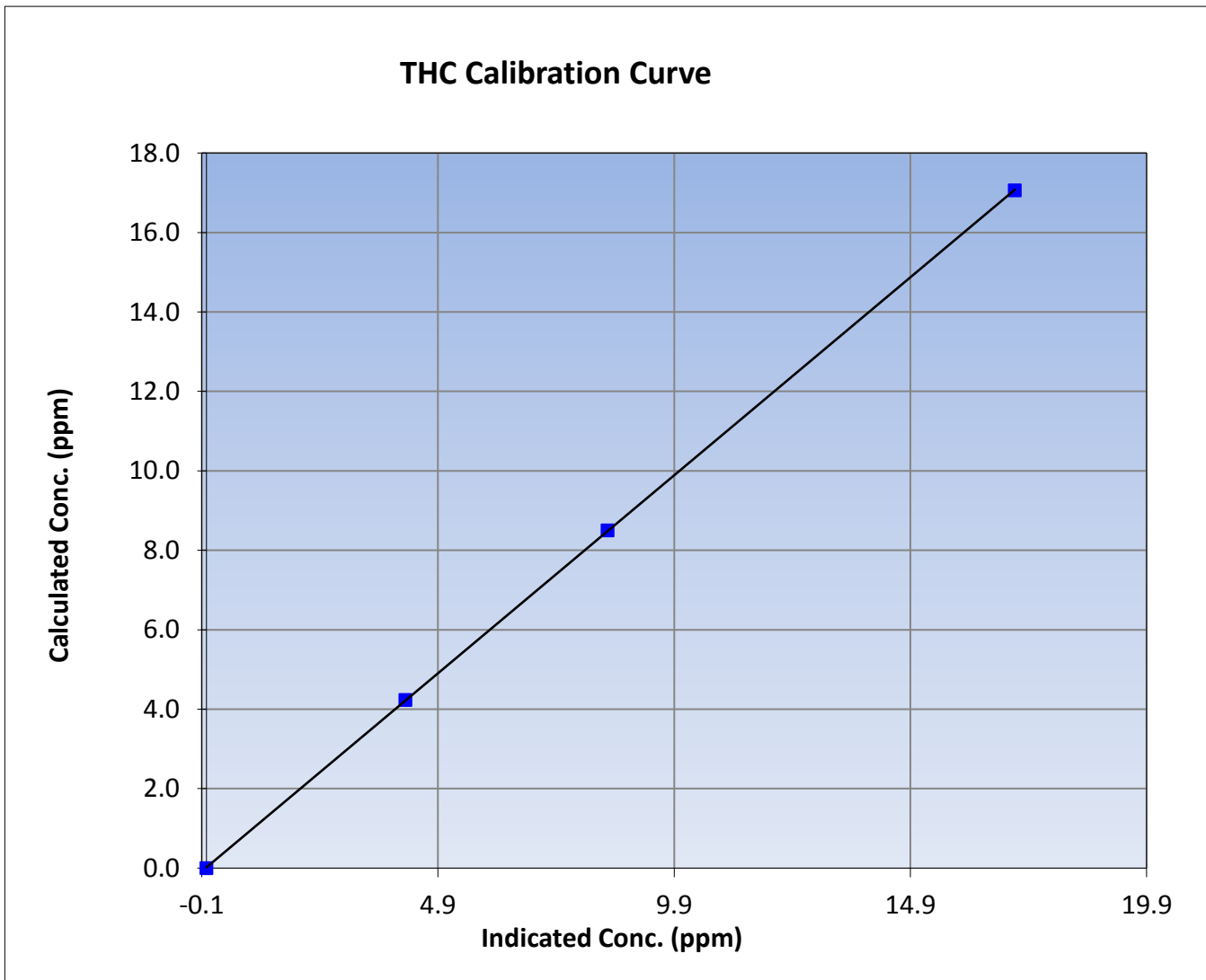
# Wood Buffalo Environmental Association THC Calibration Report

## Station Information

Calibration Date	December 11, 2015	Previous Calibration	November 23, 2015
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:50	End Time (MST)	14:55
Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059295

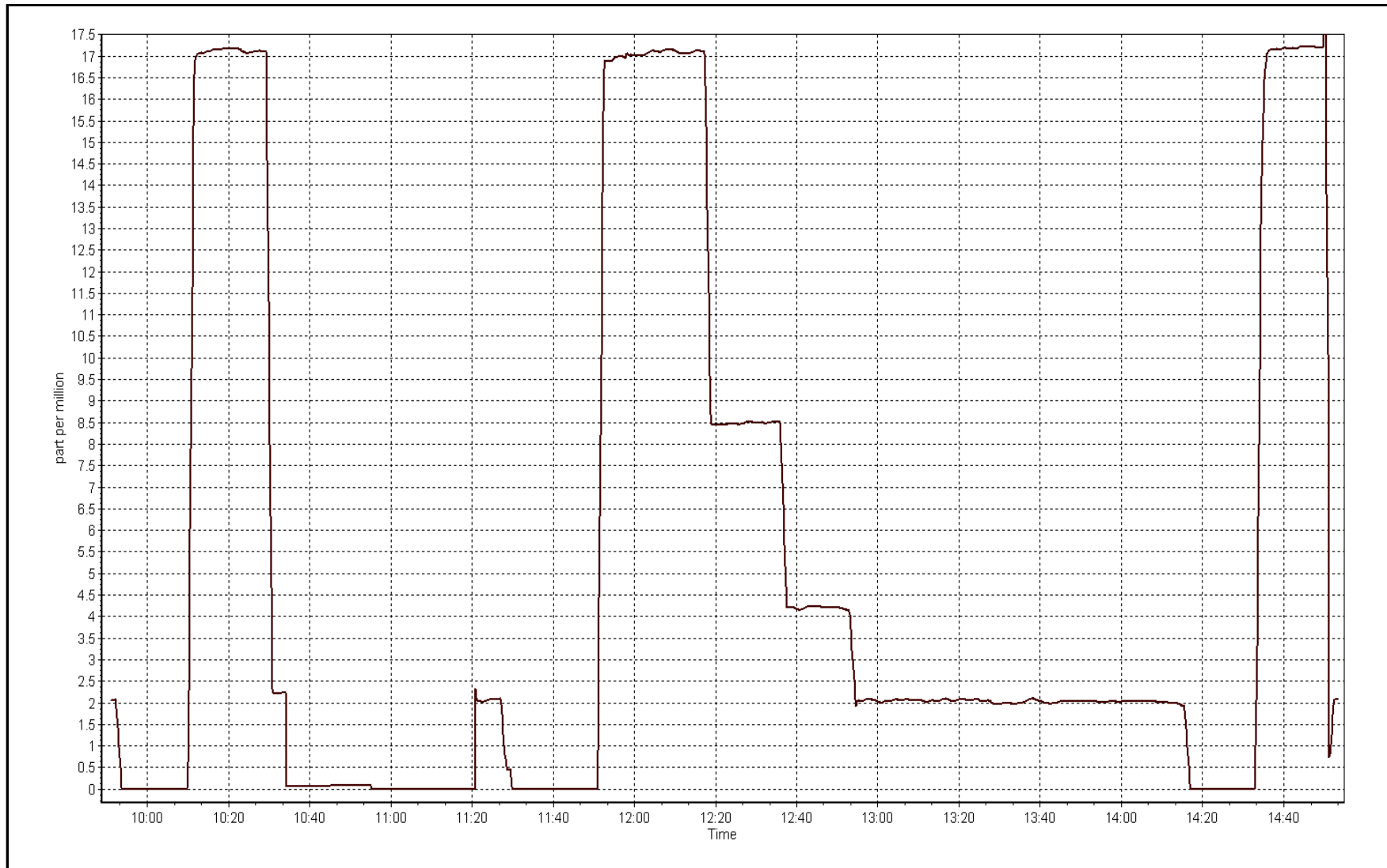
## Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999994
17.06	17.11	0.9972		
8.50	8.49	1.0011	Slope	0.996792
4.23	4.21	1.0045		
			Intercept	0.019033



THC Calibration Plot

Date: December 11, 2015





# Wood Buffalo Environmental Association THC Calibration Report

### Station Information

Calibration Date	December-21-15	Last Calibration	December-11-15
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	<input type="checkbox"/> Other: <input checked="" type="checkbox"/> Maintenance		
Start Time (MST)	10:10	End Time (MST)	15:30
Gas Cert Reference	S0002486	Cal Gas Expiry Date	26-Sep-17
CH4 Cal Gas Conc.	505 ppm	CH4 Equiv Conc.	1046.8 ppm
C3H8 Cal Gas Conc.	197 ppm	Station temp.	22 Deg C
Calibrator Make/Model	Teledyne API T700	Serial Number	1223
ZAG make/model	Teledyne API 701	Serial Number	1004
DACS make/model	Campbell Scientific CR3000	Serial Number	2580

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.7	8.7
Analyzer IP address	192.168.1.51		Air or Bypass Press	37.6	38.0
Calculated slope	0.996792	1.001857	Fuel Pressure	26.3	26.3
Calculated intercept	0.019033	0.001323	Analyzer Coeff	3.1	3.1
			Analyzer BKG	0.000	1.840

Analyzer make: Thermo 51i-LT      Analyzer serial #: 1327059295

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	81.5	17.06	17.06	1.000
calibrator zero	5000	0.0	0.00	0.03	----
high point	5000	81.5	17.06	17.05	1.001
second point	5000	40.6	8.50	8.45	1.006
third point	5000	20.2	4.23	4.20	1.007
as left zero	5000	0.0	0.00	-0.03	----
as left span	5000	81.5	17.06	17.17	0.994
Average Correction Factor					1.004

Corrected As found: 17.06      Previous response: 17.10      % change: 0.2%

**Notes:**

As founds completed. Troubleshooting to determine cause of flatline zero response. Fuel, air and sample pressures adjusted, then set back to factory settings. Input board calibration completed. After input board calibration zero response showed around 1.8 ppm. Full calibration completed. Zero and span adjusted.

Calibration Performed By: \_\_\_\_\_

Devin Russell



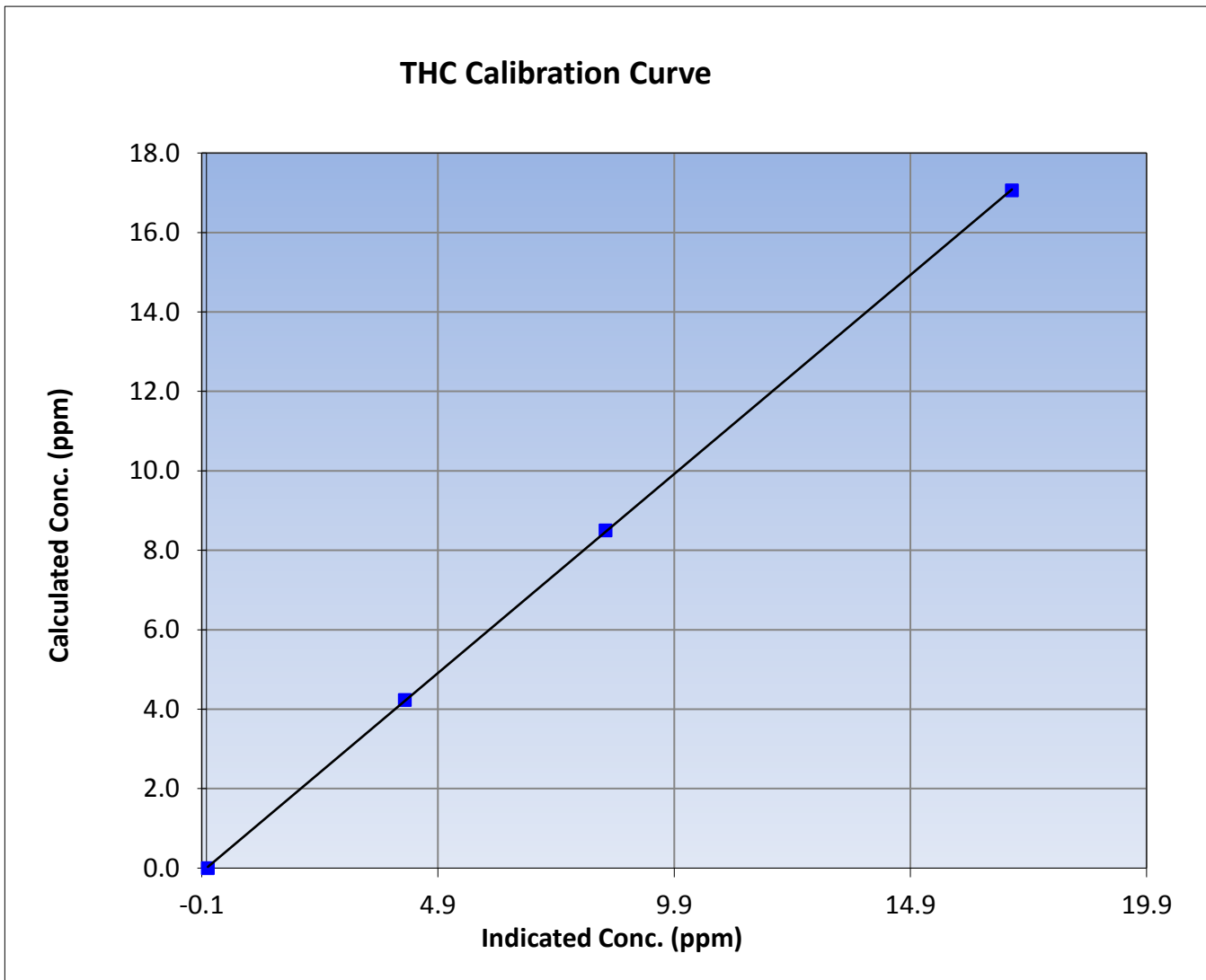
# Wood Buffalo Environmental Association THC Calibration Report

## Station Information

Calibration Date	December 21, 2015	Previous Calibration	December 11, 2015
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	10:10	End Time (MST)	15:30
Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059295

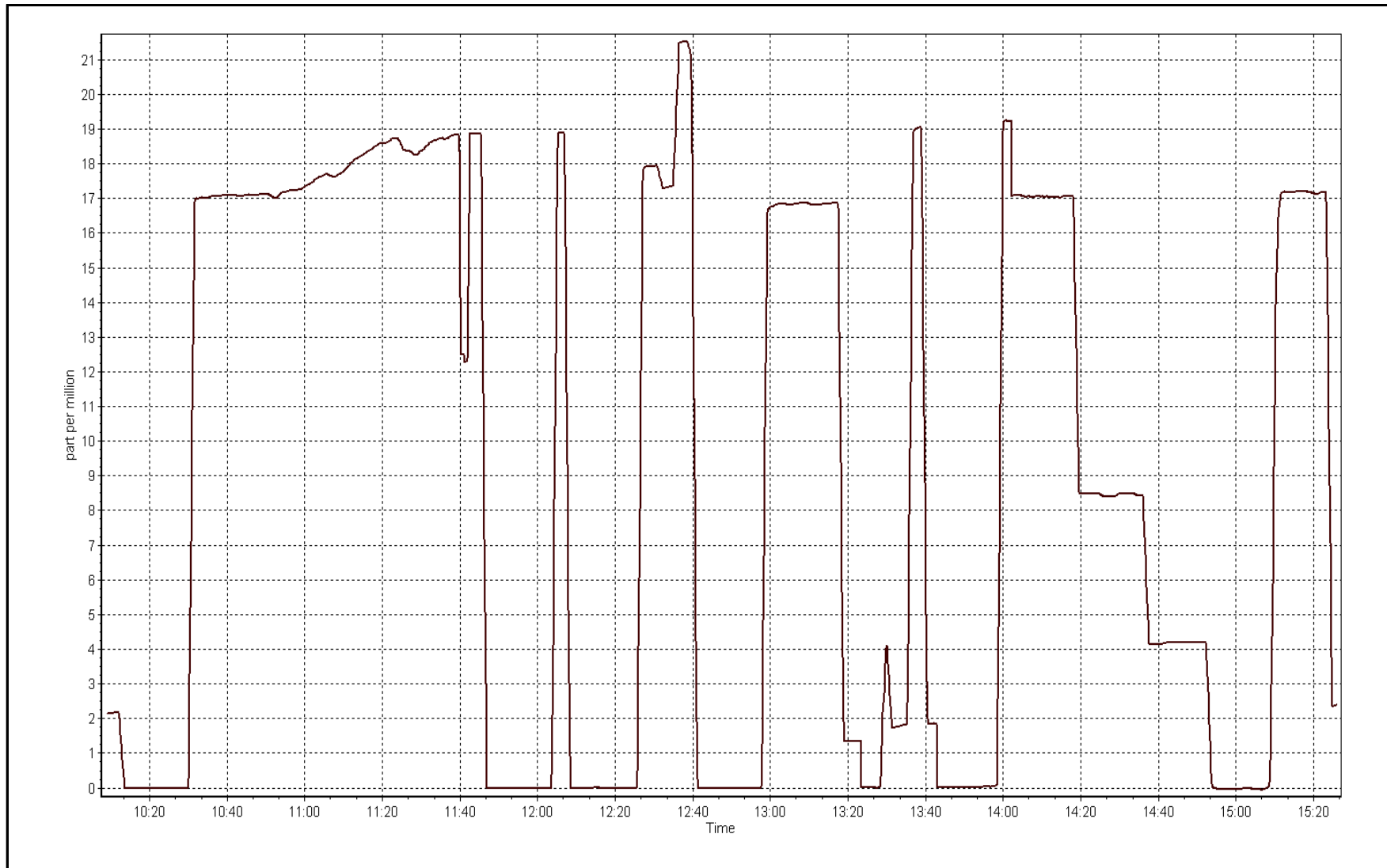
## Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.03	----	Correlation Coefficient	0.999982
17.06	17.05	1.0007		
8.50	8.45	1.0059	Slope	1.001857
4.23	4.20	1.0069		
			Intercept	0.001323



THC Calibration Plot

Date: December 21, 2015





# Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

## Station Information

Calibration Date	December 11, 2015	Previous Calibration	November 23, 2015
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	9:50	End Time (MST)	14:56
NO Cal Gas Conc	48.9 ppm	Gas Cert Reference	S0002486
NOX Cal Gas Conc	48.9 ppm	Cal Gas Expiry Date	26/09/2017
Calibrator	Teledyne API T700	Serial Number	1223
Zero air Generator	Teledyne API T701	Serial Number	1004

## DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	2580
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## Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.994134	0.994970	0.994571
	Data Offset	0.436278	0.589546	-0.642586
Current Calibration	Data Slope	1.000700	1.000140	0.998935
	Data Offset	0.197738	0.427515	0.077236

## Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	710321429
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	0.747		1.013	
NOX coefficient	1.001		0.999	
NO2 coefficient	1.000		1.000	
NO bkgrnd	9.4		9.8	
NOX bkgrnd	9.6		9.8	
Chamber Temp	50.2	Deg C	50.1	Deg C
Moly Temp	323.4	Deg C	325.3	Deg C
PMT voltage	-784.8	V	-753	V
PMT Temp	-2.7	Deg C	-3.1	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	159.2	mmHg	158.7	mmHg
R Cell Press Nox	160.2	mmHg	159	mmHg
NO sample flow	0.686	lpm	0.68	lpm
Nox sample Flow	0.688	lpm	0.681	lpm

**Notes:**

Inlet filter replaced after as founds. PMT adjusted after as founds due to NO coeff being very low. Adjusted both zero and span.



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

### Station Information

Calibration Date:

December 11, 2015

Station Number:

AMS 15

### Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.3	0.0	----	----
as found span	5000	81.5	797.1	797.1	0.0	807.1	805.6	1.5	0.9876	0.9894
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	----	----
high point	5000	81.5	797.1	797.1	0.0	796.2	796.5	-0.3	1.0011	1.0007
second point	5000	40.6	397.1	397.1	0.0	397.2	397.0	0.2	0.9997	1.0001
third point	5000	20.2	197.6	197.6	0.0	196.6	196.4	0.2	1.0048	1.0058
as left zero	5000	0.0	0.0	0.0	0.0	0.1	0.0	0.1	----	----
as left span	5000	81.5	797.1	429.2	367.9	791.9	428.3	363.6	1.0065	1.0019
Average Correction Factor									1.0019	1.0022

Corrected As found  
Previous Response

NO<sub>x</sub>= 807.4  
NO<sub>x</sub>= 801.3

NO= 805.9  
NO= 800.5

Percent Change

NO<sub>x</sub>= -0.7%

NO= -0.7%

### GPT Calibration Data

Dilution Flow

5000

ccm

Source Gas Flow

81.50

ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero			0.0			0.1			N/A	
1st NO2 (300)	----	429.2	364.0	793.7	429.2	364.5	0.9882	1.0000	0.9987	100.1%
2nd NO2 (200)	----	545.8	247.4	793.2	545.8	247.4	0.9887	1.0000	1.0000	100.0%
3rd NO2 (100)	----	664.1	129.1	793.1	664.1	129.0	0.9889	1.0000	1.0006	99.9%
4th NO2 (0)	793.2	----	2.3	795.5	793.2	2.2	0.9859	1.0000	N/A	----
Average Correction Factor							0.9879	1.0000	0.9998	100.0%

Calibration Performed By:

Asad Hidayat



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

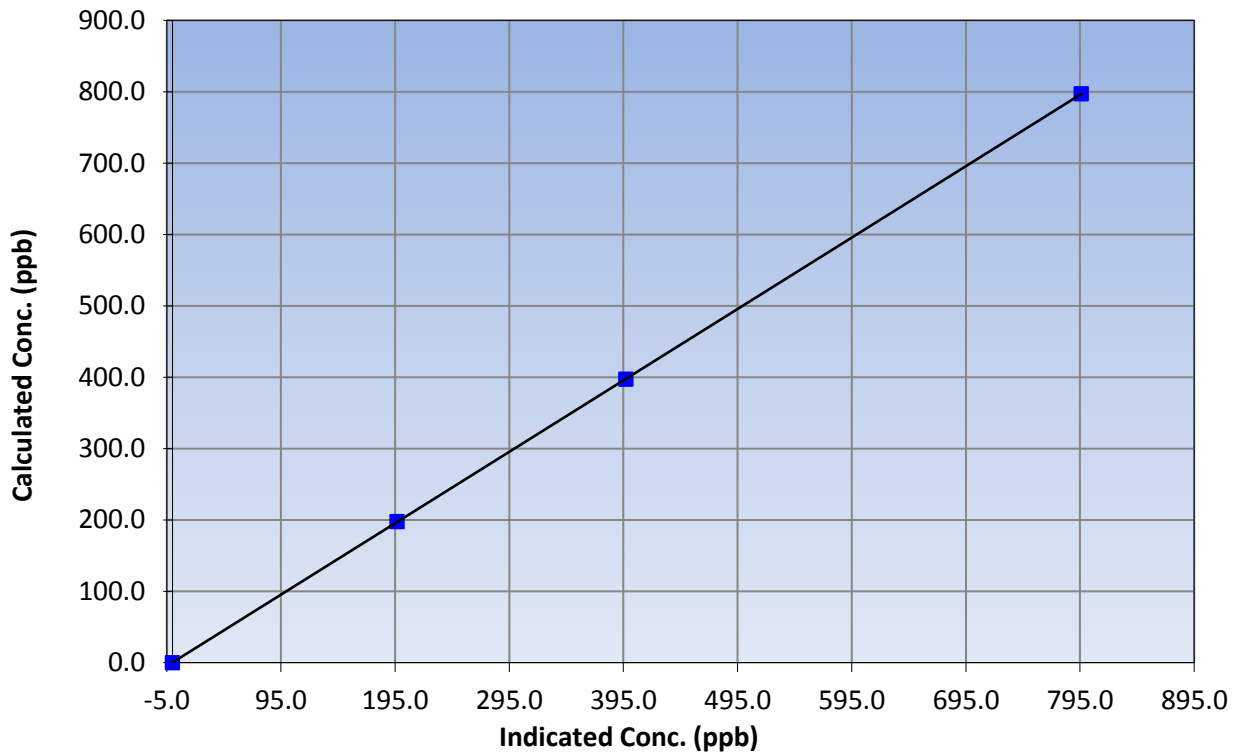
### Station Information

Calibration Date	December 11, 2015	Previous Calibration	November 23, 2015
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:50	End Time (MST)	14:56
Analyzer make	Thermo 42i	Analyzer serial #	710321429

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999998
797.1	796.2	1.0011		
397.1	397.2	0.9997	Slope	1.000700
197.6	196.6	1.0048		
			Intercept	0.197738

### NO<sub>x</sub> Calibration Curve







# Wood Buffalo Environmental Association

## NO Calibration Summary

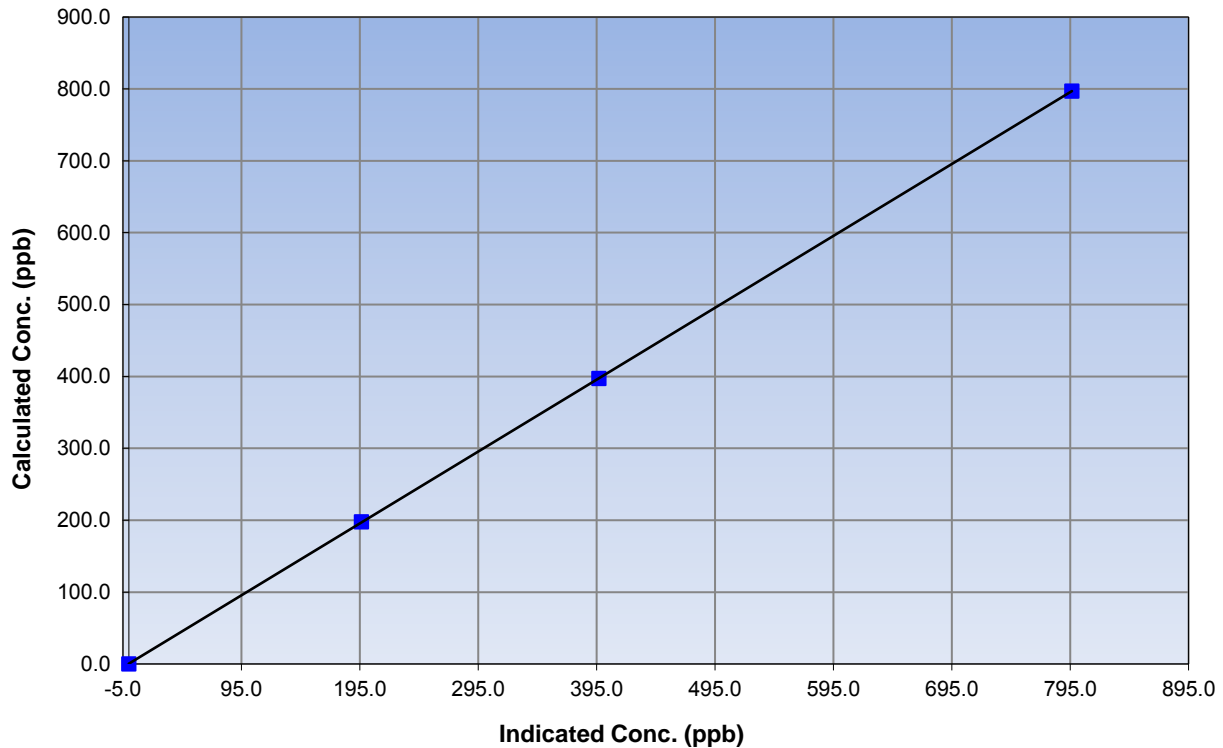
### Station Information

Calibration Date	December 11, 2015	Previous Calibration	November 23, 2015
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:50	End Time (MST)	14:56
Analyzer make	Thermo 42i	Analyzer serial #	710321429

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999998
797.1	796.5	1.0007		
397.1	397.0	1.0001	Slope	1.000140
197.6	196.4	1.0058		
			Intercept	0.427515

### NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

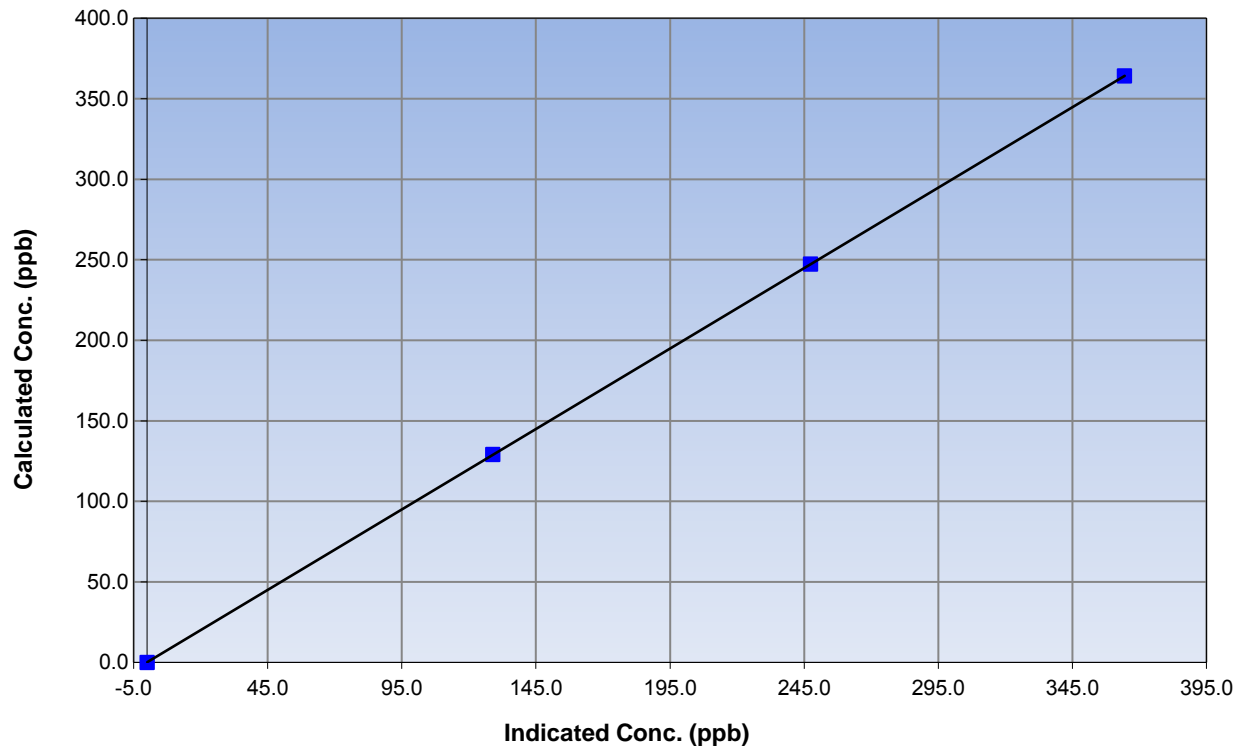
### Station Information

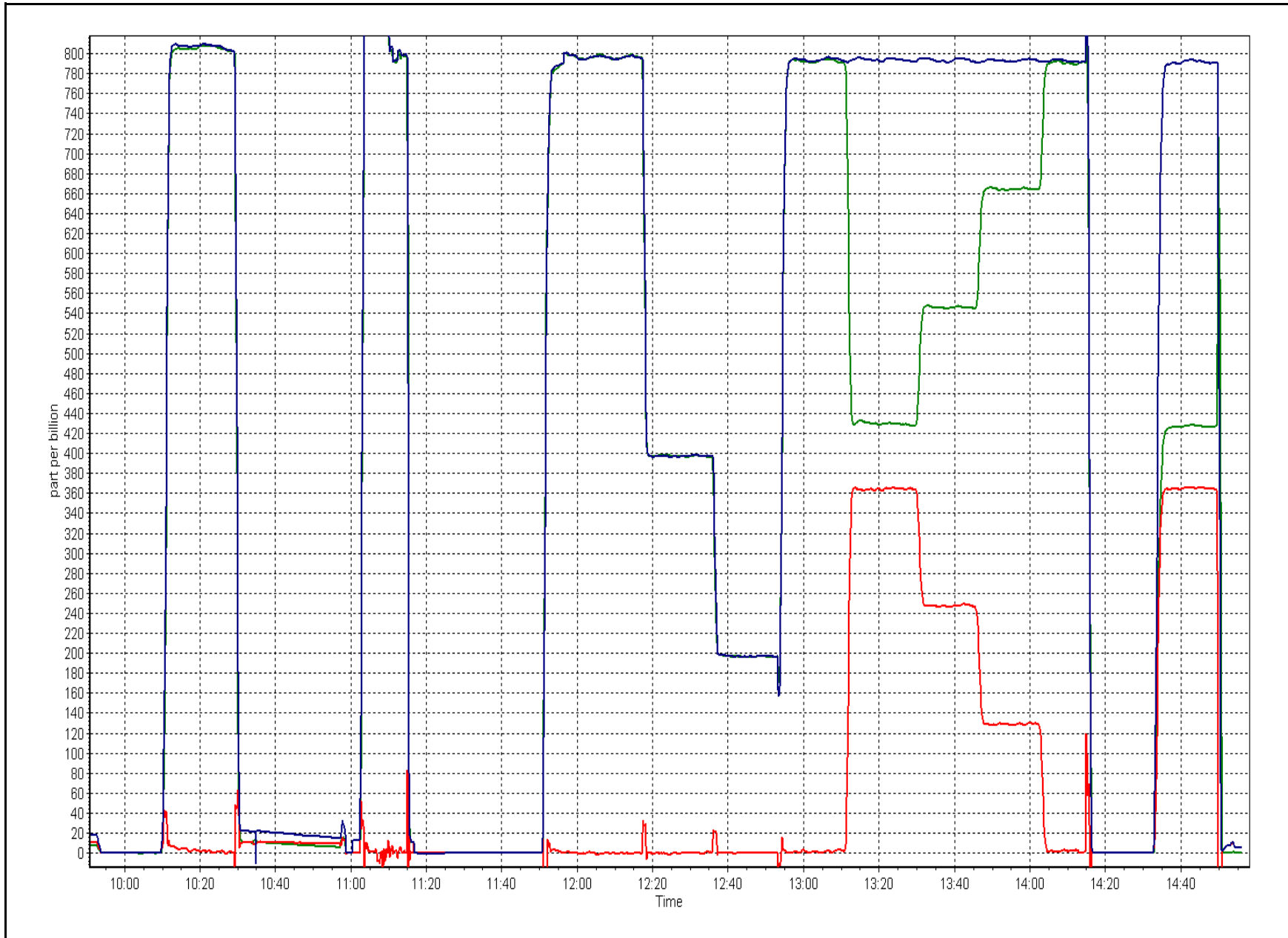
Calibration Date	December 11, 2015	Previous Calibration	November 23, 2015
Station Number	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:50	End Time (MST)	14:56
Analyzer make	Thermo 42i	Analyzer serial #	710321429

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999999
364.0	364.5	0.9987		
247.4	247.4	1.0000	Slope	0.998935
129.1	129.0	1.0006		
			Intercept	0.077236

### NO<sub>2</sub> Calibration Curve







## Wood Buffalo Environmental Association

### SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	<u>December 11, 2015</u>	Previous Calibration:	<u>November 23, 2015</u>
Station Name:	<u>CNRL Horizon</u>	Station Number:	<u>AMS 15</u>
Start Time (MST):	<u>12:00</u>	End Time (MST):	<u>13:07</u>
Calibrator Make/Model:	<u>Delta Cal</u>	Calibrator Serial Number:	<u>1451</u>

SHARP INFORMATION			
Particulate Fraction:	<u>PM2.5</u>		
Make/Model:	<u>Thermo / SHARP 5030</u>		
Serial Number	<u>E-2020</u>		
C <sub>14</sub> Source SN:	<u>7409</u>		
Confirmation of Time settings:	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Parameters Checked:	T1 <input checked="" type="checkbox"/>	T2 <input checked="" type="checkbox"/>	T3 <input checked="" type="checkbox"/>
	T4 <input checked="" type="checkbox"/>	P3 <input checked="" type="checkbox"/>	Main Flow <input checked="" type="checkbox"/>
		Beta <input checked="" type="checkbox"/>	Neph <input checked="" type="checkbox"/>

#### CALIBRATION DATA

Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	-3.0	-2.6	0.4	-3.0
T2	19.0	na	na	19.0
T3	20.0	na	na	20.0
T4	15.0	na	na	15.0
RH (%)	25.0	na	na	25.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	970	973.0	3.0	970

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
999	997	-2	993	999

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	165		165
Neph	0.2		0.2
C14	27.3		27.3
Indicated Concentration (ug/m3)	0	No	0
Offset 1			
Offset 2			

#### Leak Check (Quarterly)

Leak Check Date:	<u>August 26, 2015</u>	Previous Leak Check Date:	<u>May 14, 2015</u>
	<b>Measured</b>		<b>Difference LPM (Limit +/- 0.42 LPM)</b>
Flow without adaptor (LPM):	16.72		0.04
*Flow with adaptor (LPM):	16.68		

*\*Note - do not attach adaptor without shutting off the pump first*

Mass Foil Calibration (Annually)			
Foil Calibration Date:	<u>June 22, 2015</u>	Previous Foil Calibration:	NA
Zeroed?:	<u>Yes</u>		
Foil Mass:	<u>1507</u>		<b>Mass foil set S/N:</b> 2022
Previous Correction Factor:	<u>7091</u>		
New Correction Factor:	<u>7029</u>		

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	23/11/2015
Pump	Good	09/06/2014
Filter Tape	Good	09/06/2014
Mass Foil Cal Set	Good	NA
HEPA filter	Good	09/06/2014

#### NOTES:

No adjustments. Cleaned cyclone head.

Calibration Performed By: Asad Hidayat



## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 16**  
**SHELL MUSKEG RIVER**  
**DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SHELL MUSKEG RIVER (AMS 16)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	708	36	36	100.00	30	0	5	0
THC (ppm) Average	708	36	36	100.00	5.6	-	3.2	-
NO2 (ppb) Average	708	36	36	100.00	43	0	24	-
NO (ppb) Average	708	36	36	100.00	177	-	43	-
NOX (ppb) Average	708	36	36	100.00	220	-	67	-
PM2.5 (ug/m3) Average	742	2	2	100.00	82.8	-	21.8	0
Temperature 2 m (C) Average	744	0	0	100.00	3.7	-	-1.6	-
Relative Humidity (%) Average	744	0	0	100.00	96	-	94	-
Barometric Pressure (inHg) Average	744	0	0	100.00	29.5	-	29.4	-
Wind Speed 10 m (km/h) Average	744	0	0	100.00	25	-	14	-
Wind Direction 10 m (deg) Average	744	0	0	100.00	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SHELL MUSKEG RIVER (AMS 16)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	708	0.9	2	-	0	0	0	0	1	2	30
THC (ppm) Average	708	2.49	0.4	-	2	2.2	2.3	2.4	2.6	2.9	5.6
NO2 (ppb) Average	708	11.3	8	-	0	2	5	10	17	23	43
NO (ppb) Average	708	7.9	17	-	0	0	0	1	8	22	177
NOX (ppb) Average	708	19.3	23	-	0	2	6	13	24	43	220
PM2.5 (ug/m3) Average	742	5.96	6.3	-	0.5	1.6	2.9	4.9	7.5	10.3	82.8
Temperature 2 m (C) Average	744	-11.59	6.5	-	-31.3	-19.9	-16.8	-11.6	-5.8	-4.1	3.7
Relative Humidity (%) Average	744	84.3	7	-	52	77	81	84	89	93	96
Barometric Pressure (inHg) Average	744	28.75	0.3	-	28.3	28.4	28.5	28.7	28.9	29.1	29.5
Wind Speed 10 m (km/h) Average	744	7.7	4	-	0	3	5	7	10	14	25
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SHELL MUSKEG RIVER (AMS 16)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
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No operational issues to report

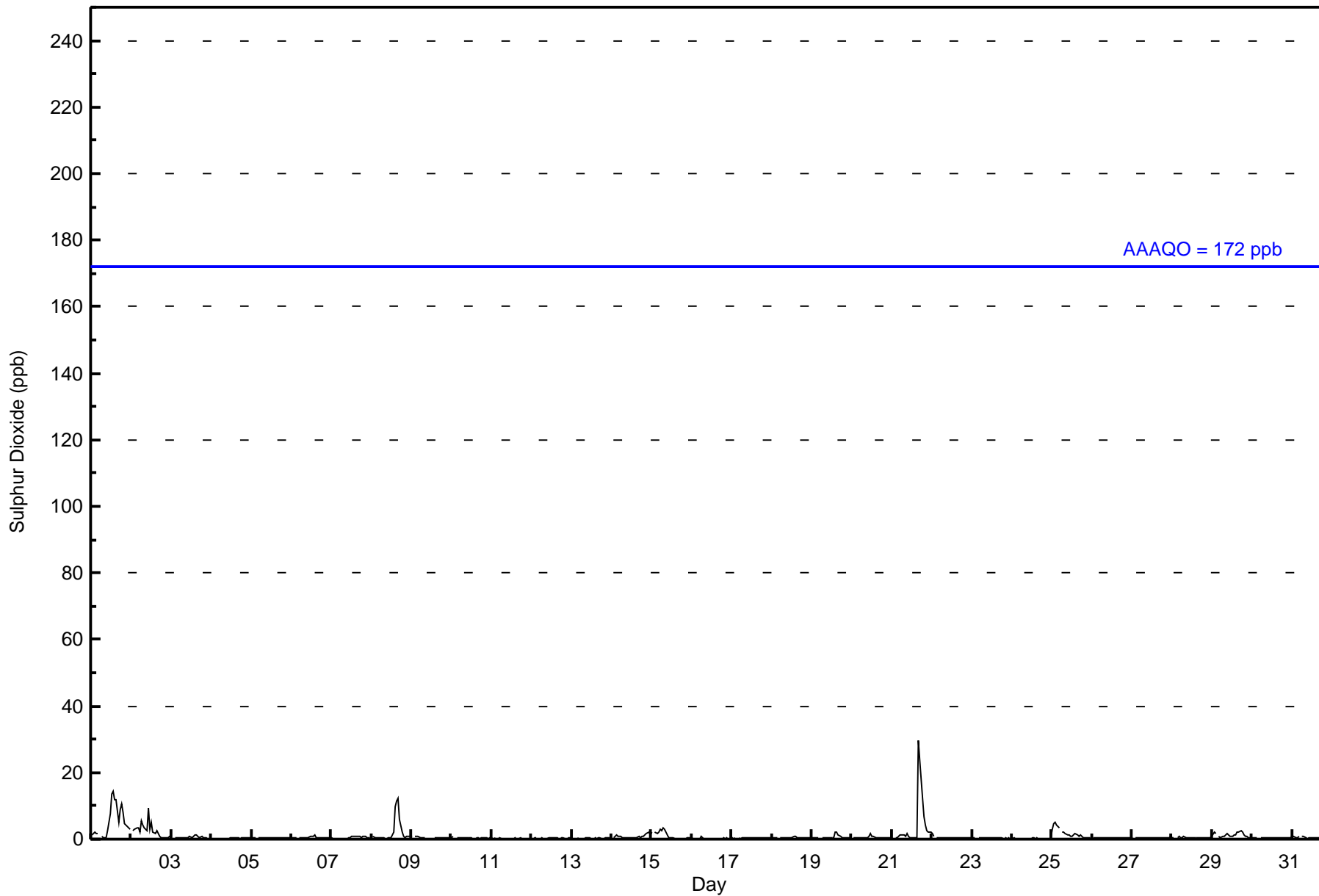


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 30 ppb on Dec 21 17:00	Maximum Daily Average: 5.2 ppb on Dec 1		Hours of Data:	708
Minimum Value: 0 ppb on Dec 4 04:00	Minimum Daily Average: 0.2 ppb on Dec 24		Hours of Missing Data:	36
Maximum Diurnal Average: 2.0 ppb at hour 17	Minimum Diurnal Average: 0.5 ppb at hour 10		Hours of Calibration:	36
Monthly Average: 0.9 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 2 P <sub>99</sub> = 11		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	2	2	2	2	Z	1	1	0	0	2	8	14	14	12	12	5	9	10	8	5	4	4	3	5.2	14
2-Dec	Z	2	3	3	3	2	6	4	3	3	9	3	5	2	2	3	2	1	1	0	0	0	0	1	2.6	9
3-Dec	1	Z	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0.6	1
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0.5	1
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1
8-Dec	Z	1	1	0	0	0	0	0	0	0	0	0	0	2	10	11	12	6	2	1	1	1	1	1	2.2	12
9-Dec	1	Z	1	1	1	1	1	0	0	C	C	C	C	C	0	0	0	0	0	0	1	1	1	0	0.6	1
10-Dec	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Dec	Z	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	2	2	1	0.7	2
15-Dec	2	Z	2	2	2	3	3	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	3
16-Dec	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.3	1
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.4	1
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	2	2	1	1	0	0	0	1	0	0	0.6	2
20-Dec	Z	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0.4	1
21-Dec	0	Z	0	0	1	1	1	1	1	2	1	0	0	0	0	0	30	24	12	7	4	2	2	2	4.1	30
22-Dec	2	1	Z	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0.5	2
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
25-Dec	3	5	5	4	3	Z	2	2	2	1	1	1	1	1	2	1	1	1	1	1	0	1	0	0	1.8	5
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.4	1
27-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.4	1
28-Dec	1	1	Z	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	0	0	0	0	1	0	0.5	1
29-Dec	1	2	2	Z	1	1	1	1	1	2	1	1	1	1	2	2	2	2	2	1	1	1	0	1	1.2	2
30-Dec	1	0	1	1	Z	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0.5	1
31-Dec	1	1	0	0	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1

0.6	0.8	0.9	0.8	0.7	0.6	0.7	0.6	0.6	0.5	0.8	0.8	1.0	1.1	1.3	1.3	2.0	1.7	1.2	0.9	0.7	0.6	0.6	0.5	Diurnal Average	
3	5	5	4	3	3	6	4	3	3	9	8	14	14	12	12	30	24	12	8	5	4	4	3	Diurnal Maximum	

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Shell Muskeg River - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	699	98.73	98.73
11 - 20	7	0.99	99.72
21 - 60	2	0.28	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



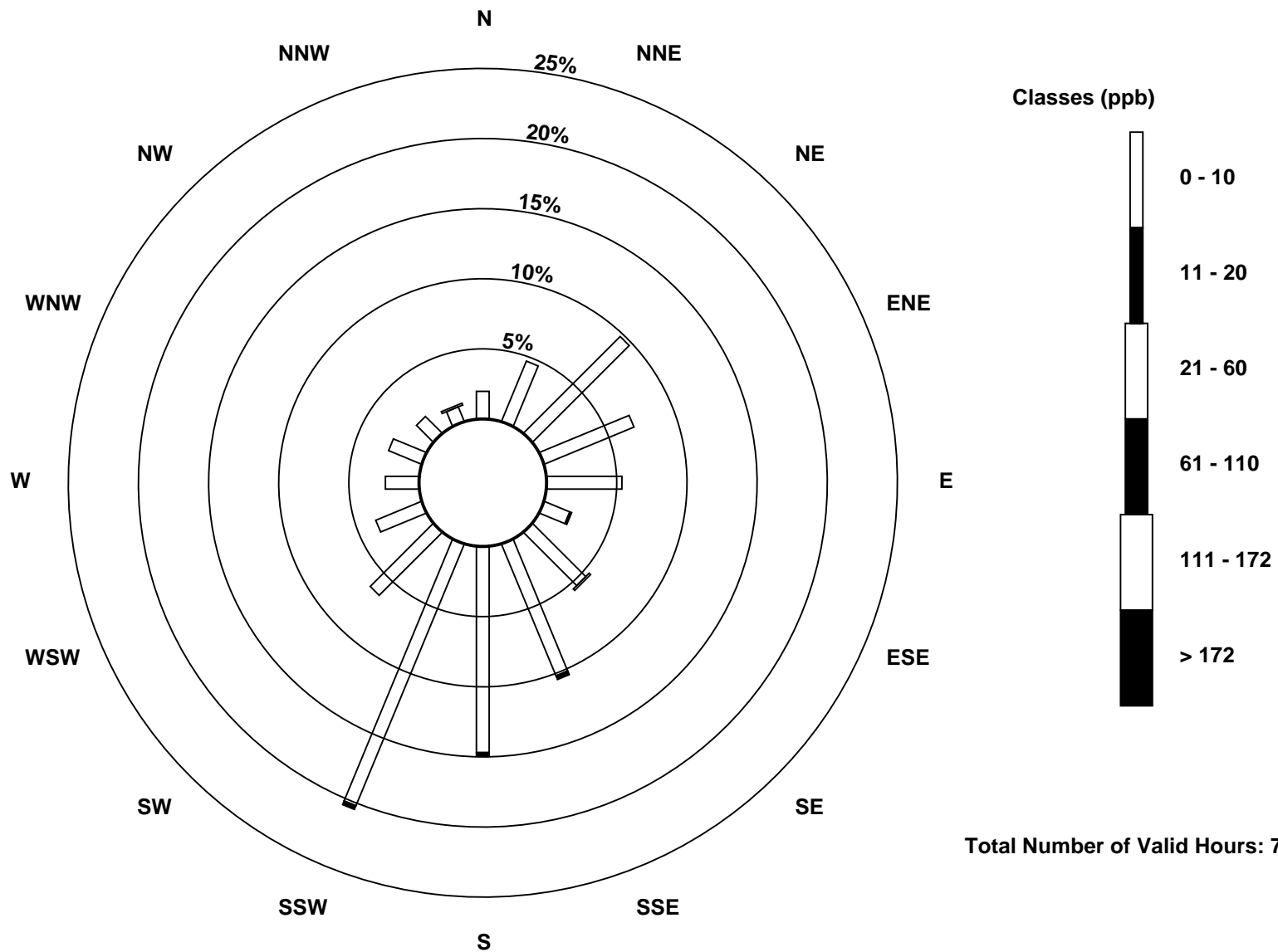
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Shell Muskeg River - December 2015**

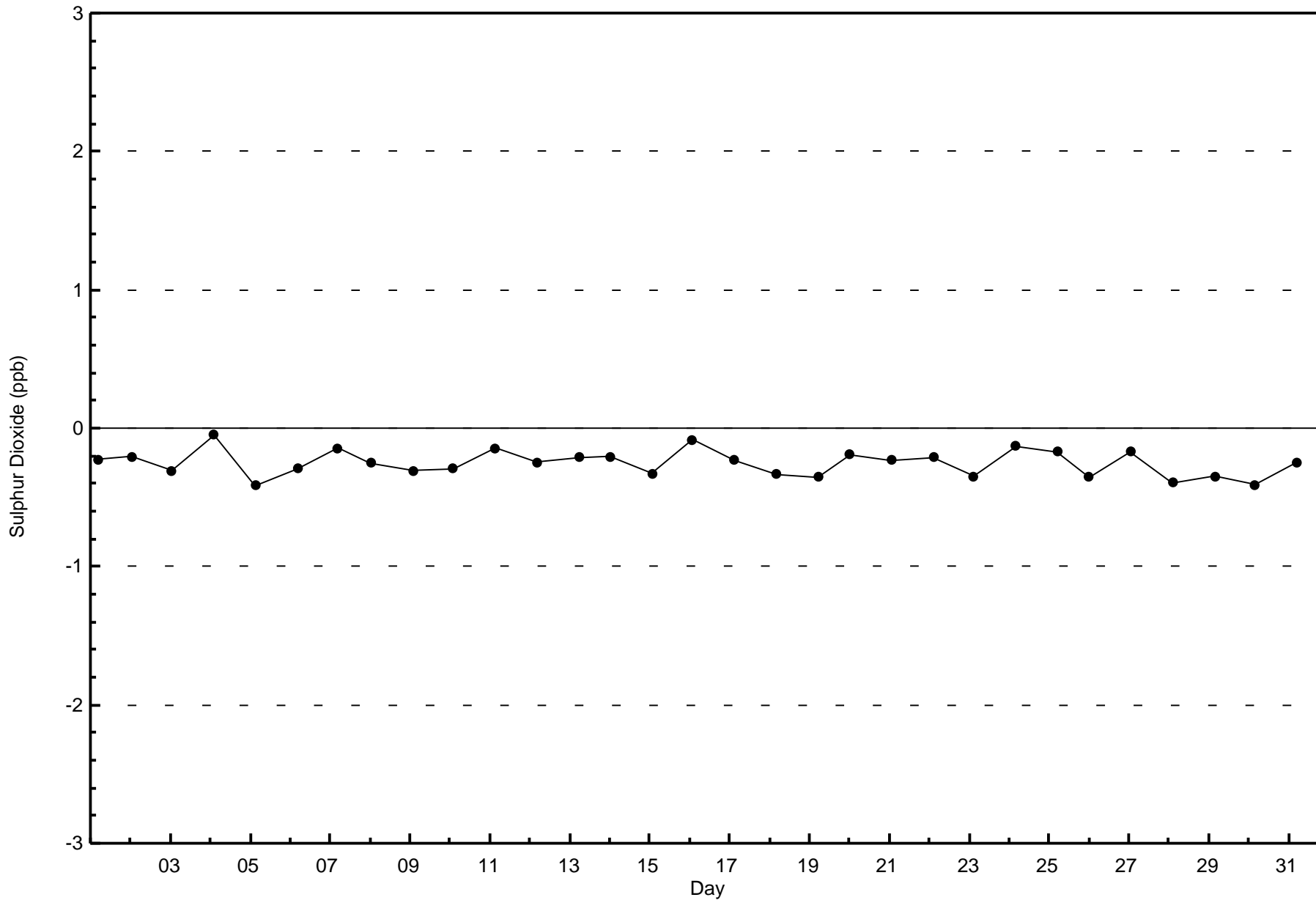
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	14	33	69	49	38	14	38	72	104	143	45	25	17	18	12	8	699
11 - 20	0	0	0	0	0	1	0	2	2	2	0	0	0	0	0	0	7
21 - 60	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	14	33	69	49	38	15	39	74	106	145	45	25	17	18	12	9	708

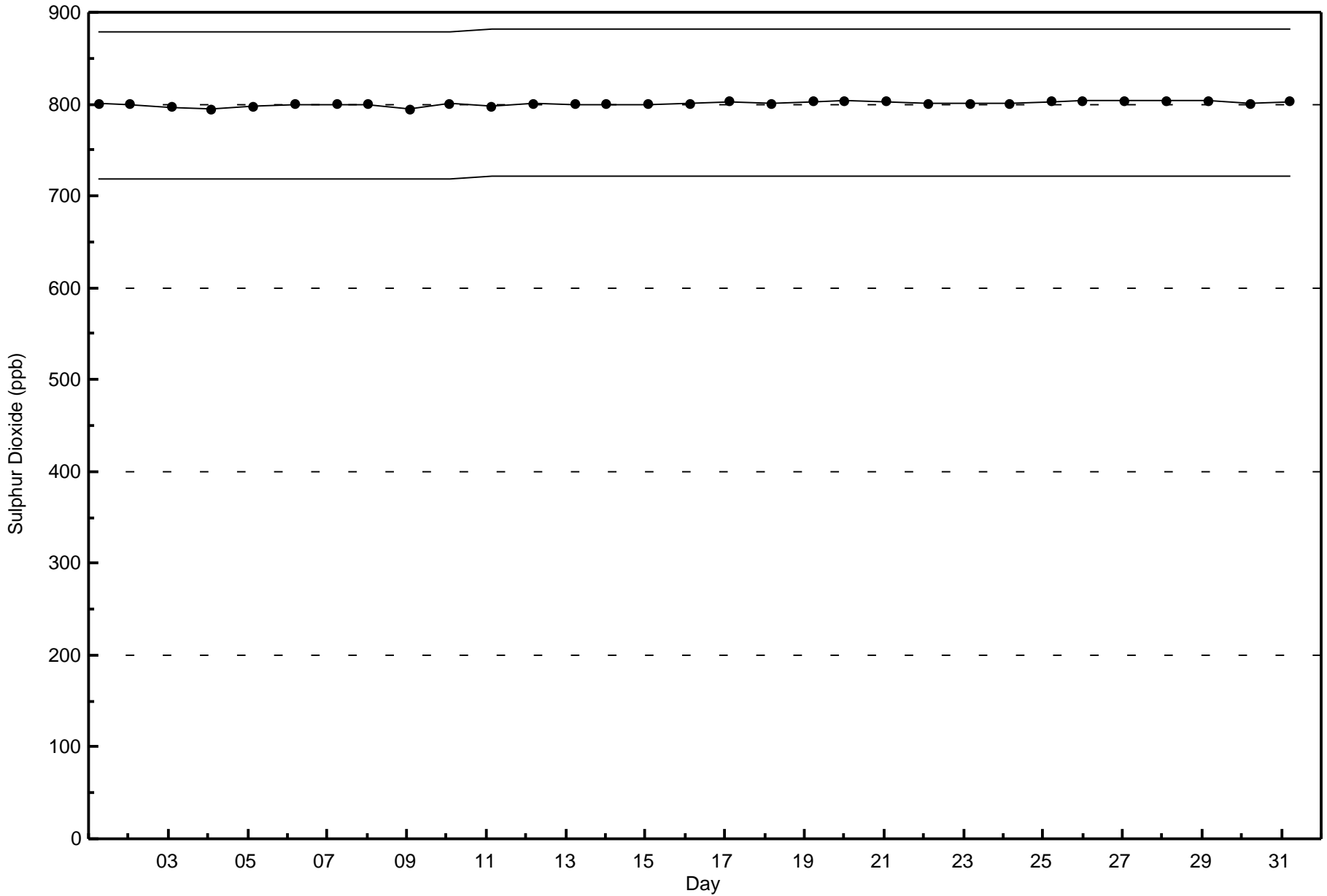
Total Number of Valid Hours: 708

Total Number of Hours: 744



Total Number of Valid Hours: 708

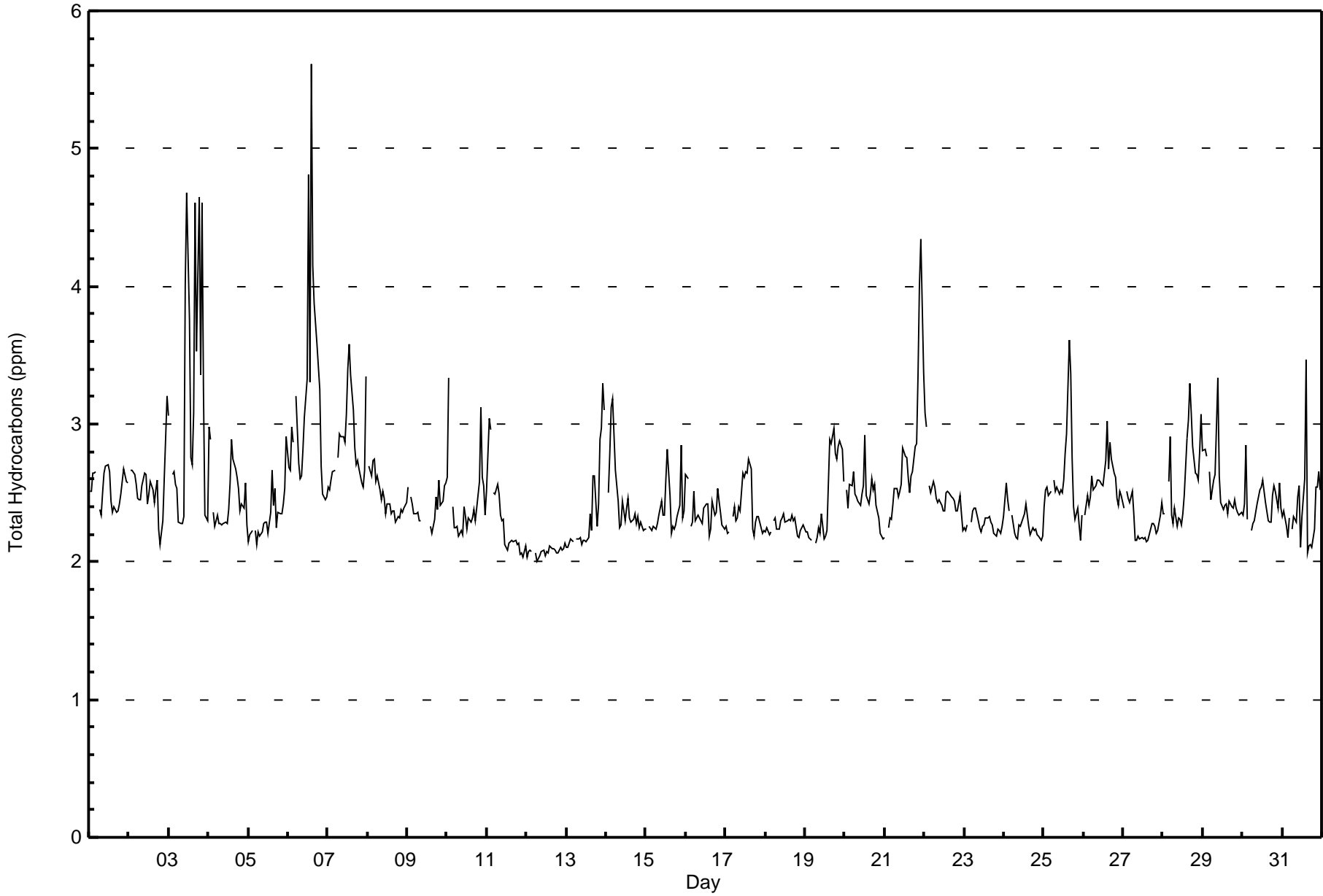








Maximum Value: 5.6 ppm on Dec 6 15:00		Maximum Daily Average: 3.2 ppm on Dec 6		Hours in Service: 744																						
Minimum Value: 2.0 ppm on Dec 12 07:00		Minimum Daily Average: 2.1 ppm on Dec 12		Hours of Data: 708																						
Maximum Diurnal Average: 2.6 ppm at hour 15		Minimum Diurnal Average: 2.4 ppm at hour 8		Hours of Missing Data: 36																						
Monthly Average: 2.49 ppm		Percentiles: P <sub>1</sub> = 2.1 P <sub>10</sub> = 2.2 Q <sub>1</sub> = 2.3 Median = 2.4 Q <sub>3</sub> = 2.6 P <sub>90</sub> = 2.9 P <sub>99</sub> = 4.2		Hours of Calibration: 36																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.5	2.5	2.6	2.6	2.7	Z	2.4	2.3	2.5	2.6	2.7	2.7	2.7	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.6	2.7	2.6	2.6	2.5	2.7
2-Dec	Z	2.7	2.7	2.6	2.6	2.5	2.5	2.5	2.6	2.6	2.6	2.4	2.5	2.6	2.5	2.4	2.5	2.6	2.2	2.1	2.3	2.6	2.9	3.2	2.6	3.2
3-Dec	3.1	Z	2.6	2.7	2.6	2.5	2.3	2.3	2.3	2.3	4.0	4.7	3.8	2.8	2.7	3.1	4.6	3.5	4.6	3.4	4.6	3.2	2.3	2.3	3.1	4.7
4-Dec	3.0	2.9	Z	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.6	2.9	2.7	2.7	2.6	2.5	2.4	2.4	2.4	2.6	2.3	2.5	3.0	2.5
5-Dec	2.2	2.2	2.2	Z	2.2	2.1	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.4	2.7	2.4	2.5	2.2	2.4	2.4	2.3	2.4	2.5	2.9	2.3	2.9
6-Dec	2.7	2.7	3.0	2.9	Z	3.2	2.7	2.6	2.6	2.8	3.0	3.3	4.8	3.3	5.6	4.2	3.9	3.6	3.4	3.3	2.7	2.5	2.5	2.5	3.2	5.6
7-Dec	2.5	2.5	2.6	2.7	2.7	Z	2.8	2.9	2.9	2.9	2.9	3.1	3.4	3.6	3.4	3.1	2.8	2.7	2.7	2.7	2.6	2.5	2.7	3.3	2.9	3.6
8-Dec	Z	2.7	2.6	2.7	2.7	2.6	2.6	2.5	2.4	2.5	2.5	2.3	2.4	2.4	2.3	2.4	2.4	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.5	2.7
9-Dec	2.5	Z	2.5	2.4	2.3	2.3	2.4	2.3	2.3	C	C	C	C	C	2.3	2.2	2.3	2.5	2.4	2.6	2.4	2.4	2.6	2.6	2.4	2.6
10-Dec	2.6	3.3	Z	2.4	2.2	2.2	2.3	2.2	2.2	2.2	2.4	2.3	2.2	2.3	2.3	2.3	2.4	2.3	2.4	2.6	3.1	2.6	2.5	2.3	2.4	3.3
11-Dec	2.5	3.0	3.0	Z	2.5	2.5	2.6	2.5	2.3	2.3	2.3	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.0	2.1	2.3	3.0
12-Dec	2.0	2.1	2.1	2.1	Z	2.1	2.0	2.0	2.0	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
13-Dec	2.1	2.1	2.2	2.2	2.1	Z	2.2	2.2	2.2	2.1	2.2	2.2	2.1	2.2	2.3	2.2	2.6	2.6	2.3	2.4	2.9	3.0	3.3	3.1	2.4	3.3
14-Dec	Z	2.5	2.8	3.1	3.2	2.7	2.6	2.4	2.3	2.3	2.4	2.3	2.4	2.5	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.2	2.2	2.4	3.2
15-Dec	2.2	Z	2.3	2.2	2.3	2.2	2.2	2.3	2.3	2.3	2.4	2.3	2.3	2.6	2.8	2.5	2.2	2.3	2.2	2.3	2.3	2.4	2.8	2.3	2.4	2.8
16-Dec	2.6	2.6	Z	2.3	2.3	2.5	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.2	2.2	2.4	2.3	2.4	2.5	2.4	2.4	2.3	2.2	2.4	2.6
17-Dec	2.3	2.2	2.2	Z	2.3	2.4	2.3	2.3	2.4	2.4	2.6	2.6	2.7	2.6	2.7	2.7	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.4	2.7
18-Dec	2.2	2.2	2.2	2.2	Z	2.3	2.3	2.2	2.2	2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.3	2.3	2.4
19-Dec	2.2	2.2	2.2	2.2	2.2	Z	2.1	2.2	2.2	2.2	2.4	2.2	2.2	2.2	2.6	2.9	2.9	3.0	2.8	2.7	2.8	2.9	2.8	2.6	2.5	3.0
20-Dec	Z	2.5	2.4	2.6	2.6	2.7	2.5	2.5	2.4	2.4	2.5	2.6	2.9	2.5	2.4	2.5	2.6	2.5	2.6	2.4	2.3	2.2	2.2	2.2	2.5	2.9
21-Dec	2.2	Z	2.2	2.3	2.3	2.4	2.5	2.5	2.5	2.5	2.6	2.8	2.8	2.8	2.6	2.5	2.6	2.7	2.8	2.9	3.4	4.0	4.3	3.4	2.8	4.3
22-Dec	3.1	3.0	Z	2.5	2.5	2.6	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.5	2.3	2.2	2.5	3.1
23-Dec	2.3	2.2	2.3	Z	2.3	2.4	2.4	2.4	2.3	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.4
24-Dec	2.3	2.6	2.5	2.4	Z	2.3	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.6
25-Dec	2.4	2.5	2.5	2.5	2.5	Z	2.6	2.5	2.5	2.5	2.5	2.5	2.6	2.8	2.9	3.6	3.4	2.7	2.4	2.3	2.4	2.3	2.2	2.3	2.6	3.6
26-Dec	Z	2.3	2.5	2.4	2.5	2.6	2.5	2.6	2.6	2.6	2.6	2.6	2.6	2.7	3.0	2.7	2.9	2.7	2.6	2.6	2.5	2.4	2.5	2.5	2.6	3.0
27-Dec	2.4	Z	2.5	2.5	2.4	2.5	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.3	2.4	2.3	2.5
28-Dec	2.3	2.3	Z	2.6	2.9	2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.4	2.5	2.9	3.0	3.3	3.1	2.8	2.6	2.6	2.6	2.8	3.1	3.3
29-Dec	2.8	2.8	2.8	Z	2.6	2.5	2.6	2.6	3.0	3.3	2.6	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.4	2.6	3.3
30-Dec	2.3	2.4	2.8	2.3	Z	2.2	2.3	2.3	2.4	2.4	2.5	2.5	2.6	2.5	2.4	2.3	2.3	2.3	2.5	2.5	2.5	2.4	2.6	2.4	2.4	2.8
31-Dec	2.3	2.4	2.3	2.2	2.3	Z	2.2	2.3	2.3	2.5	2.6	2.1	2.3	2.6	3.5	2.1	2.1	2.1	2.1	2.2	2.5	2.5	2.7	2.5	2.4	3.5
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Shell Muskeg River - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	6	0.85	0.85
2.1 - 3.0	656	92.66	93.50
3.1 - 10.0	46	6.50	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Shell Muskeg River - December 2015**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	0	0	0	0	4	2	0	0	0	0	0	0	0	0	6
2.1 - 3.0	13	29	63	46	38	14	33	70	102	139	41	24	13	15	10	6	656
3.1 - 10.0	1	4	6	3	0	1	2	2	4	6	4	1	4	3	2	3	46
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	14	33	69	49	38	15	39	74	106	145	45	25	17	18	12	9	708

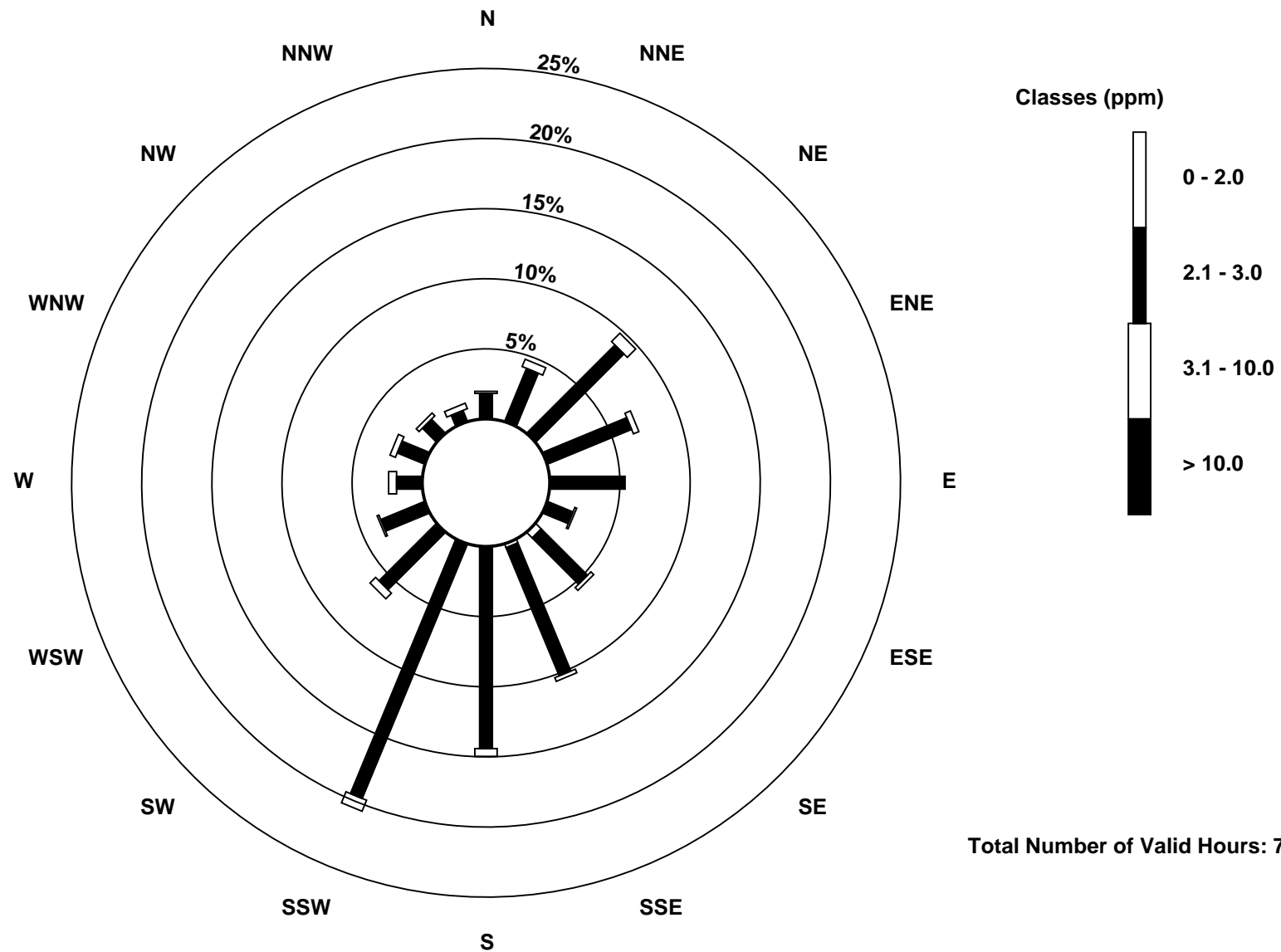
Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

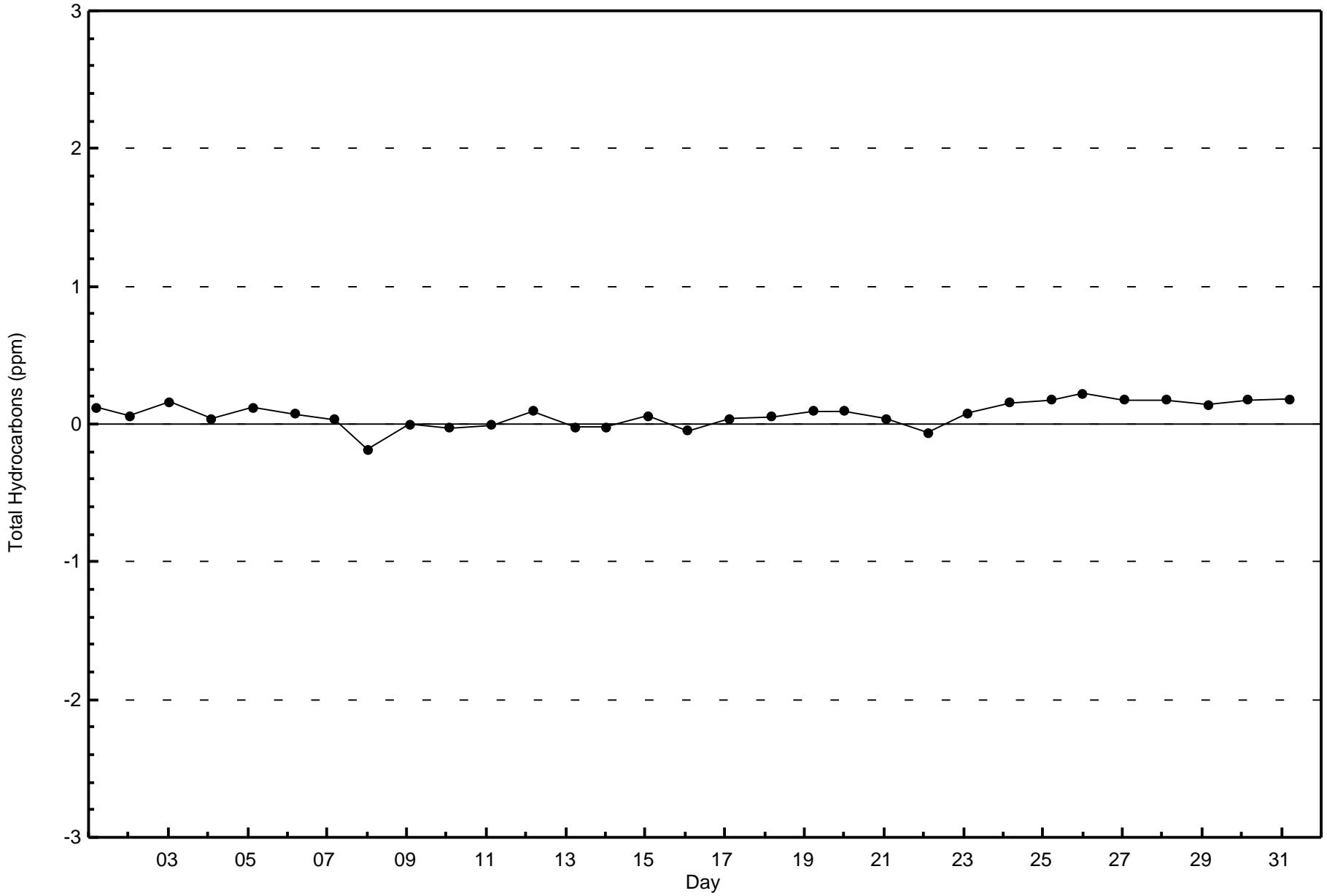
Total Hydrocarbons (THC) - ppm  
Shell Muskeg River (AMS 16)

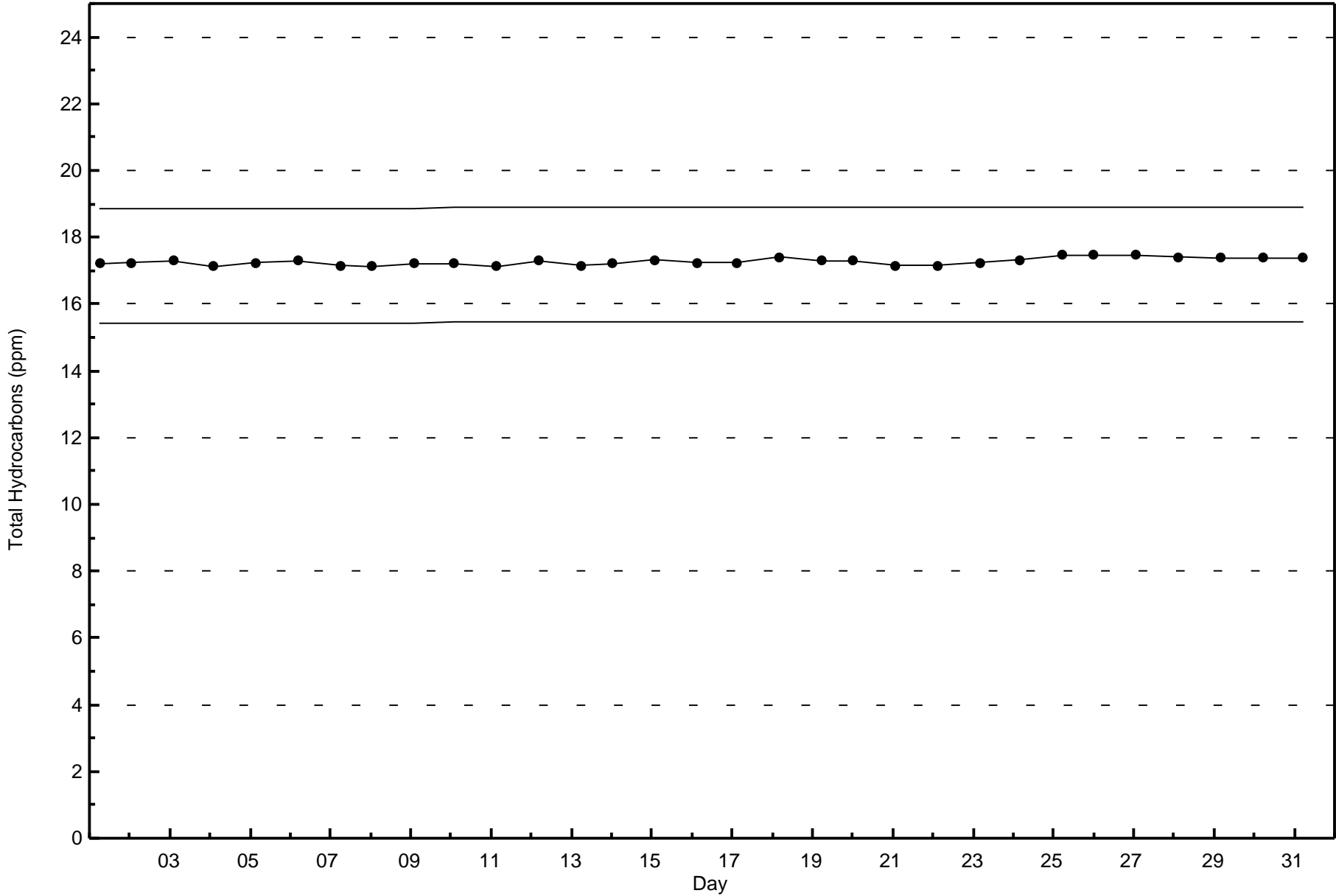




Wood Buffalo Environmental Association  
Zero Responses

Total Hydrocarbons (THC) - ppm  
Shell Muskeg River - December 2015

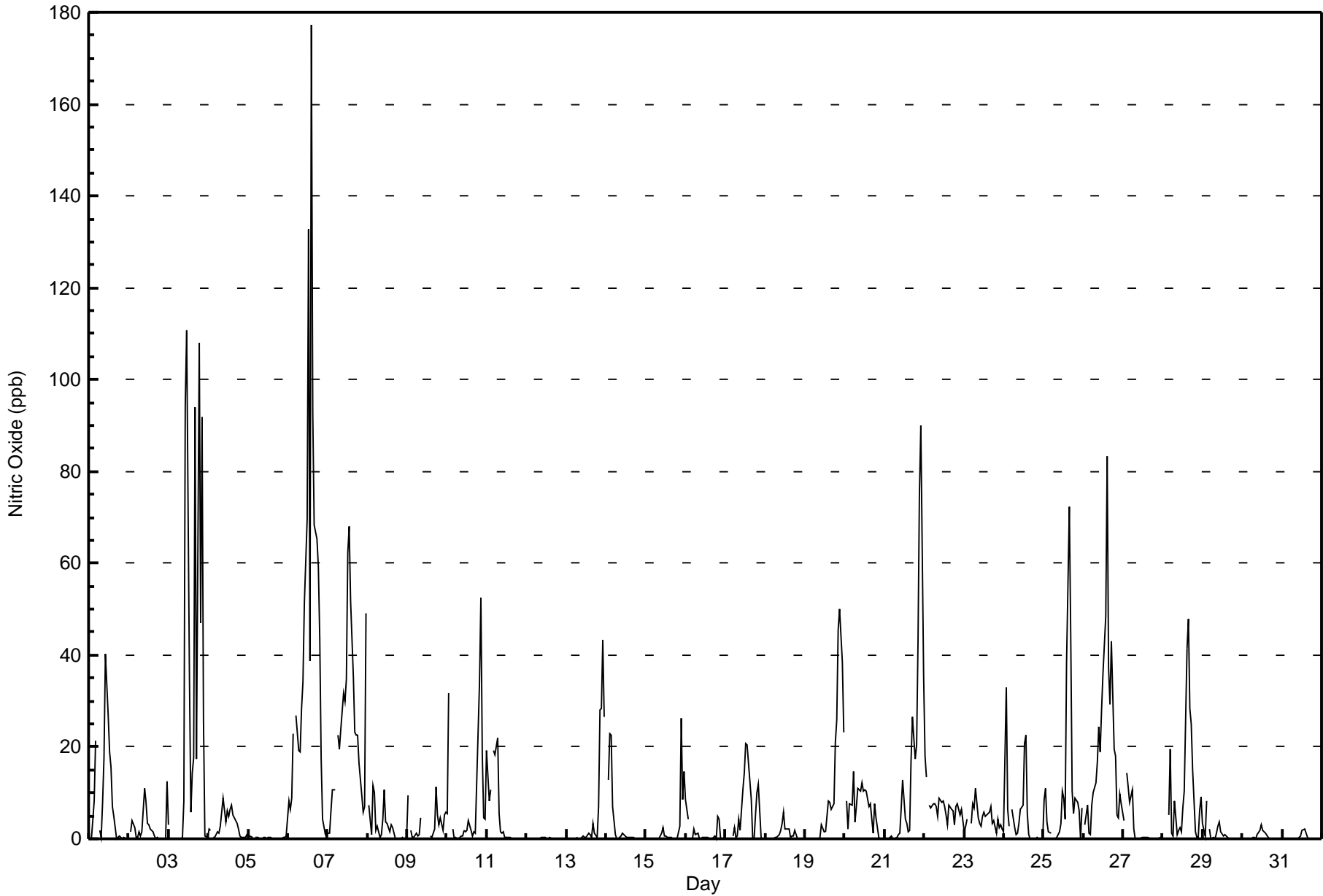






Maximum Value: 177 ppb on Dec 6 15:00		Maximum Daily Average: 43.3 ppb on Dec 6		Hours in Service: 744																							
Minimum Value: 0 ppb on Dec 21 01:00		Minimum Daily Average: 0.1 ppb on Dec 12		Hours of Data: 708																							
Maximum Diurnal Average: 15.6 ppb at hour 15		Minimum Diurnal Average: 3.2 ppb at hour 8		Hours of Missing Data: 36																							
Monthly Average: 7.9 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 8 P <sub>90</sub> = 22 P <sub>99</sub> = 93		Hours of Calibration: 36																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	4	8	21	Z	2	0	8	18	40	27	19	15	7	5	0	0	1	0	0	0	0	0	7.7	40	
2-Dec	Z	1	4	3	0	0	1	1	1	11	8	3	3	2	2	1	0	0	0	0	0	0	0	13	2.4	13	
3-Dec	3	Z	0	0	0	0	0	0	0	8	95	111	35	6	14	18	94	17	108	47	92	26	0	0	29.3	111	
4-Dec	2	2	Z	0	0	1	1	3	6	9	4	6	5	7	7	5	4	3	2	1	0	0	1	3.1	9		
5-Dec	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1		
6-Dec	8	6	9	23	Z	27	19	19	28	34	51	69	133	39	177	93	68	65	59	44	17	4	1	1	43.3	177	
7-Dec	1	1	6	11	11	Z	22	20	24	32	30	35	62	68	52	35	23	23	23	16	10	6	7	49	24.6	68	
8-Dec	Z	7	1	12	10	2	3	0	1	4	11	4	3	2	3	3	1	0	0	0	0	0	0	0	2.9	12	
9-Dec	9	Z	2	0	0	1	1	1	5	C	C	C	C	C	1	0	2	11	5	3	5	2	5	6	3.3	11	
10-Dec	5	32	Z	2	0	0	0	0	1	1	2	1	2	4	2	1	1	1	12	34	53	18	4	4	7.8	53	
11-Dec	19	8	11	Z	19	18	22	6	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4.7	22	
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
13-Dec	0	0	0	0	0	Z	0	0	0	0	1	0	0	1	1	0	3	1	0	7	28	28	43	27	6.2	43	
14-Dec	Z	13	23	22	7	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.0	23	
15-Dec	0	Z	0	0	0	0	0	0	0	1	2	1	1	0	0	0	0	0	0	0	3	26	9	14	2.5	26	
16-Dec	9	4	Z	0	0	2	1	1	0	0	0	0	0	0	0	0	0	1	0	5	4	0	0	0	1.3	9	
17-Dec	0	0	0	Z	1	3	0	1	4	2	11	14	21	20	16	9	0	0	5	10	12	0	0	0	5.6	21	
18-Dec	0	0	0	0	Z	0	0	0	1	2	3	6	2	2	2	0	1	1	2	0	0	0	0	0	1.0	6	
19-Dec	0	0	0	0	0	Z	0	0	0	0	3	1	2	5	8	8	6	8	21	26	46	50	38	23	10.7	50	
20-Dec	Z	8	2	8	7	15	4	7	11	10	12	10	11	10	7	8	4	1	8	5	0	0	0	0	6.4	15	
21-Dec	0	Z	0	0	1	0	0	0	1	1	7	13	4	4	2	2	17	26	17	20	43	75	90	36	15.6	90	
22-Dec	18	14	Z	7	7	8	8	7	5	9	8	8	7	5	3	7	6	6	3	7	8	5	6	4	7.2	18	
23-Dec	2	3	4	Z	3	8	7	11	5	3	3	5	6	5	6	6	7	3	4	1	4	3	3	2	4.5	11	
24-Dec	1	33	6	3	Z	6	2	1	1	3	6	7	21	22	5	1	0	0	0	0	0	0	0	0	5.3	33	
25-Dec	9	11	4	1	1	Z	0	0	0	2	3	10	9	4	38	72	44	11	5	9	8	6	0	7	11.1	72	
26-Dec	Z	3	7	1	1	7	10	12	17	24	19	28	36	49	83	37	29	43	19	18	5	4	10	8	20.5	83	
27-Dec	4	Z	14	11	8	11	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.3	14	
28-Dec	0	0	Z	5	19	1	1	8	1	2	3	2	7	10	42	48	28	25	15	2	0	0	6	9	10.2	48	
29-Dec	3	1	8	Z	2	0	0	0	1	3	4	1	1	1	1	0	0	0	0	0	0	0	0	0	1.2	8	
30-Dec	0	0	0	0	Z	0	0	0	0	1	2	3	2	1	1	0	0	0	0	0	0	0	0	0	0.5	3	
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0.3	2	
3.6		5.7	4.1	4.6	4.7	4.5	3.5	3.2	4.0	6.1	11.0	12.3	13.1	9.6	15.6	11.6	11.0	8.0	10.0	8.3	10.9	8.3	7.3	6.6	Diurnal Average		
19		33	23	23	21	27	22	20	28	34	95	111	133	68	177	93	94	65	108	47	92	75	90	49	Diurnal Maximum		
Z - zerospan		C - Calibration																									







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Shell Muskeg River - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	629	88.84	88.84
21 - 40	46	6.50	95.34
41 - 80	23	3.25	98.59
81 - 159	9	1.27	99.86
> 159	1	0.14	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



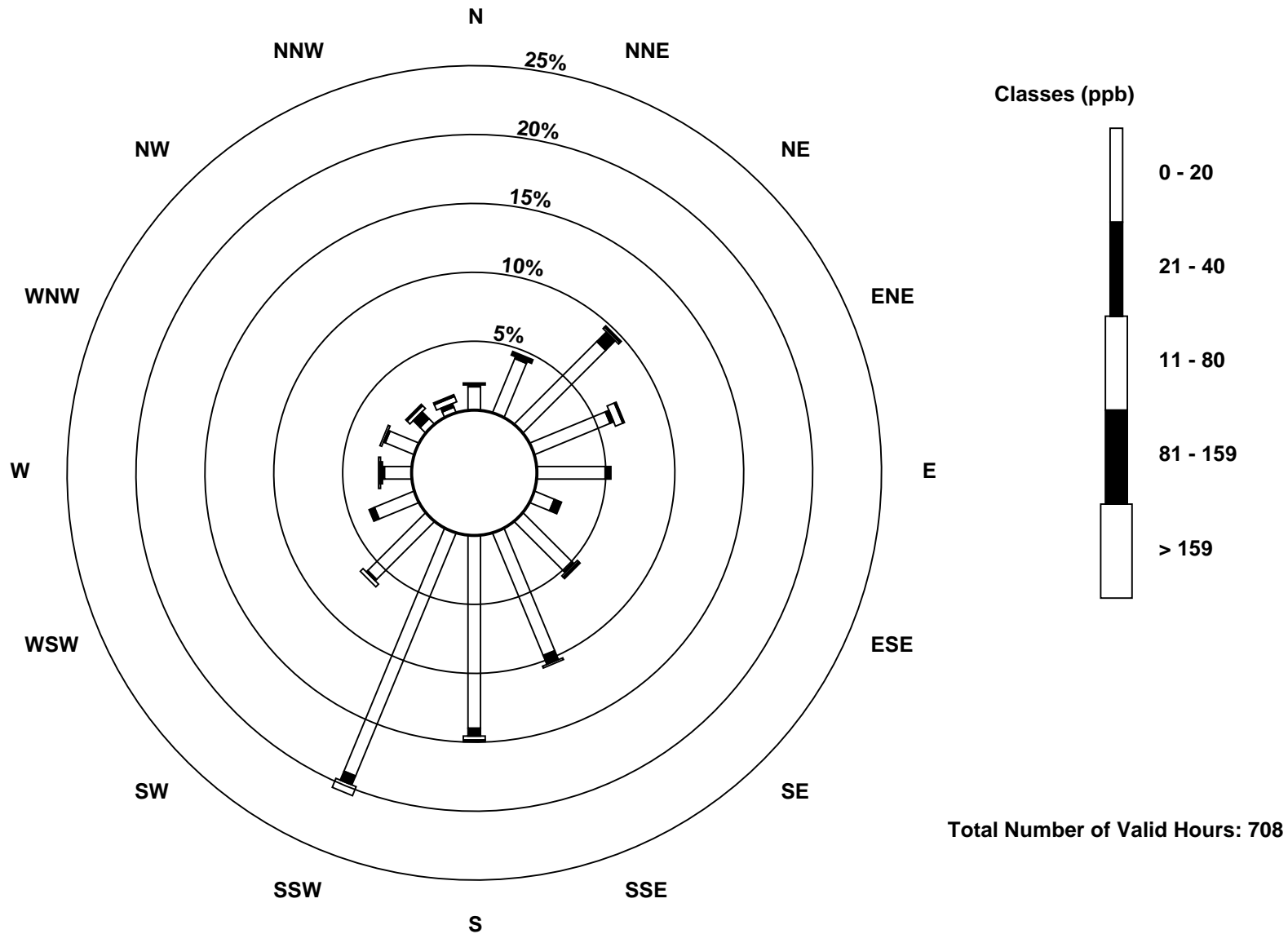
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

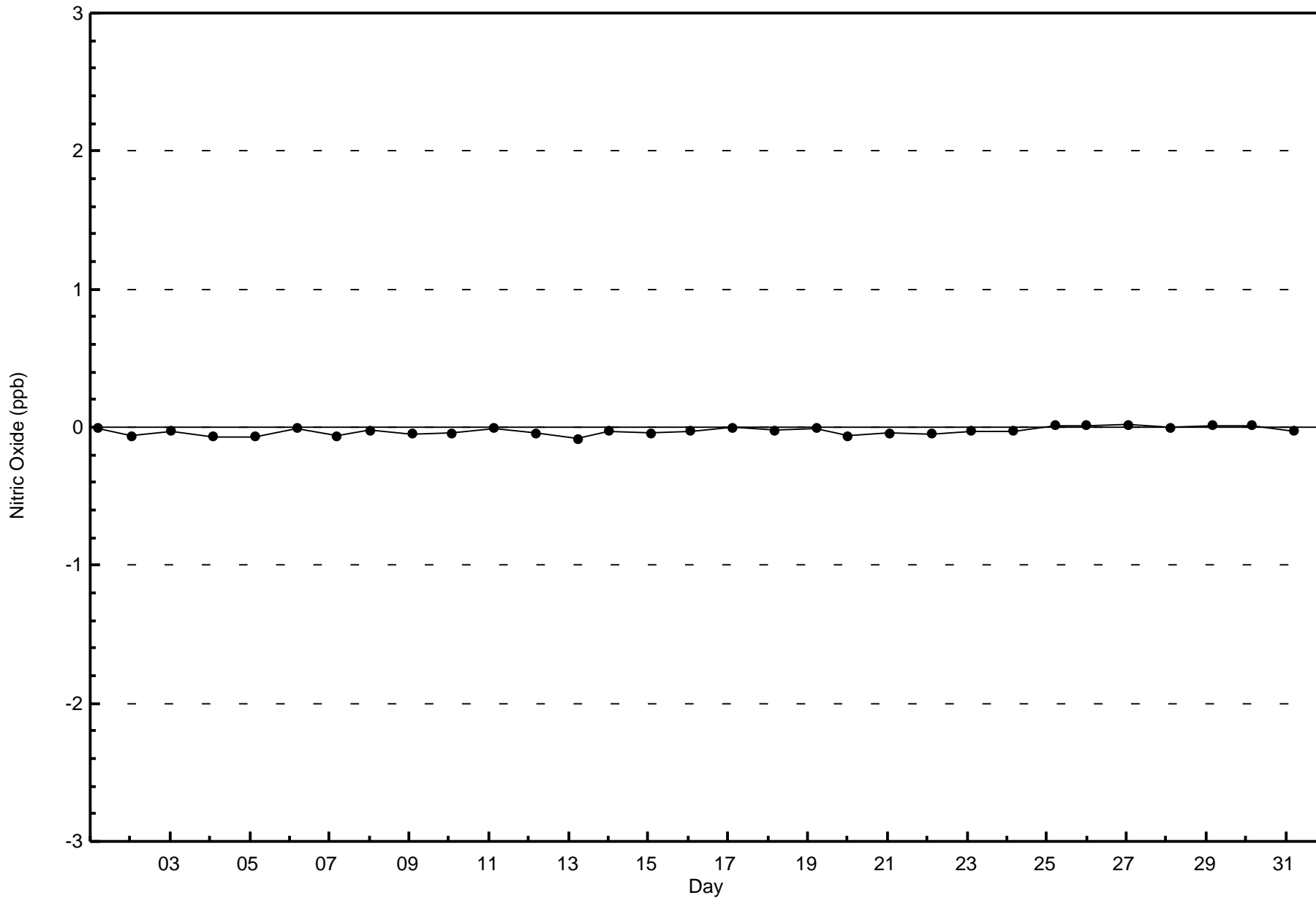
**Nitric Oxide (NO) - ppb**  
**Shell Muskeg River - December 2015**

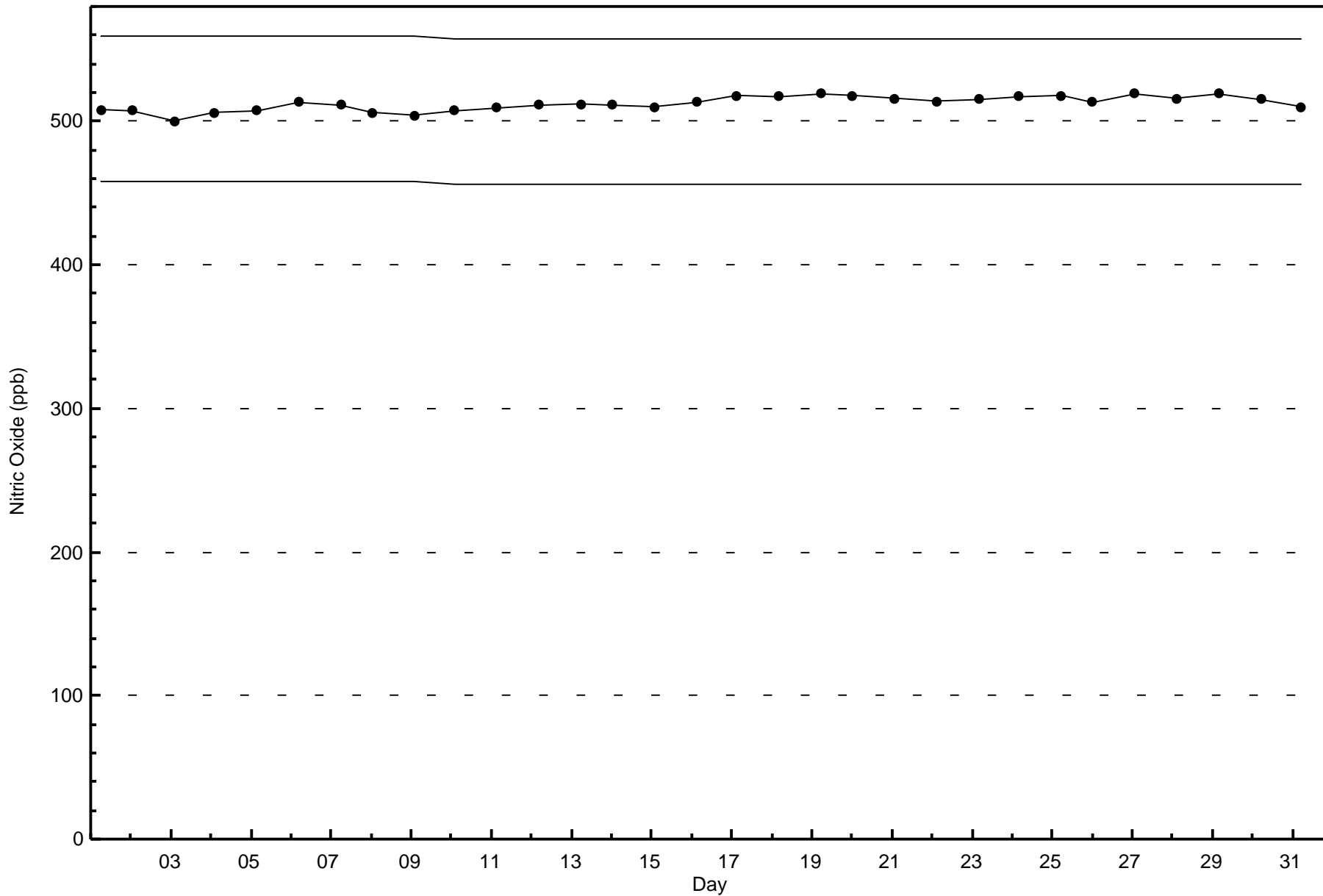
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	12	30	60	42	35	11	36	68	99	135	42	22	14	16	4	3	629
21 - 40	1	1	7	2	3	4	1	5	4	5	1	3	1	1	5	2	46
11 - 80	0	0	1	4	0	0	1	1	2	5	2	0	1	1	2	3	23
81 - 159	1	2	1	1	0	0	1	0	1	0	0	0	0	0	1	1	9
> 159	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
<b>Totals</b>	14	33	69	49	38	15	39	74	106	145	45	25	17	18	12	9	708

Total Number of Valid Hours: 708

Total Number of Hours: 744

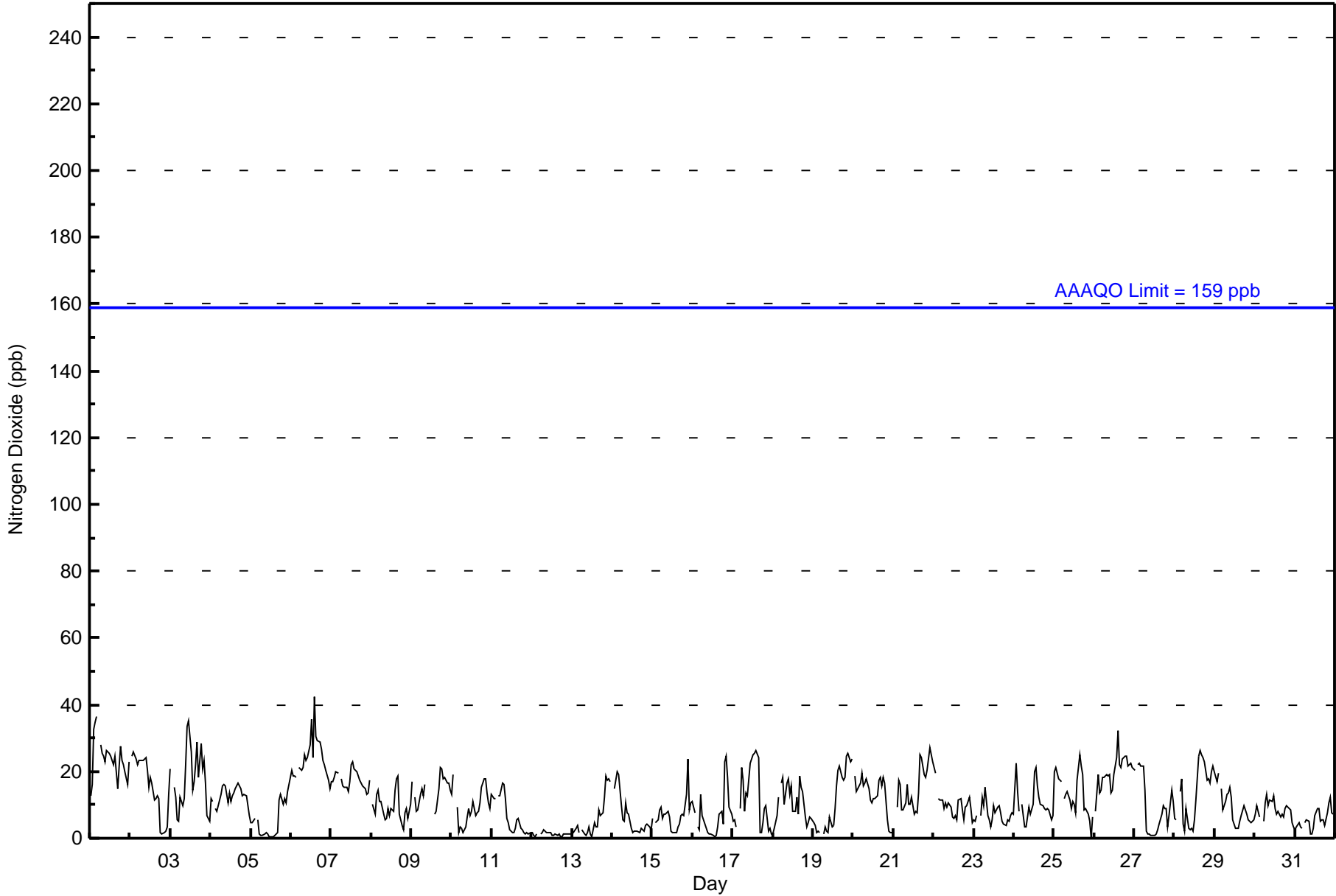








Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 43 ppb on Dec 6 15:00 Maximum Daily Average: 24.1 ppb on Dec 6																		Hours in Service: 744 Hours of Data: 708 Hours of Missing Data: 36 Hours of Calibration: 36 Percent Operational Time: 100.0								
Minimum Value: 0 ppb on Dec 25 23:00 Minimum Daily Average: 1.2 ppb on Dec 12 Maximum Diurnal Average: 13.0 ppb at hour 17 Minimum Diurnal Average: 9.9 ppb at hour 12 Monthly Average: 11.3 ppb Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 5 Median = 10 Q <sub>3</sub> = 17 P <sub>90</sub> = 23 P <sub>99</sub> = 32																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	13	16	33	35	36	Z	28	25	25	23	26	25	25	23	22	25	15	22	28	24	22	20	16	23	23.9	36
2-Dec	Z	25	26	24	22	23	24	23	23	24	20	15	18	16	11	12	13	12	2	1	2	2	3	13	15.4	26
3-Dec	21	Z	15	12	6	5	12	10	12	22	33	35	26	15	17	22	29	18	28	21	23	16	7	5	17.8	35
4-Dec	12	11	Z	9	8	12	13	16	16	16	11	14	11	13	14	15	16	16	15	13	13	13	10	7	12.6	16
5-Dec	5	5	6	Z	5	1	1	1	1	2	1	0	0	1	1	1	2	12	13	10	12	11	14	16	5.2	16
6-Dec	21	19	19	18	Z	21	20	21	25	23	24	28	36	24	43	31	29	29	27	23	22	20	17	15	24.1	43
7-Dec	17	17	18	20	20	Z	18	16	15	15	14	17	22	23	21	20	19	17	16	16	15	13	14	18	17.4	23
8-Dec	Z	10	7	13	14	11	11	7	6	6	9	7	9	8	14	18	19	7	4	3	8	9	6	10	9.3	19
9-Dec	17	Z	12	8	9	13	15	13	16	C	C	C	C	C	7	8	15	21	21	18	18	17	17	15	14.4	21
10-Dec	13	19	Z	9	2	3	3	2	3	6	9	7	8	11	7	8	8	11	15	18	18	14	11	9	9.2	19
11-Dec	13	12	12	Z	13	13	17	16	12	6	5	3	2	2	3	6	6	3	3	2	1	2	1	2	6.5	17
12-Dec	2	1	1	1	Z	1	2	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1.2	3
13-Dec	1	2	3	4	2	Z	2	1	1	2	3	1	1	5	3	3	9	7	8	12	19	18	18	17	6.1	19
14-Dec	Z	15	18	20	19	10	6	5	11	8	7	3	2	2	2	2	2	3	3	2	4	4	3	3	6.6	20
15-Dec	6	Z	5	6	8	10	6	7	7	8	6	2	2	2	2	3	4	7	7	7	13	24	8	11	7.0	24
16-Dec	11	8	Z	3	2	13	7	4	3	2	1	1	1	1	1	3	7	8	4	23	25	18	9	7	7.1	25
17-Dec	5	6	4	Z	9	21	17	8	13	13	23	24	25	25	26	24	2	2	5	9	10	2	3	1	12.0	26
18-Dec	1	3	7	12	Z	17	18	10	17	18	13	16	8	8	12	7	19	15	14	7	4	5	6	6	10.5	19
19-Dec	5	4	2	2	2	Z	1	3	2	2	6	3	4	9	16	20	22	18	17	18	25	26	23	24	11.0	26
20-Dec	Z	19	14	15	17	19	16	17	18	15	11	11	12	12	13	17	18	16	18	17	6	2	2	2	13.2	19
21-Dec	1	Z	9	18	16	9	8	11	16	10	10	12	7	8	8	14	25	24	19	18	21	24	27	23	14.7	27
22-Dec	21	19	Z	12	11	12	9	11	9	11	9	6	6	7	6	11	12	9	6	9	10	12	9	5	10.0	21
23-Dec	5	5	7	Z	7	12	10	15	7	5	4	6	10	8	9	10	8	5	4	4	5	5	7	8	7.1	15
24-Dec	7	23	14	8	Z	10	3	3	6	9	7	10	20	21	16	12	10	10	9	8	9	8	6	7	10.3	23
25-Dec	20	21	20	18	17	Z	12	13	14	11	9	11	10	8	17	25	22	19	8	9	7	5	0	6	13.1	25
26-Dec	Z	8	19	14	14	18	18	19	19	19	14	15	19	24	32	22	21	24	24	25	22	22	22	21	19.7	32
27-Dec	20	Z	22	22	22	21	15	2	1	1	1	1	1	1	3	4	7	10	9	9	3	7	15	11	9.1	22
28-Dec	6	6	Z	14	18	4	2	9	3	2	3	2	6	11	25	26	25	24	23	17	18	17	20	21	13.2	26
29-Dec	20	17	19	Z	15	9	11	13	14	15	12	6	3	3	3	5	7	10	8	7	5	5	5	6	9.4	20
30-Dec	7	10	8	6	Z	5	11	13	10	12	11	13	9	7	8	7	7	6	9	10	9	9	5	3	8.4	13
31-Dec	3	4	5	4	3	Z	5	6	5	1	1	3	7	9	9	5	6	6	4	8	10	12	8	7	5.6	12
10.5 11.6 12.4 12.6 12.1 11.7 11.0 10.4 10.7 10.3 10.2 9.9 10.2 10.2 11.9 12.5 13.0 12.5 11.9 11.9 12.2 11.7 10.1 10.3																								Diurnal Average		
21 25 33 35 36 23 28 25 25 24 33 35 36 25 43 31 29 29 28 25 25 26 27 24																								Diurnal Maximum		
Z - zerospan C - Calibration Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb																										







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Shell Muskeg River - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	602	85.03	85.03
21 - 40	105	14.83	99.86
41 - 80	1	0.14	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Shell Muskeg River - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	12	30	59	41	32	14	36	71	91	118	42	21	14	12	7	2	602
21 - 40	2	3	10	8	6	1	3	3	15	27	3	4	2	6	5	7	105
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	14	33	69	49	38	15	39	74	106	145	45	25	17	18	12	9	708

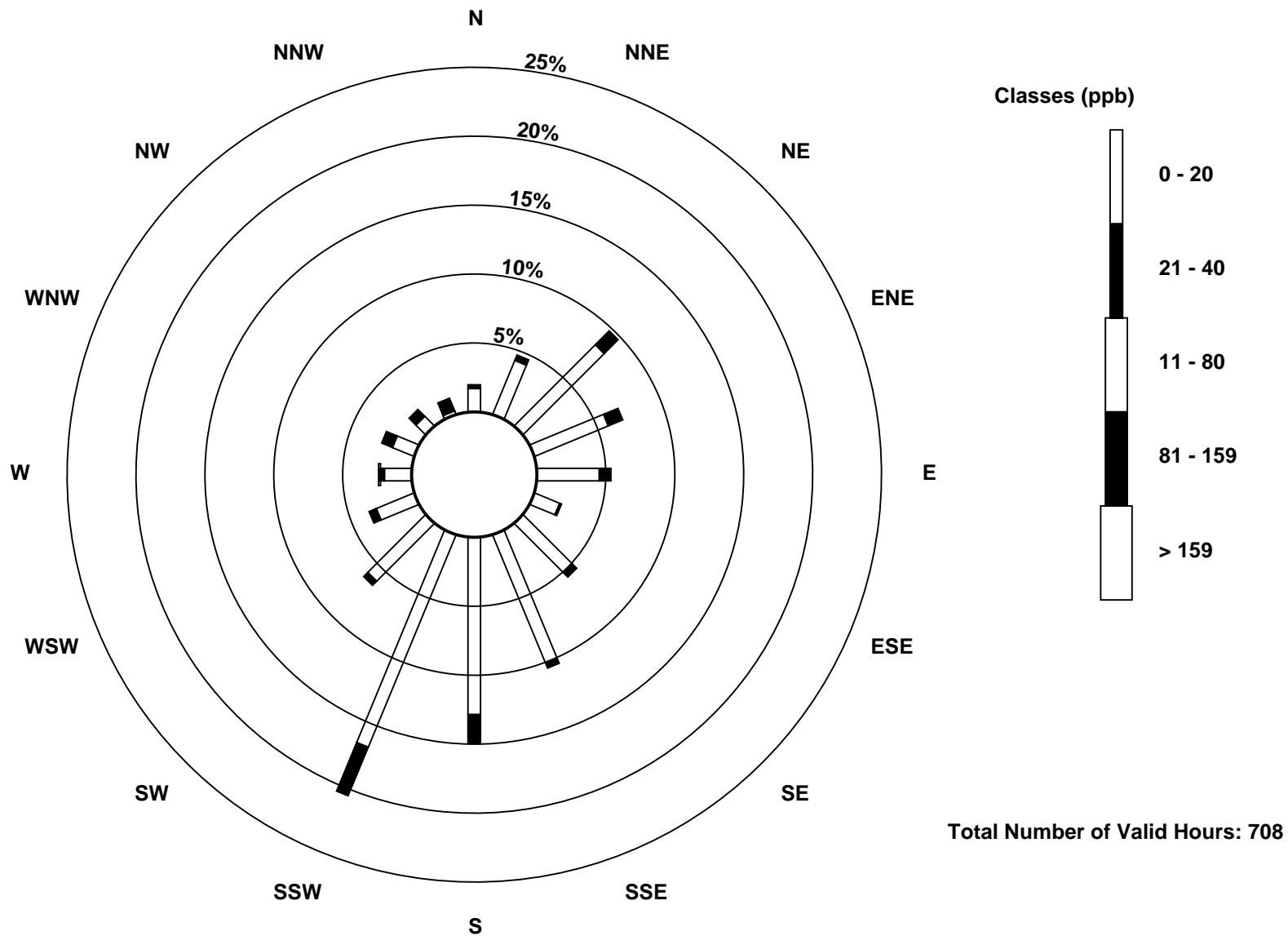
Total Number of Valid Hours: 708

Total Number of Hours: 744

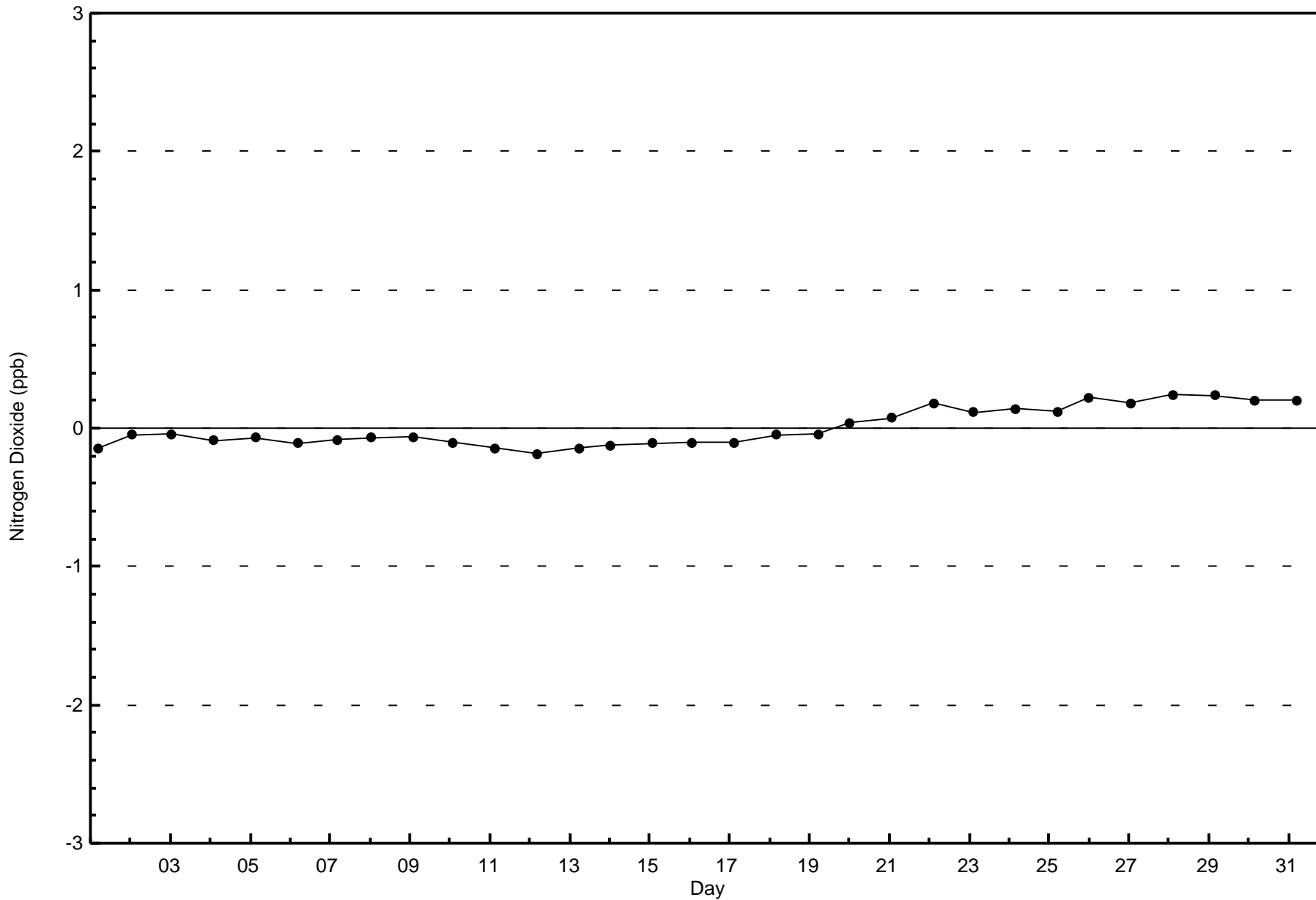


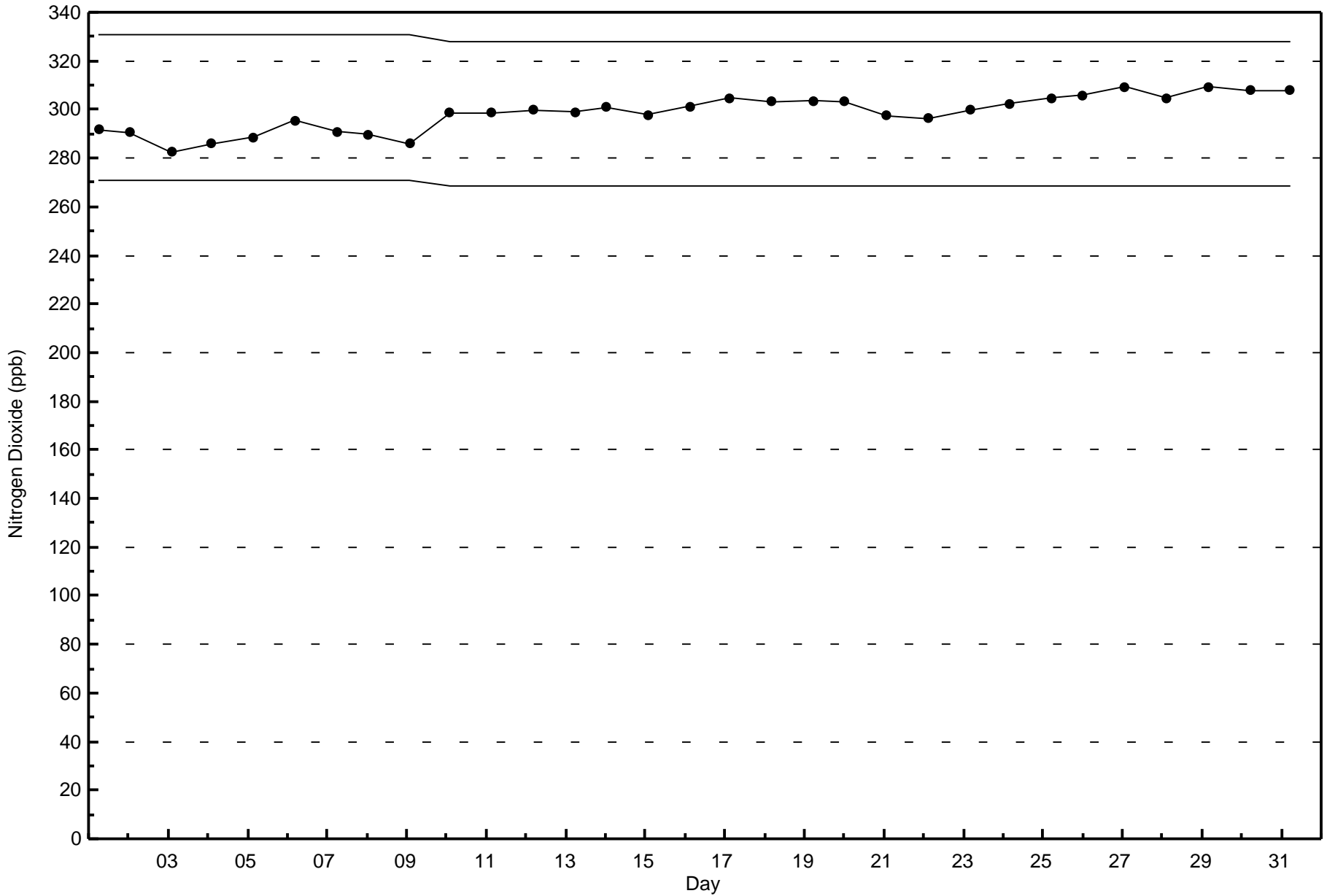
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Shell Muskeg River (AMS 16)



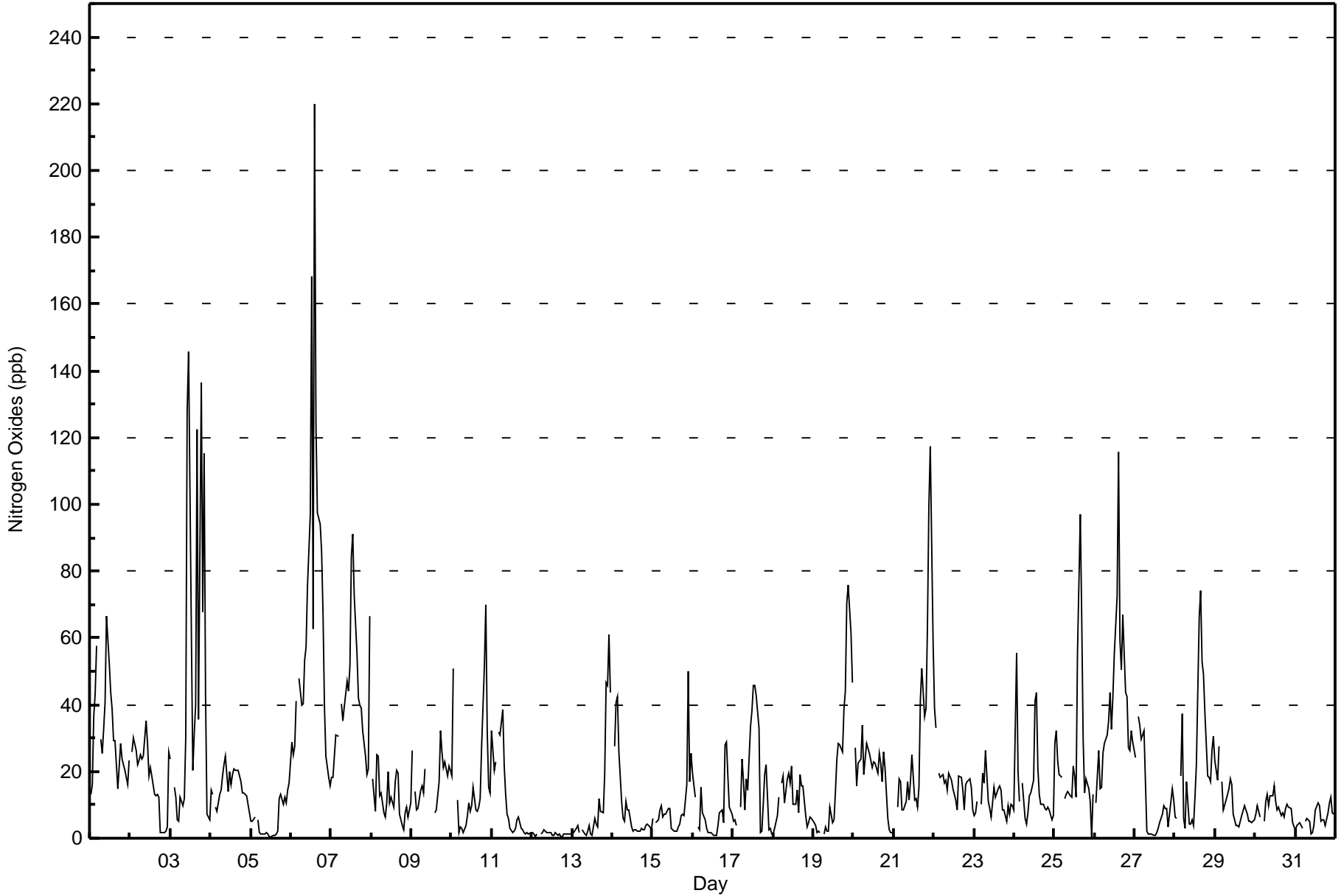
Total Number of Valid Hours: 708







Maximum Value: 220 ppb on Dec 6 15:00																			Maximum Daily Average: 67.4 ppb on Dec 6																			Hours in Service: 744						
Minimum Value: 0 ppb on Dec 25 23:00																			Minimum Daily Average: 1.4 ppb on Dec 12																			Hours of Data: 708						
Maximum Diurnal Average: 27.5 ppb at hour 15																			Minimum Diurnal Average: 13.6 ppb at hour 8																			Hours of Missing Data: 36						
Monthly Average: 19.3 ppb																			Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 6 Median = 13 Q <sub>3</sub> = 24 P <sub>90</sub> = 43 P <sub>99</sub> = 122																			Hours of Calibration: 36						
																																						Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																				
1-Dec	13	16	36	43	58	Z	30	26	33	41	67	52	44	39	29	29	15	22	28	24	22	20	16	23	31.5	67																		
2-Dec	Z	26	30	26	22	23	25	24	25	35	28	19	21	19	13	13	13	12	2	2	2	2	3	26	17.8	35																		
3-Dec	24	Z	15	12	6	5	12	10	12	30	128	146	60	20	31	40	123	36	136	68	115	42	7	5	47.2	146																		
4-Dec	14	13	Z	9	8	13	15	18	22	24	14	20	16	19	21	20	20	19	17	14	14	13	10	8	15.7	24																		
5-Dec	5	5	6	Z	6	1	1	1	1	2	1	0	0	1	1	1	2	12	13	10	12	11	14	17	5.4	17																		
6-Dec	29	25	27	41	Z	48	40	40	53	57	75	97	168	63	220	124	98	94	86	67	39	24	18	16	67.4	220																		
7-Dec	18	18	24	31	30	Z	40	35	39	47	44	52	84	91	73	55	42	40	39	32	24	19	21	67	42.0	91																		
8-Dec	Z	18	8	25	25	13	14	8	6	10	20	10	12	9	17	20	20	7	4	3	8	9	6	10	12.3	25																		
9-Dec	26	Z	14	8	9	14	16	14	21	C	C	C	C	C	8	9	17	32	26	21	23	19	22	20	17.7	32																		
10-Dec	18	51	Z	11	2	3	3	2	4	7	11	8	10	15	9	8	10	12	27	52	70	32	15	13	17.1	70																		
11-Dec	32	20	23	Z	32	31	39	22	13	7	6	3	2	2	3	6	6	3	2	2	1	2	1	2	11.3	39																		
12-Dec	2	1	1	1	Z	1	2	3	2	2	2	2	1	1	2	1	1	1	1	1	1	1	1	1	1.4	3																		
13-Dec	1	2	3	4	2	Z	3	1	1	2	4	1	1	6	4	4	12	8	8	19	47	46	61	44	12.3	61																		
14-Dec	Z	28	41	42	26	11	6	5	11	8	8	3	2	2	2	2	2	3	3	2	4	4	3	3	9.6	42																		
15-Dec	6	Z	5	6	9	10	6	7	7	9	9	3	2	2	2	4	4	7	7	7	16	50	17	25	9.5	50																		
16-Dec	20	12	Z	3	2	15	8	5	3	2	2	2	1	1	1	4	7	8	4	28	29	18	9	7	8.4	29																		
17-Dec	5	5	4	Z	10	24	18	9	18	14	33	38	46	46	43	33	2	2	10	19	22	2	3	1	17.6	46																		
18-Dec	1	3	7	12	Z	17	18	11	18	19	17	22	10	10	14	7	19	16	16	7	4	4	6	6	11.5	22																		
19-Dec	5	4	2	2	2	Z	1	3	2	2	9	5	6	14	24	28	28	26	39	44	70	76	61	47	21.7	76																		
20-Dec	Z	27	16	23	24	34	19	24	28	25	24	21	23	22	20	25	22	17	26	21	6	2	2	2	19.7	34																		
21-Dec	1	Z	9	18	17	9	9	11	17	12	17	25	12	12	9	15	42	51	36	39	63	99	117	59	30.4	117																		
22-Dec	39	33	Z	19	18	19	16	17	14	19	17	15	13	12	9	19	18	15	8	16	17	18	15	9	17.2	39																		
23-Dec	7	8	11	Z	10	20	17	26	11	9	6	10	15	12	15	16	15	8	8	5	10	7	10	10	11.6	26																		
24-Dec	8	55	20	11	Z	17	6	4	8	13	13	17	41	44	21	13	10	10	9	8	9	8	6	7	15.6	55																		
25-Dec	28	32	23	19	18	Z	12	13	14	13	12	22	19	12	55	97	66	29	14	18	15	11	0	13	24.2	97																		
26-Dec	Z	11	26	15	15	25	28	31	35	44	32	42	55	73	116	59	50	67	44	42	27	26	32	29	40.3	116																		
27-Dec	24	Z	36	34	30	32	17	2	1	1	1	1	1	2	3	5	7	10	9	9	4	7	15	11	11.4	36																		
28-Dec	6	6	Z	19	37	6	3	17	4	4	5	4	12	22	66	74	53	49	38	19	18	17	26	31	23.3	74																		
29-Dec	23	17	28	Z	17	9	11	13	15	18	16	7	4	4	4	5	7	10	8	7	5	5	5	6	10.6	28																		
30-Dec	7	10	8	6	Z	5	11	13	10	13	13	16	11	8	9	7	7	6	9	10	9	9	5	3	9.0	16																		
31-Dec	3	4	5	4	3	Z	5	6	5	1	2	4	8	11	10	5	6	6	4	8	10	12	8	7	5.9	12																		
																			14.1	17.3	16.5	17.1	16.8	16.2	14.5	13.6	14.7	16.4	21.2	22.2	23.4	19.8	27.5	24.1	24.0	20.5	22.0	20.1	23.1	20.0	17.4	17.0	Diurnal Average	
																			39	55	41	43	58	48	40	40	53	57	128	146	168	91	220	124	123	94	136	68	115	99	117	67	Diurnal Maximum	
Z - zerospan																			C - Calibration																									





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Shell Muskeg River - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	495	69.92	69.92
21 - 40	132	18.64	88.56
41 - 80	63	8.90	97.46
81 - 159	16	2.26	99.72
> 159	2	0.28	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Shell Muskeg River - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	11	24	50	31	24	10	33	67	78	91	38	18	9	8	2	1	495
21 - 40	1	6	9	11	11	2	2	2	21	43	4	5	5	6	2	2	132
11 - 80	1	1	9	5	3	3	3	5	6	7	2	2	1	4	6	5	63
81 - 159	1	2	1	2	0	0	0	0	1	4	1	0	1	0	2	1	16
> 159	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2
<b>Totals</b>	14	33	69	49	38	15	39	74	106	145	45	25	17	18	12	9	708

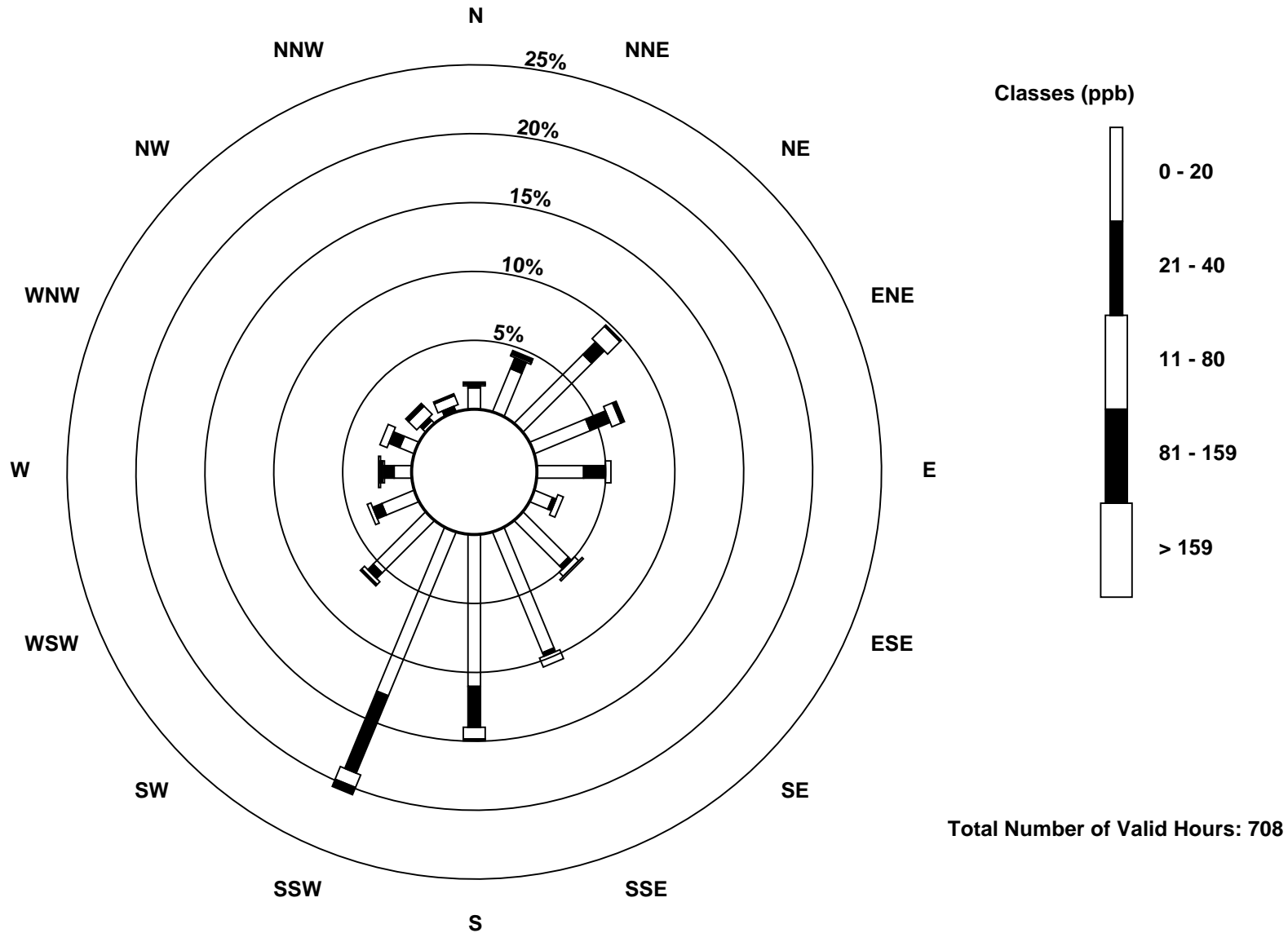
Total Number of Valid Hours: 708

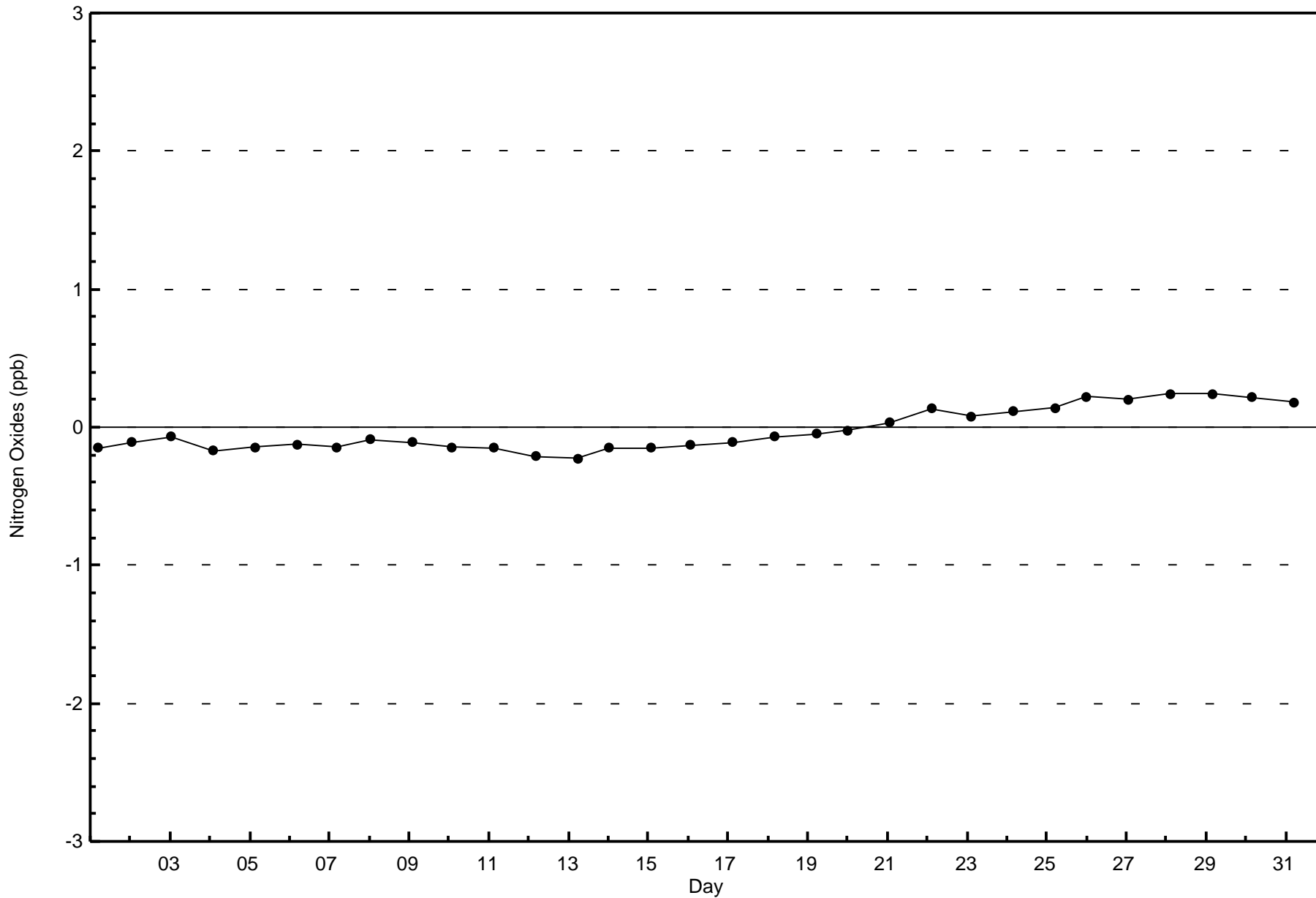
Total Number of Hours: 744

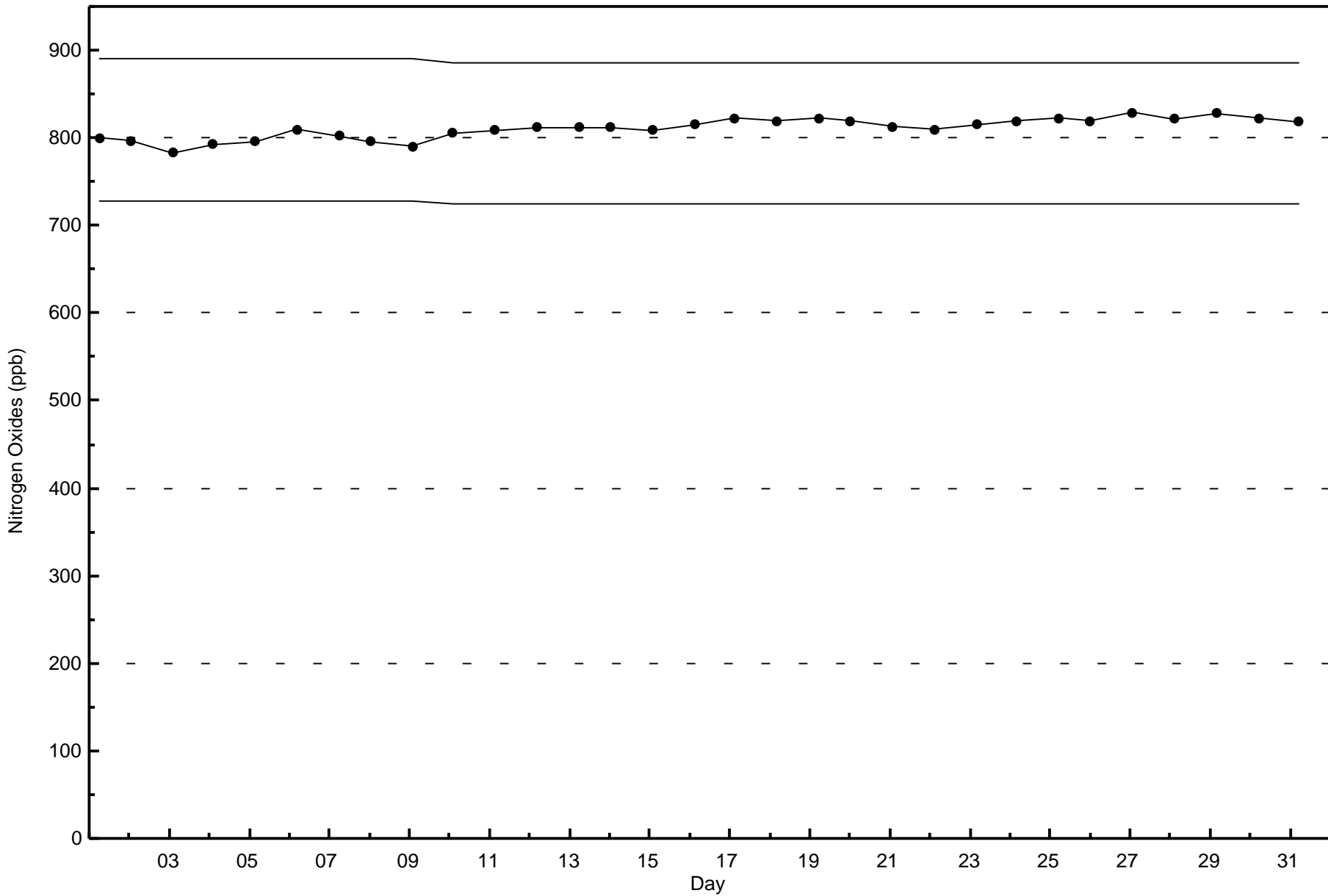


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Shell Muskeg River (AMS 16)









Number of Exceedences (AAAQO):	24-hr: 0	Hours in Service:	744
Maximum Value: 82.8 µg/m <sup>3</sup> on Dec 21 18:00	Maximum Daily Average: 21.8 µg/m <sup>3</sup> on Dec 21	Hours of Data:	742
Minimum Value: 0.5 µg/m <sup>3</sup> on Dec 16 15:00	Minimum Daily Average: 1.0 µg/m <sup>3</sup> on Dec 16	Hours of Missing Data:	2
Maximum Diurnal Average: 8.2 µg/m <sup>3</sup> at hour 18	Minimum Diurnal Average: 5.0 µg/m <sup>3</sup> at hour 10	Hours of Calibration:	2
Monthly Average: 5.96 µg/m <sup>3</sup>	Percentiles: P <sub>1</sub> = 0.6 P <sub>10</sub> = 1.6 Q <sub>1</sub> = 2.9 Median = 4.9 Q <sub>3</sub> = 7.5 P <sub>90</sub> = 10.3 P <sub>99</sub> = 25.6	Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	7.1	7.8	9.4	9.8	12.8	12.2	8.6	8.7	8.7	9.3	14.5	13.2	12.1	10.4	9.5	11.1	11.4	11.8	12.0	12.1	12.4	13.9	13.7	13.4	11.1	14.5																							
2-Dec	13.6	13.6	14.1	16.0	16.7	14.6	11.6	11.5	12.2	11.6	10.3	8.7	10.6	9.7	9.3	9.3	8.2	5.0	1.9	1.6	1.6	1.4	1.4	2.3	9.0	16.7																							
3-Dec	2.2	2.5	2.9	3.0	2.0	1.8	2.1	2.3	3.7	3.4	7.6	9.0	6.4	6.6	5.5	7.3	11.9	9.3	12.8	10.7	11.7	8.9	7.9	7.7	6.2	12.8																							
4-Dec	7.9	8.0	8.5	8.1	8.2	8.6	7.1	6.9	6.3	6.4	6.3	8.6	9.5	8.9	7.7	5.9	5.6	5.6	5.4	4.2	2.4	2.8	4.0	4.7	6.6	9.5																							
5-Dec	3.8	3.3	3.2	2.6	2.4	1.3	1.2	1.3	1.2	1.2	1.0	0.8	0.7	0.5	0.5	0.5	0.6	1.1	1.3	1.5	2.2	3.7	4.5	4.7	1.9	4.7																							
6-Dec	5.3	5.0	5.9	7.5	7.1	4.9	4.5	4.7	6.2	5.3	6.0	10.1	37.1	8.3	31.1	14.2	13.4	11.8	11.1	9.6	6.0	4.7	5.0	5.3	9.6	37.1																							
7-Dec	5.4	5.2	4.8	4.9	4.5	3.8	3.7	3.9	4.9	4.8	5.0	6.4	10.0	11.8	11.1	10.3	9.1	8.4	7.7	8.0	8.1	7.0	6.1	6.9	6.7	11.8																							
8-Dec	6.4	3.8	3.5	4.2	4.2	3.9	4.1	3.9	4.2	4.7	7.3	4.8	5.2	9.3	18.0	6.6	5.8	3.5	2.8	3.0	3.8	3.9	4.2	5.0	5.2	18.0																							
9-Dec	5.3	5.6	5.4	5.4	5.7	5.4	4.7	4.0	3.4	2.5	1.8	C	C	1.5	1.4	1.6	3.1	6.1	10.1	9.9	8.1	7.2	7.4	7.2	5.1	10.1																							
10-Dec	8.5	10.3	6.8	5.1	4.3	4.8	4.5	4.4	3.6	2.8	3.0	3.3	3.7	3.8	4.6	5.7	7.5	7.8	6.6	6.1	7.1	7.3	6.4	5.9	5.6	10.3																							
11-Dec	6.8	7.2	7.3	6.3	7.0	6.9	6.0	4.9	4.0	3.9	4.2	3.0	2.2	2.2	2.3	2.5	2.7	2.5	2.1	1.2	0.7	0.6	0.6	0.6	3.7	7.3																							
12-Dec	0.7	1.1	1.2	1.4	1.4	1.4	1.6	1.9	2.7	3.2	3.1	2.8	2.5	2.6	3.4	2.3	1.8	1.7	1.6	1.8	1.4	1.0	0.8	0.8	1.8	3.4																							
13-Dec	1.8	3.9	4.8	4.3	2.4	1.7	1.4	1.2	1.4	1.7	3.4	3.2	2.4	2.1	2.3	2.6	3.2	3.1	2.9	3.5	5.3	5.5	5.8	5.0	3.1	5.8																							
14-Dec	4.9	6.7	10.2	9.1	6.3	4.5	3.9	3.6	3.3	3.1	3.1	2.4	1.8	1.7	2.3	1.7	1.7	2.3	2.4	4.1	4.0	4.4	4.2	3.6	4.0	10.2																							
15-Dec	3.5	6.0	6.3	6.4	5.8	5.2	4.2	4.0	5.1	6.3	5.6	4.6	4.4	4.0	3.8	3.8	4.7	8.1	7.1	6.5	6.6	8.3	3.0	1.5	5.2	8.3																							
16-Dec	1.9	1.6	1.3	1.3	1.2	1.6	1.0	0.7	0.7	0.8	0.9	0.8	1.2	0.5	0.5	0.5	0.7	0.6	0.6	1.4	1.5	1.1	0.9	0.8	1.0	1.9																							
17-Dec	1.4	1.8	1.7	2.0	2.1	3.3	2.5	2.5	2.5	2.8	3.4	3.3	3.2	3.1	2.6	2.9	2.1	1.9	1.6	1.3	1.3	1.1	1.4	1.5	2.2	3.4																							
18-Dec	2.0	2.4	2.7	3.6	4.1	3.9	3.5	2.9	3.2	3.3	3.4	4.7	3.4	3.5	4.7	3.3	3.9	3.8	3.7	2.5	2.3	3.2	7.8	5.5	3.6	7.8																							
19-Dec	5.2	5.7	4.7	4.2	3.4	2.4	2.3	2.4	2.5	2.4	3.0	3.2	15.8	3.0	4.3	6.2	6.6	6.7	5.0	6.8	11.5	8.5	6.4	5.9	5.3	15.8																							
20-Dec	6.9	7.0	6.2	6.1	6.6	7.1	7.0	7.3	7.9	7.6	7.7	8.9	7.6	9.3	7.1	9.3	8.5	7.4	8.5	6.7	4.8	4.8	4.0	3.8	7.0	9.3																							
21-Dec	3.8	4.0	4.6	5.1	6.3	6.7	7.9	8.1	8.6	9.9	9.7	12.6	11.4	11.1	12.0	10.8	62.0	82.8	80.7	61.2	40.6	26.5	23.3	14.6	21.8	82.8																							
22-Dec	13.8	11.3	4.5	5.8	7.0	8.7	10.2	9.7	10.5	7.6	5.7	5.8	5.0	7.7	8.5	8.5	11.7	8.3	8.5	7.5	5.5	7.5	5.1	3.6	7.8	13.8																							
23-Dec	3.6	3.3	3.4	3.4	3.3	4.3	5.3	4.9	3.4	5.9	2.9	2.9	3.3	3.5	3.5	3.4	3.2	2.8	2.7	2.9	3.0	3.1	3.3	4.6	3.6	5.9																							
24-Dec	4.4	6.8	12.1	18.8	17.5	12.3	9.9	9.1	10.0	9.8	8.6	7.4	8.2	7.9	6.8	6.6	6.5	6.7	6.5	5.9	5.8	6.0	5.8	5.5	8.5	18.8																							
25-Dec	8.8	10.7	9.8	9.0	8.5	8.7	7.9	6.8	6.2	5.8	5.7	4.4	5.3	5.6	7.6	12.5	10.7	9.8	7.9	6.5	6.7	6.5	5.4	7.3	7.7	12.5																							
26-Dec	8.2	9.5	10.2	7.9	4.6	4.7	6.4	5.8	7.4	5.7	5.5	8.9	9.5	12.0	16.2	8.6	7.0	8.6	9.4	7.8	5.9	5.0	4.7	4.6	7.7	16.2																							
27-Dec	3.2	2.1	2.4	2.5	2.7	2.9	3.3	3.8	3.2	3.1	3.1	2.9	3.6	3.3	3.5	4.4	4.8	5.1	5.2	4.9	4.3	4.3	5.0	6.1	3.7	6.1																							
28-Dec	5.7	5.9	6.4	5.8	8.2	6.5	7.1	6.4	5.3	4.8	4.6	5.0	5.2	5.6	7.0	7.6	6.8	7.1	6.7	6.8	6.6	6.1	6.6	7.1	6.3	8.2																							
29-Dec	7.8	10.0	11.0	11.7	8.4	9.5	10.8	10.9	10.4	10.7	9.2	7.3	6.8	7.3	6.5	8.7	9.6	8.8	7.4	5.8	4.7	4.0	3.9	3.7	8.1	11.7																							
30-Dec	3.2	3.0	2.7	2.3	2.1	2.1	2.3	2.2	2.4	2.4	2.6	2.4	2.0	1.9	1.2	1.5	1.9	2.1	2.5	2.5	4.8	4.3	3.4	2.8	2.5	4.8																							
31-Dec	3.7	4.2	3.1	3.0	4.3	4.0	3.7	4.8	2.5	1.8	1.5	1.6	1.5	2.3	1.4	1.4	2.1	2.1	1.9	2.5	3.6	3.1	3.5	3.1	2.8	4.8																							
																								5.4	5.8	5.8	6.0	5.8	5.5	5.2	5.0	5.1	5.0	5.2	5.4	6.7	5.5	6.6	5.9	7.7	8.2	8.0	7.0	6.3	5.7	5.3	5.0	Diurnal Average	
																								13.8	13.6	14.1	18.8	17.5	14.6	11.6	11.5	12.2	11.6	14.5	13.2	37.1	12.0	31.1	14.2	62.0	82.8	80.7	61.2	40.6	26.5	23.3	14.6	Diurnal Maximum	

C - Calibration

Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m<sup>3</sup>

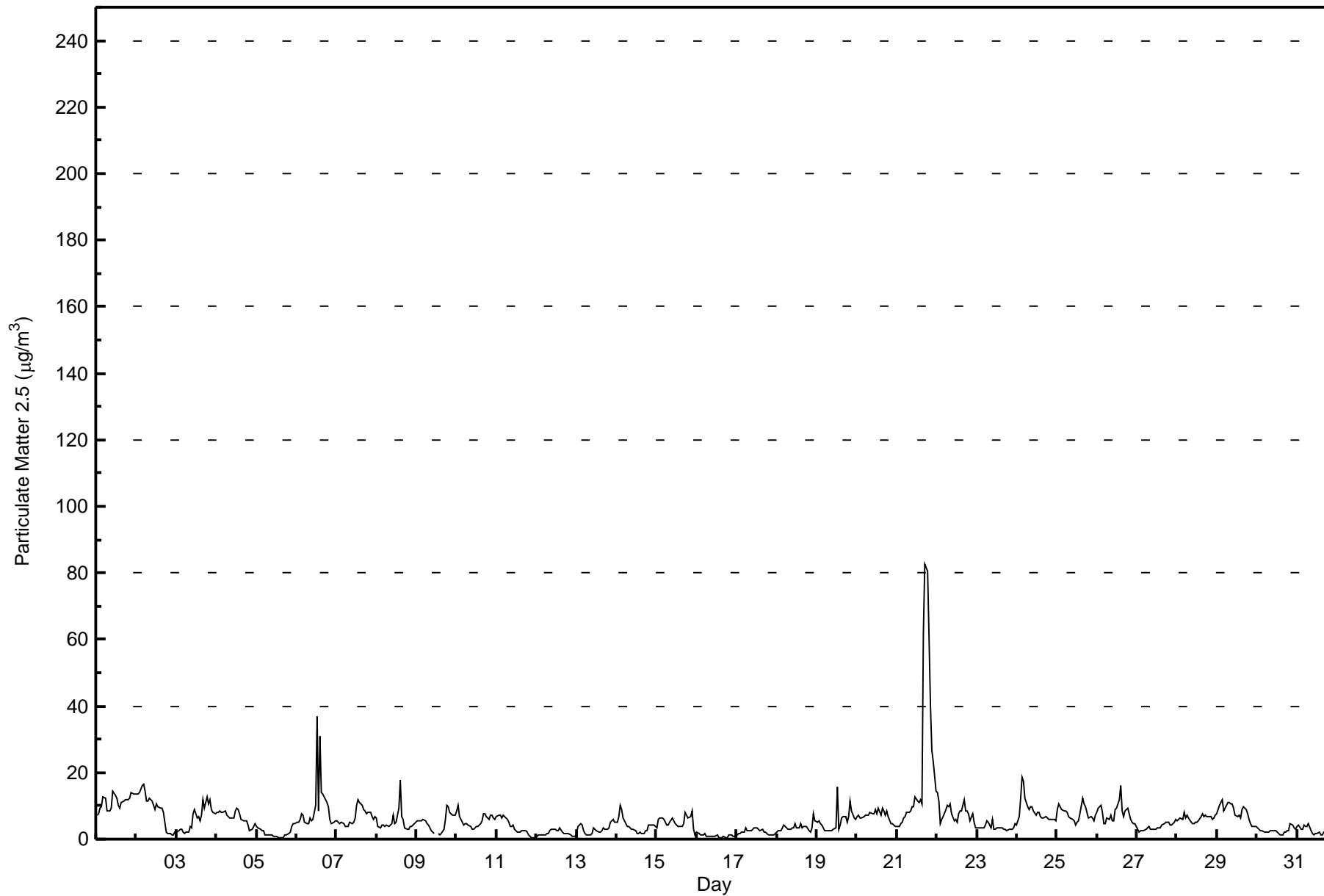


Wood Buffalo Environmental Association

Hourly Averages

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$

Shell Muskeg River - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Shell Muskeg River - December 2015**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	390	52.56	52.56
6 - 15	309	41.64	94.20
16 - 25	8	1.08	95.28
26 - 80	6	0.81	96.09
> 81.0	2	0.27	96.36

Total Number of Valid Hours: 742

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Shell Muskeg River - December 2015**

Concentration Ranges ( $\mu\text{g}/\text{m}^3$ )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	6	12	32	32	33	11	27	61	55	55	22	18	7	13	3	3	390
6 - 15	8	21	40	22	7	5	7	10	55	90	14	5	6	5	9	5	309
16 - 25	2	1	0	1	0	0	0	1	2	1	0	0	0	0	0	0	8
26 - 80	0	0	0	0	0	0	2	0	0	1	0	1	1	0	1	0	6
> 81.0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2
<b>Totals</b>	16	34	72	55	40	17	36	72	112	147	36	24	14	18	13	9	715

Total Number of Valid Hours: 742

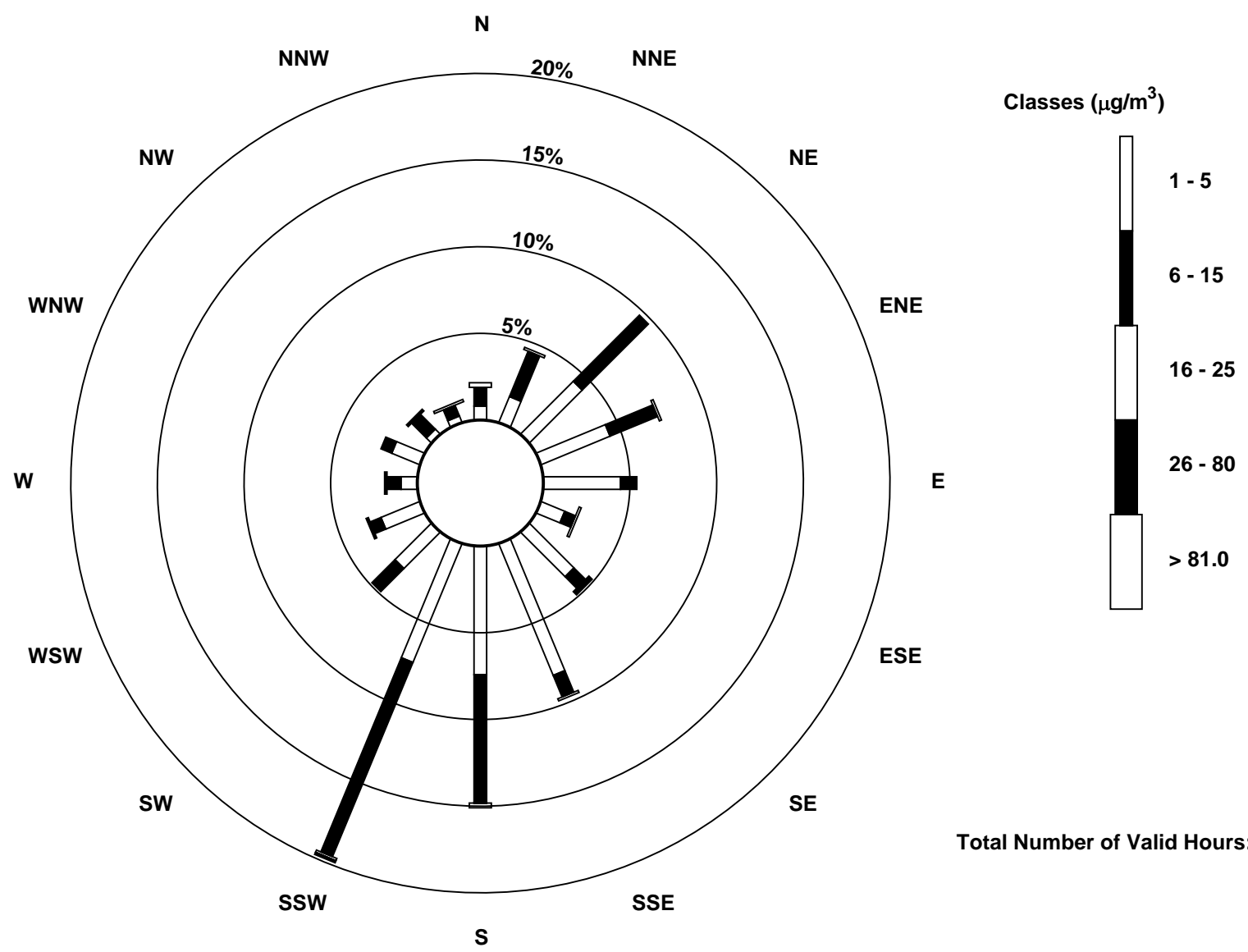
Total Number of Hours: 744





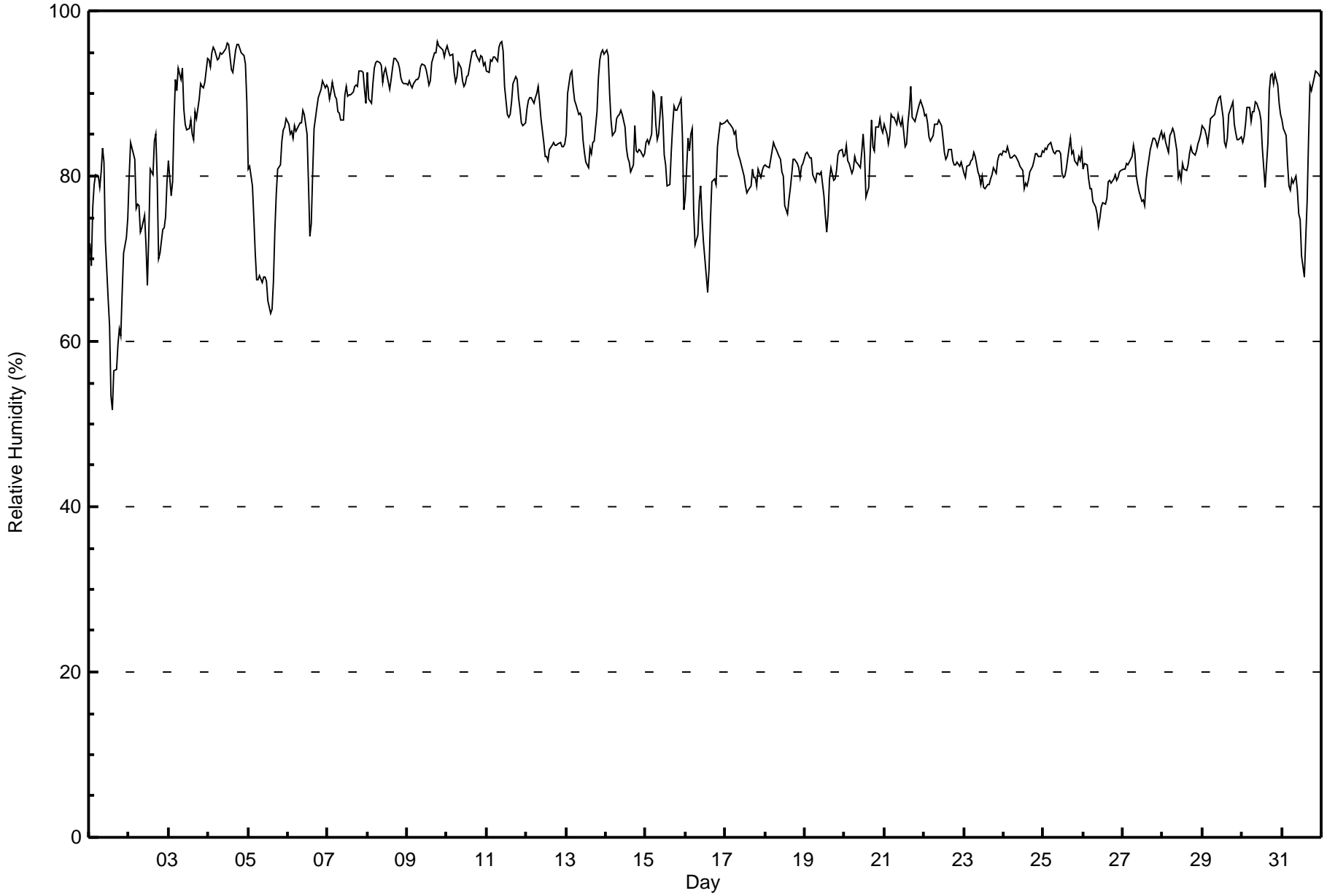
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Shell Muskeg River (AMS 16)





Maximum Value: 96 % on Dec 9 19:00																	Maximum Daily Average: 94.5 % on Dec 4																	Hours in Service: 744															
Minimum Value: 52 % on Dec 1 15:00																	Minimum Daily Average: 69.3 % on Dec 1																	Hours of Data: 744															
Maximum Diurnal Average: 86.0 % at hour 22																	Minimum Diurnal Average: 79.6 % at hour 14																	Hours of Missing Data: 0															
Monthly Average: 84.3 %																	Percentiles: P <sub>1</sub> = 62 P <sub>10</sub> = 77 Q <sub>1</sub> = 81 Median = 84 Q <sub>3</sub> = 89 P <sub>90</sub> = 93 P <sub>99</sub> = 96																	Hours of Calibration: 0															
																																		Percent Operational Time: 100.0															
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	72	69	76	79	80	80	79	81	83	82	72	65	62	53	52	56	57	60	62	61	66	71	72	75	69.3	83																							
2-Dec	80	84	83	82	76	77	76	73	74	75	72	67	73	81	80	84	85	80	70	71	74	74	75	79	76.9	85																							
3-Dec	82	78	79	87	92	90	93	92	93	88	86	86	86	87	85	84	88	87	89	91	91	91	91	94	87.9	94																							
4-Dec	94	93	95	96	95	94	94	95	95	95	95	96	94	93	93	93	95	96	96	95	95	95	93	89	94.5	96																							
5-Dec	81	81	79	75	71	68	67	68	67	68	68	67	65	63	64	67	73	78	81	81	84	86	86	87	73.9	87																							
6-Dec	86	85	85	85	86	86	86	86	86	88	87	85	79	73	74	80	86	88	89	90	91	92	91	91	85.7	92																							
7-Dec	91	89	90	91	90	89	88	88	87	87	90	91	90	90	90	91	91	91	91	93	93	93	91	89	90.0	93																							
8-Dec	93	89	89	91	93	94	94	94	93	91	93	93	92	91	92	93	94	94	94	93	92	91	91	91	92.3	94																							
9-Dec	91	91	91	91	91	92	92	92	93	94	93	93	92	91	92	94	95	95	96	96	96	95	94	95	93.1	96																							
10-Dec	96	95	95	95	93	91	92	94	93	91	91	91	92	92	94	95	95	95	95	94	95	94	93	94	93.5	96																							
11-Dec	93	93	94	94	94	94	94	96	96	96	95	91	88	87	87	89	91	92	92	89	88	87	86	87	91.4	96																							
12-Dec	88	89	89	89	89	89	90	91	89	87	84	82	82	82	83	84	84	84	84	84	84	84	84	84	85.8	91																							
13-Dec	85	90	92	93	91	89	89	88	88	87	84	83	82	81	83	83	84	84	88	92	94	95	95	95	88.1	95																							
14-Dec	95	95	90	87	85	85	87	87	88	88	88	86	83	82	82	81	81	86	83	83	83	83	82	83	85.5	95																							
15-Dec	84	84	84	85	90	90	86	84	85	90	87	83	81	79	79	83	86	88	88	88	89	85	76	85.2	90																								
16-Dec	78	85	83	85	86	76	72	73	77	79	75	72	68	66	69	75	79	80	79	84	85	86	86	87	78.4	87																							
17-Dec	87	87	86	86	86	85	85	83	82	82	81	80	79	78	78	79	81	80	80	79	81	80	81	81	81.9	87																							
18-Dec	81	81	81	82	83	84	84	83	82	82	81	80	76	75	77	78	80	82	82	81	81	80	81	82	80.9	84																							
19-Dec	83	83	83	82	82	80	79	80	80	80	81	78	75	73	75	80	81	79	80	81	83	83	83	82	80.3	83																							
20-Dec	83	84	82	81	80	81	82	82	82	81	83	85	82	78	79	83	87	84	83	86	86	87	86	85	82.9	87																							
21-Dec	86	85	84	85	87	87	87	86	87	87	86	87	83	84	87	88	91	87	87	87	88	89	89	88	86.8	91																							
22-Dec	87	87	86	85	84	85	86	86	86	87	86	85	83	82	82	83	83	82	81	81	82	81	82	81	84.0	87																							
23-Dec	80	80	81	81	82	82	83	82	80	80	79	80	79	78	79	79	80	80	81	80	82	83	83	83	80.7	83																							
24-Dec	83	83	84	83	82	82	83	82	82	82	81	81	78	79	79	80	81	81	82	83	83	82	82	83	81.7	84																							
25-Dec	83	83	83	84	84	83	83	83	83	83	83	80	80	80	81	83	85	83	83	82	81	82	82	83	82.5	85																							
26-Dec	81	81	81	80	78	79	77	76	75	74	75	76	77	77	77	79	79	79	80	80	79	80	80	81	78.5	81																							
27-Dec	81	81	81	81	82	82	84	83	80	79	78	77	77	76	79	81	83	84	84	85	84	83	85	85	81.5	85																							
28-Dec	85	85	84	83	85	85	86	85	83	80	81	80	81	81	81	81	83	84	83	83	83	84	84	85	83.1	86																							
29-Dec	86	86	85	84	85	87	87	88	88	89	89	90	87	84	84	85	88	88	89	86	85	84	84	85	86.4	90																							
30-Dec	84	85	86	88	88	87	88	88	89	89	88	87	83	81	79	84	90	92	92	91	92	91	89	87	87.5	92																							
31-Dec	87	86	85	82	79	78	80	79	80	78	75	75	70	68	73	77	84	91	90	92	93	92	92	92	82.4	93																							
																								85.3	85.4	85.4	85.5	85.5	84.9	84.9	84.8	84.8	84.4	83.4	82.3	80.7	79.6	80.3	82.3	84.5	85.0	84.9	85.2	85.9	86.0	85.8	85.7	Diurnal Average	
																								96	95	95	96	95	94	94	96	96	96	95	96	96	94	94	95	95	96	96	96	96	95	95	95	Diurnal Maximum	





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Shell Muskeg River - December 2015**

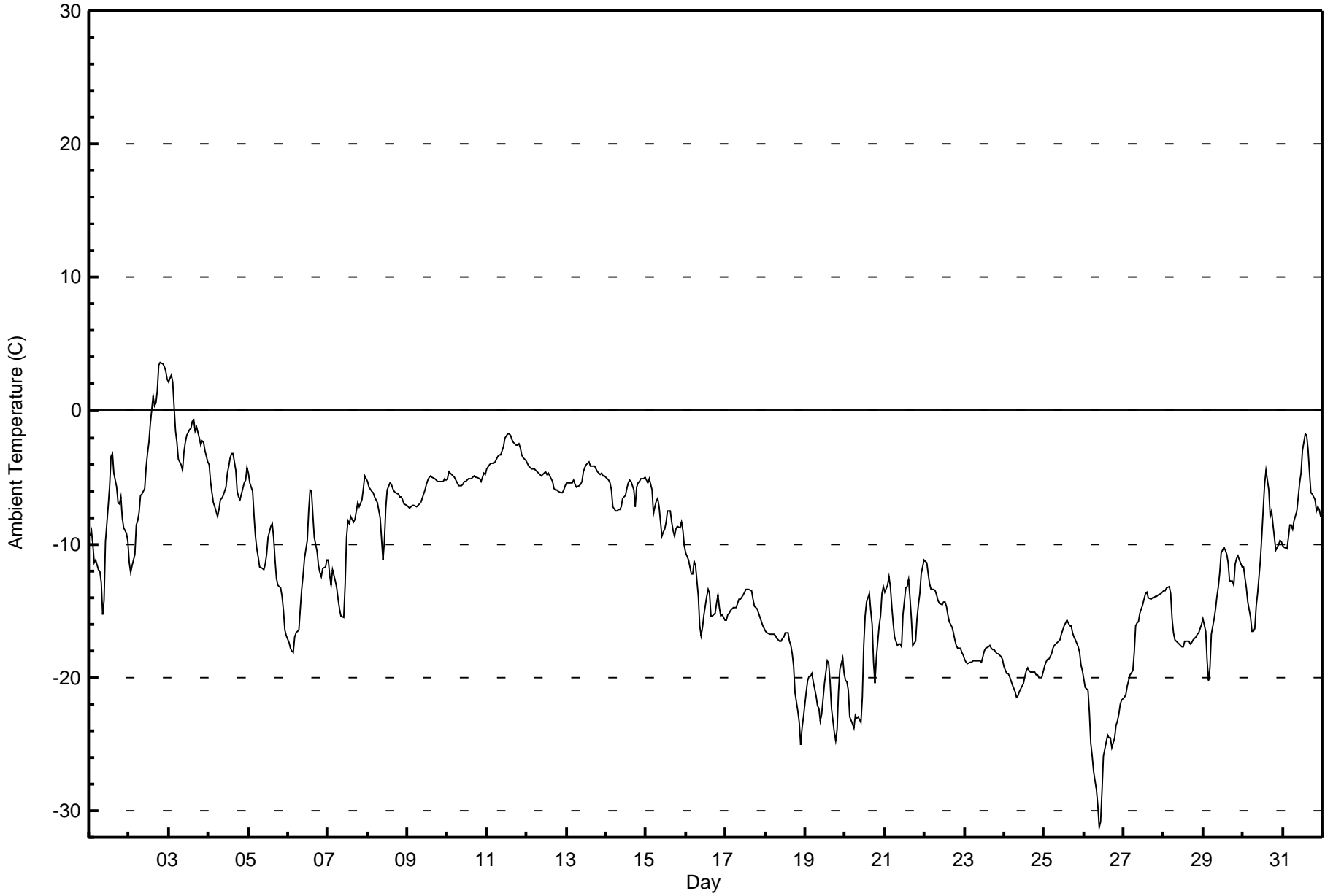
<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	5	0.67	0.67
60 - 80	145	19.49	20.16
80 - 100	594	79.84	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 3.7 C on Dec 2 20:00		Maximum Daily Average: -1.6 C on Dec 3		Hours in Service: 744																																												
Minimum Value: -31.3 C on Dec 26 10:00		Minimum Daily Average: -24.9 C on Dec 26		Hours of Data: 744																																												
Maximum Diurnal Average: -9.6 C at hour 15		Minimum Diurnal Average: -13.1 C at hour 9		Hours of Missing Data: 0																																												
Monthly Average: -11.59 C		Percentiles: P <sub>1</sub> = -25.9 P <sub>10</sub> = -19.9 Q <sub>1</sub> = -16.8 Median = -11.6 Q <sub>3</sub> = -5.8 P <sub>90</sub> = -4.1 P <sub>99</sub> = 2.2		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-9.4	-8.9	-10.1	-11.4	-11.2	-11.9	-12.0	-12.9	-15.3	-14.3	-9.9	-7.1	-5.6	-3.4	-3.2	-4.7	-5.8	-6.8	-7.0	-6.5	-8.1	-8.8	-9.2	-9.8	-8.9	-3.2																						
2-Dec	-11.4	-12.2	-11.6	-10.8	-8.5	-8.3	-7.6	-6.3	-6.3	-5.9	-4.3	-3.2	-2.4	-1.0	1.1	0.4	0.5	1.5	3.4	3.7	3.5	3.3	3.0	2.4	-3.2	3.7																						
3-Dec	2.1	2.7	2.1	0.2	-1.5	-2.4	-3.6	-4.1	-4.5	-3.1	-2.4	-1.9	-1.5	-1.3	-0.8	-0.7	-1.5	-1.2	-2.1	-2.6	-2.2	-2.4	-3.0	-3.8	-1.6	2.7																						
4-Dec	-4.1	-5.3	-6.2	-6.9	-7.2	-8.0	-7.4	-6.6	-6.6	-6.3	-5.7	-4.7	-4.1	-3.5	-3.2	-3.2	-4.5	-6.0	-6.4	-6.6	-6.2	-5.4	-5.2	-4.3	-5.6	-3.2																						
5-Dec	-4.7	-5.4	-6.1	-7.8	-9.5	-10.3	-11.0	-11.7	-11.8	-11.9	-11.5	-10.8	-9.6	-8.7	-8.5	-9.5	-11.2	-12.6	-13.1	-13.3	-14.0	-15.0	-16.5	-16.9	-10.9	-4.7																						
6-Dec	-17.4	-17.8	-18.0	-18.1	-17.0	-16.7	-16.4	-14.9	-13.4	-12.4	-11.0	-9.7	-7.5	-6.0	-6.0	-7.8	-9.5	-10.6	-11.6	-12.1	-12.5	-11.8	-11.7	-11.2	-12.5	-6.0																						
7-Dec	-11.2	-12.3	-13.1	-11.9	-12.7	-13.3	-14.2	-14.9	-15.4	-15.5	-13.1	-9.5	-8.3	-8.4	-7.9	-8.4	-8.1	-7.5	-6.9	-7.2	-6.7	-5.8	-4.9	-5.1	-10.1	-4.9																						
8-Dec	-5.3	-5.7	-6.1	-6.2	-6.5	-6.7	-6.9	-8.1	-9.7	-11.2	-9.9	-7.3	-5.9	-5.4	-5.6	-5.9	-6.0	-6.2	-6.2	-6.5	-6.5	-6.7	-7.0	-7.0	-6.9	-5.3																						
9-Dec	-7.2	-7.3	-7.2	-7.1	-7.1	-7.2	-7.1	-7.0	-6.9	-6.5	-6.0	-5.5	-5.2	-5.0	-4.9	-5.0	-5.1	-5.2	-5.3	-5.3	-5.3	-5.3	-5.1	-5.2	-6.0	-4.9																						
10-Dec	-5.1	-4.6	-4.6	-4.9	-5.0	-5.2	-5.4	-5.6	-5.6	-5.5	-5.3	-5.3	-5.2	-5.1	-5.1	-5.0	-4.9	-5.0	-5.0	-5.1	-5.3	-5.0	-4.7	-4.8	-5.1	-4.6																						
11-Dec	-4.4	-4.0	-4.0	-3.9	-4.0	-3.8	-3.4	-3.3	-3.3	-3.0	-2.7	-2.0	-1.7	-1.7	-1.9	-2.1	-2.4	-2.5	-2.6	-2.4	-2.8	-3.3	-3.5	-3.8	-3.0	-1.7																						
12-Dec	-4.0	-4.2	-4.3	-4.3	-4.4	-4.5	-4.6	-4.7	-4.8	-4.8	-4.7	-4.6	-4.8	-4.7	-4.9	-5.3	-5.8	-5.9	-5.9	-6.0	-6.1	-6.1	-5.9	-5.7	-5.0	-4.0																						
13-Dec	-5.4	-5.4	-5.4	-5.4	-5.2	-5.5	-5.8	-5.7	-5.6	-5.3	-4.6	-4.2	-4.0	-3.9	-4.1	-4.1	-4.1	-4.1	-4.6	-4.7	-4.8	-4.7	-4.9	-4.9	-4.8	-3.9																						
14-Dec	-5.1	-5.2	-5.4	-5.9	-7.2	-7.5	-7.5	-7.4	-7.5	-7.2	-6.6	-6.3	-5.9	-5.4	-5.2	-5.3	-6.0	-7.2	-5.8	-5.5	-5.3	-5.1	-5.1	-5.0	-6.1	-5.0																						
15-Dec	-5.2	-5.4	-5.1	-6.0	-7.7	-7.2	-6.7	-6.6	-7.2	-9.4	-9.1	-8.8	-8.4	-7.5	-7.5	-8.4	-9.0	-9.4	-8.9	-8.7	-8.8	-8.3	-9.0	-10.1	-7.9	-5.1																						
16-Dec	-10.6	-11.2	-11.7	-12.2	-12.2	-11.3	-11.6	-13.9	-16.2	-16.9	-16.3	-15.3	-13.9	-13.4	-13.7	-15.4	-15.4	-15.2	-14.5	-13.8	-14.8	-15.4	-15.3	-15.7	-14.0	-10.6																						
17-Dec	-15.7	-15.3	-15.2	-15.0	-14.7	-14.7	-14.8	-14.5	-14.1	-14.1	-13.9	-13.6	-13.4	-13.4	-13.4	-13.5	-14.2	-14.6	-14.8	-14.8	-15.2	-15.8	-16.1	-16.3	-14.6	-13.4																						
18-Dec	-16.5	-16.7	-16.8	-16.7	-16.7	-16.8	-16.8	-17.1	-17.3	-17.3	-17.0	-17.0	-16.7	-16.7	-17.3	-17.6	-18.2	-19.2	-21.1	-22.5	-23.4	-25.0	-23.8	-23.0	-18.6	-16.5																						
19-Dec	-21.1	-20.2	-20.0	-19.9	-19.7	-20.4	-21.4	-22.2	-22.4	-23.3	-22.7	-20.4	-19.5	-18.7	-19.0	-20.3	-22.4	-24.1	-24.8	-23.9	-21.1	-19.4	-18.5	-19.7	-21.0	-18.5																						
20-Dec	-20.2	-20.4	-20.9	-23.0	-23.5	-23.8	-22.9	-23.0	-23.0	-23.4	-21.5	-17.6	-15.4	-14.3	-13.7	-15.0	-16.0	-18.9	-20.5	-18.5	-16.2	-15.4	-13.7	-13.2	-18.9	-13.2																						
21-Dec	-13.6	-13.1	-12.4	-13.2	-14.7	-16.0	-17.0	-17.6	-17.5	-17.5	-17.7	-15.3	-13.3	-13.2	-12.7	-14.0	-15.6	-17.6	-17.3	-15.6	-14.5	-13.7	-12.3	-11.2	-14.9	-11.2																						
22-Dec	-11.3	-11.4	-12.3	-12.9	-13.4	-13.4	-13.5	-13.8	-14.2	-14.4	-14.6	-14.4	-14.4	-14.6	-15.3	-15.8	-16.3	-16.6	-17.1	-17.6	-17.8	-17.8	-18.1	-18.4	-15.0	-11.3																						
23-Dec	-18.7	-18.9	-19.0	-18.9	-18.8	-18.7	-18.8	-18.8	-18.7	-18.8	-18.8	-18.4	-18.1	-17.8	-17.7	-17.6	-17.8	-17.9	-18.0	-18.2	-18.2	-18.3	-18.4	-18.7	-18.4	-17.6																						
24-Dec	-19.2	-19.7	-19.7	-19.9	-20.3	-20.6	-21.1	-21.5	-21.4	-21.0	-20.8	-20.4	-19.9	-19.5	-19.3	-19.5	-19.5	-19.6	-19.6	-19.8	-19.8	-20.1	-20.0	-19.6	-20.1	-19.2																						
25-Dec	-19.1	-18.9	-18.7	-18.6	-18.3	-17.9	-17.6	-17.5	-17.4	-17.2	-16.7	-16.4	-16.2	-15.9	-15.7	-16.1	-16.1	-16.7	-16.9	-17.2	-17.7	-18.1	-19.1	-19.5	-17.5	-15.7																						
26-Dec	-20.2	-20.8	-20.9	-22.6	-24.9	-25.9	-27.1	-28.5	-29.6	-31.3	-30.8	-28.5	-25.9	-24.9	-24.3	-24.5	-24.5	-25.3	-24.5	-23.6	-23.3	-22.7	-22.1	-21.7	-24.9	-20.2																						
27-Dec	-21.5	-21.2	-20.7	-20.2	-19.9	-19.5	-18.2	-16.1	-15.9	-15.9	-15.2	-14.6	-14.1	-13.7	-13.6	-14.0	-14.2	-14.1	-14.0	-14.0	-13.9	-13.8	-13.7	-13.6	-16.1	-13.6																						
28-Dec	-13.5	-13.5	-13.3	-13.1	-13.7	-15.6	-16.7	-17.2	-17.4	-17.5	-17.6	-17.7	-17.7	-17.3	-17.2	-17.3	-17.5	-17.4	-17.2	-16.9	-16.8	-16.6	-16.4	-16.0	-16.3	-13.1																						
29-Dec	-15.6	-16.5	-18.7	-20.2	-19.2	-16.7	-15.7	-14.9	-14.0	-13.1	-12.1	-10.7	-10.2	-10.5	-10.8	-11.4	-12.8	-12.8	-13.1	-11.5	-11.1	-10.9	-11.2	-11.7	-13.6	-10.2																						
30-Dec	-11.7	-12.5	-13.3	-14.4	-15.5	-16.6	-16.5	-16.3	-14.7	-13.7	-11.2	-9.4	-7.4	-5.5	-4.4	-6.0	-7.9	-7.5	-8.5	-9.5	-10.5	-10.0	-9.8	-9.9	-10.9	-4.4																						
31-Dec	-10.2	-10.2	-10.4	-9.5	-8.5	-8.5	-8.8	-8.3	-7.5	-6.5	-5.4	-4.7	-3.0	-1.8	-1.9	-2.9	-4.5	-6.1	-6.2	-6.6	-7.5	-7.2	-7.4	-7.9	-6.7	-1.8																						
																								-11.5	-11.7	-11.9	-12.3	-12.5	-12.7	-12.8	-12.9	-13.1	-13.0	-12.2	-11.2	-10.3	-9.7	-9.6	-10.2	-10.9	-11.4	-11.5	-11.4	-11.4	-11.3	-11.3	-11.3	Diurnal Average
																								2.1	2.7	2.1	0.2	-1.5	-2.4	-3.4	-3.3	-3.3	-3.0	-2.4	-1.9	-1.5	-1.0	1.1	0.4	0.5	1.5	3.4	3.7	3.5	3.3	3.0	2.4	Diurnal Maximum





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C**  
**Shell Muskeg River - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	71	9.54	9.54
-20 - 0	659	88.58	98.12
0 - 10	14	1.88	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

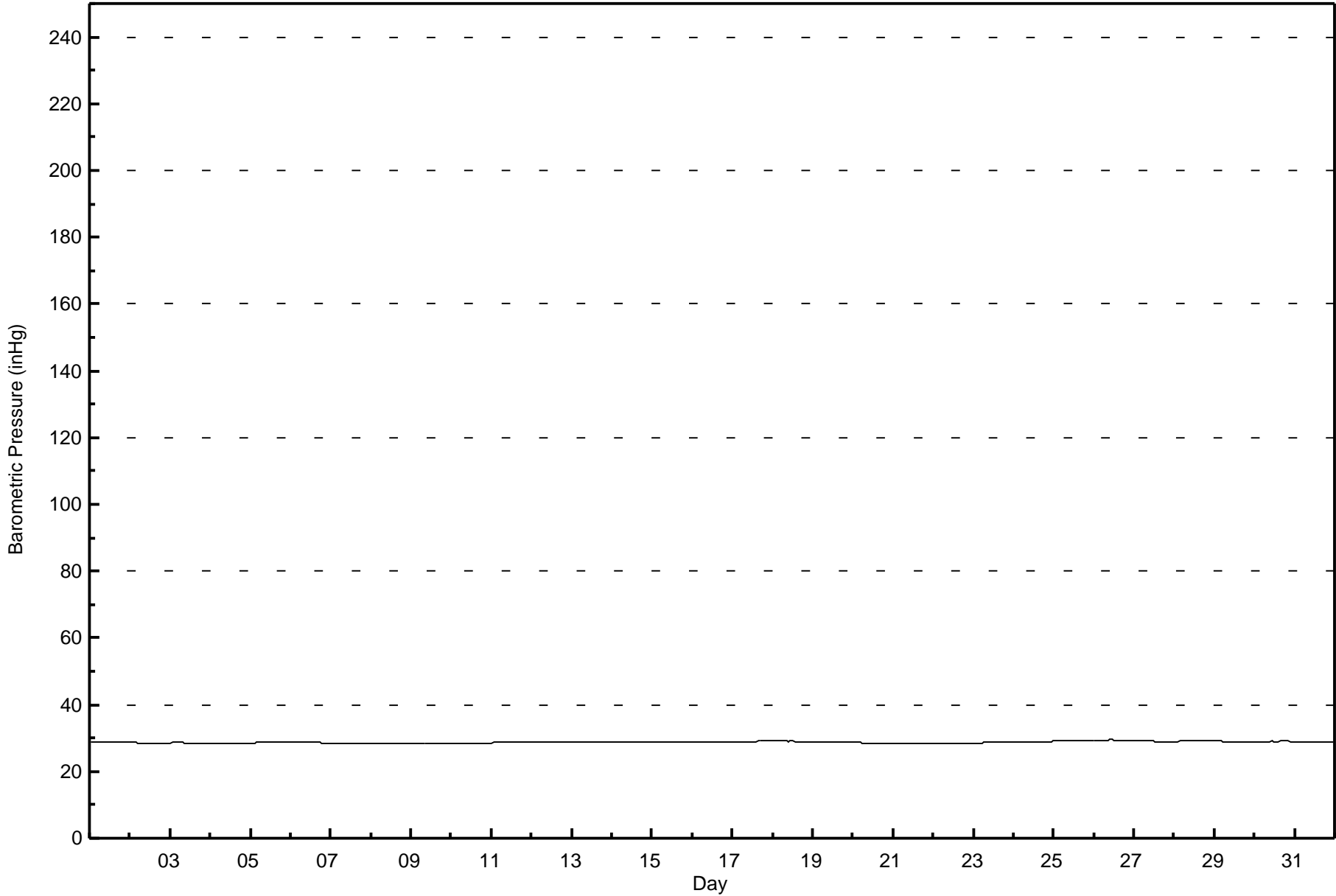
Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 29.5 inHg on Dec 26 10:00      Maximum Daily Average: 29.4 inHg on Dec 26																						Hours in Service: 744																													
Minimum Value: 28.3 inHg on Dec 4 06:00      Minimum Daily Average: 28.4 inHg on Dec 21 Maximum Diurnal Average: 28.8 inHg at hour 4      Minimum Diurnal Average: 28.7 inHg at hour 15 Monthly Average: 28.75 inHg      Percentiles: $P_1 = 28.3$ $P_{10} = 28.4$ $Q_1 = 28.5$ Median = 28.7 $Q_3 = 28.9$ $P_{90} = 29.1$ $P_{99} = 29.4$																						Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																											
1-Dec	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8																							
2-Dec	28.7	28.6	28.6	28.6	28.6	28.6	28.5	28.5	28.5	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.5	28.5	28.5	28.6	28.6	28.6	28.6	28.7																							
3-Dec	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.5	28.5	28.5	28.5	28.4	28.4	28.4	28.4	28.4	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3																							
4-Dec	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.4	28.4	28.4	28.4	28.4	28.4	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5																							
5-Dec	28.5	28.6	28.6	28.6	28.6	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.9																							
6-Dec	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7																							
7-Dec	28.6	28.5	28.5	28.5	28.5	28.5	28.4	28.4	28.4	28.4	28.4	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.4	28.4	28.6																							
8-Dec	28.4	28.4	28.4	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.5																							
9-Dec	28.4	28.4	28.4	28.4	28.4	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.5	28.5	28.5																							
10-Dec	28.5	28.5	28.5	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.5	28.5	28.5	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6																							
11-Dec	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8																							
12-Dec	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8																							
13-Dec	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8																							
14-Dec	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9																							
15-Dec	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8																							
16-Dec	28.8	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9																							
17-Dec	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1																							
18-Dec	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.1																							
19-Dec	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.9																							
20-Dec	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.5																							
21-Dec	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.3	28.3	28.3	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4																							
22-Dec	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.6																							
23-Dec	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7																							
24-Dec	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0																							
25-Dec	29.0	29.0	29.0	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.3	29.3	29.3	29.3	29.3	29.3	29.3																							
26-Dec	29.3	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.5	29.5	29.5	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.3	29.3	29.3	29.3	29.3	29.3	29.4																							
27-Dec	29.3	29.3	29.2	29.2	29.2	29.2	29.2	29.1	29.1	29.1	29.1	29.1	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.1																							
28-Dec	29.0	29.0	29.0	29.0	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.2	29.2	29.2	29.1	29.1	29.1	29.2	29.2	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1																							
29-Dec	29.1	29.1	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.9																							
30-Dec	28.9	28.9	28.9	28.9	28.9	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0																							
31-Dec	29.0	29.0	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9																							
																								28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	Diurnal Average	
																								29.3	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.3	29.3	29.3	Diurnal Maximum







Maximum Speed: 25 km/h on Dec 2 19:00	Maximum Daily Speed Average: 13.6 km/h on Dec 22	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 13 23:00	Minimum Daily Speed Average: 1.8 km/h on Dec 25	Hours of Data: 744
Maximum Diurnal Speed Average: 3.2 km/h at hour 13	Minimum Diurnal Speed Average: 1.6 km/h at hour 3	Hours of Missing Data: 0
Monthly Average Velocity: 2.3 km/h 169.6 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 5 Median = 7 Q <sub>3</sub> = 10 P <sub>90</sub> = 14 P <sub>99</sub> = 20	Percent Operational Time: 100.0

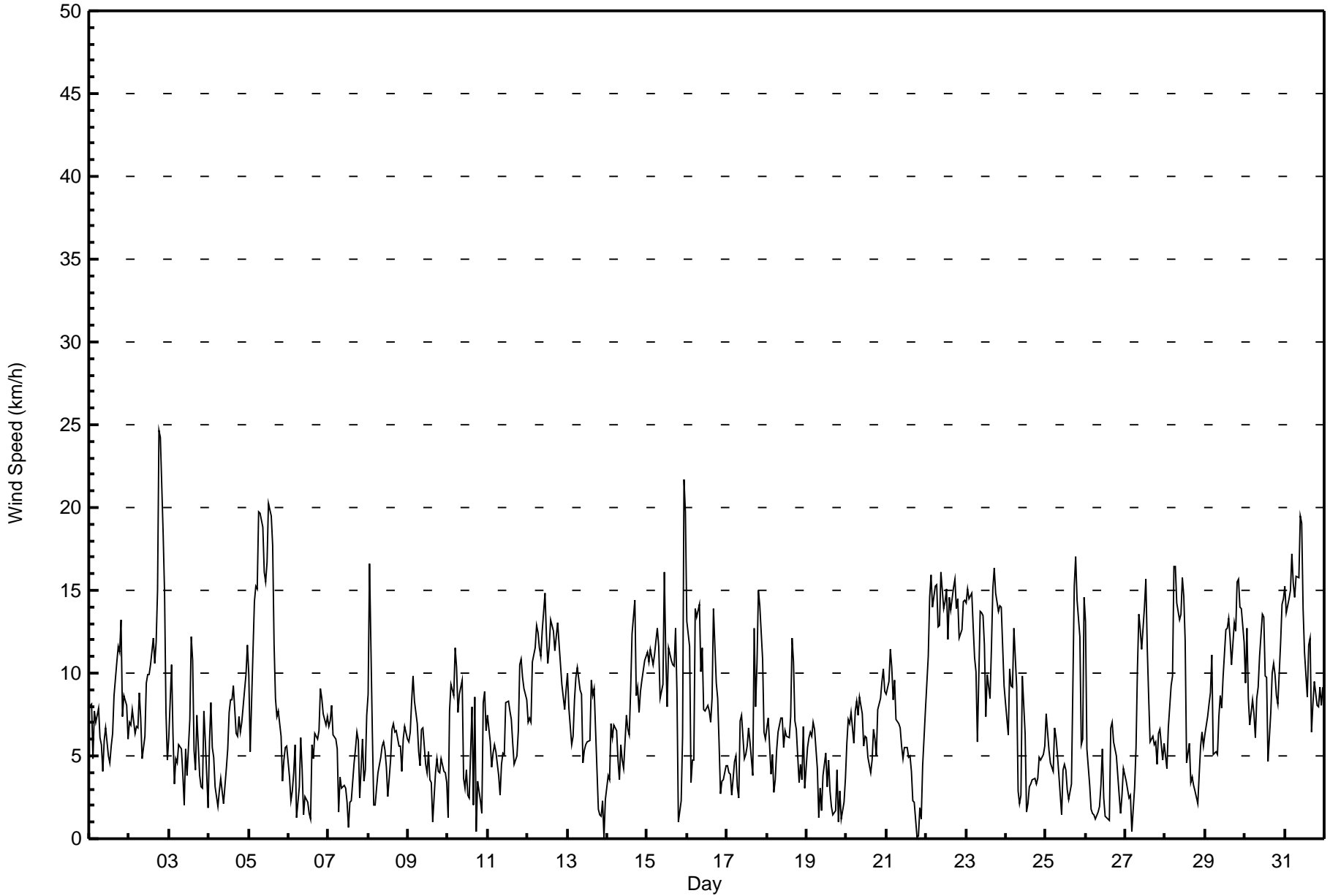
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	S8	SSW8	S5	S8	S7	S8	SSW6	SSW6	S4	SSW6	SSW7	SSW5	SSW5	SSW6	S6	S9	SSW11	SSW12	SSW11	SSW13	SSW7	S9	S8	S6	SSW7.3	SSW13
2-Dec	SSW7	SSW7	SSW8	S6	SSW7	SSW7	SSW9	SSW7	SSW5	SW6	SSW9	SSW10	SSW10	SSW11	SSW12	SSW11	SSW12	SW15	WSW25	WSW24	WSW18	WSW15	WSW8	WNW5	SSW9.7	WSW25
3-Dec	WNW6	NW10	W6	SSE3	SW5	SSW5	S6	S5	SSE4	NE2	NW5	N4	NE7	NE12	NE11	NNE5	NNE4	NNE7	NNW4	NW3	NE3	ENE8	ENE6	ENE2	NNE2.0	NE12
4-Dec	NNE6	NE8	NE6	ENE5	NE3	SE2	ENE3	ENE4	SW3	S2	SSW4	SSW5	SSW8	SSW8	SSW8	SSW9	SSE6	SSE6	SE7	SSE6	S7	SSW9	SW10	W12	S2.9	W12
5-Dec	W10	WNW5	WNW11	WNW14	WNW15	W15	WSW20	WSW20	WSW19	WSW16	SW15	SW17	SW20	SW19	SW18	SW12	SW8	S7	SSW8	SSW6	S3	SSE5	SE6	S6	WSW10.5	SW20
6-Dec	S4	S2	W3	NE4	ENE6	SSE1	E3	ENE6	NE4	SSE1	SSE3	SSW2	SE1	ESE1	W6	S5	SSW6	SSW6	SSW7	S9	S8	S8	S7	SSW7	S2.8	S9
7-Dec	SSW7	SSW7	S8	SSW6	SSW6	SW5	SSE2	SSW4	WSW3	SSE3	E3	SW2	W1	SW2	S2	S5	S5	S6	SSW6	SSW2	SSW6	SSW3	W4	NNW7	SSW3.5	S8
8-Dec	N9	NE17	NE6	WNW2	S2	SSE3	S4	S5	S6	S6	S5	S4	S3	S5	SSE7	SSE7	SSE6	SSE7	SE6	ESE6	ENE4	ENE6	ENE7	ENE6	SE2.8	NE17
9-Dec	ENE6	ENE6	ENE8	ENE10	ENE8	ENE7	ENE5	ENE4	ENE7	ENE7	E5	ENE4	NE5	ENE4	E3	SSW1	WSW4	WNW5	WSW4	S4	S5	S4	SSW4	SSW3	E2.8	ENE10
10-Dec	S1	NE8	ENE9	ENE9	ENE11	ENE10	ENE8	E9	ENE10	E4	NE3	E4	ESE3	E2	ENE8	ENE2	NE9	WNW0	NW3	NW2	ENE1	ENE8	NE9	NE7	ENE5.3	ENE11
11-Dec	NE7	NE6	NE4	ENE5	E6	E5	ESE4	S3	SE5	SE5	SSE5	SSE8	SSE8	SSE8	SSE7	SE6	SE4	SE5	SE6	SE11	SE11	SE10	SE9	SE8	SE5.4	SE11
12-Dec	SSE7	SSE7	SSE7	SSE11	SSE12	SE13	SE12	SE12	SE11	SSE13	SSE15	SSE12	SSE11	SSE12	SSE13	SSE13	SSE11	SSE12	SSE13	SSE12	SSE9	SSE9	SSE8	SSE9	SSE10.9	SSE15
13-Dec	SSE10	SSE8	SE6	SSE6	SSE8	SSE10	SE10	SSE9	SSE9	SSE5	SSE5	SE6	ESE6	ENE6	ENE10	ENE9	NE9	ENE7	SE2	NW1	E1	NNE2	SE0	SSE2	SE4.5	SE10
14-Dec	SSE4	WNW4	NW7	WNW6	W7	W7	SW5	S4	SSW6	SSW5	SSW4	SW7	SW7	SW6	SW9	WSW12	WSW14	SSW9	S9	S8	S9	S10	S11	S11	SW6.1	WSW14
15-Dec	S11	S11	S11	S10	S11	S12	S13	S12	SSW8	SSW9	SW16	SW11	SW8	SW12	SW11	SSW11	SSW10	SW13	SSW9	S1	NW2	N6	NE22	NNE20	SSW6.3	NE22
16-Dec	NNE13	NNE12	ESE3	S5	SW5	WNW14	WNW13	WNW14	W10	W11	WSW8	SW8	SW8	SW8	SSW7	SW8	SW14	W9	W9	WNW6	WSW3	SSE3	S4	SSE4	WSW5.0	WNW14
17-Dec	SSW4	S4	S4	SSW3	E5	E5	SSE3	N2	N7	NNW7	NNW5	NNW5	NW6	WNW7	WNW6	NW4	NE13	ENE8	NE11	NE15	NE14	ENE11	E6	E6	NE3.4	NNE15
18-Dec	E7	E7	ESE4	E5	ESE3	E4	E5	E6	E7	E7	E6	E7	ESE6	E6	E7	ENE12	ENE11	E7	SE7	SE3	ESE4	SE4	E7	SE3	E5.8	ENE12
19-Dec	ESE5	ESE6	SE6	SE6	SE7	SE7	SSE4	SSW1	WSW3	SSE2	ESE4	SSE5	S3	SW5	W3	SW2	SE1	NE2	ENE4	E1	E3	WNW1	SSW2	WSW4	SSE2.3	SE7
20-Dec	S6	SSW7	SSW7	SSW8	SSW6	SSW8	SSW8	SSW7	SSW9	SSW8	SSW6	SW6	SSW6	WSW5	SW4	SSW5	SSW7	SSW6	S5	S8	S9	S9	S10	S9	SSW6.6	S10
21-Dec	S9	S9	S11	S10	SSW8	SSW10	SSW7	S7	SSW7	SSW6	SSW5	SSW5	SSW6	SSW5	S5	SE4	SE2	NNW2	ESE0	WSW0	SSW2	NW1	NNE4	NE8	S4.2	S11
22-Dec	NE9	NNE11	NNE15	NNE16	NNE14	NNE15	NE15	NNE13	NNE13	NNE16	NE14	NE14	NE15	N12	N15	N14	NNE15	NNE16	N14	NNE15	NNE12	NNE13	NE14	NE14	NNE13.6	NNE16
23-Dec	NE14	NE15	NE15	NE15	NE13	NE11	NNE10	NNE6	NE14	NE14	NE13	NE12	N7	N10	NNE8	NNE12	NE15	NE16	NE15	NE14	NE14	NE14	NNE12	N9	NE12.0	NE16
24-Dec	N8	NNW6	NNE10	N9	N9	NNE13	NE9	E3	ENE2	NE3	NE10	NNE6	NW2	S2	SE3	SSE3	SE4	S4	SSE3	SSE4	SSE5	S5	SSW5	S6	NE2.2	NNE13
25-Dec	SSW8	S6	SSW5	S5	S4	SSW7	SSW6	S5	S4	S1	SW4	W4	WSW4	WSW3	NW2	ENE3	NE9	NE15	NE17	NNE14	NNE12	NE6	E6	NE15	ENE1.8	NE17
26-Dec	NE13	NE5	NE3	E2	ESE2	ENE1	ENE1	ENE2	SSE2	ESE3	ENE5	SE2	ESE1	SW1	ENE1	NE7	NE7	ENE6	NE5	ENE4	E3	E2	ENE3	ENE4	ENE3.1	NE13
27-Dec	E3	E3	E2	E3	S0	E3	SE6	SSE10	SSE14	SSE13	SSE11	SSE14	SSE16	SSE12	SSE9	SSE6	SSE6	S6	SSE6	SSE4	SSE6	S7	S5	SSW6	SSE6.5	SSE16
28-Dec	SSW5	S4	W7	NW9	N10	NE16	NE16	NE14	NE13	NE14	NE16	NE15	NE12	NNE5	NNW6	NW3	W4	WSW3	SSW3	SSW2	SSW4	S6	S6	SSW6	NE3.6	NE16
29-Dec	SSW6	S7	SSW8	S9	SSW11	SSW5	SW5	SSW5	SW7	SW9	SSW8	SSW10	SSW13	SSW13	S13	S12	S11	S13	S13	S16	S16	SSW14	SSW14	SSW12	SSW10.2	S16
30-Dec	SSW9	SW13	SSW8	S7	S8	S8	S6	SSW8	S9	SSW11	SSW14	SSW13	SSW10	SSW10	S5	SSW8	SSW10	SW11	SSW10	SSW9	S8	SSW12	SSW14	SSW14	SSW9.6	SSW14
31-Dec	SSW15	SSW14	SSW15	SSW15	SSW17	S15	SSW15	SSW16	SSW16	SW19	SW19	SW14	SSW11	SSW9	SW12	SW12	SSW6	S8	SSW9	SSW8	S8	SSW9	S8	S9	SSW12.1	SW19

SE1.9 SE1.7 SSE1.6 SSE1.9 SSE1.9 SSE2.1 SSE2.6 S2.6 S2.4 S2.4 S2.6 S3.1 S3.2 SSW3.1 SSW2.6 S2.8 SSE2.3 S2.4 S2.6 S2.3 SSE2.7 SSE2.8 SE2.7 SSE1.7	Diurnal Average
SSW15 NE17 NNE15 NNE16 SSW17 NE16 WSW20 WSW20 WSW19 SW19 SW19 SW17 SW20 SW19 SW18 N14 NNE15 NE16 WSW25 WSW24 WSW18 WSW15 NE22 NNE20	Diurnal Maximum

All monthly, daily, and diurnal averages have been calculated using vector methods



Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8 km/h on Dec 15 22:00 Minimum Value: 1 km/h on Dec 20 00:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 5																		Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	2	2	3	1	1	1	1	1	2	1	2	2	2	2	2	3	2	2	1	2	2	2	1	1	3
2-Dec	1	1	2	2	2	2	2	2	1	2	2	3	3	3	4	2	2	6	3	4	3	2	3	2	6
3-Dec	3	3	1	2	3	1	2	2	1	1	1	2	3	3	3	5	2	3	2	2	2	2	3	1	5
4-Dec	2	2	2	2	3	1	2	2	3	1	1	1	2	2	2	2	1	1	1	1	2	2	2	3	3
5-Dec	4	1	3	3	3	3	4	5	4	4	3	3	4	3	4	4	3	1	1	1	1	1	1	1	5
6-Dec	1	2	1	1	2	1	2	2	3	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	3
7-Dec	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2
8-Dec	5	3	4	2	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	3	1	2	2	1	5
9-Dec	1	1	1	2	1	1	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3
10-Dec	1	4	3	3	3	2	2	2	2	4	1	1	1	1	3	2	3	1	2	1	1	1	1	1	4
11-Dec	1	1	2	1	1	1	1	1	1	1	1	2	3	2	2	1	1	1	1	3	3	3	3	2	3
12-Dec	2	2	2	4	3	4	4	3	4	4	5	4	3	4	4	4	4	4	4	4	3	3	2	2	5
13-Dec	3	2	2	2	2	2	3	3	2	1	2	2	2	2	2	2	2	2	1	2	1	2	1	1	3
14-Dec	1	2	2	2	1	2	1	1	1	1	1	2	3	2	3	3	3	2	2	2	2	3	3	3	3
15-Dec	3	3	3	2	2	2	3	3	2	2	3	4	2	3	5	3	2	2	4	1	2	8	5	5	8
16-Dec	4	3	3	1	1	4	3	2	2	2	2	2	1	2	2	2	3	1	1	1	2	1	1	1	4
17-Dec	1	1	1	1	2	2	1	2	3	3	2	2	2	2	2	3	3	4	5	3	3	3	2	2	5
18-Dec	2	2	2	1	1	1	2	2	2	2	2	2	2	2	2	3	3	2	2	1	1	1	2	1	3
19-Dec	1	2	2	2	2	3	2	1	1	2	1	2	2	1	1	1	1	2	1	1	1	1	2	1	3
20-Dec	2	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	2	2	3	2	3
21-Dec	2	2	3	2	1	2	2	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	3	2	3
22-Dec	3	2	3	4	4	4	3	3	4	3	3	2	2	3	4	4	4	4	3	3	3	3	2	2	4
23-Dec	2	2	2	2	2	3	3	3	2	2	2	2	3	3	3	3	3	2	3	3	2	2	3	3	3
24-Dec	3	2	3	3	3	3	5	2	2	4	3	3	1	1	1	1	1	1	1	1	1	1	1	1	5
25-Dec	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	2	4	2	2	2	4	4	3	3	4
26-Dec	3	3	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	3	2	1	1	1	2	3
27-Dec	1	1	1	1	1	1	2	3	5	4	4	5	5	4	2	2	1	1	2	1	1	2	1	2	5
28-Dec	2	1	2	3	3	2	2	3	2	2	2	3	3	2	2	2	1	1	1	1	1	1	2	1	3
29-Dec	1	2	2	2	3	2	1	1	2	2	2	3	4	3	4	3	2	3	2	3	4	4	3	3	4
30-Dec	3	4	3	1	1	2	2	1	2	3	4	3	4	3	2	2	2	3	2	2	2	3	4	4	4
31-Dec	3	3	4	4	5	5	3	3	7	3	5	3	4	3	3	4	1	1	2	1	1	2	1	1	7
Diurnal Maximum																									





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Shell Muskeg River - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	252	33.87	33.87
6 - 11	344	46.24	80.11
12 - 19	141	18.95	99.06
20 - 28	7	0.94	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Shell Muskeg River - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	2	5	13	24	24	13	17	27	41	34	12	12	6	8	9	5	252
6 - 11	10	8	22	31	16	4	20	35	62	92	18	2	10	6	4	4	344
12 - 19	4	20	37	1	0	0	3	15	10	22	15	7	2	5	0	0	141
20 - 28	0	1	1	0	0	0	0	0	0	0	1	4	0	0	0	0	7
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	16	34	73	56	40	17	40	77	113	148	46	25	18	19	13	9	744

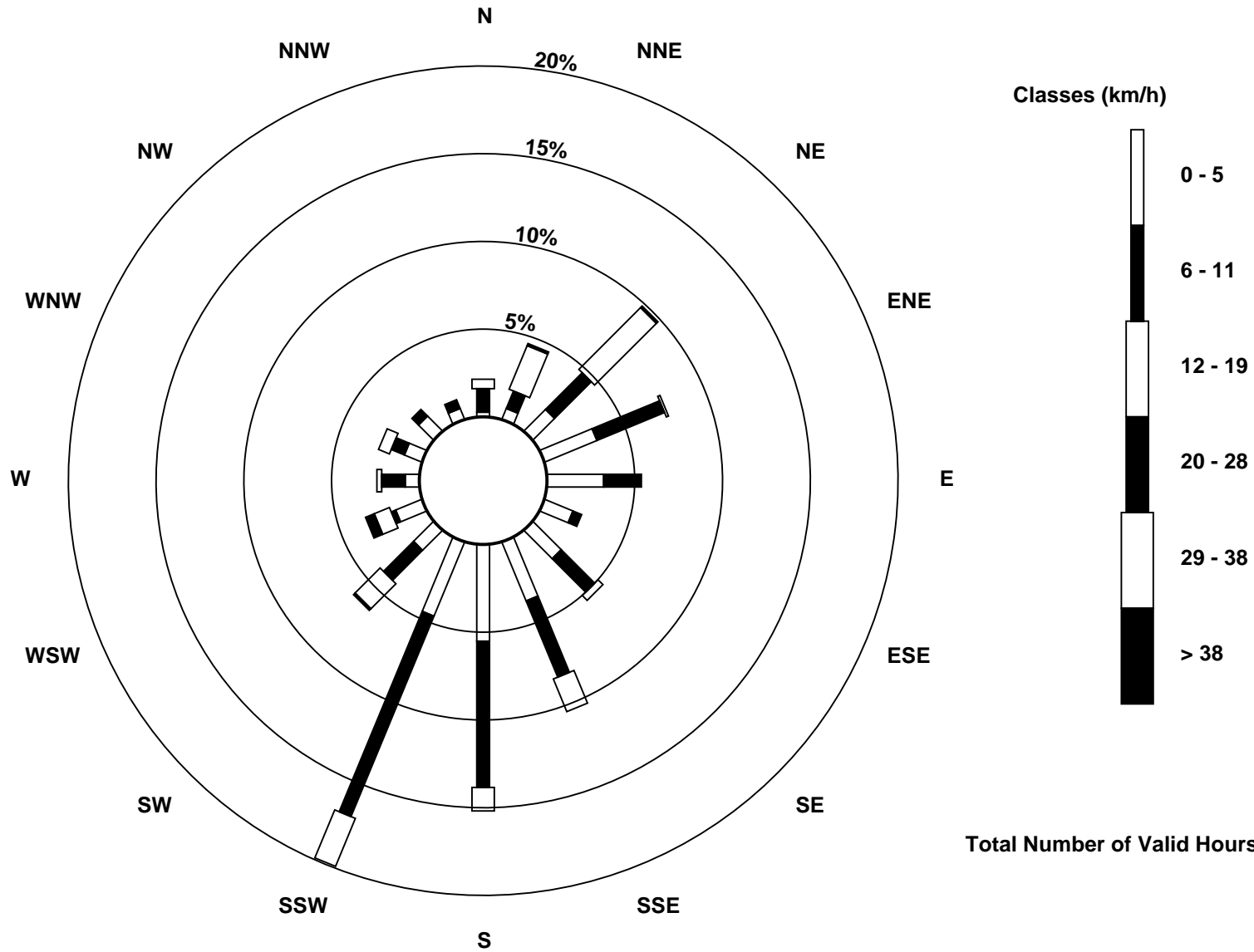
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
Shell Muskeg River (AMS 16)





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Wind Direction (WD) - deg**

**Shell Muskeg River - December 2015**

Direction of Maximum Speed: 246 deg on Dec 2 19:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 26.5 deg on Dec 22	Hours of Data: 744
Direction of Minimum Speed: 135 deg on Dec 13 23:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 1.8 deg on Dec 25	Percent Operational Time: 100.0
Monthly Average Direction: 197.7 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	180	192	178	182	182	179	192	192	188	198	210	203	196	201	189	187	194	198	211	208	195	179	178	181	192.2
2-Dec	194	203	205	191	198	202	204	207	200	234	211	201	199	199	204	202	212	234	246	249	249	245	245	291	222.4
3-Dec	287	307	272	150	223	196	189	175	148	49	307	9	37	51	34	25	15	25	329	326	38	60	62	73	17.7
4-Dec	28	49	53	65	56	136	67	67	222	180	198	208	207	202	208	208	167	164	145	150	189	209	223	279	185.1
5-Dec	276	289	289	292	282	266	252	257	252	246	236	227	225	234	235	224	221	189	202	196	189	160	141	176	242.3
6-Dec	173	177	260	53	60	152	92	70	53	159	164	203	125	102	270	185	207	192	194	188	174	184	182	203	175.2
7-Dec	196	203	184	201	213	223	158	213	243	147	90	224	276	215	191	174	187	190	192	202	204	204	271	327	203.2
8-Dec	5	46	46	290	191	161	184	175	187	189	175	190	169	188	159	156	163	153	126	109	73	73	68	65	124.7
9-Dec	77	77	64	60	60	59	72	75	72	75	81	62	47	58	96	202	253	282	258	183	174	186	196	204	80.2
10-Dec	188	51	66	71	63	61	72	79	62	81	37	86	109	88	62	72	54	293	307	318	75	58	53	53	62.4
11-Dec	50	46	56	71	80	89	115	183	132	142	151	152	163	153	147	144	137	130	139	144	145	143	141	145	130.8
12-Dec	154	163	168	149	152	143	141	139	143	150	149	156	162	156	152	153	152	157	161	155	152	155	151	152	152.2
13-Dec	153	148	139	150	152	148	146	164	159	159	148	127	117	71	61	68	50	67	127	304	90	30	135	164	125.7
14-Dec	168	283	313	295	265	261	224	180	193	213	206	214	214	217	228	247	244	199	191	185	189	189	190	187	217.8
15-Dec	178	191	187	180	183	176	183	187	194	209	228	219	225	227	222	209	209	216	208	176	306	11	36	27	200.2
16-Dec	12	26	118	180	217	292	289	282	264	259	250	222	217	217	207	215	232	269	266	296	258	156	179	155	255.6
17-Dec	196	184	179	202	100	98	147	352	8	345	334	329	319	288	289	315	52	65	48	34	44	62	82	100	38.0
18-Dec	90	85	102	91	114	93	100	89	88	93	100	90	106	97	92	70	76	95	132	132	113	141	83	136	95.3
19-Dec	104	123	136	143	141	145	148	207	238	167	121	161	182	236	259	235	138	45	67	87	79	296	193	237	150.2
20-Dec	186	206	210	198	207	199	202	201	212	212	208	219	213	239	219	207	209	204	172	173	171	175	174	172	197.3
21-Dec	178	177	178	180	205	199	203	178	195	207	193	194	200	209	176	146	138	341	115	255	208	304	30	42	185.8
22-Dec	47	33	31	28	14	22	36	26	16	30	36	42	43	9	1	5	24	22	11	27	30	20	37	47	26.5
23-Dec	46	47	46	46	45	37	32	20	41	45	44	43	355	11	12	25	37	46	41	45	44	44	33	359	37.3
24-Dec	357	344	20	2	1	29	50	94	72	55	51	30	305	191	144	157	140	173	166	162	153	170	194	182	50.5
25-Dec	193	184	198	184	179	196	195	186	182	184	236	278	258	255	326	77	43	42	46	33	20	43	81	47	66.2
26-Dec	48	45	50	99	122	74	78	63	168	121	75	138	114	218	71	49	53	60	53	59	89	81	62	70	66.6
27-Dec	86	84	97	89	172	96	133	154	153	154	160	160	162	166	161	156	166	175	165	161	165	179	177	205	157.1
28-Dec	203	177	259	307	358	46	52	36	54	54	51	52	47	20	340	317	278	243	212	211	203	186	189	198	38.8
29-Dec	201	188	195	188	210	201	215	197	220	225	211	198	193	195	191	189	179	182	187	190	191	192	201	210	196.3
30-Dec	203	217	212	187	189	191	184	192	185	204	208	213	211	212	180	192	213	214	211	199	179	207	205	202	202.5
31-Dec	192	196	198	200	198	190	204	211	212	227	235	219	209	209	221	220	197	191	200	192	188	200	173	186	205.1

144.1 131.8 157.4 150.4 168.0 153.6 160.7 174.5 170.9 182.2 183.3 181.5 186.4 199.4 193.8 182.1 167.1 169.4 181.3 171.5 159.3 158.7 142.6 149.4  
Diurnal Average

All monthly, daily, and diurnal averages have been calculated using vector methods





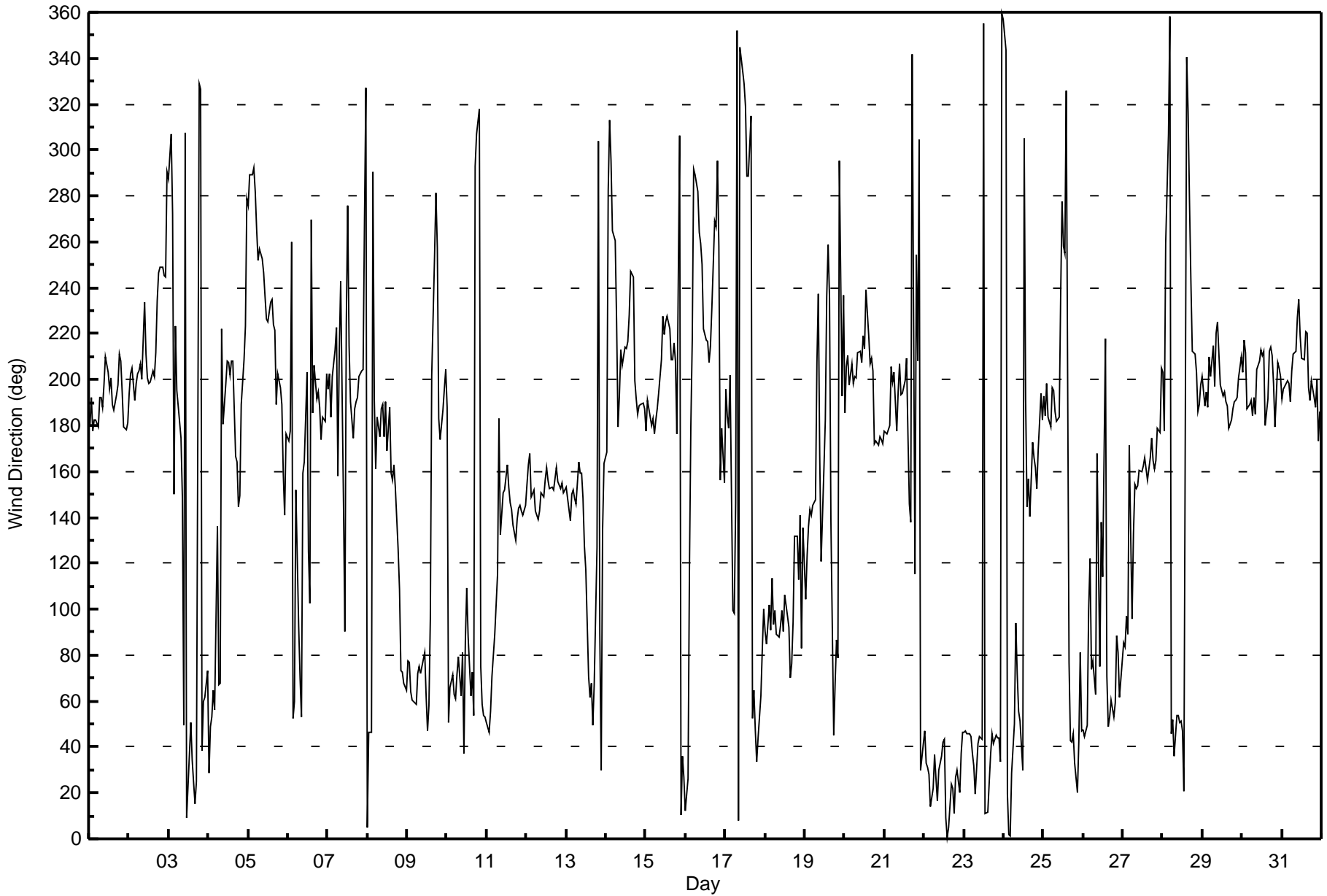
Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Direction (WD) - deg

Shell Muskeg River - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0																			Hours in Service: 744						
Maximum Value: 99 deg on Dec 17 08:00																			Hours of Data: 744						
Minimum Value: 5 deg on Dec 10 23:00																			Hours of Missing Data: 0						
Percentiles: P <sub>1</sub> = 8 P <sub>10</sub> = 11 Q <sub>1</sub> = 14 Median = 17 Q <sub>3</sub> = 25 P <sub>90</sub> = 53 P <sub>99</sub> = 90																			Hours of Calibration: 0						
Percentiles: P <sub>1</sub> = 8 P <sub>10</sub> = 11 Q <sub>1</sub> = 14 Median = 17 Q <sub>3</sub> = 25 P <sub>90</sub> = 53 P <sub>99</sub> = 90																			Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	12	15	18	12	10	9	12	10	26	20	26	38	43	24	23	16	13	14	11	10	18	12	10	12	43
2-Dec	12	13	17	20	15	17	13	19	15	17	18	23	22	22	19	16	13	13	9	7	9	8	17	43	43
3-Dec	44	24	15	64	40	37	21	21	19	70	19	37	23	10	25	50	39	26	33	52	60	15	55	62	70
4-Dec	27	13	25	23	68	52	63	47	75	50	19	19	17	16	21	15	11	28	11	12	27	15	20	17	75
5-Dec	17	18	14	13	10	14	9	11	11	12	11	12	11	10	11	16	22	25	12	14	30	16	12	20	30
6-Dec	27	56	53	25	18	69	26	39	59	91	51	80	77	76	27	21	17	15	16	16	11	17	15	17	91
7-Dec	20	15	13	20	11	13	56	34	36	41	24	66	88	50	43	26	22	29	22	59	15	18	40	24	88
8-Dec	46	13	41	80	65	24	31	19	12	14	16	18	41	25	23	19	20	19	26	25	14	10	17	13	80
9-Dec	11	11	10	8	9	17	53	11	11	8	19	33	13	20	22	71	19	11	32	18	14	18	15	13	71
10-Dec	73	48	14	16	13	12	17	13	16	53	50	23	47	24	51	71	12	93	54	46	73	8	5	9	93
11-Dec	8	13	51	15	11	14	28	18	10	11	12	20	23	18	18	14	16	13	15	16	17	17	18	19	51
12-Dec	23	20	19	18	16	17	16	17	18	18	17	19	16	17	17	16	18	16	15	16	15	15	15	15	23
13-Dec	14	14	17	14	13	14	14	20	14	17	17	18	21	22	14	13	20	26	73	89	63	61	97	29	97
14-Dec	17	56	15	21	19	15	21	30	17	24	23	14	21	17	15	11	12	19	16	14	15	17	17	19	56
15-Dec	15	16	17	16	13	12	14	16	17	13	10	16	17	15	30	15	13	10	25	98	78	86	15	14	98
16-Dec	19	23	48	20	17	14	17	10	21	10	22	14	11	11	20	13	12	14	11	10	61	49	30	14	61
17-Dec	21	25	19	49	28	22	43	99	26	21	35	26	22	17	21	74	16	34	31	14	19	20	26	27	99
18-Dec	19	18	27	17	21	32	17	23	16	14	19	19	20	18	13	10	12	27	14	41	15	34	14	43	43
19-Dec	23	17	16	15	15	19	15	73	25	83	15	22	60	27	17	27	56	60	41	79	18	72	56	23	83
20-Dec	11	12	11	14	13	12	14	13	12	12	15	15	24	10	28	13	12	14	23	20	17	15	15	14	28
21-Dec	12	14	15	12	18	13	15	13	18	13	17	24	21	16	15	15	65	41	85	96	44	82	44	15	96
22-Dec	12	19	13	15	17	16	13	18	19	14	18	12	10	21	16	22	16	19	18	15	20	18	13	8	22
23-Dec	8	8	9	9	10	17	28	46	11	9	9	11	31	24	26	24	12	9	11	10	11	8	19	22	46
24-Dec	22	26	21	23	23	18	34	59	79	90	19	40	82	43	23	17	16	17	9	9	13	17	14	11	90
25-Dec	14	13	15	13	18	17	18	17	30	70	21	20	19	28	42	37	25	9	8	14	21	71	56	12	71
26-Dec	11	53	62	72	66	81	76	69	58	23	12	22	64	73	59	20	9	14	35	31	27	67	26	25	81
27-Dec	49	30	62	31	92	26	23	16	16	17	16	18	16	18	16	15	16	12	16	14	14	17	22	22	92
28-Dec	24	27	21	25	24	11	6	18	10	10	8	10	9	49	32	56	25	27	21	44	22	17	20	16	56
29-Dec	14	13	15	15	17	20	23	19	18	11	17	20	18	18	17	16	13	13	14	15	14	16	16	15	23
30-Dec	27	19	20	17	13	13	26	15	15	13	14	18	23	16	45	18	13	16	16	18	17	18	17	18	45
31-Dec	16	16	17	18	19	17	16	13	26	10	11	14	23	21	9	13	16	13	16	14	14	15	9	13	26
	73	56	62	80	92	81	76	99	79	91	51	80	88	76	59	74	65	93	85	98	78	86	97	62	
Diurnal Maximum																									





# Wood Buffalo Environmental Association SO2 Calibration Report

## Station Information

Calibration Date	December 9, 2015	Last Calibration	November 13, 2015
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Routine		
Start Time (MST)	9:40	End Time (MST)	13:55
Gas Cert Reference	LL104193	Station temp.	22 Deg C
Cal Gas Concentration	48.3 ppm	Cal Gas Exp Date	12-Feb-18
Calibrator Make/Model	API T700	Serial Number	493
ZAG Make/Model	API 701	Serial Number	2155
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2632

## Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-710	-710
Analyzer IP address	192.168.1.43		Lamp voltage	770	773
Calculated slope	1.002701	1.004322	Chamber temp	44.9	45.0
Calculated intercept	0.314501	1.326667	Pressure	689.7	692.7
Analyzer Background	8.8	8.8	Flow	0.433	0.433
Analyzer Coefficient	1.215	1.215	Intensity	91	91

Analyzer make Thermo 43i Analyzer serial # 1118148498

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.5	----
as found span	5000	83.6	807.6	803.6	1.005
calibrator zero	5000	0.0	0.0	-0.5	----
high point	5000	83.6	807.6	803.6	1.005
second point	5000	42.0	405.7	401.1	1.012
third point	5000	21.1	203.8	201.7	1.011
as left zero	6000	0.0	0.0	0.0	----
as left span	5000	83.6	807.6	798.6	1.011
Average Correction Factor					1.009

Corrected As found 804.1 Previous response 805.1 % change 0.1%

**Notes:**

Changed inlet filter after as founds. No adjustments.

Calibration Performed By: Evan Magill



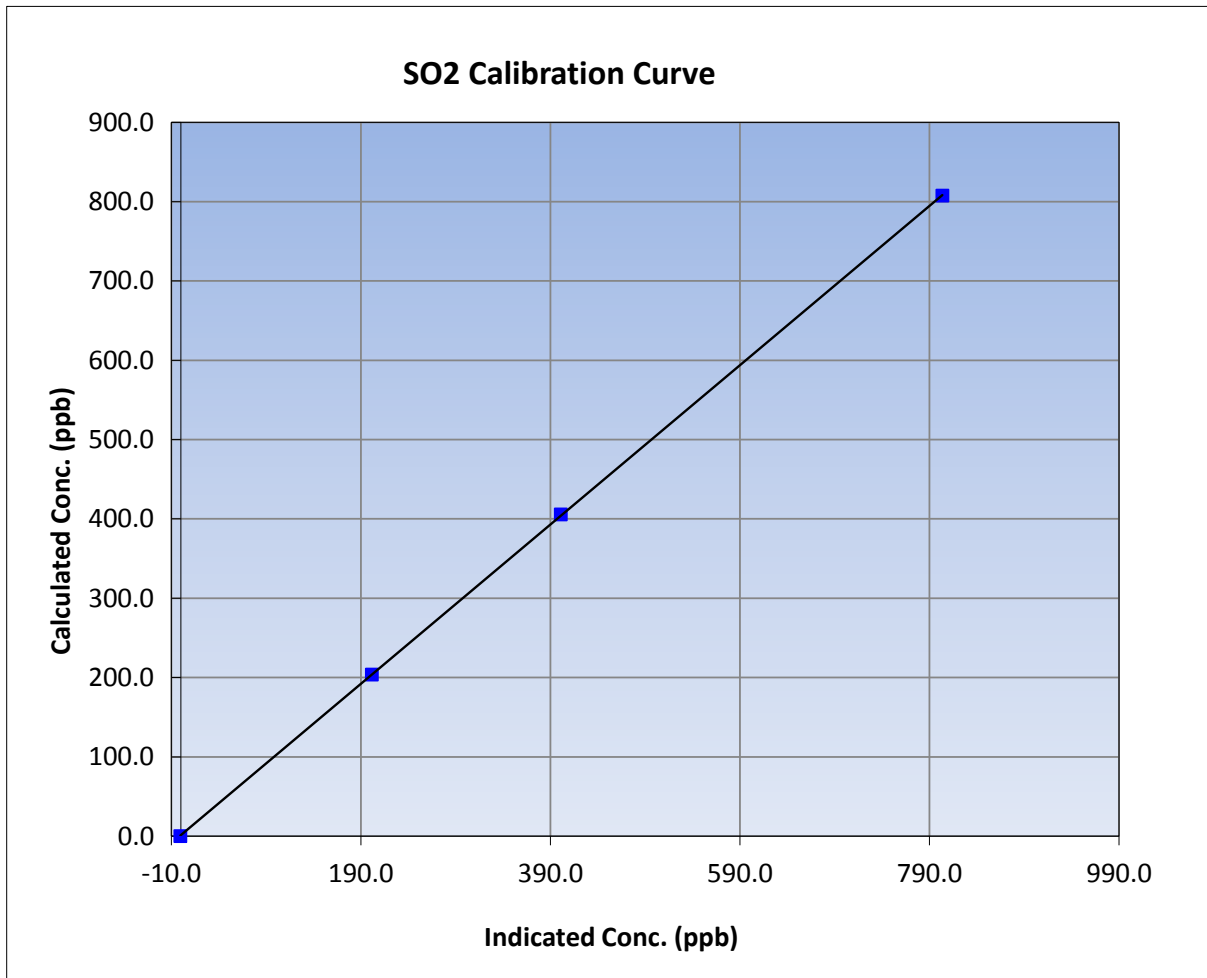
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 9, 2015	Previous Calibration	November 13, 2015
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	9:40	End Time (MST)	13:55
Analyzer make	Thermo 43i	Analyzer serial #	1118148498

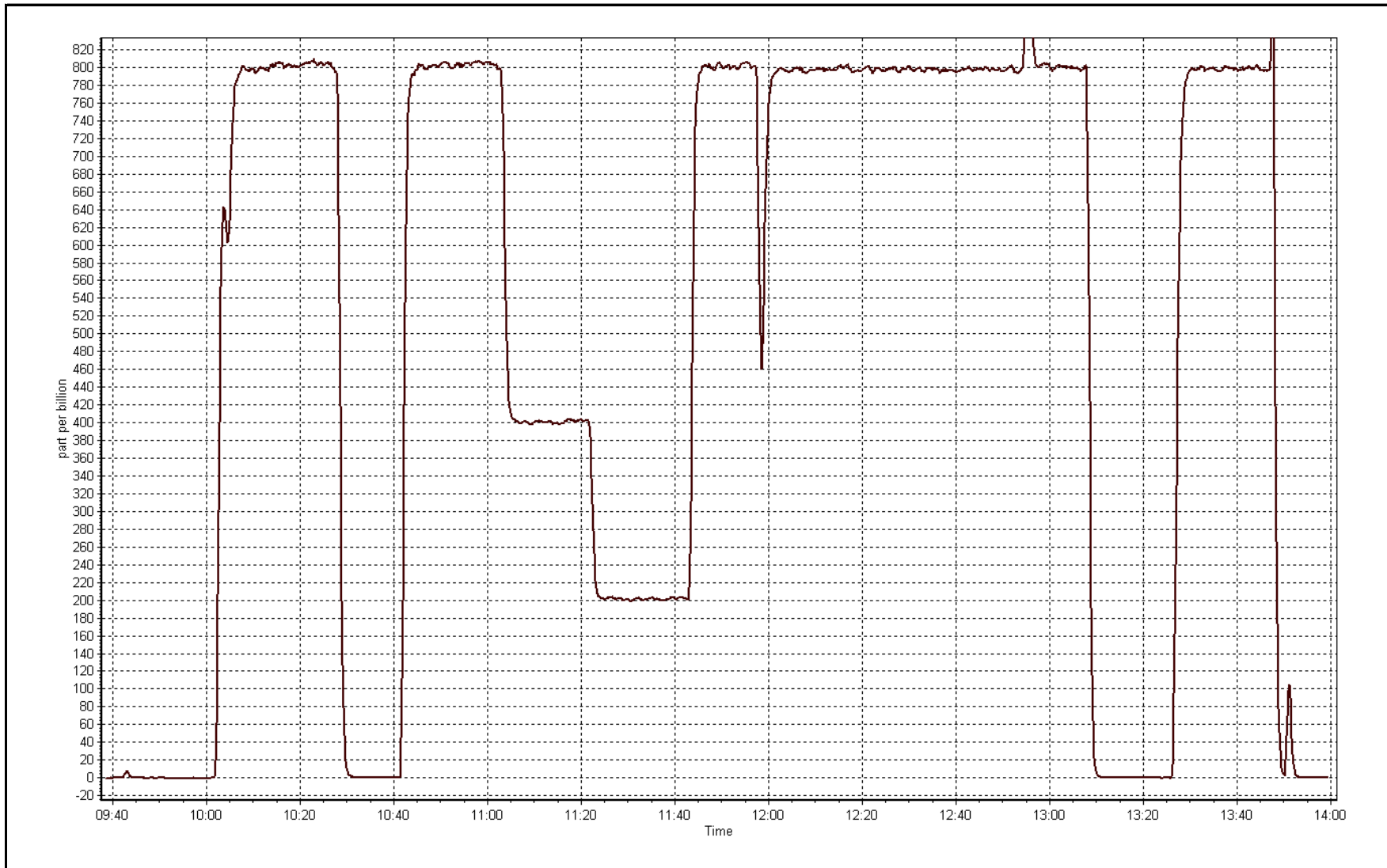
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.5	----	Correlation Coefficient	0.999989
807.6	803.6	1.0050		
405.7	401.1	1.0116	Slope	1.004322
203.8	201.7	1.0108		
			Intercept	1.326667



SO2 Calibration Plot

Date: December 9, 2015





# Wood Buffalo Environmental Association THC Calibration Report

## Station Information

Calibration Date	December-09-15	Last Calibration	November-13-15
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Routine		
Start Time (MST)	9:40	End Time (MST)	13:55
Gas Cert Reference	LL104193	Cal Gas Expiry Date	12-Feb-18
CH4 Cal Gas Conc.	487 ppm	CH4 Equiv Conc.	1017.8 ppm
C3H8 Cal Gas Conc.	193 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	493
ZAG make/model	Teledyne API 701	Serial Number	2155
DACS make/model	Campbell Scientific CR3000	Serial Number	2632

## Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.2	8.2
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.8	34.8
Calculated slope	0.999881	0.999699	Fuel Pressure	24.2	24.2
Calculated intercept	0.028582	-0.015049	Analyzer Coeff	4.695	4.695
			Analyzer BKG	2.30	2.30

Analyzer make Thermo 51i-LT Analyzer serial # 1218153458

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.02	----
as found span	5000	83.6	17.02	17.04	0.999
calibrator zero	5000	0.0	0.00	-0.02	----
high point	5000	83.6	17.02	17.04	0.999
second point	5000	42.0	8.55	8.52	1.003
third point	5000	21.1	4.29	4.39	0.978
as left zero	6000	0.0	0.00	-0.05	----
as left span	5000	83.6	17.02	17.13	0.993
Average Correction Factor					0.993

Corrected As found 17.06 Previous response 16.99 % change -0.4%

**Notes:**

Changed inlet filter after as founds. No adjustments.

Calibration Performed By:

Evan Magill



# Wood Buffalo Environmental Association THC Calibration Report

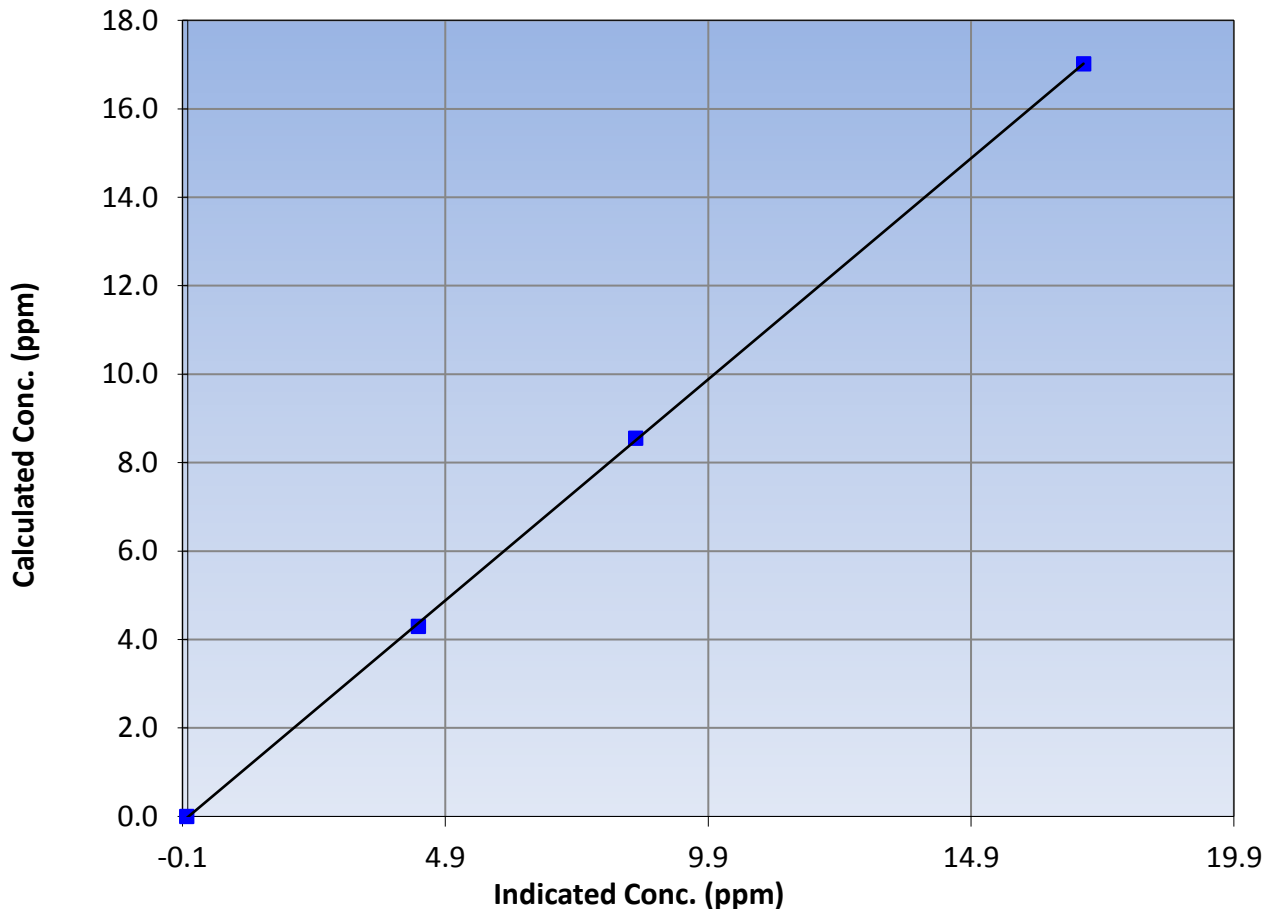
## Station Information

Calibration Date	December 9, 2015	Previous Calibration	November 13, 2015
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	9:40	End Time (MST)	13:55
Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153458

## Calibration Data

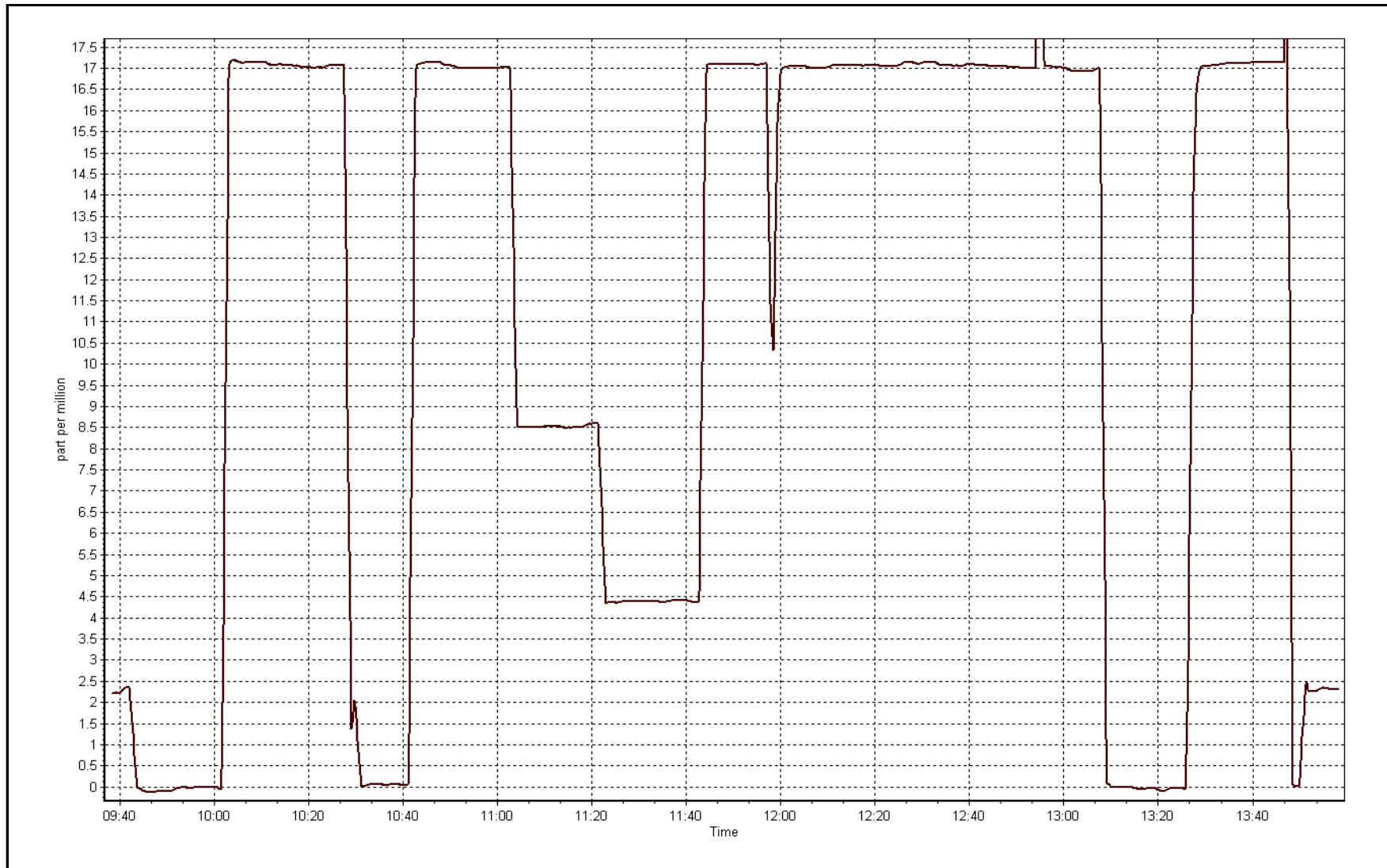
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.02	----	Correlation Coefficient	0.999939
17.02	17.04	0.9986		
8.55	8.52	1.0034	Slope	0.999699
4.29	4.39	0.9783		
			Intercept	-0.015049

**THC Calibration Curve**



THC Calibration Plot

Date: December 9, 2015







# Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

## Station Information

Calibration Date	December 9, 2015	Previous Calibration	November 24, 2015
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Routine		
Start Time (MST)	9:40	End Time (MST)	13:55
NO Cal Gas Conc	48 ppm	Gas Cert Reference	LL104193
NOX Cal Gas Conc	48 ppm	Cal Gas Expiry Date	February 12, 2018
Calibrator	API T700	Serial Number	493
Zero air Generator	Teledyne API T701	Serial Number	2155

## DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	2632
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## Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.998879	0.998227	1.004899
	Data Offset	-0.047313	0.384743	1.603146
Current Calibration	Data Slope	1.000502	0.999888	0.998154
	Data Offset	0.321145	0.809263	0.678750

## Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1426262593
---------------------	------------	-------------------	------------

Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.43		192.168.1.43	
NO coefficient	0.787		0.800	
NOX coefficient	0.997		0.997	
NO2 coefficient	1.000		1.000	
NO bkgrnd	8.6		8.8	
NOX bkgrnd	8.9		9.1	
Chamber Temp	50	Deg C	50	Deg C
Moly Temp	324.2	Deg C	323.2	Deg C
PMT voltage	-774	V	-774	V
PMT Temp	-2.7	Deg C	-2.7	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	173.1	mmHg	169.2	mmHg
R Cell Press Nox	172.8	mmHg	168.9	mmHg
NO sample flow	0.881	lpm	0.853	lpm
Nox sample Flow	0.884	lpm	0.855	lpm

**Notes:**

Changed inlet filter after as founds. Adjusted span. Used 2nd GPT points.



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

### Station Information

Calibration Date:

December 9, 2015

Station Number:

AMS 16

### Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	----	----
as found span	5000	83.6	802.6	802.6	0.0	790.5	789.7	0.8	1.0153	1.0163
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	----	----
high point	5000	83.6	802.6	802.6	0.0	802.0	802.3	-0.3	1.0007	1.0003
second point	5000	42.0	403.2	403.2	0.0	402.3	401.7	0.7	1.0021	1.0038
third point	5000	21.1	202.6	202.6	0.0	202.2	201.3	0.9	1.0020	1.0064
as left zero	6000	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	----	----
as left span	5000	83.6	802.6	513.6	288.9	800.3	508.0	292.3	1.0028	1.0111
Average Correction Factor									1.0016	1.0035

Corrected As found      NO<sub>x</sub>= 790.7                      NO= 789.8                      Percent Change              NO<sub>x</sub>= 1.6%                      NO= 1.8%  
 Previous Response      NO<sub>x</sub>= 803.5                      NO= 803.6

### GPT Calibration Data

Dilution Flow      5000      ccm      Source Gas Flow      83.60      ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero			0.0			-0.1			N/A	
1st NO2 (300)	----	513.6	285.3	799.5	513.6	285.9	0.9873	1.0000	0.9981	100.2%
2nd NO2 (200)	----	602.3	196.7	797.9	602.3	195.6	0.9893	1.0000	1.0055	99.5%
3rd NO2 (100)	----	697.0	101.9	798.0	697.0	100.9	0.9892	1.0000	1.0099	99.0%
4th NO2 (0)	799.0	----	-1.2	797.8	799.0	-1.2	0.9894	1.0000	N/A	----
Average Correction Factor							0.9888	1.0000	1.0045	99.6%

Calibration Performed By: Evan Magill



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

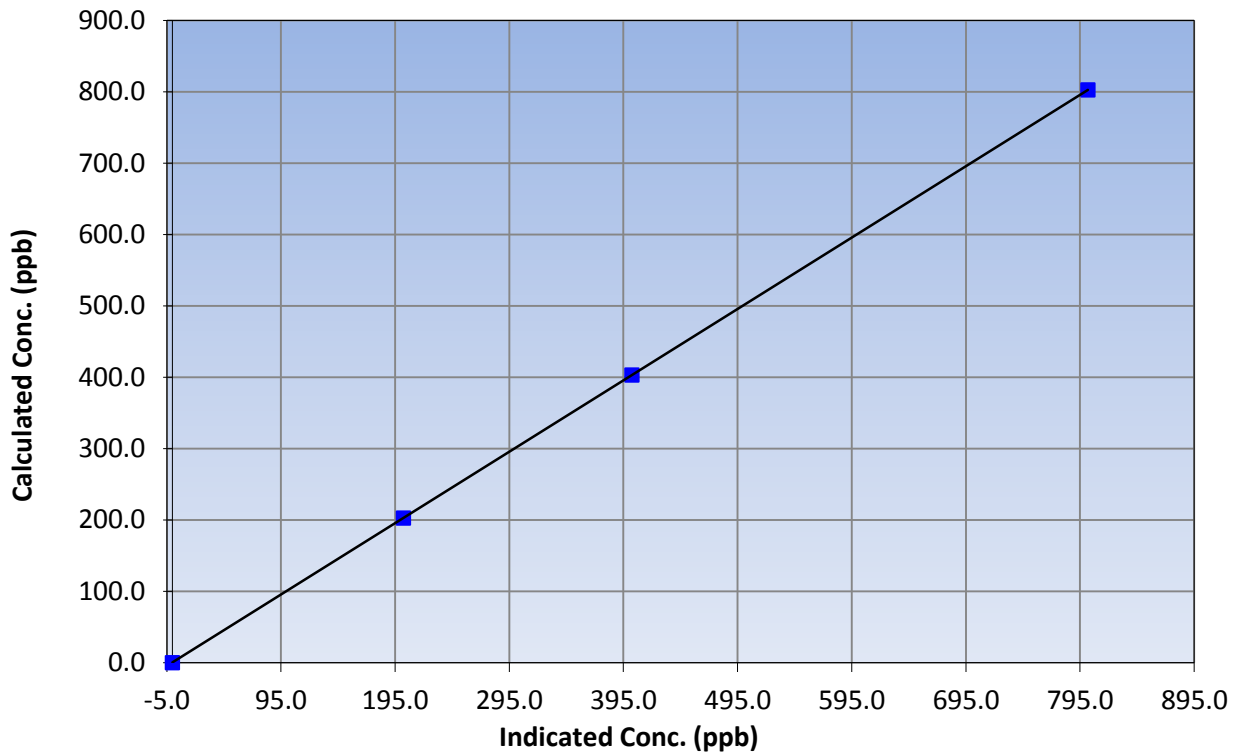
### Station Information

Calibration Date	December 9, 2015	Previous Calibration	November 24, 2015
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	9:40	End Time (MST)	13:55
Analyzer make	Thermo 42i	Analyzer serial #	1426262593

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	1.000000
802.6	802.0	1.0007		
403.2	402.3	1.0021	Slope	1.000502
202.6	202.2	1.0020		
			Intercept	0.321145

### NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

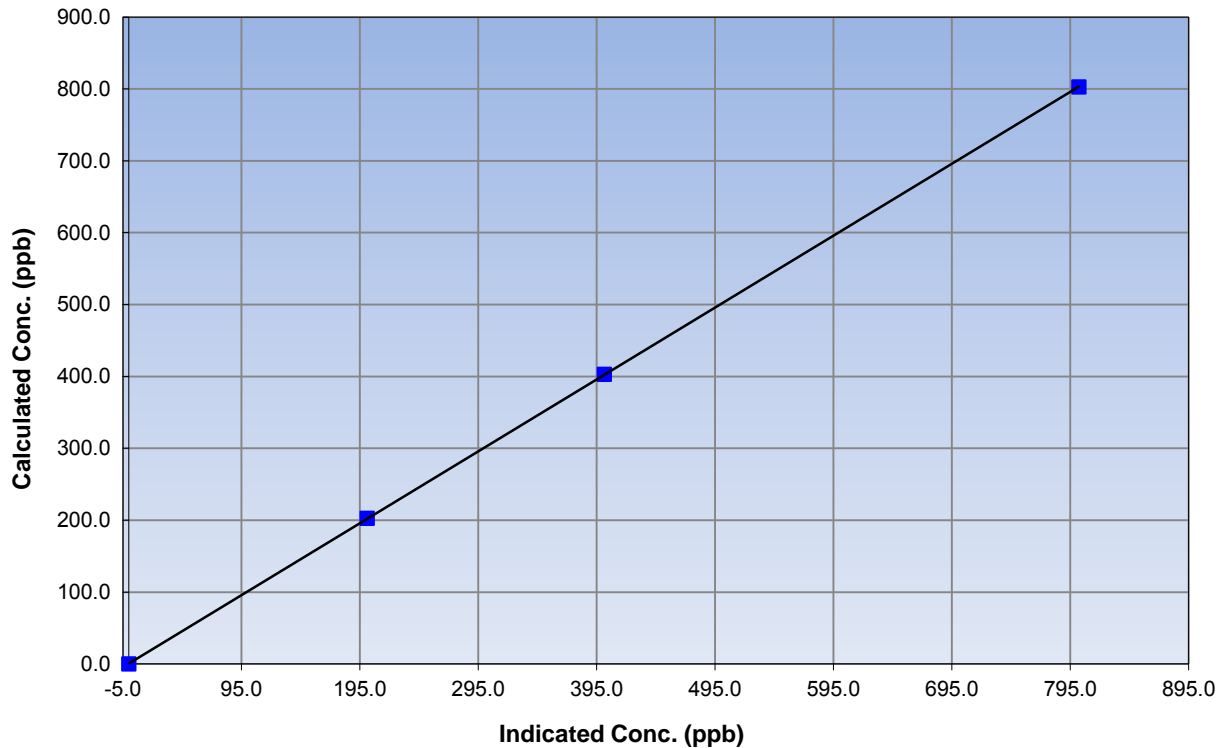
### Station Information

Calibration Date	December 9, 2015	Previous Calibration	November 24, 2015
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	9:40	End Time (MST)	13:55
Analyzer make	Thermo 42i	Analyzer serial #	1426262593

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999995
802.6	802.3	1.0003		
403.2	401.7	1.0038	Slope	0.999888
202.6	201.3	1.0064		
			Intercept	0.809263

### NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

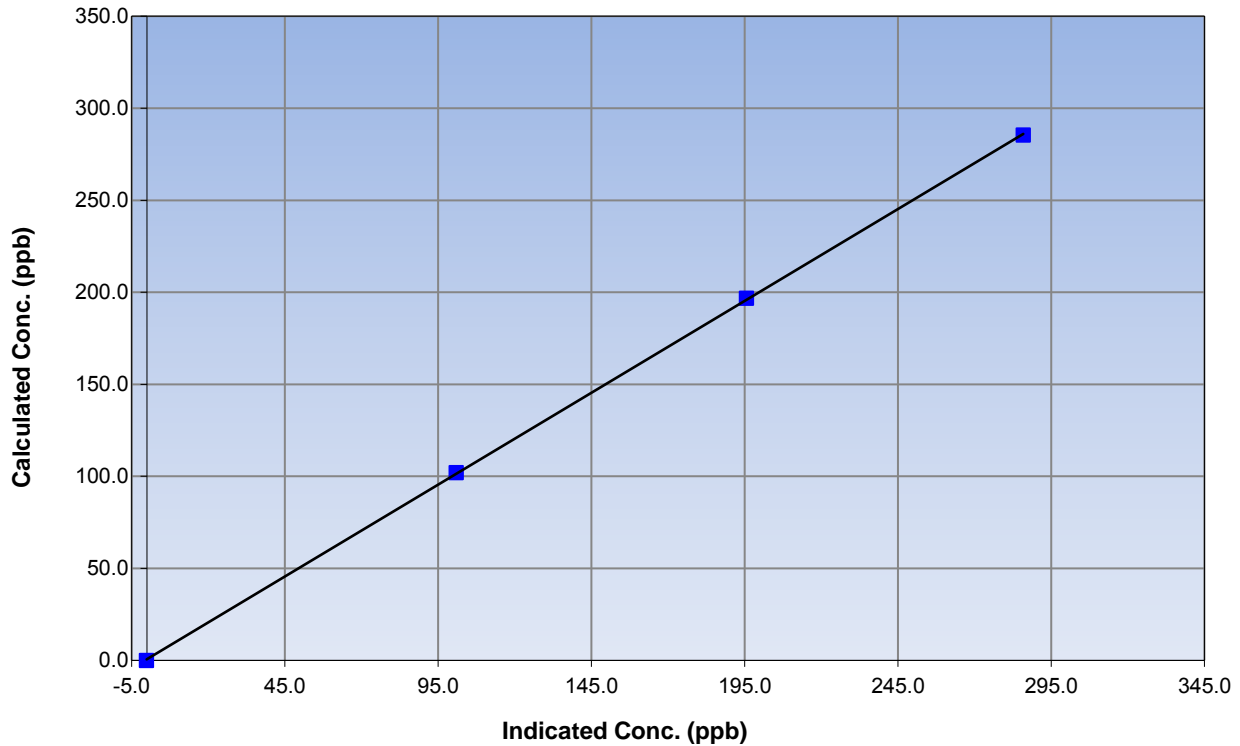
### Station Information

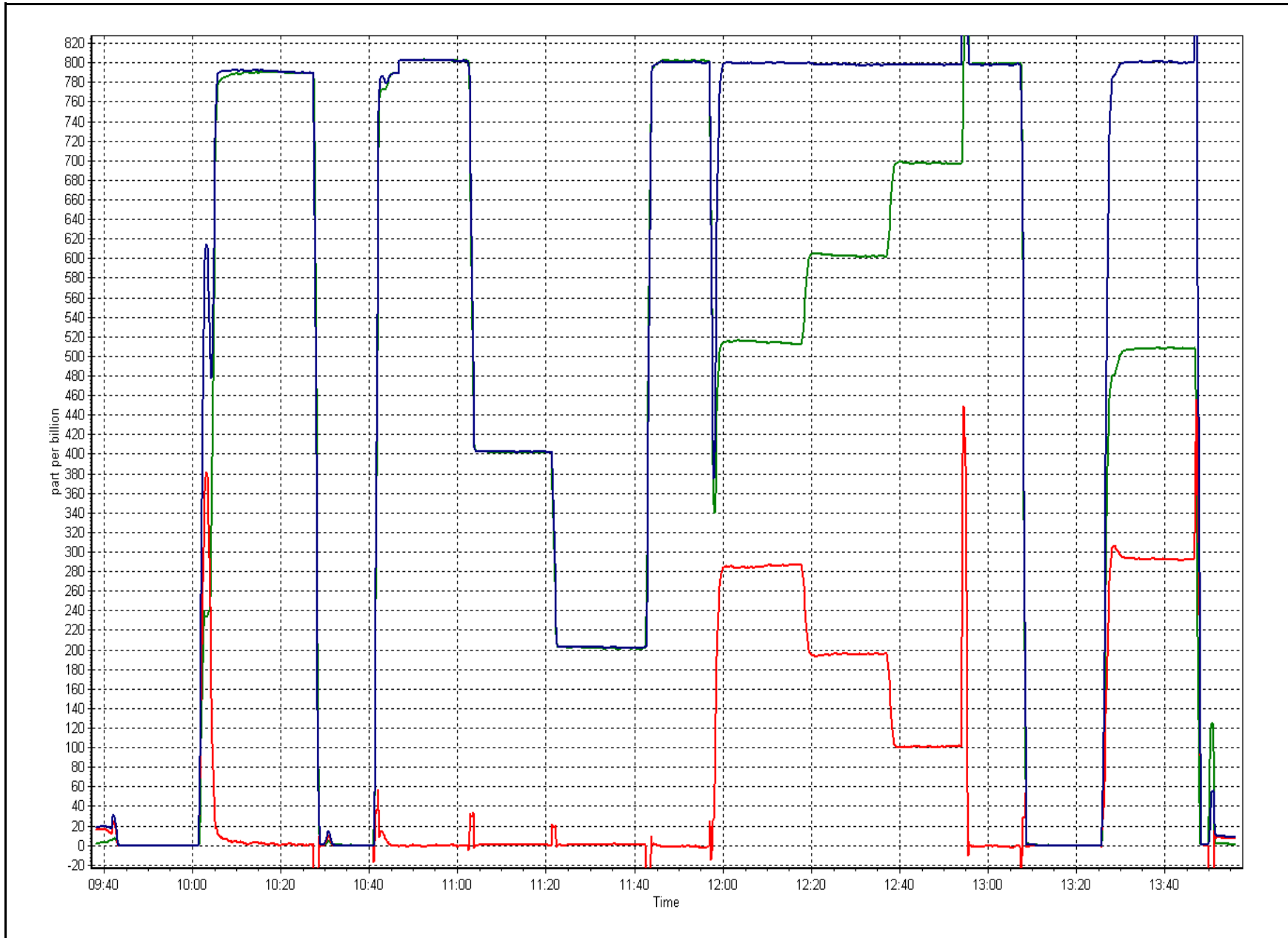
Calibration Date	December 9, 2015	Previous Calibration	November 24, 2015
Station Number	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	9:40	End Time (MST)	13:55
Analyzer make	Thermo 42i	Analyzer serial #	1426262593

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999963
285.3	285.9	0.9981		
196.7	195.6	1.0055	Slope	0.998154
101.9	100.9	1.0099		
			Intercept	0.678750

### NO<sub>2</sub> Calibration Curve







# Wood Buffalo Environmental Association

## SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	December 9, 2015	Previous Calibration:	November 24, 2015
Station Name:	Shell Muskeg River	Station Number:	AMS 16
Start Time (MST):	11:35	End Time (MST):	12:40
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	1102

SHARP INFORMATION			
Particulate Fraction:		PM2.5	
Make/Model:		Thermo / SHARP 5030	
Serial Number		E-798	
C <sub>14</sub> Source SN:		4142	
Confirmation of Time settings:		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Parameters Checked:	T1 <input checked="" type="checkbox"/> T2 <input type="checkbox"/> T3 <input type="checkbox"/> T4 <input type="checkbox"/>	P3 <input checked="" type="checkbox"/> Main Flow <input checked="" type="checkbox"/> Beta <input type="checkbox"/> Neph <input checked="" type="checkbox"/>	

CALIBRATION DATA				
Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	-2.5	-4.0	-1.5	-2.5
T2		na	na	
T3		na	na	
T4		na	na	
RH (%)		na	na	

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	960	959.4	-0.6	960

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1006	6	1006	1000

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	544		544
Neph	0		0
C14	9.3		9.3
Indicated Concentration (ug/m3)	0	no	0
Offset 1	na		na
Offset 2	na		na

Leak Check (Quarterly)			
Leak Check Date:	October 29, 2015	Previous Leak Check Date:	August 11, 2015
	Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.67		0.12
*Flow with adaptor (LPM):	16.55		
<i>*Note - do not attach adaptor without shutting off the pump first</i>			

Mass Foil Calibration (Annually)			
Foil Calibration Date:	May 25, 2015	Previous Foil Calibration:	na
Zeroed?:	yes		
Foil Mass:	1337		Mass foil set S/N: 2518
Previous Correction Factor:	7029		
New Correction Factor:	7067		

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	
Pump	Good	
Filter Tape	Good	
Mass Foil Cal Set	na	
HEPA filter	Good	

### NOTES:

No adjustments made. Replaced PM head with a clean one.

Calibration Performed By: Evan Magill



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## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 17  
WAPASU  
DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	709	35	35	100.00	14	0	4	0
H2S (ppb) Average	710	34	34	100.00	1	0	0	0
THC (ppm) Average	709	35	35	100.00	2.8	-	2.4	-
O3 (ppb) Average	709	35	35	100.00	40	0	32	-
NO2 (ppb) Average	709	35	35	100.00	20	0	13	-
NO (ppb) Average	709	35	35	100.00	18	-	2	-
NOX (ppb) Average	709	35	35	100.00	37	-	14	-
PM2.5 (ug/m3) Average	743	1	1	100.00	20.7	-	7.2	0
Temperature 2 m (C) Average	744	0	0	100.00	3.5	-	0.6	-
Relative Humidity (%) Average	744	0	0	100.00	96	-	95	-
Precipitation (mm) Total	744	0	0	100.00	0.5	-	1.7	-
Wind Speed 10 m (km/h) Average	743	0	1	99.87	21	-	14	-
Wind Direction 10 m (deg) Average	743	0	1	99.87	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	709	1.1	2	-	0	0	0	0	1	3	14
H2S (ppb) Average	710	0.3	0	-	0	0	0	0	0	0	1
THC (ppm) Average	709	2.26	0.1	-	2.1	2.2	2.2	2.2	2.3	2.4	2.8
O3 (ppb) Average	709	21	7	-	1	11	17	21	26	29	40
NO2 (ppb) Average	709	4	4	-	0	0	1	2	6	11	20
NO (ppb) Average	709	0.5	1	-	0	0	0	0	0	1	18
NOX (ppb) Average	709	4.5	5	-	0	0	1	2	7	12	37
PM2.5 (ug/m3) Average	743	3.94	2.7	-	0.3	1.1	1.9	3.7	5.3	7.3	20.7
Temperature 2 m (C) Average	744	-11.22	7.1	-	-33.5	-20.5	-16.6	-10.5	-5.8	-3.3	3.5
Relative Humidity (%) Average	744	83.2	9	-	41	74	81	85	89	93	96
Precipitation (mm) Total	744	-	-	8.37	-	-	-	-	-	-	-
Wind Speed 10 m (km/h) Average	743	7.5	4	-	1	3	5	7	10	13	21
Wind Direction 10 m (deg) Average	743	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed, Wind Direction	10 Dec 2015 13:00	10 Dec 2015 13:00	1	Flat line in sensor output signal -sensor frozen



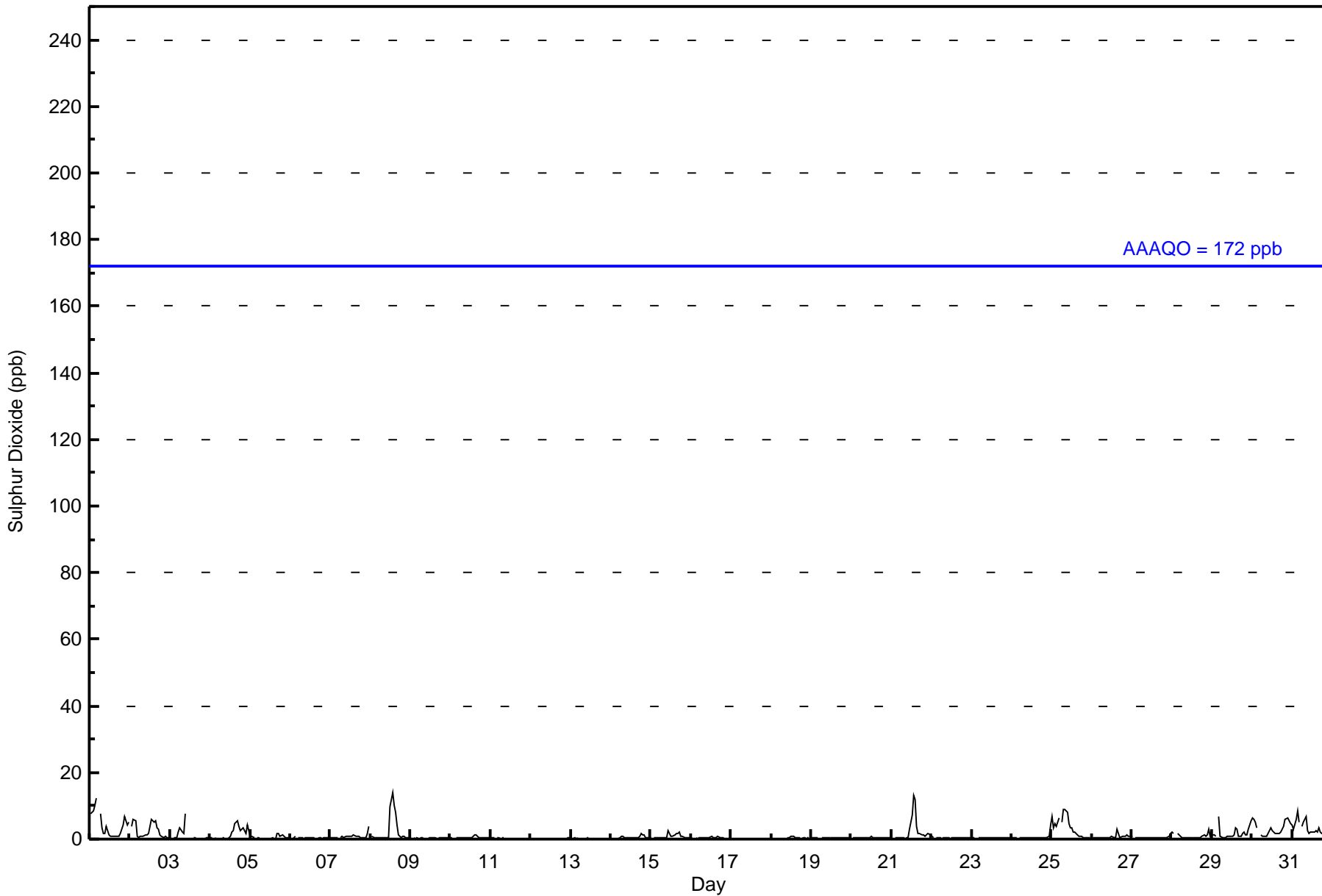
Summary of Hour Averages

Wapasu - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 14 ppb on Dec 8 14:00	Maximum Daily Average: 4.2 ppb on Dec 1		Hours of Data:	709
Minimum Value: 0 ppb on Dec 11 22:00	Minimum Daily Average: 0.1 ppb on Dec 17		Hours of Missing Data:	35
Maximum Diurnal Average: 1.7 ppb at hour 14	Minimum Diurnal Average: 0.4 ppb at hour 6		Hours of Calibration:	35
Monthly Average: 1.1 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 3 P <sub>99</sub> = 10		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	8	8	8	10	12	Z	7	4	2	2	4	1	1	1	1	1	1	1	2	3	4	7	4	5	4.2	12
2-Dec	Z	4	6	6	1	1	1	1	1	1	1	2	4	6	5	5	3	3	1	1	1	1	1	1	2.3	6
3-Dec	0	Z	1	0	0	2	3	2	2	8	C	C	C	C	0	0	0	0	0	0	0	0	0	1.1	8	
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	1	2	2	5	6	4	2	3	3	2	4	3	1.7	6
5-Dec	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	0	0	0.5	2
6-Dec	0	0	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
7-Dec	0	0	0	0	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4	0.8	4
8-Dec	Z	1	1	0	0	0	0	0	0	0	0	1	10	14	10	8	4	1	1	1	1	1	0	0	2.4	14
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
10-Dec	1	1	Z	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	1	1	1	0.6	1
11-Dec	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Dec	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	1	2	1	1	0	0	0	0.5	2
15-Dec	0	Z	0	0	0	0	0	0	0	0	2	2	1	1	1	2	2	2	1	1	1	0	0	0	0.8	2
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0.3	1
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
20-Dec	Z	0	0	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	1
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	3	7	13	12	4	2	2	1	1	1	1	2	1	2.3	13
22-Dec	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0.5	4
25-Dec	7	3	5	4	6	Z	5	9	9	8	5	3	3	2	2	1	1	1	1	0	0	0	0	0	3.4	9
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	3	2	0	1	1	1	1	1	1	1	0.7	3
27-Dec	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0.5	2
28-Dec	2	2	Z	2	1	1	1	1	0	0	1	1	0	1	0	0	0	0	1	1	1	1	3	1	0.9	3
29-Dec	1	1	1	Z	7	1	0	0	0	1	1	1	1	1	3	3	1	1	2	2	1	1	3	6	1.7	7
30-Dec	6	6	5	3	Z	1	1	1	1	1	2	3	3	2	2	1	2	2	3	4	6	6	6	5	3.1	6
31-Dec	4	3	6	9	5	Z	4	5	7	2	2	2	2	2	2	2	3	2	2	2	4	4	5	7	3.8	9
	1.4	1.3	1.4	1.5	1.5	0.4	0.9	0.9	0.9	0.9	0.8	0.8	1.3	1.7	1.6	1.4	1.1	0.9	0.8	0.8	1.0	1.0	1.2	1.4	Diurnal Average	
	8	8	8	10	12	2	7	9	9	8	5	3	10	14	12	8	6	4	3	4	6	7	6	7	Diurnal Maximum	

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Wapasu - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	705	99.44	99.44
11 - 20	4	0.56	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744





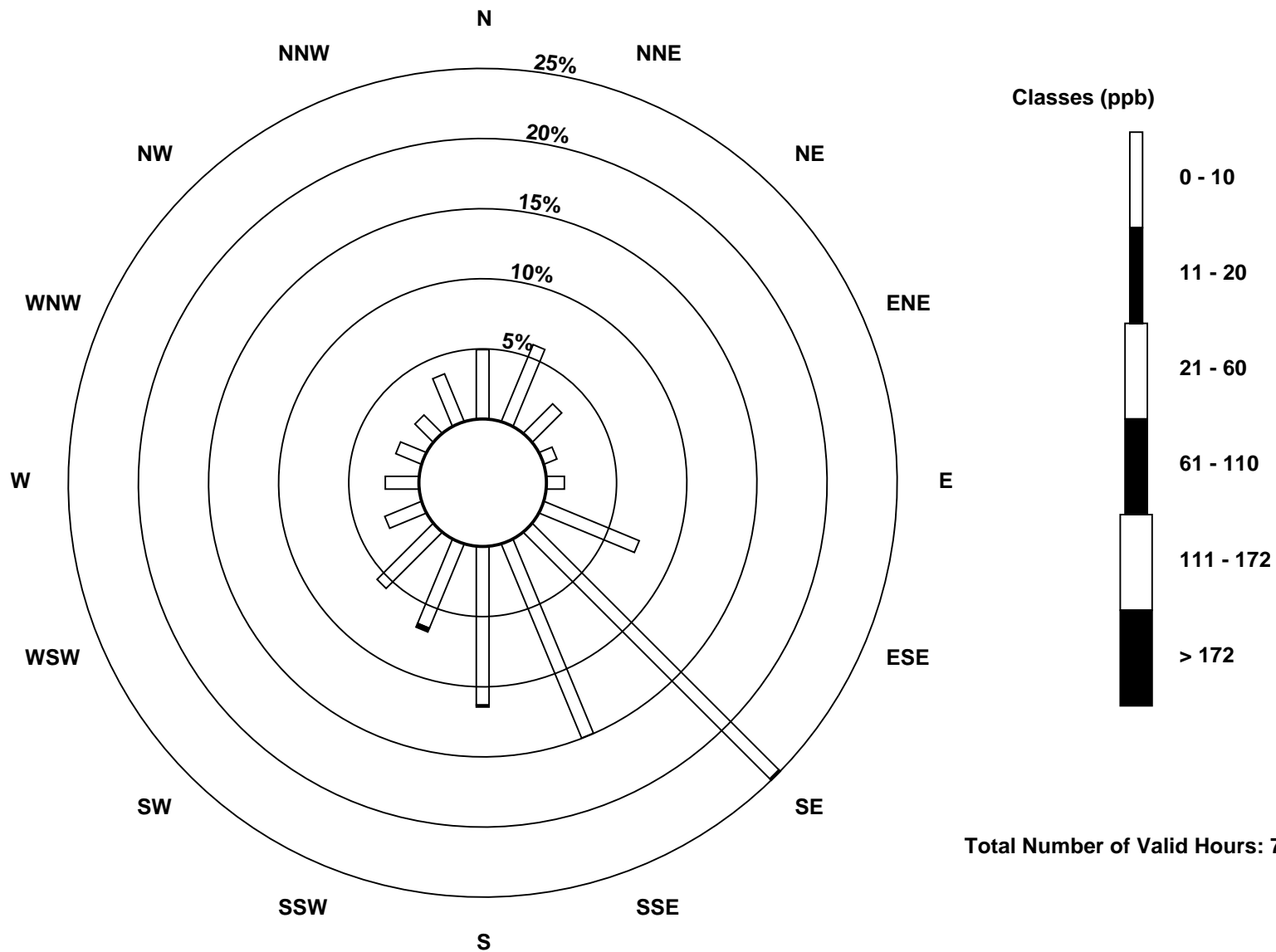
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Wapasu - December 2015**

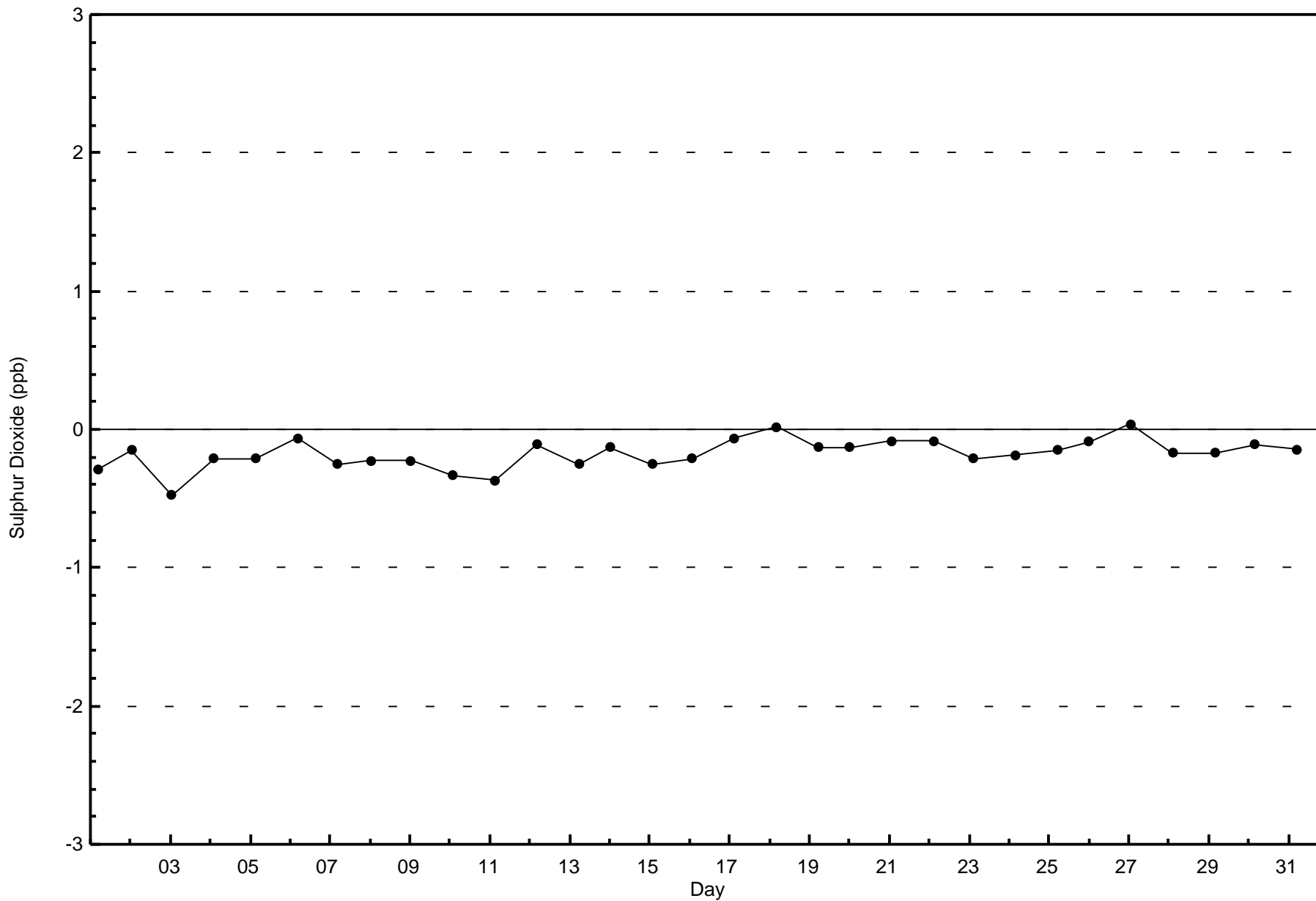
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	35	42	21	7	9	52	176	106	80	46	40	20	17	14	13	26	704
11 - 20	0	0	0	0	0	0	1	0	1	2	0	0	0	0	0	0	4
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	35	42	21	7	9	52	177	106	81	48	40	20	17	14	13	26	708

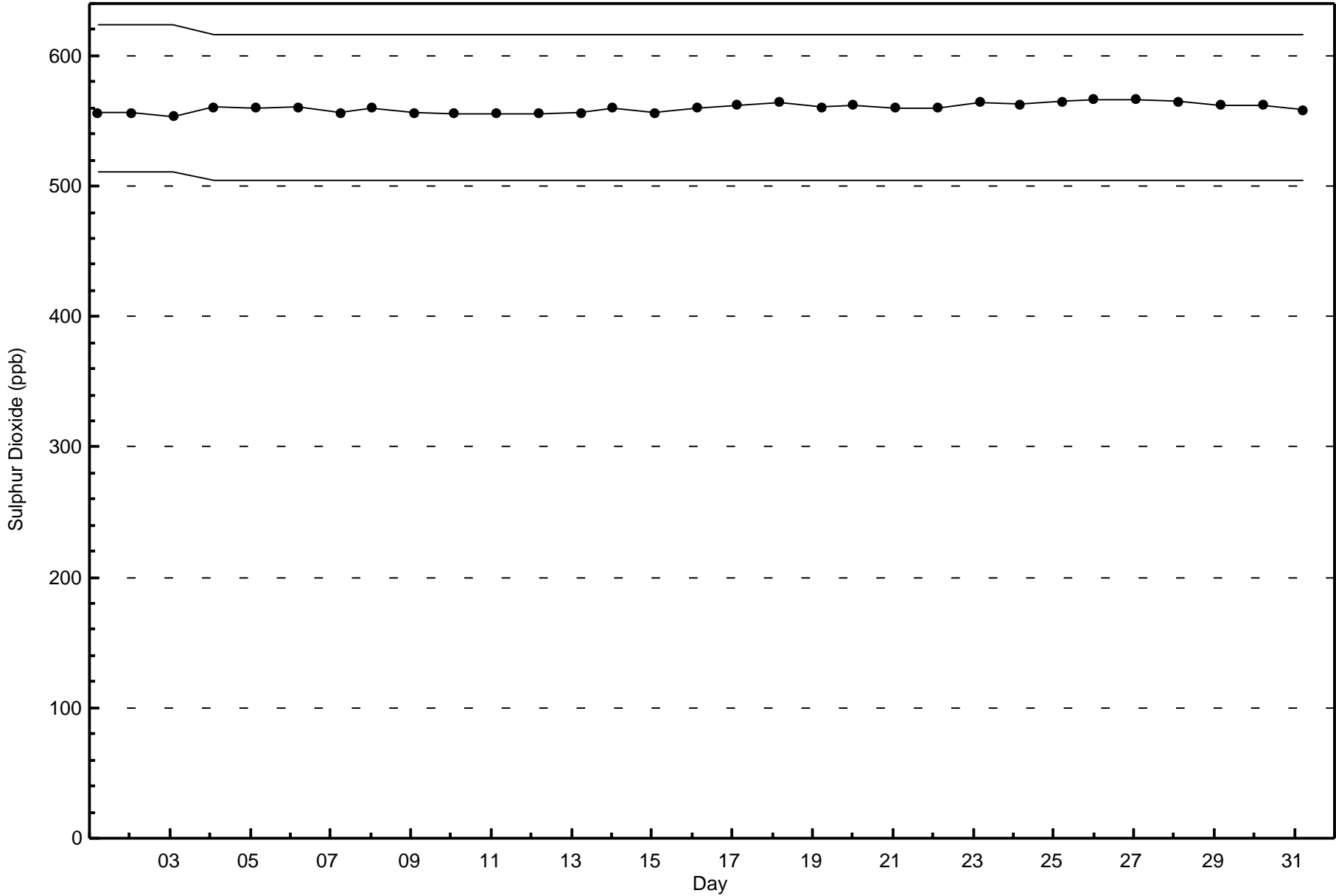
Total Number of Valid Hours: 708

Total Number of Hours: 744



Total Number of Valid Hours: 708





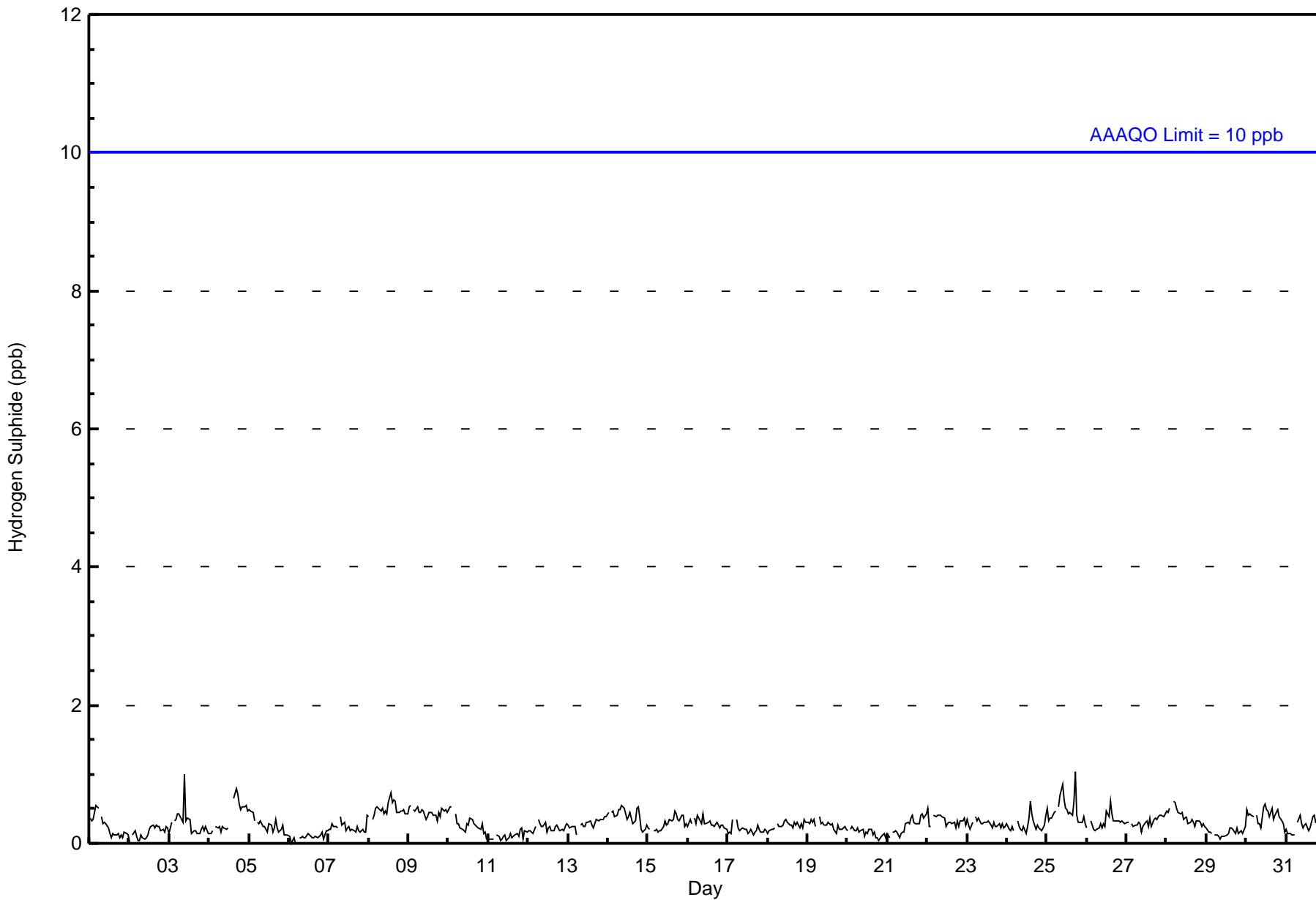


Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 1 ppb on Dec 25 18:00	Maximum Daily Average: 0.5 ppb on Dec 8
Minimum Value: 0 ppb on Dec 6 02:00	Hours of Data: 710
Maximum Diurnal Average: 0.3 ppb at hour 17	Hours of Missing Data: 34
Monthly Average: 0.3 ppb	Hours of Calibration: 34
Minimum Daily Average: 0.1 ppb on Dec 6	Percent Operational Time: 100.0
Minimum Diurnal Average: 0.3 ppb at hour 2	
Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 1	

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Dec	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	C	C	C	1	1	1	1	1	1	1	1	1	0	0.4	1
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
8-Dec	0	Z	0	0	1	1	1	0	1	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0.5	1
9-Dec	1	1	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.5	1
10-Dec	0	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
14-Dec	0	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0.4	1
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
22-Dec	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.3	1
25-Dec	1	0	0	0	0	0	Z	1	1	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0.5	1
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.3	1
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
28-Dec	0	0	0	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
30-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0.4	1
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0.3	1

0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Diurnal Average			
1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	Diurnal Maximum

Z - zerospan C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Wapasu - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	710	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

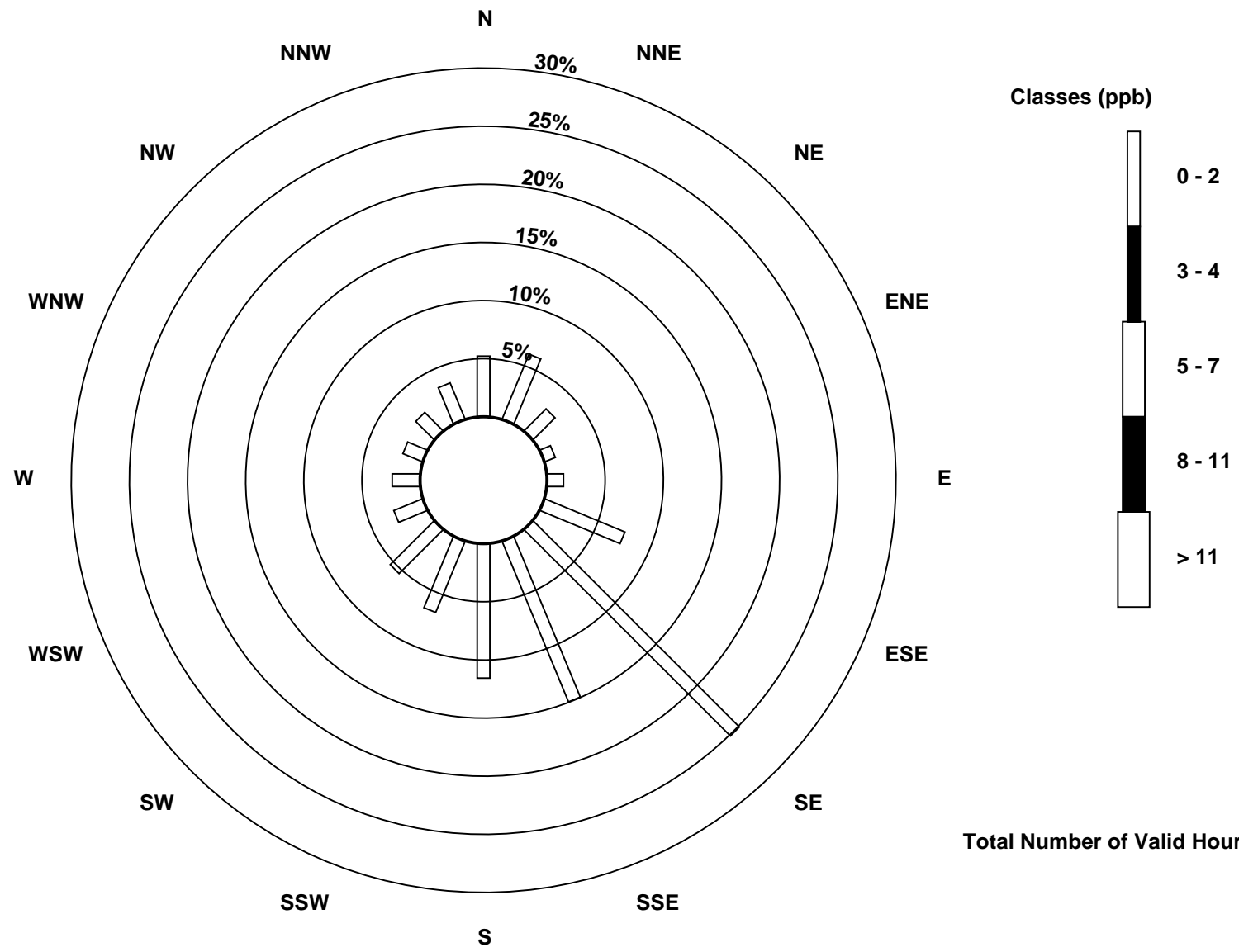
**Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Wapasu - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	37	43	19	7	10	53	178	106	82	47	38	19	17	13	16	24	709
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	37	43	19	7	10	53	178	106	82	47	38	19	17	13	16	24	709

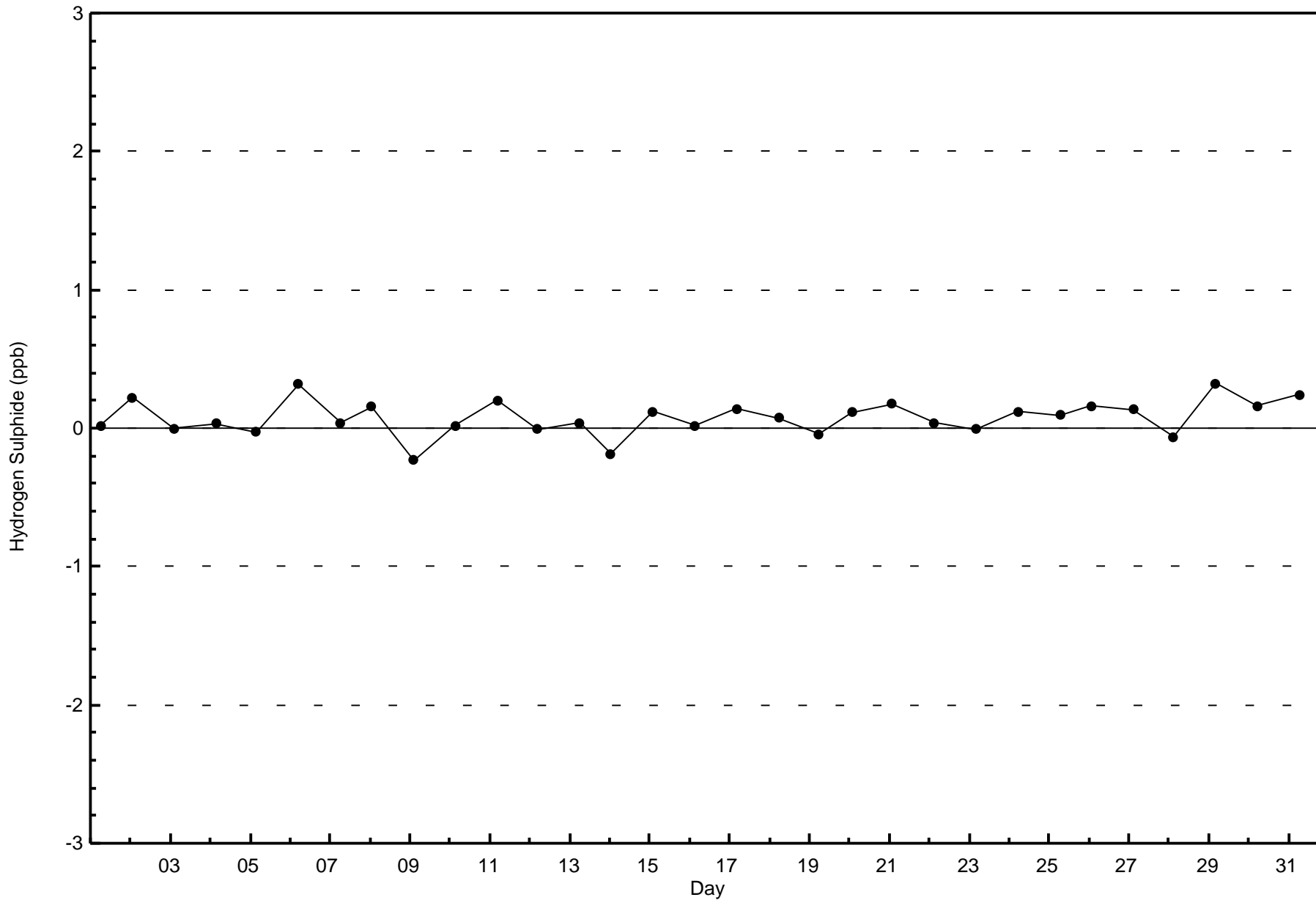
Total Number of Valid Hours: 709

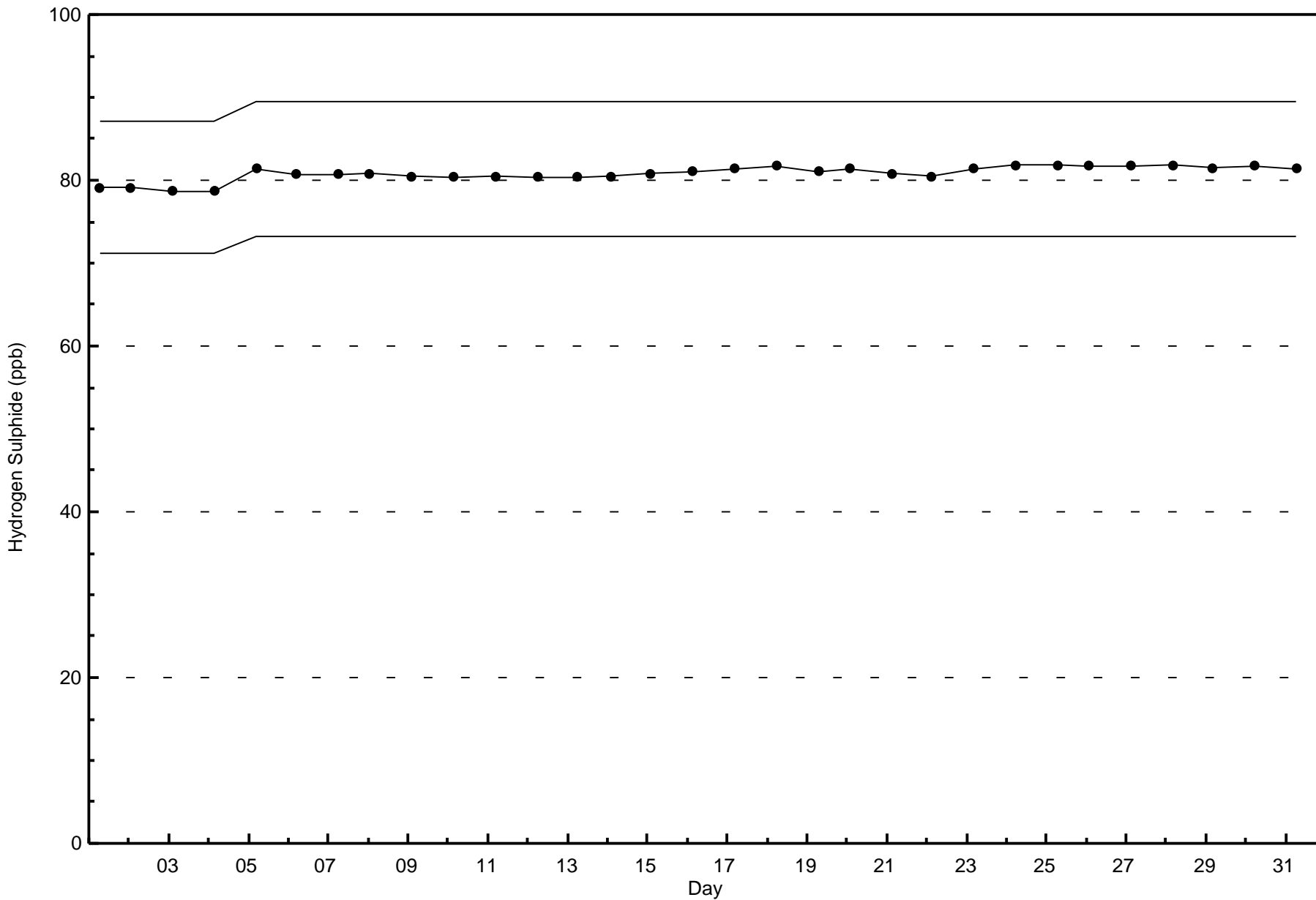
Total Number of Hours: 744



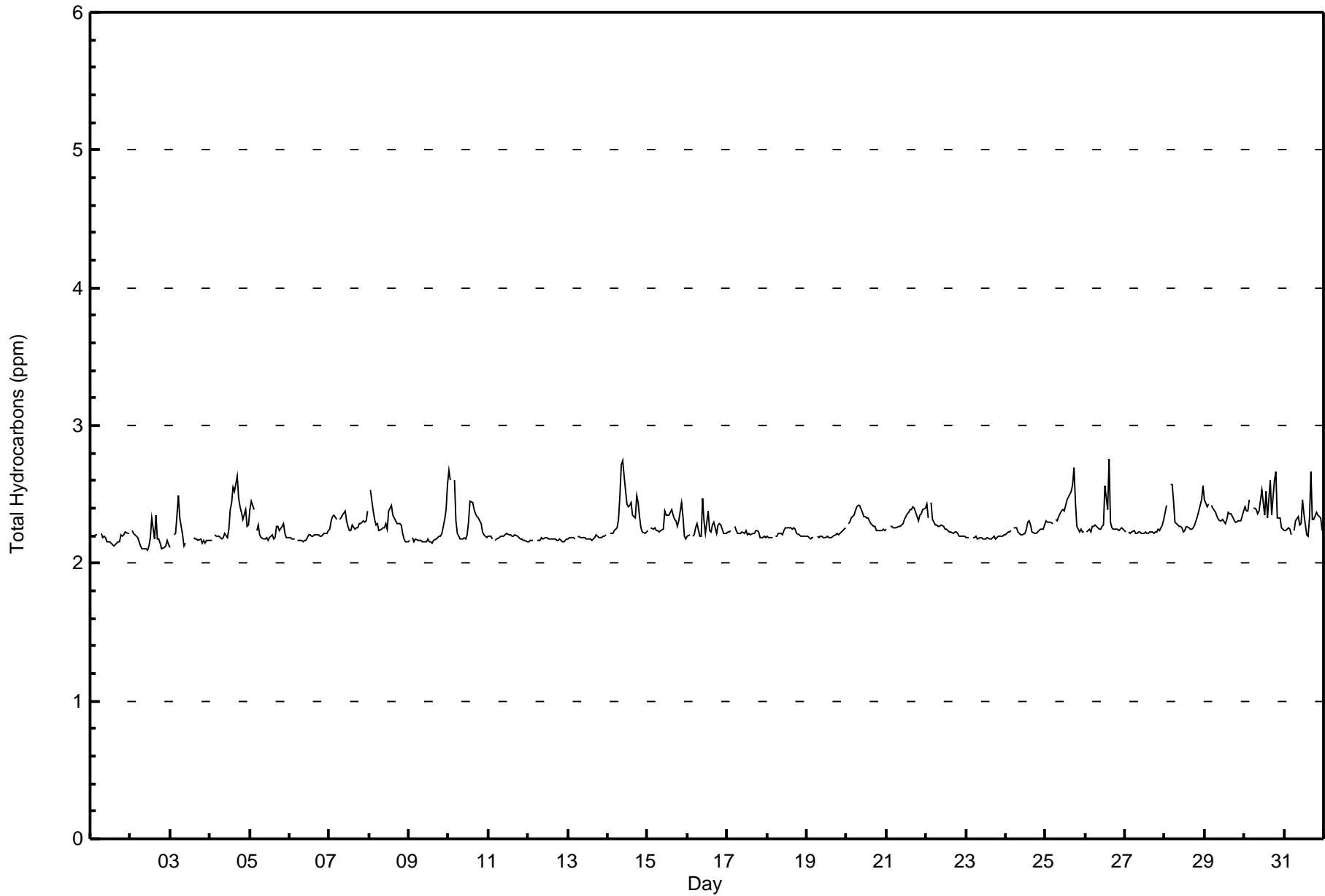


Total Number of Valid Hours: 709











**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Wapasu - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	0	0.00	0.00
2.1 - 3.0	709	100.00	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Wapasu - December 2015**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.1 - 3.0	35	42	21	7	9	52	177	106	81	48	40	20	17	14	13	26	708
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	35	42	21	7	9	52	177	106	81	48	40	20	17	14	13	26	708

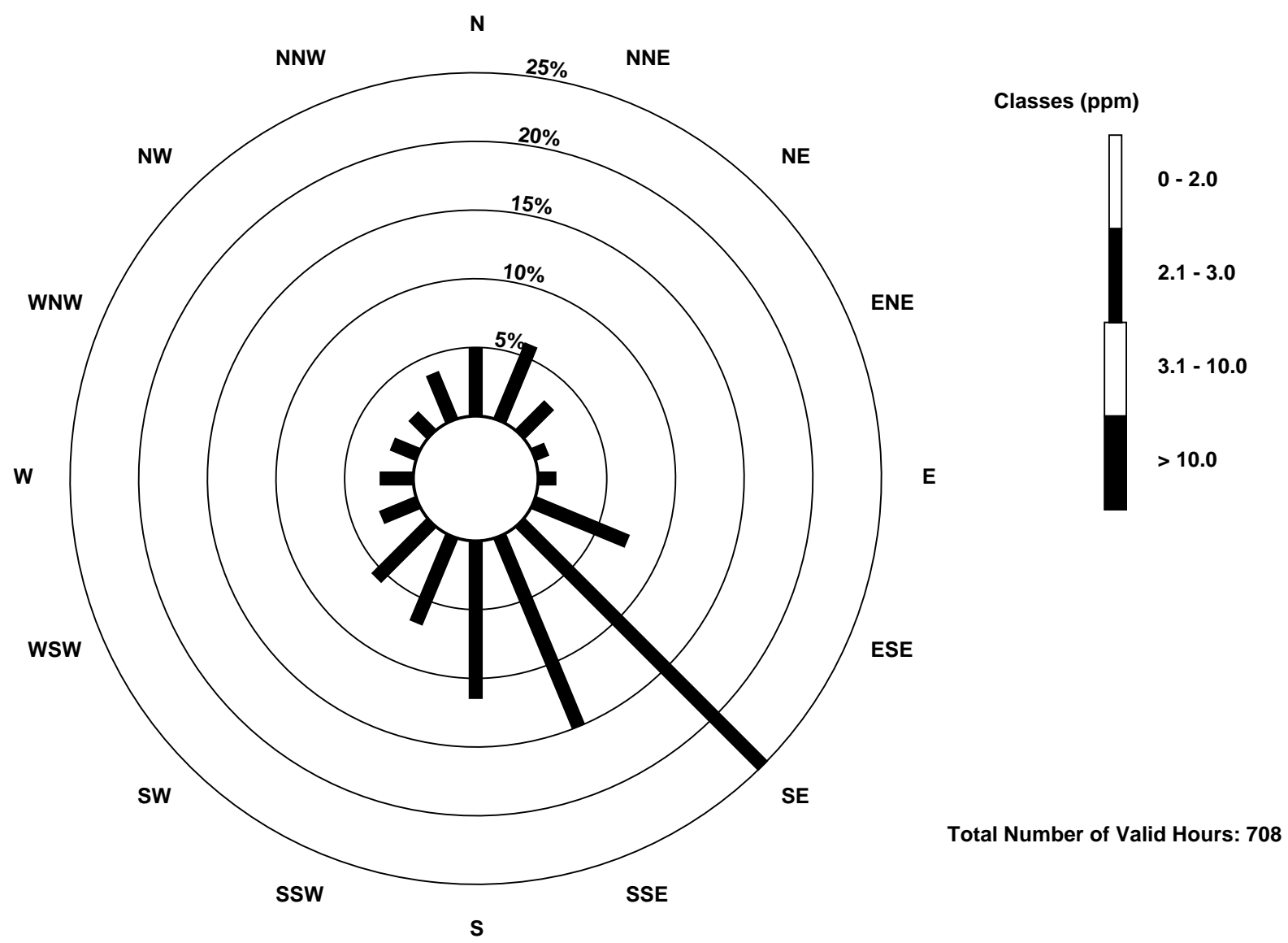
Total Number of Valid Hours: 708

Total Number of Hours: 744

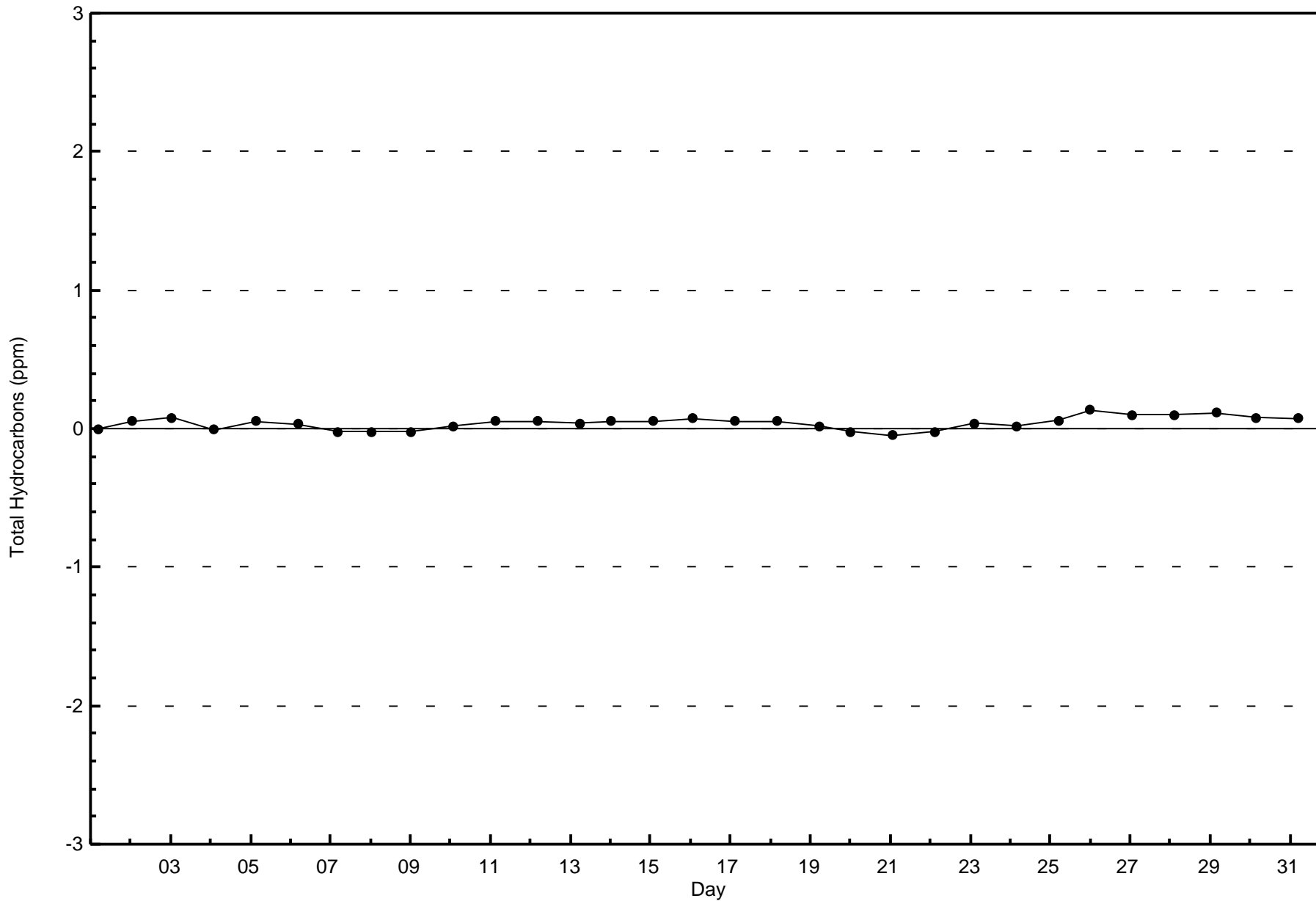


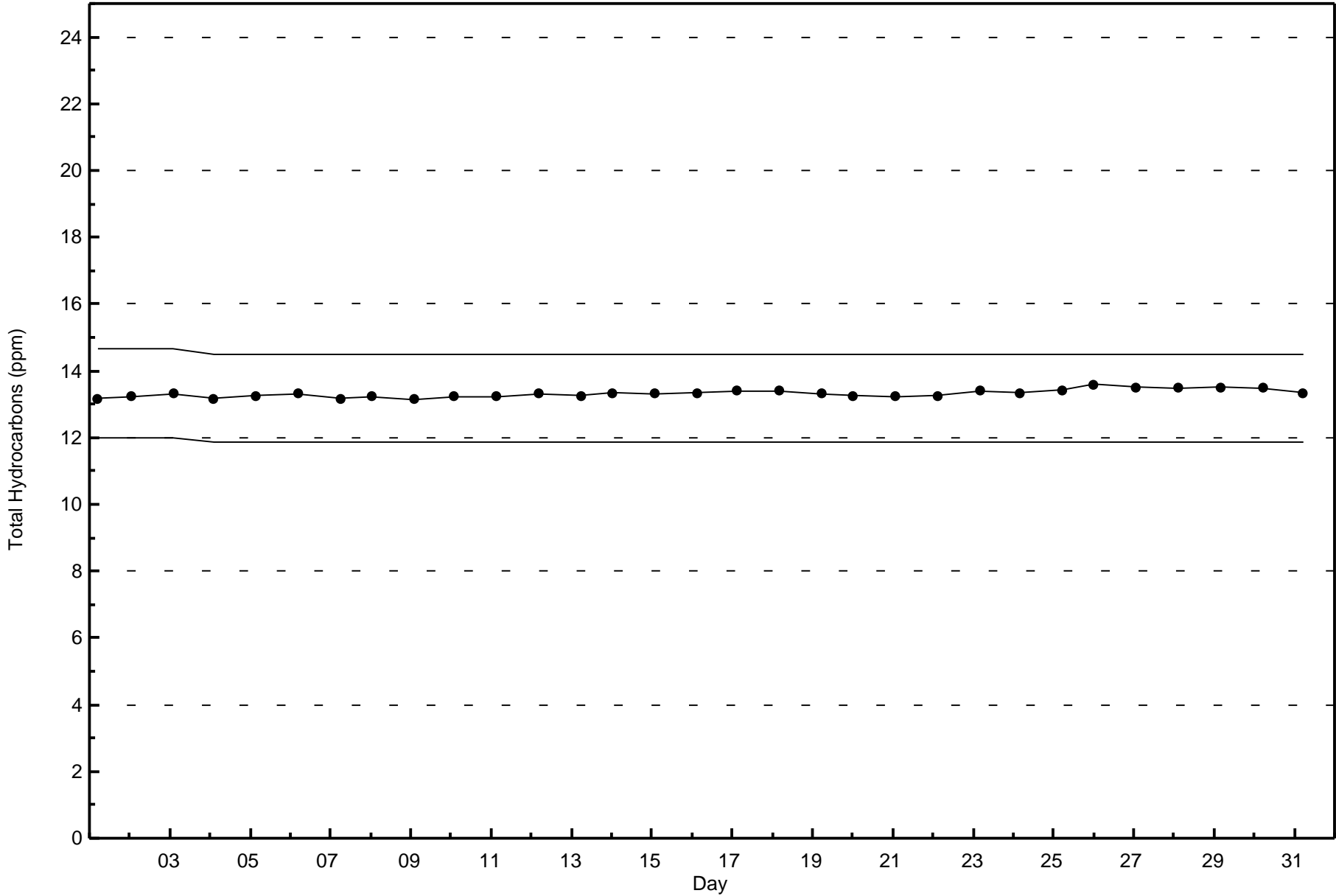
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Total Hydrocarbons (THC) - ppm  
Wapasu (AMS 17)











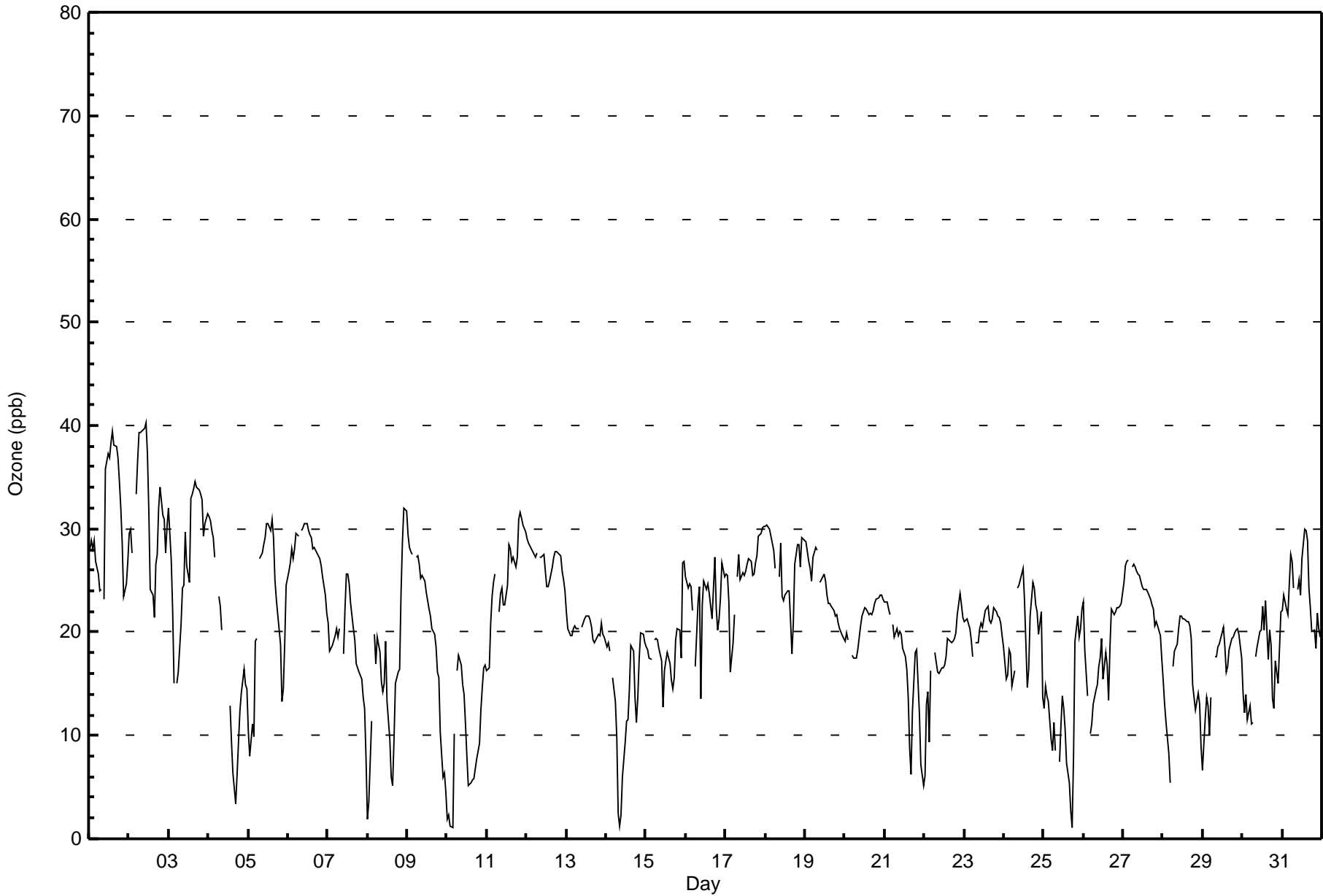
Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O<sub>3</sub>) - ppb

Wapasu - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 744																
Maximum Value: 40 ppb on Dec 2 11:00										Maximum Daily Average: 31.9 ppb on Dec 2										Hours of Data: 709						
Minimum Value: 1 ppb on Dec 25 18:00										Minimum Daily Average: 9.6 ppb on Dec 10										Hours of Missing Data: 35						
Maximum Diurnal Average: 22.7 ppb at hour 12										Minimum Diurnal Average: 19.5 ppb at hour 4										Hours of Calibration: 35						
Monthly Average: 21.0 ppb										Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 11 Q <sub>1</sub> = 17 Median = 21 Q <sub>3</sub> = 26 P <sub>90</sub> = 29 P <sub>99</sub> = 38										Percent Operational Time: 100.0						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	28	29	28	29	27	26	24	24	Z	23	36	37	37	38	39	38	38	37	35	32	29	24	25	27	30.8	39
2-Dec	30	30	28	Z	33	37	39	39	39	40	40	37	32	24	24	21	27	28	32	34	31	31	28	30	31.9	40
3-Dec	32	27	22	15	Z	15	16	21	24	24	30	26	25	33	33	34	35	34	34	33	33	29	30	31	27.7	35
4-Dec	31	31	30	29	27	Z	24	22	20	C	C	C	C	13	9	6	3	6	9	12	14	16	15	15	17.6	31
5-Dec	10	8	11	10	19	19	Z	27	28	28	29	30	31	30	31	29	25	23	22	19	13	15	19	25	21.8	31
6-Dec	26	27	28	27	28	30	29	Z	30	30	31	31	30	29	29	28	28	28	27	27	26	25	24	22	27.8	31
7-Dec	21	18	18	19	20	20	20	20	Z	18	22	26	26	25	23	20	19	17	17	16	15	14	13	8	18.9	26
8-Dec	2	3	11	Z	20	17	19	18	15	14	15	19	13	10	6	5	10	15	16	16	24	29	32	32	15.7	32
9-Dec	29	28	28	28	Z	27	27	27	25	25	25	24	23	22	22	20	20	19	16	16	10	6	6	4	20.8	29
10-Dec	2	2	1	1	10	Z	16	18	17	15	14	11	8	5	5	6	6	7	8	9	13	15	17	17	9.6	18
11-Dec	16	17	21	24	25	26	Z	22	24	24	23	23	25	28	28	27	27	26	27	31	32	31	30	30	25.4	32
12-Dec	29	29	28	28	28	27	28	Z	27	27	28	26	24	24	25	26	27	28	28	28	27	26	25	24	26.8	29
13-Dec	22	20	20	20	20	21	20	20	Z	20	21	21	22	22	21	20	19	19	20	20	20	21	20	19	20.3	22
14-Dec	19	19	18	Z	16	13	10	2	1	2	6	9	11	12	14	19	18	14	11	14	18	20	20	19	13.2	20
15-Dec	19	18	17	17	Z	19	19	19	18	17	13	16	17	18	17	15	15	16	19	20	20	18	27	27	18.4	27
16-Dec	25	24	25	24	22	Z	17	23	24	14	23	25	24	25	24	22	21	27	22	20	21	23	27	25	23.0	27
17-Dec	26	25	23	16	19	22	Z	25	28	25	26	26	26	27	27	27	25	26	27	27	29	30	30	30	25.7	30
18-Dec	30	30	30	29	29	28	26	Z	25	29	23	23	24	24	24	21	18	21	27	28	28	26	29	29	26.2	30
19-Dec	29	28	27	26	25	27	28	28	Z	25	25	26	25	24	23	23	23	22	22	22	21	20	20	19	24.2	29
20-Dec	19	20	19	Z	18	17	17	18	18	21	22	22	22	22	22	22	22	22	23	23	23	24	24	23	21.0	24
21-Dec	23	23	22	22	Z	21	20	20	20	20	20	18	18	16	14	9	6	12	18	18	15	12	7	5	16.5	23
22-Dec	6	13	14	9	16	Z	18	17	16	16	17	17	17	18	19	19	19	19	19	20	22	24	23	21	17.4	24
23-Dec	21	21	21	20	19	18	Z	19	19	20	21	20	21	22	22	21	21	21	22	22	22	21	21	20	20.8	22
24-Dec	19	15	16	18	18	15	16	Z	24	24	25	26	23	19	15	16	22	25	24	23	22	20	22	14	20.0	26
25-Dec	13	15	14	13	10	9	11	9	Z	8	11	14	13	11	7	5	3	1	8	19	22	20	20	22	12.0	22
26-Dec	23	18	14	Z	10	11	13	14	15	17	17	19	15	18	17	13	19	22	22	22	22	22	23	23	17.8	23
27-Dec	25	26	27	27	Z	26	27	26	26	26	26	24	24	24	24	24	23	23	22	21	21	21	20	17	23.9	27
28-Dec	15	13	11	8	5	Z	17	18	19	20	22	22	21	21	21	21	21	19	15	13	13	14	13	9	16.2	22
29-Dec	7	12	14	13	10	14	Z	18	18	19	19	19	21	19	16	17	18	19	20	20	20	20	20	17	16.9	21
30-Dec	14	12	14	12	13	11	11	Z	18	19	20	20	22	20	23	17	20	19	14	13	17	15	18	22	16.7	23
31-Dec	22	24	22	22	25	27	27	24	Z	24	25	24	27	30	30	29	24	22	20	20	18	22	20	20	23.9	30
20.4 20.2 20.1 19.5 19.6 20.9 20.8 20.8 21.6 21.2 22.4 22.7 22.2 21.7 21.1 20.1 20.0 20.5 20.8 21.2 21.4 21.0 21.5 20.9																								Diurnal Average		
32 31 30 29 33 37 39 39 39 40 40 37 37 38 39 38 38 37 35 34 33 31 32 32																								Diurnal Maximum		
Z - zerospan C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Wapasu - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	329	46.40	46.40
21 - 50	380	53.60	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb  
Wapasu - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	13	27	13	3	5	22	40	44	61	34	24	10	10	8	8	6	328
21 - 50	25	14	7	5	4	31	140	61	20	12	14	9	6	6	9	17	380
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	38	41	20	8	9	53	180	105	81	46	38	19	16	14	17	23	708

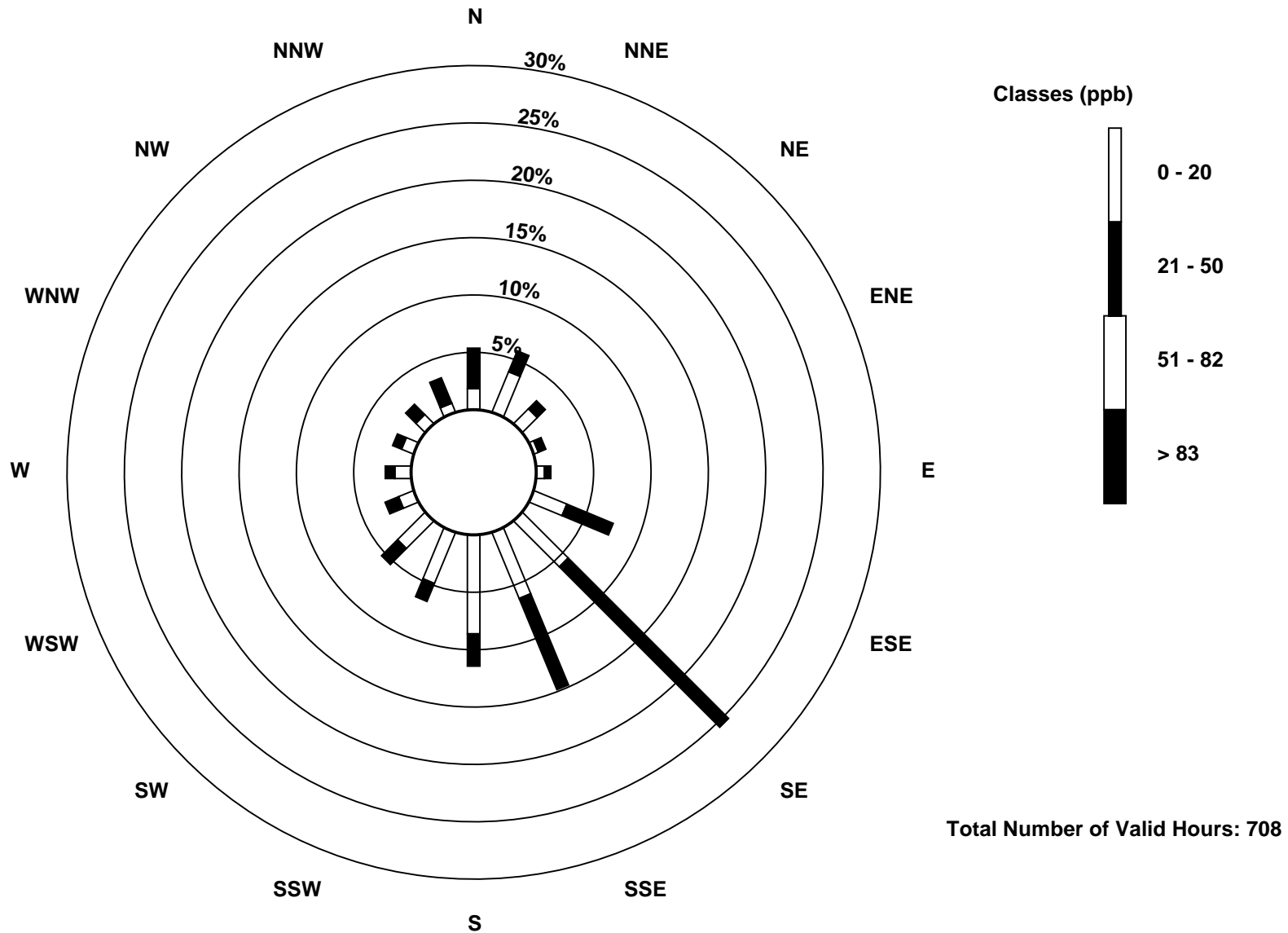
Total Number of Valid Hours: 708

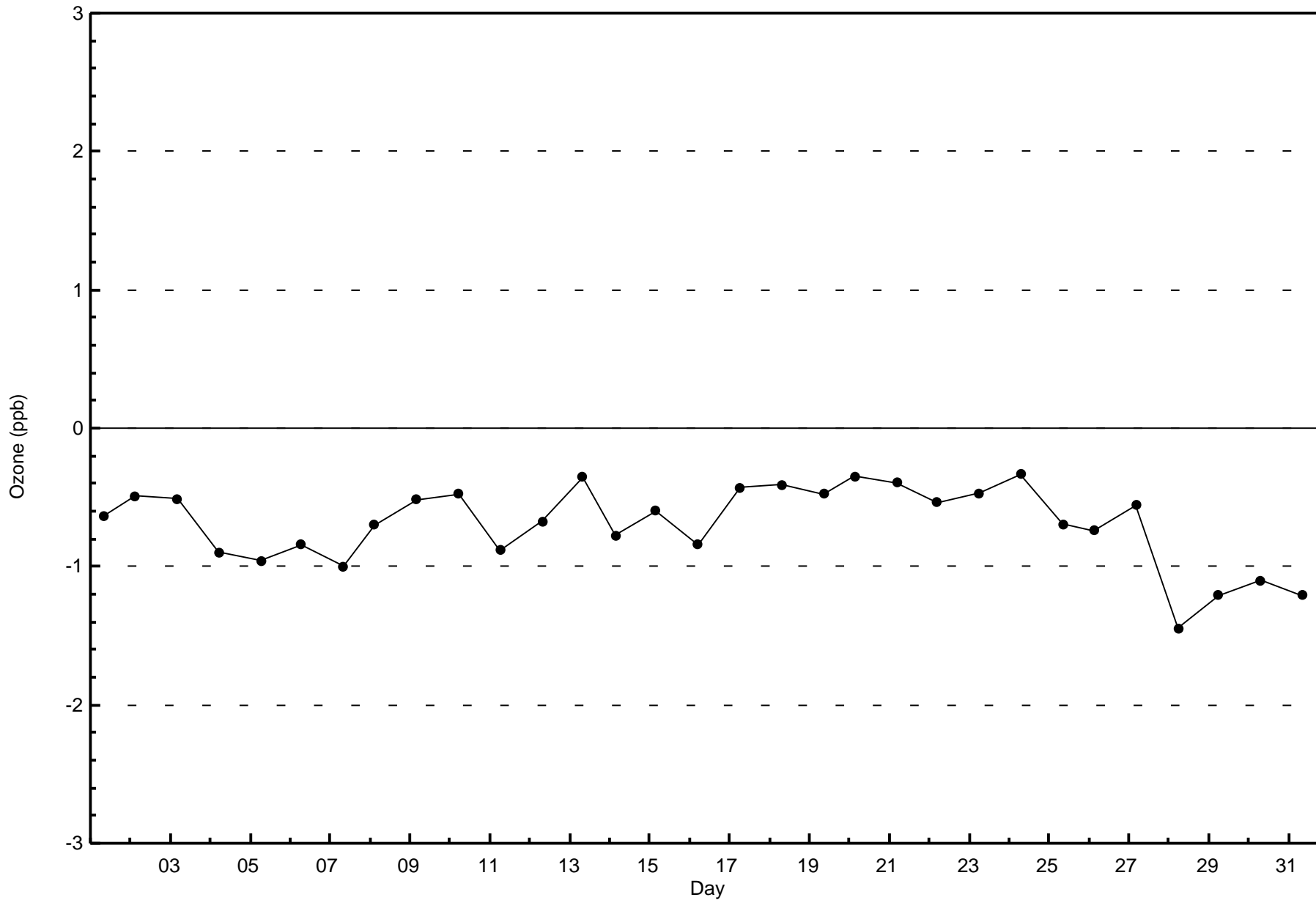
Total Number of Hours: 744



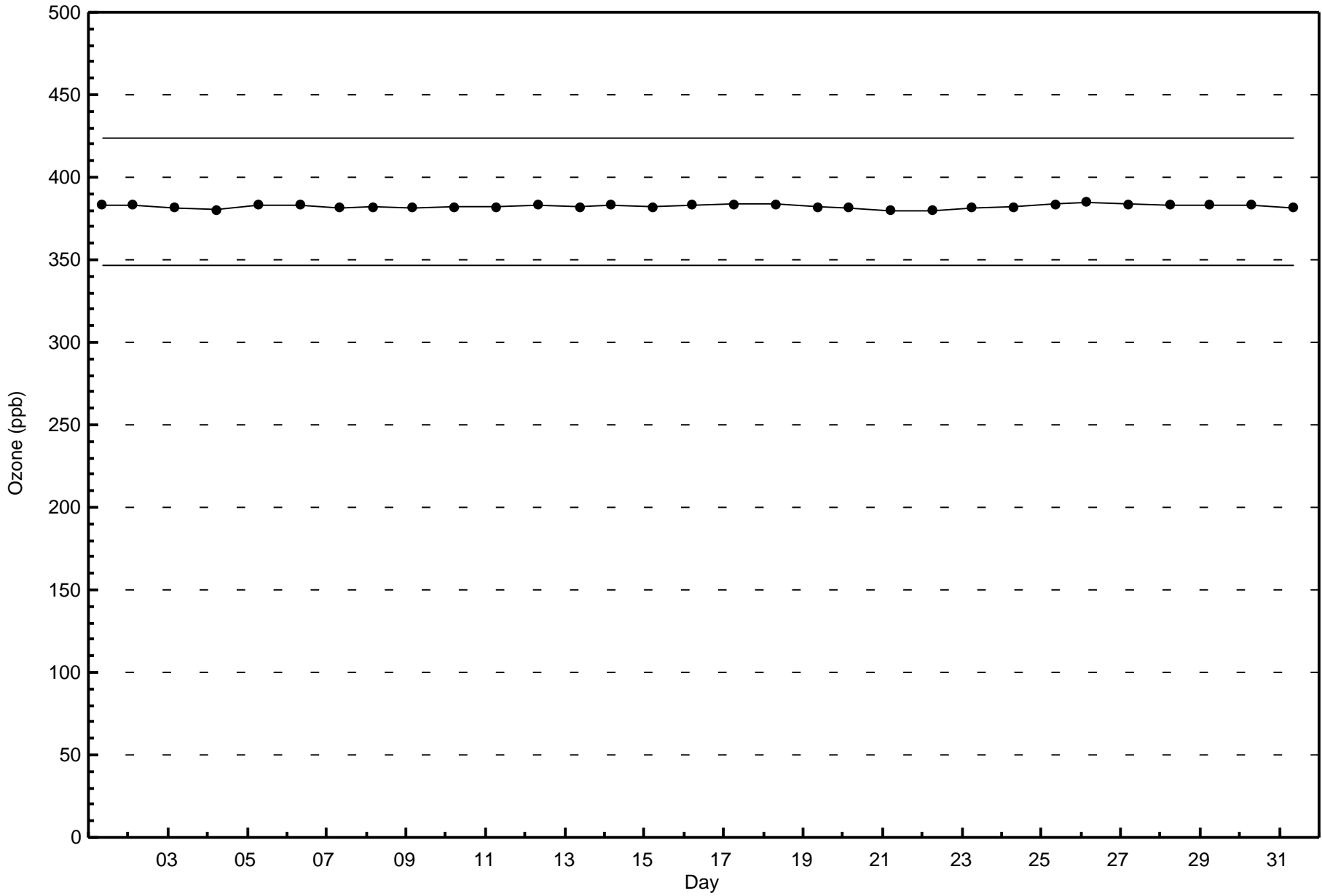
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Ozone (O<sub>3</sub>) - ppb  
Wapasu (AMS 17)









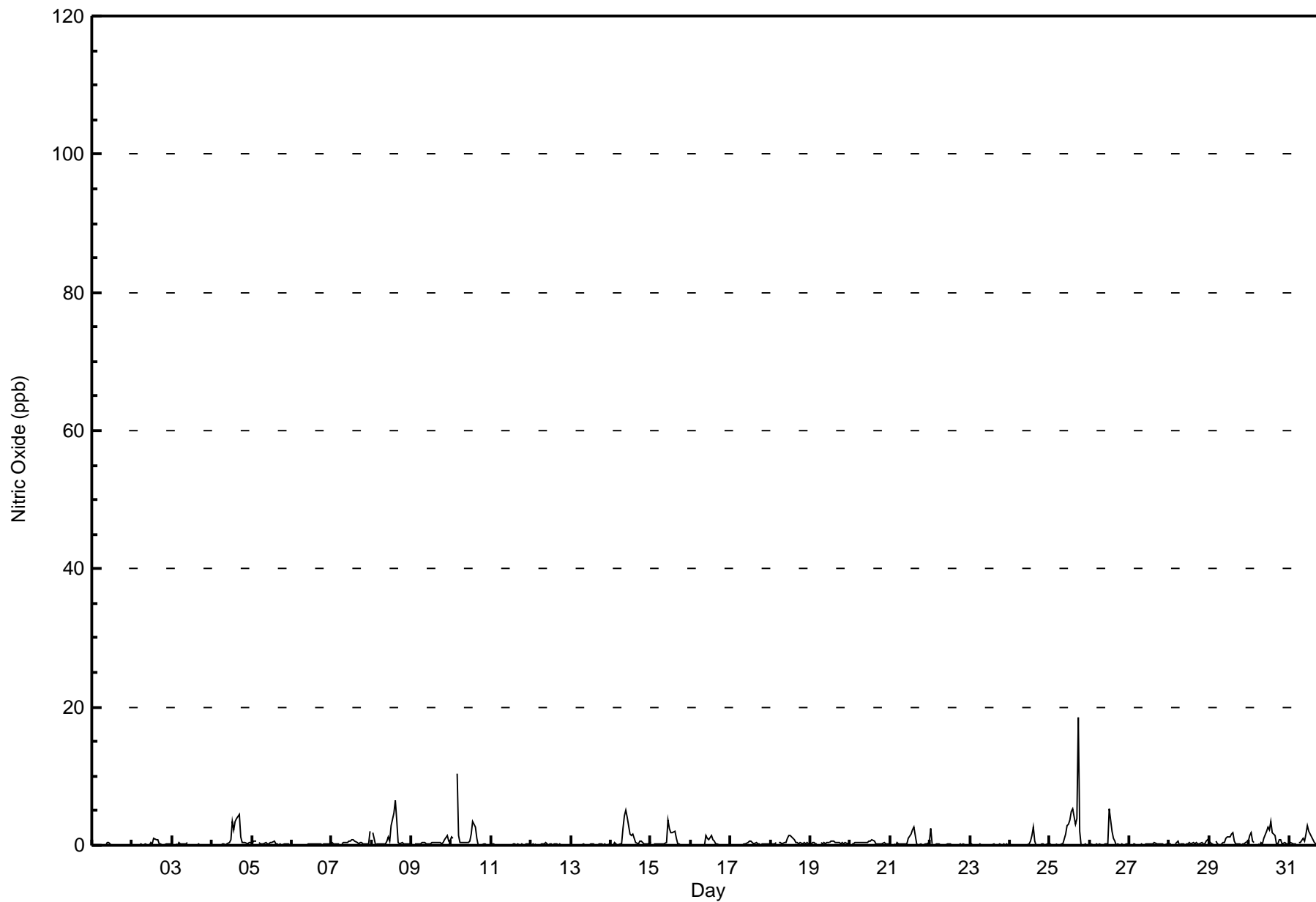


Maximum Value: 18 ppb on Dec 25 18:00																		Maximum Daily Average: 2.2 ppb on Dec 25						Hours in Service: 744			
Minimum Value: 0 ppb on Dec 1 01:00																		Minimum Daily Average: 0.0 ppb on Dec 1						Hours of Data: 709			
Maximum Diurnal Average: 1.3 ppb at hour 14																		Minimum Diurnal Average: 0.1 ppb at hour 7						Hours of Missing Data: 35			
Monthly Average: 0.5 ppb																		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 5						Hours of Calibration: 35			
																		Percent Operational Time: 100.0									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
2-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0.2	1
3-Dec	0	Z	0	0	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.1	0	
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	1	3	2	4	4	4	1	0	0	0	0	0	0	0	1.0	4
5-Dec	0	1	1	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.3	1	
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
7-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	2	
8-Dec	Z	2	0	0	0	0	0	0	0	1	1	1	3	5	7	4	0	0	0	0	0	0	0	0	1.1	7	
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.4	1	
10-Dec	1	1	Z	10	1	0	0	0	0	0	0	1	2	3	3	1	0	0	0	0	0	0	0	0	1.1	10	
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
14-Dec	Z	0	0	0	0	0	0	2	4	5	4	2	1	2	1	0	0	1	1	0	0	0	0	0	1.1	5	
15-Dec	0	Z	0	0	0	0	0	0	0	1	4	2	2	2	2	1	0	0	0	0	0	0	0	0	0.7	4	
16-Dec	0	0	Z	0	0	0	0	0	0	1	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0.3	2	
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
18-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.5	1	
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	1	
20-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1	
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	2	2	3	1	0	0	0	0	0	0	0	0	0.5	3	
22-Dec	2	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2	
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	1	2	3	1	0	0	0	0	0	0	0	0	0.3	3	
25-Dec	0	0	0	0	0	Z	0	0	0	2	3	3	4	5	5	3	4	18	2	0	0	0	0	0	2.2	18	
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	5	2	1	1	0	0	0	0	0	0	0	0	0	0.5	5	
27-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
28-Dec	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	1	
29-Dec	1	0	0	Z	1	0	0	0	1	0	1	1	1	2	2	1	0	0	0	0	0	0	0	1	0.5	2	
30-Dec	1	2	1	0	Z	0	0	0	0	1	2	3	2	3	2	1	0	0	1	1	0	0	0	0	1.0	3	
31-Dec	0	0	0	0	0	Z	0	0	1	1	2	3	2	1	1	0	0	0	0	0	0	0	0	0	0.6	3	
																		Diurnal Average		Diurnal Maximum							
0.3 0.3 0.2 0.5 0.2 0.2 0.1 0.3 0.3 0.5 0.8 0.8 1.2 1.3 1.2 0.7 0.4 0.8 0.3 0.2 0.2 0.2 0.2 0.3																											
2 2 1 10 1 1 0 2 4 5 4 3 5 5 7 4 4 18 2 1 1 1 1 2																											
Z - zerospan		C - Calibration																									



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Nitric Oxide (NO) - ppb**  
**Wapasu - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Wapasu - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	709	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitric Oxide (NO) - ppb  
Wapasu - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	35	42	21	7	9	52	177	106	81	48	40	20	17	14	13	26	708
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	35	42	21	7	9	52	177	106	81	48	40	20	17	14	13	26	708

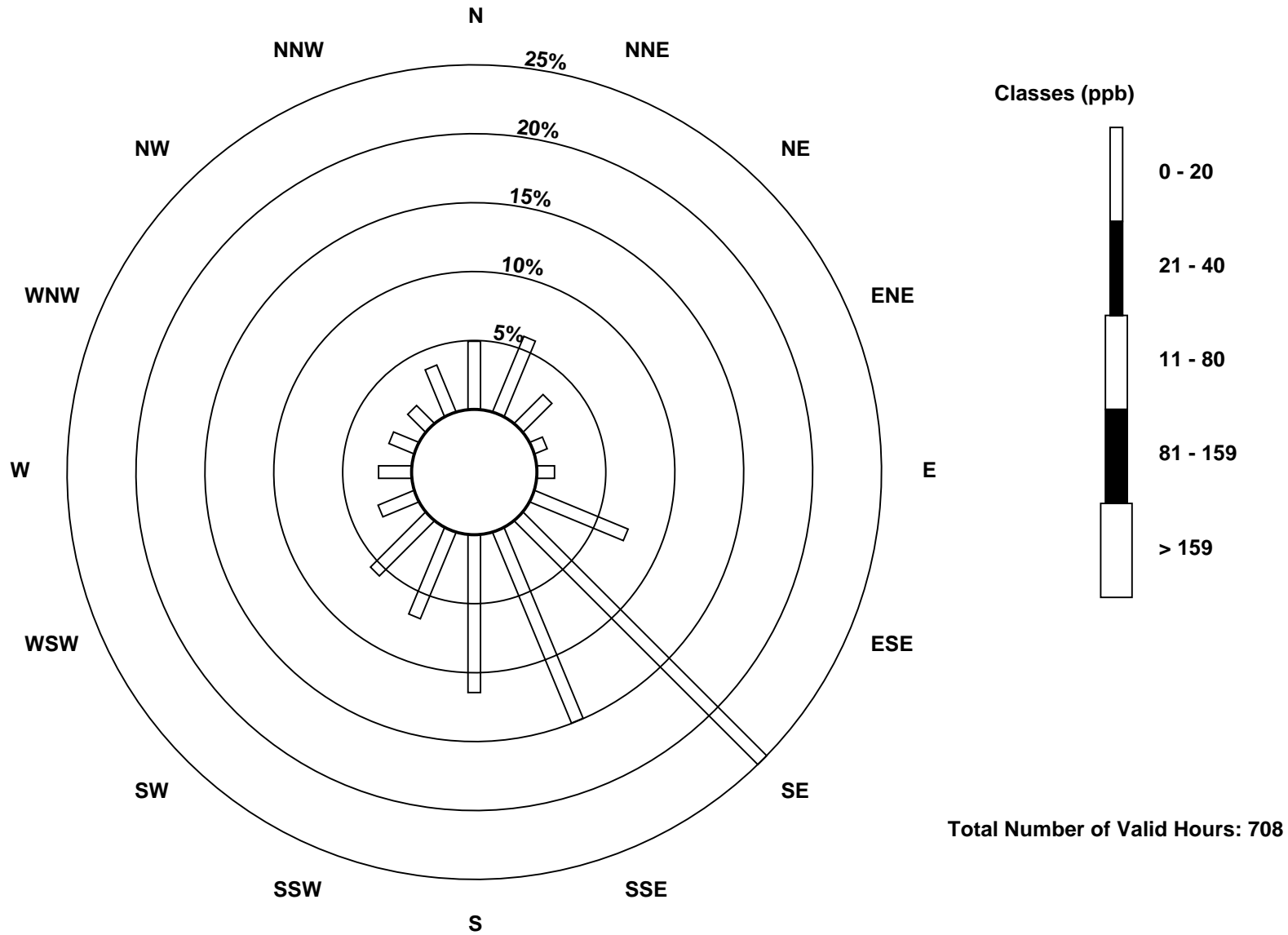
Total Number of Valid Hours: 708

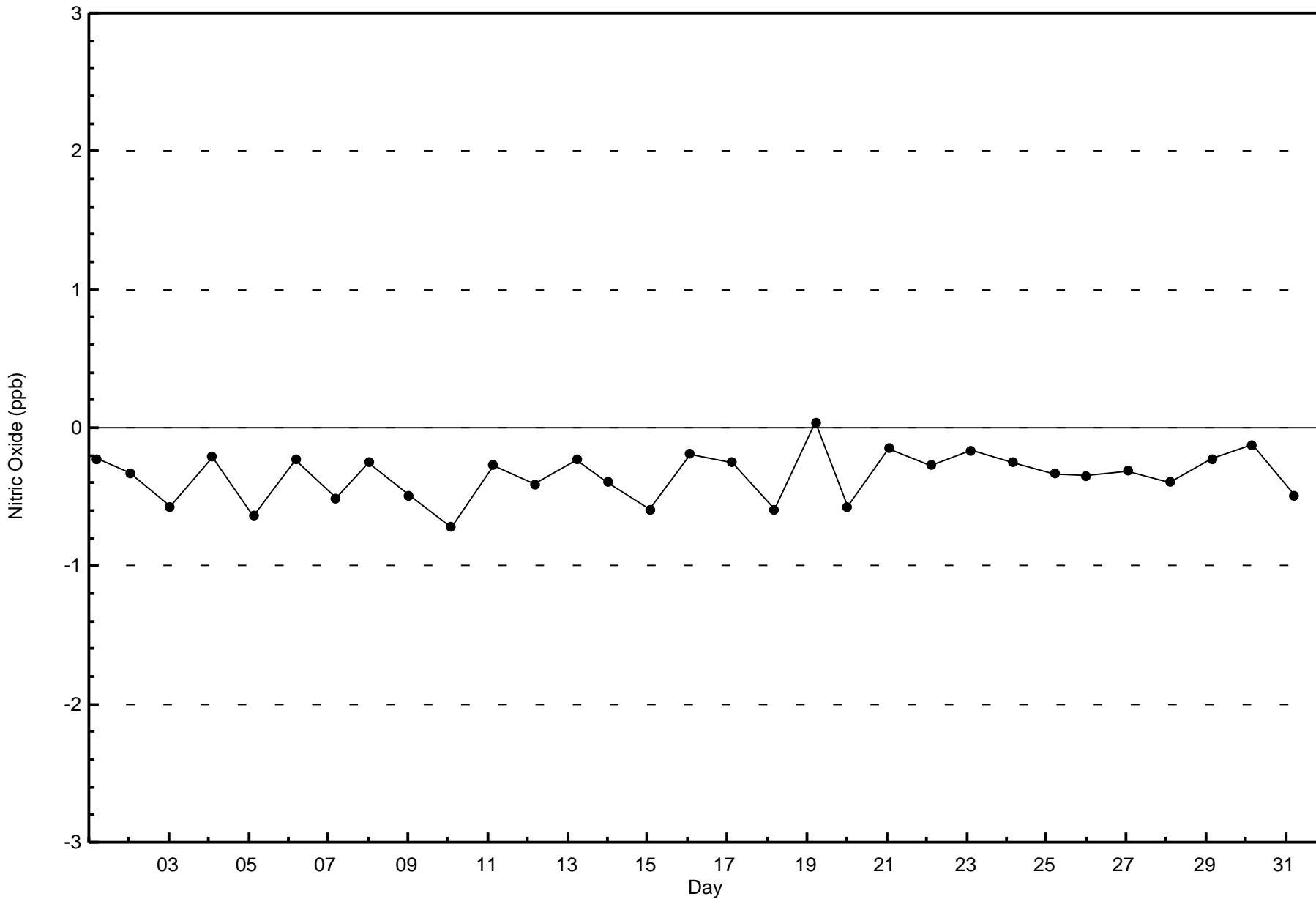
Total Number of Hours: 744

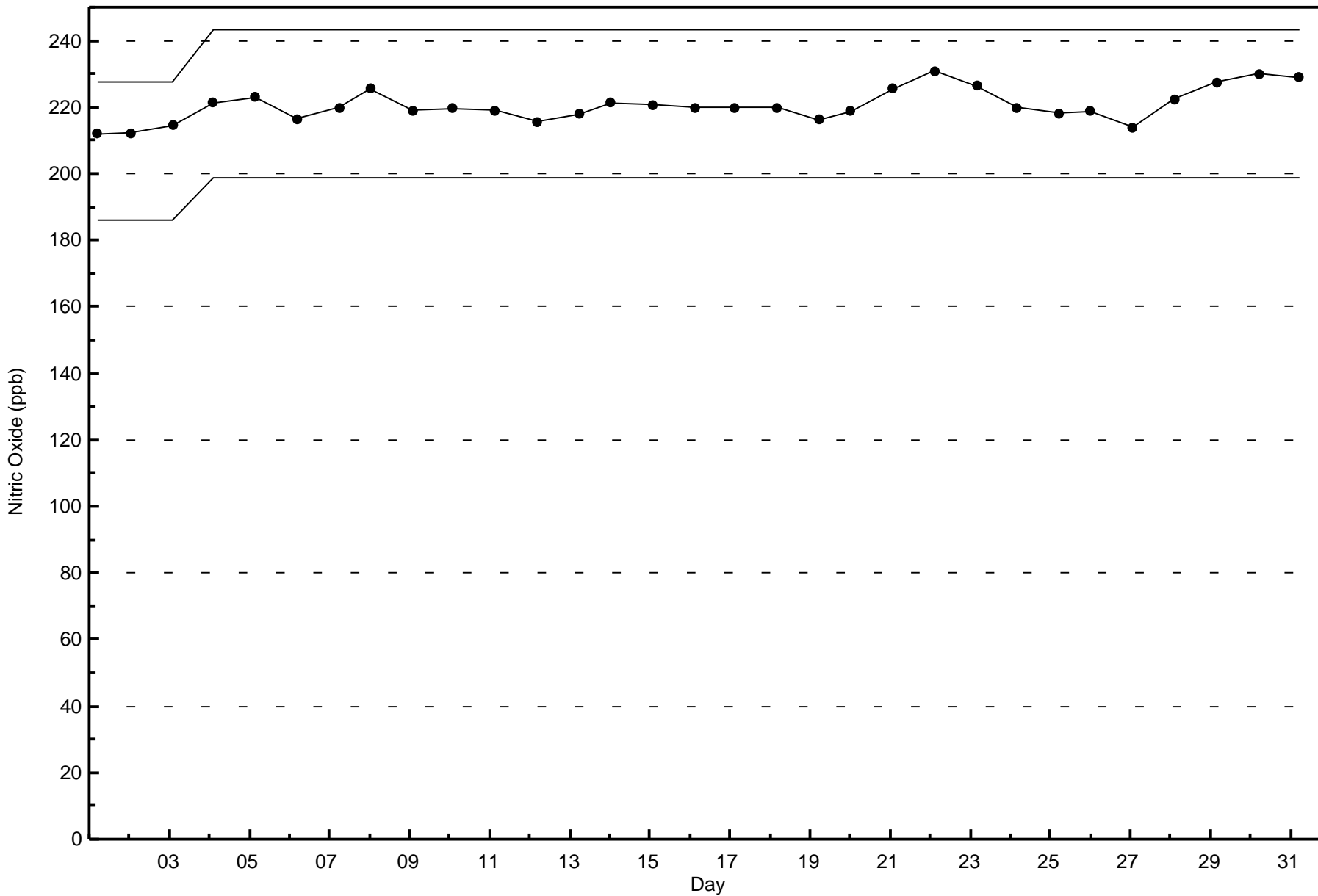


**Wood Buffalo Environmental Association**  
**Wind Rose Dec 2015**

**Nitric Oxide (NO) - ppb**  
**Wapasu (AMS 17)**









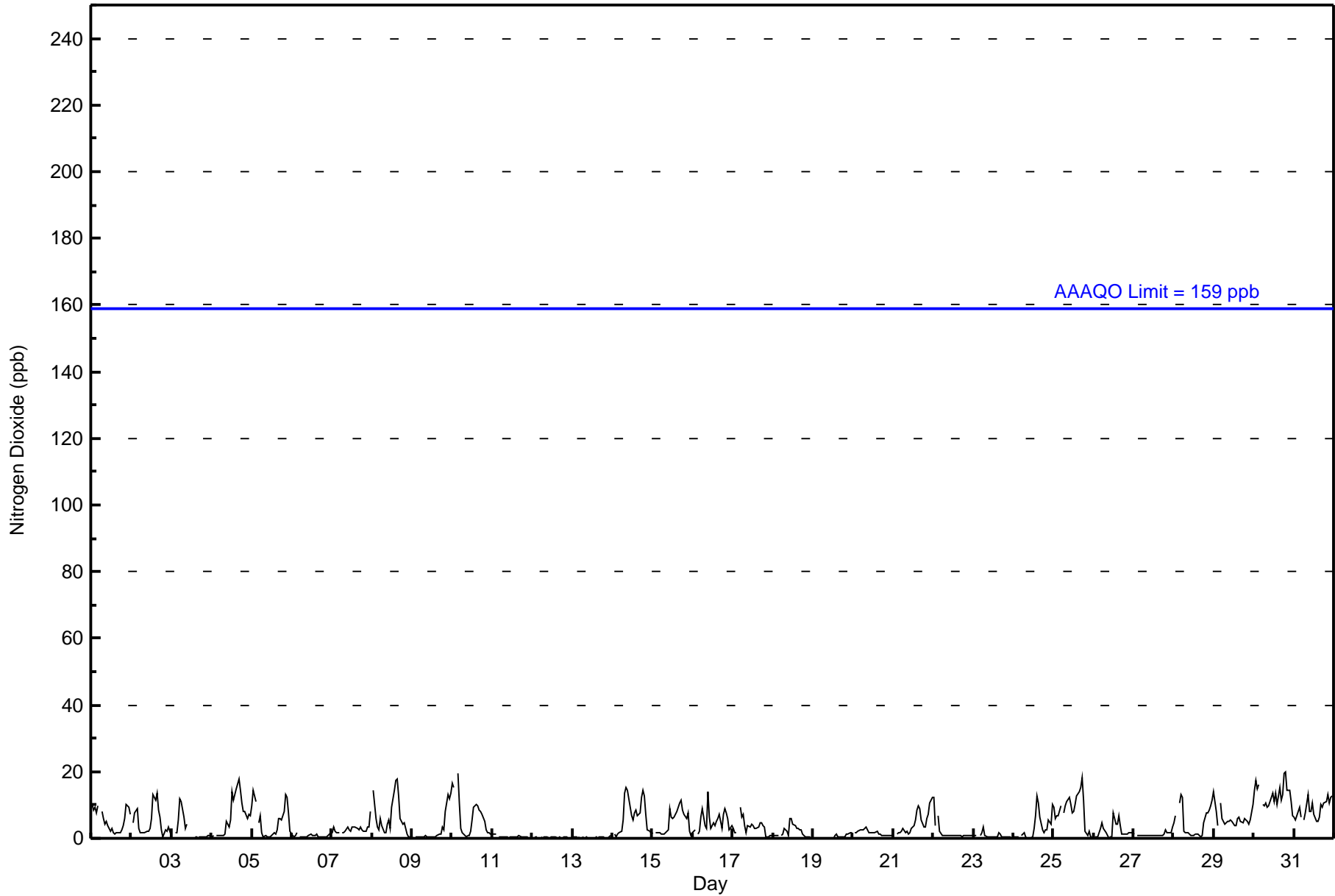


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 20 ppb on Dec 30 20:00	Maximum Daily Average: 13.0 ppb on Dec 30		Hours of Data:	709
Minimum Value: 0 ppb on Dec 13 21:00	Minimum Daily Average: 0.3 ppb on Dec 12		Hours of Missing Data:	35
Maximum Diurnal Average: 5.5 ppb at hour 16	Minimum Diurnal Average: 2.9 ppb at hour 9		Hours of Calibration:	35
Monthly Average: 4.0 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 6 P <sub>90</sub> = 11 P <sub>99</sub> = 17		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	10	9	10	8	10	Z	8	6	4	5	4	2	3	2	1	2	2	2	3	4	6	10	9	7	5.5	10
2-Dec	Z	5	8	9	3	2	2	2	2	2	2	3	6	13	11	14	8	6	2	1	2	2	4	2	4.8	14
3-Dec	1	Z	2	2	5	12	11	6	3	4	C	C	C	C	1	0	0	1	0	1	1	1	1	1	2.6	12
4-Dec	1	1	Z	1	1	1	1	1	1	5	3	6	14	11	13	15	18	14	11	8	8	6	7	7	6.6	18
5-Dec	10	14	11	Z	5	7	2	1	1	1	0	0	1	2	1	3	6	6	8	13	12	8	2	5.2	14	
6-Dec	1	1	1	2	Z	0	0	1	0	1	1	1	1	1	1	1	1	1	0	0	0	1	1	2	0.8	2
7-Dec	2	3	2	2	2	Z	2	2	2	3	3	2	3	3	3	3	3	3	2	2	2	3	4	8	2.8	8
8-Dec	Z	15	6	3	3	6	4	2	2	4	5	3	10	15	17	18	13	6	4	5	3	1	1	0	6.3	18
9-Dec	1	Z	0	1	0	0	0	1	1	0	0	1	0	1	0	1	1	1	3	3	8	13	12	14	2.7	14
10-Dec	17	15	Z	20	11	3	2	1	1	1	1	2	6	9	10	10	9	8	7	5	2	2	2	1	6.2	20
11-Dec	1	1	1	Z	1	0	0	0	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0.5	1
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.3	1	
14-Dec	Z	1	1	1	2	2	5	14	15	14	12	7	6	8	8	7	8	12	14	13	7	2	2	1	7.0	15
15-Dec	2	Z	2	2	2	1	1	1	2	2	9	6	6	6	8	9	10	12	9	7	6	8	2	1	4.9	12
16-Dec	2	3	Z	1	2	6	9	4	3	14	6	3	5	4	5	6	7	3	7	9	8	6	3	4	5.2	14
17-Dec	3	2	2	Z	10	6	7	4	2	4	3	4	4	3	3	3	5	5	4	3	1	1	1	1	3.4	10
18-Dec	1	1	1	1	Z	1	1	3	2	1	6	6	4	4	3	3	3	3	1	1	0	0	0	0	2.0	6
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	1	1	1	1	1	2	2	0.5	2
20-Dec	Z	2	2	2	2	3	3	3	3	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1.7	3
21-Dec	1	Z	1	2	2	2	3	2	2	1	2	3	4	6	8	10	9	6	4	3	6	7	11	12	4.5	12
22-Dec	12	4	Z	7	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.7	12
23-Dec	1	1	1	Z	1	2	4	1	1	1	1	1	0	1	0	2	1	0	1	0	0	0	0	0	0.8	4
24-Dec	0	0	0	0	Z	1	2	0	0	0	0	1	3	7	13	11	6	2	2	3	3	5	4	10	3.2	13
25-Dec	9	6	7	7	10	Z	8	10	11	12	10	8	8	10	13	14	15	18	12	2	1	2	0	1	8.4	18
26-Dec	Z	1	0	2	3	5	3	2	1	0	0	1	8	4	4	7	4	1	1	1	1	2	2	2	2.3	8
27-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	3	1.1	3
28-Dec	5	7	Z	11	13	12	2	2	2	1	1	1	1	1	1	1	1	1	5	8	8	8	10	12	4.8	13
29-Dec	14	8	4	Z	10	6	4	5	5	5	5	5	4	4	6	6	5	5	6	5	5	4	6	10	6.0	14
30-Dec	15	17	15	16	Z	10	10	11	10	10	12	14	11	13	10	15	12	13	20	20	14	14	11	7	13.0	20
31-Dec	6	5	8	9	6	Z	6	8	13	8	8	11	7	5	5	6	10	9	11	11	13	10	12	13	8.8	13

4.4	4.7	3.2	4.1	4.0	3.6	3.3	3.0	2.9	3.4	3.3	3.1	3.9	4.6	5.0	5.5	5.2	4.6	4.5	4.1	4.0	4.1	3.8	4.0	Diurnal Average	
17	17	15	20	13	12	11	14	15	14	12	14	14	15	17	18	18	18	18	20	20	14	14	12	14	Diurnal Maximum

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Wapasu - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	709	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Wapasu - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	35	42	21	7	9	52	177	106	81	48	40	20	17	14	13	26	708
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	35	42	21	7	9	52	177	106	81	48	40	20	17	14	13	26	708

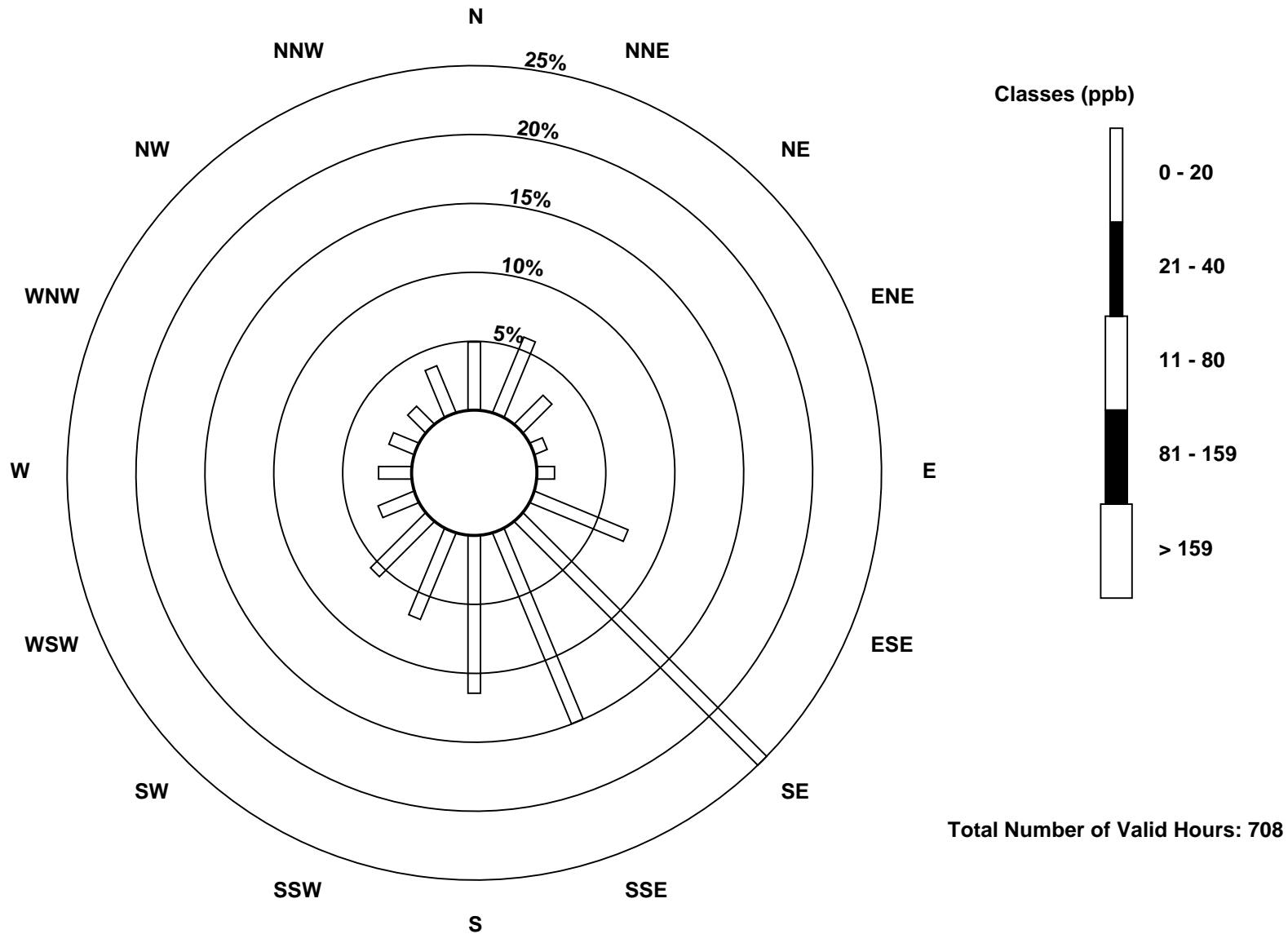
Total Number of Valid Hours: 708

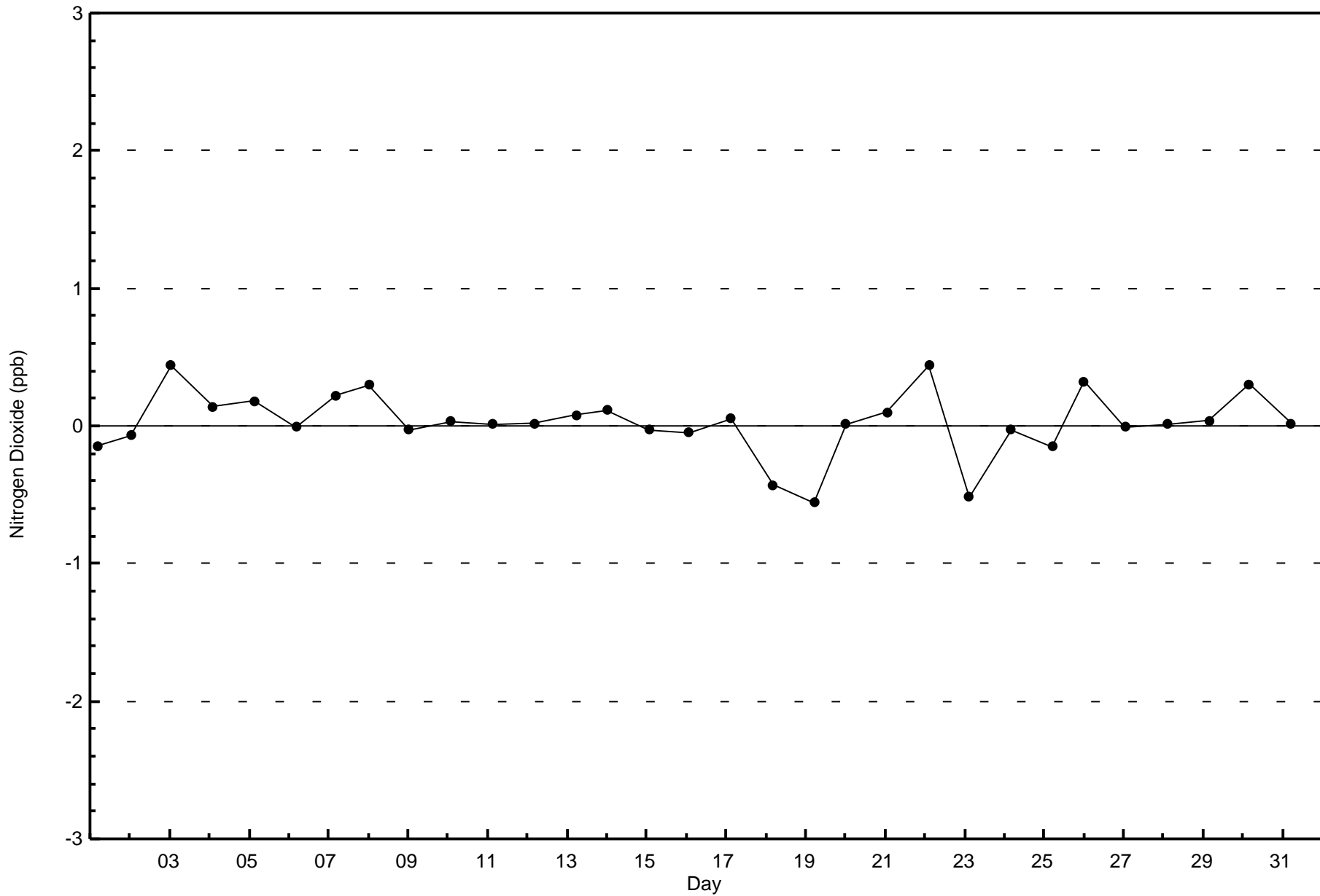
Total Number of Hours: 744

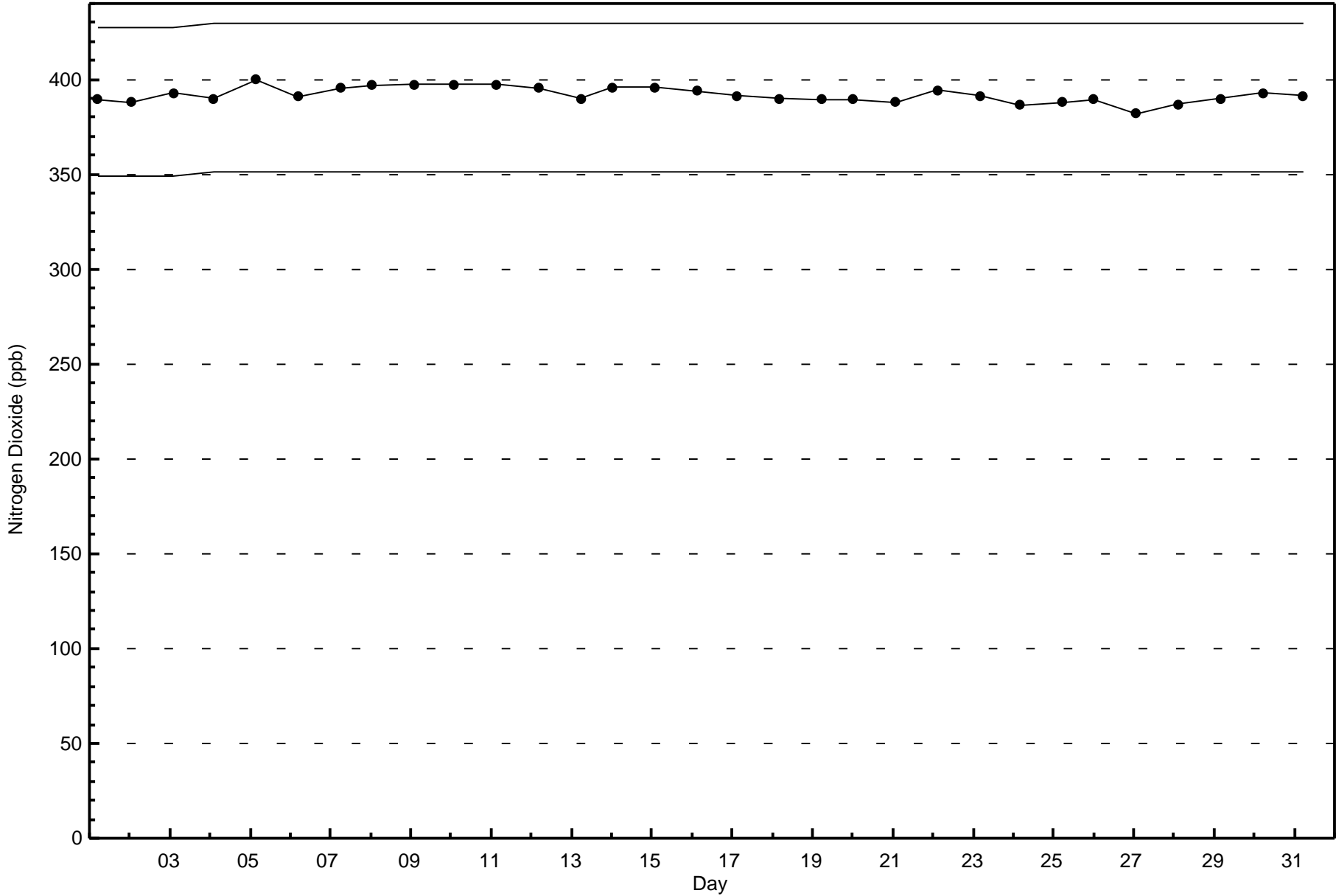


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Wapasu (AMS 17)



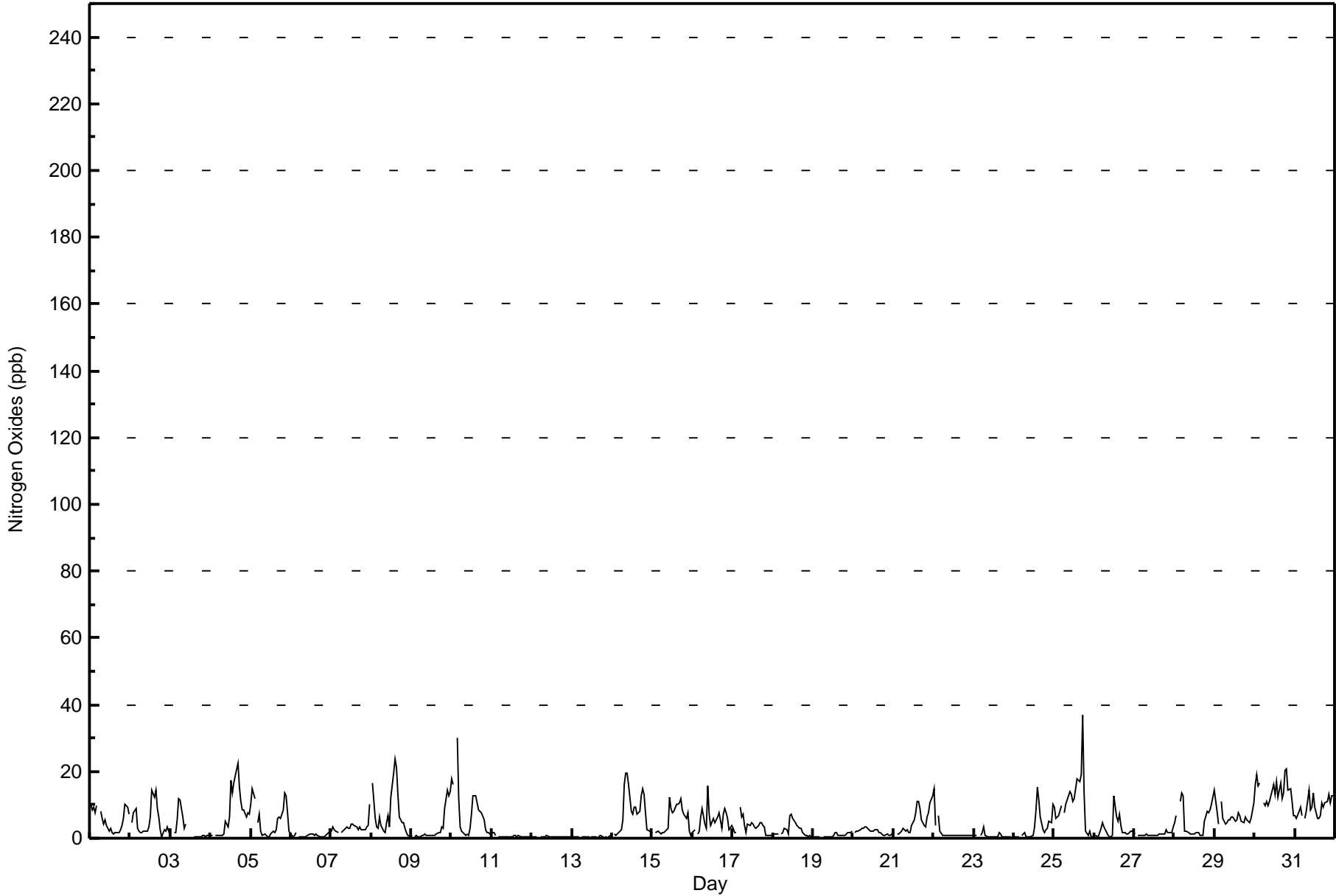






Maximum Value: 37 ppb on Dec 25 18:00																		Maximum Daily Average: 14.0 ppb on Dec 30						Hours in Service: 744			
Minimum Value: 0 ppb on Dec 13 16:00																		Minimum Daily Average: 0.4 ppb on Dec 13						Hours of Data: 709			
Maximum Diurnal Average: 6.2 ppb at hour 16																		Minimum Diurnal Average: 3.2 ppb at hour 8						Hours of Missing Data: 35			
Monthly Average: 4.5 ppb																		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 7 P <sub>90</sub> = 12 P <sub>99</sub> = 20						Hours of Calibration: 35			
																		Percent Operational Time: 100.0									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	10	9	10	8	10	Z	8	6	4	5	4	2	3	2	1	2	2	2	3	4	6	10	9	7	5.5	10	
2-Dec	Z	5	8	9	3	2	2	2	2	2	2	3	6	14	12	14	9	6	2	0	3	2	4	2	5.0	14	
3-Dec	1	Z	2	2	6	12	11	6	3	4	C	C	C	C	1	0	1	0	0	1	1	1	1	1	2.8	12	
4-Dec	1	1	Z	1	1	1	1	1	1	5	3	6	17	14	17	19	22	15	11	8	8	6	8	7	7.6	22	
5-Dec	10	15	12	Z	5	7	2	1	1	1	1	1	1	2	2	3	6	6	8	14	13	8	2	5.4	15		
6-Dec	1	1	1	2	Z	0	0	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	2	2	0.9	2	
7-Dec	2	3	2	2	2	Z	2	2	2	3	3	3	4	4	4	4	3	3	3	2	2	3	4	10	3.3	10	
8-Dec	Z	16	6	4	3	6	4	2	2	5	7	4	12	19	24	21	13	6	4	5	3	2	1	1	7.4	24	
9-Dec	1	Z	0	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	3	9	14	13	14	3.1	14	
10-Dec	18	16	Z	30	12	3	2	1	1	1	1	3	7	13	13	11	9	8	8	5	3	2	2	1	7.4	30	
11-Dec	2	2	1	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0.6	2	
12-Dec	0	0	0	0	Z	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0.4	1	
14-Dec	Z	1	1	1	2	2	6	16	20	19	16	8	7	9	9	7	8	13	15	13	7	3	2	2	8.2	20	
15-Dec	2	Z	2	2	2	1	2	2	2	3	12	9	8	8	10	10	11	12	8	7	6	8	2	1	5.6	12	
16-Dec	2	3	Z	1	2	6	9	4	3	16	7	4	6	5	5	6	8	3	7	9	8	6	3	4	5.5	16	
17-Dec	3	2	2	Z	10	6	7	4	2	4	4	5	4	3	3	4	5	5	4	3	1	1	1	1	3.6	10	
18-Dec	1	1	1	1	Z	1	2	3	2	1	7	7	6	5	4	3	3	3	2	1	1	1	1	1	2.5	7	
19-Dec	0	0	1	0	1	Z	1	0	0	0	1	1	1	2	2	1	1	1	1	1	1	2	2	2	0.9	2	
20-Dec	Z	2	2	2	3	3	3	3	4	2	2	2	2	3	3	2	2	1	1	1	1	1	1	1	2.0	4	
21-Dec	1	Z	1	1	2	2	3	2	2	2	2	4	6	8	11	11	9	6	4	3	6	7	11	13	5.1	13	
22-Dec	15	4	Z	7	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.9	15	
23-Dec	1	1	1	Z	1	2	4	1	1	1	1	1	0	1	0	2	1	0	1	0	0	0	0	0	0.8	4	
24-Dec	0	0	0	0	Z	1	2	0	0	0	0	1	4	8	15	11	6	2	2	3	3	5	4	10	3.5	15	
25-Dec	9	6	7	7	10	Z	7	10	11	14	13	11	12	15	18	17	19	37	14	2	1	2	0	0	10.5	37	
26-Dec	Z	1	0	2	3	5	3	2	1	0	0	1	13	6	5	7	4	2	2	1	1	2	2	2	2.8	13	
27-Dec	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	2	3	1.3	3	
28-Dec	5	7	Z	11	14	13	2	2	2	1	1	1	1	2	2	1	1	1	5	8	8	9	10	12	5.1	14	
29-Dec	14	8	4	Z	11	6	4	5	6	5	6	6	5	6	8	7	5	5	6	5	5	5	6	11	6.5	14	
30-Dec	16	19	16	17	Z	11	10	11	10	11	14	16	13	17	12	17	12	14	20	21	15	15	11	7	14.0	21	
31-Dec	7	6	8	9	7	Z	6	8	14	9	9	14	9	6	6	7	10	9	11	11	13	11	13	13	9.4	14	
4.7 5.0 3.4 4.7 4.3 3.8 3.4 3.2 3.3 3.9 4.0 3.9 5.1 5.8 6.2 6.2 5.6 5.4 4.7 4.3 4.2 4.3 3.9 4.3																		Diurnal Average									
18 19 16 30 14 13 11 16 20 19 16 16 17 19 24 21 22 37 20 21 15 15 13 14																		Diurnal Maximum									
Z - zerospan		C - Calibration																									







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Wapasu - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	703	99.15	99.15
21 - 40	6	0.85	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Wapasu - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	35	41	21	7	9	52	176	105	80	47	40	20	17	14	13	25	702
21 - 40	0	1	0	0	0	0	1	1	1	1	0	0	0	0	0	1	6
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	35	42	21	7	9	52	177	106	81	48	40	20	17	14	13	26	708

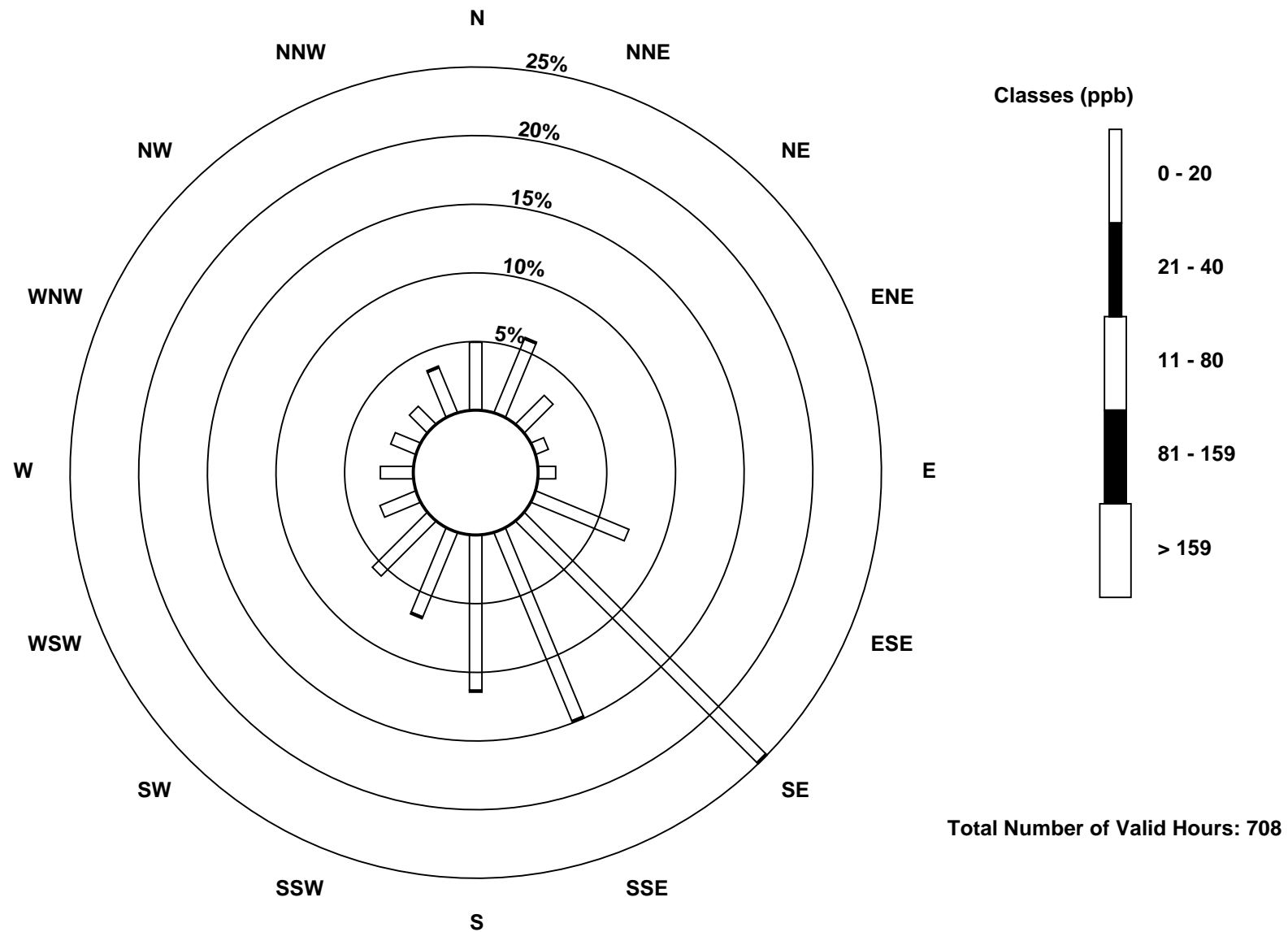
Total Number of Valid Hours: 708

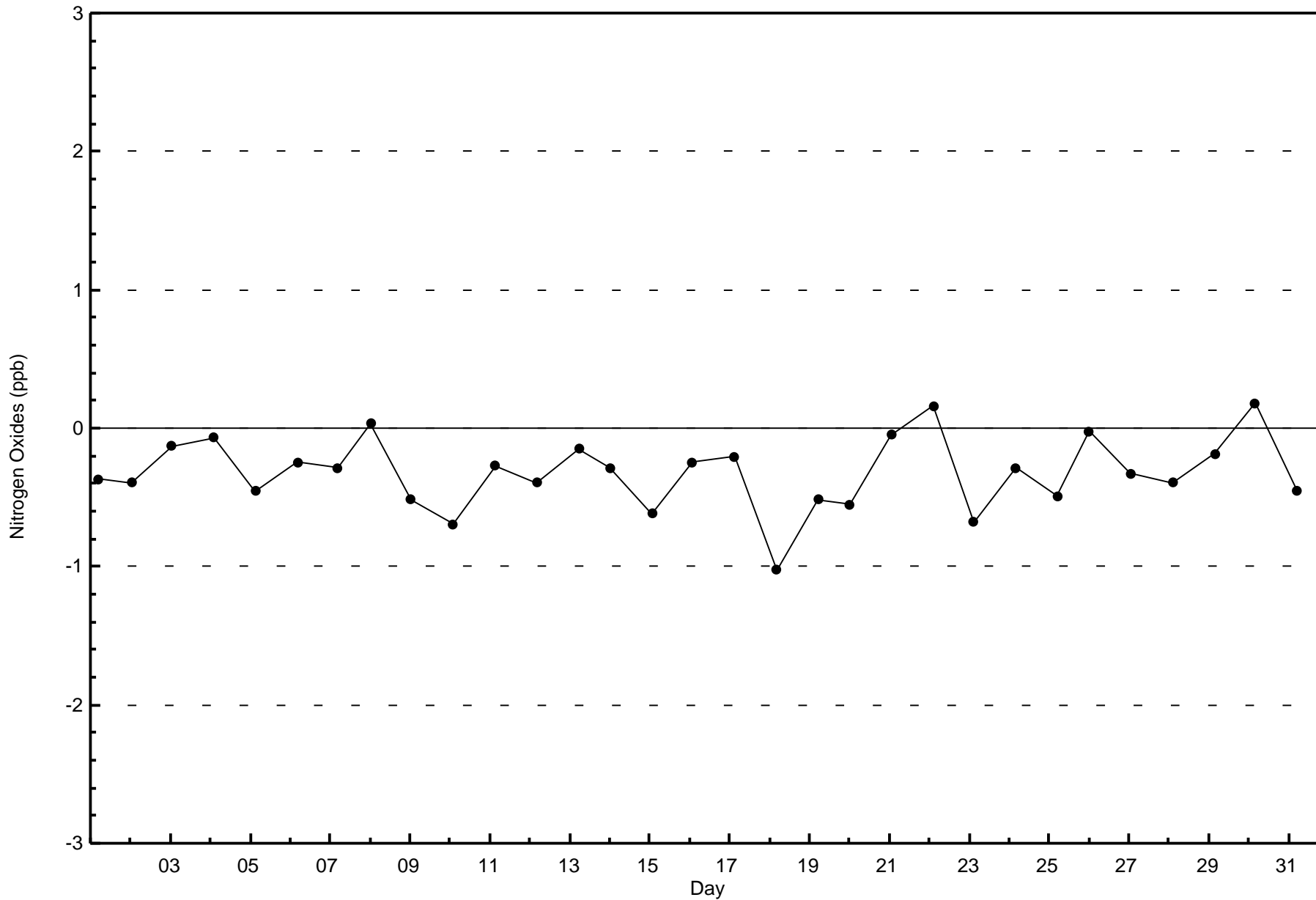
Total Number of Hours: 744

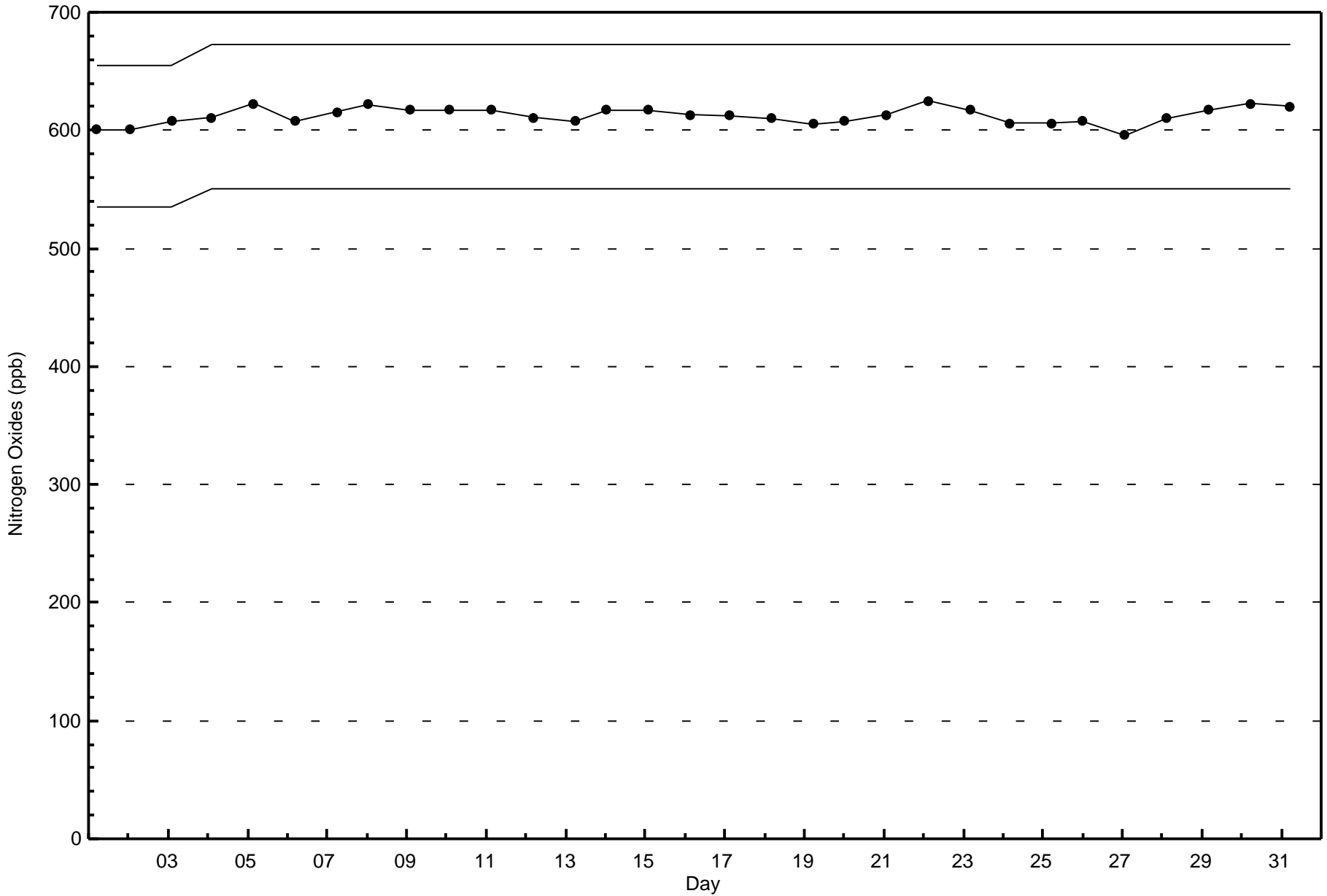


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Wapasu (AMS 17)





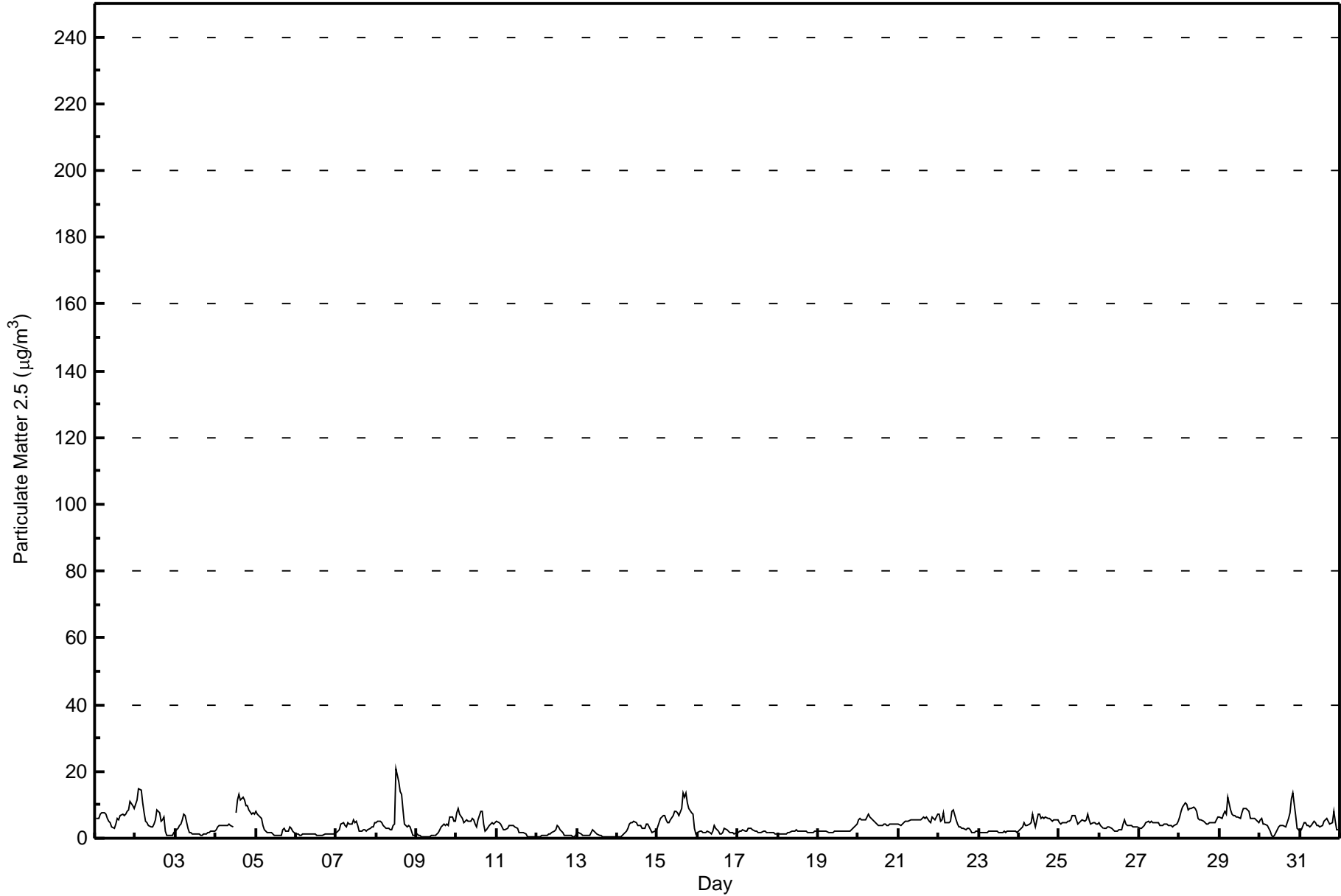




Summary of Hour Averages

Wapasu - December 2015

Number of Exceedences (AAAQO): 24-hr: 0		Hours in Service: 744																																														
Maximum Value: 20.7 µg/m <sup>3</sup> on Dec 8 13:00		Maximum Daily Average: 7.2 µg/m <sup>3</sup> on Dec 29																																														
Minimum Value: 0.3 µg/m <sup>3</sup> on Dec 11 23:00		Hours of Data: 743																																														
Maximum Diurnal Average: 4.5 µg/m <sup>3</sup> at hour 16		Hours of Missing Data: 1																																														
Monthly Average: 3.94 µg/m <sup>3</sup>		Hours of Calibration: 1																																														
Minimum Daily Average: 1.0 µg/m <sup>3</sup> on Dec 13		Percent Operational Time: 100.0																																														
Minimum Diurnal Average: 3.3 µg/m <sup>3</sup> at hour 23		Percentiles: P <sub>1</sub> = 0.5 P <sub>10</sub> = 1.1 Q <sub>1</sub> = 1.9 Median = 3.7 Q <sub>3</sub> = 5.3 P <sub>90</sub> = 7.3 P <sub>99</sub> = 13.2																																														
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	5.9	6.1	6.1	7.1	7.8	7.7	7.3	6.0	5.0	4.6	3.4	2.8	4.3	5.8	5.4	6.8	7.2	6.9	7.1	8.1	8.5	11.1	9.9	8.9	6.7	11.1																						
2-Dec	10.4	11.6	14.7	14.3	10.7	7.4	5.2	4.5	3.8	3.5	3.5	4.4	5.6	8.5	7.8	5.3	5.5	6.3	2.0	1.1	1.0	1.0	1.0	1.5	5.9	14.7																						
3-Dec	2.3	2.9	3.7	4.1	5.4	7.2	7.0	2.8	1.6	1.8	1.3	1.3	1.3	1.1	1.1	1.0	1.0	1.1	1.2	1.6	1.8	1.9	2.2	2.1	2.5	7.2																						
4-Dec	2.6	3.2	3.7	3.7	3.7	3.9	4.0	3.9	4.1	3.9	3.5	C	7.7	11.3	13.3	11.4	12.4	11.4	9.9	9.8	8.5	7.3	7.7	7.4	6.9	13.3																						
5-Dec	8.0	7.2	6.3	5.7	3.8	2.7	2.1	1.8	1.6	1.5	1.3	1.1	1.0	0.9	0.9	1.0	2.6	2.8	2.1	2.3	3.2	2.8	2.1	1.7	2.8	8.0																						
6-Dec	1.2	1.1	1.0	1.0	1.1	1.3	1.5	1.5	1.4	1.3	1.3	1.2	1.0	1.0	0.9	0.9	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.6	1.2	1.6																						
7-Dec	1.6	2.1	2.5	4.1	4.6	3.9	3.5	4.6	4.1	4.3	5.7	4.8	5.1	3.8	2.3	2.2	2.4	2.4	2.3	2.7	3.1	3.4	3.5	4.5	3.5	5.7																						
8-Dec	4.9	5.0	5.3	4.8	3.7	3.5	3.1	2.8	2.4	2.5	3.9	4.3	20.7	16.8	13.9	13.0	8.3	4.4	3.5	3.7	3.2	2.2	1.0	0.8	5.7	20.7																						
9-Dec	1.1	1.1	0.8	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.8	1.0	1.3	1.7	2.4	3.5	4.3	3.7	4.0	4.0	6.5	6.4	5.2	5.1	2.4	6.5																						
10-Dec	7.8	8.9	7.2	6.1	4.6	4.9	5.5	4.9	5.0	6.0	5.5	4.4	3.2	5.5	8.2	7.9	4.3	2.0	2.7	3.7	4.4	4.6	4.4	4.9	5.3	8.9																						
11-Dec	5.0	4.8	4.2	3.3	2.7	2.5	2.8	3.8	3.8	3.6	3.8	3.4	2.8	1.8	1.6	1.7	1.7	1.3	0.6	0.4	0.4	0.3	0.3	0.4	2.4	5.0																						
12-Dec	0.6	0.5	0.6	0.6	0.8	0.8	1.0	1.3	1.5	1.7	2.0	2.7	3.7	3.2	2.6	1.5	1.0	1.0	1.0	0.9	0.8	0.6	0.6	0.9	1.3	3.7																						
13-Dec	1.9	1.9	1.4	1.0	0.7	0.7	0.7	0.9	1.7	2.4	2.0	1.5	1.1	0.7	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.5	0.5	1.0	2.4																						
14-Dec	0.6	0.5	0.6	0.7	1.4	2.1	3.0	4.4	4.5	4.5	5.1	4.9	4.0	3.8	3.9	3.0	3.0	4.4	4.2	3.4	2.5	1.7	2.2	2.0	2.9	5.1																						
15-Dec	3.4	4.7	5.8	7.0	7.0	5.3	4.7	4.7	5.5	6.6	8.1	7.9	7.5	6.9	8.9	13.4	12.3	13.4	10.6	9.1	7.8	7.2	2.8	1.2	7.2	13.4																						
16-Dec	1.9	2.3	2.0	1.7	1.7	1.9	1.9	1.6	1.5	2.1	3.8	3.1	2.0	1.3	1.5	1.8	2.9	2.4	2.0	1.8	1.7	1.6	1.4	1.5	2.0	3.8																						
17-Dec	1.6	2.0	1.9	2.5	2.3	2.3	2.8	3.0	2.8	2.7	2.0	2.0	1.8	1.7	1.9	2.0	2.0	1.7	1.7	1.7	1.5	1.5	1.4	1.4	2.0	3.0																						
18-Dec	1.4	1.4	1.4	1.3	1.4	1.4	1.5	1.8	1.9	1.9	2.3	2.6	2.2	2.1	2.1	1.9	2.0	2.1	1.6	1.6	1.6	1.7	2.1	2.1	1.8	2.6																						
19-Dec	2.1	2.0	2.1	2.1	1.9	1.9	1.9	1.8	1.8	1.7	1.9	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.6	3.0	3.9	4.1	2.2	4.1																						
20-Dec	5.4	5.8	5.3	5.5	5.6	6.2	7.0	6.5	5.8	5.2	4.8	4.2	3.9	3.7	3.7	4.1	4.4	4.0	3.9	4.1	4.3	4.3	4.4	4.4	4.9	7.0																						
21-Dec	4.0	4.0	4.4	4.7	5.1	4.9	5.2	5.7	5.6	5.4	5.6	5.5	5.5	5.6	5.9	6.2	5.8	6.2	5.1	4.8	6.3	5.8	5.4	7.1	5.4	7.1																						
22-Dec	7.0	4.9	5.5	7.5	4.8	4.8	4.6	5.2	8.1	8.5	5.7	4.1	3.5	3.4	2.9	2.9	2.7	2.8	2.8	2.4	1.9	1.8	2.0	2.1	4.2	8.5																						
23-Dec	1.6	1.5	1.7	1.7	1.7	1.8	2.0	2.1	2.2	2.2	2.1	2.0	1.8	1.9	1.8	1.9	1.8	2.0	2.2	2.0	2.1	2.0	1.9	1.8	1.9	2.2																						
24-Dec	2.3	2.8	3.6	4.8	3.9	3.8	4.2	4.5	7.1	5.1	3.4	7.4	7.3	6.0	6.3	5.9	6.3	6.1	5.7	5.4	5.1	5.4	5.7	5.3	5.1	7.4																						
25-Dec	4.8	4.0	4.9	4.7	4.6	5.1	5.2	5.5	6.8	6.7	5.5	4.4	4.5	5.1	5.5	5.2	5.4	7.3	5.6	4.1	4.5	4.8	4.2	4.1	5.1	7.3																						
26-Dec	4.5	3.9	3.0	3.1	2.9	3.5	3.2	2.8	2.5	2.3	1.9	2.1	2.7	2.7	4.1	5.7	4.4	3.6	3.6	3.8	3.6	3.4	3.6	3.6	3.4	5.7																						
27-Dec	2.8	3.1	3.3	4.0	4.5	4.9	4.8	4.9	4.7	4.5	4.6	4.4	3.9	3.8	4.0	4.1	4.2	3.9	3.7	3.7	3.6	3.7	4.1	4.9	4.1	4.9																						
28-Dec	6.4	8.1	9.3	10.5	10.3	8.4	8.7	8.9	9.4	9.0	8.0	6.1	5.4	5.6	5.0	4.6	4.4	4.3	4.6	4.8	4.7	4.5	5.4	6.4	6.8	10.5																						
29-Dec	6.5	6.0	7.1	8.1	7.3	12.2	8.4	7.4	6.8	6.6	6.3	6.3	6.0	7.6	9.0	9.1	9.1	8.1	5.8	5.7	6.0	5.8	5.6	4.8	7.2	12.2																						
30-Dec	5.6	5.8	4.4	4.1	3.8	3.1	2.0	0.7	0.6	0.7	2.6	3.2	3.6	3.8	3.8	3.4	4.6	5.7	7.8	12.0	13.7	6.6	2.9	2.4	4.5	13.7																						
31-Dec	2.3	2.5	4.6	4.8	3.9	3.7	3.5	3.9	5.3	4.5	3.7	3.7	3.3	3.9	5.0	5.3	5.9	4.9	4.3	4.8	8.3	5.1	2.4	2.6	4.2	8.3																						
																								3.8	3.9	4.1	4.4	4.0	4.0	3.8	3.7	3.9	3.8	3.7	3.6	4.2	4.3	4.5	4.5	4.4	4.2	3.7	3.8	4.0	3.7	3.3	3.3	Diurnal Average
																								10.4	11.6	14.7	14.3	10.7	12.2	8.7	8.9	9.4	9.0	8.1	7.9	20.7	16.8	13.9	13.4	12.4	13.4	10.6	12.0	13.7	11.1	9.9	8.9	Diurnal Maximum
C - Calibration																																																
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																																																







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Wapasu - December 2015**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	515	69.31	69.31
6 - 15	166	22.34	91.66
16 - 25	2	0.27	91.92
26 - 80	0	0.00	91.92
> 81.0	0	0.00	91.92

Total Number of Valid Hours: 743

Total Number of Hours: 744



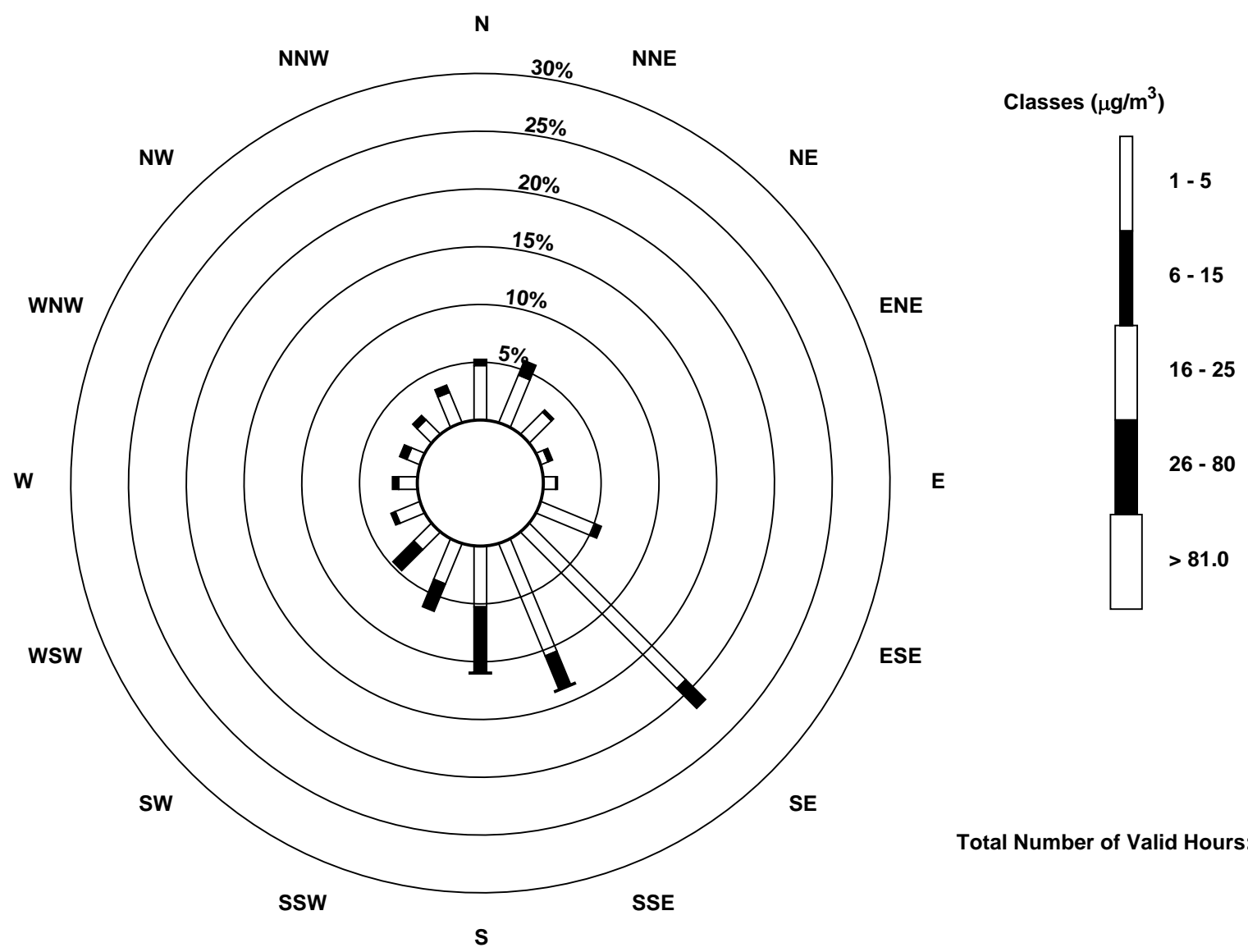
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Wapasu - December 2015**

Concentration Ranges ( $\mu\text{g}/\text{m}^3$ )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	35	33	20	5	8	38	142	78	39	28	16	17	12	9	13	21	514
6 - 15	4	10	2	3	1	4	18	23	42	19	19	3	4	5	4	5	166
16 - 25	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	39	43	22	8	9	42	160	102	82	47	35	20	16	14	17	26	682

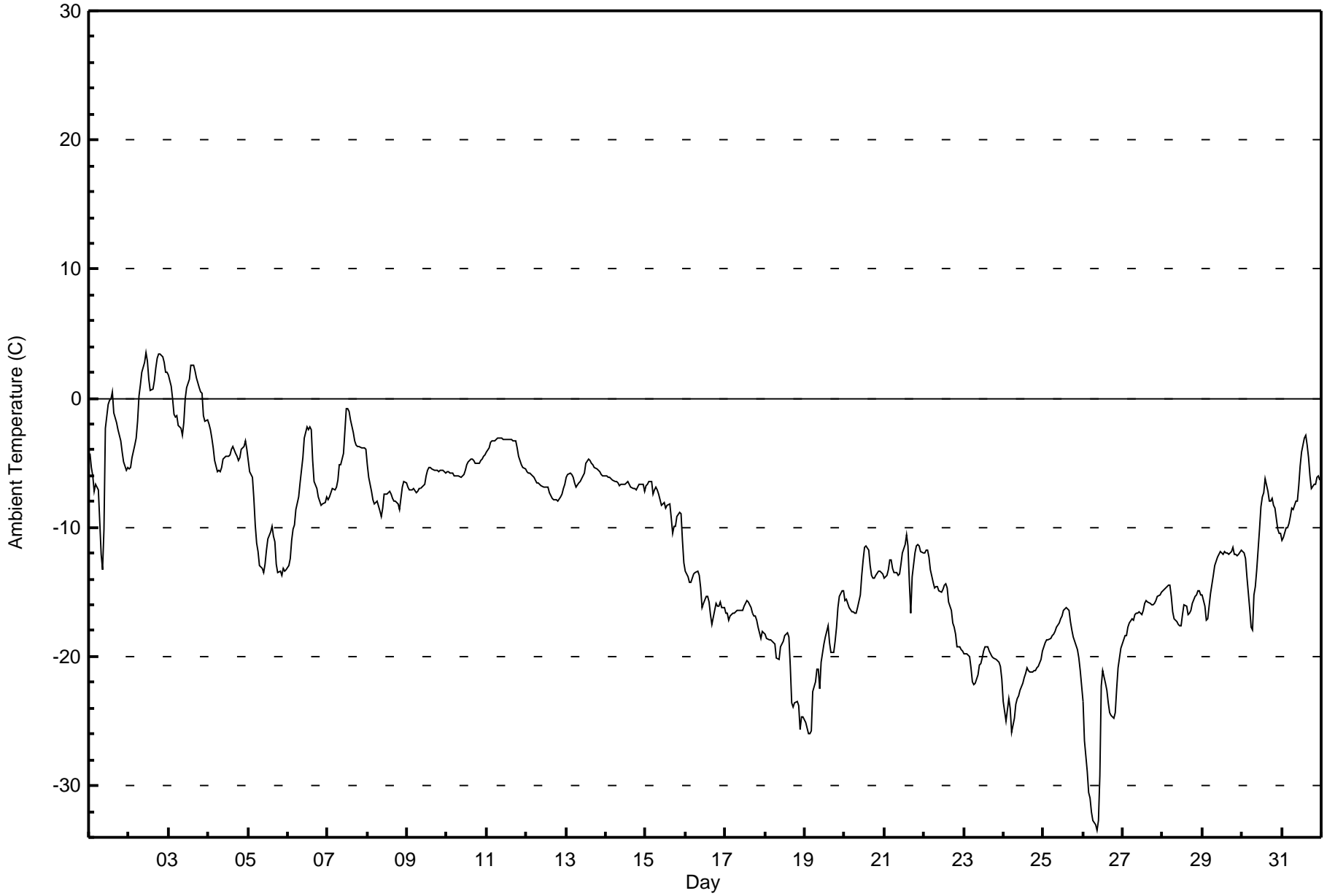
Total Number of Valid Hours: 742

Total Number of Hours: 744





Maximum Value: 3.5 C on Dec 2 11:00		Maximum Daily Average: 0.6 C on Dec 2		Hours in Service: 744																																												
Minimum Value: -33.5 C on Dec 26 09:00		Minimum Daily Average: -26.1 C on Dec 26		Hours of Data: 744																																												
Maximum Diurnal Average: -9.6 C at hour 14		Minimum Diurnal Average: -12.3 C at hour 6		Hours of Missing Data: 0																																												
Monthly Average: -11.22 C		Percentiles: P <sub>1</sub> = -29.2 P <sub>10</sub> = -20.5 Q <sub>1</sub> = -16.6 Median = -10.5 Q <sub>3</sub> = -5.8 P <sub>90</sub> = -3.3 P <sub>99</sub> = 2.7		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-4.3	-5.3	-6.0	-7.2	-6.7	-7.0	-9.6	-12.1	-13.2	-10.1	-2.3	-0.5	-0.2	-0.1	0.5	-1.2	-1.9	-2.4	-2.9	-3.3	-4.1	-5.0	-5.6	-5.4	-4.8	0.5																						
2-Dec	-5.4	-5.3	-4.6	-3.6	-3.1	-1.7	0.2	1.1	2.0	2.8	3.5	2.9	1.5	0.6	0.7	1.4	2.3	3.1	3.4	3.5	3.2	2.8	2.0	2.0	0.6	3.5																						
3-Dec	1.8	0.9	0.0	-1.2	-1.4	-1.3	-2.2	-2.4	-2.9	-1.9	-0.1	0.8	1.4	2.6	2.6	2.5	2.1	1.6	0.8	0.5	0.4	-1.4	-1.8	-1.6	0.0	2.6																						
4-Dec	-2.0	-2.5	-3.1	-3.8	-4.8	-5.6	-5.5	-5.7	-5.4	-4.8	-4.5	-4.5	-4.4	-3.9	-3.7	-4.2	-4.4	-4.8	-4.6	-4.6	-4.0	-3.8	-3.3	-4.0	-4.2	-2.0																						
5-Dec	-4.8	-5.7	-6.2	-7.7	-9.8	-11.2	-11.9	-12.9	-13.2	-13.5	-12.9	-11.8	-10.9	-10.3	-9.9	-10.7	-11.1	-12.8	-13.5	-13.4	-13.7	-13.2	-13.4	-13.3	-11.2	-4.8																						
6-Dec	-13.0	-12.4	-11.0	-10.2	-9.8	-8.6	-7.6	-6.5	-5.6	-4.6	-3.1	-2.2	-2.5	-2.2	-2.4	-4.9	-6.4	-7.0	-7.6	-8.0	-8.2	-8.1	-8.1	-7.7	-7.0	-2.2																						
7-Dec	-7.9	-7.7	-7.3	-7.0	-7.1	-6.9	-6.3	-5.1	-5.2	-4.3	-2.5	-0.8	-0.8	-1.0	-1.6	-2.7	-3.3	-3.7	-3.7	-3.7	-3.8	-3.8	-3.8	-3.9	-4.3	-0.8																						
8-Dec	-5.1	-6.2	-7.2	-7.8	-8.2	-8.1	-8.0	-8.8	-9.1	-8.5	-7.5	-7.4	-7.4	-7.2	-7.4	-7.7	-7.9	-8.0	-8.2	-8.6	-7.8	-6.9	-6.4	-6.6	-7.6	-5.1																						
9-Dec	-6.9	-7.1	-7.1	-7.1	-7.0	-7.3	-7.2	-6.9	-7.0	-6.9	-6.6	-6.0	-5.5	-5.4	-5.4	-5.5	-5.5	-5.6	-5.6	-5.7	-5.6	-5.6	-5.7	-5.8	-6.3	-5.4																						
10-Dec	-5.7	-5.7	-5.7	-5.8	-6.0	-6.1	-6.0	-6.1	-6.1	-6.0	-5.9	-5.6	-5.2	-4.9	-4.7	-4.7	-4.9	-5.0	-5.1	-5.0	-4.8	-4.7	-4.5	-4.4	-5.4	-4.4																						
11-Dec	-4.2	-3.9	-3.4	-3.3	-3.3	-3.2	-3.1	-3.1	-3.0	-3.1	-3.2	-3.2	-3.2	-3.2	-3.2	-3.2	-3.3	-3.3	-3.9	-4.5	-4.8	-5.1	-5.4	-5.5	-3.7	-3.0																						
12-Dec	-5.7	-5.8	-5.8	-5.9	-6.1	-6.3	-6.5	-6.6	-6.7	-6.8	-6.9	-6.9	-6.9	-6.9	-7.4	-7.7	-7.9	-7.8	-7.9	-7.9	-7.6	-7.4	-7.0	-6.6	-6.9	-5.7																						
13-Dec	-6.2	-5.9	-5.8	-5.9	-6.2	-6.6	-6.9	-6.6	-6.4	-6.3	-6.1	-5.8	-5.1	-4.7	-4.8	-5.0	-5.2	-5.4	-5.4	-5.6	-5.7	-5.9	-6.0	-6.0	-5.8	-4.7																						
14-Dec	-6.0	-6.1	-6.1	-6.2	-6.3	-6.4	-6.5	-6.5	-6.8	-6.7	-6.7	-6.7	-6.6	-6.5	-6.6	-6.8	-7.0	-7.0	-7.1	-6.9	-6.7	-6.7	-6.7	-7.2	-6.6	-6.0																						
15-Dec	-6.8	-6.6	-6.4	-6.4	-7.4	-7.1	-6.9	-7.1	-7.4	-8.3	-8.2	-8.1	-8.5	-8.3	-8.1	-9.3	-10.4	-9.9	-9.9	-9.2	-8.8	-8.9	-11.0	-12.7	-8.4	-6.4																						
16-Dec	-13.4	-13.8	-14.3	-14.3	-13.9	-13.6	-13.5	-13.3	-13.7	-14.7	-16.2	-15.9	-15.4	-15.4	-15.8	-16.8	-17.5	-16.4	-15.9	-16.1	-16.1	-15.8	-16.2	-16.3	-15.2	-13.3																						
17-Dec	-16.6	-16.7	-17.2	-16.9	-16.6	-16.6	-16.5	-16.4	-16.4	-16.5	-16.4	-16.1	-15.9	-15.7	-15.8	-16.2	-16.7	-16.9	-16.9	-17.2	-17.8	-18.6	-18.1	-18.1	-16.8	-15.7																						
18-Dec	-18.3	-18.6	-18.7	-18.7	-18.8	-18.9	-19.0	-20.1	-20.2	-19.3	-19.0	-18.8	-18.4	-18.1	-18.5	-20.8	-23.6	-23.9	-23.6	-23.5	-23.8	-25.6	-24.7	-24.7	-20.7	-18.1																						
19-Dec	-25.1	-25.6	-25.9	-26.0	-25.7	-22.8	-22.0	-21.0	-21.0	-22.5	-20.4	-19.0	-18.5	-18.1	-17.6	-18.9	-19.7	-19.6	-18.8	-17.7	-16.2	-15.4	-14.9	-14.9	-20.3	-14.9																						
20-Dec	-15.7	-15.6	-15.9	-16.2	-16.5	-16.5	-16.6	-16.7	-16.3	-15.2	-13.7	-12.5	-11.6	-11.5	-11.8	-13.0	-13.7	-13.9	-13.9	-13.7	-13.4	-13.4	-13.5	-13.6	-14.4	-11.5																						
21-Dec	-13.9	-13.7	-13.3	-12.5	-12.5	-13.2	-13.5	-13.5	-13.7	-13.7	-12.8	-11.9	-11.3	-10.6	-11.5	-14.3	-16.6	-13.8	-12.0	-11.4	-11.3	-11.5	-11.9	-11.9	-12.8	-10.6																						
22-Dec	-11.9	-11.7	-11.8	-12.4	-13.3	-14.2	-14.7	-14.6	-14.5	-14.9	-15.1	-14.8	-14.5	-14.4	-14.7	-15.7	-16.4	-17.4	-17.7	-18.3	-19.2	-19.3	-19.5	-19.6	-15.4	-11.7																						
23-Dec	-19.8	-19.8	-19.7	-20.1	-20.9	-21.9	-22.2	-22.1	-21.4	-20.7	-20.6	-20.1	-19.5	-19.3	-19.2	-19.5	-19.8	-20.0	-20.1	-20.2	-20.3	-20.5	-20.8	-21.8	-20.4	-19.2																						
24-Dec	-23.5	-25.0	-24.2	-23.2	-24.1	-25.9	-24.7	-23.7	-23.3	-23.0	-22.6	-22.1	-21.7	-21.3	-20.9	-21.1	-21.2	-21.2	-21.1	-21.1	-20.9	-20.8	-20.3	-19.6	-22.4	-19.6																						
25-Dec	-19.2	-18.9	-18.8	-18.7	-18.6	-18.4	-18.3	-18.1	-17.8	-17.4	-17.1	-16.8	-16.5	-16.3	-16.2	-16.5	-17.3	-17.9	-18.5	-18.8	-19.4	-20.1	-21.1	-22.3	-18.3	-16.2																						
26-Dec	-23.5	-26.6	-28.9	-30.5	-31.0	-32.0	-32.7	-33.0	-33.5	-32.7	-29.2	-22.3	-21.1	-22.1	-22.6	-23.6	-24.3	-24.6	-24.8	-24.4	-22.5	-20.9	-20.1	-19.4	-26.1	-19.4																						
27-Dec	-18.7	-18.4	-18.4	-17.8	-17.4	-17.0	-17.2	-16.7	-16.7	-16.6	-16.6	-16.7	-16.4	-15.9	-15.7	-15.8	-15.9	-16.0	-16.0	-15.9	-15.6	-15.4	-15.2	-15.0	-16.5	-15.0																						
28-Dec	-14.9	-14.8	-14.7	-14.4	-14.5	-15.3	-16.6	-17.1	-17.3	-17.5	-17.7	-17.6	-16.7	-16.0	-16.1	-16.7	-16.7	-16.4	-15.9	-15.4	-15.3	-14.9	-14.9	-15.2	-15.9	-14.4																						
29-Dec	-15.3	-16.2	-17.2	-17.1	-16.1	-15.1	-13.7	-13.0	-12.6	-12.3	-12.1	-11.9	-12.0	-11.8	-11.9	-12.0	-12.0	-11.9	-11.6	-12.1	-12.1	-12.2	-12.1	-11.8	-13.2	-11.6																						
30-Dec	-11.8	-12.0	-12.4	-13.8	-16.3	-17.7	-18.0	-15.2	-14.5	-13.3	-10.1	-8.3	-7.7	-7.4	-6.2	-7.2	-8.0	-8.0	-7.7	-8.3	-8.5	-10.1	-10.5	-10.4	-11.0	-6.2																						
31-Dec	-11.0	-10.8	-10.0	-10.0	-9.7	-9.2	-8.5	-8.6	-8.0	-7.9	-6.8	-5.3	-4.2	-3.1	-2.9	-3.6	-4.6	-6.0	-7.0	-6.6	-6.7	-6.1	-6.0	-6.4	-7.0	-2.9																						
																								-11.4	-11.7	-11.8	-12.0	-12.2	-12.3	-12.3	-12.2	-12.2	-11.8	-10.9	-10.2	-9.9	-9.6	-9.7	-10.4	-10.9	-11.0	-11.1	-11.1	-11.0	-11.1	-11.2	-11.3	Diurnal Average
																								1.8	0.9	0.0	-1.2	-1.4	-1.3	0.2	1.1	2.0	2.8	3.5	2.9	1.5	2.6	2.6	2.5	2.3	3.1	3.4	3.5	3.2	2.8	2.0	2.0	Diurnal Maximum





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C**  
**Wapasu - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	86	11.56	11.56
-20 - 0	626	84.14	95.70
0 - 10	32	4.30	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

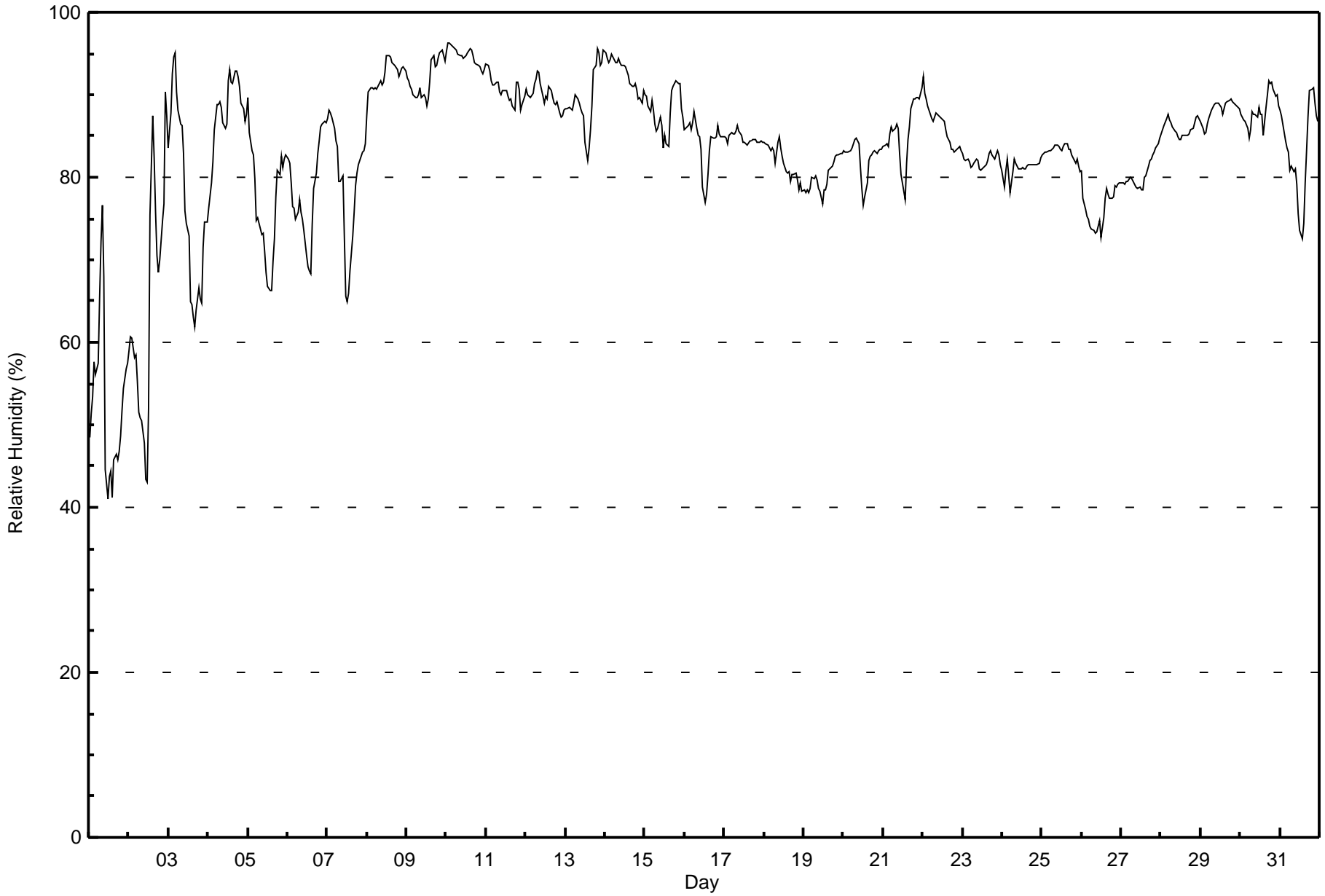
**Wapasu - December 2015**

Maximum Value: 96 % on Dec 10 03:00														Maximum Daily Average: 94.7 % on Dec 10														Hours in Service: 744			
Minimum Value: 41 % on Dec 1 12:00														Minimum Daily Average: 53.1 % on Dec 1														Hours of Data: 744			
Maximum Diurnal Average: 85.1 % at hour 23														Minimum Diurnal Average: 79.9 % at hour 12														Hours of Missing Data: 0			
Monthly Average: 83.2 %														Percentiles: P <sub>1</sub> = 46 P <sub>10</sub> = 74 Q <sub>1</sub> = 81 Median = 85 O <sub>3</sub> = 89 P <sub>90</sub> = 93 P <sub>99</sub> = 95														Hours of Calibration: 0			
																												Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24							
1-Dec	49	51	53	58	56	58	65	72	77	68	45	41	44	44	41	46	46	46	47	49	52	54	57	57	53.1	77					
2-Dec	59	61	61	58	58	55	52	51	51	48	43	43	52	75	87	82	76	71	68	70	75	77	90	87	64.6	90					
3-Dec	84	88	93	95	95	90	88	86	86	83	76	74	73	65	64	63	62	64	67	65	65	72	75	75	76.9	95					
4-Dec	76	78	79	82	86	89	89	89	88	87	86	86	92	93	92	91	93	93	92	91	89	88	87	88	87.7	93					
5-Dec	90	85	83	83	80	75	75	74	73	73	71	69	67	66	66	70	73	78	81	80	83	81	82	83	76.7	90					
6-Dec	82	82	79	76	76	75	76	77	76	75	74	70	69	69	68	74	79	81	83	84	86	86	87	87	78.0	87					
7-Dec	87	88	88	87	86	84	84	79	79	80	73	66	65	66	69	73	76	79	81	82	83	83	83	84	79.3	88					
8-Dec	88	90	91	91	91	91	91	91	92	91	92	93	95	95	95	94	94	93	93	92	93	93	93	93	92.2	95					
9-Dec	92	92	91	91	90	90	90	90	91	90	90	90	89	89	92	94	95	93	94	94	95	95	95	94	91.8	95					
10-Dec	95	96	96	96	96	96	95	95	95	95	94	95	95	95	96	95	95	94	94	94	93	93	93	93	94.7	96					
11-Dec	94	94	93	92	91	91	92	92	90	90	91	90	91	90	89	90	89	88	91	91	91	88	89	90	90.6	94					
12-Dec	91	90	90	90	90	91	92	93	93	91	90	89	90	89	91	90	90	89	89	89	88	87	87	88	89.9	93					
13-Dec	88	88	89	88	88	89	90	89	89	88	88	87	84	82	84	86	89	93	93	96	95	94	94	95	89.5	96					
14-Dec	95	94	94	94	95	94	94	94	94	94	94	94	93	93	92	91	91	91	91	91	90	90	89	90	92.6	95					
15-Dec	90	90	89	88	89	88	86	86	86	87	86	84	85	84	84	88	90	91	91	92	91	91	88	87	88.0	92					
16-Dec	86	86	86	87	86	87	88	86	85	85	83	79	77	78	80	83	85	85	85	85	86	85	85	85	84.3	88					
17-Dec	85	85	84	85	85	85	85	86	86	86	85	84	84	84	84	84	84	85	85	85	84	84	84	84	84.7	86					
18-Dec	84	84	84	84	83	83	83	82	84	85	84	83	82	81	81	81	80	80	80	80	80	78	79	78	81.8	85					
19-Dec	78	78	78	78	79	80	80	80	80	79	78	77	79	79	79	81	81	81	82	83	83	83	83	83	80.0	83					
20-Dec	83	83	83	83	83	83	84	85	85	84	81	79	77	78	79	82	83	83	83	83	83	83	83	83	82.4	85					
21-Dec	84	84	84	84	85	86	86	86	86	86	83	80	78	77	82	85	86	88	90	90	90	90	90	91	85.4	91					
22-Dec	92	90	89	89	88	87	87	87	88	88	87	87	87	87	86	85	84	83	83	83	83	84	84	83	86.3	92					
23-Dec	83	82	82	82	82	81	81	82	82	82	81	81	81	81	81	82	83	83	83	82	83	83	83	82	82.0	83					
24-Dec	81	79	81	82	80	78	81	82	82	81	81	81	81	81	81	81	81	82	82	82	82	82	82	82	81.1	82					
25-Dec	83	83	83	83	83	83	83	83	84	84	84	83	83	84	84	84	83	83	83	82	82	82	81	81	83.0	84					
26-Dec	81	77	76	75	75	74	74	73	73	73	74	75	73	75	77	79	78	78	77	78	79	79	79	79	76.3	81					
27-Dec	79	79	79	80	79	80	80	79	79	79	79	79	79	79	80	80	81	82	82	83	83	84	84	85	80.5	85					
28-Dec	85	86	86	87	88	87	87	86	86	85	85	85	85	85	85	85	85	85	86	86	87	87	87	87	85.9	88					
29-Dec	87	86	85	85	87	87	88	89	89	89	89	89	89	88	88	89	89	89	90	89	89	89	89	88	88.1	90					
30-Dec	88	87	87	87	86	85	86	88	88	88	87	88	88	88	85	89	90	92	91	92	91	90	90	89	88.2	92					
31-Dec	88	88	85	84	84	83	81	81	81	81	79	76	74	72	74	79	83	87	91	91	91	89	87	87	83.2	91					
84.1														84.0														Diurnal Average			
95														96														Diurnal Maximum			



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Wapasu - December 2015**







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Wapasu - December 2015**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	31	4.17	4.17
60 - 80	142	19.09	23.25
80 - 100	571	76.75	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Precipitation (PC) - mm**

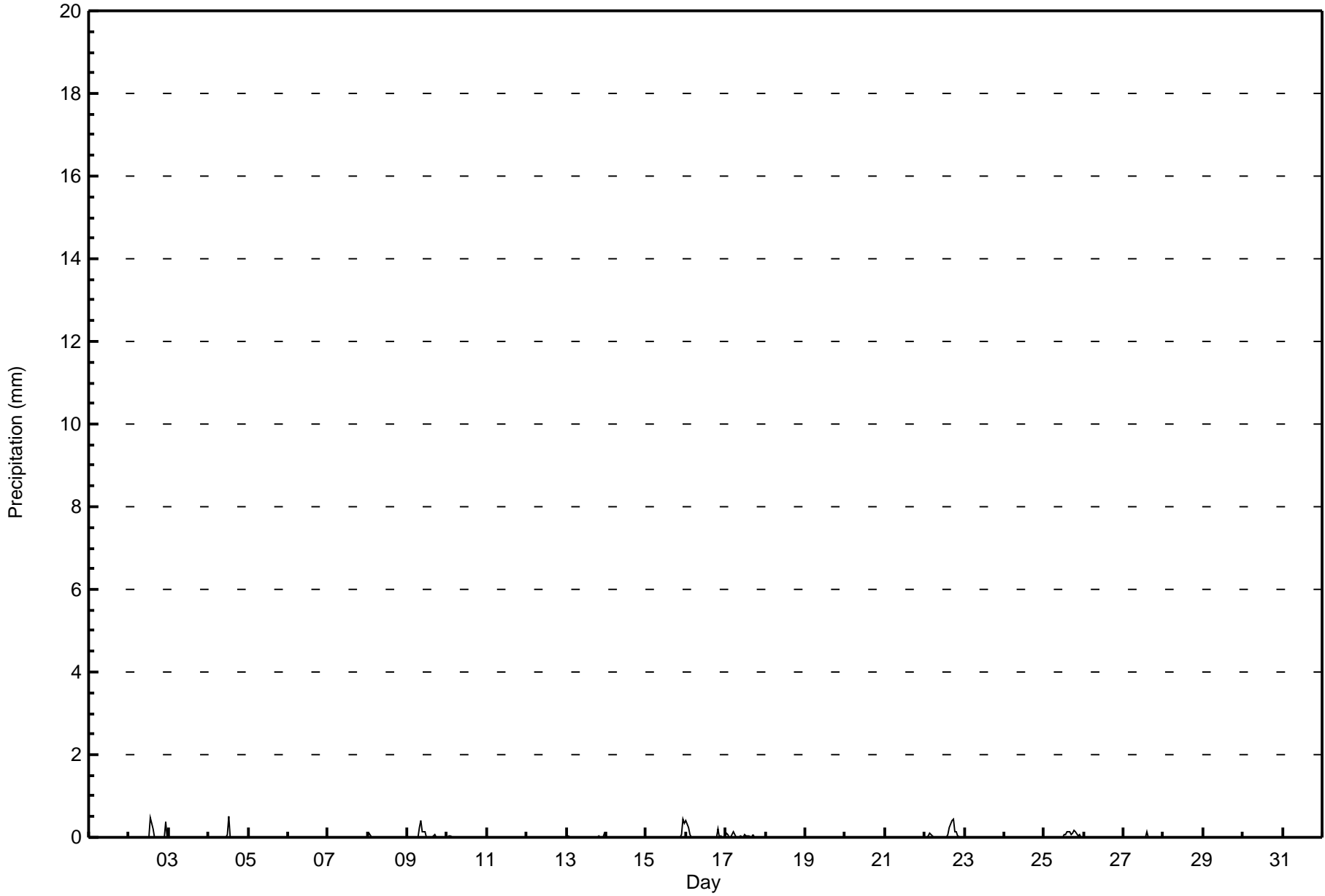
**Wapasu - December 2015**

Maximum Value: 0.5 mm on Dec 4 13:00		Maximum Daily Total: 1.7 mm on Dec 22		Hours in Service: 744																													
Minimum Value: 0.0 mm on Dec 1 01:00		Minimum Daily Total: 0.0 mm on Dec 1		Hours of Data: 744																													
Maximum Diurnal Total: 0.8 mm at hour 23		Minimum Diurnal Total: 0.0 mm at hour 7		Hours of Missing Data: 0																													
Monthly Total: 8.37 mm		Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 O <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.4		Hours of Calibration: 0																													
				Percent Operational Time: 100.0																													
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24									
1-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.5	
3-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
4-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.5		
5-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
6-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
7-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
8-Dec	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1			
9-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.4			
10-Dec	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1				
11-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
12-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
13-Dec	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.1	0.1			
14-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
15-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.5	0.3	0.0	0.0	0.8	0.5				
16-Dec	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0	1.0	0.4					
17-Dec	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.1					
18-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
19-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
20-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
21-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
22-Dec	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.4					
23-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
24-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
25-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	1.0	0.2						
26-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
27-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1						
28-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
29-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
30-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
31-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
		0.5	0.5	0.2	0.1	0.2	0.1	0.0	0.2	0.4	0.2	0.1	0.1	0.6	0.6	0.6	0.4	0.6	0.5	0.3	0.5	0.1	0.2	0.8	0.4	Diurnal Average							
		0.4	0.2	0.1	0.1	0.1	0.1	0.0	0.2	0.4	0.2	0.1	0.1	0.5	0.5	0.2	0.2	0.4	0.4	0.2	0.2	0.1	0.1	0.5	0.3	Diurnal Maximum							



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Precipitation (PC) - mm**  
**Wapasu - December 2015**





Maximum Speed: 21 km/h on Dec 27 12:00	Maximum Daily Speed Average: 13.7 km/h on Dec 20	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 19 10:00	Minimum Daily Speed Average: 0.2 km/h on Dec 28	Hours of Data: 743
Maximum Diurnal Speed Average: 5.2 km/h at hour 11	Minimum Diurnal Speed Average: 3.7 km/h at hour 1	Hours of Missing Data: 1
Monthly Average Velocity: 4.3 km/h 151.9 deg	Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 3 Q <sub>1</sub> = 5 Median = 7 Q <sub>3</sub> = 10 P <sub>90</sub> = 13 P <sub>99</sub> = 18	Percent Operational Time: 99.9

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SSE7	SE7	SE7	SE7	SE8	SE8	SE6	ESE4	SE5	SSE5	SE7	SSE7	SSE7	SE9	S7	SSE9	SSE10	SSE9	SSE9	S8	SSE6	SSE7	SSE7	SSE7	SSE7.0	SSE10
2-Dec	SSE8	SSE7	SSE7	S8	SSE10	SE10	SSE10	SSE11	SE12	SE13	SSE13	S12	S10	SSW10	S10	SSW10	SW13	SW13	WSW16	WSW16	WSW14	W10	W10	WNW12	SSW7.8	WSW16
3-Dec	W9	NW6	NW2	SE3	S4	S6	S6	SSE6	SE7	ESE8	SE8	NW1	E3	ESE9	ESE12	ESE14	SE11	ESE14	SE15	SE13	SE5	ENE4	E8	ESE9	SE5.5	SE15
4-Dec	ESE8	ESE8	ESE6	ESE7	ESE5	ESE4	N2	ENE3	SE2	SSW3	S2	SW9	SSW7	SW8	SW8	SW8	SSW6	SW8	SW8	SW10	SW10	SW8	SW10	SW11	SSW4.5	SW11
5-Dec	WSW9	WSW9	W9	W10	W12	WSW14	WSW12	WSW14	WSW15	WSW13	WSW12	WSW12	SW13	SW13	SW12	SW7	SSW6	S5	SSE5	SSE5	SE6	SSE6	SE6	SE6	SW7.7	WSW15
6-Dec	SE6	ESE7	SE8	ESE8	ESE13	SE14	SE14	SE15	SE16	SE9	SE10	SE11	SSE7	SE10	SSE9	SSE8	SE12	SE12	SE12	SE12	SE10	SSE11	SE10	SSE8	SE10.2	SE16
7-Dec	SSE8	SSE8	SE8	SE7	SE9	SE9	SE12	ESE13	SE12	SE14	SE14	SE15	SE14	SSE9	S6	SSE9	SSE10	SSE10	SSE8	SSE9	S7	S4	SSW3	WNW4	SE8.6	SE15
8-Dec	N6	N7	N6	NNW7	NW5	NNW3	NW4	SE1	SE3	SSE4	SSW7	SSW7	SSE6	S5	SE6	SSE7	SSE7	SE6	SE7	ESE8	ESE7	SSE5	ESE9	ESE10	SE2.5	ESE10
9-Dec	SE8	SE6	ESE6	ESE8	ESE10	ESE10	ESE10	SE6	ESE6	SE9	SE11	SE11	SE10	SE7	SSE5	SSE5	S4	S3	SW3	SSW3	SW5	SSW6	SW5	WSW3	SE5.5	SE11
10-Dec	SSW3	WNW4	NW4	NNW4	NNW5	N3	N2	NNE2	NNE2	NNW1	ENE1	WSW1	AF	SSE3	SE2	ENE4	E6	ESE7	ESE7	SE7	ESE7	ESE6	ESE6	ESE7	E2.0	ESE7
11-Dec	ESE8	ESE9	SE10	SE9	SE8	ESE10	SE10	SE9	SE11	SE13	SE13	SE11	SE11	SSE7	SE6	SSE8	SE8	SSE7	SE10	SE9	SE9	SE9	SE9	SE9	SE9.1	SE13
12-Dec	SE10	SE11	SE11	SE12	SE13	SE11	SE11	SE12	SE12	SE13	SE15	SE13	SE12	SE11	SE14	SE16	SE16	SE15	SE15	SE16	SE17	SSE13	SE15	SE13	SE13.1	SE17
13-Dec	SE13	SE12	SE12	SE14	SE15	SE16	SE15	SE16	SE16	SE17	SE16	SE10	SE7	ESE6	ESE5	ESE4	E3	ESE2	SSE2	SE3	SE5	SE5	S2	SSW3	SE8.8	SE17
14-Dec	S3	S3	S3	W4	W3	WSW3	SW2	W3	WSW3	NNW2	W4	SW3	SSW4	SW5	SW5	SW6	SSW6	S6	SSW6	S7	S8	S8	S9	S10	SSW4.2	S10
15-Dec	S10	S10	S11	S9	SSE10	SSE12	S12	SSE11	S9	S9	SSW9	SW9	SW7	SSW7	SW8	S6	S5	SSW6	SSW5	SW4	W3	NNW6	NNW12	N8	S5.7	S12
16-Dec	NNW12	NNW9	N6	NNW3	WNW3	W5	W5	WNW6	W6	WSW7	SW7	SW6	SSW5	SW7	SSW6	S5	S6	WSW7	W4	NW4	NW5	NNW6	NNW6	N5	W3.4	NNW12
17-Dec	N3	NNE2	WNW2	NW3	NW5	NW7	NNW8	NNW11	NNW9	NW10	NW9	NNW9	NNW9	NNW9	NNW9	NNW8	NNW7	NNW6	NNW8	N6	N5	N5	N6	N5	NNW6.4	NNW11
18-Dec	N5	N4	NNE4	NE3	ENE3	ENE3	NE3	NE3	NE3	ENE2	SSE4	S4	SSE4	SE4	ESE4	E4	ESE4	ESE6	ESE6	SE8	SE5	SE6	SE8	SSE4	ESE3.0	SE8
19-Dec	SE7	SE6	ESE5	SE5	SE7	SE10	SE12	SE12	SSE6	WNW1	SSE5	SSE8	SSE8	SSE7	SSE7	SE9	SE10	SE10	SE13	SE13	SE14	SE14	SSE13	SE12	SE8.7	SE14
20-Dec	SE12	SE13	SE13	SE13	SE13	SE14	SSE13	SE13	SE14	SE13	SE15	SE12	SSE8	SSE10	SSE9	SE12	SE14	SE16	SE19	SE19	SE16	SE18	SE17	SE15	SE13.7	SE19
21-Dec	SE14	SE16	SSE15	SSE13	SSE14	SSE11	SSE11	SSE9	SSE10	SSE9	S8	S8	S6	SSW5	SSW3	ESE3	ESE4	SE6	ESE4	NE2	ENE3	WNW3	NNW2	N4	SSE6.4	SE16
22-Dec	NE5	NE5	N5	N4	NNE7	NNE8	NNE8	NNE7	NNE6	NNE6	NNE7	NE6	NNE6	N6	NNE6	N7	NNE7	NNE7	N6	NNE6	NNE5	NNE6	NNE6	NNE6	NNE5.9	NNE8
23-Dec	NE7	NNE6	NE5	NNE5	NE4	NE4	NE4	NNE2	NNE3	NNE5	NE5	NNE4	N5	N6	N6	N6	NNE6	NNE7	NNE6	NNE5	N5	N5	NNW3	NNE3	NNE4.7	NE7
24-Dec	NE2	NE2	NE2	NE2	NE3	N4	NNE4	N3	N4	N3	NNW4	NW4	NW3	NNW2	WNW3	W3	SW2	SW1	SSE3	SSE3	SE4	SSE5	SSE4	NNE0.8	SSE5	
25-Dec	S5	S5	SSE5	SSE4	SSE4	SSE5	SSE4	SSE4	S4	S3	SSW4	SW5	SW5	WSW5	WNW4	NW2	N2	NNE4	NNE5	NNE4	N5	N4	NNE4	N4	SSW0.9	SW5
26-Dec	N4	NE2	SE2	E3	ESE3	E3	E3	ESE3	ESE4	SE4	ESE3	SSE3	W3	W2	E3	ESE4	ESE6	SE6	SE7	SE7	SE8	SE10	SE10	SE12	ESE3.9	SE12
27-Dec	SE13	SE12	SE14	SE15	SE14	SE14	SE17	SE18	SE18	SE20	SE21	SE21	SE16	SSE14	SSE11	SE11	SE9	SE10	SSE9	SSE9	SSE7	SSE6	SSE5	S6	SE12.8	SE21
28-Dec	S5	S4	S3	WSW4	WNW4	NNW6	NNE6	NNE6	NNE5	NNE5	NNE5	NE6	NNE3	E2	NW4	N3	NNE2	SSE2	SSE3	SSW4	S6	SSW6	SSW8	SSW8	S0.2	SSW8
29-Dec	S8	S7	SSE8	S9	S9	S8	S8	S8	SSW8	SSW8	S8	SSW9	S8	S8	S7	S8	S8	S8	S7	S7	S8	S8	S8	SSW7	S7.8	S9
30-Dec	SSW7	SSW7	SSW5	SSE3	SSE3	SE3	SE4	SSE4	SSE4	SSE4	SSW5	SSW5	SSW4	SSW4	SSW4	S4	S5	SSW6	SSW5	S5	S7	SSE7	S8	S9	S4.9	S9
31-Dec	S8	S8	S8	S8	S10	S10	S10	S11	SW12	SW9	SSW9	SSW7	SSW8	SW8	SW7	SSW6	S5	SSE5	SSE6	SSE6	SSE7	SSE7	S7	S8	S7.6	SW12

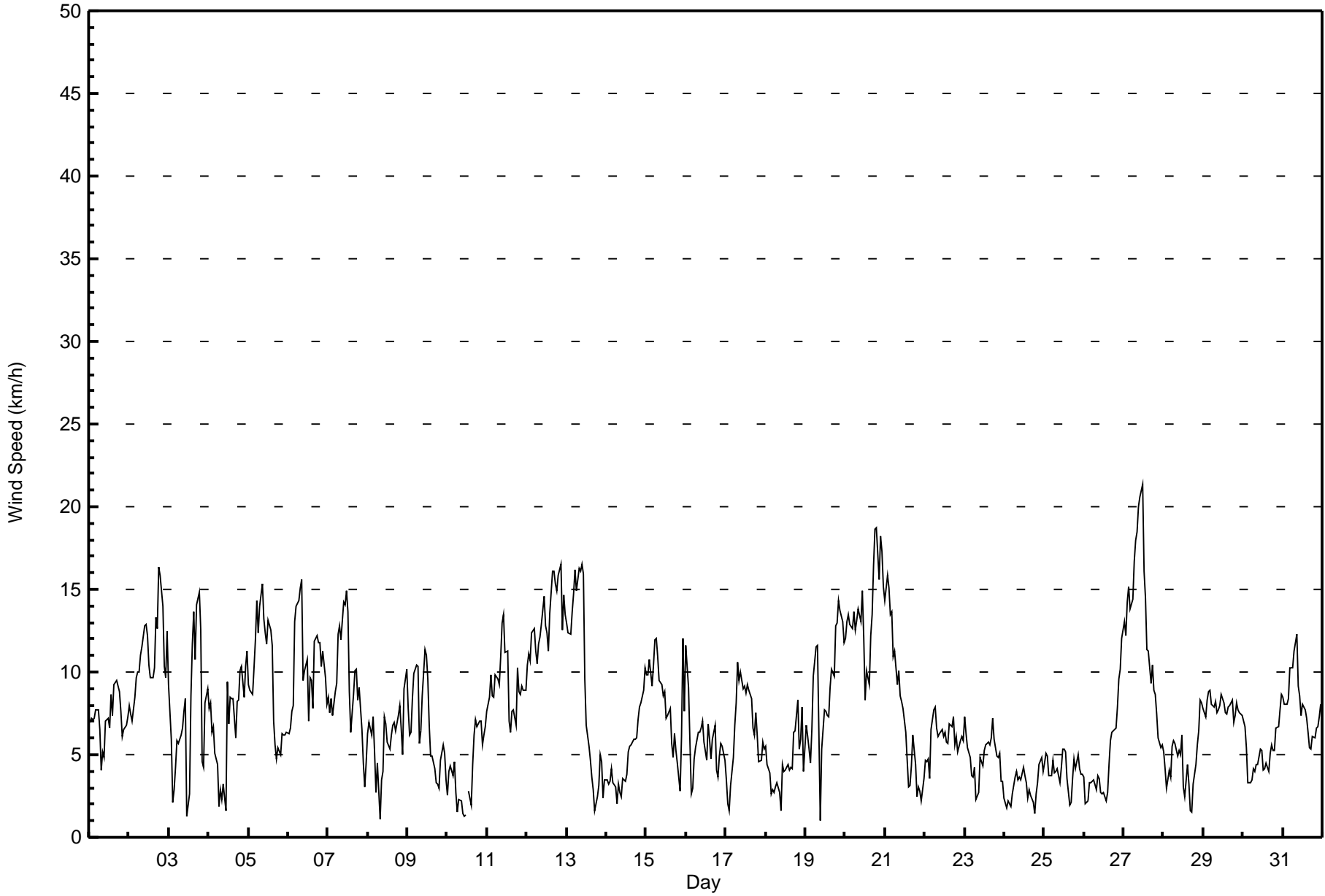
SE3.7 SE3.8 SE4.1 SE3.9 SE4.4 SE4.8 SE4.6 SE4.6 SSE4.7 SSE4.4 SSE5.2 SSE4.8 S4.4 S4.1 S3.7 SSE4.1 SSE4.7 SSE4.9 SSE4.8 SSE4.9 SSE4.4 SSE4.0 SSE3.9 SSE3.7	Diurnal Average
SE14 SE16 SSE15 SE15 SE15 SE16 SE17 SE18 SE18 SE20 SE21 SE21 SE16 SSE14 SE14 SE16 SE16 SE16 SE19 SE19 SE17 SE18 SE17 SE15	Diurnal Maximum

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Speed (WS) - km/h**  
**Wapasu - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Wapasu - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	256	34.45	34.45
6 - 11	360	48.45	82.91
12 - 19	124	16.69	99.60
20 - 28	3	0.40	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 743

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Wapasu - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	26	22	19	8	8	17	18	33	25	19	12	6	11	12	12	8	256
6 - 11	13	21	3	0	2	33	81	65	59	29	22	4	6	1	5	16	360
12 - 19	0	0	0	0	0	5	86	11	2	0	6	10	1	1	0	2	124
20 - 28	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	39	43	22	8	10	55	188	109	86	48	40	20	18	14	17	26	743

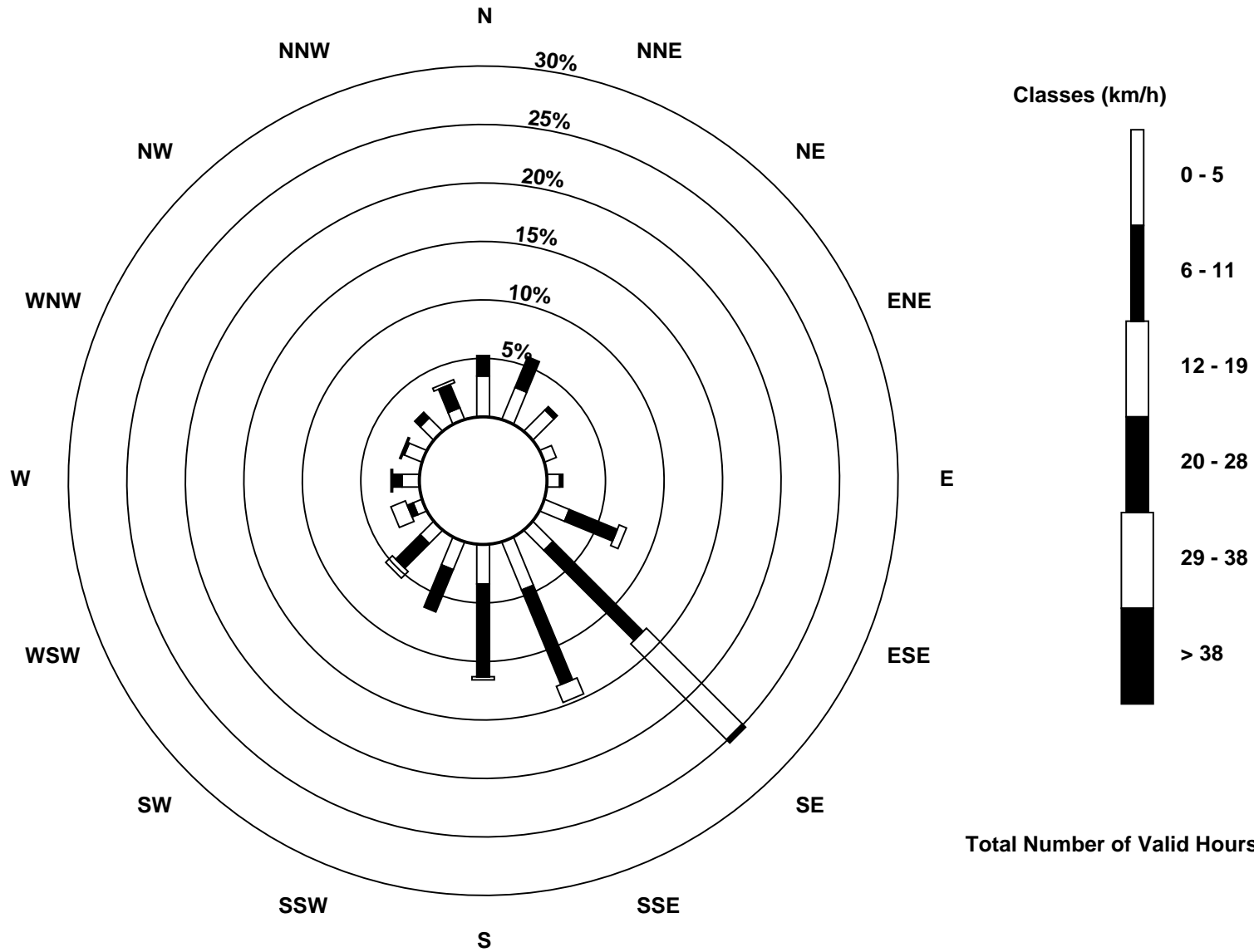
Total Number of Valid Hours: 743

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
Wapasu (AMS 17)







**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Wapasu - December 2015**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 km/h on Dec 27 10:00														Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9											
Minimum Value: 0 km/h on Dec 26 06:00																									
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 5																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	1	1	1	1	1	1	1	1	2	1	2	3	2	2	2	3	3	3	2	2	1	1	1	2	3
2-Dec	2	2	2	2	3	3	2	3	3	3	4	4	3	4	3	4	4	4	5	5	5	3	4	4	5
3-Dec	3	3	1	2	1	1	1	2	1	2	2	2	2	2	3	4	3	4	4	3	2	1	3	2	4
4-Dec	2	2	2	2	2	1	1	1	1	1	2	2	3	2	3	3	2	2	3	3	3	3	3	3	3
5-Dec	3	3	3	4	4	4	4	5	5	4	4	4	4	4	3	2	2	1	1	1	1	1	1	1	5
6-Dec	1	1	1	2	3	3	3	4	4	5	3	4	4	3	5	3	3	3	3	3	3	3	3	3	5
7-Dec	2	2	2	2	2	2	3	3	4	4	3	4	5	4	3	3	4	3	3	3	2	1	1	2	5
8-Dec	2	3	2	2	2	2	2	1	1	1	3	3	2	2	2	2	2	2	2	2	3	3	3	3	3
9-Dec	3	2	2	2	2	3	3	3	2	3	3	3	3	2	2	2	2	1	1	1	2	2	2	1	3
10-Dec	1	1	1	1	2	1	1	1	1	1	2	1	AF	1	1	1	2	2	2	2	2	1	1	2	2
11-Dec	2	2	2	2	2	2	2	2	3	4	4	3	3	2	2	2	3	2	3	3	3	2	3	2	4
12-Dec	3	3	3	4	3	3	3	3	3	4	4	4	4	4	4	4	5	4	4	4	4	4	4	4	5
13-Dec	4	4	4	4	4	4	4	4	4	4	4	4	3	2	1	1	1	1	1	1	1	1	1	1	4
14-Dec	1	1	1	1	1	1	1	1	2	1	1	1	1	2	2	2	2	2	2	2	3	2	3	3	3
15-Dec	3	3	4	3	3	4	4	4	3	3	4	3	2	3	3	2	1	2	1	1	1	3	4	3	4
16-Dec	4	3	2	1	1	1	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	2	2	2	4
17-Dec	1	1	1	1	1	2	2	4	3	3	3	3	2	3	3	3	2	2	2	2	2	2	2	2	4
18-Dec	2	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	2	2	2	1	2	2	2
19-Dec	2	1	1	1	2	3	3	3	3	1	2	3	2	2	2	2	2	2	3	3	4	4	4	3	4
20-Dec	3	3	3	3	3	4	3	3	4	3	4	4	3	4	3	4	4	5	5	5	5	5	5	4	5
21-Dec	4	5	4	5	4	4	3	3	3	3	3	3	2	1	1	1	1	1	1	1	1	1	1	1	5
22-Dec	2	2	1	1	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
23-Dec	2	2	2	2	1	1	1	2	1	2	2	1	2	2	2	2	2	2	2	2	1	2	1	1	2
24-Dec	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2
25-Dec	1	2	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	2	2	1	2	1	1	1	2
26-Dec	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	3	3
27-Dec	3	3	4	4	4	4	5	6	5	6	6	6	6	5	4	4	3	3	3	3	2	2	2	2	6
28-Dec	2	1	1	1	1	2	2	2	2	2	2	2	1	1	2	1	1	2	1	2	2	2	3	3	3
29-Dec	3	2	3	3	3	2	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	3	3	3
30-Dec	2	2	2	1	1	1	1	1	1	1	2	2	1	1	1	1	1	2	1	2	2	2	2	3	3
31-Dec	2	2	3	2	3	3	3	4	4	3	3	2	2	2	2	2	1	1	1	1	1	1	2	2	4
Diurnal Maximum																									
4 5 4 5 4 4 5 6 5 6 6 6 6 5 5 4 5 5 5 5 5 5 5 5 4																									
AF - Analyzer Failure																									



**Wood Buffalo Environmental Association**  
**Summary of Hour Averages**

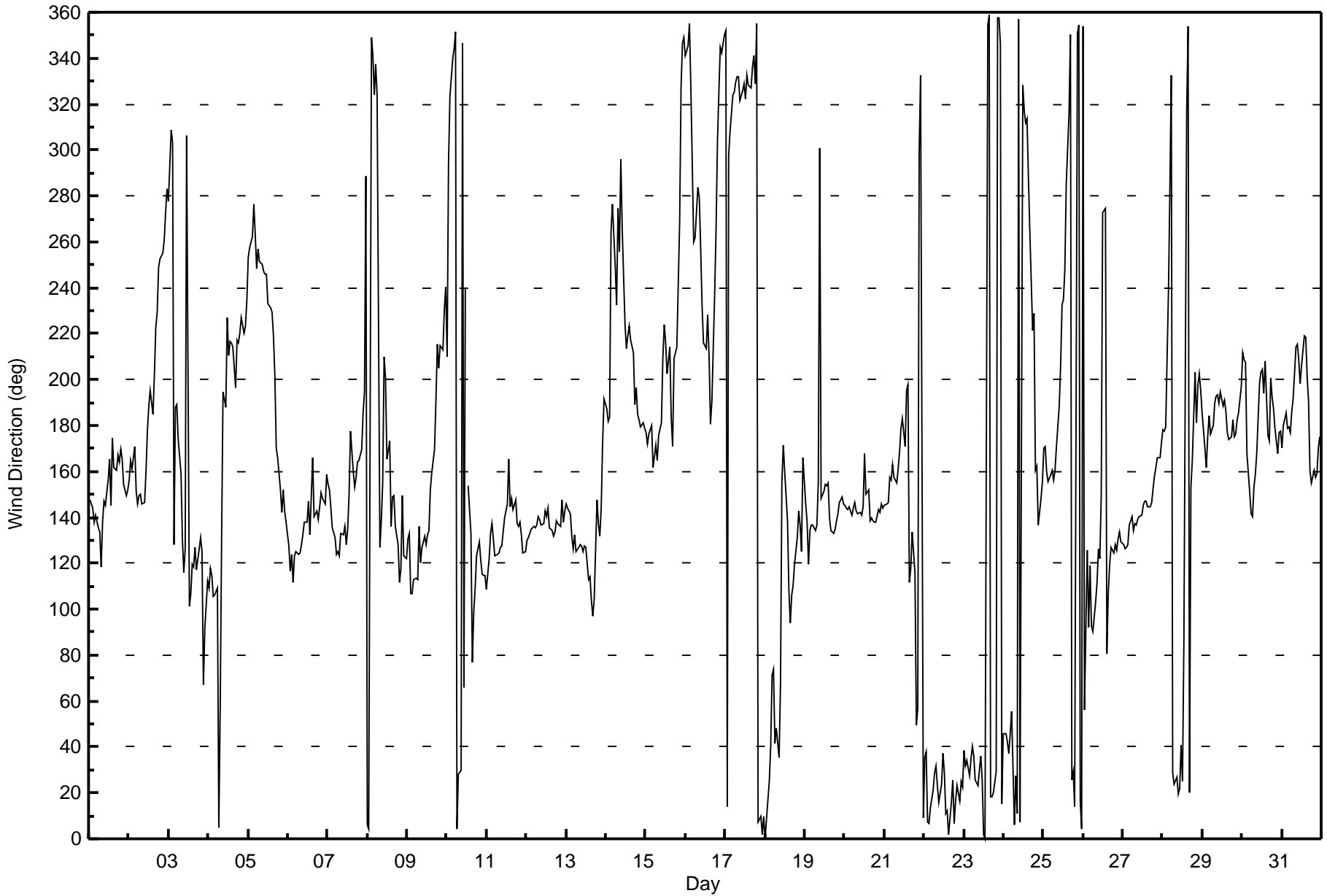
**Wind Direction (WD) - deg**  
**Wapasu - December 2015**

Direction of Maximum Speed: 141 deg on Dec 27 12:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 143.3 deg on Dec 20	Hours of Data: 743
Direction of Minimum Speed: 301 deg on Dec 19 10:00	Hours of Missing Data: 1
Direction of Minimum Daily Speed Average: 0.2 deg on Dec 28	Percent Operational Time: 99.9
Monthly Average Direction: 177.7 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	148	146	144	138	141	135	133	118	138	147	145	156	165	145	175	162	160	167	164	169	166	154	149	152	152.0
2-Dec	156	165	161	171	152	146	149	150	146	146	160	177	189	195	185	202	223	229	249	252	255	261	273	283	197.2
3-Dec	278	309	304	128	188	189	174	159	131	116	126	307	101	107	120	119	127	117	126	131	125	67	92	112	126.8
4-Dec	109	118	115	105	106	109	5	58	131	194	188	227	211	217	216	214	196	217	216	221	227	220	223	234	197.8
5-Dec	253	258	262	276	263	248	257	251	250	247	246	246	233	231	229	219	202	170	166	152	142	152	143	138	234.8
6-Dec	128	117	124	112	123	125	124	124	128	132	138	138	147	132	149	166	141	143	139	145	150	149	146	159	136.0
7-Dec	154	152	144	136	131	124	125	123	133	132	136	128	135	150	177	160	153	158	164	165	170	186	195	288	144.6
8-Dec	6	4	349	341	324	338	324	127	139	155	210	200	165	173	136	149	150	136	128	112	118	150	123	122	131.6
9-Dec	131	133	107	107	113	114	113	136	120	127	132	128	133	134	152	159	170	191	215	205	215	213	231	241	138.8
10-Dec	210	295	323	340	344	352	4	28	30	346	66	240	AF	154	133	77	99	109	123	130	122	116	114	115	97.0
11-Dec	109	122	133	137	130	123	124	125	127	127	134	139	146	165	144	148	143	148	137	136	138	132	124	125	133.5
12-Dec	130	131	133	135	136	136	137	140	139	136	137	143	140	144	135	134	132	133	139	137	136	148	138	143	137.2
13-Dec	146	144	142	132	126	132	125	127	128	127	125	127	127	113	114	104	97	104	148	137	132	144	173	192	131.1
14-Dec	187	182	184	264	276	250	233	275	256	296	265	224	213	219	223	217	212	189	197	185	182	179	181	179	207.2
15-Dec	177	172	176	180	162	166	172	165	176	181	210	224	216	202	214	183	171	209	212	214	268	327	347	349	191.0
16-Dec	341	345	355	327	295	260	261	284	279	258	232	216	213	228	210	181	191	237	265	304	325	345	342	350	279.0
17-Dec	352	14	298	308	324	325	329	332	332	321	326	329	322	333	328	327	336	341	329	355	7	10	2	10	334.9
18-Dec	0	8	25	40	71	74	41	48	36	67	156	171	160	138	108	94	106	110	119	131	143	137	125	166	107.2
19-Dec	146	138	120	135	137	137	134	137	155	301	148	151	154	154	155	140	134	133	135	139	142	146	149	146	141.8
20-Dec	145	144	143	144	141	144	147	143	142	142	141	145	168	150	152	139	140	139	138	138	143	142	146	144	143.3
21-Dec	145	146	147	157	156	163	158	155	161	168	178	183	171	195	198	111	118	134	116	49	57	299	333	9	153.9
22-Dec	35	38	7	7	13	21	29	32	23	16	24	37	28	11	12	2	16	26	7	17	23	17	25	22	20.5
23-Dec	38	32	34	28	35	40	36	26	23	30	36	26	2	0	355	359	18	19	20	29	357	358	346	15	19.1
24-Dec	46	46	42	37	46	56	6	27	11	357	7	329	317	312	314	288	265	222	229	160	162	137	148	156	14.5
25-Dec	170	171	160	156	158	160	156	161	171	189	206	233	235	248	285	316	351	26	30	14	351	355	17	4	192.9
26-Dec	354	56	126	92	119	93	90	103	111	127	122	150	272	275	81	107	120	127	125	128	126	131	134	129	119.8
27-Dec	128	126	127	128	137	141	134	137	137	139	140	141	145	147	147	144	144	146	152	158	161	166	166	172	141.2
28-Dec	178	178	179	239	283	332	29	24	27	20	22	41	25	86	316	354	20	153	165	203	181	197	202	195	189.6
29-Dec	185	170	161	175	184	176	180	190	193	193	190	194	188	191	186	177	174	175	183	175	176	182	186	197	182.6
30-Dec	212	209	207	168	151	142	141	153	159	168	198	203	204	194	208	176	173	201	192	187	179	168	177	177	183.5
31-Dec	170	180	185	179	180	177	186	191	214	216	208	198	206	219	218	201	190	160	155	161	157	159	170	175	187.3

145.9 142.6 141.6 142.0 143.0 142.8 138.2 140.3 146.3 148.5 154.8 165.6 170.9 172.4 172.3 155.4 150.6 151.1 153.2 153.0 155.3 155.7 150.9 155.6  
 Diurnal Average

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods





**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Direction (WD) - deg**  
**Wapasu - December 2015**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 82 deg on Dec 4 11:00 Minimum Value: 7 deg on Dec 1 04:00 Percentiles: P <sub>1</sub> = 11 P <sub>10</sub> = 18 Q <sub>1</sub> = 21 Median = 27 Q <sub>3</sub> = 33 P <sub>90</sub> = 38 P <sub>99</sub> = 67																	Hours in Service: 744 Hours of Data: 743 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9								
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	12	11	10	7	9	9	11	15	36	17	21	25	31	24	33	27	27	26	24	24	22	18	16	17	36
2-Dec	19	22	21	28	24	22	23	22	23	22	28	35	34	35	34	35	27	24	25	24	26	25	28	26	35
3-Dec	27	34	56	34	22	28	24	25	20	17	17	81	67	24	20	20	22	20	18	19	46	24	26	19	81
4-Dec	22	20	19	20	19	28	63	49	67	51	82	21	33	28	27	31	37	27	27	29	26	27	25	20	82
5-Dec	25	25	25	26	25	24	28	25	23	22	24	27	23	23	23	25	33	18	26	19	12	14	10	14	33
6-Dec	11	13	14	15	18	16	16	17	19	40	26	30	43	23	37	33	21	22	21	21	25	23	24	30	43
7-Dec	24	21	22	15	16	17	18	17	39	17	19	18	25	34	45	31	29	27	32	27	31	35	40	34	45
8-Dec	36	39	39	33	28	54	31	66	20	27	32	39	31	36	27	24	24	23	22	23	47	46	21	22	66
9-Dec	31	22	20	17	19	21	20	50	20	29	19	20	20	24	30	30	33	34	31	31	34	30	26	39	50
10-Dec	35	21	28	36	34	36	33	38	23	38	69	58	AF	26	56	20	20	19	22	18	16	19	18	19	69
11-Dec	18	18	19	19	17	19	19	19	18	20	18	21	22	32	26	25	23	29	22	19	21	19	20	18	32
12-Dec	18	19	20	19	20	19	20	20	21	20	21	22	23	22	21	19	20	19	22	21	19	24	20	22	24
13-Dec	22	23	24	20	18	18	19	18	19	18	18	37	35	39	26	21	21	37	20	20	17	20	34	35	39
14-Dec	33	31	26	29	29	26	27	44	53	48	37	50	33	30	27	29	30	30	33	34	33	30	35	31	53
15-Dec	31	31	32	33	30	31	34	30	32	31	35	27	28	35	30	29	20	27	23	30	38	30	33	36	38
16-Dec	32	34	38	25	35	26	26	25	25	27	22	26	28	22	28	29	31	25	30	21	29	34	37	36	38
17-Dec	38	32	30	31	22	21	26	26	27	23	27	26	22	31	26	24	30	33	25	33	40	33	38	38	40
18-Dec	40	38	30	32	37	24	40	27	37	67	44	37	38	27	22	17	13	15	18	16	21	15	20	46	67
19-Dec	21	18	13	15	14	21	19	21	26	70	31	25	28	26	25	18	18	18	18	19	21	21	22	22	70
20-Dec	22	20	19	21	22	21	21	21	20	21	20	28	31	26	27	20	21	20	18	19	24	20	22	21	31
21-Dec	21	22	24	28	26	28	30	27	29	28	34	33	29	35	33	30	22	12	21	21	41	45	54	36	54
22-Dec	31	29	31	39	32	30	29	27	31	35	33	38	30	37	34	35	36	29	34	35	36	35	30	31	39
23-Dec	24	33	28	35	29	26	25	60	38	29	29	33	34	34	33	32	32	34	33	35	37	37	31	25	60
24-Dec	32	45	29	27	41	24	29	36	45	44	42	34	36	32	51	24	23	21	34	28	23	16	20	24	51
25-Dec	27	28	21	22	20	23	22	23	26	30	33	27	25	23	27	31	25	29	30	35	33	37	31	27	37
26-Dec	30	42	20	18	19	15	24	23	18	13	41	28	46	24	14	16	14	13	12	15	17	18	18	18	46
27-Dec	18	19	18	18	21	21	20	20	20	23	22	21	25	24	24	26	23	22	24	29	25	28	27	27	29
28-Dec	34	34	31	27	36	34	31	34	31	34	34	29	39	48	44	36	58	79	30	40	33	34	36	39	79
29-Dec	34	28	27	30	35	32	37	36	36	39	38	38	37	35	38	32	34	33	32	31	33	35	38	37	39
30-Dec	34	32	33	23	15	13	12	18	16	20	32	32	42	34	35	25	22	29	31	32	32	25	28	32	42
31-Dec	29	31	35	30	32	32	33	33	33	30	32	34	30	27	26	30	29	12	14	21	18	19	25	28	35
40 45 56 39 41 54 63 66 67 70 82 81 67 48 56 36 58 79 34 40 47 46 54 46																									
Diurnal Maximum																									
AF - Analyzer Failure																									



# Wood Buffalo Environmental Association

## SO2 Calibration Report

### Station Information

Calibration Date	December 3, 2015	Last Calibration	November 19, 2015
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	10:05	End Time (MST)	13:45
Gas Cert Reference	SA130010A	Station temp.	Deg C
Cal Gas Concentration	47.8 ppm	Cal Gas Exp Date	12/12/2016
Calibrator Make/Model	API T700	Serial Number	493
ZAG Make/Model	API 701	Serial Number	4427
DACS make/model	Campbell Scientific CR3000	DACS serial No.	6894

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-702	-702
Analyzer IP address	192.168.1.43		Lamp voltage	873	874
Calculated slope	1.001162	1.014716	Chamber temp	44.9	44.9
Calculated intercept	0.942041	1.887104	Pressure	682.3	682.3
Analyzer Background	8.9	8.9	Flow	0.447	0.447
Analyzer Coefficient	0.840	0.840	Intensity	82	82
Analyzer make	Thermo 43i		Analyzer serial #	1218153459	

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.3	----
as found span	5000	60.4	577.4	568.0	1.017
calibrator zero	5000	0.0	0.0	-0.3	----
high point	5000	60.4	577.4	568.0	1.017
second point	5000	30.2	288.7	281.8	1.025
third point	5000	15.2	145.3	139.8	1.039
as left zero	5000	0.0	0.0	-0.2	----
as left span	5000	60.4	577.4	569.1	1.015
Average Correction Factor					1.027

Corrected As found      568.3      Previous response      575.8      % change      1.3%

**Notes:**

No adjustments or maintenance performed.

Calibration Performed By:

\_\_\_\_\_  
Kelly Baragar



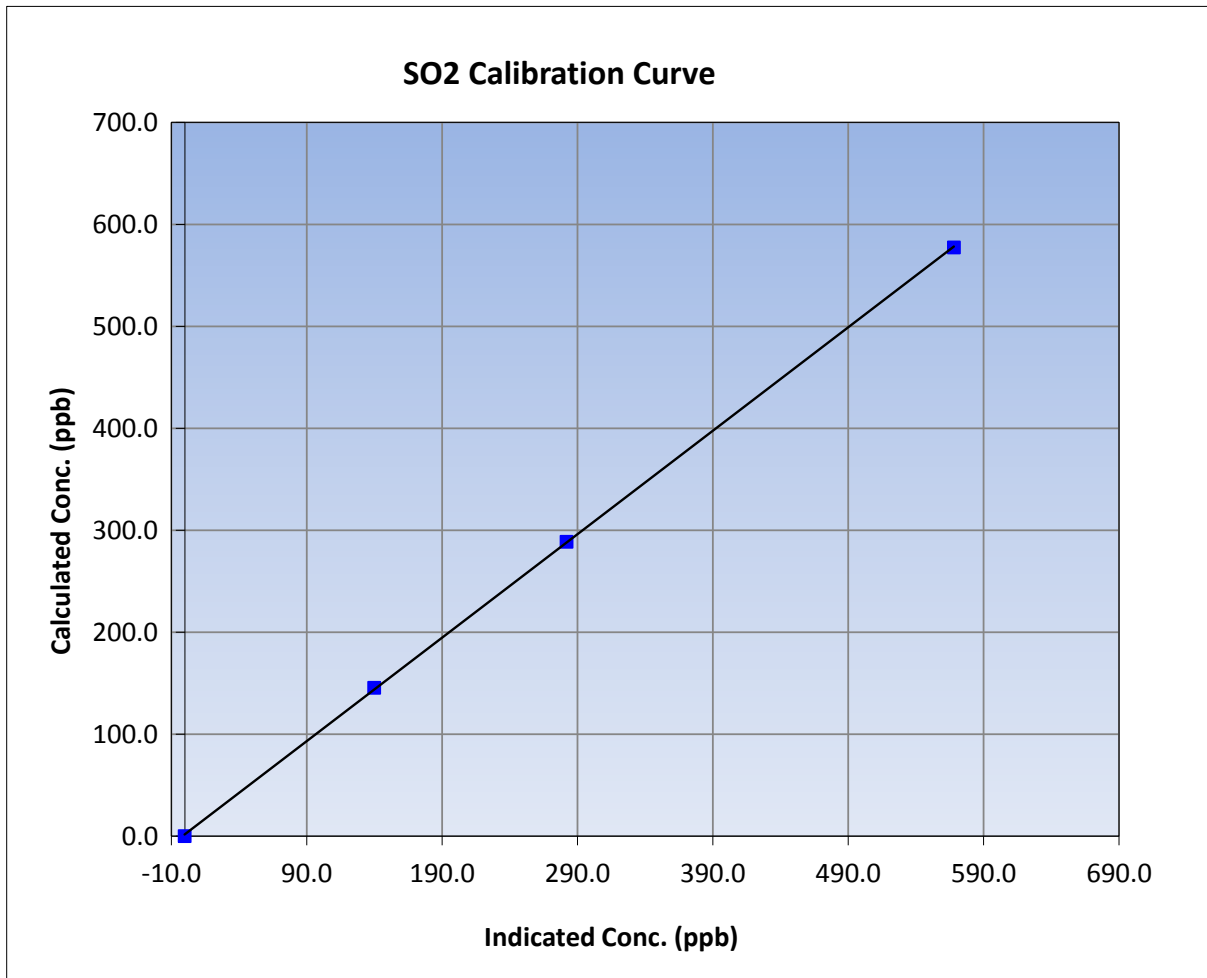
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 19, 2015
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	10:05	End Time (MST)	13:45
Analyzer make	Thermo 43i	Analyzer serial #	1218153459

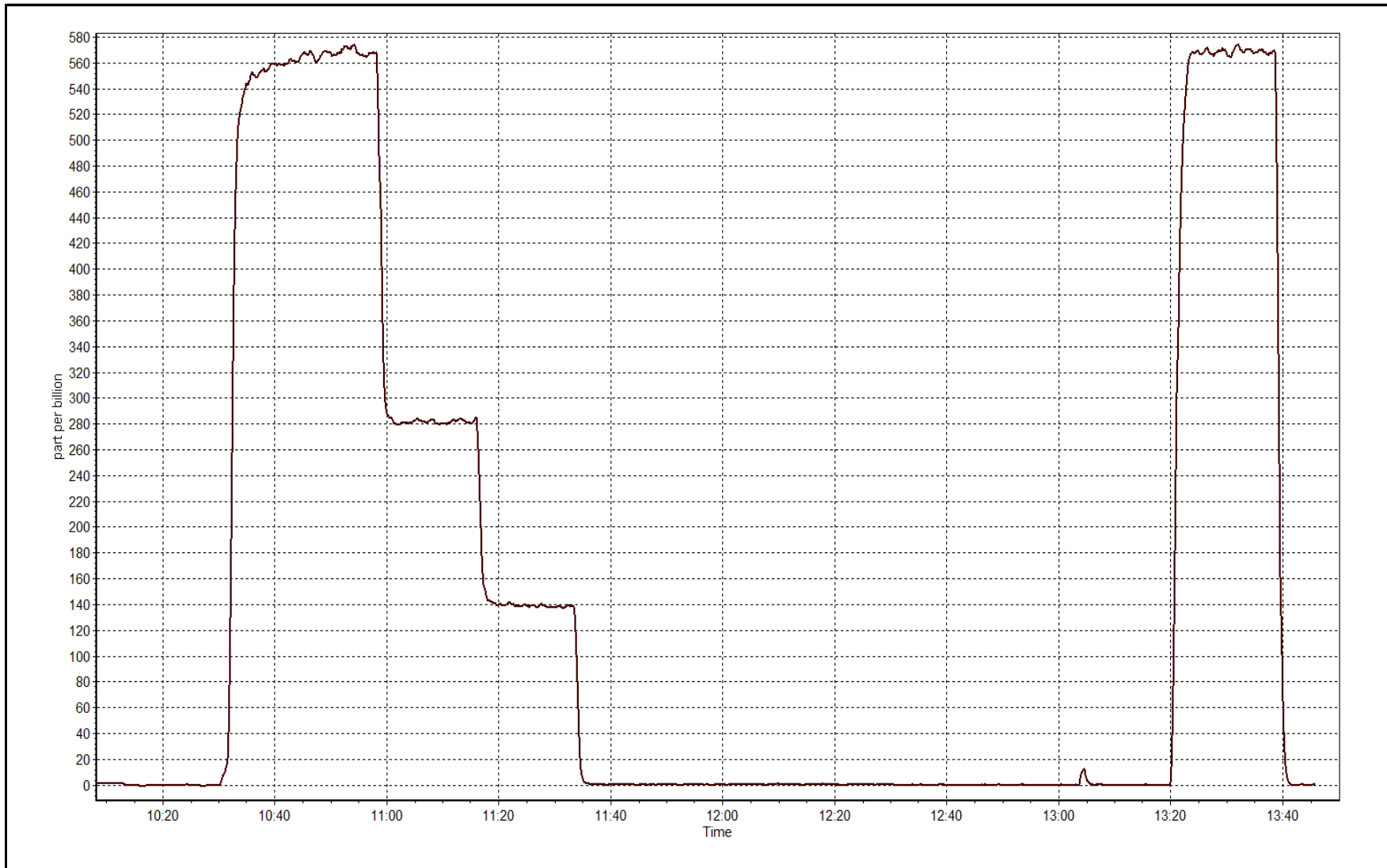
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	0.999964
577.4	568.0	1.0166		
288.7	281.8	1.0245	Slope	1.014716
145.3	139.8	1.0394		
			Intercept	1.887104



SO2 Calibration Plot

Date: December 3, 2015





# Wood Buffalo Environmental Association H2S Calibration Report

## Station Information

Calibration Date	December 4, 2015	Last Calibration	November 19, 2015
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	11:45	End Time (MST)	14:50
Gas Cert Reference	CC107167	Station temp.	21 Deg C
Cal Gas Concentration	5.1 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	API T700	Serial Number	997
ZAG air Make/Model	API 701	Serial Number	4227
DACS make/model	Campbell Scientific CR3000	Serial Number	6894
SO2 gas concentration	47.8 ppm	SO2 gas cert/exp	SA130010A 12-Dec-16

## Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-651	-651
Analyzer IP address	192.168.1.45		Lamp voltage	801	800
Calculated slope	0.999602	0.989468	Chamber temp	45	45
Calculated intercept	-0.231452	0.049407	Pressure	550.4	538.7
Analyzer Background	14.3	14.6	Flow	0.958	0.949
Analyzer Coefficient	1.222	1.244	Intensity	112	113
			Converter temp.	340	342

Analyzer make/model Thermo 450i Analyzer serial # 1218153583

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.0	----
as found span	5000	78.4	80.0	79.6	1.004
SO2 scrubber check	5000	20.9	199.8	1.8	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	78.4	80.0	80.8	0.989
second point	5000	39.3	40.1	40.4	0.993
third point	5000	19.7	20.1	20.2	0.995
as left zero	5000	0.0	0.0	0.3	----
as left span	5000	78.5	80.1	81.1	0.987
Average Correction Factor					0.992

Corrected As found 79.6 Previous response 80.2 % change 0.8%

Notes:

Scrubber check completed after as founds. Span adjusted.

Calibration Performed By: Devin Russell





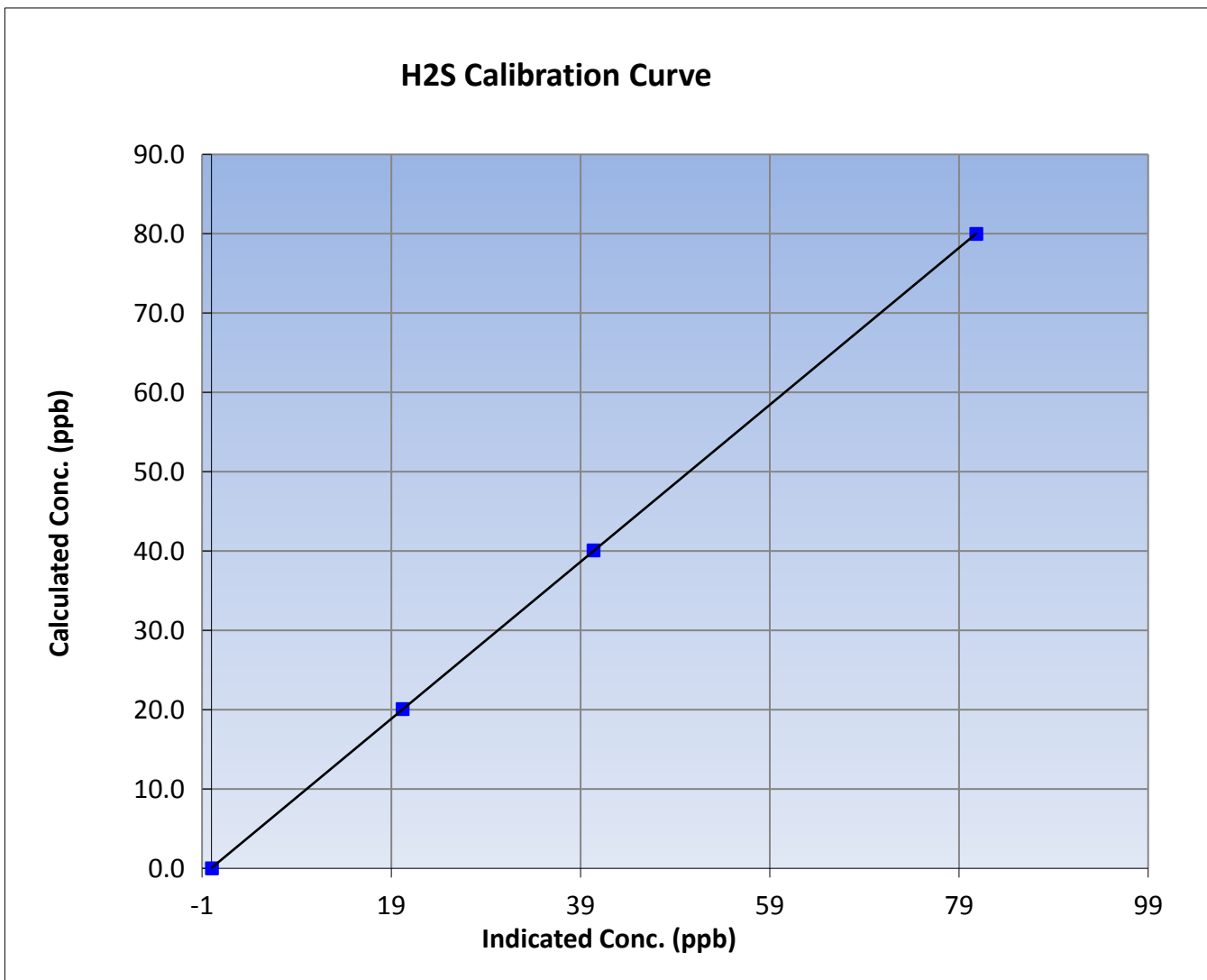
# Wood Buffalo Environmental Association H2S Calibration Report

## Station Information

Calibration Date	December 4, 2015	Previous Calibration	November 19, 2015
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	11:45	End Time (MST)	14:50
Analyzer make	Thermo 450i	Analyzer serial #	1218153583

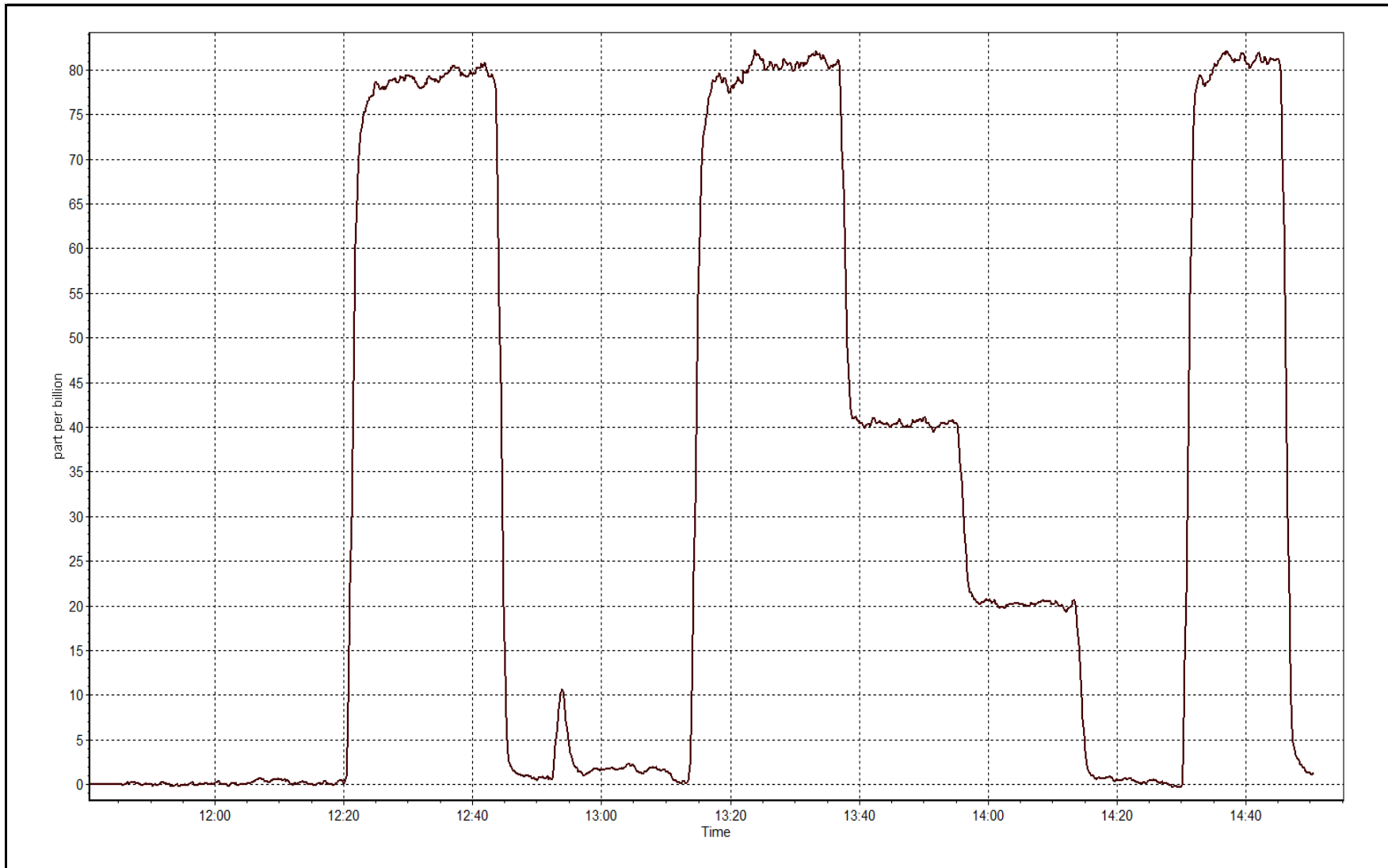
## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999993
80.0	80.8	0.9893		
40.1	40.4	0.9930	Slope	0.989468
20.1	20.2	0.9948		
			Intercept	0.049407



H2S Calibration Plot

Date: December 4, 2015





# Wood Buffalo Environmental Association THC Calibration Report

### Station Information

Calibration Date	December 3, 2015	Last Calibration	November 19, 2015
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	10:05	End Time (MST)	13:45
Gas Cert Reference	SA130010A	Cal Gas Expiry Date	12/12/2016
CH4 Cal Gas Conc.	512 ppm	CH4 Equiv Conc.	1092.3 ppm
C3H8 Cal Gas Conc.	211 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	493
ZAG make/model	Teledyne API 701	Serial Number	4427
DACS make/model	Campbell Scientific CR3000	Serial Number	6894

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.5	8.5
Analyzer IP address	192.168.1.51		Air or Bypass Press	37.3	37.4
Calculated slope	1.005524	1.002997	Fuel Pressure	24.8	24.8
Calculated intercept	-0.031411	-0.009289	Analyzer Coeff	4.3	4.3
			Analyzer BKG	2.680	2.680

Analyzer make: Thermo 51i-LT      Analyzer serial #: 1218153352

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	60.4	13.19	13.16	1.003
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	60.4	13.19	13.16	1.003
second point	5000	30.2	6.60	6.59	1.001
third point	5000	15.2	3.32	3.33	0.997
as left zero	5000	0.0	0.00	0.05	----
as left span	5000	60.4	13.19	13.18	1.001
Average Correction Factor					1.000

Corrected As found: 13.16      Previous response: 13.15      % change: -0.1%

Notes:

No adjustments or maintenance performed.

Calibration Performed By:

Kelly Baragar



# Wood Buffalo Environmental Association THC Calibration Report

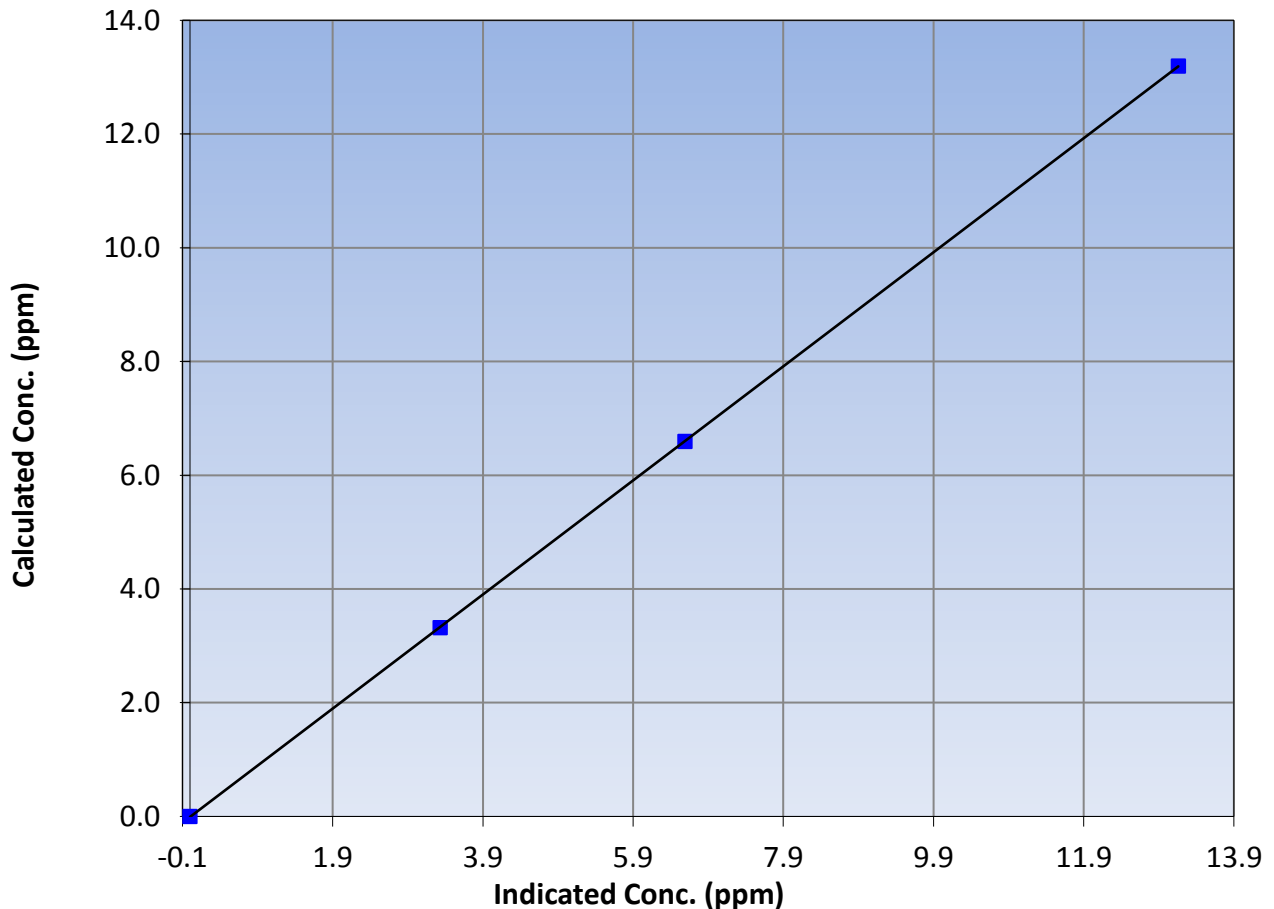
## Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 19, 2015
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	10:05	End Time (MST)	13:45
Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153352

## Calibration Data

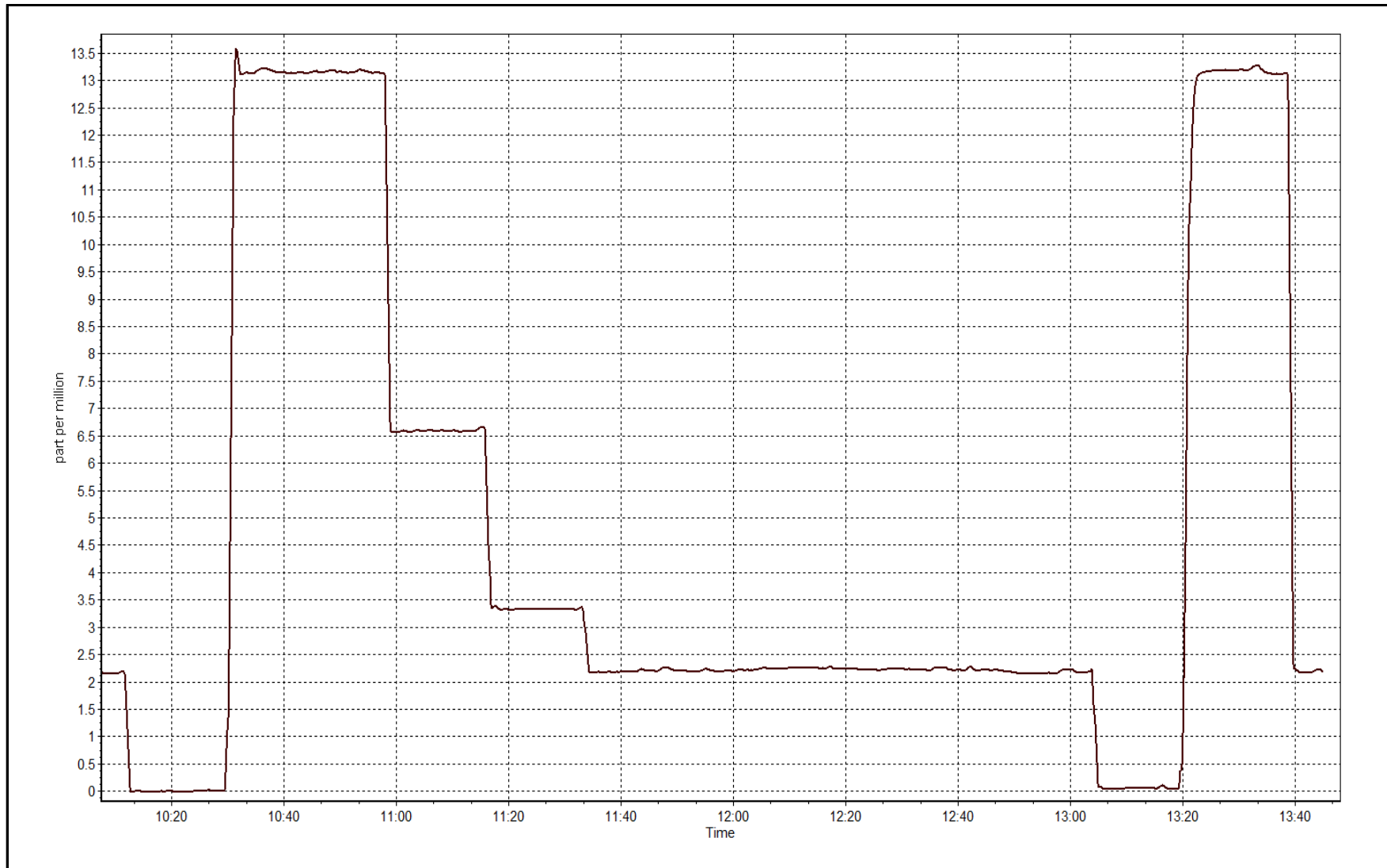
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999998
13.19	13.16	1.0026		
6.60	6.59	1.0011	Slope	1.002997
3.32	3.33	0.9971		
			Intercept	-0.009289

**THC Calibration Curve**



THC Calibration Plot

Date: December 3, 2015





# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Report

### Station Information

Calibration Date	December 4, 2015	Previous Calibration	November 24, 2015
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	9:45	End Time (MST)	12:25
NO2 GPT Ref date	December-03-15	Transfer Standard	23
		Station temp.	23 Deg C
Calibrator Make/Model	Teledyne API 700	Serial Number	997
ZAG make/model	Teledyne API 701	Serial Number	4427
DACS make/model	Campbell Scientific CR3000	Serial Number	6894

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	27.0	28.8
Analyzer IP address	192.168.1.79		Lamp temp.	58.0	58.0
Calculated slope	0.994930	1.007498	Pressure	26.4	25.5
Calculated intercept	-0.397079	-0.158582	Flow cell A	750	700
Analyzer Background	6.6	6.6	Flow cell B	738	691
Analyzer Coefficient	0.991	0.991	O3 measure	4602.1	4560.6
			O3 reference	4602.3	4561.5

Analyzer make	Teledyne API T400	Analyzer serial #	824
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### Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000		0.0	-0.4	----
as found span	5000	713.6/1082.0	388.1	389.0	0.998
calibrator zero	5000		0.0	0.3	----
high point	5000	713.6/1082.0	388.1	385.4	1.007
second point	5000	496.5/973.6	261.3	259.6	1.007
third point	5000	260.3/849.3	133.9	132.8	1.008
as left zero	5000		0.0	-0.8	----
as left span	5000	713.6/1082.0	388.1	379.0	1.024
Average Correction Factor					1.007

Corrected As found	389.4	Previous response	390.5	% change	0.3%
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**Notes:**

As founds span showed slow stabilization. Inlet filter changed after as founds. No adjustments made.

Calibration Performed By: Devin Russell



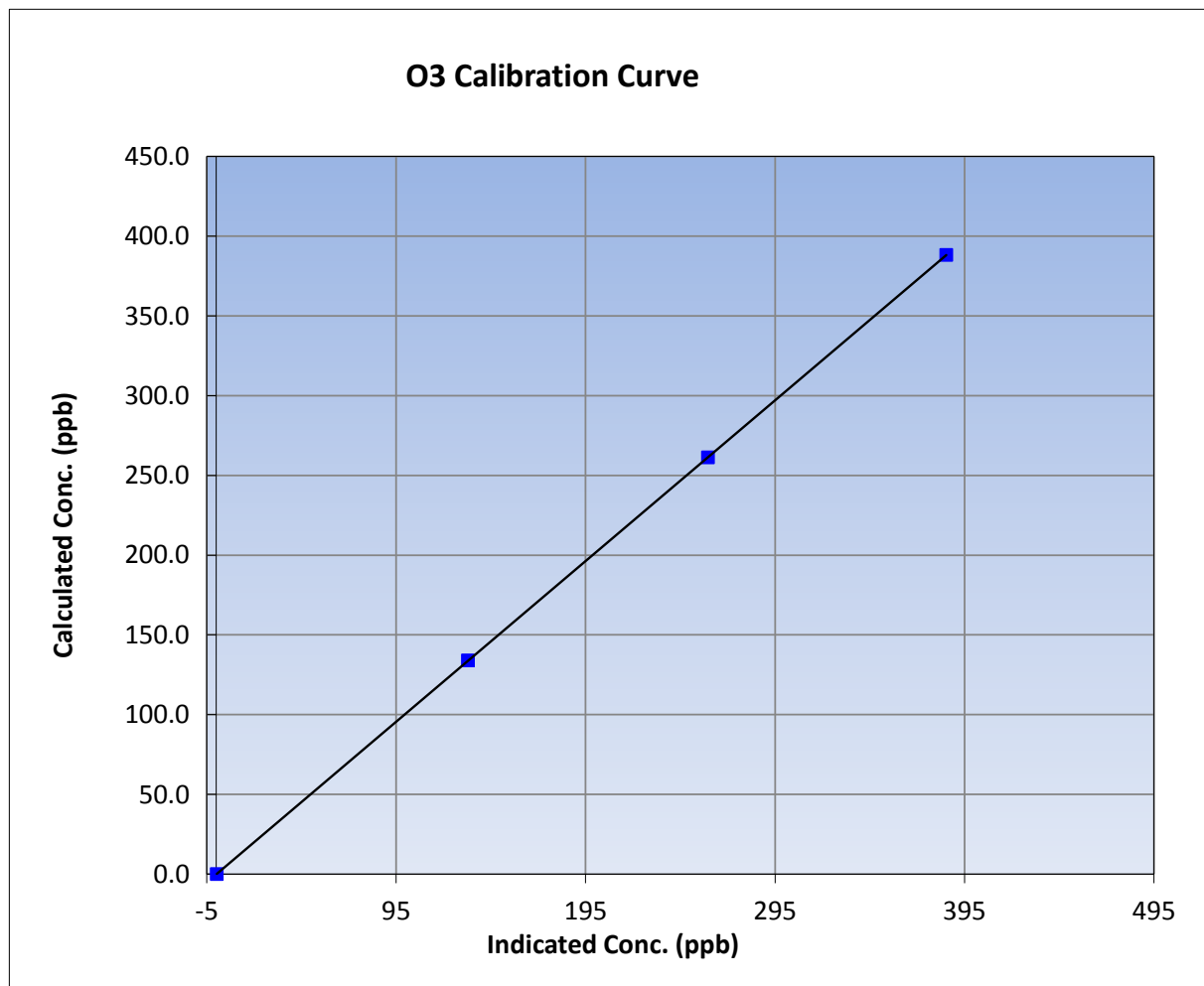
# Wood Buffalo Environmental Association O3 Calibration Report

## Station Information

Calibration Date	December-04-15	Previous Calibration	November 24, 2015
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	9:45	End Time (MST)	12:25
Analyzer make	Teledyne API T400	Analyzer serial #	824

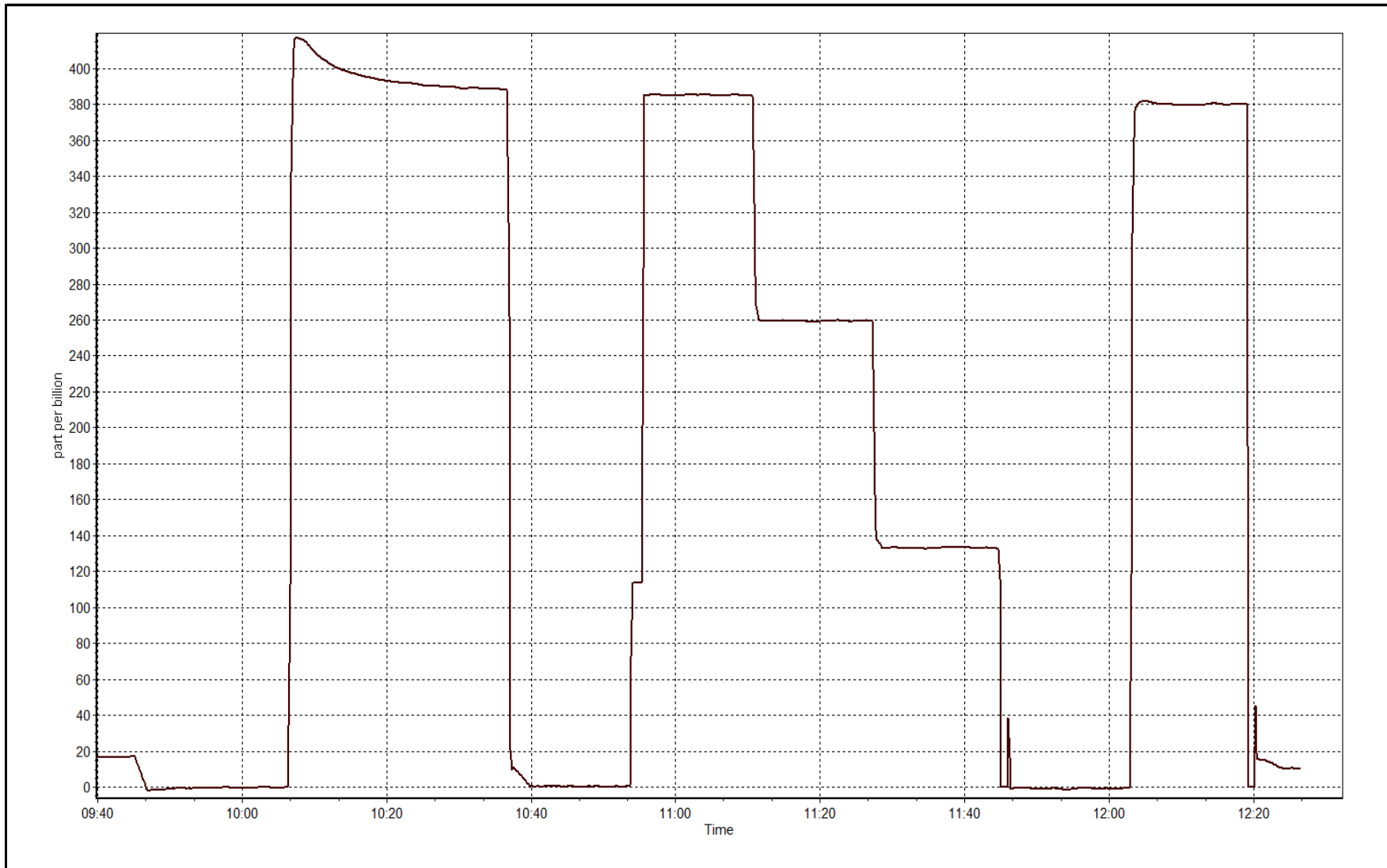
## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999999
388.1	385.4	1.0070		
261.3	259.6	1.0065	Slope	1.007498
133.9	132.8	1.0083		
			Intercept	-0.158582



O3 Calibration Plot

Date: December 4, 2015







# Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

## Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 19, 2015
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	10:05	End Time (MST)	13:45
NO Cal Gas Conc	49.7 ppm	Gas Cert Reference	SA130010A
NOx Cal Gas Conc	49.7 ppm	Cal Gas Expiry Date	12/1216
Calibrator	API T700	Serial Number	997
Zero air Generator	Teledyne API T701	Serial Number	4427

## DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	6894
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## Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.999608	0.994950	1.002478
	Data Offset	3.104855	2.691373	-0.787711
Current Calibration	Data Slope	0.991446	0.990261	1.000038
	Data Offset	1.647250	1.303297	0.005021

## Analyzer Information

Analyzer make/model	API T200	Analyzer serial #	833
---------------------	----------	-------------------	-----

Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.72		192.168.1.72	
NO coefficient	0.964		0.964	
NOx coefficient	0.960		0.960	
NO2 coefficient	1.000		1.000	
NO bkgrnd	0.6		0.6	
NOx bkgrnd	1.1		1.1	
Chamber Temp	50	Deg C	50	Deg C
Moly Temp	314.8	Deg C	314.8	Deg C
PMT voltage	781	V	781	V
PMT Temp	7	Deg C	7	Deg C
O3 flow	72	ccm	72	ccm
R Cell press NO	4.9	mmHg	4.9	mmHg
R Cell Press Nox	4.9	mmHg	4.9	mmHg
NO sample flow	0.442	lpm	0.442	lpm
Nox sample Flow	0.446	lpm	0.446	lpm

**Notes:**

No adjustments or maintenance performed.



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

### Station Information

Calibration Date: December 3, 2015 Station Number: AMS 17

### Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	----	----
as found span	5000	60.4	600.4	600.4	0.0	604.5	605.2	-2.0	0.9932	0.9920
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	----	----
high point	5000	60.4	600.4	600.4	0.0	604.5	605.2	-2.0	0.9932	0.9920
second point	5000	30.2	300.2	300.2	0.0	300.9	302.3	-1.5	0.9977	0.9930
third point	5000	15.2	151.1	151.1	0.0	148.8	149.3	-0.6	1.0156	1.0117
as left zero	5000	0.0	0.0	0.0	0.0	-0.4	-0.5	0.0	----	----
as left span	5000	60.4	600.4	219.5	380.9	604.9	217.9	387.0	0.9925	1.0075
Average Correction Factor									1.0022	0.9989

Corrected As found NO<sub>x</sub>= 604.6 NO= 605.3 Percent Change NO<sub>x</sub>= -1.2% NO= -0.8%  
 Previous Response NO<sub>x</sub>= 597.5 NO= 600.7

### GPT Calibration Data

Dilution Flow 5000 ccm Source Gas Flow 60.40 ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero			0.0			0.1			N/A	
1st NO2 (300)	----	219.5	388.1	607.4	219.5	387.9	0.9766	1.0000	1.0005	99.9%
2nd NO2 (200)	----	346.3	261.3	608.0	346.3	261.7	0.9757	1.0000	0.9985	100.2%
3rd NO2 (100)	----	473.7	133.9	607.3	473.7	133.6	0.9768	1.0000	1.0022	99.8%
4th NO2 (0)	607.6	----	-0.7	606.9	607.6	-0.6	0.9774	1.0000	N/A	----
Average Correction Factor							0.9766	1.0000	1.0004	100.0%

Calibration Performed By: Kelly Baragar



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

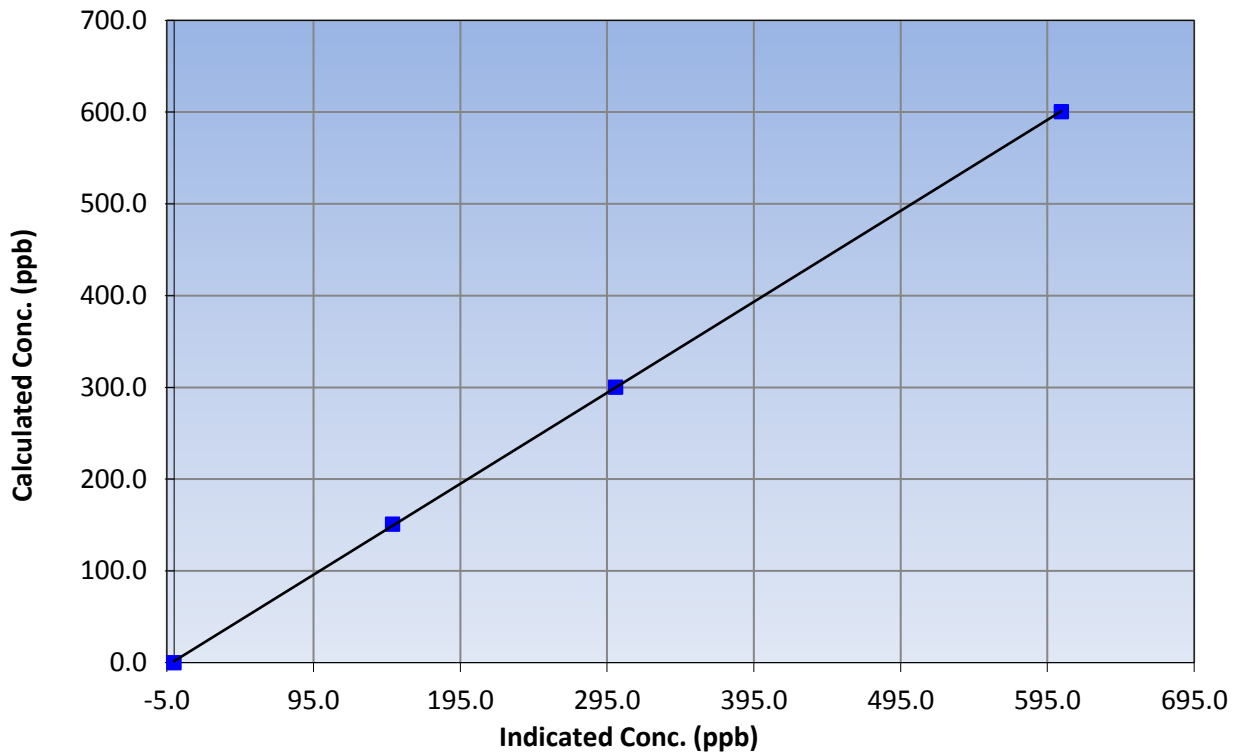
### Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 19, 2015
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	10:05	End Time (MST)	13:45
Analyzer make	API T200	Analyzer serial #	833

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999966
600.4	604.5	0.9932		
300.2	300.9	0.9977	Slope	0.991446
151.1	148.8	1.0156		
			Intercept	1.647250

### NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

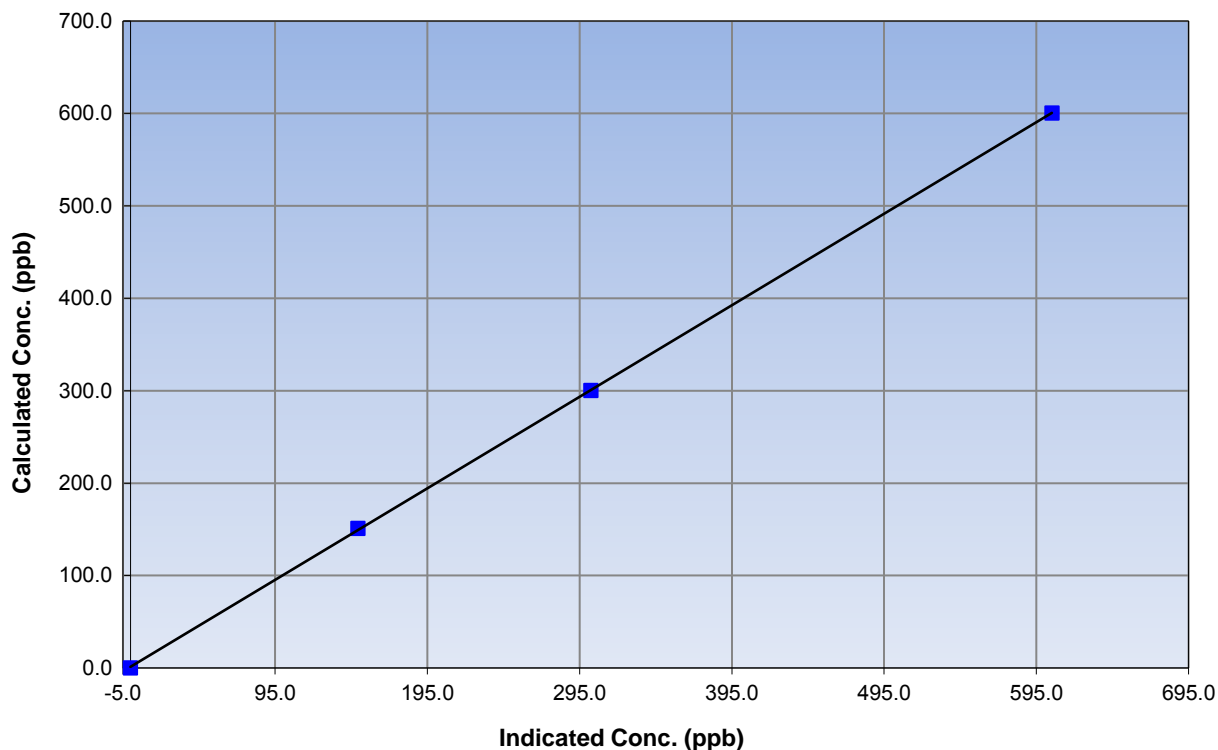
### Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 19, 2015
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	10:05	End Time (MST)	13:45
Analyzer make	API T200	Analyzer serial #	833

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999973
600.4	605.2	0.9920		
300.2	302.3	0.9930	Slope	0.990261
151.1	149.3	1.0117		
			Intercept	1.303297

### NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

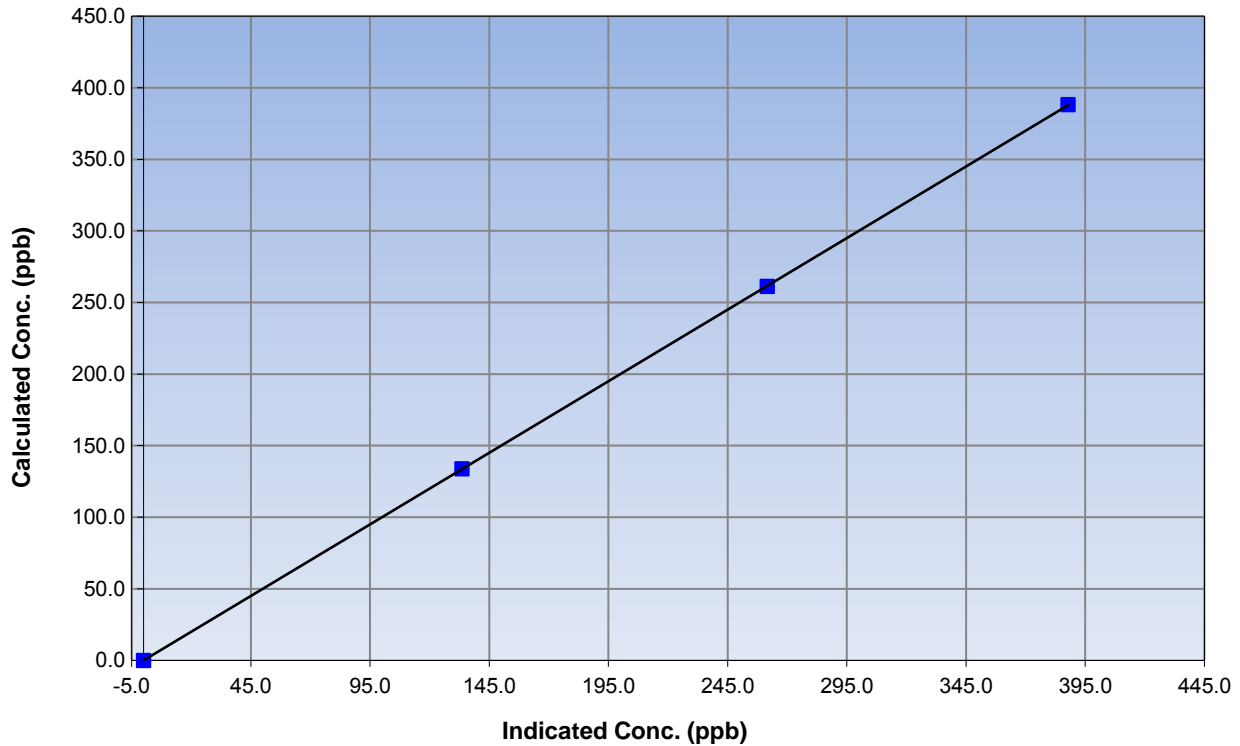
### Station Information

Calibration Date	December 3, 2015	Previous Calibration	November 19, 2015
Station Number	Wapasu	Station Number	AMS 17
Start Time (MST)	10:05	End Time (MST)	13:45
Analyzer make	API T200	Analyzer serial #	833

### Calibration Information

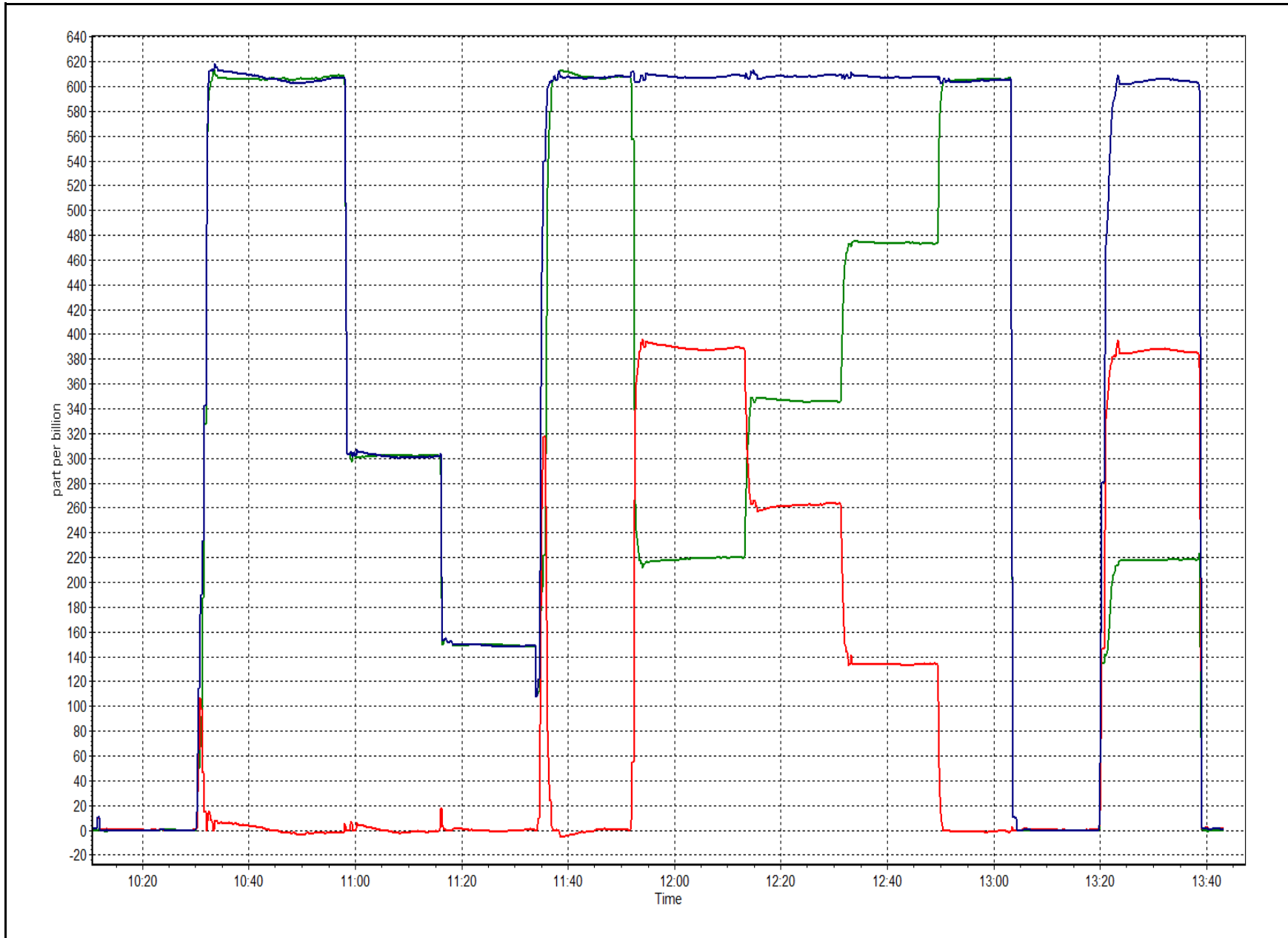
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999997
388.1	387.9	1.0005		
261.3	261.7	0.9985	Slope	1.000038
133.9	133.6	1.0022		
			Intercept	0.005021

### NO<sub>2</sub> Calibration Curve



NOX Calibration Plot

Date: December 3, 2015





# Wood Buffalo Environmental Association

## SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	December 4, 2015	Previous Calibration:	November 19, 2015
Station Name:	Wapasu	Station Number:	AMS 17
Start Time (MST):	10:45	End Time (MST):	11:45
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	1451

SHARP INFORMATION			
Particulate Fraction:		PM2.5	
Make/Model:		Thermo / SHARP 5030	
Serial Number		E-1107	
C <sub>14</sub> Source SN:		2518	
Confirmation of Time settings:		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Parameters Checked:	T1 <input checked="" type="checkbox"/>	T2 <input type="checkbox"/>	T3 <input type="checkbox"/>
	T4 <input type="checkbox"/>	P3 <input checked="" type="checkbox"/>	Main Flow <input checked="" type="checkbox"/>
		Beta <input type="checkbox"/>	Neph <input checked="" type="checkbox"/>

### CALIBRATION DATA

Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	-4.0	-3.8	0.2	-4.0
T2	17.0	na	na	
T3	19.0	na	na	
T4	18.0	na	na	
RH (%)	17.0	na	na	

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	934	931.5	-2.5	934

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1006	6	1006	1000

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	198		198
Neph	0.1		0.1
C14	2.1		2.1
Indicated Concentration (ug/m3)	0.1	no	0.1
Offset 1			
Offset 2			

### Leak Check (Quarterly)

Leak Check Date:		Previous Leak Check Date:	June 10, 2015
	<b>Measured</b>	<b>Difference LPM (Limit +/- 0.42 LPM)</b>	
Flow without adaptor (LPM):			0.00
*Flow with adaptor (LPM):			
<i>*Note - do not attach adaptor without shutting off the pump first</i>			

Mass Foil Calibration (Annually)	
Foil Calibration Date:	Previous Foil Calibration:
Zeroed?:	
Foil Mass:	<b>Mass foil set S/N:</b>
Previous Correction Factor:	
New Correction Factor:	

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	23/10/2015
Pump	Good	
Filter Tape	Good	
Mass Foil Cal Set	na	
HEPA filter	Good	

### NOTES:

Cyclone head cleaned. No adjustments made.

Calibration Performed By: Devin Russell



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## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 18  
CONKLIN LOOKOUT  
DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN LOOKOUT (AMS 18)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2(ppb) Average	708	36	36	100.00	11	0	2	0
TRS(ppb) Average	709	35	35	100.00	1	0	0	0
THC(ppm) Average	708	36	36	100.00	2.4	-	2.3	-
NMHC(ppm) Average	708	36	36	100.00	0.135	-	0.081	-
CH4(ppm) Average	708	36	36	100.00	2.4	-	2.3	-
O3 (ppb) Average	710	34	34	100.00	49	0	39	-
NO2 (ppb) Average	708	36	36	100.00	11	0	9	-
NO (ppb) Average	708	36	36	100.00	3	-	1	-
NOX (ppb) Average	708	36	36	100.00	14	-	9	-
PM2.5 (ug/m3) Average	740	2	4	99.73	20.9	-	11.5	0
Wind Speed 10 m (km/h) Average	744	0	0	100.00	20	-	15	-
Wind Direction 10 m (deg) Average	744	0	0	100.00	-	-	-	-
Temperature 2 m (C) Average	744	0	0	100.00	4.7	-	0.5	-
Relative Humidity (%) Average	744	0	0	100.00	97	-	96.0	-
Precipitation (mm) Total	744	0	0	100.00	1.1	-	3.7	-
Leaf Wetness (% of range) Average	744	0	0	100.00	7	-	5.0	-
Global Solar Radiation (W/m2) Average	744	0	0	100.00	268	-	43.0	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN LOOKOUT (AMS 18)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	708	0.4	1	-	0	0	0	0	0	1	11
TRS (ppb) Average	709	0.3	0	-	0	0	0	0	0	0	1
THC (ppm) Average	708	2.07	0.1	-	1.9	2	2	2	2.1	2.3	2.4
NMHC(ppm) Average	708	0.016	0.026	-	0	0	0	0	0	0.1	0.135
CH4(ppm) Average	708	2.05	0.1	-	1.9	2	2	2	2.1	2.2	2.4
O3 (ppb) Average	710	25.5	7	-	8	17	20	24	30	36	49
NO2 (ppb) Average	708	2.9	2	-	0	1	1	2	4	5	11
NO (ppb) Average	708	0.2	0	-	0	0	0	0	0	0	3
NOX (ppb) Average	708	3	2	-	0	1	1	2	5	6	14
PM2.5 (ug/m3) Average	740	4.4	3.6	-	0	0.8	1.6	3.4	6.7	9.1	20.9
Wind Speed 10 m (km/h) Average	744	7.5	4	-	0	3	4	7	10	14	20
Wind Direction 10 m (deg) Average	744	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	744	-9.32	6.4	-	-22.3	-17.2	-15.1	-8.4	-3.9	-0.8	4.7
Relative Humidity (%) Average	744	81.5	14	-	21	60	81	84	90	94	97
Precipitation (mm) Total	744	-	-	7.16	-	-	-	-	-	-	-
Surface Wetness (% of range) Average	744	2.5	1	-	1	2	2	2	3	3	7
Global Solar Radiation (W/m2) Average	744	15	39	-	0	0	0	0	8	46	268

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN LOOKOUT (AMS 18)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
PM2.5	22 Dec 2015 10:00	22 Dec 2015 11:00	2	Maintenance - Zero check

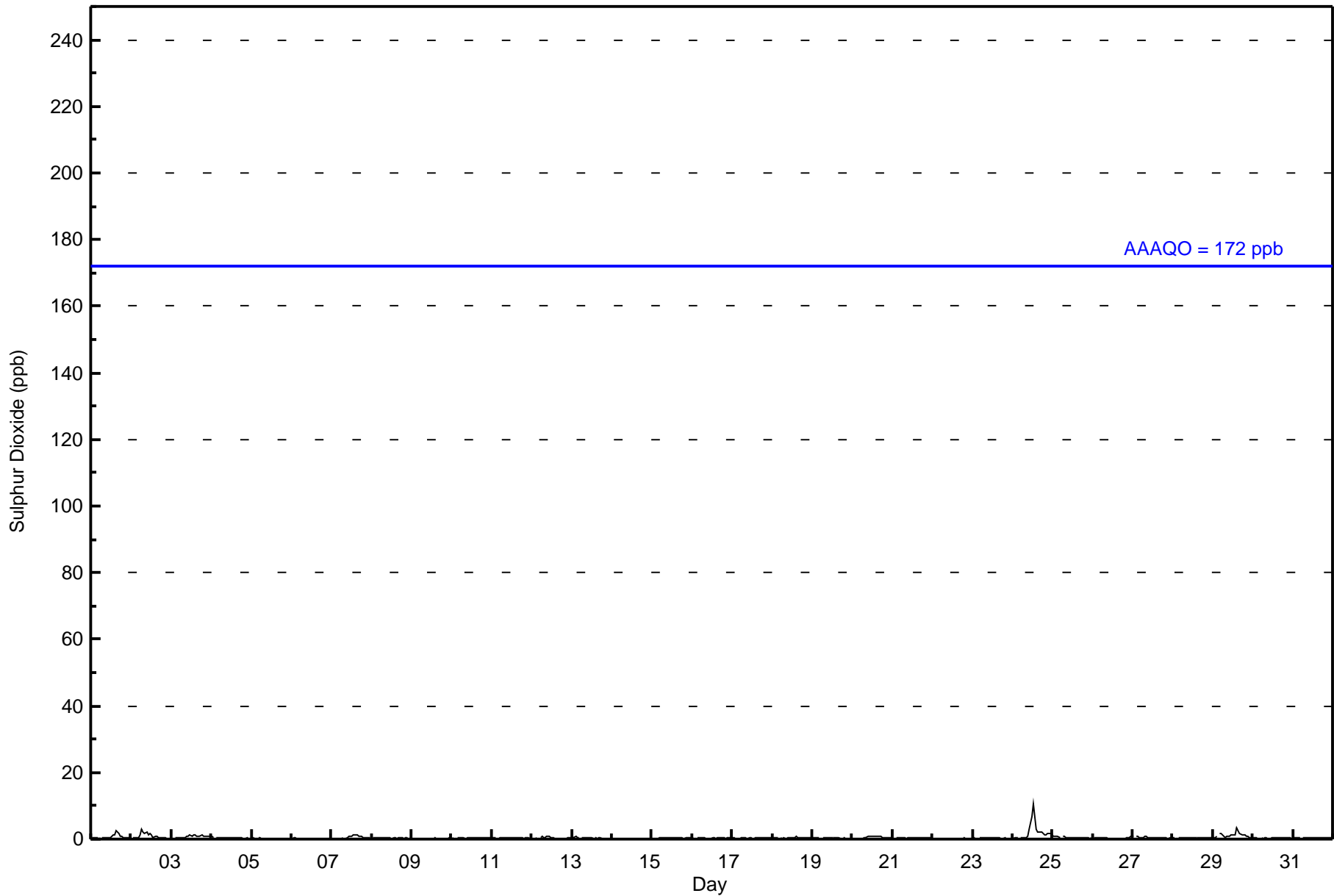


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 11 ppb on Dec 24 13:00	Maximum Daily Average: 2.2 ppb on Dec 24		Hours of Data:	708
Minimum Value: 0 ppb on Dec 5 13:00	Minimum Daily Average: 0.1 ppb on Dec 6		Hours of Missing Data:	36
Maximum Diurnal Average: 0.8 ppb at hour 13	Minimum Diurnal Average: 0.3 ppb at hour 4		Hours of Calibration:	36
Monthly Average: 0.4 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 3		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	3	2	1	1	1	1	0	0	0	0.7	3
2-Dec	Z	0	0	0	0	1	3	2	2	2	1	2	1	1	1	1	1	0	0	0	0	0	0	0	0.9	3
3-Dec	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
4-Dec	1	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
7-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.5	1
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
9-Dec	0	Z	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.1	0
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
12-Dec	0	0	0	0	Z	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
13-Dec	1	1	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	0	1	1	1	0	0	1	0	0.4	1
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
20-Dec	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0	0.5	1
21-Dec	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.3	1
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
23-Dec	1	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
24-Dec	0	0	0	0	Z	0	0	0	0	1	3	7	11	7	3	2	2	2	2	1	1	2	2	2	2.2	11
25-Dec	1	1	1	1	1	Z	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.5	1
26-Dec	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
27-Dec	1	Z	1	1	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.5	1
28-Dec	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.4	1
29-Dec	0	0	1	Z	2	2	1	1	1	1	1	1	1	1	3	3	1	1	1	1	1	1	1	0	1.1	3
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0

0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.7	0.8	0.6	0.6	0.6	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	Diurnal Average	
1	1	1	1	2	2	3	2	2	2	2	3	7	11	7	3	3	2	2	2	2	1	1	2	2	2	Diurnal Maximum

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Conklin Lookout - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	707	99.86	99.86
11 - 20	1	0.14	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744





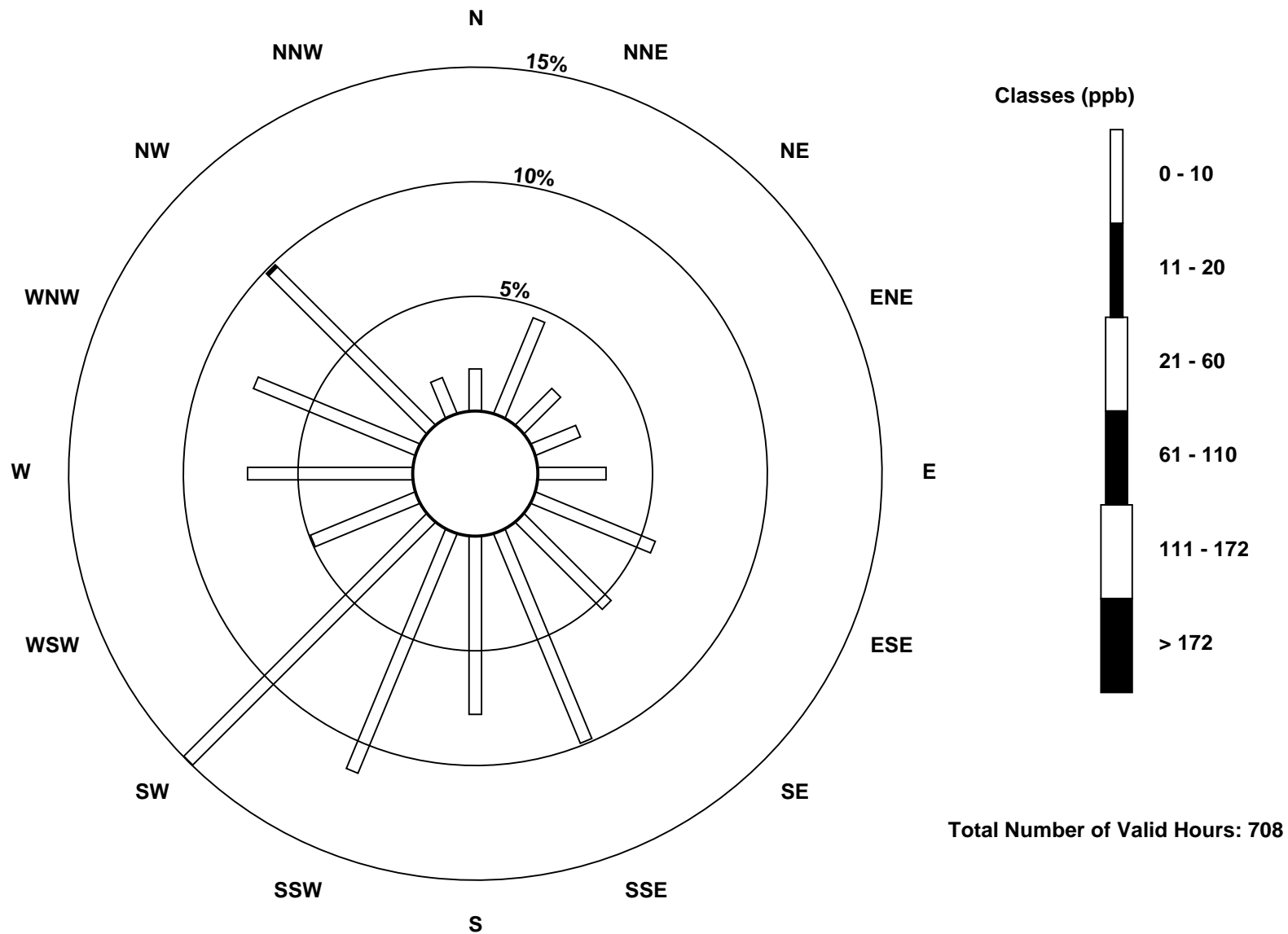
**Wood Buffalo Environmental Association  
Frequency Distribution**

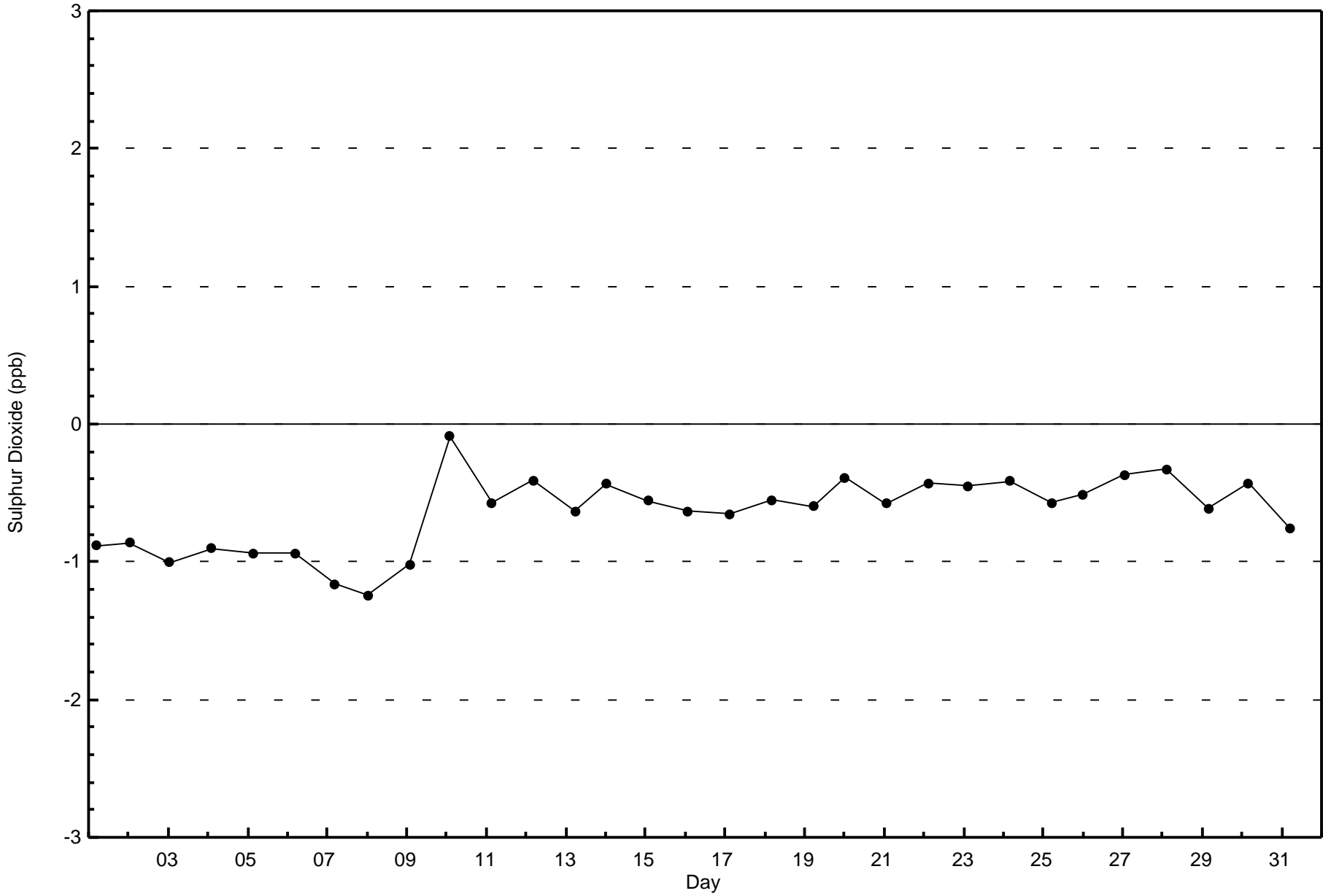
**Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Conklin Lookout - December 2015**

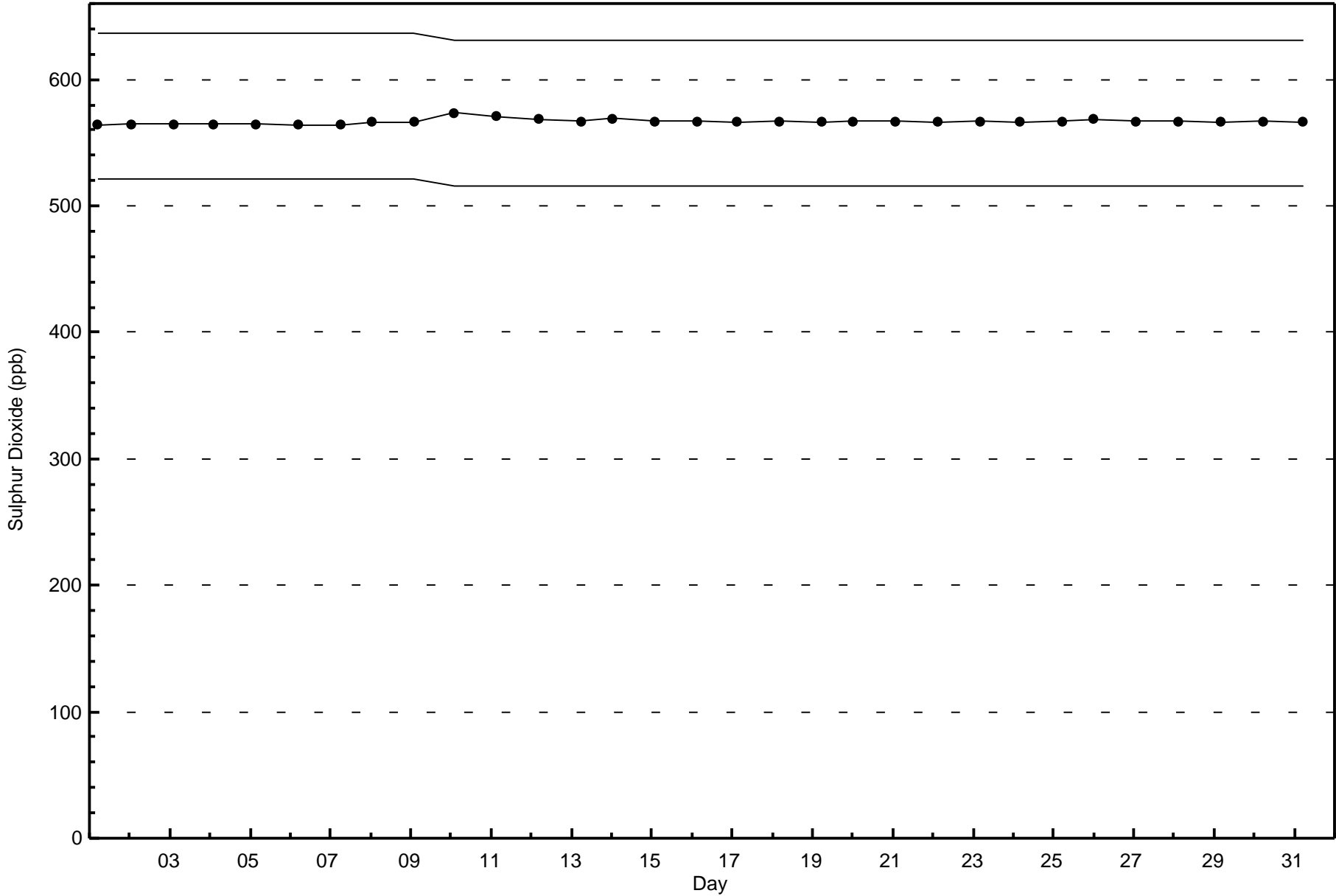
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	13	32	16	15	21	40	38	70	55	80	106	35	51	54	69	12	707
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	32	16	15	21	40	38	70	55	80	106	35	51	54	70	12	708

Total Number of Valid Hours: 708

Total Number of Hours: 744









Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 1 ppb on Dec 23 07:00	Maximum Daily Average: 0.4 ppb on Dec 23		Hours of Data:	709
Minimum Value: 0 ppb on Dec 6 11:00	Minimum Daily Average: 0.3 ppb on Dec 2		Hours of Missing Data:	35
Maximum Diurnal Average: 0.3 ppb at hour 7	Minimum Diurnal Average: 0.3 ppb at hour 1		Hours of Calibration:	35
Monthly Average: 0.3 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 0		Percent Operational Time:	100.0

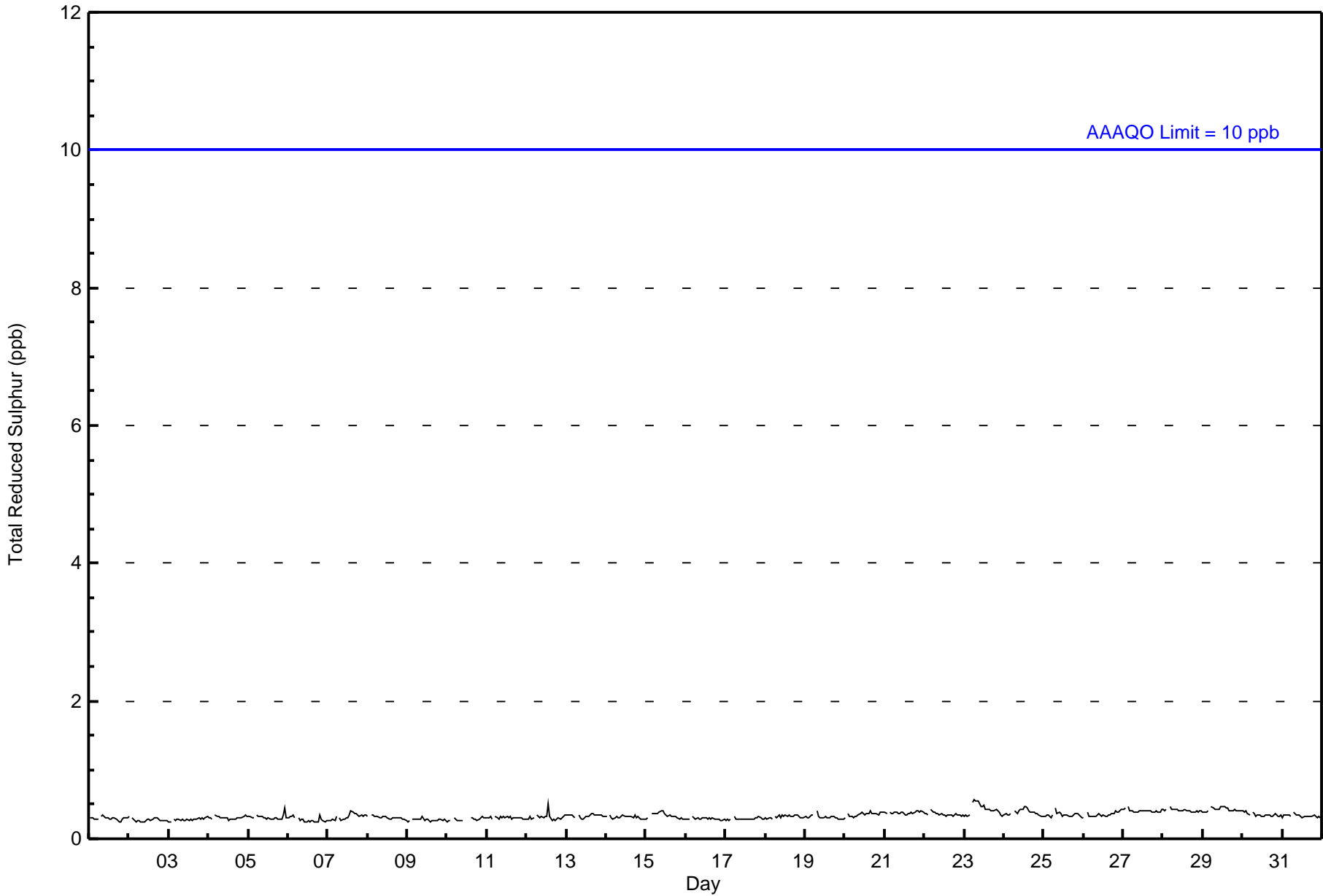
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
10-Dec	0	0	0	Z	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.3	0
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
23-Dec	0	0	0	0	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
25-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0
30-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
0.3																								Diurnal Average			
0																								Diurnal Maximum			

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb    24-hr 3 ppb



Wood Buffalo Environmental Association  
Hourly Averages

Total Reduced Sulphur (TRS) - ppb  
Conklin Lookout - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Conklin Lookout - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	709	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb**  
**Conklin Lookout - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	12	33	17	14	20	41	36	68	56	79	106	35	51	56	72	13	709
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	12	33	17	14	20	41	36	68	56	79	106	35	51	56	72	13	709

Total Number of Valid Hours: 709

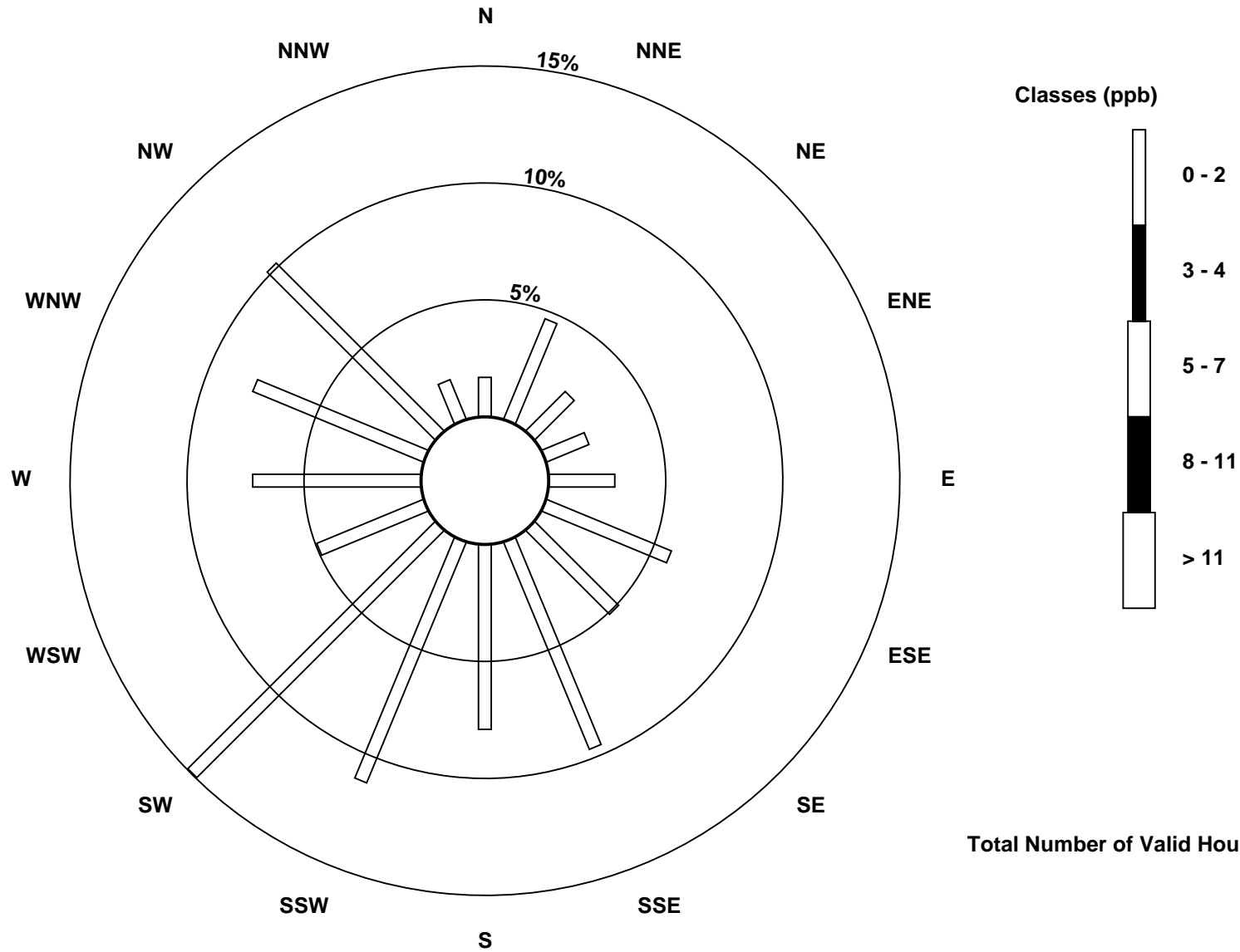
Total Number of Hours: 744



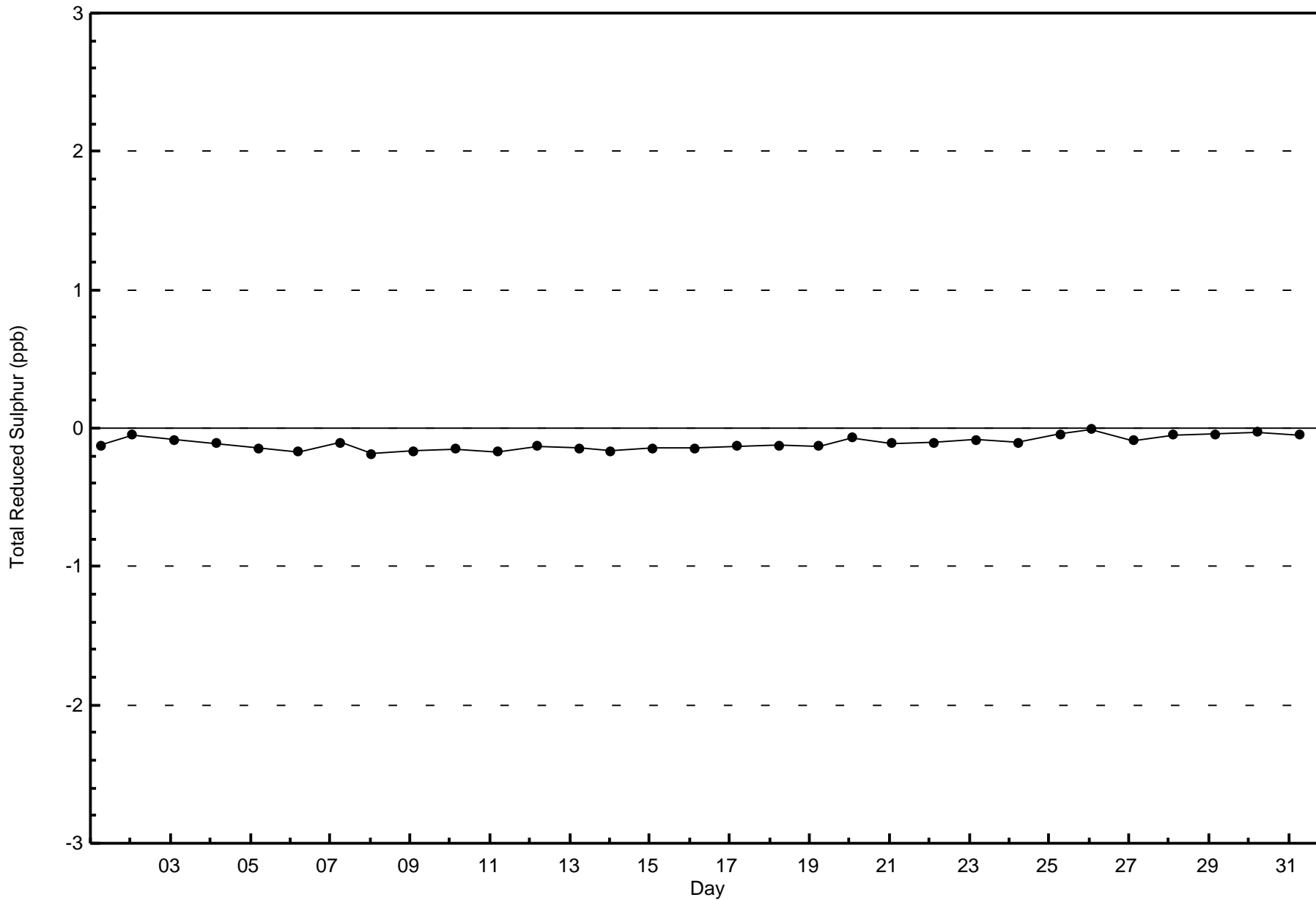


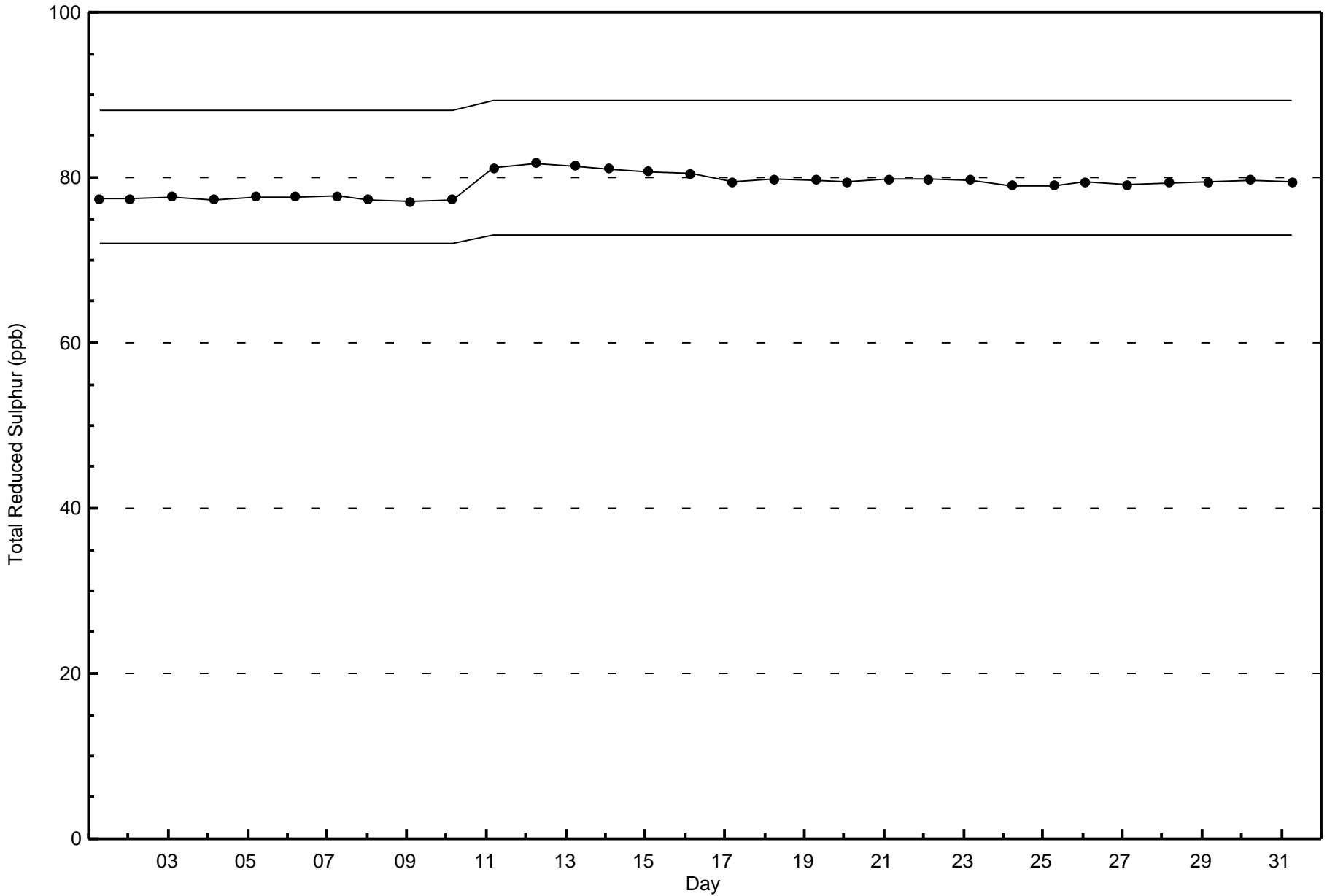
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Total Reduced Sulphur (TRS) - ppb  
Conklin Lookout (AMS 18)



Total Number of Valid Hours: 709







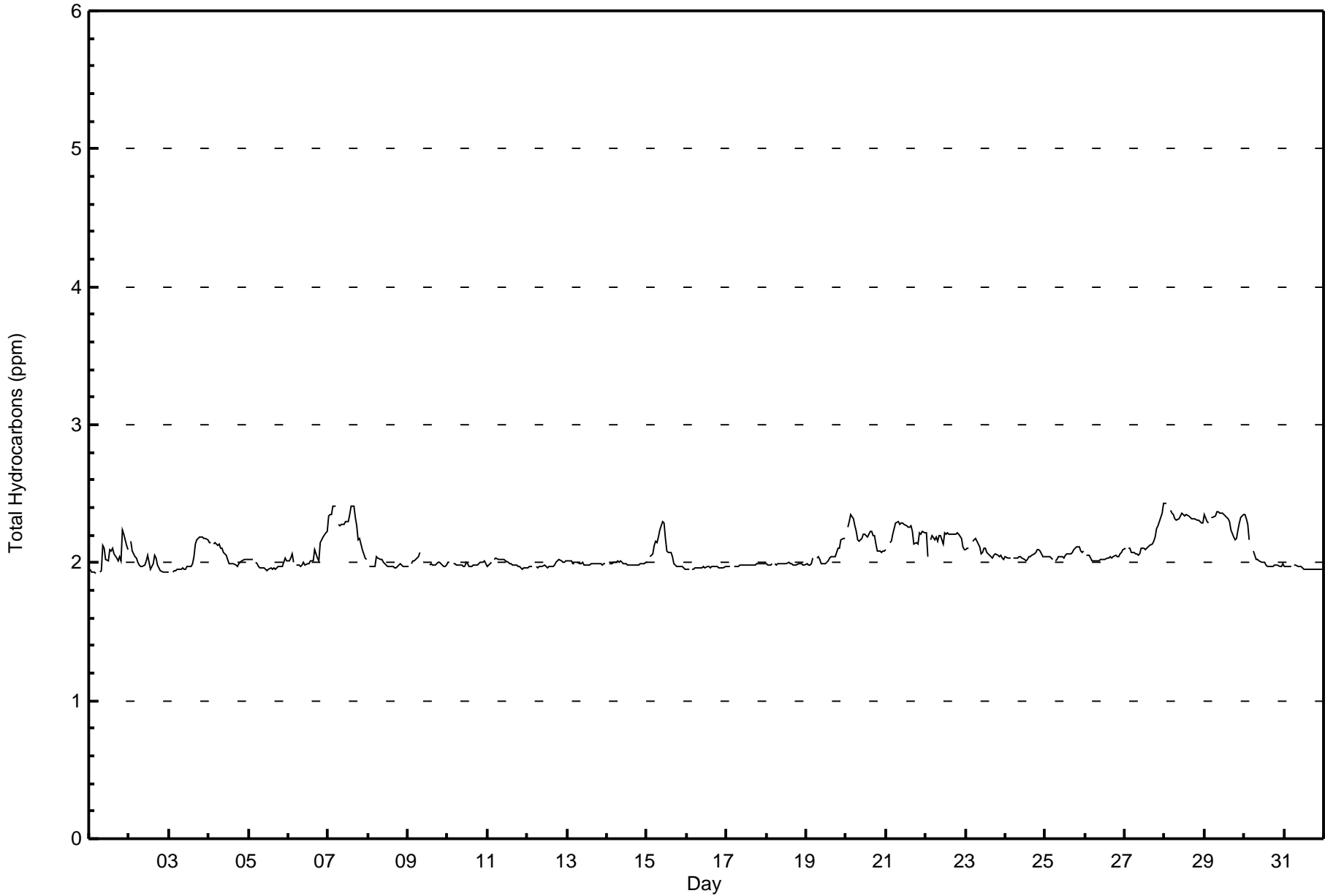
Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

Conklin Lookout - December 2015

Maximum Value: 2.4 ppm on Dec 28 02:00																				Maximum Daily Average: 2.3 ppm on Dec 28					Hours in Service: 744	
Minimum Value: 1.9 ppm on Dec 1 05:00																				Minimum Daily Average: 2.0 ppm on Dec 31					Hours of Data: 708	
Maximum Diurnal Average: 2.1 ppm at hour 5																				Minimum Diurnal Average: 2.1 ppm at hour 19					Hours of Missing Data: 36	
Monthly Average: 2.07 ppm																				Percentiles: P <sub>1</sub> = 1.9 P <sub>10</sub> = 2.0 Q <sub>1</sub> = 2.0 Median = 2.0 Q <sub>3</sub> = 2.1 P <sub>90</sub> = 2.3 P <sub>99</sub> = 2.4					Hours of Calibration: 36	
																									Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2.0	1.9	1.9	1.9	1.9	Z	1.9	1.9	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.2	2.2	2.1	2.1	2.0	2.2
2-Dec	Z	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.2
3-Dec	1.9	Z	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.0	2.2
4-Dec	2.2	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2
5-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
6-Dec	2.0	2.0	2.1	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.1	2.2	2.2	2.2	2.2	2.0	2.2
7-Dec	2.3	2.4	2.4	2.4	2.4	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.3	2.3	2.2	2.2	2.1	2.1	2.0	2.0	2.3	2.4
8-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
9-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.1	C	C	C	C	C	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1
10-Dec	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
11-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
12-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
13-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
14-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
15-Dec	2.0	Z	2.0	2.1	2.1	2.2	2.1	2.2	2.2	2.3	2.3	2.2	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.3
16-Dec	2.0	1.9	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
17-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
18-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
19-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.2	2.2	2.0	2.2
20-Dec	Z	2.3	2.3	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.4
21-Dec	2.1	Z	2.1	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.3
22-Dec	2.2	2.0	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.2
23-Dec	2.1	2.1	2.1	Z	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.1	2.0	2.1	2.2
24-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.1
25-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
26-Dec	Z	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.1	2.1	2.1	2.0	2.1
27-Dec	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.3	2.3	2.4	2.4	2.1	2.4
28-Dec	2.4	2.4	Z	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4
29-Dec	2.4	2.3	2.3	Z	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.4
30-Dec	2.3	2.3	2.3	2.2	Z	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.3
31-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Conklin Lookout - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	447	63.14	63.14
2.1 - 3.0	261	36.86	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Conklin Lookout - December 2015**

<b>Concentration</b> <b>Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	10	21	9	9	18	40	31	47	21	19	41	24	42	47	58	10	447
2.1 - 3.0	3	11	7	6	3	0	7	23	34	61	65	11	9	7	12	2	261
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	32	16	15	21	40	38	70	55	80	106	35	51	54	70	12	708

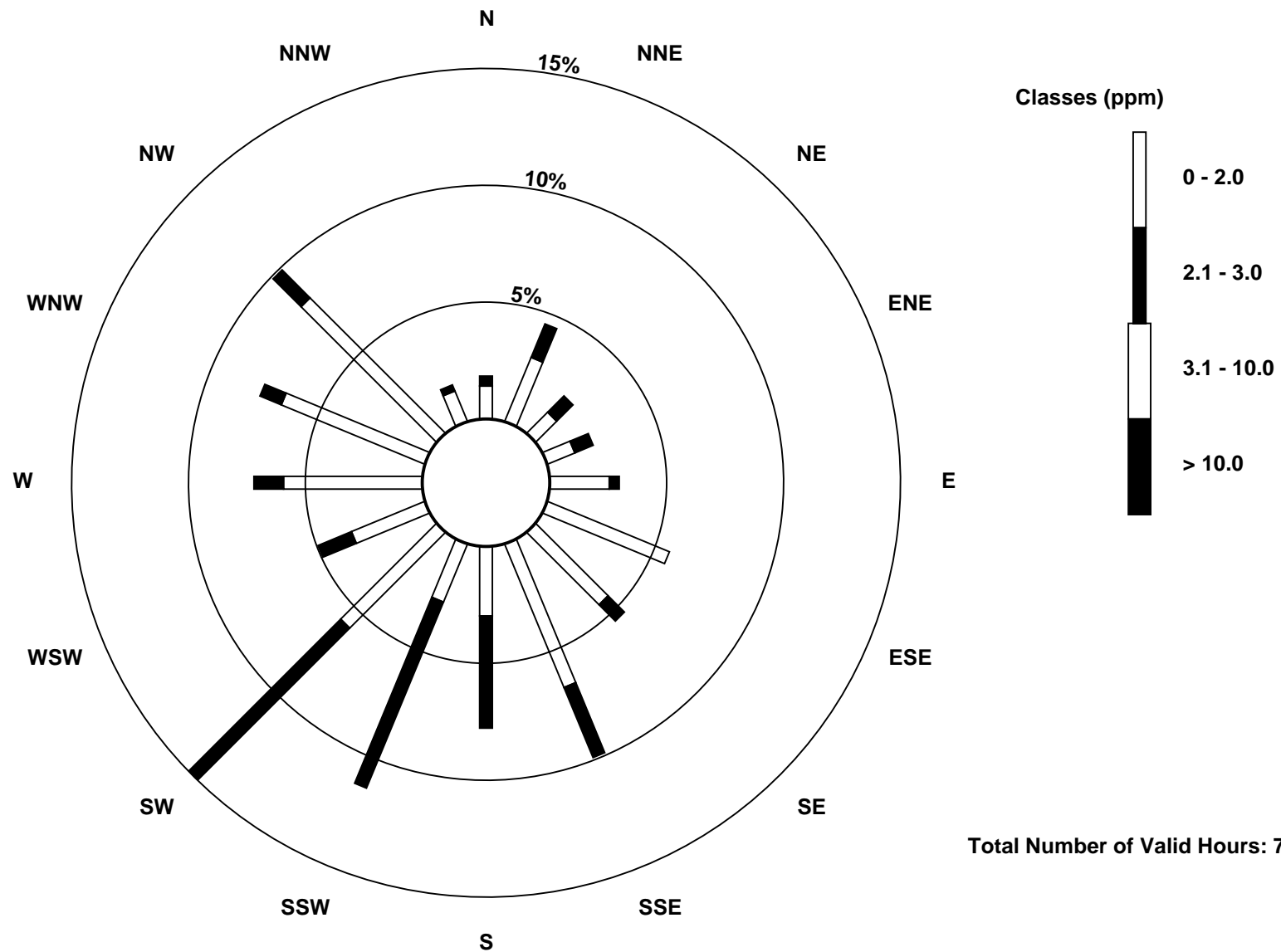
Total Number of Valid Hours: 708

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Total Hydrocarbons (THC) - ppm  
Conklin Lookout (AMS 18)

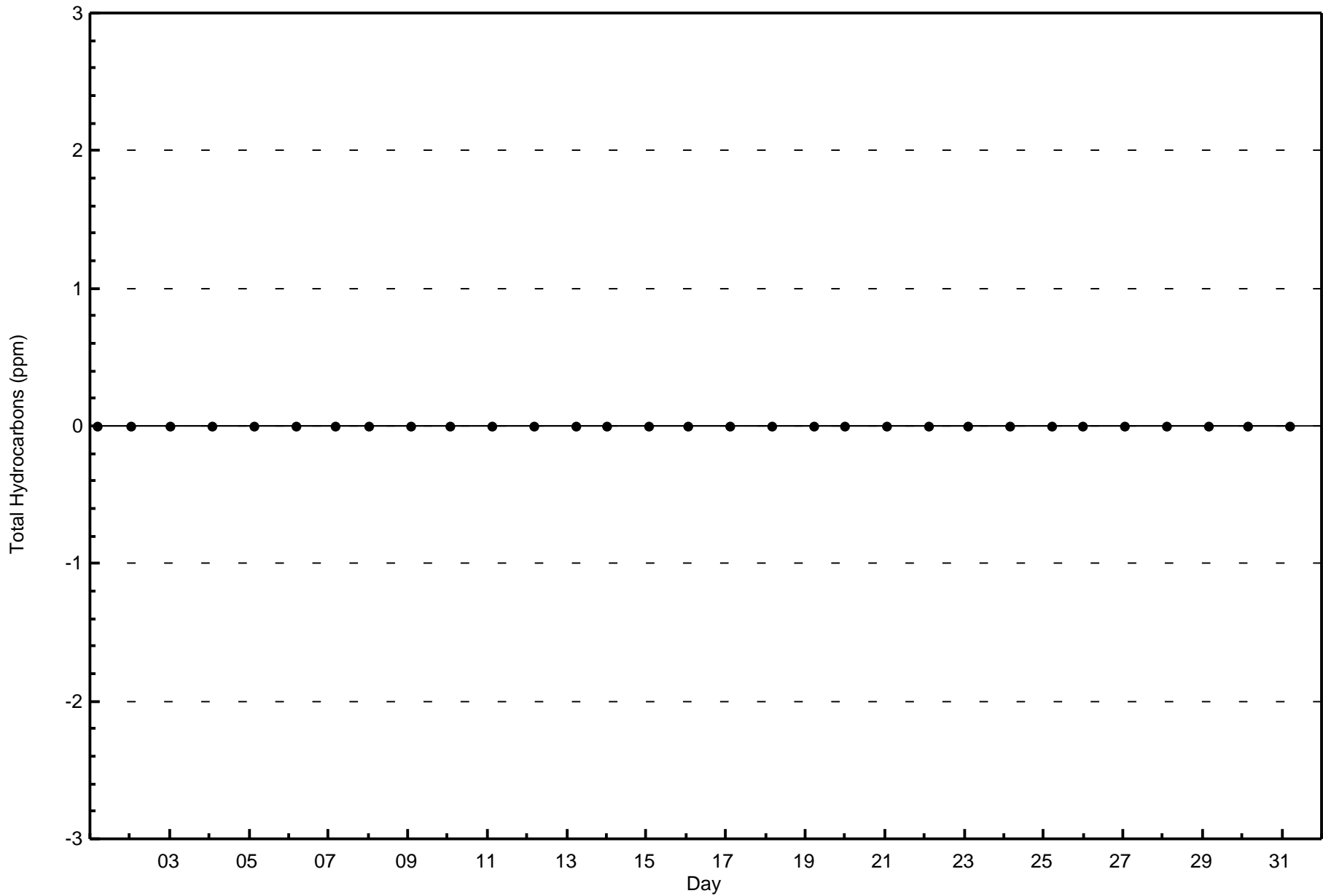


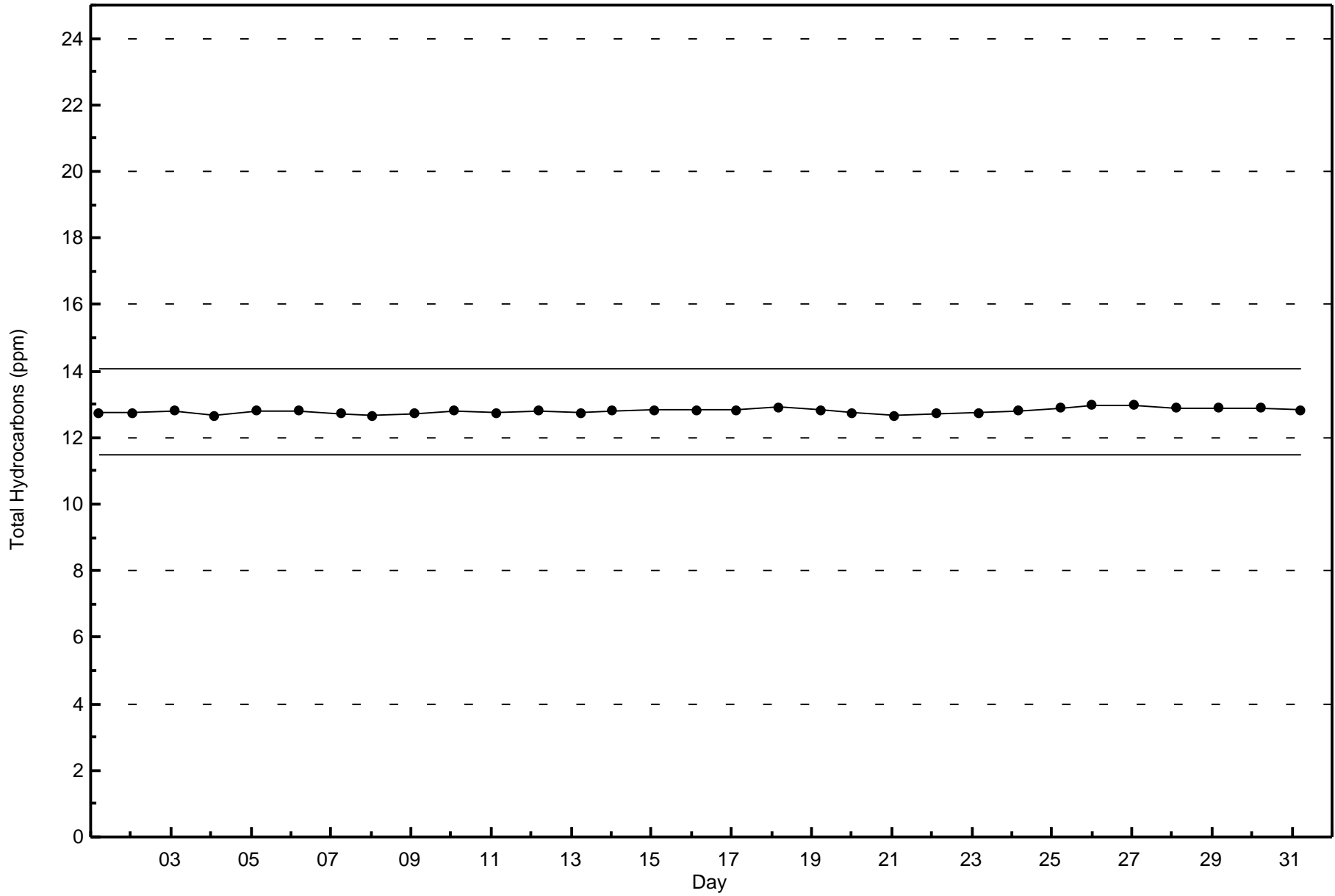




Wood Buffalo Environmental Association  
Zero Responses

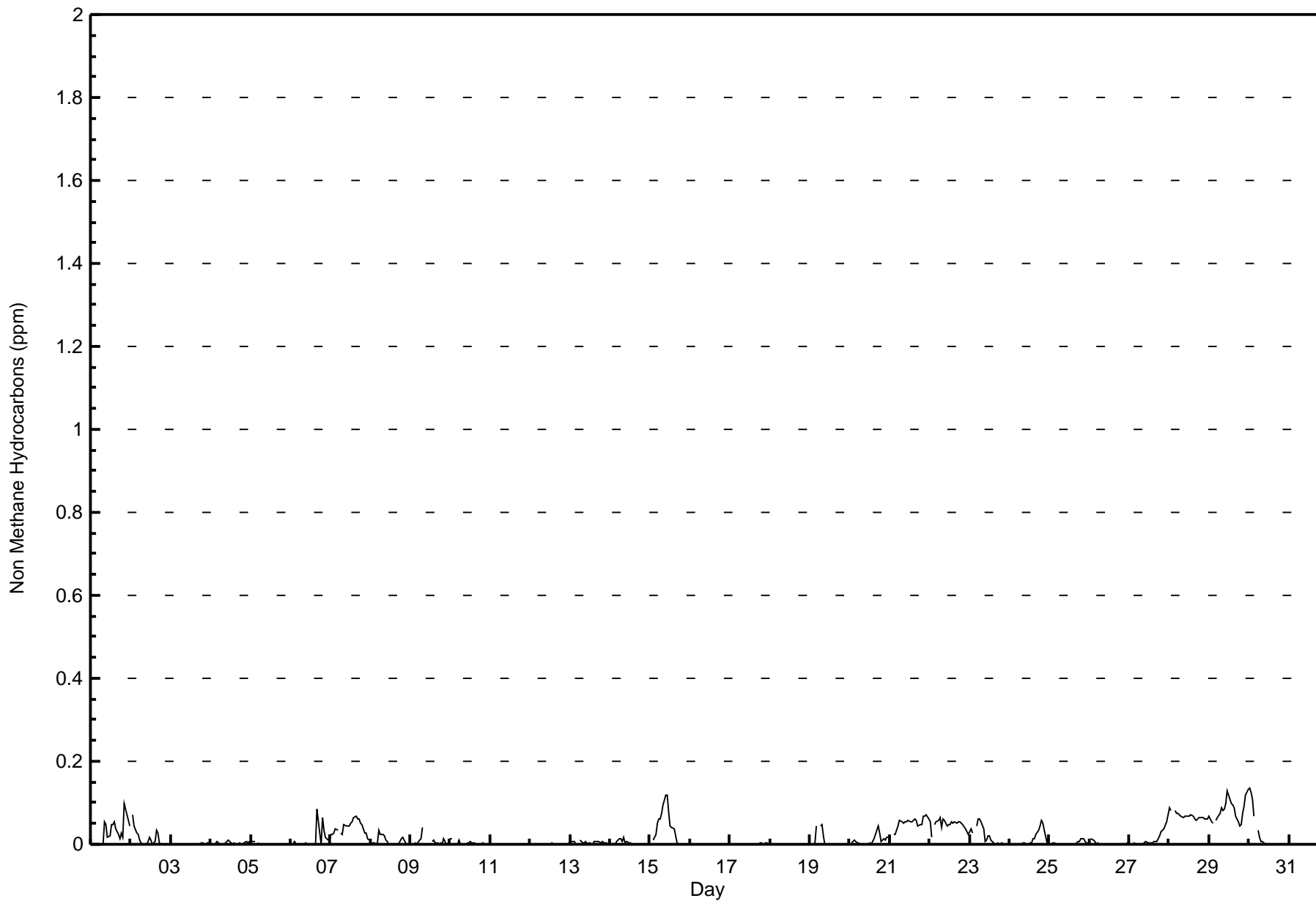
Total Hydrocarbons (THC) - ppm  
Conklin Lookout - December 2015







Maximum Value: 0.135 ppm on Dec 30 01:00		Maximum Daily Average: 0.081 ppm on Dec 29		Hours in Service:	744																					
Minimum Value: 0.000 ppm on Dec 1 02:00		Minimum Daily Average: 0.000 ppm on Dec 16		Hours of Data:	708																					
Maximum Diurnal Average: 0.019 ppm at hour 6		Minimum Diurnal Average: 0.013 ppm at hour 3		Hours of Missing Data:	36																					
Monthly Average: 0.016 ppm		Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.1 P <sub>99</sub> = 0.1		Hours of Calibration:	36																					
				Percent Operational Time:	100.0																					
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0.000	0.000	0.000	0.000	0.000	Z	0.000	0.001	0.053	0.047	0.017	0.019	0.047	0.048	0.054	0.038	0.023	0.015	0.026	0.017	0.097	0.084	0.059	0.044	0.030	0.097
2-Dec	Z	0.071	0.043	0.026	0.025	0.011	0.004	0.000	0.001	0.001	0.005	0.018	0.011	0.000	0.008	0.036	0.028	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.071
3-Dec	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.004	0.003	0.002	0.002	0.005	0.002	0.001	0.005
4-Dec	0.001	0.002	Z	0.002	0.008	0.001	0.002	0.002	0.001	0.003	0.010	0.005	0.002	0.001	0.004	0.002	0.000	0.002	0.000	0.001	0.002	0.006	0.003	0.008	0.003	0.010
5-Dec	0.006	0.006	0.006	Z	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.006
6-Dec	0.000	0.000	0.008	0.002	Z	0.000	0.000	0.000	0.000	0.002	0.001	0.001	0.000	0.000	0.000	0.002	0.085	0.028	0.000	0.064	0.035	0.018	0.009	0.010	0.011	0.085
7-Dec	0.024	0.025	0.029	0.037	0.035	Z	0.026	0.023	0.046	0.043	0.044	0.044	0.052	0.056	0.063	0.068	0.061	0.060	0.051	0.047	0.027	0.026	0.012	0.009	0.040	0.068
8-Dec	Z	0.003	0.003	0.001	0.005	0.035	0.024	0.022	0.020	0.011	0.006	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.012	0.015	0.010	0.003	0.000	0.000	0.008	0.035
9-Dec	0.000	Z	0.001	0.003	0.001	0.011	0.013	0.039	C	C	C	C	C	0.006	0.011	0.002	0.002	0.001	0.002	0.000	0.014	0.000	0.001	0.011	0.007	0.039
10-Dec	0.014	0.013	Z	0.000	0.000	0.009	0.001	0.000	0.000	0.000	0.003	0.004	0.006	0.002	0.002	0.002	0.000	0.000	0.000	0.002	0.001	0.000	0.001	0.001	0.003	0.014
11-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
12-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.003	0.000	0.004
13-Dec	0.007	0.007	0.008	0.001	0.000	Z	0.010	0.004	0.002	0.007	0.001	0.002	0.004	0.001	0.006	0.006	0.008	0.006	0.005	0.006	0.002	0.002	0.002	0.001	0.004	0.010
14-Dec	Z	0.002	0.000	0.000	0.007	0.013	0.014	0.008	0.018	0.002	0.005	0.002	0.003	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.003	0.018
15-Dec	0.001	Z	0.010	0.025	0.051	0.060	0.062	0.075	0.095	0.119	0.118	0.080	0.045	0.039	0.036	0.021	0.002	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.036	0.119
16-Dec	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17-Dec	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.004	0.002	0.001	0.003	0.005	0.001	0.001	0.005
18-Dec	0.004	0.001	0.000	0.001	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
19-Dec	0.000	0.000	0.000	0.005	0.043	Z	0.043	0.047	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.007	0.047
20-Dec	Z	0.004	0.008	0.009	0.004	0.003	0.001	0.000	0.000	0.001	0.001	0.001	0.003	0.001	0.015	0.025	0.034	0.045	0.026	0.008	0.015	0.010	0.018	0.017	0.011	0.045
21-Dec	0.018	Z	0.023	0.023	0.034	0.044	0.056	0.056	0.052	0.054	0.055	0.056	0.055	0.055	0.056	0.062	0.058	0.044	0.047	0.049	0.068	0.066	0.073	0.062	0.051	0.073
22-Dec	0.056	0.018	Z	0.047	0.055	0.057	0.066	0.039	0.062	0.057	0.042	0.047	0.047	0.053	0.052	0.054	0.052	0.053	0.055	0.051	0.047	0.038	0.032	0.023	0.048	0.066
23-Dec	0.030	0.036	0.029	Z	0.045	0.060	0.060	0.056	0.038	0.007	0.009	0.020	0.021	0.011	0.002	0.001	0.000	0.003	0.001	0.002	0.001	0.001	0.000	0.000	0.019	0.060
24-Dec	0.000	0.000	0.000	0.000	Z	0.000	0.001	0.001	0.002	0.002	0.002	0.001	0.003	0.002	0.014	0.014	0.025	0.035	0.044	0.056	0.051	0.035	0.004	0.002	0.013	0.056
25-Dec	0.001	0.000	0.003	0.002	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.002	0.006	0.008	0.014	0.014	0.007	0.002	0.005	0.003	0.014
26-Dec	Z	0.013	0.011	0.008	0.000	0.003	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.003	0.002	0.013
27-Dec	0.001	Z	0.002	0.002	0.000	0.000	0.001	0.000	0.001	0.002	0.006	0.004	0.003	0.004	0.004	0.006	0.008	0.013	0.019	0.031	0.034	0.039	0.053	0.070	0.013	0.070
28-Dec	0.087	0.082	Z	0.080	0.074	0.075	0.073	0.068	0.066	0.067	0.068	0.068	0.069	0.070	0.069	0.061	0.058	0.061	0.064	0.063	0.063	0.063	0.060	0.062	0.068	0.087
29-Dec	0.066	0.054	0.051	Z	0.059	0.064	0.074	0.087	0.081	0.083	0.099	0.128	0.109	0.099	0.096	0.087	0.069	0.055	0.044	0.047	0.074	0.092	0.119	0.132	0.081	0.132
30-Dec	0.135	0.126	0.108	0.069	Z	0.035	0.016	0.006	0.007	0.002	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022	0.135
31-Dec	0.000	0.000	0.000	0.001	0.000	Z	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan      C - Calibration																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm**  
**Conklin Lookout - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.005	441	62.29	62.29
0.006 - 0.05	183	25.85	88.14
0.06 - 0.1	84	11.86	100.00
> 0.1	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm  
Conklin Lookout - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	8	24	9	7	13	32	32	61	41	30	33	19	38	41	45	8	441
0.006 - 0.05	4	5	7	8	8	8	5	9	10	27	38	10	11	10	20	3	183
0.06 - 0.1	1	3	0	0	0	0	1	0	4	23	35	6	2	3	5	1	84
> 0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	32	16	15	21	40	38	70	55	80	106	35	51	54	70	12	708

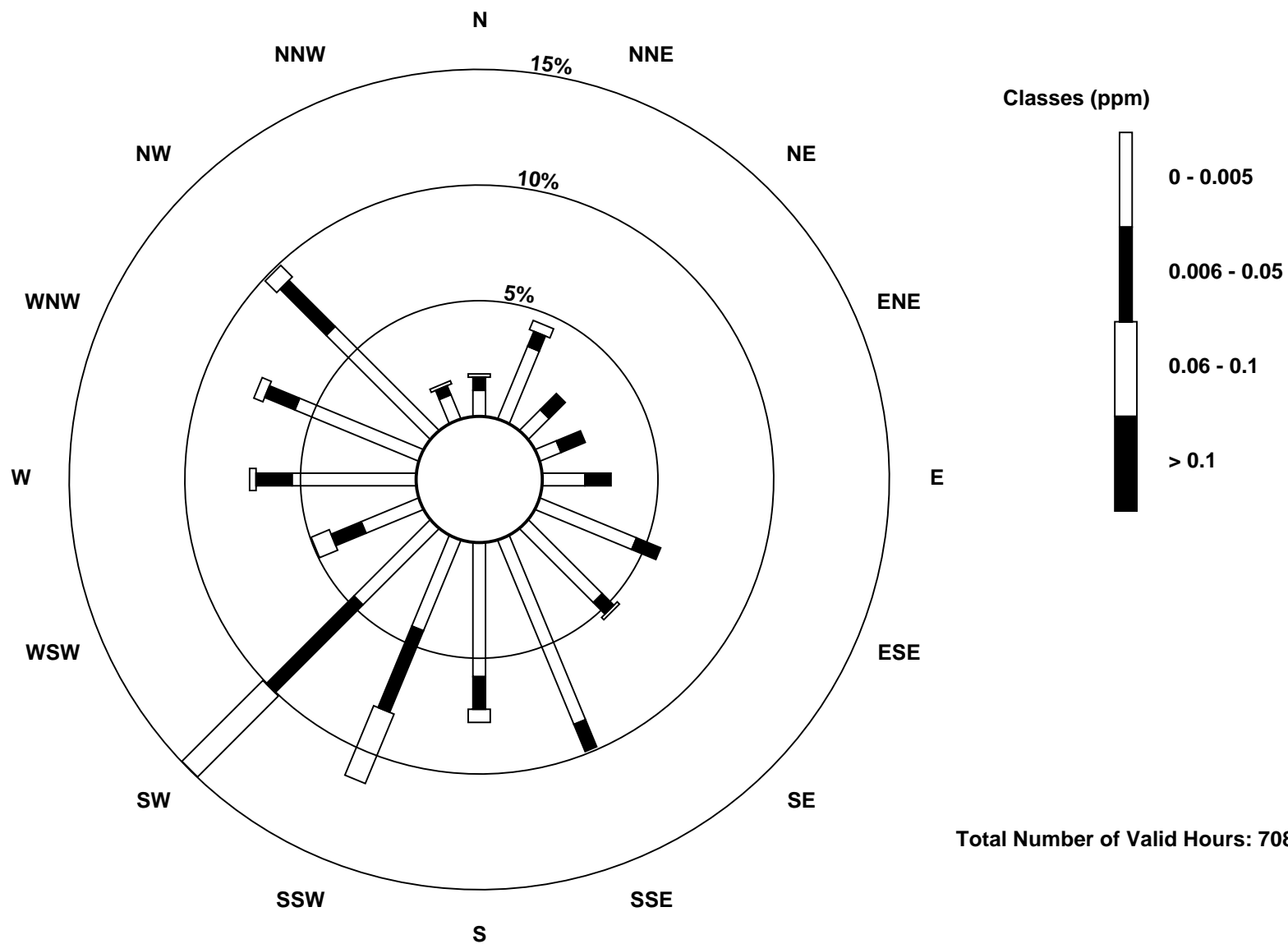
Total Number of Valid Hours: 708

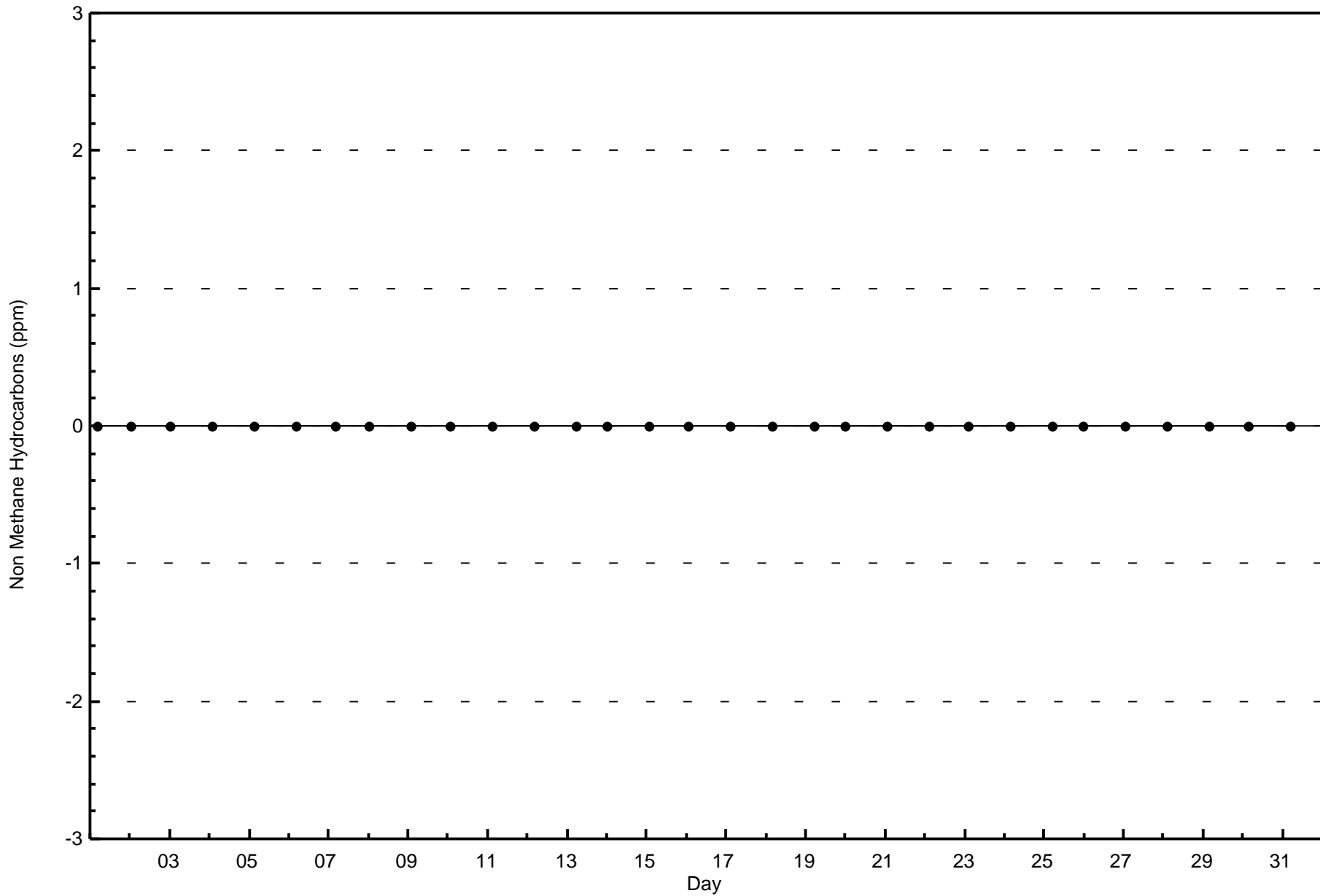
Total Number of Hours: 744



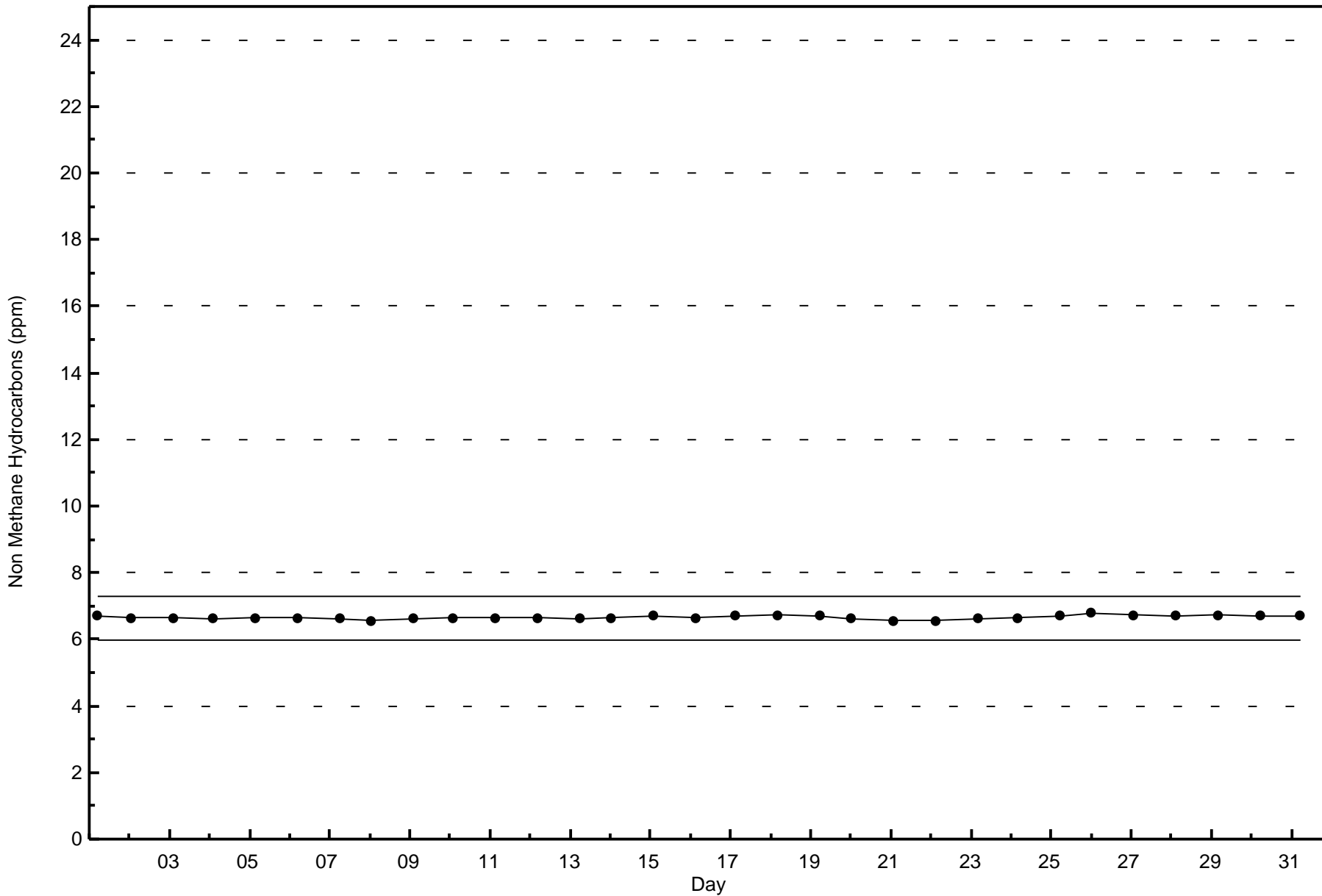
**Wood Buffalo Environmental Association  
Wind Rose Dec 2015**

**Non Methane Hydrocarbons (NMHC) - ppm  
Conklin Lookout (AMS 18)**







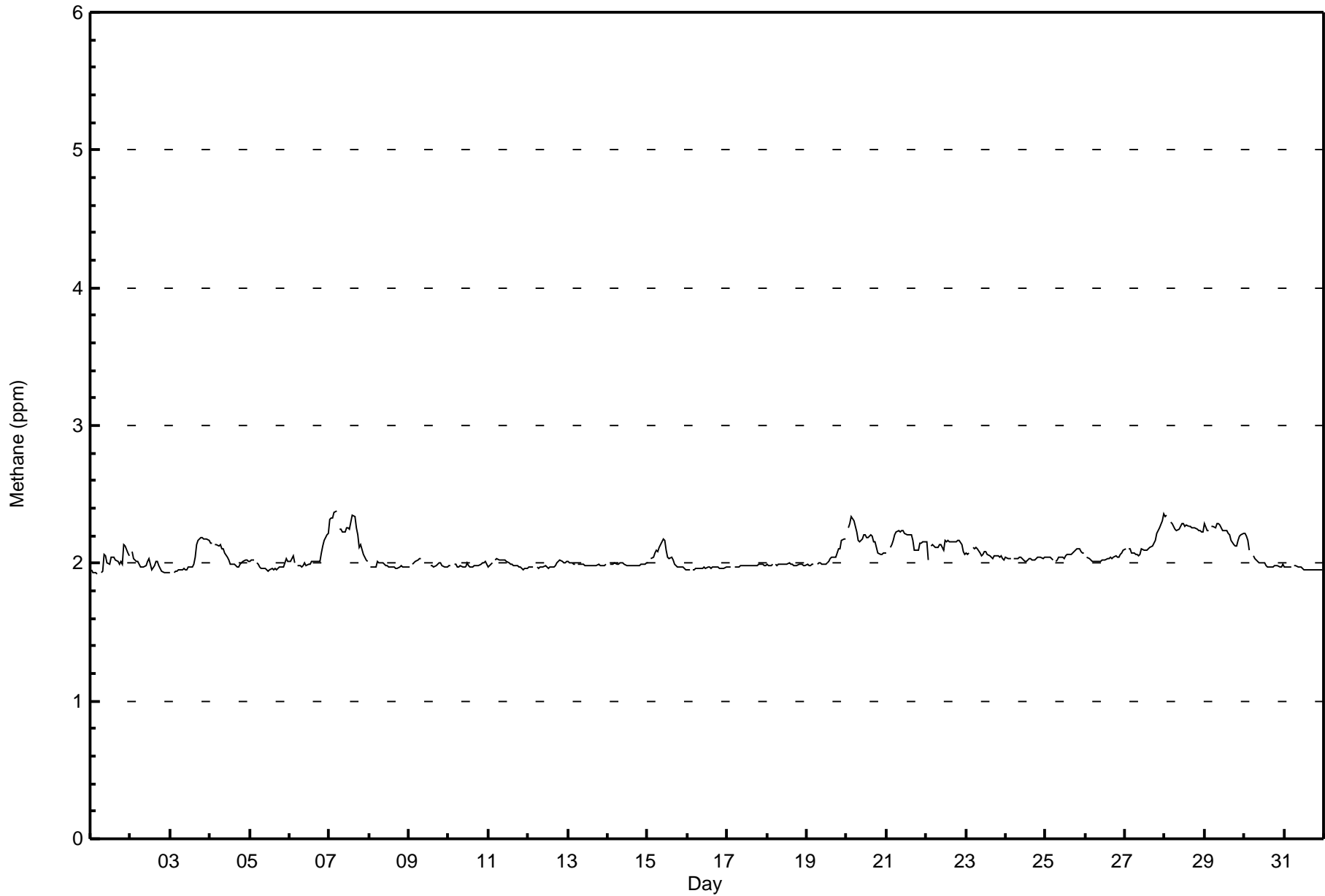




Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 2.4 ppm on Dec 7 05:00	Maximum Daily Average: 2.3 ppm on Dec 28		Hours of Data:	708
Minimum Value: 1.9 ppm on Dec 1 05:00	Minimum Daily Average: 2.0 ppm on Dec 31		Hours of Missing Data:	36
Maximum Diurnal Average: 2.1 ppm at hour 5	Minimum Diurnal Average: 2.0 ppm at hour 18		Hours of Calibration:	36
Monthly Average: 2.05 ppm	Percentiles: P <sub>1</sub> = 1.9 P <sub>10</sub> = 2.0 Q <sub>1</sub> = 2.0 Median = 2.0 Q <sub>3</sub> = 2.1 P <sub>90</sub> = 2.2 P <sub>99</sub> = 2.3		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	2.0	1.9	1.9	1.9	1.9	Z	1.9	1.9	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.1																						
2-Dec	Z	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.1																						
3-Dec	1.9	Z	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.0	2.2																						
4-Dec	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1																						
5-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
6-Dec	2.0	2.0	2.1	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.0	2.2																						
7-Dec	2.3	2.3	2.3	2.4	2.4	Z	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.1	2.1	2.1	2.0	2.0	2.0	2.2	2.4																						
8-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
9-Dec	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	C	C	C	C	C	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
10-Dec	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
11-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
12-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
13-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
14-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
15-Dec	2.0	Z	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2																						
16-Dec	2.0	1.9	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
17-Dec	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
18-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
19-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.2	2.2	2.0	2.2																						
20-Dec	Z	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3																						
21-Dec	2.1	Z	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2																						
22-Dec	2.2	2.0	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.2																						
23-Dec	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.1	2.1																						
24-Dec	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
25-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1																						
26-Dec	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.1	2.1	2.1	2.0	2.1																						
27-Dec	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.3	2.3	2.4	2.1	2.4																						
28-Dec	2.3	2.3	Z	2.3	2.3	2.3	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.3																						
29-Dec	2.3	2.2	2.2	Z	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.3																						
30-Dec	2.2	2.2	2.2	2.1	Z	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2																						
31-Dec	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0																						
																								2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	Diurnal Average
																								2.3	2.3	2.3	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.3	2.3	2.4	Diurnal Maximum

Z - zerospan      C - Calibration





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Methane (CH<sub>4</sub>) - ppm**  
**Conklin Lookout - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	469	66.24	66.24
2.1 - 3.0	239	33.76	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



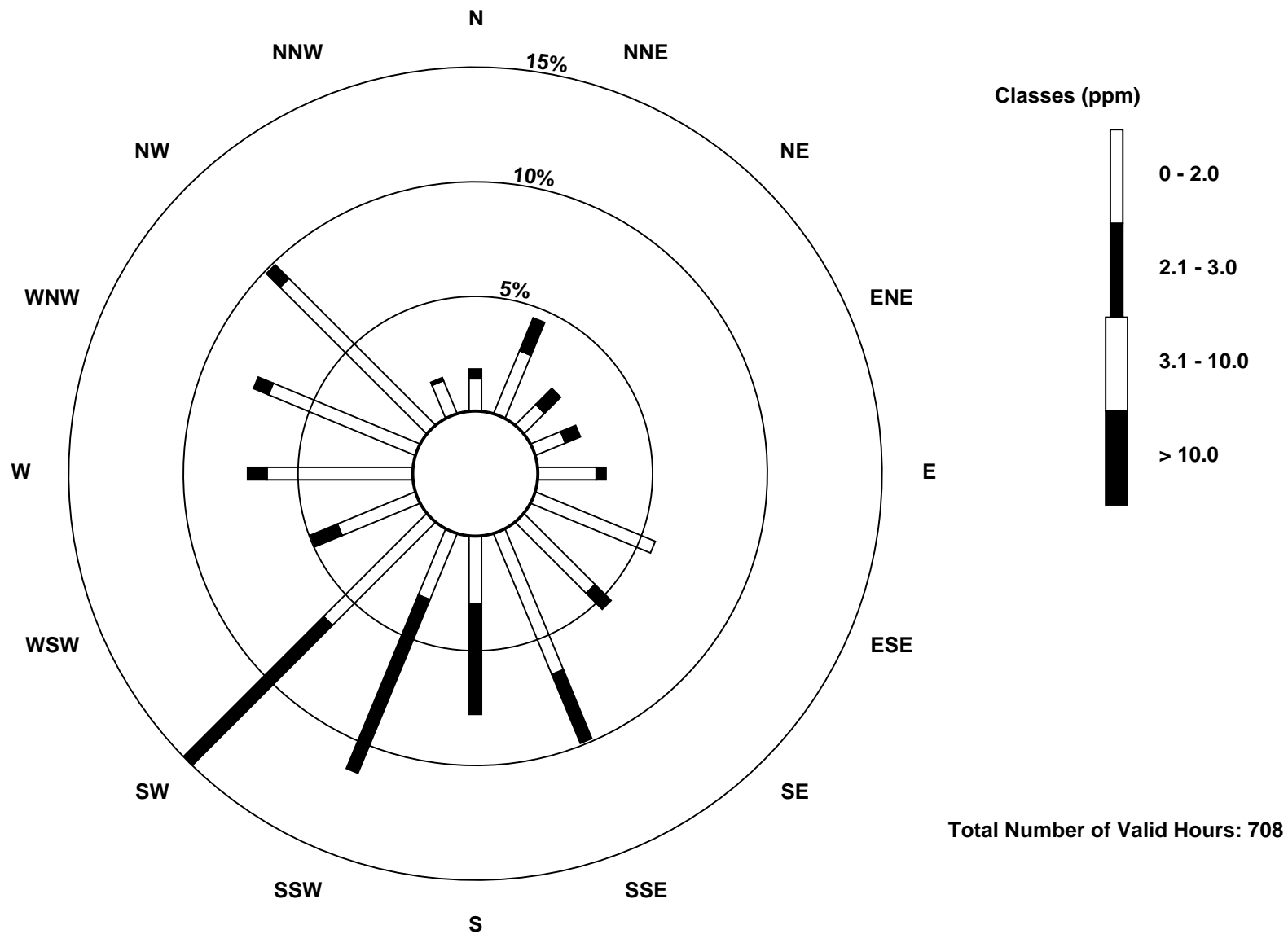
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

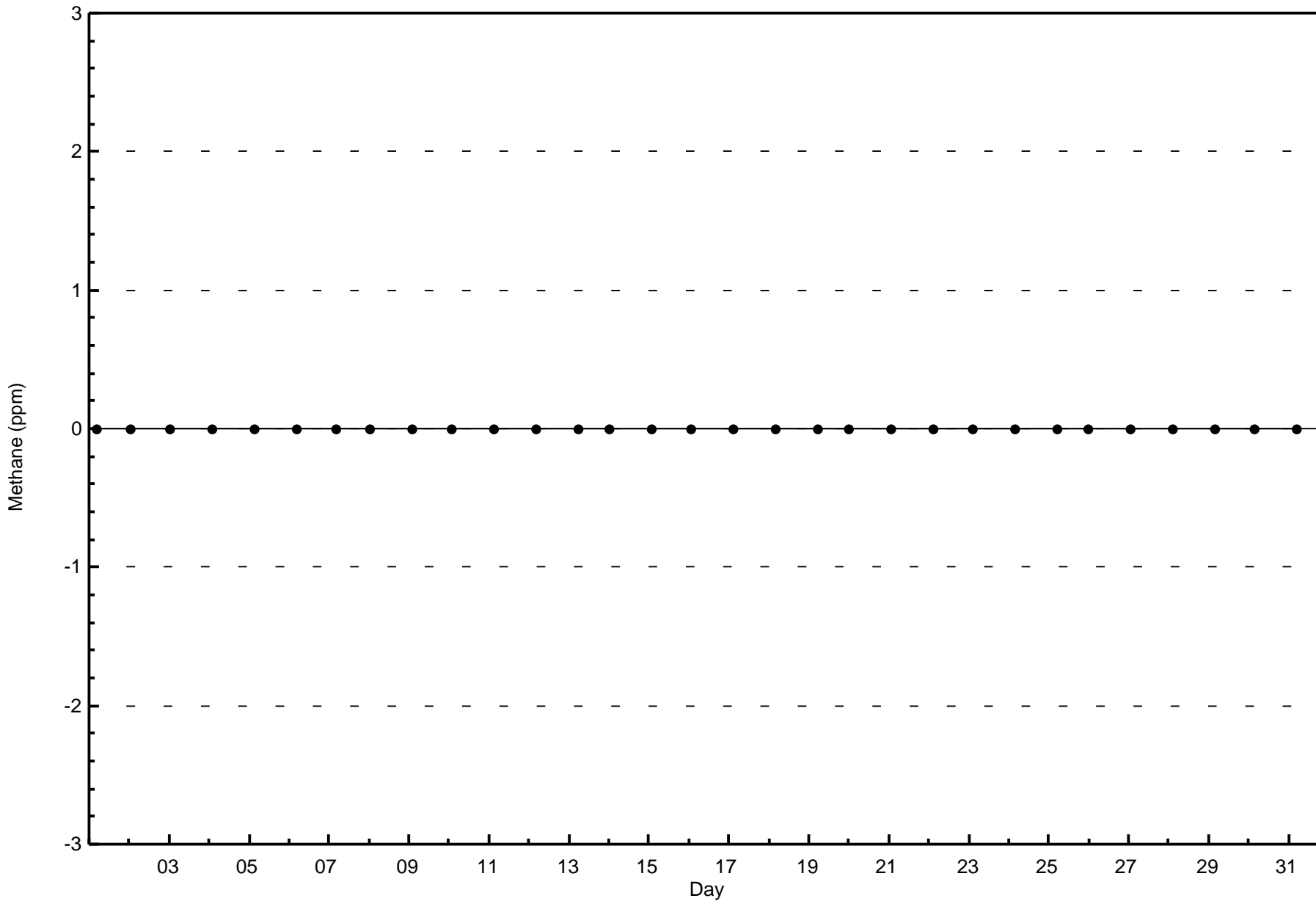
**Methane (CH<sub>4</sub>) - ppm**  
**Conklin Lookout - December 2015**

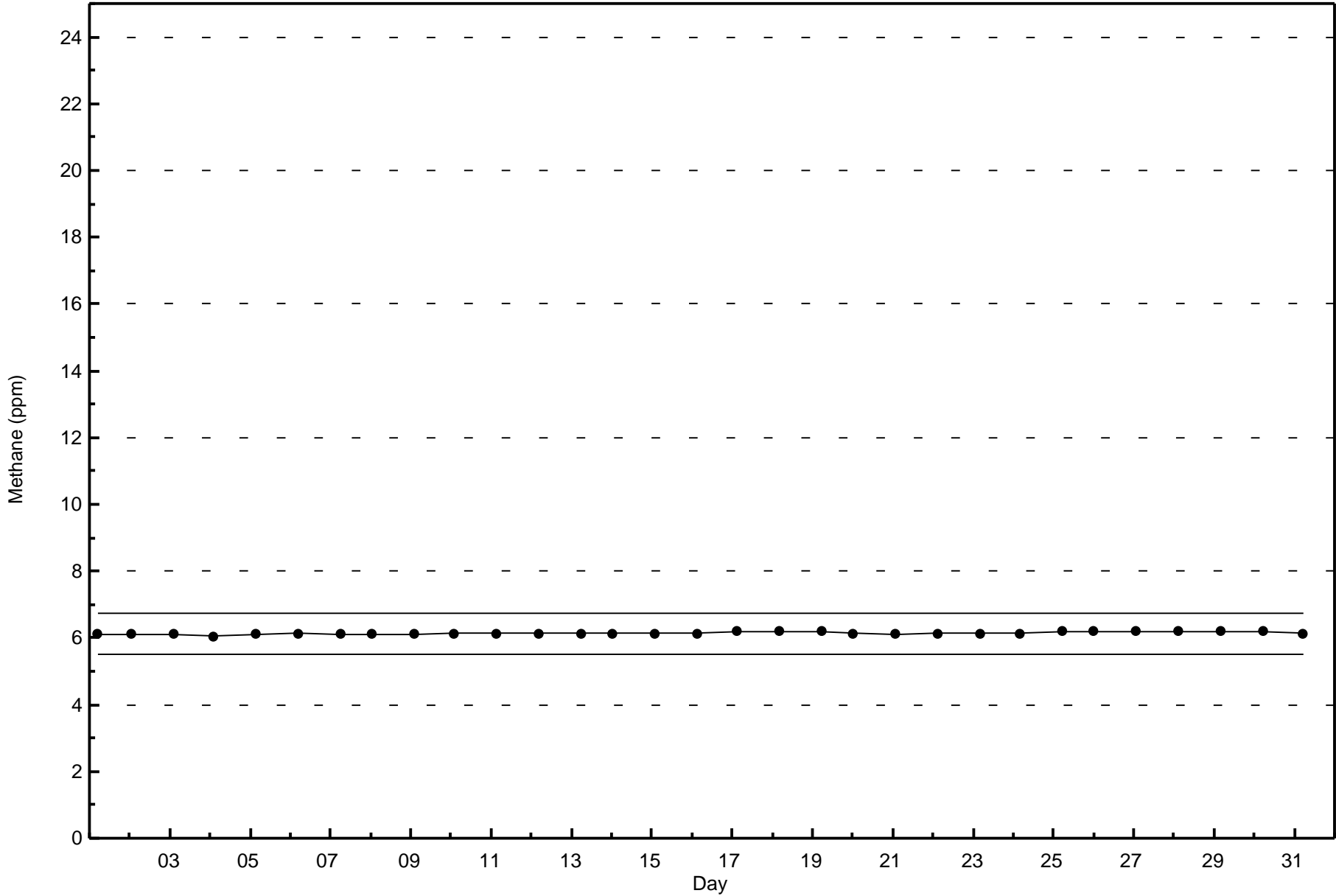
Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	10	21	9	10	18	40	31	47	21	22	45	26	45	49	64	11	469
2.1 - 3.0	3	11	7	5	3	0	7	23	34	58	61	9	6	5	6	1	239
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	32	16	15	21	40	38	70	55	80	106	35	51	54	70	12	708

Total Number of Valid Hours: 708

Total Number of Hours: 744











Maximum Value: 3 ppb on Dec 7 13:00      Maximum Daily Average: 0.7 ppb on Dec 29																	Hours in Service: 744 Hours of Data: 708 Hours of Missing Data: 36 Hours of Calibration: 36 Percent Operational Time: 100.0										
Minimum Value: 0 ppb on Dec 16 02:00      Minimum Daily Average: 0.0 ppb on Dec 8 Maximum Diurnal Average: 0.8 ppb at hour 13      Minimum Diurnal Average: 0.0 ppb at hour 24 Monthly Average: 0.2 ppb      Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 2																											
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1
2-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1
7-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	3	2	1	0	0	0	0	0	0	0	0	0	0	0.4	3
8-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
9-Dec	0	Z	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
15-Dec	0	Z	0	0	0	0	0	0	0	1	3	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0.3	3
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0.2	2
20-Dec	Z	0	0	0	0	0	0	0	0	0	1	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0.3	2
21-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1
22-Dec	0	0	Z	0	0	0	0	0	0	0	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0.3	2
23-Dec	0	0	0	Z	0	0	0	0	0	0	1	1	1	2	2	1	1	0	0	0	0	0	0	0	0	0.4	2
24-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0.4	2
25-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
27-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1
28-Dec	0	0	Z	0	0	0	0	0	0	1	1	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0.4	2
29-Dec	0	0	0	Z	0	0	0	0	0	1	2	3	3	3	3	1	0	0	0	0	0	0	0	0	0	0.7	3
30-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan      C - Calibration																											

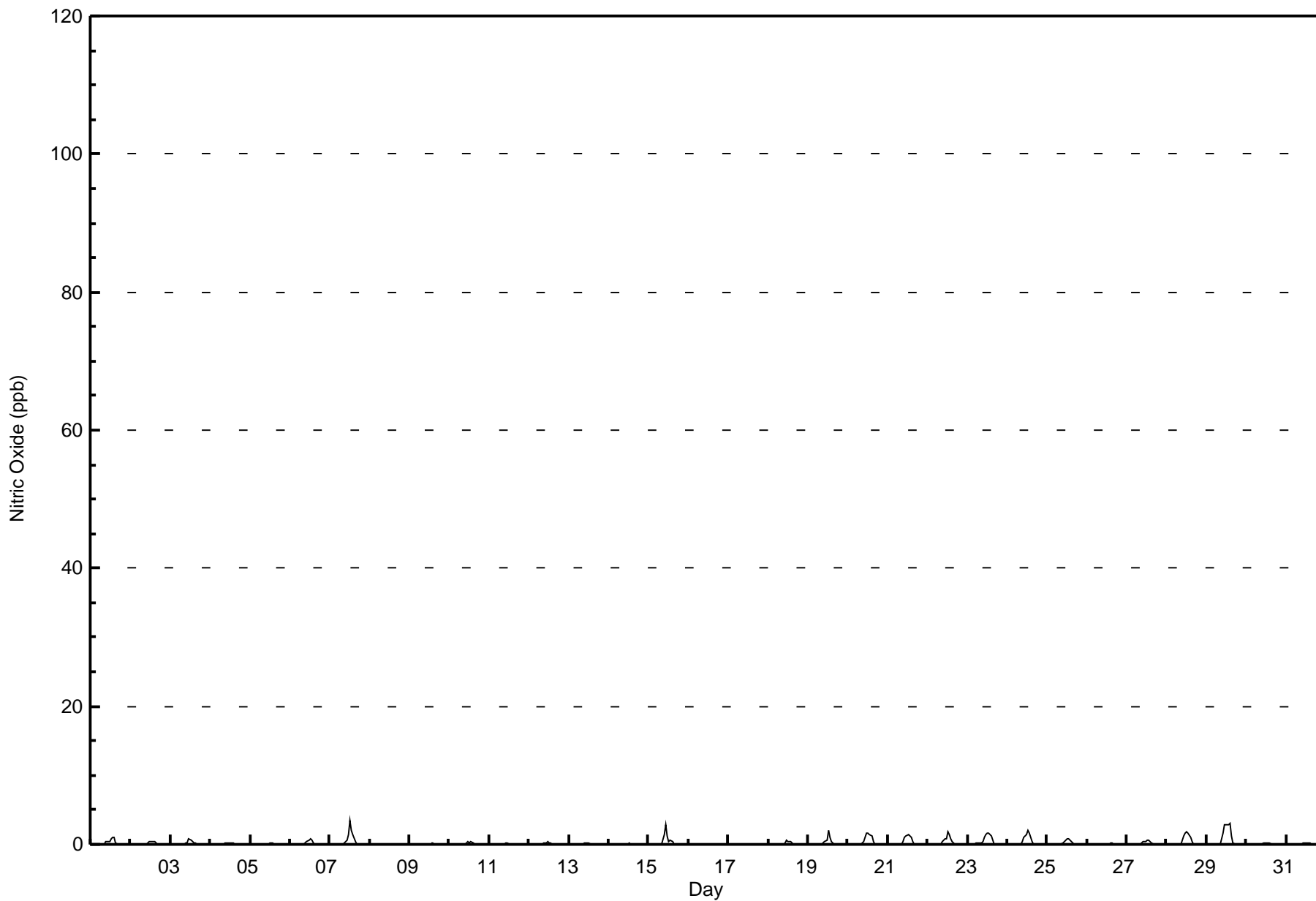


Wood Buffalo Environmental Association

Hourly Averages

Nitric Oxide (NO) - ppb

Conklin Lookout - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Conklin Lookout - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitric Oxide (NO) - ppb**  
**Conklin Lookout - December 2015**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	13	32	16	15	21	40	38	70	55	80	106	35	51	54	70	12	708
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	32	16	15	21	40	38	70	55	80	106	35	51	54	70	12	708

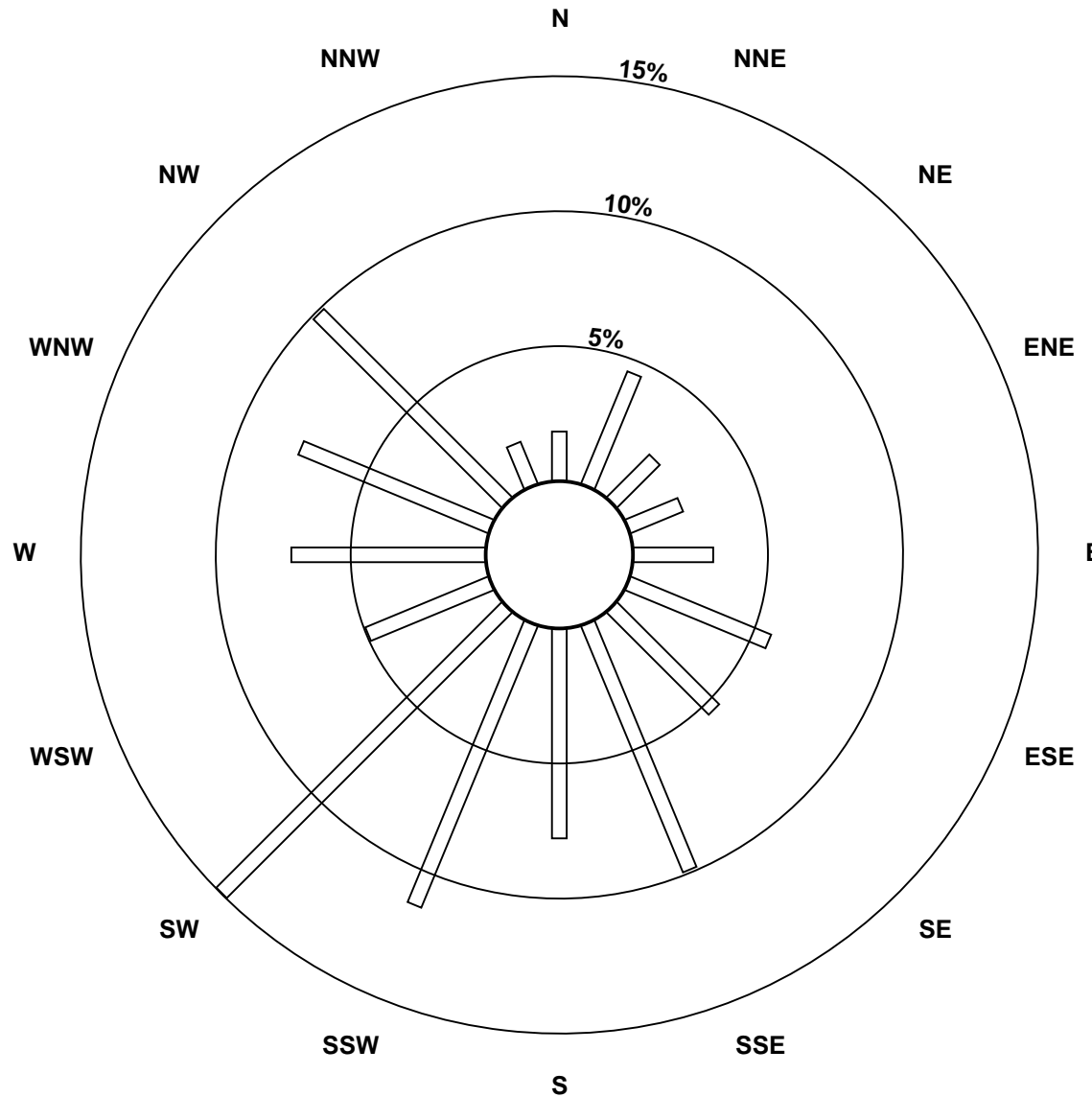
Total Number of Valid Hours: 708

Total Number of Hours: 744

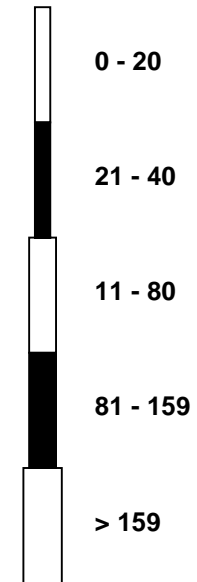


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

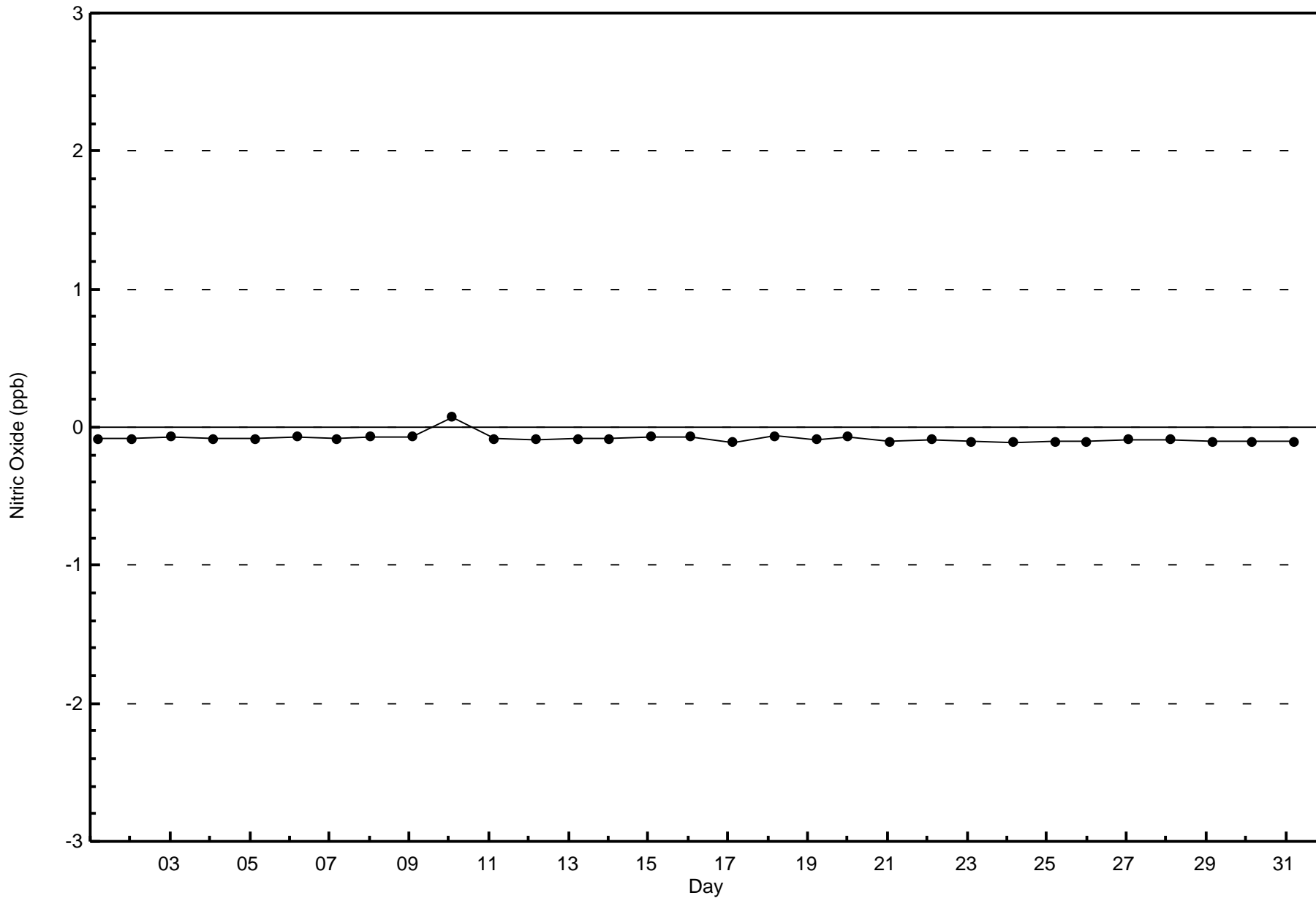
Nitric Oxide (NO) - ppb  
Conklin Lookout (AMS 18)

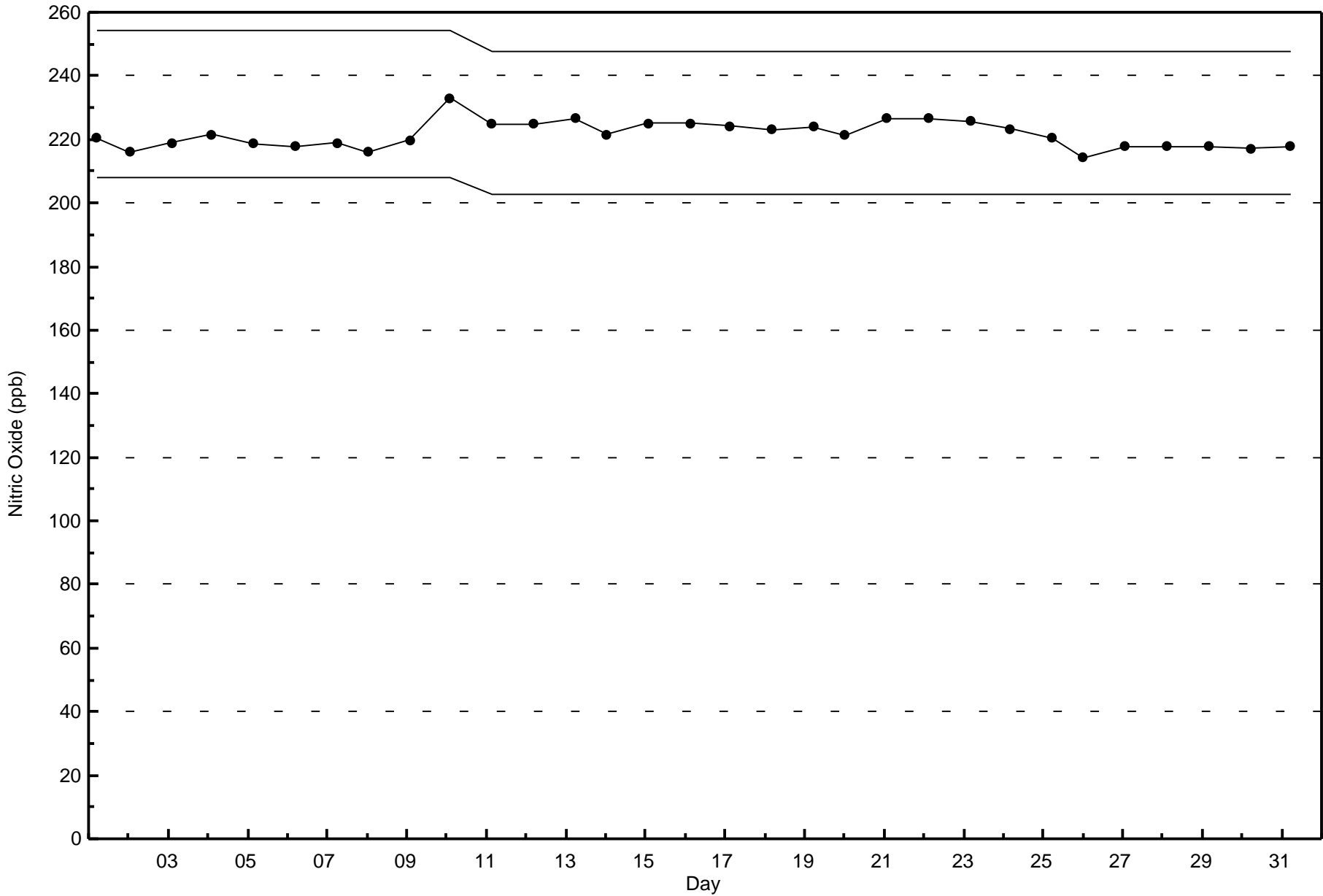


Classes (ppb)



Total Number of Valid Hours: 708







Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 11 ppb on Dec 29 16:00	Maximum Daily Average: 8.6 ppb on Dec 29		Hours of Data:	708
Minimum Value: 0 ppb on Dec 17 02:00	Minimum Daily Average: 0.4 ppb on Dec 16		Hours of Missing Data:	36
Maximum Diurnal Average: 3.1 ppb at hour 16	Minimum Diurnal Average: 2.6 ppb at hour 3		Hours of Calibration:	36
Monthly Average: 2.9 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 4 P <sub>90</sub> = 5 P <sub>99</sub> = 10		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	2	1	1	1	Z	1	1	5	5	4	3	4	5	7	6	6	4	5	4	9	8	6	5	4.1	9
2-Dec	Z	7	5	4	4	4	3	3	3	4	4	5	5	3	4	5	4	3	2	1	1	1	1	1	3.3	7
3-Dec	1	Z	1	1	1	1	1	2	3	2	2	4	3	3	4	4	5	5	5	5	5	5	5	4	3.1	5
4-Dec	4	3	Z	3	3	4	4	3	3	4	4	3	2	2	2	2	2	2	2	2	2	3	3	3	2.7	4
5-Dec	3	3	2	Z	2	2	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	2	2	2	1.2	3
6-Dec	3	4	5	3	Z	2	2	2	2	2	2	2	3	3	2	2	3	3	3	4	3	3	3	3	2.7	5
7-Dec	4	5	5	6	5	Z	5	5	4	5	5	6	6	7	8	9	8	7	6	5	4	4	3	3	5.4	9
8-Dec	Z	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	3	3	2	1	1	1.4	3
9-Dec	1	Z	2	1	2	2	2	2	Z	C	C	C	C	C	2	2	2	3	4	3	2	1	1	1	1.8	4
10-Dec	1	1	Z	2	2	1	2	2	1	1	2	5	2	3	2	3	2	2	2	2	2	2	2	1	2.0	5
11-Dec	1	1	1	Z	1	1	1	1	1	2	2	2	1	1	1	1	2	1	1	1	1	1	1	1	1.2	2
12-Dec	1	1	1	2	Z	2	3	3	3	3	3	2	2	2	1	1	2	2	2	2	2	1	1	2	1.9	3
13-Dec	3	2	2	2	1	Z	2	1	2	2	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1.4	3
14-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
15-Dec	1	Z	2	2	3	4	3	4	6	8	8	6	4	3	3	3	2	2	1	2	2	1	1	1	3.1	8
16-Dec	1	0	Z	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0	0	0.4	1
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0.5	1
18-Dec	1	1	1	1	Z	1	1	2	1	1	3	3	2	2	2	2	2	2	1	1	1	1	1	1	1.5	3
19-Dec	1	1	1	1	1	Z	1	2	3	2	2	2	5	3	2	2	2	2	2	3	2	3	4	3	2.1	5
20-Dec	Z	4	5	5	4	4	3	3	4	4	4	4	4	4	5	5	5	4	4	3	3	4	5	5	4.0	5
21-Dec	4	Z	3	3	4	4	4	5	5	4	4	4	4	4	5	6	6	5	5	5	6	6	6	6	4.6	6
22-Dec	5	3	Z	4	5	6	6	5	5	5	5	4	5	5	4	5	5	7	7	6	5	4	3	2	4.8	7
23-Dec	3	2	2	Z	8	9	10	9	7	5	4	4	4	4	4	5	4	5	5	6	6	7	5	4	5.3	10
24-Dec	5	5	5	5	Z	6	5	6	5	4	4	4	5	5	5	5	5	5	5	4	4	4	4	5	4.6	6
25-Dec	3	3	4	3	2	Z	2	2	3	3	2	2	2	2	3	3	3	4	4	5	7	5	3	3	3.1	7
26-Dec	Z	1	1	2	1	1	1	1	1	0	0	0	0	0	2	3	1	1	2	2	2	3	3	5	1.4	5
27-Dec	6	Z	4	3	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	4	4	4	5	5	3.2	6
28-Dec	5	6	Z	6	6	6	5	5	5	4	4	3	3	3	4	4	4	4	4	4	5	5	5	5	4.5	6
29-Dec	5	4	4	Z	8	8	9	10	9	9	8	9	9	8	11	11	10	10	9	9	9	10	10	10	8.6	11
30-Dec	10	8	8	5	Z	3	3	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2.8	10
31-Dec	1	1	1	1	1	Z	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1.3	2

2.9	2.7	2.6	2.7	2.7	3.0	2.8	2.8	2.9	2.8	2.8	2.9	2.8	2.7	3.0	3.1	3.1	3.0	2.9	3.0	3.1	3.0	2.8	2.8	Diurnal Average
10	8	8	6	8	9	10	10	9	9	8	9	9	8	11	11	10	10	9	9	9	10	10	10	Diurnal Maximum

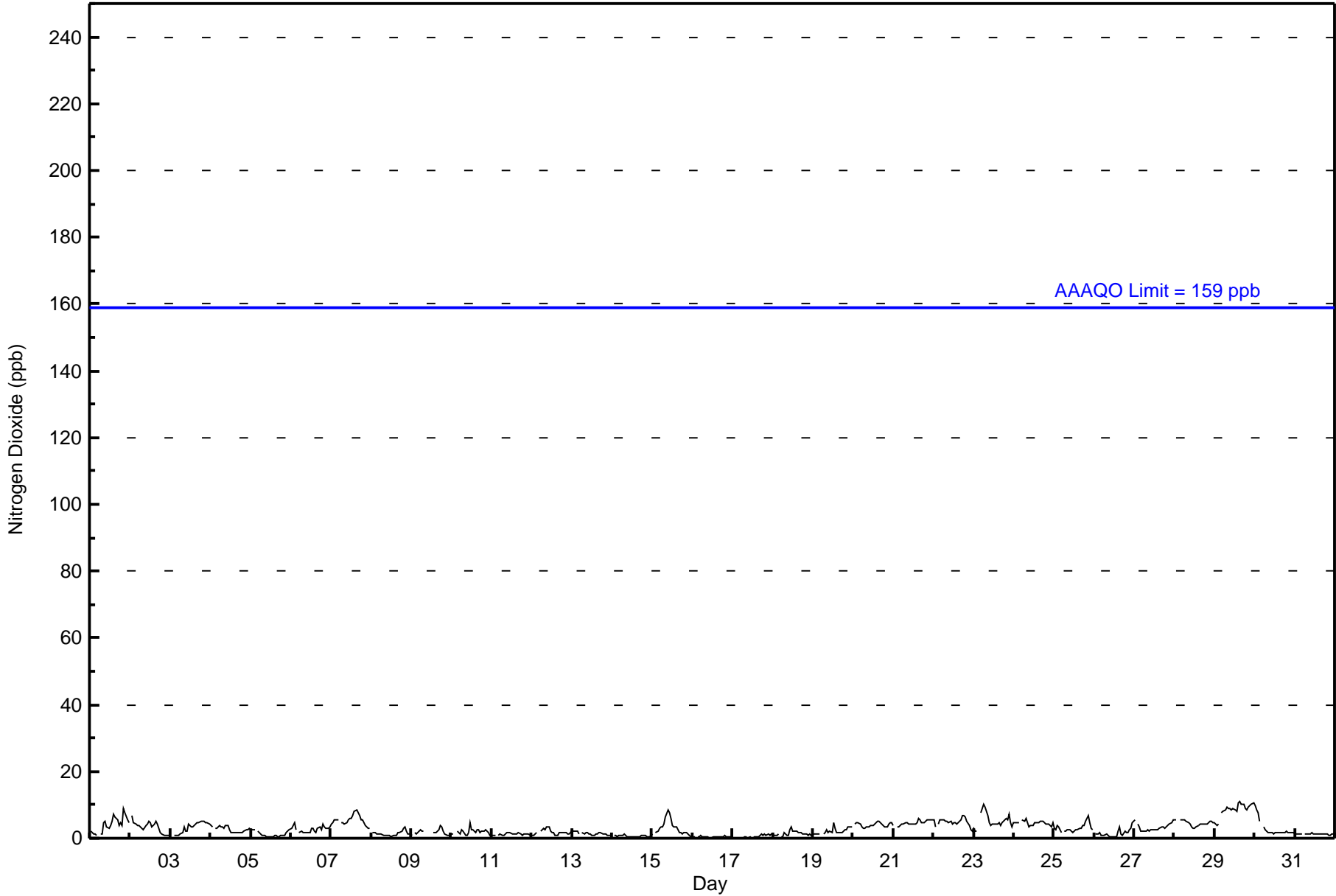
Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb





Wood Buffalo Environmental Association  
Hourly Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Conklin Lookout - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Conklin Lookout - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Conklin Lookout - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	13	32	16	15	21	40	38	70	55	80	106	35	51	54	70	12	708
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	32	16	15	21	40	38	70	55	80	106	35	51	54	70	12	708

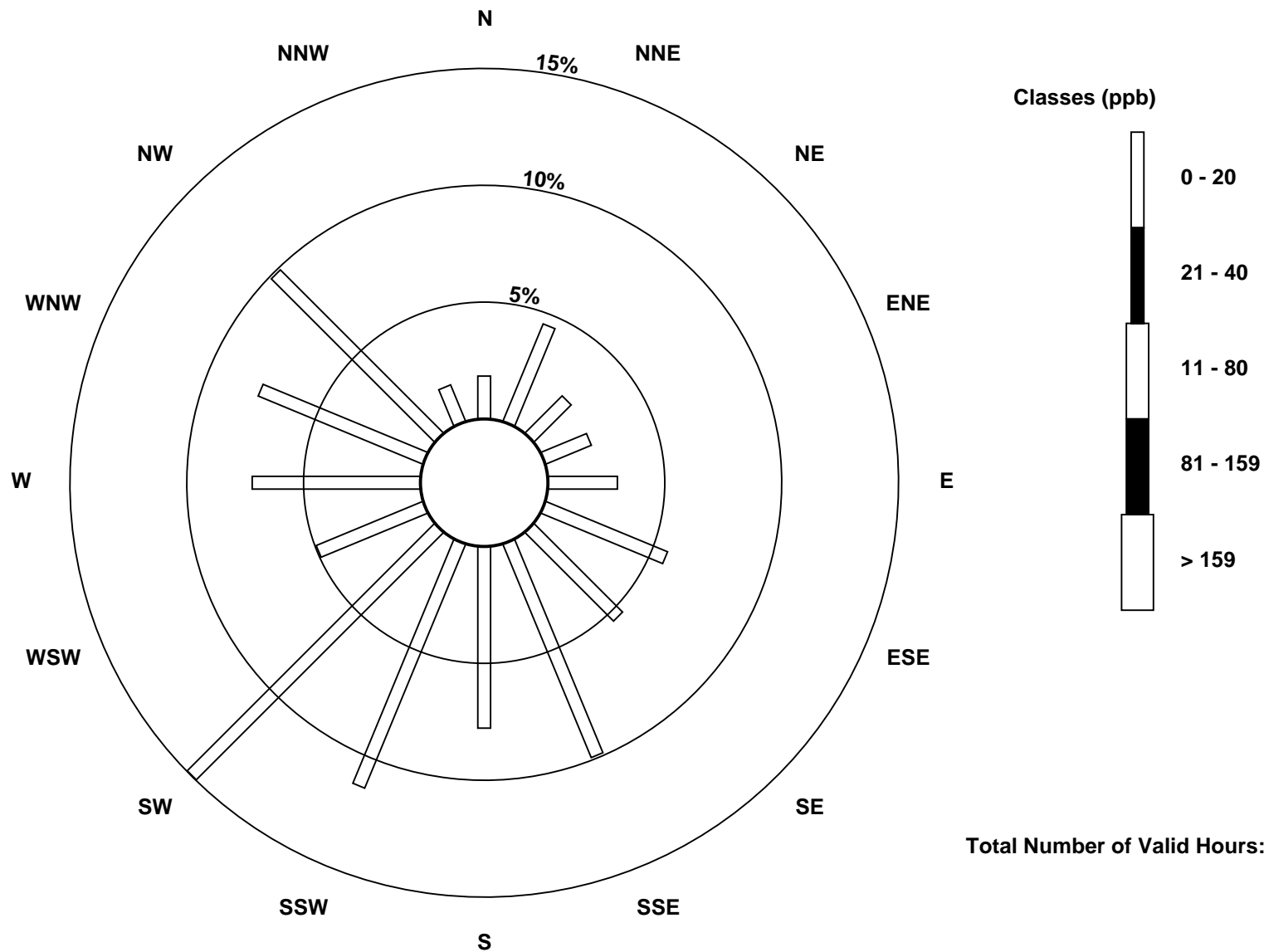
Total Number of Valid Hours: 708

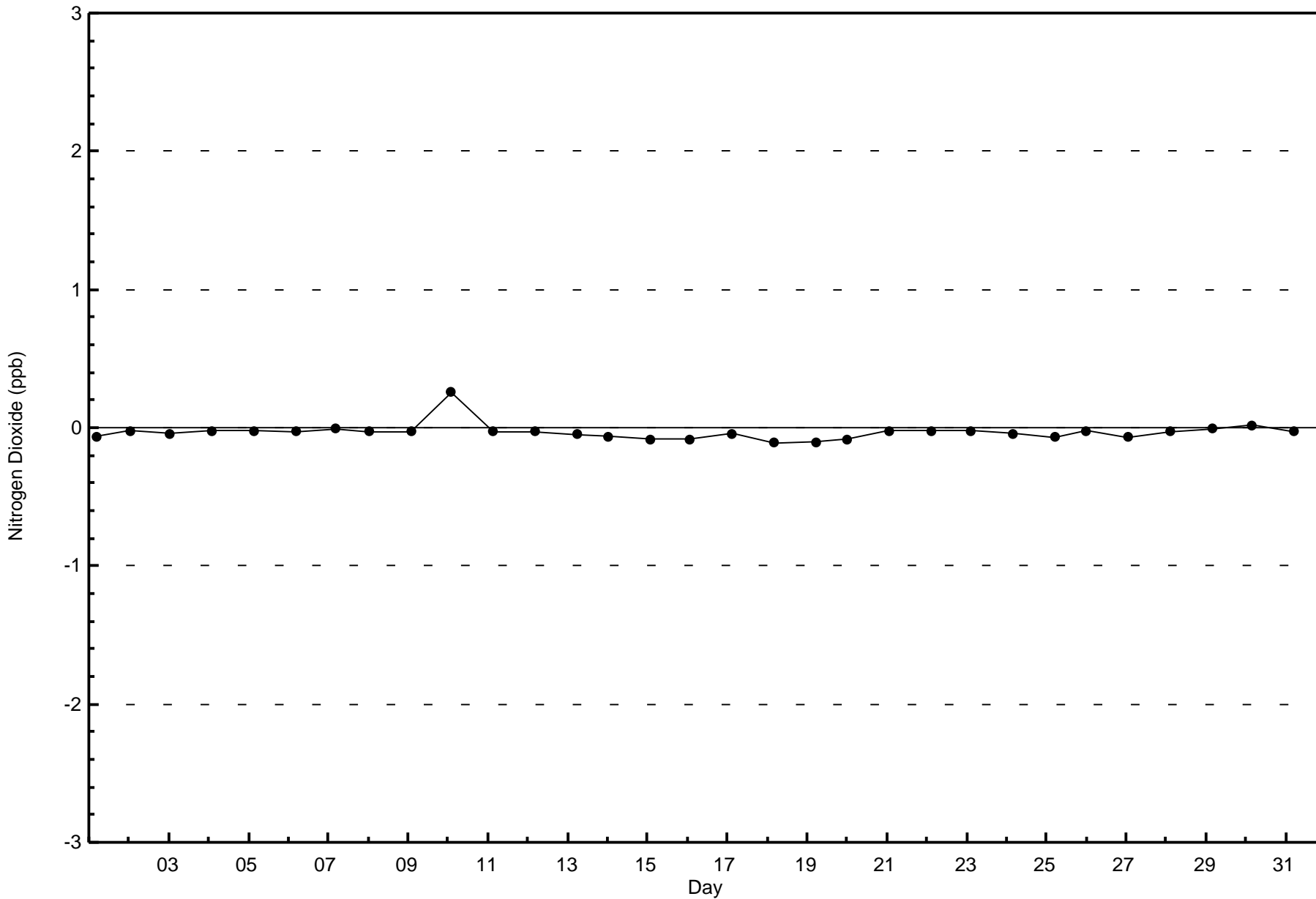
Total Number of Hours: 744

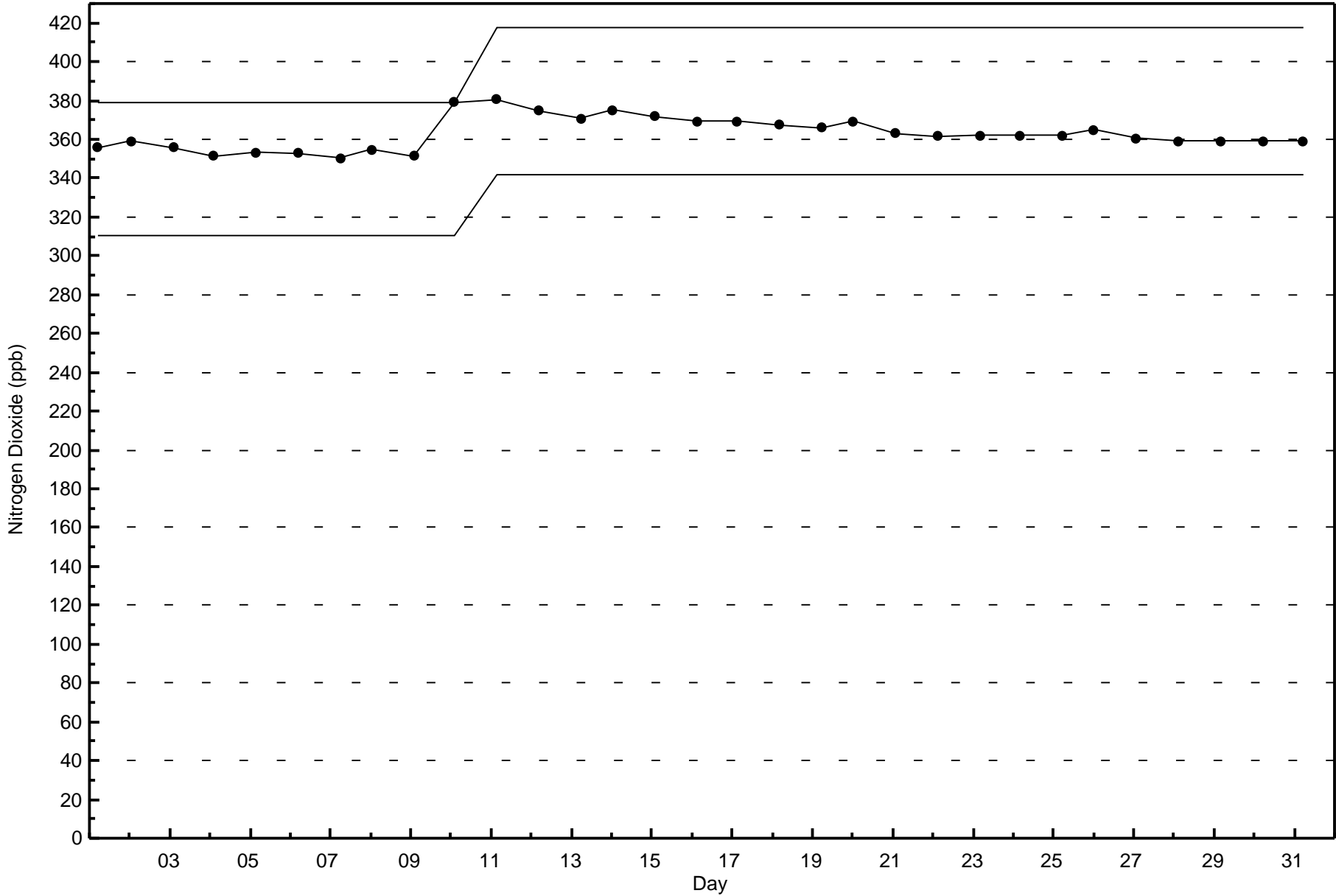


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Conklin Lookout (AMS 18)

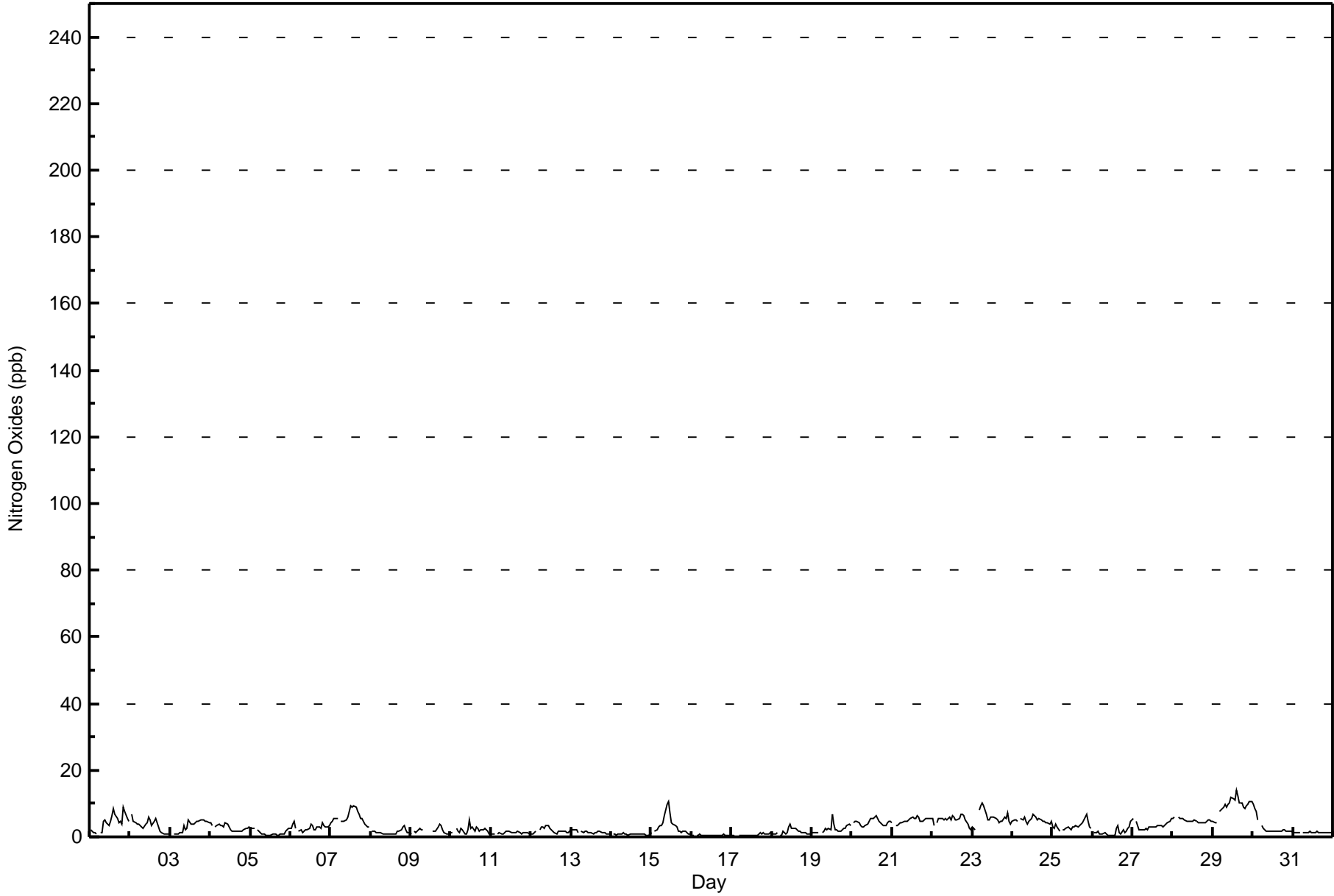








Maximum Value: 14 ppb on Dec 29 15:00		Maximum Daily Average: 9.3 ppb on Dec 29		Hours in Service: 744																							
Minimum Value: 0 ppb on Dec 17 03:00		Minimum Daily Average: 0.4 ppb on Dec 16		Hours of Data: 708																							
Maximum Diurnal Average: 3.6 ppb at hour 13		Minimum Diurnal Average: 2.7 ppb at hour 3		Hours of Missing Data: 36																							
Monthly Average: 3.0 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 5 P <sub>90</sub> = 6 P <sub>99</sub> = 10		Hours of Calibration: 36																							
				Percent Operational Time: 100.0																							
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	2	2	1	1	1	Z	1	1	5	5	4	4	5	6	8	7	6	4	5	4	9	8	6	5	4.3	9	
2-Dec	Z	7	5	4	4	4	3	3	3	4	4	6	5	4	5	5	4	3	2	1	1	1	1	1	3.4	7	
3-Dec	1	Z	1	1	1	1	1	1	3	2	3	5	4	4	4	4	5	5	5	5	5	5	5	4	3.2	5	
4-Dec	4	3	Z	3	3	4	3	3	3	4	4	3	2	2	2	2	2	2	2	2	2	3	3	3	2.8	4	
5-Dec	3	3	2	Z	2	2	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	2	2	2	1.2	3	
6-Dec	3	4	5	3	Z	2	2	1	2	2	2	2	4	3	2	2	3	3	2	4	3	3	3	3	2.8	5	
7-Dec	4	5	5	6	5	Z	5	4	5	5	6	8	9	9	9	9	8	7	6	5	4	4	3	3	5.8	9	
8-Dec	Z	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	3	3	2	1	1	1.4	3	
9-Dec	1	Z	2	1	2	2	2	2	C	C	C	C	C	2	2	2	3	4	3	2	1	1	1	1	1.9	4	
10-Dec	1	1	Z	2	2	1	2	2	1	1	2	5	3	3	2	3	2	2	2	2	2	2	2	1	2.0	5	
11-Dec	1	1	1	Z	1	1	1	1	1	2	2	2	1	1	1	1	2	1	1	1	1	1	1	1	1.2	2	
12-Dec	1	1	1	2	Z	2	3	3	3	3	4	3	2	2	1	1	2	2	2	2	2	1	1	2	1.9	4	
13-Dec	3	2	2	2	1	Z	2	1	2	2	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1.5	3	
14-Dec	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1	
15-Dec	1	Z	2	2	3	3	3	4	6	10	11	7	4	4	4	3	2	1	1	2	2	1	1	1	3.4	11	
16-Dec	0	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0.4	1	
17-Dec	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0.6	1	
18-Dec	1	1	1	1	Z	1	1	2	1	1	3	4	3	3	2	2	2	2	1	1	1	1	1	1	1.6	4	
19-Dec	1	1	1	1	1	Z	1	2	3	2	2	2	7	4	2	2	2	2	2	2	2	3	4	3	2.3	7	
20-Dec	Z	4	5	5	4	4	3	3	4	4	5	6	6	5	6	6	5	4	4	3	3	4	5	5	4.4	6	
21-Dec	4	Z	3	3	4	4	4	5	5	5	5	6	6	6	6	6	6	5	5	5	6	6	6	6	4.9	6	
22-Dec	5	3	Z	4	5	6	5	5	5	5	6	5	6	6	5	5	5	7	7	6	5	4	3	2	5.1	7	
23-Dec	3	2	2	Z	8	9	10	9	7	5	5	6	6	6	5	4	5	5	6	6	7	5	4	4	5.7	10	
24-Dec	5	5	5	5	Z	6	5	6	5	4	5	5	7	6	6	5	5	5	4	4	4	4	4	4	5.0	7	
25-Dec	3	2	4	3	2	Z	2	2	3	3	3	2	3	3	3	3	3	4	4	5	7	5	3	3	3.3	7	
26-Dec	Z	1	1	2	1	1	1	1	1	0	0	0	0	0	2	3	1	1	2	1	2	3	3	5	1.5	5	
27-Dec	6	Z	5	3	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	4	4	4	5	5	3.3	6	
28-Dec	6	6	Z	6	6	6	5	5	5	5	5	5	5	5	4	4	4	4	4	4	5	5	5	5	4.9	6	
29-Dec	5	4	4	Z	8	8	9	10	9	10	10	12	11	11	14	12	10	10	9	9	9	10	10	11	9.3	14	
30-Dec	10	9	8	5	Z	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.9	10	
31-Dec	1	1	1	1	1	Z	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1.4	2	
2.9		2.7	2.7	2.7	2.7	3.0	2.8	2.8	2.9	3.1	3.3	3.5	3.6	3.4	3.5	3.4	3.2	3.0	2.9	3.0	3.1	3.1	2.8	2.8	Diurnal Average		
10		9	8	6	8	9	10	10	9	10	11	12	11	11	14	12	10	10	9	9	9	10	10	11	Diurnal Maximum		
Z - zerospan		C - Calibration																									







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Conklin Lookout - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	708	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 708

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Conklin Lookout - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	13	32	16	15	21	40	38	70	55	80	106	35	51	54	70	12	708
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	32	16	15	21	40	38	70	55	80	106	35	51	54	70	12	708

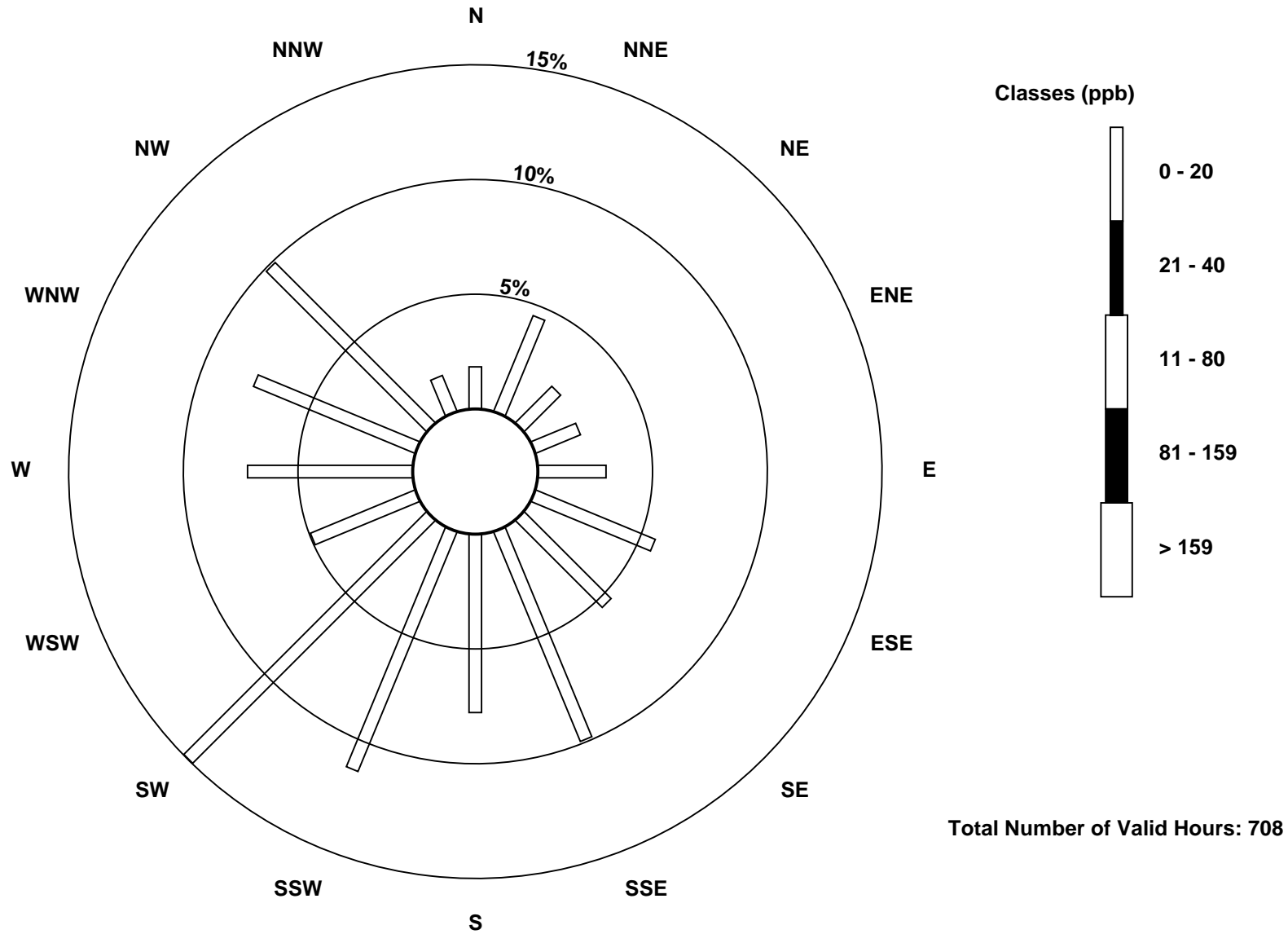
Total Number of Valid Hours: 708

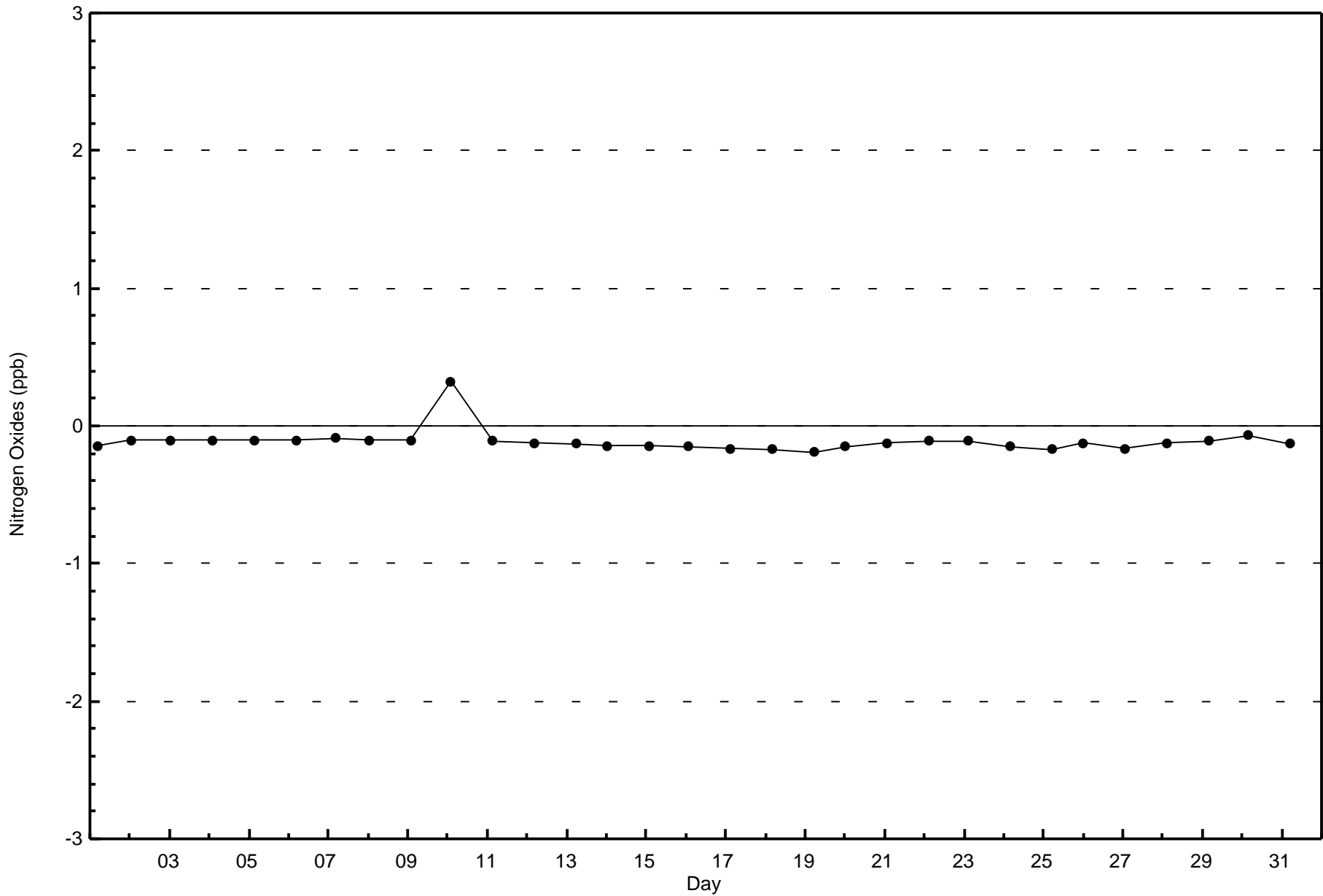
Total Number of Hours: 744

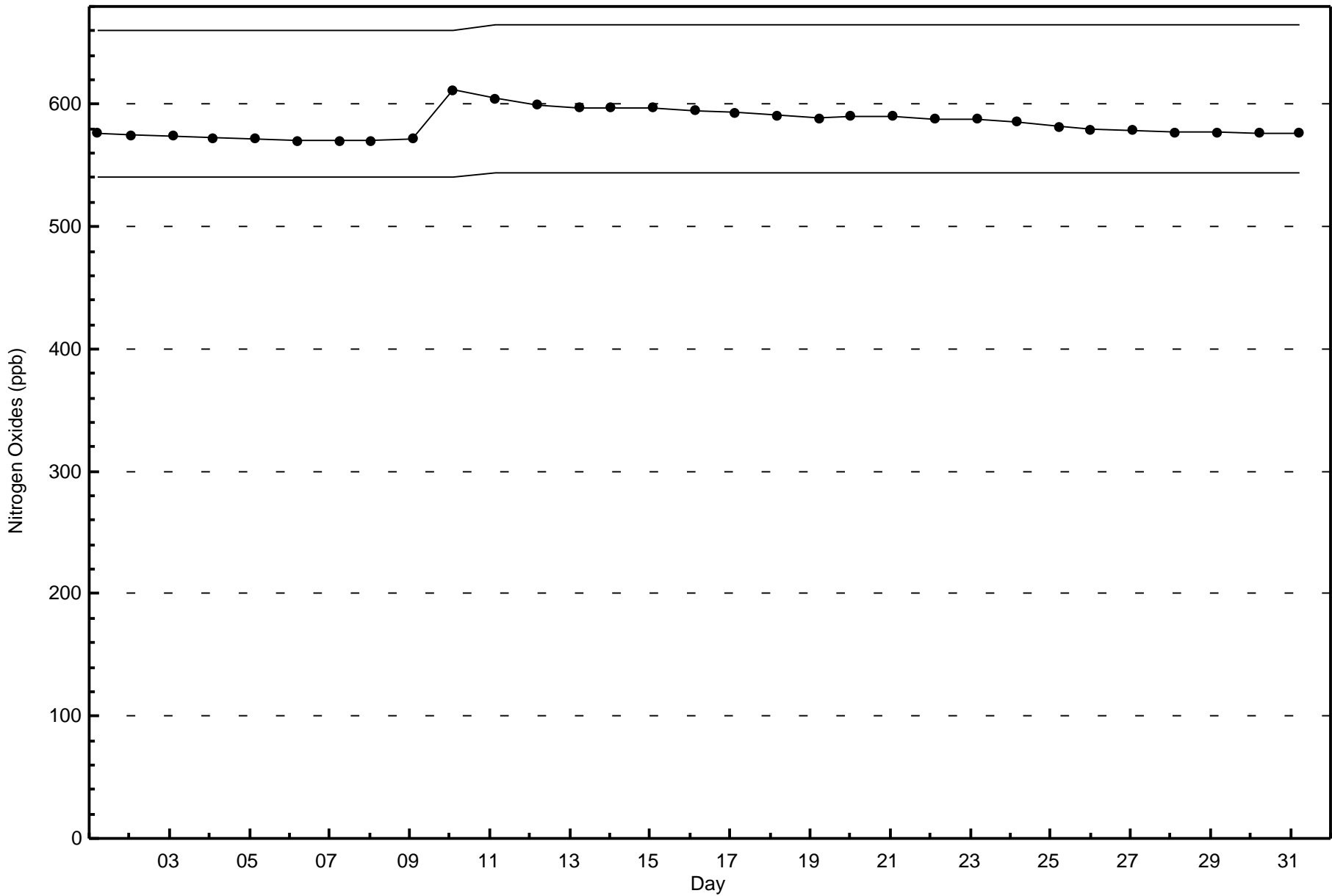


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Conklin Lookout (AMS 18)

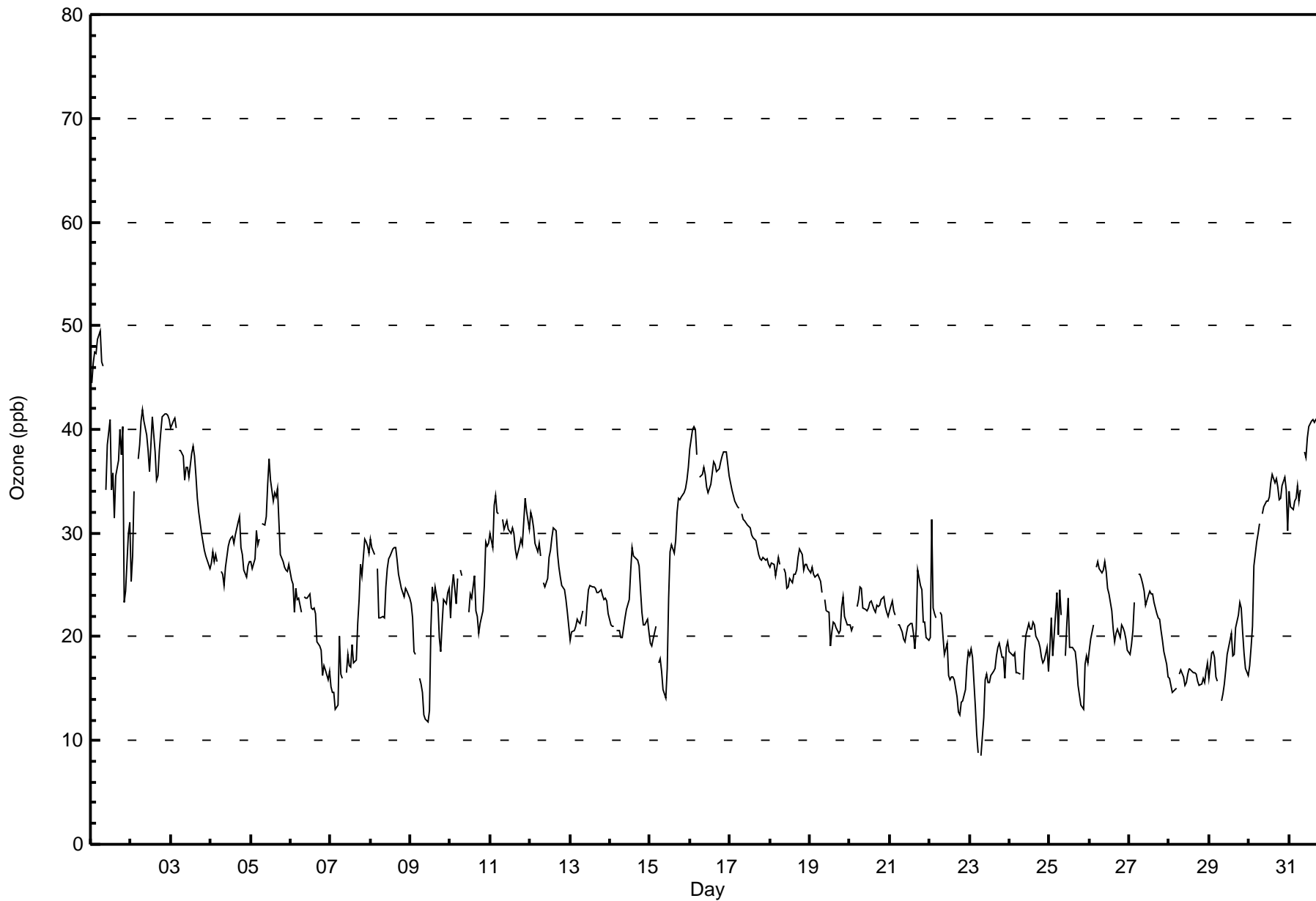








Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 49 ppb on Dec 1 06:00      Maximum Daily Average: 38.7 ppb on Dec 1		Hours in Service: 744 Hours of Data: 710 Hours of Missing Data: 34 Hours of Calibration: 34 Percent Operational Time: 100.0																								
Minimum Value: 8 ppb on Dec 23 08:00 Maximum Diurnal Average: 26.7 ppb at hour 14 Monthly Average: 25.5 ppb		Minimum Daily Average: 16.0 ppb on Dec 28 Minimum Diurnal Average: 24.2 ppb at hour 9 Percentiles: P <sub>1</sub> = 12 P <sub>10</sub> = 17 Q <sub>1</sub> = 20 Median = 24 Q <sub>3</sub> = 30 P <sub>90</sub> = 36 P <sub>99</sub> = 46																								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	45	46	47	47	49	49	47	46	Z	34	38	41	34	36	31	35	37	40	38	40	23	24	30	31	38.7	49
2-Dec	25	28	34	Z	37	39	41	42	41	39	38	36	39	41	38	35	36	38	40	41	42	41	41	41	37.9	42
3-Dec	40	41	41	40	Z	38	38	37	35	36	36	35	38	38	37	36	33	32	30	29	28	28	27	27	34.9	41
4-Dec	27	28	27	28	27	Z	26	26	25	27	29	29	30	30	29	30	31	32	29	28	26	26	27	27	28.0	32
5-Dec	27	27	28	30	29	29	Z	31	31	32	35	37	35	33	34	34	34	31	28	27	27	26	26	27	30.3	37
6-Dec	25	25	22	25	24	24	22	Z	24	24	24	24	23	23	23	22	20	19	19	16	17	17	16	17	21.5	25
7-Dec	15	15	15	13	13	20	16	16	Z	17	18	17	17	19	18	18	21	24	27	26	29	29	29	28	20.0	29
8-Dec	29	29	28	Z	27	22	22	22	22	25	27	27	28	28	29	29	27	26	25	24	24	25	24	24	25.7	29
9-Dec	23	22	19	18	Z	16	15	15	12	12	12	13	21	25	23	25	23	20	19	21	24	23	24	25	19.6	25
10-Dec	22	25	26	23	26	Z	27	26	C	C	C	22	24	24	26	23	22	20	21	22	25	29	29	29	24.5	29
11-Dec	30	29	33	34	32	32	Z	31	30	31	31	30	30	30	30	28	28	29	29	29	31	33	32	30	30.6	34
12-Dec	32	31	31	29	28	29	28	Z	25	25	26	28	28	30	31	30	28	27	26	25	25	24	22	21	27.3	32
13-Dec	20	20	21	21	22	21	21	23	Z	21	23	25	25	25	25	25	24	24	24	24	24	24	22	22	22.9	25
14-Dec	21	21	21	Z	21	21	20	20	21	22	23	24	26	29	28	28	27	27	24	22	21	21	22	20	23.0	29
15-Dec	19	19	20	21	Z	17	18	17	15	14	17	24	28	29	28	29	32	33	33	34	34	34	35	36	25.5	36
16-Dec	38	40	40	40	38	Z	35	36	36	36	34	34	35	36	37	37	36	36	37	37	38	38	38	36	36.8	40
17-Dec	35	34	34	33	33	32	Z	32	31	31	31	31	30	30	30	29	29	28	28	27	28	27	28	27	30.3	35
18-Dec	27	27	27	26	27	28	27	Z	27	26	25	25	26	25	26	26	26	28	28	28	26	27	27	27	26.5	28
19-Dec	26	27	26	26	26	26	25	24	Z	24	23	22	19	21	21	21	21	20	21	23	24	22	21	21	23.0	27
20-Dec	21	21	21	Z	23	24	25	25	23	23	23	23	23	24	23	22	23	23	23	24	24	23	22	22	22.8	25
21-Dec	23	23	23	22	Z	21	21	21	20	20	20	21	21	21	20	19	21	26	25	25	21	21	20	20	21.5	26
22-Dec	20	31	23	22	22	Z	22	22	20	18	19	16	16	16	16	16	14	13	13	14	14	15	17	19	18.2	31
23-Dec	18	19	18	13	11	9	Z	8	12	16	16	16	16	16	17	17	18	19	19	18	18	16	19	20	16.0	20
24-Dec	19	18	18	18	17	17	16	Z	16	19	20	21	21	21	21	20	19	19	19	18	17	18	19	17	18.7	21
25-Dec	19	22	18	20	24	20	24	22	Z	18	21	24	19	19	19	19	17	15	14	13	13	17	18	17	18.9	24
26-Dec	19	20	21	Z	27	27	27	26	26	27	26	25	24	23	21	19	20	21	20	21	21	20	20	19	22.6	27
27-Dec	18	19	21	23	Z	26	26	26	25	24	23	24	24	24	24	23	22	22	22	22	21	20	19	17	22.2	26
28-Dec	16	15	15	15	15	Z	16	17	16	15	16	16	17	17	17	17	16	16	15	15	16	16	17	17	16.0	17
29-Dec	16	18	19	18	16	16	Z	14	15	15	17	18	20	20	18	18	21	22	23	23	20	18	17	16	18.2	23
30-Dec	17	19	21	27	29	30	31	Z	32	33	33	33	33	33	35	36	35	35	34	33	33	35	35	34	31.0	36
31-Dec	34	33	32	33	33	35	33	34	Z	38	37	39	40	41	41	41	41	41	41	41	41	41	41	42	37.9	42
24.7 25.6 25.4 25.6 25.9 25.7 25.8 25.3 24.2 24.7 25.4 25.8 26.1 26.7 26.3 26.0 26.0 26.0 25.6 25.5 25.0 25.1 25.3 24.8																								Diurnal Average		
45 46 47 47 49 49 47 46 41 39 38 41 40 41 41 41 41 41 41 41 41 42 41 41 42																								Diurnal Maximum		
Z - zerospan      C - Calibration																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																										





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Conklin Lookout - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	191	26.90	26.90
21 - 50	519	73.10	100.00
51 - 82	0	0.00	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Ozone (O<sub>3</sub>) - ppb**  
**Conklin Lookout - December 2015**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	3	23	9	6	7	3	8	7	9	42	41	2	4	6	13	8	191
21 - 50	8	9	10	8	13	37	29	63	45	40	63	35	47	49	58	5	519
51 - 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	11	32	19	14	20	40	37	70	54	82	104	37	51	55	71	13	710

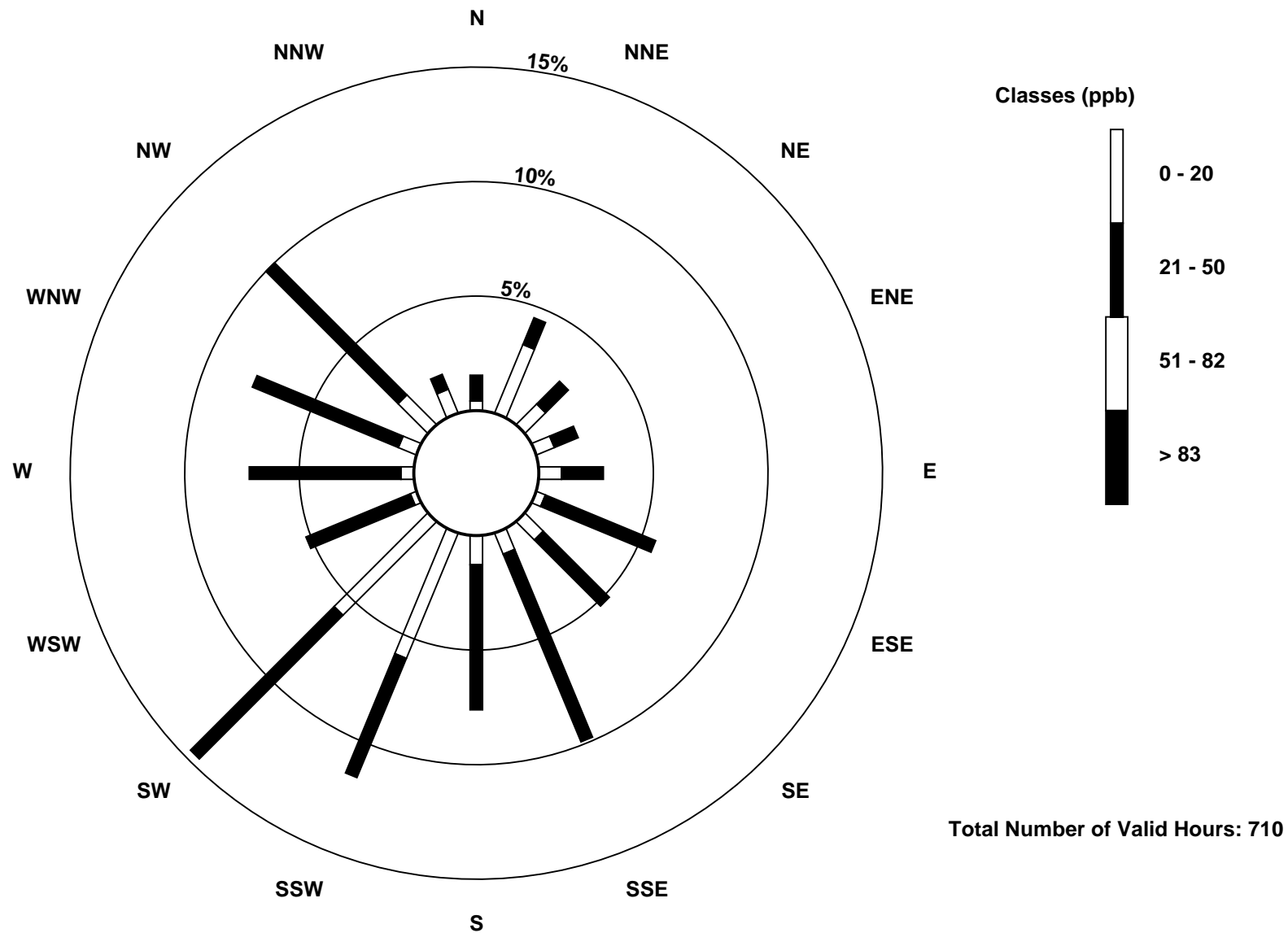
Total Number of Valid Hours: 710

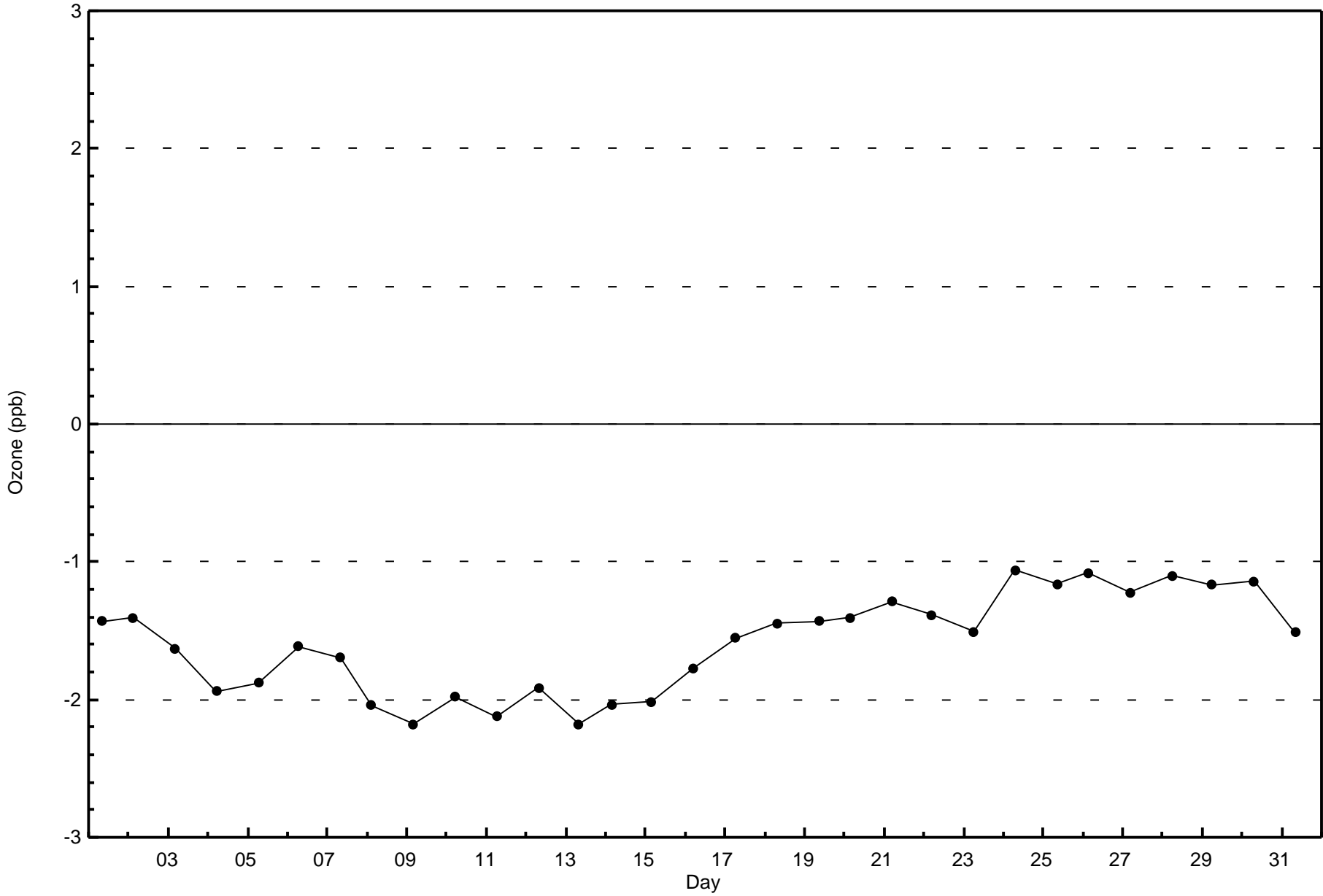
Total Number of Hours: 744

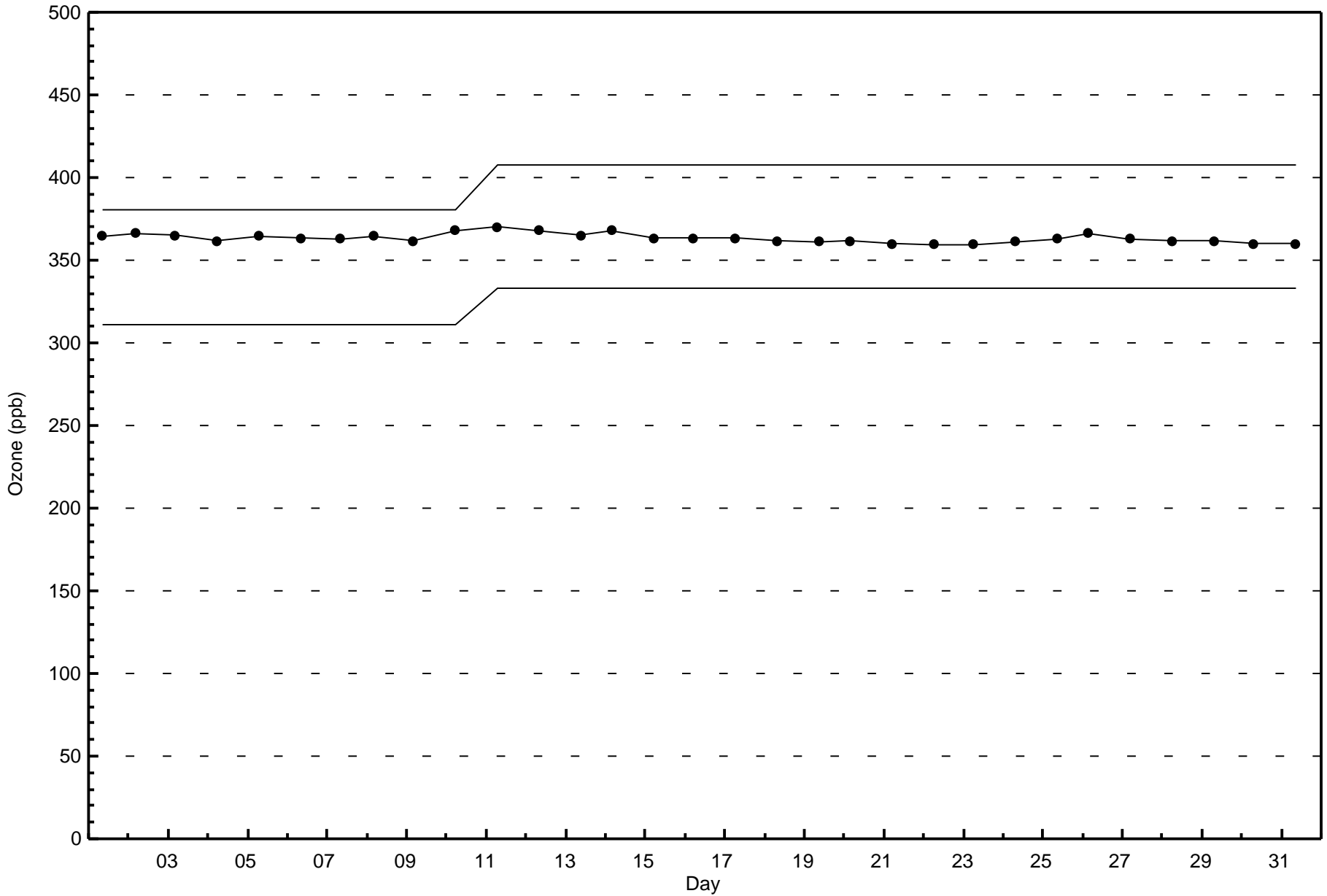


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Ozone (O<sub>3</sub>) - ppb  
Conklin Lookout (AMS 18)







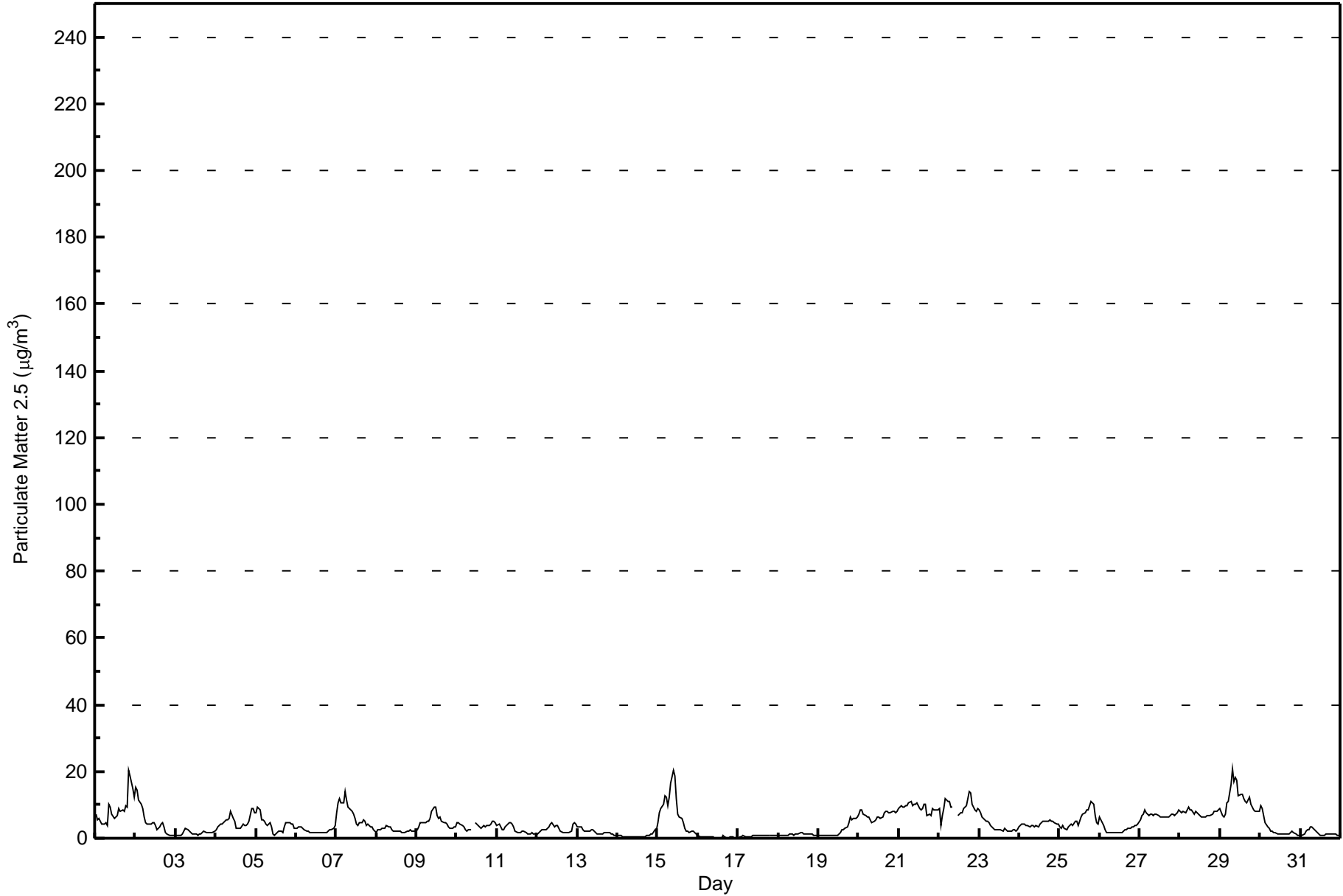


Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 20.9 µg/m <sup>3</sup> on Dec 29 08:00 Minimum Value: 0.0 µg/m <sup>3</sup> on Dec 16 13:00 Maximum Diurnal Average: 5.1 µg/m <sup>3</sup> at hour 10 Monthly Average: 4.40 µg/m <sup>3</sup>		Maximum Daily Average: 11.5 µg/m <sup>3</sup> on Dec 29 Minimum Daily Average: 0.3 µg/m <sup>3</sup> on Dec 16 Minimum Diurnal Average: 3.7 µg/m <sup>3</sup> at hour 14 Percentiles: P <sub>1</sub> = 0.2 P <sub>10</sub> = 0.8 Q <sub>1</sub> = 1.6 Median = 3.4 Q <sub>3</sub> = 6.7 P <sub>90</sub> = 9.1 P <sub>99</sub> = 16.7		Hours in Service: 744 Hours of Data: 740 Hours of Missing Data: 4 Hours of Calibration: 2 Percent Operational Time: 99.7																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	7.2	5.7	5.7	5.0	4.4	4.3	4.7	3.6	10.1	9.4	7.2	5.7	6.4	7.0	9.1	8.0	8.5	8.1	9.9	9.2	20.5	18.8	14.6	12.4	8.6	20.5
2-Dec	15.3	14.5	11.3	10.1	8.9	6.2	4.4	4.1	4.2	4.1	4.6	4.7	4.0	2.4	3.2	4.4	4.6	3.3	1.8	1.1	0.8	0.8	0.8	0.8	5.0	15.3
3-Dec	0.8	0.9	0.9	0.9	1.2	2.3	2.9	2.5	2.1	1.6	1.2	1.2	1.1	1.0	1.1	1.3	1.8	1.9	1.7	1.7	1.9	1.9	1.9	2.0	1.6	2.9
4-Dec	2.5	3.4	3.7	4.1	4.3	5.2	5.4	5.6	5.8	8.0	6.1	4.9	3.1	3.0	3.1	3.1	4.0	3.7	3.8	4.3	5.1	8.9	8.9	7.6	4.9	8.9
5-Dec	7.8	9.2	8.4	5.3	5.5	4.9	4.2	4.0	4.6	3.3	1.5	0.9	1.5	2.1	1.9	2.0	1.7	3.3	4.6	4.6	4.7	4.4	4.2	3.1	4.1	9.2
6-Dec	2.9	3.2	3.6	3.2	2.8	2.5	2.1	2.0	1.8	1.6	1.5	1.5	1.7	1.8	1.8	1.7	1.6	1.5	1.5	2.0	2.3	2.7	2.9	3.8	2.3	3.8
7-Dec	7.6	10.5	12.0	10.7	10.8	13.9	11.3	9.2	8.7	7.9	7.2	5.9	4.2	4.0	4.7	4.7	5.4	5.1	3.9	4.2	3.3	3.3	2.7	2.3	6.8	13.9
8-Dec	1.8	2.4	2.6	3.1	2.9	3.0	3.8	3.3	3.2	2.5	2.3	2.1	2.1	2.0	2.1	1.8	1.6	1.9	2.0	2.0	2.4	2.3	2.0	2.2	2.4	3.8
9-Dec	2.5	3.5	4.6	4.6	4.7	4.5	4.9	5.0	5.8	7.8	9.2	9.1	6.6	5.9	6.1	5.0	4.8	4.9	4.4	3.6	3.1	3.1	3.2	3.2	5.0	9.2
10-Dec	4.6	4.8	4.4	3.8	3.3	2.3	2.2	2.5	2.4	C	C	4.6	4.1	3.8	3.0	3.3	3.6	3.6	3.8	4.0	4.3	5.0	5.3	4.7	3.8	5.3
11-Dec	3.8	4.3	3.4	2.4	2.5	3.2	4.4	4.7	4.5	4.3	3.4	2.2	1.8	1.9	1.8	2.0	2.2	1.8	1.3	1.2	1.3	1.5	1.3	1.4	2.6	4.7
12-Dec	1.4	1.7	2.3	2.6	2.3	2.4	2.8	3.3	4.4	4.8	3.5	3.8	3.8	3.1	2.2	1.8	1.8	1.5	1.5	1.5	2.3	4.1	4.5	4.2	2.8	4.8
13-Dec	3.3	3.3	3.5	2.7	2.1	2.2	2.1	2.2	2.6	2.6	2.0	1.6	1.1	1.1	1.3	1.4	1.6	1.8	1.6	1.7	1.5	1.2	1.0	0.9	1.9	3.5
14-Dec	0.9	0.8	0.8	0.5	0.4	0.5	0.5	0.5	0.5	0.4	0.4	0.5	0.6	0.4	0.5	0.5	0.6	0.7	0.8	0.8	1.2	1.2	2.4	2.6	0.8	2.6
15-Dec	4.8	7.6	9.1	10.3	12.7	12.2	9.8	12.4	16.4	20.3	18.7	11.8	7.1	6.5	5.9	4.5	2.8	1.9	2.0	1.9	2.2	2.2	1.8	1.3	7.8	20.3
16-Dec	0.9	0.6	0.4	0.4	0.4	0.4	0.3	0.4	0.5	0.3	0.1	0.1	0.0	0.1	0.1	0.7	0.5	0.2	0.1	0.3	0.3	0.2	0.1	0.2	0.3	0.9
17-Dec	0.2	0.3	0.4	0.7	0.6	0.4	0.4	0.5	0.6	0.7	0.7	0.8	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.7	1.0
18-Dec	0.7	0.8	0.9	0.9	1.0	1.0	1.0	1.1	1.1	1.0	1.3	1.3	1.3	1.8	1.5	1.3	1.4	1.3	1.3	1.3	1.2	1.0	0.9	0.9	1.1	1.8
19-Dec	0.9	1.0	1.0	0.9	0.8	0.8	0.7	0.8	0.8	0.9	0.8	1.0	1.4	1.7	2.5	2.7	3.0	3.5	4.6	6.2	5.6	5.9	5.9	6.2	2.5	6.2
20-Dec	7.1	8.3	8.3	7.3	6.8	6.4	6.2	5.3	4.8	5.1	5.7	6.3	6.4	6.0	6.4	7.7	8.1	7.9	7.6	7.5	7.9	8.0	7.7	7.9	7.0	8.3
21-Dec	8.8	9.6	9.2	9.3	9.7	9.9	10.5	11.2	9.9	10.3	10.3	10.4	9.0	8.3	8.9	10.2	10.1	6.9	7.0	6.7	9.1	8.4	8.5	8.3	9.2	11.2
22-Dec	8.8	3.8	6.8	9.0	11.9	11.2	11.0	9.2	9.4	M	M	6.9	7.2	7.4	7.7	8.7	9.8	11.8	14.1	13.5	10.1	8.3	8.0	9.0	9.2	14.1
23-Dec	8.4	7.5	6.5	5.5	5.1	5.0	4.5	3.9	2.8	2.5	2.6	2.7	2.6	2.5	2.3	2.9	2.6	2.1	2.0	2.3	2.4	2.6	2.3	2.3	3.6	8.4
24-Dec	3.5	4.4	4.4	4.1	3.8	3.6	3.6	3.7	3.8	3.3	3.7	3.6	4.1	4.7	5.1	5.0	5.3	5.1	5.3	5.1	5.1	4.8	4.2	4.1	4.3	5.3
25-Dec	3.2	2.9	3.7	3.1	2.5	3.3	3.8	4.3	4.0	5.0	5.0	3.8	5.1	6.2	7.1	7.8	8.4	8.5	9.9	11.2	10.3	6.6	4.5	4.4	5.6	11.2
26-Dec	6.2	5.7	3.9	2.5	1.9	1.7	1.5	1.5	1.7	1.7	1.8	1.8	1.7	1.9	2.3	2.5	2.6	2.9	2.8	3.2	3.3	3.7	3.7	4.1	2.8	6.2
27-Dec	5.3	6.8	7.2	8.4	7.5	6.7	7.2	7.4	7.0	7.2	7.3	6.9	6.5	6.5	6.2	6.4	6.5	6.6	6.7	7.1	7.1	6.8	7.7	8.6	7.0	8.6
28-Dec	8.0	7.8	8.1	7.8	8.6	9.1	8.4	8.4	7.3	8.0	7.8	7.3	6.7	6.3	6.2	6.5	6.7	6.7	6.8	7.1	8.1	7.9	7.9	8.6	7.6	9.1
29-Dec	8.9	6.9	6.2	7.0	10.5	10.9	16.1	20.9	16.9	18.1	17.4	12.7	13.1	13.1	11.8	11.2	10.4	12.3	10.3	9.2	8.3	8.0	7.9	8.0	11.5	20.9
30-Dec	9.8	8.7	6.9	4.8	3.4	2.8	2.3	2.0	1.8	1.6	1.4	1.4	1.3	1.2	1.1	1.3	1.3	1.4	1.9	2.0	1.6	1.1	0.8	1.0	2.6	9.8
31-Dec	0.8	0.9	1.2	1.9	2.5	2.6	3.4	3.2	2.6	2.1	1.7	1.1	1.0	0.9	1.0	1.1	1.4	1.3	1.1	1.4	1.3	1.1	1.0	1.1	1.6	3.4
																								Diurnal Average		
																								Diurnal Maximum		
4.8 4.9 4.9 4.6 4.7 4.7 4.7 4.8 4.9 5.1 4.7 4.2 3.8 3.7 3.8 4.0 4.0 4.0 4.1 4.2 4.5 4.4 4.2 4.1 15.3 14.5 12.0 10.7 12.7 13.9 16.1 20.9 16.9 20.3 18.7 12.7 13.1 13.1 11.8 11.2 10.4 12.3 14.1 13.5 20.5 18.8 14.6 12.4																										
C - Calibration M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m <sup>3</sup>																										



Wood Buffalo Environmental Association  
Hourly Averages

Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$   
Conklin Lookout - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM<sub>2.5</sub>) -  $\mu\text{g}/\text{m}^3$**   
**Conklin Lookout - December 2015**

<b>Concentration Ranges (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
1 - 5	410	55.41	55.41
6 - 15	218	29.46	84.86
16 - 25	10	1.35	86.22
26 - 80	0	0.00	86.22
> 81.0	0	0.00	86.22

Total Number of Valid Hours: 740

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

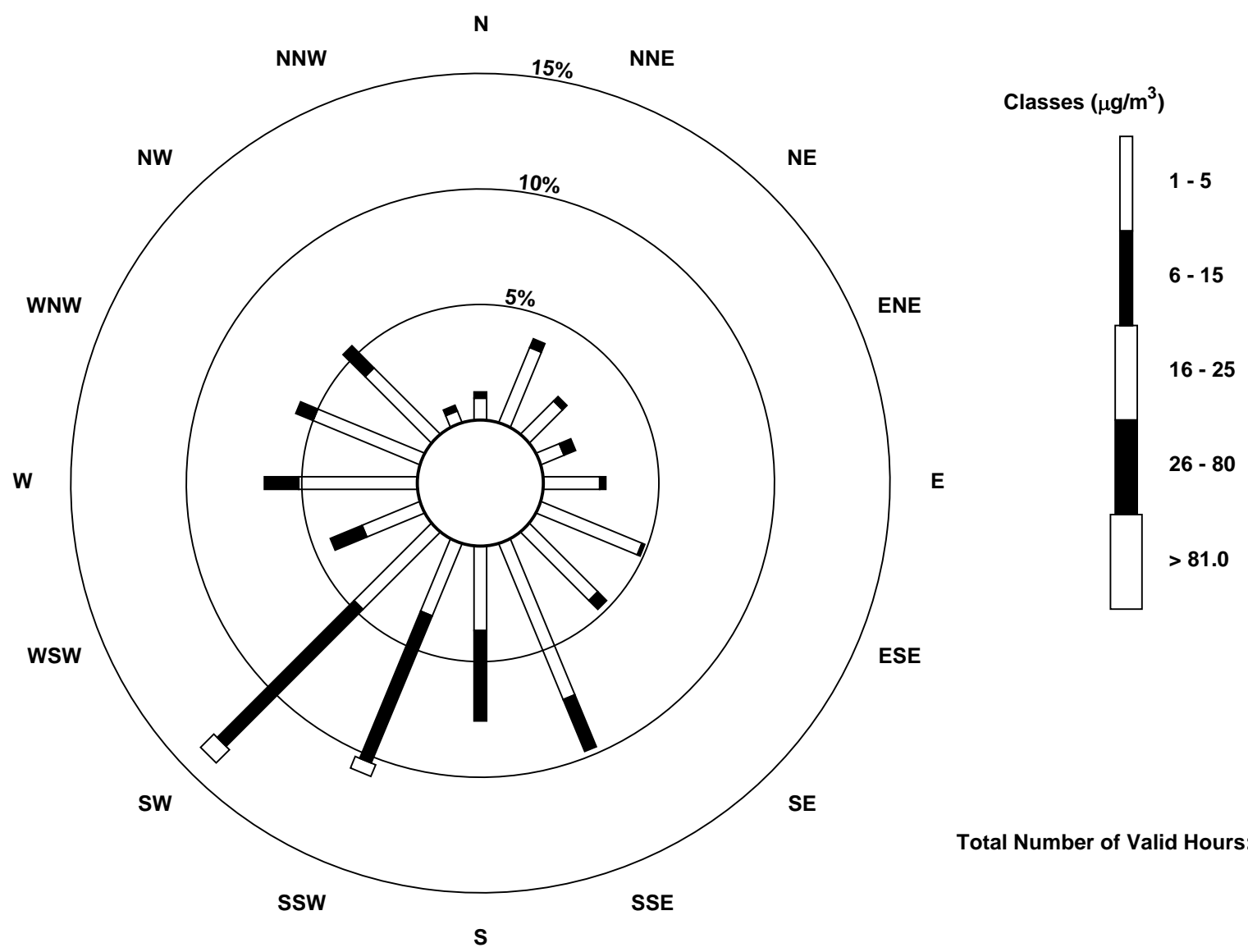
**Particulate Matter 2.5 (PM<sub>2.5</sub>) - μg/m<sup>3</sup>**  
**Conklin Lookout - December 2015**

Concentration Ranges (μg/m <sup>3</sup> )	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	7	26	15	8	18	35	31	54	27	25	35	20	38	37	30	4	410
6 - 15	2	3	2	4	2	1	4	18	29	51	62	11	11	6	10	2	218
16 - 25	0	0	0	0	0	0	0	0	0	4	6	0	0	0	0	0	10
26 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	9	29	17	12	20	36	35	72	56	80	103	31	49	43	40	6	638

Total Number of Valid Hours: 740

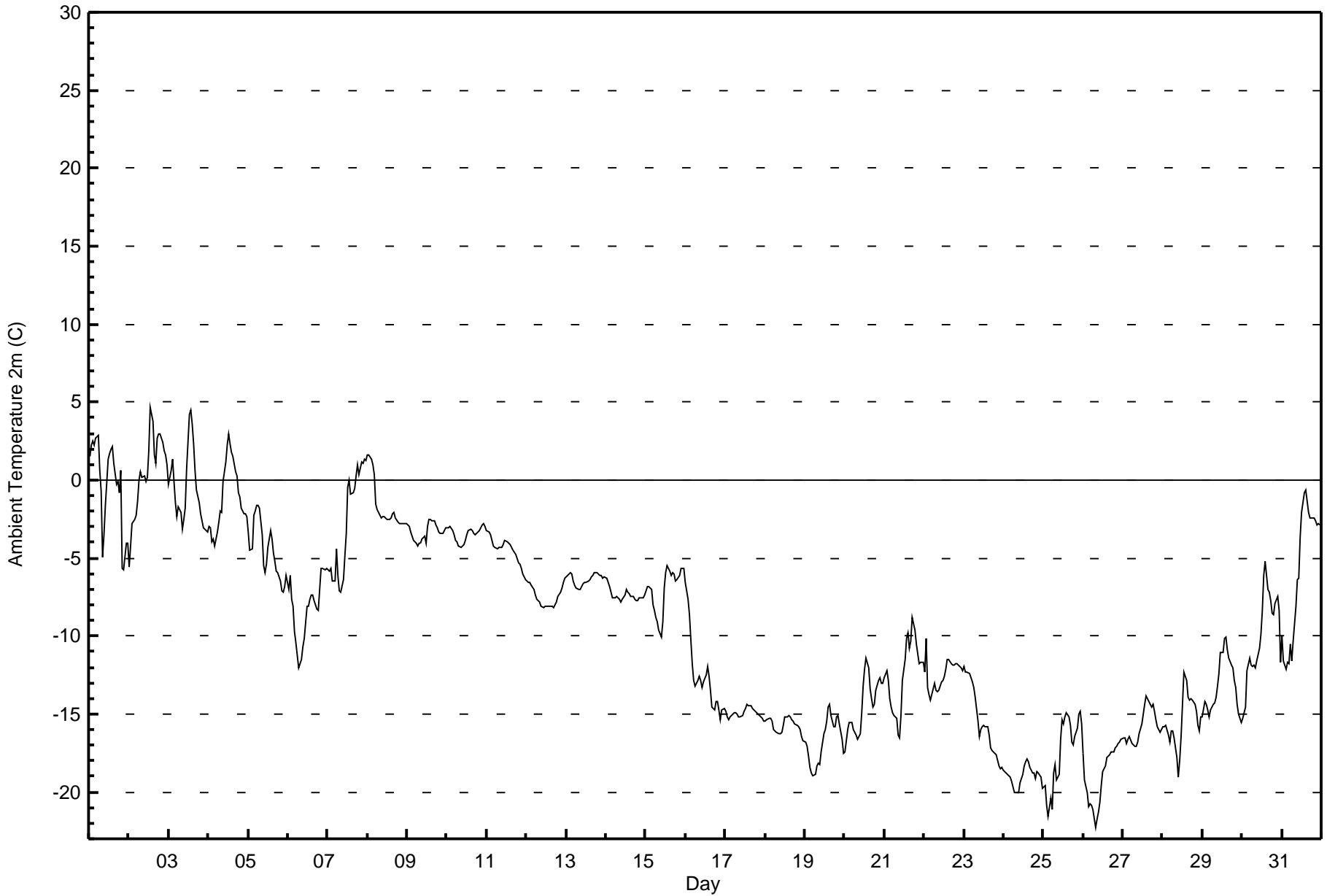
Total Number of Hours: 744







Maximum Value: 4.7 C on Dec 2 14:00		Maximum Daily Average: 0.5 C on Dec 2		Hours in Service: 744																						
Minimum Value: -22.3 C on Dec 26 08:00		Minimum Daily Average: -19.0 C on Dec 24		Hours of Data: 744																						
Maximum Diurnal Average: -7.7 C at hour 14		Minimum Diurnal Average: -10.8 C at hour 9		Hours of Missing Data: 0																						
Monthly Average: -9.32 C		Percentiles: P <sub>1</sub> = -20.9 P <sub>10</sub> = -17.2 Q <sub>1</sub> = -15.1 Median = -8.4 Q <sub>3</sub> = -3.9 P <sub>90</sub> = -0.8 P <sub>99</sub> = 3.0		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1.5	2.2	2.5	2.3	2.7	2.8	0.6	-0.7	-4.9	-3.5	-1.6	1.4	1.7	2.0	2.1	1.1	-0.3	-0.1	-0.8	0.6	-5.6	-5.8	-4.1	-4.0	-0.3	2.8
2-Dec	-5.6	-4.2	-2.8	-2.5	-2.3	-1.4	0.0	0.5	0.2	0.3	-0.1	0.2	1.9	4.7	3.7	1.7	1.1	2.7	3.0	3.0	2.5	1.8	1.7	1.0	0.5	4.7
3-Dec	-0.3	0.7	1.4	-0.1	-1.5	-2.3	-1.7	-2.1	-3.1	-2.6	-1.8	0.7	4.2	4.5	3.6	2.3	0.6	-0.6	-1.5	-2.2	-2.6	-3.1	-3.2	-3.3	-0.6	4.5
4-Dec	-2.9	-3.1	-4.0	-3.7	-4.2	-3.4	-2.7	-2.0	-2.1	-0.1	1.2	2.2	3.0	2.3	1.8	1.5	0.5	0.3	-0.8	-1.0	-1.8	-2.1	-2.2	-2.3	-1.1	3.0
5-Dec	-3.3	-4.5	-4.4	-2.3	-2.0	-1.7	-1.6	-1.8	-3.5	-5.5	-5.9	-5.4	-4.4	-3.2	-3.8	-4.6	-5.2	-5.8	-5.9	-6.4	-7.1	-7.2	-6.8	-6.1	-4.5	-1.6
6-Dec	-7.0	-6.1	-7.6	-8.1	-9.7	-10.4	-12.1	-11.8	-11.5	-10.7	-10.1	-8.1	-8.1	-7.7	-7.4	-7.4	-7.7	-8.2	-8.4	-7.0	-5.7	-5.6	-5.8	-5.6	-8.2	-5.6
7-Dec	-5.8	-5.9	-5.7	-6.4	-6.4	-4.4	-6.1	-7.1	-7.2	-6.4	-4.9	-3.4	-0.5	0.0	-0.9	-0.8	-0.6	0.3	1.0	0.3	1.2	1.1	1.3	1.3	-2.8	1.3
8-Dec	1.7	1.6	1.3	1.0	0.3	-1.5	-1.9	-2.3	-2.4	-2.4	-2.4	-2.4	-2.5	-2.5	-2.4	-2.1	-2.1	-2.5	-2.7	-2.8	-2.8	-2.8	-2.8	-2.8	-1.7	1.7
9-Dec	-2.9	-3.0	-3.3	-3.6	-3.8	-4.1	-4.2	-4.1	-4.1	-3.8	-3.6	-4.1	-3.0	-2.5	-2.6	-2.6	-2.6	-2.9	-3.0	-3.3	-3.4	-3.4	-3.3	-3.1	-3.3	-2.5
10-Dec	-3.1	-3.1	-3.0	-3.2	-3.5	-3.8	-3.9	-4.2	-4.3	-4.3	-4.2	-3.9	-3.5	-3.2	-3.2	-3.2	-3.4	-3.5	-3.4	-3.3	-3.1	-2.9	-2.8	-2.9	-3.5	-2.8
11-Dec	-3.2	-3.3	-3.5	-3.9	-4.2	-4.3	-4.4	-4.4	-4.3	-4.4	-4.1	-3.9	-3.9	-4.1	-4.2	-4.3	-4.5	-4.8	-5.1	-5.3	-5.4	-5.7	-6.0	-6.4	-4.5	-3.2
12-Dec	-6.5	-6.5	-6.6	-6.7	-7.0	-7.3	-7.6	-7.7	-7.8	-8.1	-8.2	-8.1	-8.1	-8.1	-8.1	-8.1	-8.1	-8.0	-7.8	-7.5	-7.2	-6.9	-6.6	-6.3	-7.5	-6.3
13-Dec	-6.2	-6.1	-5.9	-6.1	-6.5	-6.7	-6.9	-7.0	-7.0	-6.8	-6.6	-6.6	-6.5	-6.5	-6.4	-6.2	-6.1	-5.9	-6.0	-6.0	-6.1	-6.1	-6.3	-6.2	-6.4	-5.9
14-Dec	-6.3	-6.5	-6.8	-7.2	-7.6	-7.5	-7.5	-7.5	-7.7	-7.8	-7.6	-7.4	-7.0	-7.2	-7.3	-7.4	-7.5	-7.6	-7.7	-7.7	-7.6	-7.5	-7.6	-7.3	-7.4	-6.3
15-Dec	-7.1	-6.8	-6.8	-7.0	-8.0	-8.3	-8.8	-9.1	-9.7	-10.1	-9.1	-6.9	-6.0	-5.5	-5.9	-6.1	-6.0	-6.0	-6.4	-6.4	-6.1	-5.7	-5.6	-5.7	-7.0	-5.5
16-Dec	-6.5	-7.6	-8.7	-10.2	-11.8	-12.8	-13.2	-12.8	-12.5	-12.8	-13.3	-13.0	-12.5	-11.9	-12.6	-13.5	-14.5	-14.7	-14.2	-14.2	-14.7	-15.4	-14.7	-14.6	-12.6	-6.5
17-Dec	-14.8	-15.2	-15.3	-15.2	-15.0	-14.9	-14.9	-15.0	-15.2	-15.2	-15.1	-14.8	-14.6	-14.4	-14.4	-14.5	-14.7	-14.7	-14.8	-14.9	-15.0	-15.2	-15.3	-15.5	-14.9	-14.4
18-Dec	-15.4	-15.4	-15.3	-15.3	-15.4	-16.0	-16.1	-16.2	-16.3	-16.2	-16.1	-15.7	-15.2	-15.2	-15.1	-15.2	-15.4	-15.5	-15.6	-15.7	-15.8	-16.0	-16.5	-16.7	-15.7	-15.1
19-Dec	-16.8	-17.0	-17.7	-18.5	-18.8	-19.0	-18.9	-18.4	-18.2	-18.2	-17.4	-16.2	-16.0	-15.5	-14.5	-14.4	-15.1	-15.8	-15.8	-15.2	-15.1	-15.7	-16.6	-17.5	-16.8	-14.4
20-Dec	-17.4	-16.7	-16.0	-15.6	-15.5	-16.0	-16.2	-16.4	-16.6	-16.3	-14.9	-13.2	-12.1	-11.4	-12.0	-13.4	-14.1	-14.6	-14.3	-13.5	-12.9	-12.7	-13.0	-13.1	-14.5	-11.4
21-Dec	-12.7	-12.3	-12.9	-14.0	-14.6	-14.9	-15.1	-15.3	-16.4	-16.5	-15.1	-12.9	-11.5	-10.1	-9.8	-10.8	-10.3	-8.9	-9.6	-10.5	-11.1	-11.8	-11.7	-11.7	-12.5	-8.9
22-Dec	-12.3	-10.2	-13.3	-13.8	-14.1	-13.4	-13.0	-13.5	-13.6	-13.5	-12.9	-12.9	-12.6	-12.2	-11.5	-11.5	-11.7	-11.9	-11.9	-11.7	-11.8	-12.0	-12.1	-12.2	-12.5	-10.2
23-Dec	-11.9	-12.3	-12.3	-12.4	-12.7	-12.9	-13.3	-13.9	-15.5	-16.4	-16.0	-15.8	-15.8	-15.8	-16.3	-17.1	-17.3	-17.4	-17.6	-18.0	-18.3	-18.5	-18.4	-18.4	-15.5	-11.9
24-Dec	-18.6	-18.8	-18.8	-18.9	-19.1	-19.3	-20.0	-20.0	-20.1	-20.0	-19.4	-18.9	-18.3	-18.0	-17.9	-18.1	-18.4	-18.8	-18.8	-19.1	-18.7	-18.8	-19.0	-19.7	-19.0	-17.9
25-Dec	-19.7	-19.6	-20.9	-21.6	-20.4	-21.1	-18.8	-18.2	-19.2	-18.8	-16.6	-15.4	-15.7	-15.1	-15.0	-15.2	-15.8	-16.8	-17.0	-16.5	-15.9	-15.0	-14.9	-15.7	-17.5	-14.9
26-Dec	-17.6	-19.2	-20.0	-20.9	-20.8	-20.9	-21.2	-22.3	-21.7	-21.3	-20.6	-19.6	-18.7	-18.4	-17.8	-17.7	-17.6	-17.5	-17.4	-17.2	-17.1	-16.9	-16.8	-16.6	-19.0	-16.6
27-Dec	-16.5	-16.5	-16.9	-16.6	-16.5	-16.9	-17.0	-17.1	-17.1	-16.8	-16.2	-15.6	-15.0	-14.4	-13.8	-14.0	-14.3	-14.5	-14.4	-14.8	-15.4	-15.9	-16.2	-16.0	-15.8	-13.8
28-Dec	-15.8	-15.8	-15.8	-16.4	-16.8	-16.1	-16.1	-16.6	-17.8	-19.1	-18.0	-16.5	-14.4	-12.3	-12.8	-13.9	-14.1	-14.0	-14.1	-14.4	-14.8	-15.7	-16.1	-15.2	-15.5	-12.3
29-Dec	-15.2	-14.2	-14.3	-14.7	-15.2	-14.8	-14.4	-14.2	-13.9	-13.2	-12.4	-11.0	-11.0	-10.2	-10.0	-10.9	-11.4	-11.8	-12.1	-12.8	-13.3	-14.4	-15.0	-15.5	-13.2	-10.0
30-Dec	-15.3	-15.0	-14.5	-12.2	-11.4	-11.8	-11.9	-11.9	-12.0	-11.6	-10.8	-9.9	-8.4	-6.1	-5.3	-7.0	-7.2	-7.7	-8.6	-8.6	-7.9	-7.4	-8.4	-11.7	-10.1	-5.3
31-Dec	-10.0	-11.6	-12.2	-11.7	-11.8	-10.5	-11.6	-10.3	-8.1	-6.3	-6.3	-3.7	-2.0	-0.8	-0.6	-1.4	-2.1	-2.4	-2.4	-2.4	-2.6	-2.9	-2.8	-2.9	-5.8	-0.6
	-9.5	-9.4	-9.7	-9.9	-10.1	-10.2	-10.3	-10.4	-10.8	-10.6	-10.0	-9.1	-8.3	-7.7	-7.7	-8.2	-8.6	-8.7	-8.8	-8.9	-9.1	-9.2	-9.3	-9.4		Diurnal Average
	1.7	2.2	2.5	2.3	2.7	2.8	0.6	0.5	0.2	0.3	1.2	2.2	4.2	4.7	3.7	2.3	1.1	2.7	3.0	3.0	2.5	1.8	1.7	1.3		Diurnal Maximum





**Wood Buffalo Environmental Association  
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C  
Conklin Lookout - December 2015**

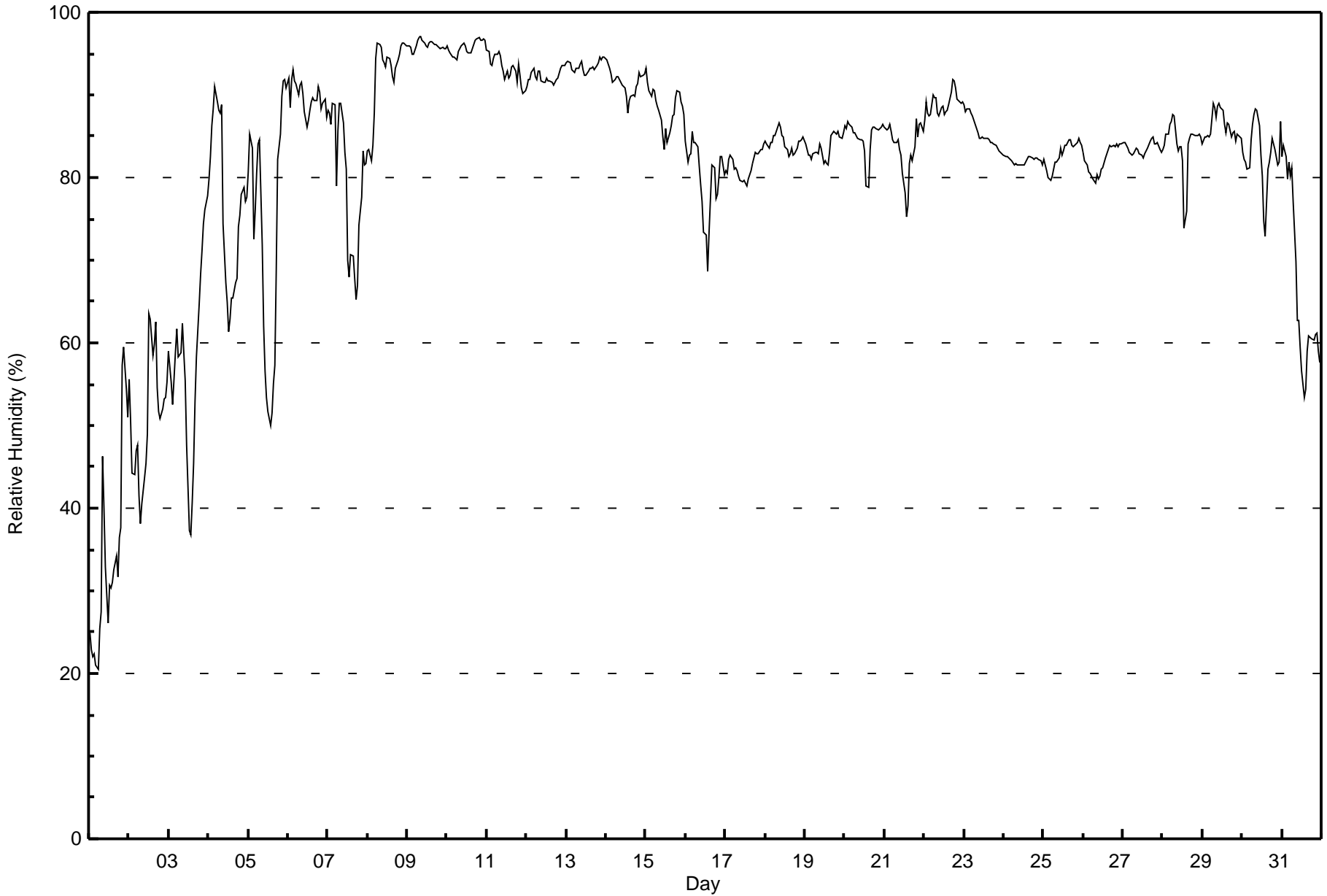
<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	17	2.28	2.28
-20 - 0	669	89.92	92.20
0 - 10	58	7.80	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 97 % on Dec 9 09:00																			Maximum Daily Average: 96.0 % on Dec 9						Hours in Service: 744																				
Minimum Value: 21 % on Dec 1 06:00																			Minimum Daily Average: 34.1 % on Dec 1						Hours of Data: 744																				
Maximum Diurnal Average: 84.1 % at hour 22																			Minimum Diurnal Average: 77.2 % at hour 14						Hours of Missing Data: 0																				
Monthly Average: 81.5 %																			Percentiles: P <sub>1</sub> = 26 P <sub>10</sub> = 60 Q <sub>1</sub> = 81 Median = 84 Q <sub>3</sub> = 90 P <sub>90</sub> = 94 P <sub>99</sub> = 97						Hours of Calibration: 0																				
																			Percent Operational Time: 100.0																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																					
1-Dec	25	23	22	22	21	21	25	27	46	40	33	26	31	30	31	32	34	32	36	38	57	59	54	51	34.1	59																			
2-Dec	56	51	44	44	47	48	41	38	41	44	45	49	64	63	59	60	63	55	52	51	52	53	53	55	51.1	64																			
3-Dec	59	55	53	56	59	62	58	59	62	59	55	48	37	37	41	45	53	58	65	68	71	74	76	78	57.8	78																			
4-Dec	80	83	86	88	91	89	88	88	89	74	67	65	61	63	65	65	67	68	74	75	78	79	77	78	76.7	91																			
5-Dec	81	85	84	73	76	81	84	85	72	62	57	53	52	50	52	55	57	69	82	85	90	92	92	91	73.2	92																			
6-Dec	92	88	92	93	92	91	90	91	91	90	88	86	87	88	89	90	89	89	91	90	88	89	89	87	89.7	93																			
7-Dec	88	88	86	89	89	79	86	89	89	87	83	81	70	68	71	70	68	65	67	74	78	83	82	82	79.6	89																			
8-Dec	83	83	82	84	88	94	96	96	96	94	94	93	95	94	94	92	92	93	94	95	96	96	96	96	92.4	96																			
9-Dec	96	96	96	95	95	96	97	97	97	97	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96.0	97																			
10-Dec	96	95	95	95	95	94	94	95	96	96	96	96	95	95	95	96	96	97	97	97	97	97	97	97	95.7	97																			
11-Dec	95	95	94	94	94	95	95	95	95	94	93	92	93	92	92	93	94	93	92	94	92	91	90	91	93.2	95																			
12-Dec	91	92	92	93	93	92	92	93	93	92	91	92	92	92	92	92	91	92	92	92	93	94	94	94	92.2	94																			
13-Dec	94	94	94	93	93	93	93	93	94	94	93	92	92	93	93	93	93	93	94	94	95	94	95	95	93.5	95																			
14-Dec	94	94	93	92	92	92	92	92	92	91	91	90	88	89	90	90	90	91	91	93	92	92	92	92	91.5	94																			
15-Dec	93	92	91	90	91	90	89	89	88	87	85	83	86	84	85	86	87	88	90	91	90	89	89	88	88.3	93																			
16-Dec	84	82	83	83	86	84	84	84	81	79	77	73	73	69	73	77	81	81	77	78	80	83	83	80	79.9	86																			
17-Dec	81	81	82	83	82	81	81	81	80	80	80	80	79	79	80	81	82	82	83	83	83	83	83	84	81.4	84																			
18-Dec	84	84	84	84	84	85	85	86	87	86	85	85	84	83	83	83	84	83	83	84	84	84	85	85	84.3	87																			
19-Dec	84	83	83	83	82	83	83	83	83	84	84	82	82	82	82	83	85	86	86	85	86	85	85	85	83.6	86																			
20-Dec	86	86	87	86	86	86	85	85	85	85	85	84	83	79	79	83	86	86	86	86	86	86	86	86	84.9	87																			
21-Dec	86	86	86	86	86	85	84	84	85	83	83	80	78	75	77	82	83	82	84	87	85	86	87	86	83.5	87																			
22-Dec	87	89	88	87	88	90	90	90	88	88	89	89	88	88	88	89	90	92	92	91	89	89	89	89	88.9	92																			
23-Dec	89	88	88	88	88	87	87	87	85	85	85	85	85	85	85	84	84	84	84	84	83	83	83	83	85.4	89																			
24-Dec	83	82	82	82	82	82	82	82	82	81	82	82	82	82	82	83	82	82	82	82	82	82	82	82	82.1	83																			
25-Dec	82	81	81	80	80	80	81	82	82	82	84	83	83	84	84	85	85	84	84	84	84	85	84	84	82.8	85																			
26-Dec	83	82	82	81	80	80	80	79	80	80	80	81	81	82	83	83	84	84	84	84	84	84	84	84	82.1	84																			
27-Dec	84	84	84	84	83	83	83	83	84	83	83	83	82	83	83	84	84	85	85	84	84	84	83	83	83.6	85																			
28-Dec	83	84	85	85	86	87	88	87	84	83	84	84	82	74	76	84	85	85	85	85	85	85	85	85	84.1	88																			
29-Dec	84	85	85	85	85	85	89	89	87	89	89	88	88	86	85	87	86	85	85	86	84	85	85	85	86.2	89																			
30-Dec	83	82	82	81	81	84	87	88	88	88	86	83	80	75	73	81	82	83	85	84	83	82	82	87	82.9	88																			
31-Dec	83	84	83	80	82	80	81	77	70	63	63	60	57	53	54	59	61	61	60	60	61	61	59	58	67.0	84																			
																			82.9	82.5	82.2	81.9	82.4	82.6	82.9	83.0	82.9	81.3	80.1	78.8	78.3	77.2	77.8	79.5	80.5	80.7	81.8	82.5	83.6	84.1	83.8	83.7	Diurnal Average		
																			96	96	96	95	95	96	97	97	97	97	96	96	96	96	96	96	96	96	97	97	97	97	97	97	97	Diurnal Maximum	



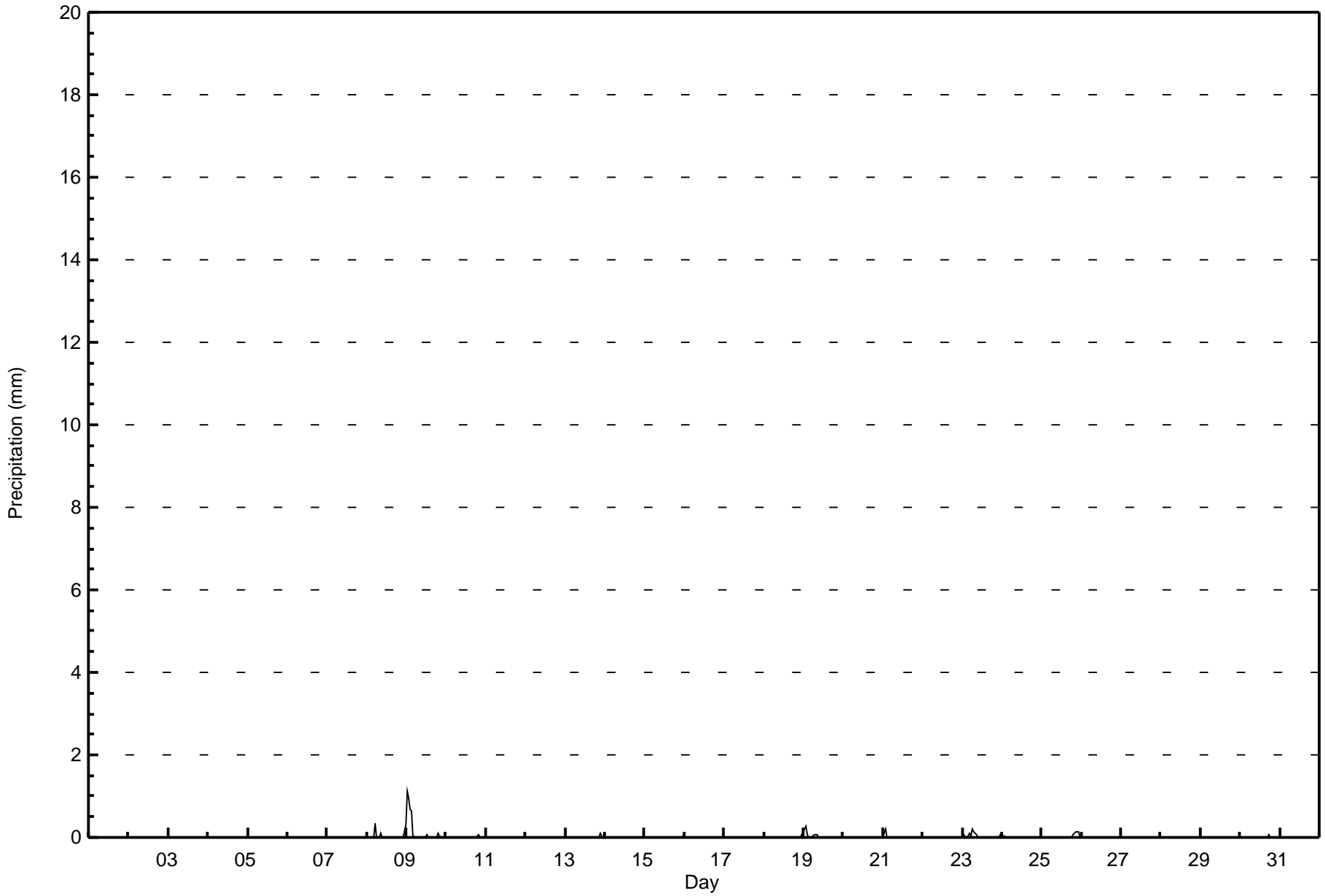


Maximum Value: 1.1 mm on Dec 9 01:00																			Maximum Daily Total: 3.7 mm on Dec 9						Hours in Service: 744																								
Minimum Value: 0.0 mm on Dec 1 01:00																			Minimum Daily Total: 0.0 mm on Dec 1						Hours of Data: 744																								
Maximum Diurnal Total: 1.6 mm at hour 2																			Minimum Diurnal Total: 0.0 mm at hour 10						Hours of Missing Data: 0																								
Monthly Total: 7.16 mm																			Percentiles: P <sub>1</sub> = 0.0 P <sub>10</sub> = 0.0 Q <sub>1</sub> = 0.0 Median = 0.0 Q <sub>3</sub> = 0.0 P <sub>90</sub> = 0.0 P <sub>99</sub> = 0.3						Hours of Calibration: 0																								
																									Percent Operational Time: 100.0																								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
2-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
3-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
4-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
5-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
6-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
7-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
8-Dec	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.7	0.3															
9-Dec	1.1	1.0	0.7	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	1.1															
10-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1															
11-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
12-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
13-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1														
14-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
15-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1														
16-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
17-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
18-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1														
19-Dec	0.2	0.3	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.3															
20-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
21-Dec	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2														
22-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
23-Dec	0.1	0.1	0.0	0.1	0.1	0.0	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.8	0.2														
24-Dec	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1														
25-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.2	0.2	0.2														
26-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
27-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
28-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
29-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
30-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1														
31-Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
																								1.5	1.6	0.7	0.7	0.2	0.4	0.3	0.2	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.2	0.2	0.2	0.5	Diurnal Average	
																								1.1	1.0	0.7	0.6	0.1	0.3	0.2	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.1	0.1	0.3	Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Precipitation (PC) - mm**  
**Conklin Lookout - December 2015**







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Precipitation (PC) - mm**  
**Conklin Lookout - December 2015**

<b>Concentration Ranges (mm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	740	99.46	99.46
0.4 - 0.5	0	0.00	99.46
0.6 - 0.7	2	0.27	99.73
0.8 - 1.4	2	0.27	100.00
1.5 - 10	0	0.00	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 744

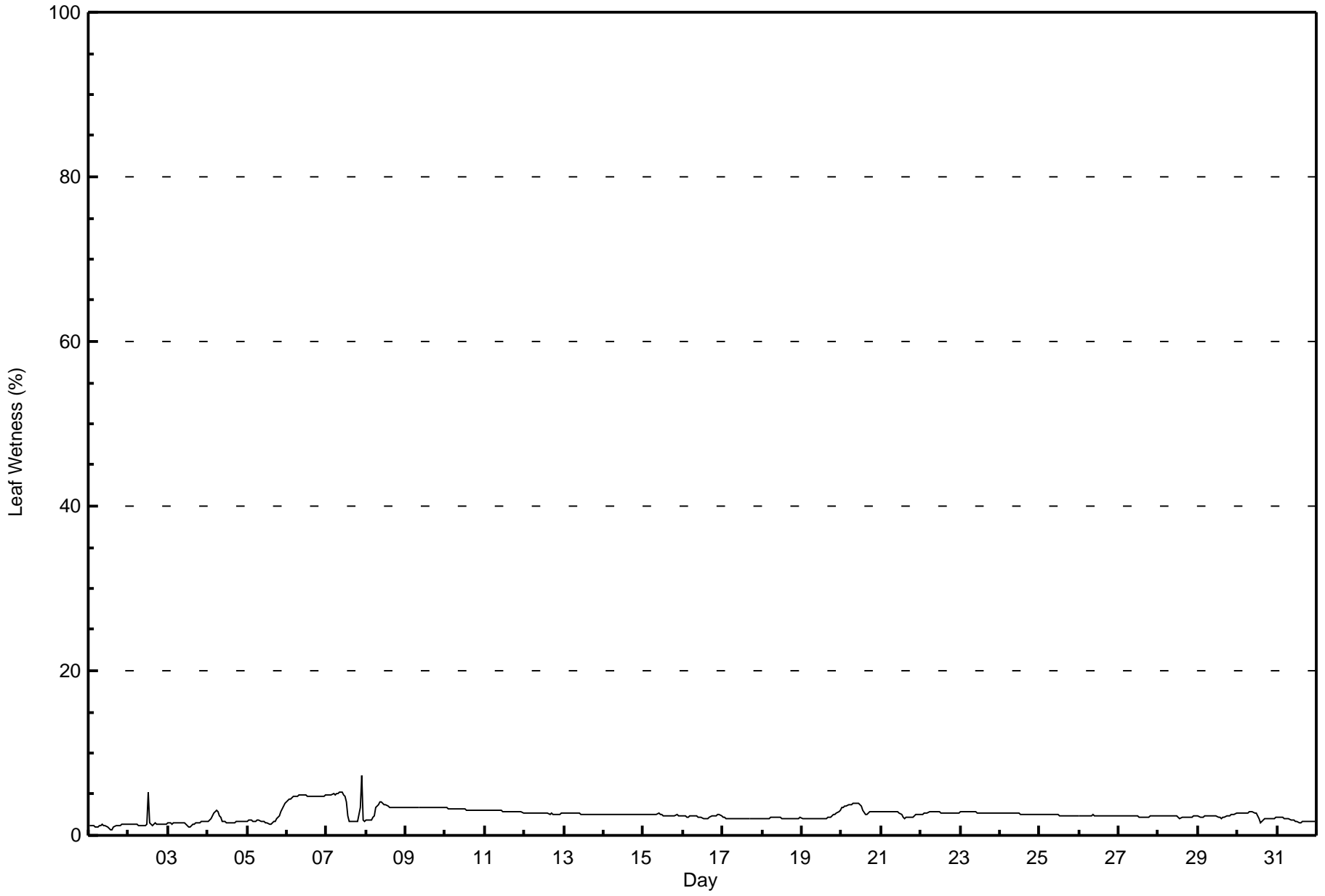
Total Number of Hours: 744



Summary of Hour Averages

Conklin Lookout - December 2015

Maximum Value: 7 % on Dec 7 22:00														Maximum Daily Average: 4.7 % on Dec 6														Hours in Service: 744	
Minimum Value: 1 % on Dec 1 15:00														Minimum Daily Average: 1.1 % on Dec 1														Hours of Data: 744	
Maximum Diurnal Average: 2.7 % at hour 9														Minimum Diurnal Average: 2.2 % at hour 15														Hours of Missing Data: 0	
Monthly Average: 2.5 %														Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 2 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 3 P <sub>99</sub> = 5														Hours of Calibration: 0	
																												Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	1			
2-Dec	1	1	1	1	1	1	1	1	1	1	1	1	5	1	1	1	1	1	1	1	1	1	1	1	1.5	5			
3-Dec	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1.5	2			
4-Dec	2	2	2	2	3	3	3	2	2	2	2	2	2	2	1	1	1	2	2	2	2	2	2	2	1.9	3			
5-Dec	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2	2	2	2	2	3	3	4	4	2.0	4			
6-Dec	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4.7	5			
7-Dec	5	5	5	5	5	5	5	5	5	5	5	5	4	2	2	2	2	2	2	2	3	7	2	2	3.8	7			
8-Dec	2	2	2	2	2	2	3	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3.1	4			
9-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3.4	3			
10-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3.2	3			
11-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.9	3			
12-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.7	3			
13-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.6	3			
14-Dec	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2.5	3			
15-Dec	2	2	2	2	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2.5	3			
16-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.3	2			
17-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.0	2			
18-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.1	2			
19-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	2.2	3			
20-Dec	3	3	4	4	4	4	4	4	4	4	4	4	4	3	2	3	3	3	3	3	3	3	3	3	3.3	4			
21-Dec	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2.6	3			
22-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.8	3			
23-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.8	3			
24-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.6	3			
25-Dec	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2.5	3			
26-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.4	2			
27-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.3	2			
28-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.3	2			
29-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	2.3	3			
30-Dec	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2.4	3			
31-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	1.8	2			
2.5														2.5														Diurnal Average	
5														5														Diurnal Maximum	





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Leaf Wetness (LW) - %**  
**Conklin Lookout - December 2015**

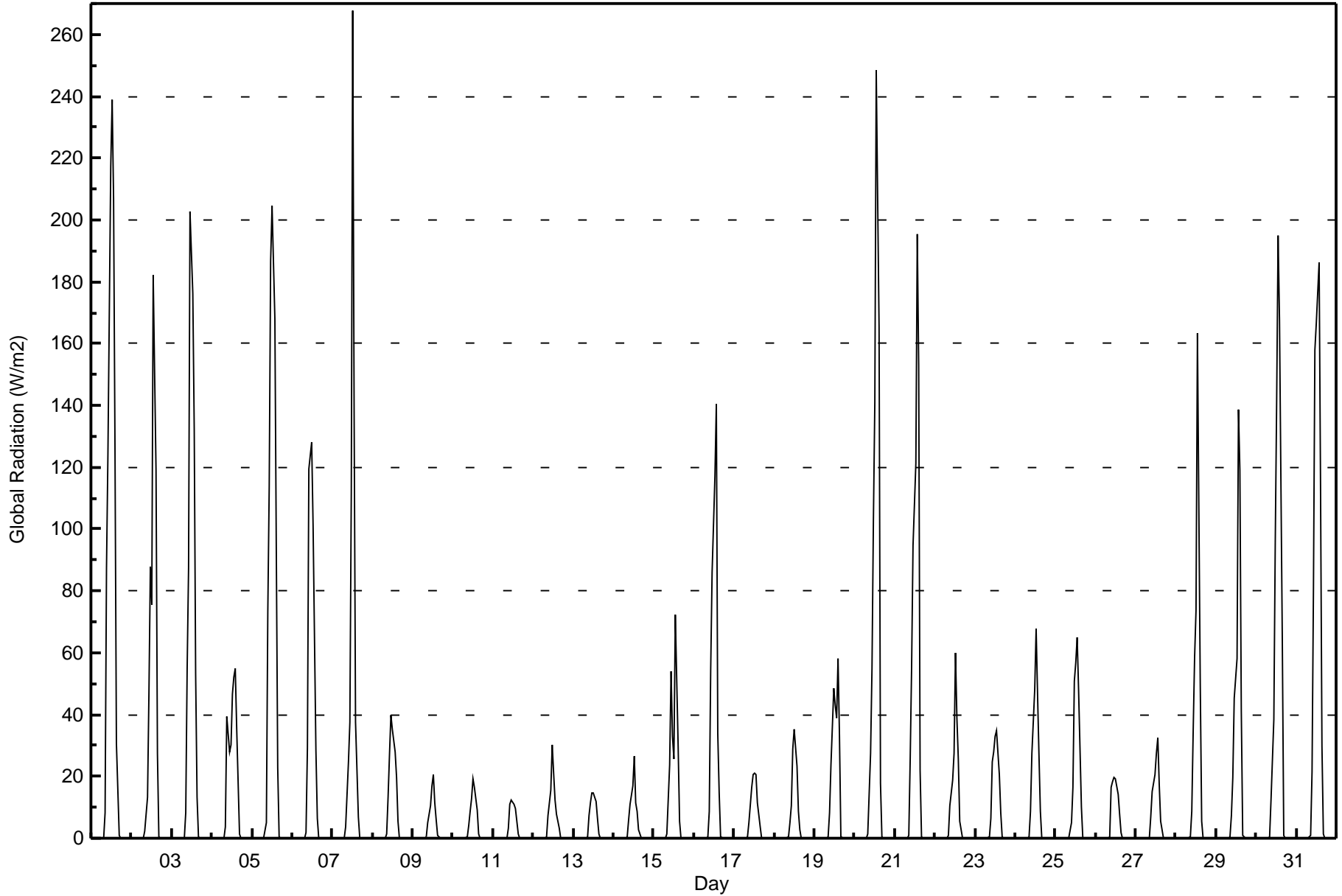
<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 0.3	0	0.00	0.00
0.4 - 0.5	0	0.00	0.00
0.6 - 0.7	1	0.13	0.13
0.8 - 1.4	56	7.53	7.66
1.5 - 10	678	91.13	98.79
> 10	0	0.00	98.79

Total Number of Valid Hours: 744

Total Number of Hours: 744



Maximum Value: 268 W/m2 on Dec 7 13:00      Maximum Daily Average: 43.4 W/m2 on Dec 1																		Hours in Service: 744 Hours of Data: 744								
Minimum Value: 0 W/m2 on Dec 1 01:00      Minimum Daily Average: 2.3 W/m2 on Dec 11 Maximum Diurnal Average: 87.1 W/m2 at hour 14      Minimum Diurnal Average: 0.0 W/m2 at hour 19 Monthly Average: 15.0 W/m2      Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 8 P <sub>90</sub> = 46 P <sub>99</sub> = 201																		Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	0	0	0	0	8	87	124	217	239	207	126	30	1	0	0	0	0	0	0	0	43.4	239
2-Dec	0	0	0	0	0	0	0	0	2	13	47	88	76	182	119	28	1	0	0	0	0	0	0	0	23.1	182
3-Dec	0	0	0	0	0	0	0	0	8	55	87	203	176	132	53	13	1	0	0	0	0	0	0	0	30.4	203
4-Dec	0	0	0	0	0	0	0	0	3	39	28	30	47	52	55	36	1	0	0	0	0	0	0	0	12.1	55
5-Dec	0	0	0	0	0	0	0	0	5	73	114	187	204	168	93	23	0	0	0	0	0	0	0	0	36.2	204
6-Dec	0	0	0	0	0	0	0	0	2	29	119	128	101	64	28	6	0	0	0	0	0	0	0	0	19.9	128
7-Dec	0	0	0	0	0	0	0	0	4	25	38	111	268	138	38	7	0	0	0	0	0	0	0	0	26.1	268
8-Dec	0	0	0	0	0	0	0	0	1	13	27	40	35	28	20	5	0	0	0	0	0	0	0	0	7.1	40
9-Dec	0	0	0	0	0	0	0	0	0	5	11	17	21	11	6	1	0	0	0	0	0	0	0	0	3.0	21
10-Dec	0	0	0	0	0	0	0	0	0	4	9	13	19	17	9	2	0	0	0	0	0	0	0	0	3.0	19
11-Dec	0	0	0	0	0	0	0	0	0	3	11	12	11	10	6	2	0	0	0	0	0	0	0	0	2.3	12
12-Dec	0	0	0	0	0	0	0	0	0	7	15	30	21	12	8	3	0	0	0	0	0	0	0	0	4.1	30
13-Dec	0	0	0	0	0	0	0	0	0	7	11	15	15	12	6	1	0	0	0	0	0	0	0	0	2.8	15
14-Dec	0	0	0	0	0	0	0	0	1	6	11	17	27	12	9	3	0	0	0	0	0	0	0	0	3.5	27
15-Dec	0	0	0	0	0	0	0	0	1	24	54	33	26	72	30	6	0	0	0	0	0	0	0	0	10.2	72
16-Dec	0	0	0	0	0	0	0	0	0	9	54	86	117	140	34	15	1	0	0	0	0	0	0	0	19.0	140
17-Dec	0	0	0	0	0	0	0	0	0	5	16	21	21	20	12	4	0	0	0	0	0	0	0	0	4.2	21
18-Dec	0	0	0	0	0	0	0	0	0	5	11	29	35	23	9	3	0	0	0	0	0	0	0	0	4.8	35
19-Dec	0	0	0	0	0	0	0	0	1	8	24	49	43	39	58	34	1	0	0	0	0	0	0	0	10.6	58
20-Dec	0	0	0	0	0	0	0	0	1	27	55	103	141	249	165	18	0	0	0	0	0	0	0	0	31.6	249
21-Dec	0	0	0	0	0	0	0	0	1	26	56	95	121	196	153	22	0	0	0	0	0	0	0	0	27.9	196
22-Dec	0	0	0	0	0	0	0	0	1	10	19	27	60	39	26	6	0	0	0	0	0	0	0	0	7.8	60
23-Dec	0	0	0	0	0	0	0	0	0	7	25	28	33	35	20	8	0	0	0	0	0	0	0	0	6.5	35
24-Dec	0	0	0	0	0	0	0	0	1	9	27	48	68	46	27	9	0	0	0	0	0	0	0	0	9.8	68
25-Dec	0	0	0	0	0	0	0	0	0	5	17	51	57	65	48	10	0	0	0	0	0	0	0	0	10.5	65
26-Dec	0	0	0	0	0	0	0	0	1	16	18	20	19	14	8	2	0	0	0	0	0	0	0	0	4.1	20
27-Dec	0	0	0	0	0	0	0	0	0	7	15	20	27	33	18	5	0	0	0	0	0	0	0	0	5.2	33
28-Dec	0	0	0	0	0	0	0	0	1	9	35	58	74	163	49	5	0	0	0	0	0	0	0	0	16.4	163
29-Dec	0	0	0	0	0	0	0	0	0	7	20	45	58	139	119	41	1	0	0	0	0	0	0	0	18.0	139
30-Dec	0	0	0	0	0	0	0	0	1	12	38	96	142	195	168	63	1	0	0	0	0	0	0	0	29.8	195
31-Dec	0	0	0	0	0	0	0	0	1	21	81	158	167	186	114	30	2	0	0	0	0	0	0	0	31.6	186
0.0																								Diurnal Average		
0																								Diurnal Maximum		





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Global Radiation (GR) - W/m2**  
**Conklin Lookout - December 2015**

<b>Concentration Ranges (W/m2)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	614	82.53	82.53
21 - 100	91	12.23	94.76
101 - 300	39	5.24	100.00
301 - 600	0	0.00	100.00
601 - 900	0	0.00	100.00
> 900	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



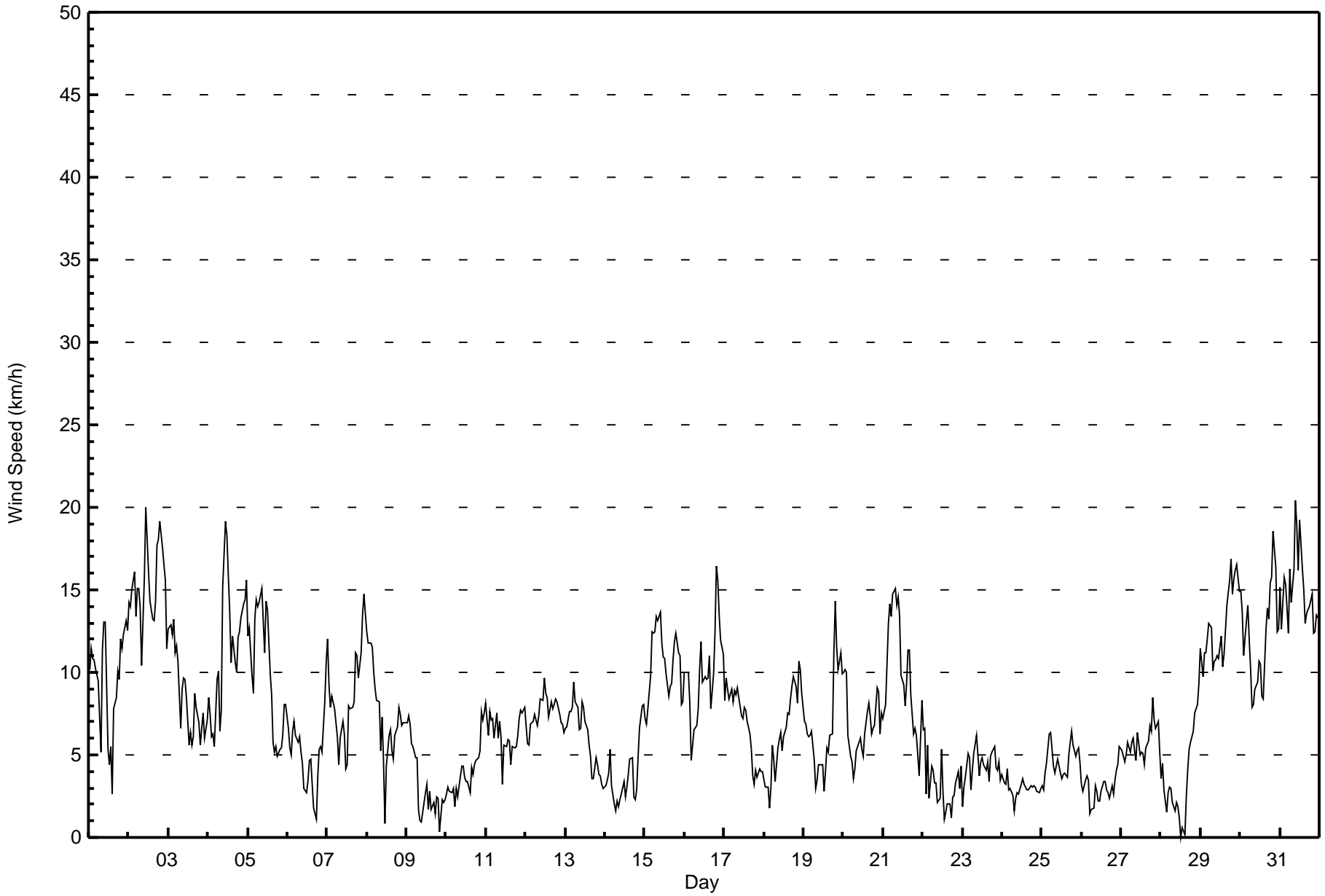
Maximum Speed: 20 km/h on Dec 31 10:00	Maximum Daily Speed Average: 14.4 km/h on Dec 2	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 28 13:00	Minimum Daily Speed Average: 0.7 km/h on Dec 22	Hours of Data: 744
Maximum Diurnal Speed Average: 4.7 km/h at hour 24	Minimum Diurnal Speed Average: 2.6 km/h at hour 14	Hours of Missing Data: 0
Monthly Average Velocity: 3.6 km/h 227.1 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 4 Median = 7 Q <sub>3</sub> = 10 P <sub>90</sub> = 14 P <sub>99</sub> = 18	Percent Operational Time: 100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	W10	W11	W11	W11WNW10	W10	WSW7	WSW5	SW11	SW13	SW13	WSW5	SSW4	SSW5	SW3	W8	WSW9	WSW10	WSW10	W12	SW11	SW12	SW13	SW13	WSW8.7	SW13		
2-Dec	SW14	SW14	SW15	SW16	SW13	SSW15	SSW15	SSW14	S10	SSW16	SSW20	SW18	WSW16	W14	SW13	SW13	SW14	WSW18	WSW18	WSW19	WSW18	WSW17	WSW16	SW11	SW14.4	SSW20	
3-Dec	SW13	WSW13	WSW12	SW13	SW11	SW12	SW11	SSW7	SSE9	S10	SSE10	SE9	SE6	SE6	S6	SSE6	SSE9	SSE8	S7	SSE6	SSE7	SSE8	S6	S7	S7.1	SW13	
4-Dec	SSW8	SSW7	SSW6	SSW6	SSW6	SSW10	SSW10	SW6	SW8	W15	WNW19	WNW18	WNW16	WNW14	WNW11	W12	W11	WSW10	SW12	SW12	SW13	SW14	SW14	SW16	WSW9.1	WNW19	
5-Dec	SW12	SW13	SW10	WSW9	W13	W14	W14	W14	WNW15	WNW13	W11	W14	W14	W10	W9	W6	WSW5	SW6	SW5	SSW5	S5	SE6	SSE8	SSE8	WSW7.7	WNW15	
6-Dec	SSE7	SE5	E5	ENE6	NE7	NE6	N6	NNE6	NE5	NE4	NNE3	NE3	ENE3	ESE5	ESE5	ESE3	NNW2	NW1	S4	SW5	SW6	SW5	SSW8	SW11	ESE1.3	SW11	
7-Dec	SW12	SW9	SW8	SSW9	SSW8	SSW7	S6	SSE4	SSE6	S7	S6	S4	SW4	SSW8	SSW8	SW8	WSW8	WSW11	WSW11	WSW10	WSW11	W14	W15	W14	SW7.3	W15	
8-Dec	W12	W12	WNW12	WNW11	WNW10	NW9	NW8	NW8	NW5	NW7	WNW5	N1	S4	SSE6	SSE7	SSE5	SSE5	ESE6	ESE7	ESE8	E7	E7	ESE7	E7	WNW1.3	WNW12	
9-Dec	E7	E7	E7	E6	ENE5	E5	E5	ENE2	NNW1	ESE1	NNE2	NW3	WSW3	WNW2	NW3	NW2	N2	NE1	E2	ESE2	WNW0	S2	SSW2	W2	ENE1.6	E7	
10-Dec	NW3	WNW3	WNW3	N3	N3	N2	NE3	ESE2	ESE4	ESE4	SE4	SE4	ESE3	E3	SE3	ENE4	E4	ESE4	ESE5	ESE5	SE5	SSE8	SSE7	SSE8	ESE2.5	SSE8	
11-Dec	SSE8	SSE6	SSE8	SSE7	SSE7	SSE6	SSE8	SSE6	S7	SSE6	SE3	SSE6	SE6	SE6	SE6	SE4	SE6	SSE5	SE5	SE6	SSE7	SSE8	SSE8	S8	SSE6.2	SSE8	
12-Dec	S7	S6	SSE6	SSE7	SSE7	SSE7	SSE7	S7	SSE7	SSE8	SSE8	SSE10	SSE9	SSE8	SSE7	SE8	SSE8	SSE8	SSE8	SE8	SSE7	SE7	SE7	SE6	SSE7.4	SSE10	
13-Dec	SE7	ESE7	SE8	SE8	ESE8	ESE9	SE8	ESE8	ESE7	ESE7	ESE8	ESE7	SE7	ESE6	ESE5	E4	ENE4	NE5	NE4	NNE4	N4	NNE3	NNE3	NNE3	ESE5.1	ESE9	
14-Dec	NNE3	NNE3	NNE4	NNE5	NNE3	N2	NNW2	NNW2	NW2	W2	WNW3	WNW3	WNW2	W3	SSW4	SW5	SW5	SSW2	SSW2	SSW3	SSW5	SSW7	SSW8	SW8	WSW1.5	SW8	
15-Dec	SSW7	SSW7	SSW8	SSW10	SSW12	SSW12	SSW12	SSW13	SW13	SW14	SW12	WSW11	WSW11	W10	WSW9	W9	W9	W11	W12	W12	W11	W11	WNW8	WNW8	WSW9.0	SW14	
16-Dec	NW10	NW10	NW10	NW8	NNW5	NW6	NW7	NW7	NW8	WNW10	NW12	NW9	WNW10	WNW10	NW10	NW11	NW8	WNW10	W12	WNW16	WNW16	WNW14	NW12	NW11	WNW9.7	WNW16	
17-Dec	NW8	NW10	NW9	NW8	NW9	NW8	NW9	NW9	NW9	NW8	NW7	NW7	NW8	NW8	NW7	NW6	NW5	NNW4	NNW3	NW4	NNW4	NW4	NNW4	NW4	NW4	NW6.8	NW10
18-Dec	NW3	WNW3	N3	N2	NE3	ENE6	NE5	E3	ESE5	ESE6	ESE6	ESE5	E6	E7	ESE8	ESE7	E8	ESE9	ESE10	ESE9	ESE8	SE11	ESE10	ESE9	ESE5.3	SE11	
19-Dec	ESE7	E7	ENE6	ENE6	ENE6	ESE6	ESE5	ESE3	E3	SE4	SSE4	S4	S3	S4	S5	S5	SSE6	S6	SSW11	SSW14	S11	S10	S11	S10	SSE4.8	SSW14	
20-Dec	S10	SSW10	S10	S6	S5	S5	S4	S4	S5	S6	S6	S5	S5	SSE6	SSE8	SSE8	SSE7	SSE6	SSE7	S7	S9	S9	S6	S8	S6.6	SSW10	
21-Dec	SSW7	SW8	SSW11	SSW13	SW14	SW13	SW15	SW15	SSW14	SSW15	SSW13	SW10	SSW9	SSW8	SSW9	SSW11	SW11	SW9	SW6	SSW7	SW6	SW5	WSW4	SW8	SW10.0	SW15	
22-Dec	SW6	WNW7	WNW3	SW6	W2	NW4	NW4	NW3	NW3	NW2	N2	NE5	E3	NNW1	NW2	N2	NNE2	SE1	SSE2	ENE3	ENE3	ENE4	E3	SE4	NNW0.7	WNW7	
23-Dec	NNE2	NE3	ENE4	NE5	NE5	NNE3	NNE4	NNE5	NNE6	NE5	ENE4	NE5	NE5	NNE4	NNE4	NNE5	NNE3	NNE5	NNE5	NE5	NNE4	NNE4	NNE5	NNE4	NNE4.2	NNE6	
24-Dec	NNE4	NNE3	NNE3	NNE4	NNE3	NNE3	NNE3	N2	NNW2	NNW3	NNW3	NW3	NW4	NW3	NW3	NW3	NW3	NW3	NW3	NW3	NW3	WNW3	W3	SW3	NNW2.3	NNE4	
25-Dec	W3	WSW3	SW4	SW5	SW6	WSW5	SW4	SW4	SW5	W4	WSW4	SSW4	SSW4	SSW4	SSW4	SSW4	SSW5	SSW6	SSW6	SSW6	SW5	W5	WNW5	WNW4	SW4.2	SW6	
26-Dec	NW3	NW3	NW3	NW4	NW3	NW1	SW2	SSW2	WSW3	W3	SW2	SSW2	S3	S3	S3	SSE3	SSE3	SSE2	SE3	SE3	SE3	SE3	SSE4	SE4	SE6	SSW1.2	SE6
27-Dec	SE5	SSE5	SSE5	SSE5	SSE6	SSE5	SE6	SE6	SSE5	SSE5	S6	S5	S5	S5	S4	SSW5	SSW6	SSW7	SSW6	SSW8	SW7	SSW7	SW7	SW5	S5.1	SSW8	
28-Dec	WNW4	WNW4	NW3	SW2	SW3	W3	WNW3	WSW2	SSW2	S2	S2	SE1	W0	N1	S0	S2	SSW4	SSW5	SSW6	SSW6	SSW8	SSW8	SW8	SW9	SW3.0	SW9	
29-Dec	SW11	SW10	SSW11	SSW11	SSW12	SW13	SW13	SW10	SSW11	SSW11	SSW11	SW11	SW12	SSW10	SSW11	SSW13	SW14	SW16	SW17	SW15	SW16	SW16	SW17	SW15	SW12.7	SW17	
30-Dec	SW15	SW14	SW11	WSW12	W14	W12	WNW10	WNW8	WNW8	NW9	WNW9	WNW11	NW10	WNW9	W8	WNW13	WNW14	W13	W15	W16	W19	W16	WSW12	SW13	W11.1	W19	
31-Dec	WSW15	SW13	SW16	SW15	SW14	SW12	SW16	SW14	WSW16	W20	W19	WNW16	WNW19	WNW16	WNW15	NW13	NW14	WNW14	WNW14	WNW15	WNW12	WNW12	WNW13	W13	W12.9	W20	

SW4.6 SW4.1 SW3.6 SW3.5 SW3.2 SW3.4 SW3.4 SW3.0 SW2.9 SW3.9 SW3.7 WSW3.0 WSW3.0 WSW2.6 SW2.8 SW2.9 SW3.2 SW3.8 SW4.2 SW4.4 SW4.6 SW4.6 SW4.7 SW4.7	Diurnal Average
WSW15 SW14 SW16 SW16 SW14 SSW15 SW16 SW15 WSW16 W20 SSW20 WNW18 WNW19 WNW16 WNW15 SW13 SW14 WSW18 WSW18 WSW19 W19 WSW17 SW17 SW16	Diurnal Maximum

All monthly, daily, and diurnal averages have been calculated using vector methods







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Conklin Lookout - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	286	38.44	38.44
6 - 11	321	43.15	81.59
12 - 19	135	18.15	99.73
20 - 28	2	0.27	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Conklin Lookout - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	12	33	17	10	11	17	16	17	27	21	20	10	11	16	35	13	286
6 - 11	1	2	2	5	11	26	22	56	29	46	37	15	16	17	36	0	321
12 - 19	0	0	0	0	0	0	0	0	0	16	53	13	25	24	4	0	135
20 - 28	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	13	35	19	15	22	43	38	73	56	84	110	38	53	57	75	13	744

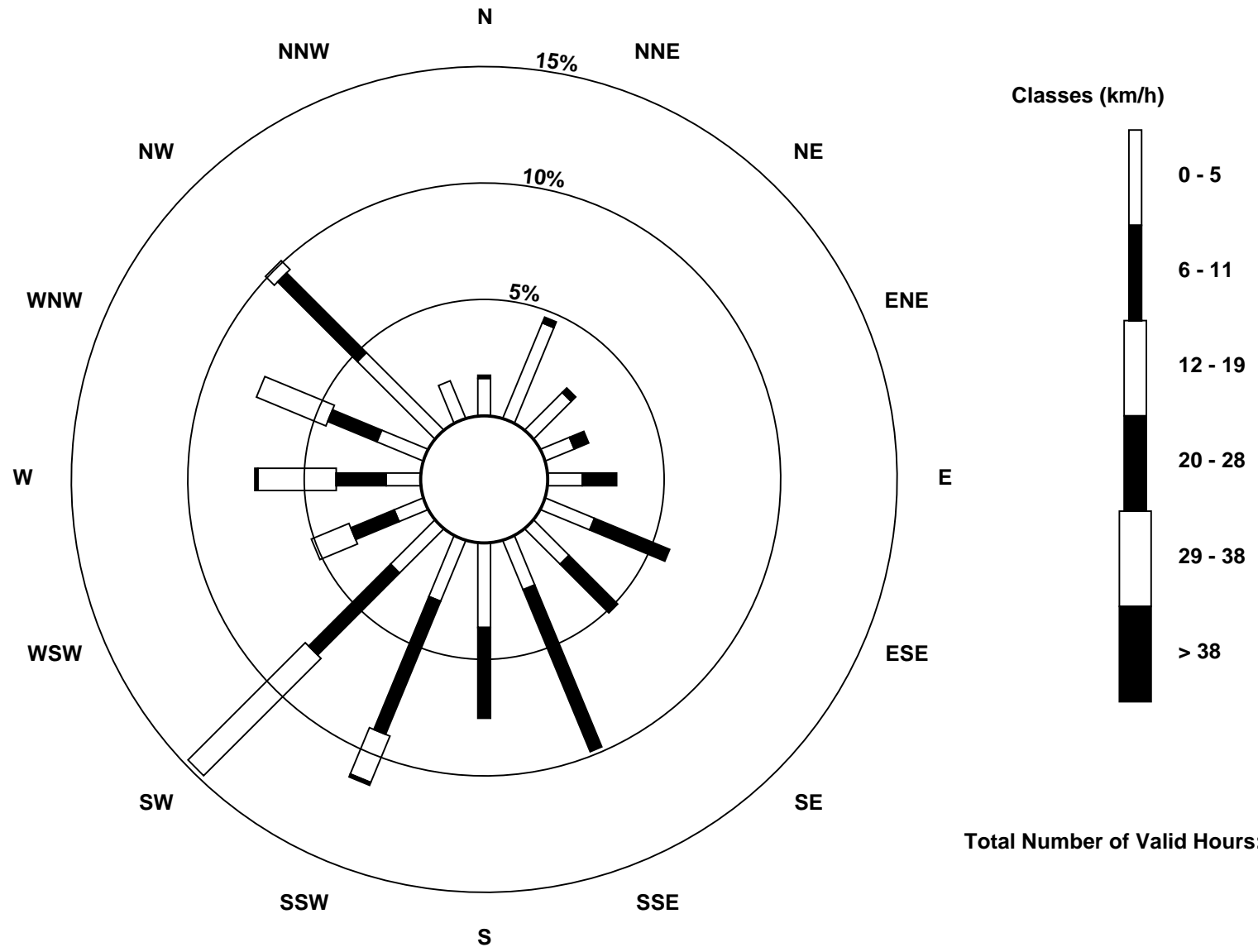
Total Number of Valid Hours: 744

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
Conklin Lookout (AMS 18)





Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Dec 4 10:00 Minimum Value: 1 km/h on Dec 25 00:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 3 P <sub>90</sub> = 4 P <sub>99</sub> = 6														Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0											
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	3	3	3	3	2	2	2	2	3	2	4	2	2	3	2	3	2	3	4	4	2	2	3	3	4
2-Dec	3	3	4	4	3	4	4	3	2	4	5	5	5	5	4	3	4	5	5	6	5	5	5	3	6
3-Dec	3	4	4	3	2	2	2	2	2	2	2	2	2	2	2	2	3	3	2	1	1	1	1	2	4
4-Dec	2	2	2	2	2	2	2	3	3	7	6	6	6	4	3	4	3	3	3	3	3	3	3	4	7
5-Dec	3	2	2	3	4	5	4	5	5	5	4	4	4	3	3	2	2	2	1	1	1	1	2	2	5
6-Dec	1	2	1	2	2	2	1	1	2	2	1	1	2	2	1	1	1	1	1	2	3	2	3	3	3
7-Dec	4	2	2	2	1	3	2	2	3	3	2	3	3	3	2	2	3	3	3	2	3	4	4	4	4
8-Dec	4	4	4	4	4	3	3	2	2	3	2	1	2	2	2	2	2	2	2	2	2	2	2	2	4
9-Dec	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
10-Dec	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	2	2	2	2
11-Dec	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	1	2	2	2	2	2	2	2	3	3
12-Dec	2	2	2	2	2	2	2	2	2	2	2	3	3	3	2	2	2	2	2	2	2	2	2	1	3
13-Dec	2	2	2	2	2	3	2	2	2	2	3	3	2	2	2	2	1	1	1	1	1	1	1	1	3
14-Dec	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2
15-Dec	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	4	3	3	2	3	4
16-Dec	3	3	3	3	2	2	2	3	2	3	4	3	3	3	4	4	2	3	4	5	5	4	4	4	5
17-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	1	1	1	1	1	1	1	3
18-Dec	1	1	1	1	2	2	1	1	2	2	2	1	2	2	2	2	2	3	3	3	2	3	3	2	3
19-Dec	2	2	1	2	2	2	1	1	1	1	1	1	1	2	1	1	1	2	4	5	3	3	3	3	5
20-Dec	3	3	3	2	1	1	1	1	1	1	2	1	2	2	2	2	2	2	2	2	3	3	2	2	3
21-Dec	3	3	3	3	3	3	3	3	4	3	3	2	2	2	2	2	2	3	3	2	3	2	2	2	4
22-Dec	2	2	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	2	1	1	2
23-Dec	1	1	1	1	2	1	1	2	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	2
24-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
25-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	2
26-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
27-Dec	1	1	1	1	2	2	2	2	2	1	2	2	1	2	1	2	2	2	2	3	2	2	2	2	3
28-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	3	3
29-Dec	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4
30-Dec	3	3	3	4	4	4	3	2	2	2	2	3	3	3	2	4	4	4	4	5	5	5	4	3	5
31-Dec	4	3	3	3	3	3	4	4	5	6	6	5	6	5	5	4	4	4	4	4	4	4	4	4	6
														Diurnal Maximum											
														4 4 4 4 4 5 4 5 5 7 6 6 6 5 5 4 4 5 5 6 5 5 5 4											



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Wind Direction (WD) - deg**

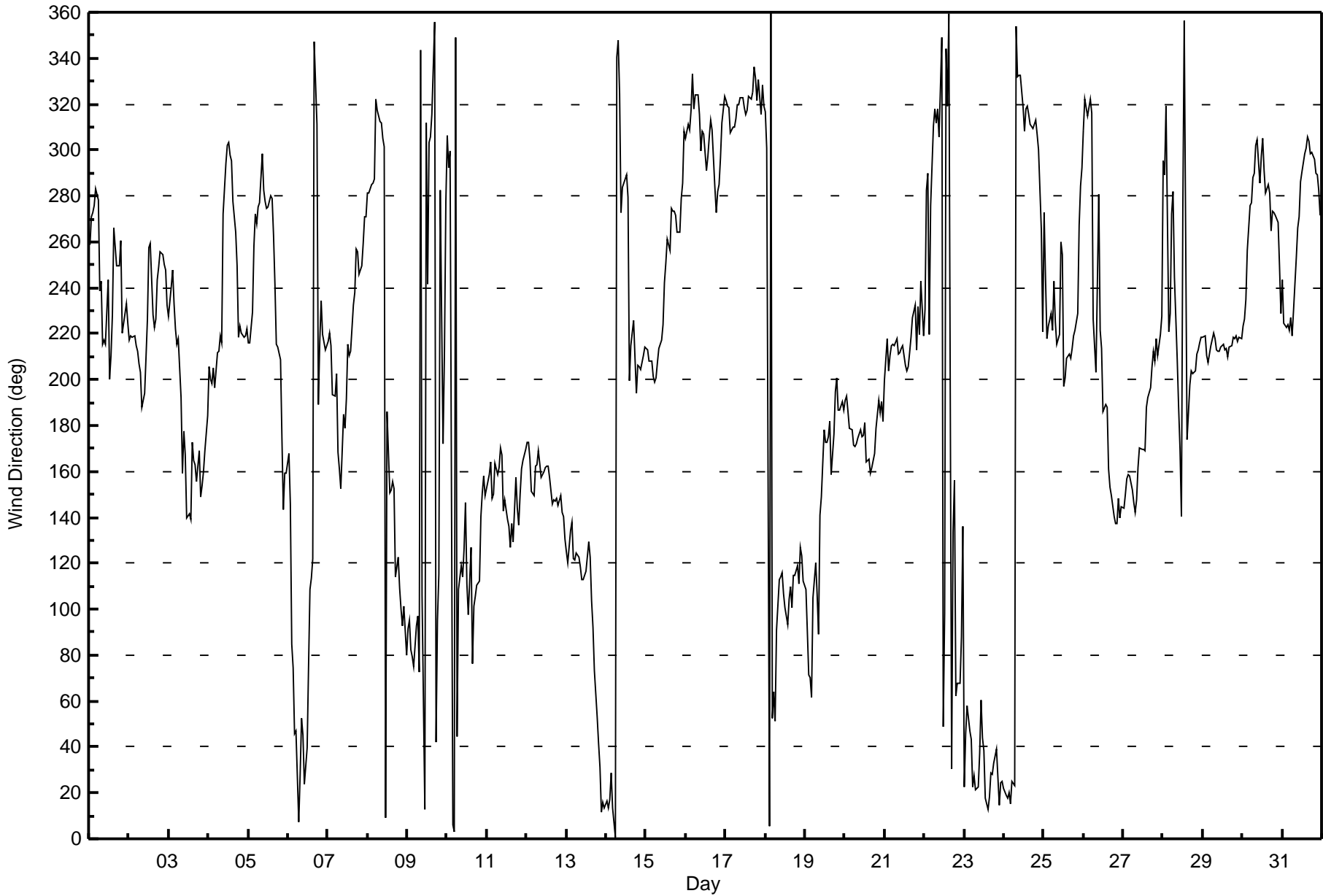
**Conklin Lookout - December 2015**

Direction of Maximum Speed: 266 deg on Dec 31 10:00		Hours in Service:	744
Direction of Maximum Daily Speed Average: 228.6 deg on Dec 2		Hours of Data:	744
Direction of Minimum Speed: 274 deg on Dec 28 13:00		Hours of Missing Data:	0
Direction of Minimum Daily Speed Average: 0.7 deg on Dec 22		Percent Operational Time:	100.0
Monthly Average Direction: 243.2 deg			

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	259	271	273	276	283	278	238	243	215	217	215	244	200	211	228	266	250	250	250	261	220	225	233	224	243.8
2-Dec	217	219	218	219	215	213	207	203	188	194	210	226	258	260	228	223	226	244	249	255	255	250	248	232	228.6
3-Dec	228	241	248	233	222	215	218	192	159	178	167	140	141	139	173	164	163	156	169	149	154	160	169	184	189.3
4-Dec	206	200	198	205	197	211	212	219	216	272	294	302	303	298	296	278	264	249	219	224	220	219	219	222	246.5
5-Dec	216	216	230	258	272	268	275	277	298	282	278	275	275	280	279	263	242	215	214	208	174	144	160	160	254.3
6-Dec	168	146	85	74	46	47	7	28	52	45	23	40	75	109	113	122	347	311	189	217	234	220	213	215	108.0
7-Dec	217	220	215	193	193	203	169	161	153	185	179	191	216	210	213	232	238	257	256	246	249	259	271	271	226.5
8-Dec	281	281	285	286	287	322	317	313	312	305	301	9	186	150	152	156	153	114	123	109	100	93	102	80	285.8
9-Dec	92	95	83	80	75	93	97	73	344	106	13	312	242	303	306	316	356	42	95	115	283	172	212	277	78.6
10-Dec	306	292	300	6	3	349	44	108	119	114	126	146	111	98	127	76	101	106	110	112	140	151	158	149	117.5
11-Dec	153	158	164	148	150	164	159	162	170	167	143	148	139	136	127	137	130	157	144	137	150	161	165	169	152.9
12-Dec	173	173	165	151	150	163	163	169	164	158	160	162	162	162	157	146	147	147	148	145	150	142	141	130	155.2
13-Dec	125	120	135	138	122	121	125	123	119	113	114	117	130	122	104	92	73	53	41	31	11	16	13	109.1	
14-Dec	17	13	17	29	14	1	340	348	324	273	284	288	289	280	199	215	226	209	194	206	206	204	211	214	247.5
15-Dec	213	213	208	208	201	199	201	207	214	217	224	242	251	261	257	275	274	273	272	264	264	279	285	308	240.0
16-Dec	305	311	309	317	333	318	324	324	316	300	308	307	291	297	306	313	309	284	273	282	285	297	312	323	303.1
17-Dec	322	319	319	308	310	310	313	320	319	323	323	318	315	317	323	322	325	336	331	321	331	316	329	319	319.0
18-Dec	316	301	5	360	52	64	52	91	113	114	116	106	101	93	104	110	101	115	115	119	111	127	123	112	103.9
19-Dec	108	91	72	70	61	105	120	106	89	141	149	178	173	173	175	182	159	176	194	201	187	187	190	187	158.3
20-Dec	191	193	186	179	178	172	171	172	175	178	175	176	181	164	165	159	162	165	168	179	191	186	190	182	177.7
21-Dec	200	218	204	211	215	216	215	218	211	211	213	215	206	204	205	212	218	227	232	213	232	220	243	219	214.4
22-Dec	231	282	290	220	276	310	318	312	318	306	349	49	98	344	319	360	31	134	156	62	68	68	88	136	328.5
23-Dec	23	46	58	47	43	23	28	21	23	37	60	44	38	18	13	18	29	28	33	39	27	15	24	25	31.6
24-Dec	22	19	17	20	15	25	23	354	332	332	318	308	318	319	315	311	309	311	313	307	300	266	221	332.9	
25-Dec	273	244	218	223	229	221	243	225	216	220	260	254	197	201	209	211	209	213	219	222	229	267	284	292	231.6
26-Dec	309	322	315	318	322	316	226	203	242	281	222	213	186	189	188	161	153	150	140	137	137	149	140	145	191.9
27-Dec	144	150	157	159	158	152	146	142	148	162	170	170	170	169	188	192	196	206	212	208	218	210	219	227	180.5
28-Dec	295	289	319	221	229	272	282	245	209	188	169	140	274	356	174	186	197	204	203	204	211	213	216	218	221.8
29-Dec	218	219	211	208	211	215	220	218	213	213	213	214	215	213	213	210	214	215	218	218	219	217	218	218	215.3
30-Dec	223	226	235	256	276	277	288	290	302	304	285	297	305	291	281	285	282	265	273	273	272	268	249	229	270.1
31-Dec	243	225	223	224	221	227	219	230	253	266	271	286	290	298	301	305	304	298	299	296	290	289	283	271	267.8

223.7 229.6 227.4 224.7 228.7 225.9 224.0 223.9 219.7 228.0 231.4 243.3 243.9 237.3 226.7 231.6 227.0 227.0 223.9 228.0 225.5 222.5 222.9 217.4  
Diurnal Average

All monthly, daily, and diurnal averages have been calculated using vector methods





Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Direction (WD) - deg

Conklin Lookout - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 94 deg on Dec 8 12:00																	Hours in Service: 744 Hours of Data: 744 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 12 deg on Dec 1 09:00																									
Percentiles: P <sub>1</sub> = 13 P <sub>10</sub> = 17 Q <sub>1</sub> = 19 Median = 22 Q <sub>3</sub> = 25 P <sub>90</sub> = 32 P <sub>99</sub> = 73																									
Day	Hourly Period Ending At (MST)																							Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
1-Dec	22	19	19	20	17	15	21	25	12	12	17	39	52	32	67	22	19	24	31	29	14	15	17	18	67
2-Dec	14	16	17	17	18	17	17	16	16	18	19	20	26	24	19	18	21	22	22	22	23	23	21	22	26
3-Dec	18	22	25	19	16	15	15	23	16	16	15	19	26	23	24	23	19	18	21	16	13	15	15	14	26
4-Dec	15	15	21	26	40	16	18	34	21	31	20	21	23	22	21	20	22	27	17	16	16	16	17	40	
5-Dec	15	14	19	34	21	23	21	23	23	24	23	25	25	21	21	21	22	22	19	13	20	13	12	15	34
6-Dec	12	29	15	17	20	29	18	21	35	33	43	41	42	25	24	29	42	77	42	30	44	22	18	14	77
7-Dec	19	21	15	12	12	17	14	16	38	23	23	53	73	25	21	21	22	23	22	22	23	24	23	24	73
8-Dec	24	26	26	24	30	23	22	20	27	25	39	94	38	29	26	23	30	20	21	23	21	20	18	19	94
9-Dec	17	17	18	19	19	22	18	62	81	81	50	31	42	64	37	60	29	76	26	31	89	24	31	38	89
10-Dec	27	24	34	18	25	30	25	36	24	27	27	24	27	30	38	22	32	19	22	20	23	21	22	21	38
11-Dec	21	19	21	22	25	27	24	24	27	26	25	28	24	27	23	23	23	27	25	20	22	23	24	24	28
12-Dec	25	24	25	21	23	24	21	20	23	21	21	22	22	22	23	20	20	19	19	18	19	20	20	18	25
13-Dec	17	17	21	19	20	19	20	20	22	21	23	24	26	30	29	29	22	18	25	20	22	26	27	30	
14-Dec	27	26	27	20	34	37	37	35	32	43	34	23	33	35	22	19	21	30	23	26	20	18	18	18	43
15-Dec	20	20	20	23	17	18	17	19	18	18	19	24	27	25	23	24	20	20	22	22	23	22	24	23	27
16-Dec	22	21	22	22	22	22	20	26	22	23	21	22	23	24	24	21	19	19	22	20	19	20	22	25	26
17-Dec	24	22	23	22	22	23	22	21	21	22	24	24	24	24	23	23	20	28	25	23	26	20	22	19	28
18-Dec	24	27	29	37	32	20	22	26	19	22	21	25	24	24	22	20	19	21	22	20	20	22	19	19	37
19-Dec	20	19	18	18	17	21	18	27	21	21	21	22	23	25	20	19	17	18	20	21	19	19	21	21	27
20-Dec	22	21	22	26	24	18	17	18	19	20	24	25	26	26	22	18	17	21	20	22	25	25	21	22	26
21-Dec	24	25	21	19	16	16	16	14	17	15	15	16	15	17	15	15	16	30	49	29	38	32	60	17	60
22-Dec	22	15	48	18	55	23	14	25	28	49	48	24	56	70	41	35	36	62	40	47	27	34	39	26	70
23-Dec	53	19	16	18	22	22	18	20	17	23	22	19	19	23	23	21	24	21	20	27	23	23	21	21	53
24-Dec	19	23	22	19	21	18	17	28	24	27	29	29	32	36	34	26	21	17	16	16	20	19	21	12	36
25-Dec	19	26	16	18	16	14	26	20	16	18	27	30	19	21	20	17	16	17	18	17	18	31	24	19	31
26-Dec	20	24	19	17	24	56	28	57	19	14	35	25	20	20	18	21	20	24	22	25	18	21	19	21	57
27-Dec	22	20	20	23	25	24	22	22	24	26	27	28	24	28	30	24	22	22	23	20	21	19	18	25	30
28-Dec	30	27	31	61	28	24	29	42	27	14	28	28	90	41	86	22	16	19	17	17	17	18	19	18	90
29-Dec	19	20	18	17	18	18	18	19	19	19	19	19	19	20	20	19	19	18	18	18	18	17	17	17	20
30-Dec	17	17	20	25	24	22	23	21	18	18	20	21	19	22	20	20	20	21	20	20	21	22	26	18	26
31-Dec	20	17	16	16	16	19	16	19	21	22	22	21	21	21	22	21	20	22	20	19	20	21	20	20	22
																	53 29 48 61 55 56 37 62 81 81 50 94 90 70 86 60 42 77 49 47 89 34 60 38								
Diurnal Maximum																									





# Wood Buffalo Environmental Association

## SO2 Calibration Report

### Station Information

Calibration Date	December 9, 2015	Last Calibration	November 10, 2015
Station Name	Conklin Lookout	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	8:30	End Time (MST)	12:47
Gas Cert Reference	EY0000368	Station temp.	22 Deg C
Cal Gas Concentration	49 ppm	Cal Gas Exp Date	10/06/2016
Calibrator Make/Model	API T700	Serial Number	1222
ZAG Make/Model	API 701	Serial Number	5610
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9035

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-601	-601
Analyzer IP address	192.168.1.43		Lamp voltage	889	895
Calculated slope	1.000843	0.999232	Chamber temp	45.1	45.2
Calculated intercept	1.489674	1.267096	Pressure	654.6	640.9
Analyzer Background	23.4	23.0	Flow	0.426	0.419
Analyzer Coefficient	0.918	0.918	Intensity	86	86

Analyzer make Thermo 43i Analyzer serial # JC1501301453

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-1.2	----
as found span	5000	58.6	574.3	571.7	1.005
calibrator zero	5000	0.0	0.0	-0.3	----
high point	5000	58.6	574.3	574.1	1.000
second point	5000	29.3	287.1	285.1	1.007
third point	5000	14.6	143.1	141.3	1.013
as left zero	5000	0.0	0.0	-0.3	----
as left span	5000	58.6	574.3	574.9	0.999
Average Correction Factor					1.007

Corrected As found 572.9 Previous response 572.3 % change -0.1%

**Notes:**

No maintenance done, Zero adjusted filter changed out

Calibration Performed By: Melissa Lemay



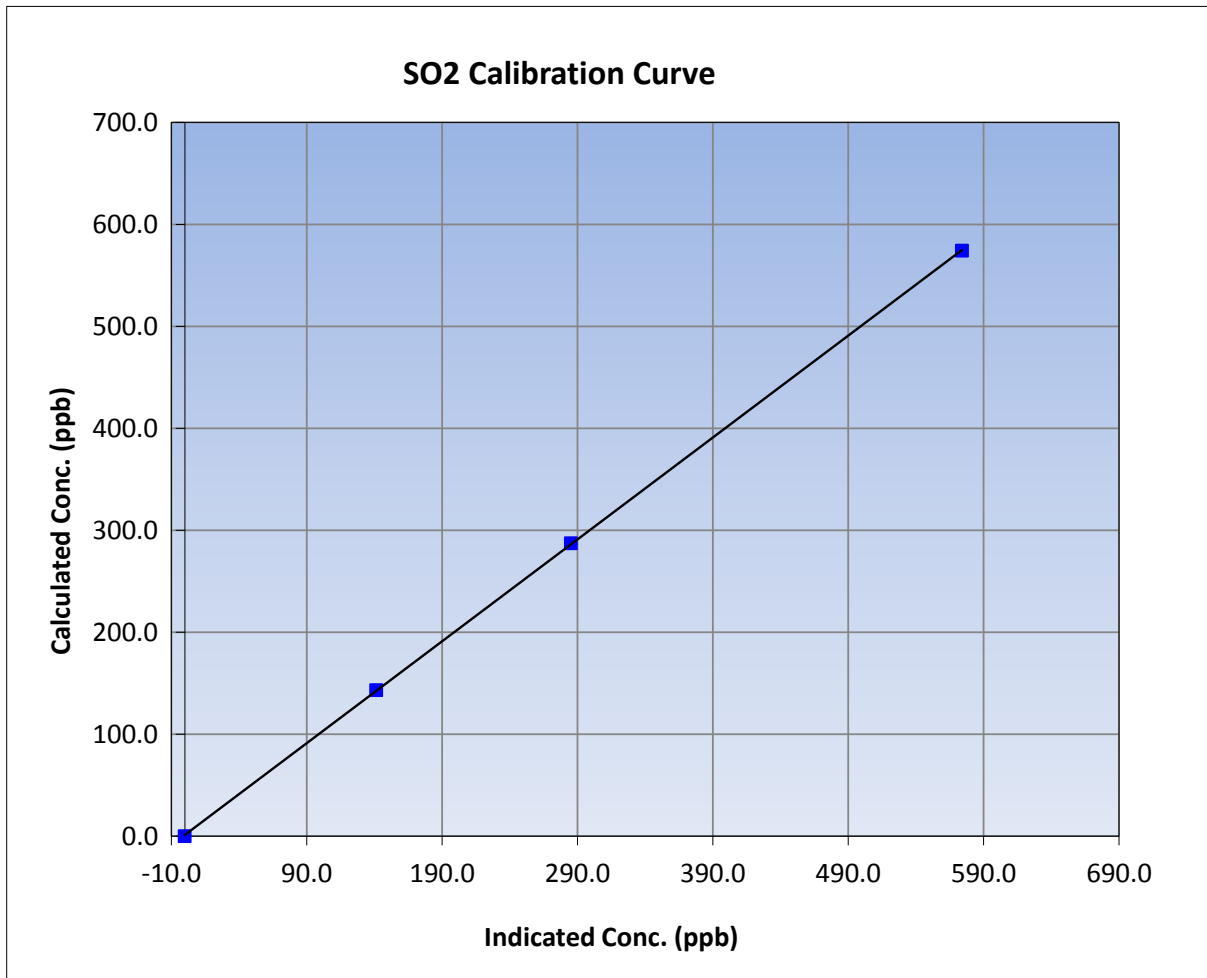
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 9, 2015	Previous Calibration	November 10, 2015
Station Name	Conklin Lookout	Station Number	AMS 18
Start Time (MST)	8:30	End Time (MST)	12:47
Analyzer make	Thermo 43i	Analyzer serial #	JC1501301453

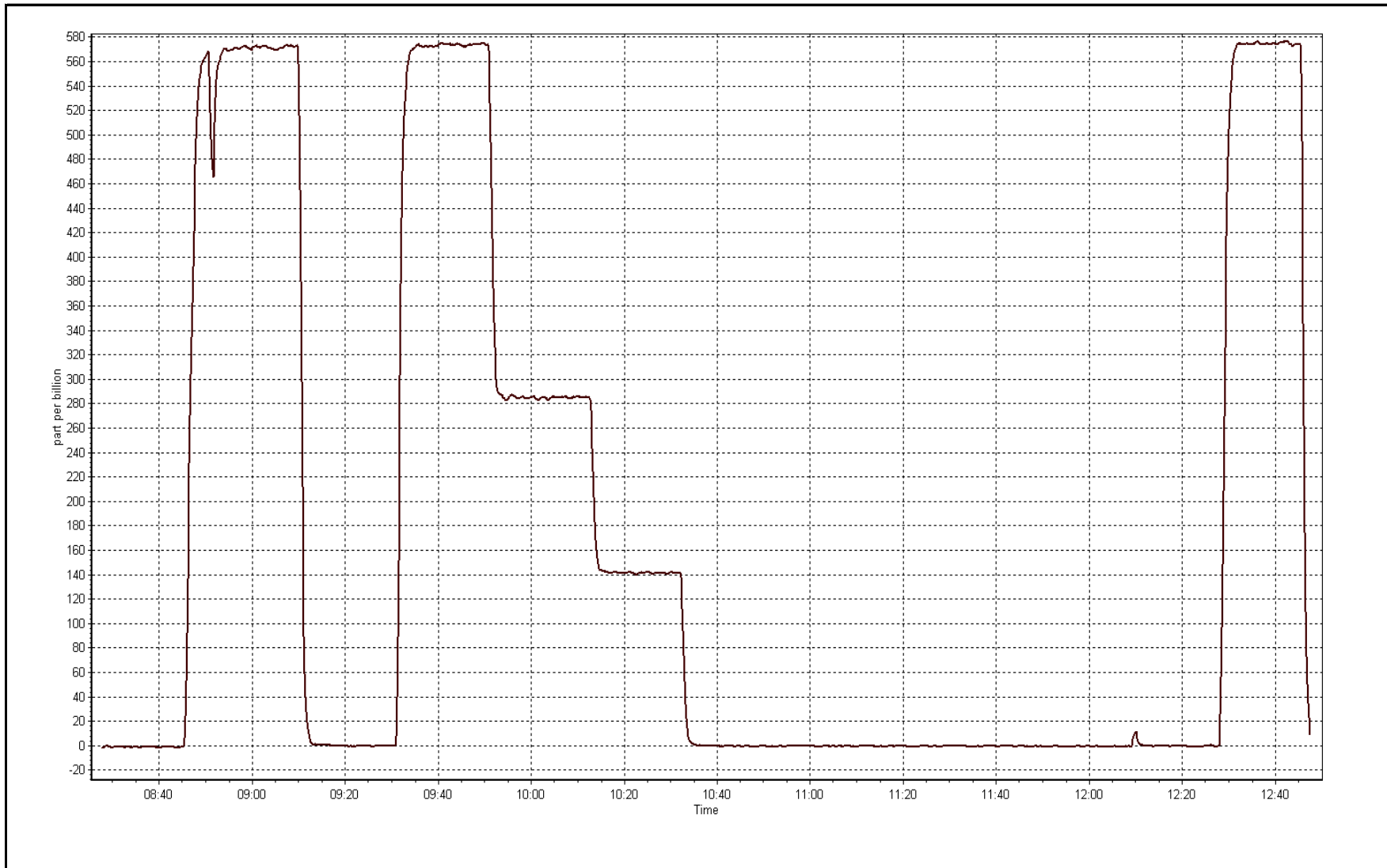
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	0.999985
574.3	574.1	1.0003		
287.1	285.1	1.0072	Slope	0.999232
143.1	141.3	1.0126		
			Intercept	1.267096



SO2 Calibration Plot

Date: December 9, 2015





# Wood Buffalo Environmental Association

## TRS Calibration Report

### Station Information

Calibration Date	December 10, 2015	Last Calibration	November 20, 2015
Station Name	Conklin Lookout	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	10:40	End Time (MST)	13:05
Gas Cert Reference	CC233389	Station temp.	22 Deg C
Cal Gas Concentration	4.88 ppm	Cal Gas Exp Date	06/10/2014
Calibrator Make/Model	API 700	Serial Number	1222
Dil air Make/Model	API 701	Serial Number	5610
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9035
SO2 gas concentration	49 ppm	SO2 gas cert/exp	EY0000368 10/Jun/15

### Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-699	-699
Analyzer IP address	192.168.1.42		Lamp voltage	1018	1014
Calculated slope	1.010422	0.988803	Chamber temp	45	45
Calculated intercept	-0.072921	0.158694	Pressure	641.7	627.5
Analyzer Background	1.63	2.99	Flow	0.414	0.405
Analyzer Coefficient	0.976	1.121	Intensity	91	91
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1336160090	
Converter make/model	CDN-101		Converter serial #	522	

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.2	----
as found span	5000	82.0	80.0	78.2	1.023
SO2 scrubber check	5000	19.5	191.1	0.7	----
calibrator zero	5000	0.0	0.0	-0.2	----
high point	5000	82.0	80.0	80.7	0.992
second point	5000	41.0	40.0	40.5	0.988
third point	5000	20.5	20.0	20.0	1.000
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	82.0	80.0	82.1	0.975
Average Correction Factor					0.993

Corrected As found	78.4	Previous response	79.3	% change	1.1%
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Notes:

no maintenance done, span adjusted, filter changed out

Calibration Performed By:

Melissa Lemay



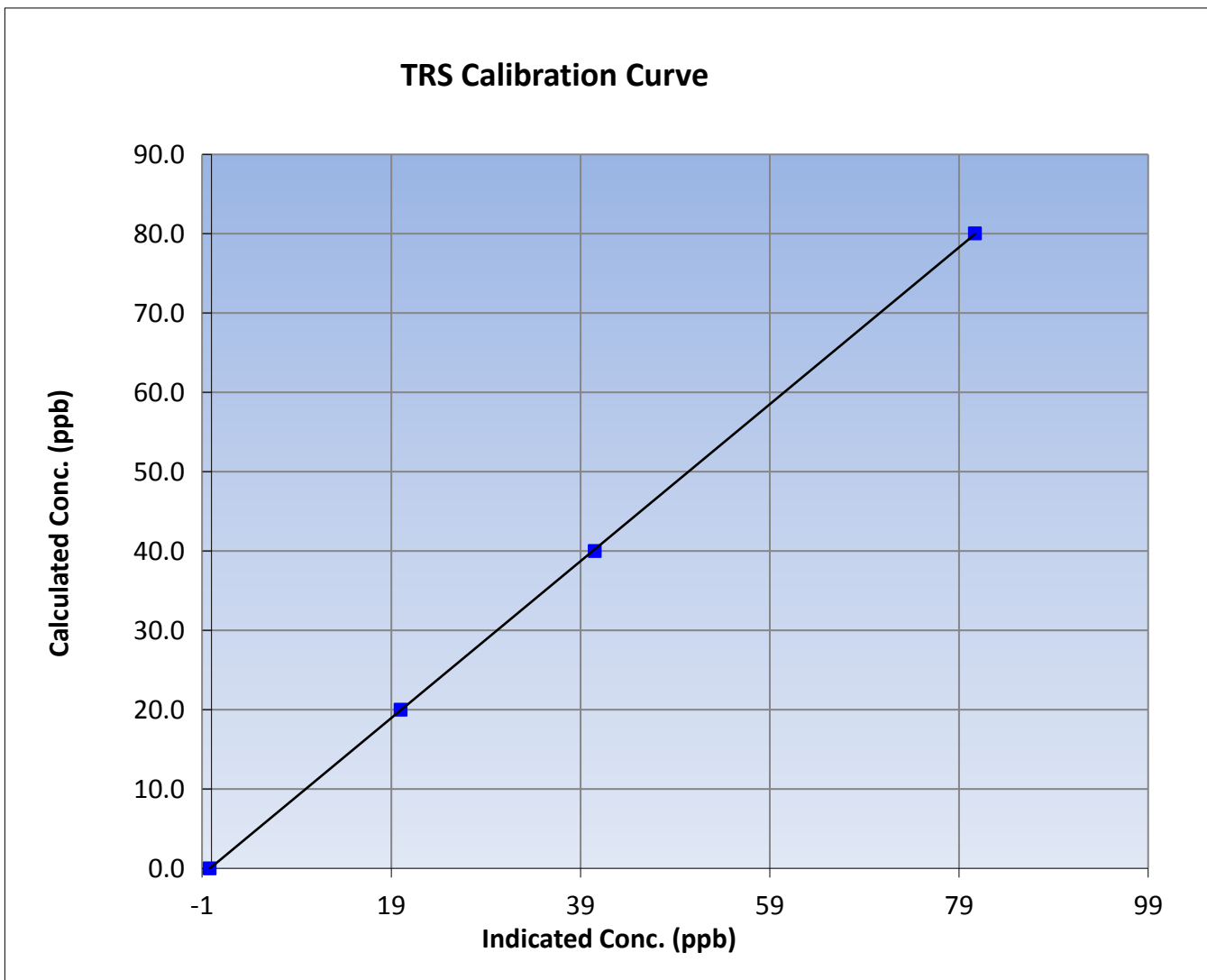
# Wood Buffalo Environmental Association TRS Calibration Report

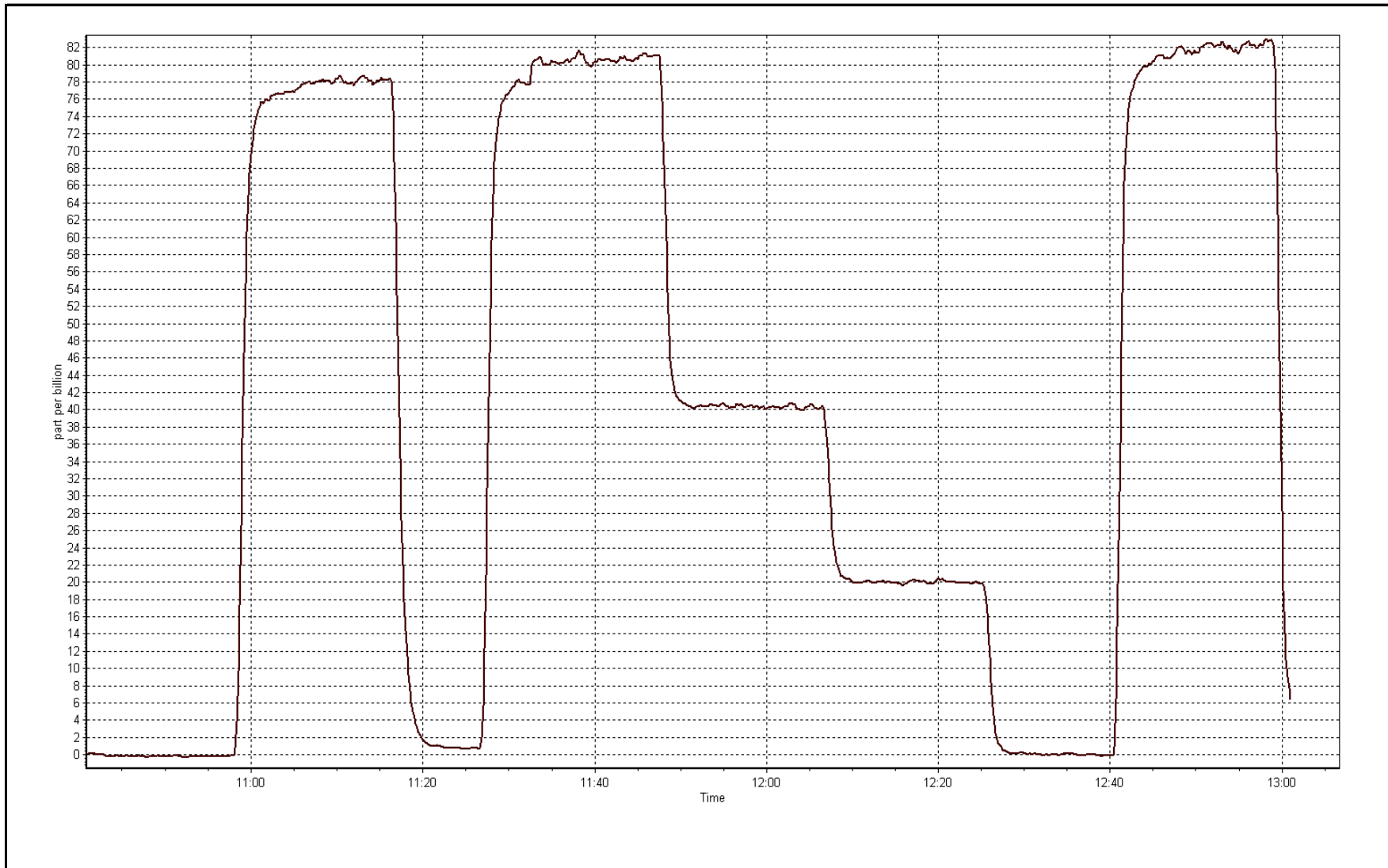
## Station Information

Calibration Date	December 10, 2015	Previous Calibration	November 20, 2015
Station Name	Conklin Lookout	Station Number	AMS 18
Start Time (MST)	10:40	End Time (MST)	13:05
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1336160090

## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999986
80.0	80.7	0.9917		
40.0	40.5	0.9880	Slope	0.988803
20.0	20.0	1.0004		
			Intercept	0.158694







## Wood Buffalo Environmental Association THC / NMHC Calibration Report

### Station Information

Calibration Date	December 9, 2015	Last Calibration	November 10, 2015
Station Name	Conklin Lookout	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	8:30	End Time (MST)	12:48
Gas Cert Reference	EY0000368	Cal Gas Expiry Date	June 10, 2016
CH4 Cal Gas Conc.	518.0 ppm	CH4 Equiv Conc.	1076.3 ppm
C3H8 Cal Gas Conc.	203.0 ppm	Station temp.	22 Deg C
Calibrator Model	API T700	Serial Number	1222
ZAG make/model	Teledyne API 701	Serial Number	5610
DACS make/model	Campbell Scientific CR3000	Serial Number	9035

### Analyzer Information

	Before	After		Before	After
THC Range (ppm)	0 - 50 ppm		Column Temp	75.1	75.1
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	0.999271	1.004095	Carrier Pressure	31.7	31.7
THC Calc intercept	0.019789	0.015849	Fuel Pressure	42.2	42.2
NMHC Calc slope	1.000087	1.003586	Air Pressure	32.4	32.4
NMHC Calc intercept	0.005782	0.005828			

Analyzer make Thermo 55i Analyzer serial # 1218153354

### THC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	0.00	----
as found span	5000	58.6	12.61	12.51	1.008
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	58.6	12.61	12.56	1.004
second point	5000	29.3	6.31	6.24	1.011
third point	5000	14.6	3.14	3.11	1.010
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	58.6	12.61	12.68	0.995
Average Correction Factor					1.008

Corrected As found 12.51 Previous response 12.60 % change 0.7%

**Notes:**

Hydrogen changed out, No adjustments done filter changed out

Calibration Performed By: Melissa Lemay



## Wood Buffalo Environmental Association THC / NMHC Calibration Report

### NMHC Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	58.6	6.54	6.49	1.008
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	58.6	6.54	6.52	1.003
second point	5000	29.3	3.27	3.24	1.010
third point	5000	14.6	1.63	1.62	1.006
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	58.6	6.54	6.59	0.993
Average Correction Factor					1.006

Corrected As found      6.49      Previous response      6.54      % change      0.7%

### CH4 Calibration Data

Set Point	Dilution air flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration NMHC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0	0.00	0.00	----
as found span	5000	58.6	6.07	6.02	1.008
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	58.6	6.07	6.05	1.003
second point	5000	29.3	3.04	3.00	1.012
third point	5000	14.6	1.51	1.49	1.015
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	58.6	6.07	6.10	0.995
Average Correction Factor					1.010

Corrected As found      6.02      Previous response      6.07      % change      0.8%





# Wood Buffalo Environmental Association

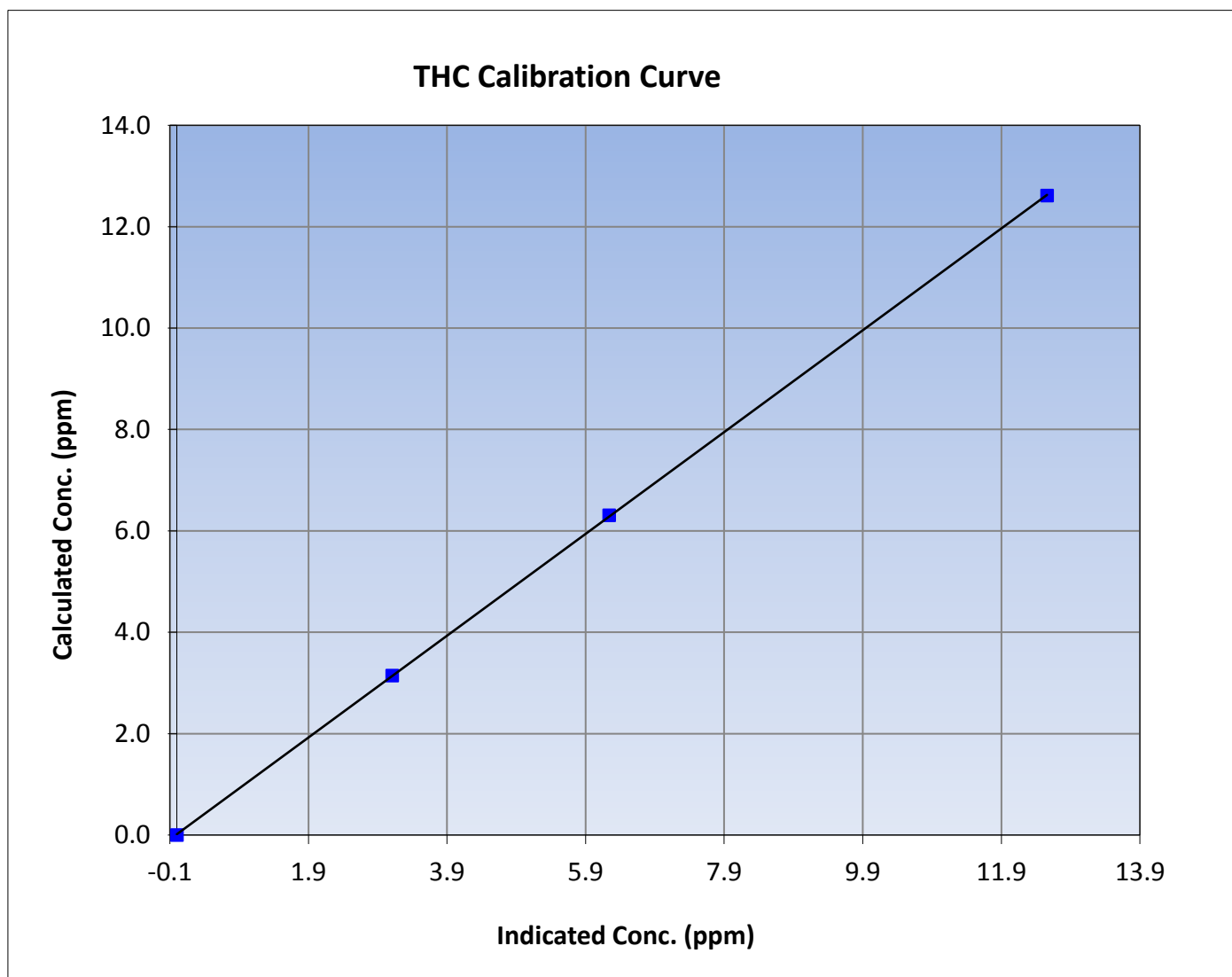
## THC Calibration Summary

### Station Information

Calibration Date	December 9, 2015	Previous Calibration	November 10, 2015
Station Name	Conklin Lookout	Station Number	AMS 18
Start Time (MST)	8:30	End Time (MST)	12:48
Analyzer make	Thermo 55i	Analyzer serial #	1218153354

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999987
12.61	12.56	1.0043		
6.31	6.24	1.0107	Slope	1.004095
3.14	3.11	1.0105		
			Intercept	0.015849





# Wood Buffalo Environmental Association

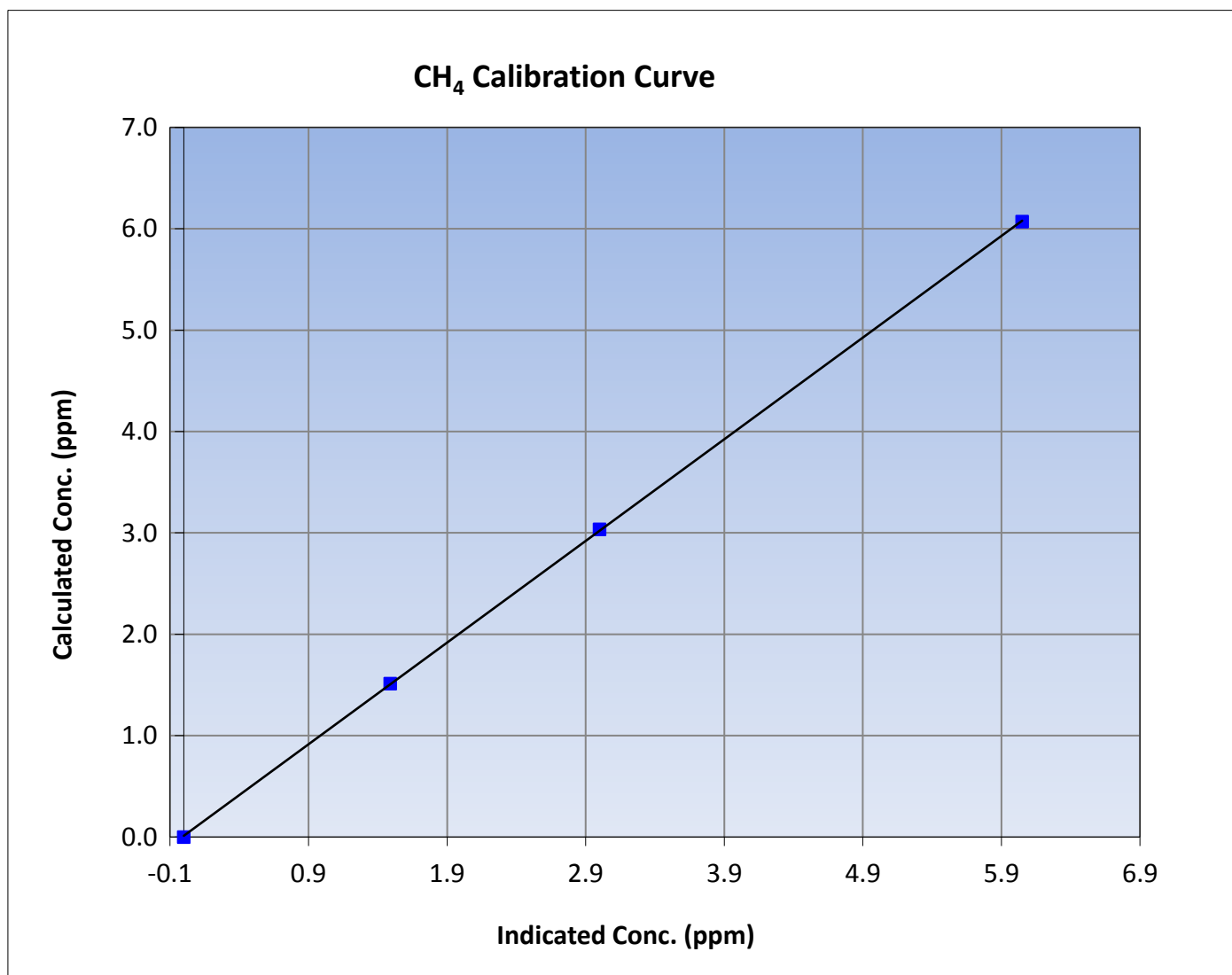
## CH<sub>4</sub> Calibration Summary

### Station Information

Calibration Date	December 9, 2015	Previous Calibration	November 10, 2015
Station Name	Conklin Lookout	Station Number	AMS 18
Start Time (MST)	8:30	End Time (MST)	12:48
Analyzer make	Thermo 55i	Analyzer serial #	1218153354

### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999976
6.07	6.05	1.0035		
3.04	3.00	1.0118	Slope	1.002928
1.51	1.49	1.0151		
			Intercept	0.012036





# Wood Buffalo Environmental Association

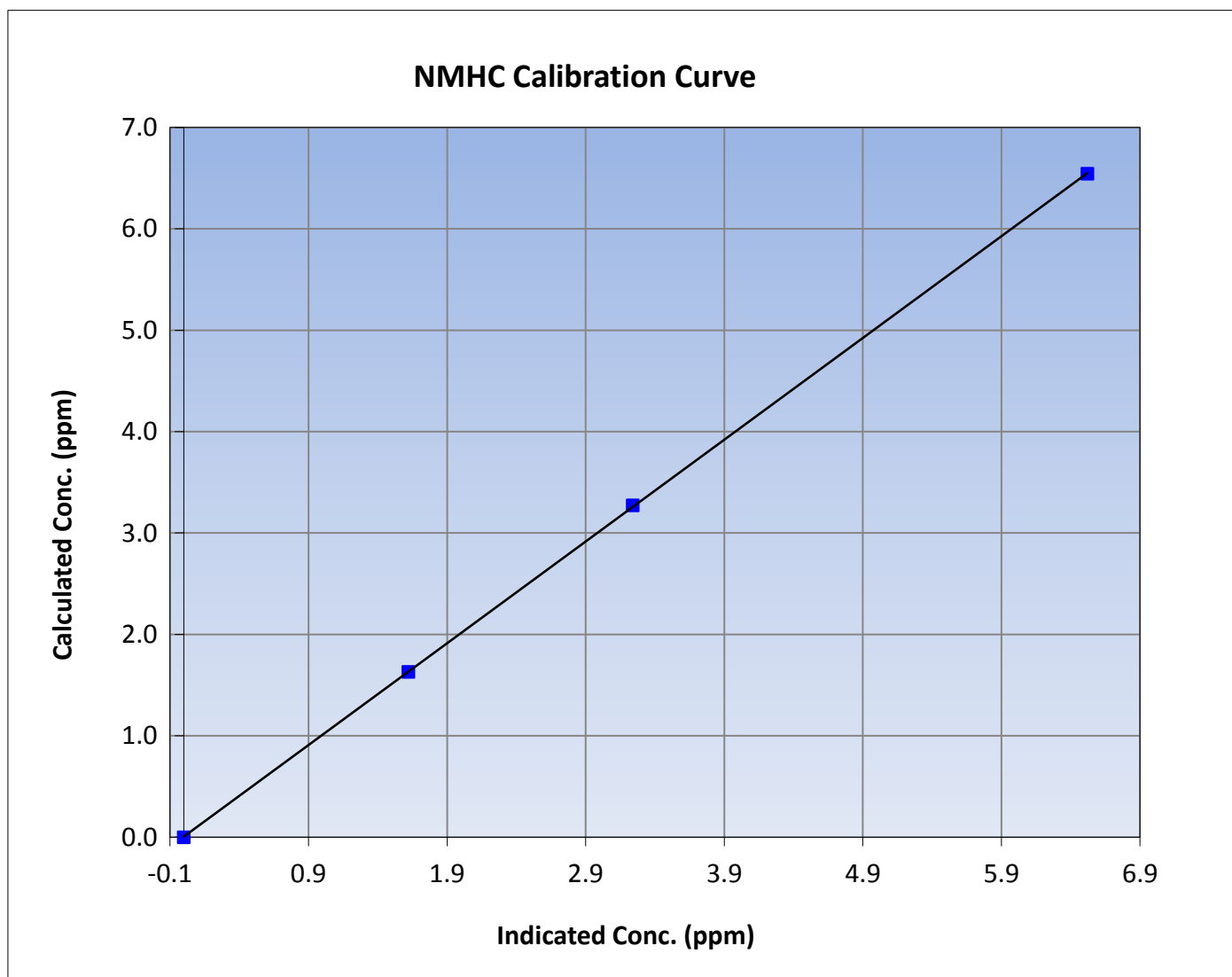
## NMHC Calibration Summary

### Station Information

Calibration Date	December 9, 2015	Previous Calibration	November 10, 2015
Station Name	Conklin Lookout	Station Number	AMS 18
Start Time (MST)	8:30	End Time (MST)	12:48
Analyzer make	Thermo 55i	Analyzer serial #	1218153354

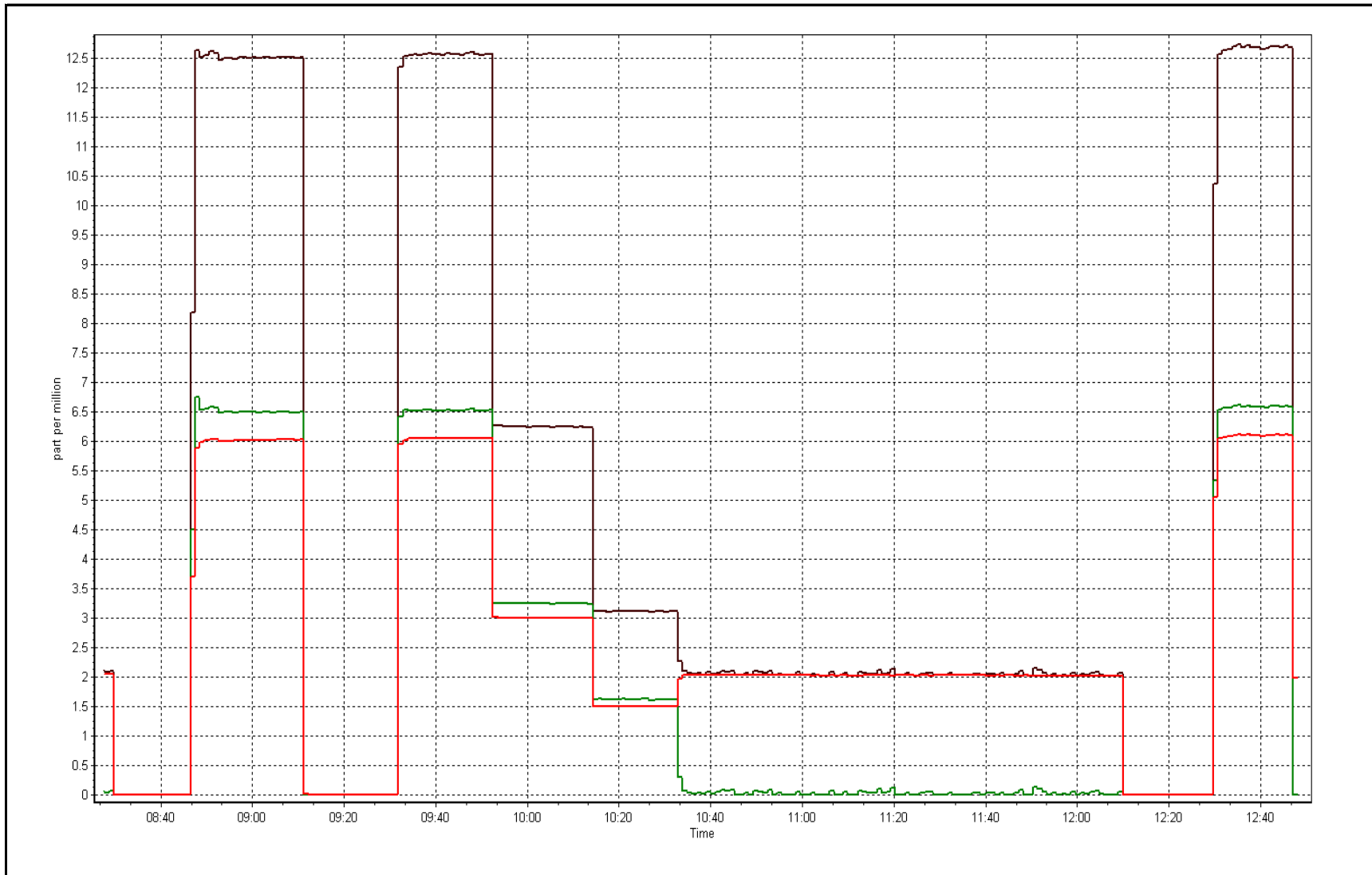
### Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999988
6.54	6.52	1.0035		
3.27	3.24	1.0097	Slope	1.003586
1.63	1.62	1.0062		
			Intercept	0.005828



THC Calibration Plot

Date: December 9, 2015





# Wood Buffalo Environmental Association

## O<sub>3</sub> Calibration Report

### Station Information

Calibration Date	December 10, 2015	Previous Calibration	November 20, 2015
Station Name	Conklin Lookout	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	8:30	End Time (MST)	10:44
NO2 GPT Ref date	December-09-15	Transfer Standard	GPT
		Station temp.	22 Deg C
Calibrator Make/Model	Teledyne API 700	Serial Number	1222
ZAG make/model	Teledyne API 701	Serial Number	5610
DACS make/model	Campbell Scientific CR3000	Serial Number	9305

### Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	26.9	27.4
Analyzer IP address	192.168.1.48		Lamp temp.	53.2	53.3
Calculated slope	0.994709	1.013920	Pressure	633.5	602.0
Calculated intercept	0.184699	-0.223946	Flow cell A	0.708	0.685
Analyzer Background	-1.6	-1.6	Flow cell B	0.705	0.684
Analyzer Coefficient	1.043	1.043	Cell A Intensity	82600	80015
			Cell B Intensity	76466	74678

Analyzer make	Thermo 49i	Analyzer serial #	1501663733
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### Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp Intensity	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.00	0.0	-0.4	----
as found span	5000	757.00	373.4	368.0	1.015
calibrator zero	5000	0.00	0.0	-0.4	----
high point	5000	757.00	373.4	368.0	1.015
second point	5000	520.00	254.2	251.2	1.012
third point	5000	270.00	130.9	130.2	1.005
as left zero	5000	0.00	0.0	0.9	----
as left span	5000	757.00	373.4	373.7	0.999
Average Correction Factor					1.011

Corrected As found	368.4	Previous response	375.2	% change	1.8%
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**Notes:**

Filter changed out, no adjustments or maintenance done

Calibration Performed By: Melissa Lemay



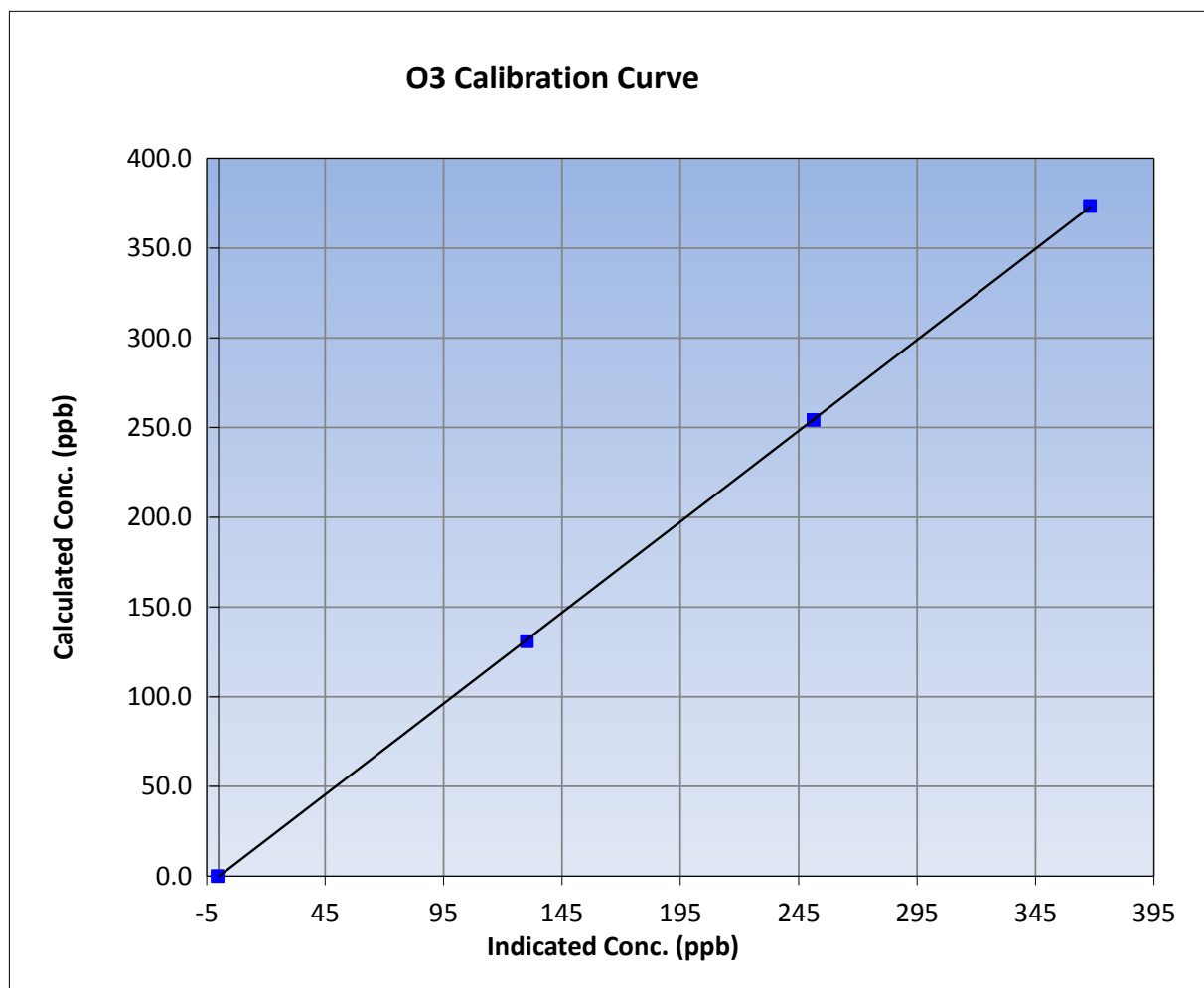
## Wood Buffalo Environmental Association O3 Calibration Report

### Station Information

Calibration Date	December-10-15	Previous Calibration	November 20, 2015
Station Name	Conklin Lookout	Station Number	AMS 18
Start Time (MST)	8:30	End Time (MST)	10:44
Analyzer make	Thermo 49i	Analyzer serial #	1501663733

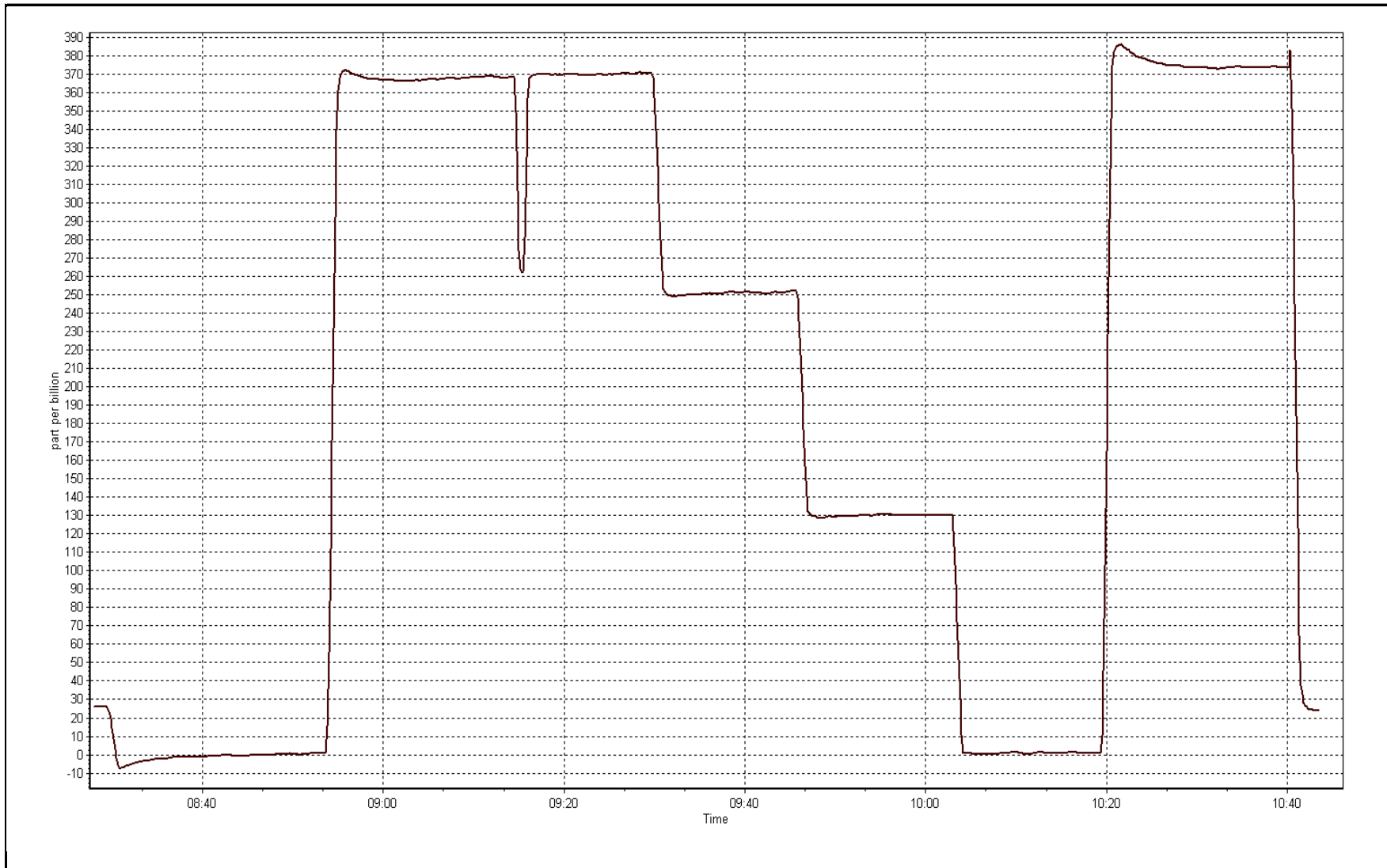
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	----	Correlation Coefficient	0.999980
373.4	368.0	1.0147		
254.2	251.2	1.0119	Slope	1.013920
130.9	130.2	1.0054		
			Intercept	-0.223946



O3 Calibration Plot

Date: December 10, 2015





# Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

## Station Information

Calibration Date	December 9, 2015	Previous Calibration	November 10, 2015
Station Name	Conklin Lookout	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	8:30	End Time (MST)	12:48
NO Cal Gas Conc	51.2 ppm	Gas Cert Reference	EY0000368
NOX Cal Gas Conc	51.2 ppm	Cal Gas Expiry Date	10/06/2016
Calibrator	API T700	Serial Number	1222
Zero air Generator	Teledyne API T701	Serial Number	5610

## DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	9035
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## Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.997565	0.997063	0.995291
	Data Offset	0.414372	0.995050	-0.231056
Current Calibration	Data Slope	0.991728	0.991390	0.994238
	Data Offset	-0.184872	0.350866	-0.592682

## Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1336160088
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	0.771		0.810	
NOX coefficient	0.997		0.997	
NO2 coefficient	0.999		0.999	
NO bkgrnd	1.6		1.7	
NOX bkgrnd	1.7		1.8	
Chamber Temp	50.6	Deg C	50.4	Deg C
Moly Temp	327.1	Deg C	324.5	Deg C
PMT voltage	-842.9	V	-842.5	V
PMT Temp	-2.7	Deg C	-2.9	Deg C
O3 flow	OK	ccm	OK	ccm
R Cell press NO	153.6	mmHg	154.1	mmHg
R Cell Press Nox	153.6	mmHg	154.1	mmHg
NO sample flow	0.957	lpm	0.914	lpm
Nox sample Flow	0.958	lpm	0.914	lpm

**Notes:**

No maintenance done, Span adjusted, filter changed out





# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

### Station Information

Calibration Date:

December 9, 2015

Station Number:

AMS 18

### Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	----	----
as found span	5000	58.6	600.1	600.1	0.0	572.2	572.2	1.1	1.0487	1.0487
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
high point	5000	58.6	600.1	600.1	0.0	605.1	605.0	0.1	0.9917	0.9918
second point	5000	29.3	300.0	300.0	0.0	302.9	302.3	0.6	0.9905	0.9925
third point	5000	14.6	149.5	149.5	0.0	151.2	150.1	1.1	0.9888	0.9960
as left zero	5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
as left span	5000	58.6	600.1	239.1	361.0	615.9	231.8	384.1	0.9743	1.0315
Average Correction Factor									0.9903	0.9935

Corrected As found  
Previous Response

NO<sub>x</sub>= 572.3  
NO<sub>x</sub>= 601.1

NO= 572.3  
NO= 600.8

Percent Change

NO<sub>x</sub>= 5.0%

NO= 5.0%

### GPT Calibration Data

Dilution Flow

5000

ccm

Source Gas Flow

58.60

ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero			0.0			0.0			N/A	
1st NO2 (300)	----	239.1	373.4	614.5	239.1	375.5	0.9652	1.0000	0.9944	100.6%
2nd NO2 (200)	----	358.3	254.2	615.2	358.3	256.9	0.9641	1.0000	0.9895	101.1%
3rd NO2 (100)	----	481.6	130.9	614.5	481.6	132.9	0.9652	1.0000	0.9850	101.5%
4th NO2 (0)	612.5	----	-0.5	612.0	612.5	-0.6	0.9691	1.0000	N/A	----
Average Correction Factor							0.9659	1.0000	0.9896	101.1%

Calibration Performed By:

Melissa Lemay



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

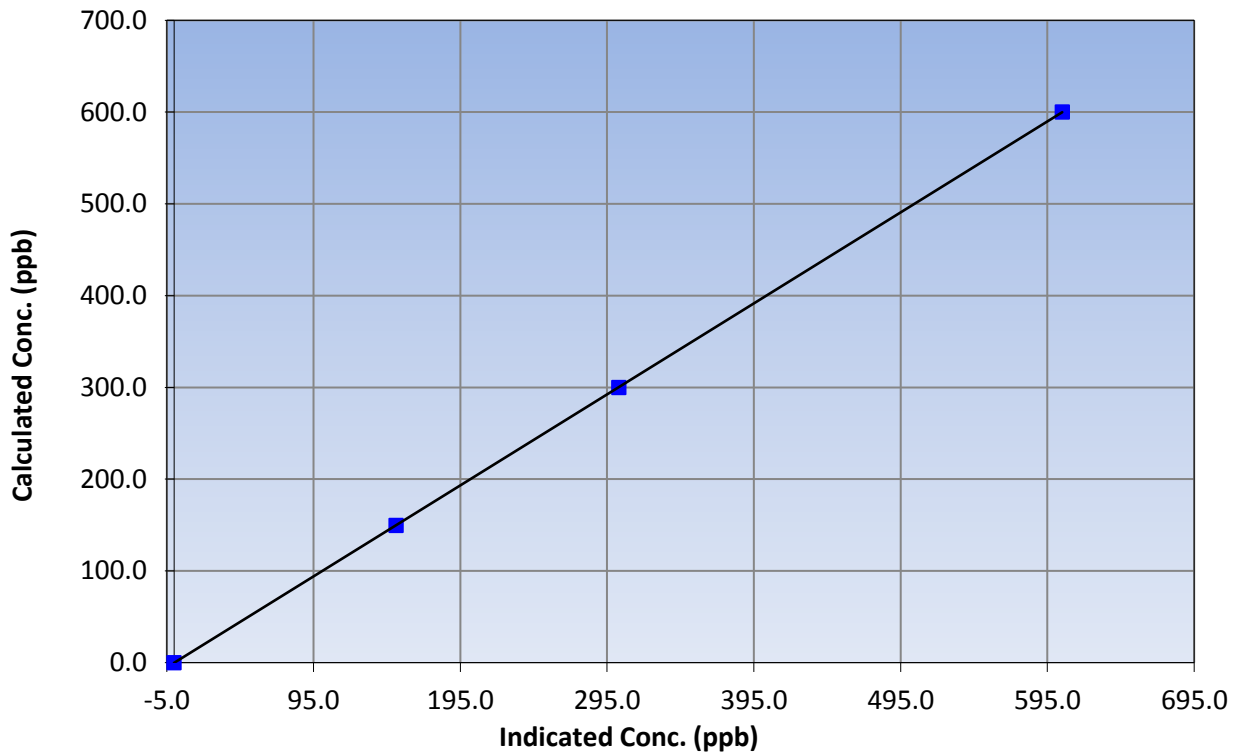
### Station Information

Calibration Date	December 9, 2015	Previous Calibration	November 10, 2015
Station Name	Conklin Lookout	Station Number	AMS 18
Start Time (MST)	8:30	End Time (MST)	12:48
Analyzer make	Thermo 42i	Analyzer serial #	1336160088

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999999
600.1	605.1	0.9917		
300.0	302.9	0.9905	Slope	0.991728
149.5	151.2	0.9888		
			Intercept	-0.184872

### NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

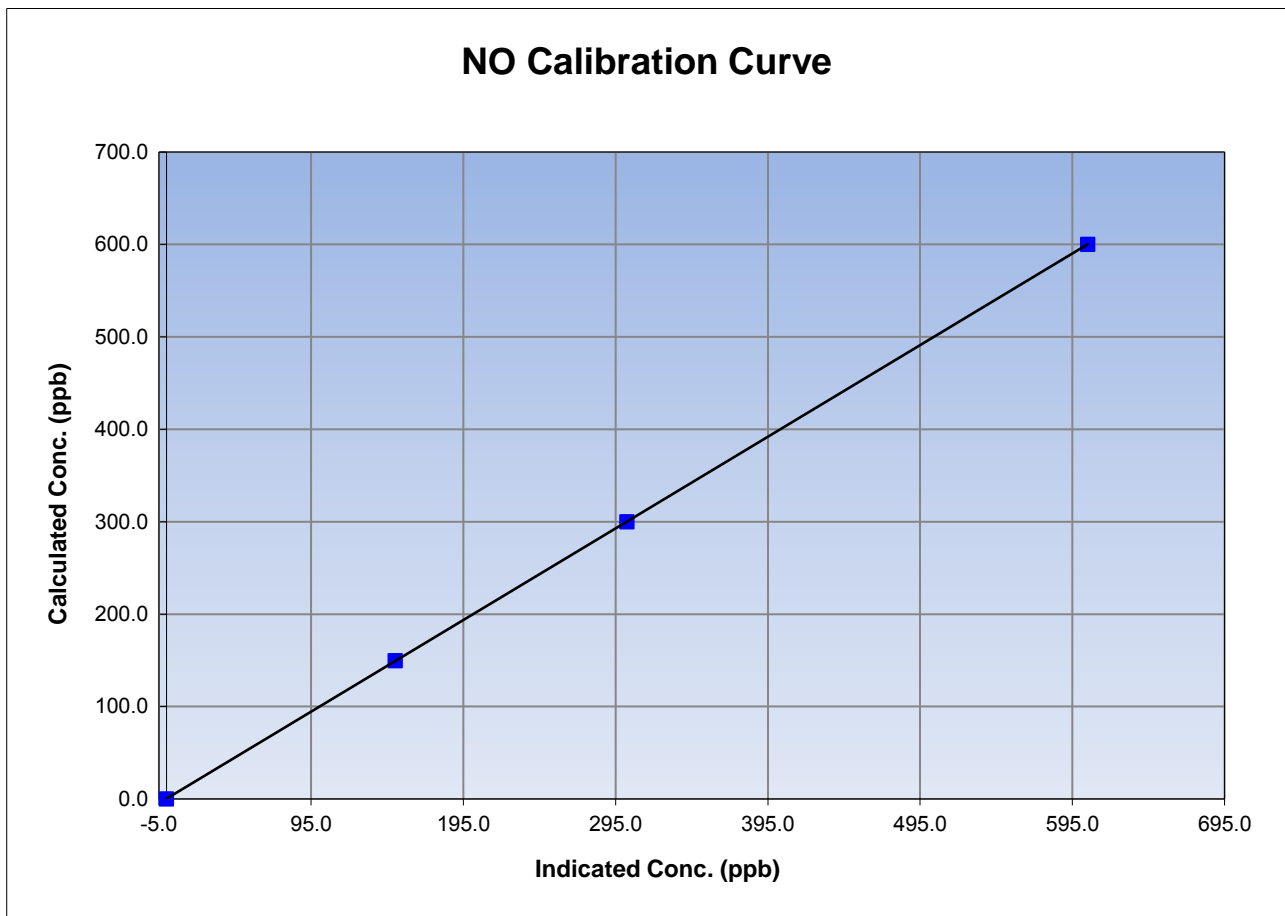
## NO Calibration Summary

### Station Information

Calibration Date	December 9, 2015	Previous Calibration	November 10, 2015
Station Name	Conklin Lookout	Station Number	AMS 18
Start Time (MST)	8:30	End Time (MST)	12:48
Analyzer make	Thermo 42i	Analyzer serial #	1336160088

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999999
600.1	605.0	0.9918		
300.0	302.3	0.9925	Slope	0.991390
149.5	150.1	0.9960		
			Intercept	0.350866





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

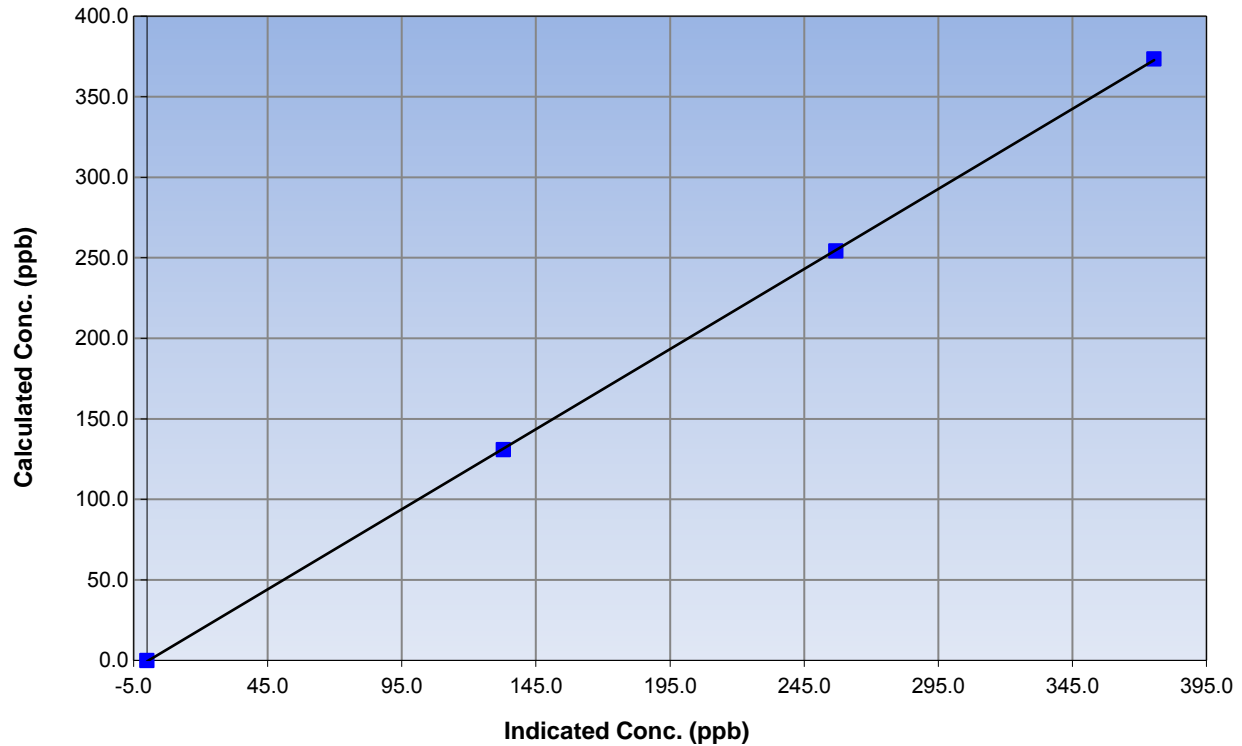
### Station Information

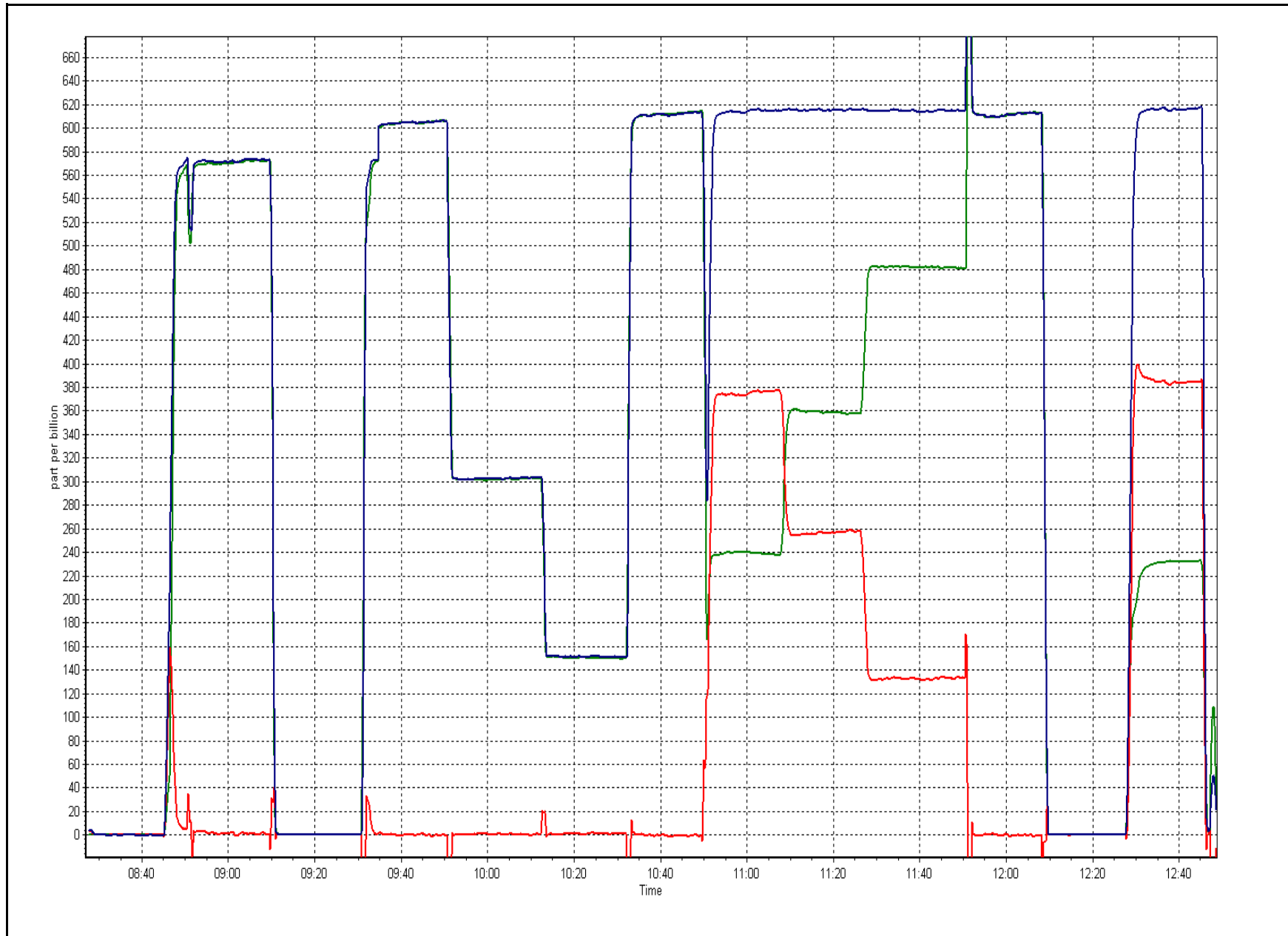
Calibration Date	December 9, 2015	Previous Calibration	November 10, 2015
Station Number	Conklin Lookout	Station Number	AMS 18
Start Time (MST)	8:30	End Time (MST)	12:48
Analyzer make	Thermo 42i	Analyzer serial #	1336160088

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999979
373.4	375.5	0.9944		
254.2	256.9	0.9895	Slope	0.994238
130.9	132.9	0.9850		
			Intercept	-0.592682

### NO<sub>2</sub> Calibration Curve







## Wood Buffalo Environmental Association

### SHARP CALIBRATION

#### STATION INFORMATION

Calibration Date:	December 10, 2015	Previous Calibration:	November 29, 2015
Station Name:	Conklin Lookout	Station Number:	AMS 18
Start Time (MST):	9:38	End Time (MST):	10:36
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	1097

#### SHARP INFORMATION

Particulate Fraction:	PM2.5
Make/Model:	Thermo / SHARP 5030
Serial Number:	E-781
C <sub>14</sub> Source SN:	
Confirmation of Time settings:	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Parameters Checked:	T1 <input checked="" type="checkbox"/> T2 <input type="checkbox"/> T3 <input type="checkbox"/> T4 <input type="checkbox"/> P3 <input checked="" type="checkbox"/> Main Flow <input checked="" type="checkbox"/> Beta <input type="checkbox"/> Neph <input checked="" type="checkbox"/>

#### CALIBRATION DATA

##### Temperature (°C)

Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	-4.2	-3.0	1.2	-4.2
T2	19.0	na	na	19.0
T3	27.0	na	na	27.0
T4	17.0	na	na	17.0
RH (%)	19.0	na	na	19.0

##### Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	925	919.0	-6.0	925

##### Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1000	0	1000	1000

#### Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	291		291
Neph	0.1		0.1
C14	5.9		5.9
Indicated Concentration (ug/m3)	0	No	0
Offset 1			
Offset 2			

#### Leak Check (Quarterly)

Leak Check Date:	November 29, 2015	Previous Leak Check Date:	September 29, 2015
------------------	-------------------	---------------------------	--------------------

	<b>Measured</b>	<b>Difference LPM (Limit +/- 0.42 LPM)</b>
Flow without adaptor (LPM):	16.63	
*Flow with adaptor (LPM):	16.60	0.03

\*Note - do not attach adaptor without shutting off the pump first

#### Mass Foil Calibration (Annually)

Foil Calibration Date:	June 30, 2015	Previous Foil Calibration:	
Zeroed?:	Yes		
Foil Mass:	1337		
Previous Correction Factor:	6983	<b>Mass foil set S/N:</b>	12111
New Correction Factor:	7050		

#### INSPECTION DATA

Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	
Pump	Good	
Filter Tape	Good	
Mass Foil Cal Set	na	
HEPA filter	Good	

#### NOTES:

No adjustments done, sample head cleaned

<b>Calibration Performed By:</b>	<b>Melissa Lemay</b>
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## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 19  
SUNCOR FIREBAG  
DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)  
 DECEMBER 2015  
 MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	709	35	35	100.00	18	0	4	0
H2S (ppb) Average	710	34	34	100.00	2	0	0	0
THC (ppm) Average	709	35	35	100.00	2.6	-	2.3	-
NO2 (ppb) Average	709	35	35	100.00	30	0	9	-
NO (ppb) Average	709	35	35	100.00	16	-	4	-
NOX (ppb) Average	709	35	35	100.00	39	-	10	-
Temperature 2 m (C) Average	744	0	0	100.00	2.9	-	0.2	-
Relative Humidity (%) Average	744	0	0	100.00	96	-	94	-
Wind Speed 10 m (km/h) Average	737	0	7	99.06	29	-	20	-
Wind Direction 10 m (deg) Average	737	0	7	99.06	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	709	1.1	2	-	0	0	0	0	1	3	18
H2S (ppb) Average	710	0.2	0	-	0	0	0	0	0	0	2
THC (ppm) Average	709	2.17	0.1	-	2	2.1	2.1	2.1	2.2	2.3	2.6
NO2 (ppb) Average	709	4.3	4	-	0	0	2	3	6	10	30
NO (ppb) Average	709	0.9	2	-	0	0	0	0	1	2	16
NOX (ppb) Average	709	5.2	5	-	0	0	2	4	7	11	39
Temperature 2 m (C) Average	744	-11.67	6.9	-	-31.3	-20.8	-17.1	-11.2	-6.3	-4	2.9
Relative Humidity (%) Average	744	84.3	10	-	40	77	82	85	91	93	96
Wind Speed 10 m (km/h) Average	737	9.9	5	-	1	3	5	9	14	18	29
Wind Direction 10 m (deg) Average	737	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Wind Speed, Wind Direction	26 Dec 2015 09:00	26 Dec 2015 12:00	4	Flat line in sensor output signal - sensor frozen
Wind Speed, Wind Direction	28 Dec 2015 13:00	28 Dec 2015 14:00	2	Flat line in sensor output signal - sensor frozen
Wind Speed, Wind Direction	28 Dec 2015 17:00	28 Dec 2015 17:00	1	Flat line in sensor output signal - sensor frozen



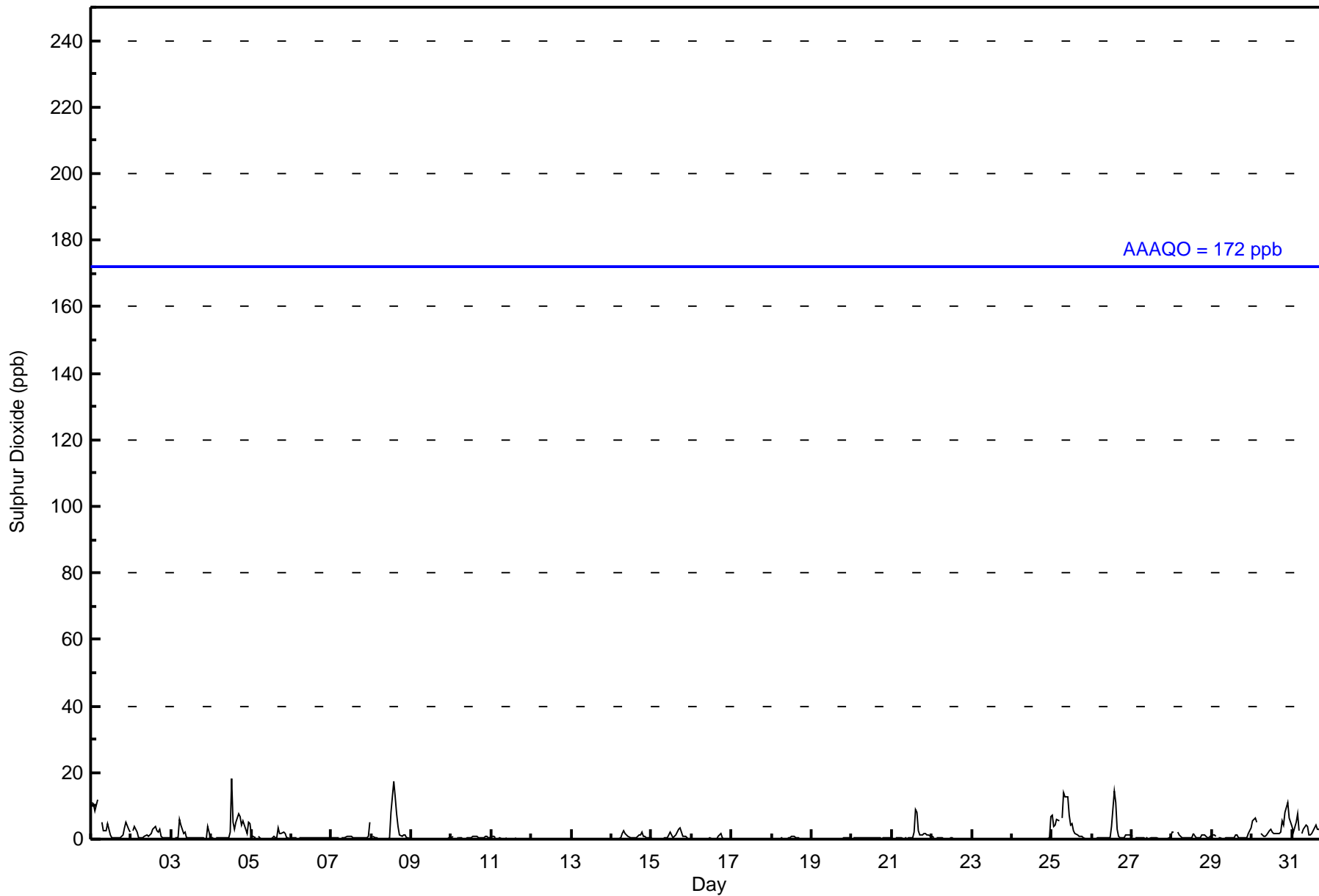
Summary of Hour Averages

Firebag - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 18 ppb on Dec 4 13:00	Maximum Daily Average: 4.2 ppb on Dec 25		Hours of Data:	709
Minimum Value: 0 ppb on Dec 9 07:00	Minimum Daily Average: 0.0 ppb on Dec 12		Hours of Missing Data:	35
Maximum Diurnal Average: 1.9 ppb at hour 14	Minimum Diurnal Average: 0.5 ppb at hour 6		Hours of Calibration:	35
Monthly Average: 1.1 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 1 P <sub>90</sub> = 3 P <sub>99</sub> = 12		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	11	11	8	10	12	Z	5	2	2	3	5	1	0	0	0	0	0	0	1	1	4	5	3	2	3.9	12
2-Dec	Z	2	4	2	0	0	0	1	1	1	1	1	2	3	4	2	2	3	1	0	0	1	0	0	1.5	4
3-Dec	0	Z	0	0	0	6	4	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	1.0	6
4-Dec	0	0	Z	0	0	0	0	0	0	0	0	2	18	5	3	5	8	7	4	6	4	2	5	5	3.3	18
5-Dec	1	1	0	Z	1	0	0	0	0	0	0	0	0	1	0	0	3	2	2	2	1	0	0	0	0.8	3
6-Dec	0	0	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
7-Dec	0	0	0	0	0	Z	0	0	0	1	1	1	1	1	1	1	1	0	1	1	1	0	1	5	0.8	5
8-Dec	Z	1	0	0	0	0	0	0	0	0	0	0	8	18	13	8	4	1	1	1	1	0	0	0	2.5	18
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
10-Dec	0	1	Z	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	1	1	1	0.5	1
11-Dec	1	1	0	Z	0	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.2	1
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
14-Dec	Z	0	0	0	0	0	2	2	2	1	1	0	0	0	0	1	1	1	2	1	1	1	0	0	0.8	2
15-Dec	0	Z	0	0	0	0	0	0	0	0	1	2	1	1	1	2	3	4	2	1	1	0	0	0	0.9	4
16-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0.2	2
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
18-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
20-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	1
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	2	9	8	3	1	1	1	2	2	1	1	1	1.5	9
22-Dec	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0.4	7
25-Dec	7	4	4	6	6	Z	6	14	13	13	7	4	5	3	2	1	1	1	1	0	0	0	0	0	4.2	14
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	4	15	11	3	1	0	0	1	1	1	1	1	1	1.8	15
27-Dec	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
28-Dec	2	2	Z	2	1	1	0	0	0	0	0	0	2	1	0	0	0	0	1	1	1	0	1	1	0.9	2
29-Dec	1	1	1	Z	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	1	2	4	4	0.7	4
30-Dec	5	6	6	5	Z	2	1	1	1	1	2	3	2	2	2	2	2	2	6	4	8	11	7	5	3.7	11
31-Dec	4	2	5	8	2	Z	2	3	4	4	1	1	2	3	4	3	3	3	2	4	5	6	6	7	3.7	8
	1.5	1.3	1.3	1.5	1.1	0.5	0.8	0.9	0.9	0.9	0.8	0.7	1.6	1.9	1.8	1.3	1.2	1.0	0.9	0.9	1.1	1.1	1.1	1.4	Diurnal Average	
	11	11	8	10	12	6	6	14	13	13	7	4	18	18	13	8	8	7	6	6	8	11	7	7	Diurnal Maximum	

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Firebag - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	697	98.31	98.31
11 - 20	12	1.69	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Firebag - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	42	25	37	5	0	18	77	114	77	48	95	65	27	26	6	28	690
11 - 20	0	0	0	0	0	0	0	0	3	1	7	1	0	0	0	0	12
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	42	25	37	5	0	18	77	114	80	49	102	66	27	26	6	28	702

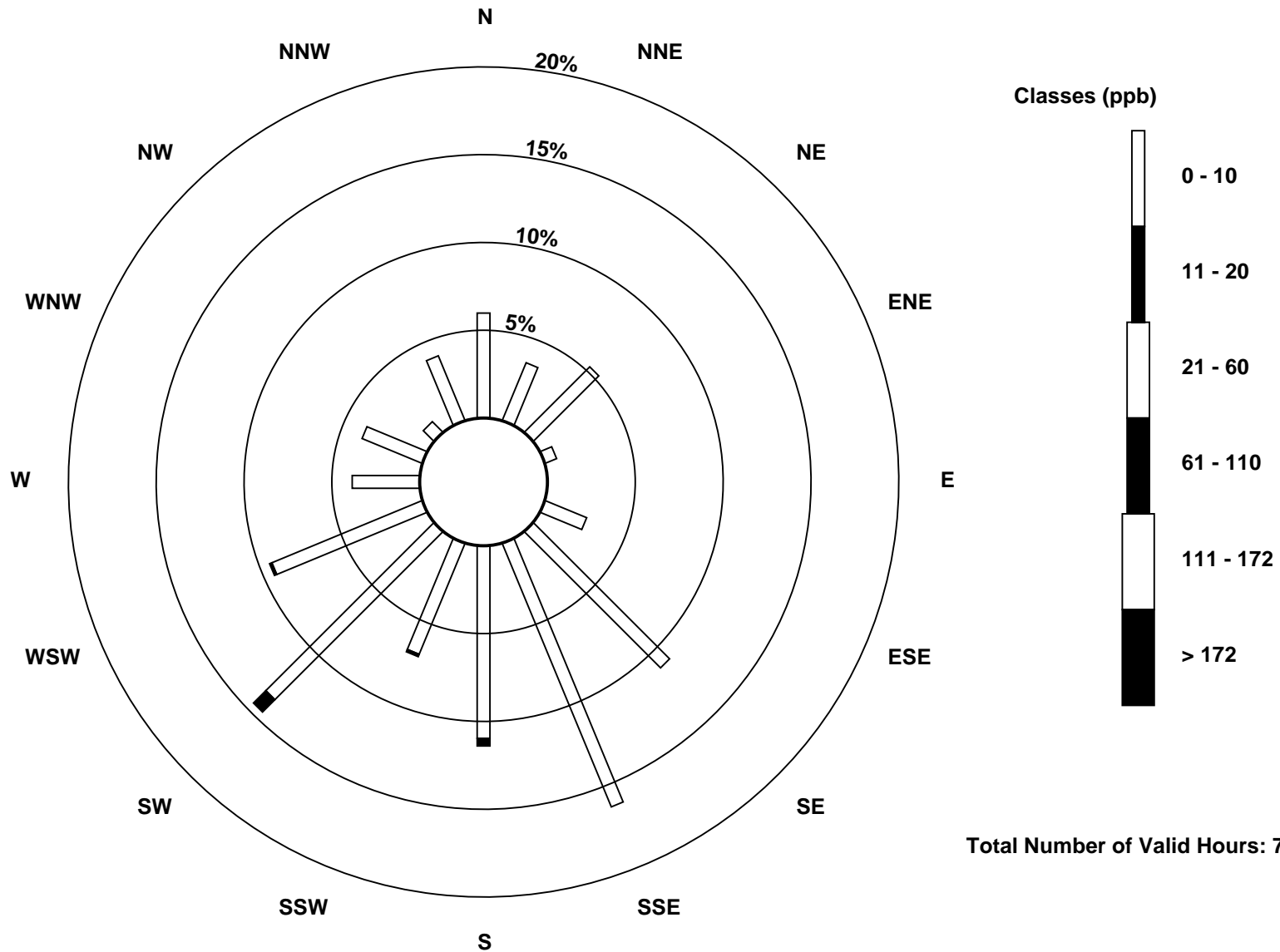
Total Number of Valid Hours: 702

Total Number of Hours: 744

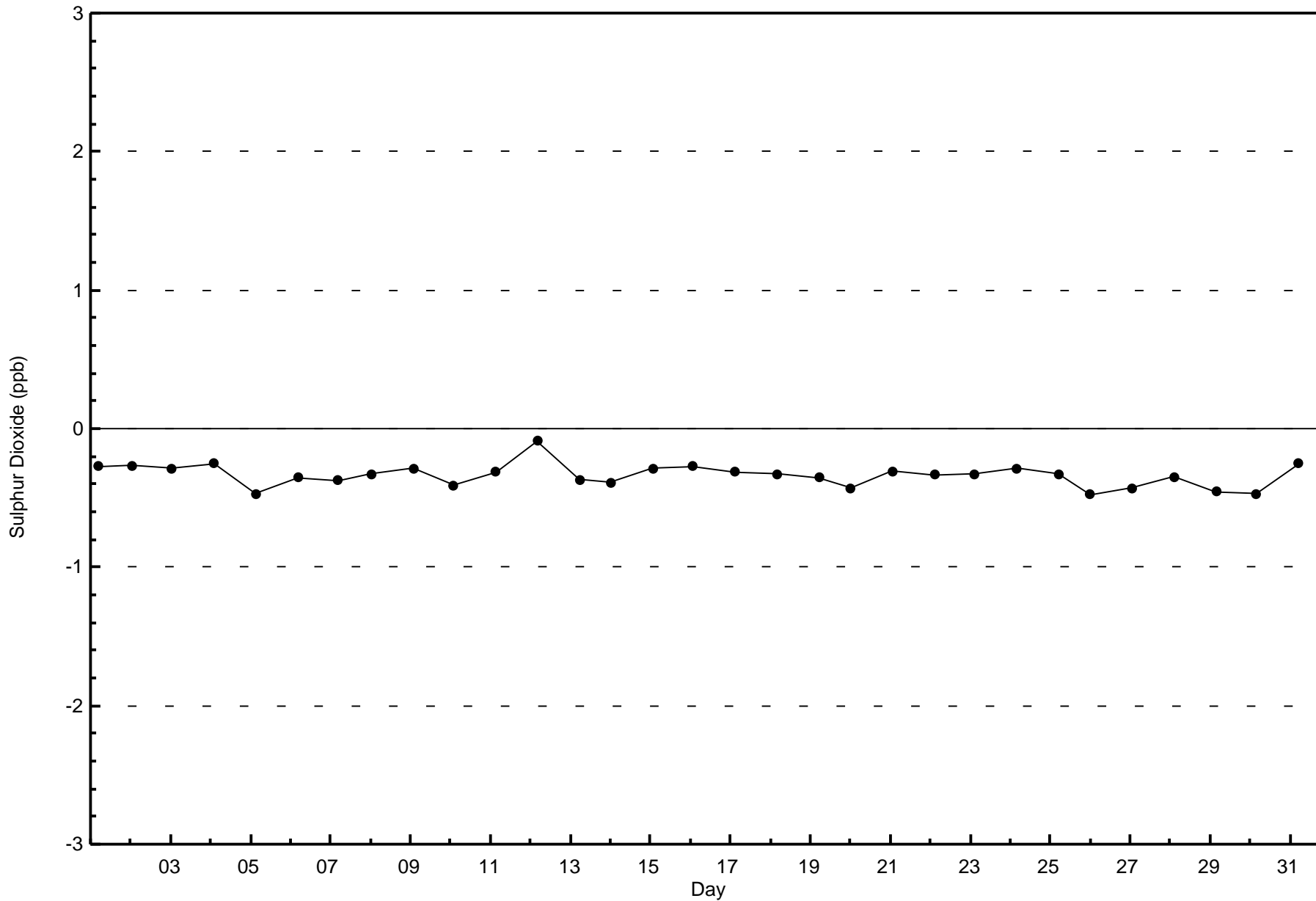


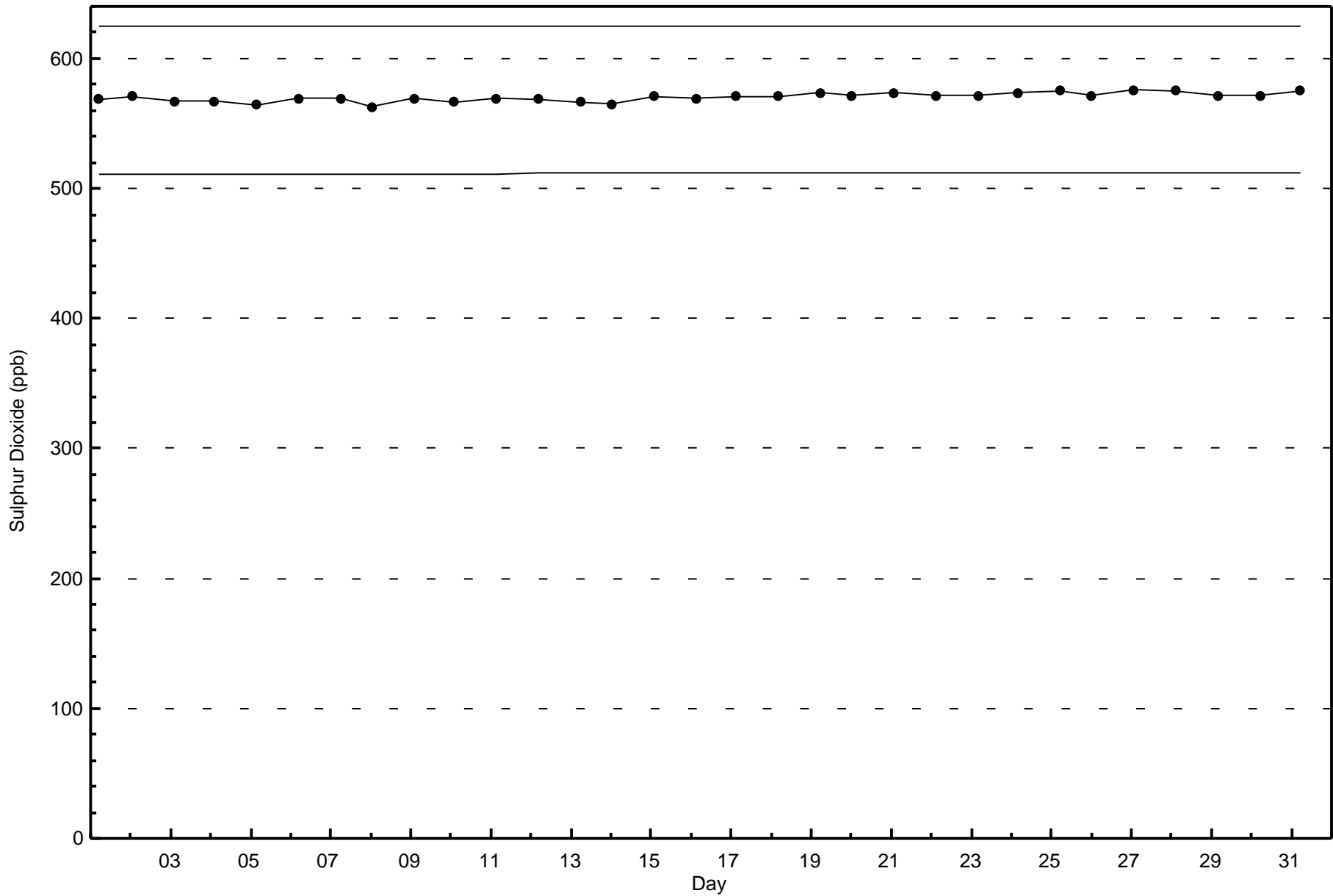
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Firebag (AMS 19)











Summary of Hour Averages

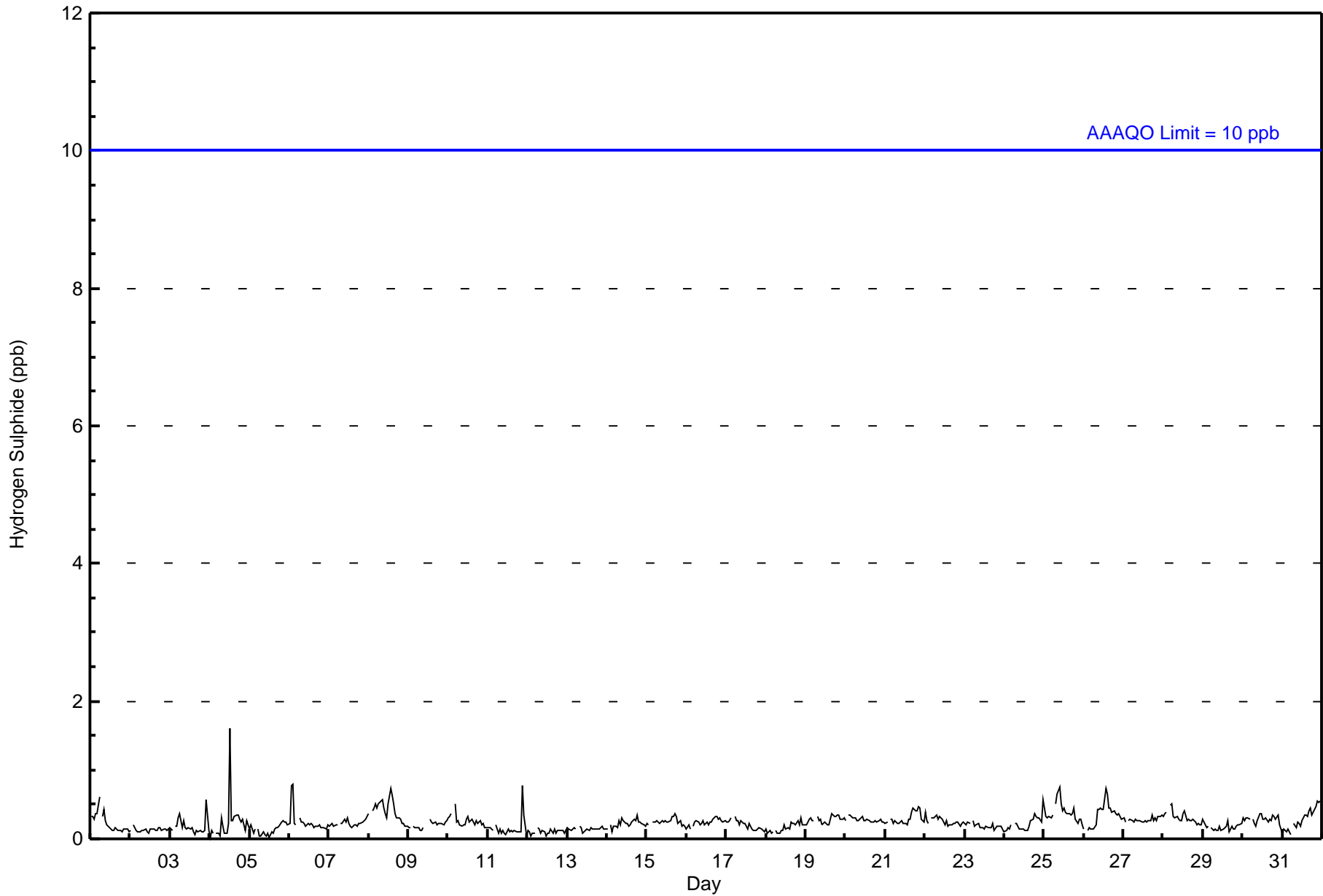
Firebag - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 2 ppb on Dec 4 13:00	Maximum Daily Average: 0.4 ppb on Dec 8		Hours of Data:	710
Minimum Value: 0 ppb on Dec 4 01:00	Minimum Daily Average: 0.1 ppb on Dec 12		Hours of Missing Data:	34
Maximum Diurnal Average: 0.3 ppb at hour 13	Minimum Diurnal Average: 0.2 ppb at hour 4		Hours of Calibration:	34
Monthly Average: 0.2 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 O <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 1		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.2	1	
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Dec	0	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
8-Dec	0	Z	0	0	0	0	1	1	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0.4	1
9-Dec	0	0	Z	0	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
10-Dec	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1	
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
16-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
23-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.2	1	
25-Dec	0	0	0	0	0	0	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
28-Dec	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
30-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.3	1	

0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	Diurnal Average	
0	1	1	0	1	1	1	1	1	1	1	1	0	2	1	1	1	0	0	0	0	0	0	1	1	1	Diurnal Maximum	

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb    24-hr 3 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Firebag - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	710	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 710

Total Number of Hours: 744



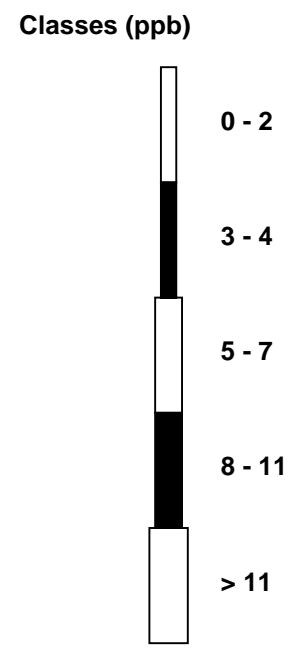
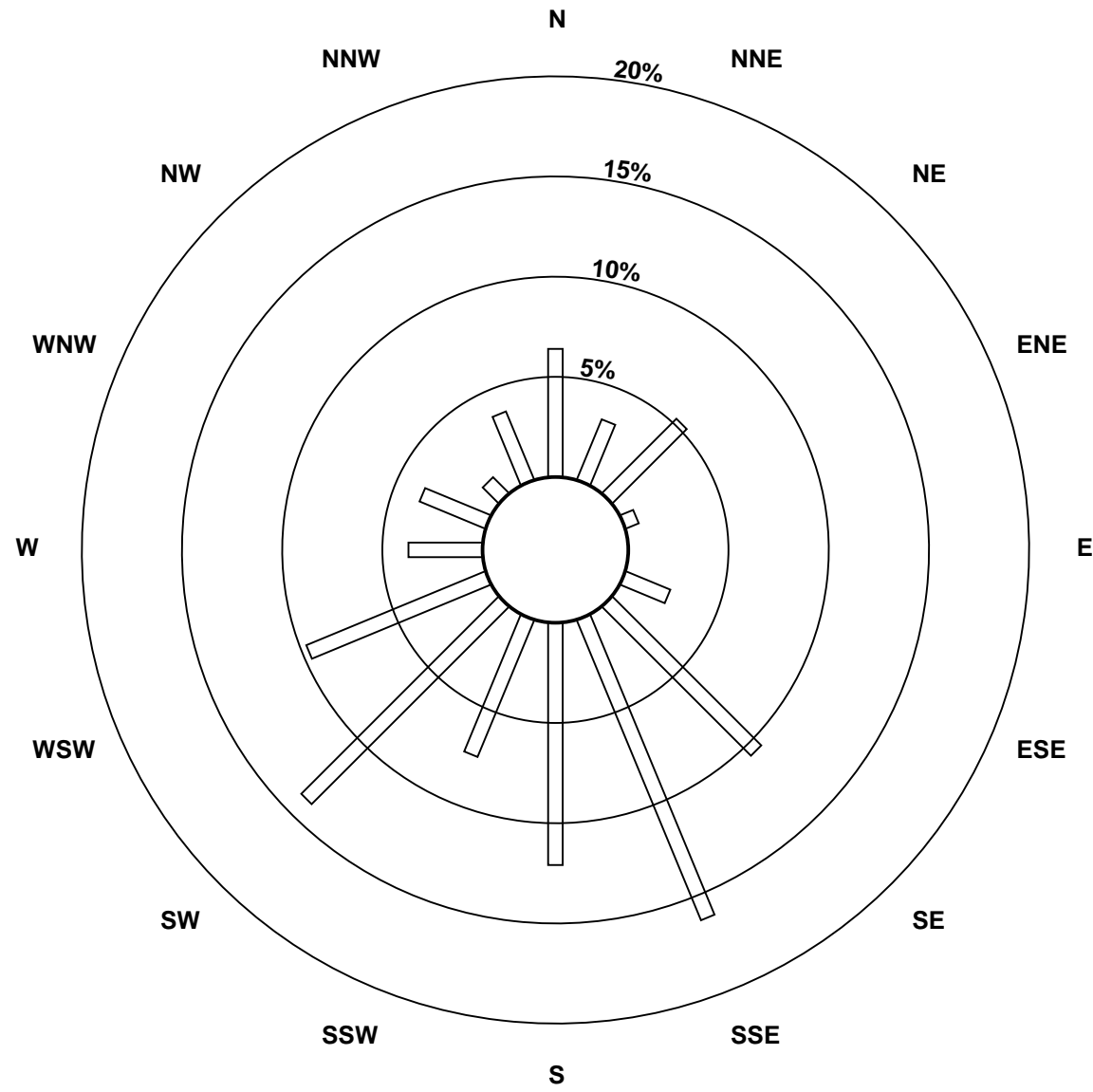
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Firebag - December 2015**

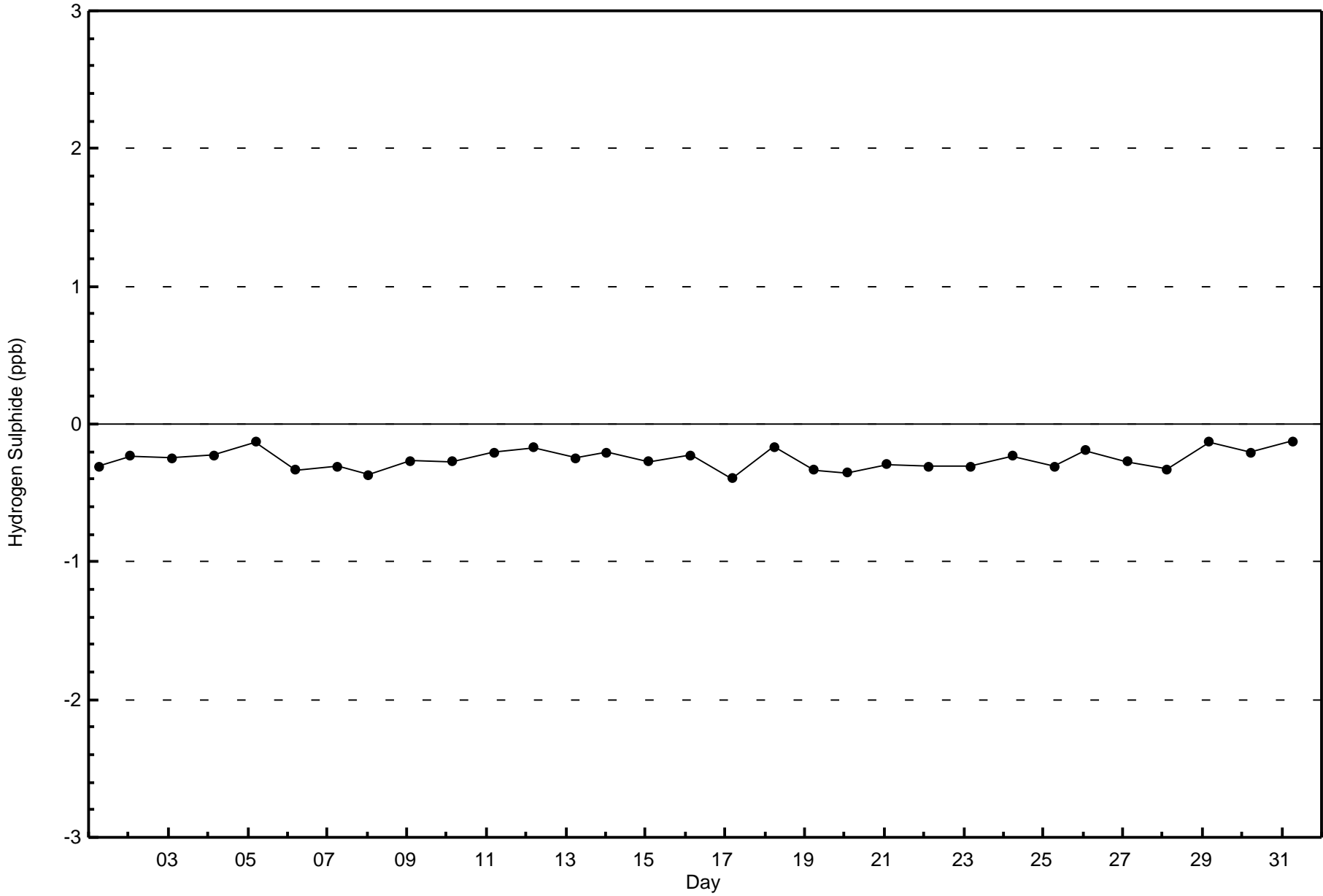
Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	45	23	37	5	0	17	74	114	85	52	98	68	26	25	8	26	703
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	45	23	37	5	0	17	74	114	85	52	98	68	26	25	8	26	703

Total Number of Valid Hours: 703

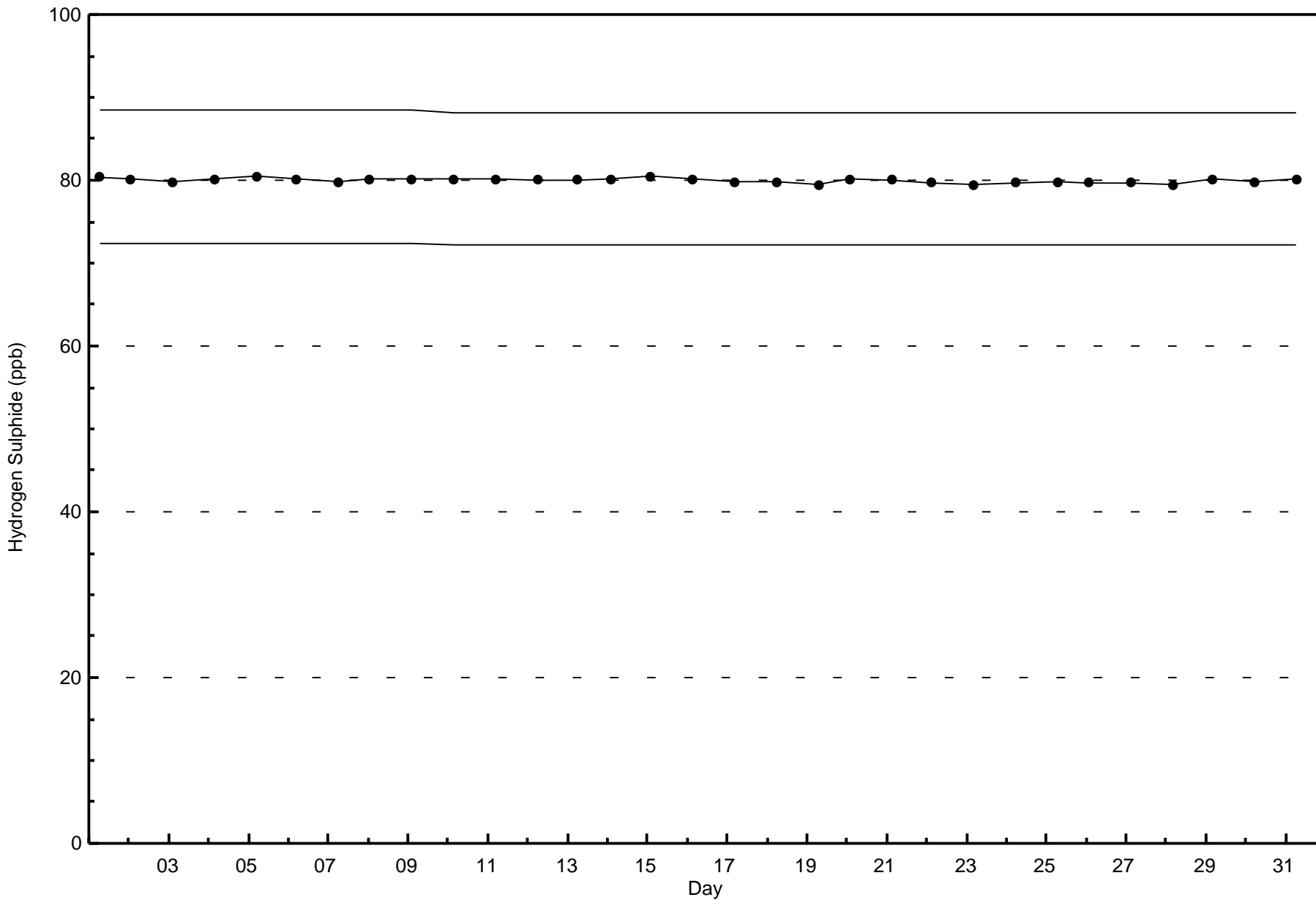
Total Number of Hours: 744



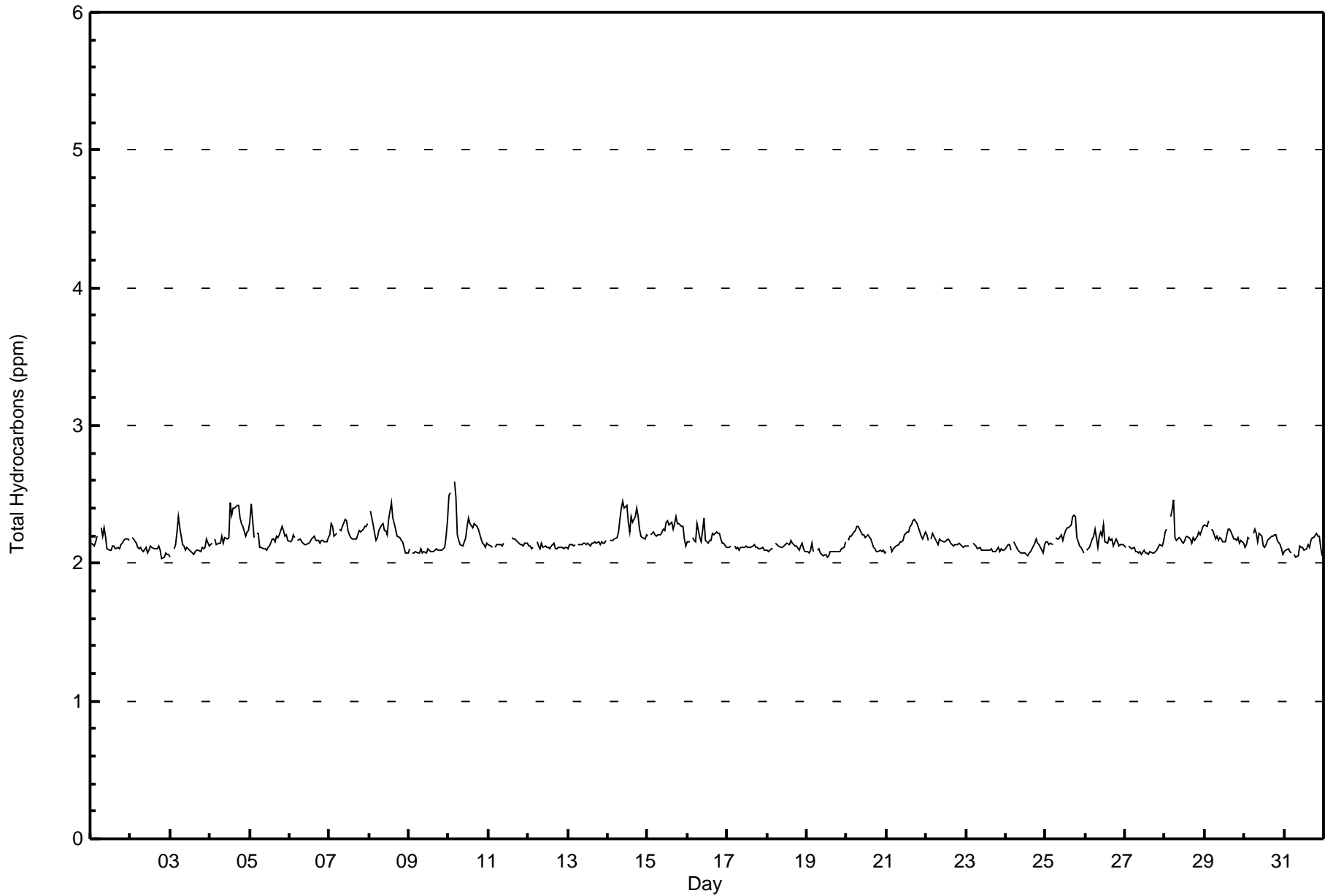
Total Number of Valid Hours: 703













**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Firebag - December 2015**

<b>Concentration Ranges (ppm)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2.0	5	0.71	0.71
2.1 - 3.0	704	99.29	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Total Hydrocarbons (THC) - ppm**  
**Firebag - December 2015**

Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2.0	0	0	0	0	0	0	0	0	1	0	1	0	1	2	0	0	5
2.1 - 3.0	42	25	37	5	0	18	77	114	79	49	101	66	26	24	6	28	697
3.1 - 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	42	25	37	5	0	18	77	114	80	49	102	66	27	26	6	28	702

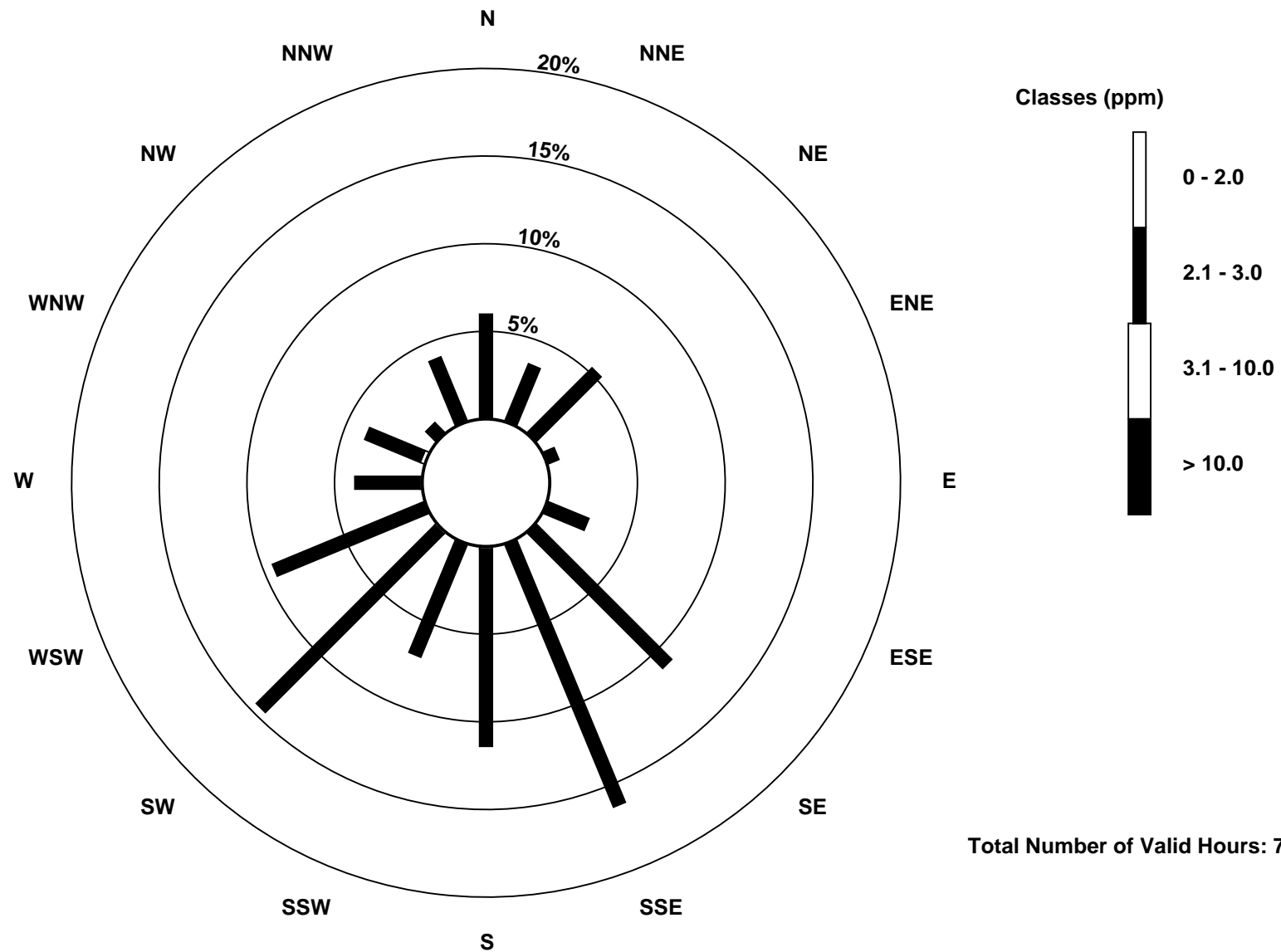
Total Number of Valid Hours: 702

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Total Hydrocarbons (THC) - ppm  
Firebag (AMS 19)



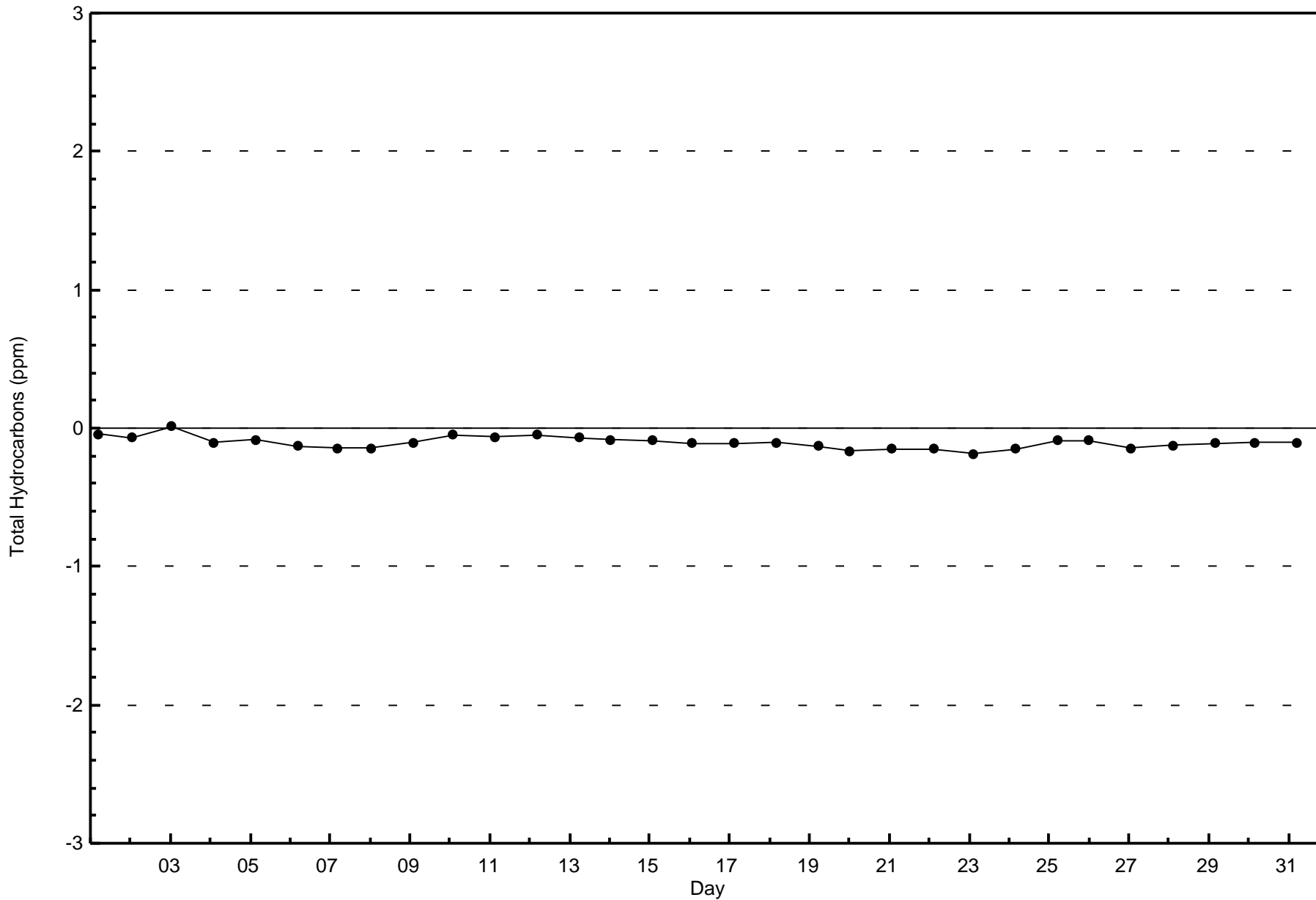


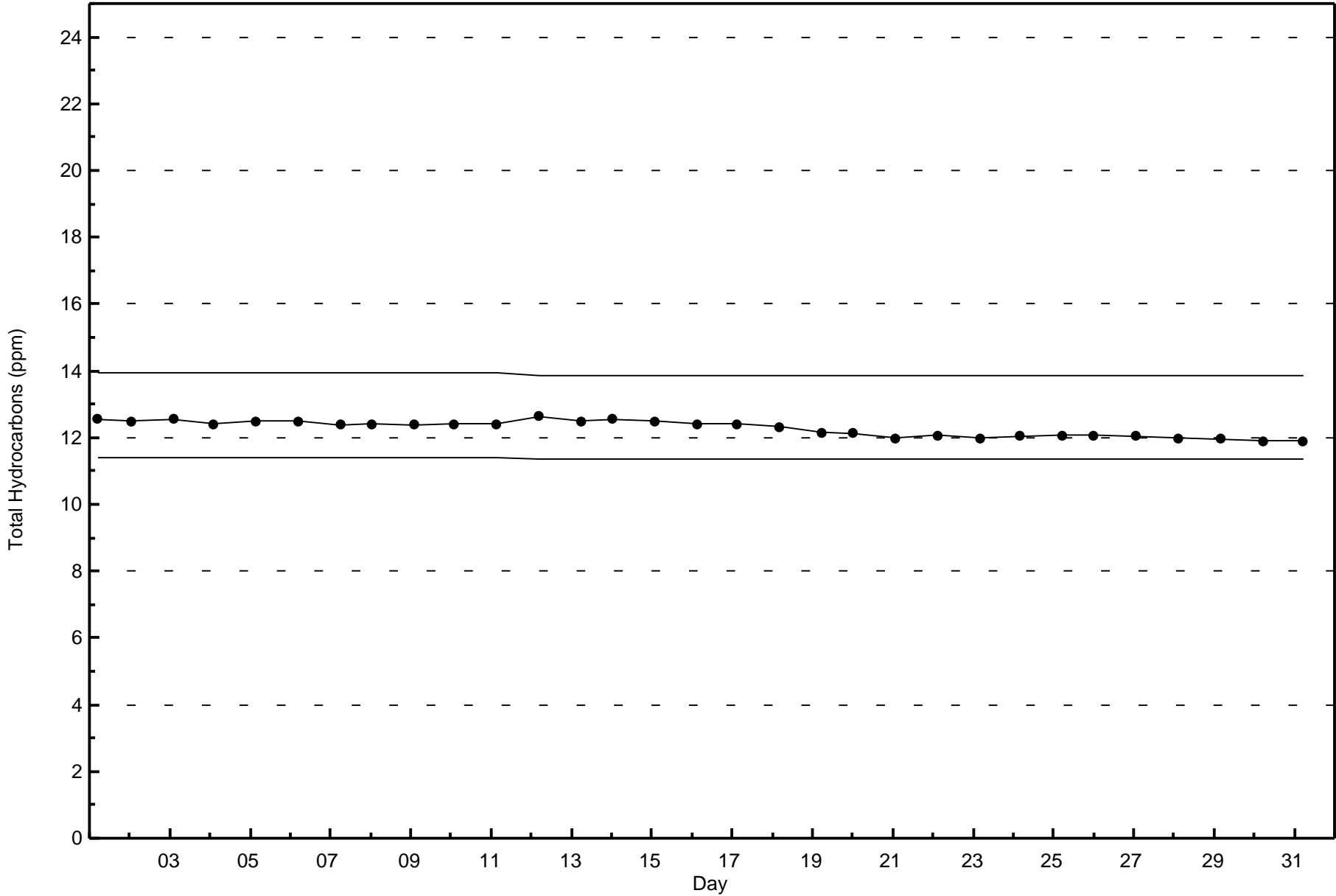
Wood Buffalo Environmental Association

Zero Responses

Total Hydrocarbons (THC) - ppm

Firebag - December 2015









Maximum Value: 16 ppb on Dec 26 11:00																		Maximum Daily Average: 3.8 ppb on Dec 26																		Hours in Service: 744			
Minimum Value: 0 ppb on Dec 5 07:00																		Minimum Daily Average: 0.0 ppb on Dec 17																		Hours of Data: 709			
Maximum Diurnal Average: 1.5 ppb at hour 11																		Minimum Diurnal Average: 0.4 ppb at hour 1																		Hours of Missing Data: 35			
Monthly Average: 0.9 ppb																		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 2 P <sub>99</sub> = 7																		Hours of Calibration: 35			
																																				Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24															
1-Dec	0	0	0	2	2	Z	9	2	6	3	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1.2	9													
2-Dec	Z	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.2	1													
3-Dec	0	Z	0	0	0	0	0	0	1	2	1	2	1	0	1	1	1	1	1	1	1	0	0	0	0.6	2													
4-Dec	0	1	Z	1	1	1	1	1	1	0	0	1	7	2	2	1	0	0	0	0	0	0	0	0	0.9	7													
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	2	3	2	0.5	3													
6-Dec	1	3	1	1	Z	1	1	2	1	1	1	1	1	1	0	1	1	1	1	1	1	2	1	1	1.1	3													
7-Dec	1	0	1	2	1	Z	2	1	2	3	4	2	1	3	1	0	1	1	1	0	0	0	0	0	1.2	4													
8-Dec	Z	0	0	0	0	0	0	0	0	1	1	1	3	7	8	6	1	2	2	1	0	1	0	0	1.6	8													
9-Dec	0	Z	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.6	1													
10-Dec	0	0	Z	6	6	0	0	0	0	1	1	3	4	3	3	2	1	3	2	3	2	1	1	1	1.9	6													
11-Dec	1	1	1	Z	1	2	1	1	1	1	C	C	C	C	1	1	1	1	1	1	1	1	1	0	0.9	2													
12-Dec	1	1	1	1	Z	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	1													
13-Dec	1	1	1	1	1	Z	2	1	1	1	1	0	0	1	1	1	1	1	2	1	1	1	0	0	0.8	2													
14-Dec	Z	0	0	0	0	0	0	0	1	2	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0.4	2													
15-Dec	0	Z	0	0	0	1	2	1	0	0	1	2	2	1	1	0	0	0	0	0	0	0	0	0	0.5	2													
16-Dec	0	0	Z	0	0	0	0	0	0	1	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	2													
17-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0													
18-Dec	0	0	0	0	Z	0	0	0	0	0	1	1	2	1	3	4	5	4	3	4	1	2	2	1	1.5	5													
19-Dec	2	2	3	3	2	Z	3	2	2	2	1	1	1	1	1	1	3	4	5	5	2	1	1	1	2.1	5													
20-Dec	Z	1	1	1	2	3	1	1	1	1	2	2	2	2	2	2	3	2	1	1	1	1	1	1	1.5	3													
21-Dec	1	Z	1	1	1	1	0	0	0	1	1	1	1	1	2	2	13	14	7	2	2	1	0	0	2.3	14													
22-Dec	0	1	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1													
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0													
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1	1													
25-Dec	0	0	0	0	0	Z	0	0	0	2	3	3	4	3	3	2	0	1	2	0	0	0	0	0	1.0	4													
26-Dec	Z	0	0	0	0	0	1	0	4	15	16	9	2	4	5	5	4	4	4	5	3	3	2	2	3.8	16													
27-Dec	1	Z	1	1	1	2	2	1	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0.8	2													
28-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0.2	2													
29-Dec	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1													
30-Dec	0	0	0	0	Z	0	0	0	0	1	2	1	1	2	2	1	0	0	0	0	0	0	0	0	0.4	2													
31-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1													
0.4 0.5 0.5 0.9 0.7 0.5 0.9 0.5 0.8 1.3 1.5 1.4 1.3 1.4 1.4 1.0 1.3 1.3 1.1 0.9 0.6 0.5 0.5 0.4																								Diurnal Average															
2 3 3 6 6 3 9 2 6 15 16 9 7 7 8 6 13 14 7 5 3 3 3 2																								Diurnal Maximum															
Z - zerospan C - Calibration																																							

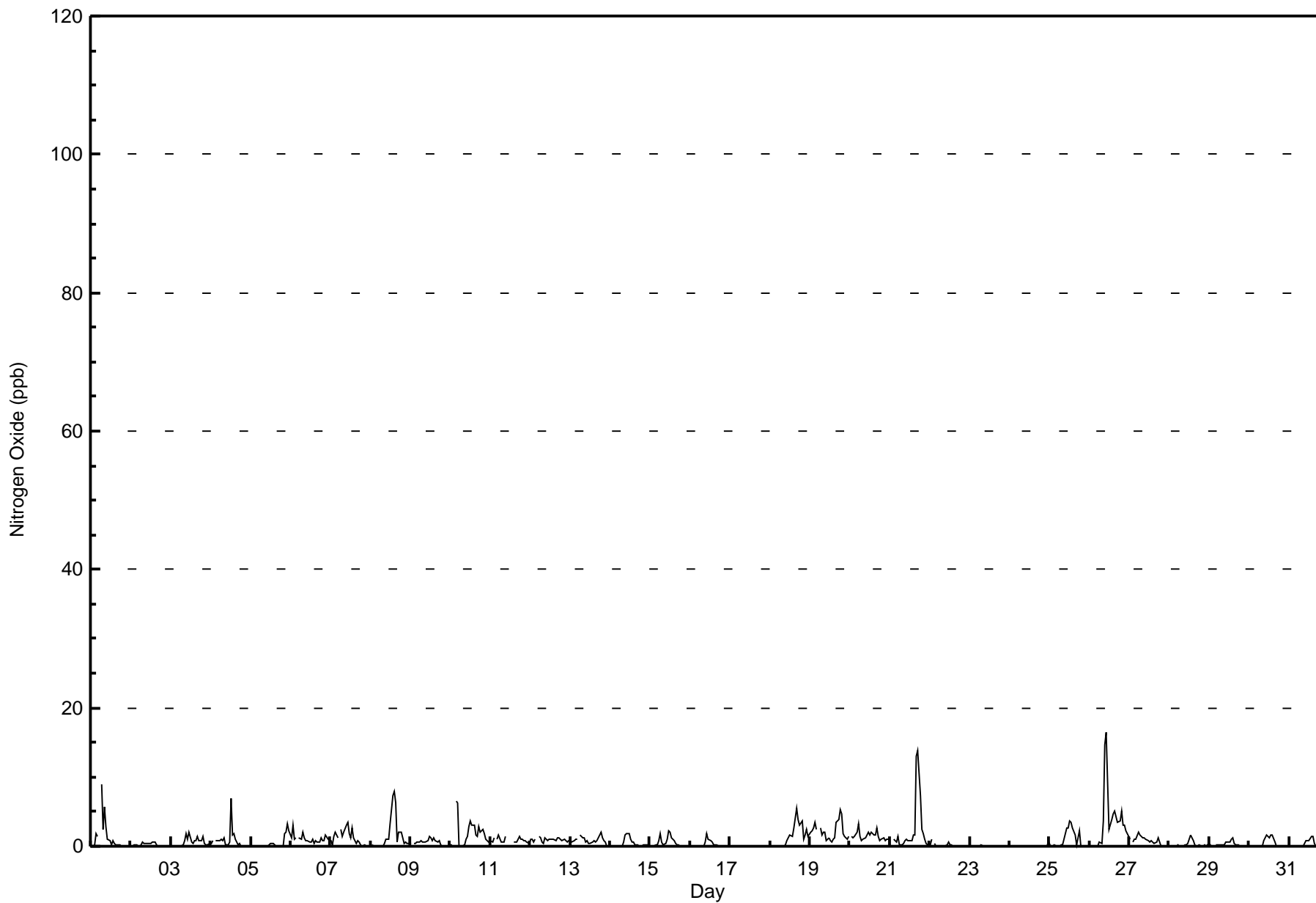


Wood Buffalo Environmental Association

Hourly Averages

Nitrogen Oxide (NO) - ppb

Firebag - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb**  
**Firebag - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	709	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Oxide (NO) - ppb**  
**Firebag - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	42	25	37	5	0	18	77	114	80	49	102	66	27	26	6	28	702
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	42	25	37	5	0	18	77	114	80	49	102	66	27	26	6	28	702

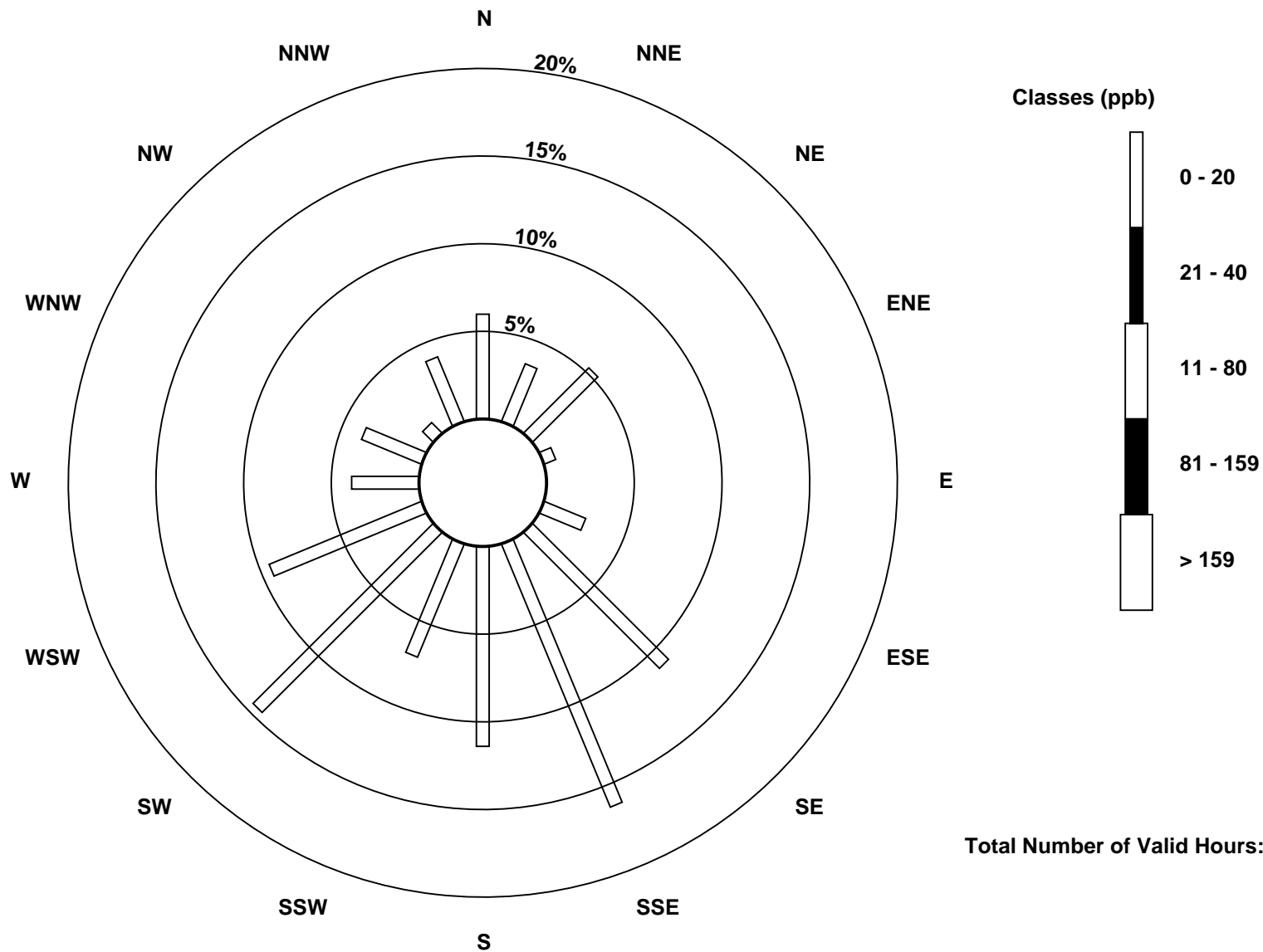
Total Number of Valid Hours: 702

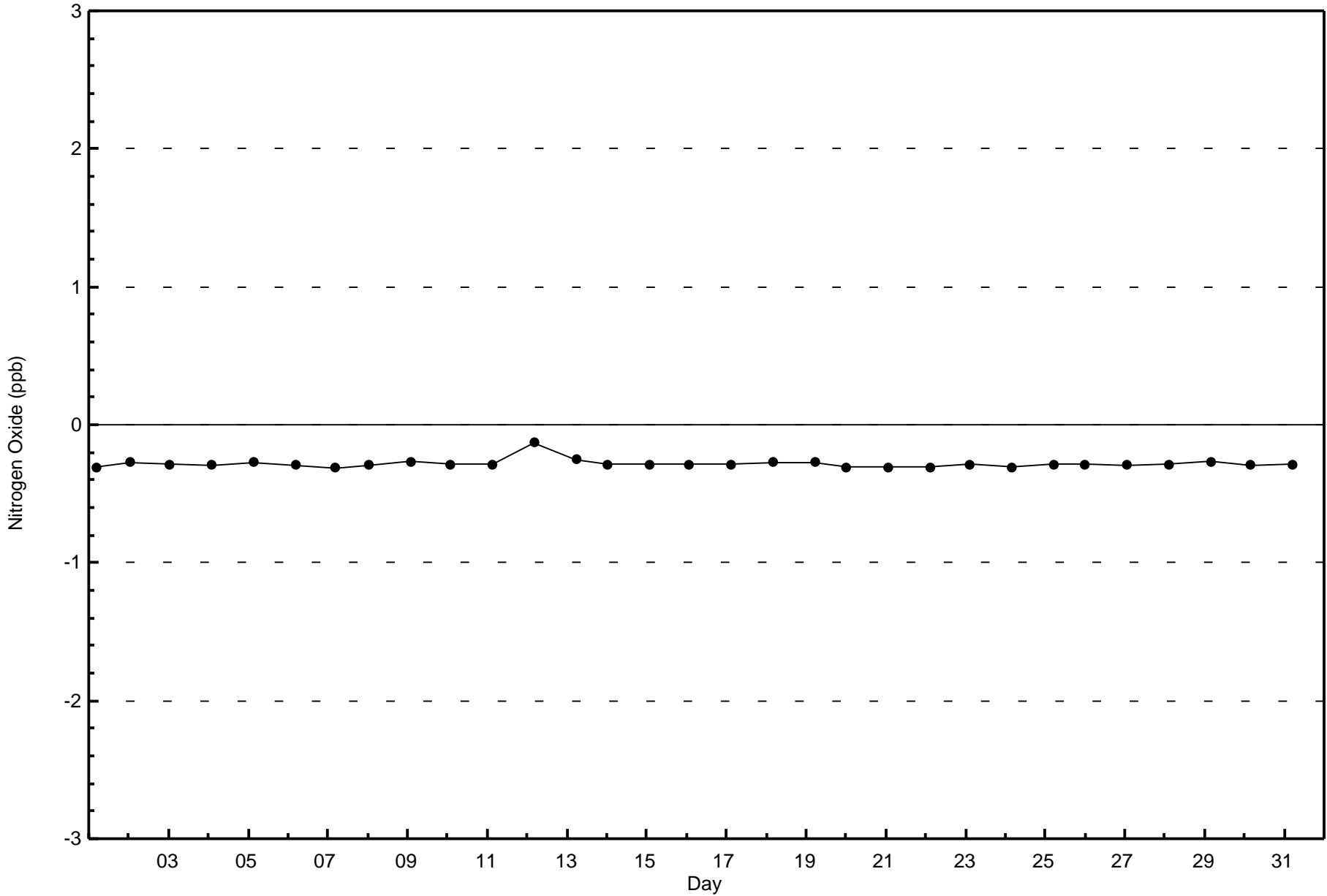
Total Number of Hours: 744

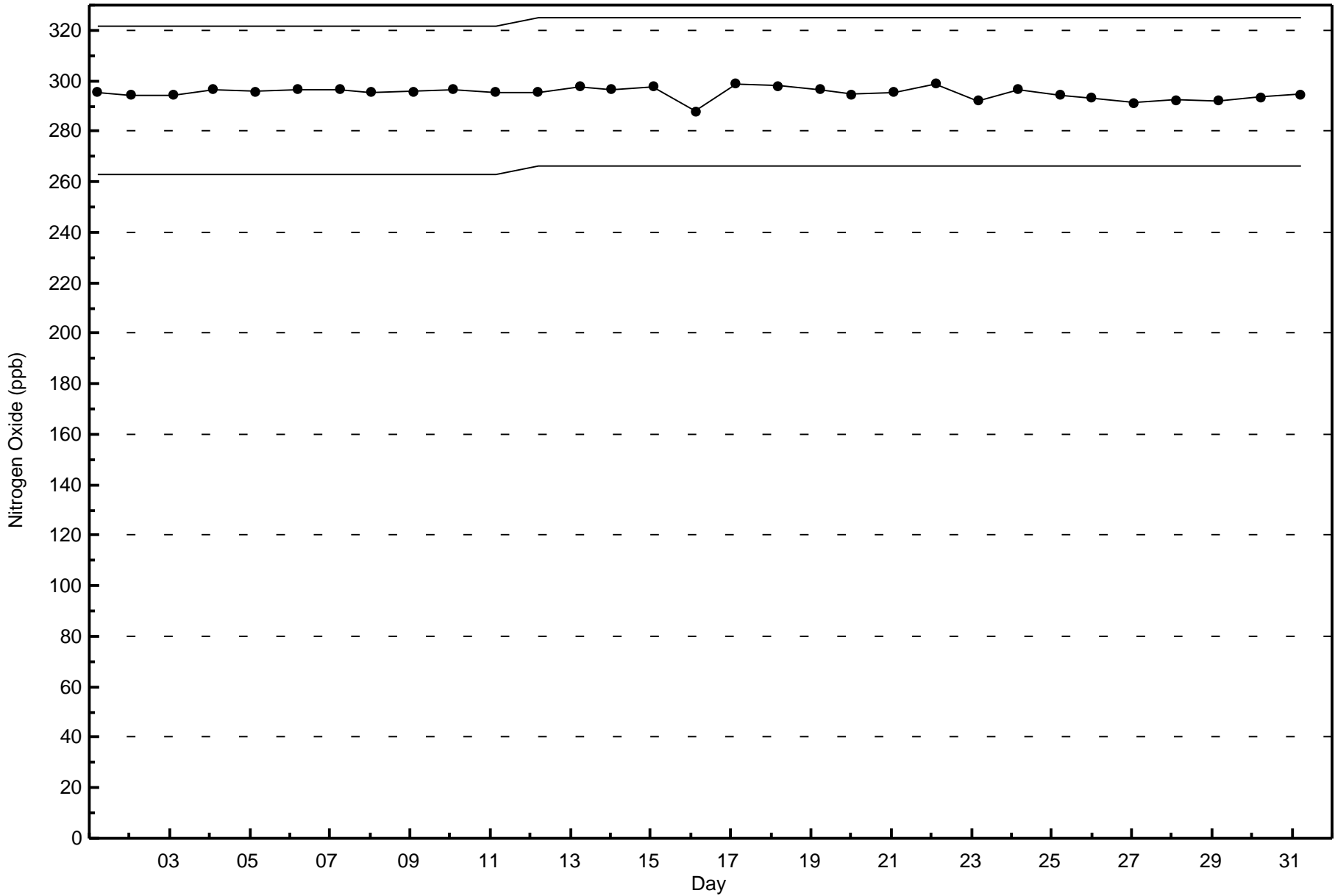


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Oxide (NO) - ppb  
Firebag (AMS 19)









Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 30 ppb on Dec 1 07:00	Maximum Daily Average: 9.2 ppb on Dec 1		Hours of Data:	709
Minimum Value: 0 ppb on Dec 17 21:00	Minimum Daily Average: 0.3 ppb on Dec 17		Hours of Missing Data:	35
Maximum Diurnal Average: 5.9 ppb at hour 18	Minimum Diurnal Average: 3.3 ppb at hour 12		Hours of Calibration:	35
Monthly Average: 4.3 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 2 Median = 3 O <sub>3</sub> = 6 P <sub>90</sub> = 10 P <sub>99</sub> = 17		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
1-Dec	12	11	10	20	17	Z	30	21	26	16	5	4	2	3	2	2	2	2	2	3	6	8	5	4	9.2	30																							
2-Dec	Z	4	6	6	2	2	4	4	3	3	3	3	4	6	7	5	6	6	3	1	2	3	3	2	3.7	7																							
3-Dec	1	Z	3	5	8	9	8	5	6	7	3	7	3	2	2	2	3	3	3	5	3	2	3	3	4.1	9																							
4-Dec	2	6	Z	5	3	4	5	5	5	3	2	4	16	10	10	11	14	15	10	9	8	4	6	7	7.0	16																							
5-Dec	7	13	3	Z	6	7	1	1	1	1	1	1	1	2	2	2	4	3	7	9	15	13	12	7	5.0	15																							
6-Dec	4	8	4	4	Z	3	3	5	3	2	2	2	2	2	3	2	2	3	2	2	3	2	2	2	2.9	8																							
7-Dec	3	3	4	5	3	Z	5	4	4	6	6	5	4	6	4	3	3	3	3	3	3	3	3	6	3.9	6																							
8-Dec	Z	8	3	2	1	2	8	11	10	7	4	3	7	12	15	15	11	8	8	6	4	2	1	2	6.5	15																							
9-Dec	1	Z	2	1	1	2	2	2	2	2	2	3	2	2	3	2	2	2	1	1	1	3	8	11	2.5	11																							
10-Dec	14	14	Z	17	17	6	3	2	2	4	5	7	8	7	8	8	9	10	8	6	5	4	3	3	7.2	17																							
11-Dec	3	3	3	Z	4	6	2	2	2	3	C	C	C	C	1	1	2	4	3	3	2	3	3	2	2.7	6																							
12-Dec	4	3	3	3	Z	3	3	1	1	3	1	2	2	2	2	2	2	2	2	1	2	2	1	2	2.0	4																							
13-Dec	2	1	1	2	2	Z	3	2	3	2	2	1	1	1	2	2	2	3	5	4	2	2	1	1	2.0	5																							
14-Dec	Z	1	0	1	1	2	5	10	14	12	8	7	4	3	5	5	8	8	12	7	4	2	1	2	5.2	14																							
15-Dec	1	Z	1	2	2	2	3	2	2	3	4	6	5	4	4	6	10	13	10	7	6	6	2	0	4.4	13																							
16-Dec	0	0	Z	1	1	3	11	5	2	5	8	3	2	2	2	3	6	10	7	7	5	1	1	0	3.7	11																							
17-Dec	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
18-Dec	0	0	1	1	Z	0	1	1	1	1	3	4	4	4	6	9	10	9	7	8	4	5	5	3	3.7	10																							
19-Dec	4	4	6	6	4	Z	6	3	4	3	1	1	1	1	2	2	4	5	6	6	3	3	3	4	3.6	6																							
20-Dec	Z	4	4	4	5	5	5	4	4	3	3	3	3	3	3	3	4	3	2	2	3	2	3	3	3.3	5																							
21-Dec	3	Z	3	3	3	3	2	2	3	3	3	2	2	3	6	9	16	17	14	9	8	6	5	4	5.6	17																							
22-Dec	3	4	Z	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1.1	4																							
23-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0																							
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	4	6	9	9	7	4	4	9	9	2.4	9																							
25-Dec	8	5	6	8	7	Z	7	10	12	12	8	6	7	7	8	10	12	13	14	5	1	1	0	0	7.2	14																							
26-Dec	Z	0	0	1	2	3	4	3	14	18	16	10	4	6	9	9	9	9	7	8	5	6	5	4	6.7	18																							
27-Dec	3	Z	2	2	2	3	3	3	2	2	2	1	1	1	1	1	2	2	1	1	1	2	2	2	1.9	3																							
28-Dec	4	5	Z	7	12	16	4	2	2	2	2	1	3	4	4	3	2	3	5	4	5	5	7	7	4.6	16																							
29-Dec	10	6	4	Z	4	4	3	4	4	3	3	2	2	3	4	4	4	4	4	4	4	4	5	6	4.1	10																							
30-Dec	8	9	10	10	Z	9	9	8	6	8	9	7	6	7	8	9	10	9	11	13	13	12	7	5	8.7	13																							
31-Dec	5	3	5	6	4	Z	3	4	7	7	5	4	3	5	7	7	10	11	9	10	11	11	10	9	6.7	11																							
																								3.8	4.4	3.3	4.7	4.3	3.9	4.6	4.1	4.6	4.5	3.6	3.3	3.3	3.6	4.1	4.5	5.5	5.9	5.7	4.9	4.3	3.9	3.5	3.5	Diurnal Average	
																								14	14	10	20	17	16	30	21	26	18	16	10	16	12	15	15	16	17	14	13	15	13	12	11	Diurnal Maximum	

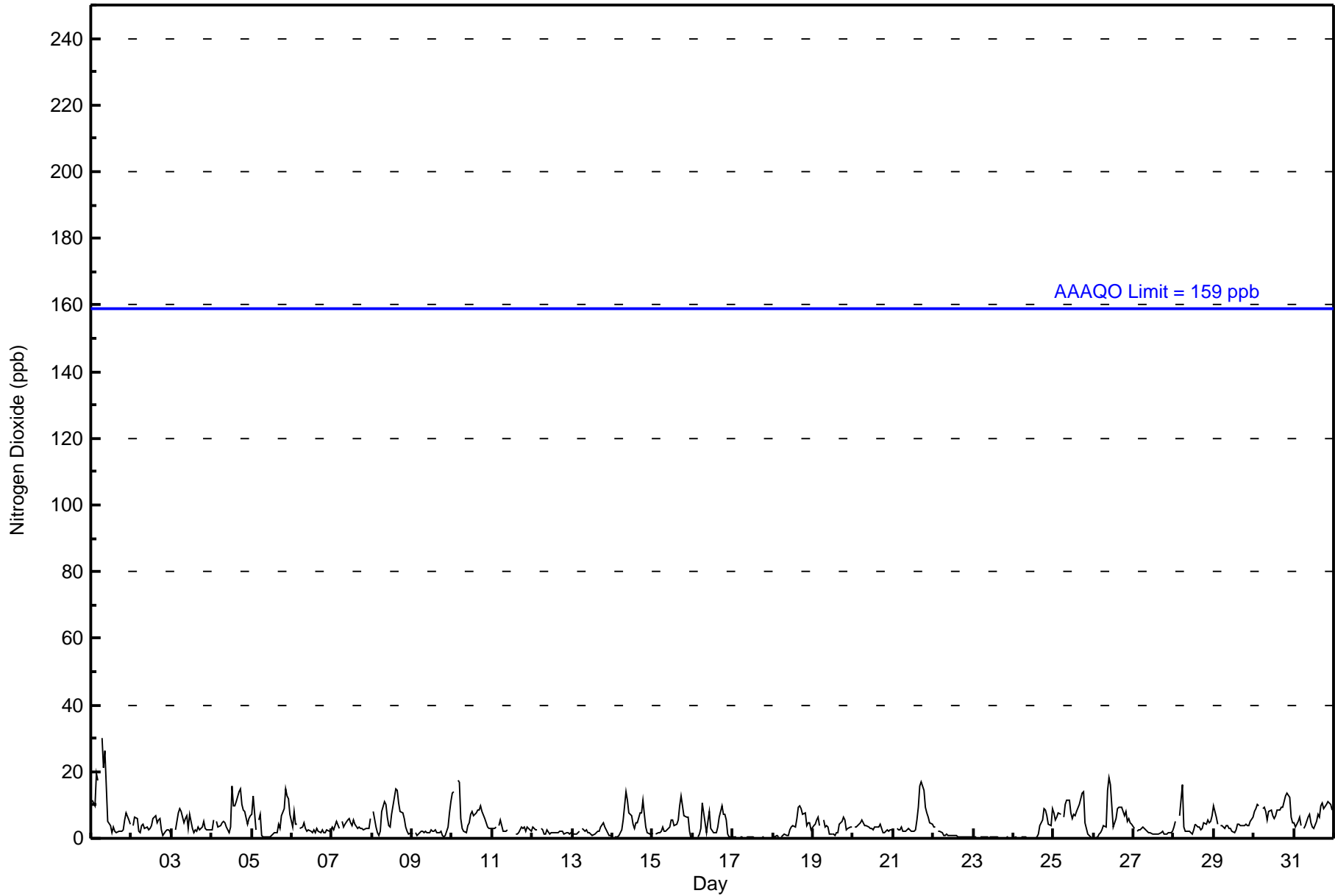
Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb





Wood Buffalo Environmental Association  
Hourly Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Firebag - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Firebag - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	706	99.58	99.58
21 - 40	3	0.42	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Firebag - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	42	25	37	5	0	17	75	114	80	49	102	66	27	26	6	28	699
21 - 40	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	3
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	42	25	37	5	0	18	77	114	80	49	102	66	27	26	6	28	702

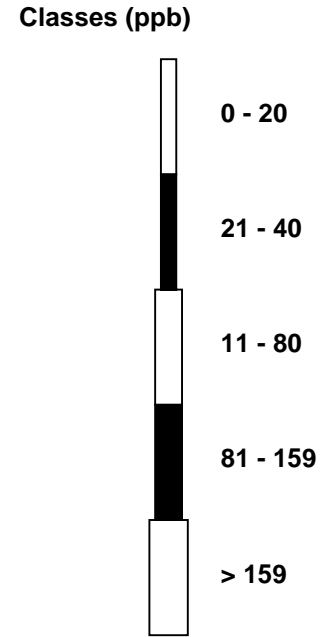
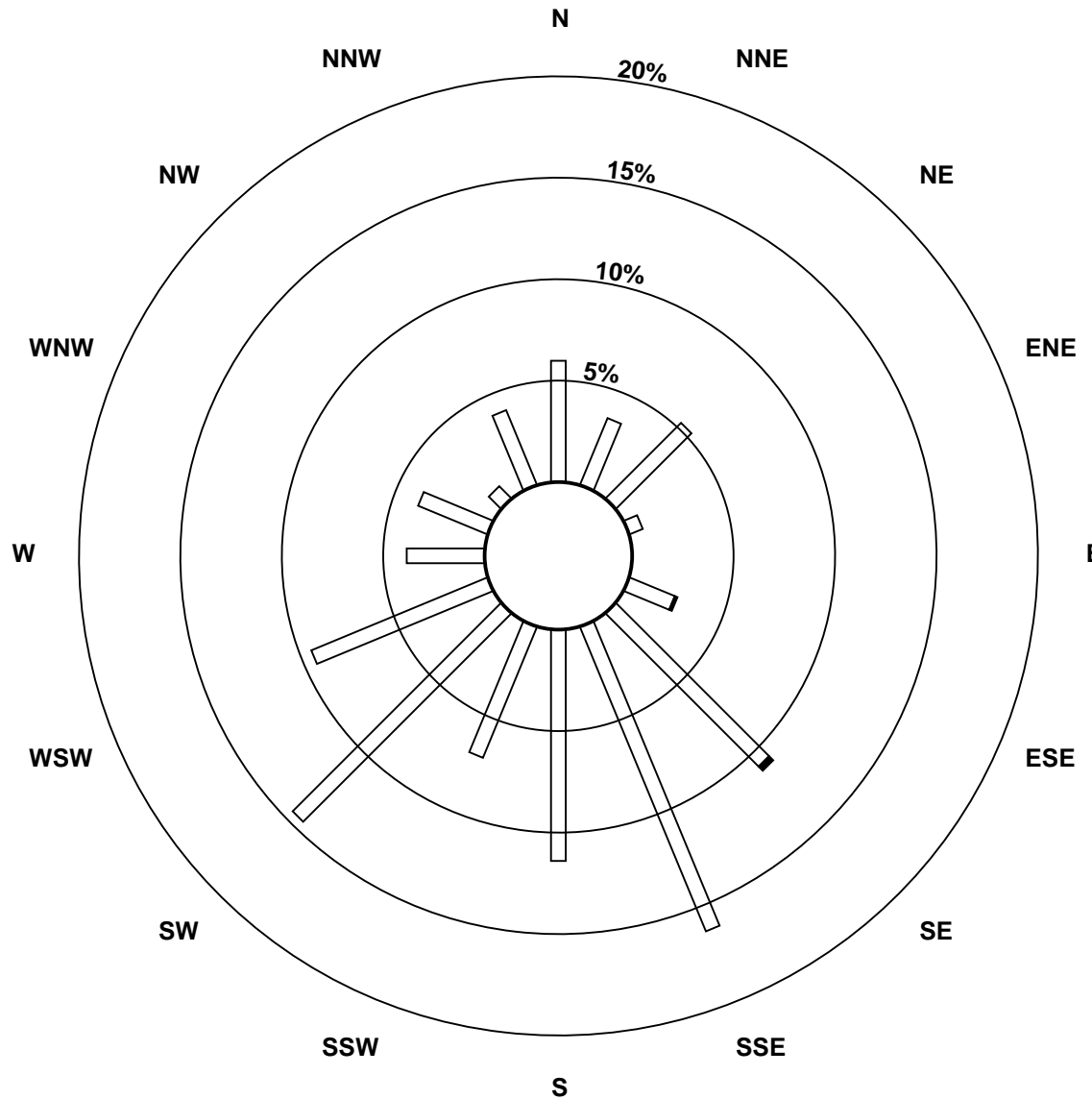
Total Number of Valid Hours: 702

Total Number of Hours: 744

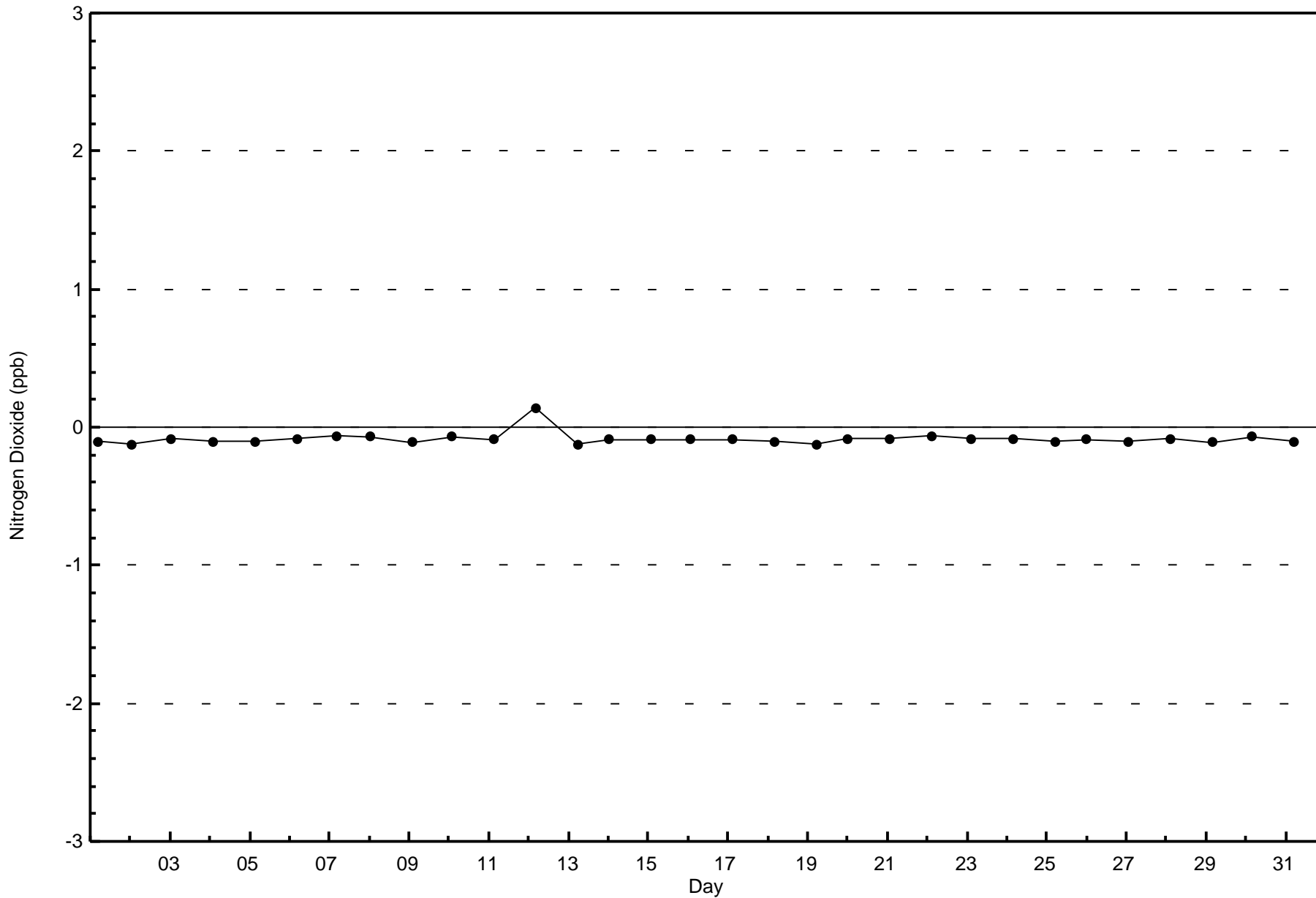


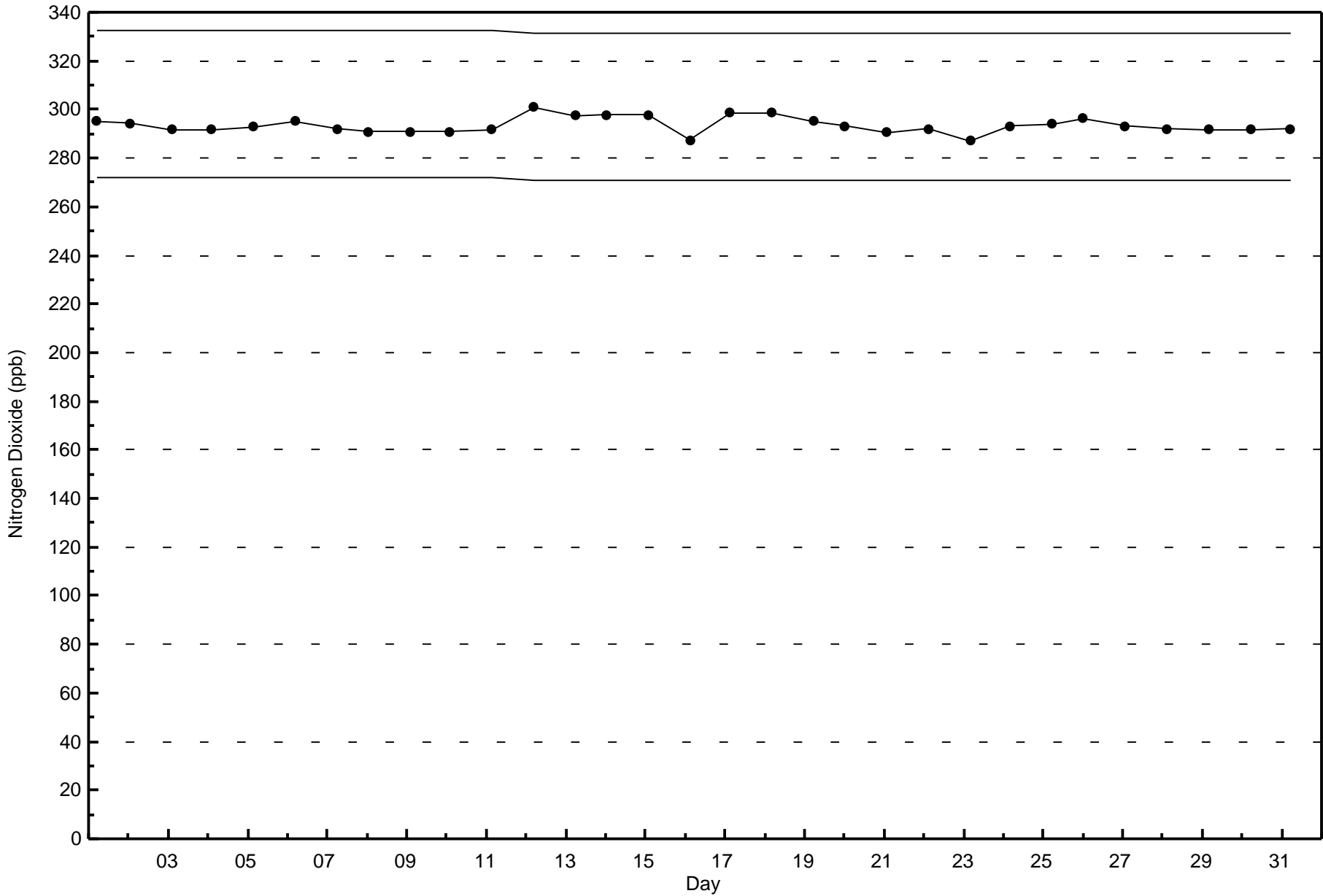
Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Firebag (AMS 19)



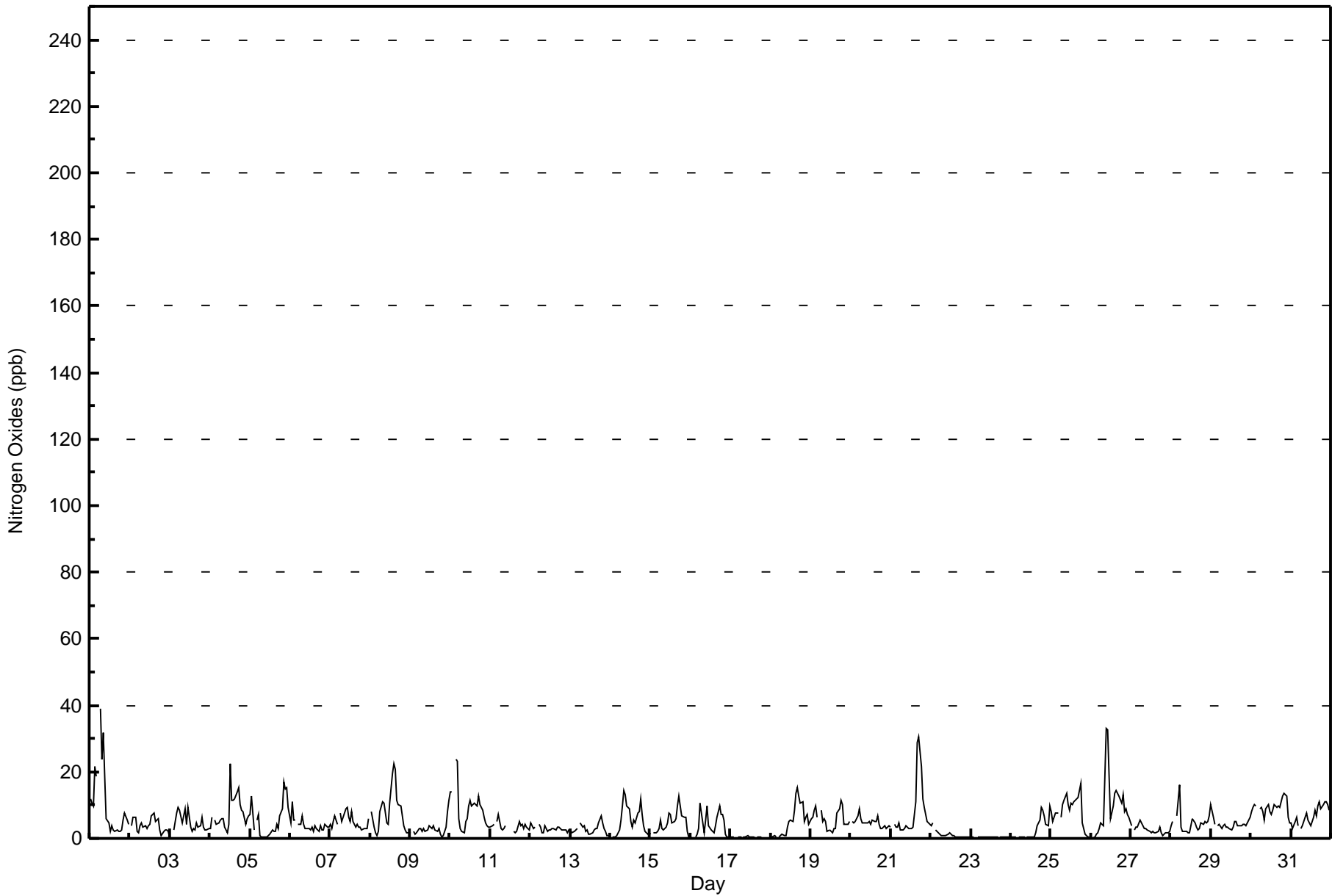
Total Number of Valid Hours: 702







Maximum Value: 39 ppb on Dec 1 07:00																	Maximum Daily Average: 10.5 ppb on Dec 26																	Hours in Service: 744			
Minimum Value: 0 ppb on Dec 17 22:00																	Minimum Daily Average: 0.3 ppb on Dec 17																	Hours of Data: 709			
Maximum Diurnal Average: 7.3 ppb at hour 18																	Minimum Diurnal Average: 3.8 ppb at hour 3																	Hours of Missing Data: 35			
Monthly Average: 5.2 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 2 Median = 4 O <sub>3</sub> = 7 P <sub>90</sub> = 11 P <sub>99</sub> = 21																	Hours of Calibration: 35			
																																		Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	12	11	10	22	19	Z	39	24	32	19	6	5	2	4	3	2	2	2	2	3	6	8	5	4	10.4	39											
2-Dec	Z	4	6	6	2	2	4	5	3	4	3	4	4	7	8	5	6	6	3	1	2	3	3	2	3.9	8											
3-Dec	1	Z	3	5	8	9	8	5	7	9	4	9	3	2	3	3	5	3	4	6	3	3	3	3	4.7	9											
4-Dec	3	7	Z	6	4	5	6	6	6	3	2	4	22	11	11	12	14	15	10	9	8	4	6	7	7.9	22											
5-Dec	7	13	3	Z	6	7	1	0	1	1	1	1	1	2	2	2	4	3	7	9	17	15	15	9	5.5	17											
6-Dec	5	11	5	6	Z	4	4	7	4	3	3	3	2	3	2	4	3	2	4	3	3	4	3	3	4.0	11											
7-Dec	4	3	5	7	4	Z	7	5	6	9	9	6	5	8	5	3	4	4	3	3	3	3	3	6	5.1	9											
8-Dec	Z	8	3	2	1	2	8	11	11	7	5	4	10	20	23	21	11	10	10	7	4	3	2	2	8.0	23											
9-Dec	2	Z	2	1	2	3	3	2	3	2	2	4	3	3	4	3	2	3	1	1	1	3	8	11	3.0	11											
10-Dec	14	14	Z	24	23	6	3	2	2	5	6	10	12	10	11	10	10	13	10	8	6	4	4	3	9.1	24											
11-Dec	4	4	4	Z	5	7	3	3	3	4	C	C	C	C	2	2	2	5	4	4	3	4	4	2	3.6	7											
12-Dec	5	4	3	3	Z	4	4	2	2	4	2	3	3	3	3	2	3	3	3	2	3	2	2	3	2.9	5											
13-Dec	2	2	2	3	3	Z	5	3	4	2	2	1	1	2	3	3	3	4	7	5	3	2	1	1	2.8	7											
14-Dec	Z	1	0	0	1	2	5	10	15	13	10	9	5	3	5	5	8	8	12	7	4	2	1	2	5.6	15											
15-Dec	1	Z	2	2	2	3	5	3	3	3	4	8	7	5	5	6	10	13	10	7	6	6	2	0	4.9	13											
16-Dec	0	0	Z	0	1	3	11	5	2	6	10	4	3	2	2	4	7	10	7	7	5	1	0	0	3.9	11											
17-Dec	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1											
18-Dec	0	0	1	1	Z	0	1	1	1	1	4	5	5	5	9	13	15	13	10	11	5	6	7	4	5.2	15											
19-Dec	6	6	8	10	6	Z	8	5	6	5	2	2	2	2	3	3	8	9	12	10	4	4	4	5	5.7	12											
20-Dec	Z	5	5	5	7	9	6	5	5	5	5	5	4	6	5	5	7	4	3	3	4	3	3	4	4.8	9											
21-Dec	3	Z	4	4	3	5	3	2	3	4	4	3	3	4	7	11	29	31	22	12	10	7	5	4	7.9	31											
22-Dec	4	5	Z	3	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	0	1	0	0	1.3	5											
23-Dec	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1											
24-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	2	4	6	9	9	7	4	4	10	10	2.5	10											
25-Dec	8	5	6	8	8	Z	6	10	12	13	10	9	11	10	11	12	12	15	16	5	1	1	0	0	8.2	16											
26-Dec	Z	0	0	1	2	3	5	4	18	33	33	19	6	10	14	14	14	13	11	13	8	9	7	6	10.5	33											
27-Dec	4	Z	3	3	4	5	5	4	3	3	3	2	2	2	2	2	2	3	2	1	1	2	2	2	2.6	5											
28-Dec	4	5	Z	7	12	16	3	2	2	2	2	2	4	6	5	3	2	3	5	4	5	5	7	7	4.8	16											
29-Dec	10	6	4	Z	4	4	3	4	4	3	3	3	3	3	5	5	4	4	4	4	4	4	5	6	4.4	10											
30-Dec	8	9	10	10	Z	9	9	8	6	9	10	8	7	8	10	9	10	9	11	13	13	13	7	5	9.2	13											
31-Dec	5	3	5	6	4	Z	3	4	6	8	6	4	4	6	8	7	10	11	9	10	11	11	10	9	6.9	11											
4.3																	4.9																	Diurnal Average			
14																	10																	Diurnal Maximum			
Z - zerospan																	C - Calibration																				







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Firebag - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	695	98.03	98.03
21 - 40	14	1.97	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Firebag - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	41	25	37	5	0	16	73	113	79	49	101	65	27	26	6	27	690
21 - 40	1	0	0	0	0	2	4	1	1	0	1	1	0	0	0	1	12
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	42	25	37	5	0	18	77	114	80	49	102	66	27	26	6	28	702

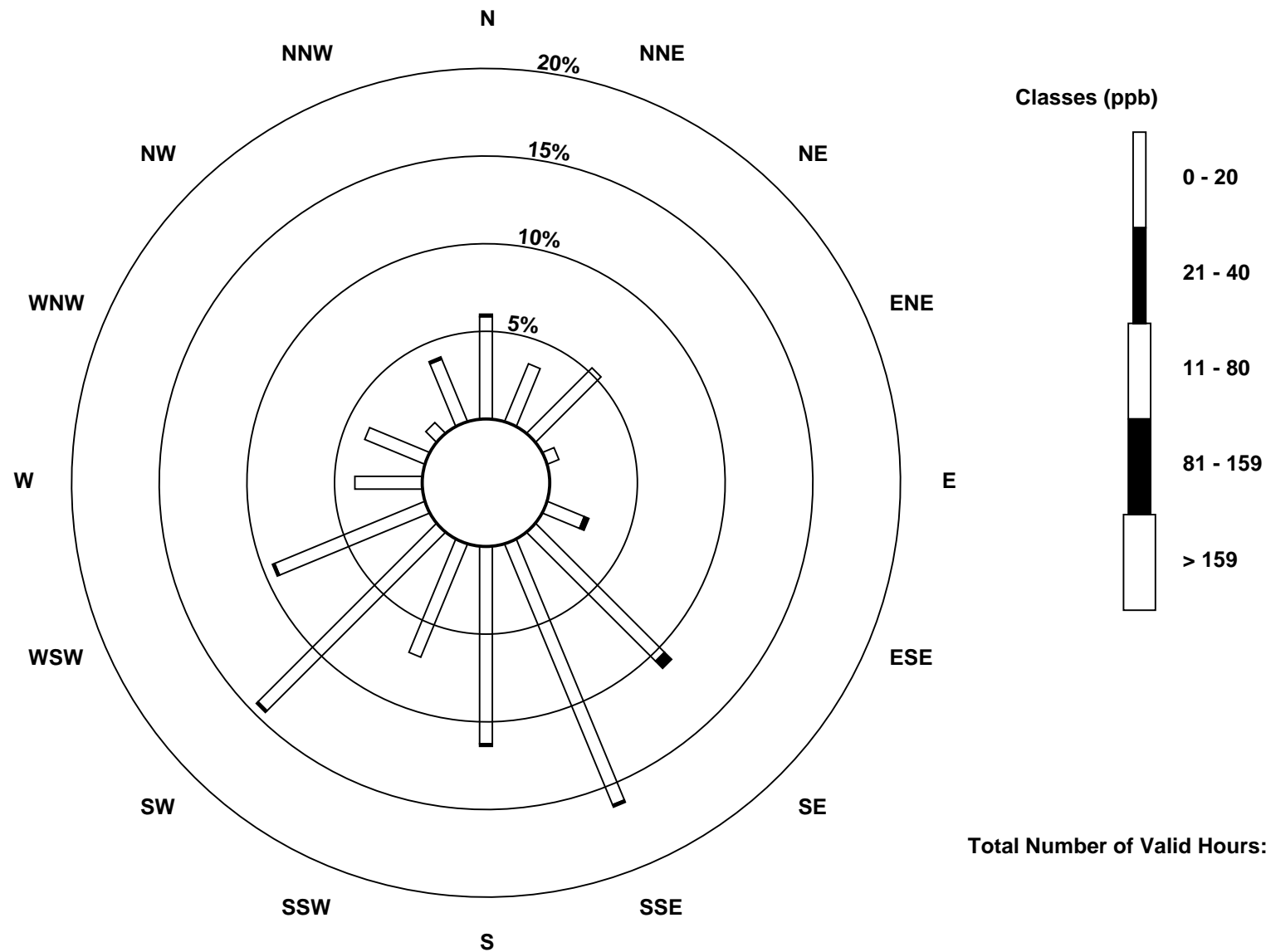
Total Number of Valid Hours: 702

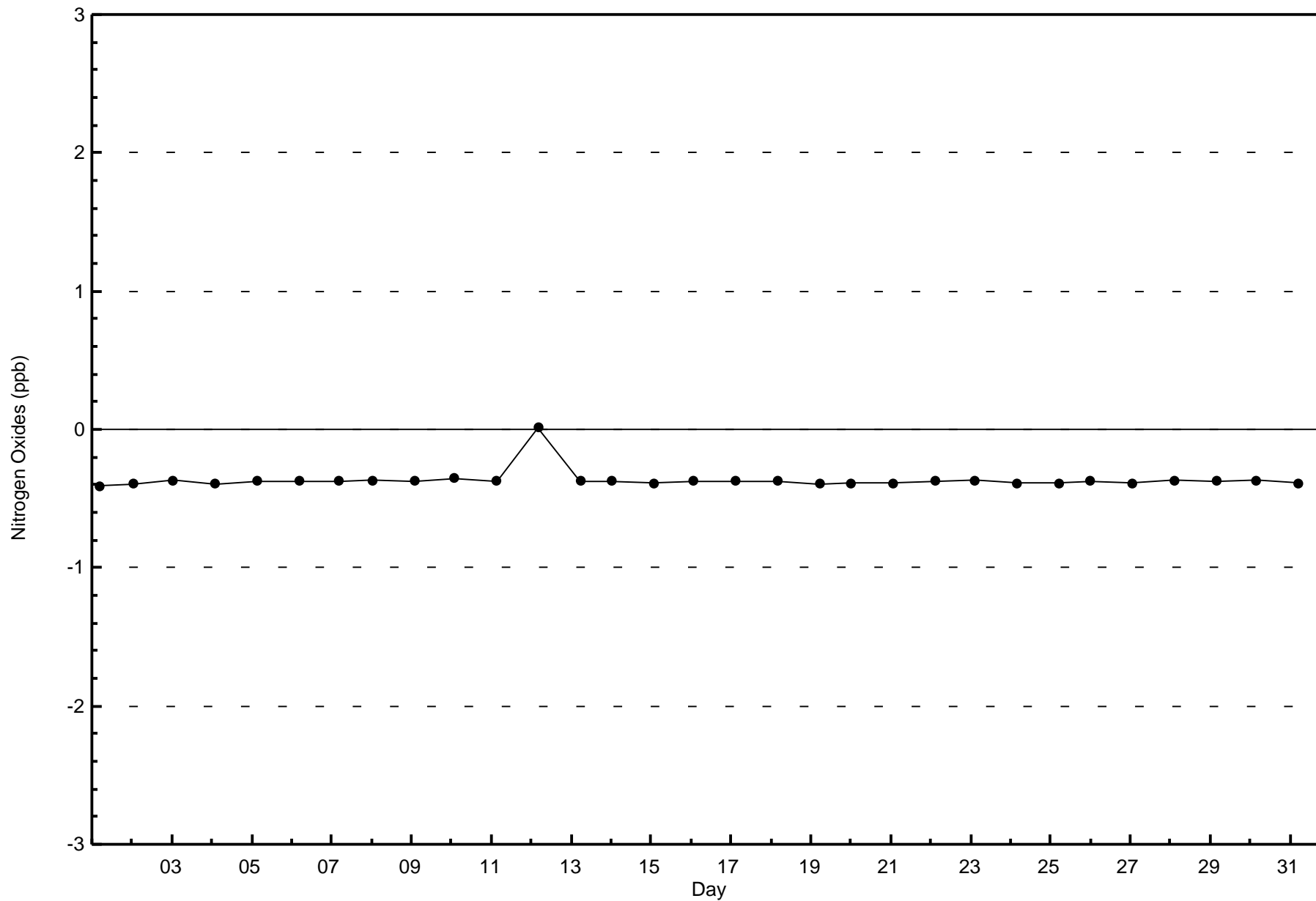
Total Number of Hours: 744

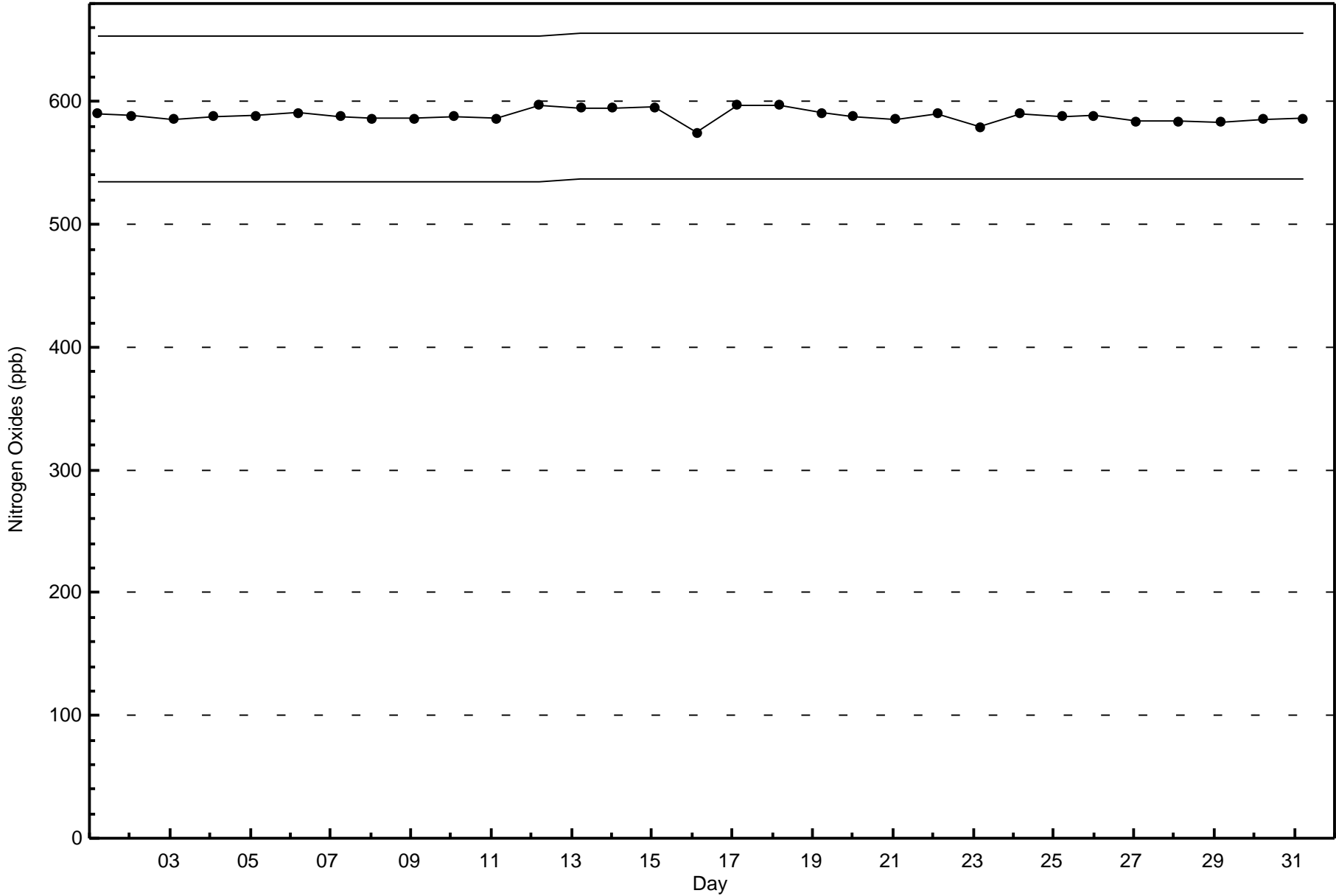


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Firebag (AMS 19)

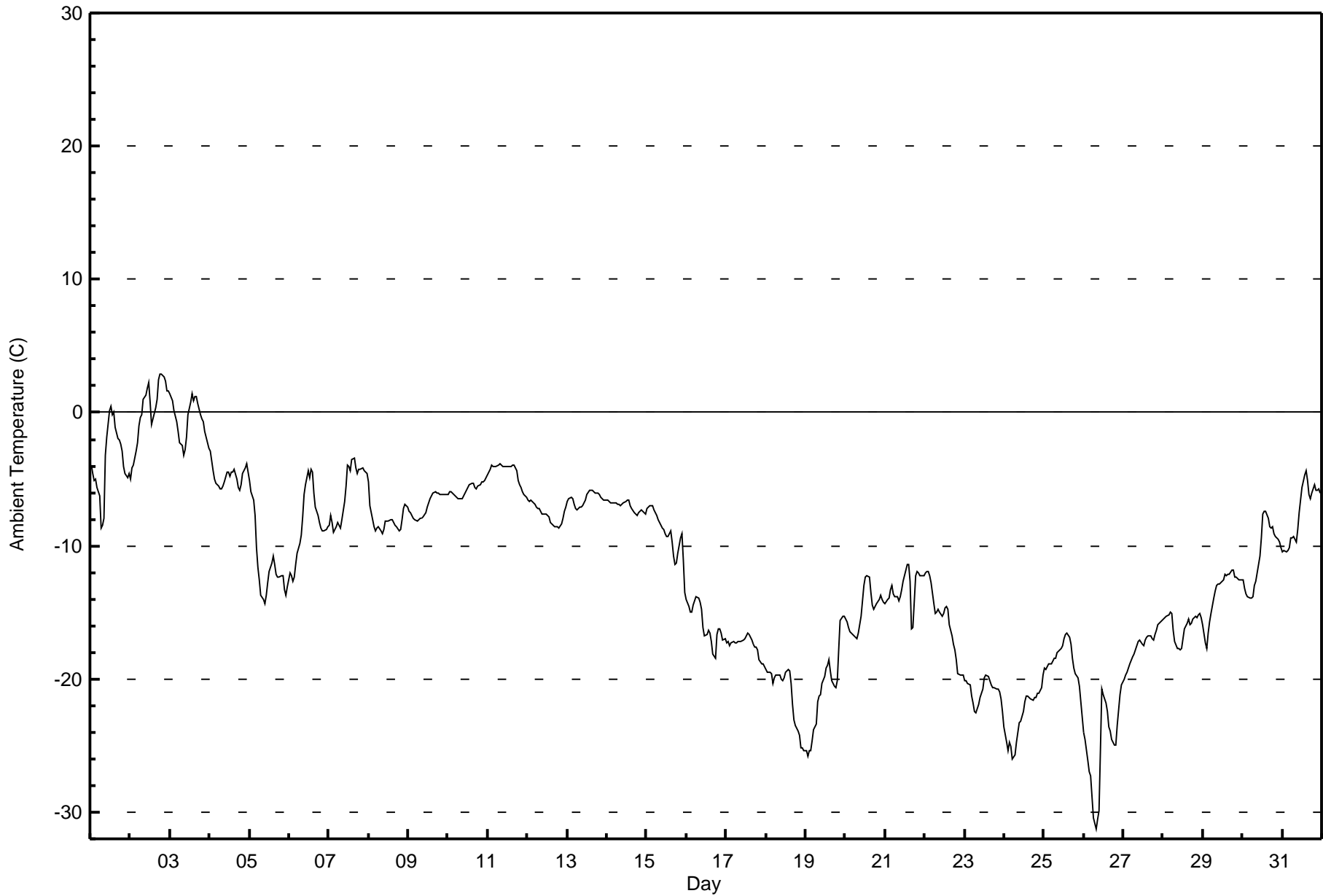








Maximum Value: 2.9 C on Dec 2 20:00		Maximum Daily Average: 0.2 C on Dec 2		Hours in Service: 744																																												
Minimum Value: -31.3 C on Dec 26 08:00		Minimum Daily Average: -25.0 C on Dec 26		Hours of Data: 744																																												
Maximum Diurnal Average: -10.4 C at hour 15		Minimum Diurnal Average: -12.7 C at hour 7		Hours of Missing Data: 0																																												
Monthly Average: -11.67 C		Percentiles: P <sub>1</sub> = -26.1 P <sub>10</sub> = -20.8 Q <sub>1</sub> = -17.1 Median = -11.2 Q <sub>3</sub> = -6.3 P <sub>90</sub> = -4.0 P <sub>99</sub> = 1.5		Hours of Calibration: 0																																												
				Percent Operational Time: 100.0																																												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	-4.0	-4.6	-5.1	-5.0	-5.7	-6.3	-8.7	-8.4	-8.0	-3.2	-1.8	0.2	0.4	-0.1	0.1	-1.1	-1.9	-2.0	-2.4	-2.9	-4.0	-4.6	-4.8	-4.6	-3.7	0.4																						
2-Dec	-5.0	-4.2	-4.0	-2.9	-2.3	-1.0	-0.4	-0.2	1.0	1.3	1.9	2.3	0.7	-0.9	-0.1	0.3	1.0	2.5	2.9	2.9	2.7	2.3	1.6	1.6	0.2	2.9																						
3-Dec	1.4	0.9	0.1	-0.3	-0.7	-1.4	-2.2	-2.5	-3.2	-2.7	-1.9	-0.2	0.8	1.4	0.9	1.2	1.2	0.7	-0.1	-0.5	-0.7	-1.4	-1.8	-2.7	-0.6	1.4																						
4-Dec	-2.9	-3.6	-4.3	-5.0	-5.4	-5.5	-5.8	-5.8	-5.6	-5.2	-4.5	-4.5	-4.8	-4.5	-4.5	-4.2	-4.9	-5.6	-5.8	-5.4	-4.6	-4.1	-3.9	-4.4	-4.8	-2.9																						
5-Dec	-5.1	-6.0	-6.6	-7.8	-10.2	-11.7	-12.5	-13.7	-14.0	-14.3	-13.7	-12.8	-11.9	-11.3	-10.7	-11.4	-12.2	-12.4	-12.2	-12.2	-12.2	-13.3	-13.7	-13.1	-11.5	-5.1																						
6-Dec	-12.0	-12.2	-12.7	-12.3	-11.4	-10.6	-9.8	-9.2	-7.8	-6.2	-5.4	-4.4	-4.9	-4.3	-4.5	-6.0	-7.1	-7.8	-8.2	-8.6	-8.8	-8.9	-8.7	-8.6	-8.4	-4.3																						
7-Dec	-8.4	-7.7	-8.2	-9.0	-8.6	-8.3	-8.5	-8.7	-8.0	-6.7	-5.6	-3.9	-4.1	-4.3	-3.5	-3.4	-4.2	-4.6	-4.3	-4.3	-4.1	-4.4	-4.5	-4.5	-5.9	-3.4																						
8-Dec	-5.2	-7.0	-8.0	-8.5	-8.9	-8.7	-8.6	-8.9	-9.1	-8.8	-8.1	-8.1	-8.2	-8.0	-8.0	-8.3	-8.4	-8.6	-8.9	-8.7	-8.0	-7.2	-6.9	-7.1	-8.1	-5.2																						
9-Dec	-7.4	-7.6	-7.8	-7.9	-8.0	-8.1	-8.1	-7.9	-7.9	-7.8	-7.5	-7.1	-6.8	-6.5	-6.3	-6.1	-6.0	-6.0	-6.1	-6.1	-6.1	-6.1	-6.1	-6.2	-7.0	-6.0																						
10-Dec	-6.2	-6.0	-6.0	-6.1	-6.2	-6.4	-6.4	-6.5	-6.5	-6.3	-6.0	-5.9	-5.6	-5.4	-5.3	-5.3	-5.6	-5.7	-5.5	-5.4	-5.2	-5.2	-5.1	-4.9	-5.8	-4.9																						
11-Dec	-4.7	-4.3	-3.9	-4.0	-4.1	-4.0	-3.9	-3.8	-3.9	-4.1	-4.1	-4.1	-4.0	-4.0	-4.0	-4.0	-3.9	-4.3	-5.1	-5.4	-5.6	-6.0	-6.2	-6.3	-4.5	-3.8																						
12-Dec	-6.6	-6.7	-6.6	-6.7	-6.9	-7.1	-7.2	-7.2	-7.4	-7.6	-7.6	-7.6	-7.7	-7.8	-8.2	-8.4	-8.6	-8.6	-8.6	-8.6	-8.4	-8.0	-7.4	-7.1	-7.6	-6.6																						
13-Dec	-6.7	-6.4	-6.3	-6.5	-6.9	-7.2	-7.3	-7.1	-7.1	-7.0	-6.8	-6.6	-6.1	-5.9	-5.8	-5.9	-6.0	-6.0	-6.1	-6.1	-6.3	-6.5	-6.6	-6.5	-6.5	-5.8																						
14-Dec	-6.6	-6.7	-6.8	-6.8	-6.8	-6.8	-6.9	-6.9	-7.0	-6.9	-6.8	-6.6	-6.6	-6.5	-7.0	-7.2	-7.5	-7.6	-7.8	-7.5	-7.4	-7.3	-7.5	-7.6	-7.0	-6.5																						
15-Dec	-7.2	-7.1	-7.0	-7.0	-7.3	-7.5	-7.8	-8.0	-8.3	-8.7	-8.8	-9.1	-9.3	-9.3	-8.8	-9.8	-10.8	-11.4	-11.2	-10.6	-9.4	-9.1	-11.1	-13.5	-9.1	-7.0																						
16-Dec	-14.0	-14.5	-15.0	-15.0	-14.4	-14.1	-13.8	-13.9	-14.2	-14.8	-16.1	-16.8	-16.6	-16.3	-16.5	-17.2	-18.1	-18.5	-16.6	-16.3	-16.3	-16.6	-17.0	-17.0	-15.8	-13.8																						
17-Dec	-17.3	-17.2	-17.5	-17.3	-17.2	-17.3	-17.3	-17.2	-17.2	-17.1	-17.1	-17.0	-16.8	-16.6	-16.7	-17.0	-17.4	-17.6	-17.6	-17.8	-18.5	-18.9	-18.9	-19.1	-17.5	-16.6																						
18-Dec	-19.3	-19.5	-19.5	-19.6	-20.4	-19.9	-19.7	-19.7	-19.7	-20.0	-20.1	-19.9	-19.5	-19.3	-19.4	-20.3	-21.9	-23.0	-23.5	-23.9	-24.2	-25.2	-25.2	-25.3	-21.2	-19.3																						
19-Dec	-25.4	-25.8	-25.4	-25.4	-24.6	-23.8	-23.3	-21.7	-21.3	-21.2	-20.4	-19.8	-19.1	-19.0	-18.5	-19.4	-20.1	-20.6	-20.7	-20.1	-17.8	-15.6	-15.3	-15.3	-20.8	-15.3																						
20-Dec	-15.5	-15.8	-16.2	-16.5	-16.7	-16.7	-16.9	-16.9	-16.5	-15.3	-14.1	-13.0	-12.4	-12.2	-12.3	-13.5	-14.4	-14.7	-14.6	-14.4	-14.0	-13.7	-14.1	-14.3	-14.8	-12.2																						
21-Dec	-14.4	-14.0	-13.9	-13.2	-13.0	-13.6	-13.9	-13.9	-14.1	-13.9	-13.3	-12.7	-11.9	-11.4	-11.4	-12.6	-16.2	-16.1	-12.3	-12.0	-12.0	-12.2	-12.3	-12.3	-13.2	-11.4																						
22-Dec	-12.0	-11.9	-11.9	-12.2	-12.8	-14.3	-15.1	-15.0	-14.8	-14.9	-15.2	-15.1	-14.7	-14.5	-14.7	-15.9	-16.7	-17.4	-17.9	-18.6	-19.6	-19.7	-19.7	-19.7	-15.6	-11.9																						
23-Dec	-20.1	-20.2	-20.3	-20.4	-21.3	-21.9	-22.4	-22.6	-21.9	-21.4	-21.1	-20.7	-19.9	-19.7	-19.8	-20.2	-20.5	-20.6	-20.7	-20.8	-20.7	-21.0	-21.5	-22.4	-20.9	-19.7																						
24-Dec	-23.6	-24.8	-25.4	-24.7	-25.1	-26.0	-25.6	-24.7	-24.0	-23.3	-23.1	-22.4	-21.7	-21.3	-21.3	-21.4	-21.5	-21.6	-21.4	-21.4	-21.1	-21.1	-20.7	-19.7	-22.8	-19.7																						
25-Dec	-19.2	-19.2	-19.1	-18.9	-18.8	-18.6	-18.5	-18.4	-18.0	-17.8	-17.7	-17.5	-17.0	-16.7	-16.6	-16.9	-17.4	-18.4	-19.2	-19.6	-19.9	-20.6	-21.7	-22.8	-18.7	-16.6																						
26-Dec	-24.0	-24.5	-26.1	-26.9	-27.3	-28.9	-30.4	-31.3	-30.5	-29.9	-25.4	-20.7	-21.2	-21.8	-22.5	-23.6	-24.0	-24.6	-24.9	-24.9	-23.5	-22.3	-21.1	-20.4	-25.0	-20.4																						
27-Dec	-20.1	-19.8	-19.5	-19.2	-18.9	-18.4	-18.2	-17.8	-17.5	-17.2	-17.1	-17.4	-17.5	-17.1	-16.9	-16.8	-16.7	-17.0	-17.0	-16.7	-16.4	-16.0	-15.7	-15.7	-17.5	-15.7																						
28-Dec	-15.5	-15.4	-15.3	-15.2	-15.0	-15.1	-16.3	-17.2	-17.7	-17.8	-17.8	-17.8	-16.9	-16.3	-15.8	-15.5	-15.9	-15.9	-15.5	-15.3	-15.4	-15.2	-15.1	-15.4	-16.0	-15.0																						
29-Dec	-15.9	-17.3	-17.7	-16.5	-15.7	-15.1	-13.9	-13.4	-13.0	-12.9	-12.9	-12.7	-12.6	-12.1	-12.2	-12.2	-12.2	-12.2	-11.8	-11.8	-12.3	-12.4	-12.5	-12.5	-13.5	-11.8																						
30-Dec	-12.6	-13.2	-13.6	-13.8	-13.9	-13.9	-13.8	-13.0	-12.7	-12.1	-10.7	-9.4	-7.7	-7.4	-7.4	-7.9	-8.6	-8.7	-8.6	-9.1	-9.3	-9.5	-9.7	-10.1	-10.7	-7.4																						
31-Dec	-10.5	-10.4	-10.5	-10.3	-10.2	-9.4	-9.4	-9.3	-9.7	-8.7	-7.6	-6.6	-5.6	-4.7	-4.4	-5.1	-6.2	-6.5	-6.1	-5.4	-5.9	-5.8	-5.7	-6.1	-7.5	-4.4																						
																								-11.8	-12.0	-12.3	-12.3	-12.4	-12.5	-12.7	-12.6	-12.4	-12.0	-11.5	-10.9	-10.6	-10.4	-10.4	-10.8	-11.4	-11.6	-11.5	-11.5	-11.5	-11.5	-11.6	-11.7	Diurnal Average
																								1.4	0.9	0.1	-0.3	-0.7	-1.0	-0.4	-0.2	1.0	1.3	1.9	2.3	0.8	1.4	0.9	1.2	1.2	2.5	2.9	2.9	2.7	2.3	1.6	1.6	Diurnal Maximum





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C**  
**Firebag - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	99	13.31	13.31
-20 - 0	619	83.20	96.51
0 - 10	26	3.49	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

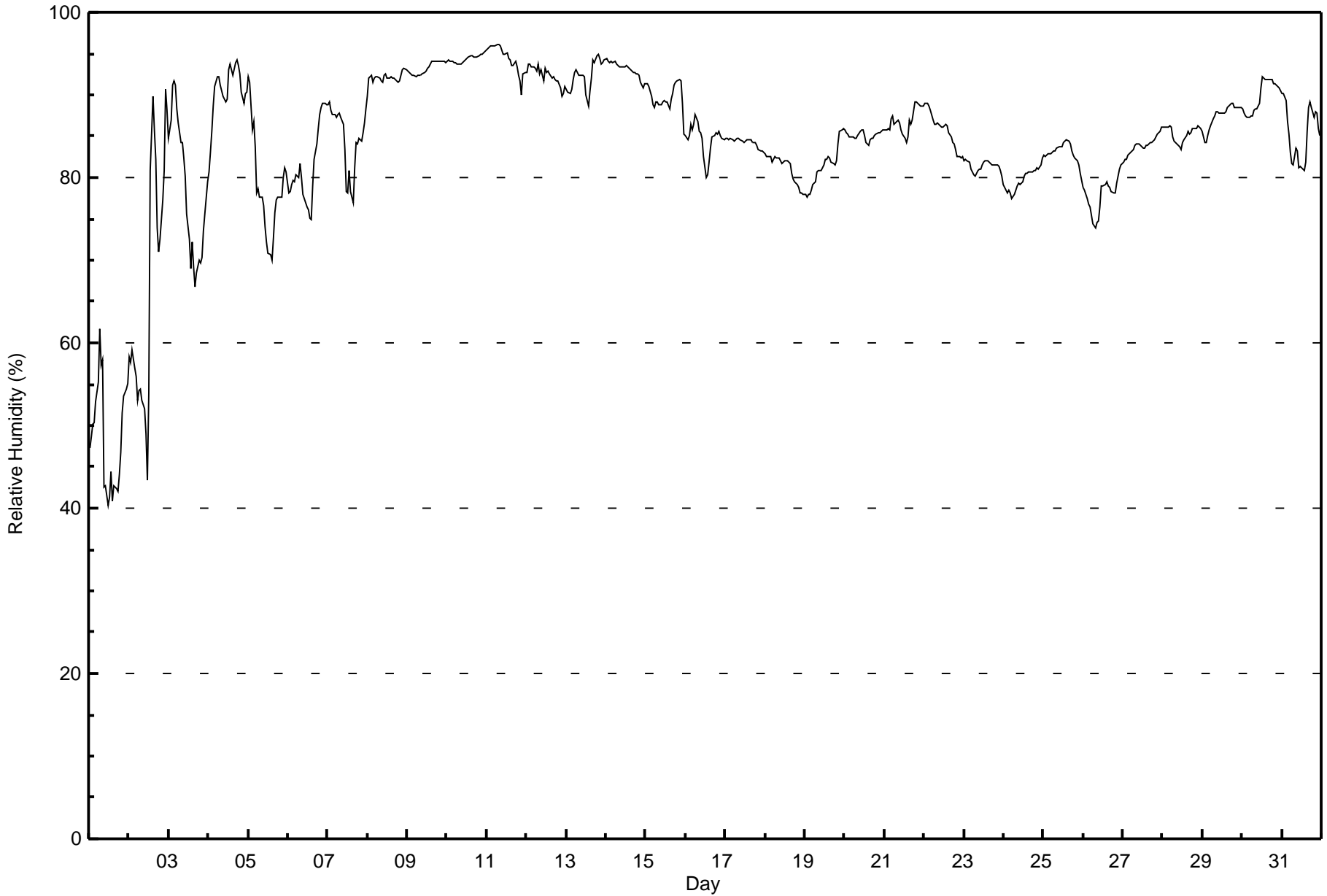
**Firebag - December 2015**

Maximum Value: 96 % on Dec 11 08:00														Maximum Daily Average: 94.4 % on Dec 11														Hours in Service: 744	
Minimum Value: 40 % on Dec 1 12:00														Minimum Daily Average: 48.6 % on Dec 1														Hours of Data: 744	
Maximum Diurnal Average: 85.7 % at hour 23														Minimum Diurnal Average: 82.5 % at hour 12														Hours of Missing Data: 0	
Monthly Average: 84.3 %														Percentiles: P <sub>1</sub> = 43 P <sub>10</sub> = 77 Q <sub>1</sub> = 82 Median = 85 O <sub>3</sub> = 91 P <sub>90</sub> = 93 P <sub>99</sub> = 96														Hours of Calibration: 0	
																												Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	47	49	50	50	53	55	62	57	58	43	43	40	41	44	41	43	42	42	44	47	52	54	54	55	48.6	62			
2-Dec	58	58	59	57	56	53	54	54	53	52	49	43	54	81	90	86	82	74	71	73	77	81	91	88	66.4	91			
3-Dec	85	87	91	92	91	88	87	84	84	82	80	76	73	69	72	69	67	69	70	70	70	73	76	79	78.5	92			
4-Dec	81	83	86	89	91	92	92	91	91	90	89	90	93	94	93	92	94	94	94	93	90	89	90	90	90.4	94			
5-Dec	92	92	86	87	84	78	79	78	78	77	74	72	71	71	70	73	76	77	78	78	78	80	81	81	78.6	92			
6-Dec	78	78	79	80	80	80	80	82	80	78	77	76	76	75	75	79	82	84	86	88	88	89	89	89	81.2	89			
7-Dec	89	89	88	88	88	87	88	88	87	87	83	78	78	81	78	77	81	84	84	85	84	85	87	88	84.7	89			
8-Dec	90	92	92	92	92	92	92	92	92	92	92	93	92	92	92	92	92	92	92	92	92	92	93	93	92.1	93			
9-Dec	93	93	93	92	92	92	92	92	92	93	93	93	93	93	94	94	94	94	94	94	94	94	94	94	93.2	94			
10-Dec	94	94	94	94	94	94	94	94	94	94	94	94	94	95	95	95	95	94	95	95	95	95	95	95	94.3	95			
11-Dec	95	96	96	96	96	96	96	96	96	95	95	95	95	94	94	94	94	94	93	92	92	90	93	93	94.4	96			
12-Dec	93	94	94	93	93	93	93	94	93	93	92	93	93	93	92	92	92	92	92	92	91	90	90	91	92.4	94			
13-Dec	91	90	90	91	92	93	93	92	92	92	92	92	90	89	90	92	94	94	95	95	94	94	94	94	92.3	95			
14-Dec	94	94	94	94	94	94	94	93	93	93	93	94	93	93	93	93	93	93	93	93	92	92	91	91	93.1	94			
15-Dec	91	91	91	90	89	89	89	89	89	89	89	89	89	89	88	89	90	91	91	92	92	92	89	85	89.7	92			
16-Dec	85	85	85	86	86	87	88	87	86	85	85	83	80	80	82	84	85	85	85	85	86	85	85	85	84.7	88			
17-Dec	85	85	85	85	85	84	85	85	85	85	84	84	84	84	85	85	85	84	84	84	84	83	83	83	84.3	85			
18-Dec	83	83	83	83	82	82	82	82	82	82	82	82	82	82	82	82	81	80	79	79	79	78	78	78	81.1	83			
19-Dec	78	78	78	78	79	79	79	81	81	81	81	82	82	82	83	82	82	82	82	82	84	86	86	86	81.3	86			
20-Dec	86	86	85	85	85	85	85	85	85	86	86	86	85	84	84	85	85	85	85	85	85	86	86	86	85.1	86			
21-Dec	86	86	86	86	87	87	87	87	87	87	86	85	85	84	85	87	86	87	89	89	89	89	89	89	86.8	89			
22-Dec	89	89	89	89	88	87	86	86	86	86	86	86	86	86	85	85	84	84	83	83	83	82	82	82	85.8	89			
23-Dec	82	82	82	82	81	81	80	80	81	81	81	81	82	82	82	82	82	82	82	81	81	81	81	80	81.4	82			
24-Dec	79	78	78	78	78	77	78	78	79	79	79	79	80	80	81	81	81	81	81	81	81	81	82	82	79.7	82			
25-Dec	83	83	83	83	83	83	83	83	84	84	84	84	84	84	85	84	84	83	83	82	82	82	81	80	83.0	85			
26-Dec	79	78	77	77	76	75	74	74	75	75	76	79	79	79	80	79	79	78	78	78	79	80	81	82	77.8	82			
27-Dec	82	82	82	83	83	83	83	84	84	84	84	84	84	84	84	84	84	84	84	85	85	85	86	86	83.8	86			
28-Dec	86	86	86	86	86	86	85	84	84	84	84	84	83	84	85	85	86	85	85	86	86	86	86	86	85.3	86			
29-Dec	86	84	84	85	86	86	87	88	88	88	88	88	88	88	88	88	89	89	89	89	89	88	88	88	87.4	89			
30-Dec	88	88	87	87	87	87	87	88	88	88	89	91	92	92	92	92	92	92	92	91	91	91	91	90	89.8	92			
31-Dec	90	90	89	87	85	83	82	81	83	83	81	81	81	81	82	86	88	89	89	87	88	88	86	85	85.3	90			
84.4														84.6														Diurnal Average	
95														96														Diurnal Maximum	



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Firebag - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Firebag - December 2015**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	0	0.00	0.00
40 - 60	36	4.84	4.84
60 - 80	99	13.31	18.15
80 - 100	609	81.85	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

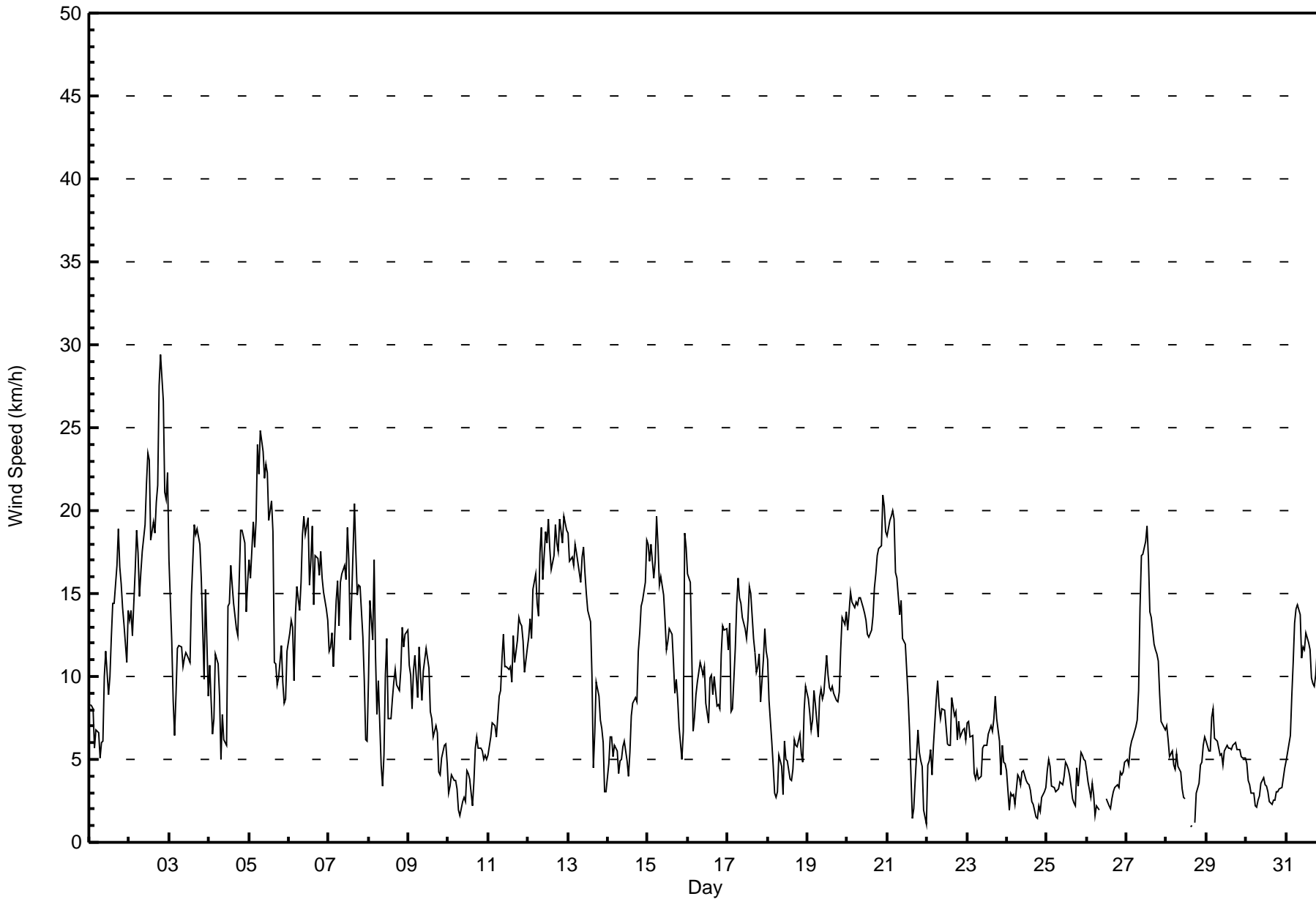


Maximum Speed: 29 km/h on Dec 2 20:00	Maximum Daily Speed Average: 16.9 km/h on Dec 12	Hours in Service: 744
Minimum Speed Value: 1 km/h on Dec 28 15:00	Minimum Daily Speed Average: 1.0 km/h on Dec 26	Hours of Data: 737
Maximum Diurnal Speed Average: 6.4 km/h at hour 12	Minimum Diurnal Speed Average: 3.2 km/h at hour 1	Hours of Missing Data: 7
Monthly Average Velocity: 4.8 km/h 190.4 deg	Percentiles: P <sub>1</sub> = 2 P <sub>10</sub> = 3 Q <sub>1</sub> = 5 Median = 9 Q <sub>3</sub> = 14 P <sub>90</sub> = 18 P <sub>99</sub> = 23	Percent Operational Time: 99.1

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SW8	SW8	SW8	SW6	S7	S7	SE5	ESE6	SE6	SE10	S12	SSW9	SSW10	S12	SSW14	SSW14	SSW17	SSW19	SW17	SW16	SW14	SW13	SW11	SW14	SSW9.7	SSW19
2-Dec	SSW13	SW14	SW12	SSW16	SSW19	SSW17	S15	S16	S18	S19	S22	SSW23	SW23	SW18	SW19	SW19	WSW21	WSW22	W28	W29	WNW27	WNW21	WNW21	WNW22	SW15.5	W29
3-Dec	WNW17	NW12	WNW9	WSW6	SW9	SW12	SW12	SSW12	SSE11	SE11	SE11	SSE11	SE11	SE15	SE17	SE19	SE19	SE19	SE18	SSE16	SE13	ESE10	ESE15	ESE9	SSE8.0	SE19
4-Dec	ESE11	SE9	SE7	ESE7	ESE11	SE11	SE9	ESE5	SE8	SW6	SW6	WSW14	WSW14	WSW17	WSW16	WSW14	WSW13	WSW12	WSW16	WSW19	WSW18	WSW14	WSW16	SW7.6	WSW19	
5-Dec	W17	W16	W19	WNW18	WNW19	W24	W22	W25	W24	W22	W23	W22	W19	W21	WSW19	WSW11	WSW11	WSW9	SW10	SW12	S10	S8	S9	SSE12	W14.7	W25
6-Dec	SSE13	SSE13	SE13	SE10	SE14	SE15	SE14	SE16	SE19	SE20	SE19	SE20	SE15	SSE17	SSE19	SSE14	SSE17	S17	S16	S18	S16	S15	S14	S13	SSE15.0	SE20
7-Dec	S12	SSW12	S13	SSE11	SSE15	SSE16	SE13	SE16	SSE16	SSE17	SSE16	SSE19	SE17	SSE12	S15	S20	S17	S15	S15	SSW15	SSW12	SW10	WSW6	WNW6	S12.4	S20
8-Dec	N10	NNE15	N12	NNW17	NNW11	NW8	NNW10	NNW5	WSW3	SW5	SW10	SW12	SW7	SW7	S9	SSE10	S10	SSE9	SSE9	SE10	ESE13	SE12	SE13	SE13	SSE1.6	NNW17
9-Dec	SE11	SSE10	SE8	ESE10	ESE11	SE9	SE12	SE10	SE9	SE10	SE12	SSE11	SSE11	SE8	SSE7	S6	S7	SSW7	SW4	WSW4	SW5	WSW6	W6	W5	SSE6.5	SE12
10-Dec	WSW3	WNW3	NW4	NNW4	N4	N3	NNE2	ENE2	ENE2	SE3	SE2	S4	S4	S4	SSE2	ESE4	ESE6	SE6	SE6	SSE6	SSE5	SE5	SE5	SE5	SE1.9	SE6
11-Dec	ESE5	SE6	SSE7	SSE7	SSE7	SSE6	SE9	SE9	SE11	SSE13	S11	S11	S10	S11	S10	S12	S11	SSE12	SSE14	SSE13	SSE13	SSE12	SSE10	SE12	SSE9.8	SSE14
12-Dec	SSE12	SSE14	SSE12	SSE15	SSE16	SSE14	SSE14	S17	SSE19	SSE16	S19	SSE18	SSE20	SSE18	SSE16	SSE17	SSE19	SSE18	SSE18	SSE19	SSE18	SSE20	SSE19	SSE19	SSE16.9	SSE20
13-Dec	SSE19	SSE17	S17	SSE17	SSE18	SSE17	SSE17	SSE16	SSE17	SE18	SSE16	SE15	SE14	SE13	SE10	ESE4	ESE7	SE10	SSE9	SSE7	SSE7	S6	SW3	WSW3	SSE11.9	SSE19
14-Dec	WSW5	SW6	SW6	W5	WNW6	WNW6	WNW4	NW5	WNW5	NNW6	NNW6	W5	W4	W5	WSW8	WSW8	WSW9	SW8	SW12	SW13	SW14	SSW15	SSW16	SSW18	WSW6.5	SSW18
15-Dec	SSW18	SSW17	SSW18	SSW16	S17	S20	S18	S15	SSW16	SSW15	SW13	WSW12	WSW12	SW13	WSW13	SW11	SW9	WSW10	WSW9	WSW7	WNW5	NNW7	N19	N18	SW9.4	S20
16-Dec	NNW16	N16	N12	NNW7	NW8	WNW9	WNW10	NNW11	NNW10	NNW10	W11	WSW8	WSW7	WSW10	SW10	SW9	SW10	WSW8	WNW8	NW8	NNW11	N13	NNW13	N13	NW7.4	NNW16
17-Dec	N12	N13	NNW8	NNW8	NNW12	NNW14	N16	NNW15	N14	NNW14	NNW13	NNW12	NNW13	NNW15	NNW15	NNW12	NNW11	N10	NNW11	N11	N8	N11	N13	N11	NNW12.2	N16
18-Dec	N11	N9	N6	NNW5	N3	NNE3	NNE3	NE5	NE5	ENE3	SSW6	SSW5	SSW5	S4	SE4	SE4	SE6	SSE6	SSE6	SSE6	SE5	SSE5	SSE8	SSE9	SE1.7	N11
19-Dec	SE9	SSE8	SSE7	SSE7	SE9	SSE8	SSE6	SSE9	SSE9	SSE9	S9	S11	S10	S9	S9	SSE9	SSE9	SSE9	SSE8	SSE9	SSE12	S14	S13	S14	SSE9.3	S14
20-Dec	S13	S14	S15	S14	S14	S15	S14	S15	SSE15	S14	S14	SSE13	SSE13	SSE12	S13	SSE14	SSE15	SSE16	SSE17	SSE18	SSE18	S21	S20	S19	S15.2	S21
21-Dec	S18	S19	S20	S20	S19	S16	SSW16	S14	S15	SSW12	SSW12	SW12	SW9	SW7	WSW4	S1	ESE2	SE4	SE7	SE5	ESE5	SE5	SSE2	NE1	S9.3	S20
22-Dec	NE5	ENE5	ENE6	ENE4	NNE6	NNE9	NE10	NE8	NE7	NE8	NE8	NE7	NE6	NE6	NNE6	NNE9	NNE8	NE8	NE6	NNE7	NNE6	NE7	NE7	NE6	NE6.7	NE10
23-Dec	NE7	NE7	NE6	NE6	NE4	NE4	NE4	NE4	NE4	NE6	NE6	NE6	NNE6	NNE7	NNE7	N7	NNE7	NNE9	NNE7	NE6	NNE4	NNE6	N5	N5	NNE5.7	NNE9
24-Dec	NNE4	N2	NNW3	N3	N3	N2	NNE4	NNE4	N3	N4	N4	N4	N4	N3	N3	N2	WNW2	WSW1	WSW1	WSW2	SSW2	SSW3	SSW3	SSW3	NNW1.7	NNE4
25-Dec	SW4	SW5	SW5	SW3	SW3	SSW3	SW3	SW3	SW4	SW3	WSW4	W5	W5	W4	WNW4	NW3	WNW2	N2	NE5	NNE3	N5	N5	N5	NNE5	W1.9	N5
26-Dec	N4	N4	WNW3	N4	N3	N2	NNE2	NE2	AF	AF	AF	AF	SSW3	SSW2	S2	SE3	SE3	SE3	SE3	SSE3	SSE4	SSE4	SSE4	SSE5	SE1.0	SSE5
27-Dec	SE5	SE5	SE6	SE6	SE6	SSE7	SSE7	SSE9	SSE14	SSE17	SSE17	SSE18	SSE19	S17	S14	S14	S12	S12	S11	S11	SSW9	SSW7	SW7	SW7	S10.2	SSE19
28-Dec	SW7	SW6	WSW5	W6	WNW5	NW4	NE5	NE5	NE4	NE3	NE3	NE3	AF	AF	SW1	WSW1	AF	SSW1	SSW3	SW4	SW5	SW5	SW6	SW6	WSW1.6	SW7
29-Dec	SSW6	SSW5	SSW6	SSW8	SW8	SSW6	SSW6	SSW6	SSW5	SW5	SW5	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW5	SW5	SW5	SW5.7	SW8
30-Dec	WSW5	WSW4	WSW3	WSW3	WSW3	SW2	WSW2	SW3	SW3	WSW4	WSW4	WSW3	W3	W3	W2	WSW2	SW3	WSW3	WSW3	WSW3	SW3	SW3	SW4	SW4	WSW3.1	WSW5
31-Dec	SW5	SW5	SW6	SW9	SW11	SW13	SW14	SW14	WSW14	WSW11	WSW12	WSW12	WSW13	WSW12	WSW12	WSW10	WSW10	SW9	SW10	WSW13	SW11	SW11	SW15	SW16	SW11.0	SW16

SSW3.2SSW3.2SSW3.6	S3.3	S4.2	S4.4	S3.8	S4.1	S5.2	S5.3	S6.0	SSW6.4	SSW6.0	SSW5.6	SSW5.6	SSW5.5	S6.0	S5.8	SSW5.7	SSW5.7	SSW4.9	SSW4.4	SSW3.8	SSW3.7	Diurnal Average		
SSE19	S19	S20	S20	S19	W24	W22	W25	W24	W22	W23	SSW23	SW23	W21	SW19	S20	WSW21	WSW22	W28	W29	WNW27	WNW21	WNW21	WNW22	Diurnal Maximum

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Firebag - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	195	26.46	26.46
6 - 11	258	35.01	61.47
12 - 19	255	34.60	96.07
20 - 28	28	3.80	99.86
29 - 38	1	0.14	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 737

Total Number of Hours: 744



**Wood Buffalo Environmental Association  
Frequency Distribution**

**Wind Speed (WS) - km/h  
Firebag - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	26	10	17	5	0	6	18	9	6	13	33	24	10	10	4	4	195
6 - 11	9	14	21	1	0	10	33	41	23	14	45	19	3	10	3	12	258
12 - 19	12	1	0	0	0	2	27	68	51	25	24	24	4	3	1	13	255
20 - 28	0	0	0	0	0	0	2	2	7	1	1	2	9	4	0	0	28
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	47	25	38	6	0	18	80	120	87	53	103	69	27	27	8	29	737

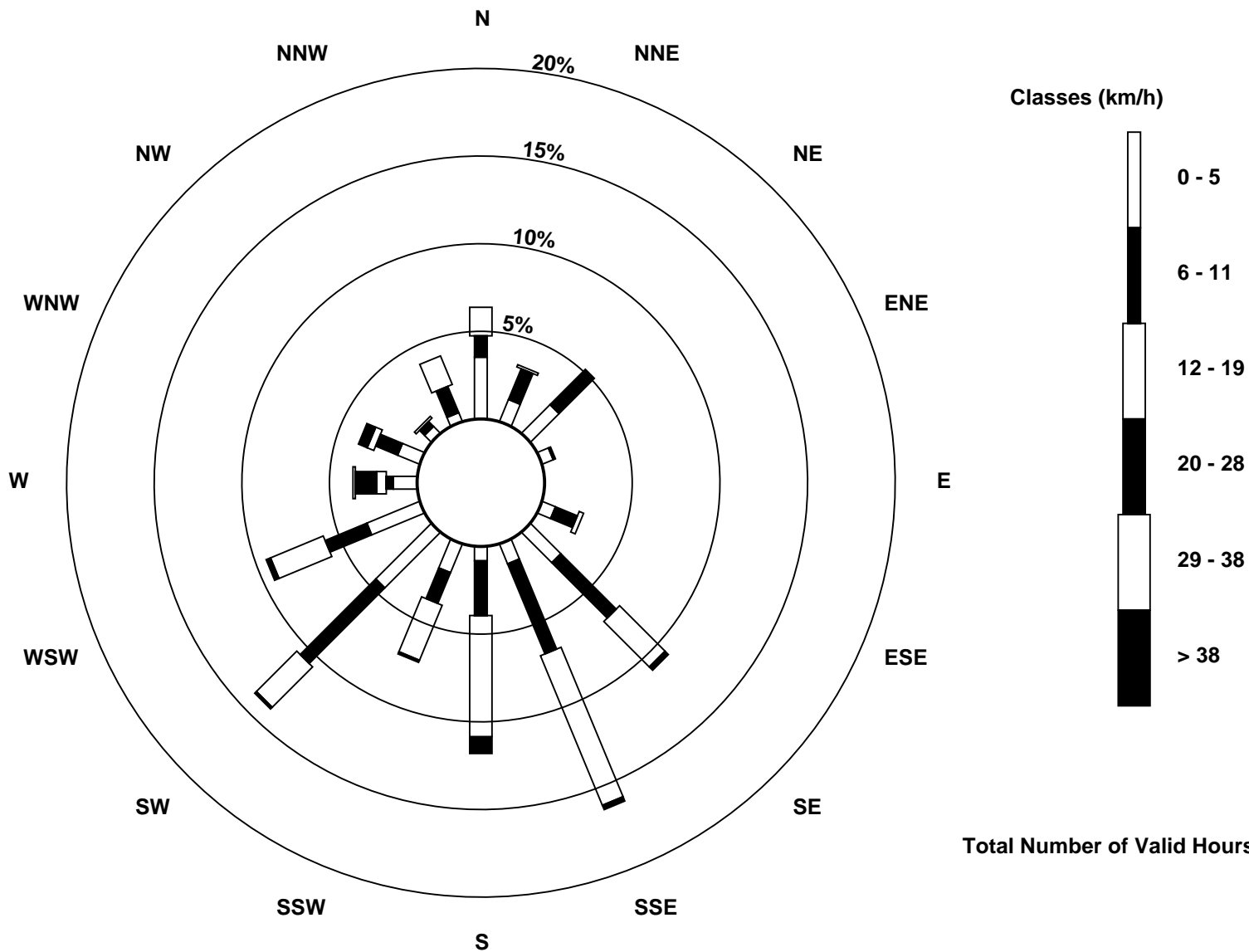
Total Number of Valid Hours: 737

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
Firebag (AMS 19)







**Wood Buffalo Environmental Association**  
**Summary of Hour Standard Deviations**

**Wind Speed (WS) - km/h**  
**Firebag - December 2015**

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 7 km/h on Dec 2 20:00 Minimum Value: 0 km/h on Dec 30 16:00 Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 5																	Hours in Service: 744 Hours of Data: 737 Hours of Missing Data: 7 Hours of Calibration: 0 Percent Operational Time: 99.1									
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	2	1	1	1	1	1	1	1	3	2	2	3	2	2	2	2	2	2	2	2	3	2	1	2	3	
2-Dec	1	2	2	3	2	2	1	3	2	3	3	4	4	3	3	4	4	4	5	7	5	4	5	5	7	
3-Dec	4	3	2	2	1	2	2	1	1	2	2	2	2	3	3	3	3	4	3	3	2	3	3	2	4	
4-Dec	3	1	1	2	2	2	2	2	2	2	2	4	3	3	3	2	2	2	3	3	4	2	3	4	4	
5-Dec	3	3	4	3	4	5	4	5	5	4	4	4	4	4	4	2	2	1	1	1	1	2	1	3	5	
6-Dec	2	2	3	2	3	2	2	3	3	4	3	4	4	3	4	3	3	3	2	2	2	2	2	2	4	
7-Dec	2	2	2	2	2	3	3	3	3	4	4	3	3	2	3	3	2	2	3	2	2	2	1	1	4	
8-Dec	2	3	2	3	3	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	
9-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	2	
10-Dec	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
11-Dec	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	3	
12-Dec	2	2	2	4	3	3	3	3	3	3	3	3	3	3	3	3	4	4	3	3	3	3	3	3	4	
13-Dec	3	3	3	3	4	3	4	3	3	3	4	3	2	2	3	2	1	2	1	1	1	2	1	1	4	
14-Dec	1	1	1	1	1	1	1	1	1	1	2	2	1	2	2	1	1	2	2	2	2	2	3	3	3	
15-Dec	3	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2	1	3	4	3	4	
16-Dec	3	3	3	1	2	2	2	2	2	2	2	1	1	2	2	2	2	1	2	1	3	3	3	2	3	
17-Dec	2	2	2	3	2	3	3	3	3	3	2	2	2	3	3	3	2	2	2	3	2	3	3	2	3	
18-Dec	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	
19-Dec	1	1	1	2	2	2	1	2	2	1	2	2	2	1	1	1	2	1	1	1	2	2	2	2	2	
20-Dec	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	
21-Dec	3	3	2	3	2	2	2	2	2	2	2	2	2	1	1	1	1	3	1	1	1	2	1	2	3	
22-Dec	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	
23-Dec	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	
24-Dec	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	0	1	0	0	0	1	
25-Dec	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	
26-Dec	1	1	0	1	1	1	0	1	AF	AF	AF	AF	1	0	0	0	0	0	0	0	1	1	1	1	1	
27-Dec	1	1	1	1	1	1	1	2	2	3	3	4	4	4	2	3	2	2	1	2	2	1	1	1	4	
28-Dec	1	1	1	1	1	1	1	1	1	0	0	1	AF	AF	1	1	AF	1	0	1	1	1	1	1	1	
29-Dec	1	0	0	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	2	
30-Dec	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	
31-Dec	0	1	1	1	2	2	2	2	2	2	2	1	2	2	1	1	1	2	1	2	1	2	2	2	2	
																	Diurnal Maximum									
																	4 3 4 4 4 5 4 5 5 4 4 4 4 4 4 4 4 4 5 7 5 4 5 5									
AF - Analyzer Failure																										



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Wind Direction (WD) - deg**

**Firebag - December 2015**

Direction of Maximum Speed: 274 deg on Dec 2 20:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 161.5 deg on Dec 12	Hours of Data: 737
Direction of Minimum Speed: 224 deg on Dec 28 15:00	Hours of Missing Data: 7
Direction of Minimum Daily Speed Average: 1.0 deg on Dec 26	Percent Operational Time: 99.1
Monthly Average Direction: 217.8 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	226	222	218	215	186	170	142	105	132	144	180	197	208	174	197	209	205	211	214	224	234	224	214	216	202.5
2-Dec	204	217	214	209	203	198	191	181	177	176	180	206	221	220	222	228	240	256	271	274	283	283	290	294	230.6
3-Dec	296	305	292	255	231	229	217	211	164	144	141	149	132	127	127	131	132	131	142	154	140	121	114	122	153.3
4-Dec	122	140	124	120	122	125	131	110	129	216	228	256	248	253	247	243	241	241	251	251	255	253	241	256	227.2
5-Dec	271	275	273	287	284	269	273	269	272	271	269	266	262	260	252	247	242	237	221	223	190	170	170	167	259.0
6-Dec	165	150	146	133	138	137	137	137	139	139	137	143	137	149	153	167	168	175	173	175	180	176	175	178	154.2
7-Dec	187	203	179	165	165	152	146	136	153	157	157	147	145	148	170	181	178	187	189	194	202	235	251	293	171.4
8-Dec	354	16	356	348	339	319	331	343	242	228	223	215	217	216	173	153	173	160	151	125	119	125	131	140	155.5
9-Dec	134	148	132	118	121	130	126	129	138	137	143	149	147	145	161	182	177	194	219	239	230	242	261	281	151.9
10-Dec	254	296	322	342	0	6	32	68	69	145	135	185	184	183	164	116	118	127	137	155	148	125	131	127	134.3
11-Dec	120	140	158	152	148	147	140	141	145	160	172	181	182	180	173	173	176	148	160	156	160	153	149	146	158.3
12-Dec	152	149	147	158	165	161	163	170	167	158	171	163	167	158	166	164	160	157	160	164	159	162	164	159	161.5
13-Dec	159	162	169	153	147	148	150	147	151	146	147	140	140	138	137	112	118	143	152	151	156	182	222	247	150.4
14-Dec	240	219	226	269	288	298	293	304	297	332	338	279	276	267	251	248	243	223	224	217	214	211	210	209	240.6
15-Dec	212	200	201	202	191	191	189	182	192	206	221	244	246	236	242	233	229	243	248	253	294	333	0	358	220.5
16-Dec	347	353	359	339	311	294	293	301	303	296	268	255	241	247	236	224	224	247	294	324	348	351	348	350	306.2
17-Dec	350	352	346	345	341	341	349	347	349	344	339	341	346	347	345	340	343	349	345	353	360	3	358	2	347.8
18-Dec	356	358	352	338	353	17	30	51	35	60	194	192	197	191	144	137	140	153	159	155	134	151	150	149	124.0
19-Dec	145	157	153	151	146	152	149	149	151	162	177	169	169	178	171	165	158	157	156	156	168	176	179	175	162.7
20-Dec	180	176	172	172	175	175	176	174	168	169	172	165	168	161	169	157	156	162	165	166	164	172	176	170	169.2
21-Dec	174	178	177	181	183	185	192	188	189	196	204	215	221	232	244	186	120	142	141	128	122	130	157	37	183.9
22-Dec	37	70	63	58	29	28	36	45	42	36	38	50	53	39	25	16	28	36	35	29	32	42	38	39	38.1
23-Dec	39	49	43	46	42	47	34	51	39	40	50	47	28	17	13	6	24	31	31	34	29	12	2	9	31.4
24-Dec	31	8	337	349	356	354	18	15	8	5	3	355	353	357	349	293	251	250	230	194	209	193	205	348.6	
25-Dec	221	223	219	228	218	211	218	217	224	231	241	259	261	266	288	308	291	10	36	18	360	355	4	12	271.8
26-Dec	3	356	302	355	354	10	22	37	AF	AF	AF	AF	212	197	171	140	137	143	144	157	158	155	155	151	134.7
27-Dec	143	139	141	140	143	156	156	156	159	157	161	165	168	171	173	172	172	174	181	191	194	198	214	220	168.8
28-Dec	226	234	249	263	294	316	37	43	47	46	37	52	AF	AF	224	244	AF	213	197	222	216	218	218	217	245.2
29-Dec	207	193	194	209	215	213	206	213	213	218	214	217	214	215	218	217	214	217	223	223	219	222	226	236	214.6
30-Dec	243	246	249	248	244	236	243	236	225	242	250	255	269	271	259	249	231	240	237	235	228	223	223	223	241.5
31-Dec	221	226	232	230	223	225	230	229	239	248	253	246	246	248	247	239	240	226	228	238	231	225	227	225	234.6

198.4 193.0 193.7 190.7 185.9 187.2 179.0 172.3 172.6 175.1 186.4 193.2 196.2 196.8 197.2 191.9 187.8 187.1 194.2 199.5 196.0 196.7 197.0 201.6

Diurnal Average

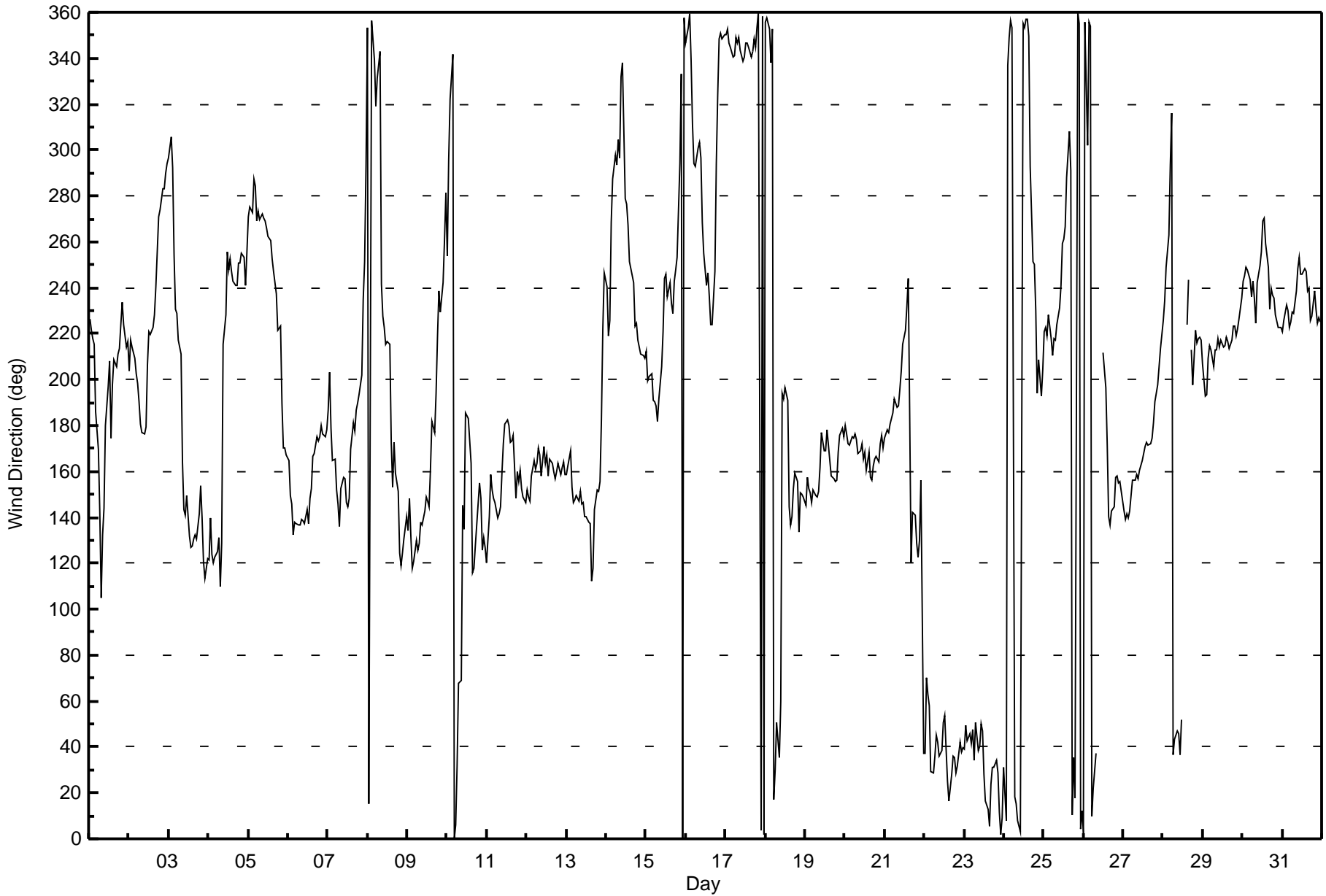
AF - Analyzer Failure

All monthly, daily, and diurnal averages have been calculated using vector methods



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Wind Direction (WD) - deg**  
**Firebag - December 2015**





Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Direction (WD) - deg

Firebag - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value:	88 deg on Dec 22 00:00		Hours of Data:	737
Minimum Value:	5 deg on Dec 2 07:00		Hours of Missing Data:	7
Percentiles:	P <sub>1</sub> = 6 P <sub>10</sub> = 8 Q <sub>1</sub> = 9 Median = 11 Q <sub>3</sub> = 13 P <sub>90</sub> = 17 P <sub>99</sub> = 42		Hours of Calibration:	0
			Percent Operational Time:	99.1

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	6	7	7	5	17	10	19	16	24	9	12	11	14	10	17	13	8	7	7	9	9	11	9	9	24
2-Dec	7	7	7	6	5	6	5	8	9	7	8	12	9	10	9	8	12	10	11	10	11	12	12	12	12
3-Dec	11	14	14	25	8	8	8	10	20	12	12	9	15	11	10	11	11	11	13	9	12	16	10	13	25
4-Dec	12	14	12	16	9	13	13	36	25	25	14	10	10	9	8	8	9	8	8	8	9	9	9	9	36
5-Dec	10	11	9	12	13	11	10	11	11	10	10	11	11	11	10	10	8	9	8	6	13	10	8	10	13
6-Dec	8	8	9	12	11	10	10	11	11	11	11	11	11	12	19	9	9	10	8	8	7	7	11	8	19
7-Dec	7	8	9	13	8	9	13	10	13	10	10	9	10	12	22	7	8	8	8	6	11	12	14	17	22
8-Dec	27	12	16	11	14	13	11	37	32	18	10	15	24	24	18	15	11	12	13	12	10	12	14	14	37
9-Dec	13	15	16	10	11	14	11	13	14	12	13	12	11	12	15	9	9	8	18	12	10	9	13	13	18
10-Dec	18	17	15	14	14	12	16	22	19	24	28	15	13	11	16	19	10	11	15	14	12	13	12	14	28
11-Dec	11	12	11	12	12	13	11	11	10	11	11	12	12	14	10	11	13	11	11	10	11	10	11	10	14
12-Dec	10	9	9	10	8	11	10	9	9	11	9	10	9	11	11	10	11	10	11	10	10	10	10	10	11
13-Dec	10	9	10	12	11	11	11	11	10	10	11	11	10	11	15	35	15	14	10	12	16	17	15	15	35
14-Dec	16	15	11	16	13	12	12	14	13	16	18	23	24	16	10	9	9	10	9	9	10	8	9	9	24
15-Dec	9	7	8	8	8	8	9	9	6	9	10	13	8	9	10	9	8	10	8	9	23	22	14	12	23
16-Dec	11	12	12	18	13	11	12	12	13	16	11	11	11	9	11	10	11	14	17	16	14	12	10	11	18
17-Dec	10	11	13	11	12	11	10	11	11	11	11	11	12	11	10	11	11	10	12	13	13	14	14	15	15
18-Dec	15	13	15	28	25	31	23	13	19	38	27	15	18	23	23	21	14	15	11	12	17	20	15	14	38
19-Dec	13	11	12	12	13	14	13	14	12	11	10	9	8	9	8	9	11	10	10	11	9	9	8	8	14
20-Dec	8	8	9	8	8	8	8	8	9	9	9	10	13	12	9	9	10	10	10	9	15	10	8	8	15
21-Dec	9	8	8	10	8	7	7	11	6	6	9	10	10	12	18	62	50	49	9	12	11	38	62	88	88
22-Dec	23	17	15	18	14	10	10	10	10	9	15	23	11	15	15	10	12	12	17	11	13	14	13	11	23
23-Dec	12	13	11	9	11	14	13	16	14	11	10	9	10	11	13	12	15	11	13	12	18	13	13	17	18
24-Dec	11	23	9	12	14	19	11	14	15	13	14	15	13	15	13	13	17	12	9	14	11	9	6	6	23
25-Dec	9	9	8	9	8	10	9	9	10	10	11	12	11	13	13	17	14	45	9	18	11	12	10	6	45
26-Dec	10	19	22	17	12	20	17	11	AF	AF	AF	AF	9	9	17	16	12	12	13	12	14	14	14	14	22
27-Dec	14	14	13	13	14	12	13	11	11	11	11	10	9	10	9	9	9	8	10	6	7	8	7	8	14
28-Dec	8	11	12	11	17	16	12	11	8	13	12	22	AF	AF	29	42	AF	44	11	10	8	12	9	9	44
29-Dec	9	5	5	11	8	8	9	9	10	9	9	10	9	9	9	9	9	9	9	8	8	9	10	10	11
30-Dec	9	9	9	7	9	8	11	10	7	8	8	12	11	11	9	8	7	8	7	6	7	8	8	8	12
31-Dec	8	8	8	8	8	8	8	8	9	9	9	7	8	8	8	8	8	9	7	7	7	7	7	7	9
	27	23	22	28	25	31	23	37	32	38	28	23	24	24	29	62	50	49	18	18	23	38	62	88	
	Diurnal Maximum																								

AF - Analyzer Failure



# Wood Buffalo Environmental Association SO2 Calibration Report

## Station Information

Calibration Date	December 11, 2015	Last Calibration	November 20, 2015
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	9:50	End Time (MST)	13:35
Gas Cert Reference	SA130123A	Station temp.	Deg C
Cal Gas Concentration	49.3 ppm	Cal Gas Exp Date	12/12/2016
Calibrator Make/Model	API T700	Serial Number	996
ZAG Make/Model	API 701	Serial Number	4891
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9037

## Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	-606	-606
Analyzer IP address	192.168.1.43		Lamp voltage	798	797
Calculated slope	0.998108	1.002388	Chamber temp	45.0	45.0
Calculated intercept	-0.580793	-1.221674	Pressure	688.6	680.1
Analyzer Background	7.9	8.0	Flow	0.448	0.441
Analyzer Coefficient	0.950	0.950	Intensity	90	90

Analyzer make Thermo 43i Analyzer serial # 1410661308

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.3	----
as found span	5000	58.3	574.8	573.5	1.002
calibrator zero	5000	0.0	0.0	-0.3	----
high point	5000	58.3	574.8	573.5	1.002
second point	5000	29.3	288.9	291.3	0.992
third point	5000	14.7	144.9	146.7	0.988
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	58.3	574.8	576.7	0.997
Average Correction Factor					0.994

Corrected As found 573.9 Previous response 576.5 % change 0.5%

**Notes:**

No maintenance done. No adjustments made.

Calibration Performed By: Devin Russell



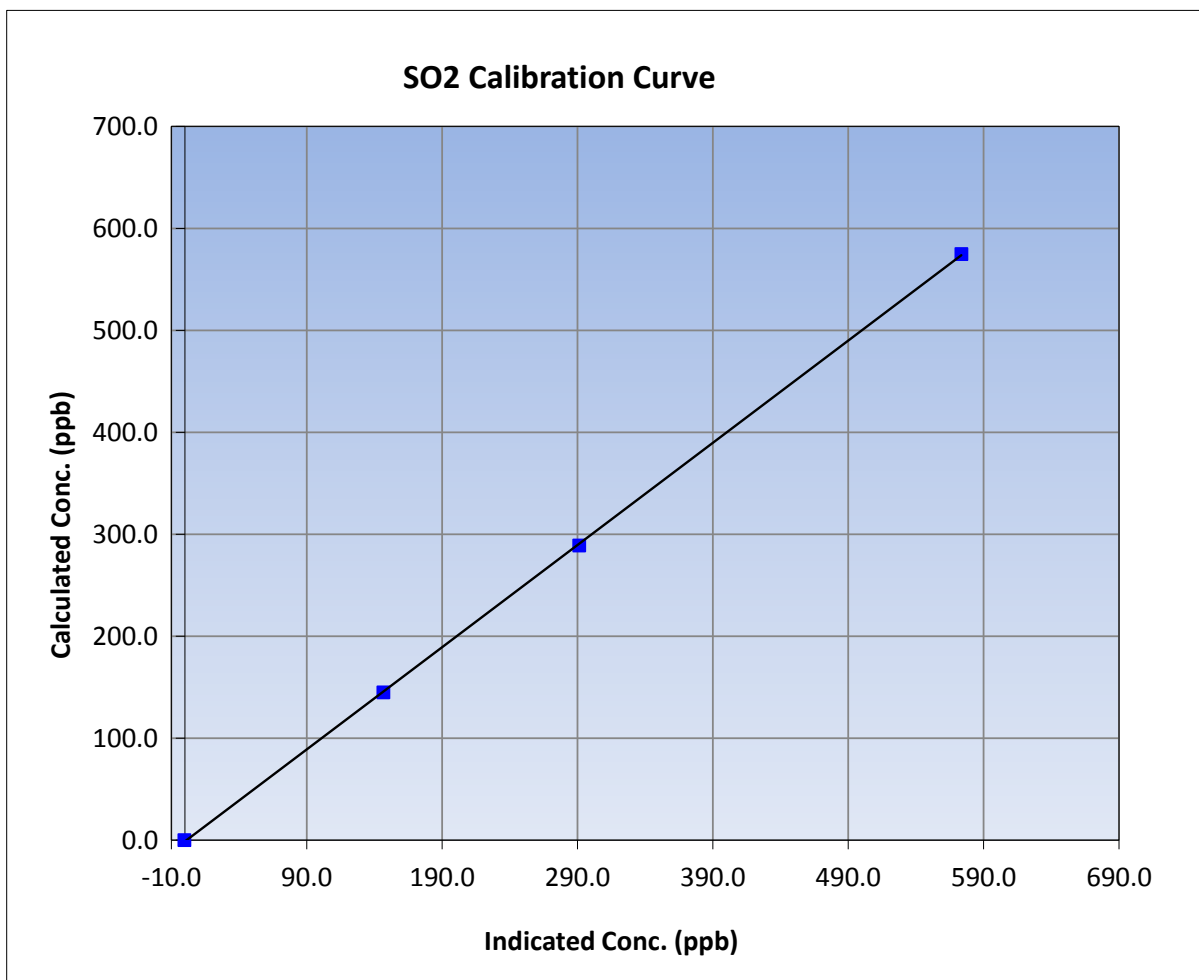
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 11, 2015	Previous Calibration	November 20, 2015
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	9:50	End Time (MST)	13:35
Analyzer make	Thermo 43i	Analyzer serial #	1410661308

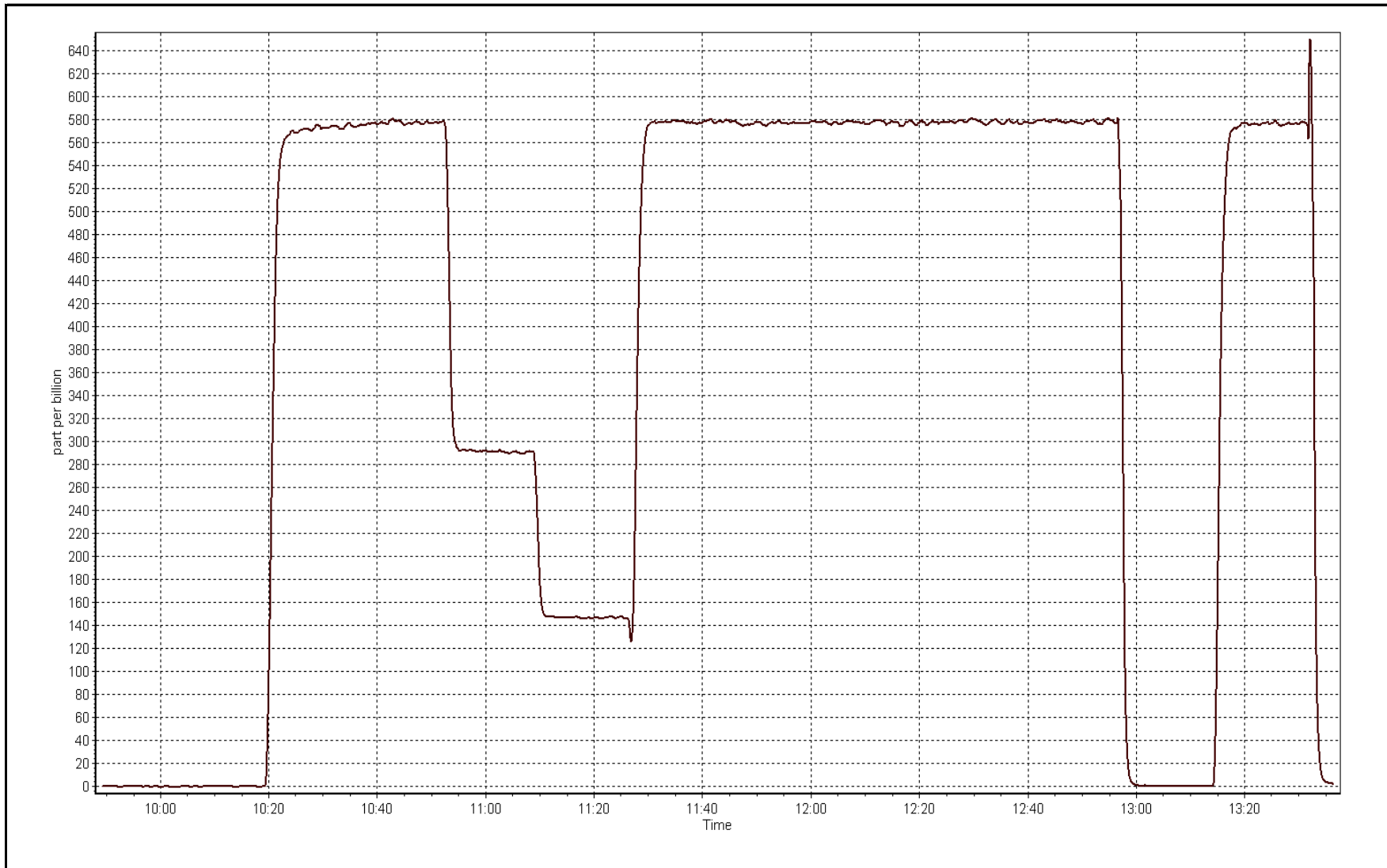
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	0.999956
574.8	573.5	1.0023		
288.9	291.3	0.9919	Slope	1.002388
144.9	146.7	0.9880		
			Intercept	-1.221674



SO2 Calibration Plot

Date: December 11, 2015





# Wood Buffalo Environmental Association H2S Calibration Report

## Station Information

Calibration Date	December 9, 2015	Last Calibration	November 20, 2015
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	10:10	End Time (MST)	12:35
Gas Cert Reference	ALM066720	Station temp.	22 Deg C
Cal Gas Concentration	4.85 ppm	Cal Gas Exp Date	10/06/2014
Calibrator Make/Model	API T700	Serial Number	996
ZAG air Make/Model	API 701	Serial Number	4891
DACS make/model	Campbell Scientific CR3000	Serial Number	9037
SO2 gas concentration	49.3 ppm	SO2 gas cert/exp	SA130123A December-12-16

## Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-574	-574
Analyzer IP address	192.168.1.45		Lamp voltage	931	933
Calculated slope	0.995766	0.998275	Chamber temp	45	45
Calculated intercept	0.106286	-0.303998	Pressure	547.3	529.8
Analyzer Background	12.7	12.9	Flow	0.972	0.945
Analyzer Coefficient	1.131	1.131	Intensity	84	85
			Converter temp.	337	335

Analyzer make/model	Thermo 450i	Analyzer serial #	815129098
Converter make/model	NA	Converter serial #	NA

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.3	----
as found span	5000	83.4	80.9	80.3	1.007
SO2 scrubber check	5000	15.2	149.9	1.0	----
calibrator zero	5000	0.0	0.0	-0.3	----
high point	5000	83.4	80.9	80.3	1.007
second point	5000	41.8	40.5	40.2	1.008
third point	5000	21.0	20.4	20.3	1.003
as left zero	5000	0.0	0.0	-0.2	----
as left span	5000	83.4	80.9	80.4	1.006
Average Correction Factor					1.006

Corrected As found	80.6	Previous response	81.1	% change	0.7%
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**Notes:**

Scrubber check completed after as founds. No adjustments made.

Calibration Performed By: Devin Russell





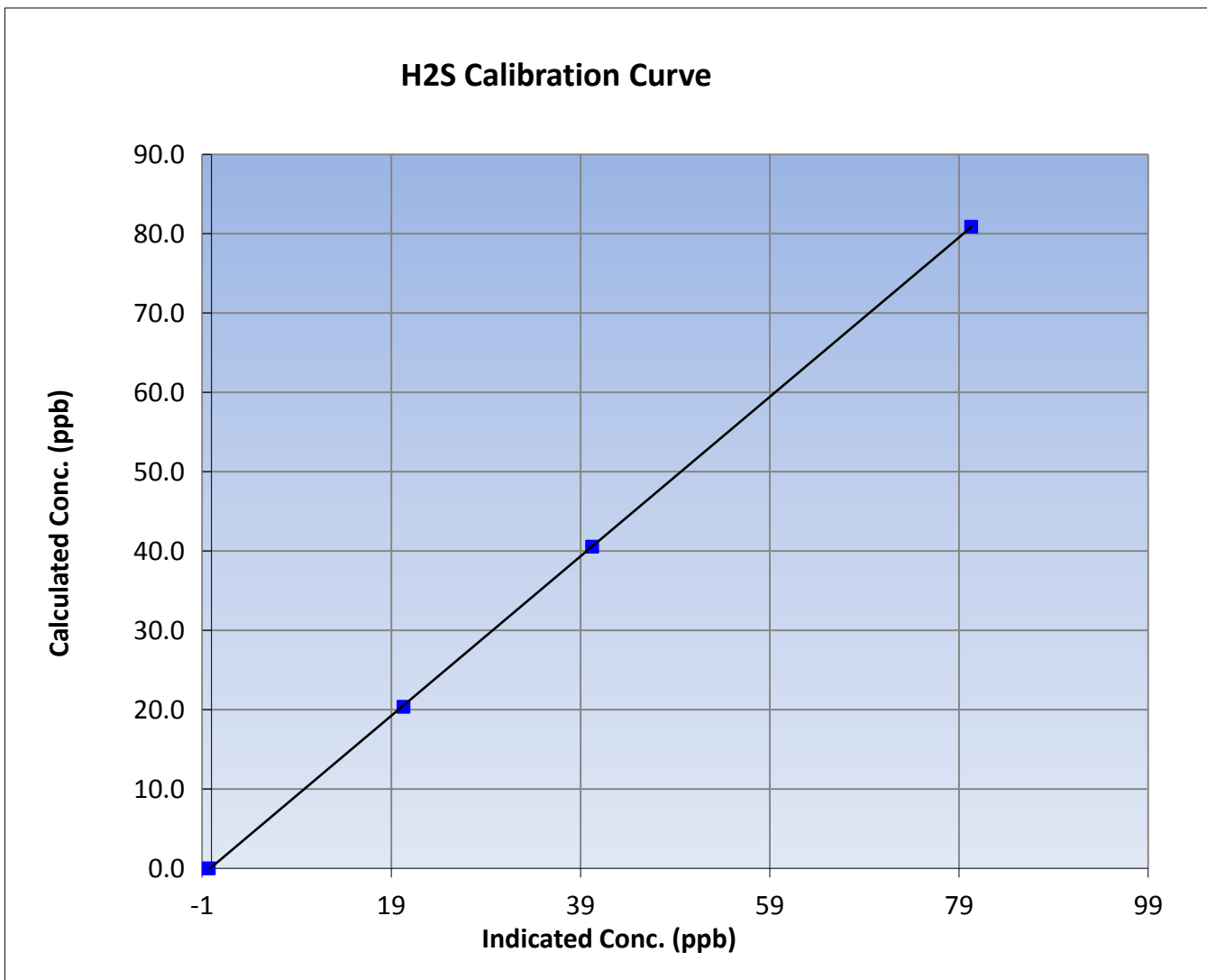
# Wood Buffalo Environmental Association H2S Calibration Report

## Station Information

Calibration Date	December 9, 2015	Previous Calibration	November 20, 2015
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:10	End Time (MST)	12:35
Analyzer make	Thermo 450i	Analyzer serial #	815129098

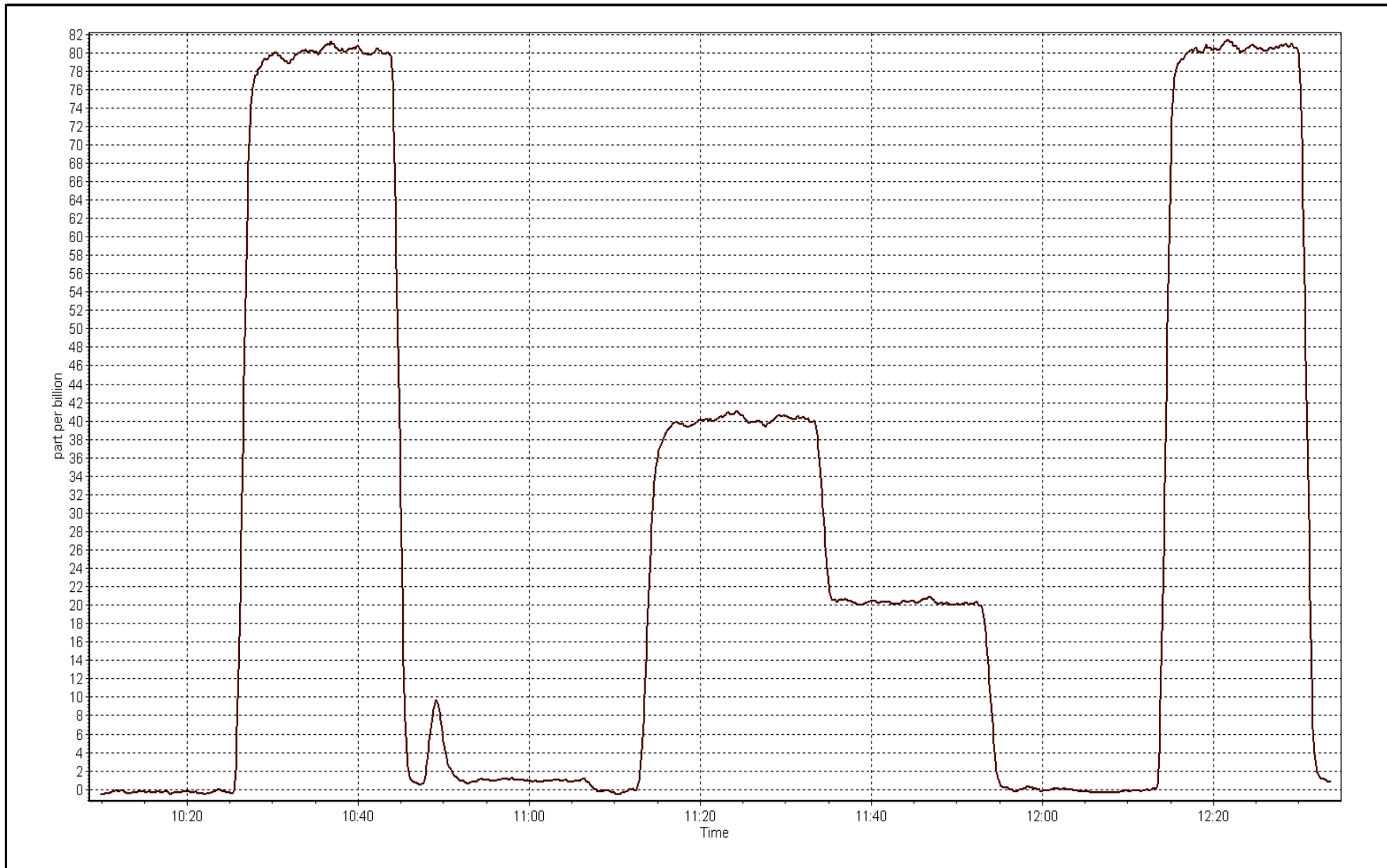
## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	0.999984
80.9	80.3	1.0074		
40.5	40.2	1.0076	Slope	1.004873
20.4	20.3	1.0034		
			Intercept	0.144766



H2S Calibration Plot

Date: December 9, 2015





# Wood Buffalo Environmental Association THC Calibration Report

## Station Information

Calibration Date	December-11-15	Last Calibration	November-20-15
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	9:50	End Time (MST)	13:35
Gas Cert Reference	SA130123A	Cal Gas Expiry Date	12/12/2016
CH4 Cal Gas Conc.	512 ppm	CH4 Equiv Conc.	1092.3 ppm
C3H8 Cal Gas Conc.	211 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	996
ZAG make/model	Teledyne API 701	Serial Number	4891
DACS make/model	Campbell Scientific CR3000	Serial Number	9037

## Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.5	8.5
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.9	34.9
Calculated slope	0.994021	1.001316	Fuel Pressure	23.0	23.0
Calculated intercept	0.007422	0.009527	Analyzer Coeff	3.5	3.6
			Analyzer BKG	4.840	4.940

Analyzer make	Thermo 51i-LT	Analyzer serial #	1336160089
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## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration THC (ppm) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.00	-0.02	----
as found span	5000	58.3	12.74	12.42	1.025
calibrator zero	5000	0.0	0.00	-0.02	----
high point	5000	58.3	12.74	12.71	1.002
second point	5000	29.3	6.40	6.37	1.005
third point	5000	14.7	3.21	3.22	0.997
as left zero	5000	0.0	0.00	-0.03	----
as left span	5000	58.3	12.74	12.66	1.006
Average Correction Factor					1.001

Corrected As found	12.44	Previous response	12.80	% change	2.9%
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Notes:

No maintenance done. Span adjusted.

Calibration Performed By:

Devin Russell



# Wood Buffalo Environmental Association THC Calibration Report

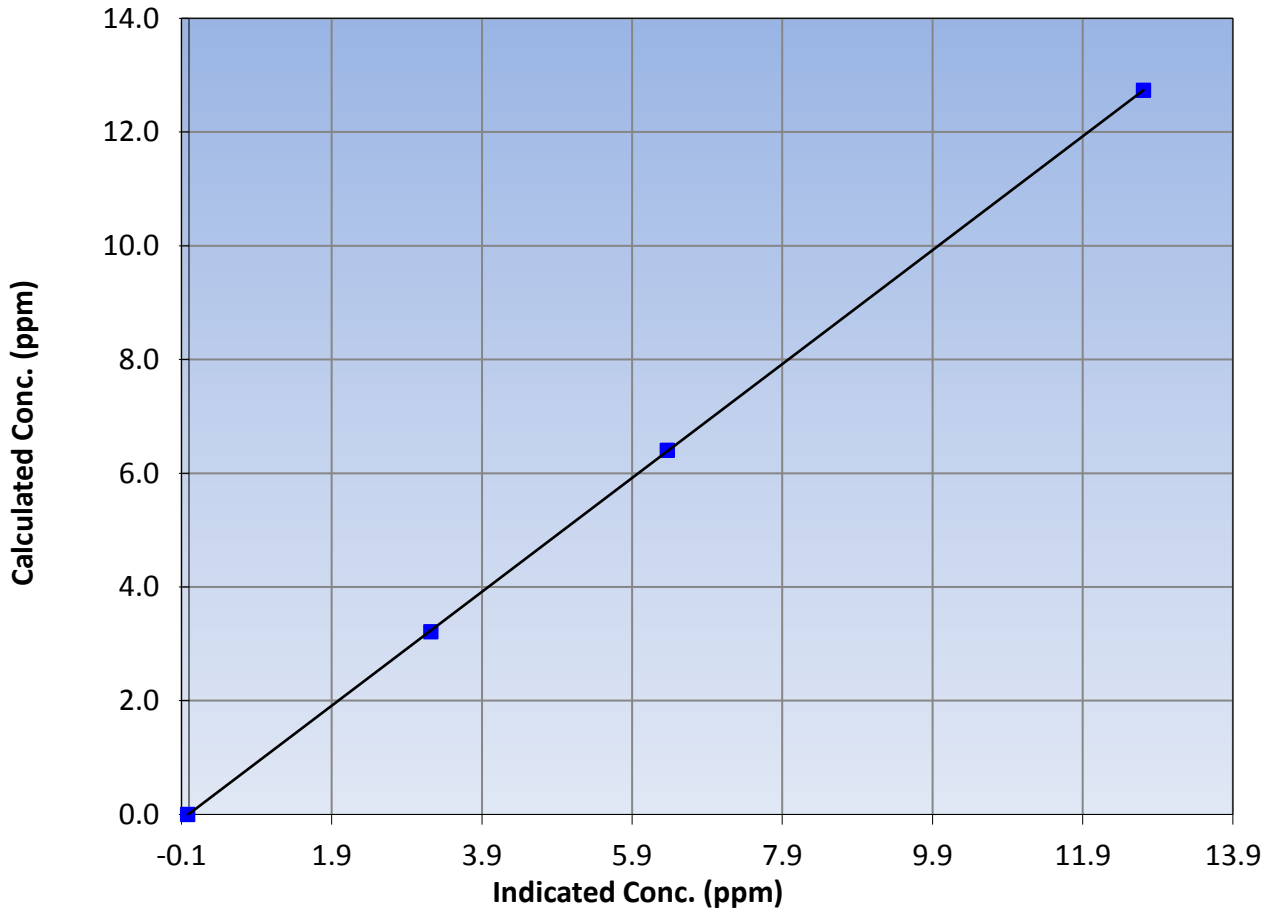
## Station Information

Calibration Date	December 11, 2015	Previous Calibration	November 20, 2015
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	9:50	End Time (MST)	13:35
Analyzer make	Thermo 51i-LT	Analyzer serial #	1336160089

## Calibration Data

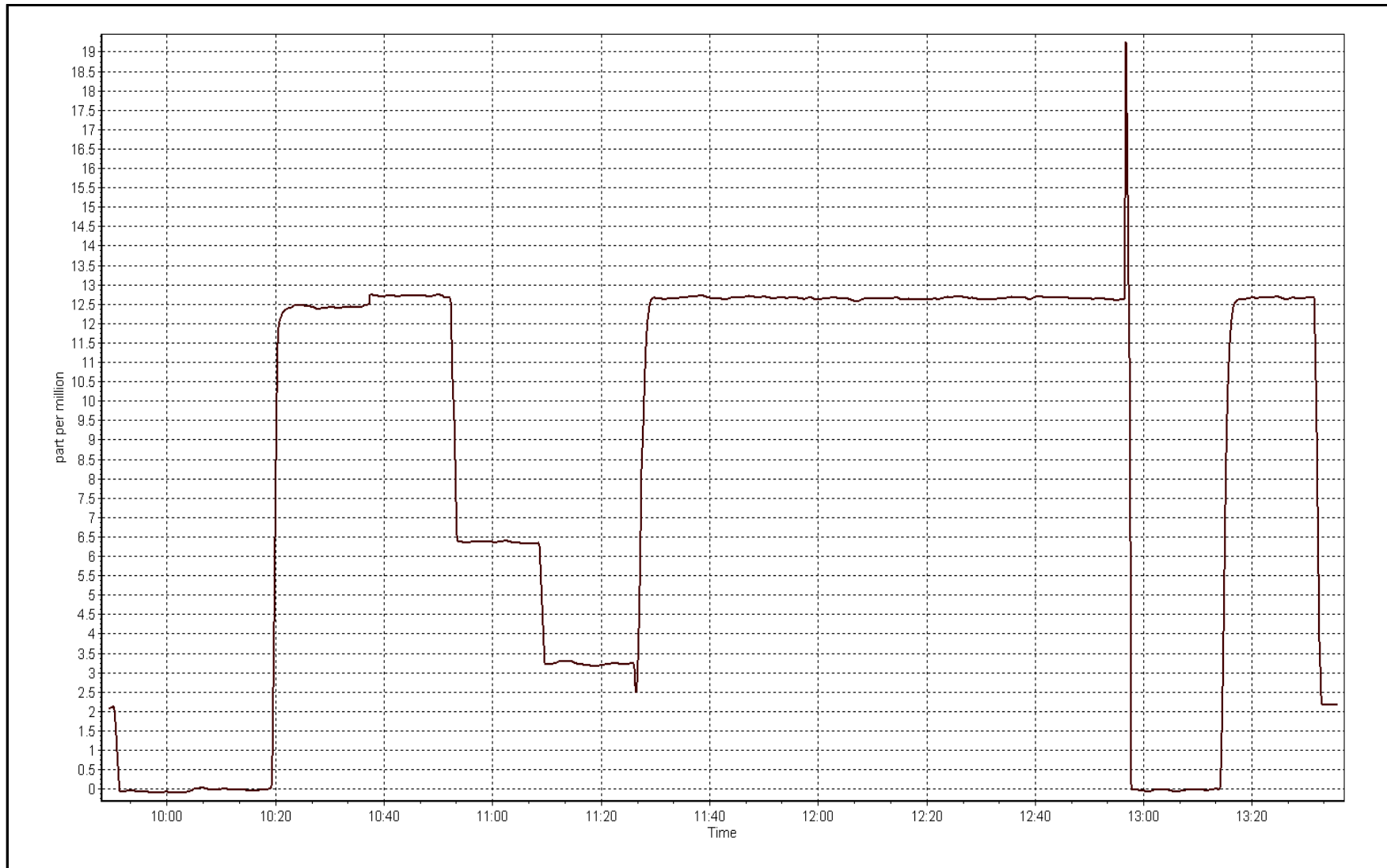
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.02	----	Correlation Coefficient	0.999991
12.74	12.71	1.0020		
6.40	6.37	1.0048	Slope	1.001316
3.21	3.22	0.9973		
			Intercept	0.009527

**THC Calibration Curve**



THC Calibration Plot

Date: December 11, 2015





# Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

## Station Information

Calibration Date	December 11, 2015	Previous Calibration	November 20, 2015
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	9:50	End Time (MST)	13:35
NO Cal Gas Conc	51.5 ppm	Gas Cert Reference	SA130123A
NOX Cal Gas Conc	51.5 ppm	Cal Gas Expiry Date	12/12/2016
Calibrator	API T700	Serial Number	996
Zero air Generator	Teledyne API T701	Serial Number	4891

## DACs Information

DACs make & model	Campbell Scientific CR3000	DACs serial No.	9037
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## Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.998434	0.998715	0.997635
	Data Offset	-0.833450	-0.670545	-0.206699
Current Calibration	Data Slope	0.998066	0.997447	1.000659
	Data Offset	-0.678169	-0.387246	-0.211362

## Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1410661309
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.43		192.168.1.43	
NO coefficient	0.885		0.897	
NOX coefficient	1.000		0.998	
NO2 coefficient	1.000		1.000	
NO bkgrnd	4.0		4.0	
NOX bkgrnd	4.1		4.1	
Chamber Temp	50.4	Deg C	50.4	Deg C
Moly Temp	324.5	Deg C	326	Deg C
PMT voltage	-780.3	V	-780.3	V
PMT Temp	-2.7	Deg C	-2.8	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	164.2	mmHg	163.3	mmHg
R Cell Press Nox	164.2	mmHg	163.3	mmHg
NO sample flow	0.624	lpm	0.61	lpm
Nox sample Flow	0.624	lpm	0.610	lpm

**Notes:**

No maintenance done. Span adjusted.



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

### Station Information

Calibration Date:

December 11, 2015

Station Number:

AMS 19

### Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.4	-0.3	-0.1	----	----
as found span	5000	58.3	600.5	600.5	0.0	594.2	592.7	1.5	1.0105	1.0131
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.4	-0.3	-0.1	----	----
high point	5000	58.3	600.5	600.5	0.0	601.7	602.0	-0.3	0.9980	0.9975
second point	5000	29.3	301.8	301.8	0.0	303.9	303.5	0.3	0.9932	0.9943
third point	5000	14.7	151.4	151.4	0.0	153.3	152.7	0.5	0.9880	0.9915
as left zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.2	-0.1	----	----
as left span	5000	58.3	600.5	304.0	296.5	596.2	297.0	299.2	1.0073	1.0237
Average Correction Factor									0.9931	0.9944

Corrected As found  
Previous Response

NO<sub>x</sub>= 594.6  
NO<sub>x</sub>= 602.3

NO= 593.0  
NO= 601.9

Percent Change

NO<sub>x</sub>= 1.3%

NO= 1.5%

### GPT Calibration Data

Dilution Flow

5000

ccm

Source Gas Flow

58.30

ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero			0.0			-0.1			N/A	
1st NO2 (300)	----	304.0	296.6	600.5	304.0	296.5	0.9885	1.0000	1.0004	100.0%
2nd NO2 (200)	----	400.2	200.4	600.6	400.2	200.5	0.9883	1.0000	0.9999	100.0%
3rd NO2 (100)	----	498.2	102.4	601.2	498.2	103.0	0.9873	1.0000	0.9939	100.6%
4th NO2 (0)	600.6	----	0.5	601.1	600.6	0.5	0.9875	1.0000	N/A	----
Average Correction Factor							0.9879	1.0000	0.9980	100.2%

Calibration Performed By:

Devin Russell



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

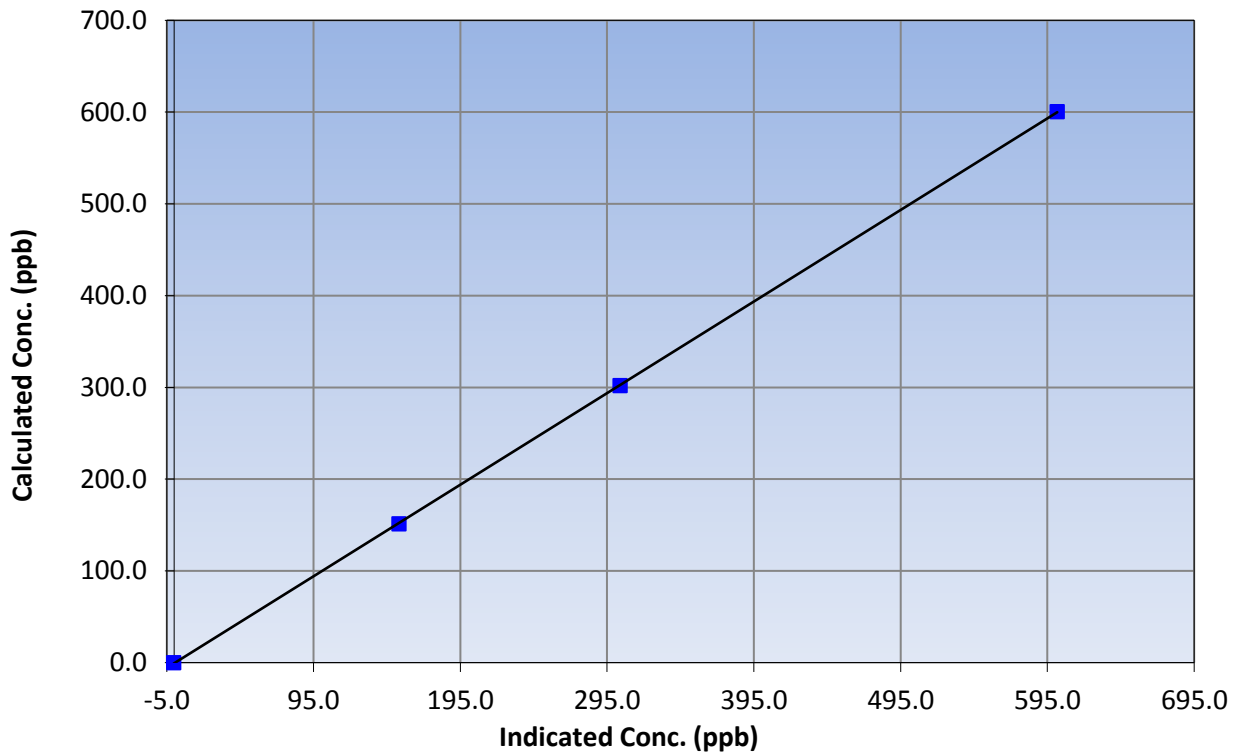
### Station Information

Calibration Date	December 11, 2015	Previous Calibration	November 20, 2015
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	9:50	End Time (MST)	13:35
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	----	Correlation Coefficient	0.999986
600.5	601.7	0.9980		
301.8	303.9	0.9932	Slope	0.998066
151.4	153.3	0.9880		
			Intercept	-0.678169

### NO<sub>x</sub> Calibration Curve







# Wood Buffalo Environmental Association

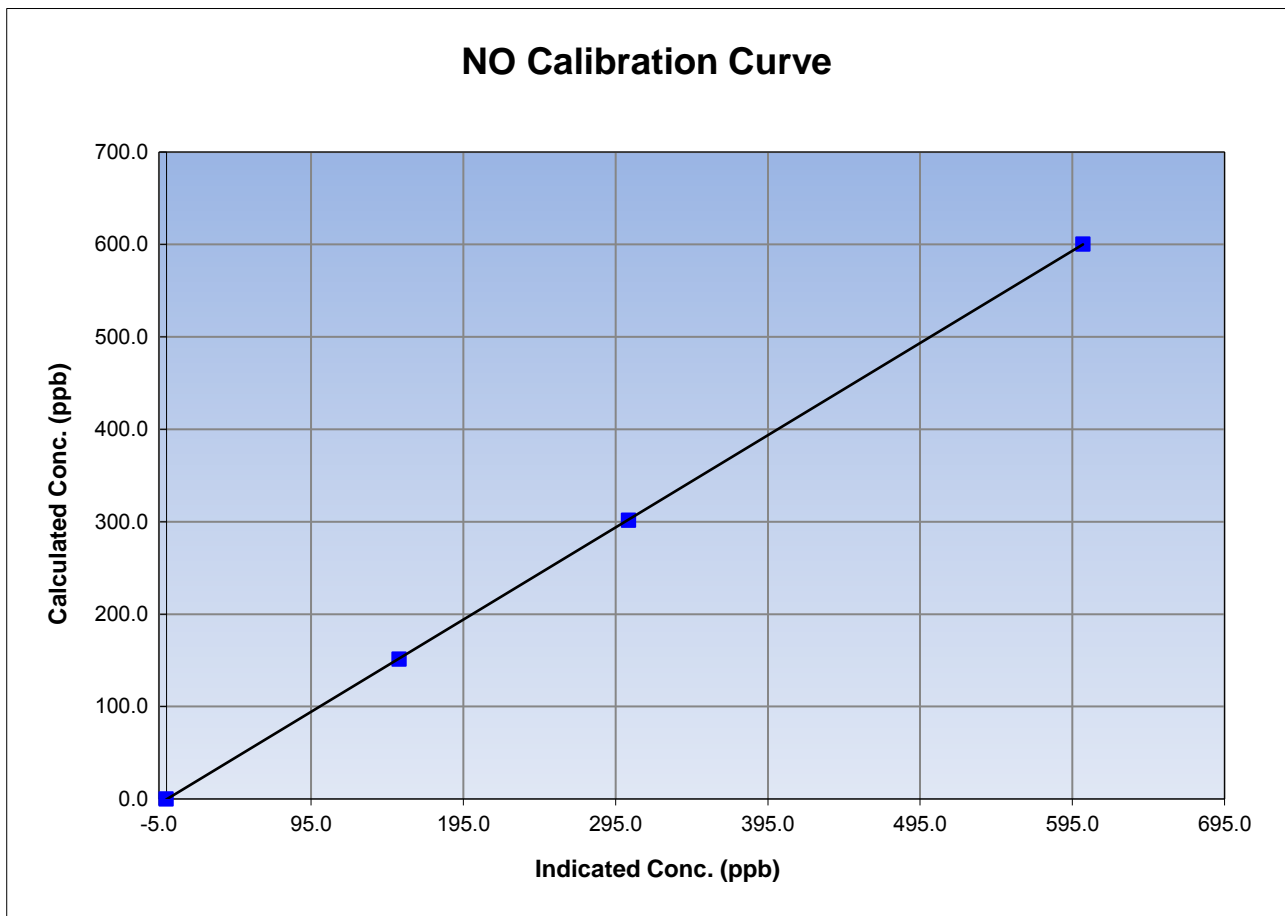
## NO Calibration Summary

### Station Information

Calibration Date	December 11, 2015	Previous Calibration	November 20, 2015
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	9:50	End Time (MST)	13:35
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	N/A	Correlation Coefficient	0.999994
600.5	602.0	0.9975		
301.8	303.5	0.9943	Slope	0.997447
151.4	152.7	0.9915		
			Intercept	-0.387246





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

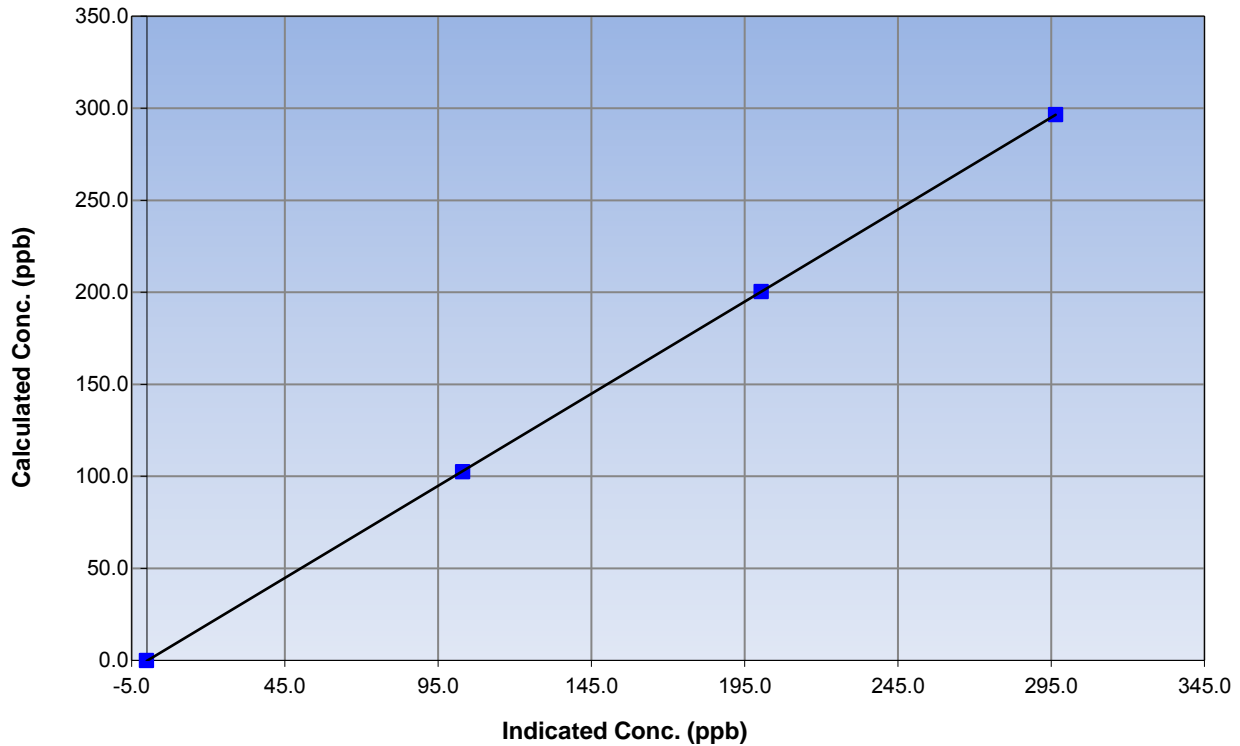
### Station Information

Calibration Date	December 11, 2015	Previous Calibration	November 20, 2015
Station Number	Firebag	Station Number	AMS 19
Start Time (MST)	9:50	End Time (MST)	13:35
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

### Calibration Information

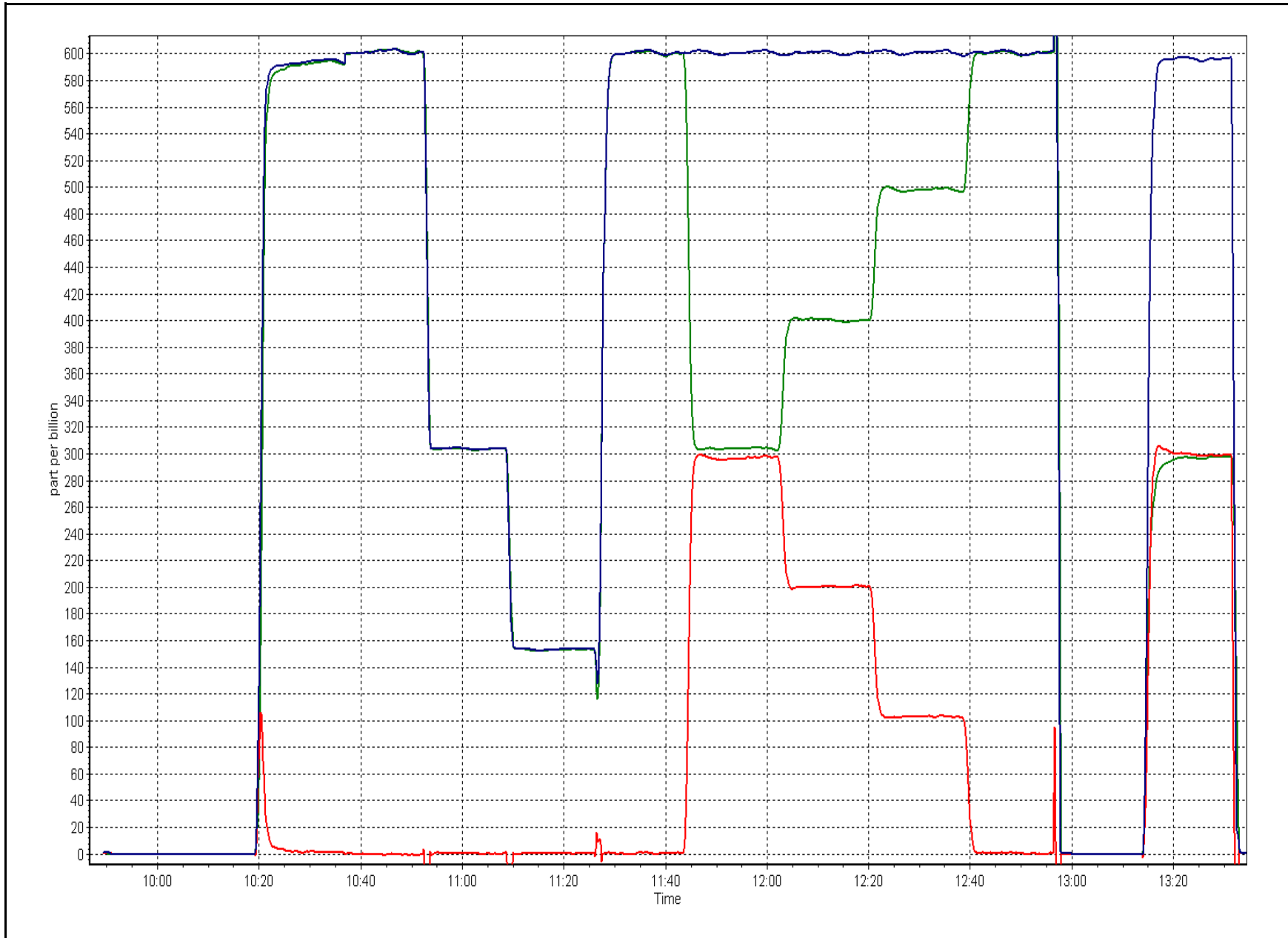
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999993
296.6	296.5	1.0004		
200.4	200.5	0.9999	Slope	1.000659
102.4	103.0	0.9939		
			Intercept	-0.211362

### NO<sub>2</sub> Calibration Curve



NOX Calibration Plot

Date: December 11, 2015





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## **WOOD BUFFALO ENVIRONMENTAL ASSOCIATION**

**CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT**

**AMS 501  
STATOIL  
LEISMER  
DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STATOIL LEISMER (AMS 501)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	709	35	35	100	22	0	4	0
H2S (ppb) Average	702	36	42	99.19	1	0	0	0
NO2 (ppb) Average	709	35	35	100	16	0	9	-
NO (ppb) Average	709	35	35	100	13	-	3	-
NOX (ppb) Average	709	35	35	100	27	-	10	-
Temperature 2 m (C) Average	744	0	0	100	5.2	-	-0.2	-
Relative Humidity (%) Average	744	0	0	100	97	-	95	-
Wind Speed 10 m (km/h) Average	742	0	2	99.73	29	-	18	-
Wind Direction 10 m (deg) Average	742	0	2	99.73	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STATOIL LEISMER (AMS 501)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	709	0.6	1	-	0	0	0	0	0	1	22
H2S (ppb) Average	702	0.3	0	-	0	0	0	0	0	0	1
NO2 (ppb) Average	709	2.9	2	-	0	1	1	2	4	5	16
NO (ppb) Average	709	0.6	2	-	0	0	0	0	0	2	13
NOX (ppb) Average	709	3.4	3	-	0	1	1	3	4	7	27
Temperature 2 m (C) Average	744	-9.82	6	-	-23.7	-17.4	-15.2	-9	-4.4	-2.6	5.2
Relative Humidity (%) Average	744	82.6	13	-	23	65	81	85	90	94	97
Wind Speed 10 m (km/h) Average	742	8	5	-	0	3	4	7	10	16	29
Wind Direction 10 m (deg) Average	742	-	-	-	-	-	-	-	-	-	-



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STATOIL LEISMER (AMS 501)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
H2S	02 Dec 2015 06:00	02 Dec 2015 06:00	1	Intermittent unstable operation - excessive baseline drift
H2S	04 Dec 2015 06:00	04 Dec 2015 06:00	1	Intermittent unstable operation - excessive baseline drift
H2S	06 Dec 2015 20:00	06 Dec 2015 20:00	1	Intermittent unstable operation - excessive baseline drift
H2S	11 Dec 2015 18:00	11 Dec 2015 18:00	1	Intermittent unstable operation - excessive baseline drift
H2S	29 Dec 2015 23:00	30 Dec 2015 00:00	2	Intermittent unstable operation - excessive baseline drift
Wind Speed, Wind Direction	06 Dec 2015 18:00	06 Dec 2015 18:00	1	Flat line in sensor output signal -sensor frozen
Wind Speed, Wind Direction	07 Dec 2015 03:00	07 Dec 2015 03:00	1	Flat line in sensor output signal -sensor frozen



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 22 ppb on Dec 24 11:00	Maximum Daily Average: 3.6 ppb on Dec 24		Hours of Data:	709
Minimum Value: 0 ppb on Dec 5 12:00	Minimum Daily Average: 0.1 ppb on Dec 13		Hours of Missing Data:	35
Maximum Diurnal Average: 1.2 ppb at hour 11	Minimum Diurnal Average: 0.2 ppb at hour 21		Hours of Calibration:	35
Monthly Average: 0.6 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 1 P <sub>99</sub> = 6		Percent Operational Time:	100.0

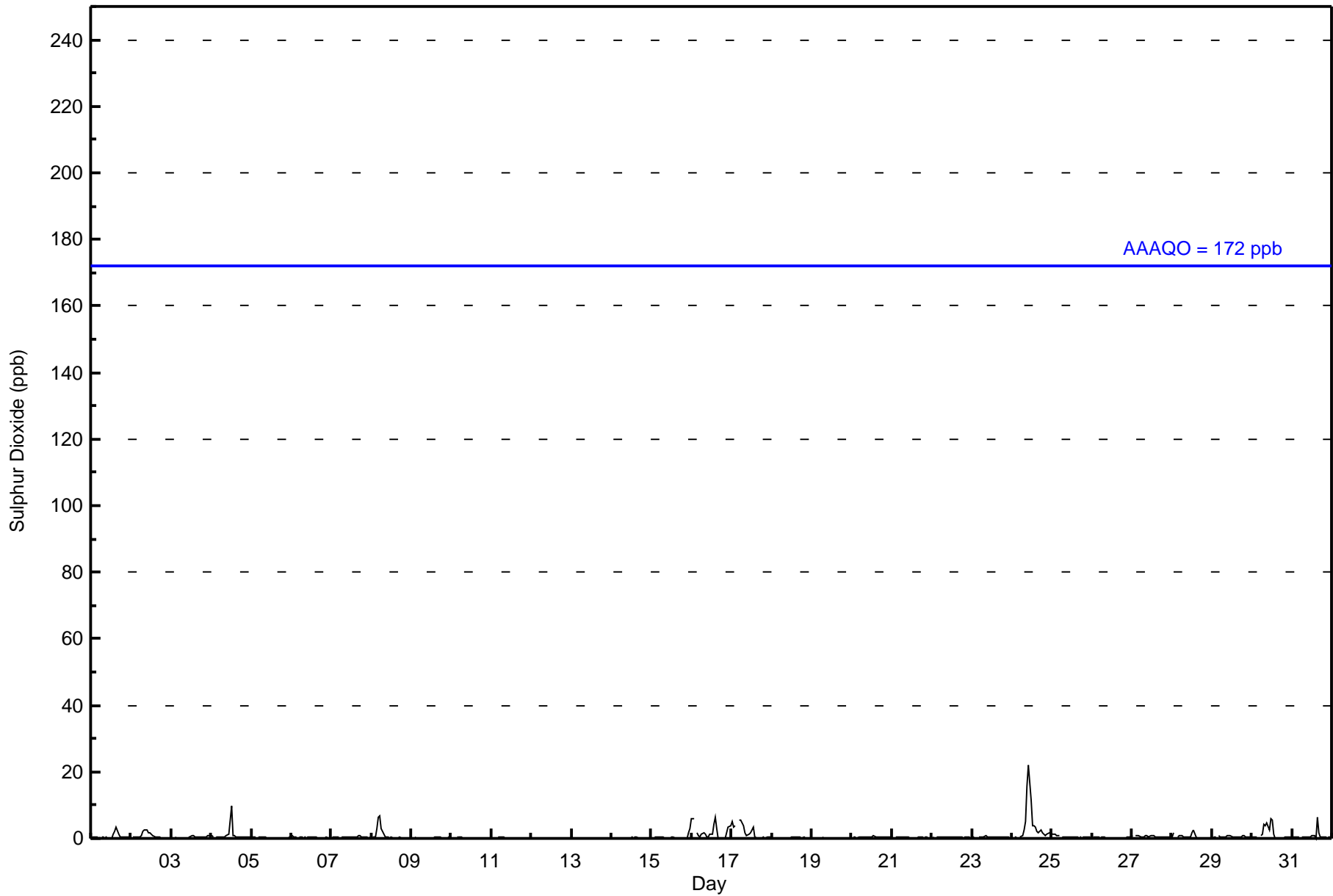
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	0	0	0	0	1	Z	0	0	0	0	0	0	0	1	2	4	1	0	0	0	0	0	0	0	0.6	4
2-Dec	Z	0	0	0	0	0	1	2	2	3	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0.7	3
3-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	1	1	1	1	0.4	1
4-Dec	1	0	Z	0	0	0	0	0	0	1	1	6	10	1	1	0	0	0	0	0	0	0	0	0	1.1	10
5-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Dec	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
7-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	1	1	0	1	1	1	1	1	0	0	0	0	0.4	1
8-Dec	Z	0	0	3	6	7	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	7
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
10-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
11-Dec	0	0	0	Z	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.1	0
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	0.4	3
16-Dec	6	6	Z	2	1	0	1	2	1	0	0	1	1	4	6	3	0	0	0	0	0	2	3	4	1.9	6
17-Dec	5	3	4	Z	5	5	5	4	2	1	1	2	2	3	0	0	0	0	0	0	0	0	0	0	1.9	5
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.2	1
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
20-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0.4	1
21-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
23-Dec	0	0	0	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
24-Dec	0	0	0	0	Z	0	1	2	5	16	22	12	4	4	3	2	2	2	2	1	1	1	2	2	3.6	22
25-Dec	1	1	1	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.5	1
26-Dec	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
27-Dec	1	Z	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.5	1
28-Dec	1	2	Z	1	1	1	1	0	0	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0.6	3
29-Dec	0	0	0	Z	1	0	0	0	1	1	1	1	1	1	1	0	1	0	1	1	1	1	0	0	0.5	1
30-Dec	0	0	0	0	Z	1	1	4	4	5	3	6	6	1	0	0	0	0	0	0	0	0	0	0	1.4	6
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	1	1	0	6	2	0	0	0	0	0	0	0	0.6	6
	0.7	0.7	0.5	0.5	0.8	0.8	0.6	0.7	0.7	1.0	1.2	1.1	1.1	0.8	0.6	0.7	0.3	0.3	0.3	0.3	0.2	0.3	0.4	0.5	Diurnal Average	
	6	6	4	3	6	7	5	4	5	16	22	12	10	4	6	6	2	2	2	2	1	1	2	3	4	Diurnal Maximum

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb



Wood Buffalo Environmental Association  
Hourly Averages

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Statoil - Leismer - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Statoil - Leismer - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	706	99.58	99.58
11 - 20	2	0.28	99.86
21 - 60	1	0.14	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**Statoil - Leismer - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	31	17	6	9	19	87	78	86	35	65	27	15	53	83	41	52	704
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	31	17	6	9	19	87	78	86	35	65	27	15	53	83	42	54	707

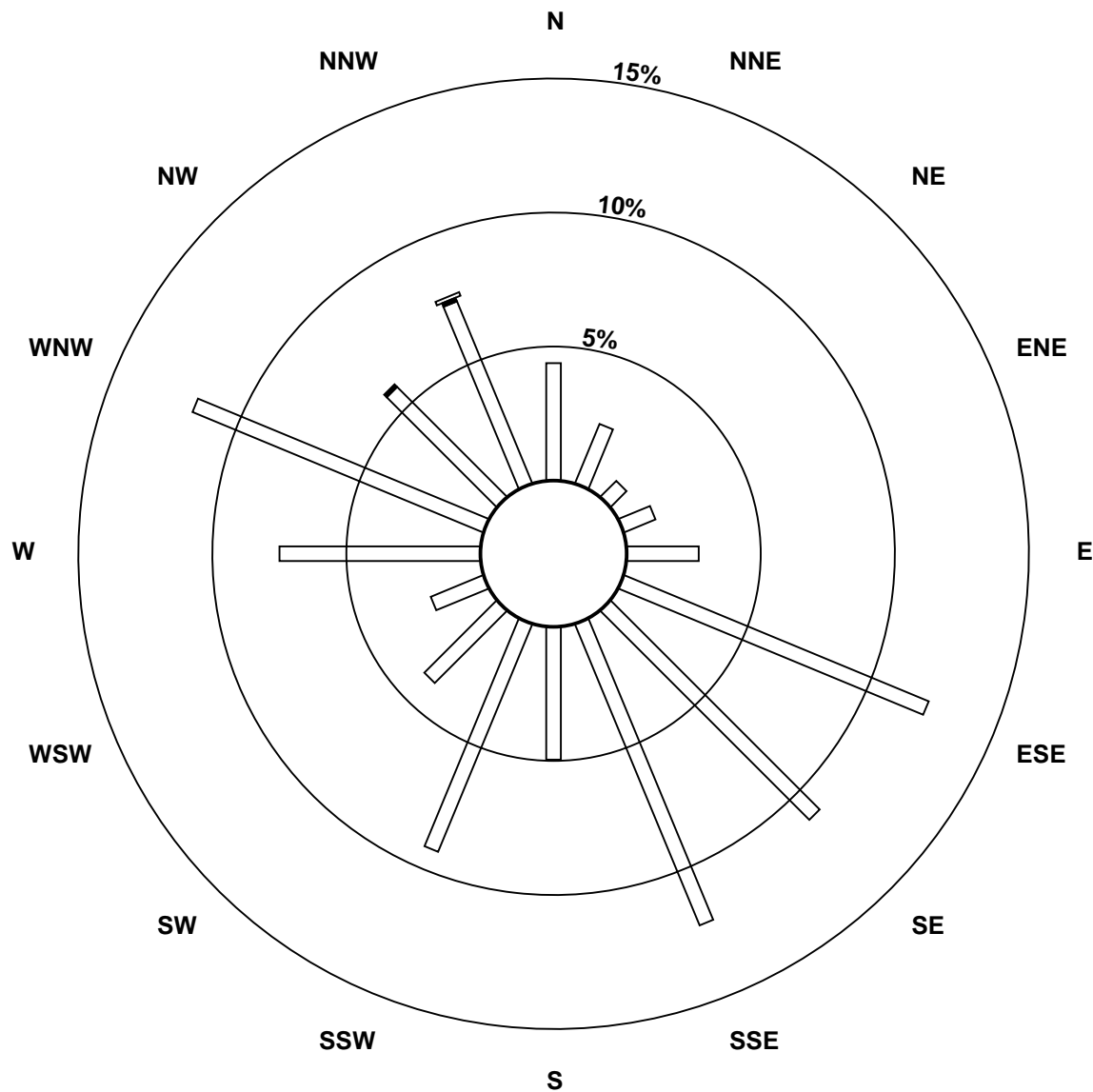
Total Number of Valid Hours: 707

Total Number of Hours: 744

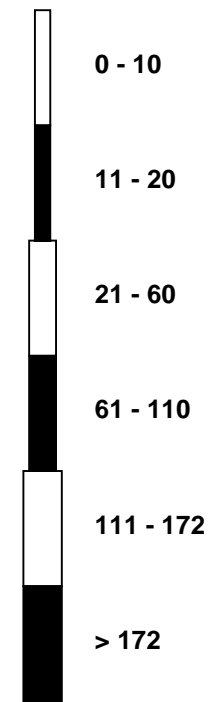


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

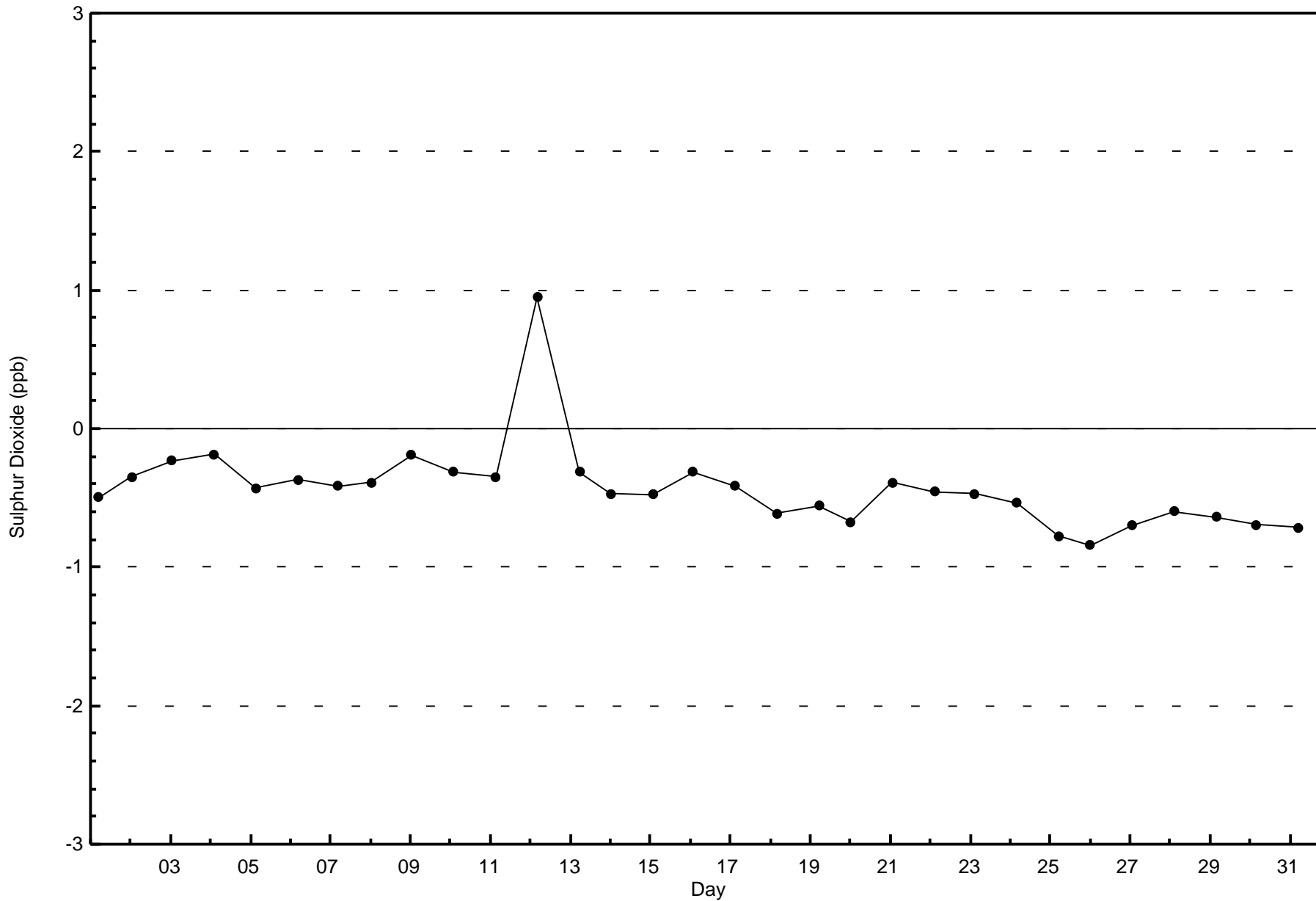
Sulphur Dioxide (SO<sub>2</sub>) - ppb  
Statoil - Leismer (AMS501)

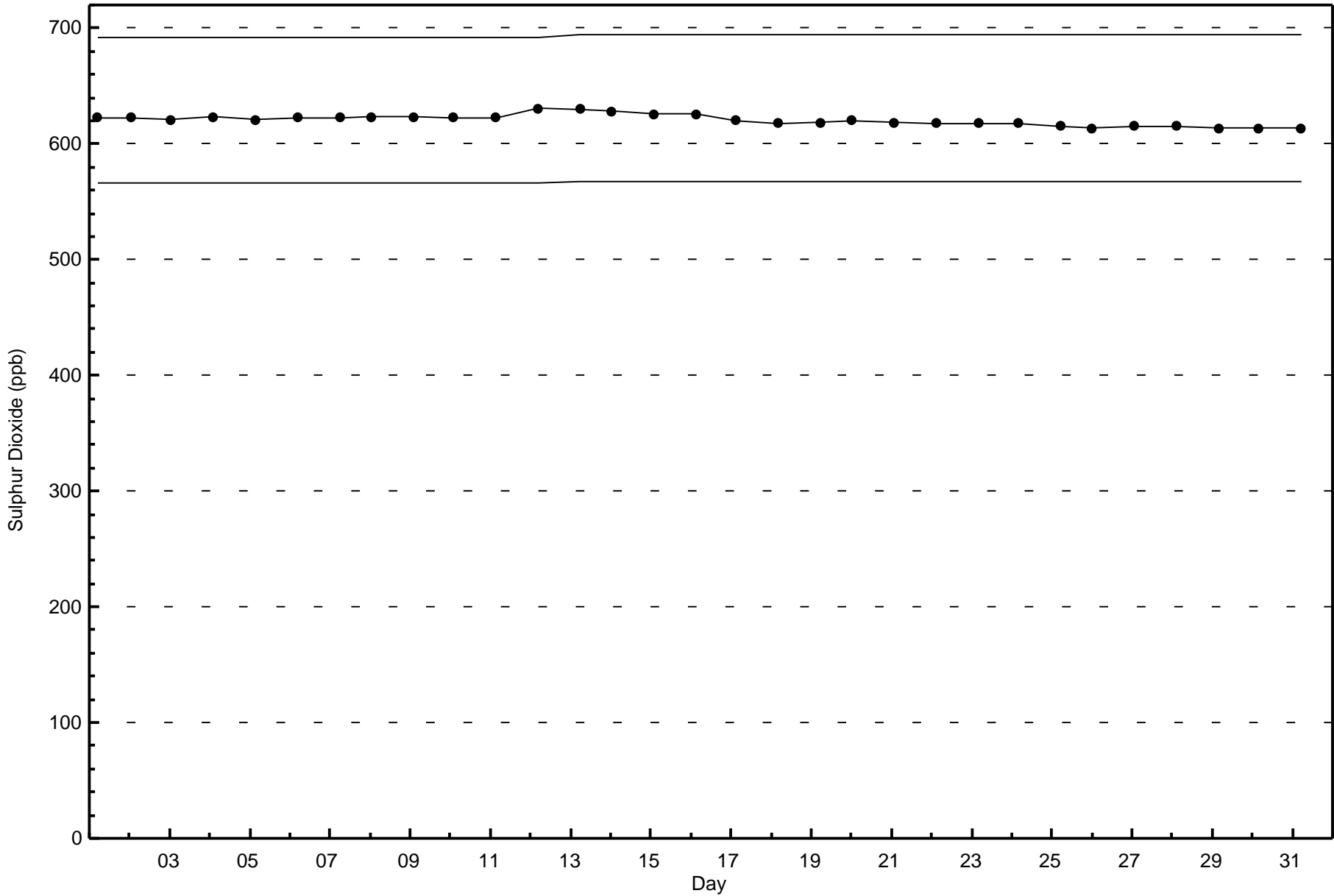


Classes (ppb)



Total Number of Valid Hours: 707







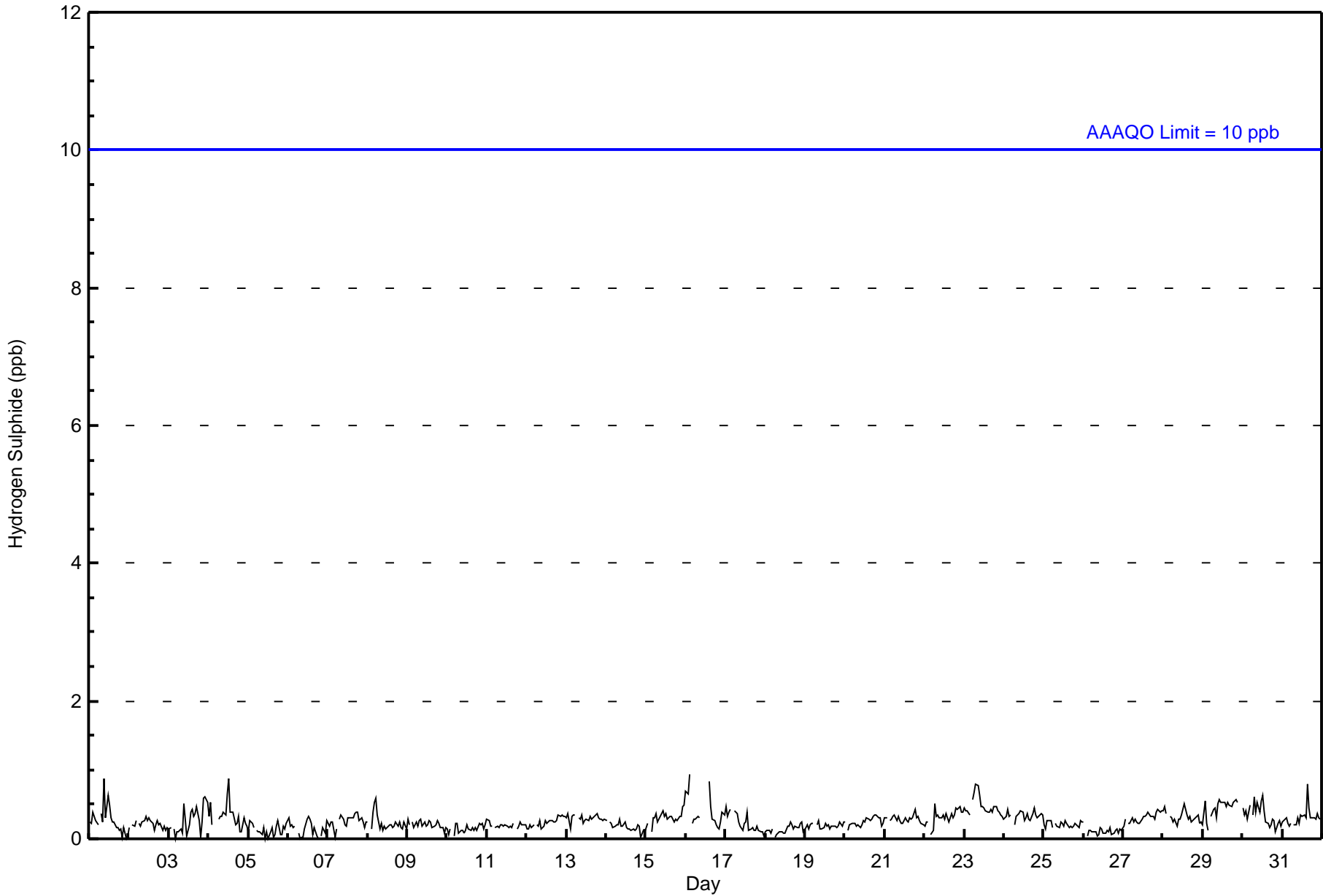


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 1 ppb on Dec 16 03:00	Maximum Daily Average: 0.5 ppb on Dec 23		Hours of Data:	702
Minimum Value: 0 ppb on Dec 3 05:00	Minimum Daily Average: 0.1 ppb on Dec 26		Hours of Missing Data:	42
Maximum Diurnal Average: 0.3 ppb at hour 13	Minimum Diurnal Average: 0.2 ppb at hour 5		Hours of Calibration:	36
Monthly Average: 0.3 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 1		Percent Operational Time:	99.2

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	Z	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
2-Dec	0	Z	0	0	0	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Dec	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.3	1
4-Dec	0	1	0	Z	0	UO	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	UO	0	0	0	0	0.1	0
7-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
8-Dec	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	UO	0	0	0	0	0	0	0	0.2	0
12-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
14-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
16-Dec	1	1	1	Z	0	0	0	0	0	C	C	C	C	C	1	0	0	0	0	0	0	0	0	0	0	0.4	1
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
22-Dec	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
23-Dec	0	0	0	0	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
24-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
25-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
26-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
29-Dec	0	1	0	0	Z	0	0	0	0	1	1	1	1	1	0	1	0	0	1	1	1	1	1	UO	UO	0.4	1
30-Dec	0	0	0	0	0	Z	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1

0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.3	0.2	0.2		Diurnal Average
1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1		Diurnal Maximum

Z - zerospan                      C - Calibration                      UO - Unstable Operation  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb    24-hr 3 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Statoil - Leismer - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	702	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 702

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**Statoil - Leismer - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	31	17	6	8	20	87	78	87	34	61	27	16	52	79	43	54	700
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	31	17	6	8	20	87	78	87	34	61	27	16	52	79	43	54	700

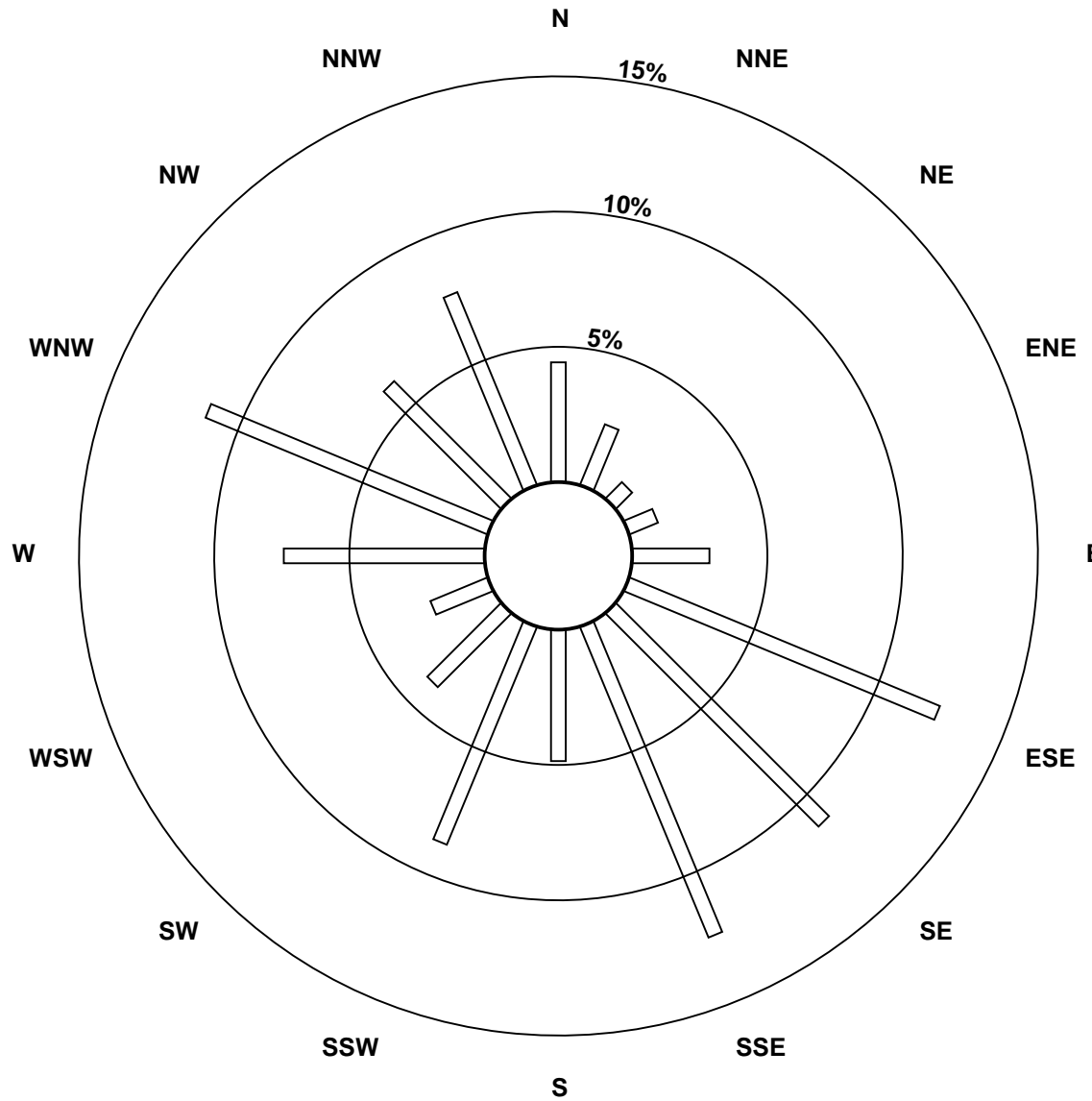
Total Number of Valid Hours: 700

Total Number of Hours: 744

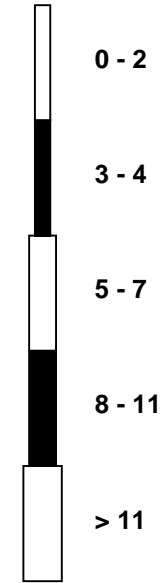


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

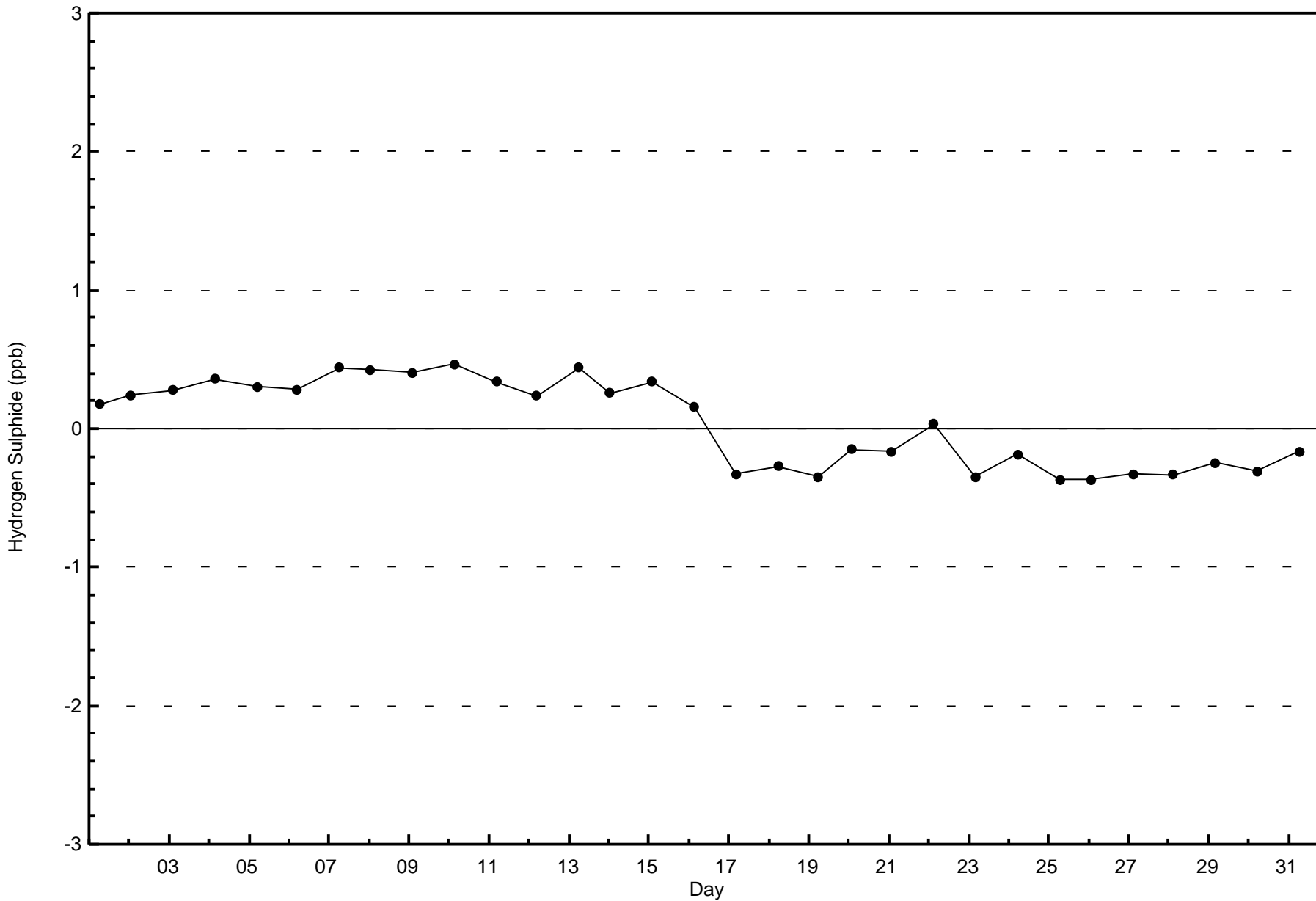
Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
Statoil - Leismer (AMS501)

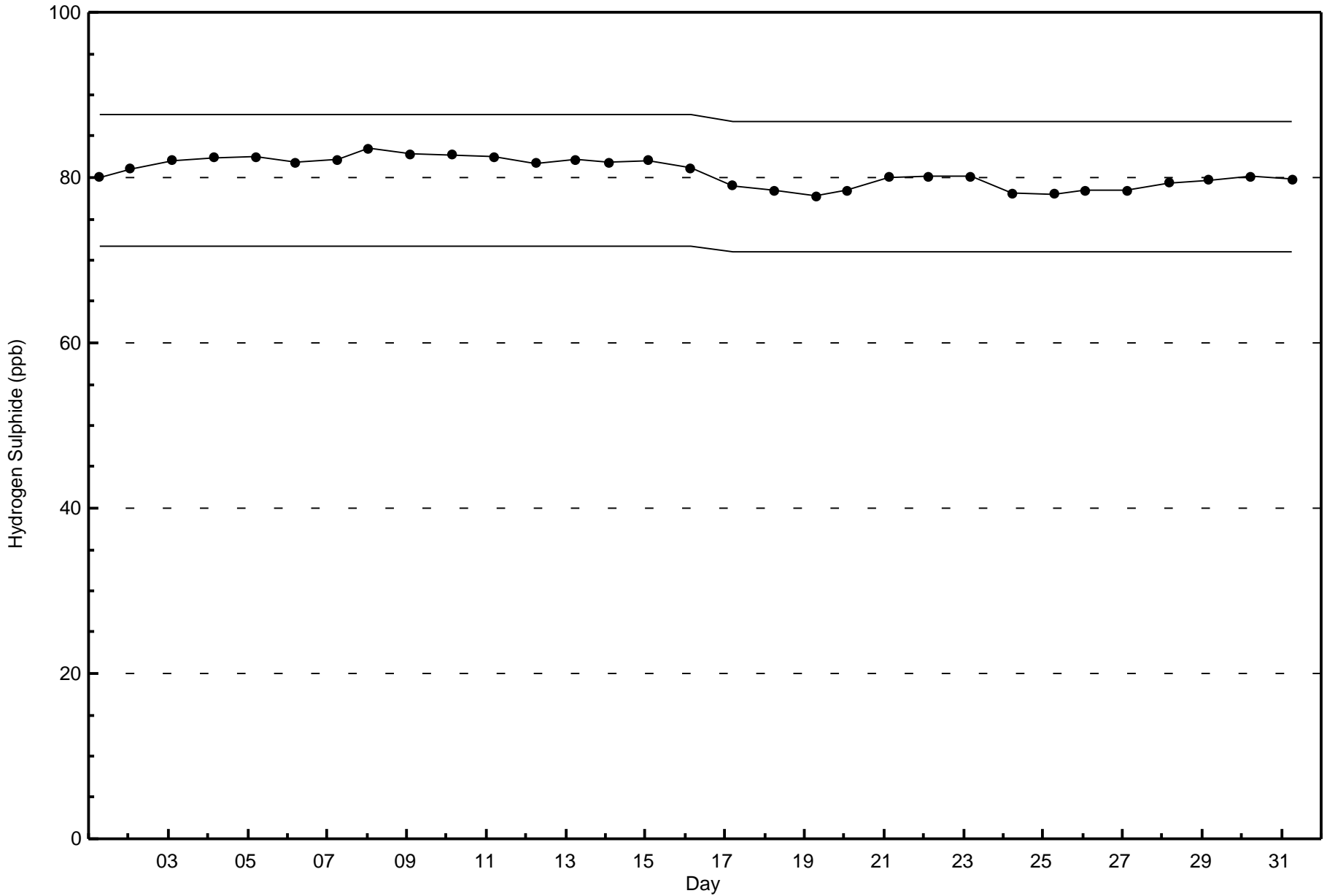


Classes (ppb)



Total Number of Valid Hours: 700







Maximum Value: 13 ppb on Dec 4 13:00																	Maximum Daily Average: 2.8 ppb on Dec 16																	Hours in Service: 744			
Minimum Value: 0 ppb on Dec 7 02:00																	Minimum Daily Average: 0.0 ppb on Dec 11																	Hours of Data: 709			
Maximum Diurnal Average: 1.8 ppb at hour 13																	Minimum Diurnal Average: 0.0 ppb at hour 20																	Hours of Missing Data: 35			
Monthly Average: 0.6 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 2 P <sub>99</sub> = 9																	Hours of Calibration: 35			
																																		Percent Operational Time: 100.0			
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24													
1-Dec	0	0	0	0	0	Z	0	2	0	11	2	6	2	1	0	0	0	0	0	0	0	0	0	0	0	1.2	11										
2-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0										
3-Dec	0	Z	0	0	0	0	0	1	0	0	0	1	1	2	1	1	0	0	1	0	0	0	0	0	0.4	2											
4-Dec	0	2	Z	1	0	0	0	0	0	2	2	9	13	1	1	0	0	0	0	0	0	0	0	0	1.3	13											
5-Dec	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.2	1											
6-Dec	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	2	0.4	3											
7-Dec	0	0	0	0	0	Z	0	1	0	1	1	1	2	2	1	0	0	0	0	0	0	0	0	0	0.4	2											
8-Dec	Z	0	0	6	9	10	3	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.4	10											
9-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0.2	1											
10-Dec	0	0	Z	0	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	5											
11-Dec	0	0	0	Z	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.0	0											
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0											
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0											
14-Dec	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1											
15-Dec	0	Z	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	3	3	0.4	3											
16-Dec	8	7	Z	1	1	0	1	3	1	1	1	3	3	7	10	3	0	0	0	0	0	3	5	5	2.8	10											
17-Dec	6	4	5	Z	6	6	5	4	2	1	2	3	4	4	0	0	0	0	0	0	0	0	0	0	2.3	6											
18-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0											
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0											
20-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.2	1											
21-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	2	0	0	0	0	0	0.3	2											
22-Dec	0	0	Z	0	0	0	6	1	2	1	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0.8	6											
23-Dec	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1											
24-Dec	0	1	0	0	Z	0	0	2	1	1	2	4	2	2	2	0	0	2	0	0	0	0	0	0	0.8	4											
25-Dec	0	0	0	0	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1											
26-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0											
27-Dec	0	Z	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.1	1											
28-Dec	1	2	Z	0	0	0	0	0	0	0	1	2	4	6	1	0	0	0	0	0	0	0	0	0	0.8	6											
29-Dec	0	0	0	Z	0	0	0	0	0	1	3	3	3	3	2	1	0	0	0	0	0	0	0	0	0.7	3											
30-Dec	0	0	0	0	Z	1	2	5	4	7	4	10	8	2	0	0	0	0	0	0	0	0	0	0	1.8	10											
31-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	2	1	0	6	1	0	0	0	0	0	0	0	0.5	6											
																	0.6 0.7 0.2 0.3 0.6 0.9 0.7 0.7 0.4 1.0 0.8 1.7 1.8 1.2 0.8 0.5 0.1 0.1 0.2 0.0 0.0 0.2 0.3 0.4																	Diurnal Average			
																	8 7 5 6 9 10 6 5 4 11 4 10 13 7 10 6 1 2 2 0 0 3 5 5																	Diurnal Maximum			
Z - zerospan																	C - Calibration																				



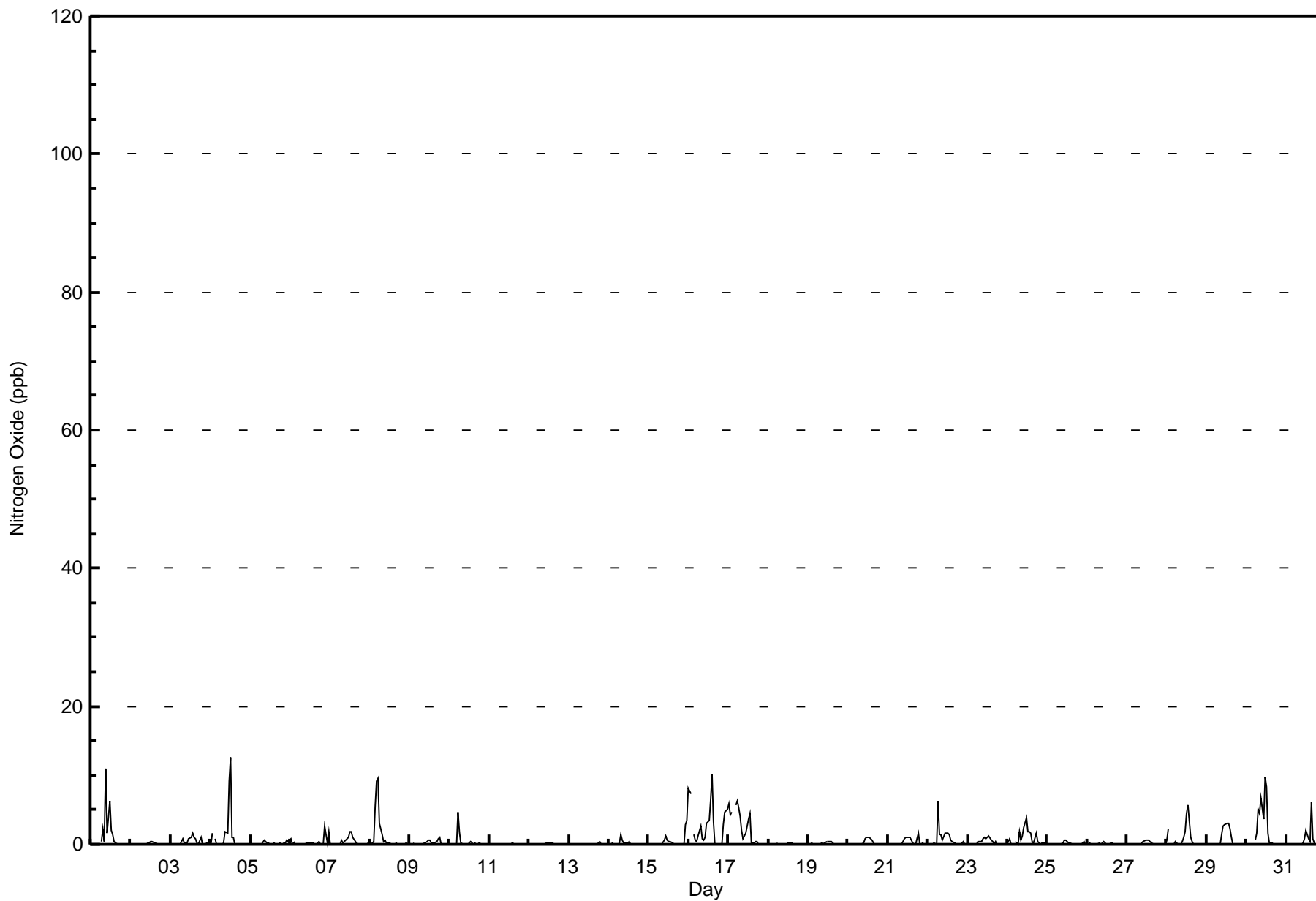


Wood Buffalo Environmental Association

Hourly Averages

Nitrogen Oxide (NO) - ppb

Statoil - Leismer - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb**  
**Statoil - Leismer - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	709	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Oxide (NO) - ppb**  
**Statoil - Leismer - December 2015**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	<b>N</b>	<b>NNE</b>	<b>NE</b>	<b>ENE</b>	<b>E</b>	<b>ESE</b>	<b>SE</b>	<b>SSE</b>	<b>S</b>	<b>SSW</b>	<b>SW</b>	<b>WSW</b>	<b>W</b>	<b>WNW</b>	<b>NW</b>	<b>NNW</b>	
0 - 20	31	17	6	9	19	87	78	86	35	65	27	15	53	83	42	54	707
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	31	17	6	9	19	87	78	86	35	65	27	15	53	83	42	54	707

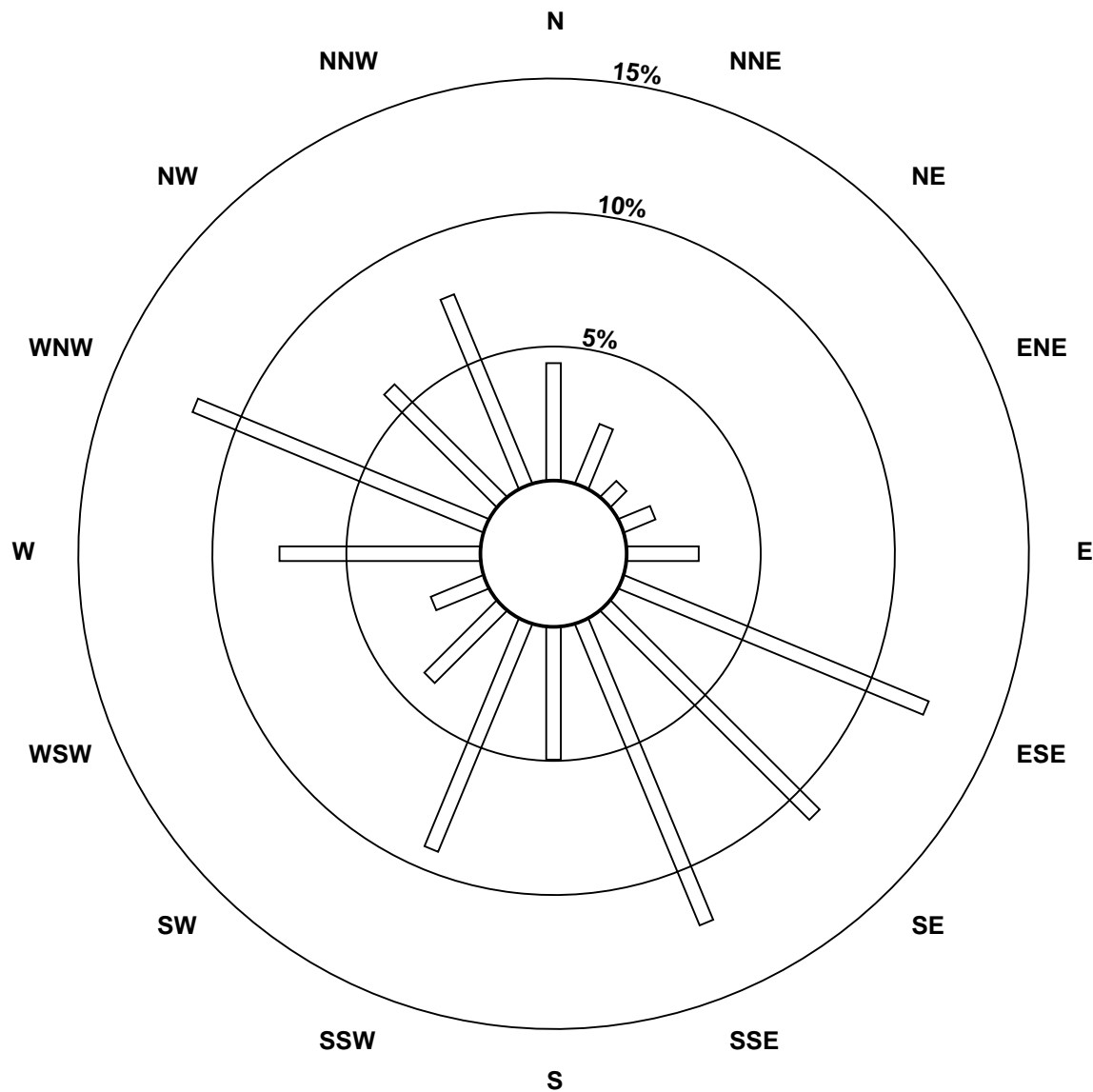
Total Number of Valid Hours: 707

Total Number of Hours: 744

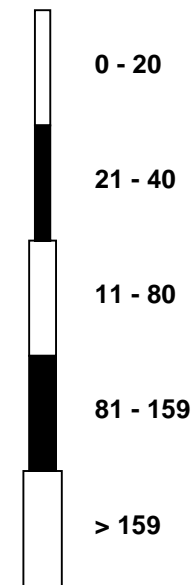


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Oxide (NO) - ppb  
Statoil - Leismer (AMS501)



Classes (ppb)

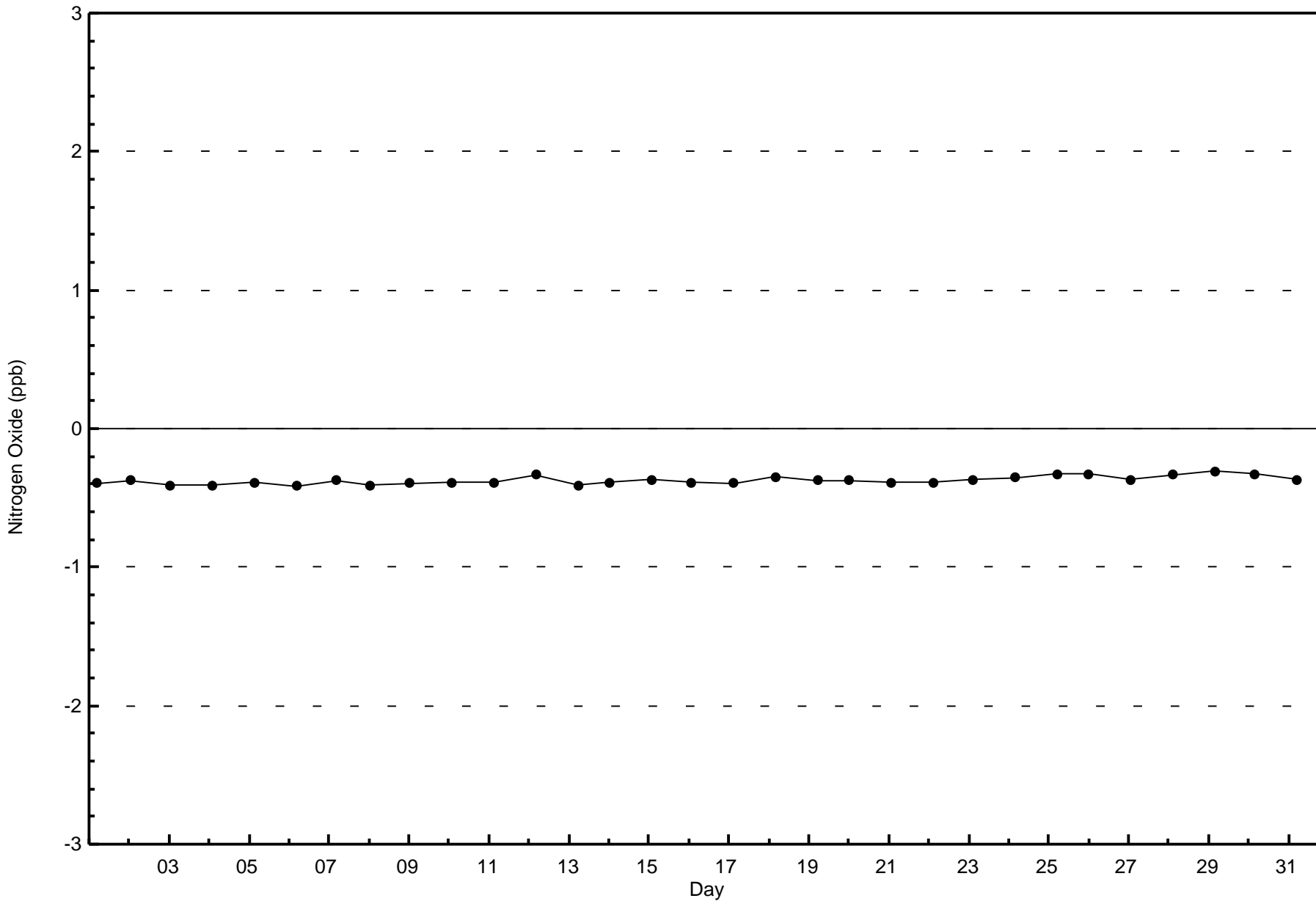


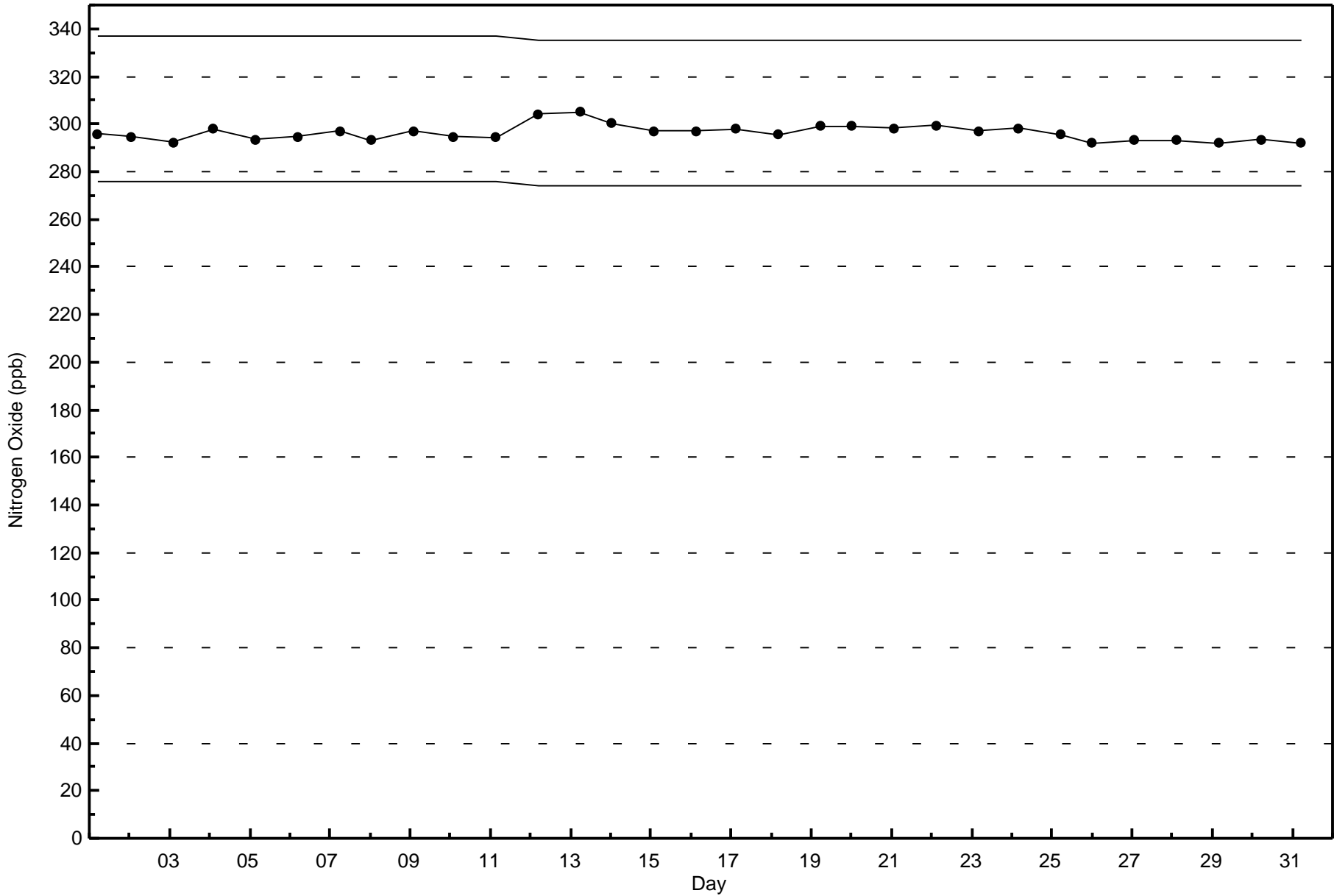
Total Number of Valid Hours: 707



Wood Buffalo Environmental Association  
Zero Responses

Nitrogen Oxide (NO) - ppb  
Statoil - Leismer - December 2015







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb

Statoil - Leismer - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 16 ppb on Dec 1 10:00	Maximum Daily Average: 9.0 ppb on Dec 29		Hours of Data:	709
Minimum Value: 0 ppb on Dec 5 12:00	Minimum Daily Average: 0.8 ppb on Dec 13		Hours of Missing Data:	35
Maximum Diurnal Average: 3.3 ppb at hour 10	Minimum Diurnal Average: 2.6 ppb at hour 3		Hours of Calibration:	35
Monthly Average: 2.9 ppb	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 O <sub>3</sub> = 4 P <sub>90</sub> = 5 P <sub>99</sub> = 11		Percent Operational Time:	100.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	3	3	4	4	4	Z	7	5	4	16	5	11	5	5	4	5	3	3	4	4	3	4	4	3	4.9	16
2-Dec	Z	3	3	5	5	4	4	5	4	3	4	5	5	4	2	2	3	3	2	1	1	1	1	1	2.9	5
3-Dec	1	Z	2	2	1	1	1	2	2	2	2	3	4	5	7	4	4	4	5	4	3	3	5	4	3.0	7
4-Dec	4	4	Z	3	3	3	3	3	3	4	5	8	10	3	3	2	2	2	2	2	2	2	3	2	3.4	10
5-Dec	2	2	2	Z	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	2	2	3	1.2	3
6-Dec	5	3	2	2	Z	1	1	1	1	1	1	1	1	1	2	2	1	3	2	1	2	3	2	3	1.7	5
7-Dec	3	3	3	3	3	Z	3	5	5	4	4	5	4	4	5	6	7	7	6	6	5	3	3	2	4.3	7
8-Dec	Z	2	2	4	7	7	3	2	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1.9	7
9-Dec	1	Z	2	1	1	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1.5	2
10-Dec	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	1
11-Dec	1	1	1	Z	1	1	1	1	1	C	C	C	C	1	1	1	1	1	1	1	1	1	1	1	1.1	1
12-Dec	1	1	1	1	Z	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1.4	2
13-Dec	2	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	0.8	2
14-Dec	Z	1	1	0	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	2
15-Dec	1	Z	1	1	3	3	4	4	4	4	4	4	3	2	2	2	2	1	1	1	1	4	5	5	2.5	5
16-Dec	9	7	Z	2	1	1	2	3	2	1	1	3	3	6	8	5	1	1	1	1	1	4	5	5	3.1	9
17-Dec	6	4	5	Z	6	6	6	4	2	1	2	3	3	4	1	1	1	1	1	1	1	1	1	1	2.5	6
18-Dec	1	1	1	1	Z	1	0	1	1	0	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1.1	2
19-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	2	3	3	3	3	3	3	2	4	1.7	4
20-Dec	Z	3	4	4	3	4	3	3	3	3	3	2	2	3	3	3	4	5	5	4	4	3	3	3	3.3	5
21-Dec	3	Z	3	3	4	4	4	4	4	4	3	3	3	3	3	4	4	5	7	5	5	4	4	6	4.0	7
22-Dec	4	5	Z	4	4	3	9	6	6	4	4	5	4	4	4	4	4	4	4	4	4	4	3	3	4.4	9
23-Dec	2	2	2	Z	5	5	6	7	8	6	3	2	2	2	4	4	3	5	5	5	5	4	3	4.0	8	
24-Dec	3	5	7	6	Z	5	4	5	7	7	6	4	4	4	3	4	6	5	4	4	4	4	5	4.9	7	
25-Dec	4	4	4	4	3	Z	3	3	3	2	2	2	1	1	1	2	2	2	3	3	3	2	1	2.4	4	
26-Dec	Z	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	2	2	2	3	3	1.3	3
27-Dec	4	Z	5	4	4	3	2	2	2	2	3	3	3	3	3	3	3	3	3	4	5	5	5	5	3.3	5
28-Dec	6	7	Z	5	5	5	4	4	4	4	3	3	5	7	4	4	4	4	4	5	5	5	4	4	4.5	7
29-Dec	4	4	4	Z	7	8	9	10	11	12	11	9	8	7	8	9	9	10	11	12	12	12	11	9	9.0	12
30-Dec	8	6	5	4	Z	3	4	7	6	8	5	8	8	3	2	2	2	2	2	2	2	2	1	4.0	8	
31-Dec	1	1	1	2	2	Z	1	1	2	1	1	2	3	2	2	10	3	2	2	1	1	1	2	2	2.0	10

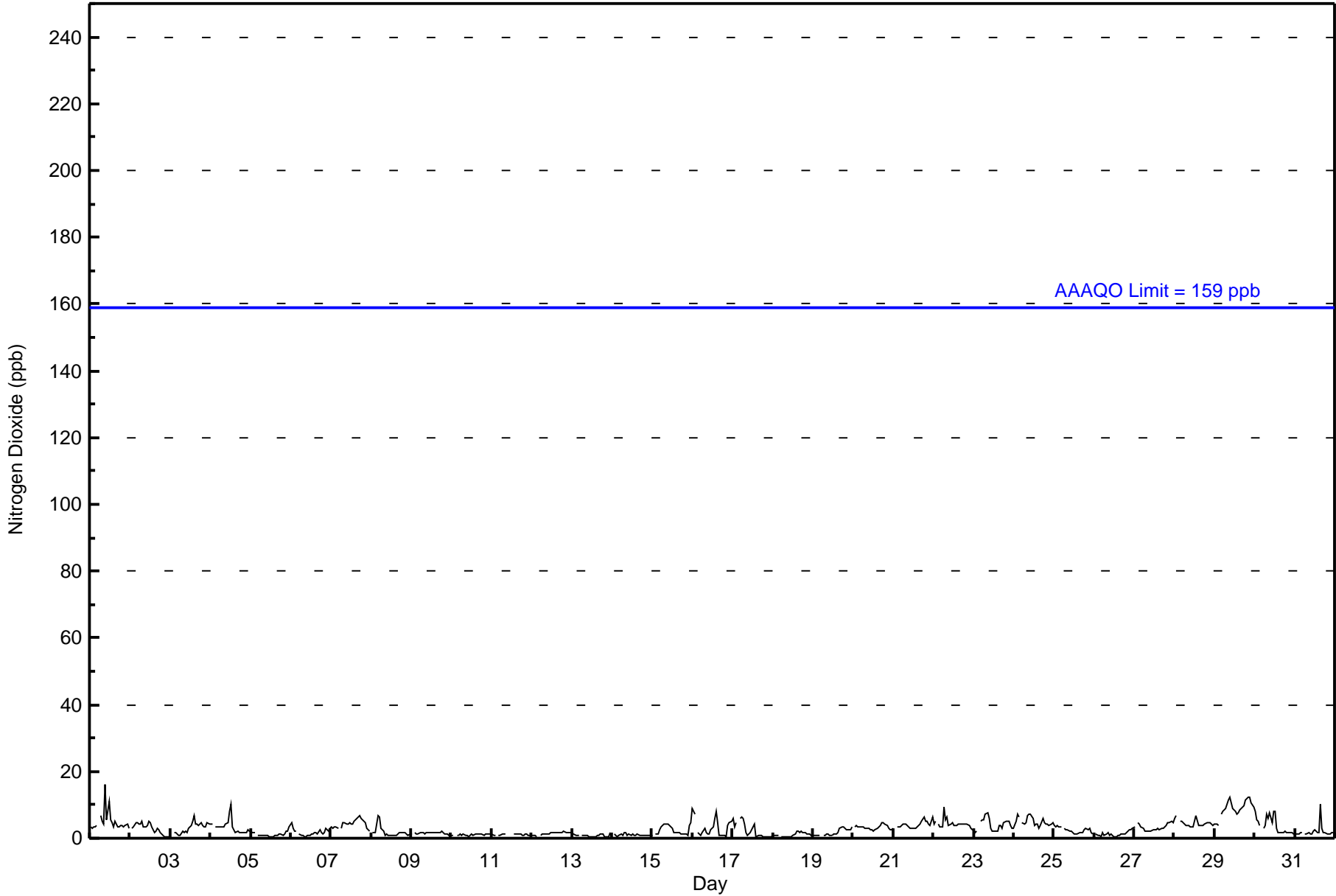
3.1	2.9	2.6	2.6	2.9	3.0	3.0	3.2	3.0	3.3	2.7	3.2	3.0	2.7	2.6	2.8	2.6	2.8	2.9	2.7	2.7	2.7	2.7	2.7	2.7	2.7	Diurnal Average
9	7	7	6	7	8	9	10	11	16	11	11	10	7	8	10	9	10	11	12	12	12	11	9	9	Diurnal Maximum	

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association  
Hourly Averages

Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Statoil - Leismer - December 2015







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Statoil - Leismer - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	709	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**Statoil - Leismer - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	31	17	6	9	19	87	78	86	35	65	27	15	53	83	42	54	707
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	31	17	6	9	19	87	78	86	35	65	27	15	53	83	42	54	707

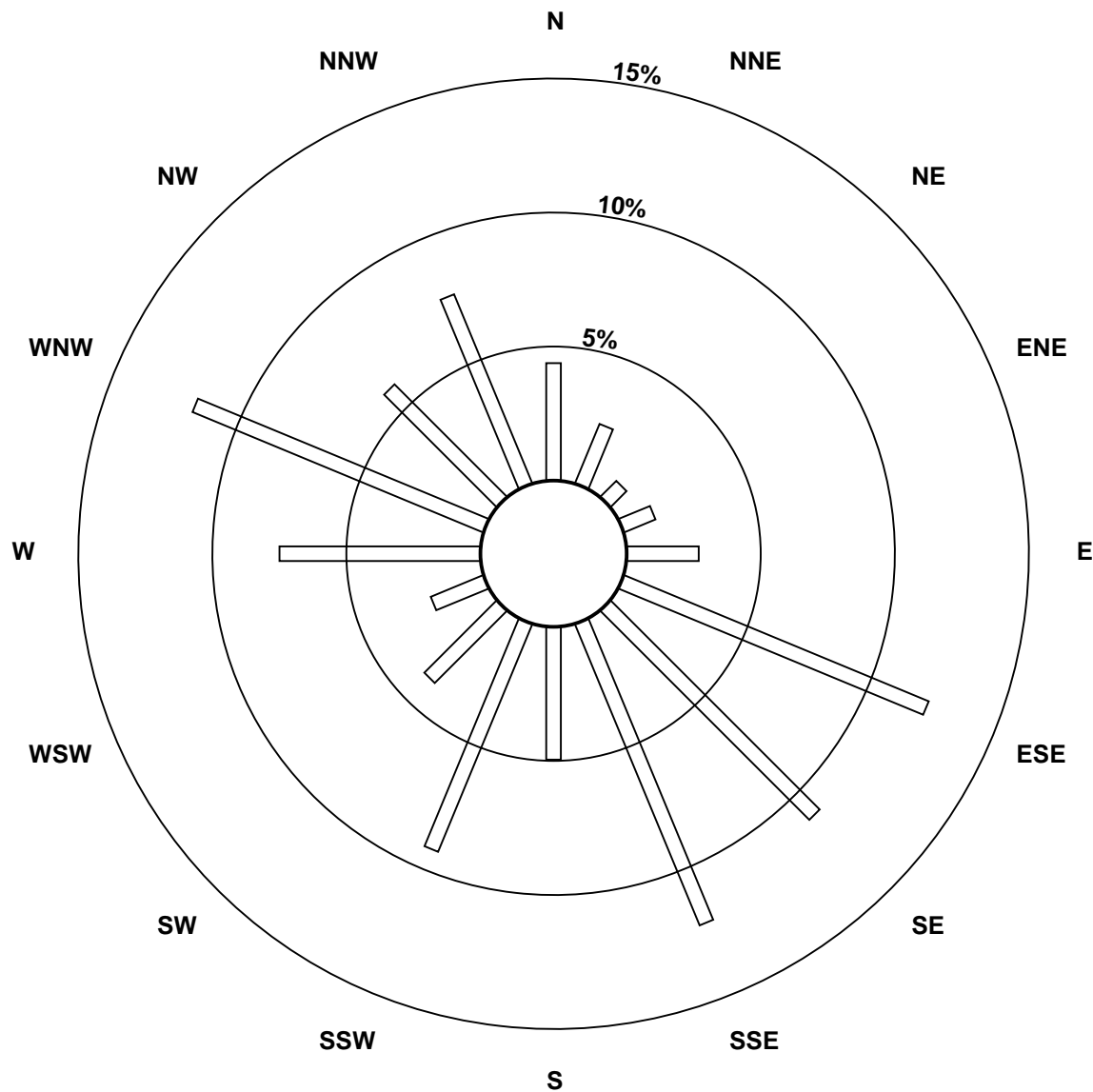
Total Number of Valid Hours: 707

Total Number of Hours: 744

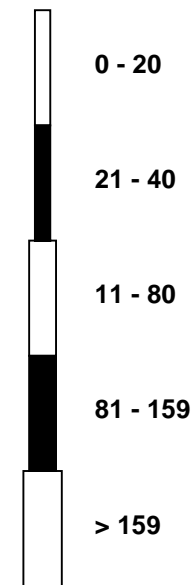


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

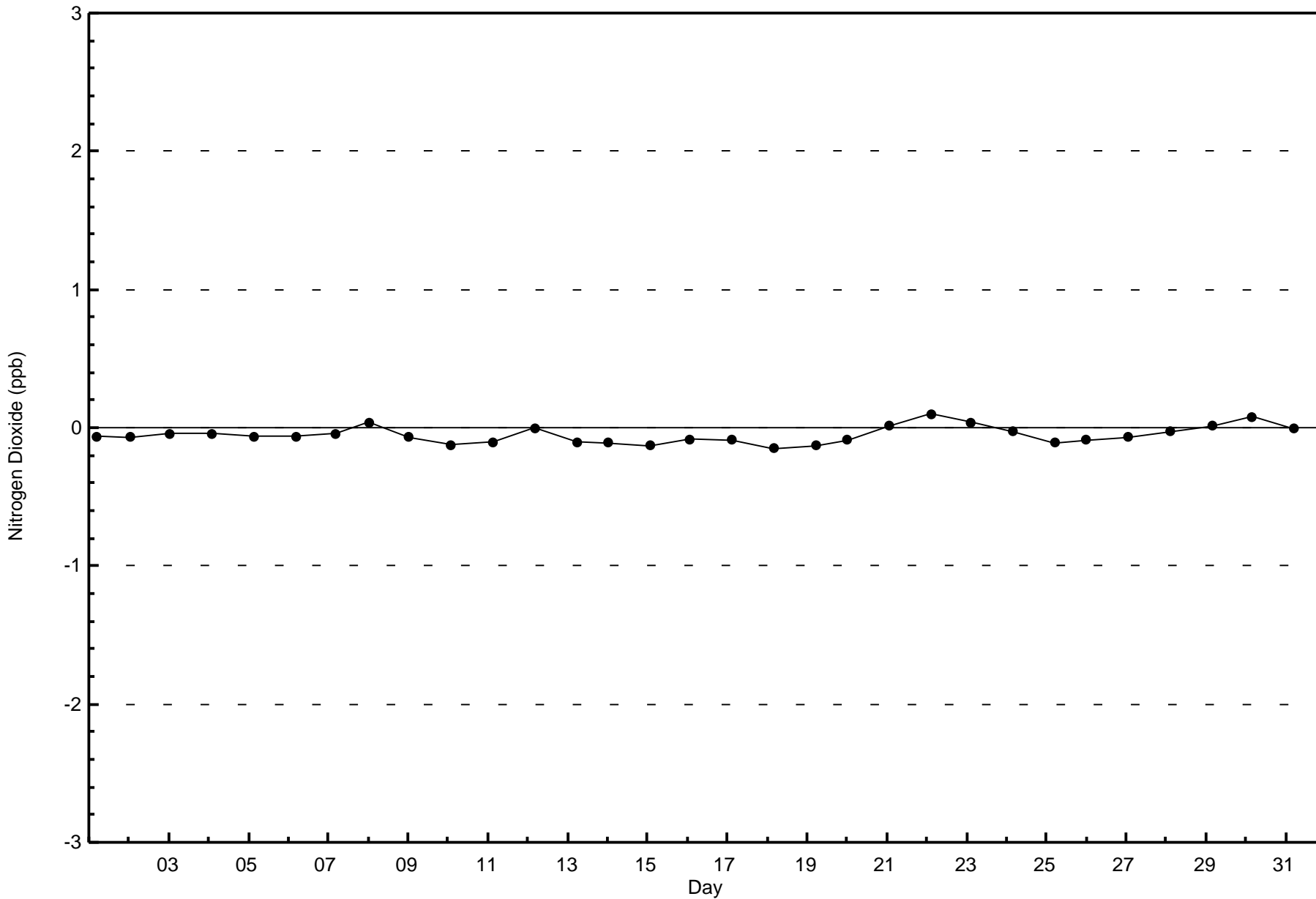
Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
Statoil - Leismer (AMS501)

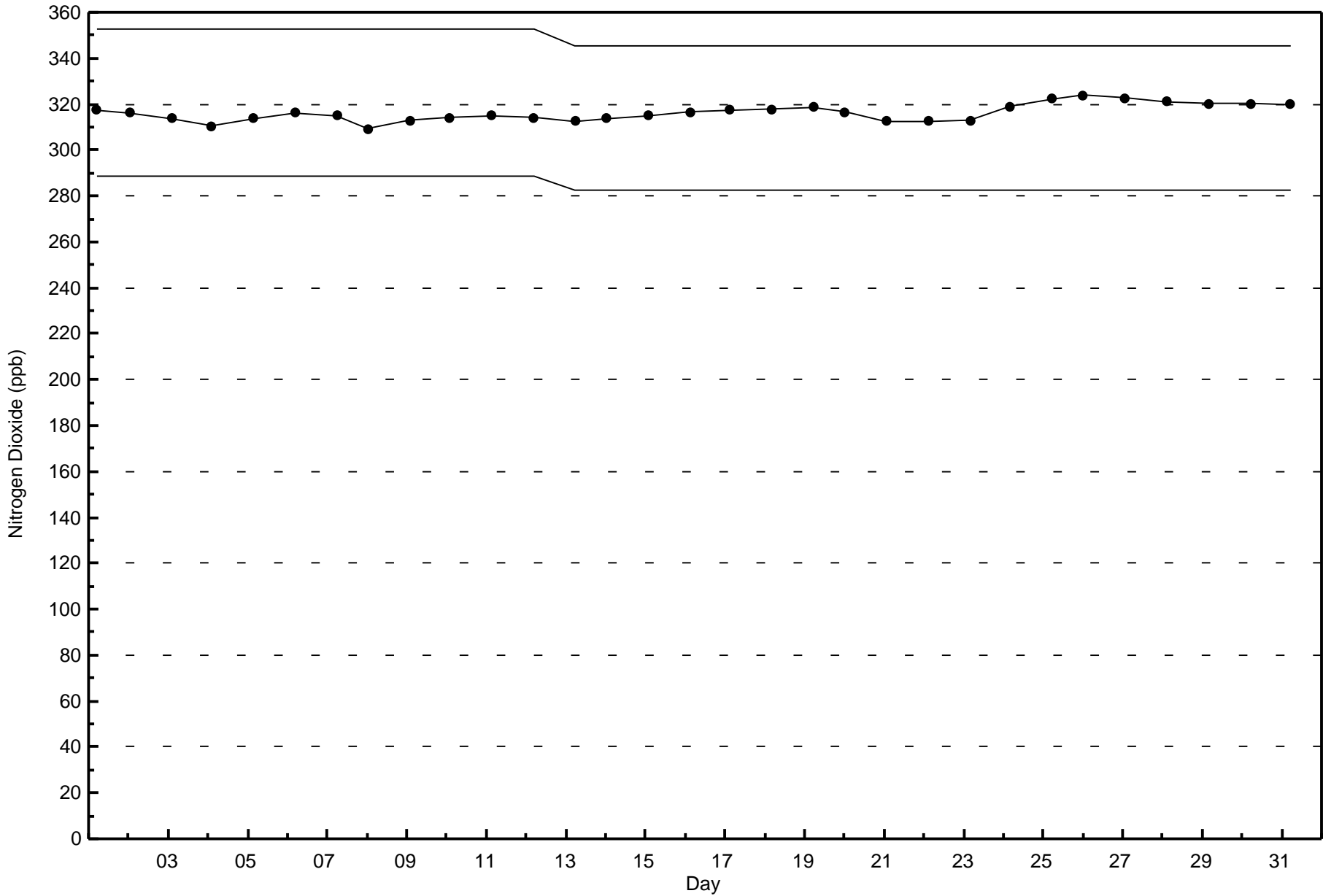


Classes (ppb)



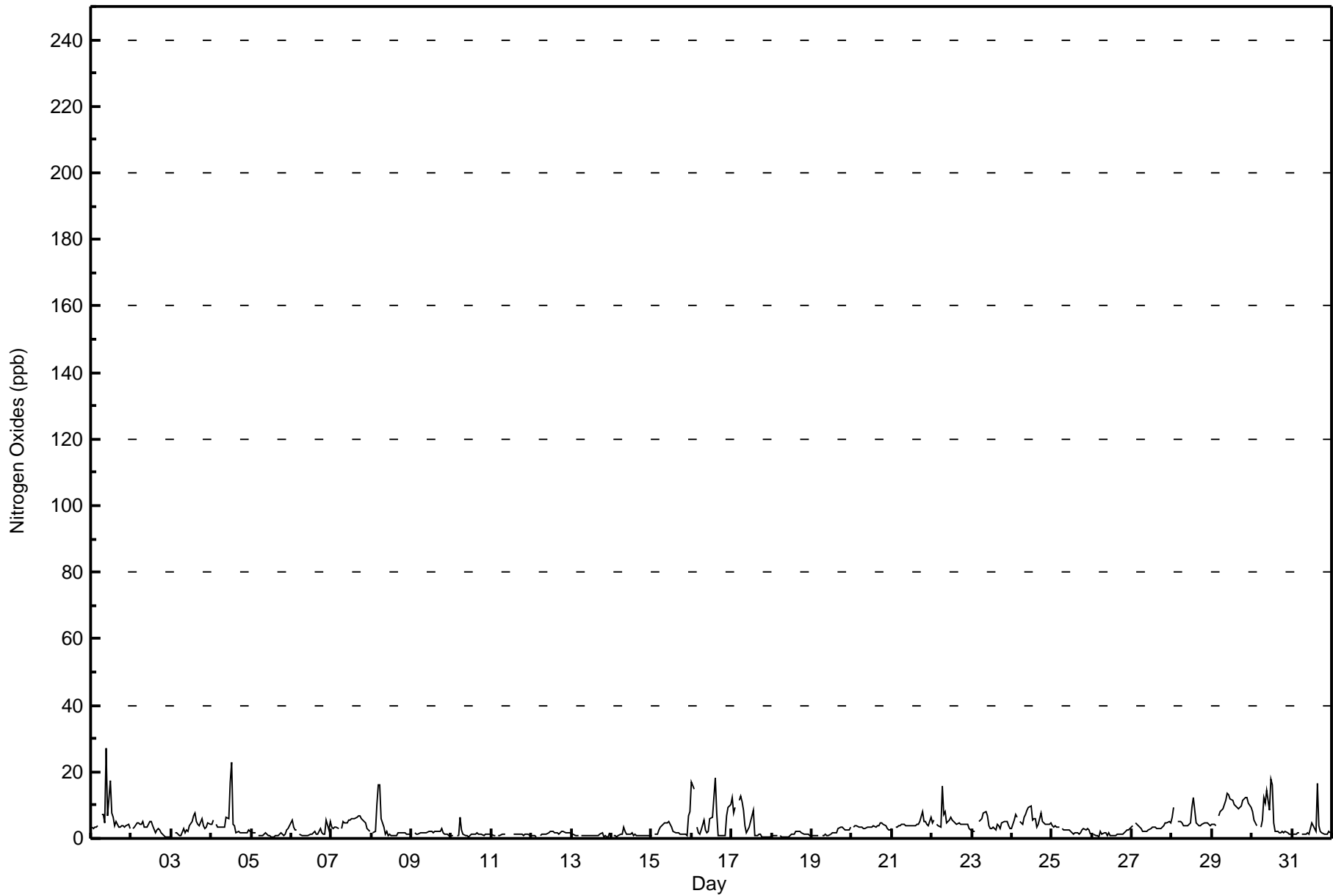
Total Number of Valid Hours: 707







Maximum Value: 27 ppb on Dec 1 10:00																	Maximum Daily Average: 9.7 ppb on Dec 29																	Hours in Service: 744	
Minimum Value: 0 ppb on Dec 18 07:00																	Minimum Daily Average: 0.9 ppb on Dec 13																	Hours of Data: 709	
Maximum Diurnal Average: 4.9 ppb at hour 12																	Minimum Diurnal Average: 2.7 ppb at hour 21																	Hours of Missing Data: 35	
Monthly Average: 3.4 ppb																	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 3 O <sub>3</sub> = 4 P <sub>90</sub> = 7 P <sub>99</sub> = 17																	Hours of Calibration: 35	
																	Percent Operational Time: 100.0																		
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24											
1-Dec	3	3	4	3	4	Z	7	7	5	27	7	17	7	6	4	5	3	3	4	4	3	4	4	3	6.1	27									
2-Dec	Z	3	3	4	5	4	4	5	4	3	4	5	5	4	2	2	3	3	2	1	1	1	1	1	3.0	5									
3-Dec	1	Z	2	2	1	1	1	3	2	2	2	4	5	7	8	5	4	4	6	4	3	3	5	4	3.4	8									
4-Dec	4	6	Z	4	3	3	3	3	4	6	6	17	23	4	4	2	2	2	2	2	2	2	2	2	4.7	23									
5-Dec	2	2	2	Z	1	1	1	1	1	1	1	1	0	0	1	1	1	1	2	1	1	2	3	4	1.4	4									
6-Dec	6	3	3	2	Z	1	1	1	1	1	1	1	1	2	2	1	1	3	2	1	1	5	3	5	2.1	6									
7-Dec	3	3	3	3	3	Z	3	5	5	5	5	6	6	6	6	6	7	7	6	6	5	3	3	2	4.6	7									
8-Dec	Z	2	2	10	16	16	6	3	1	2	1	1	1	1	1	1	2	2	2	2	2	1	1	1	3.3	16									
9-Dec	1	Z	2	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	3	2	1	1	1	1	1.7	3									
10-Dec	1	1	Z	1	1	6	3	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1.4	6									
11-Dec	1	1	1	Z	1	1	1	1	1	C	C	C	C	1	1	1	1	1	1	1	1	1	1	1	1.1	1									
12-Dec	1	1	1	1	Z	1	1	1	1	1	1	2	2	2	2	2	1	2	2	2	2	2	1	2	1.5	2									
13-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2	0.9	2									
14-Dec	Z	1	1	0	1	1	1	3	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1.1	3									
15-Dec	1	Z	1	1	3	3	4	4	5	5	5	4	3	2	2	2	2	2	1	1	1	1	7	8	2.9	8									
16-Dec	17	15	Z	3	2	1	3	5	3	2	2	6	7	12	18	8	1	1	1	1	1	7	9	10	5.8	18									
17-Dec	12	8	10	Z	11	13	11	8	4	2	3	5	7	9	1	1	1	1	1	1	1	1	1	1	4.8	13									
18-Dec	1	1	1	1	Z	1	0	0	0	0	0	1	1	1	2	2	2	2	2	2	1	1	1	1	1.1	2									
19-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	2	2	2	2	3	3	3	3	3	2	2	4	1.8	4									
20-Dec	Z	3	4	4	3	4	3	3	3	3	4	3	3	4	3	4	4	5	5	4	4	3	3	3	3.5	5									
21-Dec	3	Z	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	5	8	5	5	4	4	6	4.3	8									
22-Dec	5	5	Z	4	4	3	15	7	8	4	6	6	5	5	4	4	5	4	4	4	4	4	3	3	5.1	15									
23-Dec	2	2	2	Z	5	5	6	7	8	7	4	3	3	3	4	4	3	5	5	5	5	4	3	3	4.3	8									
24-Dec	3	6	7	6	Z	5	4	7	7	8	10	10	6	6	6	3	4	8	5	5	4	4	5	5	5.8	10									
25-Dec	4	3	4	4	3	Z	3	3	3	2	3	2	2	1	2	2	1	2	2	3	2	3	2	1	2.5	4									
26-Dec	Z	1	1	1	1	2	1	2	2	1	2	1	1	1	1	1	1	1	1	2	2	2	2	3	1.4	3									
27-Dec	4	Z	5	4	4	3	2	2	2	2	3	3	3	3	3	3	3	3	3	4	5	5	5	5	3.4	5									
28-Dec	6	9	Z	5	5	5	4	4	4	4	4	5	9	12	5	4	4	4	4	5	5	5	4	4	5.3	12									
29-Dec	4	4	4	Z	7	8	9	10	11	14	13	12	11	10	10	9	9	10	11	12	12	12	11	9	9.7	14									
30-Dec	8	6	5	4	Z	4	6	12	11	14	9	18	16	5	2	2	2	2	2	2	2	2	1	1	5.8	18									
31-Dec	1	1	1	2	2	Z	1	1	1	2	1	3	5	3	2	16	4	2	2	1	1	1	2	2	2.5	16									
3.7																	3.5																	Diurnal Average	
17																	15																	Diurnal Maximum	
2.8																	2.9																		
10																	10																		
3.5																	3.9																		
16																	16																		
3.7																	3.9																		
15																	12																		
3.4																	3.4																		
4.3																	27																		
3.5																	13																		
4.9																	18																		
4.8																	23																		
3.9																	12																		
3.4																	18																		
3.3																	16																		
2.7																	9																		
2.9																	10																		
3.1																	11																		
2.7																	12																		
2.7																	12																		
2.9																	12																		
3.0																	11																		
3.1																	10																		
Z - zerospan																								C - Calibration											





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Statoil - Leismer - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	707	99.72	99.72
21 - 40	2	0.28	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 709

Total Number of Hours: 744





**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**Statoil - Leismer - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	31	17	6	9	19	87	77	86	35	65	27	15	53	83	41	54	705
21 - 40	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	2
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	31	17	6	9	19	87	78	86	35	65	27	15	53	83	42	54	707

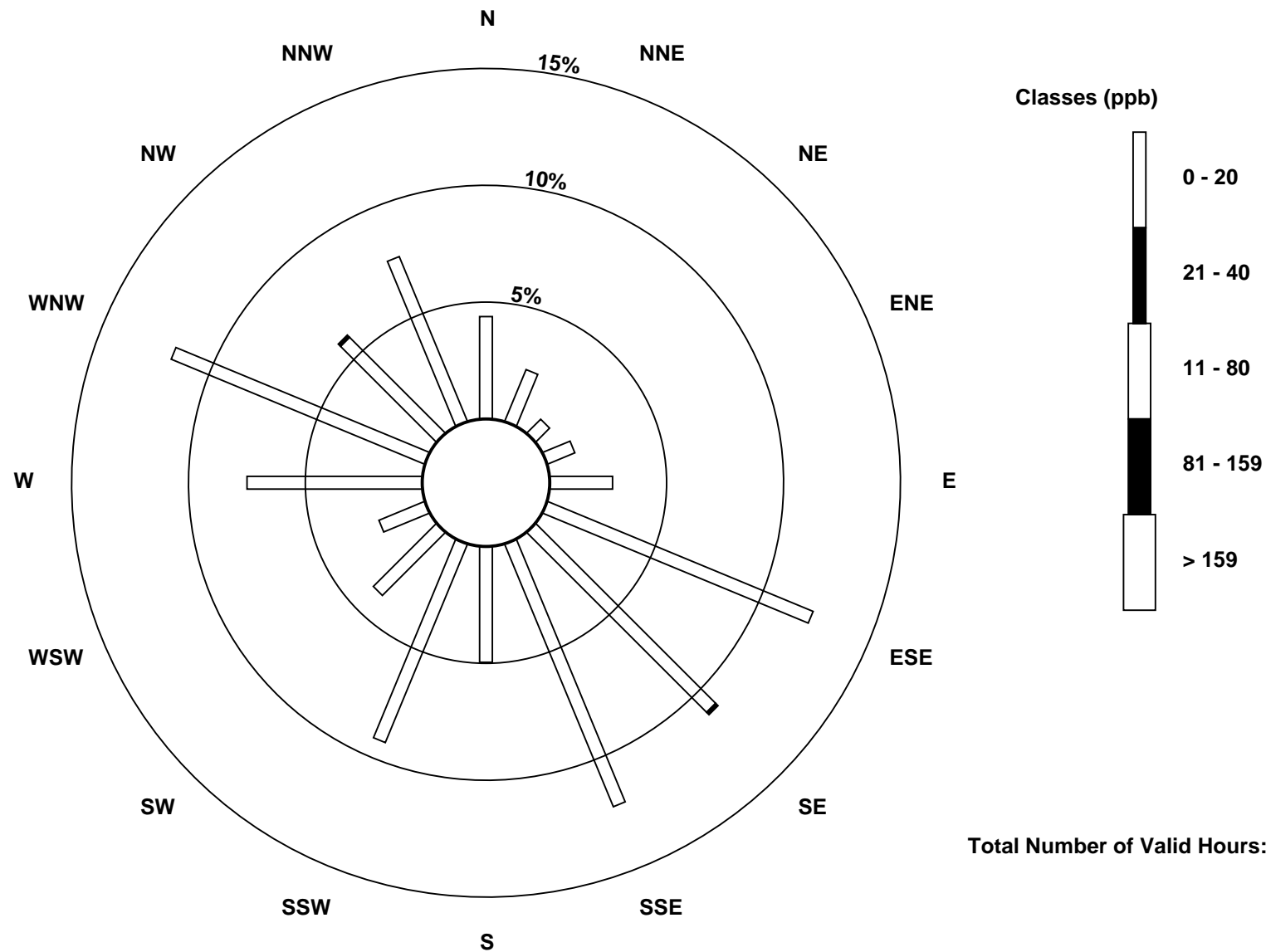
Total Number of Valid Hours: 707

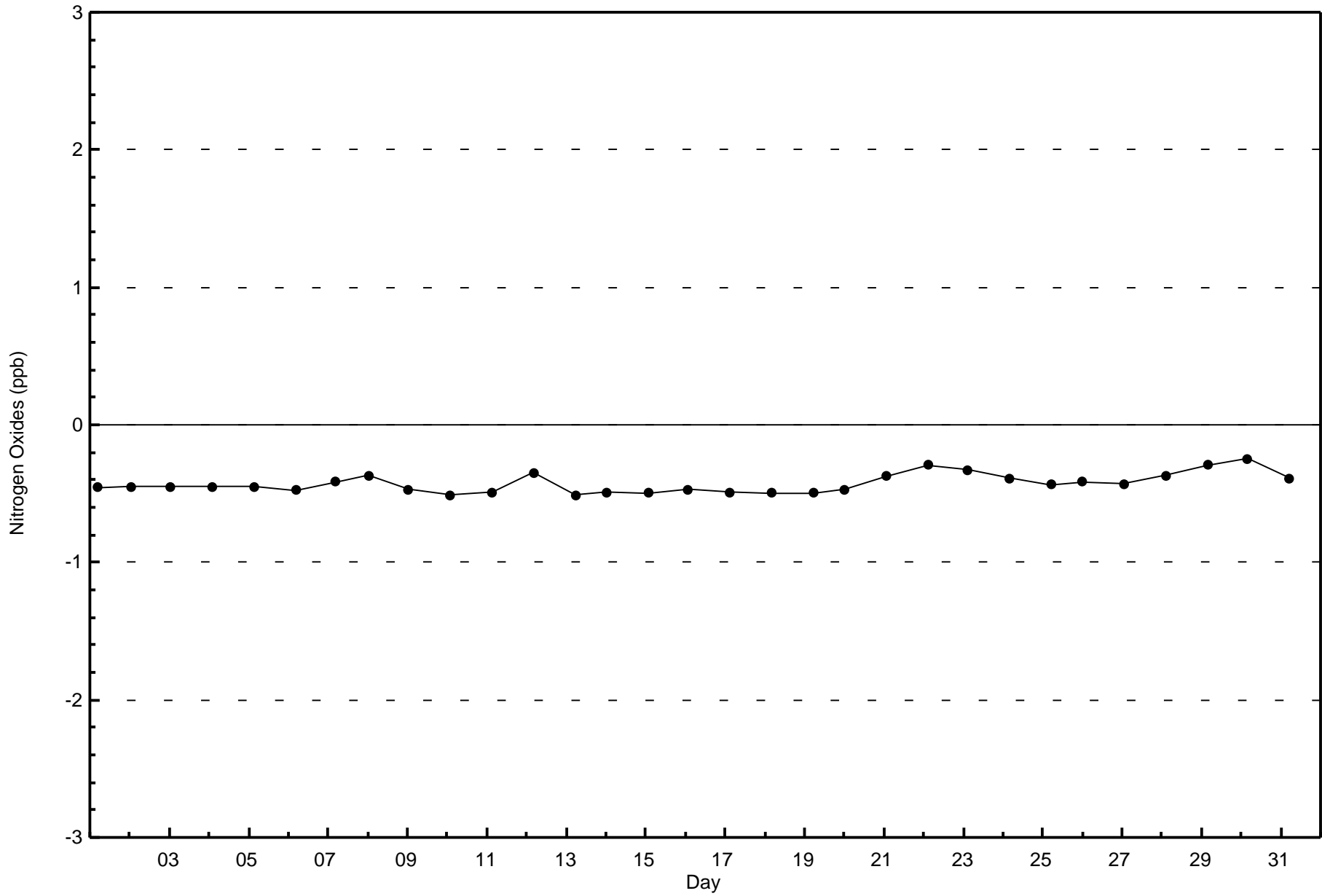
Total Number of Hours: 744

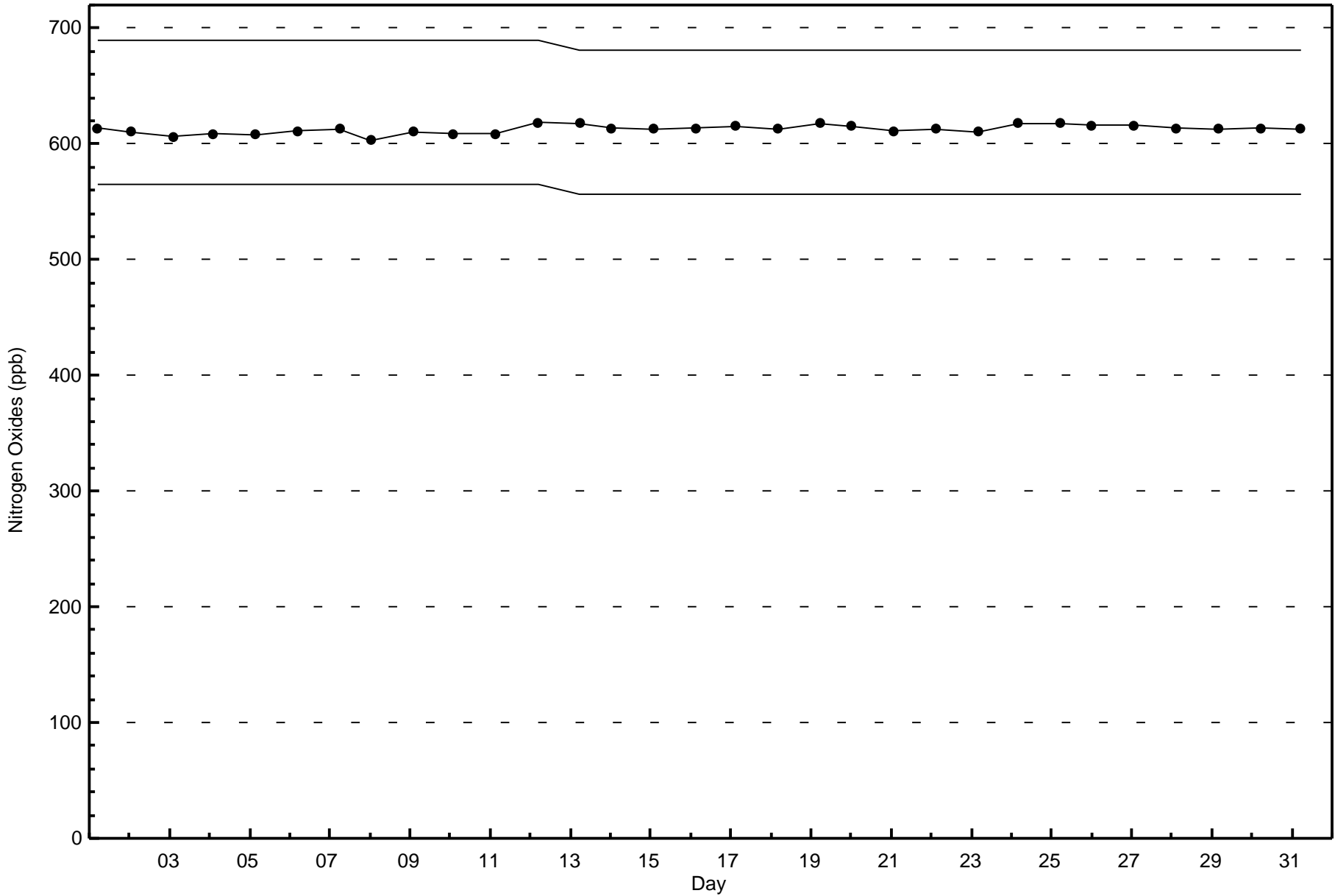


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
Statoil - Leismer (AMS501)









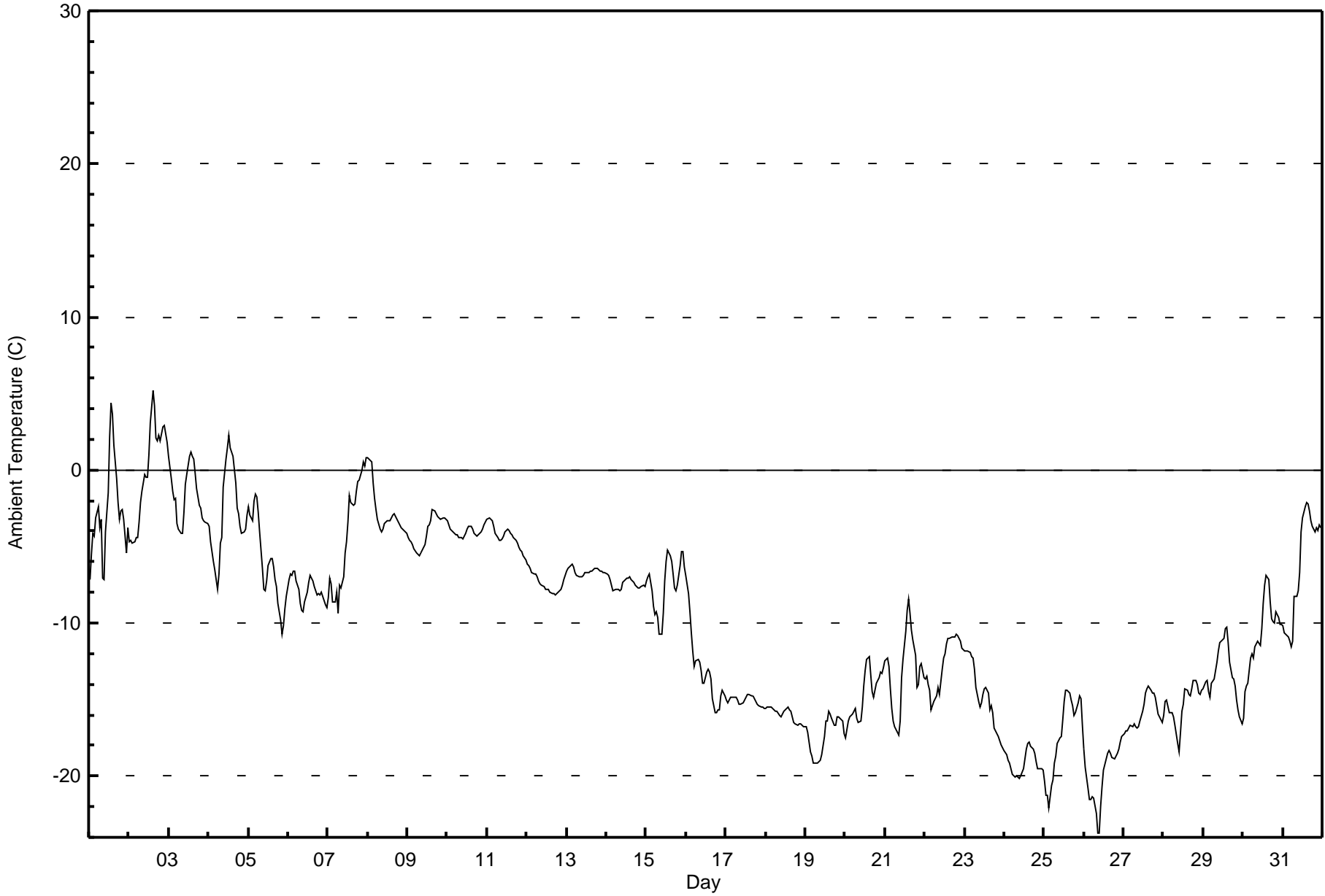
**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Ambient Temperature (AT) - C**

**Statoil - Leismer - December 2015**

Maximum Value: 5.2 C on Dec 2 15:00		Maximum Daily Average: -0.2 C on Dec 2		Hours in Service: 744																						
Minimum Value: -23.7 C on Dec 26 10:00		Minimum Daily Average: -20.0 C on Dec 26		Hours of Data: 744																						
Maximum Diurnal Average: -8.1 C at hour 15		Minimum Diurnal Average: -11.2 C at hour 9		Hours of Missing Data: 0																						
Monthly Average: -9.82 C		Percentiles: P <sub>1</sub> = -21.5 P <sub>10</sub> = -17.4 Q <sub>1</sub> = -15.2 Median = -9.0 Q <sub>3</sub> = -4.4 P <sub>90</sub> = -2.6 P <sub>99</sub> = 2.7		Hours of Calibration: 0																						
				Percent Operational Time: 100.0																						
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	-7.2	-5.5	-4.2	-4.3	-3.1	-2.4	-3.8	-3.2	-7.1	-7.2	-4.1	-1.5	2.2	4.4	3.7	1.7	-0.5	-2.2	-3.2	-2.7	-2.6	-3.3	-5.5	-3.8	-2.7	4.4
2-Dec	-4.7	-4.6	-4.8	-4.7	-4.4	-4.4	-3.4	-2.1	-1.4	-0.3	-0.4	-0.5	1.0	3.1	5.2	4.2	2.0	1.9	2.3	1.9	2.8	2.9	2.4	1.8	-0.2	5.2
3-Dec	0.9	-0.6	-1.4	-2.0	-1.8	-3.5	-3.9	-4.2	-4.2	-2.8	-0.9	-0.3	0.9	1.2	0.9	0.7	-0.2	-1.2	-2.4	-2.5	-3.1	-3.3	-3.4	-3.5	-1.7	1.2
4-Dec	-3.7	-4.6	-5.4	-5.9	-6.6	-7.8	-6.8	-4.8	-4.4	-1.1	0.7	1.4	2.3	1.4	1.2	0.9	-0.9	-2.4	-2.9	-3.7	-4.1	-4.0	-3.9	-2.9	-2.8	2.3
5-Dec	-2.4	-2.9	-3.3	-2.0	-1.6	-1.8	-2.7	-4.0	-6.4	-7.8	-7.9	-7.3	-6.2	-5.8	-5.8	-6.3	-7.2	-7.6	-8.7	-9.8	-10.7	-10.2	-9.0	-8.3	-6.1	-1.6
6-Dec	-7.1	-6.8	-6.9	-6.6	-6.6	-7.3	-7.8	-8.8	-9.1	-9.2	-8.7	-8.0	-7.3	-6.9	-7.0	-7.3	-7.7	-8.2	-8.1	-8.2	-8.0	-8.2	-8.8	-8.9	-7.8	-6.6
7-Dec	-8.3	-7.1	-7.4	-8.6	-8.6	-7.9	-9.4	-7.5	-7.7	-6.9	-5.4	-4.6	-3.4	-1.7	-2.1	-2.3	-2.2	-1.4	-0.7	-0.6	0.0	0.5	0.3	0.8	-4.3	0.8
8-Dec	0.8	0.7	0.5	-0.9	-1.9	-2.6	-3.2	-3.9	-4.0	-3.8	-3.5	-3.4	-3.4	-3.3	-3.1	-2.9	-2.8	-3.0	-3.4	-3.6	-3.8	-3.9	-4.0	-4.2	-2.8	0.8
9-Dec	-4.4	-4.6	-4.7	-4.9	-5.2	-5.4	-5.5	-5.6	-5.4	-5.2	-4.9	-4.3	-3.7	-3.6	-3.3	-2.6	-2.7	-2.9	-3.1	-3.1	-3.2	-3.1	-3.1	-3.2	-4.1	-2.6
10-Dec	-3.3	-3.6	-3.8	-4.0	-4.1	-4.2	-4.3	-4.4	-4.4	-4.5	-4.4	-4.1	-3.8	-3.7	-3.6	-3.9	-4.1	-4.2	-4.3	-4.2	-4.1	-3.9	-3.6	-3.4	-4.0	-3.3
11-Dec	-3.2	-3.1	-3.3	-3.4	-3.7	-4.1	-4.4	-4.6	-4.6	-4.5	-4.4	-4.0	-3.9	-4.0	-4.1	-4.3	-4.4	-4.6	-4.7	-5.1	-5.2	-5.3	-5.6	-5.9	-4.3	-3.1
12-Dec	-6.2	-6.3	-6.4	-6.7	-6.8	-6.8	-7.0	-7.2	-7.5	-7.5	-7.6	-7.8	-7.8	-7.8	-8.0	-8.1	-8.1	-8.2	-8.1	-8.0	-7.8	-7.5	-7.2	-6.9	-7.4	-6.2
13-Dec	-6.6	-6.4	-6.2	-6.2	-6.3	-6.7	-6.9	-7.0	-7.0	-6.9	-6.7	-6.7	-6.7	-6.6	-6.6	-6.5	-6.4	-6.5	-6.5	-6.6	-6.6	-6.6	-6.7	-6.7	-6.6	-6.2
14-Dec	-6.8	-6.9	-7.2	-7.6	-7.9	-7.8	-7.8	-7.8	-7.9	-7.8	-7.4	-7.1	-7.1	-7.0	-7.1	-7.3	-7.5	-7.7	-7.7	-7.7	-7.7	-7.6	-7.5	-7.6	-7.5	-6.8
15-Dec	-7.2	-7.0	-6.8	-7.9	-8.9	-9.4	-9.3	-9.6	-10.7	-10.8	-9.4	-7.2	-6.0	-5.2	-5.6	-6.0	-6.8	-7.7	-7.9	-7.6	-6.2	-5.4	-5.3	-6.3	-7.5	-5.2
16-Dec	-6.9	-8.1	-9.2	-10.6	-11.8	-12.9	-12.5	-12.3	-12.5	-13.1	-13.9	-14.0	-13.2	-13.0	-13.2	-13.7	-14.9	-15.8	-15.9	-15.6	-15.6	-14.7	-14.4	-14.7	-13.0	-6.9
17-Dec	-15.1	-15.2	-15.0	-14.8	-14.8	-14.8	-14.9	-15.0	-15.3	-15.3	-15.2	-15.1	-14.9	-14.7	-14.7	-14.7	-14.8	-14.9	-15.1	-15.3	-15.4	-15.5	-15.5	-15.6	-15.1	-14.7
18-Dec	-15.6	-15.5	-15.5	-15.5	-15.6	-15.7	-15.8	-15.8	-16.1	-16.1	-16.0	-15.8	-15.7	-15.5	-15.6	-15.8	-16.1	-16.5	-16.5	-16.6	-16.6	-16.6	-16.6	-16.8	-16.0	-15.5
19-Dec	-16.8	-17.1	-17.8	-18.4	-18.7	-19.1	-19.2	-19.1	-19.1	-19.0	-18.6	-17.4	-16.4	-16.4	-15.7	-15.9	-16.2	-16.7	-16.7	-16.1	-16.1	-16.2	-16.4	-17.2	-17.3	-15.7
20-Dec	-17.5	-17.0	-16.4	-16.1	-16.0	-15.8	-15.6	-16.2	-16.5	-16.4	-15.4	-14.1	-13.1	-12.4	-12.2	-13.4	-14.5	-14.9	-14.3	-13.9	-13.6	-13.2	-13.3	-12.9	-14.8	-12.2
21-Dec	-12.5	-12.2	-12.8	-14.3	-15.5	-16.4	-16.8	-17.1	-17.4	-16.4	-13.6	-12.4	-10.5	-9.2	-8.5	-9.4	-10.4	-11.1	-12.1	-14.2	-14.1	-12.8	-12.7	-13.6	-13.2	-8.5
22-Dec	-13.6	-13.5	-14.1	-14.4	-15.7	-15.2	-14.9	-14.8	-14.2	-14.7	-13.0	-12.3	-12.0	-11.4	-11.0	-11.0	-10.9	-10.9	-10.9	-10.7	-10.8	-11.2	-11.7	-11.8	-12.7	-10.7
23-Dec	-11.8	-11.9	-11.8	-11.9	-12.2	-12.3	-13.0	-14.2	-15.1	-15.4	-15.2	-14.7	-14.3	-14.2	-14.6	-15.7	-15.4	-15.8	-16.8	-17.2	-17.4	-17.7	-17.9	-18.1	-14.8	-11.8
24-Dec	-18.3	-18.6	-19.0	-19.2	-19.5	-19.9	-20.0	-20.0	-20.1	-20.1	-20.0	-19.5	-18.9	-18.3	-17.8	-17.8	-18.1	-18.2	-18.5	-19.0	-19.5	-19.5	-19.5	-19.6	-19.1	-17.8
25-Dec	-20.4	-21.3	-21.3	-22.1	-20.6	-20.3	-19.2	-18.7	-17.9	-17.5	-17.4	-16.3	-15.1	-14.4	-14.4	-14.6	-15.0	-15.4	-16.0	-15.9	-15.2	-14.7	-14.9	-16.7	-17.3	-14.4
26-Dec	-18.2	-19.5	-20.8	-21.5	-21.6	-21.3	-21.5	-22.4	-23.7	-23.7	-22.0	-20.7	-19.6	-18.9	-18.5	-18.3	-18.5	-18.8	-18.8	-18.7	-18.5	-18.2	-17.8	-17.4	-20.0	-17.4
27-Dec	-17.2	-17.0	-17.0	-16.8	-16.7	-16.8	-16.6	-16.7	-16.9	-16.8	-16.4	-15.7	-15.3	-14.6	-14.3	-14.1	-14.4	-14.6	-14.6	-14.9	-15.4	-16.0	-16.3	-16.5	-15.9	-14.1
28-Dec	-16.1	-15.1	-15.0	-15.8	-15.9	-15.8	-16.1	-16.7	-17.9	-18.4	-17.1	-15.7	-15.3	-14.3	-14.4	-14.7	-14.8	-14.3	-13.7	-13.7	-14.0	-14.6	-14.6	-14.4	-15.4	-13.7
29-Dec	-14.3	-13.8	-13.7	-14.5	-14.8	-14.0	-13.6	-13.1	-12.5	-11.8	-11.3	-11.2	-11.0	-10.4	-10.3	-11.3	-12.6	-13.5	-13.7	-14.1	-15.0	-15.7	-16.2	-16.6	-13.3	-10.3
30-Dec	-16.2	-14.5	-14.1	-13.9	-12.3	-12.0	-12.3	-11.5	-11.3	-11.2	-11.4	-10.4	-8.7	-7.5	-6.9	-7.2	-8.6	-9.7	-9.9	-10.0	-9.2	-9.7	-10.1	-10.1	-10.8	-6.9
31-Dec	-10.2	-10.7	-10.9	-10.9	-11.2	-11.5	-11.2	-8.3	-8.3	-7.9	-6.7	-4.0	-3.1	-2.4	-2.2	-2.2	-2.7	-3.3	-3.7	-4.0	-3.7	-4.0	-3.6	-3.7	-6.3	-2.2
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C**  
**Statoil - Leismer - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	19	2.55	2.55
-20 - 0	692	93.01	95.56
0 - 10	33	4.44	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744



**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Relative Humidity (RH) - %**

**Statoil - Leismer - December 2015**

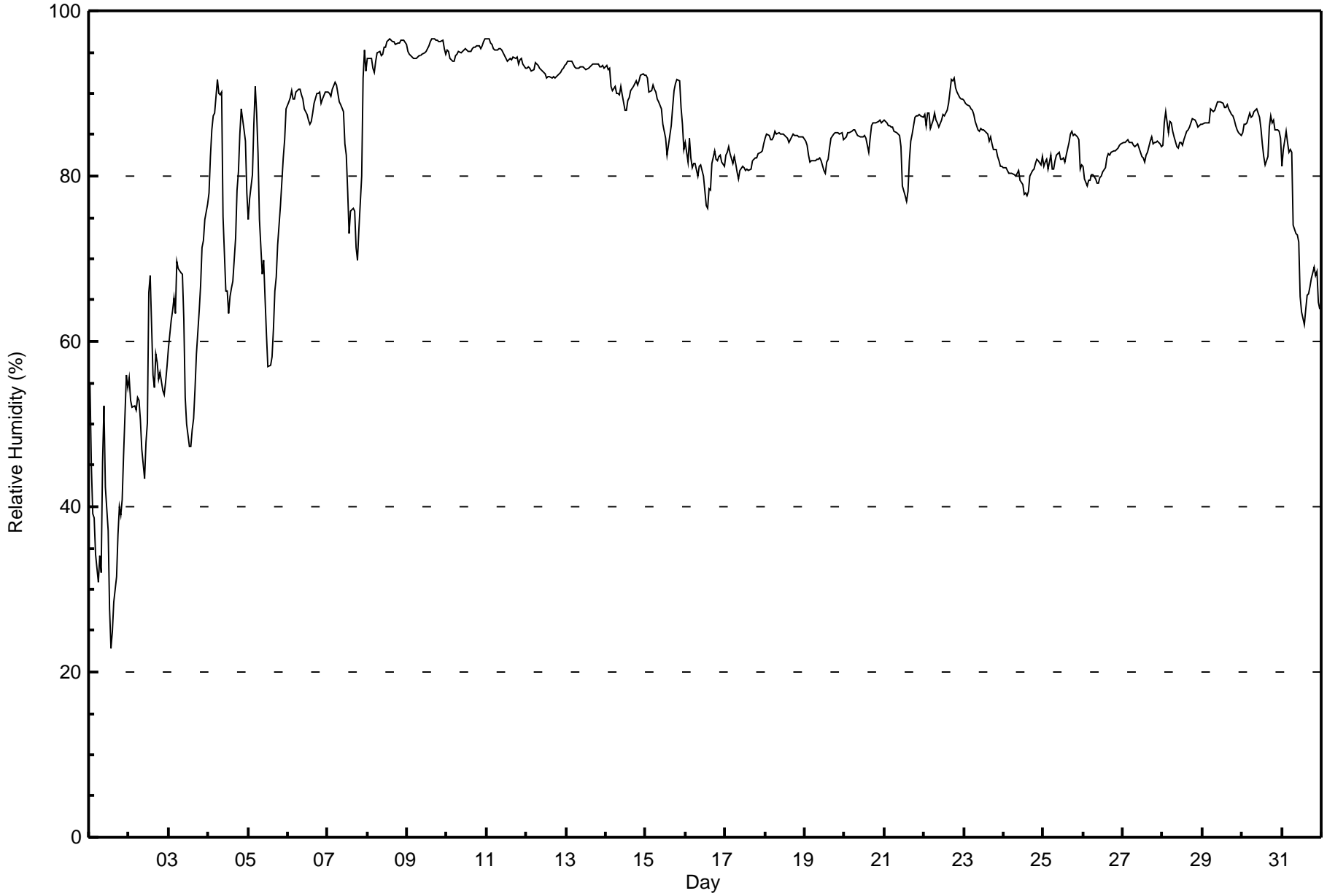
Maximum Value: 97 % on Dec 11 01:00														Maximum Daily Average: 95.3 % on Dec 9														Hours in Service: 744	
Minimum Value: 23 % on Dec 1 14:00														Minimum Daily Average: 38.9 % on Dec 1														Hours of Data: 744	
Maximum Diurnal Average: 84.4 % at hour 23														Minimum Diurnal Average: 79.2 % at hour 14														Hours of Missing Data: 0	
Monthly Average: 82.6 %														Percentiles: P <sub>1</sub> = 34 P <sub>10</sub> = 65 Q <sub>1</sub> = 81 Median = 85 O <sub>3</sub> = 90 P <sub>90</sub> = 94 P <sub>99</sub> = 96														Hours of Calibration: 0	
																												Percent Operational Time: 100.0	
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	55	45	39	39	34	31	34	32	45	52	42	37	28	23	25	28	31	37	40	39	41	46	56	54	38.9	56			
2-Dec	56	53	52	52	52	53	53	51	47	43	48	50	66	68	56	54	58	58	55	56	54	54	55	57	54.2	68			
3-Dec	59	63	64	65	63	70	69	68	68	63	53	50	47	47	49	51	54	58	64	67	71	72	75	77	62.0	77			
4-Dec	78	82	86	87	88	92	90	90	90	75	66	66	63	65	66	67	73	78	81	85	88	86	84	78	79.4	92			
5-Dec	75	77	80	86	91	88	83	75	68	70	65	61	57	57	58	62	66	68	72	76	79	82	84	88	73.7	91			
6-Dec	89	90	90	89	89	90	91	91	90	89	88	87	87	86	87	88	89	90	90	90	89	89	90	90	89.1	91			
7-Dec	90	90	90	91	91	91	90	89	89	88	84	83	78	73	76	76	76	71	70	73	80	92	95	93	84.1	95			
8-Dec	94	94	94	93	93	94	95	95	95	95	96	96	96	97	97	96	96	96	96	96	96	96	96	96	95.3	97			
9-Dec	95	95	95	94	94	94	94	95	95	95	95	95	95	96	96	97	97	96	96	96	96	96	95	95	95.3	97			
10-Dec	95	95	94	94	94	95	95	95	95	95	95	95	95	95	95	95	96	96	96	96	95	96	96	97	95.2	97			
11-Dec	97	97	96	96	95	95	95	95	95	95	95	95	94	94	94	94	94	94	94	94	94	94	94	93	94.8	97			
12-Dec	93	93	93	93	93	94	93	93	93	93	92	92	92	92	92	92	92	92	92	92	92	93	93	93	92.7	94			
13-Dec	94	94	94	94	94	93	93	93	93	93	93	93	93	93	93	94	94	94	94	94	93	93	93	93	93.4	94			
14-Dec	93	93	93	91	90	91	90	90	90	91	90	88	88	89	89	90	91	91	92	91	92	92	92	92	90.8	93			
15-Dec	92	92	90	90	91	91	90	89	89	88	86	85	85	83	85	86	88	90	91	92	92	88	86	83	88.5	92			
16-Dec	84	82	85	82	81	81	81	80	81	81	81	80	76	76	78	78	82	83	82	82	82	83	82	81	81.0	85			
17-Dec	82	83	84	83	82	82	81	81	80	81	81	81	81	81	81	81	82	82	82	82	83	83	83	84	81.8	84			
18-Dec	85	85	85	84	84	85	85	85	85	85	85	85	85	84	84	84	85	85	85	85	85	85	85	85	84.8	85			
19-Dec	84	84	82	82	82	82	82	82	82	82	82	81	80	82	82	83	85	85	85	85	85	85	85	84	83.1	85			
20-Dec	85	85	85	85	85	86	86	85	85	85	85	85	85	85	83	85	86	86	86	87	87	87	86	87	85.4	87			
21-Dec	87	86	86	86	86	86	85	85	85	85	84	79	78	77	78	82	84	85	87	87	87	87	87	87	84.5	87			
22-Dec	87	86	88	88	86	87	88	87	86	86	87	87	87	88	88	89	92	92	92	92	91	90	89	89	88.3	92			
23-Dec	89	89	89	89	88	88	87	87	86	86	86	86	86	85	85	84	85	84	83	83	82	82	81	81	85.4	89			
24-Dec	81	81	81	80	80	80	80	80	80	81	80	79	78	78	78	80	81	81	82	82	82	81	82	82	80.2	82			
25-Dec	81	82	82	81	83	81	81	82	82	83	82	82	82	82	83	84	85	85	85	85	85	84	81	81	82.6	85			
26-Dec	81	80	79	80	79	80	80	80	79	79	80	80	81	81	82	83	83	83	83	83	83	83	84	84	81.2	84			
27-Dec	84	84	84	84	84	84	84	84	84	84	83	82	82	82	83	83	84	85	84	84	84	84	84	84	83.7	85			
28-Dec	84	87	88	85	87	86	85	85	84	83	84	84	84	84	85	86	86	86	87	87	87	86	86	86	85.5	88			
29-Dec	86	86	86	86	87	88	88	88	88	89	89	89	89	88	88	89	88	87	87	87	86	86	85	85	87.4	89			
30-Dec	85	86	86	86	88	87	87	88	88	88	87	86	84	82	81	82	86	87	86	87	86	86	85	85	85.9	88			
31-Dec	81	83	85	84	83	83	83	74	73	73	72	65	64	62	64	66	66	67	68	69	68	68	65	64	72.1	85			
														83.9 83.9 84.0 83.9 83.7 84.1 83.9 83.0 82.9 82.4 81.2 80.2 79.5 79.2 79.4 80.2 81.7 82.4 82.8 83.3 83.7 84.2 84.4 84.1														Diurnal Average	
														97 97 96 96 95 95 95 95 95 95 96 96 96 96 97 97 97 97 96 96 96 96 96 97														Diurnal Maximum	





**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**Statoil - Leismer - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**Statoil - Leismer - December 2015**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	0	0.00	0.00
20 - 40	15	2.02	2.02
40 - 60	43	5.78	7.80
60 - 80	91	12.23	20.03
80 - 100	595	79.97	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

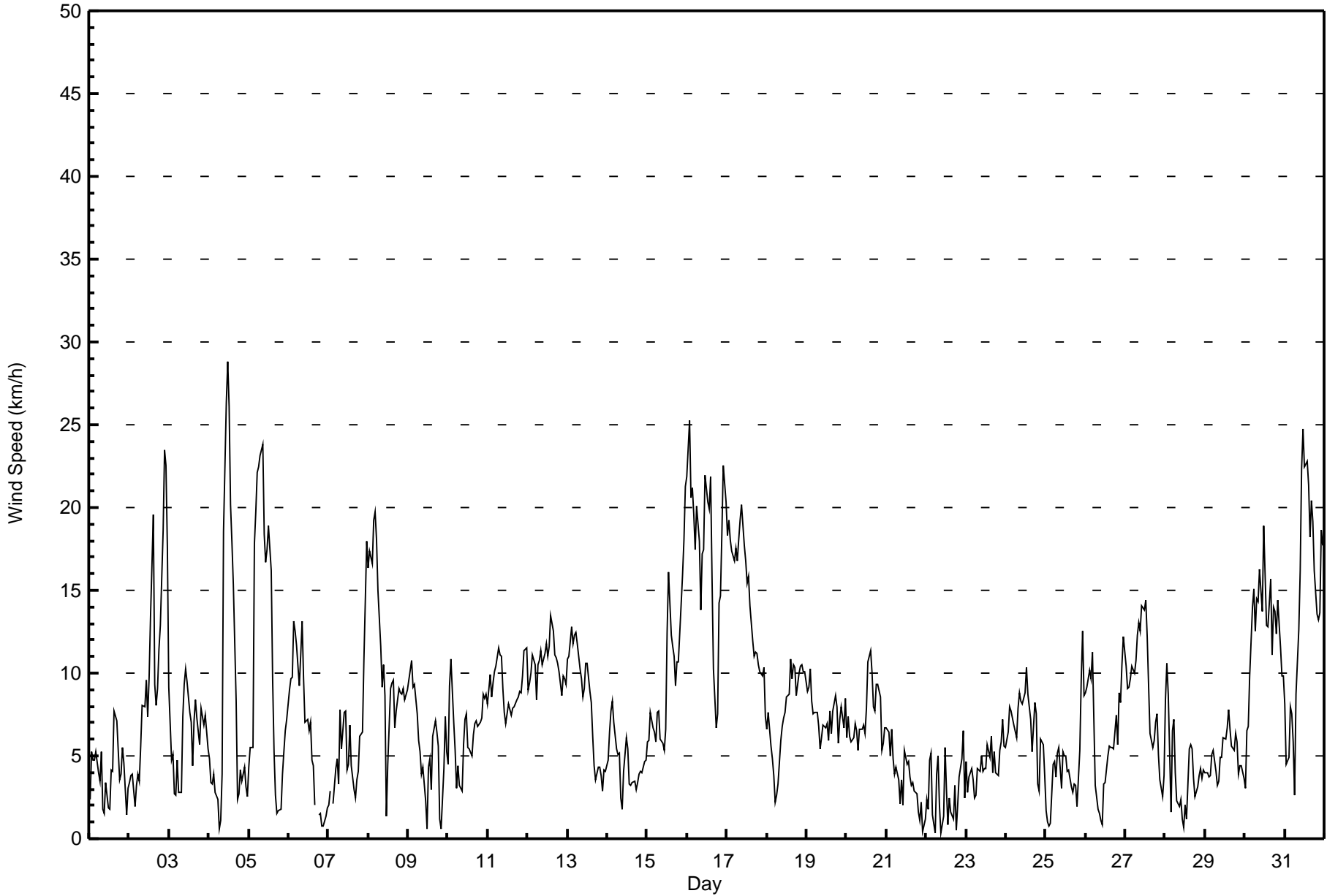


Maximum Speed: 29 km/h on Dec 4 12:00	Maximum Daily Speed Average: 17.2 km/h on Dec 16	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 22 06:00	Minimum Daily Speed Average: 0.7 km/h on Dec 22	Hours of Data: 742
Maximum Diurnal Speed Average: 2.6 km/h at hour 15	Minimum Diurnal Speed Average: 0.4 km/h at hour 8	Hours of Missing Data: 2
Monthly Average Velocity: 1.3 km/h 260.7 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 4 Median = 7 Q <sub>3</sub> = 10 P <sub>90</sub> = 16 P <sub>99</sub> = 23	Percent Operational Time: 99.7

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	WSW2	WNW5	NW5	NW5	NW5	NW4	WNW3	N5	NNW2	SE2	SSW3	NW2	WNW2	W4	SW4	W8	W7	W5	SW4	W4	WNW6	W5	WSW1	W3	WNW3.3	W8	
2-Dec	S3	S4	SSW4	SSW2	S3	SSW4	S3	SSE6	SSE8	S8	SSW10	WSW7	W10	W13	W20	WSW9	WSW8	WSW9	W11	W13	W19	W23	WNW23	W18	WSW7.8	W23	
3-Dec	W9	WSW5	WNW5	SW3	WSW3	SSE5	S3	SE3	SE7	SE9	SE10	ESE9	ESE8	E7	SE4	ESE7	ESE8	SE7	SSE6	SE8	SSE7	SE7	SE7	SE5	SE4.5	SE10	
4-Dec	SSE5	E3	ESE3	ESE4	ESE3	SSE2	SSE1	SSW1	W4	WNW19	WNW26	NW29	NW26	WNW20	WNW18	WNW15	W8	SSW2	SSW3	S4	S3	S4	S3	SSW3	WNW5.7	NW29	
5-Dec	W4	W6	WSW5	WNW18	W20	WNW22	WNW22	WNW23	WNW24	WNW18	W17	WNW17	W19	WNW16	W10	W5	WSW3	SW2	ESE2	E2	ENE4	SE5	SE7	ESE7	WNW9.3	WNW24	
6-Dec	ESE9	E10	E10	E13	E13	E12	E9	ESE11	ESE13	ESE10	ESE7	ESE7	ESE7	SE7	ESE5	SE4	SE2	AF	S1	S2	N1	SSW1	N1	NNW2	ESE6.2	ESE13	
7-Dec	SE2	SSE3	AF	ESE2	SE4	SE5	ESE3	ESE8	SE5	SE8	SE8	SE4	ESE5	SSE7	S4	SSW3	WSW2	W4	W4	W6	W6	W11	W14	WNW18	SSW1.9	WNW18	
8-Dec	WNW16	WNW17	WNW17	NNW19	NW20	NW18	NW15	NNW12	NW9	WNW10	WNW9	WSW1	SSE5	SSE9	SE9	SSE10	SE7	ESE8	ESE9	ESE9	ESE9	ESE9	ESE8	ESE9	NW2.7	NW20	
9-Dec	ESE10	E10	E11	ESE9	ESE9	ESE8	ESE6	SE5	SE4	SE4	ESE2	E1	SE4	SE5	NW3	WNW6	NW7	N6	NNE6	ESE1	NE1	NNW4	WNW7	WNW5	E2.3	E11	
10-Dec	NW5	N9	NNW11	NNW7	NW5	NNW3	NNE4	ESE3	E3	ESE6	SE7	SE8	SE6	ESE5	SE5	E6	ESE7	ESE7	ESE7	E7	ESE7	ESE9	ESE8	ESE9	E3.5	NNW11	
11-Dec	SE8	SSE10	SE9	SSE9	SSE10	SSE10	SSE11	SSE11	S11	SSE9	SSE8	ESE7	SSE8	SSE8	SE7	SSE8	SE8	SSE8	SSE9	SSE9	SE9	SSE10	SSE11	SSE12	SSE9.1	SSE12	
12-Dec	SSE9	SSE9	SSE10	SSE11	SSE11	SSE8	SSE11	SSE11	SSE11	SSE10	SSE11	SSE12	SSE11	SSE12	SSE13	SSE13	SE11	SE11	SE11	SE10	SE9	SE10	SE10	SE9	SSE10.3	SSE13	
13-Dec	ESE11	ESE11	ESE13	ESE12	ESE12	ESE12	ESE12	SE10	ESE10	ESE9	ESE9	ESE11	SE11	SE9	ESE8	ESE6	SE4	E4	ESE4	NE4	E4	NE3	N4	N4	ESE7.4	ESE13	
14-Dec	NNE5	N6	N8	N8	N7	N5	N5	NNE5	NW2	W2	N4	NNW6	NW5	SW3	SW3	SW3	SW3	SSW3	SSW3	SSW4	SSW4	S4	SSW5	SSW5	NW1.7	N8	
15-Dec	SSW6	SSW6	SSW8	SSW7	SSW6	SSW6	SSW8	SSW8	SSW6	SW6	SW5	W7	WNW12	WNW16	WNW12	WNW12	WNW11	WNW9	WNW11	W11	WNW14	WNW16	WNW18	NW21	W7.6	NW21	
16-Dec	NW22	NW25	NW21	NNW21	NW20	NNW17	NNW20	NNW18	NW14	WNW17	WNW17	WNW22	WNW20	NW20	NW22	NW16	WNW10	W7	W8	WNW14	WNW15	WNW18	NW23	NW20	NW17.2	NW25	
17-Dec	NW18	NW19	NW18	NW17	NW17	NW18	NW17	NW18	NNW19	NNW20	NNW18	NNW17	NW15	NW16	NNW14	NNW12	NNW11	NNW11	NNW11	NNW10	NNW10	NNW10	NNW10	NNW10	NNW7	NNW14.6	NNW20
18-Dec	NNW7	NNW8	NNE6	NNW5	NNW4	NNE2	WSW3	SSE3	SE6	SSE7	SE7	SE8	SE9	ESE9	SE11	SE10	ESE11	ESE10	ESE9	ESE10	ESE10	ESE10	ESE10	ESE10	ESE5.2	SE11	
19-Dec	ESE9	ESE9	ESE10	ESE8	ESE8	ESE8	SE8	ESE7	SE5	SE6	SE7	SSE7	SSE7	SSE6	SSE8	SE6	SE8	SSE9	SSE8	S6	SSE7	SSE8	S7	S8	SE6.9	ESE10	
20-Dec	S6	S7	S6	S6	SSE6	SSE7	SSE7	SE5	SSE7	SSE7	SSE7	SSE6	SSE8	SSE11	SSE11	SSE10	SSE8	SSE8	SSE9	SSE9	SSE9	S5	S6	S7	SSE7.3	SSE11	
21-Dec	S7	SSW6	SSW5	SSW7	SSW5	SSW4	S4	SSW4	SW2	WNW4	SW2	SSE5	S5	SSW5	SSW4	SSW3	SSW3	SSW3	N3	NNE2	SE1	NNE2	NE0	NNW1	SSW2.7	S7	
22-Dec	N2	N2	N5	N5	SSE1	SSE0	N4	N5	N2	WSW0	ENE1	SE6	SSW3	NW1	SW2	SSW2	NNE1	SSE3	ENE1	SSE2	SE4	ESE5	SSE6	SE2	E0.7	SSE6	
23-Dec	SSE5	ESE3	ENE4	E4	ENE4	E2	E3	E4	ENE4	ENE5	E4	ESE4	ENE4	NE6	NE5	NNE6	N4	NNE5	NE4	NNE4	NNE5	NNE6	NNE7	NNE6	NE3.6	NNE7	
24-Dec	N5	NNW6	N8	N8	N7	N7	N6	N8	N9	NNW8	NNW8	NW9	NNW10	N9	NNW8	NNW7	NW5	NNW8	NW3	W3	WNW6	WNW6	NW4	NNW6.5	NNW10		
25-Dec	NNW2	W1	SW1	W1	N5	WNW5	W4	W5	W5	WSW3	W5	W5	W5	WSW4	SW4	SW3	S3	S3	SSW3	SSW2	W5	WNW10	NNW13	NNW9	W3.2	NNW13	
26-Dec	NNW9	NNW9	NNW10	NNW10	NNW11	NNW7	WNW3	N2	SE2	ESE1	ESE1	SSE3	SE3	SSE5	SE6	SE6	ESE6	ESE5	ESE7	ESE6	ESE9	ESE8	ESE10	ESE12	E2.1	ESE12	
27-Dec	SE10	SE9	SE9	SE10	SE10	SSE10	SE11	SE12	SE13	SSE13	SSE14	SSE14	SSE14	S12	S9	S6	S5	SSW6	SSW7	SSW8	SW5	SW4	SW3	W4	SSE7.9	SSE14	
28-Dec	WNW8	NNW11	N9	ESE2	WNW7	NNW7	WNW4	SW2	SSE2	SE2	ESE1	ENE1	NNW2	NNW1	S5	SSE6	SSE5	S4	S3	SSW3	SSW4	SSW4	SSW4	SW4	WSW1.3	NNW11	
29-Dec	SSW4	SSW4	S4	S4	SSW5	SW5	SSW4	SSW3	SSW4	SW5	SW5	SSW6	SSW6	SSW7	SSW8	SSW7	SSW6	SSW5	SW6	SSW6	SSW4	SSW4	SSW4	S4	SSW4.9	SSW8	
30-Dec	SW3	W7	W7	WNW10	WNW14	WNW15	NW13	NW14	NNW14	NNW16	NW14	NW19	NW16	WNW13	WNW13	WNW16	WNW11	WNW14	WNW14	WNW12	WNW14	WNW12	W10	W10	WNW11.9	NNW19	
31-Dec	W8	SW4	W5	WNW8	WNW8	WNW6	S3	WNW9	W13	WNW16	WNW22	WNW25	WNW22	WNW23	WNW21	NW18	WNW20	WNW19	WNW16	WNW14	WNW13	WNW14	WNW19	WNW18	WNW13.9	WNW25	

W0.9	NW1.3	NNW1.3	NNW1.3	NW1.6	WNW1.3	W0.9	WNW0.4	SW0.8	WSW1.7	SSW2.2	W2.1	W2.4	WSW2.4	WSW2.6	WSW1.9	SW1.5	SW1.3	SSW1.3	SW1.6	SW1.4	WSW1.8	W1.9	WNW1.6	Diurnal Average
NNW22	NW25	NW21	NNW21	NW20	WNW22	WNW22	WNW23	WNW24	NNW20	WNW26	NW29	NW26	WNW23	NW22	NW18	WNW20	WNW19	WNW16	WNW14	W19	W23	NW23	NW21	Diurnal Maximum

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Statoil - Leismer - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	283	38.14	38.14
6 - 11	323	43.53	81.67
12 - 19	103	13.88	95.55
20 - 28	32	4.31	99.87
29 - 38	1	0.13	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 742

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed (WS) - km/h**  
**Statoil - Leismer - December 2015**

<b>Wind Speed</b> <b>Ranges (km/h)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	20	11	5	9	11	21	27	18	23	45	25	12	23	10	12	11	283
6 - 11	14	7	1	0	8	63	51	64	14	22	2	4	20	20	4	29	323
12 - 19	0	0	0	0	3	7	2	9	1	0	0	0	8	42	18	13	103
20 - 28	0	0	0	0	0	0	0	0	0	0	0	0	2	16	10	4	32
29 - 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	34	18	6	9	22	91	80	91	38	67	27	16	53	88	45	57	742

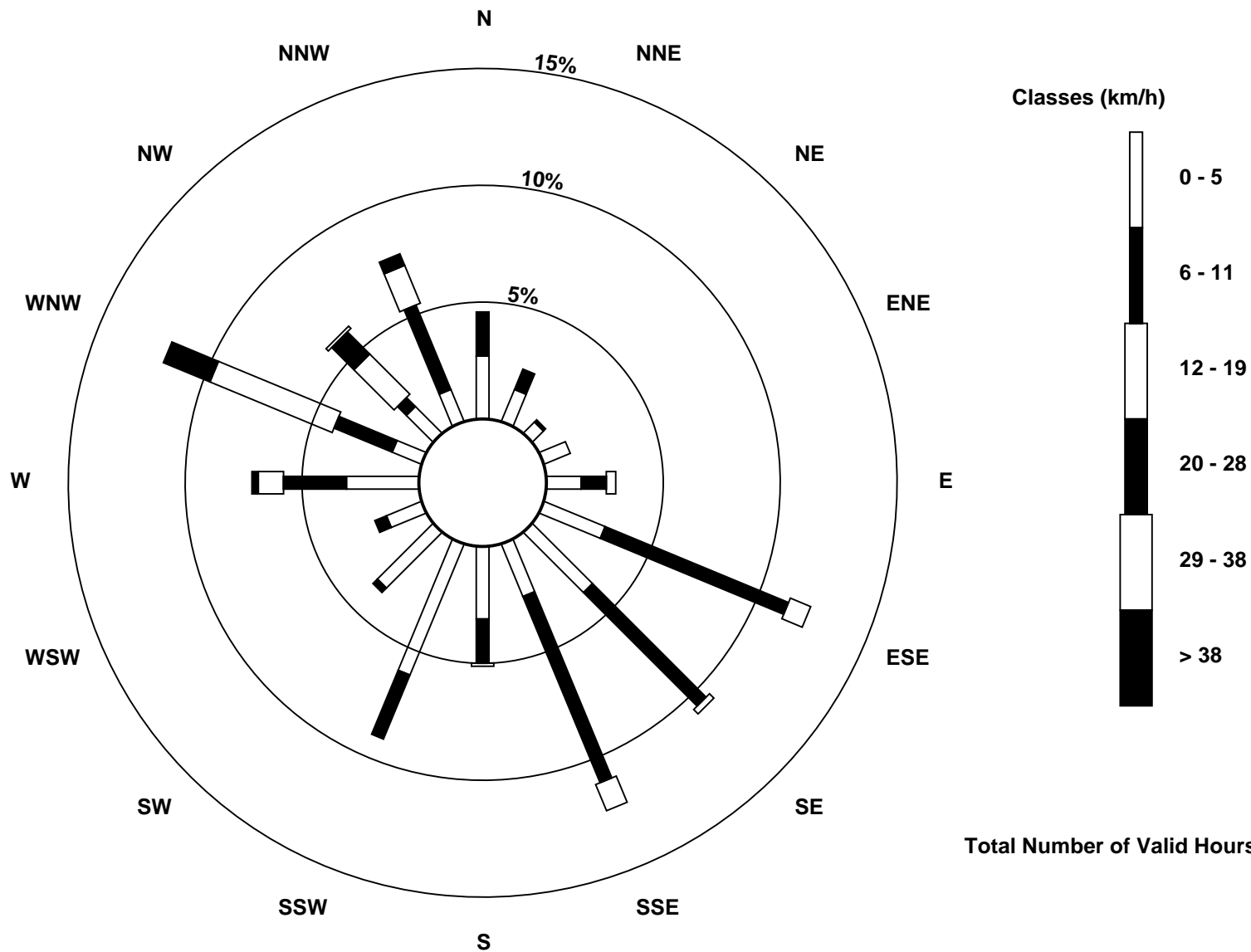
Total Number of Valid Hours: 742

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
Statoil - Leismer (AMS501)





Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed (WS) - km/h

Statoil - Leismer - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 6 km/h on Dec 4 11:00 Minimum Value: 1 km/h on Dec 2 07:00 Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 1 Median = 2 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 5																	Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 0 Percent Operational Time: 99.7									
Day	Hourly Period Ending At (MST)																								Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	1	1	1	2	1	1	1	1	1	2	1	2	3	2	2	2	1	2	1	3	1	1	3	
2-Dec	1	1	1	1	1	1	1	2	1	2	3	3	3	4	5	4	3	4	4	4	4	5	5	5	5	
3-Dec	3	2	1	1	1	1	1	2	2	3	2	2	2	1	2	2	2	2	1	2	2	1	1	1	3	
4-Dec	1	2	2	2	2	1	2	1	2	5	6	6	6	4	4	3	4	1	1	1	1	1	1	1	2	
5-Dec	2	3	3	5	4	4	5	5	5	4	4	4	4	4	2	3	1	1	1	1	1	1	2	2	5	
6-Dec	2	2	2	3	3	3	3	3	3	3	2	2	2	2	2	1	1	AF	2	1	1	1	2	1	3	
7-Dec	1	1	AF	1	1	2	2	2	2	2	1	2	1	2	1	1	1	2	2	2	4	3	3	3	4	
8-Dec	3	3	3	4	4	4	4	3	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	4	
9-Dec	2	2	3	2	2	2	2	1	1	1	1	1	1	1	2	3	3	2	1	1	1	1	3	2	3	
10-Dec	2	1	2	2	2	2	1	1	1	2	2	2	1	1	1	2	1	2	1	2	1	2	2	2	2	
11-Dec	2	2	1	2	2	2	2	2	3	2	2	1	2	2	2	3	2	2	2	2	2	2	2	2	3	
12-Dec	2	2	2	2	2	2	2	2	3	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	3	
13-Dec	2	2	3	3	3	3	2	2	2	2	2	3	3	3	2	2	2	2	2	1	2	1	1	1	3	
14-Dec	1	1	1	2	1	1	2	2	2	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	2	
15-Dec	2	1	2	1	2	1	2	2	1	2	1	3	3	3	2	2	2	1	2	3	3	3	4	3	4	
16-Dec	4	5	4	3	3	4	5	4	4	3	3	4	4	4	5	4	2	2	3	2	2	4	5	4	5	
17-Dec	4	4	4	3	4	3	3	4	3	3	3	3	4	3	3	2	2	2	2	1	1	1	2	1	4	
18-Dec	2	2	1	1	2	1	2	2	2	1	2	2	2	2	3	3	3	2	2	2	2	3	2	2	3	
19-Dec	2	2	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	
20-Dec	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	2	2	2	1	2	2	1	2	
21-Dec	2	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	3	2	2	3	
22-Dec	1	2	1	2	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	
23-Dec	1	1	1	1	1	1	1	1	1	2	1	1	2	1	2	3	1	2	1	1	2	1	2	1	3	
24-Dec	1	2	1	2	2	1	2	1	1	2	2	2	2	2	2	1	1	2	1	2	2	2	1	1	2	
25-Dec	1	1	1	1	2	2	1	2	2	1	2	2	1	1	1	1	1	1	1	1	4	2	2	1	4	
26-Dec	1	2	1	1	2	3	2	1	1	1	1	1	1	1	1	1	2	2	2	1	2	2	2	3	3	
27-Dec	2	2	2	2	2	2	2	3	3	2	3	2	3	3	2	3	2	2	2	2	2	1	1	2	3	
28-Dec	2	3	2	1	2	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	3	
29-Dec	1	1	1	1	1	2	1	1	1	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	2	
30-Dec	1	2	2	2	3	3	3	3	2	2	3	3	3	2	2	3	2	3	2	2	3	3	2	2	3	
31-Dec	3	2	2	1	1	2	1	4	3	4	5	5	4	4	4	4	4	3	3	2	2	3	3	3	5	
																	Diurnal Maximum									
AF - Analyzer Failure																										





**Wood Buffalo Environmental Association**

**Summary of Hour Averages**

**Wind Direction (WD) - deg**

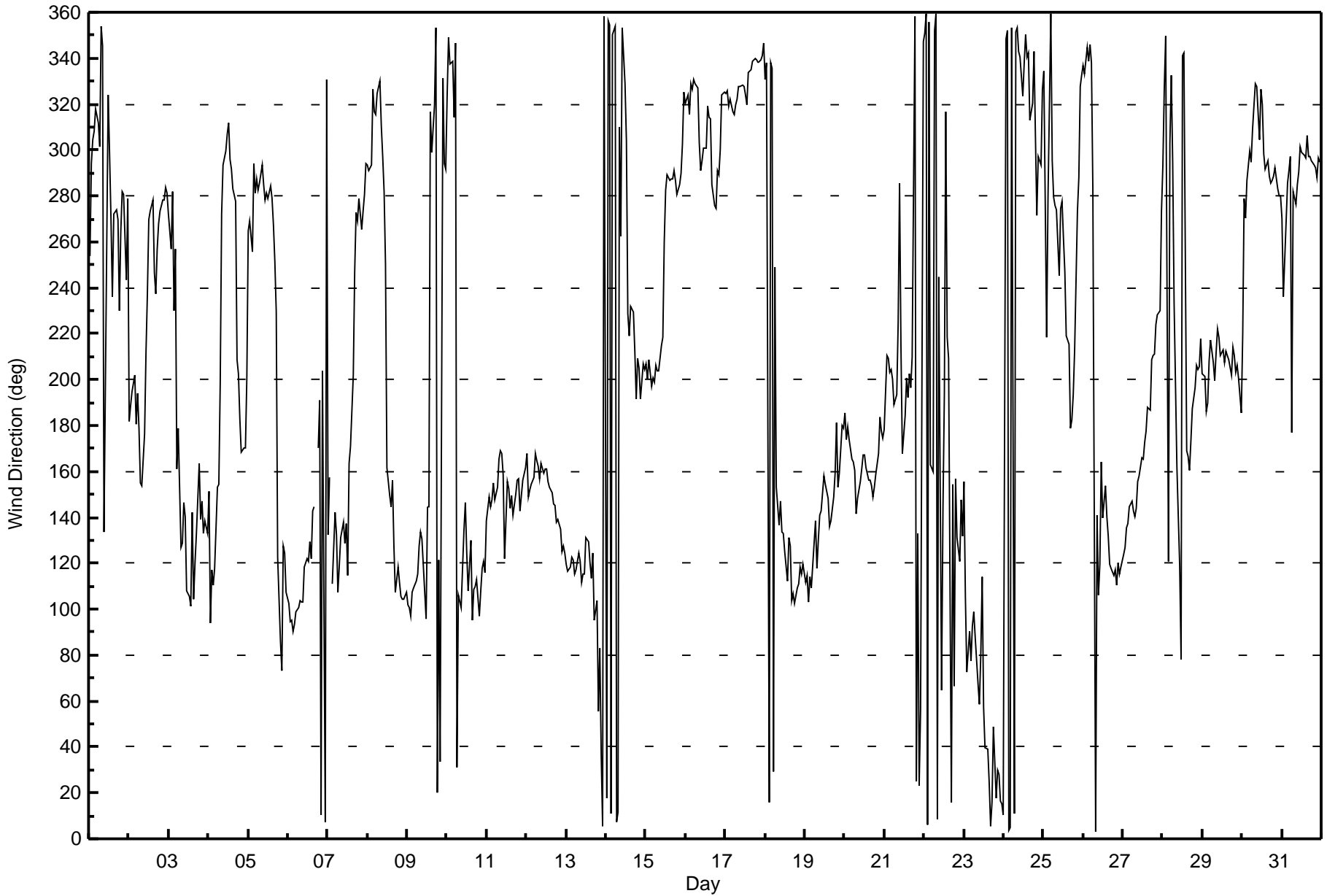
**Statoil - Leismer - December 2015**

Direction of Maximum Speed: 307 deg on Dec 4 12:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 312.1 deg on Dec 16	Hours of Data: 742
Direction of Minimum Speed: 160 deg on Dec 22 06:00	Hours of Missing Data: 2
Direction of Minimum Daily Speed Average: 0.7 deg on Dec 22	Percent Operational Time: 99.7
Monthly Average Direction: 265.8 deg	

Day	Hourly Period Ending At (MST)																								Daily Average	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	254	294	304	308	318	312	301	354	345	134	197	324	298	270	236	272	274	270	230	264	282	281	243	279	283.3	
2-Dec	182	189	195	202	181	194	179	155	153	176	212	237	270	274	278	246	238	257	268	274	278	278	283	281	255.3	
3-Dec	272	257	282	230	257	161	179	127	129	146	140	108	105	101	142	104	120	133	163	139	147	133	139	133	140.8	
4-Dec	151	94	117	110	118	153	154	198	272	294	299	307	312	296	292	283	278	209	202	183	169	170	170	201	287.5	
5-Dec	265	269	255	294	281	288	283	286	294	285	278	282	279	285	279	267	252	230	123	86	73	128	124	108	281.6	
6-Dec	103	95	95	90	93	99	101	104	103	103	119	122	121	130	122	143	145	AF	170	191	10	204	7	331	105.5	
7-Dec	132	157	AF	111	142	132	107	119	131	138	129	137	115	163	171	202	247	272	269	279	265	273	281	294	206.5	
8-Dec	293	291	294	327	317	316	325	330	310	297	282	250	162	149	145	156	128	108	118	111	105	104	104	107	315.0	
9-Dec	102	101	97	107	109	112	115	127	133	130	107	96	144	145	317	299	319	353	20	122	34	331	294	292	92.3	
10-Dec	324	349	337	339	314	346	31	106	100	118	134	146	124	108	130	95	109	110	113	97	108	118	121	116	94.8	
11-Dec	139	149	145	147	155	148	153	165	169	168	158	122	156	152	144	150	141	150	156	157	143	150	156	161	152.3	
12-Dec	168	149	152	154	158	168	165	162	157	164	159	161	161	156	153	151	146	145	138	139	135	125	128	124	151.1	
13-Dec	120	117	118	123	121	115	117	124	121	112	115	115	131	129	120	114	125	95	104	56	83	37	6	358	113.7	
14-Dec	18	356	355	11	350	354	8	12	310	262	353	329	304	229	219	232	229	212	192	209	205	191	207	205	313.1	
15-Dec	207	200	209	197	201	199	206	204	204	215	218	260	283	289	287	287	288	291	182	287	281	285	290	303	325	269.4
16-Dec	320	324	316	329	326	331	329	327	304	291	295	301	301	319	314	314	285	276	275	291	289	300	324	325	312.1	
17-Dec	325	326	319	322	316	315	320	322	328	328	328	327	324	320	334	335	338	339	340	339	338	339	341	347	327.7	
18-Dec	331	338	16	338	336	29	249	153	136	147	133	133	125	113	131	128	104	107	102	109	111	118	115	119	111.6	
19-Dec	111	115	103	114	109	119	139	118	130	141	143	158	154	152	148	136	138	149	159	181	153	160	180	179	139.8	
20-Dec	185	174	179	174	165	164	160	141	148	156	161	167	167	162	156	156	154	149	153	159	168	184	178	175	163.1	
21-Dec	178	211	210	203	204	200	189	193	224	286	214	168	185	201	192	203	197	210	358	25	133	23	56	347	200.1	
22-Dec	351	359	6	356	163	160	352	359	8	244	65	144	194	317	219	209	16	154	67	157	131	121	148	132	96.9	
23-Dec	155	106	73	90	78	93	99	88	68	58	80	114	57	40	39	24	6	16	49	18	30	28	16	15	52.4	
24-Dec	10	348	352	4	5	353	11	351	353	343	341	324	338	350	340	342	313	320	343	306	271	297	293	326	340.4	
25-Dec	334	278	218	280	360	295	280	276	274	245	275	278	262	247	219	215	179	182	194	213	273	288	328	332	278.8	
26-Dec	337	333	345	339	346	338	283	3	141	106	119	164	140	154	140	132	119	118	115	117	111	120	115	119	82.6	
27-Dec	124	127	136	138	145	147	143	140	144	155	158	166	165	173	178	188	187	209	210	211	224	228	230	274	162.2	
28-Dec	294	327	349	121	302	333	295	234	163	140	119	78	341	342	169	167	161	173	187	196	206	204	206	218	251.5	
29-Dec	202	201	186	190	208	217	207	200	212	222	218	211	213	208	212	211	209	202	214	211	203	206	201	186	207.5	
30-Dec	220	279	270	287	300	295	309	319	329	328	305	326	320	299	292	295	288	285	287	288	292	283	280	280	299.4	
31-Dec	270	236	269	285	291	297	177	282	276	285	291	301	299	298	297	306	297	297	296	293	292	288	296	295	292.5	

273.4 313.2 329.6 336.4 309.0 296.6 273.7 287.9 227.7 244.7 246.9 268.0 266.1 253.8 242.5 240.8 225.5 217.9 209.7 220.2 232.4 251.9 278.4 290.1  
Diurnal Average

AF - Analyzer Failure  
All monthly, daily, and diurnal averages have been calculated using vector methods





Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Direction (WD) - deg

Statoil - Leismer - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 104 deg on Dec 22 10:00 Minimum Value: 6 deg on Dec 19 22:00 Percentiles: P <sub>1</sub> = 8 P <sub>10</sub> = 11 Q <sub>1</sub> = 13 Median = 17 Q <sub>3</sub> = 24 P <sub>90</sub> = 46 P <sub>99</sub> = 86																			Hours in Service: 744 Hours of Data: 742 Hours of Missing Data: 2 Hours of Calibration: 0 Percent Operational Time: 99.7						
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	44	16	18	17	12	43	41	14	70	69	41	80	77	47	55	15	14	21	26	29	14	48	53	57	80
2-Dec	22	23	20	55	13	13	12	15	14	17	22	32	22	17	15	31	30	33	24	17	12	12	11	12	55
3-Dec	20	33	23	51	43	14	27	25	18	14	13	19	22	24	26	29	16	24	20	15	12	14	15	18	51
4-Dec	20	22	35	28	57	55	100	70	37	10	11	13	10	11	10	28	55	31	17	24	16	22	43	100	
5-Dec	40	36	40	10	12	11	11	10	11	11	15	13	15	12	14	38	43	53	54	60	21	16	14	16	60
6-Dec	15	17	17	15	17	18	21	18	17	20	20	18	19	18	20	15	50	AF	94	54	83	80	56	58	94
7-Dec	63	23	AF	35	17	53	39	20	23	20	16	53	27	21	16	24	51	49	33	22	36	18	13	10	63
8-Dec	10	9	12	10	15	15	14	14	25	17	20	89	43	15	15	13	18	20	16	20	24	19	20	18	89
9-Dec	18	17	18	18	18	19	23	24	21	21	54	99	24	15	29	25	31	22	18	70	87	25	22	37	99
10-Dec	43	10	12	13	28	26	23	37	45	17	18	14	20	18	24	19	23	16	17	18	17	14	15	15	45
11-Dec	15	11	12	13	11	15	14	13	13	15	18	15	15	16	21	18	18	16	13	12	13	13	11	11	21
12-Dec	12	11	11	11	10	13	11	13	12	12	14	13	14	12	13	12	13	12	14	15	15	16	16	15	16
13-Dec	14	14	14	16	15	16	15	17	16	18	18	19	21	21	21	24	31	41	31	37	40	51	21	16	51
14-Dec	17	13	12	13	13	15	23	26	50	59	27	18	26	28	23	27	25	19	17	18	16	15	17	15	59
15-Dec	17	15	18	14	13	14	18	15	15	21	24	33	14	12	11	10	8	7	10	13	10	10	15	10	33
16-Dec	12	10	13	10	10	11	12	13	21	12	13	10	12	15	14	18	10	15	21	8	9	15	12	11	21
17-Dec	10	11	14	13	16	14	13	14	10	10	10	12	15	13	10	12	10	11	10	10	10	10	10	12	16
18-Dec	17	20	21	29	44	72	63	60	27	19	20	18	19	23	18	21	19	17	20	16	16	16	15	16	72
19-Dec	20	17	19	18	20	17	16	13	22	17	16	13	14	12	10	13	13	7	8	16	8	6	14	13	22
20-Dec	13	10	13	11	10	8	11	12	8	10	11	12	12	13	10	8	12	14	11	13	10	19	18	11	19
21-Dec	20	20	22	15	14	19	13	11	43	19	58	14	23	22	19	19	38	45	45	73	98	80	88	69	98
22-Dec	73	76	12	28	77	93	26	17	83	104	78	20	66	88	35	54	72	27	85	45	25	21	19	83	104
23-Dec	16	40	29	29	28	30	39	31	26	24	30	22	32	21	25	52	31	20	39	24	20	16	15	17	52
24-Dec	16	15	14	14	13	11	15	11	12	14	13	21	14	18	16	10	19	20	11	44	43	13	11	25	44
25-Dec	75	61	74	43	17	17	23	14	23	37	21	28	21	22	19	27	23	17	15	31	31	14	10	8	75
26-Dec	11	13	9	8	13	34	46	55	54	61	84	22	28	20	20	19	17	21	16	19	17	17	14	13	84
27-Dec	15	16	15	15	12	11	14	16	14	11	11	12	12	13	15	20	16	17	17	17	20	24	40	42	42
28-Dec	15	15	16	42	24	18	31	33	28	27	51	87	32	79	13	11	10	20	17	18	16	15	19	20	87
29-Dec	21	21	30	17	16	23	22	24	25	26	24	20	24	21	15	13	11	11	15	17	22	16	19	19	30
30-Dec	42	15	17	11	14	10	19	14	10	8	18	9	13	14	10	10	9	9	8	10	12	11	13	15	42
31-Dec	21	37	36	12	11	17	56	28	13	15	9	11	11	11	11	13	10	10	9	9	11	11	10	10	56
75 76 74 55 77 93 100 70 83 104 84 99 77 88 55 54 72 55 94 73 98 80 88 83																								Diurnal Maximum	
AF - Analyzer Failure																									



# Wood Buffalo Environmental Association

## SO2 Calibration Report

### Station Information

Calibration Date	December 11, 2015	Last Calibration	November 24, 2015
Station Name	Statoil - Leismer	Station Number	AMS 501
Reason:	Routine		
Start Time (MST)	8:45	End Time (MST)	12:18
Gas Cert Reference	S990374A	Station temp.	22 Deg C
Cal Gas Concentration	50 ppm	Cal Gas Exp Date	26-Sep-17
Calibrator Make/Model	Sabio 4010	Serial Number	11581008
ZAG Make/Model	API 701	Serial Number	4522
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2579

### Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	549	549
Analyzer IP address	192.168.1.72		Lamp voltage	2708	2706
Calculated slope	0.992933	0.985259	Chamber temp	50.1	50.1
Calculated intercept	1.527899	1.880115	Pressure	25.9	25.5
Analyzer Background	18.2	18.2	Flow	448	443
Analyzer Coefficient	1.052	1.052	Intensity	67	67

Analyzer make API T100 Analyzer serial # 721

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	-0.6	----
as found span	5000	63.1	631.0	639.0	0.987
calibrator zero	5000	0.0	0.0	-0.6	----
high point	5000	63.1	631.0	639.0	0.987
second point	5000	31.6	316.0	318.7	0.992
third point	5000	15.8	158.0	156.8	1.008
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	63.1	631.0	631.8	0.999
Average Correction Factor					0.996

Corrected As found 639.6 Previous response 634.0 % change -0.9%

**Notes:**

no adjustments or maintenance done, filter changed out

Calibration Performed By: Melissa Lemay



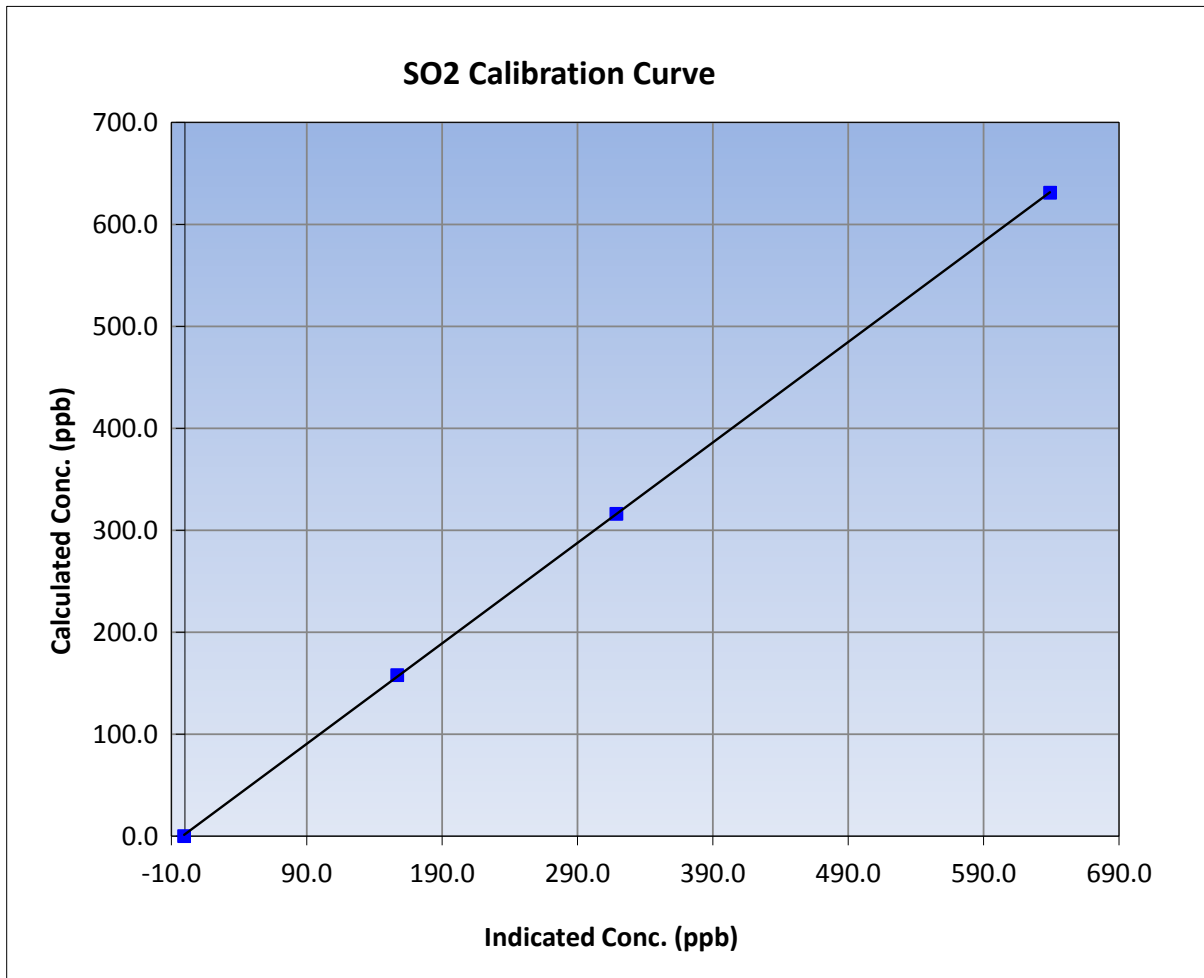
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 11, 2015	Previous Calibration	November 24, 2015
Station Name	Statoil - Leismer	Station Number	AMS 501
Start Time (MST)	8:45	End Time (MST)	12:18
Analyzer make	API T100	Analyzer serial #	721

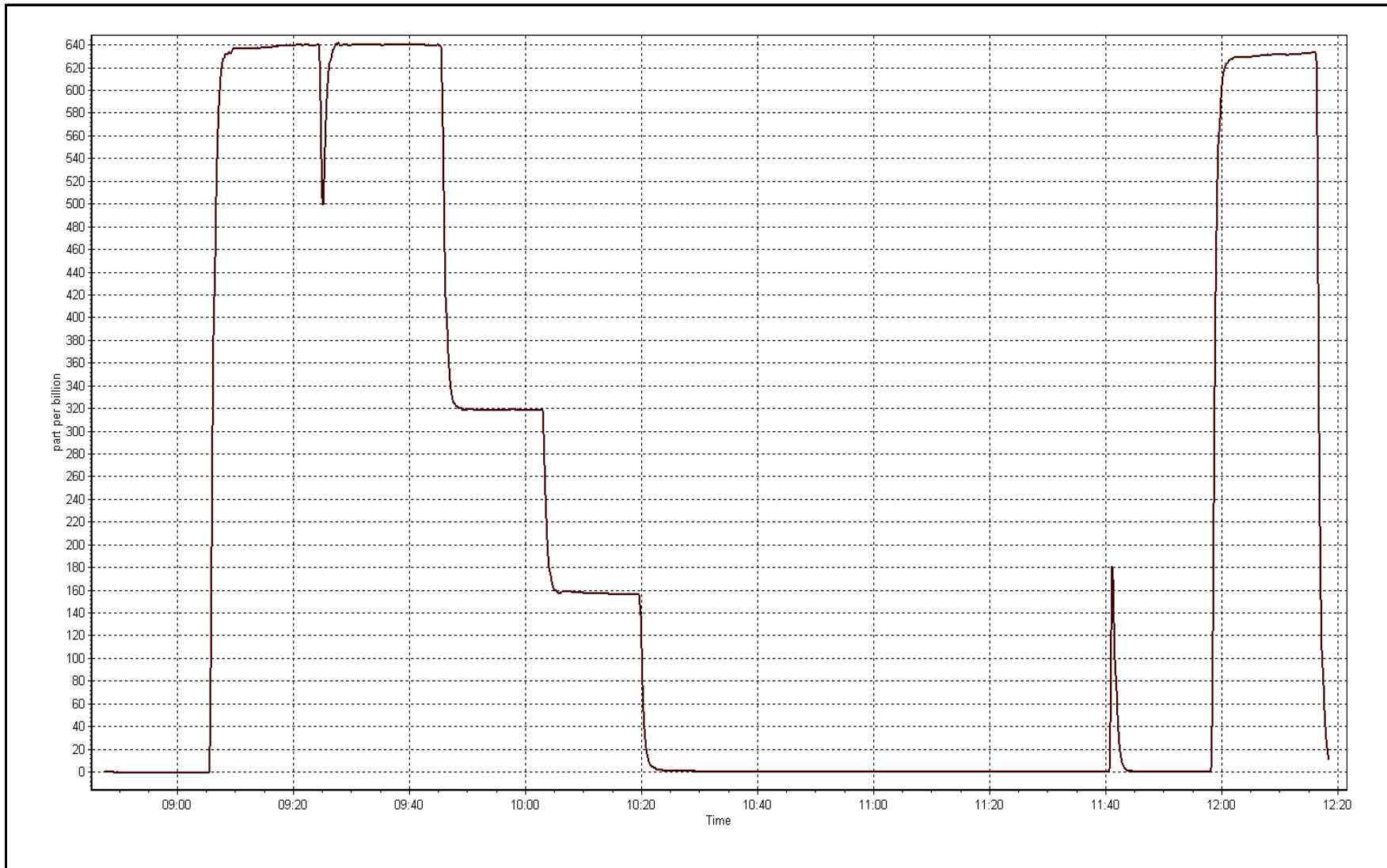
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.6	----	Correlation Coefficient	0.999979
631.0	639.0	0.9875		
316.0	318.7	0.9915	Slope	0.985259
158.0	156.8	1.0077		
			Intercept	1.880115



SO2 Calibration Plot

Date: December 11, 2015





# Wood Buffalo Environmental Association H2S Calibration Report

### Station Information

Calibration Date	December 16, 2015	Last Calibration	November 24, 2015
Station Name	Statoil	Station Number	AMS 501
Reason:	Routine		
Start Time (MST)	8:48	End Time (MST)	13:09
Gas Cert Reference	ALM066183	Station temp.	21 Deg C
Cal Gas Concentration	5.09 ppm	Cal Gas Exp Date	09/09/2017
Calibrator Make/Model	Sabio 4010	Serial Number	11581008
ZAG air Make/Model	API 701	Serial Number	4522
DACS make/model	Campbell Scientific CR3000	Serial Number	2579
SO2 gas concentration	50 ppm	SO2 gas cert/exp	S990374A 26-Sep-17

### Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	512	504
Analyzer IP address	192.168.1.75		Lamp voltage	1582	1926
Calculated slope	1.000578	0.996424	Chamber temp	50	50
Calculated intercept	-0.279868	0.315264	Pressure	22.8	22.4
Analyzer Background	19.4	20.7	Flow	553	535
Analyzer Coefficient	1.037	1.006	Intensity	39	48
			Converter temp.	316	314

Analyzer make/model	API T101	Analyzer serial #	157
Converter make/model	na	Converter serial #	na

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.2	----
as found span	5000	78.6	80.0	80.9	0.989
SO2 scrubber check	5000	15.8	158.0	4.2	----
calibrator zero	5000	0.0	0.0	-0.2	----
high point	5000	78.6	80.0	80.0	1.000
second point	5000	39.3	40.0	40.0	1.000
third point	5000	24.6	25.0	24.5	1.022
as left zero	5000	0.0	0.0	0.4	----
as left span	5000	78.6	80.0	76.8	1.042
Average Correction Factor					1.008

Corrected As found	80.7	Previous response	80.2	% change	-0.6%
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**Notes:**

Peaked the UV lamp up from 1582 now 1926, factory calibration was done, restarted calibration at 10:45MST, scrubber test done before calibrator zero, filter changed out, zero and span adjusted, had trouble with as left span, diagnostics were

Calibration Performed By: Melissa Lemay



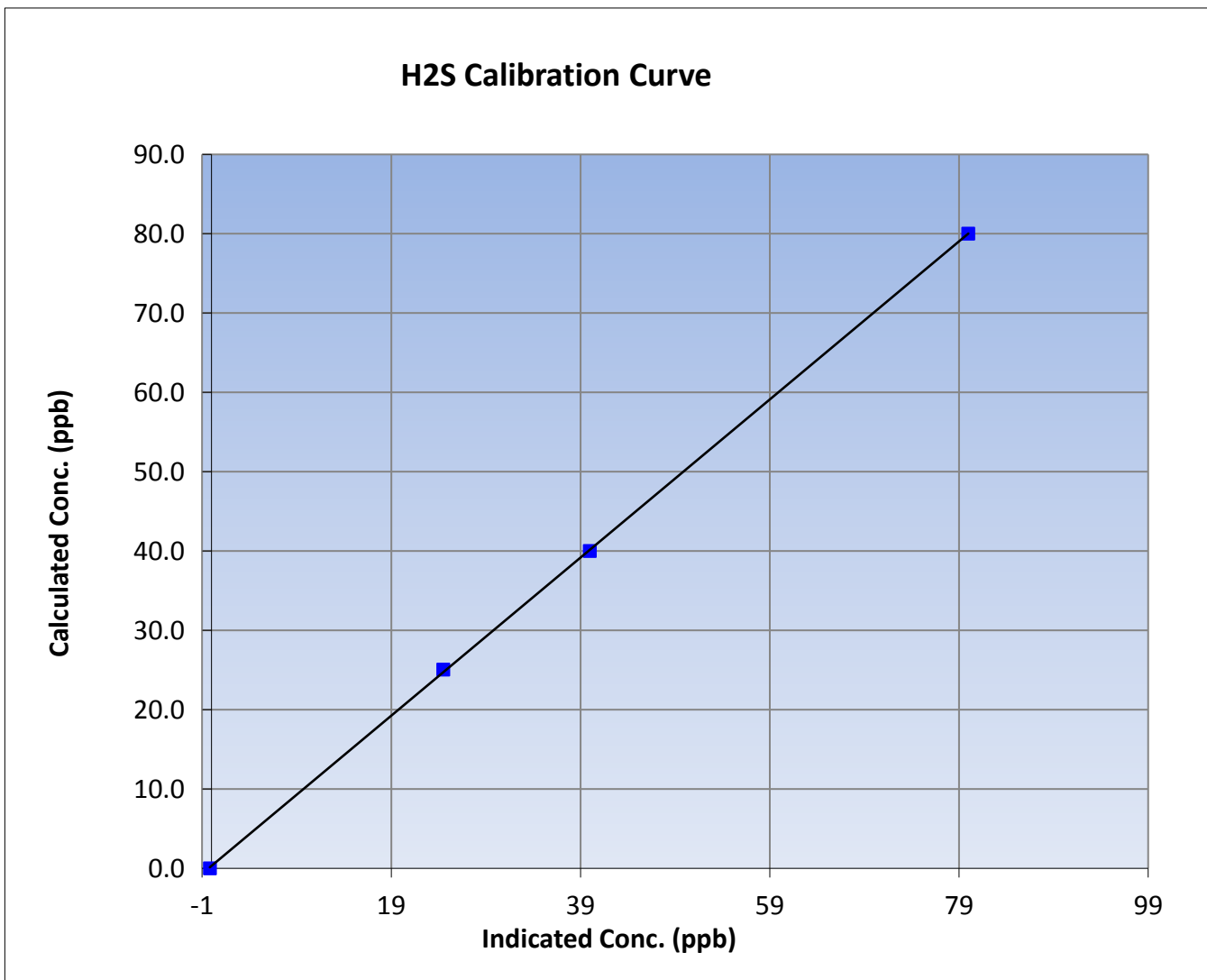
# Wood Buffalo Environmental Association H2S Calibration Report

## Station Information

Calibration Date	December 16, 2015	Previous Calibration	November 24, 2015
Station Name	Statoil	Station Number	AMS 501
Start Time (MST)	8:48	End Time (MST)	13:09
Analyzer make	API T101	Analyzer serial #	157

## Calibration Data

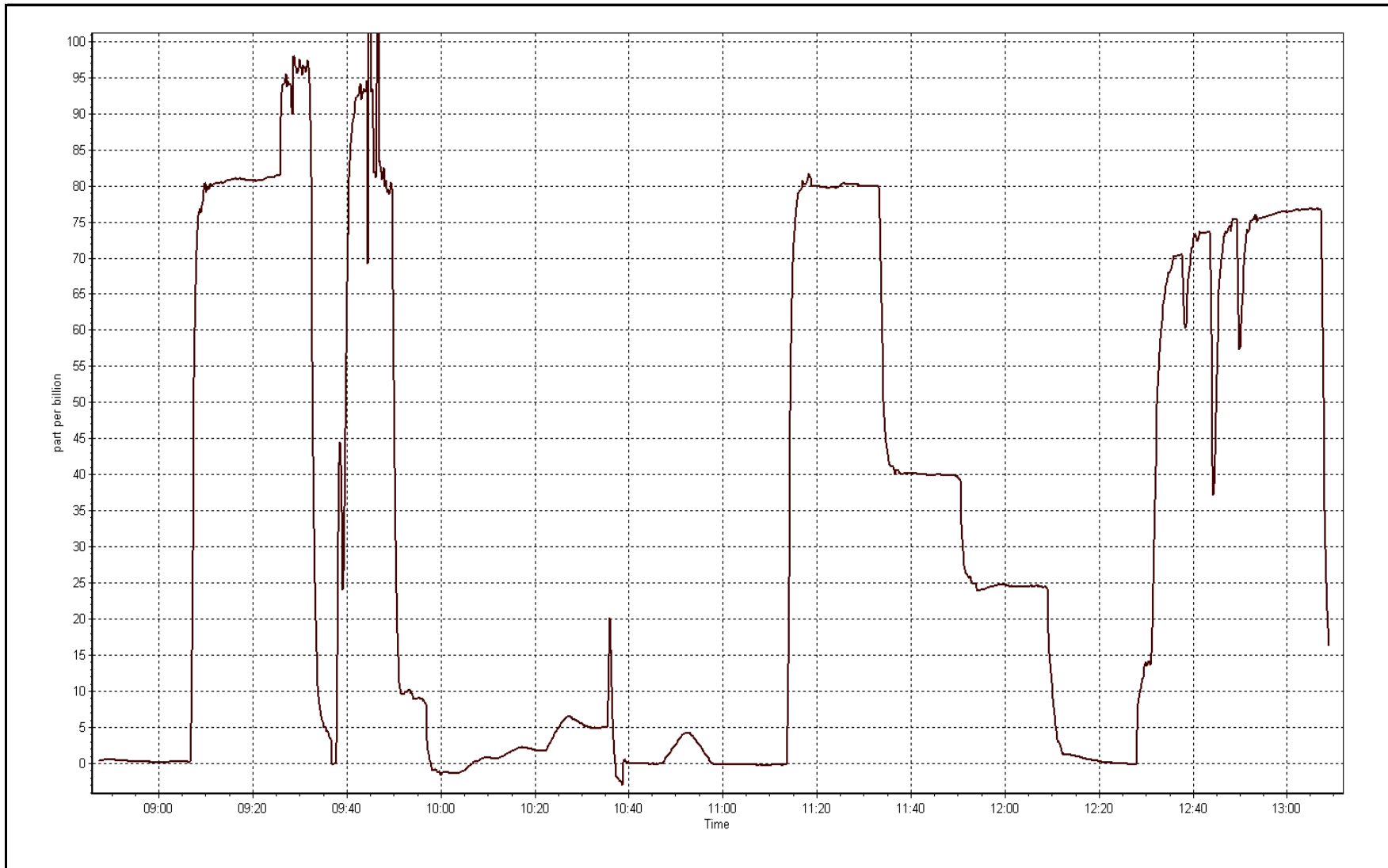
Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999957
80.0	80.0	1.0002		
40.0	40.0	1.0002	Slope	0.996424
25.0	24.5	1.0222		
			Intercept	0.315264





H2S Calibration Plot

Date: December 16, 2015





# Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

## Station Information

Calibration Date	December 11, 2015	Previous Calibration	November 24, 2015
Station Name	Statoil	Station Number	AMS 501
Reason:	Routine		
Start Time (MST)	8:45	End Time (MST)	12:18
NO Cal Gas Conc	47.5 ppm	Gas Cert Reference	S990374A
NOx Cal Gas Conc	47.5 ppm	Cal Gas Expiry Date	26-Sep-17
Calibrator	Sabio 4010	Serial Number	11581008
Zero air Generator	Teledyne API T701	Serial Number	4522

## DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	2579
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## Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.997944	0.995818	1.010237
	Data Offset	1.450140	1.508190	-0.762311
Current Calibration	Data Slope	0.998673	0.999258	1.027093
	Data Offset	1.933621	1.956048	-0.185896

## Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1118148498
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	0.852		0.835	
NOx coefficient	0.996		0.999	
NO2 coefficient	1.000		1.000	
NO bkgrnd	4.4		4.4	
NOx bkgrnd	4.5		4.5	
Chamber Temp	50	Deg C	50	Deg C
Moly Temp	322.6	Deg C	324.7	Deg C
PMT voltage	-756.3	V	-756.7	V
PMT Temp	-2.8	Deg C	-3.1	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	183.7	mmHg	182.2	mmHg
R Cell Press Nox	183.7	mmHg	182.2	mmHg
NO sample flow	0.723	lpm	0.733	lpm
Nox sample Flow	0.724	lpm	0.733	lpm

**Notes:**

Span adjusted, Due to drift during the GPT, the second high GPT point used, filter changed out,



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

### Station Information

Calibration Date: December 11, 2015 Station Number: AMS 501

### Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	-0.5	-0.4	-0.1	----	----
as found span	5000	63.1	599.5	599.5	0.0	611.5	612.0	-0.6	0.9803	0.9795
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.5	-0.4	-0.1	----	----
high point	5000	63.1	599.5	599.5	0.0	599.0	598.6	0.3	1.0008	1.0014
second point	5000	31.6	300.2	300.2	0.0	298.0	298.0	0.1	1.0074	1.0074
third point	5000	15.8	150.1	150.1	0.0	146.9	146.5	0.4	1.0218	1.0246
as left zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.3	-0.1	----	----
as left span	5000	63.1	599.5	291.1	308.4	606.5	302.8	303.8	0.9884	0.9614
Average Correction Factor									1.0100	1.0111

Corrected As found NO<sub>x</sub>= 612.0 NO= 612.4 Percent Change NO<sub>x</sub>= -2.1% NO= -1.9%  
 Previous Response NO<sub>x</sub>= 599.2 NO= 600.5

### GPT Calibration Data

Dilution Flow 5000 ccm Source Gas Flow 63.10 ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero			0.0			-0.1			N/A	
1st NO2 (300)	----	291.1	312.9	595.8	291.1	304.7	0.9936	1.0000	1.0269	97.4%
2nd NO2 (200)	----	408.4	195.6	598.9	408.4	190.5	0.9884	1.0000	1.0268	97.4%
3rd NO2 (100)	----	489.1	114.9	601.7	489.1	112.6	0.9838	1.0000	1.0204	98.0%
4th NO2 (0)	604.0	----	-0.5	603.5	604.0	-0.4	0.9809	1.0000	N/A	----
Average Correction Factor							0.9867	1.0000	1.0247	97.6%

Calibration Performed By: Melissa Lemay



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

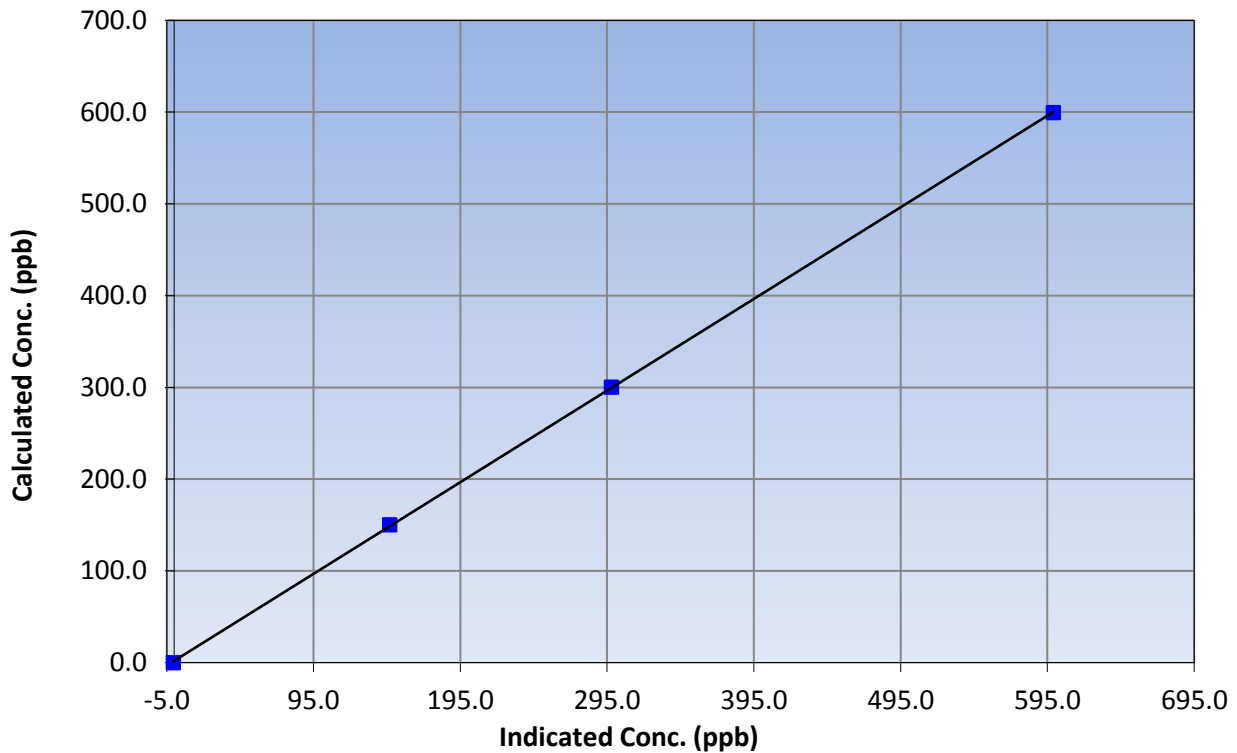
### Station Information

Calibration Date	December 11, 2015	Previous Calibration	November 24, 2015
Station Name	Statoil	Station Number	AMS 501
Start Time (MST)	8:45	End Time (MST)	12:18
Analyzer make	Thermo 42i	Analyzer serial #	1118148498

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.5	----	Correlation Coefficient	0.999974
599.5	599.0	1.0008		
300.2	298.0	1.0074	Slope	0.998673
150.1	146.9	1.0218		
			Intercept	1.933621

### NO<sub>x</sub> Calibration Curve





# Wood Buffalo Environmental Association

## NO Calibration Summary

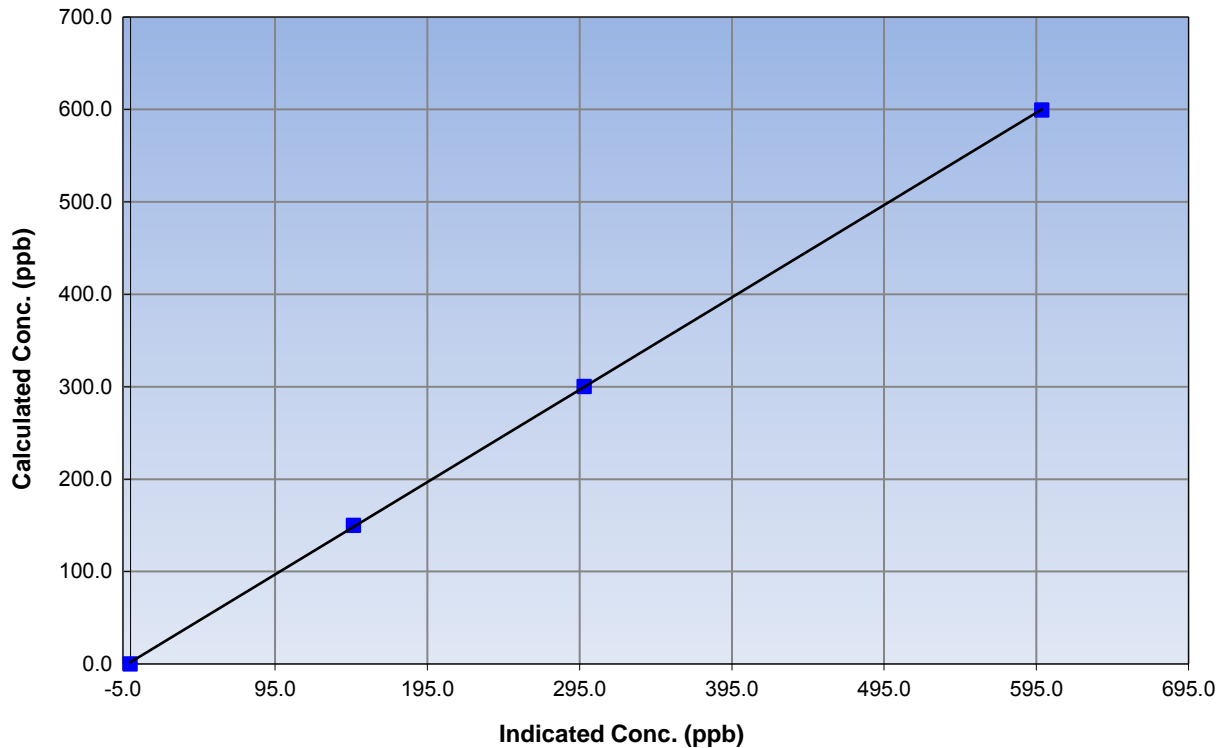
### Station Information

Calibration Date	December 11, 2015	Previous Calibration	November 24, 2015
Station Name	Statoil	Station Number	AMS 501
Start Time (MST)	8:45	End Time (MST)	12:18
Analyzer make	Thermo 42i	Analyzer serial #	1118148498

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	N/A	Correlation Coefficient	0.999969
599.5	598.6	1.0014		
300.2	298.0	1.0074	Slope	0.999258
150.1	146.5	1.0246		
			Intercept	1.956048

### NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

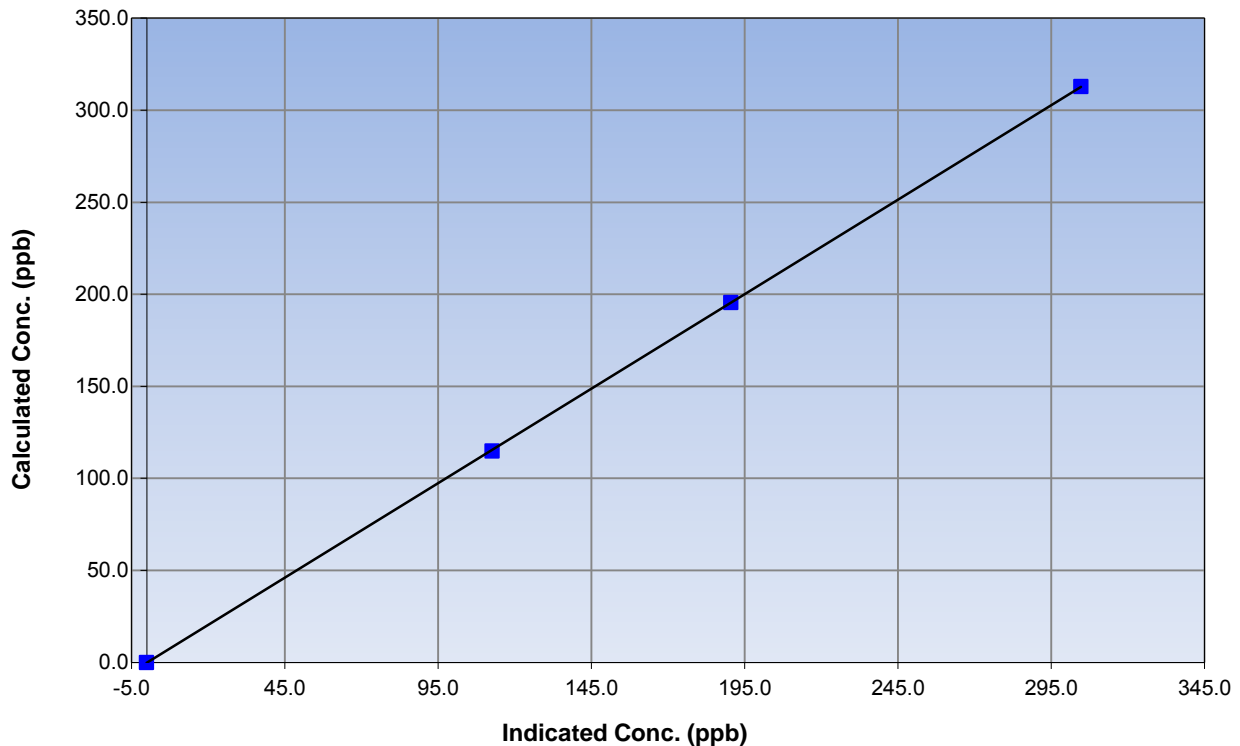
### Station Information

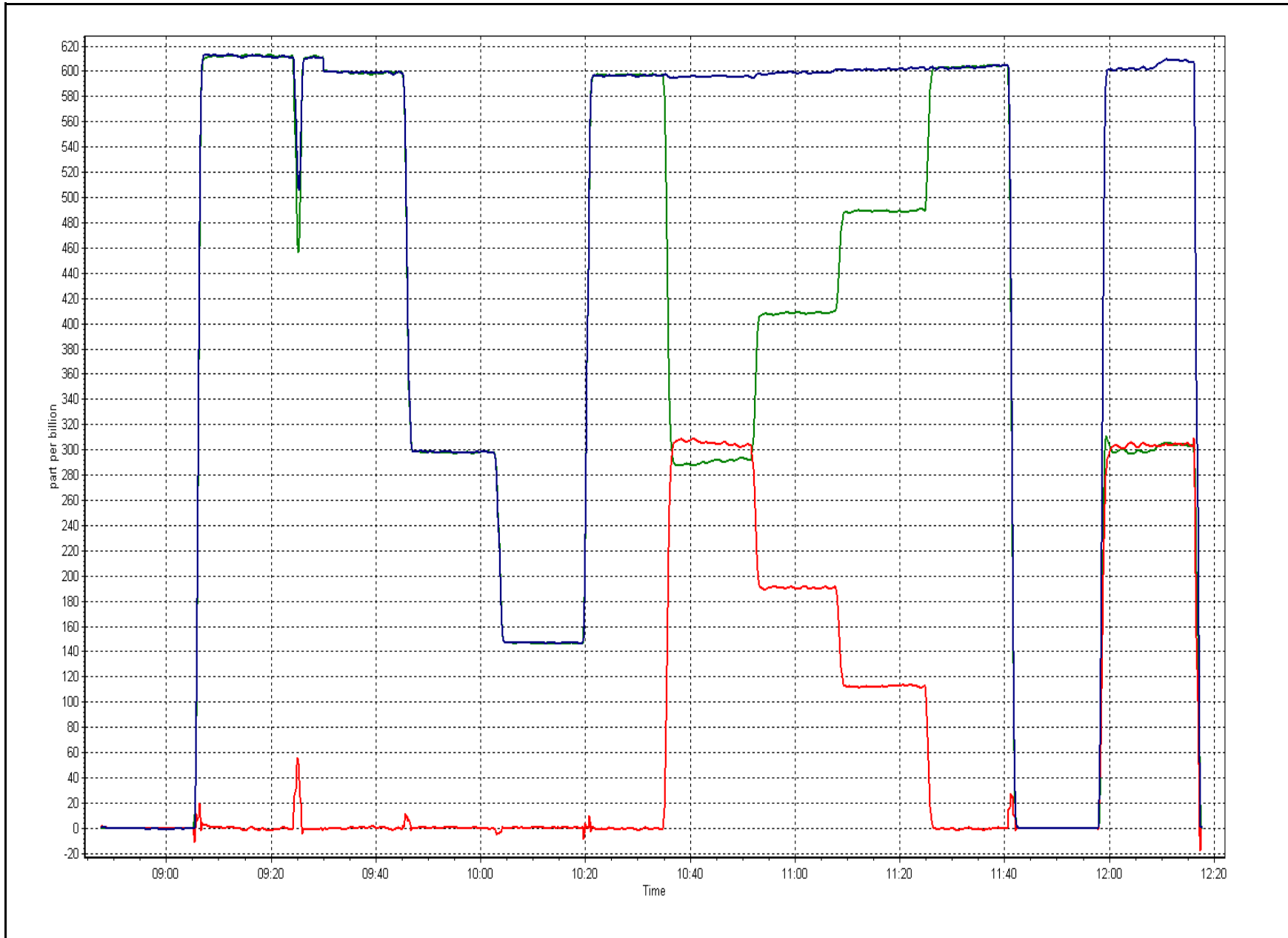
Calibration Date	December 11, 2015	Previous Calibration	November 24, 2015
Station Number	Statoil	Station Number	AMS 501
Start Time (MST)	8:45	End Time (MST)	12:18
Analyzer make	Thermo 42i	Analyzer serial #	1118148498

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999991
312.9	304.7	1.0269		
195.6	190.5	1.0268	Slope	1.027093
114.9	112.6	1.0204		
			Intercept	-0.185896

### NO<sub>2</sub> Calibration Curve







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## WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY  
MONITORING PROGRAM  
MONTHLY REPORT

**AMS 502  
CONOCOPHILLIPS  
SURMONT  
DECEMBER 2015**

Operations, Data Collection,  
QA/QC, Data Validation and Reporting by:  
Wood Buffalo Environmental Association  
Fort McMurray, Alberta

January 27, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONOCOPHILLIPS SURMONT (AMS 502)  
 DECEMBER 2015

MONTHLY SUMMARY for  
 AMD SECTION III.B.1(c)

Parameter	Hours of Data	Hours of Calibration	Hours without Data	Operational Time	Maximum 1-Hour Value	1-Hour Exceedances	Maximum 24-Hour Value	24-Hour Exceedances
SO2 (ppb) Average	707	37	37	100.00	11	0	3	0
H2S (ppb) Average	706	34	38	99.46	1	0	1	0
NO2 (ppb) Average	700	37	44	99.06	20	0	8	-
NO (ppb) Average	700	37	44	99.06	15	-	4	-
NOX (ppb) Average	700	37	44	99.06	22	-	9	-
Temperature 2 m (C) Average	744	0	0	100.00	7.2	-	3.2	-
Relative Humidity (%) Average	744	0	0	100.00	97	-	96	-
Wind Speed 10 m (km/h) Average	707	0	37	95.03	42	-	28	-
Wind Direction 10 m (deg) Average	707	0	37	95.03	-	-	-	-

Note : Operational time includes periods of data collection and instrument calibration

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONOCOPHILLIPS SURMONT (AMS 502)  
 DECEMBER 2015

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	707	0.8	1	-	0	0	0	0	1	2	11
H2S (ppb) Average	706	0.2	0	-	0	0	0	0	0	0	1
NO2 (ppb) Average	700	3.2	2	-	0	1	2	3	4	6	20
NO (ppb) Average	700	1.4	2	-	0	0	0	1	2	3	15
NOX (ppb) Average	700	4.6	3	-	0	1	2	4	6	9	22
Temperature 2 m (C) Average	744	-9.24	6.6	-	-23.2	-18.2	-14.9	-8	-4.5	-0.8	7.2
Relative Humidity (%) Average	744	81.6	14	-	17	64	80	85	90	94	97
Wind Speed 10 m (km/h) Average	707	8.7	7	-	0	3	4	6	9	20	42
Wind Direction 10 m (deg) Average	707	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONOCOPHILLIPS SURMONT (AMS 502)  
DECEMBER 2015

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
H2S	07 Dec 2015 08:00	07 Dec 2015 08:00	1	Unstable operation - excessive baseline drift
H2S	08 Dec 2015 12:00	08 Dec 2015 12:00	1	Maintenance - sample manifold cleaned
H2S	12 Dec 2015 01:00	12 Dec 2015 02:00	2	Unstable operation - excessive baseline drift
NO2, NO, NOX	24 Dec 2015 19:00	24 Dec 2015 19:00	1	Unstable operation - excessive baseline drift
NO2, NO, NOX	28 Dec 2015 11:00	28 Dec 2015 12:00	2	Unstable operation - excessive baseline drift
NO2, NO, NOX	28 Dec 2015 23:00	29 Dec 2015 00:00	2	Unstable operation - excessive baseline drift
NO2, NO, NOX	29 Dec 2015 23:00	30 Dec 2015 00:00	2	Unstable operation - excessive baseline drift
Wind Speed, Wind Direction	13 Dec 2015 01:00	13 Dec 2015 02:00	2	Flat line in sensor output signal - sensor frozen
Wind Speed, Wind Direction	13 Dec 2015 22:00	15 Dec 2015 04:00	31	Flat line in sensor output signal - sensor frozen
Wind Speed, Wind Direction	24 Dec 2015 21:00	24 Dec 2015 22:00	2	Flat line in sensor output signal - sensor frozen
Wind Speed, Wind Direction	28 Dec 2015 20:00	28 Dec 2015 20:00	1	Flat line in sensor output signal - sensor frozen
Wind Speed, Wind Direction	29 Dec 2015 00:00	29 Dec 2015 00:00	1	Flat line in sensor output signal - sensor frozen



Summary of Hour Averages

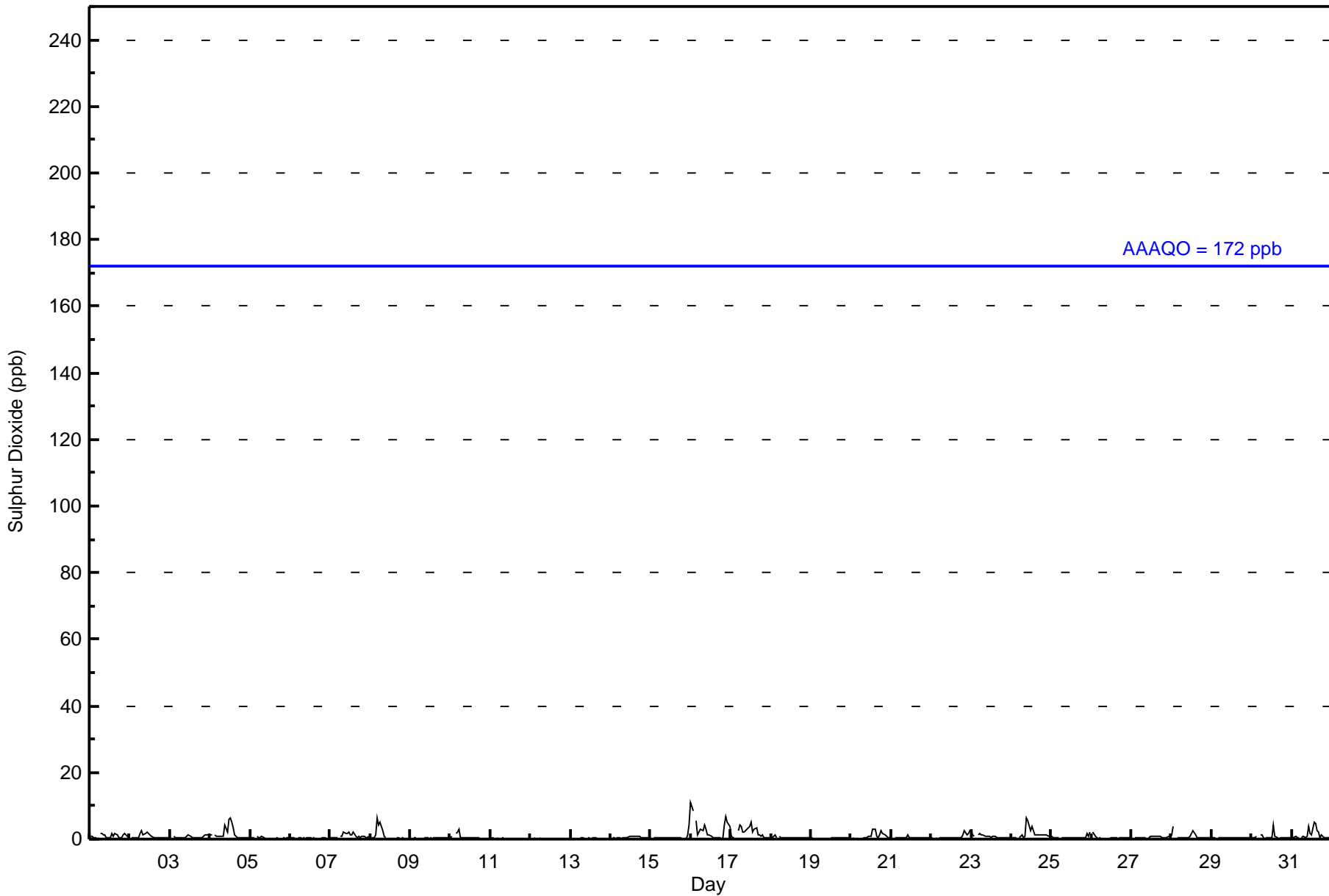
ConocoPhillips - Surmont - December 2015

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 11 ppb on Dec 16 01:00	Maximum Daily Average: 2.9 ppb on Dec 16
Minimum Value: 0 ppb on Dec 19 09:00	Hours of Data: 707
Maximum Diurnal Average: 1.2 ppb at hour 14	Hours of Missing Data: 37
Monthly Average: 0.8 ppb	Hours of Calibration: 37
Minimum Daily Average: 0.1 ppb on Dec 12	Percent Operational Time: 100.0
Minimum Diurnal Average: 0.4 ppb at hour 3	
Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 1 P <sub>90</sub> = 2 P <sub>99</sub> = 6	

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	1	1	0	0	1	Z	2	2	1	1	0	0	0	2	1	2	1	0	1	1	1	2	1	1	0.9	2
2-Dec	Z	1	0	0	0	0	2	2	1	2	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0.8	2
3-Dec	0	Z	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0.6	1
4-Dec	1	1	Z	1	1	1	1	1	1	4	2	6	6	5	3	1	0	1	1	0	1	1	0	0	1.7	6
5-Dec	0	0	0	Z	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
6-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
7-Dec	0	0	0	0	0	Z	1	1	2	2	2	2	1	1	2	1	1	1	1	1	1	0	0	1	1.0	2
8-Dec	Z	1	1	1	6	4	5	2	1	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	--	6
9-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
10-Dec	0	1	Z	1	2	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	3
11-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
12-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
13-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
14-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0.4	1
15-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0.5	4
16-Dec	11	9	Z	5	1	2	3	3	4	3	1	1	1	1	1	0	0	0	0	0	4	7	5	4	2.9	11
17-Dec	1	0	0	Z	2	4	4	2	2	2	3	4	5	2	3	3	1	1	1	1	1	0	0	0	2.0	5
18-Dec	0	0	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.4	1
19-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0.3	1
20-Dec	Z	0	0	0	0	0	0	0	0	0	1	1	1	3	3	1	0	1	3	2	1	1	0	1	0.9	3
21-Dec	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0.4	1
22-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	2	2	0.6	2
23-Dec	2	1	1	Z	1	2	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.8	2
24-Dec	0	0	0	0	Z	1	1	1	1	6	6	3	4	3	1	1	1	1	1	1	1	1	1	1	1.6	6
25-Dec	1	1	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	0.6	2
26-Dec	Z	2	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.4	2
27-Dec	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1
28-Dec	1	4	Z	1	0	0	0	0	0	0	0	1	2	2	1	1	0	0	0	0	0	0	0	0	0.8	4
29-Dec	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1
30-Dec	0	0	0	1	Z	1	1	0	0	0	1	0	0	4	1	0	0	0	0	0	0	0	0	0	0.6	4
31-Dec	1	1	1	1	1	Z	1	1	1	1	4	2	1	5	4	3	2	0	1	1	0	0	0	0	1.3	5

0.9	1.0	0.4	0.7	0.8	1.0	0.9	0.7	0.7	0.9	0.9	0.9	1.0	1.2	1.0	0.7	0.5	0.4	0.5	0.5	0.6	0.7	0.6	0.8	Diurnal Average	
11	9	1	5	6	4	5	3	4	6	6	6	6	6	5	4	3	2	1	3	2	4	7	5	4	Diurnal Maximum

Z - zerospan      C - Calibration  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb    24-hr 48 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**ConocoPhillips - Surmont - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 10	706	99.86	99.86
11 - 20	1	0.14	100.00
21 - 60	0	0.00	100.00
61 - 110	0	0.00	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744





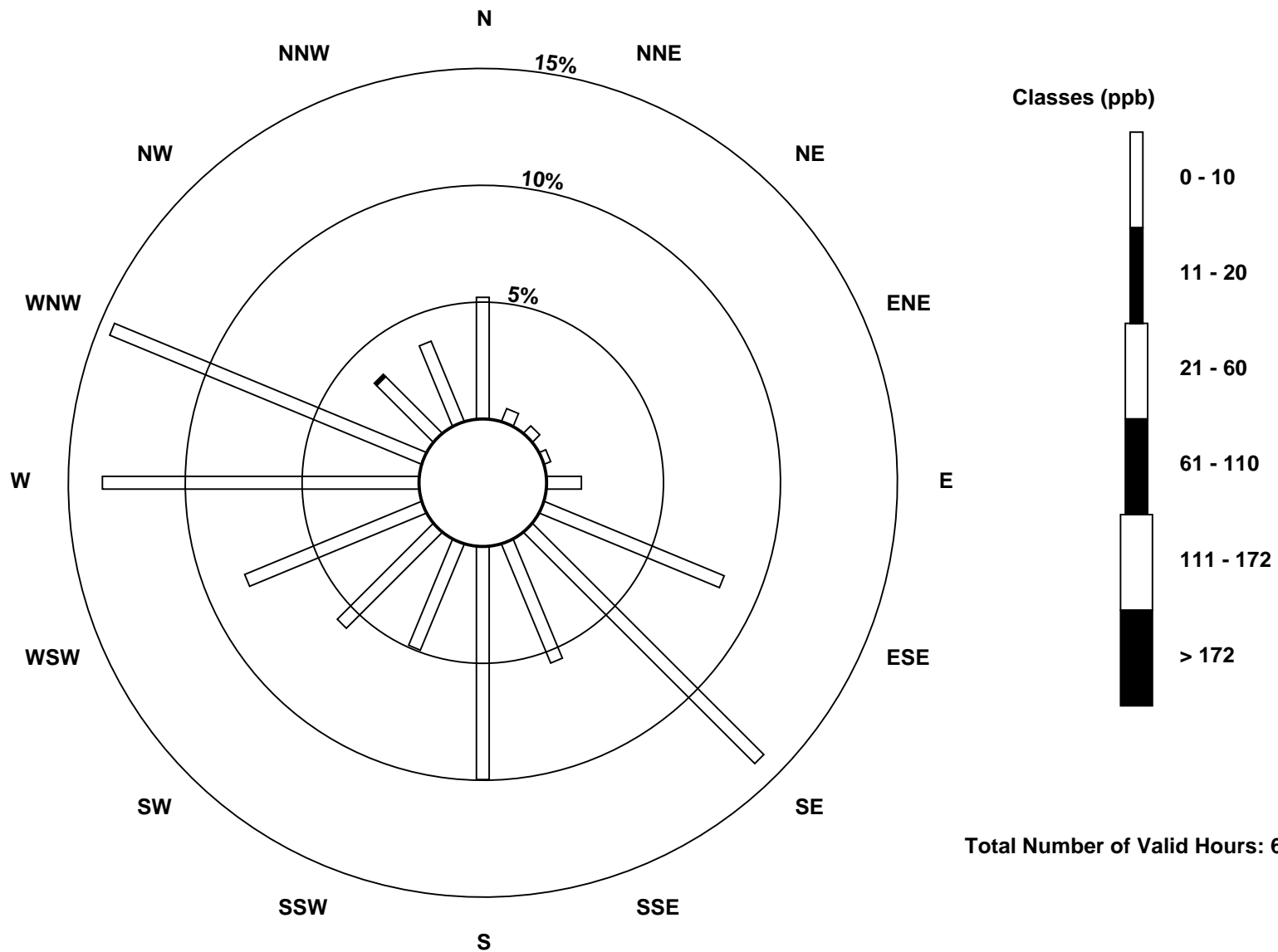
**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Sulphur Dioxide (SO<sub>2</sub>) - ppb**  
**ConocoPhillips - Surmont - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	35	4	3	2	10	56	94	37	67	33	39	55	91	97	23	25	671
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111 - 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 172	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	35	4	3	2	10	56	94	37	67	33	39	55	91	97	24	25	672

Total Number of Valid Hours: 672

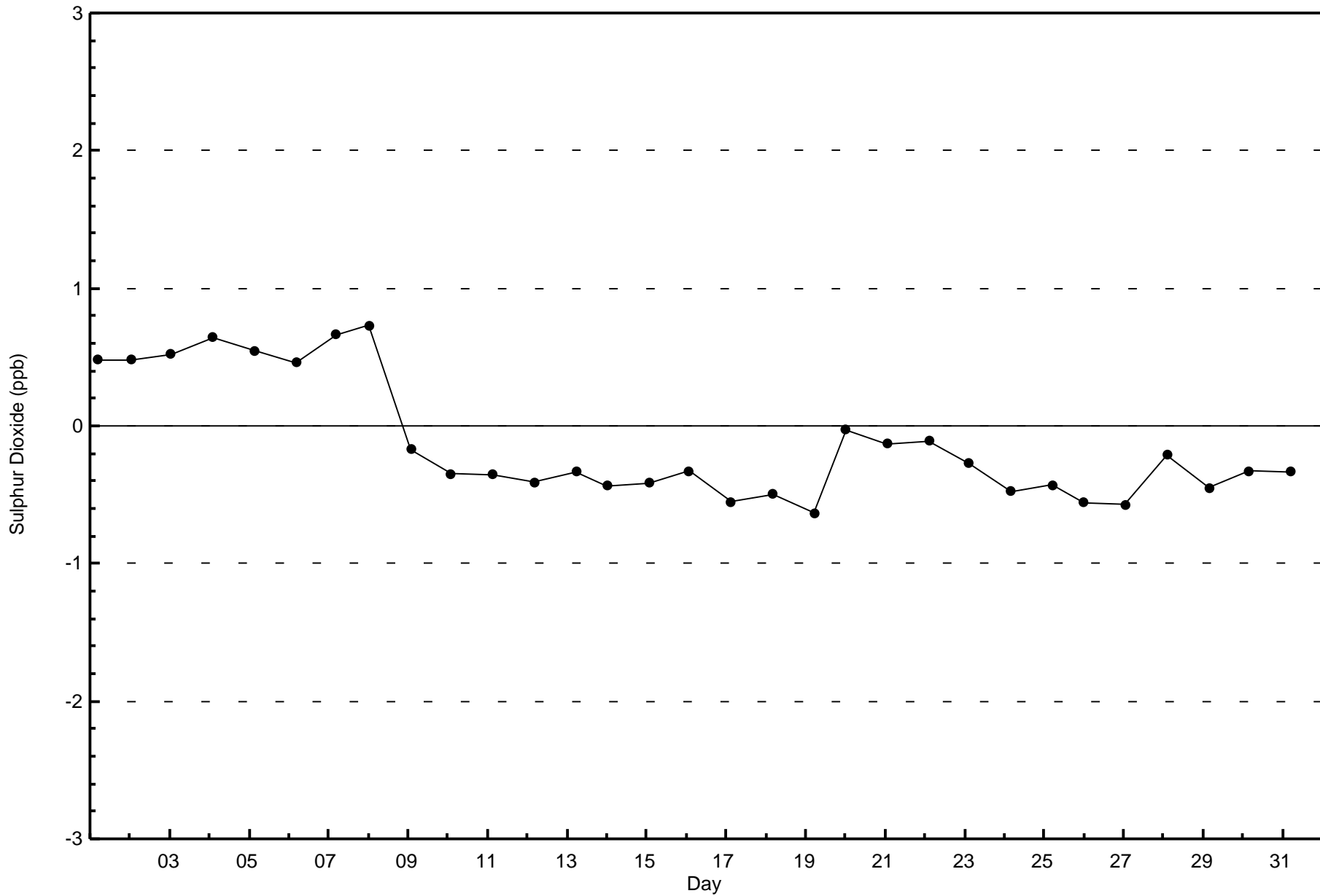
Total Number of Hours: 744

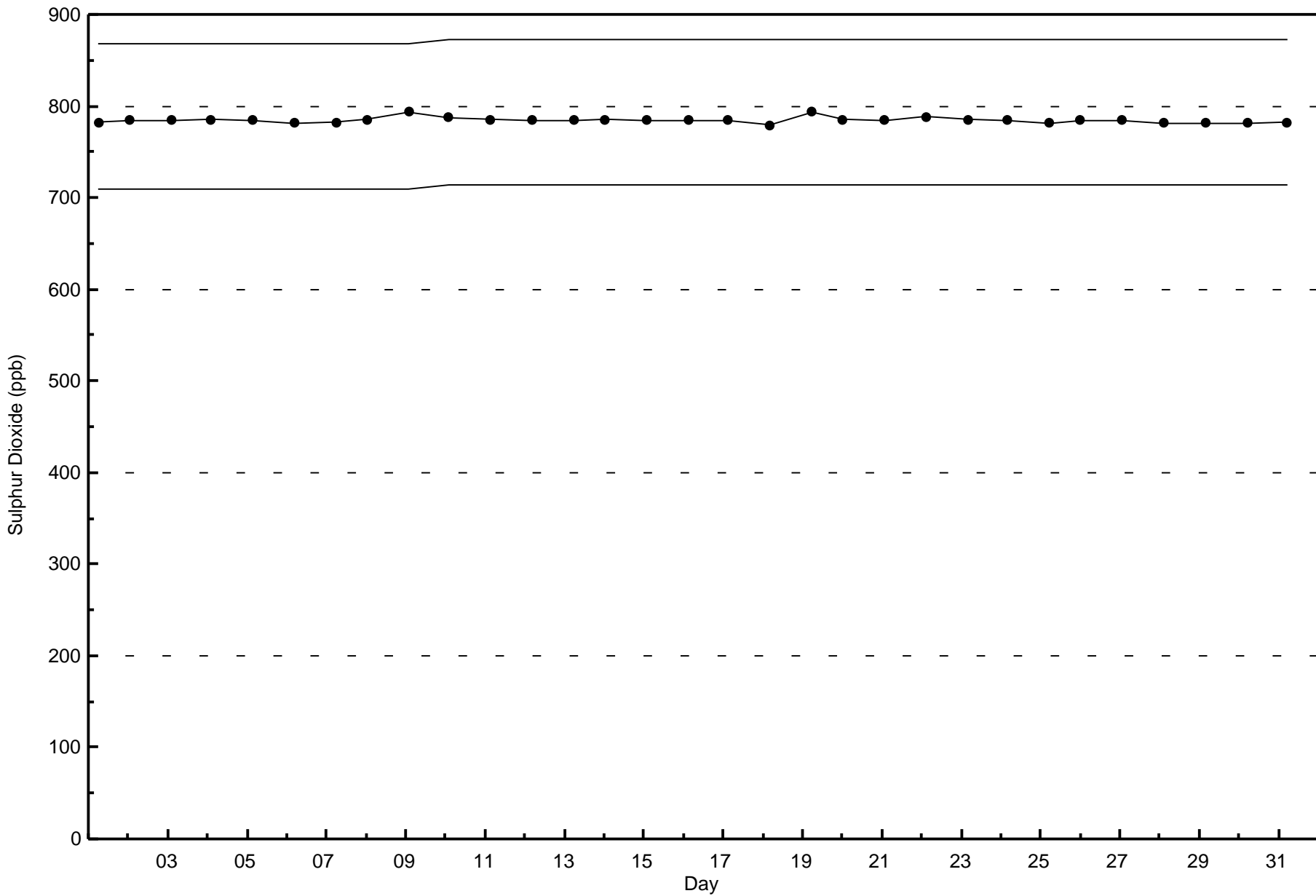




Wood Buffalo Environmental Association  
Zero Responses

Sulphur Dioxide (SO<sub>2</sub>) - ppb  
ConocoPhillips - Surmont - December 2015





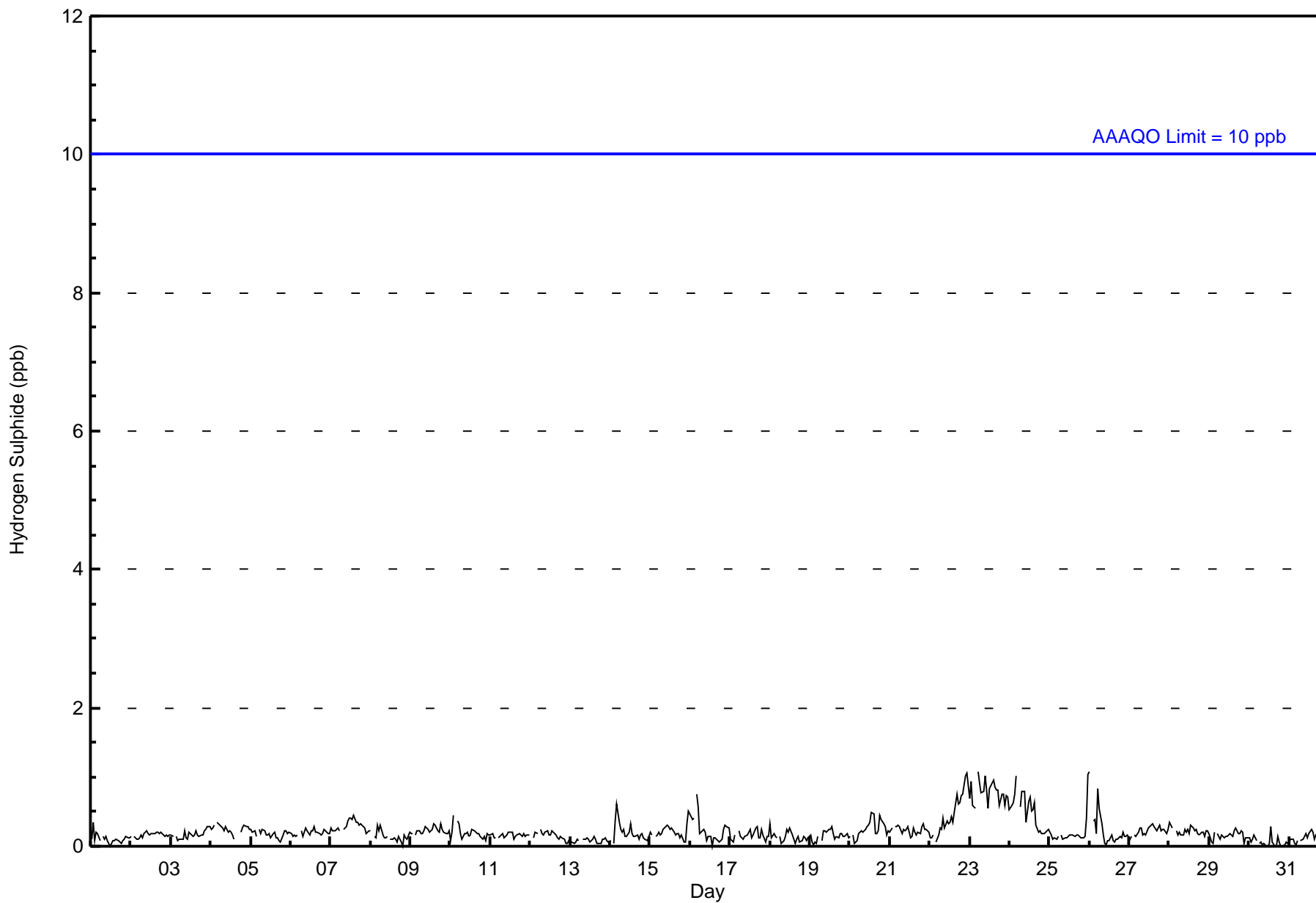


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 1 ppb on Dec 23 06:00	Maximum Daily Average: 0.8 ppb on Dec 23		Hours of Data:	706
Minimum Value: 0 ppb on Dec 8 20:00	Minimum Daily Average: 0.1 ppb on Dec 30		Hours of Missing Data:	38
Maximum Diurnal Average: 0.3 ppb at hour 6	Minimum Diurnal Average: 0.2 ppb at hour 18		Hours of Calibration:	34
Monthly Average: 0.2 ppb	Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 0 Q <sub>3</sub> = 0 P <sub>90</sub> = 0 P <sub>99</sub> = 1		Percent Operational Time:	99.5

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
2-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0.3	0
5-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
6-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
7-Dec	0	0	0	0	0	0	Z	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
8-Dec	0	Z	0	0	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
9-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
10-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
11-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
12-Dec	UO	UO	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
13-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
14-Dec	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
15-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1
16-Dec	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
17-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
18-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
19-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
20-Dec	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
21-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
22-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0.5	1
23-Dec	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1
24-Dec	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.5	1
25-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1
26-Dec	1	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
27-Dec	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
28-Dec	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
29-Dec	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
30-Dec	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
31-Dec	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0

0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	Diurnal Average
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Diurnal Maximum

Z - zerospan                      C - Calibration                      M - Maintenance                      UO - Unstable Operation  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb    24-hr 3 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**ConocoPhillips - Surmont - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 2	706	100.00	100.00
3 - 4	0	0.00	100.00
5 - 7	0	0.00	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 706

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Hydrogen Sulphide (H<sub>2</sub>S) - ppb**  
**ConocoPhillips - Surmont - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	36	3	5	2	10	57	91	37	68	35	38	55	90	96	23	25	671
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	36	3	5	2	10	57	91	37	68	35	38	55	90	96	23	25	671

Total Number of Valid Hours: 671

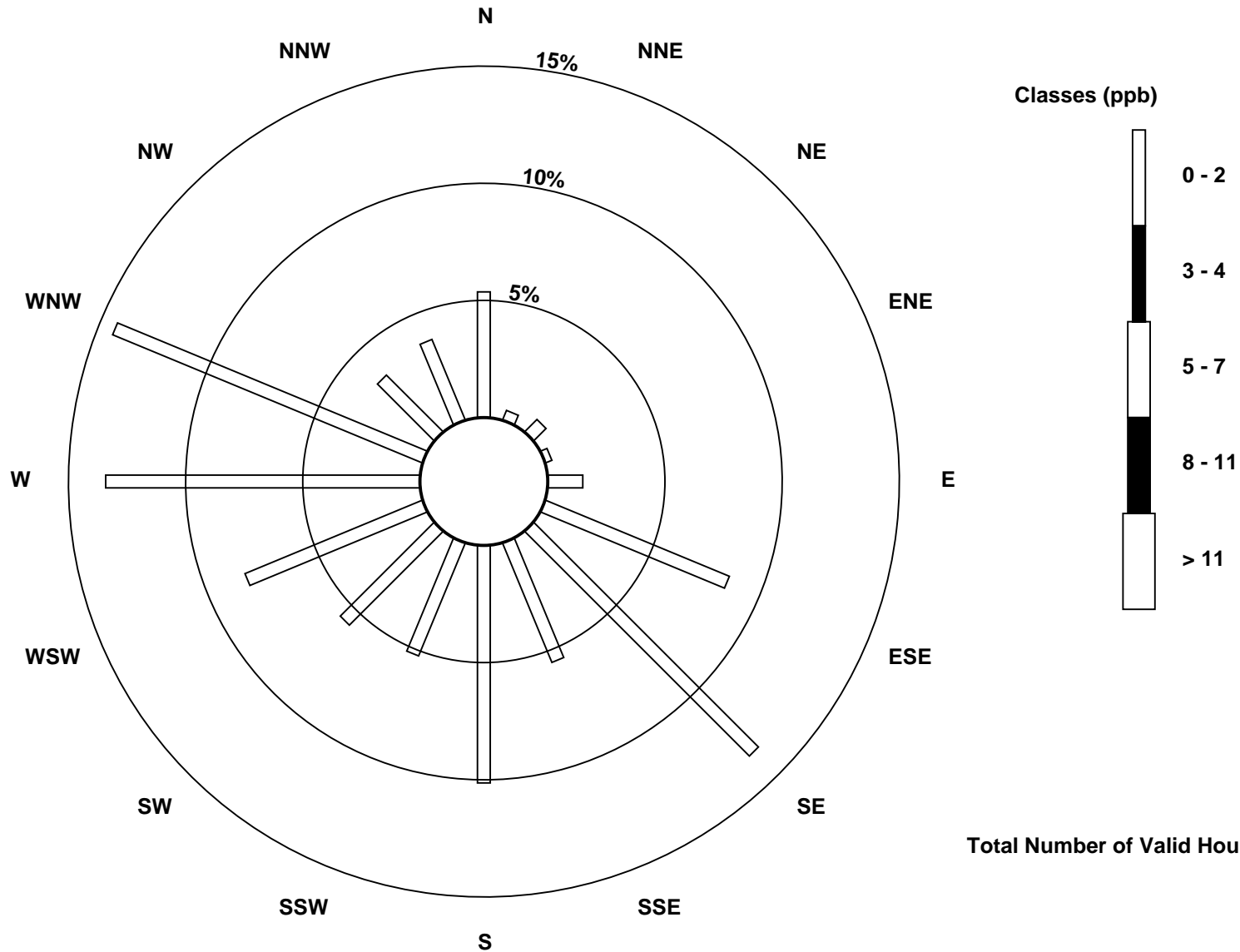
Total Number of Hours: 744

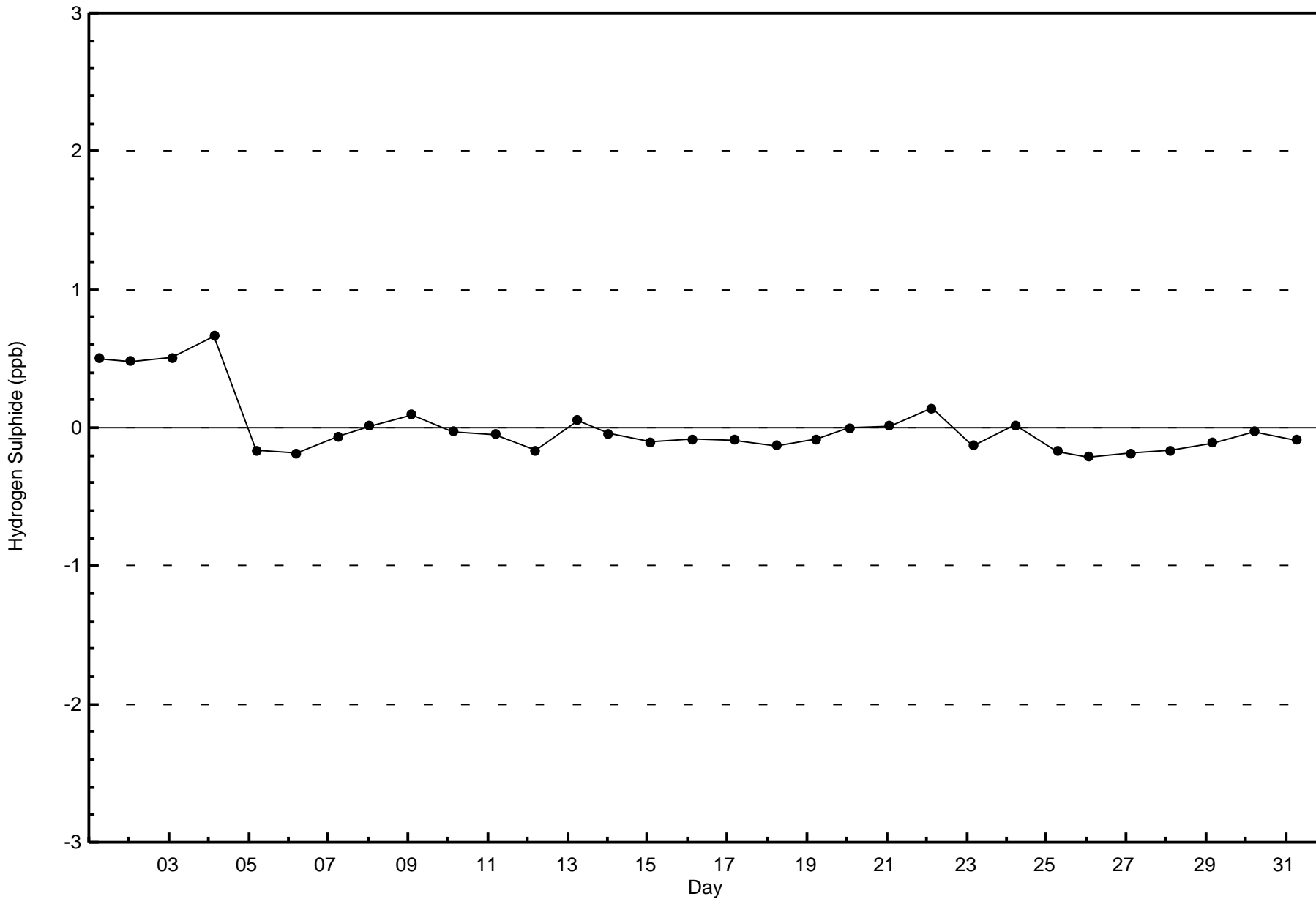


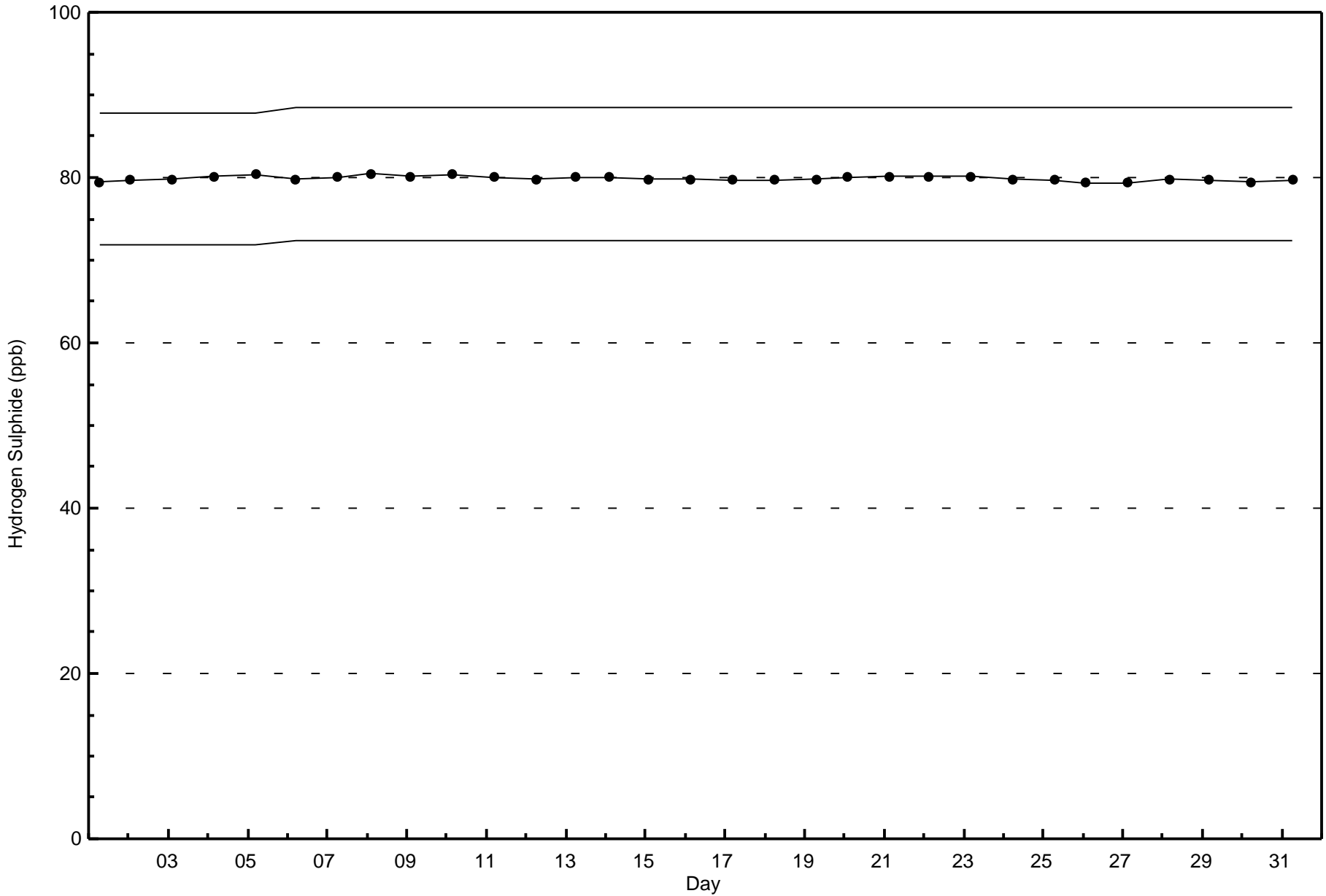


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Hydrogen Sulphide (H<sub>2</sub>S) - ppb  
ConocoPhillips - Surmont (AMS502)

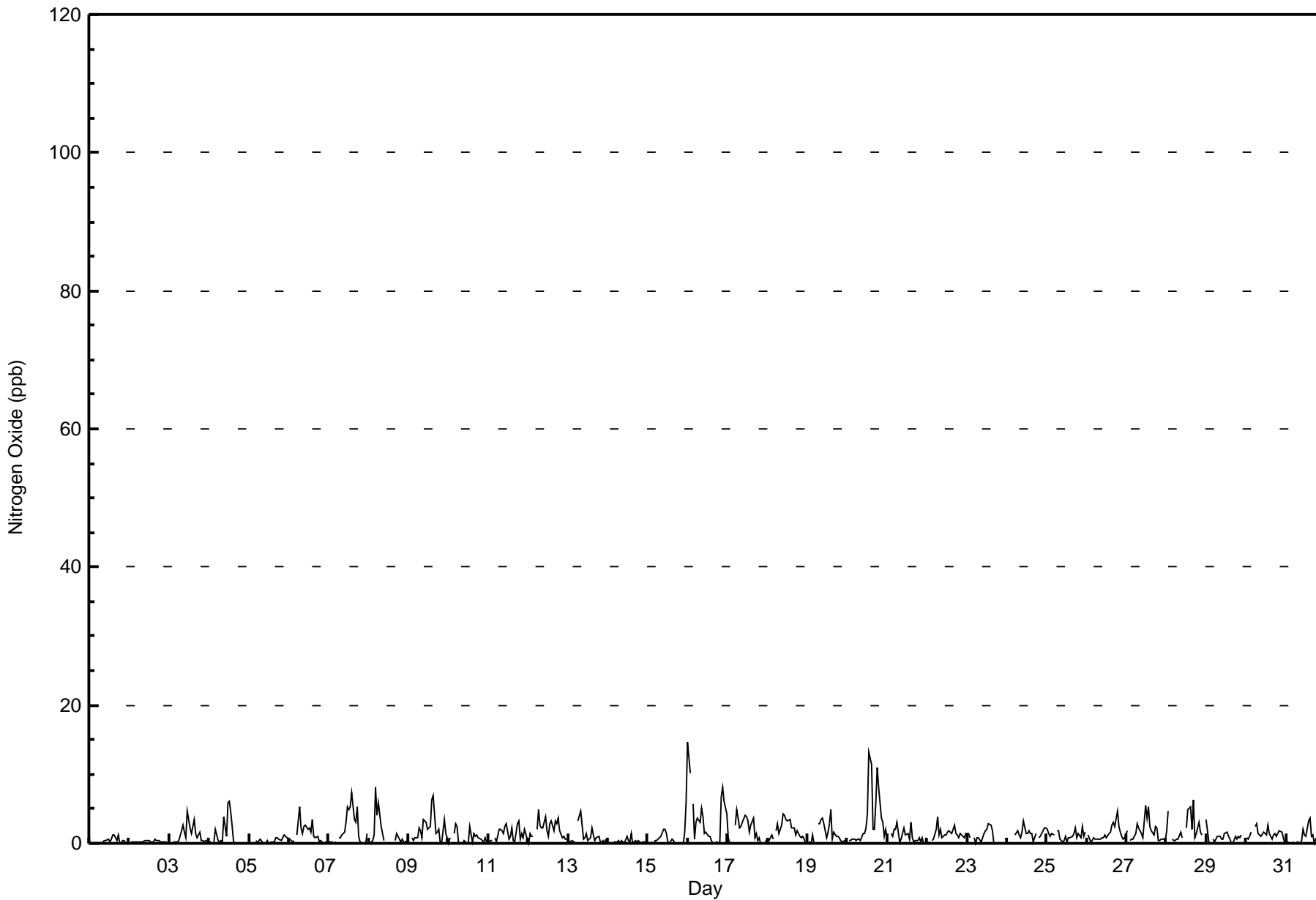








Maximum Value: 15 ppb on Dec 16 01:00		Maximum Daily Average: 3.5 ppb on Dec 16		Hours in Service: 744																										
Minimum Value: 0 ppb on Dec 1 02:00		Minimum Daily Average: 0.3 ppb on Dec 2		Hours of Data: 700																										
Maximum Diurnal Average: 2.7 ppb at hour 15		Minimum Diurnal Average: 0.4 ppb at hour 3		Hours of Missing Data: 44																										
Monthly Average: 1.4 ppb		Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 0 Q <sub>1</sub> = 0 Median = 1 Q <sub>3</sub> = 2 P <sub>90</sub> = 3 P <sub>99</sub> = 8		Hours of Calibration: 37																										
				Percent Operational Time: 99.1																										
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24						
1-Dec	0	0	0	0	0	Z	0	0	0	0	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0.3	1				
2-Dec	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.3	1				
3-Dec	0	Z	0	0	0	0	0	2	3	2	1	5	2	1	2	4	1	1	2	0	0	0	0	0	1.2	5				
4-Dec	0	0	Z	0	2	0	0	0	0	4	1	6	6	4	2	0	0	0	0	0	0	0	0	0	1.2	6				
5-Dec	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	1	0.4	1				
6-Dec	1	0	0	0	Z	1	5	2	1	3	3	2	2	2	3	1	1	1	0	0	0	0	0	0	1.3	5				
7-Dec	0	0	0	0	0	Z	1	1	1	2	3	5	5	5	7	3	3	5	1	0	0	0	0	1	2.0	7				
8-Dec	Z	0	0	1	8	4	6	2	1	0	C	C	C	C	C	C	0	1	1	0	1	0	0	0	--	8				
9-Dec	0	Z	1	0	1	1	2	2	1	3	3	2	2	2	6	7	1	2	2	0	0	3	1	1	2.0	7				
10-Dec	0	1	Z	1	3	3	0	0	0	0	0	0	0	2	0	1	1	1	1	1	0	0	1	0	0.8	3				
11-Dec	0	0	0	Z	1	0	2	2	2	2	2	3	1	1	2	0	0	3	3	1	1	1	2	1	1.3	3				
12-Dec	0	1	1	1	Z	2	5	3	2	2	4	2	1	3	3	2	3	3	4	2	1	1	1	1	2.0	5				
13-Dec	1	0	0	0	0	Z	3	5	3	1	1	1	0	1	2	1	0	1	1	0	0	1	0	1	1.0	5				
14-Dec	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0.3	2				
15-Dec	0	Z	0	0	0	0	1	1	1	2	2	1	0	0	1	0	0	0	0	0	0	0	2	6	0.8	6				
16-Dec	15	10	Z	6	1	3	4	3	5	4	1	2	1	1	0	0	0	0	0	0	7	8	6	4	3.5	15				
17-Dec	1	0	0	Z	3	5	4	2	2	3	4	4	3	2	3	4	1	1	0	1	0	0	0	0	1.9	5				
18-Dec	0	0	1	1	Z	2	3	1	3	4	4	3	3	3	2	2	2	1	2	1	1	1	1	0	1.9	4				
19-Dec	0	0	0	1	0	Z	3	3	4	4	3	1	2	3	5	1	2	1	1	1	0	0	0	0	1.5	5				
20-Dec	Z	0	0	1	1	0	1	1	0	1	1	2	4	13	11	2	2	6	11	8	4	3	1	2	3.3	13				
21-Dec	1	Z	1	1	2	2	3	0	1	2	2	1	1	1	3	1	0	0	0	1	0	1	0	0	1.1	3				
22-Dec	0	0	Z	0	1	2	4	1	2	1	1	1	2	2	2	1	3	1	1	1	1	1	1	1	1.3	4				
23-Dec	1	1	1	Z	1	0	1	1	0	1	1	2	2	3	2	0	0	0	0	0	0	0	0	0	0.8	3				
24-Dec	0	0	0	0	Z	1	2	1	1	2	3	1	1	2	1	1	0	1	UO	1	1	1	2	2	1.2	3				
25-Dec	2	1	1	1	1	Z	2	2	1	0	1	1	0	1	1	1	1	2	1	1	1	2	1	2	1.2	2				
26-Dec	Z	1	0	0	1	1	1	1	1	1	1	1	1	1	2	3	3	2	5	2	2	1	1	1	1.3	5				
27-Dec	2	Z	1	1	1	2	3	2	2	1	1	6	4	5	2	2	1	2	2	0	0	1	1	0	1.8	6				
28-Dec	2	5	Z	1	0	0	1	1	2	1	UO	UO	2	5	5	2	6	1	1	3	2	1	UO	UO	2.1	6				
29-Dec	4	0	0	Z	1	0	1	1	1	1	1	1	2	1	1	0	0	1	1	1	1	1	1	UO	UO	0.9	4			
30-Dec	1	1	1	2	Z	3	3	1	1	1	2	1	1	3	1	1	1	1	1	1	2	2	1	0	1.4	3				
31-Dec	0	0	0	0	0	Z	0	0	0	0	2	1	1	3	4	1	1	0	1	0	0	0	0	0	0.7	4				
		1.1	1.0	0.4	0.8	1.1	1.3	1.9	1.4	1.3	1.5	1.7	2.0	1.7	2.4	2.7	1.5	1.2	1.4	1.4	0.9	0.9	1.0	0.8	0.9	Diurnal Average				
		15	10	1	6	8	5	6	5	5	4	4	6	6	13	11	7	6	6	6	11	8	7	8	6	6	Diurnal Maximum			
Z - zerospan		C - Calibration					UO - Unstable Operation																							





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb**  
**ConocoPhillips - Surmont - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	700	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 700

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Oxide (NO) - ppb**  
**ConocoPhillips - Surmont - December 2015**

<b>Concentration</b> <b>Ranges (ppb)</b>	<b>Wind Direction</b>																<b>Totals</b>
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	35	4	3	2	10	56	94	37	67	33	38	52	90	97	24	24	666
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	35	4	3	2	10	56	94	37	67	33	38	52	90	97	24	24	666

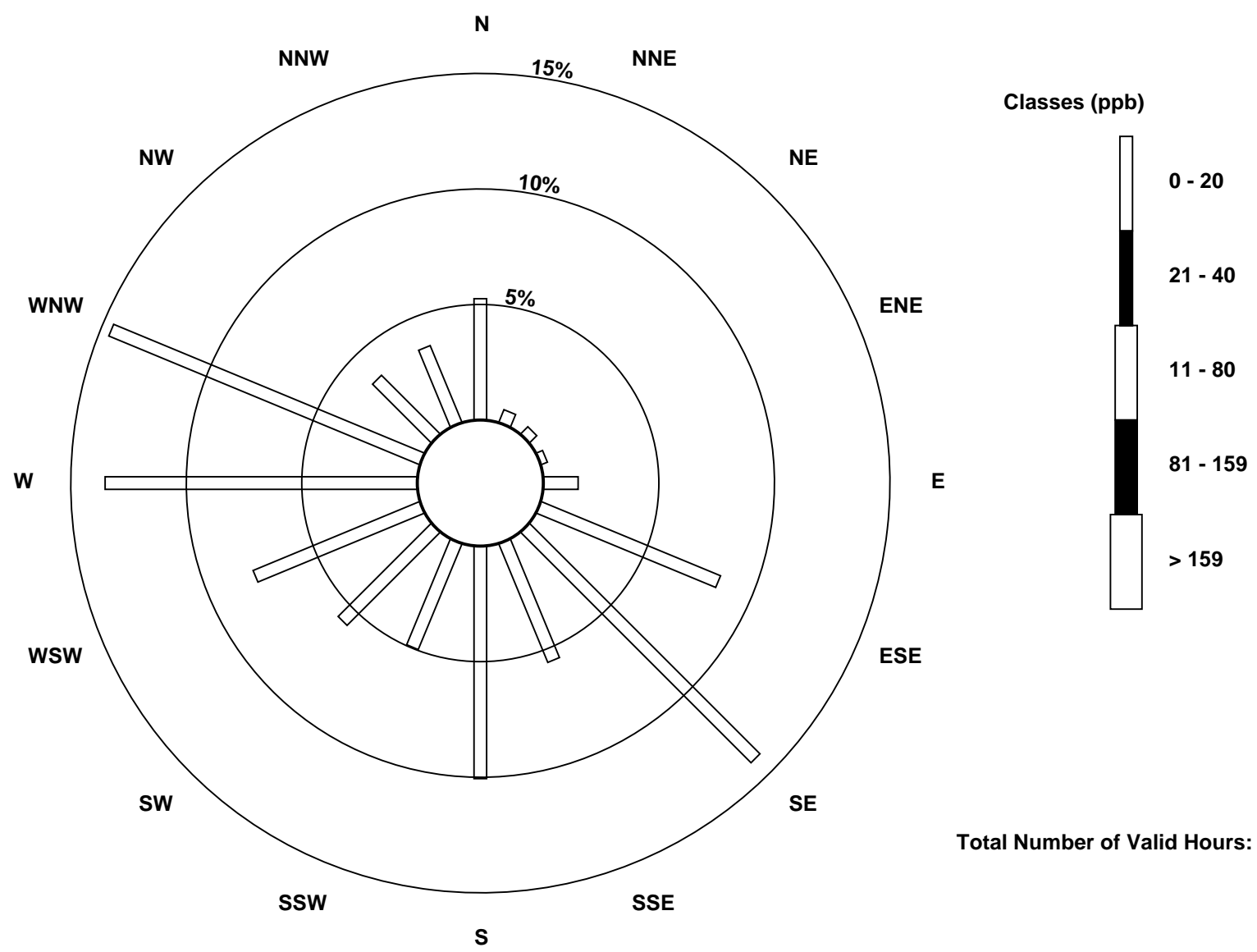
Total Number of Valid Hours: 666

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Nitrogen Oxide (NO) - ppb  
ConocoPhillips - Surmont (AMS502)



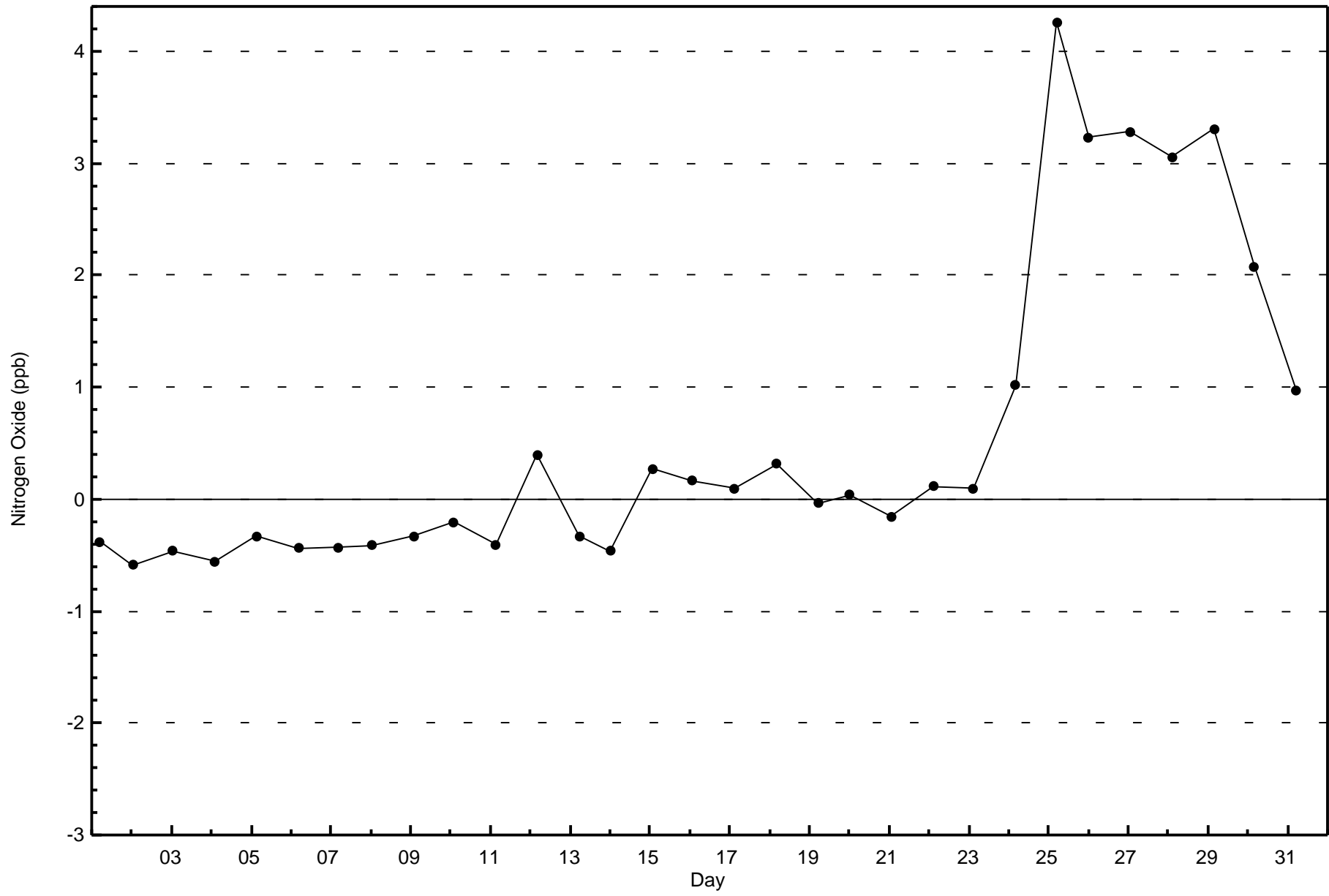


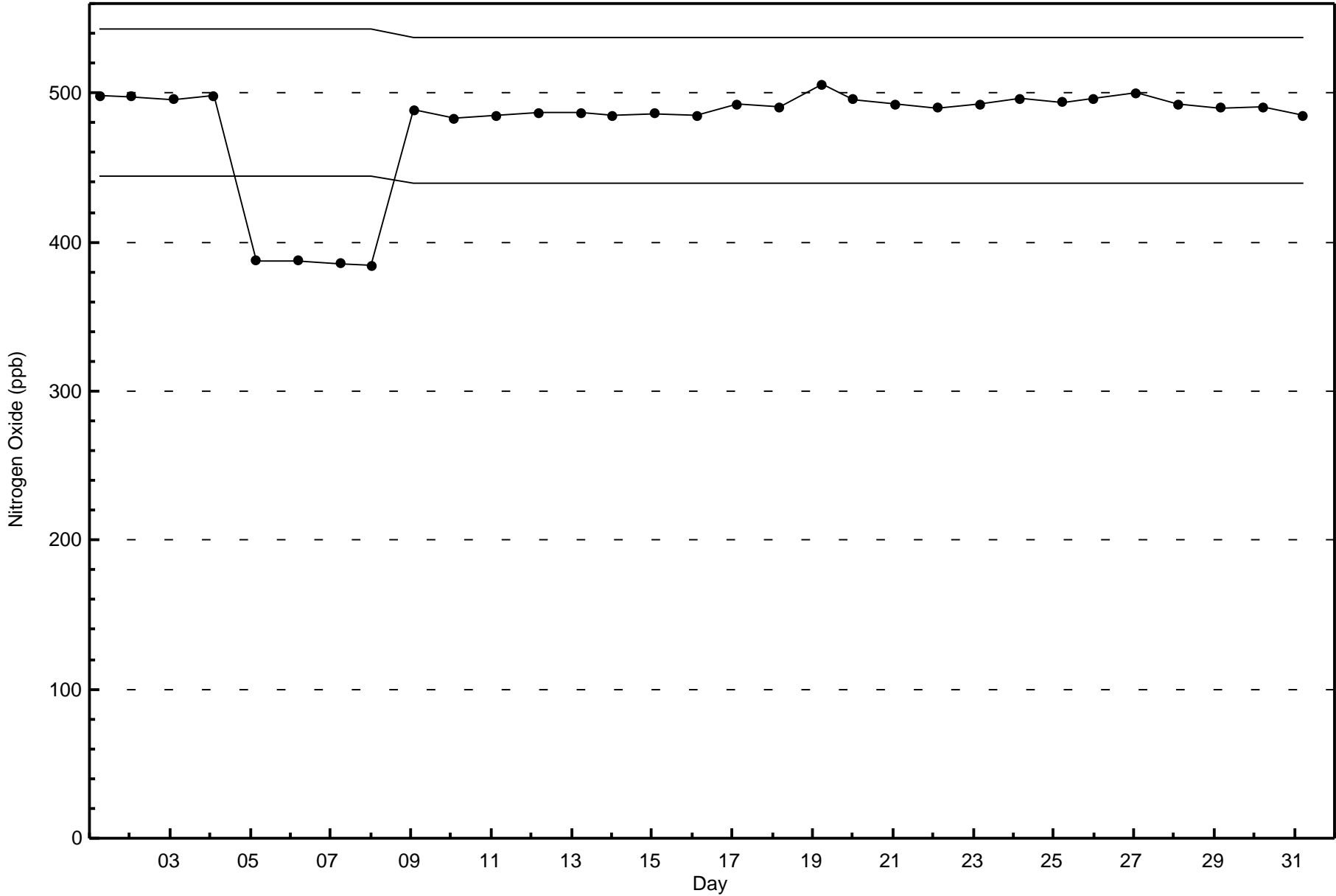


Wood Buffalo Environmental Association

Zero Responses

Nitrogen Oxide (NO) - ppb  
ConocoPhillips - Surmont - December 2015



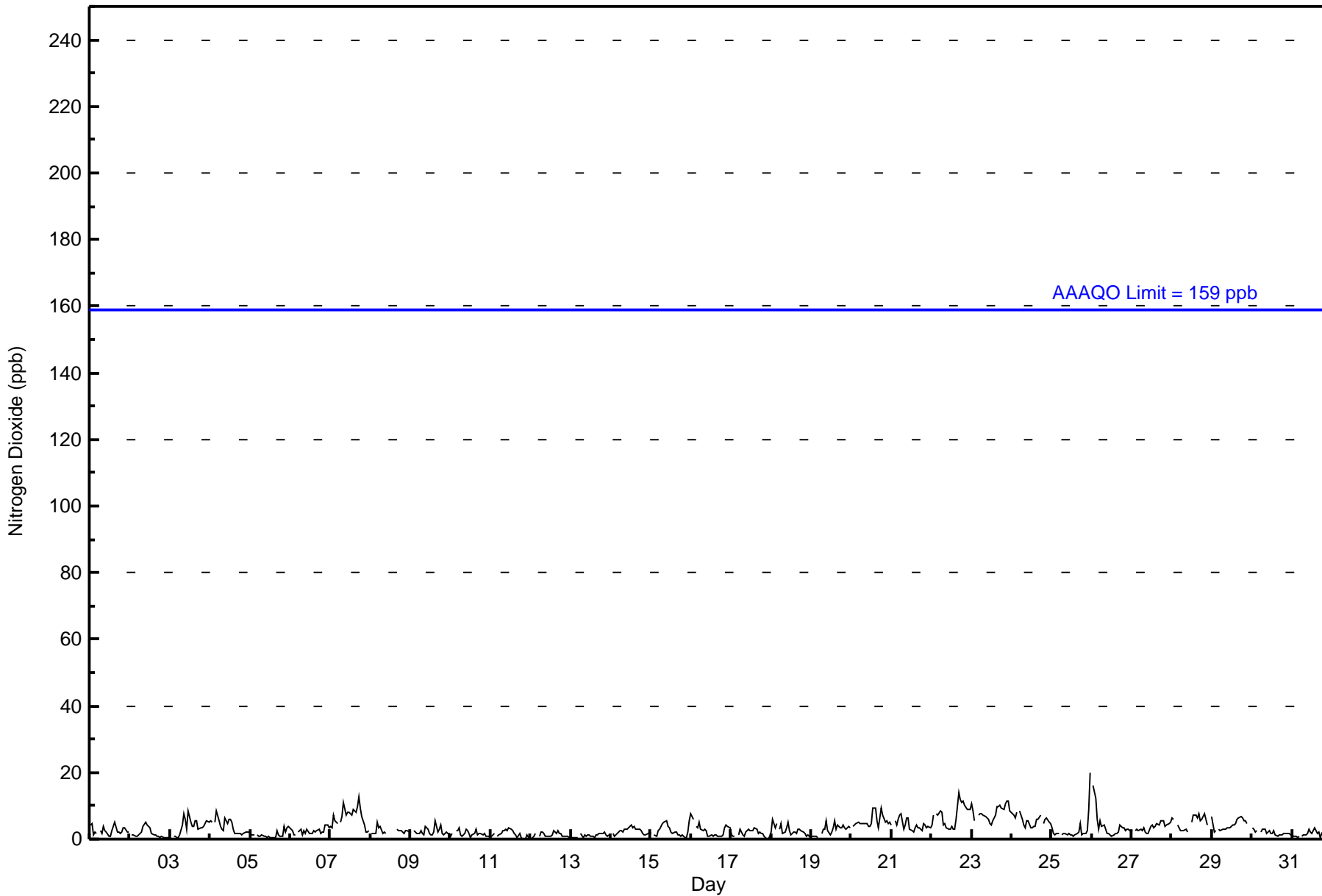




Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 744
Maximum Value: 20 ppb on Dec 26 00:00	Maximum Daily Average: 8.0 ppb on Dec 23
Minimum Value: 0 ppb on Dec 11 20:00	Hours of Data: 700
Maximum Diurnal Average: 3.8 ppb at hour 18	Hours of Missing Data: 44
Monthly Average: 3.2 ppb	Hours of Calibration: 37
Minimum Daily Average: 1.0 ppb on Dec 13	Percent Operational Time: 99.1
Minimum Diurnal Average: 2.7 ppb at hour 3	
Percentiles: P <sub>1</sub> = 0 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 3 Q <sub>3</sub> = 4 P <sub>90</sub> = 6 P <sub>99</sub> = 12	

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	4	5	1	2	2	Z	3	2	4	3	2	1	1	3	4	5	2	2	2	2	4	3	2	2	2.5	5
2-Dec	Z	1	1	1	1	1	2	2	4	5	4	4	4	2	1	1	1	1	1	1	1	1	1	1	1.7	5
3-Dec	1	Z	1	1	1	1	1	4	8	6	3	8	5	4	4	5	6	3	4	3	4	5	6	5	3.8	8
4-Dec	6	5	Z	5	8	6	4	3	3	6	5	6	6	5	3	2	2	2	2	1	2	2	2	2	3.7	8
5-Dec	2	1	1	Z	1	1	1	1	1	1	1	1	0	1	1	1	3	1	1	1	4	2	3	4	1.4	4
6-Dec	3	3	1	1	Z	2	3	1	3	2	3	2	2	2	3	2	3	3	2	2	2	4	4	4	2.4	4
7-Dec	4	3	7	5	5	Z	5	7	11	7	8	8	8	7	9	8	10	13	9	7	4	2	2	3	6.6	13
8-Dec	Z	2	2	2	5	3	4	2	2	2	C	C	C	C	C	C	3	3	2	2	2	3	2	2	--	5
9-Dec	2	Z	3	2	2	2	3	2	1	4	3	2	1	1	2	5	2	3	4	2	1	2	2	2	2.3	5
10-Dec	1	2	Z	3	2	3	1	1	2	3	3	2	1	1	2	3	1	2	2	1	2	1	1	1	1.7	3
11-Dec	1	1	2	Z	1	1	2	3	3	3	3	3	3	2	2	1	1	2	0	0	0	0	1	0	1.5	3
12-Dec	0	1	1	2	Z	1	2	2	2	1	1	1	1	1	3	2	3	2	2	1	1	1	1	0	1.2	3
13-Dec	1	0	0	1	1	Z	2	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1.0	2
14-Dec	Z	2	1	1	2	2	3	2	3	3	3	4	4	4	4	3	3	3	3	2	1	1	2	2	2.5	4
15-Dec	2	Z	1	1	3	3	4	5	5	6	4	3	2	2	2	2	1	1	1	1	0	1	2	5	2.5	6
16-Dec	8	6	Z	4	4	5	3	2	3	2	1	1	1	1	1	1	1	1	1	1	4	4	4	3	2.7	8
17-Dec	1	1	1	Z	1	3	2	1	1	2	3	3	3	2	3	3	2	2	2	2	1	0	0	1	1.7	3
18-Dec	2	6	4	5	Z	3	5	2	2	4	5	3	1	2	2	2	3	3	3	2	2	1	1	1	2.7	6
19-Dec	1	1	1	1	1	Z	2	3	3	6	3	1	2	3	5	3	4	3	4	4	4	3	4	3	2.8	6
20-Dec	Z	4	4	5	5	5	5	5	5	5	4	4	5	9	10	5	4	7	9	7	5	5	5	5	5.4	10
21-Dec	4	Z	5	4	6	7	8	3	4	6	6	3	3	2	3	4	4	4	3	5	4	3	4	4	4.3	8
22-Dec	4	7	Z	8	7	8	8	4	5	4	3	3	4	3	3	6	14	12	11	12	10	9	9	9	7.0	14
23-Dec	11	8	6	Z	7	8	8	7	7	6	6	5	4	5	7	10	10	10	10	9	10	11	11	9	8.0	11
24-Dec	8	7	7	8	Z	8	6	4	3	6	5	3	3	4	4	6	6	7	UO	5	6	6	5	5	5.6	8
25-Dec	4	2	1	2	2	Z	1	2	2	1	2	1	1	1	1	2	2	5	1	2	2	3	9	20	2.9	20
26-Dec	Z	16	12	6	3	6	4	4	3	2	2	1	1	1	2	2	2	4	3	3	3	3	3	3	3.8	16
27-Dec	3	Z	3	3	3	3	2	3	2	2	2	4	4	3	4	5	4	6	5	6	4	4	5	5	3.6	6
28-Dec	6	6	Z	4	4	3	3	2	3	2	UO	UO	5	7	7	6	8	5	6	8	6	4	UO	UO	5.0	8
29-Dec	7	2	2	Z	3	3	3	3	3	3	4	4	4	4	5	6	7	7	6	6	5	5	UO	UO	4.3	7
30-Dec	4	3	2	3	Z	2	3	3	3	2	3	2	2	3	1	1	1	1	1	2	2	2	2	1	2.0	4
31-Dec	1	1	1	1	1	Z	1	1	1	2	3	2	2	4	3	2	2	1	2	1	1	1	2	1	1.4	4
	3.4	3.6	2.7	3.0	2.9	3.6	3.2	2.8	3.3	3.4	3.2	2.9	2.8	3.0	3.3	3.5	3.7	3.8	3.4	3.3	3.1	3.0	3.2	3.5	Diurnal Average	
	11	16	12	8	8	8	8	7	11	7	8	8	8	9	10	10	14	13	11	12	10	11	11	20	Diurnal Maximum	

Z - zerospan                      C - Calibration                      UO - Unstable Operation  
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**ConocoPhillips - Surmont - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	700	100.00	100.00
21 - 40	0	0.00	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 700

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Dioxide (NO<sub>2</sub>) - ppb**  
**ConocoPhillips - Surmont - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	35	4	3	2	10	56	94	37	67	33	38	52	90	97	24	24	666
21 - 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	35	4	3	2	10	56	94	37	67	33	38	52	90	97	24	24	666

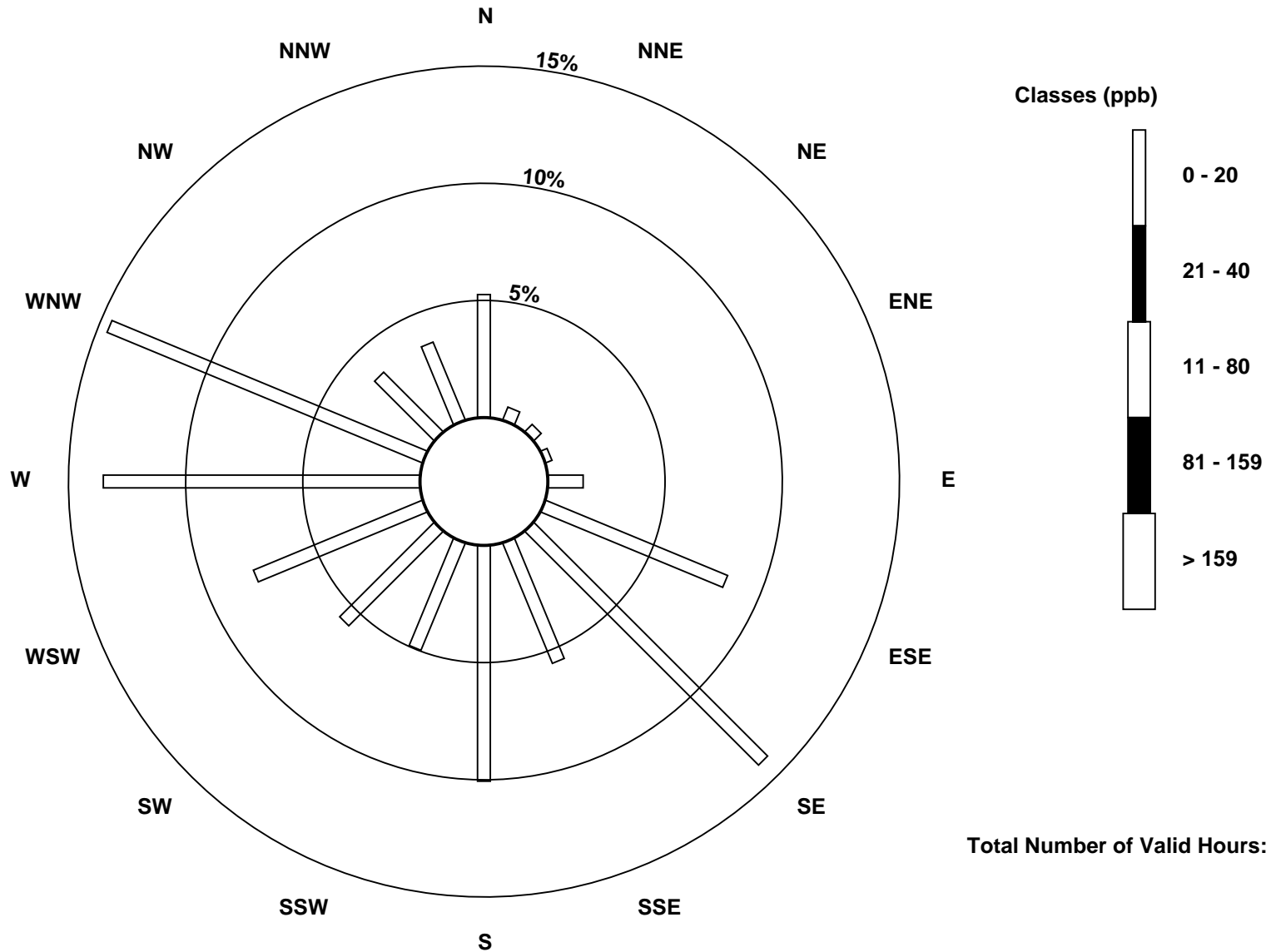
Total Number of Valid Hours: 666

Total Number of Hours: 744

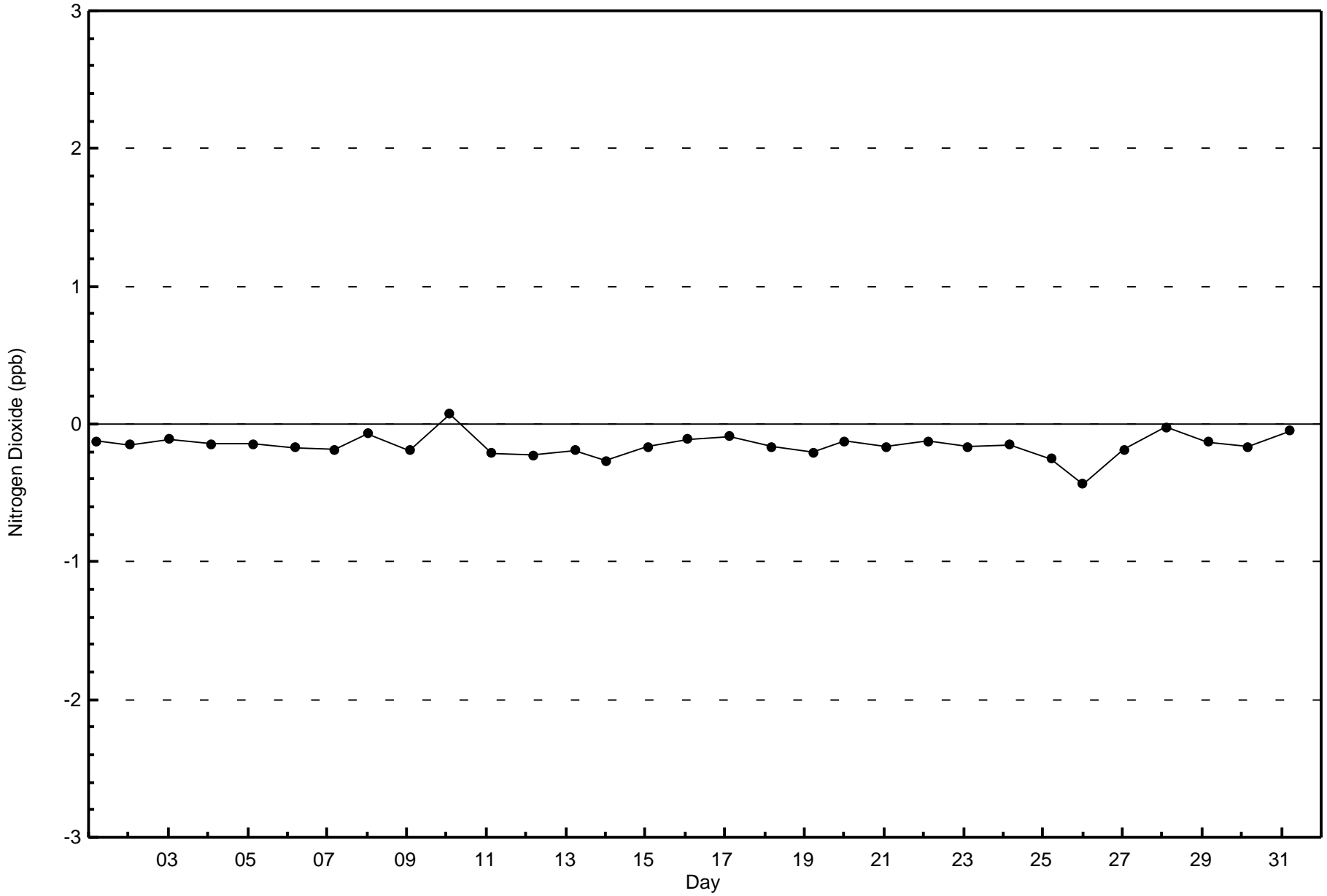


Wood Buffalo Environmental Association  
Wind Rose Dec 2015

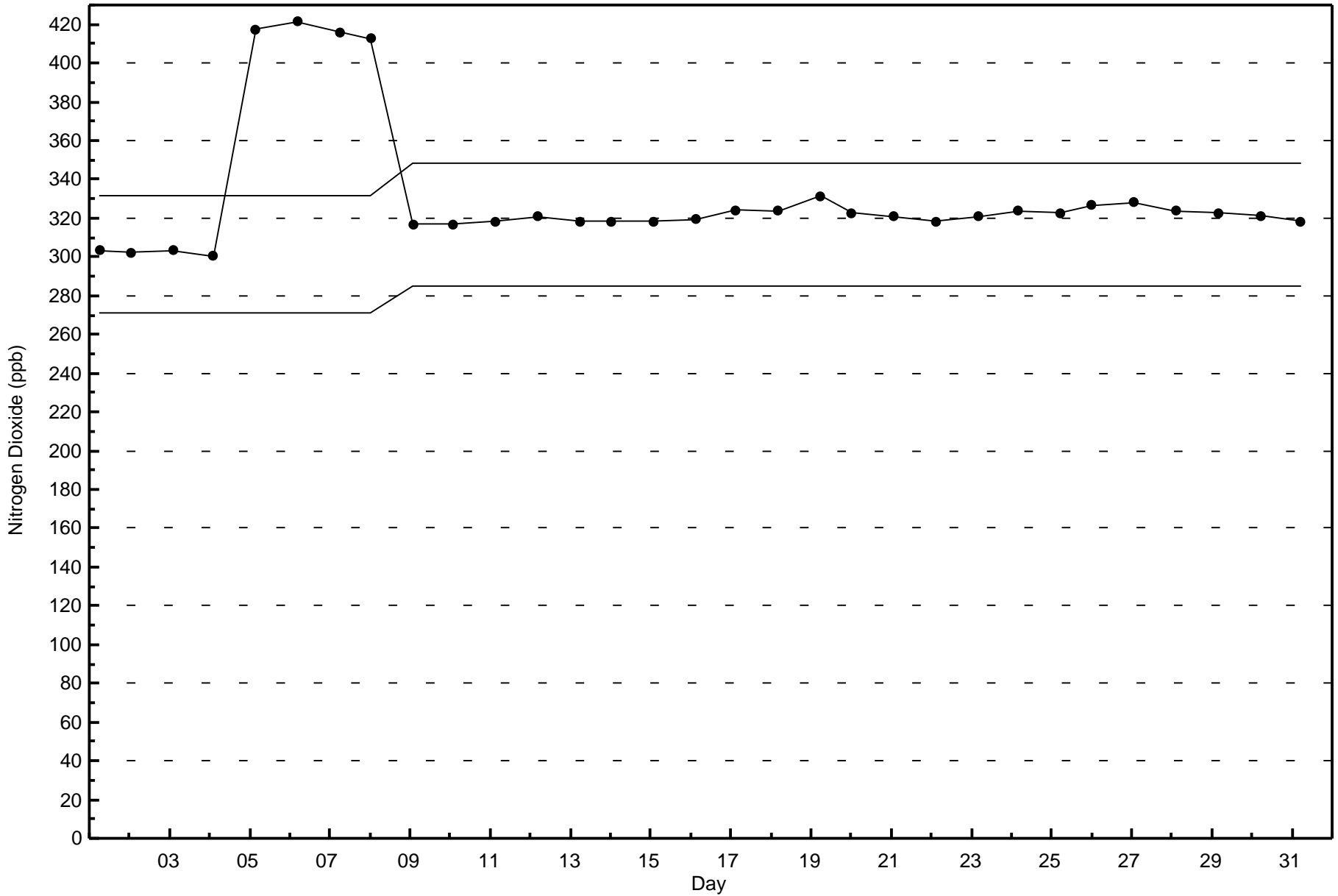
Nitrogen Dioxide (NO<sub>2</sub>) - ppb  
ConocoPhillips - Surmont (AMS502)



Total Number of Valid Hours: 666









Maximum Value: 22 ppb on Dec 20 14:00																		Maximum Daily Average: 8.8 ppb on Dec 23						Hours in Service: 744																																									
Minimum Value: 0 ppb on Dec 17 22:00																		Minimum Daily Average: 1.8 ppb on Dec 5						Hours of Data: 700																																									
Maximum Diurnal Average: 6.0 ppb at hour 15																		Minimum Diurnal Average: 3.1 ppb at hour 3						Hours of Missing Data: 44																																									
Monthly Average: 4.6 ppb																		Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 1 Q <sub>1</sub> = 2 Median = 4 Q <sub>3</sub> = 6 P <sub>90</sub> = 9 P <sub>99</sub> = 17						Hours of Calibration: 37																																									
																		Percent Operational Time: 99.1																																															
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																																									
1-Dec	4	5	1	2	2	Z	3	2	4	3	2	1	1	3	5	6	3	3	2	2	4	4	2	2	2.9	6																																							
2-Dec	Z	2	1	1	1	1	2	2	4	6	5	4	4	2	2	2	1	1	1	1	1	1	1	1	2.0	6																																							
3-Dec	1	Z	1	1	1	1	2	6	10	7	4	13	7	5	6	9	7	4	5	4	4	5	6	5	5.0	13																																							
4-Dec	6	5	Z	5	10	6	4	4	3	10	6	12	12	9	6	2	2	2	2	1	2	2	2	2	5.0	12																																							
5-Dec	2	1	1	Z	1	1	1	2	1	1	0	1	0	1	1	1	3	2	1	1	5	3	4	5	1.8	5																																							
6-Dec	4	3	1	2	Z	3	8	4	4	4	6	4	4	3	6	3	3	4	2	2	2	4	4	4	3.7	8																																							
7-Dec	4	3	7	5	5	Z	6	8	12	9	11	13	12	12	16	12	13	18	10	7	4	2	2	4	8.5	18																																							
8-Dec	Z	2	2	3	13	7	10	4	4	2	C	C	C	C	C	C	3	4	3	3	3	3	3	2	--	13																																							
9-Dec	2	Z	3	2	3	3	5	4	2	7	6	4	3	4	8	12	4	4	6	2	1	6	3	2	4.2	12																																							
10-Dec	1	2	Z	4	5	6	1	1	2	3	3	2	1	4	2	4	2	3	2	2	2	1	2	1	2.4	6																																							
11-Dec	1	2	2	Z	2	1	4	5	4	4	5	6	4	3	4	2	1	5	4	1	1	1	3	1	2.8	6																																							
12-Dec	0	2	2	2	Z	3	7	5	4	3	5	3	2	4	6	3	6	5	6	3	2	2	1	1	3.3	7																																							
13-Dec	1	1	1	1	1	Z	5	5	4	2	2	3	1	2	3	2	2	2	3	2	2	2	1	2	2.1	5																																							
14-Dec	Z	2	1	1	2	2	3	2	4	3	3	5	5	4	5	3	3	3	3	2	1	1	2	2	2.7	5																																							
15-Dec	2	Z	2	1	3	3	4	5	6	8	6	5	2	2	3	2	1	1	1	1	0	1	4	11	3.2	11																																							
16-Dec	22	16	Z	10	4	8	7	5	8	6	3	3	2	2	1	1	1	1	1	2	10	12	10	8	6.2	22																																							
17-Dec	2	1	1	Z	4	8	6	4	3	5	7	6	6	4	6	6	2	4	2	2	1	0	0	1	3.5	8																																							
18-Dec	2	6	5	5	Z	5	8	3	5	8	9	6	4	6	4	4	5	4	4	3	3	2	2	1	4.5	9																																							
19-Dec	1	1	1	2	1	Z	4	6	7	9	5	2	4	6	10	4	6	4	5	5	4	3	4	4	4.3	10																																							
20-Dec	Z	4	4	5	5	5	5	5	5	6	5	6	9	22	21	7	5	12	20	16	9	8	6	7	8.7	22																																							
21-Dec	5	Z	7	5	8	9	11	3	5	8	8	4	4	3	6	5	4	4	3	6	5	4	4	3	5.4	11																																							
22-Dec	4	7	Z	8	8	10	12	6	7	4	4	4	6	5	5	7	16	13	12	12	12	10	10	10	8.4	16																																							
23-Dec	12	10	6	Z	8	8	8	8	7	7	7	6	6	8	10	12	10	10	10	9	10	11	11	8	8.8	12																																							
24-Dec	8	7	6	8	Z	10	8	5	4	7	9	5	5	6	5	7	6	9	UO	6	7	8	7	7	6.8	10																																							
25-Dec	6	3	2	3	3	Z	3	4	2	2	2	2	1	2	2	3	3	7	2	3	3	5	10	22	4.1	22																																							
26-Dec	Z	17	12	6	4	6	4	5	4	2	2	3	2	3	3	4	5	7	8	6	4	4	4	3	5.2	17																																							
27-Dec	4	Z	3	3	3	4	5	5	4	3	3	9	8	9	7	7	5	8	8	6	4	5	5	6	5.4	9																																							
28-Dec	8	11	Z	5	4	3	3	3	5	3	UO	UO	7	12	12	8	14	6	7	11	7	5	UO	UO	7.1	14																																							
29-Dec	10	3	2	Z	4	3	4	4	4	4	4	5	6	5	5	6	7	8	7	7	6	6	UO	UO	5.2	10																																							
30-Dec	4	3	3	4	Z	5	6	4	4	2	4	3	3	5	3	2	2	3	2	3	4	3	2	1	3.4	6																																							
31-Dec	1	1	1	1	1	Z	1	2	1	2	5	3	3	7	6	3	3	1	2	1	1	1	2	1	2.1	7																																							
4.5																		4.6		3.1		3.8		4.0		4.9		5.1		4.2		4.6		4.9		4.8		4.9		4.5		5.4		6.0		5.0		4.9		5.2		4.8		4.2		4.0		4.0		4.4		Diurnal Average			
22																		17		12		10		13		10		12		8		12		10		11		13		12		22		21		12		16		18		20		16		12		12		11		22		Diurnal Maximum	
Z - zerospan			C - Calibration						UO - Unstable Operation																																																								

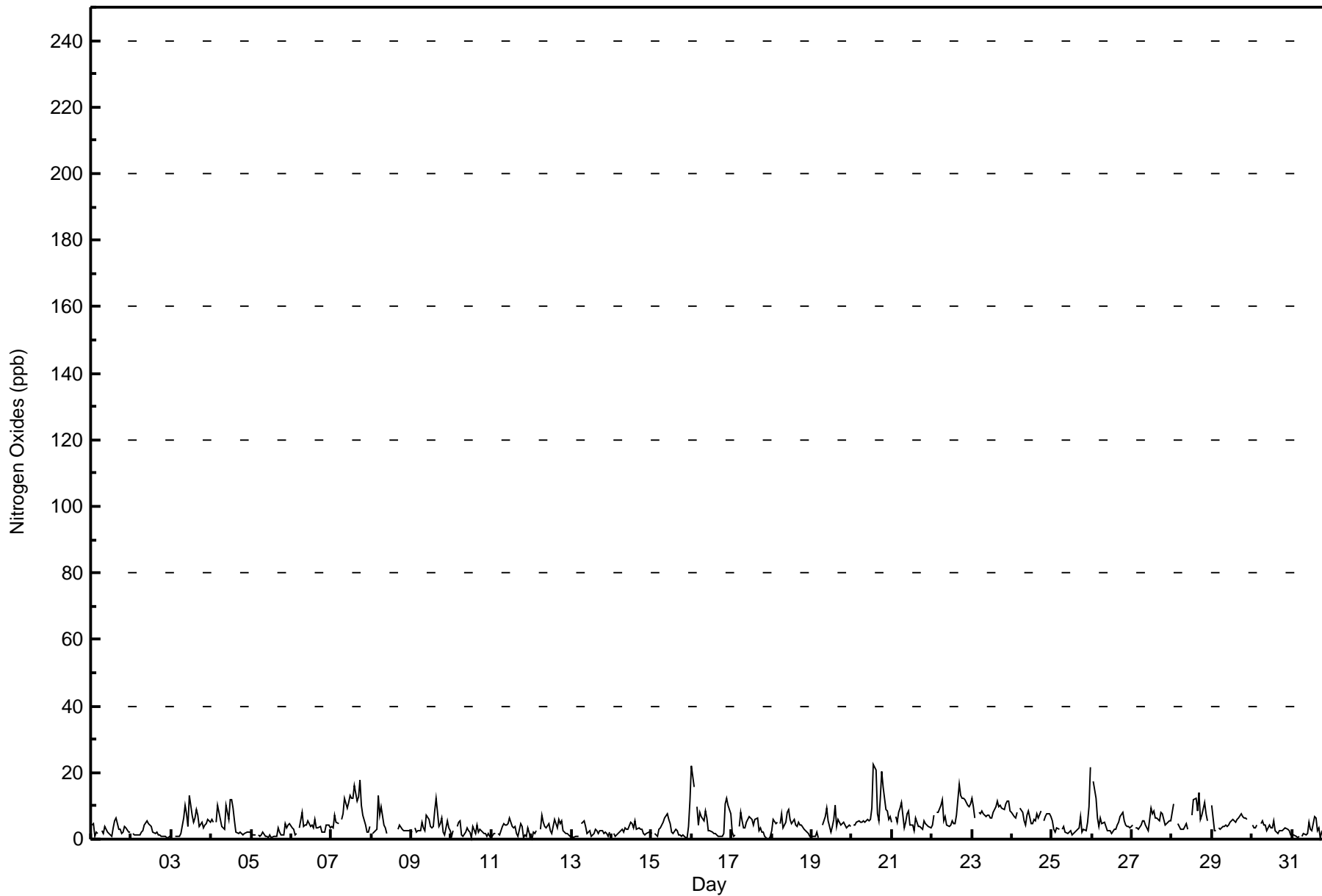


Wood Buffalo Environmental Association

Hourly Averages

Nitrogen Oxides (NO<sub>x</sub>) - ppb

ConocoPhillips - Surmont - December 2015





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**ConocoPhillips - Surmont - December 2015**

<b>Concentration Ranges (ppb)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	696	99.43	99.43
21 - 40	4	0.57	100.00
41 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 700

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Nitrogen Oxides (NO<sub>x</sub>) - ppb**  
**ConocoPhillips - Surmont - December 2015**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	35	4	3	2	10	56	94	35	67	33	38	52	90	97	23	23	662
21 - 40	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	1	4
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81 - 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	35	4	3	2	10	56	94	37	67	33	38	52	90	97	24	24	666

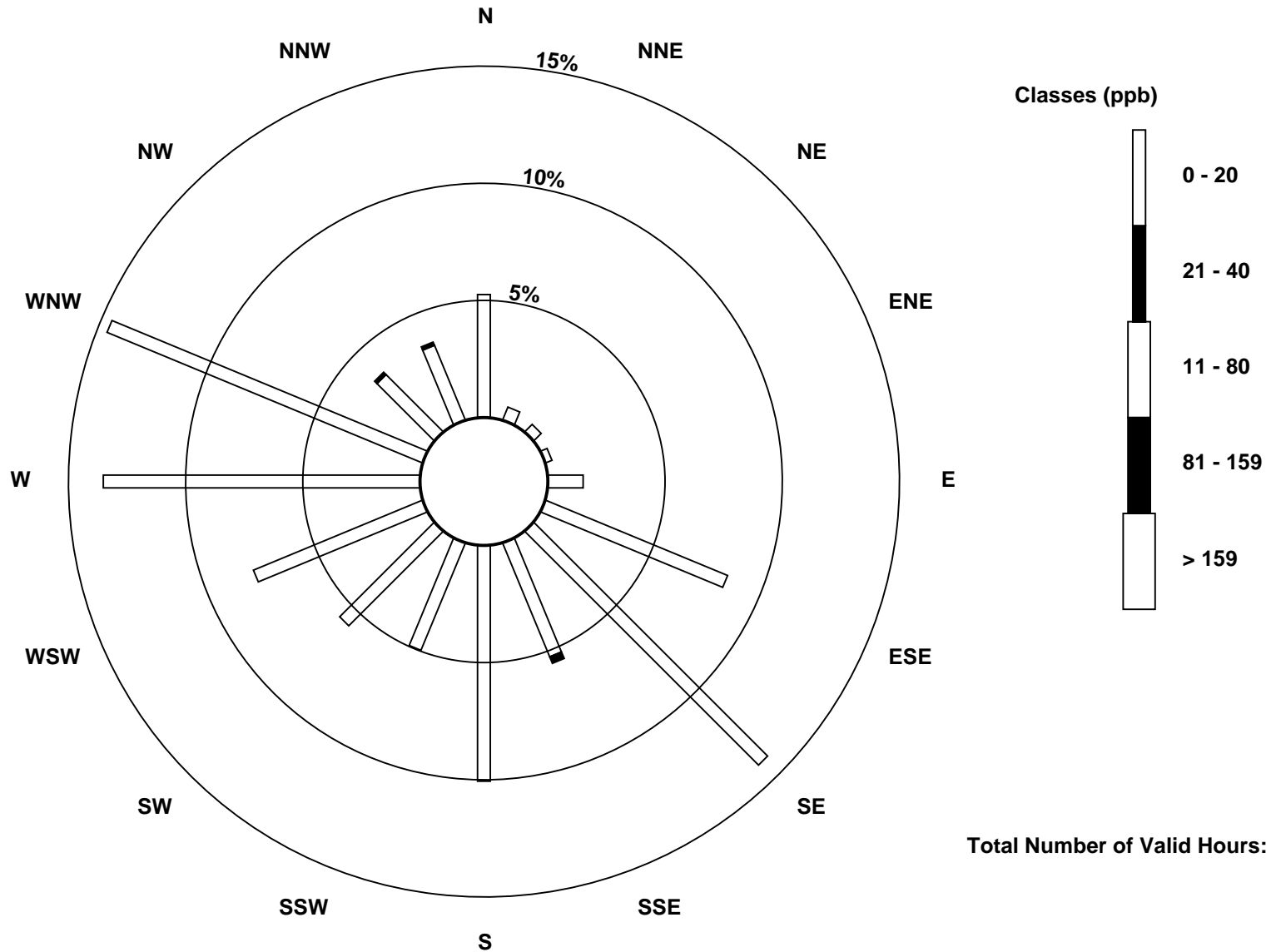
Total Number of Valid Hours: 666

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

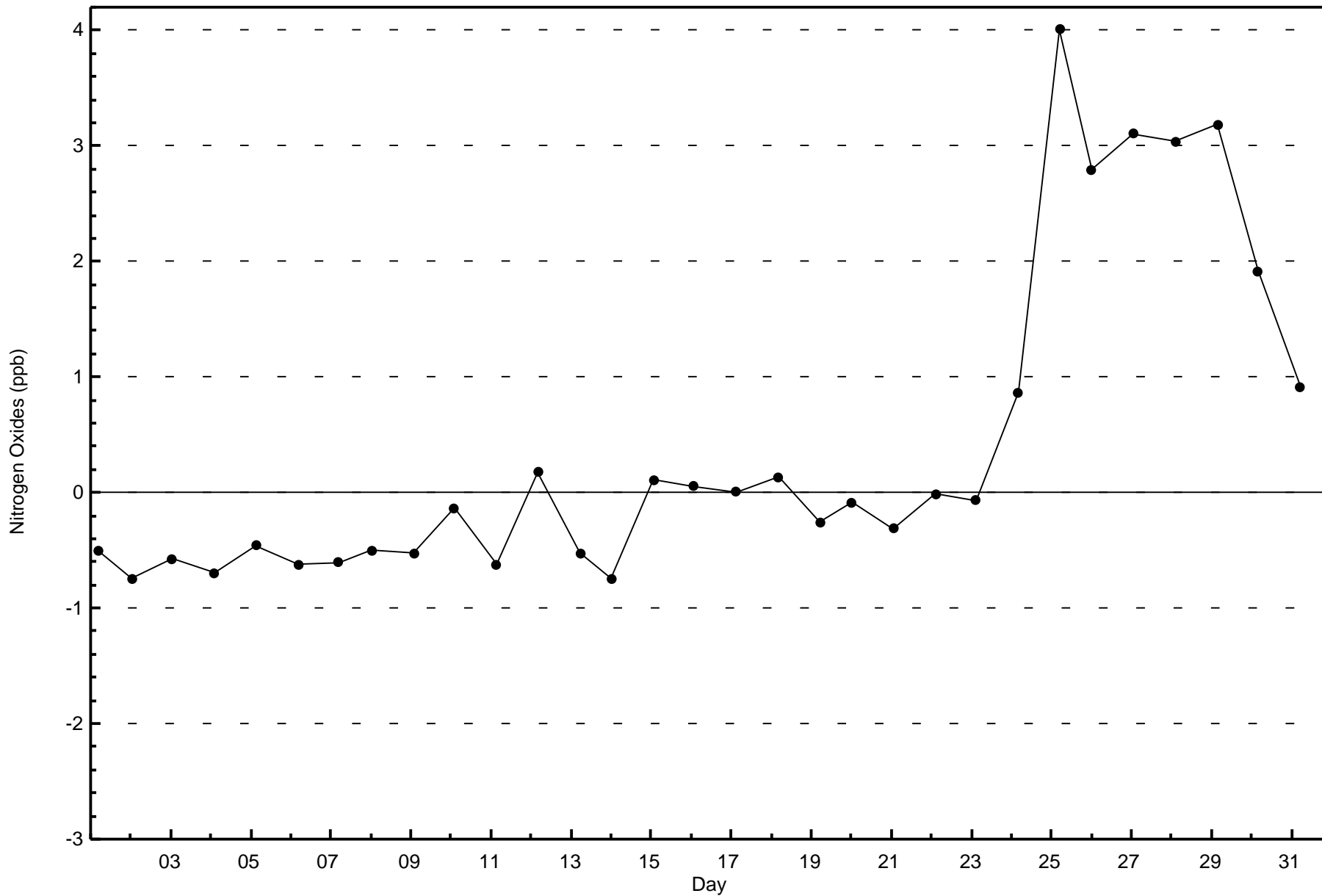
Nitrogen Oxides (NO<sub>x</sub>) - ppb  
ConocoPhillips - Surmont (AMS502)

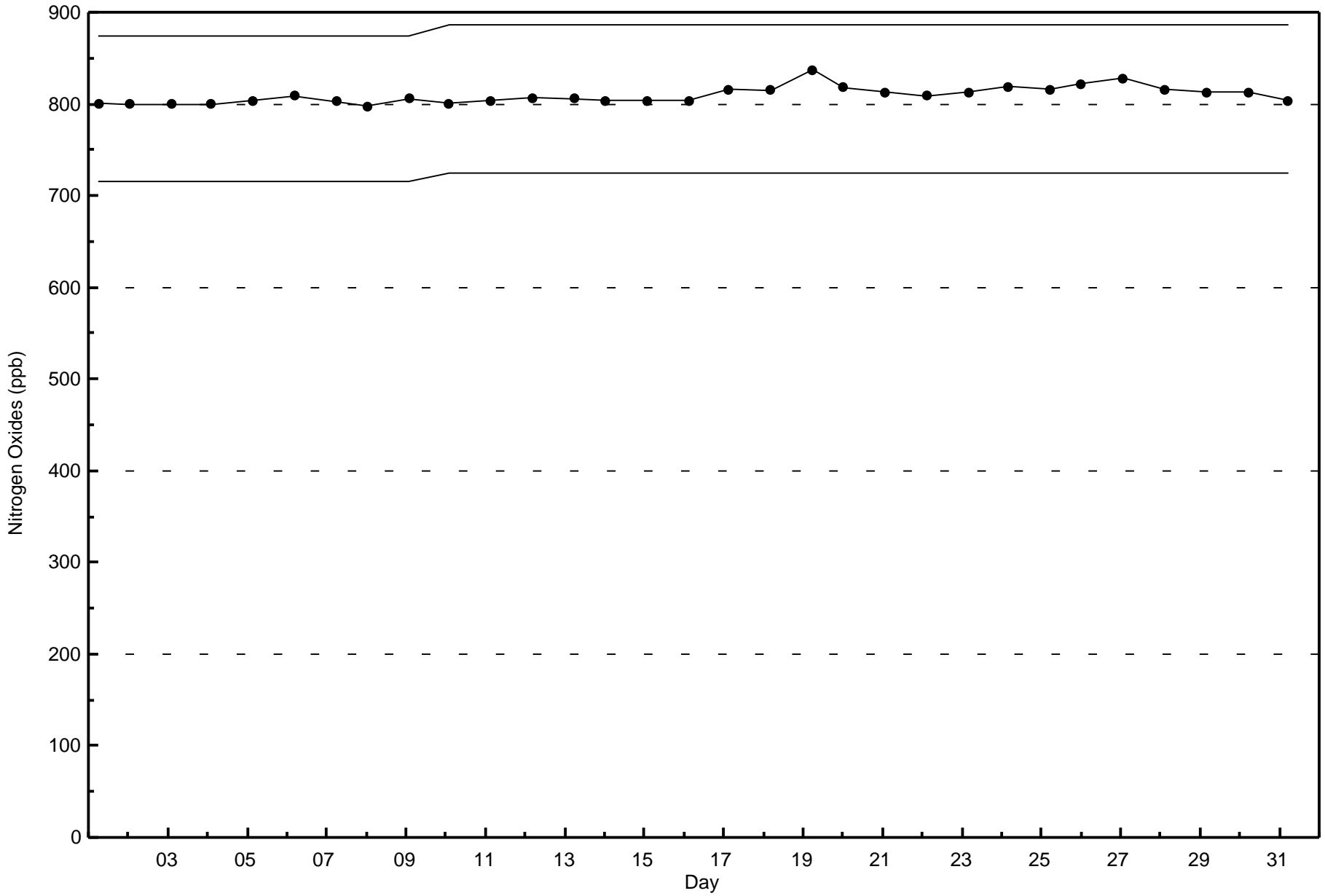




Wood Buffalo Environmental Association  
Zero Responses

Nitrogen Oxides (NO<sub>x</sub>) - ppb  
ConocoPhillips - Surmont - December 2015

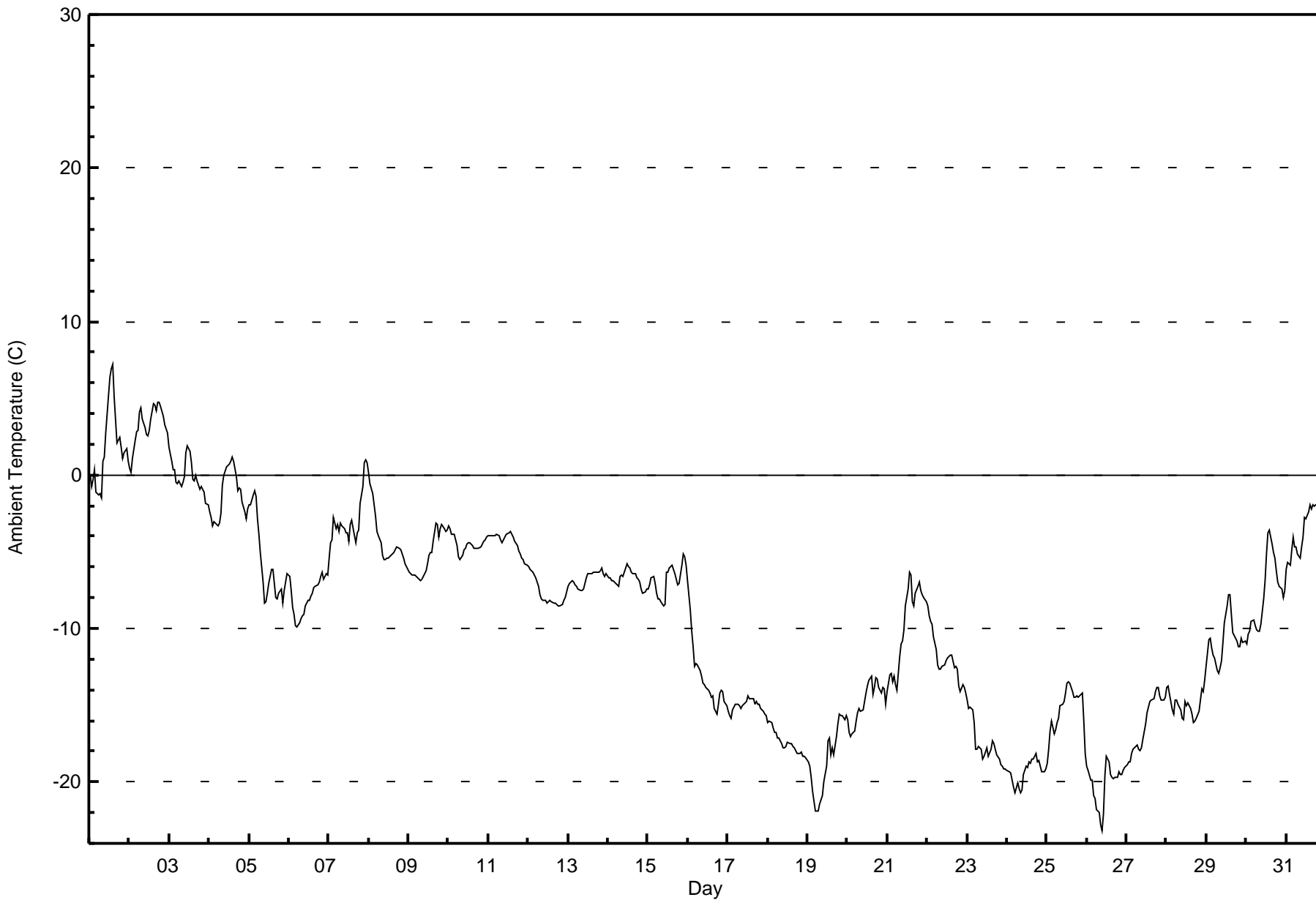








Maximum Value: 7.2 C on Dec 1 15:00																				Maximum Daily Average: 3.2 C on Dec 2					Hours in Service: 744				
Minimum Value: -23.2 C on Dec 26 10:00																				Minimum Daily Average: -20.1 C on Dec 26					Hours of Data: 744				
Maximum Diurnal Average: -8.3 C at hour 14																				Minimum Diurnal Average: -10.1 C at hour 9					Hours of Missing Data: 0				
Monthly Average: -9.24 C																				Percentiles: P <sub>1</sub> = -21.4 P <sub>10</sub> = -18.2 Q <sub>1</sub> = -14.9 Median = -8.0 Q <sub>3</sub> = -4.5 P <sub>90</sub> = -0.8 P <sub>99</sub> = 4.7					Hours of Calibration: 0				
																				Percent Operational Time: 100.0									
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1-Dec	-0.1	-0.7	-0.3	0.3	-1.1	-1.3	-1.2	-1.5	0.9	1.1	2.8	5.2	6.4	7.0	7.2	5.1	2.1	2.2	2.5	1.8	1.1	1.4	1.7	0.9	1.8	7.2			
2-Dec	0.5	0.2	1.1	2.3	2.8	2.9	4.1	4.4	3.6	3.1	2.7	2.6	2.9	3.7	4.7	4.6	4.2	4.7	4.8	4.5	3.8	3.3	3.0	2.7	3.2	4.8			
3-Dec	1.8	0.9	0.4	0.4	-0.4	-0.6	-0.4	-0.8	-0.5	-0.1	1.4	1.9	1.6	0.8	-0.3	-0.4	0.0	-0.4	-0.9	-0.7	-1.0	-1.1	-1.9	-1.9	-0.1	1.9			
4-Dec	-2.4	-2.7	-3.3	-3.0	-3.2	-3.3	-3.2	-2.5	-0.7	0.0	0.5	0.6	0.7	0.9	1.1	0.9	-0.2	-1.0	-0.9	-1.0	-1.7	-2.4	-2.8	-2.2	-1.3	1.1			
5-Dec	-2.0	-1.9	-1.3	-1.0	-1.4	-2.8	-3.8	-5.0	-7.0	-8.3	-8.2	-7.7	-7.0	-6.1	-6.2	-7.1	-8.0	-8.1	-7.7	-7.4	-8.3	-7.5	-7.0	-6.4	-5.7	-1.0			
6-Dec	-6.6	-7.5	-8.6	-9.1	-9.8	-9.9	-9.7	-9.3	-9.1	-9.1	-8.5	-8.2	-8.1	-7.9	-7.7	-7.3	-7.2	-7.1	-7.0	-6.6	-6.4	-6.7	-6.4	-6.5	-7.9	-6.4			
7-Dec	-5.4	-4.5	-4.2	-2.8	-3.5	-3.3	-3.7	-3.2	-3.3	-3.5	-3.7	-3.8	-4.4	-3.2	-2.9	-3.9	-4.4	-3.8	-3.6	-1.9	-0.8	0.8	1.0	0.8	-3.0	1.0			
8-Dec	0.1	-0.6	-1.3	-2.0	-2.7	-3.6	-3.9	-4.4	-5.3	-5.5	-5.5	-5.4	-5.4	-5.3	-5.2	-5.0	-4.9	-4.7	-4.8	-4.8	-5.1	-5.5	-5.8	-6.1	-4.3	0.1			
9-Dec	-6.3	-6.4	-6.5	-6.5	-6.5	-6.7	-6.8	-6.8	-6.8	-6.6	-6.2	-5.8	-5.3	-5.1	-5.1	-4.3	-3.1	-3.2	-4.0	-3.5	-3.2	-3.5	-3.6	-3.6	-5.2	-3.1			
10-Dec	-3.3	-3.5	-3.9	-3.9	-4.2	-4.6	-5.3	-5.5	-5.3	-4.9	-4.8	-4.5	-4.5	-4.4	-4.6	-4.8	-4.8	-4.8	-4.7	-4.6	-4.5	-4.3	-4.2	-4.1	-4.5	-3.3			
11-Dec	-3.9	-3.9	-4.0	-4.0	-3.9	-3.9	-3.9	-4.2	-4.4	-4.3	-4.1	-3.8	-3.7	-3.7	-3.9	-4.1	-4.3	-4.6	-4.9	-5.2	-5.4	-5.5	-5.8	-5.9	-4.4	-3.7			
12-Dec	-6.0	-6.1	-6.2	-6.4	-6.7	-7.0	-7.3	-7.8	-8.1	-8.1	-8.2	-8.3	-8.2	-8.2	-8.3	-8.4	-8.3	-8.5	-8.5	-8.6	-8.4	-8.2	-8.0	-7.7	-7.7	-6.0			
13-Dec	-7.3	-7.0	-6.9	-7.0	-7.1	-7.3	-7.5	-7.6	-7.5	-7.4	-7.1	-6.7	-6.4	-6.4	-6.4	-6.4	-6.3	-6.4	-6.3	-6.2	-6.1	-6.4	-6.6	-6.5	-6.8	-6.1			
14-Dec	-6.7	-6.7	-6.9	-6.9	-6.9	-7.2	-7.2	-6.6	-6.5	-6.6	-6.3	-5.8	-6.0	-6.1	-6.4	-6.4	-6.5	-6.7	-6.8	-6.9	-7.4	-7.7	-7.6	-7.4	-6.8	-5.8			
15-Dec	-7.4	-7.2	-6.7	-6.6	-7.0	-7.7	-8.1	-8.0	-8.2	-8.5	-8.4	-6.3	-6.4	-6.1	-5.9	-6.2	-6.4	-6.8	-7.2	-7.1	-5.9	-5.2	-5.3	-5.9	-6.9	-5.2			
16-Dec	-6.8	-8.8	-10.2	-11.1	-12.4	-12.3	-12.4	-12.8	-13.1	-13.5	-13.7	-13.9	-14.0	-14.2	-14.4	-14.4	-15.2	-15.6	-15.0	-14.2	-14.1	-14.1	-14.7	-15.0	-13.2	-6.8			
17-Dec	-15.4	-15.7	-15.8	-15.3	-15.0	-14.9	-14.9	-15.0	-15.2	-15.0	-14.9	-14.8	-14.4	-14.6	-14.5	-14.6	-14.9	-14.8	-14.9	-15.0	-15.2	-15.4	-15.5	-15.7	-15.1	-14.4			
18-Dec	-16.2	-16.0	-16.2	-16.5	-16.8	-16.8	-17.1	-17.1	-17.5	-17.8	-17.8	-17.6	-17.4	-17.5	-17.5	-17.7	-17.7	-18.0	-18.1	-18.1	-18.1	-18.3	-18.4	-18.4	-17.4	-16.0			
19-Dec	-18.7	-19.0	-19.7	-20.6	-21.2	-21.9	-21.9	-21.4	-21.1	-20.8	-20.0	-19.0	-17.3	-17.2	-18.2	-17.8	-18.2	-17.1	-16.2	-15.6	-15.7	-15.7	-15.9	-15.6	-18.6	-15.6			
20-Dec	-16.0	-16.8	-17.1	-16.8	-16.7	-16.0	-15.5	-15.2	-15.4	-15.3	-14.7	-14.2	-13.8	-13.4	-13.1	-14.3	-13.9	-13.2	-13.3	-13.9	-14.2	-13.9	-13.9	-15.0	-14.8	-13.1			
21-Dec	-14.2	-13.0	-12.9	-13.5	-13.1	-13.7	-14.0	-11.8	-11.0	-10.8	-10.1	-8.5	-7.5	-6.4	-6.5	-8.2	-8.5	-7.7	-7.2	-7.0	-7.5	-7.8	-7.9	-8.3	-9.9	-6.4			
22-Dec	-8.5	-9.2	-9.5	-9.7	-10.5	-11.4	-12.4	-12.7	-12.6	-12.5	-12.3	-12.1	-11.9	-11.8	-11.7	-11.8	-12.5	-12.5	-12.6	-13.8	-14.1	-13.7	-13.8	-14.2	-12.0	-8.5			
23-Dec	-14.7	-15.2	-15.1	-15.3	-16.1	-17.9	-17.8	-17.6	-17.9	-18.5	-18.3	-18.0	-17.8	-18.3	-17.9	-17.4	-17.5	-17.9	-18.2	-18.5	-18.8	-19.0	-19.1	-19.2	-17.6	-14.7			
24-Dec	-19.3	-19.4	-19.4	-19.8	-20.4	-20.7	-20.1	-20.5	-20.7	-20.5	-19.5	-19.0	-19.0	-18.7	-18.8	-18.5	-18.5	-18.2	-18.7	-18.6	-19.0	-19.3	-19.4	-19.2	-19.4	-18.2			
25-Dec	-18.8	-17.9	-16.7	-16.1	-16.8	-16.5	-16.2	-15.9	-15.0	-14.9	-14.8	-14.2	-13.6	-13.5	-13.6	-14.1	-14.5	-14.5	-14.4	-14.5	-14.3	-14.2	-16.0	-18.1	-15.4	-13.5			
26-Dec	-19.0	-19.3	-19.8	-19.9	-20.9	-21.0	-21.8	-22.0	-22.8	-23.2	-22.1	-19.6	-18.3	-18.7	-19.6	-19.7	-19.8	-19.7	-19.7	-19.3	-19.5	-19.5	-19.2	-19.1	-20.1	-18.3			
27-Dec	-18.9	-18.7	-18.7	-18.2	-17.9	-17.7	-17.6	-17.9	-18.0	-17.7	-17.2	-16.2	-15.5	-15.1	-14.7	-14.7	-14.5	-14.2	-13.9	-13.9	-14.4	-14.7	-14.7	-14.5	-16.2	-13.9			
28-Dec	-13.9	-13.8	-14.3	-15.3	-15.6	-14.7	-14.7	-15.0	-15.3	-15.9	-15.9	-14.8	-15.0	-14.9	-15.2	-15.5	-16.2	-16.0	-15.9	-15.4	-14.7	-13.9	-14.1	-13.3	-15.0	-13.3			
29-Dec	-12.5	-10.8	-10.6	-11.3	-11.7	-11.9	-12.8	-12.9	-12.5	-12.1	-10.9	-9.7	-8.5	-7.8	-7.8	-9.1	-10.3	-10.6	-10.8	-11.2	-11.1	-10.6	-10.9	-10.9	-10.8	-7.8			
30-Dec	-11.0	-10.4	-10.2	-9.6	-9.4	-9.8	-10.1	-10.2	-10.2	-9.7	-8.1	-6.9	-5.1	-3.8	-3.6	-4.5	-5.1	-5.4	-6.2	-7.0	-7.3	-7.4	-8.0	-7.5	-7.8	-3.6			
31-Dec	-6.2	-5.7	-5.9	-4.9	-4.1	-4.7	-4.7	-5.2	-5.5	-4.7	-4.1	-2.8	-2.8	-2.4	-2.0	-2.3	-1.9	-2.1	-1.9	-2.0	-2.6	-2.9	-2.9	-2.8	-3.6	-1.9			
																								Diurnal Average					
																								Diurnal Maximum					





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C**  
**ConocoPhillips - Surmont - December 2015**

<b>Concentration Ranges (C)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
-50 - -20	21	2.82	2.82
-20 - 0	664	89.25	92.07
0 - 10	59	7.93	100.00
10 - 20	0	0.00	100.00
> 20	0	0.00	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

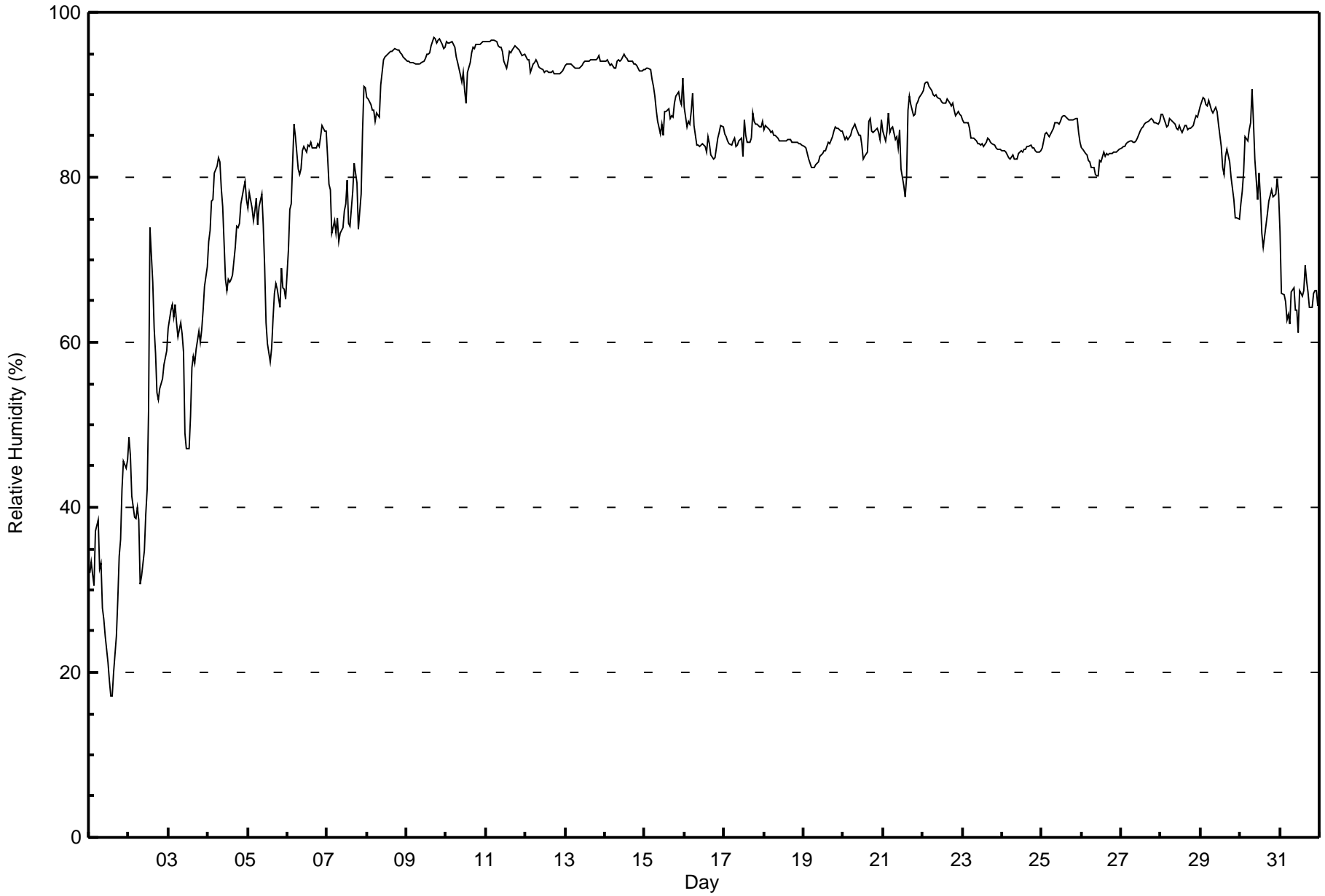


Maximum Value: 97 % on Dec 9 17:00																		Maximum Daily Average: 95.5 % on Dec 11																		Hours in Service: 744												
Minimum Value: 17 % on Dec 1 15:00																		Minimum Daily Average: 31.0 % on Dec 1																		Hours of Data: 744												
Maximum Diurnal Average: 83.2 % at hour 24																		Minimum Diurnal Average: 79.5 % at hour 12																		Hours of Missing Data: 0												
Monthly Average: 81.6 %																		Percentiles: P <sub>1</sub> = 26 P <sub>10</sub> = 64 Q <sub>1</sub> = 80 Median = 85 Q <sub>3</sub> = 90 P <sub>90</sub> = 94 P <sub>99</sub> = 97																		Hours of Calibration: 0												
																																				Percent Operational Time: 100.0												
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Dec	32	33	32	31	37	39	32	33	28	26	24	21	19	17	17	20	24	29	34	36	42	46	45	46	31.0	46																						
2-Dec	48	46	41	39	39	40	39	31	32	35	39	42	52	74	67	62	59	54	53	54	56	57	58	59	49.0	74																						
3-Dec	62	64	65	63	65	62	61	62	61	59	49	47	47	51	57	58	57	59	61	60	61	64	67	69	59.7	69																						
4-Dec	72	74	77	77	81	81	82	82	79	76	68	66	68	67	68	68	72	74	74	74	77	79	80	77	74.7	82																						
5-Dec	76	78	76	75	76	77	74	76	78	74	69	62	60	58	59	63	66	67	66	64	69	67	66	65	69.3	78																						
6-Dec	71	76	77	82	86	85	81	80	81	83	84	83	84	84	84	84	84	84	84	84	85	86	86	86	82.6	86																						
7-Dec	83	79	78	73	75	73	75	72	73	74	76	77	80	74	74	78	82	81	79	74	78	86	91	91	78.1	91																						
8-Dec	90	89	89	88	88	87	88	87	91	93	94	95	95	95	95	95	95	96	95	95	95	95	95	94	92.5	96																						
9-Dec	94	94	94	94	94	94	94	94	94	94	94	94	95	95	95	96	97	97	96	97	97	96	96	96	94.9	97																						
10-Dec	96	96	96	96	96	96	95	94	92	92	93	90	89	93	94	95	96	96	96	96	96	96	96	96	94.7	96																						
11-Dec	97	96	96	97	97	97	96	96	96	96	95	94	93	94	95	95	95	96	96	96	96	95	95	95	95.5	97																						
12-Dec	95	94	94	93	94	94	94	94	93	93	93	93	93	93	93	93	93	93	92	92	93	93	93	93	93.2	95																						
13-Dec	94	94	94	94	94	93	93	93	93	93	94	94	94	94	94	94	94	94	94	94	95	94	94	94	93.9	95																						
14-Dec	94	94	94	94	94	93	93	94	94	94	94	95	95	94	94	94	94	94	94	94	93	93	93	93	93.8	95																						
15-Dec	93	93	93	93	92	91	90	88	87	85	87	85	88	88	88	87	87	87	89	90	90	89	89	92	89.2	93																						
16-Dec	88	86	87	86	88	90	86	84	84	84	84	84	84	83	85	84	83	82	82	84	85	85	86	86	85.0	90																						
17-Dec	85	85	84	84	84	84	85	84	84	84	85	83	87	85	84	84	85	88	87	87	86	86	86	87	85.1	88																						
18-Dec	86	86	86	86	85	86	85	85	85	84	84	84	84	84	85	85	85	84	84	84	84	84	84	84	84.8	86																						
19-Dec	84	83	83	82	82	81	81	82	82	82	83	83	83	83	84	84	84	85	86	86	86	86	86	86	83.6	86																						
20-Dec	85	85	85	85	85	86	86	86	86	85	85	84	82	83	83	87	87	86	85	86	86	85	85	87	85.2	87																						
21-Dec	86	84	86	88	85	86	86	85	85	84	86	81	79	78	80	88	90	89	87	88	89	89	90	90	85.7	90																						
22-Dec	90	91	92	92	91	90	90	90	90	90	90	89	89	89	89	89	89	89	89	88	87	88	88	87	89.4	92																						
23-Dec	87	87	87	87	86	85	85	85	84	84	84	84	84	84	85	85	84	84	84	84	84	83	83	83	84.6	87																						
24-Dec	83	83	83	83	82	82	83	82	82	82	83	83	83	83	83	84	84	84	84	84	83	83	83	83	83.0	84																						
25-Dec	84	84	85	86	85	85	86	86	87	87	86	87	87	87	87	87	87	87	87	87	87	87	85	84	86.2	87																						
26-Dec	84	83	83	83	82	82	81	81	80	80	80	82	82	83	83	83	83	83	83	83	83	83	83	83	82.3	84																						
27-Dec	83	84	84	84	84	84	84	84	84	84	85	86	86	86	86	87	87	87	87	87	87	87	86	87	85.4	87																						
28-Dec	88	88	87	86	86	87	87	87	86	86	86	86	86	86	85	86	86	86	86	86	87	87	87	88	86.5	88																						
29-Dec	89	90	89	89	89	89	88	88	88	89	88	87	84	81	80	83	83	82	80	79	77	75	75	75	84.0	90																						
30-Dec	77	78	81	85	84	86	87	91	87	82	77	81	77	73	72	74	76	77	78	78	78	78	80	78	79.7	91																						
31-Dec	73	66	66	65	63	63	62	66	67	64	64	61	66	66	66	69	67	66	64	64	66	66	66	64	65.5	73																						
																								82.2	82.1	82.1	81.8	82.2	82.3	81.6	81.4	81.1	80.6	80.1	79.5	79.8	80.2	80.4	81.3	81.7	81.9	81.9	81.7	82.5	82.9	83.1	83.2	Diurnal Average
																								97	96	96	97	97	97	96	96	96	96	95	95	95	95	95	96	97	97	96	97	97	96	96	96	Diurnal Maximum



**Wood Buffalo Environmental Association**  
**Hourly Averages**

**Relative Humidity (RH) - %**  
**ConocoPhillips - Surmont - December 2015**





**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Relative Humidity (RH) - %**  
**ConocoPhillips - Surmont - December 2015**

<b>Concentration Ranges (%)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 20	4	0.54	0.54
20 - 40	24	3.23	3.76
40 - 60	29	3.90	7.66
60 - 80	128	17.20	24.87
80 - 100	559	75.13	100.00

Total Number of Valid Hours: 744

Total Number of Hours: 744

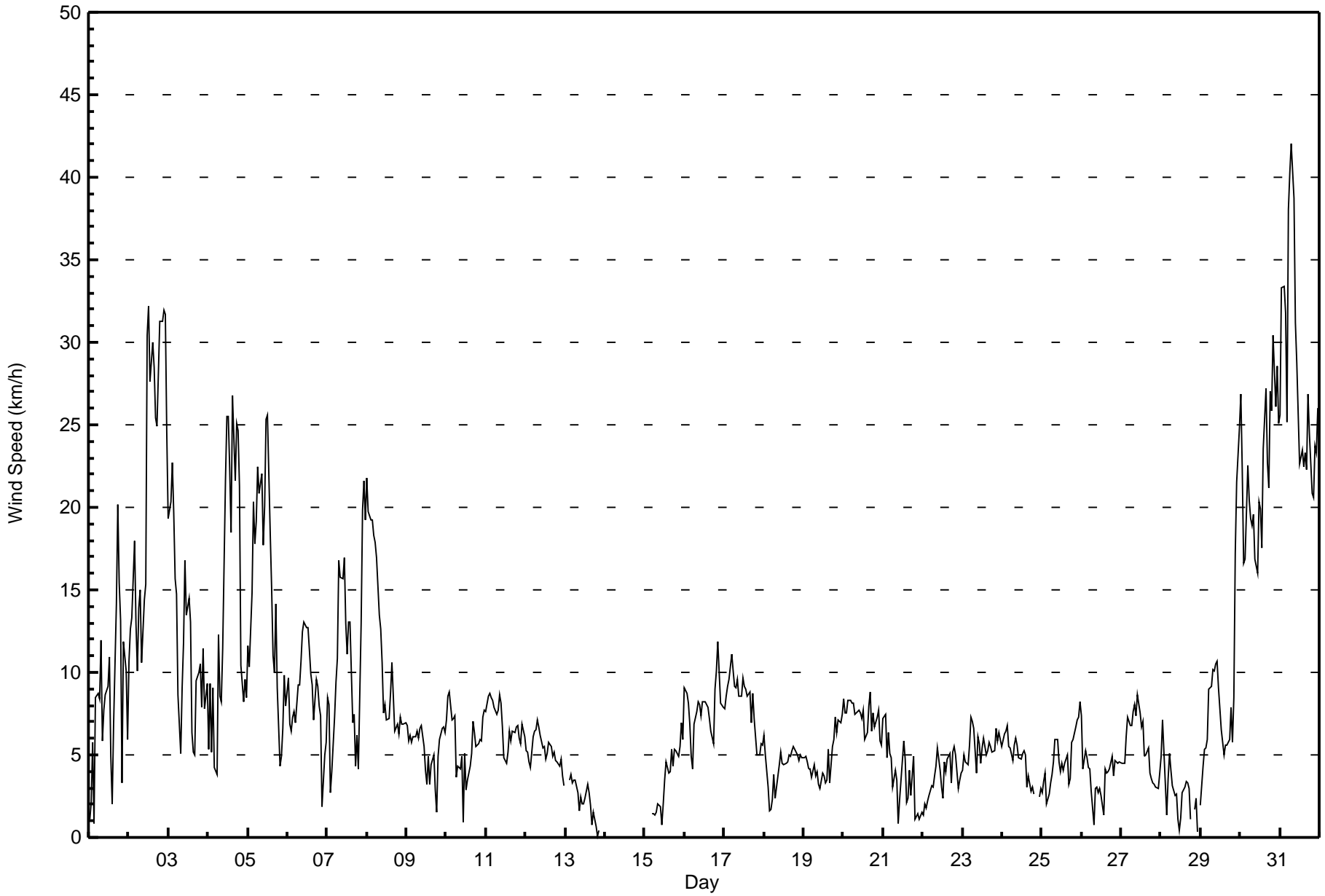


Maximum Speed: 42 km/h on Dec 31 08:00	Maximum Daily Speed Average: 27.2 km/h on Dec 31	Hours in Service: 744
Minimum Speed Value: 0 km/h on Dec 13 20:00	Minimum Daily Speed Average: 0.8 km/h on Dec 26	Hours of Data: 707
Maximum Diurnal Speed Average: 5.4 km/h at hour 22	Minimum Diurnal Speed Average: 2.9 km/h at hour 14	Hours of Missing Data: 37
Monthly Average Velocity: 4.4 km/h 250.9 deg	Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 3 Q <sub>1</sub> = 4 Median = 6 Q <sub>3</sub> = 9 P <sub>90</sub> = 20 P <sub>99</sub> = 32	Percent Operational Time: 95.0

Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1-Dec	SW1	S2	SSW6	SE1	WNW8	WNW9	WSW8	SW12	SW6	SW8	SW9	SW9	WSW11	W5	SW2	WSW7	WSW14	W20	W15	W13	WSW3	W12	W10	SW6	WSW7.4	W20
2-Dec	SSW11	SW13	SW13	WSW18	WSW13	SW10	SW14	SW15	SSW11	SSW14	SSW15	WSW30	W32	W28	W30	WSW28	WSW25	WSW25	W28	W31	W31	W32	W32	W25	WSW20.1	W32
3-Dec	W19	WSW20	WSW23	W20	WSW16	WSW15	SSW9	SSE5	SSE9	S12	S17	S13	S14	SE13	SE6	ESE5	E5	ESE10	SSE10	S10	SSW8	S11	S8	SSW9	SSW8.3	WSW23
4-Dec	SSE5	SSW9	SSW5	SSW9	S4	S4	SSW12	SSW9	SW8	WNW11	WNW22	WNW26	WNW25	WNW22	WNW18	WNW27	W22	W25	W25	W21	WSW10	SW8	SW10	WSW8	W11.6	WNW27
5-Dec	WSW12	WSW10	W15	W20	WNW18	W19	WNW22	WNW21	WNW22	WNW18	W20	W25	W26	W18	W15	W11	WSW10	WSW14	WSW9	SW4	ESE5	SSE7	S10	S8	W13.0	W26
6-Dec	SSE10	SE7	SE6	SE7	SE8	SE7	SE9	SE9	SE11	SE12	SE13	SE13	SE13	SE11	SE10	SSE9	S7	S10	SSW9	S8	SSW7	E2	SE5	SSW6	SSE7.9	SE13
7-Dec	SSW8	SSW8	SSW3	S4	S7	S9	S11	S17	S16	S16	S17	S13	SSE11	SE13	S13	SSE7	SE7	SSE4	SW6	W4	W13	W20	W22	WNW19	SSW8.0	W22
8-Dec	WNW22	WNW20	WNW19	WNW19	NW18	WNW18	NW17	WNW13	WNW13	W11	W8	W8	SW7	SSE7	S9	SSW11	S9	SE6	E7	ESE6	E7	E7	ESE7	ESE7	W5.3	WNW22
9-Dec	ESE7	ESE6	ESE6	ESE6	ESE6	ESE6	ESE6	ESE6	ESE7	SE7	SE5	SE4	SE3	SE5	SSW3	WSW4	W5	WNW3	NW2	W5	WNW6	W7	W7	W6	SSE2.0	SE7
10-Dec	WNW7	WNW9	WNW9	WNW7	WNW7	WNW7	WSW4	SSW4	SW4	S5	ESE1	S5	SW3	E3	E4	ESE5	ESE7	SE6	ESE5	ESE6	ESE6	ESE6	SE7	SE8	S1.2	WNW9
11-Dec	SE8	SE9	SE9	SE8	SE8	SE8	SE7	SE8	SE9	SE8	SE7	SSE5	SSE4	SE5	ESE6	ESE6	ESE6	SE6	ESE7	SE7	SE6	SE6	SE7	SE6	SE6.8	SE9
12-Dec	SE5	SE5	SSE5	S4	SE6	SE6	SE7	SE7	SE7	SE6	SE5	SE6	SE5	SE5	SE6	SE6	SE5	SE5	SE5	SE5	SE4	SE5	SE4	SE3	SE5.2	SE7
13-Dec	AF	AF	ESE4	ESE4	ESE3	ESE3	ESE4	ESE3	ESE2	ESE2	ESE2	ESE2	ESE2	SE3	ESE3	ESE2	E1	E2	ESE1	ENE0	NE0	AF	AF	AF	ESE2.2	ESE4
14-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	---	---
15-Dec	AF	AF	AF	AF	S1	S1	SSW1	S1	S2	S2	SSW1	W2	W3	WNW5	WNW4	WNW4	W5	W4	W5	W5	W5	WNW5	WNW7	NW6	W3.0	WNW7
16-Dec	NW9	NW9	NW8	NW7	N5	NW4	WNW7	WNW8	WNW8	WNW8	WNW7	WNW8	WNW8	WNW8	WNW8	WNW7	W6	W6	W9	WNW10	WNW12	NW10	NW8	NW8	WNW7.6	WNW12
17-Dec	WNW8	WNW9	WNW9	WNW10	WNW11	WNW10	WNW9	WNW9	WNW10	NW9	NW9	NW10	WNW9	WNW9	WNW9	NW9	NW7	WNW9	WNW7	NW6	WNW5	WNW5	W6	WNW6	WNW8.1	WNW11
18-Dec	N6	WNW5	NNW3	NNW2	NE2	WNW2	NNE4	WNW2	ESE4	SE4	SE5	SSE5	S4	SE4	ESE5	ESE5	ESE5	ESE5	ESE6	ESE5	ESE5	ESE5	ESE5	SE5	ESE2.3	N6
19-Dec	ESE5	ESE5	ESE5	ESE4	ESE4	ESE4	SE4	SE4	SE4	SSE3	S3	SSW4	SSW4	SSE3	SE3	SSW5	SSE3	S5	S6	S7	S6	S7	S7	S7	SSE4.1	S7
20-Dec	S8	S8	S8	S8	S8	S8	S8	S7	S8	S8	S8	S7	S8	SSE6	SSE6	SE8	SE9	SSE6	S8	S7	S7	S8	SSE6	SSE6	S7.2	SE9
21-Dec	S7	S7	SSE5	SSE6	S5	SSE5	SSE3	SW4	SW3	S1	WNW2	WNW3	WSW6	WSW5	SSW2	WSW2	WSW4	WSW3	WSW5	WNW1	WNW1	NW1	NNW1	W2	SSW2.4	S7
22-Dec	N1	ENE2	NE2	NNE2	E3	NNE3	NNE3	N4	N4	N5	N4	NE3	NE2	N5	N4	N5	N5	N3	N5	N6	N5	NW3	N3	N4	N3.3	N6
23-Dec	N4	N5	N5	N4	N6	N7	NNW7	NNW7	NNW4	NNW6	NNW6	N4	N5	N6	N5	N5	NNW6	N5	N5	NNW5	NNW7	NNW6	N6	N6	N5.5	N7
24-Dec	N5	N6	NNW6	NNW7	N6	NNW5	NNW5	NNW6	NNW6	NNW6	NNW5	NNW5	N5	N5	N5	NW3	WNW4	WNW3	W3	W3	AF	AF	SW2	SW3	NNW4.1	NNW7
25-Dec	WSW3	WSW3	W4	WNW2	W3	WSW3	W4	W5	W6	WNW6	W5	W4	W5	W4	W4	WSW5	SW3	SW4	WSW6	WSW6	W7	WNW7	NNW7	NNW8	W4.0	NNW8
26-Dec	NNW7	NW4	WNW5	WNW5	WNW4	NNW4	WNW3	WSW1	SW3	WSW3	SW3	SW3	SW1	SE4	SE4	SE4	SSE4	SE5	SSE4	SE5	SE5	SE5	SE5	SE5	SSW0.8	NNW7
27-Dec	SE4	SE4	SE5	SE6	SE7	SE7	SE7	SE8	SE8	SE7	SE9	SSE8	SSE7	SSE7	SSE5	SSE5	S5	S4	S4	S3	WSW3	W3	WSW3	W4	SSE4.7	SE9
28-Dec	NW5	NW7	WNW5	SW1	W4	W5	W4	WSW3	SW3	SSW3	SW1	NNW0	ESE1	ESE3	SE3	S3	SSE3	S3	SSE1	AF	S2	SSW2	WSW0	AF	WSW1.5	NW7
29-Dec	SSE2	SW4	WSW5	SW5	SW6	WSW9	WSW9	WSW10	WSW10	WSW10	WSW11	WSW9	SW7	SSW6	SSW5	SSW6	SW6	SW6	SW8	SSW6	WSW8	WSW17	WSW22	WSW25	WSW8.4	WSW25
30-Dec	WSW27	W22	W17	WNW17	WNW23	WNW20	WNW19	WNW19	WNW20	WNW17	WNW16	WNW20	WNW20	WNW18	WNW24	W27	W23	W21	W27	W26	W30	W26	WSW29	W25	W21.5	W30
31-Dec	W26	W33	W33	W32	W25	WSW38	WSW40	W42	W39	W31	WNW29	WNW26	WNW23	WNW23	WNW22	WNW23	WNW22	W27	WNW24	WNW21	W21	W24	W23	W26	W27.2	W42

WSW4.1	WSW5.0	WSW4.6	W4.4	W3.6	W4.1	WSW4.3	WSW4.6	WSW4.2	WSW3.8	WSW4.3	WSW5.1	WSW5.1	WSW2.9	WSW3.0	WSW4.1	WSW4.0	WSW4.7	WSW5.0	WSW4.8	WSW4.5	WSW5.4	WSW5.3	WSW5.1	Diurnal Average	
WSW27	W33	W33	W32	W25	WSW38	WSW40	W42	W39	W31	WNW29	WSW30	W32	W28	W30	WSW28	WSW25	W27	W28	W31	W31	W32	W32	W26	Diurnal Maximum	

AF - Analyzer Failure  
 All monthly, daily, and diurnal averages have been calculated using vector methods







**Wood Buffalo Environmental Association**  
**Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h**  
**ConocoPhillips - Surmont - December 2015**

<b>Wind Speed Ranges (km/h)</b>	<b>Number of Hours</b>	<b>%</b>	<b>Cumulative %</b>
0 - 5	289	40.88	40.88
6 - 11	278	39.32	80.20
12 - 19	60	8.49	88.68
20 - 28	62	8.77	97.45
29 - 38	15	2.12	99.58
> 38	3	0.42	100.00

Total Number of Valid Hours: 707

Total Number of Hours: 744



**Wood Buffalo Environmental Association**  
**Frequency Distribution**

**Wind Speed (WS) - km/h**  
**ConocoPhillips - Surmont - December 2015**

Wind Speed Ranges (km/h)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	29	4	5	2	7	36	40	21	23	14	21	19	27	23	8	10	289
6 - 11	8	0	0	0	3	23	52	17	38	19	15	19	14	39	15	16	278
12 - 19	0	0	0	0	0	0	6	0	10	3	5	8	10	16	2	0	60
20 - 28	0	0	0	0	0	0	0	0	0	0	0	8	30	24	0	0	62
29 - 38	0	0	0	0	0	0	0	0	0	0	0	3	11	1	0	0	15
> 38	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	3
<b>Totals</b>	<b>37</b>	<b>4</b>	<b>5</b>	<b>2</b>	<b>10</b>	<b>59</b>	<b>98</b>	<b>38</b>	<b>71</b>	<b>36</b>	<b>41</b>	<b>58</b>	<b>94</b>	<b>103</b>	<b>25</b>	<b>26</b>	<b>707</b>

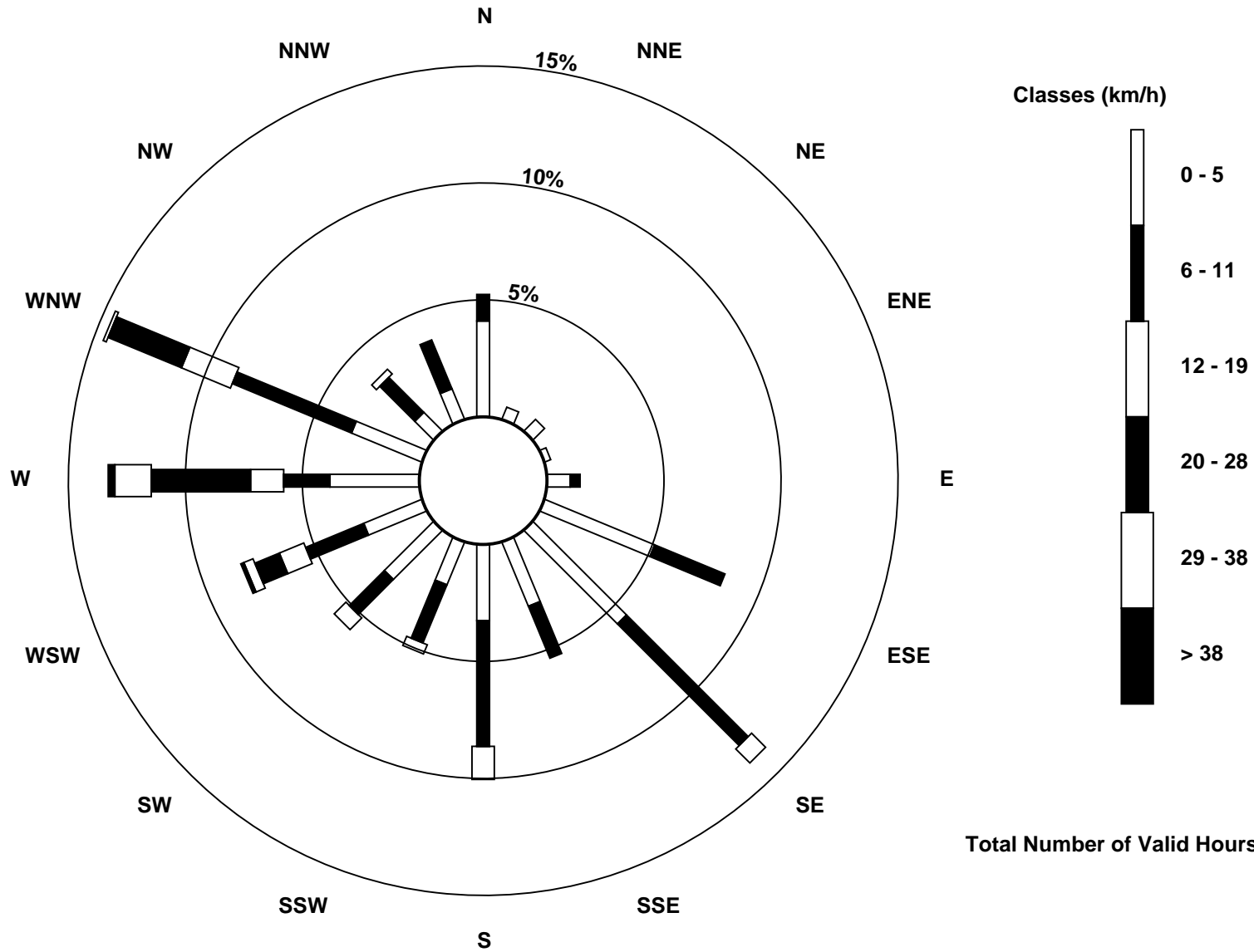
Total Number of Valid Hours: 707

Total Number of Hours: 744



Wood Buffalo Environmental Association  
Wind Rose Dec 2015

Wind Speed (WS) - km/h  
ConocoPhillips - Surmont (AMS502)





Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Speed (WS) - km/h

ConocoPhillips - Surmont - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 7 km/h on Dec 4 11:00			Hours of Data:	174
Minimum Value: 1 km/h on Dec 6 22:00			Hours of Missing Data:	570
			Hours of Calibration:	0
			Percent Operational Time:	23.4
Percentiles: P <sub>1</sub> = 1 P <sub>10</sub> = 2 Q <sub>1</sub> = 2 Median = 3 Q <sub>3</sub> = 4 P <sub>90</sub> = 5 P <sub>99</sub> = 7				

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	1	1	2	1	3	2	3	3	2	2	2	2	2	3	2	3	2	4	4	5	2	4	4	1	5
2-Dec	2	4	3	3	4	2	3	4	2	3	4	6	6	5	6	5	5	5	6	6	6	6	7	7	7
3-Dec	3	3	4	3	3	3	2	1	3	5	3	4	4	3	2	1	2	2	2	3	2	3	2	2	5
4-Dec	2	2	2	2	2	2	3	3	2	4	7	5	5	5	5	5	4	4	4	4	4	2	3	4	7
5-Dec	3	3	4	4	4	5	4	6	5	4	4	5	5	5	3	2	2	3	4	2	1	2	3	2	6
6-Dec	4	2	1	1	1	2	2	2	2	2	2	2	3	2	2	4	2	3	2	3	2	1	1	2	4
7-Dec	2	3	3	2	2	3	3	3	3	4	4	3	3	3	3	4	2	1	2	1	6	4	4	4	6
8-Dec	5	4	3	3	4	4	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	5
9-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
10-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
11-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
12-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
13-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
14-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
15-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
16-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
17-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
18-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
19-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
20-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
21-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
22-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
23-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
24-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
25-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
26-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
27-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
28-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
29-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
30-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
31-Dec	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	--
	5	4	4	4	4	5	4	6	5	5	7	6	6	5	6	5	5	5	6	6	6	6	7	7	
Diurnal Maximum																									

NF - Not Flagged



Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Direction (WD) - deg

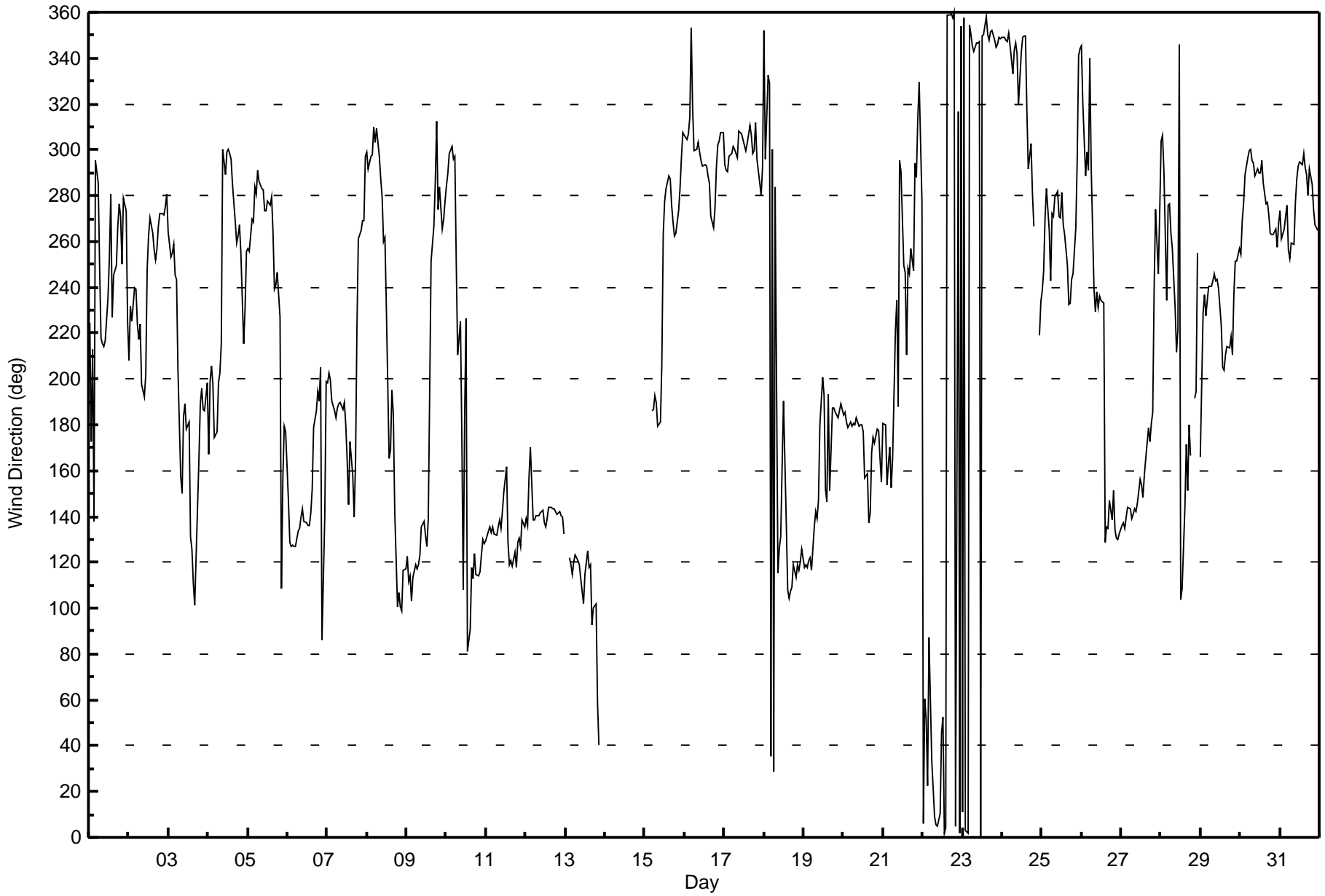
ConocoPhillips - Surmont - December 2015

Direction of Maximum Speed: 260 deg on Dec 31 08:00	Hours in Service: 744
Direction of Maximum Daily Speed Average: 273.9 deg on Dec 31	Hours of Data: 707
Direction of Minimum Speed: 59 deg on Dec 13 20:00	Hours of Missing Data: 37
Direction of Minimum Daily Speed Average: 0.8 deg on Dec 26	Percent Operational Time: 95.0
Monthly Average Direction: 257.2 deg	

Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	225	173	213	138	296	286	249	218	215	214	217	235	253	281	227	246	249	267	277	271	250	279	273	225	253.0
2-Dec	208	232	225	240	239	224	217	224	197	192	202	248	262	271	264	256	252	257	267	272	272	271	275	281	253.1
3-Dec	264	253	255	259	245	243	204	157	150	184	189	178	181	131	126	111	101	123	165	189	196	187	186	199	204.0
4-Dec	167	199	206	198	174	177	198	203	215	300	289	299	300	298	296	285	268	259	262	267	255	216	230	255	264.8
5-Dec	257	256	269	268	283	281	291	286	283	282	273	273	278	276	279	264	239	241	247	227	108	156	180	177	268.1
6-Dec	147	129	127	127	127	127	134	135	140	143	138	137	136	136	142	152	179	186	195	190	205	86	141	199	148.1
7-Dec	198	203	199	190	186	183	187	189	190	187	190	180	165	145	173	158	140	164	223	261	265	269	269	297	204.2
8-Dec	299	292	297	298	310	303	309	297	288	279	260	262	232	165	169	195	185	142	101	107	101	99	117	117	279.6
9-Dec	123	112	114	103	114	119	117	119	123	135	138	132	127	139	194	252	267	285	312	274	284	266	270	278	151.9
10-Dec	285	290	298	301	296	297	251	210	225	175	108	184	226	81	91	118	113	124	115	114	116	123	130	128	170.9
11-Dec	129	134	136	133	136	133	132	135	138	135	142	151	162	129	119	121	119	124	118	129	131	127	138	136	132.4
12-Dec	139	136	157	170	138	138	140	140	140	142	142	137	135	139	144	144	143	143	142	141	142	140	140	132	141.8
13-Dec	AF	AF	122	119	115	120	123	121	119	113	107	102	115	125	118	119	93	100	102	59	40	AF	AF	AF	115.7
14-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
15-Dec	AF	AF	AF	AF	186	187	193	190	180	181	207	263	278	283	289	287	276	268	263	263	273	283	297	308	270.8
16-Dec	307	304	307	314	353	319	300	300	303	299	295	293	293	293	289	286	271	266	275	293	302	304	308	308	298.4
17-Dec	294	291	291	297	298	301	300	299	297	308	307	304	302	299	303	311	306	298	299	312	296	286	280	293	299.3
18-Dec	352	296	333	329	35	300	28	284	116	126	131	162	190	137	108	104	107	109	119	114	119	117	120	126	112.5
19-Dec	118	119	118	121	122	117	135	142	139	147	180	201	193	152	146	194	151	187	188	185	184	183	189	187	162.9
20-Dec	185	185	181	179	181	179	180	180	183	179	180	180	177	157	159	137	142	168	174	172	178	177	165	155	172.8
21-Dec	180	180	154	163	171	153	165	221	234	188	295	291	249	247	210	248	246	257	247	294	288	314	330	277	213.3
22-Dec	6	60	52	23	87	33	22	9	5	5	10	46	52	2	4	359	359	360	358	360	5	317	2	354	10.0
23-Dec	11	358	3	2	354	350	346	343	347	346	347	0	349	350	358	350	348	352	352	348	345	346	349	349	351.1
24-Dec	349	349	348	347	351	345	333	344	346	342	320	343	349	350	350	317	292	303	280	266	AF	AF	219	233	334.3
25-Dec	239	247	271	283	265	243	272	271	280	282	271	270	281	268	263	250	232	233	244	246	266	296	341	344	273.1
26-Dec	345	320	288	299	291	340	292	239	229	238	231	236	234	233	129	135	135	147	138	151	134	131	130	132	194.7
27-Dec	136	137	135	140	144	143	139	141	143	142	146	156	154	149	158	165	179	173	181	186	239	274	246	274	156.0
28-Dec	304	306	290	235	276	276	263	257	231	212	221	346	104	109	144	172	151	180	166	AF	191	195	255	AF	243.8
29-Dec	166	229	237	228	234	241	241	243	246	243	244	240	224	205	204	210	214	214	219	211	237	252	251	257	237.4
30-Dec	255	269	277	289	296	300	300	295	294	289	292	290	290	295	286	277	277	272	263	263	263	265	257	268	278.1
31-Dec	274	261	265	271	276	256	253	260	259	277	288	293	295	293	298	292	289	280	292	285	274	267	266	265	273.9

254.5 253.0 258.1 258.9 264.5 258.9 247.2 242.1 237.1 237.3 240.4 252.2 256.6 257.7 252.7 250.8 242.8 242.4 249.1 252.3 253.1 252.9 251.3 258.2  
Diurnal Average

AF - Analyzer Failure  
All monthly, daily, and diurnal averages have been calculated using vector methods





Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

Wind Direction (WD) - deg

ConocoPhillips - Surmont - December 2015

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	744
Maximum Value: 94 deg on Dec 1 01:00			Hours of Data:	707
Minimum Value: 7 deg on Dec 30 07:00			Hours of Missing Data:	37
Percentiles: P <sub>1</sub> = 8 P <sub>10</sub> = 10 Q <sub>1</sub> = 11 Median = 14 Q <sub>3</sub> = 18 P <sub>90</sub> = 30 P <sub>99</sub> = 81			Hours of Calibration:	0
			Percent Operational Time:	95.0

Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Dec	94	57	28	85	11	15	18	10	37	15	16	9	12	57	76	37	8	9	13	26	66	18	22	30	94
2-Dec	10	14	14	10	10	14	13	15	15	14	18	11	10	9	11	9	10	11	12	10	10	10	11	11	18
3-Dec	10	9	8	8	9	9	16	38	12	21	13	19	22	12	13	31	36	13	36	18	17	14	28	16	38
4-Dec	35	14	20	12	34	43	14	14	18	21	12	13	11	11	13	12	10	8	9	9	18	15	18	28	43
5-Dec	9	13	11	11	13	11	12	14	12	13	12	11	11	14	12	14	12	10	17	62	31	23	17	20	62
6-Dec	17	13	13	11	11	12	11	11	12	11	11	11	10	11	11	23	29	25	18	19	25	83	16	23	83
7-Dec	13	35	81	40	19	16	18	13	14	16	14	19	27	18	17	46	20	32	36	28	10	11	10	12	81
8-Dec	10	11	10	10	13	10	15	14	13	13	22	20	20	30	27	17	23	39	12	13	12	13	14	12	39
9-Dec	13	11	12	13	12	18	11	11	11	12	14	16	17	21	29	13	10	56	75	11	14	12	10	14	75
10-Dec	13	13	10	16	13	10	39	21	50	40	83	28	47	19	19	28	11	15	15	10	9	11	11	10	83
11-Dec	11	11	10	11	11	11	12	14	13	12	21	26	30	24	11	18	12	14	13	12	12	12	11	12	30
12-Dec	20	17	30	28	14	12	12	12	11	12	12	12	13	12	11	11	12	11	11	10	10	10	11	12	30
13-Dec	AF	AF	13	12	12	13	12	12	45	12	14	14	16	16	21	16	14	39	12	17	AF	AF	AF	AF	45
14-Dec	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--
15-Dec	AF	AF	AF	AF	16	15	15	16	12	14	17	18	11	11	13	13	10	9	9	8	10	9	11	11	18
16-Dec	11	10	11	20	14	27	11	11	13	10	11	13	11	11	12	11	9	13	11	10	10	10	14	13	27
17-Dec	10	9	9	9	10	10	11	11	10	17	14	17	15	10	14	17	25	10	15	20	18	13	10	28	28
18-Dec	16	25	46	72	53	63	27	44	15	11	16	28	32	21	18	19	14	16	12	12	12	12	12	12	72
19-Dec	11	12	11	14	12	9	11	17	13	17	30	18	19	24	24	15	30	16	15	14	14	13	15	15	30
20-Dec	13	15	14	13	14	14	15	14	14	14	15	15	15	17	17	10	9	21	16	17	16	16	19	22	22
21-Dec	15	14	24	26	20	18	32	16	22	83	76	14	15	9	73	37	34	63	16	90	68	62	73	57	90
22-Dec	57	32	36	26	28	20	24	16	14	14	22	26	34	18	20	15	15	20	16	16	15	42	16	23	57
23-Dec	15	17	16	16	16	11	10	17	46	10	12	16	13	11	15	14	13	13	14	13	10	11	12	12	46
24-Dec	13	12	12	11	12	17	16	14	12	17	18	16	14	14	14	29	16	33	13	24	AF	AF	10	11	33
25-Dec	13	12	14	38	23	12	15	15	12	10	23	26	15	12	13	10	14	13	10	9	10	15	19	10	38
26-Dec	9	27	11	23	20	25	35	62	13	17	39	11	16	52	12	14	16	16	14	22	11	13	11	12	62
27-Dec	11	12	11	11	11	11	12	11	11	11	10	18	17	14	19	23	22	24	22	28	29	17	17	12	29
28-Dec	21	13	18	49	17	10	17	20	17	16	41	76	46	12	20	23	20	19	57	AF	48	27	73	AF	76
29-Dec	40	18	14	13	14	10	10	9	8	9	9	12	19	16	17	16	17	18	15	19	19	9	8	9	40
30-Dec	8	11	14	12	11	8	7	8	8	8	9	8	8	13	13	10	10	10	9	9	8	9	8	10	14
31-Dec	12	9	9	11	15	10	9	9	9	16	14	13	13	16	11	10	14	10	12	10	11	9	9	9	16
	94	57	81	85	53	63	39	62	50	83	83	76	47	57	76	46	36	63	75	90	68	83	73	57	

Diurnal Maximum

AF - Analyzer Failure



# Wood Buffalo Environmental Association SO2 Calibration Report

## Station Information

Calibration Date	December 8, 2015	Last Calibration	November 6, 2015
Station Name	ConocoPhillips - Surmont	Station Number	AMS 502
Reason:	Routine		
Start Time (MST)	10:42	End Time (MST)	15:15
Gas Cert Reference	LL104215	Station temp.	21 Deg C
Cal Gas Concentration	48.3 ppm	Cal Gas Exp Date	12-Feb-18
Calibrator Make/Model	API T700	Serial Number	622
ZAG Make/Model	API 701	Serial Number	4865
DACS make/model	Campbell Scientific CR3000	DACS serial No.	7882

## Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	518	517
Analyzer IP address	192.168.1.43		Lamp voltage	2195	2131
Calculated slope	1.000495	0.997555	Chamber temp	49.9	50.0
Calculated intercept	-1.080393	-0.455546	Pressure	21.8	21.5
Analyzer Background	19.3	21.1	Flow	0.546	0.533
Analyzer Coefficient	1.010	1.011	Intensity	54	53

Analyzer make API T100 Analyzer serial # 598

## Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.7	----
as found span	5000	83.2	803.7	799.4	1.005
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	83.2	803.7	805.7	0.998
second point	5000	41.6	401.9	404.2	0.994
third point	5000	20.8	200.9	201.9	0.995
as left zero	5000	0.0	0.0	0.3	----
as left span	5000	83.2	803.7	799.6	1.005
Average Correction Factor					0.996

Corrected As found 798.8 Previous response 804.4 % change 0.7%

**Notes:**

Inlet filter replaced after as founds. Adjusted zero.

Calibration Performed By: Asad Hidayat





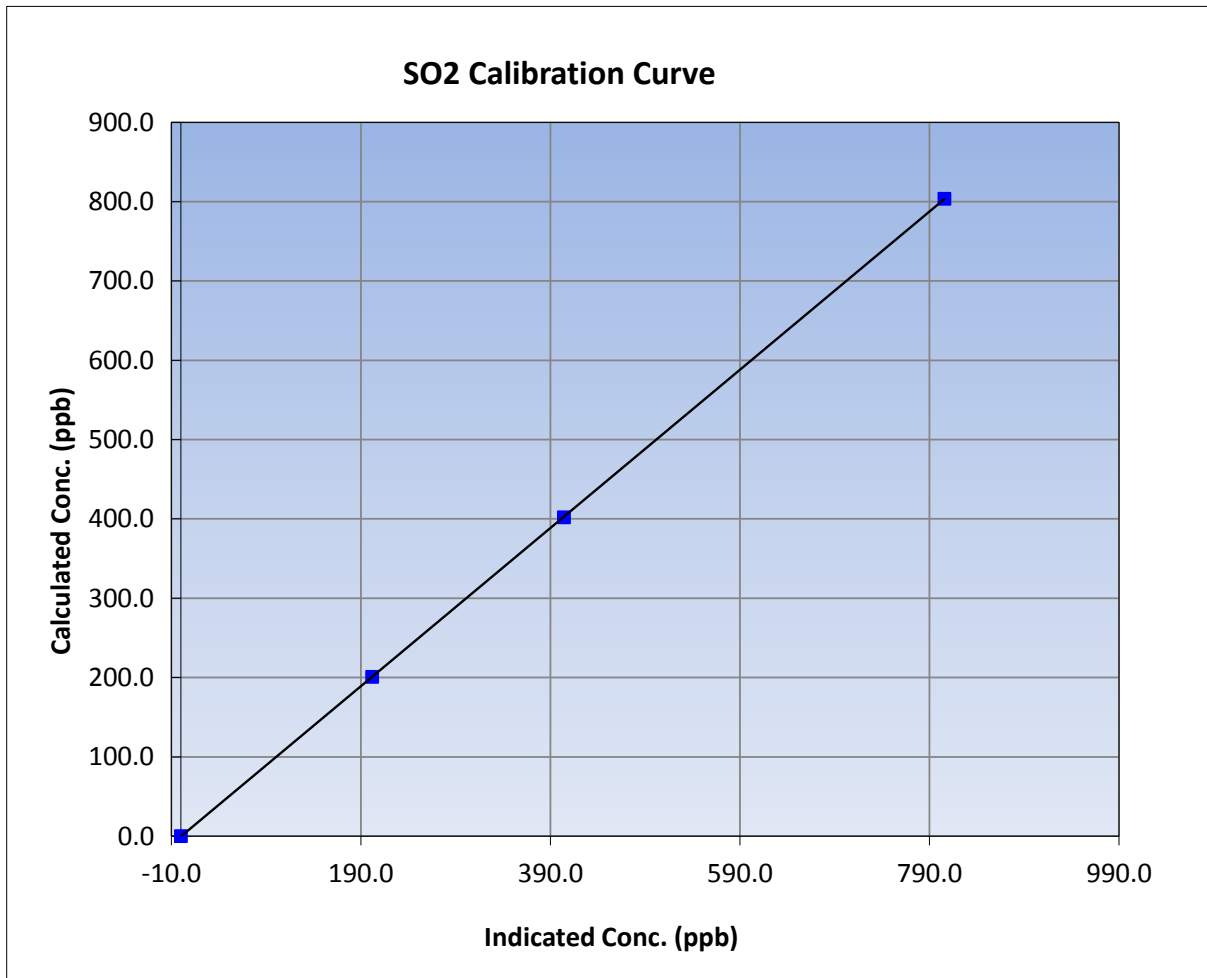
## Wood Buffalo Environmental Association SO2 Calibration Report

### Station Information

Calibration Date	December 8, 2015	Previous Calibration	November 6, 2015
Station Name	ConocoPhillips - Surmont	Station Number	AMS 502
Start Time (MST)	10:42	End Time (MST)	15:15
Analyzer make	API T100	Analyzer serial #	598

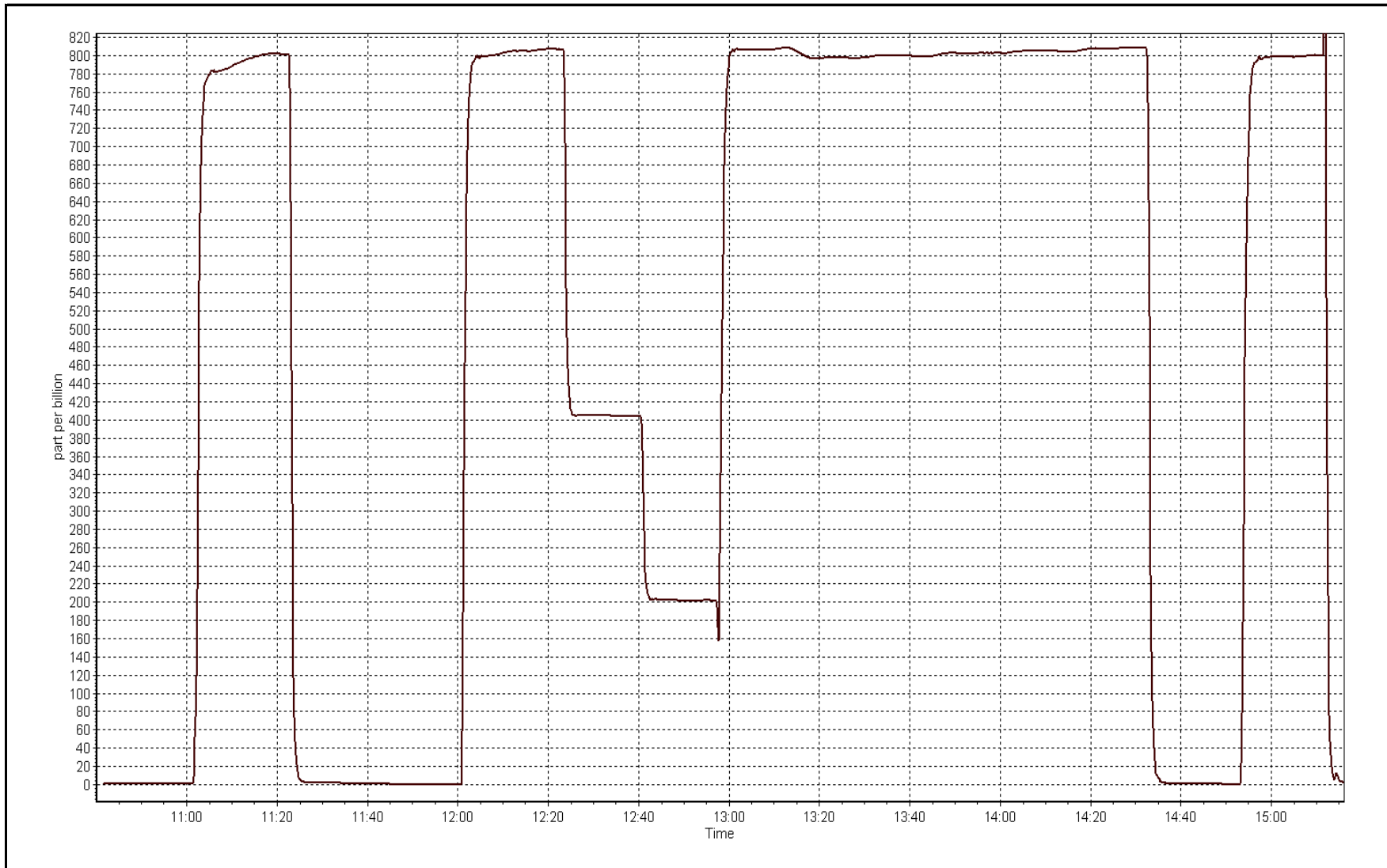
### Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999996
803.7	805.7	0.9976		
401.9	404.2	0.9941	Slope	0.997555
200.9	201.9	0.9951		
			Intercept	-0.455546



SO2 Calibration Plot

Date: December 8, 2015





# Wood Buffalo Environmental Association H2S Calibration Report

### Station Information

Calibration Date	December 4, 2015	Last Calibration	November 5, 2015
Station Name	ConocoPhillips	Station Number	AMS 502
Reason:	Routine		
Start Time (MST)	14:50	End Time (MST)	17:30
Gas Cert Reference	LL34303	Station temp.	21 Deg C
Cal Gas Concentration	10.4 ppm	Cal Gas Exp Date	21/12/2012
Calibrator Make/Model	API T700	Serial Number	622
ZAG air Make/Model	API 701	Serial Number	4865
DACS make/model	Campbell Scientific CR3000	Serial Number	7882
SO2 gas concentration	48.3 ppm	SO2 gas cert/exp	LL104215 12-Feb-18

### Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	513	513
Analyzer IP address	192.168.1.75		Lamp voltage	2114	2067
Calculated slope	1.005983	0.996511	Chamber temp	50	50
Calculated intercept	-0.387990	-0.106875	Pressure	22.9	22.4
Analyzer Background	20.6	21.9	Flow	0.569	0.557
Analyzer Coefficient	0.908	0.915	Intensity	47	47
			Converter temp.	314	315

Analyzer make/model	API T101	Analyzer serial #	197
Converter make/model	N/A	Converter serial #	N/A

### Calibration Data

Set Point	Total flow rate (cc/min)	Source gas flow rate (cc/min)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.0	0.0	0.6	----
as found span	5000	38.5	80.1	80.5	0.995
SO2 scrubber check	5000	20.7	200.0	4.2	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	38.5	80.1	80.4	0.996
second point	5000	19.3	40.1	40.4	0.993
third point	5000	12.1	25.2	25.5	0.987
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	38.5	80.1	80.3	0.997
Average Correction Factor					0.992

Corrected As found	79.9	Previous response	80.0	% change	0.2%
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**Notes:**

Inlet filter replaced and scrubber check done after as founds. Adjusted zero.

Calibration Performed By: Asad Hidayat



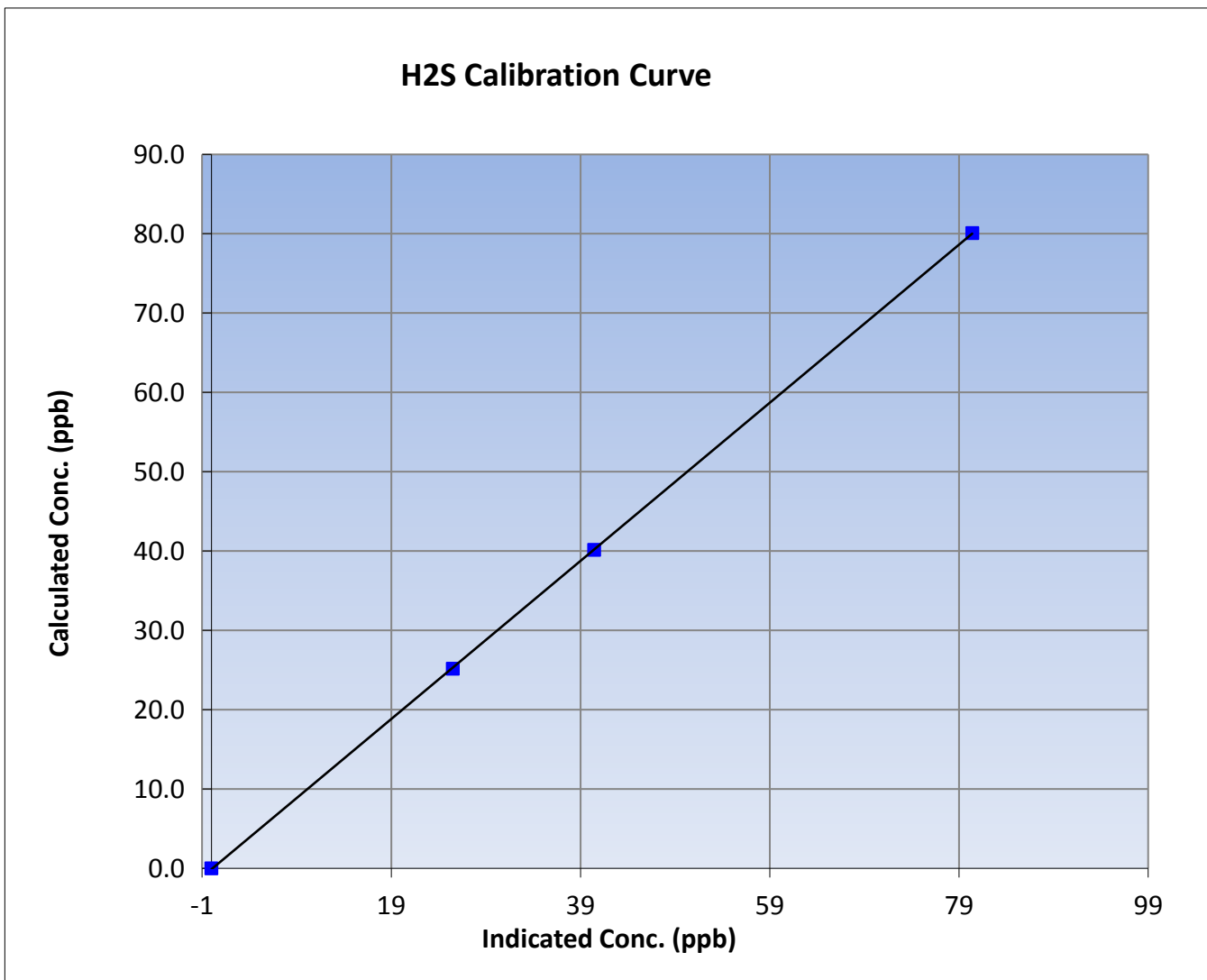
# Wood Buffalo Environmental Association H2S Calibration Report

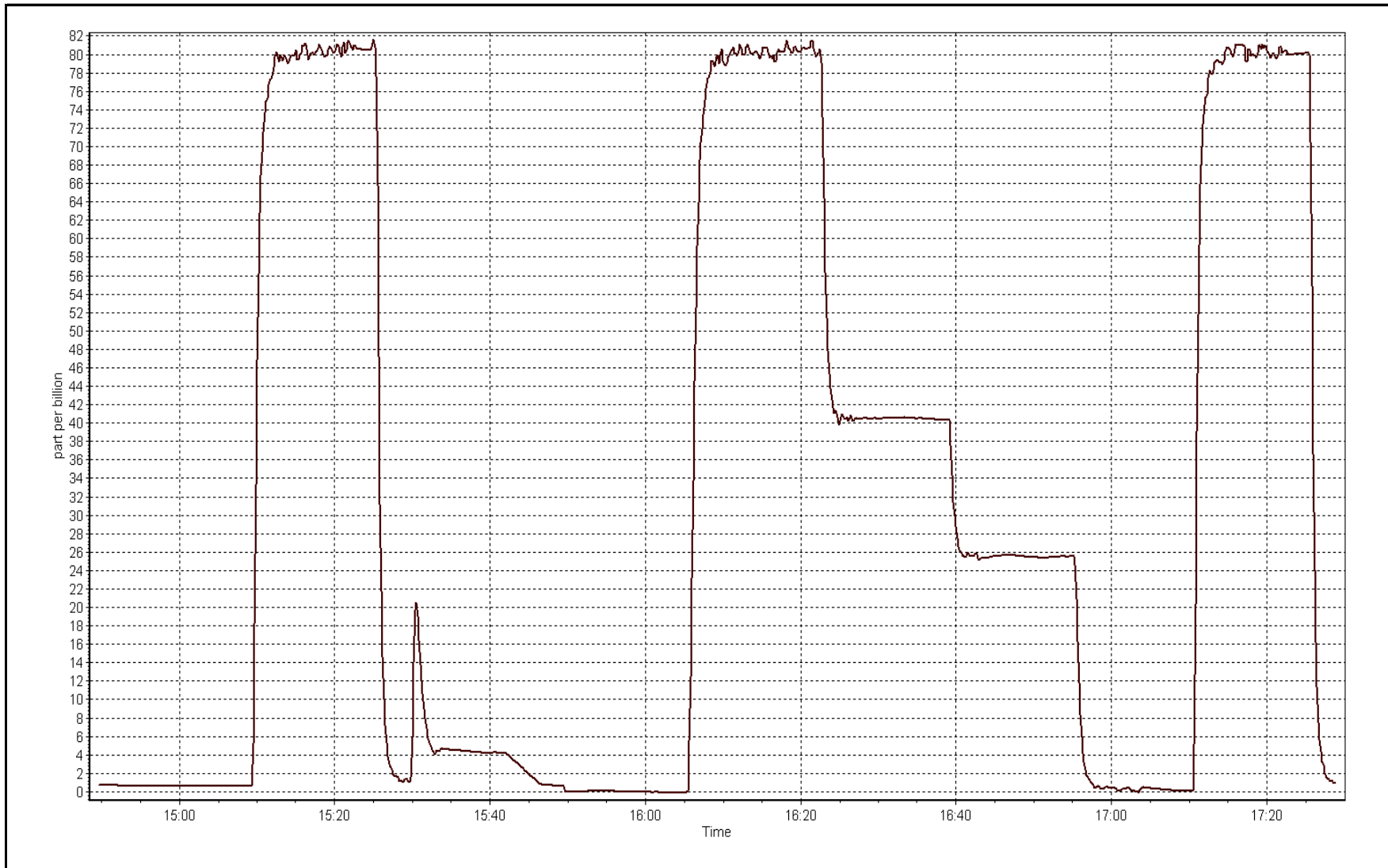
## Station Information

Calibration Date	December 4, 2015	Previous Calibration	November 5, 2015
Station Name	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	14:50	End Time (MST)	17:30
Analyzer make	API T101	Analyzer serial #	197

## Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999988
80.1	80.4	0.9960		
40.1	40.4	0.9927	Slope	0.996511
25.2	25.5	0.9870		
			Intercept	-0.106875







# Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

## Station Information

Calibration Date	December 8, 2015	Previous Calibration	November 6, 2015
Station Name	ConocoPhillips	Station Number	AMS 502
Reason:	Routine		
Start Time (MST)	10:42	End Time (MST)	15:15
NO Cal Gas Conc	48.1 ppm	Gas Cert Reference	LL104215
NOx Cal Gas Conc	48.1 ppm	Cal Gas Expiry Date	12-Feb-18
Calibrator	API T700	Serial Number	622
Zero air Generator	Teledyne API T701	Serial Number	4865

## DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	7882
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## Calibration Statistics

Parameter	NOx	NO	NO2	
As Found (last calibration results)	Data Slope	0.999268	1.000115	0.993102
	Data Offset	-0.380273	-0.047189	-1.056493
Current Calibration	Data Slope	0.998108	0.996969	0.996160
	Data Offset	-0.392630	0.064844	-1.323711

## Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153356
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Test Point	before		after	
Concentration range	0-1000	ppb	0-1000	ppb
Analyzer IP	192.168.1.42		192.168.1.42	
NO coefficient	0.950		0.951	
NOX coefficient	1.001		0.999	
NO2 coefficient	1.000		1.000	
NO bkgrnd	4.4		4.4	
NOX bkgrnd	4.7		4.7	
Chamber Temp	50.1	Deg C	50.2	Deg C
Moly Temp	323.7	Deg C	322.4	Deg C
PMT voltage	-866.9	V	-866.5	V
PMT Temp	-3.1	Deg C	-3.1	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	159.4	mmHg	157	mmHg
R Cell Press Nox	159.7	mmHg	156.7	mmHg
NO sample flow	0.662	lpm	0.651	lpm
Nox sample Flow	0.658	lpm	0.649	lpm

**Notes:**

Inlet filter replaced after as founds. Adjusted span.



# Wood Buffalo Environmental Association

## NOX-NO-NO2 Calibration Report

### Station Information

Calibration Date: December 8, 2015 Station Number: AMS 502

### Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NOx conc (ppb)	Calculated NO conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor
as found zero	5000	0.0	0.0	0.0	0.0	0.4	-0.2	0.6	----	----
as found span	5000	83.2	800.4	800.4	0.0	801.6	799.2	2.4	0.9985	1.0015
calibrator zero	5000	0.0	0.0	0.0	0.0	0.4	-0.2	0.6	----	----
high point	5000	83.2	800.4	800.4	0.0	802.1	802.4	-0.3	0.9979	0.9975
second point	5000	41.6	400.2	400.2	0.0	402.0	402.2	-0.2	0.9955	0.9950
third point	5000	20.8	200.1	200.1	0.0	200.5	200.3	0.2	0.9981	0.9990
as left zero	5000	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	----	----
as left span	5000	83.2	800.4	489.5	310.9	805.3	490.4	314.9	0.9939	0.9982
Average Correction Factor									0.9972	0.9972

Corrected As found NO<sub>x</sub>= 801.2 NO= 799.4 Percent Change NO<sub>x</sub>= 0.0% NO= 0.1%  
 Previous Response NO<sub>x</sub>= 801.4 NO= 800.3

### GPT Calibration Data

Dilution Flow 5000 ccm Source Gas Flow 83.20 ccm

O3 Setpoint (ppb)	Indicated NO high point (ppb)	Indicated NO drop conc (ppb)	Calculated NO2 conc (ppb)	Indicated NOx conc (ppb)	Indicated NO conc (ppb)	Indicated NO2 conc (ppb)	NOx Correction factor	NO Correction factor	NO2 Correction factor	Converter Efficiency
Cal zero			0.0			0.6			N/A	
1st NO2 (300)	----	489.5	310.9	802.4	489.5	312.9	0.9812	1.0000	0.9939	100.6%
2nd NO2 (200)	----	586.6	213.8	803.0	586.6	216.4	0.9805	1.0000	0.9883	101.2%
3rd NO2 (100)	----	688.4	112.0	803.1	688.4	114.7	0.9803	1.0000	0.9764	102.4%
4th NO2 (0)	800.4	----	1.3	801.7	800.4	1.2	0.9820	1.0000	N/A	----
Average Correction Factor							0.9810	1.0000	0.9862	101.4%

Calibration Performed By: Asad Hidayat



# Wood Buffalo Environmental Association

## NO<sub>x</sub> Calibration Summary

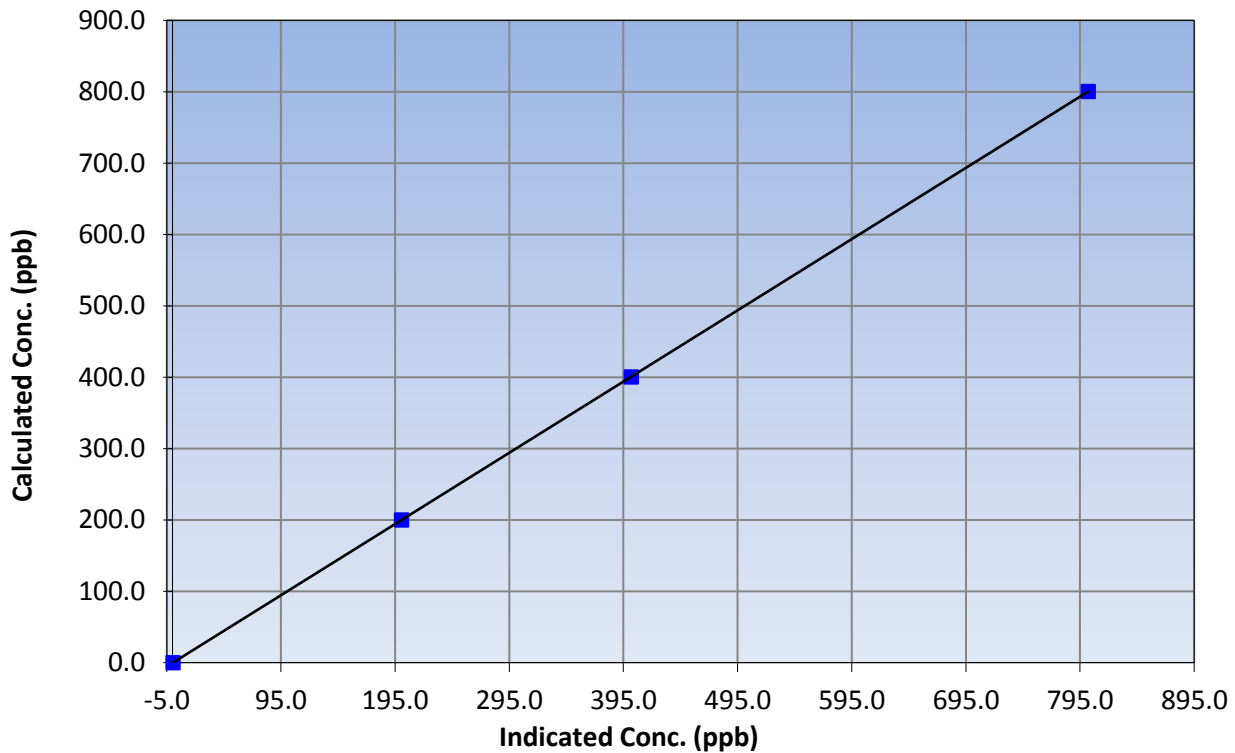
### Station Information

Calibration Date	December 8, 2015	Previous Calibration	November 6, 2015
Station Name	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	10:42	End Time (MST)	15:15
Analyzer make	Thermo 42i	Analyzer serial #	1218153356

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.4	----	Correlation Coefficient	0.999998
800.4	802.1	0.9979		
400.2	402.0	0.9955	Slope	0.998108
200.1	200.5	0.9981		
			Intercept	-0.392630

### NO<sub>x</sub> Calibration Curve







# Wood Buffalo Environmental Association

## NO Calibration Summary

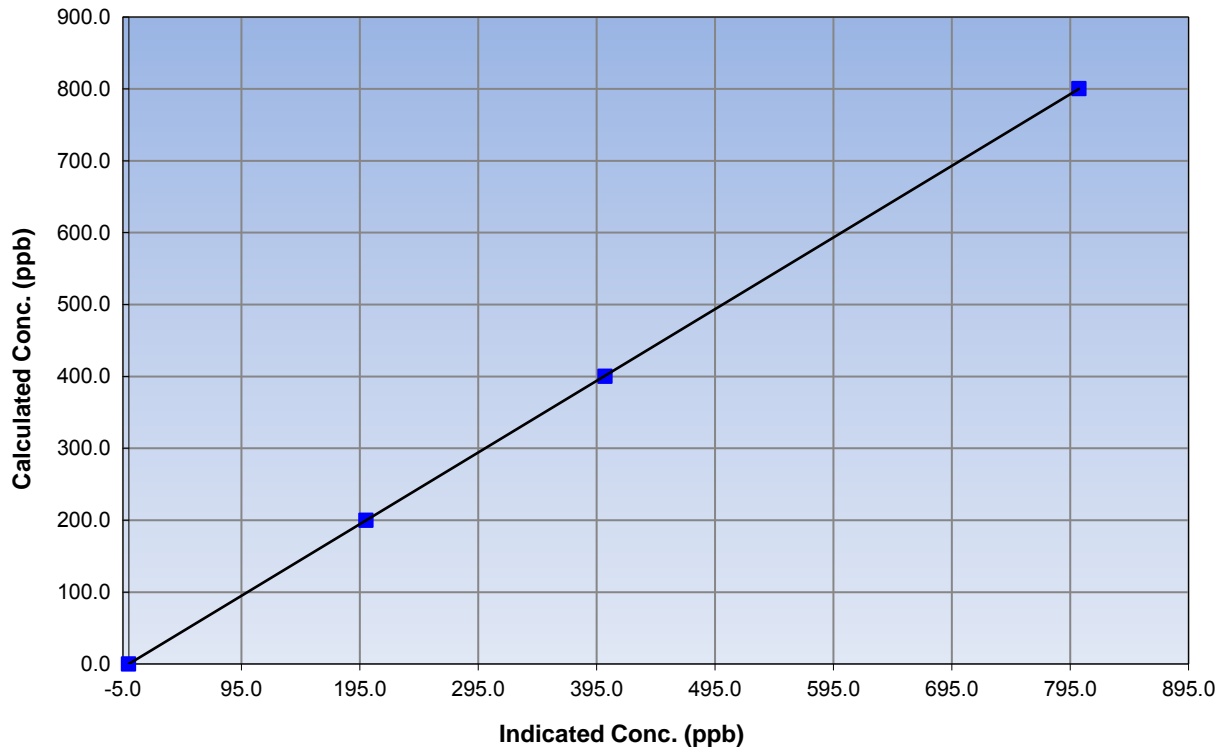
### Station Information

Calibration Date	December 8, 2015	Previous Calibration	November 6, 2015
Station Name	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	10:42	End Time (MST)	15:15
Analyzer make	Thermo 42i	Analyzer serial #	1218153356

### Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	N/A	Correlation Coefficient	0.999997
800.4	802.4	0.9975		
400.2	402.2	0.9950	Slope	0.996969
200.1	200.3	0.9990		
			Intercept	0.064844

### NO Calibration Curve





# Wood Buffalo Environmental Association

## NO<sub>2</sub> Calibration Summary

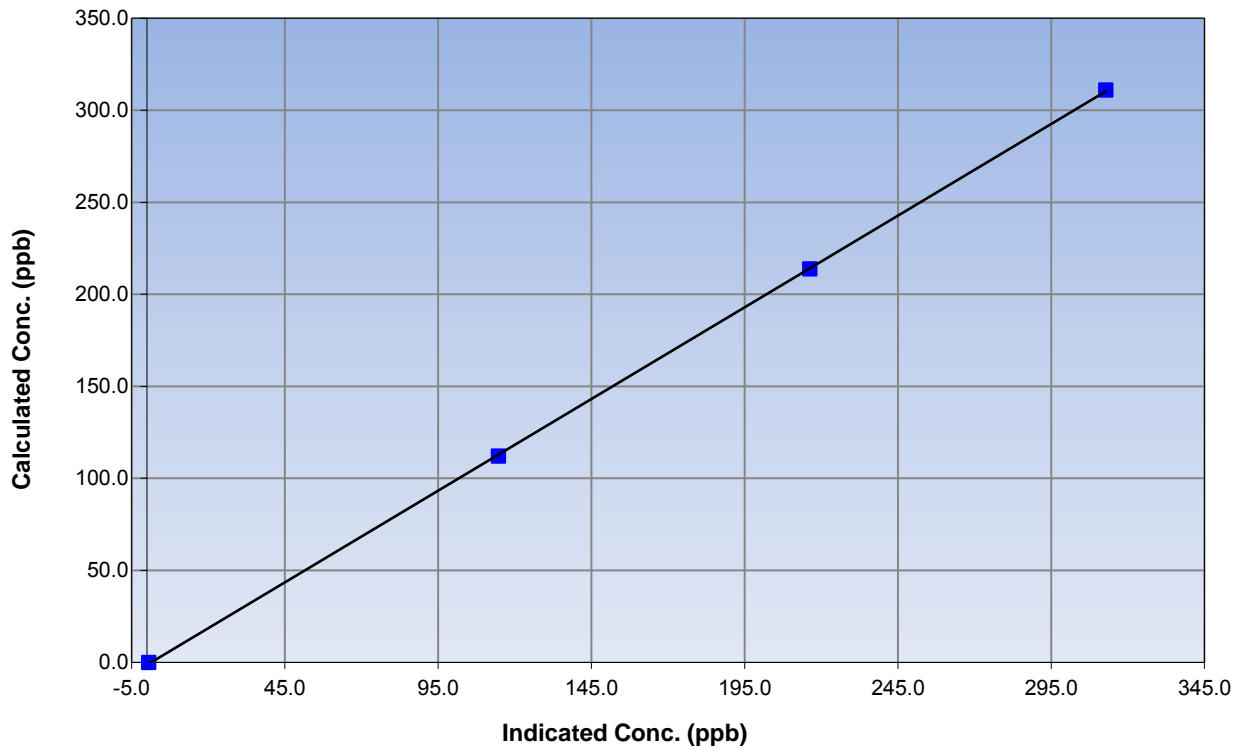
### Station Information

Calibration Date	December 8, 2015	Previous Calibration	November 6, 2015
Station Number	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	10:42	End Time (MST)	15:15
Analyzer make	Thermo 42i	Analyzer serial #	1218153356

### Calibration Information

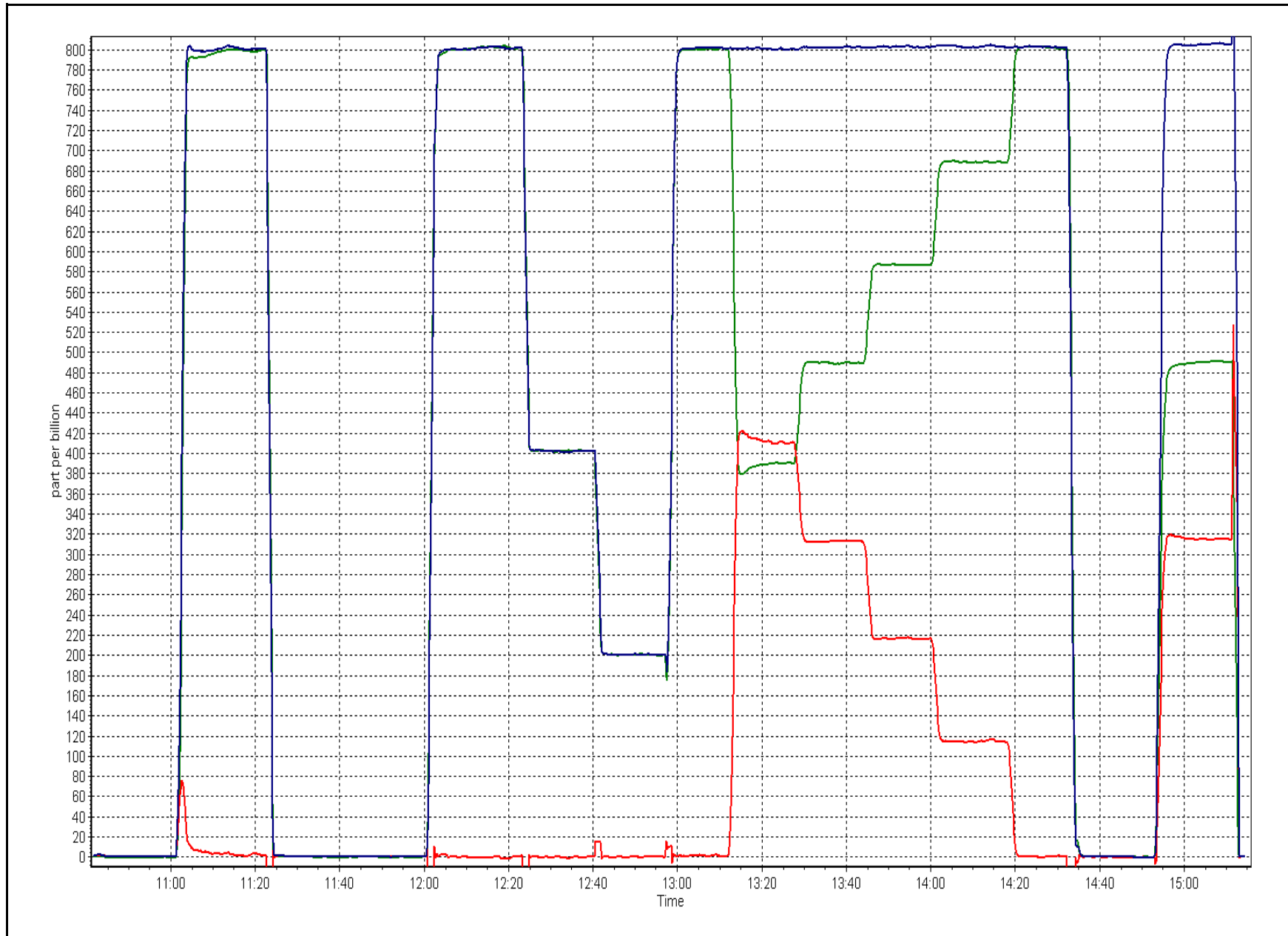
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.6	N/A	Correlation Coefficient	0.999964
310.9	312.9	0.9939		
213.8	216.4	0.9883	Slope	0.996160
112.0	114.7	0.9764		
			Intercept	-1.323711

### NO<sub>2</sub> Calibration Curve



NOX Calibration Plot

Date: December 8, 2015





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