



Wood Buffalo Environmental Association

JUNE 2016 MONTHLY REPORT

CONTINUOUS MONITORING
INTEGRATED MONITORING
July 29, 2016

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



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July 29, 2016

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

**RE: Monthly Ambient Air Quality Monitoring Report June 2016
Wood Buffalo Environmental Association**

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Enclosed is the June 2016 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 - Stony Mountain
AMS 19 - Firebag
AMS 20 - Brion MacKay River
AMS 21 - Conklin Community
AMS 500 - Cenovus Christina Lake
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:

Member	EPEA Approval No.
Athabasca Oil Corporation	289664-00-00
Brion Energy	254465-00-00
Canadian Natural Resources Ltd.	149968-00-01



Member	EPEA Approval No.
Cenovus Energy	48522-01-00
Connacher Oil and Gas Ltd.	240008-00-03
ConocoPhillips Canada	48263-01-00
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 & Parks
Alberta Health Services
Alberta Health & Wellness
Environment Canada
Health Canada
Parks Canada
Pembina Institute for Appropriate Development
Regional Municipality of Wood Buffalo
Saskatchewan Environment

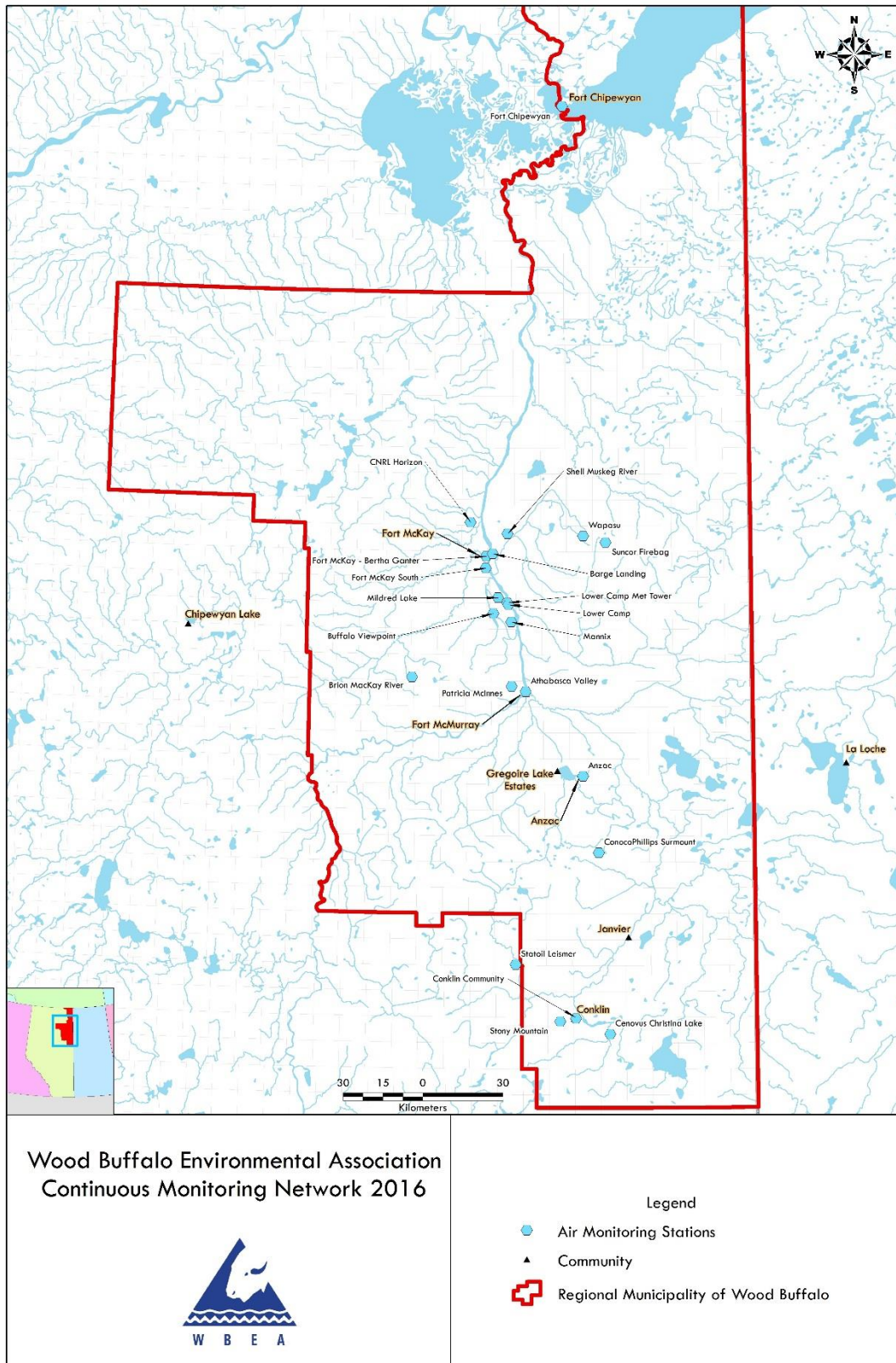


Figure 1: Map of WBEA Air Monitoring Network.

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 SO₂, CO, NO₂, O₃, and NH₃.

There were 6 H₂S ambient ground level concentrations in excess of the 1-hour and 24-hour H₂S air quality objectives reported to the Energy and Environmental Response Centre in real time. After data processing to account for analyzer drift with baseline correction, there were 5 concentrations in excess of the 1-hour H₂S air quality objective and 1 concentration in excess of the 24-hour H₂S air quality objective.

There were 3 ambient ground level concentrations of Particulate Matter (PM_{2.5}) in excess of the PM_{2.5} 24-hour air quality objective reported to the Energy and Environmental Response Centre in real time. After data processing to account for valid analyzer response and correction, there were 2 concentrations in excess of the PM_{2.5} air quality objective. There was 1 24-hour objective exceedance reported in real-time that was found not to be in exceedance due to excessive loading and foreign material in the sample chamber.

The following table provides the status of the incidents and final data averages.

Site	Parameter	Date / Time	Reference	Period	Concentration ppb or ug/m ³		Status
					Reported	Final	
AMS 2 Mildred Lake	H ₂ S	20Jun 16, 04:00	312835	1hr	14	14	exc
AMS 2 Mildred Lake	H ₂ S	20Jun 16, 05:00	312835	1hr	13	13	exc
AMS 2 Mildred Lake	H ₂ S	20Jun 16, 06:00	312835	1hr	22	22	exc
AMS 2 Mildred Lake	H ₂ S	20Jun 16, 07:00	312835	1hr	29	29	exc
AMS 2 Mildred Lake	H ₂ S	20Jun 16, 08:00	312835	1hr	15	15	exc
AMS 2 Mildred Lake	H ₂ S	20Jun 16, 24:00	312835	24hr	5	5.1	exc
AMS 8 Fort Chipewyan	PM _{2.5}	18Jun 16, 24:00	312815	24hr	1576	-	ret
AMS 14 Anzac	PM _{2.5}	08Jun 16, 24:00	312469	24hr	31	31.2	exc
AMS 21 Conklin Community	PM _{2.5}	08Jun 16, 24:00	312470	24hr	75	74.3	exc

*status legend:

- late exceedance, raw values were not found to be in exceedance in real time, and/or were not reported, but final values were found to be an exceedance after data processing.
- exc exceedance, raw values reported in real time were confirmed to be in exceedance after data processing.

- nae not an exceedance, raw values reported in real time were found not in exceedance after data processing.
- ret retracted, reported exceedance was found to be not an exceedance after investigation of measurement system status and/or validation of raw data in conjunction with all associated measurement parameters.

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 $PM_{2.5}$, 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_2 concentrations were re-calculated from baseline-corrected NO_x and NO concentrations. Specifically, the NO concentration was subtracted from the NO_x concentration to determine the NO_2 concentration. In cases where the NO_x and/or NO values exceeded the operating range of the analyzer, values reported for NO_2 were determined as the largest of either the difference between baseline-corrected NO_x and NO values, or the NO_2 value reported by the data acquisition system with baseline correction applied.

1.2 Revisions to AEMERA Airdata Warehouse

There were no revisions to historical data stored at the AEMERA Airdata Warehouse with this monthly report.

2.0 Operational Status

Continuous Monitoring

In June 2016, there were 2 incidents resulting in compliance monitoring instruments operating less than 90% of the time:

1. The sulphur dioxide (SO₂) analyzer at AMS 14 – Anzac Community operated less than 90% of the time in June 2016.

The station temperature control at AMS 14 failed to operate properly June 7 to 9 and June 25 to 27, 2016. This resulted in high internal station temperatures during those periods. The PMT cooler on the SO₂ analyzer could not maintain stable temperature during these periods resulting in unacceptable drift.

A portable air conditioning unit is now operating in the station and a replacement of the faulty station unit will be scheduled shortly. Moving forward, this will accomplish proper control of the station temperature.

In June, the SO₂ analyzer at AMS 14 operated for 87% of the time. This incident was reported to Alberta Environment and Parks on July 27, 2016 (reference number 314319).

2. The Total Reduced Sulphur (TRS) analyzer at AMS 21 – Conklin Community operated less than 90% of the time in June 2016.

From June 7 to 8, TRS data was invalidated due to an unlinear calibration completed on June 7. Maintenance was performed on the calibration rig and the calibration was repeated on June 8, meeting calibration acceptance criteria.

The analyzer sensitivity stability failed after the June 10 span point. A number of tests were conducted on the analyzer to determine the cause, but were unsuccessful. The analyzer was then replaced on June 17 and calibrated that day. The failed analyzer will be investigated further at the WBEA Field Operations Centre before being re-deployed.

In June, the TRS analyzer at AMS 21 operated for 73% of the time. This incident was reported to Alberta Environment and Parks on July 27, 2016 (reference number 314320).

In June 2016, there were 2 incidents of a monitoring instrument not required for air quality compliance operating less than 90% of the time. Normal operations of the solar radiation and leaf wetness sensors at the Fort Chipewyan air monitoring station (AMS 8) were invalidated for 128 and 154 hours, respectively, due to intermittent electrical interference of sensor output signals.

Intermittent Monitoring

The results for passive and integrated monitoring of PAH, VOC, RSC, PM_{2.5} and PM₁₀ 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 (NH₃) 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 NH₃ 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 NH₃ gas is an inherent behavior in the NH₃ analyzer operations resulting from the properties of the NH₃ gas. Data for 1 to 3 hours following the daily spans have been reported as invalid for a total of 69 hours this month.

Maintenance and cleaning of the sample manifold on June 2 interrupted the normal operations of the all air quality analyzers for 1 hour.

Brownout conditions on June 10 affected the routine operations of all analyzers to varying degrees of interference. Analyzers experienced between 1 and 9 hours of invalid data. The THC analyzer required a manual relight of the FID on June 11 resulting in an additional 8 hours of invalid data.

Station operator activities on June 20 interrupted the routine operations of the THC analyzer for 1 hour. Depletion and replacement of the fuel cylinder at the station on June 24 affected the normal operations of the THC analyzer for 3 hours.

Maintenance to investigate analyzer noise on June 13 interrupted the routine operations of the O₃ analyzer for 3 hours. On June 21 the analyzer was removed and replaced with a backup analyzer.

Excessive baseline drift on June 17 affected the normal operations of the PM_{2.5} analyzer for 3 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

No operational issues to report this month.

Station 3, Lower Camp B - Meteorology

No operational issues to report this month.

Station 4, Buffalo Viewpoint

Maintenance and cleaning of the sample manifold on June 15 interrupted the normal operations of the H₂S analyzer for 1 hour.

Station 5, Mannix

Maintenance and cleaning of the sample manifold on June 7 interrupted the normal operations of the THC analyzer for 1 hour.

Spurious values in the output signal of the 90m elevation wind sensor resulted in 2 hours of downtime this month.

Station 6, Patricia McInnes

The NH₃ 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 NH₃ gas is an inherent behavior in the NH₃ analyzer operations resulting from the properties of the NH₃ gas. Data for 1 to 3 hours following each daily span has been reported as invalid for a total of 51 hours this month.

Maintenance and cleaning of the sample manifold on June 2 interrupted the normal operations of the TRS and O₃ analyzers for 2 hours and the NH₃ analyzer for 3 hours.

The sample pump of the THC analyzer failed on June 1 resulting in 27 hours of invalid data. Maintenance on June 2 to replace the sample pump and stabilize prior to calibration interrupted the normal operations of the THC analyzer for 4 hours.

Maintenance to clean, optimize, and stabilize the PMT assembly on June 2 interrupted the routine operations of the NO₂ analyzer for 26 hours.

Station operator activities on June 14 affected the normal operations of the SO₂ analyzer for 1 hour.

There were 5 issues with the operation of the PM_{2.5} analyzer. Maintenance on June 10 to verify the baseline zero response interrupted the routine operations of the PM_{2.5} analyzer for 1 hour. Maintenance to inspect and clean the sample chambers on June 14 affected the routine operations

of the PM_{2.5} analyzer for 5 hours. Two instances of negative baseline drift on June 16 resulted in 2 hours of invalid data. Maintenance on June 16 to adjust the zero response interrupted the routine operations of the PM_{2.5} analyzer for 1 hour.

Station 7, Athabasca Valley

Maintenance and cleaning of the sample manifold on June 1 interrupted the normal operations of the TRS, O₃, and CO analyzers for 1 hour. Additional maintenance to complete cleaning of the sample manifold on June 2 interrupted the normal operations of all air quality analyzers for 1 hour.

The PM_{2.5} analyzer exhibited 4 instances of excessive baseline drift resulting in 13 hours of invalid data this reporting period.

Station 8, Fort Chipewyan

A station power outage on June 15 affected the routine operations of all air quality analyzers for 1 to 2 hours. The NO₂ analyzer required an additional 1 hour to stabilize following the power outage.

Unstable operation due to foreign debris in the sample chamber of the PM_{2.5} analyzer on June 18 resulted in 69 hours of invalid data. Maintenance to replace the analyzer on June 21 and verify operation resulted in 1 additional hour of invalid data.

Maintenance to lower the meteorological tower to access a remote camera on June 14 interrupted the normal operations of the meteorological sensors for 1 hour.

Six instances of excessive signal noise affected the normal operation of the O₃ analyzer for 8 hours this reporting period.

Grounding issues with the analogue signal cables of the surface leaf wetness and solar radiation sensors resulted in 154 hours and 128 hours, respectively, of invalid data this reporting period.

Station 9, Barge Landing

A station power outage on June 10 interrupted the normal operations of the TRS analyzer for 10 hours and the THC analyzer for 11 hours.

Maintenance and cleaning of the sample manifold on June 13 interrupted the normal operation of the TRS analyzer for 2 hours.

Maintenance to service the zero air generator on June 16 interrupted the routine operation of the THC analyzer for 1 hour.

Station 11, Lower Camp

No operational issues to report this month.

Station 13, Fort McKay South

Maintenance to service the zero air generator on June 7 interrupted the routine operations of the TRS and O₃ analyzers for 2 hours.

Maintenance to initiate the daily QA check on June 9 interrupted the normal operation of the O₃ analyzer for 3 hours. A flat line in the signal output of the O₃ analyzer on June 19 resulted in 28 hours of invalid data; the analyzer was reset on June 20 and analyzer response verified, interrupting 2 hours of data. Station operator activities on June 28 affected the normal operation of the O₃ analyzer for 3 hours.

Multiple instances of digital communication interruptions on June 10 resulted in 1 to 3 hours of invalid data for all air quality analyzers.

Multiple instances of unstable operation due to baseline drift on June 9 and 12 affected the normal operations of the PM_{2.5} analyzer for 4 hours.

Station operator activities on June 23 and 28 affected the normal operation of the NO₂ analyzer for 3 hours.

Station 14, Anzac

Maintenance to verify daily QA responses on June 6 interrupted the routine operations of all air quality analyzers for 1 to 2 hours. Maintenance to verify daily QA responses on June 8 interrupted the routine operations of the TRS, NO₂, and O₃ analyzers for 1 hour.

Maintenance to service the zero air generator on June 14 affected the routine operations of the TRS and O₃ for 3 hours.

Maintenance to clean the reaction chamber assembly and allow for stabilization on June 13 interrupted the routine operations of the NO₂ analyzer for 19 hours.

Unstable, high station temperatures throughout the reporting period affected the routine operations of all air quality analyzers for 18 to 91 hours. Maintenance to shut down all analyzers during an extreme temperature event on June 26 affected all air quality analyzers for 4 to 20 hours.

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

Station 15, CNRL Horizon

Maintenance and cleaning of the sample manifold on June 20 interrupted the normal operations of the SO₂, THC, and NO₂ analyzers for 1 hour.

A flat-line in the output signal of the wind sensor resulted in 1 hour of invalid data this reporting period.

Station 16, Shell Muskeg River

Maintenance to replace the sample manifold stack on June 28 interrupted the normal operations of all air quality analyzers for 1 hour.

Station 17, Wapasu

A station power interruption on June 15 affected the routine operations of the THC and O₃ analyzers for 1 hour.

The NO₂ analyzer failed to operate on June 15 and required the replacement of its power cable, resulting in 23 hours of invalid data.

Maintenance to restore a frozen display screen and verify analyzer response on June 16 interrupted the routine operations of the O₃ analyzer for 2 hours.

Maintenance to inspect and clean the sample chambers on June 22 affected the routine operation of the PM_{2.5} analyzer for 5 hours. A sample leak outside of operational criteria resulted from the maintenance work performed and resulted in 20 hours of invalid data. The leak was corrected on June 23 by the station operator and normal operations were restored.

Maintenance and cleaning of the sample manifold on June 23 interrupted the normal operations of the SO₂, THC, O₃, and NO₂ analyzers for 2 hours.

Routine maintenance and functional checks on June 23 interrupted the normal operations of the precipitation collector for 1 hour.

Station 18, Stony Mountain

A station power outage on June 3 interrupted the routine operation of all air quality analyzers for 4 to 5 hours.

A station power interruption on June 10 affected the routine operations of the NO₂ analyzer for 1 hour.

Routine maintenance and functional checks on June 17 interrupted the normal operations of the precipitation collector for 1 hour.

Maintenance to service the zero air generator on June 21 interrupted the routine operation of the TRS and O₃ analyzers for 2 and 3 hours, respectively.

Station 19, Firebag

Maintenance to service the zero air generator and change sample inlet filters on June 27 interrupted the routine operation of the SO₂, THC, and NO₂ analyzers for 4 hours.

Maintenance and cleaning of the sample manifold on June 28 interrupted the normal operations of the H₂S analyzer for 1 hour.

A flat-line in the output signal of the wind sensor resulted in 1 hour of invalid data this reporting period.

Station 20, Brion MacKay River

Maintenance and cleaning of the sample manifold on June 23 interrupted the normal operations of the H₂S analyzer for 1 hour.

Maintenance to reconfigure the data logger on June 29 interrupted the routine operations of all parameters for 1 hour.

Unstable operations due to excessive baseline drift on June 27 and 30 affected the normal operations of the H₂S analyzer for 4 hours.

Station 21, Conklin Community

Maintenance and cleaning of the sample manifold on June 8 interrupted the normal operations of the SO₂, THC, NO₂, and O₃ analyzers for 1 hour.

Maintenance to service the zero air generator on June 9 interrupted the routine operation of the THC analyzer for 6 hours.

There were 3 issues with the operation of the TRS analyzer this month resulting in 196 hours of invalid data. Maintenance to diagnose and repair operational issues on June 7 interrupted the routine operation of the TRS analyzer for 7 hours. Operation outside of AMD criteria for linearity on June 7 and span response from June 10 to 17 resulted in 18 and 171 hours of invalid data, respectively.

Maintenance to confirm calibration points for the ozone calibration on June 14 interrupted the routine operations of the NO₂ analyzer for 3 hours.

There were 4 issues with the operation of the PM_{2.5} analyzer this reporting period resulting in 47 hours of invalid data. Unstable operations due to excessive baseline drift on June 5 and 9 resulted in 20 hours total of invalid data. Sample pump failure and replacement on June 16 affected the

routine operation of the PM_{2.5} analyzer for 24 hours. Maintenance to confirm sample flow and zero response interrupted the routine operation of the PM_{2.5} analyzer for 3 hours.

Flat-lines in the output signal of the wind sensor resulted in 4 hours of invalid data this reporting period.

Station 500, Cenovus Christina Lake

Maintenance and cleaning of the sample manifold on June 10 interrupted the normal operations of the H₂S analyzer for 2 hours.

Station 502, ConocoPhillips Surmont

The H₂S analyzer experienced multiple instances of unstable operations due to excessive baseline drift resulting in 8 hours of invalid data this reporting period. Maintenance and cleaning of the sample manifold on June 28 interrupted the normal operations of the H₂S analyzer for 2 hours.

Station power failures on June 13 and 15 affected all air quality analyzers resulting in 8 and 2 hours of invalid data, respectively. Following the power outages, the SO₂ analyzer required 34 and 7 hours of stabilization time.

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

If additional information is required, please contact either Mike Martineau at (780) 715 1770 ext. 222 or the Wood Buffalo Environmental Association at (780) 799 4420.

Yours sincerely,

Wood Buffalo Environmental Association

Mike Martineau
Data Technician

Sanjay Prasad
Air Quality Scientist



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

JUNE 2016
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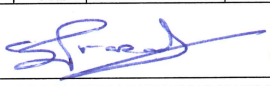
Prepared: Jul 27 2016 15:15

APPROVAL NUMBERS	REPORT DATE						
	MONTH	YEAR					
289664-00-00	6	2016					
254465-00-00	CONTINUOUS AMBIENT MONITORING						
149968-00-01							
48522-01-00							
240008-00-03				ONE-HOUR AVERAGE		24-HOUR AVERAGE	
48263-00-00	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
224816-00-03							
189942-00-02							
206355-00-00	SO2(ppm)	1	99.72	0.078	0	0.008	0
46586-00-00	SO2(ppm)	2	100.00	0.079	0	0.015	0
216466-00-04	SO2(ppm)	4	100.00	0.041	0	0.004	0
137467-00-00	SO2(ppm)	5	100.00	0.091	0	0.010	0
20809-01-00	SO2(ppm)	6	99.86	0.040	0	0.006	0
241311-00-00	SO2(ppm)	7	99.86	0.017	0	0.003	0
094-02-00	SO2(ppm)	8	99.86	0.003	0	0.001	0
305529-00-00	SO2(ppm)	11	100.00	0.124	0	0.017	0
026-02-00	SO2(ppm)	13	99.86	0.087	0	0.007	0
228044-00-00	SO2(ppm)	14	86.67	0.005	0	0.001	0
73203-01-00	SO2(ppm)	15	99.86	0.027	0	0.004	0
	SO2(ppm)	16	99.86	0.024	0	0.006	0
	SO2(ppm)	17	99.72	0.023	0	0.003	0
	SO2(ppm)	18	99.31	0.002	0	0.001	0
	SO2(ppm)	19	99.44	0.016	0	0.002	0
	SO2(ppm)	20	99.86	0.011	0	0.002	0
	SO2(ppm)	21	99.86	0.001	0	0.000	0
	SO2(ppm)	500	100.00	0.011	0	0.003	0
	SO2(ppm)	502	92.92	0.013	0	0.005	0
	H2S(ppm)	2	100.00	0.029	5	0.005	1
	H2S(ppm)	4	99.86	0.002	0	0.000	0
	H2S(ppm)	5	100.00	0.006	0	0.001	0
	H2S(ppm)	11	100.00	0.008	0	0.001	0
	H2S(ppm)	17	100.00	0.001	0	0.000	0
	H2S(ppm)	19	99.86	0.001	0	0.000	0
	H2S(ppm)	20	99.17	0.001	0	0.000	0
	H2S(ppm)	500	99.72	0.001	0	0.000	0
	H2S(ppm)	502	97.22	0.003	0	0.001	0
	TRS(ppm)	1	99.72	0.003	0	0.001	0
	TRS(ppm)	6	99.72	0.002	0	0.000	0
	TRS(ppm)	7	99.72	0.001	0	0.001	0
	TRS(ppm)	9	98.33	0.002	0	0.000	0
	TRS(ppm)	13	99.31	0.005	0	0.001	0
	TRS(ppm)	14	90.69	0.001	0	0.000	0
	TRS(ppm)	15	100.00	0.002	0	0.001	0
	TRS(ppm)	18	99.03	0.000	0	0.000	0
	TRS(ppm)	21	72.78	0.001	0	0.001	0
	THC(ppm)	1	96.94	5.0	-	2.5	-
	THC(ppm)	2	100.00	111.5	-	16.6	-
	THC(ppm)	4	100.00	5.8	-	2.7	-
	THC(ppm)	5	99.86	5.1	-	2.6	-
	THC(ppm)	6	95.69	2.8	-	2.2	-
	THC(ppm)	7	99.86	2.5	-	2.1	-
	THC(ppm)	9	98.33	5.3	-	2.6	-
	THC(ppm)	11	100.00	14.1	-	3.8	-
	THC(ppm)	13	99.86	14.3	-	3.9	-
	THC(ppm)	14	93.47	2.6	-	2.1	-
	THC(ppm)	15	99.86	5.4	-	2.6	-
	THC(ppm)	16	99.86	4.7	-	2.9	-
	THC(ppm)	17	99.58	2.9	-	2.3	-
	THC(ppm)	18	99.31	2.3	-	2.1	-
	THC(ppm)	19	99.44	2.8	-	2.3	-
	THC(ppm)	20	99.86	2.6	-	2.2	-
	THC(ppm)	21	99.03	2.6	-	2.0	-
	O3(ppm)	1	98.89	0.068	0	0.043	-
	O3(ppm)	6	99.72	0.068	0	0.048	-
	O3(ppm)	7	99.86	0.064	0	0.046	-

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

JUNE 2016
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Prepared: Jul 27 2016 15:15

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289664-00-00	6	2016					
254465-00-00	CONTINUOUS AMBIENT MONITORING						
149968-00-01							
48522-01-00							
240008-00-03				ONE-HOUR AVERAGE		24-HOUR AVERAGE	
48263-00-00	PARAMETER	STN. NO.	% TIME OPERATIONAL	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION	MAXIMUM CONCENTRATION	NO. READINGS > REGULATION
224816-00-03	O3(ppm)	8	98.75	0.053	0	0.044	-
189942-00-02	O3(ppm)	13	94.44	0.066	0	0.040	-
206355-00-00	O3(ppm)	14	96.53	0.065	0	0.046	-
46586-00-00	O3(ppm)	17	99.31	0.059	0	0.047	-
216466-00-04	O3(ppm)	18	98.89	0.073	0	0.057	-
137467-00-00	O3(ppm)	21	99.86	0.069	0	0.047	-
20809-01-00	NO2(ppm)	1	99.03	0.025	0	0.005	-
241311-00-02	NO2(ppm)	6	96.39	0.020	0	0.005	-
094-02-00	NO2(ppm)	7	99.86	0.012	0	0.006	-
305529-00-00	NO2(ppm)	8	99.58	0.008	0	0.002	-
026-02-00	NO2(ppm)	13	99.17	0.020	0	0.005	-
228044-00-00	NO2(ppm)	14	90.14	0.007	0	0.002	-
73203-01-00	NO2(ppm)	15	99.86	0.028	0	0.007	-
	NO2(ppm)	16	99.86	0.041	0	0.012	-
	NO2(ppm)	17	96.53	0.009	0	0.002	-
	NO2(ppm)	18	99.17	0.005	0	0.001	-
	NO2(ppm)	19	99.44	0.014	0	0.003	-
	NO2(ppm)	20	99.86	0.007	0	0.002	-
	NO2(ppm)	21	99.44	0.006	0	0.002	-
	NO2(ppm)	500	100.00	0.014	0	0.005	-
	NO2(ppm)	502	98.61	0.009	0	0.004	-
	CO(ppm)	7	99.72	0.6	0	0.2	-
	NH3(ppm)	1	90.14	0.000	0	0.000	-
	NH3(ppm)	6	92.50	0.072	0	0.010	-
	PM2.5(ug/m3)	1	99.58	80.9	-	16.8	0
	PM2.5(ug/m3)	6	98.75	181.7	-	27.6	0
	PM2.5(ug/m3)	7	98.19	101.1	-	29.2	0
	PM2.5(ug/m3)	8	90.14	43.5	-	11.7	0
	PM2.5(ug/m3)	13	99.31	24.5	-	11.8	0
	PM2.5(ug/m3)	14	97.36	92.8	-	31.2	1
	PM2.5(ug/m3)	15	100.00	46.7	-	21.4	0
	PM2.5(ug/m3)	16	100.00	71.4	-	16.9	0
	PM2.5(ug/m3)	17	96.53	70.6	-	13.1	0
	PM2.5(ug/m3)	18	99.44	36.3	-	15.6	0
	PM2.5(ug/m3)	21	93.47	221.6	-	74.3	1
	WIND	1	100.00	-	-	-	-
	WIND	2	100.00	-	-	-	-
	WIND	4	99.86	-	-	-	-
	WIND	5	100.00	-	-	-	-
	WIND	6	100.00	-	-	-	-
	WIND	7	100.00	-	-	-	-
	WIND	8	99.86	-	-	-	-
	WIND	9	100.00	-	-	-	-
	WIND	11	100.00	-	-	-	-
	WIND	13	100.00	-	-	-	-
	WIND	14	99.86	-	-	-	-
	WIND	15	99.86	-	-	-	-
	WIND	16	100.00	-	-	-	-
	WIND	17	100.00	-	-	-	-
	WIND	18	100.00	-	-	-	-
	WIND	19	99.86	-	-	-	-
	WIND	20	99.72	-	-	-	-
	WIND	21	99.44	-	-	-	-
	WIND	500	100.00	-	-	-	-
	WIND	502	99.72	-	-	-	-
							
SIGNATURE OF ASSOCIATION REPRESENTATIVE				FOR ALBERTA ENVIRONMENT USE ONLY			



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

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

**AMS 1
BERTHA GANTER FORT MCKAY
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT McKAY - BERTHA GANTER (AMS 1)
 JUNE 2016

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	681	37	39	99.72	78	0	8	0
TRS(ppb) Average	684	34	36	99.72	3	0	1	0
THC(ppm) Average	663	35	57	96.94	5	-	2.5	-
NMHC(ppm) Average	663	35	57	96.94	3.013	-	0.509	-
CH4(ppm) Average	663	35	57	96.94	2.5	-	2.1	-
O3 (ppb) Average	674	38	46	98.89	68	0	43	-
NO2 (ppb) Average	677	36	43	99.03	25	0	5	-
NO (ppb) Average	677	36	43	99.03	26	-	2	-
NOX (ppb) Average	677	36	43	99.03	51	-	7	-
NH3 (ppb) Average	604	45	116	90.14	0	0	0	-
PM2.5 (ug/m3) Average	713	4	7	99.58	80.9	-	16.8	0
Wind Speed 10 m (km/h) Average	720	0	0	100.00	34	-	14	-
Wind Direction 10 m (deg) Average	720	0	0	100.00	-	-	-	-
Temperature 2 m (C) Average	720	0	0	100.00	30.2	-	21.5	-
Temperature 10 m (C) Average	720	0	0	100.00	29.3	-	22.3	-
Relative Humidity (%) Average	720	0	0	100.00	99	-	94	-
Precipitation (mm) Total	720	0	0	100.00	7.8	-	31.3	-
Leaf Wetness (% of range) Average	720	0	0	100.00	50	-	26	-
Global Solar Radiation (W/m2) Average	720	0	0	100.00	908	-	351	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BERTHA GANTER FORT McKAY (AMS 1)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	681	1.4	5	-	0	0	0	0	0	2	78
TRS (ppb) Average	684	0.5	0	-	0	0	0	0	1	1	3
THC (ppm) Average	663	2.05	0.3	-	1.9	1.9	1.9	2	2.1	2.3	5
NMHC(ppm) Average	663	0.074	0.209	-	0	0	0	0	0.1	0.2	3.013
CH4(ppm) Average	663	1.97	0.1	-	1.9	1.9	1.9	1.9	2	2.1	2.5
O3 (ppb) Average	674	27.8	14	-	3	10	18	27	36	46	68
NO2 (ppb) Average	677	2.4	3	-	0	0	1	1	3	6	25
NO (ppb) Average	677	0.5	2	-	0	0	0	0	0	1	26
NOX (ppb) Average	677	2.9	4	-	0	0	1	2	3	7	51
NH3 (ppb) Average	604	0	0	-	0	0	0	0	0	0	0
PM2.5 (ug/m3) Average	713	7.76	7.1	-	0.1	1.5	2.9	5.7	10.5	17.3	80.9
Wind Speed 10 m (km/h) Average	720	7.3	5	-	0	2	4	6	10	14	34
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	720	17.08	5.7	-	3.5	9.8	12.9	16.6	21.4	25	30.2
Temperature 10 m (C) Average	720	17.41	5.1	-	5.3	11	13.5	16.8	21.3	24.4	29.3
Relative Humidity (%) Average	720	66	23	-	21	32	47	67	87	96	99
Precipitation (mm) Total	720	-	-	95.57	-	-	-	-	-	-	-
Leaf Wetness (% of range) Average	720	4.2	11	-	-2	-1	-1	0	3	17	50
Global Solar Radiation (W/m2) Average	720	240.9	272	-	0	0	4	108	434	702	908

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BERTHA GANTER Fort McKAY (AMS 1)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
AIR QUALITY ANALYZERS	02 Jun 2016 10:00	02 Jun 2016 10:00	1	Maintenance - manifold cleaning
SO2, TRS	10 Jun 2016 19:00	10 Jun 2016 19:00	1	Station power brownouts
NMHC, CH4, THC	10 Jun 2016 16:00	11 Jun 2016 00:00	9	Station power brownouts
NMHC, CH4, THC	11 Jun 2016 01:00	11 Jun 2016 08:00	8	Analyzer Failure - FID required manual relight
NMHC, CH4, THC	20 Jun 2016 13:00	20 Jun 2016 13:00	1	Maintenance - Station operator on site
NMHC, CH4, THC	24 Jun 2016 10:00	24 Jun 2016 12:00	3	Maintenance - replaced fuel cylinder
O3	10 Jun 2016 18:00	10 Jun 2016 19:00	2	Station power brownouts
O3	10 Jun 2016 22:00	10 Jun 2016 22:00	1	Station power brownouts
O3	11 Jun 2016 00:00	11 Jun 2016 00:00	1	Station power brownouts
O3	13 Jun 2016 12:00	13 Jun 2016 14:00	3	Maintenance - verified analyzer response and linearity
NO2, NO, NOX	10 Jun 2016 16:00	10 Jun 2016 16:00	1	Station power brownouts
NO2, NO, NOX	10 Jun 2016 19:00	10 Jun 2016 23:00	5	Station power brownouts
NH3	01 Jun 2016 06:00	30 Jun 2016 07:00	69	Stabilization after daily span
NH3	10 Jun 2016 21:00	10 Jun 2016 21:00	1	Station power brownouts
NH3	11 Jun 2016 00:00	11 Jun 2016 00:00	1	Station power brownouts
PM2.5	17 Jun 2016 10:00	17 Jun 2016 12:00	3	Unstable Operation - negative baseline



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Fort McKay - Bertha Ganter - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 78 ppb on Jun 30 12:00	Maximum Daily Average: 7.6 ppb on Jun 30		Hours of Data:	681
Minimum Value: 0 ppb on Jun 2 02:00	Minimum Daily Average: 0.0 ppb on Jun 4		Hours of Missing Data:	39
Maximum Diurnal Average: 4.1 ppb at hour 12	Minimum Diurnal Average: 0.2 ppb at hour 5		Hours of Calibration:	37
Monthly Average: 1.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 2 P ₉₉ = 27		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-Jun	0	0	Z	0	0	0	1	7	C	C	C	C	C	C	C	0	0	14	49	7	2	1	0	0	--	49
2-Jun	0	0	0	Z	0	0	0	0	0	M	1	5	8	11	9	11	1	0	2	2	4	7	2	1	2.9	11
3-Jun	2	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	2
4-Jun	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
5-Jun	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
6-Jun	0	Z	0	0	0	0	0	2	6	28	30	18	10	8	1	1	2	7	0	1	1	0	1	0	5.1	30
7-Jun	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
8-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	8	3	0	0	0	1.0	8
9-Jun	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
10-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	PF	0	0	0	0	0.1	0
11-Jun	Z	0	0	0	0	0	0	1	3	3	1	8	12	7	0	1	0	0	1	0	0	0	0	0	1.7	12
12-Jun	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
13-Jun	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
14-Jun	0	0	0	Z	0	0	1	2	57	10	4	1	1	1	0	0	0	0	0	0	4	5	16	0	4.5	57
15-Jun	0	0	0	0	Z	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
16-Jun	0	1	2	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2
17-Jun	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
18-Jun	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
19-Jun	0	0	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
20-Jun	0	0	0	Z	0	0	0	0	1	1	1	1	0	3	20	13	20	36	21	6	3	4	2	1	5.8	36
21-Jun	1	0	0	0	Z	1	3	4	1	0	0	0	1	0	1	1	1	1	3	8	4	2	1	1	1.6	8
22-Jun	0	0	0	0	0	Z	1	2	6	8	8	3	2	0	3	2	3	0	0	0	0	0	0	0	1.8	8
23-Jun	Z	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1
24-Jun	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
25-Jun	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
26-Jun	0	0	0	Z	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1
27-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	2	1	1	1	0.5	3
28-Jun	0	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
29-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	7	6	2	1	1	1	1.1	7
30-Jun	1	Z	0	0	0	1	1	3	3	9	7	78	30	18	5	9	5	1	0	0	0	1	1	1	7.6	78

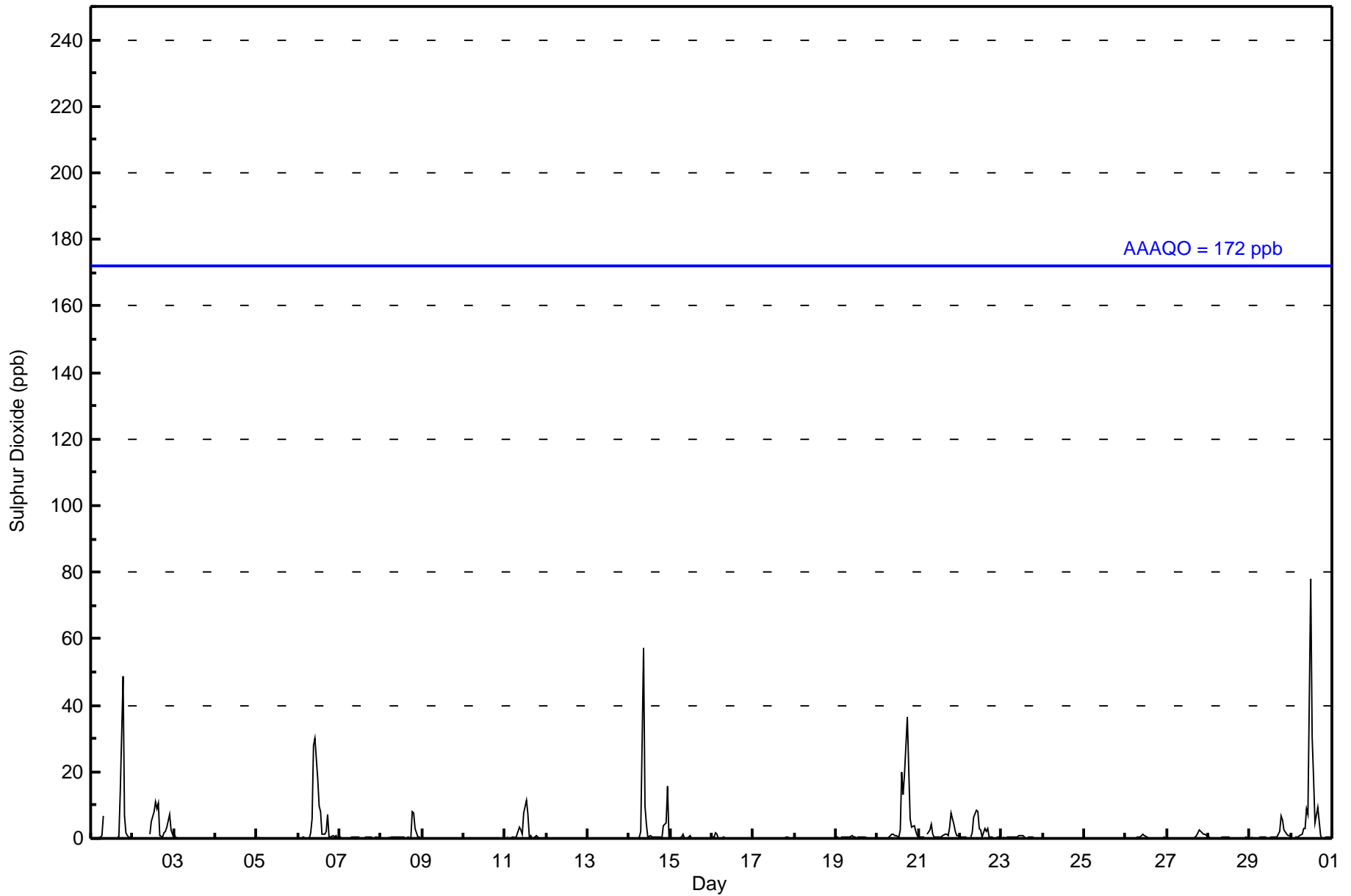
0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.8	2.8	2.3	2.0	4.1	2.3	1.8	1.4	1.4	1.2	2.2	3.3	1.4	0.9	0.8	0.9	0.3	Diurnal Average	
2	1	2	1	0	1	3	7	57	28	30	78	30	18	20	13	20	36	49	8	4	7	16	1	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Fort McKay - Bertha Ganter - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Fort McKay - Bertha Ganter - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	663	97.36	97.36
11 - 20	10	1.47	98.83
21 - 60	7	1.03	99.85
61 - 110	1	0.15	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 681

Total Number of Hours: 720



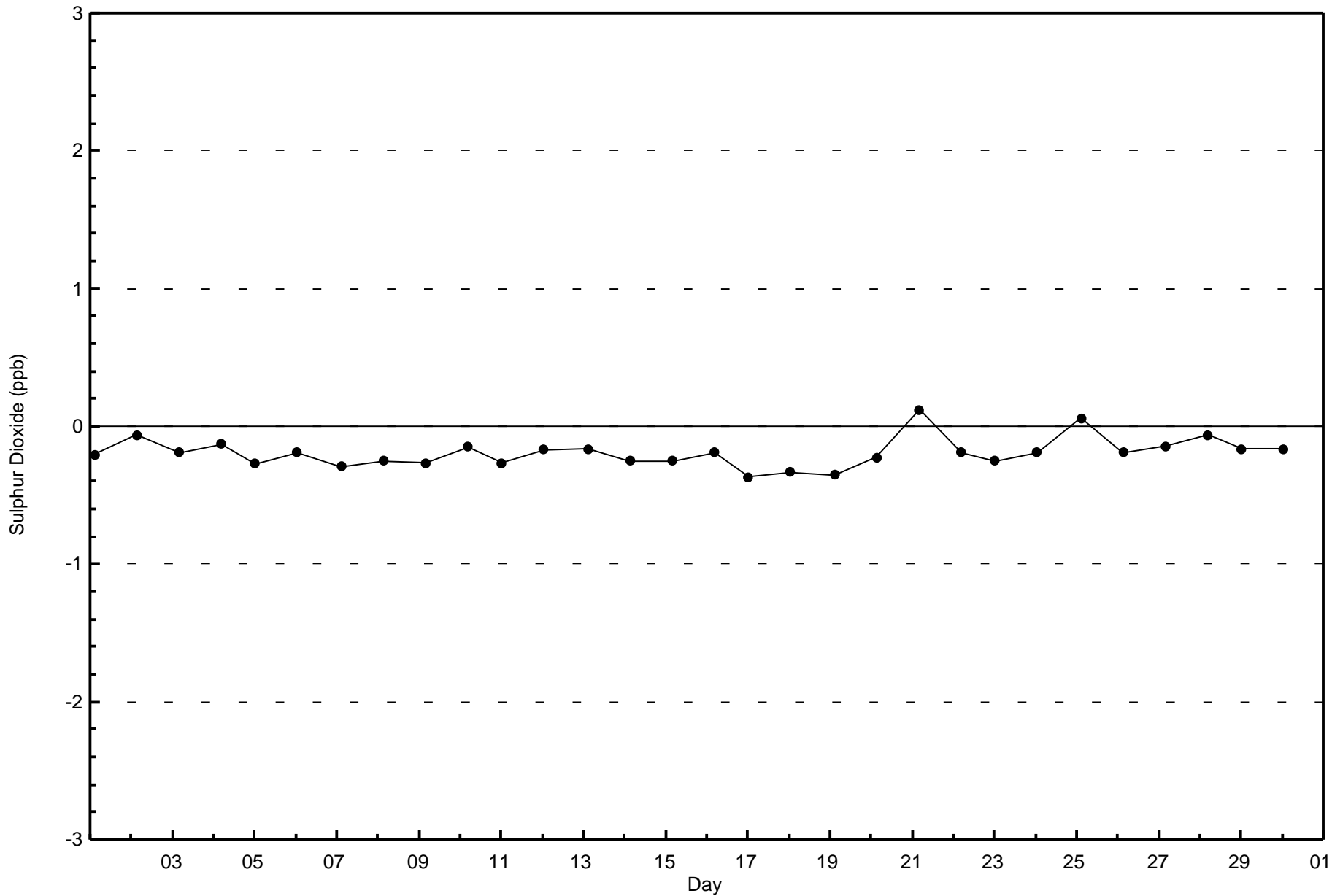
**Wood Buffalo Environmental Association
Frequency Distribution**

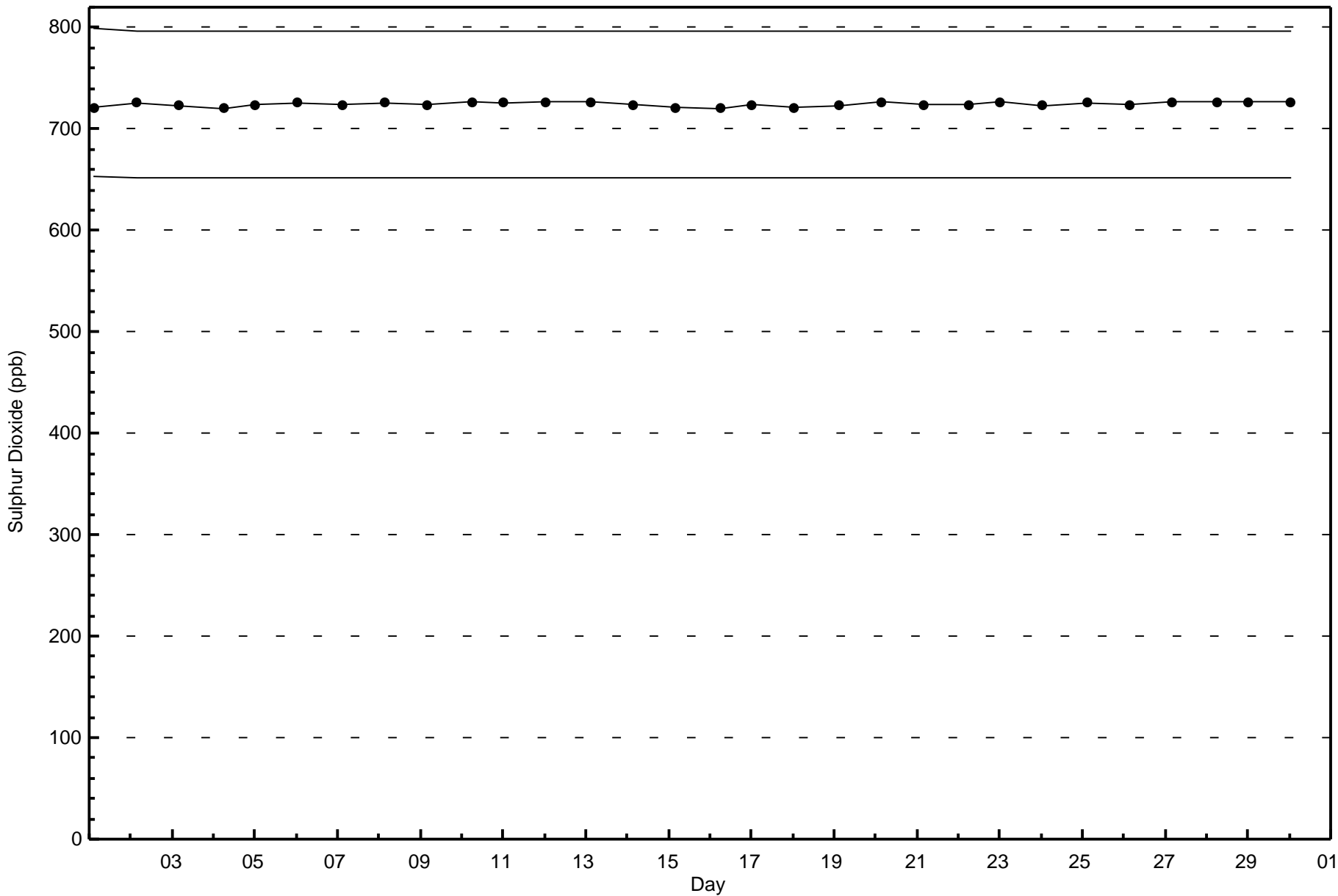
**Sulphur Dioxide (SO₂) - ppb
Fort McKay - Bertha Ganter - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	73	34	25	17	13	9	29	65	71	43	44	36	32	64	75	33	663
11 - 20	0	1	0	0	0	0	1	7	1	0	0	0	0	0	0	0	10
21 - 60	0	0	0	0	1	0	0	2	4	0	0	0	0	0	0	0	7
61 - 110	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
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
Totals	73	35	25	17	14	9	30	75	76	43	44	36	32	64	75	33	681

Total Number of Valid Hours: 681

Total Number of Hours: 720







Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb
Fort McKay - Bertha Ganter - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 3 ppb on Jun 21 01:00	Maximum Daily Average: 0.8 ppb on Jun 21
Minimum Value: 0 ppb on Jun 16 17:00	Hours of Data: 684
Maximum Diurnal Average: 0.6 ppb at hour 9	Hours of Missing Data: 36
Monthly Average: 0.5 ppb	Hours of Calibration: 34
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 1	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-Jun	1	0	1	Z	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1	0	0.6	1	
2-Jun	0	0	0	0	Z	0	1	1	1	M	1	0	0	1	1	1	0	0	1	1	1	1	1	1	0.6	1	
3-Jun	1	1	1	1	1	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0.5	1	
4-Jun	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	
5-Jun	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.4	1	
6-Jun	0	0	Z	1	1	0	0	0	1	1	1	1	1	0	0	0	0	1	1	0	1	1	1	1	0.6	1	
7-Jun	1	1	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.5	1	
8-Jun	0	0	0	1	Z	0	0	1	C	C	C	C	0	0	0	0	0	0	0	1	1	0	0	0	0.5	1	
9-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	
10-Jun	1	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	PF	0	0	1	0	0.4	1	
11-Jun	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.4	1	
12-Jun	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	
13-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.4	1	
14-Jun	0	0	0	1	Z	0	0	1	1	1	1	0	0	0	0	0	1	1	0	0	0	1	1	0	0.5	1	
15-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	
16-Jun	1	1	1	1	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
17-Jun	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	
18-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4	1	
19-Jun	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
20-Jun	0	1	1	0	Z	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	2	0.8	2
21-Jun	3	2	1	1	1	Z	2	2	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.8	3	
22-Jun	1	1	1	0	1	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.6	1	
23-Jun	0	Z	0	1	0	0	0	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	1	0.5	1	
24-Jun	0	1	Z	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.5	1	
25-Jun	1	0	1	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.5	1	
26-Jun	0	1	1	0	Z	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1	
27-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	0.5	1	
28-Jun	1	1	1	1	0	0	Z	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0.5	1	
29-Jun	1	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.5	1	
30-Jun	1	1	Z	1	1	1	1	1	1	1	1	2	1	1	0	0	0	0	0	0	0	0	1	1	0.7	2	

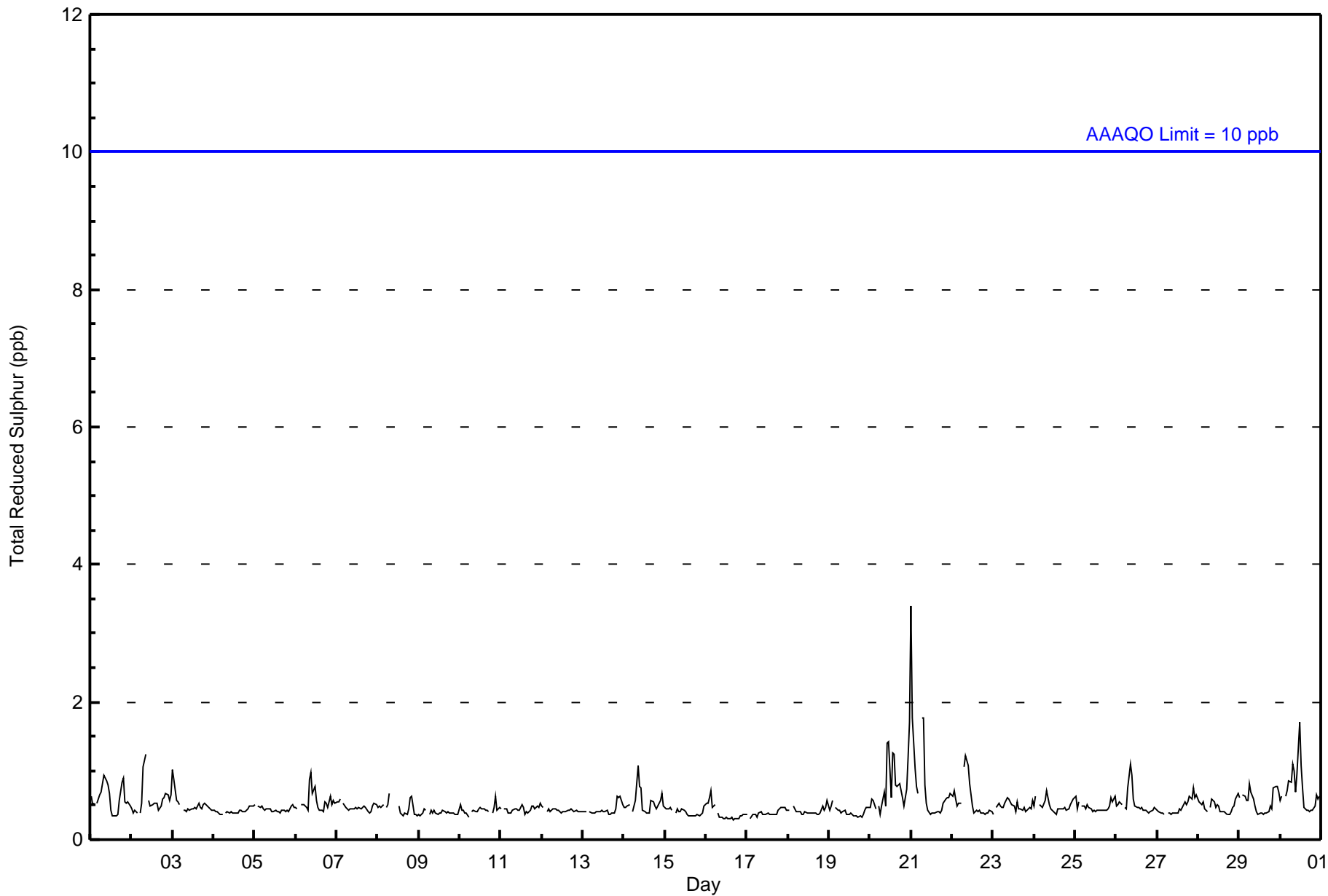
0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	Diurnal Average
3	2	1	1	1	1	1	2	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2	Diurnal Maximum

Z - zerspan 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

Total Reduced Sulphur (TRS) - ppb
Fort McKay - Bertha Ganter - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Fort McKay - Bertha Ganter - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	683	99.85	99.85
3 - 4	1	0.15	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Fort McKay - Bertha Ganter - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	72	32	25	17	15	9	30	75	77	47	44	37	35	63	70	35	683
3 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
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
Totals	72	32	25	17	15	9	30	75	77	47	44	37	35	63	71	35	684

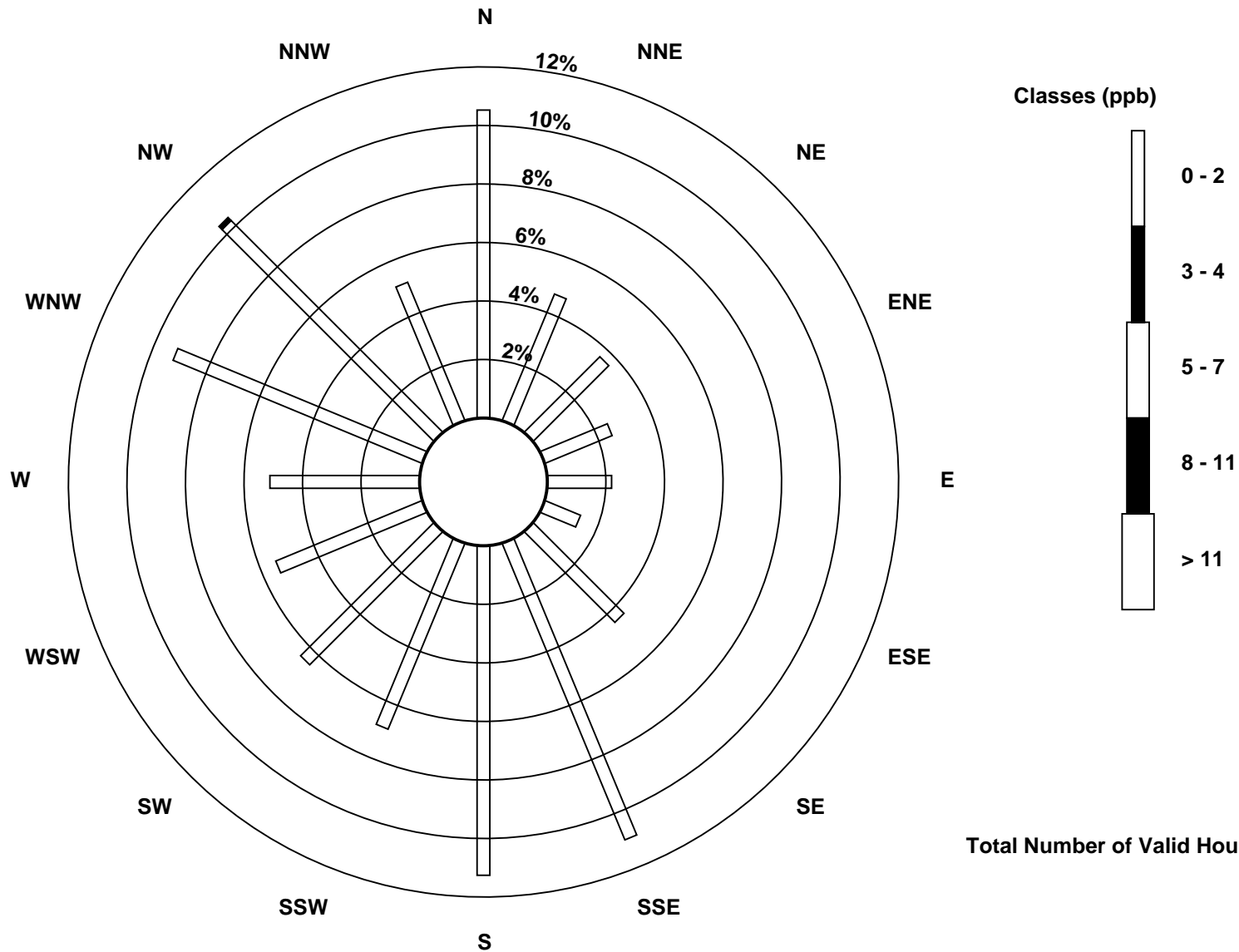
Total Number of Valid Hours: 684

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

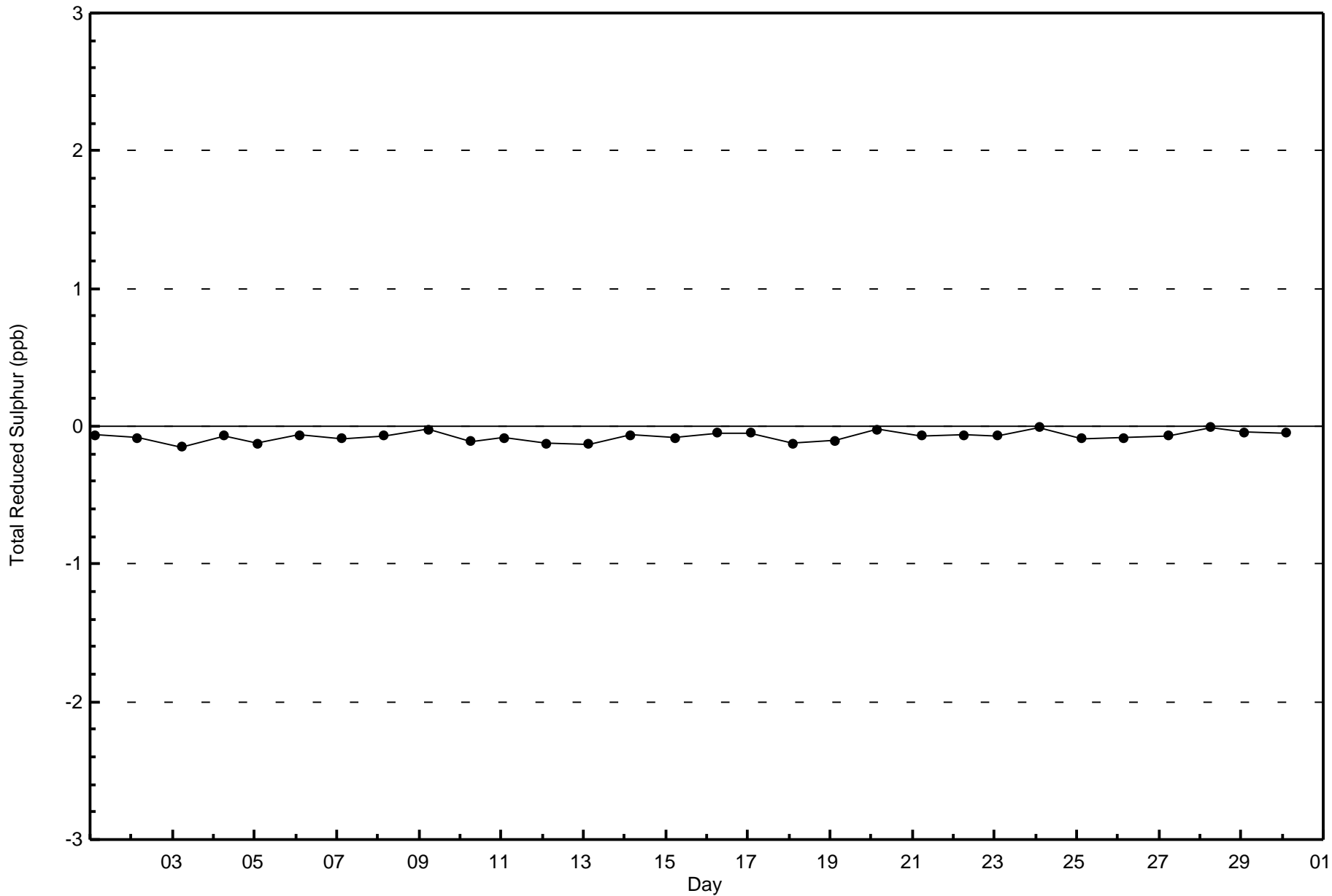
Total Reduced Sulphur (TRS) - ppb
Fort McKay - Bertha Ganter (AMS 1)

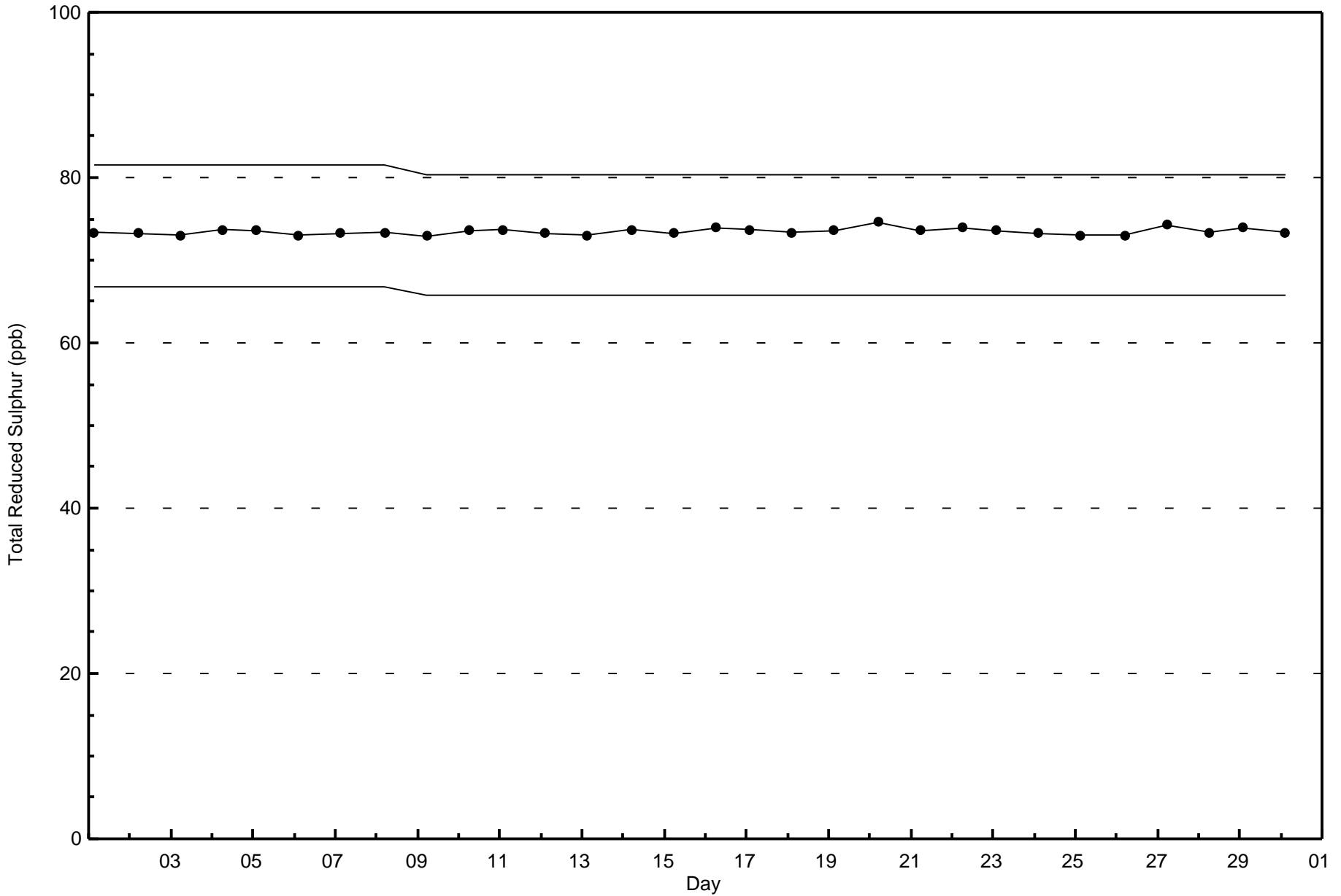




Wood Buffalo Environmental Association
Zero Responses

Total Reduced Sulphur (TRS) - ppb
Fort McKay - Bertha Ganter - June 2016





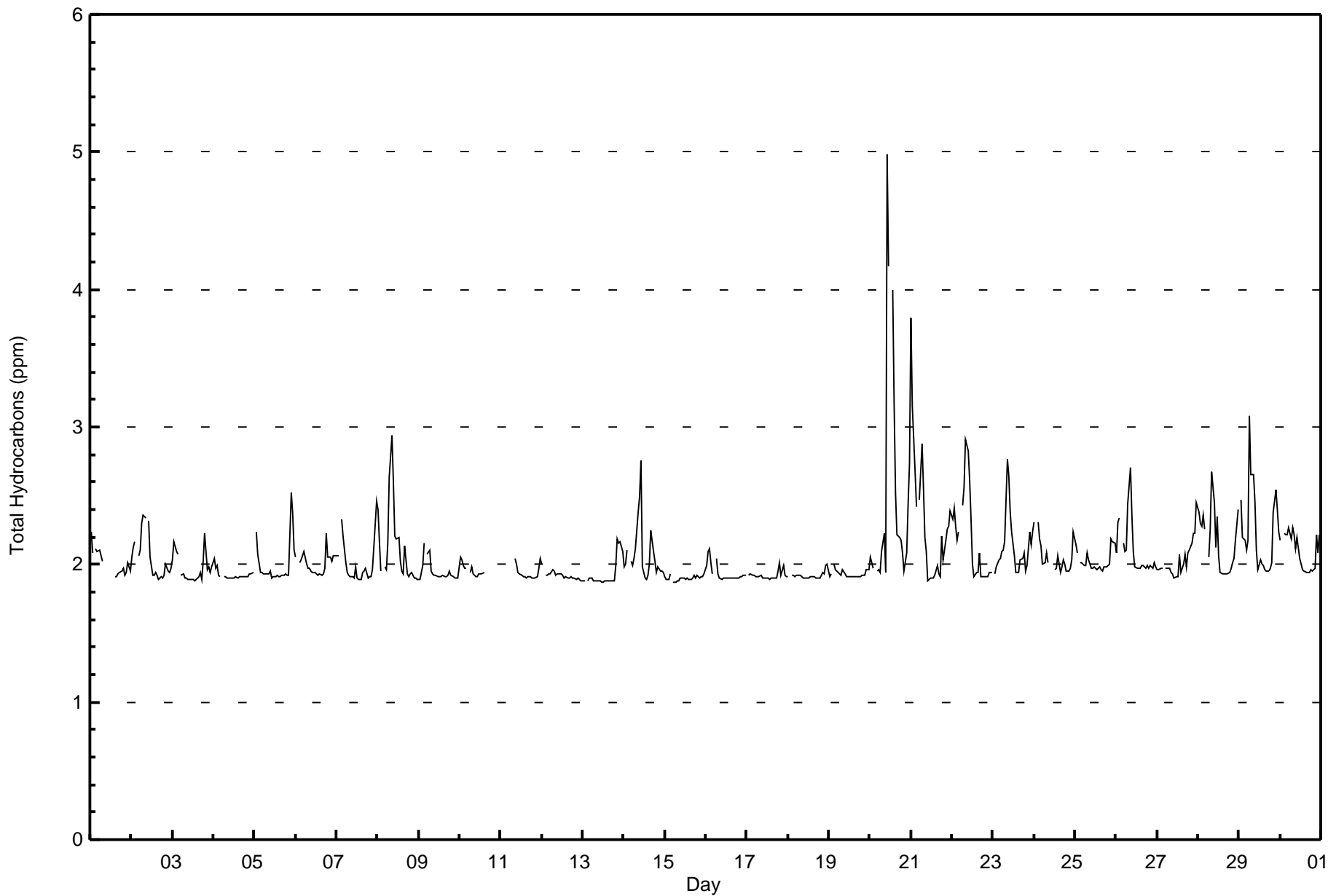


Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm
Fort McKay - Bertha Ganter - June 2016

Maximum Value: 5.0 ppm on Jun 20 11:00		Maximum Daily Average: 2.5 ppm on Jun 20		Hours in Service: 720																							
Minimum Value: 1.9 ppm on Jun 15 07:00		Minimum Daily Average: 1.9 ppm on Jun 15		Hours of Data: 663																							
Maximum Diurnal Average: 2.2 ppm at hour 9		Minimum Diurnal Average: 1.9 ppm at hour 13		Hours of Missing Data: 57																							
Monthly Average: 2.05 ppm		Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 2.0 Q ₃ = 2.1 P ₉₀ = 2.3 P ₉₉ = 3.1		Hours of Calibration: 35																							
				Percent Operational Time: 96.9																							
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-Jun	2.2	2.1	Z	2.1	2.1	2.1	2.1	2.0	C	C	C	C	C	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	2.0	2.0	--	2.2	
2-Jun	2.1	2.1	2.2	Z	2.1	2.1	2.3	2.4	2.3	M	2.3	2.1	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	2.4
3-Jun	2.0	2.2	2.1	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	2.0	2.2	2.0	2.0	1.9	2.0	2.0	2.2	
4-Jun	2.0	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	1.9	1.9	2.0	
5-Jun	Z	2.2	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	2.5	2.4	2.1	2.0	2.5	
6-Jun	2.1	Z	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.2	2.1	2.1	2.0	2.1	2.1	2.0	2.2	
7-Jun	2.1	2.1	Z	2.3	2.2	2.0	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	1.9	2.0	2.1	2.5	2.0	2.5	
8-Jun	2.4	2.2	2.0	Z	2.0	2.0	2.2	2.6	2.9	2.6	2.2	2.2	2.2	2.0	1.9	1.9	2.1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.9	
9-Jun	1.9	1.9	2.0	2.2	Z	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	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.2	
10-Jun	2.1	2.0	2.0	2.0	2.0	Z	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	--	2.1
11-Jun	AF	AF	AF	AF	AF	AF	AF	AF	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	2.0	2.0	--	2.0	
12-Jun	2.0	Z	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
13-Jun	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	2.0	2.2	2.2	2.2	2.1	1.9	2.2	
14-Jun	2.0	2.0	2.1	Z	2.0	2.0	2.0	2.1	2.4	2.5	2.8	2.0	1.9	1.9	1.9	2.0	2.2	2.1	2.0	1.9	2.0	2.0	2.0	1.9	2.1	2.8	
15-Jun	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	
16-Jun	2.0	2.1	2.1	2.0	1.9	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	1.9	1.9	1.9	1.9	2.1	
17-Jun	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	2.0	2.0	1.9	2.0	1.9	1.9	2.0	
18-Jun	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	2.0	2.0	1.9	2.0	
19-Jun	1.9	1.9	Z	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	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	1.9	2.0	
20-Jun	2.1	2.0	2.0	Z	2.0	2.0	1.9	2.1	2.2	1.9	5.0	4.2	M	4.0	3.2	2.5	2.2	2.2	2.2	2.1	2.0	2.1	2.4	2.7	2.5	5.0	
21-Jun	3.8	3.2	2.7	2.4	Z	2.5	2.9	2.6	2.2	2.1	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	2.2	2.0	2.2	2.3	2.3	2.4	2.3	3.8	
22-Jun	2.3	2.4	2.3	2.2	2.2	Z	2.4	2.6	2.9	2.8	2.6	2.3	2.0	1.9	1.9	1.9	2.1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.2	
23-Jun	Z	1.9	2.0	2.0	2.0	2.1	2.1	2.2	2.8	2.6	2.4	2.2	2.1	1.9	1.9	2.0	2.0	2.1	1.9	2.0	2.2	2.1	2.2	2.1	2.1	2.8	
24-Jun	2.3	Z	2.3	2.2	2.1	2.0	2.0	2.1	2.0	2.0	M	M	M	2.0	2.0	2.1	1.9	2.0	2.0	2.0	2.0	2.0	2.2	2.1	2.1	2.3	
25-Jun	2.2	2.1	Z	2.0	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	2.0	2.2	2.2	2.2	2.0	2.2	
26-Jun	2.1	2.3	2.3	Z	2.2	2.1	2.1	2.4	2.7	2.4	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	2.7	
27-Jun	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.1	1.9	2.0	2.1	2.0	2.1	2.1	2.2	2.2	2.2	2.4	2.0	2.4	
28-Jun	2.4	2.3	2.3	2.4	2.3	Z	2.1	2.3	2.7	2.4	2.1	2.4	2.1	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.2	2.4	2.2	2.7	
29-Jun	Z	2.5	2.2	2.2	2.1	2.2	3.1	2.7	2.6	2.4	2.1	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.4	2.5	2.4	2.2	2.2	3.1	
30-Jun	2.2	Z	2.2	2.2	2.2	2.3	2.2	2.3	2.2	2.1	2.2	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.2	2.1	2.2	2.1	2.3	
																								Diurnal Average			
																								Diurnal Maximum			
																								Z - zerospan C - Calibration M - Maintenance AF - Analyzer Failure PF - Power Failure			





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Fort McKay - Bertha Ganter - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	472	71.19	71.19
2.1 - 3.0	184	27.75	98.94
3.1 - 10.0	7	1.06	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 663

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Fort McKay - Bertha Ganter - June 2016

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	53	27	11	13	9	5	21	48	49	30	35	29	23	39	52	28	472
2.1 - 3.0	15	8	12	1	5	4	9	21	26	13	9	7	8	20	21	5	184
3.1 - 10.0	1	0	0	0	0	0	0	4	0	0	0	0	0	1	1	0	7
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	69	35	23	14	14	9	30	73	75	43	44	36	31	60	74	33	663

Total Number of Valid Hours: 663

Total Number of Hours: 720

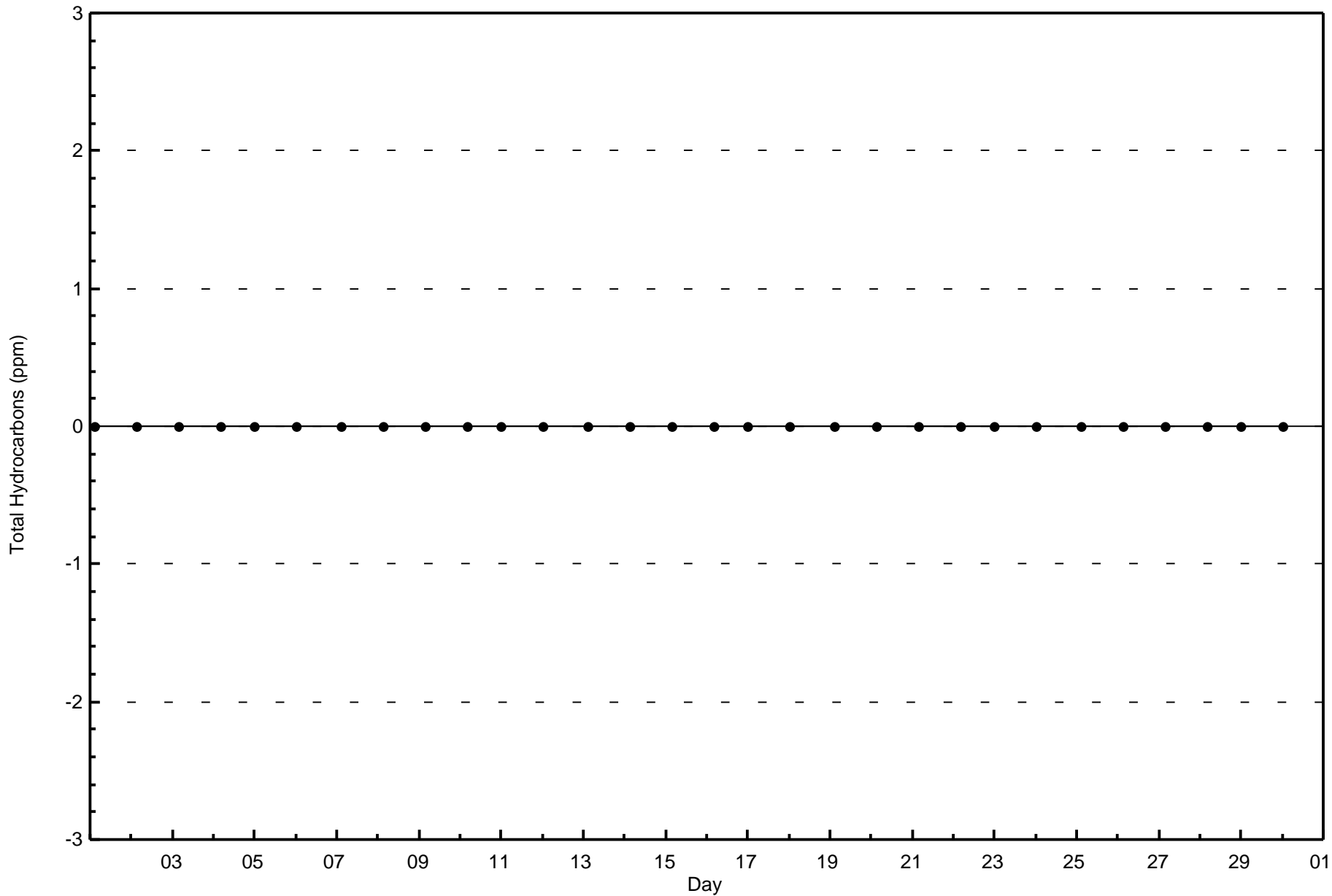


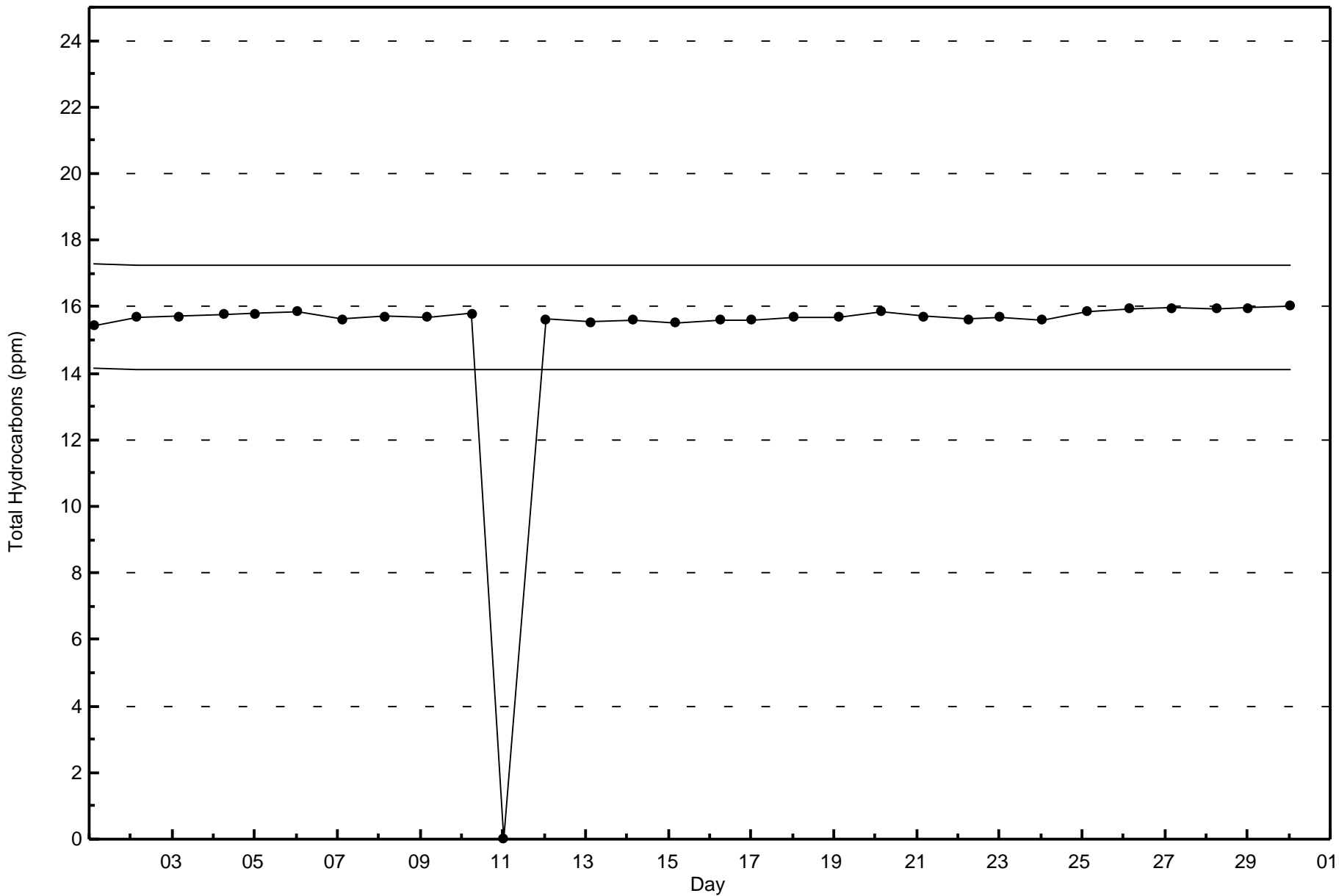
Wood Buffalo Environmental Association

Zero Responses

Total Hydrocarbons (THC) - ppm

Fort McKay - Bertha Ganter - June 2016







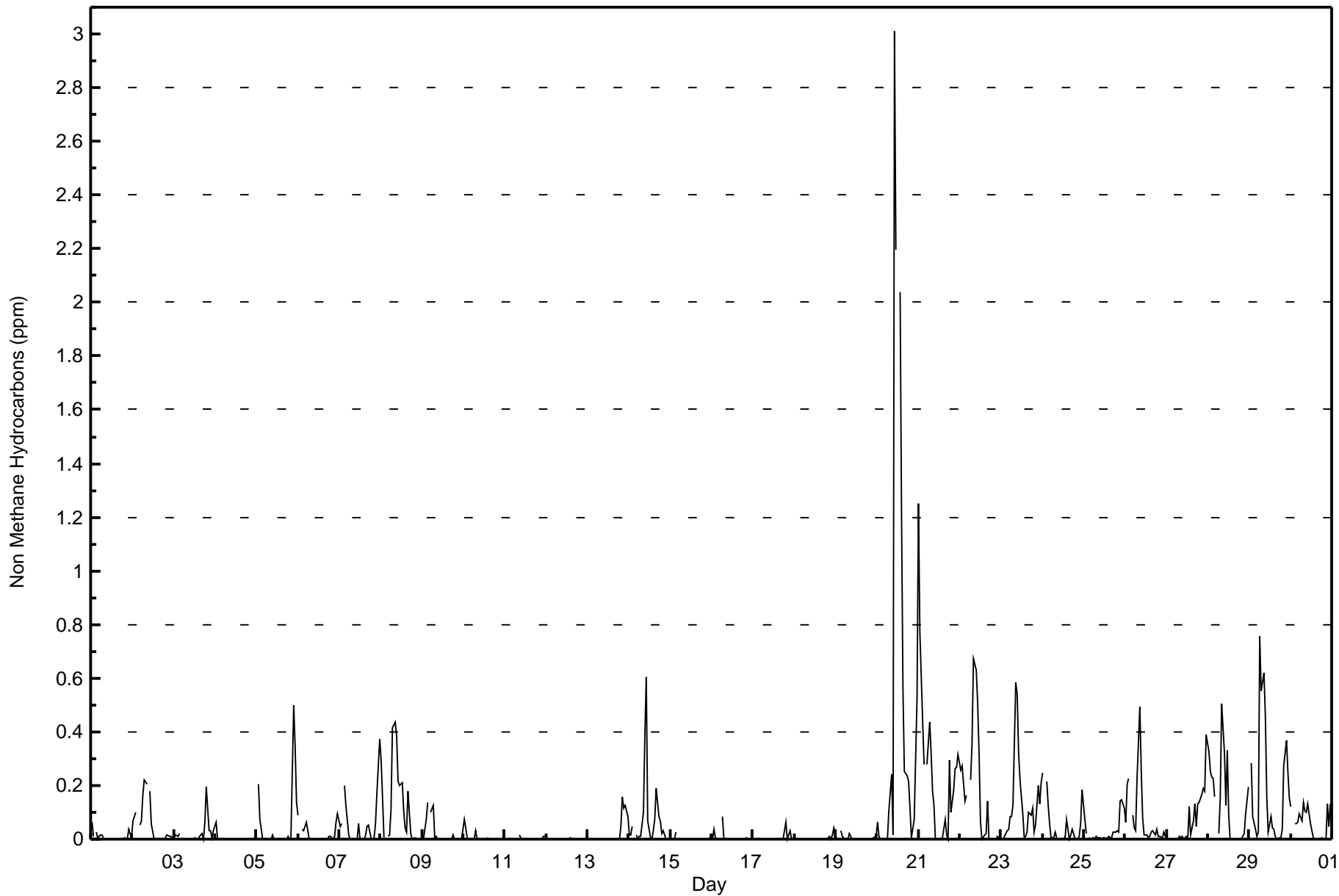
Wood Buffalo Environmental Association

Summary of Hour Averages

Non Methane Hydrocarbons (NMHC) - ppm

Fort McKay - Bertha Ganter - June 2016

Maximum Value: 3.013 ppm on Jun 20 11:00		Maximum Daily Average: 0.509 ppm on Jun 20		Hours in Service: 720																							
Minimum Value: 0.000 ppm on Jun 1 15:00		Minimum Daily Average: 0.000 ppm on Jun 12		Hours of Data: 663																							
Maximum Diurnal Average: 0.191 ppm at hour 11		Minimum Diurnal Average: 0.021 ppm at hour 18		Hours of Missing Data: 57																							
Monthly Average: 0.074 ppm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.1 P ₉₀ = 0.2 P ₉₉ = 0.8		Hours of Calibration: 35																							
				Percent Operational Time: 96.9																							
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-Jun	0.063	0.009	Z	0.024	0.003	0.017	0.015	0.005	C	C	C	C	C	C	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.002	0.035	0.005	--	0.063
2-Jun	0.067	0.085	0.100	Z	0.051	0.066	0.164	0.222	0.202	M	0.177	0.057	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.015	0.011	0.008	0.003	0.056	0.222
3-Jun	0.005	0.018	0.010	0.021	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.014	0.020	0.000	0.061	0.196	0.029	0.032	0.007	0.030	0.019	0.196	
4-Jun	0.065	0.002	0.002	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	0.002	0.005	0.003	0.065	
5-Jun	Z	0.203	0.074	0.000	0.000	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	0.013	0.000	0.000	0.501	0.345	0.135	0.056	0.501	
6-Jun	0.089	Z	0.036	0.031	0.045	0.063	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.009	0.002	0.011	0.065	0.093	0.020	0.093		
7-Jun	0.047	0.057	Z	0.202	0.127	0.017	0.000	0.000	0.000	0.000	0.000	0.057	0.000	0.001	0.002	0.014	0.048	0.053	0.000	0.000	0.004	0.058	0.175	0.372	0.054	0.372	
8-Jun	0.294	0.150	0.005	Z	0.013	0.018	0.112	0.416	0.435	0.382	0.215	0.201	0.212	0.104	0.042	0.024	0.177	0.019	0.000	0.000	0.004	0.000	0.000	0.000	0.123	0.435	
9-Jun	0.000	0.000	0.072	0.138	Z	0.098	0.129	0.008	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.000	0.000	0.000	0.000	0.020	0.138		
10-Jun	0.074	0.042	0.006	0.002	0.001	Z	0.000	0.031	0.002	0.000	0.000	0.000	0.000	0.000	0.004	PF	PF	PF	PF	PF	PF	PF	PF	PF	--	0.074	
11-Jun	AF	AF	AF	AF	AF	AF	AF	AF	0.014	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.009	--	0.014		
12-Jun	0.004	Z	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	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	
13-Jun	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	0.047	0.158	0.115	0.127	0.086	0.023	0.158	
14-Jun	0.014	0.018	0.049	Z	0.016	0.000	0.012	0.011	0.099	0.386	0.603	0.067	0.004	0.000	0.031	0.075	0.192	0.085	0.069	0.020	0.032	0.000	0.000	0.000	0.078	0.603	
15-Jun	0.000	0.000	0.000	0.028	Z	0.002	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.004	0.002	0.028	
16-Jun	0.000	0.038	0.005	0.000	0.000	Z	0.086	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	0.007	0.000	0.000	0.000	0.006	0.086	
17-Jun	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	0.029	0.064	0.000	0.032	0.000	0.000	0.005	0.064	
18-Jun	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	0.011	0.002	0.018	0.041	0.003	0.041	
19-Jun	0.000	0.000	Z	0.033	0.008	0.000	0.000	0.000	0.021	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	0.003	0.012	0.003	0.033	
20-Jun	0.064	0.009	0.000	Z	0.000	0.000	0.000	0.106	0.242	0.016	3.013	2.199	M	2.039	1.219	0.566	0.252	0.238	0.216	0.117	0.007	0.072	0.298	0.523	0.509	3.013	
21-Jun	1.251	0.770	0.434	0.278	Z	0.277	0.434	0.322	0.178	0.125	0.000	0.000	0.000	0.008	0.075	0.018	0.002	0.294	0.098	0.182	0.265	0.266	0.315	0.243	1.251		
22-Jun	0.260	0.273	0.206	0.140	0.164	Z	0.221	0.357	0.671	0.628	0.506	0.317	0.061	0.000	0.018	0.022	0.142	0.000	0.000	0.000	0.000	0.000	0.000	0.174	0.671		
23-Jun	Z	0.000	0.013	0.031	0.038	0.084	0.083	0.127	0.581	0.539	0.328	0.220	0.096	0.003	0.009	0.026	0.098	0.088	0.117	0.029	0.050	0.201	0.131	0.213	0.135	0.581	
24-Jun	0.245	Z	0.216	0.126	0.058	0.005	0.006	0.028	0.004	M	M	M	0.003	0.006	0.073	0.002	0.017	0.036	0.024	0.002	0.000	0.013	0.057	0.182	0.055	0.245	
25-Jun	0.074	0.023	Z	0.008	0.000	0.004	0.003	0.009	0.007	0.005	0.002	0.007	0.007	0.000	0.011	0.003	0.004	0.028	0.026	0.033	0.027	0.139	0.149	0.116	0.030	0.149	
26-Jun	0.063	0.204	0.228	Z	0.089	0.040	0.034	0.224	0.497	0.251	0.079	0.014	0.014	0.006	0.012	0.027	0.031	0.014	0.037	0.010	0.008	0.008	0.029	0.009	0.084	0.497	
27-Jun	0.005	0.000	0.000	0.000	Z	0.000	0.000	0.009	0.007	0.010	0.001	0.008	0.005	0.122	0.016	0.070	0.129	0.045	0.130	0.138	0.170	0.188	0.178	0.391	0.070	0.391	
28-Jun	0.327	0.252	0.229	0.227	0.160	Z	0.019	0.151	0.505	0.318	0.125	0.331	0.088	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.021	0.093	0.193	0.132	0.505	
29-Jun	Z	0.286	0.085	0.039	0.012	0.024	0.755	0.550	0.622	0.457	0.155	0.027	0.086	0.043	0.035	0.008	0.001	0.006	0.007	0.037	0.272	0.365	0.248	0.153	0.186	0.755	
30-Jun	0.122	Z	0.059	0.060	0.065	0.096	0.066	0.137	0.107	0.099	0.132	0.056	0.031	0.003	0.000	0.001	0.001	0.001	0.006	0.000	0.000	0.131	0.046	0.132	0.059	0.137	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan																											
C - Calibration																											
M - Maintenance																											
AF - Analyzer Failure																											
PF - Power Failure																											





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Fort McKay - Bertha Ganter - June 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	342	51.58	51.58
0.006 - 0.05	138	20.81	72.40
0.06 - 0.1	87	13.12	85.52
> 0.1	96	14.48	100.00

Total Number of Valid Hours: 663

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Fort McKay - Bertha Ganter - June 2016**

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	33	16	5	2	6	4	17	38	40	25	28	21	18	32	35	22	342
0.006 - 0.05	16	10	4	10	3	0	4	11	14	9	9	8	5	9	18	8	138
0.06 - 0.1	13	4	2	2	2	3	3	9	12	4	1	3	4	11	13	1	87
> 0.1	7	5	12	0	3	2	6	15	9	5	6	4	4	8	8	2	96
Totals	69	35	23	14	14	9	30	73	75	43	44	36	31	60	74	33	663

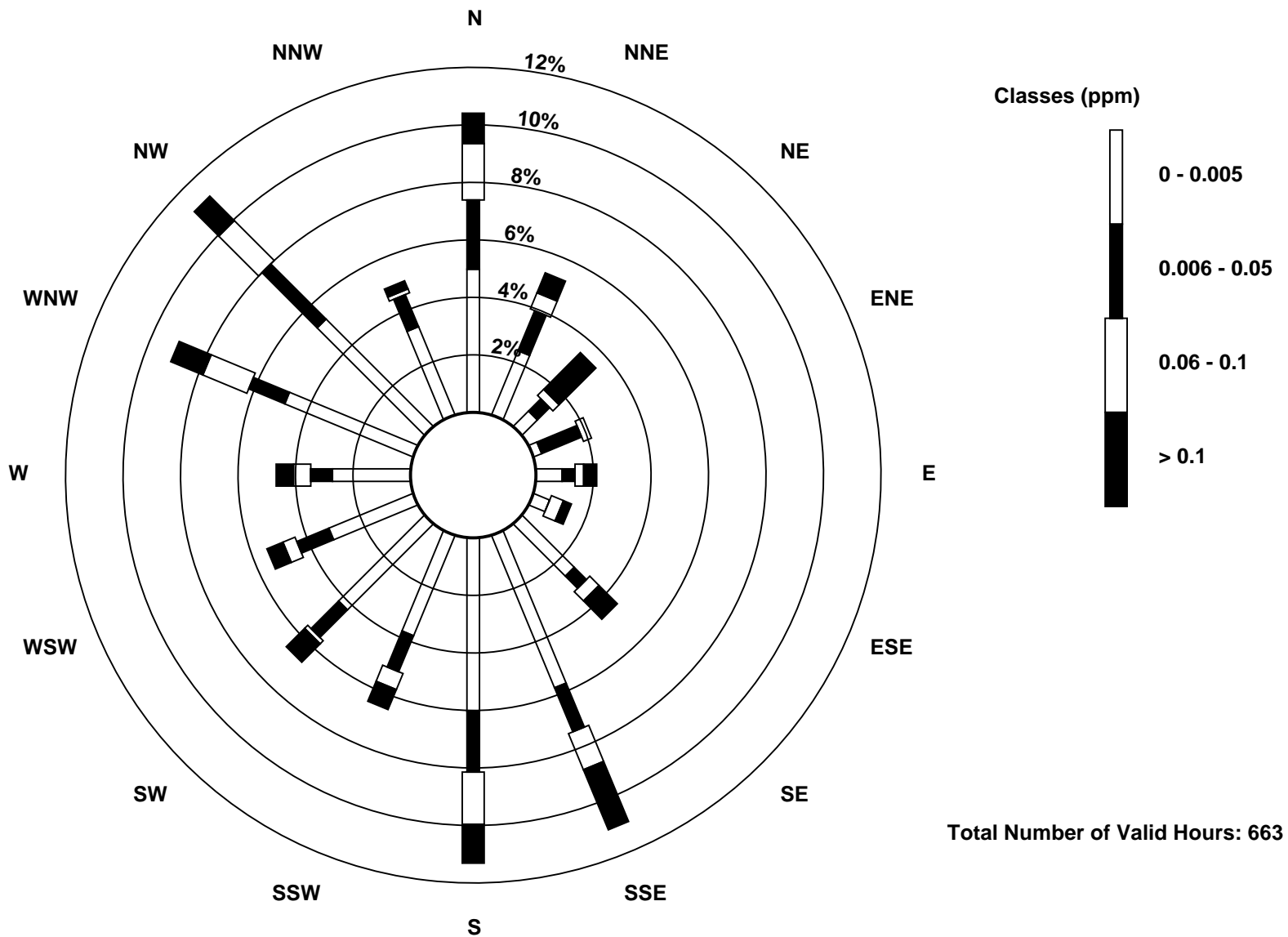
Total Number of Valid Hours: 663

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

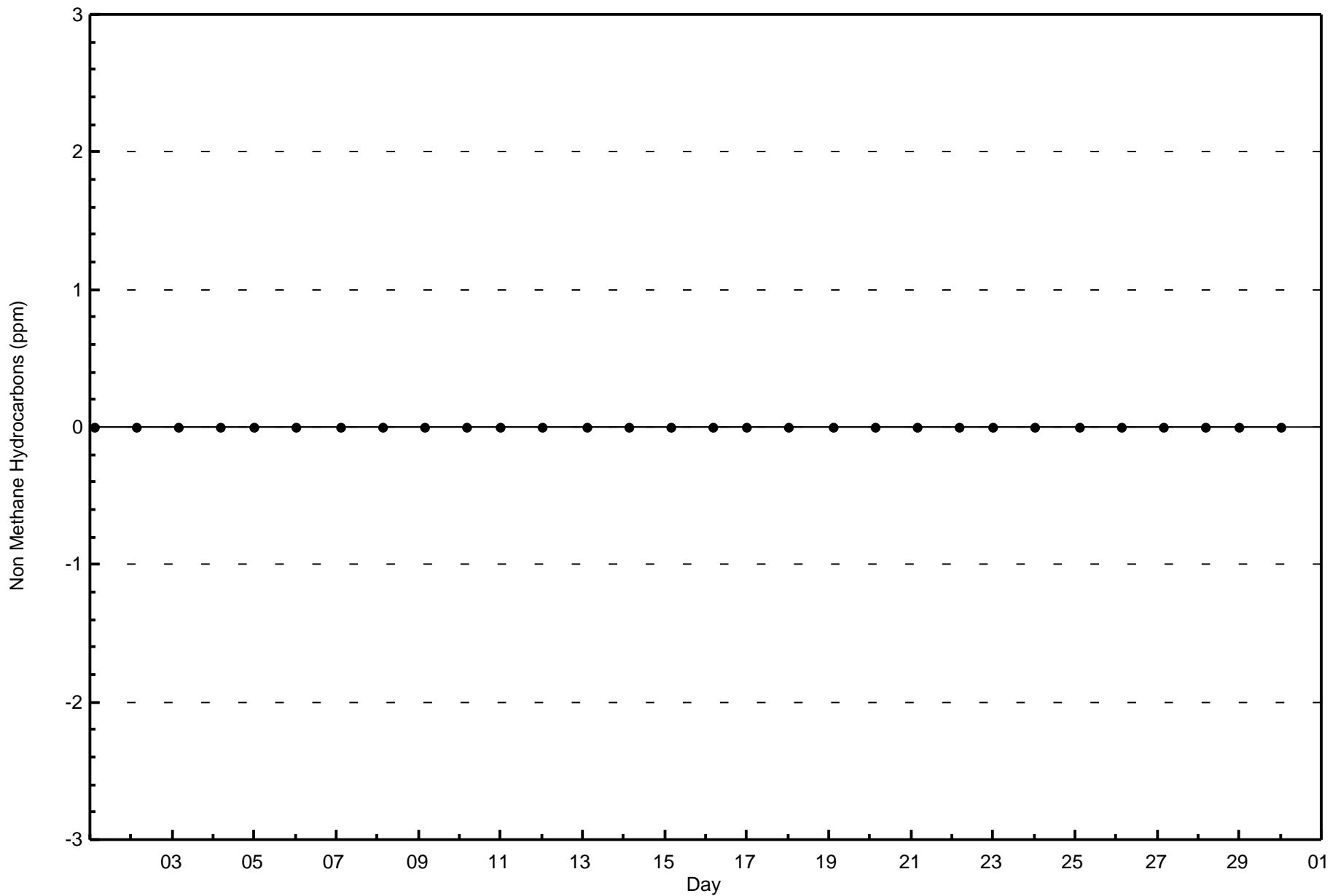
Non Methane Hydrocarbons (NMHC) - ppm
Fort McKay - Bertha Ganter (AMS 1)

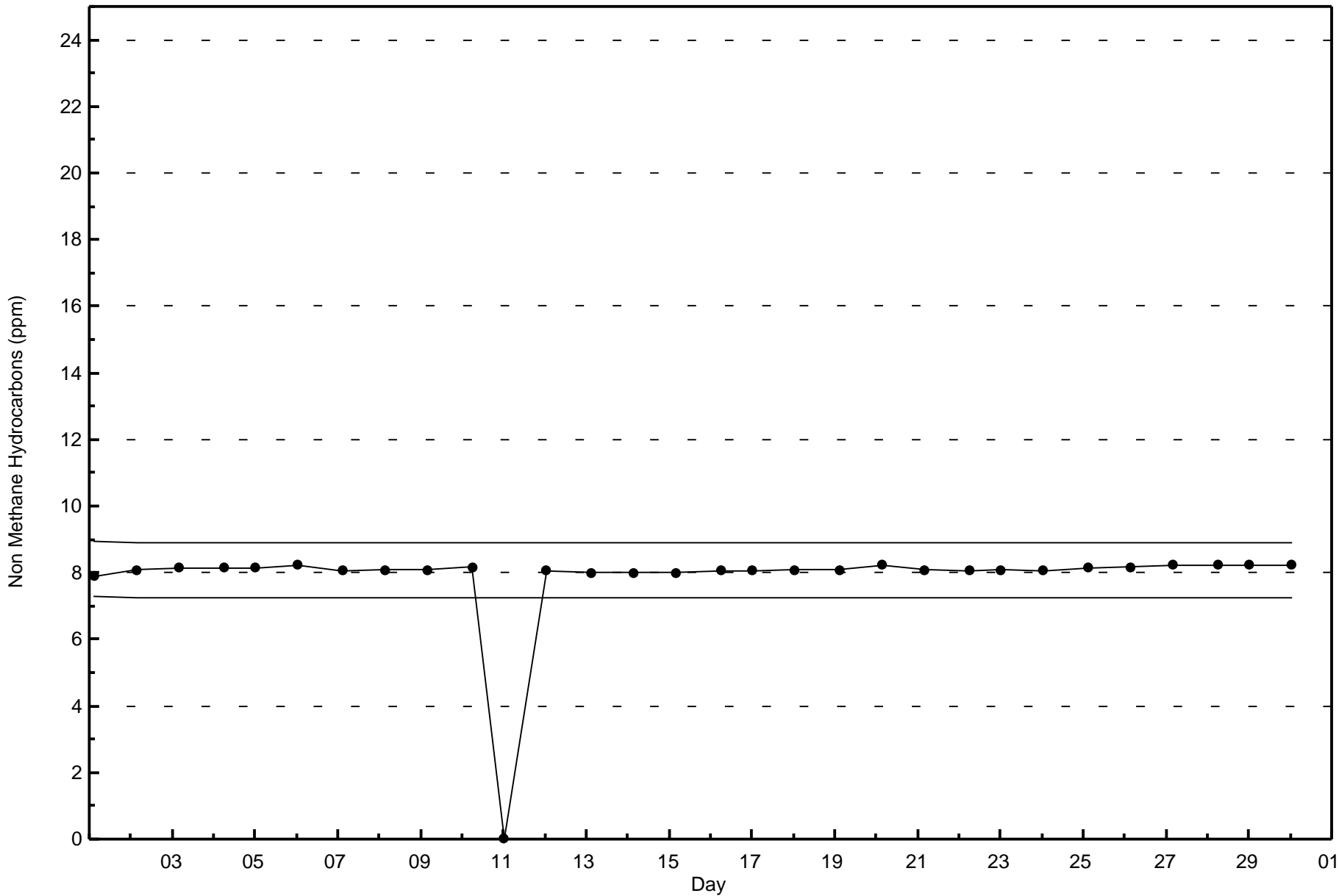




Wood Buffalo Environmental Association
Zero Responses

Non Methane Hydrocarbons (NMHC) - ppm
Fort McKay - Bertha Ganter - June 2016





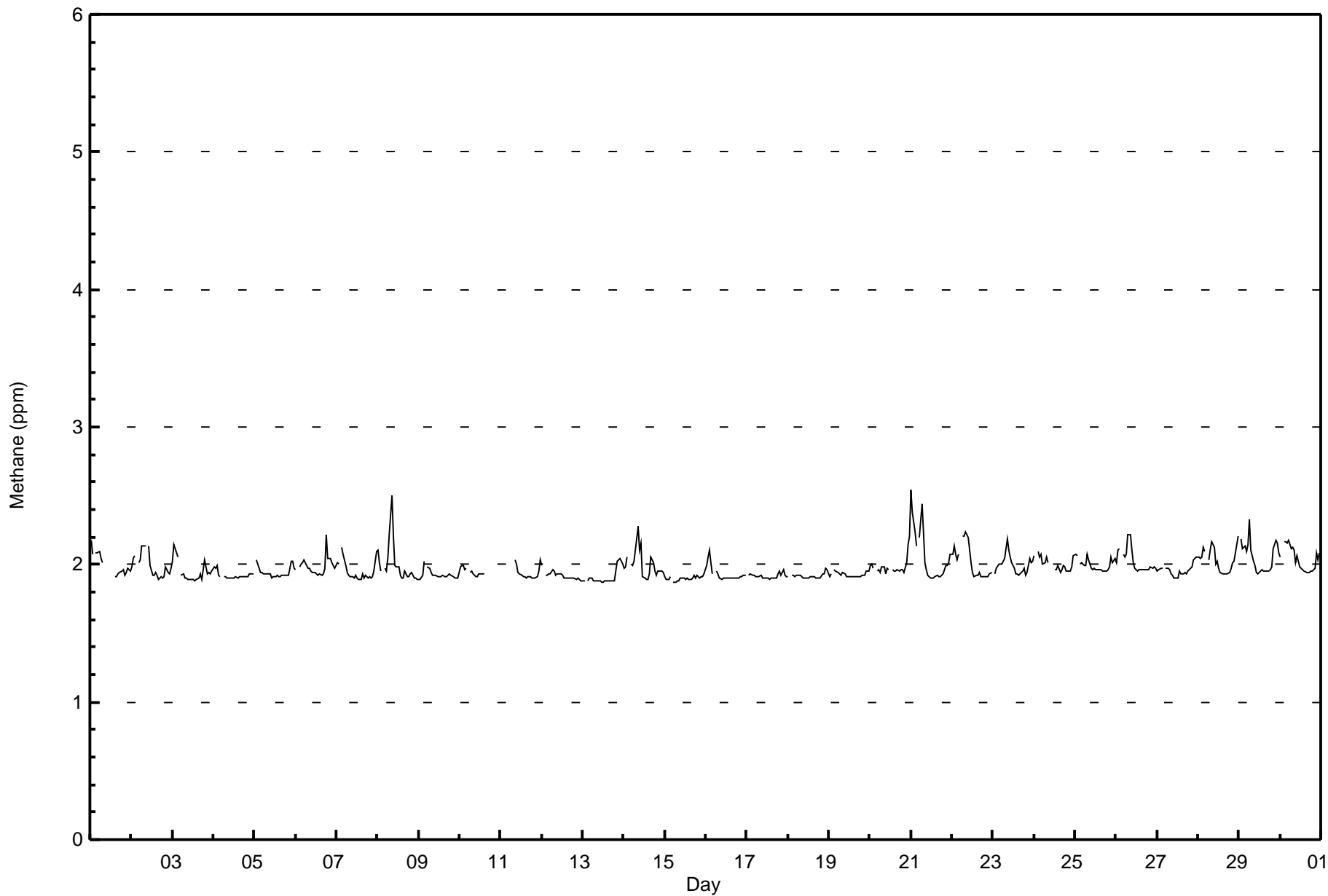


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 2.5 ppm on Jun 21 01:00	Maximum Daily Average: 2.1 ppm on Jun 21		Hours of Data:	663
Minimum Value: 1.9 ppm on Jun 15 07:00	Minimum Daily Average: 1.9 ppm on Jun 15		Hours of Missing Data:	57
Maximum Diurnal Average: 2.0 ppm at hour 2	Minimum Diurnal Average: 1.9 ppm at hour 16		Hours of Calibration:	35
Monthly Average: 1.97 ppm	Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 1.9 Q ₃ = 2.0 P ₉₀ = 2.1 P ₉₉ = 2.2		Percent Operational Time:	96.9

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-Jun	2.2	2.1	Z	2.1	2.1	2.1	2.0	2.0	C	C	C	C	C	C	1.9	1.9	1.9	1.9	2.0	2.0	1.9	1.9	2.0	2.0	--	2.2	
2-Jun	2.0	2.0	2.1	Z	2.0	2.0	2.1	2.1	2.1	M	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	2.0	2.0	2.1	
3-Jun	2.0	2.1	2.1	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	2.0	2.0	1.9	1.9	1.9	2.0	1.9	2.1	
4-Jun	2.0	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	1.9	1.9	2.0	
5-Jun	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	1.9	1.9	1.9	2.0	2.0	2.0	1.9	2.0	
6-Jun	2.0	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	1.9	2.0	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.2	
7-Jun	2.0	2.0	Z	2.1	2.1	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	2.1	1.9	2.1	
8-Jun	2.1	2.0	2.0	Z	2.0	1.9	2.0	2.2	2.5	2.2	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	2.5	
9-Jun	1.9	1.9	1.9	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	1.9	1.9	1.9	2.0	
10-Jun	2.0	2.0	2.0	2.0	2.0	Z	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	--	2.0
11-Jun	AF	AF	AF	AF	AF	AF	AF	AF	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	2.0	2.0	--	2.0	
12-Jun	2.0	Z	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	
13-Jun	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	2.0	2.0	2.0	2.0	2.0	1.9	2.0	
14-Jun	2.0	2.0	2.1	Z	2.0	2.0	2.0	2.1	2.3	2.1	2.2	1.9	1.9	1.9	1.9	1.9	2.1	2.0	2.0	2.0	1.9	2.0	1.9	2.0	2.0	2.3	
15-Jun	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	
16-Jun	2.0	2.1	2.1	2.0	1.9	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	1.9	1.9	1.9	1.9	2.1	
17-Jun	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	2.0	1.9	2.0	1.9	1.9	2.0	
18-Jun	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	2.0	2.0	1.9	2.0	
19-Jun	1.9	1.9	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	1.9	1.9	2.0	2.0	1.9	2.0	
20-Jun	2.0	2.0	2.0	Z	2.0	2.0	1.9	2.0	2.0	1.9	2.0	2.0	M	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.1	2.2	2.0	2.2	
21-Jun	2.5	2.4	2.2	2.1	Z	2.2	2.4	2.2	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	2.1	2.1	2.5	
22-Jun	2.1	2.1	2.1	2.0	2.1	Z	2.2	2.2	2.2	2.2	2.1	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	2.2	
23-Jun	Z	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.2	2.1	2.1	2.0	2.0	1.9	1.9	1.9	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.2	
24-Jun	2.1	Z	2.1	2.1	2.1	2.0	2.0	2.1	2.0	M	M	M	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.1	2.0	2.1	
25-Jun	2.1	2.1	Z	2.0	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	2.0	2.1	2.0	2.0	2.0	2.1	
26-Jun	2.0	2.1	2.1	Z	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	2.0	2.0	2.0	2.2	
27-Jun	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.1	2.0	2.1	
28-Jun	2.1	2.0	2.1	2.1	2.1	Z	2.0	2.1	2.2	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.2	2.0	2.2	
29-Jun	Z	2.2	2.1	2.1	2.1	2.1	2.3	2.1	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.1	2.1	2.3	
30-Jun	2.1	Z	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.0	2.1	2.0	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	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	Diurnal Average
2.5	2.4	2.2	2.2	2.2	2.2	2.2	2.4	2.2	2.5	2.2	2.2	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.2	2.0	2.1	2.2	2.2	2.2	2.2	2.2	Diurnal Maximum

Z - zerospan C - Calibration M - Maintenance AF - Analyzer Failure PF - Power Failure





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Methane (CH₄) - ppm
Fort McKay - Bertha Ganter - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	562	84.77	84.77
2.1 - 3.0	101	15.23	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 663

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Methane (CH₄) - ppm
Fort McKay - Bertha Ganter - June 2016

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	64	31	19	14	11	7	25	63	59	32	39	31	26	48	64	29	562
2.1 - 3.0	5	4	4	0	3	2	5	10	16	11	5	5	5	12	10	4	101
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
Totals	69	35	23	14	14	9	30	73	75	43	44	36	31	60	74	33	663

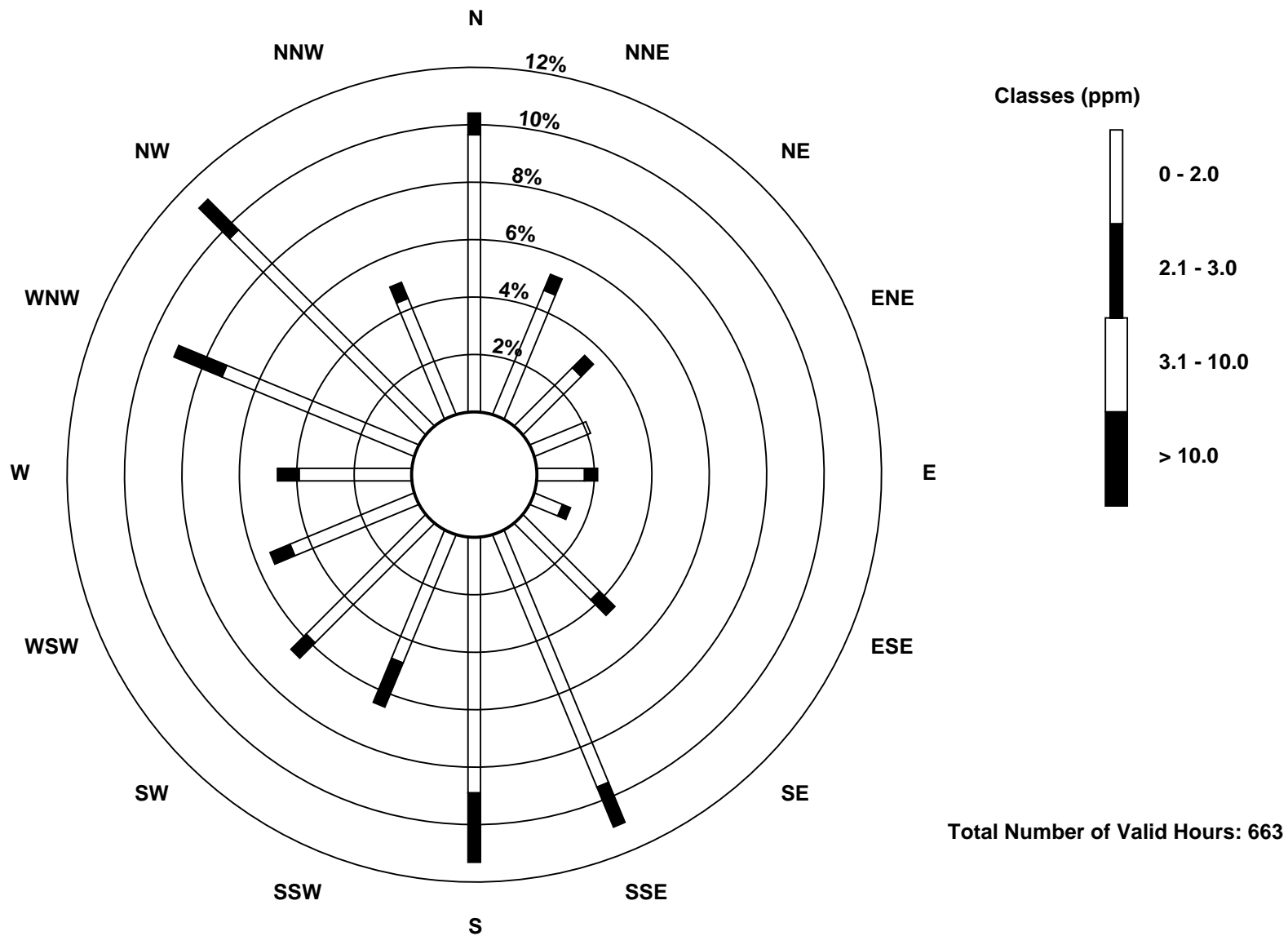
Total Number of Valid Hours: 663

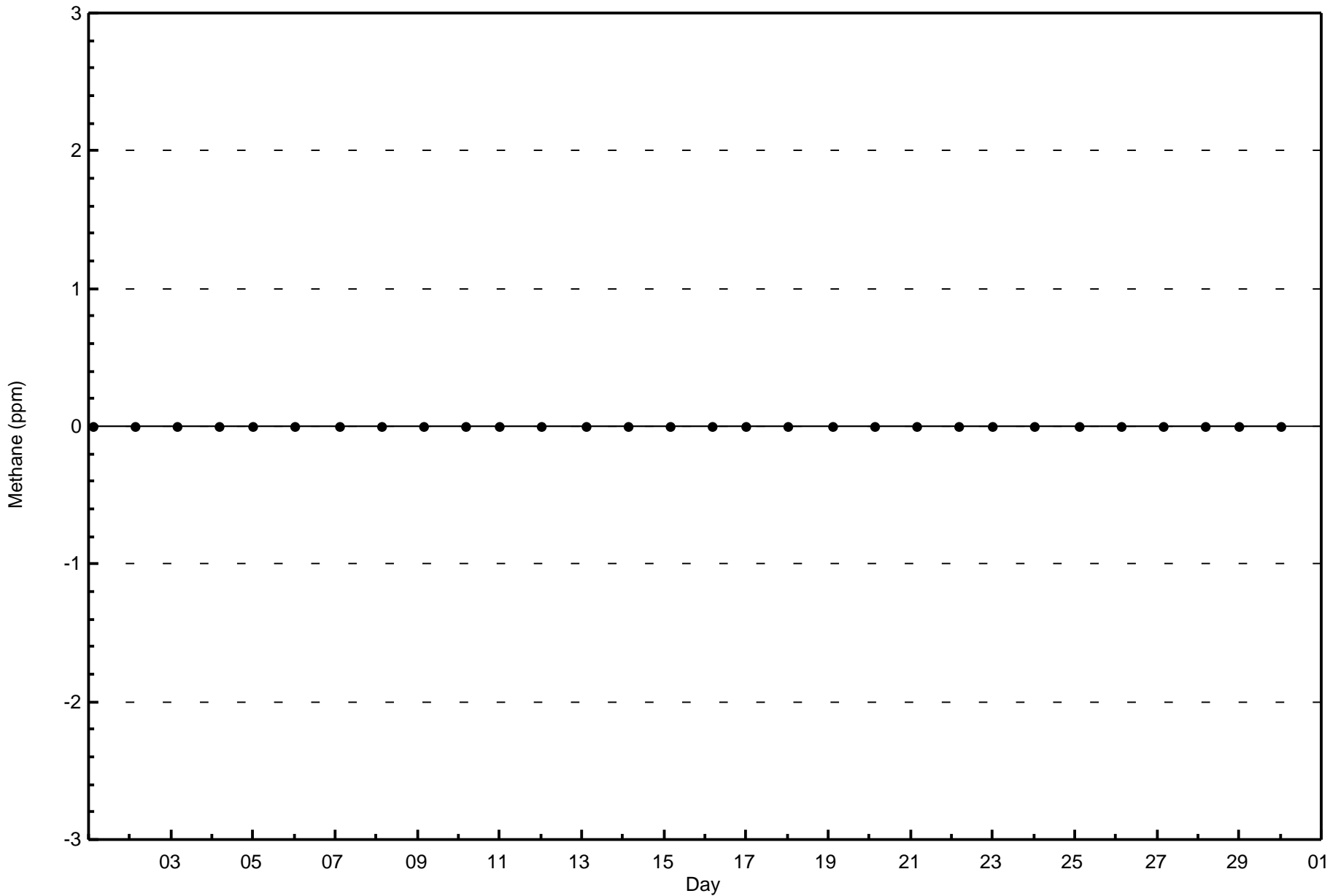
Total Number of Hours: 720

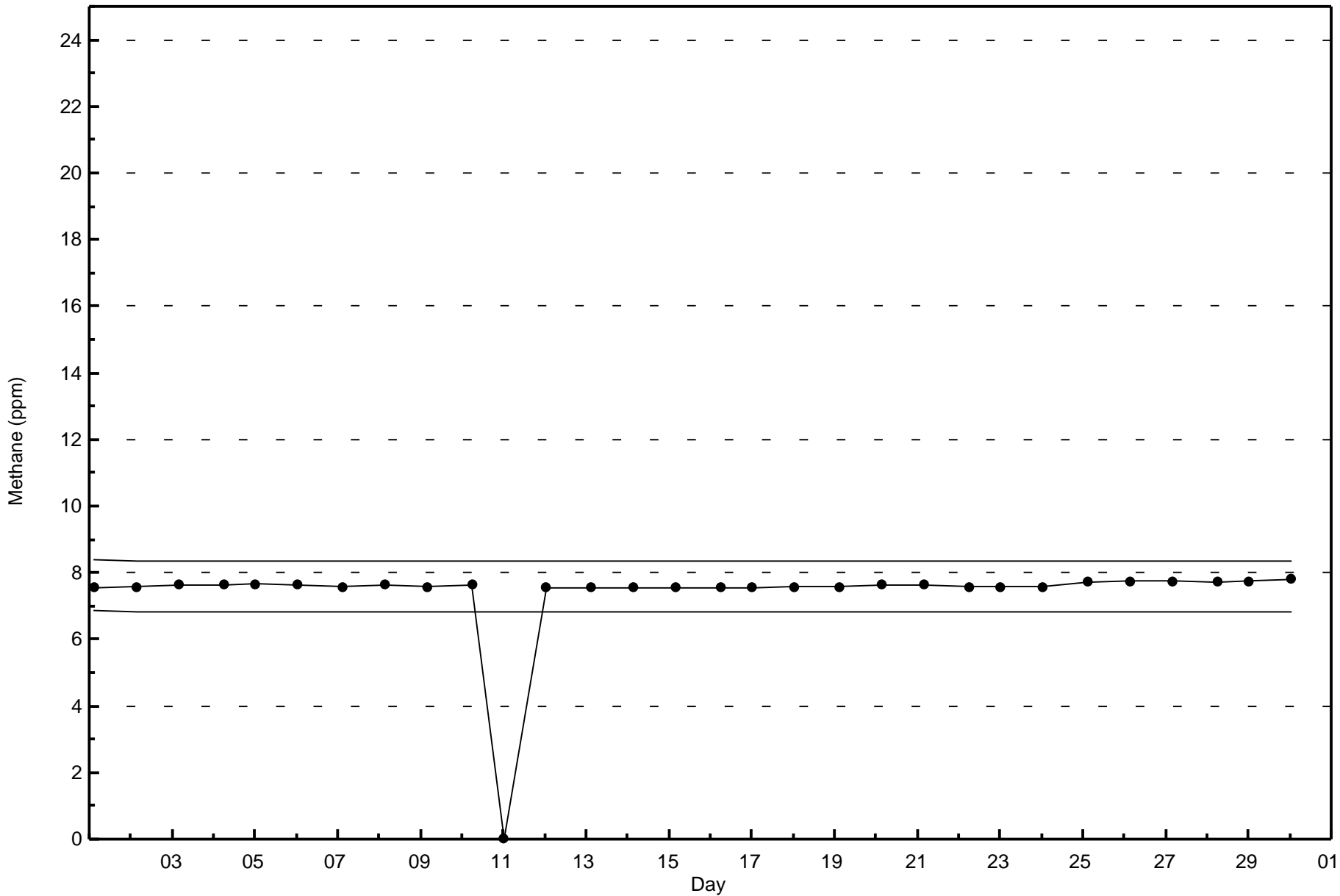


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Methane (CH₄) - ppm
Fort McKay - Bertha Ganter (AMS 1)









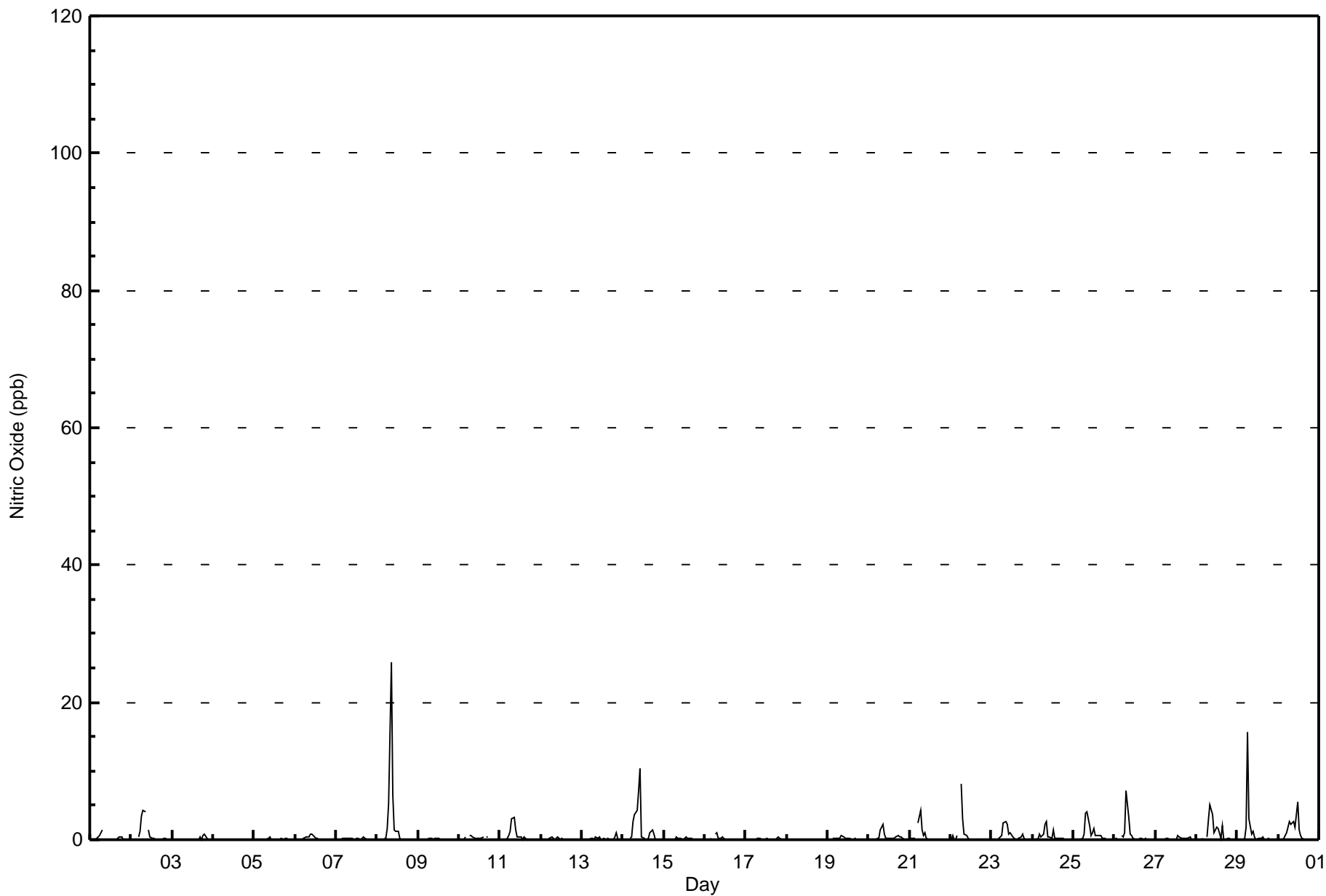
Maximum Value: 26 ppb on Jun 8 09:00																	Maximum Daily Average: 1.9 ppb on Jun 8																	Hours in Service: 720			
Minimum Value: 0 ppb on Jun 3 13:00																	Minimum Daily Average: 0.0 ppb on Jun 4																	Hours of Data: 677			
Maximum Diurnal Average: 2.3 ppb at hour 9																	Minimum Diurnal Average: 0.0 ppb at hour 23																	Hours of Missing Data: 43			
Monthly Average: 0.5 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 6																	Hours of Calibration: 36			
																																		Percent Operational Time: 99.0			
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-Jun	0	0	Z	0	0	1	1	1	C	C	C	C	C	C	0	0	0	0	1	0	0	0	0	0	--	1											
2-Jun	0	0	0	Z	0	1	3	4	4	M	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	4											
3-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0.1	1											
4-Jun	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											
5-Jun	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											
6-Jun	0	Z	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1											
7-Jun	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											
8-Jun	0	0	0	Z	0	0	2	5	26	7	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1.9	26											
9-Jun	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											
10-Jun	0	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	PF	1	0	PF	PF	PF	PF	PF	0	--	1											
11-Jun	Z	0	0	0	0	1	1	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3											
12-Jun	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											
13-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.2	1											
14-Jun	0	0	0	Z	0	1	3	4	4	7	10	0	0	0	0	0	1	1	1	0	0	0	0	0	1.4	10											
15-Jun	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											
16-Jun	0	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1											
17-Jun	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											
18-Jun	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											
19-Jun	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											
20-Jun	0	0	0	Z	0	0	0	1	2	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.4	2											
21-Jun	0	0	0	0	Z	2	4	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	4											
22-Jun	0	1	0	0	1	Z	8	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	8											
23-Jun	Z	0	0	0	0	0	1	2	3	2	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0.6	3											
24-Jun	0	Z	0	0	1	0	1	2	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3											
25-Jun	0	0	Z	0	0	0	1	4	4	2	1	1	2	1	1	1	1	1	0	0	0	0	0	0	0.8	4											
26-Jun	0	0	0	Z	1	0	1	7	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	7											
27-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1											
28-Jun	0	0	0	0	0	Z	0	3	5	4	1	1	2	2	0	2	0	0	0	0	0	0	0	0	0.9	5											
29-Jun	Z	0	0	0	0	2	16	3	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1.1	16											
30-Jun	0	Z	0	0	1	1	3	2	2	3	2	6	1	1	0	0	0	0	0	0	0	0	0	0	1.0	6											
																	Diurnal Average				Diurnal Maximum																
																	0.0				0																
																	0.1				1																
																	0.1				0																
																	0.1				0																
																	0.2				1																
																	0.5				2																
																	1.6				16																
																	1.7				7																
																	2.3				26																
																	1.2				7																
																	0.8				10																
																	0.5				6																
																	0.4				2																
																	0.2				2																
																	0.1				1																
																	0.2				2																
																	0.2				1																
																	0.2				1																
																	0.2				1																
																	0.1				1																
																	0.1				1																
																	0.0				0																
																	0.0				0																
																	0.0				0																

Z - zerospan C - Calibration M - Maintenance PF - Power Failure



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Fort McKay - Bertha Ganter - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Fort McKay - Bertha Ganter - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	676	99.85	99.85
21 - 40	1	0.15	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: 677

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Fort McKay - Bertha Ganter - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	72	35	23	16	14	9	30	75	76	44	44	36	32	63	74	33	676
21 - 40	1	0	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
Totals	73	35	23	16	14	9	30	75	76	44	44	36	32	63	74	33	677

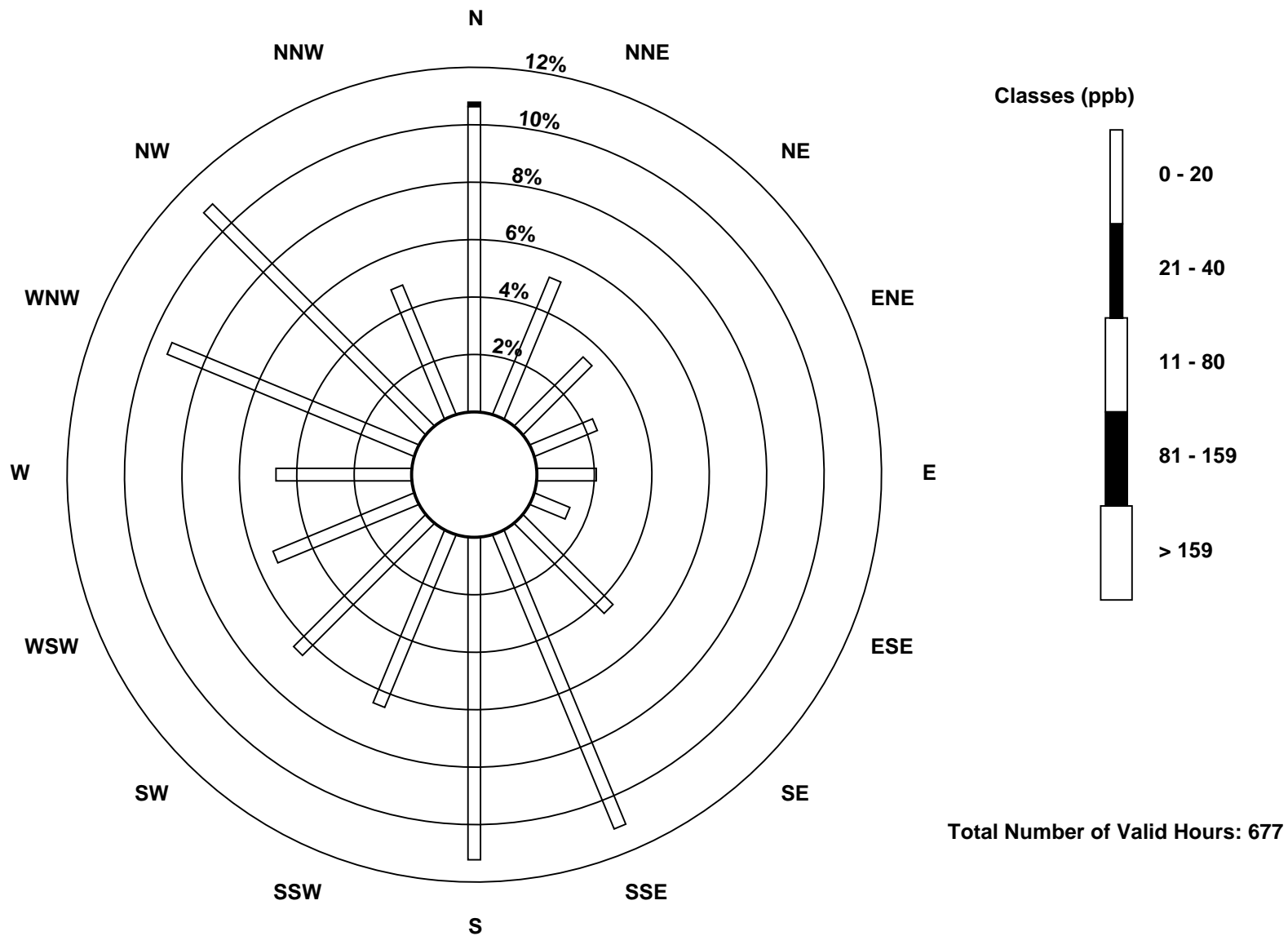
Total Number of Valid Hours: 677

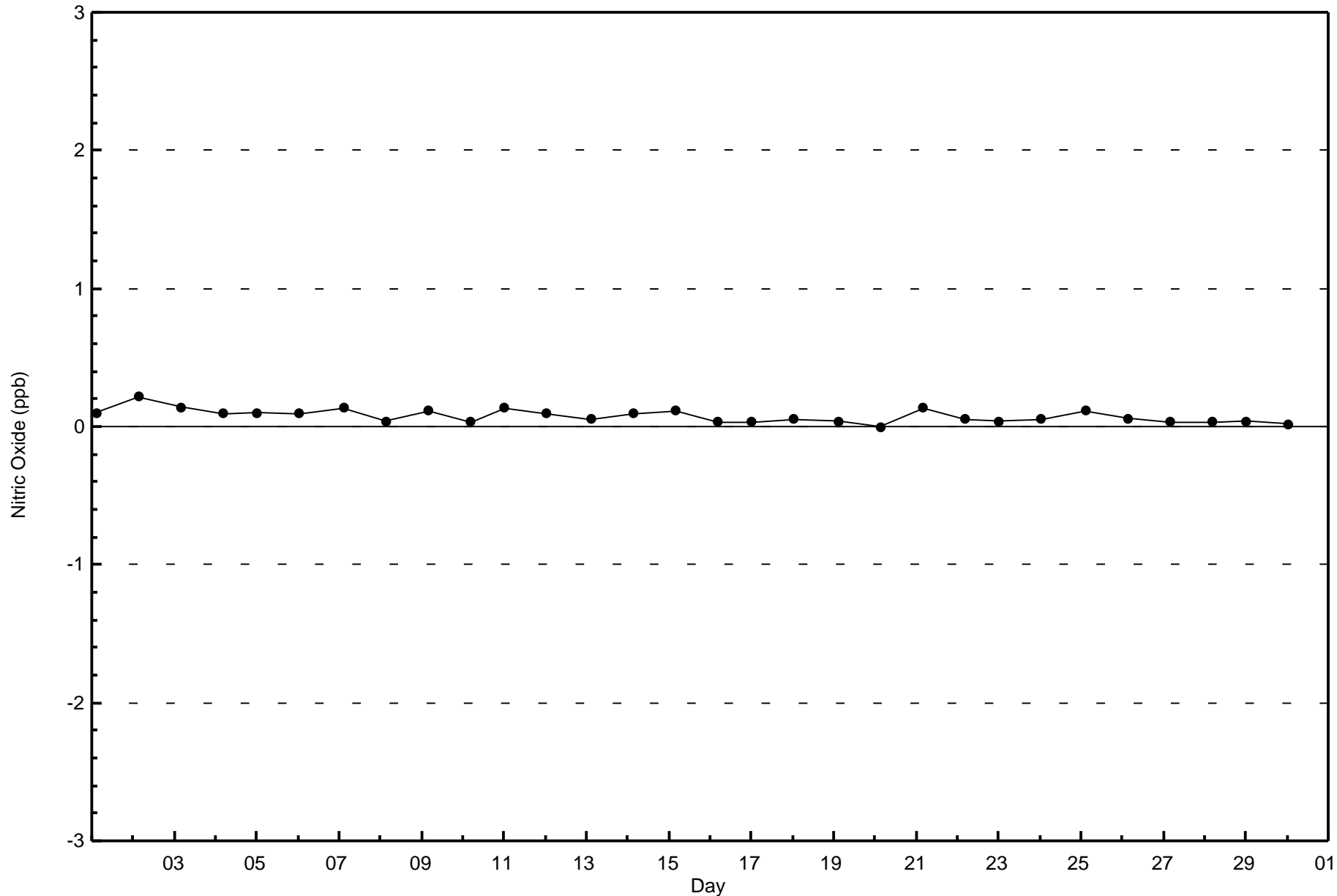
Total Number of Hours: 720

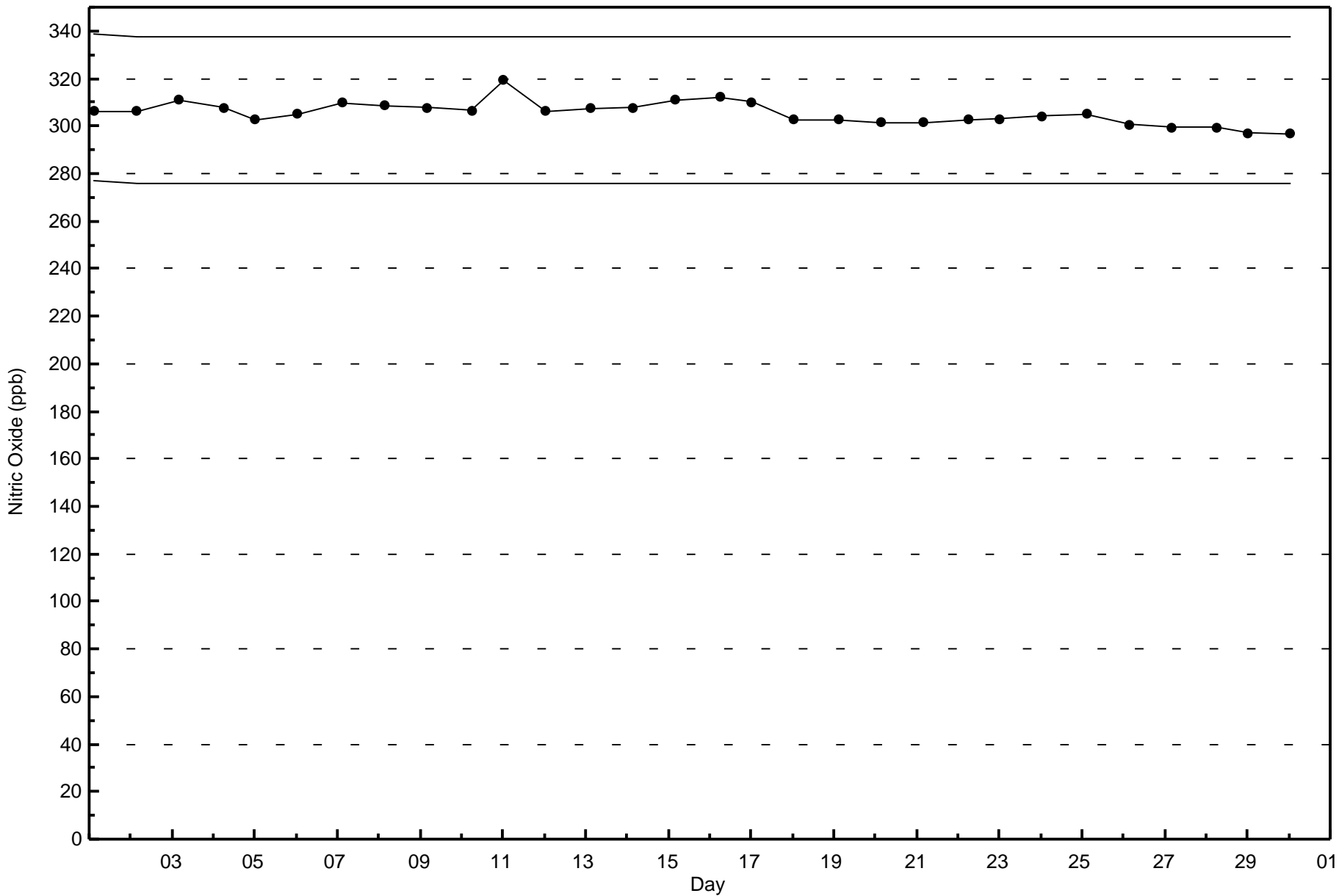


Wood Buffalo Environmental Association
Wind Rose Jun 2016

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









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Fort McKay - Bertha Ganter - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 25 ppb on Jun 8 09:00	Maximum Daily Average: 5.1 ppb on Jun 8		Hours of Data:	677
Minimum Value: 0 ppb on Jun 4 11:00	Minimum Daily Average: 0.4 ppb on Jun 4		Hours of Missing Data:	43
Maximum Diurnal Average: 4.4 ppb at hour 9	Minimum Diurnal Average: 0.9 ppb at hour 16		Hours of Calibration:	36
Monthly Average: 2.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 3 P ₉₀ = 6 P ₉₉ = 13		Percent Operational Time:	99.0

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-Jun	2	2	Z	2	2	3	5	4	C	C	C	C	C	C	1	0	1	2	7	4	1	1	1	2	--	7	
2-Jun	3	4	2	Z	3	3	4	4	5	M	4	2	1	2	2	1	1	1	1	1	2	2	1	2	2.3	5	
3-Jun	3	2	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	2	1	4	10	4	3	2	2	1.5	10	
4-Jun	2	2	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0.4	2	
5-Jun	Z	7	5	1	1	0	0	0	0	1	0	0	0	0	0	0	1	1	1	2	3	3	13	6	2.0	13	
6-Jun	3	Z	2	2	2	1	2	2	3	5	3	2	2	2	1	1	1	3	1	2	2	2	3	4	2.1	5	
7-Jun	3	3	Z	4	2	1	1	1	2	1	1	1	1	1	1	1	3	3	1	1	2	2	5	14	2.4	14	
8-Jun	10	4	1	Z	1	1	5	13	25	15	7	8	8	2	2	2	2	2	2	3	3	1	1	0	5.1	25	
9-Jun	0	0	3	10	Z	6	5	5	4	3	3	3	2	2	1	1	1	1	2	1	0	1	1	1	2.3	10	
10-Jun	3	2	1	1	1	Z	1	1	1	1	1	1	1	1	1	PF	2	2	PF	PF	PF	PF	PF	10	--	10	
11-Jun	Z	2	1	1	1	1	2	6	9	5	2	3	2	1	2	1	1	1	1	1	0	0	0	6	2.1	9	
12-Jun	3	Z	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	3	
13-Jun	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	5	14	12	6	5	1.9	14	
14-Jun	4	4	5	Z	2	1	3	5	10	11	18	3	3	1	1	2	10	10	8	3	5	2	4	2	5.0	18	
15-Jun	1	1	0	1	Z	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1.0	2	
16-Jun	5	9	6	2	2	Z	2	2	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1.4	9	
17-Jun	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	3	2	4	2	1	0.6	4	
18-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7	3	0.5	7	
19-Jun	0	0	Z	3	2	1	0	0	2	1	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0.7	3	
20-Jun	4	1	0	Z	1	0	1	2	5	2	1	2	1	1	3	3	5	7	6	6	4	5	5	5	3.0	7	
21-Jun	4	11	12	8	Z	7	10	6	4	5	1	1	1	1	1	1	1	1	1	2	2	4	4	6	4.0	12	
22-Jun	5	13	8	5	6	Z	12	9	7	8	5	2	1	1	1	1	1	1	1	1	1	1	1	1	4.0	13	
23-Jun	Z	1	1	1	3	5	4	9	13	12	6	6	4	2	1	1	2	3	6	2	2	4	7	6	4.2	13	
24-Jun	6	Z	5	4	8	4	3	5	3	2	1	1	2	1	1	1	2	2	0	0	0	1	3	3	2.5	8	
25-Jun	2	3	Z	0	1	1	1	5	4	2	2	2	2	2	2	2	2	2	1	2	1	1	2	3	1	1.9	5
26-Jun	2	5	4	Z	1	1	1	6	7	4	4	2	1	2	2	1	1	1	1	1	1	1	2	1	2.2	7	
27-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	3	1	1	1	1	3	4	5	3	4	3	1.3	5	
28-Jun	2	2	2	2	1	Z	1	4	10	10	4	7	5	2	1	0	1	0	1	3	3	3	15	17	4.2	17	
29-Jun	Z	7	4	3	2	4	16	8	4	5	2	1	2	2	2	2	2	1	2	3	3	2	4	2	3	3.6	16
30-Jun	5	Z	9	8	6	4	7	8	9	11	8	14	7	4	2	1	1	1	1	1	1	2	4	4	5.0	14	

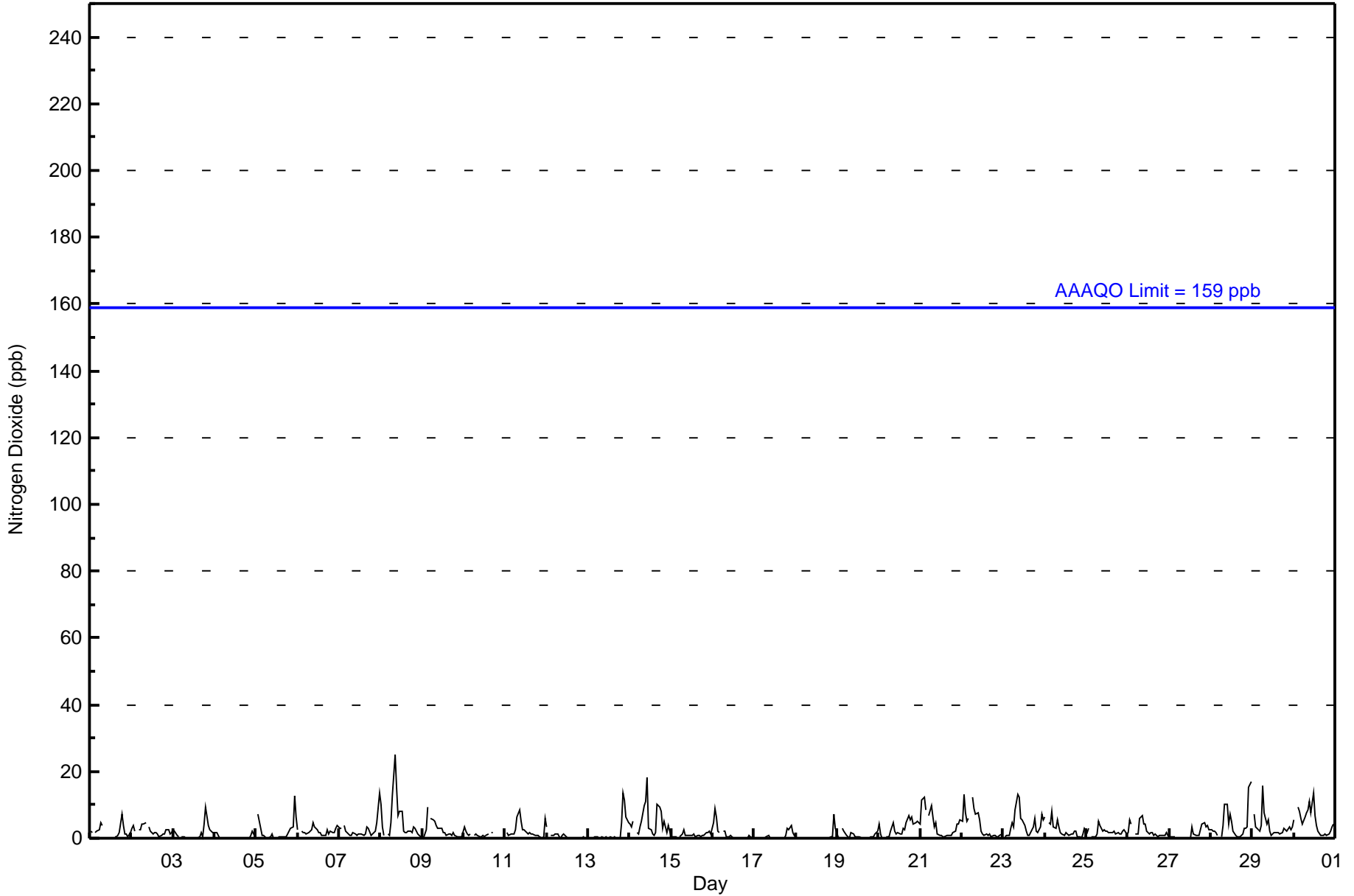
2.9	3.4	3.0	2.4	1.9	1.8	3.0	3.6	4.4	3.9	2.7	2.1	1.6	1.2	0.9	0.9	1.4	1.5	2.0	2.1	2.2	2.3	3.4	3.7	Diurnal Average	
10	13	12	10	8	7	16	13	25	15	18	14	8	4	3	3	10	10	8	10	14	12	15	17	Diurnal Maximum	

Z - zerospan C - Calibration M - Maintenance PF - Power Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Fort McKay - Bertha Ganter - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Fort McKay - Bertha Ganter - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	676	99.85	99.85
21 - 40	1	0.15	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: 677

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Fort McKay - Bertha Ganter - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	72	35	23	16	14	9	30	75	76	44	44	36	32	63	74	33	676
21 - 40	1	0	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
Totals	73	35	23	16	14	9	30	75	76	44	44	36	32	63	74	33	677

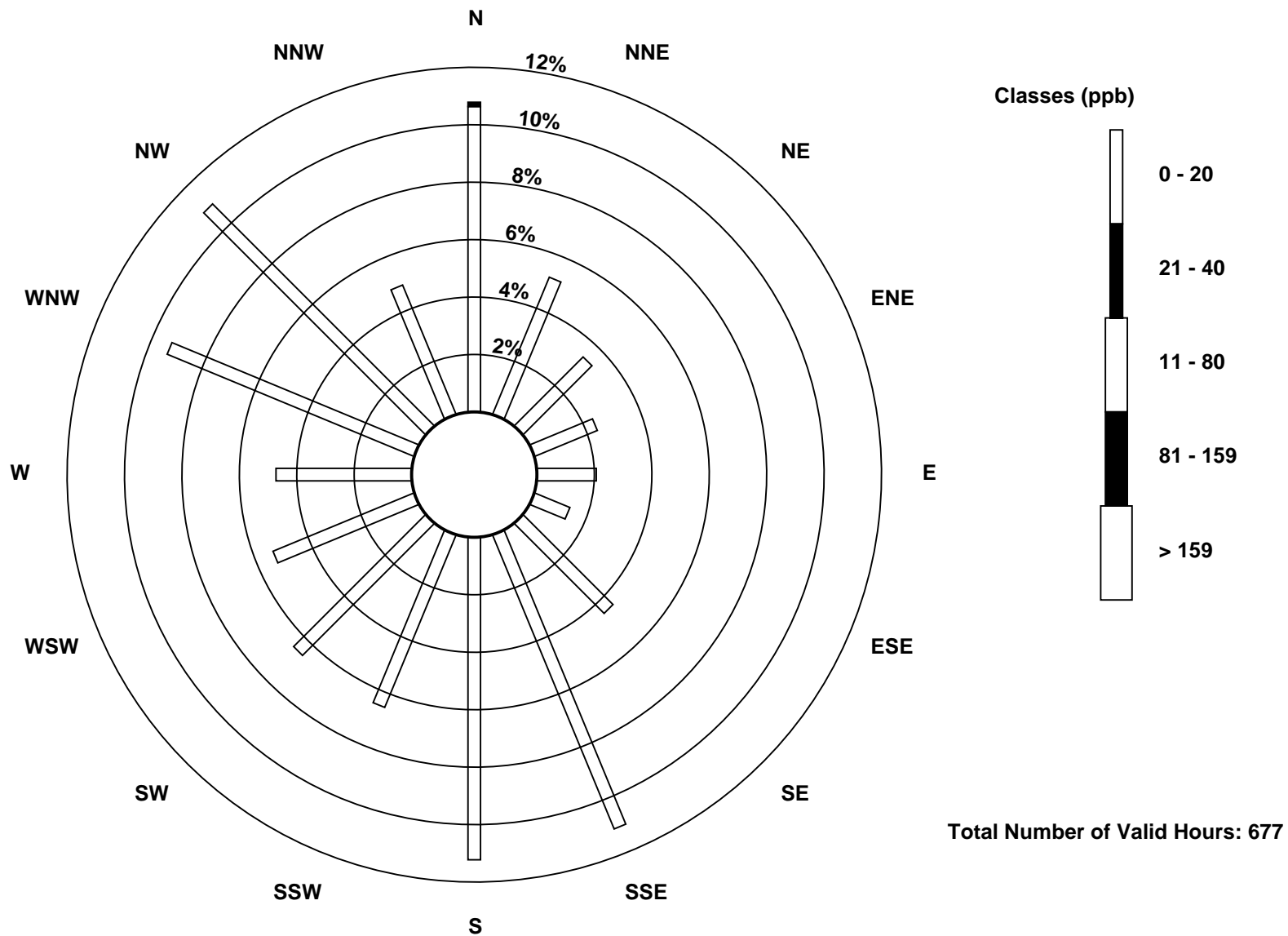
Total Number of Valid Hours: 677

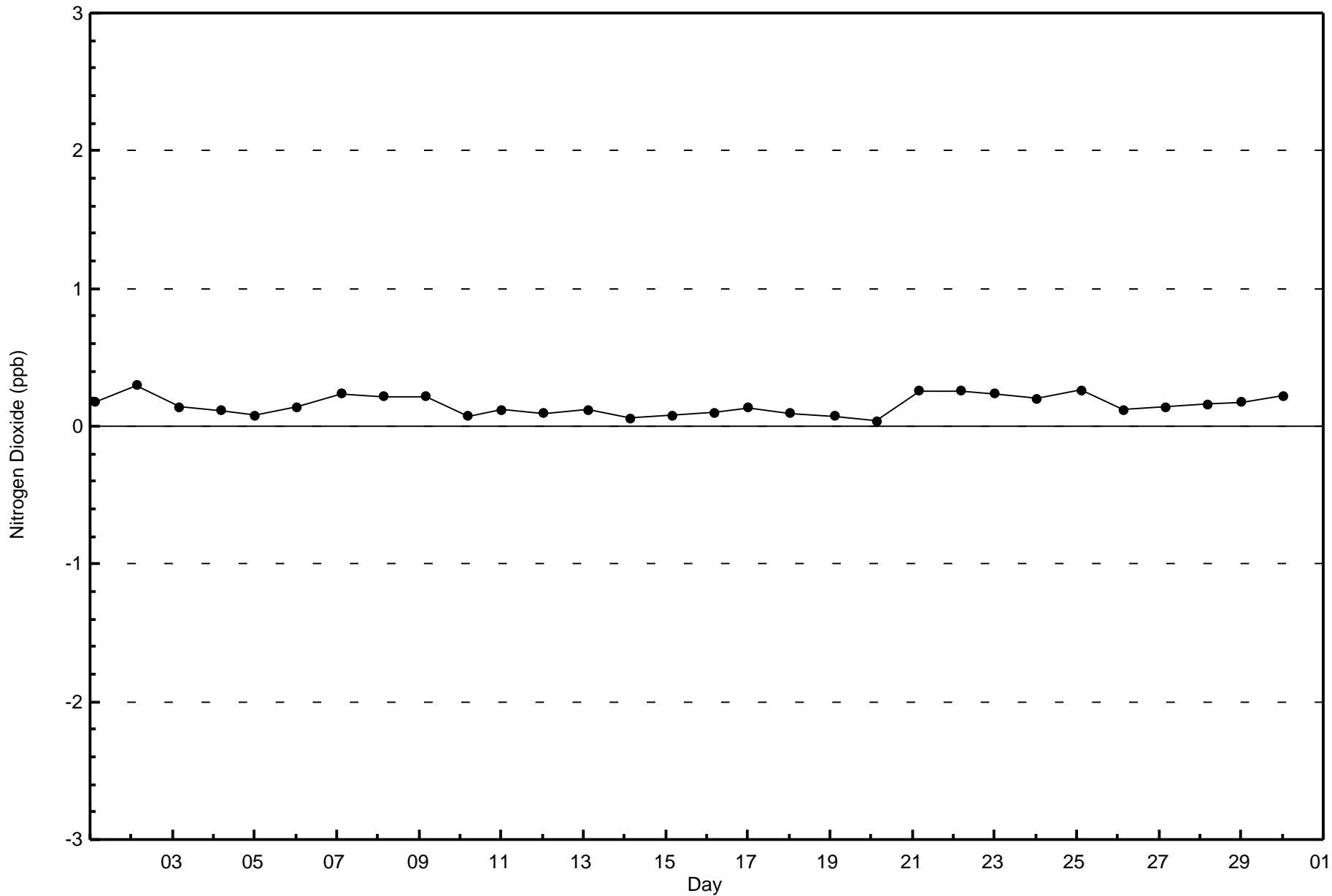
Total Number of Hours: 720

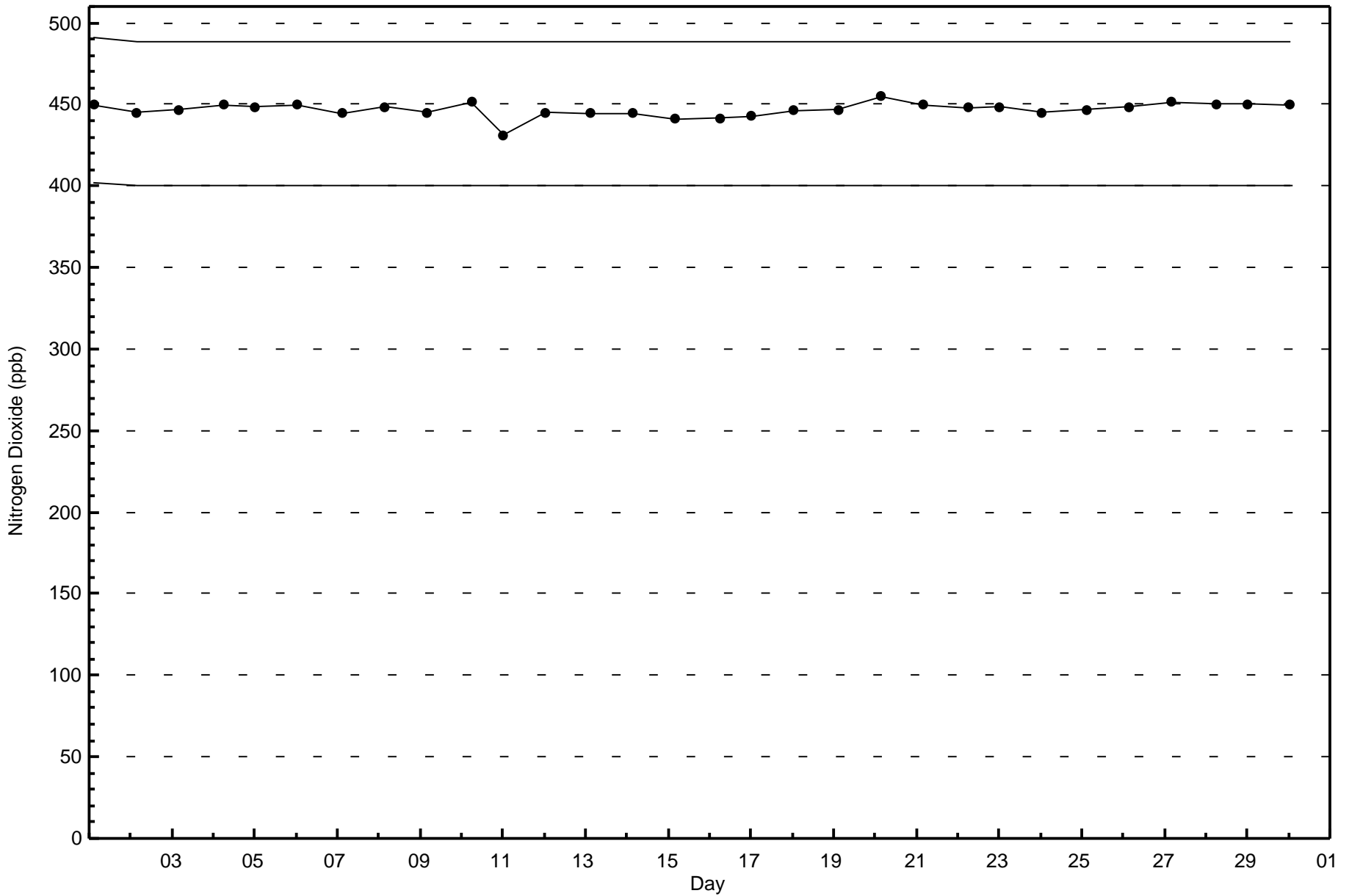


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Dioxide (NO₂) - ppb
Fort McKay - Bertha Ganter (AMS 1)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb

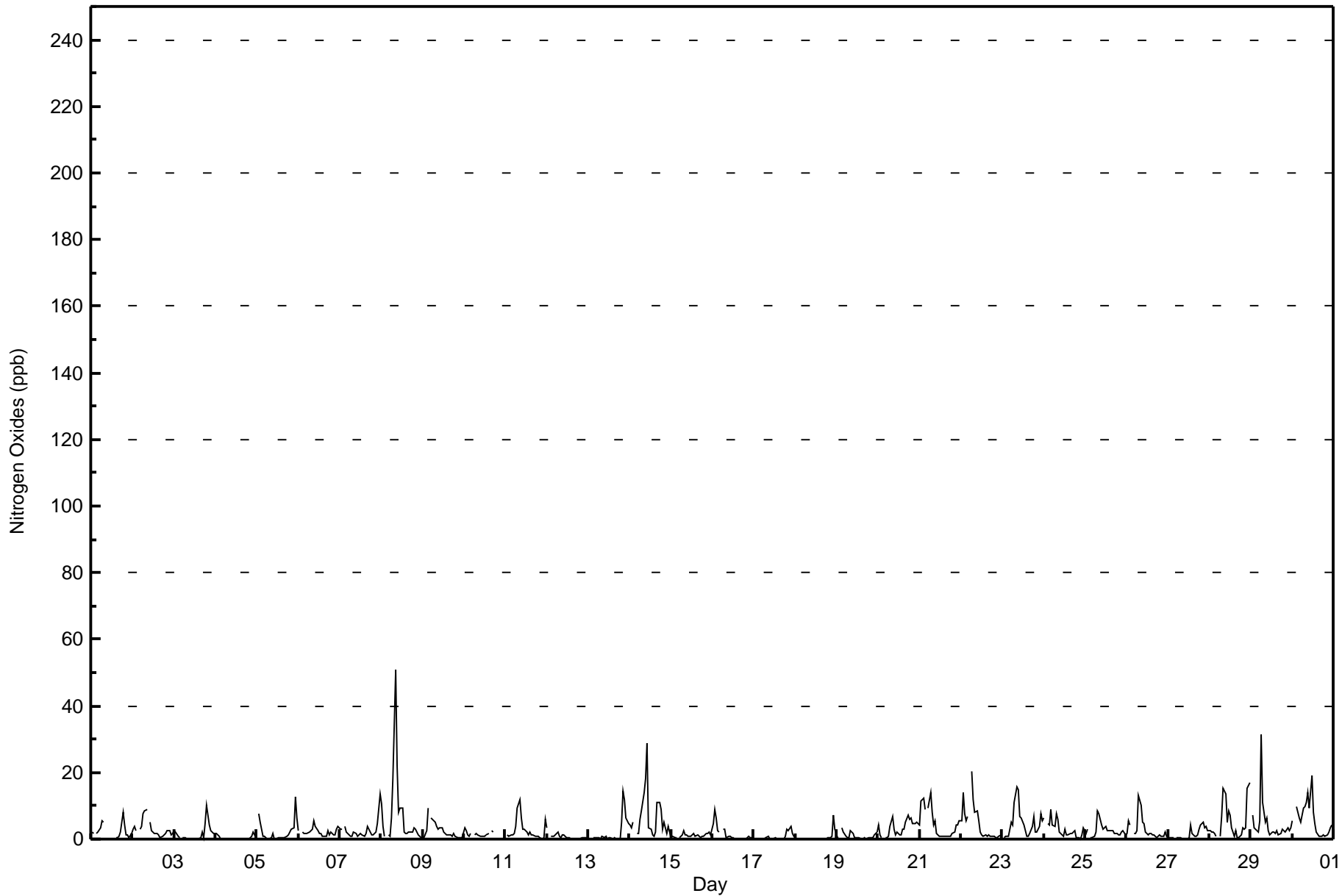
Fort McKay - Bertha Ganter - June 2016

Maximum Value: 51 ppb on Jun 8 09:00																	Maximum Daily Average: 7.0 ppb on Jun 8																	Hours in Service: 720			
Minimum Value: 0 ppb on Jun 5 11:00																	Minimum Daily Average: 0.4 ppb on Jun 4																	Hours of Data: 677			
Maximum Diurnal Average: 6.6 ppb at hour 9																	Minimum Diurnal Average: 1.0 ppb at hour 15																	Hours of Missing Data: 43			
Monthly Average: 2.9 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 7 P ₉₉ = 18																	Hours of Calibration: 36			
																																		Percent Operational Time: 99.0			
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-Jun	2	2	Z	2	2	3	6	5	C	C	C	C	C	C	0	0	1	2	8	4	1	1	1	2	--	8											
2-Jun	3	4	2	Z	3	4	8	8	9	M	5	3	2	2	2	1	1	1	1	2	3	2	1	2	3.1	9											
3-Jun	2	2	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	2	1	5	10	4	3	2	2	1.6	10											
4-Jun	2	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0.4	2											
5-Jun	Z	7	5	1	1	0	0	0	0	2	0	0	0	0	0	0	1	1	1	2	3	3	13	6	2.1	13											
6-Jun	3	Z	2	2	2	2	2	3	3	5	4	3	2	2	1	1	1	3	1	2	1	1	3	4	2.2	5											
7-Jun	3	3	Z	4	2	1	1	1	2	2	1	1	2	1	1	2	4	3	1	1	2	2	5	14	2.5	14											
8-Jun	10	4	1	Z	1	1	6	18	51	22	8	9	9	2	2	2	2	2	2	3	3	1	1	0	7.0	51											
9-Jun	0	0	3	9	Z	6	6	5	4	3	3	3	2	2	1	1	1	1	2	1	0	1	0	1	2.4	9											
10-Jun	3	2	1	1	2	Z	1	2	1	1	1	1	1	1	2	PF	2	2	PF	PF	PF	PF	PF	PF	--	10											
11-Jun	Z	1	1	1	1	2	4	9	12	6	3	3	2	1	2	1	1	1	1	1	0	0	0	6	2.6	12											
12-Jun	3	Z	1	1	1	1	2	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	3											
13-Jun	0	0	Z	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	5	14	12	6	5	2.1	14											
14-Jun	4	4	5	Z	2	2	6	9	14	18	29	3	3	1	1	2	11	11	9	3	5	2	4	2	6.5	29											
15-Jun	1	1	0	0	Z	1	1	3	1	1	1	1	2	1	1	1	1	1	1	1	2	2	2	1	1.1	3											
16-Jun	5	9	6	2	2	Z	3	3	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1.6	9											
17-Jun	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	3	2	4	2	1	0.7	4											
18-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7	3	0.6	7											
19-Jun	0	0	Z	3	2	1	0	0	2	2	0	1	0	0	0	0	0	0	0	0	1	1	1	2	0.8	3											
20-Jun	4	1	0	Z	1	1	1	4	7	3	1	2	1	1	3	3	5	7	6	7	4	5	5	5	3.4	7											
21-Jun	4	11	12	9	Z	9	14	8	4	6	1	1	1	1	1	1	1	1	1	2	2	4	4	5	4.5	14											
22-Jun	5	14	8	5	7	Z	20	12	8	8	6	2	1	1	1	1	1	1	1	1	1	1	1	1	4.6	20											
23-Jun	Z	0	1	1	3	5	4	11	16	15	7	7	4	2	1	1	2	4	7	2	2	4	7	6	4.8	16											
24-Jun	6	Z	5	4	9	4	4	8	6	2	2	1	3	1	1	2	2	2	2	1	0	0	1	3	3.0	9											
25-Jun	2	3	Z	0	1	1	2	9	8	4	3	3	4	2	2	2	3	2	2	1	1	2	3	1	2.7	9											
26-Jun	2	5	4	Z	2	1	2	13	10	5	5	2	1	2	2	1	1	1	1	1	1	1	2	1	2.9	13											
27-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	4	2	1	1	1	1	3	4	5	3	4	3	1.5	5											
28-Jun	2	2	2	2	1	Z	1	7	15	14	5	8	7	4	1	2	1	0	1	3	3	3	15	17	5.1	17											
29-Jun	Z	7	4	3	2	6	31	11	5	7	2	1	2	2	2	2	1	2	3	3	2	3	2	3	4.6	31											
30-Jun	5	Z	10	8	7	5	9	10	11	14	9	19	8	4	2	1	1	1	1	1	1	2	3	4	6.0	19											
																	Diurnal Average																				
																	Diurnal Maximum																				
Z - zerspan																	C - Calibration																	M - Maintenance		PF - Power Failure	



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Fort McKay - Bertha Ganter - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Fort McKay - Bertha Ganter - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	673	99.41	99.41
21 - 40	3	0.44	99.85
41 - 80	1	0.15	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 677

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Fort McKay - Bertha Ganter - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	71	33	23	16	14	9	30	75	76	44	44	36	32	63	74	33	673
21 - 40	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
11 - 80	1	0	0	0	0	0	0	0	0	0	0	0	0	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
Totals	73	35	23	16	14	9	30	75	76	44	44	36	32	63	74	33	677

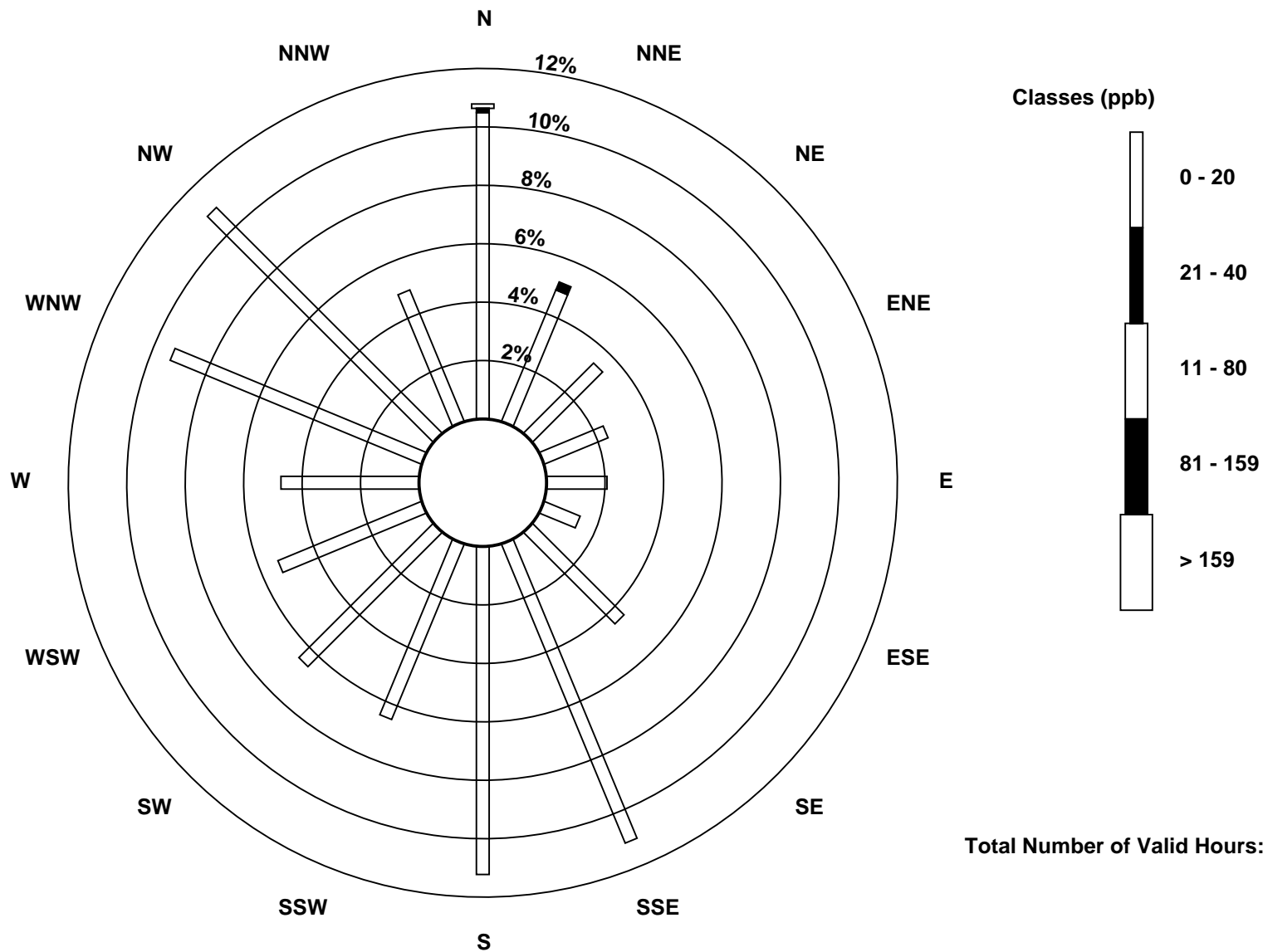
Total Number of Valid Hours: 677

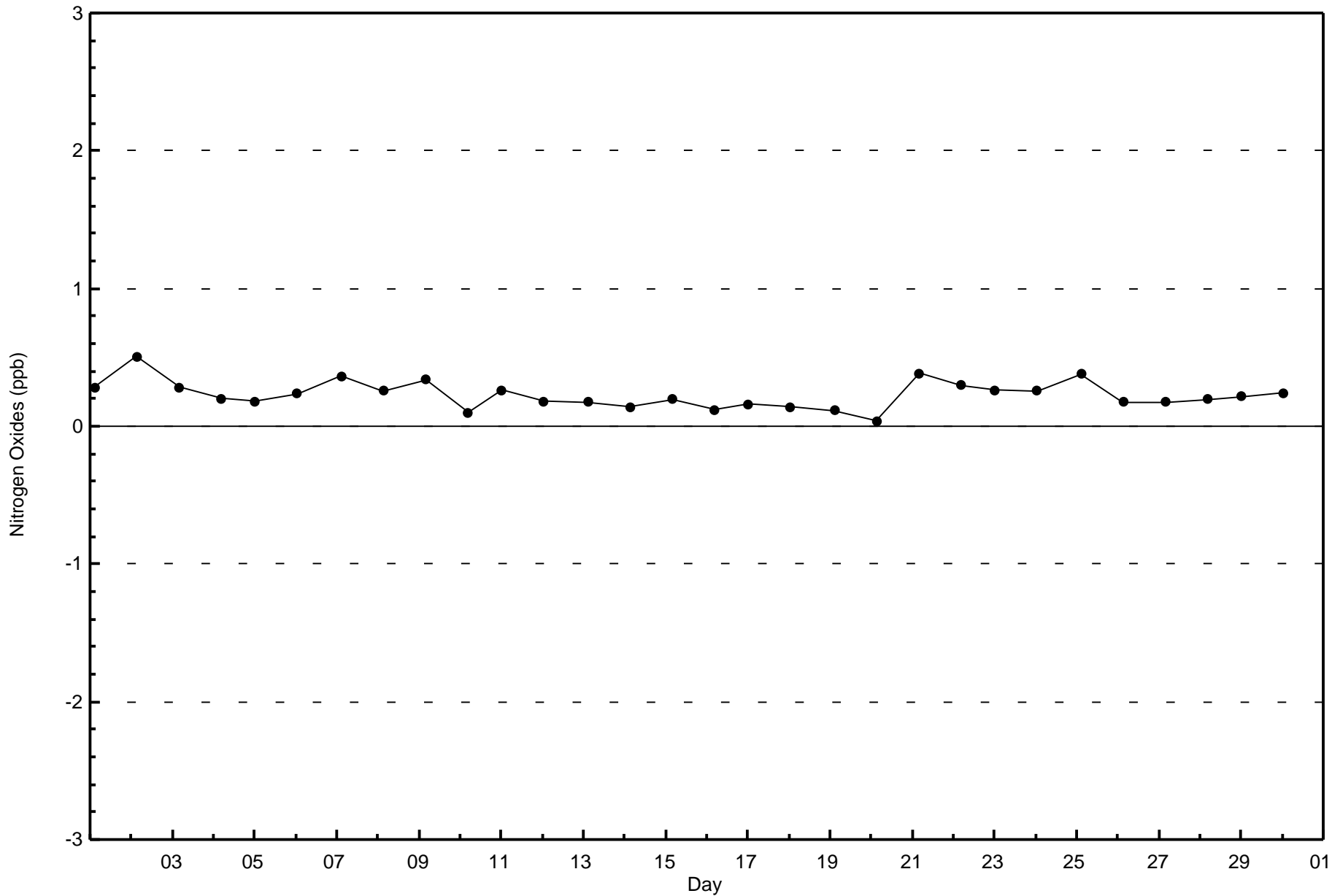
Total Number of Hours: 720

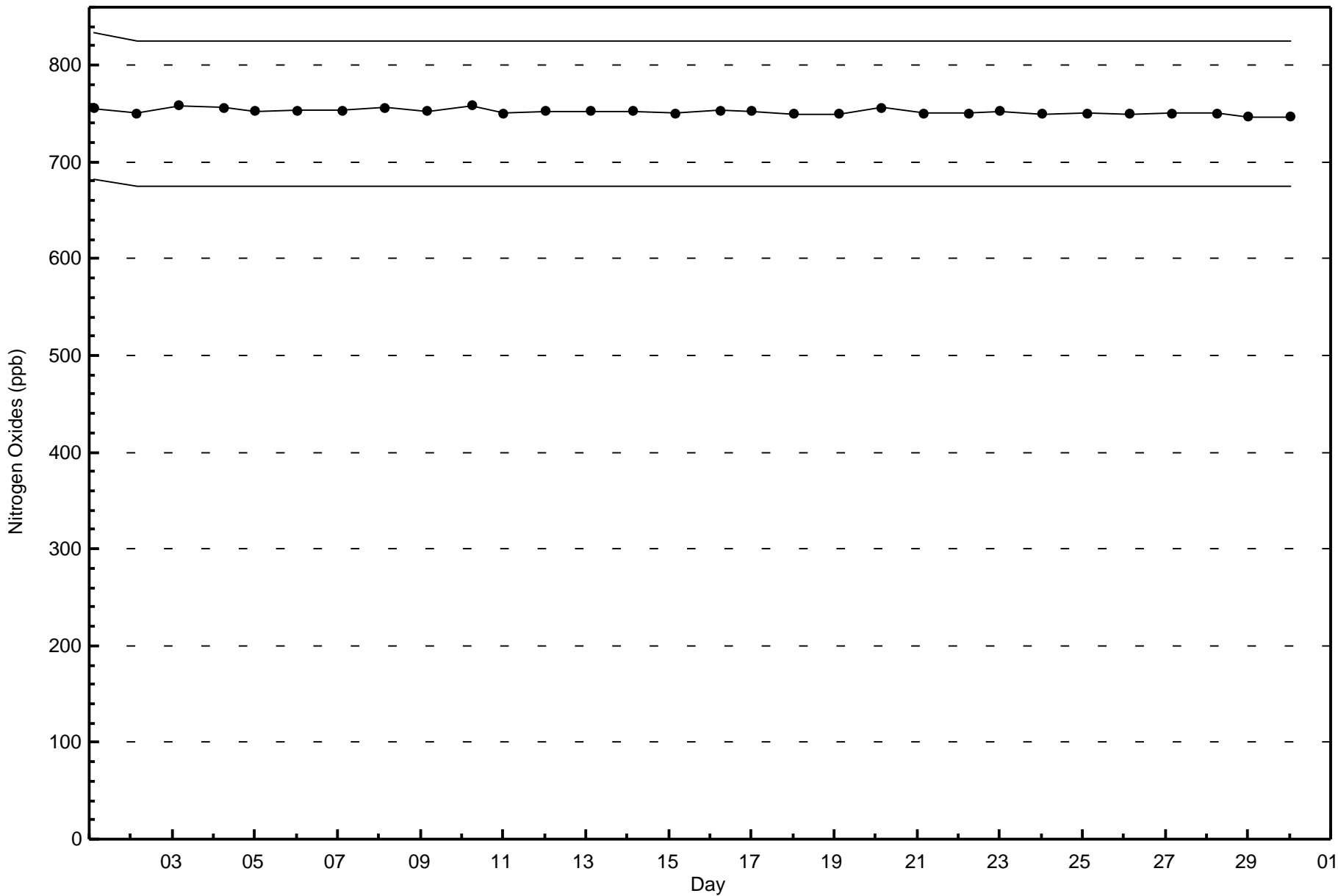


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxides (NO_x) - ppb
Fort McKay - Bertha Ganter (AMS 1)









Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

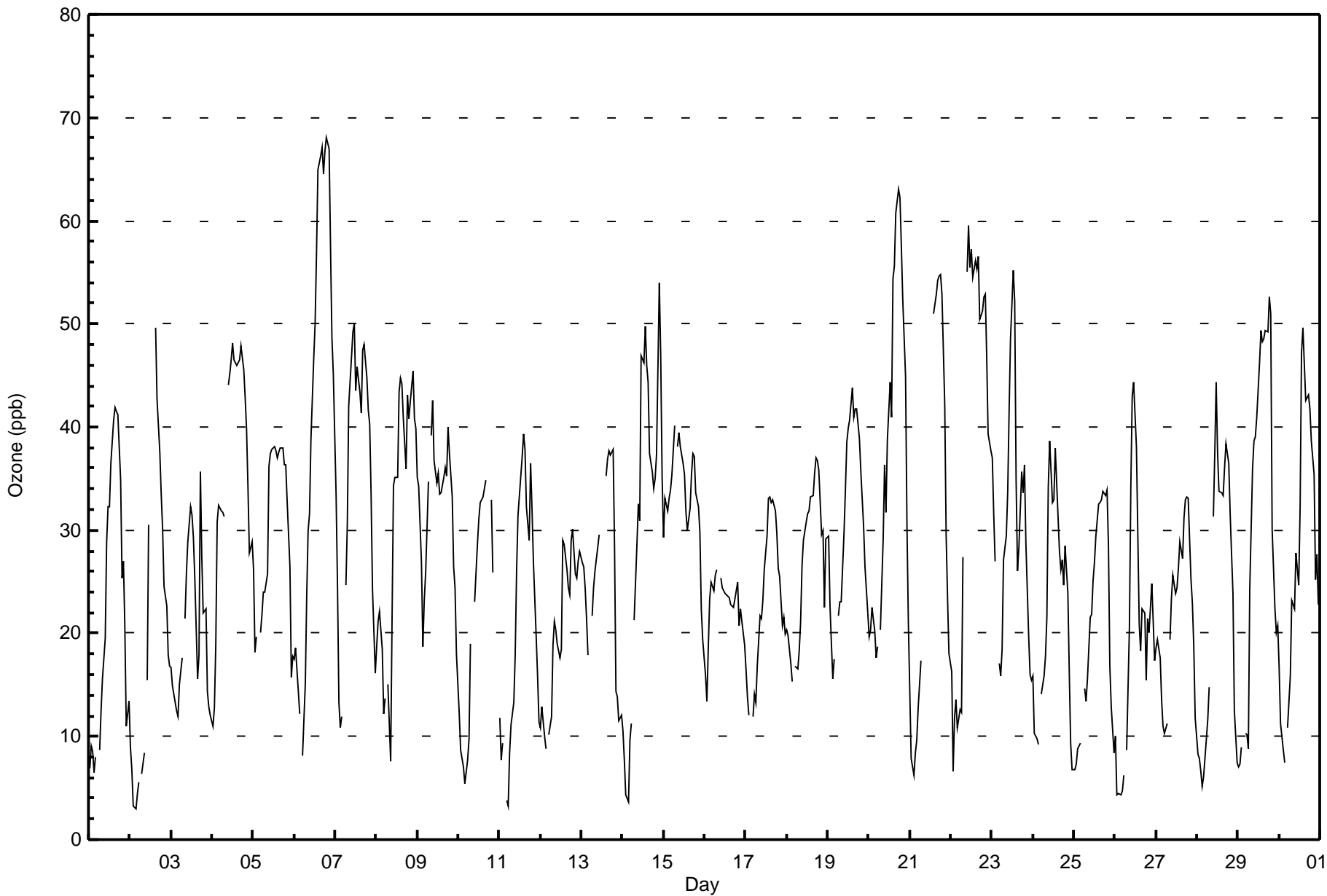
Fort McKay - Bertha Ganter - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 68 ppb on Jun 6 20:00	Maximum Daily Average: 42.6 ppb on Jun 6		Hours of Data:	674
Minimum Value: 3 ppb on Jun 2 04:00	Minimum Daily Average: 19.4 ppb on Jun 2		Hours of Missing Data:	46
Maximum Diurnal Average: 39.0 ppb at hour 18	Minimum Diurnal Average: 13.3 ppb at hour 4		Hours of Calibration:	37
Monthly Average: 27.8 ppb	Percentiles: P ₁ = 4 P ₁₀ = 10 Q ₁ = 18 Median = 27 Q ₃ = 36 P ₉₀ = 46 P ₉₉ = 64		Percent Operational Time:	98.8

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-Jun	7	9	9	6	8	Z	9	12	16	20	29	32	32	37	41	42	41	41	35	25	27	21	11	13	22.7	42
2-Jun	9	7	3	3	4	6	Z	6	8	M	15	30	C	C	C	50	43	38	33	30	25	23	18	17	19.4	50
3-Jun	17	15	13	13	12	15	18	Z	21	26	29	32	31	29	25	16	18	36	27	22	22	14	13	12	20.7	36
4-Jun	11	13	19	31	32	32	32	31	Z	44	45	47	48	47	46	46	46	48	45	43	40	34	28	29	36.4	48
5-Jun	26	18	20	Z	20	22	24	24	26	36	37	38	38	38	37	38	38	38	36	36	33	27	16	18	29.7	38
6-Jun	18	19	14	12	Z	8	15	24	30	32	39	47	50	57	65	66	67	65	67	68	67	57	49	45	42.6	68
7-Jun	33	25	13	11	12	Z	25	31	42	47	49	50	44	46	43	41	47	48	45	42	40	33	24	16	35.1	50
8-Jun	19	21	22	19	12	14	Z	15	8	22	34	35	35	43	45	44	41	36	43	41	43	45	41	40	31.2	45
9-Jun	35	34	27	19	23	26	35	Z	39	43	37	35	36	33	34	35	36	35	40	37	33	26	24	18	32.2	43
10-Jun	12	9	8	7	5	8	10	19	Z	23	26	29	31	33	33	34	35	PF	PF	33	26	PF	12	PF	20.6	35
11-Jun	12	8	9	Z	4	3	8	11	13	18	26	31	35	37	39	38	32	29	36	32	27	20	16	11	21.6	39
12-Jun	11	13	10	9	Z	10	12	19	21	20	19	18	18	29	29	26	24	24	29	30	26	25	27	28	20.8	30
13-Jun	27	26	24	21	18	Z	22	24	26	28	30	M	M	M	35	37	38	37	38	28	14	14	12	12	25.6	38
14-Jun	11	8	4	4	10	11	Z	21	29	33	31	47	46	50	46	44	37	36	34	35	37	54	47	35	30.8	54
15-Jun	29	33	32	33	34	35	40	Z	38	39	38	36	35	32	30	32	35	37	37	34	32	30	22	19	33.3	40
16-Jun	16	13	19	23	25	24	26	26	Z	25	24	24	24	24	23	23	23	24	25	21	22	21	19	19	22.5	26
17-Jun	16	14	12	Z	12	14	13	17	22	21	23	26	29	33	33	33	33	32	30	26	25	21	22	20	23.0	33
18-Jun	20	20	17	15	UO	17	16	18	21	27	29	31	32	32	33	33	35	37	37	36	30	30	22	29	26.9	37
19-Jun	29	23	19	16	17	Z	22	23	23	30	34	39	40	41	44	41	42	42	39	36	33	30	26	22	30.8	44
20-Jun	20	20	22	20	18	19	Z	20	29	36	32	39	44	41	54	56	61	63	62	57	52	45	31	21	37.5	63
21-Jun	15	8	6	8	10	13	17	Z	38	C	C	C	C	C	51	53	54	55	55	53	42	30	23	18	30.5	55
22-Jun	16	7	12	14	11	13	12	27	Z	55	59	55	57	55	56	55	57	50	51	53	53	47	39	38	38.8	59
23-Jun	37	32	27	Z	17	16	18	27	29	34	41	49	55	52	35	26	28	36	34	36	29	20	16	15	30.8	55
24-Jun	16	10	10	9	Z	14	16	18	22	34	39	33	33	38	35	28	26	27	25	29	24	16	9	7	22.4	39
25-Jun	7	7	9	9	9	Z	15	13	16	22	22	25	27	29	33	33	33	34	33	34	29	17	13	8	20.7	34
26-Jun	10	4	5	4	5	6	Z	9	21	34	43	44	38	30	21	18	22	22	15	21	20	25	21	17	19.8	44
27-Jun	19	19	18	14	11	10	11	Z	19	23	26	24	24	26	29	27	31	33	33	33	25	23	19	12	22.2	33
28-Jun	8	8	7	5	6	10	12	15	Z	31	37	44	38	34	34	33	36	38	36	32	28	24	13	7	23.3	44
29-Jun	7	7	9	Z	10	10	9	24	36	39	39	41	46	49	48	49	49	49	53	51	30	22	20	21	31.3	53
30-Jun	17	11	9	7	Z	11	16	23	23	22	28	25	32	47	50	43	43	42	39	35	25	28	23	23	27.9	50

17.6	15.4	14.2	13.3	13.8	14.7	18.1	20.0	24.6	30.8	33.1	35.9	37.0	38.5	38.8	38.0	38.5	39.0	38.5	36.6	32.3	28.3	22.8	20.4	Diurnal Average	
37	34	32	33	34	35	40	31	42	55	59	55	57	57	65	66	67	65	67	68	67	57	49	45	Diurnal Maximum	

Z - zerospan C - Calibration M - Maintenance UO - Unstable Operation PF - Power Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Fort McKay - Bertha Ganter - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	218	32.34	32.34
21 - 50	418	62.02	94.36
51 - 82	38	5.64	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 674

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Ozone (O₃) - ppb
Fort McKay - Bertha Ganter - June 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	16	1	3	0	2	1	3	12	22	25	13	18	16	45	29	12	218
21 - 50	56	34	22	14	12	7	24	45	36	24	29	18	14	21	40	22	418
51 - 82	0	0	0	2	0	0	3	16	13	0	1	0	2	1	0	0	38
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	72	35	25	16	14	8	30	73	71	49	43	36	32	67	69	34	674

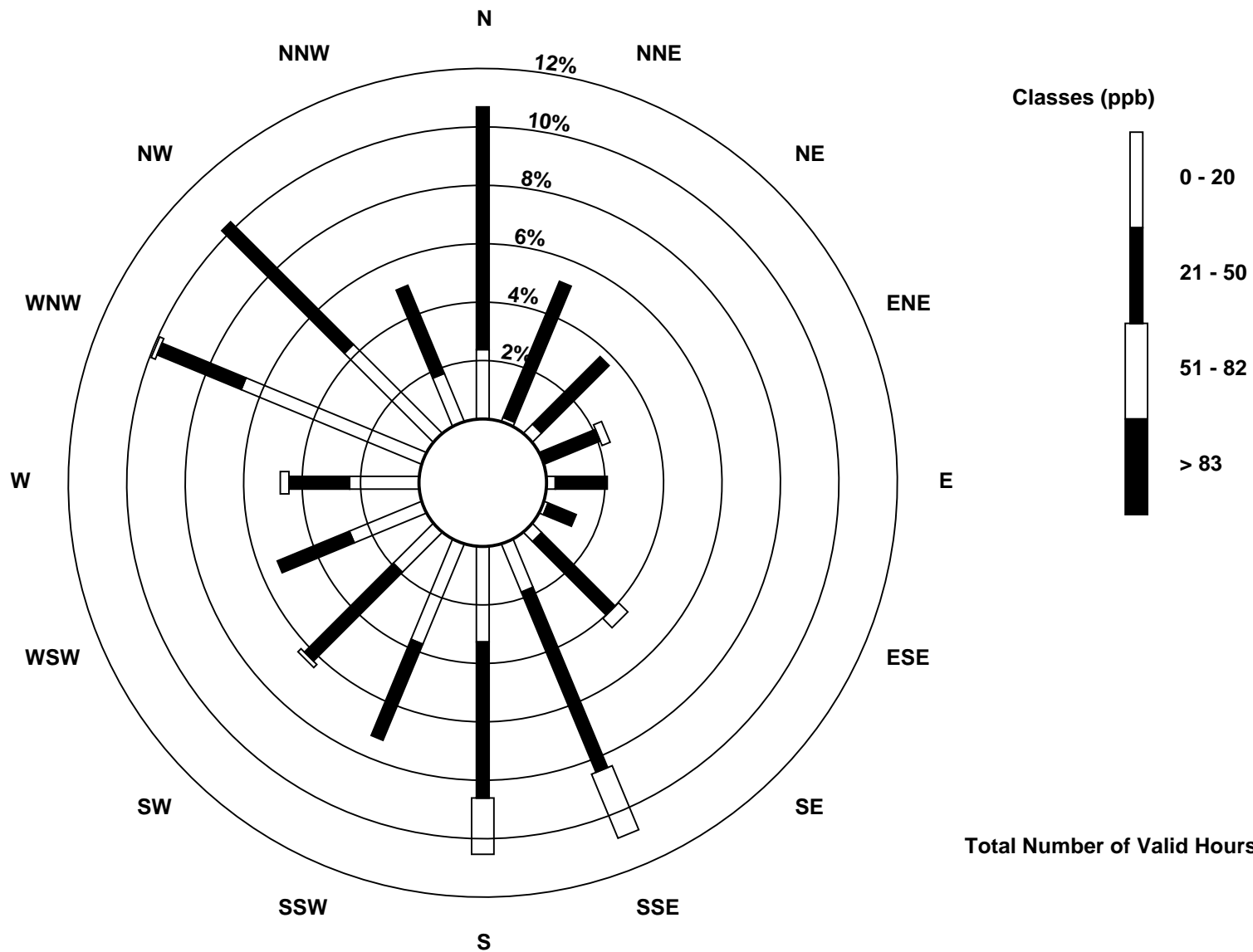
Total Number of Valid Hours: 674

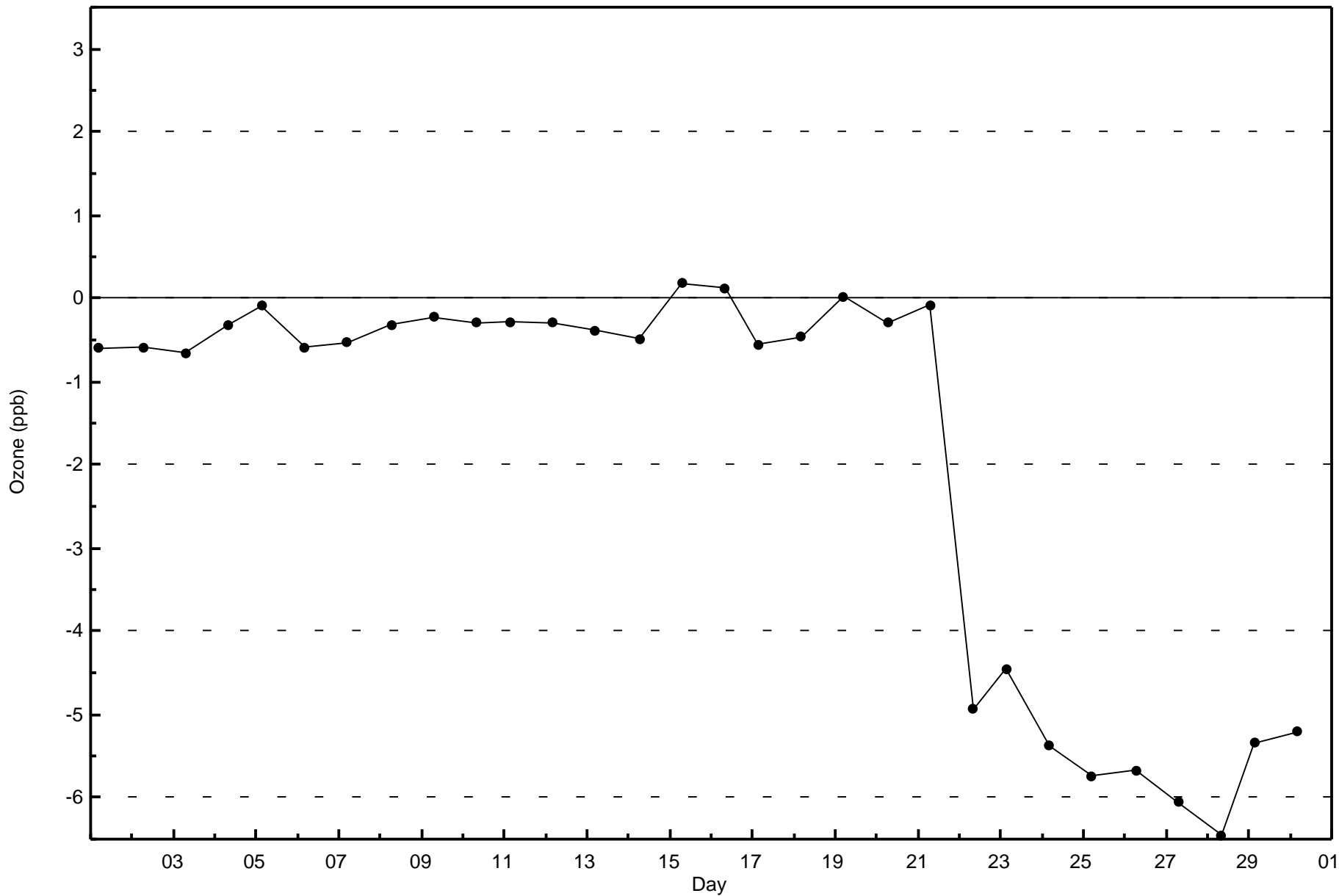
Total Number of Hours: 720

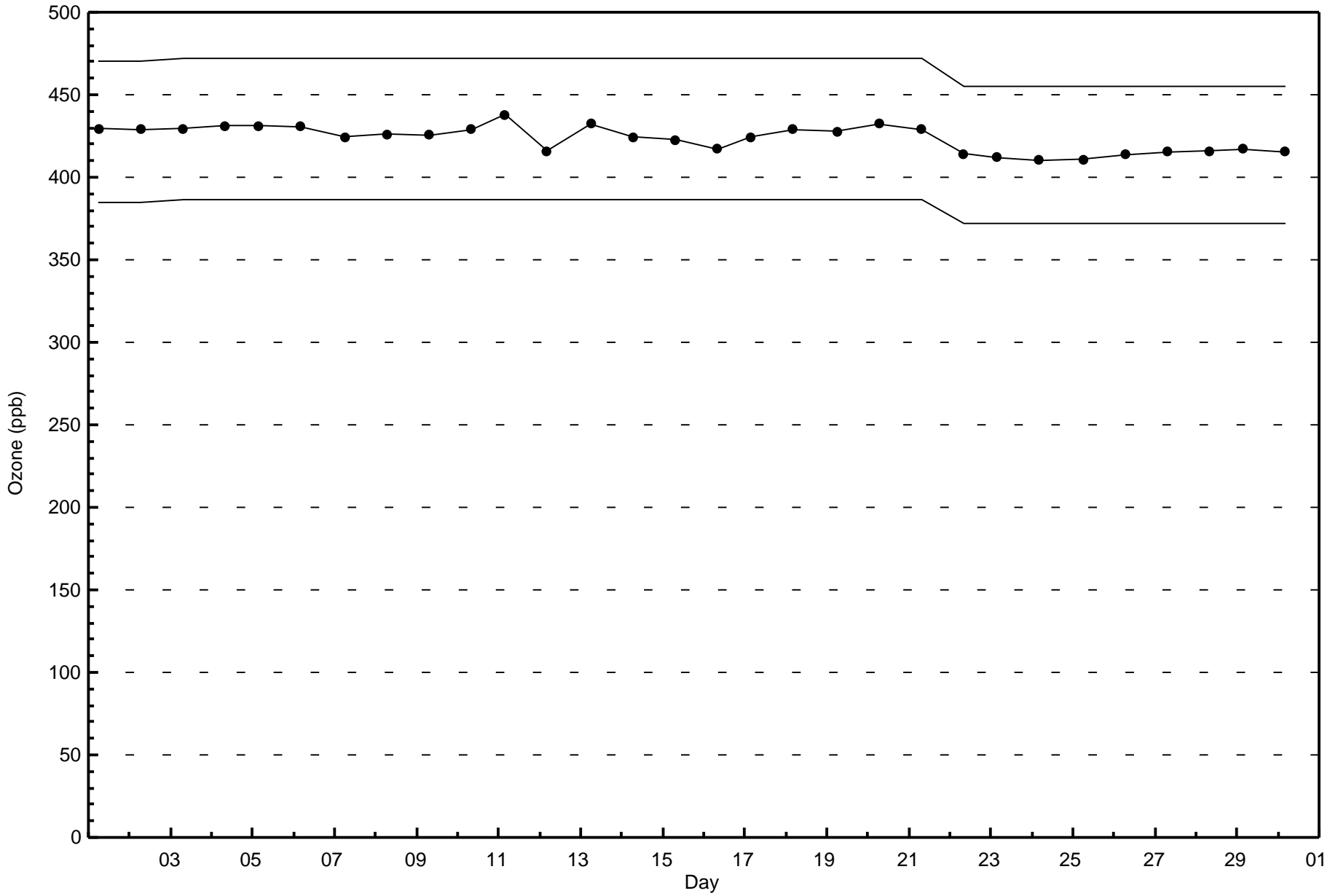


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Ozone (O₃) - ppb
Fort McKay - Bertha Ganter (AMS 1)









Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM_{2.5}) - µg/m³

Fort McKay - Bertha Ganter - June 2016

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 80.9 µg/m ³ on Jun 8 20:00 Minimum Value: 0.1 µg/m ³ on Jun 12 18:00 Maximum Diurnal Average: 10.5 µg/m ³ at hour 20 Monthly Average: 7.76 µg/m ³		Maximum Daily Average: 16.8 µg/m ³ on Jun 29 Minimum Daily Average: 1.9 µg/m ³ on Jun 12 Minimum Diurnal Average: 5.7 µg/m ³ at hour 13 Percentiles: P ₁ = 0.3 P ₁₀ = 1.5 Q ₁ = 2.9 Median = 5.7 Q ₃ = 10.5 P ₉₀ = 17.3 P ₉₉ = 28.3		Hours in Service: 720 Hours of Data: 713 Hours of Missing Data: 7 Hours of Calibration: 4 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-Jun	4.1	3.2	3.3	4.4	6.0	6.5	7.4	6.5	5.6	6.9	8.4	9.0	5.2	3.4	3.3	3.4	4.5	6.2	7.6	10.1	6.1	6.9	6.5	7.2	5.9	10.1
2-Jun	8.9	11.8	10.6	8.1	7.1	6.7	10.9	15.9	23.2	18.1	10.5	5.9	3.7	4.6	5.5	6.3	3.1	2.8	2.4	2.4	3.0	4.0	4.1	5.2	7.7	23.2
3-Jun	6.8	6.6	4.2	3.9	3.5	3.7	3.8	2.8	2.6	2.4	2.5	3.0	4.4	2.2	2.3	3.8	4.3	4.0	5.6	5.7	4.2	4.7	5.7	5.0	4.1	6.8
4-Jun	5.2	4.4	3.9	3.4	3.2	3.9	5.3	6.2	6.4	4.0	3.1	2.6	2.5	2.7	2.7	3.1	2.8	2.3	1.6	1.2	1.1	2.5	4.6	1.7	3.3	6.4
5-Jun	1.2	3.0	2.5	1.4	1.4	1.1	0.8	0.9	1.5	1.9	1.4	1.5	1.6	1.4	1.4	1.5	1.8	1.9	2.1	3.3	6.2	8.4	15.6	11.5	3.1	15.6
6-Jun	6.7	9.4	8.9	8.1	7.4	7.1	7.8	7.9	8.9	10.7	11.1	10.2	9.2	9.5	11.2	9.2	10.2	13.3	19.9	25.0	28.3	12.0	13.3	11.6	11.5	28.3
7-Jun	12.9	13.8	16.8	17.5	14.7	11.0	9.8	8.3	7.5	6.6	6.3	7.4	5.9	4.7	5.5	7.8	11.2	12.2	7.1	4.6	5.2	4.7	6.5	15.5	9.3	17.5
8-Jun	11.5	7.6	5.5	5.7	6.0	5.2	5.8	8.7	C	C	C	C	7.8	8.0	7.4	9.0	7.9	8.9	44.1	80.9	48.4	18.9	18.9	7.1	16.2	80.9
9-Jun	5.1	3.6	3.7	4.2	4.2	3.9	3.1	3.4	2.6	2.8	2.9	2.6	3.5	3.4	3.1	2.8	2.4	2.3	2.0	1.8	1.6	2.1	2.1	2.4	3.0	5.1
10-Jun	3.7	4.8	4.7	4.3	4.1	3.7	2.8	2.5	2.8	2.1	1.6	1.5	1.4	1.4	1.6	1.6	1.6	1.5	1.8	1.8	2.1	2.2	2.4	3.1	2.6	4.8
11-Jun	2.0	1.5	1.3	1.4	1.4	1.6	2.3	3.1	3.8	3.5	3.0	3.9	4.0	5.1	3.4	3.0	3.7	3.4	3.5	2.7	2.6	2.6	2.6	3.6	2.9	5.1
12-Jun	3.8	3.8	3.8	4.3	6.0	4.7	4.1	2.6	1.5	1.5	1.4	0.9	0.9	0.4	0.2	0.1	0.2	0.1	0.5	0.7	0.7	0.8	1.4	2.1	1.9	6.0
13-Jun	2.2	2.2	2.2	2.5	2.4	2.5	2.3	2.0	1.9	2.1	2.0	1.7	1.8	1.7	1.2	1.3	1.5	1.3	1.0	3.0	6.0	9.2	22.9	18.1	4.0	22.9
14-Jun	19.0	17.1	21.3	17.3	12.1	13.5	14.5	14.4	23.9	20.4	19.9	8.6	10.2	6.4	7.8	7.4	6.6	9.6	6.2	7.8	11.8	21.1	4.9	3.6	12.7	23.9
15-Jun	2.2	1.2	1.3	2.0	2.4	2.1	1.7	1.1	1.5	4.4	6.4	4.6	3.9	5.3	3.1	7.4	5.1	5.0	3.0	3.3	2.3	4.0	3.1	1.8	3.3	7.4
16-Jun	1.8	2.4	2.1	2.7	3.5	4.3	3.4	2.7	1.6	2.5	2.4	1.9	1.7	1.5	1.4	1.3	1.1	0.8	0.8	1.3	1.6	7.1	4.2	1.7	2.3	7.1
17-Jun	2.6	1.1	1.0	0.7	0.5	0.4	0.6	0.6	0.4	UO	UO	UO	0.7	1.2	1.4	1.8	14.6	7.1	5.7	7.3	5.1	2.6	1.7	1.4	2.8	14.6
18-Jun	0.8	2.8	4.2	1.6	0.2	0.3	0.6	0.6	1.5	2.6	3.0	3.1	3.1	2.9	2.8	2.8	2.9	3.1	3.5	5.1	6.1	11.6	5.6	4.3	3.1	11.6
19-Jun	3.3	3.2	3.3	4.4	4.4	4.7	4.1	3.6	4.9	4.4	3.6	4.3	4.2	4.5	4.2	4.1	4.2	3.7	4.6	6.3	8.8	5.9	5.1	4.9	4.5	8.8
20-Jun	6.5	4.7	4.4	5.8	7.3	5.6	4.6	5.1	4.7	3.3	5.4	6.7	4.2	6.1	10.5	11.1	12.7	18.7	19.8	23.3	19.4	25.1	27.9	26.0	11.2	27.9
21-Jun	23.7	27.2	24.1	21.5	17.6	22.0	22.5	20.1	14.5	13.7	8.5	7.5	7.7	8.4	8.3	9.8	10.5	9.9	10.6	14.2	13.8	17.8	19.4	23.3	15.7	27.2
22-Jun	23.7	35.0	17.4	17.1	21.1	17.2	19.4	20.2	28.6	33.3	26.5	16.3	12.8	8.5	14.2	20.8	11.9	7.2	6.1	6.8	4.5	10.9	10.9	9.5	16.7	35.0
23-Jun	5.8	6.9	7.2	8.4	9.4	10.5	10.5	15.3	21.0	16.0	12.5	13.5	12.2	11.4	12.3	7.0	6.7	6.1	8.5	8.8	9.4	10.7	12.1	10.3	10.5	21.0
24-Jun	12.2	11.7	11.2	8.6	9.4	9.3	7.3	5.1	4.3	4.8	5.3	4.0	5.0	9.3	9.5	5.5	5.2	7.0	8.1	8.6	7.7	8.5	9.7	12.5	7.9	12.5
25-Jun	12.2	11.1	5.6	5.0	6.2	7.8	7.4	5.2	3.0	2.8	3.1	4.1	6.3	7.5	6.9	8.1	8.6	8.2	9.5	14.0	11.7	14.4	11.5	10.4	7.9	14.4
26-Jun	12.0	15.2	14.8	15.4	14.1	12.6	10.1	11.5	11.8	8.7	9.1	10.0	8.4	9.0	7.0	6.6	5.9	6.6	7.2	7.4	8.0	6.6	6.6	4.5	9.6	15.4
27-Jun	2.9	3.0	3.9	5.2	5.7	5.2	3.1	1.8	1.6	1.5	1.4	1.4	1.4	3.3	13.7	5.9	4.1	4.7	10.5	10.8	9.9	10.5	18.9	22.0	6.4	22.0
28-Jun	20.1	16.0	16.3	17.5	15.6	12.9	9.8	8.7	10.0	8.8	5.4	8.2	7.9	8.2	13.5	11.7	6.7	6.4	8.5	12.3	6.1	6.5	10.4	11.1	10.8	20.1
29-Jun	11.5	9.5	8.7	8.7	8.6	8.9	17.4	24.6	29.5	22.6	15.2	12.0	18.6	17.3	16.1	17.1	13.7	13.7	20.8	21.9	20.6	24.1	19.8	21.5	16.8	29.5
30-Jun	20.2	18.3	14.8	13.7	12.7	16.8	13.8	18.8	17.6	25.0	17.4	8.6	10.4	18.2	17.2	14.8	14.8	12.8	14.3	11.9	12.0	13.7	12.9	28.8	15.8	28.8
																								Diurnal Average		
																								Diurnal Maximum		
8.5 8.7 7.8 7.5 7.3 7.2 7.2 7.7 8.6 8.5 7.1 5.9 5.7 5.9 6.6 6.5 6.4 6.4 8.2 10.5 9.1 9.3 9.7 9.7																								Diurnal Average		
23.7 35.0 24.1 21.5 21.1 22.0 22.5 24.6 29.5 33.3 26.5 16.3 18.6 18.2 17.2 20.8 14.8 18.7 44.1 80.9 48.4 25.1 27.9 28.8																								Diurnal Maximum		
C - Calibration UO - Unstable Operation																										
Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																										

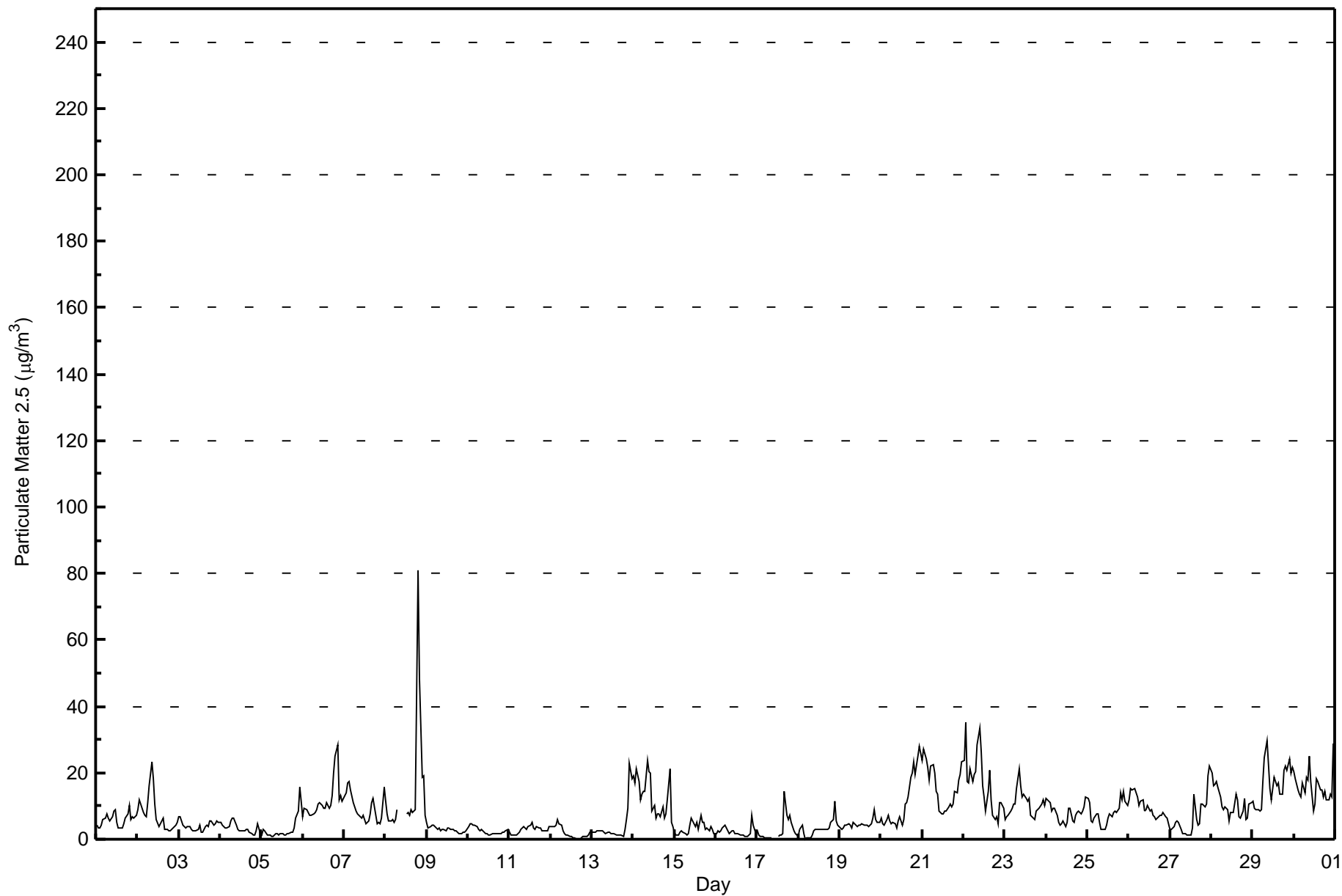


Wood Buffalo Environmental Association

Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$

Fort McKay - Bertha Ganter - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort McKay - Bertha Ganter - June 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	320	44.88	44.88
6 - 15	277	38.85	83.73
16 - 25	76	10.66	94.39
26 - 80	12	1.68	96.07
> 81.0	1	0.14	96.21

Total Number of Valid Hours: 713

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort McKay - Bertha Ganter - June 2016

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	36	17	7	7	6	3	12	25	30	26	25	20	20	29	38	19	320
6 - 15	35	11	13	6	8	6	11	38	35	13	9	11	9	28	27	17	277
16 - 25	3	4	5	4	1	0	5	10	12	9	7	4	4	4	3	1	76
26 - 80	0	0	1	0	0	0	3	2	3	1	0	1	0	1	0	0	12
> 81.0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Totals	74	32	26	17	15	9	31	75	81	49	41	36	33	62	68	37	686

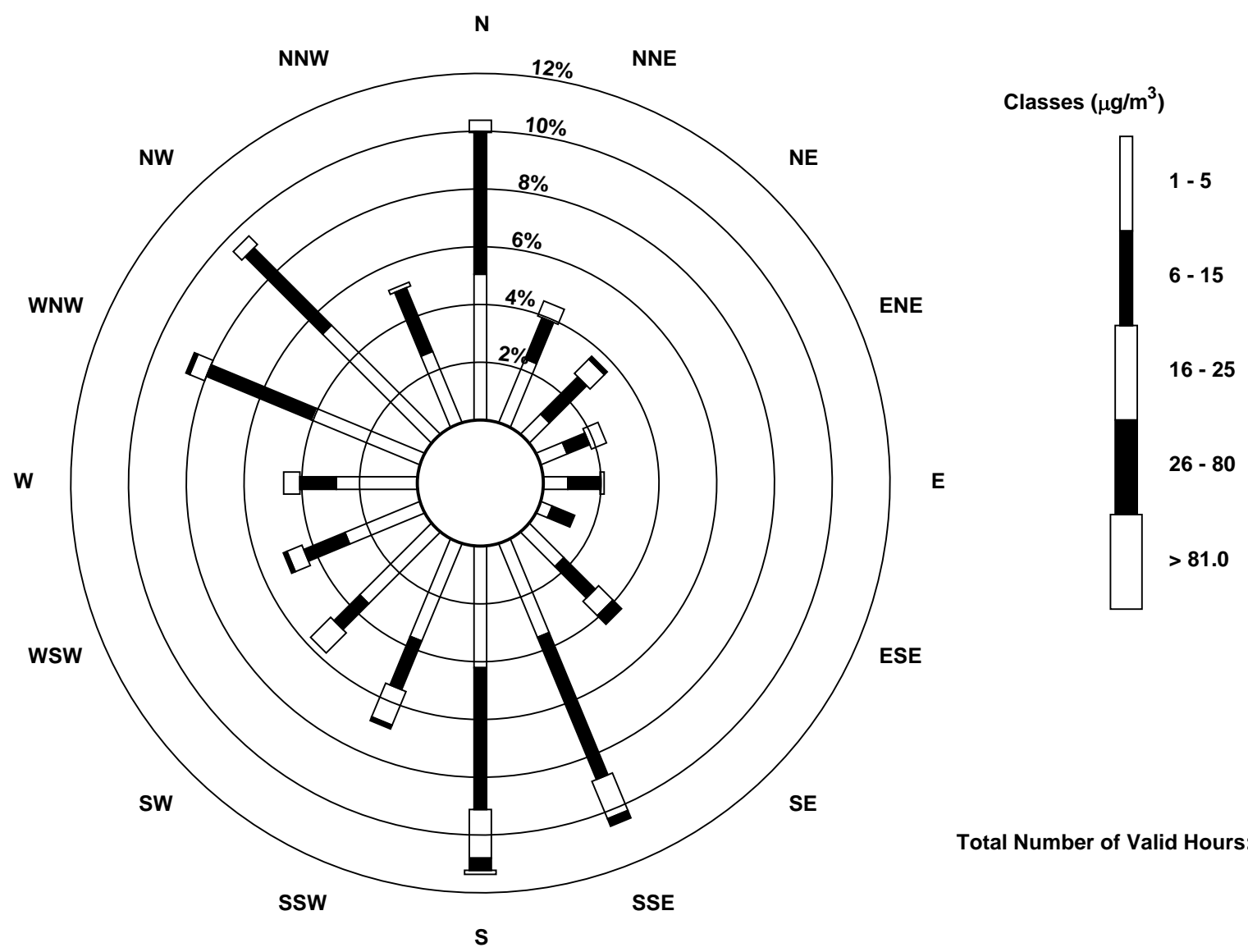
Total Number of Valid Hours: 713

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort McKay - Bertha Ganter (AMS 1)





Number of Exceedences (AAAQO): 1-hr: 0	Hours in Service: 720
Maximum Value: 0 ppb on Jun 1 01:00	Maximum Daily Average: 0.0 ppb on Jun 3
Minimum Value: 0 ppb on Jun 1 01:00	Hours of Data: 604
Maximum Diurnal Average: 0.0 ppb at hour 1	Hours of Missing Data: 116
Monthly Average: 0.0 ppb	Hours of Calibration: 45
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 0	Percent Operational Time: 90.1

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-Jun	0	0	0	0	Z	RE	RE	RE	C	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	--	0
2-Jun	0	0	0	0	0	Z	RE	RE	RE	C	C	C	C	C	C	C	C	0	0	0	0	0	0	0	--	0
3-Jun	0	0	0	0	0	0	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
4-Jun	0	0	0	0	0	0	0	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
5-Jun	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
6-Jun	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
7-Jun	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
8-Jun	0	0	0	0	0	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
9-Jun	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
10-Jun	0	0	0	0	0	0	0	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
11-Jun	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
12-Jun	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
13-Jun	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
14-Jun	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
15-Jun	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
16-Jun	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
17-Jun	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
18-Jun	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
19-Jun	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
20-Jun	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
21-Jun	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
22-Jun	0	0	0	0	0	0	0	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
23-Jun	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
24-Jun	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
25-Jun	0	0	0	0	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
26-Jun	0	0	0	0	0	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
27-Jun	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
28-Jun	0	0	0	0	0	0	0	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
29-Jun	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
30-Jun	0	0	0	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0

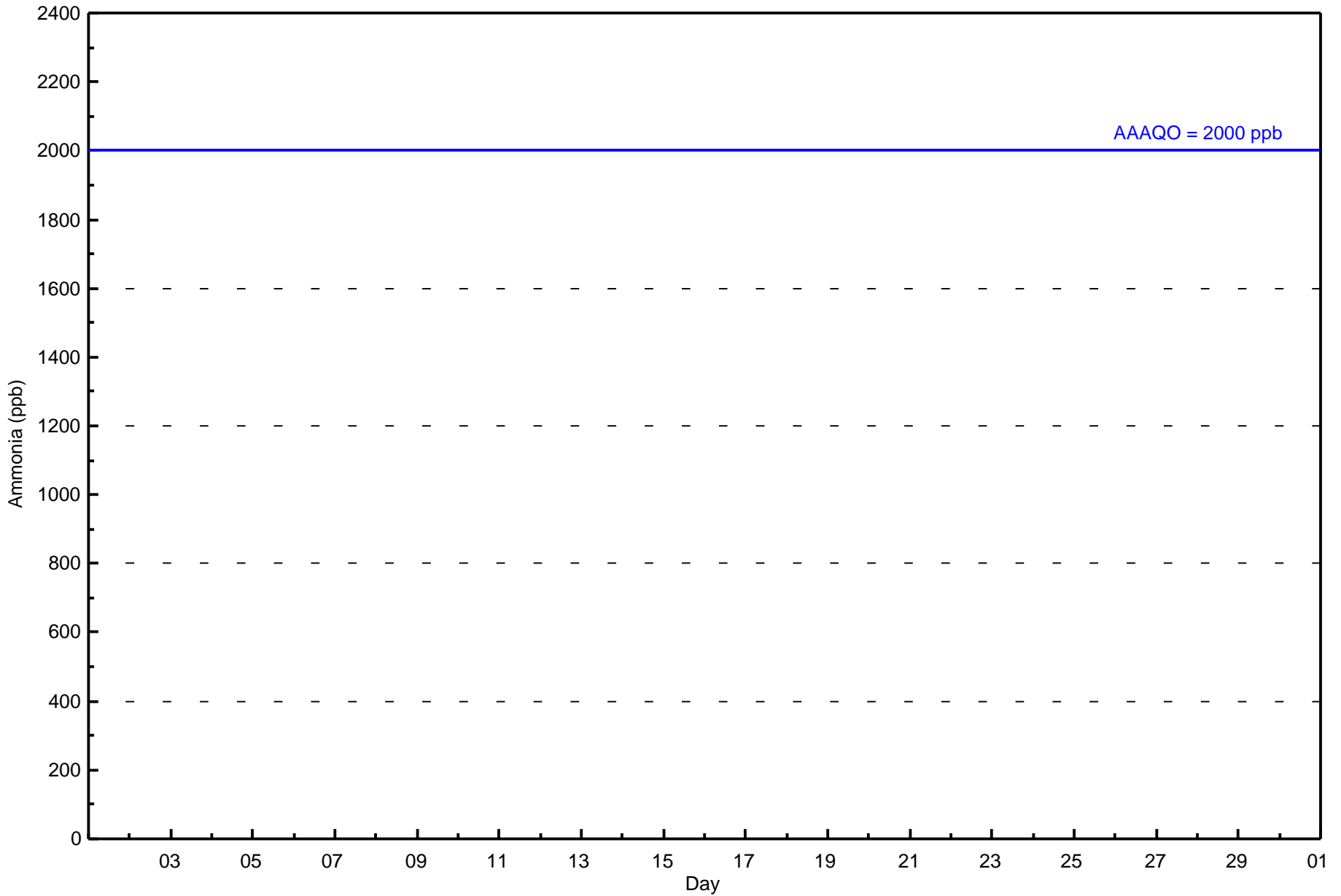
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Diurnal Average
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Diurnal Maximum

Z - zerspan C - Calibration PF - Power Failure RE - Recovery
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 2000 ppb



Wood Buffalo Environmental Association
Hourly Averages

Ammonia (NH₃) - ppb
Fort McKay - Bertha Ganter - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ammonia (NH₃) - ppb
Fort McKay - Bertha Ganter - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 5	604	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: 604

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Ammonia (NH₃) - ppb
Fort McKay - Bertha Ganter - June 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	64	31	25	16	12	7	26	65	63	41	39	33	29	62	59	32	604
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
Totals	64	31	25	16	12	7	26	65	63	41	39	33	29	62	59	32	604

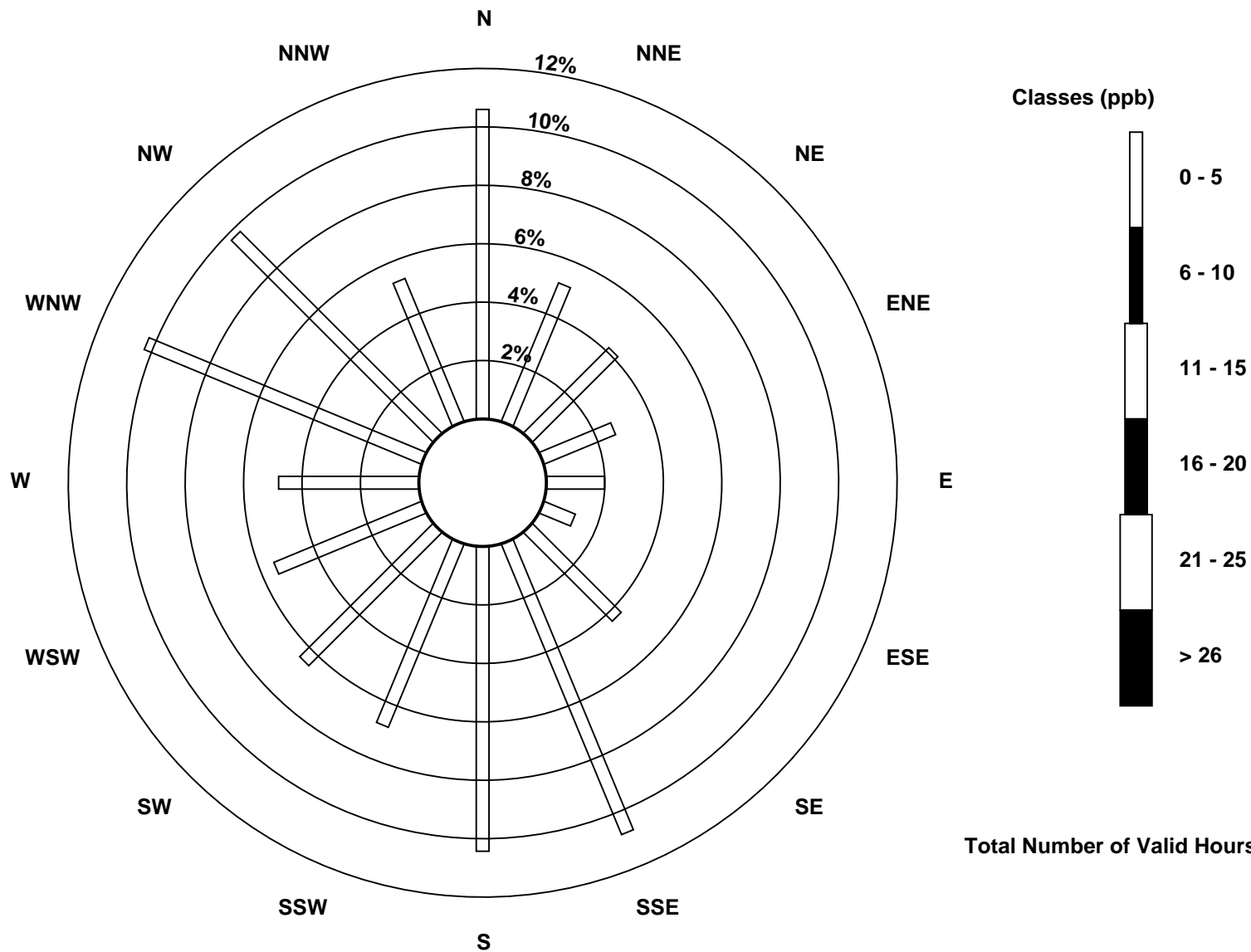
Total Number of Valid Hours: 604

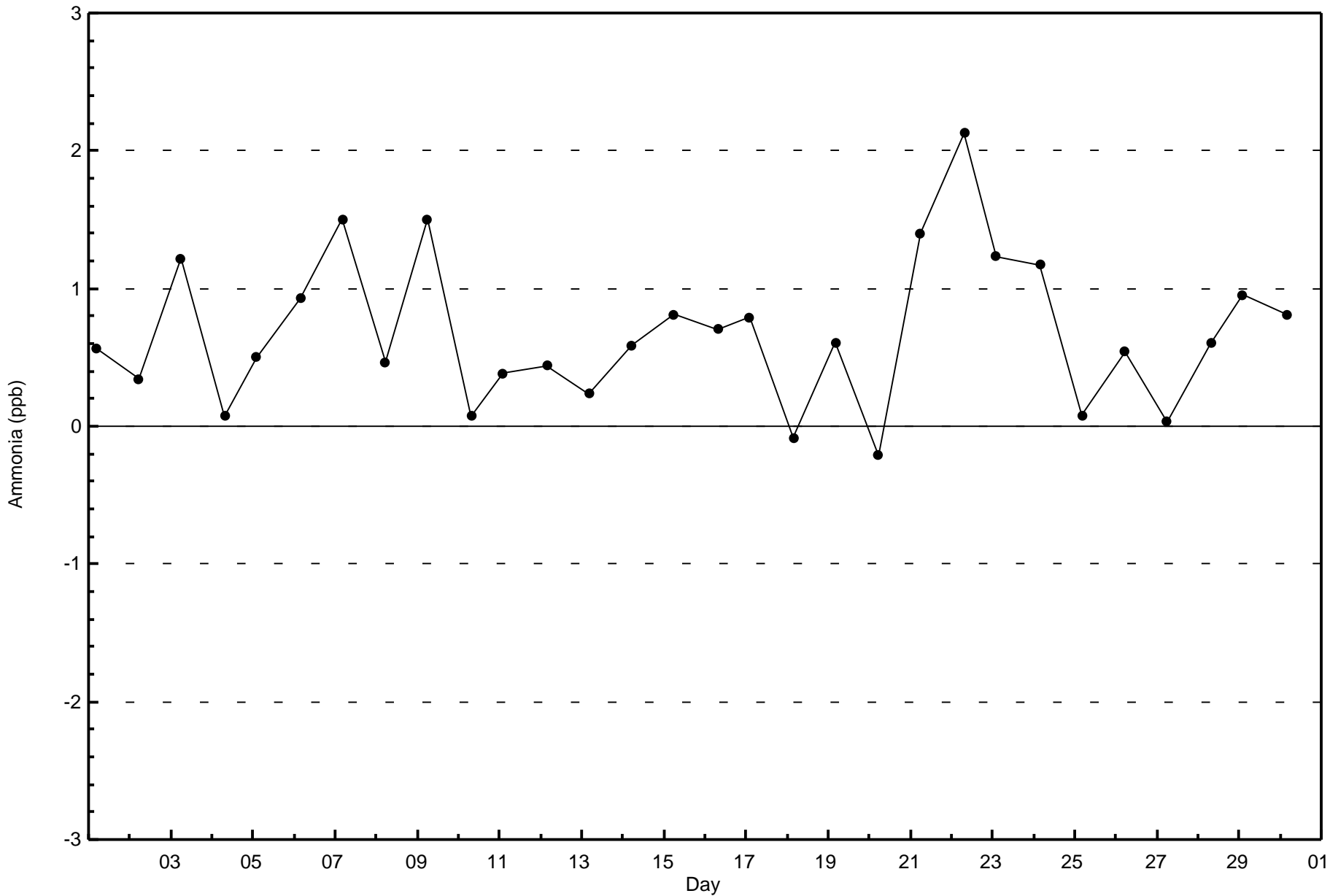
Total Number of Hours: 720

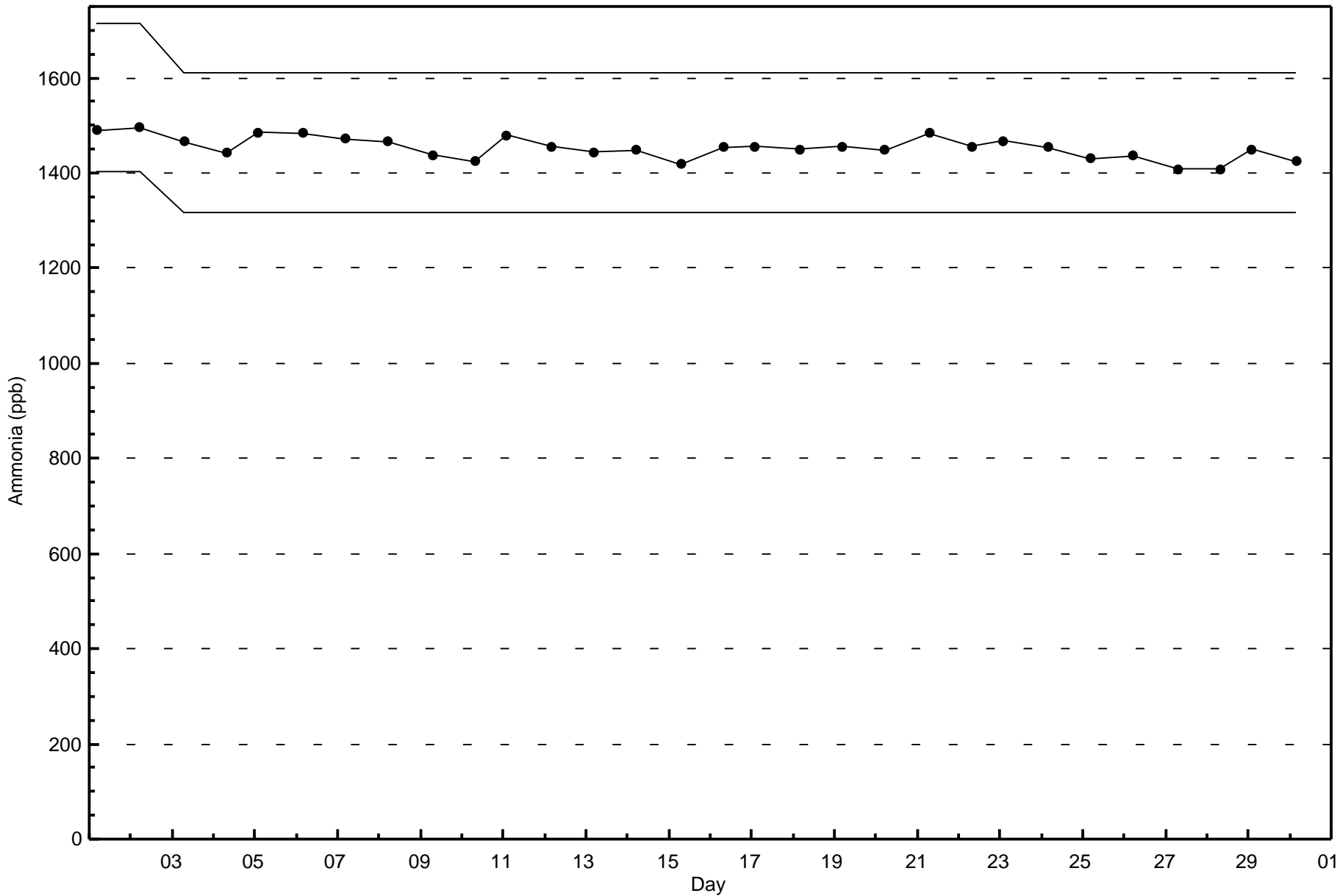


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Ammonia (NH₃) - ppb
Fort McKay - Bertha Ganter (AMS 1)









Wood Buffalo Environmental Association
Summary of Hour Averages

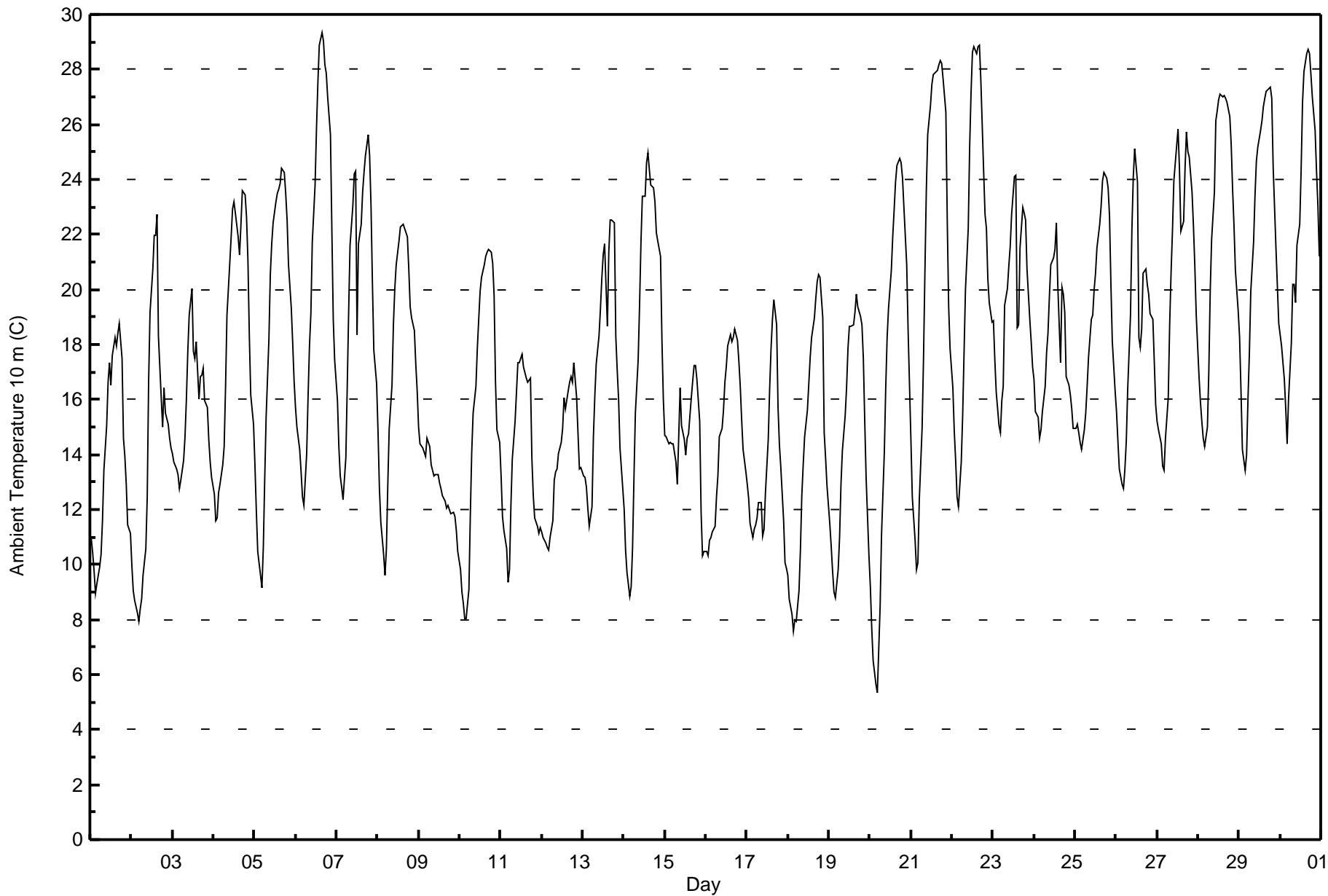
Ambient Temperature 10 m (AT 10m) - C
Fort McKay - Bertha Ganter - June 2016

Maximum Value: 29.3 C on Jun 6 16:00		Maximum Daily Average: 22.3 C on Jun 30		Hours in Service: 720																																												
Minimum Value: 5.3 C on Jun 20 05:00		Minimum Daily Average: 13.0 C on Jun 9		Hours of Data: 720																																												
Maximum Diurnal Average: 22.0 C at hour 18		Minimum Diurnal Average: 11.4 C at hour 5		Hours of Missing Data: 0																																												
Monthly Average: 17.41 C		Percentiles: P ₁ = 7.9 P ₁₀ = 11.0 Q ₁ = 13.5 Median = 16.8 Q ₃ = 21.3 P ₉₀ = 24.4 P ₉₉ = 28.7		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-Jun	10.9	10.4	9.8	8.9	9.3	9.9	10.4	11.6	13.4	15.1	16.6	17.3	16.5	17.6	18.3	17.9	18.4	18.7	17.5	14.6	13.9	12.9	11.4	11.1	13.9	18.7																						
2-Jun	9.9	9.0	8.7	8.2	7.9	8.4	8.8	9.6	10.6	12.5	16.7	19.2	20.7	22.0	22.0	22.7	18.3	16.0	15.0	16.4	15.5	15.1	14.6	14.2	14.3	22.7																						
3-Jun	14.0	13.8	13.5	13.3	12.8	13.1	13.8	14.7	16.0	17.7	19.1	20.0	17.8	17.5	18.1	16.0	16.9	16.9	17.1	16.0	15.7	14.5	13.7	13.2	15.6	20.0																						
4-Jun	12.6	11.6	11.7	12.6	12.9	13.6	14.3	16.5	19.1	20.9	21.9	22.9	23.2	22.8	21.9	21.2	22.4	23.6	23.4	22.6	21.0	18.3	16.2	15.1	18.4	23.6																						
5-Jun	13.6	12.0	10.5	9.6	9.2	10.6	13.1	15.4	18.2	20.5	21.6	22.4	23.2	23.5	23.7	23.9	24.4	24.2	23.5	22.5	20.9	19.3	18.0	16.7	18.4	24.4																						
6-Jun	15.7	15.0	14.2	13.4	12.4	12.2	14.0	16.1	18.0	19.1	21.7	23.8	25.8	27.5	28.9	29.3	29.0	28.1	27.9	27.0	25.7	22.2	18.9	17.4	21.0	29.3																						
7-Jun	15.9	14.3	13.2	12.8	12.4	13.9	16.5	19.2	21.6	23.1	24.2	24.3	18.4	21.6	22.4	23.5	24.2	24.9	25.6	24.9	23.0	20.2	17.8	16.6	19.8	25.6																						
8-Jun	14.9	12.8	11.5	10.4	9.6	10.6	12.9	15.0	16.5	18.7	20.1	20.9	21.8	22.3	22.3	22.4	22.2	21.9	20.8	19.4	18.9	18.5	17.3	16.3	17.4	22.4																						
9-Jun	15.0	14.4	14.2	14.1	13.9	14.6	14.3	13.6	13.4	13.2	13.3	13.3	13.0	12.8	12.5	12.3	12.1	12.1	12.0	11.9	11.9	11.7	11.3	10.5	13.0	15.0																						
10-Jun	9.8	9.0	8.6	8.0	8.0	9.1	11.8	14.1	15.5	16.5	17.9	18.9	19.9	20.4	20.9	21.2	21.3	21.5	21.4	21.0	19.8	16.6	14.9	14.4	15.9	21.5																						
11-Jun	13.2	11.7	11.2	10.6	9.4	9.8	12.1	13.8	15.2	16.3	17.3	17.3	17.6	17.2	17.0	16.8	16.6	16.8	13.9	12.5	11.7	11.4	11.2	11.3	13.8	17.6																						
12-Jun	11.2	11.0	10.8	10.6	10.5	11.0	11.6	13.1	13.4	13.5	14.1	14.4	15.0	16.1	15.7	16.3	16.6	16.8	16.6	17.4	16.0	14.7	13.5	13.5	13.9	17.4																						
13-Jun	13.2	13.2	12.8	12.1	11.4	12.1	14.6	16.1	17.3	18.3	19.3	20.4	21.2	21.6	18.7	21.4	22.5	22.5	22.4	18.3	17.1	16.0	14.2	12.8	17.1	22.5																						
14-Jun	12.0	10.5	9.7	8.9	9.2	10.6	13.2	15.5	17.5	19.4	21.7	23.4	23.4	24.6	25.0	24.4	23.8	23.7	23.2	22.1	21.8	21.2	18.2	16.0	18.3	25.0																						
15-Jun	14.7	14.7	14.4	14.4	14.4	14.4	13.7	12.9	14.6	16.4	15.1	14.5	14.0	14.6	14.8	16.1	16.7	17.2	17.2	16.7	15.2	11.9	10.3	10.5	14.6	17.2																						
16-Jun	10.5	10.3	10.9	11.0	11.2	11.4	12.5	13.2	14.6	15.0	15.6	16.6	17.2	18.0	18.4	18.1	18.3	18.6	18.2	17.4	16.5	15.3	14.2	13.4	14.8	18.6																						
17-Jun	12.9	12.4	11.5	11.0	11.3	11.5	11.7	12.2	12.3	11.0	11.3	12.6	14.5	16.4	17.8	18.9	19.6	18.7	15.7	14.3	13.5	11.6	10.0	9.9	13.4	19.6																						
18-Jun	9.6	8.7	8.2	7.6	8.0	7.9	9.0	10.5	12.5	13.6	14.7	15.6	16.6	17.6	18.3	19.0	19.7	20.3	20.6	20.4	19.0	14.8	13.9	12.8	14.1	20.6																						
19-Jun	11.5	10.7	9.7	9.0	8.8	9.8	11.0	12.9	14.2	15.4	16.4	17.9	18.7	18.7	18.7	19.2	19.8	19.4	19.0	18.7	17.5	15.2	13.1	10.3	14.8	19.8																						
20-Jun	9.2	7.7	6.5	5.7	5.3	6.9	8.5	11.1	14.1	16.4	18.3	19.3	20.7	21.9	22.9	23.9	24.5	24.8	24.6	24.1	23.0	20.9	18.5	16.5	16.5	24.8																						
21-Jun	14.6	12.5	10.9	9.8	10.1	12.3	15.0	17.4	20.6	23.5	25.6	26.7	27.4	27.8	27.9	27.9	28.2	28.3	28.2	27.7	26.4	22.5	19.4	17.8	21.2	28.3																						
22-Jun	16.4	14.9	13.8	12.4	12.1	13.7	15.4	17.7	20.0	22.2	25.2	27.2	28.6	28.8	28.6	28.8	28.9	27.6	24.3	22.7	22.2	20.4	19.5	18.8	21.3	28.9																						
23-Jun	18.9	17.4	16.3	15.0	14.8	16.0	16.5	19.4	20.0	20.8	21.6	22.7	24.1	24.2	18.6	18.7	21.5	23.0	22.8	22.5	20.7	18.9	18.1	17.2	19.6	24.2																						
24-Jun	16.7	15.6	15.3	14.6	14.9	15.6	16.5	17.7	18.4	19.7	20.9	21.1	21.5	22.4	20.2	17.3	20.1	19.8	19.2	16.8	16.5	16.2	15.6	15.0	17.8	22.4																						
25-Jun	14.9	15.1	14.8	14.4	14.2	14.9	15.5	16.5	17.5	18.9	19.1	20.0	20.6	21.5	22.3	23.0	24.0	24.3	24.0	23.7	22.7	20.2	18.1	16.3	19.0	24.3																						
26-Jun	15.5	14.5	13.5	12.9	12.8	13.5	14.5	16.4	19.1	22.2	24.1	25.1	23.9	18.3	17.9	18.6	20.6	20.7	20.2	19.8	19.1	18.9	17.4	15.8	18.1	25.1																						
27-Jun	15.2	14.9	14.4	13.6	13.4	14.6	16.1	18.7	20.6	22.1	23.9	25.2	25.8	24.4	22.1	22.5	24.4	25.7	25.0	24.8	23.5	22.3	20.8	19.1	20.6	25.8																						
28-Jun	16.8	15.9	15.2	14.6	14.3	15.0	17.0	19.9	21.8	23.6	26.1	26.5	26.9	27.1	27.0	27.0	26.9	26.8	26.3	25.3	23.7	22.3	20.7	19.2	21.9	27.1																						
29-Jun	18.3	16.3	14.2	13.4	14.0	16.0	17.7	19.9	21.7	23.4	24.7	25.2	25.8	26.1	26.6	26.9	27.2	27.3	27.4	27.0	24.5	21.5	20.1	18.8	21.8	27.4																						
30-Jun	18.4	17.9	16.8	15.7	14.4	16.0	18.0	20.2	20.2	19.5	21.6	22.4	24.4	26.8	27.9	28.6	28.7	28.6	27.8	27.0	25.8	24.3	23.0	21.2	22.3	28.7																						
																								13.9	12.9	12.2	11.6	11.4	12.3	13.7	15.4	16.9	18.3	19.7	20.6	20.9	21.4	21.2	21.5	21.9	22.0	21.4	20.5	19.4	17.7	16.1	15.1	Diurnal Average
																								18.9	17.9	16.8	15.7	14.9	16.0	18.0	20.2	21.8	23.6	26.1	27.2	28.6	28.8	28.9	29.3	29.0	28.6	28.2	27.7	26.4	24.3	23.0	21.2	Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 10 m (AT 10m) - C
Fort McKay - Bertha Ganter - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 10 m (AT 10m) - C
Fort McKay - Bertha Ganter - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	46	6.39	6.39
10 - 20	448	62.22	68.61
> 20	226	31.39	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature 2m (AT 2m) - C

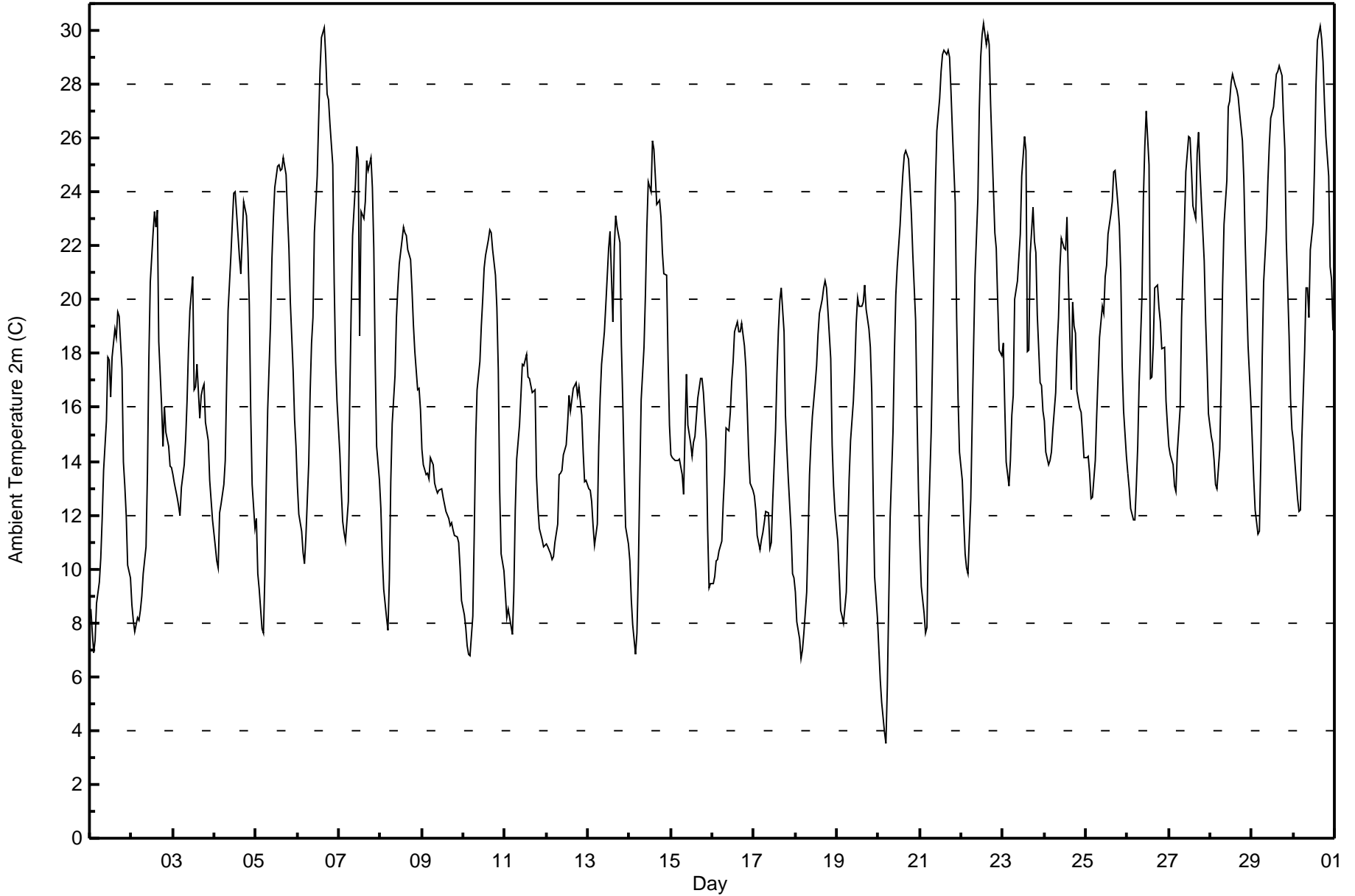
Fort McKay - Bertha Ganter - June 2016

Maximum Value: 30.2 C on Jun 22 14:00 Maximum Daily Average: 21.5 C on Jun 28																						Hours in Service: 720				
Minimum Value: 3.5 C on Jun 20 05:00 Minimum Daily Average: 12.4 C on Jun 9																						Hours of Data: 720				
Maximum Diurnal Average: 22.4 C at hour 17 Minimum Diurnal Average: 10.3 C at hour 4																						Hours of Missing Data: 0				
Monthly Average: 17.08 C Percentiles: P₁ = 6.8 P₁₀ = 9.8 Q₁ = 12.9 Median = 16.6 Q₃ = 21.4 P₉₀ = 25.0 P₉₉ = 29.6																						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-Jun	8.5	7.7	6.9	7.4	8.7	9.5	10.4	11.9	13.7	15.5	17.9	17.7	16.4	17.9	18.9	18.6	19.6	19.4	17.4	14.0	13.1	12.0	10.1	9.6	13.4	19.6
2-Jun	8.6	8.1	7.7	8.2	8.1	8.5	9.0	9.8	10.8	13.5	17.8	20.7	22.5	23.3	22.7	23.3	18.5	16.1	14.6	16.0	15.1	14.6	13.8	13.8	14.4	23.3
3-Jun	13.5	13.2	12.7	12.3	12.0	13.0	13.8	14.8	16.2	18.2	19.6	20.9	16.7	16.7	17.6	15.6	16.5	16.7	16.9	15.4	14.8	13.3	12.6	11.8	15.2	20.9
4-Jun	10.8	10.3	10.0	12.1	12.4	13.1	14.0	16.9	19.6	21.6	22.9	24.0	24.0	23.2	21.6	21.0	22.3	23.7	23.1	21.9	19.8	15.9	13.1	11.5	17.9	24.0
5-Jun	11.9	9.8	9.3	7.8	7.6	9.8	13.1	15.9	19.1	21.6	23.0	24.2	25.0	25.0	24.8	24.8	25.3	24.6	23.2	21.9	19.9	17.3	15.6	14.5	18.1	25.3
6-Jun	13.1	12.0	11.4	10.6	10.2	11.2	13.9	16.6	18.4	19.3	22.5	24.6	26.7	28.5	29.7	30.1	29.0	27.6	27.4	26.5	25.0	20.7	17.7	16.2	20.4	30.1
7-Jun	14.3	12.9	11.8	11.3	11.0	12.5	16.3	19.6	22.4	24.3	25.7	25.2	18.7	23.3	23.0	23.6	25.2	24.8	25.3	24.2	21.9	17.7	14.6	13.3	19.3	25.7
8-Jun	12.2	10.4	9.2	8.2	7.7	9.6	13.3	15.4	17.2	19.3	20.4	21.3	22.2	22.7	22.5	22.4	21.9	21.5	20.4	19.1	18.1	16.6	16.7	15.9	16.8	22.7
9-Jun	14.4	13.9	13.5	13.5	13.3	14.2	13.9	13.2	13.0	12.8	12.9	13.0	12.7	12.4	12.1	11.9	11.6	11.7	11.4	11.3	11.2	11.0	10.0	8.8	12.4	14.4
10-Jun	8.3	7.8	7.1	6.9	6.8	8.3	11.3	14.8	16.6	17.7	19.0	20.0	21.2	21.6	22.2	22.6	22.5	21.9	20.9	19.7	17.4	12.9	10.6	10.0	15.3	22.6
11-Jun	9.1	8.2	8.5	7.9	7.6	9.2	12.2	14.1	15.3	16.5	17.6	17.5	18.0	17.1	17.1	16.8	16.6	16.6	13.4	12.3	11.5	11.1	10.8	10.9	13.2	18.0
12-Jun	10.9	10.8	10.6	10.3	10.5	11.0	11.6	13.5	13.6	13.7	14.2	14.6	15.4	16.5	15.9	16.7	16.8	16.9	16.5	16.8	15.7	14.4	13.3	13.3	13.9	16.9
13-Jun	13.0	12.9	12.5	11.6	10.9	11.7	14.6	16.4	17.6	18.8	19.8	20.9	21.9	22.5	19.2	22.0	23.1	22.7	22.1	18.3	16.2	13.7	11.6	10.9	16.9	23.1
14-Jun	10.3	8.9	8.0	6.8	7.6	10.0	13.3	16.3	18.2	20.2	22.7	24.4	24.0	25.9	25.6	24.6	23.5	23.7	23.0	21.7	21.0	20.9	17.8	15.3	18.1	25.9
15-Jun	14.2	14.1	14.0	14.0	14.0	14.1	13.5	12.8	15.1	17.3	15.3	14.7	14.2	14.7	14.9	16.4	16.7	17.1	17.1	16.6	14.8	11.4	9.3	9.5	14.4	17.3
16-Jun	9.5	9.7	10.3	10.4	10.7	11.0	12.4	13.5	15.2	15.1	15.8	17.0	17.7	18.8	19.2	18.8	18.8	19.1	18.3	17.5	15.9	14.2	13.2	12.9	14.8	19.2
17-Jun	12.7	12.2	11.3	10.7	11.1	11.4	11.7	12.1	12.1	10.8	11.0	12.5	15.2	17.3	18.9	20.0	20.4	18.8	15.7	14.5	13.4	11.4	9.9	9.7	13.5	20.4
18-Jun	9.1	8.1	7.4	6.7	7.0	7.6	9.1	11.3	13.5	14.7	15.7	16.9	17.6	18.7	19.5	20.0	20.4	20.7	20.4	19.6	17.8	14.6	13.1	12.1	14.2	20.7
19-Jun	11.0	9.7	8.4	8.3	8.0	9.2	11.3	13.4	14.8	16.3	17.5	19.1	20.1	19.8	19.7	19.9	20.5	19.6	18.9	18.2	16.6	12.8	9.7	8.2	14.6	20.5
20-Jun	7.1	5.9	5.1	3.9	3.5	5.6	8.8	11.9	15.1	18.0	20.2	21.2	22.7	23.8	24.7	25.4	25.6	25.2	24.3	23.2	21.7	19.2	15.8	12.9	16.3	25.6
21-Jun	10.9	9.3	8.4	7.6	7.8	11.5	15.1	18.0	21.2	24.2	26.3	27.5	28.5	29.1	29.2	29.1	29.3	29.0	27.8	26.3	23.6	19.3	16.4	14.4	20.4	29.3
22-Jun	13.3	11.8	10.6	10.1	9.8	12.6	15.6	18.3	20.9	23.8	27.1	29.0	29.8	30.2	29.5	29.9	29.5	27.3	24.1	22.5	21.9	19.9	18.1	17.9	21.0	30.2
23-Jun	18.4	16.1	14.0	13.1	14.0	15.7	16.4	20.0	20.7	21.6	22.4	24.6	26.1	25.5	18.1	18.1	21.7	23.4	22.2	21.8	19.4	16.9	16.8	15.9	19.3	26.1
24-Jun	15.5	14.3	13.9	14.0	14.3	15.2	16.6	18.2	19.3	21.2	22.3	21.9	21.8	23.1	20.7	16.6	19.9	19.0	18.7	16.6	16.0	15.8	15.0	14.1	17.7	23.1
25-Jun	14.1	14.2	13.6	12.6	12.7	14.0	15.7	17.2	18.6	19.8	19.5	20.9	21.3	22.4	23.2	23.7	24.7	24.8	23.5	22.7	21.0	17.5	15.9	14.2	18.7	24.8
26-Jun	13.6	13.0	12.2	11.8	11.8	13.1	14.6	16.9	20.1	23.8	25.7	27.0	25.0	17.1	17.1	18.3	20.4	20.5	19.7	19.2	18.2	18.2	16.2	15.4	17.9	27.0
27-Jun	14.5	14.3	13.8	13.1	12.9	14.3	16.0	19.3	21.1	22.8	24.7	26.1	26.0	24.8	23.5	23.0	25.4	26.2	24.8	23.6	21.4	19.2	17.6	15.8	20.2	26.2
28-Jun	14.9	14.6	14.0	13.1	13.0	14.5	17.1	20.5	22.8	24.4	27.2	27.4	28.1	28.4	28.0	27.8	27.5	27.0	25.9	24.5	22.1	20.1	18.3	16.1	21.5	28.4
29-Jun	14.7	13.3	12.2	11.3	11.4	14.0	17.9	20.6	22.7	24.4	25.8	26.7	27.2	27.8	28.4	28.5	28.7	28.3	26.8	25.6	22.2	18.7	16.4	15.2	21.2	28.7
30-Jun	14.8	14.0	12.6	12.1	12.2	14.8	18.2	20.4	20.4	19.4	21.8	22.9	25.0	28.0	29.6	30.1	29.7	28.9	27.3	26.1	24.6	21.2	20.7	18.8	21.4	30.1
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 2m (AT 2m) - C
Fort McKay - Bertha Ganter - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C
Fort McKay - Bertha Ganter - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	75	10.42	10.42
10 - 20	421	58.47	68.89
> 20	224	31.11	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



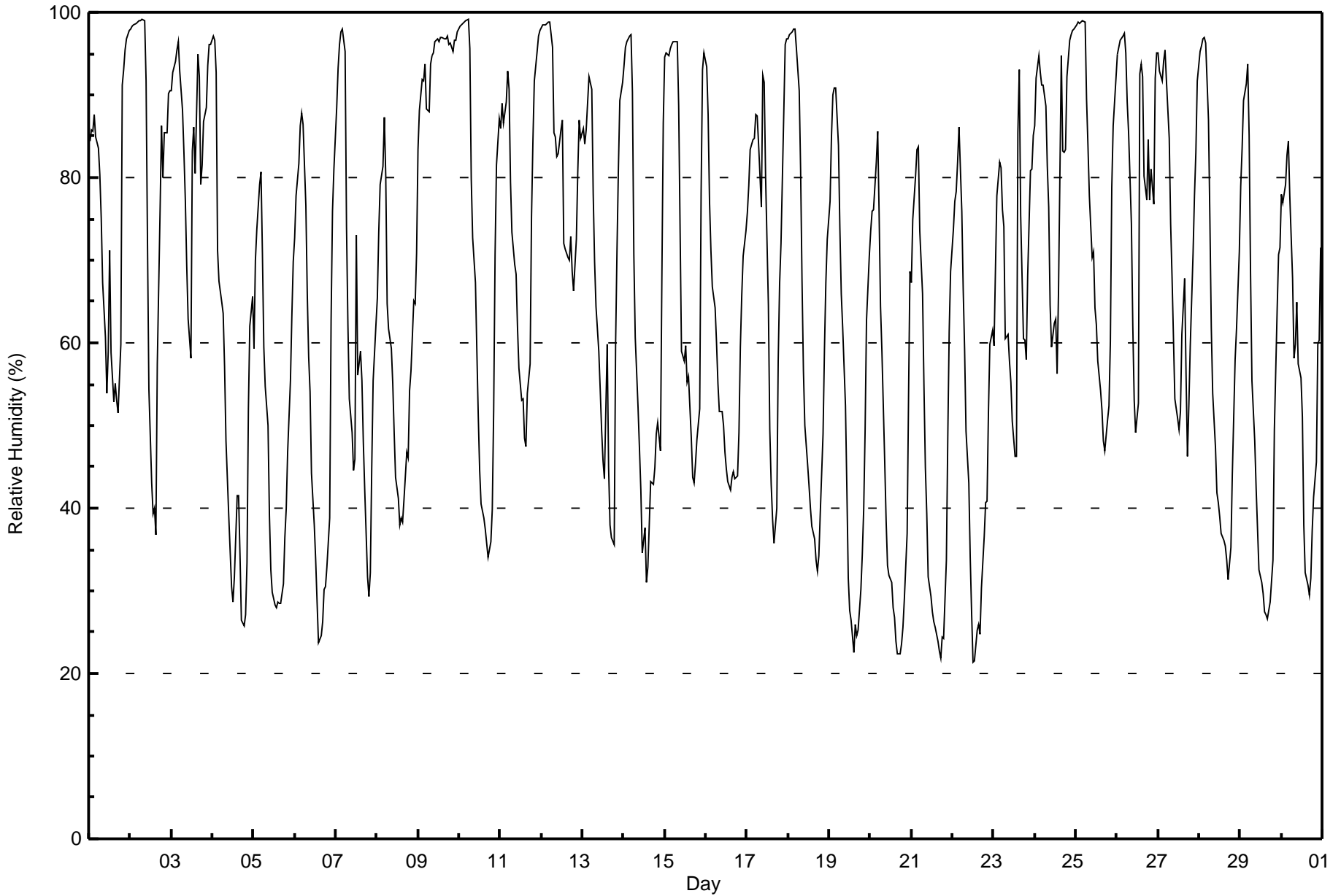
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Fort McKay - Bertha Ganter - June 2016

Maximum Value: 99 % on Jun 2 08:00 Maximum Daily Average: 94.2 % on Jun 9																		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 21 % on Jun 22 13:00 Minimum Daily Average: 47.2 % on Jun 20 Maximum Diurnal Average: 90.2 % at hour 5 Minimum Diurnal Average: 46.3 % at hour 18 Monthly Average: 66.0 % Percentiles: P ₁ = 23 P ₁₀ = 32 Q ₁ = 47 Median = 67 Q ₃ = 87 P ₉₀ = 96 P ₉₉ = 99																										
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-Jun	84	86	86	88	85	84	80	75	67	61	54	59	71	59	53	55	53	52	60	91	93	95	97	98	74.4	98
2-Jun	98	98	98	99	99	99	99	99	99	92	72	54	43	39	40	37	57	76	86	80	85	85	90	91	79.9	99
3-Jun	91	93	94	95	96	93	88	83	77	69	63	58	83	86	81	95	92	79	81	87	88	94	96	96	85.8	96
4-Jun	97	97	93	71	68	65	64	57	48	39	35	31	29	32	42	42	34	26	26	27	33	52	62	66	51.4	97
5-Jun	59	70	74	79	81	71	60	55	50	39	33	30	28	28	29	28	29	31	36	40	47	55	63	70	49.3	81
6-Jun	73	78	82	86	88	86	77	66	58	54	44	38	34	29	24	25	26	30	31	33	39	63	76	81	54.9	88
7-Jun	88	93	96	98	98	95	74	62	53	49	45	46	73	56	59	55	48	42	32	29	32	45	55	62	62.0	98
8-Jun	65	73	79	81	87	80	65	62	59	55	49	44	41	38	39	38	41	47	46	54	57	65	65	71	58.4	87
9-Jun	83	88	92	92	94	88	88	94	95	95	97	97	97	97	97	97	97	97	96	96	95	97	97	98	94.2	98
10-Jun	98	99	99	99	99	99	96	80	73	67	59	51	45	41	39	37	36	34	36	40	52	71	82	87	67.3	99
11-Jun	86	89	87	89	93	91	79	73	69	68	62	57	53	53	48	47	54	57	75	84	92	95	97	98	74.9	98
12-Jun	98	98	99	99	99	99	96	86	85	83	83	86	87	72	71	70	70	73	69	66	73	81	87	85	83.8	99
13-Jun	86	84	86	89	92	91	78	70	64	59	54	49	46	44	60	45	38	37	36	60	71	81	89	92	66.7	92
14-Jun	94	96	96	97	97	90	71	61	52	47	42	34	38	31	33	38	43	43	45	49	50	47	68	87	60.4	97
15-Jun	95	95	95	96	96	96	96	96	89	74	59	58	60	55	56	48	44	43	45	48	52	78	93	95	73.5	96
16-Jun	93	88	77	71	67	64	60	55	52	52	50	47	45	43	42	44	44	43	44	49	60	66	71	74	58.3	93
17-Jun	76	79	83	85	85	88	88	84	76	92	92	80	65	49	43	39	36	40	58	67	72	88	96	97	73.2	97
18-Jun	97	97	98	98	98	96	91	81	68	57	50	45	43	40	38	36	34	32	34	39	49	59	67	72	63.3	98
19-Jun	77	85	90	91	91	84	74	66	62	52	42	31	28	26	23	26	25	25	30	34	40	49	63	70	53.5	91
20-Jun	74	76	76	82	86	76	64	59	46	39	33	32	31	28	27	24	22	22	24	26	29	37	53	69	47.2	86
21-Jun	67	75	80	83	84	74	66	55	45	39	32	29	27	26	26	24	23	22	24	24	34	49	61	69	47.4	84
22-Jun	74	77	78	82	86	76	66	59	49	43	34	27	21	21	25	26	25	30	37	41	41	52	60	62	49.7	86
23-Jun	60	69	78	82	81	76	74	60	61	58	55	51	46	46	85	93	75	60	60	58	68	81	81	85	68.5	93
24-Jun	86	92	95	93	91	91	89	81	76	65	59	62	63	56	66	95	83	83	83	92	97	97	98	98	83.0	98
25-Jun	99	99	99	99	99	99	89	84	78	70	71	64	62	58	54	52	48	47	51	52	60	79	86	92	74.6	99
26-Jun	95	96	97	97	98	95	89	85	74	62	53	49	53	93	94	92	80	77	85	77	81	77	92	95	82.7	98
27-Jun	95	93	92	94	95	92	85	74	68	61	53	51	50	52	61	68	56	46	53	60	71	78	83	92	71.7	95
28-Jun	95	96	97	97	96	87	75	62	54	47	42	41	39	37	36	35	34	31	35	44	51	58	62	71	59.3	97
29-Jun	79	84	89	91	94	85	69	55	48	42	37	32	31	30	27	27	27	29	31	34	49	64	71	72	54.1	94
30-Jun	78	77	79	83	84	78	68	58	60	65	57	56	51	38	32	31	30	32	37	41	46	60	60	71	57.2	84
84.7 87.3 88.7 89.5 90.2 86.2 78.5 71.3 65.2 59.8 53.7 49.7 49.4 46.8 48.3 49.0 46.8 46.3 49.5 54.2 60.2 69.9 77.4 82.1																								Diurnal Average		
99 99 99 99 99 99 99 99 99 99 95 97 97 97 97 97 97 97 96 96 97 97 98 98																								Diurnal Maximum		





Wood Buffalo Environmental Association

Summary of Hour Averages

Precipitation (PC) - mm

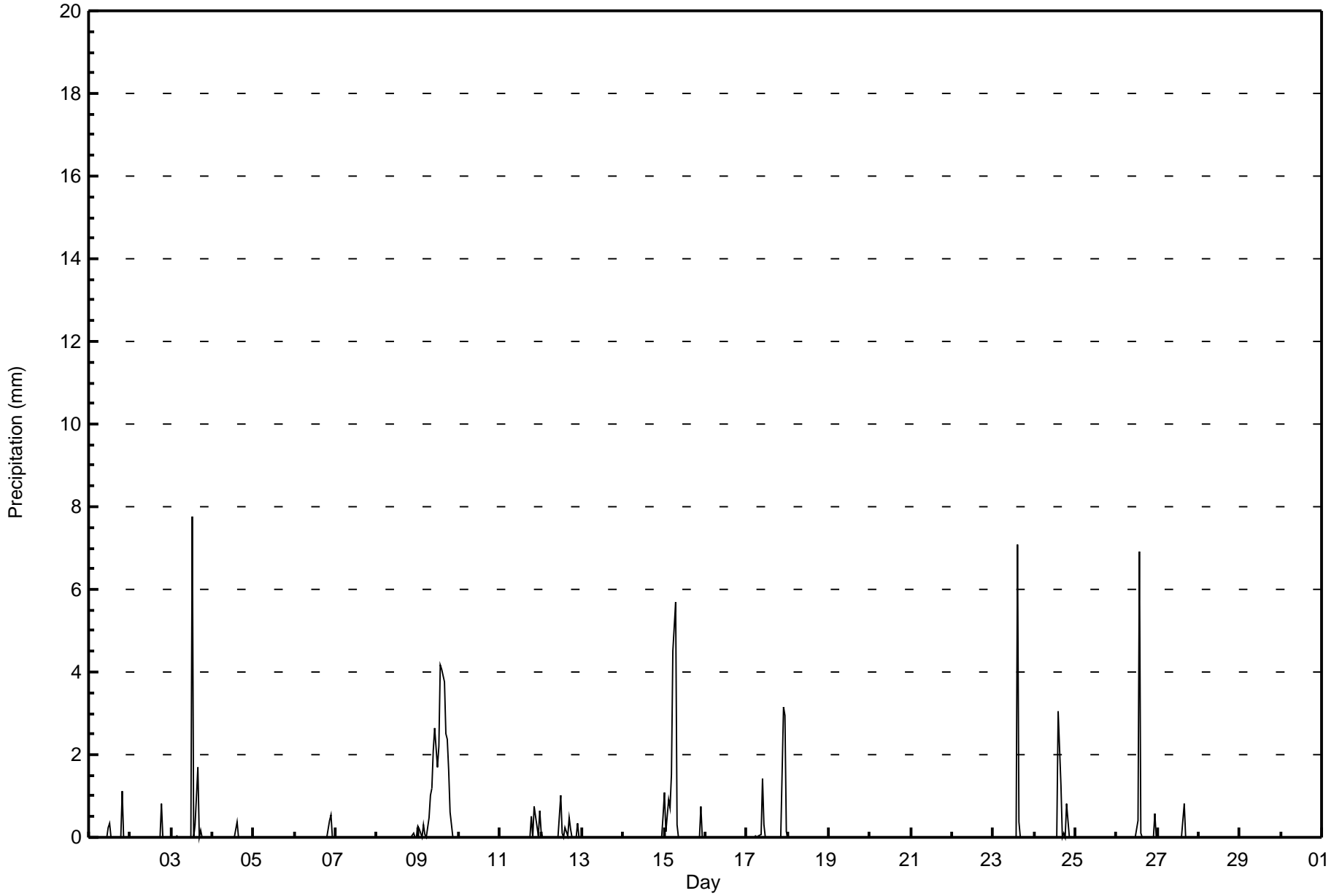
Fort McKay - Bertha Ganter - June 2016

Maximum Value: 7.8 mm on Jun 3 13:00																			Maximum Daily Total: 31.3 mm on Jun 9						Hours in Service: 720		
Minimum Value: 0.0 mm on Jun 1 01:00																			Minimum Daily Total: 0.0 mm on Jun 5						Hours of Data: 720		
Maximum Diurnal Total: 15.2 mm at hour 15																			Minimum Diurnal Total: 0.4 mm at hour 2						Hours of Missing Data: 0		
Monthly Total: 95.57 mm																			Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 4.0						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-Jun	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	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	1.7	1.1	
2-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.8	0.8	
3-Jun	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.8	0.0	0.3	1.7	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	10.0	7.8	
4-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	
5-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.5	0.0	0.0	0.9	0.5	
7-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.1
9-Jun	0.3	0.2	0.0	0.3	0.1	0.0	0.5	1.0	1.2	2.1	2.7	1.7	2.2	4.2	4.1	3.8	2.5	2.4	1.6	0.6	0.0	0.0	0.0	0.0	31.3	4.2	4.2
10-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.8	0.3	0.0	0.6	2.2	0.8	0.8
12-Jun	0.1	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	0.2	0.0	0.5	0.2	0.0	0.0	0.0	0.4	0.0	0.0	2.5	1.0	1.0
13-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.5	0.5
15-Jun	1.1	0.1	0.9	0.7	1.5	4.5	5.7	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	0.7	0.0	0.0	15.6	5.7	5.7
16-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	1.4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	2.9	0.1	8.1	3.1	3.1
18-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.5	7.1	7.1
24-Jun	0.0	0.0	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	1.3	0.0	0.1	0.0	0.8	0.0	0.0	0.0	0.0	5.2	3.1	3.1
25-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	6.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	8.0	6.9	6.9
27-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.8
28-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.4	0.9	1.1	1.6	4.6	6.2	1.4	1.2	3.6	3.0	2.9	10.8	11.1	15.2	7.9	3.0	2.8	3.0	2.5	1.1	5.1	3.5	1.3	Diurnal Average		
	1.1	0.2	0.9	0.7	1.5	4.5	5.7	1.0	1.2	2.1	2.7	1.7	7.8	6.9	7.1	3.8	2.5	2.4	1.6	1.1	0.8	3.1	2.9	0.6	Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
Fort McKay - Bertha Ganter - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Precipitation (PC) - mm
Fort McKay - Bertha Ganter - June 2016

Concentration Ranges (mm)	Number of Hours	%	Cumulative %
0 - 0.3	674	93.61	93.61
0.4 - 0.5	9	1.25	94.86
0.6 - 0.7	5	0.69	95.56
0.8 - 1.4	12	1.67	97.22
1.5 - 10	20	2.78	100.00
> 10	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



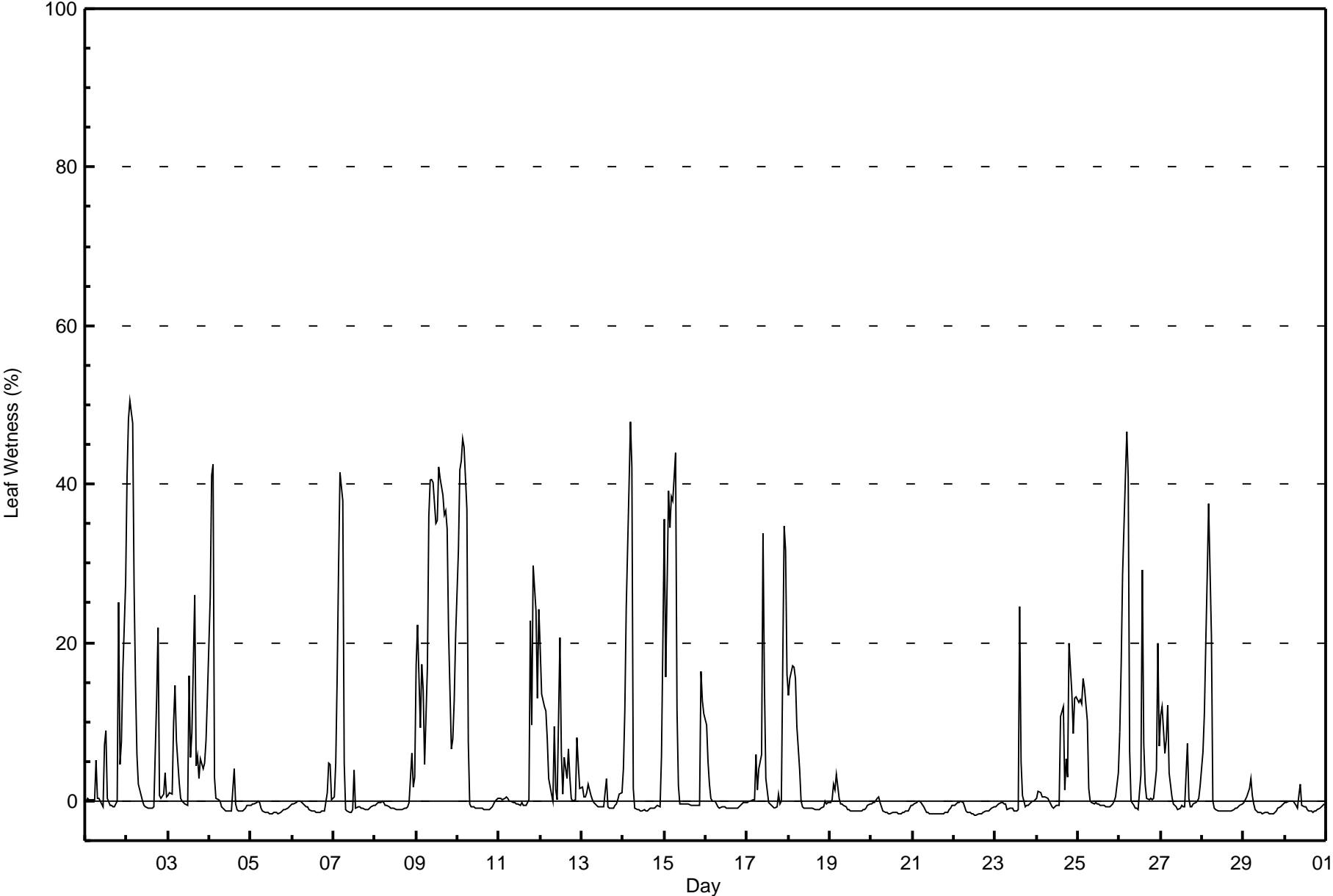
Wood Buffalo Environmental Association

Summary of Hour Averages

Leaf Wetness (LW) - %

Fort McKay - Bertha Ganter - June 2016

Maximum Value: 50 % on Jun 2 03:00 Maximum Daily Average: 26.1 % on Jun 9																	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0										
Minimum Value: -2 % on Jun 22 13:00 Minimum Daily Average: -1.1 % on Jun 22 Maximum Diurnal Average: 12.4 % at hour 5 Minimum Diurnal Average: 0.8 % at hour 17 Monthly Average: 4.2 % Percentiles: P ₁ = -2 P ₁₀ = -1 Q ₁ = -1 Median = 0 Q ₃ = 3 P ₉₀ = 17 P ₉₉ = 44																											
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-Jun	0	0	0	0	0	0	5	0	0	0	-1	7	9	0	-1	-1	-1	-1	0	25	5	7	16	28	4.2	28	
2-Jun	41	48	50	48	27	15	6	2	1	0	0	-1	-1	-1	-1	-1	-1	13	22	1	0	1	4	1	11.4	50	
3-Jun	1	1	1	10	14	8	2	0	0	0	0	16	6	9	26	4	6	3	5	4	5	8	13	5.8	26		
4-Jun	26	41	42	3	0	0	0	-1	-1	-1	-1	-1	-1	4	0	-1	-1	-1	-1	-1	-1	-1	-1	0	4.2	42	
5-Jun	-1	0	0	0	0	0	-1	-1	-1	-1	-2	-2	-2	-1	-1	-2	-1	-1	-1	-1	-1	-1	-1	-1	-1.0	0	
6-Jun	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	5	5	0	-0.3	5	
7-Jun	1	5	16	29	41	38	5	-1	-1	-1	-1	-1	4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	5.1	41	
8-Jun	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	6	2	3	-0.1	6	
9-Jun	17	22	9	17	14	5	17	36	41	41	40	35	35	42	41	39	36	37	34	21	7	8	13	21	26.1	42	
10-Jun	32	42	43	46	45	37	7	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	9.9	46	
11-Jun	0	0	0	0	1	0	0	0	0	0	0	0	-1	0	-1	-1	0	0	23	10	30	24	13	24	5.1	30	
12-Jun	19	13	12	11	8	3	1	0	9	1	0	21	6	1	6	3	7	3	0	0	0	8	5	2	5.8	21	
13-Jun	2	0	1	1	2	1	0	0	0	-1	-1	-1	-1	-1	3	-1	-1	-1	-1	-1	0	0	1	1	0.1	3	
14-Jun	4	11	24	40	48	42	2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	6	20	7.6	48	
15-Jun	36	16	39	35	39	38	44	12	2	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	16	13	11	12.2	44	
16-Jun	10	5	2	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0.2	10	
17-Jun	0	0	0	0	0	6	1	4	6	34	15	3	0	0	-1	-1	-1	-1	-1	1	0	0	35	32	16	6.2	35
18-Jun	13	15	17	17	16	9	4	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	3.3	17	
19-Jun	0	0	2	1	3	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	-0.4	3	
20-Jun	0	0	0	0	0	0	-1	-1	-1	-2	-2	-2	-1	-1	-1	-2	-2	-2	-2	-1	-1	-1	-1	-1	-1	-1.0	0
21-Jun	0	0	0	0	0	0	-1	-1	-1	-1	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-1	-1	-1	-1	-1	-1.1	0
22-Jun	0	0	0	0	0	0	-1	-1	-1	-1	-2	-2	-2	-2	-2	-2	-2	-2	-2	-1	-1	-1	-1	-1	-1	-1.1	0
23-Jun	-1	-1	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	25	5	1	-1	-1	-1	0	0	0	0	0.7	25	
24-Jun	0	1	1	1	0	0	0	0	0	-1	-1	-1	0	-1	11	12	1	5	3	20	14	9	13	13	4.2	20	
25-Jun	12	13	12	15	14	10	2	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	0	0	1	4	3.2	15	
26-Jun	9	17	29	41	47	41	6	0	-1	-1	-1	-1	3	29	7	2	0	0	0	0	0	4	20	7	10.8	47	
27-Jun	11	12	6	8	12	4	1	0	0	-1	-1	-1	0	-1	-1	7	0	-1	-1	0	0	0	0	2	2.3	12	
28-Jun	6	11	20	28	38	21	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	4.4	38	
29-Jun	0	0	1	2	3	1	0	-1	-1	-1	-2	-2	-2	-1	-2	-2	-2	-2	-2	-1	-1	-1	-1	0	-0.7	3	
30-Jun	0	0	0	0	0	0	0	-1	1	2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	-0.5	2	
																	Diurnal Average										
																	Diurnal Maximum										





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Leaf Wetness (LW) - %
Fort McKay - Bertha Ganter - June 2016**

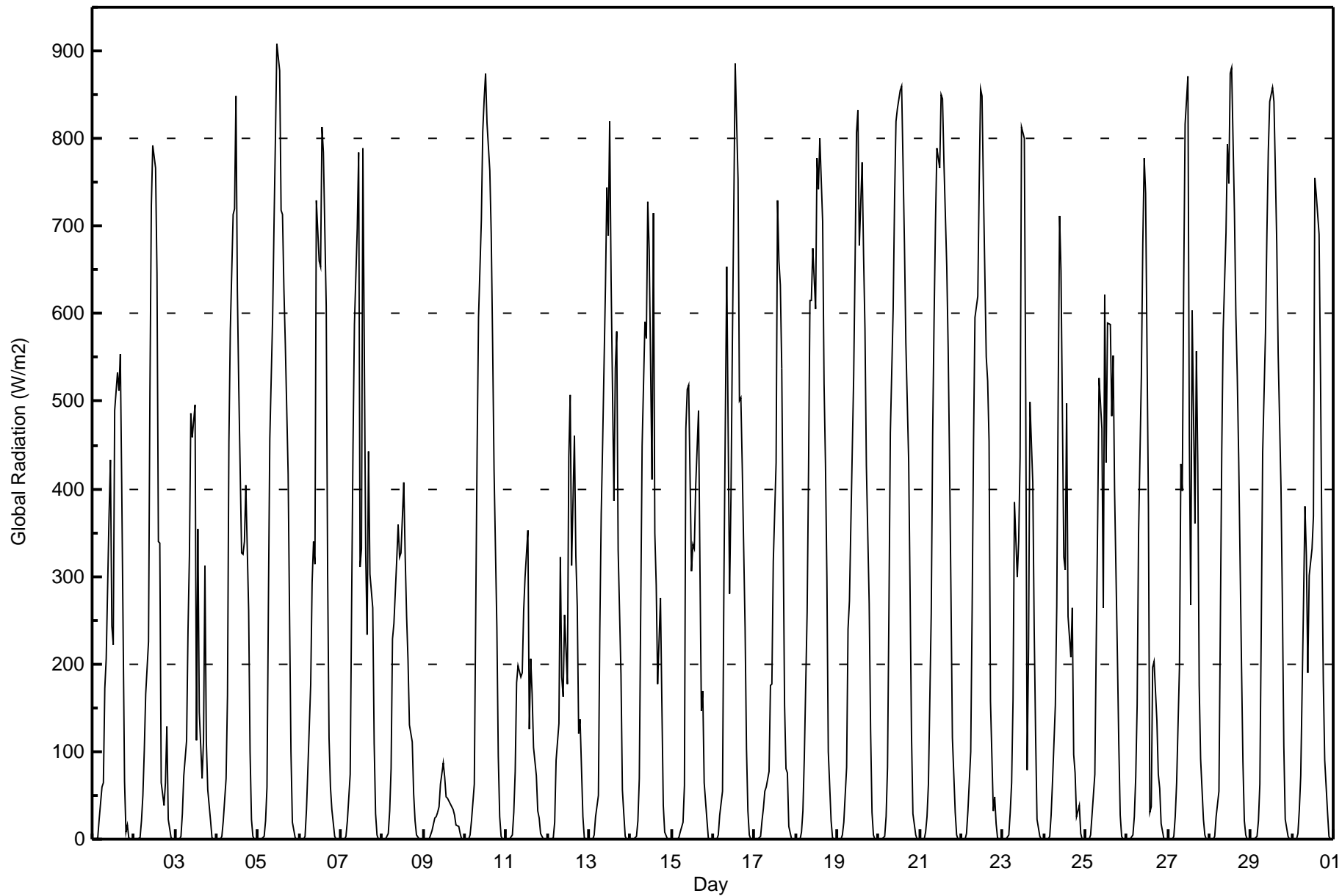
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	50	17.18	17.18
0.4 - 0.5	13	4.47	21.65
0.6 - 0.7	10	3.44	25.09
0.8 - 1.4	17	5.84	30.93
1.5 - 10	87	29.90	60.82
> 10	113	38.83	99.66

Total Number of Valid Hours: 291

Total Number of Hours: 720



Maximum Value: 908 W/m2 on Jun 5 12:00		Maximum Daily Average: 351.1 W/m2 on Jun 20		Hours in Service: 720																						
Minimum Value: 0 W/m2 on Jun 1 01:00		Minimum Daily Average: 26.1 W/m2 on Jun 9		Hours of Data: 720																						
Maximum Diurnal Average: 590.3 W/m2 at hour 12		Minimum Diurnal Average: 0.0 W/m2 at hour 2		Hours of Missing Data: 0																						
Monthly Average: 240.9 W/m2		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 4 Median = 108 Q ₃ = 434 P ₉₀ = 702 P ₉₉ = 870		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-Jun	0	0	0	1	23	60	64	173	207	369	433	243	222	490	534	511	554	404	66	8	16	2	0	0	182.5	554
2-Jun	0	0	0	2	21	50	101	166	226	510	723	792	767	646	339	338	65	38	65	129	22	1	0	0	208.4	792
3-Jun	0	0	0	3	29	73	113	238	323	487	460	496	113	354	146	70	112	312	112	56	21	1	0	0	146.6	496
4-Jun	0	0	0	3	21	70	165	455	582	713	720	848	626	516	328	326	340	405	262	100	22	3	0	0	271.0	848
5-Jun	0	0	0	4	20	60	267	457	597	703	802	908	878	719	714	629	566	417	256	100	19	2	0	0	338.1	908
6-Jun	0	0	0	3	33	81	176	293	339	313	729	660	653	813	784	609	304	116	59	34	4	0	0	0	250.2	813
7-Jun	0	0	0	4	21	74	265	450	587	697	785	311	331	788	326	234	443	303	264	109	29	4	0	0	251.1	788
8-Jun	0	0	0	7	32	81	228	246	319	359	322	327	407	323	255	205	130	112	51	21	5	0	0	0	142.9	407
9-Jun	0	0	0	0	6	10	24	26	30	37	64	87	71	49	46	41	37	34	28	16	15	6	0	0	26.1	87
10-Jun	0	0	0	5	21	63	256	445	596	706	809	845	874	819	763	690	565	423	242	94	26	4	0	0	343.5	874
11-Jun	0	0	0	4	30	78	179	197	186	191	260	300	352	126	207	166	105	73	32	25	6	0	0	0	104.9	352
12-Jun	0	0	0	2	19	90	133	323	185	163	256	178	437	507	313	461	323	266	121	137	26	2	0	0	164.2	507
13-Jun	0	0	0	4	25	50	239	371	453	632	744	689	819	640	386	538	580	330	188	56	29	4	0	0	282.5	819
14-Jun	0	0	0	4	21	69	262	449	591	572	728	673	411	714	349	290	177	276	154	39	8	1	0	0	241.2	728
15-Jun	0	0	0	0	2	8	19	60	469	513	519	307	336	332	404	490	311	147	168	64	21	1	0	0	173.8	519
16-Jun	0	0	0	6	27	55	295	478	654	279	391	569	721	885	754	500	504	426	242	102	33	5	0	0	288.6	885
17-Jun	0	0	0	3	21	35	55	60	78	176	177	317	430	729	661	633	537	153	80	76	14	0	0	0	176.5	729
18-Jun	0	0	0	8	33	93	259	420	615	615	674	605	778	742	800	705	519	428	299	99	20	2	0	0	321.5	800
19-Jun	0	0	0	4	20	81	239	271	359	528	659	806	833	677	772	668	584	426	269	124	30	4	0	0	306.5	833
20-Jun	0	0	0	4	25	82	261	464	605	731	820	834	855	860	772	679	566	431	283	119	30	5	0	0	351.1	860
21-Jun	0	0	0	8	25	63	258	460	593	703	789	766	850	846	772	653	561	429	279	116	31	4	0	0	341.9	850
22-Jun	0	0	0	6	32	100	262	456	596	620	747	857	849	742	550	524	454	158	32	48	17	1	0	0	293.8	857
23-Jun	0	0	0	4	31	64	159	385	300	339	436	813	800	504	78	218	499	408	240	119	23	3	0	0	226.0	813
24-Jun	0	0	0	4	27	65	153	266	504	711	649	323	308	498	254	208	265	96	76	26	39	6	0	0	186.6	711
25-Jun	0	0	0	4	27	74	224	362	527	468	264	622	430	589	588	483	552	398	210	108	28	4	0	0	248.4	622
26-Jun	0	0	0	5	26	70	152	348	530	680	778	738	380	30	37	196	202	135	74	57	18	1	0	0	185.7	778
27-Jun	0	0	0	3	26	65	197	428	397	633	816	871	459	268	604	361	557	428	175	93	23	5	0	0	267.1	871
28-Jun	0	0	0	3	25	55	246	445	582	693	794	749	875	880	714	600	528	434	199	89	21	4	0	0	330.7	880
29-Jun	0	0	0	4	21	63	239	442	579	691	786	843	859	843	762	680	554	401	267	107	23	3	0	0	340.3	859
30-Jun	0	0	0	7	34	72	272	380	324	191	301	332	369	754	736	690	533	334	181	90	31	3	0	0	234.7	754
		0.0	0.0	0.0	4.0	24.2	65.1	192.1	333.8	431.0	500.8	581.2	590.3	569.8	589.4	491.6	446.6	400.9	291.4	165.8	78.7	21.7	2.7	0.0	0.0	Diurnal Average
		0	0	0	8	34	100	295	478	654	731	820	908	878	885	800	705	584	434	299	137	39	6	0	0	Diurnal Maximum





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Global Radiation (GR) - W/m²
Fort McKay - Bertha Ganter - June 2016

Concentration Ranges (W/m²)	Number of Hours	%	Cumulative %
0 - 20	231	32.08	32.08
21 - 100	125	17.36	49.44
101 - 300	110	15.28	64.72
301 - 600	146	20.28	85.00
601 - 900	107	14.86	99.86
> 900	1	0.14	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Speed: 34 km/h on Jun 15 14:00	Maximum Daily Speed Average: 13.0 km/h on Jun 15	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 30 03:00	Minimum Daily Speed Average: 0.2 km/h on Jun 7	Hours of Data: 720
Maximum Diurnal Speed Average: 2.6 km/h at hour 1	Minimum Diurnal Speed Average: 0.4 km/h at hour 10	Hours of Missing Data: 0
Monthly Average Velocity: 1.0 km/h 256.7 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 4 Median = 6 O ₃ = 10 P ₉₀ = 14 P ₉₉ = 26	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-Jun	WSW3	SW2	WSW3	SSW3	S5	S4	S3	SSE5	S4	S3	SSE8	S6	S8	SSW8	SSW10	S14	SSE16	S14	S10	NNW7	N6	W1	NW5	WNW3	S4.3	SSE16	
2-Jun	WNW4	WNW4	W3	W2	NW3	NW1	W2	N3	SW2	N2	E4	SE4	SSE6	SE3	SW2	NNE2	WSW12	SSE10	SE8	WSW5	WNW5	NW5	SSE3	S6	SW1.4	WSW12	
3-Jun	SW3	SSW3	SSW1	S1	SSW3	S5	S6	SW7	SW7	SW6	WSW6	S5	NNW6	NW8	NW6	W2	WNW5	WNW0	N6	SE4	S4	NW1	N4	SW1	WSW1.9	NW8	
4-Jun	SW4	SSW4	W4	W8	WNW9	W10	WNW12	WNW12	NW16	NW18	NW15	NW18	NW21	NW11	NW13	NW14	NW19	NW23	NW22	NW18	NNW11	NW4	WNW4	WNW8	NW11.8	NW23	
5-Jun	NNW9	WNW4	W2	W1	SSW2	SW3	SW2	SSE4	ESE4	NW12	NNW18	NW16	NW16	NNW14	N13	NNE10	NNE8	NE7	ENE6	E7	ENE3	N3	NE1	SE2	NNW4.5	NNW18	
6-Jun	ESE3	SSW1	NW1	NNW3	NW4	NW4	NNW1	SSE4	SSE9	S8	S12	SSE13	SSE13	SSE15	S17	SSE15	S13	S10	S16	S16	S18	WNW4	N7	ENE2	S6.7	S18	
7-Jun	WNW6	WSW2	WSW3	S2	S3	S3	S3	SSW3	SSE2	ESE6	SE7	ESE4	SSE11	SSE9	SSE12	SE4	ENE6	N8	NNW13	NNW12	NNW11	NW8	NW5	WNW3	WSW0.2	NNW13	
8-Jun	WNW3	NW4	NW5	WNW4	WSW2	WSW2	NW5	N5	N5	NNE5	NNE7	NNE7	NE6	NE6	E5	ENE5	NE3	E4	SSE10	S8	SE5	SSE7	SSE12	SE9	ENE1.3	SSE12	
9-Jun	E5	E5	NNE4	N9	N10	N11	NNE11	N14	NNE17	N19	NNE17	NNE16	NNE18	NNE17	NNE18	NNE15	N13	N12	NNE10	N10	N10	NNW10	NNW8	NW7	N11.3	N19	
10-Jun	NW5	NW3	NW5	WNW4	WSW3	SSW3	WSW2	NW5	N7	N10	NNE10	NE8	NNE8	NNE9	NE8	NE7	ENE7	ENE5	NE4	NE3	ENE2	NW4	WNW3	SSW1	N3.4	N10	
11-Jun	W3	WNW2	N3	WNW2	WNW3	W2	S3	SSE7	S9	S6	SSE10	SSE15	SSE18	SSE15	SE15	SSE15	SSE6	SE7	SE15	SE12	SSE5	NE3	N6	NNW4	SSE5.6	SSE18	
12-Jun	N5	NNW5	NW4	NW3	WNW3	WSW3	SSW6	WSW6	SW6	SSW9	SSW9	SW6	S9	SSW12	WSW9	WSW8	W9	W7	WNW9	W6	SSW5	SW6	SW9	W8	WSW5.0	SSW12	
13-Jun	WSW8	W9	W6	SSW6	S5	S6	SW9	WSW7	SW9	SW10	SW12	WSW12	WSW13	W10	WNW10	SW8	SW11	SW9	WSW6	NNE5	NNW4	W2	NW2	WNW5	WSW6.1	WSW13	
14-Jun	SW3	W3	SW3	WNW4	SSW3	S3	NW2	SSW1	E3	NE4	NNE6	NE3	E3	SE6	E6	ENE6	NE3	N12	N11	N9	SSE10	SSE21	SSE9	SE4	ESE1.5	SSE21	
15-Jun	ESE4	SE7	E5	ENE4	E3	SE6	ESE8	E4	SE8	SE20	SSE34	SSE31	S29	S34	S27	S27	S28	S21	S12	SW7	S8	SSW9	S5	SSE4	SSE13.0	S34	
16-Jun	SSE6	SSE8	SSE10	S13	S15	S14	S17	S23	S19	SSW14	SSW14	SSW14	SW13	SSW14	SW12	SSW11	SW9	SW9	WSW7	W6	NW6	WNW4	WNW5	WNW6	SSW9.2	S23	
17-Jun	WNW5	W4	WNW6	WNW5	NW6	WNW8	WNW7	NW12	NW17	NW13	NW13	NW13	NW16	NW18	NW15	NW16	WNW12	W9	NW12	N5	ENE4	N6	N5	S3	NW8.7	NW18	
18-Jun	WNW7	WNW7	WNW7	NW10	WNW8	WNW7	WNW9	WNW9	W8	WNW10	WNW9	NW9	W7	WSW8	WSW7	WSW7	WSW7	SSW8	SSW8	SW5	SW3	NNE14	NNE4	N7	WNW5.5	NNE14	
19-Jun	NW9	WNW5	WNW5	WNW5	W4	SSW2	NW3	NNW4	ENE4	N10	N11	NNW19	NNW21	NNW24	N21	N21	NNW21	N22	N13	N11	N9	NNW5	WNW5	WNW5	NNW9.7	NNW24	
20-Jun	WNW5	NW4	NW4	SW2	WNW1	NE1	S4	SSE5	SSE6	SE8	SSE9	SSE10	SSE11	SSE12	SSE12	SSE12	SSE12	SSE13	S11	S11	S9	S6	S5	S4	SSE6.1	SSE13	
21-Jun	NW3	WNW3	W3	WSW3	SSW3	S5	SSE8	SSE10	S10	S11	S13	S13	S12	S12	SSE11	SSE13	SSE10	SSE8	S7	S6	SW4	SW2	SW3	SW3	S6.5	SSE13	
22-Jun	SW3	WSW2	WNW4	SSW3	SSW4	SSW3	S5	SSE8	SSE8	SE7	SE8	SSE10	S5	S7	SSE10	SE7	SSE10	WNW7	W9	W8	SW6	SSW3	SW1	SW4	S3.9	SSE10	
23-Jun	WNW5	NW3	WSW2	WSW3	WSW2	WNW3	NW4	N3	NE3	NNE5	ESE2	SE6	SSE4	SSE6	NNW11	NW7	N4	N6	N8	NE6	NNE4	N4	NW4	N5	NNW2.3	NW11	
24-Jun	NW1	NNW3	NW4	NW7	NNW4	N5	N6	NNE8	N13	N11	N11	N11	N11	N9	N14	N12	WSW4	N6	NNE6	N3	NNW12	NNW7	NW6	NW6	NW3	N6.7	N14
25-Jun	WNW4	WNW3	NNW6	NNW6	NNW6	NNW8	N13	N11	N14	N11	N11	N12	N12	N11	NNE9	NNE8	NNE7	NE6	NE5	ENE4	NE1	WNW4	WSW2	WNW3	N6.4	N14	
26-Jun	WNW4	WNW4	WNW3	WSW2	SSW3	S3	S5	SSE6	SSE8	SE9	SE11	SSE9	NNW8	N1	SSW2	WSW1	SSW6	SW3	S4	SSW5	WSW4	WNW4	WSW0	WNW7	SSW2.2	SSE11	
27-Jun	W5	W5	SSW5	S4	SSW4	SW3	SW4	W4	W5	SSW4	SW6	SW8	WSW6	N3	SSE10	S6	SSE7	S10	E5	ESE4	E2	NE2	SSW2	WSW3	SSW2.8	SSE10	
28-Jun	WSW3	W3	SSW3	SSW4	SSW5	S5	SSE4	E2	ESE2	S4	NW1	NE8	NNE9	N13	N15	N13	N16	N16	N12	NNE8	N7	NNW4	NW4	NW3	N4.1	N16	
29-Jun	WNW4	WNW4	WNW4	NNW4	NW1	NNW1	N3	NE3	NE3	NE4	NE5	NNE6	NNE8	NE5	ENE2	ENE4	SSW3	SE3	ENE1	ENE3	NW4	W2	NNW2	SE2	NNE1.8	NNE8	
30-Jun	SE4	SE4	WNW0	W2	NW3	SSW2	SSE8	S11	S14	S12	SSE2	SSE8	SSE3	SSE5	SE7	SSE9	SSE10	SSE9	SSE8	SE9	S5	S3	SW3	SSW3	SSE5.3	S14	

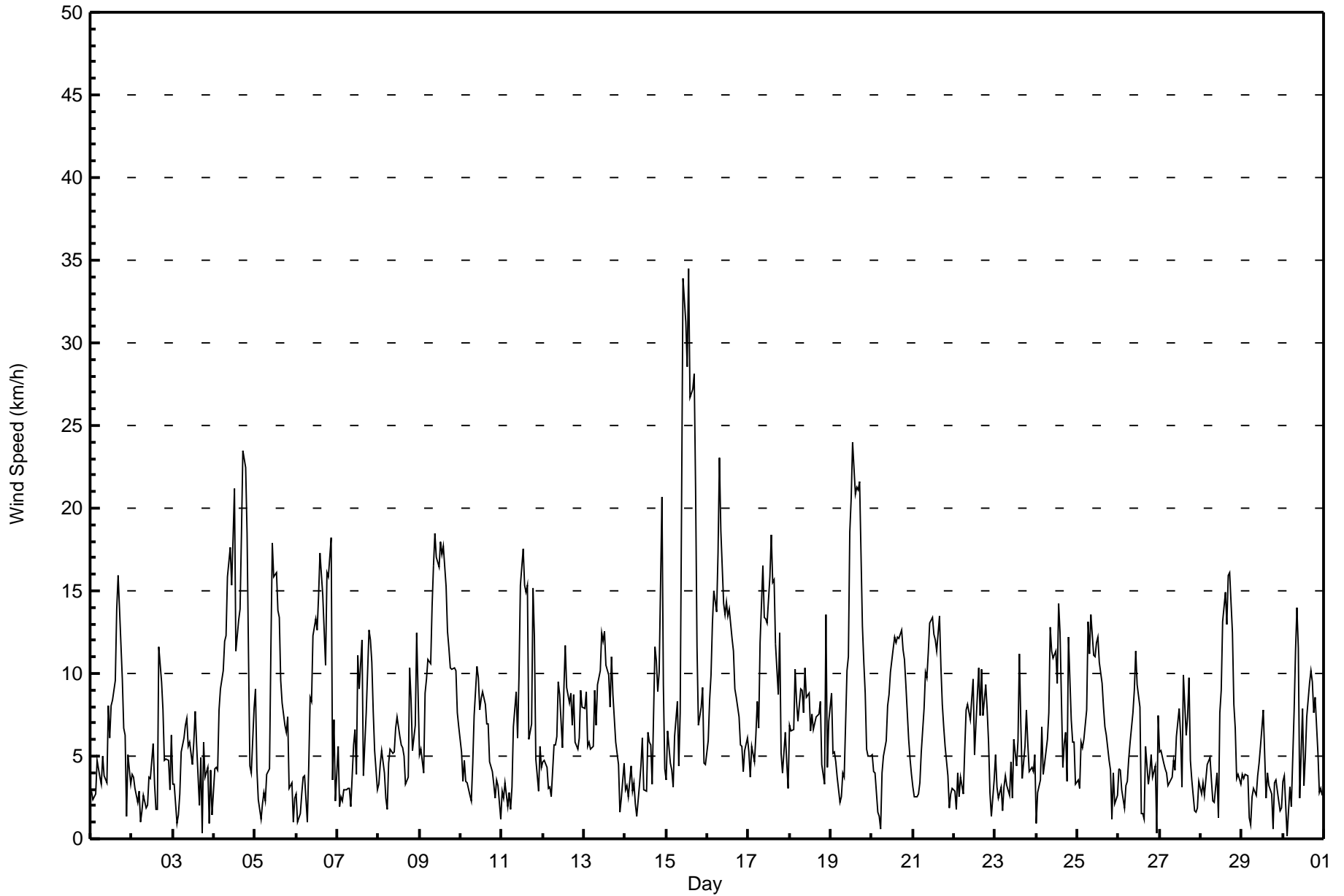
WNW2.6	W2.WNW2.2	W2.0WSW1.9	SW1.6	SW1.5	SW1.0	SSW1.0	SW0.4	SSW0.9	S1.0	W1.0	WSW1.0	SW0.5	S1.2	SSW1.6	WSW0.5	NNW0.6	NNW0.9	W0.7	NNW1.6	NNW1.4	W1.6	Diurnal Average						
NNW9	W9	SSE10	S13	S15	S14	S17	S23	S19	SE20	SSE34	SSE31	S29	S34	S27	S27	S28	NW23	NW22	NW18	S18	SSE21	SSE12	SE9	Diurnal Maximum				

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Fort McKay - Bertha Ganter - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Fort McKay - Bertha Ganter - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	332	46.11	46.11
6 - 11	259	35.97	82.08
12 - 19	109	15.14	97.22
20 - 28	16	2.22	99.44
29 - 38	4	0.56	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Fort McKay - Bertha Ganter - June 2016**

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	19	8	17	13	13	7	11	13	31	34	23	23	21	48	37	14	332
6 - 11	33	19	9	4	2	2	16	43	24	12	19	13	15	20	14	14	259
12 - 19	20	8	0	0	0	0	3	17	20	5	3	3	0	3	21	6	109
20 - 28	3	0	0	0	0	0	1	1	5	0	0	0	0	0	3	3	16
29 - 38	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	4
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	75	35	26	17	15	9	31	76	82	51	45	39	36	71	75	37	720

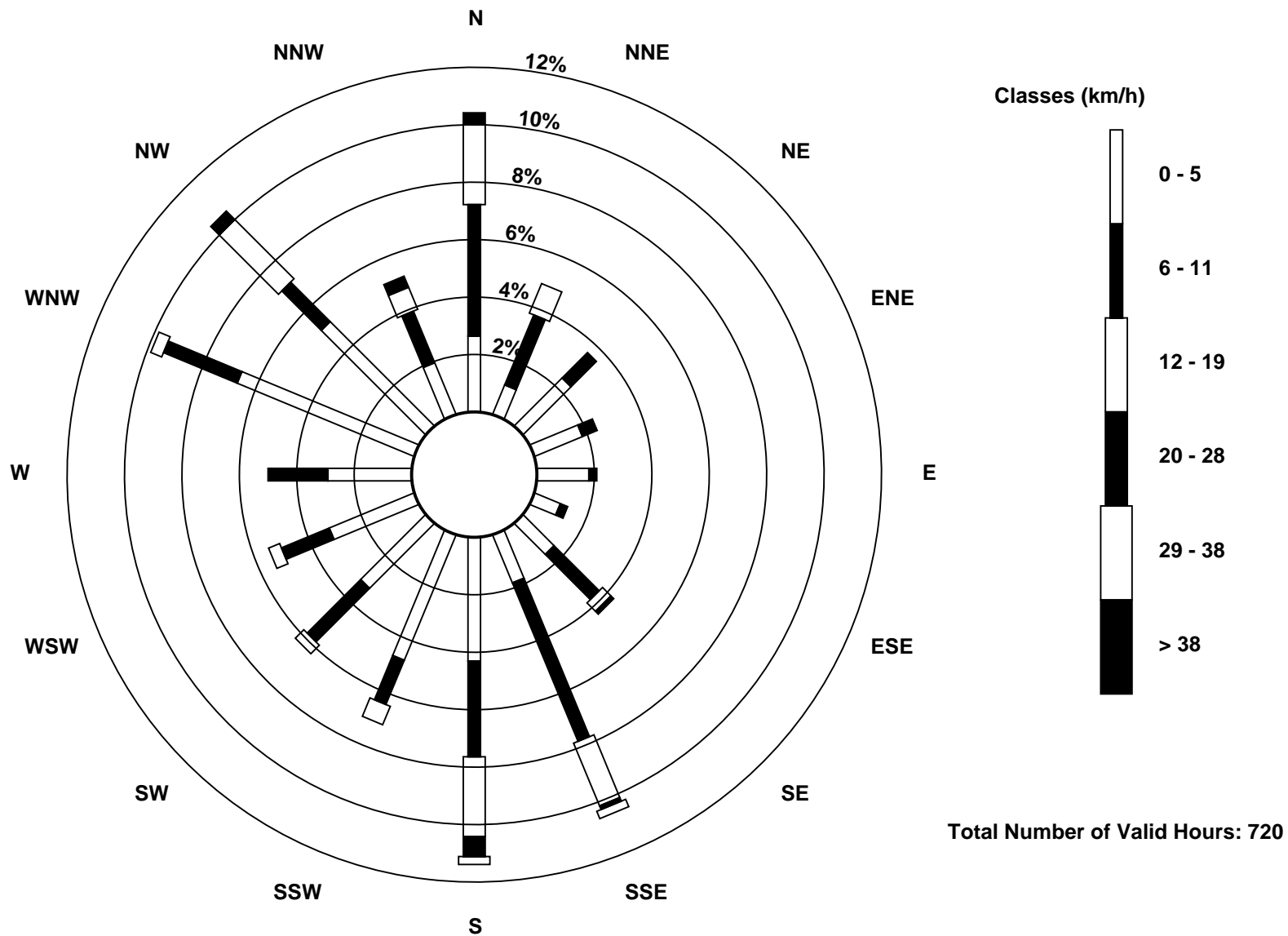
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

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





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Fort McKay - Bertha Ganter - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 11 km/h on Jun 18 22:00	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0
Minimum Value: 1 km/h on Jun 6 07:00	
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 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-Jun	1	1	2	1	1	1	2	2	1	2	2	2	2	3	4	4	3	3	4	6	3	2	1	1	6
2-Jun	1	1	1	1	1	1	1	1	1	2	1	2	2	2	1	1	5	2	6	2	1	1	2	1	6
3-Jun	2	1	1	1	1	1	1	2	2	2	3	3	5	3	2	2	6	3	3	2	2	2	5	2	6
4-Jun	2	1	2	3	3	4	4	4	5	6	6	6	7	6	8	5	5	6	6	5	4	2	1	2	8
5-Jun	3	1	1	1	1	1	2	1	2	7	6	6	5	5	5	4	5	3	3	3	1	1	1	1	7
6-Jun	1	1	1	1	1	1	1	2	2	2	3	3	3	4	4	5	4	2	4	4	6	7	5	2	7
7-Jun	2	1	1	1	1	1	1	1	2	2	2	5	8	3	3	3	3	3	5	3	2	2	1	1	8
8-Jun	1	2	2	2	1	1	2	1	2	2	3	3	2	2	2	2	2	1	4	2	2	2	3	5	5
9-Jun	2	2	2	2	2	3	4	4	5	5	5	5	5	5	5	5	3	3	3	3	2	2	1	1	5
10-Jun	1	2	1	1	1	1	1	2	4	3	4	3	4	5	3	3	3	3	2	1	1	1	1	1	5
11-Jun	1	1	1	1	1	1	2	1	2	2	4	4	4	4	5	5	3	6	5	4	3	2	1	2	6
12-Jun	1	1	1	1	1	1	2	2	3	3	3	2	3	4	5	4	4	3	3	3	1	3	3	3	5
13-Jun	3	4	2	2	1	1	4	4	4	5	5	5	6	5	7	4	5	3	3	2	1	1	2	1	7
14-Jun	1	1	2	2	2	2	1	1	2	2	2	2	2	4	2	3	2	4	3	3	6	6	5	1	6
15-Jun	1	2	2	2	2	3	4	2	6	7	7	8	8	9	9	8	7	6	4	3	2	8	1	1	9
16-Jun	2	2	2	4	3	3	5	5	5	4	4	5	5	5	5	4	4	4	3	2	2	1	1	1	5
17-Jun	1	1	2	2	2	3	2	5	5	4	4	4	6	6	6	6	5	4	7	1	2	3	4	1	7
18-Jun	2	2	1	2	2	2	3	3	4	4	4	4	4	4	3	3	4	3	3	2	3	11	2	5	11
19-Jun	2	1	2	1	1	1	2	2	1	5	5	6	6	7	6	5	6	6	4	3	2	1	1	1	7
20-Jun	1	1	1	1	1	1	1	2	1	2	2	2	2	3	3	2	2	2	2	2	2	1	1	1	3
21-Jun	2	2	1	1	1	2	2	2	2	3	3	4	4	4	4	3	3	2	1	1	1	1	2	1	4
22-Jun	1	1	1	1	1	1	1	2	2	1	2	2	4	4	3	3	2	5	3	3	2	3	1	2	5
23-Jun	2	1	1	1	1	2	2	1	2	2	1	3	3	4	7	3	2	2	2	3	1	1	3	1	7
24-Jun	1	1	1	1	2	2	2	2	3	4	3	3	3	4	4	2	3	2	3	4	1	2	1	1	4
25-Jun	1	1	1	1	1	3	3	4	4	3	3	4	4	3	3	3	3	3	2	2	1	1	1	1	4
26-Jun	1	1	1	1	1	1	1	2	2	2	2	3	9	4	2	2	2	2	2	2	2	3	2	3	9
27-Jun	2	2	2	1	1	1	2	2	2	2	3	3	4	4	3	4	3	4	3	1	1	1	1	1	4
28-Jun	1	1	1	1	2	1	1	1	1	2	4	3	4	5	4	4	4	4	4	3	2	1	1	1	5
29-Jun	1	1	1	1	1	1	1	1	1	2	3	3	3	4	2	2	2	2	1	1	1	1	1	1	4
30-Jun	1	1	1	1	1	1	2	3	4	6	2	2	1	3	4	3	3	3	2	2	2	1	2	2	6

Diurnal Maximum



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Fort McKay - Bertha Ganter - June 2016

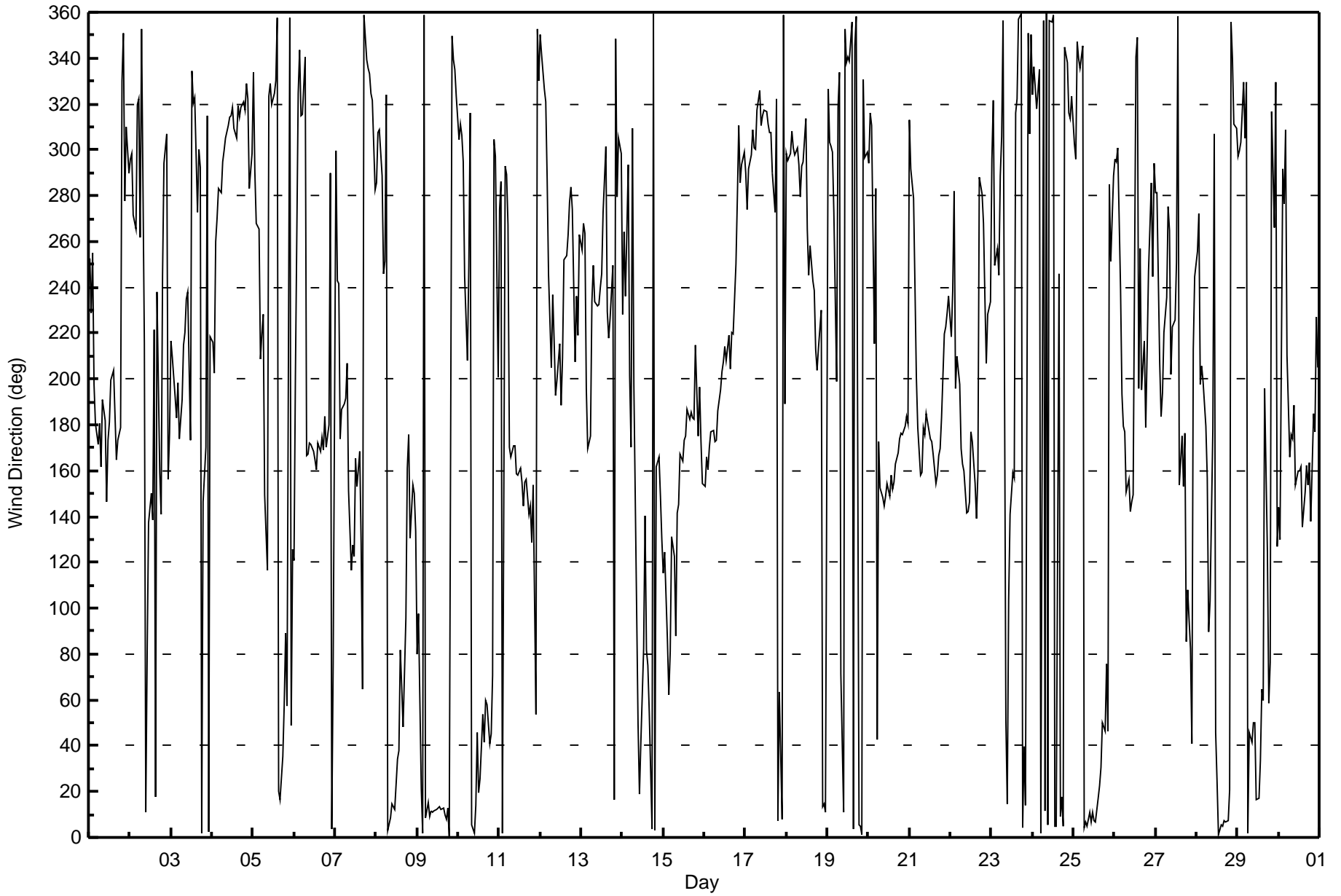
Direction of Maximum Speed: 175 deg on Jun 15 14:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 168.5 deg on Jun 15	Hours of Data: 720
Direction of Minimum Speed: 291 deg on Jun 30 03:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 0.2 deg on Jun 7	Percent Operational Time: 100.0
Monthly Average Direction: 268.9 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-Jun	252	229	255	197	181	171	180	162	191	182	147	173	181	199	204	184	165	173	179	330	351	278	310	290	188.8
2-Jun	296	298	271	265	320	322	262	353	215	11	80	137	150	138	222	18	238	159	141	245	294	307	156	177	215.2
3-Jun	216	209	192	183	198	174	191	215	220	235	238	173	335	320	323	273	300	292	2	146	170	315	2	218	239.1
4-Jun	216	202	260	271	283	281	295	300	305	310	314	315	319	309	305	319	314	318	321	317	329	322	283	298	307.4
5-Jun	334	290	268	266	209	220	228	150	117	323	329	320	324	330	358	20	16	35	58	89	57	358	49	126	346.1
6-Jun	121	202	325	344	315	316	340	167	167	172	172	168	165	161	172	168	175	169	184	170	180	290	4	76	172.5
7-Jun	300	243	241	174	187	189	191	207	152	117	127	123	165	153	168	128	64	359	339	335	333	325	321	283	237.0
8-Jun	286	308	309	289	246	251	324	3	8	14	14	12	34	38	82	66	48	96	161	176	131	154	150	133	72.9
9-Jun	80	98	21	2	359	9	15	9	12	11	12	12	13	13	12	13	10	8	13	0	350	339	335	323	8.8
10-Jun	305	311	307	295	244	208	249	316	6	2	14	46	19	26	54	41	60	58	41	45	71	304	297	201	10.0
11-Jun	274	286	2	293	289	267	170	166	171	171	158	158	161	155	145	155	156	141	144	129	154	54	353	330	155.3
12-Jun	350	342	326	321	287	245	205	237	217	193	199	215	189	209	252	254	263	277	284	274	208	236	219	263	241.1
13-Jun	256	268	264	196	170	175	234	249	234	232	240	246	273	301	230	218	227	250	17	348	280	305	299	245.6	
14-Jun	228	264	236	293	201	170	309	198	99	49	19	41	83	140	82	75	55	4	359	3	162	166	149	130	101.7
15-Jun	115	125	86	62	81	131	122	88	141	145	167	164	174	175	187	182	186	183	183	215	175	197	173	154	168.5
16-Jun	153	166	160	170	177	178	173	173	186	195	203	207	214	208	219	205	221	220	250	279	310	286	294	299	198.4
17-Jun	290	274	292	298	308	301	300	317	326	310	315	317	317	311	307	308	290	273	322	7	64	8	359	189	312.2
18-Jun	299	295	298	308	301	298	301	294	279	293	295	314	265	245	258	243	239	213	204	214	230	13	14	11	287.0
19-Jun	326	303	301	299	273	199	318	333	71	11	353	338	340	338	355	4	346	358	5	5	1	331	297	299	345.2
20-Jun	294	316	310	216	283	43	172	152	148	145	149	154	149	158	152	155	163	168	174	176	176	180	184	181	165.4
21-Jun	313	292	279	241	201	179	158	159	179	176	185	178	174	173	167	155	158	167	170	183	220	223	229	236	177.8
22-Jun	218	238	282	196	210	198	169	163	160	141	142	147	177	173	154	139	159	288	281	268	236	207	228	233	185.6
23-Jun	296	322	250	257	245	289	306	356	51	15	104	141	159	157	316	322	357	359	4	40	14	351	307	350	340.4
24-Jun	324	336	318	326	335	2	356	12	360	5	356	356	359	5	5	246	9	17	5	345	338	316	314	323	351.5
25-Jun	303	296	347	340	336	346	4	7	5	11	6	11	7	7	17	23	30	50	47	75	47	285	251	288	4.6
26-Jun	296	295	301	239	194	179	177	151	156	142	146	149	340	349	196	257	195	217	179	212	247	286	245	294	196.6
27-Jun	281	281	207	184	194	220	235	275	265	202	223	226	251	358	154	175	153	176	86	108	82	41	213	245	205.2
28-Jun	256	272	198	206	199	180	157	90	103	178	307	46	25	1	6	5	7	7	7	21	356	340	311	309	4.9
29-Jun	297	299	303	329	305	330	2	45	41	50	50	17	17	34	65	60	196	125	59	76	317	266	329	127	14.0
30-Jun	144	130	291	276	308	210	166	176	174	189	154	160	160	162	135	150	162	154	164	138	185	177	227	205	166.4

287.7 276.7 287.2 276.6 253.1 231.2 228.1 217.5 203.5 227.9 199.6 188.7 266.0 236.7 235.8 173.4 209.6 237.3 300.6 348.1 277.4 296.9 290.0 274.7

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 - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 100 deg on Jun 28 11:00 Minimum Value: 8 deg on Jun 10 00:00 Percentiles: P ₁ = 11 P ₁₀ = 16 Q ₁ = 20 Median = 34 Q ₃ = 52 P ₉₀ = 68 P ₉₉ = 94		Hours in Service: 720 Hours of Data: 720 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-Jun	24	23	59	51	21	21	71	34	42	52	14	37	21	32	43	23	15	16	51	49	25	71	18	20	71
2-Jun	20	22	31	48	37	84	69	63	75	93	59	73	39	74	83	88	46	23	67	48	24	28	68	18	93
3-Jun	51	27	82	69	35	17	18	32	36	54	63	66	85	23	46	68	47	91	58	58	48	89	83	90	91
4-Jun	46	14	43	51	43	41	31	31	19	22	27	25	22	51	34	21	17	16	14	15	26	38	26	15	51
5-Jun	21	41	65	79	67	60	86	51	65	63	22	23	27	30	26	39	48	45	55	34	60	18	91	37	91
6-Jun	31	74	85	58	27	13	84	29	18	16	19	17	19	18	19	20	18	14	15	15	17	80	62	78	85
7-Jun	17	57	60	68	28	34	58	67	98	38	39	76	49	44	16	73	61	30	22	17	14	10	52	51	98
8-Jun	22	53	17	32	32	68	30	19	31	43	32	28	48	44	46	53	62	39	25	17	46	18	16	44	68
9-Jun	41	47	55	14	17	21	31	20	22	21	22	22	21	20	21	22	18	23	34	17	17	14	13	8	55
10-Jun	10	56	14	27	23	34	60	42	44	25	37	52	46	56	51	57	51	77	51	45	54	20	14	85	85
11-Jun	41	50	48	56	21	43	53	18	17	18	16	16	18	19	18	17	27	35	17	17	45	56	15	40	56
12-Jun	22	20	22	36	28	51	26	48	41	20	29	38	21	32	49	51	51	45	40	50	27	45	37	52	52
13-Jun	48	48	53	25	18	22	49	60	51	56	44	46	53	55	44	55	43	47	58	49	28	85	64	17	85
14-Jun	48	47	57	35	60	47	66	90	65	60	46	89	65	57	50	57	64	17	18	16	39	16	25	30	90
15-Jun	32	20	39	51	70	35	35	61	40	17	15	17	17	15	18	18	18	17	18	37	30	56	26	24	70
16-Jun	15	13	13	14	14	16	15	15	20	24	27	29	35	37	43	40	50	50	51	46	25	21	18	17	51
17-Jun	27	39	28	28	21	24	25	20	16	15	14	20	23	23	30	27	40	44	26	25	53	41	62	41	62
18-Jun	21	17	16	12	19	25	24	35	48	41	47	44	60	60	59	53	57	47	32	36	44	40	48	54	60
19-Jun	14	16	19	26	48	63	81	50	51	22	31	24	24	22	23	19	23	20	21	19	14	21	11	17	81
20-Jun	12	17	20	39	59	86	25	25	19	18	25	19	17	17	17	15	16	14	14	13	11	11	9	12	86
21-Jun	67	56	32	38	17	15	13	13	19	19	24	20	25	31	45	16	18	19	15	11	19	45	68	61	68
22-Jun	53	69	38	57	18	26	23	18	19	18	16	16	76	65	19	26	16	51	43	48	46	97	72	49	97
23-Jun	35	62	52	33	65	55	65	63	86	40	76	57	77	69	31	36	52	37	17	53	42	33	64	20	86
24-Jun	77	59	35	13	74	56	16	26	23	29	24	21	19	18	30	40	47	32	66	17	14	18	17	39	77
25-Jun	15	18	16	19	16	22	17	21	17	22	20	21	24	25	34	45	52	54	53	51	75	19	38	44	75
26-Jun	19	24	54	54	40	21	21	16	21	15	14	25	87	98	95	85	20	44	31	29	52	69	96	35	98
27-Jun	42	48	43	21	29	60	73	71	46	56	49	50	63	90	27	48	38	28	60	36	65	67	71	29	90
28-Jun	40	21	62	27	13	13	63	75	78	66	100	47	43	24	20	24	18	19	20	34	15	16	19	20	100
29-Jun	25	28	37	24	77	88	68	67	76	63	68	65	39	74	93	73	61	56	91	32	23	47	44	58	93
30-Jun	18	28	99	50	45	62	15	16	18	25	83	16	42	71	51	29	30	22	17	14	29	33	55	46	99
	77	74	99	79	77	88	86	90	98	93	100	89	87	98	95	88	64	91	91	58	75	97	96	90	
	Diurnal Maximum																								



Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 1, 2016	Last Calibration	May 12, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	8:35	End Time (MST)	13:45
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	-614
Analyzer IP address	192.168.1.43		Lamp voltage	819	813
Calculated slope	0.998135	0.989640	Chamber temp	45.0	44.9
Calculated intercept	0.739025	0.444017	Pressure	699.6	679.2
Analyzer Background	12.9	13.2	Flow	0.510	0.493
Analyzer Coefficient	0.950	0.954	Intensity	92	91

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	-0.1	----
as found span	5500	81.3	734.7	735.9	0.998
calibrator zero	5500	0.0	0.0	0.2	----
high point	5500	81.3	734.7	742.2	0.990
second point	5500	45.6	412.1	415.8	0.991
third point	5500	22.8	206.0	206.9	0.996
as left zero	5500	0.0	0.0	0.6	----
as left span	5500	81.3	734.7	736.9	0.997
Average Correction Factor					0.992

Corrected As found 736.0 Previous response 735.3 % change -0.1%

Notes:

Inlet filter changed after as founds. Second zero and span point completed after filter change to document any changes.
Span adjusted.

Calibration Performed By: Devin Russell



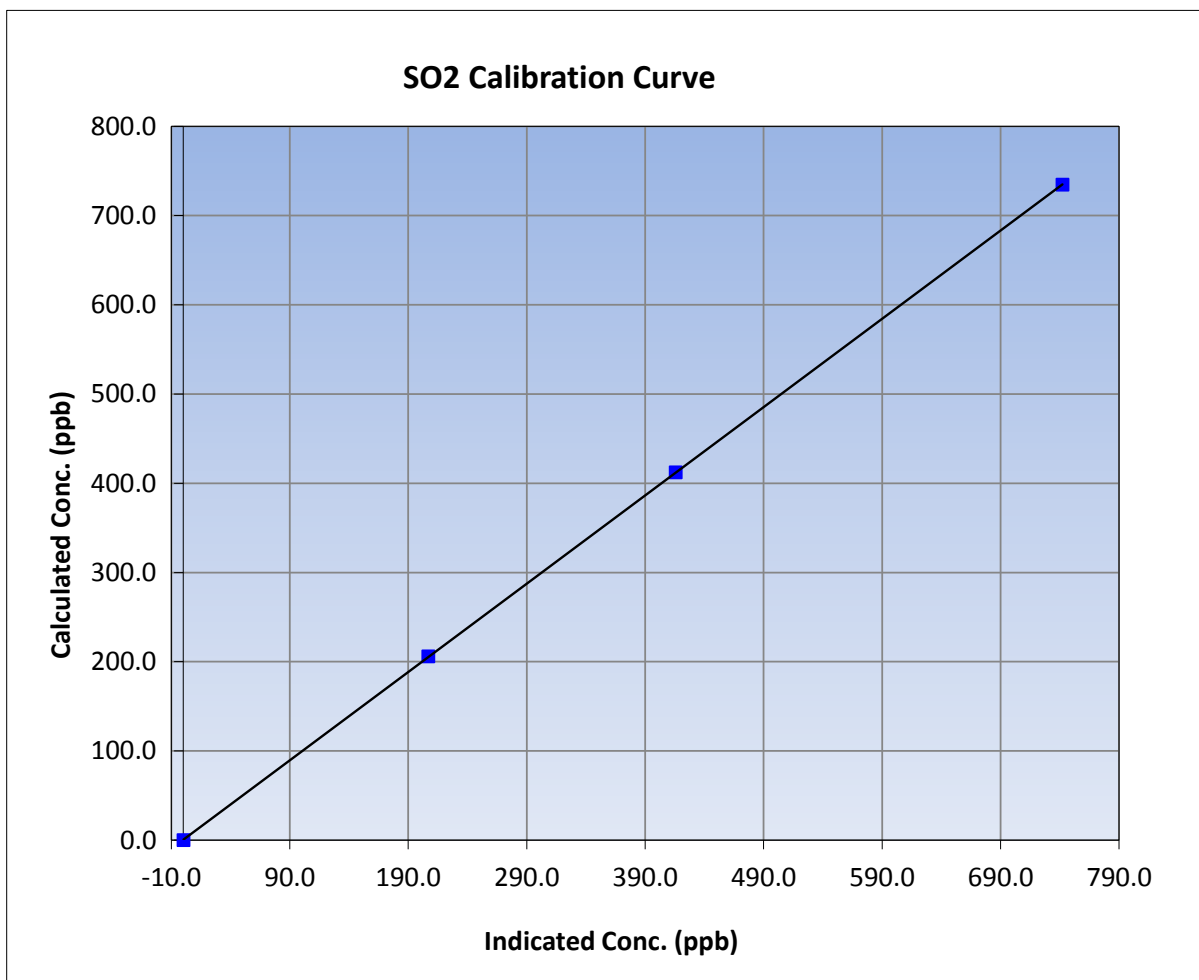
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 12, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:35	End Time (MST)	13:45
Analyzer make	Thermo 43i	Analyzer serial #	JC1501301448

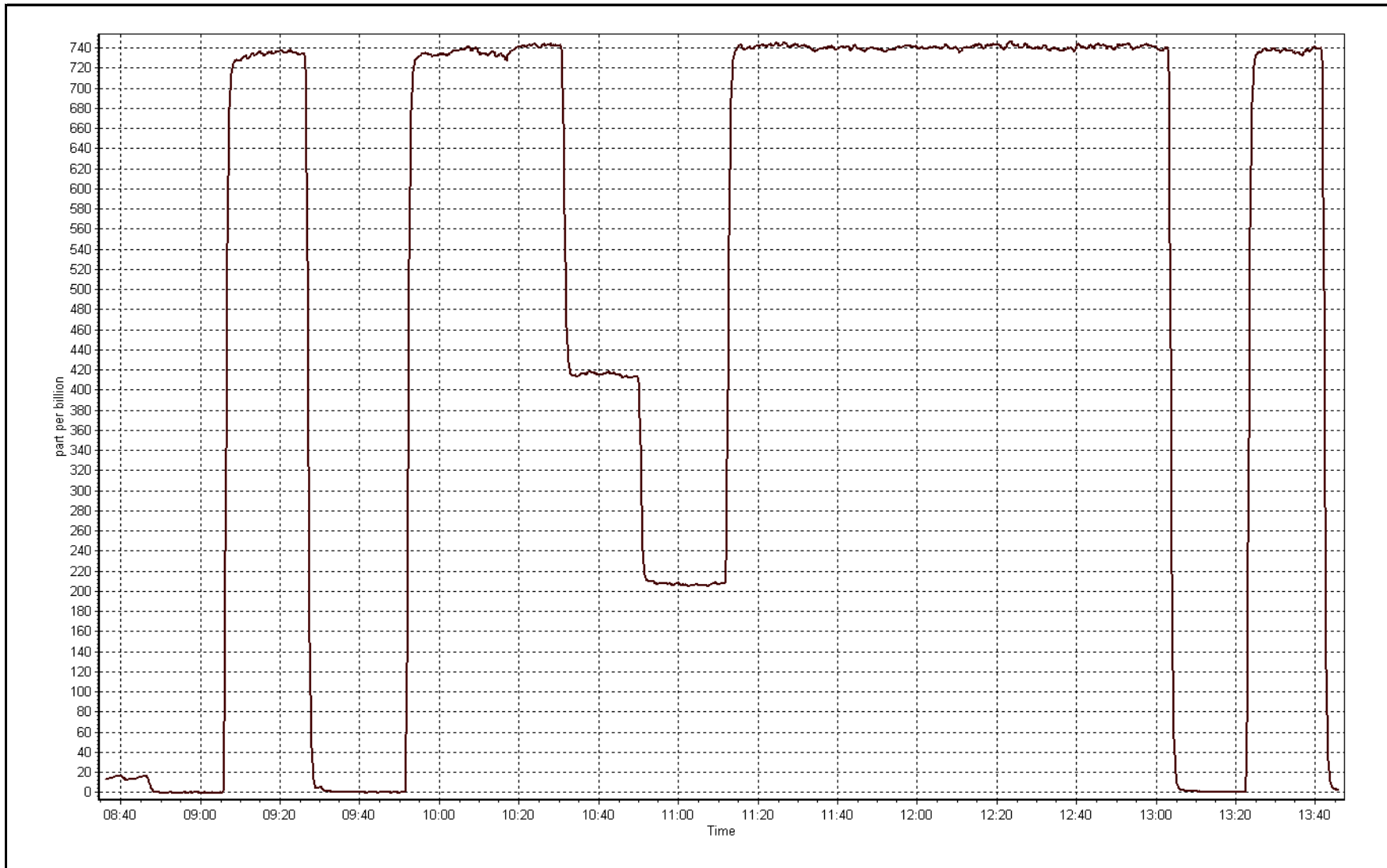
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999996
734.7	742.2	0.9898		
412.1	415.8	0.9910	Slope	0.989640
206.0	206.9	0.9959		
			Intercept	0.444017



SO2 Calibration Plot

Date: June 1, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	June 8, 2016	Last Calibration	May 13, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	8:15	End Time (MST)	11:55
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	-860	-860
Analyzer IP address	192.168.1.42		Lamp voltage	1159	1146
Calculated slope	0.993314	1.005606	Chamber temp	45	45
Calculated intercept	0.054832	-0.058537	Pressure	682.0	672.1
Analyzer Background	1.9	1.9	Flow	0.443	0.437
Analyzer Coefficient	1.029	1.029	Intensity	79	79
			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	-0.1	----
as found span	6500	46.0	75.0	74.1	1.013
SO2 scrubber check	5500	22.8	206.0	0.5	----
calibrator zero	6500	0.0	0.0	0.0	----
high point	6500	46.0	75.0	74.6	1.005
second point	6500	24.6	40.1	40.0	1.003
third point	6500	12.3	20.1	20.0	1.001
as left zero	6000	0.0	0.0	0.0	----
as left span	6500	46.0	75.0	75.3	0.996
Average Correction Factor					1.003

Corrected As found	74.2	Previous response	75.5	% change	1.7%
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Notes:

Inlet filter changed after as founds. Second zero and span point completed after filter change to document any changes. No adjustments made. Scrubber check completed after third point.

Calibration Performed By:

Devin Russell



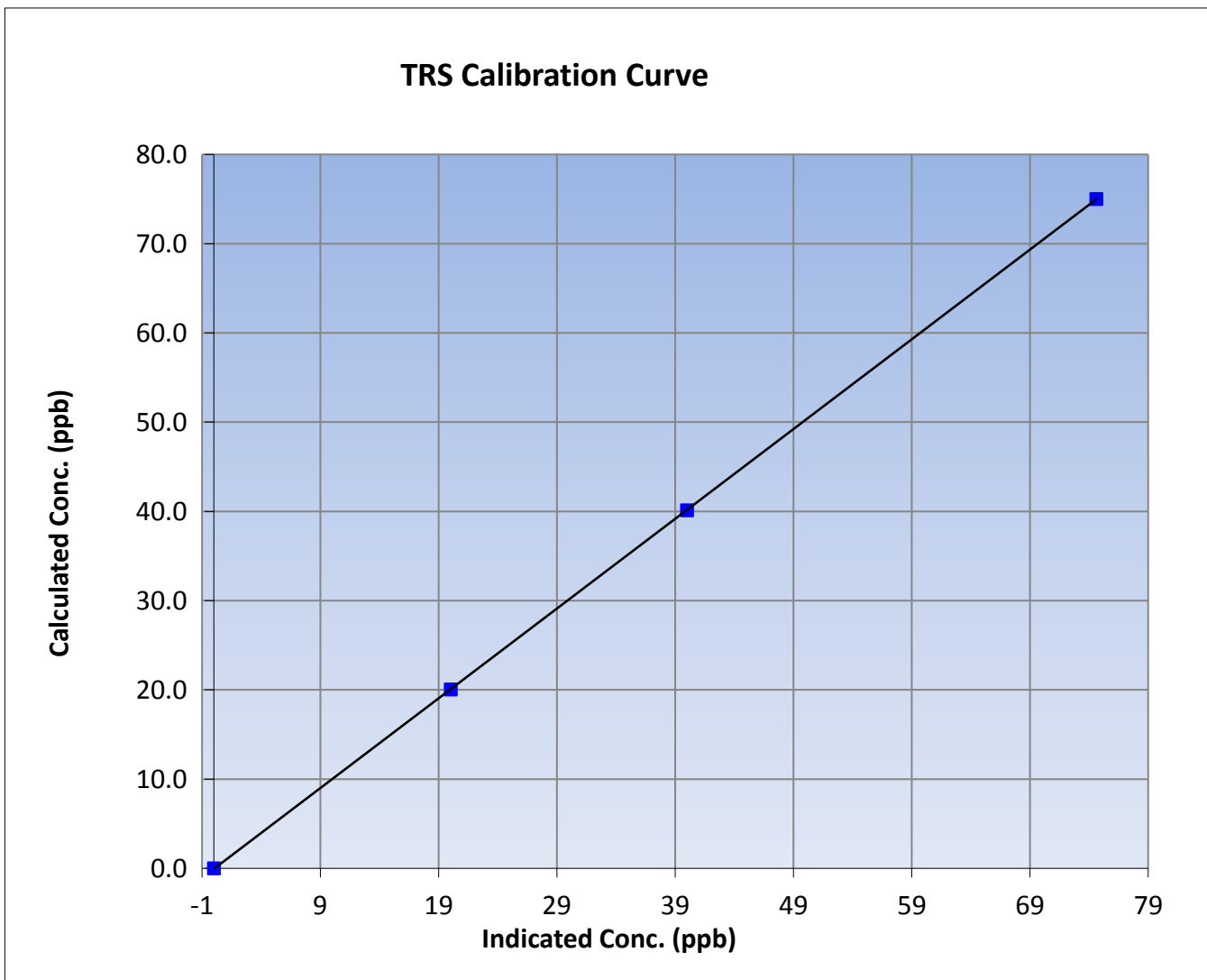
Wood Buffalo Environmental Association TRS Calibration Report

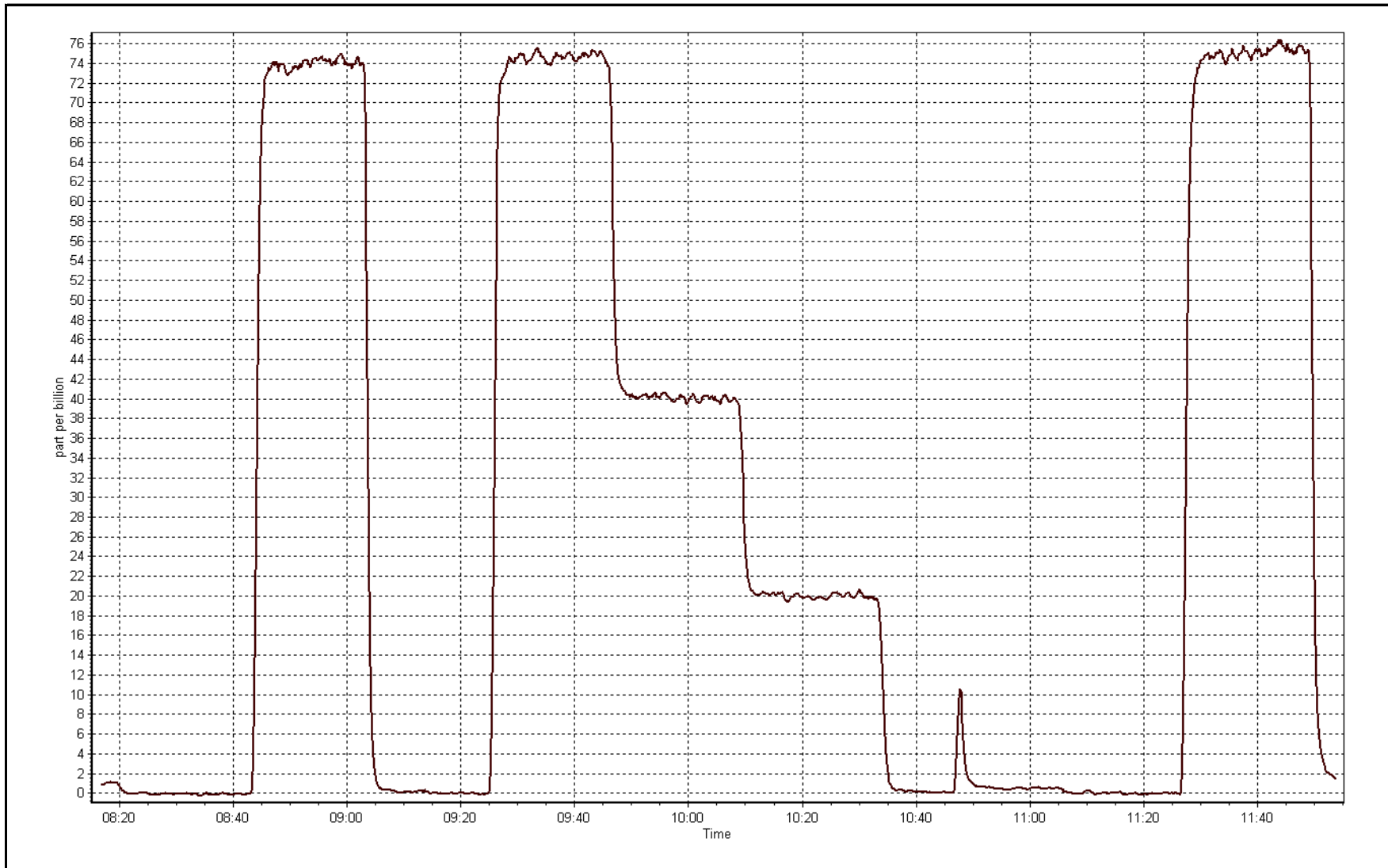
Station Information

Calibration Date	June 8, 2016	Previous Calibration	May 13, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:15	End Time (MST)	11:55
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	0.999998
75.0	74.6	1.0053		
40.1	40.0	1.0029	Slope	1.005606
20.1	20.0	1.0009		
			Intercept	-0.058537







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	June 1, 2016	Last Calibration	May 12, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	8:35	End Time (MST)	13:45
Gas Cert Reference	LL107945	Cal Gas Expiry Date	September-08-18
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	75.3	75.2
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	0.998541	0.998743	Carrier Pressure	37.3	37.3
THC Calc intercept	0.037372	0.025928	Fuel Pressure	44.3	44.3
NMHC Calc slope	1.001848	0.998322	Air Pressure	38.9	39.0
NMHC Calc intercept	-0.004412	-0.011193			

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	15.41	1.022
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	15.74	15.76	0.999
second point	5500	45.6	8.83	8.78	1.006
third point	5500	22.8	4.41	4.38	1.008
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	15.74	15.72	1.001
Average Correction Factor					1.004

Corrected As found 15.41 Previous response 15.73 % change 2.1%

Notes:

Inlet filter changed after as founds. Second zero and span point completed after filter change to document any changes. Span adjusted.

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	7.92	1.027
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	8.13	8.15	0.998
second point	5500	45.6	4.56	4.58	0.996
third point	5500	22.8	2.28	2.31	0.987
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	8.13	8.13	1.000
Average Correction Factor					0.993

Corrected As found 7.92 Previous response 8.12 % change 2.5%

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	5500	0	0.00	0.00	----
as found span	5500	81.3	7.61	7.50	1.015
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	4.20	1.017
third point	5500	22.8	2.13	2.07	1.031
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	7.61	7.58	1.004
Average Correction Factor					1.017

Corrected As found 7.50 Previous response 7.61 % change 1.5%



Wood Buffalo Environmental Association

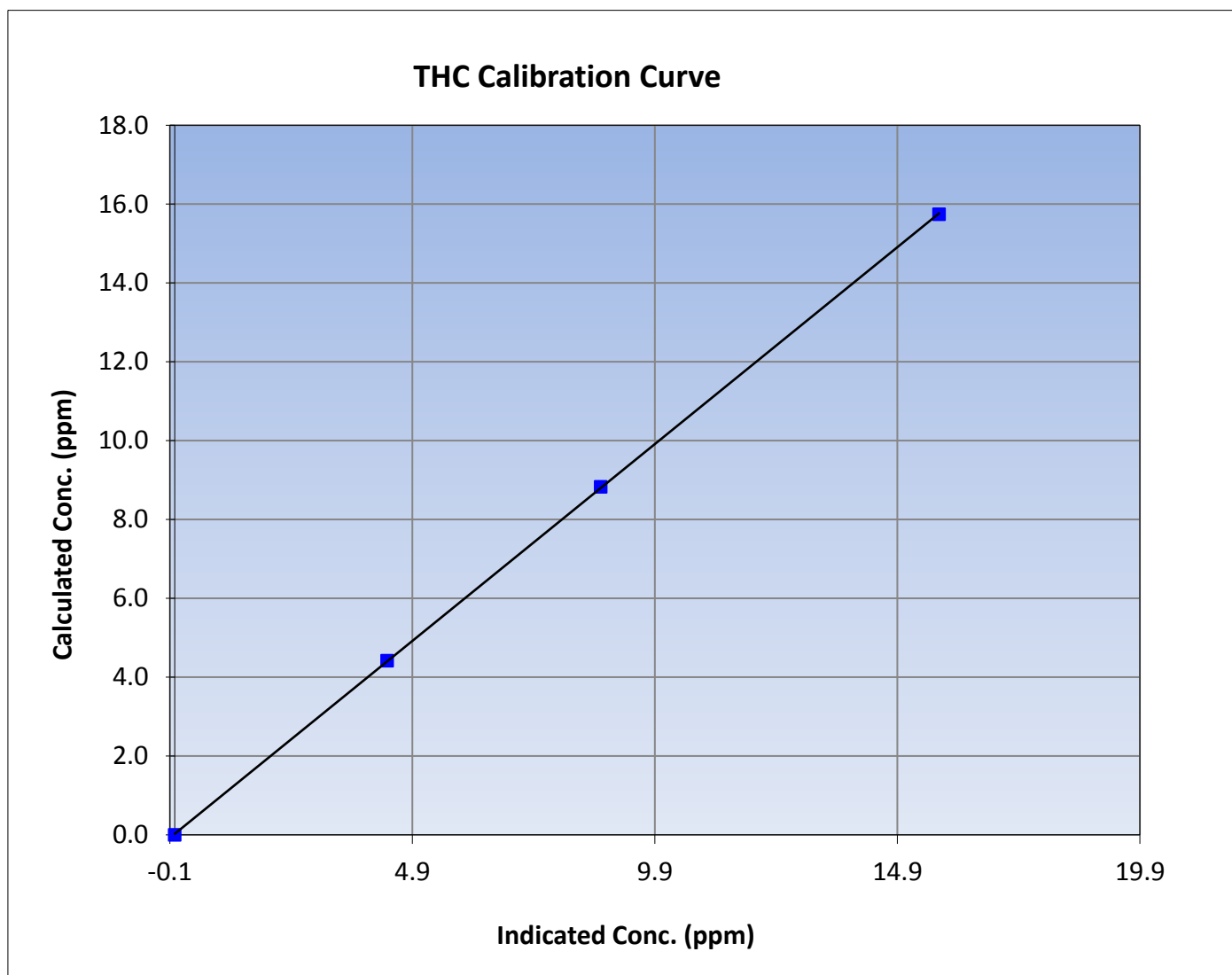
THC Calibration Summary

Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 12, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:35	End Time (MST)	13:45
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	0.999980
15.74	15.76	0.9989		
8.83	8.78	1.0057	Slope	0.998743
4.41	4.38	1.0080		
			Intercept	0.025928





Wood Buffalo Environmental Association

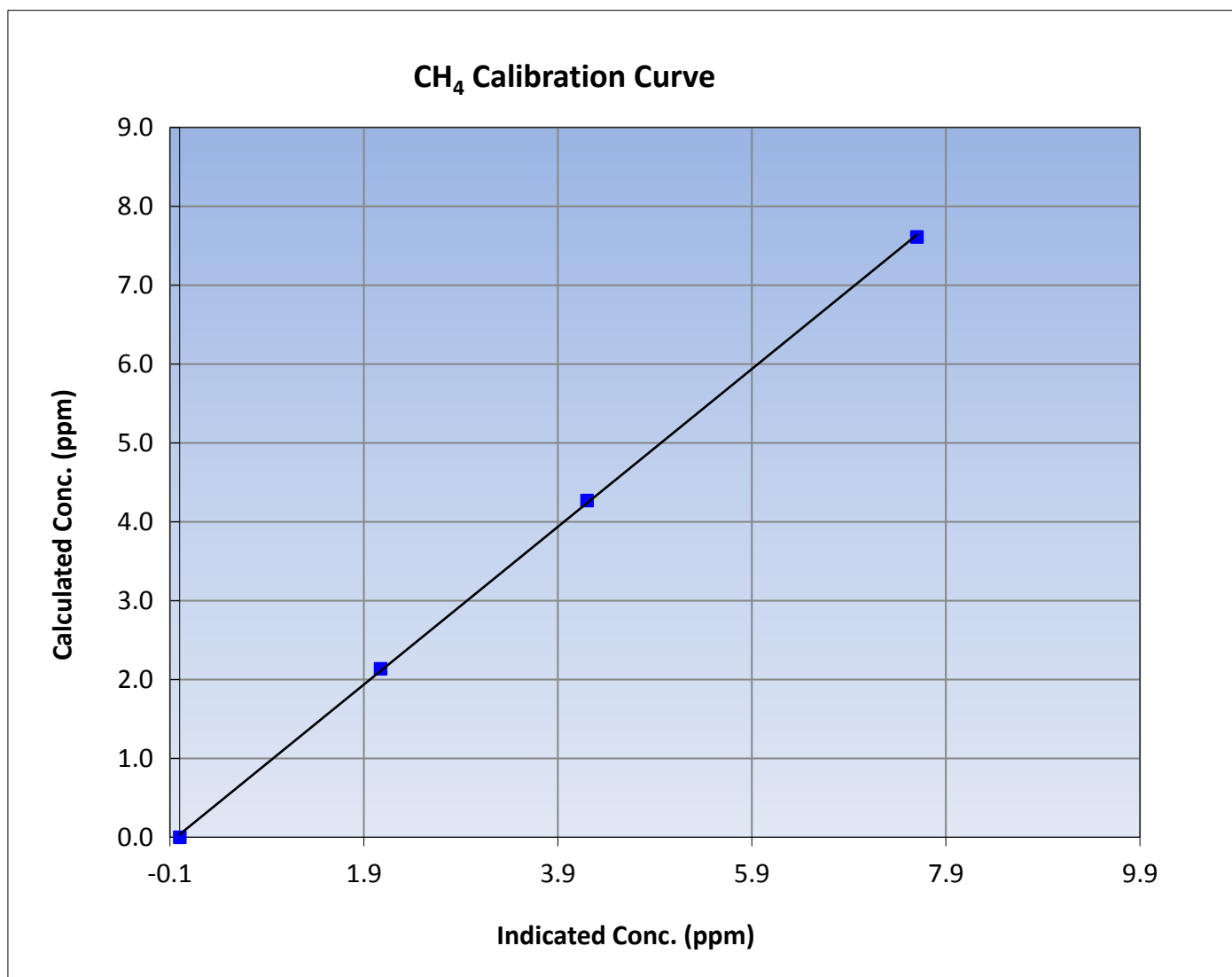
CH₄ Calibration Summary

Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 12, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:35	End Time (MST)	13:45
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	0.999879
7.61	7.60	1.0017		
4.27	4.20	1.0166	Slope	1.000400
2.13	2.07	1.0314		
			Intercept	0.035452





Wood Buffalo Environmental Association

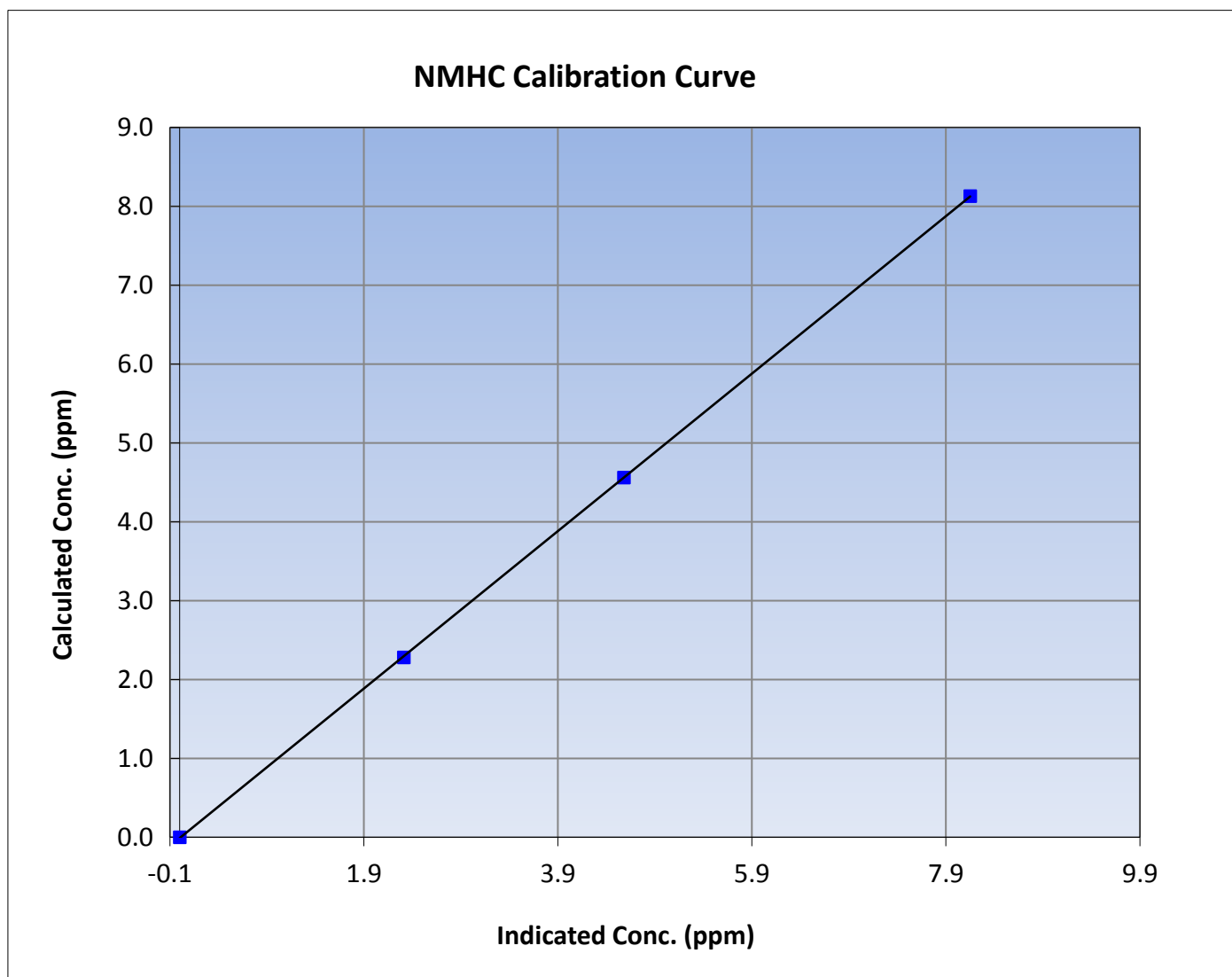
NMHC Calibration Summary

Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 12, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:35	End Time (MST)	13:45
Analyzer make	Thermo 55i	Analyzer serial #	1152430012

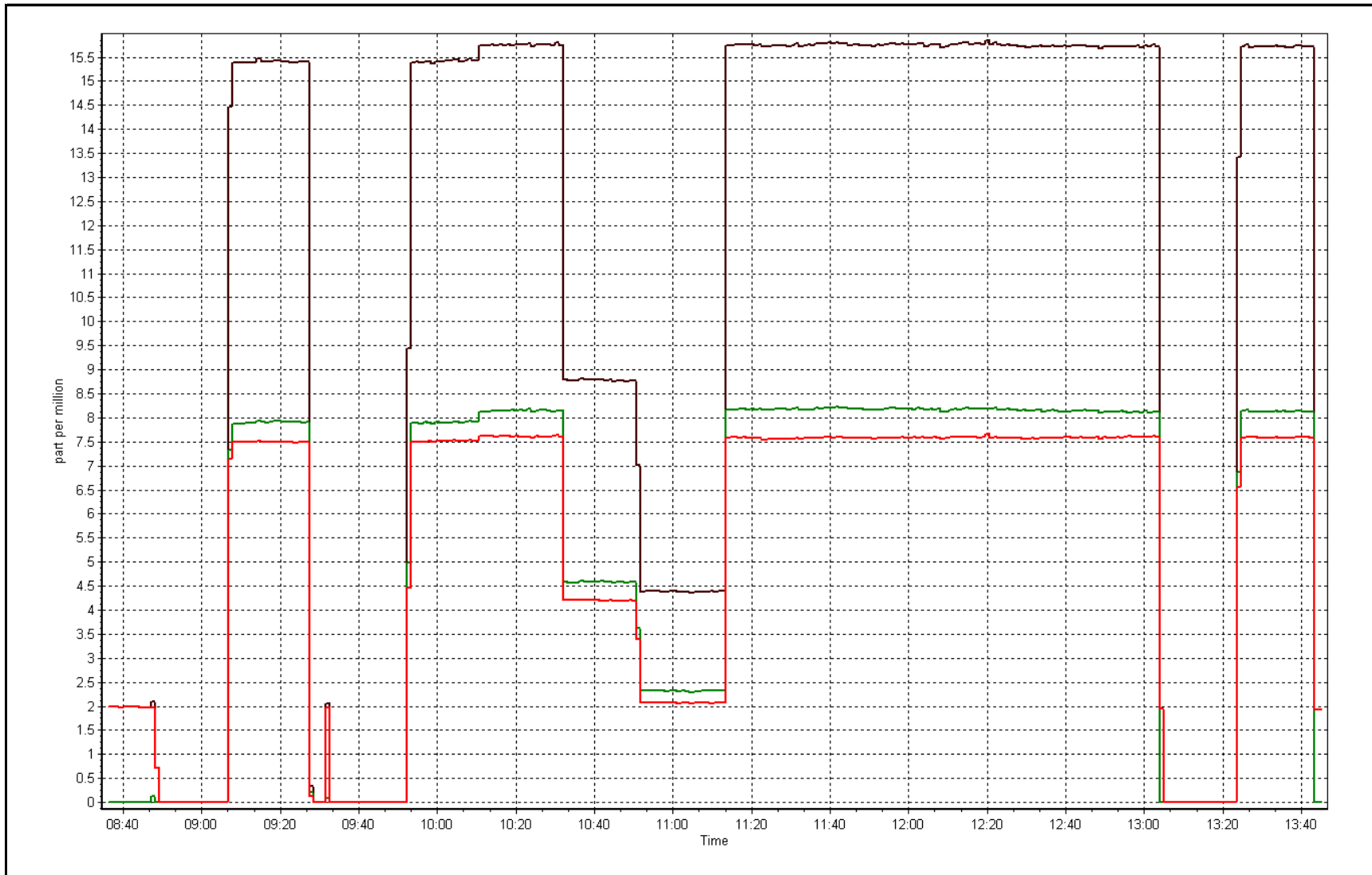
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999990
8.13	8.15	0.9975		
4.56	4.58	0.9956	Slope	0.998322
2.28	2.31	0.9870		
			Intercept	-0.011193



THC Calibration Plot

Date: June 1, 2016





Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	June 24, 2016	Last Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	8:48	End Time (MST)	12:00
Gas Cert Reference	LL107945	Cal Gas Expiry Date	September-08-18
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	75.2	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	0.998743	0.999174	Carrier Pressure	37.3	37.3
THC Calc intercept	0.025928	0.025309	Fuel Pressure	44.3	44.3
NMHC Calc slope	0.998322	0.999760	Air Pressure	39.0	39.0
NMHC Calc intercept	-0.011193	-0.011600			

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	15.71	1.002
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	15.74	15.76	0.999
second point	5500	45.6	8.83	8.76	1.008
third point	5500	22.8	4.41	4.39	1.006
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	15.74	15.76	0.999
Average Correction Factor					1.004

Corrected As found 15.71 Previous response 15.74 % change 0.2%

Notes:

H2 cylinder changed after as founds. Span response increased. Adjusted span, completed 3-point calibration.

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	8.14	0.999
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	4.57	0.998
third point	5500	22.8	2.28	2.31	0.987
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					0.995

Corrected As found 8.14 Previous response 8.15 % change 0.2%

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	7.57	1.006
calibrator zero	5500	0.0	0.00	0.00	----
high point	5500	81.3	7.61	7.62	0.999
second point	5500	45.6	4.27	4.20	1.017
third point	5500	22.8	2.13	2.07	1.031
as left zero	5500	0.0	0.00	0.00	----
as left span	5500	81.3	7.61	7.62	0.999
Average Correction Factor					1.016

Corrected As found 7.57 Previous response 7.58 % change 0.2%



Wood Buffalo Environmental Association

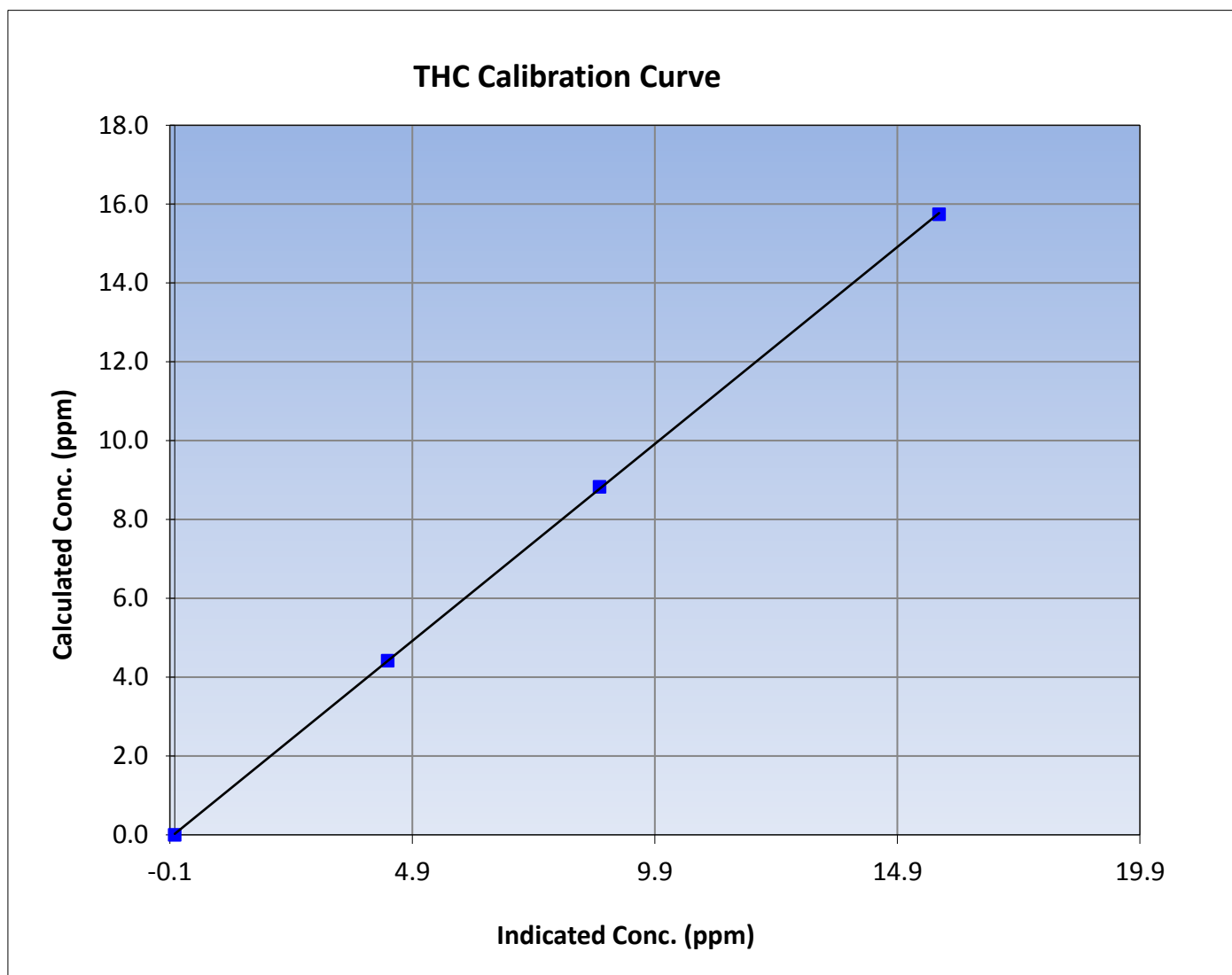
THC Calibration Summary

Station Information

Calibration Date	June 24, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:48	End Time (MST)	12:00
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	0.999969
15.74	15.76	0.9989		
8.83	8.76	1.0080	Slope	0.999174
4.41	4.39	1.0057		
			Intercept	0.025309





Wood Buffalo Environmental Association

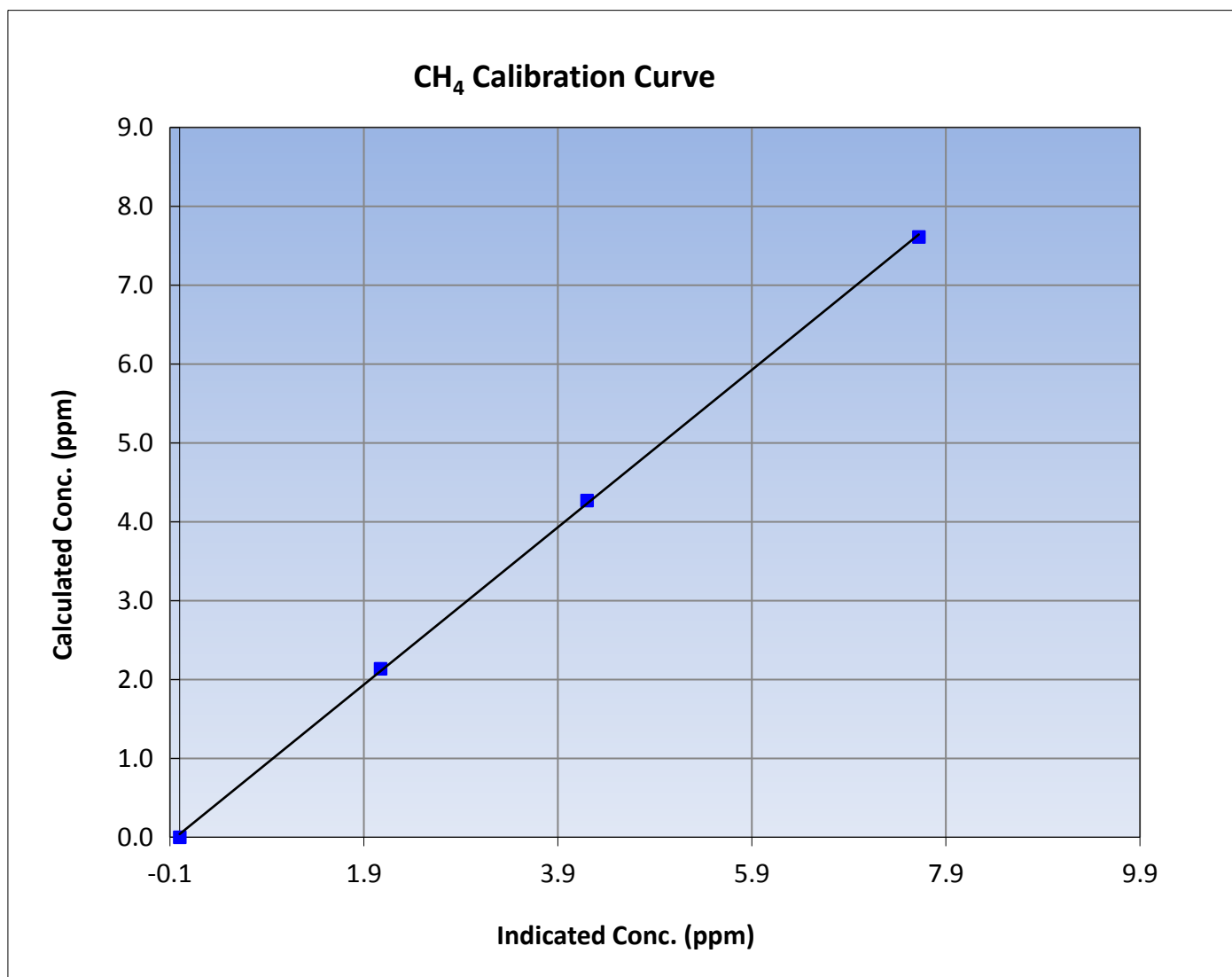
CH₄ Calibration Summary

Station Information

Calibration Date	June 24, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:48	End Time (MST)	12:00
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	0.999844
7.61	7.62	0.9990		
4.27	4.20	1.0166	Slope	0.997771
2.13	2.07	1.0314		
			Intercept	0.039581





Wood Buffalo Environmental Association

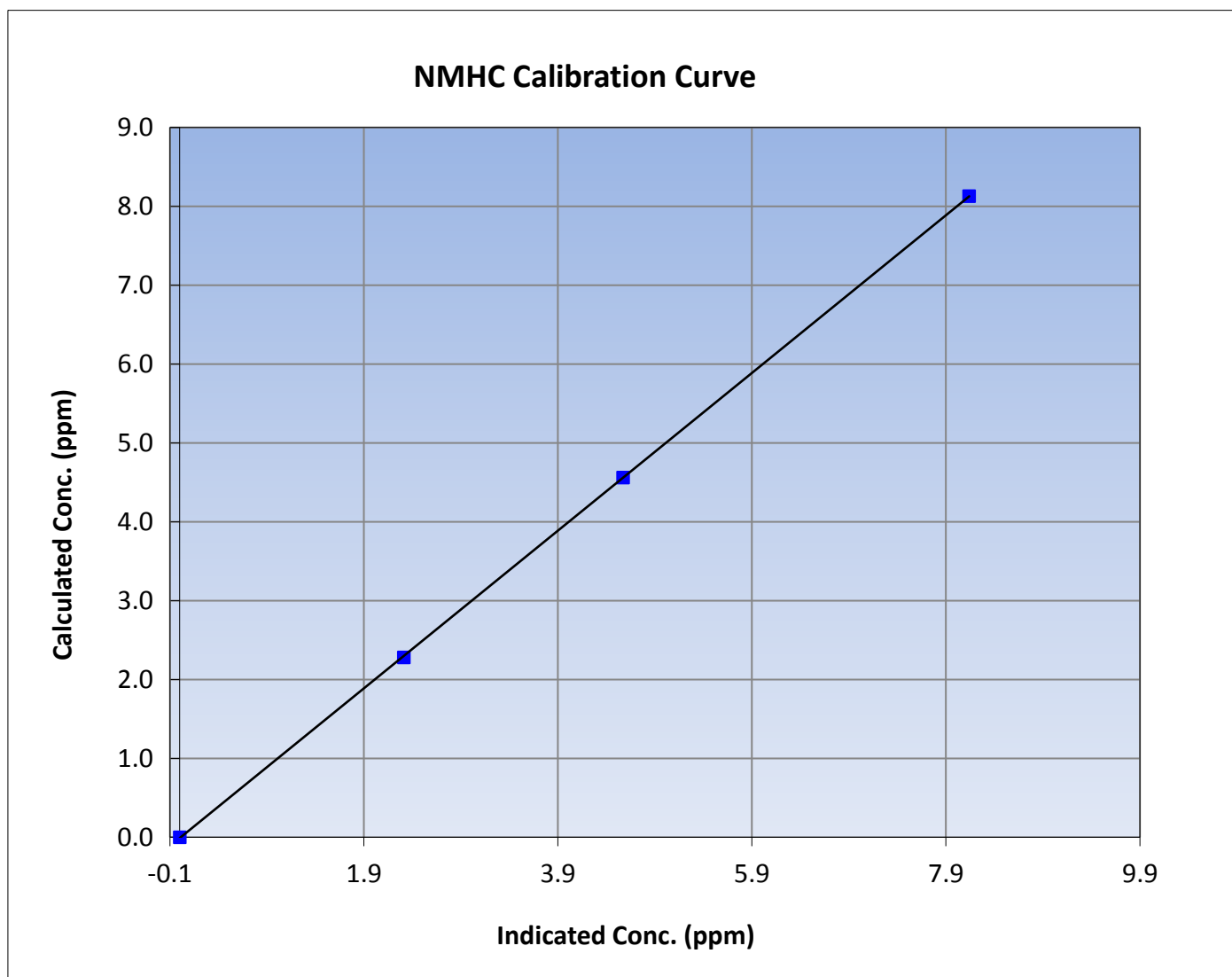
NMHC Calibration Summary

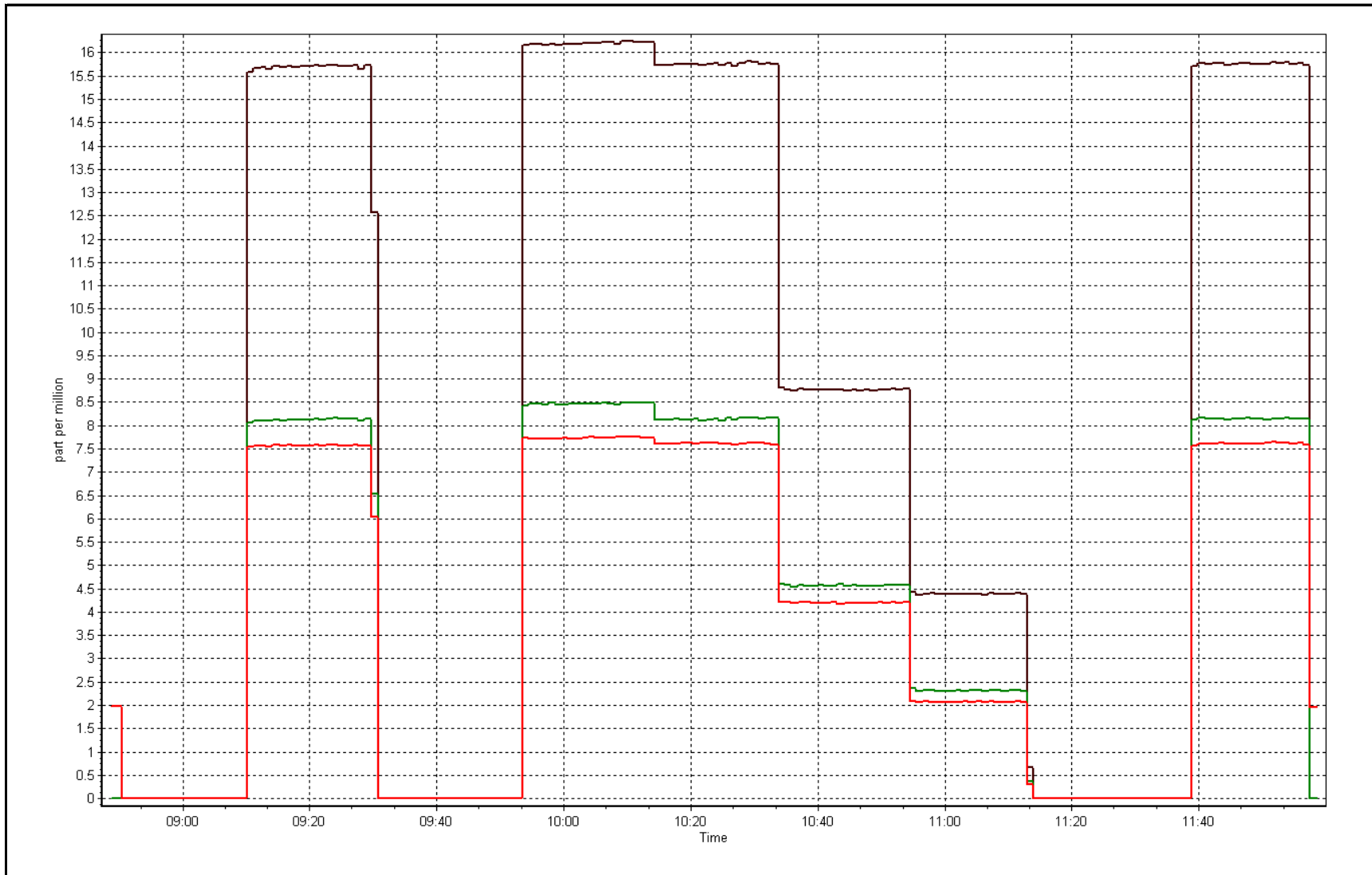
Station Information

Calibration Date	June 24, 2016	Previous Calibration	June 1, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:48	End Time (MST)	12:00
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	0.999987
8.13	8.14	0.9988		
4.56	4.57	0.9978	Slope	0.999760
2.28	2.31	0.9870		
			Intercept	-0.011600







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	June 2, 2016	Previous Calibration	May 13, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	12:16	End Time (MST)	14:40
NO2 GPT Ref date	June-01-16	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.	27.4	27.8
Analyzer IP address	192.168.1.79		Lamp temp.	58.0	58.0
Calculated slope	0.997704	0.995156	Pressure	27.4	26.5
Calculated intercept	-0.840018	-0.586649	Flow cell A	0.776	0.738
Analyzer Background	0.7	0.7	Flow cell B	0.776	0.738
Analyzer Coefficient	1.085	1.085	Cell A Intensity	NA	NA
			Cell B Intensity	NA	NA

Analyzer make	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	5000	0.00	0.0	0.0	----
as found span	5000	0.98	414.8	415.6	0.998
calibrator zero	5000	0.00	0.0	0.1	----
high point	5000	0.98	414.8	416.8	0.995
second point	5000	0.56	246.4	249.2	0.989
third point	5000	0.34	128.1	129.5	0.989
as left zero	5000	0.98	0.0	-0.1	----
as left span	5000	0.00	414.8	429.2	0.966
Average Correction Factor					0.991

Corrected As found	415.6	Previous response	416.6	% change	0.2%
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Notes:

Inlet filter changed after as founds. Second zero and span point completed after filter change to document any changes. No adjustments made. As left point were shortened to 5 minutes due to time restraints.

Calibration Performed By: Devin Russell



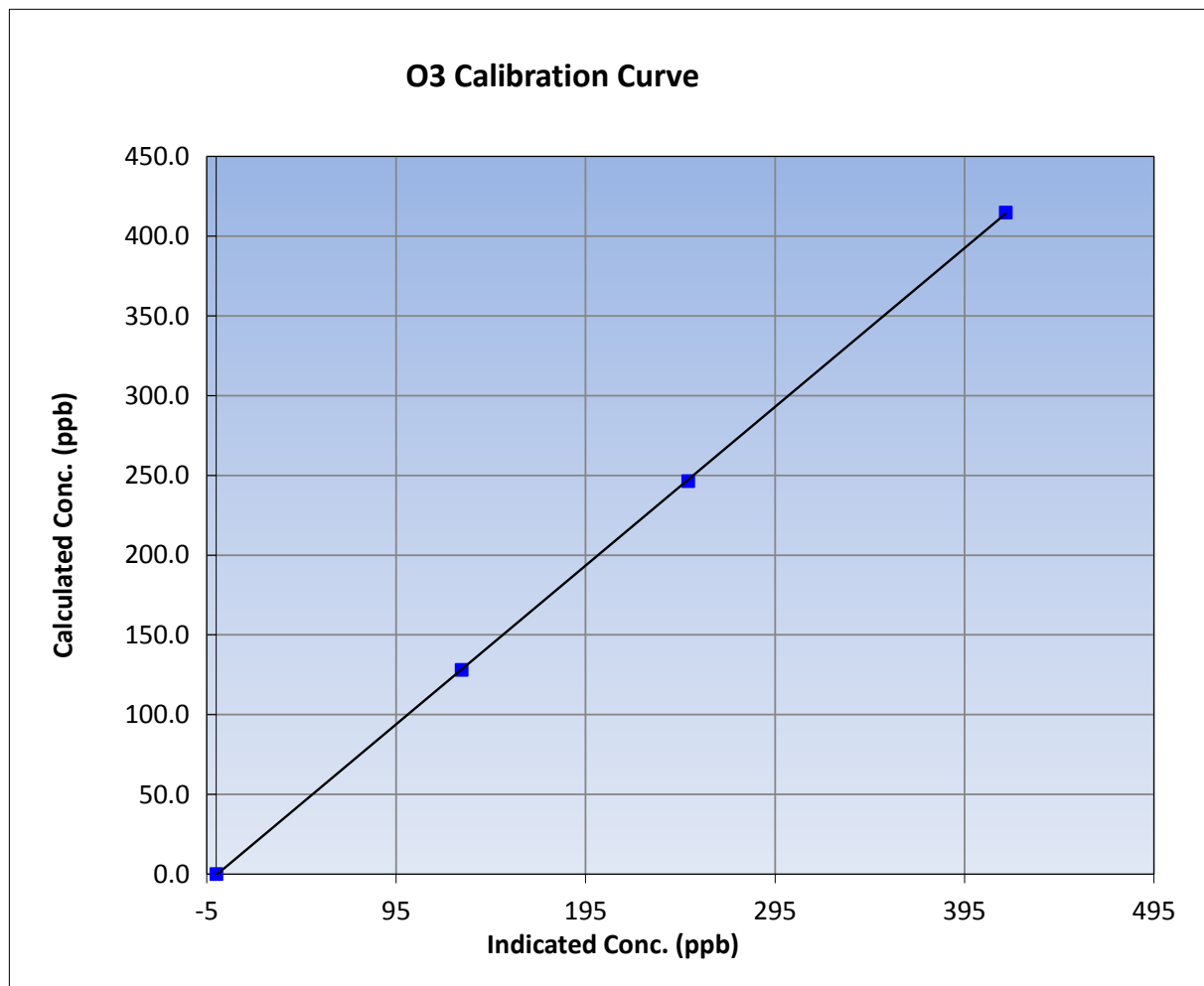
Wood Buffalo Environmental Association O3 Calibration Report

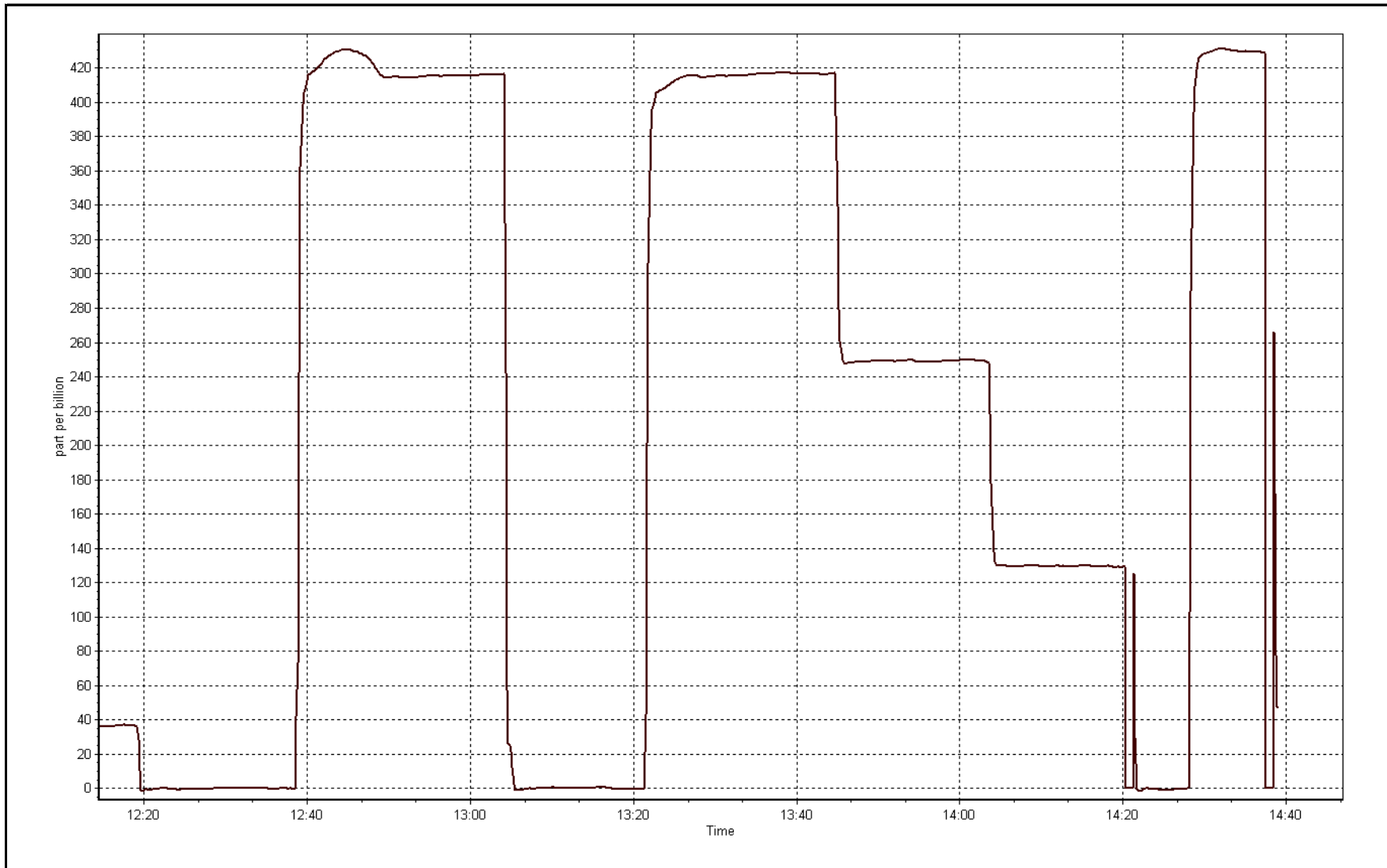
Station Information

Calibration Date	June-02-16	Previous Calibration	May 13, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	12:16	End Time (MST)	14:40
Analyzer make	API T400	Analyzer serial #	1107

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999982
414.8	416.8	0.9953		
246.4	249.2	0.9889	Slope	0.995156
128.1	129.5	0.9892		
			Intercept	-0.586649







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	June 13, 2016	Previous Calibration	June 2, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	<input type="checkbox"/> Other: <input checked="" type="checkbox"/> Maintenance		
Start Time (MST)	11:05	End Time (MST)	13:40
NO2 GPT Ref date	May-12-16	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.	27.8	27.7
Analyzer IP address	192.168.1.79		Lamp temp.	58.0	58.0
Calculated slope	0.995156	0.985566	Pressure	26.5	26.4
Calculated intercept	-0.586649	0.706997	Flow cell A	0.738	0.738
Analyzer Background	0.7	0.7	Flow cell B	0.738	0.738
Analyzer Coefficient	1.085	1.085	Cell A Intensity	NA	NA
			Cell B Intensity	NA	NA

Analyzer make	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	5000	0.00	0.0	0.3	----
as found span	5000	0.98	414.8	421.2	0.985
calibrator zero	5000	0.00	0.0	0.3	----
high point	5000	0.98	414.8	421.2	0.985
second point	5000	0.56	246.4	247.7	0.995
third point	5000	0.34	128.1	128.8	0.995
as left zero	5000	0.98	0.0	0.2	----
as left span	5000	0.00	414.8	425.6	0.975
Average Correction Factor					0.991

Corrected As found	421.0	Previous response	417.4	% change	-0.8%
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Notes:

As founds completed. Troubleshooting completed to determine why signal drops off periodically. Voltages look good. Diagnostics show no indication as to why the signal is dropping out. Sensitivity and linearity were checked; both were good.

Calibration Performed By: Devin Russell



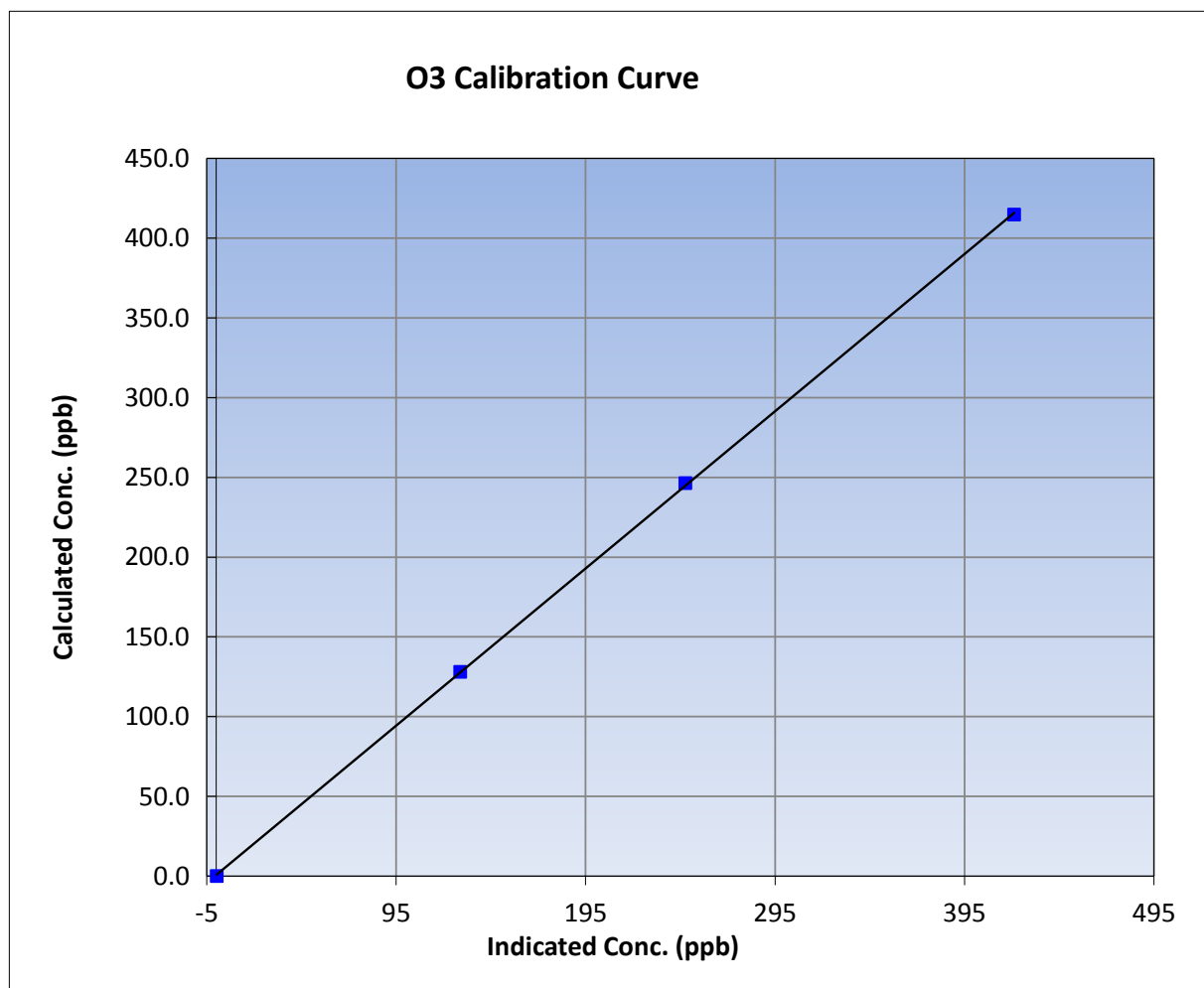
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	June-13-16	Previous Calibration	June 2, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	11:05	End Time (MST)	13:40
Analyzer make	API T400	Analyzer serial #	1107

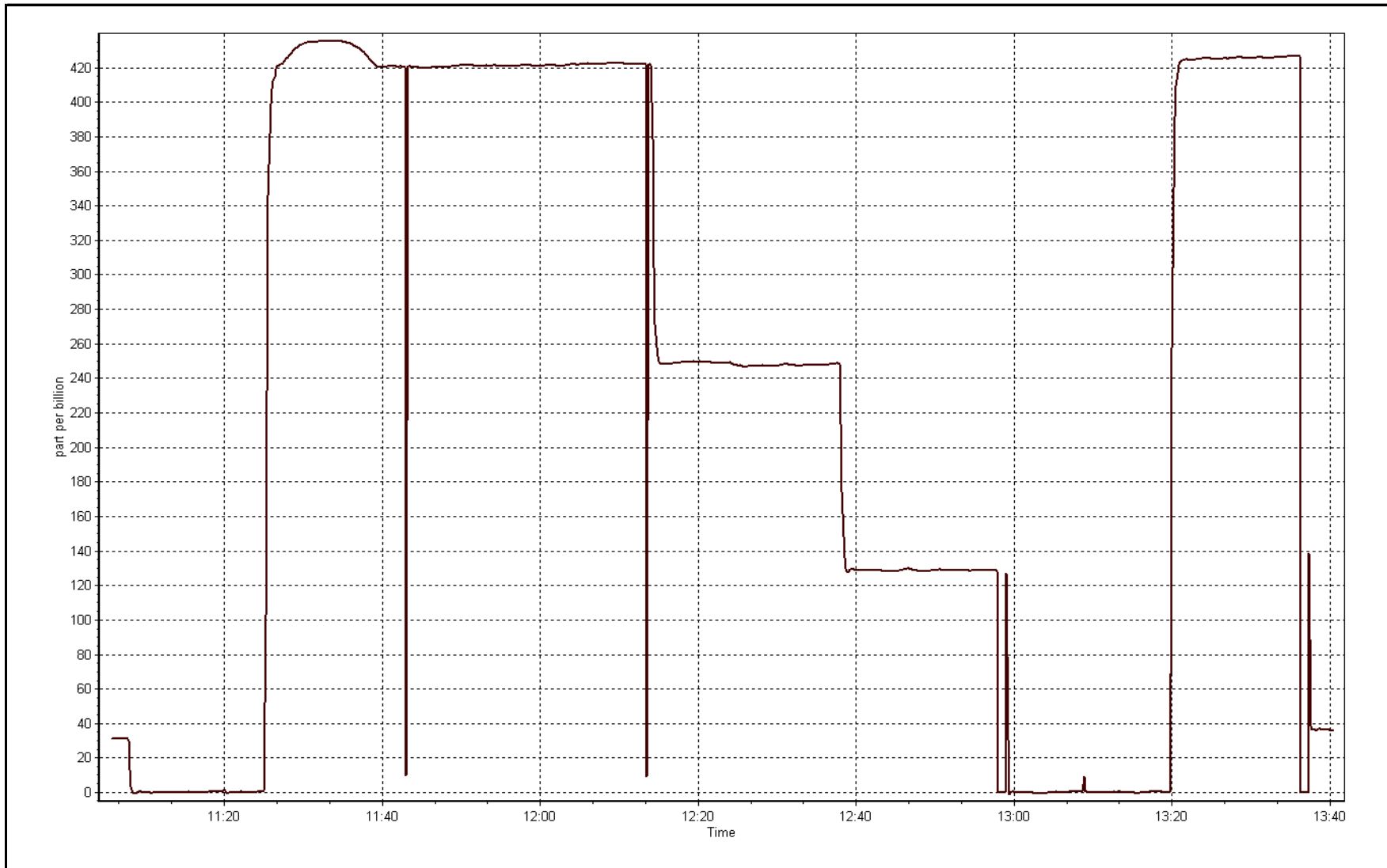
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999950
414.8	421.2	0.9847		
246.4	247.7	0.9947	Slope	0.985566
128.1	128.8	0.9946		
			Intercept	0.706997



O3 Calibration Plot

Date: June 13, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	June 21, 2016	Previous Calibration	June 13, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Removal		
Start Time (MST)	9:24	End Time (MST)	10:42
NO2 GPT Ref date	May-12-16	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.	36.7	36.7
Analyzer IP address	192.168.1.79		Lamp temp.	58.0	58.0
Calculated slope	0.985566	0.964051	Pressure	26.9	26.9
Calculated intercept	0.706997	-0.852634	Flow cell A	0.768	0.768
Analyzer Background	0.7	0.7	Flow cell B	0.768	0.768
Analyzer Coefficient	1.085	1.085	Cell A Intensity	NA	NA
			Cell B Intensity	NA	NA

Analyzer make	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	5000	0.00	0.0	0.3	----
as found span	5000	0.98	414.8	430.4	0.964
calibrator zero	5000	0.00	0.0	0.3	----
high point	5000	0.98	414.8	430.4	0.964
second point	5000	0.56	246.4	257.6	0.957
third point	5000	0.34	128.1	134.0	0.956
Average Correction Factor					0.959

Corrected As found	430.1	Previous response	420.2	% change	-2.3%
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Notes:

Removal calibration, no adjustments made or as lefts performed. Instrument removed due to negative spiking issue resulting in lost measurement time.

Calibration Performed By: Zach Eastman



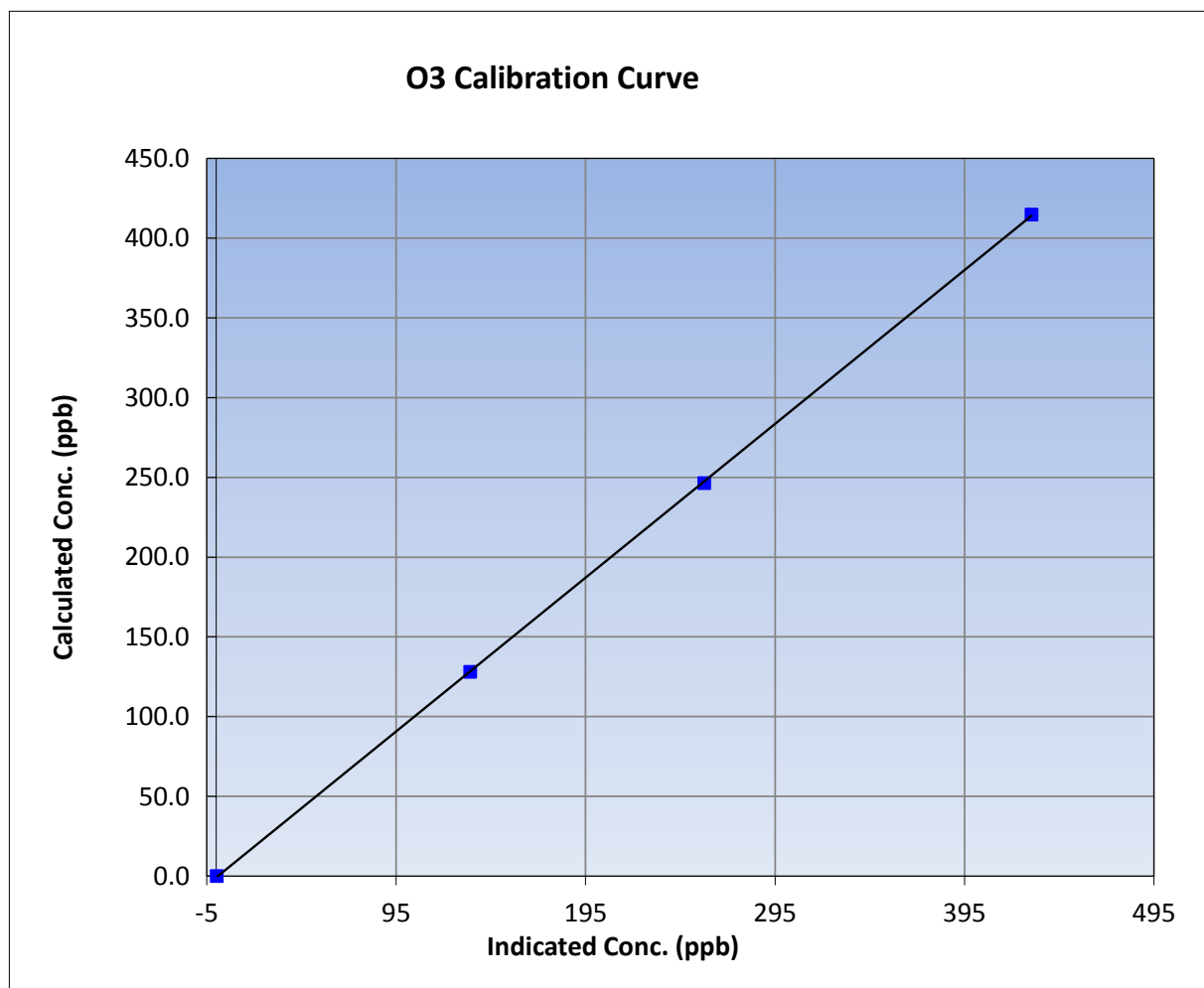
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	June-21-16	Previous Calibration	June 13, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	9:24	End Time (MST)	10:42
Analyzer make	API T400	Analyzer serial #	1107

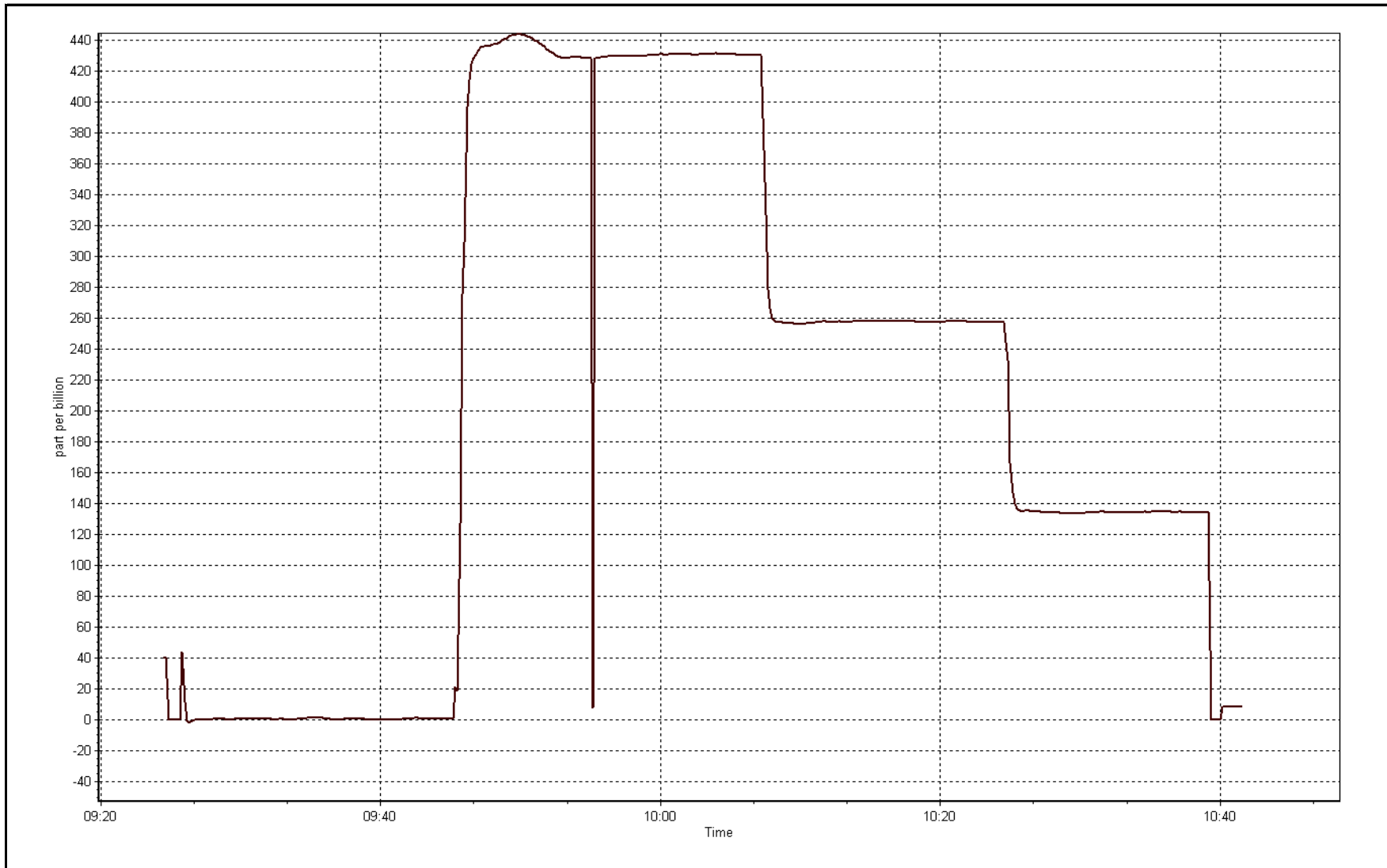
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999977
414.8	430.4	0.9638		
246.4	257.6	0.9565	Slope	0.964051
128.1	134.0	0.9559		
			Intercept	-0.852634



O3 Calibration Plot

Date: June 21, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	June 21, 2016	Previous Calibration	NA
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Install		
Start Time (MST)	11:50	End Time (MST)	13:52
NO2 GPT Ref date	May-12-16	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.	29.0	29.0
Analyzer IP address	192.168.1.79		Lamp temp.	54.0	54.0
Calculated slope	NA	0.999126	Pressure	718.0	718.0
Calculated intercept	NA	-1.401120	Flow cell A	0.776	0.776
Analyzer Background	NA	-2.3	Flow cell B	0.815	0.815
Analyzer Coefficient	NA	1.029	Cell A Intensity	74xxx	74xxx
			Cell B Intensity	87xxx	87xxx

Analyzer make	49i	Analyzer serial #	1152220026
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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)
calibrator zero	5000	0.00	0.0	0.4	----
high point	5000	0.98	414.8	415.7	0.998
second point	5000	0.56	246.4	249.0	0.990
third point	5000	0.34	128.1	130.5	0.982
As Left Zero	5000	0.00	0.0	1.5	----
As Left Span	5000	0.98	414.8	416.0	0.997
Average Correction Factor					0.990

Corrected As found	NA	Previous response	NA	% change	NA
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Notes:

Install calibration, as founds not performed. Instrument allowed to stabilize for 1h before adjustments and calibration began.

Calibration Performed By: Zach Eastman



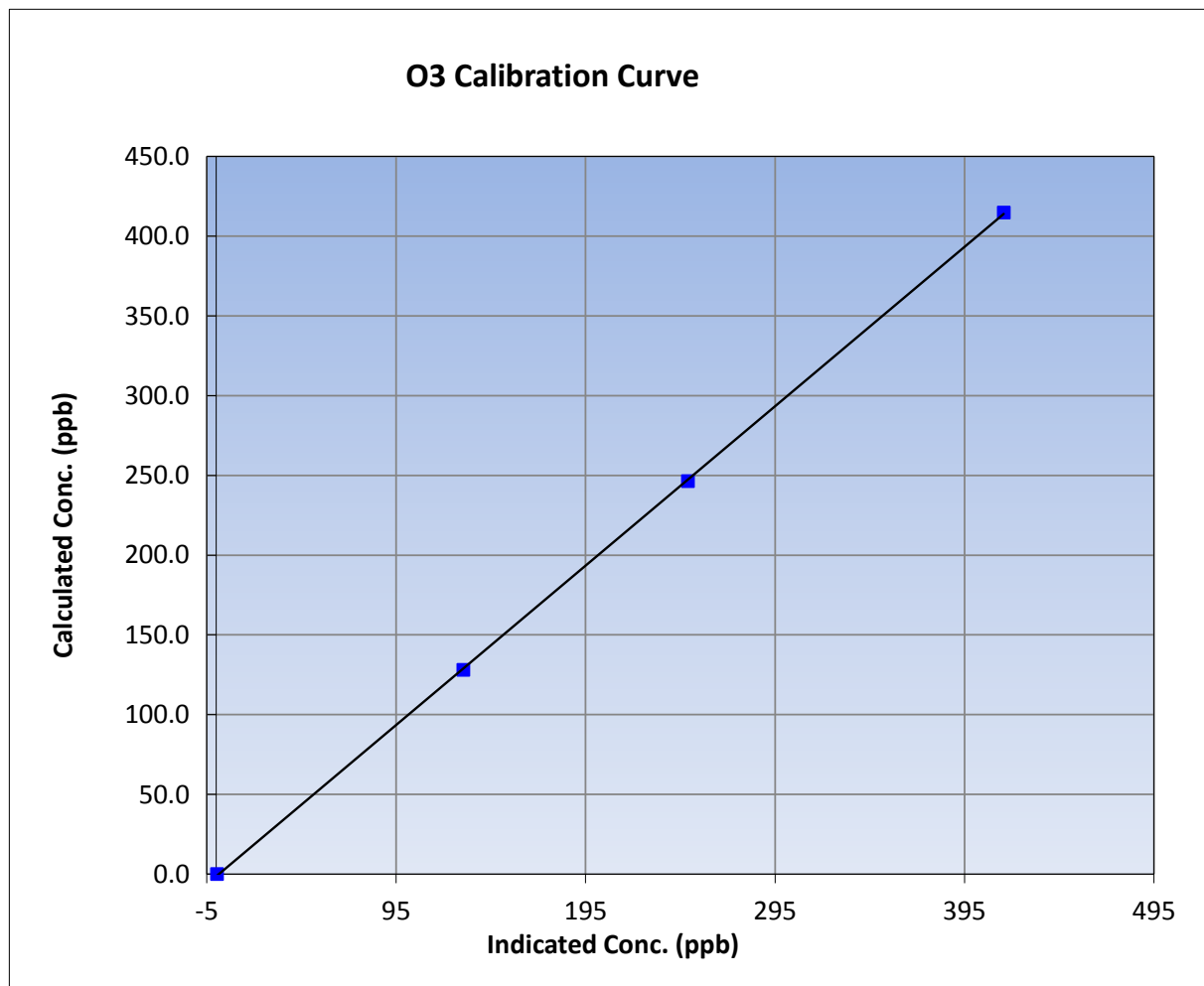
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	June-21-16	Previous Calibration	NA
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	11:50	End Time (MST)	13:52
Analyzer make	49i	Analyzer serial #	1152220026

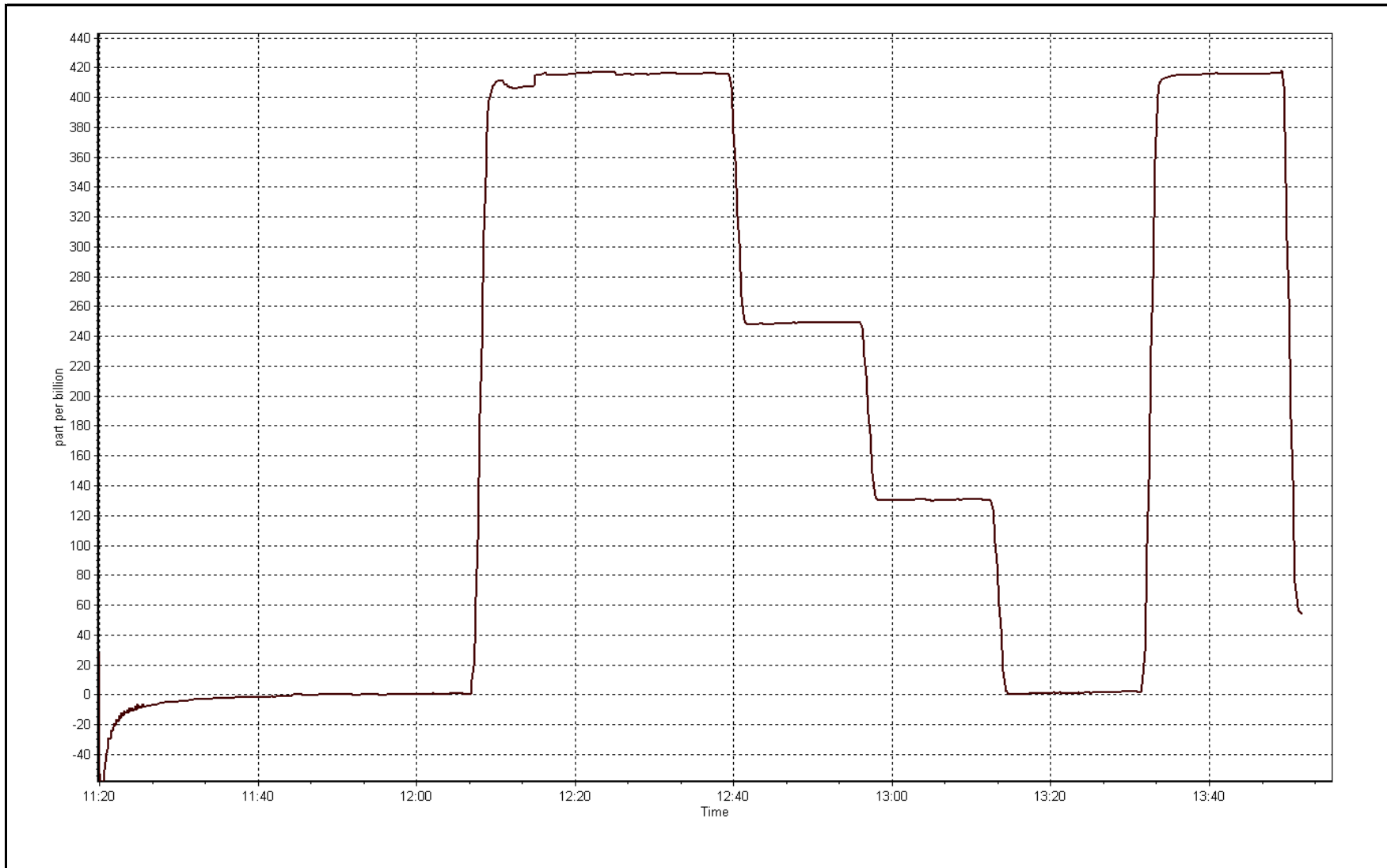
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.4	----	Correlation Coefficient	0.999963
414.8	415.7	0.9978		
246.4	249.0	0.9896	Slope	0.999126
128.1	130.5	0.9816		
			Intercept	-1.401120



O3 Calibration Plot

Date: June 21, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 12, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Reason:	Routine		
Start Time (MST)	8:35	End Time (MST)	13:45
NO Cal Gas Conc	50.7 ppm	Gas Cert Reference	LL107945
NOx Cal Gas Conc	50.9 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
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.999379	1.003746	0.996010
	Data Offset	0.287883	0.715349	-1.148605
Current Calibration	Data Slope	0.998522	0.998272	1.001850
	Data Offset	-0.316248	0.090752	0.577622

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153357
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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	0.849		0.854	
NOx coefficient	1.008		1.003	
NO2 coefficient	1.000		1.000	
NO bkgrnd	5.3		5.4	
NOx bkgrnd	5.4		5.4	
Chamber Temp	50.6	Deg C	50.4	Deg C
Moly Temp	325.5	Deg C	327.4	Deg C
PMT voltage	-816.2	V	-816.2	V
PMT Temp	-2.7	Deg C	-2.6	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	161.3	mmHg	157.2	mmHg
R Cell Press Nox	161.3	mmHg	157.2	mmHg
NO sample flow	0.677	lpm	0.653	lpm
Nox sample Flow	0.677	lpm	0.653	lpm

Notes:

Inlet filter changed after as founds. Second zero and span point completed after filter change to document any changes.
Span adjusted.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 1, 2016

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	0.5	0.2	0.3	----	----
as found span	5500	81.4	753.3	750.4	3.0	752.2	745.2	6.9	1.0015	1.0069
calibrator zero	5500	0.0	0.0	0.0	0.0	0.4	0.2	0.3	----	----
high point	5500	81.4	753.3	750.4	3.0	754.7	751.7	3.0	0.9982	0.9982
second point	5500	45.6	422.0	420.3	1.7	423.2	420.9	2.3	0.9971	0.9987
third point	5500	22.8	211.0	210.2	0.8	211.3	210.1	1.2	0.9986	1.0004
as left zero	5500	0.0	0.0	0.0	0.0	0.4	0.2	0.3	----	----
as left span	5500	81.4	753.3	338.3	415.0	751.5	329.7	421.8	1.0025	1.0262
Average Correction Factor									0.9980	0.9991

Corrected As found
Previous Response

NO_x= 751.7
NO_x= 753.5

NO= 745.0
NO= 746.8

Percent Change

NO_x= 0.2%

NO= 0.2%

GPT Calibration Data

Dilution Flow (total) 5500 ccm Source Gas Flow 81.40 ccm NOx ref calc conc = 753.3 ppb NO ref calc conc = 750.4 ppb

O3 Setpoint (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
1st NO ref point		3.0	756.2	753.1	0.3	0.9962	0.9963	----	----
1st NO2 (300)	338.3	417.8	755.0	338.3	416.7	0.9977	----	1.0025	99.7%
2nd NO2 (200)	506.8	249.3	755.3	506.8	248.5	0.9974	----	1.0034	99.7%
3rd NO2 (100)	625.0	131.1	754.0	625.0	129.0	0.9992	----	1.0165	98.4%
2nd NO ref point	----	3.0	752.7	749.9	2.8	1.0008	1.0006	----	----
Average Correction Factor						0.9988		1.0075	99.3%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NO_x Calibration Summary

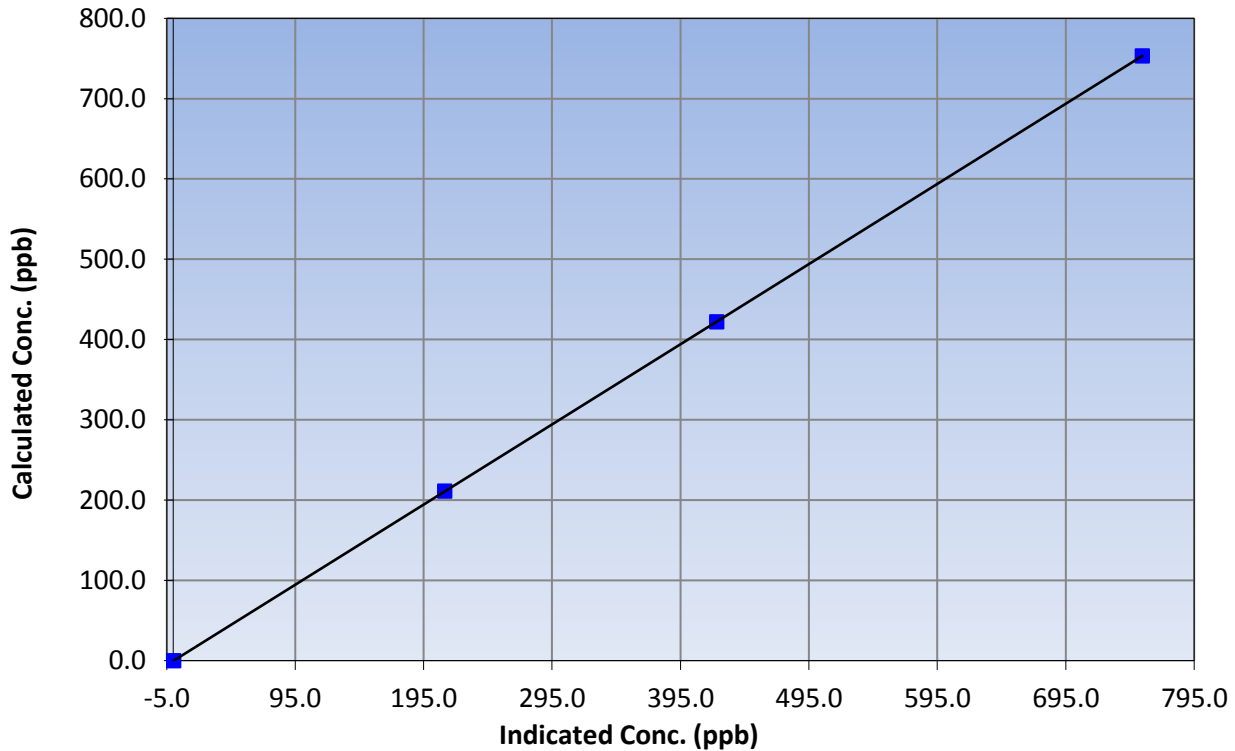
Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 12, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:35	End Time (MST)	13:45
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	0.4	----	Correlation Coefficient	0.999999
753.3	754.7	0.9982		
422.0	423.2	0.9971	Slope	0.998522
211.0	211.3	0.9986		
			Intercept	-0.316248

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

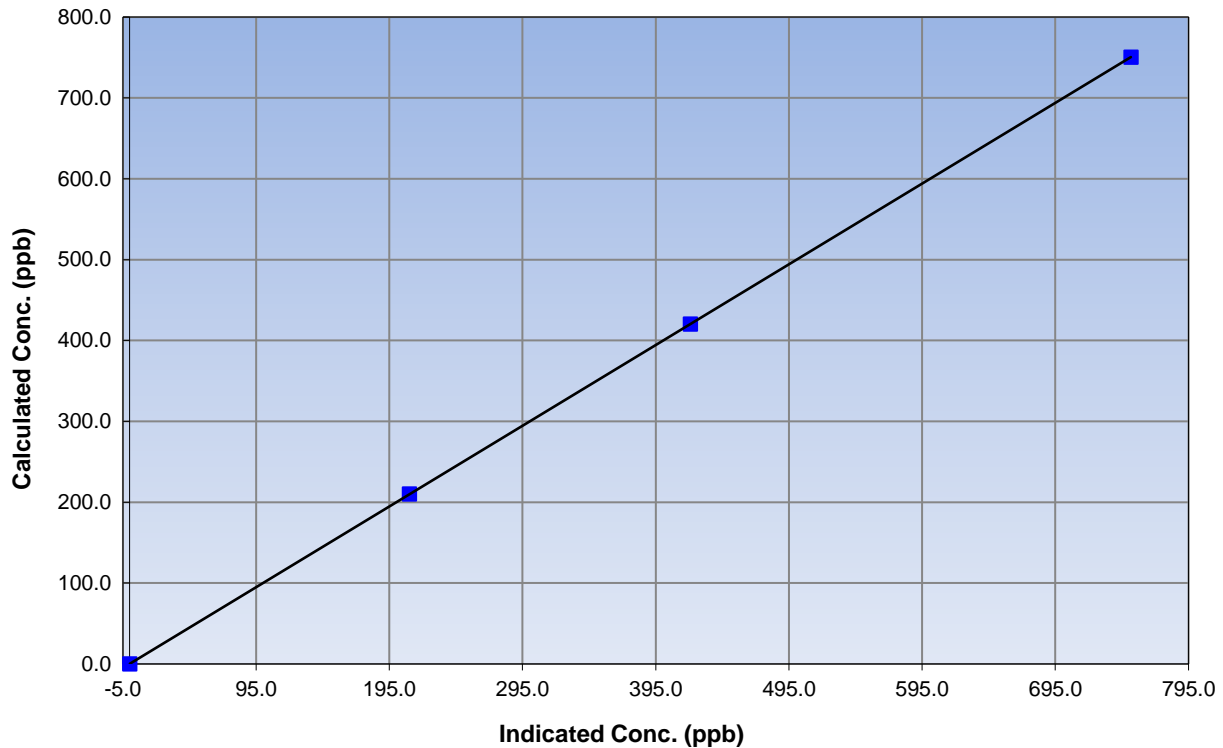
Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 12, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:35	End Time (MST)	13:45
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	0.999999
750.4	751.7	0.9982		
420.3	420.9	0.9987	Slope	0.998272
210.2	210.1	1.0004		
			Intercept	0.090752

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

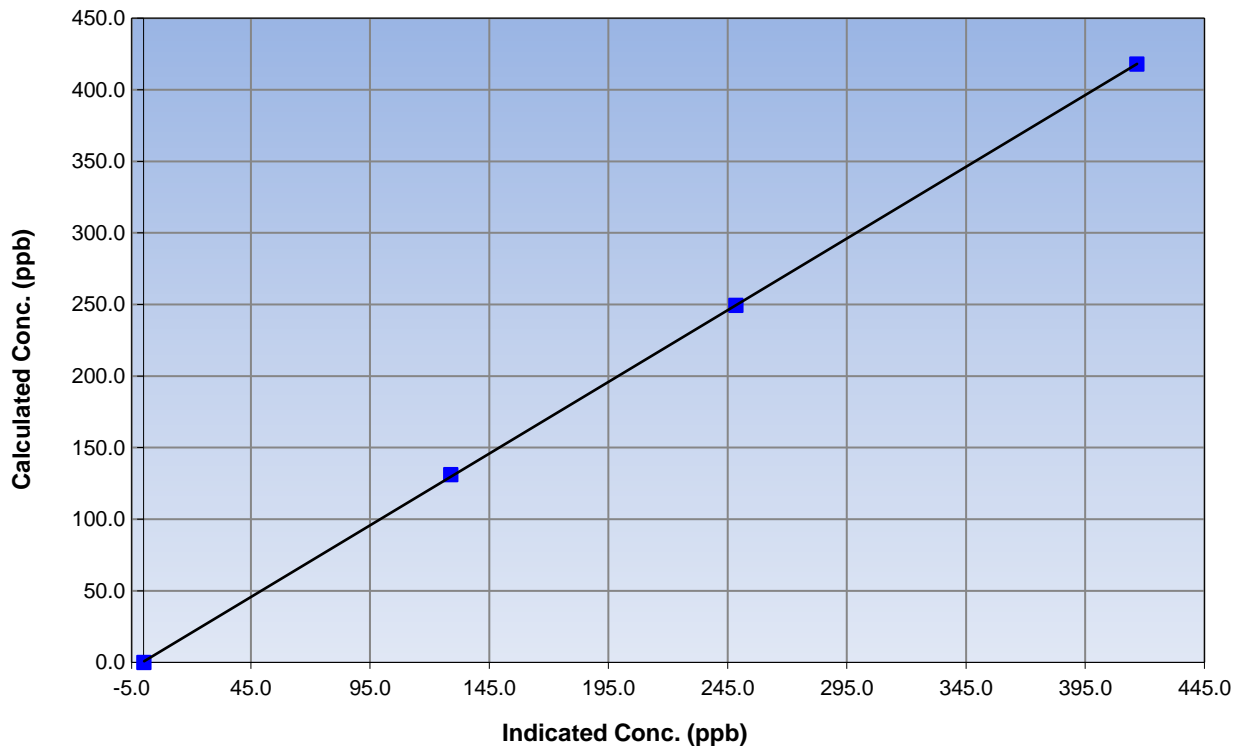
Station Information

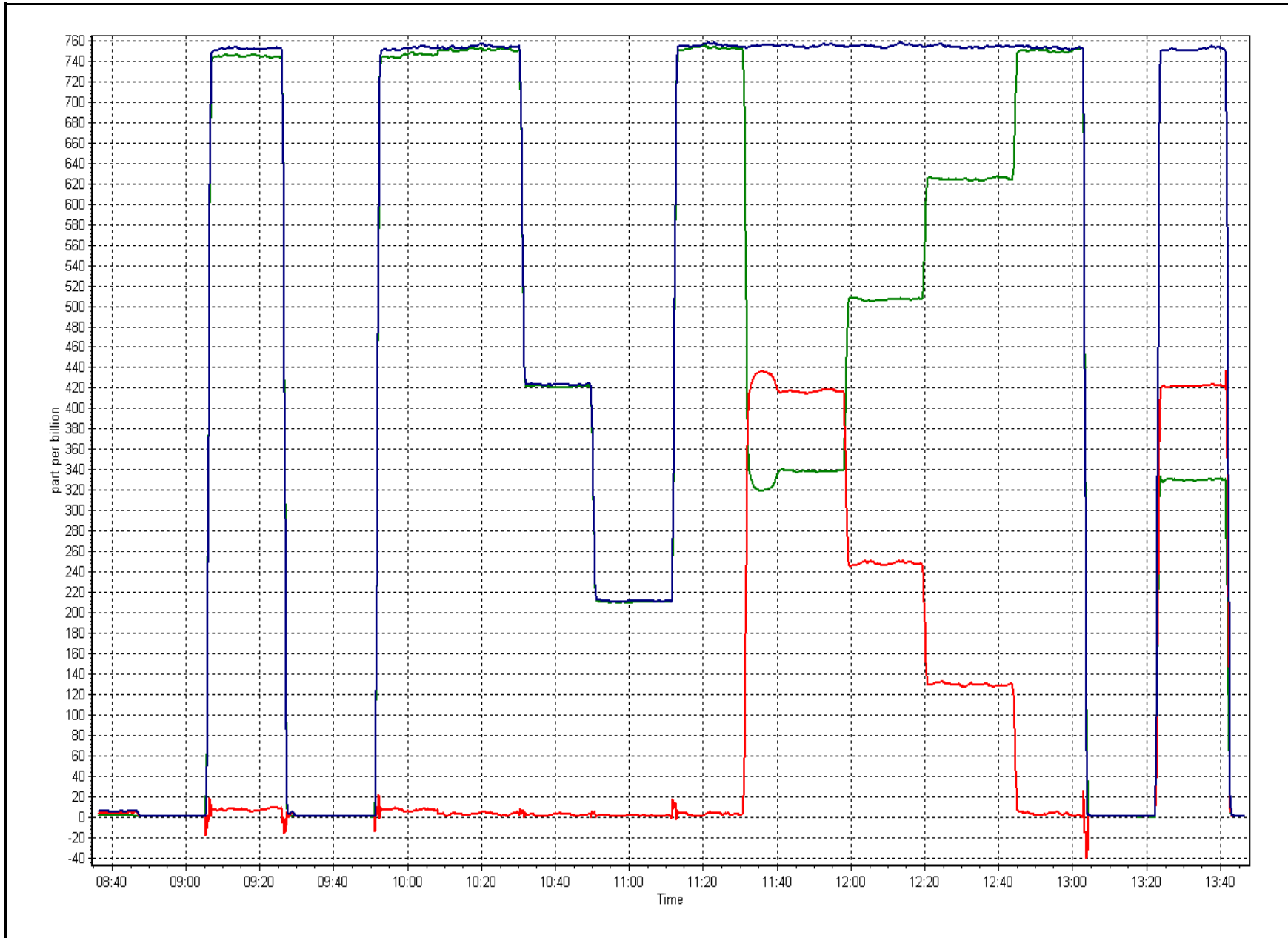
Calibration Date	June 1, 2016	Previous Calibration	May 12, 2016
Station Number	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:35	End Time (MST)	13:45
Analyzer make	Thermo 42i	Analyzer serial #	1218153357

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	N/A	Correlation Coefficient	0.999973
417.8	416.7	1.0025		
249.3	248.5	1.0034	Slope	1.001850
131.1	129.0	1.0165		
			Intercept	0.577622

NO₂ Calibration Curve







Wood Buffalo Environmental Association

N_t-NO_x-NH₃ Calibration Report

Station Information

Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
NOX Calibration Date	June 1, 2016	NOX Previous Cal Date	May 12, 2016
NH3 Calibration Date	June 2, 2016	NH3 Previous Cal Date	May 12, 2016
Reason:	Routine		
Start Time (MST)	8:35	End Time (MST)	13:45
Calibrator	Sabio 4010	Station Temperature	21.0 Deg C
NH3 Cal Gas Conc	30.6 ppm	Serial Number	14300410
NOx Cal Gas Conc	50.9 ppm	NH3 Expiry Date / SN	21/Dec/2012 LL76495
NO Cal Gas Conc	50.7 ppm	NO Expiry Date / SN	8/Sep/2018 LL107945

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	2582
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Parameter		NH3	Nt	NOx	NO	NO2
Cal Stats As Found	Data Slope	1.009011	0.999206	0.999857	1.004453	1.013137
	Data Offset	-2.688579	-2.9521051	0.644664	-0.883521	0.735530
Cal Stats After	Data Slope	1.004477	0.995359	0.998802	0.998586	1.006793
	Data Offset	-5.12	-5.45	0.095795	0.361896	0.488104
IP address		192.168.1.77				

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	-0.1	ppb	-0.1	ppb
NOx BKG	0.0	ppb	0.0	ppb
Nt BKG	0.1		0.1	
NO coefficient	1.208		1.211	
NO2 coefficient	1.000	ppb	1.000	ppb
NOx coefficient	1.330		1.343	
NH3 coefficient	0.932		0.951	
Nt coefficient	1.361		1.387	
NH3 conv temp	825	DegC	825	Deg C
Chamber Temp	50.0	Deg C	50.0	Deg C
Moly Temp	316.2	Deg C	314.7	Deg C
PMT Temp	7.0	Deg C	7.0	Deg C
O3 flow	86.0	ccm	84.0	ccm
R Cell Press	5.0	mmHg	4.9	mmHg
PMT Voltage	645.0	v	645.0	v
Sample Flow 1 NO	527.0	ccm	547.0	ccm
Sample Flow 2 Nox	527.0	ccm	527.0	ccm
Sample Flow 3 Nt	527.0	ccm	510.0	ccm

Notes:

Inlet filter changed after as founds. Second zero and span point completed after filter change to document any changes. NO Span adjusted. NH3 span adjusted.



Wood Buffalo Environmental Association

NH₃ Calibration Report

Station Information

Calibration Date:

June 2, 2016

Station Number:

AMS 1

NH₃ Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated Nt conc (ppb)	Calculated NOx conc (ppb)	Calculated NH ₃ conc (ppb)	Indicated Nt conc (ppb)	Indicated NOx conc (ppb)	Indicated NH ₃ conc (ppb)	Nt Correction factor	NH ₃ Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	0.4	-1.2	1.5	----	----
as found NO	5500	81.3	752.4	752.4	----	738.9	740.1	-1.2	1.018	----
calibrator zero	5500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
high NO point	5500	81.3	752.4	752.4	----	753.5	754.2	-0.7	0.999	----
NO/O ₃ point	5500	81.3	752.4	752.4	----	760.7	754.1	6.7	0.989	----
as found NH ₃	1500	88.2	1799.3	NA	1799.3	1831.4	15.8	1815.5	0.982	0.991
first NH ₃	1500	88.2	1799.3	NA	1799.3	1807.4	16.5	1790.9	0.996	1.005
second NH ₃	1500	49.0	999.6	NA	999.6	1018.9	10.0	1009.0	0.981	0.991
third NH ₃	1500	24.6	501.8	NA	501.8	511.7	5.2	506.5	0.981	0.991
Average Correction Factor									0.9938	0.9954

Nt Corrected As Found Nt = 738.6 ppb
 NOx Corrected As Found NOx = 741.3 ppb
 NH₃ Previous Converter Efficiency = 93.2 %

Previous Response Nt = 755.9 ppb
 Previous Response NOx = 751.9 ppb
 NH₃ Current Converter Efficiency = 95.1 %

Nt percent change 2.4%
 NOx percent change 1.4%
 NH₃ percent change 1.9%



Wood Buffalo Environmental Association

NO_x(NH₃) Calibration Report

Station Information

Calibration Date:

June 1, 2016

Station Number:

AMS 1

NO_x / NO / Nt Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NO _x conc (ppb)	Calculated NO conc (ppb)	Calculated Nt conc (ppb)	Indicated NO _x conc (ppb)	Indicated NO conc (ppb)	Indicated Nt conc (ppb)	NO _x Correction factor	NO Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	0.3	0.3	0.3	----	----
as found span	5500	81.4	753.3	750.4	753.3	746.6	748.5	742.3	1.0090	1.0025
calibrator zero	5500	0.0	0.0	0.0	0.0	0.0	0.2	0.0	----	----
high point	5500	81.4	753.3	750.4	753.3	754.2	751.2	753.5	0.9988	0.9989
second point	5500	45.6	422.0	420.3	422.0	422.3	420.8	422.6	0.9994	0.9990
third point	5500	22.8	211.0	210.2	211.0	211.1	209.2	210.7	0.9996	1.0047
Average Correction Factor									0.9993	1.0008

	<u>Nt</u>	<u>NO_x</u>	<u>NO</u>	<u>NO₂</u>
Corrected As found	742.0	746.3	748.2	----
Previous Response	756.9	752.8	747.9	----
Percent Change	2.0%	0.9%	0.0%	0.9%

GPT Calibration Data

Dilution Flow (total) 5500 ccm Source Gas Flow 81.4 ccm NO_x ref calc conc = 753.3 ppb NO ref calc conc = 750.4 ppb

O ₃ Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO ₂ conc (ppb)	Indicated NO _x conc (ppb)	Indicated NO conc (ppb)	Indicated NO ₂ conc (ppb)	NO _x Correction factor	NO Correction factor	NO ₂ Correction factor	Converter Efficiency
1st NO ref point	----	3.0	754.1	751.7	2.4	0.9990	0.9983	----	----
1st NO ₂ (300)	335.1	419.5	751.5	335.1	416.4	1.0024	----	1.0074	99.3%
2nd NO ₂ (200)	505.5	249.1	752.3	505.5	246.8	1.0014	----	1.0096	99.1%
3rd NO ₂ (100)	621.3	133.3	752.9	621.3	131.6	1.0006	----	1.0129	98.7%
2nd NO ref point	----	3.0	754.7	750.7	4.0	0.9981	0.9995	----	----
Average Correction Factor						1.0006	0.9989	1.0100	99.0%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NH3 Calibration Summary

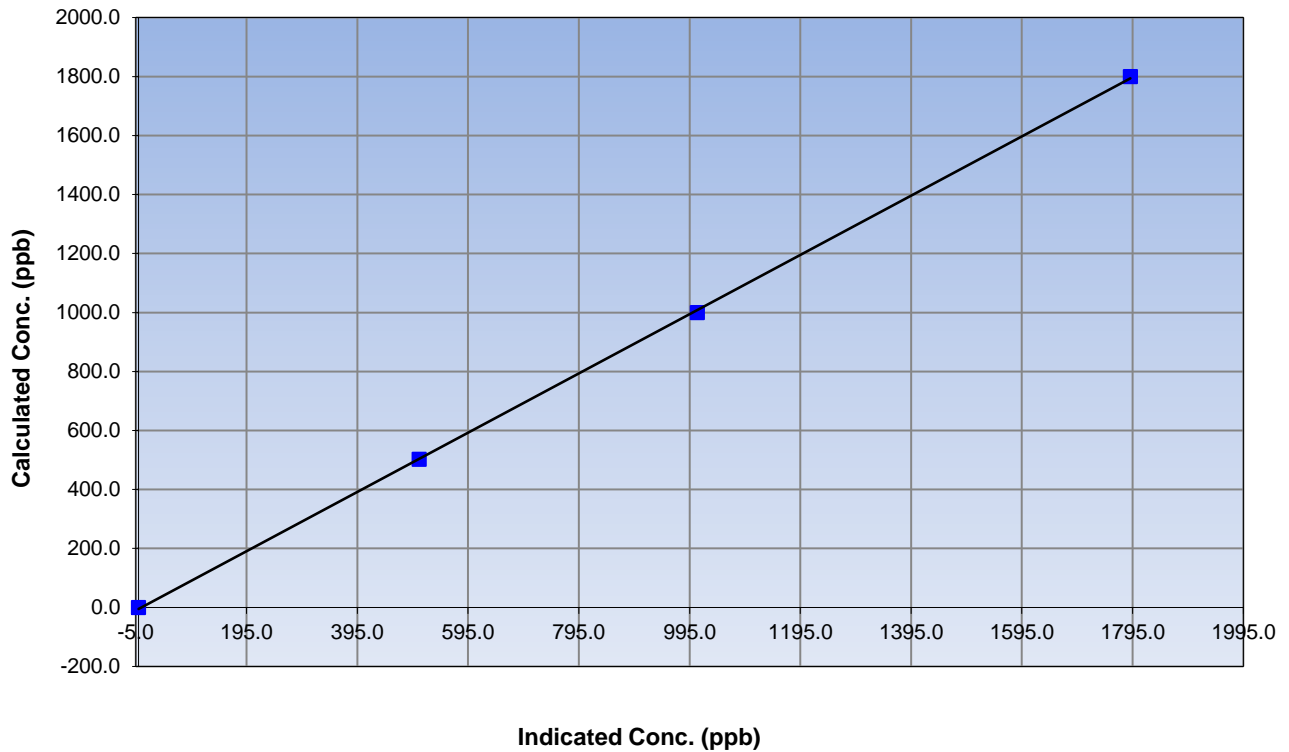
Station Information

Calibration Date	June 2, 2016	Previous Calibration	May 12, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:35	End Time (MST)	13:45
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	0.0	----	Correlation Coefficient	0.999923
1799.3	1790.9	1.0047		
999.6	1009.0	0.9907	Slope	1.004477
501.8	506.5	0.9909	Intercept	-5.123507

NH3 Calibration Curve





Wood Buffalo Environmental Association

Nt Calibration Summary

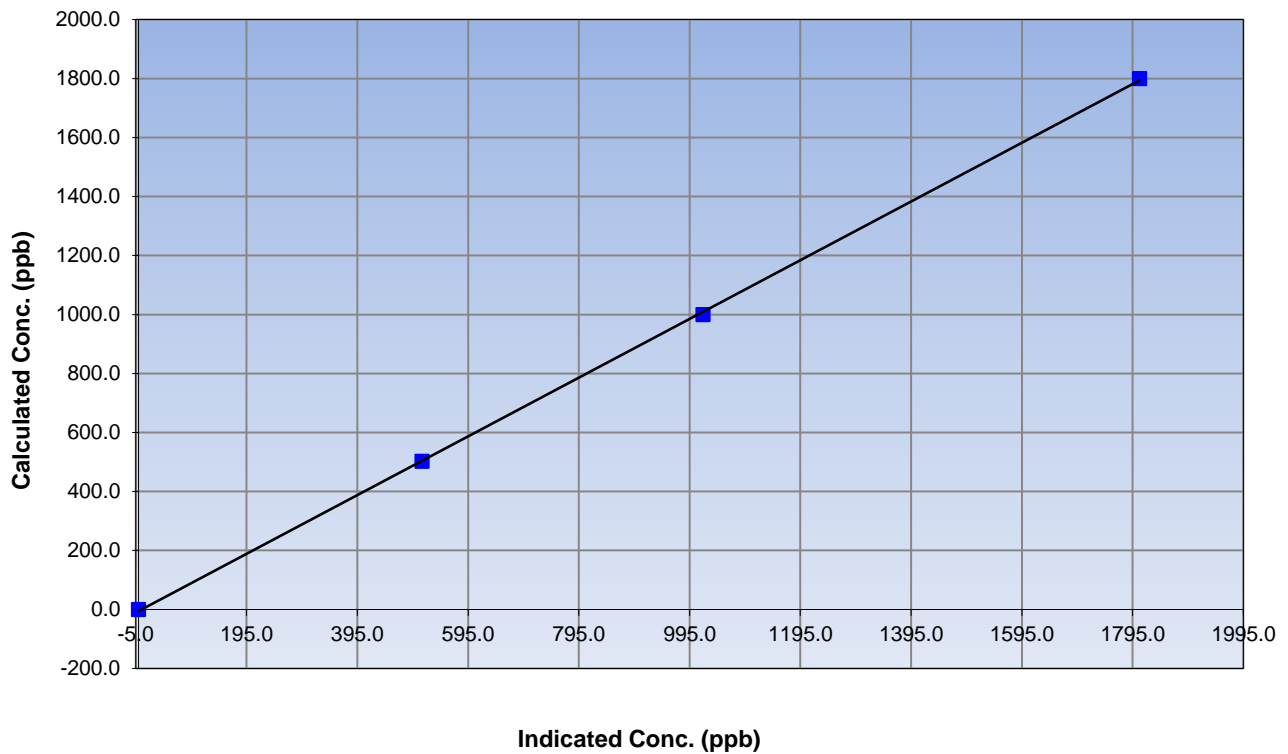
Station Information

Calibration Date	June 2, 2016	Previous Calibration	May 12, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:35	End Time (MST)	13:45
Analyzer make	API T201	Analyzer serial #	152

Nt (NH₃) Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999915
1799.3	1807.4	0.9955		
999.6	1018.9	0.9810	Slope	0.995359
501.8	511.7	0.9808		
			Intercept	-5.454493

Nt Calibration Curve





Wood Buffalo Environmental Association

NOx Calibration Summary

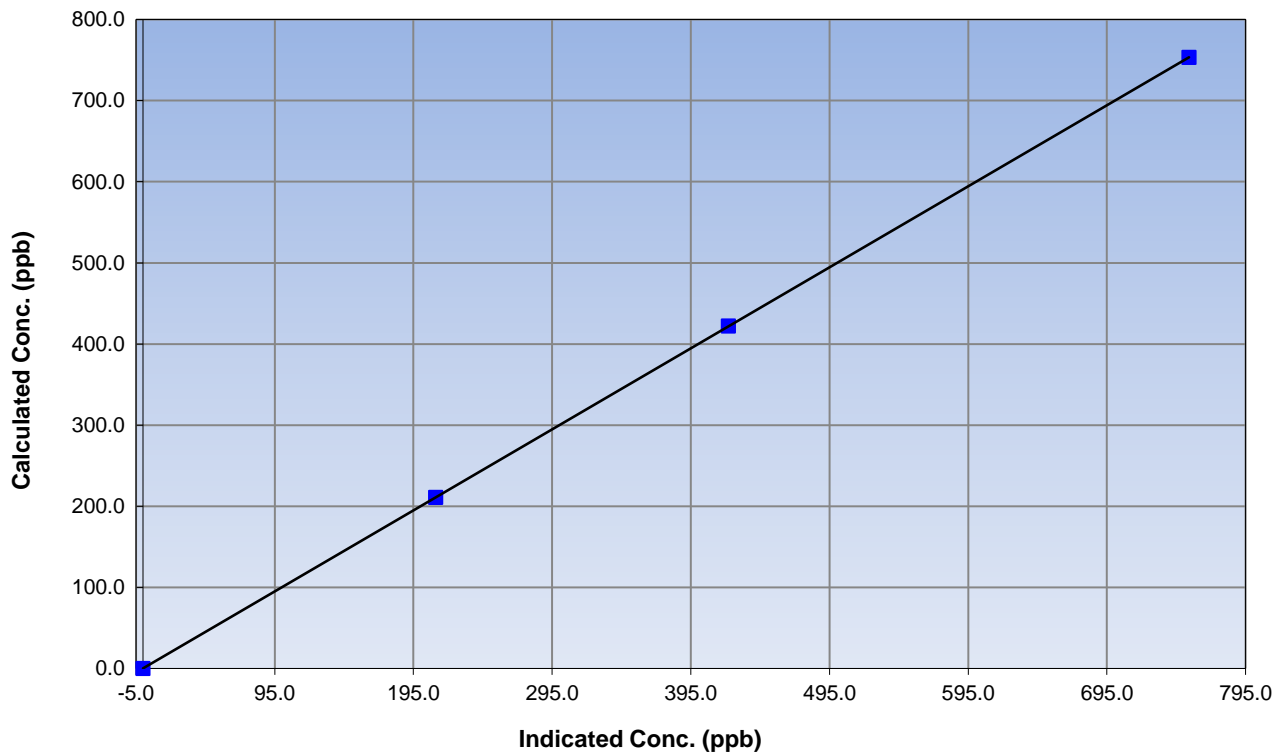
Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 12, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:35	End Time (MST)	13:45
Analyzer make	API T201	Analyzer serial #	152

NO_x Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	1.000000
753.3	754.2	0.9988		
422.0	422.3	0.9994	Slope	0.998802
211.0	211.1	0.9996		
			Intercept	0.095795

NOx Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

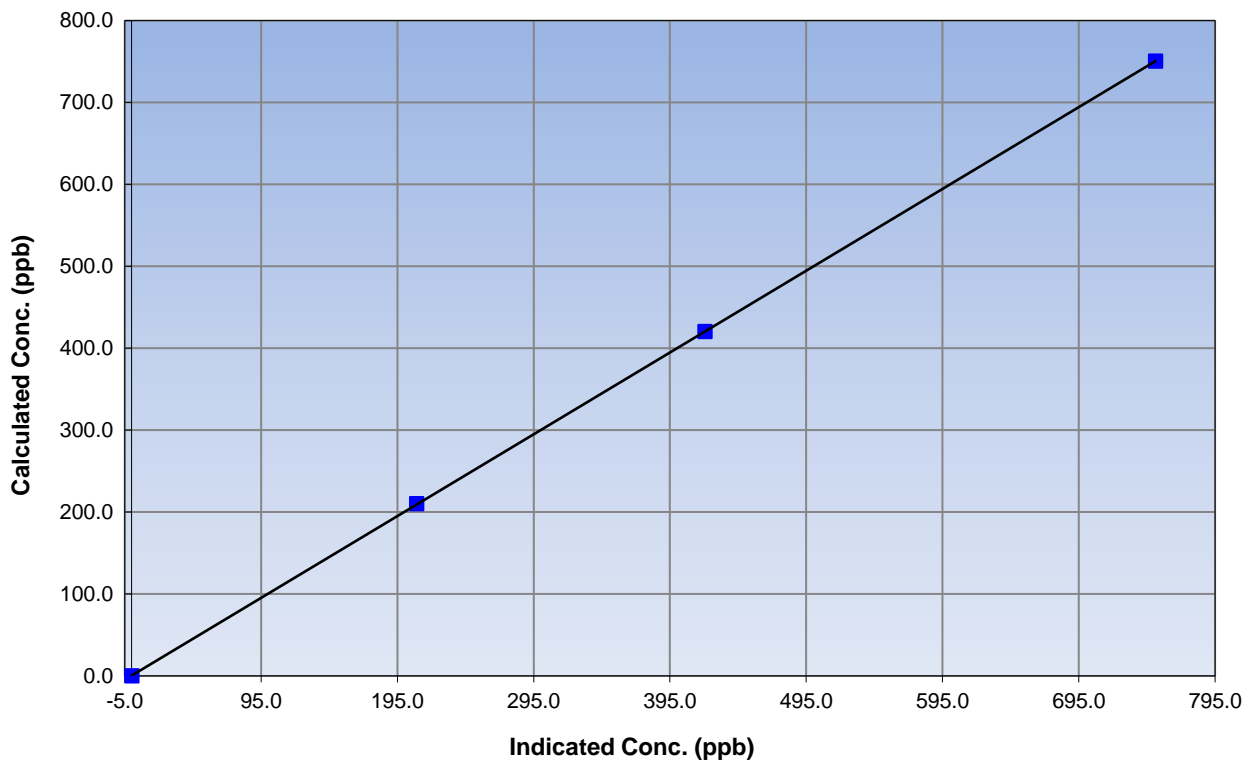
Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 12, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:35	End Time (MST)	13:45
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	0.2	----	Correlation Coefficient	0.999996
750.4	751.2	0.9989		
420.3	420.8	0.9990	Slope	0.998586
210.2	209.2	1.0047		
			Intercept	0.361896

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

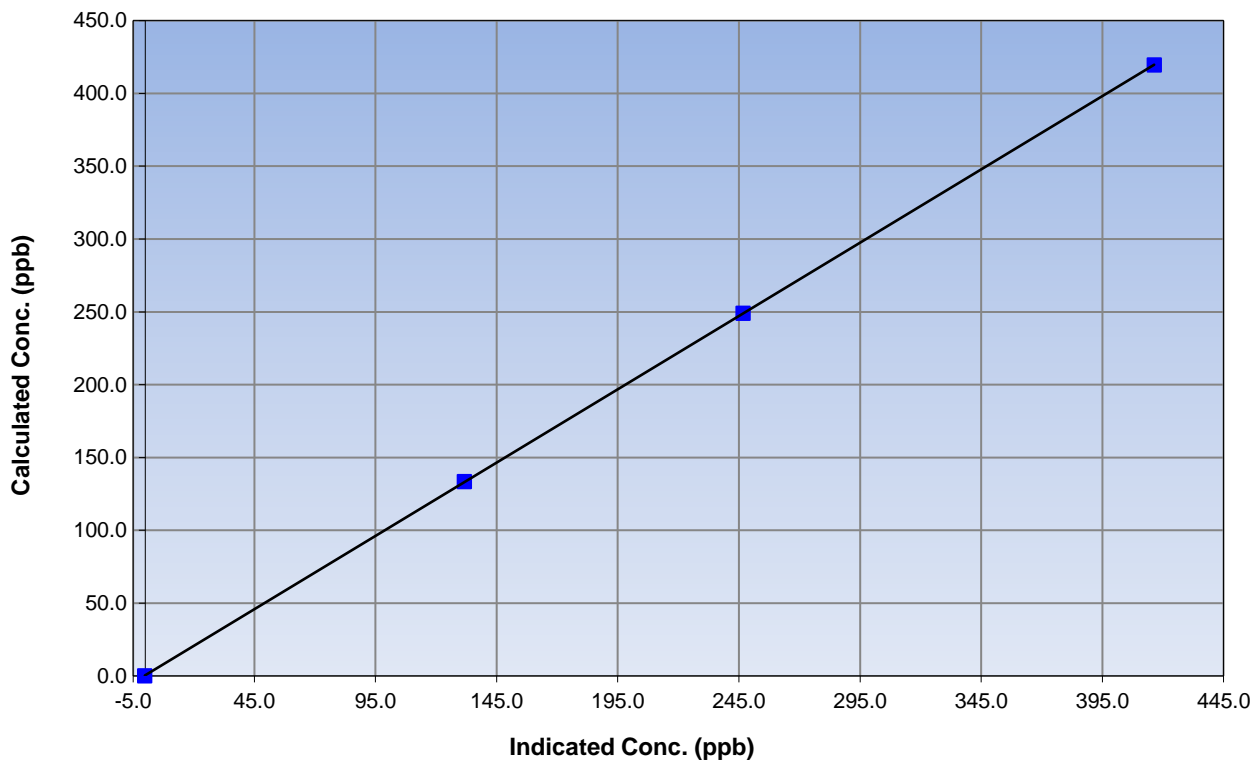
Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 12, 2016
Station Name	Bertha Ganter - Fort McKay	Station Number	AMS 1
Start Time (MST)	8:35	End Time (MST)	13:45
Analyzer make	API T201	Analyzer serial #	152

Calibration Information

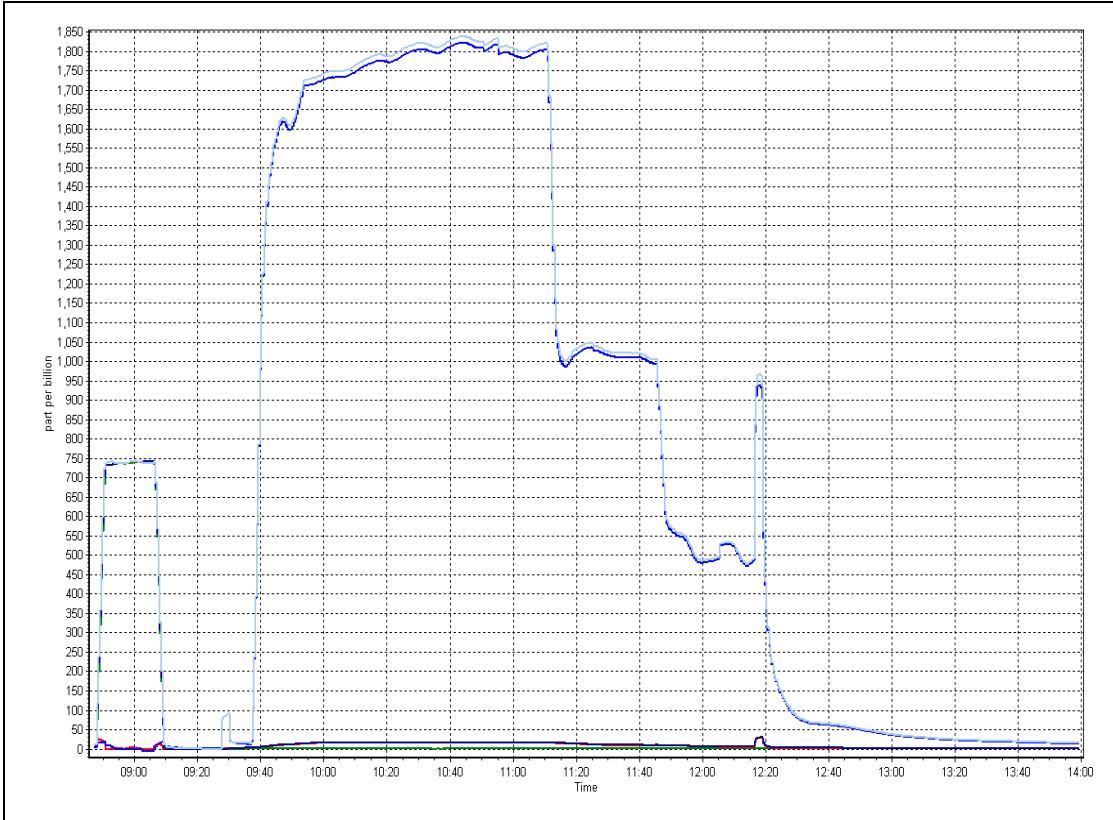
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999997
419.5	416.4	1.0074		
249.1	246.8	1.0096	Slope	1.006793
133.3	131.6	1.0129		
			Intercept	0.488104

NO₂ Calibration Curve



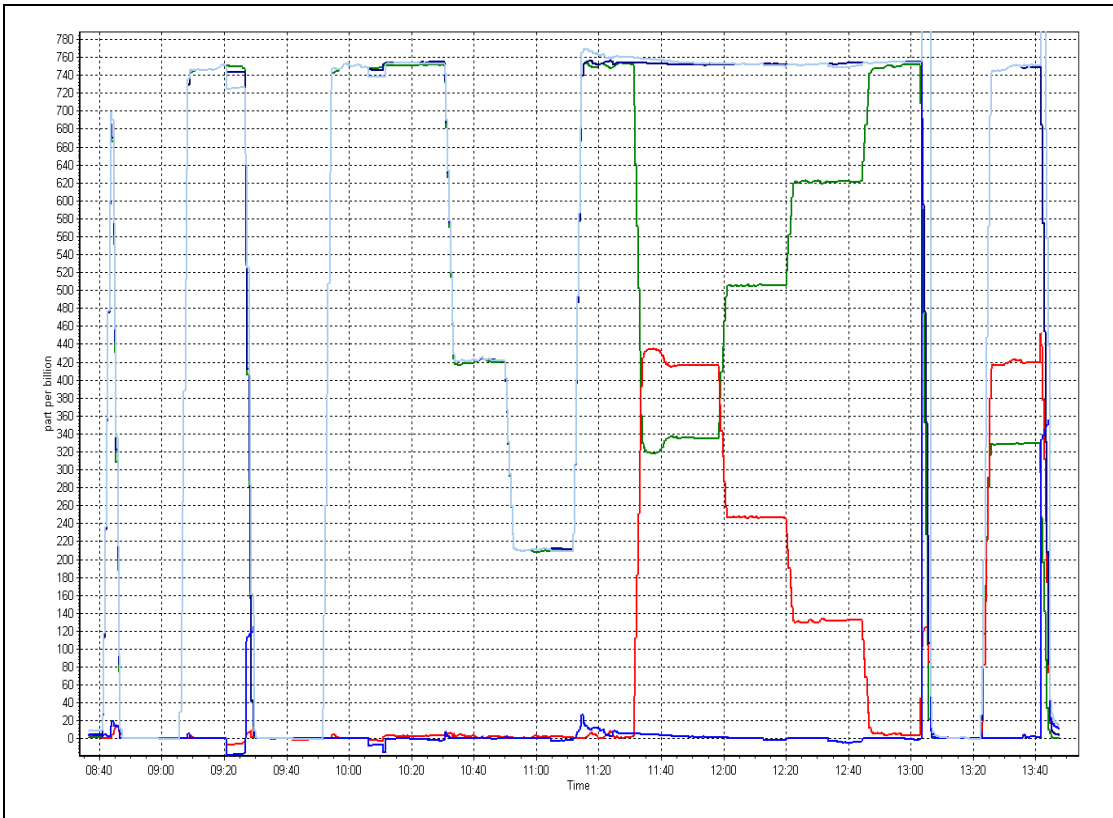
NH₃ Calibration Plot

Date: June 2, 2016



NO_x Calibration Plot

Date: June 1, 2016





Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	June 8, 2016	Previous Calibration:	May 12, 2016
Station Name:	Bertha Ganter - Fort McKay	Station Number:	AMS 1
Start Time (MST):	8:20	End Time (MST):	12:05
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	141228

SHARP INFORMATION			
Particulate Fraction:		PM2.5	
Make/Model:		Thermo / SHARP 5030	
Serial Number		E-1486	
C ₁₄ Source SN:		5691	
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 type="checkbox"/> Neph <input checked="" type="checkbox"/>

CALIBRATION DATA

Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	17.0	16.1	-0.9	17.0
T2	25.0	24.2	-0.8	25.0
T3	23.0	24.2	1.2	23.0
T4	23.0	24.2	1.2	23.0
RH (%)	61.0	49.0	-12.0	61.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	975	973.9	-1.1	975

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	987	-13	1001	1000

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	205		207
Neph	-0.4		0
C14	38.2		65.1
Indicated Concentration (ug/m3)	-0.6	yes	0
Offset 1	206.9		206.5
Offset 2	33.8		34

Leak Check (Quarterly)

Leak Check Date:	June 8, 2016	Previous Leak Check Date:	April 20, 2015
	Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.69		0.02
*Flow with adaptor (LPM):	16.67		

*Note - do not attach adaptor without shutting off the pump first

Mass Foil Calibration (Annually)			
Foil Calibration Date:	June 8, 2016	Previous Foil Calibration:	NA
Zeroed?:	yes		
Foil Mass:	1186		Mass foil set S/N:2582
Previous Correction Factor:	6979		
New Correction Factor:	7002		

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good/clean	08/06/2016
Pump	Good	
Filter Tape	Good	
Mass Foil Cal Set	na	
HEPA filter	Good	08/06/2016

NOTES:

T1, T2, T3 and T4 checked. No adjustments made. P3 checked; no adjustments. Mass foil calibration completed. Flow adjusted, and leak check completed. Nephelometer zeroed. PM head cleaned.

Calibration Performed By: Devin Russell



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 2
MILDRED LAKE
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MILDRED LAKE (AMS 2)
 JUNE 2016

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	685	35	35	100.00	79	0	15	0
H2S (ppb) Average	685	35	35	100.00	29	5	5	1
THC (ppm) Average	685	35	35	100.00	111.5	-	16.6	-
Temperature (C) Average	720	0	0	100.00	29.9	-	22.7	-
Relative Humidity (%) Average	720	0	0	100.00	100	-	96	-
Wind Speed 10 m (km/h) Average	720	0	0	100.00	37	-	19	-
Wind Direction 10 m (deg) Average	720	0	0	100.00	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MILDRED LAKE (AMS 2)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	685	2.4	7	-	0	0	0	0	1	7	79
H2S (ppb) Average	685	0.5	2	-	0	0	0	0	0	1	29
THC (ppm) Average	685	2.73	6.1	-	1.9	2	2.1	2.1	2.3	2.6	111.5
Temperature 2 m (C) Average	720	17.73	5.3	-	5.5	11.3	13.9	17	21.7	25.1	29.9
Relative Humidity (%) Average	720	60.9	22	-	18	32	44	60	80	91	100
Wind Speed 10 m (km/h) Average	720	9.2	5	-	0	3	5	8	12	16	37
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MILDRED LAKE (AMS 2)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
<hr/>				
No operational issues to report				



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Mildred Lake - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 79 ppb on Jun 20 13:00	Maximum Daily Average: 14.7 ppb on Jun 20		Hours of Data:	685
Minimum Value: 0 ppb on Jun 7 20:00	Minimum Daily Average: 0.0 ppb on Jun 25		Hours of Missing Data:	35
Maximum Diurnal Average: 5.9 ppb at hour 12	Minimum Diurnal Average: 0.7 ppb at hour 3		Hours of Calibration:	35
Monthly Average: 2.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 7 P ₉₉ = 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-Jun	0	0	0	Z	2	7	15	19	9	1	1	0	0	0	0	0	9	22	2	0	4	8	9	1	4.9	22
2-Jun	0	0	0	0	Z	0	0	0	1	8	67	38	22	19	22	9	0	1	0	7	1	0	0	1	8.6	67
3-Jun	1	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	0.4	3
4-Jun	Z	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
5-Jun	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	12	0.7	12
6-Jun	6	12	Z	6	8	10	8	5	2	7	5	1	5	6	1	0	0	0	0	0	0	13	4	2	4.5	13
7-Jun	1	1	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
8-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	5	17	2	1	0	0	1.2	17
9-Jun	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
10-Jun	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
11-Jun	0	Z	2	8	4	5	5	7	10	26	7	3	2	3	6	8	8	9	4	6	9	2	0	3	6.0	26
12-Jun	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
13-Jun	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
14-Jun	0	0	0	0	Z	4	12	8	28	10	2	7	11	0	1	7	0	5	6	1	8	0	2	1	5.0	28
15-Jun	10	3	0	0	0	Z	1	1	6	C	C	C	C	C	0	0	0	0	0	1	0	0	0	3	1.4	10
16-Jun	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
17-Jun	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0	0	0	0	0	0	0.4	5
18-Jun	0	0	Z	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	8	2	0	0	0.6	8
19-Jun	0	0	0	Z	2	2	5	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	5
20-Jun	0	0	1	6	Z	11	15	7	2	1	17	57	79	44	8	27	32	12	8	6	2	0	1	2	14.7	79
21-Jun	3	2	4	3	8	3	Z	5	2	1	1	0	0	0	1	0	0	0	4	1	0	4	1	0	2.0	8
22-Jun	Z	2	7	5	2	0	0	0	2	3	2	1	0	0	1	0	0	2	8	43	15	0	0	0	4.1	43
23-Jun	2	Z	0	0	0	0	0	0	0	0	5	10	3	26	40	0	0	0	0	0	0	0	0	0	3.8	40
24-Jun	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
25-Jun	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
26-Jun	0	0	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	3	8	0	0	0.6	8
27-Jun	0	1	0	1	0	Z	5	3	0	2	9	13	7	0	0	10	2	0	1	8	1	1	0	2	2.9	13
28-Jun	Z	0	0	0	0	0	0	0	0	0	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	8
29-Jun	0	Z	0	0	0	0	1	14	34	1	0	0	0	0	1	5	8	7	6	2	1	0	0	0	3.6	34
30-Jun	0	9	Z	5	8	5	3	5	0	0	22	36	3	1	11	2	4	1	0	1	0	1	1	0	5.2	36

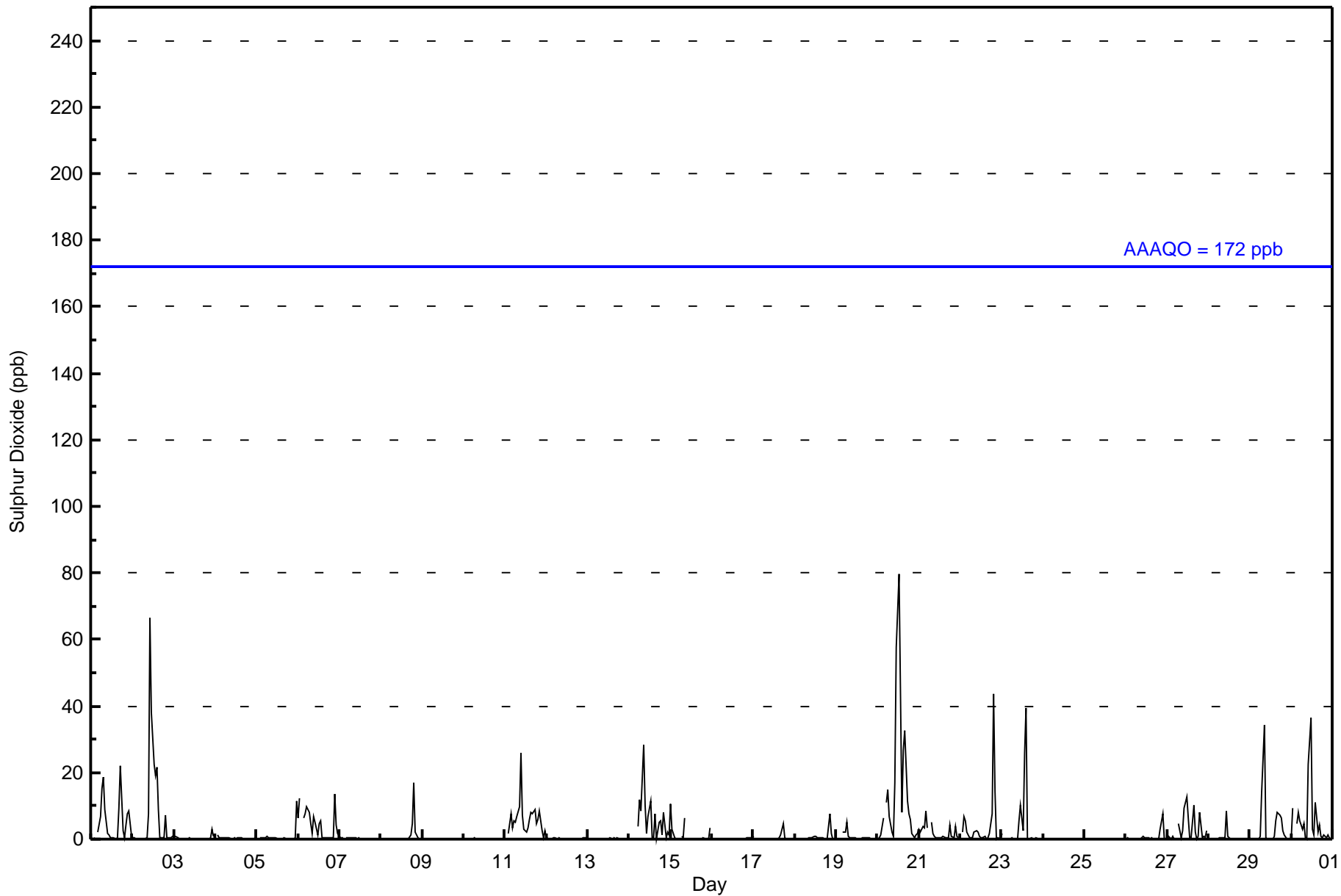
1.1	1.3	0.7	1.5	1.4	1.9	2.5	2.6	3.3	2.2	5.2	5.9	4.7	3.6	3.1	2.4	2.3	2.2	1.6	3.2	1.8	1.4	0.8	1.0	Diurnal Average	
10	12	7	8	8	11	15	19	34	26	67	57	79	44	40	27	32	22	8	43	15	13	9	12	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Mildred Lake - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Mildred Lake - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	650	94.89	94.89
11 - 20	17	2.48	97.37
21 - 60	16	2.34	99.71
61 - 110	2	0.29	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



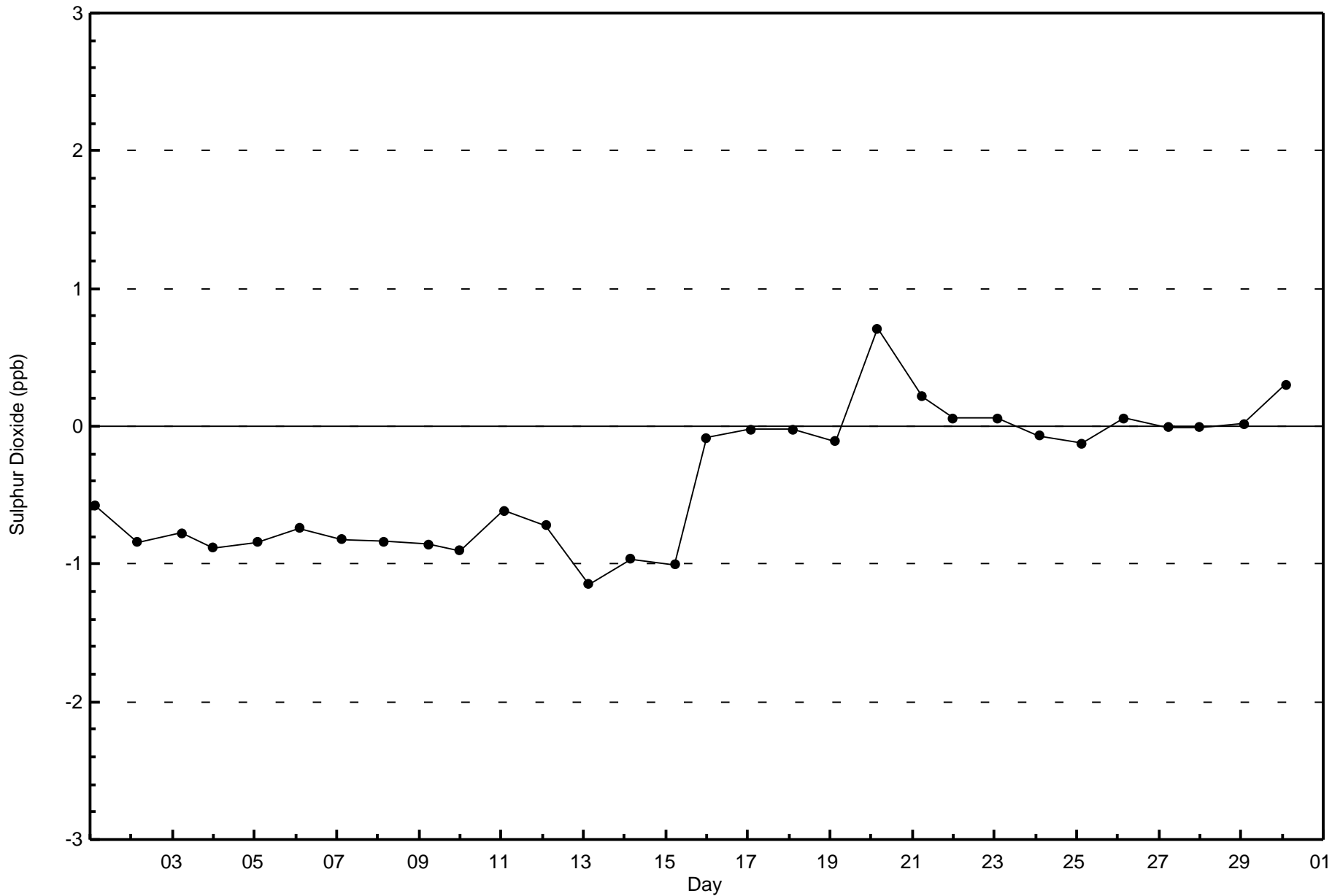
**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Mildred Lake - June 2016**

Concentration Ranges (ppb)	Wind Direction																
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Totals
0 - 10	76	59	32	23	14	24	27	63	40	58	29	57	39	41	32	36	650
11 - 20	0	0	0	0	1	1	3	5	1	2	0	1	0	1	0	2	17
21 - 60	0	0	0	0	2	0	3	3	0	2	3	0	0	2	0	1	16
61 - 110	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2
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
Totals	76	59	32	23	17	25	33	71	41	62	32	59	39	44	32	40	685

Total Number of Valid Hours: 685

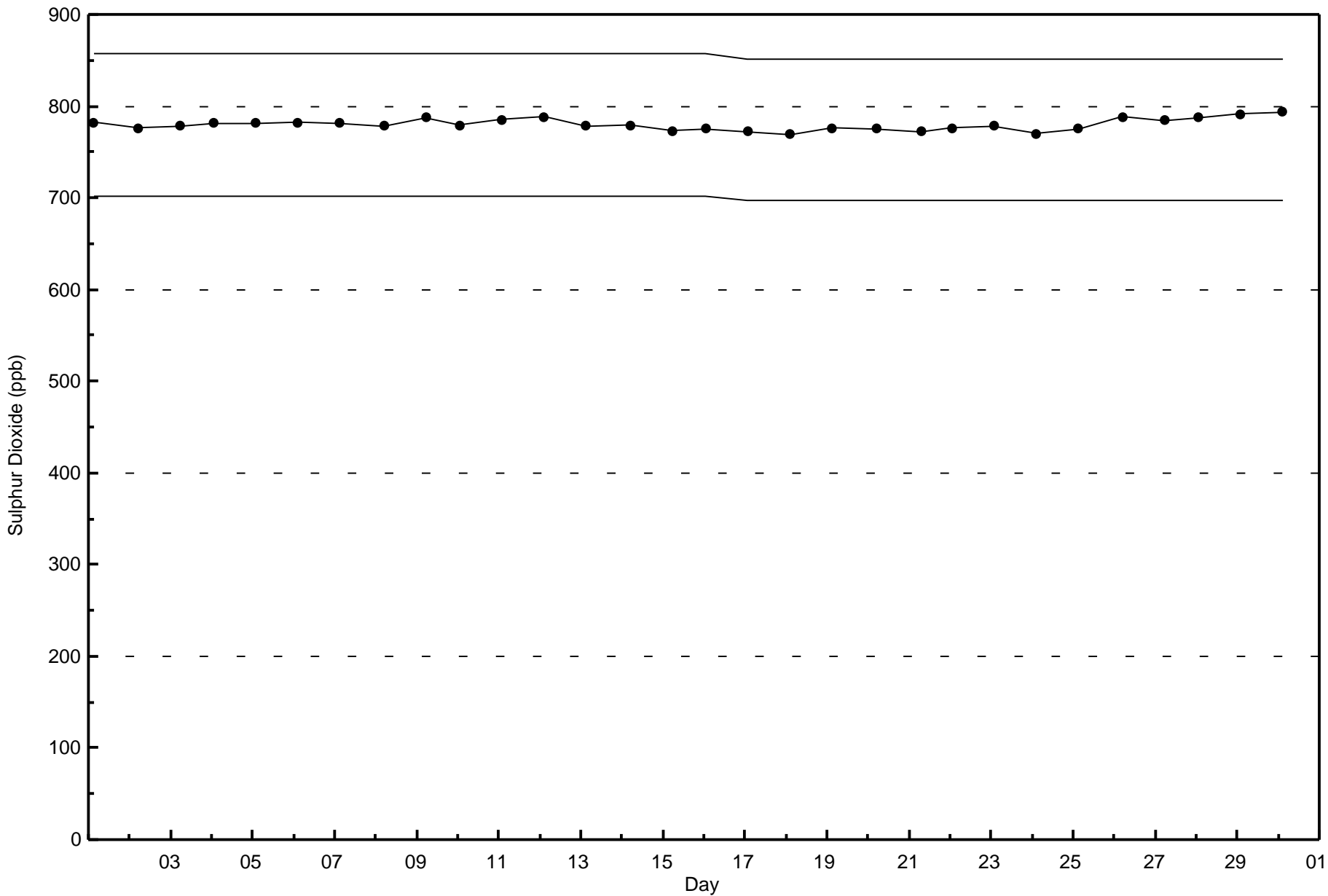
Total Number of Hours: 720





Wood Buffalo Environmental Association
Span Responses

Sulphur Dioxide (SO₂) - ppb
Mildred Lake - June 2016



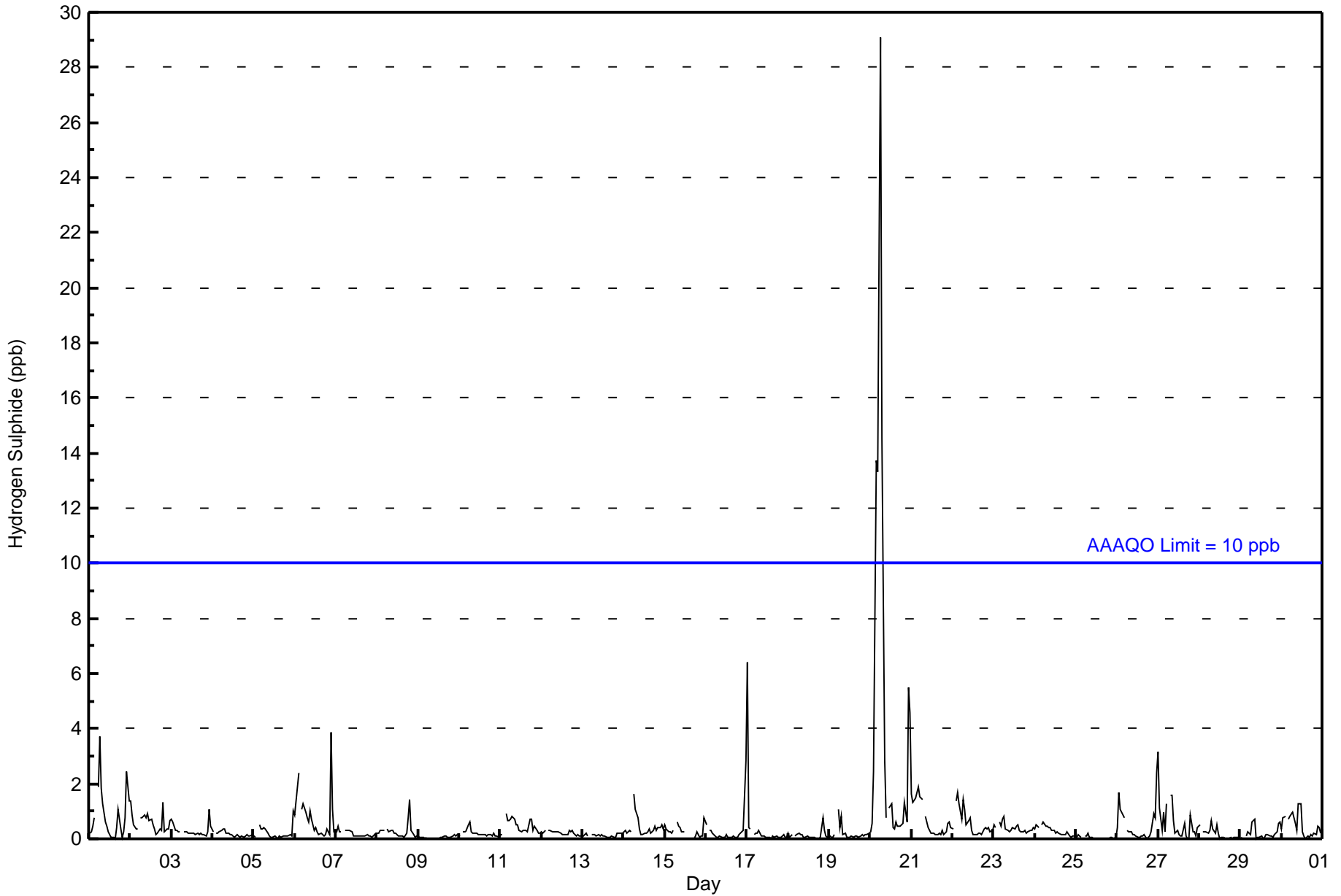


Number of Exceedences (AAAQO):	1-hr: 5	24-hr: 1	Hours in Service:	720
Maximum Value: 29 ppb on Jun 20 07:00	Maximum Daily Average: 5.1 ppb on Jun 20		Hours of Data:	685
Minimum Value: 0 ppb on Jun 9 05:00	Minimum Daily Average: 0.0 ppb on Jun 25		Hours of Missing Data:	35
Maximum Diurnal Average: 1.8 ppb at hour 7	Minimum Diurnal Average: 0.1 ppb at hour 15		Hours of Calibration:	35
Monthly Average: 0.5 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 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-Jun	0	0	0	1	Z	2	4	2	1	1	0	0	0	0	0	0	0	1	0	0	0	1	2	1	0.8	4
2-Jun	1	1	1	0	0	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0	1	0.6	1
3-Jun	1	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1
4-Jun	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
5-Jun	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1
6-Jun	1	1	2	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	4	1	0	0.8	4
7-Jun	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-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0.3	1
9-Jun	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
10-Jun	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
11-Jun	0	0	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0.5	1
12-Jun	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
13-Jun	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-Jun	0	0	0	0	0	Z	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
15-Jun	1	0	0	0	0	0	Z	1	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	1	0.3	1
16-Jun	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.3	3
17-Jun	6	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	6
18-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.1	1
19-Jun	0	0	0	0	Z	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
20-Jun	0	1	2	14	13	22	29	15	3	1	Z	1	1	0	0	1	0	0	1	1	1	1	5	5	5.1	29
21-Jun	2	1	1	2	2	2	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.7	2
22-Jun	0	Z	1	2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	2
23-Jun	1	0	Z	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
24-Jun	0	1	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
25-Jun	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-Jun	0	2	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0.5	2
27-Jun	3	1	0	1	0	1	Z	2	2	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0.6	3
28-Jun	1	Z	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
29-Jun	0	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.2	1
30-Jun	0	1	1	Z	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1

0.7	0.5	0.6	1.0	1.0	1.4	1.8	1.0	0.5	0.3	0.3	0.3	0.2	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.3	0.2	0.4	0.5	0.6	Diurnal Average
6	2	2	14	13	22	29	15	3	1	1	1	1	1	0	1	0	1	0	1	1	1	4	5	5	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 (H₂S) - ppb
Mildred Lake - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	672	98.10	98.10
3 - 4	5	0.73	98.83
5 - 7	3	0.44	99.27
8 - 11	0	0.00	99.27
> 11	5	0.73	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Mildred Lake - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	77	59	31	23	17	26	32	68	45	56	33	59	33	42	33	38	672
3 - 4	0	0	0	0	0	0	0	2	0	1	0	0	1	1	0	0	5
5 - 7	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	3
8 - 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
> 11	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2	5
Totals	78	59	31	23	17	26	33	71	45	58	33	59	35	44	33	40	685

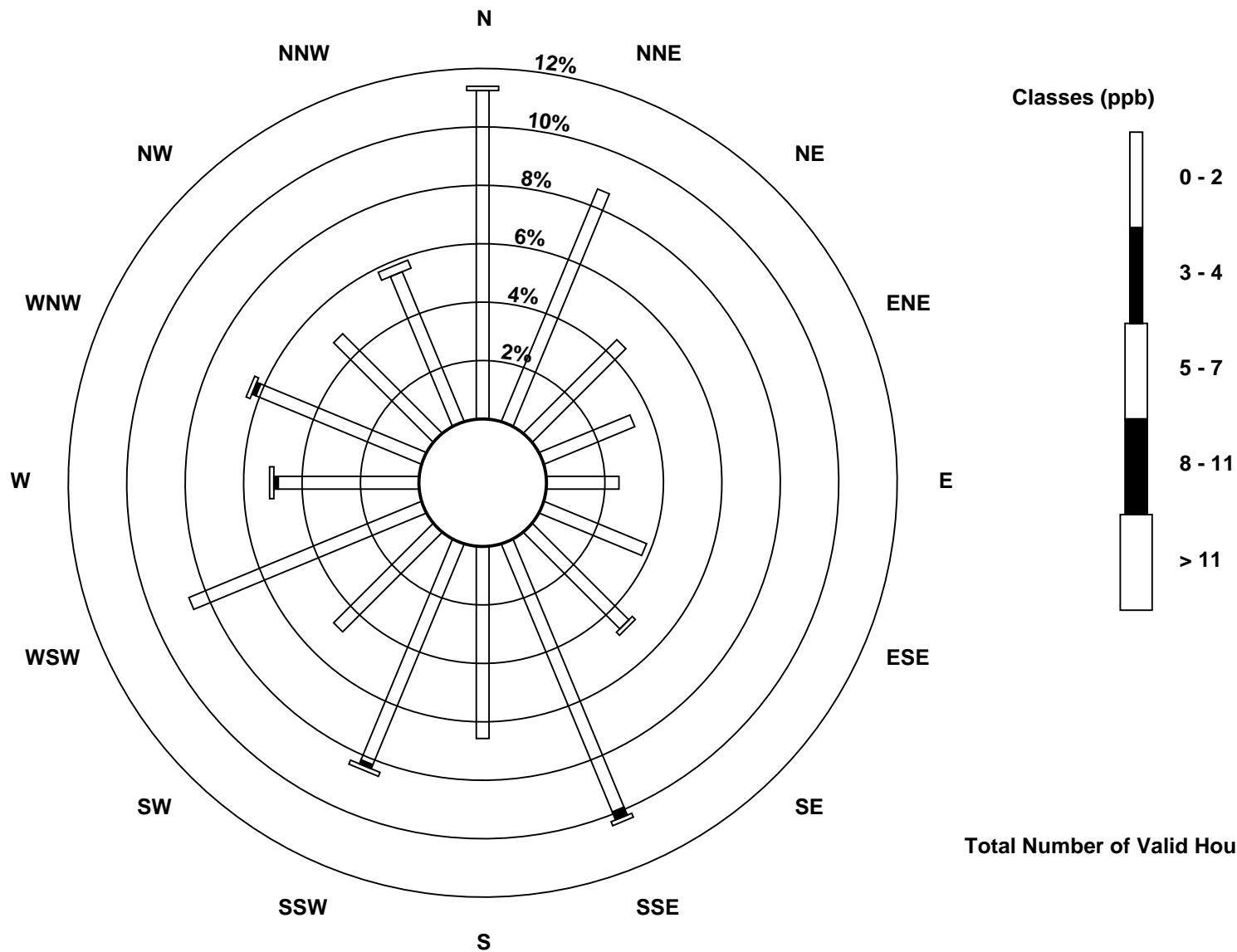
Total Number of Valid Hours: 685

Total Number of Hours: 720

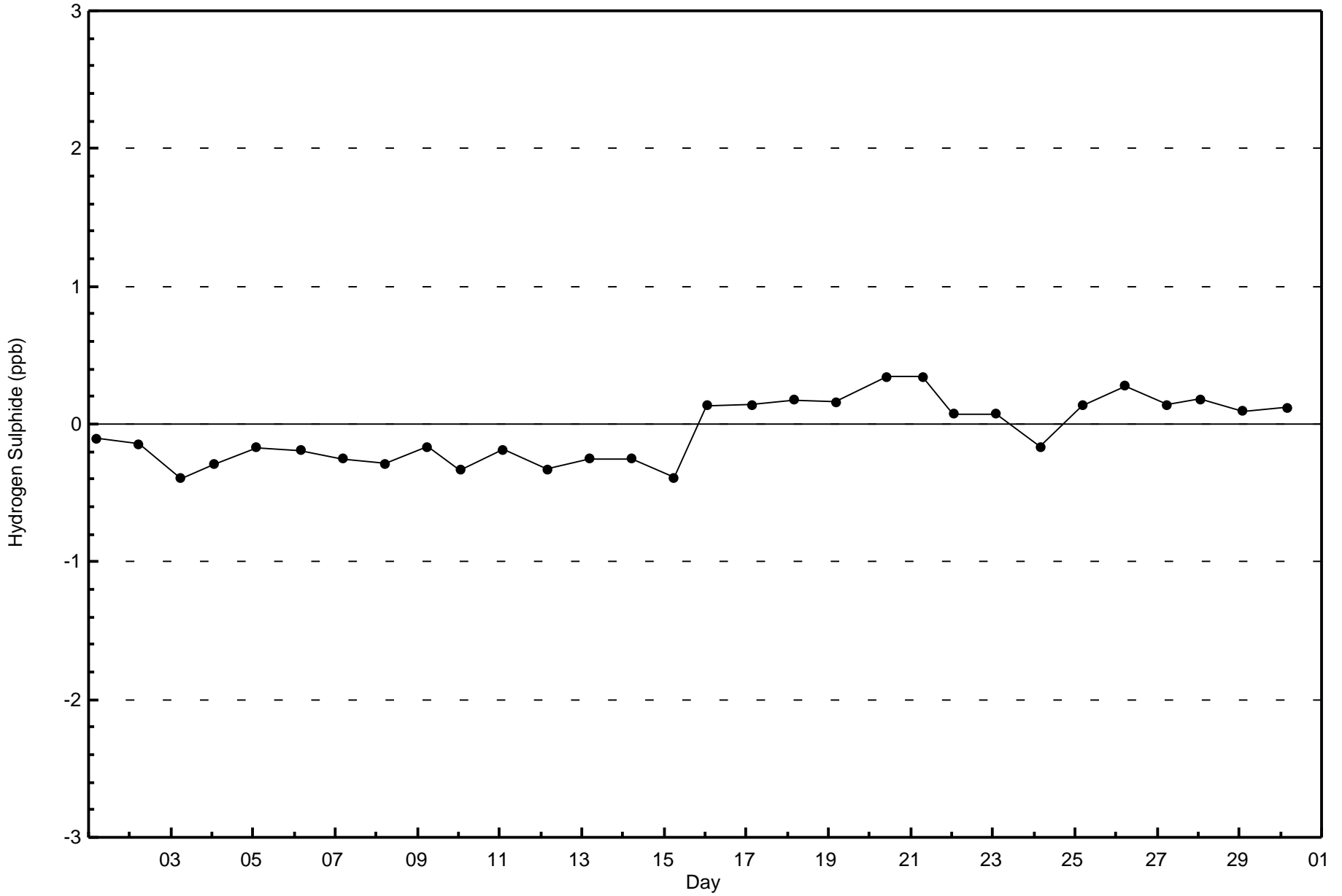


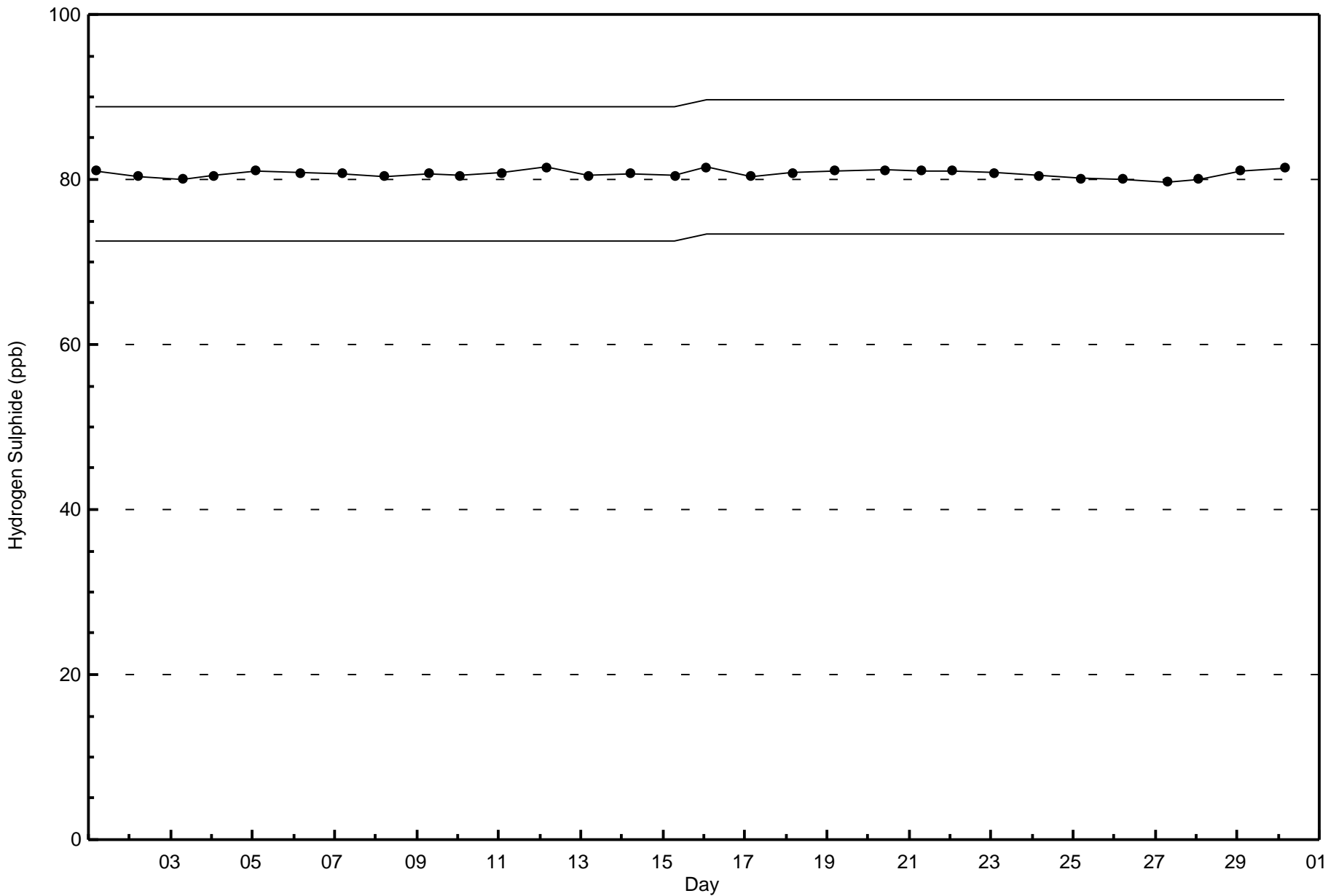
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Hydrogen Sulphide (H₂S) - ppb
Mildred Lake (AMS 2)



Total Number of Valid Hours: 685







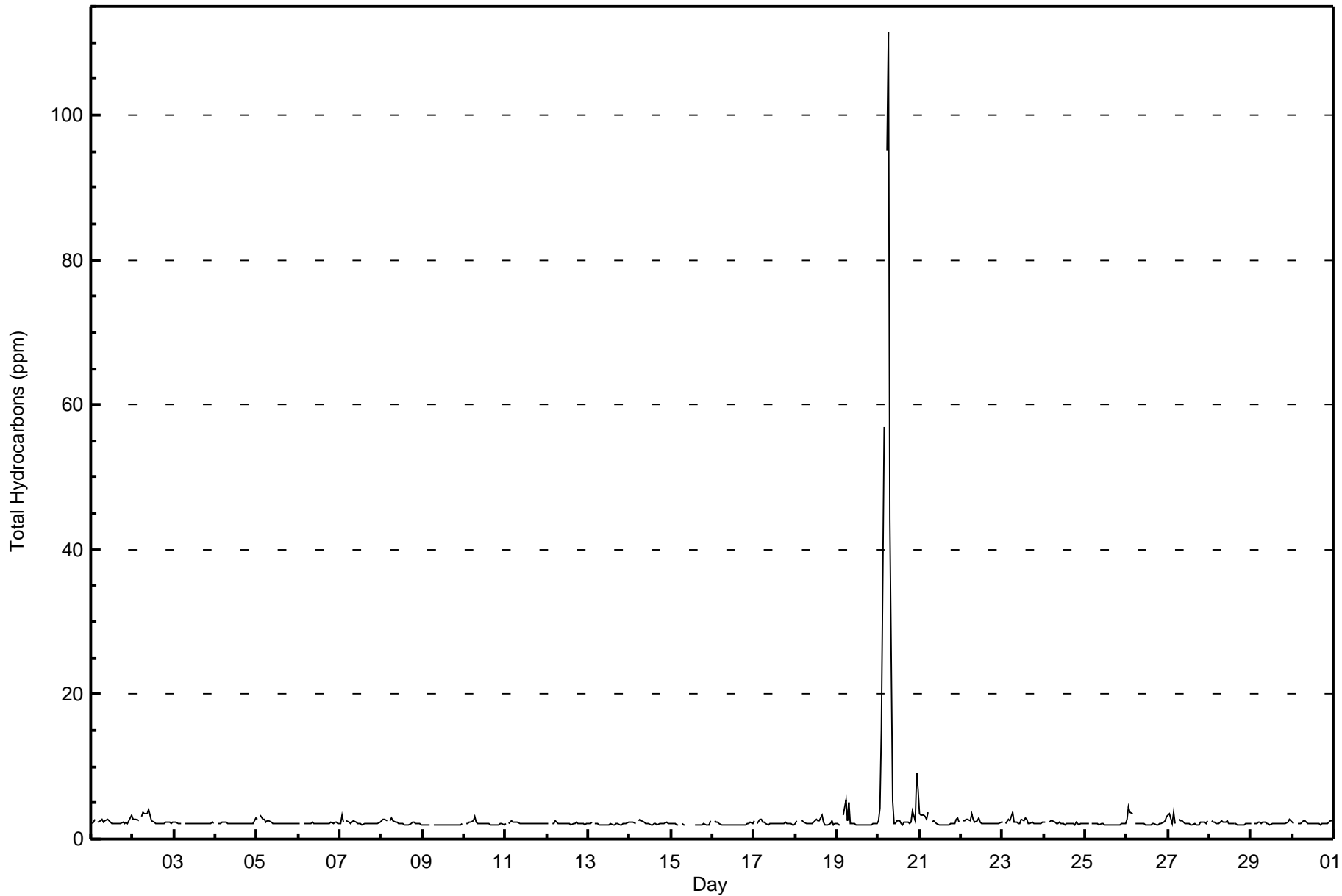
Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

Mildred Lake - June 2016

Maximum Value: 111.5 ppm on Jun 20 07:00		Maximum Daily Average: 16.6 ppm on Jun 20		Hours in Service: 720																							
Minimum Value: 1.9 ppm on Jun 27 18:00		Minimum Daily Average: 2.0 ppm on Jun 9		Hours of Data: 685																							
Maximum Diurnal Average: 6.3 ppm at hour 7		Minimum Diurnal Average: 2.1 ppm at hour 18		Hours of Missing Data: 35																							
Monthly Average: 2.73 ppm		Percentiles: P ₁ = 2.0 P ₁₀ = 2.0 Q ₁ = 2.1 Median = 2.1 O ₃ = 2.3 P ₉₀ = 2.6 P ₉₉ = 6.0		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-Jun	2.2	2.3	2.7	Z	2.4	2.4	2.7	2.3	2.5	2.6	2.6	2.3	2.1	2.2	2.1	2.1	2.2	2.2	2.3	2.2	2.2	2.2	2.6	3.3	2.4	3.3	
2-Jun	2.8	2.8	2.7	2.6	Z	3.1	3.6	3.5	3.6	4.1	3.3	2.5	2.4	2.2	2.2	2.1	2.1	2.2	2.2	2.4	2.3	2.3	2.2	2.3	2.7	4.1	
3-Jun	2.4	2.4	2.2	2.2	2.2	Z	2.2	2.2	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	2.3	2.1	2.2	2.4		
4-Jun	Z	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.9	2.2	2.9		
5-Jun	2.7	Z	3.3	2.7	2.7	2.4	2.6	2.5	2.3	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	2.3	3.3		
6-Jun	2.2	2.2	Z	2.1	2.2	2.1	2.2	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.1	2.3	2.3	2.1	2.2	2.3	
7-Jun	2.2	3.3	2.4	Z	2.5	2.3	2.2	2.4	2.5	2.3	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.4	2.2	3.3	
8-Jun	2.6	2.7	2.7	2.4	Z	2.6	2.9	2.5	2.4	2.3	2.2	2.2	2.1	2.0	2.0	2.0	2.0	2.1	2.3	2.3	2.2	2.1	2.1	2.0	2.3	2.9	
9-Jun	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	2.0
10-Jun	Z	2.2	2.2	2.3	2.3	2.6	3.1	2.4	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.2	3.1	
11-Jun	2.1	Z	2.2	2.5	2.3	2.4	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.2	2.5	
12-Jun	2.1	2.1	Z	2.2	2.2	2.5	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.2	2.3	2.2	2.2	2.1	2.1	2.0	2.1	2.1	2.5	
13-Jun	2.1	2.2	2.3	Z	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	2.0	2.0	2.0	2.2	2.2	2.3	2.1	2.3	
14-Jun	2.4	2.4	2.4	2.2	Z	2.5	2.8	2.6	2.3	2.2	2.1	2.0	2.0	2.0	2.0	2.1	2.0	2.1	2.1	2.1	2.3	2.2	2.1	2.2	2.2	2.8	
15-Jun	2.1	2.1	2.0	2.0	2.0	Z	2.2	2.0	2.0	C	C	C	C	C	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.5	2.1	2.5	
16-Jun	Z	2.5	2.3	2.3	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	2.1	2.1	2.3	2.2	2.1	2.5	
17-Jun	2.6	Z	2.2	2.6	2.8	2.4	2.4	2.2	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.1	2.1	2.1	2.0	2.0	2.2	2.8	
18-Jun	2.2	2.5	Z	2.6	2.6	2.4	2.2	2.1	2.1	2.1	2.1	2.5	2.7	2.6	2.6	3.4	2.4	2.0	2.0	2.0	2.2	2.5	2.0	2.1	2.3	3.4	
19-Jun	2.1	2.0	2.0	Z	3.4	5.4	2.5	5.0	2.1	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.1	2.4	5.4	
20-Jun	2.6	4.4	15.0	57.0	Z	95.1	111.5	44.2	5.2	2.1	2.2	2.6	2.6	2.1	2.0	2.4	2.4	2.3	2.2	2.4	3.9	2.5	9.2	6.8	16.6	111.5	
21-Jun	3.4	3.2	3.4	3.2	2.7	3.7	Z	2.4	2.5	2.3	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.6	2.9	2.4	2.5	3.7	
22-Jun	Z	2.5	2.6	2.7	2.7	2.6	3.4	2.8	2.3	2.5	2.9	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.1	2.2	2.4	2.4	3.4	
23-Jun	2.3	Z	2.2	2.6	2.5	3.1	3.8	2.4	2.3	2.1	2.2	2.7	2.5	3.0	2.7	2.1	2.2	2.3	2.1	2.1	2.1	2.1	2.1	2.3	2.4	3.8	
24-Jun	2.3	2.3	Z	2.4	2.5	2.5	2.3	2.2	2.1	2.3	2.2	2.1	2.0	2.1	2.1	2.1	2.2	2.1	2.0	2.4	2.0	2.0	2.1	2.2	2.2	2.5	
25-Jun	2.1	2.1	2.2	Z	2.2	2.1	2.2	2.2	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	2.1	2.0	2.1	2.1	2.2	
26-Jun	2.7	4.5	3.8	3.6	Z	2.2	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.1	2.2	2.4	2.5	3.1	2.4	4.5	
27-Jun	3.2	3.4	2.1	3.6	2.2	Z	2.7	2.5	2.6	2.2	2.1	2.1	2.1	2.0	2.0	2.2	2.0	1.9	2.0	2.3	2.2	2.4	2.2	2.5	2.4	3.6	
28-Jun	Z	2.5	2.2	2.3	2.2	2.2	2.3	2.5	2.4	2.3	2.5	2.2	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.5	
29-Jun	2.1	Z	2.1	2.1	2.3	2.2	2.1	2.3	2.3	2.1	2.1	2.0	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.6	2.6	2.2	2.6	
30-Jun	2.3	2.2	Z	2.2	2.2	2.2	2.6	2.5	2.3	2.1	2.2	2.2	2.1	2.0	2.0	2.1	2.0	2.1	2.1	2.2	2.2	2.4	2.5	2.6	2.2	2.6	
																								Diurnal Average			
																								Diurnal Maximum			
																								Z - zerospan C - Calibration			





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Mildred Lake - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	153	22.34	22.34
2.1 - 3.0	493	71.97	94.31
3.1 - 10.0	34	4.96	99.27
> 10.0	5	0.73	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Mildred Lake - June 2016

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	18	28	14	6	5	7	5	2	6	20	8	23	2	1	0	8	153
2.1 - 3.0	57	29	18	17	12	17	27	65	30	39	23	34	31	35	30	29	493
3.1 - 10.0	1	2	0	0	0	1	1	4	5	2	1	2	5	8	1	1	34
> 10.0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	2	5
Totals	76	59	32	23	17	25	33	71	41	62	32	59	39	44	32	40	685

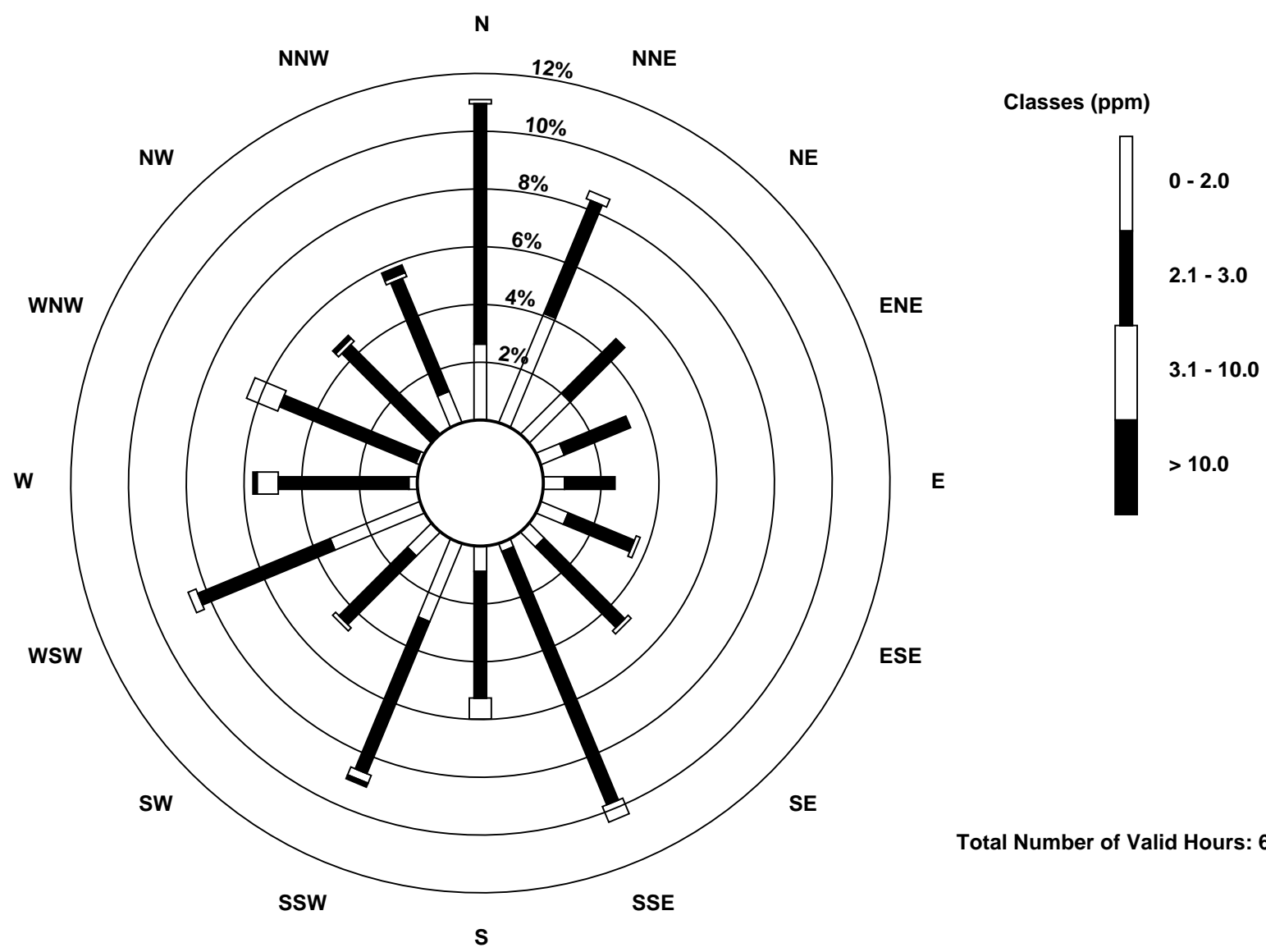
Total Number of Valid Hours: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

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



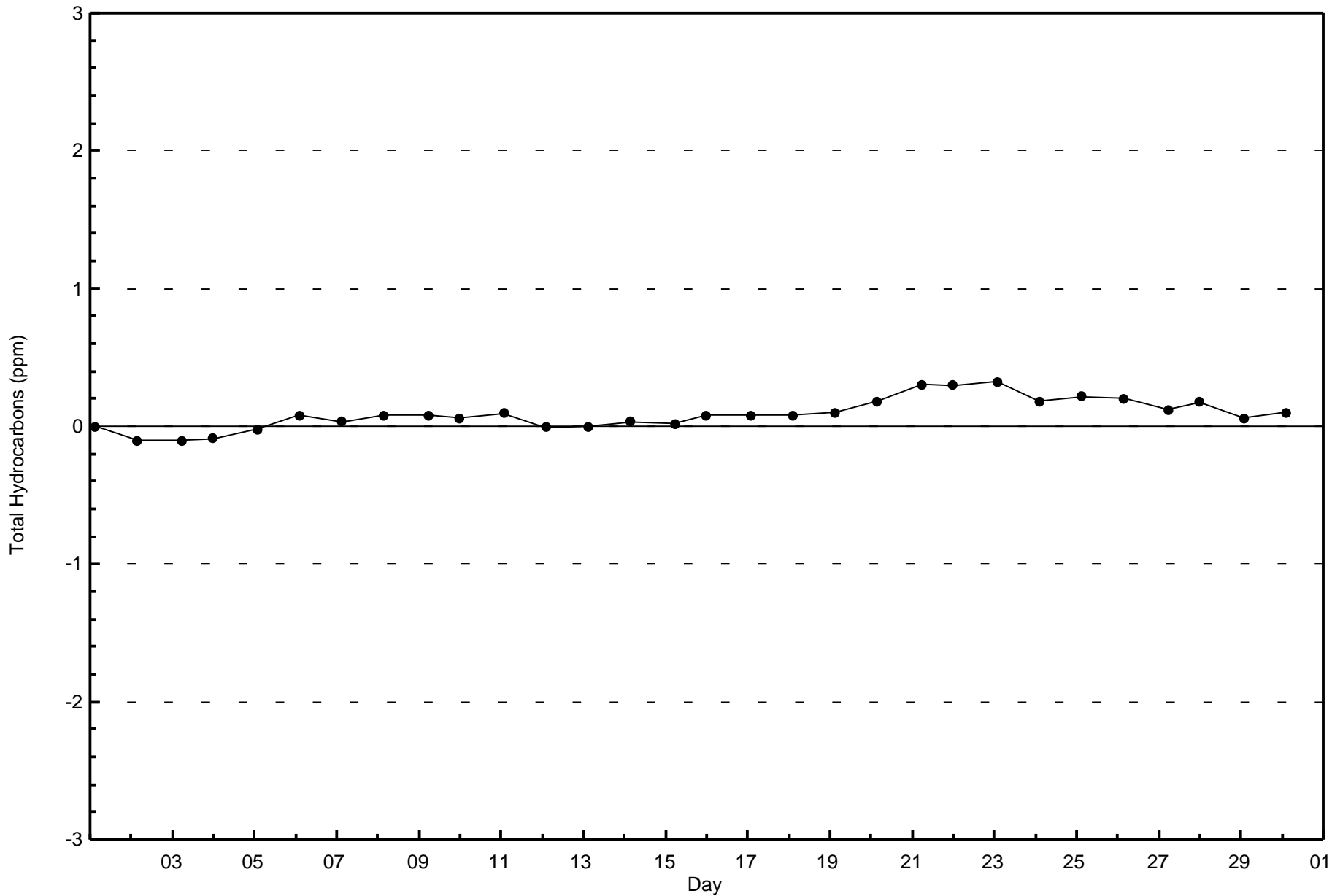


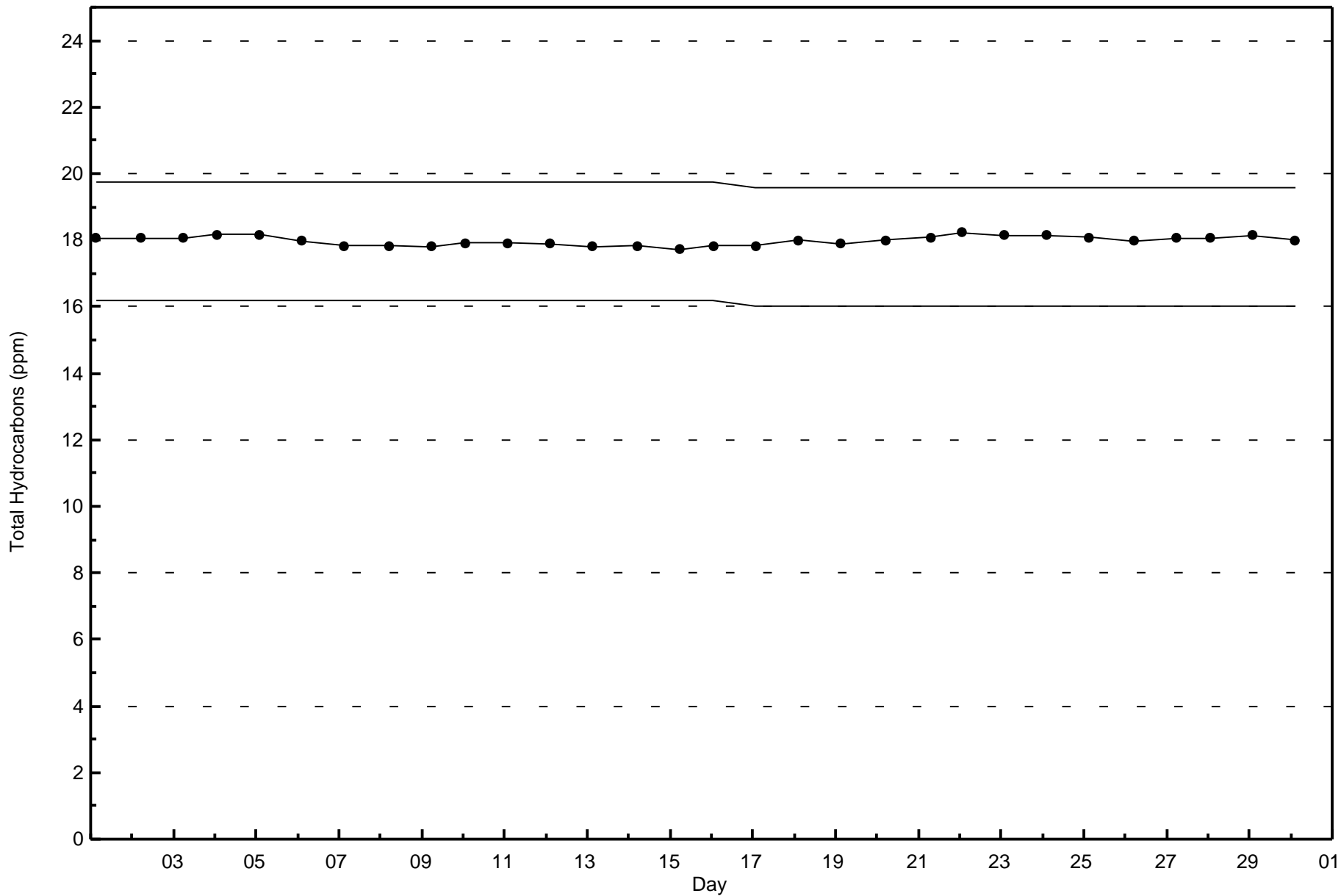
Wood Buffalo Environmental Association

Zero Responses

Total Hydrocarbons (THC) - ppm

Mildred Lake - June 2016







Wood Buffalo Environmental Association
Summary of Hour Averages

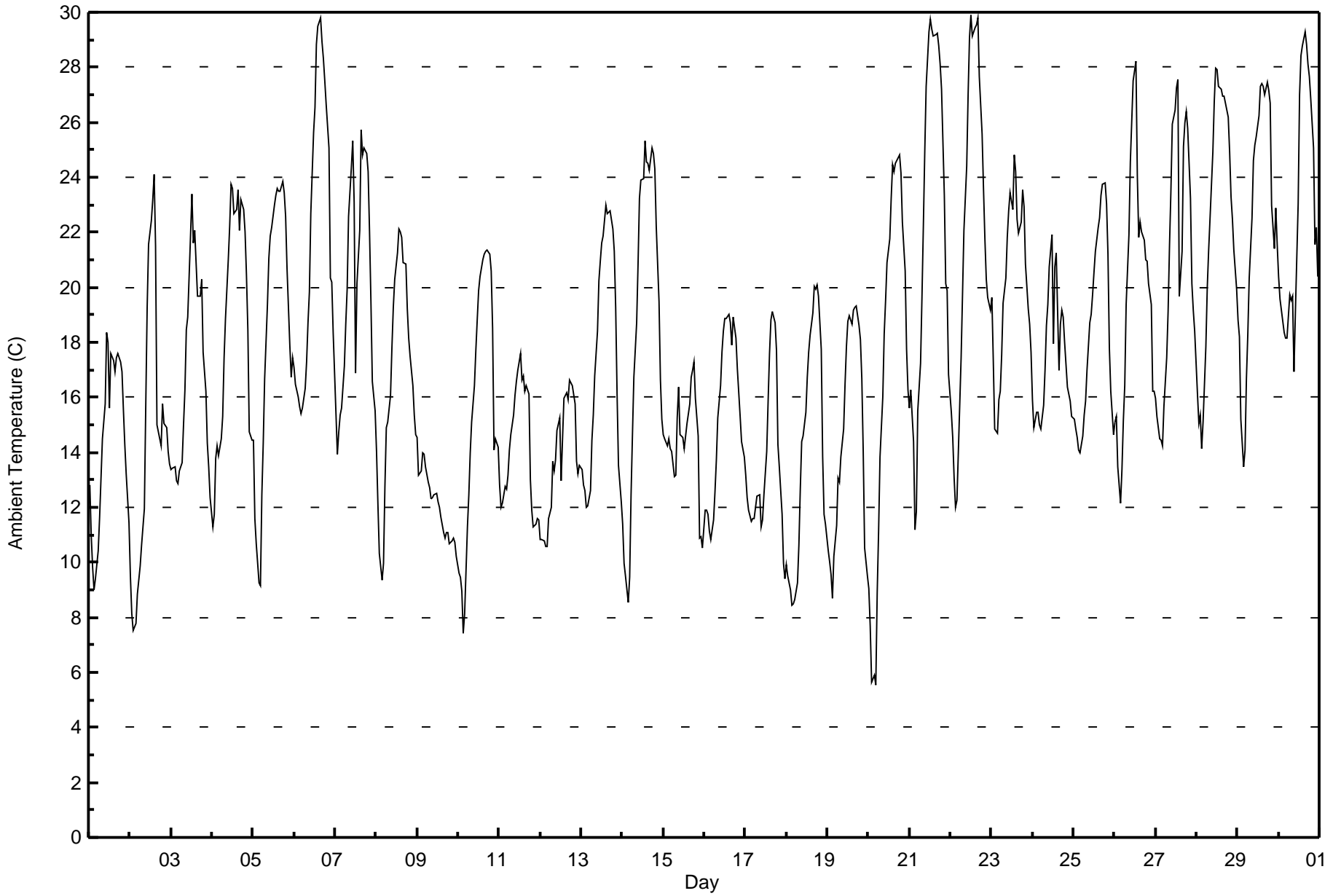
Ambient Temperature (AT) - C
Mildred Lake - June 2016

Maximum Value: 29.9 C on Jun 22 13:00		Maximum Daily Average: 22.7 C on Jun 30		Hours in Service: 720																						
Minimum Value: 5.5 C on Jun 20 05:00		Minimum Daily Average: 12.1 C on Jun 9		Hours of Data: 720																						
Maximum Diurnal Average: 22.0 C at hour 15		Minimum Diurnal Average: 12.0 C at hour 4		Hours of Missing Data: 0																						
Monthly Average: 17.73 C		Percentiles: P ₁ = 8.1 P ₁₀ = 11.3 Q ₁ = 13.9 Median = 17.0 Q ₃ = 21.7 P ₉₀ = 25.1 P ₉₉ = 29.4		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-Jun	12.8	11.0	9.8	9.0	9.4	10.4	11.6	13.1	14.5	15.8	18.4	18.0	15.6	17.6	17.4	16.9	17.4	17.6	17.3	16.9	15.6	14.3	13.2	11.4	14.4	18.4
2-Jun	9.5	8.1	7.5	7.8	8.9	9.4	9.8	10.6	12.0	15.7	19.3	21.6	22.4	23.2	24.1	21.5	15.0	14.5	14.2	15.8	15.1	14.9	14.0	13.6	14.5	24.1
3-Jun	13.4	13.4	13.5	13.0	12.9	13.3	13.7	15.0	16.3	18.4	18.9	21.9	23.4	21.6	22.1	19.7	19.7	19.7	20.3	17.7	16.2	14.3	13.5	12.4	16.8	23.4
4-Jun	11.3	11.7	13.8	14.2	13.9	14.5	15.3	17.4	18.9	21.0	22.2	23.8	23.6	22.7	22.8	23.5	22.1	23.2	22.8	22.0	20.4	18.4	14.7	14.4	18.7	23.8
5-Jun	14.4	11.6	10.7	9.2	9.1	12.4	14.3	16.7	19.4	21.0	21.9	22.2	23.0	23.3	23.6	23.5	23.5	23.8	23.4	22.6	20.7	17.9	16.7	17.5	18.4	23.8
6-Jun	17.1	16.5	16.0	15.7	15.4	15.6	16.3	17.3	18.7	19.8	22.7	25.6	26.5	28.8	29.5	29.8	29.0	28.3	27.5	26.7	25.1	20.3	20.2	18.4	22.0	29.8
7-Jun	15.4	13.9	14.8	15.4	15.6	17.1	18.7	19.9	22.6	24.3	25.3	23.1	16.9	20.1	22.0	25.7	24.8	25.1	24.9	24.2	22.0	19.5	16.6	15.5	20.1	25.7
8-Jun	14.0	12.1	10.3	9.4	10.0	12.7	14.9	15.1	16.0	17.8	19.3	20.3	21.3	22.1	22.0	21.8	20.9	20.9	19.2	18.2	17.5	16.4	15.3	14.7	16.8	22.1
9-Jun	14.6	13.2	13.3	14.0	13.9	13.5	12.9	12.7	12.3	12.3	12.5	12.5	12.2	12.0	11.6	11.1	10.9	11.1	11.1	10.7	10.8	10.9	10.8	10.2	12.1	14.6
10-Jun	9.6	9.5	8.9	7.4	8.1	11.3	12.4	14.0	15.1	16.4	17.7	18.8	19.9	20.4	21.0	21.2	21.3	21.4	21.2	20.6	18.5	14.1	14.5	14.2	15.7	21.4
11-Jun	12.8	12.0	12.2	12.8	12.7	13.2	14.1	14.6	15.4	16.1	16.6	17.0	17.6	16.6	16.8	16.2	16.4	16.1	13.0	11.9	11.3	11.4	11.6	11.5	14.2	17.6
12-Jun	10.8	10.8	10.8	10.6	10.6	11.6	12.0	13.7	13.3	13.7	14.8	15.3	13.0	14.5	16.0	16.2	15.9	16.6	16.5	16.4	15.8	13.7	13.2	13.5	13.7	16.6
13-Jun	13.4	12.8	12.6	12.0	12.1	12.6	14.4	15.3	16.8	18.4	20.2	21.0	21.6	21.8	23.0	22.7	22.7	22.8	22.1	21.3	19.3	16.1	13.5	12.2	17.5	23.0
14-Jun	11.4	10.0	9.5	8.6	9.5	12.4	14.6	16.7	18.7	20.8	23.2	23.9	24.0	25.3	24.6	24.5	24.3	25.1	24.8	24.3	22.2	19.5	16.7	15.2	18.7	25.3
15-Jun	14.6	14.5	14.3	14.5	14.1	14.0	13.1	13.2	15.3	16.4	14.6	14.5	14.1	14.6	15.1	15.7	16.7	17.0	17.3	16.0	14.6	10.9	10.9	10.5	14.4	17.3
16-Jun	11.9	11.9	11.7	11.1	10.8	11.5	12.5	13.8	15.2	16.4	17.6	18.4	18.9	18.8	19.0	18.7	17.9	18.9	18.1	17.0	16.2	15.3	14.4	13.8	15.4	19.0
17-Jun	13.2	12.4	11.9	11.5	11.6	11.6	12.0	12.4	12.4	11.3	11.6	12.5	14.1	15.9	17.6	18.8	19.1	18.7	17.7	14.3	13.5	11.7	10.0	9.4	13.5	19.1
18-Jun	9.9	9.5	9.0	8.4	8.5	8.7	9.2	10.6	12.6	14.4	14.6	15.4	16.7	17.6	18.3	19.1	20.0	19.9	20.1	19.7	17.8	13.8	11.7	11.4	14.0	20.1
19-Jun	10.4	10.0	9.6	8.7	10.2	11.3	13.0	12.9	13.8	14.8	16.5	17.8	18.8	19.0	18.6	19.2	19.3	19.3	18.6	18.1	16.7	14.0	10.5	9.5	14.6	19.3
20-Jun	9.0	7.7	5.6	5.9	5.5	8.9	11.2	13.9	16.0	18.3	19.5	20.9	21.7	23.2	24.5	24.2	24.5	24.7	24.8	24.1	22.4	20.6	17.8	16.3	17.1	24.8
21-Jun	15.6	16.3	14.4	11.2	11.8	15.5	17.3	19.7	22.2	24.9	27.3	29.3	29.7	29.4	29.2	29.2	29.2	28.8	28.1	27.2	23.4	20.1	19.9	16.8	22.3	29.7
22-Jun	15.5	14.5	13.1	12.0	12.3	15.7	17.4	19.7	22.1	24.4	27.0	29.1	29.9	29.1	29.4	29.5	29.8	27.7	25.6	23.6	21.7	20.3	19.6	19.2	22.0	29.9
23-Jun	19.6	17.3	14.9	14.7	15.9	16.2	17.6	19.4	20.4	21.8	22.8	23.4	22.9	24.8	24.2	22.5	22.0	22.4	23.6	22.9	20.8	19.2	18.7	17.7	20.2	24.8
24-Jun	15.9	14.9	15.5	15.4	15.0	14.9	15.7	17.0	18.6	19.4	20.7	21.9	18.0	20.7	21.3	17.0	18.7	19.2	18.9	18.0	16.4	16.1	15.8	15.3	17.5	21.9
25-Jun	15.2	14.9	14.5	14.1	14.0	14.6	15.3	15.9	17.0	18.7	19.0	19.7	20.6	21.3	22.2	22.5	23.3	23.7	23.8	23.1	21.2	17.8	16.2	14.6	18.5	23.8
26-Jun	15.1	15.3	13.5	12.1	13.3	15.2	16.4	19.3	21.9	24.5	26.1	27.5	28.2	24.1	21.8	22.4	22.0	21.7	21.0	21.0	20.1	19.4	16.2	16.2	19.8	28.2
27-Jun	16.0	15.3	14.5	14.4	14.3	15.6	17.5	19.1	21.5	23.5	26.0	26.4	27.3	27.6	19.7	21.3	25.1	26.0	26.4	25.8	23.3	20.2	19.2	18.4	21.0	27.6
28-Jun	16.1	15.1	15.3	14.1	15.1	17.9	20.0	21.4	22.5	24.9	26.7	28.0	27.9	27.3	27.2	26.9	27.0	26.7	26.2	24.9	23.3	22.5	21.3	19.9	22.4	28.0
29-Jun	18.8	18.2	15.2	13.5	14.1	16.7	18.3	20.4	22.5	24.6	25.2	25.5	26.2	27.3	27.4	27.3	27.0	27.5	27.2	26.7	23.0	21.4	22.9	21.6	22.4	27.5
30-Jun	20.4	19.6	18.8	18.3	18.2	18.1	19.7	19.5	19.7	16.9	19.1	23.0	27.0	28.4	28.8	29.3	28.8	28.1	27.7	26.8	25.1	21.6	22.2	20.4	22.7	29.3
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Mildred Lake - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ambient Temperature (AT) - C
Mildred Lake - June 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	41	5.69	5.69
10 - 20	444	61.67	67.36
> 20	235	32.64	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

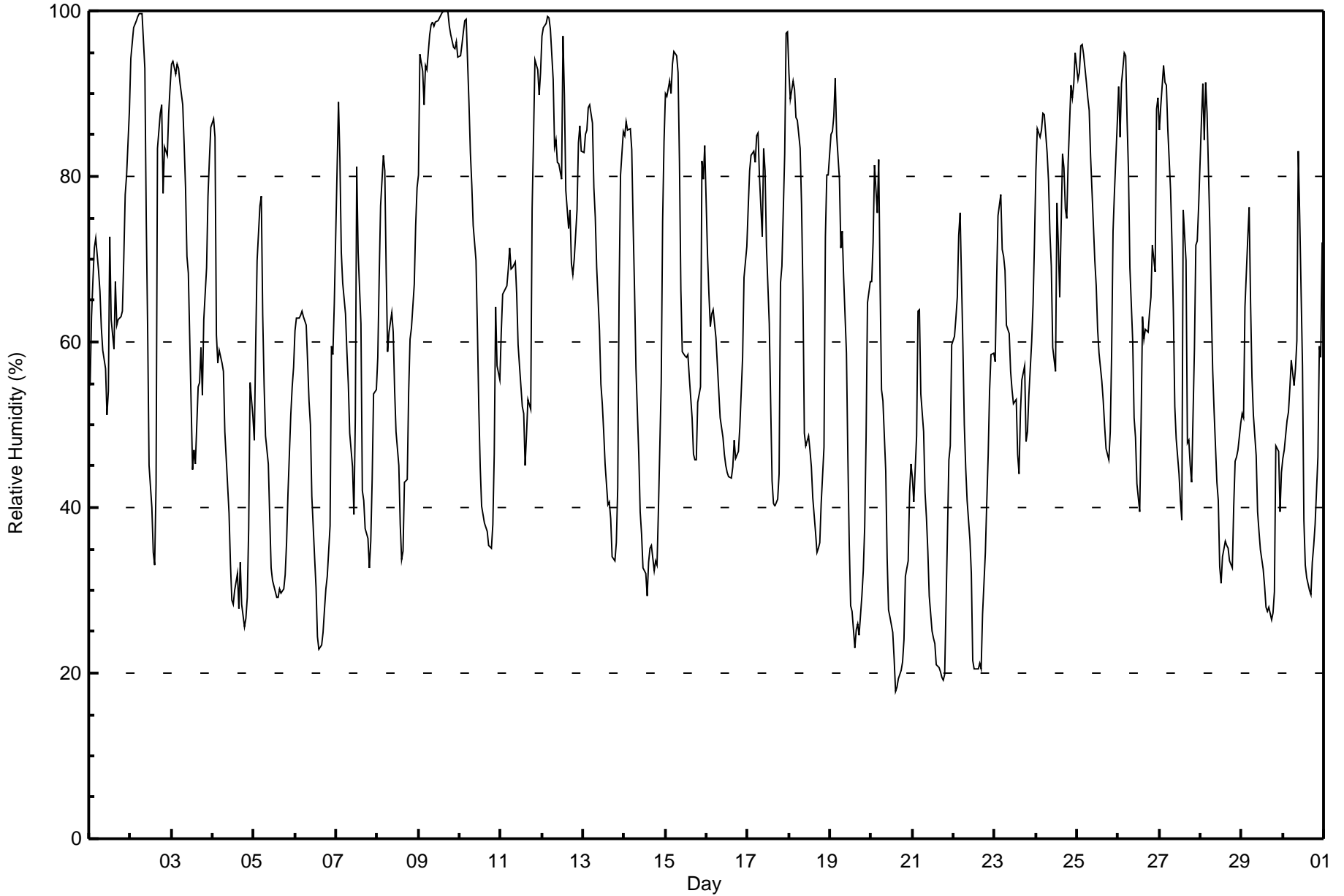
Mildred Lake - June 2016

Maximum Value: 100 % on Jun 9 17:00																			Maximum Daily Average: 96.2 % on Jun 9						Hours in Service: 720																									
Minimum Value: 18 % on Jun 20 15:00																			Minimum Daily Average: 37.1 % on Jun 21						Hours of Data: 720																									
Maximum Diurnal Average: 81.2 % at hour 5																			Minimum Diurnal Average: 43.9 % at hour 15						Hours of Missing Data: 0																									
Monthly Average: 60.9 %																			Percentiles: P ₁ = 20 P ₁₀ = 32 Q ₁ = 44 Median = 60 Q ₃ = 80 P ₉₀ = 91 P ₉₉ = 100						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-Jun	55	63	68	71	72	69	66	62	59	57	51	54	73	63	59	67	62	63	63	64	70	78	80	88	65.7	88																								
2-Jun	94	96	98	99	99	100	100	100	93	75	61	45	40	35	33	43	83	88	89	78	84	83	88	91	78.9	100																								
3-Jun	94	94	92	94	93	91	89	84	79	70	68	52	45	47	45	55	55	59	54	63	69	78	82	86	72.3	94																								
4-Jun	87	85	61	57	59	58	56	49	46	39	33	29	28	30	32	28	33	28	26	27	29	37	55	51	44.3	87																								
5-Jun	48	60	70	76	78	63	55	49	45	39	33	31	30	29	29	30	30	30	32	36	42	51	54	57	45.7	78																								
6-Jun	61	63	63	63	64	63	62	58	53	50	41	34	30	24	23	23	25	28	30	32	38	59	59	65	46.3	65																								
7-Jun	81	89	82	71	67	63	59	55	49	45	39	51	81	71	62	42	41	37	36	33	36	43	54	54	55.9	89																								
8-Jun	58	68	76	83	81	68	59	61	64	61	54	49	45	38	34	35	43	43	54	60	62	67	74	79	59.0	83																								
9-Jun	80	95	93	89	93	93	97	98	99	98	99	99	99	100	100	100	100	100	98	97	96	95	96	94	96.2	100																								
10-Jun	95	96	97	99	99	89	83	79	74	70	62	52	45	40	38	38	37	35	35	38	46	64	57	55	63.5	99																								
11-Jun	61	66	66	67	69	71	69	69	70	66	60	57	52	51	45	49	53	52	76	85	94	93	90	93	67.6	94																								
12-Jun	97	98	99	99	99	98	92	84	84	82	81	80	97	90	78	74	76	69	68	70	76	84	86	83	85.2	99																								
13-Jun	83	85	86	88	89	86	79	75	69	61	55	53	49	45	40	41	39	34	33	36	42	66	80	86	62.5	89																								
14-Jun	85	87	86	86	83	74	66	57	46	39	37	33	32	29	33	35	35	32	34	33	40	55	75	84	54.0	87																								
15-Jun	90	90	92	90	94	95	95	93	82	66	59	58	58	58	56	51	46	46	46	53	55	82	80	84	71.5	95																								
16-Jun	70	66	62	63	64	60	57	54	51	48	46	45	44	44	45	48	46	47	50	54	58	68	71	54.4	71																									
17-Jun	76	81	83	83	82	85	85	80	73	83	81	71	62	53	43	41	40	41	44	67	69	83	97	97	70.8	97																								
18-Jun	92	89	92	91	87	87	83	77	66	49	47	49	47	45	41	37	35	35	36	40	47	73	80	80	62.7	92																								
19-Jun	85	86	87	92	85	80	71	73	68	59	46	36	28	27	23	25	26	25	29	32	38	48	65	67	54.2	92																								
20-Jun	67	72	81	76	82	67	54	53	44	34	28	27	25	22	18	18	19	20	21	24	32	34	42	45	41.9	82																								
21-Jun	44	41	49	64	64	54	49	42	39	35	29	25	24	24	21	21	20	20	19	20	37	46	47	60	37.1	64																								
22-Jun	61	63	65	73	76	59	50	45	41	36	32	21	21	21	21	21	21	27	35	41	46	54	59	59	43.6	76																								
23-Jun	58	67	75	78	71	70	69	62	61	56	54	52	53	46	44	52	55	57	48	49	54	60	65	72	59.5	78																								
24-Jun	81	86	85	86	88	87	83	80	73	69	59	56	77	72	65	83	81	76	75	82	91	90	91	95	79.6	95																								
25-Jun	92	92	96	96	95	91	90	88	82	74	70	67	62	59	55	53	50	47	46	49	59	73	78	87	72.9	96																								
26-Jun	91	85	91	95	95	87	80	69	60	51	48	43	39	50	63	60	62	61	64	65	72	68	88	90	69.9	95																								
27-Jun	86	89	93	91	91	86	78	72	64	52	48	44	41	38	76	70	48	48	45	43	59	72	72	76	65.9	93																								
28-Jun	87	91	84	91	88	74	64	57	52	43	41	33	31	34	36	35	35	34	33	40	46	46	47	50	53.0	91																								
29-Jun	51	51	64	73	76	65	56	51	46	39	37	35	33	30	28	27	28	26	27	30	48	47	40	44	43.9	76																								
30-Jun	46	47	50	51	54	58	55	57	60	83	75	57	39	33	32	30	29	33	35	38	46	60	58	72	50.0	83																								
																								75.2	77.9	79.5	81.1	81.2	76.4	71.7	67.6	63.0	57.7	52.5	47.9	47.6	44.9	43.9	44.3	45.2	44.7	45.9	49.1	55.8	64.9	70.2	73.8	Diurnal Average		
																								97	98	99	99	99	100	100	100	99	98	99	99	99	100	100	100	100	100	100	98	97	96	95	97	97	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Mildred Lake - June 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Mildred Lake - June 2016

Maximum Speed: 37 km/h on Jun 15 13:00	Maximum Daily Speed Average: 16.2 km/h on Jun 15	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 5 05:00	Minimum Daily Speed Average: 1.5 km/h on Jun 2	Hours of Data: 720
Maximum Diurnal Speed Average: 2.7 km/h at hour 13	Minimum Diurnal Speed Average: 0.3 km/h at hour 21	Hours of Missing Data: 0
Monthly Average Velocity: 0.9 km/h 249.4 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 5 Median = 8 O ₃ = 12 P ₉₀ = 16 P ₉₉ = 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-Jun	SSW6	S5	S3	E3	ESE6	SE7	SSE7	SE8	SSE9	SSE7	SSE10	S11	WSW5	SW6	WNW8	SSW11	SSE10	SSE13	SSE12	S9	NE3	ESE6	SSE6	SSW3	SSE5.7	SSE13	
2-Jun	ENE1	N3	NNW1	NE1	NNE4	W2	NNE0	SW3	NW1	W5	WSW5	SW5	SW4	SSW2	WNW4	W4WSW14	SE10	ESE11	S8	W4	WNW7	ESE4	E4	SW1.5	WSW14		
3-Jun	WSW3	WSW5	SW4	SW4	SW4	SSW7	SSW7	SW7	WSW8	WSW8	SSW9	WSW9WSW14	NNW15	NNW12	N16	N13	NNE8	NE6	NE10	E5	S2	N3	NNE6	WNW2.6	N16		
4-Jun	SE4	WSW5	W10	W15	W17	W16WNW15	WNW16	WNW16	WNW16	WNW16	NW15	NW15	NW16	NW14WNW10	NW19	NNW19	NNW20	NW22	NNW20	NNW15	N9	NW5	WNW7	NW12.3	NW22		
5-Jun	NNW8	NW6	WNW5	W2	ESE0	WSW5	W5	NW4	NW3	NNW9	NW17	NNW16	NNW15	N13	N15	NNE10	NE9	NNE8	ENE9	ENE8	NE7	ENE6	ESE8	SSE12	N5.0	NW17	
6-Jun	SSE12	SE10	SSE10	SSE13	SSE13	SSE11	SSE9	SSE14	SSE13	SSE14	SSE17	SSE16	SSE15	S17	S16	S16	SSW17	SSW21	S20	S21	SSE14	N8	ENE5	SSE12.5	SSW21		
7-Jun	SSW3	S4	SSW6	WNW4	W4	WSW4	W6	W6	W5	W6	WNW6	W3	NNE9	ENE7	S6	W4	NNW10	N12	N11	N10	N8	N8	N7	N7	NNW3.4	N12	
8-Jun	N4	NNW2	ESE2	N1	NNW3	NNW5	N8	N7	N6	N7	N7	NNE9	NNE10	ENE8	ENE6	E6	SE2	SSE9	SSE10	ESE4	ENE5	ESE4	SE10	ESE11	NE3.1	ESE11	
9-Jun	E13	NE9	NNE11	NE12	N11	NE12	NE14	NNE17	NE19	NNE18	NE16	NE16	NE17	NNE18	NNE18	NNE19	NNE16	NNE15	NNE15	N14	N14	N12	N10	NNW10	NNE13.5	NNE19	
10-Jun	NNW9	NNW8	NNW7	NE2	NW2	WSW2	WNW4	NNW7	N12	N11	N14	NNE12	NNE12	N11	NNE10	NNE9	NE6	NNE6	NNE4	NE5	NE5	NE5	ENE7	E10	NNE6.2	N14	
11-Jun	SE5	ESE6	SSE5	SSE8	SE6	SSE7	SSE12	SSE10	SE10	SE11	SSE17	SSE18	SSE18	SSE17	SE20	SE13	SE10	SSE21	SE16	SE15	ESE7	E7	E7	NE3	SE10.6	SSE21	
12-Jun	N5	N5	N5	NNE3	ENE1	WSW4	WSW7	SW7	SW9	SSW11	SSW9	SSW11	SW10	SW11	SW11	W10	W11	W13	W12	WNNW7	SW7	WSW10	WSW13	WSW14	WSW6.7	WSW14	
13-Jun	WSW13	W12	W12	WSW10	WSW10	WSW11	WSW12	WSW13	WSW14	WSW13	WSW14	WSW17	WSW18	W16	WSW16	WSW15	WSW13	WNNW14	W12	WSW11	WSW9	NNW7	NNW1	SW2	WSW11.4	WSW18	
14-Jun	WSW4	SSW2	SSW4	S3	S1	E3	S4	S5	E3	SE5	WSW5	SE11	SE14	ESE12	SE10	SE14	ESE13	SE14	SSE16	SSE14	SSE23	SSE21	SE9	ESE12	SE8.0	SSE23	
15-Jun	ESE10	ESE11	ESE12	ESE15	ESE15	SE15	SE7	ESE10	SE18	SSE28	S35	S34	S37	S32	SSW32	SSW30	SSW29	SSW24	S16	SW7	SSW9	SSW12	S9	SE7	S16.2	S37	
16-Jun	S11	SSE16	SSE20	S19	S16	SSW19	SSW21	SSW22	SSW22	SSW22	SSW28	SW18	WSW14	WSW14	SW15	SW13	WSW10	WSW10	WSW9	WSW8	W8	WNW10	WNW8	WNW8	W7	SSW11.6	SSW22
17-Jun	WNW7	WNW7	WNW8	NW8	NW9	WNW10	WNW11	NW14	NNW21	NW17	NW18	NW17	NW19	NW16	NW16	WNW14	WNW13	WNW13	WNW11	N10	ENE5	NNE9	NNE11	NNW3	NW10.5	NNW21	
18-Jun	NW10	NW12	NW10	NW10	NW11	NW10	WNW11	WNW13	WNW11	WNW11	NW10	W8	W10	WSW10	W10	W10	WSW7	SSW6	S6	SSW8	SSE6	N11	ENE9	NE5	WNW6.3	WNW13	
19-Jun	NNW7	NNW7	NNW7	NW5	WNW7	W6	W4	N7	N7	NNE11	N13	N16	N22	N26	N21	N19	N23	N20	NNE13	NNE11	NNE7	N6	N5	N5	N10.7	N26	
20-Jun	NW5	WNW4	NW5	W2	N1	NNW3	NNW3	SSW4	SSW5	SSW6	SSW3	SSW4	NNW0	SSW3	S6	SSE9	SSE11	SSE10	SSE11	SSE10	SSE9	SSE10	SSE7	SE6	S3.7	SSE11	
21-Jun	ESE6	SSE8	S6	SSE4	SSE6	S8	SSE9	SSE9	SSE9	S8	SSW7	SW9	WSW8	SW8	S6	SSW8	SSW7	SSW6	SSE6	SE5	SE1	SSE6	SSW5	SSW2	S5.6	SSE9	
22-Jun	SSE4	SE3	S4	ESE2	S4	SSW8	S8	SSW7	SSW5	SSW4	SSW5	S6	S7	SSE9	S6	SW5	SSW4	SW8	W14	WNW13	WSW7	WSW6	SW6	WSW4	SSW4.8	W14	
23-Jun	W8	SW5	W1	WNW4	SW4	WNW4	NNE4	N8	NNE7	NNE5	N3	NW6	N6	SW3	NNW7	N14	N10	N7	N8	ENE7	ENE7	E7	N9	NNW11	N4.3	N14	
24-Jun	NNE3	ENE5	N5	N7	NNE7	NE5	NNE8	NNE11	N13	N15	N11	NNW10	N13	NNW11	N15	N13	N10	NNE9	N5	NNW12	NNW10	NNW10	N10	N7	N8.9	N15	
25-Jun	NE8	NNE6	N4	N6	N5	N7	N11	NNE11	NNE11	N11	NNE11	NNE12	N14	N13	NNE12	NNE11	NNE10	NE11	NE10	ENE7	NE4	NE3	WNW2	S2	NNE7.9	N14	
26-Jun	WSW3	NNW6	WNW1	S3	S4	S6	S7	SSW7	SW6	SSW7	SSW8	SSW7	SSW9	NNW13	NE5	SSW4	WSW9	SW7	SSW4	SSW6	WSW6	WNW16	NNE2	WNW6	SW3.6	WNW16	
27-Jun	NW9	W5	SW6	WSW6	WSW6	WSW6	W7	NW7	WNW6	WNW5	WSW7	WNW9	W12	WSW15	E10	S5	SSW8	SW10	WSW6	NW8	NNE2	ENE4	ESE7	SSE4	WSW4.1	WSW15	
28-Jun	S3	S2	WSW2	SSW3	SW4	SW3	SW5	NNW4	NNE6	WNW2	WSW5	NW6	N9	N13	NNE14	NNE14	NNE14	NNE14	NNE13	NNE11	NNE6	NE6	NE6	ENE8	NNE4.5	NNE14	
29-Jun	E9	ESE7	NE3	NNE5	N5	NE4	E5	E4	E4	S3	E3	ENE6	E5	SSW7	N3	NE6	NNE3	NNW6	ENE5	ENE4	ENE4	SE7	SSE16	SSE16	E3.2	SSE16	
30-Jun	SSE12	SSE12	SE11	SE12	SSE13	S6	SSE9	SE8	SSW6	SW3	SE7	SE8	SSE12	S11	SSE11	SSE12	SSE11	SSE12	SSE13	SSE13	S8	ESE5	SSW3	SSW4	SSE8.8	SSE13	

SSW0.3SSW0.7	SW1.1SSW0.9	SW1.3	SW2.3	SW2.2	W1.4	W1.3	WSW1.7	WSW2.4	WSW2.5	W2.7	W2.4	NNW1.2	NNW1.3	NNW1.3	SW0.7	S1.0	E0.4	S0.3	ENE0.9	ENE1.2	E0.9						Diurnal Average		
WSW13	SSE16	SSE20	S19	W17	SSW19	SSW21	SSW22	SSW22	SSE28	S35	S34	S37	S32	SSW32	SSW30	SSW29	SSW24	NW22	S20	SSE23	SSE21	SSE16	SSE16						Diurnal Maximum

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

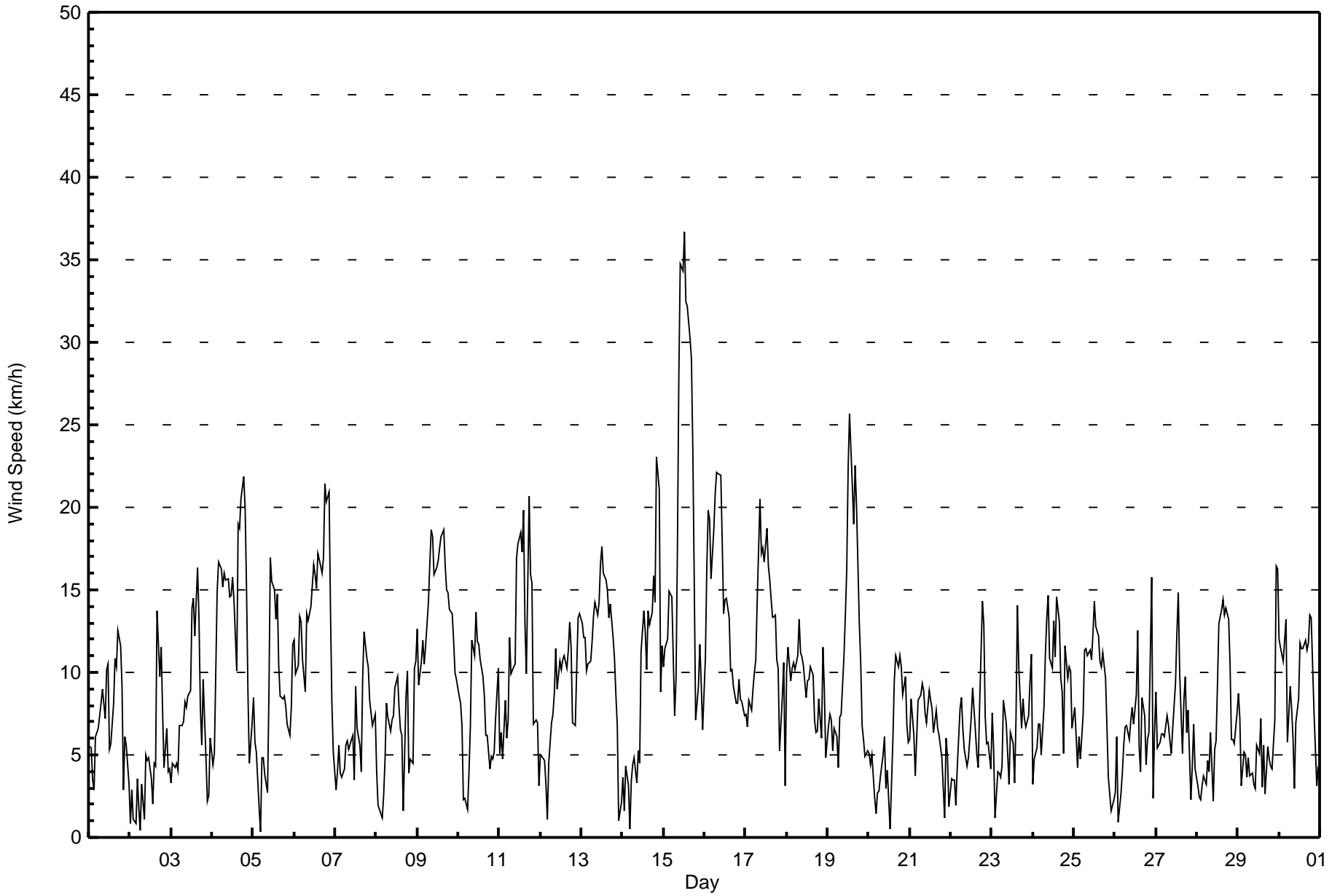
Wind Speed (WS) - km/h
Mildred Lake - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 9 km/h on Jun 15 13:00 Minimum Value: 0 km/h on Jun 25 22:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 8																		Hours in Service: 720 Hours of Data: 720 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-Jun	2	2	2	2	1	2	2	3	2	2	3	4	2	2	3	5	2	4	3	2	2	2	1	2	5
2-Jun	1	1	1	1	2	1	1	1	2	2	1	2	1	2	2	8	5	3	5	2	1	3	1	2	8
3-Jun	1	2	1	1	1	2	2	3	3	3	2	3	5	5	5	5	4	2	3	2	2	1	3	2	5
4-Jun	1	2	3	6	5	5	5	5	5	5	6	5	5	5	8	5	5	6	5	4	3	4	1	2	8
5-Jun	2	1	2	2	1	2	2	2	2	6	6	5	4	5	5	3	3	3	3	2	1	2	2	3	6
6-Jun	3	2	2	3	4	3	3	3	3	3	3	4	4	5	6	5	4	4	5	5	7	4	4	2	7
7-Jun	1	2	2	3	1	1	2	2	2	2	3	4	6	3	2	2	3	3	3	2	2	1	1	1	6
8-Jun	2	2	1	1	1	1	1	2	1	2	2	2	2	2	1	1	6	2	2	2	3	3	3	3	6
9-Jun	3	2	3	4	3	5	4	5	5	5	5	4	5	5	5	5	4	3	4	3	2	2	2	1	5
10-Jun	1	1	1	1	1	1	1	3	3	3	3	3	3	5	4	3	3	3	2	1	1	1	2	2	5
11-Jun	3	1	1	2	2	2	4	4	3	3	4	4	4	6	5	5	4	5	5	5	3	1	2	2	6
12-Jun	1	1	2	1	1	2	3	3	3	3	3	4	3	4	4	4	4	5	4	2	3	4	5	5	5
13-Jun	5	5	5	4	4	4	4	5	5	5	5	6	6	6	6	6	5	5	5	4	3	2	1	1	6
14-Jun	2	1	2	1	1	1	1	2	2	2	2	5	4	4	3	4	4	6	3	5	6	5	3	2	6
15-Jun	3	2	3	3	3	4	4	3	6	8	7	9	9	8	9	8	8	7	4	3	4	9	3	2	9
16-Jun	3	3	4	4	4	4	5	5	6	6	6	5	5	5	5	4	4	4	3	3	3	3	3	3	6
17-Jun	3	2	3	2	2	3	3	5	5	5	5	5	5	6	5	5	5	5	4	6	1	3	3	2	6
18-Jun	4	3	2	3	3	3	4	4	3	4	4	3	4	4	4	4	4	2	2	1	1	9	3	1	9
19-Jun	1	1	1	2	2	2	2	2	2	3	4	5	6	5	6	5	6	5	4	3	2	1	1	1	6
20-Jun	1	2	2	2	1	1	1	2	1	2	2	2	2	2	3	3	3	2	2	2	1	1	1	1	3
21-Jun	1	4	2	2	1	2	2	2	2	2	3	3	3	4	3	3	2	2	1	1	1	3	2	1	4
22-Jun	2	1	2	1	2	2	2	2	1	1	1	3	3	3	3	2	2	4	5	4	2	2	2	2	5
23-Jun	3	2	1	2	1	1	2	2	2	3	2	3	3	2	6	3	2	2	2	2	1	1	2	2	6
24-Jun	2	1	2	3	3	1	3	3	3	3	3	3	6	3	4	4	2	3	1	3	2	2	2	1	6
25-Jun	2	2	1	1	1	2	3	3	3	4	3	3	4	3	3	3	3	3	3	2	1	0	1	1	4
26-Jun	2	1	1	1	2	1	2	1	2	2	2	3	3	6	2	2	4	3	1	2	6	6	3	2	6
27-Jun	3	3	2	2	2	2	3	2	2	2	3	4	6	5	8	3	3	4	3	3	1	1	1	2	8
28-Jun	1	1	1	1	1	1	1	3	3	2	2	3	4	5	4	4	4	4	3	3	1	1	1	2	5
29-Jun	2	3	1	2	1	1	1	1	2	2	2	3	3	3	3	3	2	2	2	1	1	4	4	4	4
30-Jun	2	2	2	2	3	2	2	2	3	3	2	2	3	3	3	4	3	3	3	3	4	2	2	1	4
																		5 5 5 6 5 5 5 5 6 8 7 9 9 8 9 8 8 7 5 6 7 9 5 5							
Diurnal Maximum																									



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Mildred Lake - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Mildred Lake - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	191	26.53	26.53
6 - 11	330	45.83	72.36
12 - 19	169	23.47	95.83
20 - 28	23	3.19	99.03
29 - 38	7	0.97	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Mildred Lake - June 2016**

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	16	12	14	10	10	8	6	4	17	22	14	15	14	11	8	10	191
6 - 11	37	30	12	13	7	13	20	34	20	29	17	26	15	23	13	21	330
12 - 19	22	18	7	0	1	6	9	32	6	3	2	20	10	12	13	8	169
20 - 28	5	0	0	0	0	0	1	5	2	6	0	0	0	0	1	3	23
29 - 38	0	0	0	0	0	0	0	0	4	3	0	0	0	0	0	0	7
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	80	60	33	23	18	27	36	75	49	63	33	61	39	46	35	42	720

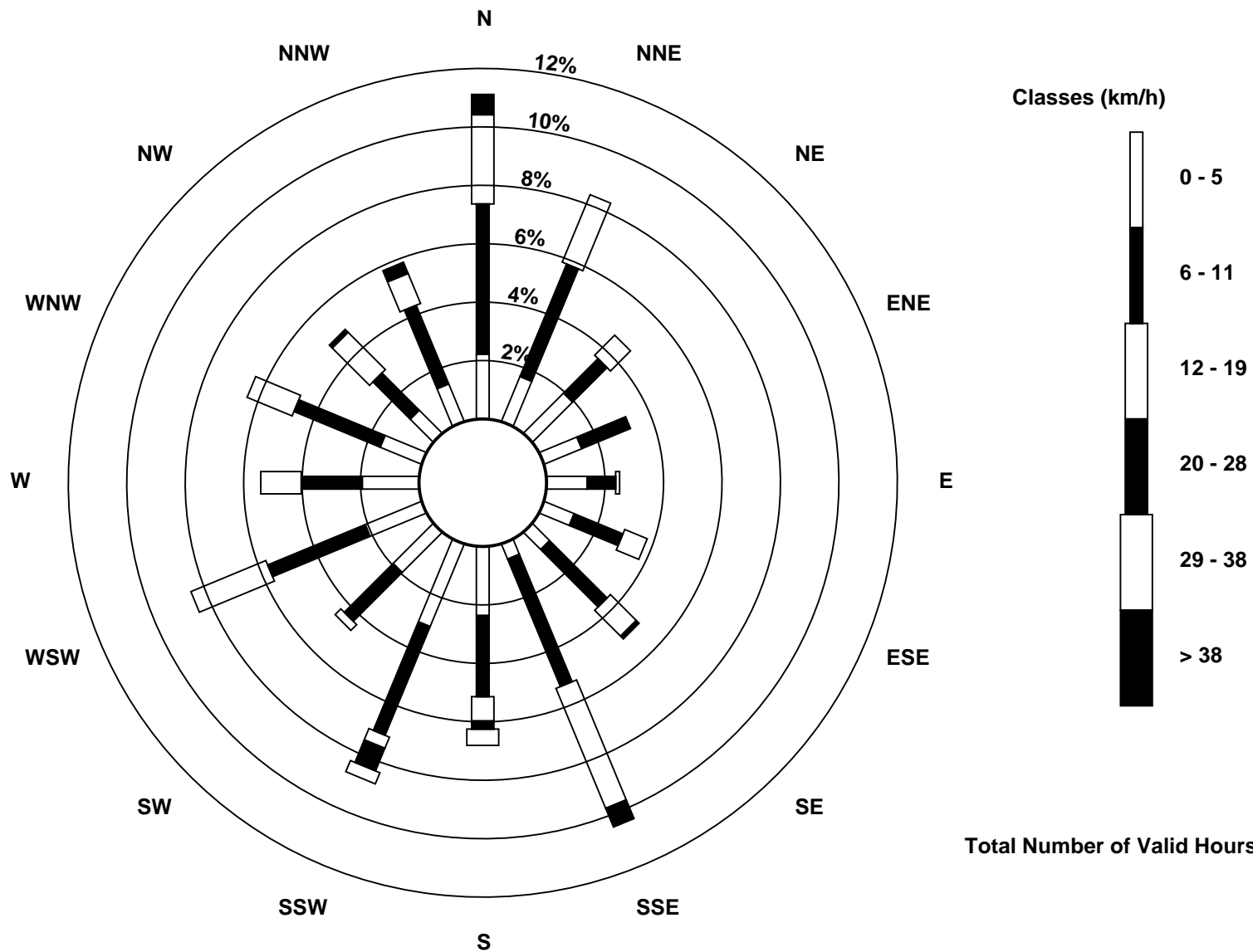
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

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





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Mildred Lake - June 2016

Direction of Maximum Speed: 190 deg on Jun 15 13:00		Hours in Service: 720
Direction of Maximum Daily Speed Average: 171.8 deg on Jun 15		Hours of Data: 720
Direction of Minimum Speed: 107 deg on Jun 5 05:00	Direction of Minimum Daily Speed Average: 1.5 deg on Jun 2	Hours of Missing Data: 0
Monthly Average Direction: 264.2 deg		Percent Operational Time: 100.0

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-Jun	196	186	173	82	123	141	150	125	152	165	167	190	254	235	284	194	160	156	158	170	54	120	155	193	166.7
2-Jun	69	8	342	54	33	275	17	216	309	264	241	219	235	203	303	279	249	133	115	189	270	284	123	101	223.1
3-Jun	240	245	214	222	222	205	213	233	252	253	213	238	245	341	347	3	349	29	46	36	100	182	1	22	295.3
4-Jun	128	237	259	272	272	273	282	287	292	300	309	304	304	306	291	321	344	327	324	332	327	351	324	300	304.5
5-Jun	333	305	297	267	107	253	270	312	320	329	325	337	334	353	358	24	35	29	59	65	43	72	105	147	357.5
6-Jun	148	141	149	157	155	154	153	166	162	155	156	162	149	167	184	182	171	197	195	175	188	147	356	59	165.8
7-Jun	193	181	206	282	275	243	270	280	279	266	299	263	27	73	174	280	344	4	357	351	351	354	358	359	326.9
8-Jun	354	329	113	10	347	337	2	2	350	359	9	13	15	58	72	82	124	154	160	123	65	115	127	112	53.8
9-Jun	97	53	32	47	8	45	40	28	34	33	37	37	34	33	27	26	24	17	25	10	4	359	350	348	28.3
10-Jun	344	342	344	35	305	252	295	346	356	9	11	19	19	10	13	29	40	23	30	52	48	53	76	100	16.4
11-Jun	124	117	147	162	133	147	159	152	144	139	155	159	159	156	146	146	142	155	144	128	122	97	87	47	144.1
12-Jun	2	354	7	28	78	240	243	235	227	201	210	213	223	231	229	274	280	272	279	286	235	250	255	257	250.5
13-Jun	258	261	265	252	250	247	250	248	255	256	240	244	252	259	256	247	257	283	261	250	245	346	336	216	255.6
14-Jun	251	194	205	188	180	99	184	186	89	133	237	128	127	119	144	134	115	133	158	164	165	166	129	102	146.0
15-Jun	123	108	105	110	109	129	138	108	146	163	175	178	190	187	194	195	195	201	183	219	209	195	185	141	171.8
16-Jun	172	166	168	171	186	193	192	195	195	203	218	237	242	236	231	243	256	244	240	264	286	295	286	271	212.5
17-Jun	282	285	286	306	311	301	296	307	331	323	322	320	324	305	305	290	288	282	293	10	77	15	24	343	314.0
18-Jun	311	311	309	314	310	305	296	293	292	296	304	279	260	251	267	279	256	192	188	195	148	11	60	35	291.2
19-Jun	343	333	340	314	294	279	267	3	7	25	356	353	351	351	351	2	3	360	19	20	19	7	355	349	354.4
20-Jun	314	303	311	272	353	339	338	196	210	212	203	205	327	197	178	151	154	151	158	159	168	164	161	133	175.4
21-Jun	113	159	172	149	163	174	157	163	168	178	206	224	243	236	186	197	203	192	147	128	143	154	199	209	180.0
22-Jun	166	133	169	116	184	194	185	194	193	213	196	191	191	165	171	214	205	219	269	284	248	242	223	257	210.4
23-Jun	278	234	266	283	234	301	29	7	18	32	350	317	359	222	346	355	358	2	1	68	67	92	358	346	355.5
24-Jun	13	60	7	357	25	40	18	12	1	4	0	345	351	337	3	349	357	23	357	333	341	347	349	10	359.4
25-Jun	36	13	2	3	10	7	9	22	21	10	16	16	359	5	25	26	26	41	37	61	41	46	295	190	19.4
26-Jun	258	327	292	185	188	190	181	205	215	207	205	209	201	347	35	210	240	217	211	194	255	297	23	287	234.9
27-Jun	304	272	233	242	244	251	263	305	294	302	239	284	265	241	94	174	197	227	245	307	22	75	118	154	252.8
28-Jun	175	191	237	196	218	225	219	345	26	302	255	306	349	10	22	22	31	29	19	30	25	47	46	66	17.1
29-Jun	95	114	38	20	11	37	91	91	82	170	93	78	99	207	6	40	17	348	77	57	61	146	163	163	100.7
30-Jun	156	149	140	146	160	184	166	145	208	223	139	145	159	178	155	161	148	154	163	160	181	103	205	213	159.4

193.7 203.2 224.1 203.7 220.3 221.2 225.1 259.4 279.5 256.6 247.3 249.0 274.6 278.8 298.4 301.4 298.0 224.9 180.2 81.2 173.2 59.0 72.5 86.8

Diurnal Average

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

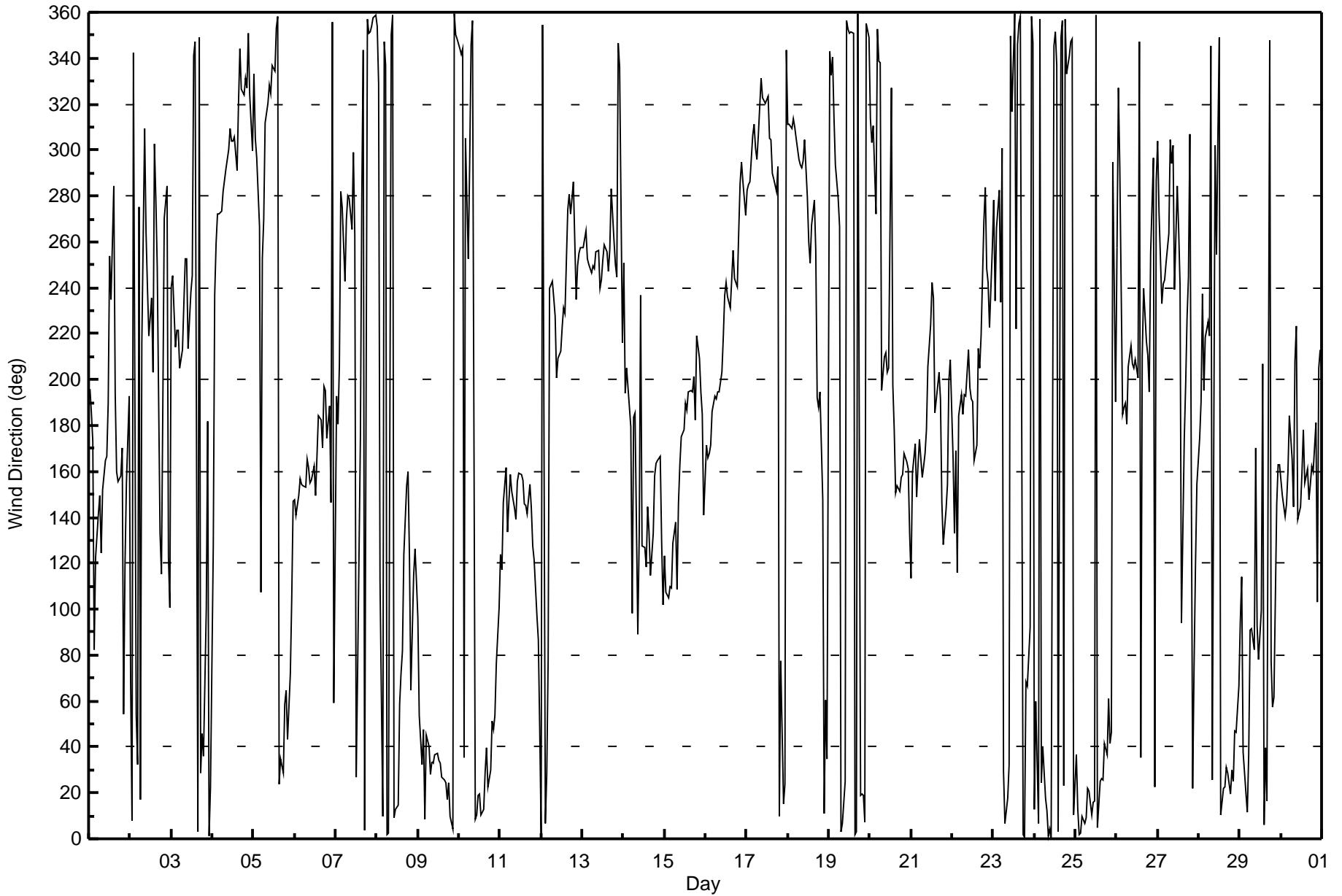
Wind Direction (WD) - deg
Mildred Lake - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 100 deg on Jun 20 13:00 Minimum Value: 7 deg on Jun 10 02:00 Percentiles: P ₁ = 9 P ₁₀ = 15 Q ₁ = 19 Median = 24 Q ₃ = 34 P ₉₀ = 55 P ₉₉ = 89																		Hours in Service: 720 Hours of Data: 720 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-Jun	31	39	52	50	34	15	22	21	21	24	24	39	28	37	33	30	30	22	16	16	66	26	22	36	66
2-Jun	77	20	80	91	36	65	90	44	86	38	36	58	74	94	55	94	28	35	35	23	32	30	48	54	94
3-Jun	23	27	30	24	22	19	19	28	27	33	22	35	31	37	25	16	17	33	55	26	30	70	89	38	89
4-Jun	40	30	25	22	21	22	24	23	22	23	26	27	24	22	45	23	15	16	15	11	11	22	28	20	45
5-Jun	34	20	21	74	96	35	32	49	81	60	24	25	26	24	24	32	35	35	23	19	13	22	16	17	96
6-Jun	16	17	17	15	17	18	21	14	15	17	18	17	19	35	23	22	20	15	14	16	19	21	34	34	35
7-Jun	54	31	23	64	43	26	33	24	41	44	41	76	50	32	24	56	31	22	18	14	9	9	10	10	76
8-Jun	76	61	68	89	63	16	12	14	16	15	18	17	18	30	23	24	77	25	14	47	27	77	18	18	89
9-Jun	17	26	19	20	24	34	21	20	20	19	20	18	19	18	19	18	18	17	18	16	13	13	12	8	34
10-Jun	7	7	8	71	36	57	30	38	18	24	22	29	29	37	39	47	54	53	54	21	15	10	14	10	71
11-Jun	41	11	31	18	23	17	16	20	21	21	16	16	17	17	20	22	27	16	22	16	21	19	15	54	54
12-Jun	20	18	28	29	81	44	29	28	28	18	25	31	24	30	31	36	25	24	23	28	27	26	27	26	81
13-Jun	25	26	26	27	30	26	27	25	29	28	32	29	28	27	32	30	29	23	27	27	25	15	82	71	82
14-Jun	58	67	21	58	93	34	38	40	60	55	49	42	23	30	26	19	16	24	15	23	20	14	28	12	93
15-Jun	21	12	14	15	14	20	46	18	23	20	18	18	15	16	15	16	16	16	20	49	27	41	22	26	49
16-Jun	16	11	12	15	17	14	15	15	17	17	23	30	28	30	30	31	29	31	30	31	23	19	21	27	31
17-Jun	25	23	20	23	19	19	19	21	14	16	18	17	17	22	24	22	25	22	25	22	24	45	20	57	57
18-Jun	26	17	17	15	20	20	22	20	22	26	30	31	36	39	33	34	44	35	25	12	19	67	20	29	67
19-Jun	12	9	9	23	22	25	37	21	23	26	23	24	19	18	20	23	19	22	22	19	16	12	13	12	37
20-Jun	17	19	22	40	48	47	44	48	30	28	78	71	100	88	45	24	21	19	15	14	9	9	12	14	100
21-Jun	13	20	17	43	18	15	17	15	16	26	38	28	36	34	52	28	31	23	23	13	28	20	31	51	52
22-Jun	39	25	34	72	26	13	18	26	31	40	39	54	34	27	45	34	56	38	27	20	29	29	23	39	72
23-Jun	26	27	83	27	32	36	58	24	21	55	84	48	28	75	86	17	15	19	20	28	18	14	21	13	86
24-Jun	65	30	24	21	41	23	18	19	18	20	26	25	22	14	24	16	16	20	27	15	12	9	12	20	65
25-Jun	18	14	22	12	22	15	17	21	23	26	26	23	18	19	25	27	29	25	25	21	14	20	55	59	59
26-Jun	46	14	88	24	36	18	20	18	24	23	28	37	36	49	65	54	31	26	24	19	43	24	80	32	88
27-Jun	23	39	30	28	20	22	28	28	39	45	43	32	35	31	51	68	33	28	43	26	54	33	17	40	68
28-Jun	30	44	68	20	25	38	23	75	39	90	47	46	42	26	25	24	24	22	20	18	17	18	18	20	90
29-Jun	15	30	20	19	15	23	20	46	59	71	87	77	67	45	97	63	86	49	30	22	19	25	12	12	97
30-Jun	14	16	16	16	14	25	17	20	50	77	24	21	25	22	33	27	32	19	14	14	21	21	55	26	77
																		77 67 88 91 96 65 90 75 86 90 87 77 100 94 97 94 86 53 55 49 66 77 89 71							
Diurnal Maximum																									



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Mildred Lake - June 2016





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	June 15, 2016	Last Calibration	May 25, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	Routine		
Start Time (MST)	9:31	End Time (MST)	13:17
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

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		PMT voltage	-653	-653
Analyzer IP address	192.168.1.43		Lamp voltage	800	797
Calculated slope	1.000827	1.002521	Chamber temp	45.2	45.0
Calculated intercept	1.233213	0.019427	Pressure	690.2	680.5
Analyzer Background	20.5	19.3	Flow	0.491	0.484
Analyzer Coefficient	0.935	0.912	Intensity	90	91

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	-1.1	----
as found span	5000	82.7	780.7	778.7	1.003
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	82.7	780.7	778.7	1.003
second point	5000	41.5	391.8	390.9	1.002
third point	5000	20.8	196.4	195.7	1.003
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	82.7	780.7	780.1	1.001
Average Correction Factor					1.003

Corrected As found 779.8 Previous response 778.8 % change -0.1%

Notes:

Changed inlet filter after as founds. Additional zero/span conducted after inlet filter change to measure the potential impact of smoke on the filter. Adjusted zero.

Calibration Performed By: Evan Magill



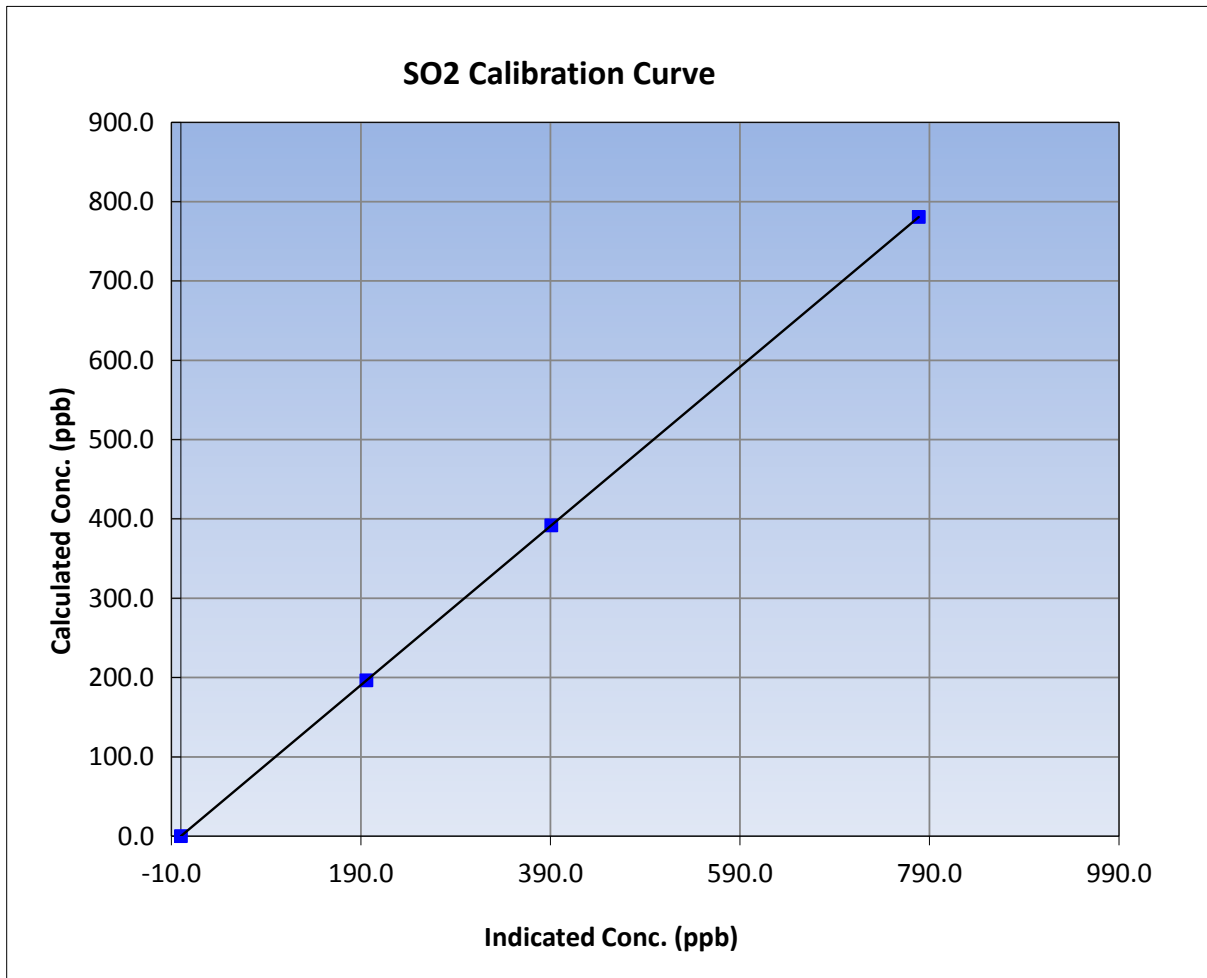
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 15, 2016	Previous Calibration	May 25, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	9:31	End Time (MST)	13:17
Analyzer make	TEI 43i	Analyzer serial #	JC1404901075

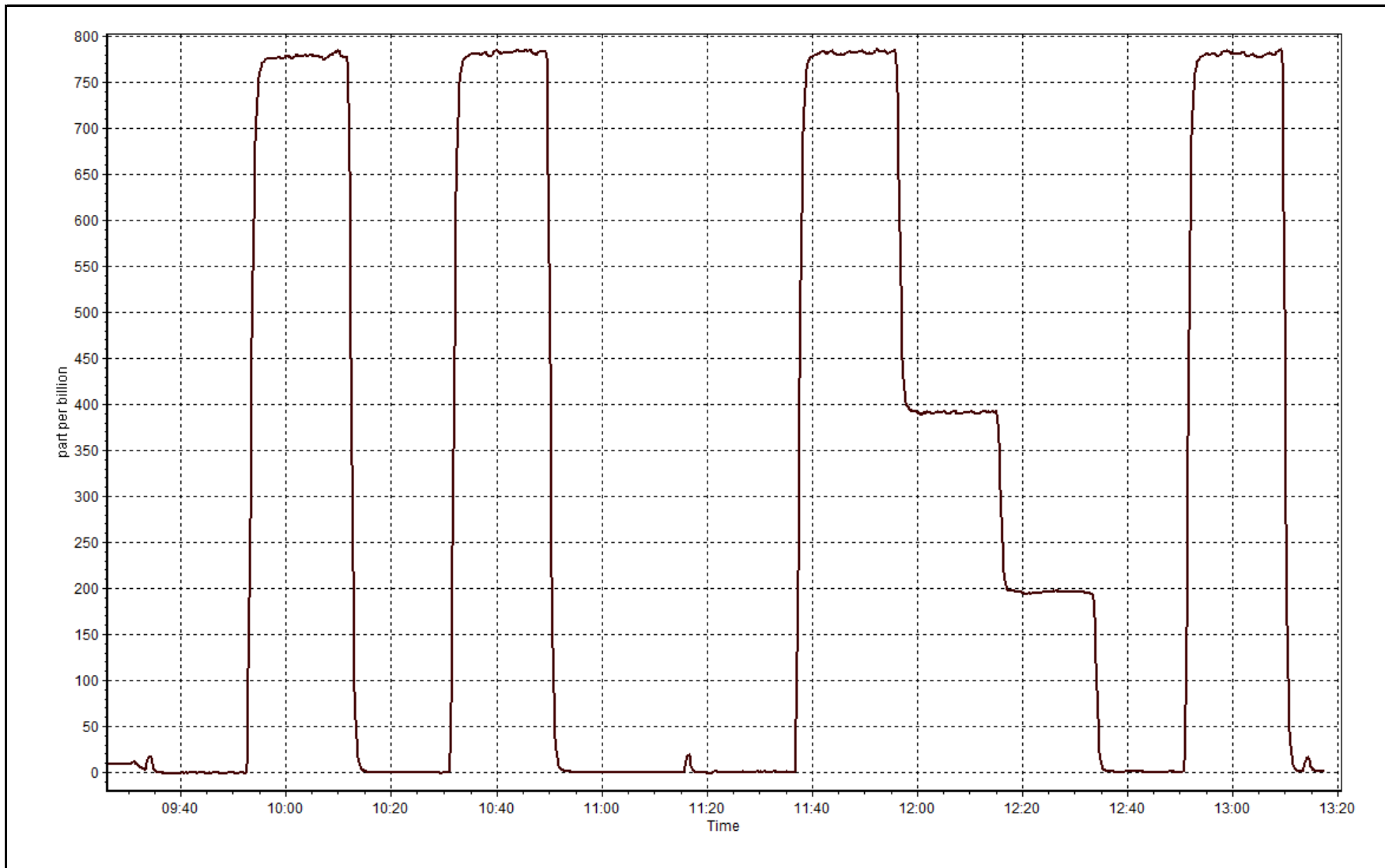
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	1.000000
780.7	778.7	1.0026		
391.8	390.9	1.0022	Slope	1.002521
196.4	195.7	1.0035		
			Intercept	0.019427



SO2 Calibration Plot

Date: June 15, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	June 15, 2016	Last Calibration	May 25, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	Routine		
Start Time (MST)	13:20	End Time (MST)	16:45
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	785	782
Calculated slope	0.991415	0.991626	Chamber temp	45	45
Calculated intercept	0.357394	-0.119807	Pressure	545.4	539.9
Analyzer Background	16	15.9	Flow	1.039	1.029
Analyzer Coefficient	0.969	0.969	Intensity	89	87
			Converter temp.	325	324

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	5000	0.0	0.0	-0.3	----
as found span	5000	80.1	80.7	81.5	0.991
SO2 scrubber check	5000	21.2	200.1	1.2	----
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	80.1	80.7	81.5	0.991
second point	5000	40.2	40.5	41.2	0.984
third point	5000	20.0	20.2	20.4	0.991
as left zero	5000	0.0	0.0	0.1	----
as left span	4000	64.0	80.6	83.1	0.970
Average Correction Factor					0.989

Corrected As found	81.8	Previous response	81.1	% change	-0.9%
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Notes:

Changed inlet filter after as founds. Additional zero/span conducted after inlet filter change to measure the potential impact of smoke on the filter. Scrubber check done after additional zero/span. Adjusted zero.

Calibration Performed By: Evan Magill



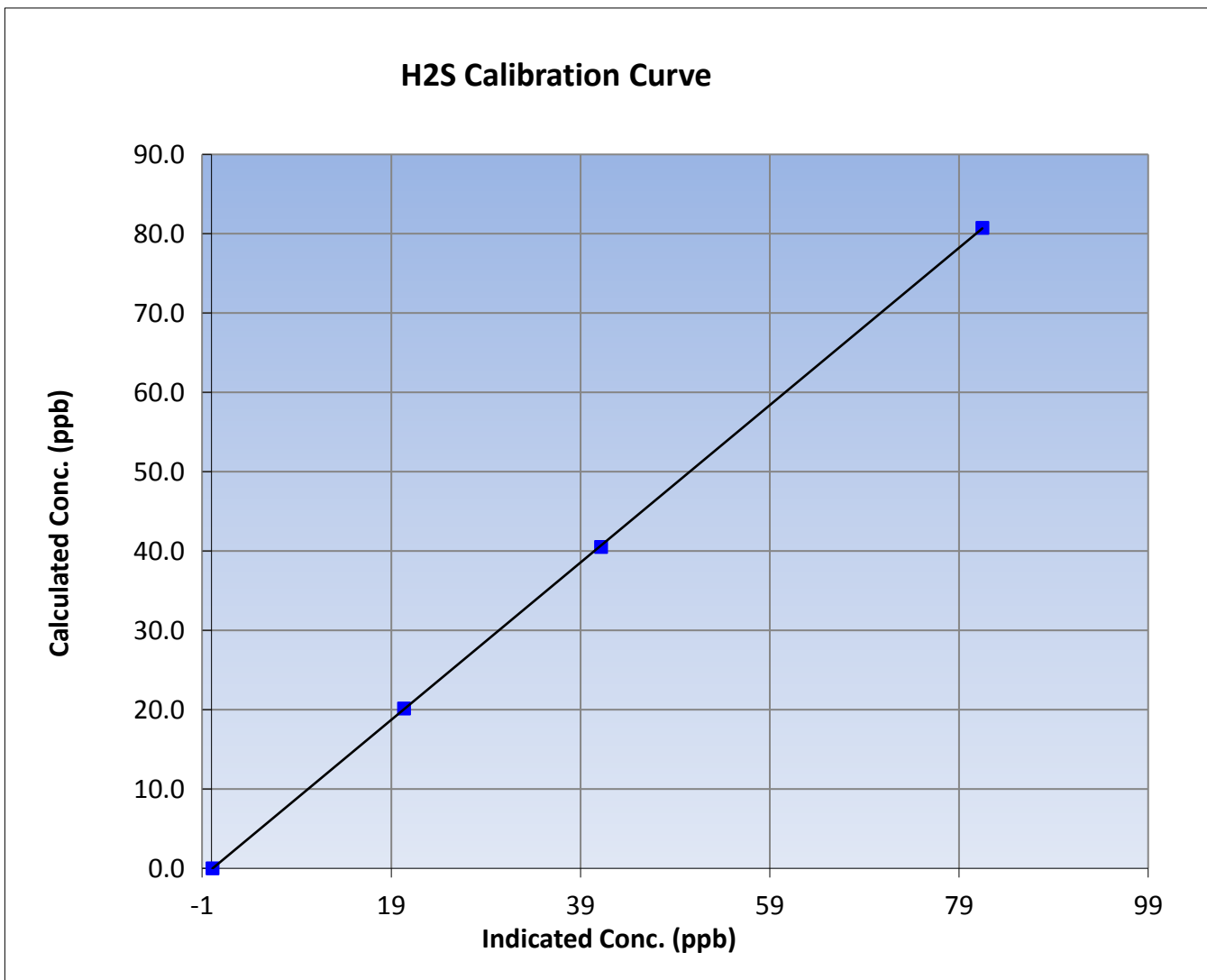
Wood Buffalo Environmental Association H2S Calibration Report

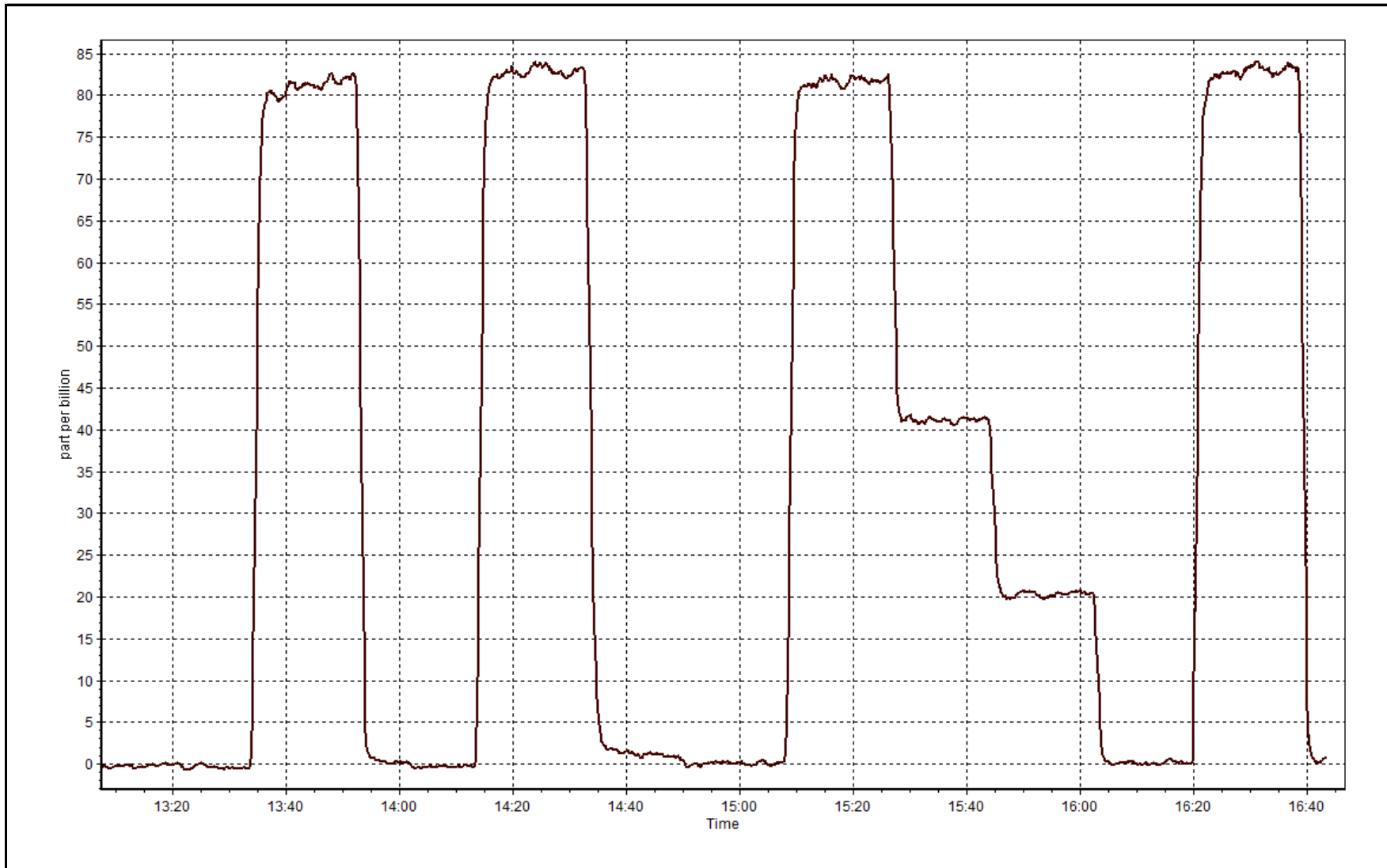
Station Information

Calibration Date	June 15, 2016	Previous Calibration	May 25, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	13:20	End Time (MST)	16:45
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	0.1	----	Correlation Coefficient	0.999985
80.7	81.5	0.9910		
40.5	41.2	0.9840	Slope	0.991626
20.2	20.4	0.9907		
			Intercept	-0.119807







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June-15-16	Last Calibration	May-25-16
Station Name	Mildred Lake	Station Number	AMS 2
Reason:	Routine		
Start Time (MST)	9:31	End Time (MST)	13:17
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	8.0	8.2
Analyzer IP address	192.168.1.51		Air or Bypass Press	39.8	39.9
Calculated slope	0.997648	1.007215	Fuel Pressure	25.6	25.7
Calculated intercept	0.015427	-0.002118	Analyzer Coeff	4.604	4.604
			Analyzer BKG	2.33	2.33

Analyzer make	Thermo 51i-LT	Analyzer serial #	1300156231
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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	-0.06	----
as found span	5000	82.7	17.99	17.82	1.009
calibrator zero	5000	0.0	0.00	-0.06	----
high point	5000	82.7	17.99	17.82	1.009
second point	5000	41.5	9.03	9.02	1.001
third point	5000	20.8	4.52	4.54	0.996
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					1.002

Corrected As found	17.88	Previous response	18.01	% change	0.8%
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Notes:

Changed inlet filter after as founds. Additional zero/span conducted after inlet filter change to measure the potential impact of smoke on the filter. Changed zero air generator scrubbers after additional zero/span. No adjustments.

Calibration Performed By:

Evan Magill



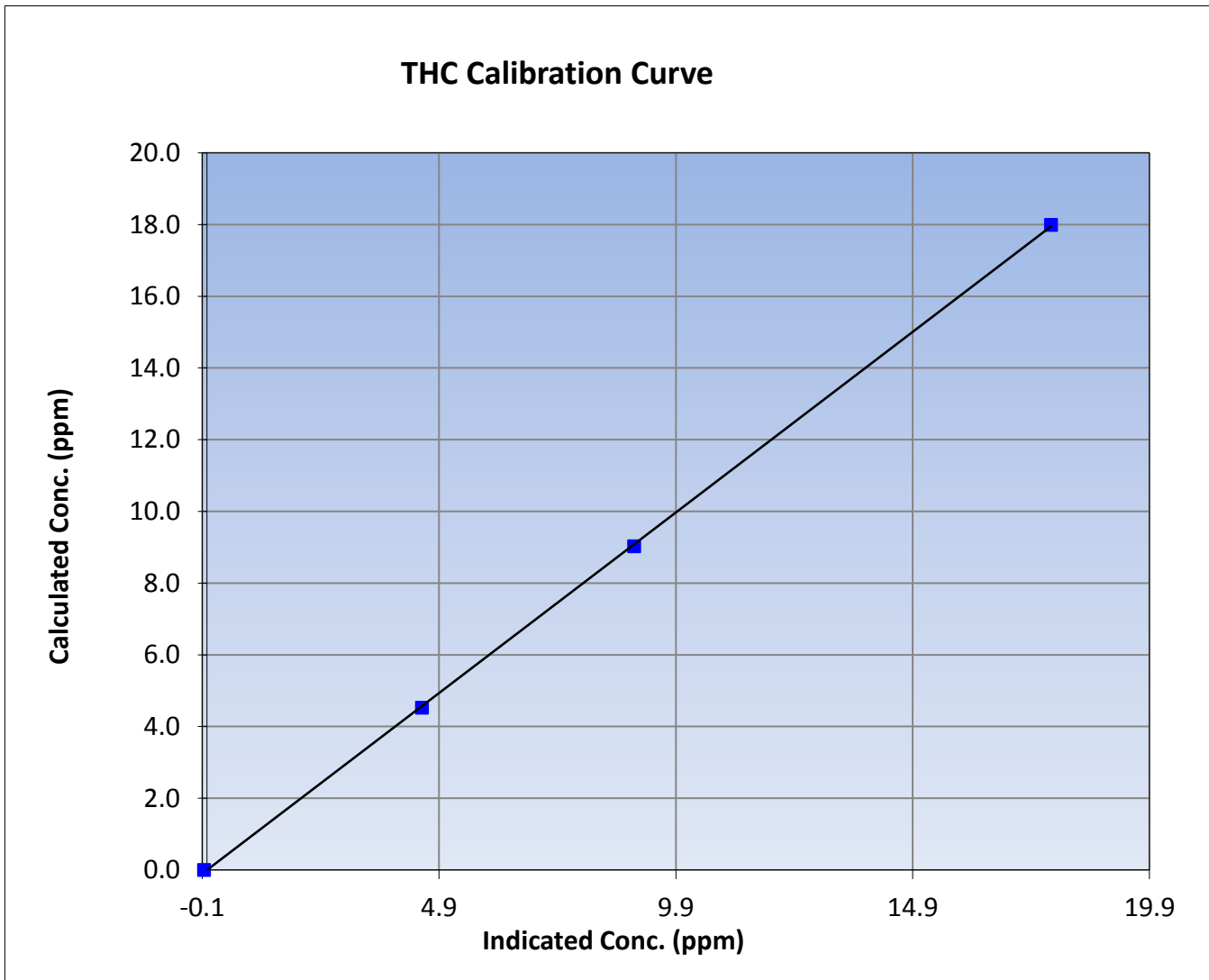
Wood Buffalo Environmental Association THC Calibration Report

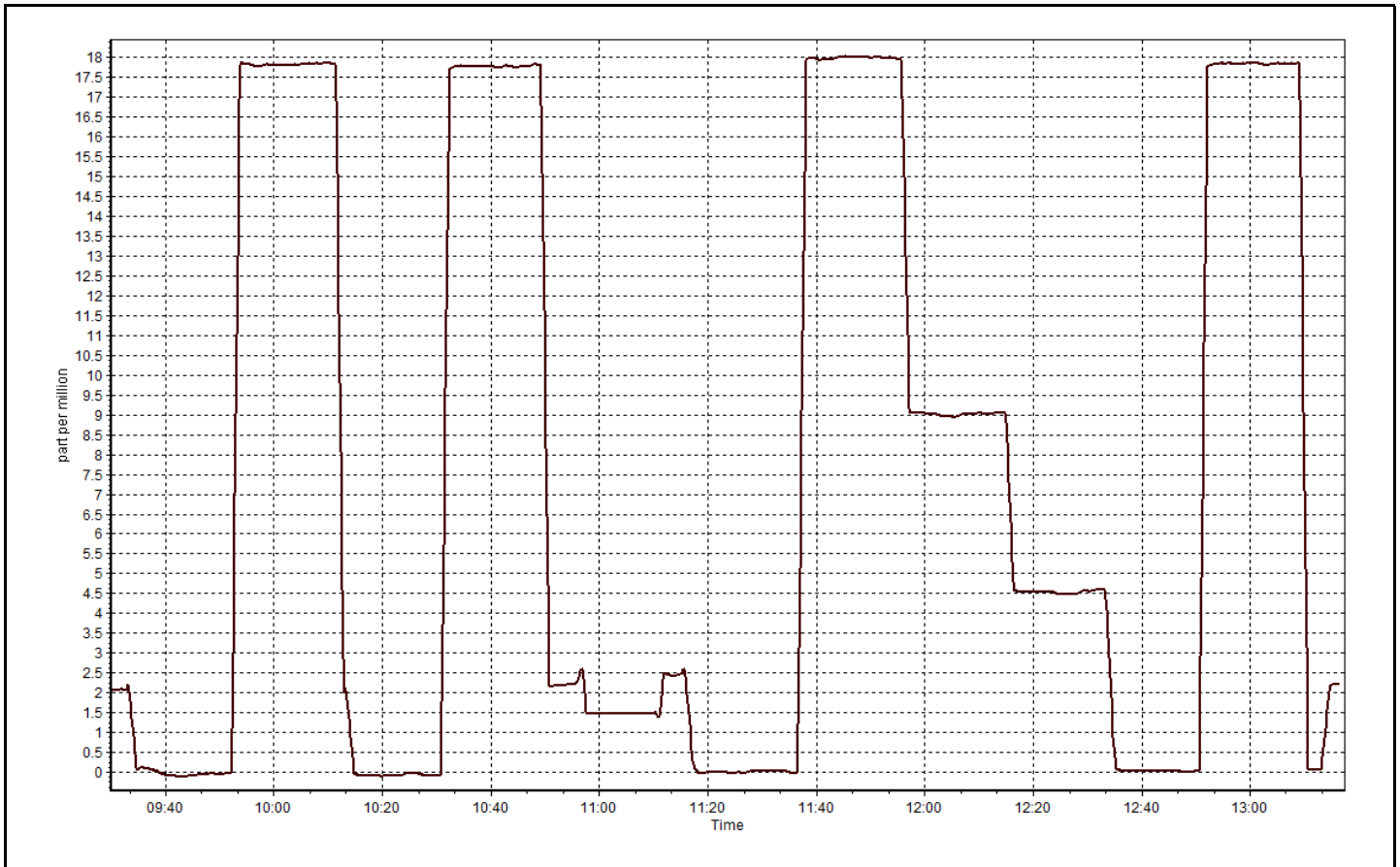
Station Information

Calibration Date	June 15, 2016	Previous Calibration	May 25, 2016
Station Name	Mildred Lake	Station Number	AMS 2
Start Time (MST)	9:31	End Time (MST)	13:17
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	-0.06	----	Correlation Coefficient	0.999938
17.99	17.82	1.0094		
9.03	9.02	1.0007	Slope	1.007215
4.52	4.54	0.9965		
			Intercept	-0.002118







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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 3 LOWER CAMP METEOROLOGY JUNE 2016

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP MET TOWER (AMS 3)
JUNE 2016

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	720	0	0	100.00	29.4	-	23.2	-
Temperature 45 m (C) Average	720	0	0	100.00	29.4	-	23.1	-
Temperature 100 m (C) Average	720	0	0	100.00	28.9	-	23.1	-
Temperature 167 m (C) Average	720	0	0	100.00	28.2	-	23.0	-
Relative Humidity 20 m (%) Average	720	0	0	100.00	99	-	94.0	-
Relative Humidity 45 m (%) Average	720	0	0	100.00	99	-	91.0	-
Relative Humidity 100 m (%) Average	720	0	0	100.00	99	-	91.0	-
Relative Humidity 167 m (%) Average	720	0	0	100.00	98	-	88.0	-
Wind Speed 20 m (km/h) Average	720	0	0	100.00	36	-	17.0	-
Wind Speed 45 m (km/h) Average	720	0	0	100.00	39	-	20.0	-
Wind Speed 100 m (km/h) Average	720	0	0	100.00	46	-	27.0	-
Wind Speed 167 m (km/h) Average	720	0	0	100.00	55	-	33.0	-
Wind Direction 20 m (deg) Average	720	0	0	100.00	-	-	-	-
Wind Direction 45 m (deg) Average	720	0	0	100.00	-	-	-	-
Wind Direction 100 m (deg) Average	720	0	0	100.00	-	-	-	-
Wind Direction 167 m (deg) Average	720	0	0	100.00	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	720	0	0	100.00	1.1	-	0.3	-
Vertical Wind Speed 45 m (km/h) Average	720	0	0	100.00	1.4	-	0.6	-
Vertical Wind Speed 100 m (km/h) Average	720	0	0	100.00	2.6	-	1.3	-
Vertical Wind Speed 167 m (km/h) Average	720	0	0	100.00	3.5	-	1.5	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP MET TOWER (AMS 3)
 JUNE 2016

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	720	17.95	5.1	-	6.2	11.7	14.3	17.3	21.8	24.9	29.4
Temperature 45 m (C) Average	720	17.94	4.9	-	6.5	11.8	14.3	17.3	21.6	24.9	29.4
Temperature 100 m (C) Average	720	17.85	4.7	-	8.5	11.9	14.4	17.1	21.4	24.5	28.9
Temperature 167 m (C) Average	720	17.7	4.6	-	8.2	11.8	14.2	17.1	21.2	24.2	28.2
Relative Humidity 20 m (%) Average	720	61.1	22	-	15	32	44	60	81	91	99
Relative Humidity 45 m (%) Average	720	59.2	21	-	14	31	42	58	78	89	99
Relative Humidity 100 m (%) Average	720	56.1	21	-	14	29	40	54	73	86	99
Relative Humidity 167 m (%) Average	720	54.4	20	-	14	29	38	52	70	84	98
Wind Speed 20 m (km/h) Average	720	7.5	6	-	0	2	3	7	11	15	36
Wind Speed 45 m (km/h) Average	720	10.2	7	-	0	2	4	9	14	20	39
Wind Speed 100 m (km/h) Average	720	14.8	9	-	1	4	8	14	21	27	46
Wind Speed 167 m (km/h) Average	720	17.7	10	-	1	5	10	16	25	32	55
Wind Direction 20 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-
Wind Direction 45 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-
Wind Direction 100 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-
Wind Direction 167 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	720	-0.09	0.3	-	-1	-0.5	-0.3	-0.1	0.1	0.3	1.1
Vertical Wind Speed 45 m (km/h) Average	720	-0.05	0.5	-	-1.6	-0.7	-0.4	0	0.2	0.6	1.4
Vertical Wind Speed 100 m (km/h) Average	720	0.29	0.6	-	-1.5	-0.4	-0.1	0.1	0.6	1.2	2.6
Vertical Wind Speed 167 m (km/h) Average	720	0.56	0.8	-	-1.5	-0.3	0.1	0.4	1	1.7	3.5

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP MET TOWER (AMS 3)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
<hr/>				
No operational issues to report				

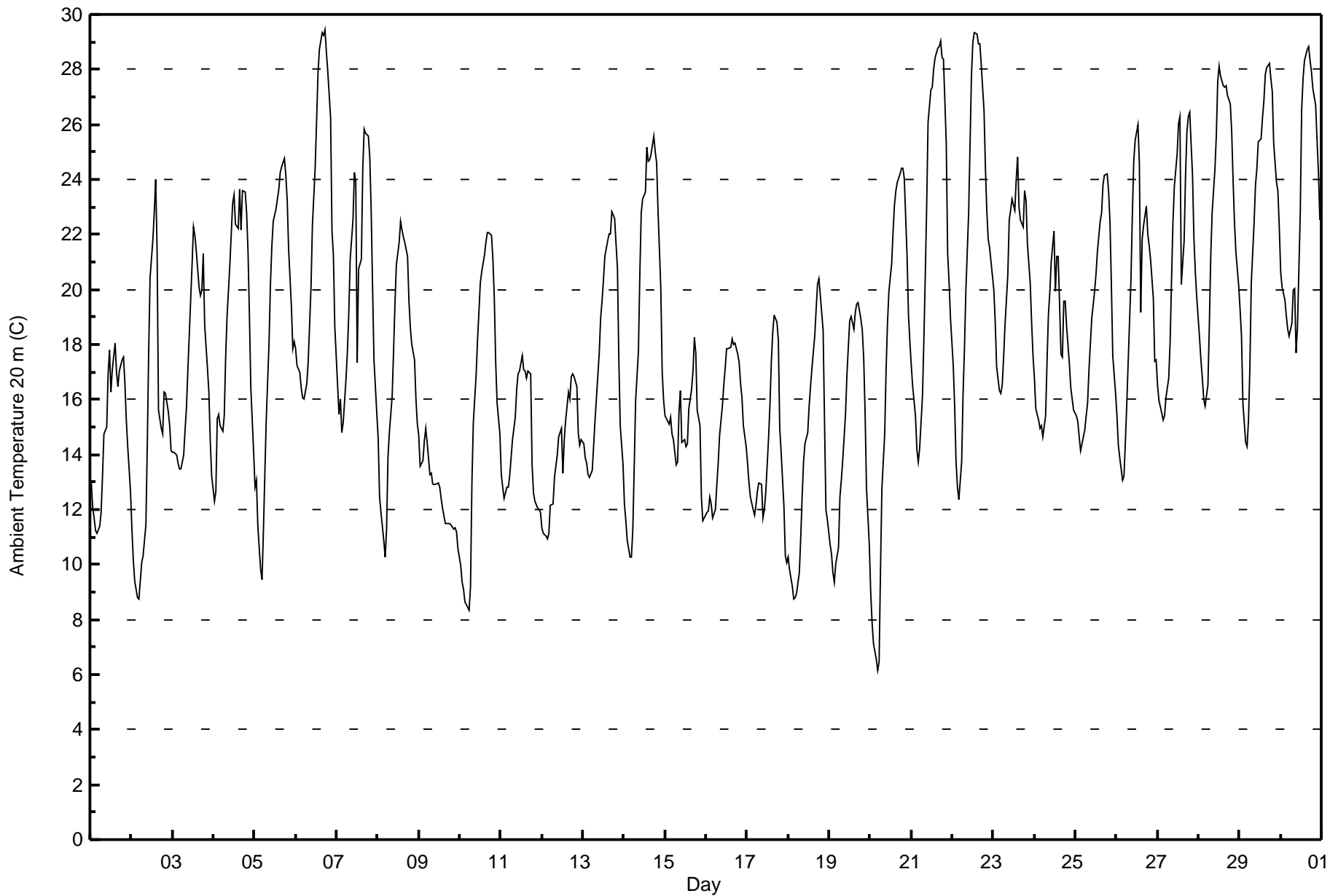


Maximum Value: 29.4 C on Jun 6 18:00																				Maximum Daily Average: 23.2 C on Jun 30					Hours in Service: 720																							
Minimum Value: 6.2 C on Jun 20 05:00																				Minimum Daily Average: 12.6 C on Jun 9					Hours of Data: 720																							
Maximum Diurnal Average: 22.2 C at hour 18																				Minimum Diurnal Average: 12.7 C at hour 5					Hours of Missing Data: 0																							
Monthly Average: 17.95 C																				Percentiles: P ₁ = 8.6 P ₁₀ = 11.7 Q ₁ = 14.3 Median = 17.3 O ₃ = 21.8 P ₉₀ = 24.9 P ₉₉ = 29.0					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-Jun	13.0	12.1	11.7	11.3	11.1	11.4	11.9	13.2	14.7	15.0	16.9	17.8	16.3	17.1	18.1	17.0	16.4	17.1	17.4	17.5	16.6	15.3	14.3	12.7	14.8	18.1																						
2-Jun	11.3	10.1	9.4	8.8	8.8	9.4	10.0	10.3	11.4	14.3	17.8	20.5	21.8	22.8	24.0	21.4	15.6	14.9	14.7	16.3	16.2	15.6	15.0	14.1	14.8	24.0																						
3-Jun	14.1	14.1	14.0	13.7	13.5	13.5	14.0	14.9	15.7	17.1	18.3	20.9	22.3	22.0	21.4	20.1	19.8	20.0	21.3	18.7	17.1	16.3	14.5	13.2	17.1	22.3																						
4-Jun	12.3	12.7	15.3	15.5	15.0	14.9	15.4	17.5	19.0	20.9	22.0	23.1	23.5	22.4	22.2	23.6	22.2	23.6	23.5	22.8	21.3	19.0	16.4	14.1	19.1	23.6																						
5-Jun	12.8	13.1	11.4	9.8	9.4	11.2	13.3	15.2	18.0	20.2	21.5	22.5	22.9	23.3	23.7	24.3	24.5	24.8	24.1	23.3	21.5	19.4	17.9	18.1	18.6	24.8																						
6-Jun	17.9	17.2	17.0	16.4	16.0	16.0	16.6	17.4	18.7	20.1	22.3	24.5	26.1	27.9	28.7	29.4	29.2	29.4	28.6	27.9	26.2	22.1	21.3	18.7	22.3	29.4																						
7-Jun	16.5	15.4	16.0	14.8	15.2	16.7	17.7	19.1	21.1	22.5	24.3	23.9	17.4	20.7	21.1	24.4	25.8	25.7	25.6	24.8	22.9	20.1	17.4	15.5	20.2	25.8																						
8-Jun	14.6	12.5	11.9	10.9	10.3	11.3	13.9	14.8	16.1	17.8	19.5	20.9	21.7	22.5	22.2	21.9	21.7	21.2	19.6	18.6	18.0	17.5	16.0	15.1	17.1	22.5																						
9-Jun	14.7	13.6	13.8	14.5	14.9	14.5	13.3	13.3	12.9	12.9	12.9	13.0	12.8	12.4	12.1	11.5	11.5	11.5	11.5	11.4	11.3	11.4	11.2	10.6	12.6	14.9																						
10-Jun	10.0	9.3	9.1	8.7	8.5	8.3	9.2	13.0	15.1	16.9	18.2	19.2	20.2	20.6	21.3	21.7	22.1	22.1	22.0	21.1	19.7	17.3	15.9	14.7	16.0	22.1																						
11-Jun	13.3	12.8	12.4	12.8	12.8	13.2	13.9	14.5	15.4	16.4	16.9	17.0	17.6	17.1	17.1	16.8	17.0	16.9	13.6	12.6	12.3	12.1	12.0	11.9	14.5	17.6																						
12-Jun	11.3	11.1	11.0	11.0	11.1	12.2	12.2	13.2	13.6	14.0	14.6	14.9	13.3	14.5	15.3	16.3	16.0	16.8	16.9	16.8	16.5	14.8	14.4	14.5	14.0	16.9																						
13-Jun	14.4	13.9	13.7	13.3	13.2	13.4	14.3	15.3	16.1	17.7	19.0	19.6	20.4	21.2	21.7	22.0	22.0	22.8	22.6	21.7	20.8	17.4	15.1	13.6	17.7	22.8																						
14-Jun	12.2	11.6	10.9	10.2	10.3	11.3	13.6	16.0	17.7	20.5	22.8	23.3	23.5	25.1	24.7	24.7	24.9	25.6	25.0	24.6	22.9	20.0	17.0	16.0	18.9	25.6																						
15-Jun	15.4	15.3	15.1	15.4	14.8	14.6	13.6	13.7	15.6	16.3	14.5	14.5	14.3	14.4	15.7	16.4	17.1	18.2	17.7	15.6	15.0	12.4	11.6	11.7	15.0	18.2																						
16-Jun	11.9	12.0	12.5	12.2	11.7	12.0	12.8	13.7	14.7	15.8	16.5	17.2	17.8	17.8	17.9	18.2	18.0	18.0	17.7	17.4	16.6	16.1	15.0	14.3	15.3	18.2																						
17-Jun	13.7	13.0	12.4	12.0	11.8	12.2	12.6	13.0	12.9	11.7	12.0	12.6	14.6	15.8	17.4	18.5	19.1	18.8	18.1	15.0	14.1	12.1	10.3	10.1	13.9	19.1																						
18-Jun	10.3	9.8	9.2	8.8	8.8	9.0	9.7	11.0	12.4	13.7	14.4	14.8	15.8	16.5	17.1	18.3	19.3	20.2	20.4	19.8	18.5	15.2	12.0	11.6	14.0	20.4																						
19-Jun	10.7	10.4	9.7	9.4	10.0	10.6	12.5	13.1	13.8	15.5	16.9	17.9	18.8	19.0	18.5	19.2	19.5	19.5	18.9	18.5	17.5	15.5	12.8	10.7	15.0	19.5																						
20-Jun	9.0	7.9	7.1	6.6	6.2	6.5	9.8	12.8	14.8	17.1	18.8	19.9	21.0	22.1	23.1	23.6	23.9	24.2	24.4	24.4	24.1	21.2	19.0	18.1	16.9	24.4																						
21-Jun	17.2	16.5	15.4	14.2	13.7	14.2	16.1	18.1	20.5	23.0	26.1	27.3	27.3	28.0	28.4	28.8	28.8	29.0	28.4	28.4	25.3	21.3	20.3	19.0	22.3	29.0																						
22-Jun	17.2	15.7	13.7	12.8	12.4	13.7	16.1	17.8	19.9	22.8	25.3	27.8	29.0	29.3	29.3	29.0	29.0	28.2	26.5	24.4	22.9	21.8	21.5	20.5	21.9	29.3																						
23-Jun	20.0	18.8	17.2	16.3	16.2	16.5	17.5	18.7	20.5	22.5	22.9	23.3	22.9	24.0	24.8	23.0	22.5	22.3	23.6	23.2	21.7	20.2	18.8	17.6	20.6	24.8																						
24-Jun	16.8	15.7	15.3	14.9	15.1	14.7	15.4	17.4	19.1	19.9	21.0	22.1	19.9	21.2	21.2	17.7	17.5	19.6	19.6	18.7	17.3	16.4	16.0	15.6	17.8	22.1																						
25-Jun	15.4	15.2	14.7	14.2	14.4	14.9	15.4	15.9	17.1	18.9	19.4	19.9	20.5	21.3	22.5	22.8	23.8	24.1	24.2	23.6	22.5	20.2	17.6	16.2	19.0	24.2																						
26-Jun	15.4	14.3	13.9	13.1	13.2	14.4	15.8	17.3	20.4	22.8	24.7	25.4	26.0	24.6	19.2	21.8	22.3	23.1	22.0	21.6	21.1	19.7	17.4	17.4	19.5	26.0																						
27-Jun	16.5	15.9	15.5	15.3	15.4	16.1	16.8	18.1	20.4	22.4	23.7	24.9	26.0	26.3	20.2	21.8	24.2	25.7	26.3	26.4	24.2	21.9	20.6	19.7	21.0	26.4																						
28-Jun	18.2	17.4	16.8	16.0	15.8	16.5	18.7	21.2	22.8	24.4	25.6	27.6	28.1	27.8	27.4	27.4	27.4	27.0	26.7	25.7	23.9	22.4	21.4	20.1	22.8	28.1																						
29-Jun	19.3	18.3	15.8	14.4	14.3	15.2	17.2	20.2	22.4	23.8	24.4	25.4	25.5	26.2	26.9	27.8	28.0	28.2	27.7	27.2	25.3	23.9	23.6	22.3	22.6	28.2																						
30-Jun	20.7	20.1	19.6	19.0	18.6	18.3	18.8	20.0	20.0	17.7	18.6	22.8	26.5	27.6	28.3	28.7	28.8	28.3	27.9	27.3	26.7	25.4	24.3	22.5	23.2	28.8																						
																								14.5	13.9	13.4	12.9	12.7	13.2	14.3	15.7	17.1	18.5	19.7	20.8	21.1	21.7	21.7	21.9	21.9	22.2	21.9	21.2	20.0	18.1	16.7	15.7	Diurnal Average
																								20.7	20.1	19.6	19.0	18.6	18.3	18.8	21.2	22.8	24.4	26.1	27.8	29.0	29.3	29.3	29.4	29.2	29.4	28.6	28.4	26.7	25.4	24.3	22.5	Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 20 m (AT20m) - C
Lower Camp Met Tower - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 20 m (AT20m) - C
Lower Camp Met Tower - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	28	3.89	3.89
10 - 20	446	61.94	65.83
> 20	246	34.17	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720

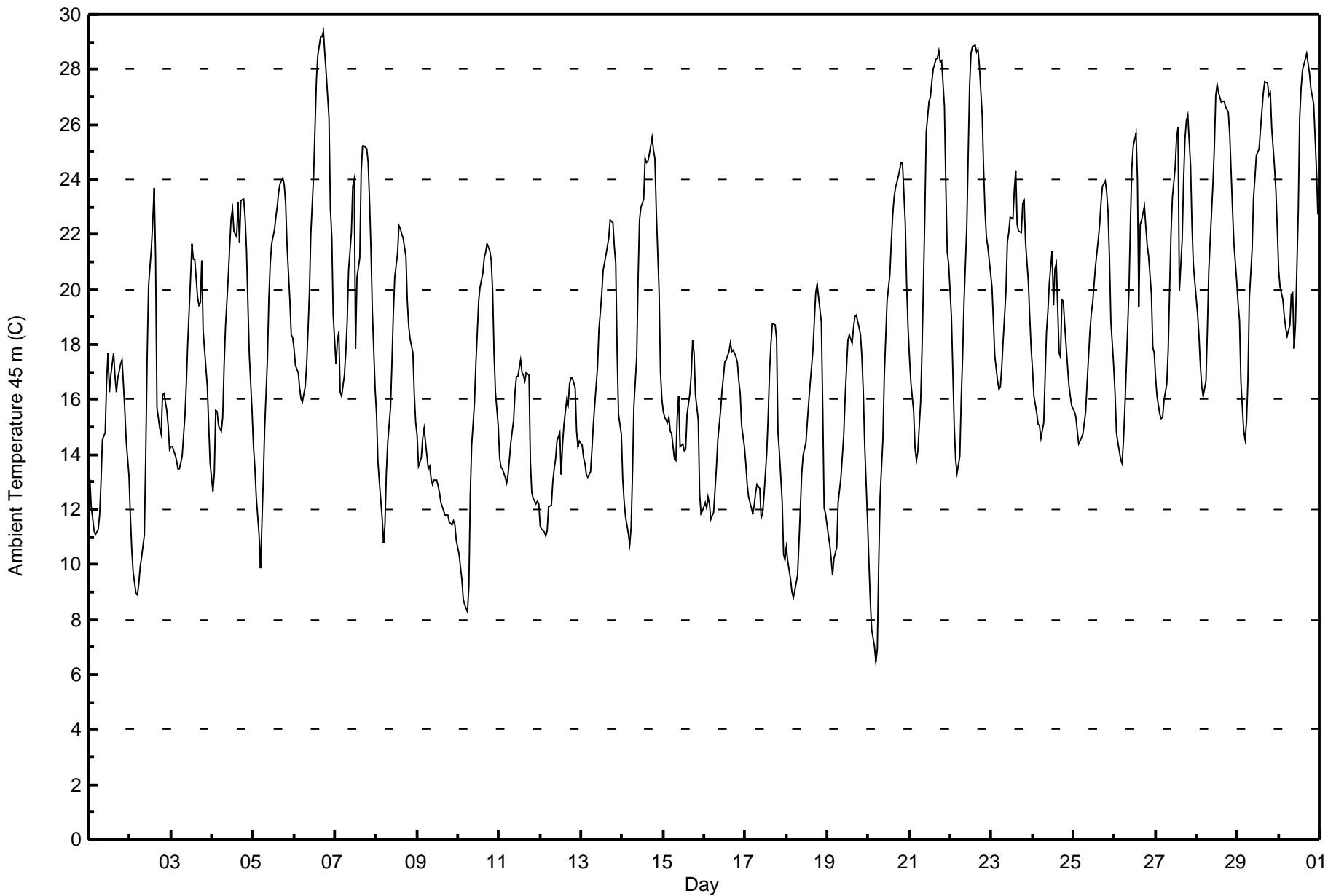


Maximum Value: 29.4 C on Jun 6 18:00 Maximum Daily Average: 23.1 C on Jun 30																				Hours in Service: 720 Hours of Data: 720						
Minimum Value: 6.5 C on Jun 20 05:00 Minimum Daily Average: 12.8 C on Jun 9 Maximum Diurnal Average: 22.0 C at hour 18 Minimum Diurnal Average: 12.9 C at hour 5 Monthly Average: 17.94 C Percentiles: P ₁ = 8.7 P ₁₀ = 11.8 Q ₁ = 14.3 Median = 17.3 O ₃ = 21.6 P ₉₀ = 24.9 P ₉₉ = 28.7																				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-Jun	13.1	12.1	11.7	11.2	11.1	11.3	11.8	13.0	14.6	14.8	16.7	17.7	16.3	16.9	17.7	16.8	16.3	16.8	17.3	17.5	16.6	15.6	14.5	13.2	14.8	17.7
2-Jun	11.8	10.5	9.7	9.0	8.9	9.3	9.9	10.2	11.1	14.1	17.6	20.1	21.5	22.5	23.7	21.2	15.7	14.9	14.7	16.2	16.2	15.6	15.0	14.2	14.7	23.7
3-Jun	14.3	14.3	14.0	13.8	13.5	13.5	13.9	14.7	15.4	16.6	18.1	20.4	21.6	21.1	21.1	19.7	19.4	19.5	21.0	18.5	17.1	16.5	15.0	13.7	17.0	21.6
4-Jun	12.6	13.3	15.6	15.6	15.1	14.8	15.4	17.3	18.7	20.5	21.6	22.6	23.0	22.1	21.9	23.2	21.7	23.2	23.3	22.6	21.4	19.5	17.6	15.6	19.1	23.3
5-Jun	14.3	13.5	12.5	11.1	9.9	11.4	13.1	15.0	17.5	19.7	21.0	21.7	22.2	22.6	23.1	23.5	23.9	24.1	23.8	23.1	21.6	19.6	18.4	18.2	18.5	24.1
6-Jun	17.8	17.2	17.0	16.4	16.0	15.9	16.5	17.2	18.5	19.9	22.0	24.2	25.9	27.6	28.5	29.2	29.2	29.4	28.6	27.9	26.3	23.0	21.9	19.1	22.3	29.4
7-Jun	17.3	18.1	18.5	16.3	16.1	16.9	17.7	18.8	20.7	22.1	23.7	24.0	17.8	20.4	21.1	24.2	25.2	25.2	25.1	24.6	23.2	21.4	19.2	16.4	20.6	25.2
8-Jun	15.5	13.7	13.0	11.7	10.8	11.4	13.3	14.5	15.7	17.4	19.1	20.4	21.3	22.3	22.2	22.0	21.9	21.2	19.6	18.6	18.2	17.7	16.2	15.1	17.2	22.3
9-Jun	14.7	13.6	13.9	14.6	15.0	14.4	13.5	13.6	13.1	12.9	13.1	13.1	12.9	12.6	12.2	11.9	11.8	11.8	11.8	11.5	11.5	11.6	11.4	10.9	12.8	15.0
10-Jun	10.4	9.9	9.5	8.7	8.6	8.3	9.2	12.5	14.4	15.9	17.3	18.4	19.6	20.1	20.6	21.1	21.4	21.7	21.4	21.0	19.9	17.7	16.3	15.0	15.8	21.7
11-Jun	13.9	13.5	13.5	13.2	13.0	13.3	13.8	14.4	15.3	16.3	16.8	16.8	17.4	17.0	16.9	16.7	17.0	16.9	13.7	12.6	12.4	12.2	12.3	12.2	14.6	17.4
12-Jun	11.4	11.3	11.2	11.1	11.2	12.1	12.1	13.0	13.5	13.9	14.5	14.8	13.3	14.4	15.1	16.0	15.8	16.6	16.8	16.8	16.4	14.8	14.3	14.5	14.0	16.8
13-Jun	14.4	13.9	13.7	13.3	13.2	13.4	14.2	15.1	15.8	17.2	18.6	19.1	19.9	20.7	21.2	21.6	21.8	22.5	22.4	21.6	20.9	17.7	15.4	14.7	17.6	22.5
14-Jun	13.1	12.3	11.7	11.1	10.7	11.3	13.3	15.8	17.5	20.4	22.5	23.0	23.3	24.8	24.6	24.7	24.9	25.5	25.1	24.8	22.9	19.9	17.0	16.0	19.0	25.5
15-Jun	15.6	15.4	15.2	15.4	14.8	14.7	13.8	13.8	15.4	16.1	14.3	14.4	14.1	14.2	15.5	16.2	16.9	18.1	17.7	16.2	15.3	12.5	11.8	11.9	15.0	18.1
16-Jun	12.3	12.0	12.5	12.2	11.6	11.9	12.7	13.5	14.5	15.6	16.3	16.8	17.4	17.4	17.7	18.1	17.8	17.8	17.6	17.3	16.7	16.2	15.0	14.3	15.2	18.1
17-Jun	13.7	12.9	12.4	12.1	11.9	12.2	12.6	12.9	12.8	11.7	11.8	12.5	14.1	15.4	17.0	18.1	18.7	18.7	18.2	14.8	14.1	12.3	10.4	10.2	13.8	18.7
18-Jun	10.6	10.1	9.5	9.0	8.8	9.0	9.6	10.8	12.1	13.3	14.0	14.4	15.2	15.9	16.6	17.8	18.9	19.9	20.2	19.7	18.8	15.7	12.0	11.9	13.9	20.2
19-Jun	11.1	10.7	10.2	9.6	10.2	10.6	12.2	12.7	13.2	14.7	16.0	17.1	18.1	18.4	18.0	18.6	19.0	19.1	18.6	18.4	17.5	16.3	14.3	11.7	14.9	19.1
20-Jun	10.1	8.7	7.6	7.0	6.5	6.9	10.0	12.5	14.5	16.8	18.2	19.6	20.5	21.7	22.7	23.3	23.7	24.1	24.4	24.6	24.6	22.4	20.2	18.6	17.0	24.6
21-Jun	17.6	16.6	15.6	14.2	13.8	14.1	15.9	17.8	20.2	22.7	25.7	26.9	27.0	27.5	28.0	28.4	28.4	28.7	28.3	28.3	26.7	23.8	21.3	21.0	22.4	28.7
22-Jun	19.0	17.0	15.1	13.8	13.3	13.9	16.0	17.5	19.5	22.3	24.9	27.4	28.6	28.8	28.9	28.7	28.7	28.1	26.3	24.4	22.9	21.9	21.6	20.6	22.1	28.9
23-Jun	20.1	18.9	17.6	16.7	16.3	16.5	17.2	18.1	19.9	21.7	22.0	22.6	22.6	23.6	24.3	22.4	22.1	22.1	23.1	23.2	21.7	20.3	19.0	17.8	20.4	24.3
24-Jun	17.1	16.1	15.5	15.1	15.1	14.6	15.1	16.9	18.5	19.2	20.2	21.4	19.4	20.7	20.9	17.7	17.6	19.6	19.6	18.7	17.2	16.5	16.1	15.8	17.7	21.4
25-Jun	15.6	15.4	14.8	14.4	14.5	14.8	15.2	15.6	16.6	18.5	19.1	19.5	20.2	20.9	21.8	22.4	23.2	23.8	23.9	23.5	22.8	21.2	18.9	17.2	18.9	23.9
26-Jun	16.2	14.8	14.5	13.8	13.7	14.5	15.6	17.1	20.1	22.5	24.4	25.2	25.7	24.0	19.4	22.4	22.5	23.0	22.3	21.6	21.2	19.9	17.9	17.7	19.6	25.7
27-Jun	16.8	16.1	15.5	15.3	15.4	16.0	16.6	17.8	20.0	22.0	23.4	24.4	25.5	25.9	19.9	21.8	24.0	25.5	26.1	26.3	24.5	22.3	20.9	20.3	20.9	26.3
28-Jun	19.1	18.3	17.2	16.5	16.1	16.7	18.5	20.6	21.8	23.8	25.1	27.1	27.4	27.1	26.8	26.8	26.8	26.6	26.5	25.6	24.2	22.9	21.7	20.3	22.7	27.4
29-Jun	19.5	18.9	16.6	14.9	14.5	15.2	16.7	19.7	21.5	23.3	24.1	24.9	25.1	25.8	26.5	27.1	27.6	27.5	27.1	27.2	25.9	24.5	23.6	22.2	22.5	27.6
30-Jun	20.7	20.1	19.6	19.0	18.6	18.3	18.7	19.8	19.9	17.8	18.7	22.8	26.3	27.3	28.0	28.4	28.6	28.2	27.9	27.3	26.7	25.6	24.3	22.7	23.1	28.6
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 45 m (AT45m) - C
Lower Camp Met Tower - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 45 m (AT45m) - C
Lower Camp Met Tower - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	24	3.33	3.33
10 - 20	458	63.61	66.94
> 20	238	33.06	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720

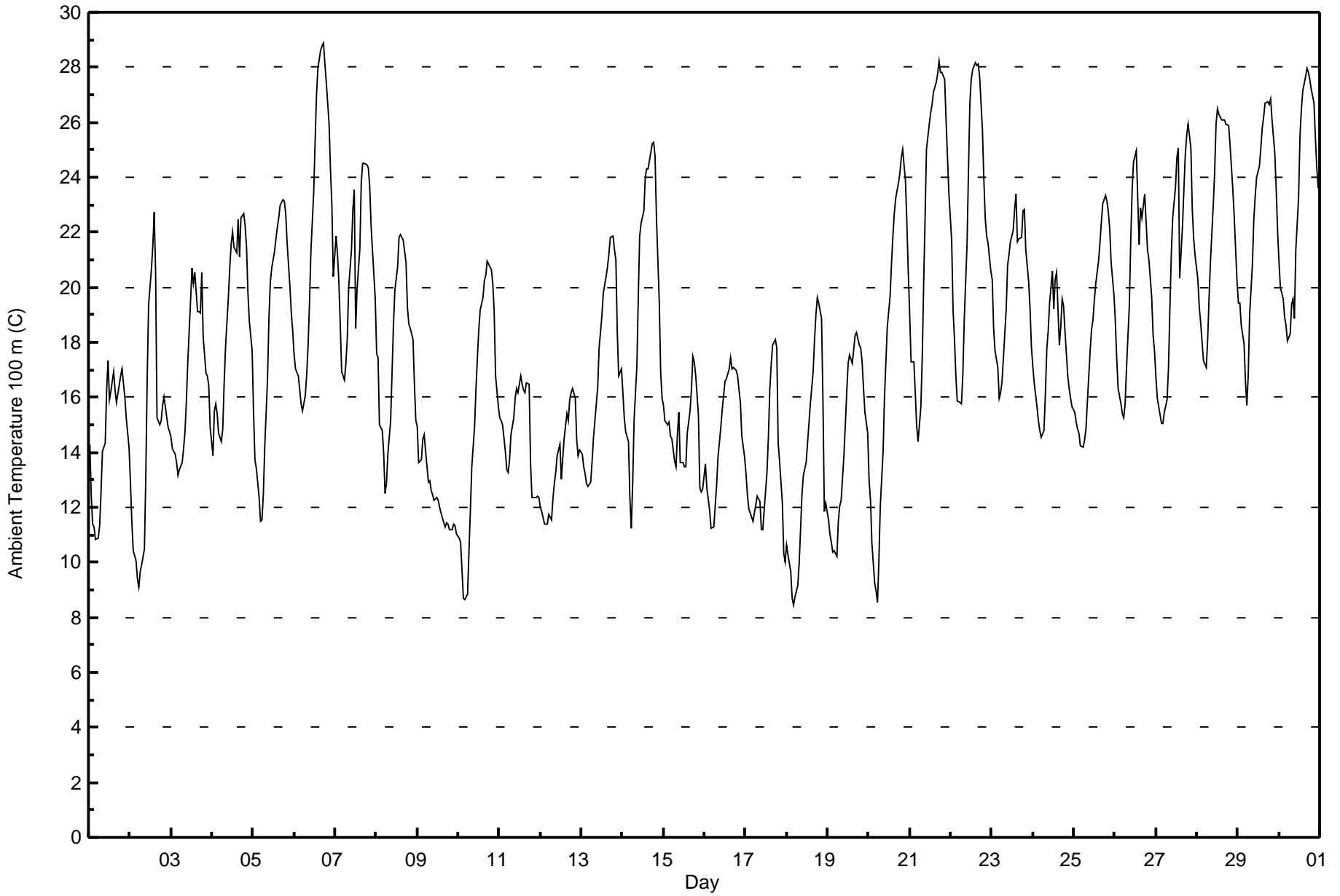


Maximum Value: 28.9 C on Jun 6 18:00																				Maximum Daily Average: 23.1 C on Jun 30					Hours in Service: 720																							
Minimum Value: 8.5 C on Jun 18 05:00																				Minimum Daily Average: 12.5 C on Jun 9					Hours of Data: 720																							
Maximum Diurnal Average: 21.5 C at hour 18																				Minimum Diurnal Average: 13.3 C at hour 6					Hours of Missing Data: 0																							
Monthly Average: 17.85 C																				Percentiles: P ₁ = 8.9 P ₁₀ = 11.9 Q ₁ = 14.4 Median = 17.1 O ₃ = 21.4 P ₉₀ = 24.5 P ₉₉ = 28.1					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-Jun	14.3	12.4	11.4	11.3	10.9	10.9	11.3	12.6	14.0	14.4	16.2	17.4	15.9	16.2	16.9	16.3	15.8	16.1	16.8	17.0	16.5	16.0	15.3	14.2	14.6	17.4																						
2-Jun	12.9	11.5	10.4	10.1	9.4	9.1	9.6	9.9	10.4	13.2	16.7	19.4	20.7	21.5	22.7	20.6	15.3	15.0	15.2	15.7	16.0	15.3	14.9	14.7	14.6	22.7																						
3-Jun	14.5	14.1	14.0	13.6	13.2	13.4	13.6	14.1	14.7	15.9	17.3	19.5	20.7	20.2	20.6	19.1	19.1	19.1	20.5	18.2	16.9	16.8	16.4	14.9	16.7	20.7																						
4-Jun	13.9	15.5	15.8	15.4	14.7	14.4	14.8	16.5	17.8	19.6	20.7	21.6	22.0	21.5	21.2	22.5	21.1	22.6	22.7	22.2	21.5	19.8	18.8	17.7	18.9	22.7																						
5-Jun	15.5	13.7	13.4	12.3	11.5	11.5	12.5	14.2	16.7	18.9	20.2	20.7	21.3	21.8	22.2	22.5	23.0	23.2	23.1	22.7	21.6	20.1	19.1	18.4	18.3	23.2																						
6-Jun	17.5	17.1	16.8	16.3	15.8	15.5	16.1	16.9	17.9	19.4	21.3	23.5	25.3	27.0	28.0	28.6	28.8	28.9	28.1	27.5	26.0	24.2	23.0	20.4	22.1	28.9																						
7-Jun	21.8	21.2	20.2	18.6	16.9	16.6	17.2	18.1	20.0	21.4	22.9	23.5	18.5	19.9	21.4	23.8	24.5	24.5	24.5	24.4	23.7	22.3	21.3	19.6	21.1	24.5																						
8-Jun	17.6	17.4	15.0	14.8	14.0	12.5	12.9	14.0	15.1	16.9	18.6	19.9	20.8	21.8	21.9	21.8	21.7	20.9	19.3	18.7	18.5	18.1	16.5	15.1	17.7	21.9																						
9-Jun	14.9	13.6	13.8	14.5	14.6	14.0	12.9	13.0	12.6	12.4	12.3	12.3	12.2	12.0	11.8	11.5	11.3	11.4	11.4	11.2	11.2	11.4	11.4	11.0	12.5	14.9																						
10-Jun	10.9	10.7	9.7	8.7	8.7	8.8	10.4	11.9	13.5	14.9	16.3	17.4	18.4	19.2	19.6	20.2	20.5	20.9	20.8	20.6	20.1	19.1	16.8	15.7	15.6	20.9																						
11-Jun	15.3	15.2	15.0	14.1	13.4	13.3	13.7	14.6	15.3	16.0	16.3	16.2	16.8	16.5	16.3	16.2	16.5	16.4	13.6	12.4	12.3	12.3	12.4	12.4	14.7	16.8																						
12-Jun	12.0	11.8	11.4	11.4	11.4	11.7	11.5	12.3	12.9	13.3	13.9	14.3	13.0	13.8	14.5	15.4	15.1	15.9	16.2	16.3	16.0	14.4	13.9	14.1	13.6	16.3																						
13-Jun	13.9	13.5	13.2	12.9	12.8	12.9	13.7	14.5	15.1	16.4	17.8	18.3	19.0	19.8	20.4	20.8	21.2	21.8	21.9	21.3	21.0	18.4	16.8	17.0	17.3	21.9																						
14-Jun	16.1	15.3	14.8	14.4	12.4	11.2	12.9	15.1	17.2	19.6	21.8	22.3	22.8	24.0	24.3	24.3	24.6	25.2	25.3	24.8	22.5	19.5	16.9	16.0	19.3	25.3																						
15-Jun	15.7	15.1	15.0	15.1	14.6	14.5	13.7	13.5	14.7	15.5	13.6	13.6	13.5	13.5	14.7	15.5	16.3	17.5	17.3	16.8	15.3	12.7	12.5	12.7	14.7	17.5																						
16-Jun	13.6	12.7	12.3	11.9	11.2	11.3	12.1	12.8	13.8	14.9	15.6	16.1	16.6	16.7	17.0	17.4	17.0	17.1	17.0	16.8	16.2	15.8	14.6	13.8	14.8	17.4																						
17-Jun	13.2	12.5	12.0	11.6	11.5	11.8	12.1	12.4	12.2	11.2	11.2	11.9	13.3	14.5	16.3	17.2	17.9	18.1	17.8	14.4	13.7	12.2	10.3	10.0	13.3	18.1																						
18-Jun	10.6	10.3	9.7	8.7	8.5	8.8	9.2	10.0	11.2	12.4	13.2	13.6	14.4	15.0	15.8	16.9	18.1	19.0	19.6	19.4	18.9	15.9	11.9	12.1	13.5	19.6																						
19-Jun	11.5	11.0	10.7	10.4	10.4	10.2	11.5	12.1	12.3	13.9	15.0	16.2	17.2	17.5	17.2	17.7	18.2	18.3	17.9	17.8	17.3	16.3	15.4	14.7	14.6	18.3																						
20-Jun	13.0	12.3	10.7	9.2	9.0	8.5	10.1	12.1	14.1	16.0	17.3	18.6	19.7	20.9	21.9	22.7	23.3	23.8	24.2	24.7	25.0	23.9	22.3	20.5	17.6	25.0																						
21-Jun	19.0	17.3	17.3	16.1	14.9	14.4	15.6	17.5	20.2	22.5	25.0	25.9	26.3	26.6	27.1	27.5	27.7	28.2	27.8	27.8	27.6	26.1	24.8	23.4	22.8	28.2																						
22-Jun	21.7	19.2	18.2	16.8	15.9	15.8	15.8	16.8	18.8	21.6	24.2	26.7	27.6	27.9	28.2	28.0	28.1	27.6	25.7	23.9	22.6	21.9	21.6	20.6	22.3	28.2																						
23-Jun	20.3	18.5	17.7	17.1	16.0	16.2	16.6	17.4	19.2	20.8	21.2	21.7	22.1	22.8	23.4	21.7	21.8	21.8	22.8	22.8	21.4	20.2	19.3	17.8	20.0	23.4																						
24-Jun	17.1	16.5	15.7	15.1	14.8	14.5	14.8	16.1	17.7	18.4	19.4	20.6	19.2	20.3	20.6	17.9	18.6	19.6	19.3	18.4	16.8	16.3	16.0	15.7	17.5	20.6																						
25-Jun	15.5	15.1	14.8	14.7	14.2	14.2	14.5	14.8	15.8	17.7	18.4	18.8	19.5	20.1	20.9	21.6	22.4	23.0	23.4	23.1	22.7	22.1	20.9	19.7	18.7	23.4																						
26-Jun	18.7	17.4	16.3	15.8	15.4	15.3	15.8	17.1	19.3	21.7	23.5	24.5	25.0	23.2	21.6	22.9	22.5	23.4	22.3	21.4	21.0	19.6	18.3	17.7	20.0	25.0																						
27-Jun	16.7	16.0	15.4	15.1	15.0	15.5	15.9	17.1	19.2	21.2	22.5	23.6	24.7	25.1	20.4	22.2	23.5	24.8	25.5	25.9	25.1	22.9	21.8	21.1	20.7	25.9																						
28-Jun	20.3	19.3	18.7	18.0	17.3	17.1	18.1	19.6	20.9	23.0	24.2	26.0	26.5	26.3	26.1	26.1	26.1	26.0	25.9	25.2	24.3	23.5	22.5	20.2	22.5	26.5																						
29-Jun	19.4	19.4	18.6	18.0	16.6	15.7	16.8	19.0	20.8	22.5	23.4	24.0	24.4	25.1	25.8	26.2	26.7	26.8	26.6	26.8	26.1	24.8	23.5	22.0	22.5	26.8																						
30-Jun	20.9	20.0	19.6	18.9	18.6	18.0	18.3	19.4	19.6	18.8	21.4	23.3	25.5	26.5	27.1	27.7	28.0	27.8	27.6	27.2	26.7	25.4	24.3	23.6	23.1	28.0																						
																								16.0	15.2	14.6	14.0	13.5	13.3	13.8	14.9	16.1	17.5	18.7	19.7	20.1	20.6	20.9	21.1	21.2	21.5	21.3	20.8	20.2	18.9	17.8	16.9	Diurnal Average
																								21.8	21.2	20.2	18.9	18.6	18.0	18.3	19.6	20.9	23.0	25.0	26.7	27.6	27.9	28.2	28.6	28.8	28.9	28.1	27.8	27.6	26.1	24.8	23.6	Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 100 m (AT100m) - C
Lower Camp Met Tower - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 100 m (AT100m) - C
Lower Camp Met Tower - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	18	2.50	2.50
10 - 20	467	64.86	67.36
> 20	235	32.64	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720

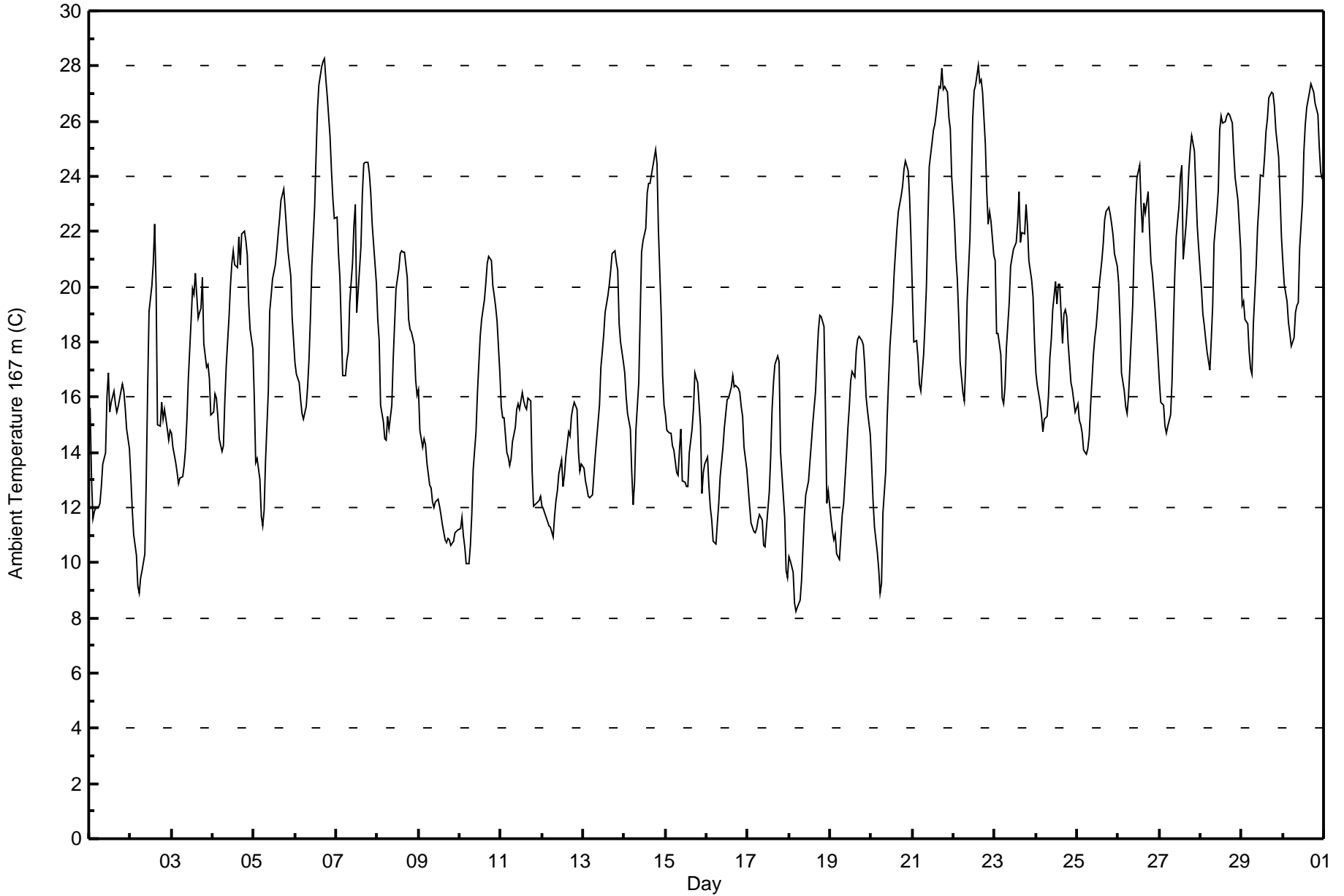


Maximum Value: 28.2 C on Jun 6 18:00		Maximum Daily Average: 23.0 C on Jun 21		Hours in Service: 720																																												
Minimum Value: 8.2 C on Jun 18 05:00		Minimum Daily Average: 12.3 C on Jun 9		Hours of Data: 720																																												
Maximum Diurnal Average: 21.2 C at hour 18		Minimum Diurnal Average: 13.4 C at hour 6		Hours of Missing Data: 0																																												
Monthly Average: 17.70 C		Percentiles: P ₁ = 9.2 P ₁₀ = 11.8 Q ₁ = 14.2 Median = 17.1 O ₃ = 21.2 P ₉₀ = 24.2 P ₉₉ = 27.5		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-Jun	15.6	13.1	11.6	11.9	12.0	12.0	12.2	12.7	13.6	14.0	16.0	16.9	15.5	15.8	16.2	15.7	15.4	15.7	16.2	16.5	16.2	15.6	14.9	14.2	14.6	16.9																						
2-Jun	13.1	12.0	11.0	10.3	9.2	8.9	9.5	9.7	10.3	13.0	16.3	19.1	20.1	20.8	22.3	20.1	15.0	14.9	15.8	15.2	15.6	14.8	14.5	14.8	14.4	22.3																						
3-Jun	14.7	14.2	13.6	13.3	12.9	13.1	13.1	13.5	14.1	15.2	16.7	18.8	19.9	19.7	20.5	18.8	19.0	19.2	20.4	17.9	17.1	17.2	16.7	15.4	16.5	20.5																						
4-Jun	15.4	16.1	16.0	15.3	14.5	14.0	14.2	15.9	17.1	18.9	20.0	20.9	21.3	20.8	20.7	21.8	20.8	21.9	22.0	21.7	21.1	19.4	18.5	17.7	18.6	22.0																						
5-Jun	16.0	13.6	13.8	13.0	11.7	11.4	11.9	13.7	16.2	19.1	19.7	20.3	20.8	21.3	21.9	22.5	23.2	23.6	22.8	22.1	21.3	20.4	18.9	18.0	18.2	23.6																						
6-Jun	17.2	16.8	16.5	15.9	15.4	15.2	15.7	16.4	17.4	18.9	20.7	22.9	24.7	26.4	27.3	28.0	28.2	28.2	27.5	26.9	25.4	24.2	23.2	22.5	21.7	28.2																						
7-Jun	22.5	21.2	20.3	18.6	16.8	16.8	17.3	17.6	19.4	20.8	22.2	23.0	19.1	19.8	21.4	23.3	24.5	24.5	24.5	24.1	23.4	22.2	21.6	20.1	21.1	24.5																						
8-Jun	18.8	18.0	15.7	15.1	14.5	14.5	15.3	14.9	15.7	17.4	18.7	20.0	20.7	21.2	21.3	21.3	21.3	20.4	18.8	18.5	18.3	17.9	16.6	16.1	17.9	21.3																						
9-Jun	16.3	14.8	14.2	14.5	14.3	13.6	12.8	12.7	12.2	12.0	12.2	12.3	12.1	11.8	11.4	10.9	10.7	10.9	10.8	10.6	10.8	11.1	11.2	11.2	12.3	16.3																						
10-Jun	11.2	11.7	11.0	10.6	10.0	10.0	10.6	11.8	13.3	14.7	16.1	17.2	18.2	18.8	19.5	20.1	20.8	21.1	20.9	20.0	19.7	19.3	18.8	16.9	15.9	21.1																						
11-Jun	15.7	15.2	15.2	14.0	13.9	13.5	13.8	14.4	14.9	15.6	15.8	15.6	16.2	15.9	15.6	15.6	16.0	15.9	13.3	12.0	12.1	12.2	12.3	12.4	14.5	16.2																						
12-Jun	12.1	12.0	11.6	11.5	11.3	11.3	10.9	11.7	12.3	12.6	13.2	13.7	12.8	13.2	13.8	14.8	14.6	15.3	15.6	15.8	15.6	14.0	13.3	13.6	13.2	15.8																						
13-Jun	13.4	12.9	12.7	12.4	12.3	12.4	13.1	13.9	14.5	15.7	17.1	17.7	18.3	19.1	19.7	20.1	20.6	21.2	21.3	20.9	20.6	18.6	18.0	17.3	16.8	21.3																						
14-Jun	16.9	16.0	15.4	14.8	13.3	12.1	12.9	14.9	16.5	18.9	21.2	21.7	22.1	23.4	23.8	23.7	24.0	24.7	25.0	24.4	22.1	19.0	16.8	15.7	19.1	25.0																						
15-Jun	15.4	14.8	14.7	14.7	14.2	14.1	13.3	13.2	14.1	14.8	13.0	12.9	12.8	12.8	14.0	14.8	15.6	16.9	16.7	16.5	15.0	12.5	13.2	13.6	14.3	16.9																						
16-Jun	13.8	12.8	12.0	11.5	10.8	10.7	11.4	12.2	13.1	14.2	14.9	15.4	15.9	16.0	16.4	16.8	16.4	16.4	16.3	16.2	15.7	15.3	14.2	13.4	14.2	16.8																						
17-Jun	12.7	12.1	11.4	11.1	11.1	11.3	11.5	11.8	11.6	10.6	10.6	11.3	12.6	13.8	15.5	16.5	17.2	17.5	17.3	14.0	13.2	11.6	9.7	9.4	12.7	17.5																						
18-Jun	10.2	10.0	9.7	8.5	8.2	8.4	8.6	9.4	10.5	11.7	12.5	13.0	13.7	14.3	15.1	16.2	17.4	18.4	19.0	18.9	18.6	15.7	12.1	12.6	13.0	19.0																						
19-Jun	11.6	11.1	10.8	11.0	10.3	10.1	11.0	11.8	12.2	13.9	14.8	15.6	16.6	16.9	16.8	17.7	18.1	18.2	18.0	17.9	17.2	16.0	15.5	14.7	14.5	18.2																						
20-Jun	13.5	12.2	11.3	10.4	9.8	8.9	9.2	11.8	13.3	15.2	16.6	17.8	19.4	20.5	21.3	22.1	22.7	23.3	23.6	24.2	24.6	24.2	23.2	21.7	17.5	24.6																						
21-Jun	19.8	18.0	18.1	17.4	16.5	16.2	17.5	18.6	20.1	22.3	24.4	25.2	25.7	25.9	26.3	27.3	27.2	27.9	27.2	27.2	27.1	26.1	25.7	24.0	23.0	27.9																						
22-Jun	22.3	21.1	20.3	18.9	17.3	16.2	15.9	17.2	19.5	21.8	23.9	26.2	27.1	27.3	28.0	27.4	27.5	27.0	25.1	23.4	22.2	22.7	22.4	21.2	22.6	28.0																						
23-Jun	21.0	18.3	18.3	17.6	16.0	15.8	16.4	17.8	19.4	20.8	21.1	21.4	21.6	22.3	23.4	21.6	22.0	21.9	23.0	22.2	21.0	20.2	19.6	18.0	20.0	23.4																						
24-Jun	16.9	16.4	15.8	15.4	14.7	15.2	15.3	16.1	17.4	18.1	19.2	20.2	19.4	20.1	20.1	17.9	19.0	19.2	18.9	17.9	16.5	16.3	15.9	15.5	17.4	20.2																						
25-Jun	15.8	15.2	15.0	14.7	14.1	14.0	14.1	14.6	15.7	17.5	18.1	18.6	19.2	20.0	21.0	21.6	22.4	22.8	22.9	22.6	22.3	21.8	21.2	20.7	18.6	22.9																						
26-Jun	20.1	18.8	16.9	16.2	15.7	15.4	16.0	17.1	19.3	21.3	23.0	23.9	24.4	22.9	21.9	23.0	22.7	23.4	22.0	20.9	20.5	19.2	18.3	17.5	20.0	24.4																						
27-Jun	16.6	15.8	15.7	14.9	14.7	15.0	15.4	16.5	18.6	20.5	21.8	23.0	24.0	24.4	21.0	22.2	23.0	24.2	25.0	25.5	24.9	23.6	22.2	21.4	20.4	25.5																						
28-Jun	19.9	19.0	18.6	18.1	17.6	17.0	18.1	19.3	21.6	22.8	23.5	25.7	26.2	25.9	26.0	26.2	26.3	26.2	25.9	24.9	23.9	23.5	23.1	21.3	22.5	26.3																						
29-Jun	19.3	19.5	18.8	18.7	17.7	17.0	16.8	18.7	20.8	22.2	23.0	24.0	24.0	24.7	25.6	26.1	26.9	27.1	27.0	26.5	25.7	24.7	23.3	21.8	22.5	27.1																						
30-Jun	20.9	20.1	19.5	18.7	18.3	17.8	18.1	19.1	19.3	19.4	21.4	23.1	24.9	25.9	26.5	27.0	27.3	27.2	27.0	26.7	26.3	25.0	24.1	23.9	22.8	27.3																						
																								16.3	15.4	14.9	14.3	13.6	13.4	13.7	14.6	15.8	17.1	18.3	19.2	19.6	20.1	20.5	20.7	20.9	21.2	21.0	20.4	19.8	18.8	18.0	17.2	Diurnal Average
																								22.5	21.2	20.3	18.9	18.3	17.8	18.1	19.3	21.6	22.8	24.4	26.2	27.1	27.3	28.0	28.0	28.2	28.2	27.5	27.2	27.1	26.1	25.7	24.0	Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 167 m (AT167m) - C
Lower Camp Met Tower - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 167 m (AT167m) - C
Lower Camp Met Tower - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	17	2.36	2.36
10 - 20	469	65.14	67.50
> 20	234	32.50	100.00

Total Number of Valid Hours: 720

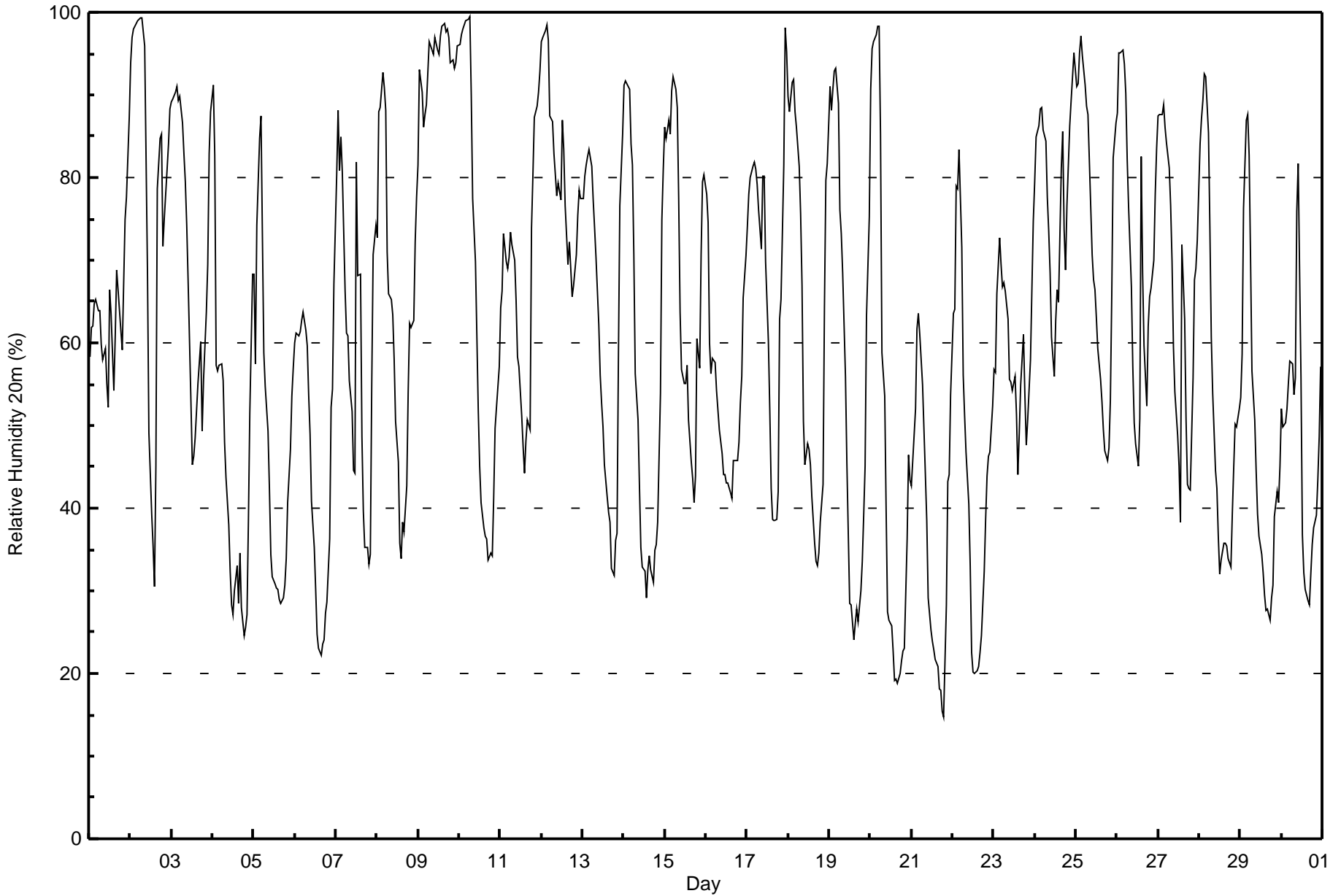
Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

Relative Humidity 20m (RH20m) - %
Lower Camp Met Tower - June 2016

Maximum Value: 99 % on Jun 10 07:00 Maximum Daily Average: 94.0 % on Jun 9																			Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: 15 % on Jun 21 20:00 Minimum Daily Average: 37.2 % on Jun 21 Maximum Diurnal Average: 82.7 % at hour 4 Minimum Diurnal Average: 43.4 % at hour 18 Monthly Average: 61.1 % Percentiles: P ₁ = 20 P ₁₀ = 32 Q ₁ = 44 Median = 60 Q ₃ = 81 P ₉₀ = 91 P ₉₉ = 99																										
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-Jun	58	62	62	65	65	64	64	60	58	59	55	52	67	64	54	61	69	67	62	59	67	75	78	87	63.8	87
2-Jun	94	97	98	99	99	99	99	99	96	82	68	49	39	35	30	45	79	85	85	72	75	81	84	88	78.3	99
3-Jun	89	89	90	91	89	90	87	83	80	74	67	53	45	46	49	55	58	60	49	56	64	69	83	88	71.0	91
4-Jun	91	83	57	57	57	57	55	48	44	38	32	28	27	30	33	28	35	28	25	26	27	38	52	68	44.4	91
5-Jun	68	57	74	85	88	73	59	55	49	42	34	32	31	30	30	29	28	29	31	34	41	47	54	57	48.2	88
6-Jun	60	61	61	61	63	64	62	60	54	49	41	35	30	25	23	22	24	24	27	29	36	52	54	67	45.1	67
7-Jun	80	88	81	85	81	66	61	61	55	52	45	44	82	68	68	49	40	35	35	33	34	55	71	74	60.2	88
8-Jun	73	88	88	93	91	88	71	66	65	63	58	51	46	36	34	38	37	43	54	62	62	63	72	78	63.3	93
9-Jun	82	93	90	86	88	89	96	96	95	95	97	95	95	97	98	99	98	98	97	94	94	93	94	96	94.0	99
10-Jun	96	97	98	99	99	99	99	90	77	70	61	52	45	41	38	37	36	34	35	34	41	50	52	57	64.0	99
11-Jun	64	66	73	70	69	70	73	72	70	65	58	57	51	47	44	48	51	49	74	80	87	89	90	93	67.2	93
12-Jun	96	97	98	98	97	88	87	83	80	78	79	77	87	83	77	69	72	69	66	67	71	75	79	77	81.3	98
13-Jun	77	80	82	83	83	81	77	74	70	62	56	53	50	45	41	39	38	33	32	36	37	58	77	85	60.5	85
14-Jun	91	92	91	91	84	82	71	56	51	43	35	33	32	29	33	34	33	31	35	36	38	54	75	81	55.4	92
15-Jun	86	85	87	85	91	92	91	88	77	64	57	55	55	57	51	46	44	41	44	61	57	71	80	80	68.4	92
16-Jun	78	75	60	56	58	58	54	52	49	47	44	44	43	43	42	41	46	46	46	48	53	56	65	71	53.1	78
17-Jun	74	78	80	81	82	81	79	76	71	80	80	70	60	52	42	39	38	39	42	63	65	81	98	95	68.7	98
18-Jun	90	88	92	92	88	86	81	76	67	51	45	48	47	45	41	36	34	33	35	38	43	64	80	82	61.7	92
19-Jun	91	88	91	93	93	89	76	73	68	56	45	37	29	28	24	26	28	26	30	34	39	45	63	75	56.2	93
20-Jun	91	96	96	97	98	98	85	59	54	40	27	26	26	23	19	19	19	20	21	23	23	36	46	43	49.5	98
21-Jun	43	46	52	62	64	61	55	50	44	38	29	25	24	23	22	21	18	18	15	15	28	43	44	54	37.2	64
22-Jun	64	64	79	79	83	72	56	51	47	41	33	23	20	20	20	21	23	25	32	39	44	46	47	52	45.0	83
23-Jun	57	57	66	73	69	67	67	66	63	56	55	54	56	51	44	49	55	61	54	48	51	58	66	75	59.1	75
24-Jun	79	85	86	88	89	86	84	78	74	69	61	56	63	66	65	81	86	74	69	77	86	89	92	95	78.2	95
25-Jun	91	91	95	97	95	91	89	88	82	71	68	66	63	59	56	53	49	47	46	47	53	66	82	87	72.2	97
26-Jun	88	95	95	96	94	90	82	76	67	57	50	48	45	51	82	68	60	52	62	66	67	70	78	84	71.8	96
27-Jun	87	88	88	89	86	84	81	77	70	59	54	49	45	38	72	63	51	43	42	42	56	68	69	72	65.5	89
28-Jun	84	87	89	93	92	85	74	61	54	45	42	37	32	34	36	36	35	34	33	39	45	50	50	52	54.9	93
29-Jun	53	59	76	87	88	83	70	57	51	45	39	37	34	32	29	28	28	26	29	31	39	42	41	45	47.8	88
30-Jun	52	50	50	52	55	58	57	54	56	76	82	56	37	32	30	29	28	32	36	38	39	43	49	57	47.8	82
77.6 79.4 80.9 82.7 82.6 79.7 74.8 69.4 64.6 58.8 53.3 48.1 46.9 44.5 44.3 43.7 44.6 43.4 44.7 47.5 52.1 61.0 68.8 73.9																								Diurnal Average		
96 97 98 99 99 99 99 99 99 96 95 97 95 95 97 98 99 98 98 97 94 94 93 98 96																								Diurnal Maximum		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Relative Humidity 20m (RH20m) - %
Lower Camp Met Tower - June 2016**

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	8	1.11	1.11
20 - 40	143	19.86	20.97
40 - 60	209	29.03	50.00
60 - 80	170	23.61	73.61
80 - 100	190	26.39	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

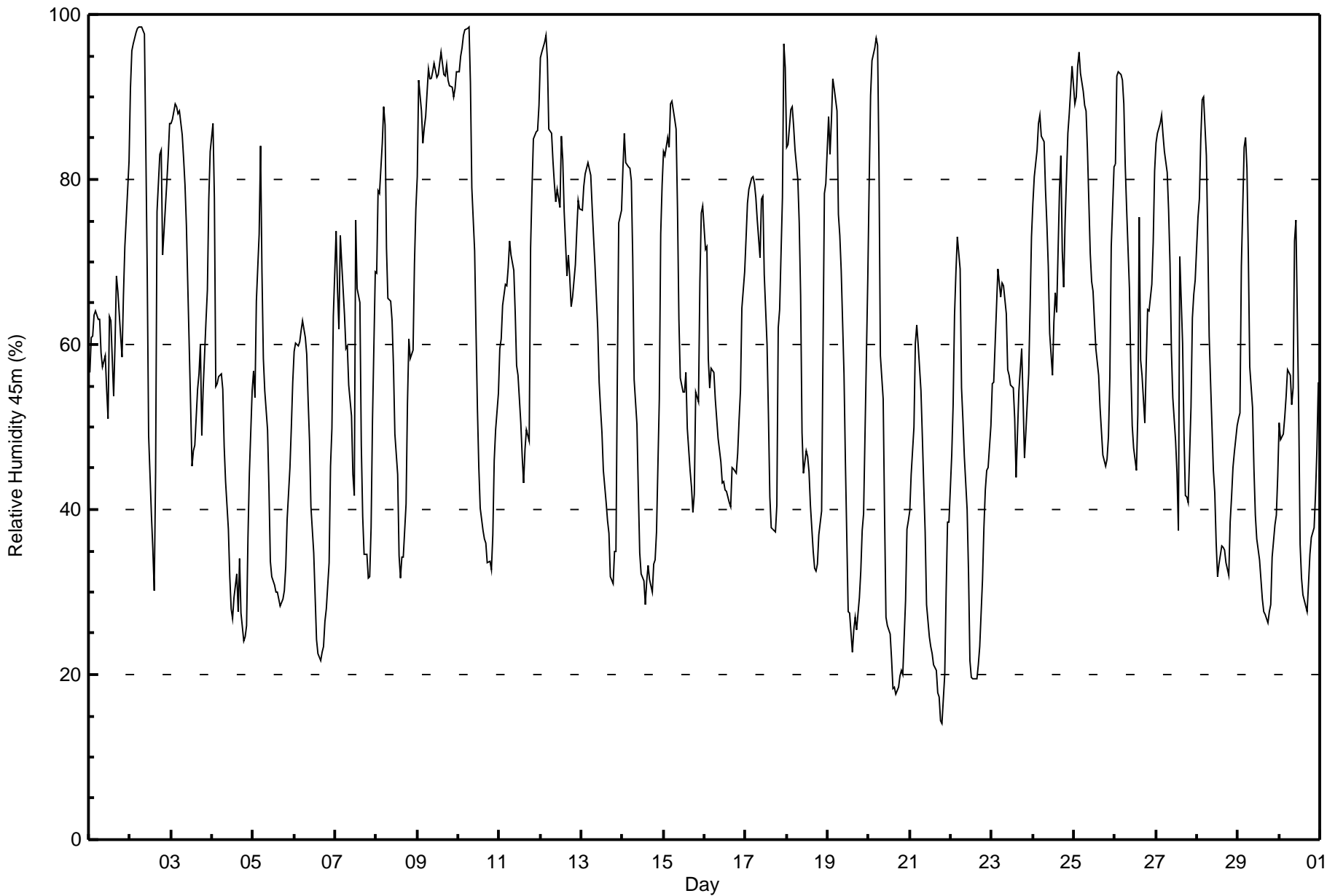
Relative Humidity 45m (RH45m) - %
Lower Camp Met Tower - June 2016

Maximum Value: 99 % on Jun 2 08:00 Maximum Daily Average: 91.1 % on Jun 9																		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 14 % on Jun 21 20:00 Minimum Daily Average: 34.6 % on Jun 21 Maximum Diurnal Average: 80.4 % at hour 5 Minimum Diurnal Average: 42.3 % at hour 16 Monthly Average: 59.2 % Percentiles: P ₁ = 18 P ₁₀ = 31 Q ₁ = 42 Median = 58 Q ₃ = 78 P ₉₀ = 89 P ₉₉ = 98																										
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-Jun	57	61	61	64	64	63	63	59	57	59	55	51	63	63	54	60	68	66	61	58	66	72	75	82	62.6	82
2-Jun	91	96	97	98	98	98	99	99	98	84	69	49	39	35	30	45	76	83	84	71	74	80	83	87	77.5	99
3-Jun	87	87	89	89	88	88	85	83	79	74	67	53	45	47	48	55	56	60	49	55	63	67	78	83	69.8	89
4-Jun	87	78	55	55	56	56	55	48	43	38	32	28	27	29	32	28	34	27	24	25	26	37	44	54	42.4	87
5-Jun	57	54	65	73	84	69	58	54	50	43	34	32	31	30	30	29	28	29	30	33	39	45	50	55	45.9	84
6-Jun	59	60	60	60	62	63	61	59	53	48	40	35	30	24	23	22	23	23	27	28	34	45	50	63	43.8	63
7-Jun	74	67	62	73	70	64	60	60	55	51	44	42	75	67	65	48	39	35	35	32	32	38	51	69	54.4	75
8-Jun	69	79	78	84	89	87	72	66	65	63	57	49	44	34	32	34	34	41	53	61	58	59	70	76	60.6	89
9-Jun	80	92	88	84	86	88	93	92	92	93	94	92	93	94	95	93	93	94	92	91	91	90	91	93	91.1	95
10-Jun	93	95	96	98	98	98	98	92	79	71	62	52	45	40	37	36	36	34	34	33	37	46	50	54	63.1	98
11-Jun	59	61	65	67	67	69	73	71	69	64	58	56	50	46	43	47	50	48	72	79	85	86	86	89	65.0	89
12-Jun	95	95	97	97	95	86	86	82	79	77	79	77	85	82	76	68	71	68	65	66	70	74	77	76	80.1	97
13-Jun	76	79	81	81	82	80	77	73	70	62	55	52	49	45	41	39	37	32	31	35	35	56	75	76	59.1	82
14-Jun	81	86	82	82	81	80	70	56	50	42	35	32	31	28	31	33	32	30	33	34	37	53	73	79	53.1	86
15-Jun	83	83	85	84	89	90	87	86	76	63	56	54	54	57	50	45	43	40	42	54	53	68	76	77	66.4	90
16-Jun	71	72	58	55	57	57	53	51	49	46	43	43	42	42	41	40	45	45	44	47	51	54	64	69	51.7	72
17-Jun	73	77	79	80	80	79	78	75	71	78	78	69	60	51	41	38	38	37	41	62	64	78	96	94	67.4	96
18-Jun	84	84	89	89	86	84	80	75	66	49	44	47	46	45	40	35	33	33	33	37	40	60	78	79	59.8	89
19-Jun	88	83	87	92	91	88	76	73	69	57	46	37	28	27	23	25	27	25	29	32	37	39	49	68	54.0	92
20-Jun	80	90	94	96	97	96	82	59	53	39	27	26	25	22	18	18	18	19	20	21	20	29	38	39	46.9	97
21-Jun	40	44	50	60	62	60	54	49	43	37	28	25	23	22	21	21	18	17	14	14	20	30	39	38	34.6	62
22-Jun	47	53	64	69	73	69	55	51	46	40	32	22	20	20	19	20	21	23	32	38	42	45	45	50	41.4	73
23-Jun	55	55	60	69	67	66	67	67	64	57	56	55	55	51	44	49	54	59	53	46	50	57	64	73	58.2	73
24-Jun	77	80	84	87	88	85	85	79	75	70	61	56	63	66	64	79	83	71	67	75	86	88	91	94	77.1	94
25-Jun	89	90	94	95	93	91	89	88	83	71	68	66	63	59	56	52	49	47	45	46	49	56	72	82	70.6	95
26-Jun	82	93	93	93	92	89	82	76	67	57	50	47	45	52	75	58	56	50	58	64	64	67	72	81	69.3	93
27-Jun	84	86	87	88	85	83	81	76	70	59	54	48	44	38	71	60	49	42	41	41	52	63	66	68	64.0	88
28-Jun	75	78	85	90	90	83	73	61	55	45	42	36	32	33	36	35	35	33	32	38	42	45	47	50	53.0	90
29-Jun	51	52	70	84	85	81	71	57	52	45	39	36	34	31	29	28	27	26	28	28	34	38	39	44	46.3	85
30-Jun	51	48	49	51	54	57	56	53	55	73	75	52	36	32	30	28	28	31	35	37	38	42	47	55	46.3	75
73.2 75.2 76.7 79.6 80.4 78.3 73.9 69.0 64.5 58.5 52.7 47.3 45.9 43.8 43.2 42.3 43.4 42.3 43.4 46.0 49.6 56.8 64.6 70.0																								Diurnal Average		
95 96 97 98 98 98 99 99 98 93 94 92 93 94 95 93 93 94 92 91 91 90 96 94																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity 45m (RH45m) - %
Lower Camp Met Tower - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Relative Humidity 45m (RH45m) - %
Lower Camp Met Tower - June 2016**

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	13	1.81	1.81
20 - 40	153	21.25	23.06
40 - 60	213	29.58	52.64
60 - 80	184	25.56	78.19
80 - 100	157	21.81	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



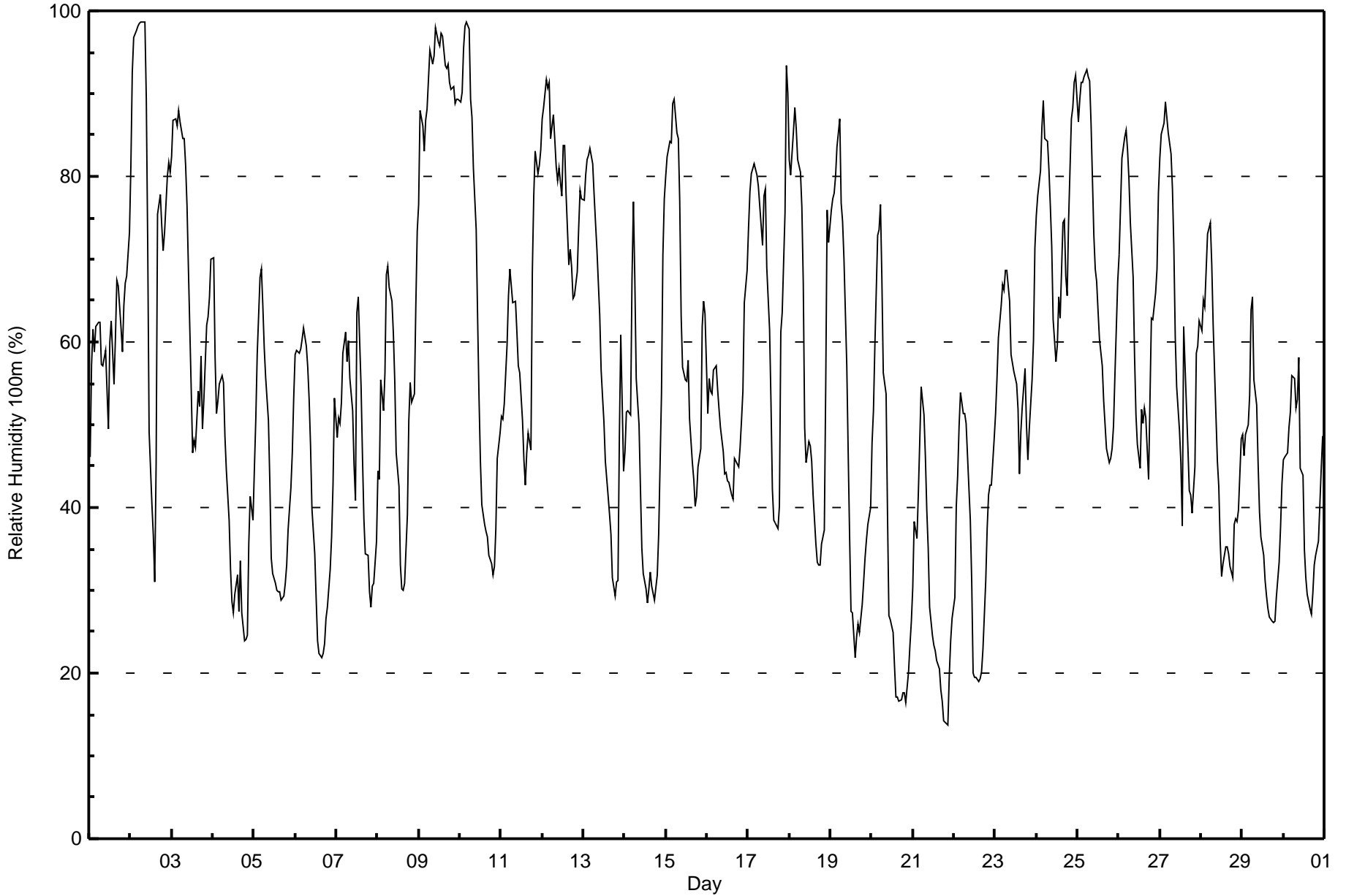
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity 100m (RH100m) - %

Lower Camp Met Tower - June 2016

Maximum Value: 99 % on Jun 2 08:00 Maximum Daily Average: 91.3 % on Jun 9																		Hours in Service: 720 Hours of Data: 720								
Minimum Value: 14 % on Jun 21 21:00 Minimum Daily Average: 29.5 % on Jun 21 Maximum Diurnal Average: 74.7 % at hour 6 Minimum Diurnal Average: 41.5 % at hour 18 Monthly Average: 56.1 % Percentiles: P ₁ = 17 P ₁₀ = 29 Q ₁ = 40 Median = 54 Q ₃ = 73 P ₉₀ = 86 P ₉₉ = 98																		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-Jun	46	57	62	59	62	62	62	57	57	59	54	50	60	62	55	61	68	67	62	59	64	67	68	73	60.5	73
2-Jun	81	93	97	98	98	99	99	99	99	89	72	49	40	37	31	45	75	78	74	71	73	80	82	80	76.6	99
3-Jun	82	87	87	86	88	87	85	85	81	77	69	54	47	48	47	54	52	58	49	53	62	63	65	70	68.2	88
4-Jun	70	58	51	53	55	56	55	49	45	38	32	29	27	29	32	28	34	27	24	24	25	36	41	38	39.9	70
5-Jun	45	51	58	68	69	64	59	56	50	43	34	32	31	30	30	30	29	29	31	33	37	42	47	53	43.8	69
6-Jun	58	59	59	59	60	62	60	57	53	47	40	34	29	24	22	22	22	24	27	28	33	36	43	53	42.1	62
7-Jun	49	51	50	53	59	61	58	60	56	52	45	41	64	65	55	46	39	34	34	30	28	31	31	36	46.9	65
8-Jun	44	43	55	52	56	68	69	67	65	61	55	47	43	33	30	30	31	39	50	55	53	54	64	73	51.6	73
9-Jun	77	88	86	83	87	88	95	94	94	95	98	96	96	97	97	93	93	94	91	91	91	89	89	89	91.3	98
10-Jun	89	90	95	98	99	98	89	87	81	73	63	53	46	40	38	37	36	34	33	32	33	37	46	49	61.6	99
11-Jun	51	51	52	60	66	69	67	65	65	61	57	56	51	46	43	47	49	47	68	78	83	80	81	83	61.5	83
12-Jun	87	88	92	91	91	85	87	84	81	79	81	78	84	84	78	69	71	69	65	66	68	74	78	77	79.5	92
13-Jun	77	80	82	83	83	82	78	74	71	63	57	53	50	46	41	39	37	31	29	31	31	49	61	44	57.2	83
14-Jun	47	52	52	51	68	77	68	56	50	42	35	32	30	29	30	32	31	29	30	32	37	54	71	77	46.2	77
15-Jun	80	82	84	84	89	89	85	85	77	63	57	55	55	58	51	45	43	40	41	45	47	62	65	63	64.5	89
16-Jun	51	56	54	54	57	57	54	52	50	47	44	44	43	43	42	41	46	46	45	47	50	54	65	69	50.4	69
17-Jun	74	78	80	82	81	80	79	76	72	78	78	69	62	53	42	39	38	37	40	61	64	76	93	90	67.5	93
18-Jun	82	80	85	88	86	82	80	76	67	50	45	48	48	46	41	36	33	33	33	36	37	55	76	72	59.0	88
19-Jun	76	77	78	80	84	87	77	75	70	57	47	37	27	27	22	24	26	25	28	31	34	36	38	40	50.1	87
20-Jun	48	52	60	73	74	77	68	56	54	39	27	26	25	21	17	17	17	17	18	18	16	20	23	26	37.0	77
21-Jun	30	38	36	42	48	55	51	46	40	35	28	25	23	23	21	21	18	17	14	14	14	20	24	27	29.5	55
22-Jun	29	40	44	50	54	51	51	50	46	38	31	20	20	19	19	19	20	23	31	37	41	43	43	48	36.2	54
23-Jun	51	56	60	64	67	66	69	69	65	59	57	56	55	52	44	49	52	57	50	46	49	55	60	71	57.5	71
24-Jun	75	78	81	86	89	85	84	81	76	72	63	58	60	65	63	74	75	68	66	75	87	88	91	92	76.3	92
25-Jun	87	89	91	91	92	93	92	91	86	73	69	67	64	60	57	53	50	47	46	46	47	50	56	67	69.4	93
26-Jun	70	76	82	85	86	83	80	74	68	58	51	48	45	52	50	52	51	43	53	63	63	66	69	78	64.4	86
27-Jun	82	85	86	89	87	85	83	79	71	61	55	49	45	38	62	52	47	42	42	39	45	59	60	63	62.7	89
28-Jun	61	65	64	69	73	74	69	62	56	46	42	36	32	33	35	35	34	33	32	38	39	38	40	48	48.2	74
29-Jun	49	46	49	50	54	64	65	55	52	45	40	36	34	31	29	28	27	26	26	26	29	33	38	43	40.7	65
30-Jun	46	46	47	50	52	56	56	52	53	58	45	44	35	31	30	28	27	30	33	34	36	40	45	49	42.5	58
	63.2	66.4	68.7	70.9	73.7	74.7	72.5	69.0	65.0	58.6	52.4	47.4	45.6	44.1	41.8	41.6	42.4	41.5	42.2	44.6	47.2	52.9	58.4	61.5	Diurnal Average	
	89	93	97	98	99	99	99	99	99	95	98	96	96	97	97	93	93	94	91	91	91	89	93	92	Diurnal Maximum	





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Relative Humidity 100m (RH100m) - %
Lower Camp Met Tower - June 2016**

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	17	2.36	2.36
20 - 40	164	22.78	25.14
40 - 60	249	34.58	59.72
60 - 80	163	22.64	82.36
80 - 100	127	17.64	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



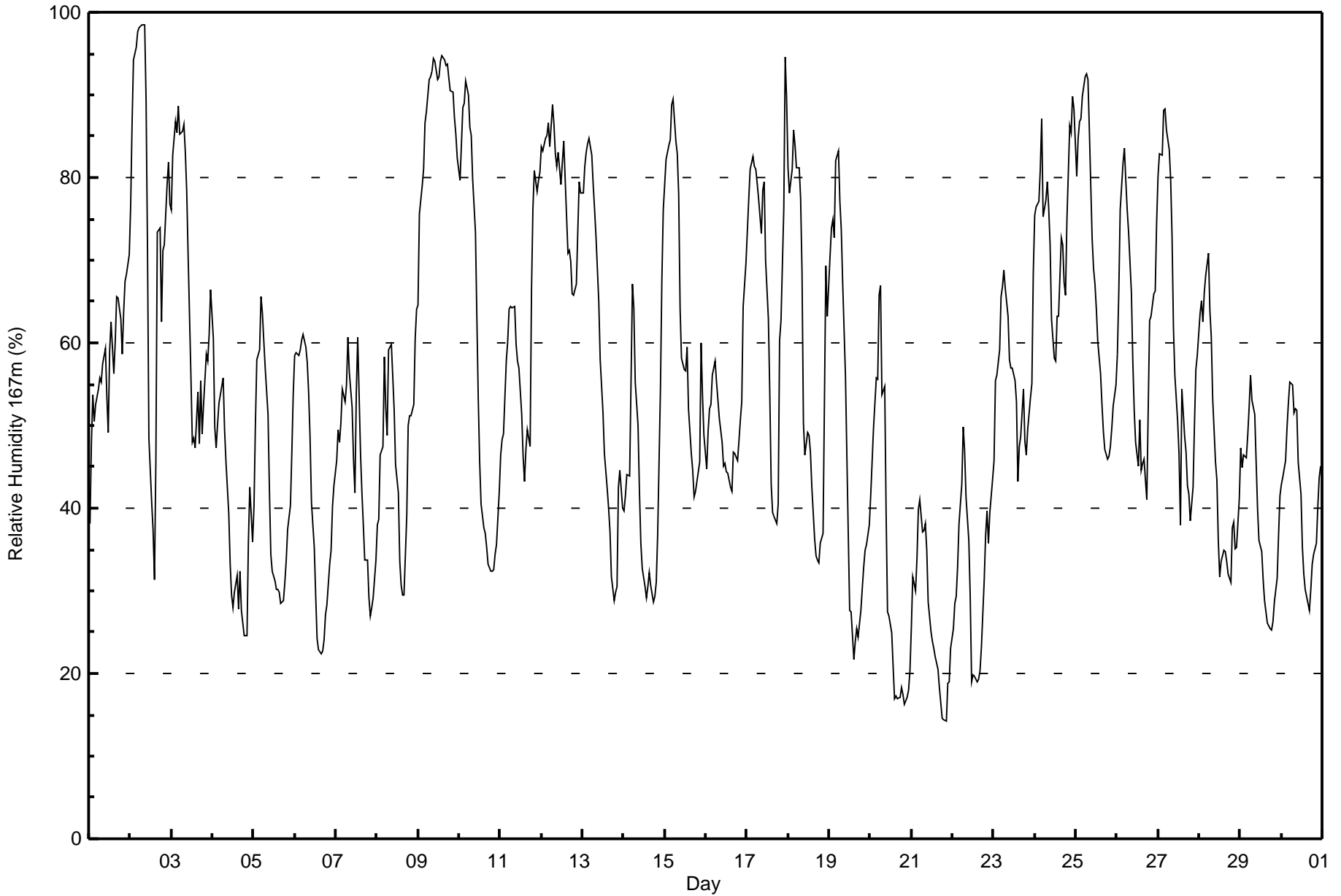
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity 167m (RH167m) - %

Lower Camp Met Tower - June 2016

Maximum Value: 98 % on Jun 2 08:00																		Maximum Daily Average: 88.4 % on Jun 9																		Hours in Service: 720	
Minimum Value: 14 % on Jun 21 21:00																		Minimum Daily Average: 26.3 % on Jun 21																		Hours of Data: 720	
Maximum Diurnal Average: 70.6 % at hour 6																		Minimum Diurnal Average: 41.1 % at hour 18																		Hours of Missing Data: 0	
Monthly Average: 54.4 %																		Percentiles: P ₁ = 17 P ₁₀ = 29 Q ₁ = 38 Median = 52 Q ₃ = 70 P ₉₀ = 84 P ₉₉ = 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-Jun	38	48	54	50	53	54	56	55	58	59	54	49	59	63	56	60	66	65	63	59	64	68	68	71	57.8	71											
2-Jun	77	86	94	96	98	98	98	98	98	89	72	48	41	37	31	46	73	74	63	71	72	79	82	77	75.0	98											
3-Jun	76	83	87	85	89	85	86	86	83	78	71	56	48	48	47	54	48	55	49	52	59	58	61	66	67.1	89											
4-Jun	60	50	47	50	53	55	56	50	46	39	33	29	28	30	32	28	32	28	25	25	24	36	43	36	38.9	60											
5-Jun	40	50	58	59	66	64	60	57	51	42	34	32	31	30	30	30	29	29	31	34	37	40	47	54	43.2	66											
6-Jun	58	59	58	59	60	61	60	58	54	48	41	35	30	24	23	22	23	24	27	28	33	35	40	43	41.8	61											
7-Jun	46	50	48	50	54	53	55	61	56	52	46	42	54	61	47	42	38	34	34	29	27	28	29	34	44.5	61											
8-Jun	38	39	46	48	58	52	49	59	60	56	52	45	42	34	31	30	29	39	50	51	51	53	61	64	47.3	64											
9-Jun	65	76	79	81	87	88	92	92	93	94	94	92	92	94	95	94	94	94	92	91	90	87	85	82	88.4	95											
10-Jun	80	84	88	89	92	90	86	85	80	73	63	53	46	40	38	37	35	33	32	32	33	34	36	42	58.4	92											
11-Jun	46	48	49	58	60	64	64	64	64	60	58	57	51	46	43	47	49	47	66	76	81	78	80	81	60.0	81											
12-Jun	84	83	85	85	87	84	89	86	83	81	83	79	82	84	80	71	71	70	66	66	67	73	80	78	79.0	89											
13-Jun	78	81	83	84	85	83	79	76	73	65	58	55	52	47	42	40	37	32	29	30	31	42	45	40	56.9	85											
14-Jun	40	41	44	44	55	67	64	55	50	42	36	33	31	29	30	32	31	29	29	31	37	55	68	76	43.7	76											
15-Jun	79	82	84	85	89	89	84	83	78	64	58	57	57	60	52	47	45	41	42	43	46	60	54	49	63.6	89											
16-Jun	45	49	52	53	56	58	55	53	51	48	45	45	44	44	43	42	47	47	46	48	51	53	64	70	50.3	70											
17-Jun	74	77	81	83	81	81	79	78	73	78	80	70	63	54	43	39	39	38	41	60	63	76	95	90	68.1	95											
18-Jun	81	78	81	86	84	81	81	77	68	50	46	49	49	47	43	36	34	34	33	36	37	53	69	63	58.3	86											
19-Jun	70	74	75	73	82	83	77	74	67	56	46	37	28	27	22	24	25	24	28	30	33	35	36	38	48.5	83											
20-Jun	42	46	50	56	56	66	67	54	55	39	28	27	25	21	17	17	17	17	18	17	16	17	18	20	33.5	67											
21-Jun	26	32	30	34	40	41	37	37	38	35	29	25	24	23	22	20	18	16	15	14	14	19	19	23	26.3	41											
22-Jun	25	28	29	33	38	43	50	47	41	36	29	19	20	20	19	19	20	23	31	37	40	36	39	44	32.0	50											
23-Jun	46	55	56	59	66	67	69	67	63	58	57	57	55	53	43	47	49	54	48	47	50	53	55	68	55.9	69											
24-Jun	75	76	77	81	87	75	77	79	76	72	63	58	58	63	63	73	72	67	66	75	86	85	90	88	74.4	90											
25-Jun	80	85	87	87	90	92	93	92	86	73	69	67	64	60	56	53	49	47	46	46	47	50	52	55	67.7	93											
26-Jun	59	66	76	82	84	80	76	73	66	58	52	48	45	51	44	45	46	41	52	63	63	66	66	75	61.5	84											
27-Jun	80	83	83	88	88	86	83	80	73	62	56	51	46	38	54	49	47	43	42	39	42	50	57	58	61.6	88											
28-Jun	64	65	63	66	68	71	64	61	53	46	43	36	32	33	35	35	34	32	31	38	38	35	35	41	46.6	71											
29-Jun	47	45	46	46	49	52	56	53	51	46	40	36	35	31	29	28	26	25	25	26	29	31	37	42	38.8	56											
30-Jun	43	44	46	50	53	55	55	52	52	52	46	42	35	32	30	28	28	30	33	34	36	40	44	45	41.8	55											
58.7																		62.1																		Diurnal Average	
84																		86																		Diurnal Maximum	
64.5																		66.6																			
70.2																		70.6																			
69.9																		68.1																			
64.7																		58.4																			
52.7																		47.7																			
45.5																		44.2																			
41.3																		41.2																			
41.7																		41.1																			
41.7																		44.3																			
46.5																		50.9																			
55.1																		55.1																			
57.1																		90																			





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Relative Humidity 167m (RH167m) - %
Lower Camp Met Tower - June 2016**

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	21	2.92	2.92
20 - 40	175	24.31	27.22
40 - 60	263	36.53	63.75
60 - 80	150	20.83	84.58
80 - 100	111	15.42	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Speed: 36 km/h on Jun 15 12:00	Maximum Daily Speed Average: 15.5 km/h on Jun 15	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 20 07:00	Minimum Daily Speed Average: 0.8 km/h on Jun 29	Hours of Data: 720
Maximum Diurnal Speed Average: 3.4 km/h at hour 13	Minimum Diurnal Speed Average: 0.6 km/h at hour 23	Hours of Missing Data: 0
Monthly Average Velocity: 1.6 km/h 224.8 deg	Percentiles: P ₁ = 0 P ₁₀ = 2 Q ₁ = 3 Median = 7 O ₃ = 11 P ₉₀ = 15 P ₉₉ = 23	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-Jun	SSE5	ESE3	ESE7	SE9	SSE9	SSE10	SSE11	SSE10	SSE4	E6	SSE12	S15	SW2	ESE2	WNW8	SSW13	SSE9	SSE10	SSE11	S10	SE3	SE4	SE4	N3	SSE6.2	S15	
2-Jun	NNW2	NNE1	WNW1	N2	NW2	NW2	NNW2	WSW2	W3	SW4	SE1	ESE2	SSE4	SSE4	W2	WSW7	WSW18	SE8	ESE6	S6	W2	WNW4	SSE3	NE2	SW1.4	WSW18	
3-Jun	S2	SSE4	SE6	SSE3	SSE5	SSE5	SSE6	SW5	WSW10	WSW11	WSW7	WSW11	WSW17	WNW10	NNE8	N11	NNW7	N4	N3	N7	SE2	SSE1	N2	N3	W2.2	WSW17	
4-Jun	S2	SSW2	W11	W14	W17	W15	WNW11	NW10	WNW15	WNW15	NW14	WNW14	WNW16	WNW12	W11	NW11	N12	NW13	NW15	NNW12	NW12	NNW4	NW1	SSE1	WNW9.8	W17	
5-Jun	NNW3	WNW3	NNW1	NE1	NNE2	WSW4	WSW7	SW4	NE3	NNE3	NNW11	N10	N11	N9	N9	N7	N6	N5	ENE5	ENE6	NE4	SE0	E3	SSE8	N3.1	N11	
6-Jun	SE13	SE12	SE12	SE10	SSE9	SSE8	SSE8	SSE7	SSE9	SE9	SSE12	SSE16	SSE15	SSE16	S18	S19	SSE18	SSW16	SSW16	S21	S15	SSE15	N3	ENE2	SSE11.6	S21	
7-Jun	SSE2	SSE2	SSE3	N2	SE3	SSW2	W8	W7	WSW7	WSW9	WSW8	W5	NNW7	NNE2	SSE3	SW1	N7	N9	N7	NNW7	NNW5	N4	NNW3	WNW0	WNW2.2	WSW9	
8-Jun	WNW1	NNW3	NNE0	NNW2	NW4	NNW2	N5	NW4	NNW3	NNW4	NNW3	N4	N5	E3	ENE4	ENE1	SE2	SSE10	SSE11	ESE3	NE3	SE3	ESE9	ESE7	ENE1.1	SSE11	
9-Jun	E9	NNE5	NNE6	NE7	NE7	NE9	NE9	NNE12	NNE14	NNE13	NNE11	NNE12	NNE12	NNE13	NNE14	NNE15	NNE13	N11	NNE11	N9	N7	NNW8	NNW7	NNW5	NNE9.4	NNE15	
10-Jun	NNW4	NNW4	NNW3	ESE2	NE1	ESE2	SE1	NNE1	N5	N7	N8	N9	N7	N6	NNE6	NE5	NNE6	NE2	N3	ENE4	NE3	NW2	E1	ESE4	NNE3.2	N9	
11-Jun	ENE0	ENE1	NE1	ESE2	E4	ESE3	SSE6	SSE9	SE10	SSE9	SSE15	SSE15	SSE18	SSE17	SSE20	SSE11	SE10	SSE21	SSE13	SE13	SE8	ENE3	N4	NNW5	SSE8.0	SSE21	
12-Jun	N4	NNW4	NNW3	NNW2	WNW1	SW7	WSW10	SW8	SW9	SSW9	SSW10	SSW12	SW13	SW12	SSW12	W12	W12	W14	W12	W8	WSW10	WSW14	WSW18	WSW17	WSW8.3	WSW18	
13-Jun	WSW17	W14	W14	WSW14	WSW12	WSW12	WSW14	WSW15	WSW15	WSW17	WSW18	WSW22	WSW22	WSW22	WSW20	WSW18	W14	W15	W14	W12	WSW12	NNW4	SE0	NE1	WSW13.7	WSW22	
14-Jun	NE1	SSE2	SSE1	SSE2	E3	N3	SE1	SSE5	SSW2	SSE1	SSW2	SE7	SE10	SE8	SE10	SE12	SE10	SE12	SSE11	SSE12	SSE24	SSE22	SE8	ESE6	SSE6.6	SSE24	
15-Jun	SE7	SE6	SE7	SE11	ESE9	SE11	SE7	SE7	SE16	SSE26	S34	S36	S36	S34	S32	S31	SSW23	SSW19	SSW15	S5	S5	SSW10	SSE8	SSE6	S15.5	S36	
16-Jun	SSE11	SSE15	SSE20	SSE22	SSE20	S17	S19	S23	S22	SSW19	SW22	SW18	WSW19	WSW20	SW18	SW13	W13	WSW12	WSW11	W10	W9	W8	W10	WSW12	SSW12.6	S23	
17-Jun	W10	W10	W8	NW3	NNW3	WNW8	WNW13	NW14	NNW14	NW14	NW11	NW12	NW13	WNW16	WNW14	WNW15	WNW14	W14	WNW10	N7	E2	N5	N7	NNW1	NW9.0	WNW16	
18-Jun	NW5	NW6	N4	N4	NNE2	NNW4	NW3	WNW4	W9	W12	WNW10	W9	WSW12	WSW13	WSW14	W10	WSW8	WSW3	SSW1	S7	SE7	N8	ENE2	NNW2	W4.4	WSW14	
19-Jun	NW2	NNW3	NNW3	WNW2	NNE2	N2	W3	NNW5	N5	N8	N10	N11	NNW15	NNW16	NNW14	N14	N14	N14	N11	NNE8	N5	NNW3	N2	NW2	N6.9	NNW16	
20-Jun	NNW0	NE1	SSE1	E0	ESE0	W1	ENE0	E1	S1	SW2	W4	WSW3	E4	E5	SE6	SSE9	SSE10	SSE10	SSE10	SSE10	SSE10	SE11	SE11	SE8	SSE7	SSE3.9	SE11
21-Jun	SSE6	S3	SSE8	SSE7	SE7	SE5	SE6	SE8	SSE9	SSE8	S3	WSW9	SSW7	W7	W6	N0	SSE3	E1	SSE5	ENE3	S1	SE6	ESE4	SE0	SSE3.6	SSE9	
22-Jun	SE3	N2	S0	E1	ENE1	SE4	SSE8	SE8	SE7	SE6	SE5	ESE4	WNW2	N2	NNE3	NW5	SE2	SW11	W17	W12	WSW12	WSW11	SW8	WSW4	SW2.6	W17	
23-Jun	W5	S3	S2	W1	SSW3	NW2	NW2	NNW3	NNE1	NNW3	N6	N4	N3	SSE1	N6	N9	NNW7	NNW4	NNW3	ENE6	ENE3	E1	N5	NNW5	N2.3	N9	
24-Jun	E1	NE2	NNE2	N3	NE2	NNE2	NNW4	N7	NNW7	N10	NNW7	NNW7	NNW9	NNW7	N11	NNW9	N4	NNE6	NNW3	NNW6	NNW7	NNW5	N4	NNW4	N5.1	N11	
25-Jun	NNW4	NNW3	NNW3	NNW2	NNW3	N4	N8	N8	N8	NNE9	NNE8	N9	N9	N8	N8	NNE7	NNE7	NE6	NE6	NE6	NNE3	NW1	N1	SSE3	N5.1	NNE9	
26-Jun	NW1	N2	SE2	SE2	SE4	SE5	SE8	SE6	SSE4	SSE4	SE3	SSE4	ESE5	NNW4	NNW5	WSW3	WSW11	SSW7	E1	SSE3	WSW4	WNW13	WNW2	SW2	S1.5	WNW13	
27-Jun	NNW1	SW3	SW5	S4	SSW5	WSW5	WSW8	WSW8	WSW6	W7	WSW8	WSW12	WSW17	WSW20	ESE2	SSW5	S7	WSW14	WSW10	WSW4	SE8	E3	SE4	E2	SW5.5	WSW20	
28-Jun	S2	SSE3	ESE2	SSE2	SSE3	SE5	SSE3	NNW2	NNW3	WNW3	W5	N1	N7	N9	N11	N10	N10	N10	NNE9	NNE9	NNE4	NE3	NE2	NNW3	N3.2	N11	
29-Jun	NNW2	NE3	NNW5	NNW3	NNW4	NNW2	NW3	N1	NNW3	WNW3	WNW3	NNE3	NW3	NW2	NE2	N4	N3	N5	N4	NE3	NE1	SSE6	SSE13	SSE14	N0.8	SSE14	
30-Jun	SSE11	SSE11	SSE12	SE7	SE9	SSE2	SSE7	SSE10	SSE8	SSE2	SSE2	SSE7	SSE8	SE9	SE9	SE11	SSE9	SE11	SSE11	SSE10	S9	SE6	SSW4	S2	SSE7.7	SSE12	

S1.0SSW1.0	S1.5	SSE1.5	SSE1.6	SSW1.5	SSW2.2	SSW1.9	SW1.6	WSW2.1	WSW2.4	WSW3.2	WSW3.4	WSW2.9	WSW1.9	WSW2.1	W2.0	SW2.2	WSW1.8	S0.7	SSW1.9	SW1.1	S0.6	SSW0.9	Diurnal Average		
WSW17	SSE15	SSE20	SSE22	SSE20	S17	S19	S23	S22	SSE26	S34	S36	S36	S34	S32	S31	SSW23	SSE21	W17	S21	SSE24	SSE22	WSW18	WSW17	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

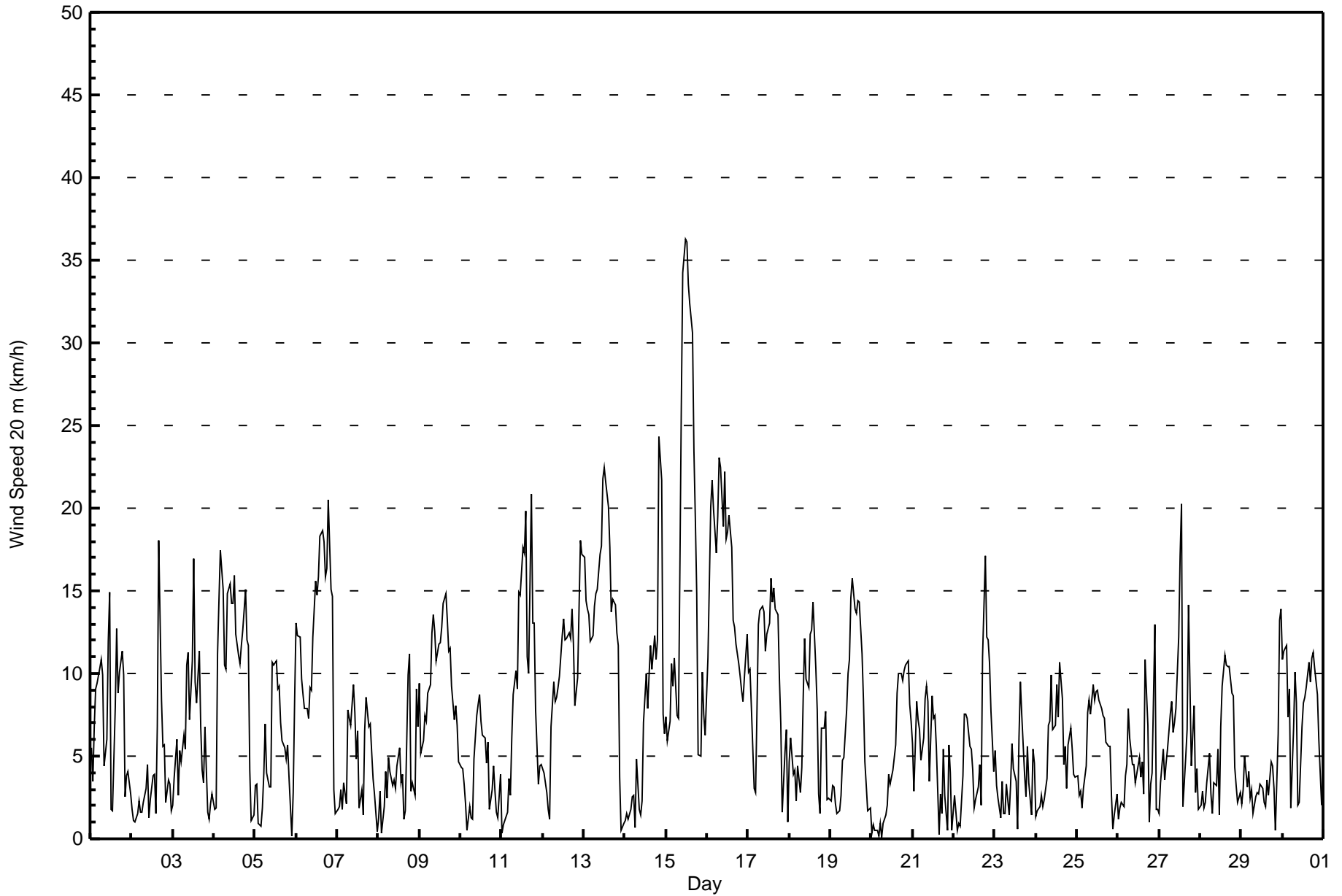
Wind Speed 20 m (WS20m) - km/h
Lower Camp Met Tower - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 12 km/h on Jun 2 16:00 Minimum Value: 0 km/h on Jun 20 05:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 6 P ₉₉ = 8																	Hours in Service: 720 Hours of Data: 720 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-Jun	3	2	3	4	4	4	4	4	3	3	5	4	4	1	4	5	4	4	4	2	3	2	2	2	5
2-Jun	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	12	8	3	3	2	2	2	2	2	12
3-Jun	1	2	2	2	2	2	2	3	4	4	4	5	7	8	3	5	4	3	5	3	1	1	2	2	8
4-Jun	2	3	4	6	6	6	5	6	6	7	6	6	6	5	6	6	6	6	6	5	4	2	1	1	7
5-Jun	2	1	1	1	2	3	3	2	2	3	5	5	5	4	5	4	4	3	3	3	2	1	2	5	5
6-Jun	5	4	4	4	3	3	3	3	4	3	5	5	6	5	6	6	5	5	5	5	7	4	3	2	7
7-Jun	2	1	2	2	2	2	3	3	3	3	3	5	6	2	2	2	4	4	3	3	2	1	1	1	6
8-Jun	1	2	2	2	2	1	2	1	2	1	1	2	2	2	2	1	1	5	3	3	2	4	3	3	5
9-Jun	5	2	3	4	3	5	4	5	6	5	5	5	5	5	5	6	5	4	5	4	3	3	3	2	6
10-Jun	2	1	2	1	1	1	1	1	2	4	4	4	3	4	4	4	3	3	2	2	2	1	2	2	4
11-Jun	2	1	1	1	2	2	3	3	4	4	5	6	6	8	7	5	6	7	7	6	3	2	2	2	8
12-Jun	2	1	2	1	1	3	4	3	3	3	3	6	4	4	4	5	5	6	5	3	6	5	6	6	6
13-Jun	6	6	5	5	4	4	5	5	6	6	6	7	8	7	7	7	6	5	5	5	3	2	2	1	8
14-Jun	1	1	1	1	2	1	2	3	1	1	3	3	4	4	4	5	4	6	4	6	7	7	3	3	7
15-Jun	3	3	4	5	5	5	5	3	7	10	10	10	10	9	9	8	7	6	5	4	5	9	2	2	10
16-Jun	3	3	5	5	5	5	6	6	6	5	7	6	7	7	6	5	5	5	4	4	4	3	4	4	7
17-Jun	4	4	4	2	1	4	5	5	6	5	5	5	6	7	7	7	6	6	4	7	2	3	3	2	7
18-Jun	3	3	2	2	1	2	2	4	4	5	5	4	5	5	5	5	4	2	3	3	2	7	2	1	7
19-Jun	1	1	1	1	1	1	2	3	2	3	4	6	6	7	6	5	6	6	5	4	2	1	2	1	7
20-Jun	1	1	1	1	0	1	1	1	1	2	2	2	2	3	3	3	3	3	3	2	2	2	2	3	3
21-Jun	3	3	3	3	2	2	4	3	3	3	4	4	4	3	3	2	3	1	2	1	1	3	1	1	4
22-Jun	2	1	1	1	1	2	3	3	3	2	2	2	2	2	2	2	3	7	6	5	4	4	3	3	7
23-Jun	3	2	2	1	2	2	2	2	2	2	2	2	2	2	5	4	3	2	2	3	2	2	2	2	5
24-Jun	1	1	1	2	2	1	2	3	3	4	3	3	5	3	5	4	2	3	2	3	3	2	2	2	5
25-Jun	1	1	1	1	1	3	3	3	3	4	4	4	4	4	3	3	4	3	3	3	1	1	1	2	4
26-Jun	2	2	1	2	1	2	3	2	2	2	2	2	2	5	4	2	4	3	2	3	6	6	3	2	6
27-Jun	2	3	2	2	2	4	5	3	3	3	4	5	7	8	5	5	3	5	3	4	2	2	2	2	8
28-Jun	1	2	1	1	2	2	2	2	2	3	3	3	4	4	4	4	4	4	4	4	2	1	1	1	4
29-Jun	1	2	2	1	1	1	1	1	2	2	2	3	2	2	2	2	2	2	2	2	1	4	3	4	4
30-Jun	3	3	4	4	4	2	4	3	3	3	1	2	3	4	5	4	4	4	3	4	3	2	3	2	5
																	Diurnal Maximum								
																	6 6 5 6 6 6 6 6 7 10 10 10 10 9 9 12 8 7 7 7 7 9 6 6								



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed 20 m (WS20m) - km/h
Lower Camp Met Tower - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed 20 m (WS20m) - km/h
Lower Camp Met Tower - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	326	45.28	45.28
6 - 11	245	34.03	79.31
12 - 19	124	17.22	96.53
20 - 28	19	2.64	99.17
29 - 38	6	0.83	100.00
> 38	0	0.00	100.00

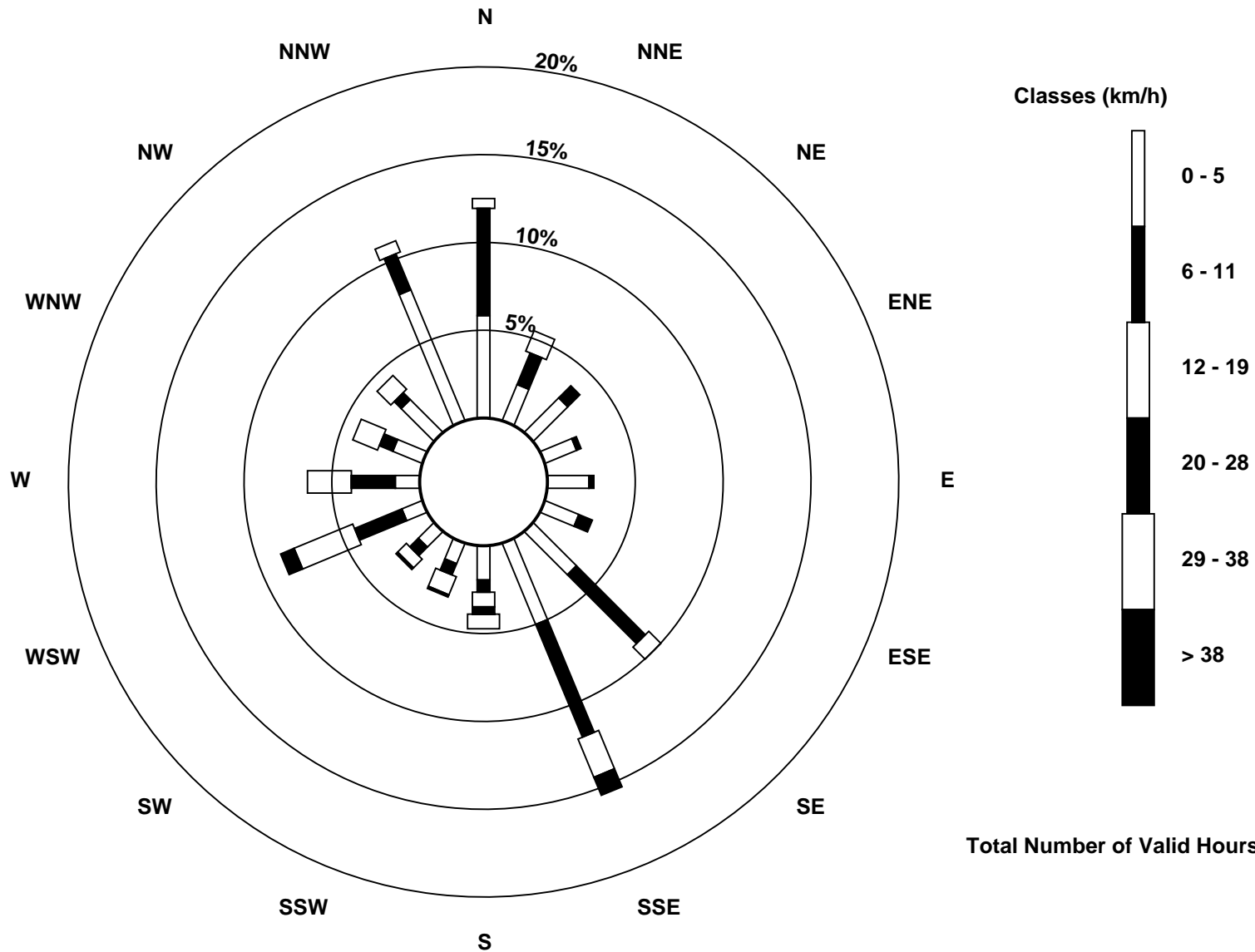
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

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





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed 45 m (WS45m) - km/h

Lower Camp Met Tower - June 2016

Maximum Speed: 39 km/h on Jun 15 12:00	Maximum Daily Speed Average: 19.8 km/h on Jun 13	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 14 01:00	Minimum Daily Speed Average: 1.2 km/h on Jun 29	Hours of Data: 720
Maximum Diurnal Speed Average: 4.4 km/h at hour 13	Minimum Diurnal Speed Average: 0.3 km/h at hour 20	Hours of Missing Data: 0
Monthly Average Velocity: 1.7 km/h 223.2 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 4 Median = 9 O ₃ = 14 P ₉₀ = 20 P ₉₉ = 33	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-Jun	SE9	ESE6	E11	SE12	SE12	SE14	SE14	SE13	SE6	E8	SE15	SSE17	SW2	ESE2	W11	S14	SE10	SE13	SSE13	SSE11	SE4	ESE6	SE7	N1	SE8.1	SSE17
2-Jun	NNW2	NNW2	WNW2	NNW1	NNW2	NW2	NNW2	WSW2	W3	SW4	E1	E2	SE4	SE4	W2WSW10	WSW27	SE12	E9	SSE7	WSW3	W6	SE5	ENE4	SSW1.7	WSW27	
3-Jun	SSW3	S4	SE7	SSE4	SSE6	SSE6	SSE7	SW7WSW15	WSW17	WSW10	WSW14	WSW24	WNW14	N12	N16	NNW10	N7	NNW5	N10	ESE2	SE3	N3	N4	W3.3	WSW24	
4-Jun	SE3	SW5	WSW16	W21	W25	W22	W15	WNW13	WNW20	WNW21	WNW19	WNW19	WNW22	W18	W16	NW15	NNW17	NW17	NW21	NW18	NW16	N7	NW3	WNW13.7	W25	
5-Jun	NNW6	WNW5	WNW2	W0	N3	WSW6	WSW9	SW5	NNE4	NNE5	NNW15	NNW14	N15	NNW12	NNW13	NNW9	N8	N7	NE7	NE9	NE7	E2	ESE5	SE12	N4.3	NNW15
6-Jun	SE18	SE18	SE17	SE14	SE13	SE11	SE11	SE10	SE12	SE12	SE16	SE19	SE18	SSE19	SSE21	SSE21	SSE21	S19	S20	SSE23	S18	SSE18	N5	ENE2	SSE14.6	SSE23
7-Jun	SSE3	SSE5	SSE5	NW2	SSE2	SW3	W12	WSW10	WSW9	WSW12	WSW9	W6	NNW11	NNE3	SE4	WSW2	NNW9	N12	NNW10	NNW11	NNW10	NNW8	NNW7	N2	WNW3.6	N12
8-Jun	W2	NNW4	SW1	NNW3	NNW5	N3	NNW6	NW5	NNW4	NW5	NW5	NNW6	N8	ENE5	ENE7	ENE3	ESE3	SSE12	SSE14	ESE5	NE6	ESE5	ESE13	E10	ENE2.1	SSE14
9-Jun	E15	NNE8	NNE9	NE13	NE11	NE13	NE15	NNE19	NNE21	NNE19	NNE17	NNE18	NNE18	NNE19	NNE20	NNE21	N19	N16	N17	N14	NNW12	NNW13	NNW12	NNW8	NNE14.3	NNE21
10-Jun	NNW8	NNW8	NNW6	E2	NE0	ESE2	SE1	NNE1	N6	NNW11	N11	N11	N9	N9	NNE9	NNE7	N8	NNE3	N5	NE8	NE7	N2	E3	ESE7	N4.8	N11
11-Jun	SE2	ESE4	ESE3	SE4	ESE6	SE5	SE9	SE12	SE14	SE13	SE19	SE19	SSE21	SE22	SE25	SE14	SE13	SSE26	SE17	SE17	SE11	E5	NNE5	N5	SE11.3	SSE26
12-Jun	NNW7	NNW6	NNW5	N3	SSW1	SSW9	SW12	SW11	SW11	SSW11	S12	SSW16	SW17	SW16	SSW16	WSW17	W18	WSW21	W17	W12	SW13	WSW21	WSW27	WSW26	WSW11.3	WSW27
13-Jun	WSW26	WSW22	WSW20	WSW20	WSW18	WSW17	SW19	WSW21	WSW22	WSW25	WSW24	WSW30	WSW33	WSW31	WSW29	WSW26	WSW19	WSW21	W20	W18	SW16	NNW6	NNE1	SE1	WSW19.8	WSW33
14-Jun	E0	SSE2	SSE2	SSE4	ESE4	N3	ESE1	SE6	S2	SE2	S2	SE9	SE12	SE10	SE13	SE16	ESE14	SE17	SE15	SSE15	SSE28	SSE24	ESE11	ESE9	SE8.7	SSE28
15-Jun	ESE11	SE8	ESE10	ESE14	ESE13	SE14	SE10	ESE10	SE22	SSE30	SSE37	SSE39	S38	S36	S35	S33	S26	SSW22	SSW18	S8	S7	SSW12	SE10	SE9	SSE18.0	SSE39
16-Jun	SSE14	SSE18	SSE23	SSE24	SSE22	SSE18	S21	S24	S24	SSW22	SSW28	SW23	WSW25	SW26	SSW22	SSW15	WSW17	WSW16	WSW15	WSW14	W14	W13	W14	WSW18	SSW15.4	SSW28
17-Jun	WSW15	W15	W12	NW5	NNW4	WNW11	WNW19	WNW20	NNW20	NNW19	NW15	NW17	NW18	WNW21	WNW20	WNW21	W19	W20	WNW14	N10	ENE3	N8	NNW10	NNW2	WNW12.5	WNW21
18-Jun	NW7	WNW10	NNW6	NNW6	N3	NW6	NW4	WNW6	W12	W16	WNW13	W12	WSW17	WSW18	WSW19	WSW14	WSW10	WSW3	SSW2	SSE8	SE9	N11	ENE5	NNW3	W6.1	WSW19
19-Jun	NNW4	NNW5	NNW6	NW1	NNE2	N2	W4	NNW6	N6	N10	N13	NNW15	NNW21	NNW23	NNW21	N19	NNW20	N21	N16	N13	N7	NNW6	NNW4	NW2	NNW10.0	NNW23
20-Jun	WNW1	N2	SSW1	SSW1	SW1	WSW0	ENE1	ENE1	S2	SW2	W5	WSW4	ENE5	ENE6	SE6	SE10	SE13	SE13	SE14	SSE13	SSE12	SE15	SE13	SE11	SE4.9	SE15
21-Jun	SE9	SSE6	SE12	SSE10	SE9	SE7	SE9	SE12	SE12	SE10	S4	WSW11	SSW9	W9	W7	NW0	SSE3	E2	SE7	ENE3	E1	SE10	SE7	SE3	SSE5.1	SE12
22-Jun	SE5	E1	SSE1	SE2	SSE0	SE6	SE10	SE10	SE9	SE7	SE6	ESE5	WNW3	NNW3	N4	WNW6	SE2	SW15	W24	W17	SW17	WSW15	SW11	WSW6	SW3.8	W24
23-Jun	W9	S4	SSW3	W3	SSW5	WNW3	NW2	NNW4	NNE2	NNW4	N8	N5	NNW6	WNW0	N8	NNW13	NNW11	NNW6	NNW4	ENE9	ENE6	ENE3	N8	NNW7	NNW3.4	NNW13
24-Jun	NNE2	NE4	N3	N4	NNE4	NNE3	NNW5	NNW9	NNW10	NNW14	NNW10	NNW9	NNW13	NNW11	NNW16	NNW13	NNW7	N9	NNW5	NW9	NW10	NNW9	NNW6	NNW6	NNW7.7	NNW16
25-Jun	NNW6	NNW4	NNW4	NNW4	NNW5	N6	N10	N11	N10	NNE14	NNE12	N12	N12	N12	N10	NNE11	N11	NE9	NE9	NE5	E1	NNW2	SSE2	N7.3	NNE14	
26-Jun	NW1	NNW3	SSE2	SE3	SE6	SE6	SE10	SE7	SE5	SE5	SE4	SE4	ESE6	NNW6	NNW7	SW4	WSW16	SSW10	E2	SSE5	SW5	WNW19	NNW2	SW4	S2.1	WNW19
27-Jun	NW3	SW5	SSW8	S4	S5	WSW8	WSW11	WSW11	WSW8	WSW9	WSW10	WSW16	WSW24	WSW27	E5	SSW7	S8	SW19	WSW13	WSW6	SE10	E5	SE7	ESE4	SW7.3	WSW27
28-Jun	SSE3	SSE5	SE4	SSE4	SE6	SE6	S3	NNW2	NNW4	WNW4	W7	NNW4	N9	N12	N15	N15	N14	N15	N13	NNE13	NNE8	NE7	NE5	N3	N4.5	N15
29-Jun	NNW2	ENE5	NNW6	NNW4	NNW5	NNW3	NW3	N2	NNW3	WNW3	WNW3	N4	NW4	NW3	NE3	NNW4	N3	NNW6	NNW7	NNE5	ENE2	SSE9	SSE16	SSE16	N1.2	SSE16
30-Jun	SE14	SE15	SE17	SE11	SE14	SE3	SE8	SSE12	SE10	SSE3	SE4	SSE9	SE10	SE11	SE12	SE14	SE11	SE15	SSE13	SE14	SSE11	SE8	S5	SSW3	SE10.1	SE17
S1.5 S1.3 S2.0 SSE2.0 SSE2.2 S1.9SSW2.6SSW2.0 SW1.8WSW2.5WSW2.8WSW3.9WSW4.4WSW4.0 W2.1 W2.6 W2.7 SW2.5WSW1.8 SE0.3 S1.8SSW1.1 SE0.8 S1.3																								Diurnal Average		
WSW26WSW22 SSE23 SSE24 W25 W22 S21 S24 S24 SSE30 SSE37 SSE39 S38 S36 S35 S33WSW27 SSE26 W24 SSE23 SSE28 SSE24WSW27WSW26																								Diurnal Maximum		

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

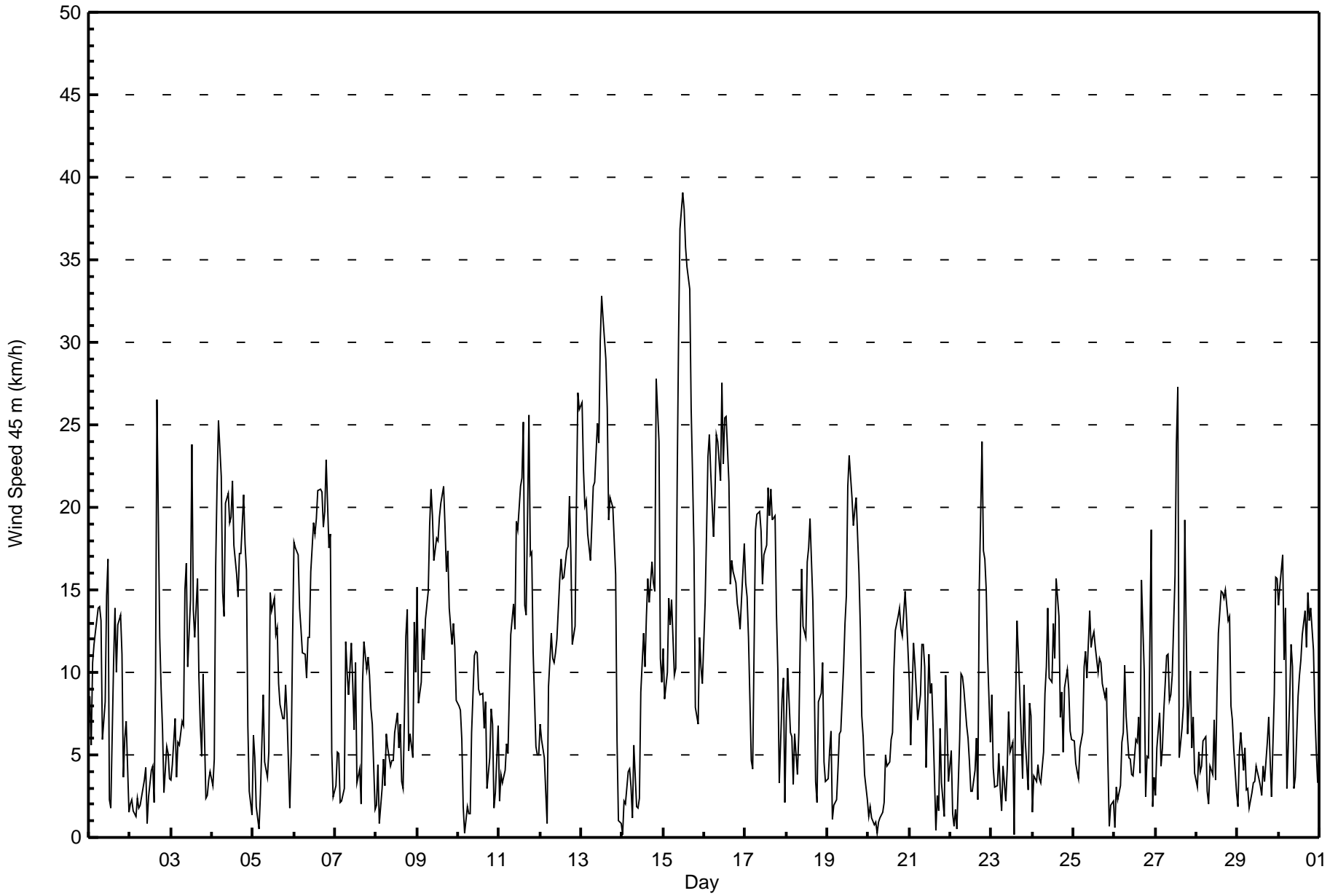
Wind Speed 45 m (WS45m) - km/h
Lower Camp Met Tower - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 17 km/h on Jun 2 16:00 Minimum Value: 0 km/h on Jun 20 04:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 5 P ₉₀ = 6 P ₉₉ = 9																	Hours in Service: 720 Hours of Data: 720 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-Jun	3	3	3	3	4	4	5	4	3	3	5	4	4	1	4	4	5	5	4	2	3	3	2	2	5
2-Jun	2	1	1	1	1	1	1	2	2	2	2	2	2	2	2	17	10	4	5	2	2	2	2	3	17
3-Jun	1	2	3	2	3	2	2	3	4	3	6	6	7	9	4	6	5	4	6	3	2	2	3	2	9
4-Jun	2	5	4	6	6	6	6	6	6	7	6	7	6	6	6	6	8	6	6	5	4	3	2	1	8
5-Jun	3	1	1	1	2	3	3	2	2	4	6	5	6	5	6	5	5	4	4	3	2	1	3	6	6
6-Jun	5	4	4	4	4	4	4	3	4	4	6	5	6	6	7	6	5	5	5	5	7	6	4	2	7
7-Jun	2	1	2	3	1	2	4	3	3	2	3	7	9	3	2	2	4	4	4	3	2	1	1	1	9
8-Jun	1	2	2	3	2	2	2	2	2	2	2	2	2	3	2	2	1	5	4	4	2	5	4	4	5
9-Jun	5	3	4	4	4	5	5	6	6	6	5	5	6	6	6	6	6	4	5	4	3	4	3	2	6
10-Jun	2	2	3	1	1	1	1	1	2	4	4	4	4	4	5	5	3	3	2	2	2	2	2	4	5
11-Jun	3	2	2	2	2	2	4	4	4	4	6	7	6	8	8	6	7	8	8	7	4	2	2	1	8
12-Jun	2	1	2	1	1	4	4	3	3	3	3	8	4	4	4	5	6	5	5	3	7	5	5	5	8
13-Jun	5	5	5	4	4	4	5	5	6	5	6	6	7	6	6	7	6	5	5	4	2	3	2	1	7
14-Jun	2	1	1	1	3	1	3	3	1	1	3	3	5	5	5	6	5	7	5	7	7	7	3	4	7
15-Jun	3	3	5	6	5	5	4	4	8	9	9	10	9	9	8	8	7	6	6	5	5	10	3	2	10
16-Jun	3	3	5	5	5	5	5	5	5	5	7	6	6	6	7	5	5	5	4	4	4	3	4	3	7
17-Jun	4	4	4	3	1	5	5	5	6	5	5	5	6	7	7	7	6	6	5	9	2	5	3	3	9
18-Jun	4	4	2	2	2	2	2	5	5	5	5	4	5	5	5	5	4	3	3	3	2	10	3	2	10
19-Jun	1	2	1	1	1	2	3	3	2	3	5	7	7	7	7	6	7	6	6	4	2	1	1	1	7
20-Jun	1	1	1	0	1	1	1	1	1	2	2	2	3	3	3	3	3	3	3	2	2	2	3	4	4
21-Jun	4	4	4	3	3	3	5	4	3	3	5	5	5	4	3	2	3	1	2	1	1	4	2	1	5
22-Jun	2	1	1	2	1	2	3	3	3	2	2	2	3	3	2	2	3	8	6	5	2	3	3	4	8
23-Jun	5	2	2	2	2	2	2	3	2	2	2	2	2	2	7	5	3	2	2	3	3	2	3	2	7
24-Jun	1	1	2	2	2	1	2	3	3	4	4	3	7	4	6	4	2	4	2	3	3	3	2	2	7
25-Jun	2	1	1	2	2	3	3	4	3	4	5	4	4	4	4	4	4	4	3	3	2	1	1	1	5
26-Jun	2	3	1	3	2	2	3	2	2	2	2	2	3	5	4	2	5	4	2	3	7	6	4	4	7
27-Jun	2	3	3	2	2	4	6	3	3	4	4	4	6	7	7	6	3	5	3	4	2	3	2	3	7
28-Jun	1	2	2	1	1	2	2	2	2	3	3	3	4	4	4	5	5	5	5	5	3	1	2	2	5
29-Jun	1	3	2	1	2	1	1	1	2	2	2	3	3	2	2	2	2	2	2	2	2	5	4	5	5
30-Jun	3	4	5	5	5	2	4	2	3	4	2	2	3	5	6	5	5	5	4	5	4	3	3	2	6
																	Diurnal Maximum								



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed 45 m (WS45m) - km/h
Lower Camp Met Tower - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed 45 m (WS45m) - km/h
Lower Camp Met Tower - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	234	32.50	32.50
6 - 11	215	29.86	62.36
12 - 19	193	26.81	89.17
20 - 28	67	9.31	98.47
29 - 38	10	1.39	99.86
> 38	1	0.14	100.00

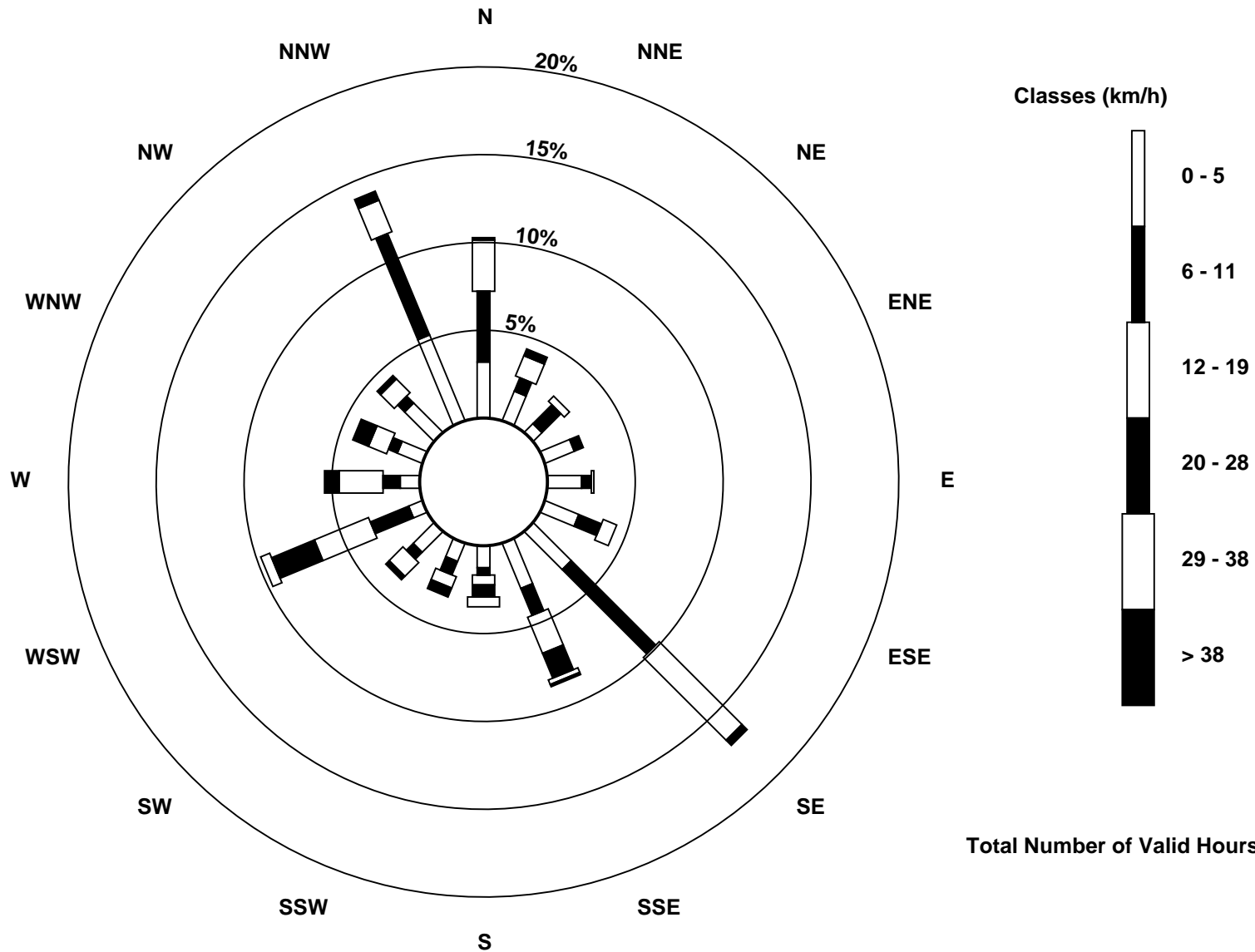
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

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





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed 100 m (WS100m) - km/h
Lower Camp Met Tower - June 2016

Maximum Speed: 46 km/h on Jun 15 12:00	Maximum Daily Speed Average: 24.3 km/h on Jun 13	Hours in Service: 720
Minimum Speed Value: 1 km/h on Jun 2 06:00	Minimum Daily Speed Average: 2.3 km/h on Jun 2	Hours of Data: 720
Maximum Diurnal Speed Average: 4.3 km/h at hour 13	Minimum Diurnal Speed Average: 1.1 km/h at hour 20	Hours of Missing Data: 0
Monthly Average Velocity: 2.1 km/h 207.8 deg	Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 8 Median = 14 Q ₃ = 21 P ₉₀ = 27 P ₉₉ = 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-Jun	SSE16	SSE12	ESE11	SSE12	SE16	SE19	SE18	SE21	SE12	ESE10	SSE17	SSE19	WSW5	S1	W13	S15	SE15	SE21	SSE19	SSE14	SE6	SE12	SSE16	SSE7	SSE12.2	SE21
2-Jun	WSW2	NNW3	NNW3	WSW2	NNE2	WSW1	NNW2	W3	WNW4	W3	N1	ESE2	SE5	SE5	WNW1	WSW10	WSW32	SE19	E20	SSE8	WSW5	W10	SE8	ESE12	S2.3	WSW32
3-Jun	SW5	SW7	S5	SSW6	SSW5	SSW6	SSW6	SW8	WSW16	WSW17	WSW12	WSW16	WSW26	NW16	N16	N22	NNW15	N10	N6	NNE15	E8	SE6	NNW1	NE4	W4.0	WSW26
4-Jun	SE11	WSW15	WSW27	WSW33	WSW37	W34	W21	NNW19	NNW25	NNW26	NNW25	NNW25	NNW27	W21	W20	NW21	NNW25	NW25	NW30	NW29	NW28	N12	NNW7	WNW11	WNW19.5	WSW37
5-Jun	NNW13	NW9	W7	W8	W6	WSW9	WSW8	SW5	N3	N7	NNW20	NNW19	NNW19	NNW17	NNW18	NNW12	N10	N10	NE10	ENE14	ENE17	E11	SE16	SE25	N5.3	SE25
6-Jun	SE29	SE28	SE28	SE26	SE24	SE21	SE20	SE18	SE20	SE21	SE26	SE27	SE26	SE26	SSE26	SSE24	SSE25	S21	S24	SSE29	S22	SE27	N5	ESE5	SSE21.6	SSE29
7-Jun	SSW8	SSW7	SW11	WSW13	WSW9	WSW9	WSW16	W11	W8	WSW11	WSW9	W6	N16	NE6	SSE4	WSW3	NNW12	N17	N14	NNW18	NNW19	NNW15	N15	N10	NW6.3	NNW19
8-Jun	NNW6	NW7	N2	NNW4	NNW6	NNW5	NNW8	NNW6	NW7	NW8	NNW8	N10	N12	ENE9	ENE11	ENE8	E8	SSE15	SSE21	SE15	E10	ESE15	ESE28	E24	ENE4.6	ESE28
9-Jun	E32	ENE18	NE19	ENE25	NE19	NE21	NE26	NNE28	NNE30	NNE29	NE25	NE26	NNE26	NNE28	NNE31	NNE32	NNE29	N25	NNE26	N23	N20	N22	N20	NNW16	NNE22.9	E32
10-Jun	NNW17	NNW16	NNW12	N2	W3	WSW3	WSW5	NW3	N9	NNW14	N15	N15	N13	N12	NNE11	NNE8	N11	NNE5	NNE7	ENE11	NE14	ENE15	E12	ESE14	N7.4	NNW17
11-Jun	SE13	SE14	SE15	SE15	SE14	SE14	SE23	SE25	SE25	SE23	SE28	SE28	SSE30	SE31	SE36	SE21	SE23	SE38	SE29	SE29	SE20	ESE14	ESE9	E7	SE21.6	SE38
12-Jun	NNE3	NNW3	N6	ENE3	SSE4	SW15	SW15	SW12	SW12	SSW11	S12	SSW17	SW24	SW20	SSW20	WSW21	W24	WSW25	W23	W16	SW17	WSW26	WSW32	WSW32	WSW14.2	WSW32
13-Jun	WSW32	WSW29	WSW26	WSW25	WSW24	WSW23	WSW23	WSW24	WSW24	WSW27	WSW27	WSW32	WSW36	WSW34	WSW32	WSW29	WSW24	WSW25	WSW28	WSW27	WSW23	WNW10	NNW3	SW7	WSW24.3	WSW36
14-Jun	WSW7	S5	S4	S5	SSE9	ESE3	SE6	SE7	SE3	ESE4	SSE3	SE12	SE18	SE16	SE21	SE25	ESE23	SE28	SE30	SSE21	SSE36	SSE29	SE20	SE18	SE13.9	SSE36
15-Jun	SE22	SE17	ESE20	ESE26	ESE24	SE25	SE17	ESE19	SE32	SSE41	SSE42	SSE46	S45	S42	S39	S37	S28	SSW23	S19	SSW14	SSW13	SSW16	SSE14	SE15	SSE23.9	SSE46
16-Jun	SSE20	SSE26	SSE30	SSE32	SSE30	S21	S24	S27	S26	SSW23	SSW32	SW25	SW27	SW28	SW25	SSW16	WSW21	WSW17	WSW17	WSW17	W19	W18	W19	WSW21	SSW18.8	SSE32
17-Jun	WSW20	WSW18	WSW17	WNW8	NW8	WNW18	WNW25	NNW26	NW28	NW26	NW22	NW24	NW24	WNW26	WNW24	WNW27	W25	W26	W19	N16	ENE8	N12	N14	N4	WNW16.7	NW28
18-Jun	WNW13	WNW22	WNW18	NW10	NW8	WNW13	WNW7	WNW9	W15	W20	NNW15	W15	WSW18	WSW19	WSW20	W17	WSW11	WSW4	SW5	SSE10	SE11	N17	ENE13	NE9	W8.6	WNW22
19-Jun	NNW9	NW11	NW13	NW8	W7	WNW4	W7	NNW7	N9	N14	N18	NNW20	NNW29	NNW32	NNW30	N27	N29	N29	N24	NNE19	N14	N11	N10	N10	NNW15.2	NNW32
20-Jun	WNW7	W9	WNW6	WSW2	E1	SSE2	SSW1	E1	SSE2	WSW2	W6	WSW5	NE4	ENE7	ESE7	SE12	SE14	SE17	SE19	SSE18	S17	SSE18	SSE20	SSE21	SSE6.0	SSE21
21-Jun	SSE21	SE19	SSE17	SSE17	SSE14	SSE14	SE16	SE18	SSE11	SE10	SSW6	WSW13	SSW10	W11	W8	NNW1	SSE1	E1	SE7	ENE4	E3	SSE13	S14	SSE9	SSE8.6	SSE21
22-Jun	SSE14	SSE11	SSE9	SSE10	SSE9	SSE11	SE16	SE14	SE12	SE10	ESE8	ESE5	WNW4	NW3	N4	WNW7	SE3	SW18	WSW33	W23	WSW20	WSW21	WSW17	WSW11	SSW6.5	WSW33
23-Jun	W18	SSW7	WSW6	WSW9	SW10	W8	NW3	NNW6	N5	NNW5	NNW8	NNW6	NNW6	WNW2	N11	NNW20	NNW16	NNW9	N6	ENE15	ENE12	E10	N13	NNW16	NNW5.2	NNW20
24-Jun	NNW6	NE5	N6	N10	N9	NNE6	N9	N12	NNW14	NNW18	NNW13	NNW12	NNW21	NNW16	N23	NNW24	NNW18	NNE16	N7	NNW13	NNW16	NNW17	NNW14	N11	NNW12.7	NNW24
25-Jun	NNE10	N7	N7	N13	N11	N15	N15	N15	N13	NNE19	NNE16	N18	N18	N16	N14	NNE16	N15	NE14	NE13	NE14	NE10	E6	W2	SSW4	NNE11.4	NNE19
26-Jun	W5	WNW7	WSW1	S3	S5	SSE5	SSE10	SE6	ESE6	ESE5	SE4	S2	ESE7	NNW9	N11	S5	SW22	SSW19	SE3	SSE8	SW8	W27	N6	WSW9	SW3.5	W27
27-Jun	WNW7	WSW11	SW14	SW6	SW9	WSW10	WSW13	WSW11	WSW9	WSW10	WSW11	WSW17	WSW24	WSW29	E13	SSW9	S9	SW20	WSW14	W10	SSE6	SE10	ESE17	SE10	SW9.0	WSW29
28-Jun	SSW5	SW5	SW5	SSW3	SW6	SW5	SW6	NW4	NNW5	WNW3	W9	NW5	N11	N17	N20	N21	N22	N22	NNE20	NNE20	NE15	NE19	ENE19	ENE9	N7.0	N22
29-Jun	ESE3	ESE13	SE2	ENE3	ENE7	NE4	NE3	E3	N2	WNW3	WNW3	N5	NNW5	NNW3	NE2	NNW6	N4	NNW6	N8	NE6	E4	SSE16	SSE23	SSE23	E2.3	SSE23
30-Jun	SSE23	SE27	SE30	SE22	SE24	SE8	SE14	SSE12	SSE12	SSE8	SE12	SE13	SE15	SE15	SE18	SE19	SE17	SE23	SSE19	SE27	SSE19	SE11	S9	SW12	SE16.4	SE30

S3.8 SSW3.6 SSW3.7 S3.7 S4.2 SSW4.2 SSW3.9 S2.6 SW1.6 WSW2.1 WSW2.7 WSW3.9 W4.3 W3.9 NNW1.6 NNW2.4 NNW3.0 SSW2.2 SSW1.6 ESE1.1 SSE1.8 SE1.7 SE2.9 SSE3.0	Diurnal Average
E32 WSW29 SSE30 WSW33 WSW37 W34 NE26 NNE28 SE32 SSE41 SSE42 SSE46 S45 S42 S39 S37 WSW32 SE38 WSW33 SE29 SSE36 SSE29 WSW32 WSW32	Diurnal Maximum

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

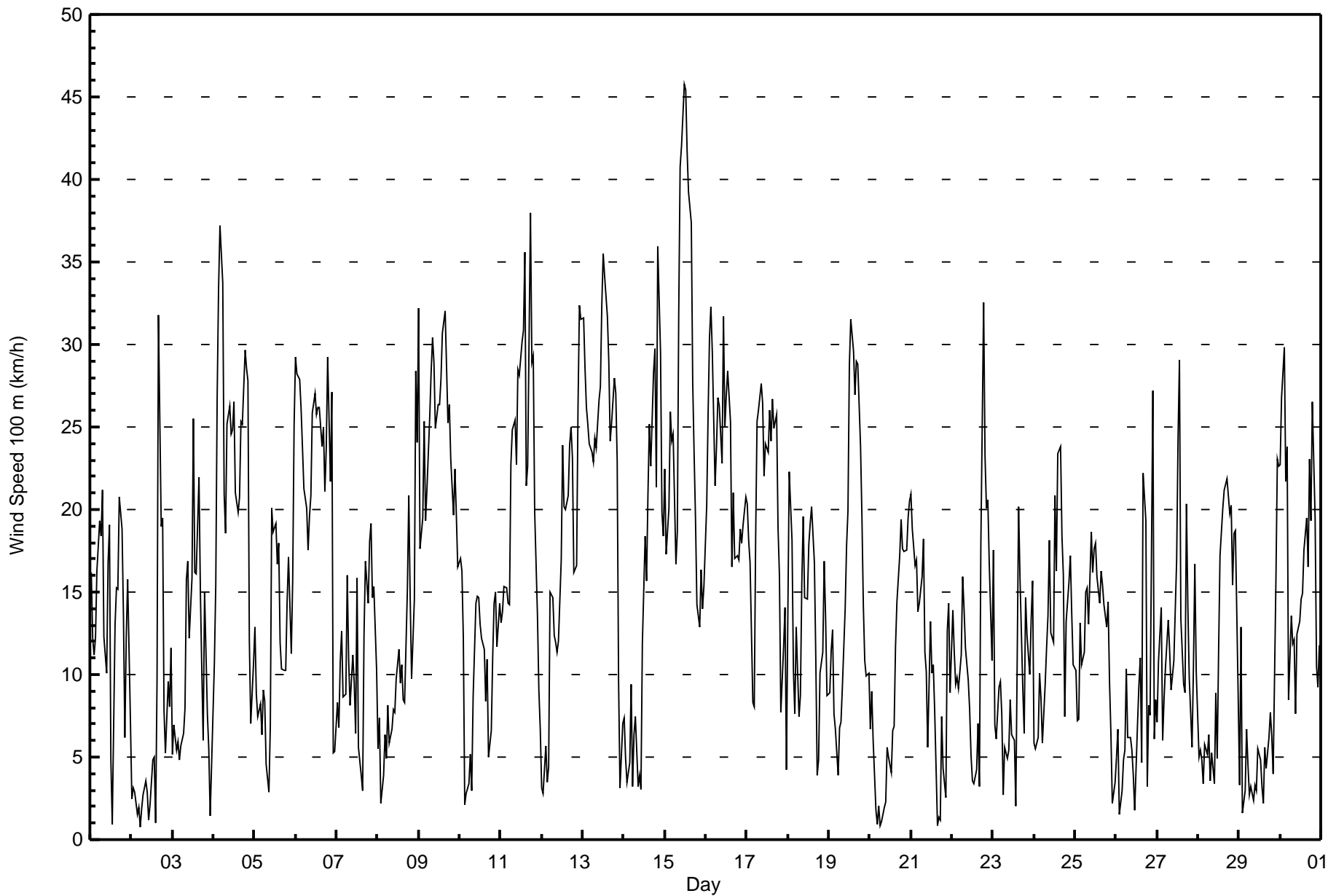
Wind Speed 100 m (WS100m) - km/h
Lower Camp Met Tower - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 18 km/h on Jun 2 16:00 Minimum Value: 1 km/h on Jun 20 05:00 Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 2 Median = 3 Q ₃ = 5 P ₉₀ = 6 P ₉₉ = 10														Hours in Service: 720 Hours of Data: 720 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-Jun	4	3	2	3	4	2	4	3	3	3	4	4	6	2	4	4	3	3	4	3	5	5	2	4	6	
2-Jun	1	1	2	1	1	1	1	2	2	2	2	1	2	2	2	18	8	5	7	2	2	3	3	4	18	
3-Jun	2	2	2	3	2	2	2	3	3	3	5	5	7	7	4	7	5	5	8	3	3	3	3	2	8	
4-Jun	3	7	4	5	5	6	6	8	6	6	5	6	5	5	6	5	7	8	7	6	5	3	4	1	2	8
5-Jun	5	3	2	3	2	3	3	2	1	5	5	5	5	5	5	5	5	4	5	3	2	4	5	6	6	
6-Jun	3	2	2	2	2	2	2	2	3	3	4	4	5	7	8	7	6	5	6	7	8	9	5	3	9	
7-Jun	3	2	2	3	3	2	3	2	3	2	3	8	10	4	2	2	6	4	4	4	2	1	1	1	10	
8-Jun	2	2	2	2	2	2	2	2	1	1	1	1	2	4	3	3	3	6	3	6	3	9	3	4	9	
9-Jun	5	3	5	5	5	7	5	5	6	5	4	5	5	5	5	5	4	3	4	3	3	3	3	2	7	
10-Jun	1	1	4	2	1	1	1	2	3	3	3	4	4	4	5	6	3	4	2	2	1	3	3	4	6	
11-Jun	3	2	4	3	2	3	3	2	2	3	4	6	7	8	6	5	10	7	9	8	5	4	3	2	10	
12-Jun	2	2	1	1	2	4	4	3	4	4	4	9	4	3	5	5	5	4	4	4	8	4	4	4	9	
13-Jun	4	4	5	3	3	4	4	4	5	3	4	4	5	4	4	6	5	4	4	5	2	4	4	3	6	
14-Jun	2	2	1	2	3	2	4	3	1	2	3	4	7	5	5	6	4	7	4	9	10	8	4	4	10	
15-Jun	3	4	6	7	5	5	4	4	8	9	10	11	10	10	10	10	8	7	6	6	10	4	3	11		
16-Jun	4	5	6	6	6	6	6	7	7	7	7	6	5	5	8	5	5	4	4	3	3	3	3	2	8	
17-Jun	2	3	3	4	3	4	4	4	5	5	4	5	6	6	6	6	6	5	6	11	2	6	3	4	11	
18-Jun	9	4	4	3	4	3	3	5	5	4	5	4	4	4	3	4	3	3	4	3	2	14	5	2	14	
19-Jun	2	2	1	2	1	2	2	3	2	4	5	7	7	7	7	5	6	5	5	4	2	2	1	2	7	
20-Jun	2	1	1	2	1	1	1	1	1	2	2	2	2	3	3	3	2	2	1	2	3	3	3	3	3	
21-Jun	3	2	2	2	2	1	2	2	3	2	5	5	6	3	3	2	3	1	2	1	1	5	4	2	6	
22-Jun	4	4	2	2	2	2	2	2	1	1	2	2	3	3	3	2	3	10	4	5	2	1	2	6	10	
23-Jun	7	3	2	3	3	3	2	3	2	2	2	2	2	2	9	5	2	2	3	3	4	3	4	3	9	
24-Jun	4	2	2	2	5	2	2	3	3	3	4	3	7	3	8	3	2	4	3	3	3	1	3	2	8	
25-Jun	3	2	1	3	2	3	2	2	2	3	4	3	4	4	3	4	4	4	3	3	2	3	2	2	4	
26-Jun	1	2	2	2	2	2	3	2	1	1	2	2	2	6	5	3	5	7	2	4	10	7	5	6	10	
27-Jun	3	4	2	4	3	3	6	3	3	3	3	3	5	6	8	8	4	4	3	5	3	3	3	4	8	
28-Jun	1	1	3	1	2	2	1	2	2	3	3	4	5	4	4	5	6	5	4	4	3	2	5	4	6	
29-Jun	2	4	2	2	1	1	1	2	1	2	2	4	3	2	3	2	2	2	2	2	2	6	5	5	6	
30-Jun	3	4	3	4	3	4	4	4	3	3	1	3	4	4	5	5	5	3	5	3	7	4	4	3	7	
Diurnal Maximum																										
9 7 6 7 6 7 6 8 8 9 10 11 10 10 10 18 10 10 9 11 10 14 5 6																										



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed 100 m (WS100m) - km/h
Lower Camp Met Tower - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed 100 m (WS100m) - km/h
Lower Camp Met Tower - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	114	15.83	15.83
6 - 11	185	25.69	41.53
12 - 19	209	29.03	70.56
20 - 28	160	22.22	92.78
29 - 38	46	6.39	99.17
> 38	6	0.83	100.00

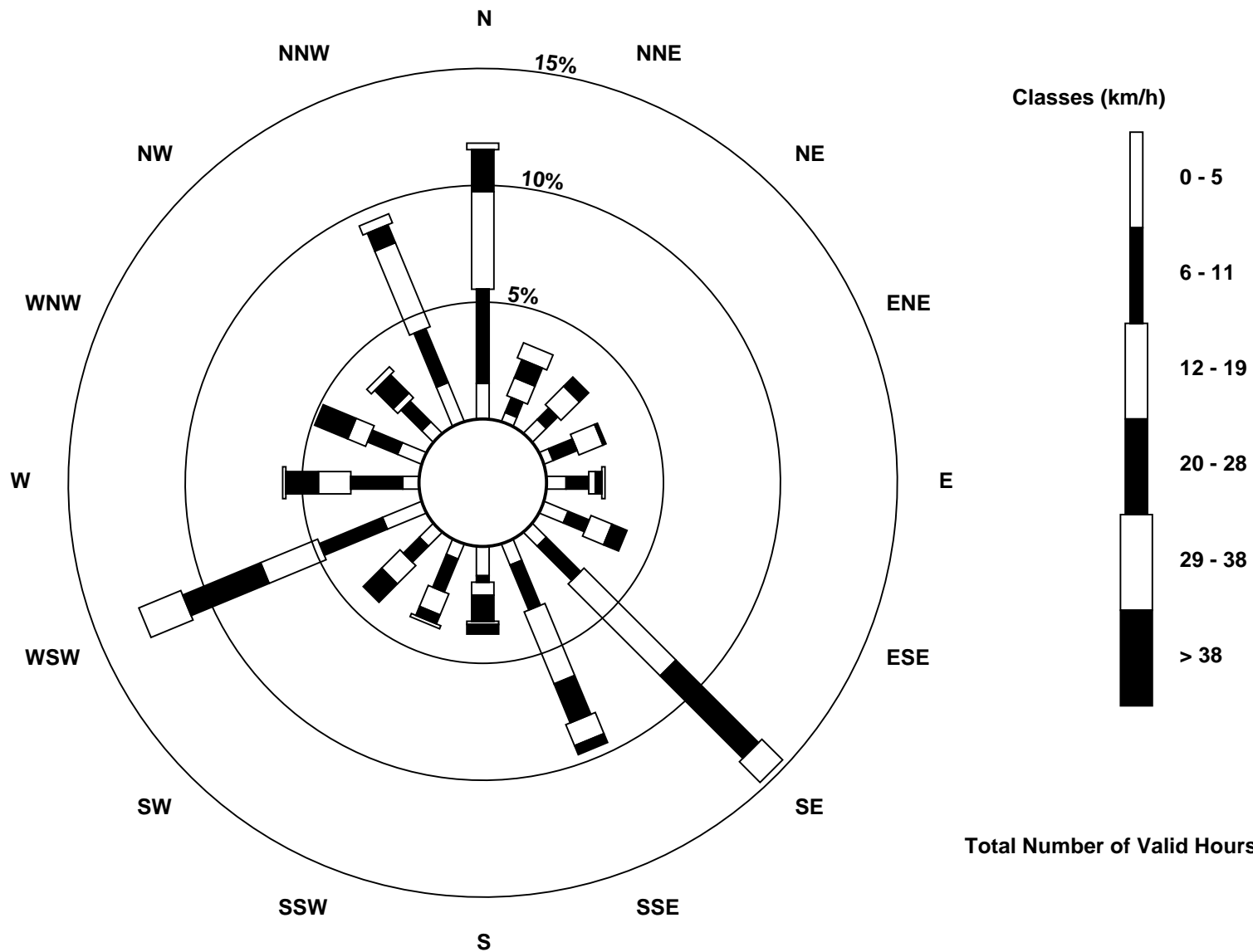
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

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





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed 167 m (WS167m) - km/h

Lower Camp Met Tower - June 2016

Maximum Speed: 55 km/h on Jun 15 13:00	Maximum Daily Speed Average: 30.0 km/h on Jun 13	Hours in Service: 720
Minimum Speed Value: 1 km/h on Jun 2 15:00	Minimum Daily Speed Average: 3.3 km/h on Jun 2	Hours of Data: 720
Maximum Diurnal Speed Average: 6.2 km/h at hour 6	Minimum Diurnal Speed Average: 1.0 km/h at hour 20	Hours of Missing Data: 0
Monthly Average Velocity: 2.7 km/h 225.3 deg	Percentiles: P ₁ = 2 P ₁₀ = 5 Q ₁ = 10 Median = 16 Q ₃ = 25 P ₉₀ = 32 P ₉₉ = 43	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-Jun	S23	S16	SSE11	S11	S10	S16	S11	SE18	SE13	SE8	S16	S19	WSW8	WSW4	W14	SSW18	SE15	SE20	SSE18	S17	SSE9	SSE15	SSE17	S13	S12.5	S23
2-Jun	S3	SSW4	SSW3	WSW3	NNE2	SSW4	NW2	W2	WNW3	NW3	W2	SSE2	SE5	SE5	WNW1	WSW11	WSW40	SE17	E23	SSE7	SW7	W14	SSE6	E13	SSW3.3	WSW40
3-Jun	S3	WSW12	SW7	SW11	WSW10	SW12	SW10	SW10	WSW18	WSW20	WSW15	WSW18	WSW30	WNW19	N16	N24	NNW19	NNE12	NNE5	NNE18	E14	SE10	SSE3	ENE5	W5.5	WSW30
4-Jun	SE8	WSW25	WSW41	WSW45	W48	W43	W28	WNW22	WNW29	WNW29	WNW26	WNW26	WNW29	W23	W23	NW24	NNW30	NW29	NW34	NW33	NW35	N15	N10	NW17	WNW24.1	W48
5-Jun	NW21	NNW14	W7	W12	W11	WSW11	WSW10	WSW5	WNW4	N8	NNW22	NNW20	NNW20	NNW18	NNW19	NNW13	N11	N11	ENE15	ENE20	E20	SE22	SE31	N5.8	SE31	
6-Jun	SSE31	SSE30	SSE29	SE28	SE28	SE25	SE22	SSE18	SSE18	SE20	SE27	SSE27	SE27	SSE28	SSE27	S26	SSE27	S26	S30	S35	S27	SSE31	W2	ESE5	SSE23.8	S35
7-Jun	SW11	SW10	SW12	WSW20	W16	W15	W16	WNW10	WNW8	W10	WSW9	W6	N18	ENE8	SSW4	W5	NNW14	N18	N15	NNW21	NNW23	N23	N22	N16	NW8.6	NNW23
8-Jun	N10	NNW10	N7	N4	NW4	NNW5	NNE11	NNE9	N8	N9	N10	N10	NNE12	ENE11	ENE11	ENE10	E11	SSE16	SSE22	SE20	ESE16	ESE20	ESE37	E38	E7.7	E38
9-Jun	ESE41	ENE31	ENE33	ENE38	ENE28	NE28	NE35	NE37	NE39	NE37	NE33	NE34	NE33	NNE34	NNE37	NNE38	NNE35	NNE31	NNE32	NNE29	N25	N29	N27	N25	NE30.0	ESE41
10-Jun	N22	NNW23	NNW19	N13	NW8	W9	W7	NW7	NNW10	NNW15	N15	N15	N14	N13	NNE13	NNE9	NNE11	NNE5	NNE7	ENE12	NE15	ENE20	E26	ESE27	NNE9.8	ESE27
11-Jun	SE19	SE21	SE23	SE17	SE21	SSE20	SSE24	SE25	SE27	SE26	SE30	SE30	SSE31	SE32	SE37	SE23	SE26	SSE40	SE34	SE37	SE25	SE20	SE18	SE13	SE25.7	SSE40
12-Jun	SE5	SSW5	WSW2	SE3	S9	SW17	SW17	SW13	SW13	SSW13	SSW14	SSW18	SW28	SW23	SW22	WSW24	W28	W29	W27	W20	WSW21	WSW35	WSW41	WSW39	WSW17.5	WSW41
13-Jun	WSW40	WSW37	WSW34	WSW33	WSW32	WSW32	WSW29	WSW28	WSW28	WSW31	WSW31	WSW37	WSW41	WSW39	WSW37	WSW33	WSW28	WSW29	WSW32	WSW32	WSW28	W15	W10	WSW9	WSW30.0	WSW41
14-Jun	WSW11	SW7	SSW6	SSW6	SSE12	SE13	SSE10	SSE7	ESE5	ESE6	SSE3	SE13	SE20	SE16	SE23	SE29	SE26	SE33	SE35	SSE25	SSE43	SSE32	SE23	SE24	SSE16.3	SSE43
15-Jun	SE28	SE24	SE28	ESE34	ESE34	SE32	SE19	SE24	SE35	SSE45	S50	S52	S55	S50	S47	S45	SSW33	SSW28	SSW24	SSW19	SW18	SSW21	SSW20	S22	SSE29.2	S55
16-Jun	S25	S30	SSE33	SSE37	S35	S26	S27	S31	S30	SSW27	SSW34	SW27	SW29	SW31	SW28	SSW19	WSW23	WSW19	WSW20	WSW19	W21	W22	W21	WSW24	SSW21.9	SSE37
17-Jun	W23	W20	W19	WNW12	NW14	WNW22	WNW29	WNW29	NW31	NW30	NW25	NW28	NW26	WNW29	WNW27	WNW28	W28	W29	W23	NNW19	ENE10	N13	NNE16	NNW6	WNW19.5	NW31
18-Jun	WNW18	NW28	WNW26	NW19	WNW17	WNW19	WNW11	WNW12	W16	W21	WNW16	W17	WSW20	WSW21	WSW22	W19	WSW12	W5	SW7	S10	SSE9	N22	NE25	NE18	WNW11.3	NW28
19-Jun	N13	NNW17	NW16	WNW13	W10	W9	W9	NW8	NNW11	N16	N18	NNW22	NNW31	NNW34	NNW32	N28	N32	N31	N25	NNE21	N18	NNE18	NNE16	N17	NNW17.7	NNW34
20-Jun	NW12	WNW10	W11	W10	WNW7	WNW5	W4	SSW1	SSW3	W4	W6	WSW5	NNE3	ENE6	ESE5	SE10	SE13	SE16	SSE17	SSE17	S21	S25	S28	S26	S5.9	S28
21-Jun	S24	SSE22	S15	S10	S13	S13	S9	S10	S8	SSE8	SW7	WSW15	SSW11	W12	W9	NW2	SW1	ESE1	SE7	ENE4	E1	S16	SSW20	SSW12	S8.6	S24
22-Jun	S13	SSE14	S13	S11	S12	S15	SSE9	SSE9	S7	SSE7	SE7	ESE4	W3	WNW3	NNW5	WNW8	SSE4	SW21	W37	W28	WSW24	W25	W21	W17	SW8.6	W37
23-Jun	W24	WSW14	W11	W12	WSW14	W12	NW5	N6	N8	NNW6	NNW8	NW7	NW6	WNW3	NNW12	NNW24	N17	NNE10	NNE8	ENE16	E18	E17	NNE13	NNW22	NNW6.6	NNW24
24-Jun	NNW11	NE10	NNE8	N12	N14	NNE8	NNE15	N13	N15	N19	NNW13	NNW13	NNW23	NNW20	N26	NNW29	N26	NNE20	NNE9	NNW15	N17	N19	N18	NNE15	N15.4	NNW29
25-Jun	NE20	NNE12	NNE11	N20	N17	N17	N17	N15	N14	NNE20	NNE17	N19	N19	N17	N16	NNE17	NNE16	NE15	NE14	NE16	NE12	E7	SW1	WSW6	NNE13.3	N20
26-Jun	W11	NW14	NW5	W3	SW6	SSW7	SSW8	SSW5	SSE3	SE4	S2	WSW2	ESE6	NNW11	NNE12	SSE5	SW25	SSW19	S4	S11	WSW11	W34	N11	W10	WSW5.1	W34
27-Jun	W13	W16	W18	W15	WSW14	WSW14	WSW16	WSW13	W9	WSW11	WSW13	WSW19	WSW27	WSW32	E13	SSW10	SSW10	WSW22	WSW17	W14	SW2	SSE5	SE16	SSE12	WSW11.6	WSW32
28-Jun	SW5	WSW8	WSW10	WSW7	WSW11	WSW10	WSW7	NW5	N6	NW4	W10	NW6	NNW12	N18	N21	N22	N23	NNE23	NNE21	NE23	NE19	NE26	ENE27	E25	N8.0	ENE27
29-Jun	ESE11	ESE18	SE10	SE9	ESE10	ESE11	ESE8	ESE4	NE3	WNW4	NW3	N5	NNW6	NNW4	NNE2	NNW5	NNE3	NNW5	N6	NE6	ESE5	SSE21	SSE27	SSE26	SE4.8	SSE27
30-Jun	SSE26	SSE30	SSE33	SSE25	SSE23	SSE11	SSE13	SSE9	S11	S7	SE13	SE16	SSE15	SE15	SE19	SE20	SE17	SE23	SSE20	SE29	SSE24	SE13	S11	SW17	SSE17.5	SSE33

SSW4.3SSW4.5 SW4.9 SW4.6SSW5.3 SW6.2 SW4.5 SW2.6WSW2.0 W2.7WSW3.5WSW4.6 W5.4 W4.6WNW2.1WNW3.0WNW3.6 SW2.5SSW2.3 SE1.0 SSE2.1 SE2.0 ESE3.4 SSE3.4	Diurnal Average
ESE41 WSW37 WSW41 WSW45 W48 W43 NE35 NE37 NE39 SSE45 S50 S52 S55 S50 S47 S45 WSW40 SSE40 W37 SE37 SSE43 WSW35 WSW41 WSW39	Diurnal Maximum

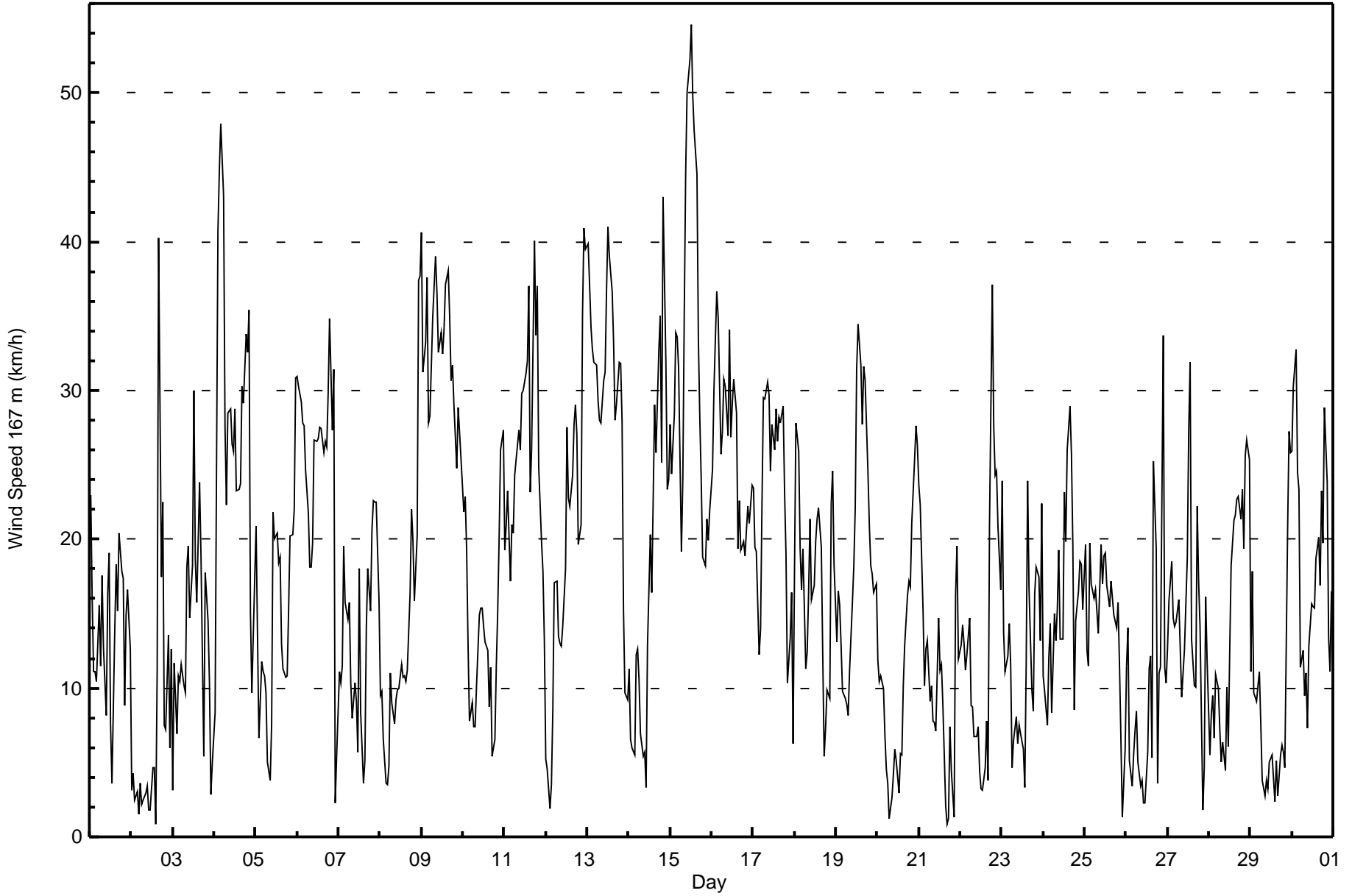
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed 167 m (WS167m) - km/h
Lower Camp Met Tower - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 21 km/h on Jun 2 16:00 Minimum Value: 1 km/h on Jun 10 05:00 Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 2 Median = 3 Q ₃ = 5 P ₉₀ = 6 P ₉₉ = 12														Hours in Service: 720 Hours of Data: 720 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-Jun	4	4	2	3	2	2	3	3	4	3	4	4	7	3	3	4	2	2	4	2	5	5	2	4	7
2-Jun	1	2	1	2	1	1	1	2	2	2	2	2	3	3	2	21	9	5	5	2	3	4	3	3	21
3-Jun	1	4	3	2	3	3	3	2	3	3	5	5	7	9	5	6	4	5	7	3	3	4	3	2	9
4-Jun	3	9	4	5	3	6	7	8	5	5	5	4	6	7	5	7	8	7	6	4	4	5	2	4	9
5-Jun	3	5	2	2	1	2	3	2	2	5	5	4	5	4	5	5	4	4	5	2	2	2	6	4	6
6-Jun	2	2	3	2	2	2	2	3	4	3	3	4	5	7	6	6	5	4	4	5	10	9	6	2	10
7-Jun	3	2	3	5	3	3	2	2	2	2	3	8	8	4	2	1	5	4	4	4	2	2	2	2	8
8-Jun	2	3	3	2	1	1	2	1	1	1	1	1	2	4	3	2	3	5	2	5	6	10	3	3	10
9-Jun	4	2	6	4	6	9	5	6	6	5	4	5	6	5	5	5	5	4	4	4	4	4	4	2	9
10-Jun	1	1	2	2	1	1	1	2	3	3	3	3	3	4	5	5	3	4	2	2	1	2	2	4	5
11-Jun	4	3	3	3	2	2	2	2	3	2	5	5	6	7	6	4	11	7	10	8	5	3	3	3	11
12-Jun	3	2	1	2	2	4	4	3	3	4	3	8	3	3	4	5	4	4	4	3	8	5	4	4	8
13-Jun	4	3	4	3	3	4	3	4	4	3	4	4	4	4	4	7	5	3	2	3	2	6	2	2	7
14-Jun	2	3	2	2	3	2	2	2	2	3	3	4	6	5	5	6	4	7	3	9	8	7	4	4	9
15-Jun	3	5	7	7	5	6	3	4	7	9	8	10	10	10	9	9	7	7	5	5	6	12	5	2	12
16-Jun	4	5	4	4	4	5	6	6	5	6	6	6	5	5	6	6	4	5	4	2	2	2	3	2	6
17-Jun	2	2	2	4	3	4	4	4	5	5	4	4	6	7	6	6	7	4	6	12	2	13	4	5	13
18-Jun	9	3	2	4	5	3	4	5	4	4	5	4	3	3	3	4	3	4	4	3	2	15	5	2	15
19-Jun	2	1	1	2	1	1	2	3	3	3	5	7	7	6	9	5	6	5	4	4	3	2	2	3	9
20-Jun	1	1	1	1	2	1	1	1	1	2	3	2	2	3	2	3	2	3	2	3	2	1	2	2	3
21-Jun	2	3	4	2	2	2	2	2	2	2	5	5	5	3	3	2	3	1	2	1	1	7	2	4	7
22-Jun	4	2	2	2	2	2	2	2	1	2	2	2	3	3	3	2	3	12	4	4	2	1	1	6	12
23-Jun	5	4	3	2	3	4	2	3	2	2	2	2	2	2	10	5	2	2	3	2	2	2	2	3	10
24-Jun	4	4	3	4	6	2	2	2	2	3	4	3	6	2	8	3	4	5	3	5	3	1	3	3	8
25-Jun	4	3	2	3	3	3	2	2	2	3	4	3	4	4	4	4	5	5	3	2	2	3	1	1	5
26-Jun	2	3	1	1	2	1	1	2	2	2	2	3	2	7	2	2	6	6	3	5	12	7	6	6	12
27-Jun	3	3	4	5	3	2	6	3	3	3	3	3	6	5	10	8	5	4	4	5	2	3	3	5	10
28-Jun	3	2	2	1	1	2	1	2	2	2	3	4	4	4	3	5	5	4	4	3	3	2	1	4	5
29-Jun	4	4	3	2	2	1	1	1	1	3	2	4	3	2	2	2	2	2	2	2	3	7	5	7	7
30-Jun	5	5	3	3	3	4	3	4	3	2	2	3	4	4	5	5	4	3	5	3	7	5	4	2	7
Diurnal Maximum																									
9 9 7 7 6 9 7 8 7 9 8 10 10 10 10 21 11 12 10 12 12 15 6 7																									





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed 167 m (WS167m) - km/h
Lower Camp Met Tower - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	83	11.53	11.53
6 - 11	154	21.39	32.92
12 - 19	198	27.50	60.42
20 - 28	170	23.61	84.03
29 - 38	94	13.06	97.08
> 38	21	2.92	100.00

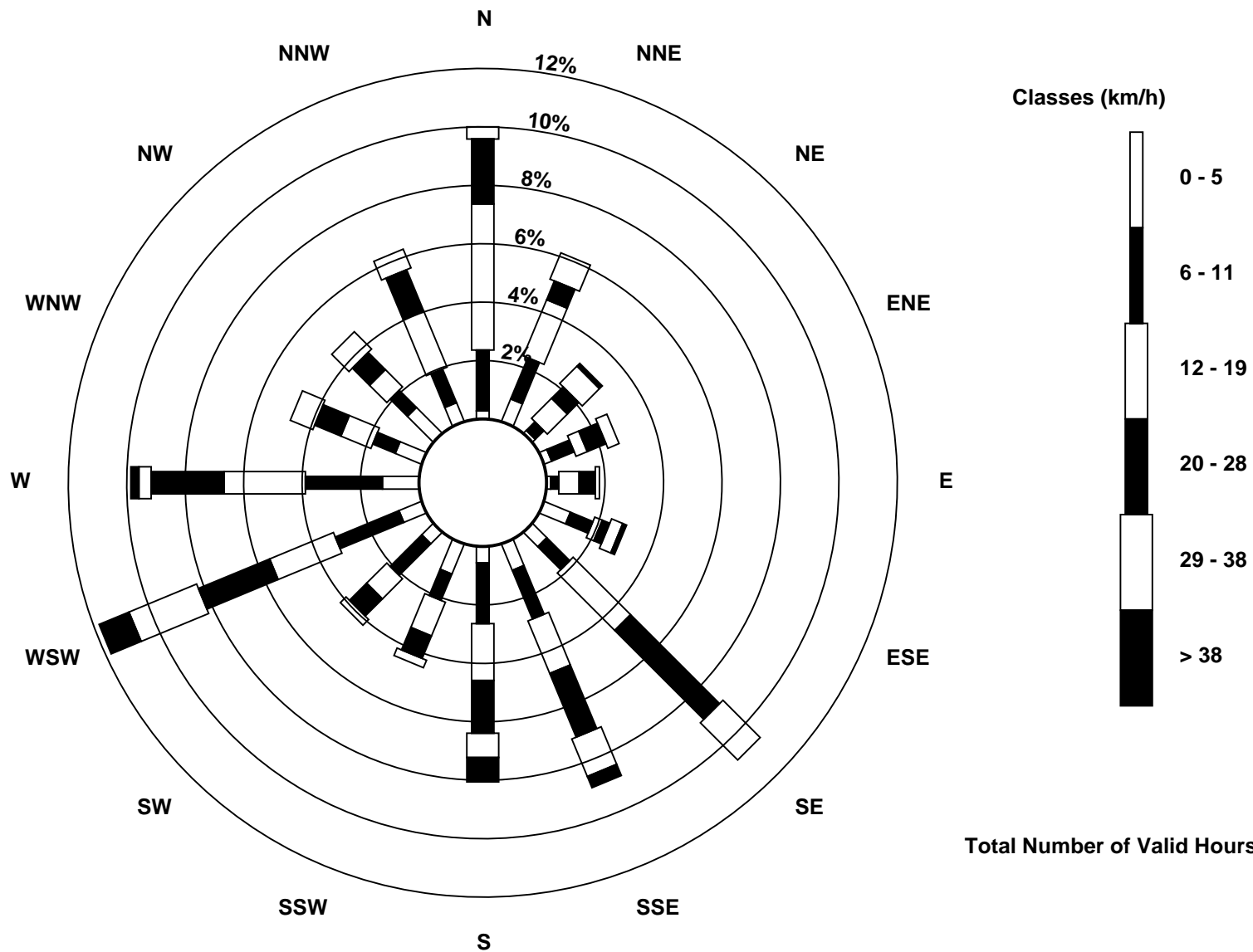
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

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 - June 2016

Direction of Maximum Speed: 178 deg on Jun 15 12:00		Hours in Service: 720
Direction of Maximum Daily Speed Average: 174.4 deg on Jun 15		Hours of Data: 720
Direction of Minimum Speed: 76 deg on Jun 20 07:00		Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 0.8 deg on Jun 29		Percent Operational Time: 100.0
Monthly Average Direction: 289.8 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-Jun	147	121	107	142	148	150	150	147	153	96	150	170	229	118	282	200	160	154	160	173	134	128	139	353	154.6
2-Jun	339	13	298	353	321	325	332	246	279	228	130	114	150	151	259	250	249	131	113	175	273	288	151	54	219.4
3-Jun	185	168	145	149	160	148	162	226	256	256	250	256	255	303	18	358	347	2	354	3	139	157	8	5	271.9
4-Jun	170	208	267	275	274	278	286	306	301	295	307	293	300	286	270	319	350	326	324	331	322	346	315	158	299.4
5-Jun	337	290	338	48	32	252	255	226	36	33	345	352	0	360	351	351	8	359	63	58	42	143	95	151	359.9
6-Jun	146	143	145	142	150	152	151	157	152	146	147	156	151	160	169	174	167	192	199	175	186	159	2	62	162.1
7-Jun	153	163	159	352	140	201	271	261	257	251	246	266	348	17	148	224	355	1	354	332	331	354	347	293	298.5
8-Jun	282	347	20	335	324	332	350	325	342	334	330	352	357	86	69	66	138	158	162	115	40	124	120	105	62.8
9-Jun	88	24	32	54	36	39	40	28	27	28	30	29	28	25	18	18	15	3	14	2	352	347	343	340	22.3
10-Jun	339	329	329	117	49	118	139	28	358	350	359	359	10	5	22	38	12	55	6	64	44	317	82	115	13.2
11-Jun	74	59	34	109	96	123	155	155	145	148	150	155	159	154	150	151	142	158	149	143	137	77	3	348	146.8
12-Jun	349	332	340	342	297	216	237	229	232	202	194	209	226	222	213	262	278	263	276	272	240	250	250	254	244.0
13-Jun	255	259	266	258	255	244	244	248	252	255	251	252	257	257	257	257	266	266	271	270	243	331	138	45	257.0
14-Jun	42	150	165	148	84	2	139	160	194	162	194	150	154	140	145	142	128	144	154	163	167	168	125	121	150.8
15-Jun	125	133	127	129	123	144	145	129	146	165	175	178	184	182	188	188	198	205	201	185	189	204	154	152	174.4
16-Jun	152	159	165	166	168	176	187	187	191	202	220	235	246	240	220	216	266	254	257	267	271	278	275	251	210.7
17-Jun	268	270	274	319	336	298	298	304	328	323	324	316	319	297	301	296	284	279	293	357	87	356	352	331	304.9
18-Jun	324	317	351	1	15	331	324	287	281	276	298	268	254	252	252	265	255	244	194	177	138	0	69	334	277.9
19-Jun	325	339	346	285	24	352	271	342	3	360	1	349	342	348	348	1	355	357	8	12	359	342	352	323	352.3
20-Jun	335	37	152	92	105	272	76	85	177	223	274	245	84	84	138	150	153	154	153	156	166	145	144	150	151.2
21-Jun	150	182	154	157	143	139	146	145	148	148	187	258	213	272	266	356	163	98	154	78	184	133	123	137	164.6
22-Jun	145	10	183	88	75	131	151	141	139	140	139	121	285	352	14	306	145	235	269	273	243	249	236	257	223.5
23-Jun	269	188	178	267	207	310	326	331	30	348	357	0	351	149	5	352	341	345	342	75	77	81	356	339	350.3
24-Jun	81	53	14	354	38	28	344	353	343	355	348	340	348	347	351	338	349	15	341	330	328	338	349	329	349.0
25-Jun	336	336	327	333	343	353	9	6	2	23	16	3	3	1	360	18	15	40	45	49	26	324	356	148	10.1
26-Jun	325	353	139	131	124	134	141	136	150	153	138	161	123	346	341	248	247	211	92	147	237	293	302	230	186.5
27-Jun	335	218	215	169	192	254	252	249	255	260	253	250	253	247	114	207	182	244	248	252	146	84	140	89	235.0
28-Jun	172	157	122	148	148	132	167	342	336	288	270	1	1	355	359	4	2	9	12	28	30	36	42	330	9.1
29-Jun	336	50	343	337	342	327	310	10	344	289	283	16	309	318	46	352	2	355	356	37	56	154	165	167	351.0
30-Jun	154	153	149	143	141	156	150	158	152	148	158	162	153	142	134	144	148	145	165	154	172	146	195	176	152.2

183.4 192.2 177.1 163.8 161.7 194.7 210.3 213.8 233.4 244.9 237.5 236.6 254.6 254.7 251.6 256.0 264.3 229.2 237.5 185.4 198.8 214.2 169.4 196.6

Diurnal Average

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



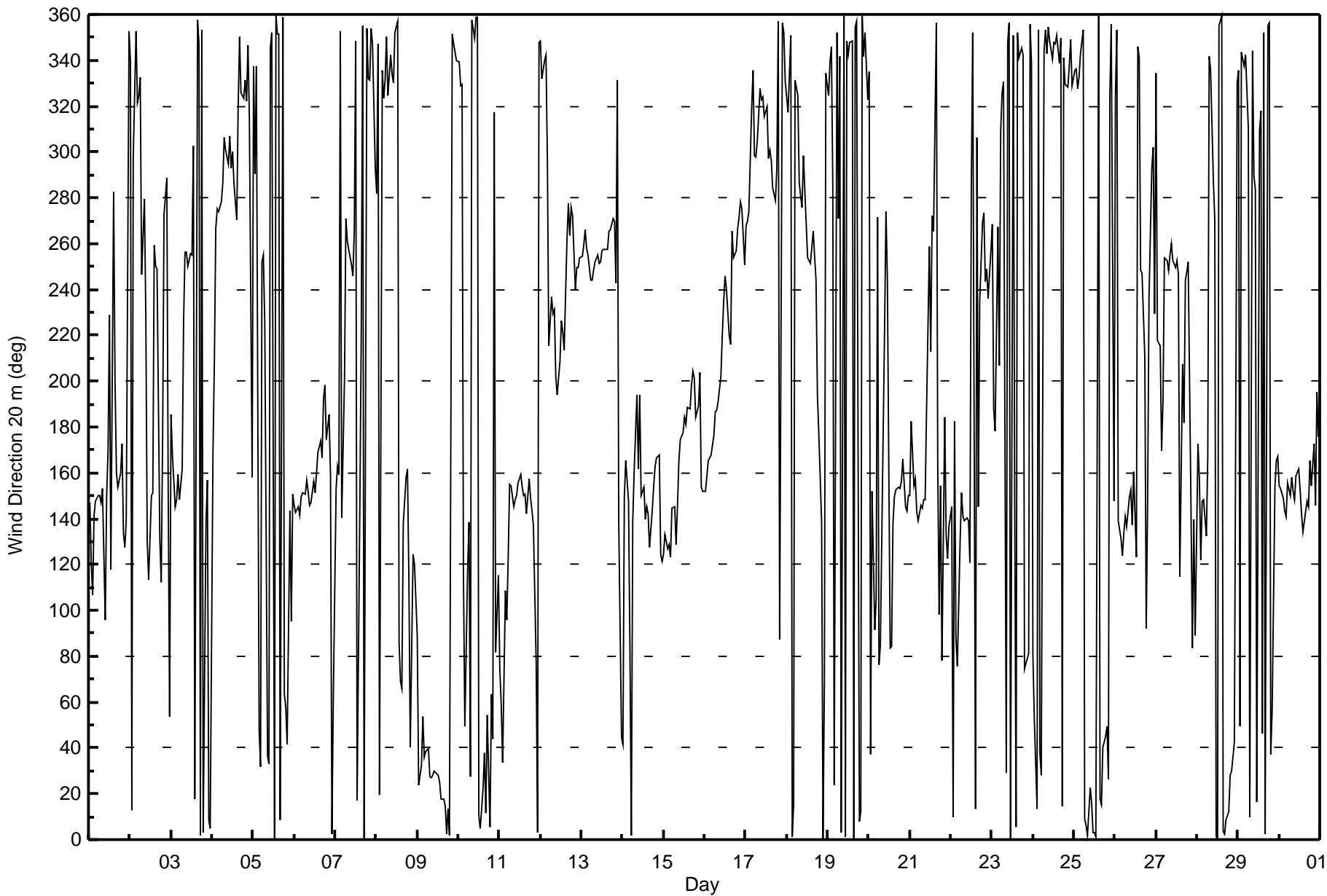
Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction 20 m (WD20m) - deg
Lower Camp Met Tower - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 105 deg on Jun 29 21:00	Hours of Data: 720
Minimum Value: 9 deg on Jun 16 04:00	Hours of Missing Data: 0
Percentiles: P ₁ = 11 P ₁₀ = 17 Q ₁ = 21 Median = 28 Q ₃ = 52 P ₉₀ = 77 P ₉₉ = 98	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-Jun	29	43	27	23	27	20	19	22	48	31	23	25	92	70	30	27	21	20	15	13	85	60	25	69	92
2-Jun	72	62	89	52	26	34	52	56	55	35	99	68	45	51	90	96	22	23	53	17	71	46	41	64	99
3-Jun	61	35	17	48	23	21	18	37	20	19	33	26	22	55	24	20	39	81	84	31	73	80	76	67	84
4-Jun	76	59	16	19	19	22	29	37	22	25	26	29	24	26	27	34	24	22	21	16	47	60	44	76	76
5-Jun	49	28	85	82	60	48	24	53	52	89	34	30	26	28	37	61	55	38	45	32	28	103	58	23	103
6-Jun	19	19	17	22	20	22	21	20	21	22	21	17	21	24	18	17	14	16	11	12	51	20	89	85	89
7-Jun	82	39	46	92	42	56	27	22	25	19	22	48	76	83	66	77	47	26	25	21	14	11	11	93	93
8-Jun	57	43	86	78	33	30	24	26	30	24	27	22	24	54	31	80	52	22	12	66	40	96	22	32	96
9-Jun	33	35	33	38	32	36	33	28	28	28	27	29	28	25	24	24	24	21	25	24	24	21	20	17	38
10-Jun	22	16	51	66	83	34	68	89	38	31	28	28	34	40	49	55	41	98	47	25	28	37	87	50	98
11-Jun	98	87	86	64	41	60	30	19	18	18	18	19	19	18	23	34	15	25	19	26	49	28	23	98	
12-Jun	23	26	45	67	90	23	17	19	15	20	16	27	11	12	12	34	25	21	23	21	15	17	16	17	90
13-Jun	17	19	18	17	18	16	16	18	20	19	19	18	18	18	19	20	22	21	20	19	12	44	91	78	91
14-Jun	86	56	68	72	55	36	96	24	60	80	76	29	23	37	24	20	20	22	19	20	16	11	30	24	96
15-Jun	20	29	26	28	30	27	49	28	20	20	12	13	12	12	12	14	14	13	18	66	51	32	19	20	66
16-Jun	11	9	9	9	9	13	13	13	14	16	11	18	20	18	17	21	26	21	20	19	21	20	20	16	26
17-Jun	22	17	28	39	35	29	20	21	22	19	23	23	26	22	25	24	24	22	23	43	82	56	30	94	94
18-Jun	21	33	29	24	53	27	46	72	34	25	26	32	24	21	20	30	29	68	91	32	12	60	75	36	91
19-Jun	20	24	19	38	56	62	72	40	32	27	27	33	25	25	26	24	23	23	26	29	22	19	47	40	72
20-Jun	91	72	75	79	94	58	104	74	74	58	50	56	65	43	41	20	17	15	16	11	11	9	14	22	104
21-Jun	29	86	18	22	18	35	40	22	17	18	62	37	51	37	47	103	77	67	13	38	90	28	24	90	103
22-Jun	38	44	80	80	88	17	19	23	20	24	23	38	86	69	52	30	86	40	25	19	15	17	21	76	88
23-Jun	63	47	38	80	40	90	75	55	77	64	28	37	58	101	42	23	23	30	63	31	39	81	20	23	101
24-Jun	81	66	54	57	64	38	29	25	26	23	31	30	23	24	27	22	29	42	37	17	19	19	31	26	81
25-Jun	23	26	30	63	35	38	27	26	24	33	33	28	24	26	28	33	40	47	38	30	31	89	81	55	89
26-Jun	85	80	30	74	19	21	18	20	24	33	49	46	39	87	51	63	23	47	91	64	79	31	86	94	94
27-Jun	75	62	17	37	22	43	34	26	32	25	31	19	18	18	90	63	35	17	19	61	12	62	37	73	90
28-Jun	41	48	64	27	32	19	45	97	44	64	38	93	43	27	22	27	24	27	32	31	28	26	55	42	97
29-Jun	48	63	27	37	23	24	28	76	54	62	61	65	71	69	77	61	66	39	24	72	105	26	12	11	105
30-Jun	12	17	20	28	23	71	27	12	19	91	37	20	30	36	31	25	27	19	13	19	23	18	50	52	91

98	87	89	92	94	90	104	97	77	91	99	93	92	101	90	103	86	98	91	72	105	103	91	94	
Diurnal Maximum																								





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction 45 m (WD45m) - deg
Lower Camp Met Tower - June 2016

Direction of Maximum Speed: 168 deg on Jun 15 12:00 Direction of Maximum Daily Speed Average: 248.1 deg on Jun 13	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0
Direction of Minimum Speed: 81 deg on Jun 14 01:00 Direction of Minimum Daily Speed Average: 1.2 deg on Jun 29	Percent Operational Time: 100.0
Monthly Average Direction: 294.6 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-Jun	140	122	98	132	138	138	142	139	140	96	143	163	220	112	277	190	146	140	148	166	126	121	130	8	143.6
2-Jun	342	340	288	339	340	317	330	253	274	231	87	97	134	140	269	244	240	124	99	165	251	278	141	78	211.8
3-Jun	208	174	142	155	156	147	157	222	249	247	243	247	293	11	350	339	357	345	1	119	134	353	8	268.7	
4-Jun	140	227	256	264	264	266	275	297	291	286	299	284	292	278	262	312	341	318	315	324	315	349	321	263	290.4
5-Jun	334	294	287	275	6	245	250	226	26	18	333	346	349	348	346	343	359	355	55	53	44	91	110	139	353.8
6-Jun	136	133	136	133	141	140	140	143	141	138	137	144	140	148	159	165	158	181	186	165	177	149	4	71	150.4
7-Jun	148	158	164	310	165	226	259	255	253	245	243	264	346	13	142	239	345	352	346	330	330	341	343	355	298.2
8-Jun	278	334	219	331	337	352	345	323	333	326	325	341	351	68	66	62	107	150	150	112	51	111	115	95	58.9
9-Jun	80	26	31	50	35	37	36	25	24	25	26	27	24	21	15	14	11	359	9	357	345	343	339	336	19.0
10-Jun	340	340	341	95	55	115	131	16	352	342	350	351	6	358	15	31	4	33	3	53	43	8	87	116	9.2
11-Jun	142	111	119	125	110	124	140	140	135	138	141	144	150	143	140	141	132	147	139	133	129	90	15	356	136.2
12-Jun	344	338	337	353	210	207	230	222	224	193	182	201	219	214	204	253	268	254	265	262	231	241	241	245	237.1
13-Jun	245	250	254	247	246	237	236	240	244	247	243	243	248	248	249	248	255	258	261	260	235	327	16	146	248.1
14-Jun	81	157	150	149	109	11	117	145	177	139	181	141	142	127	134	133	120	134	142	153	157	160	116	117	140.2
15-Jun	121	125	119	118	114	131	128	121	137	155	166	168	174	172	178	178	189	195	192	186	191	194	146	142	163.1
16-Jun	147	150	156	158	160	168	176	176	181	193	212	227	239	232	213	207	257	245	248	258	262	268	265	242	206.2
17-Jun	257	260	262	308	333	289	288	294	319	314	315	306	310	288	292	287	274	270	282	351	71	351	348	347	296.0
18-Jun	309	303	334	347	1	323	317	285	272	267	290	261	245	245	244	258	250	242	206	165	134	3	60	348	272.4
19-Jun	330	329	344	324	14	351	264	337	360	353	354	339	332	338	340	357	348	349	4	10	1	338	342	310	346.1
20-Jun	297	357	204	209	220	252	65	60	169	223	269	249	65	72	127	140	141	142	140	149	166	139	135	138	142.8
21-Jun	139	153	144	147	138	129	131	135	138	138	188	250	204	266	262	326	157	89	144	71	83	133	129	142	152.6
22-Jun	144	89	149	124	149	134	139	132	131	133	126	111	288	335	4	296	137	227	260	263	236	240	228	251	215.9
23-Jun	259	182	192	265	211	295	316	328	12	339	352	352	346	303	354	342	332	335	340	67	71	73	349	338	340.6
24-Jun	30	51	357	351	26	18	341	348	334	346	342	334	338	334	345	330	344	9	343	324	323	333	344	330	342.3
25-Jun	339	341	335	345	342	352	4	5	358	18	13	359	357	358	355	12	9	35	40	45	36	90	329	156	7.3
26-Jun	310	345	157	146	135	133	134	129	135	137	126	146	113	336	335	224	238	200	101	149	225	282	297	235	186.4
27-Jun	325	225	211	177	191	250	246	242	249	252	248	244	246	240	91	197	175	236	240	248	138	95	129	118	227.6
28-Jun	165	153	132	148	146	132	179	339	334	282	267	335	353	349	353	358	357	4	10	25	31	40	54	355	8.8
29-Jun	348	76	343	348	344	337	314	8	337	288	282	6	307	306	47	343	354	345	345	28	69	151	153	156	7.9
30-Jun	143	139	136	129	131	138	141	149	143	158	141	150	142	135	124	132	137	137	153	140	159	139	187	194	141.4

176.0 180.4 170.5 158.0 156.9 185.5 203.2 207.4 233.7 246.9 241.7 238.8 257.5 258.0 262.3 264.4 270.1 228.2 238.2 129.9 183.9 202.2 138.5 175.4

Diurnal Average

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



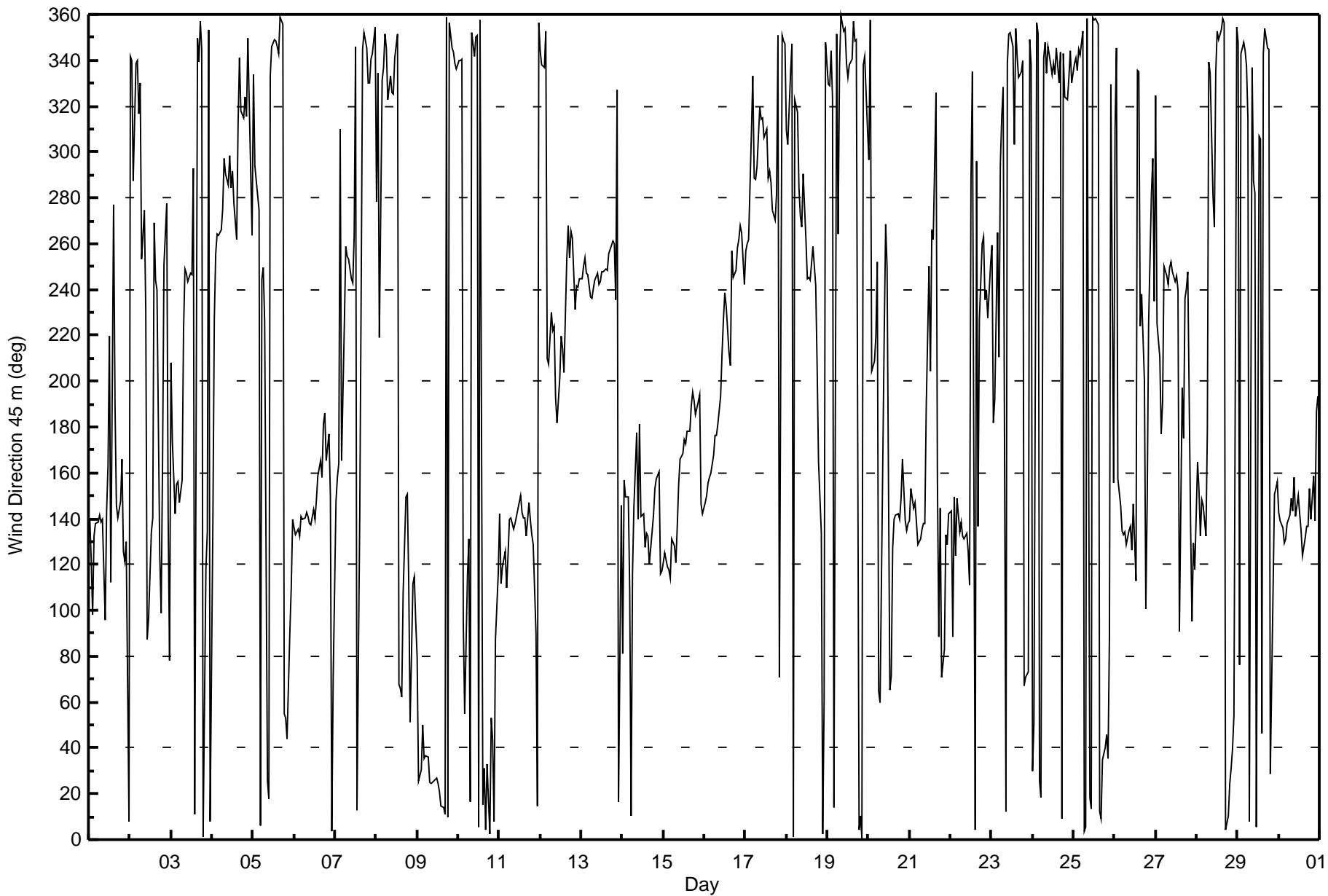
Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction 45 m (WD45m) - deg
Lower Camp Met Tower - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 110 deg on Jun 2 11:00	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0
Minimum Value: 5 deg on Jun 7 22:00	
Percentiles: P ₁ = 8 P ₁₀ = 11 Q ₁ = 15 Median = 21 Q ₃ = 41 P ₉₀ = 70 P ₉₉ = 98	

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-Jun	16	32	20	14	17	15	15	16	33	23	20	24	92	70	23	29	20	17	13	10	83	42	14	79	92
2-Jun	65	33	59	80	32	34	48	63	49	40	110	68	44	45	84	94	17	22	42	14	64	39	40	69	110
3-Jun	45	26	14	25	24	20	16	32	11	10	26	22	13	52	16	15	29	71	79	24	61	56	84	57	84
4-Jun	54	40	11	11	11	13	21	31	16	16	19	22	18	19	20	28	17	17	15	13	11	33	25	71	71
5-Jun	25	27	64	94	60	47	20	52	44	54	25	26	19	20	30	47	41	31	34	19	14	75	38	14	94
6-Jun	13	12	13	16	15	16	16	16	15	17	16	14	16	21	17	14	11	14	10	9	46	16	85	71	85
7-Jun	46	17	18	83	60	45	19	14	22	13	17	48	74	74	60	89	45	19	17	14	8	5	7	58	89
8-Jun	43	21	74	80	24	23	16	16	20	16	18	14	21	41	24	60	30	17	10	58	25	87	16	21	87
9-Jun	19	26	23	20	25	30	21	19	17	17	18	17	18	15	17	17	17	16	17	17	16	14	12	11	30
10-Jun	11	9	42	71	99	30	62	72	30	19	21	22	26	34	38	48	34	96	38	15	14	59	59	33	99
11-Jun	94	30	58	29	22	34	24	15	13	14	14	15	17	16	14	18	25	12	21	14	18	39	34	24	94
12-Jun	12	20	28	52	74	16	12	16	13	19	11	25	9	10	13	30	17	13	16	17	11	9	8	9	74
13-Jun	8	11	11	9	9	9	9	10	12	9	13	11	10	10	11	12	15	13	12	12	8	39	87	86	87
14-Jun	95	33	40	14	46	34	101	17	59	75	75	24	18	31	19	16	15	17	14	17	15	10	21	18	101
15-Jun	14	21	19	19	22	23	41	21	14	18	10	11	9	9	10	12	14	14	18	51	41	28	17	14	51
16-Jun	9	8	8	7	8	11	10	9	12	15	10	16	14	13	16	20	22	16	13	13	14	13	13	10	22
17-Jun	13	10	17	30	23	19	11	15	15	13	17	16	20	15	18	17	18	15	17	36	48	50	23	85	85
18-Jun	16	24	21	20	46	21	33	55	25	17	19	24	17	13	13	23	24	64	101	33	7	82	51	34	101
19-Jun	26	18	9	77	38	36	57	38	23	19	22	25	18	17	19	19	19	20	19	19	17	10	21	23	77
20-Jun	32	71	43	71	40	108	65	76	71	56	39	48	76	39	38	15	12	10	11	12	9	7	7	12	108
21-Jun	17	52	10	15	13	23	29	15	12	13	60	35	51	31	42	103	82	64	11	35	79	12	15	25	103
22-Jun	19	63	84	76	94	12	15	17	15	18	18	35	70	66	45	22	83	39	18	13	8	11	17	62	94
23-Jun	63	41	34	55	22	75	84	46	67	46	21	34	43	102	38	17	16	18	56	20	29	60	18	15	102
24-Jun	77	47	39	35	52	33	18	18	15	16	21	24	18	16	23	15	21	35	32	12	14	12	22	17	77
25-Jun	19	17	21	48	22	24	19	20	17	22	25	21	19	19	23	24	29	31	30	22	24	82	66	72	82
26-Jun	76	53	28	41	11	14	12	14	23	27	43	50	32	87	36	32	17	38	71	62	72	25	89	85	89
27-Jun	73	48	15	35	21	29	20	16	26	20	28	12	10	13	72	57	34	11	14	52	9	41	25	61	73
28-Jun	19	14	34	10	12	14	51	79	33	54	28	73	35	21	17	21	18	19	22	19	16	18	23	53	79
29-Jun	68	43	18	27	20	20	27	70	49	62	54	54	68	58	67	54	56	32	14	28	86	18	12	12	86
30-Jun	9	12	14	19	14	49	19	9	17	82	26	16	26	30	23	21	23	14	11	15	20	16	47	36	82

95	71	84	94	99	108	101	79	71	82	110	73	92	102	84	103	83	96	101	62	86	87	89	86	
Diurnal Maximum																								





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction 100 m (WD100m) - deg
Lower Camp Met Tower - June 2016

Direction of Maximum Speed: 168 deg on Jun 15 12:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 246.6 deg on Jun 13	Hours of Data: 720
Direction of Minimum Speed: 257 deg on Jun 2 06:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 2.3 deg on Jun 2	Percent Operational Time: 100.0
Monthly Average Direction: 274.7 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-Jun	164	149	122	148	144	142	144	139	138	121	151	166	240	173	276	191	141	139	148	168	145	143	149	159	151.4
2-Jun	240	333	345	237	23	257	341	265	287	267	351	106	129	128	286	242	237	133	99	161	237	271	146	104	184.2
3-Jun	214	221	171	211	201	195	196	225	244	245	237	245	246	305	5	353	342	5	5	19	95	139	333	52	276.6
4-Jun	126	245	252	256	258	262	271	293	285	285	297	287	293	276	260	311	340	318	314	323	316	2	327	300	288.7
5-Jun	328	310	275	264	268	246	250	233	4	2	328	345	345	343	346	346	357	2	53	59	59	91	134	142	353.6
6-Jun	140	140	140	138	142	141	140	145	140	140	138	143	139	146	157	166	158	184	187	164	177	145	3	105	149.1
7-Jun	202	195	222	249	249	251	256	265	267	253	244	265	5	52	164	255	346	353	350	337	343	347	353	353	305.0
8-Jun	348	315	10	334	327	327	338	338	322	322	340	355	5	69	73	62	90	151	147	131	95	114	115	97	75.9
9-Jun	92	58	48	60	52	47	44	33	32	32	36	34	31	26	21	19	16	8	16	8	359	356	354	348	29.4
10-Jun	338	336	343	351	269	237	258	304	349	346	353	353	4	359	20	30	9	24	15	57	53	60	89	120	10.8
11-Jun	138	138	142	140	141	144	141	139	140	139	140	143	147	142	141	138	133	146	140	131	137	121	106	96	138.7
12-Jun	23	328	351	61	153	215	230	221	221	196	186	205	227	219	212	252	266	254	264	263	236	241	241	246	236.4
13-Jun	246	249	252	247	246	237	237	238	242	244	240	244	246	247	245	254	256	257	256	237	294	331	222	246.6	
14-Jun	242	182	188	179	151	107	131	137	124	109	159	139	139	126	134	133	123	136	142	153	157	159	128	127	142.1
15-Jun	135	125	122	119	115	129	131	122	138	154	166	168	174	173	180	179	191	198	191	193	210	197	162	160	160.9
16-Jun	167	161	158	159	161	172	177	179	181	195	212	225	233	230	215	208	253	242	245	255	260	267	264	246	205.9
17-Jun	257	258	258	288	314	288	286	292	320	313	314	305	312	290	293	287	273	267	279	352	73	3	4	356	296.6
18-Jun	297	299	298	315	315	301	303	289	273	267	294	259	244	241	241	259	249	252	231	166	140	7	62	34	277.7
19-Jun	331	326	326	317	279	289	260	335	358	357	354	338	332	336	341	358	351	352	7	12	8	1	360	352	345.6
20-Jun	291	279	292	245	87	168	197	91	161	258	266	258	48	68	122	130	133	138	140	156	173	162	160	157	157.0
21-Jun	152	145	156	153	156	148	145	141	148	146	202	245	203	263	269	329	154	101	140	78	84	164	183	163	162.3
22-Jun	147	149	155	149	152	159	146	139	130	131	119	111	299	305	356	289	144	224	258	261	244	250	239	254	203.9
23-Jun	262	213	244	257	232	265	317	340	356	346	348	344	335	291	351	343	339	347	5	71	76	92	360	340	336.9
24-Jun	337	42	354	349	5	15	358	354	341	347	347	335	336	327	351	334	343	23	11	328	331	336	344	358	346.4
25-Jun	21	5	356	350	357	358	6	9	1	21	18	4	3	4	2	16	10	39	47	50	45	82	281	213	14.0
26-Jun	260	296	240	180	188	167	151	144	122	123	143	181	119	340	356	184	233	211	138	168	236	279	351	252	221.7
27-Jun	290	247	236	236	231	247	247	245	255	252	245	241	244	237	97	192	189	234	238	264	148	126	123	145	227.4
28-Jun	207	216	222	204	214	217	234	309	346	302	267	326	350	352	356	2	3	9	17	31	39	55	71	67	8.9
29-Jun	121	119	135	73	72	54	36	91	349	294	303	4	336	337	38	346	7	346	349	35	84	157	154	155	98.6
30-Jun	149	142	142	138	140	140	143	151	152	160	134	141	140	135	126	128	135	136	147	141	153	144	187	218	143.7

181.6 193.0 194.6 180.2 178.3 198.8 196.5 188.0 217.9 244.7 239.6 240.5 263.5 263.5 284.4 290.7 288.7 213.4 203.9 104.9 155.4 144.5 125.0 155.0

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 - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 103 deg on Jun 21 16:00	Hours of Data: 720
Minimum Value: 2 deg on Jun 7 23:00	Hours of Missing Data: 0
Percentiles: P ₁ = 4 P ₁₀ = 6 Q ₁ = 9 Median = 14 Q ₃ = 25 P ₉₀ = 47 P ₉₉ = 88	Hours of Calibration: 0
	Percent Operational Time: 100.0

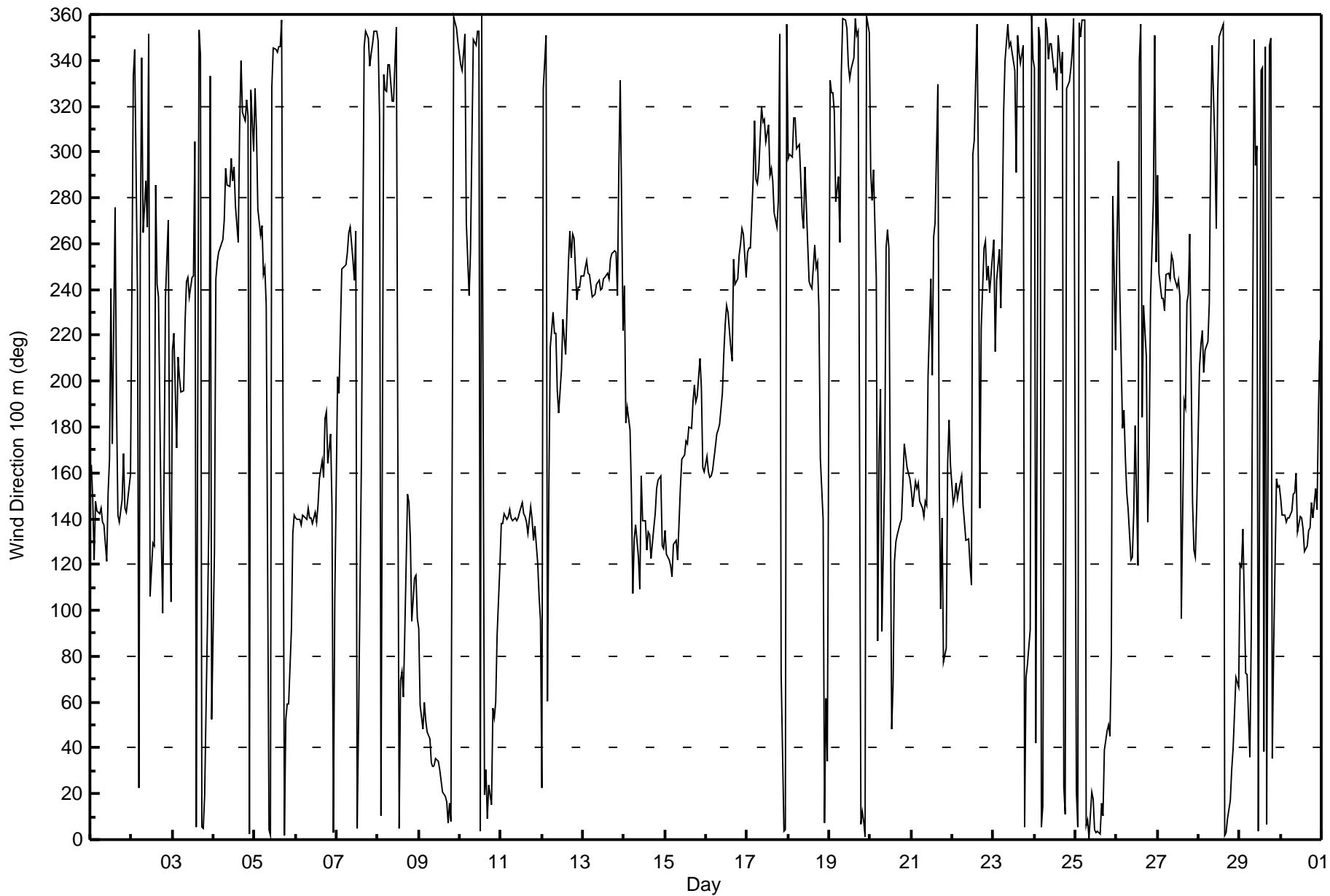
Day	Hourly Period Ending At (MST)																								Daily Maximum
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jun	10	17	14	12	12	5	5	4	13	15	16	24	88	83	17	24	13	4	8	8	69	23	5	31	88
2-Jun	25	34	69	53	54	79	62	53	42	63	98	75	35	33	90	94	10	21	20	17	46	23	42	13	98
3-Jun	30	17	26	18	28	21	21	21	7	7	17	15	10	51	11	9	16	24	77	19	22	35	89	41	89
4-Jun	22	23	6	5	4	6	15	22	11	13	15	17	15	22	17	23	12	12	11	8	6	23	25	14	25
5-Jun	30	19	14	11	15	16	13	37	56	33	20	18	14	16	25	28	26	22	26	11	7	20	11	5	56
6-Jun	4	4	4	4	3	3	3	5	6	5	5	8	11	17	17	14	10	13	10	9	38	15	86	40	86
7-Jun	26	29	7	21	15	12	9	11	19	13	16	50	49	42	33	74	36	14	14	9	4	4	2	6	74
8-Jun	20	16	70	17	14	25	10	12	12	7	17	7	16	27	13	27	11	15	5	35	20	42	7	10	70
9-Jun	6	18	13	9	17	21	12	11	10	9	9	10	11	9	9	8	8	8	9	9	8	7	7	6	21
10-Jun	4	4	9	69	30	21	16	48	19	13	14	14	15	25	30	56	20	67	32	9	6	8	18	13	69
11-Jun	9	7	6	6	4	7	3	3	3	4	6	9	12	9	8	11	15	6	13	7	8	14	21	23	23
12-Jun	53	67	17	47	25	8	9	12	11	18	14	25	7	7	8	25	11	9	10	10	11	7	5	6	67
13-Jun	5	7	6	5	6	6	6	6	9	7	10	9	7	7	7	8	10	9	6	6	4	36	73	13	73
14-Jun	11	25	24	15	17	40	23	9	28	50	63	16	11	21	12	9	8	10	4	16	13	8	10	11	63
15-Jun	6	10	10	10	11	17	29	13	7	14	10	11	8	8	10	11	14	13	16	37	18	26	20	10	37
16-Jun	8	6	7	6	7	10	11	9	10	16	8	12	10	9	13	17	18	13	9	9	7	8	11	7	18
17-Jun	5	6	8	24	12	10	7	12	10	9	11	10	13	12	16	15	15	10	15	25	25	47	16	70	70
18-Jun	31	9	10	22	30	14	28	42	19	12	19	19	13	10	10	18	19	65	63	33	6	81	17	22	81
19-Jun	16	6	4	22	12	37	18	35	11	12	14	19	13	13	14	12	14	14	9	9	7	12	9	10	37
20-Jun	15	5	14	67	67	39	60	70	42	71	36	35	67	31	22	14	7	4	4	9	6	8	7	8	71
21-Jun	8	7	6	4	6	5	5	4	15	12	55	35	46	25	27	103	98	71	8	24	36	14	11	20	103
22-Jun	10	11	11	11	7	6	5	6	4	7	7	29	64	68	51	15	76	34	14	8	6	8	9	44	76
23-Jun	19	35	17	18	14	26	62	36	47	30	15	31	30	76	36	10	11	21	40	12	15	20	26	7	76
24-Jun	32	33	25	9	24	13	8	12	10	11	13	20	12	7	22	10	11	27	24	13	7	4	14	12	33
25-Jun	18	11	13	8	10	11	11	9	10	14	19	14	13	14	16	16	22	23	23	15	7	37	31	40	40
26-Jun	35	18	50	36	23	16	14	20	12	16	52	83	22	85	33	48	12	8	64	36	70	21	44	41	85
27-Jun	31	15	5	59	22	13	12	12	25	14	18	9	7	9	46	48	29	8	10	40	23	18	16	19	59
28-Jun	15	15	24	20	17	18	16	52	24	58	17	60	32	18	11	13	11	10	14	12	9	11	7	21	60
29-Jun	49	13	90	64	13	24	41	45	54	64	71	40	61	67	81	32	38	26	19	15	46	11	9	8	90
30-Jun	7	4	4	6	4	12	6	11	18	33	5	13	18	23	11	14	16	5	9	4	15	18	39	15	39

53	67	90	69	67	79	62	70	56	71	98	83	88	85	90	103	98	71	77	40	70	81	89	70	
Diurnal Maximum																								



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction 100 m (WD100m) - deg
Lower Camp Met Tower - June 2016





Maximum Value: 1.1 km/h on Jun 6 20:00		Maximum Daily Average: 0.3 km/h on Jun 15		Hours in Service: 720																							
Minimum Value: -1.0 km/h on Jun 19 16:00		Minimum Daily Average: -0.5 km/h on Jun 9		Hours of Data: 720																							
Maximum Diurnal Average: 0.0 km/h at hour 21		Minimum Diurnal Average: -0.2 km/h at hour 15		Hours of Missing Data: 0																							
Monthly Average: -0.09 km/h		Percentiles: $P_1 = -0.8$ $P_{10} = -0.5$ $Q_1 = -0.3$ Median = -0.1 $Q_3 = 0.1$ $P_{90} = 0.3$ $P_{99} = 0.8$		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-Jun	0.2	-0.1	-0.6	-0.1	0.1	0.2	0.0	0.3	0.1	-0.5	0.0	0.8	-0.1	0.1	-0.1	0.4	0.3	0.4	0.3	0.6	0.0	0.0	0.0	-0.2	0.1	0.8	
2-Jun	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	0.2	0.2	0.4	0.6	0.2	0.1	0.4	0.1	-0.2	-0.3	-0.3	-0.3	0.2	-0.2	-0.2	-0.1	-0.1	0.0	0.6	
3-Jun	0.0	0.2	0.1	0.1	0.2	0.2	0.3	0.1	-0.3	-0.2	0.1	-0.2	-0.3	-0.4	-0.5	-0.8	-0.3	-0.1	0.0	-0.3	0.1	0.1	-0.1	-0.2	-0.1	0.3	
4-Jun	0.1	0.0	-0.4	-0.5	-0.7	-0.5	-0.4	-0.5	-0.4	-0.6	-0.6	-0.5	-0.8	-0.5	-0.3	-0.5	-0.4	-0.5	-0.8	-0.5	-0.7	-0.2	0.1	0.1	-0.4	0.1	
5-Jun	-0.2	-0.1	0.0	0.0	-0.1	-0.1	-0.2	0.0	-0.1	-0.6	-0.5	-0.6	-0.6	-0.3	-0.5	-0.6	-0.3	-0.3	-0.3	-0.5	-0.2	0.1	0.0	0.0	-0.2	0.1	
6-Jun	0.3	0.0	0.0	-0.2	0.2	0.3	0.3	0.0	0.5	0.6	0.4	0.4	0.2	0.3	0.6	0.8	0.6	0.5	0.4	1.1	0.5	0.5	-0.4	0.0	0.3	1.1	
7-Jun	0.1	0.1	0.2	-0.1	0.1	0.1	-0.4	-0.1	-0.1	-0.2	0.1	-0.1	-0.4	0.0	0.1	0.3	-0.3	-0.4	-0.4	-0.4	-0.2	-0.2	-0.1	0.1	-0.1	0.3	
8-Jun	0.1	-0.2	0.1	-0.1	-0.3	-0.1	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2	-0.3	-0.2	-0.3	0.0	0.1	0.3	0.4	-0.1	-0.4	-0.2	-0.2	-0.3	-0.1	0.4	
9-Jun	-0.6	-0.3	-0.4	-0.5	-0.7	-0.7	-0.6	-0.7	-0.8	-0.7	-0.5	-0.6	-0.6	-0.9	-0.8	-0.8	-0.7	-0.5	-0.5	-0.3	-0.2	-0.3	-0.2	-0.2	-0.5	-0.2	
10-Jun	-0.2	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	-0.4	-0.4	-0.5	-0.8	-0.3	-0.2	-0.4	-0.4	-0.4	0.0	-0.3	-0.3	-0.1	0.1	0.0	-0.1	-0.2	0.1	
11-Jun	0.0	0.1	0.0	0.1	-0.2	0.0	0.1	0.3	0.3	0.3	0.4	0.5	0.5	0.2	0.3	0.1	0.2	0.4	0.2	0.0	-0.1	-0.3	-0.1	-0.2	0.1	0.5	
12-Jun	-0.3	-0.3	-0.2	-0.2	-0.1	0.2	0.0	0.0	-0.1	0.2	0.3	0.3	-0.1	0.3	0.4	-0.4	-0.2	-0.1	-0.4	-0.3	-0.1	-0.1	-0.3	-0.2	-0.1	0.4	
13-Jun	-0.2	-0.2	-0.5	-0.3	-0.2	-0.2	-0.1	-0.2	-0.1	-0.3	-0.3	-0.4	-0.5	-0.3	-0.6	-0.2	-0.6	-0.6	-0.7	-0.5	-0.1	-0.2	0.0	0.1	-0.3	0.1	
14-Jun	-0.1	0.1	0.0	0.0	0.0	-0.2	-0.1	0.2	0.1	0.2	0.0	0.0	0.2	0.0	-0.1	0.0	-0.1	0.3	0.2	0.4	0.8	0.7	-0.4	-0.2	0.1	0.8	
15-Jun	-0.1	0.0	0.0	0.0	-0.2	0.0	0.0	-0.1	0.3	0.6	0.9	0.8	1.0	0.9	0.8	0.7	0.3	0.3	0.5	0.1	0.2	0.3	0.3	0.3	0.3	1.0	
16-Jun	0.4	0.4	0.7	0.6	0.7	0.8	0.6	0.6	0.7	0.6	-0.1	-0.3	-0.2	-0.2	0.2	0.1	-0.6	-0.1	-0.2	-0.4	-0.3	-0.3	-0.4	-0.1	0.1	0.8	
17-Jun	-0.3	-0.5	-0.2	-0.1	-0.2	-0.3	-0.5	-0.4	-0.8	-0.8	-0.5	-0.5	-0.6	-0.7	-0.5	-0.5	-0.5	-0.4	-0.4	-0.5	-0.2	-0.4	-0.3	-0.1	-0.4	-0.1	
18-Jun	-0.2	-0.2	-0.1	-0.3	-0.2	-0.3	-0.3	-0.2	-0.1	-0.4	-0.4	-0.3	0.0	0.0	-0.2	-0.2	-0.2	0.2	0.3	0.1	0.1	-0.5	0.0	-0.1	-0.1	0.3	
19-Jun	-0.1	-0.2	-0.1	0.0	0.0	-0.1	0.0	-0.3	-0.2	-0.6	-0.7	-0.5	-0.7	-0.7	-0.6	-1.0	-0.8	-0.8	-0.7	-0.6	-0.2	-0.1	0.0	0.0	-0.4	0.0	
20-Jun	0.0	0.1	0.1	0.1	0.1	0.0	-0.1	0.0	0.1	0.2	0.1	0.1	-0.1	-0.1	0.1	0.1	0.2	0.2	0.0	0.2	0.5	0.2	0.4	0.3	0.1	0.5	
21-Jun	0.2	0.0	0.1	-0.1	0.1	-0.4	0.1	0.4	0.1	0.2	0.0	-0.2	0.0	-0.2	-0.1	0.1	0.0	0.2	0.1	-0.1	0.1	0.2	0.0	0.1	0.0	0.4	
22-Jun	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.3	0.3	0.6	0.1	0.3	0.4	0.0	-0.3	-0.4	0.0	0.0	-0.5	-0.5	0.1	-0.2	0.1	-0.1	0.0	0.6	
23-Jun	-0.1	0.1	0.1	0.0	0.2	0.0	0.0	-0.3	-0.1	-0.2	-0.2	-0.2	-0.3	0.1	-0.2	-0.4	-0.4	-0.2	-0.4	-0.5	-0.3	0.0	-0.4	-0.3	-0.2	0.2	
24-Jun	-0.1	-0.2	-0.2	-0.1	-0.2	-0.1	-0.2	-0.6	-0.3	-0.6	-0.3	-0.3	-0.5	-0.3	-0.7	-0.3	-0.2	-0.4	-0.2	-0.3	-0.1	-0.3	-0.2	-0.2	-0.3	-0.1	
25-Jun	-0.3	-0.2	-0.2	-0.1	-0.1	-0.3	-0.4	-0.5	-0.7	-0.8	-0.7	-0.6	-0.6	-0.6	-0.7	-0.5	-0.4	-0.3	-0.4	-0.6	-0.1	0.1	0.0	0.1	-0.4	0.1	
26-Jun	-0.1	-0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.2	0.3	0.3	0.2	0.2	-0.3	-0.4	0.0	-0.1	0.3	-0.1	-0.1	-0.2	-0.5	-0.3	-0.1	0.0	0.3	
27-Jun	-0.1	0.1	0.1	0.3	0.2	-0.3	-0.1	0.1	0.0	-0.2	-0.1	-0.1	-0.5	-0.2	-0.2	0.1	0.4	-0.2	-0.3	-0.1	0.2	-0.1	0.0	0.0	0.0	0.4	
28-Jun	0.0	0.1	0.0	0.1	0.0	0.1	0.2	0.0	-0.2	-0.1	0.3	0.3	-0.5	-0.5	-0.8	-0.6	-0.6	-0.7	-0.5	-0.5	-0.3	-0.2	0.0	-0.1	-0.2	0.3	
29-Jun	-0.1	-0.2	-0.3	-0.1	-0.3	-0.1	-0.1	0.1	-0.1	0.1	-0.1	-0.1	-0.3	0.0	-0.1	-0.2	0.0	-0.2	-0.2	-0.2	0.0	0.2	0.4	0.4	-0.1	0.4	
30-Jun	0.1	0.1	0.0	-0.2	0.0	0.1	0.0	0.1	0.2	-0.1	0.1	0.2	0.1	0.1	0.0	0.2	-0.1	0.1	0.2	0.3	0.3	0.2	0.0	0.0	0.1	0.3	
		Diurnal Average																								Diurnal Maximum	
		0.4																								0.8	



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Vertical Wind Speed 20 m (VW20m) - km/h
Lower Camp Met Tower - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 4.2 km/h on Jun 15 10:00 Minimum Value: 0.1 km/h on Jun 20 06:00 Percentiles: P ₁ = 0.2 P ₁₀ = 0.4 Q ₁ = 0.9 Median = 1.6 Q ₃ = 2.3 P ₉₀ = 2.9 P ₉₉ = 3.8																								Hours in Service: 720 Hours of Data: 720 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-Jun	1.4	1.2	1.7	1.6	1.9	2.5	2.1	2.3	1.3	1.6	2.3	2.0	0.9	1.1	2.0	1.8	1.9	2.7	2.0	1.4	1.1	0.7	0.8	0.4	2.7
2-Jun	0.3	0.2	0.2	0.2	0.4	0.5	0.8	1.0	1.3	1.5	1.5	1.7	1.7	1.6	1.6	3.1	3.3	1.8	2.0	0.9	0.7	0.9	0.8	0.7	3.3
3-Jun	0.5	0.6	1.0	0.6	0.8	0.8	1.0	1.2	2.2	2.3	1.8	2.3	3.3	3.3	2.1	2.5	1.9	1.6	1.4	1.7	0.7	0.4	0.7	0.5	3.3
4-Jun	0.4	0.8	1.9	2.8	3.3	3.2	2.5	2.7	3.4	3.3	3.3	3.3	3.5	2.7	2.4	2.8	2.9	3.0	3.4	2.8	2.3	1.0	0.2	0.2	3.5
5-Jun	0.7	0.3	0.2	0.3	0.4	1.0	1.4	1.4	1.4	1.7	2.8	2.7	2.7	2.4	2.6	2.1	1.9	1.6	1.6	1.6	1.0	0.5	0.7	1.9	2.8
6-Jun	2.9	2.7	2.6	2.5	2.1	2.1	2.0	1.7	2.2	2.2	3.0	3.1	3.1	3.1	2.8	2.6	2.4	2.1	2.1	2.5	2.3	1.4	1.3	0.5	3.1
7-Jun	0.4	0.3	0.4	0.5	0.6	0.7	1.8	1.6	1.5	1.9	1.8	1.6	2.1	1.1	0.9	1.1	1.7	2.1	1.7	1.5	0.9	0.4	0.3	0.2	2.1
8-Jun	0.2	0.4	0.4	0.3	0.4	0.4	1.2	0.9	0.9	0.9	0.7	1.1	1.3	1.3	1.1	0.7	0.3	1.7	1.6	1.4	0.8	1.6	2.1	1.8	2.1
9-Jun	2.9	1.5	1.7	2.3	1.9	2.7	2.8	3.4	3.9	3.5	3.0	3.2	3.3	3.5	3.7	3.8	3.3	2.6	3.1	2.3	1.8	1.8	1.6	0.9	3.9
10-Jun	0.8	0.6	0.7	0.5	0.3	0.7	0.6	0.7	1.4	2.2	2.1	2.2	2.2	2.1	2.3	1.9	1.9	1.4	1.0	1.1	0.8	0.3	0.6	1.0	2.3
11-Jun	0.6	0.4	0.5	0.7	0.8	1.0	1.8	2.2	2.3	2.1	3.1	3.1	3.3	3.3	4.0	2.3	2.5	3.8	2.8	3.0	1.9	0.9	0.9	0.6	4.0
12-Jun	0.7	0.6	0.6	0.5	0.4	1.2	1.5	1.4	1.2	1.5	1.6	2.1	1.7	1.7	1.8	2.6	2.7	2.9	2.5	1.6	1.5	2.4	3.1	3.2	3.2
13-Jun	3.2	3.0	2.7	2.5	2.3	2.1	2.2	2.6	2.8	3.2	2.8	3.5	4.1	4.0	3.7	3.5	2.7	2.8	2.8	2.3	1.4	0.8	0.4	0.3	4.1
14-Jun	0.3	0.2	0.2	0.3	0.6	0.6	0.8	1.3	0.8	1.2	1.5	1.6	2.2	2.2	2.2	2.7	2.4	3.0	2.4	2.0	3.5	2.7	1.7	1.4	3.5
15-Jun	1.7	1.5	1.9	2.6	2.5	2.6	1.8	1.7	3.7	4.2	3.8	4.1	3.6	3.6	3.6	3.4	2.5	2.2	1.9	1.3	1.1	1.4	1.2	1.1	4.2
16-Jun	1.3	1.9	2.4	2.5	2.4	2.1	2.1	2.4	2.4	2.3	2.5	2.5	3.1	2.9	2.4	2.0	2.5	2.2	2.0	1.9	1.8	1.6	1.8	1.9	3.1
17-Jun	2.0	1.9	1.8	0.9	0.4	1.8	2.9	2.9	3.2	2.9	2.6	2.9	3.2	3.4	3.2	3.2	3.0	3.0	2.1	2.2	0.8	1.5	1.6	0.8	3.4
18-Jun	1.0	1.4	0.9	0.8	0.7	1.0	0.9	1.5	2.2	2.7	2.3	2.1	2.6	2.5	2.6	2.4	1.7	1.2	1.0	1.2	0.5	2.8	1.2	0.5	2.8
19-Jun	0.3	0.3	0.4	0.3	0.3	0.5	1.0	1.3	1.6	2.0	2.5	2.9	3.6	3.8	3.4	3.3	3.5	3.5	2.8	2.3	1.0	0.3	0.3	0.2	3.8
20-Jun	0.1	0.2	0.1	0.2	0.1	0.1	0.5	0.9	1.1	1.3	1.6	1.7	1.8	1.7	1.7	1.8	1.9	2.0	2.0	1.3	1.0	1.1	1.3	1.3	2.0
21-Jun	1.4	1.4	1.4	1.7	1.3	1.4	1.9	2.2	2.0	1.9	1.9	2.1	2.0	2.1	1.8	1.5	1.4	0.9	0.7	0.3	0.2	0.8	0.7	0.2	2.2
22-Jun	0.2	0.2	0.1	0.2	0.2	0.6	1.8	2.1	1.8	1.7	1.6	1.5	1.6	1.6	1.3	0.9	1.3	2.0	3.4	2.5	1.7	1.5	1.2	1.0	3.4
23-Jun	1.3	1.0	0.4	0.5	0.9	0.7	1.0	1.3	1.2	1.4	1.6	1.5	1.1	1.3	1.9	2.3	1.8	0.9	1.1	1.6	1.2	0.8	0.9	0.7	2.3
24-Jun	0.5	0.4	0.4	0.5	0.8	0.5	1.0	1.6	1.9	2.3	1.9	1.9	2.4	1.9	2.7	2.0	1.0	1.7	0.8	1.2	1.5	1.2	0.9	0.7	2.7
25-Jun	0.7	0.5	0.4	0.5	0.7	1.3	2.0	2.2	1.8	2.7	2.2	2.3	2.2	2.2	2.0	2.2	2.3	2.0	1.8	1.6	0.6	0.2	0.2	0.2	2.7
26-Jun	0.3	0.3	0.2	0.3	0.5	0.7	1.6	1.3	1.4	1.5	1.5	1.3	1.6	2.4	1.2	0.4	1.8	1.4	0.6	1.3	1.6	2.8	0.8	0.7	2.8
27-Jun	0.6	0.9	1.0	0.9	0.9	1.4	2.0	1.7	1.6	1.7	1.9	2.3	3.0	3.1	2.1	1.2	1.4	2.3	1.6	1.1	0.9	0.7	0.9	0.5	3.1
28-Jun	0.3	0.3	0.3	0.2	0.5	0.7	0.8	1.0	1.3	1.3	1.7	1.8	2.1	2.3	2.6	2.6	2.6	2.7	2.4	2.4	1.2	0.6	0.8	0.6	2.7
29-Jun	0.5	0.9	0.6	0.3	0.5	0.5	0.7	0.9	1.1	1.5	1.3	1.7	1.1	1.3	1.4	1.5	1.2	1.3	0.8	0.7	0.6	1.2	2.0	1.9	2.0
30-Jun	1.8	2.2	2.7	2.0	2.1	0.7	1.2	1.5	1.6	1.0	0.6	1.2	2.0	2.2	2.5	2.5	2.1	2.6	1.7	2.3	1.8	0.9	0.9	0.5	2.7
Diurnal Maximum																									



Maximum Value: 1.4 km/h on Jun 20 23:00 Maximum Daily Average: 0.6 km/h on Jun 6																				Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: -1.6 km/h on Jun 17 09:00 Minimum Daily Average: -0.8 km/h on Jun 4 Maximum Diurnal Average: 0.1 km/h at hour 24 Minimum Diurnal Average: -0.2 km/h at hour 13 Monthly Average: -0.05 km/h Percentiles: P ₁ = -1.3 P ₁₀ = -0.7 Q ₁ = -0.4 Median = 0.0 Q ₃ = 0.2 P ₉₀ = 0.6 P ₉₉ = 1.1																											
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-Jun	0.8	0.0	-0.6	0.3	0.5	0.6	0.4	0.5	0.3	-0.4	0.6	1.0	-0.1	0.3	-0.4	0.1	0.5	0.8	0.6	0.3	0.2	0.3	0.3	-0.1	0.3	1.0	
2-Jun	0.0	0.0	0.0	-0.1	-0.1	-0.2	0.2	0.2	0.2	0.7	1.1	0.3	0.3	0.8	0.2	-0.2	-0.3	0.2	0.2	0.3	-0.3	-0.3	0.0	0.0	0.1	1.1	
3-Jun	0.0	0.2	0.4	0.2	0.3	0.5	0.5	0.2	-0.4	-0.4	0.2	-0.3	-0.3	-0.9	-0.7	-1.0	-0.6	-0.2	0.0	-0.4	0.1	0.2	-0.1	-0.3	-0.1	0.5	
4-Jun	0.2	-0.1	-0.6	-0.9	-1.3	-1.1	-0.8	-0.7	-1.1	-1.2	-1.3	-1.0	-1.5	-0.9	-0.3	-0.8	-0.9	-1.1	-1.6	-1.2	-1.3	-0.4	-0.1	-0.1	-0.1	-0.8	0.2
5-Jun	-0.4	-0.3	0.0	0.0	-0.2	-0.1	-0.2	-0.1	0.1	-0.5	-0.9	-0.9	-0.8	-0.7	-0.7	-0.7	-0.4	-0.3	-0.2	-0.4	-0.1	0.1	0.2	0.3	-0.3	0.3	
6-Jun	0.8	0.6	0.6	0.3	0.5	0.4	0.5	0.2	0.8	0.8	0.9	1.0	0.8	0.7	1.1	1.0	0.9	0.2	0.2	1.1	0.1	1.0	-0.5	0.0	0.6	1.1	
7-Jun	0.2	0.2	0.2	-0.2	0.1	0.0	-0.4	-0.2	0.0	-0.1	0.0	-0.3	-0.6	-0.2	0.1	0.5	-0.4	-0.6	-0.6	-0.7	-0.6	-0.4	-0.3	0.0	-0.2	0.5	
8-Jun	0.0	-0.2	0.1	-0.2	-0.4	-0.2	-0.6	-0.5	-0.1	-0.3	-0.3	-0.3	-0.3	0.0	-0.3	0.0	0.2	0.6	0.7	0.1	-0.4	0.0	0.4	0.1	-0.1	0.7	
9-Jun	0.0	-0.2	-0.2	-0.2	-0.4	-0.7	-0.3	-0.5	-0.6	-0.6	-0.4	-0.5	-0.3	-0.8	-0.7	-0.8	-0.8	-0.6	-0.6	-0.5	-0.4	-0.5	-0.5	-0.3	-0.5	0.0	
10-Jun	-0.4	-0.3	-0.2	-0.1	0.0	0.1	0.1	0.1	-0.3	-0.6	-0.7	-0.8	-0.2	-0.4	-0.4	-0.5	-0.4	0.2	-0.3	-0.3	0.0	0.1	0.1	0.1	-0.2	0.2	
11-Jun	0.1	0.3	0.2	0.3	0.0	0.2	0.3	0.5	0.8	0.6	1.0	1.1	1.0	0.8	1.0	0.4	0.5	1.1	0.7	0.6	0.3	-0.1	-0.2	-0.3	0.5	1.1	
12-Jun	-0.8	-0.5	-0.3	-0.3	-0.1	0.2	0.0	0.2	0.0	0.2	0.1	0.2	-0.2	0.0	0.1	-0.3	-0.7	-0.3	-0.6	-0.4	0.1	-0.1	0.0	-0.2	-0.1	0.2	
13-Jun	-0.2	-0.2	-0.5	-0.2	-0.3	0.2	-0.1	-0.1	-0.2	-0.6	-0.2	-0.5	-0.6	-0.5	-0.8	-0.4	-0.8	-0.8	-0.9	-0.8	0.1	-0.4	0.0	0.1	-0.4	0.2	
14-Jun	0.0	0.2	0.1	0.1	0.2	-0.2	0.0	0.2	0.0	0.3	0.2	0.2	0.4	0.4	0.5	0.6	0.3	0.6	0.6	0.9	1.0	0.2	0.1	0.3	1.0	1.0	
15-Jun	0.2	0.3	0.4	0.6	0.2	0.6	0.2	0.2	1.0	1.1	0.9	0.5	-0.2	0.5	0.4	0.1	-0.4	-0.1	0.4	0.5	0.3	0.1	0.9	0.9	0.4	1.1	
16-Jun	1.1	1.1	1.2	1.2	1.1	0.8	0.3	0.2	0.2	0.2	-0.4	-0.1	0.0	0.1	0.3	-0.1	-0.7	0.0	-0.1	-0.5	-0.4	-0.6	-0.5	0.0	0.2	1.2	
17-Jun	-0.3	-0.4	-0.2	-0.3	-0.3	-0.7	-1.3	-1.1	-1.6	-1.4	-0.9	-1.0	-1.1	-1.2	-1.2	-1.2	-0.9	-1.0	-0.9	-0.6	0.0	-0.6	-0.6	-0.1	-0.8	0.0	
18-Jun	-0.4	-0.5	-0.2	-0.5	-0.2	-0.4	-0.3	-0.3	-0.1	-0.7	-0.7	-0.5	-0.3	-0.1	-0.2	-0.3	-0.3	0.2	0.4	0.3	0.6	-0.7	0.0	-0.2	-0.2	0.6	
19-Jun	-0.2	-0.3	-0.3	0.0	0.0	-0.2	0.1	-0.5	-0.2	-0.8	-0.7	-0.9	-1.3	-1.4	-1.2	-0.8	-1.1	-1.1	-0.9	-0.4	-0.3	-0.3	-0.1	0.0	-0.5	0.1	
20-Jun	0.0	0.1	0.0	0.0	0.1	0.0	-0.1	0.2	0.1	0.2	0.0	-0.1	-0.1	0.1	0.3	0.5	0.8	0.6	0.5	0.7	0.7	1.2	1.4	1.0	0.3	1.4	
21-Jun	0.6	-0.1	0.5	0.3	0.2	-0.2	0.5	0.7	0.6	0.6	0.1	-0.3	0.0	-0.2	-0.1	0.3	0.2	0.3	0.3	0.0	0.1	1.0	0.4	0.2	0.3	1.0	
22-Jun	0.3	0.2	0.1	0.2	0.1	0.3	0.4	0.5	0.6	0.9	0.4	0.5	0.5	0.0	-0.3	-0.6	0.2	0.1	-1.0	-0.7	0.2	0.0	0.0	0.0	0.1	0.9	
23-Jun	0.0	0.0	0.0	-0.1	0.0	-0.1	0.2	-0.2	0.0	-0.3	-0.3	-0.1	-0.1	0.4	-0.1	-0.6	-0.7	-0.3	-0.4	-0.2	0.0	-0.1	-0.5	-0.5	-0.2	0.4	
24-Jun	-0.1	-0.1	-0.2	-0.2	-0.1	-0.2	-0.3	-0.6	-0.6	-1.0	-0.6	-0.6	-0.8	-0.7	-0.9	-0.7	-0.3	-0.3	-0.4	-0.6	-0.5	-0.6	-0.3	-0.3	-0.5	-0.1	
25-Jun	-0.4	-0.3	-0.3	-0.1	-0.2	-0.2	-0.5	-0.6	-0.8	-0.8	-0.5	-0.6	-0.7	-0.7	-0.4	-0.4	-0.4	-0.1	-0.2	-0.3	-0.1	0.1	0.0	0.2	-0.3	0.2	
26-Jun	-0.1	-0.2	0.2	0.3	0.5	0.5	0.5	0.3	0.4	0.5	0.7	0.5	0.5	-0.3	-0.6	-0.1	0.1	0.3	0.1	-0.1	-0.4	-1.0	-0.3	0.0	0.1	0.7	
27-Jun	-0.1	0.1	0.1	0.4	0.0	-0.3	0.0	0.1	0.1	-0.1	-0.2	-0.1	-0.5	0.0	0.0	0.3	0.6	-0.1	-0.1	0.0	0.9	0.2	0.3	0.2	0.1	0.9	
28-Jun	0.1	0.3	0.2	0.1	0.3	0.5	0.3	0.1	-0.4	0.0	0.3	0.4	-0.7	-0.6	-1.0	-0.6	-0.7	-0.6	-0.6	-0.4	-0.2	0.0	0.2	-0.1	-0.1	0.5	
29-Jun	0.0	0.0	-0.4	-0.1	-0.5	-0.2	-0.3	0.4	0.0	0.2	-0.1	-0.1	-0.3	0.1	0.1	0.0	0.2	-0.3	-0.3	-0.2	0.2	0.6	0.9	0.7	0.0	0.9	
30-Jun	0.6	0.7	0.6	0.2	0.5	0.2	0.3	0.5	0.6	0.0	0.2	0.4	0.5	0.5	0.6	0.7	0.5	0.7	0.6	0.9	0.5	0.6	0.1	0.1	0.5	0.9	
																								Diurnal Average			
																								Diurnal Maximum			



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Vertical Wind Speed 45 m (VW45m) - km/h
Lower Camp Met Tower - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 5.0 km/h on Jun 15 13:00 Minimum Value: 0.1 km/h on Jun 20 05:00 Percentiles: P ₁ = 0.2 P ₁₀ = 0.5 Q ₁ = 1.0 Median = 1.7 Q ₃ = 2.4 P ₉₀ = 3.1 P ₉₉ = 4.5																								Hours in Service: 720 Hours of Data: 720 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-Jun	1.6	1.4	1.7	1.5	1.9	2.6	2.3	2.4	1.6	1.5	2.3	2.1	1.0	1.2	2.1	2.0	2.0	2.8	2.1	1.5	1.2	0.8	0.8	0.6	2.8
2-Jun	0.3	0.2	0.2	0.3	0.4	0.5	0.9	1.1	1.5	1.7	1.4	1.8	1.9	1.8	1.9	2.9	2.8	1.7	2.2	1.0	0.8	1.1	0.8	0.8	2.9
3-Jun	0.6	0.8	1.0	0.7	0.9	1.0	1.1	1.4	1.8	2.0	1.8	2.4	3.1	3.3	2.0	2.7	2.0	1.5	1.5	1.8	0.9	0.5	0.7	0.6	3.3
4-Jun	0.5	1.0	2.1	3.0	3.6	3.6	2.9	3.1	3.7	3.6	3.4	3.6	3.5	2.8	2.7	3.2	3.1	3.3	3.7	3.1	2.4	1.1	0.3	0.3	3.7
5-Jun	0.8	0.4	0.3	0.4	0.4	1.2	1.6	1.3	1.5	2.1	3.1	2.8	2.9	2.5	2.7	2.1	2.1	1.8	1.8	1.8	1.2	0.7	1.0	2.1	3.1
6-Jun	2.9	2.5	2.7	2.3	2.2	2.3	2.1	1.8	2.4	2.4	3.2	3.0	3.0	3.1	3.2	2.9	2.6	2.6	2.8	2.9	2.7	1.4	1.6	0.6	3.2
7-Jun	0.5	0.5	0.5	0.8	0.7	0.9	1.9	1.7	1.5	1.8	1.8	1.8	2.2	1.3	0.9	1.2	1.9	2.2	1.8	1.7	1.1	0.4	0.2	0.2	2.2
8-Jun	0.2	0.5	0.4	0.3	0.4	0.5	1.1	0.9	1.0	0.9	0.9	1.1	1.4	1.4	1.0	0.8	0.5	1.8	1.7	1.6	0.8	1.7	2.2	2.2	2.2
9-Jun	3.0	1.6	2.0	2.5	2.2	3.0	3.1	3.5	3.9	3.5	3.1	3.3	3.4	3.3	3.8	4.0	3.6	2.9	3.3	2.5	2.0	2.1	1.8	1.1	4.0
10-Jun	0.9	0.8	0.9	0.5	0.3	0.7	0.8	0.8	1.7	2.3	2.3	2.3	2.4	2.3	2.4	2.1	2.1	1.6	1.0	1.0	0.8	0.5	0.8	1.2	2.4
11-Jun	0.7	0.6	0.6	0.9	0.8	1.2	2.1	2.4	2.2	2.2	3.1	3.3	3.5	3.4	3.9	2.3	2.9	3.7	2.9	2.9	1.8	1.0	1.1	0.8	3.9
12-Jun	0.8	0.6	0.7	0.5	0.4	1.3	1.5	1.5	1.4	1.7	1.8	2.4	1.9	2.0	2.1	2.7	2.9	2.8	2.8	1.9	1.5	2.2	2.9	2.9	2.9
13-Jun	2.7	2.7	2.6	2.3	2.1	2.2	2.1	2.3	2.6	2.8	3.0	3.3	3.6	3.4	3.3	3.2	2.7	2.7	3.0	2.4	1.3	0.9	0.4	0.4	3.6
14-Jun	0.5	0.3	0.2	0.4	0.8	0.8	0.8	1.4	0.8	1.3	1.6	1.6	2.3	2.4	2.2	2.7	2.5	3.2	2.5	2.1	3.7	2.9	1.7	1.6	3.7
15-Jun	1.7	1.6	2.0	3.0	2.8	2.7	1.8	1.9	3.7	4.7	4.5	5.0	5.0	5.0	4.9	4.5	3.3	2.9	2.3	1.6	1.2	1.9	1.3	1.1	5.0
16-Jun	1.4	1.9	2.7	2.6	2.7	2.6	2.9	3.4	3.3	2.9	3.2	2.8	3.1	2.9	2.8	2.4	2.7	2.0	1.8	1.8	1.9	1.7	1.9	1.6	3.4
17-Jun	2.1	1.9	1.8	1.2	0.5	1.9	2.7	2.9	3.3	3.0	2.9	3.0	3.5	3.4	3.2	3.4	3.2	3.1	2.2	2.2	1.0	1.6	1.7	0.9	3.5
18-Jun	1.2	1.7	1.2	1.0	0.8	1.3	1.1	1.9	2.6	2.8	2.4	2.2	2.4	2.5	2.4	2.5	1.8	1.4	1.2	1.3	0.6	3.1	1.4	0.6	3.1
19-Jun	0.3	0.3	0.4	0.4	0.4	0.6	1.3	1.3	1.6	2.0	2.9	3.3	3.8	4.1	3.7	3.6	3.7	3.6	3.1	2.5	1.2	0.4	0.4	0.3	4.1
20-Jun	0.1	0.2	0.2	0.2	0.1	0.1	0.6	0.9	1.2	1.6	1.9	2.1	1.7	1.7	1.7	1.7	1.7	1.8	2.0	1.4	1.0	1.1	1.1	1.5	2.1
21-Jun	1.7	1.7	1.4	1.9	1.5	1.5	2.1	2.3	1.9	1.7	1.8	2.3	2.4	2.2	2.0	1.8	1.6	1.1	0.7	0.4	0.3	1.2	1.0	0.4	2.4
22-Jun	0.4	0.3	0.2	0.4	0.3	0.7	2.0	2.2	1.7	1.7	1.5	1.5	1.8	1.8	1.4	1.0	1.4	1.9	3.6	2.4	1.6	1.5	1.3	1.0	3.6
23-Jun	1.4	1.4	0.6	0.7	1.1	1.0	1.1	1.4	1.3	1.5	1.7	1.8	1.2	1.5	2.1	2.5	1.9	0.9	1.2	1.6	1.3	0.9	0.9	0.9	2.5
24-Jun	0.5	0.5	0.5	0.5	1.0	0.5	1.0	1.6	2.0	2.4	2.0	2.1	2.5	2.0	2.9	2.2	1.1	1.9	0.8	1.2	1.6	1.3	1.1	0.8	2.9
25-Jun	0.8	0.6	0.4	0.6	0.9	1.5	2.1	2.2	1.8	2.5	2.3	2.3	2.2	2.2	2.2	2.3	2.4	2.3	1.9	1.6	0.5	0.3	0.2	0.3	2.5
26-Jun	0.4	0.4	0.2	0.4	0.5	0.8	1.6	1.3	1.6	1.6	1.5	1.6	1.7	2.6	1.0	0.5	1.9	1.5	0.7	1.5	1.7	3.3	0.8	0.9	3.3
27-Jun	0.8	1.1	1.1	1.0	1.1	1.6	2.0	1.7	1.7	1.8	2.0	2.2	2.6	3.0	2.2	1.3	1.6	2.0	1.6	1.3	0.8	0.8	0.8	0.6	3.0
28-Jun	0.4	0.5	0.5	0.3	0.5	0.7	1.0	1.1	1.2	1.5	1.9	2.0	2.2	2.4	2.5	2.6	2.8	2.8	2.6	2.5	1.1	0.7	1.0	0.8	2.8
29-Jun	0.7	1.2	0.6	0.4	0.5	0.5	0.7	0.9	1.2	1.6	1.6	1.7	1.4	1.4	1.5	1.7	1.4	1.4	0.8	0.7	0.8	1.4	2.4	2.1	2.4
30-Jun	1.7	2.5	2.9	2.2	2.1	0.8	1.2	1.3	1.7	1.0	0.6	1.1	2.0	2.3	2.4	2.6	2.2	2.5	1.8	2.6	1.8	1.1	1.0	0.7	2.9
Diurnal Maximum																									



Maximum Value: 2.6 km/h on Jun 29 23:00		Maximum Daily Average: 1.3 km/h on Jun 11		Hours in Service: 720																						
Minimum Value: -1.5 km/h on Jun 4 13:00		Minimum Daily Average: -0.3 km/h on Jun 4		Hours of Data: 720																						
Maximum Diurnal Average: 0.4 km/h at hour 1		Minimum Diurnal Average: 0.1 km/h at hour 10		Hours of Missing Data: 0																						
Monthly Average: 0.29 km/h		Percentiles: P ₁ = -1.0 P ₁₀ = -0.4 Q ₁ = -0.1 Median = 0.1 Q ₃ = 0.6 P ₉₀ = 1.2 P ₉₉ = 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-Jun	2.3	1.6	-1.0	0.0	0.6	1.4	1.0	1.4	1.0	-0.6	0.8	1.1	0.0	0.4	-0.3	-0.1	1.1	1.2	1.1	0.1	0.2	0.5	1.2	0.3	0.6	2.3
2-Jun	0.0	0.1	0.1	0.1	-0.3	-0.1	0.7	0.2	0.0	1.1	2.2	0.0	0.1	0.5	0.3	0.7	0.7	0.9	0.7	0.3	0.0	0.1	0.4	0.4	0.4	2.2
3-Jun	0.2	0.0	-0.1	0.2	0.2	0.2	0.0	0.5	0.1	0.2	0.4	0.1	1.0	-0.6	-0.5	-0.3	0.0	0.4	0.3	0.4	0.2	0.1	0.0	0.0	0.1	1.0
4-Jun	0.4	0.0	0.0	0.0	0.0	0.0	-0.2	-0.5	-0.8	-0.5	-1.1	-0.9	-1.5	-0.3	0.6	0.5	-0.9	-0.2	-0.9	-1.0	-0.8	0.0	0.0	-0.3	-0.3	0.6
5-Jun	-0.2	-0.2	-0.1	-0.1	0.0	-0.2	-0.2	0.4	0.3	-0.1	-0.1	-0.3	-0.8	-0.6	-0.5	-0.7	-0.2	0.2	0.2	-0.1	0.2	0.6	0.8	1.4	0.0	1.4
6-Jun	1.8	1.9	1.8	1.7	1.4	1.6	1.4	1.1	1.3	1.3	1.8	1.9	1.5	1.7	2.0	0.9	1.2	0.0	-0.2	0.5	-0.4	1.3	-0.5	0.2	1.1	2.0
7-Jun	0.0	0.2	0.2	0.1	-0.1	-0.2	1.0	0.1	0.2	0.4	0.1	-0.3	0.2	0.0	-0.1	0.5	-0.1	-0.8	-0.1	-0.4	0.0	-0.1	-0.1	0.1	0.0	1.0
8-Jun	0.0	-0.2	-0.1	0.0	-0.2	-0.2	-0.2	-0.4	-0.2	-0.3	-0.1	0.0	-0.2	0.8	0.0	0.2	0.6	1.2	1.4	1.1	-0.1	0.6	0.9	1.1	0.2	1.4
9-Jun	0.7	0.3	0.0	-0.1	0.2	0.0	-0.1	-0.1	-0.1	-0.2	-0.2	-0.1	0.0	0.0	-0.3	-0.5	-0.1	0.2	-0.1	0.4	0.2	0.1	-0.1	-0.2	0.0	0.7
10-Jun	-0.2	-0.2	-0.1	-0.1	0.0	-0.1	-0.1	0.0	0.3	0.1	-0.6	-0.7	-0.2	0.0	-0.7	-0.3	0.2	0.2	-0.3	-0.3	0.2	0.4	-0.1	0.0	-0.1	0.4
11-Jun	0.6	0.6	1.0	0.9	0.7	1.3	2.6	1.9	1.5	1.1	1.5	2.1	2.0	2.1	1.3	1.3	2.2	1.8	1.2	0.9	0.4	0.1	-0.1	1.3	2.6	
12-Jun	-0.1	-0.2	-0.2	0.0	0.2	0.7	0.6	0.7	0.6	0.3	0.1	0.6	1.1	0.9	0.2	0.6	-0.3	0.7	-0.2	0.0	0.7	0.8	1.0	0.9	0.4	1.1
13-Jun	1.1	1.2	0.9	0.5	0.7	0.9	0.7	1.0	0.9	0.2	0.6	0.4	0.6	0.8	0.1	0.3	-0.2	-0.3	0.1	0.1	0.7	0.1	0.0	0.0	0.5	1.2
14-Jun	0.1	0.1	0.0	0.2	0.5	-0.1	0.1	0.3	-0.1	0.4	0.8	0.1	1.0	1.0	1.4	1.3	0.8	1.5	2.0	1.1	1.2	1.9	0.8	0.5	0.7	2.0
15-Jun	0.8	0.7	0.6	1.5	1.1	0.9	0.6	0.5	1.7	1.9	0.8	0.2	-0.9	-0.3	-0.2	-0.2	-0.3	0.3	0.1	0.7	0.5	0.4	1.2	1.2	0.6	1.9
16-Jun	0.5	0.6	1.1	0.7	0.5	-0.3	-0.2	-0.4	-0.4	0.7	0.3	1.2	1.3	1.5	1.0	0.2	0.1	0.3	0.7	0.1	0.3	0.0	0.3	0.4	0.4	1.5
17-Jun	0.5	0.5	1.3	0.0	-0.4	-0.1	-0.9	-0.9	-1.2	-1.4	-0.1	-0.7	-0.4	-0.3	-0.5	-0.8	-0.1	-0.4	-0.4	-0.1	0.2	-0.3	0.1	0.3	-0.3	1.3
18-Jun	-0.4	-0.1	0.5	-0.7	0.0	-0.1	0.0	0.0	0.7	-0.6	-0.1	-0.2	0.0	0.1	0.1	-0.1	-0.2	0.3	0.8	0.7	0.5	0.4	0.1	0.0	0.1	0.8
19-Jun	-0.2	-0.3	-0.2	-0.1	-0.2	-0.2	0.5	-0.3	-0.2	-0.5	-0.3	-0.6	-1.1	-1.0	-0.5	-0.1	0.1	-0.8	-0.1	0.2	0.3	-0.1	0.1	0.1	-0.2	0.5
20-Jun	-0.2	-0.2	-0.2	0.0	0.1	0.2	0.1	0.4	0.1	0.4	0.2	0.0	-0.2	0.5	-0.1	0.4	0.6	0.6	0.9	0.9	0.5	1.0	1.6	1.7	0.4	1.7
21-Jun	2.0	0.8	0.7	2.3	0.3	0.3	1.5	1.3	0.4	0.3	-0.1	0.1	0.3	0.6	0.4	0.4	0.5	-0.1	-0.2	-0.1	0.1	0.4	0.0	0.3	0.5	2.3
22-Jun	0.9	0.5	0.2	0.7	0.4	0.3	0.8	0.7	0.2	0.2	0.3	0.5	0.8	0.7	0.1	-0.4	0.3	0.6	-0.3	0.1	0.7	0.5	1.2	0.5	0.4	1.2
23-Jun	0.2	-0.2	0.1	-0.2	0.2	-0.3	0.5	-0.3	0.1	0.0	0.0	0.4	0.4	0.7	-0.4	-0.4	-0.4	-0.1	-0.1	0.1	0.1	0.1	-0.3	-0.5	0.0	0.7
24-Jun	-0.2	-0.2	-0.2	-0.2	-0.1	-0.4	0.0	-0.2	-0.4	-0.7	-0.4	0.0	-0.6	-1.0	-0.4	-0.2	-0.2	0.3	0.0	-0.3	-0.4	-0.3	-0.3	0.1	-0.3	0.3
25-Jun	0.1	-0.2	-0.2	-0.1	-0.2	0.4	-0.1	-0.3	-0.8	-0.8	-0.3	0.0	0.0	-0.3	0.2	0.0	-0.1	0.4	0.4	-0.3	0.0	0.3	0.0	0.0	-0.1	0.4
26-Jun	0.0	-0.3	0.0	0.2	0.1	0.3	0.4	0.1	0.3	0.1	0.9	0.3	0.3	0.2	-0.3	0.0	1.4	0.5	0.3	0.4	0.0	-0.6	-0.3	0.4	0.2	1.4
27-Jun	0.5	1.1	1.3	0.6	-0.1	0.6	0.7	0.2	0.7	-0.2	0.0	0.2	-0.2	0.5	1.4	0.7	0.6	0.4	0.2	0.5	0.3	0.7	0.5	0.5	0.5	1.4
28-Jun	0.1	0.1	0.2	0.0	0.0	0.0	0.4	0.5	-0.4	0.6	0.1	0.6	-0.5	-0.4	-0.6	-0.6	0.0	-0.4	0.1	-0.1	-0.2	0.1	0.8	0.3	0.0	0.8
29-Jun	0.0	0.2	0.1	0.1	0.3	0.0	-0.2	0.3	0.1	0.1	0.4	-0.4	0.0	0.4	0.0	-0.2	0.6	-0.6	-0.2	-0.3	0.1	1.0	2.6	2.4	0.3	2.6
30-Jun	1.4	1.8	2.4	1.8	1.4	0.4	0.9	0.7	0.5	0.2	0.5	-0.1	0.9	0.5	0.6	1.2	1.1	1.1	2.4	2.1	1.3	0.5	0.6	0.4	1.0	2.4
																								Diurnal Average		
																								Diurnal Maximum		
																								0.4 2.3		
																								0.3 1.9		
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																								0.4 1.9		
																								0.4 2.6		
																								0.4 2.4		



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Vertical Wind Speed 100 m (VW100m) - km/h
Lower Camp Met Tower - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 5.4 km/h on Jun 15 12:00 Minimum Value: 0.2 km/h on Jun 8 00:00 Percentiles: P ₁ = 0.3 P ₁₀ = 0.6 Q ₁ = 1.1 Median = 1.7 Q ₃ = 2.5 P ₉₀ = 3.2 P ₉₉ = 4.2																								Hours in Service: 720 Hours of Data: 720 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-Jun	1.7	1.5	1.2	1.1	1.3	1.4	1.3	1.0	1.5	1.6	1.9	2.4	1.1	1.4	2.4	2.0	1.5	1.5	1.7	1.3	1.5	1.4	0.9	0.9	2.4
2-Jun	0.4	0.4	0.3	0.4	0.5	0.5	1.2	1.3	1.7	1.7	1.5	1.8	1.9	2.2	2.3	3.1	2.4	1.3	1.8	1.2	0.9	1.4	0.8	0.6	3.1
3-Jun	0.7	1.1	1.2	1.1	1.1	1.2	1.3	1.6	1.7	2.1	1.9	3.2	3.4	2.8	1.6	2.2	2.3	1.4	1.1	1.9	1.4	0.7	1.0	0.8	3.4
4-Jun	0.9	1.4	2.2	2.1	2.4	2.7	3.9	3.7	3.8	4.1	3.7	3.8	3.6	3.2	3.0	3.9	2.9	3.8	3.7	2.9	2.3	1.7	0.4	0.7	4.1
5-Jun	1.1	0.6	0.5	0.7	0.7	1.5	1.6	1.5	1.4	2.2	3.7	3.2	3.0	2.5	2.5	2.4	2.6	2.2	2.2	1.6	1.0	1.1	1.5	1.9	3.7
6-Jun	1.8	1.5	1.5	1.3	1.1	0.9	0.9	1.2	1.8	1.8	2.3	2.7	2.7	3.3	3.7	3.5	3.3	2.5	2.6	3.4	2.9	2.0	2.1	1.0	3.7
7-Jun	1.0	0.7	1.0	1.3	1.2	1.2	1.8	1.6	1.7	1.9	2.2	1.7	2.4	1.4	0.6	1.2	1.7	2.3	1.9	1.5	0.7	0.6	0.2	0.2	2.4
8-Jun	0.3	0.5	0.5	0.3	0.5	0.4	0.9	0.8	0.9	0.6	0.9	0.8	1.5	1.9	1.2	1.0	0.8	2.0	1.2	1.5	1.0	1.8	1.6	2.3	2.3
9-Jun	2.6	1.7	2.4	2.7	2.7	3.0	3.5	3.5	4.0	3.8	2.9	3.5	3.6	3.4	3.5	3.7	3.3	2.4	2.9	2.5	1.9	1.8	1.7	1.1	4.0
10-Jun	0.6	0.4	0.5	0.5	0.5	0.6	0.5	0.9	2.2	2.6	2.5	2.6	2.5	2.6	2.5	2.6	2.5	2.1	1.3	0.9	0.4	1.1	1.6	1.9	2.6
11-Jun	1.1	0.9	1.1	1.1	0.9	1.4	0.8	0.6	1.1	1.4	2.6	2.7	3.1	3.1	3.1	2.2	2.5	3.1	2.8	2.8	1.4	0.8	1.7	1.3	3.1
12-Jun	0.9	0.6	0.6	0.7	0.7	1.3	1.8	2.0	1.8	2.2	2.0	2.9	1.5	2.5	2.6	3.2	2.6	2.8	2.6	1.7	1.5	2.3	2.8	2.7	3.2
13-Jun	2.6	2.7	2.8	2.0	2.1	2.5	2.3	2.4	2.7	2.5	3.1	3.6	3.4	3.5	3.4	3.0	2.2	2.2	1.9	1.3	0.9	1.3	0.5	0.6	3.6
14-Jun	0.7	0.6	0.4	0.6	0.9	0.8	1.0	0.8	0.7	1.6	2.1	2.1	2.4	3.1	2.2	2.5	2.2	2.5	1.7	2.3	4.0	3.4	1.4	1.7	4.0
15-Jun	1.6	1.9	2.5	3.5	3.2	2.8	1.7	2.0	3.1	4.1	4.9	5.4	4.8	4.6	4.5	4.3	3.5	3.1	2.7	1.7	1.4	1.9	1.3	1.6	5.4
16-Jun	1.3	2.0	2.8	3.0	2.8	2.6	2.9	3.3	3.2	3.4	3.9	3.7	4.1	4.0	3.6	3.0	2.6	2.4	2.0	1.6	1.5	1.6	1.5	1.3	4.1
17-Jun	1.5	1.3	1.5	1.4	1.1	1.9	2.1	2.8	3.3	2.8	3.1	3.3	3.9	3.8	3.9	3.5	3.1	2.7	2.3	2.1	1.5	1.6	1.8	1.3	3.9
18-Jun	1.3	1.4	1.4	1.5	1.5	1.8	1.8	2.4	2.9	3.0	3.2	2.8	2.8	3.1	3.4	2.9	2.5	1.9	1.6	1.4	0.8	2.7	2.0	1.3	3.4
19-Jun	0.7	0.4	0.3	0.3	0.6	0.6	1.6	1.3	1.2	2.3	2.8	4.1	4.2	4.6	3.7	3.0	3.7	3.2	2.5	2.1	1.3	1.2	0.8	0.7	4.6
20-Jun	0.4	0.3	0.3	0.3	0.3	0.3	0.3	1.0	1.2	2.1	2.2	2.3	2.0	2.1	1.5	1.9	1.3	1.1	1.2	1.3	0.9	1.8	2.0	1.9	2.3
21-Jun	1.9	1.8	1.3	1.2	0.9	1.1	1.1	1.0	1.2	1.1	2.3	2.9	3.0	3.2	2.7	2.4	2.4	1.2	0.9	0.7	0.3	1.4	1.4	1.2	3.2
22-Jun	1.0	0.8	0.6	0.6	0.6	0.8	1.2	1.0	0.7	0.8	0.9	1.5	2.6	2.4	1.6	1.5	1.8	2.4	2.8	2.0	1.2	1.0	1.6	1.8	2.8
23-Jun	1.6	1.8	0.9	1.0	1.4	1.5	1.2	1.2	1.4	1.7	1.5	2.0	1.8	1.9	1.9	2.1	1.3	0.7	1.4	1.6	1.4	1.4	0.7	1.0	2.1
24-Jun	0.6	0.6	0.8	0.6	1.1	0.6	0.8	1.5	2.0	2.2	2.5	2.4	1.9	2.0	2.4	1.7	0.9	2.3	1.0	1.3	1.3	0.9	1.2	1.0	2.5
25-Jun	1.2	0.8	0.5	0.8	1.1	1.4	1.9	1.8	1.7	2.3	2.3	1.9	2.1	2.0	2.0	2.5	2.3	2.6	2.6	1.4	0.4	0.2	0.4	0.3	2.6
26-Jun	0.4	0.3	0.3	0.5	0.5	0.8	0.8	0.7	1.0	1.5	1.8	1.7	1.3	2.8	1.1	0.8	1.6	1.5	1.0	1.7	1.5	3.3	0.9	1.1	3.3
27-Jun	1.3	1.3	1.2	1.7	1.3	1.8	2.1	1.8	2.1	2.3	2.5	2.9	3.1	3.5	2.8	1.3	1.8	2.3	2.1	1.7	1.1	0.8	1.0	0.9	3.5
28-Jun	0.6	0.6	0.7	0.4	0.7	0.8	1.0	1.4	1.6	2.0	2.5	2.6	2.8	2.3	2.5	2.5	2.3	2.6	2.7	2.3	1.1	0.7	0.9	1.6	2.8
29-Jun	1.2	1.5	0.9	0.5	0.5	0.5	0.9	0.9	1.2	2.1	2.1	1.6	2.4	1.9	2.1	2.3	1.8	1.7	1.1	1.1	1.2	2.1	2.5	2.6	2.6
30-Jun	2.2	1.8	1.8	1.8	1.3	1.0	1.4	1.1	1.7	1.3	0.5	1.4	2.5	2.5	2.8	2.9	2.2	1.7	2.0	1.6	1.6	1.5	1.4	0.9	2.9
Diurnal Maximum																									
2.6 2.7 2.8 3.5 3.2 3.0 3.9 3.7 4.0 4.1 4.9 5.4 4.8 4.6 4.5 4.3 3.7 3.8 3.7 3.4 4.0 3.4 2.8 2.7																									



Maximum Value: 3.5 km/h on Jun 30 19:00		Maximum Daily Average: 1.5 km/h on Jun 11		Hours in Service: 720																							
Minimum Value: -1.5 km/h on Jun 4 13:00		Minimum Daily Average: -0.1 km/h on Jun 19		Hours of Data: 720																							
Maximum Diurnal Average: 0.9 km/h at hour 23		Minimum Diurnal Average: 0.2 km/h at hour 10		Hours of Missing Data: 0																							
Monthly Average: 0.56 km/h		Percentiles: P ₁ = -1.1 P ₁₀ = -0.3 Q ₁ = 0.1 Median = 0.4 Q ₃ = 1.0 P ₉₀ = 1.7 P ₉₉ = 2.5		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-Jun	1.8	1.4	-0.5	0.1	0.7	0.3	0.4	1.0	1.5	-0.3	0.4	0.9	0.7	0.5	0.0	0.8	1.2	1.3	1.0	0.2	0.2	0.6	1.2	0.3	0.7	1.8	
2-Jun	0.1	0.4	0.2	0.2	0.1	0.2	0.7	0.1	-0.3	0.3	1.7	-0.6	-0.1	0.2	0.1	1.5	2.5	1.5	1.5	0.4	0.5	0.6	0.6	0.8	0.5	2.5	
3-Jun	0.4	0.8	0.1	1.1	0.8	0.8	0.6	1.1	0.9	0.8	0.7	0.2	1.3	0.1	-0.5	-0.3	-0.1	0.3	0.4	0.4	1.0	0.8	0.4	0.2	0.5	1.3	
4-Jun	0.6	0.7	1.0	1.0	1.1	0.8	0.7	-0.1	-0.5	-0.3	-0.9	-0.4	-1.5	-0.1	0.9	1.2	-0.9	-0.2	-0.6	-0.8	-1.1	0.2	0.1	0.0	0.0	1.2	
5-Jun	0.2	0.0	0.2	-0.1	0.2	-0.4	-0.1	0.5	0.0	0.1	-0.1	0.2	-0.7	-0.9	-0.3	-0.9	-0.6	0.1	0.7	0.5	1.0	1.6	1.1	1.4	0.2	1.6	
6-Jun	1.6	1.9	2.0	2.1	1.5	1.7	1.4	1.0	1.4	1.2	1.9	1.9	1.5	1.6	2.1	0.8	1.0	0.7	1.1	0.3	-0.2	1.5	0.3	0.5	1.3	2.1	
7-Jun	0.7	0.8	0.8	0.6	0.3	-0.3	0.7	0.2	0.3	0.4	-0.1	-0.3	1.1	0.4	0.1	0.4	0.2	-0.9	-0.1	-0.3	0.2	0.0	0.1	0.2	0.2	1.1	
8-Jun	0.2	0.0	0.1	0.1	0.1	0.0	0.2	0.0	0.1	-0.1	0.1	-0.1	-0.3	1.3	0.4	0.3	1.0	1.3	1.1	1.8	0.7	1.2	1.9	3.0	0.6	3.0	
9-Jun	2.6	1.7	1.1	0.9	1.1	0.7	0.3	0.2	0.5	-0.1	0.2	0.2	0.1	-0.1	-0.3	-0.2	-0.1	0.1	0.0	0.5	0.5	0.1	0.0	0.1	0.4	2.6	
10-Jun	0.1	0.0	0.0	0.1	-0.1	0.1	0.1	-0.1	0.7	0.5	-0.6	-0.9	0.0	0.2	-0.8	-0.4	0.3	-0.1	-0.3	-0.2	0.5	0.9	1.1	0.9	0.1	1.1	
11-Jun	1.1	0.8	1.1	0.9	1.1	1.6	2.9	1.8	1.5	1.4	1.4	2.2	2.1	1.9	1.7	1.5	1.7	1.7	2.3	2.4	1.4	1.1	0.9	0.4	1.5	2.9	
12-Jun	0.3	0.3	0.1	0.3	0.5	1.8	1.1	1.5	1.2	0.8	0.8	1.1	1.8	2.0	1.6	1.2	0.2	1.2	0.5	0.3	1.2	1.8	2.0	1.8	1.1	2.0	
13-Jun	1.8	1.9	1.7	1.1	1.2	1.9	1.6	1.9	1.9	0.9	1.1	1.2	1.5	1.3	0.8	1.2	0.4	0.6	0.8	0.8	1.5	0.8	0.0	0.4	1.2	1.9	
14-Jun	0.4	0.4	0.5	0.4	0.6	0.8	0.5	0.5	0.0	0.3	1.1	-0.2	0.7	1.1	1.6	1.6	1.4	1.9	2.2	1.5	0.7	1.7	1.1	1.1	0.9	2.2	
15-Jun	1.4	1.2	1.7	2.4	2.5	2.1	0.8	1.2	2.1	1.7	0.3	-0.1	-1.5	-0.7	0.3	0.4	1.3	2.0	1.2	0.8	2.1	1.6	2.2	0.7	1.2	2.5	
16-Jun	0.3	0.0	0.3	0.1	0.0	0.1	0.3	0.1	0.3	2.2	2.1	2.2	2.1	2.2	2.2	1.3	1.1	0.6	1.2	0.6	0.9	0.6	0.8	0.5	0.9	2.2	
17-Jun	1.2	1.0	2.2	0.4	-0.3	0.7	-0.4	-0.2	-1.2	-1.2	0.0	-1.1	0.0	0.0	0.1	-0.2	0.8	0.2	0.1	-0.2	0.6	1.6	0.1	0.4	0.2	2.2	
18-Jun	0.0	0.5	1.5	-0.2	1.0	0.4	0.4	0.4	1.6	-0.4	0.1	0.0	0.0	0.5	0.2	-0.1	0.1	0.1	1.2	1.0	0.2	1.2	0.7	0.3	0.4	1.6	
19-Jun	-0.1	-0.3	-0.1	-0.1	0.0	0.0	0.7	-0.1	-0.1	-0.7	0.1	-0.8	-1.1	-0.5	-0.1	0.2	0.4	-0.7	0.1	0.4	0.5	0.0	0.2	0.3	-0.1	0.7	
20-Jun	0.1	0.1	-0.1	0.1	0.0	0.0	0.0	0.1	0.4	0.4	0.0	-0.3	-0.3	0.7	-0.4	0.1	0.3	0.3	0.9	0.8	0.3	0.8	1.2	0.8	0.3	1.2	
21-Jun	1.0	0.7	0.4	0.8	0.1	0.2	0.7	0.6	0.2	0.2	0.3	0.6	0.8	1.0	0.9	0.7	0.2	-0.5	-0.6	-0.3	0.2	0.3	1.9	0.8	0.5	1.9	
22-Jun	0.5	0.7	0.2	0.4	0.4	0.4	0.4	0.3	0.2	-0.1	0.4	0.1	0.8	0.5	0.5	-0.4	0.8	1.5	0.6	0.7	0.9	0.3	1.2	1.5	0.5	1.5	
23-Jun	1.2	0.2	0.0	0.1	0.6	0.2	0.4	-0.1	0.5	-0.1	-0.1	0.8	0.7	1.1	-0.4	-0.1	-0.1	-0.1	0.3	0.6	0.9	0.8	0.1	-0.3	0.3	1.2	
24-Jun	0.0	0.1	-0.2	-0.1	0.2	-0.3	0.3	0.0	0.1	-0.6	-0.5	0.3	-0.3	-0.8	-0.2	0.0	0.1	0.0	0.1	-0.2	0.1	0.2	0.2	0.4	0.0	0.4	
25-Jun	0.5	-0.1	0.0	0.0	-0.3	0.5	0.1	-0.5	-1.0	-0.9	0.1	0.2	0.2	-0.3	0.4	0.2	0.2	0.8	1.0	0.1	0.3	0.5	0.2	0.3	0.1	1.0	
26-Jun	0.3	-0.1	0.0	0.1	0.4	0.5	0.6	0.3	0.5	-0.3	0.5	0.2	0.0	0.6	0.3	0.4	2.4	2.2	0.4	1.1	0.5	0.1	-0.3	1.0	0.5	2.4	
27-Jun	1.3	1.7	1.7	1.7	0.2	1.5	1.2	0.4	0.8	-0.2	0.1	0.3	0.4	1.3	2.2	1.0	0.9	0.9	0.8	0.9	0.4	0.5	0.9	0.7	0.9	2.2	
28-Jun	0.4	0.6	0.6	0.4	0.4	0.5	0.5	0.4	-0.4	0.6	-0.3	0.9	-0.2	-0.1	-0.6	-0.5	0.0	-0.4	0.3	0.4	0.2	0.6	1.9	2.5	0.4	2.5	
29-Jun	0.3	0.8	0.5	0.6	0.8	0.5	0.1	0.3	0.2	-0.4	0.4	-0.4	0.3	0.2	-1.2	-0.6	0.4	-0.8	-0.3	-0.2	0.4	1.2	2.6	2.2	0.3	2.6	
30-Jun	1.9	2.4	2.6	2.5	1.4	0.9	0.9	0.5	0.5	0.2	0.3	0.0	1.2	0.6	0.5	1.0	1.0	0.8	3.5	2.4	1.8	0.6	1.2	1.8	1.3	3.5	
		0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.5	0.5	0.2	0.4	0.3	0.4	0.5	0.4	0.4	0.6	0.6	0.7	0.6	0.6	0.8	0.9	0.8	Diurnal Average	
		2.6	2.4	2.6	2.5	2.5	2.1	2.9	1.9	2.1	2.2	2.1	2.2	2.1	2.2	2.2	1.6	2.5	2.2	3.5	2.4	2.1	1.8	2.6	3.0	Diurnal Maximum	



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Vertical Wind Speed 167 m (VW167m) - km/h
Lower Camp Met Tower - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 8.6 km/h on Jun 17 22:00 Minimum Value: 0.2 km/h on Jun 20 06:00 Percentiles: P ₁ = 0.3 P ₁₀ = 0.6 Q ₁ = 1.0 Median = 1.6 Q ₃ = 2.5 P ₉₀ = 3.2 P ₉₉ = 4.4																								Hours in Service: 720 Hours of Data: 720 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-Jun	1.2	1.2	1.1	1.0	1.1	1.1	1.2	1.1	1.8	1.6	1.6	1.9	1.3	1.5	2.5	1.5	1.4	1.6	1.7	0.6	1.3	1.6	1.1	0.6	2.5
2-Jun	0.4	0.5	0.4	0.5	0.5	0.5	1.2	1.5	1.4	1.6	1.7	1.6	1.6	2.1	2.1	2.9	1.8	1.6	1.5	1.3	1.0	1.2	0.9	0.7	2.9
3-Jun	0.5	1.1	1.3	1.0	1.2	1.5	1.5	1.7	1.5	1.7	1.8	3.2	3.1	2.9	2.1	2.4	2.4	1.5	1.1	1.8	1.5	1.0	1.0	0.9	3.2
4-Jun	1.0	1.5	1.8	1.5	1.6	2.3	3.8	3.9	3.9	3.9	4.2	4.5	4.1	3.7	3.2	4.3	2.8	4.2	3.9	2.7	1.9	2.0	0.6	0.9	4.5
5-Jun	1.3	0.7	0.6	0.5	0.7	1.2	1.3	1.5	1.4	2.4	4.4	3.6	3.4	2.9	3.0	2.8	2.8	2.7	2.5	1.7	0.6	0.8	1.8	1.8	4.4
6-Jun	2.1	1.9	1.8	1.3	1.2	1.0	1.1	1.6	1.8	2.1	2.4	3.0	2.9	3.3	3.9	3.3	3.1	1.9	1.7	2.4	2.2	2.4	2.4	1.2	3.9
7-Jun	1.0	0.7	1.0	1.6	1.2	0.8	1.4	1.4	1.8	2.2	2.1	2.6	4.1	2.1	0.5	1.3	2.0	2.7	2.3	1.6	0.8	0.9	0.3	0.4	4.1
8-Jun	0.2	0.6	0.5	0.5	0.4	0.3	0.4	0.8	0.7	0.6	0.7	0.8	1.6	2.0	1.5	1.2	1.0	2.1	1.4	1.5	1.2	2.3	1.2	1.2	2.3
9-Jun	1.0	1.0	1.7	2.0	2.6	3.1	3.0	3.3	4.0	3.2	2.8	3.3	3.7	3.2	3.7	3.8	3.4	2.6	3.1	2.6	2.3	2.0	2.0	1.1	4.0
10-Jun	0.6	0.4	0.4	0.5	0.4	0.4	0.3	0.9	2.4	3.1	2.8	2.5	3.1	2.7	2.9	3.0	3.1	2.5	1.6	0.9	0.4	0.3	1.2	2.0	3.1
11-Jun	1.6	1.2	1.4	1.1	1.0	1.3	1.3	1.4	1.2	1.4	2.9	2.8	3.4	3.4	3.4	2.4	2.6	3.2	2.8	2.4	1.8	1.1	1.8	1.4	3.4
12-Jun	1.4	0.7	0.6	0.8	0.8	0.9	1.4	1.9	1.9	1.8	1.5	2.5	0.9	2.3	2.7	3.2	2.1	2.4	2.2	1.3	1.5	1.5	2.2	2.4	3.2
13-Jun	2.1	2.2	2.2	1.8	1.9	2.1	1.9	2.0	2.4	2.1	3.0	3.3	2.9	2.8	2.8	2.8	1.8	1.9	1.2	0.8	0.6	1.7	0.8	0.5	3.3
14-Jun	0.6	0.6	0.5	0.4	0.7	0.8	0.8	0.7	0.8	1.5	2.2	2.3	2.5	3.7	2.3	2.2	2.3	2.5	1.8	2.3	3.2	2.9	1.4	1.9	3.7
15-Jun	1.9	1.9	2.7	3.6	3.1	2.7	1.7	2.0	3.1	3.9	3.9	4.5	3.4	3.3	3.4	3.3	2.8	2.6	2.0	1.6	1.4	1.8	1.8	1.1	4.5
16-Jun	0.9	1.4	2.2	2.3	2.0	1.8	2.1	2.4	2.4	2.7	3.4	3.9	4.3	4.0	3.4	3.0	2.4	2.4	1.7	1.5	1.1	1.1	1.3	1.1	4.3
17-Jun	1.2	1.1	1.1	1.4	1.2	1.9	1.8	2.9	3.1	2.8	3.2	3.3	4.3	4.2	4.3	4.1	3.1	2.5	2.4	1.8	1.4	8.6	2.0	1.3	8.6
18-Jun	1.5	1.6	1.1	1.8	1.9	2.1	2.1	2.7	2.9	2.9	3.6	2.9	2.9	3.2	3.0	3.0	2.6	2.2	2.1	1.5	1.0	3.7	1.9	1.2	3.7
19-Jun	0.7	0.3	0.3	0.4	0.7	0.7	1.6	1.5	1.2	2.4	3.3	4.4	4.4	4.9	4.4	3.7	3.9	3.7	3.0	2.1	1.3	1.2	1.1	1.2	4.9
20-Jun	0.3	0.6	0.5	0.4	0.3	0.2	0.2	0.7	0.9	2.3	2.4	2.2	2.0	2.4	1.4	2.1	1.5	1.4	1.8	1.1	0.5	0.5	0.7	0.8	2.4
21-Jun	1.0	1.9	1.1	0.9	0.7	0.8	0.7	0.7	1.1	1.0	2.5	2.9	3.2	3.4	2.7	2.6	2.8	1.2	1.2	0.8	0.6	1.0	0.8	1.1	3.4
22-Jun	0.9	0.8	0.6	0.6	0.5	0.5	0.7	0.7	0.5	0.7	1.0	1.3	2.7	2.5	1.9	1.5	2.4	2.2	2.2	1.7	0.9	0.5	1.3	2.5	2.7
23-Jun	1.6	2.1	0.9	0.8	1.3	1.3	1.2	0.9	1.3	1.6	1.6	2.2	2.3	2.4	1.8	1.6	0.9	0.7	1.7	1.6	0.9	1.1	0.8	0.5	2.4
24-Jun	0.4	0.9	0.9	0.6	0.8	0.8	0.7	1.3	1.9	2.2	2.5	3.1	1.8	1.5	2.6	1.4	0.9	2.3	1.2	1.3	0.9	0.6	0.9	1.2	3.1
25-Jun	0.9	1.1	0.6	0.7	1.1	1.2	1.9	2.0	2.0	2.2	2.8	2.1	2.4	2.1	2.4	2.9	2.8	2.9	2.8	1.3	0.4	0.4	0.3	0.3	2.9
26-Jun	0.5	0.4	0.3	0.3	0.4	0.6	0.6	0.5	0.6	1.1	2.1	1.6	1.5	2.9	0.7	0.9	1.2	1.1	1.1	1.6	1.6	2.8	1.3	1.2	2.9
27-Jun	1.5	1.1	0.9	2.0	1.3	1.5	1.8	1.5	2.1	2.4	2.6	2.8	2.7	3.0	4.8	1.5	1.6	2.2	1.9	1.7	1.2	0.7	1.2	0.9	4.8
28-Jun	0.7	0.6	0.8	0.3	0.4	0.5	0.8	1.4	1.5	2.1	2.4	3.1	3.1	3.0	2.7	2.7	2.5	3.0	2.9	2.0	0.9	0.5	0.6	1.1	3.1
29-Jun	1.8	2.0	1.2	0.6	0.5	0.5	0.9	0.7	1.0	2.3	2.4	1.9	2.8	1.9	1.7	2.1	1.7	1.8	1.2	1.6	1.5	2.1	2.7	2.9	2.9
30-Jun	2.8	2.6	2.1	1.9	1.6	1.1	1.2	1.1	1.5	1.2	0.8	1.6	2.9	2.7	3.4	3.5	2.7	2.1	2.3	1.7	1.6	1.5	1.6	0.9	3.5
Diurnal Maximum																									
2.8 2.6 2.7 3.6 3.1 3.1 3.8 3.9 4.0 3.9 4.4 4.5 4.4 4.9 4.8 4.3 3.9 4.2 3.9 2.7 3.2 8.6 2.7 2.9																									



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 4
BUFFALO VIEWPOINT
JUNE 2016

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)
 JUNE 2016

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	684	36	36	100.00	41	0	4	0
H2S (ppb) Average	686	33	34	99.86	2	0	0	0
THC (ppm) Average	684	36	36	100.00	5.8	-	2.7	-
Temperature (C) Average	720	0	0	100.00	30.3	-	23	-
Relative Humidity (%) Average	720	0	0	100.00	99	-	95	-
Wind Speed 10 m (km/h) Average	719	0	1	99.86	31	-	21	-
Wind Direction 10 m (deg) Average	719	0	1	99.86	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	684	0.9	3	-	0	0	0	0	0	2	41
H2S (ppb) Average	686	0.3	0	-	0	0	0	0	0	1	2
THC (ppm) Average	684	2.28	0.3	-	2	2.1	2.1	2.2	2.3	2.5	5.8
Temperature 2 m (C) Average	720	17.66	5.3	-	6.4	11.1	13.6	16.8	21.5	25.2	30.3
Relative Humidity (%) Average	720	61.9	21	-	19	33	46	60	81	92	99
Wind Speed 10 m (km/h) Average	719	10.1	6	-	0	4	6	9	13	18	31
Wind Direction 10 m (deg) Average	719	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BUFFALO VIEWPOINT (AMS 4)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
H2S	15 Jun 2016 11:00	15 Jun 2016 11:00	1	Maintenance - sample manifold cleaning
Wind Speed, Wind Direction	15 Jun 2016 13:00	15 Jun 2016 13:00	1	Maintenance - tower lowered to access visibility sensor



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Buffalo Viewpoint - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 41 ppb on Jun 2 11:00	Maximum Daily Average: 4.4 ppb on Jun 2		Hours of Data:	684
Minimum Value: 0 ppb on Jun 10 15:00	Minimum Daily Average: 0.0 ppb on Jun 13		Hours of Missing Data:	36
Maximum Diurnal Average: 3.2 ppb at hour 11	Minimum Diurnal Average: 0.2 ppb at hour 5		Hours of Calibration:	36
Monthly Average: 0.9 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 2 P ₉₉ = 16		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-Jun	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
2-Jun	0	0	0	Z	0	0	0	0	0	4	41	14	4	6	19	10	0	0	0	0	0	0	0	0	4.4	41
3-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	2	2	0.5	3
4-Jun	2	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2
5-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0.3	3
6-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3	2
7-Jun	2	1	Z	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0.3	2
8-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	22	1.2	22
9-Jun	30	4	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.7	30
10-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	14	4	1.1	14
11-Jun	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
12-Jun	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
13-Jun	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
14-Jun	0	0	0	Z	0	0	0	0	0	3	10	4	0	0	0	0	0	0	0	0	0	0	0	0	0.8	10
15-Jun	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	--	0
16-Jun	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
17-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0.2	2
18-Jun	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	1
19-Jun	0	0	Z	0	0	0	0	0	5	2	5	8	3	7	9	1	2	1	0	0	0	0	0	0	2.0	9
20-Jun	0	0	0	Z	0	0	0	1	1	0	0	0	0	2	13	19	9	5	2	1	0	0	0	0	2.4	19
21-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.3	1
22-Jun	0	0	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
23-Jun	Z	0	0	0	0	0	0	0	0	3	17	2	0	0	3	10	1	1	0	1	1	7	4	0	2.2	17
24-Jun	0	Z	2	0	0	0	0	0	0	2	6	3	3	0	1	1	0	0	0	2	1	1	0	0	1.0	6
25-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0.3	3
26-Jun	0	0	0	Z	0	0	0	0	1	1	1	1	3	0	1	0	0	0	0	0	0	1	0	0	0.5	3
27-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	7	18	1	0	0	0	0	0	0	1	0	0	1.3	18
28-Jun	0	0	0	0	0	Z	0	1	0	8	5	0	2	0	0	0	0	0	0	0	0	0	12	0	1.3	12
29-Jun	Z	2	1	0	0	1	4	3	6	12	11	4	6	5	8	10	0	0	0	0	0	0	0	0	3.2	12
30-Jun	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

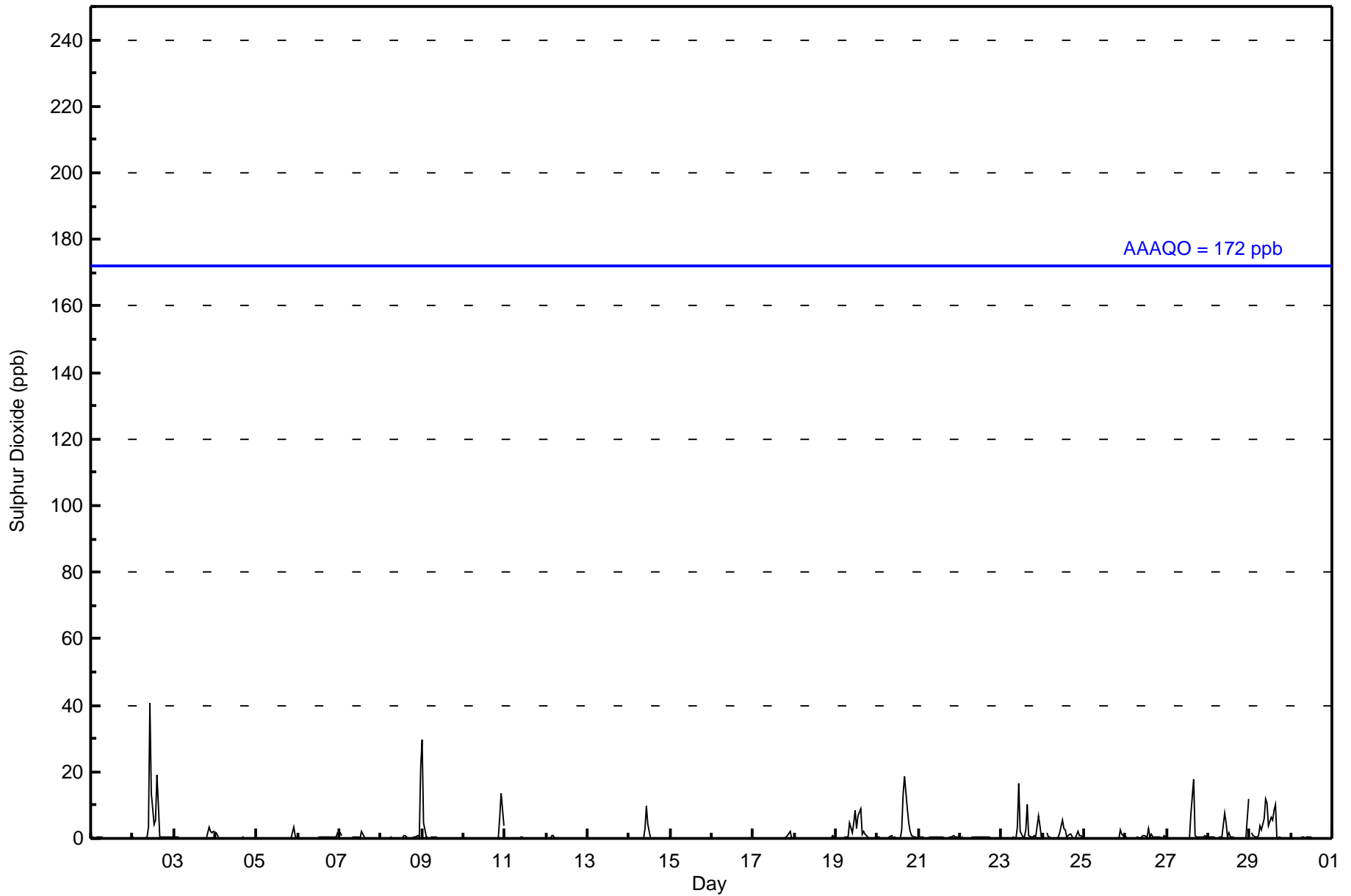
1.5	0.4	0.2	0.2	0.2	0.2	0.3	0.3	0.5	1.2	3.2	1.4	0.7	1.0	1.8	2.3	0.9	0.5	0.3	0.2	0.4	0.9	0.9	1.5	Diurnal Average	
30	4	2	1	1	1	4	3	6	12	41	14	6	7	19	18	19	9	5	2	3	7	14	22	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	671	98.10	98.10
11 - 20	10	1.46	99.56
21 - 60	3	0.44	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	92	34	15	10	7	43	85	56	41	31	48	63	36	34	39	37	671
11 - 20	4	0	1	1	0	2	0	0	0	1	0	0	0	0	1	0	10
21 - 60	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	3
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
Totals	97	34	16	12	8	45	85	56	41	32	48	63	36	34	40	37	684

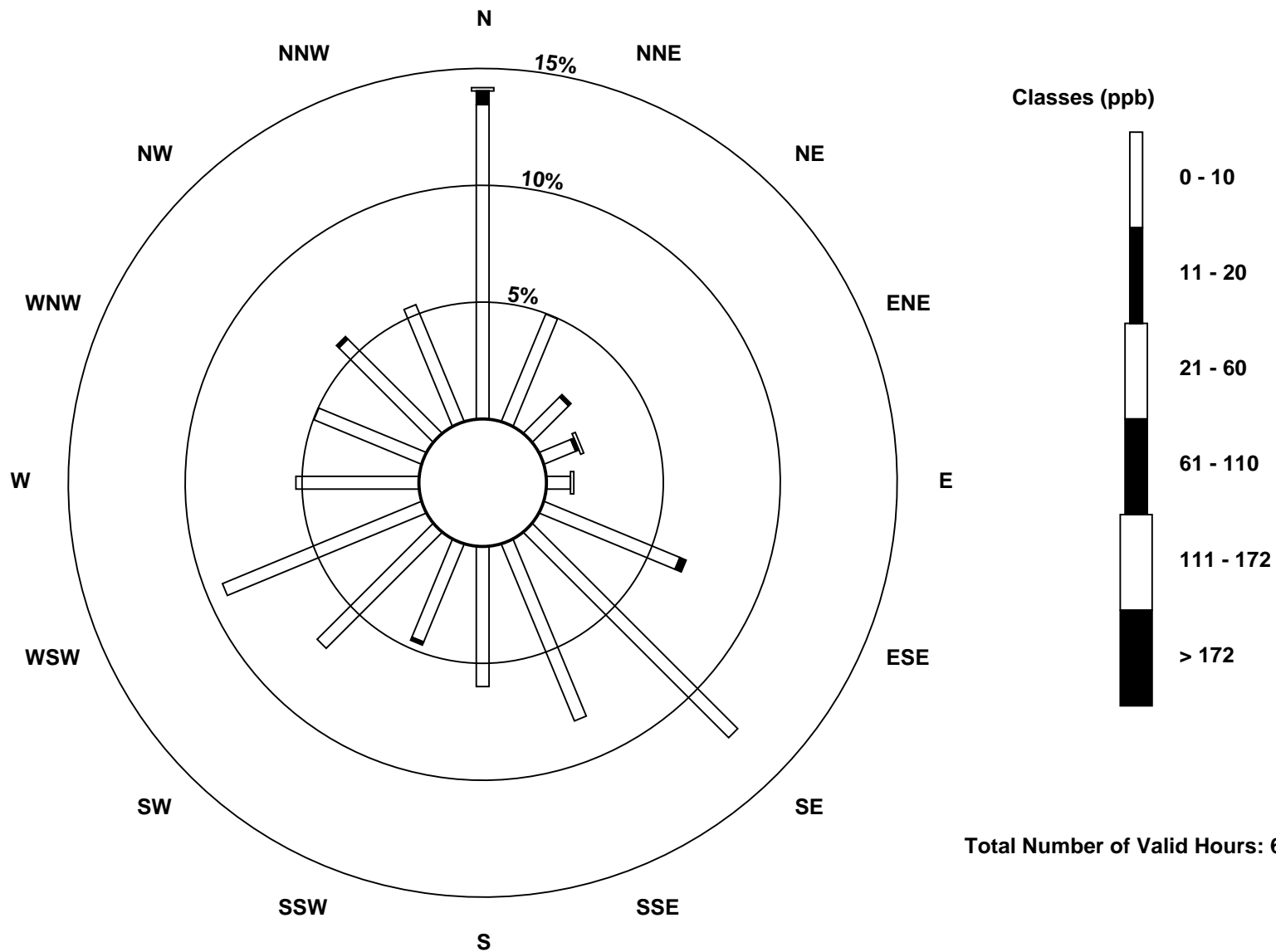
Total Number of Valid Hours: 684

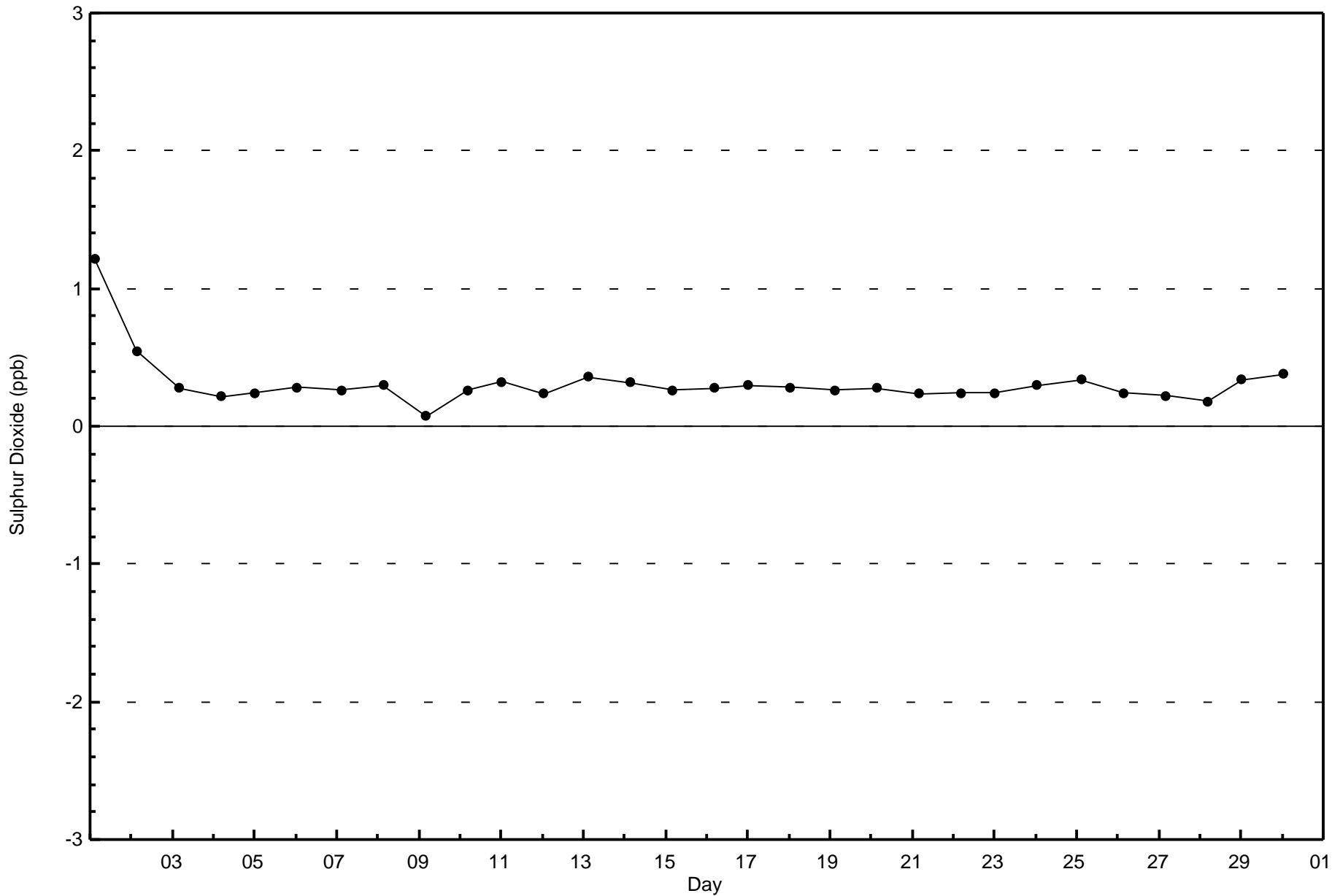
Total Number of Hours: 720

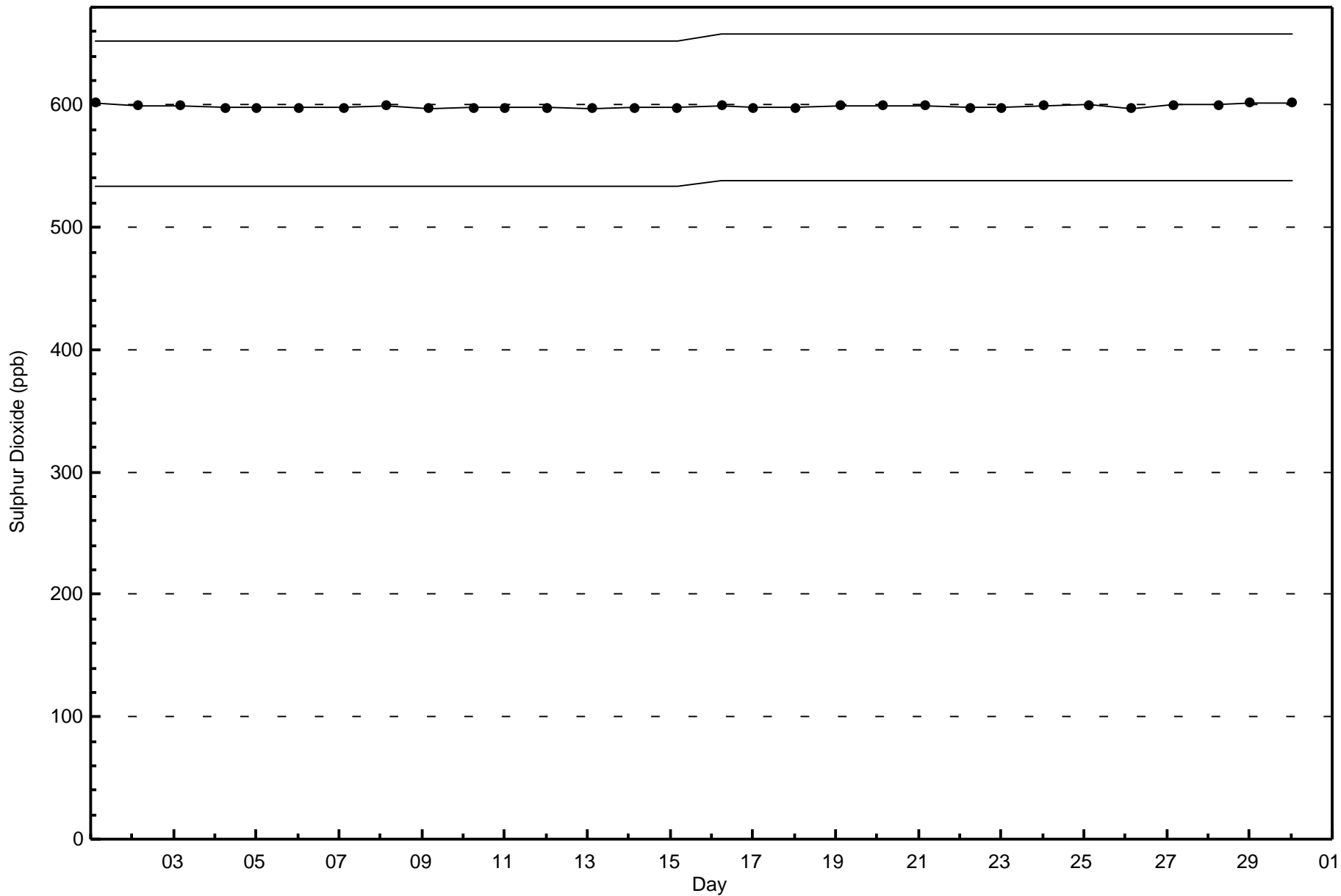


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Sulphur Dioxide (SO₂) - ppb
Buffalo Viewpoint (AMS 4)









Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 2 ppb on Jun 30 10:00	Maximum Daily Average: 0.5 ppb on Jun 20		Hours of Data:	686
Minimum Value: 0 ppb on Jun 18 19:00	Minimum Daily Average: 0.1 ppb on Jun 18		Hours of Missing Data:	34
Maximum Diurnal Average: 0.4 ppb at hour 2	Minimum Diurnal Average: 0.1 ppb at hour 18		Hours of Calibration:	33
Monthly Average: 0.3 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 1		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-Jun	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
2-Jun	0	0	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0.3	1
3-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0.3	1
4-Jun	1	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
5-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.2	1
6-Jun	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
7-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1
8-Jun	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.3	1
9-Jun	1	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
10-Jun	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
11-Jun	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1
12-Jun	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
13-Jun	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
14-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
15-Jun	0	0	0	0	0	Z	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Jun	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
17-Jun	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
18-Jun	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
19-Jun	0	0	0	Z	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
20-Jun	1	1	1	1	Z	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.5	1
21-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1
22-Jun	0	0	0	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
23-Jun	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0.3	1
24-Jun	0	1	Z	0	0	0	0	0	C	C	C	0	1	0	0	1	0	0	0	1	0	0	0	0	0.4	1
25-Jun	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
26-Jun	0	1	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
27-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0.3	1
28-Jun	0	0	1	1	1	1	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
29-Jun	1	Z	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
30-Jun	0	0	Z	0	0	0	0	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2

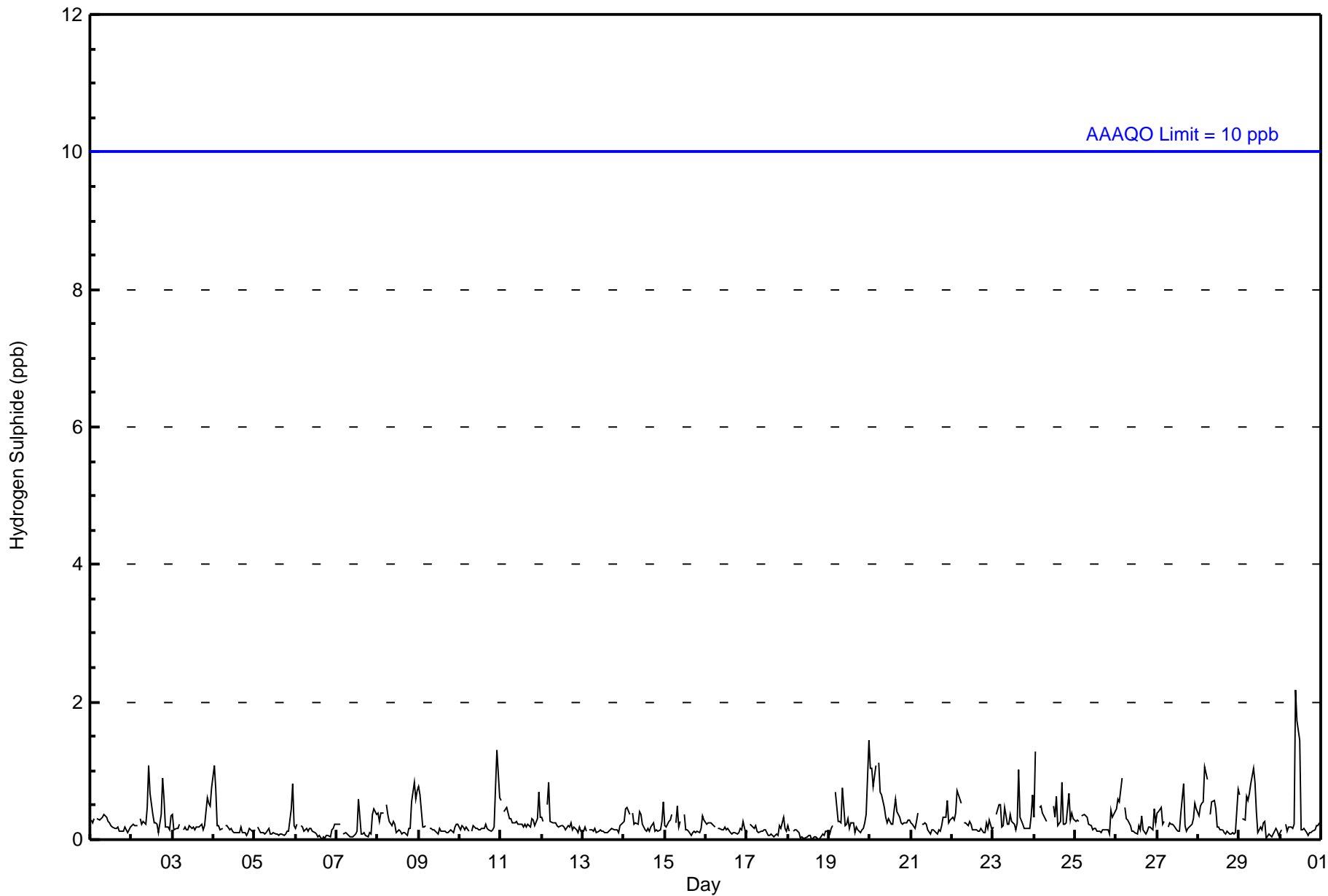
0.3	0.4	0.3	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.3	0.3	0.4	Diurnal Average
1	1	1	1	1	1	1	1	1	1	2	2	1	0	1	0	1	1	0	1	1	1	1	1	1	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Buffalo Viewpoint - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Buffalo Viewpoint - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	686	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: 686

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Buffalo Viewpoint - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	92	34	17	11	10	46	83	58	43	31	50	65	33	35	39	38	685
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
Totals	92	34	17	11	10	46	83	58	43	31	50	65	33	35	39	38	685

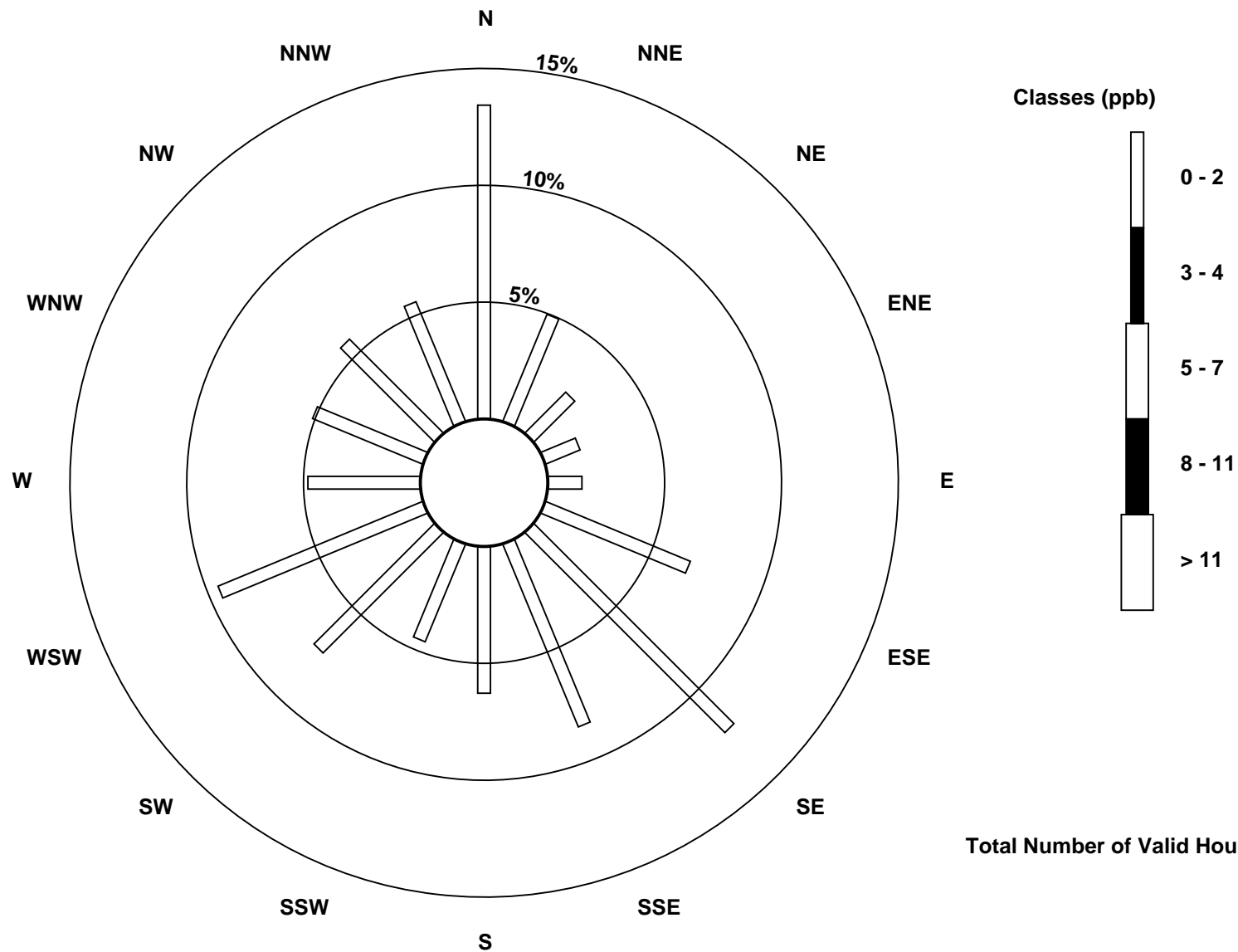
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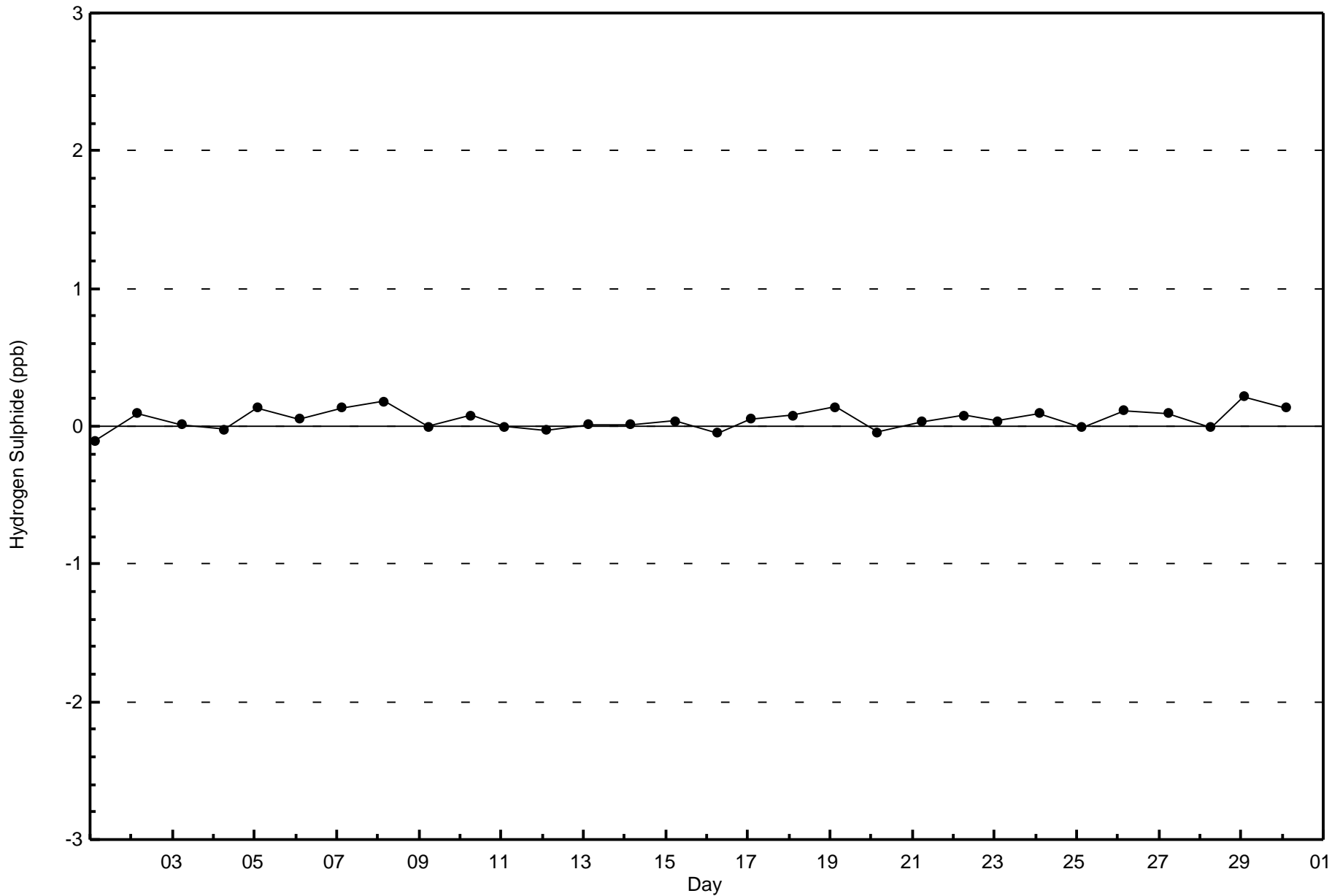
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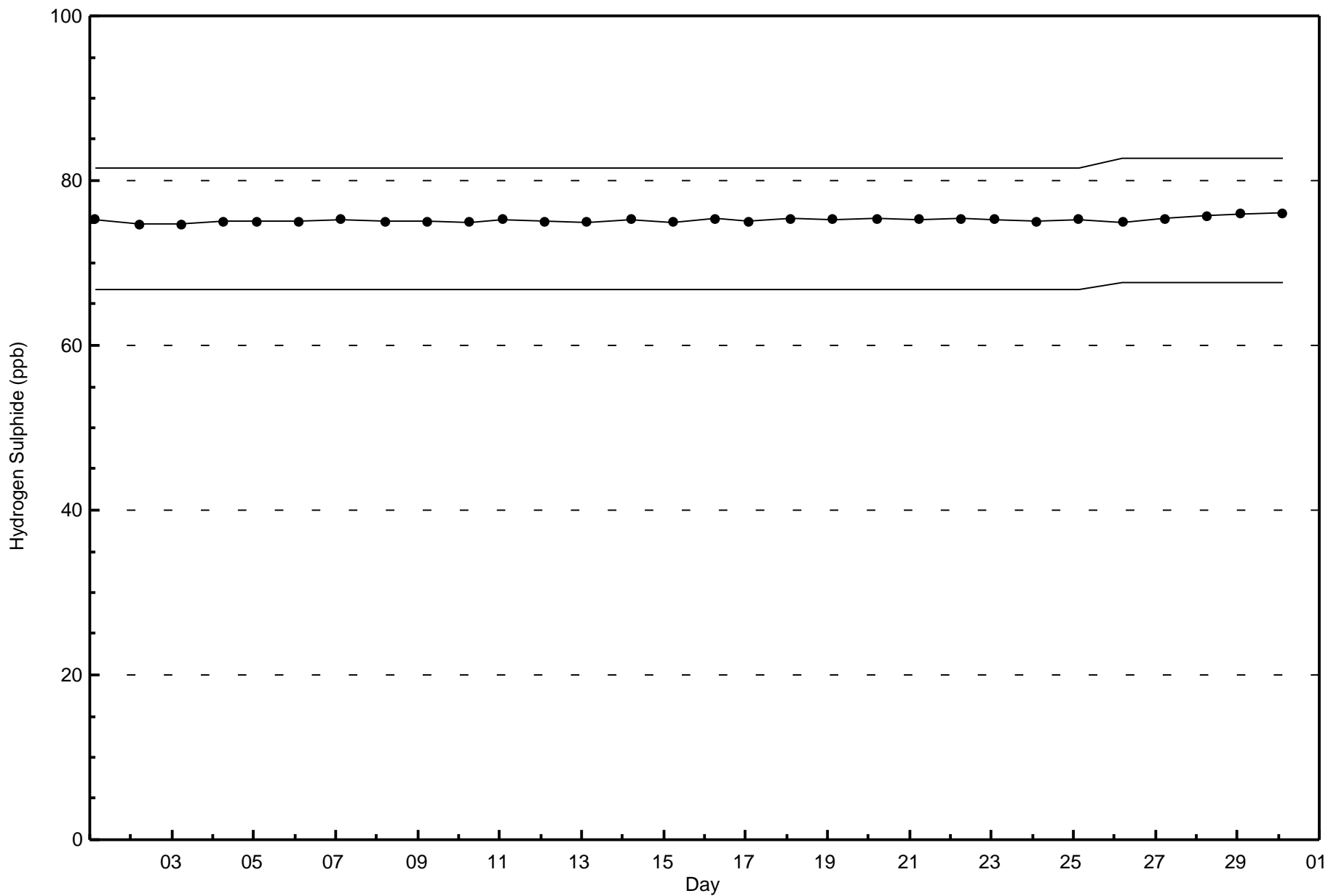


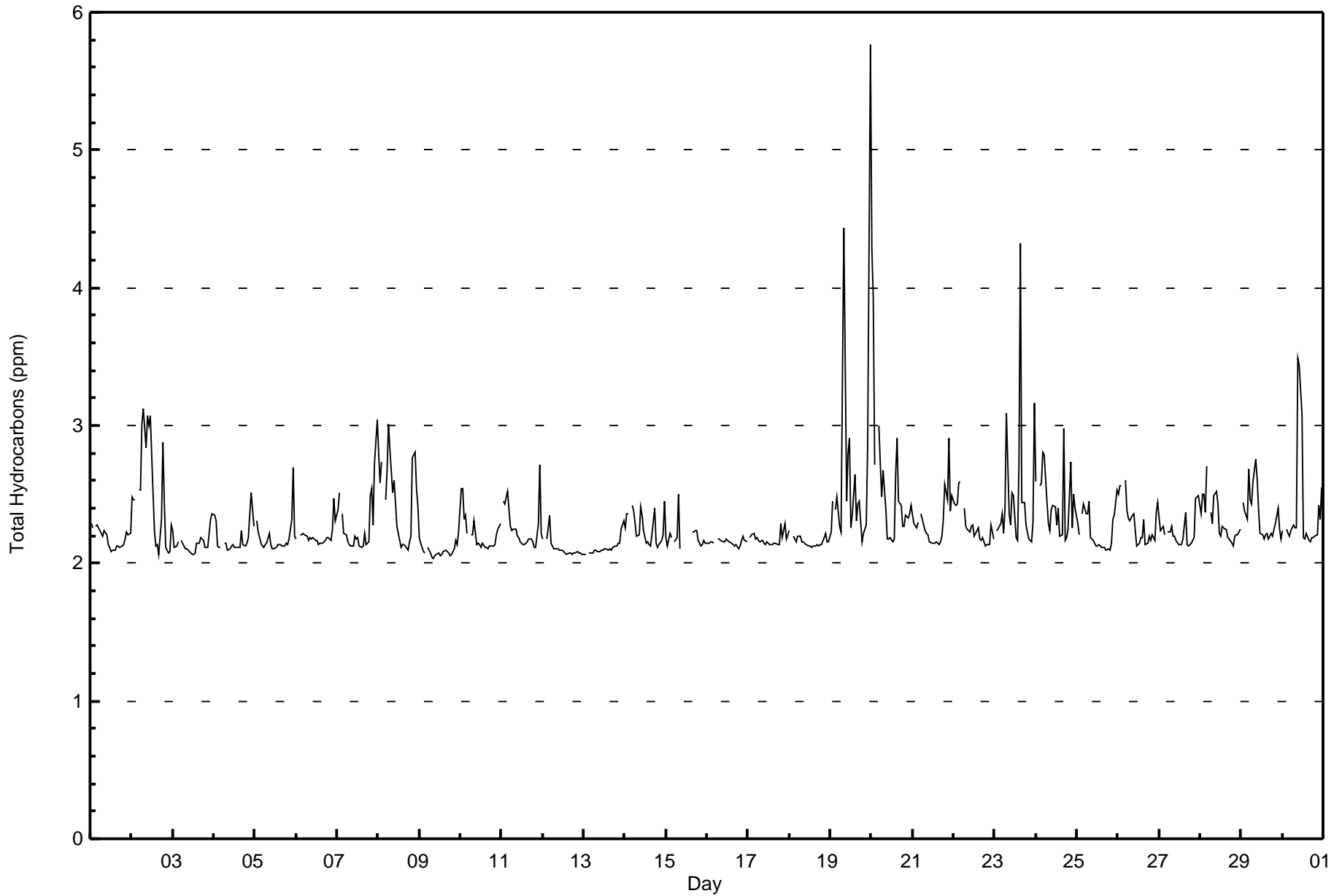
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Hydrogen Sulphide (H₂S) - ppb
Buffalo Viewpoint (AMS 4)











Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	2	0.29	0.29
2.1 - 3.0	668	97.66	97.95
3.1 - 10.0	14	2.05	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - June 2016**

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	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
2.1 - 3.0	93	32	16	11	7	44	85	56	41	32	47	63	35	31	39	36	668
3.1 - 10.0	4	0	0	1	1	1	0	0	0	0	1	0	1	3	1	1	14
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	97	34	16	12	8	45	85	56	41	32	48	63	36	34	40	37	684

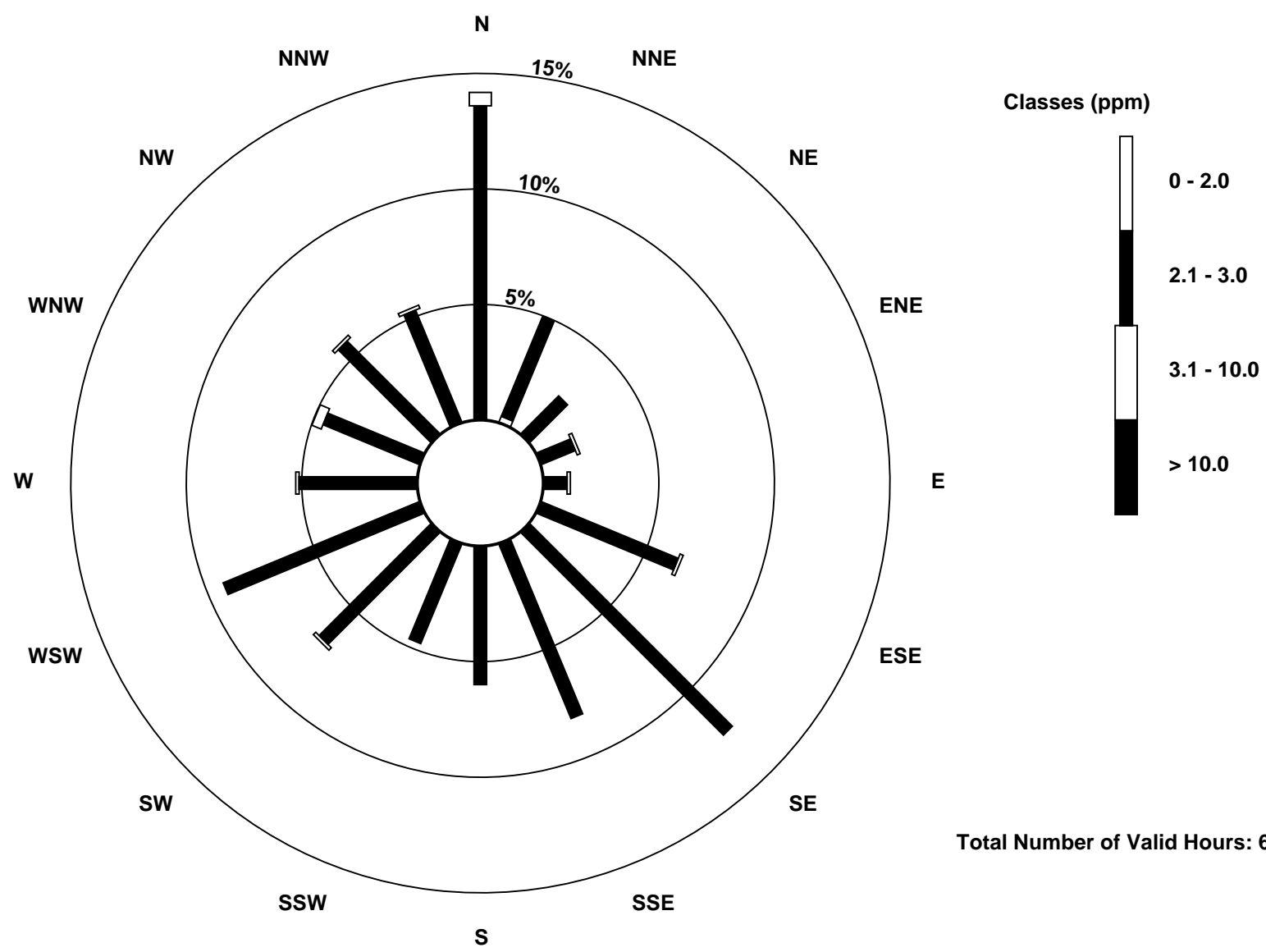
Total Number of Valid Hours: 684

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

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

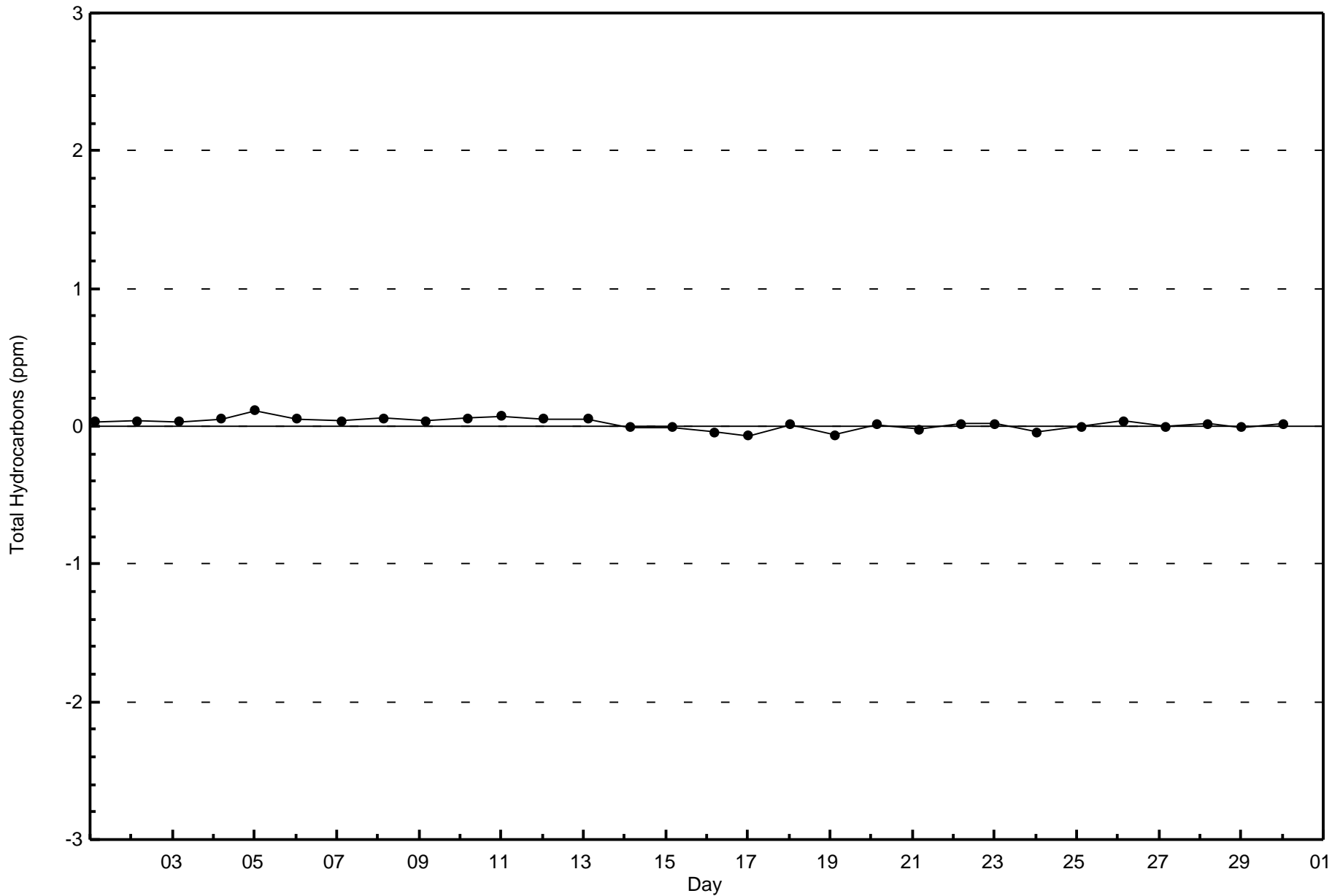


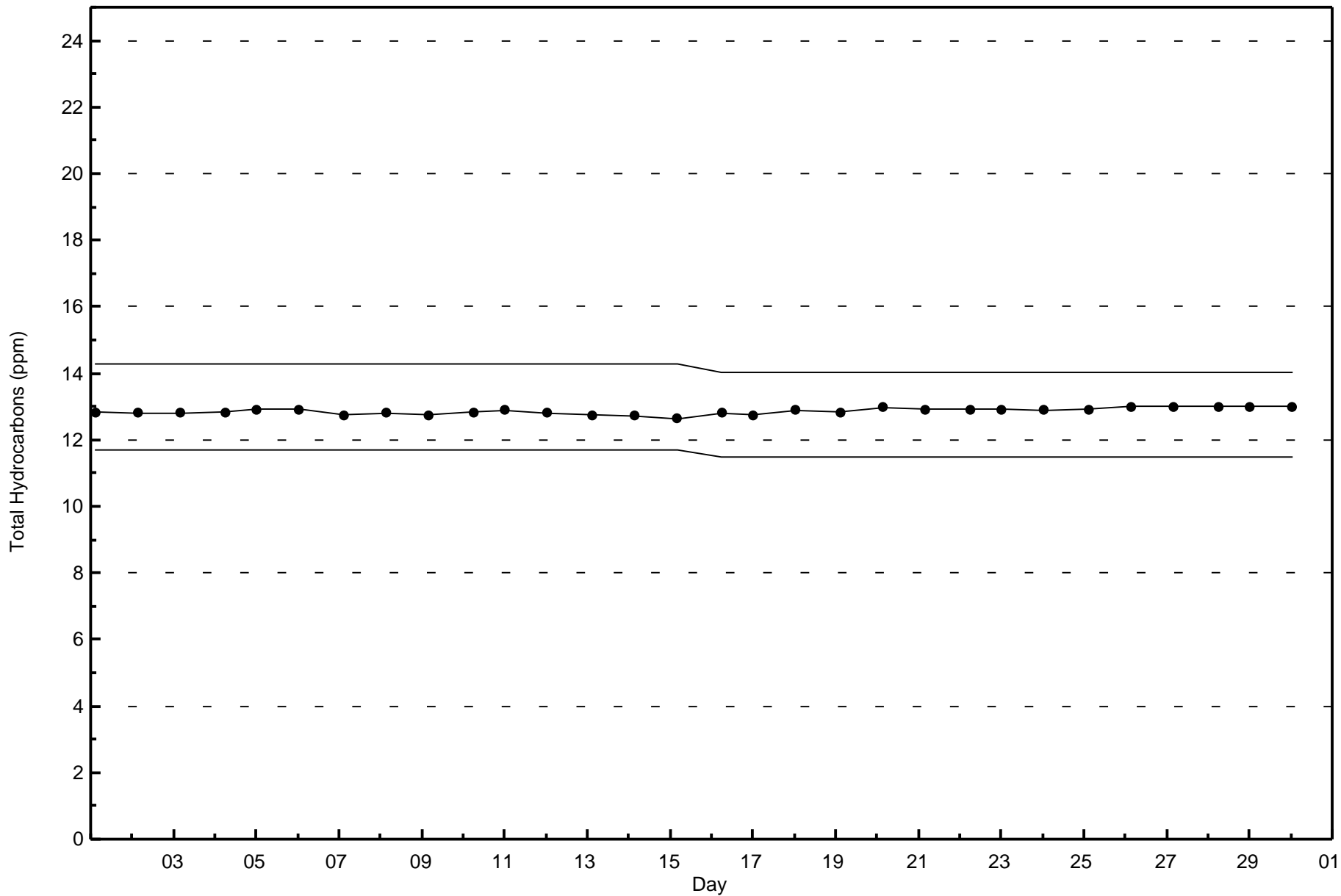
Total Number of Valid Hours: 684



Wood Buffalo Environmental Association
Zero Responses

Total Hydrocarbons (THC) - ppm
Buffalo Viewpoint - June 2016







Wood Buffalo Environmental Association
Summary of Hour Averages

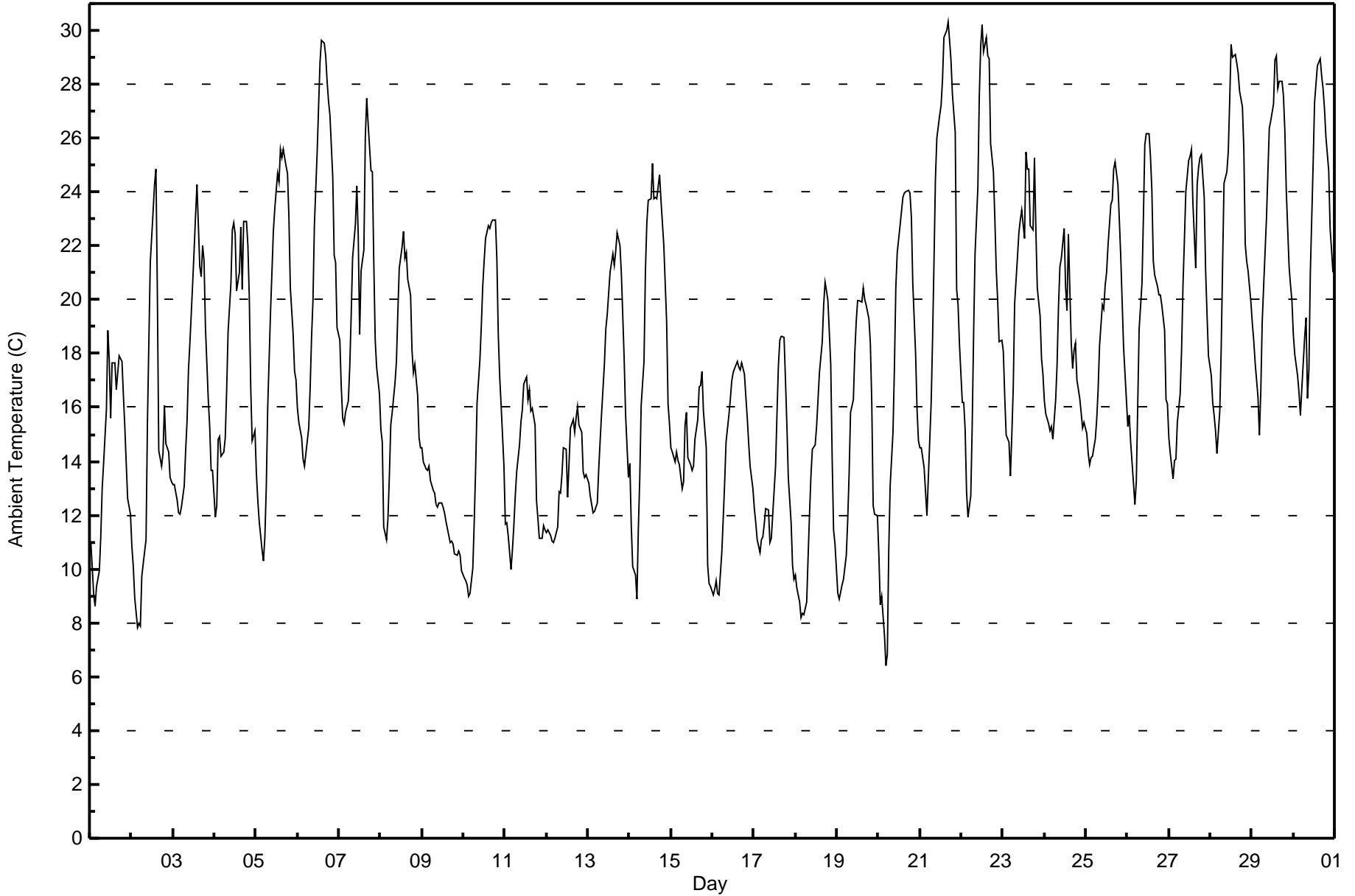
Ambient Temperature (AT) - C
Buffalo Viewpoint - June 2016

Maximum Value: 30.3 C on Jun 21 17:00		Maximum Daily Average: 23.0 C on Jun 29		Hours in Service: 720																						
Minimum Value: 6.4 C on Jun 20 05:00		Minimum Daily Average: 12.1 C on Jun 9		Hours of Data: 720																						
Maximum Diurnal Average: 22.5 C at hour 15		Minimum Diurnal Average: 11.9 C at hour 5		Hours of Missing Data: 0																						
Monthly Average: 17.66 C		Percentiles: P ₁ = 8.3 P ₁₀ = 11.1 Q ₁ = 13.6 Median = 16.8 Q ₃ = 21.5 P ₉₀ = 25.2 P ₉₉ = 29.6		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-Jun	11.0	10.0	9.1	8.6	9.3	9.9	11.2	13.0	13.9	15.9	18.9	17.7	15.6	17.6	17.6	16.6	17.3	17.9	17.7	16.5	15.3	13.9	12.6	12.0	14.1	18.9
2-Jun	10.8	10.1	8.9	7.8	8.0	7.9	9.7	10.2	11.1	15.5	18.5	21.4	23.3	24.3	24.8	20.3	14.4	13.8	14.3	16.1	14.7	14.3	13.4	13.3	14.5	24.8
3-Jun	13.1	13.2	12.5	12.1	12.1	12.3	13.1	14.4	15.5	17.4	18.4	20.6	21.8	23.1	24.3	21.2	20.9	22.0	21.4	19.0	16.3	15.3	13.7	13.6	17.0	24.3
4-Jun	11.9	12.3	14.8	14.9	14.2	14.3	14.9	16.7	18.8	20.6	22.6	22.9	22.4	20.3	21.0	22.7	20.4	22.9	22.9	22.0	20.1	16.8	14.8	15.1	18.3	22.9
5-Jun	13.6	12.5	11.7	10.7	10.3	11.2	13.1	15.9	19.6	21.0	22.5	23.4	24.7	24.4	25.6	25.3	25.6	24.9	24.7	23.0	20.4	18.7	17.4	17.0	19.1	25.6
6-Jun	16.0	15.5	14.9	14.1	13.8	14.3	15.2	16.7	18.6	20.0	22.7	25.6	27.2	28.8	29.6	29.6	29.0	28.1	27.4	26.8	24.6	21.7	21.4	19.0	21.7	29.6
7-Jun	18.5	16.8	15.6	15.4	15.8	16.2	17.5	19.4	21.6	22.8	24.2	22.4	18.7	21.1	21.9	26.0	27.5	26.5	24.8	24.7	21.4	18.5	17.5	16.5	20.5	27.5
8-Jun	15.2	14.7	11.5	11.1	11.9	13.5	15.3	15.8	16.9	17.7	19.5	21.1	21.9	22.5	21.5	21.7	20.7	20.2	18.1	17.3	17.6	16.5	14.9	14.5	17.2	22.5
9-Jun	14.5	14.0	13.7	13.7	13.8	13.3	12.9	12.8	12.4	12.3	12.5	12.5	12.3	12.1	11.8	11.2	11.0	11.0	10.9	10.5	10.5	10.7	10.5	9.9	12.1	14.5
10-Jun	9.7	9.5	9.4	9.0	9.1	10.1	11.8	13.7	16.2	17.8	19.0	20.5	21.4	22.3	22.8	22.7	22.9	22.9	23.0	21.5	18.7	17.1	16.1	13.8	16.7	23.0
11-Jun	11.7	11.7	11.3	10.0	10.7	11.6	12.7	13.6	14.6	15.5	15.9	16.9	17.1	16.3	16.7	15.9	16.0	15.3	12.5	11.9	11.1	11.1	11.6	11.5	13.5	17.1
12-Jun	11.3	11.4	11.2	11.0	11.0	11.1	11.6	12.9	12.8	13.5	14.5	14.5	12.7	13.9	15.2	15.6	15.1	15.6	16.1	15.4	15.1	13.6	13.4	13.5	13.4	16.1
13-Jun	13.2	12.7	12.4	12.1	12.1	12.4	13.7	14.7	15.7	17.6	18.9	19.4	20.2	21.0	21.7	21.3	21.8	22.5	22.0	20.9	19.4	17.8	15.7	13.4	17.2	22.5
14-Jun	13.9	11.6	10.1	9.8	8.9	11.5	13.3	16.1	17.7	21.1	22.9	23.7	23.8	25.1	23.7	23.8	23.7	24.6	23.7	22.8	22.0	19.2	16.1	15.4	18.5	25.1
15-Jun	14.5	14.4	14.0	14.3	14.0	13.9	13.0	13.2	15.4	15.8	14.1	13.9	13.7	13.8	14.8	15.6	16.8	16.8	17.3	15.8	14.5	10.2	9.5	9.4	14.1	17.3
16-Jun	9.0	9.2	9.5	9.1	9.0	10.6	11.9	13.2	14.7	15.7	16.3	17.0	17.3	17.4	17.7	17.5	17.4	17.7	17.2	16.4	15.6	14.7	13.8	13.0	14.2	17.7
17-Jun	12.2	11.7	11.1	10.6	11.1	11.2	11.7	12.2	12.2	11.0	11.2	12.0	13.8	15.8	17.6	18.5	18.7	18.6	17.1	15.4	13.4	11.7	10.1	9.6	13.3	18.7
18-Jun	9.8	9.3	8.8	8.2	8.3	8.3	8.8	10.4	12.1	13.5	14.5	14.6	15.3	16.3	17.3	18.5	19.8	20.7	20.4	20.0	17.6	14.1	11.4	10.9	13.7	20.7
19-Jun	9.1	8.9	9.1	9.4	9.6	10.5	11.8	13.6	15.8	16.3	18.0	19.2	20.0	20.0	19.9	20.4	20.0	19.8	19.3	18.4	16.2	12.3	12.0	12.0	15.1	20.4
20-Jun	10.6	8.7	9.0	7.5	6.4	6.9	10.6	13.1	15.1	17.5	20.4	21.7	22.8	23.3	23.8	24.0	24.0	24.1	23.9	23.1	20.6	17.9	15.9	14.7	16.9	24.1
21-Jun	14.5	14.5	13.8	12.8	12.0	13.4	16.2	18.6	21.5	24.5	26.0	26.9	27.2	28.2	29.8	30.0	30.3	29.6	28.9	27.7	26.2	20.4	19.8	18.3	22.1	30.3
22-Jun	16.2	16.2	15.2	12.8	11.9	12.7	15.4	18.8	21.7	24.2	27.5	29.4	30.2	29.2	29.7	29.1	29.0	25.8	24.8	23.0	21.1	20.0	18.5	18.5	21.7	30.2
23-Jun	18.1	16.4	15.0	14.7	13.4	15.0	16.7	19.9	21.6	22.5	23.0	23.3	22.3	25.5	24.8	24.9	22.8	22.6	25.3	22.6	20.5	19.4	17.8	17.2	20.2	25.5
24-Jun	16.3	15.8	15.4	15.1	15.3	14.8	16.3	17.6	19.7	21.2	21.5	22.7	20.5	19.6	22.5	18.4	17.5	18.1	18.4	17.0	16.4	15.8	15.2	15.4	17.8	22.7
25-Jun	15.0	14.3	13.9	14.1	14.2	14.8	15.5	16.6	18.3	19.8	19.6	20.5	21.0	22.0	23.5	23.7	24.9	25.1	24.3	23.0	21.6	19.9	18.2	16.3	19.2	25.1
26-Jun	15.3	15.7	14.7	13.2	12.4	13.2	16.1	18.9	20.6	23.0	25.7	26.2	26.2	25.3	24.1	21.4	20.9	20.5	20.2	20.2	19.8	18.9	16.3	16.1	19.4	26.2
27-Jun	14.9	14.3	13.3	14.1	14.1	15.5	16.5	18.1	20.5	22.2	24.0	25.2	25.3	25.6	23.6	21.2	24.3	24.9	25.2	25.4	23.8	21.0	19.4	17.9	20.4	25.6
28-Jun	17.2	16.2	15.7	15.1	14.3	15.9	18.2	21.3	24.3	24.7	25.5	27.4	29.5	29.0	29.1	28.8	28.4	27.7	27.2	25.6	22.1	21.4	21.1	19.9	22.7	29.5
29-Jun	19.1	18.5	17.7	16.4	15.0	16.6	19.2	20.5	23.0	24.7	26.4	26.6	27.3	28.9	29.0	27.9	28.1	28.1	27.6	26.3	24.1	21.2	20.6	20.0	23.0	29.0
30-Jun	18.7	18.0	17.2	16.5	15.7	16.7	18.6	19.3	16.3	17.4	21.0	25.0	27.3	28.0	28.7	28.9	28.3	27.8	27.1	26.0	24.8	22.6	21.9	21.0	22.2	28.9
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Buffalo Viewpoint - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Buffalo Viewpoint - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	42	5.83	5.83
10 - 20	438	60.83	66.67
> 20	240	33.33	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720

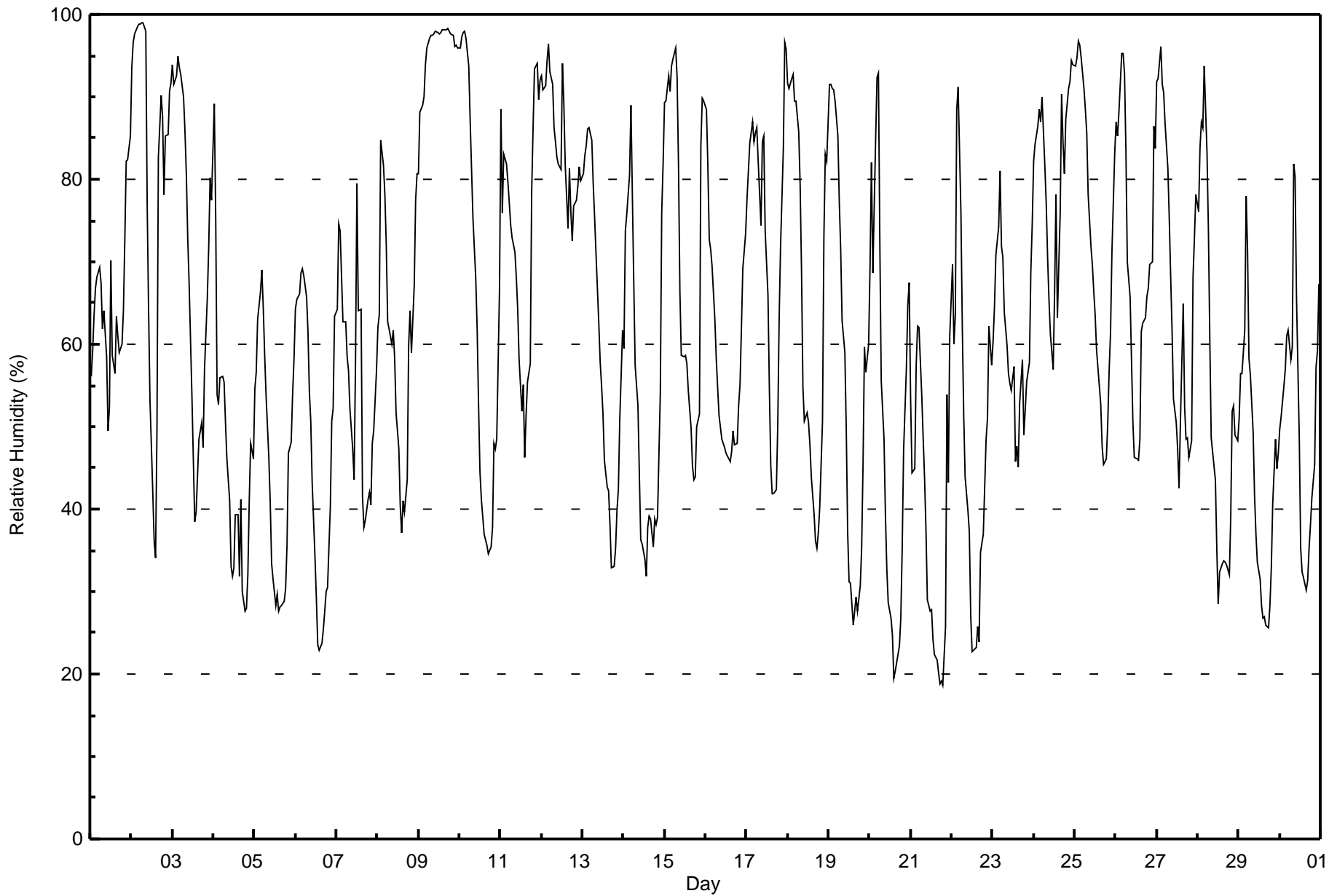


Wood Buffalo Environmental Association

Summary of Hour Averages

**Relative Humidity (RH) - %
Buffalo Viewpoint - June 2016**

Maximum Value: 99 % on Jun 2 07:00 Maximum Daily Average: 95.5 % on Jun 9																		Hours in Service: 720 Hours of Data: 720								
Minimum Value: 19 % on Jun 21 20:00 Minimum Daily Average: 38.4 % on Jun 21 Maximum Diurnal Average: 83.0 % at hour 5 Minimum Diurnal Average: 43.4 % at hour 15 Monthly Average: 61.9 % Percentiles: P ₁ = 22 P ₁₀ = 33 Q ₁ = 46 Median = 60 Q ₃ = 81 P ₉₀ = 92 P ₉₉ = 98																		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-Jun	56	59	64	67	68	69	67	62	64	59	49	52	70	59	56	63	61	59	60	64	73	82	82	85	64.7	85
2-Jun	94	97	98	98	99	99	99	99	98	77	64	53	42	36	34	50	83	90	88	78	85	85	91	92	80.3	99
3-Jun	94	92	93	95	93	93	90	86	81	73	67	54	46	38	40	48	49	51	48	57	66	72	80	77	70.1	95
4-Jun	89	76	54	53	56	56	55	51	46	41	33	32	33	39	39	32	41	30	28	28	32	41	48	46	45.0	89
5-Jun	55	57	63	66	69	65	59	54	46	41	33	31	28	30	28	28	28	29	30	36	47	48	54	58	45.1	69
6-Jun	64	65	66	69	69	68	66	62	54	51	43	34	29	24	23	24	25	28	30	31	40	51	52	63	47.1	69
7-Jun	64	75	74	68	63	63	58	57	52	47	43	58	80	64	64	42	38	39	41	42	40	48	49	57	55.3	80
8-Jun	62	63	85	82	78	72	63	62	60	62	58	52	47	40	37	41	40	44	60	64	59	67	78	81	60.7	85
9-Jun	81	88	89	90	94	96	97	97	97	98	98	98	98	98	98	98	98	98	98	98	97	96	96	96	95.5	98
10-Jun	96	97	98	98	97	94	87	81	75	68	62	53	45	41	37	36	36	35	35	38	48	47	48	67	63.3	98
11-Jun	88	76	83	82	80	77	74	73	71	68	64	58	52	55	46	51	55	58	78	86	93	94	90	92	72.8	94
12-Jun	93	91	91	94	96	93	91	86	85	83	82	81	94	89	82	74	81	76	72	77	77	79	82	80	84.6	96
13-Jun	81	83	84	86	86	85	79	75	71	63	58	55	51	46	43	42	38	33	33	35	40	42	51	62	59.3	86
14-Jun	59	74	76	80	89	78	68	57	53	44	36	36	34	32	38	39	39	35	39	38	39	54	76	82	54.0	89
15-Jun	89	90	93	91	94	95	96	92	82	66	59	58	59	58	54	50	45	44	44	50	52	84	90	90	71.8	96
16-Jun	89	82	73	72	70	63	58	55	51	48	48	47	47	47	46	47	49	48	48	52	55	62	69	73	58.3	89
17-Jun	78	81	84	87	85	86	86	82	74	85	85	74	66	54	45	42	42	42	50	63	72	84	97	96	72.5	97
18-Jun	92	91	92	93	90	90	86	79	69	55	51	52	50	48	44	39	36	35	37	40	51	73	83	82	64.9	93
19-Jun	92	91	91	91	90	85	77	72	63	59	50	37	31	31	26	28	29	28	31	35	46	60	57	60	56.6	92
20-Jun	69	82	69	85	92	93	72	56	48	39	33	29	27	25	19	20	21	23	27	35	47	57	65	68	50.1	93
21-Jun	54	44	45	58	62	62	54	49	44	37	29	28	28	24	22	22	20	19	19	19	26	54	43	61	38.4	62
22-Jun	70	60	64	88	91	76	62	51	44	40	37	27	23	23	23	26	24	35	37	43	48	51	62	57	48.4	91
23-Jun	60	65	71	74	81	72	71	64	60	56	55	54	57	46	48	45	53	58	49	52	56	58	69	75	60.3	81
24-Jun	82	84	87	88	87	90	82	77	71	65	61	57	66	78	63	76	90	85	81	87	91	92	94	94	80.4	94
25-Jun	94	95	97	96	95	91	89	86	78	72	70	66	64	59	55	53	48	45	46	50	57	61	71	83	71.7	97
26-Jun	87	85	88	95	95	93	84	70	66	58	51	46	46	46	48	62	63	63	66	67	70	70	86	84	70.4	95
27-Jun	92	92	96	92	91	87	81	75	68	62	53	50	47	42	51	65	52	48	49	46	48	68	73	78	67.0	96
28-Jun	76	84	87	86	94	83	74	61	49	45	44	35	29	32	33	34	33	33	32	39	52	53	49	48	53.6	94
29-Jun	51	56	56	62	78	71	58	56	49	42	37	34	32	28	27	27	26	26	28	33	41	48	45	47	44.1	78
30-Jun	50	51	55	57	61	62	58	60	82	80	66	49	35	32	32	30	31	35	38	41	45	57	59	67	51.4	82
	76.6	77.5	78.8	81.4	83.0	80.2	74.7	69.5	65.0	59.5	54.0	49.7	48.5	45.5	43.4	44.5	45.9	45.7	47.4	50.8	56.4	64.6	69.6	73.3	Diurnal Average	
	96	97	98	98	99	99	99	99	99	98	98	98	98	98	98	98	98	98	98	98	98	97	96	96	Diurnal Maximum	





Maximum Speed: 31 km/h on Jun 15 12:00	Maximum Daily Speed Average: 20.6 km/h on Jun 9	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 29 08:00	Minimum Daily Speed Average: 0.9 km/h on Jun 2	Hours of Data: 719
Maximum Diurnal Speed Average: 4.1 km/h at hour 13	Minimum Diurnal Speed Average: 0.2 km/h at hour 21	Hours of Missing Data: 1
Monthly Average Velocity: 1.2 km/h 273.7 deg	Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 6 Median = 9 O ₃ = 13 P ₉₀ = 18 P ₉₉ = 27	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-Jun	SSE9	SSE9	SE10	SE7	SE7	SE8	ESE8	ESE8	SE6	SE6	SSE9	SSW9	SSW1	W6WNNW11	SSE10	SE8	SE11	SSE10	SSE9	SE6	SE8	SE8	SW4	SSE6.2	SE11	
2-Jun	NW4	WSW4	SSW3	WSW2	WSW2	SSE3	NW3	WNNW3	NNW4	N6	N6	N7	N9	NNE9	N11	SW12	SW14	ESE10	ESE8	SSE5	WSW7	SW8	SE6	ESE1	WNNW0.9	SW14
3-Jun	SW4	SSW6	SSE5	S5	S5	S7	S7	SW7	WSW10	WSW12	SW9	SW13	WSW20	WSW21	NW10	N20	NW11	N11	SSE1	NNE15	E5	S6	SSE4	NE5	WSW3.5	WSW21
4-Jun	ENE2	SW8	SW16	WSW19	WSW20	WSW22	WSW21	W20	W17	W17	WNNW18	NW17	WNNW13	W11	WSW11	WNNW18	NNW21	NW24	NW24	NW22	NW17	NW12	NW10	W7	WNNW13.8	NW24
5-Jun	WNNW11	NW13	WSW7	SW6	WSW5	WSW7	WSW7	W7	N7	WNNW11	NW17	NW14	NW14	NW11	NNW12	N9	N11	NNE8	NNE9	NE10	NE7	ENE9	SE8	SE11	NNW5.1	NW17
6-Jun	SE11	SE11	SSE11	SE11	SE10	SSE9	SE8	SE9	SE10	SE10	SE12	SE15	SE15	S14	SSE14	SSE15	S12	S16	S18	SSE20	SSE10	SE10	S1	NNE5	SSE10.8	SSE20
7-Jun	S5	SSW7	S8	W7	W9	WSW4	WSW10	W9	WNNW7	WSW6	WSW5	NNW5	N15	NE8	NNW1	NW5	NNW10	N14	N12	NNW9	NNW14	NNW12	NW9	WNNW7	NW5.0	N15
8-Jun	WNNW4	WNNW4	S3	WSW4	WNNW5	NW6	NW7	NNW7	NNW7	NNW6	NNW6	N8	N12	NNE6	ENE6	NE3	ESE4	SE9	SE8	SE9	ESE7	E6	ESE11	E12	NE2.2	N12
9-Jun	ENE11	NE11	NE14	NE16	NNE15	NNE17	NNE19	NNE23	NNE26	NNE26	NNE23	NNE25	NNE25	NNE27	N30	N30	N28	N25	N25	N22	N21	NNW21	NNW19	NNW15	NNE20.6	N30
10-Jun	NNW13	NW12	NW12	NW5	W5	SW4	WNNW5	NW8	NW9	N16	N12	N14	N13	N10	N11	NE8	NNE8	NNE7	NNE5	NNE8	NE7	ENE8	ENE10	SE4	N6.6	N16
11-Jun	SSE5	SE7	SSE6	SE7	SE6	SSE7	SE10	SSE9	SE9	SE10	SE12	SE15	SE19	SE13	SE18	SE11	SE8	SE14	SE13	SE15	SE9	ESE4	E5	ESE3	SE9.5	SE19
12-Jun	S1	E3	ENE2	ENE4	S4	SSW6	SSW8	SW8	SSW10	S9	SSW10	SSW12	SSW9	SSW11	SSW11	WSW13	W13	WSW14	WSW11	SW7	SW11	SW14	SW16	SW16	SW7.9	SW16
13-Jun	WSW15	WSW16	WSW16	SW13	SW14	SW14	SW15	SW16	WSW16	WSW18	SW17	SW20	WSW21	WSW22	WSW19	WSW18	WSW17	WSW16	WSW15	WSW13	SW10	SW11	WSW2	S6	WSW14.8	WSW22
14-Jun	SW6	SSE7	SSE7	SSE6	SE7	SE3	SSE6	ESE4	ESE5	NE3	ESE1	ESE7	ESE12	ESE10	ESE9	ESE11	ESE10	ESE12	SE10	SSE8	SSE17	SSE18	ESE8	ESE9	SE7.4	SSE18
15-Jun	ESE10	ESE9	ESE11	ESE16	E16	SE3	ESE6	ESE9	SE16	SSE25	SSE29	SSE31	M	SSE20	S27	S24	S23	S21	SSE13	SW8	S10	SSE10	SE7	SE7	SSE14.4	SSE31
16-Jun	SSE8	SE12	SE14	SSE14	SSE13	S14	SSE17	S18	S18	S19	SSW18	SSW16	SW18	SW17	SSW16	SW12	SW11	SW13	SW11	WSW9	W10	WSW10	WSW10	SW10	SSW11.3	S19
17-Jun	WSW9	WSW12	W10	W10	W10	WSW10	W12	WNNW15	NNW23	NNW22	NNW19	NNW19	NNW20	NNW19	NNW18	NNW18	W17	W15	W8	N10	NE6	N9	N16	NNW4	WNNW11.8	NW23
18-Jun	WNNW9	WNNW12	W9	WNNW13	WNNW12	WSW10	W12	W13	W13	W13	WNNW12	W10	WSW11	WSW12	WSW12	W9	WNNW8	NNW2	SSW5	S4	SE6	N17	NE11	N3	W7.1	N17
19-Jun	N10	NW10	WNNW9	W8	WSW5	WNNW6	WSW9	WNNW9	N11	NNE13	N13	NNW18	NNW23	NNW27	NNW27	N23	NNW27	N29	N22	N15	N12	N8	NW4	WNNW5	NNW12.8	N29
20-Jun	W6	SW4	WSW6	SW4	S3	SE5	SSW1	WSW1	SSW4	SW2	N6	N7	N5	ENE4	ESE6	ESE10	ESE10	ESE10	SE11	SE8	SE7	SE9	SE8	SE8	SE3.2	SE11
21-Jun	SE9	SE10	SE7	SE7	SE8	SE5	SE7	ESE7	SE6	S5	SW10	WSW9	SW8	W6	N9	N7	N7	SSW1	ESE1	E4	NNE3	SE7	SSE8	SSE7	SSE3.0	SW10
22-Jun	SE6	S5	S5	SSE6	SSE7	SSE8	SSE8	SE5	SE4	SSE2	N6	N6	N7	NE4	NNE2	NNE1	ESE2	SW11	WSW15	WSW11	SW10	SW8	SSE8	SW4	S2.8	WSW15
23-Jun	WSW6	S5	SSE4	WSW5	S5	WSW7	WNNW4	N6	N7	NNE4	NW3	WNNW7	W6	NNW6	NW10	NNW17	NNW13	NNW8	N9	NNE8	NE9	ENE8	N9	NW12	NNW4.3	NNW17
24-Jun	NW4	NE8	N4	N11	N10	NNE7	N11	N12	N14	N17	N13	NNW11	N19	NNW10	NW16	NNW17	NNW10	N15	NNW7	NW14	NW12	NW11	NW11	N8	NNW10.2	N19
25-Jun	N10	NNW7	NNW8	N12	N10	N11	N14	N14	N14	N13	N14	N16	NNW17	N15	N13	N13	N13	N14	NNE12	NNE10	NNE6	SE4	SW5	S5	N10.0	NNW17
26-Jun	SSW4	WNNW6	SSW5	S5	SSE8	SSE6	SSE6	SSW4	SSE3	SSW5	WNNW2	SW4	SSE7	N13	N10	SSW7	SSW8	S7	S8	SSE8	WSW9	W17	NW2	SW6	SSW3.3	W17
27-Jun	WNNW6	SSW6	S6	WSW8	SW5	WSW9	WSW9	WSW9	W9	WSW9	WSW9	W12	WSW14	SW20	E3	SSW8	S7	SSW10	SW8	WSW6	W5	SSE5	ESE3	S8	SW6.7	SW20
28-Jun	S4	S6	SSE6	SSE5	S7	S3	SSW4	N2	N7	NW3	WSW6	W5	NNW13	N18	N20	N19	N19	NNE18	N17	N17	N10	NNE8	NE7	NE9	N5.9	N20
29-Jun	ESE6	S5	S3	E1	NNW4	N4	NW1	ENE0	N6	N5	N7	NNE7	NNE4	N9	N8	SE1	SE4	SE4	SE5	ESE6	SE6	SE9	SE11	SSE12	E2.0	SSE12
30-Jun	SE11	SE12	SE11	SSE9	SSE6	S2	SE7	SE5	SE5	ENE6	E7	ESE8	ESE11	ESE11	ESE11	ESE12	ESE12	ESE10	SE11	SSE7	SSE5	SE6	SSW6	SSW6	SE7.5	SE12

SSW1.6SSW2.4SSW3.1SSW2.1SSW2.3SSW3.0 SW2.8 W2.2 NW2.2WNNW2.1WNNW2.5WNNW3.1 NW4.1WNNW3.3 NW3.3 NW2.8 NW2.9NNW1.3NNW0.5 N1.3 NO.2 SE0.3 E0.9 S1.2	Diurnal Average
WSW15WSW16 SW16WSW19WSW20WSW22WSW21 NNE23 NNE26 NNE26 SSE29 SSE31 NNE25 SSE29 N30 N30 N28 N29 N25 NW22 N21 NNW21 NNW19 SW16	Diurnal Maximum

M - Maintenance
 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
Buffalo Viewpoint - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 12 km/h on Jun 2 16:00	Hours in Service: 720 Hours of Data: 719 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9
Minimum Value: 1 km/h on Jun 20 07:00	
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 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-Jun	2	2	1	3	2	2	2	2	2	2	4	5	1	4	4	4	3	3	3	2	1	1	1	1	5
2-Jun	1	1	2	2	1	2	1	1	2	1	1	2	3	4	3	12	6	3	5	2	1	4	1	1	12
3-Jun	1	2	2	1	2	1	2	3	3	3	3	4	6	6	4	6	6	4	1	4	3	2	2	2	6
4-Jun	2	3	4	5	5	5	5	5	5	4	5	4	4	5	8	6	5	6	5	5	3	2	2	2	8
5-Jun	3	3	2	2	2	2	3	3	2	5	5	4	4	3	4	3	5	2	3	2	1	2	3	3	5
6-Jun	2	2	2	2	2	3	3	3	3	3	4	4	4	5	5	5	4	5	5	6	5	2	4	3	6
7-Jun	1	1	2	3	5	2	2	2	2	2	2	4	7	3	2	2	5	3	3	3	3	2	2	1	7
8-Jun	2	1	2	1	2	1	1	1	1	1	1	2	2	3	2	2	2	3	2	2	2	4	3	3	4
9-Jun	4	3	3	4	3	4	4	5	6	6	5	6	5	5	6	6	5	4	5	4	4	3	3	2	6
10-Jun	2	2	2	1	1	1	2	2	2	4	4	3	4	3	4	3	3	2	1	2	1	1	2	2	4
11-Jun	1	1	1	1	1	2	2	2	2	3	4	5	6	5	5	4	3	5	5	5	3	1	2	1	6
12-Jun	1	1	2	1	2	2	2	2	3	2	3	4	2	3	3	5	4	3	3	2	5	3	5	4	5
13-Jun	4	4	4	3	4	4	4	4	6	5	5	5	6	6	5	6	5	4	4	3	2	2	3	3	6
14-Jun	1	2	2	2	1	2	2	2	2	2	2	4	5	3	3	4	3	5	3	5	6	6	3	2	6
15-Jun	3	3	4	4	4	4	2	3	5	10	9	10	M	9	9	8	7	6	4	4	6	6	2	2	10
16-Jun	2	3	3	4	3	4	5	5	6	5	5	5	4	4	4	4	3	4	3	4	2	2	3	2	6
17-Jun	3	3	3	2	3	2	3	4	6	5	5	5	5	6	5	5	5	4	2	7	2	5	3	5	7
18-Jun	4	3	2	3	3	3	3	3	3	3	4	3	3	4	3	3	3	2	2	1	1	11	4	2	11
19-Jun	2	1	1	2	2	2	2	3	3	3	3	5	6	6	7	5	6	6	5	3	3	1	1	1	7
20-Jun	1	1	1	1	1	1	1	1	1	2	2	3	2	2	3	3	3	2	2	1	1	1	1	1	3
21-Jun	2	2	1	1	1	2	2	2	1	3	2	3	3	3	2	2	3	1	1	1	1	2	1	1	3
22-Jun	2	1	1	1	1	1	2	2	1	1	1	2	2	2	1	1	2	5	4	3	2	2	1	2	5
23-Jun	2	2	1	1	1	2	2	2	2	2	2	2	2	2	6	5	3	2	2	2	2	2	3	2	6
24-Jun	2	2	2	2	3	2	3	3	3	3	4	4	6	3	4	6	4	4	4	3	3	2	2	2	6
25-Jun	2	1	2	2	2	2	2	3	3	3	4	4	3	4	4	4	3	4	3	3	1	2	1	2	4
26-Jun	1	2	1	1	1	2	2	1	1	1	2	2	4	10	6	2	4	2	1	2	7	8	3	2	10
27-Jun	2	1	1	3	2	2	3	2	2	2	3	4	4	6	6	5	3	3	3	2	1	2	2	1	6
28-Jun	1	2	2	1	1	1	1	2	2	2	2	3	5	5	5	5	4	5	4	4	2	2	2	1	5
29-Jun	2	1	1	1	1	1	1	1	1	2	3	2	2	3	3	3	2	2	2	1	1	2	3	3	3
30-Jun	2	2	2	2	1	1	2	2	1	3	2	3	3	4	4	3	4	3	3	2	1	1	1	1	4

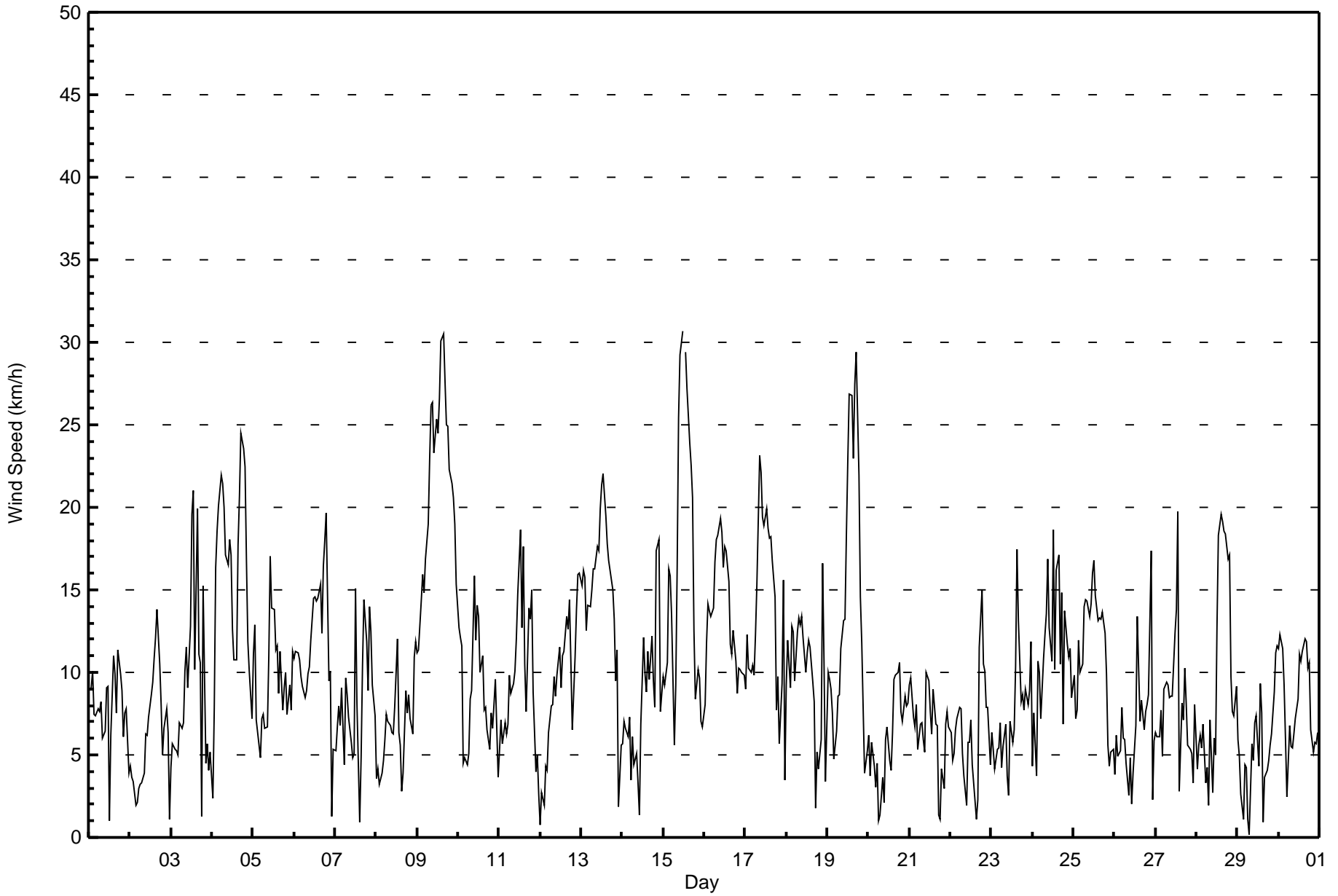
4	4	4	5	5	5	5	5	5	6	10	9	10	7	10	9	12	7	6	5	7	7	11	5	5	
Diurnal Maximum																									

M - Maintenance



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Buffalo Viewpoint - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Buffalo Viewpoint - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	143	19.89	19.89
6 - 11	349	48.54	68.43
12 - 19	177	24.62	93.05
20 - 28	44	6.12	99.17
29 - 38	6	0.83	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 719

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Buffalo Viewpoint - June 2016**

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	7	4	5	6	11	12	12	21	11	10	11	3	8	10	6	143
6 - 11	42	14	11	7	2	30	61	37	14	17	22	31	20	14	13	14	349
12 - 19	37	7	2	0	2	5	16	9	8	4	17	20	12	13	13	12	177
20 - 28	9	7	0	0	0	0	0	2	4	0	2	7	1	2	4	6	44
29 - 38	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	6
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	97	35	17	12	10	46	89	63	47	32	51	69	36	37	40	38	719

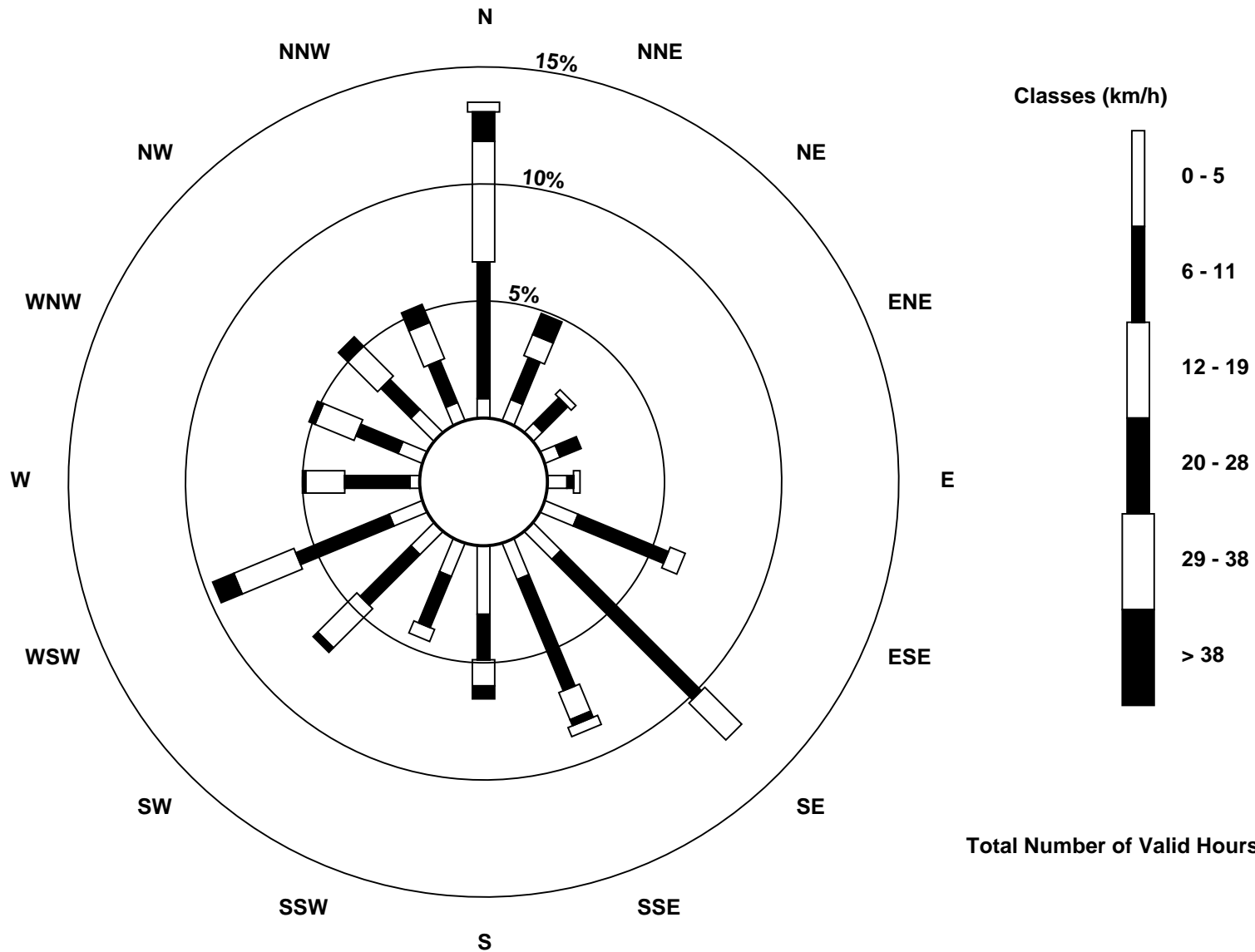
Total Number of Valid Hours: 719

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

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





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Buffalo Viewpoint - June 2016

Direction of Maximum Speed: 159 deg on Jun 15 12:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 12.4 deg on Jun 9	Hours of Data: 719
Direction of Minimum Speed: 73 deg on Jun 29 08:00	Hours of Missing Data: 1
Direction of Minimum Daily Speed Average: 0.9 deg on Jun 2	Percent Operational Time: 99.9
Monthly Average Direction: 266.6 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-Jun	153	152	140	128	124	141	122	120	140	143	159	199	198	273	282	164	140	130	148	154	128	128	140	229	149.8
2-Jun	305	237	205	248	247	148	307	300	341	351	353	354	11	23	1	236	222	106	107	165	240	233	127	115	293.2
3-Jun	223	212	154	175	169	175	188	220	244	248	214	227	249	252	323	353	322	2	155	13	87	187	158	55	252.6
4-Jun	74	224	236	240	244	246	254	270	276	272	295	306	284	272	248	294	332	305	306	313	314	315	314	267	281.7
5-Jun	290	310	253	231	253	241	243	279	354	302	311	312	324	325	330	359	5	30	30	34	43	62	126	140	326.6
6-Jun	141	144	147	145	146	148	141	142	139	132	128	125	125	176	166	165	170	178	171	156	166	143	173	25	150.5
7-Jun	189	206	178	267	263	245	257	272	287	257	244	327	0	52	335	311	347	354	354	344	341	345	320	303	314.3
8-Jun	295	294	174	258	300	309	320	335	344	332	343	350	5	33	71	37	119	144	133	130	111	90	107	81	38.6
9-Jun	77	43	34	34	16	20	26	16	15	20	19	19	19	16	9	9	8	3	7	358	353	346	345	342	12.4
10-Jun	335	306	308	310	260	220	286	304	326	357	355	355	356	356	4	34	18	25	16	28	44	61	61	135	353.1
11-Jun	161	132	163	137	143	153	144	147	144	131	134	139	144	140	132	124	130	134	127	127	139	107	101	118	136.1
12-Jun	176	101	57	61	189	202	212	215	204	177	200	201	201	210	204	251	259	255	250	218	216	225	234	235	220.6
13-Jun	237	239	239	232	233	226	231	228	245	241	227	235	239	242	250	239	250	248	253	248	221	228	249	183	237.7
14-Jun	217	157	165	158	141	143	161	121	106	54	119	123	122	118	122	117	103	113	133	163	150	148	121	108	133.3
15-Jun	116	114	106	109	101	126	116	115	130	148	157	159	M	167	172	175	170	179	166	218	184	160	142	142	151.8
16-Jun	153	145	146	153	156	169	167	174	173	184	198	213	218	214	209	221	235	223	228	255	264	258	248	224	197.5
17-Jun	242	252	262	280	279	258	276	284	316	301	296	301	302	292	287	285	273	274	276	349	54	354	10	344	293.8
18-Jun	289	292	281	301	294	247	261	276	267	271	295	259	242	237	246	260	285	335	210	182	133	9	46	5	276.7
19-Jun	349	324	300	276	257	293	256	301	359	20	350	333	333	332	341	353	344	351	2	6	3	352	316	289	339.4
20-Jun	270	214	246	225	179	145	207	241	200	218	3	360	357	67	111	118	123	123	125	131	141	135	138	136	136.2
21-Jun	142	146	146	133	130	143	133	117	126	178	223	241	223	278	6	359	352	199	123	79	26	139	158	151	150.5
22-Jun	146	176	177	153	167	161	147	135	124	149	5	2	6	48	26	30	121	217	257	256	219	215	151	215	188.8
23-Jun	245	180	156	242	173	243	295	357	357	16	326	289	269	332	320	333	346	346	357	30	50	64	351	319	333.2
24-Jun	323	51	353	355	5	13	359	0	355	354	350	340	351	282	309	343	329	4	339	307	315	309	317	360	341.6
25-Jun	4	346	344	352	355	354	360	359	360	352	4	359	346	355	358	6	4	6	19	29	28	126	228	169	0.4
26-Jun	192	287	204	181	149	148	159	206	158	200	300	216	148	357	2	199	208	181	184	161	247	260	319	231	209.3
27-Jun	294	209	185	242	222	257	251	249	275	257	253	262	249	222	90	200	186	213	219	251	263	168	114	184	233.1
28-Jun	180	169	166	165	181	173	210	351	358	326	255	271	344	1	6	5	4	12	7	8	9	33	45	55	7.2
29-Jun	107	175	184	88	341	11	323	73	351	359	353	21	24	2	11	145	124	135	128	122	130	137	146	151	85.7
30-Jun	146	141	143	152	164	189	145	145	130	72	96	116	117	114	120	112	119	118	132	154	157	127	204	192	133.0

207.5 202.1 192.6 201.8 200.7 206.7 228.0 265.9 313.2 298.7 291.1 288.9 314.1 294.3 324.4 319.6 324.8 340.0 337.0 2.0 351.6 142.1 87.7 174.9

Diurnal Average

M - Maintenance

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

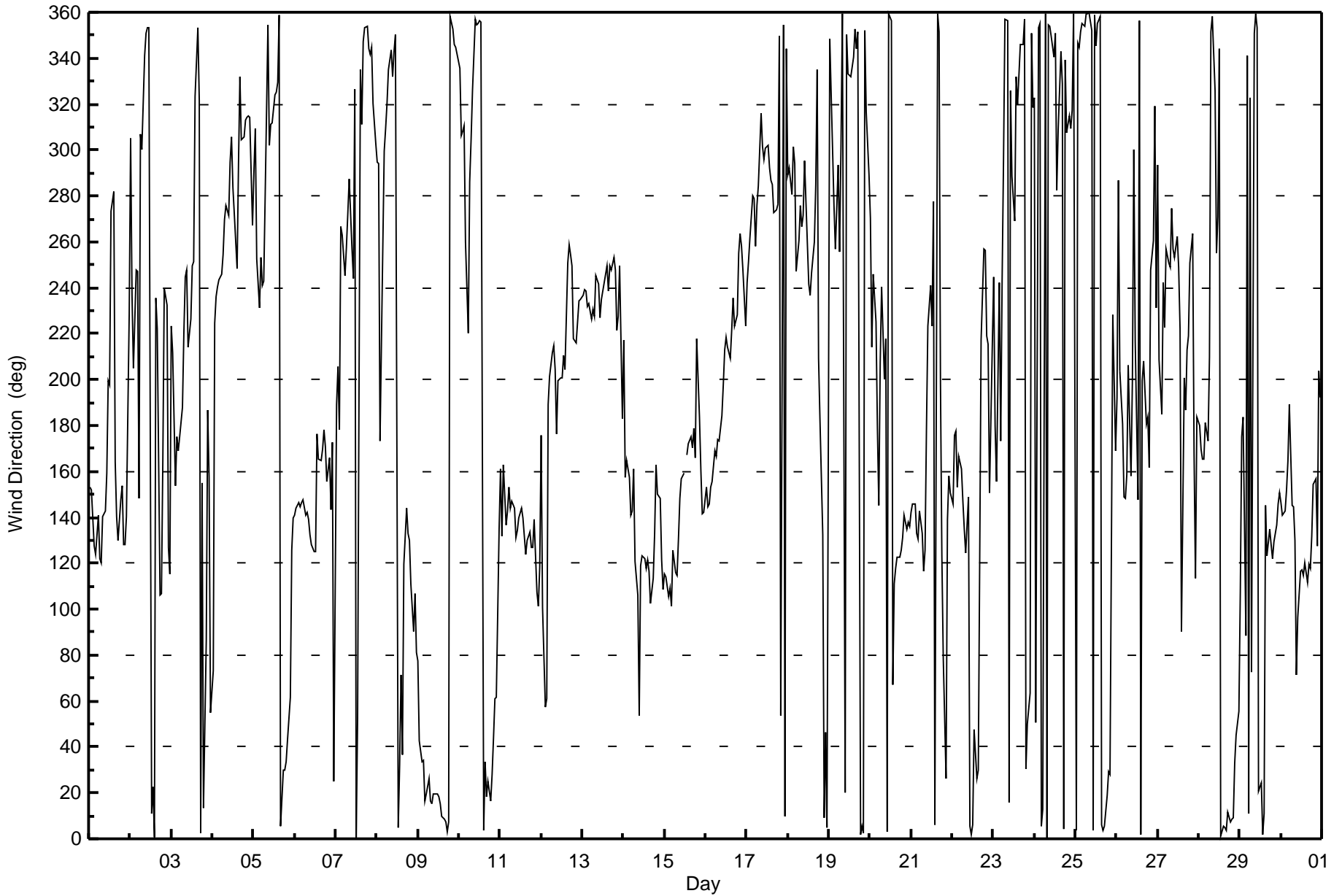
Wind Direction (WD) - deg
Buffalo Viewpoint - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 102 deg on Jun 29 16:00	Hours of Data: 719
Minimum Value: 8 deg on Jun 8 00:00	Hours of Missing Data: 1
Percentiles: P ₁ = 10 P ₁₀ = 15 Q ₁ = 18 Median = 22 O ₃ = 31 P ₉₀ = 50 P ₉₉ = 93	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-Jun	19	16	11	57	31	16	18	19	34	26	37	41	91	51	23	36	29	24	25	20	17	13	14	50	91	
2-Jun	25	28	44	56	45	56	45	44	62	27	21	29	34	38	20	81	24	29	26	26	22	28	31	93	93	
3-Jun	37	23	41	29	41	16	20	26	21	25	25	24	20	21	43	18	34	22	79	18	62	33	59	44	79	
4-Jun	76	21	17	16	15	14	14	17	20	22	20	19	22	45	34	19	17	15	16	12	11	15	21	17	76	
5-Jun	23	10	32	22	33	21	21	43	33	26	21	25	27	28	30	35	28	33	19	17	15	20	17	19	43	
6-Jun	18	18	19	19	20	22	23	24	25	22	23	22	27	31	29	28	25	20	22	21	68	27	98	72	98	
7-Jun	25	19	18	50	28	48	15	19	22	35	60	87	38	26	93	56	26	17	15	22	11	9	21	8	93	
8-Jun	74	29	72	53	35	15	16	23	17	19	18	16	17	44	28	72	61	26	19	18	20	79	18	22	79	
9-Jun	24	19	16	16	19	21	17	18	16	15	15	15	15	15	17	17	17	18	18	18	18	16	13	12	24	
10-Jun	13	10	10	33	22	21	32	19	24	19	21	20	22	29	31	37	35	26	25	16	23	10	12	43	43	
11-Jun	21	11	26	11	14	20	21	23	21	20	22	23	25	27	23	21	24	21	22	20	24	34	20	36	36	
12-Jun	81	28	64	34	31	30	21	24	20	24	24	31	19	18	22	31	24	17	18	13	19	15	18	17	81	
13-Jun	17	17	17	18	18	17	18	17	21	19	22	23	19	19	20	19	17	20	17	17	11	12	73	57	73	
14-Jun	34	25	15	17	11	50	25	43	34	68	97	62	26	22	21	22	21	25	22	45	27	21	20	19	97	
15-Jun	19	20	20	20	19	33	43	25	21	26	22	22	M	22	22	22	22	23	21	26	41	27	33	19	20	43
16-Jun	21	18	20	21	21	22	22	23	23	24	20	21	19	20	23	20	21	19	19	27	14	11	17	15	27	
17-Jun	19	14	16	15	19	17	17	20	14	16	17	16	18	20	21	20	21	24	20	42	36	50	17	70	70	
18-Jun	33	18	19	15	20	17	16	19	21	25	23	28	27	25	31	29	28	98	45	21	21	39	19	50	98	
19-Jun	14	9	14	16	33	24	19	36	21	22	23	21	19	18	20	21	20	20	19	17	16	15	35	15	36	
20-Jun	14	35	15	22	39	10	80	78	53	80	31	44	74	57	44	26	19	19	18	15	12	10	10	12	80	
21-Jun	14	14	11	11	10	18	20	20	25	44	21	29	49	47	22	28	27	77	94	9	24	27	11	9	94	
22-Jun	15	16	15	23	20	13	18	26	43	86	26	44	40	60	73	84	62	16	20	20	16	22	16	35	86	
23-Jun	47	56	44	38	30	19	43	26	25	63	83	29	23	40	31	17	16	19	18	35	20	16	27	12	83	
24-Jun	35	26	58	15	17	22	15	20	16	16	20	24	17	27	30	22	30	18	37	16	16	11	11	28	58	
25-Jun	16	12	11	14	13	14	15	16	18	17	23	19	17	18	22	21	20	21	18	19	31	34	22	42	42	
26-Jun	52	23	27	18	12	16	27	32	54	40	90	64	43	85	29	34	35	21	16	20	36	23	76	20	90	
27-Jun	22	22	25	22	30	16	18	19	25	25	30	24	23	16	84	36	31	17	17	40	17	40	69	13	84	
28-Jun	37	24	29	18	17	59	27	93	22	74	44	68	33	20	22	21	19	19	20	17	12	19	18	12	93	
29-Jun	32	19	46	79	21	18	79	98	25	44	41	40	69	34	44	102	73	46	35	18	9	16	18	18	102	
30-Jun	17	17	18	20	29	46	24	21	33	41	19	26	29	34	25	26	22	24	21	32	19	13	20	21	46	

81	56	72	79	45	59	80	98	62	86	97	87	91	85	93	102	73	98	94	45	68	79	98	93	
Diurnal Maximum																								

M - Maintenance





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 15, 2016	Last Calibration	May 3, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	9:10	End Time (MST)	14:17
Gas Cert Reference	LL107929	Station temp.	21 Deg C
Cal Gas Concentration	49.7 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

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-593	-593
Analyzer IP address	192.168.1.43		Lamp voltage	838	838
Calculated slope	0.998873	1.002095	Chamber temp	45.0	45.0
Calculated intercept	0.720161	0.110708	Pressure	693.1	684.9
Analyzer Background	10.8	10.9	Flow	0.492	0.486
Analyzer Coefficient	0.819	0.819	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	0.3	----
as found span	5000	60.4	600.4	601.3	0.998
calibrator zero	5000	0.0	0.0	0.3	----
high point	5000	60.4	600.4	598.7	1.003
second point	5000	30.2	300.2	300.9	0.998
third point	5000	15.1	150.1	148.1	1.013
as left zero	5000	0.0	0.0	0.4	----
as left span	5000	60.4	600.4	599.0	1.002
Average Correction Factor					1.005

Corrected As found 601.0 Previous response 600.3 % change -0.1%

Notes:

Sample inlet filter replaced after as founds. Scrubber and charcoal material inside ZAG unit replaced after as founds. No adjustments.

Calibration Performed By: Asad Hidayat



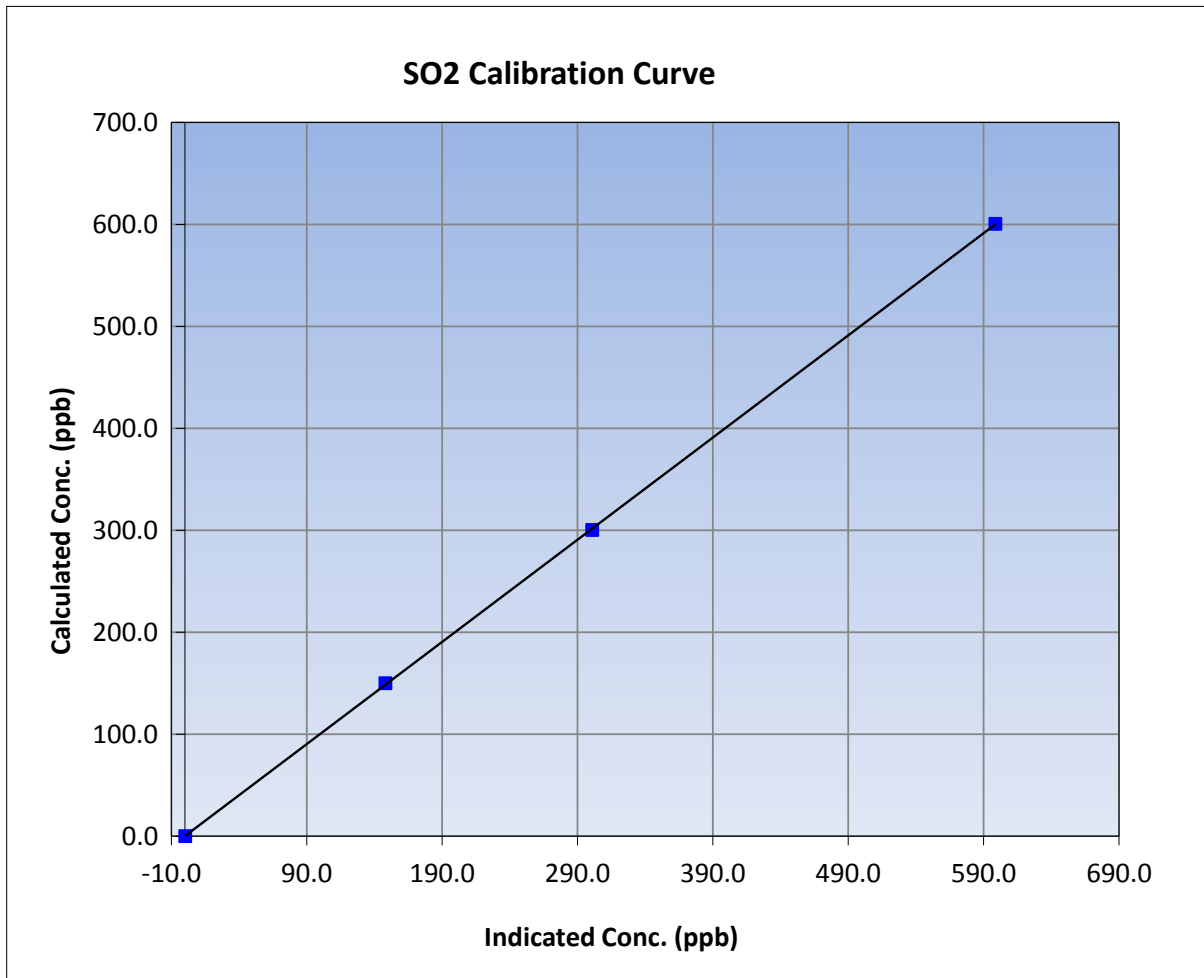
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 15, 2016	Previous Calibration	May 3, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	9:10	End Time (MST)	14:17
Analyzer make	TEI 43i	Analyzer serial #	JC1327300932

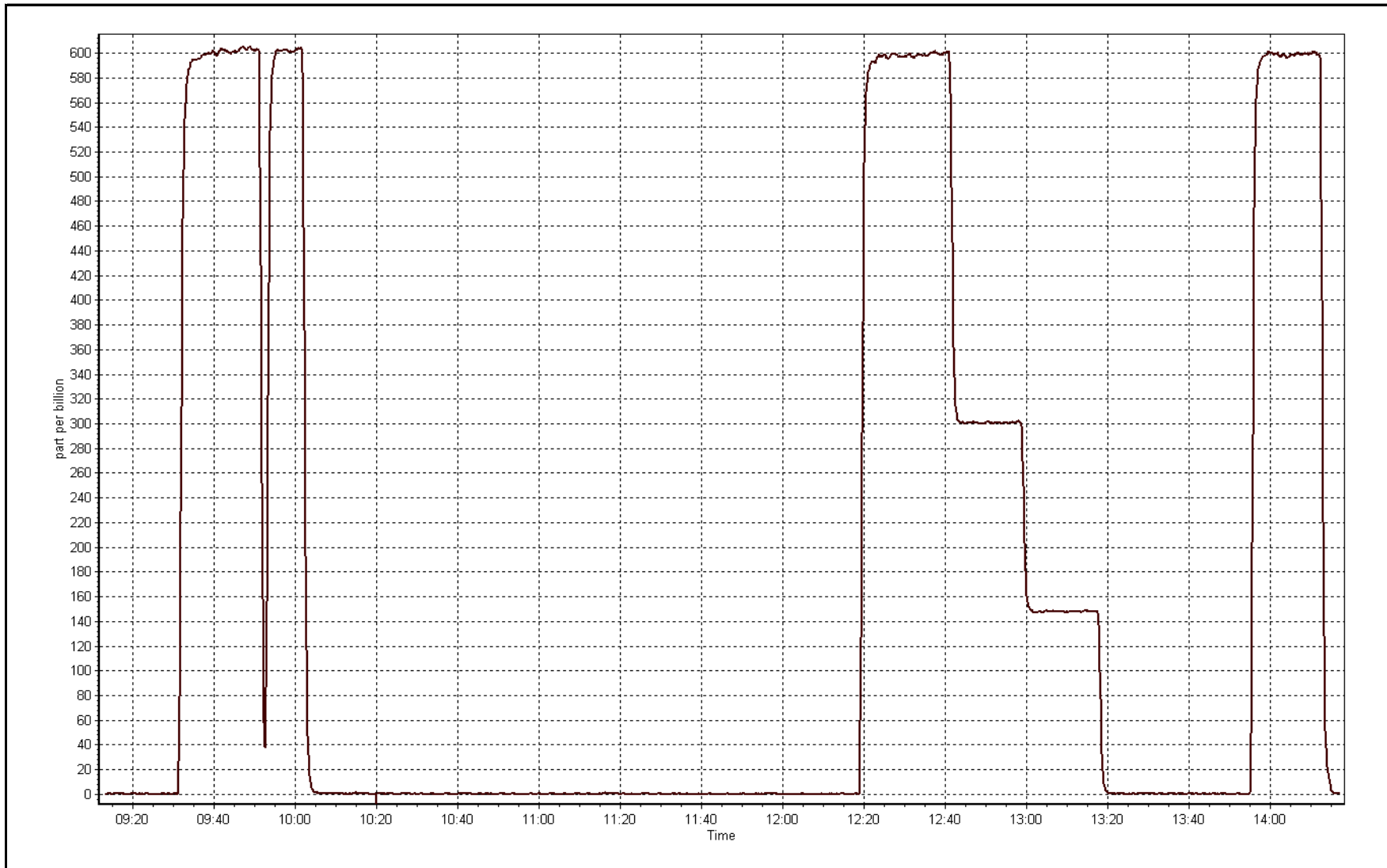
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999975
600.4	598.7	1.0029		
300.2	300.9	0.9976	Slope	1.002095
150.1	148.1	1.0133		
			Intercept	0.110708



SO2 Calibration Plot

Date: June 15, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	June 24, 2016	Last Calibration	May 3, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	8:15	End Time (MST)	11:05
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	49.7 ppm	SO2 gas cert/exp	LL107929 08-Spet-2018

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-615	-616
Analyzer IP address	192.168.1.42		Lamp voltage	879	876
Calculated slope	1.004631	0.994467	Chamber temp	45	45
Calculated intercept	-0.115436	-0.103126	Pressure	545.7	545.7
Analyzer Background	14.3	14.2	Flow	1.038	1.037
Analyzer Coefficient	0.862	0.862	Intensity	94	94
			Converter temp.	329	332

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	0.2	----
as found span	6000	46.2	75.1	75.5	0.995
SO2 scrubber check	5000	15.1	150.1	1.4	----
calibrator zero	6000	0.0	0.0	0.0	----
high point	6000	46.2	75.1	75.5	0.995
second point	6000	25.8	41.9	42.6	0.985
third point	6000	15.4	25.0	25.2	0.992
as left zero	5000	0.0	0.0	0.1	----
as left span	6000	46.1	74.9	76.2	0.984
Average Correction Factor					0.991

Corrected As found	75.3	Previous response	74.8	% change	-0.6%
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Notes:

Sample inlet filter replaced after as founds. Scrubber check done after as founds. No adjustments.

Calibration Performed By: Asad Hidayat



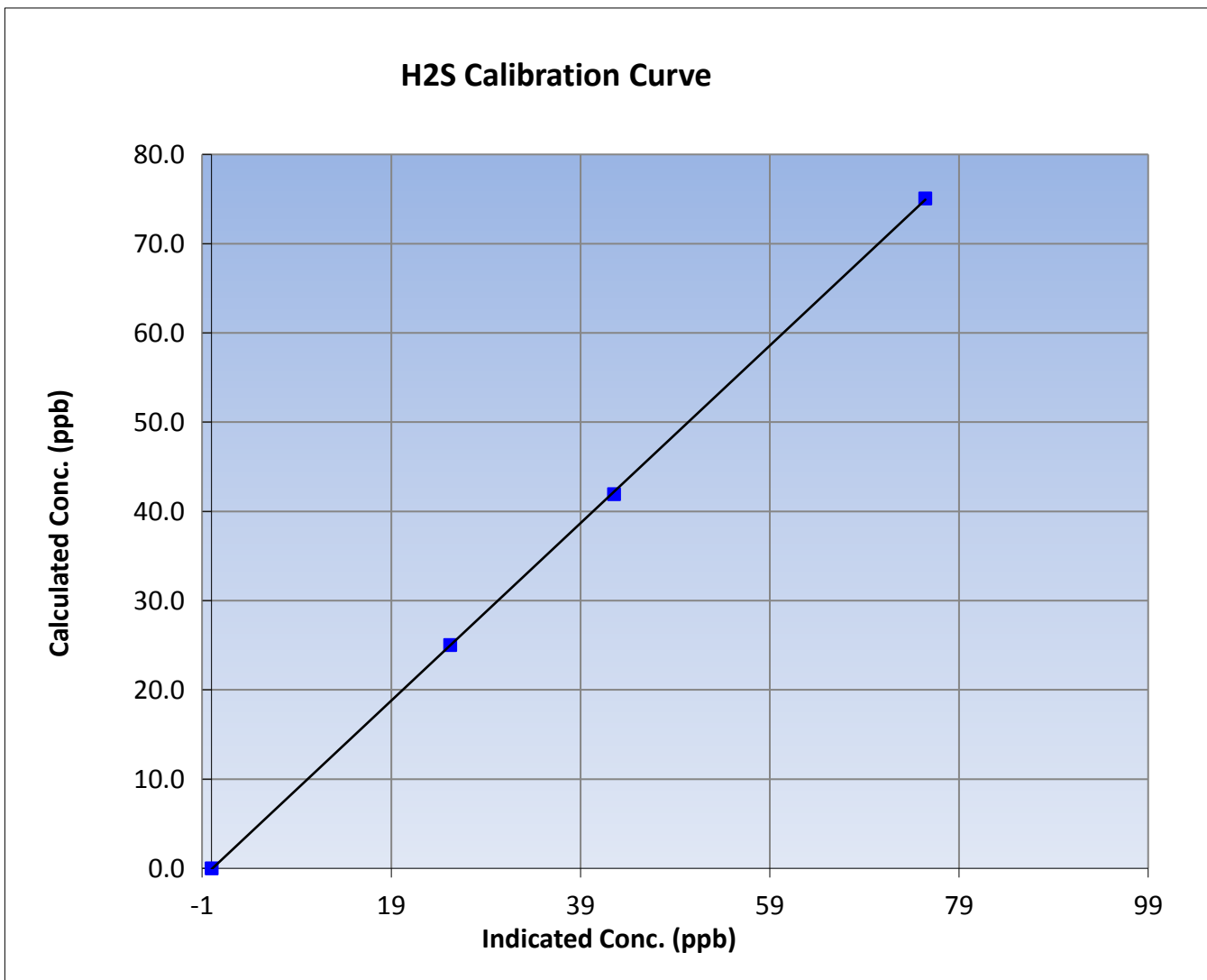
Wood Buffalo Environmental Association H2S Calibration Report

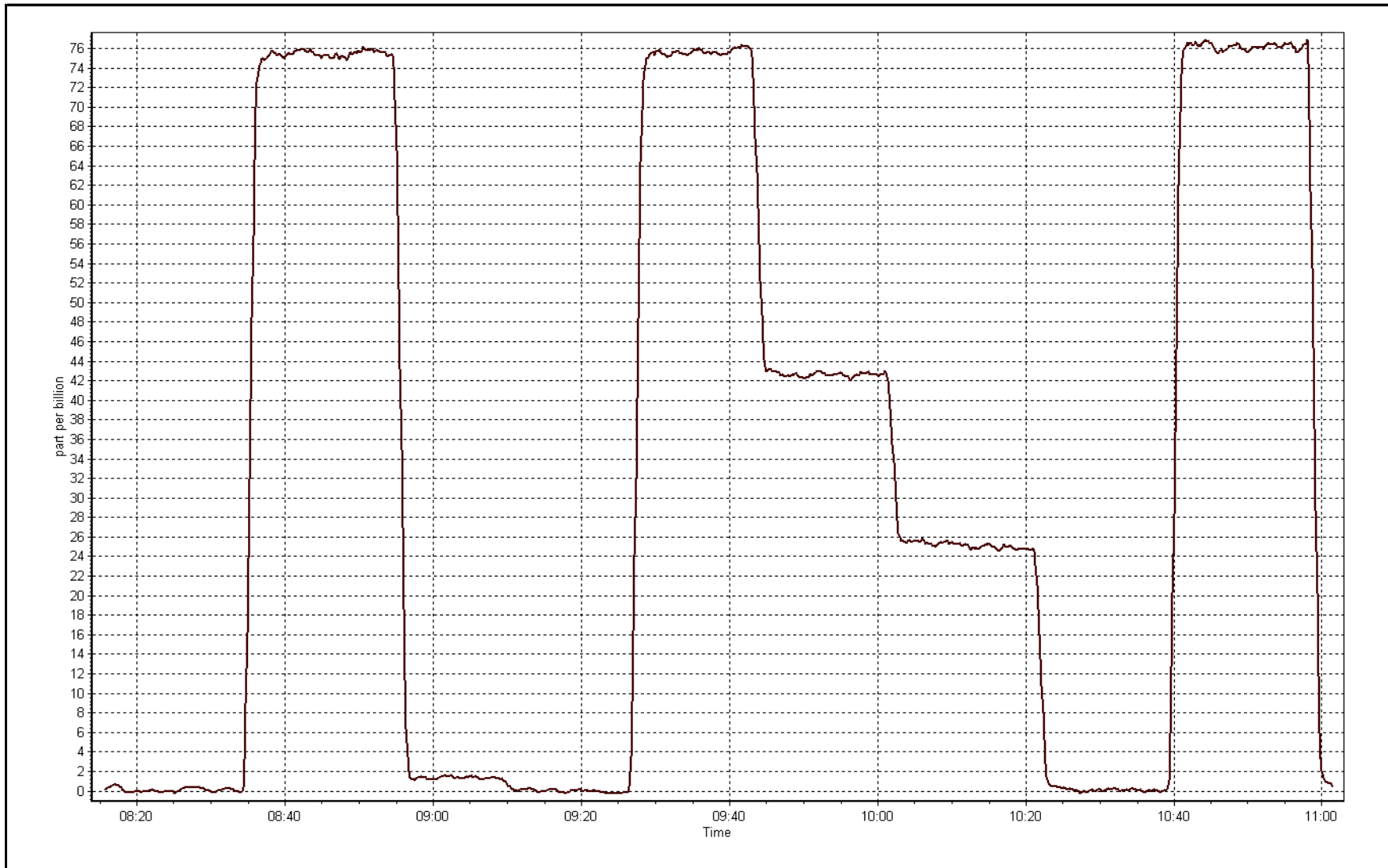
Station Information

Calibration Date	June 24, 2016	Previous Calibration	May 3, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	8:15	End Time (MST)	11:05
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	0.0	----	Correlation Coefficient	0.999962
75.1	75.5	0.9950		
41.9	42.6	0.9853	Slope	0.994467
25.0	25.2	0.9923		
			Intercept	-0.103126







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June-15-16	Last Calibration	May-03-16
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Reason:	Routine		
Start Time (MST)	9:10	End Time (MST)	14:15
Gas Cert Reference	LL107929	Cal Gas Expiry Date	08-Sep-18
CH4 Cal Gas Conc.	514 ppm	CH4 Equiv Conc.	1061.3 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

	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	30.4	30.4
Calculated slope	1.006178	1.002244	Fuel Pressure	19.9	19.9
Calculated intercept	-0.086262	-0.043951	Analyzer Coeff	4.1	4.2
			Analyzer BKG	0.870	0.890

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	60.4	12.82	12.57	1.020
calibrator zero	5000	0.0	0.00	0.04	----
high point	5000	60.4	12.82	12.82	1.000
second point	5000	30.2	6.41	6.48	0.989
third point	5000	15.1	3.20	3.22	0.995
as left zero	5000	0.0	0.00	0.05	----
as left span	5000	60.4	12.82	12.88	0.995
Average Correction Factor					0.995

Corrected As found	12.58	Previous response	12.83	% change	2.0%
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Notes:

Sample inlet filter replaced after as founds. Charcoal and scrubber material inside ZAG replaced after as founds. Used new average for "calibrator zero" without adjusting zero. Adjusted span.

Calibration Performed By: Asad Hidayat



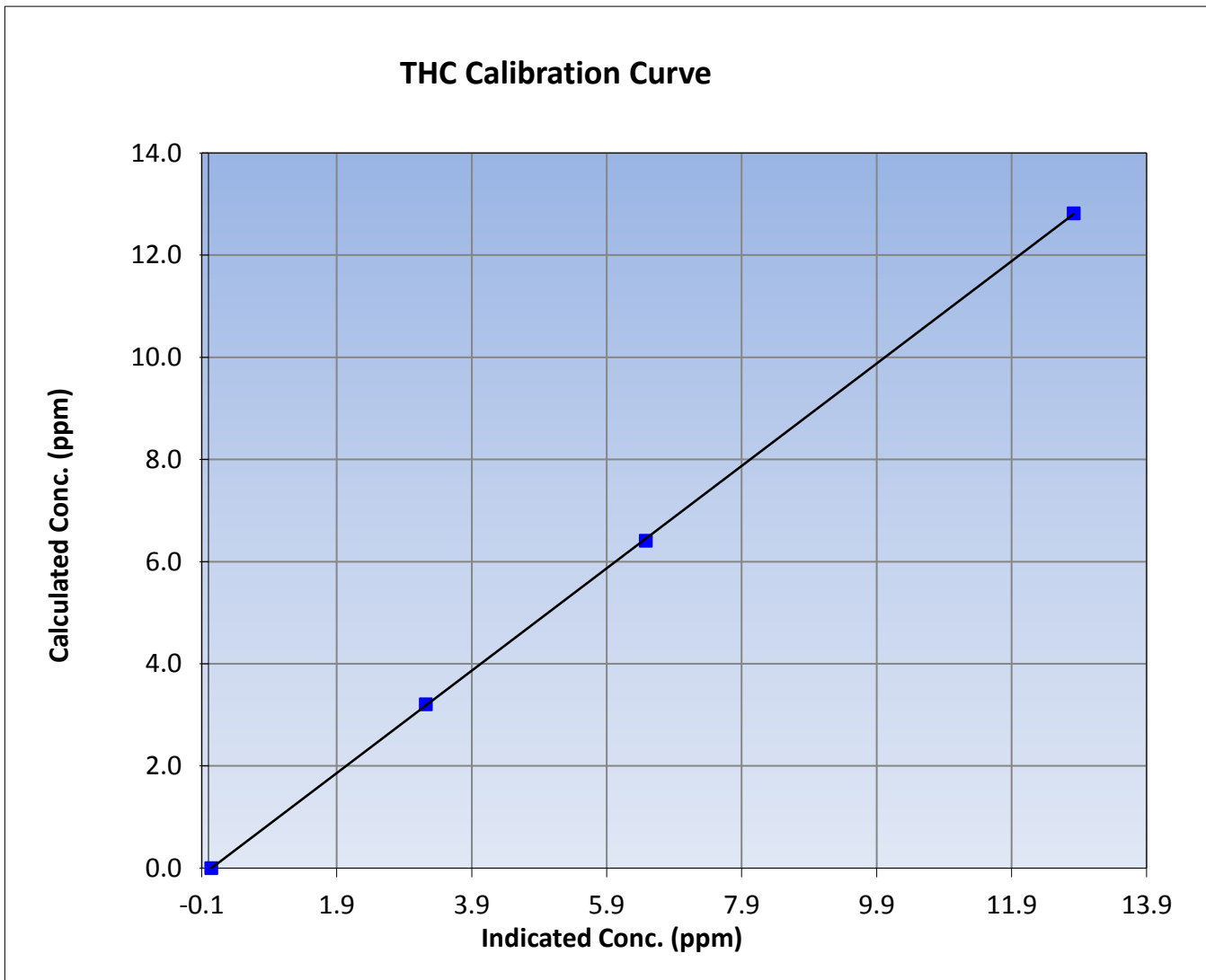
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June 15, 2016	Previous Calibration	May 3, 2016
Station Name	Buffalo Viewpoint	Station Number	AMS 4
Start Time (MST)	9:10	End Time (MST)	14:15
Analyzer make	TEI 51i-LT	Analyzer serial #	1201650671

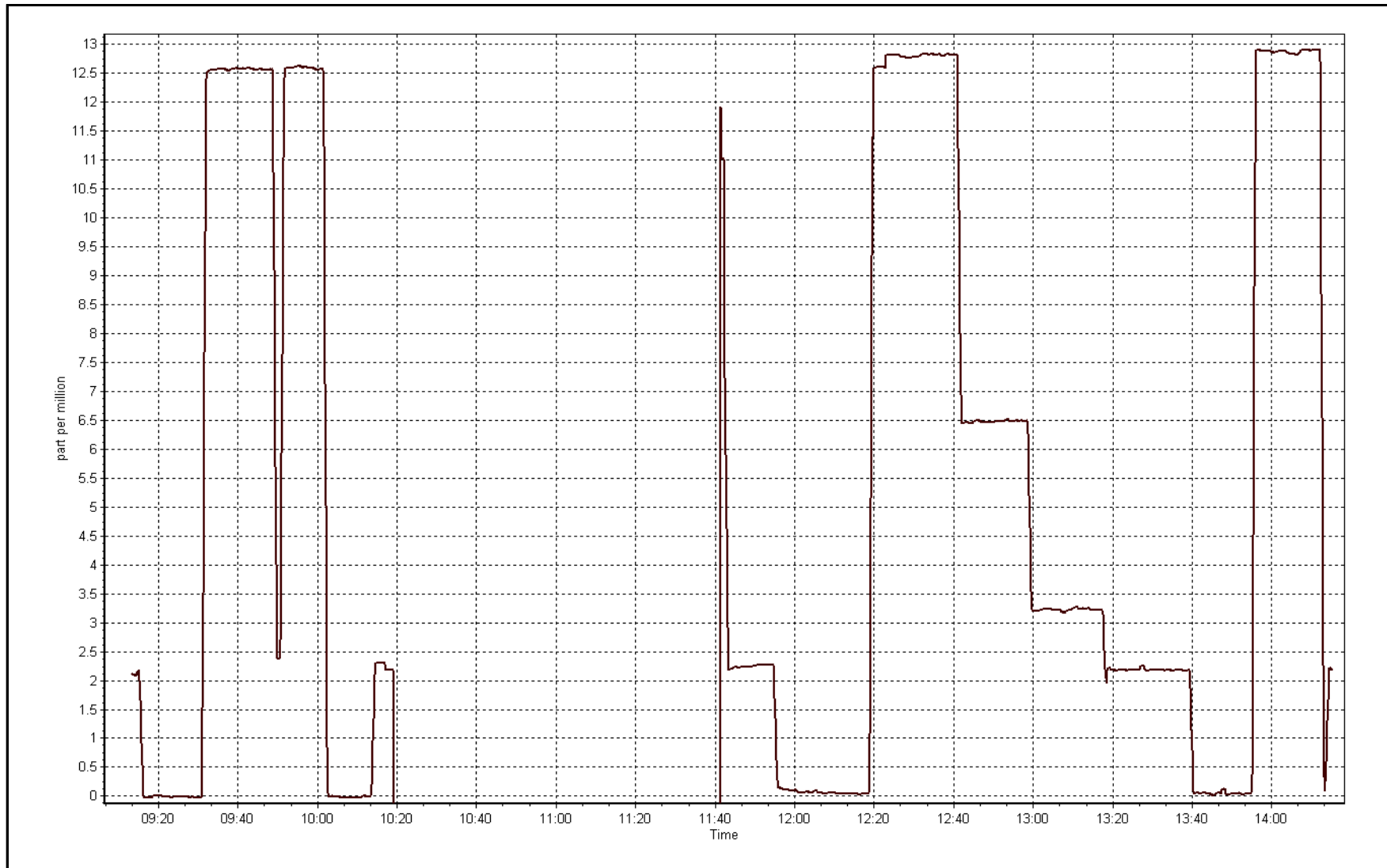
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.04	----	Correlation Coefficient	0.999974
12.82	12.82	1.0000		
6.41	6.48	0.9892	Slope	1.002244
3.20	3.22	0.9953		
			Intercept	-0.043951



THC Calibration Plot

Date: June 15, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

**AMS 5
MANNIX
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MANNIX (AMS 5)

JUNE 2016

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	686	34	34	100.00	91	0	10	0
H2S (ppb) Average	685	35	35	100.00	6	0	1	0
THC (ppm) Average	685	34	35	99.86	5.1	-	2.6	-
Temperature 2 m (C) Average	720	0	0	100.00	29.4	-	22.6	-
Temperature 20 m (C) Average	720	0	0	100.00	28.7	-	22.9	-
Temperature 45 m (C) Average	720	0	0	100.00	28.5	-	22.9	-
Temperature 75 m (C) Average	720	0	0	100.00	28.2	-	22.7	-
Temperature 90 m (C) Average	720	0	0	100.00	28	-	22.7	-
Relative Humidity 2 m (%) Average	720	0	0	100.00	98	-	92	-
Relative Humidity 20 m (%) Average	720	0	0	100.00	98	-	89	-
Relative Humidity 45 m (%) Average	720	0	0	100.00	98	-	89	-
Relative Humidity 75 m (%) Average	720	0	0	100.00	98	-	89	-
Relative Humidity 90 m (%) Average	720	0	0	100.00	97	-	89	-
Wind Speed 20 m (km/h) Average	720	0	0	100.00	35	-	19	-
Wind Speed 45 m (km/h) Average	720	0	0	100.00	51	-	26	-
Wind Speed 75 m (km/h) Average	720	0	0	100.00	56	-	31	-
Wind Speed 90 m (km/h) Average	718	0	2	99.72	58	-	33	-
Wind Direction 20 m (deg) Average	720	0	0	100.00	-	-	-	-
Wind Direction 45 m (deg) Average	720	0	0	100.00	-	-	-	-
Wind Direction 75 m (deg) Average	720	0	0	100.00	-	-	-	-
Wind Direction 90 m (deg) Average	718	0	2	99.72	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	720	0	0	100.00	1.4	-	0.7	-
Vertical Wind Speed 45 m (km/h) Average	720	0	0	100.00	3.6	-	1.4	-
Vertical Wind Speed 75 m (km/h) Average	720	0	0	100.00	2.5	-	0.7	-
Vertical Wind Speed 90 m (km/h) Average	718	0	2	99.72	3.9	-	2	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MANNIX (AMS 5)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	686	1.9	7	-	0	0	0	0	1	4	91
H2S (ppb) Average	685	0.4	0	-	0	0	0	0	1	1	6
THC (ppm) Average	685	2.24	0.2	-	1.7	2.1	2.1	2.2	2.2	2.5	5.1
Temperature 2 m (C) Average	720	17.57	5.1	-	6.2	11.1	13.7	17.1	21.5	24.8	29.4
Temperature 20 m (C) Average	720	17.79	4.8	-	8	11.6	14.2	17.3	21.5	24.4	28.7
Temperature 45 m (C) Average	720	17.7	4.7	-	7.8	11.6	14.1	17.3	21.3	24.3	28.5
Temperature 75 m (C) Average	720	17.58	4.6	-	7.6	11.6	14	17.1	21.1	24.1	28.2
Temperature 90 m (C) Average	720	17.54	4.6	-	7.6	11.7	14.1	17.1	21	24	28
Relative Humidity 2 m (%) Average	720	60.2	21	-	17	32	43	58	80	91	98
Relative Humidity 20 m (%) Average	720	55.7	21	-	14	29	39	54	73	86	98
Relative Humidity 45 m (%) Average	720	54.8	21	-	14	29	39	53	72	86	98
Relative Humidity 75 m (%) Average	720	54.2	21	-	14	29	38	52	71	85	98
Relative Humidity 90 m (%) Average	720	54.1	20	-	14	29	39	52	70	85	97
Wind Speed 20 m (km/h) Average	720	10.4	6	-	1	4	6	9	13	18	35
Wind Speed 45 m (km/h) Average	720	14.7	8	-	1	6	9	14	19	26	51
Wind Speed 75 m (km/h) Average	720	16.6	9	-	1	6	10	15	22	29	56
Wind Speed 90 m (km/h) Average	718	17.8	10	-	0	7	11	17	24	31	58
Wind Direction 20 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-
Wind Direction 45 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-
Wind Direction 75 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-
Wind Direction 90 m (deg) Average	718	-	-	-	-	-	-	-	-	-	-
Vertical Wind Speed 20 m (km/h) Average	720	0.18	0.4	-	-1.1	-0.3	-0.1	0.1	0.5	0.8	1.4
Vertical Wind Speed 45 m (km/h) Average	720	0.25	0.7	-	-1.7	-0.5	-0.2	0.1	0.7	1.3	3.6
Vertical Wind Speed 75 m (km/h) Average	720	0.24	0.4	-	-0.9	-0.2	0	0.2	0.4	0.7	2.5
Vertical Wind Speed 90 m (km/h) Average	718	0.74	0.8	-	-1.1	-0.1	0.2	0.6	1.1	1.8	3.9

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - MANNIX (AMS 5)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
THC	07 Jun 2016 15:00	07 Jun 2016 15:00	1	Maintenance - sample manifold cleaned
Wind Speed, Wind Direction, Vertical Wind Speed 90 m	09 Jun 2016 14:00	09 Jun 2016 14:00	1	Intermittent unstable operation
Wind Speed, Wind Direction, Vertical Wind Speed 90 m	12 Jun 2016 13:00	12 Jun 2016 13:00	1	Intermittent unstable operation



Summary of Hour Averages

Mannix - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 91 ppb on Jun 23 11:00	Maximum Daily Average: 9.8 ppb on Jun 9		Hours of Data:	686
Minimum Value: 0 ppb on Jun 16 22:00	Minimum Daily Average: 0.0 ppb on Jun 16		Hours of Missing Data:	34
Maximum Diurnal Average: 5.5 ppb at hour 9	Minimum Diurnal Average: 0.3 ppb at hour 3		Hours of Calibration:	34
Monthly Average: 1.9 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 4 P ₉₉ = 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-Jun	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
2-Jun	0	0	0	0	Z	0	0	0	0	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	3
3-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	2	3	4	10	2	0	0	0	2	1.1	10	
4-Jun	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	8	6	0	0	1.1	8	
5-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	3	0	0	0	0	0	0.8	4	
6-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	10	0.7	10	
7-Jun	3	1	0	Z	0	0	0	1	1	C	C	C	C	1	4	1	0	0	1	3	5	6	6	12	2.4	12
8-Jun	10	1	0	0	Z	2	24	25	17	16	9	4	1	0	0	0	0	0	0	0	0	0	0	4.8	25	
9-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	78	20	39	58	12	4	12	9.8	78	
10-Jun	Z	1	1	4	1	0	0	0	3	2	2	5	8	12	13	1	1	2	0	0	0	0	0	2.5	13	
11-Jun	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
12-Jun	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-Jun	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-Jun	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	
15-Jun	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	
16-Jun	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-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	1	3	0.7	4	
18-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1	
19-Jun	1	1	1	Z	0	0	0	0	4	1	1	1	1	0	1	1	6	9	13	8	4	5	4	10	3.2	13
20-Jun	3	0	0	0	Z	0	0	2	19	3	0	1	5	24	20	36	16	6	4	3	1	0	0	6.3	36	
21-Jun	0	0	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
22-Jun	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	
23-Jun	0	Z	0	0	0	0	0	3	15	19	91	39	3	1	1	5	3	6	0	1	0	0	6	8.4	91	
24-Jun	1	1	Z	4	14	3	9	21	8	3	2	1	2	3	1	1	1	2	0	1	1	0	1	4	3.6	21
25-Jun	1	0	2	Z	5	6	4	9	9	5	1	0	1	2	0	1	0	0	0	0	0	0	0	2.1	9	
26-Jun	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	4	1	1	0	0	0	0	0	5	0.8	5	
27-Jun	0	0	0	0	0	Z	0	0	2	10	9	1	0	0	1	1	2	0	0	0	0	0	0	1.3	10	
28-Jun	Z	0	0	0	0	0	0	1	82	23	11	2	3	1	5	3	2	5	3	1	0	0	0	6.2	82	
29-Jun	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	
30-Jun	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	

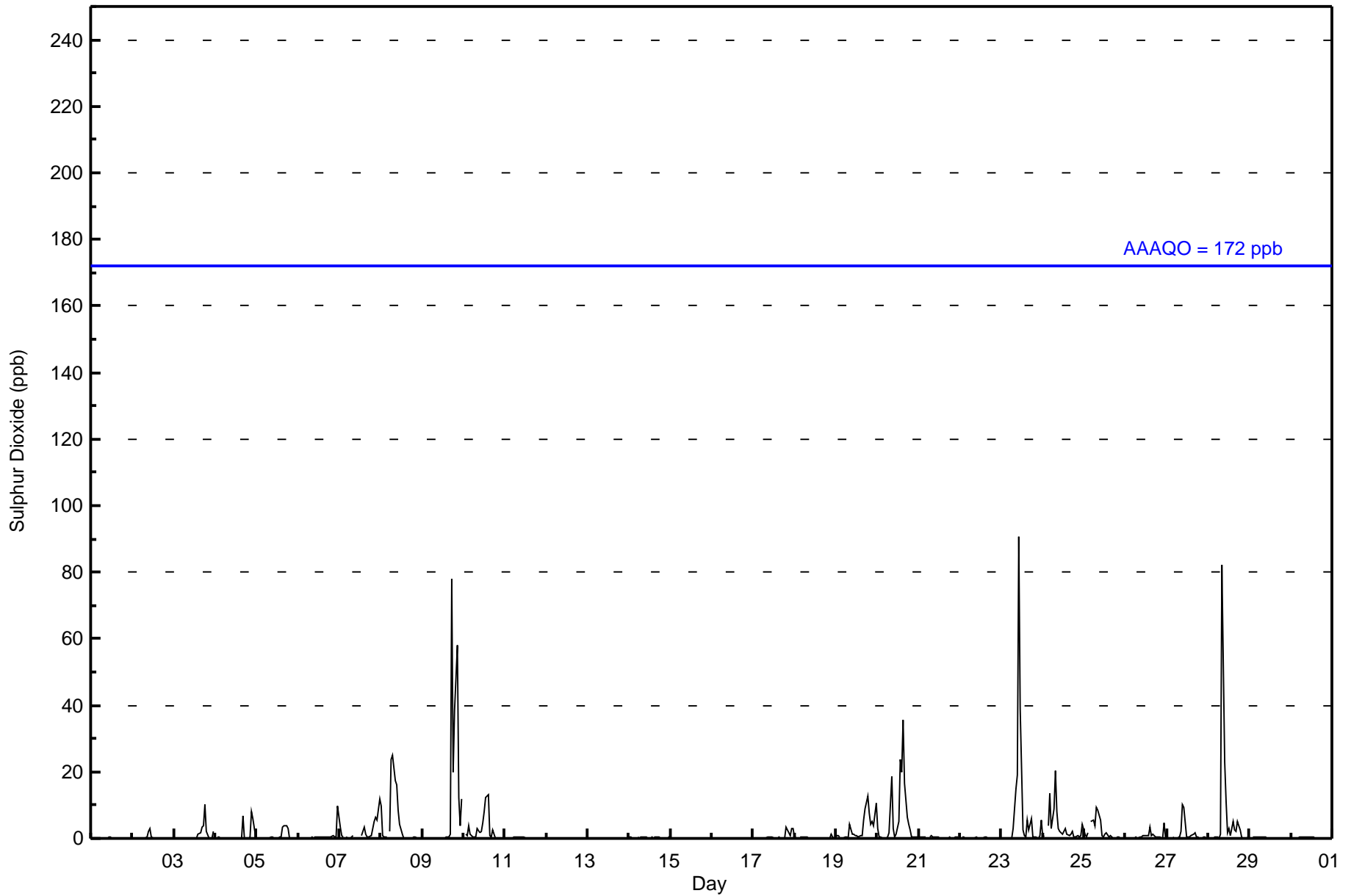
0.9	0.3	0.3	0.4	0.9	0.6	1.4	2.2	5.5	3.0	4.6	2.0	1.0	1.6	1.8	2.0	1.7	4.0	1.9	2.1	2.5	1.3	1.1	2.1	Diurnal Average
10	1	2	4	14	6	24	25	82	23	91	39	8	24	20	36	16	78	20	39	58	12	6	12	Diurnal Maximum

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 (SO₂) - ppb
Mannix - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Mannix - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	658	95.92	95.92
11 - 20	16	2.33	98.25
21 - 60	9	1.31	99.56
61 - 110	3	0.44	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 686

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Mannix - June 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	33	37	28	24	13	34	102	63	34	24	39	82	47	32	23	43	658
11 - 20	3	2	0	2	1	1	0	0	1	0	0	0	1	0	2	3	16
21 - 60	4	0	0	2	0	0	0	0	0	0	0	0	1	0	2	0	9
61 - 110	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3
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
Totals	41	40	28	28	14	35	102	63	35	24	39	83	49	32	27	46	686

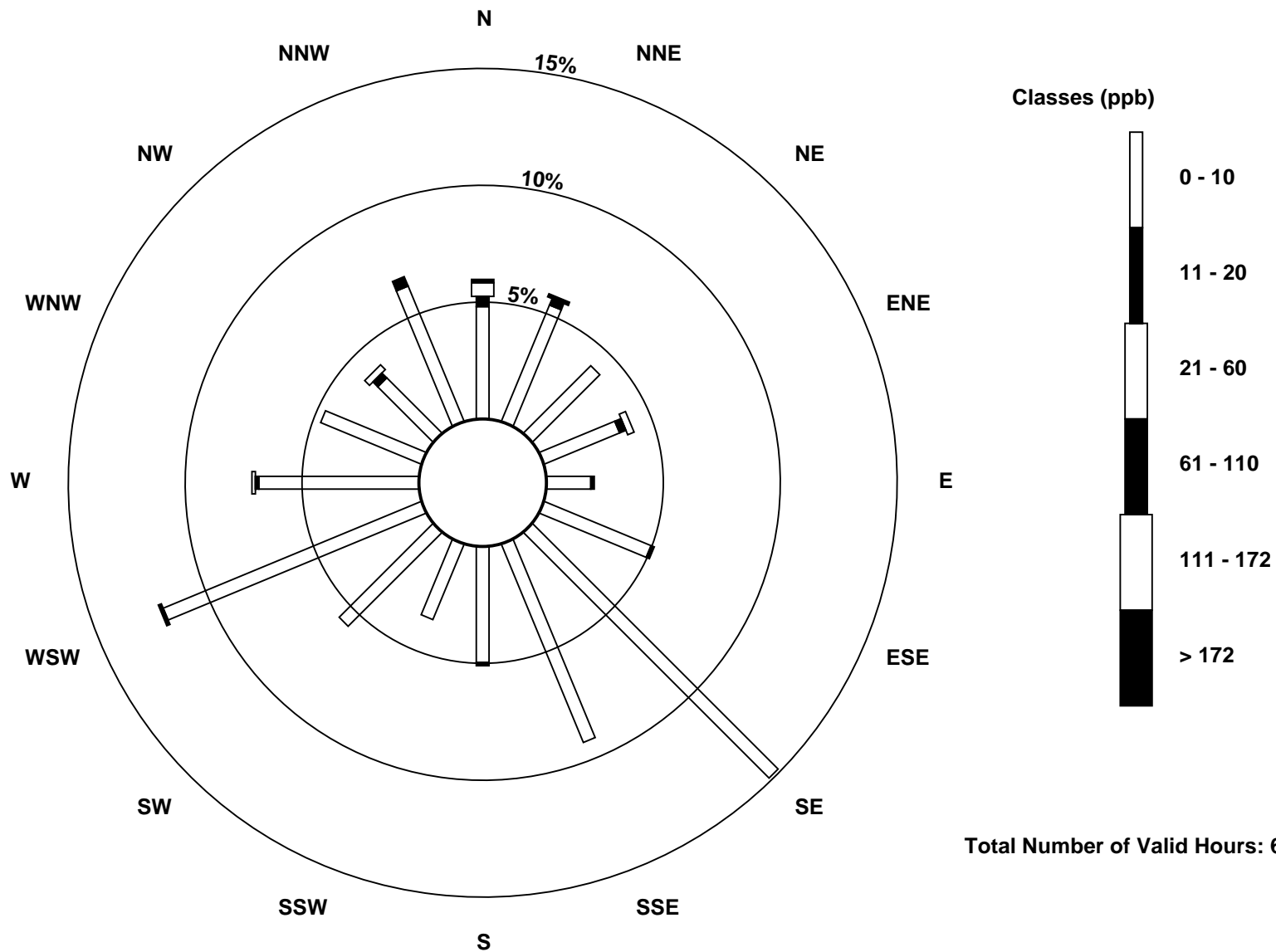
Total Number of Valid Hours: 686

Total Number of Hours: 720

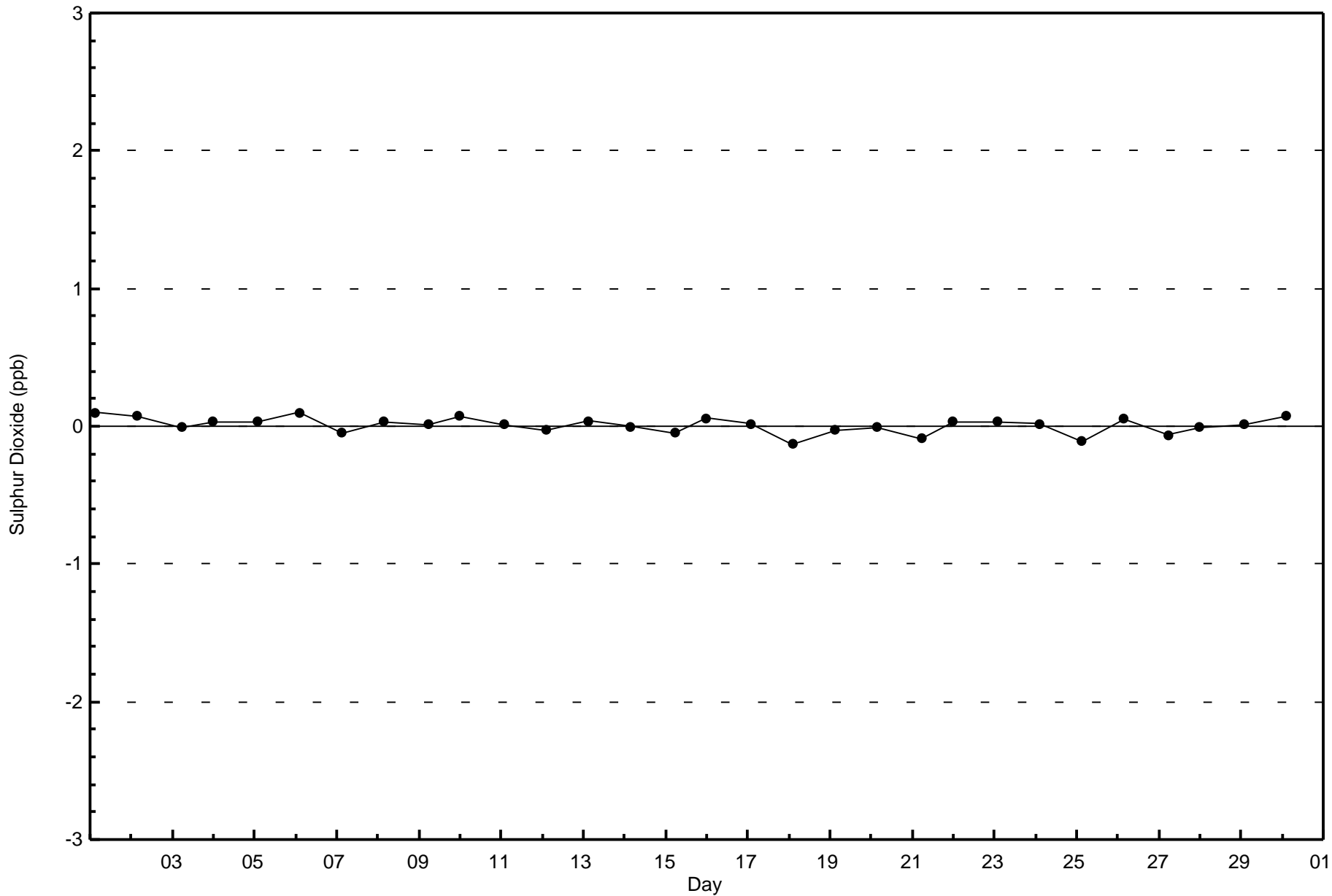


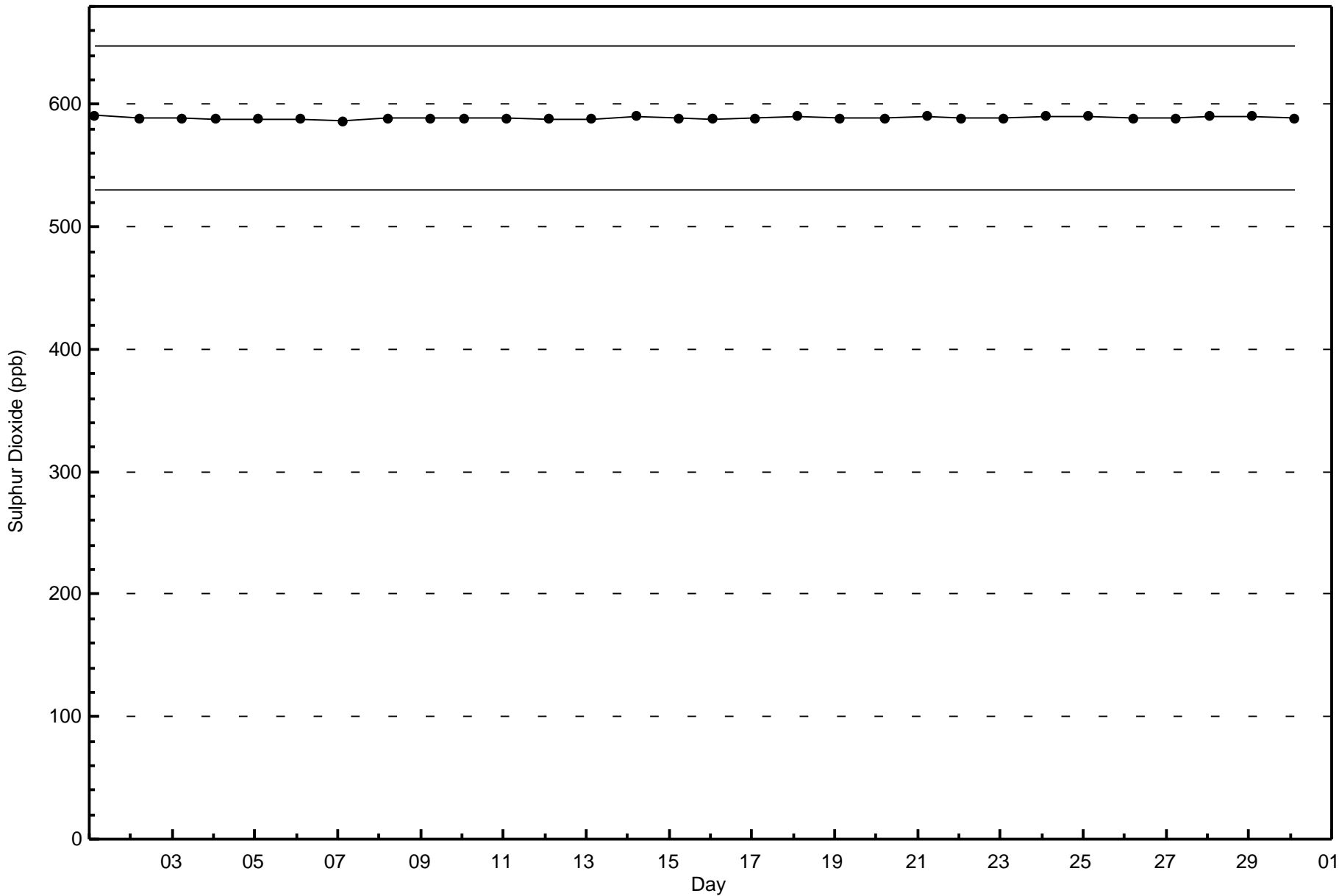
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Sulphur Dioxide (SO₂) - ppb
Mannix (AMS 5)



Total Number of Valid Hours: 686







Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 6 ppb on Jun 8 07:00	Maximum Daily Average: 1.4 ppb on Jun 8		Hours of Data:	685
Minimum Value: 0 ppb on Jun 3 06:00	Minimum Daily Average: 0.1 ppb on Jun 15		Hours of Missing Data:	35
Maximum Diurnal Average: 0.7 ppb at hour 1	Minimum Diurnal Average: 0.3 ppb at hour 14		Hours of Calibration:	35
Monthly Average: 0.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 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-Jun	0	0	0	0	Z	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.4	1
2-Jun	0	0	1	1	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
3-Jun	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1
4-Jun	3	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0.3	3
5-Jun	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0.3	1
6-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3	2
7-Jun	1	0	0	0	Z	0	0	0	0	0	0	0	C	C	C	C	C	0	0	1	2	2	2	3	0.7	3
8-Jun	4	1	1	1	2	Z	6	3	2	2	2	1	1	1	1	1	0	0	0	1	1	1	0	1	1.4	6
9-Jun	1	1	0	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	0.6	2
10-Jun	1	Z	1	1	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	0.5	1
11-Jun	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
12-Jun	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
13-Jun	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
14-Jun	1	1	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
15-Jun	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
16-Jun	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
17-Jun	0	0	Z	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	2	1	1	1	0.5	2
18-Jun	1	1	0	Z	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.5	1
19-Jun	1	1	1	1	Z	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0.6	1
20-Jun	1	2	1	1	1	Z	1	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0.6	2
21-Jun	0	0	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
22-Jun	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
23-Jun	0	0	Z	0	0	0	0	2	2	1	1	0	0	0	0	0	1	0	1	1	1	1	1	1	0.6	2
24-Jun	1	2	1	Z	1	1	2	2	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1.0	2
25-Jun	1	1	1	1	Z	1	0	1	1	0	0	1	0	0	0	0	0	1	0	1	1	0	0	1	0.6	1
26-Jun	0	1	2	2	1	Z	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0.6	2
27-Jun	0	1	1	1	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0.3	1
28-Jun	0	Z	0	1	1	0	0	1	3	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0.6	3
29-Jun	1	1	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
30-Jun	0	0	0	Z	0	0	0	0	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2

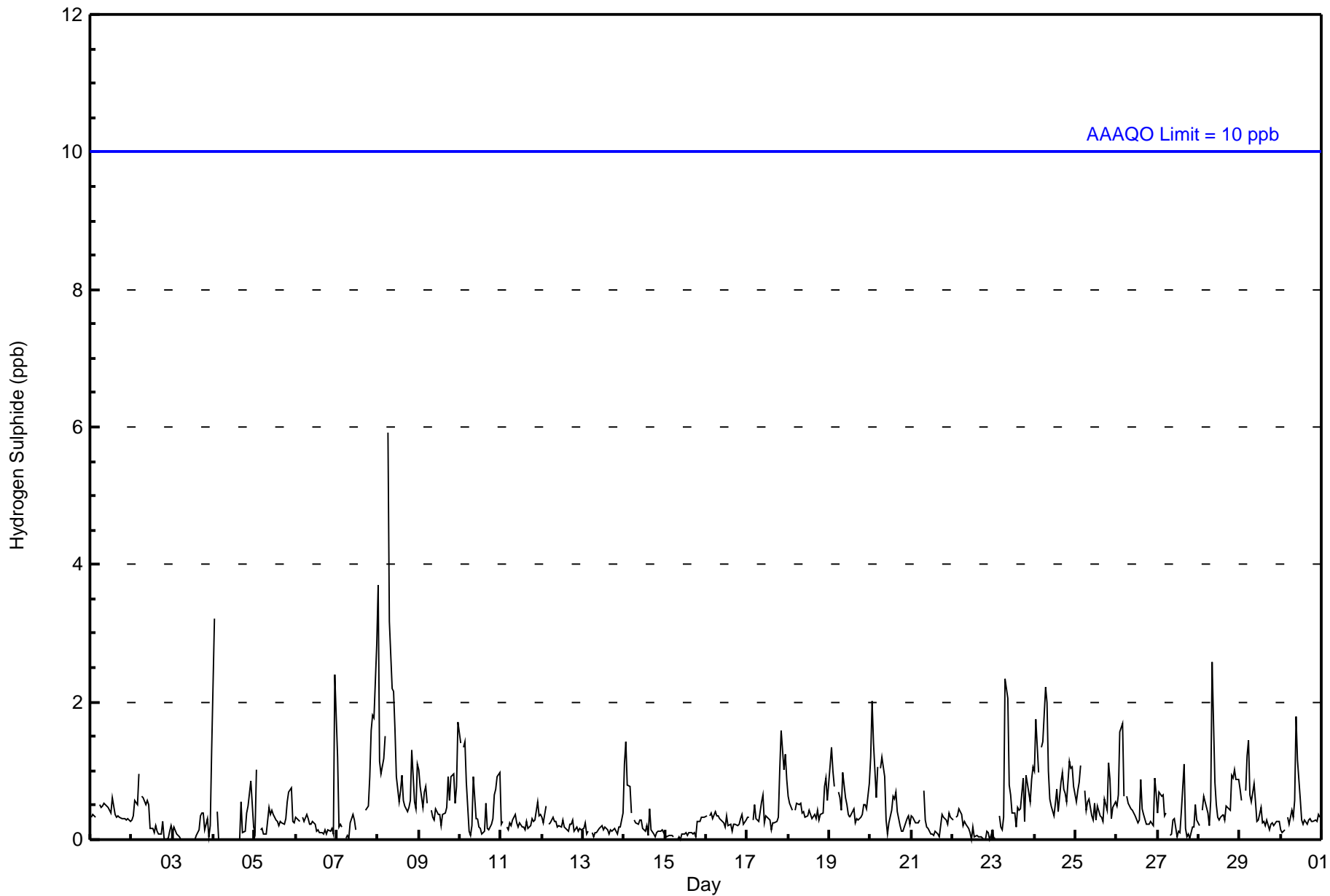
0.7	0.6	0.6	0.5	0.5	0.4	0.7	0.6	0.6	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.5	0.7	Diurnal Average
4	2	2	2	2	1	6	3	3	2	2	1	1	1	1	1	1	1	1	1	1	2	2	2	3	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Mannix - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Mannix - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	679	99.12	99.12
3 - 4	5	0.73	99.85
5 - 7	1	0.15	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Mannix - June 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	38	38	29	28	15	33	100	65	35	24	40	80	49	33	26	46	679
3 - 4	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	5
5 - 7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
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
Totals	40	39	30	28	15	33	100	65	35	24	40	80	49	34	27	46	685

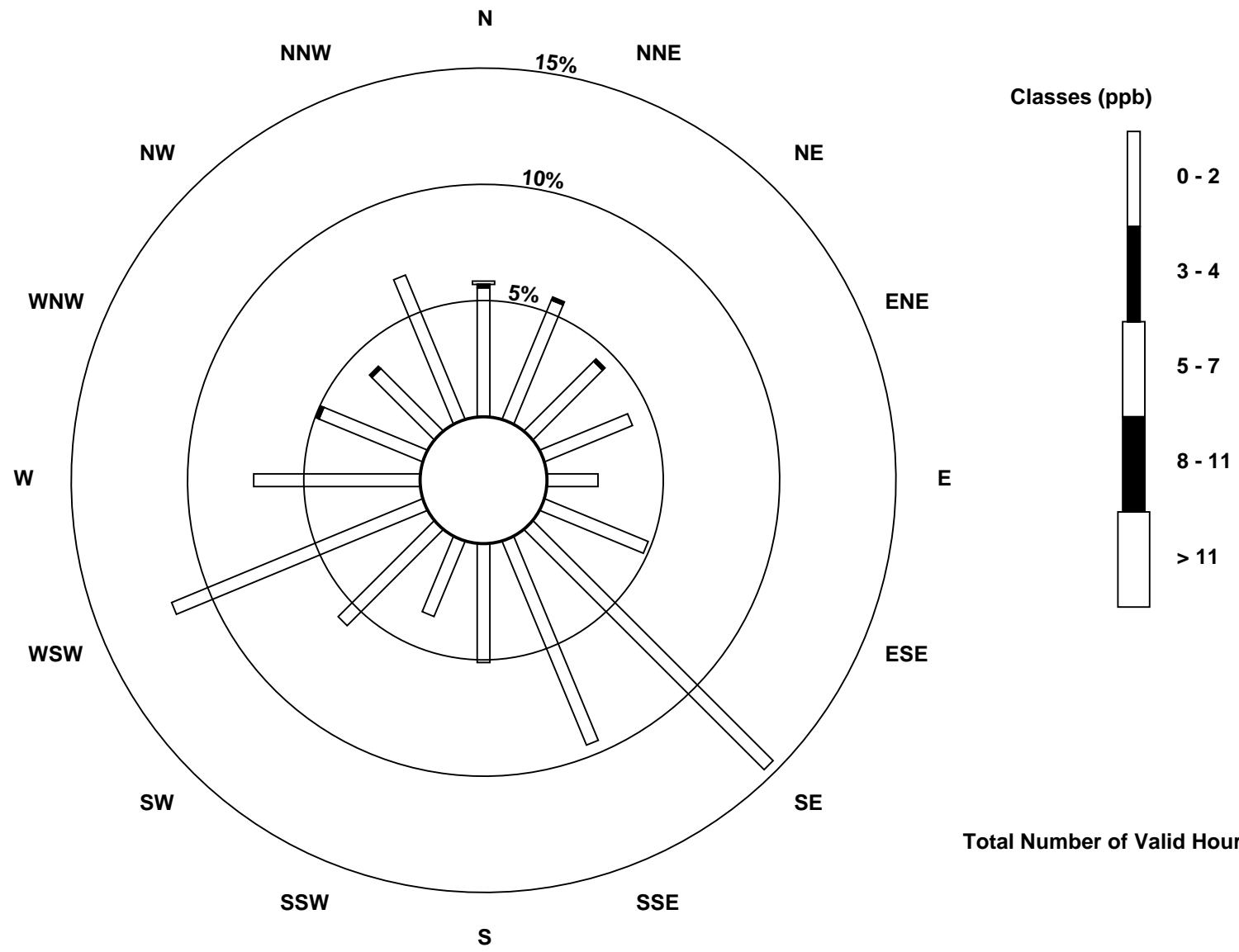
Total Number of Valid Hours: 685

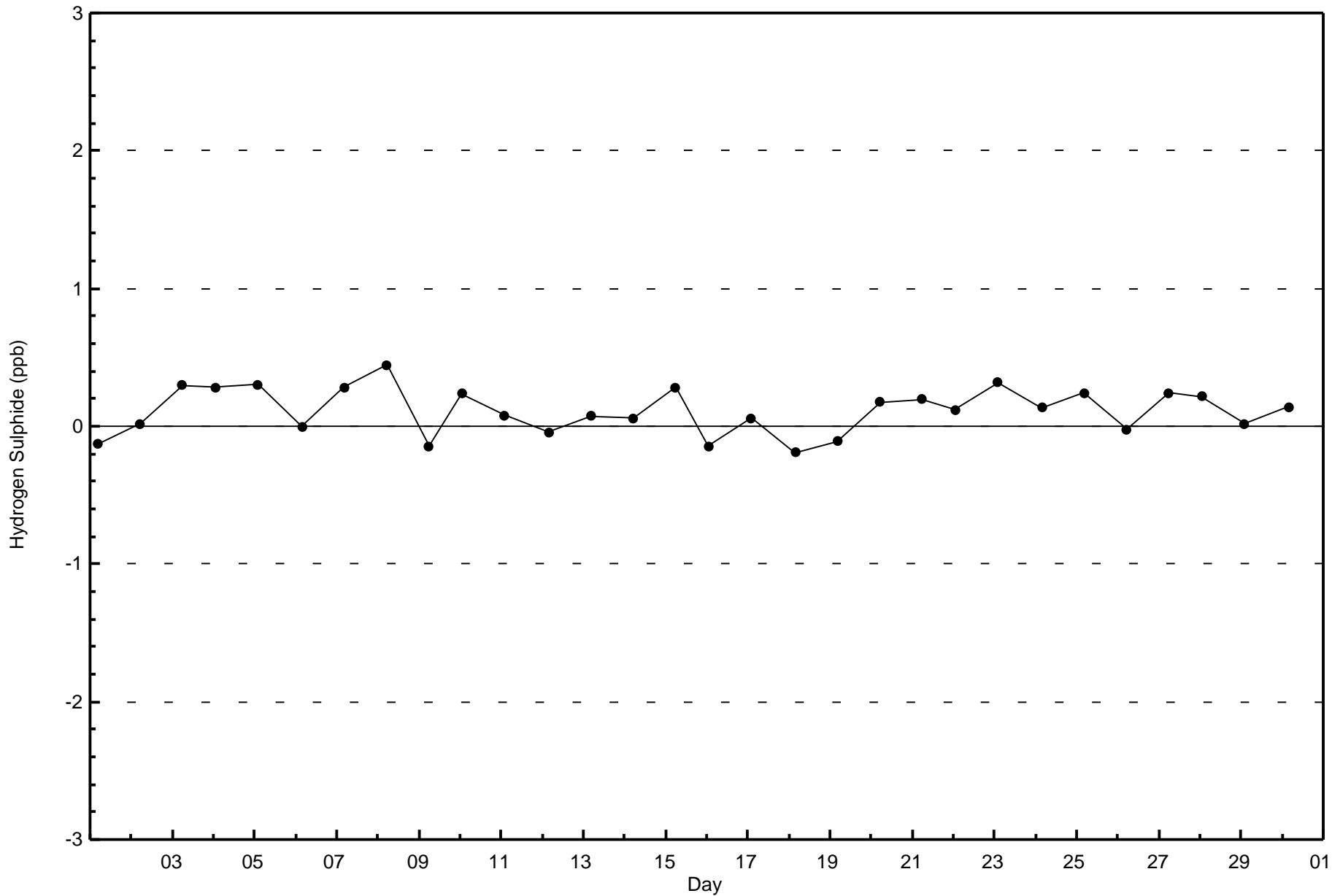
Total Number of Hours: 720

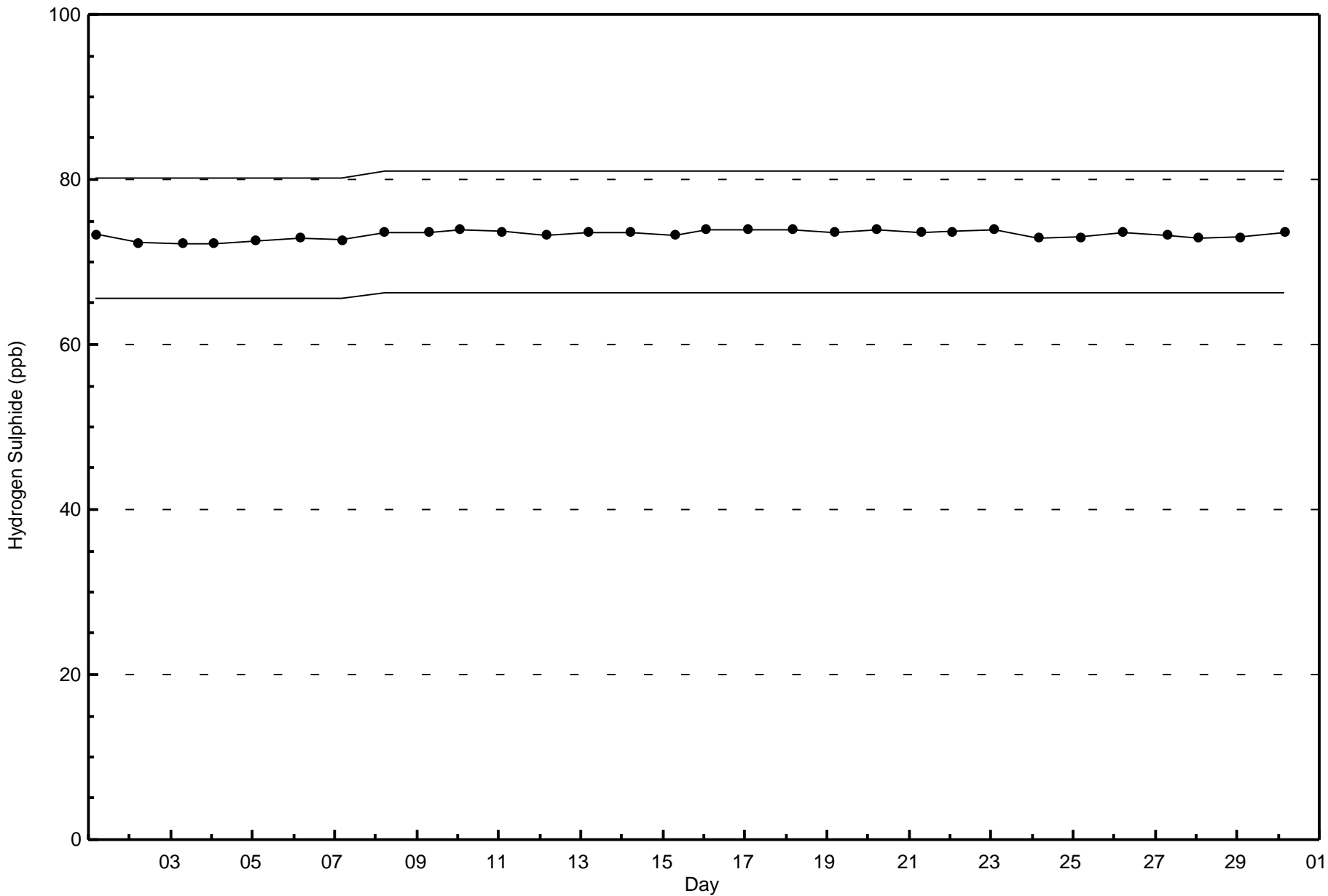


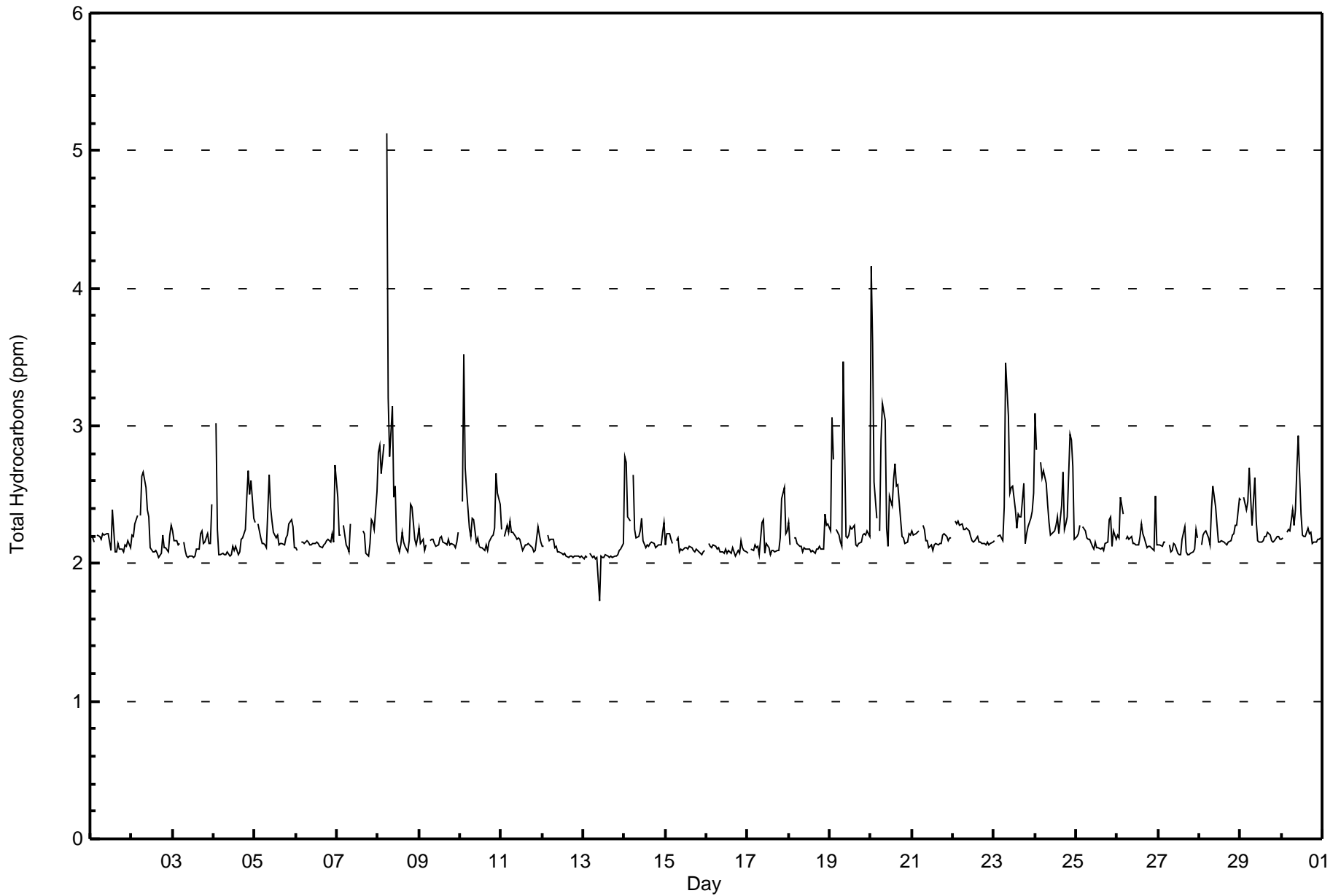
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Hydrogen Sulphide (H₂S) - ppb
Mannix (AMS 5)











Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Mannix - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	17	2.48	2.48
2.1 - 3.0	656	95.77	98.25
3.1 - 10.0	12	1.75	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Mannix - June 2016

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	7	10	0	0	0	0	17
2.1 - 3.0	40	40	28	28	12	34	102	63	35	24	32	72	48	32	24	42	656	
3.1 - 10.0	1	0	0	0	2	1	0	0	0	0	0	1	1	0	3	3	12	
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Totals	41	40	28	28	14	35	102	63	35	24	39	83	49	32	27	45	685	

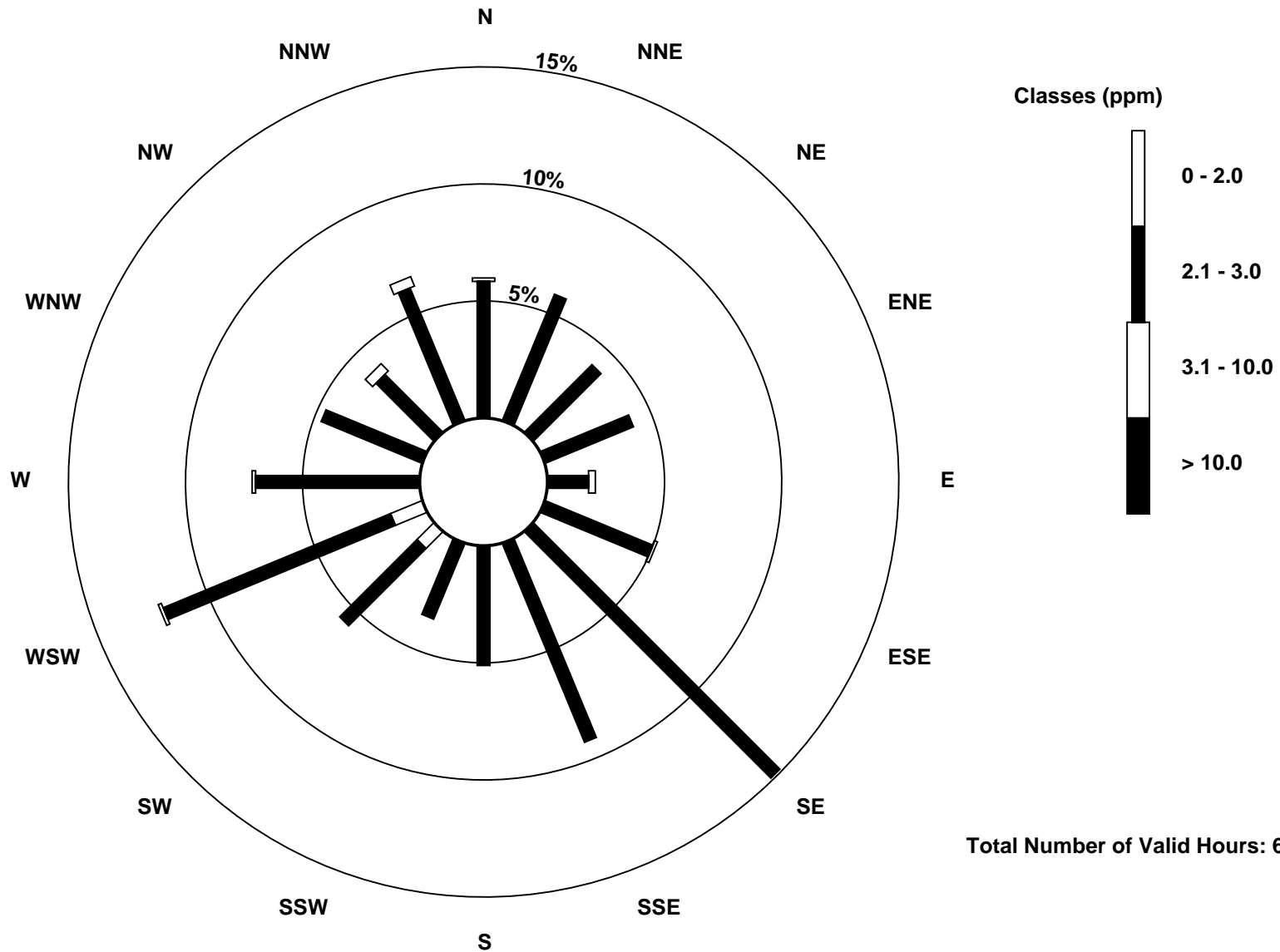
Total Number of Valid Hours: 685

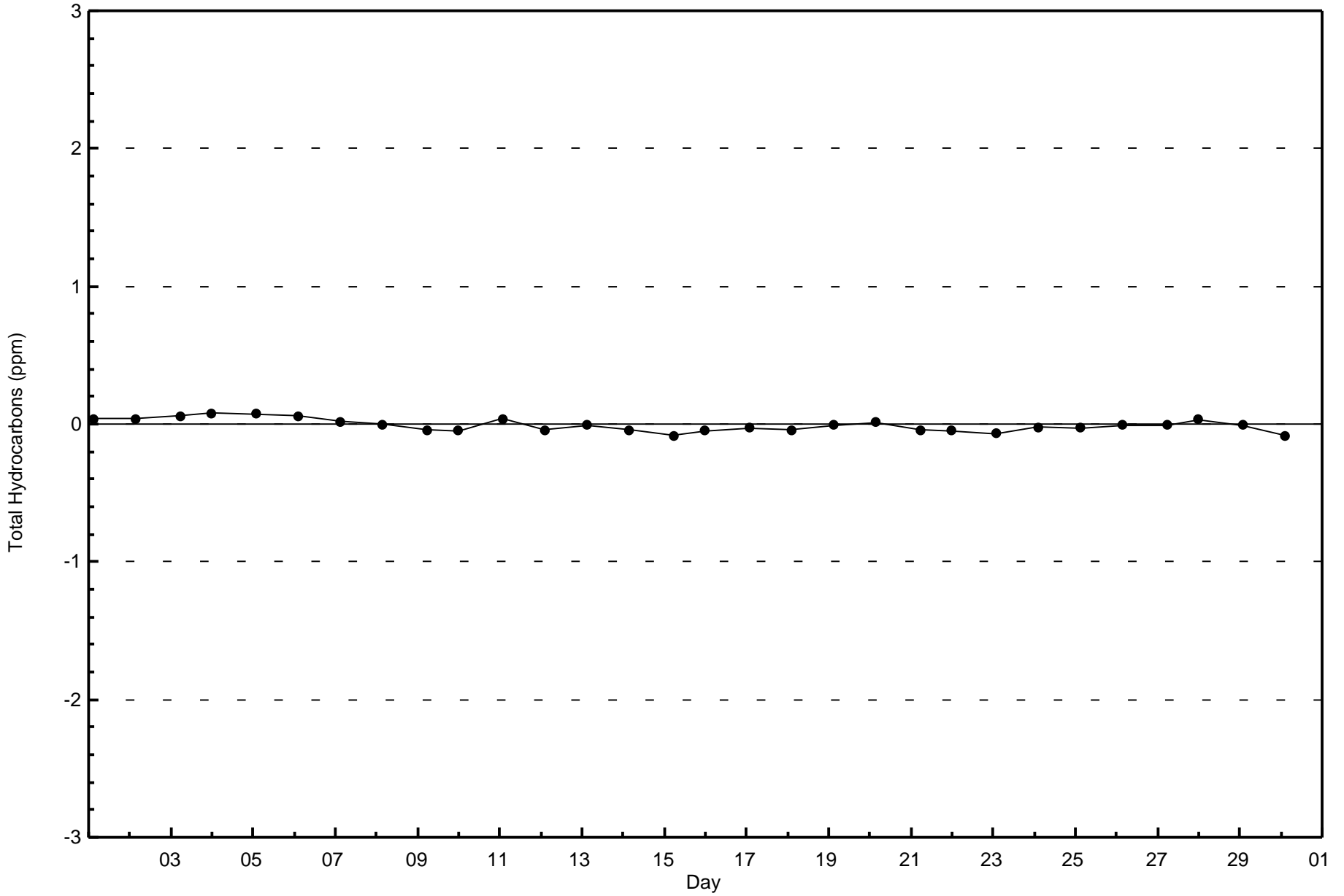
Total Number of Hours: 720

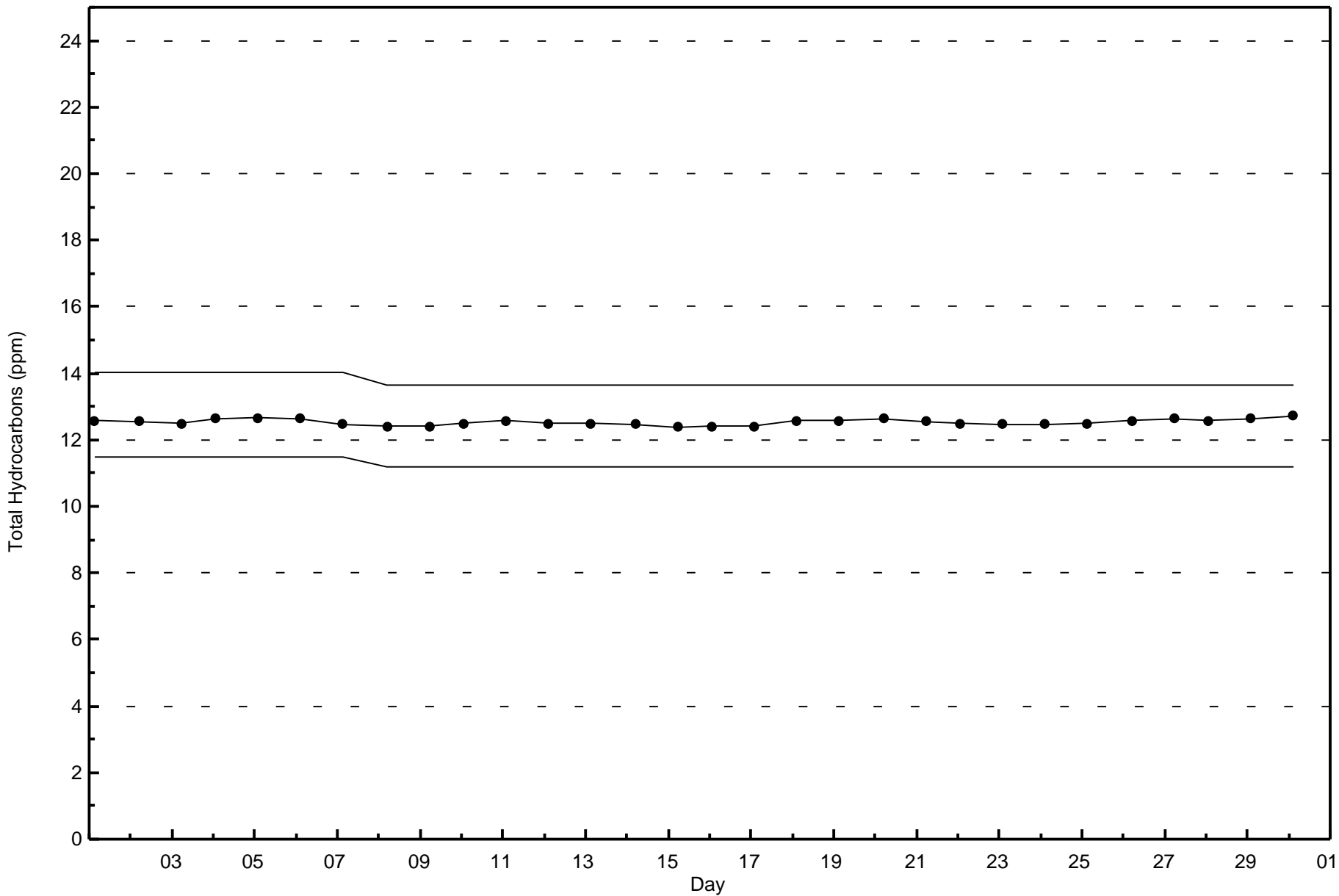


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Total Hydrocarbons (THC) - ppm
Mannix (AMS 5)

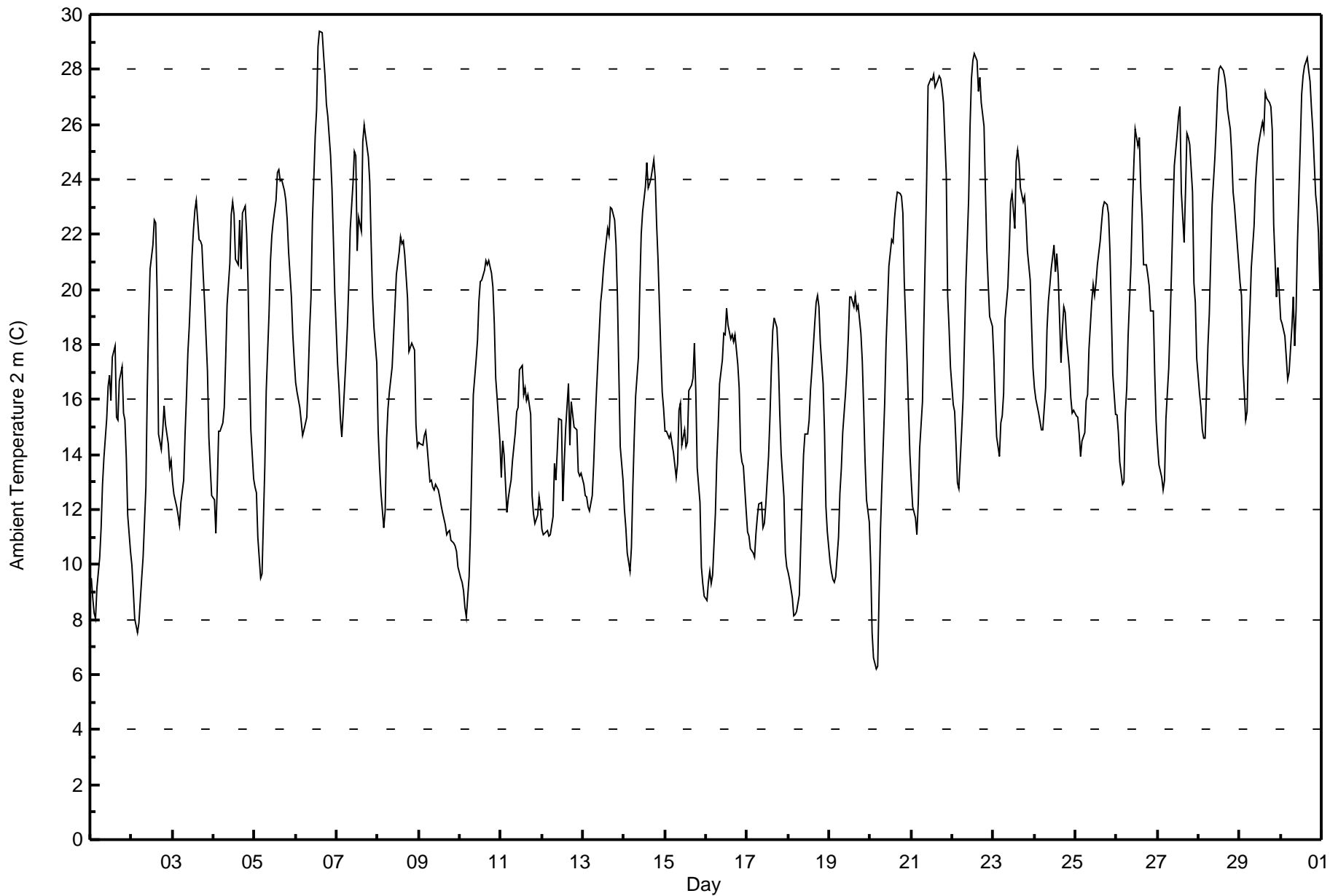








Maximum Value: 29.4 C on Jun 6 15:00 Maximum Daily Average: 22.6 C on Jun 28																				Hours in Service: 720 Hours of Data: 720																												
Minimum Value: 6.2 C on Jun 20 04:00 Minimum Daily Average: 12.4 C on Jun 9 Maximum Diurnal Average: 21.8 C at hour 15 Minimum Diurnal Average: 12.0 C at hour 4 Monthly Average: 17.57 C Percentiles: P ₁ = 8.0 P ₁₀ = 11.1 Q ₁ = 13.7 Median = 17.1 O ₃ = 21.5 P ₉₀ = 24.8 P ₉₉ = 28.3																				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-Jun	9.5	8.8	8.3	8.0	9.2	10.3	11.3	12.9	13.9	15.3	16.5	16.9	16.0	17.6	17.9	15.4	15.3	16.7	17.2	15.5	15.3	13.9	11.8	10.5	13.5	17.9																						
2-Jun	10.0	9.0	8.1	7.5	7.9	8.7	9.5	10.3	12.8	16.4	18.9	20.8	21.6	22.5	22.4	19.9	14.8	14.2	14.9	15.8	15.1	14.4	13.5	13.8	14.3	22.5																						
3-Jun	13.0	12.5	12.1	11.8	11.4	12.2	13.1	14.7	16.1	17.7	18.7	21.2	22.2	22.9	23.3	21.8	21.6	21.6	20.5	19.5	17.0	14.6	13.5	12.5	16.9	23.3																						
4-Jun	12.4	11.1	12.8	14.8	14.8	15.1	15.7	17.5	19.4	20.9	22.7	23.2	22.7	21.1	20.9	22.5	20.8	22.8	23.0	22.0	20.2	17.4	14.9	13.1	18.4	23.2																						
5-Jun	12.8	12.6	11.0	9.5	9.7	11.6	13.6	16.3	19.1	21.0	21.9	22.5	23.3	24.2	24.4	24.0	24.0	23.6	23.2	22.5	21.4	19.8	18.4	17.4	18.7	24.4																						
6-Jun	16.7	16.3	15.7	15.2	14.7	14.9	15.4	16.8	18.5	19.7	22.5	25.6	26.6	28.8	29.4	29.3	28.5	27.8	26.8	26.3	24.9	23.6	21.8	19.9	21.9	29.4																						
7-Jun	17.3	16.4	15.3	14.6	15.5	17.5	18.6	20.2	22.2	23.8	25.0	24.8	21.4	22.6	22.1	25.4	26.0	25.6	24.8	23.9	21.6	19.7	18.6	17.3	20.9	26.0																						
8-Jun	14.9	13.6	12.6	11.3	12.0	14.6	15.6	16.3	17.2	18.3	19.4	20.6	21.4	21.9	21.6	21.7	21.3	19.7	17.8	17.9	18.0	17.8	15.1	14.3	17.3	21.9																						
9-Jun	14.4	14.4	14.3	14.7	14.8	14.3	13.0	13.1	12.8	12.7	12.9	12.7	12.4	12.1	11.9	11.5	11.1	11.2	11.2	10.9	10.8	10.7	10.4	9.9	12.4	14.8																						
10-Jun	9.5	9.4	9.1	8.4	8.1	9.5	11.3	13.8	16.2	17.5	18.2	19.6	20.3	20.3	20.7	21.0	20.9	21.0	20.6	20.1	18.7	16.8	16.0	14.5	15.9	21.0																						
11-Jun	13.2	14.5	14.0	11.9	12.4	12.8	13.0	13.8	14.8	15.6	15.7	17.1	17.2	16.2	16.4	16.0	16.2	15.5	12.5	11.8	11.5	11.8	12.5	12.0	14.1	17.2																						
12-Jun	11.3	11.1	11.2	11.2	11.0	11.1	11.8	13.7	13.1	14.1	15.3	15.3	12.3	13.7	15.0	16.6	14.3	15.9	15.5	15.0	14.9	13.4	13.2	13.3	13.5	16.6																						
13-Jun	12.9	12.5	12.4	12.1	11.9	12.5	13.6	15.1	16.3	18.4	19.5	20.0	20.8	21.3	22.2	22.0	23.0	22.9	22.5	21.6	19.7	17.0	14.3	13.1	17.4	23.0																						
14-Jun	12.0	11.3	10.4	9.8	10.6	12.8	14.6	16.1	17.6	20.1	22.0	22.8	23.7	24.6	23.7	23.8	24.1	24.7	24.1	22.4	21.1	17.8	16.3	15.6	18.4	24.7																						
15-Jun	14.8	14.8	14.6	14.7	14.4	14.1	13.2	13.7	15.6	15.8	14.3	14.9	14.3	14.4	16.3	16.5	16.8	18.0	16.3	13.5	12.3	9.9	9.3	8.8	14.2	18.0																						
16-Jun	8.7	9.4	9.8	9.3	9.6	11.8	13.8	15.0	16.6	17.4	18.4	18.4	19.3	18.7	18.2	18.3	18.1	18.4	17.3	16.4	14.1	13.7	13.6	11.9	14.8	19.3																						
17-Jun	11.2	11.0	10.6	10.4	10.3	11.1	11.8	12.2	12.3	11.4	11.5	12.1	14.0	15.3	17.1	18.5	19.0	18.6	17.4	15.5	14.0	12.4	10.4	9.9	13.3	19.0																						
18-Jun	9.7	9.5	8.8	8.1	8.2	8.3	8.9	10.7	12.4	14.0	14.8	14.7	15.3	16.4	17.1	18.8	19.5	19.8	19.4	18.1	16.6	14.8	12.1	11.2	13.6	19.8																						
19-Jun	10.1	9.7	9.5	9.4	9.5	11.0	12.6	13.5	14.8	16.2	17.1	18.3	19.7	19.7	19.4	19.8	19.3	19.4	18.4	17.4	15.7	13.7	12.3	11.6	14.9	19.8																						
20-Jun	10.0	7.5	6.6	6.2	6.3	8.9	11.3	12.9	15.9	18.1	19.4	20.9	21.8	21.7	22.6	23.2	23.5	23.5	23.4	22.8	20.3	17.4	15.7	14.0	16.4	23.5																						
21-Jun	13.0	12.1	11.7	11.1	12.2	14.2	15.9	18.7	21.3	24.0	27.4	27.6	27.6	27.8	27.4	27.6	27.8	27.7	27.3	26.8	24.2	19.8	18.6	17.2	21.2	27.8																						
22-Jun	15.8	15.5	14.4	12.9	12.7	14.8	16.0	18.1	20.2	23.3	25.9	27.7	28.3	28.6	28.3	27.2	27.7	26.8	25.9	23.6	21.5	20.2	19.0	18.7	21.4	28.6																						
23-Jun	17.5	15.9	14.7	13.9	15.2	15.4	16.2	18.9	20.1	21.5	23.2	23.5	22.2	24.6	25.0	24.6	23.7	23.2	23.4	22.5	21.4	20.3	18.7	17.2	20.1	25.0																						
24-Jun	16.4	16.0	15.5	15.2	14.9	14.9	16.4	18.5	19.6	20.2	20.8	21.6	20.6	21.3	20.5	17.3	18.6	19.4	19.2	18.2	17.1	16.1	15.5	15.6	17.9	21.6																						
25-Jun	15.4	15.4	14.8	13.9	14.5	14.8	16.0	16.2	17.8	19.6	20.2	19.8	20.2	20.9	21.8	22.4	23.0	23.2	23.1	22.7	21.3	19.1	16.9	15.5	18.7	23.2																						
26-Jun	15.5	14.8	13.7	12.9	13.0	15.5	16.4	18.3	20.9	23.0	24.4	25.8	25.2	25.5	23.7	22.6	20.9	20.9	20.5	20.1	19.2	19.2	16.9	15.2	19.4	25.8																						
27-Jun	14.3	13.6	13.2	12.7	13.1	15.3	17.1	18.8	20.7	22.7	24.5	25.6	26.3	26.6	23.5	21.7	23.6	25.7	25.6	25.3	23.6	20.2	19.5	17.5	20.5	26.6																						
28-Jun	16.2	15.7	14.9	14.6	14.6	17.9	19.1	21.1	23.1	24.8	26.0	27.3	28.0	28.1	28.0	27.7	27.3	26.5	25.8	24.9	23.6	23.0	22.3	21.0	22.6	28.1																						
29-Jun	20.2	19.8	17.3	15.3	15.5	17.9	19.2	20.8	22.3	23.8	24.7	25.2	25.8	26.1	25.8	27.1	26.9	26.8	26.6	25.8	22.4	19.7	20.8	19.9	22.3	27.1																						
30-Jun	18.9	18.8	18.3	17.5	16.7	17.0	18.6	19.7	17.9	19.2	21.7	25.2	27.1	27.8	28.1	28.4	28.0	27.6	26.6	25.8	23.4	22.9	22.1	20.0	22.4	28.4																						
																								13.6	13.1	12.5	12.0	12.2	13.4	14.4	15.9	17.4	18.9	20.1	21.1	21.3	21.8	21.8	21.8	21.5	21.6	21.0	20.2	18.7	17.0	15.8	14.7	Diurnal Average
																								20.2	19.8	18.3	17.5	16.7	17.9	19.2	21.1	23.1	24.8	27.4	27.7	28.3	28.8	29.4	29.3	28.5	27.8	27.3	26.8	24.9	23.6	22.3	21.0	Diurnal Maximum





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 2 m (AT2m) - C
Mannix - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	47	6.53	6.53
10 - 20	436	60.56	67.08
> 20	237	32.92	100.00

Total Number of Valid Hours: 720

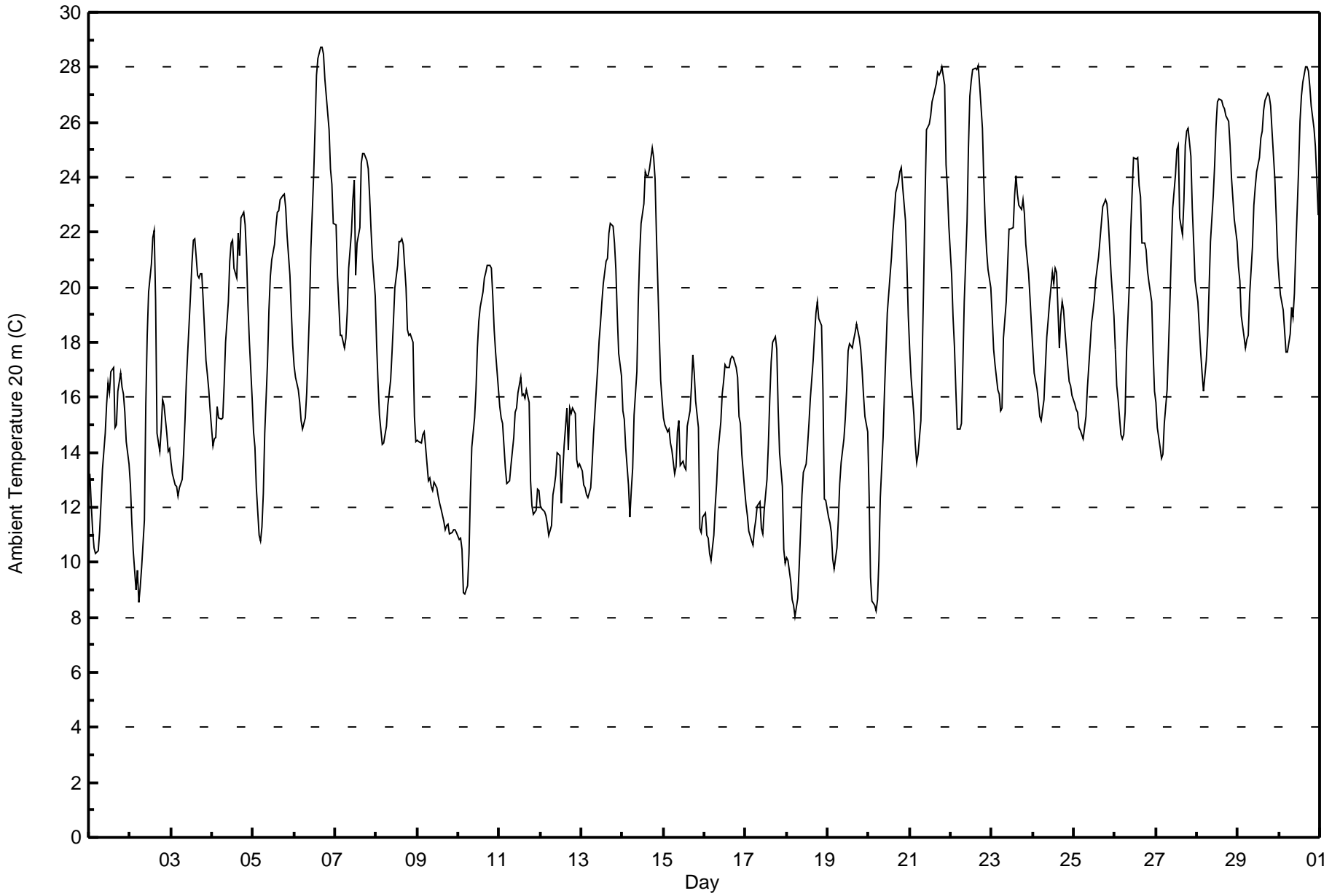
Total Number of Hours: 720



Summary of Hour Averages

Mannix - June 2016

Maximum Value: 28.7 C on Jun 6 17:00		Maximum Daily Average: 22.9 C on Jun 30		Hours in Service: 720																																												
Minimum Value: 8.0 C on Jun 18 06:00		Minimum Daily Average: 12.6 C on Jun 9		Hours of Data: 720																																												
Maximum Diurnal Average: 21.5 C at hour 18		Minimum Diurnal Average: 13.1 C at hour 5		Hours of Missing Data: 0																																												
Monthly Average: 17.79 C		Percentiles: P ₁ = 8.6 P ₁₀ = 11.6 Q ₁ = 14.2 Median = 17.3 Q ₃ = 21.5 P ₉₀ = 24.4 P ₉₉ = 28.0		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-Jun	13.2	12.1	11.1	10.5	10.3	10.4	11.1	12.2	13.4	14.7	15.8	16.5	16.2	16.9	17.1	14.9	15.0	16.2	16.9	16.4	16.1	15.4	14.4	13.6	14.2	17.1																						
2-Jun	12.8	11.4	10.4	9.0	9.7	8.5	9.1	9.8	11.5	15.8	18.3	19.8	20.8	21.8	22.1	19.5	14.7	14.1	14.9	15.9	15.7	14.7	14.0	14.1	14.5	22.1																						
3-Jun	13.6	13.2	12.8	12.8	12.4	12.7	13.0	13.9	15.1	16.6	17.7	19.8	20.9	21.7	21.8	20.4	20.4	20.5	20.5	19.5	17.4	16.8	16.3	15.5	16.9	21.8																						
4-Jun	14.2	14.5	14.5	15.7	15.2	15.2	15.3	16.5	18.0	19.5	20.9	21.6	21.7	20.7	20.4	22.0	21.2	22.6	22.7	22.3	21.1	19.4	18.0	16.0	18.7	22.7																						
5-Jun	14.8	14.2	12.7	11.0	10.8	11.3	12.5	14.7	17.3	19.2	20.4	21.0	21.5	22.2	22.7	22.8	23.2	23.4	23.4	22.9	21.9	20.4	19.1	17.9	18.4	23.4																						
6-Jun	17.2	16.7	16.3	15.8	15.1	14.9	15.2	16.2	17.7	19.2	21.4	24.1	25.8	27.7	28.3	28.7	28.7	28.5	27.6	26.9	25.7	24.3	23.8	22.3	22.0	28.7																						
7-Jun	22.3	20.4	19.4	18.2	18.3	17.8	18.2	19.1	20.7	22.0	23.2	23.9	20.4	21.6	22.2	24.5	24.9	24.9	24.6	24.3	23.3	22.1	21.1	19.7	21.5	24.9																						
8-Jun	17.9	16.5	15.4	14.3	14.3	14.6	15.0	15.7	16.6	17.7	18.8	20.0	20.8	21.7	21.7	21.8	21.6	20.0	18.5	18.3	18.3	18.0	15.3	14.4	17.8	21.8																						
9-Jun	14.4	14.4	14.4	14.7	14.7	14.2	13.0	13.1	12.8	12.6	12.9	12.7	12.4	12.2	12.0	11.5	11.2	11.4	11.4	11.0	11.1	11.2	11.2	11.1	12.6	14.7																						
10-Jun	10.8	10.9	10.5	8.9	8.8	9.1	10.3	12.5	14.2	15.3	16.3	17.8	18.8	19.3	19.8	20.3	20.6	20.8	20.8	20.7	19.7	18.4	17.6	16.3	15.8	20.8																						
11-Jun	15.7	15.3	15.1	13.4	12.9	12.9	13.0	13.5	14.5	15.5	15.6	16.2	16.7	16.1	16.1	16.0	16.3	15.8	13.0	12.0	11.8	11.9	12.7	12.6	14.4	16.7																						
12-Jun	12.1	11.9	11.9	11.7	11.4	11.0	11.3	12.4	12.8	13.2	14.0	13.9	12.1	13.3	14.2	15.6	14.1	15.6	15.4	15.6	15.4	13.7	13.5	13.6	13.3	15.6																						
13-Jun	13.3	12.8	12.7	12.5	12.4	12.7	13.6	14.6	15.4	17.1	18.1	18.7	19.5	20.1	20.9	21.1	22.0	22.3	22.2	21.6	20.6	18.9	17.6	16.8	17.4	22.3																						
14-Jun	15.5	15.2	14.2	12.8	11.7	12.6	13.4	15.3	16.9	19.5	21.2	22.3	23.0	24.2	24.0	24.1	24.3	25.1	24.7	23.9	21.9	18.3	16.6	15.9	19.0	25.1																						
15-Jun	15.2	15.0	14.7	14.9	14.3	14.1	13.2	13.5	14.7	15.2	13.5	13.7	13.5	13.4	15.0	15.5	16.4	17.5	16.9	15.9	14.9	11.3	11.1	11.7	14.4	17.5																						
16-Jun	11.8	11.0	10.9	10.3	10.1	11.0	12.0	12.9	14.0	15.1	16.1	16.6	17.2	17.1	17.1	17.4	17.5	17.4	17.1	16.7	15.3	15.1	13.9	12.7	14.4	17.5																						
17-Jun	12.1	11.7	11.2	10.8	10.6	11.2	11.5	12.0	12.2	11.3	11.0	11.9	13.0	14.3	16.0	17.3	18.0	18.2	17.7	15.5	14.0	12.8	10.5	10.0	13.1	18.2																						
18-Jun	10.2	10.0	9.3	8.6	8.5	8.0	8.7	9.8	11.1	12.5	13.3	13.6	14.3	15.0	16.0	17.3	18.3	19.0	19.5	18.9	18.6	16.3	12.3	12.2	13.4	19.5																						
19-Jun	11.7	11.4	11.1	10.1	9.7	10.5	11.5	12.9	13.6	14.5	15.2	16.3	17.7	17.9	17.8	18.1	18.4	18.7	18.1	17.7	17.0	16.1	15.3	14.7	14.8	18.7																						
20-Jun	12.4	9.5	8.6	8.4	8.2	8.6	10.1	12.3	14.5	16.2	17.6	19.1	20.4	21.1	22.0	22.7	23.5	23.9	24.2	24.3	23.6	22.4	20.8	19.0	17.2	24.3																						
21-Jun	17.8	16.7	15.3	14.3	13.6	13.9	15.1	17.5	20.2	23.3	25.7	26.0	26.2	26.8	27.0	27.4	27.8	27.7	27.8	28.0	27.4	24.4	23.5	22.2	22.3	28.0																						
22-Jun	20.4	18.9	17.9	16.3	14.9	14.8	15.0	17.1	19.5	22.4	25.0	27.0	27.5	27.9	28.0	27.9	28.0	27.4	25.8	23.9	22.3	21.3	20.6	20.0	22.1	28.0																						
23-Jun	18.9	17.7	17.2	16.3	16.1	15.5	15.6	18.1	19.5	20.8	22.1	22.2	23.3	24.0	23.4	23.0	22.8	23.2	22.7	21.5	20.5	19.6	18.7	20.2	20.2	24.0																						
24-Jun	17.7	16.9	16.3	15.9	15.3	15.1	15.9	17.1	18.2	18.8	19.5	20.6	20.2	20.7	20.6	17.8	19.0	19.5	19.1	18.4	17.1	16.6	16.4	16.1	17.9	20.7																						
25-Jun	15.7	15.6	15.4	14.9	14.8	14.5	14.9	15.3	16.3	17.9	18.7	19.1	19.6	20.3	21.1	21.7	22.3	23.0	23.2	23.0	22.4	21.4	20.4	18.9	18.8	23.2																						
26-Jun	17.7	16.4	15.9	14.6	14.5	14.7	15.5	17.6	20.1	22.1	23.5	24.7	24.7	24.7	23.7	23.3	21.6	21.6	21.3	20.6	20.2	19.5	17.7	16.2	19.7	24.7																						
27-Jun	15.8	14.9	14.2	13.8	13.9	15.0	16.3	17.8	19.4	21.3	22.9	24.1	25.0	25.2	22.5	21.9	23.1	25.2	25.7	25.8	24.8	22.9	21.6	20.2	20.5	25.8																						
28-Jun	19.5	18.5	17.7	16.9	16.2	17.4	18.2	19.9	21.7	23.4	24.4	25.9	26.7	26.9	26.8	26.6	26.5	26.3	26.0	25.2	24.0	23.3	22.5	21.7	22.6	26.9																						
29-Jun	20.7	20.2	19.0	18.2	17.8	18.1	18.2	19.7	21.4	23.0	23.6	24.2	24.7	25.4	25.7	26.4	26.8	27.1	26.9	26.6	25.7	24.0	22.6	21.1	22.8	27.1																						
30-Jun	20.3	19.7	19.2	18.4	17.7	17.7	18.3	19.3	18.9	19.8	21.4	24.3	26.0	27.0	27.5	28.0	28.0	27.9	27.3	26.6	25.8	25.1	24.0	22.6	22.9	28.0																						
																								15.5	14.8	14.2	13.5	13.1	13.3	13.8	15.1	16.4	17.8	18.9	19.9	20.3	20.9	21.1	21.2	21.2	21.5	21.2	20.7	19.8	18.5	17.5	16.6	Diurnal Average
																								22.3	20.4	19.4	18.4	18.3	18.1	18.3	19.9	21.7	23.4	25.7	27.0	27.5	27.9	28.3	28.7	28.7	28.5	27.8	28.0	27.4	25.1	24.0	22.6	Diurnal Maximum





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 20 m (AT20m) - C
Mannix - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	21	2.92	2.92
10 - 20	459	63.75	66.67
> 20	240	33.33	100.00

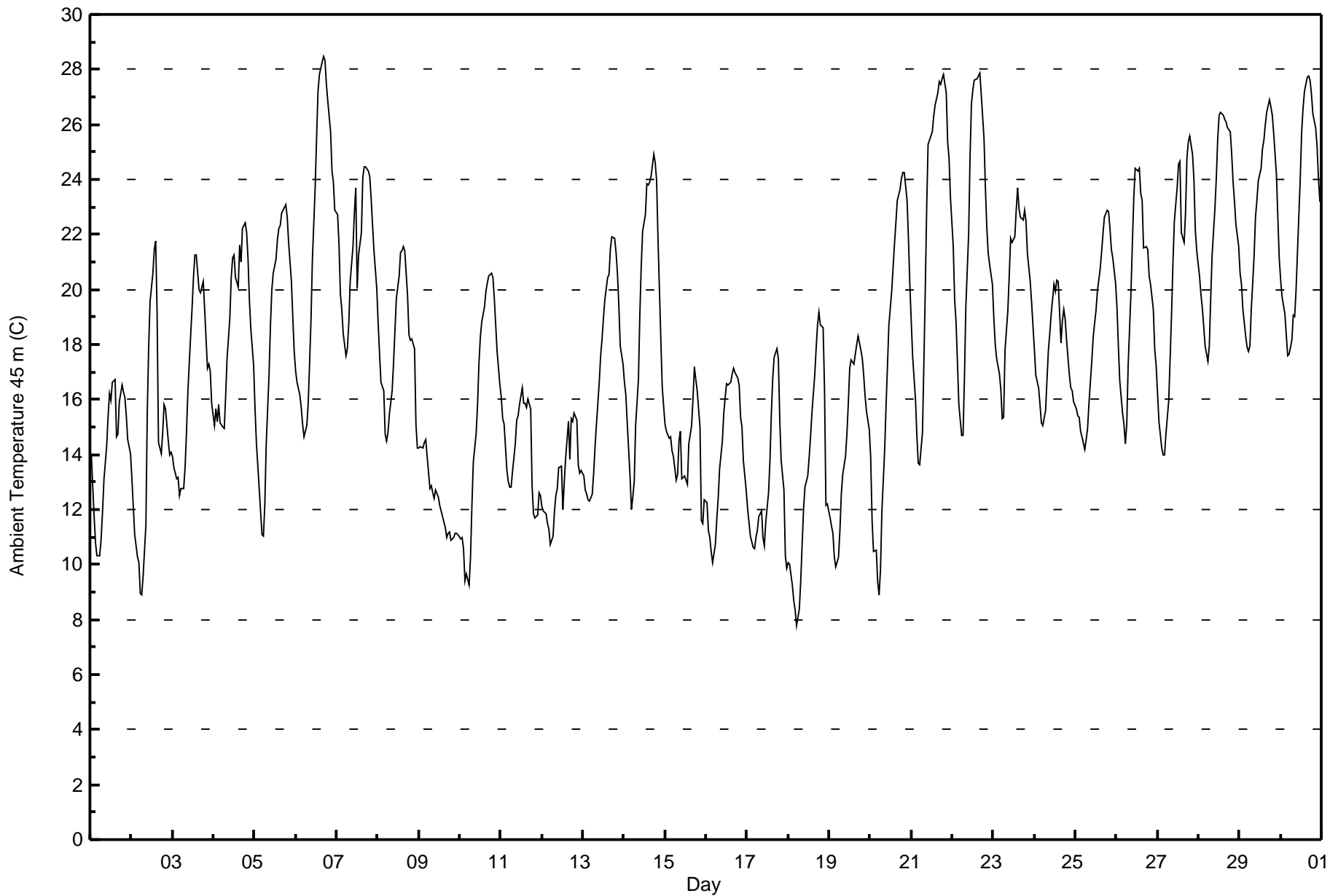
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 45 m (AT45m) - C
Mannix - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 45 m (AT45m) - C
Mannix - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	18	2.50	2.50
10 - 20	468	65.00	67.50
> 20	234	32.50	100.00

Total Number of Valid Hours: 720

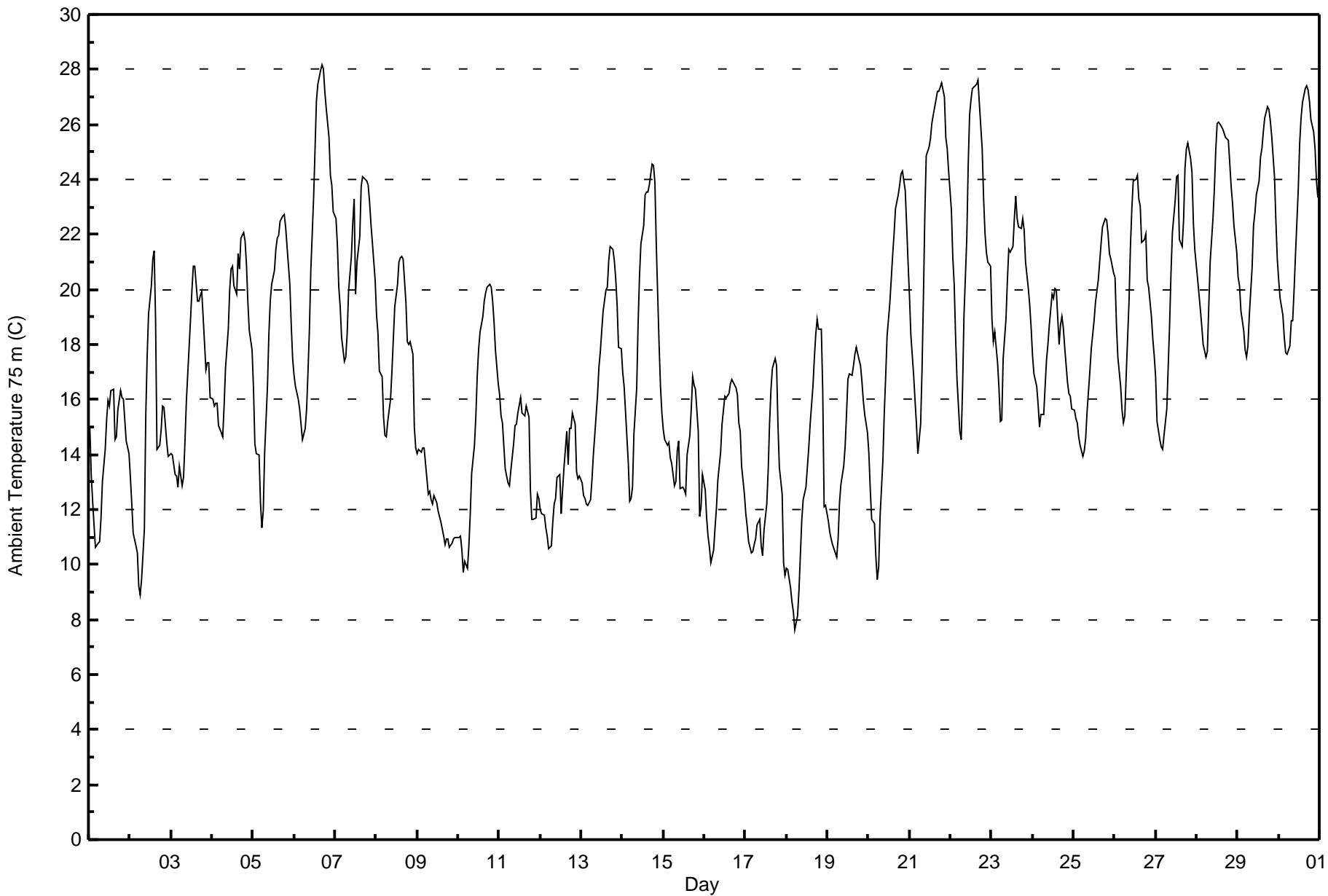
Total Number of Hours: 720



Summary of Hour Averages

Mannix - June 2016

Maximum Value: 28.2 C on Jun 6 17:00		Maximum Daily Average: 22.7 C on Jun 30		Hours in Service: 720																																												
Minimum Value: 7.6 C on Jun 18 06:00		Minimum Daily Average: 12.2 C on Jun 9		Hours of Data: 720																																												
Maximum Diurnal Average: 20.9 C at hour 18		Minimum Diurnal Average: 13.2 C at hour 6		Hours of Missing Data: 0																																												
Monthly Average: 17.58 C		Percentiles: P ₁ = 9.1 P ₁₀ = 11.6 Q ₁ = 14.0 Median = 17.1 O ₃ = 21.1 P ₉₀ = 24.1 P ₉₉ = 27.5		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-Jun	15.0	13.3	12.3	11.5	10.7	10.8	10.8	11.7	13.0	14.2	15.2	16.0	15.7	16.3	16.4	14.5	14.6	15.6	16.3	16.1	16.0	15.2	14.5	14.0	14.2	16.4																						
2-Jun	13.2	12.2	11.2	10.7	10.4	9.2	8.9	9.5	11.3	15.4	17.6	19.1	20.1	21.1	21.4	18.9	14.2	14.3	14.9	15.8	15.7	14.4	13.9	14.0	14.5	21.4																						
3-Jun	14.0	14.0	13.3	13.2	12.8	13.6	12.8	13.2	14.4	15.9	16.9	18.9	20.0	20.8	20.9	19.6	19.6	19.8	19.9	19.0	17.1	17.3	17.4	16.1	16.7	20.9																						
4-Jun	16.0	15.8	15.8	15.9	15.1	14.8	14.7	15.7	17.1	18.6	20.0	20.7	20.8	20.2	19.9	21.3	20.7	21.9	22.1	21.8	20.9	19.5	18.5	17.8	18.6	22.1																						
5-Jun	16.4	14.4	14.0	14.0	12.3	11.4	12.0	14.1	16.5	18.4	19.6	20.2	20.7	21.4	21.9	22.0	22.5	22.7	22.7	22.3	21.6	20.2	18.7	17.5	18.2	22.7																						
6-Jun	16.9	16.5	16.0	15.7	15.1	14.5	15.0	15.7	17.1	18.6	20.7	23.3	25.1	26.9	27.5	28.0	28.2	28.0	27.2	26.6	25.6	24.2	23.8	22.8	21.6	28.2																						
7-Jun	22.6	21.6	20.1	19.4	18.2	17.4	17.5	18.4	20.0	21.2	22.4	23.3	19.8	21.0	21.9	23.8	24.1	24.1	23.9	23.8	23.2	22.4	21.7	20.3	21.3	24.1																						
8-Jun	19.1	18.4	17.1	16.9	15.4	14.7	14.7	15.2	16.0	17.0	18.2	19.4	20.2	21.0	21.1	21.2	21.1	19.5	18.1	18.0	18.1	17.6	15.0	14.2	17.8	21.2																						
9-Jun	14.1	14.2	14.1	14.2	14.2	13.7	12.6	12.7	12.4	12.2	12.5	12.2	11.9	11.7	11.5	11.1	10.8	10.9	10.9	10.6	10.8	11.0	11.0	11.0	12.2	14.2																						
10-Jun	11.0	11.0	10.6	9.7	10.1	9.9	10.7	11.8	13.3	14.3	15.4	16.9	17.9	18.4	19.0	19.6	19.9	20.1	20.2	20.1	19.6	18.8	17.8	16.6	15.5	20.2																						
11-Jun	16.2	15.4	15.1	13.5	13.2	13.0	12.9	13.4	14.4	15.1	15.1	15.5	16.1	15.5	15.5	15.4	15.7	15.4	12.7	11.6	11.7	11.7	12.6	12.4	14.1	16.2																						
12-Jun	12.0	11.9	11.8	11.3	11.0	10.6	10.7	11.6	12.2	12.4	13.2	13.3	11.8	12.7	13.5	14.8	13.6	15.0	15.0	15.5	15.1	13.4	13.1	13.2	12.9	15.5																						
13-Jun	13.0	12.5	12.4	12.2	12.1	12.3	13.1	14.0	14.7	16.2	17.2	17.8	18.5	19.2	20.0	20.1	21.1	21.6	21.5	21.0	20.4	19.4	17.9	17.8	16.9	21.6																						
14-Jun	17.0	16.5	15.5	13.7	12.3	12.4	12.8	14.8	16.4	18.8	20.5	21.7	22.3	23.4	23.5	23.8	24.6	24.5	23.9	21.6	18.0	16.5	15.5	15.5	18.9	24.6																						
15-Jun	14.9	14.6	14.4	14.4	13.9	13.7	12.9	13.0	14.1	14.5	12.8	12.8	12.7	12.6	14.0	14.7	15.7	16.8	16.5	16.4	14.8	11.7	12.1	13.3	14.0	16.8																						
16-Jun	12.7	11.7	11.1	10.6	10.1	10.5	11.4	12.1	13.1	14.1	15.1	15.6	16.1	16.1	16.2	16.6	16.7	16.6	16.4	16.2	15.1	14.8	13.6	12.6	14.0	16.7																						
17-Jun	11.9	11.4	10.8	10.4	10.5	10.7	10.9	11.4	11.6	10.7	10.3	11.2	12.2	13.4	15.2	16.4	17.2	17.5	17.2	15.1	13.5	12.6	10.1	9.6	12.6	17.5																						
18-Jun	9.9	9.8	9.2	8.7	8.3	7.6	8.1	9.1	10.3	11.6	12.4	12.8	13.5	14.2	15.1	16.5	17.5	18.3	18.9	18.5	18.5	16.3	12.1	12.2	12.9	18.9																						
19-Jun	11.6	11.2	10.9	10.7	10.6	10.3	10.9	12.2	12.9	13.6	14.3	15.4	16.7	17.0	16.9	17.2	17.6	17.9	17.5	17.2	16.7	16.0	15.4	14.8	14.4	17.9																						
20-Jun	14.1	12.7	11.7	11.5	10.3	9.4	9.9	11.8	13.8	15.5	16.9	18.3	19.5	20.4	21.2	22.0	22.9	23.5	23.8	24.2	24.3	23.6	22.3	21.0	17.7	24.3																						
21-Jun	19.8	18.4	16.9	15.9	15.1	14.0	15.1	17.1	19.7	22.7	24.9	25.2	25.5	26.0	26.4	26.9	27.2	27.2	27.3	27.5	27.0	25.5	25.1	24.3	22.5	27.5																						
22-Jun	22.9	21.2	20.2	18.3	16.7	14.8	14.6	16.5	19.0	21.8	24.5	26.4	26.9	27.3	27.4	27.5	27.6	26.8	25.1	23.3	22.1	21.4	21.0	20.8	22.2	27.6																						
23-Jun	18.9	18.1	18.5	17.4	16.4	15.2	15.3	17.5	18.9	20.3	21.5	21.4	21.6	22.6	23.4	22.6	22.3	22.2	22.6	22.2	21.0	20.1	19.4	18.6	19.9	23.4																						
24-Jun	17.6	16.9	16.5	15.8	15.0	15.5	15.5	16.4	17.4	18.0	18.7	19.8	19.7	20.0	20.0	18.0	18.7	19.0	18.6	17.9	16.6	16.2	16.1	15.7	17.5	20.0																						
25-Jun	15.6	15.3	15.2	14.7	14.4	14.0	14.1	14.6	15.5	17.0	17.8	18.4	18.8	19.5	20.4	21.0	21.7	22.3	22.6	22.5	22.0	21.3	21.1	20.6	18.3	22.6																						
26-Jun	20.4	18.7	17.6	16.5	15.6	15.1	15.4	16.9	19.6	21.6	22.9	24.0	24.0	24.2	23.3	23.0	21.7	21.8	22.0	20.3	20.1	19.0	18.2	17.6	20.0	24.2																						
27-Jun	16.8	15.2	14.6	14.3	14.2	14.7	15.7	17.2	18.7	20.6	22.1	23.3	24.1	24.2	21.8	21.5	22.5	24.4	25.1	25.3	24.7	24.2	22.4	21.5	20.4	25.3																						
28-Jun	20.4	19.8	19.3	18.7	18.0	17.6	17.7	19.4	21.0	22.6	23.6	25.1	26.0	26.1	26.0	25.8	25.7	25.5	25.4	24.6	23.8	23.1	22.3	21.4	22.4	26.1																						
29-Jun	20.4	20.1	19.2	18.5	17.8	17.5	17.9	19.1	20.8	22.3	22.8	23.5	24.0	24.8	25.1	25.7	26.2	26.7	26.6	26.1	25.6	24.1	22.5	21.1	22.4	26.7																						
30-Jun	20.3	19.7	19.1	18.3	17.7	17.7	17.9	18.9	18.9	20.0	21.3	23.7	25.3	26.2	26.8	27.3	27.4	27.2	26.8	26.2	25.7	25.1	23.9	23.3	22.7	27.4																						
																								16.2	15.4	14.8	14.2	13.6	13.2	13.4	14.5	15.8	17.2	18.2	19.2	19.6	20.1	20.4	20.5	20.6	20.9	20.7	20.3	19.6	18.6	17.7	17.1	Diurnal Average
																								22.9	21.6	20.2	19.4	18.2	17.7	17.9	19.4	21.0	22.7	24.9	26.4	26.9	27.3	27.5	28.0	28.2	28.0	27.3	27.5	27.0	25.5	25.1	24.3	Diurnal Maximum





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ambient Temperature 75 m (AT75m) - C
Mannix - June 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	16	2.22	2.22
10 - 20	476	66.11	68.33
> 20	228	31.67	100.00

Total Number of Valid Hours: 720

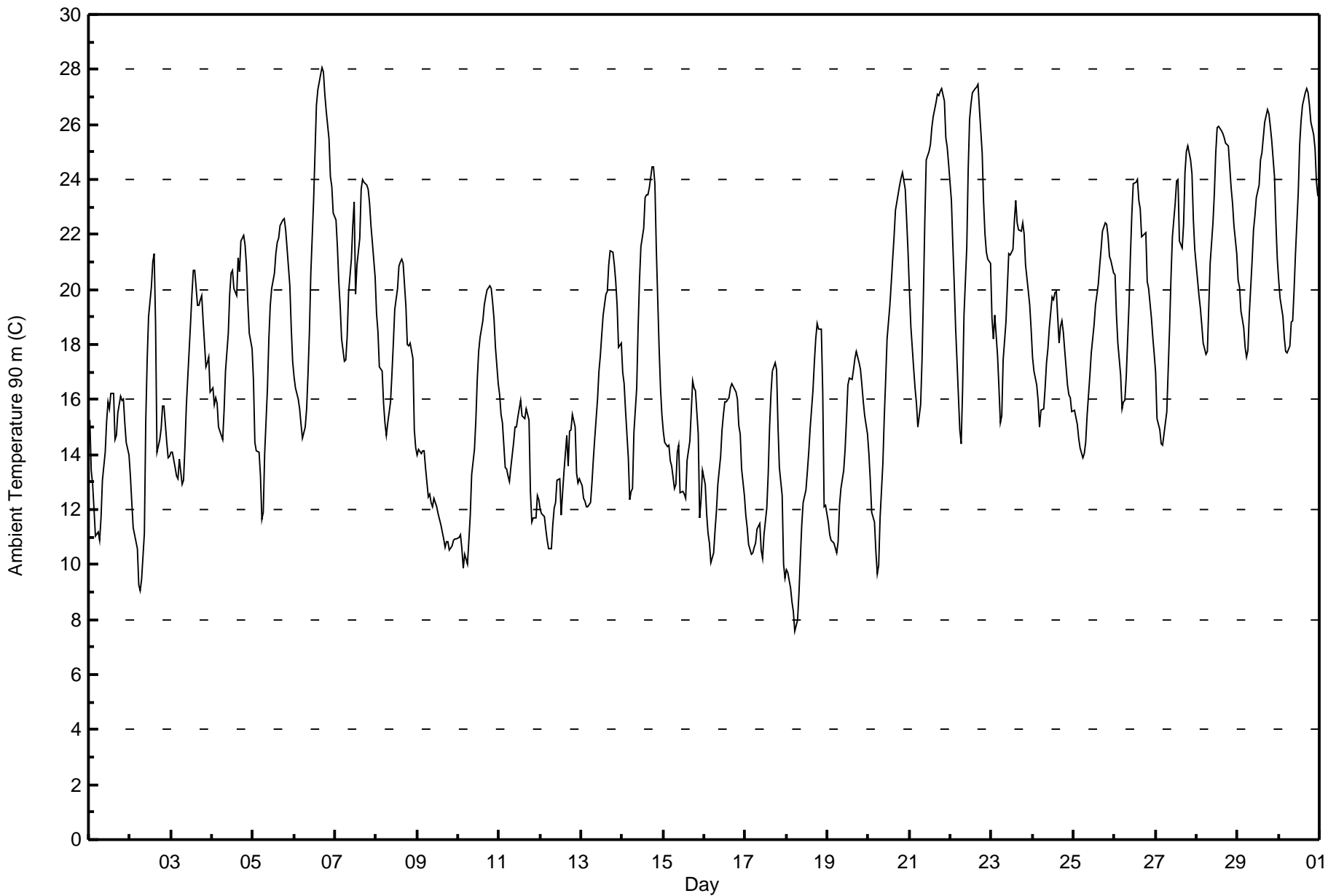
Total Number of Hours: 720



Summary of Hour Averages

Mannix - June 2016

Maximum Value: 28.0 C on Jun 6 17:00		Maximum Daily Average: 22.7 C on Jun 30		Hours in Service: 720																																												
Minimum Value: 7.6 C on Jun 18 06:00		Minimum Daily Average: 12.1 C on Jun 9		Hours of Data: 720																																												
Maximum Diurnal Average: 20.8 C at hour 18		Minimum Diurnal Average: 13.3 C at hour 6		Hours of Missing Data: 0																																												
Monthly Average: 17.54 C		Percentiles: P ₁ = 9.2 P ₁₀ = 11.7 Q ₁ = 14.1 Median = 17.1 O ₃ = 21.0 P ₉₀ = 24.0 P ₉₉ = 27.3		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-Jun	15.3	13.4	12.9	12.0	11.0	11.2	10.9	11.7	13.1	14.1	15.2	15.9	15.7	16.2	16.2	14.5	14.7	15.5	16.1	16.0	16.0	15.2	14.4	14.0	14.2	16.2																						
2-Jun	13.2	12.3	11.3	10.8	10.6	9.3	9.0	9.5	11.1	15.2	17.4	19.0	20.1	21.0	21.3	18.8	14.1	14.6	15.0	15.7	15.8	14.4	13.9	14.0	14.5	21.3																						
3-Jun	14.1	14.1	13.5	13.2	13.1	13.8	12.9	13.1	14.3	15.8	16.8	18.8	19.8	20.7	20.7	19.4	19.4	19.6	19.8	18.9	17.2	17.3	17.6	16.3	16.7	20.7																						
4-Jun	16.4	15.8	16.0	15.9	15.0	14.7	14.6	15.6	17.0	18.4	19.8	20.6	20.7	20.1	19.8	21.2	20.6	21.7	22.0	21.6	20.8	19.5	18.4	17.8	18.5	22.0																						
5-Jun	16.7	14.4	14.1	14.1	13.2	11.7	11.9	14.1	16.4	18.2	19.4	20.0	20.6	21.3	21.7	21.9	22.3	22.5	22.6	22.1	21.5	20.1	18.6	17.4	18.2	22.6																						
6-Jun	16.9	16.4	16.0	15.6	15.1	14.6	15.0	15.7	16.9	18.5	20.6	23.2	25.0	26.7	27.3	27.8	28.0	27.9	27.1	26.5	25.5	24.1	23.7	22.8	21.5	28.0																						
7-Jun	22.5	21.6	20.3	19.4	18.2	17.4	17.4	18.3	19.9	21.1	22.3	23.2	19.8	20.9	21.8	23.7	24.0	23.9	23.8	23.7	23.2	22.3	21.7	20.4	21.3	24.0																						
8-Jun	19.1	18.5	17.2	17.0	15.8	15.1	14.7	15.2	15.9	16.9	18.1	19.3	20.1	20.9	21.0	21.1	21.0	19.4	18.0	18.0	18.1	17.5	14.9	14.2	17.8	21.1																						
9-Jun	14.0	14.2	14.0	14.1	14.1	13.6	12.5	12.6	12.3	12.1	12.4	12.1	11.8	11.7	11.4	10.9	10.6	10.8	10.8	10.5	10.7	10.9	10.9	10.9	12.1	14.2																						
10-Jun	11.0	11.1	10.6	9.8	10.4	10.0	10.9	11.8	13.2	14.2	15.3	16.7	17.7	18.3	18.9	19.4	19.7	20.0	20.1	20.0	19.5	18.9	17.9	16.6	15.5	20.1																						
11-Jun	16.2	15.5	15.2	13.5	13.5	13.2	13.0	13.5	14.4	15.0	15.0	15.4	16.0	15.4	15.3	15.3	15.6	15.3	12.7	11.6	11.7	11.7	12.5	12.3	14.1	16.2																						
12-Jun	12.0	11.8	11.7	11.3	10.9	10.6	10.6	11.4	12.1	12.3	13.1	13.1	11.8	12.6	13.4	14.7	13.6	14.8	14.9	15.5	15.0	13.3	13.0	13.1	12.8	15.5																						
13-Jun	12.9	12.4	12.3	12.1	12.1	12.3	13.0	13.8	14.6	16.0	17.0	17.6	18.4	19.1	19.8	19.9	20.9	21.4	21.3	20.9	20.3	19.4	17.9	18.0	16.8	21.4																						
14-Jun	17.0	16.6	15.6	13.9	12.3	12.7	12.7	14.8	16.4	18.6	20.4	21.6	22.2	23.3	23.4	23.4	23.7	24.5	24.5	23.8	21.5	17.9	16.4	15.5	18.9	24.5																						
15-Jun	14.8	14.5	14.3	14.3	13.8	13.6	12.8	12.9	14.1	14.4	12.6	12.7	12.5	12.4	13.8	14.5	15.5	16.7	16.4	16.3	14.8	11.7	12.4	13.4	14.0	16.7																						
16-Jun	12.9	11.8	11.2	10.8	10.1	10.4	11.2	11.9	12.9	13.9	14.9	15.4	15.9	15.9	16.0	16.4	16.6	16.5	16.3	16.0	15.0	14.7	13.5	12.5	13.9	16.6																						
17-Jun	11.8	11.3	10.7	10.4	10.4	10.6	10.8	11.3	11.5	10.5	10.2	11.1	12.1	13.3	15.0	16.2	17.0	17.3	17.1	15.0	13.5	12.5	10.0	9.5	12.5	17.3																						
18-Jun	9.8	9.7	9.2	8.6	8.3	7.6	8.0	9.0	10.2	11.4	12.2	12.7	13.4	14.1	14.9	16.3	17.4	18.2	18.8	18.5	18.5	16.3	12.1	12.1	12.8	18.8																						
19-Jun	11.6	11.1	10.9	10.8	10.8	10.4	10.8	12.1	12.8	13.4	14.2	15.3	16.5	16.8	16.7	17.1	17.5	17.8	17.3	17.1	16.5	15.9	15.4	14.7	14.3	17.8																						
20-Jun	14.0	13.1	11.9	11.5	10.5	9.7	10.0	11.7	13.7	15.4	16.7	18.2	19.4	20.3	21.1	21.9	22.9	23.5	23.8	24.1	24.2	23.6	22.5	21.4	17.7	24.2																						
21-Jun	19.9	18.6	17.1	16.4	15.9	15.0	15.8	17.4	19.9	22.5	24.7	25.0	25.3	25.9	26.3	26.8	27.1	27.0	27.2	27.3	26.9	25.5	25.2	24.6	22.6	27.3																						
22-Jun	23.3	21.7	20.3	18.6	17.4	14.9	14.4	16.4	19.1	21.6	24.4	26.2	26.8	27.2	27.3	27.3	27.5	26.6	24.9	23.2	22.0	21.4	21.1	20.9	22.3	27.5																						
23-Jun	19.0	18.2	19.0	17.6	16.4	15.2	15.4	17.4	18.8	20.1	21.3	21.2	21.5	22.5	23.3	22.4	22.2	22.1	22.4	22.0	20.9	20.0	19.4	18.6	19.9	23.3																						
24-Jun	17.5	17.1	16.5	15.9	15.0	15.6	15.7	16.4	17.3	17.9	18.6	19.7	19.6	19.9	19.9	18.1	18.7	18.9	18.5	17.8	16.5	16.2	16.1	15.5	17.5	19.9																						
25-Jun	15.6	15.4	15.1	14.6	14.3	13.9	14.0	14.5	15.4	16.9	17.7	18.2	18.7	19.4	20.2	20.9	21.5	22.1	22.4	22.4	21.9	21.2	21.0	20.6	18.2	22.4																						
26-Jun	20.5	19.1	18.1	16.9	15.7	15.9	16.0	16.8	19.5	21.3	22.7	23.9	23.9	24.0	23.2	23.0	21.9	22.0	22.1	20.3	20.0	19.0	18.3	17.7	20.1	24.0																						
27-Jun	17.0	15.3	14.9	14.4	14.3	14.8	15.6	17.1	18.6	20.5	21.9	23.1	24.0	24.0	21.8	21.5	22.4	24.3	25.0	25.2	24.7	24.2	22.5	21.5	20.3	25.2																						
28-Jun	20.3	19.8	19.3	18.7	18.0	17.7	17.8	19.4	20.9	22.4	23.5	25.0	25.9	25.9	25.8	25.7	25.5	25.3	25.2	24.4	23.7	23.1	22.3	21.3	22.4	25.9																						
29-Jun	20.3	20.1	19.2	18.6	17.9	17.6	17.8	19.1	21.0	22.1	22.7	23.4	23.8	24.7	25.0	25.5	26.1	26.5	26.4	25.9	25.4	24.1	22.4	21.1	22.4	26.5																						
30-Jun	20.4	19.7	19.0	18.3	17.8	17.7	18.0	18.8	18.9	20.0	21.3	23.6	25.3	26.1	26.7	27.2	27.3	27.1	26.7	26.1	25.7	25.1	23.9	23.4	22.7	27.3																						
																								16.2	15.5	14.9	14.3	13.7	13.3	13.4	14.4	15.7	17.0	18.1	19.0	19.5	20.0	20.3	20.4	20.5	20.8	20.6	20.2	19.6	18.6	17.7	17.1	Diurnal Average
																								23.3	21.7	20.3	19.4	18.2	17.7	18.0	19.4	21.0	22.5	24.7	26.2	26.8	27.2	27.3	27.8	28.0	27.9	27.2	27.3	26.9	25.5	25.2	24.6	Diurnal Maximum





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 90 m (AT90m) - C
Mannix - June 2016**

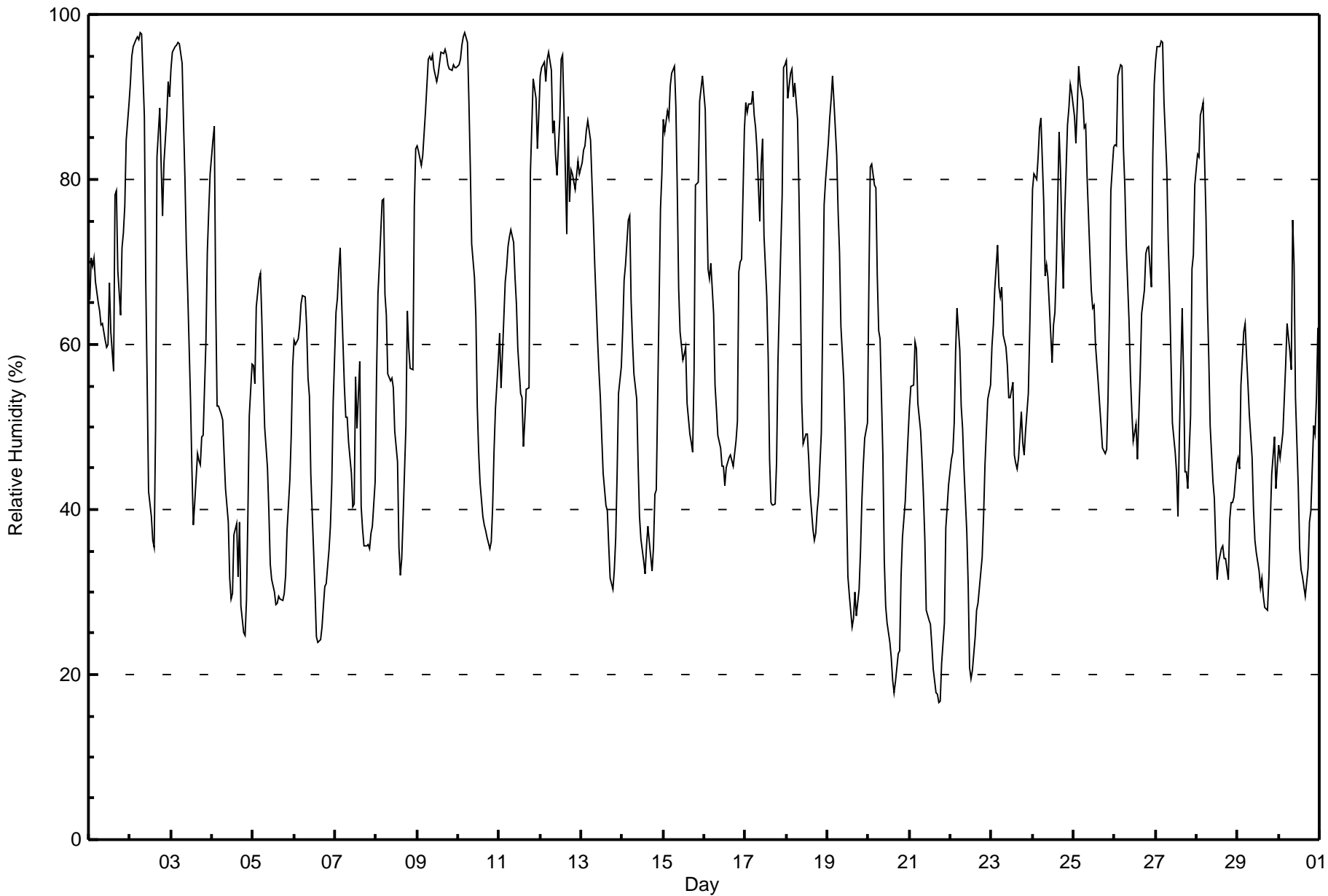
Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	16	2.22	2.22
10 - 20	480	66.67	68.89
> 20	224	31.11	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Value: 98 % on Jun 10 05:00 Maximum Daily Average: 91.7 % on Jun 9																			Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: 17 % on Jun 21 18:00 Minimum Daily Average: 36.3 % on Jun 21 Maximum Diurnal Average: 79.3 % at hour 5 Minimum Diurnal Average: 43.6 % at hour 15 Monthly Average: 60.2 % Percentiles: P ₁ = 19 P ₁₀ = 32 Q ₁ = 43 Median = 58 Q ₃ = 80 P ₉₀ = 91 P ₉₉ = 97																										
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-Jun	65	71	70	70	68	65	64	62	62	61	60	60	67	62	57	78	79	69	64	72	74	77	85	89	68.7	89
2-Jun	92	95	96	97	97	97	98	98	88	67	55	42	39	36	35	50	83	89	82	76	82	88	92	90	77.6	98
3-Jun	93	95	96	96	97	96	94	87	80	72	66	53	45	38	41	47	46	45	49	49	60	71	76	81	69.8	97
4-Jun	85	86	65	53	53	51	51	47	42	39	32	29	30	37	38	32	38	28	25	25	29	39	51	58	44.3	86
5-Jun	57	55	65	68	69	63	56	50	45	40	33	32	30	29	29	30	29	29	30	32	37	44	49	57	44.0	69
6-Jun	60	60	61	62	65	66	66	62	56	54	44	35	30	25	24	24	26	28	31	31	35	38	43	53	44.9	66
7-Jun	64	66	69	72	65	55	51	51	48	44	40	41	56	50	58	40	38	36	36	36	35	37	38	43	48.7	72
8-Jun	56	66	70	77	78	66	64	56	56	56	55	50	46	35	32	34	39	50	64	60	57	57	77	84	57.7	84
9-Jun	84	83	82	83	86	88	95	95	94	95	93	92	93	94	95	95	96	95	94	93	93	94	94	94	91.7	96
10-Jun	94	95	96	97	98	97	90	82	72	68	63	52	47	43	39	38	37	37	35	36	40	47	52	58	63.1	98
11-Jun	61	55	59	68	69	72	73	74	72	68	65	60	54	54	48	51	55	55	81	86	92	90	84	88	68.0	92
12-Jun	93	94	94	92	95	95	93	86	87	83	80	87	95	95	88	73	88	77	81	81	79	81	82	81	86.6	95
13-Jun	82	84	84	86	87	85	80	75	70	61	57	54	49	44	40	40	36	32	30	33	37	44	54	57	58.3	87
14-Jun	62	68	70	75	76	65	60	56	53	46	39	36	34	32	36	38	36	33	35	42	42	65	76	81	52.4	81
15-Jun	87	86	88	87	91	93	94	89	79	67	62	58	59	60	53	49	48	47	57	79	80	90	91	93	74.4	94
16-Jun	89	78	69	68	70	64	55	52	49	47	45	45	43	45	46	47	46	45	48	51	69	70	70	86	58.2	89
17-Jun	89	88	89	89	91	88	86	83	75	82	85	73	66	59	46	41	40	41	46	58	65	78	94	94	72.7	94
18-Jun	94	90	93	93	90	92	87	78	67	53	48	49	49	46	42	38	36	37	40	42	49	63	77	80	64.0	94
19-Jun	84	87	90	92	89	83	76	71	62	56	50	41	32	30	26	27	30	27	30	35	41	45	49	51	54.3	92
20-Jun	67	81	82	79	79	68	62	61	47	34	28	26	24	22	19	18	19	22	23	32	37	41	45	49	44.4	82
21-Jun	52	55	55	60	59	53	49	46	42	36	28	27	26	24	21	18	18	17	17	21	26	38	40	43	36.3	60
22-Jun	46	47	51	59	64	59	53	50	45	37	31	21	19	20	25	28	29	31	34	39	45	50	53	55	41.3	64
23-Jun	60	62	67	72	67	66	67	61	60	57	53	54	55	47	46	45	46	52	48	47	50	54	62	70	57.0	72
24-Jun	79	81	80	83	86	88	77	68	70	68	65	58	62	64	69	86	81	73	67	76	87	89	92	91	76.6	92
25-Jun	88	84	89	94	92	90	86	87	80	71	67	64	65	60	55	53	50	47	47	47	54	64	79	84	70.7	94
26-Jun	84	84	93	94	94	84	79	72	63	56	52	48	50	46	51	57	64	67	71	72	72	67	83	92	70.6	94
27-Jun	94	96	96	97	97	89	81	73	67	58	51	47	44	39	49	64	56	45	45	42	51	69	71	79	66.7	97
28-Jun	83	83	88	89	89	76	65	59	50	43	41	36	32	34	35	36	34	34	32	39	41	41	42	46	51.9	89
29-Jun	46	45	55	62	63	59	55	51	46	40	36	35	33	30	32	29	28	28	32	39	44	49	43	45	42.7	63
30-Jun	48	46	49	53	58	63	59	57	75	70	54	43	35	33	32	30	31	33	38	40	50	49	54	62	48.4	75
	74.7	75.5	77.0	78.9	79.3	75.8	72.2	68.0	63.4	57.6	52.6	48.2	46.9	44.4	43.6	44.5	46.0	44.9	47.0	50.3	55.1	60.9	66.5	71.1	Diurnal Average	
	94	96	96	97	98	97	98	98	94	95	93	92	95	95	95	95	96	95	94	93	93	94	94	94	Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Mannix - June 2016

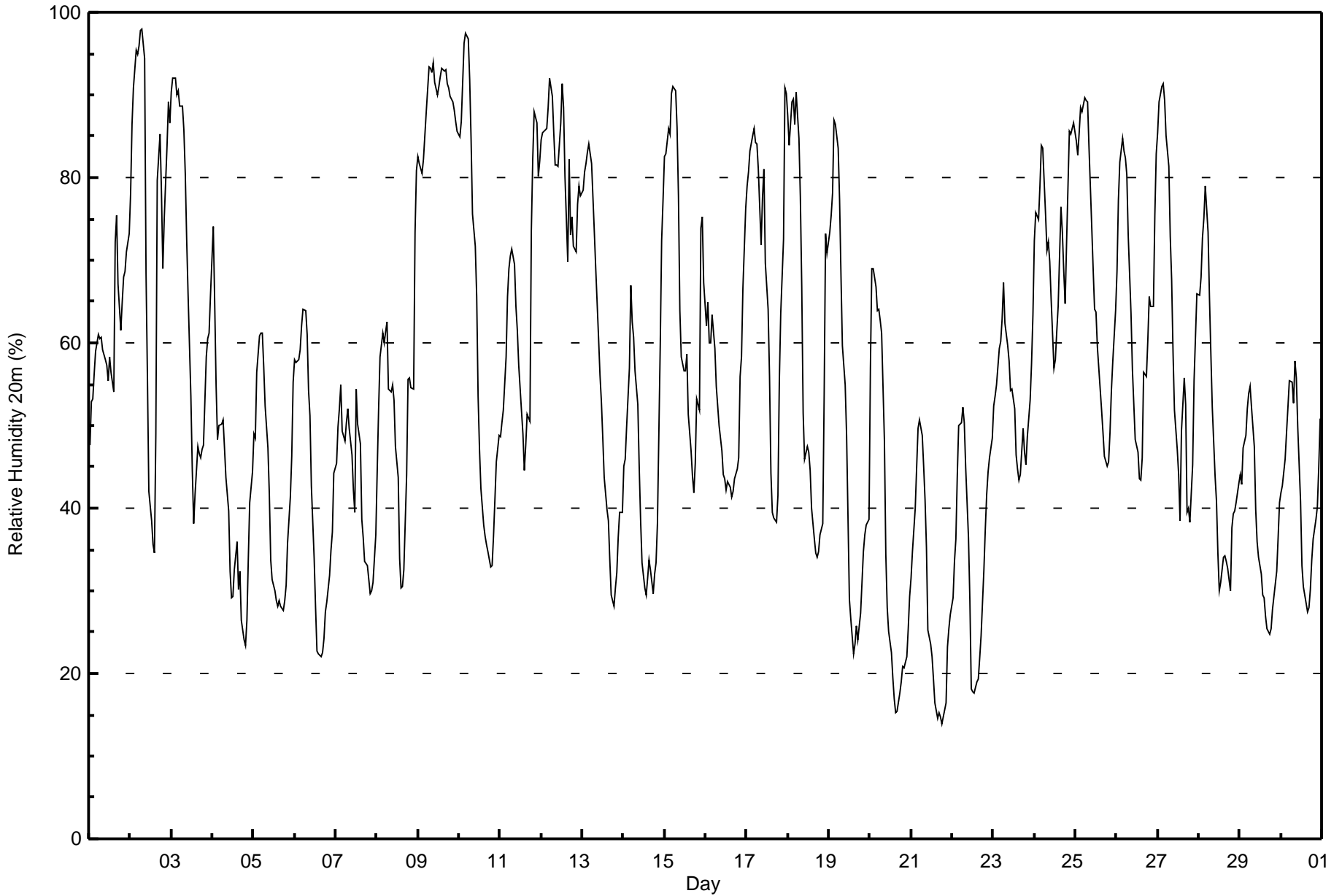
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	8	1.11	1.11
20 - 40	141	19.58	20.69
40 - 60	228	31.67	52.36
60 - 80	165	22.92	75.28
80 - 100	178	24.72	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Value: 98 % on Jun 2 08:00																			Maximum Daily Average: 89.1 % on Jun 9						Hours in Service: 720																								
Minimum Value: 14 % on Jun 21 19:00																			Minimum Daily Average: 28.9 % on Jun 21						Hours of Data: 720																								
Maximum Diurnal Average: 72.7 % at hour 6																			Minimum Diurnal Average: 40.8 % at hour 15						Hours of Missing Data: 0																								
Monthly Average: 55.7 %																			Percentiles: P ₁ = 16 P ₁₀ = 29 Q ₁ = 39 Median = 54 Q ₃ = 73 P ₉₀ = 86 P ₉₉ = 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-Jun	48	53	53	56	59	61	61	61	59	58	57	55	58	56	54	72	75	67	62	65	68	69	71	73	61.3	75																							
2-Jun	78	86	91	95	95	96	98	98	94	68	56	42	38	36	35	49	80	85	78	69	75	84	89	87	75.1	98																							
3-Jun	90	92	92	90	91	89	89	86	80	73	66	54	45	38	42	47	47	46	47	48	58	60	61	66	66.5	92																							
4-Jun	74	65	55	48	50	50	51	47	44	40	32	29	29	33	36	30	32	27	24	23	26	34	41	44	40.2	74																							
5-Jun	49	48	56	61	61	61	57	52	47	42	34	31	30	29	28	29	28	28	29	31	36	41	46	55	42.1	61																							
6-Jun	58	58	58	59	62	64	64	61	54	51	43	34	28	23	22	22	23	24	27	29	32	35	37	44	42.2	64																							
7-Jun	45	50	52	55	49	48	50	52	50	46	42	39	54	50	48	39	36	34	33	31	30	30	31	37	43.0	55																							
8-Jun	45	52	58	61	60	61	63	54	54	55	53	48	44	34	30	30	32	44	56	56	55	54	73	81	52.2	81																							
9-Jun	82	82	80	82	85	88	93	93	93	94	91	90	91	92	93	93	93	91	91	90	89	88	87	86	89.1	94																							
10-Jun	85	87	92	96	97	97	92	85	76	72	66	54	47	42	38	37	36	35	33	33	37	41	46	49	61.2	97																							
11-Jun	49	50	52	58	66	69	70	71	70	64	62	57	52	49	45	48	51	50	74	82	88	87	80	82	63.6	88																							
12-Jun	85	85	86	86	89	92	90	85	82	82	81	87	91	88	80	70	82	73	75	72	71	77	79	78	81.9	92																							
13-Jun	78	81	82	83	84	82	77	73	69	61	56	53	48	44	40	39	34	30	28	30	32	37	40	39	54.9	84																							
14-Jun	45	46	50	57	67	63	61	57	53	45	38	33	30	29	32	34	33	30	32	33	38	60	72	77	46.4	77																							
15-Jun	83	83	86	85	90	91	91	86	78	64	58	57	57	59	51	47	44	42	45	53	52	74	75	67	67.4	91																							
16-Jun	62	65	60	60	63	59	55	52	50	47	44	44	42	43	43	41	42	44	45	46	56	58	67	76	52.7	76																							
17-Jun	79	81	83	85	86	84	84	81	72	78	81	70	64	56	44	40	39	38	41	56	64	72	91	90	69.1	91																							
18-Jun	87	84	89	90	86	90	85	78	67	52	46	47	47	45	40	36	35	34	35	37	38	54	73	71	60.2	90																							
19-Jun	73	75	78	87	86	84	77	68	60	55	49	39	29	27	22	24	26	24	27	31	35	37	38	39	49.6	87																							
20-Jun	57	69	69	67	64	64	63	61	48	34	28	25	23	20	17	15	15	18	19	21	21	22	25	29	37.2	69																							
21-Jun	31	35	40	45	50	51	49	45	41	35	25	24	22	19	16	15	15	15	14	15	17	23	25	27	28.9	51																							
22-Jun	29	34	36	44	50	50	52	50	45	36	29	18	18	18	19	19	22	25	33	37	42	44	46	48	35.2	52																							
23-Jun	52	54	55	59	60	63	67	62	60	58	54	54	52	46	45	43	44	50	47	45	49	53	57	63	53.9	67																							
24-Jun	72	76	75	79	84	84	76	71	72	70	65	57	58	61	64	77	73	69	65	72	86	85	86	87	73.4	87																							
25-Jun	84	83	85	88	88	90	89	89	84	74	69	64	64	59	54	52	49	46	45	46	49	54	58	64	67.8	90																							
26-Jun	69	77	82	85	83	82	80	73	64	57	53	48	47	44	43	46	56	56	60	66	64	64	75	83	64.9	85																							
27-Jun	85	89	91	91	89	85	81	73	68	59	52	47	44	38	49	56	53	39	40	38	45	55	61	66	62.3	91																							
28-Jun	66	68	73	75	79	73	65	59	52	44	41	35	30	31	34	34	34	33	30	38	39	40	41	43	48.2	79																							
29-Jun	44	43	47	49	52	54	55	52	47	40	36	34	32	30	29	27	26	25	25	28	29	32	36	41	38.1	55																							
30-Jun	42	43	46	49	52	55	55	53	58	56	50	41	33	31	30	27	28	30	34	36	39	40	45	51	42.6	58																							
																								64.3	66.4	68.4	70.9	72.6	72.7	71.3	67.7	62.9	56.9	51.9	47.0	44.9	42.3	40.8	41.2	42.8	41.7	43.1	45.2	48.6	53.5	58.4	61.5	Diurnal Average	
																								90	92	92	96	97	97	98	98	94	94	91	90	91	92	93	93	93	91	91	90	89	88	91	90	Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity 20m (RH20m) - %
Mannix - June 2016

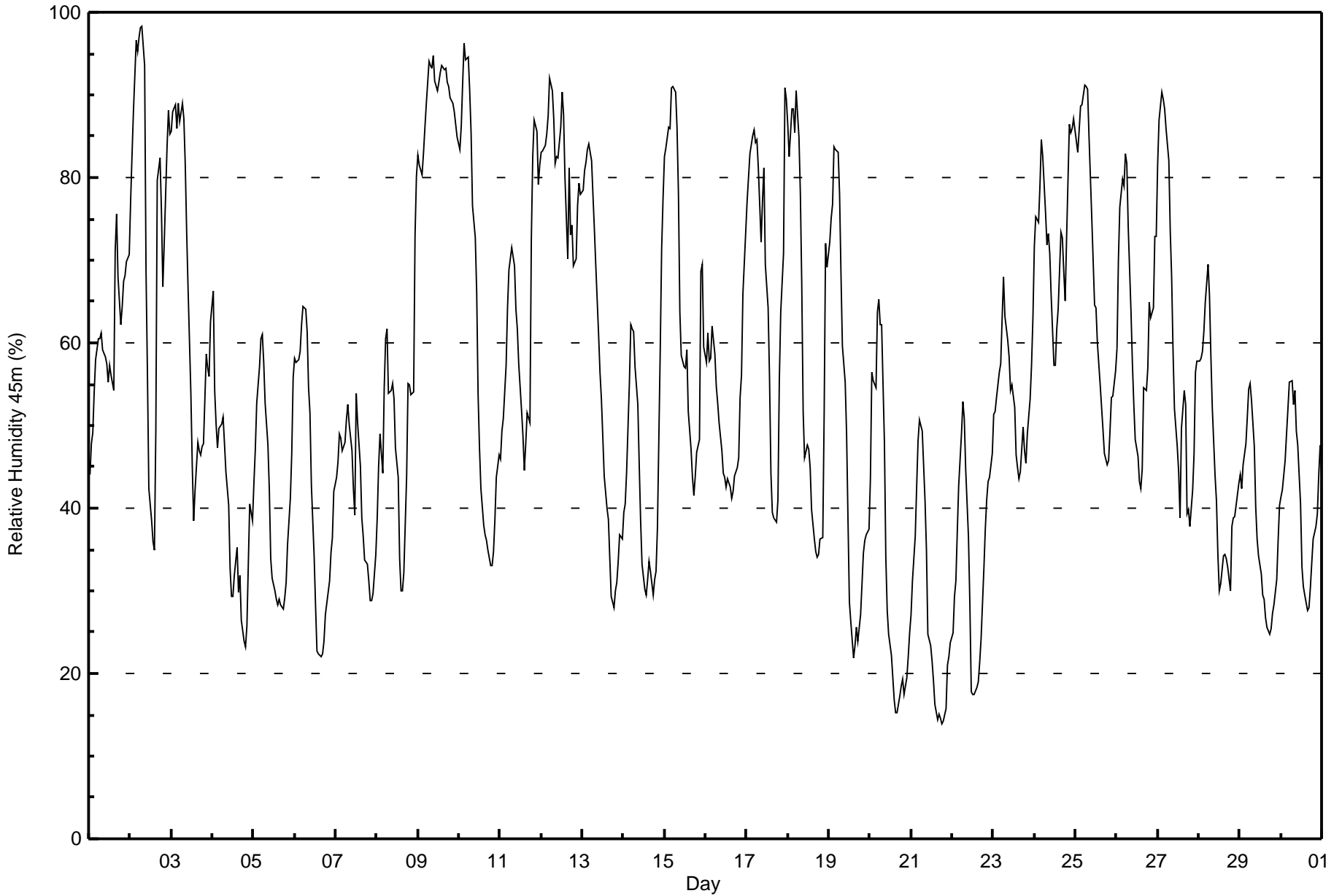
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	19	2.64	2.64
20 - 40	169	23.47	26.11
40 - 60	251	34.86	60.97
60 - 80	145	20.14	81.11
80 - 100	136	18.89	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Value: 98 % on Jun 2 08:00																			Maximum Daily Average: 89.4 % on Jun 9						Hours in Service: 720																								
Minimum Value: 14 % on Jun 21 19:00																			Minimum Daily Average: 27.7 % on Jun 21						Hours of Data: 720																								
Maximum Diurnal Average: 72.4 % at hour 6																			Minimum Diurnal Average: 40.7 % at hour 15						Hours of Missing Data: 0																								
Monthly Average: 54.8 %																			Percentiles: P ₁ = 16 P ₁₀ = 29 Q ₁ = 39 Median = 53 Q ₃ = 72 P ₉₀ = 86 P ₉₉ = 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-Jun	44	48	49	54	58	61	61	61	59	58	57	55	57	56	54	71	76	68	62	64	67	68	70	71	60.4	76																							
2-Jun	77	83	88	97	95	97	98	98	94	69	56	42	38	36	35	50	80	82	76	67	72	84	88	85	74.4	98																							
3-Jun	86	88	89	86	89	87	89	87	81	73	67	54	45	38	42	48	47	46	47	48	59	57	56	63	65.5	89																							
4-Jun	66	54	50	47	50	50	51	48	44	40	33	29	29	32	35	30	32	26	24	23	26	33	40	39	38.9	66																							
5-Jun	43	47	53	57	61	61	58	53	48	42	34	32	30	29	28	29	28	28	29	31	36	41	47	56	41.6	61																							
6-Jun	58	58	58	59	62	64	64	61	55	51	43	34	28	23	22	22	22	24	27	28	31	35	36	42	42.0	64																							
7-Jun	44	46	49	48	47	48	51	53	50	47	42	39	54	50	45	39	37	34	33	31	29	29	30	34	42.0	54																							
8-Jun	39	45	49	44	54	61	62	54	54	55	53	47	44	34	30	30	32	44	55	55	54	54	73	80	50.1	80																							
9-Jun	83	81	80	83	86	89	94	94	93	95	92	91	92	93	94	93	93	91	91	90	89	88	86	85	89.4	95																							
10-Jun	83	86	91	96	94	95	91	85	77	73	66	54	47	42	38	37	36	35	33	33	35	39	44	46	60.7	96																							
11-Jun	46	49	51	57	64	69	70	72	69	64	62	58	52	49	45	48	51	50	73	82	87	86	79	81	63.1	87																							
12-Jun	83	83	84	85	87	92	91	87	82	83	82	86	90	88	80	70	81	73	74	69	70	77	79	78	81.5	92																							
13-Jun	78	81	82	83	84	82	78	74	69	61	56	53	49	44	40	39	34	29	28	30	31	33	37	36	54.7	84																							
14-Jun	40	41	44	55	62	62	61	57	53	45	39	33	30	30	31	34	32	29	31	32	38	59	71	77	45.3	77																							
15-Jun	83	84	86	86	91	91	90	86	78	64	58	57	57	59	52	47	44	42	44	47	48	69	70	59	66.3	91																							
16-Jun	58	61	58	58	62	59	55	53	50	47	44	44	43	44	43	41	42	44	45	46	53	56	66	73	51.8	73																							
17-Jun	77	80	83	85	86	84	85	81	72	77	81	70	64	56	44	40	39	38	41	56	64	71	91	89	68.9	91																							
18-Jun	87	82	88	88	85	91	85	78	67	52	46	48	47	45	40	36	35	34	34	36	36	51	72	69	59.7	91																							
19-Jun	72	75	77	84	83	83	78	68	60	55	49	39	29	26	22	23	26	24	27	31	35	36	37	37	49.0	84																							
20-Jun	44	56	55	55	64	65	62	62	48	34	28	25	22	19	17	15	15	17	19	19	17	19	22	25	34.4	65																							
21-Jun	27	31	37	42	48	51	49	45	41	35	25	23	22	19	16	14	15	15	14	14	16	21	22	24	27.7	51																							
22-Jun	25	29	31	37	43	49	53	51	45	36	28	18	17	17	18	19	21	24	33	37	41	43	44	47	33.7	53																							
23-Jun	51	52	53	57	57	63	68	63	60	58	54	55	52	46	45	44	44	50	47	45	49	53	57	63	53.7	68																							
24-Jun	72	75	75	79	85	82	76	72	73	71	66	57	57	62	64	73	73	69	65	73	86	85	86	87	73.4	87																							
25-Jun	84	83	86	89	89	91	91	91	85	75	70	65	64	60	55	52	49	47	45	46	49	53	54	57	67.9	91																							
26-Jun	59	70	76	80	79	83	82	74	64	58	52	48	46	43	42	45	55	54	57	65	63	64	73	73	62.7	83																							
27-Jun	82	87	90	90	88	86	82	74	68	59	52	47	44	39	50	54	53	39	40	38	42	47	56	58	61.0	90																							
28-Jun	58	58	59	61	65	69	66	59	52	44	41	34	30	31	34	34	34	33	30	38	39	39	40	43	45.5	69																							
29-Jun	44	42	45	48	51	54	55	53	47	40	36	34	32	30	29	27	26	25	25	27	28	31	36	40	37.8	55																							
30-Jun	41	42	46	49	52	55	55	53	54	49	48	41	33	31	29	28	28	30	33	36	38	39	44	48	41.8	55																							
																								61.1	63.3	65.5	68.0	70.7	72.4	71.6	68.2	63.1	57.1	52.0	47.0	44.9	42.3	40.7	41.1	42.6	41.5	42.8	44.7	47.6	52.0	56.9	58.9	Diurnal Average	
																								87	88	91	97	95	97	98	98	94	95	92	91	92	93	94	93	93	91	91	90	89	88	91	89	Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity 45m (RH45m) - %
Mannix - June 2016

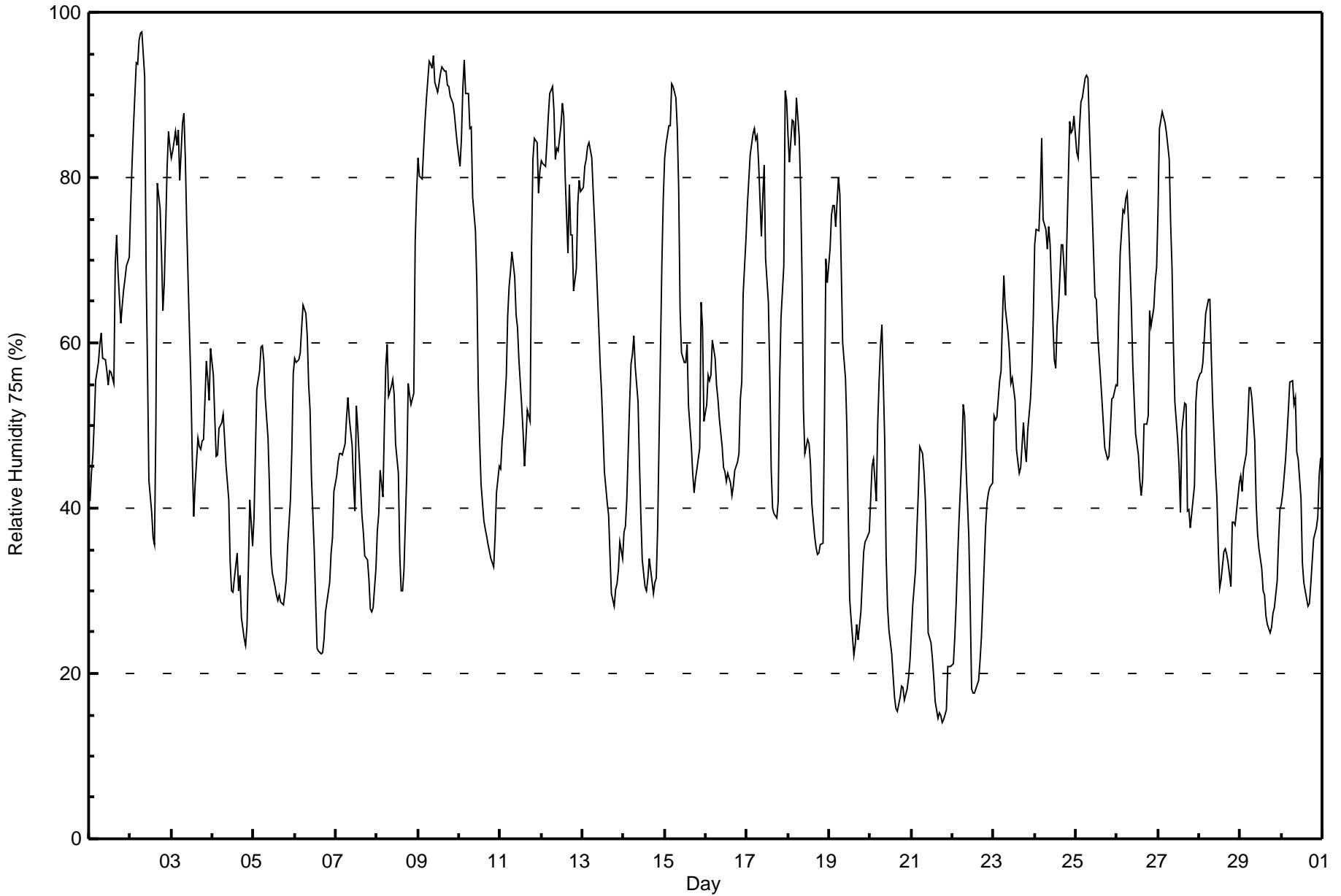
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	22	3.06	3.06
20 - 40	171	23.75	26.81
40 - 60	264	36.67	63.47
60 - 80	133	18.47	81.94
80 - 100	130	18.06	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Value: 98 % on Jun 2 08:00																		Maximum Daily Average: 89.2 % on Jun 9																		Hours in Service: 720	
Minimum Value: 14 % on Jun 21 19:00																		Minimum Daily Average: 26.6 % on Jun 21																		Hours of Data: 720	
Maximum Diurnal Average: 70.9 % at hour 7																		Minimum Diurnal Average: 40.9 % at hour 15																		Hours of Missing Data: 0	
Monthly Average: 54.2 %																		Percentiles: P ₁ = 15 P ₁₀ = 29 Q ₁ = 38 Median = 52 Q ₃ = 71 P ₉₀ = 85 P ₉₉ = 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-Jun	41	44	46	50	55	58	60	61	58	58	57	55	57	57	55	69	73	69	62	64	66	68	69	70	59.3	73											
2-Jun	76	82	86	94	94	97	97	98	92	69	57	43	39	36	36	50	79	76	71	64	67	81	86	84	73.1	98											
3-Jun	82	83	86	84	86	80	87	88	82	74	67	55	46	39	43	48	48	47	48	48	58	56	53	59	64.5	88											
4-Jun	56	51	46	46	50	50	51	48	45	41	33	30	30	32	35	30	32	27	24	23	26	33	41	35	38.2	56											
5-Jun	39	47	54	57	59	60	58	53	48	43	35	32	31	29	29	29	29	28	30	31	35	41	47	56	41.7	60											
6-Jun	58	58	58	59	62	65	64	61	55	52	44	35	29	23	23	22	23	24	27	29	31	35	37	42	42.2	65											
7-Jun	44	46	47	47	46	48	51	53	51	48	43	40	52	50	43	39	37	34	34	31	28	27	28	33	41.6	53											
8-Jun	37	39	45	41	50	57	60	54	55	56	54	48	44	34	30	30	33	44	55	54	53	54	72	78	49.0	78											
9-Jun	82	80	80	83	87	90	94	94	93	95	92	90	91	92	93	93	93	91	91	90	89	88	86	84	89.2	95											
10-Jun	81	85	91	94	90	90	86	86	78	74	67	55	48	43	38	37	37	36	34	33	33	37	42	45	60.0	94											
11-Jun	45	48	50	56	63	67	69	71	68	63	62	58	52	49	45	48	52	51	72	82	85	84	78	81	62.4	85											
12-Jun	82	82	81	84	87	90	91	88	82	84	83	86	89	87	80	71	79	73	73	66	69	77	80	78	81.0	91											
13-Jun	79	81	82	84	84	82	78	75	70	62	57	54	49	44	41	39	34	30	28	30	31	33	36	34	54.9	84											
14-Jun	37	38	41	53	57	59	61	57	53	46	39	34	31	30	31	34	32	30	31	31	38	59	70	77	44.5	77											
15-Jun	82	84	86	86	91	91	90	86	79	64	59	58	58	60	52	48	44	42	43	45	47	65	62	50	65.5	91											
16-Jun	53	56	55	56	60	58	55	53	51	47	45	44	43	44	43	42	43	45	46	47	53	55	66	73	51.4	73											
17-Jun	77	80	83	85	86	85	85	82	73	78	82	70	65	56	45	40	39	39	41	55	63	69	90	89	69.0	90											
18-Jun	85	82	87	87	84	90	85	79	68	52	47	48	48	45	40	37	35	34	35	36	36	51	70	67	59.4	90											
19-Jun	71	75	77	77	74	80	78	69	60	56	50	39	29	27	22	24	26	24	27	31	35	36	36	37	48.3	80											
20-Jun	41	45	46	41	50	55	60	62	48	34	28	25	22	20	17	16	15	17	18	18	17	18	19	22	31.5	62											
21-Jun	25	28	33	38	42	47	47	44	41	35	25	24	22	19	17	15	15	15	14	14	16	21	21	21	26.6	47											
22-Jun	21	24	29	34	38	46	53	51	45	37	28	18	18	18	19	19	22	24	33	38	41	42	43	43	32.6	53											
23-Jun	51	51	51	55	57	63	68	64	61	59	55	56	53	47	46	44	45	50	47	46	49	53	57	63	53.8	68											
24-Jun	72	74	74	78	85	75	74	71	74	72	67	58	57	62	64	72	72	69	66	73	87	85	86	87	73.0	87											
25-Jun	83	82	86	89	90	92	92	92	86	76	71	66	65	61	56	53	50	47	46	46	50	53	53	55	68.4	92											
26-Jun	55	64	71	76	76	77	78	74	64	57	53	49	46	43	41	43	50	50	51	64	62	64	67	69	60.3	78											
27-Jun	76	86	88	87	87	85	82	74	69	59	53	48	45	39	49	53	53	40	40	38	41	43	53	55	60.1	88											
28-Jun	56	56	58	61	64	65	65	59	53	44	41	35	30	31	35	35	34	33	30	38	38	38	40	43	45.2	65											
29-Jun	44	42	45	47	50	55	55	53	48	41	37	35	33	30	29	27	26	25	26	27	28	31	36	40	37.9	55											
30-Jun	41	42	46	49	52	55	55	52	53	47	46	41	33	31	30	28	28	31	34	36	38	39	44	46	41.6	55											
	59.1	61.2	63.5	65.9	68.6	70.4	70.9	68.5	63.5	57.4	52.5	47.6	45.2	42.7	40.9	41.2	42.6	41.5	42.6	44.4	46.9	51.2	55.6	57.3	Diurnal Average												
	85	86	91	94	94	97	97	98	93	95	92	90	91	92	93	93	93	91	91	90	89	88	90	89	Diurnal Maximum												





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity 75m (RH75m) - %
Mannix - June 2016

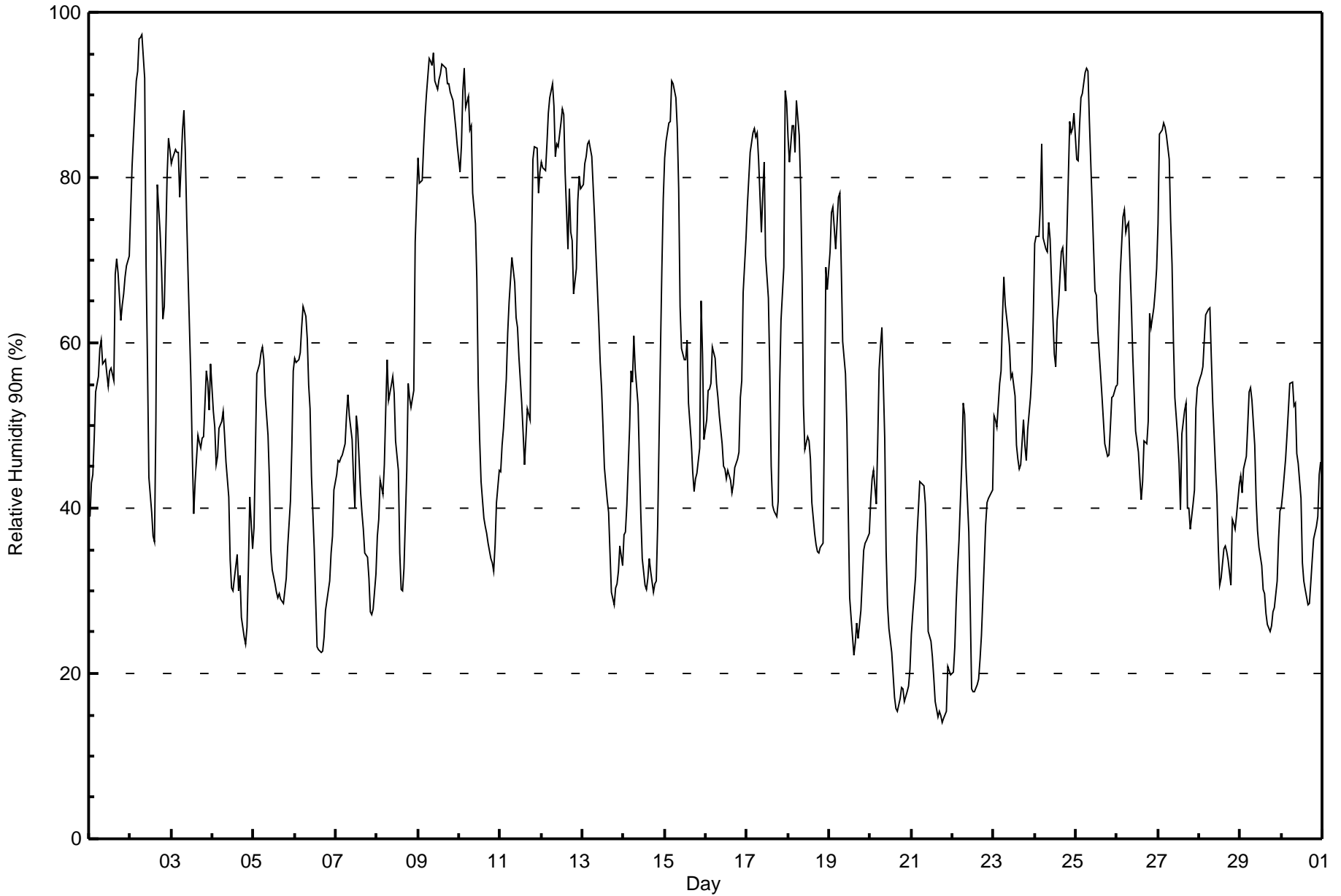
Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	23	3.19	3.19
20 - 40	175	24.31	27.50
40 - 60	272	37.78	65.28
60 - 80	132	18.33	83.61
80 - 100	118	16.39	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Value: 97 % on Jun 2 08:00																		Maximum Daily Average: 89.4 % on Jun 9																		Hours in Service: 720	
Minimum Value: 14 % on Jun 21 19:00																		Minimum Daily Average: 25.9 % on Jun 21																		Hours of Data: 720	
Maximum Diurnal Average: 70.5 % at hour 7																		Minimum Diurnal Average: 41.1 % at hour 15																		Hours of Missing Data: 0	
Monthly Average: 54.1 %																		Percentiles: P ₁ = 15 P ₁₀ = 29 Q ₁ = 39 Median = 52 Q ₃ = 70 P ₉₀ = 85 P ₉₉ = 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-Jun	39	43	44	49	54	56	59	60	57	58	56	55	57	57	55	68	70	69	63	65	66	68	69	70	58.6	70											
2-Jun	76	81	85	92	93	97	97	97	92	69	57	44	39	37	36	51	79	73	69	63	64	80	85	83	72.5	97											
3-Jun	82	82	83	83	83	78	86	88	83	75	68	55	46	39	43	49	48	47	48	49	57	55	52	57	64.1	88											
4-Jun	52	50	45	46	50	51	52	49	46	41	34	30	30	32	34	30	32	27	24	24	26	33	41	35	38.0	52											
5-Jun	38	47	56	57	59	59	58	54	49	43	35	32	31	30	29	30	29	29	30	32	35	41	47	57	41.9	59											
6-Jun	58	58	58	59	62	64	63	60	55	52	44	35	29	23	23	23	23	24	28	29	31	35	37	42	42.2	64											
7-Jun	44	46	46	46	46	48	51	54	51	48	44	40	51	50	42	40	37	35	34	32	27	27	28	32	41.6	54											
8-Jun	37	39	43	42	45	52	58	53	55	56	54	48	44	35	30	30	33	45	55	53	52	54	72	77	48.4	77											
9-Jun	82	79	80	84	87	90	94	94	94	95	92	91	92	93	94	93	93	91	91	90	89	88	86	84	89.4	95											
10-Jun	81	84	90	93	88	90	86	86	78	74	68	55	48	43	39	38	37	36	34	33	32	36	41	45	59.8	93											
11-Jun	44	48	50	56	61	65	68	70	67	63	62	58	53	49	45	48	52	51	71	82	84	84	78	81	62.1	84											
12-Jun	82	81	81	84	88	90	91	89	83	84	84	87	88	88	81	71	79	73	72	66	69	77	80	79	81.1	91											
13-Jun	79	82	83	84	84	83	79	75	71	62	58	54	50	45	41	40	35	30	28	30	31	32	35	33	55.1	84											
14-Jun	37	37	40	50	57	55	61	57	53	46	39	34	31	30	32	34	32	30	31	31	38	59	69	77	44.1	77											
15-Jun	82	84	87	87	92	91	90	86	79	64	59	58	58	60	53	48	44	42	44	44	47	65	59	48	65.5	92											
16-Jun	51	54	54	55	60	58	55	53	51	48	45	45	44	45	43	42	43	45	46	47	53	55	66	73	51.3	73											
17-Jun	77	80	83	85	86	85	85	82	73	78	82	71	65	57	45	40	40	39	41	55	63	69	91	89	69.2	91											
18-Jun	85	82	86	86	83	89	85	79	68	52	47	49	48	46	41	37	36	35	35	35	36	51	69	66	59.4	89											
19-Jun	71	76	76	74	71	78	78	69	60	56	50	40	29	27	22	24	26	24	28	31	35	36	36	37	48.1	78											
20-Jun	41	43	45	41	48	57	60	62	49	35	28	25	23	20	17	16	16	17	18	18	17	18	19	21	31.3	62											
21-Jun	25	27	32	37	40	43	43	43	41	35	25	24	22	20	17	15	15	15	14	15	15	21	20	20	25.9	43											
22-Jun	20	23	29	33	36	46	53	51	45	37	28	18	18	18	19	19	22	25	33	38	41	41	42	42	32.3	53											
23-Jun	51	51	50	55	57	63	68	65	62	60	56	56	54	48	46	45	45	51	48	46	50	53	56	63	54.0	68											
24-Jun	72	73	73	76	84	73	71	71	75	72	67	59	57	63	65	71	72	69	66	73	87	85	86	88	72.8	88											
25-Jun	82	82	86	90	90	93	93	93	87	77	72	66	66	61	56	54	51	48	46	46	50	53	54	55	68.8	93											
26-Jun	55	62	68	75	76	73	74	75	64	58	54	49	47	44	41	43	48	48	51	64	62	64	66	69	59.6	76											
27-Jun	74	85	86	87	86	85	82	75	69	60	53	49	45	40	49	52	53	40	40	38	40	42	52	55	59.9	87											
28-Jun	56	56	57	60	63	64	64	58	53	45	42	35	31	32	35	35	35	34	31	39	38	38	39	43	45.1	64											
29-Jun	44	42	45	46	50	54	55	53	48	41	37	35	33	30	30	27	26	25	26	27	28	31	36	40	37.9	55											
30-Jun	40	42	46	49	52	55	55	52	53	47	45	41	33	31	30	28	29	31	34	36	38	39	44	46	41.5	55											
	58.5	60.6	62.9	65.3	67.7	69.5	70.5	68.4	63.6	57.8	52.8	47.9	45.4	43.0	41.1	41.3	42.6	41.5	42.6	44.3	46.7	51.0	55.2	56.9	Diurnal Average												
	85	85	90	93	93	97	97	97	94	95	92	91	92	93	94	93	93	91	91	90	89	88	91	89	Diurnal Maximum												





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity 90m (RH90m) - %
Mannix - June 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	24	3.33	3.33
20 - 40	175	24.31	27.64
40 - 60	271	37.64	65.28
60 - 80	132	18.33	83.61
80 - 100	118	16.39	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Speed: 35 km/h on Jun 15 14:00	Maximum Daily Speed Average: 17.6 km/h on Jun 9	Hours in Service: 720
Minimum Speed Value: 1 km/h on Jun 21 20:00	Minimum Daily Speed Average: 1.8 km/h on Jun 2	Hours of Data: 720
Maximum Diurnal Speed Average: 3.6 km/h at hour 7	Minimum Diurnal Speed Average: 0.4 km/h at hour 19	Hours of Missing Data: 0
Monthly Average Velocity: 1.6 km/h 220.5 deg	Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 6 Median = 9 O ₃ = 13 P ₉₀ = 18 P ₉₉ = 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-Jun	SSE12	SSE12	SSE12	SSE10	SE6	SE11	SE7	SE10	SSE11	SSE10	SSE12	SSE12	WSW1	NW4	W9	S9	SE8	SE11	SSE12	SSE8	SE7	SE9	SE7	SSE7	SE7.8	SSE12
2-Jun	SE5	SSW3	SSW2	WSW4	NE1	SSW3	WSW2	WSW3	N1	ENE2	ESE3	ESE6	E6	ESE6	ENE7	SW16	SW16	ESE7	ENE12	SE5	WSW5	WSW8	ESE4	NE4	SSE1.8	SW16
3-Jun	WSW3	SSW5	S5	SSW5	SSW5	SSW5	S6	SSW5	SW10	WSW12	WSW11	SW12	WSW20	WSW25	NNW11	NNW16	NW11	NNW11	NE2	NNE13	NE8	S4	S4	NE3	WSW4.4	WSW25
4-Jun	NE5	WSW5	WSW14	WSW20	WSW22	WSW25	W29	W29	W25	W25	W20	NNW18	W18	W15	WSW13	NNW17	NW15	NNW23	NNW23	NW22	NNW15	NNW7	NNW5	W8	W15.8	W29
5-Jun	NNW10	NNW9	W10	WSW9	W7	WSW7	WSW7	W5	NW8	NNW7	NW13	NNW14	NW11	NW11	NW11	N11	N8	N7	NE8	NE9	ENE9	E7	SE11	SE13	NW4.3	NNW14
6-Jun	SE13	SE14	SE12	SE12	SE11	SE9	SE10	SE9	SE11	SE9	SE12	SE14	SE15	SE16	SSE18	SSE18	SSE17	S16	S17	SSE22	SSE18	ESE8	S9	NNE2	SE12.4	SSE22
7-Jun	S5	S5	SSW4	SE3	WSW3	WSW7	W13	W10	NNW8	NNW8	NNW7	NW6	N15	NNE10	NNW8	NNW5	NW10	NNW12	NNW10	NNW10	NNW10	NNW11	NNW10	N10	NW5.5	N15
8-Jun	NNW3	WSW2	NW1	NNW3	NW1	NW3	N4	NW3	NW4	NW4	NNW5	N5	N7	NE8	NE9	NE6	SE7	SSE12	SE7	ESE7	ENE8	E14	E13	NE13	ENE2.9	E14
9-Jun	ENE11	NE15	NNE16	NE16	NE13	NNE15	NNE17	NNE19	NNE20	NNE18	NNE21	NNE23	NNE20	NNE22	NNE25	N25	N23	N24	N22	N20	N17	NNW16	NNW15	NNW12	NNE17.6	NNE25
10-Jun	NNW10	N7	NNW3	SE2	WSW5	WSW5	W6	NNW5	NNW10	NNW10	NNW10	N9	N8	NNE9	NNE8	ENE7	ENE7	ENE7	ENE6	ENE7	NE7	NE7	ENE8	E7	NNE4.3	NNW10
11-Jun	SE8	ESE10	SE10	SE8	SE7	SE9	SE8	SE8	SE8	SE11	SE14	SE15	SE17	SE15	SE17	SE13	SE11	SE18	SE14	SE15	SE9	E6	ESE10	SE6	SE11.0	SE18
12-Jun	SSE4	SW2	N1	ESE3	SSE5	SSW7	SSW6	S6	SSW9	S9	S10	SSW10	SW13	SSW10	SSW12	SW15	WSW14	WSW19	WSW12	WSW8	SW13	SW17	SW19	SW17	SW8.8	SW19
13-Jun	WSW18	WSW17	WSW17	WSW16	WSW15	SW15	SW15	SW15	WSW16	WSW19	SW20	SW23	WSW26	WSW28	WSW26	WSW22	WSW19	WSW19	WSW20	WSW17	WSW14	SW11	WSW5	SSW5	WSW17.3	WSW28
14-Jun	NW1	SSE7	S5	SE3	SE6	ESE6	SE7	SE5	ESE6	E4	ENE5	ESE8	ESE13	ESE11	SE12	SE12	ESE9	SE16	SE13	SE12	SSE24	SSE18	ESE11	ESE9	SE8.8	SSE24
15-Jun	SE9	ESE8	ESE11	ESE16	E15	SE13	E9	ESE11	SE20	SSE29	SSE34	SSE33	SSE34	SSE35	S30	S30	S21	S17	S12	SSE6	SW8	SSW8	SE8	SE8	SSE16.0	SSE35
16-Jun	SSE12	SE13	SE16	SSE16	SSE16	SSE15	S19	SSE24	S21	S18	SSW19	SW18	SW19	SW17	SSW17	SSW14	SW14	SW16	SW10	WSW9	NNW10	WSW8	WSW13	WSW12	SSW12.2	SSE24
17-Jun	WSW9	WSW9	WSW9	W9	WSW8	W13	W19	W20	NNW21	NNW22	NNW21	NNW21	NNW20	W23	W22	W22	W23	WSW18	W11	NNW7	NE6	W7	N13	N4	W12.8	W23
18-Jun	W8	NNW13	W13	NNW11	W11	WSW10	W13	W17	W18	W16	W14	W14	WSW16	WSW16	W14	W15	NNW11	W7	S4	SE8	SE5	N13	NE16	NNE5	W8.9	W18
19-Jun	N6	NNW3	NW6	W8	W8	W5	WSW6	NNW8	NNW9	N11	NNW12	NW12	NNW16	NNW21	NNW21	NNW17	NNW19	NNW18	NNW15	N10	N9	N8	N7	N8	NNW9.9	NNW21
20-Jun	W6	WSW7	WSW6	WSW6	WSW5	SW3	WSW3	ESE3	S2	W3	WSW4	NW5	N5	ENE8	ENE8	ENE11	ESE8	SE9	SE8	SSE8	SSE9	SSE9	SSE10	SSE10	SSE2.6	ENE11
21-Jun	SSE10	SSE11	SSE9	SE8	SE7	SE8	SE9	SE8	SE6	ESE5	S8	SE15	SSE14	SE13	SE11	ESE7	ENE6	NE7	NE6	ENE1	SSE3	SSE10	S8	SSE6	SE7.1	SE15
22-Jun	SSE9	SE7	SE8	SE8	SSE7	SSE8	SE9	SE5	SE5	SE5	SE5	E6	NNE6	NNE4	NW6	SSE2	SE6	SW15	WSW20	W17	WSW12	WSW8	SSW8	SW7	S4.1	WSW20
23-Jun	SW7	SW7	WSW7	SW5	WSW7	WSW8	W5	E2	E4	ENE3	WSW2	W13	NNW8	NNW6	NNW11	NNW15	NNW12	N7	N9	NE11	ENE11	ENE9	NNE7	NNW9	NNW3.3	NNW15
24-Jun	NW6	NNE8	N4	N5	N6	NNW5	NNW6	N10	NNW8	NNW12	NW10	NNW10	NNW12	NNW9	NNW15	NNW16	NNW12	NNE11	NE8	NNW5	NNW10	NW8	NNW9	N7	NNW7.8	NW16
25-Jun	NNE9	NNE7	NNE4	NNW6	N7	NNW7	NNW9	N8	NNW9	N12	N13	NNE14	N12	NNW12	NNE13	NNE13	NNE13	NNE14	NNE13	NE9	ENE4	SSW3	WSW6	WSW8	N7.9	NNE14
26-Jun	WSW8	W7	WSW6	SW4	S6	SSE6	SSE4	SE4	SE4	SE4	ESE1	SE5	SSE10	NNW1	NNW11	WSW4	SW12	SSW7	S9	S10	SW6	W24	W1	SW8	SSW3.9	W24
27-Jun	WSW6	SW8	SW7	SW8	SSW4	SW7	WSW10	WSW9	W9	W10	WSW6	WSW15	WSW19	SW23	NNE6	SSW5	SSE7	SW11	WSW8	WSW10	SW3	S7	SE5	SSE7	SW7.0	SW23
28-Jun	SSE6	SSE6	S5	S5	S6	S3	WSW6	NNW6	NNE6	NW4	W12	W11	NW6	NNW12	N15	N16	NNE16	NNE16	NNE15	NNE15	NNE12	NE11	NE11	ENE7	N4.8	NNE16
29-Jun	E9	E12	SE4	ESE4	NE1	NE2	SE4	SSE3	ENE2	ENE5	NE8	E7	NE8	ENE2	E2	S5	ESE5	ESE5	SSE6	SSE8	SSE9	SSE12	SE14	SE13	ESE4.9	SSE14
30-Jun	SE10	SE12	SE12	SE10	SE10	SSE6	SE6	SE6	ENE4	NE5	ENE8	ESE7	SE9	ESE10	ESE12	ESE12	SE14	ESE13	SE11	SE11	SSE9	SE8	SSE7	S6	SE8.2	SE14

S2.3	S2.6	S3.1	S3.1	SSW3.0	SSW3.6	SW3.6	SW2.5	WSW1.8	W2.3	WSW2.5	WSW2.7	WSW3.1	WSW2.6	NNW2.2	W1.9	NNW1.4	WSW1.0	S0.4	E0.5	SSE1.0	S0.9	ESE1.4	SSE1.1	Diurnal Average
WSW18	WSW17	WSW17	WSW20	WSW22	WSW25	W29	W29	W25	SSE29	SSE34	SSE33	SSE34	SSE35	S30	S30	N23	N24	NNW23	NW22	SSE24	W24	SW19	SW17	Diurnal Maximum

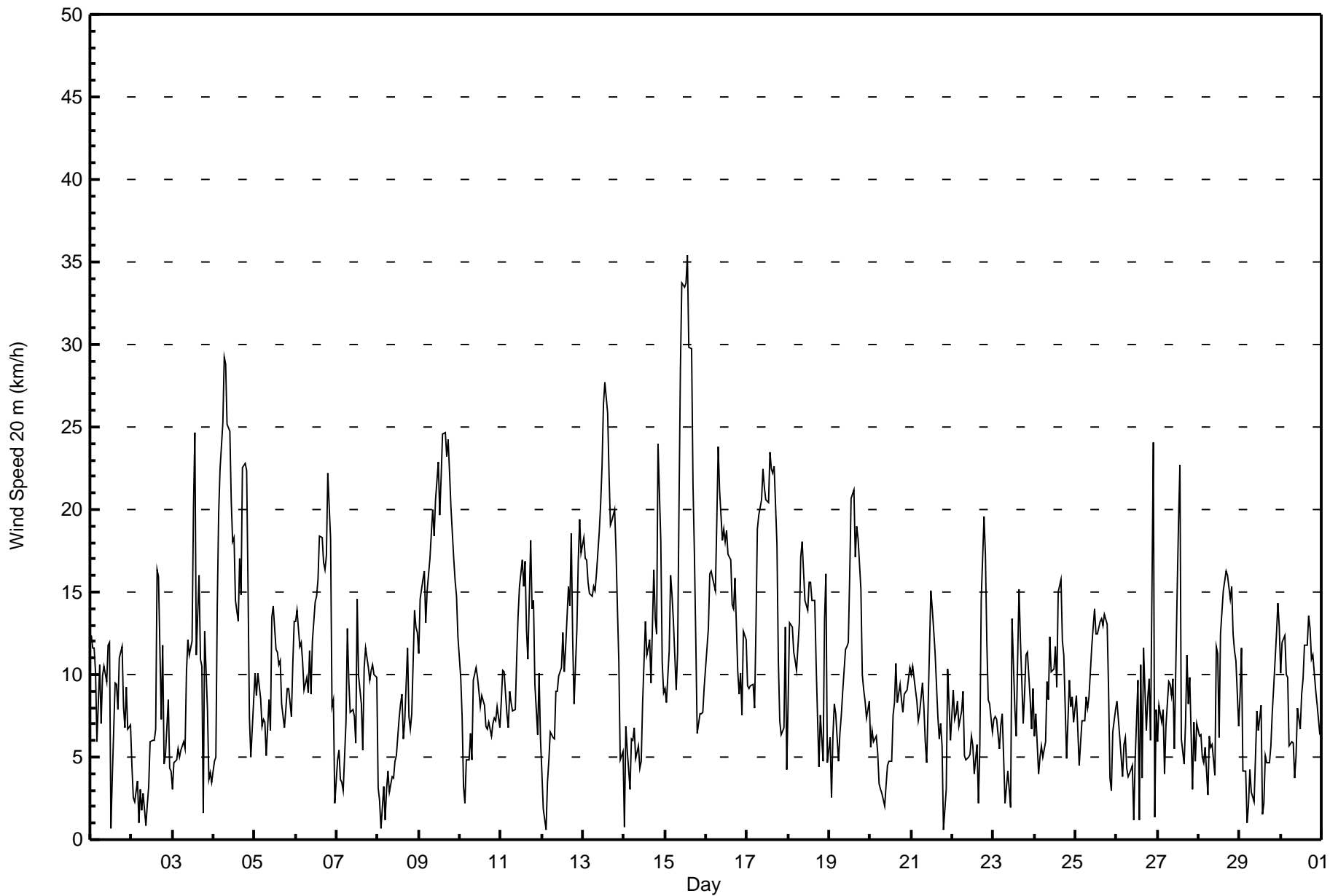
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed 20 m (WS20m) - km/h
Mannix - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 16 km/h on Jun 2 16:00 Minimum Value: 1 km/h on Jun 20 05:00 Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 2 Median = 3 Q ₃ = 5 P ₉₀ = 6 P ₉₉ = 11																	Hours in Service: 720 Hours of Data: 720 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-Jun	3	3	3	3	3	3	3	4	4	3	4	5	3	3	5	4	4	4	4	3	3	3	2	1	5
2-Jun	2	2	2	2	1	1	1	2	2	2	2	3	3	3	3	16	7	5	6	2	2	4	1	2	16
3-Jun	2	1	1	2	2	2	2	3	4	3	4	5	7	6	9	8	6	4	3	6	5	2	2	2	9
4-Jun	2	4	4	5	6	5	5	6	5	5	6	6	6	8	8	6	8	8	7	7	5	4	2	3	8
5-Jun	3	3	2	2	2	3	3	2	4	4	7	6	5	5	6	5	5	4	4	2	2	2	5	5	7
6-Jun	4	4	4	4	3	3	3	3	4	3	4	5	5	7	7	7	6	7	7	7	9	4	4	3	9
7-Jun	1	2	2	2	3	2	4	3	3	3	3	4	6	3	4	3	4	5	4	4	3	3	3	2	6
8-Jun	2	1	1	2	1	2	2	1	2	2	2	2	3	3	2	3	4	5	3	2	3	6	5	3	6
9-Jun	4	4	5	5	4	4	5	5	5	5	6	6	5	6	6	7	7	7	6	6	6	6	5	4	7
10-Jun	3	2	2	1	2	2	1	2	5	5	4	5	4	4	4	4	4	3	2	2	2	2	2	2	5
11-Jun	4	4	4	2	2	3	3	3	3	4	4	7	6	7	6	5	5	6	6	5	3	2	3	2	7
12-Jun	1	1	2	2	2	3	3	3	4	4	4	5	5	4	5	6	4	4	3	2	7	5	5	5	7
13-Jun	5	4	4	3	3	4	4	5	5	6	7	8	7	7	7	7	6	5	5	4	4	2	3	1	8
14-Jun	2	2	2	3	3	2	3	2	2	2	3	4	5	4	4	4	3	6	5	7	9	8	3	4	9
15-Jun	4	3	5	5	5	5	3	4	8	11	11	12	12	11	12	12	9	7	6	3	7	7	2	2	12
16-Jun	3	4	5	5	5	5	8	8	9	8	8	7	7	6	7	7	5	6	3	3	5	3	2	3	9
17-Jun	2	2	2	2	2	4	4	4	7	7	6	6	6	6	7	6	6	5	5	5	2	5	4	5	7
18-Jun	4	3	3	3	3	2	3	4	4	4	5	4	4	5	4	4	4	3	3	3	1	12	6	2	12
19-Jun	3	2	2	2	2	2	3	3	4	5	5	6	7	8	8	7	7	7	6	4	4	3	2	2	8
20-Jun	1	2	2	2	1	1	2	1	2	2	2	3	3	3	3	3	3	3	3	2	2	2	2	2	3
21-Jun	2	2	3	2	2	3	3	3	3	2	4	7	6	6	4	3	3	2	2	1	3	2	2	1	7
22-Jun	2	3	2	2	2	3	3	2	2	2	2	3	3	3	3	3	4	8	6	4	3	2	2	3	8
23-Jun	3	3	2	2	2	2	3	2	2	2	3	4	3	3	5	7	5	3	3	3	3	2	2	4	7
24-Jun	3	3	1	3	3	2	3	4	4	5	4	4	6	4	6	5	4	5	3	4	4	3	3	3	6
25-Jun	3	2	2	2	3	3	4	3	4	4	5	4	4	4	5	5	4	4	4	3	2	2	1	1	5
26-Jun	1	4	1	1	2	2	2	2	2	2	2	4	5	6	5	4	4	3	4	4	6	6	4	3	6
27-Jun	2	2	3	2	2	2	3	3	2	3	4	5	5	7	7	4	3	5	4	3	2	2	2	2	7
28-Jun	2	2	2	1	2	2	2	2	2	3	4	5	5	6	6	6	6	6	5	5	3	3	3	2	6
29-Jun	3	3	3	2	1	1	2	2	2	3	4	4	4	3	3	3	3	3	2	2	3	4	4	5	5
30-Jun	3	4	4	3	3	3	3	2	2	2	2	3	4	5	5	5	5	4	4	4	3	3	3	2	5
																	Diurnal Maximum								





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed 20 m (WS20m) - km/h
Mannix - June 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	139	19.31	19.31
6 - 11	331	45.97	65.28
12 - 19	191	26.53	91.81
20 - 28	50	6.94	98.75
29 - 38	9	1.25	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed 20 m (WS20m) - km/h
Mannix - June 2016**

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	4	8	9	4	9	18	6	12	13	5	17	5	5	10	6	139
6 - 11	23	12	17	18	7	22	58	33	14	8	14	33	18	17	14	23	331
12 - 19	9	18	5	1	4	5	31	20	6	4	19	25	17	6	4	17	191
20 - 28	4	7	0	0	0	0	1	3	2	0	3	11	9	7	1	2	50
29 - 38	0	0	0	0	0	0	0	5	2	0	0	0	2	0	0	0	9
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	44	41	30	28	15	36	108	67	36	25	41	86	51	35	29	48	720

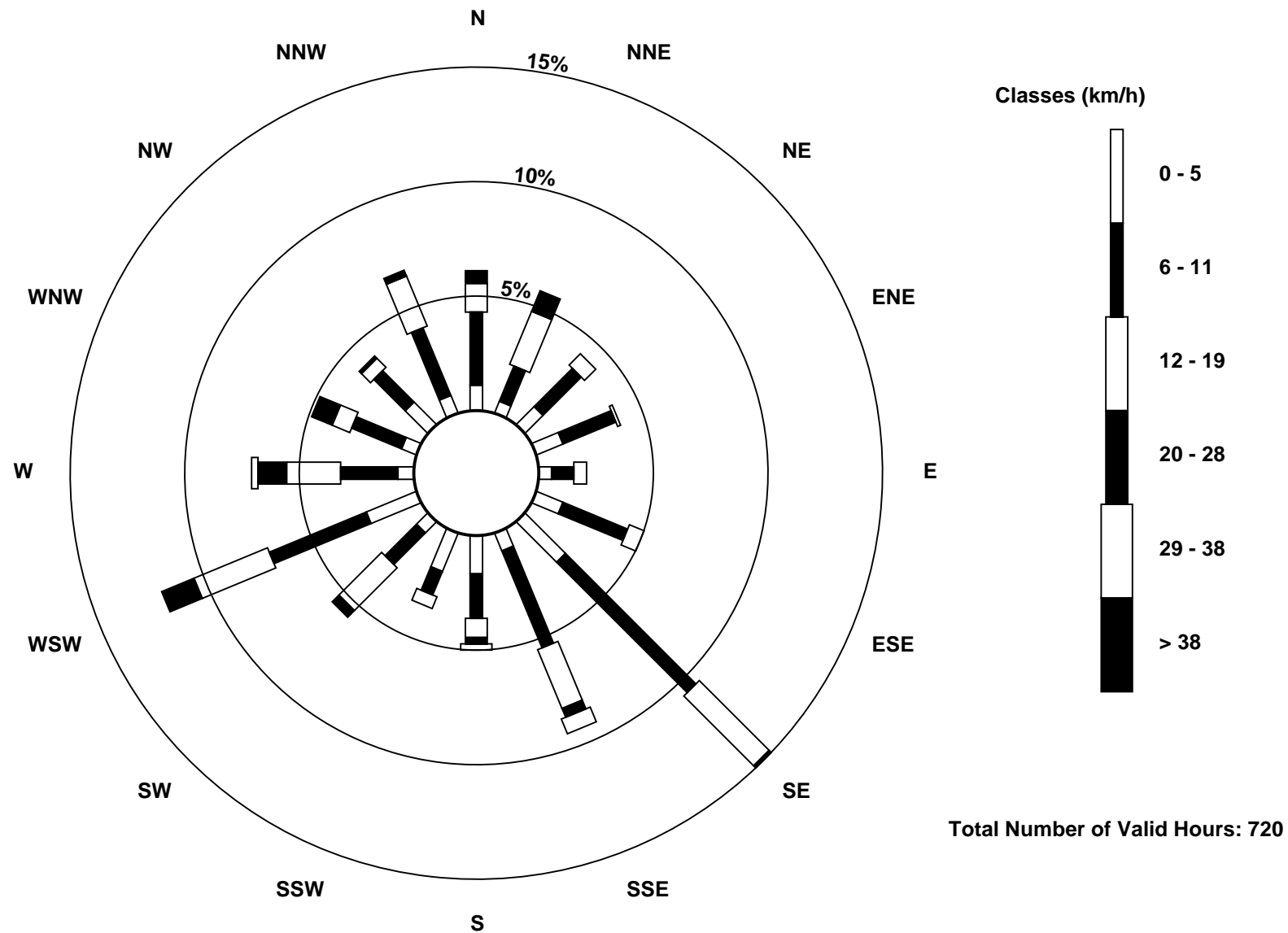
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

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





Maximum Speed: 51 km/h on Jun 15 14:00	Maximum Daily Speed Average: 24.8 km/h on Jun 9	Hours in Service: 720
Minimum Speed Value: 1 km/h on Jun 12 03:00	Minimum Daily Speed Average: 2.6 km/h on Jun 2	Hours of Data: 720
Maximum Diurnal Speed Average: 5.0 km/h at hour 6	Minimum Diurnal Speed Average: 0.7 km/h at hour 20	Hours of Missing Data: 0
Monthly Average Velocity: 2.3 km/h 214.6 deg	Percentiles: P ₁ = 2 P ₁₀ = 6 Q ₁ = 9 Median = 14 Q ₃ = 19 P ₉₀ = 26 P ₉₉ = 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-Jun	SSE24	SSE23	SSE21	SSE19	SE11	SE17	SE11	SE13	SSE16	SSE14	SE17	SE18	SW2	NW6	W12	S17	SE10	SE14	SSE16	SSE15	SE12	SE14	SE12	SSE13	SSE12.9	SSE24
2-Jun	SE7	SSE6	SSE3	W4	E2	S5	WSW2	SW3	NW1	ENE2	ESE3	ESE6	ESE6	E7	NE8	SW22	SW22	ESE9	ENE15	ESE6	SW7	WSW12	ESE6	NE6	SSE2.6	SW22
3-Jun	WSW4	SW8	S9	SSW12	SW10	SSW12	S10	S9	SW12	WSW13	SW14	SW16	SW24	WSW29	NNW15	NNW23	NW16	NNW14	NE2	N17	NE11	SE6	SSE9	ENE3	WSW5.9	WSW29
4-Jun	NE4	WSW11	WSW24	WSW28	WSW29	WSW31	WSW33	W32	W28	W28	W25	NNW24	W21	W19	WSW17	W21	NW22	NNW31	NNW32	NNW32	NNW24	NNW13	NW7	W14	W20.6	WSW33
5-Jun	WNNW18	NW15	W13	W13	W11	WSW10	WSW8	W6	WNNW12	WNNW9	WNNW19	WNNW19	NW16	NW16	NW15	NNW14	NNW11	N9	NE9	NE11	NE13	ENE10	ESE14	SE19	NW6.7	WNNW19
6-Jun	SE19	SE21	SE18	SE18	SE16	SE14	SE14	SE13	SE15	SE11	SE15	SE18	ESE17	SE22	SE25	SSE26	SE23	S28	S31	SSE33	SSE28	ESE12	S18	NNW3	SE18.2	SSE33
7-Jun	SSW6	S8	SSW7	SSW7	WSW7	SW10	WSW14	W11	WNNW10	WNNW11	W10	NW9	NNW21	NNE12	NNW12	NNW8	NW16	NNW17	NNW16	NNW14	NNW19	NNW20	NNW20	N14	NW8.7	NNW21
8-Jun	NNW6	NW5	NE4	NNW8	NNW6	NW6	NNW6	NW5	NW6	NW6	NNW7	N7	N10	NE10	NE11	NE8	SE10	SSE18	SE10	ESE9	ENE11	E18	E18	NE17	NE4.5	E18
9-Jun	ENE15	NE21	NNE23	NE22	NE18	NNE20	NNE23	NNE26	NNE27	NNE24	NNE27	NNE30	NNE27	NNE29	N33	N35	N33	N34	N31	N30	N25	NNW25	NNW24	NNW20	NNE24.8	N35
10-Jun	NNW18	NNW13	NNW8	N1	W8	WSW7	W7	WNNW6	NNW14	NNW16	NNW14	NNW13	N12	N11	N10	ENE8	ENE8	NE8	ENE7	ENE8	NNE12	NNE13	NE12	E10	N7.0	NNW18
11-Jun	SE12	ESE14	SE15	SE12	ESE11	SE14	SE13	SE12	SE12	SE15	SE18	SE21	SE23	SE20	SE22	ESE16	ESE14	SE25	SE19	ESE18	ESE14	E9	E13	ESE10	SE15.3	SE25
12-Jun	SSE9	S4	SSE1	ESE5	SSE9	S12	SSW10	S10	SSW16	S15	S16	S17	SW19	SSW16	SSW19	SW20	WSW18	WSW21	WSW15	WSW12	SW19	SW23	SW26	SW24	SSW12.9	SW26
13-Jun	SW25	SW23	WSW23	SW22	SW21	SW21	SW21	SW21	SW20	WSW24	SW27	SW29	SW33	WSW33	WSW31	SW28	SW23	WSW23	WSW25	WSW21	SW20	SW18	SW10	SSW12	SW22.9	WSW33
14-Jun	W7	SSE8	SSE10	SSE8	SE11	ESE8	SE9	SE6	ESE6	E4	NE5	ESE10	ESE16	ESE14	ESE15	ESE15	ESE11	ESE20	SE18	SE18	SSE35	SE26	ESE14	ESE11	SE11.4	SSE35
15-Jun	ESE13	ESE10	E14	ESE20	E19	SE17	E12	ESE15	SE26	SSE40	SSE47	SSE48	SSE50	SSE51	SSE48	SSE46	S37	S28	SSE19	SSE14	SSW13	SSW15	SE14	SE18	SSE24.0	SSE51
16-Jun	SE21	SE22	SE26	SE27	SSE25	SSE25	SSE31	SSE34	S33	S32	SSW31	SSW26	SSW26	SSW26	SSW27	S25	SSW20	SW20	SW13	SW12	WNNW15	WSW11	WSW17	SW17	S19.1	SSE34
17-Jun	SW14	WSW13	WSW13	W12	WSW10	W16	W22	W23	WNNW30	WNNW31	WNNW27	WNNW28	WNNW26	W29	W26	W28	W26	WSW21	W13	NNW11	NE8	N11	N19	N6	W16.6	WNNW31
18-Jun	W11	WNNW20	W18	WNNW19	W16	WSW13	W16	W19	W20	W19	W18	W16	WSW18	WSW18	WSW17	W17	WNNW14	W9	S6	SE10	SE7	N18	NNE23	NNE9	W11.0	NNE23
19-Jun	N11	NNW6	NW11	W12	W11	W6	WSW8	WNNW11	NNW13	NNW17	NNW17	NW17	NW24	NW30	NNW31	NNW24	NNW27	NNW27	NNW23	N15	N13	N13	N12	N14	NNW15.0	NNW31
20-Jun	NW10	W13	W13	W12	W8	W5	W3	ESE3	S3	WSW4	W5	NW7	N7	ENE8	ENE9	ENE12	ESE9	SE11	SE12	SE12	SSE17	SSE17	SSE19	SSE21	SSE3.0	SSE21
21-Jun	SSE20	SSE20	SSE18	SE16	SE14	SE13	SE12	SE10	SE7	ESE5	S12	SE20	SSE20	SE17	ESE13	E8	ENE7	NE8	NE6	ENE1	SE5	SSE20	S19	SSE14	SE11.3	SSE20
22-Jun	SSE18	SE15	SE15	SE15	SE13	SE13	SE11	SE6	SE5	SE5	ESE5	E6	NNE6	N5	WNNW9	SSE2	SE8	SSW22	SW25	WSW20	SW17	SW14	SSW15	SW13	S6.8	SW25
23-Jun	SW11	SW14	WSW11	WSW8	SW11	WSW10	W6	ENE2	ENE4	ENE3	W3	W15	WNNW11	WNNW8	WNNW14	NNW23	NNW18	NNW10	N12	NNE14	NE14	ENE11	N10	NNW16	NW5.3	NNW23
24-Jun	NW12	NNE11	NNE5	NNW8	N9	NNW9	NNW10	N13	NNW13	NW19	NW15	NW18	NW14	WNNW21	NW25	NNW19	N16	NE10	WNNW7	WNNW17	NW14	NNW14	NNW12	NNW12.4	NW25	
25-Jun	N14	NNE10	N7	NNW11	N11	NNW11	NNW13	N11	NNW13	N16	N17	NNE15	N17	NNE16	NNE17	N17	N17	NNE18	NNE17	NNE12	ENE5	S3	SW9	WSW11	N11.0	NNE18
26-Jun	WSW14	WNNW14	W9	WSW7	S12	SSE9	SSE6	SSE5	SE5	SE5	ESE2	ESE6	SSE14	NNW3	NNW16	SW5	SW18	SSW11	SSE17	S18	SSW10	WSW29	WNNW4	SW14	SSW6.0	WSW29
27-Jun	W10	SW12	SW13	SW14	SW8	SW9	WSW11	WSW10	W10	W11	WSW7	WSW17	WSW22	SW28	NNE8	SSW7	SSE9	SW16	SW11	WSW12	WSW4	S13	SE6	S11	SW9.6	SW28
28-Jun	S8	S8	SW8	SW7	SSW9	SW5	WSW7	WNNW7	N7	NW5	W14	W14	NW8	NNW18	N21	N21	NNE20	N21	N19	NNE20	NNE18	NNE17	NE15	NE10	N6.9	N21
29-Jun	E11	E15	ESE8	ESE7	ENE2	NE3	SE5	SE3	NE3	ENE5	NE9	E8	NNE9	ENE2	ENE2	S6	ESE5	ESE5	SE7	SSE11	SE14	SE20	SE22	SE21	ESE6.8	SE22
30-Jun	SE17	SE20	SE19	SE16	SE15	SE9	ESE7	SE7	ENE5	NE7	ENE9	E8	SE11	ESE11	ESE14	ESE14	ESE17	ESE15	SE16	SE16	SSE15	SE13	SSE14	S15	SE11.8	SE20
S3.3 S3.6 S4.6 SSW4.3 SSW4.3 SSW5.0 SSW4.3 SW3.1 WSW2.4 WSW2.8 WSW3.2 SW3.4 WSW4.0 WSW3.3 WNNW3.0 W2.6 W2.1 WSW1.6 S1.0 ESE0.7 SSE1.4 S1.5 ESE2.2 SSE2.2																								Diurnal Average		
SW25 SW23 SE26 WSW28 WSW29 WSW31 WSW33 SSE34 SSE33 SSE40 SSE47 SSE48 SSE50 SSE51 SSE48 SSE46 S37 N34 WNNW32 SSE33 SSE35 WSW29 SW26 SW24																								Diurnal Maximum		

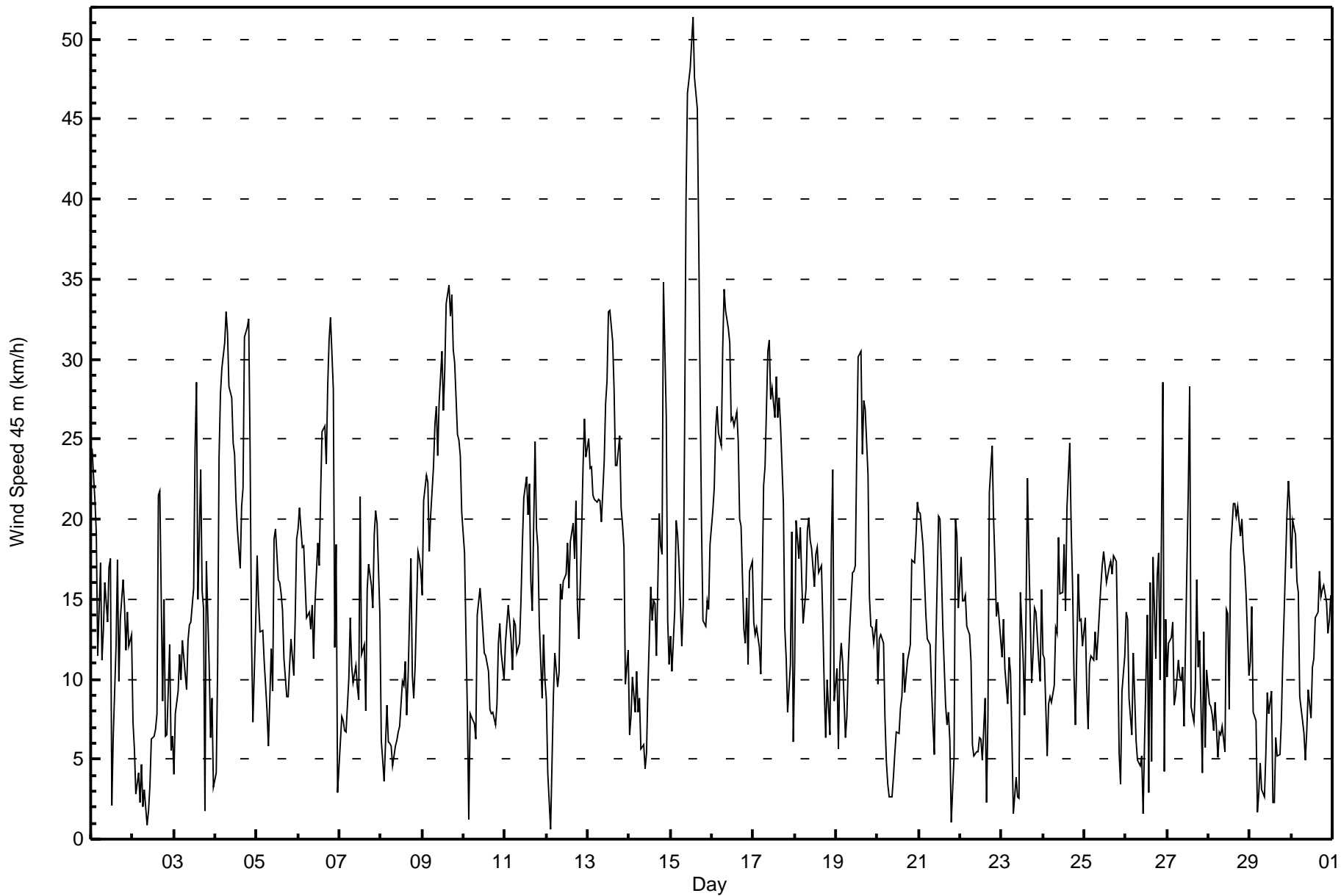
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed 45 m (WS45m) - km/h
Mannix - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 21 km/h on Jun 2 16:00 Minimum Value: 1 km/h on Jun 10 05:00 Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 2 Median = 4 Q ₃ = 5 P ₉₀ = 6 P ₉₉ = 10														Hours in Service: 720 Hours of Data: 720 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-Jun	2	2	1	2	3	2	4	4	4	3	4	4	3	4	5	5	4	4	4	2	3	3	2	1	5
2-Jun	2	3	2	1	1	2	1	2	2	1	2	3	3	3	3	21	7	5	7	3	2	6	2	3	21
3-Jun	3	2	2	2	2	2	2	2	3	3	4	5	6	6	9	8	5	4	3	7	6	2	2	2	9
4-Jun	2	5	4	4	5	5	5	5	4	4	5	4	5	9	11	7	8	6	6	5	4	5	2	4	11
5-Jun	3	4	2	2	2	3	3	2	3	5	6	5	5	4	6	5	4	5	4	2	2	2	6	5	6
6-Jun	5	4	4	3	3	3	3	3	3	3	5	5	5	7	7	7	5	6	6	6	10	4	6	4	10
7-Jun	2	2	2	3	4	1	3	2	2	3	3	7	7	3	5	4	4	4	4	4	3	3	4	2	7
8-Jun	2	3	1	3	1	2	2	1	1	2	2	2	2	3	2	2	6	5	3	3	4	8	6	3	8
9-Jun	5	5	5	5	5	4	5	5	5	5	5	6	5	6	5	6	5	6	5	5	6	4	4	3	6
10-Jun	3	2	2	2	1	2	1	2	5	4	4	4	4	4	4	4	4	3	2	2	2	2	3	3	5
11-Jun	4	4	4	2	2	3	3	3	4	4	5	7	6	8	6	5	7	7	7	6	4	3	3	3	8
12-Jun	3	2	2	3	3	3	3	3	3	3	4	5	5	3	4	6	4	4	3	2	8	4	5	4	8
13-Jun	4	4	4	3	3	4	3	4	5	5	6	7	6	6	6	8	6	6	5	4	3	2	5	4	8
14-Jun	4	3	2	4	4	2	3	2	2	3	4	5	5	5	5	4	6	5	8	9	7	3	4	9	
15-Jun	4	4	6	6	5	6	4	4	8	12	9	10	9	9	9	10	8	6	7	4	12	10	3	2	12
16-Jun	2	4	4	4	4	5	7	6	7	7	7	6	5	5	6	7	4	6	3	3	4	3	2	3	7
17-Jun	2	2	2	3	2	3	4	3	5	6	5	5	6	5	6	5	5	5	5	6	2	8	4	5	8
18-Jun	5	2	3	3	4	2	3	3	3	4	5	4	4	4	4	4	4	3	3	2	2	15	6	2	15
19-Jun	3	3	1	2	2	2	4	3	3	5	5	5	7	7	7	6	6	6	6	4	4	3	2	2	7
20-Jun	3	1	1	2	1	1	2	1	2	2	2	3	3	3	4	3	3	2	2	2	1	1	2	2	4
21-Jun	2	2	3	2	3	2	3	2	3	3	5	6	5	6	4	3	4	2	2	2	5	2	2	3	6
22-Jun	2	3	1	2	2	2	2	2	2	2	2	3	4	3	4	3	5	8	5	4	3	2	2	4	8
23-Jun	4	4	2	2	2	2	4	2	3	2	4	3	2	3	6	6	4	3	3	3	3	2	3	3	6
24-Jun	4	3	2	5	4	2	3	3	3	3	4	6	4	5	4	4	4	4	4	5	3	3	3	2	6
25-Jun	4	3	3	3	4	3	4	3	3	4	4	4	4	4	4	4	4	4	4	3	3	1	2	2	4
26-Jun	1	3	2	2	2	2	2	2	2	2	3	4	5	8	6	5	3	4	4	4	6	5	5	3	8
27-Jun	2	1	3	2	2	1	3	2	2	2	4	4	5	7	8	5	3	5	4	3	2	2	3	1	8
28-Jun	2	1	2	1	2	3	2	2	2	4	4	4	6	5	5	5	5	6	4	5	3	3	3	3	6
29-Jun	3	3	3	3	2	1	2	2	2	4	4	4	4	4	3	3	3	3	3	2	3	4	4	4	4
30-Jun	3	4	4	3	2	4	3	2	2	2	2	3	4	5	5	5	5	4	4	4	3	3	2	2	5
														Diurnal Maximum											





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed 45 m (WS45m) - km/h
Mannix - June 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	66	9.17	9.17
6 - 11	212	29.44	38.61
12 - 19	274	38.06	76.67
20 - 28	126	17.50	94.17
29 - 38	35	4.86	99.03
> 38	7	0.97	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Wind Speed 45 m (WS45m) - km/h
Mannix - June 2016

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	1	6	12	2	8	7	4	4	0	4	4	5	1	4	2	66
6 - 11	15	7	15	11	8	20	24	11	10	8	13	17	17	10	10	16	212
12 - 19	20	12	6	3	7	21	53	20	11	9	19	18	23	11	13	28	274
20 - 28	4	11	2	0	0	2	20	12	3	6	22	11	11	7	3	12	126
29 - 38	6	2	0	0	0	0	0	5	3	1	2	7	2	5	1	1	35
> 38	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	7
Totals	47	33	29	26	17	51	104	59	31	24	60	57	58	34	31	59	720

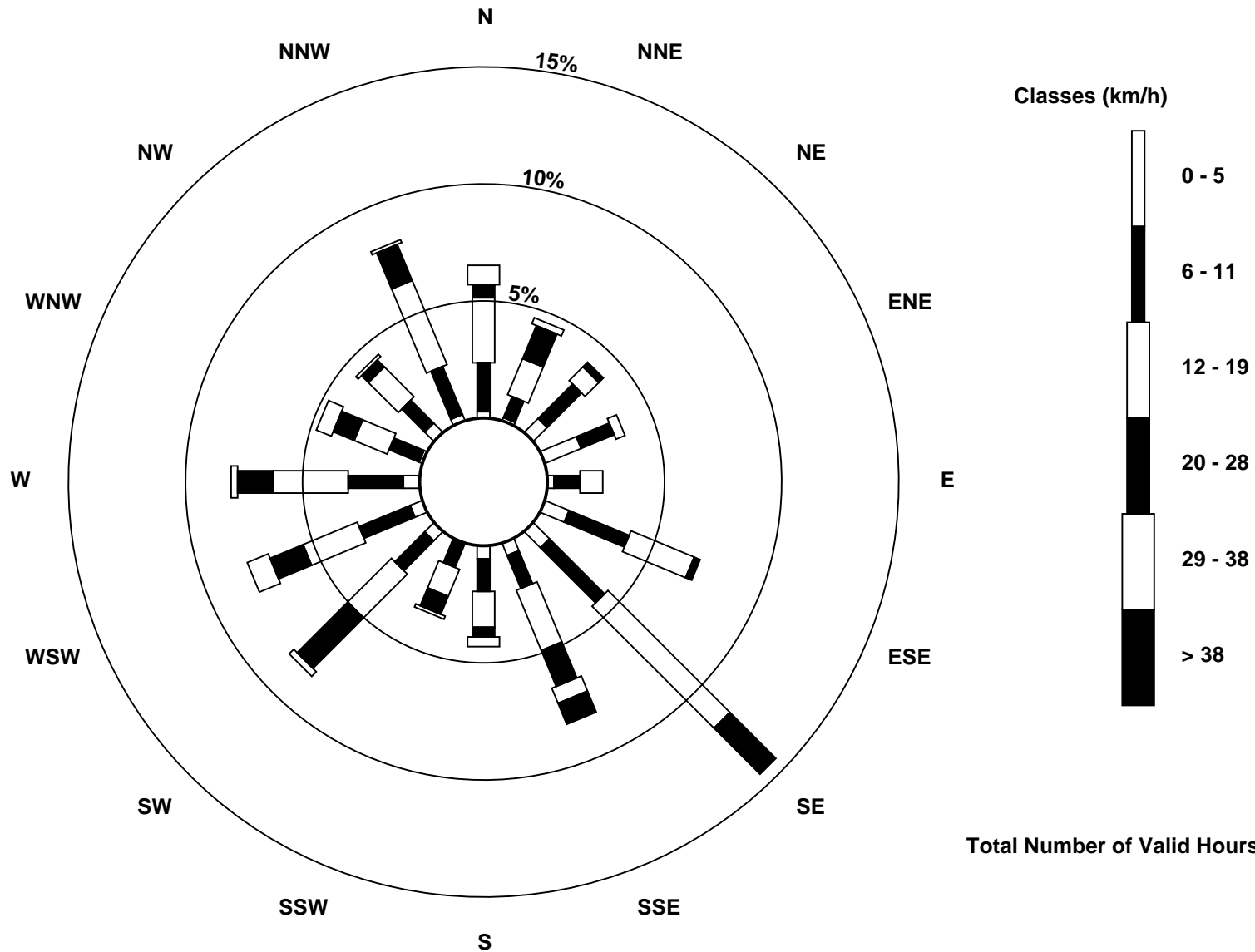
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

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





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed 75 m (WS75m) - km/h

Mannix - June 2016

Maximum Speed: 56 km/h on Jun 15 14:00	Maximum Daily Speed Average: 29.7 km/h on Jun 9	Hours in Service: 720
Minimum Speed Value: 1 km/h on Jun 2 07:00	Minimum Daily Speed Average: 3.0 km/h on Jun 20	Hours of Data: 720
Maximum Diurnal Speed Average: 5.8 km/h at hour 6	Minimum Diurnal Speed Average: 0.9 km/h at hour 20	Hours of Missing Data: 0
Monthly Average Velocity: 2.4 km/h 215.6 deg	Percentiles: P ₁ = 1 P ₁₀ = 6 Q ₁ = 10 Median = 15 Q ₃ = 22 P ₉₀ = 29 P ₉₉ = 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-Jun	SSE32	SSE27	S25	SSE23	SSE16	SSE23	SSE15	SE14	SSE20	SSE16	SSE19	SSE20	SW4	NW7	W12	S20	SE10	SE14	SSE17	SSE17	SE16	SE16	SE15	SSE14	SSE15.4	SSE32
2-Jun	SE9	SSE8	SSE5	NW2	E3	SSE7	WSW1	SW3	N2	NE1	ESE3	ESE5	ESE6	E7	NE9	SW23	SW25	SE7	ENE17	ESE7	SSW5	WSW15	ESE5	ENE7	SSE3.3	SW25
3-Jun	WSW2	SW9	SSW10	SW13	WSW15	SW17	S13	SSW10	SW12	WSW14	SW14	SW17	SW27	WSW31	NW16	NNW25	NW16	NNW15	NNE1	N19	NE15	SE6	SE13	SE4	WSW6.8	WSW31
4-Jun	W2	WSW16	WSW33	WSW35	WSW36	WSW35	WSW36	W33	W29	W28	W25	NNW25	W22	W21	WSW19	NNW22	NW25	NNW34	NNW35	NW36	NNW28	NNW15	NNW9	NNW18	W23.1	WSW36
5-Jun	WNNW24	NW18	WNNW9	W12	W15	W13	WSW9	W6	WNNW12	WNNW9	NW19	NNW20	NW17	NW16	NW16	N15	N12	N10	NE10	NE13	ENE16	E12	SSE13	SE22	NW7.2	WNNW24
6-Jun	SE26	SE26	SE23	SE23	SE19	SE16	SE17	SE16	SE16	SE12	SE13	SE18	ESE14	SE22	SE27	SSE28	SE26	S32	S35	SSE38	SSE33	SE14	S24	WNNW3	SE20.7	SSE38
7-Jun	SW7	SSW8	SSW10	SW10	WSW10	WSW12	WSW16	W10	WNNW10	NW11	NNW10	NW9	NNW24	NNE12	NNW13	NNW8	NW16	NNW19	NNW17	NNW16	NNW24	NNW26	NNW26	N18	NW10.2	NNW26
8-Jun	N9	N7	NNE6	NNW9	NNW10	NNW8	NNW6	NNW5	NW6	NNW6	NNW7	N7	N11	NE11	NE13	NE10	SE11	SSE19	ESE9	E9	ENE14	E19	E21	ENE22	NE6.2	ENE22
9-Jun	ENE20	NE29	NNE28	NE29	NE22	NNE24	NNE28	NNE31	NNE33	NNE30	NNE32	NNE36	NNE33	NNE35	N39	N40	N38	N39	N35	N34	N29	N29	NNW29	NNW25	NNE29.7	N40
10-Jun	NNW22	NNW18	NNW12	NNW6	WNNW8	W9	W7	WNNW7	NNW14	NNW16	NNW15	NNW14	N12	N13	N11	ENE9	NE8	NE9	ENE8	ENE9	NE16	NE19	ENE15	E11	N8.8	NNW22
11-Jun	ESE10	ESE12	SE16	SE17	SE12	SE18	SE16	SE15	SE16	SE16	SE21	SE23	SE24	SE21	SE22	ESE15	ESE13	SE27	SE20	ESE15	ESE12	E9	ESE10	SE11	SE16.1	SE27
12-Jun	SSE12	SSE7	SE3	SE6	S11	SSW14	SSW11	S11	SSW18	S16	S17	S19	SW22	SSW18	SSW20	SW21	WSW21	WSW23	WSW17	WSW16	SW23	SW27	SW30	SW27	SW14.6	SW30
13-Jun	SW29	SW27	WSW28	WSW26	SW25	SW25	SW24	SW23	SW21	WSW25	SW30	SW31	SW35	WSW35	WSW34	SW31	SW26	WSW25	WSW27	WSW23	SW23	SW23	SW13	SW16	SW25.9	SW35
14-Jun	W10	SSW8	SSE9	SSE11	SE12	SE8	SE10	SE6	ESE5	E4	NE6	ESE9	ESE14	ESE12	ESE14	ESE13	ESE10	ESE17	SE19	SE20	SSE39	SE32	ESE12	ESE10	SE11.4	SSE39
15-Jun	SE13	ESE9	ESE12	ESE17	E18	SE17	ESE12	ESE13	SE25	SSE43	SSE51	SSE54	SSE55	SSE56	SSE53	SSE50	S41	S31	SSE22	SSE18	SSW16	S20	SSE20	SSE26	SSE26.6	SSE56
16-Jun	SSE27	SSE29	SE33	SE35	SSE32	SSE29	SSE35	SSE37	SSE36	S35	S34	SSW29	SSW29	SSW28	SSW29	S27	SSW21	SW21	SW15	SW14	WNNW16	WSW13	WSW20	WSW20	S22.1	SSE37
17-Jun	SW16	WSW15	WSW16	W15	W12	W18	W24	W25	WNNW33	WNNW33	WNNW29	WNNW30	WNNW28	W30	W27	W29	W27	WSW22	W15	NNW13	NE9	N12	N22	N8	WNNW18.1	WNNW33
18-Jun	W13	WNNW23	W21	WNNW23	WNNW20	WSW16	W17	W20	W20	W19	W19	W16	WSW19	WSW19	WSW18	W18	WNNW14	W10	S7	SE10	SSE7	N20	NNE29	NNE14	W11.9	NNE29
19-Jun	N14	NNW7	NW12	WNNW15	W14	WNNW9	WSW8	WNNW11	NNW14	NNW18	NNW18	NW18	NW25	NNW33	NNW33	NNW26	NNW30	NNW29	N26	N17	N16	N17	N15	N16	NNW17.0	NNW33
20-Jun	NW11	WNNW15	WNNW14	WNNW15	WNNW10	WNNW8	NW3	SE2	S3	WSW4	W5	NNW7	N7	ENE8	ENE9	ENE12	ESE8	SE11	SE13	SE15	SSE21	SSE23	SSE26	SSE28	SSE3.0	SSE28
21-Jun	SSE28	SSE28	SSE24	SSE18	SSE20	SE17	SE15	SE10	SE7	SE5	S13	SE21	SSE21	SE17	ESE11	ESE8	ENE7	NE8	NE7	ENE2	SE7	SSE24	S23	S20	SSE13.4	SSE28
22-Jun	SSE24	SSE22	SSE18	SSE16	SSE18	SE18	SE12	SE6	SE5	SE5	ESE5	E6	NNE7	N5	WNNW9	SSE2	SE8	SSW25	SW27	WSW22	WSW21	WSW18	SW16	SW15	S8.3	WSW27
23-Jun	WSW13	SW17	W14	W11	SW13	WSW14	W8	NE1	NE4	NE2	WNNW3	W15	WNNW11	WNNW8	WNNW15	NNW24	NNW19	N11	N13	NE18	ENE17	ENE14	NNE11	NNW18	NW6.2	NNW24
24-Jun	NW13	NNE15	NE7	NNW10	N12	N8	N12	N14	NNW13	NNW20	NW16	NW16	NNW21	NW15	NNW22	NNW29	NNW24	N19	NE12	NW8	NW19	NW16	NNW16	N14	NNW14.0	NNW29
25-Jun	NNE19	NNE14	N9	NNW13	N13	NNW12	NNW15	N12	NNW13	N17	N19	NNE20	N19	NNE18	NNE19	NNE19	N18	NNE20	NNE19	NNE15	ENE7	SSE3	SW9	SW12	N12.5	NNE20
26-Jun	WSW12	W16	WNNW11	W5	S11	SSE12	SSE8	SSE6	SE4	SE4	SE2	ESE6	SSE14	NNW4	NNW18	SSW4	SW20	SSW16	S21	S22	SSW13	W32	WNNW7	WSW13	SSW6.6	W32
27-Jun	W14	WSW13	WSW17	WSW19	SW14	WSW12	WSW12	WSW10	W10	W10	WSW7	WSW17	WSW23	SW30	NNE10	SSW8	SSE10	SW17	SW12	WSW15	W6	S11	SSE5	S10	WSW10.9	SW30
28-Jun	SSW8	SSW6	SW9	WSW9	WSW8	WSW7	WSW7	WNNW6	N8	NW6	W15	W15	NW8	NNW19	N23	N22	NNE22	NNE23	NNE21	NNE24	NNE24	NE23	NE20	ENE14	N8.5	NNE24
29-Jun	E12	E14	ESE8	ESE6	ENE3	ENE4	SE4	SE3	ENE3	ENE6	NE10	E8	NE10	ENE3	ENE3	SSE6	ESE5	ESE5	SE7	SSE12	SE17	SE26	SE28	SE27	ESE7.9	SE28
30-Jun	SE23	SE25	SE22	SE21	SE20	SE11	ESE6	SE6	ENE6	ENE7	ENE9	ESE8	SE10	ESE10	ESE12	ESE13	ESE14	ESE13	SE19	SE18	SE17	SE14	SSE16	SSW19	SE13.1	SE25

S3.9	S4.0	SSW5.1	SSW4.7	SSW4.8	SSW5.8	SSW4.7	SW2.9	WSW2.2	WSW2.6	WSW3.1	SW3.3	WSW4.0	WSW3.3	WNNW3.1	W2.6	WNNW2.5	WSW1.7	SSE1.1	E0.9	SE1.9	SSE1.5	ESE2.7	SSE2.8	Diurnal Average
SSE32	SSE29	WSW33	SE35	WSW36	WSW35	WSW36	SSE37	SSE36	SSE43	SSE51	SSE54	SSE55	SSE56	SSE53	SSE50	S41	N39	S35	SSE38	SSE39	SE32	SW30	SSE28	Diurnal Maximum

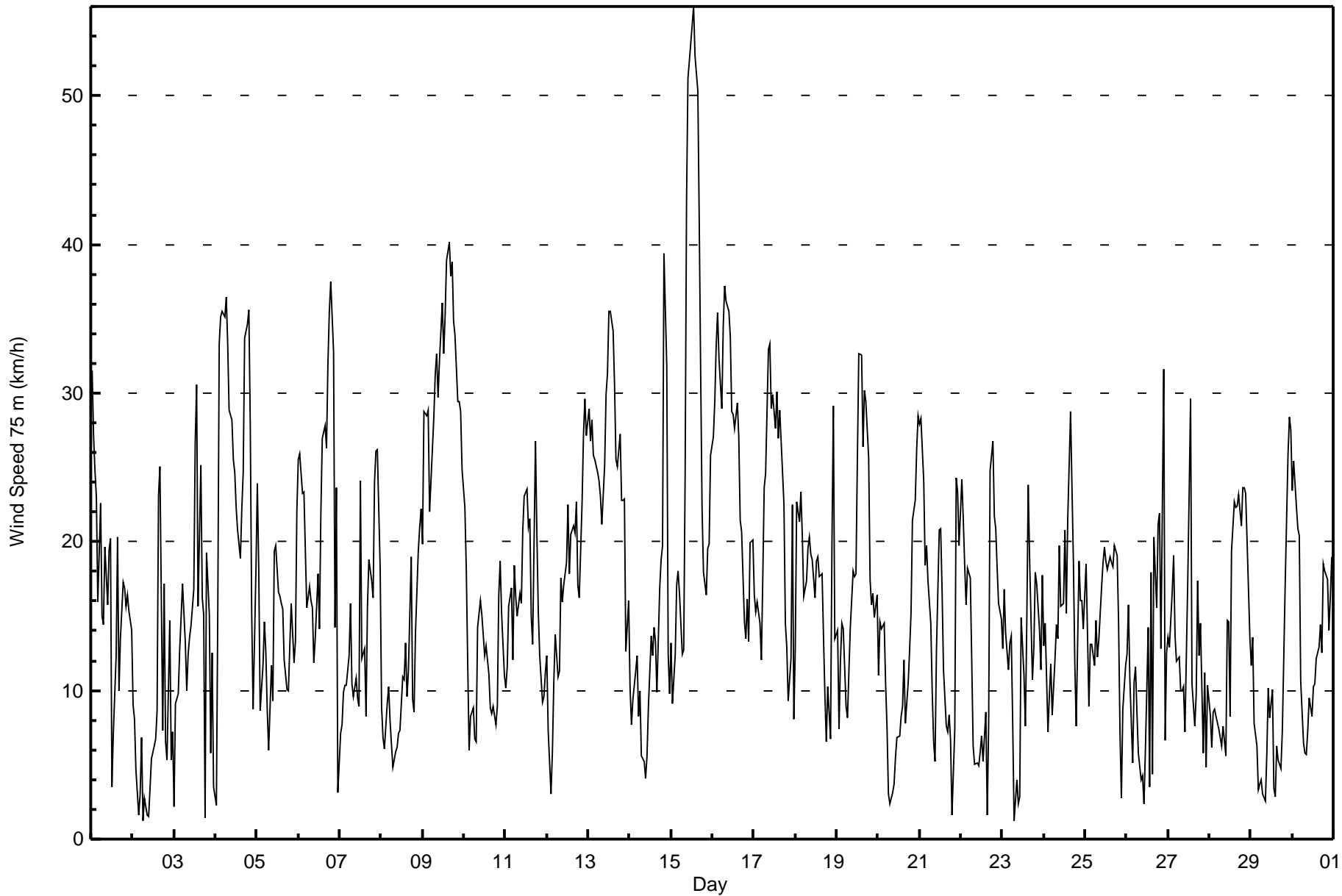
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed 75 m (WS75m) - km/h
Mannix - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 23 km/h on Jun 2 16:00 Minimum Value: 1 km/h on Jun 20 03:00 Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 3 Median = 4 Q ₃ = 5 P ₉₀ = 6 P ₉₉ = 11																	Hours in Service: 720 Hours of Data: 720 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-Jun	3	2	2	2	3	2	4	4	4	3	4	4	4	4	6	5	4	5	4	2	3	3	2	3	6
2-Jun	3	2	2	2	2	3	1	2	2	1	2	2	3	3	3	23	7	6	8	3	2	7	3	4	23
3-Jun	1	3	2	1	2	1	2	2	3	3	3	5	7	5	9	9	6	4	3	7	6	2	3	2	9
4-Jun	3	6	4	4	5	5	5	6	4	4	5	4	5	9	12	7	7	6	6	5	4	6	1	5	12
5-Jun	4	4	3	3	2	4	3	2	3	5	6	5	5	4	6	5	4	4	4	2	3	4	7	5	7
6-Jun	5	4	4	3	4	4	3	3	4	3	5	6	6	8	7	7	6	7	5	6	11	6	6	3	11
7-Jun	2	2	2	3	4	1	3	2	2	3	3	7	7	4	5	4	4	3	4	4	3	2	4	2	7
8-Jun	3	3	1	1	1	2	2	1	1	2	2	2	2	3	2	3	7	6	4	3	6	9	7	4	9
9-Jun	6	5	4	5	5	4	4	4	6	5	5	6	5	5	5	6	5	5	5	4	6	4	5	3	6
10-Jun	3	3	3	2	1	1	1	2	5	4	4	4	4	4	4	5	4	4	2	2	2	1	4	4	5
11-Jun	4	5	5	2	4	3	4	3	3	6	5	7	7	9	8	6	7	9	9	7	5	3	3	4	9
12-Jun	3	3	2	2	4	3	3	3	3	3	4	5	5	3	4	5	3	3	4	2	8	4	5	5	8
13-Jun	4	4	3	3	3	4	3	4	5	6	6	6	6	6	6	8	6	6	4	4	3	2	5	3	8
14-Jun	4	2	2	4	4	3	3	3	3	2	3	4	6	5	6	6	4	7	7	8	9	7	6	4	9
15-Jun	7	4	6	6	6	8	5	5	10	14	9	10	10	8	9	10	8	6	7	4	14	11	4	2	14
16-Jun	1	4	4	4	4	5	6	6	7	6	6	6	5	5	6	7	4	6	3	2	4	3	1	3	7
17-Jun	2	2	2	3	3	3	3	3	6	6	5	5	6	5	6	4	5	5	5	6	2	9	3	6	9
18-Jun	5	2	3	3	4	2	3	3	2	4	5	4	4	4	4	4	4	3	4	3	2	17	6	3	17
19-Jun	3	4	1	1	2	3	4	3	3	4	5	5	7	7	7	6	7	7	6	5	4	3	3	2	7
20-Jun	2	1	1	2	2	1	2	1	2	2	2	3	3	3	4	3	3	3	3	2	1	1	1	1	4
21-Jun	1	1	4	1	2	2	2	3	3	3	5	7	5	6	5	3	4	2	2	2	6	1	1	2	7
22-Jun	2	2	1	2	1	2	2	2	2	2	2	3	4	3	4	3	5	8	5	3	3	2	2	3	8
23-Jun	4	4	2	3	2	2	4	2	3	3	4	2	2	3	6	6	4	3	3	3	2	3	3	3	6
24-Jun	4	4	3	5	4	2	2	3	3	3	3	4	6	4	5	4	4	4	5	5	3	3	2	2	6
25-Jun	5	3	3	3	4	3	4	3	3	3	3	4	4	4	4	4	4	4	3	4	4	2	2	2	5
26-Jun	2	3	1	1	3	3	3	2	2	2	2	3	5	9	7	6	3	4	4	4	6	5	5	3	9
27-Jun	3	3	2	2	2	2	3	3	2	2	4	4	5	6	9	5	3	5	4	3	2	3	3	1	9
28-Jun	2	1	2	1	2	3	2	3	3	4	3	4	6	5	6	5	5	6	4	5	2	2	3	3	6
29-Jun	4	4	3	2	2	2	1	2	2	4	4	4	4	4	3	3	3	3	2	2	5	4	4	4	5
30-Jun	3	4	5	3	2	5	3	2	3	2	2	3	4	5	5	5	6	5	5	5	3	4	2	3	6
Diurnal Maximum																									





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed 75 m (WS75m) - km/h
Mannix - June 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	54	7.50	7.50
6 - 11	172	23.89	31.39
12 - 19	263	36.53	67.92
20 - 28	151	20.97	88.89
29 - 38	68	9.44	98.33
> 38	12	1.67	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed 75 m (WS75m) - km/h
Mannix - June 2016**

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	1	4	6	2	8	10	4	1	2	2	3	3	2	2	2	54
6 - 11	12	4	13	12	6	18	21	10	6	9	4	10	11	16	8	12	172
12 - 19	24	10	7	8	5	21	38	19	5	7	17	30	20	10	15	27	263
20 - 28	5	10	3	2	1	0	26	22	9	4	18	16	11	9	3	12	151
29 - 38	5	8	2	0	0	0	3	9	4	4	7	8	5	6	1	6	68
> 38	3	0	0	0	0	0	0	8	1	0	0	0	0	0	0	0	12
Totals	51	33	29	28	14	47	98	72	26	26	48	67	50	43	29	59	720

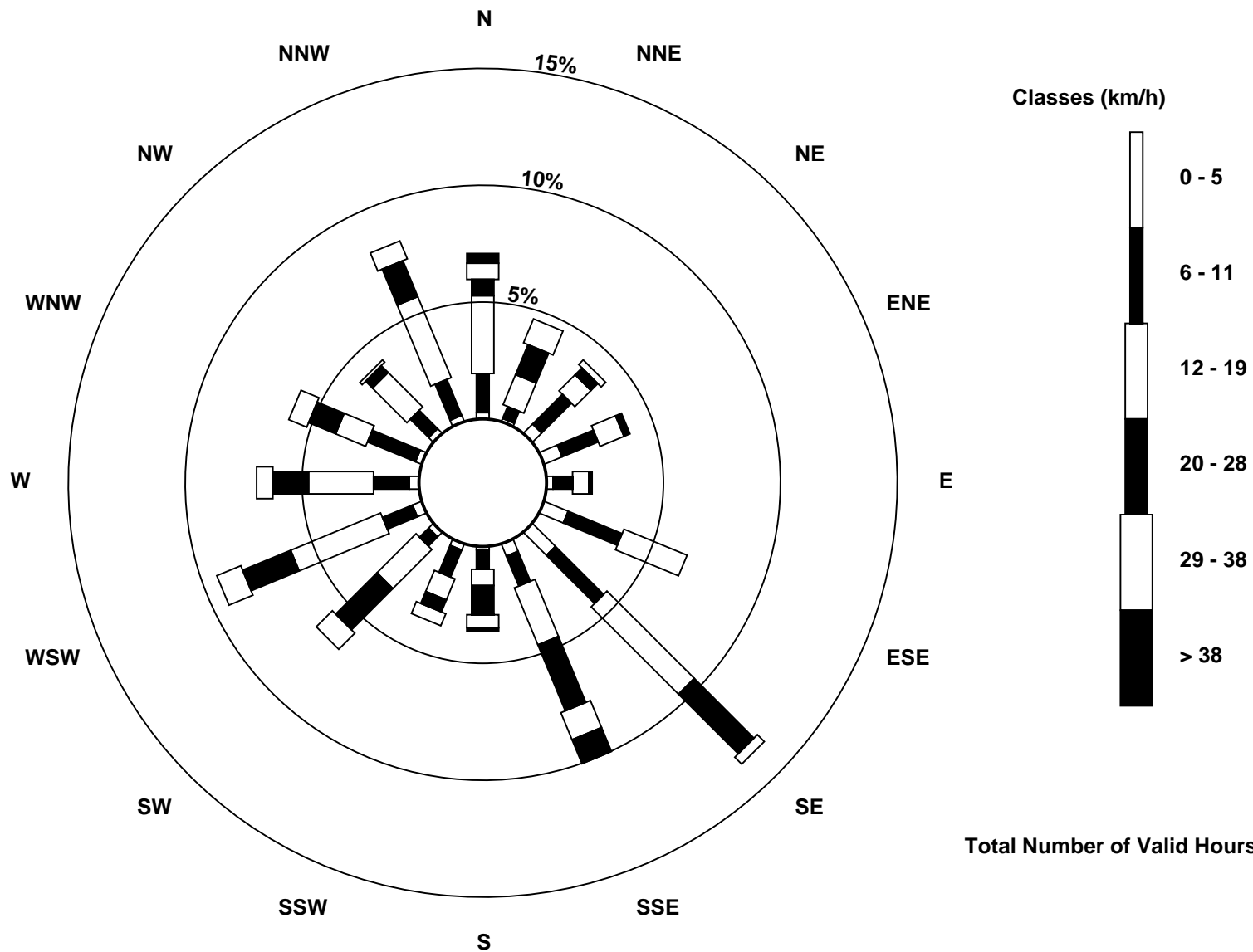
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed 75 m (WS75m) - km/h
Mannix (AMS 5)





Maximum Speed: 58 km/h on Jun 15 14:00	Maximum Daily Speed Average: 31.5 km/h on Jun 9	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 2 04:00	Minimum Daily Speed Average: 3.8 km/h on Jun 20	Hours of Data: 718
Maximum Diurnal Speed Average: 6.3 km/h at hour 6	Minimum Diurnal Speed Average: 1.4 km/h at hour 18	Hours of Missing Data: 2
Monthly Average Velocity: 2.5 km/h 204.7 deg	Percentiles: P ₁ = 2 P ₁₀ = 7 Q ₁ = 11 Median = 17 Q ₃ = 24 P ₉₀ = 31 P ₉₉ = 42	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-Jun	SSE33	SSE29	S26	S24	S18	SSE25	SSE17	SE18	SSE22	SSE17	SSE21	SSE22	SW5	NW7	W12	S22	SE12	SE16	SSE18	SSE18	SSE18	SE19	SE17	SSE15	SSE16.9	SSE33
2-Jun	SE9	S9	SSE5	SW0	ESE3	SSE8	S2	SSW3	NNE2	ENE1	ESE4	ESE7	ESE7	E8	ENE9	SW23	SW27	SE8	ENE19	ESE9	S5WSW15	ESE7	ENE7	SSE4.1	SW27	
3-Jun	WSW2	SW10	SW11	SW14	WSW17	SW17	SSW15	SSW11	SW13	WSW14	SW15	SW17	WSW27	WSW31	NW16	NNW26	NW16	NNW15	NE1	NNE20	NE17	ESE8	SE14	SSE5	WSW7.2	WSW31
4-Jun	WSW5	WSW18	WSW37	WSW38	WSW37	WSW36	W37	W34	W28	W28	WNW25	WNW25	W22	W21	WSW19	WNW22	NW26	WNW34	WNW35	NW36	NW29	NNW16	NNW9	WNW19	W24.0	WSW38
5-Jun	WNW26	NW19	WNW6	W9	W15	W14	WSW9	WNW6	WNW11	WNW9	NW20	NW19	NW17	NW16	NW16	N16	N12	N10	NE10	NE14	ENE17	E16	ESE18	SE26	NW6.7	SE26
6-Jun	SE30	SE30	SE27	SE27	SE23	SE20	SE20	SE18	SE17	SE14	SE16	SE20	ESE20	SE24	SSE29	SSE29	SSE28	S34	S37	SSE41	SSE36	SE17	S26	W4	SE23.3	SSE41
7-Jun	SW8	SSW8	SW11	SW13	WSW12	WSW13	W17	W10	WNW9	NW11	WNW9	NW9	N25	NNE12	NNW12	NNW8	NW16	NNW19	NNW18	NNW17	NNW25	NNW28	N28	N20	NW10.6	N28
8-Jun	N10	N7	NNE6	N8	N11	N9	NNW7	NNW5	NW6	NNW6	N7	N7	N11	NE11	NE14	NE11	SE12	SSE20	ESE13	E16	E16	E25	E26	ENE25	ENE7.5	E26
9-Jun	ENE22	NE32	NE31	NE32	NE24	NNE25	NNE30	NNE33	NNE35	NNE32	NNE34	NNE38	NNE35	UO	NNE41	N43	N40	N41	N37	N36	N31	N31	N31	N27	NNE31.5	N43
10-Jun	N24	NNW21	NNW14	NNW8	NW8	W8	W6	WNW6	NNW14	NNW16	NNW15	N14	N12	N13	N11	ENE9	ENE9	NE9	ENE8	ENE10	NE17	NE21	ENE18	E16	N9.3	N24
11-Jun	ESE14	ESE19	SE20	SE20	SE16	SE23	SE19	SE19	SE20	SE19	SE24	SE25	SE27	SE25	SE26	ESE19	ESE17	SE31	SE27	ESE22	ESE18	E15	ESE19	SE15	SE20.6	SE31
12-Jun	SSE14	SSE9	SE5	SE7	S12	SSW15	SSW12	S12	SSW18	S17	S18	S20	UO	SSW19	SSW21	SW21	W22	WSW23	WSW18	WSW17	SW24	SW29	SW31	SW29	SW15.0	SW31
13-Jun	WSW30	WSW28	WSW30	WSW28	WSW27	SW26	SW25	SW24	WSW22	WSW26	SW31	SW32	WSW36	WSW36	WSW35	WSW31	WSW26	WSW26	WSW28	WSW23	SW24	WSW25	WSW14	SW18	WSW26.9	WSW36
14-Jun	W11	SSW8	S9	SSE11	SE15	SE12	SE12	SE7	SE7	E5	NE5	SE11	ESE18	ESE17	ESE19	ESE19	ESE15	ESE25	SE24	SE24	SSE42	SSE35	ESE19	ESE15	SE14.2	SSE42
15-Jun	SE18	ESE15	ESE21	ESE28	E26	SE23	ESE16	ESE19	SE29	SSE46	SSE54	SSE56	SSE57	SSE58	S54	S52	S43	S33	S23	S20	SSW18	S21	SSE23	SSE28	SSE29.5	SSE58
16-Jun	SSE30	SSE33	SSE38	SSE40	SSE36	SSE31	S36	SSE38	S37	S37	SSW35	SSW30	SSW29	SSW28	SSW30	S28	SSW22	SW21	SW15	SW14	WNW16	WSW14	WSW21	WSW21	S23.6	SSE40
17-Jun	WSW18	WSW16	WSW17	W16	W13	W18	W24	W25	NW33	WNW33	WNW29	WNW30	WNW28	W30	W27	W29	W27	WSW23	W15	NNW13	NE9	N12	N23	N9	WNW18.5	WNW33
18-Jun	W14	WNW23	WNW23	WNW24	WNW21	W17	W18	W19	W20	W19	W19	W16	WSW19	WSW19	W18	W18	WNW13	W10	S7	SE11	SSE7	N13	NNE32	NNE16	W12.0	NNE32
19-Jun	N16	NNW8	NW12	WNW14	W13	WNW10	WSW9	WNW11	NNW14	N18	NNW17	NNW18	NNW26	NNW33	NNW33	NNW27	NNW31	NNW30	N26	N18	N17	N18	N16	N18	NNW17.5	NNW33
20-Jun	NNW11	NW13	WNW13	WNW14	NW10	NW6	NW3	SE3	S4	WSW4	W5	NNW7	N7	ENE9	ENE9	ENE12	ESE9	SE11	SE15	SSE17	SSE23	SSE26	SSE30	SSE32	SSE3.8	SSE32
21-Jun	SSE29	SSE30	S24	SSE16	SSE17	SSE19	SSE15	SE12	SE7	SE7	S13	SSE22	SSE22	SE18	ESE14	ESE9	ENE7	NE8	ENE7	E2	SE9	SSE26	S25	S22	SSE14.1	SSE30
22-Jun	SSE26	SSE23	S19	SSE14	SSE17	SSE20	SSE13	SSE7	SE6	SE6	SE6	E6	NE7	N5	WNW8	SSE3	SE9	SW26	WSW27	W22	WSW22	WSW20	SW16	WSW15	SSW9.0	WSW27
23-Jun	WSW14	SW18	W15	W13	WSW14	WSW15	WNW9	NE1	NE4	NE2	WNW3	W14	WNW11	WNW7	WNW14	NNW24	NNW19	N11	N13	NE19	ENE19	ENE15	NNE12	NNW18	NW6.6	NNW24
24-Jun	NW13	NNE16	NE9	N9	N13	N9	N13	N15	NNW13	NNW20	NW16	NW16	NNW21	NW16	NNW22	NNW30	NNW25	N20	NE12	NW8	NW19	NW17	NNW17	N15	NNW14.6	NNW30
25-Jun	NNE20	NNE16	N10	NNW14	N14	N12	N15	N12	N13	N17	N19	NNE20	N19	NNE19	NNE19	NNE19	NNE20	NNE19	NNE15	ENE8	SE3	SW9	SW12	N13.0	NNE20	
26-Jun	WSW11	W15	WNW11	WNW4	S9	SSE13	S11	SSE7	SSE5	SE5	SSE3	SE7	SSE15	NNW4	NNW18	SSW4	SW21	SSW18	S22	S23	SSW14	W32	NW8	WSW12	SW6.9	W32
27-Jun	W14	WSW14	WSW19	WSW22	WSW17	WSW14	WSW13	WSW10	W10	W10	WSW7	WSW17	WSW23	SW30	NNE11	SSW8	SSE10	SW18	WSW13	WSW16	W7	SSW10	SSE5	SSW10	WSW11.6	SW30
28-Jun	SW9	SSW6	WSW9	W10	WSW10	WSW8	WSW7	WNW6	N7	NW5	W15	W14	NW8	NNW20	N23	N23	NNE23	NNE24	NNE22	NNE25	NNE26	NE25	NE23	ENE16	N9.0	NNE26
29-Jun	E15	E20	ESE10	ESE9	ENE5	ENE4	SE5	SE3	ENE3	ENE6	NE10	E9	NE10	ENE4	ENE3	SSE7	ESE6	ESE5	SE8	SSE13	SE19	SE29	SE32	SE32	ESE9.2	SE32
30-Jun	SE28	SE30	SE26	SE24	SE24	SE13	SE8	SE7	E6	E8	E11	ESE9	SE12	ESE13	ESE15	ESE17	ESE18	ESE17	SE21	SE21	SSE19	SE16	S18	SSW20	SE15.5	SE30

S4.3	S4.5	SSW5.2	SSW4.9	SSW5.0	SSW6.3	SSW5.0	SSW3.0	WSW2.1	WSW2.4	SW3.2	SW3.3	WSW3.2	WSW4.2	WNW2.6	W2.1	WNW2.0	SW1.4	SSE1.7	ESE1.7	SE2.4	SE2.4	ESE3.8	SSE3.3	Diurnal Average	
SSE33	SSE33	SSE38	SSE40	WSW37	WSW36	W37	SSE38	S37	SSE46	SSE54	SSE56	SSE57	SSE58	S54	SSE52	S43	N41	S37	SSE41	SSE42	SSE35	SE32	SSE32	Diurnal Maximum	

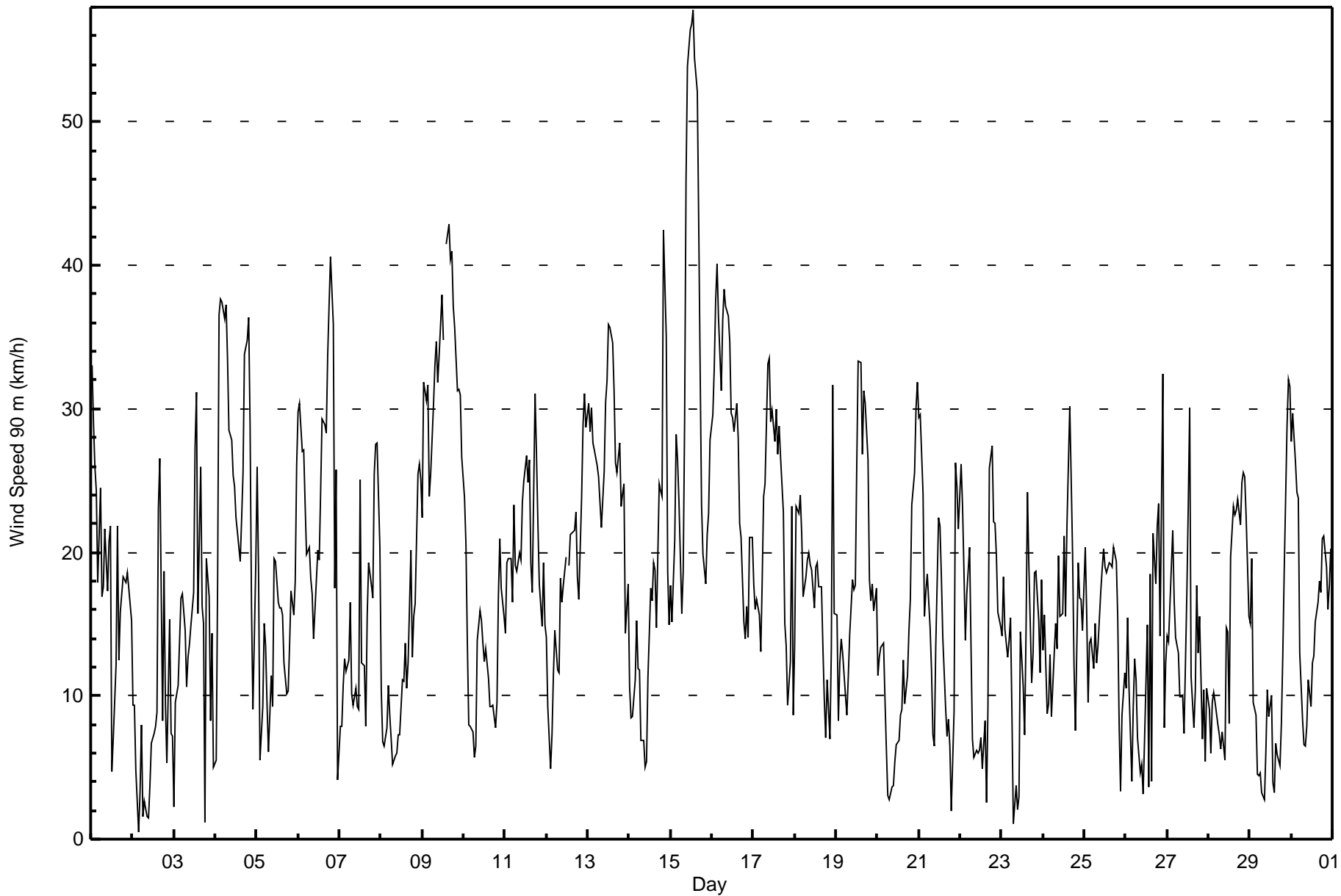
UO - Unstable Operation
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed 90 m (WS90m) - km/h
Mannix - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 720													
Maximum Value: 23 km/h on Jun 2 16:00														Hours of Data: 718													
Minimum Value: 1 km/h on Jun 21 01:00														Hours of Missing Data: 2													
Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 2 Median = 4 Q ₃ = 5 P ₉₀ = 6 P ₉₉ = 11														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-Jun	2	2	2	2	2	2	4	3	4	3	4	4	4	4	6	5	4	4	3	2	2	3	2	3	6		
2-Jun	1	2	2	1	3	3	2	2	1	1	2	3	3	3	3	23	6	5	8	3	2	7	2	4	23		
3-Jun	1	3	2	1	2	1	2	2	3	3	3	5	6	5	9	10	6	4	3	8	6	2	4	3	10		
4-Jun	4	7	4	4	5	5	5	6	3	4	5	4	5	9	11	7	7	5	6	5	4	7	1	6	11		
5-Jun	4	5	3	2	3	3	3	2	3	5	6	5	5	4	6	6	4	4	4	2	3	3	6	4	6		
6-Jun	3	3	3	3	3	3	2	3	4	3	4	5	5	7	7	7	5	6	5	5	10	5	6	3	10		
7-Jun	2	2	3	3	3	2	2	2	3	3	3	7	7	4	5	4	4	4	4	4	2	2	3	3	7		
8-Jun	3	3	2	1	1	2	2	2	2	2	2	2	2	3	1	3	8	6	3	4	7	9	7	4	9		
9-Jun	6	5	5	5	5	4	4	4	6	4	5	5	5	UO	5	6	5	5	5	4	6	4	5	3	6		
10-Jun	3	3	4	2	1	2	1	2	5	4	4	4	4	4	4	5	4	4	2	2	2	1	4	3	5		
11-Jun	5	5	5	1	3	2	3	2	3	5	5	6	6	8	7	5	6	7	7	6	4	3	4	4	8		
12-Jun	3	3	3	2	3	3	3	3	3	3	4	5	UO	3	4	5	3	3	4	1	8	4	5	5	8		
13-Jun	4	4	3	3	3	4	3	4	5	5	6	6	5	6	6	8	6	6	4	4	3	2	5	2	8		
14-Jun	4	2	1	6	3	3	2	3	3	2	3	4	5	5	5	5	5	6	5	8	8	7	5	5	8		
15-Jun	6	5	7	6	6	6	5	4	8	14	9	10	10	8	9	10	8	6	7	4	14	11	5	2	14		
16-Jun	2	4	4	3	4	4	6	6	7	6	6	6	5	5	5	7	4	6	3	2	4	3	1	3	7		
17-Jun	2	2	2	3	2	2	3	3	6	6	5	5	6	5	5	4	5	5	5	6	2	12	3	6	12		
18-Jun	5	2	3	2	5	2	3	3	2	4	4	4	4	4	4	4	4	3	4	3	2	16	6	3	16		
19-Jun	3	4	1	1	3	3	4	3	3	4	5	6	7	7	7	6	7	7	6	5	4	3	3	2	7		
20-Jun	2	1	1	2	1	1	2	1	2	2	2	3	3	3	4	2	3	3	2	2	2	2	1	1	4		
21-Jun	1	1	4	2	2	2	1	2	3	4	5	6	5	6	4	3	4	2	2	2	6	1	1	2	6		
22-Jun	2	3	2	3	3	2	2	2	2	2	2	3	4	3	3	3	5	8	5	3	2	2	1	3	8		
23-Jun	3	4	2	3	2	2	4	2	3	2	3	2	2	2	6	6	4	3	3	3	2	3	3	3	6		
24-Jun	4	5	3	4	3	3	2	4	4	3	3	4	6	4	8	4	4	4	5	5	2	3	2	3	8		
25-Jun	5	3	3	3	5	3	4	3	3	3	3	4	4	4	4	4	4	4	3	3	4	2	2	2	5		
26-Jun	2	2	2	1	3	1	3	2	2	2	3	4	5	9	8	5	4	4	4	4	6	6	6	3	9		
27-Jun	3	3	2	2	2	2	3	3	2	2	4	4	5	6	9	6	3	5	4	3	2	3	3	2	9		
28-Jun	2	1	2	1	2	3	2	3	3	4	3	4	6	5	6	5	5	6	4	5	2	2	3	3	6		
29-Jun	3	5	4	2	2	2	2	2	2	4	4	4	4	4	3	3	3	3	3	2	5	4	4	4	5		
30-Jun	3	3	4	3	2	6	3	2	3	2	1	4	4	6	5	5	5	4	4	4	3	3	1	3	6		
														Diurnal Maximum													
UO - Unstable Operation																											





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed 90 m (WS90m) - km/h
Mannix - June 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	48	6.69	6.69
6 - 11	155	21.59	28.27
12 - 19	254	35.38	63.65
20 - 28	161	22.42	86.07
29 - 38	85	11.84	97.91
> 38	15	2.09	100.00

Total Number of Valid Hours: 718

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Wind Speed 90 m (WS90m) - km/h
Mannix - June 2016

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	5	6	2	3	6	6	3	2	2	3	2	2	2	2	48
6 - 11	17	2	10	12	6	12	18	8	5	7	6	9	10	16	9	8	155
12 - 19	26	12	6	7	5	25	28	19	8	8	11	31	25	7	16	20	254
20 - 28	9	10	4	2	4	5	27	17	13	4	11	20	11	9	3	12	161
29 - 38	5	8	3	0	0	0	8	17	5	4	6	11	5	5	3	5	85
> 38	3	1	0	0	0	0	0	9	2	0	0	0	0	0	0	0	15
Totals	61	34	28	27	17	45	87	76	36	25	36	74	53	39	33	47	718

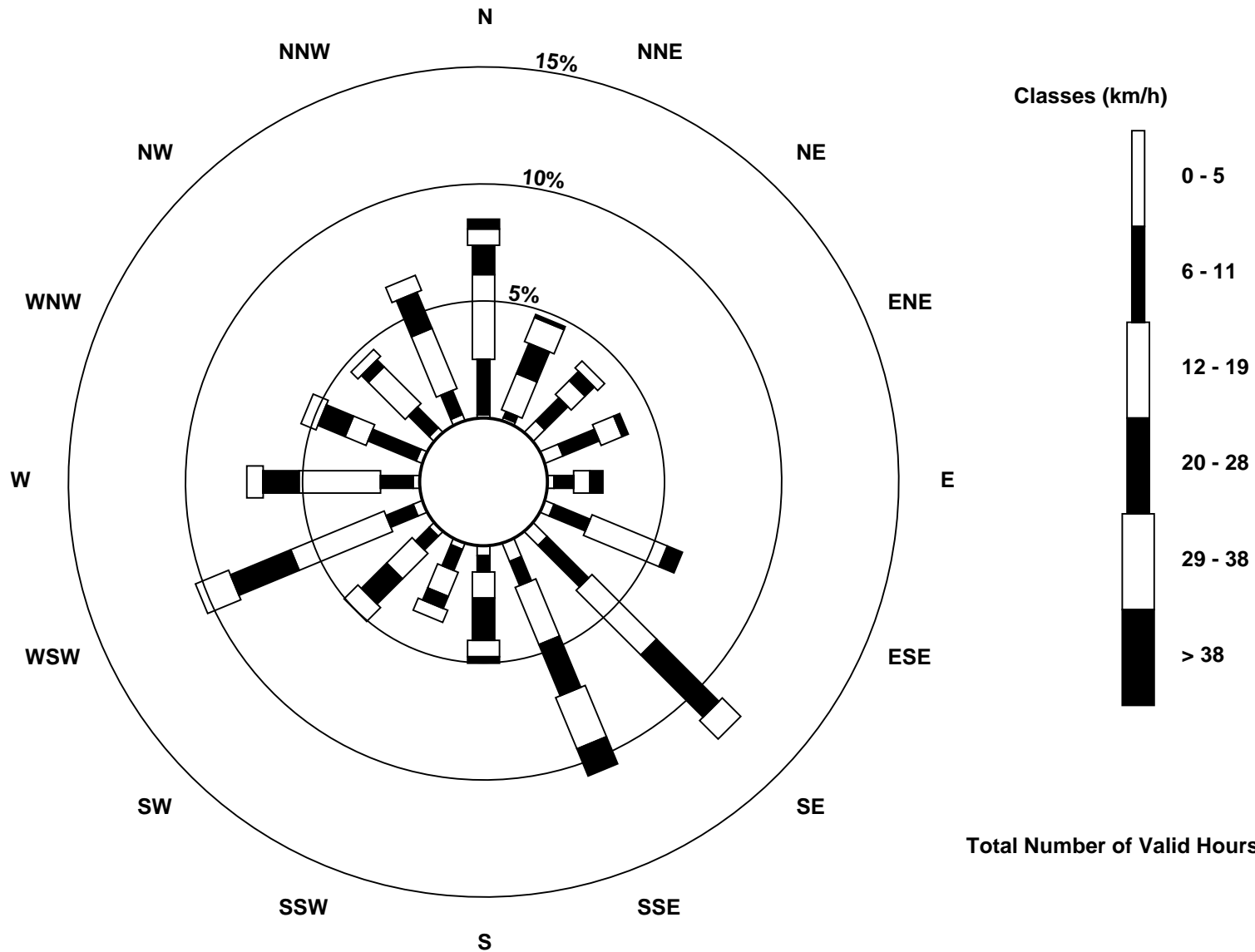
Total Number of Valid Hours: 718

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

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





Direction of Maximum Speed: 167 deg on Jun 15 14:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 18.2 deg on Jun 9	Hours of Data: 720
Direction of Minimum Speed: 61 deg on Jun 21 20:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 1.8 deg on Jun 2	Percent Operational Time: 100.0
Monthly Average Direction: 254.7 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-Jun	161	159	157	152	143	146	145	129	151	148	147	150	254	324	277	185	133	132	155	167	139	140	145	154	152.6
2-Jun	125	195	200	256	51	210	257	244	353	76	118	120	101	102	63	228	234	109	74	128	239	240	110	45	162.1
3-Jun	244	207	171	202	213	199	171	195	232	254	239	229	241	255	302	342	324	337	52	14	54	173	180	48	257.3
4-Jun	43	256	244	244	250	256	262	269	267	266	280	302	265	273	242	282	325	298	300	306	301	333	286	259	275.6
5-Jun	286	299	259	253	259	255	255	275	304	295	307	301	307	314	316	354	358	7	47	53	60	83	124	135	313.0
6-Jun	136	135	136	137	136	132	136	145	139	133	129	138	124	146	151	156	149	174	176	155	154	113	183	20	145.6
7-Jun	173	170	198	143	239	238	263	275	283	299	282	322	349	32	340	335	318	344	344	341	335	339	344	1	320.5
8-Jun	297	253	315	283	305	316	354	315	304	323	341	357	6	56	53	53	144	154	135	109	73	93	90	56	63.7
9-Jun	73	42	32	44	44	26	22	21	22	22	32	31	28	21	12	11	9	5	9	4	356	345	344	343	18.2
10-Jun	338	349	335	134	246	244	265	287	342	333	331	349	2	16	20	74	73	63	76	76	42	41	57	80	12.2
11-Jun	140	117	134	135	126	138	138	141	135	130	133	145	140	132	131	128	129	134	132	127	129	90	103	127	131.0
12-Jun	167	216	10	119	168	193	198	178	203	180	181	194	229	212	210	234	257	258	258	241	229	236	236	235	222.7
13-Jun	237	238	244	242	238	231	232	228	242	243	227	236	240	249	244	241	240	251	244	256	237	232	246	212	240.0
14-Jun	320	151	169	143	135	123	144	124	115	94	61	115	122	110	127	127	111	125	133	139	152	149	105	113	128.9
15-Jun	126	113	105	108	98	126	101	114	131	153	156	161	166	167	174	171	181	177	170	168	217	206	145	150	154.2
16-Jun	148	146	145	148	152	164	170	165	174	187	201	219	217	214	205	195	220	236	234	241	296	245	257	242	194.7
17-Jun	240	241	243	260	241	264	271	272	301	294	285	290	286	278	273	279	269	254	268	336	54	358	9	10	280.3
18-Jun	265	284	272	286	272	251	261	270	271	266	280	270	245	245	261	272	284	268	179	132	130	360	37	18	272.2
19-Jun	352	333	304	270	262	269	248	292	348	350	334	322	328	328	332	339	346	344	348	356	1	359	358	353	333.1
20-Jun	278	246	252	256	240	233	258	116	186	265	256	325	0	76	74	76	120	141	135	148	160	150	151	153	157.1
21-Jun	153	149	152	143	141	140	139	135	130	122	191	146	161	146	126	105	72	42	53	61	148	165	178	159	141.0
22-Jun	149	136	141	145	154	147	144	133	124	126	125	96	32	17	304	149	142	221	242	261	237	237	212	233	187.3
23-Jun	224	221	246	216	237	240	260	95	84	71	258	277	289	288	296	334	332	354	7	42	61	67	12	333	315.6
24-Jun	315	33	11	356	5	345	346	358	334	329	318	313	330	315	299	324	334	16	48	299	302	313	339	350	334.7
25-Jun	14	26	13	340	353	342	347	2	343	1	7	19	9	23	20	14	13	22	19	34	65	203	254	242	7.2
26-Jun	256	266	255	221	180	167	154	143	124	130	107	126	161	348	346	243	225	195	170	172	216	263	279	228	213.0
27-Jun	249	219	224	226	192	223	246	257	268	266	251	256	258	233	29	195	159	223	241	255	229	180	125	161	234.5
28-Jun	162	168	179	182	179	190	248	287	13	306	276	276	323	340	0	0	23	16	17	26	28	39	50	63	4.2
29-Jun	86	89	142	119	36	48	143	147	61	71	55	98	39	75	82	176	112	121	153	163	151	149	146	142	119.4
30-Jun	136	133	130	136	141	147	128	140	61	47	64	102	134	120	120	109	127	120	141	138	154	138	168	190	129.0

180.2 171.6 191.2 188.8 192.8 204.9 223.5 228.1 256.5 261.1 249.1 239.5 251.2 252.4 289.3 278.0 283.0 255.4 183.2 97.3 146.3 180.4 110.3 155.6

Diurnal Average

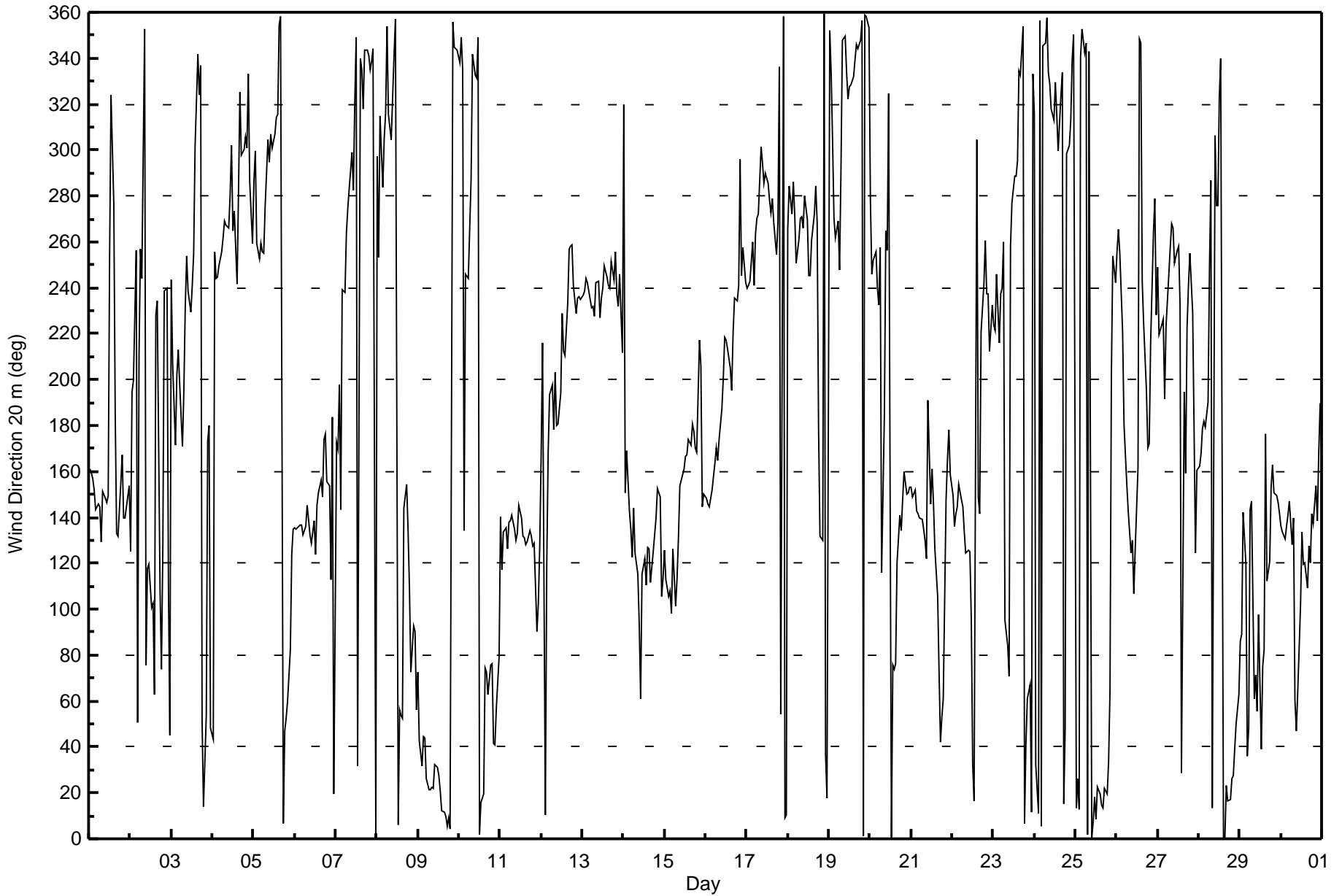
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction 20 m (WD20m) - deg
Mannix - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 103 deg on Jun 29 14:00 Minimum Value: 5 deg on Jun 26 01:00 Percentiles: P ₁ = 8 P ₁₀ = 11 Q ₁ = 13 Median = 19 Q ₃ = 29 P ₉₀ = 48 P ₉₉ = 95		Hours in Service: 720 Hours of Data: 720 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-Jun	11	12	12	12	17	12	24	12	14	14	15	26	93	66	36	19	17	14	18	16	15	12	14	9	93	
2-Jun	17	66	69	30	82	27	54	49	96	65	42	36	39	41	28	72	19	40	17	30	30	43	23	51	96	
3-Jun	59	29	23	16	20	19	19	22	16	15	19	20	19	17	42	30	32	29	90	25	23	52	59	55	90	
4-Jun	26	50	10	10	11	10	8	9	11	12	18	18	40	19	18	26	18	16	12	14	32	26	8	50		
5-Jun	30	21	13	9	9	29	21	24	22	57	34	21	28	29	42	32	33	42	45	13	13	20	15	12	57	
6-Jun	11	11	11	11	10	11	11	15	13	13	13	16	15	24	21	19	17	18	18	13	26	44	36	95	95	
7-Jun	17	32	48	64	62	16	10	14	26	29	35	61	30	24	24	44	22	21	22	17	15	14	16	9	64	
8-Jun	50	66	85	66	73	31	30	26	28	29	33	29	24	22	19	46	54	15	16	16	18	16	14	14	85	
9-Jun	18	13	14	13	15	15	13	13	13	12	11	12	13	11	11	12	13	13	12	13	16	16	15	15	18	
10-Jun	14	16	49	41	16	21	14	41	29	26	26	34	41	38	42	47	44	34	25	23	12	10	13	19	49	
11-Jun	30	17	22	12	10	12	13	13	13	11	12	15	15	12	15	15	14	12	16	11	13	21	10	12	30	
12-Jun	28	49	77	22	22	27	29	29	20	23	21	24	19	15	20	22	18	11	10	12	14	11	11	11	77	
13-Jun	11	11	10	10	11	12	12	14	19	16	15	17	15	15	14	17	15	15	12	11	11	38	20	38		
14-Jun	91	8	16	81	15	14	19	20	20	36	38	27	20	22	16	13	20	13	13	27	16	12	15	17	91	
15-Jun	13	16	14	14	14	28	30	21	11	17	12	15	15	14	17	17	19	25	20	37	26	62	17	11	62	
16-Jun	11	12	12	12	12	16	18	14	20	22	22	20	20	19	21	22	23	19	15	24	23	14	9	19	24	
17-Jun	10	10	10	9	12	15	8	11	16	13	13	14	16	12	15	14	12	15	12	40	18	58	19	73	73	
18-Jun	17	12	10	12	19	13	12	9	11	13	21	18	15	20	16	16	21	32	56	11	9	64	13	26	64	
19-Jun	25	56	17	15	10	21	22	25	25	22	28	29	24	19	20	20	17	21	19	19	15	14	10	12	56	
20-Jun	35	13	9	10	12	20	56	37	70	57	51	58	58	36	30	18	21	12	12	12	10	7	8	10	70	
21-Jun	10	10	14	11	13	13	12	13	22	29	42	25	22	26	18	29	44	22	30	102	54	11	13	19	102	
22-Jun	13	11	13	12	12	14	14	21	19	25	24	31	55	73	32	82	30	19	16	12	13	17	10	27	82	
23-Jun	21	32	18	31	23	21	31	76	48	58	97	20	21	35	28	20	20	31	19	12	13	13	27	23	97	
24-Jun	28	14	32	30	28	19	24	22	23	19	22	21	22	30	29	14	19	32	26	58	17	17	16	21	58	
25-Jun	22	19	24	20	25	20	26	25	30	22	22	17	22	20	21	21	22	20	17	17	59	42	8	6	59	
26-Jun	5	13	13	48	16	15	22	27	37	44	97	61	25	87	24	63	14	26	18	21	40	10	95	19	97	
27-Jun	29	11	12	12	30	13	15	16	17	18	44	18	16	14	83	70	30	22	39	12	54	18	45	14	83	
28-Jun	12	14	25	17	17	40	16	39	37	77	21	28	61	27	31	25	24	19	17	13	13	13	10	21	77	
29-Jun	14	17	52	17	74	43	30	43	65	66	33	48	37	103	86	55	63	37	26	15	10	11	12	13	103	
30-Jun	12	11	10	12	11	18	17	15	45	16	14	45	24	36	23	23	18	18	13	12	14	14	27	17	45	
		91	66	85	81	82	43	56	76	96	77	97	61	93	103	86	82	63	42	90	102	59	64	95	95	
		Diurnal Maximum																								





Direction of Maximum Speed: 162 deg on Jun 15 14:00		Hours in Service:	720
Direction of Maximum Daily Speed Average: 11.5 deg on Jun 9		Hours of Data:	720
Direction of Minimum Speed: 152 deg on Jun 12 03:00		Hours of Missing Data:	0
Direction of Minimum Daily Speed Average: 2.6 deg on Jun 2		Percent Operational Time:	100.0
Monthly Average Direction: 261.9 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-Jun	155	155	157	151	145	142	143	128	147	147	144	146	231	309	269	180	129	128	150	164	138	135	139	150	150.6
2-Jun	126	167	167	279	80	179	256	231	320	62	113	112	103	96	54	224	227	116	67	120	229	237	111	45	159.3
3-Jun	248	215	184	210	223	203	173	190	228	246	232	225	234	250	303	339	320	332	37	7	44	138	152	68	248.0
4-Jun	40	250	238	241	245	250	256	264	262	261	278	298	262	271	239	279	321	294	297	302	300	330	310	275	273.2
5-Jun	287	305	269	260	264	253	250	273	299	293	303	299	305	310	313	346	348	354	35	44	54	78	117	130	309.9
6-Jun	131	130	131	131	129	127	129	139	134	130	124	132	118	142	145	152	144	170	171	151	148	121	179	332	142.5
7-Jun	200	183	203	194	248	236	256	271	285	300	279	314	342	25	330	331	315	340	339	335	332	337	339	352	315.3
8-Jun	335	312	36	330	329	322	335	316	305	323	336	349	2	47	47	43	141	150	126	102	69	86	81	52	45.9
9-Jun	64	35	25	37	37	21	17	16	16	16	25	22	19	15	7	5	4	359	2	359	353	343	341	341	11.5
10-Jun	338	334	327	3	265	258	265	286	334	330	327	343	351	7	6	64	57	50	66	65	33	33	52	80	359.0
11-Jun	124	112	130	133	120	130	129	132	130	125	129	139	134	127	126	122	122	129	126	119	122	88	100	122	125.2
12-Jun	154	181	152	118	168	189	194	173	197	175	175	186	223	205	203	227	253	253	253	240	224	231	231	230	213.2
13-Jun	232	233	239	236	234	227	226	221	235	237	220	229	234	243	238	234	234	245	237	248	232	230	235	210	233.5
14-Jun	268	159	157	149	131	118	139	126	117	92	45	114	114	106	120	119	105	118	125	134	148	143	103	107	126.7
15-Jun	121	106	100	102	92	125	98	109	126	148	150	155	161	162	168	166	175	172	166	164	204	192	146	146	151.2
16-Jun	144	144	140	142	147	160	166	160	169	179	192	210	209	206	196	188	211	228	229	234	290	245	253	236	185.8
17-Jun	234	239	241	261	252	263	267	268	298	291	282	287	283	275	270	274	264	249	262	329	43	350	3	355	278.5
18-Jun	266	283	274	286	275	249	259	265	267	263	276	265	239	239	256	267	282	264	174	128	128	351	28	19	271.7
19-Jun	349	331	308	278	270	277	245	290	340	345	330	321	323	324	328	336	342	339	345	353	358	355	353	351	330.5
20-Jun	306	274	268	278	279	262	273	120	182	253	260	322	350	66	68	67	114	133	130	143	159	147	150	154	163.3
21-Jun	152	148	149	143	140	138	135	128	129	118	181	143	154	142	119	101	61	34	48	61	143	161	171	163	142.2
22-Jun	151	140	143	143	145	141	140	132	126	124	118	89	26	0	298	153	141	213	236	255	235	234	213	225	183.5
23-Jun	224	218	246	239	226	241	264	60	61	59	272	275	285	289	293	330	329	348	1	33	54	60	9	329	309.1
24-Jun	312	18	20	344	359	345	343	352	330	326	317	311	326	312	298	322	330	4	38	299	303	312	336	347	330.7
25-Jun	9	16	1	338	351	339	342	357	340	356	4	13	4	14	14	9	7	13	14	25	59	175	235	240	1.1
26-Jun	251	285	269	239	173	161	150	148	127	124	114	121	158	334	341	228	219	193	167	169	203	258	290	228	211.0
27-Jun	259	227	225	234	217	230	243	249	264	262	246	251	253	226	16	192	157	217	232	250	245	187	133	170	230.8
28-Jun	183	187	217	233	212	222	244	284	1	308	274	274	316	336	354	354	15	9	10	19	20	31	43	54	349.7
29-Jun	82	87	122	122	68	44	135	143	53	62	48	82	33	58	65	169	111	113	144	157	145	142	141	138	117.1
30-Jun	134	129	127	132	134	133	123	131	71	54	66	101	127	115	114	103	120	115	136	131	147	134	163	187	127.0

181.5 179.4 188.8 195.3 192.9 198.7 211.8 216.7 251.6 254.1 241.1 236.0 248.4 249.6 284.8 270.4 280.0 245.5 170.5 110.3 147.8 170.6 119.9 168.1

Diurnal Average

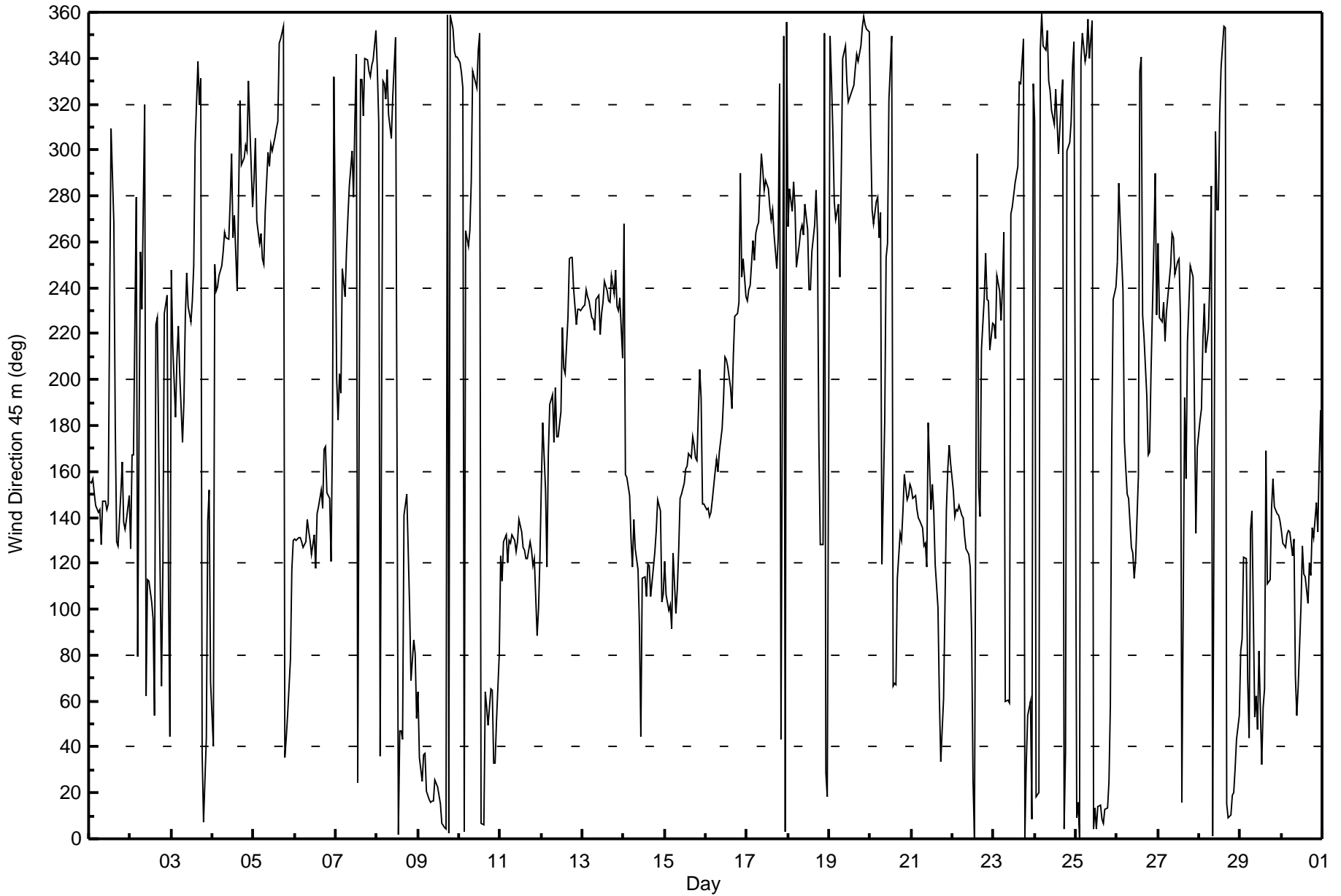
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction 45 m (WD45m) - deg
Mannix - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 103 deg on Jun 26 11:00 Minimum Value: 3 deg on Jun 20 22:00 Percentiles: P ₁ = 4 P ₁₀ = 7 Q ₁ = 9 Median = 14 Q ₃ = 22 P ₉₀ = 41 P ₉₉ = 87																		Hours in Service: 720 Hours of Data: 720 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-Jun	3	4	4	4	10	6	13	10	9	9	10	21	86	57	31	9	16	11	13	8	10	8	9	5	86	
2-Jun	17	40	46	30	60	21	58	38	95	63	48	35	32	41	22	74	15	42	14	26	34	37	19	35	95	
3-Jun	47	28	22	10	7	10	11	13	11	12	14	16	15	15	37	23	25	22	99	26	17	40	44	61	99	
4-Jun	71	14	5	7	8	8	8	8	10	11	16	14	17	37	16	16	22	14	13	8	7	27	23	8	71	
5-Jun	27	11	18	7	7	22	19	20	14	35	24	16	20	23	30	26	21	26	42	11	10	20	14	8	42	
6-Jun	7	7	7	6	6	6	7	9	9	10	10	13	13	19	16	14	13	9	8	8	20	40	16	82	82	
7-Jun	18	31	38	41	56	8	10	11	23	17	27	57	25	20	16	33	14	13	15	11	8	6	7	7	57	
8-Jun	18	62	45	14	15	17	18	18	20	19	23	17	15	17	15	41	57	11	15	12	15	16	13	12	62	
9-Jun	14	11	9	10	11	12	9	9	9	9	9	8	8	8	7	7	7	8	7	7	10	9	9	9	14	
10-Jun	8	10	13	75	10	10	8	31	20	16	17	22	33	31	36	46	50	34	21	20	7	7	10	15	75	
11-Jun	21	13	18	8	6	7	8	8	8	8	8	12	11	10	12	13	12	9	14	10	9	19	9	9	21	
12-Jun	15	41	87	19	17	19	25	16	12	15	10	18	15	9	11	20	16	10	8	8	8	7	7	8	87	
13-Jun	7	8	8	7	7	7	8	10	16	14	12	14	12	13	13	12	14	12	12	9	8	5	26	12	26	
14-Jun	51	20	13	13	9	14	17	18	20	44	37	25	19	23	15	13	17	11	10	20	12	8	14	15	51	
15-Jun	11	14	12	12	13	27	30	18	9	14	9	11	9	8	10	10	10	18	14	32	21	33	14	5	33	
16-Jun	5	7	7	6	7	9	9	9	12	11	14	14	15	14	14	13	20	16	13	22	20	10	7	14	22	
17-Jun	8	6	7	10	9	7	6	9	12	9	9	10	14	10	13	11	12	13	10	37	15	55	13	63	63	
18-Jun	15	8	7	7	16	8	9	7	9	11	16	15	13	18	15	15	18	31	53	7	10	86	9	15	86	
19-Jun	24	35	9	10	8	17	17	19	17	13	19	23	17	13	14	15	12	16	13	13	9	9	6	7	35	
20-Jun	25	4	3	4	7	12	42	38	70	45	42	43	47	32	25	15	21	8	8	8	4	3	4	4	70	
21-Jun	3	5	5	4	7	7	9	9	17	26	35	23	16	22	16	27	45	21	30	92	31	5	6	13	92	
22-Jun	7	4	8	9	5	8	10	18	19	20	23	35	59	69	26	81	27	13	14	10	10	13	5	14	81	
23-Jun	18	11	11	29	17	17	32	91	56	70	92	17	16	33	23	14	14	24	12	10	9	11	26	18	92	
24-Jun	20	12	24	22	18	13	14	14	14	10	13	15	15	23	27	8	14	27	24	54	10	9	10	13	54	
25-Jun	15	15	13	12	15	14	16	16	22	14	14	11	16	15	15	15	15	14	12	14	53	38	5	4	53	
26-Jun	5	15	19	44	6	9	15	25	29	32	103	53	21	86	20	72	10	21	10	13	35	9	72	11	103	
27-Jun	16	9	6	7	14	11	11	12	14	16	37	15	14	12	81	67	26	15	31	10	48	18	54	23	81	
28-Jun	12	15	13	8	14	25	15	38	28	79	16	20	56	18	25	20	18	13	12	10	8	8	7	17	79	
29-Jun	13	14	34	10	63	36	26	42	62	57	29	35	31	89	87	57	55	34	20	8	5	5	7	7	89	
30-Jun	8	6	5	7	6	11	14	12	38	14	13	43	20	34	20	22	15	15	10	9	11	11	19	5	43	
	71	62	87	75	63	36	58	91	95	79	103	57	86	89	87	81	57	42	99	92	53	86	72	82		
Diurnal Maximum																										





Direction of Maximum Speed: 162 deg on Jun 15 14:00 Direction of Maximum Daily Speed Average: 16.6 deg on Jun 9	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0
Direction of Minimum Speed: 245 deg on Jun 2 07:00 Direction of Minimum Daily Speed Average: 3.0 deg on Jun 20	Percent Operational Time: 100.0
Monthly Average Direction: 265.9 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-Jun	158	160	169	166	158	152	152	131	152	154	150	148	231	305	269	183	135	129	150	163	142	135	138	153	156.1
2-Jun	138	165	152	313	100	162	245	219	3	49	116	113	104	91	55	224	226	131	71	116	208	238	118	57	157.5
3-Jun	251	228	208	227	237	219	187	197	229	245	232	228	236	250	304	341	321	338	32	11	46	124	143	127	251.0
4-Jun	265	250	241	242	247	251	257	265	264	263	279	299	264	274	245	282	324	295	299	304	303	334	328	288	274.5
5-Jun	292	313	282	265	269	259	253	281	300	296	304	303	310	312	315	349	350	356	37	48	60	80	118	132	316.1
6-Jun	132	132	133	131	129	127	129	135	136	132	126	131	119	143	144	152	145	170	171	152	149	134	180	282	143.9
7-Jun	214	206	213	222	252	244	258	274	288	306	282	317	346	30	327	337	317	342	342	336	337	342	346	352	317.8
8-Jun	354	351	22	343	335	337	340	336	315	333	345	355	7	51	51	42	139	150	123	96	74	86	80	59	46.4
9-Jun	66	42	32	42	41	26	23	21	21	21	31	27	23	19	11	8	8	3	5	3	357	349	346	348	16.6
10-Jun	347	335	334	343	301	269	270	293	340	333	332	348	356	10	8	62	55	50	65	63	37	39	58	86	3.8
11-Jun	115	115	131	136	126	129	127	129	130	126	131	139	134	128	127	123	121	130	128	120	122	93	105	125	126.6
12-Jun	148	160	140	133	172	195	198	173	197	173	175	187	226	207	203	228	256	255	255	248	226	232	232	231	214.0
13-Jun	233	234	240	237	236	229	227	223	235	237	219	230	234	244	239	235	234	245	237	248	232	235	235	219	234.4
14-Jun	260	195	168	156	137	126	140	127	121	91	45	120	114	105	120	120	107	119	126	136	148	143	112	109	132.0
15-Jun	124	107	102	102	93	129	106	111	127	148	150	155	161	162	168	166	175	171	167	166	201	187	155	152	153.8
16-Jun	148	150	143	146	150	161	165	160	168	179	191	210	208	205	195	187	210	227	229	234	286	251	255	238	185.0
17-Jun	236	246	246	268	270	269	270	271	301	293	284	289	285	277	272	276	265	250	262	331	43	349	5	356	281.6
18-Jun	274	287	280	292	284	257	263	266	268	265	276	266	240	239	257	269	284	262	177	130	148	352	31	25	276.5
19-Jun	355	330	315	294	280	286	249	292	341	347	334	325	324	327	331	339	344	341	349	357	2	360	357	356	334.2
20-Jun	323	294	288	289	299	289	306	130	181	252	273	327	359	65	68	70	112	130	130	142	158	148	152	157	157.5
21-Jun	159	157	159	153	150	146	141	129	129	127	180	144	153	141	121	104	63	37	52	77	142	161	173	170	148.3
22-Jun	154	154	162	152	152	141	142	139	132	129	123	84	32	2	300	153	140	212	236	256	239	242	225	233	188.4
23-Jun	238	228	265	261	231	247	281	34	54	49	283	277	287	298	297	331	332	357	6	36	58	64	19	333	314.5
24-Jun	317	19	40	346	3	358	352	355	334	330	321	316	331	316	304	328	336	8	41	309	310	319	341	355	337.1
25-Jun	16	20	3	344	357	347	346	1	346	360	8	17	8	16	17	13	11	16	18	29	59	148	230	231	6.8
26-Jun	241	279	288	273	179	157	162	156	138	124	131	122	157	336	345	213	220	198	170	171	205	260	302	243	212.9
27-Jun	275	243	240	246	236	247	247	246	264	263	248	253	253	227	21	196	158	218	235	253	265	188	154	188	238.3
28-Jun	203	202	236	257	239	240	247	289	3	316	275	274	321	339	357	358	17	12	12	23	23	34	48	59	354.4
29-Jun	85	91	118	120	63	58	131	133	59	64	52	79	35	64	67	166	112	108	139	154	142	139	141	140	117.5
30-Jun	137	132	130	133	132	128	121	128	78	70	78	106	129	115	114	104	120	117	135	130	145	135	165	192	129.7

180.8 188.0 198.3 206.0 203.3 203.0 212.1 214.7 251.2 254.2 236.7 234.8 252.8 255.0 293.1 278.8 287.9 253.7 161.1 97.2 130.2 154.9 117.5 168.6

Diurnal Average

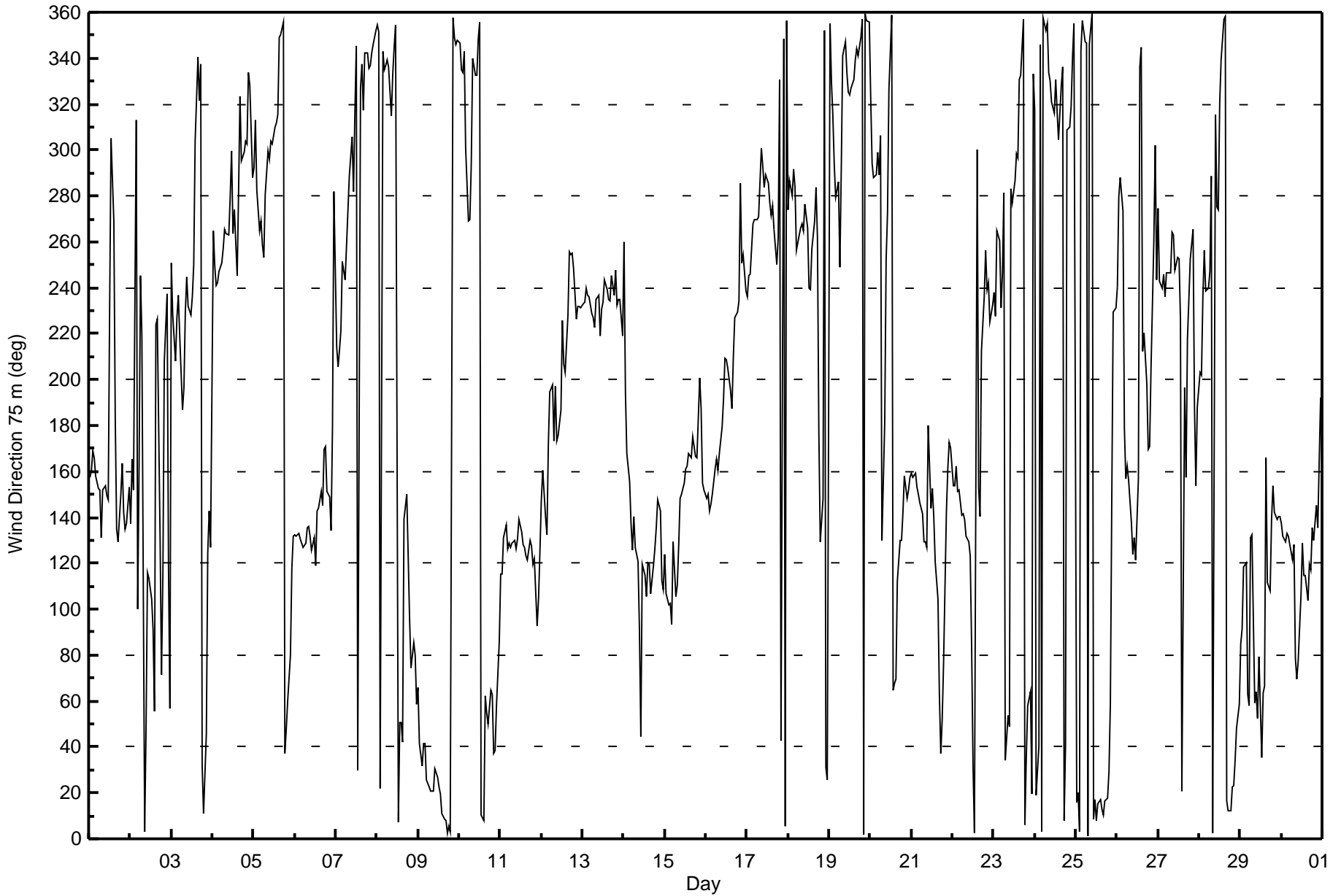
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction 75 m (WD75m) - deg
Mannix - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 101 deg on Jun 3 19:00 Minimum Value: 1 deg on Jun 20 22:00 Percentiles: P ₁ = 4 P ₁₀ = 6 Q ₁ = 8 Median = 13 Q ₃ = 20 P ₉₀ = 36 P ₉₉ = 87																	Hours in Service: 720 Hours of Data: 720 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-Jun	3	5	5	6	6	5	11	9	9	8	10	18	73	47	31	7	17	11	13	6	9	8	7	4	73		
2-Jun	11	27	25	60	58	13	89	69	69	78	39	30	26	35	18	87	12	49	13	21	39	29	18	38	89		
3-Jun	75	35	24	9	5	10	9	14	12	11	12	15	13	15	35	21	23	23	101	26	15	30	23	45	101		
4-Jun	96	12	4	5	7	7	7	7	8	9	15	14	15	35	17	16	22	13	12	6	6	26	19	8	96		
5-Jun	24	6	27	5	6	17	19	21	14	33	22	18	19	24	30	23	17	18	32	9	8	19	17	7	33		
6-Jun	5	5	6	5	5	7	6	8	9	11	12	12	14	18	14	14	12	8	7	8	17	37	15	70	70		
7-Jun	13	27	31	31	15	5	10	9	24	17	26	62	25	19	17	29	13	12	12	11	6	3	3	6	62		
8-Jun	8	30	29	10	8	10	13	20	19	18	21	14	12	14	13	34	51	10	16	15	11	15	11	10	51		
9-Jun	11	8	8	7	8	10	8	8	7	7	7	7	7	7	6	6	6	7	6	6	8	9	8	7	11		
10-Jun	6	7	8	29	15	4	9	30	17	14	15	21	29	26	35	38	42	30	17	17	4	5	11	14	42		
11-Jun	17	14	15	7	8	5	6	6	6	10	8	11	11	10	12	14	14	8	14	12	12	17	14	11	17		
12-Jun	11	23	52	20	11	14	24	15	10	13	10	18	13	8	10	19	16	9	8	6	7	6	7	7	52		
13-Jun	6	7	6	6	6	7	7	10	16	13	12	13	11	13	12	10	13	11	11	8	7	4	15	5	16		
14-Jun	29	29	15	9	13	12	15	18	19	35	37	23	19	21	16	14	17	13	11	16	11	7	17	18	37		
15-Jun	12	16	15	14	14	27	29	18	11	14	8	10	8	7	9	10	9	17	12	29	18	21	11	5	29		
16-Jun	4	5	6	5	5	9	8	8	11	10	12	13	14	13	13	13	20	15	12	23	17	6	6	12	23		
17-Jun	6	4	5	11	9	6	6	9	11	8	9	8	13	9	12	10	11	12	8	36	15	54	12	56	56		
18-Jun	15	7	5	6	12	6	8	7	8	10	15	15	12	17	15	13	16	29	52	9	25	79	7	9	79		
19-Jun	22	24	8	6	7	13	15	18	17	11	17	21	16	12	13	13	11	15	12	12	7	7	5	6	24		
20-Jun	22	4	5	5	7	6	61	40	62	47	36	44	43	29	23	13	20	9	7	8	4	1	4	3	62		
21-Jun	2	4	4	5	3	5	10	10	13	26	34	21	14	20	15	25	43	18	28	79	15	4	5	7	79		
22-Jun	5	5	4	8	6	5	8	16	21	19	24	32	47	61	25	82	26	11	14	10	8	11	4	6	82		
23-Jun	18	9	15	19	12	15	31	92	50	83	85	14	16	35	22	13	11	23	10	8	7	8	27	18	92		
24-Jun	15	14	21	16	11	15	10	14	12	10	12	15	14	22	27	7	12	25	22	52	9	9	10	11	52		
25-Jun	12	12	11	11	13	13	12	14	20	12	12	10	14	14	12	13	14	12	10	11	46	39	7	5	46		
26-Jun	8	20	10	40	7	7	12	23	32	41	95	46	18	84	20	86	10	15	9	10	31	9	62	12	95		
27-Jun	9	8	5	4	7	7	12	13	14	16	37	14	13	11	80	65	24	15	26	9	36	17	58	24	80		
28-Jun	14	17	10	6	11	15	20	43	21	72	14	17	61	16	23	18	15	12	10	8	5	6	6	12	72		
29-Jun	14	14	28	12	40	30	24	37	62	47	24	30	26	87	81	58	46	34	18	7	4	4	6	5	87		
30-Jun	5	5	6	5	4	8	17	13	27	14	14	38	16	31	19	22	16	16	7	7	10	12	18	5	38		
																	96 35 52 60 58 30 89 92 69 83 95 62 73 87 81 87 51 49 101 79 46 79 62 70										
Diurnal Maximum																											





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

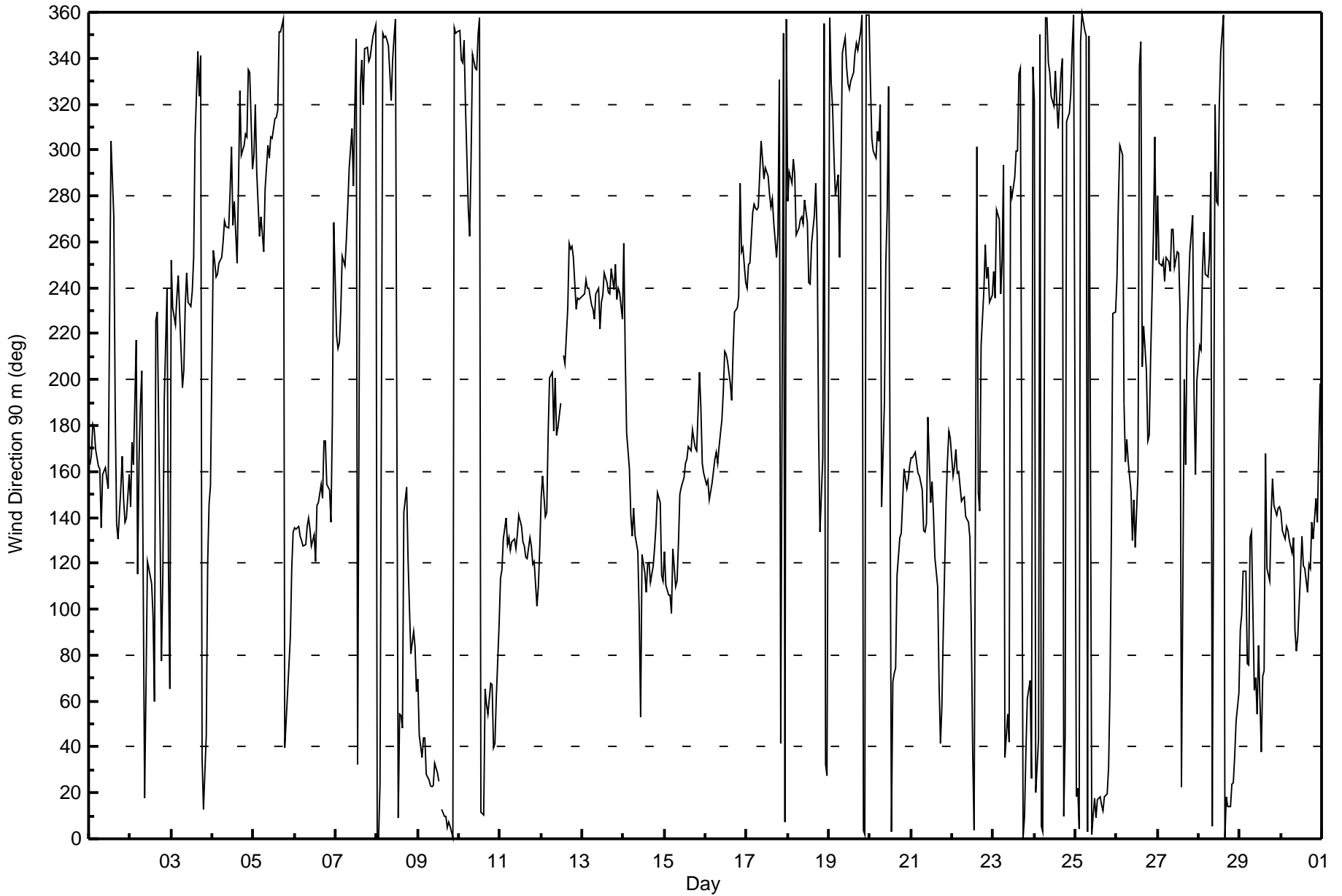
Wind Direction 90 m (WD90m) - deg
Mannix - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 100 deg on Jun 3 19:00	Hours of Data: 718
Minimum Value: 1 deg on Jun 21 01:00	Hours of Missing Data: 2
Percentiles: P ₁ = 3 P ₁₀ = 5 Q ₁ = 7 Median = 12 Q ₃ = 19 P ₉₀ = 35 P ₉₉ = 84	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-Jun	3	6	5	7	7	5	10	7	11	8	11	18	65	53	31	7	18	10	12	6	9	7	7	5	65
2-Jun	11	27	22	85	62	11	98	59	74	70	40	31	26	35	19	83	10	52	12	17	33	25	14	41	98
3-Jun	67	35	21	6	5	8	9	14	13	10	11	14	12	14	34	23	23	23	100	27	14	26	16	43	100
4-Jun	38	11	4	5	7	7	7	7	8	9	14	13	14	34	17	16	21	13	12	6	6	24	18	8	38
5-Jun	22	8	39	5	3	15	16	22	14	35	22	18	20	24	29	22	17	17	31	9	7	17	13	7	39
6-Jun	4	4	4	4	3	3	3	9	8	9	10	12	11	19	14	14	12	7	7	7	15	34	14	57	57
7-Jun	11	22	27	27	13	5	8	9	24	18	24	59	25	20	18	32	13	12	12	11	5	3	3	6	59
8-Jun	7	35	23	9	7	8	12	19	20	19	21	14	12	15	13	34	51	10	14	8	9	13	9	10	51
9-Jun	11	8	7	7	8	10	7	7	7	6	7	6	6	UO	6	6	6	6	6	5	7	8	7	6	11
10-Jun	6	7	8	14	16	6	8	29	18	13	15	21	28	25	36	39	41	30	18	17	3	4	12	11	41
11-Jun	11	9	13	6	6	3	4	3	4	6	7	11	10	9	10	11	11	8	12	7	7	12	6	7	13
12-Jun	10	16	37	21	9	12	23	14	9	13	9	17	UO	8	10	19	15	8	8	5	8	6	7	7	37
13-Jun	6	7	6	5	6	6	6	9	16	12	12	12	11	12	12	10	12	11	11	8	6	4	11	4	16
14-Jun	25	26	13	12	12	10	14	16	17	33	40	23	16	18	12	11	14	8	8	17	12	6	12	13	40
15-Jun	10	11	10	9	10	25	27	13	9	14	7	9	8	7	8	10	9	16	11	28	16	20	10	5	28
16-Jun	5	5	5	4	5	8	8	8	10	10	12	13	14	12	13	12	20	15	11	22	16	5	6	12	22
17-Jun	5	5	5	11	9	6	6	9	11	7	8	8	12	9	12	10	11	12	7	34	16	57	11	55	57
18-Jun	13	7	5	5	11	7	8	7	7	10	14	15	11	17	15	13	16	28	50	10	26	75	6	8	75
19-Jun	20	21	8	6	7	13	13	18	16	10	16	21	16	11	13	13	10	14	11	11	7	7	5	6	21
20-Jun	20	5	4	5	7	7	59	40	43	45	40	48	42	32	23	14	21	8	7	7	4	1	3	3	59
21-Jun	1	3	5	10	4	3	12	8	13	24	32	20	14	19	15	25	47	18	32	78	13	4	3	6	78
22-Jun	5	6	4	10	6	4	7	16	22	20	24	37	44	62	27	79	24	11	14	10	7	9	4	5	79
23-Jun	17	8	15	14	11	12	25	97	67	92	87	13	15	36	21	12	10	22	10	7	6	9	28	18	97
24-Jun	14	16	19	15	9	14	8	13	12	10	11	14	14	21	26	8	12	24	23	53	9	9	9	10	53
25-Jun	11	10	10	10	12	12	12	13	19	11	12	10	13	13	12	13	13	11	10	11	45	38	8	5	45
26-Jun	10	19	7	36	17	5	8	19	30	32	74	42	18	85	21	78	10	11	8	8	29	9	57	12	85
27-Jun	7	7	5	4	5	6	11	14	15	15	34	14	12	11	80	65	23	14	22	8	30	15	55	24	80
28-Jun	12	18	10	6	10	9	19	42	24	70	12	17	62	14	21	17	15	12	10	7	4	6	6	11	70
29-Jun	13	10	20	8	37	30	22	35	56	45	24	33	25	83	77	54	43	37	19	7	4	4	5	4	83
30-Jun	4	4	5	4	3	7	14	15	24	14	13	36	16	28	17	20	13	13	7	7	10	13	19	5	36

67	35	39	85	62	30	98	97	74	92	87	59	65	85	80	83	51	52	100	78	45	75	57	57	
Diurnal Maximum																								

UO - Unstable Operation





Maximum Value: 1.4 km/h on Jun 8 22:00		Maximum Daily Average: 0.7 km/h on Jun 11		Hours in Service:	720																						
Minimum Value: -1.1 km/h on Jun 17 10:00		Minimum Daily Average: -0.3 km/h on Jun 4		Hours of Data:	720																						
Maximum Diurnal Average: 0.3 km/h at hour 23		Minimum Diurnal Average: 0.1 km/h at hour 16		Hours of Missing Data:	0																						
Monthly Average: 0.18 km/h		Percentiles: $P_1 = -0.7$ $P_{10} = -0.3$ $Q_1 = -0.1$ Median = 0.1 $Q_3 = 0.5$ $P_{90} = 0.8$ $P_{99} = 1.2$		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-Jun	0.5	0.5	0.6	0.7	0.4	0.5	0.5	0.7	0.7	0.5	0.7	0.5	0.1	0.2	-0.3	0.0	0.5	0.7	0.4	0.2	0.5	0.5	0.3	0.4	0.4	0.7	
2-Jun	0.3	0.0	-0.1	-0.1	0.1	-0.1	0.1	0.1	0.1	0.3	0.2	0.2	0.5	0.4	0.5	0.6	-0.4	-0.3	0.7	1.2	0.4	-0.1	-0.1	0.6	0.3	0.2	1.2
3-Jun	0.1	-0.1	0.1	-0.1	-0.2	0.0	0.3	0.1	-0.3	-0.2	-0.2	-0.2	-0.3	-0.2	0.2	-0.3	-0.3	-0.4	0.1	0.1	0.7	0.2	0.0	0.2	0.0	0.7	
4-Jun	0.2	-0.1	-0.3	-0.5	-0.5	-0.4	-0.2	-0.2	0.0	-0.2	-0.1	-0.7	0.0	-0.5	-0.2	-0.3	-0.4	-0.7	-0.8	-0.9	-0.7	-0.3	-0.1	0.0	-0.3	0.2	
5-Jun	-0.1	-0.3	0.1	0.0	0.1	-0.1	-0.2	-0.2	-0.3	-0.1	-0.2	-0.4	-0.3	-0.4	-0.1	-0.3	0.0	0.0	0.7	0.9	0.8	0.9	0.7	0.8	0.1	0.9	
6-Jun	0.7	0.7	0.6	0.6	0.6	0.6	0.4	0.5	0.5	0.7	0.8	0.9	1.0	0.8	1.0	0.6	0.9	0.2	0.0	1.0	1.0	1.0	0.1	0.0	0.6	1.0	
7-Jun	-0.2	0.0	0.0	0.1	0.1	-0.1	0.1	0.0	-0.1	-0.2	-0.2	-0.2	0.0	0.5	-0.1	0.4	-0.4	-0.1	-0.2	-0.3	-0.1	-0.1	0.0	-0.2	-0.1	0.5	
8-Jun	-0.1	0.0	0.0	-0.2	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.2	0.7	0.7	0.7	0.6	0.6	0.4	0.6	0.9	1.4	1.3	1.0	0.4	1.4	
9-Jun	1.2	1.0	0.5	1.1	0.9	0.4	0.3	0.4	0.5	0.3	0.6	0.8	0.9	0.4	0.0	0.2	0.1	0.0	-0.2	-0.1	-0.1	-0.2	0.0	-0.1	0.4	1.2	
10-Jun	-0.2	-0.2	0.0	0.1	-0.2	-0.1	-0.3	0.1	0.1	0.1	-0.2	0.2	0.4	0.6	0.3	0.9	0.6	0.9	0.6	0.8	0.7	0.3	0.6	0.7	0.3	0.9	
11-Jun	0.6	1.0	0.8	0.5	0.5	0.4	0.5	0.3	0.5	0.6	0.7	0.6	0.9	0.8	1.2	0.7	0.6	0.9	0.6	0.9	0.5	0.8	1.0	0.4	0.7	1.2	
12-Jun	0.1	0.0	0.2	0.4	0.2	0.1	0.0	0.4	0.0	0.1	-0.1	-0.1	-0.5	-0.3	-0.2	-0.4	-0.1	0.0	0.2	-0.2	-0.3	-0.3	-0.4	-0.3	-0.1	0.4	
13-Jun	-0.4	-0.3	-0.2	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.1	-0.4	-0.4	-0.4	-0.6	-0.4	-0.5	-0.2	-0.1	-0.4	0.1	-0.3	-0.4	0.0	-0.1	-0.3	0.1	
14-Jun	0.1	0.1	0.0	0.2	0.4	0.4	0.5	0.4	0.5	0.4	0.1	0.8	1.0	0.9	0.7	0.8	0.9	0.9	0.6	0.6	0.9	0.8	1.0	0.7	0.6	1.0	
15-Jun	0.5	0.8	1.1	1.3	1.3	0.9	0.9	1.0	0.8	1.0	1.3	1.1	0.7	0.6	0.4	0.4	-0.1	0.3	0.0	0.3	0.0	-0.2	0.4	0.5	0.6	1.3	
16-Jun	0.6	0.6	0.7	0.9	0.8	0.5	0.5	0.7	0.2	0.1	-0.2	-0.3	-0.5	-0.3	-0.2	-0.2	-0.3	-0.3	-0.1	0.1	-0.3	-0.1	-0.1	-0.2	0.1	0.9	
17-Jun	-0.2	-0.1	-0.2	0.0	-0.3	0.1	0.0	0.0	-0.8	-1.1	-0.6	-0.7	-0.4	-0.1	-0.2	-0.5	-0.1	-0.3	0.1	0.0	0.6	0.1	0.0	0.1	-0.2	0.6	
18-Jun	0.0	-0.5	0.3	-0.4	0.0	-0.1	0.0	0.1	0.0	0.1	0.0	-0.2	-0.2	-0.2	0.1	-0.1	-0.2	-0.2	0.3	0.5	0.3	-0.2	0.8	0.1	0.0	0.8	
19-Jun	-0.2	0.1	-0.2	0.0	-0.1	-0.3	-0.2	-0.2	0.1	0.2	-0.1	-0.3	-0.4	-0.6	-0.7	-0.5	-0.3	-0.2	-0.2	0.1	-0.2	-0.2	-0.1	-0.2	-0.2	0.2	
20-Jun	0.0	-0.2	-0.2	0.0	-0.1	-0.1	0.0	0.5	0.3	-0.1	-0.3	0.0	0.5	1.0	1.0	1.1	0.6	0.3	0.5	0.4	0.4	0.5	0.5	0.6	0.3	1.1	
21-Jun	0.6	0.6	0.4	0.5	0.4	0.4	0.5	0.6	0.6	0.2	0.1	0.7	0.3	0.5	0.9	0.7	0.7	0.3	0.6	0.2	0.2	0.2	-0.1	0.2	0.4	0.9	
22-Jun	0.5	0.4	0.3	0.4	0.3	0.5	0.3	0.6	0.4	0.5	0.4	1.2	0.4	0.1	-0.1	0.2	0.3	-0.3	-0.1	0.0	-0.3	-0.3	-0.3	-0.1	0.2	1.2	
23-Jun	-0.1	-0.2	0.0	-0.1	-0.1	-0.2	-0.1	0.3	0.6	0.2	0.3	-0.1	0.0	-0.1	-0.5	-0.3	-0.4	0.1	0.0	0.7	1.0	0.9	0.1	-0.3	0.1	1.0	
24-Jun	-0.1	0.5	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.2	-0.2	-0.4	-0.2	0.0	-0.2	-0.8	-0.5	0.3	0.6	0.1	-0.3	-0.3	-0.3	0.0	-0.1	0.6	
25-Jun	0.1	0.2	0.1	0.0	0.1	0.0	0.0	0.2	0.0	-0.2	0.1	0.4	0.2	0.5	0.4	0.2	0.0	0.3	0.2	0.7	0.5	-0.1	0.0	0.0	0.2	0.7	
26-Jun	0.1	0.0	0.0	0.0	-0.1	0.2	0.3	0.5	0.4	0.3	0.4	0.8	0.4	-0.1	0.0	-0.1	-0.2	-0.1	0.3	0.3	0.0	-0.1	0.3	-0.2	0.1	0.8	
27-Jun	-0.1	-0.3	-0.2	-0.3	-0.2	-0.3	-0.3	-0.1	-0.1	-0.4	0.1	-0.3	-0.2	-0.5	0.6	0.1	0.3	0.0	0.1	0.0	0.1	0.0	0.5	0.1	-0.1	0.6	
28-Jun	-0.1	-0.1	-0.1	-0.2	-0.1	0.2	-0.1	0.0	0.1	0.2	-0.2	-0.2	-0.1	-0.3	0.2	0.0	0.4	0.1	0.2	0.3	0.1	0.7	0.6	0.4	0.1	0.7	
29-Jun	0.8	1.3	0.4	0.5	0.2	0.4	0.4	0.3	0.4	0.5	1.0	0.4	0.5	-0.1	0.3	0.1	0.2	0.3	0.2	0.3	0.5	0.6	0.7	0.5	0.4	1.3	
30-Jun	0.6	0.8	0.8	0.5	0.4	0.2	0.5	0.3	0.3	0.3	0.8	0.6	0.5	0.8	0.8	1.2	1.0	0.9	0.6	0.5	0.5	0.5	0.2	-0.1	0.6	1.2	
																								Diurnal Average			
																								Diurnal Maximum			



Wood Buffalo Environmental Association

Summary of Hour Standard Deviations

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

Mannix - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 5.2 km/h on Jun 15 14:00 Minimum Value: 0.2 km/h on Jun 25 23:00 Percentiles: P ₁ = 0.3 P ₁₀ = 0.7 Q ₁ = 1.1 Median = 1.6 Q ₃ = 2.2 P ₉₀ = 2.9 P ₉₉ = 4.0																								Hours in Service: 720 Hours of Data: 720 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-Jun	1.8	1.7	1.9	1.7	1.1	1.7	1.4	1.7	2.0	1.6	2.0	2.1	1.0	1.4	1.8	2.0	1.4	1.9	2.0	1.5	1.1	1.3	0.8	0.6	2.1
2-Jun	0.4	0.4	0.4	0.3	0.2	0.6	0.8	1.1	1.2	1.4	1.4	1.7	1.9	1.8	1.5	2.9	2.2	1.3	1.6	0.9	0.6	1.2	0.6	0.7	2.9
3-Jun	0.4	0.6	0.7	0.8	0.7	1.1	1.2	1.3	1.5	1.6	1.6	2.2	2.8	2.8	2.5	3.2	2.4	2.1	1.0	1.9	1.4	0.5	0.7	0.4	3.2
4-Jun	0.4	0.9	1.7	2.6	2.8	3.1	2.8	2.6	2.4	2.5	2.7	2.8	2.3	2.6	2.1	2.3	2.8	3.2	3.2	3.0	2.3	1.3	0.4	0.5	3.2
5-Jun	1.3	1.3	0.5	0.4	0.5	1.0	1.1	1.2	1.9	1.8	2.6	2.5	2.4	2.4	2.4	2.2	2.0	1.8	1.6	1.4	1.2	1.1	1.7	2.2	2.6
6-Jun	2.2	2.3	1.9	1.9	1.6	1.5	1.5	1.7	1.8	1.6	2.1	2.4	2.6	3.0	3.2	3.2	2.8	3.2	3.5	3.4	3.1	1.9	2.0	0.8	3.5
7-Jun	0.5	0.5	0.6	0.6	0.8	0.9	1.3	1.5	1.7	2.0	1.8	1.8	2.9	2.0	1.6	1.8	2.2	2.5	2.1	1.9	2.0	2.0	1.9	0.9	2.9
8-Jun	0.4	0.4	0.3	0.5	0.3	0.8	0.9	0.7	1.0	1.0	1.2	1.2	1.5	1.4	1.2	1.5	1.6	2.0	1.3	1.0	1.2	2.2	2.0	1.7	2.2
9-Jun	1.9	2.3	2.6	2.6	2.1	2.4	2.5	2.6	3.0	2.5	3.0	3.1	2.9	3.1	3.4	3.7	3.5	3.7	3.2	3.2	3.0	2.9	2.9	2.3	3.7
10-Jun	1.8	1.1	0.7	0.4	0.5	0.7	0.9	1.4	2.1	2.4	2.2	2.4	2.3	2.1	2.0	1.8	1.8	1.6	1.2	1.1	1.2	0.9	0.9	0.9	2.4
11-Jun	1.6	1.8	1.8	1.1	1.0	1.5	1.4	1.3	1.4	1.8	2.2	2.6	2.9	2.5	2.9	2.2	2.0	2.9	2.4	2.4	1.4	1.2	1.4	1.0	2.9
12-Jun	0.7	0.3	0.6	0.8	0.9	1.3	1.3	1.6	1.8	1.9	2.1	2.1	1.9	1.8	2.2	2.3	1.9	2.0	1.4	1.0	1.9	2.2	2.5	2.2	2.5
13-Jun	2.3	2.2	2.3	2.0	1.9	2.0	2.1	2.2	2.3	2.7	2.9	3.2	3.4	3.4	3.4	3.1	2.7	2.4	2.6	2.0	1.7	1.0	0.9	0.5	3.4
14-Jun	0.6	0.5	0.5	0.6	1.0	1.0	1.4	1.2	1.3	1.4	1.5	1.8	2.4	2.1	2.1	2.2	1.8	2.9	2.2	2.3	3.7	2.9	1.5	1.5	3.7
15-Jun	1.7	1.6	2.1	2.8	2.5	2.6	1.5	1.8	3.0	4.3	4.7	5.1	5.1	5.2	4.9	5.0	4.1	3.3	2.5	1.1	1.7	1.7	1.0	1.2	5.2
16-Jun	1.6	2.0	2.4	2.5	2.5	2.8	3.7	3.8	3.8	3.9	3.7	3.1	3.1	3.1	3.3	3.0	2.3	2.1	1.6	1.4	1.5	0.8	1.3	1.4	3.9
17-Jun	1.0	0.9	1.0	0.9	0.7	1.3	1.8	2.1	3.1	2.9	2.8	2.8	2.7	2.9	2.6	2.7	2.5	2.0	1.1	1.6	1.0	1.9	2.1	1.2	3.1
18-Jun	1.1	1.8	1.3	1.7	1.6	1.4	1.5	1.7	1.9	1.9	2.3	1.9	2.1	2.1	2.1	2.1	2.0	1.5	1.3	1.1	0.6	2.7	2.4	0.9	2.7
19-Jun	1.0	0.7	1.0	0.7	0.6	0.8	1.1	1.4	1.9	2.5	2.6	2.7	3.2	3.6	3.7	3.1	3.4	3.4	2.9	2.0	1.4	1.3	0.8	1.1	3.7
20-Jun	0.5	0.4	0.5	0.4	0.4	0.6	0.8	1.1	1.4	1.4	1.5	1.8	1.9	2.0	1.9	1.8	1.5	1.4	1.4	1.2	1.1	0.8	0.9	1.3	2.0
21-Jun	1.3	1.4	1.3	1.2	1.2	1.4	1.6	1.4	1.3	1.4	2.1	2.7	2.7	2.4	2.0	1.7	1.7	1.3	1.1	0.7	0.6	1.3	1.0	0.7	2.7
22-Jun	1.1	1.0	0.9	1.0	0.8	1.3	1.5	1.3	1.2	1.3	1.4	1.6	1.9	2.0	1.5	1.1	1.4	2.5	2.5	1.8	1.5	1.0	1.1	0.9	2.5
23-Jun	1.0	1.0	0.5	0.6	0.8	1.1	0.9	1.1	1.3	1.5	1.4	1.8	1.4	1.8	2.1	2.8	2.3	1.6	1.6	1.7	1.5	1.2	0.9	1.7	2.8
24-Jun	1.2	1.1	0.6	0.9	1.0	0.9	1.3	1.9	2.0	2.5	2.2	2.1	2.3	2.1	2.5	2.6	2.3	2.2	1.4	1.2	1.9	1.5	1.5	1.4	2.6
25-Jun	1.5	1.1	0.7	1.2	1.5	1.5	2.0	1.6	2.1	2.1	2.4	2.3	2.2	2.3	2.2	2.4	2.2	2.3	2.0	1.5	1.0	0.3	0.2	0.3	2.4
26-Jun	0.2	0.5	0.4	0.4	0.8	1.1	0.9	1.1	1.3	1.3	1.5	1.7	1.9	2.0	2.1	0.9	1.7	1.2	1.5	2.0	1.1	2.4	1.1	0.9	2.4
27-Jun	0.6	0.9	0.9	0.9	0.7	1.0	1.2	1.3	1.5	1.6	1.7	2.2	2.5	3.0	2.9	1.6	1.6	2.1	1.6	1.3	0.7	0.9	0.9	0.8	3.0
28-Jun	0.5	0.6	0.4	0.3	0.6	0.8	1.0	1.4	1.6	1.7	2.0	1.9	2.0	2.4	3.0	2.8	2.7	2.6	2.3	2.2	1.8	1.7	1.3	1.2	3.0
29-Jun	1.3	1.7	1.0	0.8	0.4	0.6	1.1	1.2	1.3	1.6	2.1	1.8	2.1	1.8	1.7	1.7	1.5	1.3	1.1	1.3	1.2	1.8	2.3	2.1	2.3
30-Jun	1.7	2.0	1.8	1.7	1.5	0.9	1.1	1.0	0.6	0.7	1.2	1.8	2.0	2.1	2.3	2.3	2.3	2.1	1.9	1.9	1.4	1.1	1.2	0.9	2.3
Diurnal Maximum																									
2.3 2.3 2.6 2.8 2.8 3.1 3.7 3.8 3.8 4.3 4.7 5.1 5.1 5.2 4.9 5.0 4.1 3.7 3.5 3.4 3.7 2.9 2.9 2.3																									



Maximum Value: 3.6 km/h on Jun 15 12:00		Maximum Daily Average: 1.4 km/h on Jun 15		Hours in Service: 720																							
Minimum Value: -1.7 km/h on Jun 19 15:00		Minimum Daily Average: -0.6 km/h on Jun 19		Hours of Data: 720																							
Maximum Diurnal Average: 0.4 km/h at hour 12		Minimum Diurnal Average: 0.1 km/h at hour 17		Hours of Missing Data: 0																							
Monthly Average: 0.25 km/h		Percentiles: P ₁ = -1.2 P ₁₀ = -0.5 Q ₁ = -0.2 Median = 0.1 Q ₃ = 0.7 P ₉₀ = 1.3 P ₉₉ = 2.3		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-Jun	1.6	1.7	1.6	1.7	1.0	1.6	1.0	1.2	1.4	1.3	1.5	1.6	0.2	0.2	-0.3	0.5	0.9	1.1	1.0	0.8	1.1	1.2	0.9	0.9	1.1	1.7	
2-Jun	0.5	0.3	0.2	-0.1	0.2	0.1	0.1	0.5	0.2	-0.4	0.0	0.6	0.3	0.5	0.4	-0.3	0.0	0.7	0.8	0.3	0.1	-0.1	0.4	0.2	0.2	0.8	
3-Jun	0.1	0.0	0.3	0.1	-0.1	0.1	0.6	0.3	-0.2	-0.5	-0.2	0.1	0.0	0.1	0.2	-1.1	-0.3	-0.8	0.3	-0.4	0.3	0.5	0.6	0.2	0.0	0.6	
4-Jun	0.0	-0.2	-0.3	-0.5	-0.5	-0.6	-0.2	-0.4	-0.1	-0.5	-0.3	-0.2	-0.1	-0.5	-0.2	-0.5	-0.9	-0.6	-0.9	-1.0	-0.6	-0.4	-0.2	-0.3	-0.4	0.0	
5-Jun	-0.5	-0.5	0.0	0.0	0.0	-0.1	-0.4	-0.3	-0.3	-0.2	0.0	-0.2	-0.3	-0.5	-0.2	-0.9	-0.2	-0.4	0.5	0.4	0.4	0.6	0.7	1.4	0.0	1.4	
6-Jun	1.6	1.4	1.3	1.4	1.2	1.2	1.0	1.0	1.2	1.3	1.1	1.6	1.2	2.0	2.0	1.7	1.7	1.4	1.3	2.4	2.1	1.2	0.9	-0.1	1.4	2.4	
7-Jun	0.0	0.2	0.2	0.1	0.0	-0.1	0.0	-0.1	-0.3	-0.4	-0.2	-0.1	-0.8	0.0	-0.4	0.7	-0.5	-0.6	-0.9	-1.0	-1.2	-1.2	-1.0	-0.8	-0.3	0.7	
8-Jun	-0.3	-0.2	-0.1	-0.4	-0.2	-0.1	0.0	0.0	0.0	0.1	-0.1	-0.4	0.2	0.4	0.3	0.4	1.1	1.4	0.8	0.5	0.5	0.9	0.8	0.5	0.3	1.4	
9-Jun	0.8	0.1	-0.2	0.3	0.2	0.1	-0.2	-0.4	0.0	-0.2	-0.1	-0.1	0.1	-0.5	-0.9	-1.2	-1.3	-1.4	-1.0	-1.2	-1.0	-1.3	-0.8	-1.0	-0.5	0.8	
10-Jun	-1.1	-0.8	-0.2	0.0	-0.2	0.0	-0.1	0.2	0.3	-0.1	-0.8	0.1	0.4	0.3	0.1	0.9	0.3	0.8	0.1	0.6	0.2	-0.2	0.2	0.7	0.1	0.9	
11-Jun	1.1	1.0	1.4	1.0	0.7	1.0	0.8	0.6	0.9	0.7	1.2	1.6	1.8	1.3	1.8	1.0	0.9	1.6	1.1	1.1	0.8	0.5	0.6	0.7	1.0	1.8	
12-Jun	0.5	0.0	0.1	0.4	0.5	0.3	0.2	0.9	0.2	0.6	0.6	0.4	-0.3	0.2	0.5	0.0	-0.3	-0.1	-0.1	-0.2	-0.2	0.0	-0.3	-0.1	0.2	0.9	
13-Jun	-0.1	-0.3	-0.3	-0.4	-0.3	-0.1	-0.1	0.0	-0.2	0.1	0.0	0.1	-0.2	-0.2	-0.2	-0.2	0.0	-0.1	-0.2	0.1	-0.2	-0.2	-0.1	-0.1	-0.1	0.1	
14-Jun	0.0	0.4	0.5	0.5	0.8	0.6	1.0	0.6	0.6	0.4	-0.3	0.9	1.2	0.7	1.1	1.2	1.1	1.2	1.1	1.3	2.3	1.9	0.8	0.8	0.9	2.3	
15-Jun	0.7	0.9	0.8	1.0	0.8	1.3	0.9	0.9	1.0	2.7	2.9	3.6	3.0	2.3	2.4	2.3	1.4	1.7	0.7	0.7	0.2	0.2	1.0	1.2	1.4	3.6	
16-Jun	1.5	1.6	1.9	2.0	1.8	1.8	2.0	2.0	1.6	1.3	1.1	0.4	0.2	0.3	0.6	0.8	0.1	0.0	0.2	0.1	-0.5	-0.1	-0.2	-0.2	0.8	2.0	
17-Jun	-0.2	-0.2	-0.2	-0.3	-0.4	0.0	-0.2	-0.1	-0.8	-1.0	-0.4	-0.6	-0.5	-0.3	-0.4	-0.4	-0.2	-0.3	-0.1	-0.4	0.2	-0.2	-0.8	0.0	-0.3	0.2	
18-Jun	-0.1	-0.5	-0.1	-0.5	-0.2	-0.3	-0.1	-0.1	-0.1	-0.1	0.0	-0.2	-0.2	0.1	-0.1	0.0	0.0	-0.2	0.9	0.7	0.4	-1.0	-0.1	-0.1	-0.1	0.9	
19-Jun	-0.5	-0.2	-0.4	-0.3	-0.4	-0.3	-0.1	-0.1	-0.1	-0.3	-0.4	-0.4	-0.6	-1.3	-1.7	-1.2	-1.4	-1.1	-1.0	-0.1	-0.3	-0.7	-0.6	-0.8	-0.6	-0.1	
20-Jun	-0.5	-0.3	-0.6	-0.3	-0.3	-0.1	0.1	0.7	0.5	-0.2	-0.3	0.0	0.6	0.9	0.4	0.9	0.9	0.4	0.6	0.8	1.1	1.2	1.2	1.5	0.4	1.5	
21-Jun	1.6	1.7	1.5	1.2	1.0	0.9	1.1	0.9	0.9	0.2	0.8	1.5	1.3	1.0	0.7	0.8	0.7	-0.1	0.6	0.4	0.6	1.1	0.7	0.9	0.9	1.7	
22-Jun	1.3	1.0	1.0	1.2	1.0	1.0	0.6	1.3	0.6	0.6	0.5	1.6	0.0	-0.4	-0.2	0.3	0.4	0.4	0.1	-0.4	-0.3	-0.2	-0.2	-0.2	0.5	1.6	
23-Jun	-0.1	-0.2	0.0	0.0	-0.1	-0.1	0.0	0.3	0.6	-0.2	0.5	-0.2	-0.1	0.0	-0.8	-1.0	-0.7	0.0	-0.4	0.1	0.4	0.5	-0.2	-0.8	-0.1	0.6	
24-Jun	-0.5	0.0	0.0	-0.3	-0.2	-0.3	-0.1	-0.3	-0.3	-0.9	-0.5	-0.5	-0.8	-0.3	-0.4	-1.5	-1.1	-0.2	0.3	0.1	-0.3	-0.6	-0.9	-0.6	-0.4	0.3	
25-Jun	-0.2	-0.1	-0.2	-0.3	-0.4	-0.4	-0.3	-0.1	-0.5	-0.8	-0.6	0.0	-0.3	0.0	-0.3	-0.2	-0.5	-0.4	-0.3	0.2	0.4	0.1	0.0	0.0	-0.2	0.4	
26-Jun	0.0	-0.4	-0.1	-0.1	0.3	0.3	0.5	0.7	0.8	0.4	0.5	1.1	1.3	-0.3	-0.8	0.0	-0.1	0.1	0.8	1.0	0.4	-0.3	-0.1	0.0	0.2	1.3	
27-Jun	-0.2	-0.2	-0.1	-0.3	-0.2	-0.1	-0.3	-0.1	0.2	-0.4	0.4	-0.1	-0.1	0.2	0.1	0.3	0.9	0.3	0.4	-0.1	0.2	0.3	0.6	0.5	0.1	0.9	
28-Jun	0.2	0.1	0.0	-0.1	-0.1	0.2	0.2	0.0	-0.4	0.0	0.0	-0.3	-0.2	-0.8	0.3	-0.6	-0.6	-0.5	-0.6	-0.2	-0.4	0.0	0.0	0.0	-0.2	0.3	
29-Jun	0.3	1.0	1.0	0.6	0.2	0.4	0.6	0.5	0.4	0.5	0.6	-0.1	0.2	-0.4	0.1	0.0	-0.3	0.3	0.5	0.7	0.9	1.4	1.8	1.4	0.5	1.8	
30-Jun	1.3	1.5	1.4	1.0	0.9	0.4	0.5	0.6	0.2	0.0	0.6	0.9	0.9	1.1	1.0	1.2	1.3	0.8	1.4	1.0	1.1	0.9	0.7	0.3	0.9	1.5	
		0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.4	0.3	0.1	0.3	0.4	0.3	0.2	0.2	0.1	0.1	0.2	0.3	0.3	0.3	0.2	0.2	0.2	Diurnal Average	
		1.6	1.7	1.9	2.0	1.8	1.8	2.0	2.0	1.6	2.7	2.9	3.6	3.0	2.3	2.4	2.3	1.7	1.7	1.4	2.4	2.3	1.9	1.8	1.5	Diurnal Maximum	



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

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

Mannix - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 4.9 km/h on Jun 15 12:00 Minimum Value: 0.1 km/h on Jun 25 23:00 Percentiles: P ₁ = 0.3 P ₁₀ = 0.6 Q ₁ = 1.1 Median = 1.8 Q ₃ = 2.5 P ₉₀ = 3.0 P ₉₉ = 3.9																							Hours in Service: 720 Hours of Data: 720 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-Jun	0.9	0.8	0.9	1.0	1.1	1.4	1.3	1.7	1.8	1.6	1.8	2.1	1.3	1.7	1.9	1.4	1.3	2.0	1.9	1.1	1.1	1.1	0.7	0.3	2.1
2-Jun	0.5	0.4	0.3	0.2	0.3	0.4	0.9	1.3	1.4	1.4	1.8	2.1	2.3	2.4	2.0	2.9	2.3	1.1	1.6	0.9	0.4	1.1	0.6	0.6	2.9
3-Jun	0.3	0.5	0.6	0.5	0.6	0.9	1.0	1.3	1.7	2.0	1.9	2.6	3.3	3.2	3.1	3.2	2.9	2.2	1.4	1.6	1.4	0.7	0.7	0.5	3.3
4-Jun	0.7	1.2	1.7	2.7	3.1	3.3	3.4	2.9	2.8	2.9	3.0	3.2	2.6	2.8	2.3	2.5	2.9	3.4	3.2	3.0	2.0	1.2	0.5	0.5	3.4
5-Jun	1.3	1.2	0.3	0.3	0.3	1.2	1.4	1.6	2.1	2.4	3.2	2.9	2.9	2.9	3.2	2.4	2.8	2.2	2.0	1.6	1.2	1.3	1.9	2.4	3.2
6-Jun	2.4	2.3	2.1	2.0	1.6	1.5	1.6	1.8	2.0	2.1	2.7	3.0	2.8	3.5	3.4	3.1	2.9	2.6	2.8	3.2	2.9	1.9	2.0	1.1	3.5
7-Jun	0.6	0.5	0.8	1.0	1.2	1.0	1.7	1.9	2.1	2.5	2.5	2.2	2.8	2.4	1.8	2.3	2.6	2.7	2.2	1.7	1.7	1.7	1.6	0.8	2.8
8-Jun	0.3	0.4	0.4	0.3	0.4	0.8	1.1	0.9	1.3	1.3	1.4	1.4	2.1	1.7	1.3	1.7	1.5	1.7	1.4	1.2	1.3	2.5	2.3	1.6	2.5
9-Jun	2.2	2.5	2.6	3.0	2.5	2.5	2.7	2.9	3.3	2.9	2.9	3.1	3.1	3.2	3.3	3.5	3.3	3.4	3.2	2.8	3.0	2.8	3.0	2.2	3.5
10-Jun	1.5	1.4	0.9	0.5	0.5	0.5	0.9	1.8	2.7	2.8	2.7	3.0	2.8	2.4	2.5	2.1	2.4	2.1	1.4	1.2	1.2	0.9	0.9	1.2	3.0
11-Jun	1.7	2.2	1.8	1.1	0.8	1.5	1.6	1.3	1.5	1.9	2.4	2.9	3.3	2.8	3.5	2.3	2.4	3.4	2.8	2.7	1.4	1.4	1.6	1.2	3.5
12-Jun	0.7	0.5	0.6	0.9	0.7	0.9	1.4	1.7	1.7	1.7	2.0	2.1	1.7	1.8	2.3	2.7	2.0	2.2	1.5	0.8	1.8	2.2	2.5	2.4	2.7
13-Jun	2.3	2.4	2.6	2.1	1.9	2.0	2.0	2.3	2.6	3.3	3.1	3.6	3.8	3.8	4.0	3.3	3.2	2.8	2.5	2.2	1.6	0.7	1.0	0.4	4.0
14-Jun	0.5	0.5	0.3	0.5	0.8	1.0	1.5	1.5	1.5	1.6	2.1	2.2	2.6	2.6	2.4	2.5	2.2	3.1	2.5	2.6	3.6	2.9	1.6	1.8	3.6
15-Jun	2.0	2.1	2.7	3.4	2.9	2.5	1.4	2.1	3.3	4.0	4.7	4.9	4.6	4.8	4.6	4.3	3.5	3.0	2.3	0.9	1.6	1.5	0.8	0.9	4.9
16-Jun	1.3	1.8	2.5	2.4	2.2	2.5	3.4	3.2	3.3	3.3	3.9	3.4	3.5	3.3	3.0	2.6	2.3	2.5	1.8	1.5	1.3	0.7	1.1	1.0	3.9
17-Jun	0.9	0.8	0.9	0.9	0.8	1.2	1.7	2.1	3.0	2.4	2.8	2.8	2.9	3.0	2.9	2.8	2.7	2.3	1.1	1.8	1.0	1.6	1.9	1.4	3.0
18-Jun	1.1	1.4	1.2	1.2	1.3	1.4	1.7	1.9	2.1	2.3	2.6	2.3	2.6	2.7	2.5	2.5	2.4	1.7	1.8	1.2	0.6	2.7	2.3	1.1	2.7
19-Jun	1.2	1.0	0.8	0.5	0.5	0.7	1.4	1.4	2.3	2.7	2.9	3.3	3.6	4.1	3.9	3.5	3.5	3.6	2.9	2.2	1.6	1.6	0.8	1.1	4.1
20-Jun	0.7	0.4	0.6	0.3	0.2	0.4	0.8	1.3	1.8	1.8	1.9	2.5	2.6	2.3	2.1	2.5	2.0	1.6	1.4	1.0	0.5	0.5	0.6	0.7	2.6
21-Jun	0.8	1.1	1.2	0.9	1.2	1.3	1.5	1.5	1.7	1.6	2.6	2.8	3.1	2.8	2.4	2.3	2.1	1.8	1.5	1.1	0.7	0.6	0.4	0.4	3.1
22-Jun	0.6	0.7	0.7	0.7	0.5	1.3	1.5	1.5	1.6	1.6	1.8	1.9	2.3	2.4	2.0	1.5	1.9	2.6	3.0	2.0	1.5	0.8	0.4	0.7	3.0
23-Jun	0.7	0.8	0.3	0.4	0.6	0.9	1.0	1.3	1.5	1.8	2.0	2.2	1.5	2.3	2.5	3.1	2.5	1.8	1.8	1.6	1.5	1.3	0.9	1.4	3.1
24-Jun	1.0	1.0	0.5	0.7	1.0	0.7	1.4	2.1	2.3	2.4	2.4	2.3	2.2	2.3	2.3	2.5	2.3	2.2	1.4	1.1	1.7	1.3	1.1	1.3	2.5
25-Jun	1.4	1.2	0.8	1.1	1.5	1.3	2.3	2.1	2.3	2.3	2.4	2.8	2.4	2.6	2.6	2.7	2.5	2.4	2.0	1.7	1.1	0.4	0.1	0.2	2.8
26-Jun	0.2	0.3	0.2	0.4	0.4	0.6	1.0	1.4	1.5	1.8	1.9	2.2	2.0	2.3	2.0	0.9	1.3	1.1	1.0	1.5	1.2	2.7	1.1	0.5	2.7
27-Jun	0.7	0.5	0.5	0.7	0.7	1.0	1.6	1.8	2.1	2.1	2.2	2.9	3.0	3.6	2.9	1.8	1.9	2.6	1.9	1.5	0.8	0.7	0.8	0.6	3.6
28-Jun	0.5	0.3	0.3	0.3	0.2	0.7	1.3	1.5	1.9	2.0	2.2	2.7	2.7	2.9	3.7	3.1	2.9	2.7	2.3	2.4	1.9	1.6	1.1	1.6	3.7
29-Jun	1.6	2.0	1.2	1.1	0.6	0.7	1.3	1.4	1.6	2.0	2.6	2.3	2.4	2.3	2.2	2.1	1.7	1.8	1.5	1.1	1.0	1.7	2.3	2.2	2.6
30-Jun	1.8	1.9	1.6	1.7	1.5	1.0	1.3	1.3	0.8	0.6	1.3	2.3	2.5	2.6	3.0	2.8	2.8	2.2	2.3	2.0	1.1	1.0	0.9	0.5	3.0
Diurnal Maximum																									



Summary of Hour Averages

Mannix - June 2016

Maximum Value: 2.5 km/h on Jun 15 12:00 Maximum Daily Average: 0.7 km/h on Jun 15																				Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0						
Minimum Value: -0.9 km/h on Jun 29 17:00 Minimum Daily Average: -0.1 km/h on Jun 19 Maximum Diurnal Average: 0.5 km/h at hour 12 Minimum Diurnal Average: 0.1 km/h at hour 10 Monthly Average: 0.24 km/h Percentiles: P ₁ = -0.6 P ₁₀ = -0.2 Q ₁ = 0.0 Median = 0.2 Q ₃ = 0.4 P ₉₀ = 0.7 P ₉₉ = 1.4																										
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-Jun	1.4	1.2	0.5	1.0	0.8	1.3	0.7	0.4	0.8	0.8	0.8	0.8	0.2	0.7	0.0	0.1	0.4	0.4	0.4	0.5	0.5	0.3	0.3	0.6	0.6	1.4
2-Jun	0.2	0.3	0.2	0.1	0.2	0.3	-0.1	0.5	0.1	-0.6	-0.1	0.3	0.0	0.4	0.5	-0.4	0.1	0.2	0.4	0.1	0.1	0.1	0.3	0.1	0.1	0.5
3-Jun	0.2	0.1	0.2	0.1	0.0	0.1	0.2	0.3	0.0	-0.4	-0.2	0.3	0.2	0.6	0.8	-0.3	0.3	-0.4	0.6	0.0	0.2	0.0	0.5	0.2	0.2	0.8
4-Jun	0.1	0.0	0.1	0.1	0.1	0.1	0.4	0.4	0.8	0.3	0.5	1.0	0.4	-0.1	0.0	0.2	-0.1	0.5	0.6	0.3	0.5	0.1	0.0	0.3	0.3	1.0
5-Jun	0.3	0.0	0.3	0.4	0.4	0.2	-0.1	-0.2	0.3	0.2	1.0	0.6	0.3	0.3	0.2	-0.8	0.1	-0.5	0.5	0.2	0.5	0.2	0.1	0.1	0.2	1.0
6-Jun	0.0	0.1	0.0	0.2	0.2	0.3	0.2	0.2	0.3	0.5	0.2	0.7	0.2	1.4	0.9	0.9	0.7	0.8	0.8	1.2	1.1	0.8	0.7	0.1	0.5	1.4
7-Jun	-0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.0	-0.1	0.0	0.2	0.4	-0.2	-0.1	0.1	1.3	-0.1	-0.4	-0.6	-0.6	-0.5	-0.5	-0.2	-0.3	0.0	1.3
8-Jun	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.3	-0.4	0.4	0.1	0.4	0.3	0.7	0.7	0.2	0.3	0.2	0.3	0.1	0.3	0.2	0.7
9-Jun	0.3	0.0	0.0	0.1	0.3	0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.3	0.0	-0.5	-0.6	-0.5	-0.4	-0.3	-0.4	-0.2	-0.2	0.1	-0.1	0.0	0.3
10-Jun	-0.6	-0.3	0.1	0.0	0.0	0.3	0.2	0.4	1.0	0.2	-0.8	0.2	1.3	0.4	0.4	0.7	0.2	0.8	0.0	0.5	0.2	-0.1	0.1	0.3	0.2	1.3
11-Jun	0.5	0.3	0.5	0.2	0.0	0.2	0.0	0.1	0.2	-0.2	-0.4	0.7	0.5	0.0	0.5	0.1	0.1	0.2	-0.1	-0.2	-0.3	0.3	0.3	0.0	0.1	0.7
12-Jun	0.4	0.1	0.1	0.2	0.4	0.0	0.2	0.7	0.1	0.3	0.4	0.2	-0.2	0.0	0.2	0.4	0.2	0.4	0.2	0.1	0.0	0.2	-0.1	0.3	0.2	0.7
13-Jun	0.1	0.1	-0.1	-0.1	0.1	0.2	-0.1	0.2	0.1	0.4	0.3	0.6	0.0	0.6	0.5	-0.1	0.4	0.2	0.3	0.6	0.0	-0.1	0.2	-0.1	0.2	0.6
14-Jun	0.3	0.2	0.4	0.5	0.3	0.0	0.5	0.2	0.4	0.2	-0.2	0.4	0.3	-0.2	0.1	0.2	0.6	0.2	-0.1	0.1	1.0	0.4	0.3	0.2	0.3	1.0
15-Jun	0.1	0.6	0.6	0.3	0.2	0.9	0.3	0.2	-0.7	1.1	1.6	2.5	1.9	0.7	1.6	1.2	0.6	1.1	0.3	0.5	0.2	0.1	0.7	0.9	0.7	2.5
16-Jun	0.9	1.1	0.6	1.0	1.2	1.2	1.2	1.2	0.9	0.4	0.8	0.4	-0.1	0.1	0.5	0.6	0.2	0.0	0.3	0.3	0.1	0.2	0.2	-0.1	0.5	1.2
17-Jun	0.0	-0.1	0.0	-0.2	-0.1	0.5	0.4	0.8	0.6	0.2	0.6	0.7	0.6	0.7	0.3	0.3	0.7	0.1	0.3	-0.1	0.1	0.0	-0.4	0.1	0.3	0.8
18-Jun	0.3	0.3	0.6	0.4	0.6	0.0	0.2	0.5	0.5	0.2	0.6	0.2	-0.1	0.4	0.2	0.5	0.4	0.2	0.8	0.0	0.2	-0.5	-0.1	0.2	0.3	0.8
19-Jun	-0.2	0.0	-0.1	0.4	0.1	-0.2	0.1	0.3	0.2	0.3	0.0	0.3	0.4	-0.5	-0.6	-0.6	-0.5	-0.1	-0.4	0.7	0.2	-0.3	-0.4	-0.5	-0.1	0.7
20-Jun	0.0	0.4	-0.1	0.2	0.1	0.0	0.2	0.5	0.7	-0.3	0.0	0.3	0.8	0.7	0.1	0.7	0.8	-0.5	-0.3	0.2	0.9	1.0	1.1	1.4	0.4	1.4
21-Jun	1.4	1.4	1.3	0.9	1.0	0.6	0.5	0.2	0.4	-0.1	0.7	0.6	0.7	0.6	0.0	0.4	0.7	-0.2	0.5	0.6	0.5	0.9	0.4	0.8	0.6	1.4
22-Jun	1.2	1.0	0.7	0.7	0.8	0.3	0.3	1.0	0.3	0.4	0.2	1.7	-0.2	-0.6	0.3	0.3	0.0	0.5	0.5	0.0	-0.1	0.0	-0.1	0.0	0.4	1.7
23-Jun	0.0	-0.1	0.3	0.3	0.0	0.0	0.2	0.6	0.5	-0.3	0.8	0.4	0.6	0.2	-0.3	-0.4	-0.1	0.4	-0.3	0.1	0.3	0.4	-0.1	-0.2	0.1	0.8
24-Jun	-0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.4	-0.4	0.0	0.1	-0.1	0.2	0.5	-0.6	-0.5	0.0	0.3	0.5	0.4	-0.2	-0.6	-0.2	0.0	0.5
25-Jun	0.1	0.0	-0.1	0.1	-0.2	-0.1	0.1	0.3	-0.3	-0.4	-0.4	0.3	0.1	0.4	-0.4	0.2	-0.4	-0.1	-0.1	0.3	0.4	0.1	0.1	0.2	0.0	0.4
26-Jun	0.2	0.2	0.2	0.1	0.2	0.2	0.3	0.4	0.6	0.2	0.5	0.8	1.0	-0.3	-0.5	0.1	-0.1	-0.3	0.6	0.5	0.4	0.2	0.0	0.2	0.2	1.0
27-Jun	0.2	0.0	0.1	0.0	-0.2	0.1	-0.2	0.0	0.5	-0.2	0.8	0.3	0.2	0.7	0.2	0.0	0.4	0.4	0.8	0.3	0.4	0.1	0.3	0.2	0.2	0.8
28-Jun	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.2	-0.2	0.4	0.4	0.2	0.1	-0.5	1.4	0.2	-0.4	0.0	-0.2	-0.1	-0.2	0.0	-0.1	-0.1	0.1	1.4
29-Jun	-0.3	0.2	0.6	0.2	0.1	0.3	0.3	0.4	0.2	0.4	0.4	-0.7	0.1	-0.6	0.0	-0.4	-0.9	0.3	0.3	0.5	0.2	0.2	0.5	0.4	0.1	0.6
30-Jun	0.3	0.1	0.0	-0.1	-0.2	-0.2	0.0	0.2	0.1	-0.2	0.4	0.7	0.4	0.8	0.6	0.5	0.2	0.0	0.5	0.1	0.5	0.0	0.3	0.2	0.2	0.8
																								Diurnal Average		
																								Diurnal Maximum		



Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 5.2 km/h on Jun 15 12:00 Minimum Value: 0.1 km/h on Jun 26 00:00 Percentiles: P ₁ = 0.3 P ₁₀ = 0.6 Q ₁ = 1.0 Median = 1.8 Q ₃ = 2.7 P ₉₀ = 3.2 P ₉₉ = 4.5																								Hours in Service: 720 Hours of Data: 720 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-Jun	0.4	0.8	0.9	0.7	0.8	0.9	1.1	1.6	1.4	1.4	1.4	2.0	1.7	1.8	2.3	1.2	1.4	2.2	1.9	0.9	0.9	1.1	0.7	0.2	2.3
2-Jun	0.5	0.4	0.3	0.3	0.4	0.3	0.7	1.3	1.4	1.3	2.0	2.3	2.7	2.8	2.3	2.8	2.2	1.2	1.7	1.1	0.4	0.8	0.9	0.4	2.8
3-Jun	0.3	0.5	0.6	0.4	0.4	0.4	0.9	1.2	1.7	2.1	2.0	2.9	3.2	3.4	3.5	3.1	3.3	2.2	1.6	1.3	1.1	1.0	0.8	0.8	3.5
4-Jun	1.0	1.5	1.4	2.5	3.0	3.3	3.4	3.1	3.1	3.3	3.3	3.5	2.8	3.1	2.2	2.5	3.0	3.4	3.1	3.0	2.0	1.4	0.6	0.7	3.5
5-Jun	1.3	1.0	0.5	0.3	0.3	1.0	1.3	1.5	2.3	2.9	3.6	3.4	3.3	3.4	3.4	2.7	3.2	2.5	2.2	1.4	1.1	1.8	2.5	2.2	3.6
6-Jun	2.0	2.0	1.8	1.6	1.6	1.6	1.5	1.5	2.0	2.1	2.9	3.4	3.2	4.0	3.7	3.4	2.9	2.6	2.9	3.1	2.8	2.3	2.1	1.3	4.0
7-Jun	0.7	0.6	1.1	1.3	1.6	0.7	1.4	1.8	2.3	2.7	2.9	2.6	2.5	2.2	1.9	2.7	2.8	2.6	2.1	1.8	1.2	1.1	0.8	0.9	2.9
8-Jun	0.4	0.3	0.4	0.3	0.3	0.6	1.0	1.0	1.3	1.6	1.6	1.5	2.3	1.9	0.9	1.6	1.6	1.6	1.7	2.1	1.4	3.4	2.7	1.6	3.4
9-Jun	2.3	2.2	2.6	2.7	2.4	2.3	2.5	2.7	3.3	2.9	2.8	2.9	2.9	3.0	2.8	3.4	3.0	3.2	2.9	2.5	3.0	3.0	3.0	2.2	3.4
10-Jun	1.4	1.5	1.1	0.7	0.6	0.3	0.6	2.0	3.1	3.1	2.8	3.3	3.1	2.7	2.8	2.8	2.8	2.5	1.6	1.4	0.5	0.5	1.0	1.9	3.3
11-Jun	2.5	2.8	2.1	0.9	1.3	1.3	1.7	1.1	1.4	1.9	2.4	3.0	3.4	2.8	3.6	2.5	2.6	3.3	3.0	2.9	1.8	2.2	2.7	1.6	3.6
12-Jun	0.6	0.6	0.7	1.0	0.7	0.7	1.3	1.8	1.6	1.7	2.1	2.3	1.3	1.8	2.4	3.0	1.6	2.2	1.5	0.6	1.6	2.2	2.6	2.6	3.0
13-Jun	2.5	2.5	2.3	2.0	1.8	2.2	2.1	2.2	2.7	3.4	3.4	3.4	3.8	3.9	3.3	3.3	2.8	2.5	2.2	1.5	0.7	1.3	0.4	0.4	3.9
14-Jun	0.6	0.5	0.3	0.3	0.9	1.2	1.5	1.4	1.5	1.8	2.5	2.6	3.0	3.0	2.7	2.7	2.7	3.4	2.5	2.9	3.5	2.7	2.4	2.4	3.5
15-Jun	2.2	2.7	3.5	4.6	4.1	3.4	1.7	2.7	3.6	4.1	4.7	5.2	4.6	4.8	4.6	4.6	3.6	3.0	2.4	1.0	1.7	1.7	0.8	0.6	5.2
16-Jun	0.9	1.5	1.9	2.0	2.0	2.5	3.3	3.2	3.5	3.3	4.1	3.5	3.6	3.5	3.2	2.9	2.3	2.5	1.8	1.3	1.4	0.6	0.9	0.9	4.1
17-Jun	0.9	0.7	0.7	0.9	0.9	1.2	1.7	2.2	3.0	2.5	2.8	2.8	3.0	3.0	3.1	2.8	2.9	2.4	1.2	1.6	0.7	1.5	1.8	1.6	3.1
18-Jun	1.2	1.2	1.0	0.9	1.0	1.1	1.8	2.3	2.1	2.5	2.8	2.4	2.7	2.9	2.7	2.9	2.7	1.9	2.1	1.2	0.7	2.3	2.0	1.2	2.9
19-Jun	1.2	1.2	0.9	0.4	0.3	0.7	1.4	1.6	2.6	2.9	3.2	3.6	4.2	3.8	4.1	3.6	3.5	3.5	3.0	2.5	1.8	1.7	1.0	1.2	4.2
20-Jun	0.7	0.4	0.4	0.4	0.3	0.3	0.6	1.2	2.0	1.8	2.3	3.0	2.8	2.6	2.3	2.8	2.4	1.4	1.3	0.7	0.4	0.3	0.5	0.4	3.0
21-Jun	0.4	0.8	1.1	0.8	0.7	0.8	1.1	1.4	1.6	1.6	2.8	3.1	3.3	3.1	2.9	2.8	2.5	2.0	1.6	1.1	0.8	0.6	0.4	0.2	3.3
22-Jun	0.4	0.4	0.5	0.5	0.3	0.9	1.2	1.6	1.5	1.7	1.8	2.2	2.5	2.7	2.5	1.8	2.0	2.4	3.0	2.0	1.2	0.5	0.3	0.4	3.0
23-Jun	0.8	0.6	0.5	0.5	0.6	0.8	1.0	1.5	1.9	1.9	2.4	2.5	1.9	2.7	3.0	3.0	2.3	2.1	1.8	1.2	1.3	1.2	0.8	1.4	3.0
24-Jun	0.9	0.6	0.5	0.5	1.0	0.6	1.2	2.0	2.6	2.4	2.6	2.6	2.2	2.3	2.5	2.0	2.2	2.2	1.3	1.2	1.6	1.4	1.2	1.2	2.6
25-Jun	1.2	1.0	0.9	1.1	1.3	1.3	2.2	2.0	2.4	2.5	2.4	3.0	2.4	2.8	2.7	3.0	2.5	2.5	1.9	1.6	1.0	0.6	0.2	0.1	3.0
26-Jun	0.2	0.4	0.3	0.3	0.3	0.6	0.6	1.2	1.5	1.9	2.2	2.5	2.4	2.1	1.8	0.8	1.0	1.0	0.8	1.2	1.1	2.7	1.1	0.4	2.7
27-Jun	0.5	0.7	0.6	0.7	0.6	0.8	1.5	1.9	2.2	2.3	2.6	3.2	3.1	3.6	2.7	1.6	2.1	2.8	2.0	1.3	0.8	0.6	1.0	0.5	3.6
28-Jun	0.7	0.4	0.3	0.4	0.3	0.6	1.2	1.7	2.0	2.2	2.4	3.1	2.9	3.0	4.1	3.8	3.0	2.9	2.4	2.0	1.4	1.0	1.0	1.7	4.1
29-Jun	2.3	3.0	1.7	1.2	0.8	0.8	1.2	1.6	1.8	2.3	3.0	2.8	2.8	2.6	2.6	2.3	2.1	2.1	2.0	1.1	0.8	1.5	2.3	1.8	3.0
30-Jun	1.6	1.7	1.8	1.4	1.2	1.1	1.3	1.4	1.0	0.8	1.4	2.7	2.8	3.1	3.4	3.4	3.1	2.8	2.3	2.1	1.2	1.3	0.8	0.4	3.4
Diurnal Maximum																									
2.5 3.0 3.5 4.6 4.1 3.4 3.4 3.2 3.6 4.1 4.7 5.2 4.6 4.8 4.6 4.6 3.6 3.5 3.1 3.1 3.5 3.4 3.0 2.6																									



Summary of Hour Averages

Mannix - June 2016

Maximum Value: 3.9 km/h on Jun 4 20:00		Maximum Daily Average: 2.0 km/h on Jun 4		Hours in Service: 720																						
Minimum Value: -1.1 km/h on Jun 15 09:00		Minimum Daily Average: -0.2 km/h on Jun 11		Hours of Data: 718																						
Maximum Diurnal Average: 1.1 km/h at hour 12		Minimum Diurnal Average: 0.6 km/h at hour 24		Hours of Missing Data: 2																						
Monthly Average: 0.74 km/h		Percentiles: $P_1 = -0.6$ $P_{10} = -0.1$ $Q_1 = 0.2$ Median = 0.6 $Q_3 = 1.1$ $P_{90} = 1.8$ $P_{99} = 3.2$		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-Jun	1.0	0.9	0.4	0.7	0.6	1.1	0.7	0.3	0.8	0.7	0.8	0.9	0.3	1.3	0.8	-0.1	0.2	0.2	0.2	0.4	0.6	0.3	0.4	0.4	0.6	1.3
2-Jun	0.2	0.3	0.3	0.2	0.3	0.2	-0.1	0.3	0.1	-0.6	-0.2	-0.2	-0.4	0.2	0.4	-0.2	0.4	0.1	0.4	0.0	0.2	0.5	0.1	0.2	0.1	0.5
3-Jun	0.4	0.4	0.4	0.3	0.5	0.4	-0.1	0.2	0.2	0.0	-0.1	0.5	0.7	1.9	2.1	2.0	1.9	0.8	0.7	1.2	0.5	0.0	0.6	0.2	0.7	2.1
4-Jun	0.3	0.7	1.0	1.1	1.3	1.5	2.1	2.4	2.5	1.8	2.4	3.3	1.5	1.5	0.8	2.0	2.3	3.6	3.9	3.9	3.3	1.7	0.8	2.2	2.0	3.9
5-Jun	2.9	1.8	0.7	0.9	1.7	1.1	0.4	0.1	1.3	1.0	2.7	2.4	1.6	1.8	1.6	0.5	1.0	0.1	0.7	0.4	0.7	0.2	-0.3	0.0	1.1	2.9
6-Jun	0.1	0.3	0.2	0.1	0.0	-0.1	-0.2	0.2	0.3	0.3	-0.2	0.2	-0.3	1.3	0.7	0.9	0.7	0.8	0.8	1.0	1.3	0.5	0.6	0.4	0.4	1.3
7-Jun	0.0	0.2	0.4	0.4	0.6	0.6	1.1	0.6	0.6	0.9	0.8	1.3	1.9	0.3	1.5	1.9	1.2	1.2	0.8	1.0	1.8	1.8	2.1	1.2	1.0	2.1
8-Jun	0.6	0.5	0.3	0.6	1.0	0.7	0.5	0.4	0.7	0.7	0.9	0.0	1.1	0.2	0.6	0.5	0.7	0.6	-0.1	-0.1	0.2	-0.1	0.0	0.4	0.5	1.1
9-Jun	0.6	0.8	1.0	0.7	0.7	1.0	1.5	1.9	1.9	1.7	1.6	1.7	1.7	UO	1.7	1.8	1.8	2.1	2.0	1.9	2.2	2.5	2.8	2.0	1.6	2.8
10-Jun	1.3	1.5	1.3	0.6	0.8	1.0	0.6	0.8	2.4	1.6	0.4	1.3	2.3	1.2	1.1	0.5	0.2	0.9	0.0	0.6	0.6	0.4	0.2	0.1	0.9	2.4
11-Jun	0.0	-0.2	0.2	0.4	-0.2	0.2	-0.5	-0.1	0.1	-0.5	-0.6	0.5	0.4	-0.2	0.0	-0.2	-0.2	-0.2	-0.4	-1.0	-0.7	0.0	-0.2	-0.4	-0.2	0.5
12-Jun	0.3	0.2	0.1	0.2	0.3	-0.1	0.2	0.5	0.0	0.2	0.3	0.2	UO	-0.1	0.0	0.8	1.2	1.4	1.1	0.8	0.2	0.5	0.4	0.7	0.4	1.4
13-Jun	0.5	0.5	0.7	0.4	0.6	0.3	0.2	0.4	0.6	1.0	0.3	1.2	0.6	1.7	1.4	0.3	0.9	1.1	0.8	1.5	0.2	0.4	0.5	0.1	0.7	1.7
14-Jun	1.0	0.2	0.3	0.4	0.3	0.0	0.4	0.1	0.2	0.0	-0.2	0.1	-0.3	-0.8	-0.2	-0.3	0.0	-0.8	-0.6	-0.1	1.0	0.6	-0.1	-0.3	0.0	1.0
15-Jun	-0.2	0.1	0.0	-0.4	-0.2	0.4	0.2	-0.3	-1.1	1.0	1.7	2.6	1.8	0.7	1.6	1.1	0.5	1.1	0.3	0.6	0.2	0.1	0.6	0.7	0.5	2.6
16-Jun	0.9	1.1	0.9	1.2	1.2	1.1	1.0	1.0	0.9	0.3	0.6	0.4	-0.2	-0.1	0.3	0.5	0.3	0.2	0.5	0.6	1.4	0.9	1.2	0.4	0.7	1.4
17-Jun	0.3	0.5	0.7	0.8	0.7	1.7	1.9	2.3	3.5	3.1	2.7	3.1	2.5	2.5	2.0	2.1	2.1	0.9	1.1	1.2	0.3	1.8	1.3	0.7	1.7	3.5
18-Jun	1.3	2.2	2.3	2.7	2.5	0.9	1.2	1.7	1.7	1.3	1.9	0.9	0.4	0.9	1.0	1.5	1.4	0.7	0.9	-0.1	0.1	1.1	0.8	0.8	1.3	2.7
19-Jun	1.0	0.9	0.9	1.8	1.1	0.7	0.4	1.2	1.5	1.9	1.5	1.9	2.6	2.5	2.5	1.7	2.1	2.6	1.5	2.3	1.4	1.0	0.7	0.8	1.5	2.6
20-Jun	1.1	1.9	1.5	1.7	1.2	0.8	0.5	0.2	0.8	-0.1	0.3	0.9	1.2	0.5	0.1	0.6	0.5	-0.6	-0.4	0.2	0.7	0.7	0.8	1.1	0.7	1.9
21-Jun	1.0	1.0	0.9	0.5	0.7	0.7	0.5	0.2	0.2	-0.2	0.8	0.4	0.5	0.4	-0.6	0.0	0.5	0.0	0.5	0.7	0.5	0.7	0.5	0.6	0.5	1.0
22-Jun	1.0	0.8	0.4	0.5	0.6	0.6	0.4	0.8	0.2	0.3	-0.1	1.4	-0.1	-0.4	1.0	0.3	-0.1	0.5	1.1	1.0	0.6	0.7	0.1	0.3	0.5	1.4
23-Jun	0.4	0.2	1.4	1.3	0.3	0.6	1.1	0.7	0.4	-0.3	1.1	1.4	1.5	0.8	0.8	1.8	1.5	1.3	0.5	0.5	0.5	0.5	0.6	1.6	0.9	1.8
24-Jun	1.1	0.8	0.2	0.9	1.0	0.6	1.3	1.0	1.6	1.4	1.5	1.5	1.8	1.7	2.4	2.1	1.7	1.3	0.5	1.3	2.3	1.3	0.9	0.9	1.3	2.4
25-Jun	1.2	0.7	0.5	1.4	0.8	0.8	1.4	1.3	0.8	0.8	0.7	1.3	1.3	1.5	0.6	1.3	0.8	0.8	0.9	0.8	0.4	0.1	0.1	0.2	0.9	1.5
26-Jun	0.5	1.5	1.5	0.5	0.1	0.1	0.2	0.4	0.4	-0.1	0.4	0.8	0.9	0.4	1.1	0.1	0.0	-0.6	0.5	0.4	0.6	1.9	0.8	0.7	0.5	1.9
27-Jun	1.3	0.5	0.7	0.8	0.3	0.7	0.2	0.3	1.1	0.3	1.1	1.1	1.1	1.1	1.0	0.0	0.3	0.5	1.2	1.0	0.9	0.0	0.4	0.2	0.7	1.3
28-Jun	0.1	0.1	0.5	0.8	0.4	0.5	0.4	0.6	0.2	0.9	1.3	1.1	0.9	0.9	3.4	1.9	0.7	1.4	1.1	1.0	0.8	0.6	0.4	0.1	0.8	3.4
29-Jun	-0.5	-0.1	0.3	0.0	0.1	0.3	0.1	0.4	0.1	0.2	0.3	-0.9	0.2	-0.6	0.0	-0.5	-1.1	0.2	0.0	0.4	0.2	0.4	0.5	0.5	0.0	0.5
30-Jun	0.5	0.3	-0.1	0.1	-0.1	-0.2	-0.1	0.2	0.1	-0.3	0.2	0.5	-0.1	0.2	0.0	-0.1	-0.6	-0.6	0.3	-0.2	0.4	-0.1	0.3	-0.1	0.0	0.5
																								Diurnal Average		
																								Diurnal Maximum		
UO - Unstable Operation																										



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Vertical Wind Speed 90 m (VW90m) - km/h

Mannix - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 5.8 km/h on Jun 17 22:00	Hours of Data: 718
Minimum Value: 0.1 km/h on Jun 26 00:00	Hours of Missing Data: 2
Percentiles: P ₁ = 0.3 P ₁₀ = 0.6 Q ₁ = 1.0 Median = 1.8 Q ₃ = 2.6 P ₉₀ = 3.2 P ₉₉ = 4.6	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-Jun	0.4	0.9	0.9	0.6	0.7	0.8	0.9	1.3	1.3	1.3	1.3	2.1	1.8	1.7	2.4	1.2	1.1	2.0	1.9	0.9	0.8	1.1	0.6	0.2	2.4
2-Jun	0.4	0.5	0.3	0.3	0.3	0.3	0.6	1.1	1.3	1.2	2.0	2.1	2.3	2.6	2.3	2.8	2.4	0.9	1.5	1.0	0.5	0.9	0.6	0.4	2.8
3-Jun	0.4	0.6	0.6	0.4	0.5	0.4	1.0	1.2	1.7	2.2	2.1	3.0	3.3	3.6	3.4	3.1	3.2	2.3	1.6	1.5	1.0	0.9	0.9	0.7	3.6
4-Jun	1.0	1.7	1.6	2.5	3.1	3.5	3.5	3.1	3.2	3.3	3.4	3.4	2.8	3.5	2.3	2.5	3.1	3.3	2.9	2.6	2.1	1.9	0.7	1.0	3.5
5-Jun	1.4	1.1	0.7	0.4	0.5	1.0	1.3	1.3	2.3	3.0	3.6	3.5	3.2	3.6	3.6	3.0	3.4	2.7	2.2	1.2	0.9	1.5	2.2	2.0	3.6
6-Jun	1.6	1.5	1.5	1.2	1.0	1.0	1.0	1.4	2.0	2.0	2.6	3.5	2.9	4.1	3.9	3.5	2.8	2.6	2.8	3.0	2.8	2.1	2.2	1.7	4.1
7-Jun	0.7	0.7	1.3	1.4	1.6	0.6	1.3	1.8	2.4	2.9	3.0	2.8	2.6	2.1	2.2	2.7	2.7	2.7	2.3	1.7	1.0	1.0	0.8	1.1	3.0
8-Jun	0.6	0.5	0.4	0.4	0.4	0.6	1.0	1.1	1.3	1.6	1.7	1.6	2.4	1.9	0.8	1.4	1.6	1.7	1.5	1.1	1.2	2.3	2.0	1.5	2.4
9-Jun	2.0	2.1	2.6	2.6	2.4	2.3	2.5	2.7	3.2	2.7	2.7	2.9	2.9	UO	3.1	3.5	3.3	3.3	3.0	2.7	3.2	3.1	3.1	2.4	3.5
10-Jun	1.6	1.6	1.3	0.8	0.6	0.5	0.5	2.0	3.1	3.0	3.0	3.5	3.3	2.8	3.0	2.6	2.6	2.6	1.5	1.1	0.4	0.5	1.0	1.3	3.5
11-Jun	2.1	2.5	1.9	0.7	0.9	0.7	1.2	0.6	1.0	1.7	2.2	3.0	3.3	2.6	3.3	2.2	2.3	3.0	2.7	2.8	1.6	1.6	1.7	1.5	3.3
12-Jun	0.6	0.6	0.7	0.8	0.7	0.7	1.2	1.8	1.6	1.7	2.1	2.3	UO	1.8	2.4	3.1	1.7	2.3	1.5	0.6	1.7	2.2	2.8	2.7	3.1
13-Jun	2.4	2.5	2.4	1.9	1.9	2.3	2.3	2.4	2.7	3.6	3.6	3.7	3.8	4.0	4.0	3.4	3.3	2.8	2.5	2.3	1.5	0.7	1.4	0.4	4.0
14-Jun	0.8	0.4	0.3	0.4	0.7	0.8	1.3	1.2	1.3	1.6	2.4	2.5	2.7	2.6	2.3	2.5	2.2	3.1	2.1	2.9	3.5	2.5	1.6	2.0	3.5
15-Jun	2.2	2.1	2.6	3.4	2.9	2.9	1.4	2.1	3.3	4.1	4.6	5.4	4.6	4.8	4.8	4.7	3.6	3.0	2.6	1.0	1.8	2.1	0.7	0.5	5.4
16-Jun	0.8	1.3	1.6	1.7	1.8	2.4	3.3	3.3	3.5	3.2	4.2	3.7	3.6	3.6	3.3	3.0	2.5	2.7	1.9	1.5	1.5	0.7	0.9	1.0	4.2
17-Jun	0.8	0.7	0.7	0.8	0.9	1.3	1.6	2.2	2.8	2.5	2.8	2.6	3.0	2.9	3.1	2.9	2.9	2.5	1.1	1.6	0.6	5.8	1.8	1.6	5.8
18-Jun	1.3	1.2	0.9	1.0	1.2	1.0	1.8	2.2	2.1	2.6	2.9	2.5	2.8	3.1	2.7	3.0	2.7	2.0	2.1	1.2	0.8	1.9	1.8	1.2	3.1
19-Jun	1.4	1.3	1.0	0.5	0.4	0.8	1.4	1.6	2.6	2.9	3.4	3.7	4.1	3.8	4.1	3.6	3.7	3.6	3.1	2.6	1.8	1.9	1.2	1.5	4.1
20-Jun	0.9	0.5	0.5	0.5	0.4	0.3	0.6	1.1	2.0	1.8	2.4	3.1	3.1	2.4	2.2	2.4	2.0	1.3	1.1	0.6	0.4	0.3	0.4	0.4	3.1
21-Jun	0.3	0.8	1.0	0.8	0.8	0.7	0.8	1.1	1.4	1.4	3.1	3.2	3.4	3.2	2.5	2.5	2.2	2.0	1.4	1.1	0.8	0.5	0.3	0.3	3.4
22-Jun	0.4	0.4	0.4	0.6	0.4	0.8	1.1	1.5	1.4	1.5	1.6	1.9	2.6	2.9	2.6	1.8	1.9	2.4	3.2	2.1	1.2	0.6	0.3	0.6	3.2
23-Jun	1.0	0.7	0.6	0.7	0.7	0.8	1.0	1.4	1.6	2.1	2.5	2.6	1.9	2.9	3.2	3.0	2.3	2.2	1.8	1.1	1.1	1.0	0.8	1.5	3.2
24-Jun	0.9	0.7	0.5	0.6	1.0	0.6	1.2	2.1	2.5	2.5	2.6	2.7	2.3	2.4	2.6	1.9	2.2	2.4	1.2	1.3	1.6	1.6	1.4	1.3	2.7
25-Jun	1.3	0.9	1.0	1.3	1.5	1.4	2.1	2.1	2.4	2.6	2.6	2.9	2.4	2.9	2.9	3.2	2.7	2.6	2.1	1.4	0.8	0.6	0.3	0.1	3.2
26-Jun	0.2	0.6	0.4	0.4	0.3	0.5	0.6	1.2	1.5	1.8	2.2	2.4	2.5	2.5	2.0	0.9	1.1	0.8	0.7	1.0	1.3	2.8	1.3	0.4	2.8
27-Jun	0.6	0.8	0.6	0.8	0.7	0.8	1.4	1.8	2.1	2.3	2.8	3.3	3.0	3.8	2.7	1.7	2.1	2.8	2.2	1.3	0.8	0.7	1.0	0.5	3.8
28-Jun	0.7	0.4	0.4	0.5	0.3	0.5	1.0	1.7	1.9	2.3	2.4	3.2	3.0	3.3	4.1	3.9	3.2	3.0	2.5	2.0	1.1	1.0	1.0	1.6	4.1
29-Jun	1.8	2.1	1.4	1.2	0.8	0.6	1.0	1.5	1.7	2.2	2.7	2.5	2.9	2.9	2.4	2.4	2.0	1.9	2.0	1.1	0.8	1.4	2.2	1.6	2.9
30-Jun	1.5	1.3	1.3	1.2	0.9	0.9	1.2	1.3	0.9	0.8	1.0	2.6	3.0	3.0	3.1	2.7	2.5	2.3	2.3	1.9	1.2	1.2	0.8	0.5	3.1

2.4	2.5	2.6	3.4	3.1	3.5	3.5	3.3	3.5	4.1	4.6	5.4	4.6	4.8	4.8	4.7	3.7	3.6	3.2	3.0	3.5	5.8	3.1	2.7	
Diurnal Maximum																								

UO - Unstable Operation



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	June 7, 2016	Last Calibration	May 3, 2016
Station Name	Mannix	Station Number	AMS 5
Reason:	Routine		
Start Time (MST)	9:05	End Time (MST)	12:40
Gas Cert Reference	S960161A	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

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-635	-635
Analyzer IP address	192.168.1.43		Lamp voltage	824	818
Calculated slope	1.003503	1.003925	Chamber temp	44.9	45.1
Calculated intercept	0.718737	0.144398	Pressure	691.9	687.9
Analyzer Background	7.3	7.4	Flow	0.480	0.465
Analyzer Coefficient	0.974	0.974	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	596.9	1.005
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	60.0	600.0	596.9	1.005
second point	5000	30.0	300.0	300.5	0.998
third point	5000	15.0	150.0	147.8	1.015
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	60.0	600.0	602.0	0.997
Average Correction Factor					1.006

Corrected As found 596.9 Previous response 597.2 % change 0.0%

Notes:

Inlet filter changed after as founds. Additional zero/span done after inlet filter change to measure the potential impact of smoke on the filter. No adjustments.

Calibration Performed By: Evan Magill



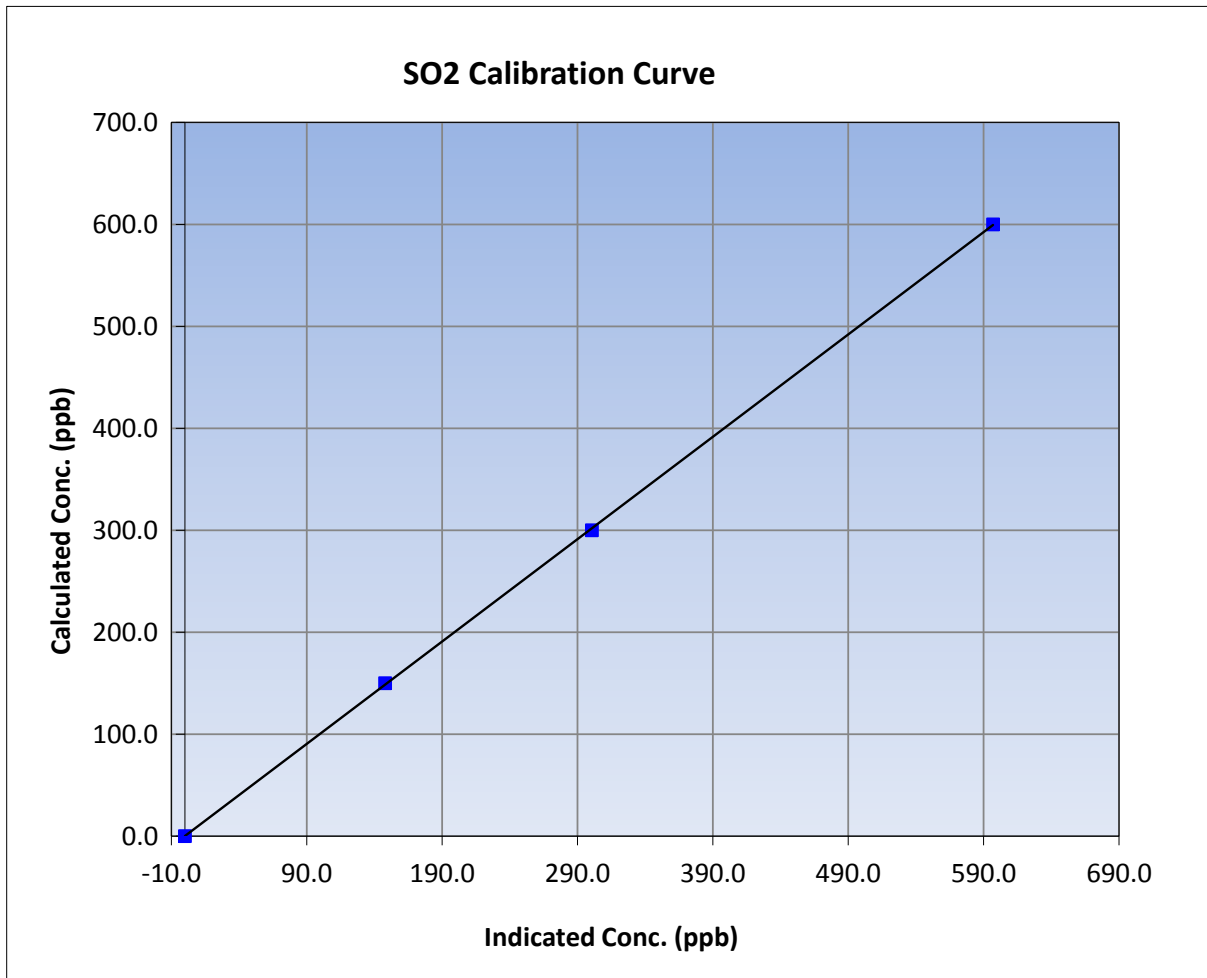
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 7, 2016	Previous Calibration	May 3, 2016
Station Name	Mannix	Station Number	AMS 5
Start Time (MST)	9:05	End Time (MST)	12:40
Analyzer make	TEI 43i	Analyzer serial #	1008841399

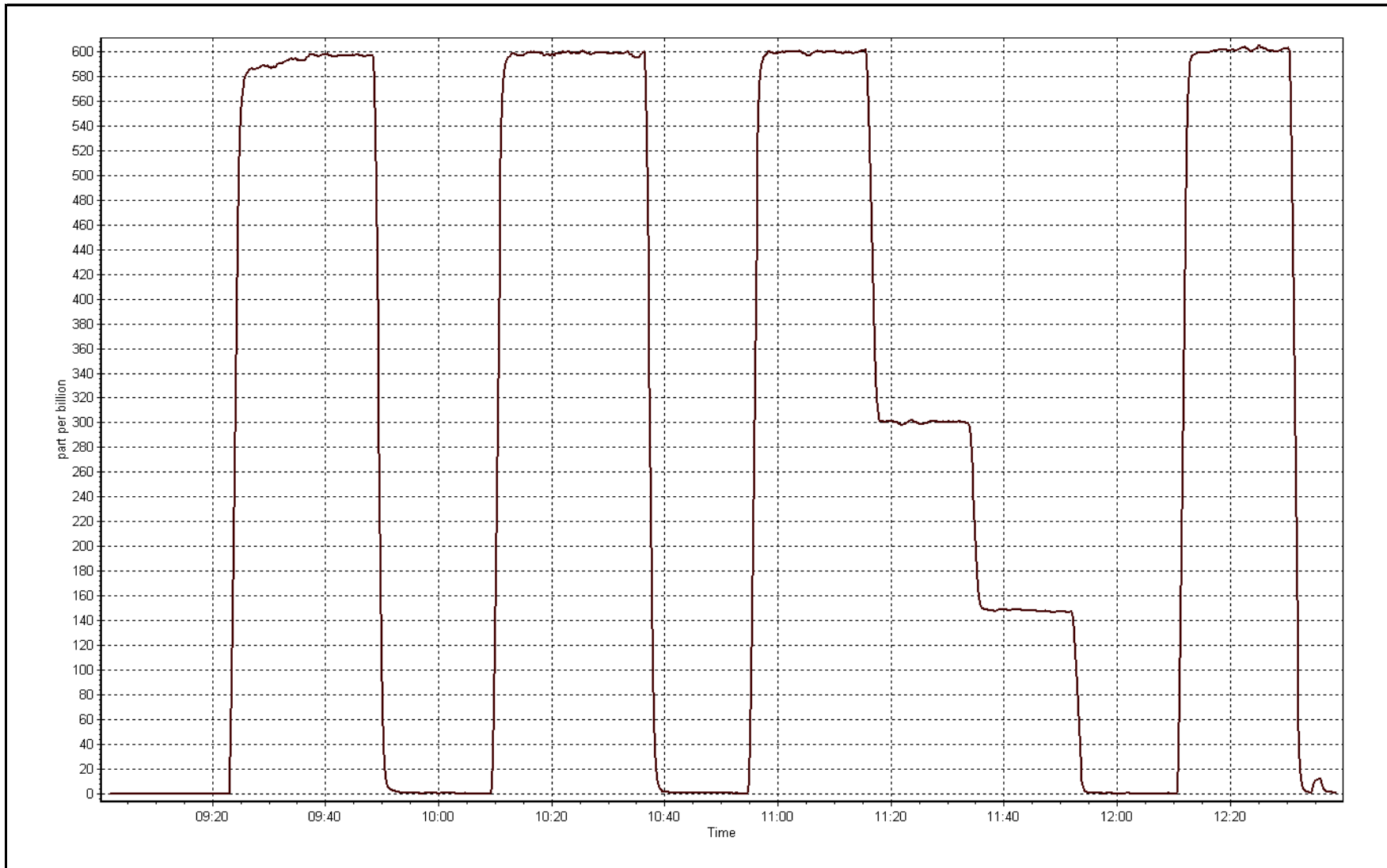
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999970
600.0	596.9	1.0051		
300.0	300.5	0.9982	Slope	1.003925
150.0	147.8	1.0146		
			Intercept	0.144398



SO2 Calibration Plot

Date: June 7, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	June 7, 2016	Last Calibration	May 13, 2016
Station Name	Mannix	Station Number	AMS 5
Reason:	Routine		
Start Time (MST)	12:45	End Time (MST)	16:45
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	-658
Analyzer IP address	192.168.1.42		Lamp voltage	814	811
Calculated slope	1.007658	0.998130	Chamber temp	45	45
Calculated intercept	-0.083678	-0.106478	Pressure	514.0	509.2
Analyzer Background	19.7	20.2	Flow	1.020	1.011
Analyzer Coefficient	0.981	0.997	Intensity	104	102
			Converter temp.	325	325

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	0.2	----
as found span	5000	74.4	75.0	73.8	1.017
SO2 scrubber check	5000	15.0	150.0	1.5	----
calibrator zero	5000	0.0	0.0	0.2	----
high point	5000	74.4	75.0	75.3	0.996
second point	5000	41.7	42.0	42.2	0.995
third point	5000	24.8	25.0	25.1	0.998
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	74.4	75.0	74.9	1.001
Average Correction Factor					0.997

Corrected As found	73.6	Previous response	74.5	% change	1.2%
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Notes:

Inlet filter changed after as founds. Additional zero/span done after inlet filter change to measure the potential impact of smoke on the filter. Scrubber check done after additional zero/span. Adjusted span.

Calibration Performed By: Evan Magill



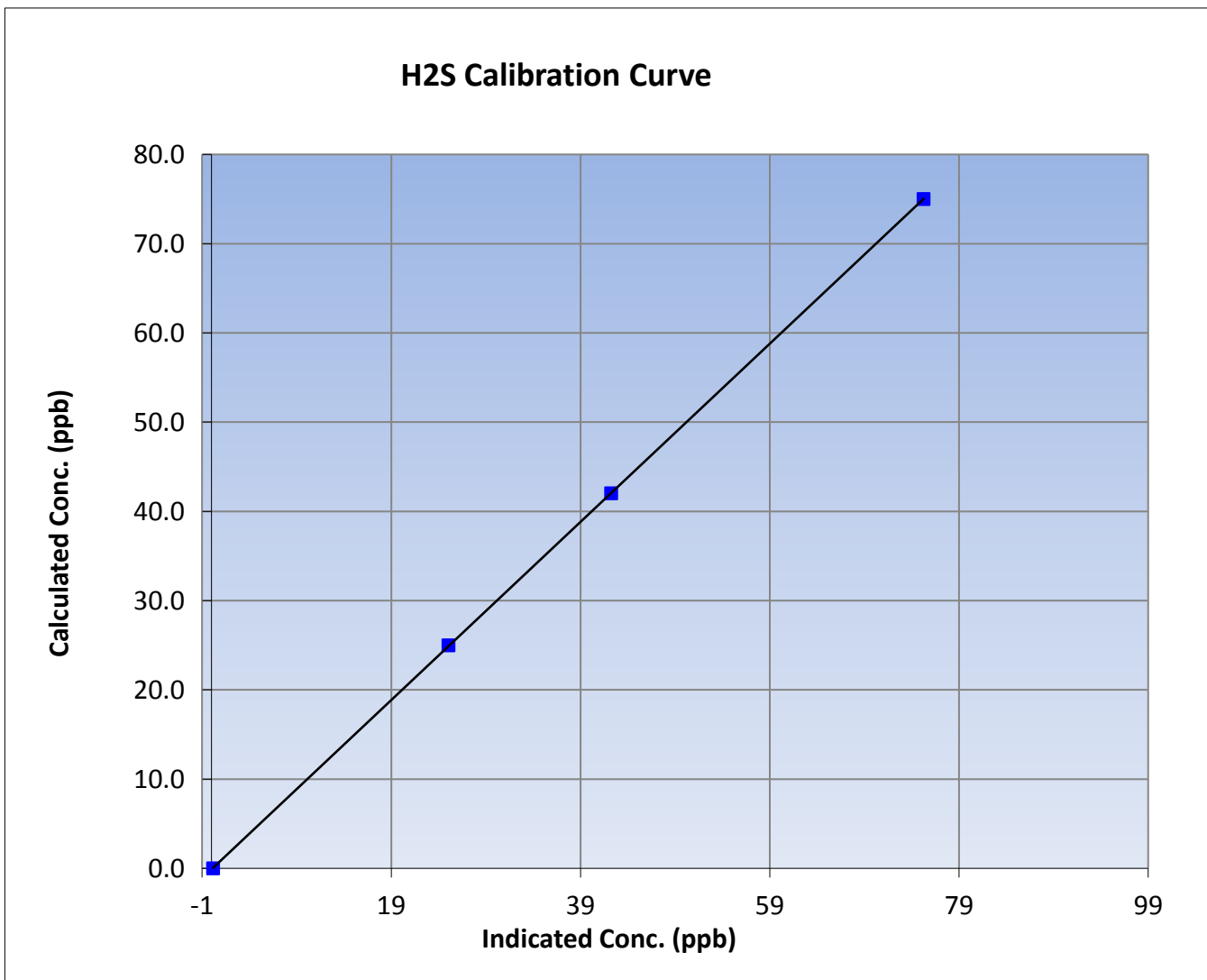
Wood Buffalo Environmental Association H2S Calibration Report

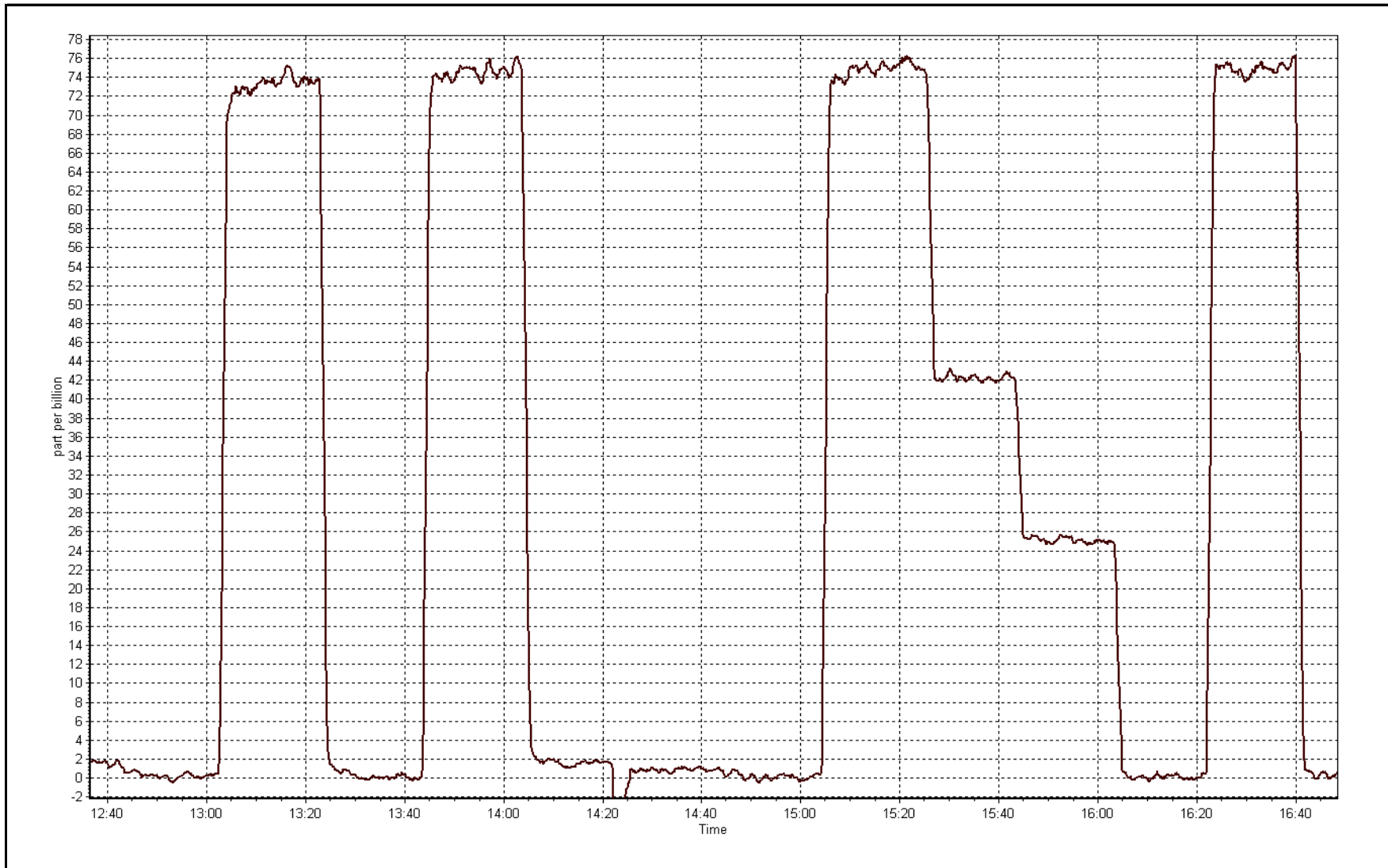
Station Information

Calibration Date	June 7, 2016	Previous Calibration	May 13, 2016
Station Name	Mannix	Station Number	AMS 5
Start Time (MST)	12:45	End Time (MST)	16:45
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	0.2	----	Correlation Coefficient	0.999995
75.0	75.3	0.9963		
42.0	42.2	0.9953	Slope	0.998130
25.0	25.1	0.9979		
			Intercept	-0.106478







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June-07-16	Last Calibration	May-03-16
Station Name	Mannix	Station Number	AMS 5
Reason:	Routine		
Start Time (MST)	9:05	End Time (MST)	12:40
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

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
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	1.003102	1.000005	Fuel Pressure	20.2	20.2
Calculated intercept	0.000150	0.044473	Analyzer Coeff	3.380	3.398
			Analyzer BKG	2.88	2.96

Analyzer make	Thermo 51i-LT	Analyzer serial #	1317958295
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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	0.04	----
as found span	5000	60.0	12.46	12.44	1.001
calibrator zero	5000	0.0	0.00	0.01	----
high point	5000	60.0	12.46	12.44	1.001
second point	5000	30.0	6.23	6.15	1.013
third point	5000	15.0	3.11	3.02	1.031
as left zero	5000	0.0	0.00	-0.07	----
as left span	5000	60.0	12.46	12.45	1.000
Average Correction Factor					1.015

Corrected As found	12.40	Previous response	12.42	% change	0.1%
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Notes:

Inlet filter changed after as founds. Additional zero/span done after inlet filter change to measure the potential impact of smoke on the filter. Changed hydrogen cylinder after additional span, no change in response and flame did not go out. Adjusted zero.

Calibration Performed By:

_____ Evan Magill



Wood Buffalo Environmental Association THC Calibration Report

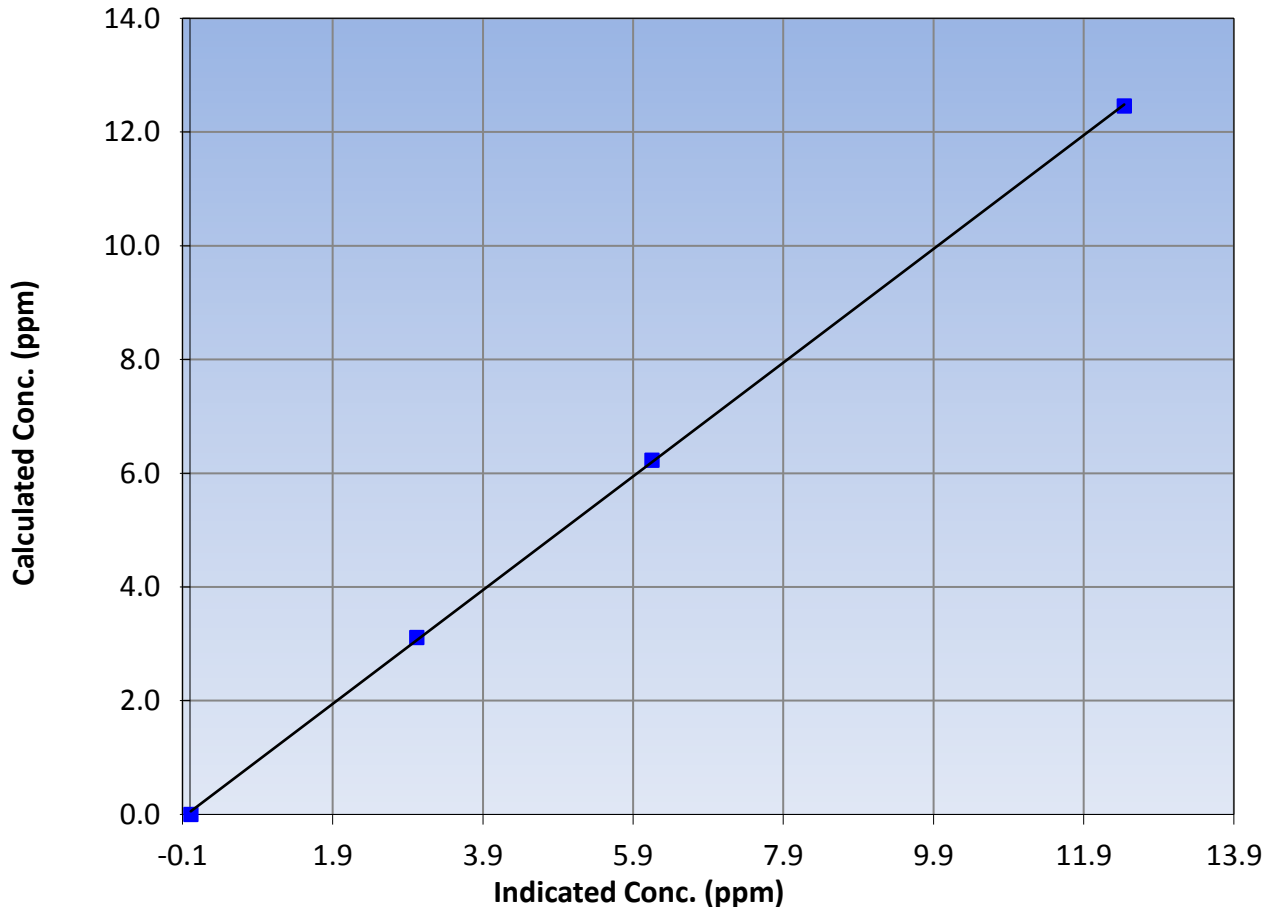
Station Information

Calibration Date	June 7, 2016	Previous Calibration	May 3, 2016
Station Name	Mannix	Station Number	AMS 5
Start Time (MST)	9:05	End Time (MST)	12:40
Analyzer make	Thermo 51i-LT	Analyzer serial #	1317958295

Calibration Data

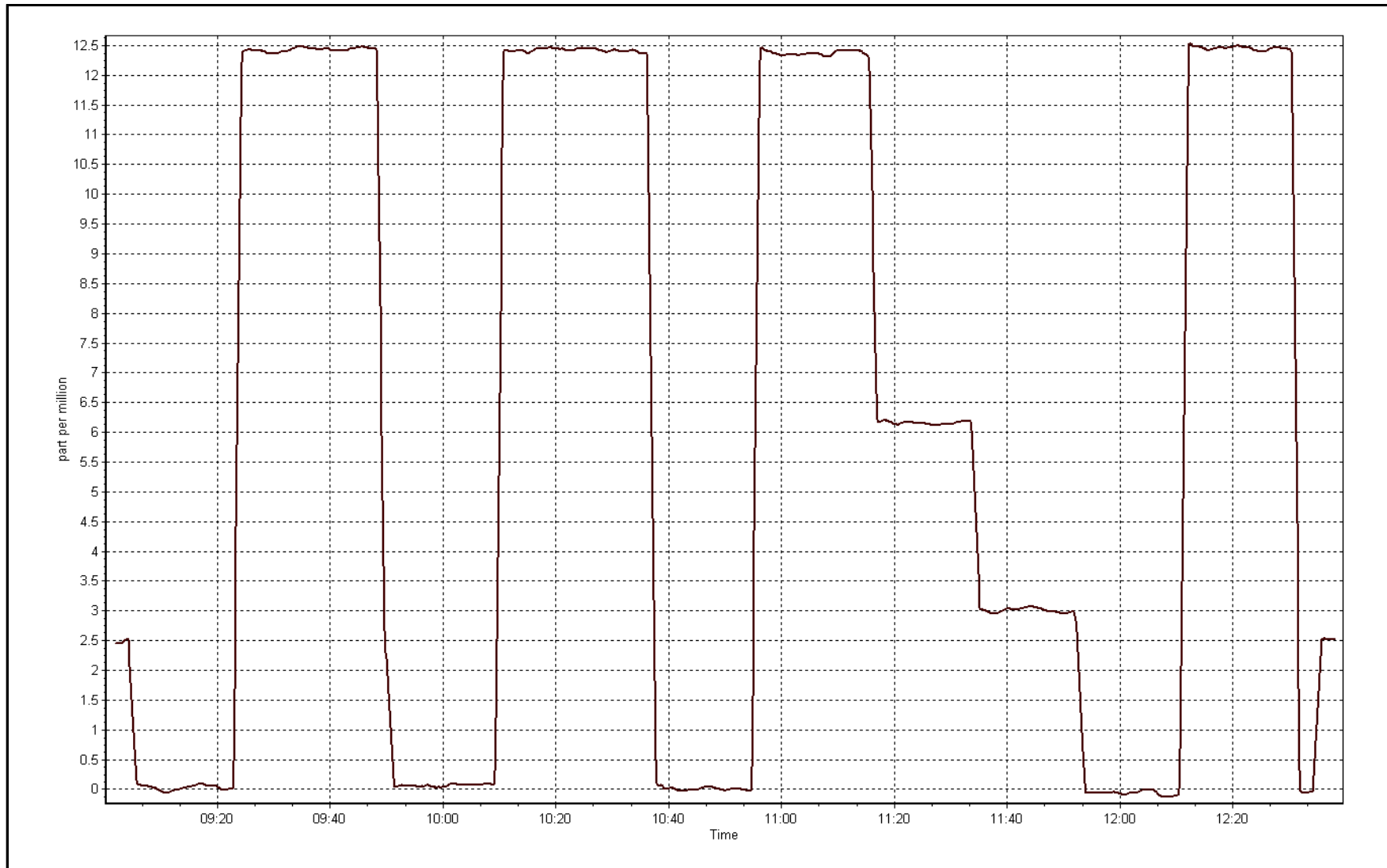
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.01	----	Correlation Coefficient	0.999913
12.46	12.44	1.0013		
6.23	6.15	1.0127	Slope	1.000005
3.11	3.02	1.0311		
			Intercept	0.044473

THC Calibration Curve



THC Calibration Plot

Date: June 7, 2016





WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 6
PATRICIA MCINNES
JUNE 2016

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - PATRICIA McINNES (AMS 6)
 JUNE 2016

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	679	40	41	99.86	40	0	6	0
TRS (ppb) Average	684	34	36	99.72	2	0	0	0
THC (ppm) Average	656	33	64	95.69	2.8	-	2.2	-
NMHC(ppm) Average	656	33	64	95.69	0.589	-	0.103	-
CH4(ppm) Average	656	33	64	95.69	2.4	-	2.1	-
O3 (ppb) Average	684	34	36	99.72	68	0	48	-
NO2 (ppb) Average	661	33	59	96.39	20	0	5	-
NO (ppb) Average	661	33	59	96.39	11	-	2	-
NOX (ppb) Average	661	33	59	96.39	21	-	6	-
NH3 (ppb) Average	622	44	98	92.50	72	0	10	-
PM2.5 (ug/m3) Average	704	7	16	98.75	181.7	-	27.6	0
Temperature 2 m (C) Average	720	0	0	100.00	29.5	-	23.1	-
Relative Humidity (%) Average	720	0	0	100.00	98	-	91	-
Wind Speed 10 m (km/h) Average	720	0	0	100.00	35	-	19	-
Wind Direction 10 m (deg) Average	720	0	0	100.00	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - PATRICIA McINNES (AMS 6)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	679	0.9	3	-	0	0	0	0	0	2	40
TRS (ppb) Average	684	0.2	0	-	0	0	0	0	0	0	2
THC (ppm) Average	656	2.01	0.1	-	1.9	2	2	2	2	2.1	2.8
NMHC(ppm) Average	656	0.007	0.045	-	0	0	0	0	0	0	0.589
CH4(ppm) Average	656	2.01	0.1	-	1.9	2	2	2	2	2.1	2.4
O3 (ppb) Average	684	34.7	11	-	10	20	27	35	41	48	68
NO2 (ppb) Average	661	1.8	2	-	0	0	1	1	2	4	20
NO (ppb) Average	661	0.5	1	-	0	0	0	0	1	1	11
NOX (ppb) Average	661	2.3	2	-	0	0	1	2	3	5	21
NH3 (ppb) Average	622	1.2	6	-	0	0	0	0	0	0	72
PM2.5 (ug/m3) Average	704	6.5	12.6	-	0.1	1	1.7	3.6	6.9	10.7	181.7
Temperature 2 m (C) Average	720	17.63	5.3	-	5.1	11	13.5	17.1	21.9	25.1	29.5
Relative Humidity (%) Average	720	57.4	22	-	15	30	40	55	76	89	98
Wind Speed 10 m (km/h) Average	720	10.9	6	-	0	4	6	10	15	20	35
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - PATRICIA McINNES (AMS 6)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2	14 Jun 2016 12:00	14 Jun 2016 12:00	1	Maintenance - Station operator on site
TRS, O3	02 Jun 2016 15:00	02 Jun 2016 16:00	2	Maintenance - sample manifold cleaned
NMHC, CH4, THC	01 Jun 2016 07:00	02 Jun 2016 09:00	27	Analyzer Failure - sample pump failure
NMHC, CH4, THC	02 Jun 2016 10:00	02 Jun 2016 13:00	4	Maintenance - replaced sample pump
NO2, NO, NOX	02 Jun 2016 09:00	03 Jun 2016 10:00	26	Maintenance - PMT cleaning and stabilization
NH3	01 Jun 2016 05:00	30 Jun 2016 05:00	51	Stabilization after daily span
NH3	02 Jun 2016 15:00	02 Jun 2016 17:00	3	Maintenance - sample manifold cleaned
PM2.5	10 Jun 2016 12:00	10 Jun 2016 12:00	1	Maintenance - verify zero response
PM2.5	14 Jun 2016 11:00	14 Jun 2016 15:00	5	Maintenance - cleaned sample chamber
PM2.5	16 Jun 2016 10:00	16 Jun 2016 10:00	1	Unstable Operation - negative baseline
PM2.5	16 Jun 2016 12:00	16 Jun 2016 12:00	1	Unstable Operation - negative baseline
PM2.5	16 Jun 2016 16:00	16 Jun 2016 16:00	1	Maintenance - adjusted zero



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 40 ppb on Jun 23 18:00	Maximum Daily Average: 5.6 ppb on Jun 23		Hours of Data:	679
Minimum Value: 0 ppb on Jun 1 05:00	Minimum Daily Average: 0.0 ppb on Jun 4		Hours of Missing Data:	41
Maximum Diurnal Average: 2.2 ppb at hour 18	Minimum Diurnal Average: 0.1 ppb at hour 5		Hours of Calibration:	40
Monthly Average: 0.9 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 2 P ₉₉ = 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-Jun	0	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
2-Jun	0	0	0	0	0	0	Z	0	C	C	C	C	C	C	C	C	C	C	0	0	0	0	0	0	--	0
3-Jun	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	6	7	0	0	1	0.7	7
4-Jun	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
5-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	4	3	1	0	0.6	4
6-Jun	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-Jun	0	0	0	0	0	Z	0	0	0	6	12	6	1	4	2	0	0	0	0	1	2	0	0	0	1.6	12
8-Jun	0	0	1	0	0	0	Z	6	4	3	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0.9	6
9-Jun	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	6	6	8	1.0	8
10-Jun	2	0	Z	0	0	1	3	5	0	0	1	13	13	6	4	2	2	4	3	0	0	0	0	0	2.6	13
11-Jun	0	0	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
12-Jun	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-Jun	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-Jun	0	0	0	0	0	0	Z	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
15-Jun	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
16-Jun	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-Jun	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	1
18-Jun	2	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.2	2
19-Jun	0	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	2	3	3	8	11	5	2	1	1.6	11
20-Jun	0	0	0	0	0	0	Z	6	20	11	9	3	3	3	1	1	0	0	0	0	0	0	0	0	2.6	20
21-Jun	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
22-Jun	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-Jun	0	0	0	Z	0	0	0	0	0	3	3	3	16	11	5	0	33	40	6	1	1	1	1	1	5.6	40
24-Jun	1	0	1	1	Z	2	7	8	5	5	4	3	4	4	3	1	1	5	3	0	1	2	3	2	2.9	8
25-Jun	1	1	1	1	1	Z	7	3	2	7	2	0	0	1	1	0	0	0	0	0	0	0	0	0	1.3	7
26-Jun	0	0	0	0	0	0	Z	0	1	1	1	1	1	1	0	2	4	0	0	1	0	0	0	0	0.6	4
27-Jun	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0.2	1
28-Jun	0	0	Z	0	0	0	0	0	0	4	5	0	0	0	3	10	7	7	0	1	0	0	0	0	1.7	10
29-Jun	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
30-Jun	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

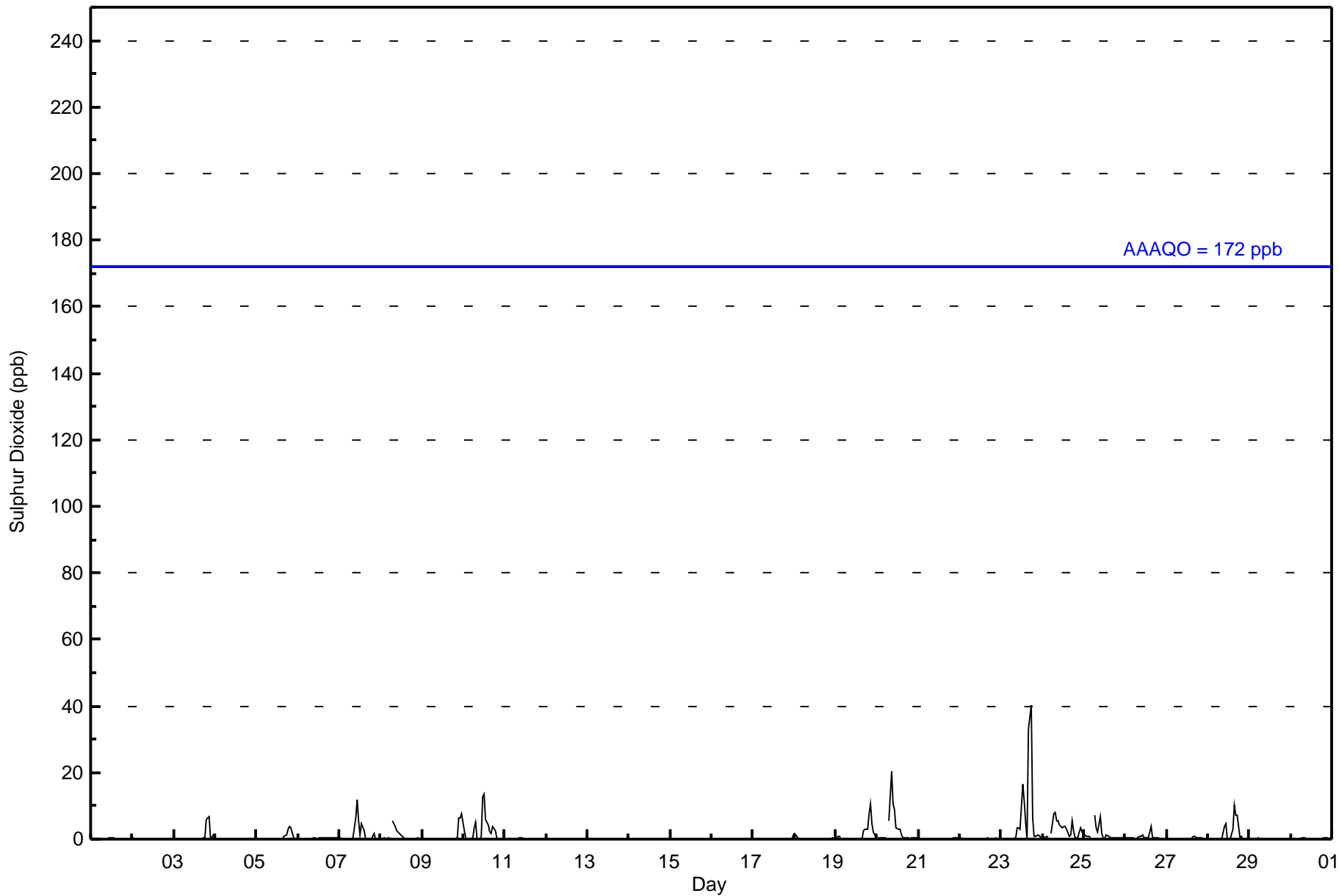
0.3	0.2	0.2	0.2	0.1	0.2	0.8	1.2	1.2	1.5	1.4	1.2	1.4	1.1	0.8	0.7	1.7	2.2	0.7	0.8	0.9	0.6	0.6	0.5	Diurnal Average	
2	1	1	1	1	2	7	8	20	11	12	13	16	11	5	10	33	40	6	8	11	6	6	8	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Patricia McInnes - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Patricia McInnes - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	669	98.53	98.53
11 - 20	8	1.18	99.71
21 - 60	2	0.29	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: 679

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Patricia McInnes - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	52	33	21	14	23	50	44	31	55	50	64	56	38	51	34	53	669
11 - 20	3	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	8
21 - 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	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
Totals	55	35	22	15	24	50	44	31	55	50	64	56	38	51	34	55	679

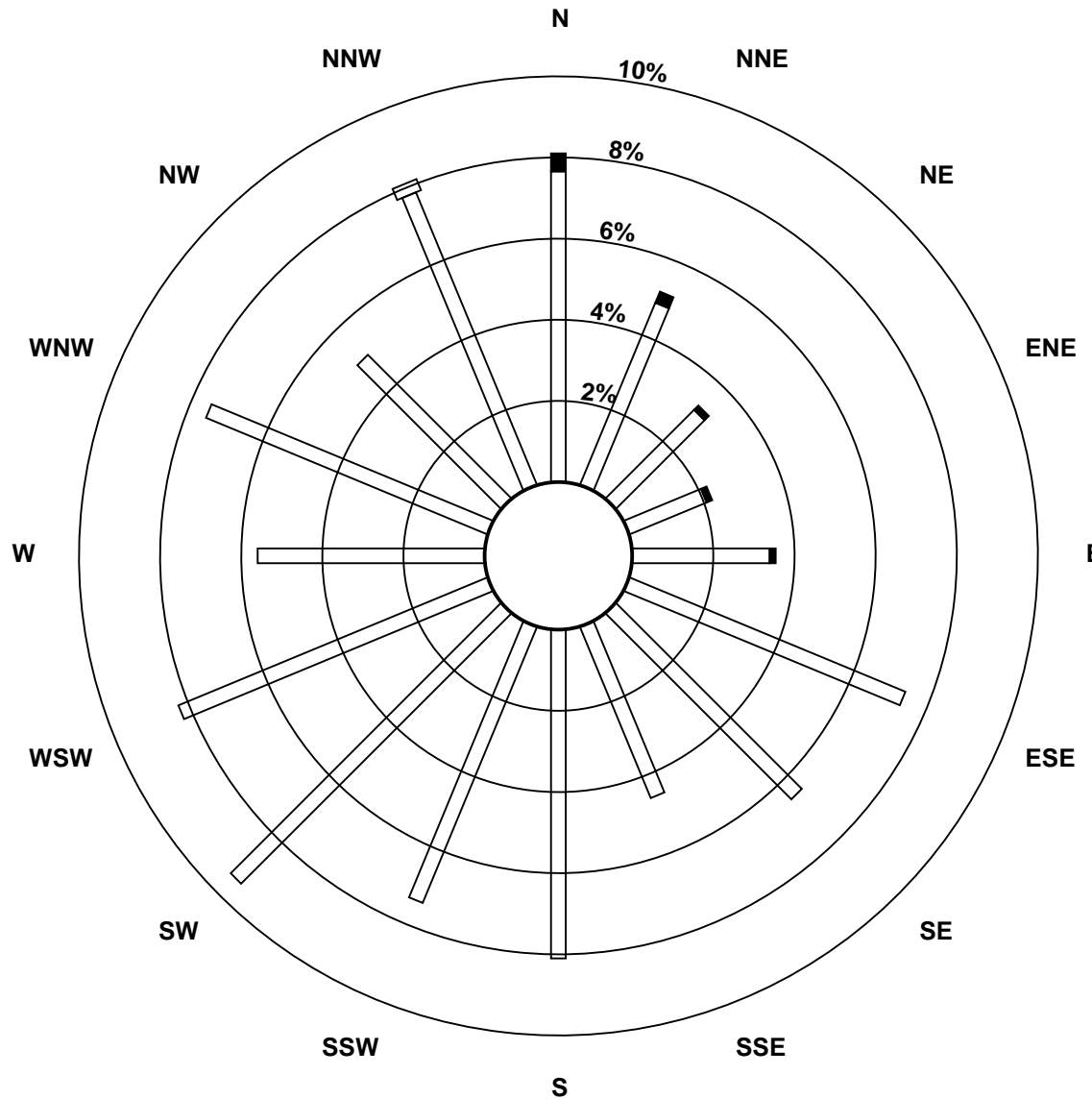
Total Number of Valid Hours: 679

Total Number of Hours: 720

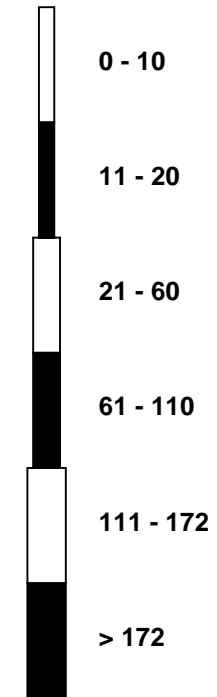


Wood Buffalo Environmental Association
Wind Rose Jun 2016

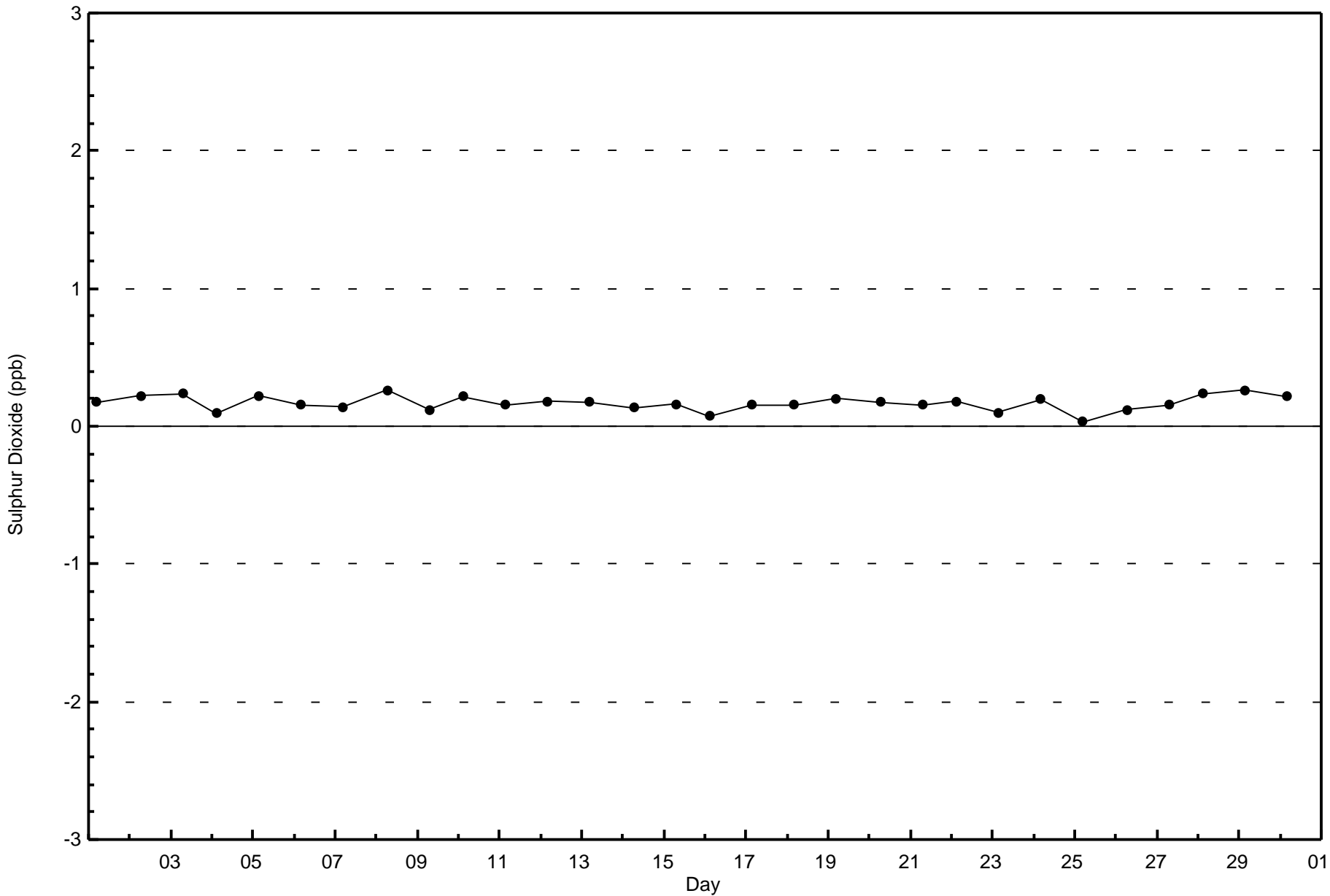
Sulphur Dioxide (SO₂) - ppb
Patricia McInnes (AMS 6)

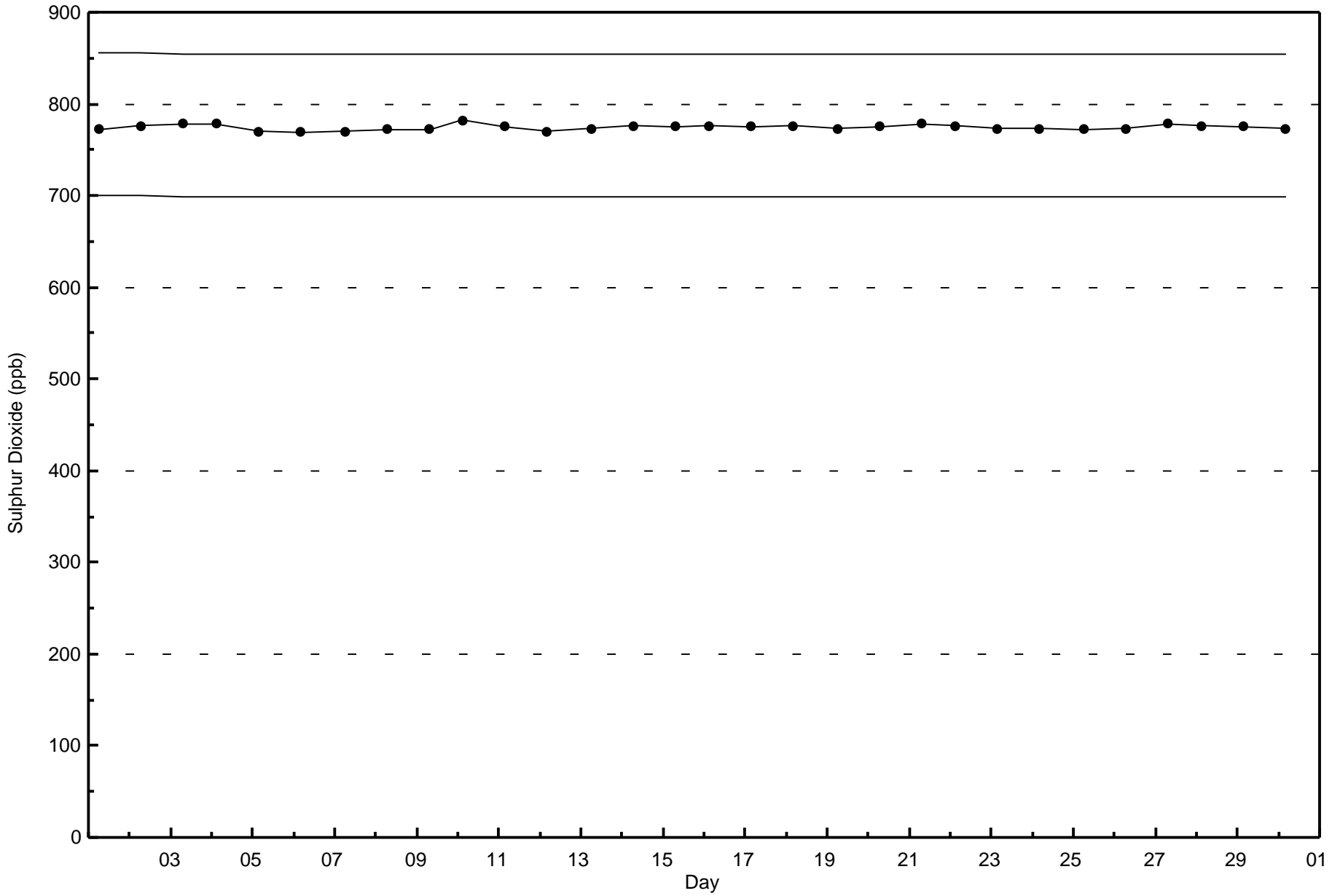


Classes (ppb)



Total Number of Valid Hours: 679







Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

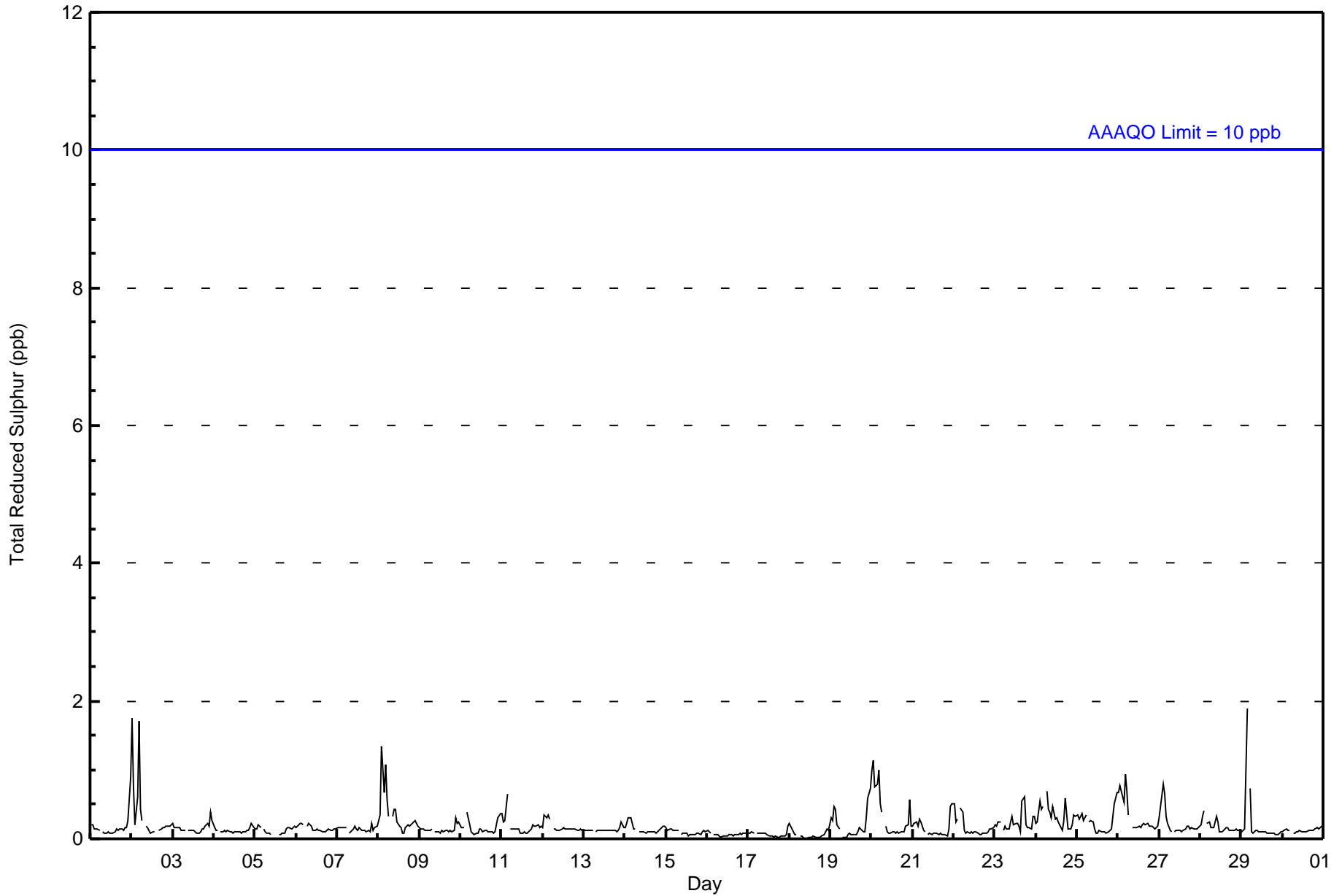
Patricia McInnes - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 2 ppb on Jun 29 04:00	Maximum Daily Average: 0.4 ppb on Jun 2
Minimum Value: 0 ppb on Jun 18 11:00	Hours of Data: 684
Maximum Diurnal Average: 0.4 ppb at hour 4	Hours of Missing Data: 36
Monthly Average: 0.2 ppb	Hours of Calibration: 34
Minimum Daily Average: 0.1 ppb on Jun 18	Percent Operational Time: 99.7
Minimum Diurnal Average: 0.1 ppb at hour 16	
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P 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-Jun	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1
2-Jun	2	1	0	1	2	0	0	Z	0	0	0	0	0	0	M	M	0	0	0	0	0	0	0	0	0.4	2
3-Jun	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
4-Jun	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
5-Jun	0	0	0	0	Z	0	0	0	0	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0.1	0
6-Jun	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-Jun	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-Jun	0	0	1	1	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
9-Jun	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
10-Jun	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-Jun	0	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
12-Jun	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-Jun	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-Jun	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
15-Jun	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
16-Jun	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-Jun	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
18-Jun	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
19-Jun	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1
20-Jun	1	1	1	1	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1
21-Jun	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1
22-Jun	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
23-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0.2	1
24-Jun	0	0	1	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.3	1
25-Jun	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.2	1
26-Jun	1	1	1	1	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
27-Jun	0	0	1	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
28-Jun	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
29-Jun	0	0	0	2	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2
30-Jun	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

0.3	0.3	0.3	0.4	0.4	0.3	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	0.2	0.2	0.3	Diurnal Average
2	1	1	2	2	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	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

Total Reduced Sulphur (TRS) - ppb
Patricia McInnes - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	684	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Patricia McInnes - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	56	36	22	14	31	51	42	35	55	49	65	56	37	51	31	53	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
Totals	56	36	22	14	31	51	42	35	55	49	65	56	37	51	31	53	684

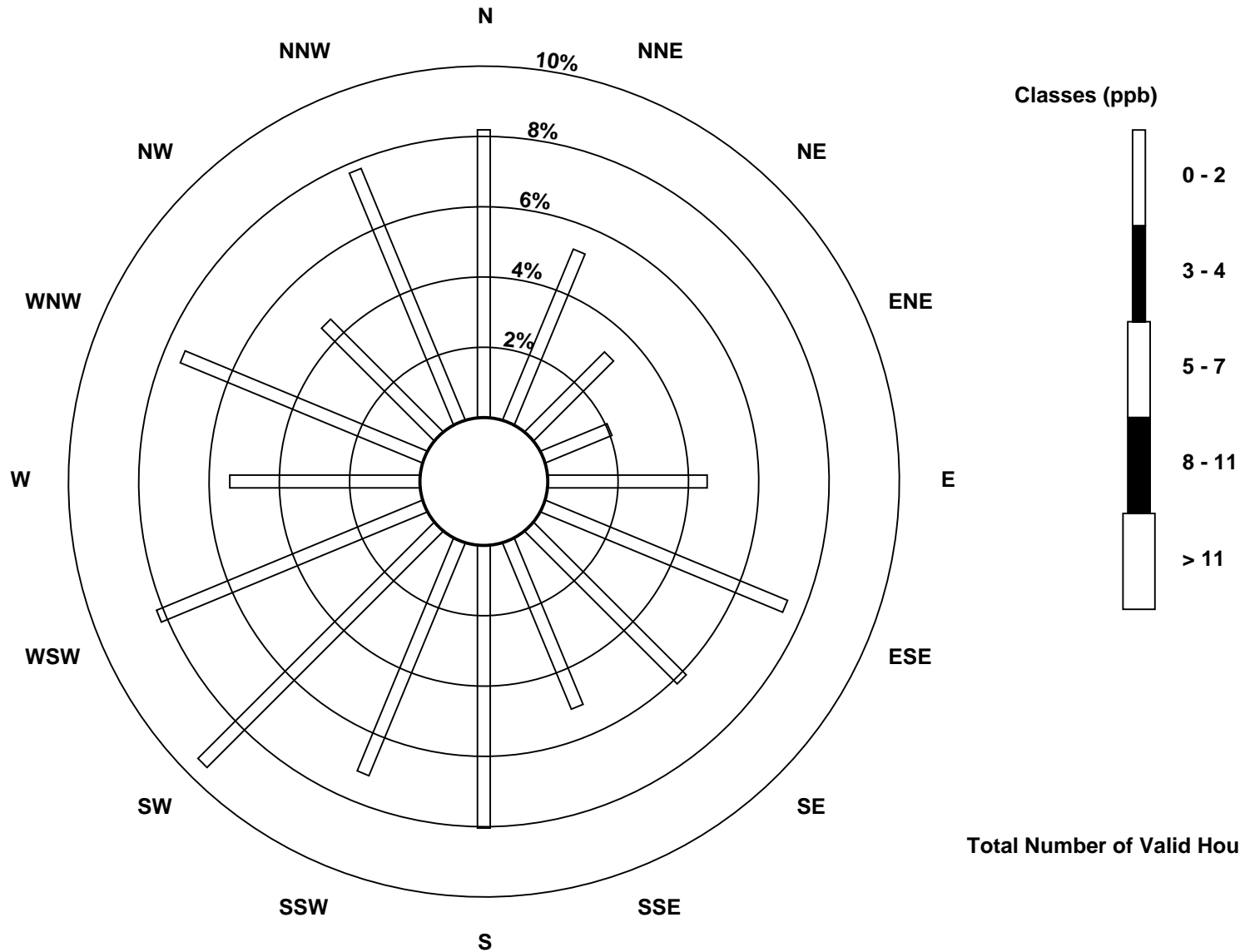
Total Number of Valid Hours: 684

Total Number of Hours: 720

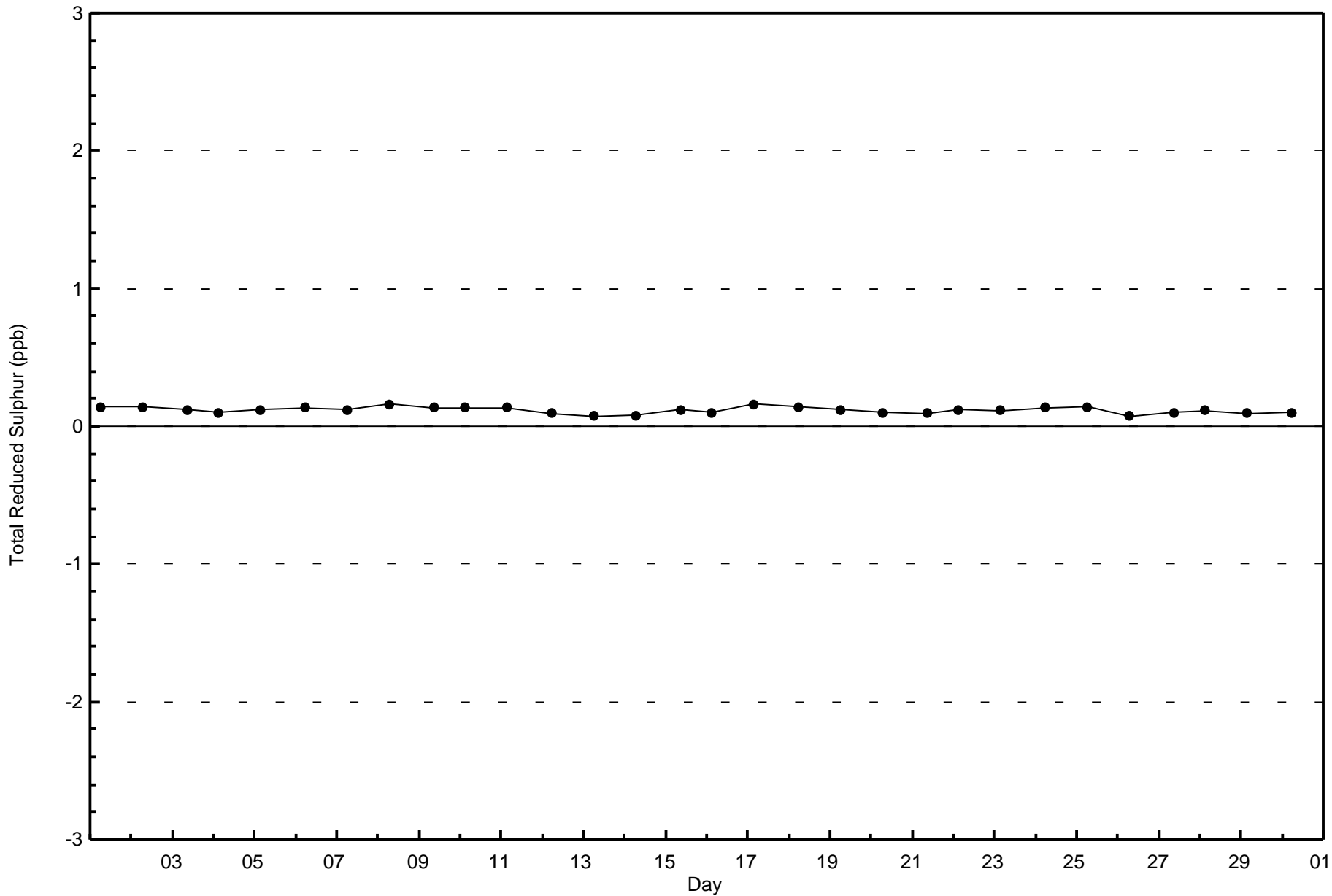


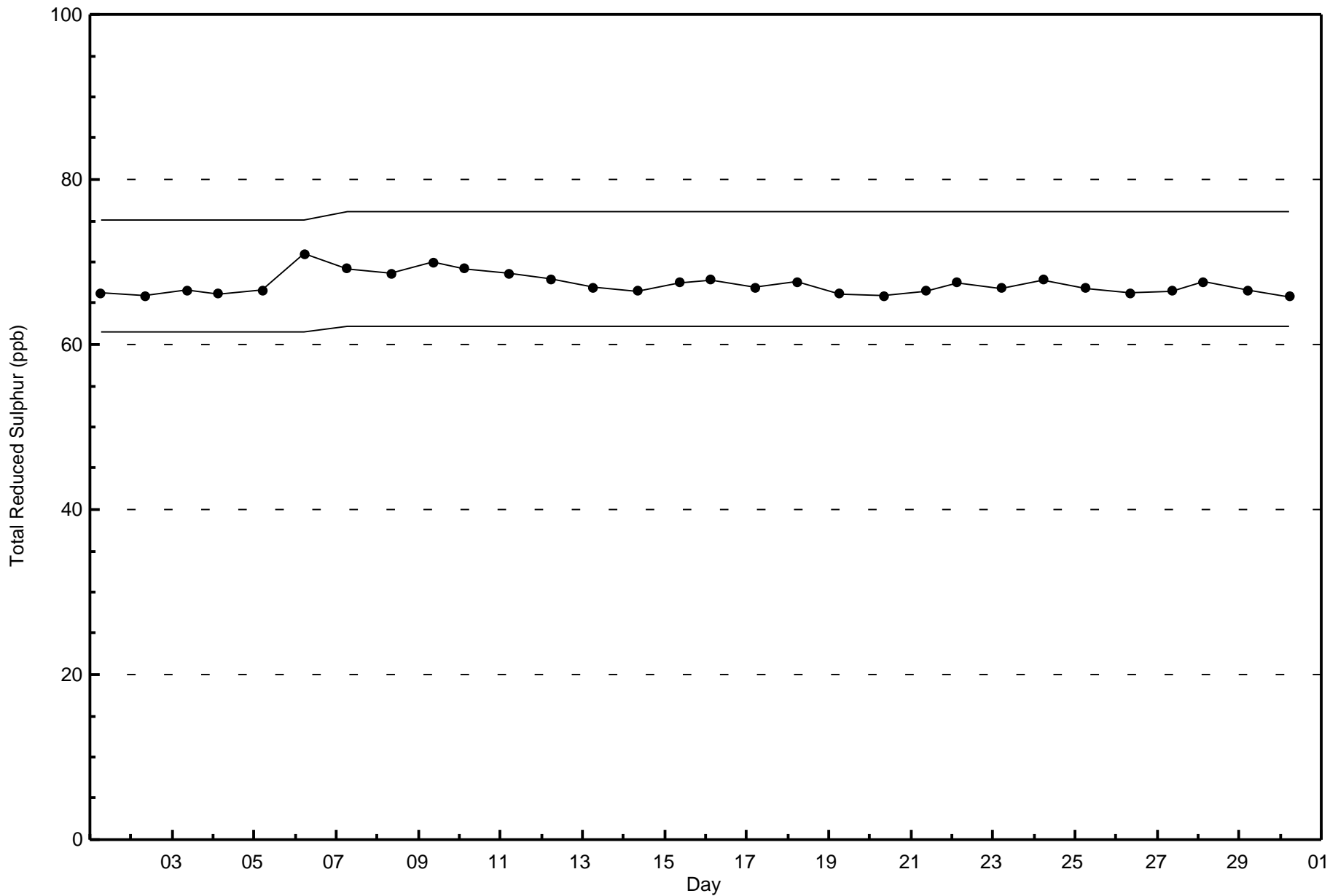
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Total Reduced Sulphur (TRS) - ppb
Patricia McInnes (AMS 6)



Total Number of Valid Hours: 684







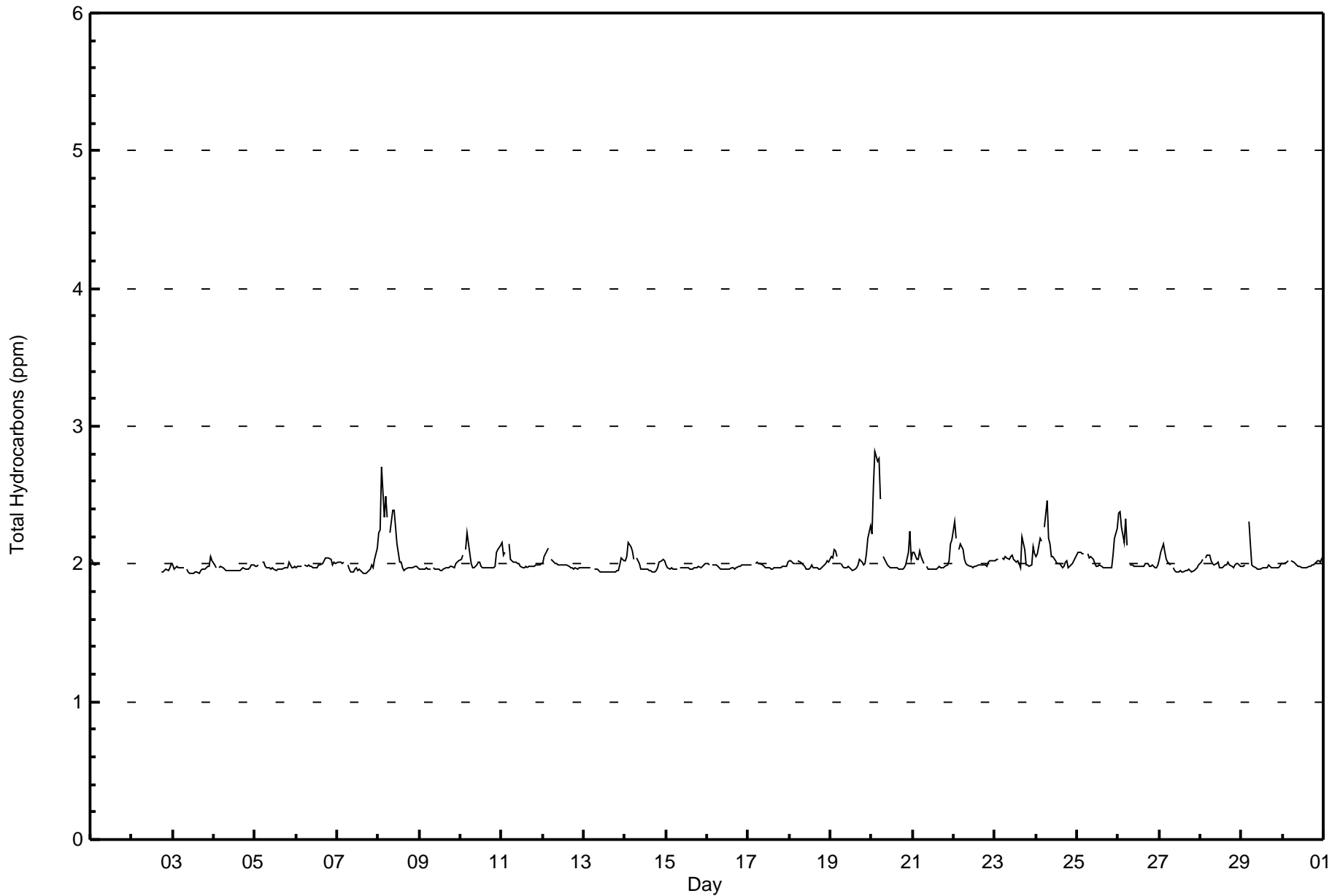
Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

Patricia McInnes - June 2016

Maximum Value: 2.8 ppm on Jun 20 03:00		Maximum Daily Average: 2.2 ppm on Jun 20		Hours in Service: 720																						
Minimum Value: 1.9 ppm on Jun 7 17:00		Minimum Daily Average: 2.0 ppm on Jun 13		Hours of Data: 656																						
Maximum Diurnal Average: 2.1 ppm at hour 5		Minimum Diurnal Average: 2.0 ppm at hour 16		Hours of Missing Data: 64																						
Monthly Average: 2.01 ppm		Percentiles: P ₁ = 1.9 P ₁₀ = 2.0 Q ₁ = 2.0 Median = 2.0 Q ₃ = 2.0 P ₉₀ = 2.1 P ₉₉ = 2.5		Hours of Calibration: 33																						
				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-Jun	2.0	2.0	2.0	2.0	2.0	Z	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	2.0
2-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	M	M	M	C	C	C	C	1.9	1.9	2.0	2.0	2.0	2.0	2.0	--	2.0
3-Jun	2.0	2.0	2.0	2.0	2.0	2.0	2.0	Z	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	2.1	2.0	2.0	2.1
4-Jun	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
5-Jun	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
6-Jun	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
7-Jun	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	1.9	1.9	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	2.1	2.0	2.1
8-Jun	2.2	2.2	2.7	2.3	2.5	2.3	Z	2.2	2.4	2.4	2.3	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	2.7
9-Jun	2.0	2.0	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
10-Jun	2.0	2.1	Z	2.1	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	2.0	2.0	2.0	2.1	2.1	2.1	2.0	2.2
11-Jun	2.2	2.1	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	2.0	2.2
12-Jun	2.0	2.1	2.1	2.1	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
13-Jun	2.0	2.0	2.0	2.0	2.0	Z	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	1.9	2.0	2.0	2.0	2.0	2.0	2.0
14-Jun	2.0	2.1	2.2	2.1	2.1	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2
15-Jun	2.0	2.0	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
16-Jun	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
17-Jun	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-Jun	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-Jun	2.1	2.0	2.1	2.1	2.1	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	2.2	2.3	2.0	2.3
20-Jun	2.2	2.6	2.8	2.7	2.8	2.5	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	2.1	2.2	2.0	2.0	2.2	2.8
21-Jun	2.1	2.1	2.0	2.0	2.1	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	2.1	2.2	2.0	2.0	2.2
22-Jun	2.3	2.2	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.3
23-Jun	2.0	2.0	2.0	Z	2.0	2.0	2.1	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.2	2.1	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.2
24-Jun	2.1	2.1	2.2	2.2	Z	2.3	2.5	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	2.0	2.0	2.0	2.0	2.1	2.5
25-Jun	2.1	2.1	2.1	2.1	2.1	Z	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	2.1	2.2	2.3	2.0	2.3
26-Jun	2.4	2.4	2.3	2.2	2.3	2.1	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	2.4
27-Jun	2.0	2.1	2.1	2.1	2.0	2.0	2.0	Z	2.0	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.1
28-Jun	2.0	2.0	Z	2.0	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	2.0	2.1
29-Jun	2.0	2.0	2.0	Z	2.3	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
30-Jun	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
																								Diurnal Average		
																								Diurnal Maximum		
																								Z - zerospan		
																								C - Calibration		
																								M - Maintenance		
																								AF - Analyzer Failure		





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Patricia McInnes - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	558	85.06	85.06
2.1 - 3.0	98	14.94	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 656

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Patricia McInnes - June 2016**

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	49	32	20	13	26	46	37	21	40	40	58	50	29	39	25	33	558
2.1 - 3.0	6	2	2	1	0	3	2	6	11	8	4	5	7	12	7	22	98
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
Totals	55	34	22	14	26	49	39	27	51	48	62	55	36	51	32	55	656

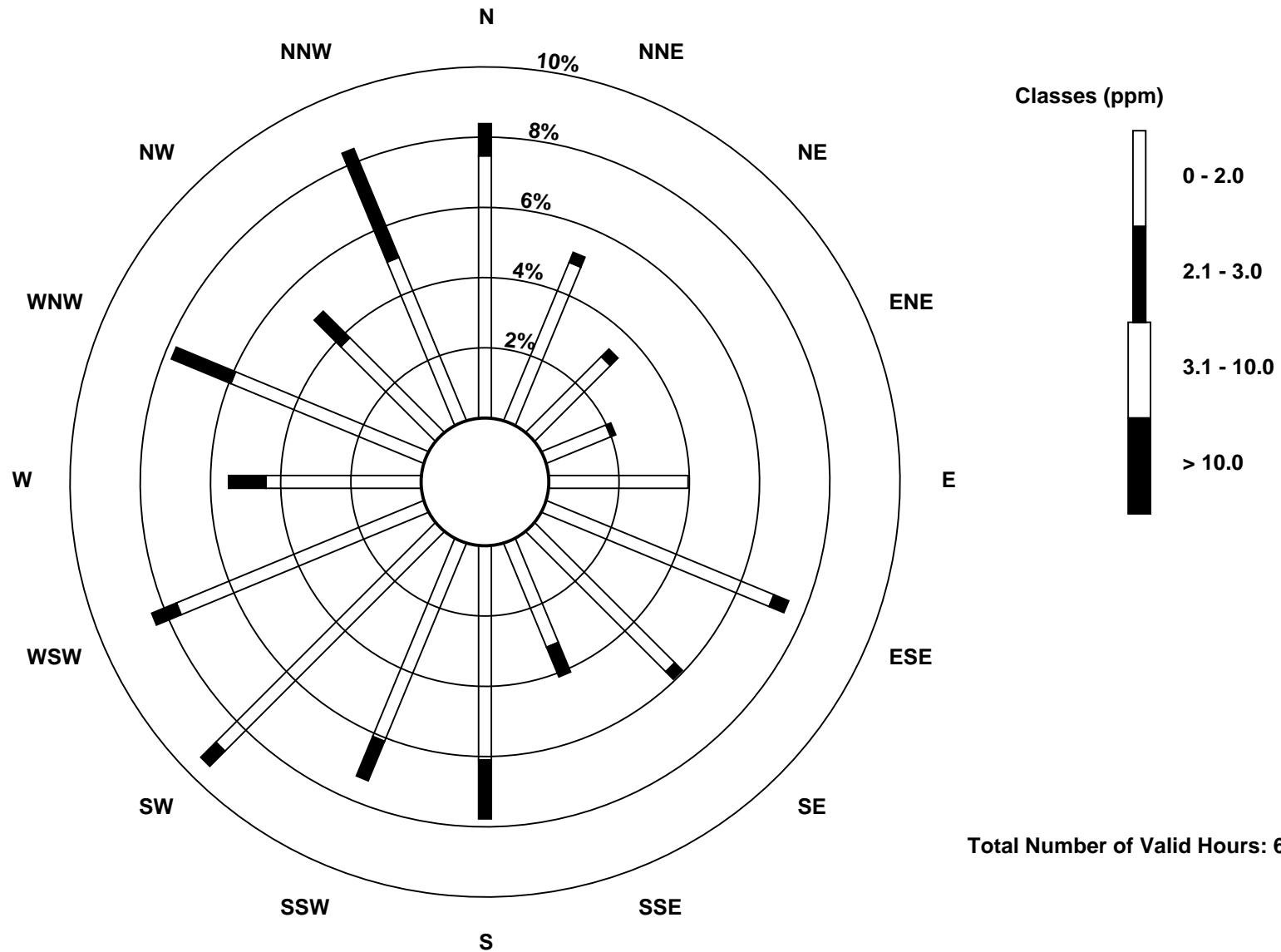
Total Number of Valid Hours: 656

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

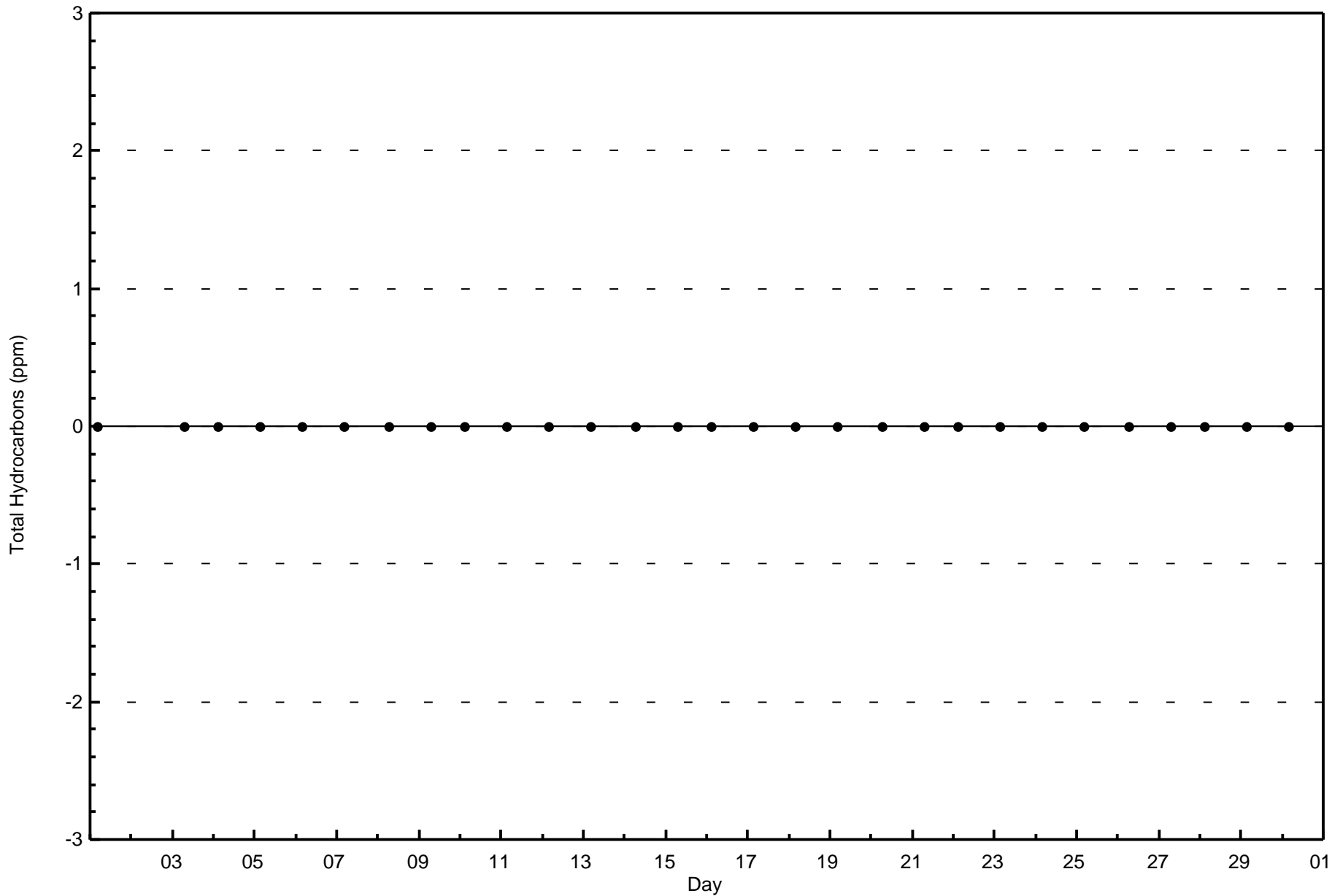
Total Hydrocarbons (THC) - ppm
Patricia McInnes (AMS 6)

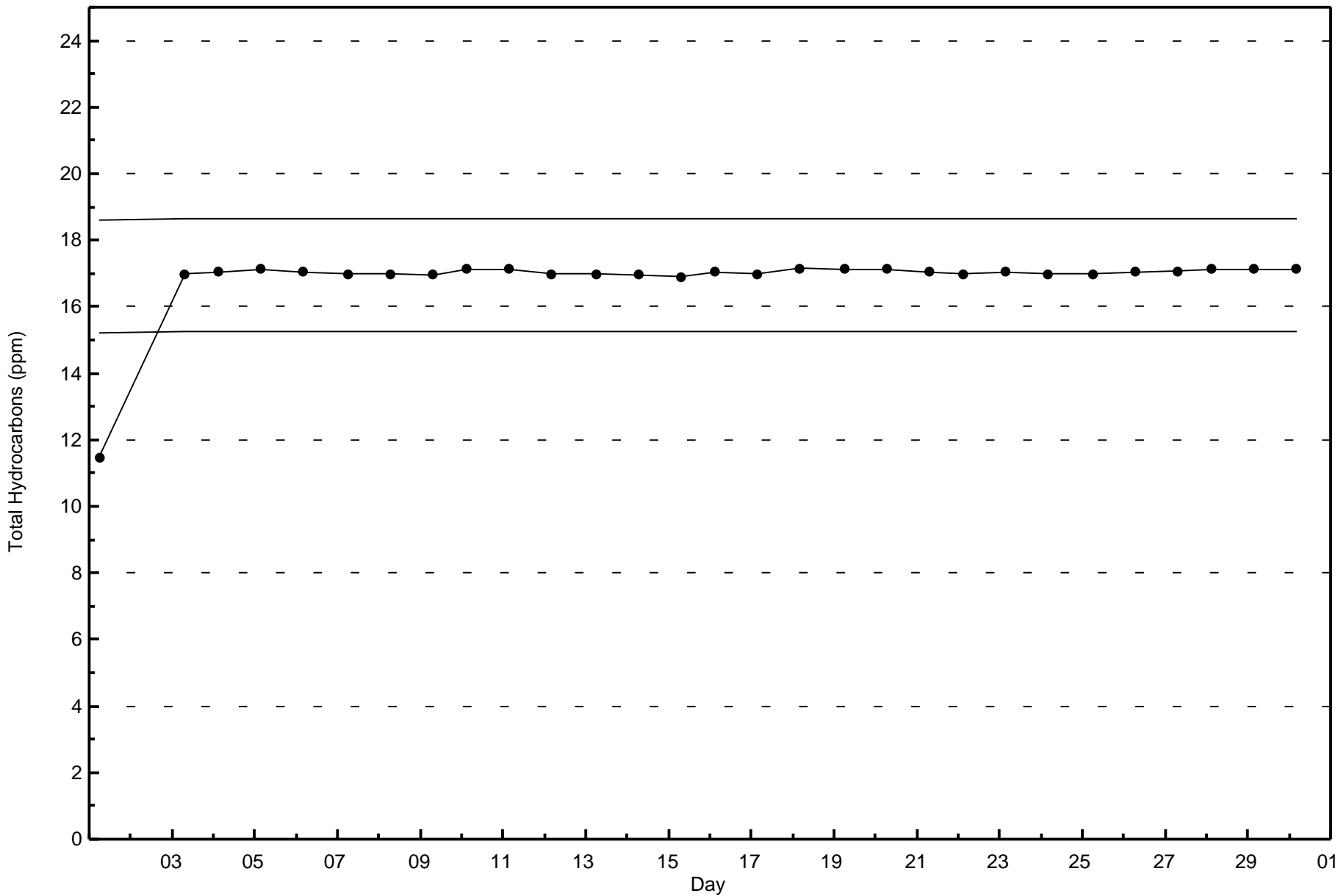




Wood Buffalo Environmental Association
Zero Responses

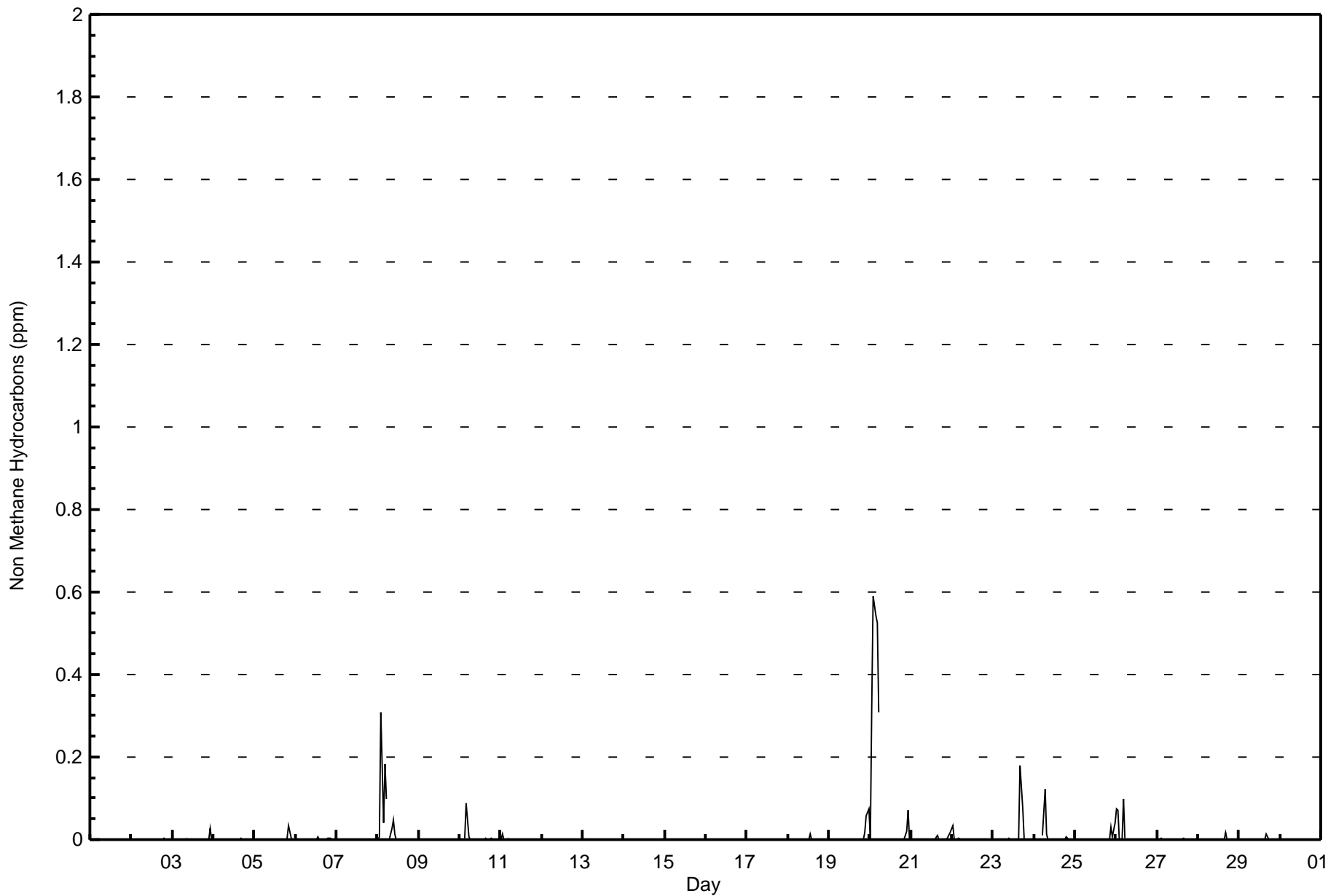
Total Hydrocarbons (THC) - ppm
Patricia McInnes - June 2016







Maximum Value: 0.589 ppm on Jun 20 03:00		Maximum Daily Average: 0.103 ppm on Jun 20		Hours in Service:	720																					
Minimum Value: 0.000 ppm on Jun 1 01:00		Minimum Daily Average: 0.000 ppm on Jun 7		Hours of Data:	656																					
Maximum Diurnal Average: 0.038 ppm at hour 5		Minimum Diurnal Average: 0.000 ppm at hour 12		Hours of Missing Data:	64																					
Monthly Average: 0.007 ppm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 0.2		Hours of Calibration:	33																					
				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-Jun	0.000	0.000	0.000	0.000	0.000	Z	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0.000
2-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	M	M	M	C	C	C	C	0.000	0.000	0.004	0.000	0.000	0.000	0.000	--	0.004
3-Jun	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Z	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	0.001	0.026
4-Jun	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	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
5-Jun	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	0.002	0.034	0.003	0.000	0.000	0.002	0.034
6-Jun	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	0.006	0.000	0.000	0.000	0.000	0.000	0.002	0.005	0.000	0.000	0.000	0.001	0.006
7-Jun	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
8-Jun	0.000	0.008	0.309	0.042	0.183	0.097	Z	0.001	0.026	0.047	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.032	0.309
9-Jun	0.000	0.000	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
10-Jun	0.000	0.000	Z	0.002	0.089	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.003	0.005	0.089
11-Jun	0.000	0.012	0.000	Z	0.005	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	0.001	0.012
12-Jun	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-Jun	0.000	0.000	0.000	0.000	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
14-Jun	0.000	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
15-Jun	0.000	0.000	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
16-Jun	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-Jun	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
18-Jun	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	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.015
19-Jun	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	0.015	0.056	0.076	0.006	0.076
20-Jun	0.000	0.321	0.589	0.542	0.525	0.307	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	0.021	0.071	0.000	0.103	0.589
21-Jun	0.000	0.000	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	0.010	0.000	0.000	0.000	0.000	0.000	0.002	0.012	0.017	0.002	0.017
22-Jun	0.034	0.000	Z	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	0.000	0.000	0.002	0.034
23-Jun	0.000	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.001	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.181	0.075	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.181
24-Jun	0.000	0.000	0.000	0.000	Z	0.011	0.124	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.007	0.124
25-Jun	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	0.029	0.006	0.039	0.000	0.003	0.039
26-Jun	0.076	0.070	0.000	0.000	0.099	0.002	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	0.011	0.099
27-Jun	0.000	0.000	0.004	0.000	0.000	0.000	0.000	Z	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	0.005
28-Jun	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	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.019
29-Jun	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	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.015
30-Jun	0.000	0.000	0.000	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance AF - Analyzer Failure																										





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Patricia McInnes - June 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	613	93.45	93.45
0.006 - 0.05	25	3.81	97.26
0.06 - 0.1	10	1.52	98.78
> 0.1	8	1.22	100.00

Total Number of Valid Hours: 656

Total Number of Hours: 720



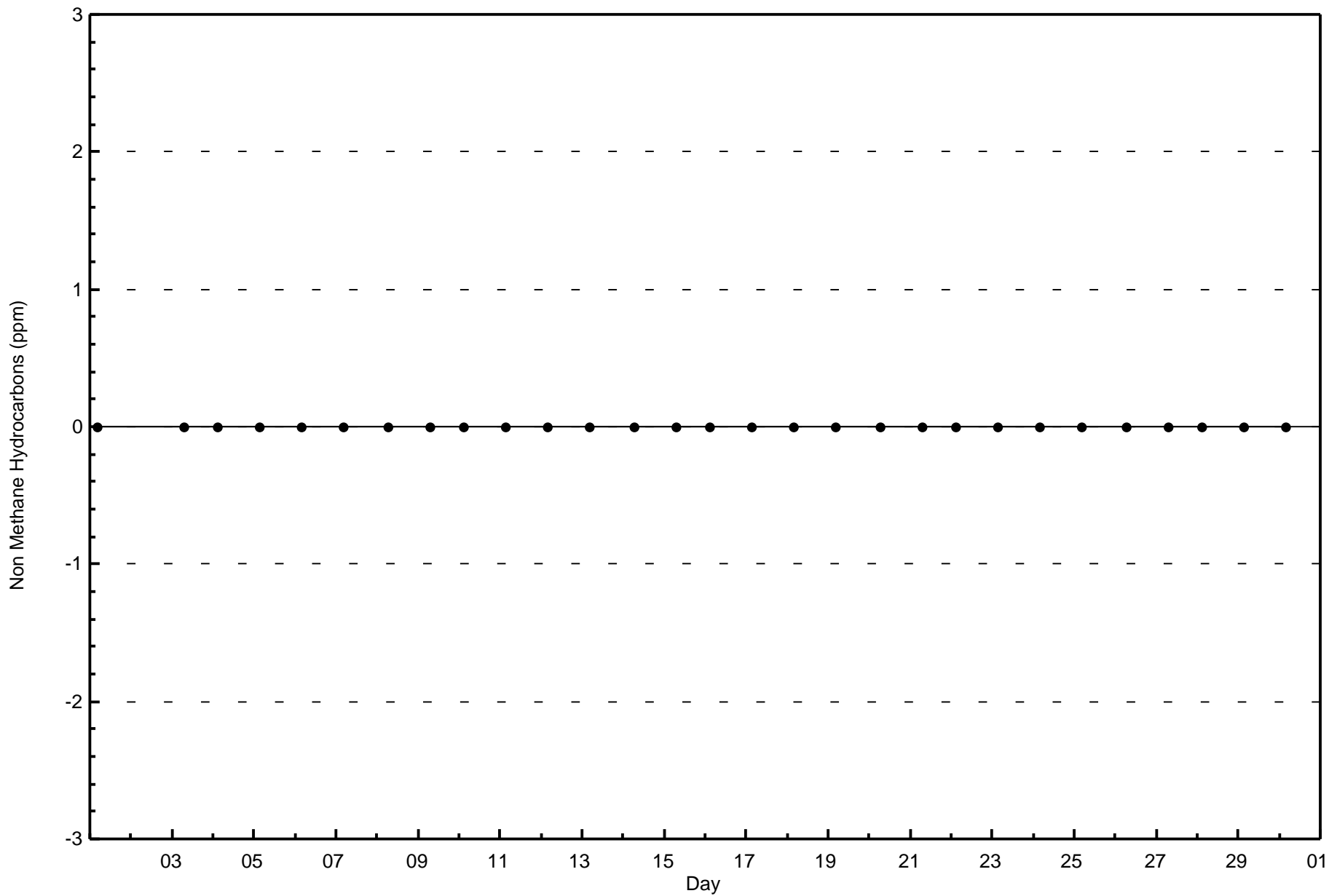
Wood Buffalo Environmental Association
Frequency Distribution

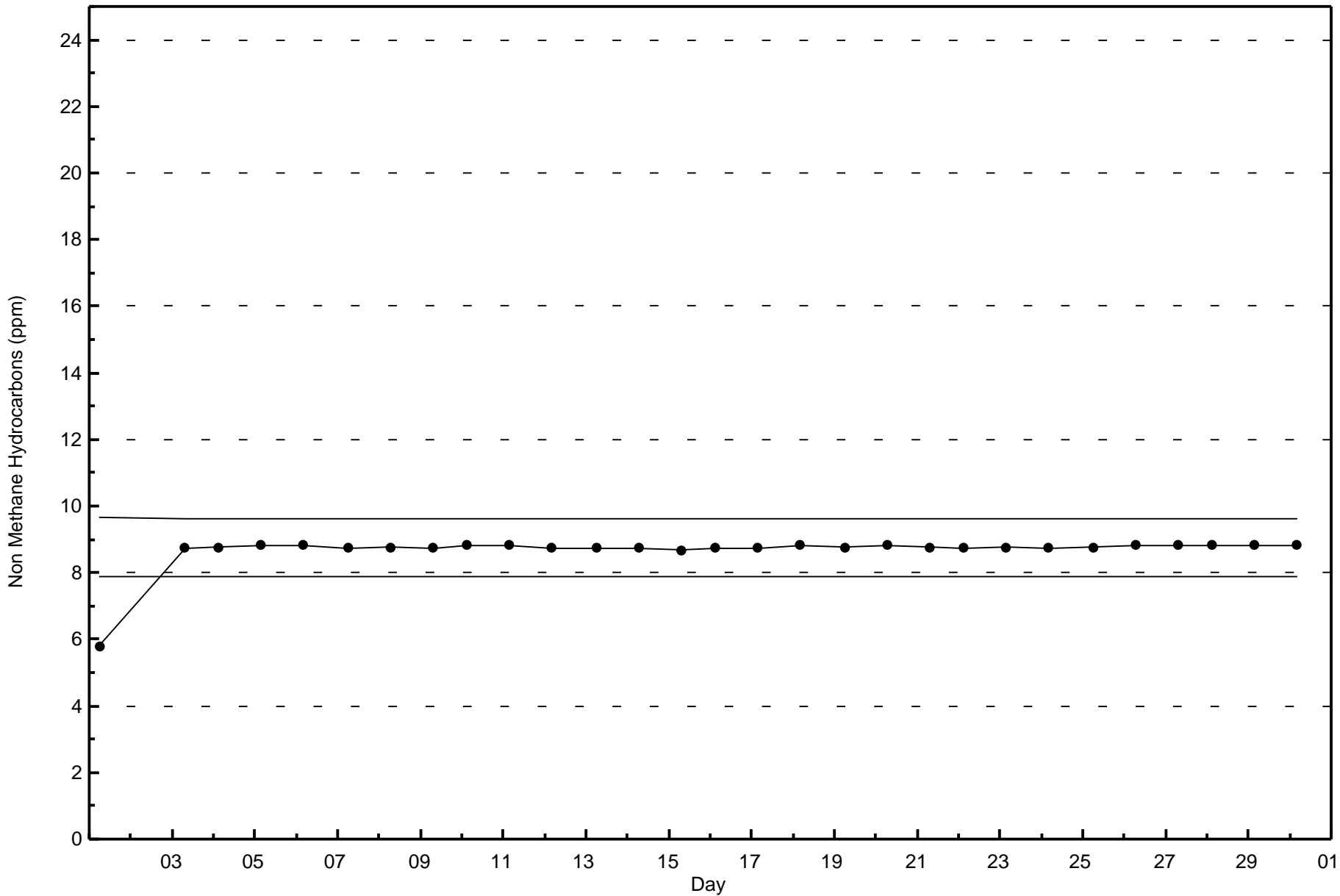
Non Methane Hydrocarbons (NMHC) - ppm
Patricia McInnes - June 2016

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	53	33	20	14	26	48	38	24	49	45	59	51	32	45	28	48	613
0.006 - 0.05	1	1	2	0	0	1	1	1	1	2	1	0	3	3	4	4	25
0.06 - 0.1	1	0	0	0	0	0	0	1	1	0	1	2	0	2	0	2	10
> 0.1	0	0	0	0	0	0	0	1	0	1	1	2	1	1	0	1	8
Totals	55	34	22	14	26	49	39	27	51	48	62	55	36	51	32	55	656

Total Number of Valid Hours: 656

Total Number of Hours: 720







Wood Buffalo Environmental Association

Summary of Hour Averages

Methane (CH₄) - ppm

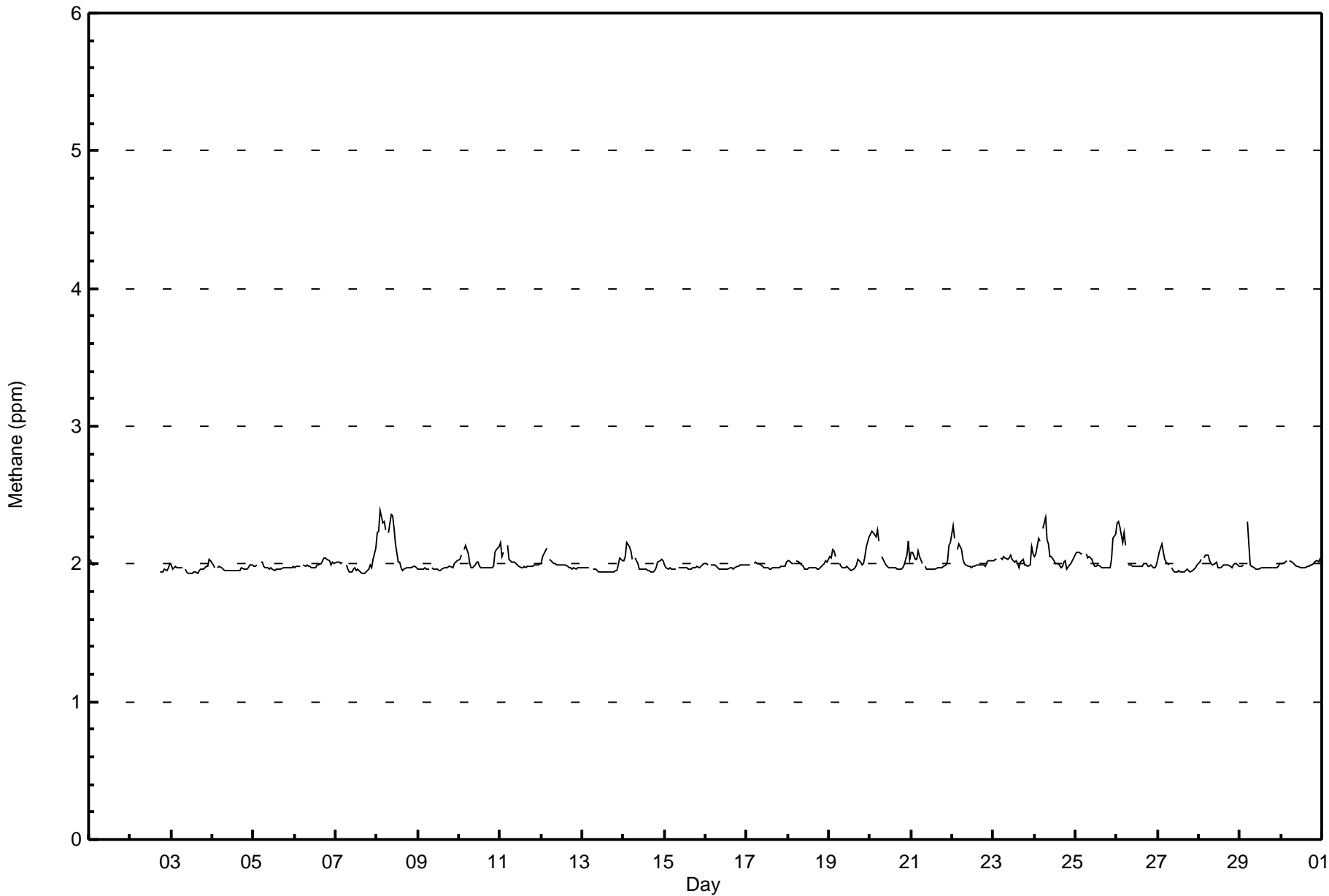
Patricia McInnes - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 2.4 ppm on Jun 8 03:00	Maximum Daily Average: 2.1 ppm on Jun 8		Hours of Data:	656
Minimum Value: 1.9 ppm on Jun 7 17:00	Minimum Daily Average: 2.0 ppm on Jun 13		Hours of Missing Data:	64
Maximum Diurnal Average: 2.1 ppm at hour 5	Minimum Diurnal Average: 2.0 ppm at hour 16		Hours of Calibration:	33
Monthly Average: 2.01 ppm	Percentiles: P ₁ = 1.9 P ₁₀ = 2.0 Q ₁ = 2.0 Median = 2.0 Q ₃ = 2.0 P ₉₀ = 2.1 P ₉₉ = 2.3		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-Jun	2.0	2.0	2.0	2.0	2.0	Z	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	2.0
2-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	M	M	M	C	C	C	C	1.9	1.9	1.9	2.0	2.0	2.0	2.0	--	2.0
3-Jun	2.0	2.0	2.0	2.0	2.0	2.0	2.0	Z	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	2.0
4-Jun	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
5-Jun	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
6-Jun	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
7-Jun	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	1.9	1.9	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	2.1	2.0	2.1
8-Jun	2.2	2.2	2.4	2.3	2.3	Z	2.2	2.4	2.3	2.3	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	2.4
9-Jun	2.0	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
10-Jun	2.0	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	2.0	2.0	2.0	2.1	2.1	2.1	2.0	2.1
11-Jun	2.2	2.1	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	2.0	2.2
12-Jun	2.0	2.1	2.1	2.1	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
13-Jun	2.0	2.0	2.0	2.0	2.0	Z	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	1.9	2.0	2.0	2.0	2.0	2.0	2.0
14-Jun	2.0	2.1	2.2	2.1	2.1	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.2	2.2
15-Jun	2.0	2.0	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
16-Jun	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
17-Jun	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-Jun	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-Jun	2.1	2.0	2.1	2.1	2.1	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	2.1	2.2	2.0	2.2
20-Jun	2.2	2.2	2.2	2.2	2.2	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	2.1	2.2	2.0	2.1	2.2
21-Jun	2.1	2.1	2.0	2.0	2.1	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	2.2	2.0	2.2
22-Jun	2.3	2.2	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.3
23-Jun	2.0	2.0	2.0	Z	2.0	2.0	2.1	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	2.1	2.1	2.0	2.1
24-Jun	2.1	2.1	2.2	2.2	Z	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	2.0	2.0	2.0	2.0	2.1	2.3
25-Jun	2.1	2.1	2.1	2.1	2.1	Z	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	2.2	2.2	2.0	2.2
26-Jun	2.3	2.3	2.3	2.2	2.2	2.1	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	2.3
27-Jun	2.0	2.1	2.1	2.1	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	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.1
28-Jun	2.0	2.0	Z	2.0	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	2.0	2.1
29-Jun	2.0	2.0	2.0	Z	2.3	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
30-Jun	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

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	2.0	2.0	2.0	Diurnal Average
2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.2	2.4	2.3	2.3	2.1	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	2.0	Diurnal Maximum

Z - zerspan C - Calibration M - Maintenance AF - Analyzer Failure





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Methane (CH₄) - ppm
Patricia McInnes - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	563	85.82	85.82
2.1 - 3.0	93	14.18	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 656

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Methane (CH₄) - ppm
Patricia McInnes - June 2016**

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	49	32	20	13	26	47	37	21	40	41	58	50	30	39	25	35	563
2.1 - 3.0	6	2	2	1	0	2	2	6	11	7	4	5	6	12	7	20	93
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
Totals	55	34	22	14	26	49	39	27	51	48	62	55	36	51	32	55	656

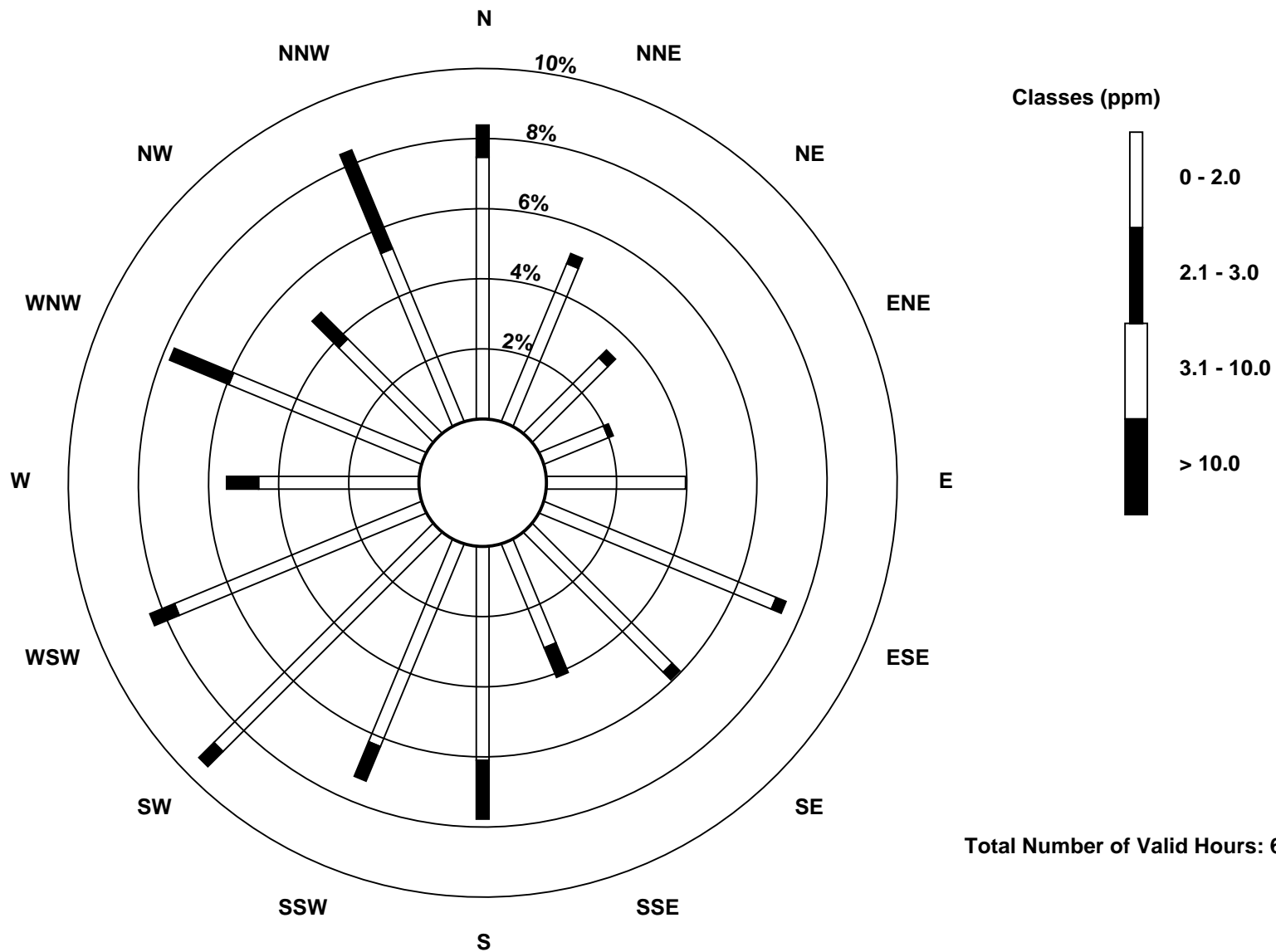
Total Number of Valid Hours: 656

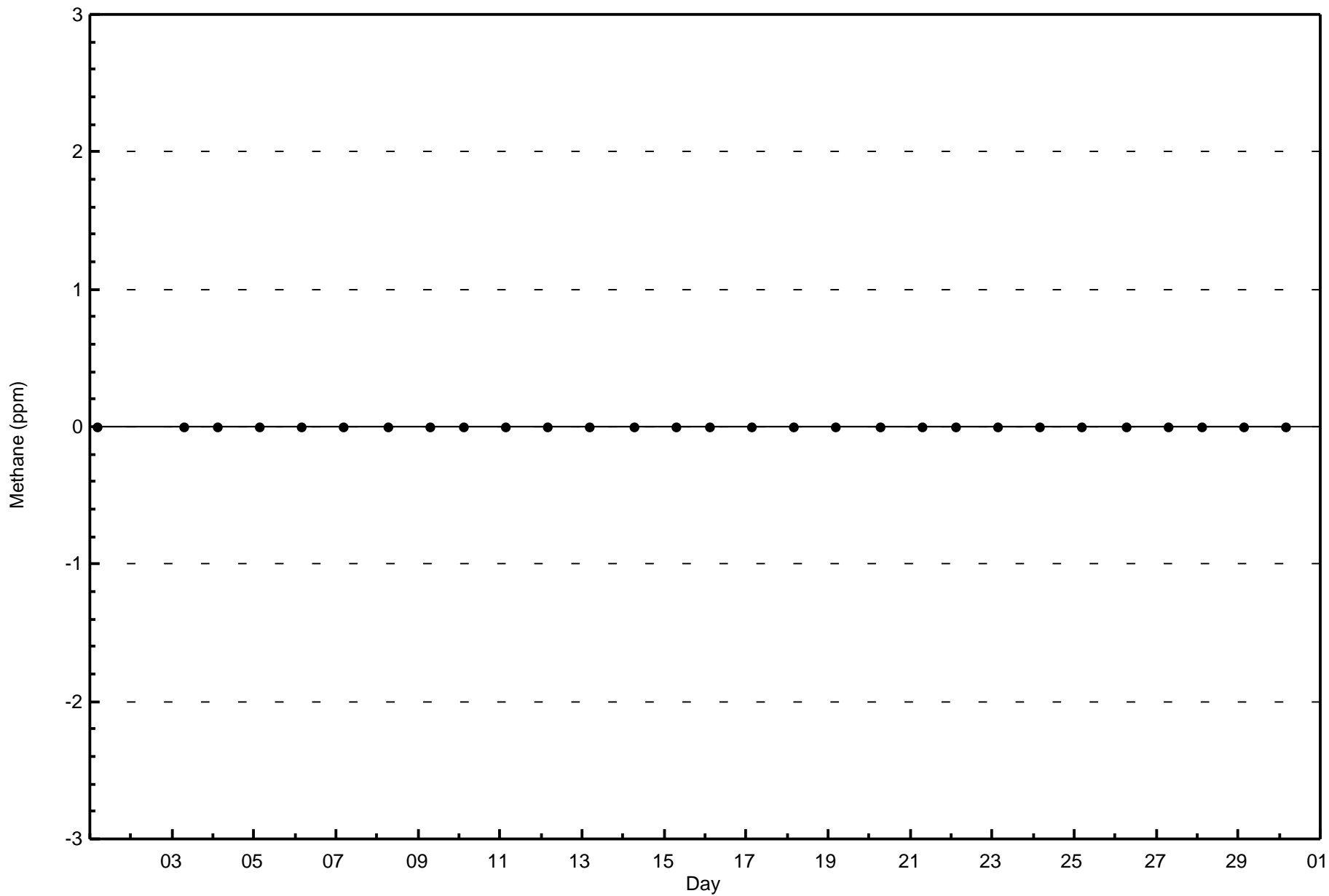
Total Number of Hours: 720

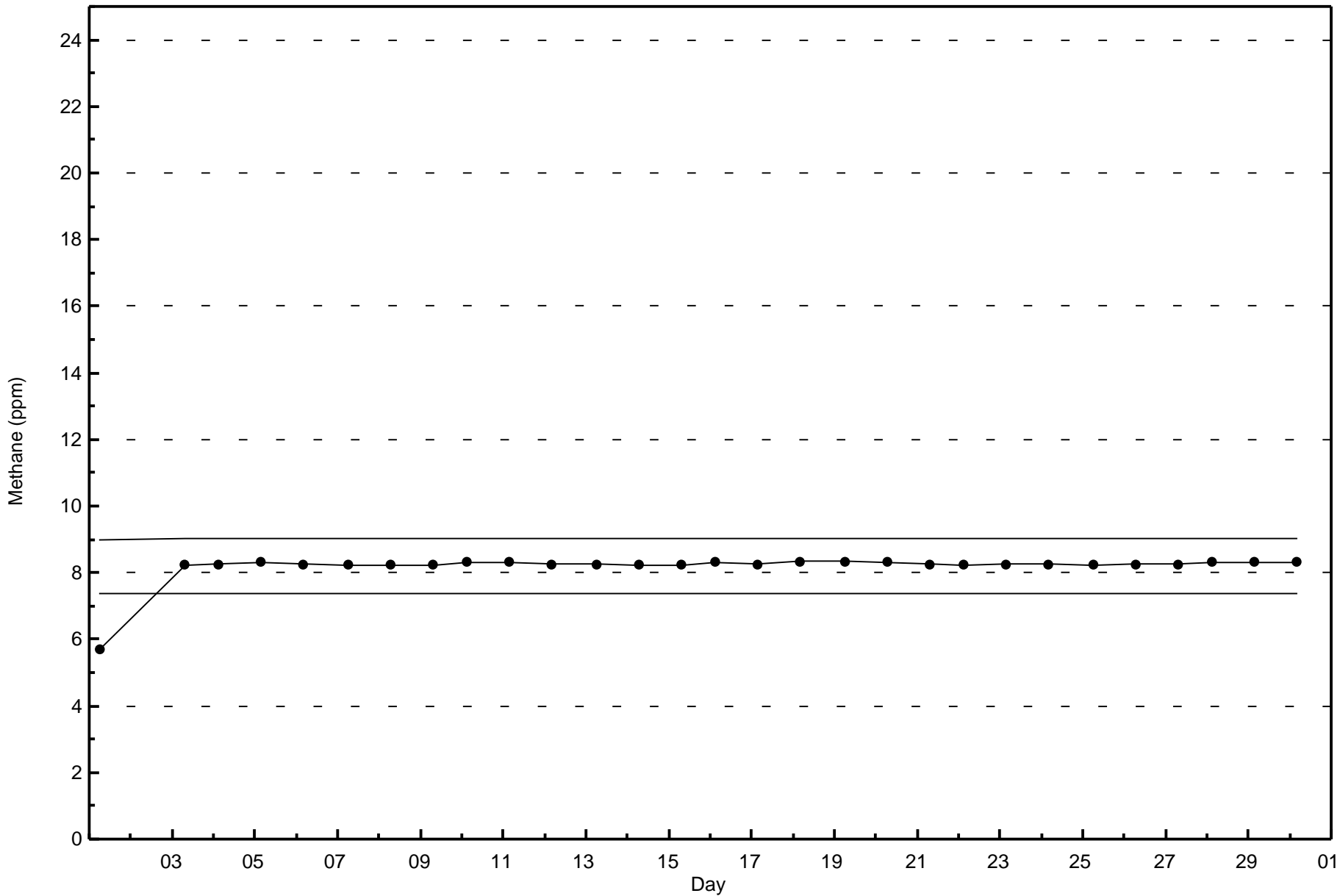


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Methane (CH₄) - ppm
Patricia McInnes (AMS 6)









Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Patricia McInnes - June 2016

Number of Exceedences (AAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 68 ppb on Jun 6 19:00	Maximum Daily Average: 47.7 ppb on Jun 6		Hours of Data:	684
Minimum Value: 10 ppb on Jun 2 02:00	Minimum Daily Average: 26.1 ppb on Jun 2		Hours of Missing Data:	36
Maximum Diurnal Average: 42.5 ppb at hour 19	Minimum Diurnal Average: 22.1 ppb at hour 5		Hours of Calibration:	34
Monthly Average: 34.7 ppb	Percentiles: P ₁ = 13 P ₁₀ = 20 Q ₁ = 27 Median = 35 Q ₃ = 41 P ₉₀ = 48 P ₉₉ = 64		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-Jun	19	19	21	19	Z	18	20	21	21	24	30	37	39	40	39	36	35	38	38	37	30	30	25	19	28.5	40
2-Jun	19	10	14	11	12	Z	11	14	20	32	40	43	41	41	M	M	39	35	37	36	29	26	23	17	26.1	43
3-Jun	19	24	16	15	19	18	Z	16	20	25	34	36	37	40	42	43	42	44	43	42	40	43	34	33	31.5	44
4-Jun	38	Z	39	37	37	38	41	43	42	45	47	48	C	C	C	C	50	46	45	45	43	40	38	37	42.0	50
5-Jun	37	36	Z	27	27	26	29	33	36	37	37	38	38	38	39	39	39	39	39	38	34	32	32	31	34.8	39
6-Jun	30	29	28	Z	27	26	26	27	28	30	35	49	62	64	64	66	66	67	68	66	63	62	60	56	47.7	68
7-Jun	51	49	47	44	Z	38	38	40	46	51	54	54	49	49	50	44	42	41	46	46	43	41	38	35	45.1	54
8-Jun	31	25	26	19	22	Z	30	28	30	31	34	38	39	40	42	44	44	43	42	39	37	37	35	34	34.4	44
9-Jun	36	35	35	34	30	26	Z	31	30	27	29	33	35	35	34	38	41	42	39	39	40	36	33	31	34.4	42
10-Jun	30	Z	25	18	15	18	30	31	32	34	33	34	36	36	37	38	39	38	40	39	35	28	20	17	30.5	40
11-Jun	14	23	Z	15	13	18	17	18	20	23	25	34	37	41	39	35	34	35	33	30	27	25	24	23	26.2	41
12-Jun	25	21	16	Z	13	18	21	24	24	24	24	25	30	33	34	35	33	34	36	38	38	35	33	32	28.2	38
13-Jun	31	29	26	25	Z	23	25	26	29	30	34	36	38	40	38	40	41	42	43	44	46	44	36	35	34.8	46
14-Jun	34	30	21	19	19	Z	26	28	35	41	45	46	47	46	45	45	49	53	55	54	57	49	47	48	40.9	57
15-Jun	45	48	47	47	47	46	Z	44	41	40	38	38	36	34	36	39	41	42	41	41	39	39	33	33	40.6	48
16-Jun	30	Z	30	31	32	31	31	31	30	30	29	29	28	27	27	28	27	26	25	25	24	25	26	22	28.1	32
17-Jun	20	17	Z	14	12	15	19	20	23	27	30	32	34	35	36	36	35	35	36	34	33	33	34	29	27.8	36
18-Jun	24	26	27	Z	22	20	22	26	28	32	35	34	34	35	33	35	39	42	42	40	37	33	31	31	31.7	42
19-Jun	24	27	25	25	Z	26	33	37	40	39	40	39	43	45	45	45	45	44	45	41	36	35	27	22	36.0	45
20-Jun	14	17	13	13	14	Z	23	29	36	39	42	44	48	52	53	53	52	50	52	48	39	22	28	38	35.7	53
21-Jun	33	33	34	33	24	30	Z	38	43	48	51	51	53	53	54	54	54	55	55	50	49	42	37	32	43.8	55
22-Jun	27	Z	25	27	19	25	33	36	37	46	51	57	57	56	54	55	55	53	52	50	47	48	44	43	43.3	57
23-Jun	42	38	Z	36	36	32	28	30	34	40	52	47	58	56	50	43	51	49	50	50	45	42	35	32	42.4	58
24-Jun	32	27	20	Z	17	20	18	25	29	33	37	43	50	47	42	43	38	37	37	42	35	32	30	26	33.1	50
25-Jun	24	22	22	28	Z	18	16	18	22	24	33	36	37	34	38	42	40	40	40	38	34	31	23	23	29.7	42
26-Jun	19	17	11	11	14	Z	17	22	26	36	42	39	38	38	40	43	34	30	34	33	31	38	41	32	29.8	43
27-Jun	24	22	19	15	19	19	Z	25	30	36	35	35	34	36	32	32	29	31	33	32	30	28	27	26	28.2	36
28-Jun	24	Z	20	21	17	16	20	22	26	40	45	39	38	39	45	44	39	39	41	42	37	29	28	34	32.4	45
29-Jun	35	34	Z	19	19	23	29	32	34	37	39	39	40	40	42	41	42	43	42	40	39	39	35	34	35.6	43
30-Jun	32	31	31	Z	27	27	28	30	34	39	43	43	44	45	46	48	48	46	44	43	40	39	36	34	38.2	48

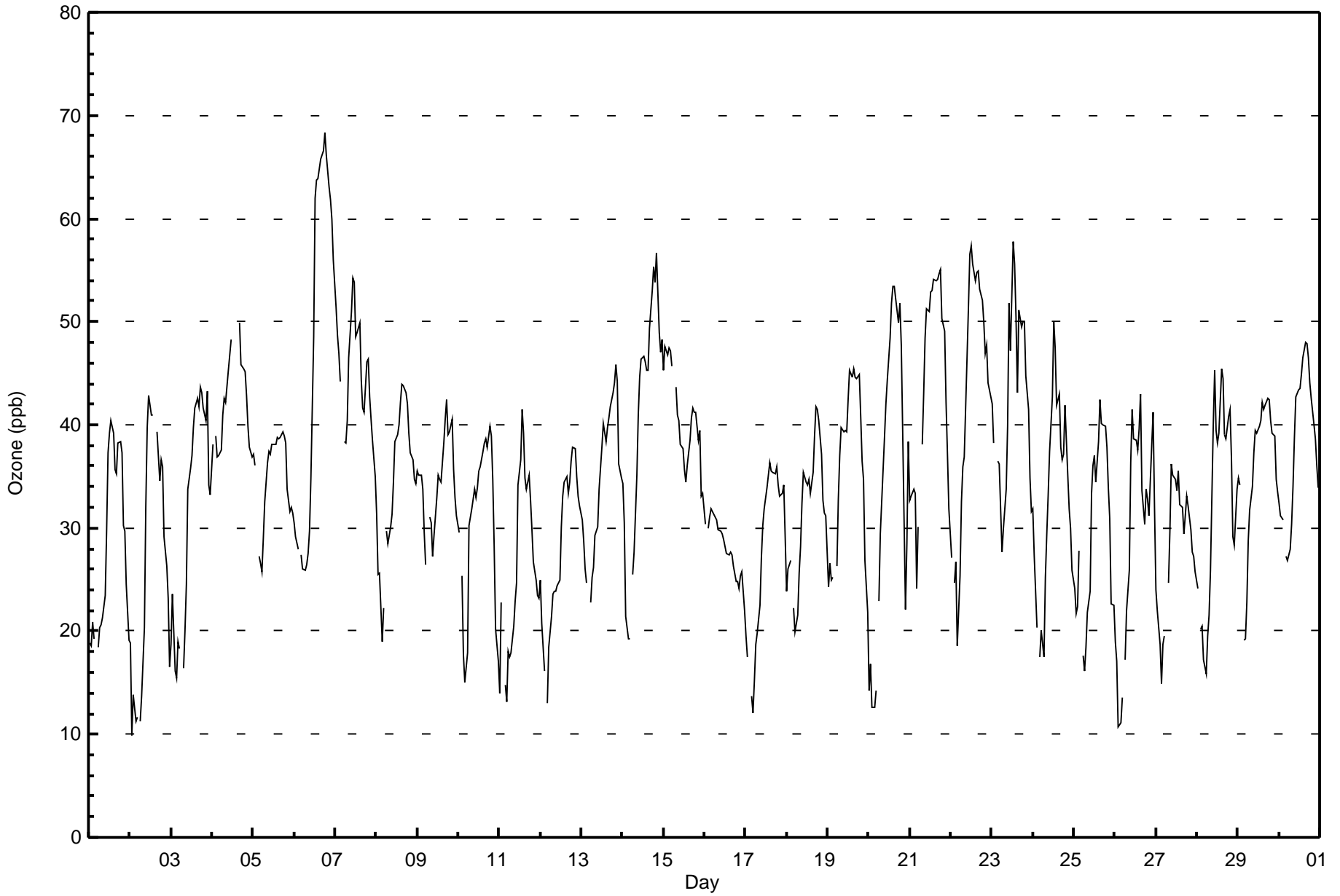
28.8	27.5	25.5	24.2	22.1	24.7	25.2	28.1	30.9	34.7	38.1	39.9	41.3	41.9	42.2	42.3	42.1	42.0	42.5	41.4	38.6	36.0	33.1	31.3	Diurnal Average	
51	49	47	47	47	46	41	44	46	51	54	57	62	64	64	66	66	67	68	66	63	62	60	56	Diurnal Maximum	

Z - zeronspan C - Calibration M - Maintenance
 Alberta Ambient Air Quality Objectives (AAQO): 1-hr 82 ppb



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Patricia McInnes - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Patricia McInnes - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	77	11.26	11.26
21 - 50	560	81.87	93.13
51 - 82	47	6.87	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ozone (O₃) - ppb
Patricia McInnes - June 2016**

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	2	1	1	1	2	5	7	6	10	13	6	7	4	3	6	77
21 - 50	50	31	16	11	27	50	39	19	35	34	47	51	31	42	28	49	560
51 - 82	1	3	5	2	2	1	1	8	11	4	6	0	1	0	1	1	47
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	54	36	22	14	30	53	45	34	52	48	66	57	39	46	32	56	684

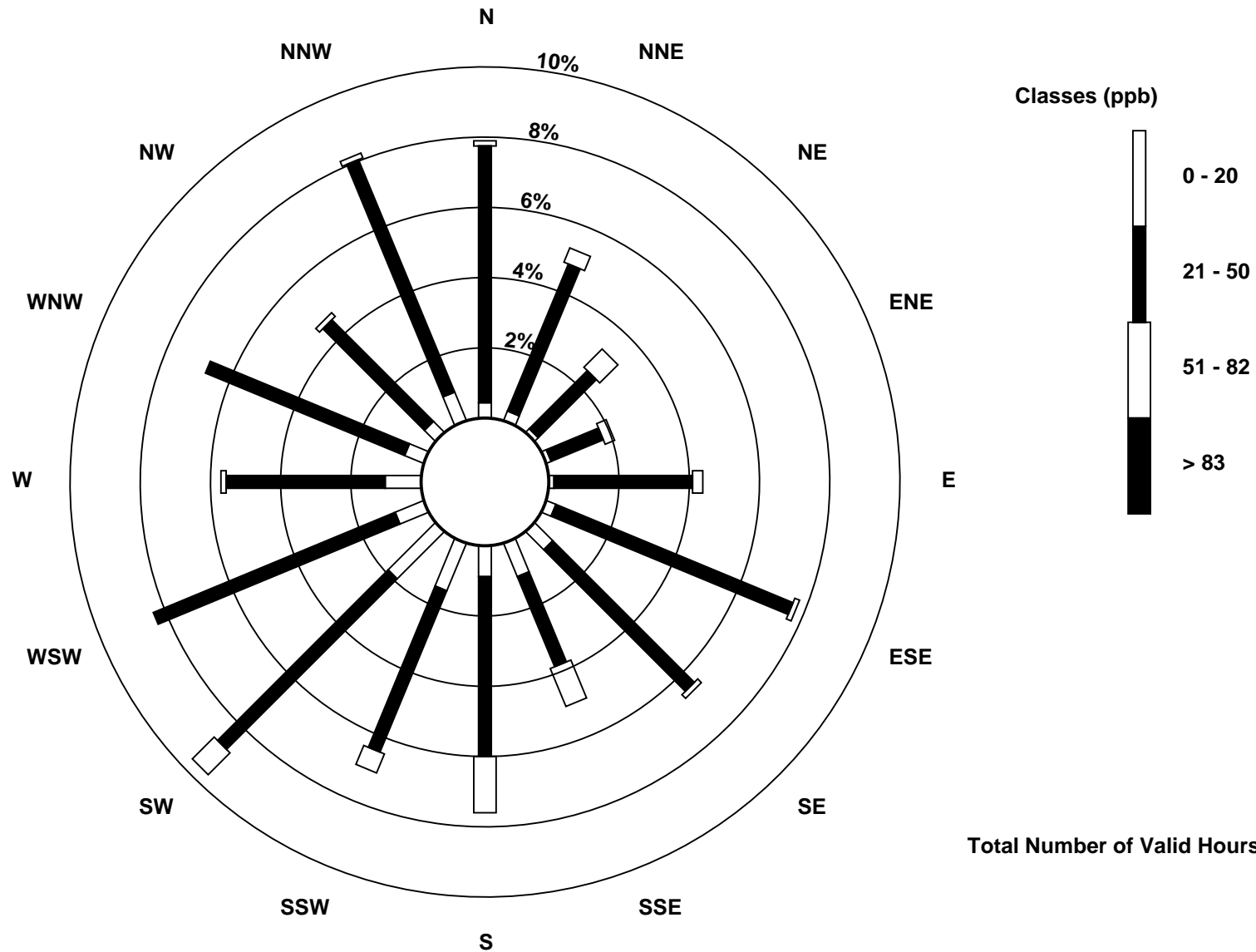
Total Number of Valid Hours: 684

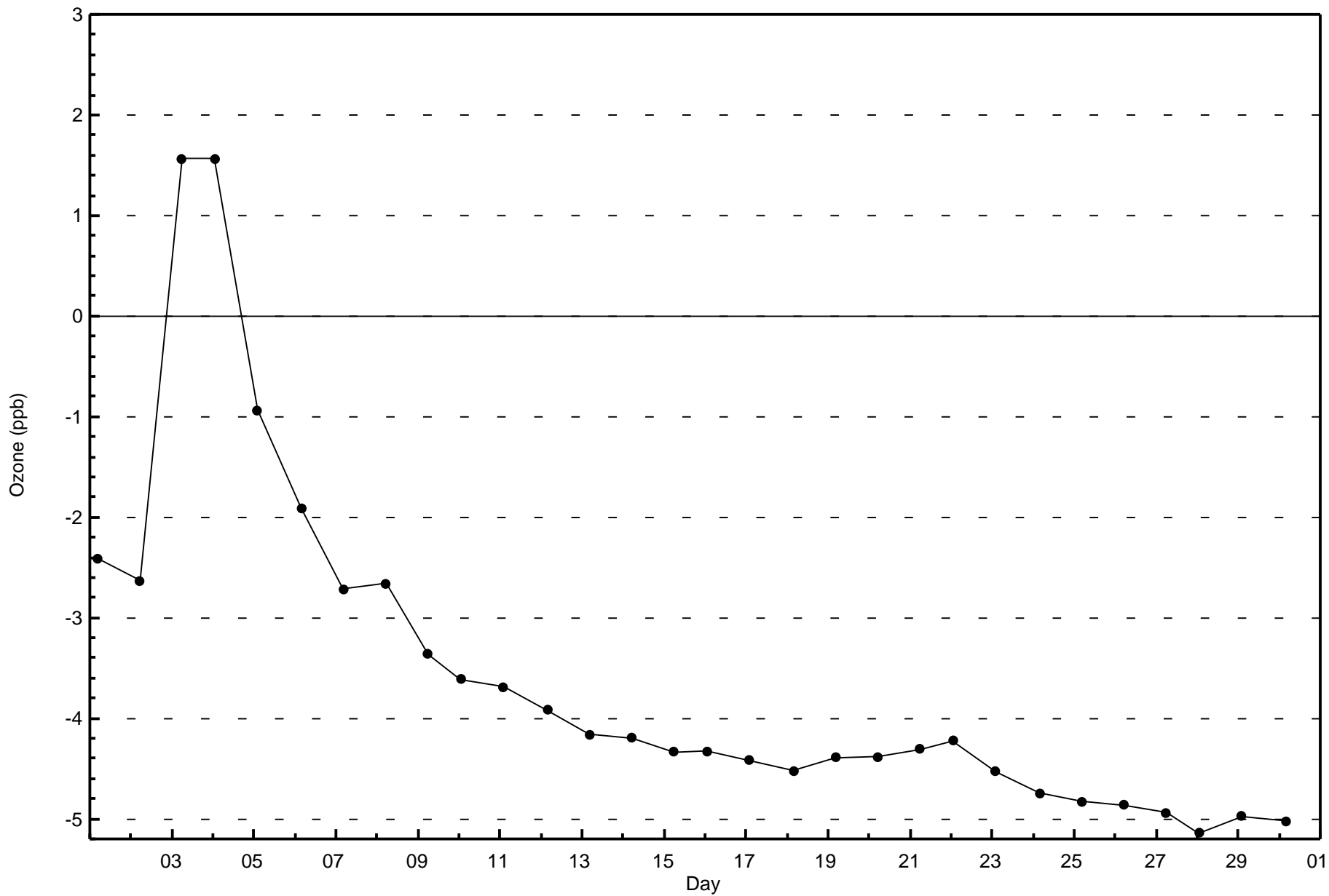
Total Number of Hours: 720

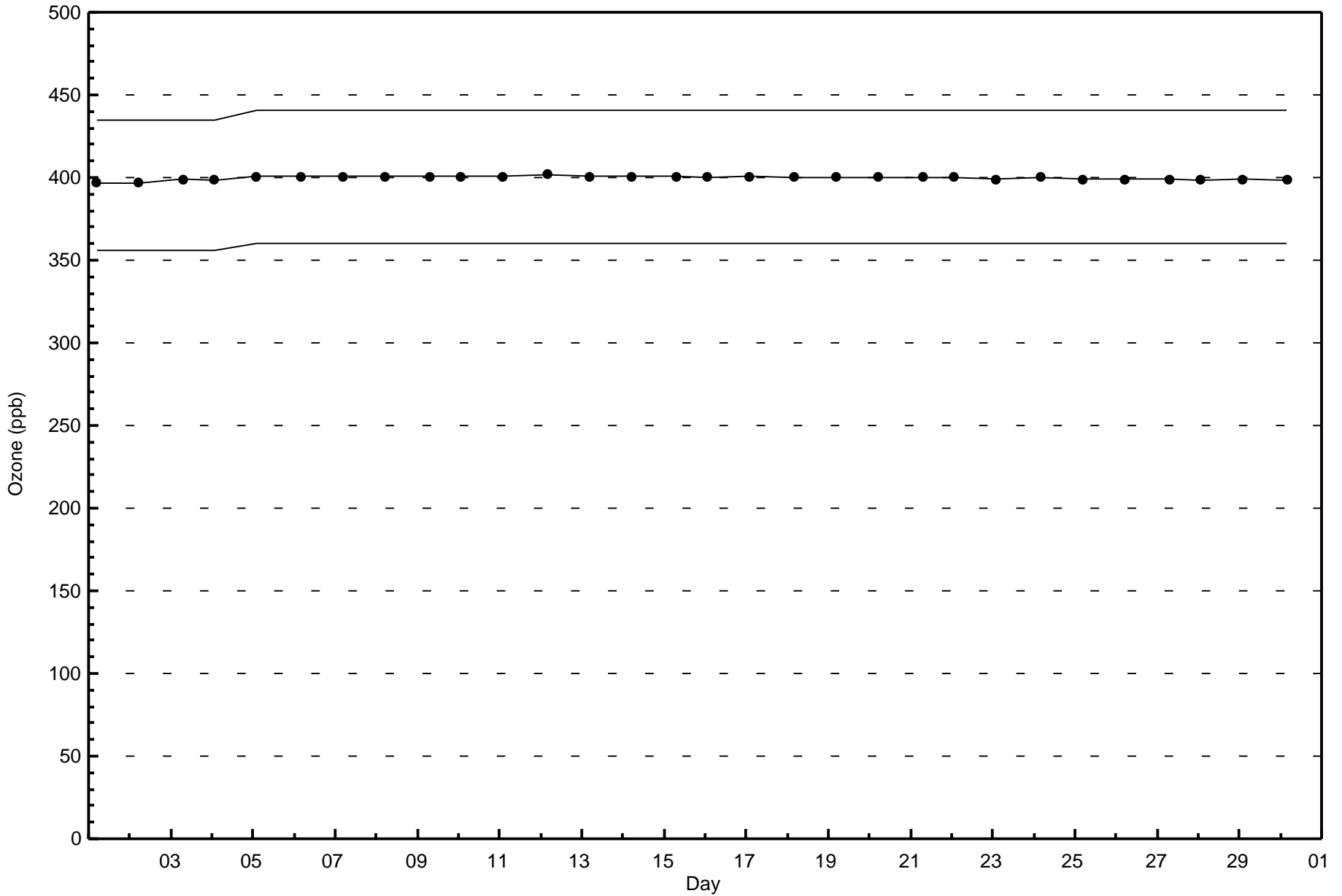


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Ozone (O₃) - ppb
Patricia McInnes (AMS 6)







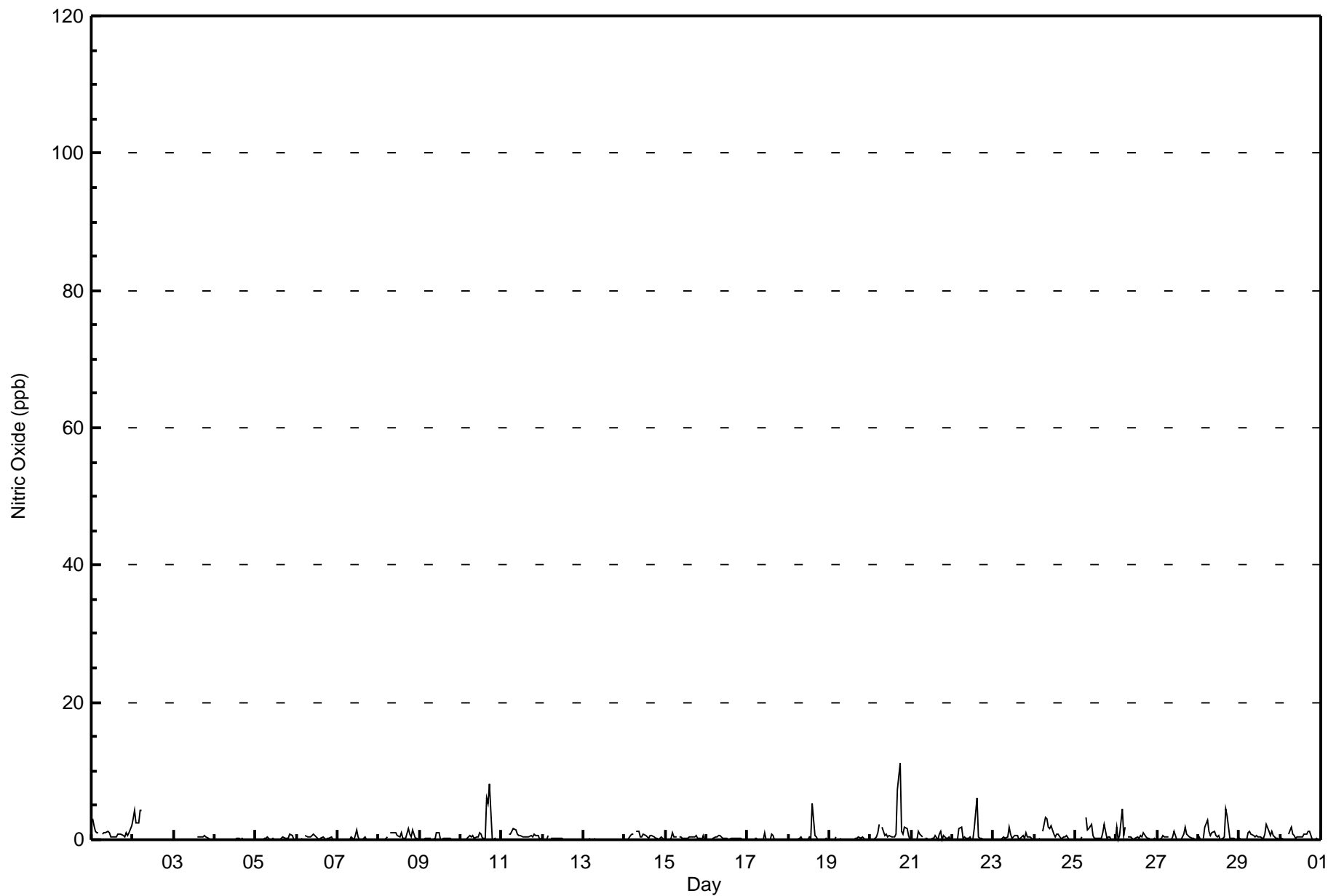


Maximum Value: 11 ppb on Jun 20 18:00														Maximum Daily Average: 1.5 ppb on Jun 20														Hours in Service: 720	
Minimum Value: 0 ppb on Jun 4 01:00														Minimum Daily Average: 0.0 ppb on Jun 4														Hours of Data: 661	
Maximum Diurnal Average: 1.3 ppb at hour 18														Minimum Diurnal Average: 0.1 ppb at hour 24														Hours of Missing Data: 59	
Monthly Average: 0.5 ppb														Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 5														Hours of Calibration: 33	
																												Percent Operational Time: 96.4	
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-Jun	3	2	1	1	1	Z	1	1	1	1	1	0	0	0	0	1	1	1	1	0	1	1	1	2	1.0	3			
2-Jun	3	4	2	2	4	4	Z	3	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	--	4			
3-Jun	M	M	M	M	M	M	M	M	M	M	C	C	C	C	0	0	0	0	1	0	0	0	0	--	1				
4-Jun	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				
5-Jun	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-Jun	0	0	0	0	Z	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1				
7-Jun	0	0	0	0	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1				
8-Jun	0	0	0	0	0	0	Z	1	1	1	1	1	0	1	0	0	0	2	1	0	1	0	0	0.5	2				
9-Jun	0	0	0	0	0	0	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1				
10-Jun	0	0	Z	0	0	1	0	1	0	0	0	1	1	0	0	6	5	8	0	0	0	0	0	1.1	8				
11-Jun	0	0	0	Z	1	1	1	2	1	1	1	1	0	0	0	0	0	1	0	1	1	1	0	0.6	2				
12-Jun	0	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1				
13-Jun	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				
14-Jun	0	0	0	1	1	1	Z	1	1	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0.5	1				
15-Jun	0	0	0	0	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0.3	1				
16-Jun	0	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1				
17-Jun	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0.1	1				
18-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	5	1	0	0	0	0	0	0	0	0.3	5				
19-Jun	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-Jun	0	0	0	0	1	2	Z	2	1	1	0	1	0	0	0	1	7	11	1	1	2	2	1	1.5	11				
21-Jun	0	0	0	0	1	1	0	Z	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	0.3	1				
22-Jun	0	0	Z	0	2	2	0	0	0	0	0	0	0	2	6	0	0	0	0	0	0	0	0	0.6	6				
23-Jun	0	0	0	Z	0	0	0	0	0	2	1	0	1	1	1	0	0	1	0	1	0	0	0	0.4	2				
24-Jun	0	0	0	0	Z	1	3	3	2	2	2	1	0	1	1	0	0	0	1	0	0	0	0	0.8	3				
25-Jun	0	0	0	0	0	Z	3	1	2	2	1	0	0	0	0	0	1	2	0	0	0	0	0	0.7	3				
26-Jun	2	0	1	5	1	2	Z	0	0	0	0	0	1	0	1	0	1	1	0	0	0	0	0	0.6	5				
27-Jun	0	0	0	1	0	0	0	Z	0	0	1	0	0	0	0	1	2	1	1	0	0	0	0	0.4	2				
28-Jun	0	0	Z	0	2	3	1	1	1	1	1	0	1	0	0	1	5	3	0	0	0	0	0	0.9	5				
29-Jun	0	0	0	Z	0	1	1	1	1	0	1	0	0	0	0	1	2	1	1	1	1	0	0	0.6	2				
30-Jun	0	0	0	0	Z	1	2	1	1	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0.5	2				
																												Diurnal Average	
0.3														0.2														Diurnal Maximum	
3														4															
0.2														0.5															
2														4															
0.2														0.7															
2														4															
0.5														0.9															
3														4															
0.7														0.8															
3														3															
0.5														0.5															
2														2															
0.6														0.6															
2														2															
0.4														0.3															
1														1															
0.3														0.3															
2														6															
0.7														0.6															
6														6															
1.1														1.1															
7														11															
0.3														0.3															
1														1															
0.3														0.3															
2														2															
0.2														0.1															
2														1															
0.1														0.1															
2														2															
Z - zerspan														C - Calibration														M - Maintenance	



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Patricia McInnes - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Patricia McInnes - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	661	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: 661

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Patricia McInnes - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	54	35	21	15	24	50	44	31	55	48	57	52	35	51	34	55	661
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
Totals	54	35	21	15	24	50	44	31	55	48	57	52	35	51	34	55	661

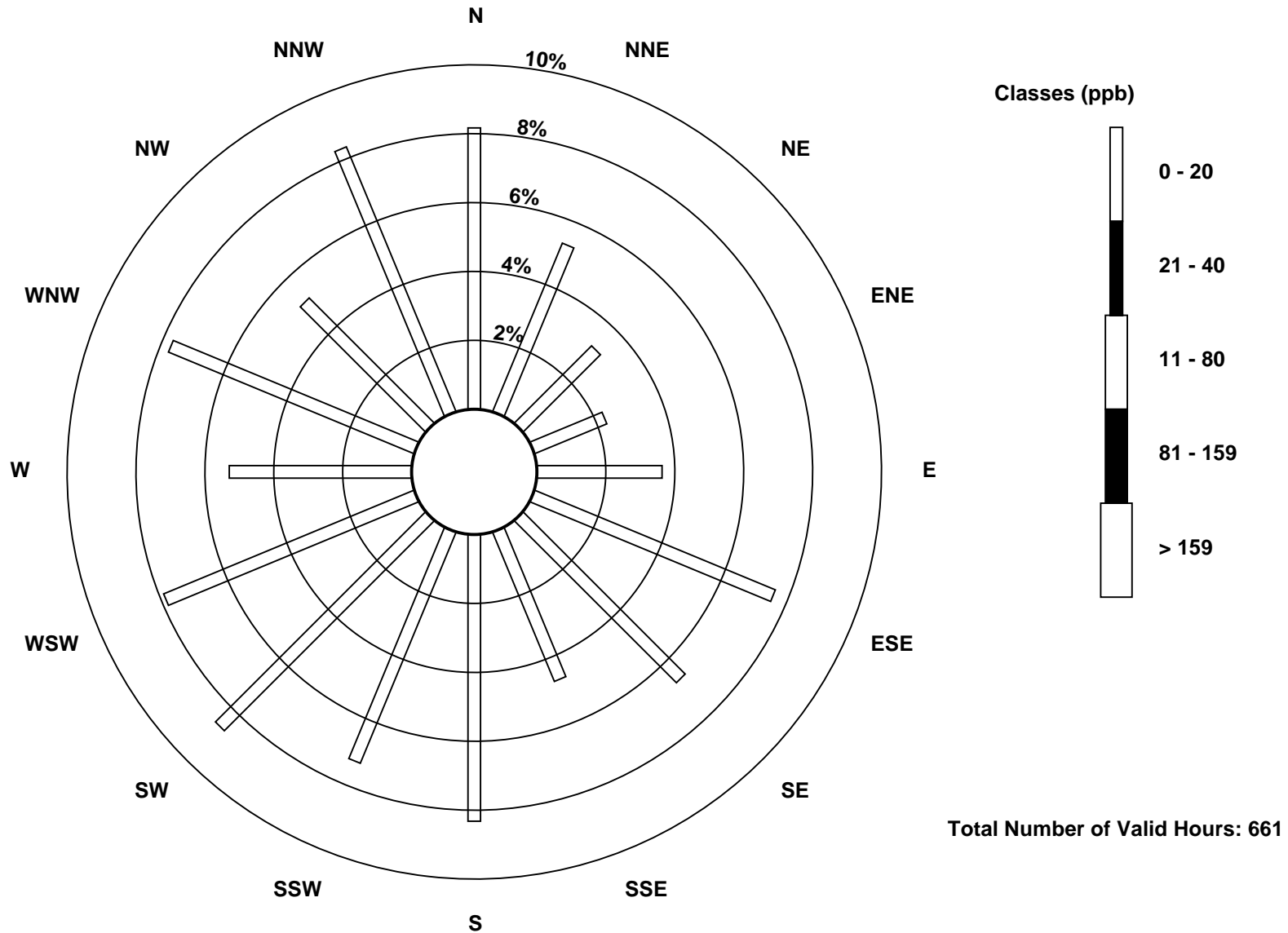
Total Number of Valid Hours: 661

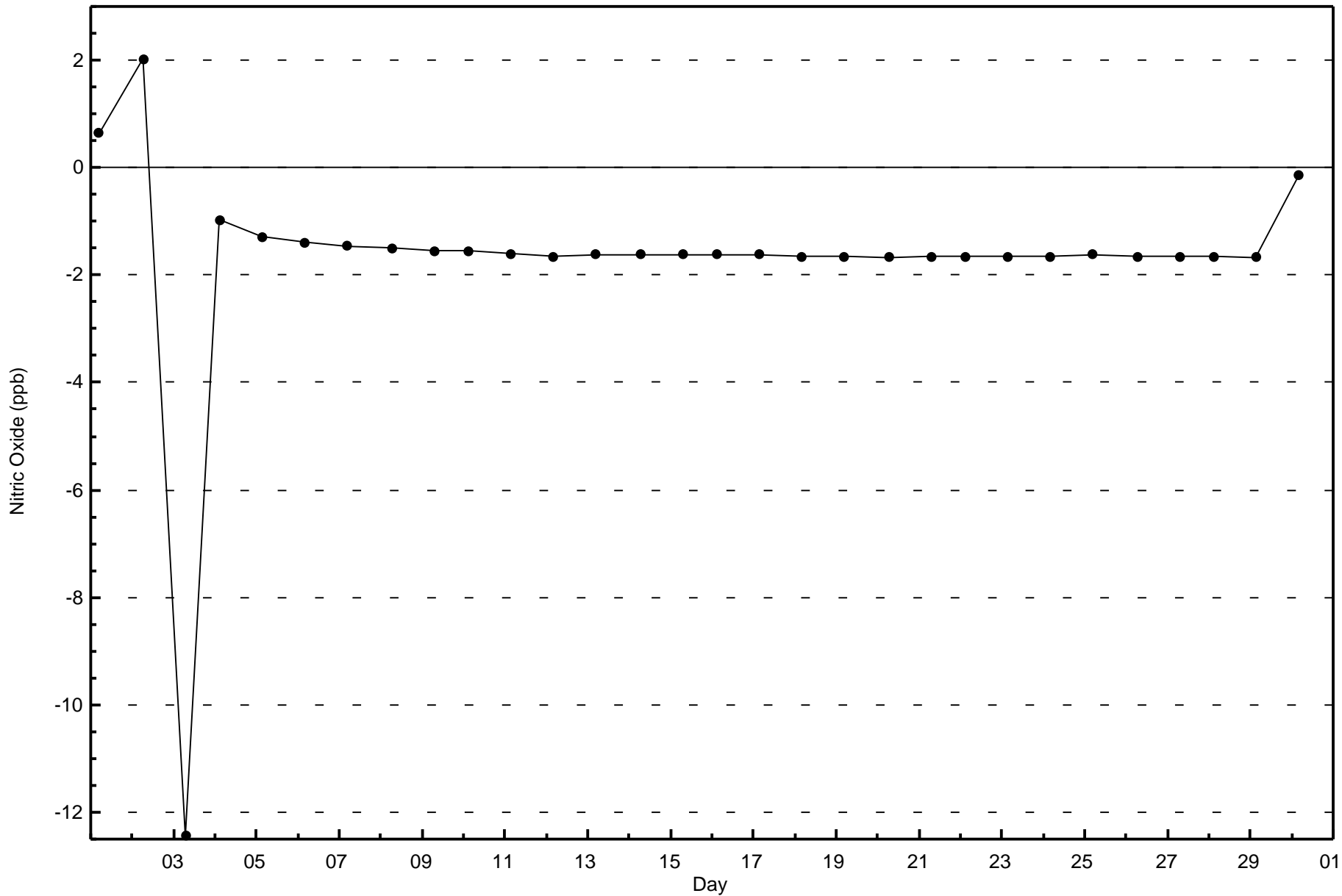
Total Number of Hours: 720

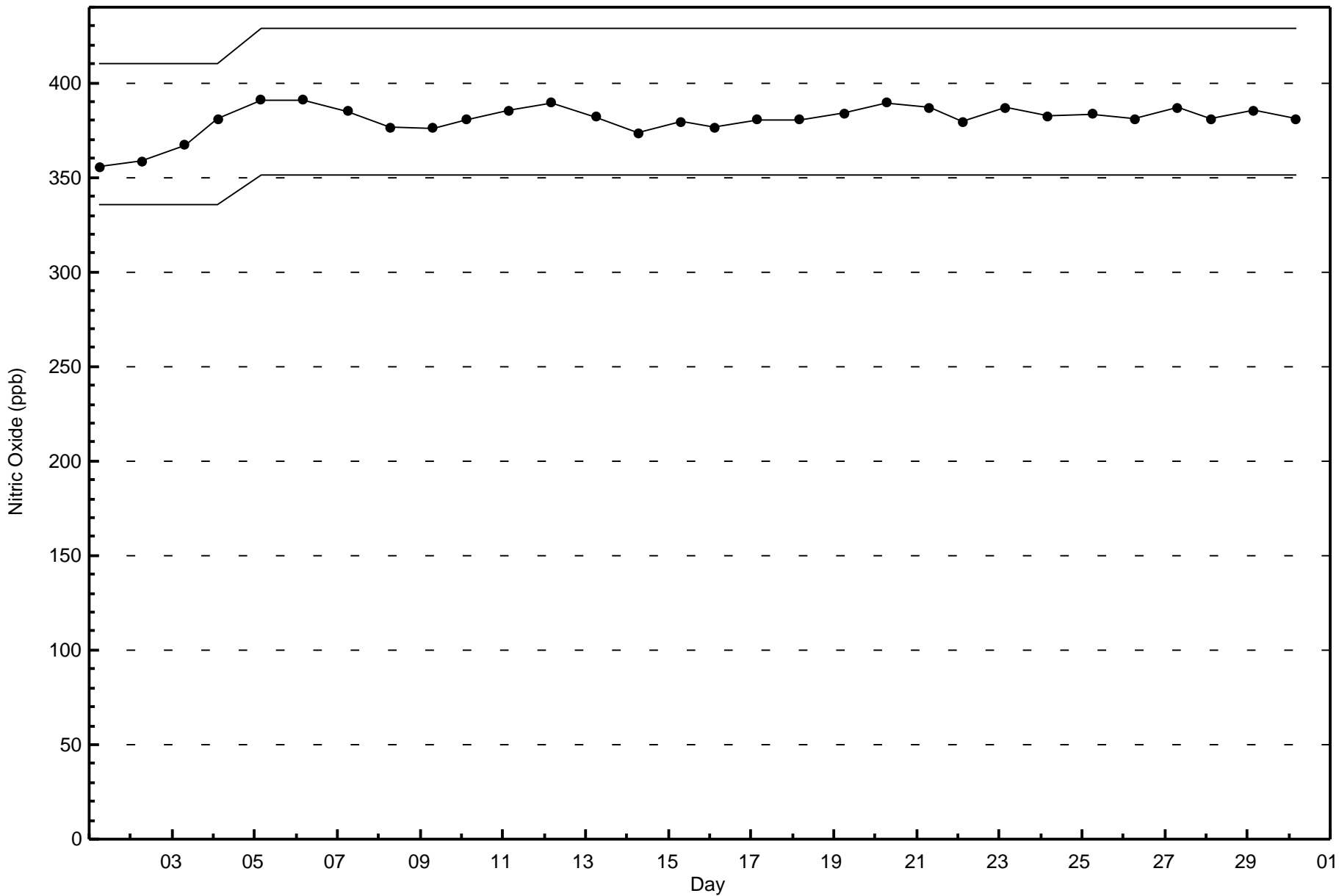


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitric Oxide (NO) - ppb
Patricia McInnes (AMS 6)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Patricia McInnes - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 20 ppb on Jun 20 22:00	Maximum Daily Average: 5.2 ppb on Jun 24		Hours of Data:	661
Minimum Value: 0 ppb on Jun 4 19:00	Minimum Daily Average: 0.3 ppb on Jun 17		Hours of Missing Data:	59
Maximum Diurnal Average: 3.0 ppb at hour 22	Minimum Diurnal Average: 0.9 ppb at hour 13		Hours of Calibration:	33
Monthly Average: 1.8 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 2 P ₉₀ = 4 P ₉₉ = 9		Percent Operational Time:	96.4

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-Jun	1	1	1	1	1	Z	1	1	1	2	2	1	1	1	1	2	2	1	1	1	4	3	4	2	1.4	4	
2-Jun	3	3	1	1	2	1	Z	1	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	--	3	
3-Jun	M	M	M	M	M	M	M	M	M	M	C	C	C	C	0	0	1	2	2	2	3	3	3	2	--	3	
4-Jun	1	0	Z	1	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	1	0	0	0	0.4	1	
5-Jun	0	0	0	Z	2	1	1	1	1	0	0	0	0	0	0	0	1	1	1	2	5	4	1	1	1.0	5	
6-Jun	1	1	1	1	Z	2	1	1	2	2	2	1	1	1	1	2	2	2	2	2	2	2	1	1	1.6	2	
7-Jun	1	1	1	1	1	Z	1	1	1	1	3	3	1	1	1	1	1	0	1	2	4	1	2	3	1.2	4	
8-Jun	4	5	4	2	5	4	Z	7	7	7	7	5	3	6	3	2	2	4	5	4	5	3	2	1	4.2	7	
9-Jun	1	0	0	1	1	1	1	Z	2	1	1	1	1	1	1	1	1	1	2	2	1	2	2	2	1.1	2	
10-Jun	3	3	Z	5	2	2	1	2	1	1	1	2	2	1	1	4	5	4	1	1	4	2	1	1	2.1	5	
11-Jun	2	2	2	Z	5	3	3	3	3	3	2	1	1	1	2	2	2	2	2	3	4	5	2	1	2.5	5	
12-Jun	2	1	2	2	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.5	2	
13-Jun	0	0	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	0.4	2	
14-Jun	1	1	3	3	5	3	Z	4	3	1	2	2	1	1	2	2	2	2	3	1	5	3	2	2	2.2	5	
15-Jun	1	1	1	1	1	2	4	Z	1	1	1	1	1	1	1	1	1	1	2	2	3	1	2	5	2	1.5	5
16-Jun	1	1	Z	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0.5	1	
17-Jun	0	0	0	Z	1	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	1	0	0	1	0.3	1	
18-Jun	3	2	0	0	Z	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	2	2	3	2	0.8	3	
19-Jun	2	2	2	3	3	Z	1	0	0	0	0	0	0	0	0	0	1	1	1	2	4	3	2	2	1.2	4	
20-Jun	1	2	3	4	3	5	Z	4	2	2	1	1	1	1	1	2	5	6	3	4	9	20	10	3	4.1	20	
21-Jun	3	2	2	2	8	3	2	Z	1	1	1	0	1	0	1	0	2	2	1	3	3	6	3	4	2.1	8	
22-Jun	2	3	Z	2	9	4	1	1	1	1	1	0	0	2	2	1	1	1	1	1	1	1	2	1	1.6	9	
23-Jun	1	1	1	Z	1	2	2	1	2	5	6	3	4	4	3	1	5	6	4	5	4	5	5	4	3.2	6	
24-Jun	4	5	9	11	Z	9	14	12	10	6	5	4	3	4	4	2	2	4	3	3	1	1	2	4	5.2	14	
25-Jun	5	5	5	4	4	Z	6	4	3	4	2	1	1	1	1	1	2	3	2	2	3	2	1	1	2.7	6	
26-Jun	3	2	5	7	5	4	Z	1	1	1	1	1	2	1	2	3	4	3	2	2	1	0	1	2	2.4	7	
27-Jun	1	1	2	3	1	1	1	Z	0	1	1	0	0	0	3	5	3	2	2	2	2	2	1	2	1.4	5	
28-Jun	2	1	Z	1	3	5	1	1	3	5	3	1	0	0	2	3	4	4	2	2	3	7	8	2	2.6	8	
29-Jun	1	1	2	Z	1	4	3	2	2	1	1	1	1	1	1	1	3	2	1	2	3	2	1	1	1.5	4	
30-Jun	1	1	1	1	Z	2	3	2	2	1	1	1	1	1	1	2	2	3	2	2	4	3	1	1	1.7	4	

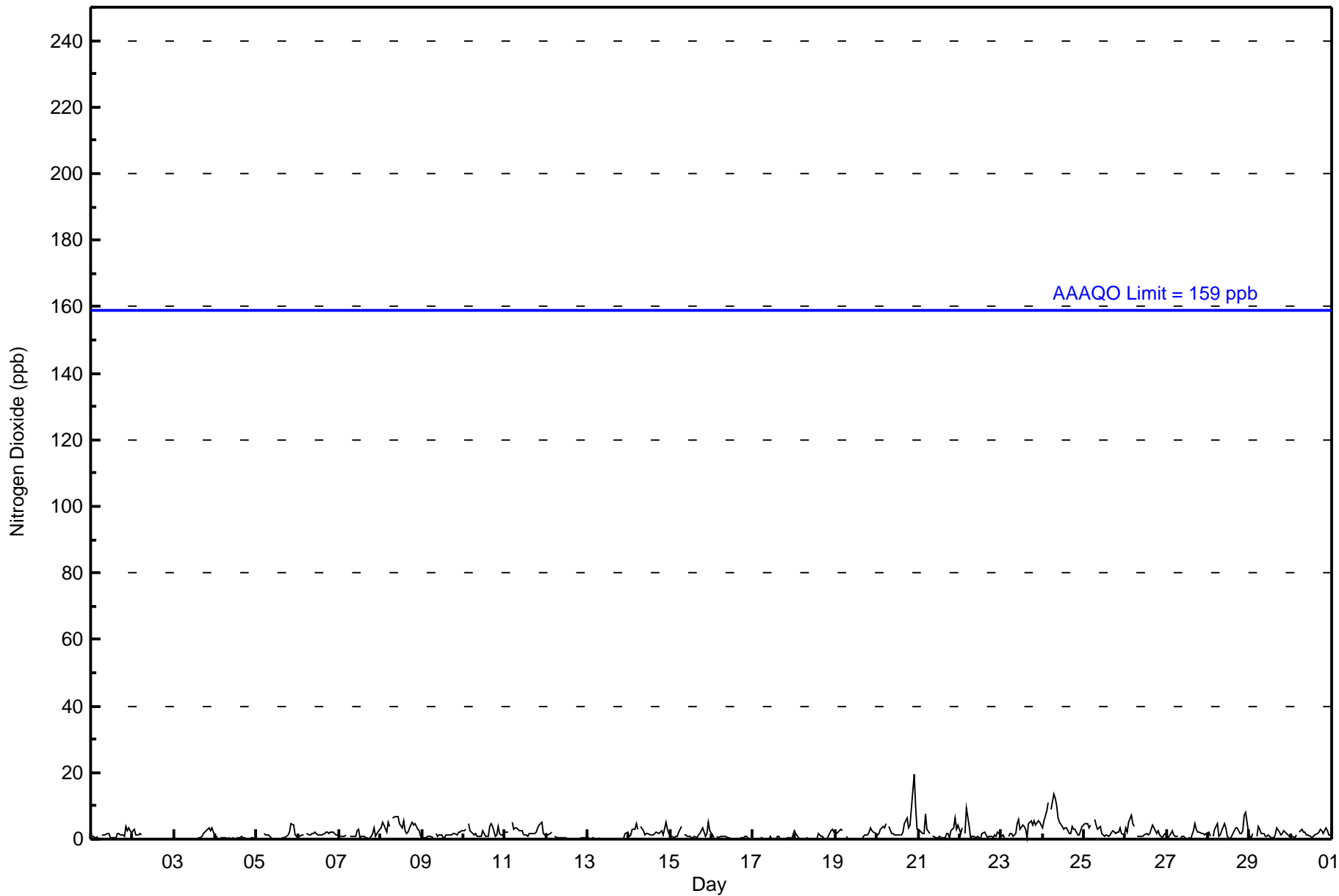
1.6	1.6	1.9	2.3	2.6	2.5	1.9	2.1	1.7	1.6	1.6	1.1	0.9	1.0	1.1	1.3	1.9	2.0	1.6	2.0	2.5	3.0	2.5	1.8	Diurnal Average	
5	5	9	11	9	9	14	12	10	7	7	5	4	6	4	4	5	6	5	5	9	20	10	4	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Patricia McInnes - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Patricia McInnes - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	661	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: 661

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Patricia McInnes - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	54	35	21	15	24	50	44	31	55	48	57	52	35	51	34	55	661
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
Totals	54	35	21	15	24	50	44	31	55	48	57	52	35	51	34	55	661

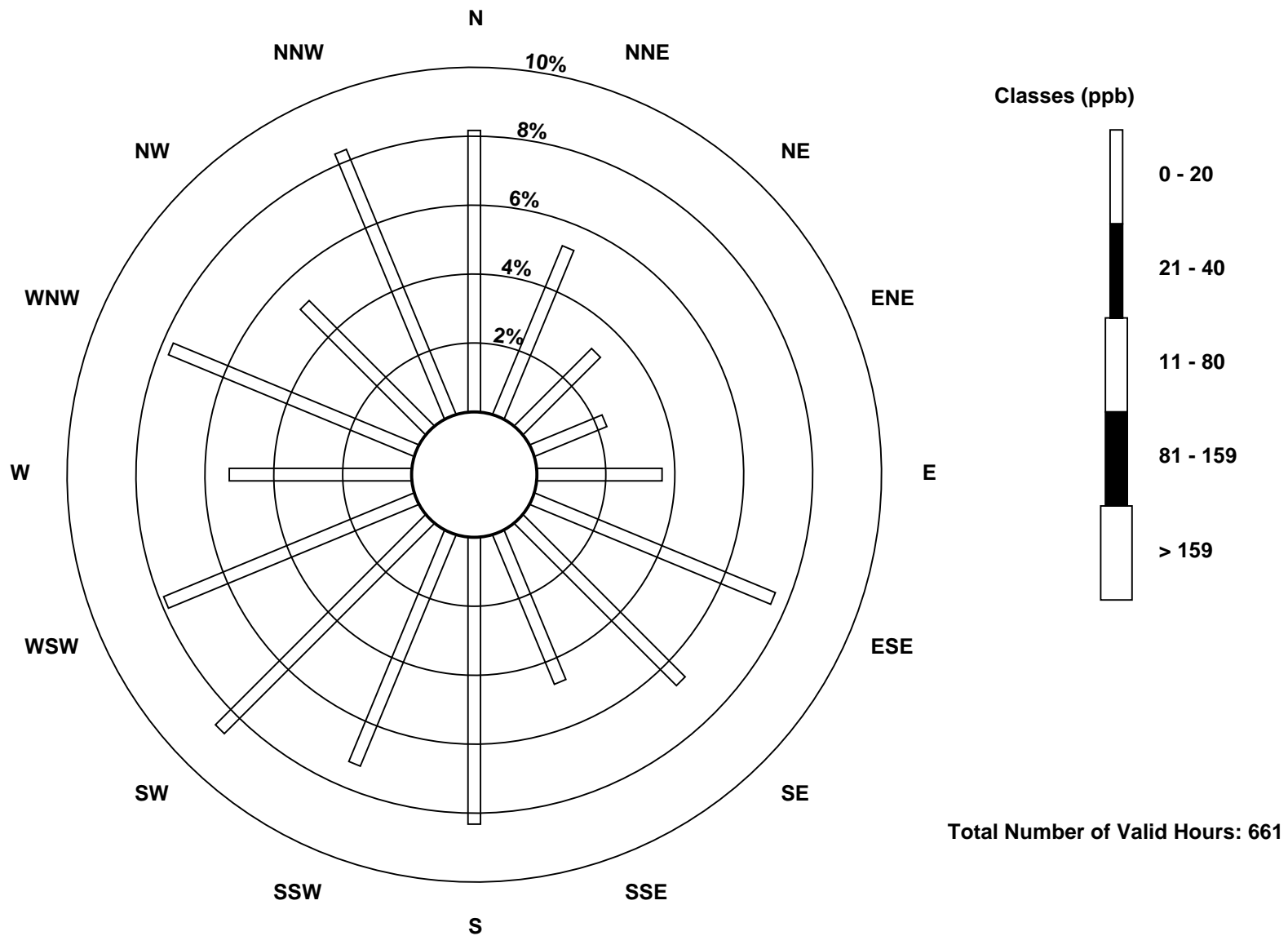
Total Number of Valid Hours: 661

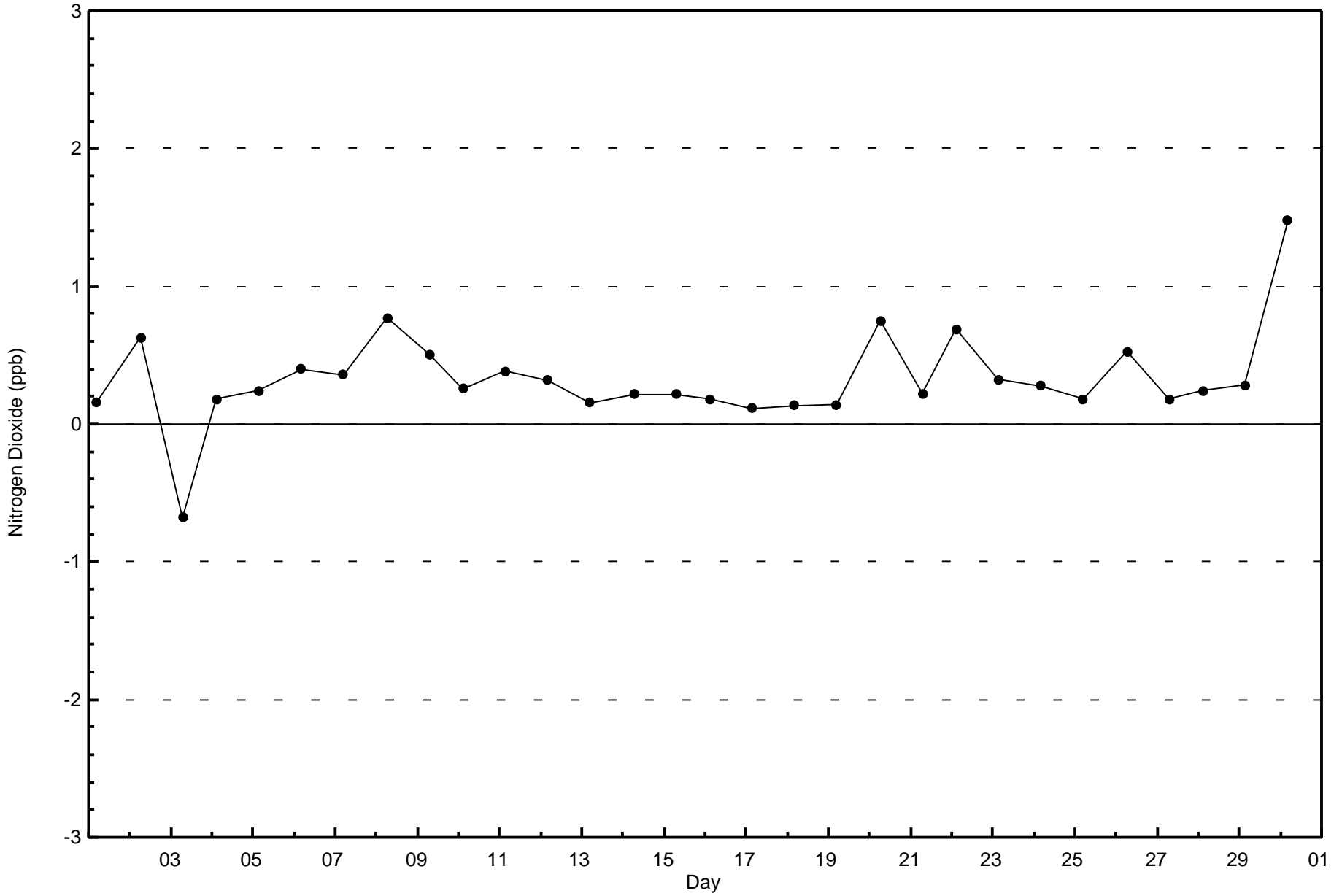
Total Number of Hours: 720

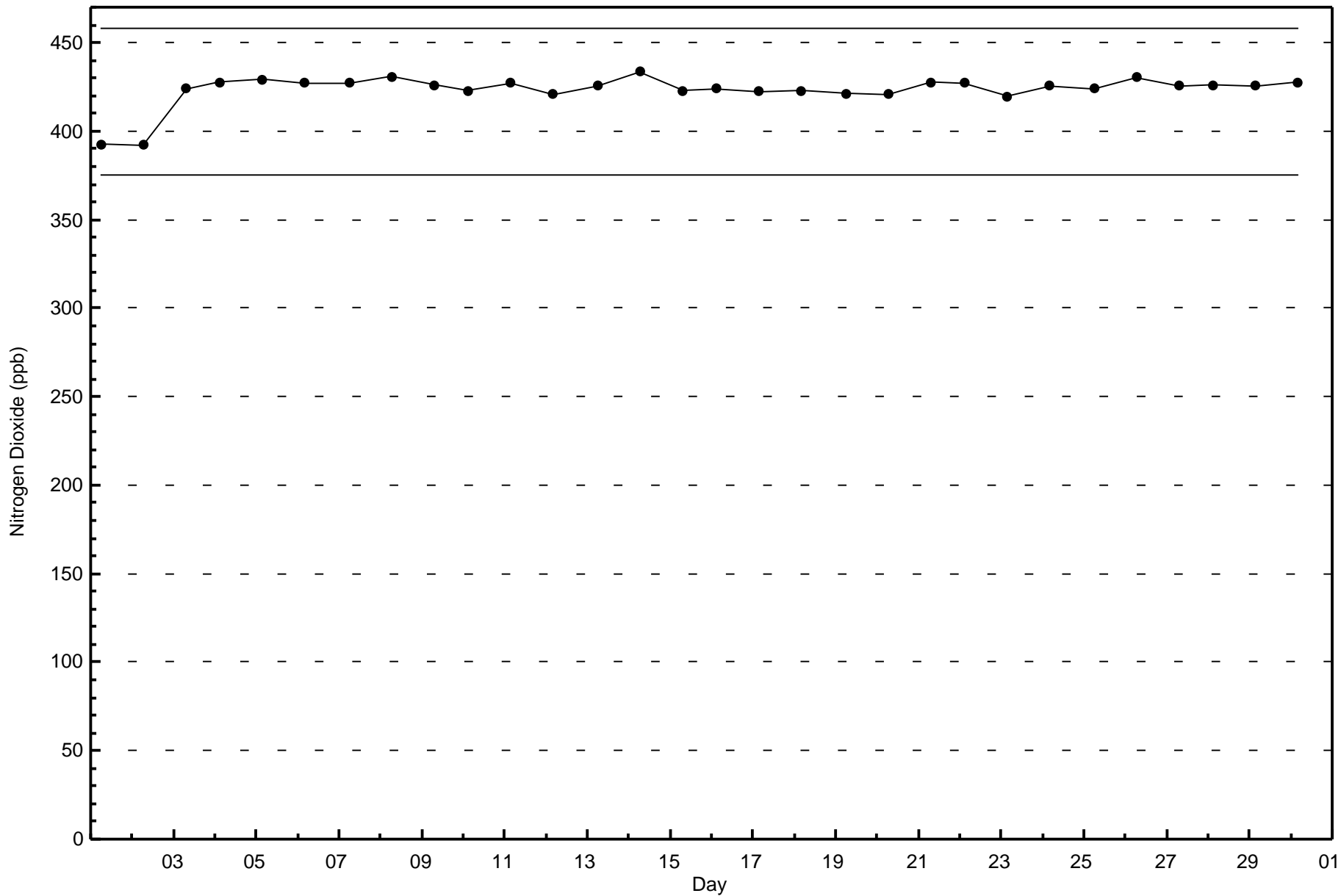


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Dioxide (NO₂) - ppb
Patricia McInnes (AMS 6)









Wood Buffalo Environmental Association
Summary of Hour Averages

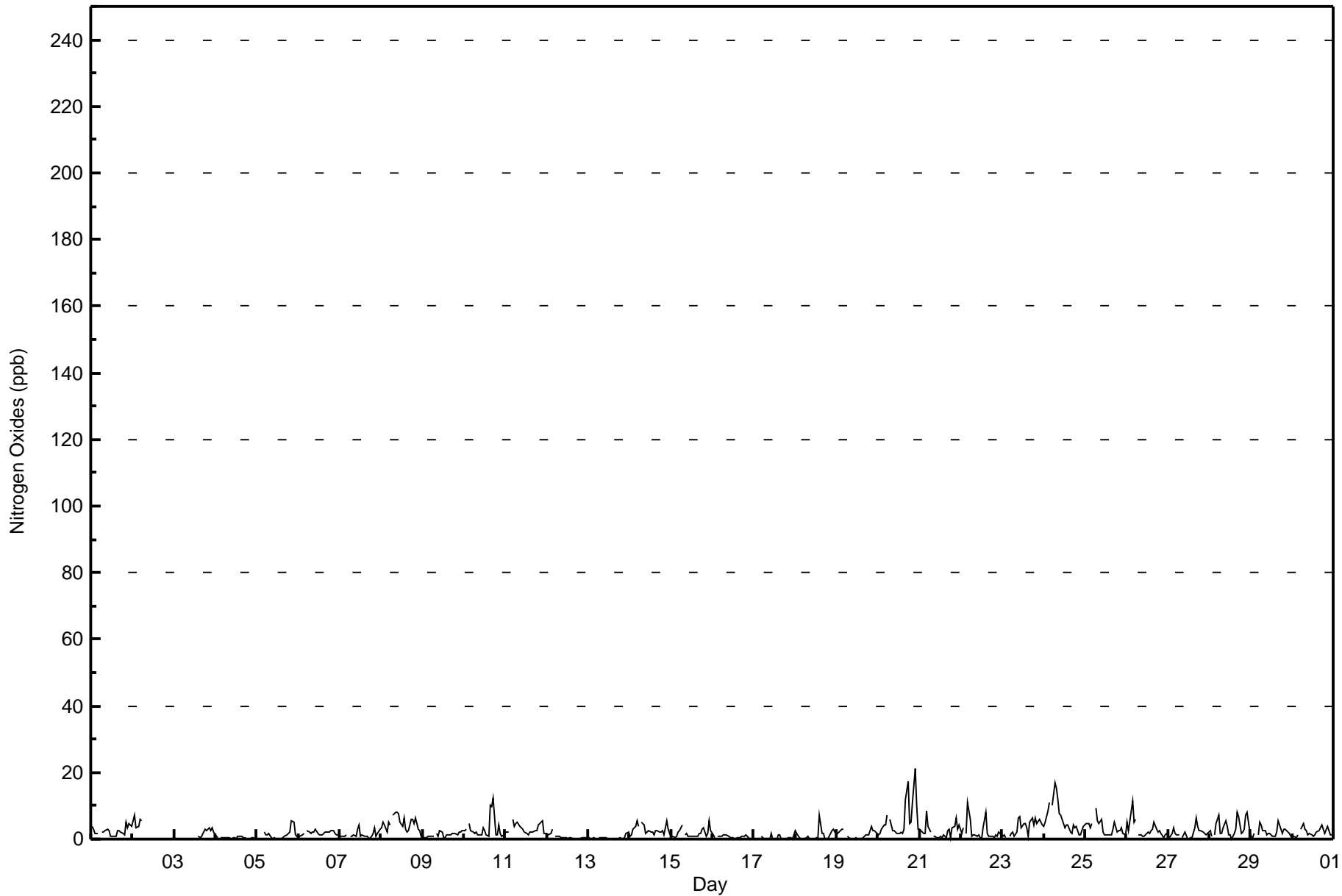
Nitrogen Oxides (NO_x) - ppb
Patricia McInnes - June 2016

Maximum Value: 21 ppb on Jun 20 22:00		Maximum Daily Average: 6.0 ppb on Jun 24		Hours in Service: 720																																												
Minimum Value: 0 ppb on Jun 4 19:00		Minimum Daily Average: 0.4 ppb on Jun 4		Hours of Data: 661																																												
Maximum Diurnal Average: 3.4 ppb at hour 6		Minimum Diurnal Average: 1.2 ppb at hour 13		Hours of Missing Data: 59																																												
Monthly Average: 2.3 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 5 P ₉₉ = 12		Hours of Calibration: 33																																												
				Percent Operational Time: 96.4																																												
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-Jun	4	3	2	2	2	Z	2	2	2	3	3	1	1	1	1	2	2	2	2	1	5	3	5	4	2.4	5																						
2-Jun	5	7	3	4	6	6	Z	4	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	--	7																						
3-Jun	M	M	M	M	M	M	M	M	M	M	C	C	C	C	1	1	1	2	3	3	3	3	3	2	--	3																						
4-Jun	1	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0.4	1																						
5-Jun	0	0	0	Z	2	1	1	2	0	0	0	0	0	0	0	1	1	1	2	2	6	5	1	1	1.2	6																						
6-Jun	1	1	1	1	Z	2	2	2	2	2	3	2	1	1	1	2	2	2	2	2	2	2	1	1	1.8	3																						
7-Jun	1	1	1	1	1	Z	1	1	1	1	3	4	1	1	1	1	1	0	1	2	3	1	2	3	1.4	4																						
8-Jun	4	5	4	2	5	4	Z	7	8	8	8	5	4	6	3	2	2	6	6	4	6	3	2	1	4.7	8																						
9-Jun	1	0	0	1	1	1	1	Z	2	1	2	2	1	1	1	1	1	2	2	2	1	2	2	2	1.3	2																						
10-Jun	3	3	Z	5	3	2	2	2	1	1	1	3	3	1	1	10	10	12	1	1	4	2	1	1	3.2	12																						
11-Jun	2	2	2	Z	6	4	5	5	4	3	3	2	2	1	2	2	2	2	3	4	5	6	2	2	3.1	6																						
12-Jun	2	1	2	3	Z	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0.6	3																						
13-Jun	0	0	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	0.4	2																						
14-Jun	1	1	3	4	5	4	Z	5	4	2	2	2	2	2	1	3	3	2	2	3	1	5	3	2	2.7	5																						
15-Jun	1	1	0	1	2	3	4	Z	1	2	1	1	1	1	1	1	2	2	3	3	1	2	6	2	1.8	6																						
16-Jun	1	0	Z	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	0	0.7	1																						
17-Jun	0	0	0	Z	1	1	0	0	0	0	2	0	0	0	1	1	0	0	0	0	1	0	0	1	0.4	2																						
18-Jun	3	2	0	0	Z	0	0	1	0	0	0	0	0	0	7	2	2	0	0	0	2	2	3	2	1.1	7																						
19-Jun	2	2	2	3	3	Z	1	0	0	0	0	0	0	0	0	0	1	1	1	3	4	3	2	2	1.3	4																						
20-Jun	1	2	3	4	4	7	Z	6	2	3	2	2	2	2	3	12	17	5	5	11	21	10	3	5.6	21																							
21-Jun	3	2	2	1	9	4	2	Z	1	1	1	0	1	1	1	0	3	3	1	3	4	6	3	4	2.4	9																						
22-Jun	1	3	Z	2	11	6	1	1	1	1	1	0	0	3	8	2	1	1	1	1	1	1	2	1	2.2	11																						
23-Jun	1	1	1	Z	1	2	2	1	2	7	7	3	5	5	4	1	5	6	4	6	5	6	5	4	3.6	7																						
24-Jun	4	5	9	11	Z	10	17	15	12	8	7	5	3	4	4	2	2	4	3	4	1	1	2	4	6.0	17																						
25-Jun	5	5	5	3	5	Z	9	5	5	6	2	1	1	1	1	1	3	5	2	2	3	3	2	1	3.4	9																						
26-Jun	5	2	6	12	5	6	Z	1	1	1	1	1	2	2	2	3	5	3	2	3	2	0	1	2	3.0	12																						
27-Jun	1	1	2	3	2	1	1	Z	0	1	2	0	0	0	0	3	6	4	3	2	2	2	1	2	1.7	6																						
28-Jun	3	1	Z	1	5	7	2	2	4	6	4	1	1	0	2	3	8	7	2	2	3	7	8	2	3.5	8																						
29-Jun	1	1	2	Z	1	5	4	3	2	1	2	2	1	1	1	2	6	3	2	3	3	2	1	1	2.1	6																						
30-Jun	1	1	1	1	Z	3	5	3	3	1	2	1	1	1	2	2	3	4	3	2	4	3	1	1	2.2	5																						
																								1.9	1.8	2.1	2.8	3.3	3.4	2.7	2.8	2.3	2.1	2.1	1.5	1.2	1.3	1.7	1.8	2.9	3.3	1.9	2.3	2.9	3.2	2.6	1.9	Diurnal Average
																								5	7	9	12	11	10	17	15	12	8	8	5	5	6	8	10	12	17	6	6	11	21	10	4	Diurnal Maximum
Z - zerospan																								C - Calibration				M - Maintenance																				



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Patricia McInnes - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Patricia McInnes - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	660	99.85	99.85
21 - 40	1	0.15	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: 661

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Patricia McInnes - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	54	35	21	15	24	50	44	30	55	48	57	52	35	51	34	55	660
21 - 40	0	0	0	0	0	0	0	1	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
Totals	54	35	21	15	24	50	44	31	55	48	57	52	35	51	34	55	661

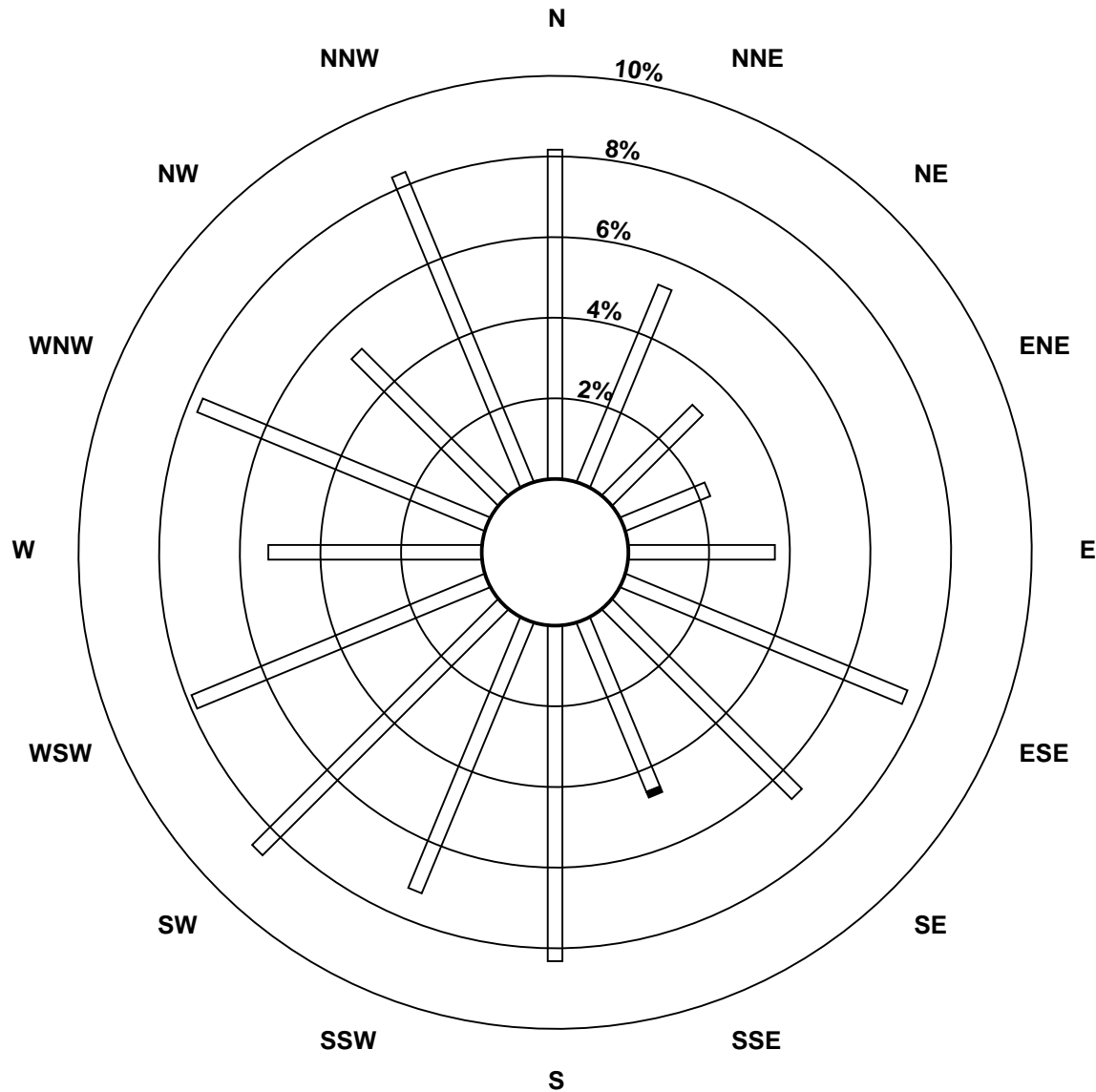
Total Number of Valid Hours: 661

Total Number of Hours: 720

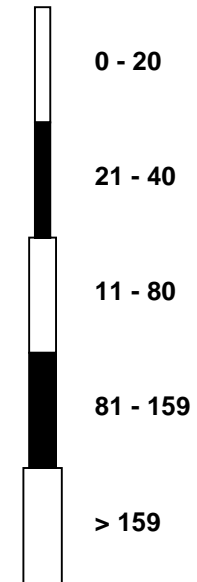


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxides (NO_x) - ppb
Patricia McInnes (AMS 6)



Classes (ppb)

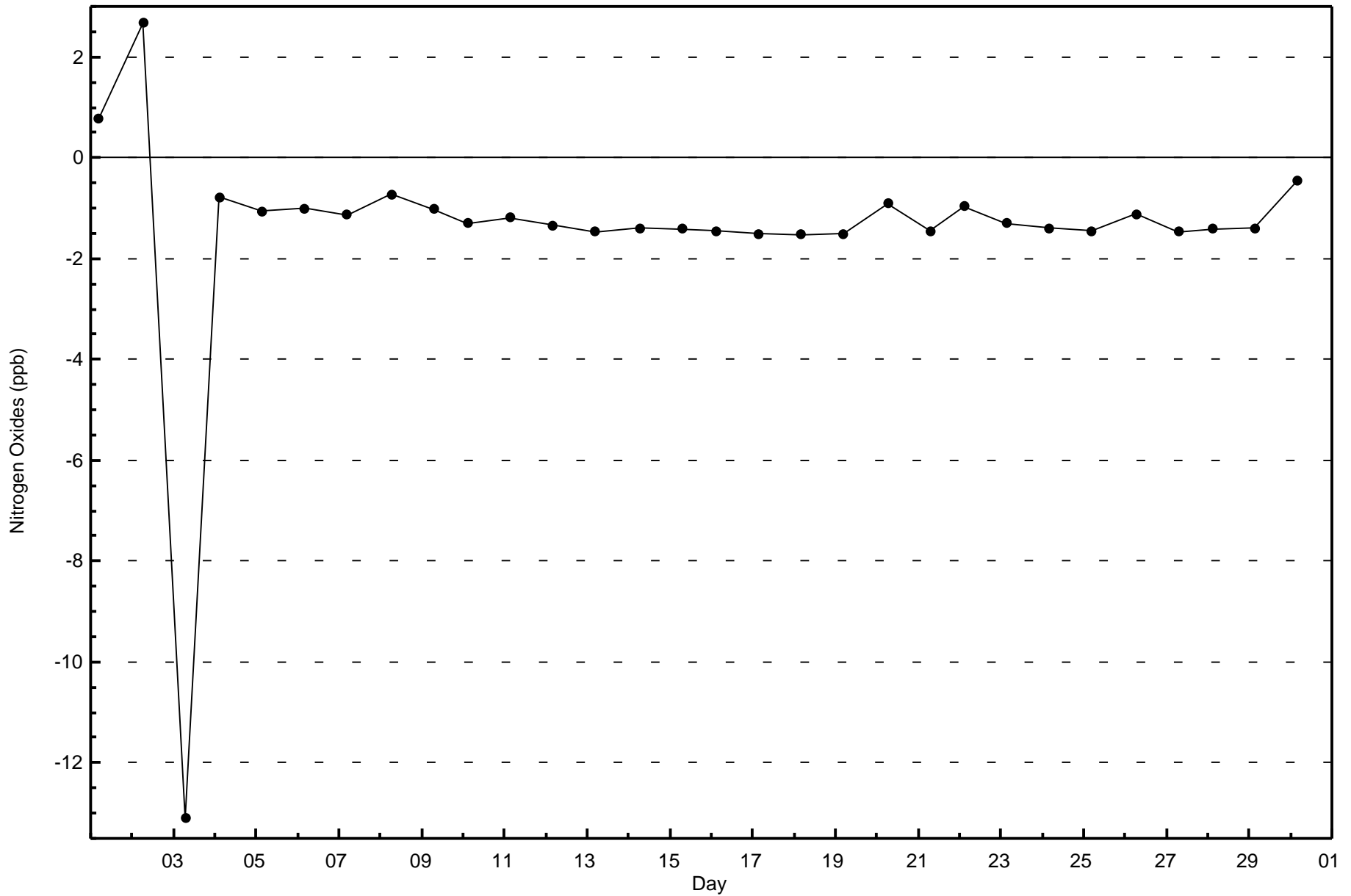


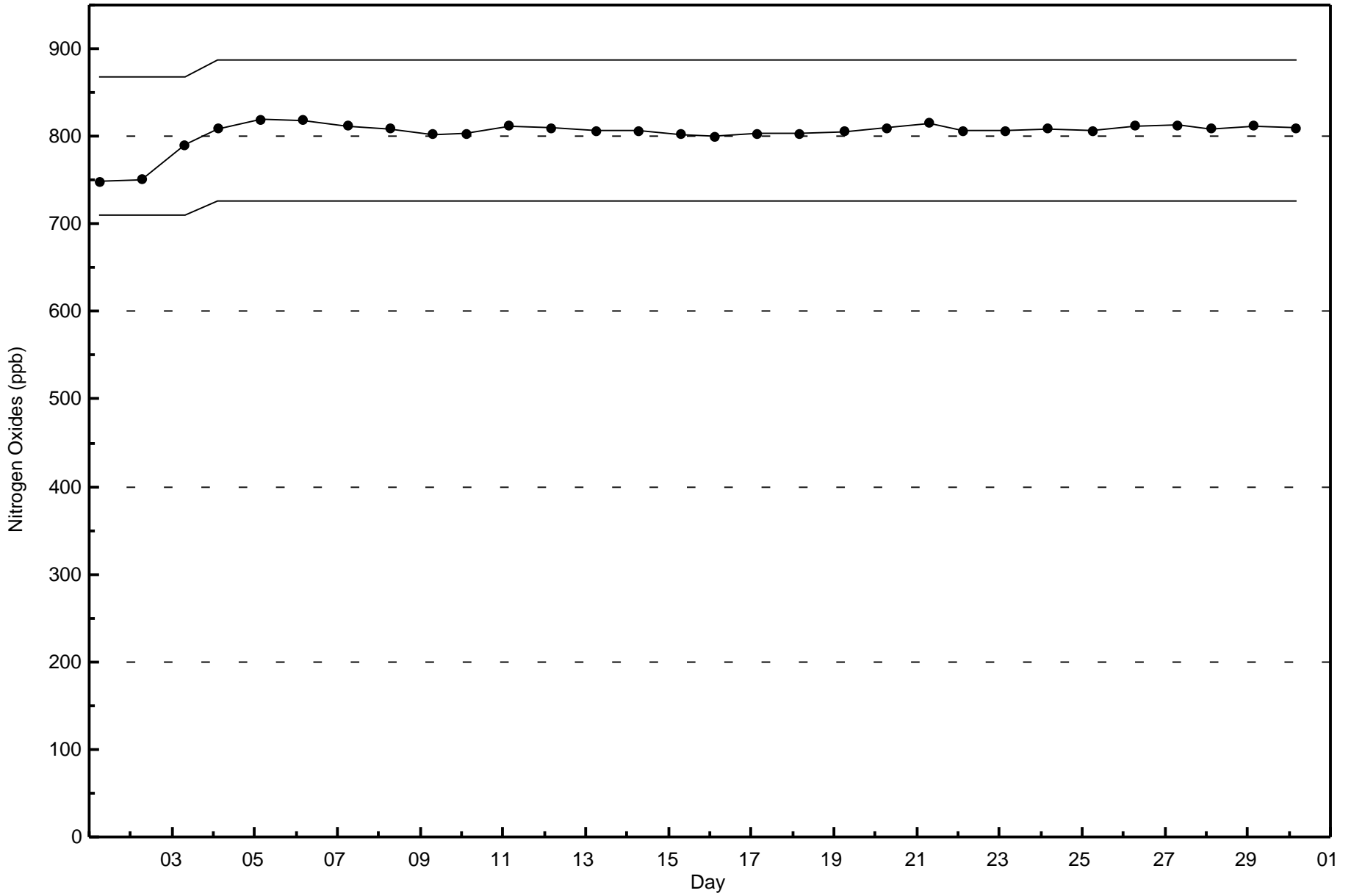
Total Number of Valid Hours: 661



Wood Buffalo Environmental Association
Zero Responses

Nitrogen Oxides (NO_x) - ppb
Patricia McInnes - June 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Ammonia (NH₃) - ppb
Patricia McInnes - June 2016

Number of Exceedences (AAAQO): 1-hr: 0	Hours in Service: 720
Maximum Value: 72 ppb on Jun 8 03:00	Maximum Daily Average: 9.9 ppb on Jun 2
Minimum Value: 0 ppb on Jun 1 03:00	Hours of Data: 622
Maximum Diurnal Average: 7.6 ppb at hour 3	Hours of Missing Data: 98
Monthly Average: 1.2 ppb	Hours of Calibration: 44
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 32	Percent Operational Time: 92.5

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-Jun	25	11	0	Z	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	3.2	35
2-Jun	67	58	16	Z	RE	18	12	0	0	0	0	0	0	M	M	M	0	0	0	0	0	0	0	0	9.9	67
3-Jun	0	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0.5	11
4-Jun	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	0
5-Jun	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
6-Jun	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
7-Jun	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
8-Jun	0	0	72	28	Z	RE	14	0	0	0	0	0	0	0	0	0	0	12	12	12	14	14	12	0	8.6	72
9-Jun	0	0	0	0	0	Z	RE	RE	0	C	C	C	C	C	C	C	0	0	0	0	0	0	0	0	--	0
10-Jun	Z	RE	0	0	0	0	0	0	C	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	--	0
11-Jun	0	Z	RE	20	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.5	20
12-Jun	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
13-Jun	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
14-Jun	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
15-Jun	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
16-Jun	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	0
17-Jun	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
18-Jun	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
19-Jun	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	41	2.9	41
20-Jun	21	21	19	0	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	0	4.3	26
21-Jun	0	0	0	0	0	Z	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0.7	15
22-Jun	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	0
23-Jun	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
24-Jun	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
25-Jun	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
26-Jun	18	44	23	12	Z	RE	RE	RE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.9	44
27-Jun	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
28-Jun	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	0
29-Jun	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
30-Jun	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

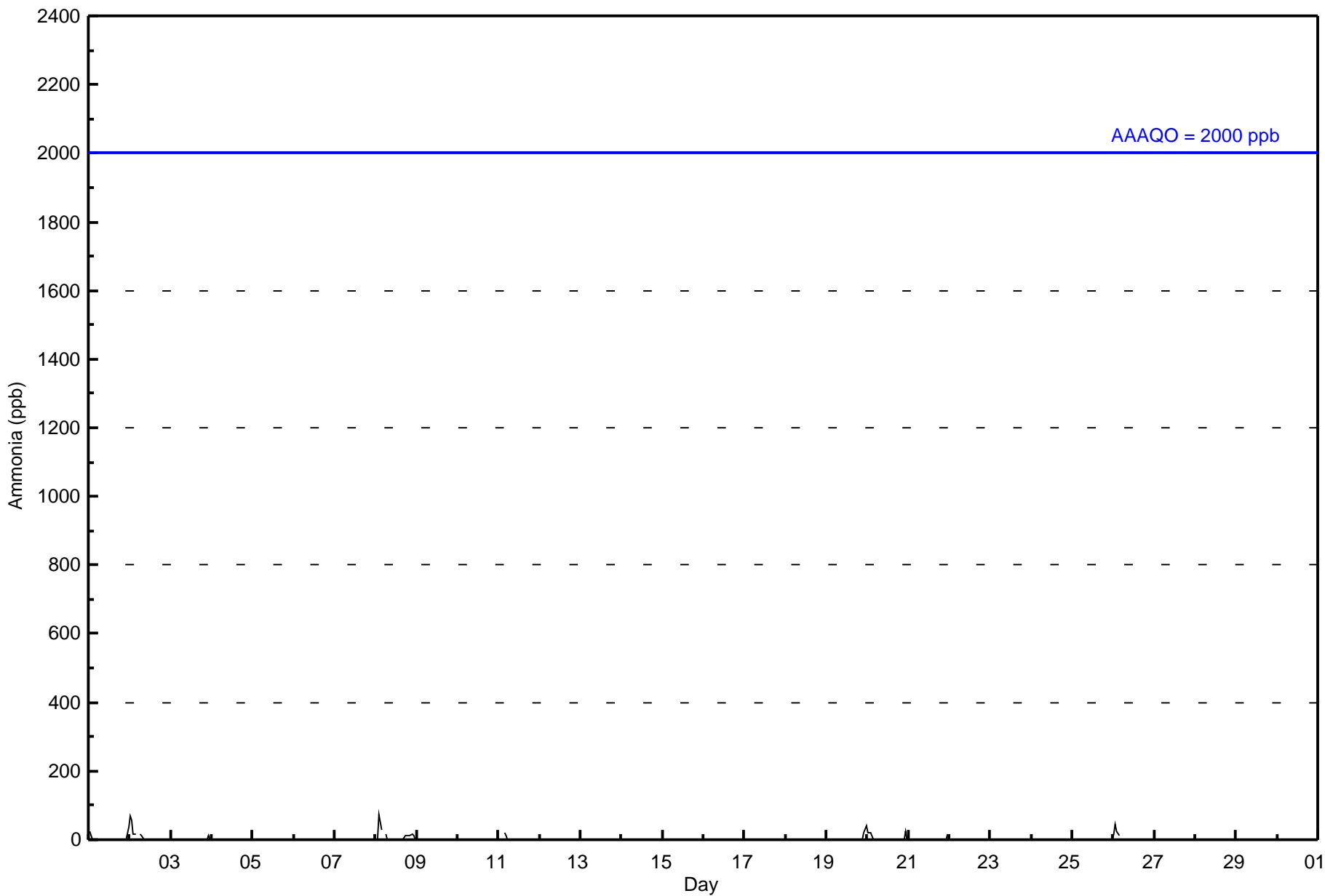
5.3	6.7	7.6	4.2	0.8	0.0	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.4	0.5	0.5	2.3	3.1	Diurnal Average	
67	58	72	28	13	0	18	12	0	0	0	0	0	0	0	0	0	0	12	12	12	14	14	26	41	Diurnal Maximum	

Z - zerospan C - Calibration M - Maintenance RE - Recovery
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 2000 ppb



Wood Buffalo Environmental Association
Hourly Averages

Ammonia (NH₃) - ppb
Patricia McInnes - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ammonia (NH₃) - ppb
Patricia McInnes - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 5	590	94.86	94.86
6 - 10	0	0.00	94.86
11 - 15	13	2.09	96.95
16 - 20	6	0.96	97.91
21 - 25	5	0.80	98.71
> 26	8	1.29	100.00

Total Number of Valid Hours: 622

Total Number of Hours: 720



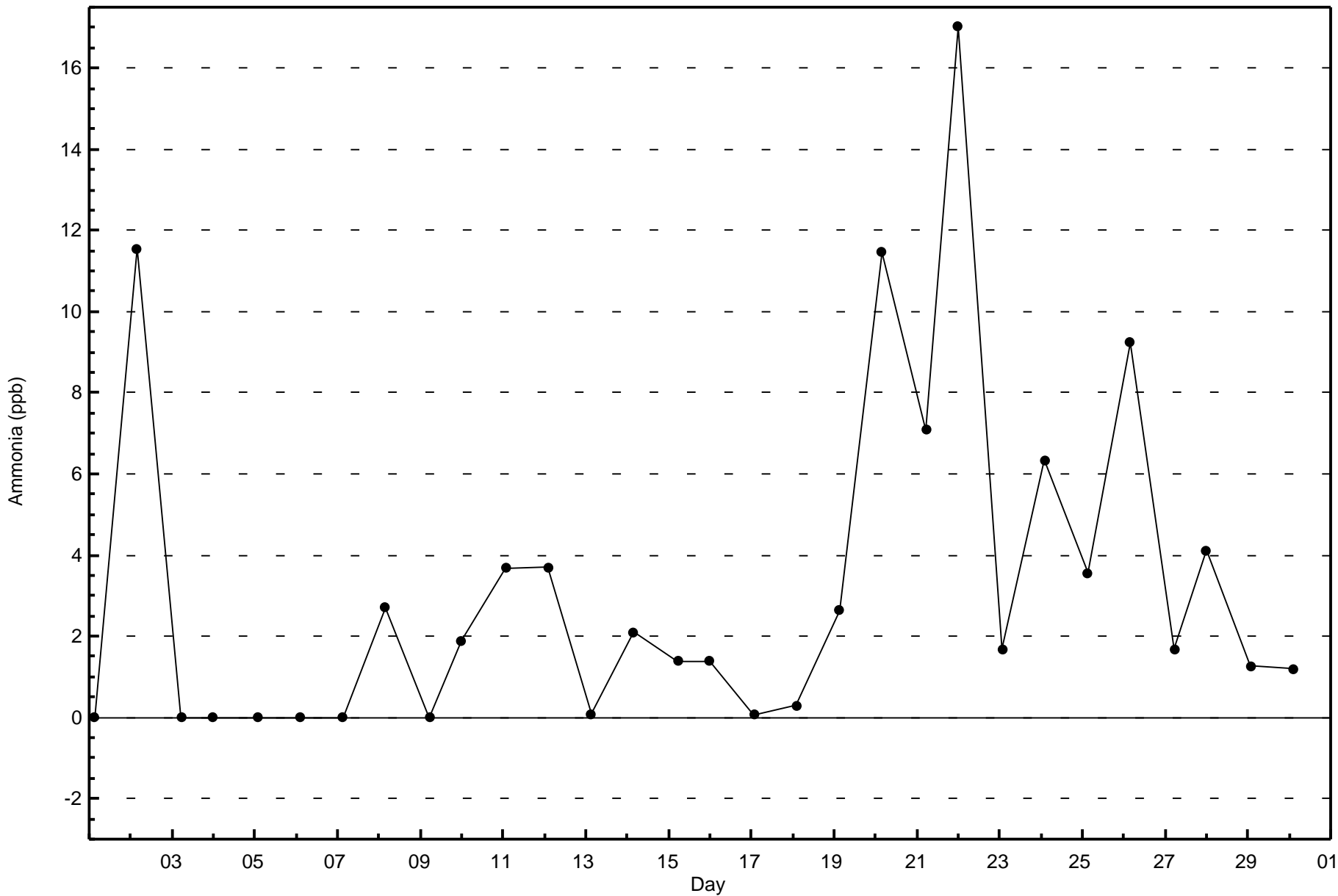
**Wood Buffalo Environmental Association
Frequency Distribution**

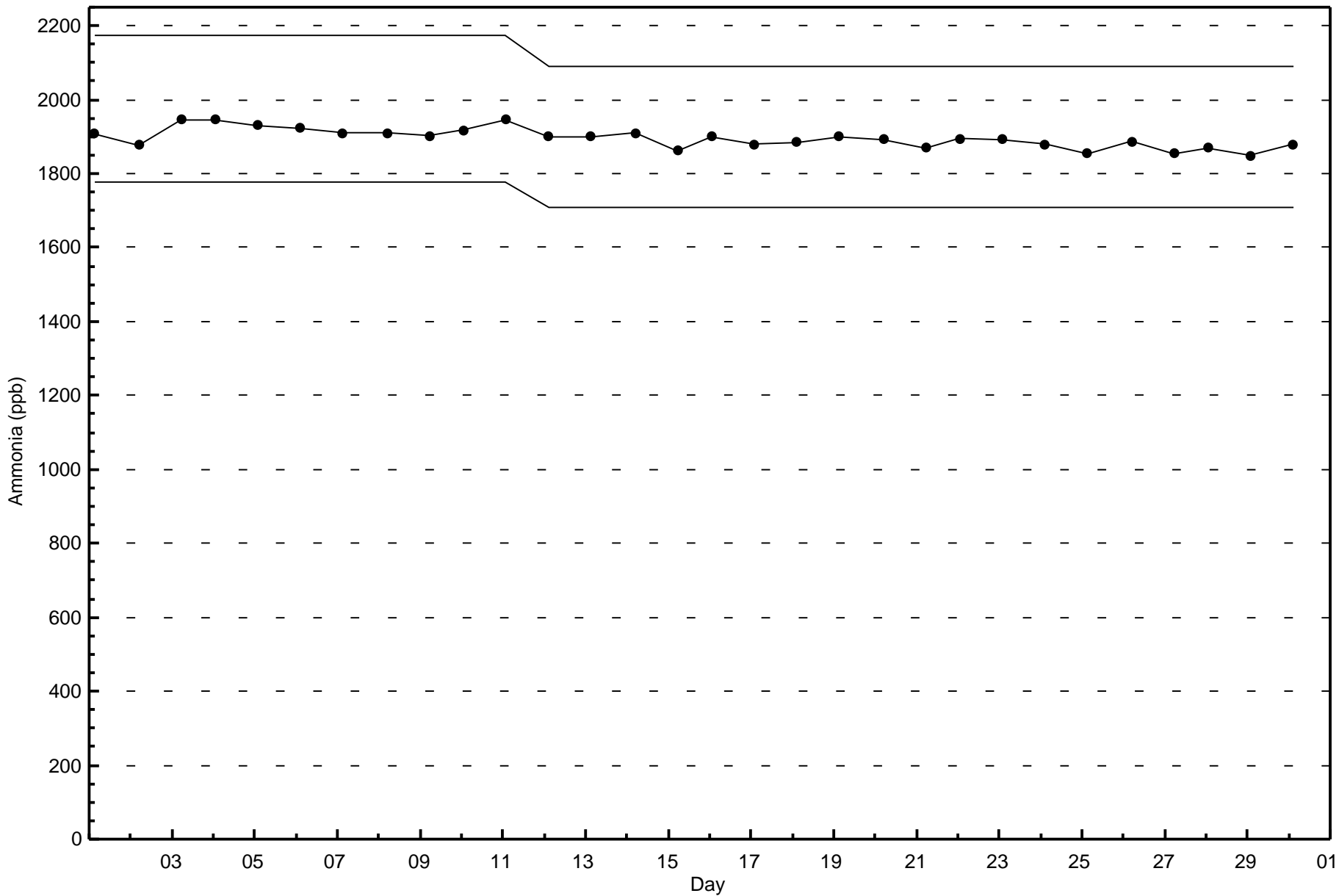
**Ammonia (NH₃) - ppb
Patricia McInnes - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 5	44	27	19	12	27	50	37	28	43	42	52	49	37	42	30	51	590
6 - 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 15	1	0	3	2	1	1	1	0	1	2	0	0	0	0	0	1	13
16 - 20	0	0	0	0	0	0	1	1	0	1	1	2	0	0	0	0	6
21 - 25	0	0	0	0	0	0	0	1	0	1	0	0	1	2	0	0	5
> 26	0	0	0	0	0	0	0	0	2	0	2	0	0	2	2	0	8
Totals	45	27	22	14	28	51	39	30	46	46	55	51	38	46	32	52	622

Total Number of Valid Hours: 622

Total Number of Hours: 720







Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM_{2.5}) - µg/m³

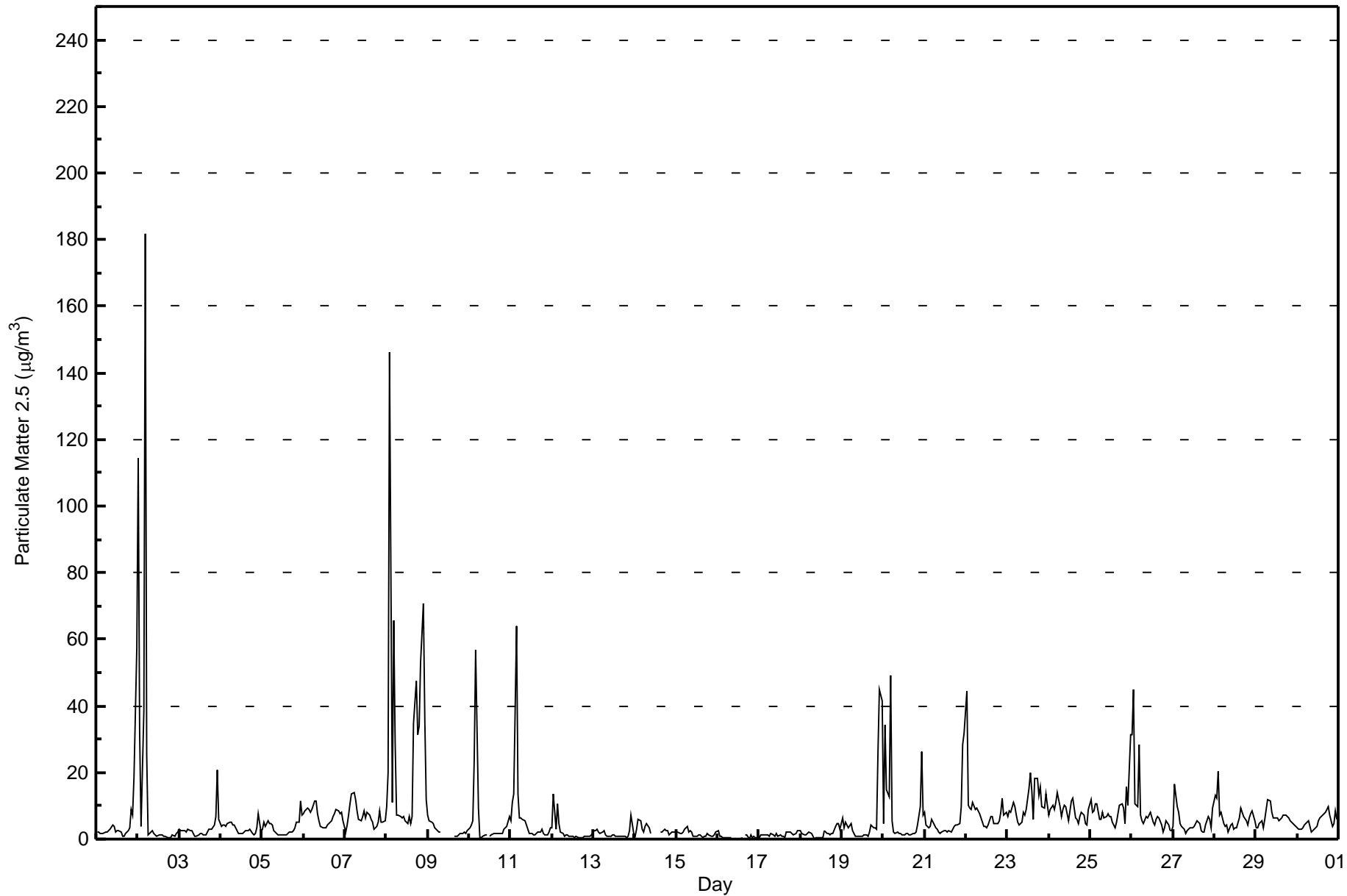
Patricia McInnes - June 2016

Number of Exceedences (AAAQO): 24-hr: 0 Maximum Value: 181.7 µg/m ³ on Jun 2 05:00 Minimum Value: 0.1 µg/m ³ on Jun 16 14:00 Maximum Diurnal Average: 17.4 µg/m ³ at hour 5 Monthly Average: 6.50 µg/m ³		Maximum Daily Average: 27.6 µg/m ³ on Jun 8 Minimum Daily Average: 0.6 µg/m ³ on Jun 16 Minimum Diurnal Average: 3.3 µg/m ³ at hour 12 Percentiles: P ₁ = 0.3 P ₁₀ = 1.0 Q ₁ = 1.7 Median = 3.6 Q ₃ = 6.9 P ₉₀ = 10.7 P ₉₉ = 54.4		Hours in Service: 720 Hours of Data: 704 Hours of Missing Data: 16 Hours of Calibration: 7 Percent Operational Time: 98.8																						
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-Jun	2.0	2.0	1.6	1.7	1.7	2.0	2.1	2.5	3.1	4.4	3.9	2.2	2.5	2.4	2.2	0.8	0.8	1.6	2.7	3.5	8.7	7.0	18.5	57.8	5.7	57.8
2-Jun	114.4	32.0	3.7	38.4	181.7	25.2	1.3	1.7	2.4	1.7	1.2	0.8	1.2	1.1	1.1	1.0	1.1	0.4	0.3	0.5	1.2	1.0	1.8	2.1	17.4	181.7
3-Jun	3.0	2.4	2.5	2.5	2.2	3.0	2.7	2.7	1.7	0.9	1.0	1.4	1.6	1.7	1.4	1.4	2.3	2.9	3.1	2.9	4.4	6.6	20.7	5.7	3.4	20.7
4-Jun	3.9	4.3	4.1	3.7	4.7	5.2	4.9	4.1	4.2	2.4	1.6	1.6	1.7	1.8	2.6	2.7	2.6	2.9	1.9	1.2	1.7	3.6	7.6	2.0	3.2	7.6
5-Jun	3.2	5.3	4.0	5.5	4.6	4.5	4.2	2.5	1.6	1.4	1.3	1.3	1.2	1.3	1.5	1.9	1.9	2.2	2.5	3.2	4.9	4.9	11.6	7.2	3.5	11.6
6-Jun	7.7	8.6	9.2	9.0	8.0	9.0	11.2	11.5	7.5	5.7	3.7	3.4	3.4	3.6	4.3	5.2	5.6	6.7	7.7	8.8	8.6	7.5	8.0	5.5	7.1	11.5
7-Jun	2.2	4.2	7.4	10.7	13.6	13.9	11.8	8.6	5.9	5.5	6.6	8.7	6.5	7.9	7.4	5.9	5.1	3.0	4.0	5.2	8.5	5.2	5.0	5.7	7.0	13.9
8-Jun	9.7	20.0	146.1	10.9	65.6	28.7	7.1	7.1	7.0	6.4	6.6	5.4	4.6	6.6	4.5	6.8	34.7	47.3	31.1	33.9	53.0	70.9	36.0	11.9	27.6	146.1
9-Jun	7.0	5.3	5.1	4.7	3.4	3.0	2.2	1.9	C	C	C	C	C	C	C	0.7	0.7	0.9	1.3	1.5	1.5	2.0	1.6	2.4	--	7.0
10-Jun	3.2	4.3	5.6	23.8	56.9	9.2	0.4	0.5	0.8	1.1	1.3	M	1.0	1.4	1.6	1.6	1.6	1.7	1.6	1.7	3.1	3.2	3.9	6.7	5.9	56.9
11-Jun	5.4	11.1	13.5	64.0	13.7	6.3	6.2	5.9	5.4	4.4	3.1	1.7	1.5	1.2	1.3	1.7	1.9	2.0	2.8	1.7	1.3	1.3	2.2	3.5	6.8	64.0
12-Jun	3.3	13.4	2.9	10.6	4.8	2.1	1.7	1.0	1.3	1.3	0.7	0.8	0.8	0.4	0.7	0.4	0.4	0.4	0.5	0.7	0.8	0.8	0.9	1.4	2.2	13.4
13-Jun	2.4	2.4	2.9	2.2	1.9	2.3	2.4	1.4	1.0	1.0	1.0	1.2	1.2	1.0	1.0	0.7	0.9	0.7	0.6	0.6	1.0	2.6	7.1	1.7	1.7	7.1
14-Jun	1.0	2.8	5.9	5.7	3.0	2.2	3.7	4.7	3.4	1.6	M	M	M	M	M	2.2	2.1	3.0	2.4	2.3	1.3	2.0	2.0	2.1	2.8	5.9
15-Jun	1.9	2.3	1.9	1.9	2.1	3.2	3.9	2.0	2.4	2.1	1.1	1.0	1.0	1.1	1.3	0.5	0.7	0.8	1.8	1.4	0.9	0.9	1.4	2.0	1.6	3.9
16-Jun	2.6	0.9	0.8	0.6	0.5	0.5	0.4	0.4	0.3	UO	0.3	UO	0.2	0.1	0.3	M	1.2	1.3	0.2	1.1	0.3	1.0	0.4	0.2	0.6	2.6
17-Jun	0.4	1.2	1.3	1.3	1.2	1.1	1.0	1.8	1.3	0.7	1.6	1.0	1.2	0.8	0.7	0.6	2.0	2.0	1.9	1.5	1.3	1.5	2.6	2.3	1.4	2.6
18-Jun	2.7	1.5	1.4	1.3	1.7	1.9	1.8	1.0	0.2	0.4	0.3	0.4	0.6	0.6	2.5	1.8	1.6	1.5	1.5	1.7	3.6	4.5	4.8	3.1	1.8	4.8
19-Jun	6.4	3.5	5.3	4.4	3.5	4.8	2.7	1.5	0.8	0.7	0.9	0.9	0.8	1.2	1.3	1.0	2.1	4.2	3.4	3.5	3.2	25.7	45.1	41.6	7.0	45.1
20-Jun	4.8	34.1	15.0	12.8	49.1	5.4	2.0	1.8	2.1	1.8	1.6	1.4	1.3	1.5	1.5	1.4	1.3	1.8	1.8	2.2	4.3	9.9	26.1	7.2	8.0	49.1
21-Jun	8.2	4.4	3.6	4.0	6.0	5.1	3.4	2.8	2.1	1.8	2.1	2.4	2.4	2.3	2.4	2.2	3.0	3.8	4.2	4.3	4.8	9.6	28.3	31.8	6.0	31.8
22-Jun	44.3	10.2	9.1	8.8	11.2	9.0	9.3	8.3	7.8	5.0	3.8	3.7	3.2	4.2	6.9	6.6	4.6	4.6	4.8	5.6	7.9	12.2	7.3	7.9	8.6	44.3
23-Jun	6.8	8.3	8.0	10.9	9.7	7.3	5.2	4.1	5.1	8.1	7.3	9.1	15.5	19.8	14.2	5.9	18.1	18.3	13.1	15.8	9.8	9.4	13.5	10.1	10.6	19.8
24-Jun	7.3	9.0	10.2	8.7	10.8	14.0	9.7	6.7	8.7	10.1	9.8	5.6	8.6	11.3	12.4	6.5	5.8	4.8	6.7	8.2	7.3	4.7	4.3	9.1	8.3	14.0
25-Jun	12.0	8.0	8.7	10.4	10.4	5.8	6.0	7.9	6.3	6.8	7.7	6.7	6.7	5.1	3.2	4.9	7.8	10.1	10.7	9.2	4.7	15.8	10.2	31.4	9.0	31.4
26-Jun	31.2	44.9	10.5	9.9	28.2	7.3	5.4	4.8	6.6	6.3	7.0	7.9	5.2	4.2	6.1	6.9	6.5	4.4	2.3	3.4	5.7	4.2	2.7	2.7	9.3	44.9
27-Jun	3.7	16.5	9.7	8.0	4.8	3.7	2.8	1.7	2.4	2.8	3.3	3.6	3.8	4.7	5.3	4.7	2.4	2.0	2.2	4.4	6.8	5.7	3.4	9.3	4.9	16.5
28-Jun	13.3	12.1	20.5	7.2	8.0	4.6	3.9	4.4	2.0	4.1	4.7	3.0	3.5	3.2	6.5	9.3	8.2	6.8	5.4	4.1	6.2	7.6	8.6	5.6	6.8	20.5
29-Jun	3.3	3.6	4.9	5.4	3.5	6.0	8.8	12.0	11.6	7.9	6.3	6.6	6.4	5.6	5.8	6.5	7.3	7.1	6.6	6.2	5.7	4.8	4.2	3.6	6.2	12.0
30-Jun	3.3	2.8	3.0	3.5	4.1	4.5	5.4	3.7	2.3	2.7	3.0	3.9	5.4	6.4	6.6	7.4	8.0	9.0	9.7	7.4	3.8	4.6	8.4	6.0	5.2	9.7
																								Diurnal Average		
10.7 9.4 10.9 9.7 17.4 6.7 4.5 4.0 3.7 3.5 3.3 3.3 3.3 3.7 3.8 3.4 4.7 5.3 4.6 4.9 5.9 8.0 9.9 9.7																								Diurnal Maximum		
114.4 44.9 146.1 64.0 181.7 28.7 11.8 12.0 11.6 10.1 9.8 9.1 15.5 19.8 14.2 9.3 34.7 47.3 31.1 33.9 53.0 70.9 45.1 57.8																										
C - Calibration M - Maintenance UO - Unstable Operation Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																										



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Patricia McInnes - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Patricia McInnes - June 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	389	55.26	55.26
6 - 15	197	27.98	83.24
16 - 25	12	1.70	84.94
26 - 80	27	3.84	88.78
> 81.0	3	0.43	89.20

Total Number of Valid Hours: 704

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Patricia McInnes - June 2016

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	30	15	11	12	21	29	30	23	27	27	35	34	22	30	20	23	389
6 - 15	18	14	6	3	5	20	17	7	17	17	19	4	3	10	8	29	197
16 - 25	0	1	1	0	0	0	0	1	2	1	0	0	3	1	0	2	12
26 - 80	2	0	3	1	1	0	0	3	2	1	2	5	3	2	2	0	27
> 81.0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	3
Totals	50	30	21	16	27	49	47	34	48	46	57	43	32	44	30	54	628

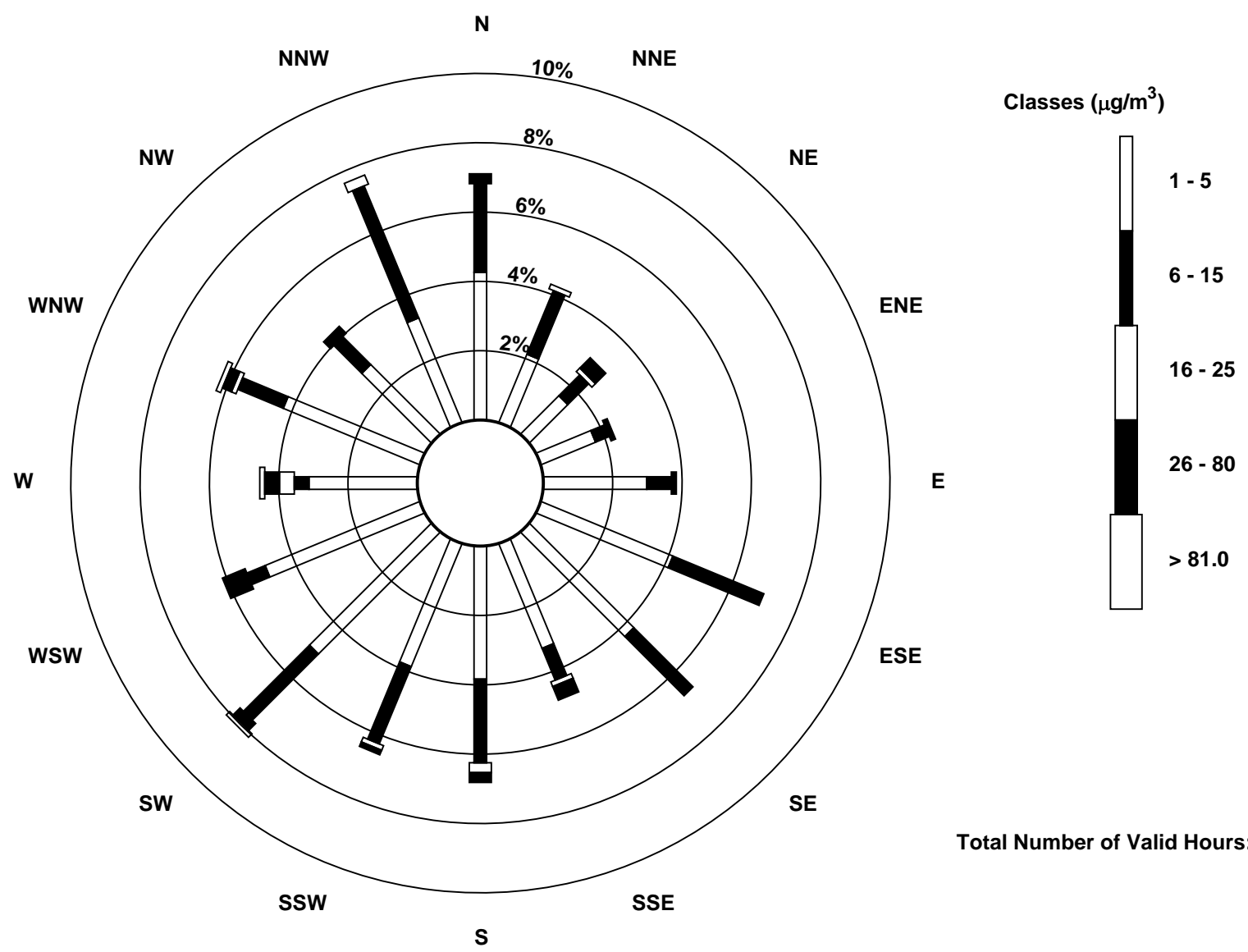
Total Number of Valid Hours: 704

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Patricia McInnes (AMS 6)

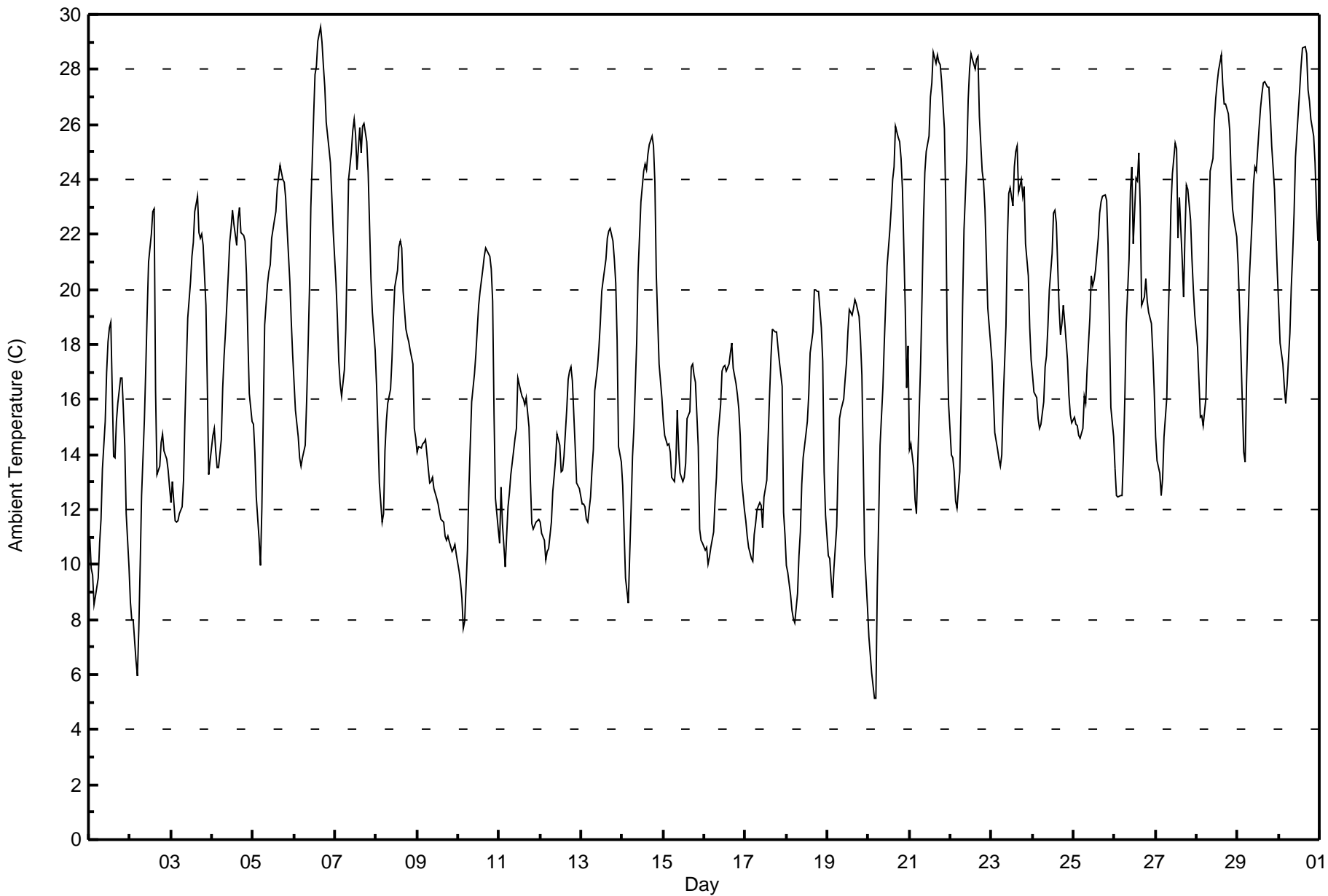




Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Patricia McInnes - June 2016

Maximum Value: 29.5 C on Jun 6 16:00		Maximum Daily Average: 23.1 C on Jun 30		Hours in Service: 720																																												
Minimum Value: 5.1 C on Jun 20 04:00		Minimum Daily Average: 12.4 C on Jun 9		Hours of Data: 720																																												
Maximum Diurnal Average: 21.9 C at hour 15		Minimum Diurnal Average: 11.7 C at hour 4		Hours of Missing Data: 0																																												
Monthly Average: 17.63 C		Percentiles: P ₁ = 7.6 P ₁₀ = 11.0 Q ₁ = 13.5 Median = 17.1 Q ₃ = 21.9 P ₉₀ = 25.1 P ₉₉ = 28.5		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-Jun	11.0	9.9	9.6	8.5	8.9	9.5	10.8	11.6	13.5	15.2	17.0	18.1	18.6	18.8	13.9	13.9	15.2	15.9	16.8	16.8	15.6	14.3	11.8	9.9	13.5	18.8																						
2-Jun	8.6	8.0	8.0	6.5	6.0	7.6	10.0	12.5	15.2	17.1	19.2	21.0	22.0	22.9	22.9	16.3	13.3	13.6	14.4	14.8	14.2	13.8	13.4	12.8	13.9	22.9																						
3-Jun	12.3	13.0	11.6	11.5	11.6	11.8	12.1	13.1	15.3	17.2	19.0	20.3	21.2	21.7	22.9	23.4	22.1	21.9	22.0	21.6	19.4	16.5	13.3	13.8	17.0	23.4																						
4-Jun	14.7	15.0	14.1	13.5	13.5	14.5	16.4	17.6	18.5	20.6	21.7	22.2	22.9	22.4	21.6	22.6	23.0	22.1	22.0	21.8	20.5	18.3	16.2	15.2	18.8	23.0																						
5-Jun	15.1	14.1	12.5	10.9	9.9	12.1	15.4	18.7	20.2	20.7	20.9	21.9	22.5	22.8	23.7	24.1	24.5	24.0	23.9	23.3	22.3	20.3	18.9	17.7	19.2	24.5																						
6-Jun	16.6	15.6	14.6	13.9	13.6	13.9	14.3	15.9	17.8	19.9	23.0	26.3	27.8	28.1	29.0	29.5	29.0	28.1	27.4	26.1	25.1	24.6	23.4	22.1	21.9	29.5																						
7-Jun	20.2	19.0	17.4	16.6	16.1	17.1	18.6	21.3	24.0	25.0	25.8	26.2	25.6	24.3	25.9	25.0	25.9	26.0	25.3	24.3	22.3	20.4	19.2	17.8	22.1	26.2																						
8-Jun	16.5	14.8	13.0	11.5	11.8	14.1	15.2	15.9	16.4	17.4	18.9	20.1	20.7	21.5	21.8	21.5	19.9	18.6	18.3	18.1	17.8	17.3	15.0	14.6	17.1	21.8																						
9-Jun	14.1	14.3	14.2	14.4	14.5	14.5	13.5	13.0	13.0	13.2	12.8	12.4	12.2	11.9	11.7	11.5	11.0	10.9	11.0	10.8	10.5	10.6	10.7	10.4	12.4	14.5																						
10-Jun	9.8	9.4	8.8	7.7	7.9	10.5	12.7	14.4	15.9	17.0	17.6	18.6	19.4	20.0	20.7	21.2	21.5	21.4	21.2	20.7	19.6	15.5	12.4	11.3	15.6	21.5																						
11-Jun	10.8	12.8	11.5	9.9	11.0	12.1	12.6	13.3	14.1	14.6	15.0	16.8	16.3	16.1	16.0	15.8	16.1	15.0	13.0	11.5	11.3	11.5	11.6	11.6	13.3	16.8																						
12-Jun	11.5	11.1	10.9	10.2	10.5	10.6	11.5	12.6	13.2	13.8	14.7	14.3	13.4	13.4	13.9	15.7	16.7	17.0	17.2	16.7	14.3	13.0	12.8	12.8	13.4	17.2																						
13-Jun	12.2	12.2	12.1	11.7	11.5	12.4	13.4	14.2	16.3	17.2	17.9	18.8	19.9	20.3	21.1	21.9	22.1	22.2	21.8	21.1	20.2	18.2	14.3	13.8	17.0	22.2																						
14-Jun	12.9	11.2	9.5	8.6	10.4	12.0	13.9	14.9	18.1	20.6	21.9	23.2	24.3	24.5	24.4	24.9	25.3	25.6	25.2	23.9	20.5	17.3	16.7	16.1	18.6	25.6																						
15-Jun	15.3	14.7	14.4	14.4	14.1	13.2	13.0	13.7	15.6	14.2	13.3	13.0	13.2	13.7	15.3	15.6	17.2	17.3	16.9	16.6	14.3	11.3	10.9	10.8	14.2	17.3																						
16-Jun	10.5	10.6	10.0	10.3	10.6	11.2	12.3	13.2	14.6	15.8	17.0	17.2	17.2	17.0	17.3	17.7	18.0	17.1	16.6	16.2	15.6	14.7	13.1	12.0	14.4	18.0																						
17-Jun	11.6	11.0	10.6	10.2	10.1	11.1	11.5	12.0	12.3	12.1	11.3	12.5	13.1	14.7	16.1	17.5	18.6	18.5	18.4	17.9	17.4	16.5	11.9	11.1	13.7	18.6																						
18-Jun	10.0	9.7	8.9	8.3	8.1	7.9	8.9	10.3	11.2	12.9	13.9	14.7	15.2	16.2	17.7	18.4	20.0	20.0	19.9	19.9	18.6	17.4	13.4	11.8	13.9	20.0																						
19-Jun	10.3	10.2	9.5	8.8	9.9	11.4	13.7	15.3	15.6	16.0	16.8	17.4	18.5	19.3	19.1	19.3	19.6	19.5	19.0	18.2	16.9	13.7	10.4	8.4	14.9	19.6																						
20-Jun	7.4	6.7	6.1	5.1	5.2	9.2	11.7	14.3	16.4	18.1	19.5	20.8	22.2	23.0	24.0	24.4	25.9	25.5	25.4	24.7	23.7	19.3	16.4	18.0	17.2	25.9																						
21-Jun	14.2	14.4	13.5	12.4	11.8	13.8	17.3	19.8	22.5	24.2	25.0	25.6	27.0	27.5	28.6	28.2	28.6	28.3	28.1	27.6	25.8	23.1	18.1	15.8	21.7	28.6																						
22-Jun	14.0	13.9	13.4	12.3	12.1	13.4	16.1	19.4	22.2	24.8	26.9	28.0	28.6	28.4	28.0	28.3	28.5	26.3	24.3	23.9	22.9	21.2	19.3	18.0	21.4	28.6																						
23-Jun	17.4	16.1	14.8	14.2	13.8	13.6	14.0	15.9	18.7	21.8	23.5	23.7	23.0	24.4	25.0	25.2	23.5	24.0	23.4	23.8	21.7	20.5	18.6	17.4	19.9	25.2																						
24-Jun	16.9	16.3	16.1	15.3	14.9	15.1	15.9	17.2	17.6	18.7	20.0	21.3	22.8	22.9	22.4	19.3	18.3	18.8	19.4	18.8	17.5	16.2	15.5	15.2	18.0	22.9																						
25-Jun	15.3	15.1	15.0	14.7	14.6	15.0	16.1	15.9	17.1	19.0	20.5	20.2	20.3	20.7	21.9	22.8	23.2	23.4	23.4	23.3	21.6	18.6	15.7	14.6	18.7	23.4																						
26-Jun	13.5	12.5	12.5	12.5	12.5	14.0	16.1	18.7	21.1	23.6	24.5	21.7	24.1	24.0	25.0	23.0	19.4	19.7	20.4	19.6	19.2	18.8	17.7	16.3	18.8	25.0																						
27-Jun	14.7	13.8	13.3	12.5	13.1	14.7	16.1	18.8	20.7	23.0	24.2	25.3	25.1	21.8	23.3	21.1	19.7	22.0	23.8	23.7	22.5	21.1	20.0	19.1	19.7	25.3																						
28-Jun	17.9	16.7	15.4	15.4	15.0	16.1	18.3	22.1	24.3	24.8	26.1	26.9	27.5	28.0	28.5	27.5	26.8	26.8	26.4	25.8	24.1	22.9	22.5	21.9	22.8	28.5																						
29-Jun	20.9	19.4	17.7	14.1	13.7	16.6	18.7	20.4	22.5	23.9	24.5	24.3	25.9	26.6	27.1	27.5	27.6	27.4	27.3	26.4	25.2	23.6	22.1	20.6	22.7	27.6																						
30-Jun	19.3	18.1	17.3	16.5	15.8	16.5	18.4	20.1	21.3	22.8	24.8	26.5	27.3	28.1	28.8	28.8	28.6	27.3	26.8	26.2	25.6	24.6	23.0	21.8	23.1	28.8																						
																								13.8	13.3	12.5	11.7	11.8	12.8	14.3	15.9	17.5	18.8	19.9	20.6	21.3	21.5	21.9	21.7	21.6	21.5	21.3	20.8	19.5	17.8	15.9	15.1	Diurnal Average
																								20.9	19.4	17.7	16.6	16.1	17.1	18.7	22.1	24.3	25.0	26.9	28.0	28.6	28.4	29.0	29.5	29.0	28.3	28.1	27.6	25.8	24.6	23.4	22.1	Diurnal Maximum





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Patricia McInnes - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	39	5.42	5.42
10 - 20	440	61.11	66.53
> 20	241	33.47	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



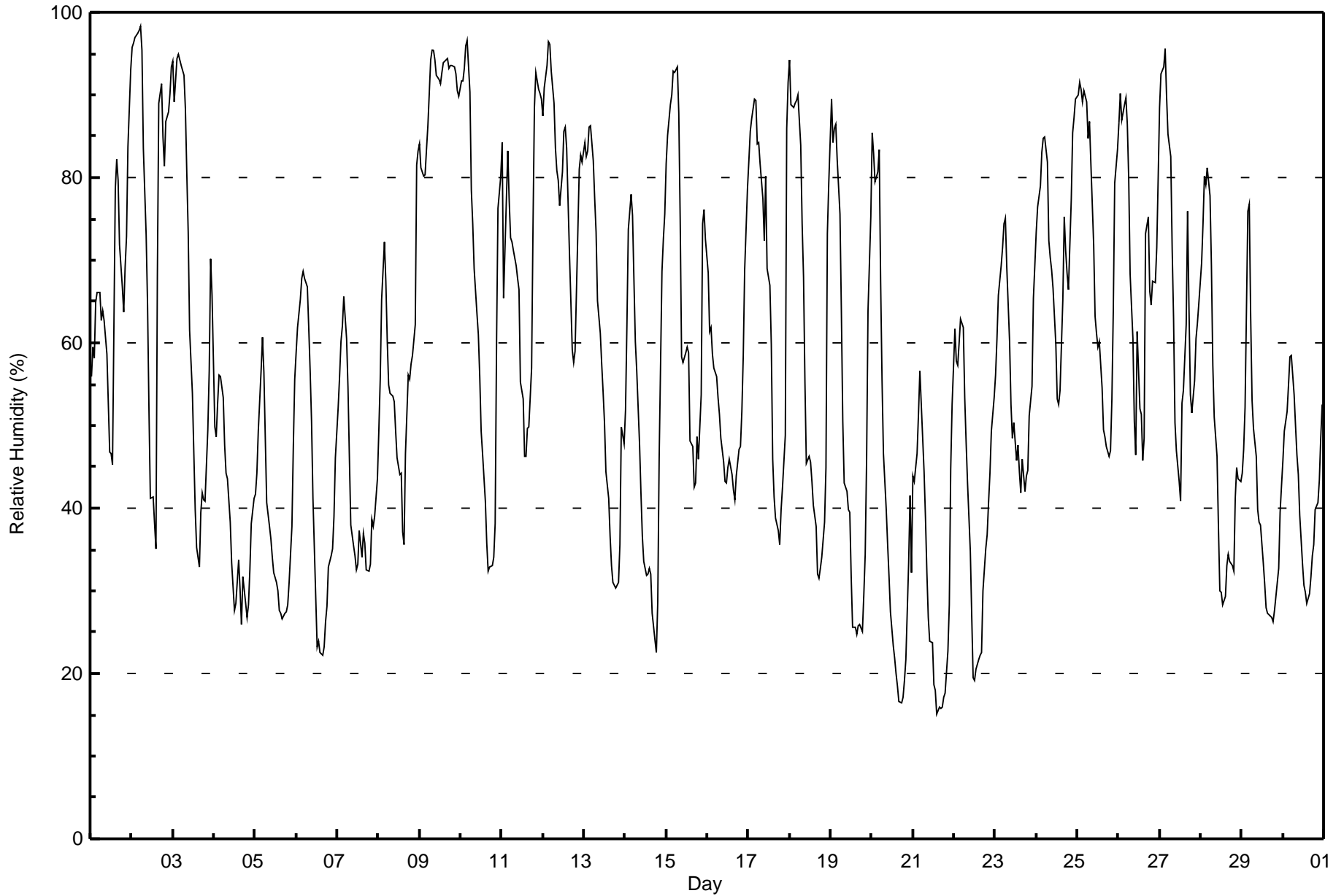
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Patricia McInnes - June 2016

Maximum Value: 98 % on Jun 2 06:00																		Maximum Daily Average: 90.5 % on Jun 9																		Hours in Service: 720													
Minimum Value: 15 % on Jun 21 15:00																		Minimum Daily Average: 32.0 % on Jun 21																		Hours of Data: 720													
Maximum Diurnal Average: 78.3 % at hour 5																		Minimum Diurnal Average: 41.4 % at hour 15																		Hours of Missing Data: 0													
Monthly Average: 57.4 %																		Percentiles: P ₁ = 17 P ₁₀ = 30 Q ₁ = 40 Median = 55 Q ₃ = 76 P ₉₀ = 89 P ₉₉ = 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-Jun	56	60	58	65	66	66	63	64	63	59	53	47	47	45	79	82	80	72	67	64	69	73	84	93	65.5	93																							
2-Jun	96	96	97	97	98	98	95	84	73	65	52	41	41	38	35	68	89	91	85	81	87	88	90	93	78.3	98																							
3-Jun	94	89	94	95	94	94	92	88	81	73	61	54	47	40	35	33	39	42	41	41	49	57	70	66	65.4	95																							
4-Jun	50	49	53	56	56	53	48	44	44	38	33	30	28	28	34	30	26	32	28	27	28	32	38	41	38.6	56																							
5-Jun	42	44	49	57	61	56	49	41	38	36	34	32	31	30	28	27	27	27	27	28	31	38	47	56	39.0	61																							
6-Jun	59	62	65	68	69	68	67	62	57	51	41	29	23	24	23	22	23	26	28	33	34	35	39	46	43.9	69																							
7-Jun	52	56	60	62	66	60	54	46	38	35	34	33	33	37	34	37	36	33	32	33	39	38	39	44	43.0	66																							
8-Jun	49	56	65	72	68	60	55	54	53	53	49	46	44	44	37	36	47	56	56	58	58	62	81	83	55.9	83																							
9-Jun	84	81	80	80	83	86	94	95	95	94	92	92	91	93	94	94	94	93	94	94	93	93	91	90	90.5	95																							
10-Jun	92	92	93	96	97	90	78	74	69	64	61	56	49	47	41	36	32	33	33	34	38	60	76	80	63.4	97																							
11-Jun	84	65	71	83	77	73	72	71	69	68	66	55	53	46	46	50	50	57	74	88	93	91	90	90	70.2	93																							
12-Jun	87	91	94	96	96	93	89	84	81	80	77	81	86	86	84	71	65	59	58	59	74	81	83	82	80.6	96																							
13-Jun	84	82	83	86	86	82	77	73	65	61	57	54	50	44	41	37	33	31	30	31	31	36	50	48	56.5	86																							
14-Jun	52	62	74	78	75	68	60	57	48	42	37	34	32	32	33	32	27	24	23	29	46	69	73	76	49.1	78																							
15-Jun	82	85	89	90	93	93	93	88	75	58	58	59	60	59	48	47	43	43	49	46	54	74	76	73	68.0	93																							
16-Jun	68	61	62	59	57	56	53	51	49	46	43	43	45	46	44	42	41	44	47	47	52	59	69	79	52.6	79																							
17-Jun	82	86	87	90	89	84	84	82	77	72	80	69	67	60	46	41	39	37	36	40	42	49	86	92	67.4	92																							
18-Jun	94	89	88	89	89	90	84	74	68	55	45	46	46	43	40	38	32	32	33	34	38	45	73	79	60.3	94																							
19-Jun	89	84	86	86	82	76	64	51	43	42	40	39	32	26	26	25	26	26	25	29	34	46	64	75	50.7	89																							
20-Jun	85	83	79	81	83	67	56	47	40	36	32	28	23	22	20	19	17	17	17	19	22	33	41	32	41.6	85																							
21-Jun	44	43	47	51	57	52	44	39	32	27	24	24	19	18	15	16	16	16	17	18	23	28	45	53	32.0	57																							
22-Jun	62	58	57	60	63	62	53	48	43	35	27	19	19	20	22	22	23	30	35	37	41	44	49	53	40.9	63																							
23-Jun	56	60	66	69	72	74	75	69	60	53	49	50	46	48	44	42	46	42	44	45	51	55	65	69	56.3	75																							
24-Jun	73	76	79	83	85	85	82	72	70	69	67	60	53	52	54	65	75	71	69	66	77	85	87	89	72.8	89																							
25-Jun	90	91	91	89	90	89	85	87	82	72	63	61	59	60	55	50	49	47	46	47	53	64	79	83	70.1	91																							
26-Jun	87	90	87	89	90	87	80	68	61	50	46	61	52	51	46	49	73	75	66	65	67	67	71	80	69.1	90																							
27-Jun	88	93	93	96	90	85	83	71	63	50	47	43	41	53	54	62	76	64	54	52	55	60	62	65	66.7	96																							
28-Jun	70	74	80	79	81	78	69	57	51	46	38	30	30	28	29	33	34	34	33	32	41	45	44	43	49.2	81																							
29-Jun	44	47	52	76	77	63	53	50	46	40	38	38	33	31	28	27	27	27	26	28	29	33	39	43	41.5	77																							
30-Jun	46	49	52	55	58	59	54	50	46	44	39	33	31	30	28	30	32	34	36	40	41	43	48	53	42.9	59																							
																								71.4	71.9	74.4	77.8	78.3	74.9	70.2	64.7	59.3	53.8	49.5	46.3	43.7	42.7	41.4	42.1	43.8	43.8	43.6	44.8	49.8	56.1	65.1	68.3	Diurnal Average	
																								96	96	97	97	98	98	95	95	95	94	92	92	91	93	94	94	94	94	94	94	93	93	91	93	Diurnal Maximum	





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Patricia McInnes - June 2016

Maximum Speed: 35 km/h on Jun 15 12:00	Maximum Daily Speed Average: 18.0 km/h on Jun 9	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 12 03:00	Minimum Daily Speed Average: 1.4 km/h on Jun 2	Hours of Data: 720
Maximum Diurnal Speed Average: 3.6 km/h at hour 13	Minimum Diurnal Speed Average: 0.7 km/h at hour 20	Hours of Missing Data: 0
Monthly Average Velocity: 1.9 km/h 258.9 deg	Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 6 Median = 10 Q ₃ = 15 P ₉₀ = 20 P ₉₉ = 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-Jun	SSW6	S6	SSW7	SSW5	SSW5	SSE7	SSE8	SSE9	SSE6	SE6	SSE8	SW4	NW6	NNE5	SSW15	W3	ESE8	SE11	SE8	S5	SE4	SE4	S3	NW1	S4.6	SSW15
2-Jun	SW3	S3	SSW4	WSW1	W3	S2	SE2	ENE5	E5	E5	ESE7	ESE8	E5	E7	ENE7	WSW24	WSW8	E8	NE8	N6	SW4	SSW7	E1	SSW4	SE1.4	WSW24
3-Jun	W5	W6	SW4	SW8	SW10	SW11	SW13	SW12	SW12	WSW13	WSW16	WSW17	WSW20	W23	W22	W23	NW13	N10	NE5	N5	NNW10	NW4	SSW4	SW9	WSW8.9	W23
4-Jun	SW12	WSW17	WSW16	WSW18	WSW20	WSW20	W22	W22	W18	NNW21	W19	NNW21	NNW24	NNW21	NNW17	NW14	NNW25	NNW16	NW19	NNW19	NW14	NNW9	NNW8	NNW10	NNW15.7	NNW25
5-Jun	NNW12	NW10	NNW9	W2	SW5	S1	W3	NNW7	NNW14	NNW14	NW14	NNW15	NW15	NW12	NNW12	N11	NNE13	NE12	NNE12	NE9	NE6	E9	ESE13	ESE14	N5.7	NW15
6-Jun	SE12	ESE8	SE7	SE9	SE8	SE9	SE9	SE9	ESE9	ESE11	ESE14	ESE15	S16	S16	SSE18	SSE18	S18	S20	S20	SSE18	SSE16	SSE17	SSW14	SSW12	SSE11.8	S20
7-Jun	SW10	SW11	SW11	SW13	SW11	SW7	SW12	WSW7	NNW6	N9	NE10	NE7	NW14	N16	N19	NNW18	NNW12	NNW15	N16	N12	N7	NNW10	NNW9	NNW8	NW6.2	N19
8-Jun	NW9	NNW1	NNW3	NW5	WSW2	N4	NNW7	NNW8	NNW7	NNW7	N9	N10	NNE8	N10	N9	SSW3	SSE11	E9	ENE10	NE8	NE9	NE8	N9	NNE10	NNE4.9	SSE11
9-Jun	NNE13	NNE13	NNE12	NNE13	N13	NNE15	N19	N20	N17	NNE16	NNE20	NNE19	NNE18	NNE22	NNE26	N27	N28	N25	N23	N18	N18	NNW18	NNW19	NNW16	N18.0	N28
10-Jun	NNW11	NW10	N5	W2	WSW3	NNW4	W4	NNW5	NNW11	N13	N15	N13	N10	N11	NNE11	NE12	NE9	NNE9	NNE10	NNE9	NNE7	NNW4	NW4	NNE1	N6.7	N15
11-Jun	NE2	SE4	S4	SSE2	SE4	SE7	SE8	SE9	ESE11	ESE12	ESE12	SE18	SSE19	SE19	SE17	ESE12	SE11	SE17	ESE14	ESE8	E8	ENE8	ESE7	SE8	SE9.6	SE19
12-Jun	SE6	SW2	N0	NNW1	SSW4	SSW8	SSW9	SW13	SSW11	SSW12	SSW15	SW14	W14	WSW13	WSW12	WSW21	WSW19	W20	W16	WSW15	WSW20	WSW18	SW17	SW16	SW11.4	WSW21
13-Jun	SW15	WSW18	WSW18	WSW12	SW13	SW15	WSW20	WSW23	WSW22	SW22	SW25	WSW24	WSW25	WSW26	WSW20	WSW18	WSW20	WSW20	WSW19	WSW17	WSW10	WSW6	SW3	SW6	WSW17.2	WSW26
14-Jun	SW6	WSW4	SSE2	SSW5	SSE5	SSE4	E4	ESE4	ESE5	SE5	E8	E12	ESE12	E16	ESE20	ESE17	SE17	SSE20	SSE14	S17	SSE21	ESE8	E8	ESE13	SE8.7	SSE21
15-Jun	ESE14	ESE12	ESE13	E18	ESE15	SE12	E10	ESE15	SE21	SSE32	SSE31	S35	S32	S31	S35	S33	S28	S17	SSE11	SSW7	SSW7	SE5	SE7	SSE16.0	SSE35	
16-Jun	S7	S12	SSE10	S14	S18	S18	S19	S24	S22	SSW22	SW20	SW21	SW20	SW20	SSW20	SW23	SW20	SW15	SSW11	SSW11	SW10	WSW12	WSW15	WSW13	SSW14.9	S24
17-Jun	SW12	SW13	SW13	WSW12	WSW7	W8	NNW13	NNW17	NNW22	NW26	NNW25	NW23	NNW20	NNW21	NNW20	NNW20	W19	W18	WSW20	WSW15	SW13	WSW15	NW15	NNW11	W14.6	NW26
18-Jun	NW6	NNW9	NNW9	W12	W9	W10	W11	W13	NNW13	W13	W11	NNW10	NNW9	NW8	ENE3	ENE8	W1	WSW11	NNW8	WSW8	SW5	SW7	N18	NNW5	NNW7.3	N18
19-Jun	NNW5	NW8	NNW8	NNW7	NNW5	SW2	W3	NNW10	NW18	NW22	NNW23	NNW18	NNW20	NNW28	NNW27	NNW24	N20	N21	N21	N13	N8	NW5	NNW5	NNW4	NNW12.5	NNW28
20-Jun	NNW6	W4	SW5	SSW1	WSW3	SSE1	SSE2	ESE3	E3	ENE5	E9	E7	ENE8	NE8	ENE7	NE8	ENE5	ENE6	E7	SE8	SE6	SSE5	S4	S6	ESE2.8	E9
21-Jun	SSW5	S7	SSW7	SSW7	S5	S6	S8	S10	S13	SSW15	SSW15	SW11	S8	S2	E3	NW4	NE6	ESE3	W4	SE9	S11	S4	W3	SSW1	S5.5	SSW15
22-Jun	SW4	SSW4	S5	S4	S4	S8	SSW8	S6	SE7	SSE7	SE5	S7	SSW8	SW9	S11	S11	SW15	SW24	SW19	SW9	NNW5	WSW6	SW6	SW9	SSW7.1	SW24
23-Jun	WSW7	SW5	SSW7	SW7	SW8	SW7	S5	SW5	SSE2	ESE5	NNE2	W5	NNE13	NNE10	NNW6	NW12	NNW15	NNW16	N10	NE7	ESE8	E5	NNW2	NNW9	NNW2.2	NNW16
24-Jun	NNW12	ENE3	N5	N7	NNW6	NNW11	NNW9	NNW10	NW10	NW10	NNW14	NNW15	NNW13	NNE16	NNE15	NNW16	NNW10	NNW12	N9	NE6	NW14	NW12	NNW9	NNW9	NNW9.7	NNE16
25-Jun	NNW11	NNW8	NNW6	NNW9	NNW11	NNW13	NNW14	N13	NNW13	NNW16	N16	N18	N16	N15	N16	N18	N16	NNE15	N14	NNE10	ESE7	W1	NNW5	W3	N10.6	N18
26-Jun	WSW3	SW2	SSE3	ESE4	SSE1	S4	S6	SE6	SE7	SSE9	SSW3	SW6	E1	SSE9	SSW2	NNW12	NNW7	SSW7	SSW10	SSW8	SW7	NNW20	WSW3	S3	SSW3.3	NNW20
27-Jun	WSW5	W7	W2	SSW5	SW11	SW12	WSW10	WSW10	WSW11	NNW10	W11	W13	NNW11	NW15	NNW7	N8	SSE8	S6	S8	SSW8	SW9	SW9	SW9	SSW5	WSW6.5	NW15
28-Jun	S6	S6	SSE5	SSW8	SSW2	S5	S4	SSE1	ENE5	NE9	N9	NW14	NNW14	NNW14	N16	NNE20	NNE20	NNE20	NNE17	N14	N12	NNE8	NE10	ENE8	N6.1	NNE20
29-Jun	E10	E7	ENE5	NNE3	NNW3	NE3	E6	ESE5	E6	ESE7	NNW1	E4	ENE6	NNE8	E6	NE8	ESE10	ESE7	ESE8	ESE12	SE11	SE12	SE14	SE11	E5.9	SE14
30-Jun	ESE9	ESE9	SE8	SE7	SE8	SE9	ESE7	E6	E6	ESE4	ESE8	SE11	SE16	ESE16	ESE14	ESE17	ESE16	ESE13	SE12	SSW8	S6	S8	SSW6	SSW5	SE8.4	ESE17

WSW2.2	SW2.6	SW2.6	SW3.0	SW3.5	SSW3.4	SW2.9	WSW2.8	W1.8	W2.1	W2.1	W2.6	NNW3.6	NW3.5	NNW1.9	NW3.9	NNW1.8	NNW1.1	NNW1.1	WSW0.7	SW1.7	WSW2.4	NNW2.0	WSW1.6		Diurnal Average
SW15	WSW18	WSW18	WSW18	WSW20	WSW20	W22	S24	WSW22	SSE32	SSE31	SSE35	S32	S31	S35	S33	S28	N25	N23	NNW19	SSE21	NNW20	NNW19	SW16		Diurnal Maximum

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

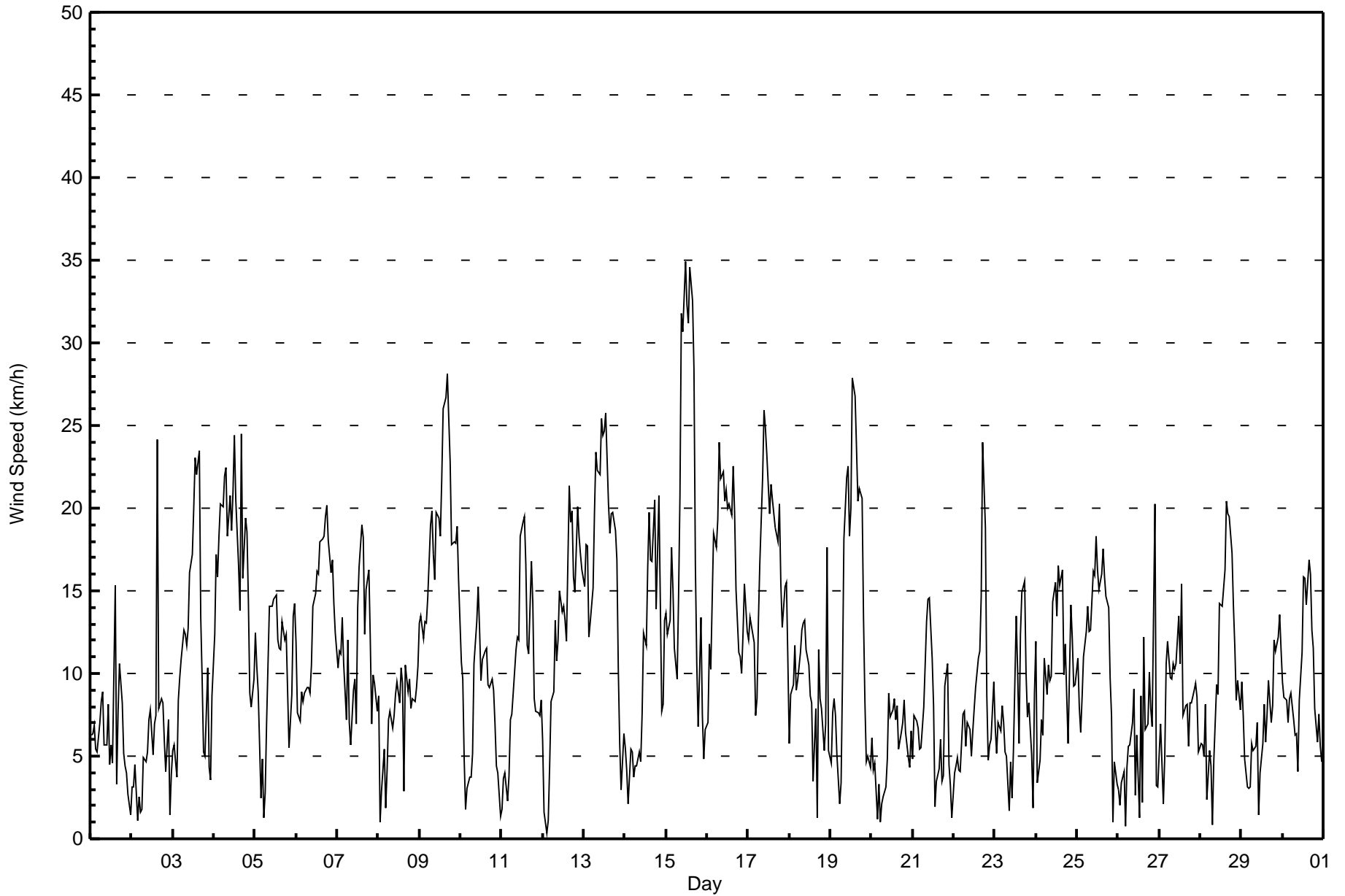
Wind Speed (WS) - km/h
Patricia McInnes - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 12 km/h on Jun 2 16:00 Minimum Value: 1 km/h on Jun 27 02:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 9																	Hours in Service: 720 Hours of Data: 720 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-Jun	1	1	1	1	1	2	2	2	2	1	2	3	3	3	5	3	3	2	2	3	2	1	1	2	5
2-Jun	2	2	2	1	2	2	2	1	2	2	2	3	3	4	3	12	5	2	2	2	1	3	2	1	12
3-Jun	2	3	3	2	1	2	2	3	2	3	5	6	5	5	5	6	5	3	3	3	6	2	1	2	6
4-Jun	2	3	3	3	3	3	5	6	4	5	5	6	6	6	6	8	6	6	5	6	3	2	1	2	8
5-Jun	2	2	1	3	1	2	2	4	5	5	4	5	5	6	5	5	4	4	3	2	1	2	3	3	6
6-Jun	3	2	2	2	2	2	2	2	2	2	3	5	5	5	6	5	5	5	5	5	4	5	4	3	6
7-Jun	1	2	1	2	3	3	2	2	3	3	4	3	11	5	5	5	4	4	4	4	2	1	1	1	11
8-Jun	1	2	1	2	1	3	1	2	1	1	2	2	2	2	4	4	2	2	2	2	3	2	2	4	4
9-Jun	3	3	2	3	2	3	4	4	3	3	5	5	5	5	5	5	5	5	5	3	3	3	4	4	5
10-Jun	2	1	2	1	1	1	1	2	3	4	3	4	4	4	4	4	3	3	2	2	1	1	1	1	4
11-Jun	2	2	2	1	2	2	2	3	3	3	3	6	5	6	5	3	3	5	5	4	2	2	2	2	6
12-Jun	2	1	1	1	1	2	2	3	3	3	4	4	4	3	3	5	4	6	4	5	4	3	4	3	6
13-Jun	3	3	3	2	3	3	4	5	5	5	5	6	6	6	6	5	5	5	4	4	4	1	2	1	6
14-Jun	1	2	2	2	2	2	2	1	2	2	3	4	5	6	5	4	5	6	4	9	6	3	2	4	9
15-Jun	4	3	4	4	4	7	3	4	7	8	8	9	8	8	10	9	8	6	3	2	9	2	1	1	10
16-Jun	2	3	2	4	4	4	5	6	6	6	6	5	5	4	5	5	5	4	4	3	2	4	3	2	6
17-Jun	3	2	2	3	1	3	3	4	5	6	6	5	5	6	6	6	5	5	4	4	2	5	5	3	6
18-Jun	3	1	2	2	2	2	2	3	3	3	4	4	3	4	3	3	3	5	3	2	2	2	7	3	7
19-Jun	1	2	1	2	3	1	1	6	4	5	6	5	6	7	6	6	5	5	5	3	2	1	1	1	7
20-Jun	1	1	1	2	1	1	1	1	2	2	3	3	3	3	3	3	3	2	2	2	1	1	1	1	3
21-Jun	1	1	1	1	1	1	2	2	3	4	4	4	4	3	4	3	3	3	2	3	3	3	1	1	4
22-Jun	1	1	2	2	1	2	2	2	2	2	3	4	5	5	3	4	4	5	4	3	2	1	1	1	5
23-Jun	2	2	2	2	3	3	2	1	2	2	2	4	4	3	3	4	3	3	2	2	4	1	2	2	4
24-Jun	3	1	2	2	2	2	2	2	2	3	3	4	4	4	4	3	2	2	3	2	3	3	2	2	4
25-Jun	2	2	1	2	2	3	3	3	2	3	3	4	4	4	4	4	4	4	3	3	2	2	1	2	4
26-Jun	1	1	1	1	1	2	1	2	1	3	4	6	2	2	4	4	4	3	3	2	4	8	6	2	8
27-Jun	2	1	2	2	2	2	2	3	3	3	4	4	4	8	2	6	2	2	2	2	1	1	1	2	8
28-Jun	1	2	1	2	2	1	1	1	3	4	3	6	5	5	5	5	4	4	4	3	3	2	2	2	6
29-Jun	3	3	1	1	1	1	2	2	2	3	3	3	4	4	3	4	4	3	4	2	3	3	3	2	4
30-Jun	2	2	2	2	2	2	2	2	3	2	3	5	5	4	4	4	3	3	3	2	2	2	1	1	5
																	Diurnal Maximum								



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Patricia McInnes - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Patricia McInnes - June 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	153	21.25	21.25
6 - 11	277	38.47	59.72
12 - 19	207	28.75	88.47
20 - 28	76	10.56	99.03
29 - 38	7	0.97	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Patricia McInnes - June 2016**

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	5	4	3	7	10	8	8	12	17	20	13	8	16	13	6	3	153
6 - 11	18	11	17	9	18	20	29	12	21	22	26	13	8	18	10	25	277
12 - 19	26	15	2	0	3	24	9	7	11	7	21	24	10	8	15	25	207
20 - 28	8	6	0	0	0	1	1	2	5	2	9	16	6	12	3	5	76
29 - 38	0	0	0	0	0	0	0	3	4	0	0	0	0	0	0	0	7
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	57	36	22	16	31	53	47	36	58	51	69	61	40	51	34	58	720

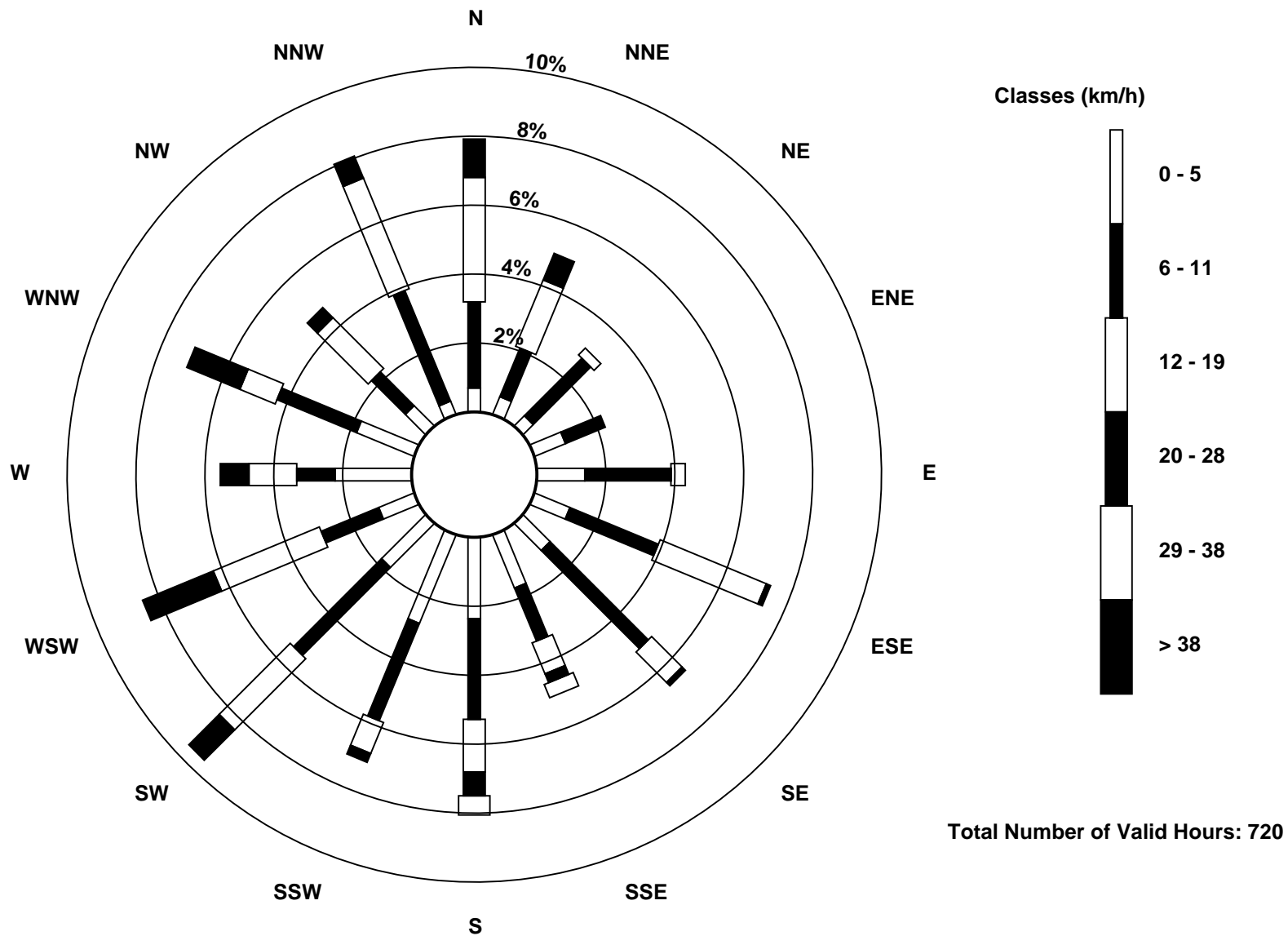
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed (WS) - km/h
Patricia McInnes (AMS 6)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Patricia McInnes - June 2016

Direction of Maximum Speed: 169 deg on Jun 15 12:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 9.5 deg on Jun 9	Hours of Data: 720
Direction of Minimum Speed: 1 deg on Jun 12 03:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 1.4 deg on Jun 2	Percent Operational Time: 100.0
Monthly Average Direction: 262.1 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-Jun	193	188	198	200	194	150	158	164	161	143	164	234	321	29	193	260	119	135	146	187	128	125	177	309	168.8
2-Jun	234	171	213	243	276	170	140	78	84	100	108	108	96	96	65	247	241	91	38	5	227	195	98	212	144.2
3-Jun	271	278	225	226	231	226	223	225	233	237	241	241	244	259	261	259	325	11	38	351	342	317	210	228	254.5
4-Jun	234	246	246	243	249	252	266	276	273	285	280	285	287	289	336	307	298	328	313	303	318	291	288	301	282.2
5-Jun	288	307	303	266	217	174	279	345	342	335	318	334	316	315	327	358	22	47	32	45	50	89	115	123	349.1
6-Jun	124	119	124	127	134	132	131	131	117	108	104	115	178	172	160	159	177	185	171	158	158	164	204	211	154.0
7-Jun	216	221	232	232	230	216	229	252	346	10	50	54	315	4	355	328	341	329	353	358	353	333	336	339	320.8
8-Jun	325	298	286	321	255	356	344	344	347	344	5	6	18	3	353	195	165	86	73	56	50	49	5	33	13.8
9-Jun	27	29	22	21	9	16	10	4	8	21	28	31	30	23	12	9	3	4	3	1	351	340	340	340	9.5
10-Jun	335	321	353	266	253	289	280	285	345	360	354	9	8	7	31	52	40	30	31	15	18	343	325	16	1.5
11-Jun	55	127	172	166	138	134	133	131	114	119	120	138	151	129	132	115	130	128	118	117	84	76	114	128	125.7
12-Jun	144	226	1	284	193	210	213	216	208	204	205	223	264	243	237	244	250	267	262	254	242	241	235	230	235.4
13-Jun	228	241	248	238	228	231	243	243	240	230	232	240	254	252	252	251	243	238	238	241	250	255	219	216	241.1
14-Jun	218	238	158	195	165	168	93	114	102	138	87	101	104	100	106	108	130	151	156	172	160	122	94	109	130.3
15-Jun	114	110	102	101	103	138	99	110	128	165	162	169	173	177	180	177	181	186	160	201	217	213	126	131	158.1
16-Jun	170	172	151	172	174	172	172	178	188	205	215	221	227	227	212	220	217	218	211	211	221	248	249	248	204.9
17-Jun	236	232	236	240	240	274	288	282	301	305	301	309	303	298	302	293	278	267	253	244	236	237	318	334	280.5
18-Jun	319	296	282	277	266	261	271	275	282	269	272	286	289	321	77	60	260	257	287	243	226	230	350	292	282.5
19-Jun	299	318	295	296	290	216	280	284	312	321	327	343	329	337	340	345	355	351	351	9	0	318	290	288	331.7
20-Jun	287	280	219	213	239	166	149	122	94	73	99	91	73	47	59	50	70	70	93	124	146	164	186	190	101.4
21-Jun	197	185	192	201	185	182	173	178	186	202	201	220	176	191	100	326	40	117	266	139	178	188	275	193	187.7
22-Jun	221	197	186	188	173	179	201	178	144	152	125	180	210	233	185	175	215	222	227	236	290	252	230	231	205.8
23-Jun	257	214	207	234	233	216	188	214	158	104	25	261	22	24	340	312	345	348	6	52	122	98	335	332	330.9
24-Jun	337	75	359	350	340	340	342	346	318	326	331	331	339	15	20	337	298	301	9	34	321	316	323	333	339.0
25-Jun	332	343	346	334	339	334	343	352	340	344	0	9	4	349	10	9	10	12	11	28	119	264	283	270	355.7
26-Jun	249	224	157	104	159	173	174	141	135	155	200	234	93	162	205	298	296	211	197	196	235	289	257	191	212.0
27-Jun	237	271	270	203	223	230	239	250	251	289	275	269	291	305	287	352	152	178	170	210	225	232	236	213	248.7
28-Jun	174	189	167	203	202	180	172	155	71	39	354	320	328	300	359	20	19	21	13	5	7	21	36	66	8.2
29-Jun	86	89	69	15	331	36	89	108	98	108	298	80	64	33	83	50	116	121	118	116	125	124	131	130	99.5
30-Jun	122	119	131	132	127	125	104	84	85	123	117	134	131	116	109	104	107	122	132	196	185	182	206	200	126.3

243.7 231.7 223.7 223.7 219.1 211.1 226.1 236.8 263.9 265.7 276.7 272.5 287.9 311.2 336.5 308.7 298.1 296.6 339.5 240.6 226.8 250.1 283.0 239.7

Diurnal Average

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

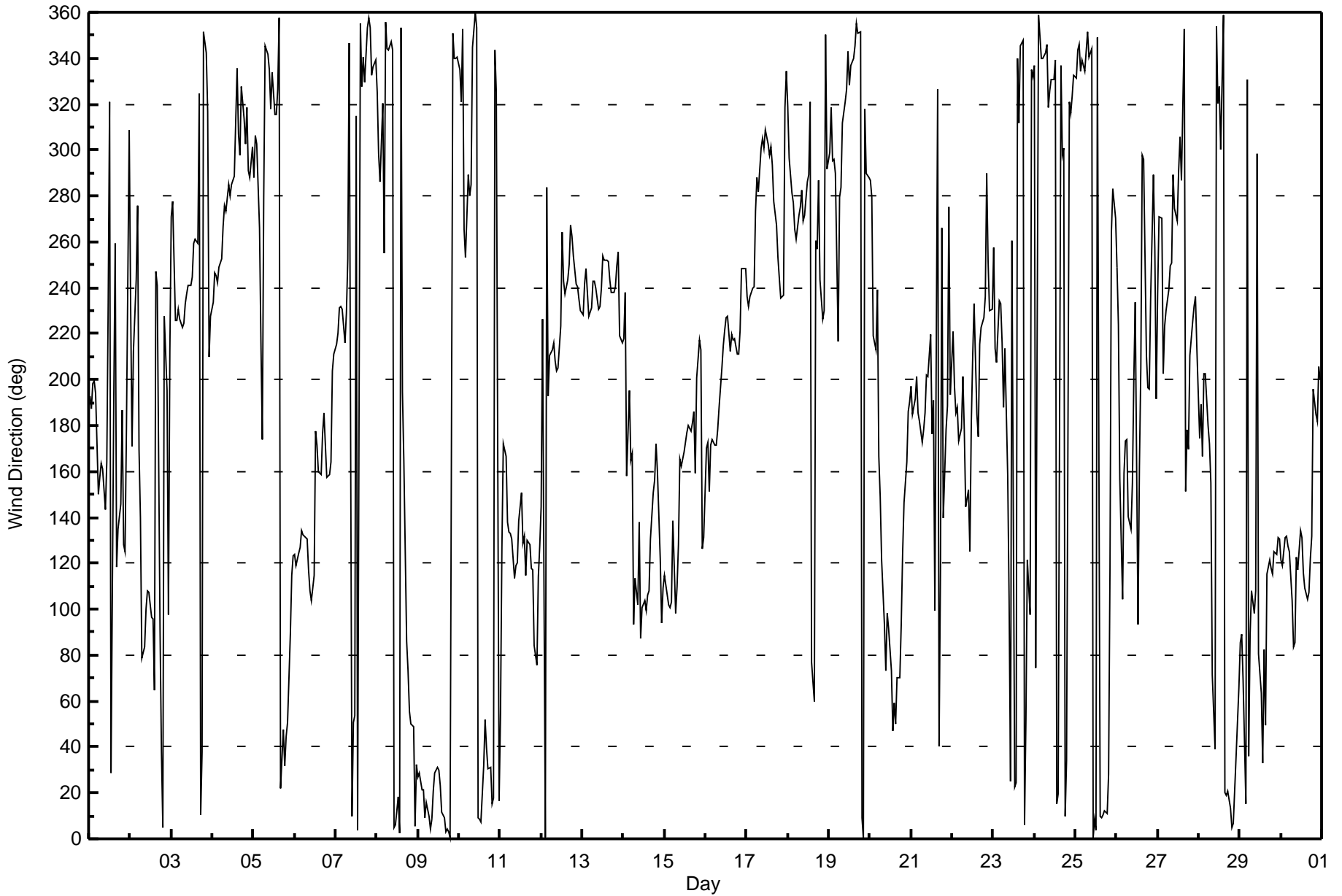
Wind Direction (WD) - deg
Patricia McInnes - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 102 deg on Jun 18 17:00		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																							
Minimum Value: 7 deg on Jun 5 03:00																									
Percentiles: P ₁ = 8 P ₁₀ = 11 Q ₁ = 14 Median = 19 Q ₃ = 30 P ₉₀ = 52 P ₉₉ = 90																									
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-Jun	11	17	13	11	16	12	14	14	35	24	32	60	47	64	21	80	24	19	24	28	51	24	38	86	86
2-Jun	23	49	16	58	34	73	81	25	35	42	33	43	71	52	44	53	52	29	18	23	50	29	74	54	81
3-Jun	24	39	55	9	11	10	11	13	17	18	18	25	19	17	18	21	45	31	60	62	26	43	18	8	62
4-Jun	9	10	10	10	9	10	14	14	15	19	22	24	17	17	26	40	17	26	13	13	12	13	29	18	40
5-Jun	8	11	7	75	16	80	76	45	28	23	25	30	30	32	51	40	32	27	20	16	16	13	15	13	80
6-Jun	13	15	12	11	12	13	14	17	16	17	17	32	23	28	27	19	15	16	16	17	15	14	18	13	32
7-Jun	8	9	7	9	11	18	14	52	50	29	38	44	56	19	24	17	26	18	20	15	12	7	7	13	56
8-Jun	8	92	44	22	45	49	12	12	13	13	15	17	19	15	18	88	30	17	13	16	15	35	21	19	92
9-Jun	13	11	11	12	14	15	15	14	14	14	13	12	13	12	14	15	18	16	16	16	15	12	10	10	18
10-Jun	12	8	34	42	26	19	30	34	26	20	19	28	44	28	32	36	30	30	24	15	9	11	14	65	65
11-Jun	60	48	19	31	26	17	15	15	14	15	15	21	15	16	20	16	24	15	14	15	18	18	19	13	60
12-Jun	16	54	85	81	19	17	17	20	18	18	17	19	16	14	23	15	16	15	15	13	12	11	11	11	85
13-Jun	11	11	11	12	11	14	14	13	15	18	15	17	19	20	20	21	17	21	17	15	17	10	22	10	22
14-Jun	10	42	63	17	24	63	60	34	31	62	35	27	30	18	14	16	25	16	15	16	15	27	13	14	63
15-Jun	15	17	16	15	15	39	22	17	19	15	15	16	15	16	15	16	16	16	24	35	36	19	25	18	39
16-Jun	18	13	18	14	13	15	17	15	18	18	22	18	20	18	19	16	18	23	20	16	15	12	10	10	23
17-Jun	11	12	11	11	10	21	13	13	14	12	12	13	16	16	18	21	17	19	14	13	12	25	13	16	25
18-Jun	47	12	10	11	17	12	14	14	14	19	33	34	30	34	90	39	102	30	19	14	21	18	28	41	102
19-Jun	17	13	8	8	45	49	48	36	16	20	19	21	22	16	17	19	23	18	18	18	15	26	10	12	49
20-Jun	10	15	14	82	24	41	43	54	62	60	26	50	44	38	48	30	56	41	28	12	10	8	18	11	82
21-Jun	18	11	10	10	14	17	15	15	15	20	23	30	51	99	83	62	61	81	52	21	12	24	46	83	99
22-Jun	13	22	29	33	16	13	22	34	24	29	61	66	58	53	29	29	22	14	12	15	27	29	14	9	66
23-Jun	36	35	19	33	19	27	21	21	92	46	96	56	21	26	53	32	14	16	18	35	16	26	86	19	96
24-Jun	15	43	40	28	20	10	15	14	15	19	17	19	23	30	23	19	17	14	48	35	11	11	11	13	48
25-Jun	10	12	12	11	11	12	15	19	18	19	21	16	19	19	18	18	24	21	17	46	14	85	9	37	85
26-Jun	32	31	36	26	71	28	30	21	23	30	85	60	85	24	78	28	58	37	20	24	24	22	101	67	101
27-Jun	31	14	66	32	9	10	16	19	21	30	27	25	27	29	36	60	33	39	23	13	13	8	9	47	66
28-Jun	36	19	17	16	56	17	41	95	57	38	44	30	26	23	26	17	16	15	15	15	14	14	14	19	95
29-Jun	14	14	14	36	34	48	20	28	33	37	97	83	70	46	62	55	43	37	43	12	13	11	13	11	97
30-Jun	12	11	12	15	10	12	21	25	24	53	48	36	21	22	24	19	17	14	25	17	17	26	18	17	53
	60	92	85	82	71	80	81	95	92	62	97	83	85	99	90	88	102	81	60	62	51	85	101	86	
	Diurnal Maximum																								



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Patricia McInnes - June 2016





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	June 2, 2016	Last Calibration	May 12, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	8:40	End Time (MST)	16:45
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	Teledyne API T700	Serial Number	2449
ZAG Make/Model	Teledyne 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	761	765
Calculated slope	0.999878	0.999589	Chamber temp	45.2	45.1
Calculated intercept	0.729317	1.198572	Pressure	706.4	690.4
Analyzer Background	5.9	6.0	Flow	0.449	0.441
Analyzer Coefficient	1.122	1.122	Intensity	92	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	0.1	----
as found span	6000	94.7	786.0	786.5	0.999
calibrator zero	6000	0.0	0.0	0.2	----
high point	6000	94.7	786.0	785.9	1.000
second point	6000	47.5	394.3	392.4	1.005
third point	6000	23.8	197.5	195.0	1.013
as left zero	5000	0.0	0.0	0.3	----
as left span	5500	86.8	785.9	783.7	1.003
Average Correction Factor					1.006

Corrected As found 786.4 Previous response 785.4 % change -0.1%

Notes:

Changed inlet filter after as founds. No change in response with new inlet filter. No adjustments.

Calibration Performed By: Evan Magill



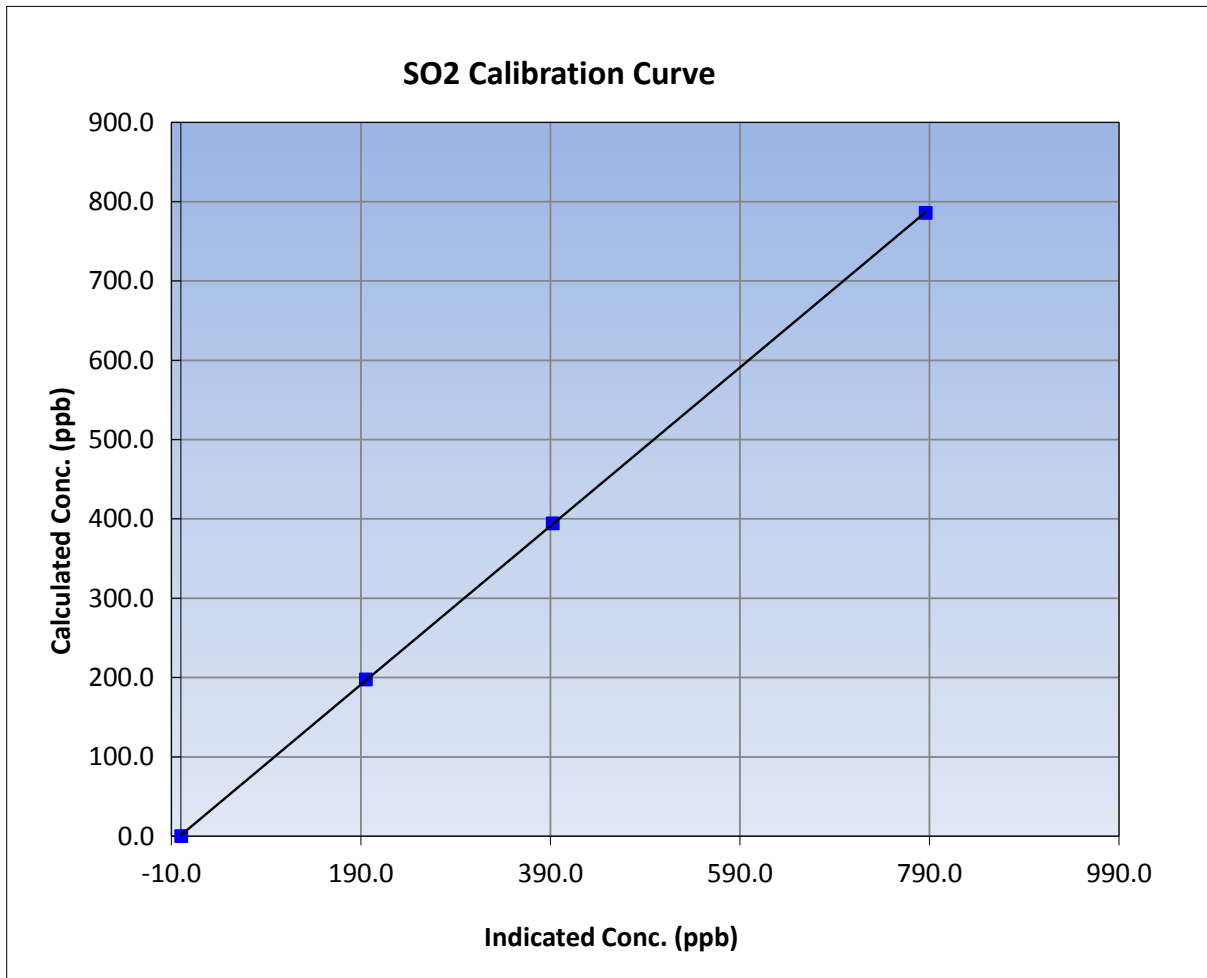
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 2, 2016	Previous Calibration	May 12, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:40	End Time (MST)	16:45
Analyzer make	Thermo 43i	Analyzer serial #	1008841397

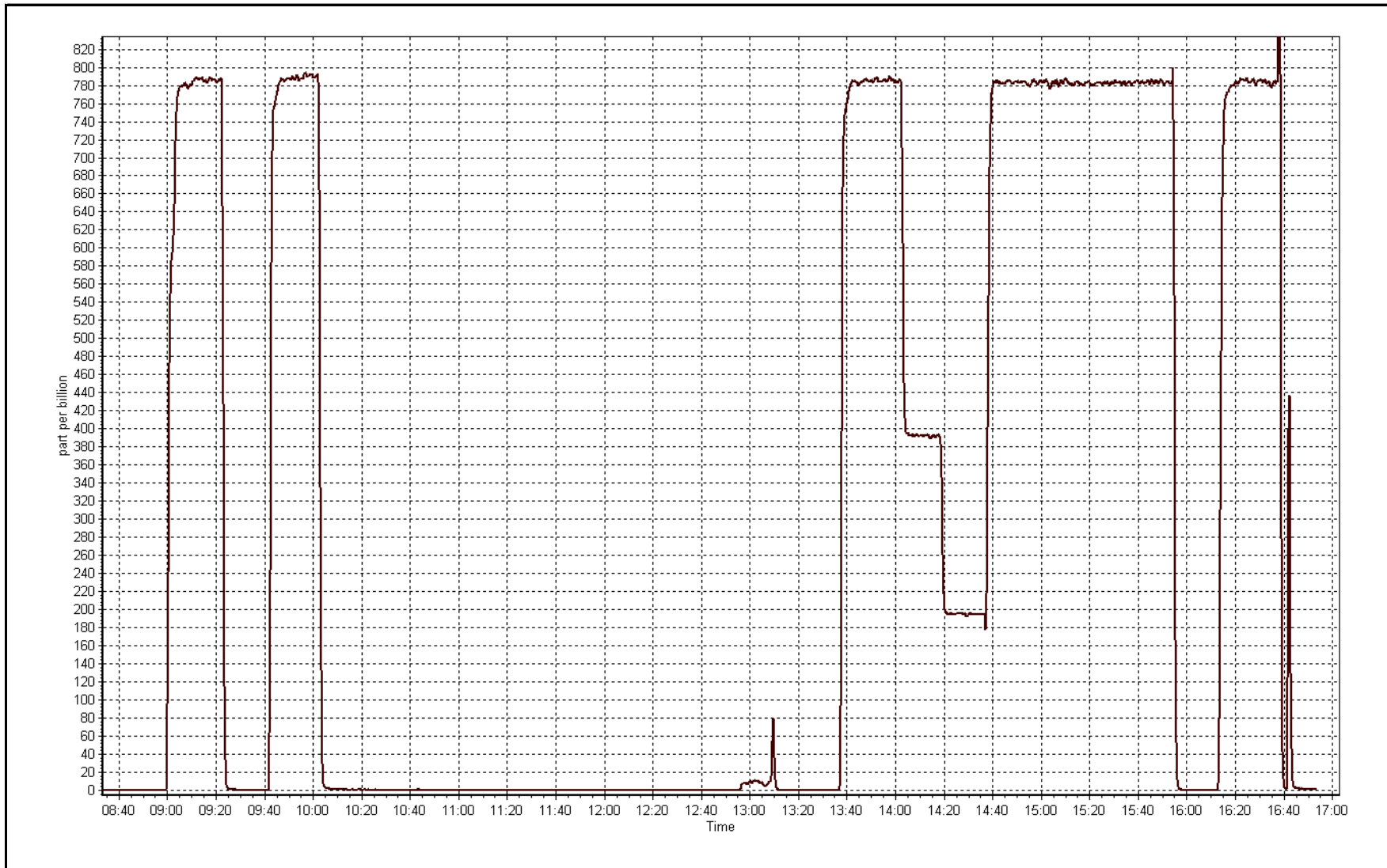
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999985
786.0	785.9	1.0002		
394.3	392.4	1.0046	Slope	0.999589
197.5	195.0	1.0129		
			Intercept	1.198572



SO2 Calibration Plot

Date: June 2, 2016





Wood Buffalo Environmental Association

TRS Calibration Report

Station Information

Calibration Date	June 5, 2016	Last Calibration	May 12, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	9:45	End Time (MST)	13:35
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	Teledyne API T700	Serial Number	2449
Dil air Make/Model	Teledyne 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	192.168.1.42		Lamp voltage	999	991
Calculated slope	1.007050	0.988131	Chamber temp	45	45
Calculated intercept	-0.352624	-0.205843	Pressure	698.8	689.4
Analyzer Background	2.09	2.16	Flow	0.442	0.435
Analyzer Coefficient	1.158	1.199	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	5500	0.0	0.0	0.1	----
as found span	5500	73.1	70.2	67.3	1.043
SO2 scrubber check	5500	21.7	196.5	0.3	----
calibrator zero	5500	0.0	0.0	0.1	----
high point	5500	73.1	70.2	71.1	0.987
second point	5500	41.8	40.1	41.0	0.979
third point	5500	20.8	20.0	20.5	0.976
as left zero	5500	0.0	0.0	0.1	----
as left span	5500	73.1	70.2	71.5	0.981
Average Correction Factor					0.981

Corrected As found	67.2	Previous response	70.0	% change	4.2%
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Notes:

Inlet filter changed after as founds. Additional zero/span done after inlet filter change to measure loading on the filter. Moderate loading noticed on the inlet filter. Adjusted span. Scrubber check done after 3rd point. Disregard the zero after the 3rd point, scrubber check needed to be done first.

Calibration Performed By:

Evan Magill



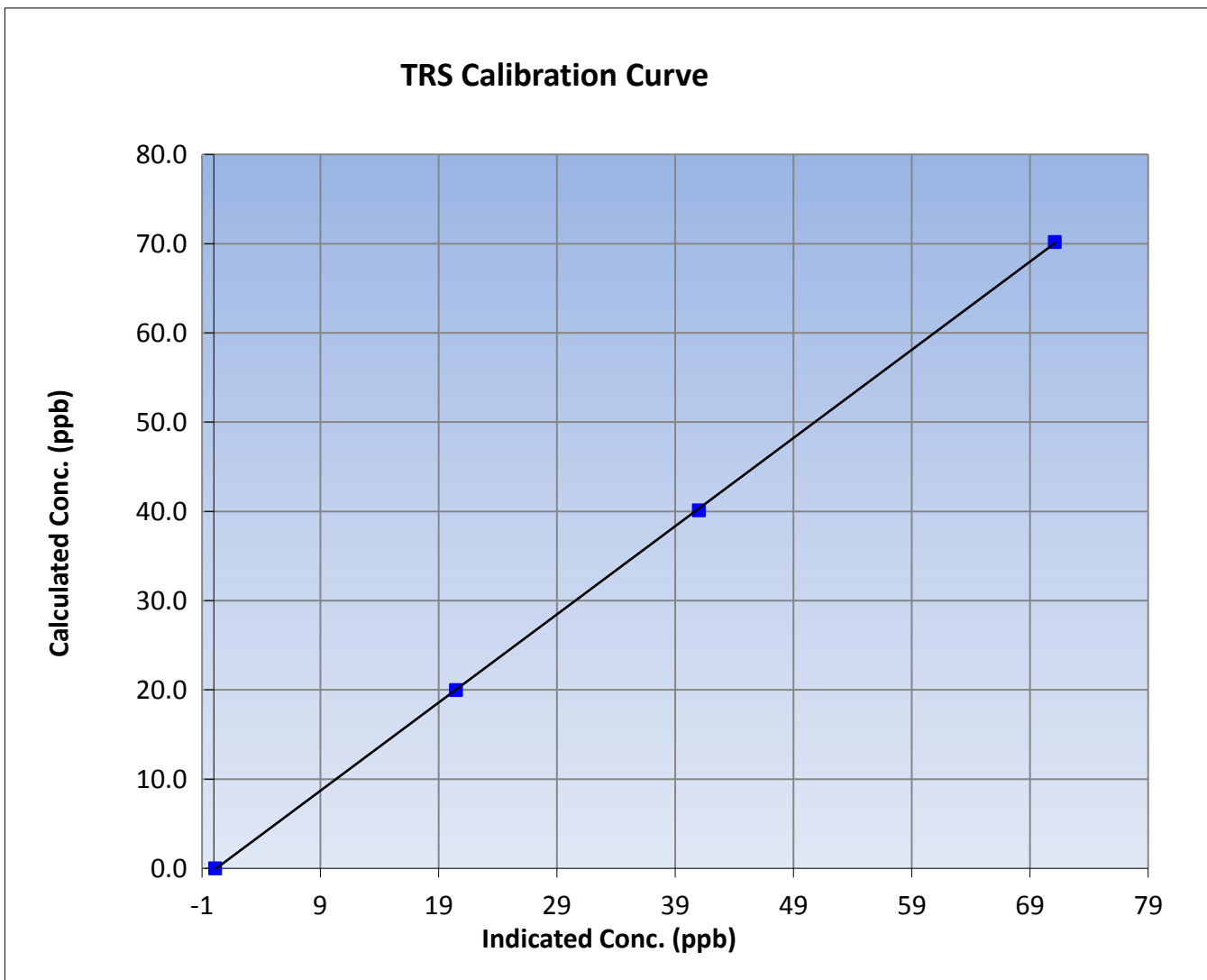
Wood Buffalo Environmental Association TRS Calibration Report

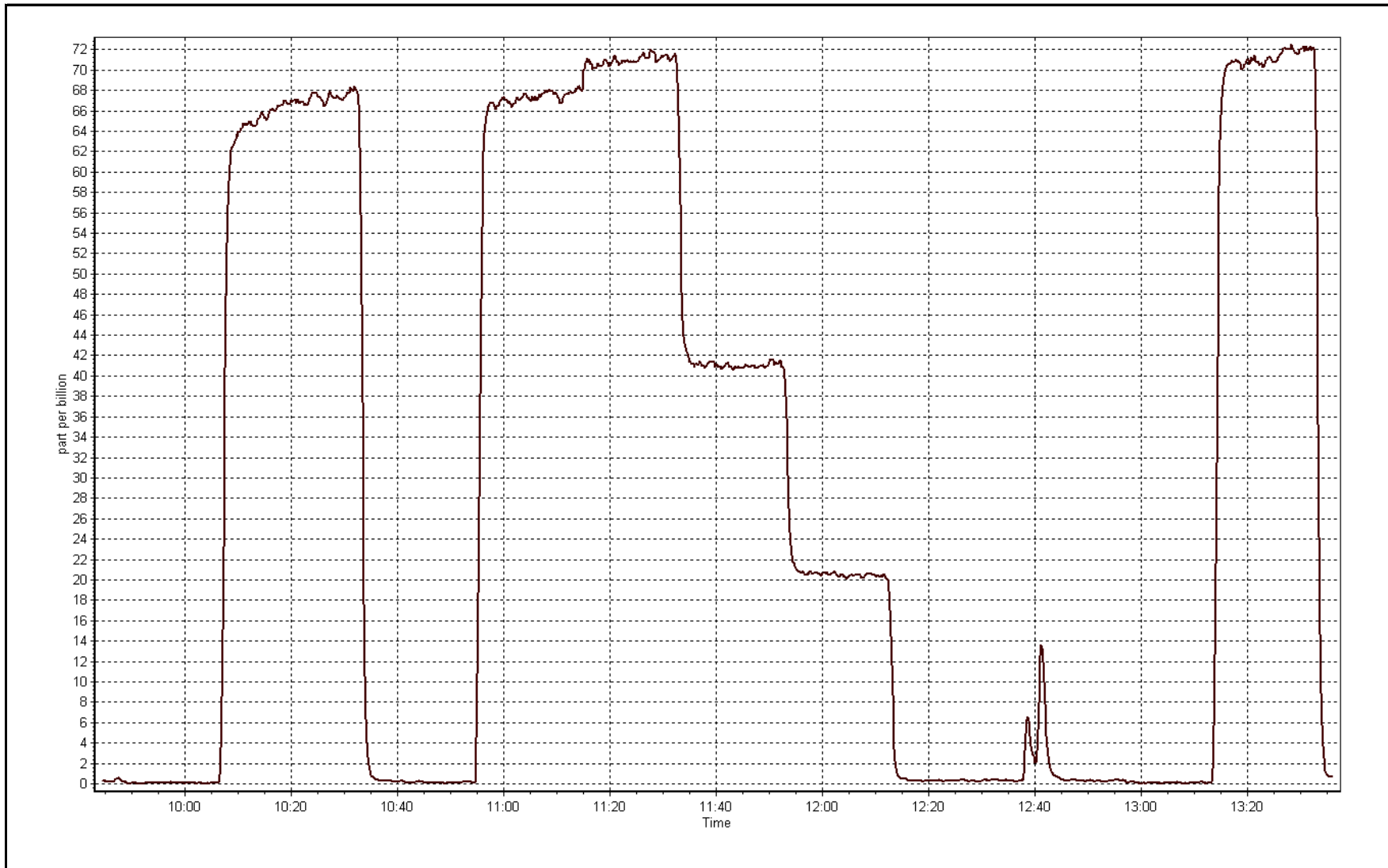
Station Information

Calibration Date	June 5, 2016	Previous Calibration	May 12, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	9:45	End Time (MST)	13:35
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	0.999978
70.2	71.1	0.9869		
40.1	41.0	0.9787	Slope	0.988131
20.0	20.5	0.9760		
			Intercept	-0.205843







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	June-02-16	Last Calibration	May-12-16
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	8:40	End Time (MST)	16:45
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	Teledyne API T700	Serial Number	2449
ZAG make/model	Teledyne API 701	Serial Number	60
DACS make/model	Campbell Scientific CR3000	Serial Number	9036

Analyzer Information

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
THC Range (ppm)	0 - 50 ppm		Column Temp	75.3	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	0.997112	0.998602	Carrier Pressure	34.5	34.5
THC Calc intercept	0.038283	0.032298	Fuel Pressure	42.3	42.3
NMHC Calc slope	0.994064	0.999952	Air Pressure	32.4	32.4
NMHC Calc intercept	0.009328	0.009347			

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	2.50	6.743
calibrator zero	6000	0.0	0.00	0.00	----
high point	6000	94.7	16.86	16.87	0.999
second point	6000	47.5	8.46	8.40	1.007
third point	6000	23.8	4.24	4.19	1.011
as left zero	5000	0.0	0.00	0.00	----
as left span	5500	86.8	16.85	16.89	0.998
Average Correction Factor					1.006

Corrected As found 2.50 Previous response 16.87 % change 574.7%

Notes:

Analyzer has been down since yesterday. Conducted As founds but analyzer barely responded. Replaced pump after the As founds and analyzer back to normal. Adjusted span.

Calibration Performed By: Evan Magill



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	1.17	7.420
calibrator zero	6000	0.0	0.00	0.00	----
high point	6000	94.7	8.68	8.68	1.000
second point	6000	47.5	4.35	4.33	1.006
third point	6000	23.8	2.18	2.17	1.005
as left zero	5000	0.0	0.00	0.00	----
as left span	5500	86.8	8.68	8.69	0.999
Average Correction Factor					1.004

Corrected As found 1.17 Previous response 8.72 % change 645.6%

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	1.33	6.147
calibrator zero	6000	0.0	0.00	0.00	----
high point	6000	94.7	8.18	8.19	0.998
second point	6000	47.5	4.10	4.07	1.008
third point	6000	23.8	2.05	2.02	1.017
as left zero	5000	0.0	0.00	0.00	----
as left span	5500	86.8	8.17	8.19	0.998
Average Correction Factor					1.008

Corrected As found 1.33 Previous response 8.14 % change 512.3%



Wood Buffalo Environmental Association

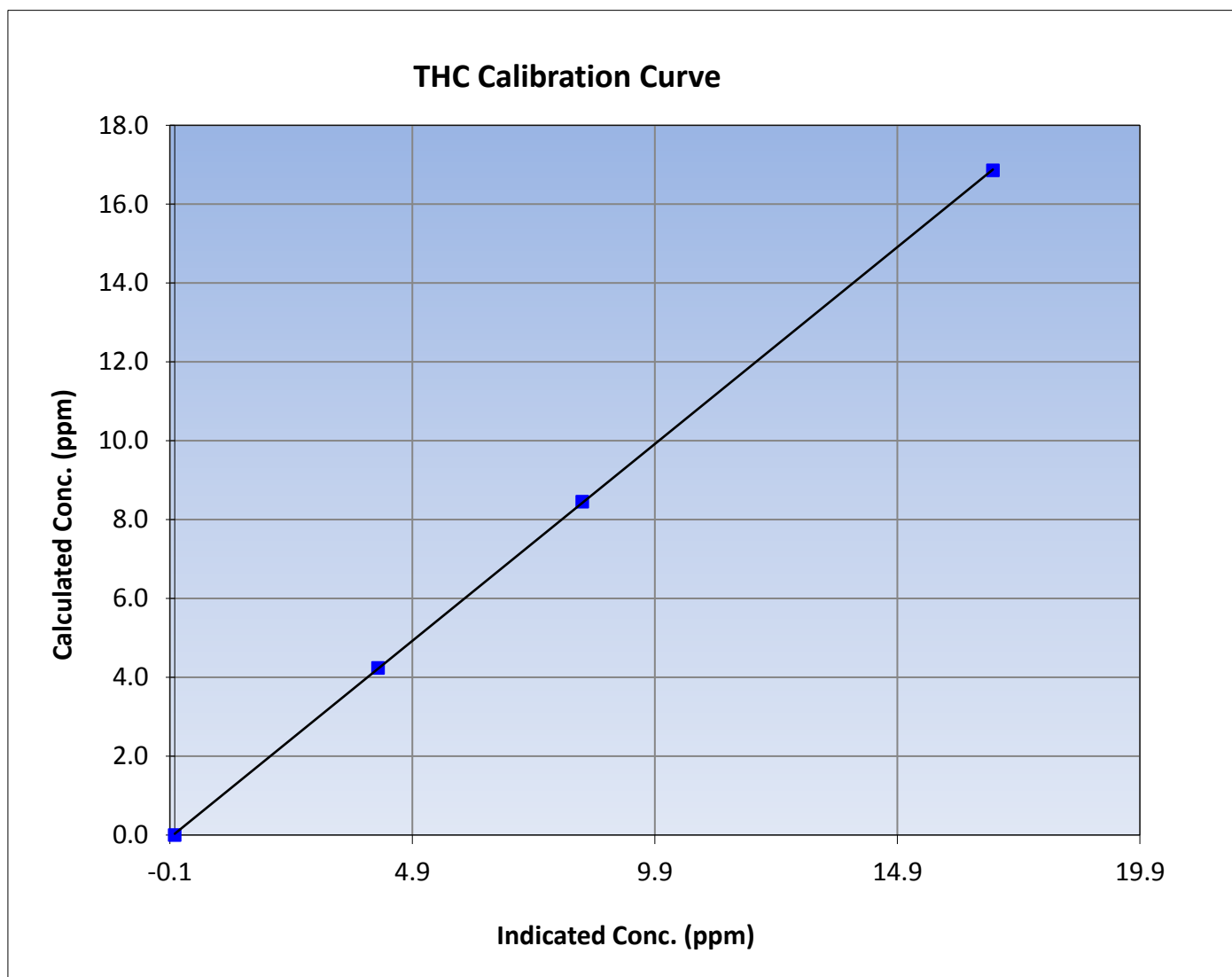
THC Calibration Summary

Station Information

Calibration Date	June 2, 2016	Previous Calibration	May 12, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:40	End Time (MST)	16:45
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
16.86	16.87	0.9992		
8.46	8.40	1.0065	Slope	0.998602
4.24	4.19	1.0111		
			Intercept	0.032298





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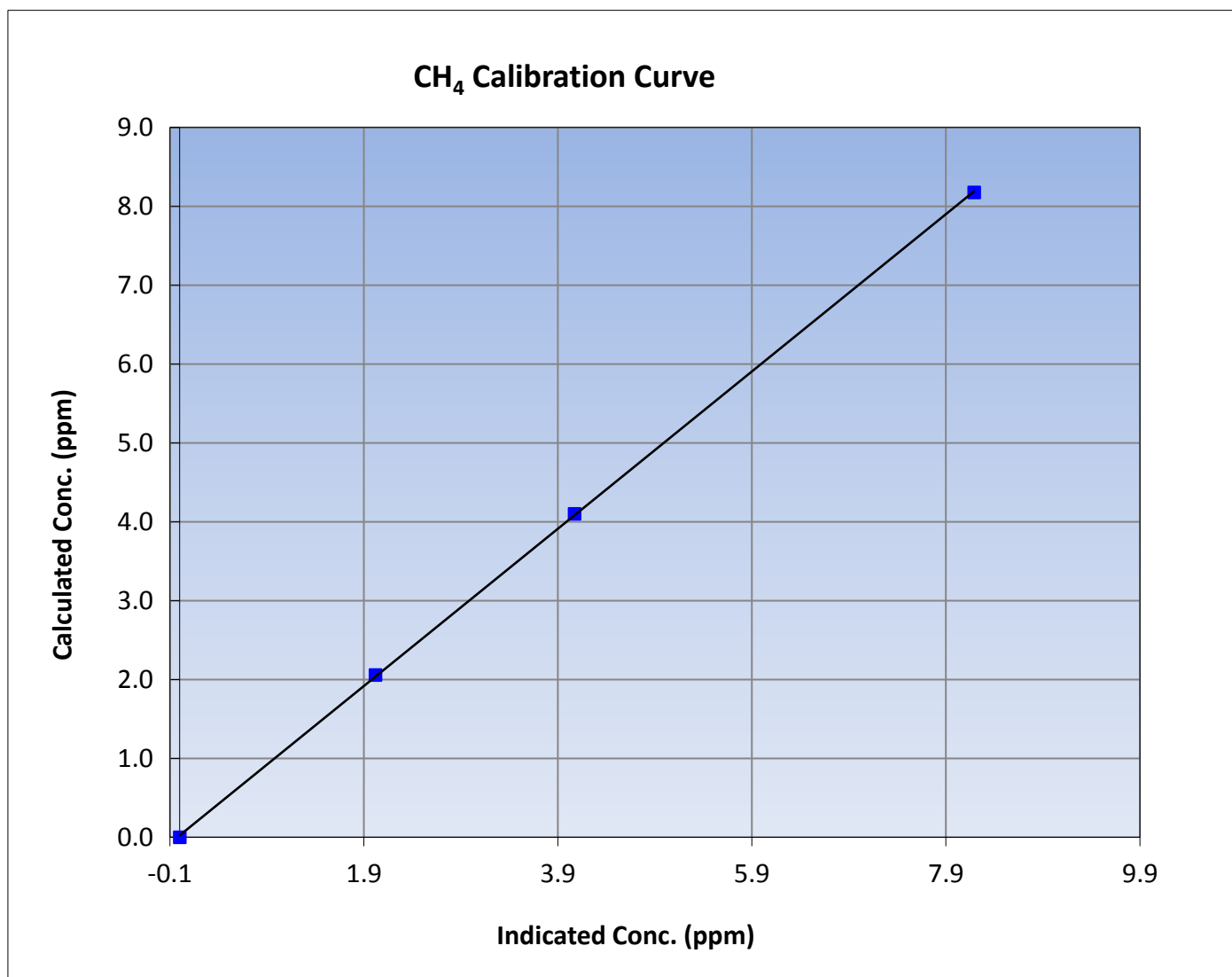
CH₄ Calibration Summary

Station Information

Calibration Date	June 2, 2016	Previous Calibration	May 12, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:40	End Time (MST)	16:45
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	0.999962
8.18	8.19	0.9983		
4.10	4.07	1.0076	Slope	0.997165
2.05	2.02	1.0172		
			Intercept	0.022956





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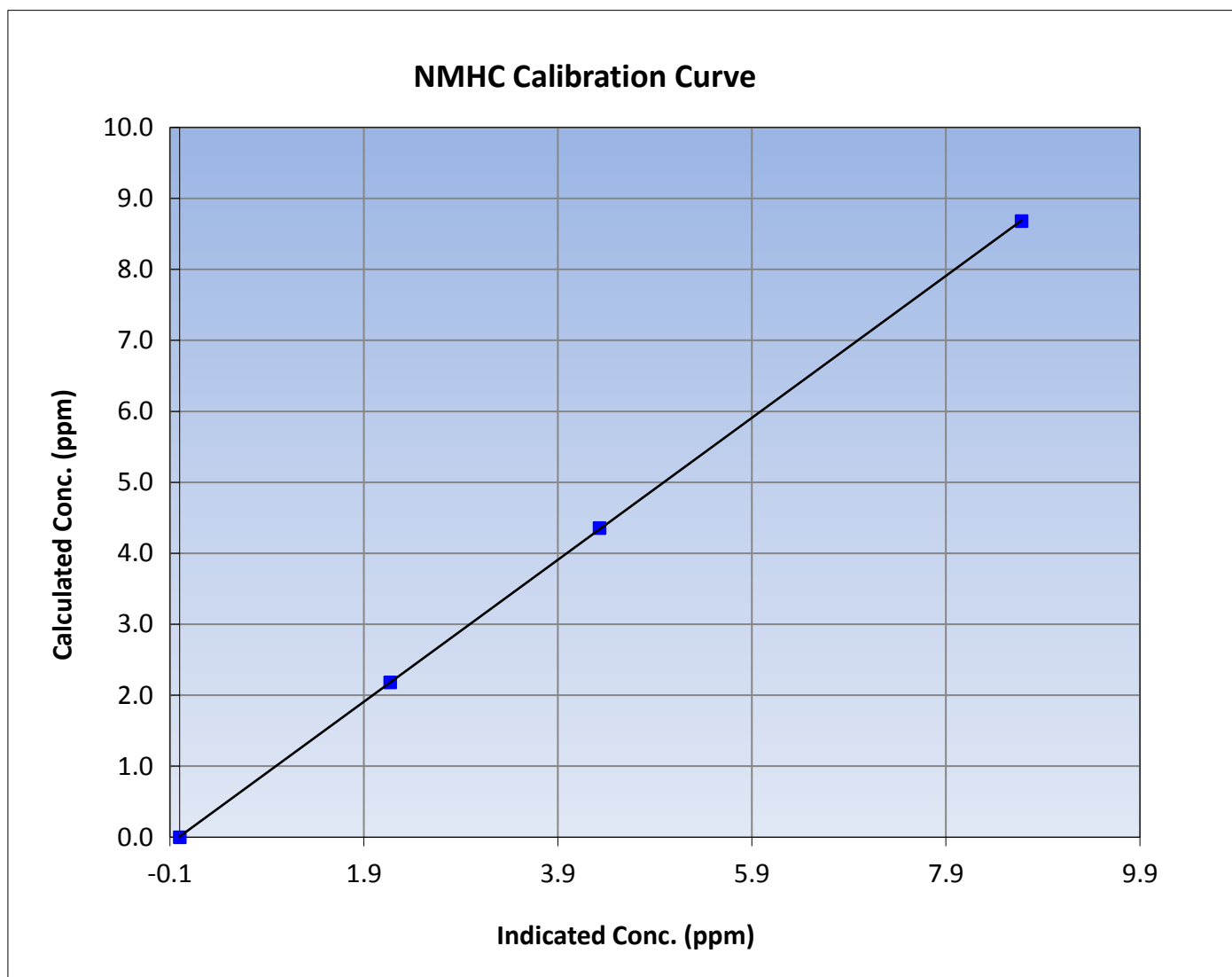
NMHC Calibration Summary

Station Information

Calibration Date	June 2, 2016	Previous Calibration	May 12, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:40	End Time (MST)	16:45
Analyzer make	Thermo 55i	Analyzer serial #	1331259521

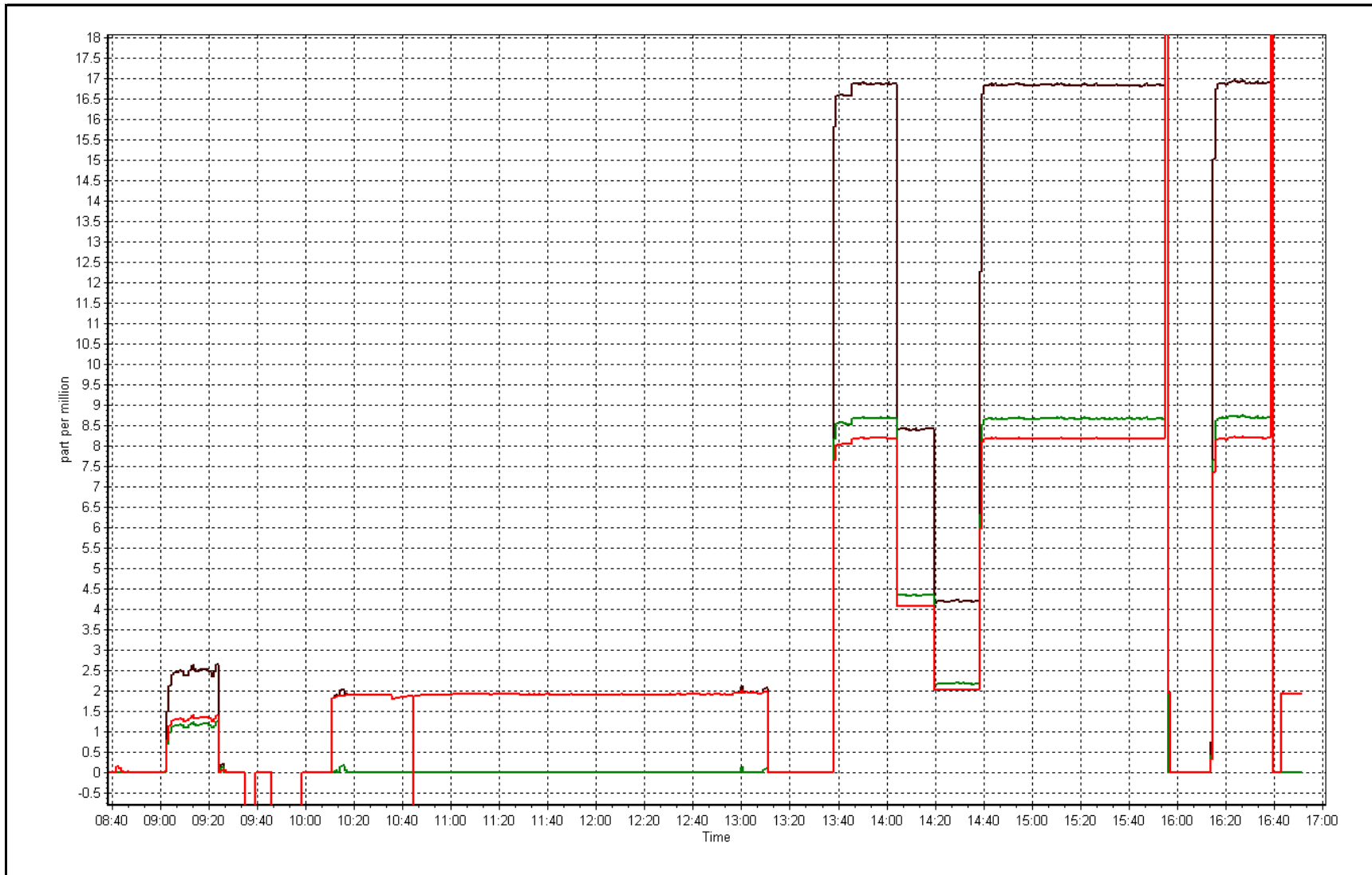
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999991
8.68	8.68	1.0001		
4.35	4.33	1.0056	Slope	0.999952
2.18	2.17	1.0054		
			Intercept	0.009347



THC Calibration Plot

Date: June 2, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	June 4, 2016	Previous Calibration	May 12, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	12:15	End Time (MST)	15:45
NO2 GPT Ref date	NA	Transfer Standard	23
		Station temp.	23 Deg C
Calibrator Make/Model	Teledyne API T700	Serial Number	2449
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	26.9
Analyzer IP address	192.168.1.48		Lamp temp.	53.5	53.4
Calculated slope	1.009508	1.000320	Pressure	678.3	678.6
Calculated intercept	-1.131311	-1.146375	Flow cell A	0.696	0.634
Analyzer Background	-1.7	0.1	Flow cell B	0.716	0.656
Analyzer Coefficient	0.991	1.001	Cell A Intensity	89490	88560
			Cell B Intensity	90696	89473

Analyzer make	Thermo 49i	Analyzer serial #	1300156234
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator O3 Generator Drive Voltage (mV)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5500	800.0	0.0	1.6	----
as found span	5500	1071.5	400.0	392.3	1.020
calibrator zero	5500	800.0	0.0	-0.1	----
high point	5500	1073.1	400.0	400.4	0.999
second point	5500	912.7	200.0	201.7	0.991
third point	5500	816.0	100.0	102.4	0.977
as left zero	5500	800.0	0.0	-0.2	----
as left span	5500	1072.7	400.0	401.4	0.997
Average Correction Factor					0.989

Corrected As found	390.8	Previous response	397.4	% change	1.7%
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Notes:

Optional photometer on the API T700 calibrator was used for this calibration. Changed inlet filter after as founds. Zero/Span conducted with new inlet filter to measure any change due to heavy loading on filter. Adjusted zero and span.

Calibration Performed By:

Evan Magill



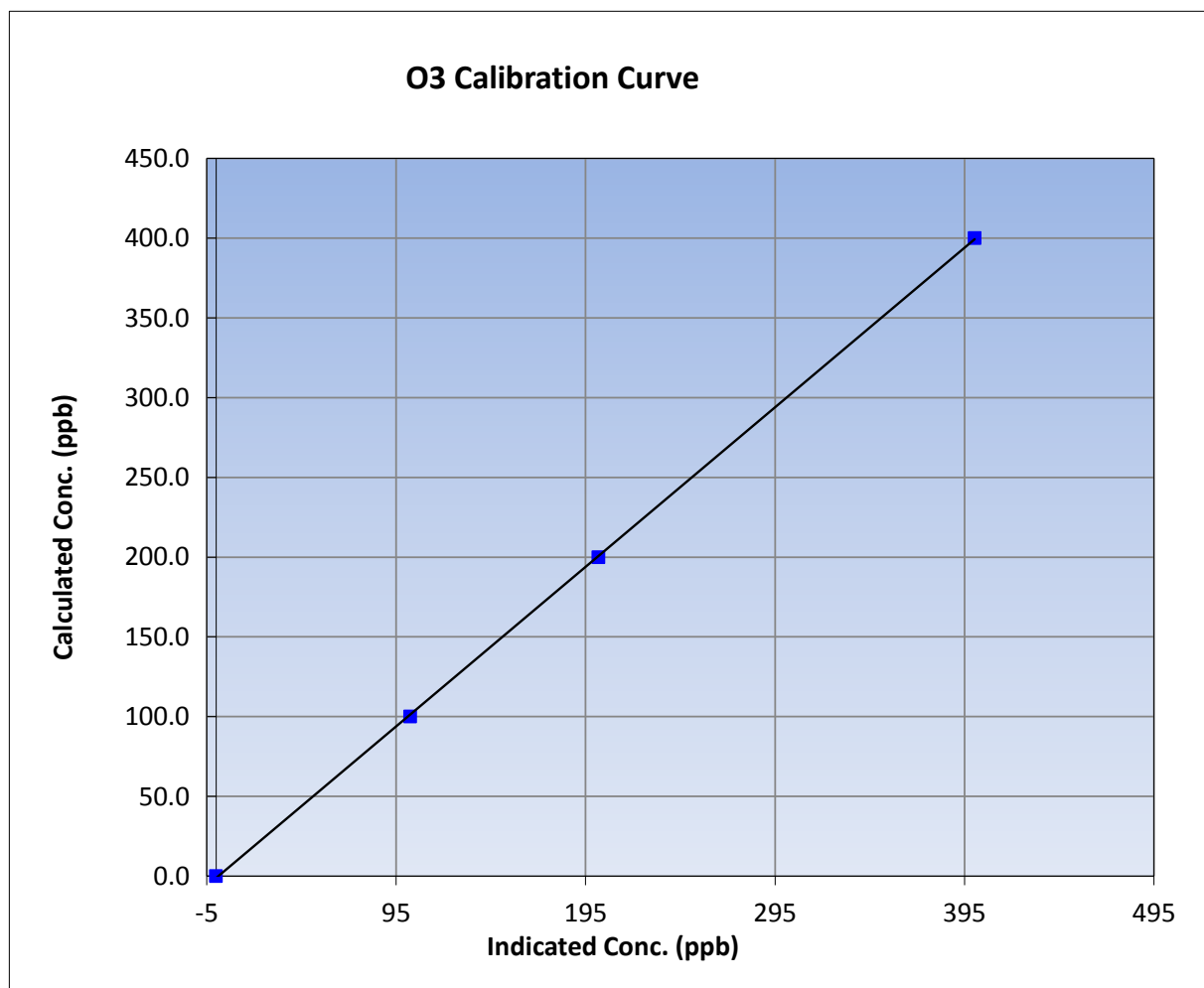
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	June-04-16	Previous Calibration	May 12, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	12:15	End Time (MST)	15:45
Analyzer make	Thermo 49i	Analyzer serial #	1300156234

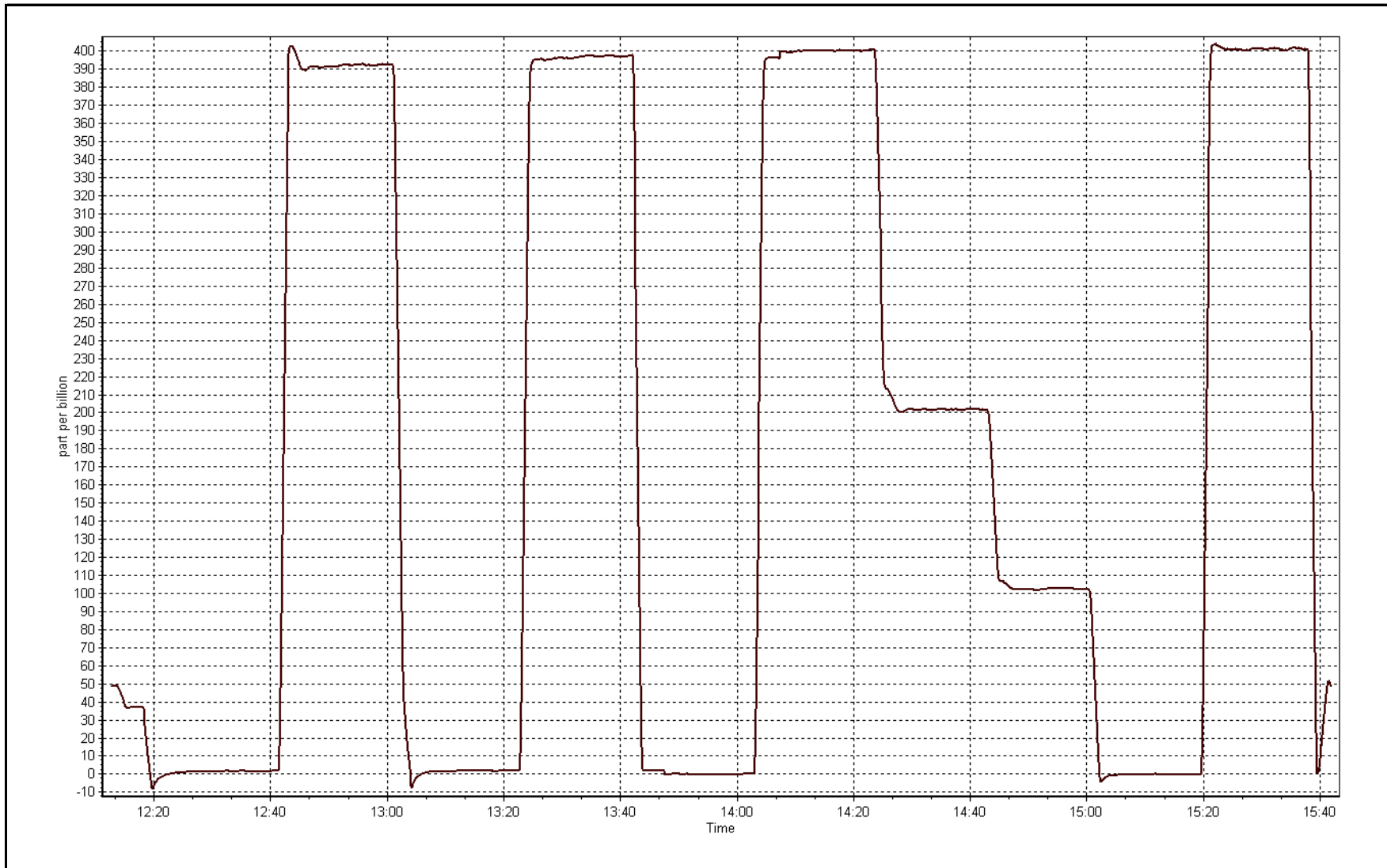
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999954
400.0	400.4	0.9991		
200.0	201.7	0.9914	Slope	1.000320
100.0	102.4	0.9768		
			Intercept	-1.146375



O3 Calibration Plot

Date: June 4, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 2, 2016	Previous Calibration	May 12, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	Routine		
Start Time (MST)	8:40	End Time (MST)	16:45
NO Cal Gas Conc	50.7 ppm	Gas Cert Reference	EY0000355
NOx Cal Gas Conc	50.9 ppm	Cal Gas Expiry Date	18/09/2018
Calibrator	Teledyne API T700	Serial Number	2449
Zero air Generator	Teledyne API 701	Serial Number	60

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	9036
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	1.001845	0.998574	1.002739
	Data Offset	1.525366	1.443744	1.535140
Current Calibration	Data Slope	0.997709	0.996430	0.991334
	Data Offset	3.960182	3.722927	0.290447

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153460
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.43		192.168.1.42	
NO coefficient	1.404		1.017	
NOx coefficient	1.002		1.003	
NO2 coefficient	1.002		1.000	
NO bkgrnd	4.100		16.7	
NOx bkgrnd	4.800		17.8	
Chamber Temp	50.700	Deg C	50.8	Deg C
Moly Temp	321.800	Deg C	322.4	Deg C
PMT voltage	-761.100	V	-773.3	V
PMT Temp	-3.000	Deg C	-3	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	188.600	mmHg	184.5	mmHg
R Cell Press Nox	188.900	mmHg	184.8	mmHg
NO sample flow	0.777	lpm	0.749	lpm
Nox sample Flow	0.776	lpm	0.748	lpm

Notes:

Changed inlet filter after as founds. No change in response after inlet filter switched out. Cleaned the reaction chamber and adjusted the PMT. Adjusted zero and span. Calibration was noisy because the average time was changed from 60 sec to 10 sec during PMT adjustment, but was not changed back until the as left span. AL span gave 400 O3, but 300 O3 was used for the GPT point. Therefore AL calculations should be disregarded.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date: June 2, 2016 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	1.7	0.7	1.0	----	----
as found span	6000	94.7	803.4	800.2	3.2	755.6	753.8	1.8	1.0632	1.0616
calibrator zero	6000	0.0	0.0	0.0	0.0	-1.2	-1.1	-0.2	----	----
high point	6000	94.7	803.4	800.2	3.2	802.4	800.5	1.9	1.0012	0.9997
second point	6000	47.5	403.0	401.4	1.6	399.1	398.3	0.9	1.0096	1.0078
third point	6000	23.8	201.9	201.1	0.8	195.3	195.1	0.2	1.0340	1.0308
as left zero	5000	0.0	0.0	0.0	0.0	-7.8	-7.2	-0.6	----	----
as left span	5500	86.8	803.3	470.5	332.8	802.5	376.4	426.1	1.0010	1.2501
Average Correction Factor									1.0149	1.0128

Corrected As found NO_x= 753.9 NO= 753.1 Percent Change NO_x= 6.2% NO= 6.2%
 Previous Response NO_x= 800.4 NO= 799.9

GPT Calibration Data

Dilution Flow (total) 5500 ccm Source Gas Flow 86.90 ccm NOx ref calc conc = 804.2 ppb NO ref calc conc = 801.1 ppb

O3 Setpoint (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
1st NO ref point		3.2	796.9	793.0	-0.2	1.0092	1.0102	----	----
1st NO2 (300)	470.5	325.6	799.3	470.5	328.7	1.0062	----	0.9904	101.0%
2nd NO2 (200)	533.5	262.6	797.3	533.5	263.8	1.0086	----	0.9954	100.5%
3rd NO2 (100)	659.9	136.2	797.1	659.9	137.1	1.0090	----	0.9932	100.7%
2nd NO ref point	----	3.2	795.7	791.8	3.9	1.0108	1.0118	----	----
Average Correction Factor						1.0086		0.9930	100.7%

Calibration Performed By: Evan Magill



Wood Buffalo Environmental Association

NO_x Calibration Summary

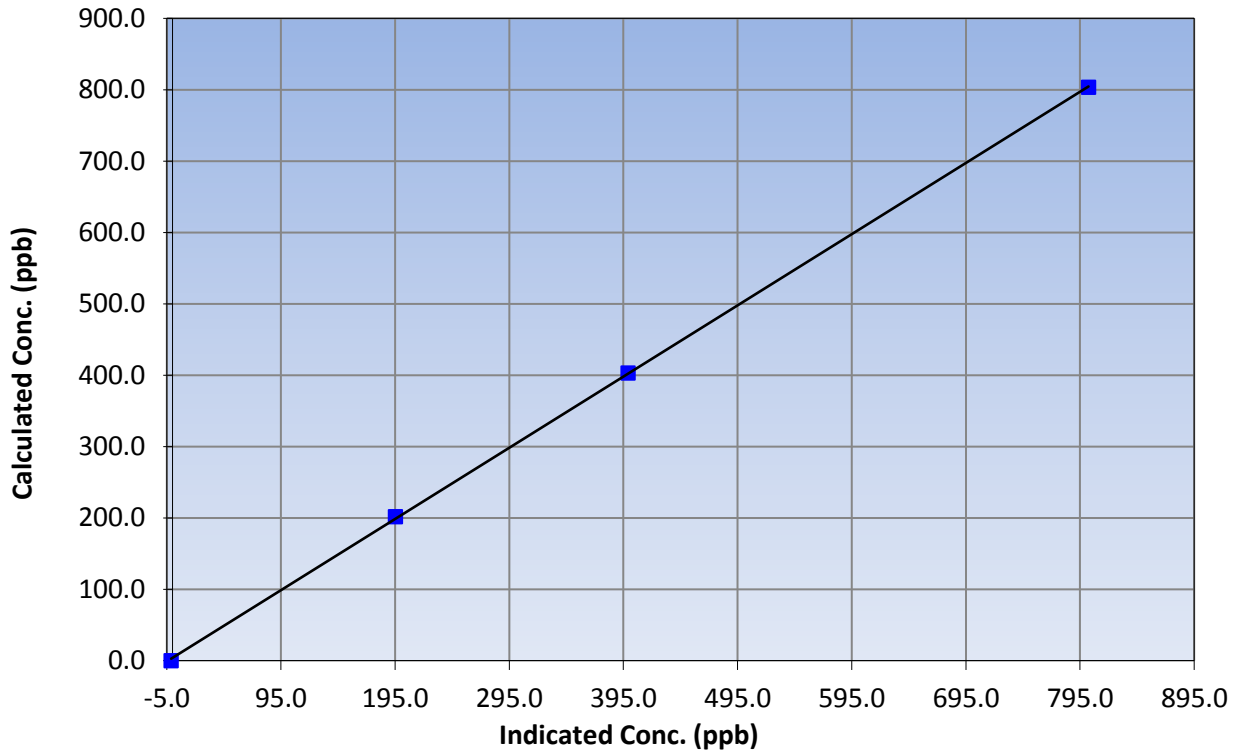
Station Information

Calibration Date	June 2, 2016	Previous Calibration	May 12, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:40	End Time (MST)	16:45
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	-1.2	----	Correlation Coefficient	0.999945
803.4	802.4	1.0012		
403.0	399.1	1.0096	Slope	0.997709
201.9	195.3	1.0340		
			Intercept	3.960182

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

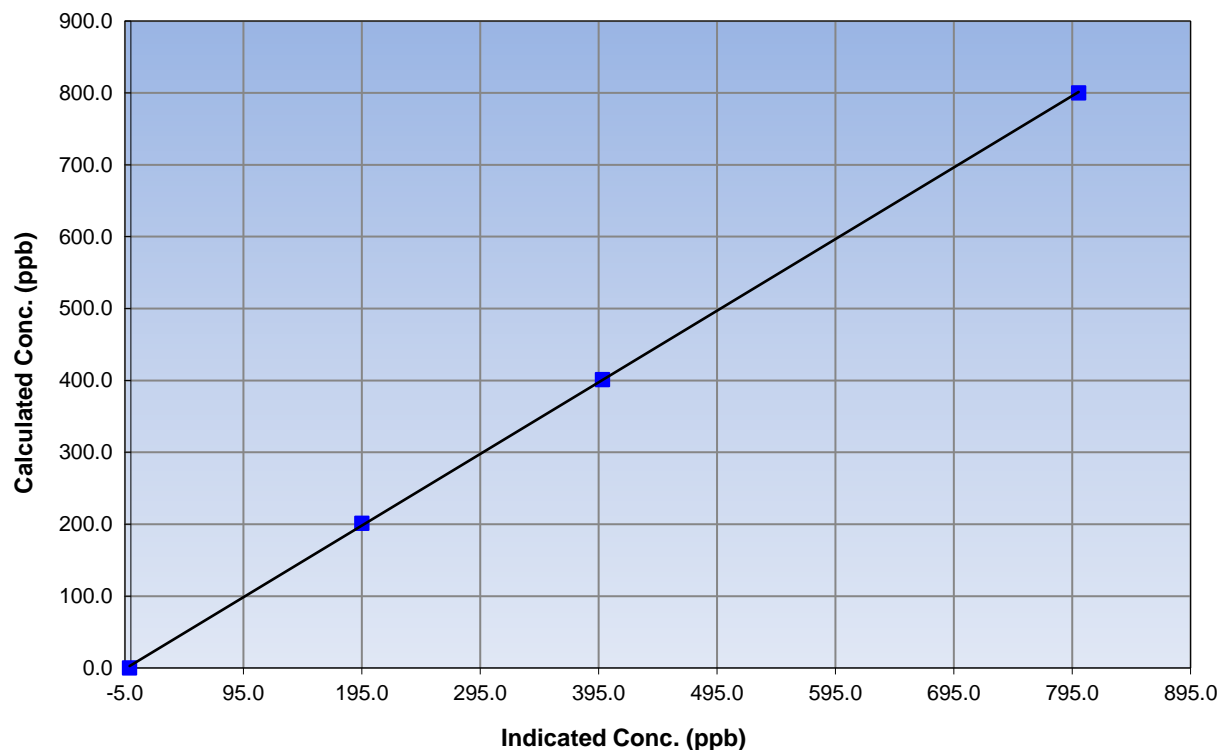
Station Information

Calibration Date	June 2, 2016	Previous Calibration	May 12, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:40	End Time (MST)	16:45
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	-1.1	N/A	Correlation Coefficient	0.999949
800.2	800.5	0.9997		
401.4	398.3	1.0078	Slope	0.996430
201.1	195.1	1.0308		
			Intercept	3.722927

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

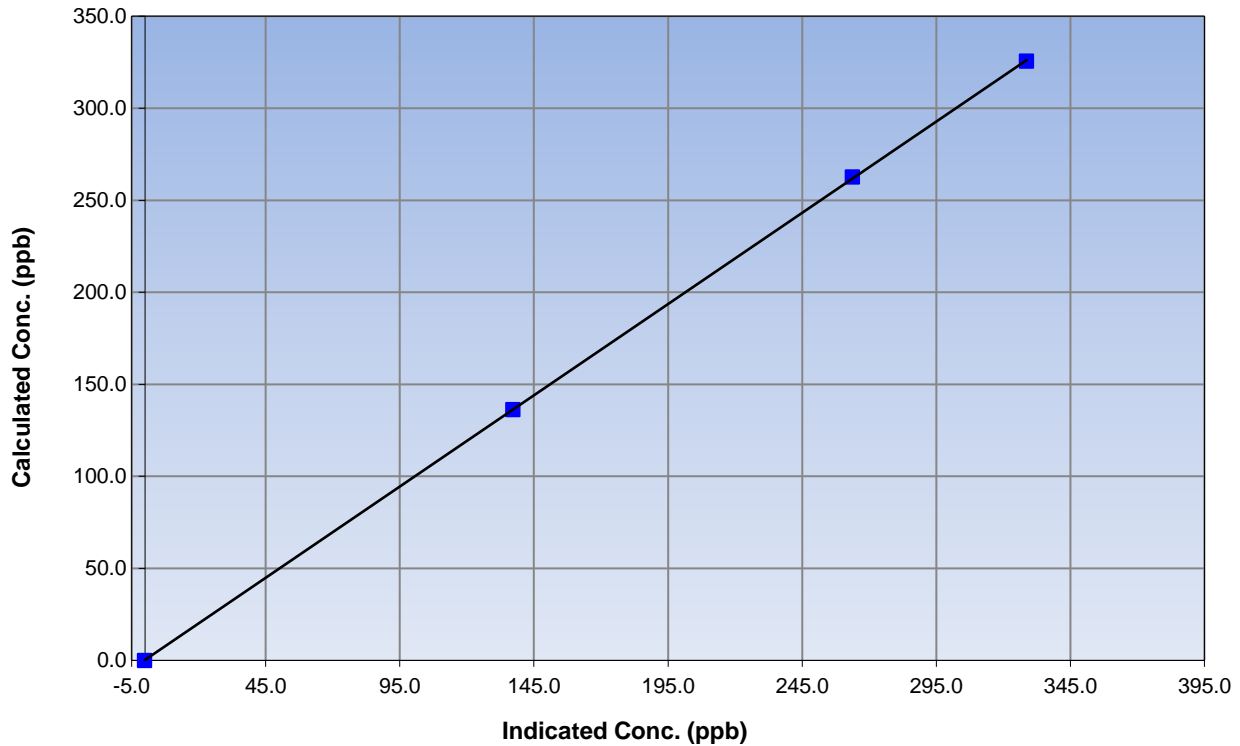
Station Information

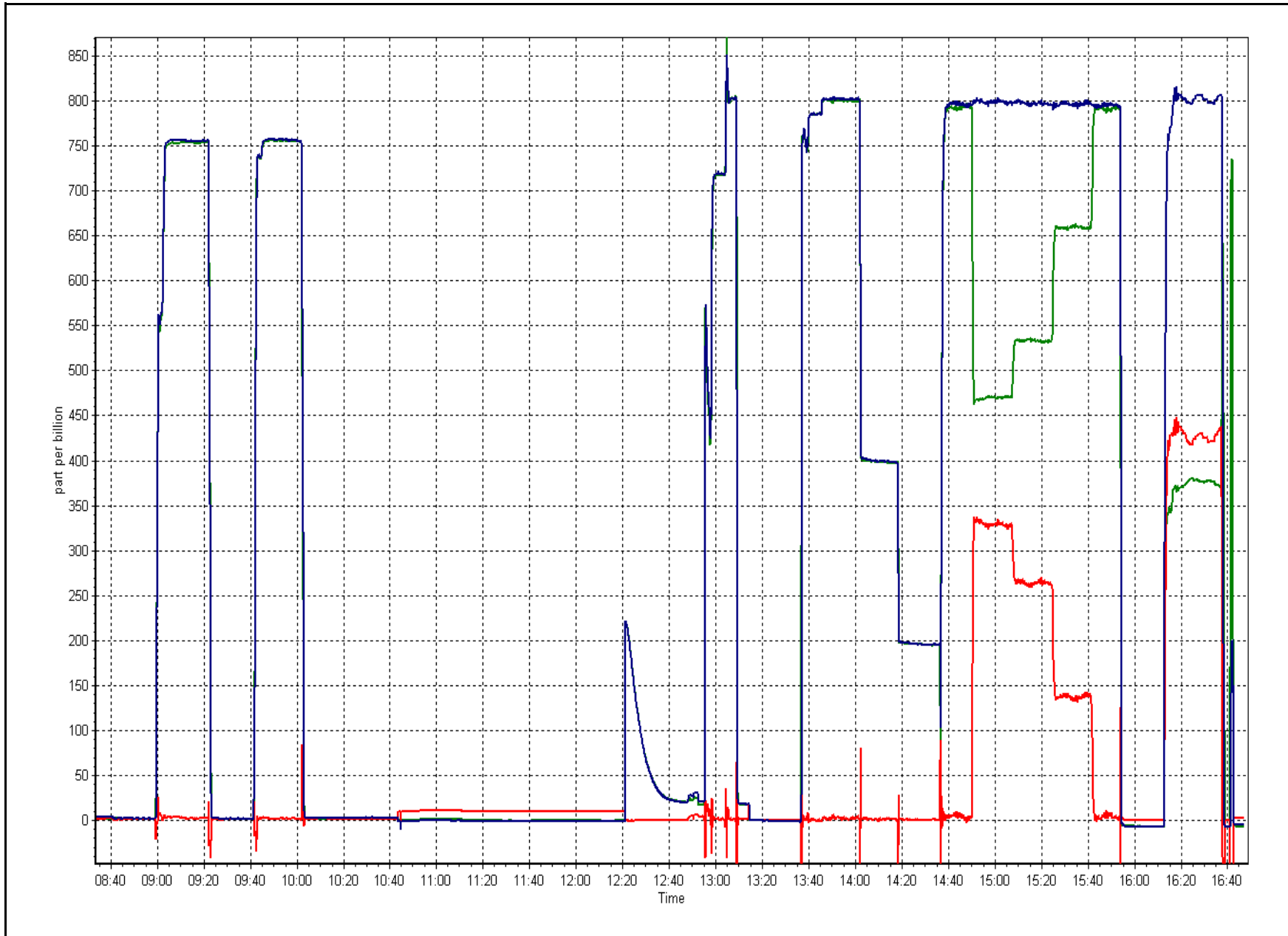
Calibration Date	June 2, 2016	Previous Calibration	May 12, 2016
Station Number	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	8:40	End Time (MST)	16:45
Analyzer make	Thermo 42i	Analyzer serial #	1218153460

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	N/A	Correlation Coefficient	0.999984
325.6	328.7	0.9904		
262.6	263.8	0.9954	Slope	0.991334
136.2	137.1	0.9932		
			Intercept	0.290447

NO₂ Calibration Curve







Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 3, 2016	Previous Calibration	June 2, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Reason:	<input type="checkbox"/> Other: Re-calibrating because baseline has drifted since calibration/reaction cell clean yesterday.		
Start Time (MST)	9:20	End Time (MST)	13:20
NO Cal Gas Conc	50.7 ppm	Gas Cert Reference	EY0000355
NOX Cal Gas Conc	50.9 ppm	Cal Gas Expiry Date	18/09/2018
Calibrator	Teledyne API T700	Serial Number	2449
Zero air Generator	Teledyne API 701	Serial Number	60

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	9036
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.997709	0.996430	0.991334
	Data Offset	3.960182	3.722927	0.290447
Current Calibration	Data Slope	0.997201	0.996760	0.992425
	Data Offset	1.075697	1.185603	-0.143845

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153460
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.43		192.168.1.42	
NO coefficient	1.017		1.017	
NOX coefficient	1.003		1.003	
NO2 coefficient	1.000		1.000	
NO bkgrnd	16.7		4.4	
NOX bkgrnd	17.8		4.6	
Chamber Temp	50.8	Deg C	50.4	Deg C
Moly Temp	322.4	Deg C	327.6	Deg C
PMT voltage	-773.3	V	-773.3	V
PMT Temp	-3.0	Deg C	-2.9	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	184.5	mmHg	185.1	mmHg
R Cell Press Nox	184.8	mmHg	185.3	mmHg
NO sample flow	0.749	lpm	0.754	lpm
Nox sample Flow	0.748	lpm	0.753	lpm

Notes:

Re-calibrating because baseline has drifted negative since calibration and reaction cell cleaning yesterday. Adjusted zero.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 3, 2016

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	5500	0.0	0.0	0.0	0.0	-13.4	-12.6	-0.8	----	----
as found span	5500	86.9	804.2	801.1	3.2	790.7	788.3	2.5	1.0171	1.0162
calibrator zero	5500	0.0	0.0	0.0	0.0	-0.2	-0.3	0.1	----	----
high point	5500	86.9	804.2	801.1	3.2	805.7	802.8	3.0	0.9981	0.9979
second point	5500	43.5	402.6	401.0	1.6	402.6	401.2	1.4	1.0000	0.9996
third point	5500	21.8	201.7	201.0	0.8	200.1	199.2	0.9	1.0085	1.0088
as left zero	5500	0.0	0.0	0.0	0.0	-0.2	-0.4	0.2	----	----
as left span	5500	86.9	804.2	367.5	436.7	808.4	366.9	441.4	0.9949	1.0015
Average Correction Factor									1.0022	1.0021

Corrected As found
Previous Response

NO_x= 804.2
NO_x= 802.1

NO= 800.9
NO= 800.2

Percent Change

NO_x= -0.3%

NO= -0.1%

GPT Calibration Data

Dilution Flow (total) 5500 ccm Source Gas Flow 86.90 ccm NOx ref calc conc = 804.2 ppb NO ref calc conc = 801.1 ppb

O3 Setpoint (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
1st NO ref point		3.2	803.9	799.3	0.1	1.0004	1.0022	----	----
1st NO2 (400)	367.5	435.0	805.8	367.5	438.3	0.9980	----	0.9924	100.8%
2nd NO2 (200)	584.7	217.8	804.6	584.7	220.0	0.9995	----	0.9902	101.0%
3rd NO2 (100)	691.4	111.0	803.2	691.4	111.8	1.0012	----	0.9931	100.7%
2nd NO ref point	----	3.2	802.0	797.0	5.0	1.0028	1.0052	----	----
Average Correction Factor						1.0004		0.9919	100.8%

Calibration Performed By: Evan Magill



Wood Buffalo Environmental Association

NO_x Calibration Summary

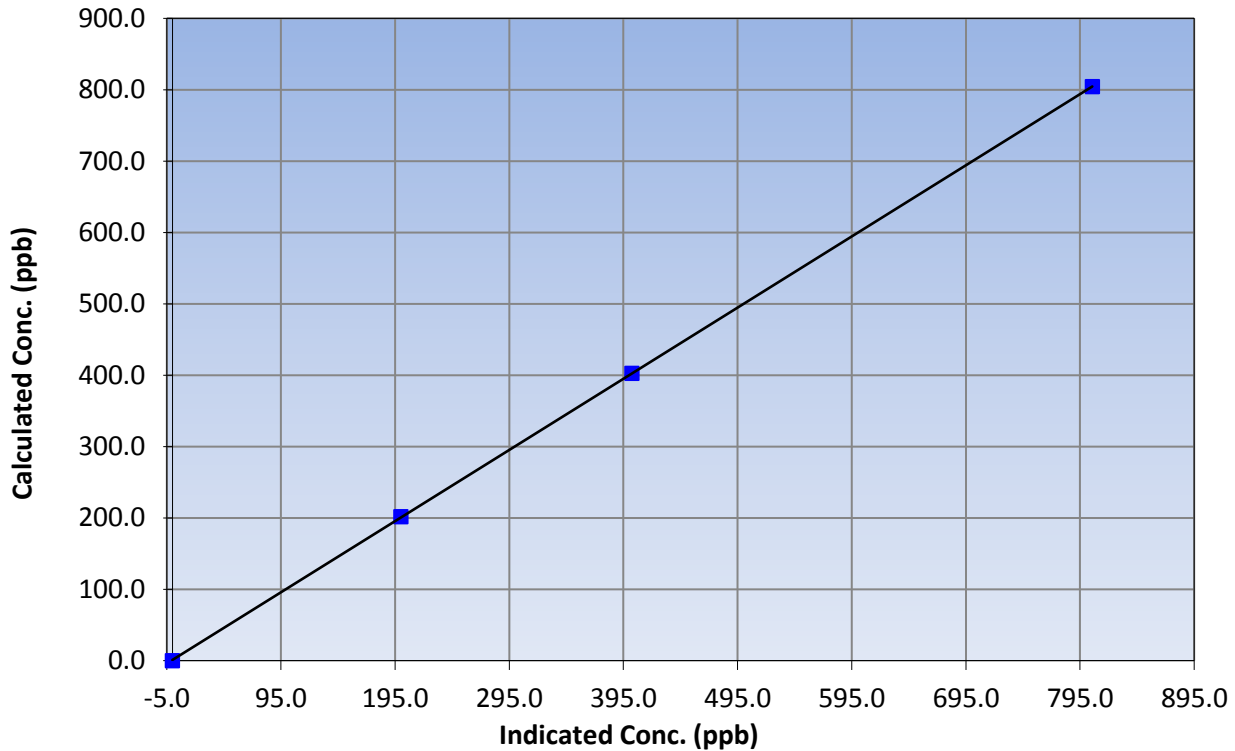
Station Information

Calibration Date	June 3, 2016	Previous Calibration	June 2, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:20	End Time (MST)	13:20
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	0.999993
804.2	805.7	0.9981		
402.6	402.6	1.0000	Slope	0.997201
201.7	200.1	1.0085		
			Intercept	1.075697

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

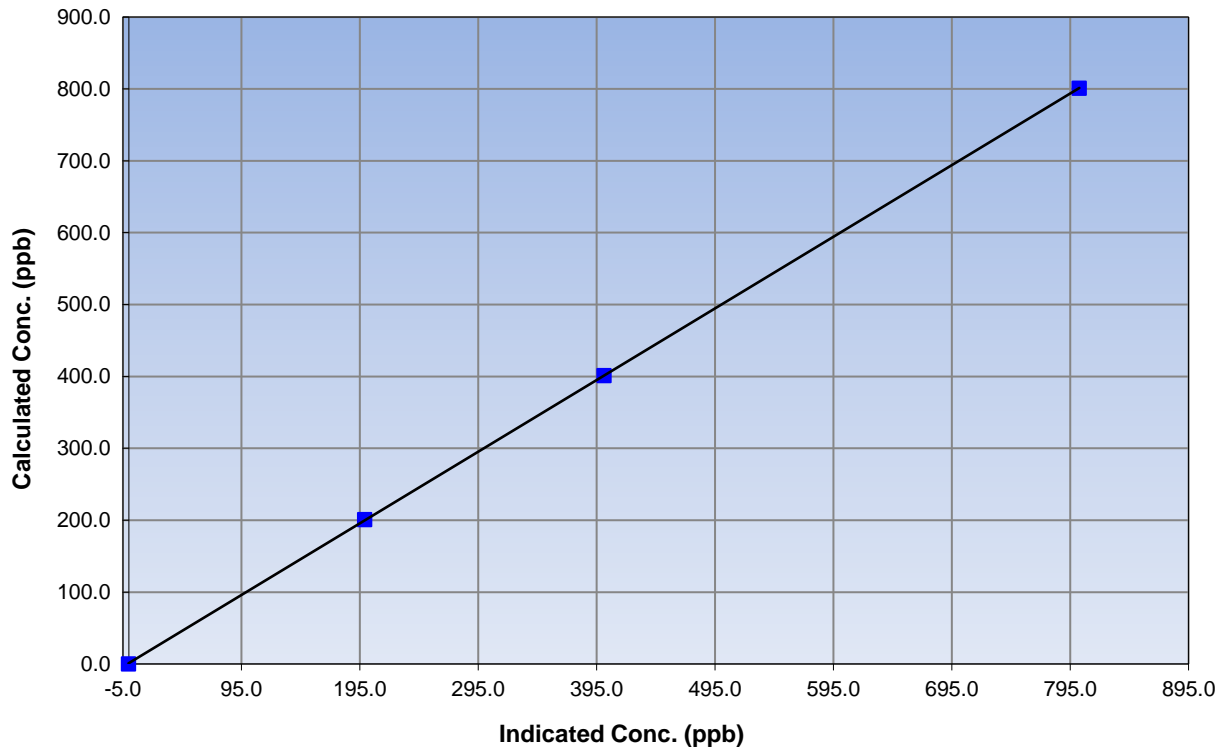
Station Information

Calibration Date	June 3, 2016	Previous Calibration	June 2, 2016
Station Name	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:20	End Time (MST)	13:20
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	-0.3	N/A	Correlation Coefficient	0.999993
801.1	802.8	0.9979		
401.0	401.2	0.9996	Slope	0.996760
201.0	199.2	1.0088		
			Intercept	1.185603

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

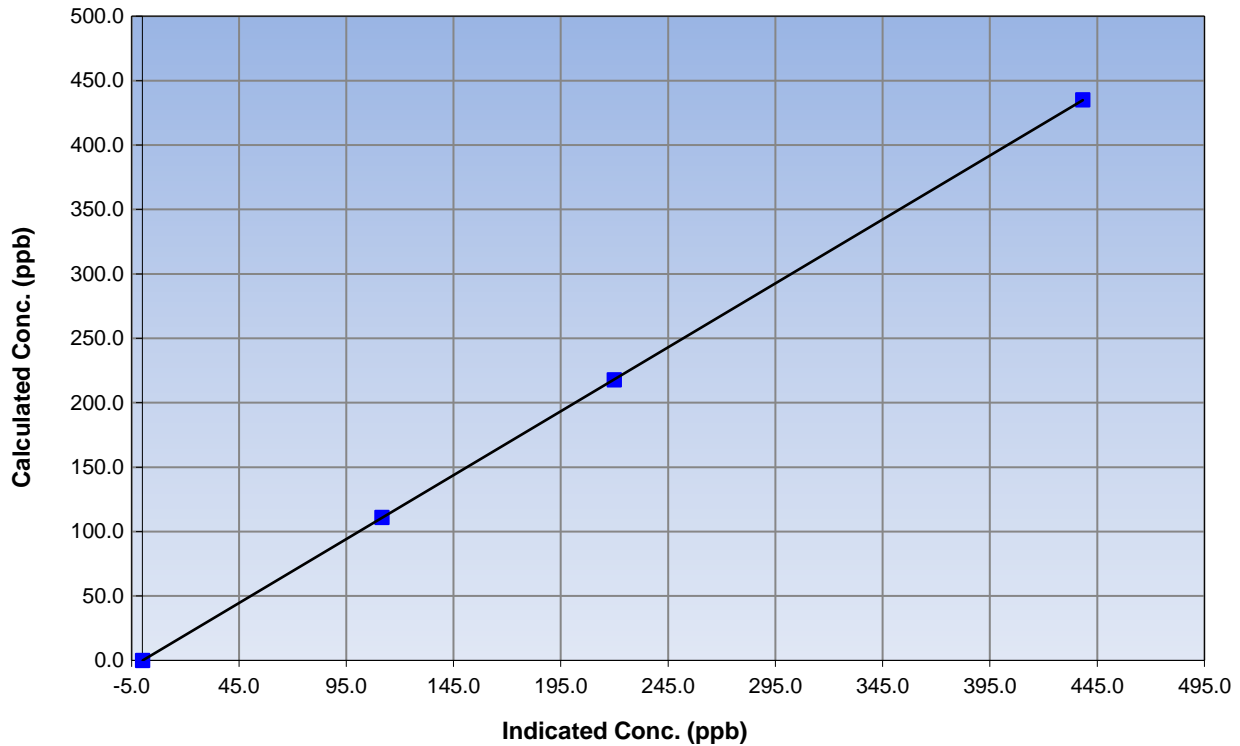
Station Information

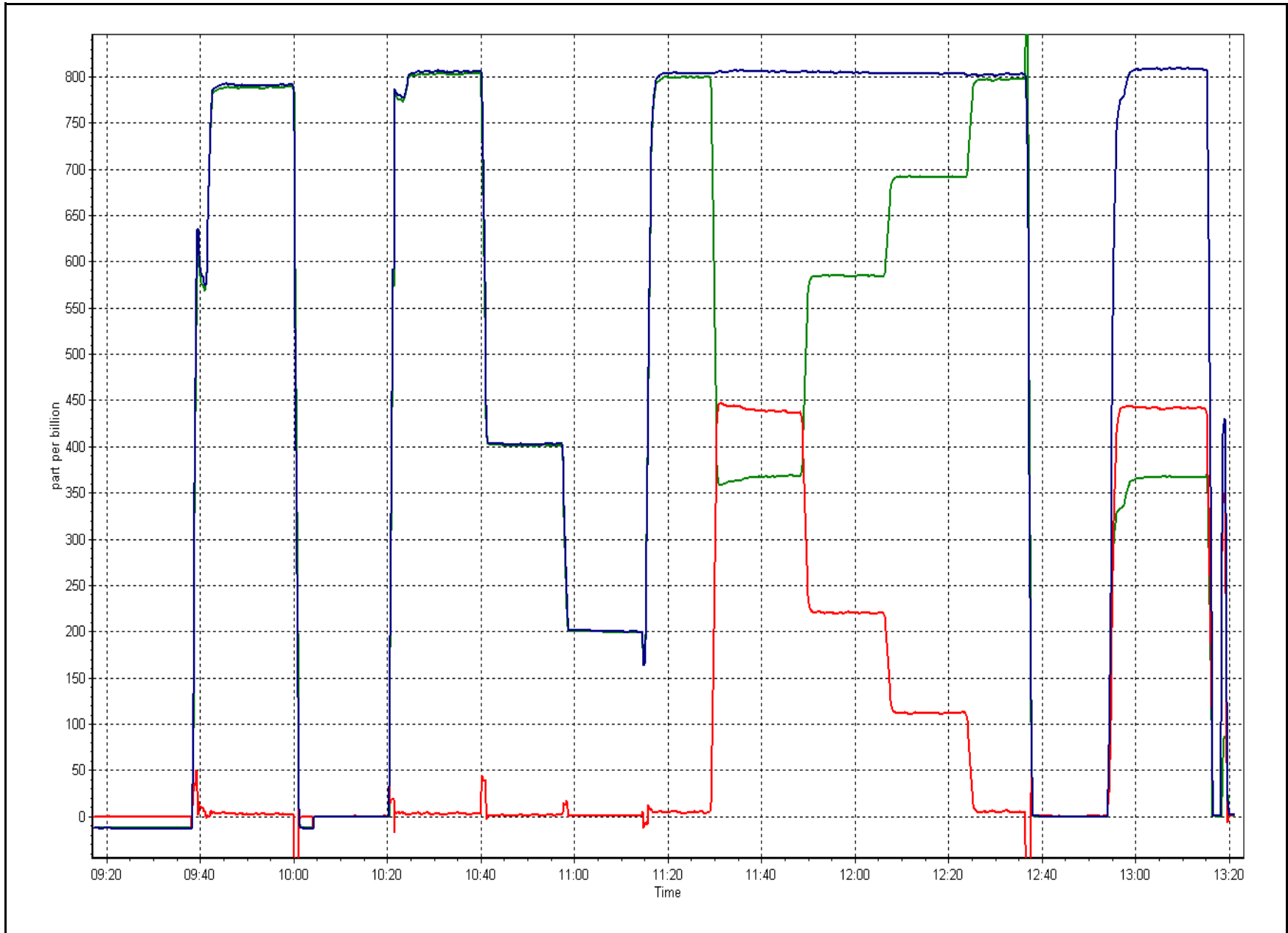
Calibration Date	June 3, 2016	Previous Calibration	June 2, 2016
Station Number	Patricia McInnes	Station Number	AMS 6
Start Time (MST)	9:20	End Time (MST)	13:20
Analyzer make	Thermo 42i	Analyzer serial #	1218153460

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999998
435.0	438.3	0.9924		
217.8	220.0	0.9902	Slope	0.992425
111.0	111.8	0.9931		
			Intercept	-0.143845

NO₂ Calibration Curve







Wood Buffalo Environmental Association

N_t-NO_x-NH₃ Calibration Report

Station Information

Station Name	Patricia McInnis	Station Number	AMS 6
NOX Calibration Date	June 9, 2016	NOX Previous Cal Date	May 12, 2016
NH3 Calibration Date	June 10, 2016	NH3 Previous Cal Date	May 12, 2016
Reason:	Routine		
Start Time (MST)	8:55	End Time (MST)	15:05
Calibrator	Teledyne API T700	Station Temperature	21.0 Deg C
NH3 Cal Gas Conc	75.1 ppm	Serial Number	2449
NOx Cal Gas Conc	50.9 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. 2582

Parameter		NH3	Nt	NOx	NO	NO2
Cal Stats As Found	Data Slope	0.988466	0.969769	1.016015	1.016874	1.001443
	Data Offset	3.866279	2.985610	2.551776	2.883819	-0.882067
Cal Stats After	Data Slope	1.001695	0.981529	0.999915	0.999485	0.993907
	Data Offset	-3.293573	-6.120323	0.796342	1.103903	-0.961617
IP address		192.168.1.17				

Analyzer Information

Analyzer make/model Teledyne T201 Analyzer serial # 215
 Converter Converter serial #

Test Point	before		after	
NH3 Conc range	2500	ppb	2500	ppb
NOX Conc range	1000	ppb	1000	ppb
NO BKG	0.1	ppb	-2.9	ppb
NOx BKG	0.7	ppb	-3.1	ppb
Nt BKG	18.4		-0.3	
NO coefficient	1.013		1.026	
NO2 coefficient	1.000	ppb	1.000	ppb
NOx coefficient	1.035		1.051	
NH3 coefficient	0.955		0.965	
Nt coefficient	1.051		1.054	
NH3 conv temp	825	DegC	825	Deg C
Chamber Temp	50.0	Deg C	50.0	Deg C
Moly Temp	314.5	Deg C	315.4	Deg C
PMT Temp	7.0	Deg C	7.0	Deg C
O3 flow	87.0	ccm	85.0	ccm
R Cell Press	6.2	mmHg	6.0	mmHg
PMT Voltage	693.0	v	693.0	v
Sample Flow 1 NO	561.0	ccm	557.0	ccm
Sample Flow 2 Nox	561.0	ccm	557.0	ccm
Sample Flow 3 Nt	561.0	ccm	546.0	ccm

Notes:

Inlet filter changed after as founds. Second zero and span point completed to document any changes. Zero and span adjusted. NH3 span adjusted.



Wood Buffalo Environmental Association

NH₃ Calibration Report

Station Information

Calibration Date:

June 10, 2016

Station Number:

AMS 6

NH₃ Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated Nt conc (ppb)	Calculated NOx conc (ppb)	Calculated NH ₃ conc (ppb)	Indicated Nt conc (ppb)	Indicated NOx conc (ppb)	Indicated NH ₃ conc (ppb)	Nt Correction factor	NH ₃ Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	-2.0	-2.2	0.0	----	----
as found NO	5500	86.8	803.3	803.3	----	782.8	785.4	-2.5	1.026	----
calibrator zero	5500	0.0	0.0	0.0	0.0	1.5	1.5	-0.1	----	----
high NO point	5500	86.8	803.3	803.3	----	801.9	803.5	-1.6	1.002	----
NO/O ₃ point	5500	86.8	803.3	803.3	----	803.5	803.6	-0.2	1.000	----
as found NH ₃	3500	93.2	1999.8	NA	1999.8	2050.1	42.3	2008.7	0.975	0.996
first NH ₃	3500	93.2	1999.8	NA	1999.8	2039.9	42.6	1997.3	0.980	1.001
second NH ₃	3500	46.6	999.9	NA	999.9	1031.4	26.1	1005.3	0.969	0.995
third NH ₃	3500	23.3	500.0	NA	500.0	517.7	13.3	504.4	0.966	0.991
Average Correction Factor									1.0008	0.9957

Nt Corrected As Found Nt = 784.8 ppb
 NOx Corrected As Found NOx = 787.6 ppb
 NH₃ Previous Converter Efficiency = 95.5 %

Previous Response Nt = 825.3 ppb
 Previous Response NOx = 788.1 ppb
 NH₃ Current Converter Efficiency = 96.5 %

Nt percent change 5.2%
 NOx percent change 0.1%
 NH₃ percent change 1.0%



Wood Buffalo Environmental Association

NO_x(NH₃) Calibration Report

Station Information

Calibration Date:

June 9, 2016

Station Number:

AMS 6

NO_x / NO / Nt Calibration Data

Set Point	Total flow rate (ccm)	Source gas flow rate (ccm)	Calculated NO _x conc (ppb)	Calculated NO conc (ppb)	Calculated Nt conc (ppb)	Indicated NO _x conc (ppb)	Indicated NO conc (ppb)	Indicated Nt conc (ppb)	NO _x Correction factor	NO Correction factor
as found zero	5500	0.0	0.0	0.0	0.0	-1.5	-1.6	-3.4	----	----
as found span	5500	86.8	803.3	800.1	803.3	789.0	786.3	782.4	1.0182	1.0177
calibrator zero	5500	0.0	0.0	0.0	0.0	1.5	1.3	1.5	----	----
high point	5500	86.8	803.3	800.1	803.3	803.5	800.7	801.9	0.9997	0.9993
second point	5500	43.5	402.6	401.0	402.6	401.3	398.8	396.4	1.0032	1.0055
third point	5500	21.8	201.7	201.0	201.7	198.2	197.6	197.0	1.0178	1.0168
Average Correction Factor									1.0069	1.0072

	<u>Nt</u>	<u>NOX</u>	<u>NO</u>	<u>NO2</u>
Corrected As found	785.9	790.4	787.9	----
Previous Response	825.3	788.1	784.0	----
Percent Change	5.0%	-0.3%	-0.5%	0.2%

GPT Calibration Data

Dilution Flow (total) 5500 ccm Source Gas Flow 86.9 ccm NO_x ref calc conc = 804.2 ppb NO ref calc conc = 801.1 ppb

O ₃ Setpoint (ppb)	Indicated NO drop conc (ppb)	Calculated NO ₂ conc (ppb)	Indicated NO _x conc (ppb)	Indicated NO conc (ppb)	Indicated NO ₂ conc (ppb)	NO _x Correction factor	NO Correction factor	NO ₂ Correction factor	Converter Efficiency
1st NO ref point	----	3.2	803.6	796.6	7.0	1.0007	1.0056	----	----
1st NO ₂ (400)	381.3	418.5	802.7	381.3	421.5	1.0019	----	0.9927	100.7%
2nd NO ₂ (200)	596.5	203.3	802.7	596.5	206.2	1.0019	----	0.9859	101.4%
3rd NO ₂ (100)	697.3	102.5	801.9	697.3	104.6	1.0029	----	0.9798	102.1%
2nd NO ref point	----	3.2	802.2	797.9	4.3	1.0025	1.0040	----	----
Average Correction Factor						1.0023	1.0048	0.9862	101.4%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NH3 Calibration Summary

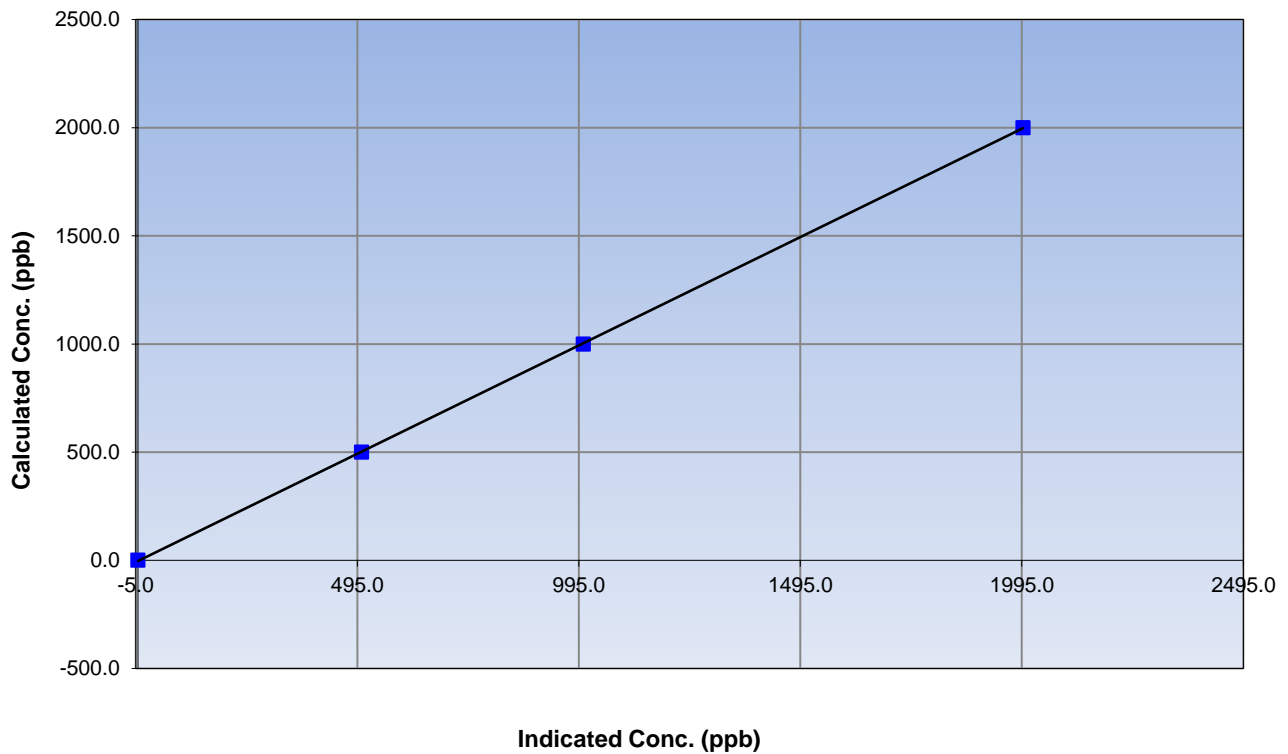
Station Information

Calibration Date	June 10, 2016	Previous Calibration	May 12, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	8:55	End Time (MST)	15:05
Analyzer make	Teledyne T201	Analyzer serial #	215

NH3 Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999984
1999.8	1997.3	1.0012		
999.9	1005.3	0.9947	Slope	1.001695
500.0	504.4	0.9912		
			Intercept	-3.293573

NH3 Calibration Curve





Wood Buffalo Environmental Association

Nt Calibration Summary

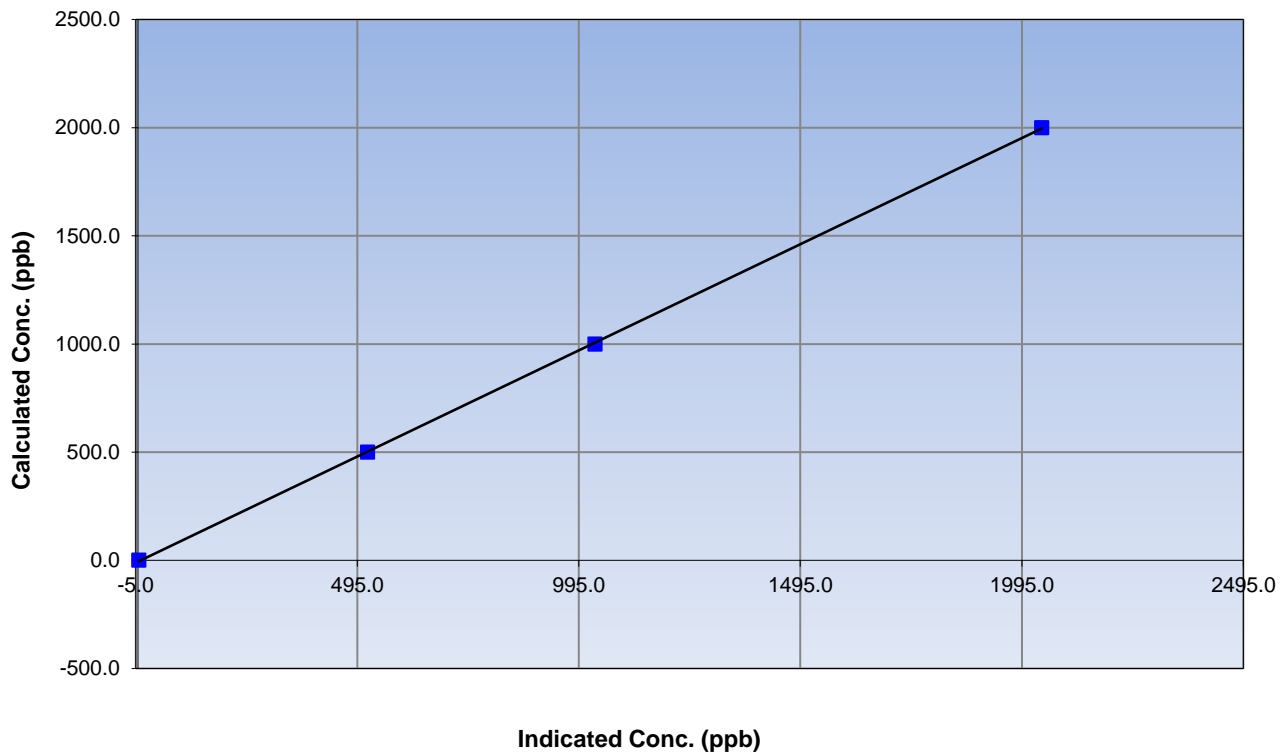
Station Information

Calibration Date	June 10, 2016	Previous Calibration	May 12, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	8:55	End Time (MST)	15:05
Analyzer make	Teledyne T201	Analyzer serial #	215

Nt (NH₃) Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	1.5	----	Correlation Coefficient	0.999964
1999.8	2039.9	0.9803		
999.9	1031.4	0.9695		
500.0	517.7	0.9657	Slope	0.981529
			Intercept	-6.120323

Nt Calibration Curve





Wood Buffalo Environmental Association

NOx Calibration Summary

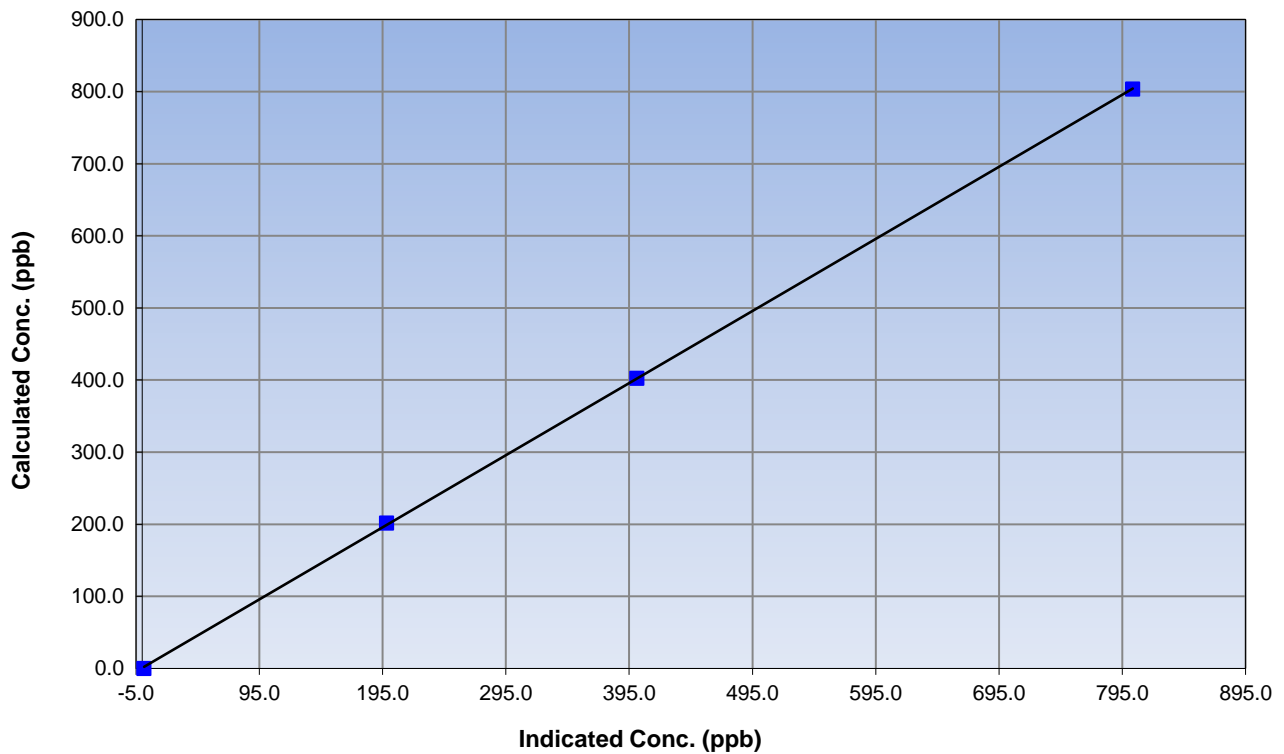
Station Information

Calibration Date	June 9, 2016	Previous Calibration	May 12, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	8:55	End Time (MST)	15:05
Analyzer make	Teledyne T201	Analyzer serial #	215

NO_x Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	1.5	----	Correlation Coefficient	0.999960
803.3	803.5	0.9997		
402.6	401.3	1.0032	Slope	0.999915
201.7	198.2	1.0178		
			Intercept	0.796342

NOx Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

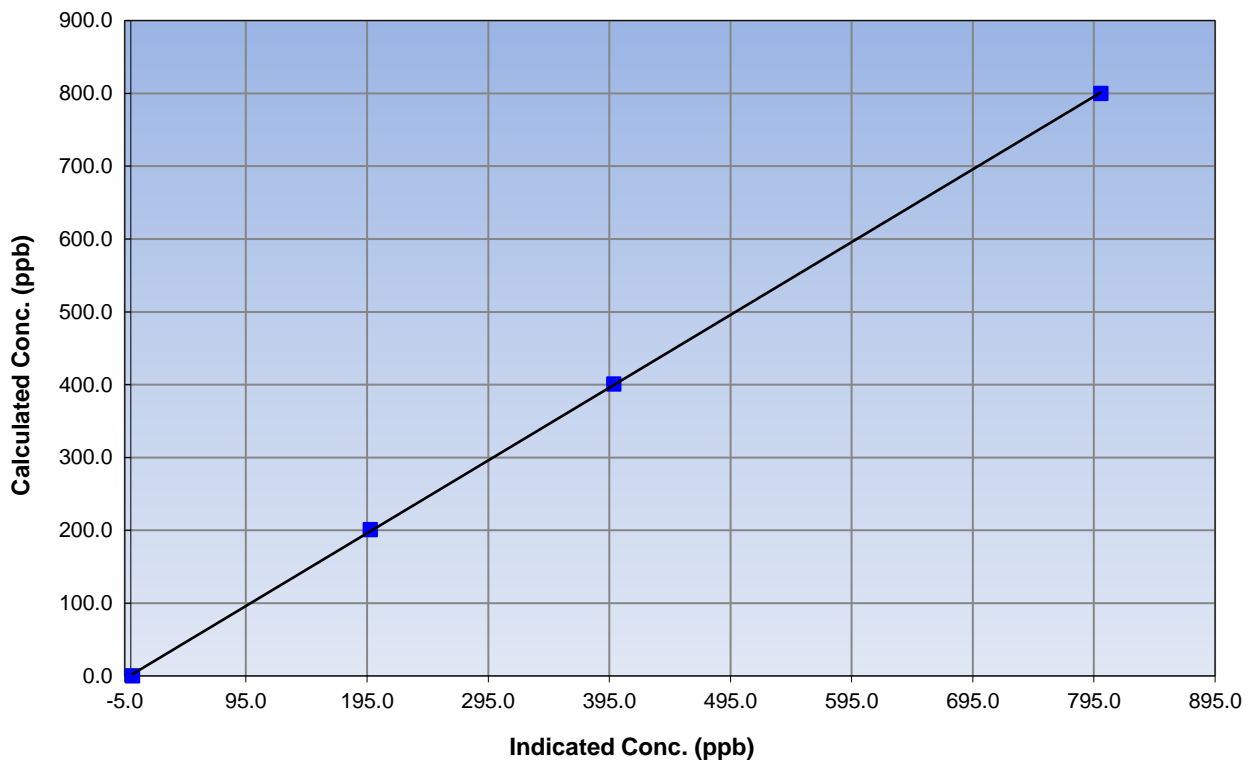
Station Information

Calibration Date	June 9, 2016	Previous Calibration	May 12, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	8:55	End Time (MST)	15:05
Analyzer make	Teledyne T201	Analyzer serial #	215

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	1.3	----	Correlation Coefficient	0.999959
800.1	800.7	0.9993		
401.0	398.8	1.0055	Slope	0.999485
201.0	197.6	1.0168		
			Intercept	1.103903

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

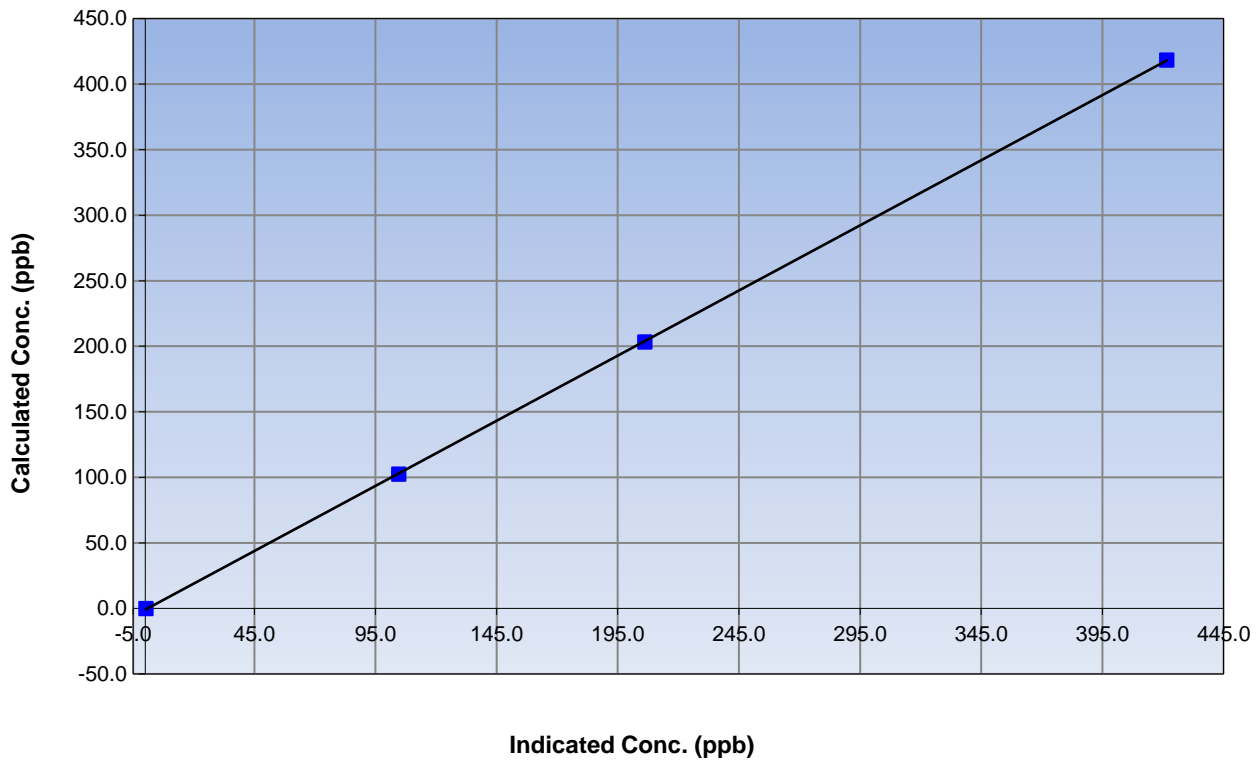
Station Information

Calibration Date	June 9, 2016	Previous Calibration	May 12, 2016
Station Name	Patricia McInnis	Station Number	AMS 6
Start Time (MST)	8:55	End Time (MST)	15:05
Analyzer make	Teledyne T201	Analyzer serial #	215

Calibration Information

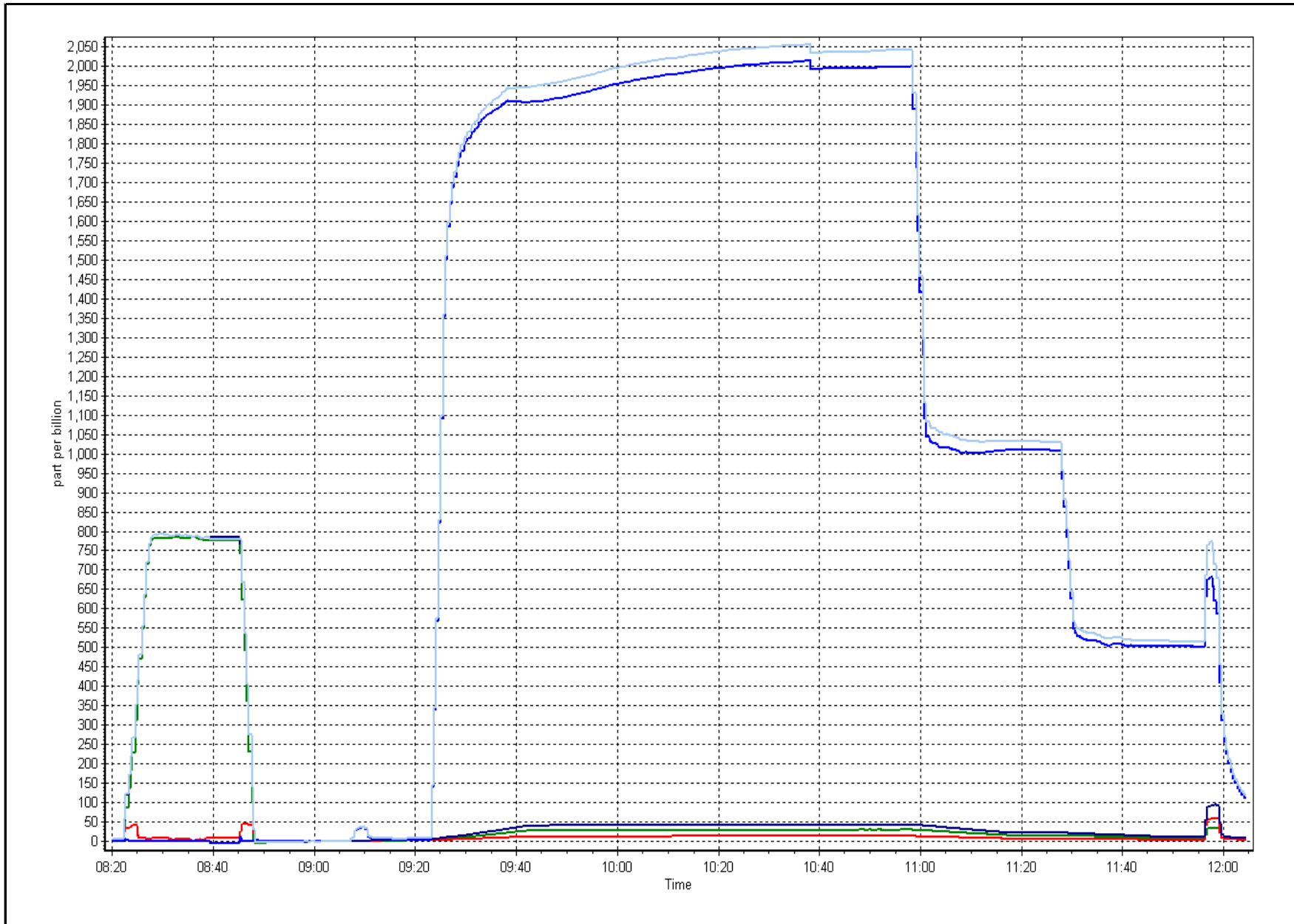
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999985
418.5	421.5	0.9927		
203.3	206.2	0.9859	Slope	0.993907
102.5	104.6	0.9798		
			Intercept	-0.961617

NO₂ Calibration Curve



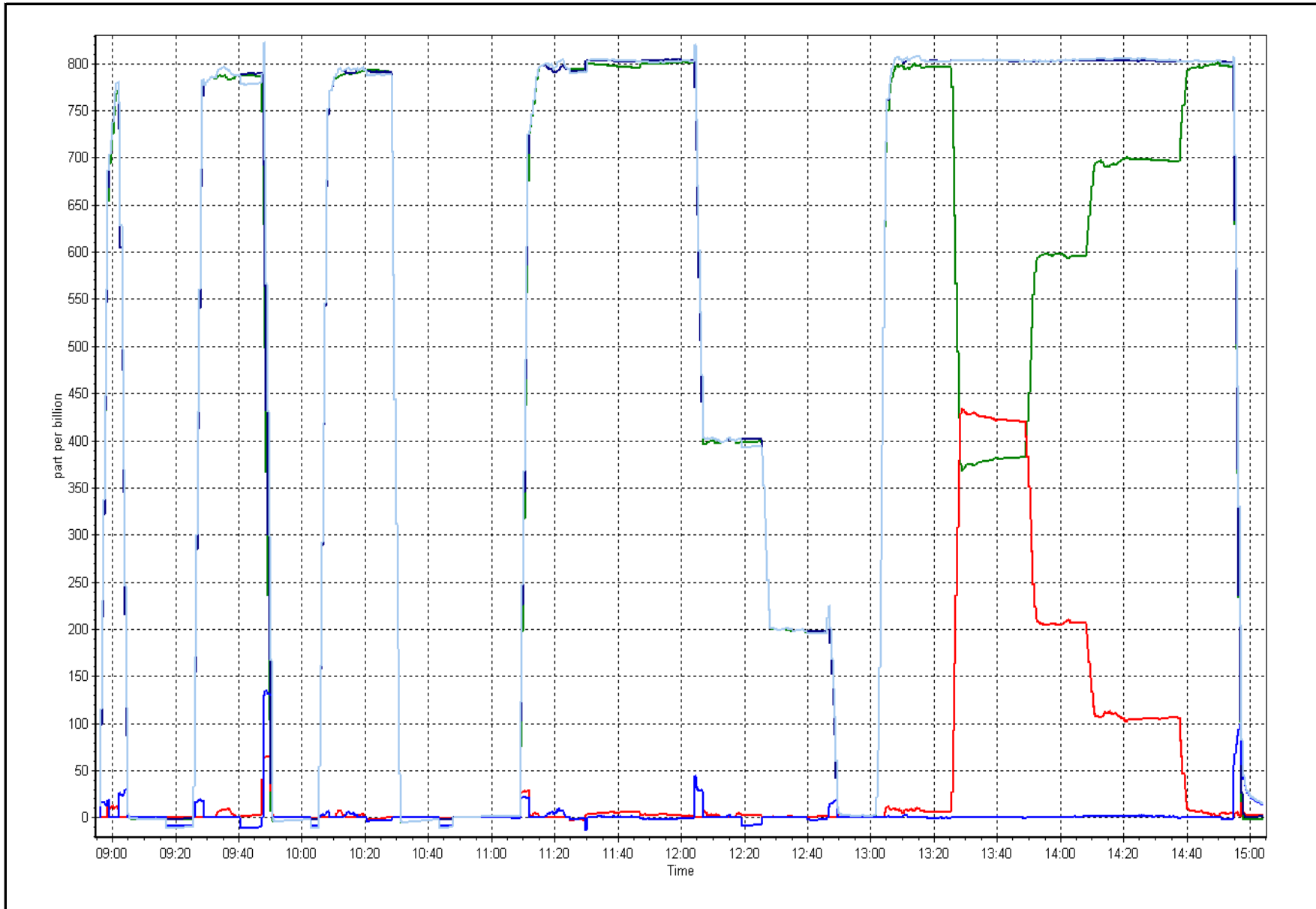
NH₃ Calibration Plot

Date: June 10, 2016



NOX Calibration Plot

Date: June 9, 2016





Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	<u>June 9, 2016</u>	Previous Calibration:	<u>May 12, 2016</u>
Station Name:	<u>Patricia McInnis</u>	Station Number:	<u>AMS 6</u>
Start Time (MST):	<u>8:10</u>	End Time (MST):	<u>14:25</u>
Calibrator Make/Model:	<u>Delta Cal</u>	Calibrator Serial Number:	<u>141228</u>

SHARP INFORMATION			
Particulate Fraction:	<u>PM2.5</u>		
Make/Model:	<u>Thermo / SHARP 5030</u>		
Serial Number:			
C ₁₄ Source SN:			
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 type="checkbox"/> Neph <input checked="" type="checkbox"/>

CALIBRATION DATA

Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	4.0	3.7	-0.3	4.0
T2	19.8	23.8	4.0	19.8
T3	24.0	23.8	-0.2	24.0
T4	24.0	23.8	-0.2	24.0
RH (%)	41.0	42.4	1.4	41.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	960	955.3	-4.8	960

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1003	3	1003	1000

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	207		207
Neph	1.6		-0.7
C14	4.1		3.1
Indicated Concentration (ug/m3)	0.7	yes	-0.3
Offset 1	206.4		208.2
Offset 2	32.8		33

Leak Check (Quarterly)	
Leak Check Date:	Previous Leak Check Date: <u>February 12, 2016</u>

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:	<u>June 9, 2016</u>	Previous Foil Calibration:	May 20, 2015
Zeroed?:	<u>yes</u>		
Foil Mass:	<u>1167</u>		<u>Mass foil set S/N:2597</u>
Previous Correction Factor:	<u>6975</u>		
New Correction Factor:	<u>6888</u>		

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	09/06/2016
Pump	Good	
Filter Tape	Good	
Mass Foil Cal Set	na	09/06/2016
HEPA filter	Good	09/06/2016

NOTES:

T1-4 checked. T2 low by 4.0 degrees. Suspect this to be because of low temperatures outside causing the inlet tube to be lower temperature than the station temperature. P3 checked. RH checked. No issues. Mass foil calibration completed. Nephelometer zeroed.

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	June 14, 2016	Previous Calibration:	June 10, 2016
Station Name:	Patricia McInnis	Station Number:	AMS 6
Start Time (MST):	12:58	End Time (MST):	14:16
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	141228

SHARP INFORMATION			
Particulate Fraction:		PM2.5	
Make/Model:		Thermo / SHARP 5030	
Serial Number		E1475	
C ₁₄ Source SN:		5680	
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	23.0	24.7	1.7	25.0
T2	22.0	NA	#VALUE!	22.0
T3	23.0	NA	#VALUE!	23.0
T4	18.0	NA	#VALUE!	18.0
RH (%)	35.0	NA	#VALUE!	35.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	958	956.0	-2.0	958

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1005	1002	-3	1013	1005

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	210		211
Neph	1.9		0
C14	13.5		-2.2
Indicated Concentration (ug/m3)	1.5	no	0
Offset 1	207.9		210.2
Offset 2	33		33.4

Leak Check (Quarterly)			
Leak Check Date:	June 14, 2016	Previous Leak Check Date:	February 12, 2016
	Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	1002.00		0.00
*Flow with adaptor (LPM):	1002.00		
<i>*Note - do not attach adaptor without shutting off the pump first</i>			

Mass Foil Calibration (Annually)			
Foil Calibration Date:		Previous Foil Calibration:	June 9, 2016
Zeroed?:			
Foil Mass:			Mass foil set S/N:2597
Previous Correction Factor:			
New Correction Factor:			

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good	09/06/2016
Pump	Good	
Filter Tape	Good	
Mass Foil Cal Set	na	09/06/2016
HEPA filter	Good	09/06/2016

NOTES:

T1 adjusted, NEPHALOMETER zero adjusted, no other adjustments. These adjustments were performed after maintenance was done to correct a particulate build up on the BETA chamber head which was causing some positive spiking.

Calibration Performed By: Zach Eastman



Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	<u>June 16, 2016</u>	Previous Calibration:	<u>June 14, 2016</u>
Station Name:	<u>Patricia McInnis</u>	Station Number:	<u>AMS 6</u>
Start Time (MST):	<u>15:09</u>	End Time (MST):	
Calibrator Make/Model:	<u>Delta Cal</u>	Calibrator Serial Number:	<u>141228</u>

SHARP INFORMATION			
Particulate Fraction:		PM2.5	
Make/Model:		Thermo / SHARP 5030	
Serial Number:		E1475	
C ₁₄ Source SN:		5680	
Confirmation of Time settings:		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Parameters Checked:	T1 <input type="checkbox"/>	T2 <input type="checkbox"/>	T3 <input type="checkbox"/> T4 <input type="checkbox"/> P3 <input type="checkbox"/> Main Flow <input 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	NA	NA	#VALUE!	NA
T2	NA		#VALUE!	NA
T3	NA		#VALUE!	NA
T4	NA		#VALUE!	NA
RH (%)	NA		#VALUE!	NA

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	NA	NA	#VALUE!	NA

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
NA	NA	#VALUE!	NA	NA

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	207		206
Neph	-0.6		-1
C14	1.5		0.9
Indicated Concentration (ug/m3)	-1	yes	0
Offset 1	209		209.5
Offset 2	33.4		33.1

Leak Check (Quarterly)			
Leak Check Date:	<u>June 14, 2016</u>	Previous Leak Check Date:	<u>February 12, 2016</u>
	Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	NA		#VALUE!
*Flow with adaptor (LPM):	NA		
<i>*Note - do not attach adaptor without shutting off the pump first</i>			

Mass Foil Calibration (Annually)			
Foil Calibration Date:		Previous Foil Calibration:	<u>June 9, 2016</u>
Zeroed?:	<u>NA</u>		
Foil Mass:	<u>NA</u>		<u>Mass foil set S/N:2597</u>
Previous Correction Factor:	<u>NA</u>		
New Correction Factor:	<u>NA</u>		

INSPECTION DATA			
Item	Condition		Date of install or rebuild
Cyclone	Good		09/06/2016
Pump	Good		
Filter Tape	Good		
Mass Foil Cal Set	na		09/06/2016
HEPA filter	Good		09/06/2016

NOTES:

Re-check and adjust NEPH zero after baseline drift into negative since repair on June 14 2016.

Calibration Performed By: Zach Eastman



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 7
ATHABASCA VALLEY
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ATHABASCA VALLEY (AMS 7)
 JUNE 2016

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	684	35	36	99.86	17	0	3	0
TRS (ppb) Average	685	33	35	99.72	1	0	1	0
THC (ppm) Average	684	35	36	99.86	2.5	-	2.1	-
NMHC (ppm) Average	684	35	36	99.86	0.465	-	0.108	-
CH4(ppm) Average	684	35	36	99.86	2.2	-	2	-
O3 (ppb) Average	686	33	34	99.86	64	0	46	-
NO2 (ppb) Average	684	35	36	99.86	12	0	6	-
NO (ppb) Average	684	35	36	99.86	10	-	2	-
NOX (ppb) Average	684	35	36	99.86	14	-	8	-
PM2.5 (ug/m3) Average	704	3	16	98.19	101.1	-	29.2	0
CO(ppm) Average	684	34	36	99.72	0.6	0	0.2	-
Temperature 2 m (C) Average	720	0	0	100.00	30.5	-	23.8	-
Barometric Pressure (inHg) Average	720	0	0	100.00	29.2	-	29.2	-
Relative Humidity (%) Average	720	0	0	100.00	99	-	86	-
Wind Speed 10 m (km/h) Average	720	0	0	100.00	30	-	17	-
Wind Direction 10 m (deg) Average	720	0	0	100.00	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ATHABASCA VALLEY (AMS 7)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	684	0.9	2	-	0	0	0	0	0	3	17
TRS (ppb) Average	685	0.3	0	-	0	0	0	0	0	0	1
THC (ppm) Average	684	1.89	0.1	-	1.8	1.8	1.8	1.9	1.9	2	2.5
NMHC (ppm) Average	684	0.013	0.045	-	0	0	0	0	0	0	0.465
CH4(ppm) Average	684	1.88	0.1	-	1.8	1.8	1.8	1.9	1.9	1.9	2.2
O3 (ppb) Average	686	32.3	11	-	8	17	25	33	39	46	64
NO2 (ppb) Average	684	2.7	2	-	0	1	1	2	4	6	12
NO (ppb) Average	684	1.1	1	-	0	0	0	1	2	3	10
NOX (ppb) Average	684	3.9	3	-	0	1	2	3	5	8	14
PM2.5 (ug/m3) Average	704	7.15	7.8	-	0.2	2.5	3.5	5.2	8.9	12.6	101.1
CO(ppm) Average	684	0.12	0.1	-	0	0.1	0.1	0.1	0.1	0.2	0.6
Temperature 2 m (C) Average	720	18.41	5.1	-	7.1	12.2	14.4	17.9	22	25.7	30.5
Barometric Pressure (inHg) Average	720	28.85	0.2	-	28.4	28.6	28.7	28.8	29	29.1	29.2
Relative Humidity (%) Average	720	57.9	20	-	16	30	41	58	75	86	99
Wind Speed 10 m (km/h) Average	720	9.7	6	-	0	3	5	8	13	18	30
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ATHABASCA VALLEY (AMS 7)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
TRS, O3, CO	01 Jun 2016 11:00	01 Jun 2016 11:00	1	Maintenance - sample manifold cleaned
AIR QUALITY ANALYZERS	02 Jun 2016 09:00	02 Jun 2016 09:00	1	Maintenance - sample manifold cleaned
PM2.5	02 Jun 2016 19:00	02 Jun 2016 19:00	1	Unstable operation - excessive baseline drift
PM2.5	03 Jun 2016 14:00	03 Jun 2016 14:00	1	Unstable operation - excessive baseline drift
PM2.5	06 Jun 2016 16:00	06 Jun 2016 19:00	4	Unstable operation - excessive baseline drift
PM2.5	21 Jun 2016 15:00	21 Jun 2016 21:00	7	Unstable operation - excessive baseline drift



Wood Buffalo Environmental Association
Summary of Hour Averages

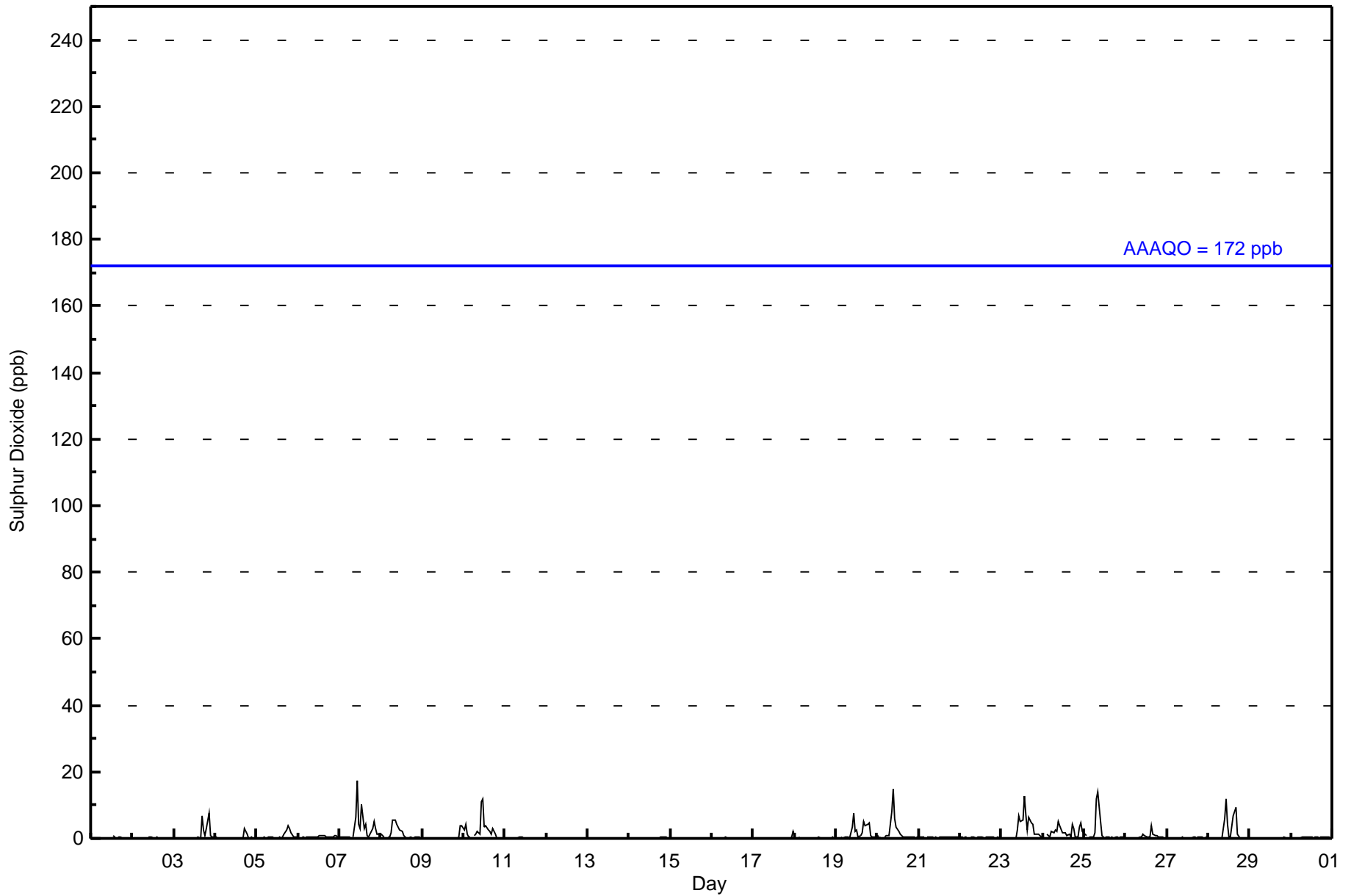
Sulphur Dioxide (SO₂) - ppb
Athabasca Valley - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 17 ppb on Jun 7 11:00 Maximum Daily Average: 3.0 ppb on Jun 7		Hours in Service: 720 Hours of Data: 684 Hours of Missing Data: 36 Hours of Calibration: 35 Percent Operational Time: 99.9																									
Minimum Value: 0 ppb on Jun 1 01:00 Maximum Diurnal Average: 2.6 ppb at hour 11 Monthly Average: 0.9 ppb		Minimum Daily Average: 0.1 ppb on Jun 12 Minimum Diurnal Average: 0.2 ppb at hour 5 Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 3 P ₉₉ = 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-Jun	0	0	Z	0	0	0	0	0	C	C	C	C	C	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1
2-Jun	0	0	0	Z	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
3-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	7	2	1	3	7	1	0	0	1.0	7	
4-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.3	3	
5-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	4	3	2	0	0	0	0.7	4	
6-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	1	1	1	0.5	1	
7-Jun	0	0	0	0	0	0	0	Z	0	6	17	4	3	10	3	4	1	0	2	3	5	3	1	1	3.0	17	
8-Jun	1	1	0	Z	0	0	2	6	6	4	3	3	2	1	0	0	0	0	0	0	0	0	0	0	1.4	6	
9-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0.4	4	
10-Jun	3	4	1	1	0	Z	1	1	2	1	11	12	3	4	3	2	1	3	1	0	0	0	0	0	2.4	12	
11-Jun	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	
12-Jun	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	
13-Jun	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	
14-Jun	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	
15-Jun	0	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
16-Jun	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	
17-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.2	2	
18-Jun	1	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	1	
19-Jun	0	0	Z	1	0	0	0	0	0	3	8	2	3	0	1	2	5	4	4	5	1	1	1	0	1.8	8	
20-Jun	1	0	0	Z	0	1	1	1	8	15	6	3	2	1	1	1	0	0	0	0	0	0	0	0	1.9	15	
21-Jun	0	0	0	0	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0.4	1	
22-Jun	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	
23-Jun	Z	0	0	0	0	0	0	0	0	2	7	5	6	13	7	2	6	5	4	1	1	1	1	1	2.8	13	
24-Jun	1	Z	1	1	0	2	2	3	2	5	4	2	2	1	1	1	4	3	0	0	3	5	2	2	2.0	5	
25-Jun	1	1	Z	0	1	1	2	12	14	5	1	0	0	1	1	0	0	0	0	0	0	0	0	0	1.8	14	
26-Jun	0	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	4	1	1	1	0	0	0	0	0	0.6	4	
27-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.2	1	
28-Jun	0	0	0	0	0	Z	0	0	0	6	12	4	0	0	7	8	9	1	0	0	0	0	0	0	2.2	12	
29-Jun	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	
30-Jun	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	
																								Diurnal Average			
																								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
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Athabasca Valley - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Athabasca Valley - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	676	98.83	98.83
11 - 20	8	1.17	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Athabasca Valley - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	65	15	18	15	22	45	113	45	33	24	42	55	29	32	36	87	676
11 - 20	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	8
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
Totals	70	16	18	15	22	45	113	45	33	24	42	55	29	32	36	89	684

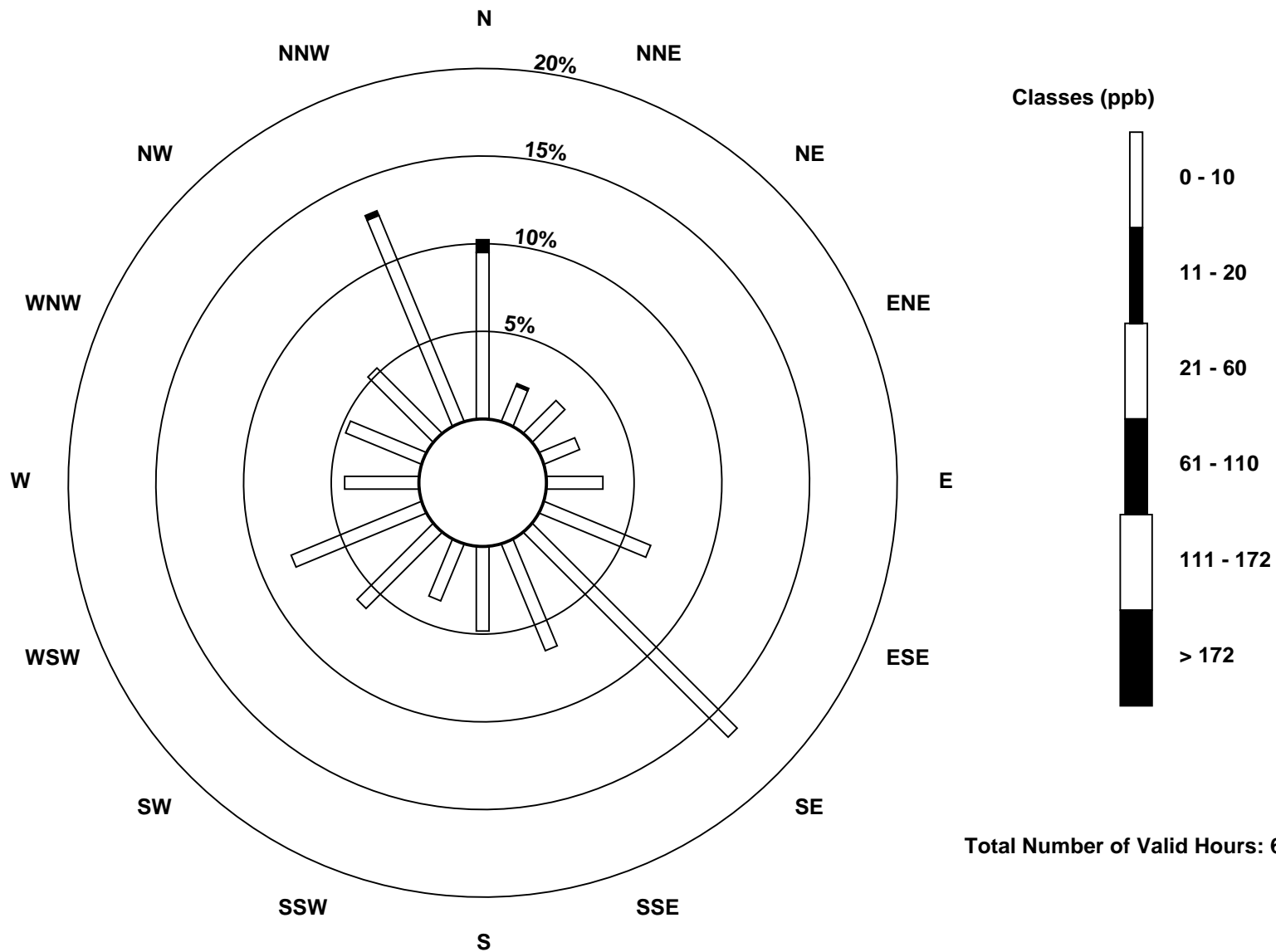
Total Number of Valid Hours: 684

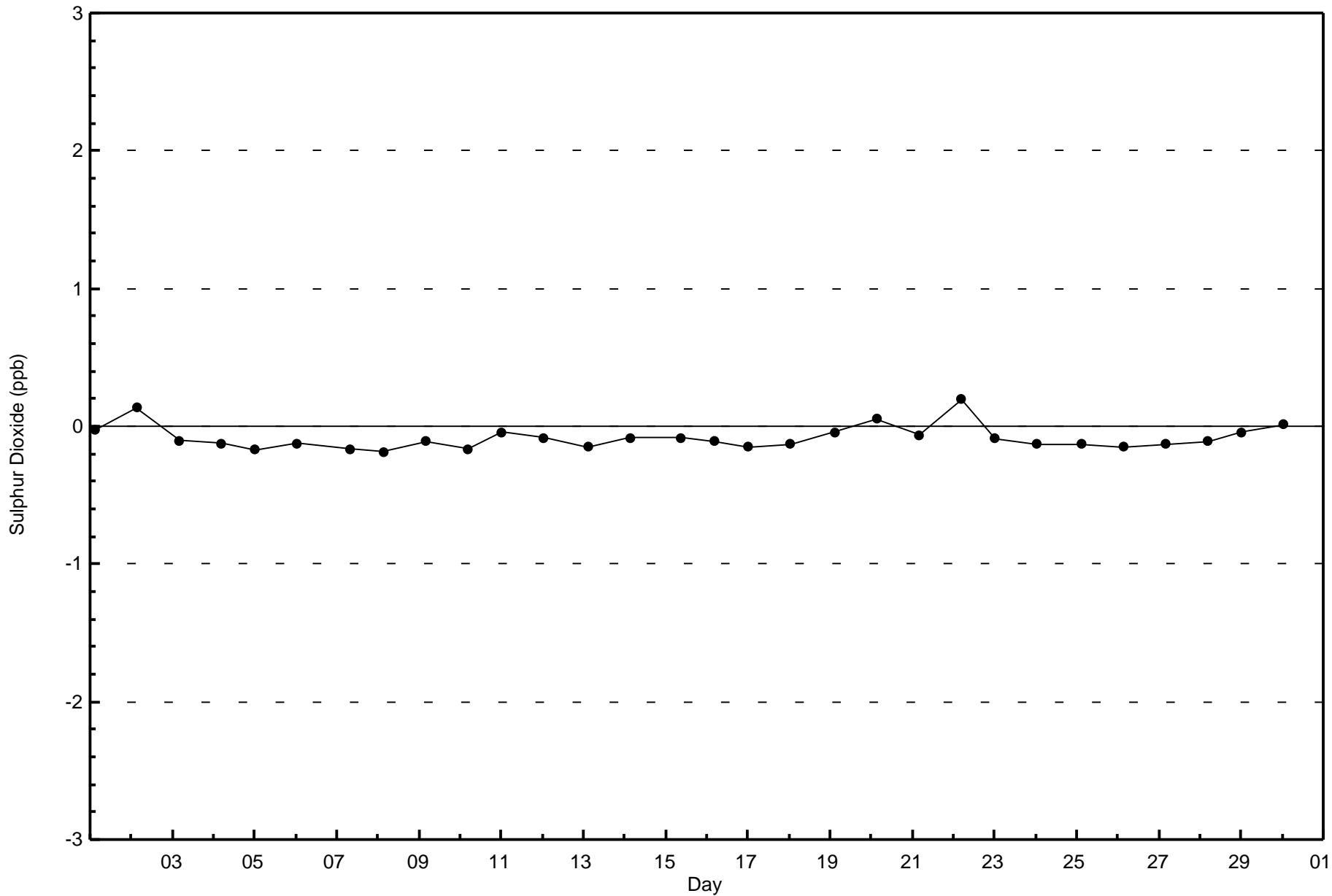
Total Number of Hours: 720

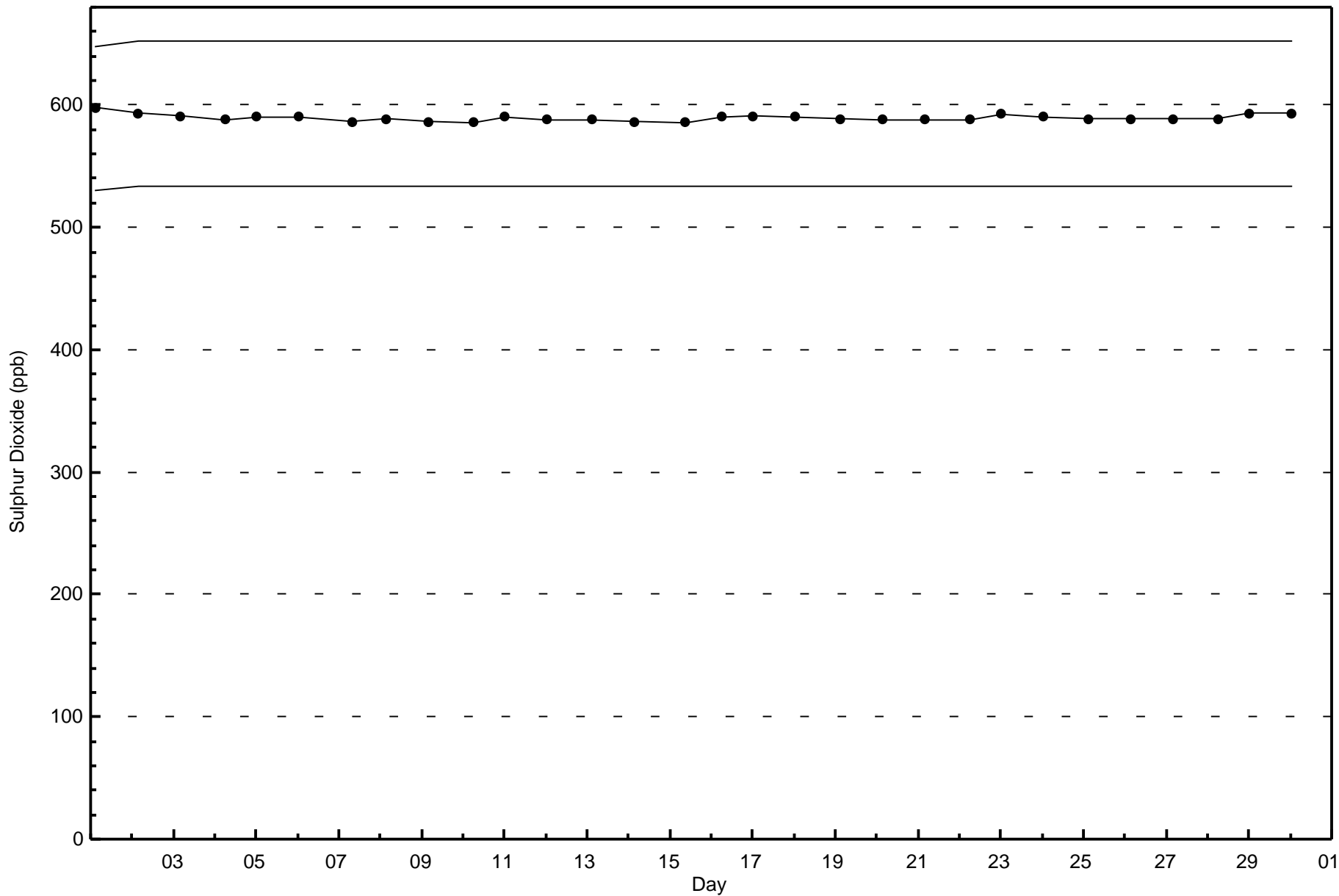


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Sulphur Dioxide (SO₂) - ppb
Athabasca Valley (AMS 7)









Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 1 ppb on Jun 8 09:00	Maximum Daily Average: 0.6 ppb on Jun 8		Hours of Data:	685
Minimum Value: 0 ppb on Jun 14 14:00	Minimum Daily Average: 0.2 ppb on Jun 16		Hours of Missing Data:	35
Maximum Diurnal Average: 0.4 ppb at hour 5	Minimum Diurnal Average: 0.2 ppb at hour 15		Hours of Calibration:	33
Monthly Average: 0.3 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1		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-Jun	0	0	0	Z	1	1	1	1	1	1	M	0	0	0	0	0	0	0	0	0	0	0	1	0	0.4	1
2-Jun	0	0	0	1	Z	1	1	1	M	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.4	1
3-Jun	0	0	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
4-Jun	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
5-Jun	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
6-Jun	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
7-Jun	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	1
8-Jun	1	1	1	1	Z	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.6	1
9-Jun	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
10-Jun	0	1	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
11-Jun	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
12-Jun	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
13-Jun	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
14-Jun	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
15-Jun	0	0	0	0	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Jun	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
17-Jun	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
18-Jun	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
19-Jun	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
20-Jun	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
21-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
22-Jun	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
23-Jun	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	1	1	0.4	1
24-Jun	1	0	Z	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	0	0	1	1	1	0.5	1
25-Jun	1	1	1	Z	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.5	1
26-Jun	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
27-Jun	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
28-Jun	0	0	0	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
29-Jun	0	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
30-Jun	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

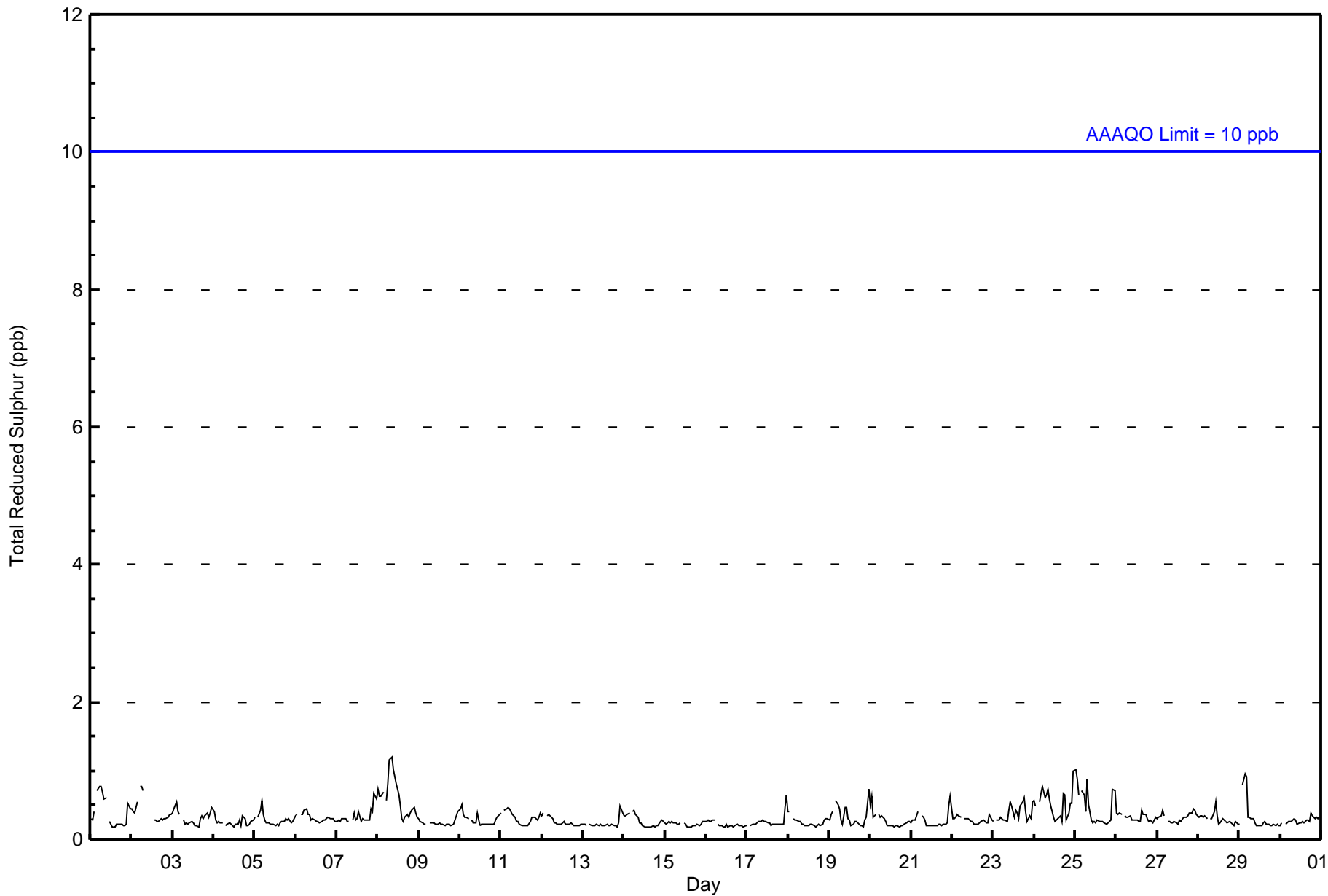
0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	Diurnal Average
1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	0	0	1	1	1	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Athabasca Valley - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Athabasca Valley - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	685	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: 685

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Athabasca Valley - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	69	17	17	16	19	45	120	44	32	22	42	57	28	31	36	90	685
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
Totals	69	17	17	16	19	45	120	44	32	22	42	57	28	31	36	90	685

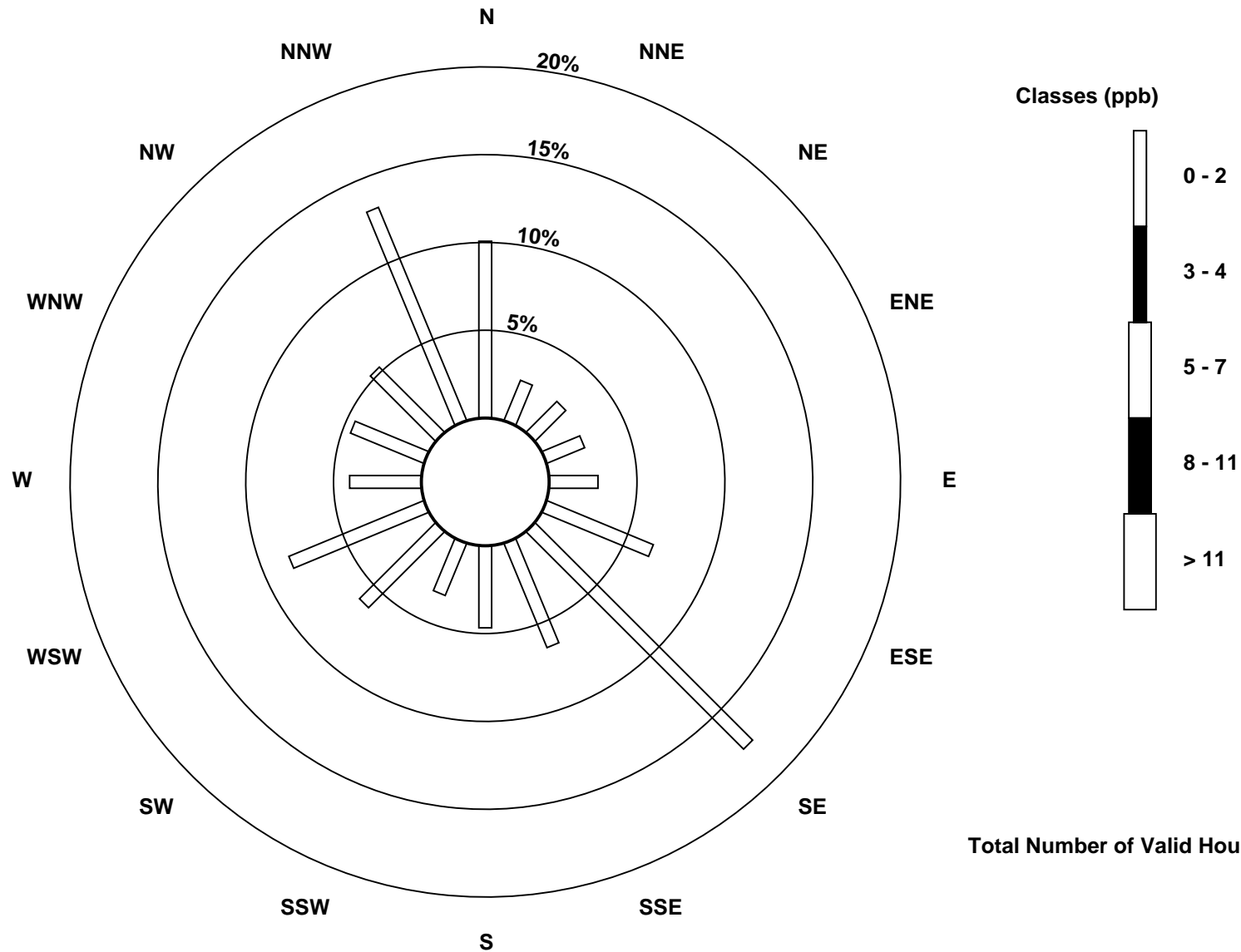
Total Number of Valid Hours: 685

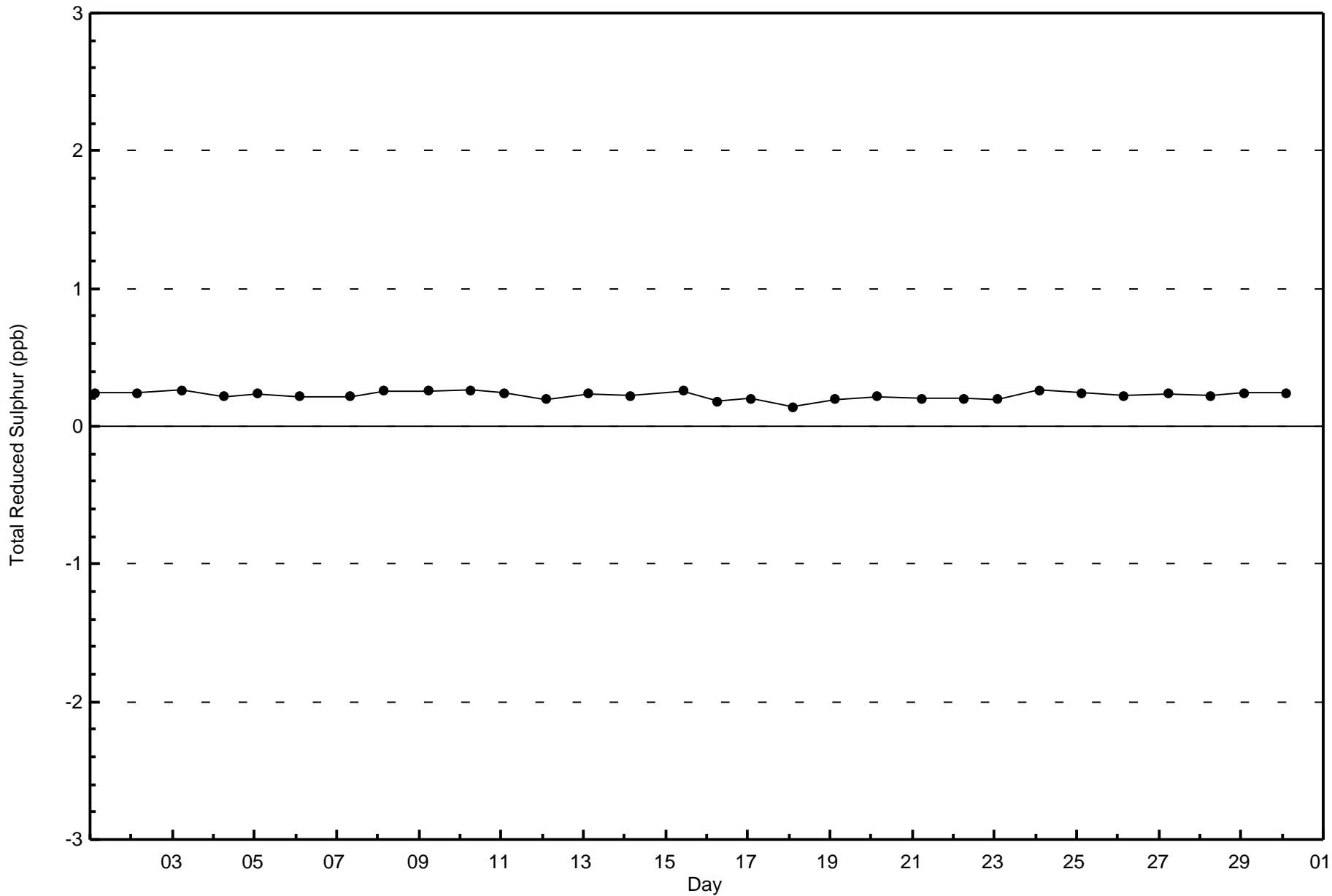
Total Number of Hours: 720

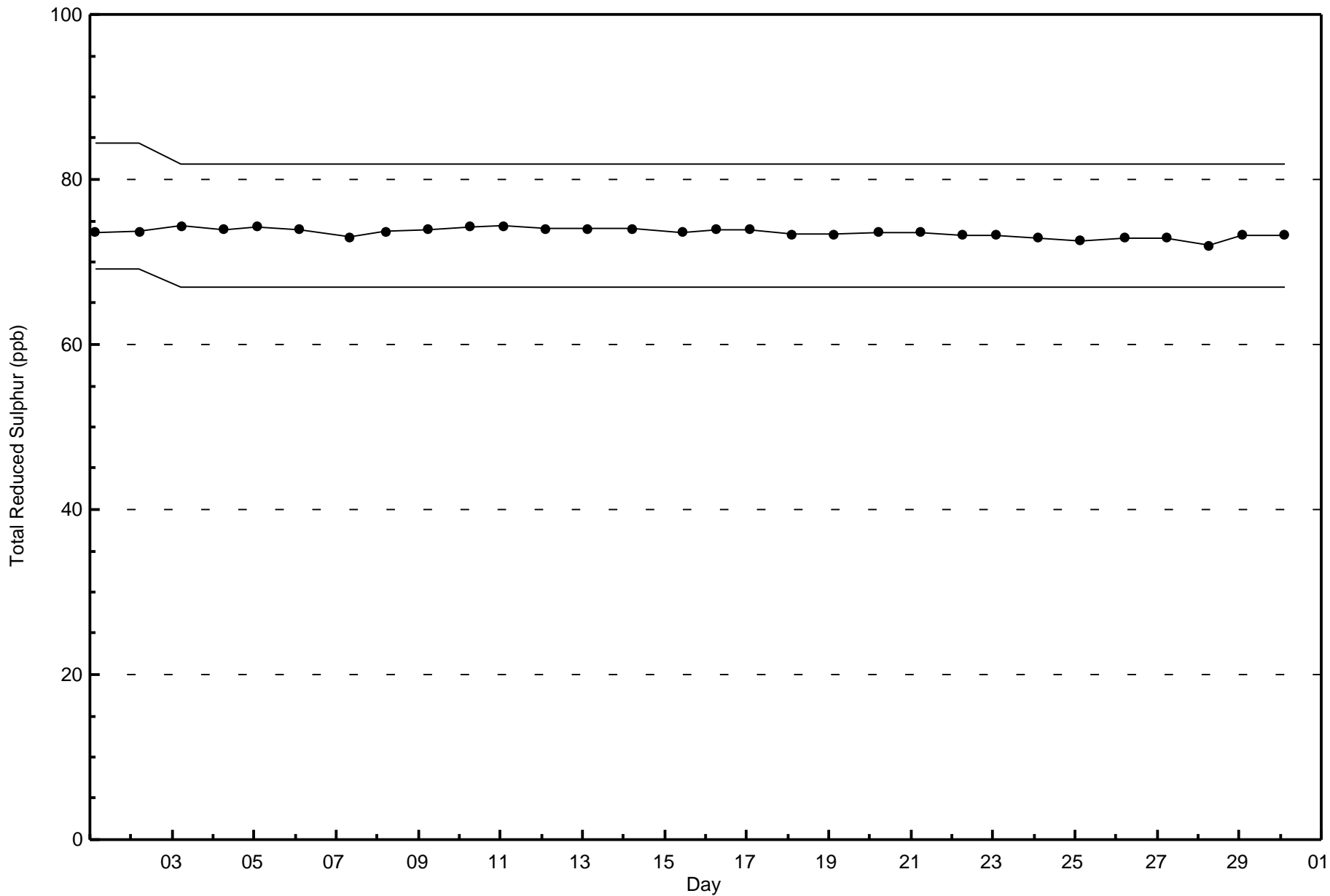


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Total Reduced Sulphur (TRS) - ppb
Athabasca Valley (AMS 7)



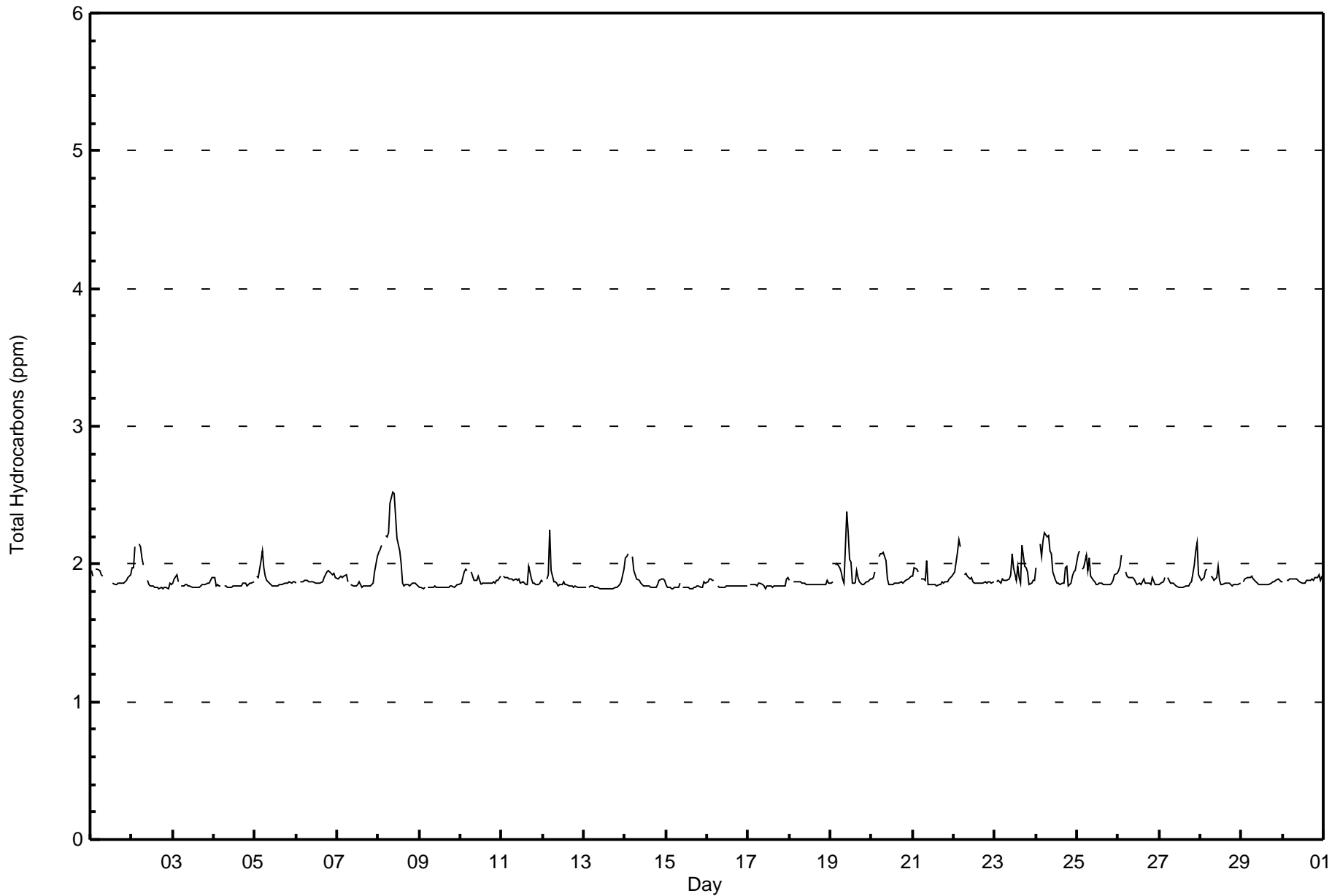






Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Athabasca Valley - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Athabasca Valley - June 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	638	93.27	93.27
2.1 - 3.0	46	6.73	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Athabasca Valley - June 2016

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	64	16	18	14	21	39	105	44	32	24	42	55	29	30	33	72	638
2.1 - 3.0	6	0	0	1	1	6	8	1	1	0	0	0	0	2	3	17	46
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
Totals	70	16	18	15	22	45	113	45	33	24	42	55	29	32	36	89	684

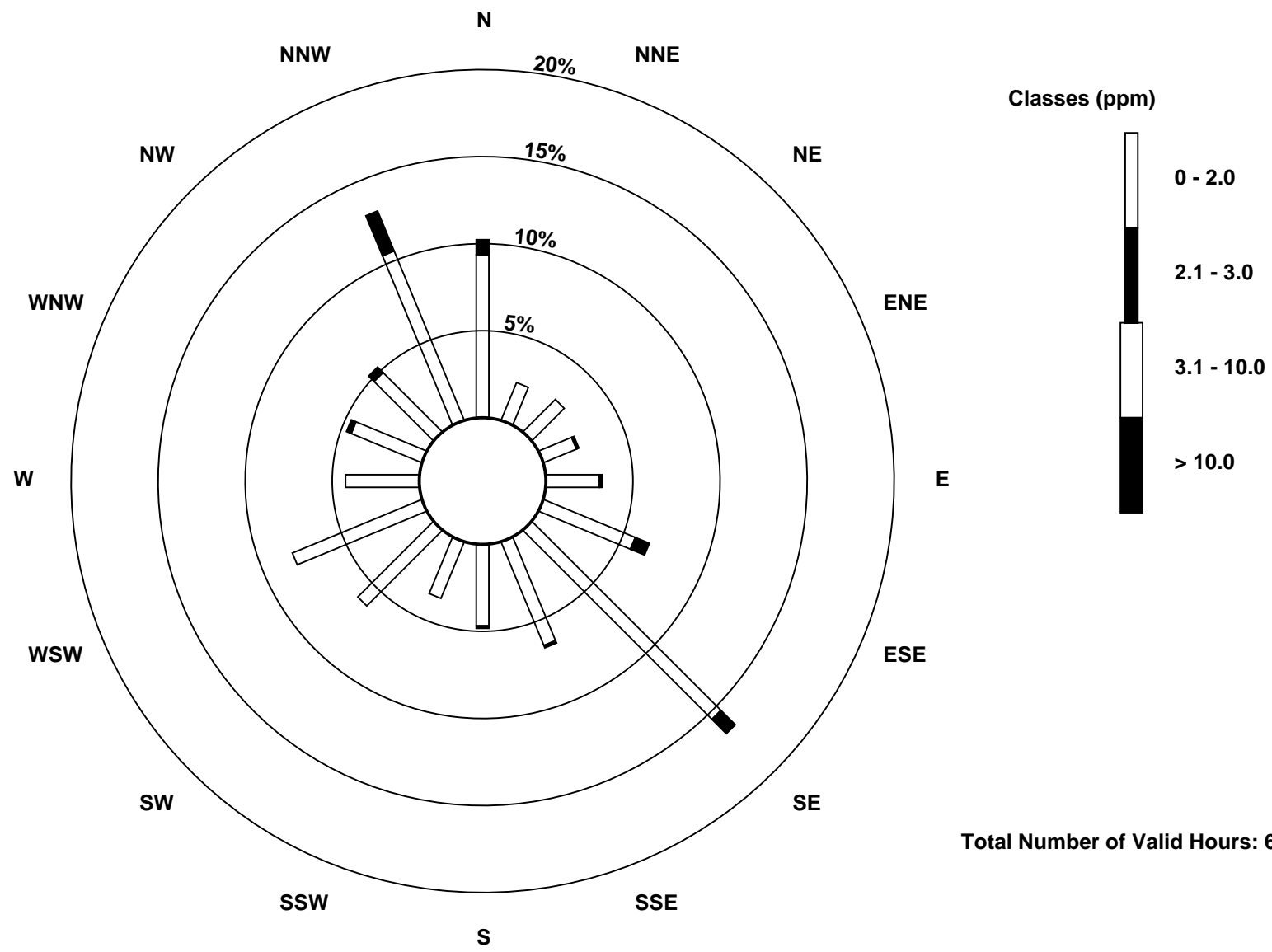
Total Number of Valid Hours: 684

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

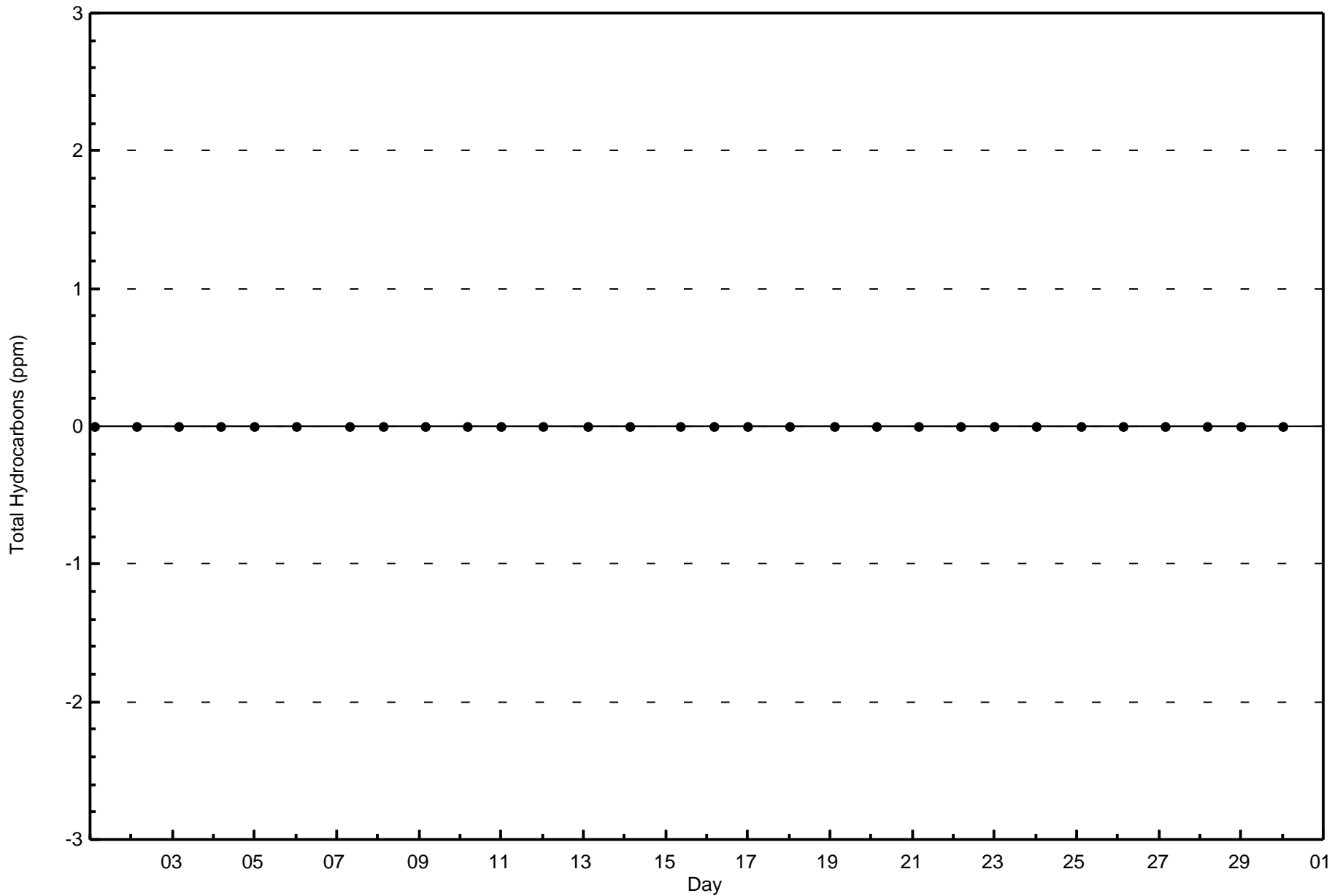
Total Hydrocarbons (THC) - ppm
Athabasca Valley (AMS 7)

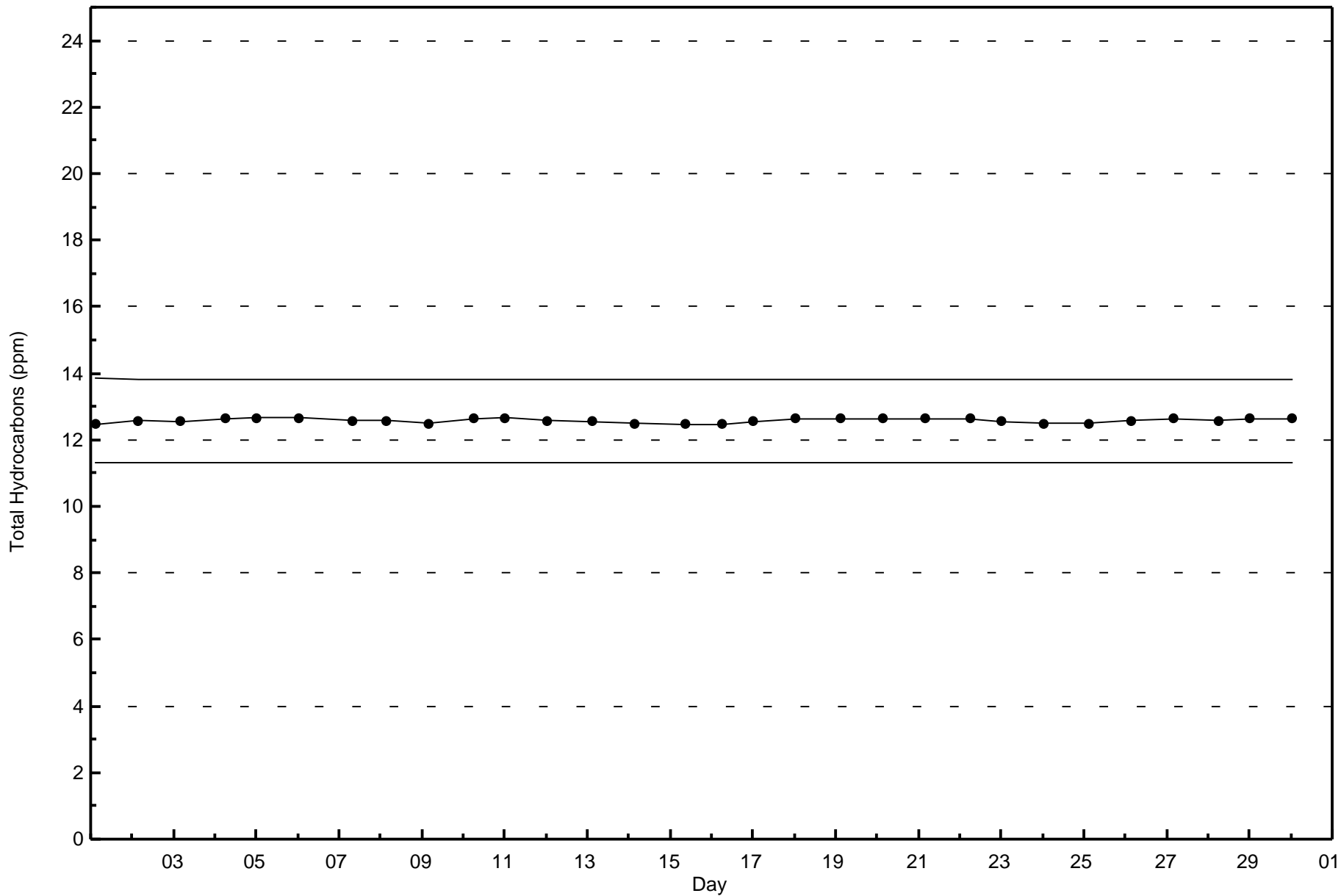


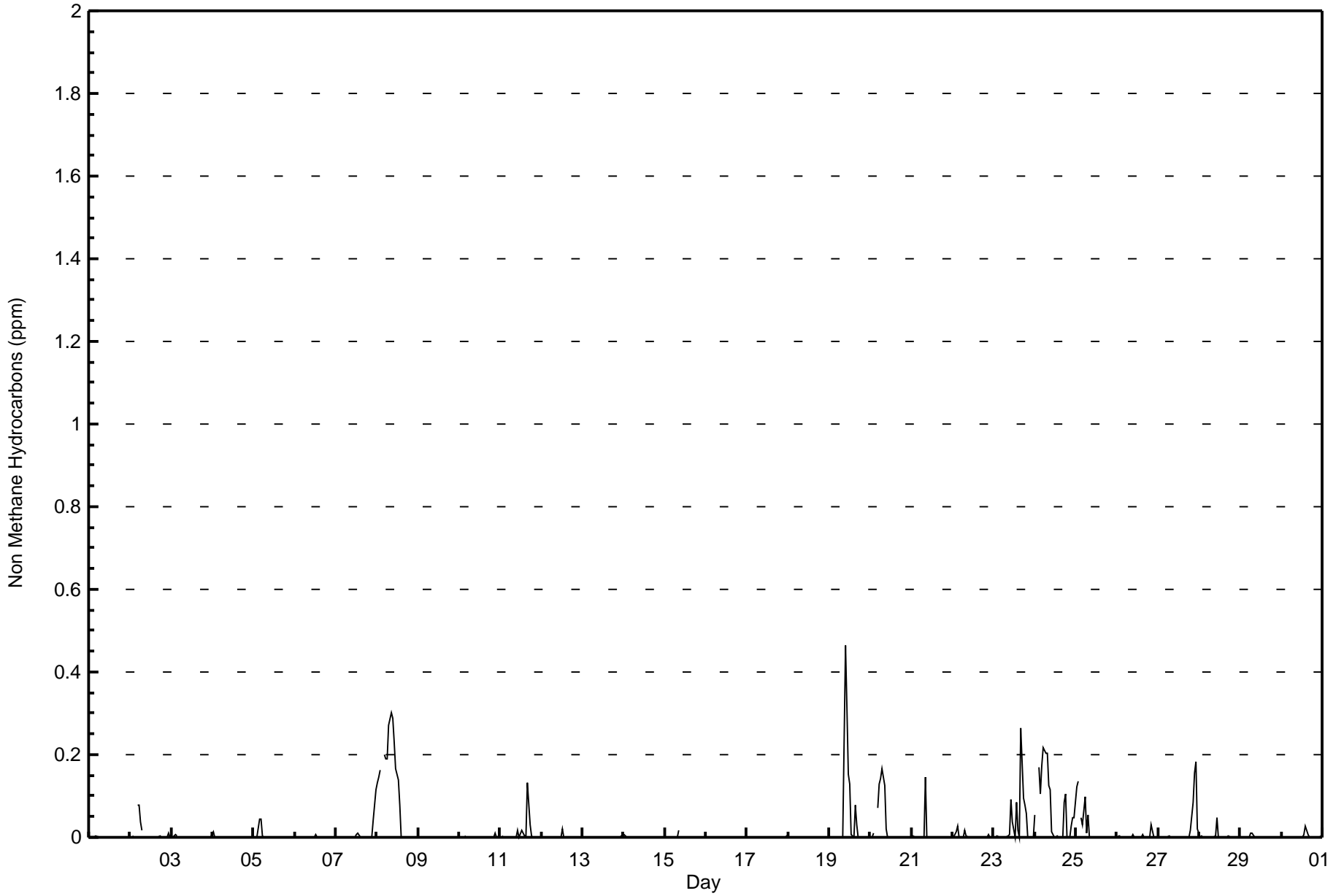


Wood Buffalo Environmental Association
Zero Responses

Total Hydrocarbons (THC) - ppm
Athabasca Valley - June 2016









**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Athabasca Valley - June 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	584	85.38	85.38
0.006 - 0.05	50	7.31	92.69
0.06 - 0.1	29	4.24	96.93
> 0.1	21	3.07	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 720



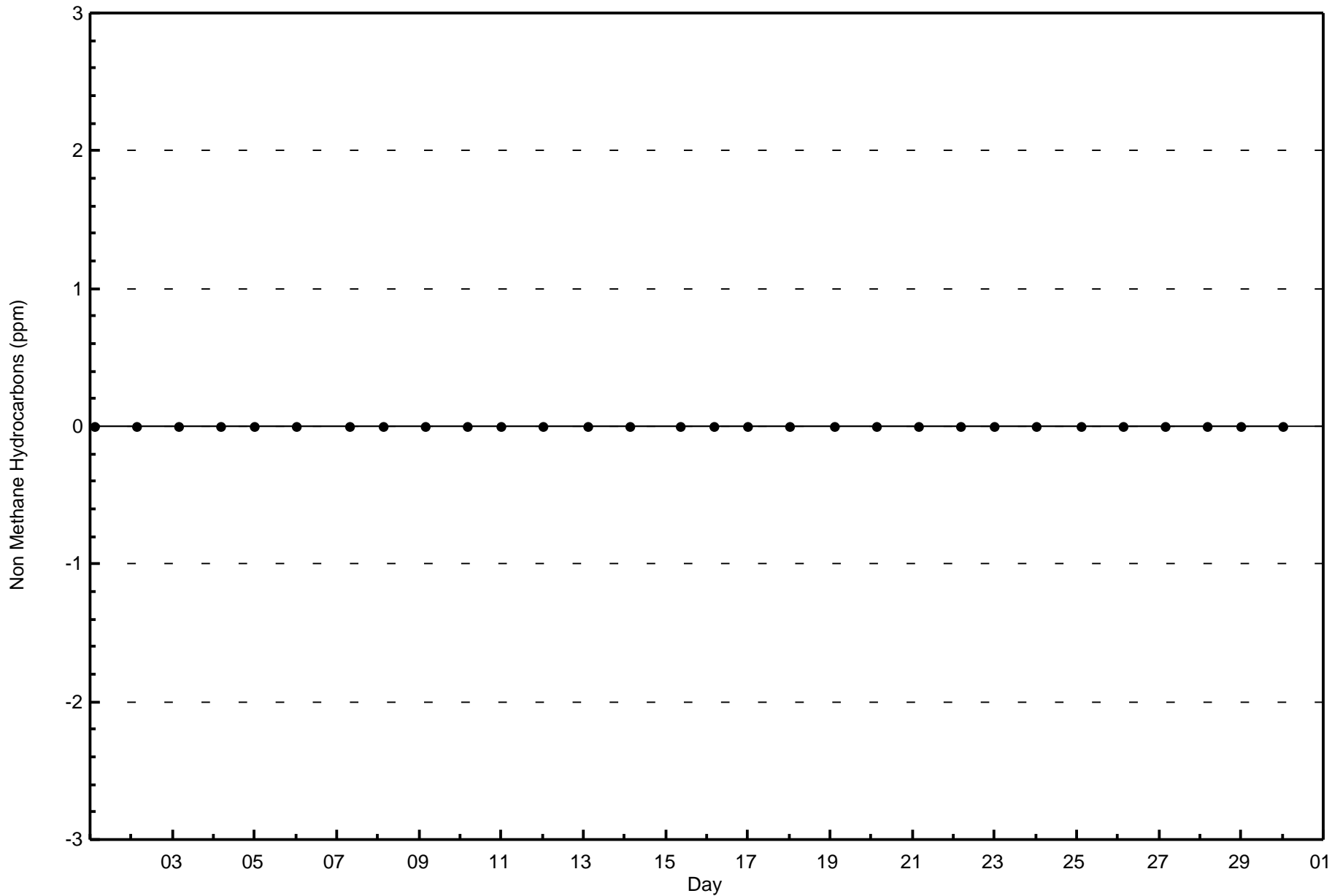
**Wood Buffalo Environmental Association
Frequency Distribution**

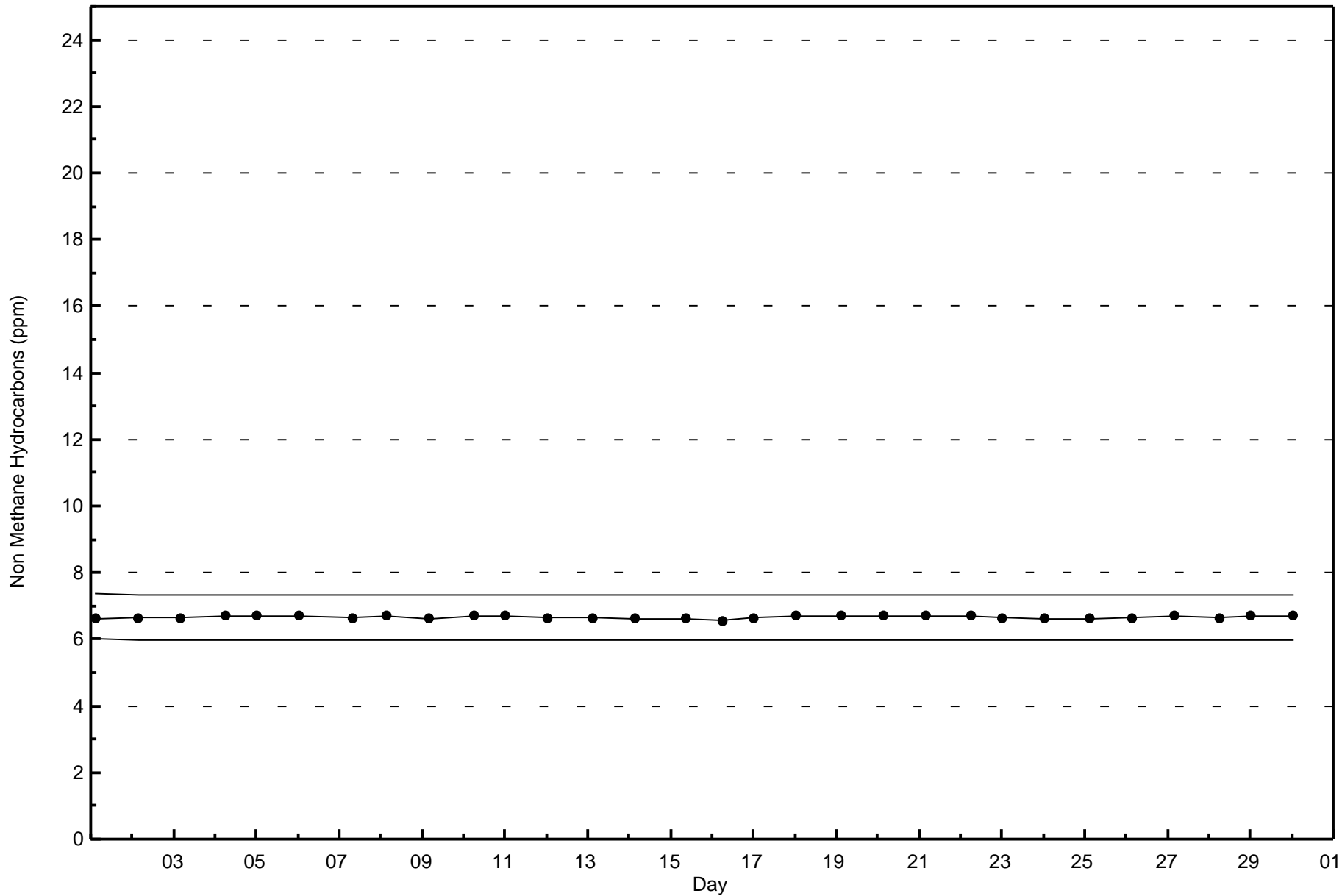
**Non Methane Hydrocarbons (NMHC) - ppm
Athabasca Valley - June 2016**

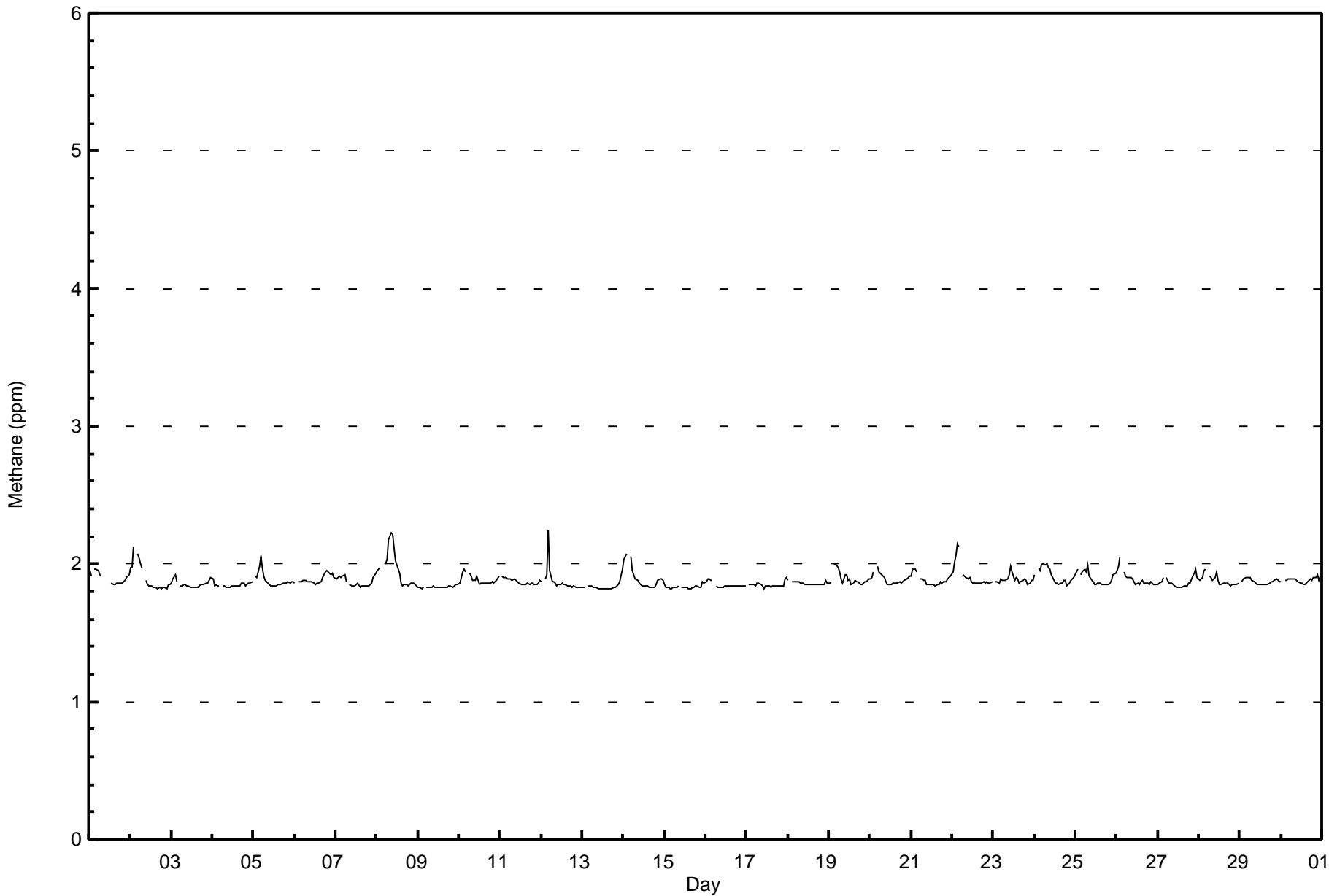
Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	51	16	16	13	21	34	94	41	33	24	41	54	26	30	30	60	584
0.006 - 0.05	8	0	1	1	0	5	15	4	0	0	1	1	3	0	2	9	50
0.06 - 0.1	5	0	1	0	1	4	4	0	0	0	0	0	0	1	3	10	29
> 0.1	6	0	0	1	0	2	0	0	0	0	0	0	0	1	1	10	21
Totals	70	16	18	15	22	45	113	45	33	24	42	55	29	32	36	89	684

Total Number of Valid Hours: 684

Total Number of Hours: 720









**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Methane (CH₄) - ppm
Athabasca Valley - June 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	670	97.95	97.95
2.1 - 3.0	14	2.05	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Methane (CH₄) - ppm
Athabasca Valley - June 2016**

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	70	16	18	15	22	44	106	44	32	24	42	55	29	32	36	85	670
2.1 - 3.0	0	0	0	0	0	1	7	1	1	0	0	0	0	0	0	4	14
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
Totals	70	16	18	15	22	45	113	45	33	24	42	55	29	32	36	89	684

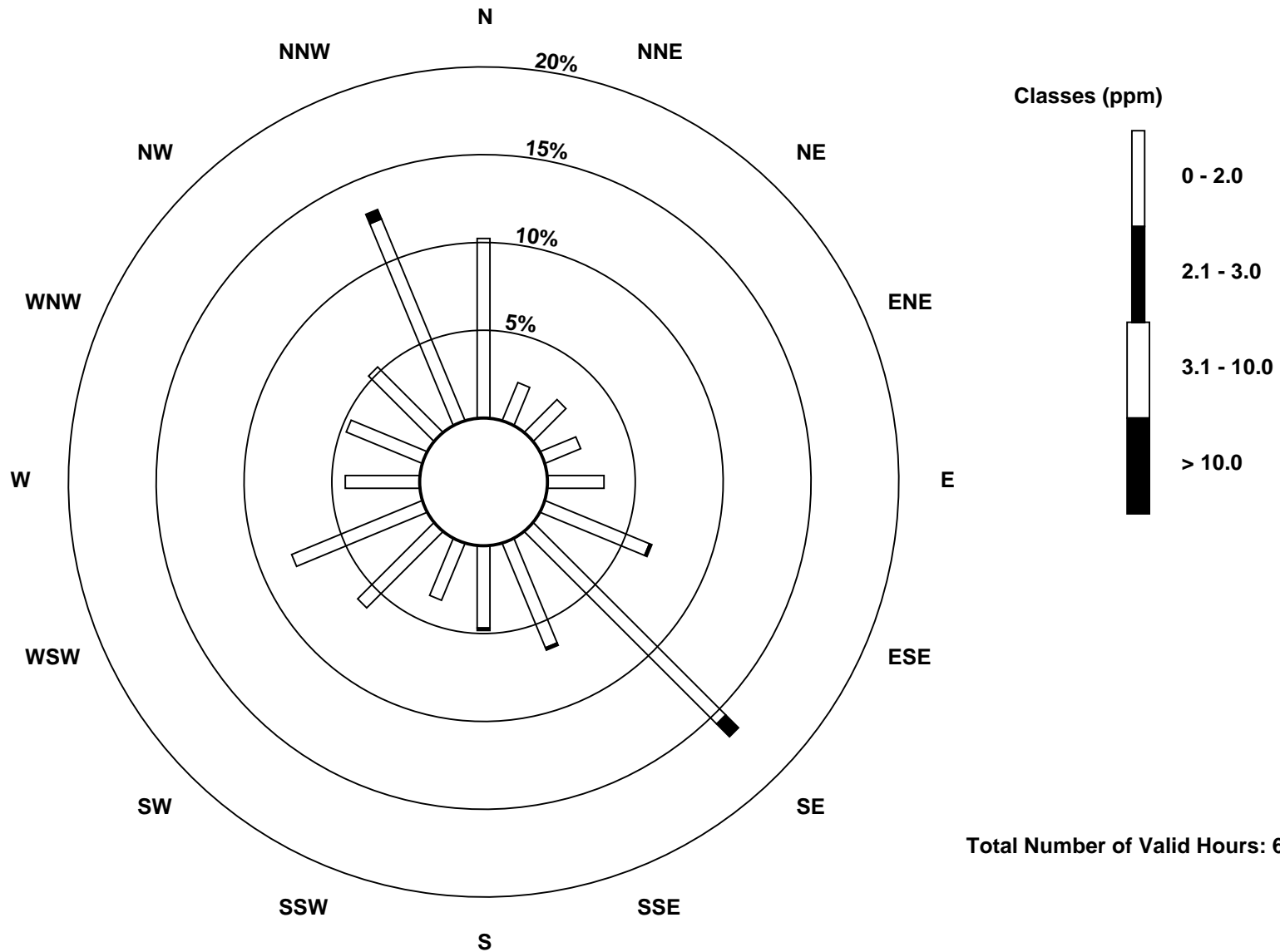
Total Number of Valid Hours: 684

Total Number of Hours: 720

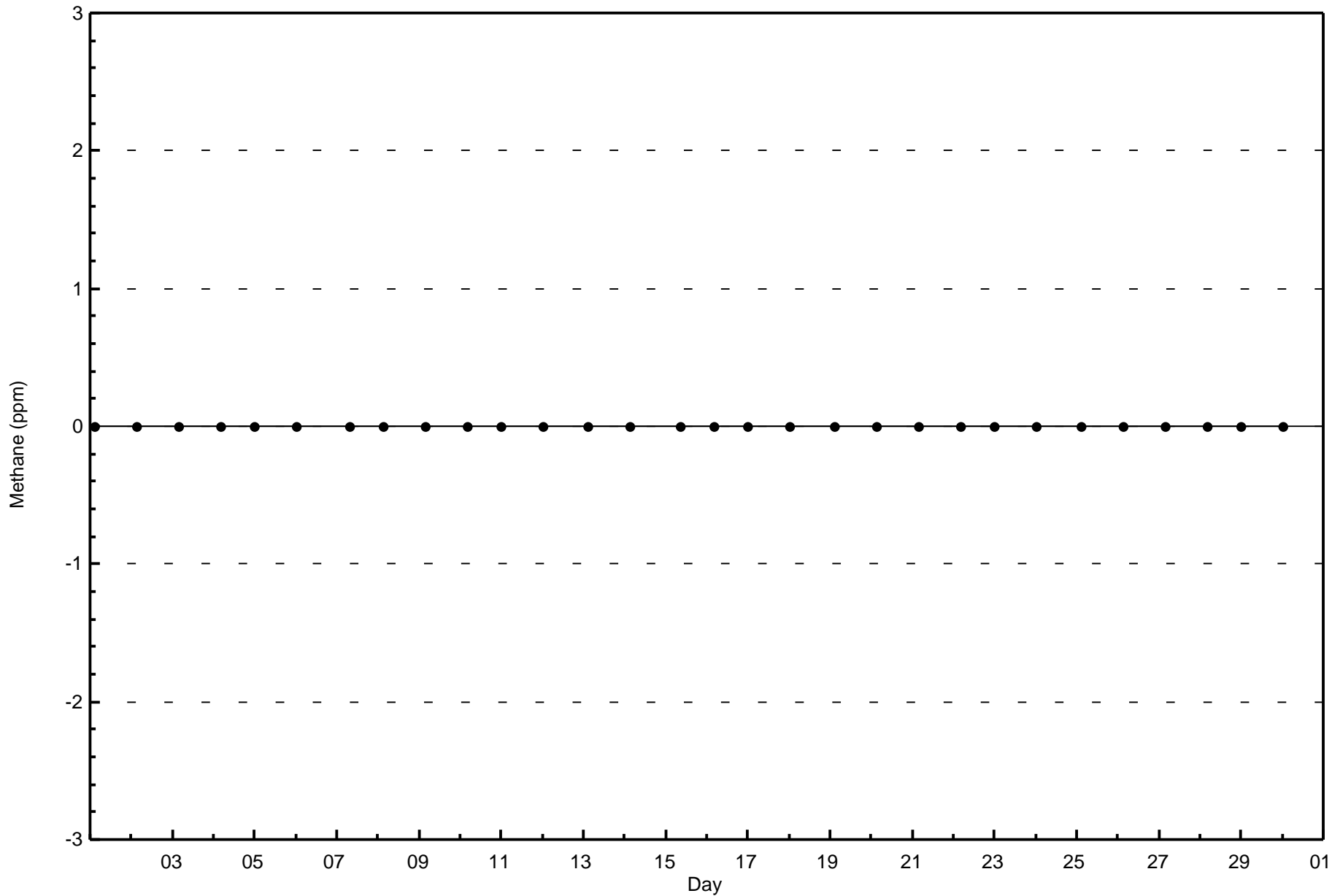


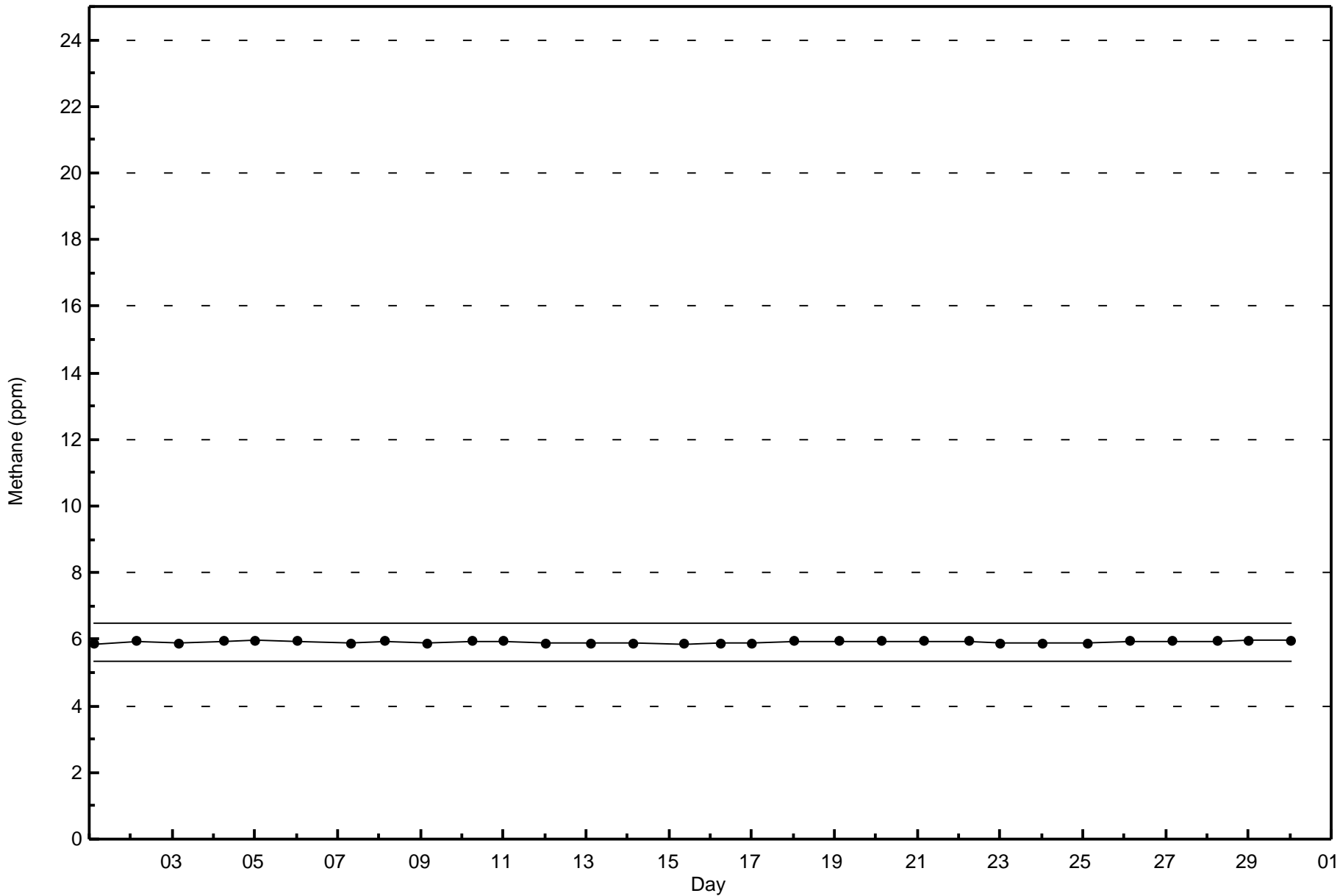
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Methane (CH₄) - ppm
Athabasca Valley (AMS 7)



Total Number of Valid Hours: 684







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Athabasca Valley - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 64 ppb on Jun 6 19:00	Maximum Daily Average: 45.6 ppb on Jun 6
Minimum Value: 8 ppb on Jun 2 05:00	Minimum Daily Average: 24.3 ppb on Jun 27
Maximum Diurnal Average: 41.3 ppb at hour 16	Minimum Diurnal Average: 20.1 ppb at hour 5
Monthly Average: 32.3 ppb	Percentiles: P ₁ = 10 P ₁₀ = 17 Q ₁ = 25 Median = 33 Q ₃ = 39 P ₉₀ = 46 P ₉₉ = 60
	Hours of Data: 686
	Hours of Missing Data: 34
	Hours of Calibration: 33
	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-Jun	15	15	14	14	Z	14	14	14	15	17	M	30	33	37	36	34	34	35	35	34	31	26	22	18	24.5	37
2-Jun	14	13	8	8	8	Z	9	C	C	C	39	41	39	40	39	40	37	33	33	30	24	26	20	17	25.9	41
3-Jun	14	10	8	11	12	16	Z	18	19	22	27	33	36	38	40	41	40	42	41	37	36	36	26	21	27.3	42
4-Jun	21	37	39	37	37	37	38	Z	40	43	45	47	47	48	46	44	49	46	43	45	43	39	33	27	40.5	49
5-Jun	20	23	Z	10	11	19	25	30	34	37	38	38	38	38	39	38	38	40	39	37	29	34	32	31	31.2	40
6-Jun	31	30	29	Z	27	27	26	27	29	31	35	46	59	62	61	63	62	61	64	60	58	54	53	54	45.6	64
7-Jun	50	47	45	43	38	34	39	39	41	Z	54	52	49	48	49	48	44	42	44	46	42	35	30	24	42.7	54
8-Jun	20	20	16	14	16	Z	22	26	25	29	31	35	36	38	39	41	43	43	42	38	36	36	35	31	30.9	43
9-Jun	31	33	36	33	30	27	Z	30	27	25	29	35	38	35	33	38	39	42	39	38	38	36	32	32	33.7	42
10-Jun	29	27	23	20	18	17	18	Z	28	32	33	33	34	35	37	39	40	39	39	36	30	24	19	13	28.8	40
11-Jun	14	17	Z	17	15	16	17	18	20	23	26	31	36	40	38	34	33	34	31	29	25	26	20	18	25.0	40
12-Jun	21	16	17	Z	18	19	20	22	23	25	26	26	30	32	34	35	33	34	36	37	37	37	33	33	28.1	37
13-Jun	32	31	28	27	Z	23	25	25	27	30	34	36	37	38	37	38	39	40	42	43	41	31	24	18	32.3	43
14-Jun	16	14	13	13	14	Z	22	24	28	35	40	44	45	45	43	44	49	48	49	49	53	46	46	46	35.9	53
15-Jun	44	46	44	47	46	44	42	42	40	39	35	Z	34	34	35	37	38	39	41	43	38	37	28	28	39.1	47
16-Jun	24	23	23	25	24	24	29	Z	29	29	29	29	28	27	27	27	27	26	24	23	24	24	26	22	25.7	29
17-Jun	21	19	Z	16	14	13	17	19	21	26	30	30	32	34	36	35	34	34	34	32	32	32	29	24	26.7	36
18-Jun	24	24	25	Z	21	19	20	24	28	31	35	33	33	33	34	34	36	38	39	37	31	26	31	29	29.7	39
19-Jun	26	25	26	24	Z	22	23	29	33	37	37	39	41	43	43	46	44	43	43	40	37	30	24	18	33.6	46
20-Jun	18	14	12	9	10	Z	18	22	32	38	40	42	45	47	48	49	51	51	50	44	35	29	25	26	32.7	51
21-Jun	26	21	25	24	24	25	Z	28	33	44	47	47	49	51	53	52	51	50	50	45	45	38	29	24	38.3	53
22-Jun	21	19	17	16	18	22	26	Z	39	46	52	53	54	53	51	51	51	50	50	47	40	40	36	34	38.5	54
23-Jun	31	31	Z	30	25	28	28	28	31	38	52	54	49	55	49	48	46	45	46	46	43	38	31	27	39.2	55
24-Jun	23	23	18	Z	14	15	18	25	34	32	36	42	45	44	38	39	37	36	40	42	35	30	28	25	31.3	45
25-Jun	22	22	21	20	Z	20	18	17	20	25	30	34	35	35	37	41	39	39	39	36	34	27	20	18	28.2	41
26-Jun	15	11	11	14	14	Z	17	22	27	32	39	40	39	37	39	42	36	35	34	34	30	35	38	31	29.2	42
27-Jun	28	24	20	15	12	15	Z	21	26	34	36	35	33	34	33	33	27	27	27	28	17	13	9	13	24.3	36
28-Jun	14	13	13	12	12	15	20	Z	30	38	50	46	38	39	47	43	40	39	40	41	37	32	34	33	31.5	50
29-Jun	33	31	Z	23	21	19	21	25	29	34	37	37	37	38	38	39	38	40	40	39	38	35	32	29	32.7	40
30-Jun	29	29	28	Z	25	25	25	27	30	34	39	41	41	43	45	46	46	45	42	41	38	36	35	31	35.7	46

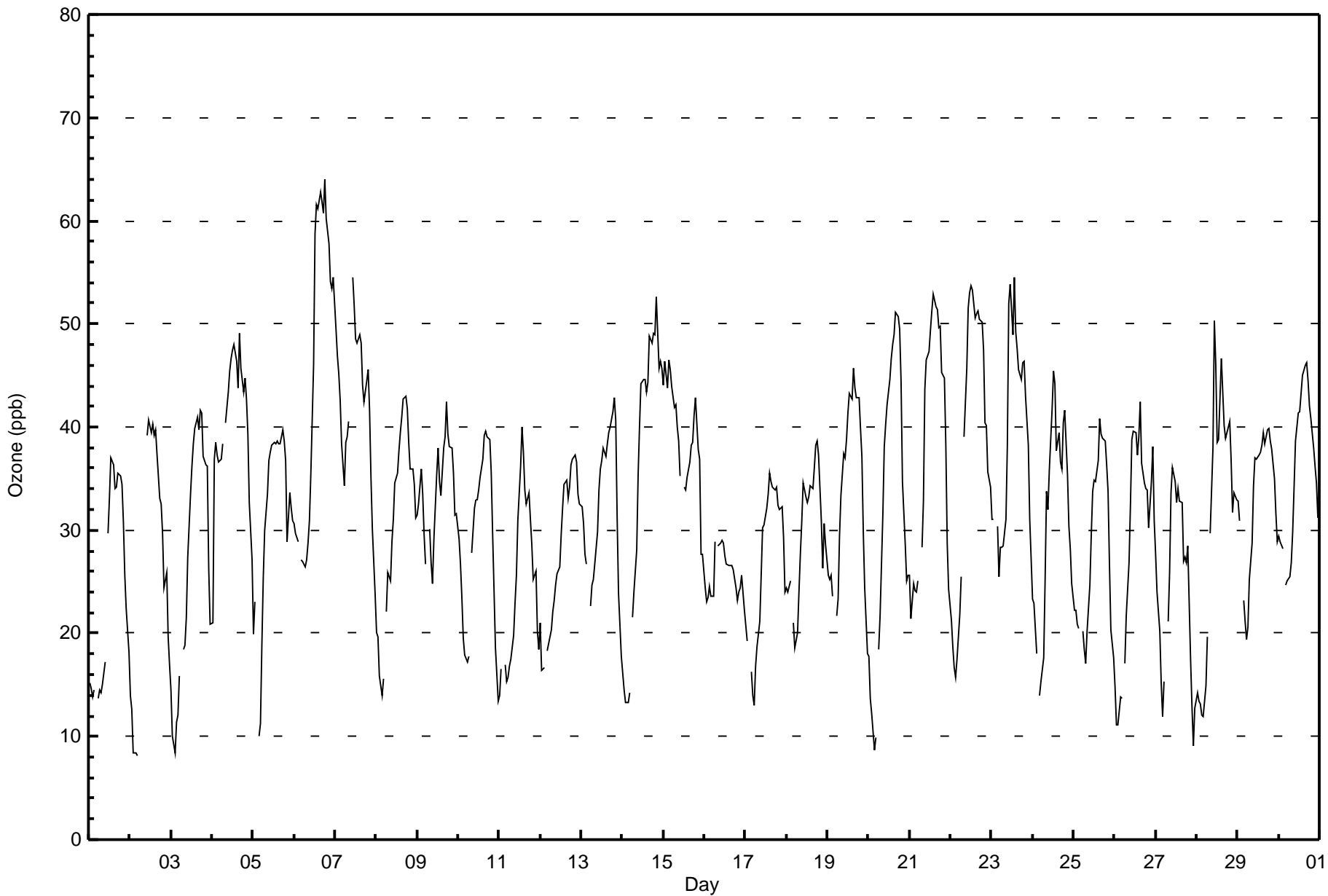
24.3	23.6	22.4	20.9	20.1	22.2	23.0	25.1	28.8	32.3	37.3	38.9	39.7	40.7	40.8	41.3	40.7	40.5	40.5	39.3	35.9	32.9	29.3	26.5	Diurnal Average	
50	47	45	47	46	44	42	42	41	46	54	54	59	62	61	63	62	61	64	60	58	54	53	54	Diurnal Maximum	

Z - zerospan C - Calibration M - Maintenance
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Athabasca Valley - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Athabasca Valley - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	114	16.62	16.62
21 - 50	541	78.86	95.48
51 - 82	31	4.52	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 686

Total Number of Hours: 720



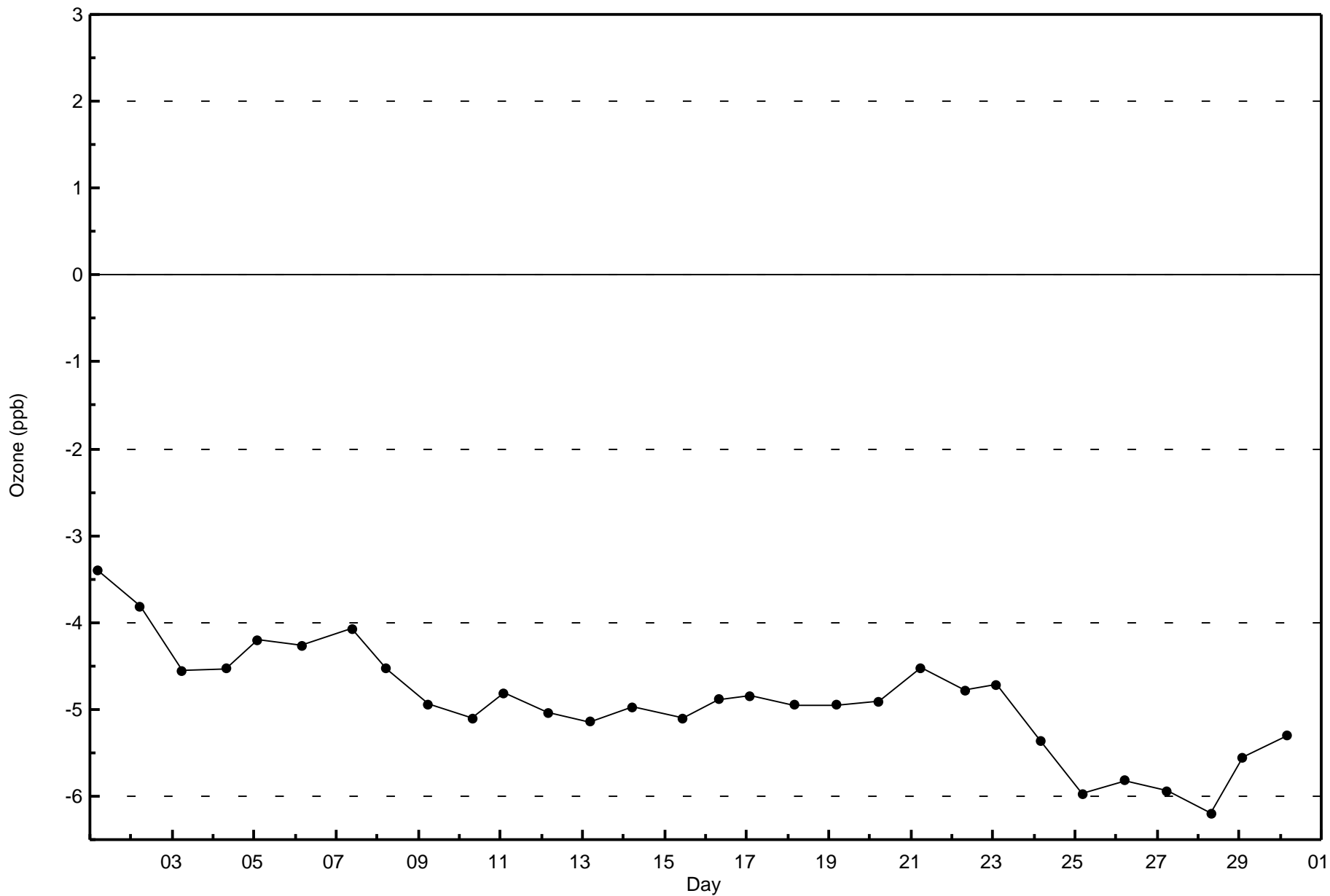
**Wood Buffalo Environmental Association
Frequency Distribution**

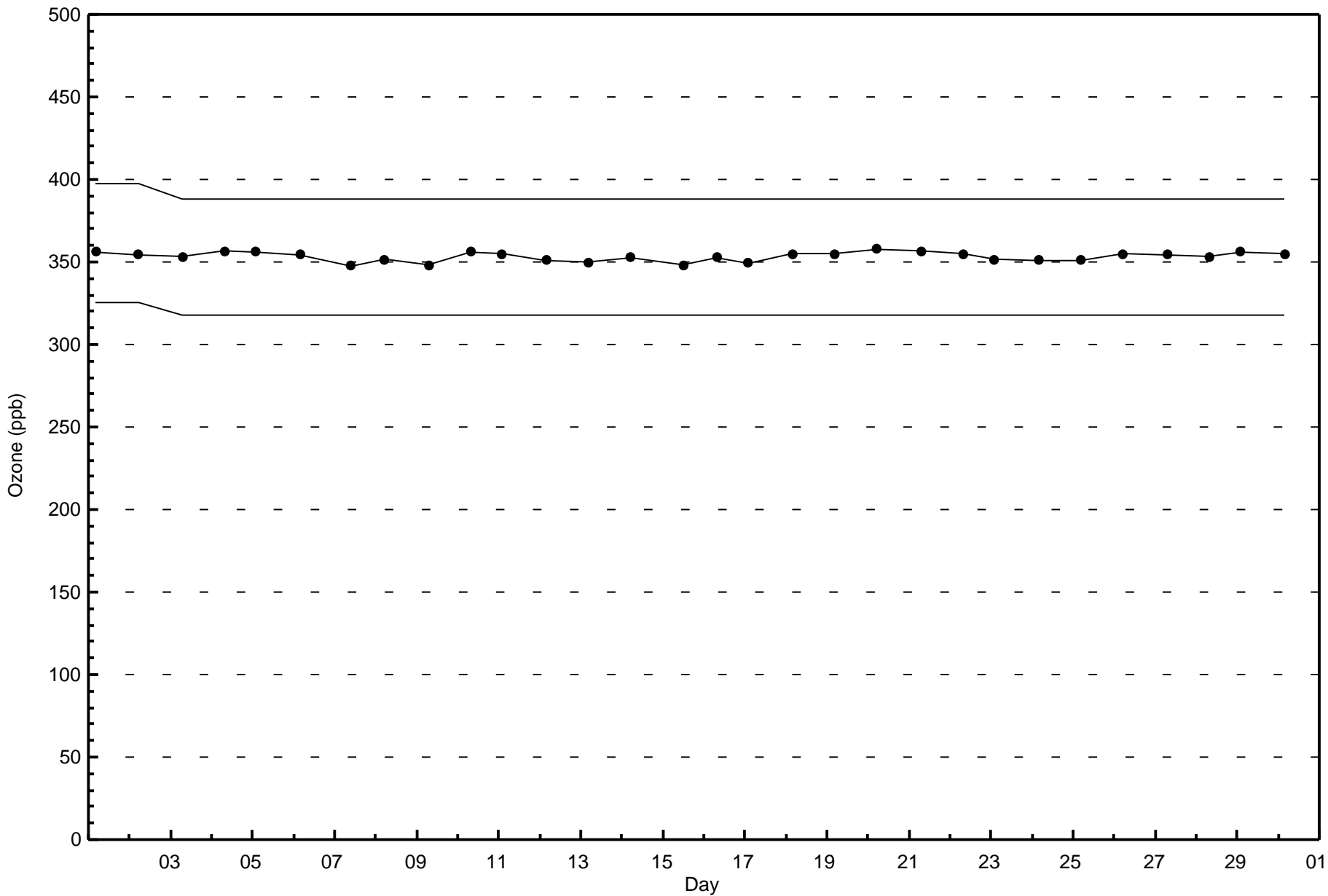
**Ozone (O₃) - ppb
Athabasca Valley - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	6	1	1	0	7	17	39	13	4	3	3	6	3	4	3	4	114
21 - 50	59	14	17	15	11	28	80	28	19	19	37	50	25	27	34	78	541
51 - 82	4	1	1	0	2	0	0	6	7	1	1	2	0	1	0	5	31
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	69	16	19	15	20	45	119	47	30	23	41	58	28	32	37	87	686

Total Number of Valid Hours: 686

Total Number of Hours: 720







Wood Buffalo Environmental Association
Summary of Hour Averages

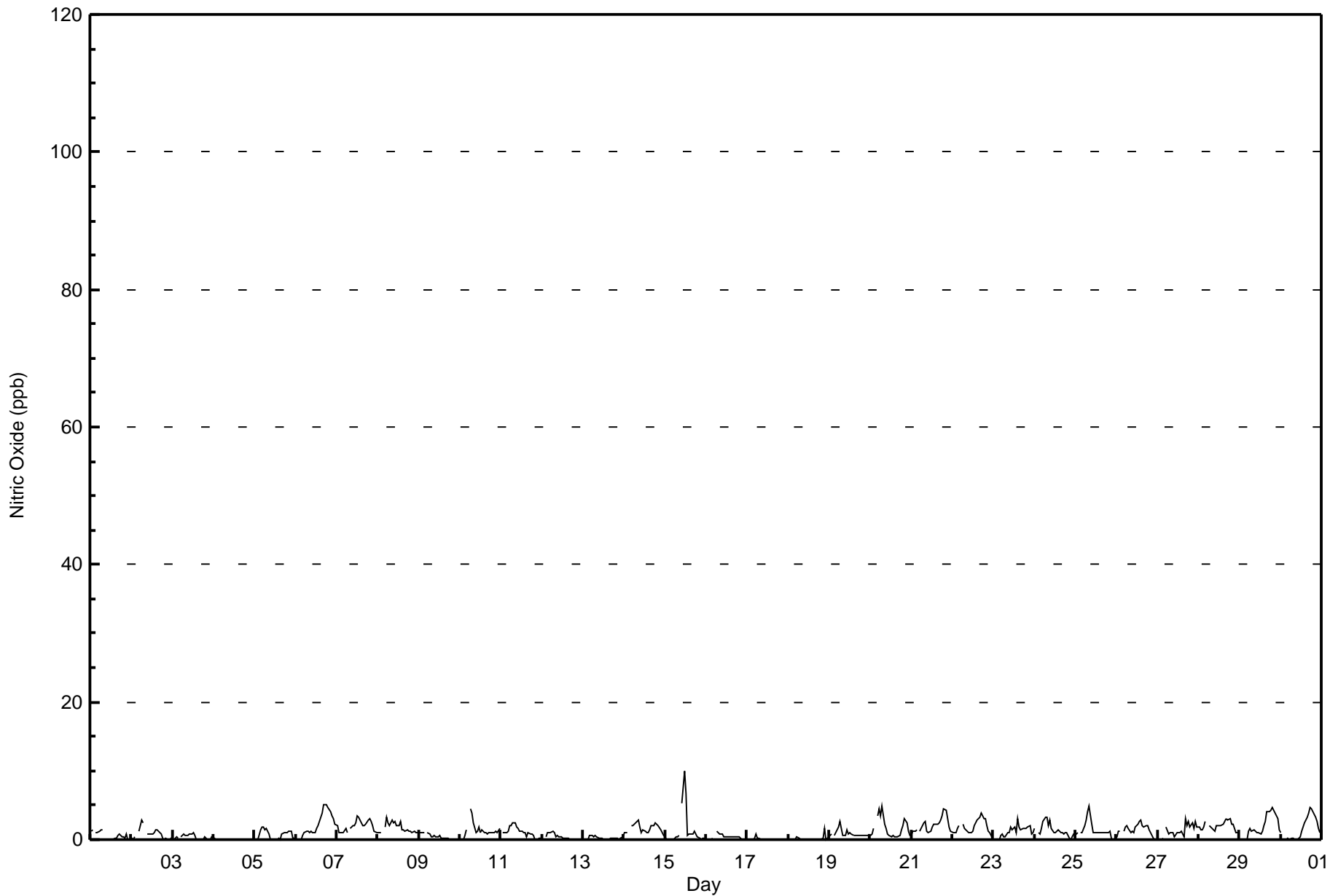
Nitric Oxide (NO) - ppb
Athabasca Valley - June 2016

Maximum Value: 10 ppb on Jun 15 12:00 Maximum Daily Average: 2.2 ppb on Jun 6																	Hours in Service: 720 Hours of Data: 684 Hours of Missing Data: 36 Hours of Calibration: 35 Percent Operational Time: 99.9									
Minimum Value: 0 ppb on Jun 4 08:00 Minimum Daily Average: 0.0 ppb on Jun 4 Maximum Diurnal Average: 1.6 ppb at hour 7 Minimum Diurnal Average: 0.5 ppb at hour 3 Monthly Average: 1.1 ppb Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 2 P ₉₀ = 3 P 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-Jun	1	1	Z	1	1	1	1	1	C	C	C	C	C	0	0	0	1	1	1	0	0	1	0	0	0.7	1
2-Jun	0	0	0	Z	1	2	3	2	M	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.9	3
3-Jun	0	0	0	0	Z	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.3	1
4-Jun	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
5-Jun	Z	0	0	1	2	2	1	2	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0.7	2
6-Jun	0	Z	0	0	1	1	1	1	1	1	1	1	2	2	3	4	5	5	5	5	4	4	3	2	2.2	5
7-Jun	2	1	1	1	1	2	1	Z	2	2	2	2	3	3	2	2	2	2	3	3	3	2	1	1	1.9	3
8-Jun	1	1	1	Z	2	3	2	2	3	2	3	2	2	3	1	1	1	1	1	1	1	1	1	1	1.7	3
9-Jun	1	1	1	1	Z	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1
10-Jun	0	0	0	1	1	Z	4	4	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1.3	4
11-Jun	Z	1	1	1	1	2	2	2	2	2	2	1	1	1	0	1	1	1	1	1	0	0	0	0	1.1	2
12-Jun	0	Z	0	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
13-Jun	0	0	Z	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
14-Jun	1	1	1	Z	2	2	2	2	3	2	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1.6	3
15-Jun	0	0	0	0	0	0	0	0	1	Z	5	10	7	1	1	1	1	1	1	1	0	0	0	0	1.3	10
16-Jun	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
17-Jun	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
18-Jun	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0.1	2
19-Jun	1	1	Z	1	1	2	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	3
20-Jun	1	1	2	Z	3	4	4	5	2	2	1	1	0	1	0	0	0	1	2	2	3	2	1	1	1.7	5
21-Jun	1	1	1	1	Z	1	2	2	3	1	1	1	2	2	2	2	3	3	3	4	4	3	2	1	2.1	4
22-Jun	1	1	1	2	2	Z	2	2	1	1	1	1	1	2	3	3	3	4	3	3	2	1	1	0	1.8	4
23-Jun	Z	0	0	0	1	1	0	0	1	1	2	1	2	1	3	2	1	2	2	2	2	1	1	1	1.2	3
24-Jun	2	Z	1	1	2	3	3	3	2	3	2	1	1	1	1	1	1	1	1	1	0	0	0	1	1.4	3
25-Jun	1	1	Z	1	1	2	3	4	5	2	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1.3	5
26-Jun	0	1	1	Z	1	2	2	2	1	1	1	2	2	3	3	2	2	2	2	1	1	0	0	0	1.4	3
27-Jun	0	0	0	0	Z	2	1	1	1	1	0	1	1	1	1	0	3	2	3	2	2	2	3	2	1.2	3
28-Jun	2	1	1	2	3	Z	2	2	2	1	2	2	2	2	3	3	3	3	3	2	2	2	1	1	2.0	3
29-Jun	Z	0	0	0	0	1	2	1	1	1	1	1	1	1	2	3	4	4	4	5	4	3	3	1	2.0	5
30-Jun	1	Z	0	0	0	0	0	0	0	0	0	0	1	2	3	3	4	5	4	4	3	3	2	1	1.6	5
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerspan C - Calibration M - Maintenance																										



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Athabasca Valley - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Athabasca Valley - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	684	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: 684

Total Number of Hours: 720



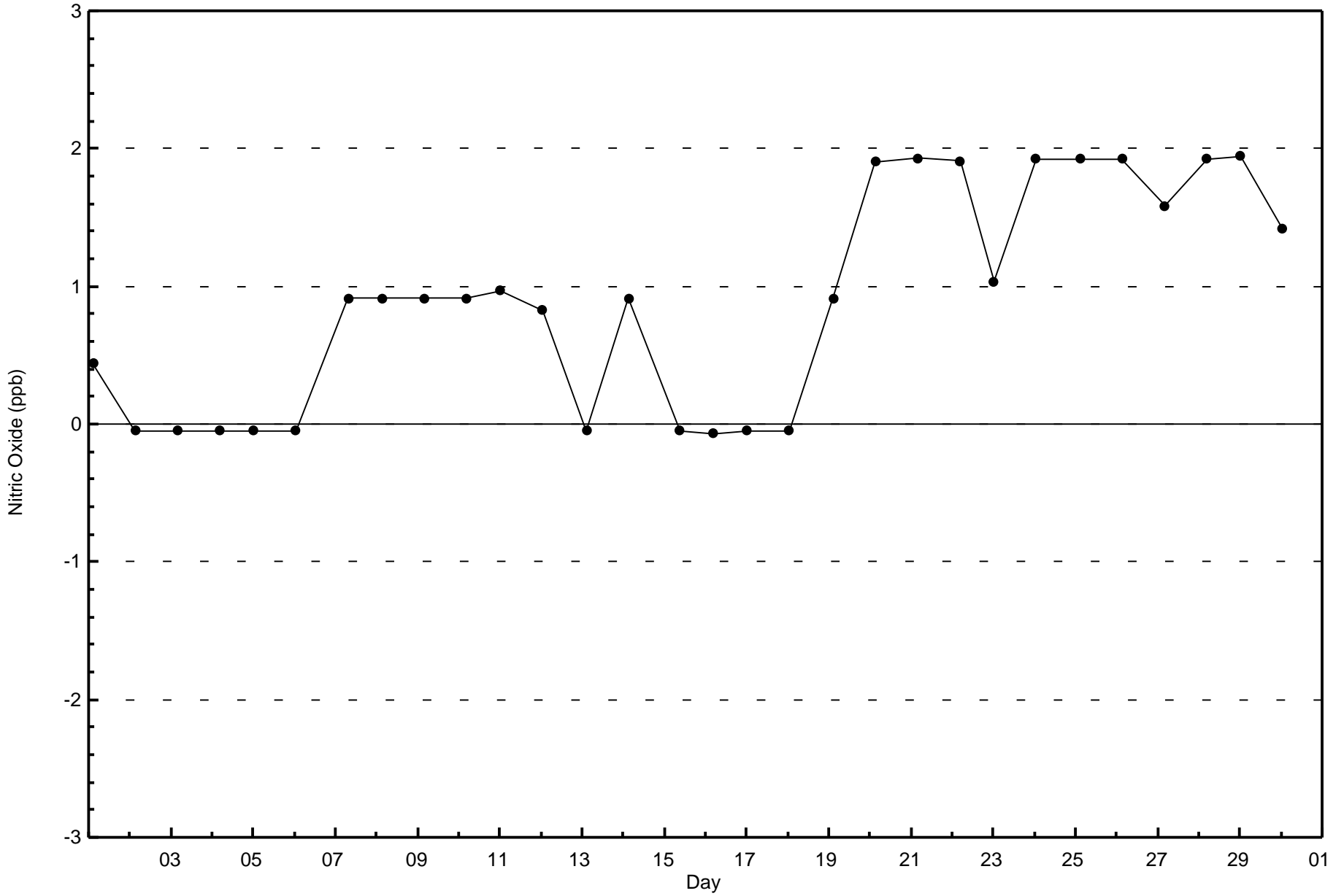
Wood Buffalo Environmental Association
Frequency Distribution

Nitric Oxide (NO) - ppb
Athabasca Valley - June 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	70	16	18	15	22	45	113	45	33	24	42	55	29	32	36	89	684
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
Totals	70	16	18	15	22	45	113	45	33	24	42	55	29	32	36	89	684

Total Number of Valid Hours: 684

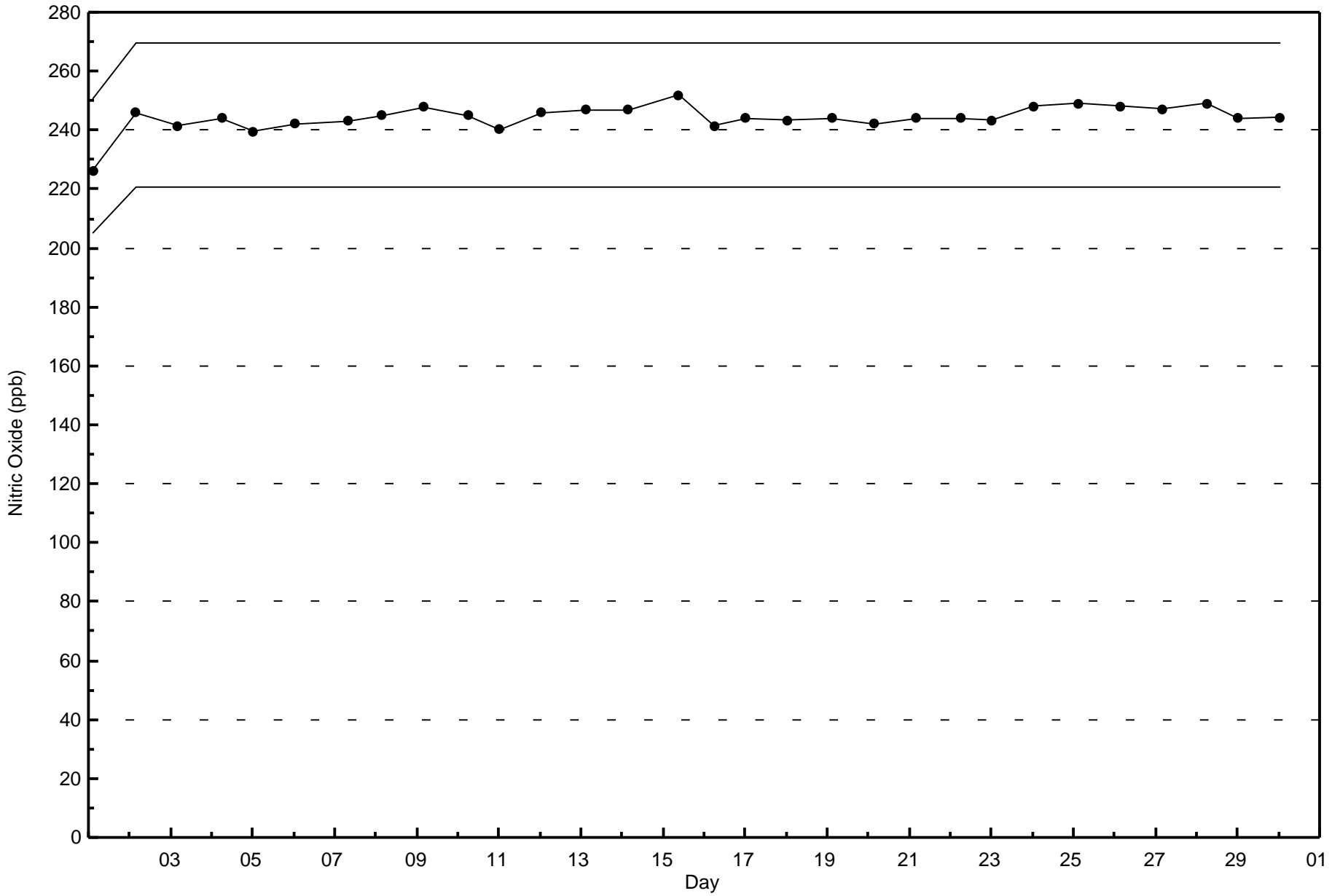
Total Number of Hours: 720





Wood Buffalo Environmental Association
Span Responses

Nitric Oxide (NO) - ppb
Athabasca Valley - June 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb
Athabasca Valley - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 12 ppb on Jun 24 05:00	Maximum Daily Average: 6.0 ppb on Jun 8		Hours of Data:	684
Minimum Value: 0 ppb on Jun 29 13:00	Minimum Daily Average: 1.1 ppb on Jun 17		Hours of Missing Data:	36
Maximum Diurnal Average: 4.1 ppb at hour 5	Minimum Diurnal Average: 1.3 ppb at hour 5		Hours of Calibration:	35
Monthly Average: 2.7 ppb	Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 4 P ₉₀ = 6 P ₉₉ = 11		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-Jun	4	4	Z	2	2	2	2	2	C	C	C	C	C	1	2	2	3	3	2	3	5	6	5	3	3.0	6	
2-Jun	7	6	7	Z	3	2	3	3	M	2	2	1	1	1	1	1	3	5	2	2	4	2	5	4	3.1	7	
3-Jun	3	5	4	2	Z	2	2	1	1	1	1	1	1	1	1	2	2	2	3	4	5	7	6	2.4	7		
4-Jun	5	1	1	1	1	Z	2	1	1	1	1	1	1	1	1	1	1	2	2	1	1	2	4	4	1.4	5	
5-Jun	Z	4	7	10	7	4	3	2	2	1	1	1	1	1	1	1	1	1	1	2	5	1	2	2	2.4	10	
6-Jun	2	Z	2	2	3	2	3	3	2	2	2	2	2	2	2	3	4	3	4	4	4	3	3	3	2.5	4	
7-Jun	3	2	2	2	3	5	2	Z	2	1	2	1	1	2	1	2	1	1	1	1	4	6	5	7	2.6	7	
8-Jun	8	6	8	Z	7	10	8	8	11	10	9	7	6	7	5	4	5	2	2	3	4	3	3	3	6.0	11	
9-Jun	1	2	2	1	Z	1	1	1	1	2	2	1	2	1	1	1	2	1	2	2	2	2	3	2	1.5	3	
10-Jun	3	4	5	6	6	Z	5	5	3	2	2	3	1	1	1	1	1	1	1	2	4	6	6	7	3.2	7	
11-Jun	Z	5	3	3	3	3	3	4	4	4	4	2	2	2	1	2	3	3	3	3	4	1	3	3	2.9	5	
12-Jun	3	Z	3	3	4	2	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.5	4	
13-Jun	1	1	Z	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	2	4	5	7	1.3	7	
14-Jun	9	6	7	Z	5	3	2	4	4	3	2	1	1	0	1	1	2	3	5	5	2	3	1	1	3.0	9	
15-Jun	1	1	1	1	1	2	3	2	2	Z	4	2	4	1	2	2	2	3	4	4	3	3	8	6	2.6	8	
16-Jun	5	3	2	2	2	Z	2	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1.6	5	
17-Jun	Z	1	1	1	1	1	2	1	1	1	1	1	1	1	0	1	1	1	1	1	2	1	1	2	4	1.1	4
18-Jun	3	Z	2	1	1	2	1	1	1	1	0	1	1	1	1	0	1	1	1	3	6	7	3	4	1.8	7	
19-Jun	3	3	Z	4	5	5	4	2	1	2	3	1	1	1	0	1	1	1	1	1	1	5	4	6	2.4	6	
20-Jun	5	6	7	Z	7	6	4	5	3	2	1	1	0	0	0	1	0	1	1	4	10	12	6	8	3.9	12	
21-Jun	5	8	3	3	Z	3	4	4	5	2	1	1	1	0	0	0	0	0	1	4	5	5	3	5	2.7	8	
22-Jun	5	4	5	9	7	Z	4	3	2	2	3	1	1	1	2	2	2	1	2	3	5	4	3	2	3.1	9	
23-Jun	Z	2	3	2	4	4	3	2	3	5	8	6	3	3	1	2	2	2	4	4	4	5	4	4	3.4	8	
24-Jun	7	Z	11	11	12	12	11	10	8	9	5	3	2	2	4	3	3	5	3	1	2	3	4	4	5.8	12	
25-Jun	5	5	Z	7	5	6	6	7	5	2	2	1	1	1	1	1	0	0	0	1	3	3	3	3	2.9	7	
26-Jun	4	5	6	Z	3	2	2	1	1	2	1	1	2	3	2	2	3	4	4	3	4	1	1	2	2.6	6	
27-Jun	2	1	1	5	Z	4	2	2	1	1	1	1	1	1	3	2	7	5	6	4	8	8	11	7	3.6	11	
28-Jun	5	6	5	7	7	Z	3	2	3	3	4	2	0	1	2	2	1	1	1	1	2	4	2	1	2.8	7	
29-Jun	Z	1	1	2	3	4	3	3	4	3	1	1	0	0	1	1	3	2	2	3	3	4	3	3	2.2	4	
30-Jun	2	Z	2	2	4	3	3	3	1	1	2	2	2	1	1	2	2	3	3	5	5	4	3	4	2.6	5	

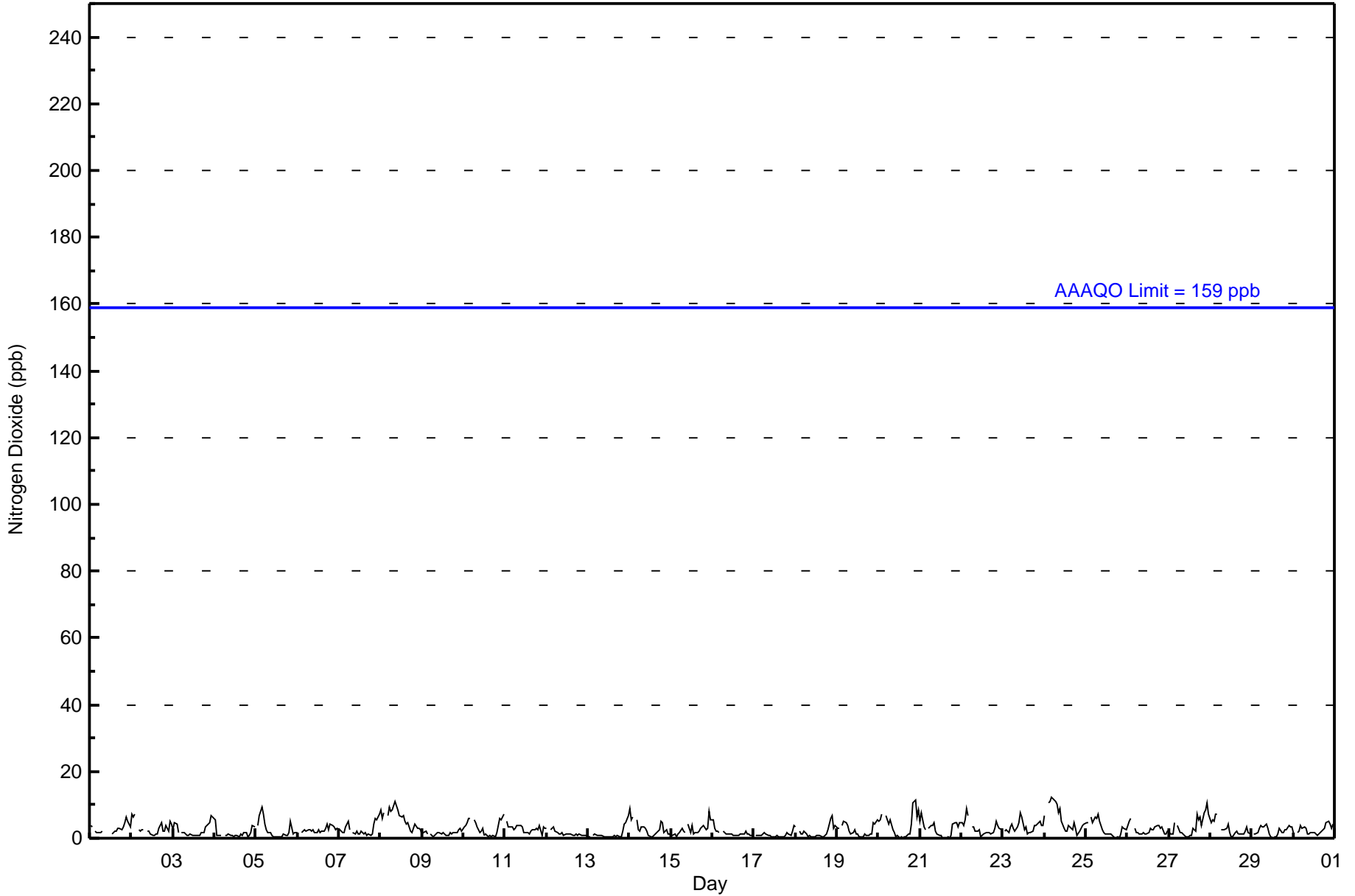
4.0	3.5	3.8	3.5	4.1	3.6	3.1	3.0	2.6	2.3	2.2	1.5	1.4	1.3	1.3	1.4	1.8	2.0	2.0	2.5	3.6	3.8	3.8	3.9	Diurnal Average	
9	8	11	11	12	12	11	10	11	10	9	7	6	7	5	4	7	5	6	5	10	12	11	8	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Athabasca Valley - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Athabasca Valley - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	684	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Athabasca Valley - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	70	16	18	15	22	45	113	45	33	24	42	55	29	32	36	89	684
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
Totals	70	16	18	15	22	45	113	45	33	24	42	55	29	32	36	89	684

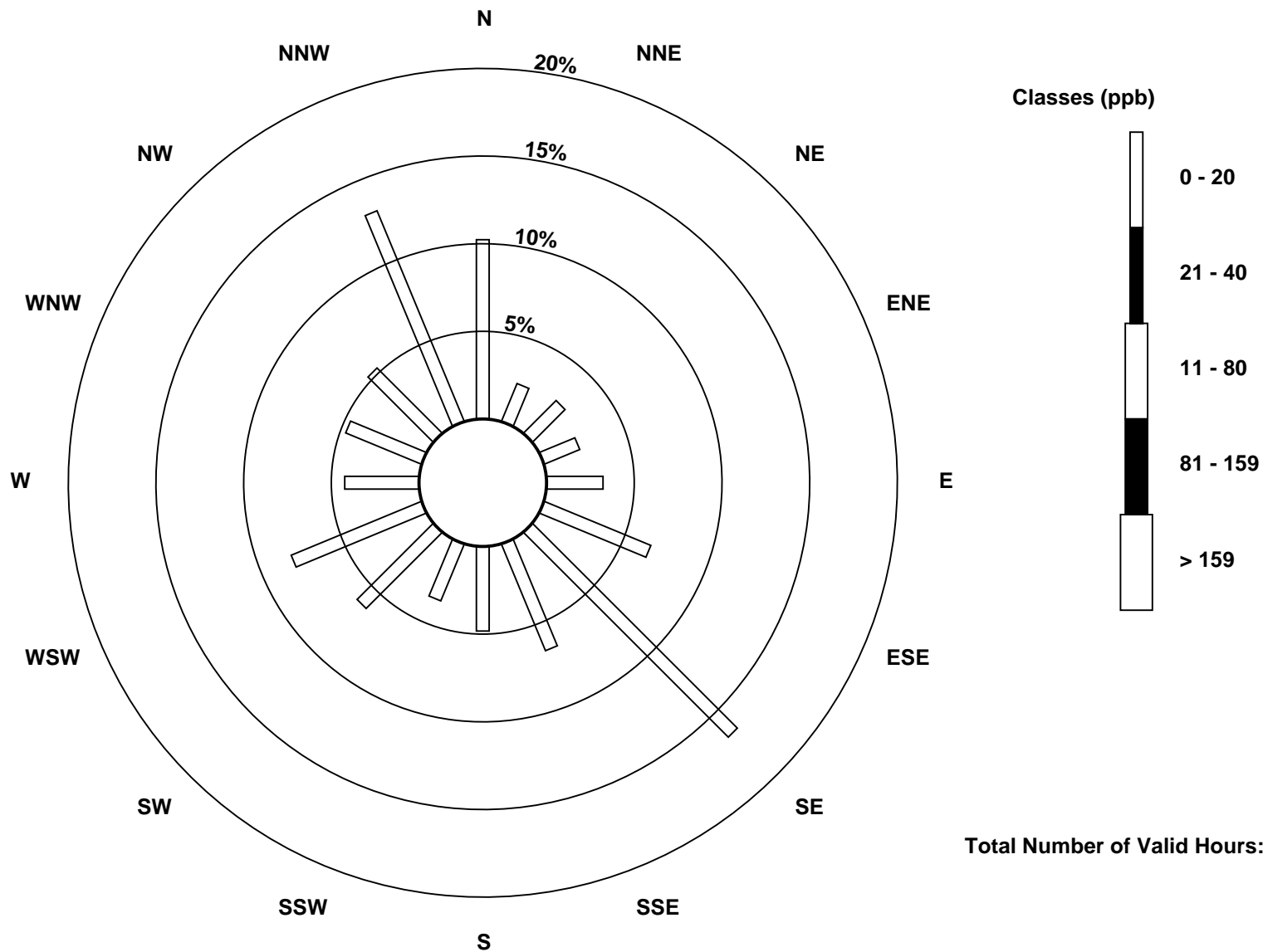
Total Number of Valid Hours: 684

Total Number of Hours: 720

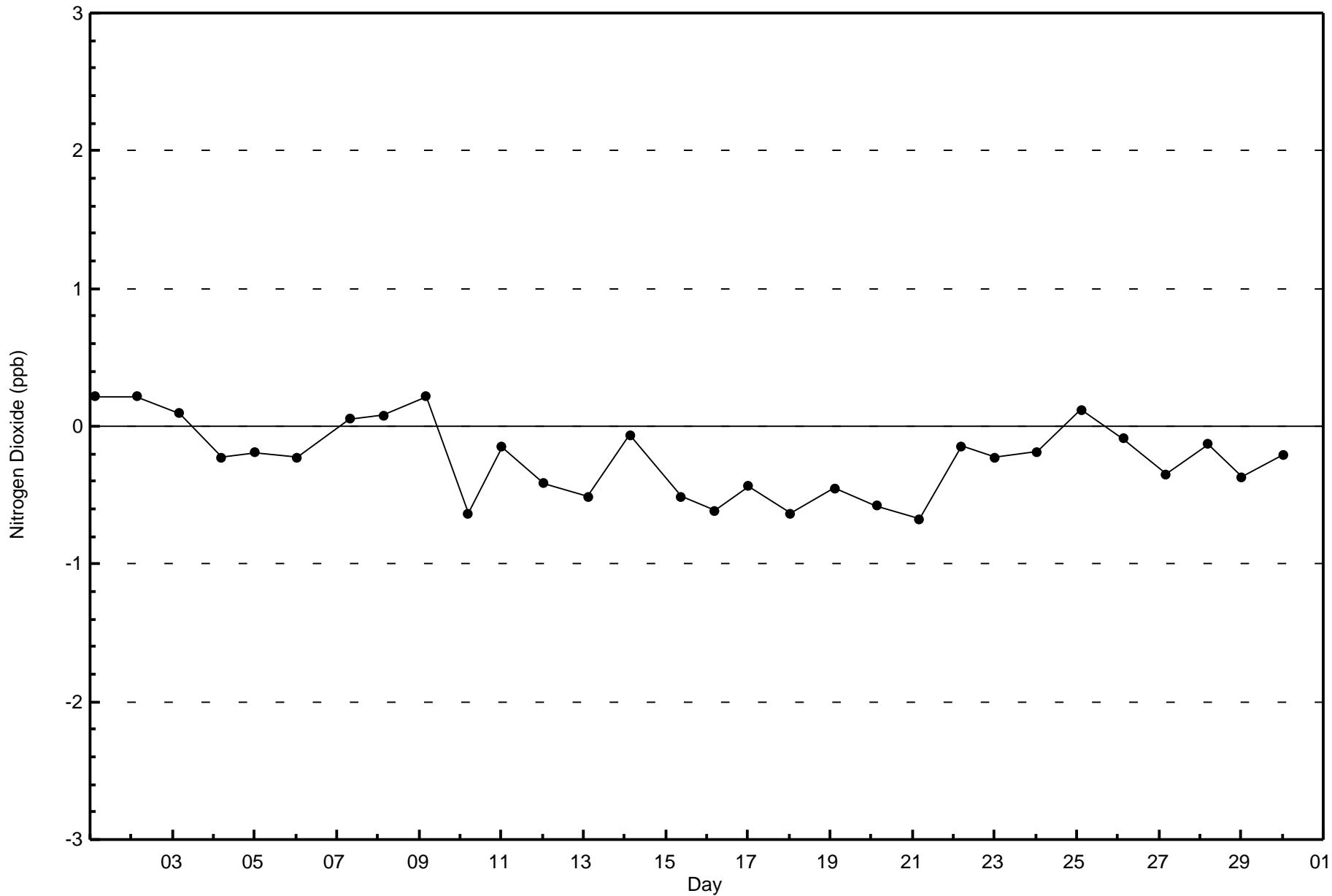


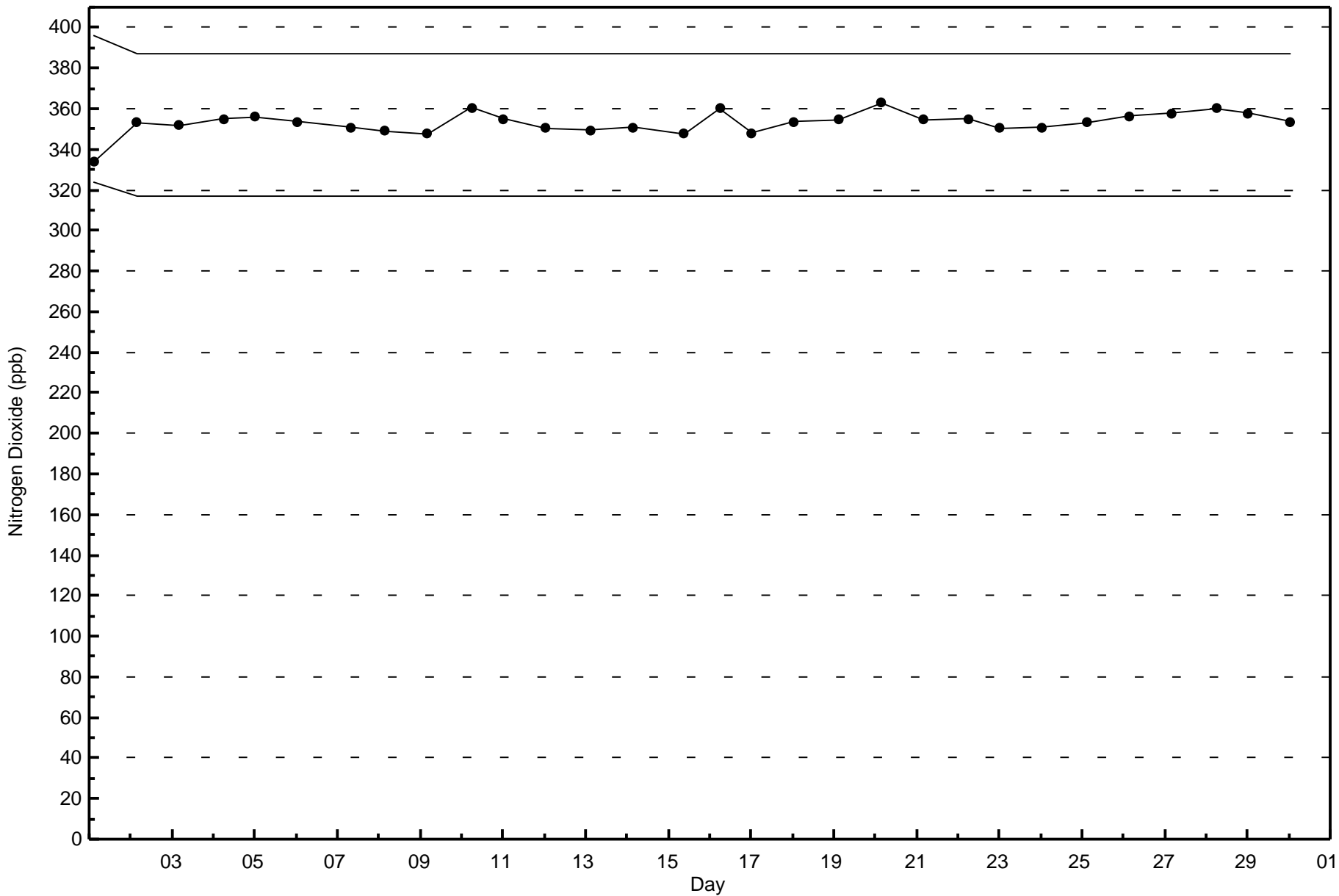
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Dioxide (NO₂) - ppb
Athabasca Valley (AMS 7)



Total Number of Valid Hours: 684







Wood Buffalo Environmental Association
Summary of Hour Averages

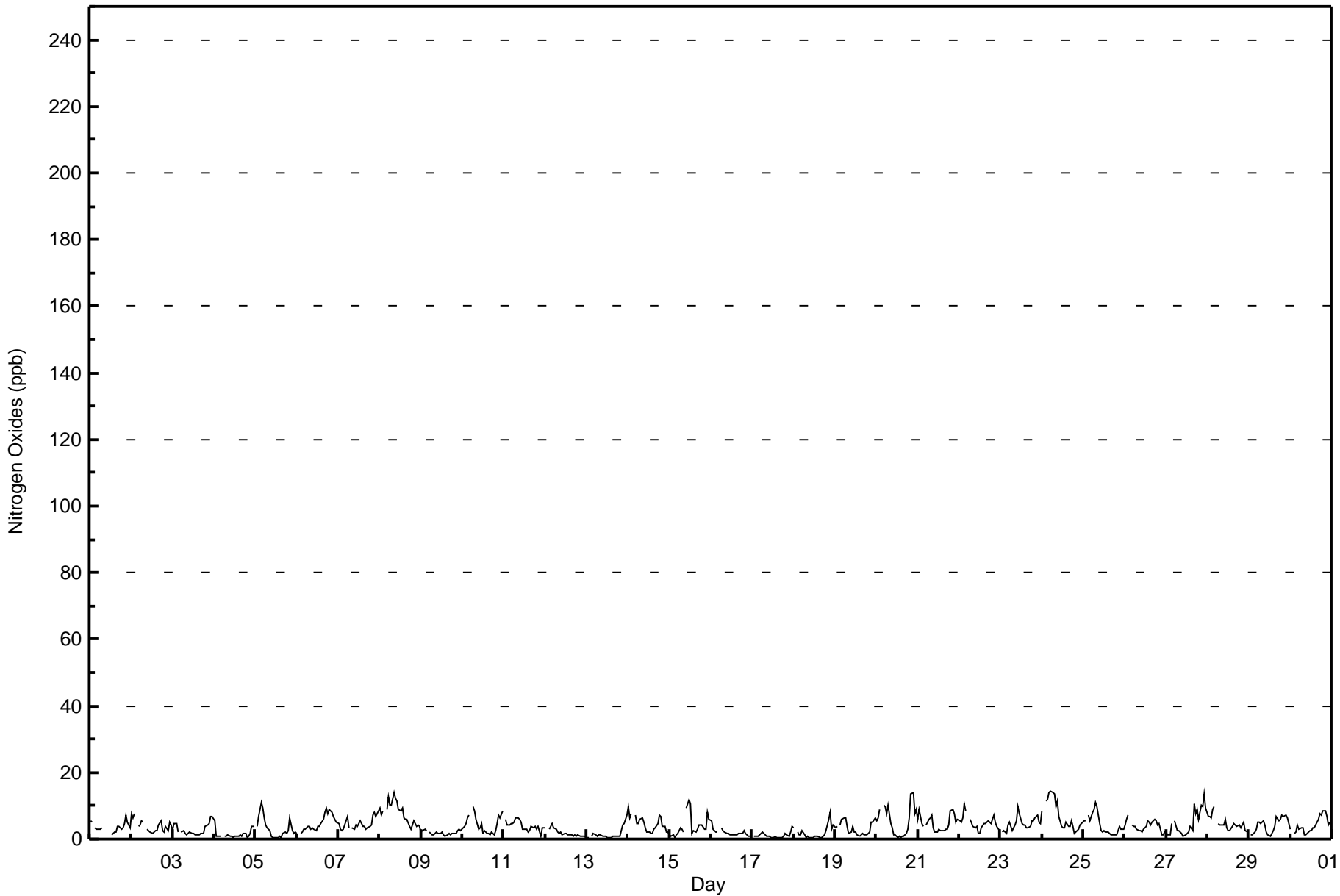
Nitrogen Oxides (NO_x) - ppb
Athabasca Valley - June 2016

Maximum Value: 14 ppb on Jun 24 06:00		Maximum Daily Average: 7.7 ppb on Jun 8		Hours in Service: 720																																												
Minimum Value: 0 ppb on Jun 18 16:00		Minimum Daily Average: 1.1 ppb on Jun 17		Hours of Data: 684																																												
Maximum Diurnal Average: 5.1 ppb at hour 5		Minimum Diurnal Average: 2.4 ppb at hour 14		Hours of Missing Data: 36																																												
Monthly Average: 3.9 ppb		Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 5 P ₉₀ = 8 P ₉₉ = 13		Hours of Calibration: 35																																												
				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-Jun	5	5	Z	3	3	3	3	4	C	C	C	C	C	1	2	2	4	4	3	4	5	7	5	3	3.7	7																						
2-Jun	8	6	8	Z	4	4	6	5	M	3	3	2	2	2	3	3	4	5	2	2	4	2	5	4	4.0	8																						
3-Jun	3	5	5	2	Z	2	2	2	1	2	2	2	2	1	1	1	2	2	2	4	4	5	7	7	2.8	7																						
4-Jun	6	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	4	4	1.4	6																						
5-Jun	Z	4	7	11	9	6	4	3	2	1	1	1	1	1	1	1	2	2	2	3	6	2	2	2	3.1	11																						
6-Jun	2	Z	2	2	3	3	4	4	3	4	3	3	4	4	5	6	8	9	8	9	8	7	6	5	4.7	9																						
7-Jun	5	3	3	3	4	7	3	Z	3	3	4	4	5	6	4	4	3	3	4	4	7	8	7	8	4.5	8																						
8-Jun	9	7	9	Z	9	13	10	10	14	12	11	9	8	10	6	6	6	4	3	4	5	4	4	4	7.7	14																						
9-Jun	2	3	3	2	Z	2	1	1	2	2	2	2	2	1	1	1	2	1	2	2	2	2	3	2	2.0	3																						
10-Jun	3	4	5	6	7	Z	10	9	6	3	3	5	2	3	2	2	1	2	1	3	5	7	6	9	4.5	10																						
11-Jun	Z	6	4	4	5	5	5	6	6	6	5	3	3	3	2	2	4	3	4	3	4	1	4	3	3.9	6																						
12-Jun	3	Z	3	4	5	3	3	2	2	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1.8	5																						
13-Jun	1	1	Z	1	2	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	2	4	5	7	1.5	7																						
14-Jun	10	7	8	Z	7	5	4	6	6	5	3	2	2	2	3	4	5	7	7	4	4	4	2	2	4.6	10																						
15-Jun	1	1	1	1	1	2	3	3	2	Z	10	12	11	2	3	2	3	4	4	4	3	3	8	6	3.9	12																						
16-Jun	5	3	2	2	2	Z	3	3	2	2	2	1	1	1	1	1	2	2	2	3	2	1	1	1	2.0	5																						
17-Jun	Z	1	1	1	1	2	2	2	1	1	1	1	1	1	0	1	1	1	1	1	2	1	1	2	4	1.1	4																					
18-Jun	3	Z	2	1	1	3	1	1	1	1	0	1	1	1	1	0	0	1	1	3	6	8	3	4	1.9	8																						
19-Jun	4	4	Z	4	6	6	7	4	2	2	4	2	2	1	1	1	2	1	1	2	2	5	5	6	3.3	7																						
20-Jun	5	6	9	Z	10	10	8	10	5	4	1	1	1	1	1	1	1	2	3	6	13	14	8	9	5.6	14																						
21-Jun	6	9	5	4	Z	4	6	6	7	3	2	2	3	3	2	2	3	3	4	9	9	8	5	6	4.8	9																						
22-Jun	6	5	6	11	9	Z	6	5	4	3	4	2	2	3	5	5	5	5	5	6	7	5	4	3	4.9	11																						
23-Jun	Z	2	3	2	4	5	4	3	4	6	10	8	5	4	4	4	3	4	5	5	6	7	5	5	4.6	10																						
24-Jun	8	Z	12	12	14	14	14	13	10	11	7	4	3	3	5	4	4	6	4	2	2	3	4	5	7.1	14																						
25-Jun	6	5	Z	7	6	8	9	11	10	5	2	2	2	2	2	2	1	1	1	3	4	3	3	3	4.2	11																						
26-Jun	4	6	7	Z	4	4	4	3	2	3	2	3	4	5	5	4	5	6	6	4	5	1	1	2	4.0	7																						
27-Jun	2	1	1	5	Z	6	2	2	2	2	1	1	2	2	4	3	10	8	9	6	10	10	13	9	4.9	13																						
28-Jun	7	7	6	9	10	Z	5	4	4	4	6	4	2	3	4	5	4	4	4	3	4	5	3	2	4.8	10																						
29-Jun	Z	1	1	2	3	5	5	5	6	4	2	1	1	2	3	4	7	6	6	7	7	7	6	5	4.2	7																						
30-Jun	3	Z	2	2	4	3	3	3	1	1	1	2	3	3	3	5	6	7	7	9	8	7	4	5	4.1	9																						
																								4.6	4.1	4.4	4.1	5.1	5.1	4.7	4.6	4.0	3.4	3.3	2.8	2.6	2.4	2.5	2.6	3.3	3.5	3.5	3.9	4.9	4.9	4.5	4.5	Diurnal Average
																								10	9	12	12	14	14	14	13	14	12	11	12	11	10	6	6	10	9	9	9	13	14	13	9	Diurnal Maximum
Z - zerospan C - Calibration M - Maintenance																																																



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Athabasca Valley - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Athabasca Valley - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	684	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Athabasca Valley - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	70	16	18	15	22	45	113	45	33	24	42	55	29	32	36	89	684
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
Totals	70	16	18	15	22	45	113	45	33	24	42	55	29	32	36	89	684

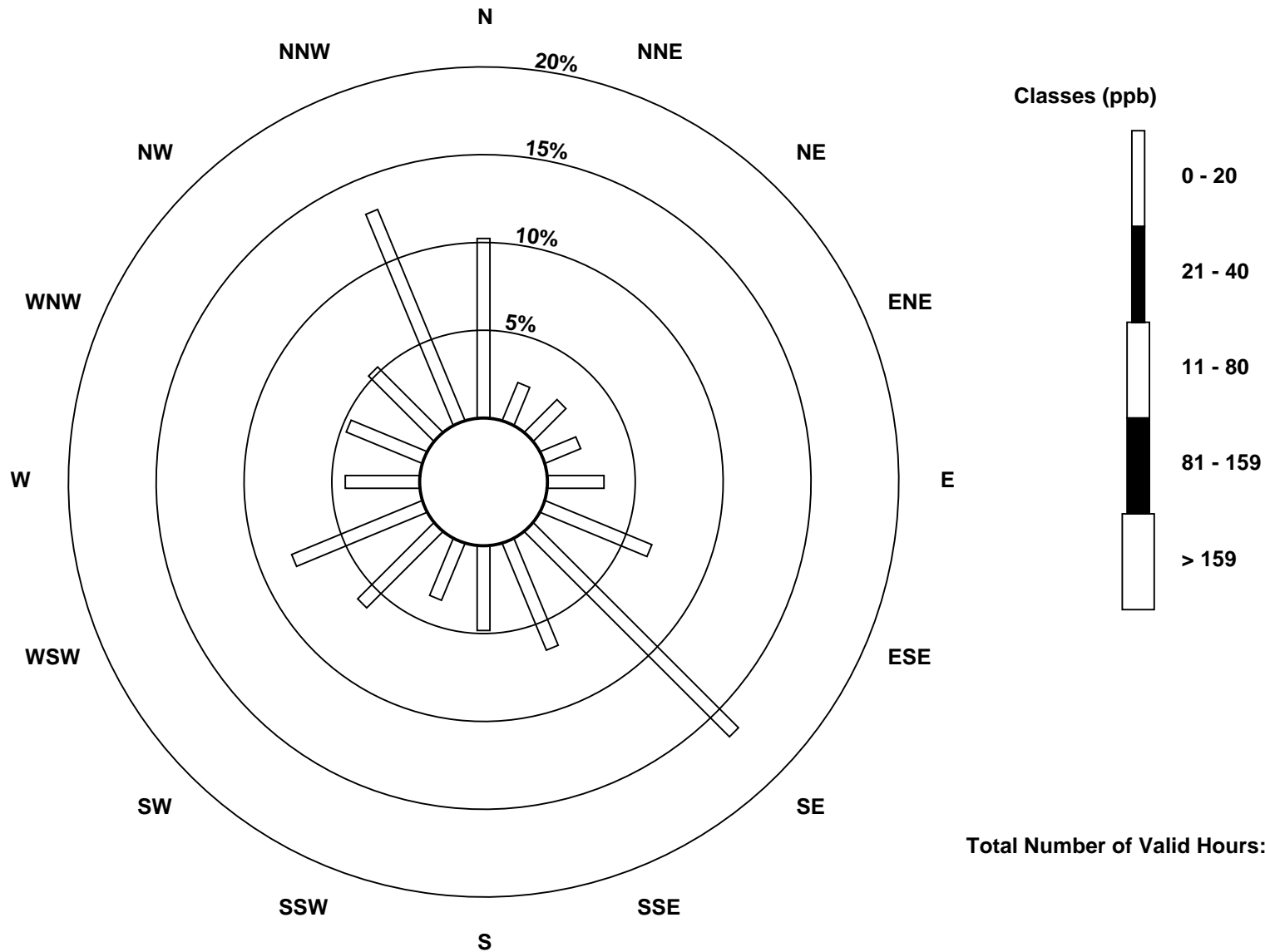
Total Number of Valid Hours: 684

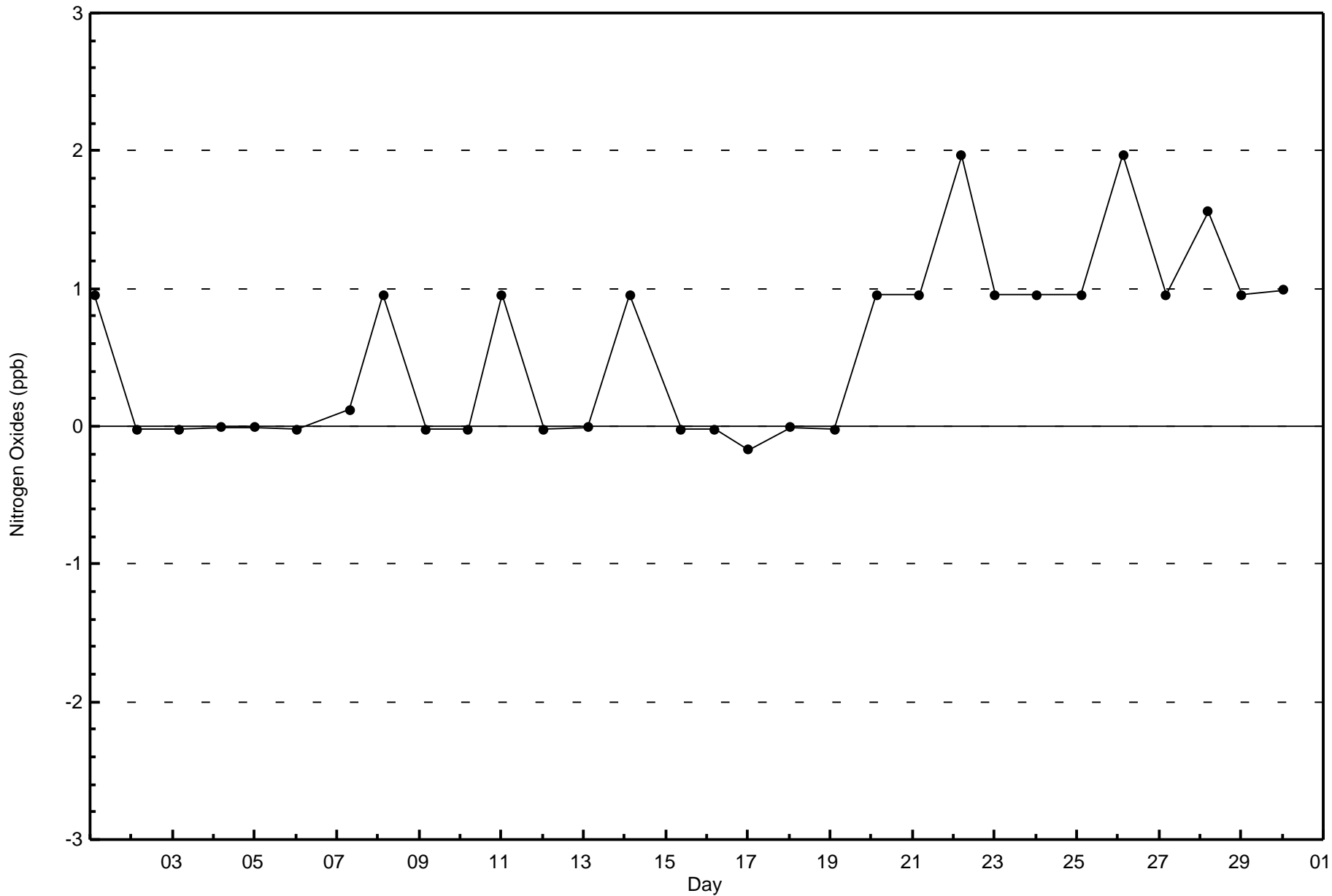
Total Number of Hours: 720

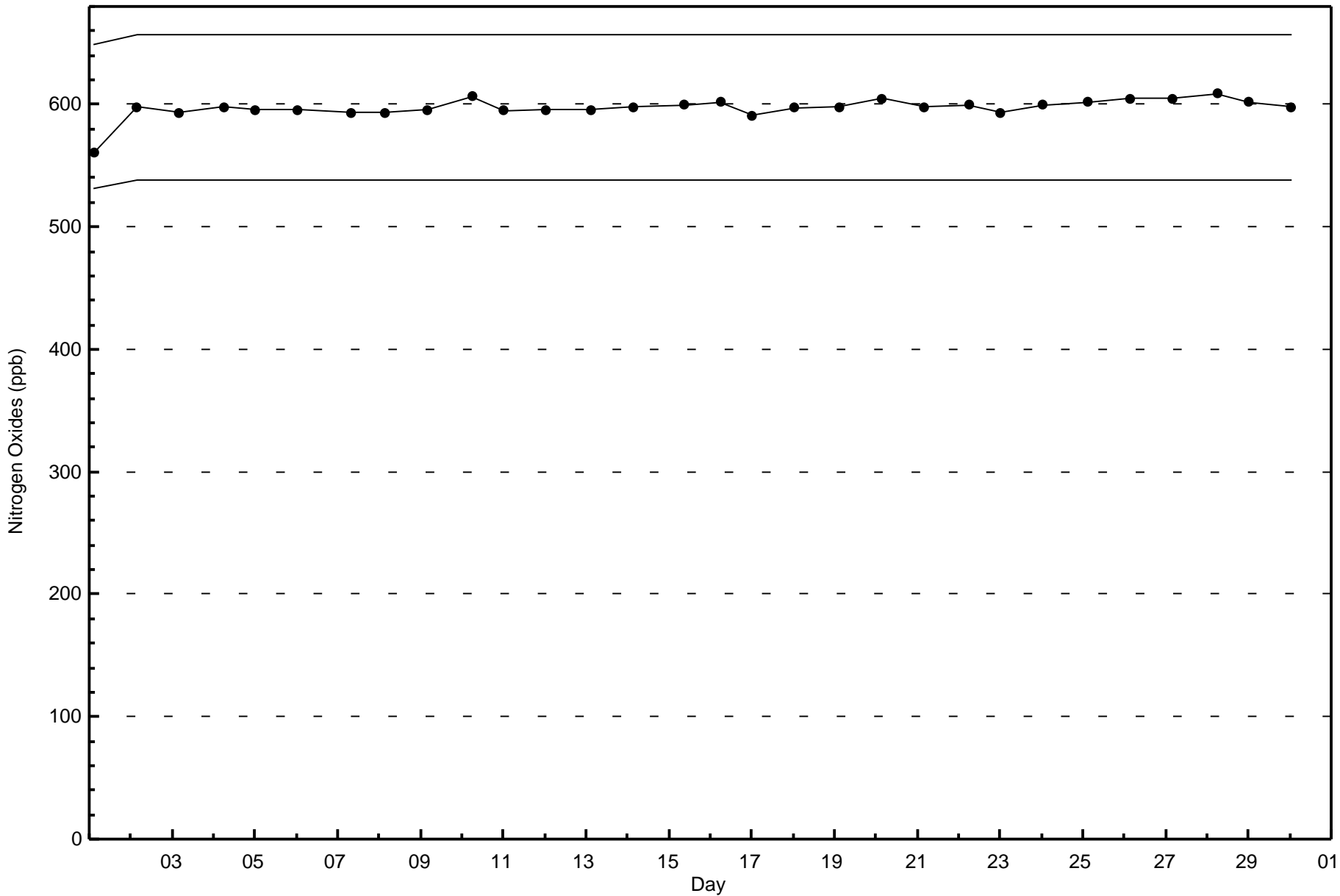


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxides (NO_x) - ppb
Athabasca Valley (AMS 7)







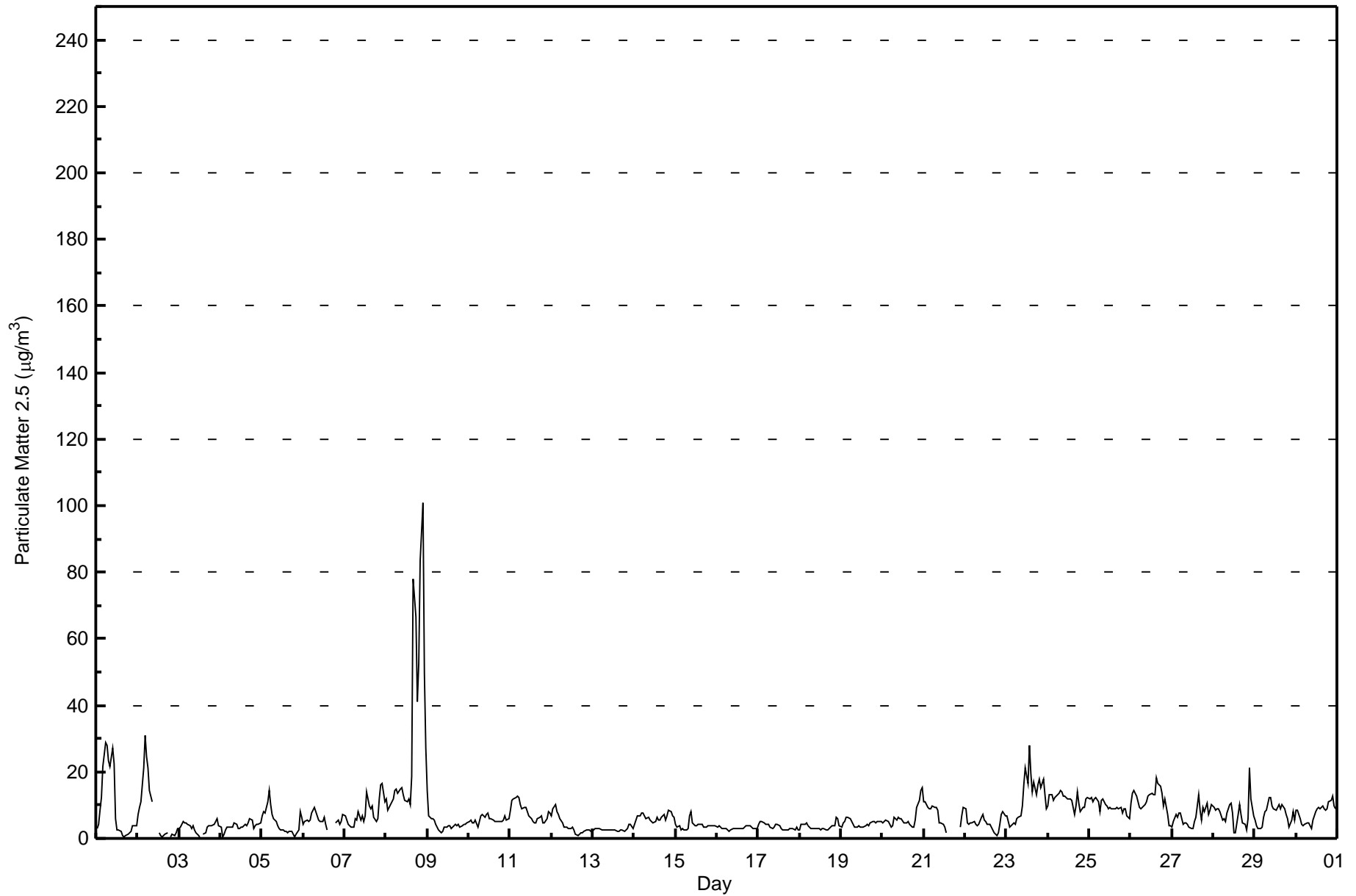


Number of Exceedences (AAAQO): 24-hr: 0	Hours in Service: 720
Maximum Value: 101.1 µg/m ³ on Jun 8 22:00	Maximum Daily Average: 29.2 µg/m ³ on Jun 8
Minimum Value: 0.2 µg/m ³ on Jun 3 13:00	Hours of Data: 704
Maximum Diurnal Average: 10.1 µg/m ³ at hour 22	Hours of Missing Data: 16
Monthly Average: 7.15 µg/m ³	Hours of Calibration: 3
Minimum Daily Average: 2.7 µg/m ³ on Jun 13	Percent Operational Time: 98.2
Minimum Diurnal Average: 5.5 µg/m ³ at hour 13	
Percentiles: P ₁ = 0.8 P ₁₀ = 2.5 Q ₁ = 3.5 Median = 5.2 Q ₃ = 8.9 P ₉₀ = 12.6 P ₉₉ = 36.2	

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-Jun	3.0	4.4	8.6	12.2	21.8	28.9	28.1	23.2	21.5	27.2	22.5	6.0	2.7	2.4	2.2	0.9	0.3	0.9	1.3	1.7	2.3	3.7	3.9	4.0	9.7	28.9	
2-Jun	7.4	9.5	11.0	21.2	31.1	24.8	21.2	14.4	11.2	C	C	C	1.6	0.9	0.5	0.9	1.5	1.5	UO	0.3	1.1	1.0	1.6	2.8	8.3	31.1	
3-Jun	3.0	3.5	5.0	4.7	4.5	4.0	3.9	3.0	3.7	2.7	1.8	0.7	0.2	UO	1.1	1.7	3.4	3.9	4.0	3.7	4.4	5.0	5.8	3.9	3.4	5.8	
4-Jun	3.2	0.5	1.3	2.4	3.2	3.6	3.4	3.3	4.6	4.2	2.8	3.0	3.4	3.6	4.1	3.9	4.7	6.1	5.3	3.0	3.7	4.1	4.4	4.8	3.6	6.1	
5-Jun	6.6	7.9	7.8	11.2	14.6	10.2	7.3	5.9	5.0	4.0	2.8	2.6	2.5	2.2	1.9	1.8	2.1	2.2	1.3	0.3	1.2	2.5	8.2	6.2	4.9	14.6	
6-Jun	4.1	5.0	5.5	5.3	5.4	7.7	9.2	8.0	6.9	5.5	4.9	5.3	6.3	4.1	2.7	UO	UO	UO	UO	4.8	5.6	4.1	5.0	7.2	5.6	9.2	
7-Jun	6.6	5.7	4.2	3.8	3.4	3.5	6.1	5.3	8.1	5.7	6.8	5.1	6.7	14.2	9.7	8.7	9.6	6.4	5.3	6.0	11.7	16.3	16.6	11.1	7.8	16.6	
8-Jun	12.0	8.5	9.2	11.2	11.7	14.6	14.6	13.5	14.9	15.2	13.2	11.6	11.2	11.9	10.1	18.7	77.9	66.7	40.9	52.5	83.4	101.1	49.7	27.0	29.2	101.1	
9-Jun	14.3	6.6	5.8	6.1	5.6	4.3	2.5	2.1	1.9	2.2	3.3	3.6	3.6	3.6	2.9	3.7	4.1	4.0	4.2	3.5	3.7	4.2	4.3	4.6	4.4	14.3	
10-Jun	5.3	5.5	4.9	4.6	5.5	3.3	5.1	6.9	7.4	6.2	7.3	7.5	6.1	6.1	5.6	5.1	5.1	5.2	4.9	4.9	5.7	6.6	5.5	6.0	5.7	7.5	
11-Jun	8.7	11.4	11.8	12.1	12.5	12.3	10.3	8.9	9.3	9.1	8.1	6.8	6.1	5.0	4.6	4.6	5.7	6.5	6.8	4.8	4.8	5.8	7.9	7.5	8.0	12.5	
12-Jun	6.8	8.9	10.0	8.2	7.1	6.1	4.5	3.4	3.2	3.4	2.9	3.0	3.2	2.7	1.4	0.9	1.1	1.6	1.8	2.1	2.6	2.5	2.6	2.3	3.8	10.0	
13-Jun	2.4	3.1	2.8	2.9	2.8	2.6	2.6	2.7	2.6	2.4	2.4	2.4	2.6	2.4	2.2	2.1	2.4	2.4	2.3	2.5	2.9	4.4	4.1	3.2	2.7	4.4	
14-Jun	4.2	5.7	6.7	6.7	7.5	7.5	7.0	6.1	6.4	5.7	5.3	4.6	5.3	6.2	5.6	5.6	6.1	7.0	5.3	6.9	8.7	8.3	6.8	6.5	6.3	8.7	
15-Jun	4.1	3.3	3.9	2.4	2.9	2.7	2.5	2.9	6.8	8.0	4.6	3.7	3.9	4.1	4.1	4.1	3.5	3.6	3.5	3.9	3.7	3.7	3.9	3.8	3.9	8.0	
16-Jun	3.3	3.6	3.5	3.1	2.8	2.8	2.5	2.3	2.5	2.9	3.0	2.9	3.0	3.0	2.9	3.0	3.4	3.6	3.8	3.8	3.3	3.1	3.0	3.1	3.1	3.8	
17-Jun	4.4	5.1	4.9	4.7	4.4	4.1	4.1	3.3	3.0	3.4	4.1	4.2	3.9	3.1	2.7	2.6	2.5	2.5	3.0	3.1	2.8	2.7	3.5	2.5	3.5	5.1	
18-Jun	2.5	4.1	4.4	4.1	4.5	3.8	2.9	2.9	2.9	2.9	2.9	2.8	2.7	2.9	3.0	2.7	2.7	3.2	3.5	3.8	3.9	6.5	5.9	3.6	3.5	6.5	
19-Jun	3.6	4.8	5.2	6.3	6.5	5.8	5.2	4.1	3.5	3.4	3.7	3.3	3.4	3.4	3.6	4.0	3.9	4.7	5.1	4.9	4.5	5.1	5.0	5.1	4.5	6.5	
20-Jun	4.9	5.2	5.4	4.9	4.1	3.5	3.8	6.1	5.7	6.4	5.9	5.8	4.6	4.6	4.6	5.0	4.2	3.3	3.6	5.4	9.3	11.4	14.5	15.3	6.1	15.3	
21-Jun	11.1	10.8	9.3	8.8	8.9	9.6	9.3	9.3	8.4	4.6	4.5	4.1	3.4	1.8	UO	UO	UO	UO	UO	UO	UO	UO	3.3	6.8	9.4	--	11.1
22-Jun	9.0	4.6	4.1	4.5	4.8	4.9	4.4	3.7	4.2	6.2	7.3	5.3	5.0	4.3	4.1	3.5	2.6	1.8	0.9	1.9	4.3	7.2	8.1	6.8	4.7	9.0	
23-Jun	7.0	4.9	3.4	4.4	4.8	4.3	5.9	6.4	6.8	9.8	16.2	21.2	16.7	27.9	19.7	14.1	17.0	13.2	16.2	17.9	15.2	18.0	12.9	8.9	12.2	27.9	
24-Jun	9.6	13.1	13.2	11.6	12.3	12.8	13.5	14.3	14.1	12.5	12.8	11.8	12.0	11.8	11.4	7.3	9.9	13.9	10.5	7.9	9.4	9.3	11.7	12.2	11.6	14.3	
25-Jun	11.9	12.2	11.2	11.8	12.4	11.2	8.0	11.6	11.8	10.3	9.6	8.7	9.3	8.8	8.7	9.0	9.2	9.0	9.1	7.6	8.8	8.9	6.6	5.8	9.7	12.4	
26-Jun	10.4	13.4	14.4	12.7	11.2	9.5	8.8	9.3	10.4	11.0	12.6	13.2	13.7	13.3	13.0	18.3	16.6	15.7	13.5	10.0	11.7	7.2	3.9	4.0	11.6	18.3	
27-Jun	3.5	5.1	7.0	6.3	7.7	7.4	4.4	4.5	4.6	4.2	3.4	3.1	3.1	5.2	6.4	13.1	8.6	5.6	9.2	8.1	10.7	7.3	8.3	10.2	6.5	13.1	
28-Jun	9.4	8.4	9.0	8.8	8.2	5.7	5.8	4.9	7.5	10.3	10.6	7.4	1.7	1.7	7.4	10.0	7.4	4.9	4.1	2.7	5.9	21.3	11.9	6.9	7.6	21.3	
29-Jun	5.4	3.8	3.0	2.8	3.4	6.5	8.1	8.4	12.5	12.5	9.9	8.9	8.7	9.3	10.1	9.0	10.2	9.0	7.2	5.9	3.4	5.3	8.1	5.5	7.4	12.5	
30-Jun	8.3	8.4	6.0	4.2	3.9	4.2	4.8	4.8	3.9	3.1	5.5	7.9	8.9	9.3	8.9	9.9	9.0	8.6	8.7	11.2	11.4	12.7	9.8	8.9	7.6	12.7	

6.5	6.6	6.7	7.1	8.0	7.7	7.3	6.9	7.2	7.1	6.9	6.1	5.5	6.2	5.7	6.2	8.4	7.7	6.9	6.7	8.6	10.1	8.3	7.0	Diurnal Average	
14.3	13.4	14.4	21.2	31.1	28.9	28.1	23.2	21.5	27.2	22.5	21.2	16.7	27.9	19.7	18.7	77.9	66.7	40.9	52.5	83.4	101.1	49.7	27.0	Diurnal Maximum	

C - Calibration UO - Unstable Operation
 Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m³





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Athabasca Valley - June 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	361	51.28	51.28
6 - 15	295	41.90	93.18
16 - 25	22	3.13	96.31
26 - 80	11	1.56	97.87
> 81.0	2	0.28	98.15

Total Number of Valid Hours: 704

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Athabasca Valley - June 2016**

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	30	9	10	4	10	16	44	16	16	17	36	49	22	26	20	36	361
6 - 15	36	5	8	8	10	29	72	26	11	6	7	5	6	7	13	46	295
16 - 25	2	1	0	1	0	2	5	2	0	1	0	0	0	0	2	6	22
26 - 80	0	2	0	1	2	0	4	1	0	0	0	0	0	0	0	1	11
> 81.0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
Totals	68	17	18	16	22	47	125	45	27	24	43	54	28	33	35	89	691

Total Number of Valid Hours: 704

Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

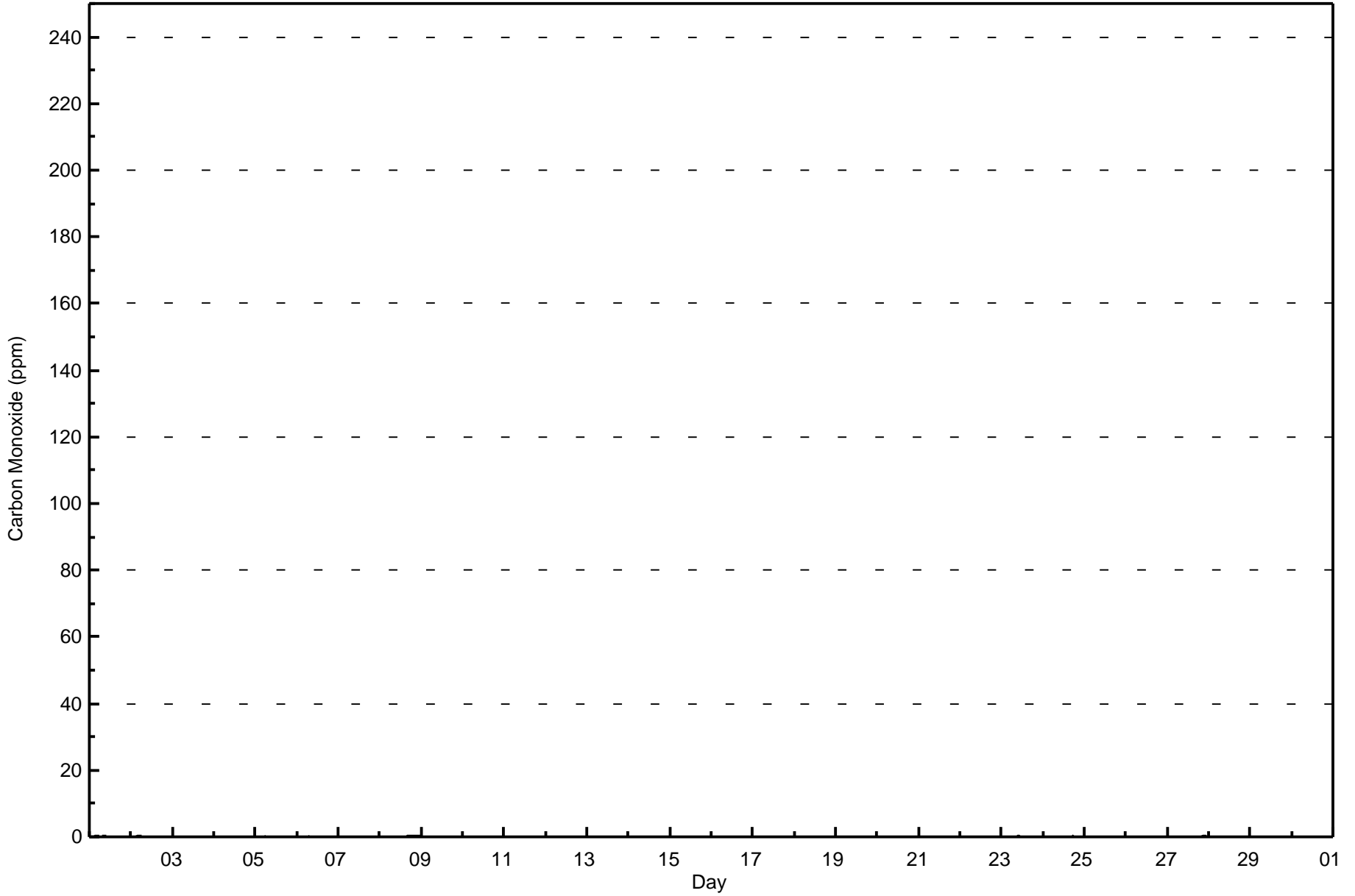
Carbon Monoxide (CO) - ppm
Athabasca Valley - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 0.6 ppm on Jun 8 22:00 Maximum Daily Average: 0.2 ppm on Jun 8		Hours in Service: 720 Hours of Data: 684 Hours of Missing Data: 36 Hours of Calibration: 34 Percent Operational Time: 99.7																								
Minimum Value: 0.0 ppm on Jun 21 14:00 Maximum Diurnal Average: 0.2 ppm at hour 6 Monthly Average: 0.12 ppm		Minimum Daily Average: 0.1 ppm on Jun 21 Minimum Diurnal Average: 0.1 ppm at hour 14 Percentiles: P ₁ = 0.0 P ₁₀ = 0.1 Q ₁ = 0.1 Median = 0.1 Q ₃ = 0.1 P ₉₀ = 0.2 P ₉₉ = 0.4																								
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-Jun	0.1	0.1	0.2	0.2	0.4	0.5	Z	0.4	0.4	0.4	M	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	0.5
2-Jun	0.2	0.2	0.2	0.3	0.4	0.5	0.5	Z	M	0.2	0.1	0.1	C	C	C	C	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.5
3-Jun	0.1	0.2	0.2	0.2	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	0.2
4-Jun	0.1	0.1	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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
5-Jun	0.1	0.1	0.1	0.2	Z	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	0.1	0.1	0.1	0.2
6-Jun	0.1	0.1	0.1	0.2	0.2	Z	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	0.1	0.1	0.1	0.1	0.1	0.1	0.2
7-Jun	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	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.1	0.2
8-Jun	0.1	0.1	0.2	0.2	0.2	0.2	0.2	Z	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.4	0.4	0.3	0.3	0.5	0.6	0.4	0.3	0.2	0.6
9-Jun	0.2	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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
10-Jun	0.1	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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.2
11-Jun	0.2	0.2	0.2	0.2	Z	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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
12-Jun	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
13-Jun	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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.2
14-Jun	0.2	0.2	0.2	0.2	0.2	0.2	0.2	Z	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	0.1	0.2
15-Jun	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	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
16-Jun	0.1	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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
17-Jun	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	0.1
18-Jun	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	0.2	0.1	0.1	0.1	0.2
19-Jun	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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
20-Jun	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	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.2
21-Jun	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Z	0.1	0.1	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	0.1	0.1
22-Jun	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	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	0.2
23-Jun	0.1	0.1	0.1	0.1	Z	0.1	0.1	0.1	0.1	0.2	0.2	0.2	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	0.2
24-Jun	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	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.2
25-Jun	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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.2
26-Jun	0.2	0.2	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	0.2	0.1	0.1	0.1	0.1	0.2
27-Jun	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	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.4	0.4	0.2	0.1	0.4
28-Jun	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.2	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	0.2
29-Jun	0.1	0.1	0.1	0.1	Z	0.1	0.1	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	0.1	0.2
30-Jun	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
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 13 ppm																										



Wood Buffalo Environmental Association
Hourly Averages

Carbon Monoxide (CO) - ppm
Athabasca Valley - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Carbon Monoxide (CO) - ppm
Athabasca Valley - June 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.3	669	97.81	97.81
0.4 - 0.5	14	2.05	99.85
0.6 - 0.7	1	0.15	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: 684

Total Number of Hours: 720



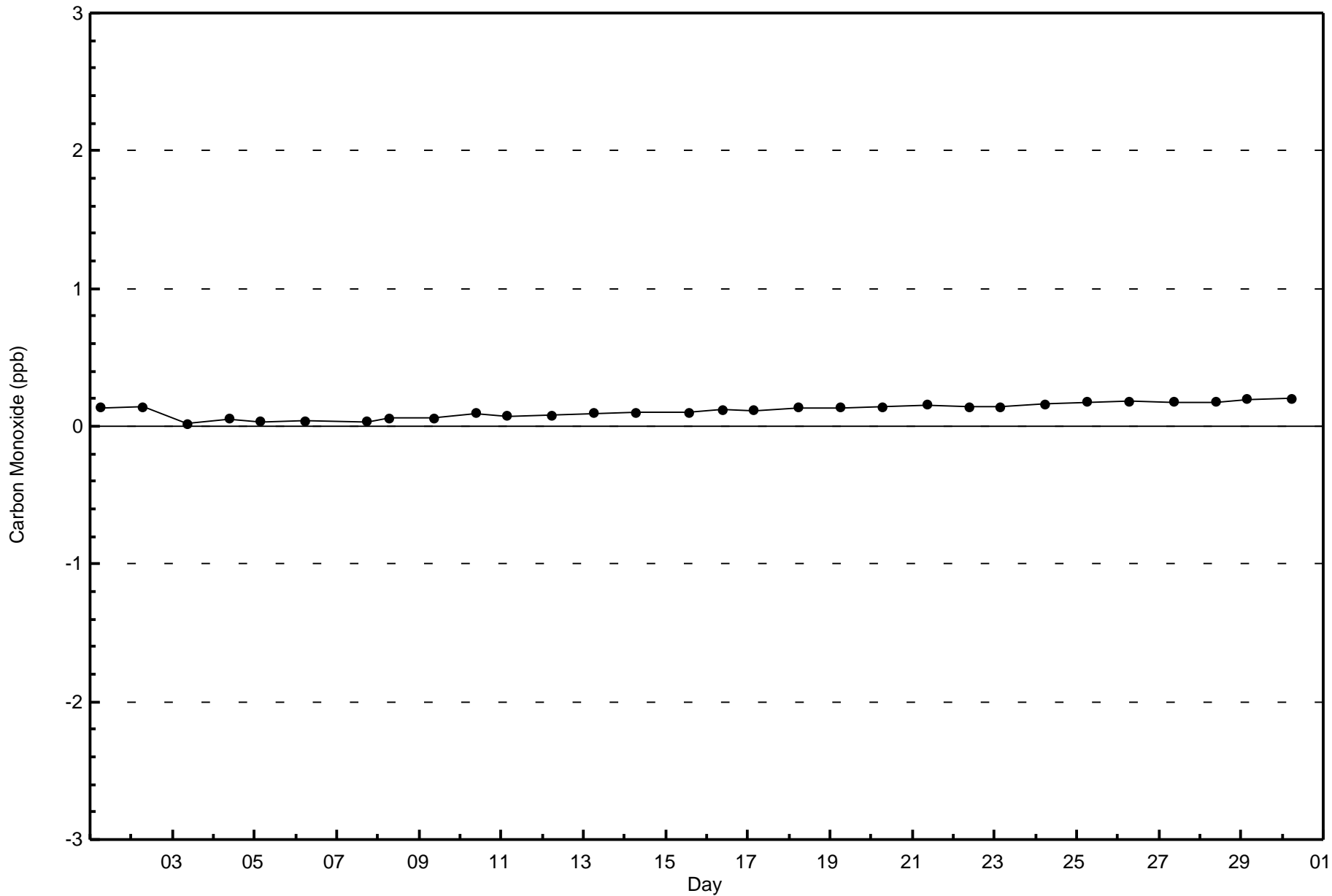
**Wood Buffalo Environmental Association
Frequency Distribution**

**Carbon Monoxide (CO) - ppm
Athabasca Valley - June 2016**

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	69	16	18	10	19	44	113	45	32	23	41	56	28	32	37	86	669
0.4 - 0.5	0	1	0	1	1	2	7	2	0	0	0	0	0	0	0	0	14
0.6 - 0.7	0	0	0	1	0	0	0	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
Totals	69	17	18	12	20	46	120	47	32	23	41	56	28	32	37	86	684

Total Number of Valid Hours: 684

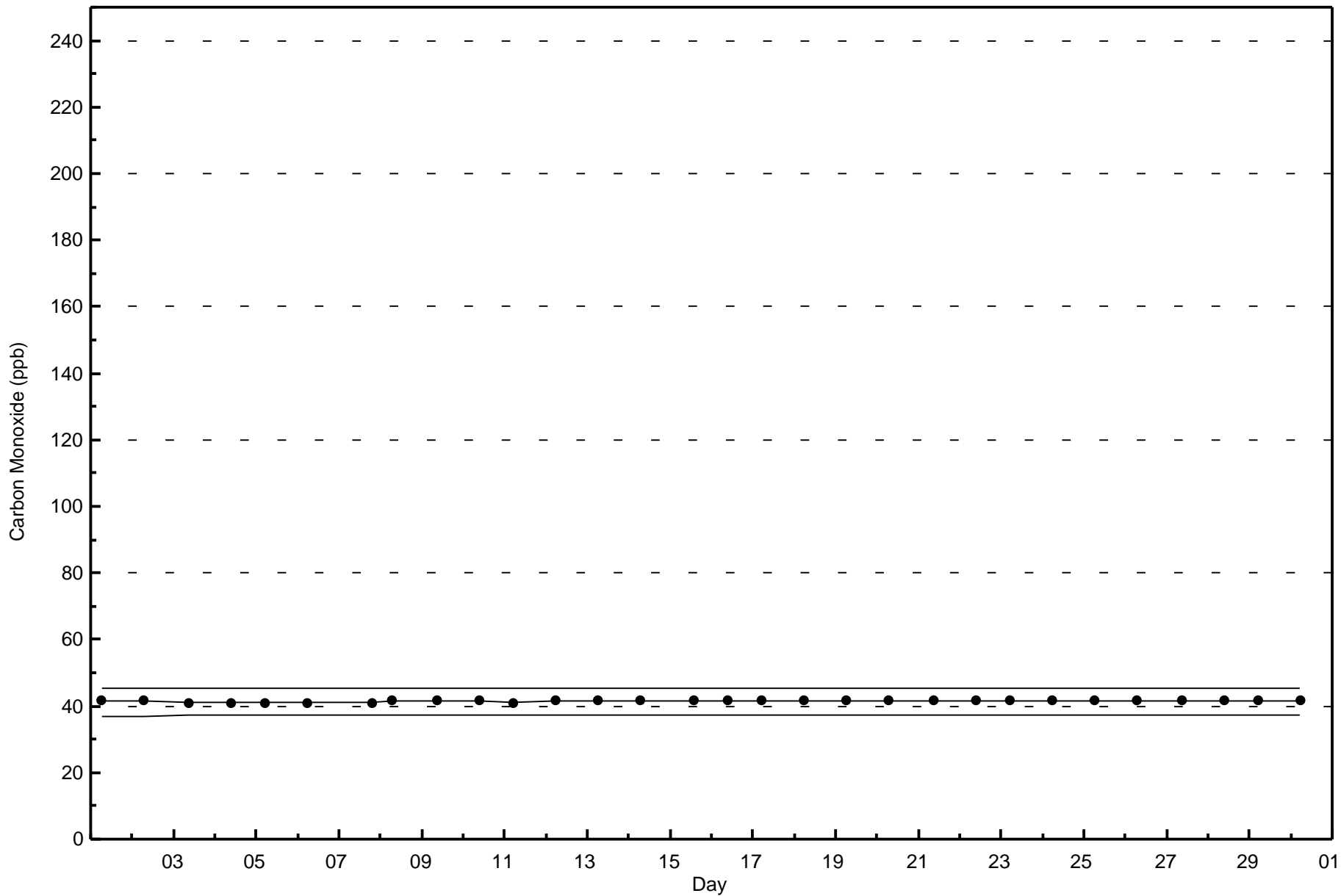
Total Number of Hours: 720





Wood Buffalo Environmental Association
Span Responses

Carbon Monoxide (CO) - ppb
Athabasca Valley - June 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

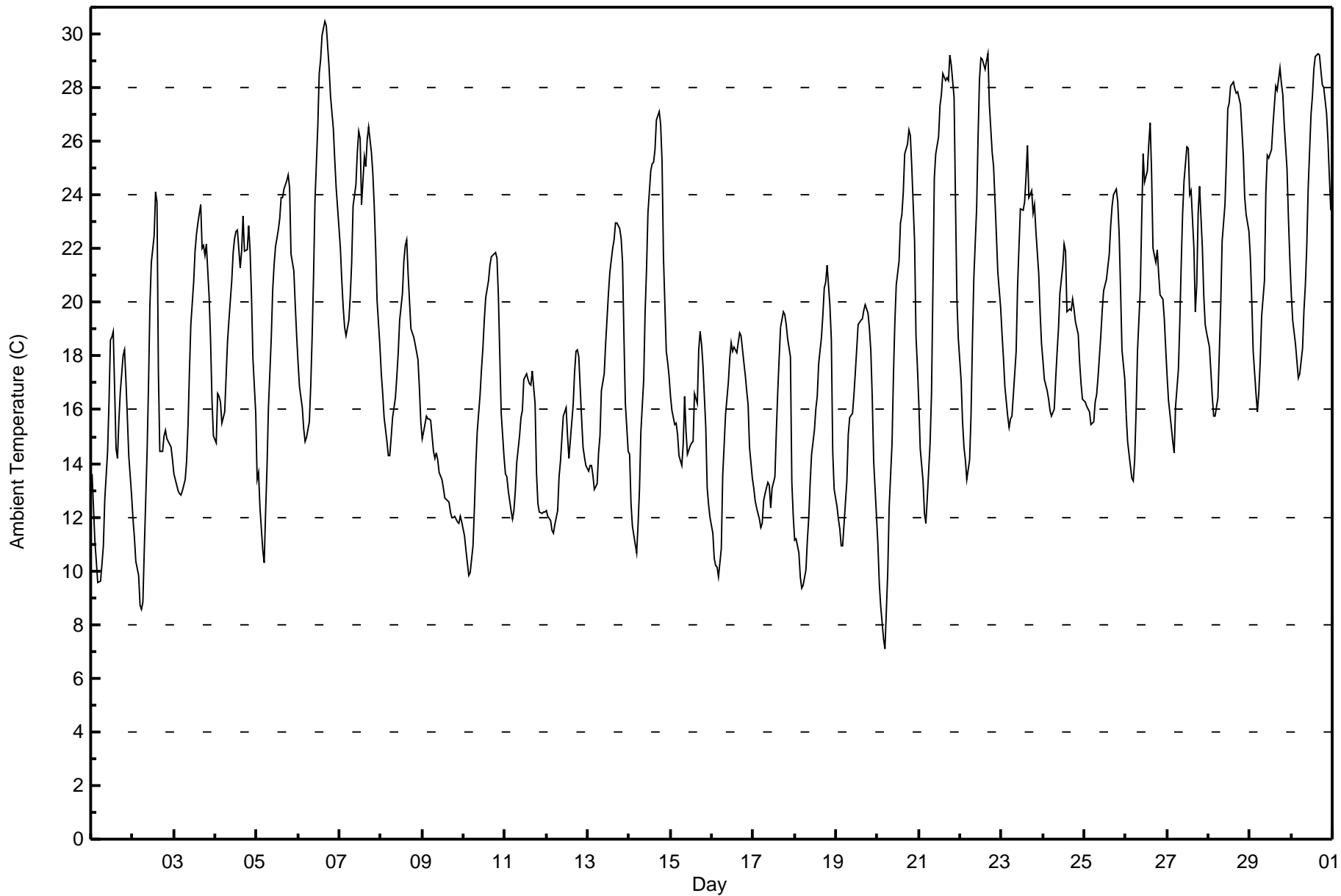
Ambient Temperature (AT) - C
Athabasca Valley - June 2016

Maximum Value: 30.5 C on Jun 6 16:00		Maximum Daily Average: 23.8 C on Jun 30		Hours in Service: 720																																												
Minimum Value: 7.1 C on Jun 20 05:00		Minimum Daily Average: 13.5 C on Jun 9		Hours of Data: 720																																												
Maximum Diurnal Average: 22.3 C at hour 18		Minimum Diurnal Average: 13.0 C at hour 5		Hours of Missing Data: 0																																												
Monthly Average: 18.41 C		Percentiles: P ₁ = 9.4 P ₁₀ = 12.2 Q ₁ = 14.4 Median = 17.9 O ₃ = 22.0 P ₉₀ = 25.7 P ₉₉ = 29.2		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-Jun	13.6	12.4	11.1	10.3	9.6	9.6	10.2	10.9	12.7	14.5	16.3	18.6	18.7	18.9	14.5	14.2	15.6	16.7	18.0	18.2	17.1	15.7	14.3	12.8	14.4	18.9																						
2-Jun	11.9	11.3	10.4	9.8	8.7	8.5	8.8	10.8	14.5	16.9	19.9	21.5	22.5	24.1	23.7	17.4	14.4	14.4	15.0	15.2	14.9	14.7	14.6	14.1	14.9	24.1																						
3-Jun	13.6	13.4	13.0	12.9	12.8	13.0	13.4	14.1	15.4	17.4	19.2	20.8	21.9	22.5	23.0	23.7	22.0	22.1	21.8	22.2	20.2	18.6	16.3	15.0	17.8	23.7																						
4-Jun	14.8	16.6	16.5	16.3	15.5	15.9	17.2	18.5	19.3	20.8	21.8	22.4	22.7	22.7	21.3	21.9	23.2	21.9	22.0	22.8	21.9	20.2	17.9	15.9	19.6	23.2																						
5-Jun	13.4	13.7	12.4	10.8	10.3	12.2	13.9	16.1	18.6	20.4	21.4	22.1	22.7	23.1	23.9	23.9	24.2	24.5	24.7	24.3	21.8	21.2	19.9	18.8	19.1	24.7																						
6-Jun	17.8	16.9	16.1	15.3	14.8	14.9	15.5	16.9	18.7	21.0	23.8	26.6	28.5	29.1	29.9	30.5	30.3	29.5	28.8	27.7	26.5	25.3	24.3	23.5	23.0	30.5																						
7-Jun	22.0	20.8	19.8	19.0	18.7	19.3	20.2	21.5	23.6	24.4	25.6	26.4	26.1	23.6	25.4	25.1	26.1	26.5	25.6	24.8	23.6	22.0	20.1	18.4	22.9	26.5																						
8-Jun	17.3	16.6	15.7	14.8	14.3	14.3	15.0	15.7	16.4	17.2	18.2	19.3	20.4	21.5	22.1	22.3	21.1	19.0	18.9	18.7	18.4	17.9	16.8	15.5	17.8	22.3																						
9-Jun	14.9	15.2	15.8	15.6	15.7	15.6	14.5	14.2	14.4	14.2	13.7	13.4	13.1	12.7	12.7	12.6	12.2	12.0	12.0	12.0	11.8	11.8	12.0	11.8	13.5	15.8																						
10-Jun	11.3	10.8	10.3	9.8	9.9	10.9	12.3	14.0	15.2	16.5	17.5	18.3	19.3	20.2	20.8	21.4	21.7	21.7	21.8	21.7	20.2	18.0	15.9	14.2	16.4	21.8																						
11-Jun	13.6	13.5	13.0	12.3	11.9	12.2	13.0	14.0	15.0	15.7	16.0	17.2	17.3	17.1	17.0	16.9	17.4	16.2	13.7	12.5	12.2	12.2	12.2	12.2	14.3	17.4																						
12-Jun	12.2	12.0	11.9	11.5	11.4	11.7	12.2	13.5	14.1	14.9	15.8	16.1	15.0	14.2	14.9	16.2	17.4	18.2	18.3	18.0	15.6	14.6	14.2	13.9	14.5	18.3																						
13-Jun	13.7	13.9	13.9	13.6	13.1	13.2	14.4	15.0	16.7	17.3	18.4	19.4	20.3	21.1	22.0	22.3	22.9	23.0	22.8	22.4	21.5	18.7	16.2	14.5	17.9	23.0																						
14-Jun	14.4	12.5	11.7	11.0	10.7	11.7	13.0	15.2	17.1	19.7	21.2	23.3	24.9	25.2	25.2	25.7	26.8	27.1	26.6	25.3	21.7	18.2	17.8	17.2	19.3	27.1																						
15-Jun	16.5	16.0	15.5	15.5	15.1	14.3	13.9	14.7	16.5	15.2	14.3	14.6	14.7	14.8	16.6	16.2	18.2	18.9	18.4	17.7	15.3	13.1	12.5	12.0	15.4	18.9																						
16-Jun	11.4	10.5	10.2	10.2	9.8	10.8	13.6	14.6	15.8	17.0	17.9	18.5	18.2	18.4	18.1	18.5	18.9	18.7	17.7	17.3	16.7	16.2	14.6	13.4	15.3	18.9																						
17-Jun	13.1	12.6	12.3	11.9	11.6	11.8	12.6	12.9	13.3	13.2	12.3	13.1	13.5	15.2	16.7	17.9	19.1	19.7	19.6	19.2	18.7	17.9	13.3	12.0	14.7	19.7																						
18-Jun	11.1	11.2	10.7	9.8	9.4	9.5	10.1	11.1	12.0	13.3	14.3	15.3	16.0	16.5	17.7	18.7	19.5	20.6	20.8	21.4	19.9	18.6	14.4	13.0	14.8	21.4																						
19-Jun	12.4	11.9	11.6	10.9	10.9	12.6	13.4	15.1	15.7	15.9	16.5	17.4	18.3	19.2	19.3	19.4	19.7	19.9	19.6	19.0	18.2	16.4	14.1	12.0	15.8	19.9																						
20-Jun	11.0	9.5	8.7	7.5	7.1	8.5	10.0	12.4	14.7	17.2	19.3	20.6	21.5	23.0	23.3	24.1	25.5	25.9	26.4	26.2	25.1	22.3	18.7	17.6	17.8	26.4																						
21-Jun	16.3	14.5	13.3	12.2	11.8	12.7	14.8	16.6	20.6	24.6	25.5	26.2	27.3	27.8	28.5	28.3	28.4	28.3	29.2	28.9	27.6	23.7	20.1	18.6	21.9	29.2																						
22-Jun	17.1	15.6	14.6	14.1	13.4	14.1	15.7	18.6	20.9	23.5	26.2	28.3	29.1	29.1	28.7	29.0	29.3	27.4	25.6	25.1	23.8	22.5	21.1	19.8	22.2	29.3																						
23-Jun	18.8	17.9	16.9	15.8	15.3	15.7	15.7	16.5	18.2	20.6	22.0	23.5	23.4	23.8	24.7	25.8	23.9	24.2	23.3	23.6	22.7	21.1	19.6	18.4	20.5	25.8																						
24-Jun	17.8	17.1	16.7	16.4	16.0	15.8	16.0	17.1	18.1	19.0	20.3	21.3	22.2	21.9	19.7	19.8	19.7	20.1	19.7	19.3	18.8	17.8	17.0	16.4	18.5	22.2																						
25-Jun	16.3	16.1	16.0	15.9	15.5	15.6	16.3	16.6	17.2	18.8	19.7	20.4	20.7	20.9	21.8	22.9	23.6	24.0	24.2	23.8	22.5	20.5	18.2	17.2	19.4	24.2																						
26-Jun	15.8	14.8	14.4	13.5	13.3	14.1	15.9	18.2	20.5	23.1	25.5	24.5	24.9	25.9	26.7	24.8	22.0	21.5	22.0	21.0	20.3	20.1	19.4	18.3	20.0	26.7																						
27-Jun	17.2	16.3	15.4	14.8	14.4	16.2	17.5	19.3	21.4	23.3	24.5	25.8	25.8	24.0	24.2	22.0	19.6	20.7	23.3	24.4	22.0	20.2	19.2	18.9	20.4	25.8																						
28-Jun	18.4	17.4	16.5	15.7	15.8	16.4	18.1	19.9	22.3	23.6	25.3	27.2	27.4	28.1	28.2	27.9	27.8	27.9	27.4	26.4	25.5	23.9	23.3	22.7	23.0	28.2																						
29-Jun	21.7	20.1	18.2	16.6	15.9	16.7	17.8	19.5	20.8	24.1	25.5	25.4	25.7	26.6	27.3	28.0	27.9	28.8	28.2	27.7	26.7	25.0	23.1	21.6	23.3	28.8																						
30-Jun	20.3	19.3	18.4	17.8	17.2	17.3	18.3	19.7	20.7	22.1	24.3	27.0	27.7	28.7	29.1	29.2	29.2	28.6	28.1	28.0	27.0	26.1	24.7	23.4	23.8	29.2																						
																								15.3	14.7	14.0	13.4	13.0	13.5	14.5	15.8	17.3	18.9	20.1	21.1	21.7	22.0	22.2	22.2	22.3	22.3	22.1	21.8	20.6	19.1	17.5	16.4	Diurnal Average
																								22.0	20.8	19.8	19.0	18.7	19.3	20.2	21.5	23.6	24.6	26.2	28.3	29.1	29.1	29.9	30.5	30.3	29.5	29.2	28.9	27.6	26.1	24.7	23.5	Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Athabasca Valley - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Athabasca Valley - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	18	2.50	2.50
10 - 20	444	61.67	64.17
> 20	258	35.83	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

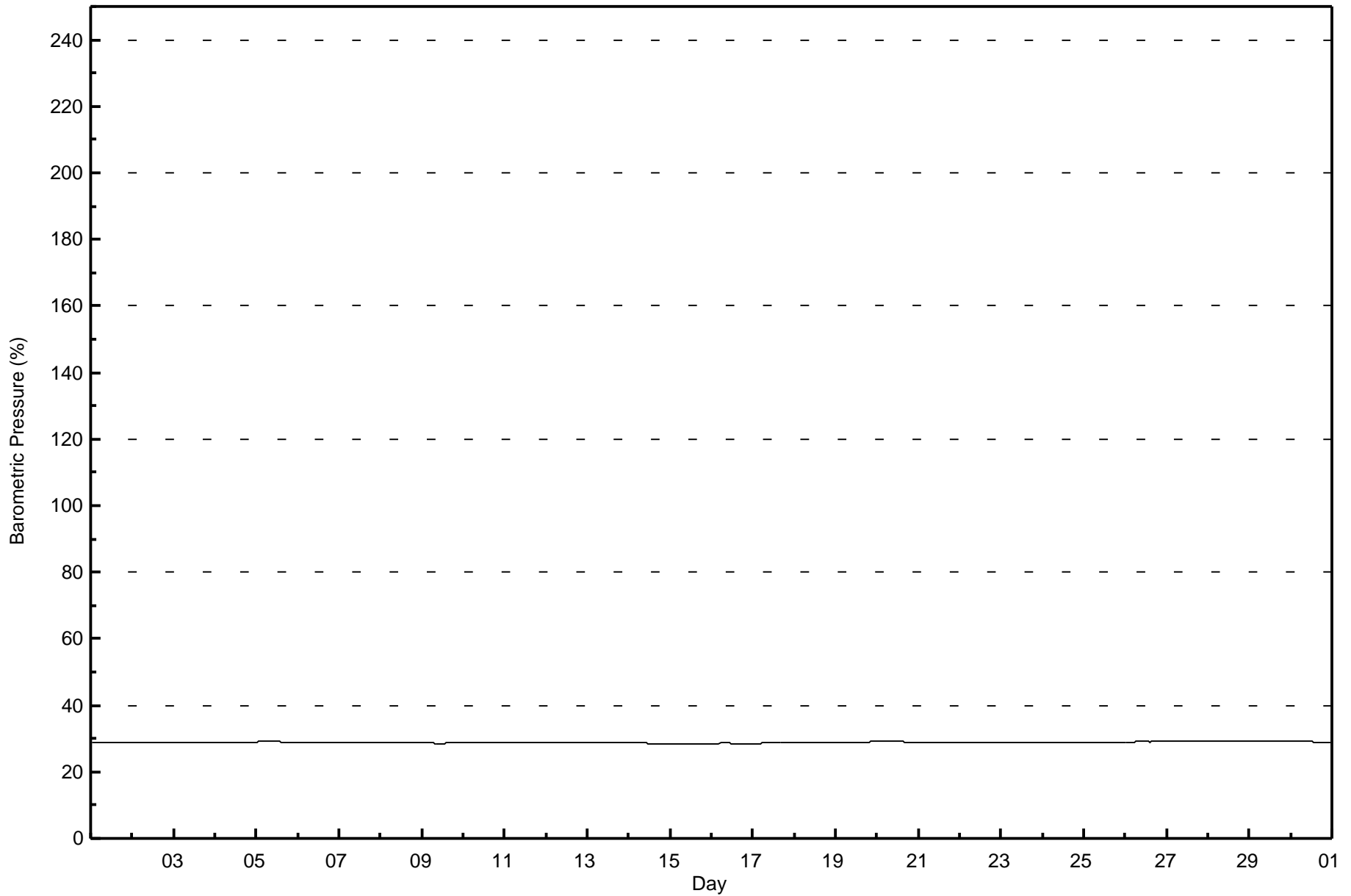
Barometric Pressure (BP) - %
Athabasca Valley - June 2016

Maximum Value: 29.2 % on Jun 29 07:00 Maximum Daily Average: 29.2 % on Jun 29																						Hours in Service: 720 Hours of Data: 720																											
Minimum Value: 28.4 % on Jun 15 09:00 Minimum Daily Average: 28.5 % on Jun 15 Maximum Diurnal Average: 28.9 % at hour 7 Minimum Diurnal Average: 28.8 % at hour 19 Monthly Average: 28.85 % Percentiles: P ₁ = 28.5 P ₁₀ = 28.6 Q ₁ = 28.7 Median = 28.8 Q ₃ = 29.0 P ₉₀ = 29.1 P ₉₉ = 29.2																						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-Jun	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	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.9																							
2-Jun	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	28.6	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																						
3-Jun	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	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.9																							
4-Jun	28.9	28.9	28.9	28.9	28.9	28.9	28.9	29.0	29.0	29.0	29.0	28.9	28.9	28.9	29.0	29.0	28.9	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0																						
5-Jun	29.0	29.0	29.0	29.0	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.0	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																						
6-Jun	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0	28.9	28.9	28.9	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.8																						
7-Jun	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.7	28.7	28.7	28.6	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	28.8																						
8-Jun	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	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.8																						
9-Jun	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	28.7	28.7	28.7	28.7	28.7	28.8	28.8	28.8	28.7	28.8	28.8																						
10-Jun	28.8	28.8	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	29.0	29.0	29.0	29.0	28.9	29.0																						
11-Jun	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	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	29.0	29.0																						
12-Jun	28.7	28.7	28.7	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	28.6	28.6	28.7																						
13-Jun	28.6	28.6	28.6	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	28.6	28.6	28.7																						
14-Jun	28.6	28.6	28.7	28.7	28.7	28.7	28.7	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	28.5	28.5	28.5	28.5	28.6	28.6	28.7																						
15-Jun	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	28.5	28.5	28.5	28.6	28.6	28.5	28.5	28.5	28.5	28.5	28.6	28.6	28.6	28.6																						
16-Jun	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	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6																						
17-Jun	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	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.9	28.9																						
18-Jun	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	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.9	28.9	29.0																						
19-Jun	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	29.0	29.0	29.0	29.0	29.0	29.1	29.1	29.1	28.9	29.1																						
20-Jun	29.1	29.1	29.1	29.1	29.1	29.2	29.2	29.2	29.2	29.2	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	29.1	29.2																						
21-Jun	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	28.9	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	29.0																						
22-Jun	28.8	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	28.8	28.8	28.8	28.8	28.8	28.8	28.9																						
23-Jun	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	28.7	28.7	28.8	28.8																						
24-Jun	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	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8																						
25-Jun	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	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.9																						
26-Jun	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	29.1	29.1	29.1	29.1	29.1	29.1	29.0	29.1																						
27-Jun	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1																						
28-Jun	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1																						
29-Jun	29.1	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.2	29.2																						
30-Jun	29.2	29.2	29.1	29.1	29.1	29.2	29.1	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	29.1	29.2																						
																						28.8	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	28.8	28.8	28.8	28.8	28.8	28.8	Diurnal Average	
																						29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.2	29.2	Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

Barometric Pressure (BP) - %
Athabasca Valley - June 2016

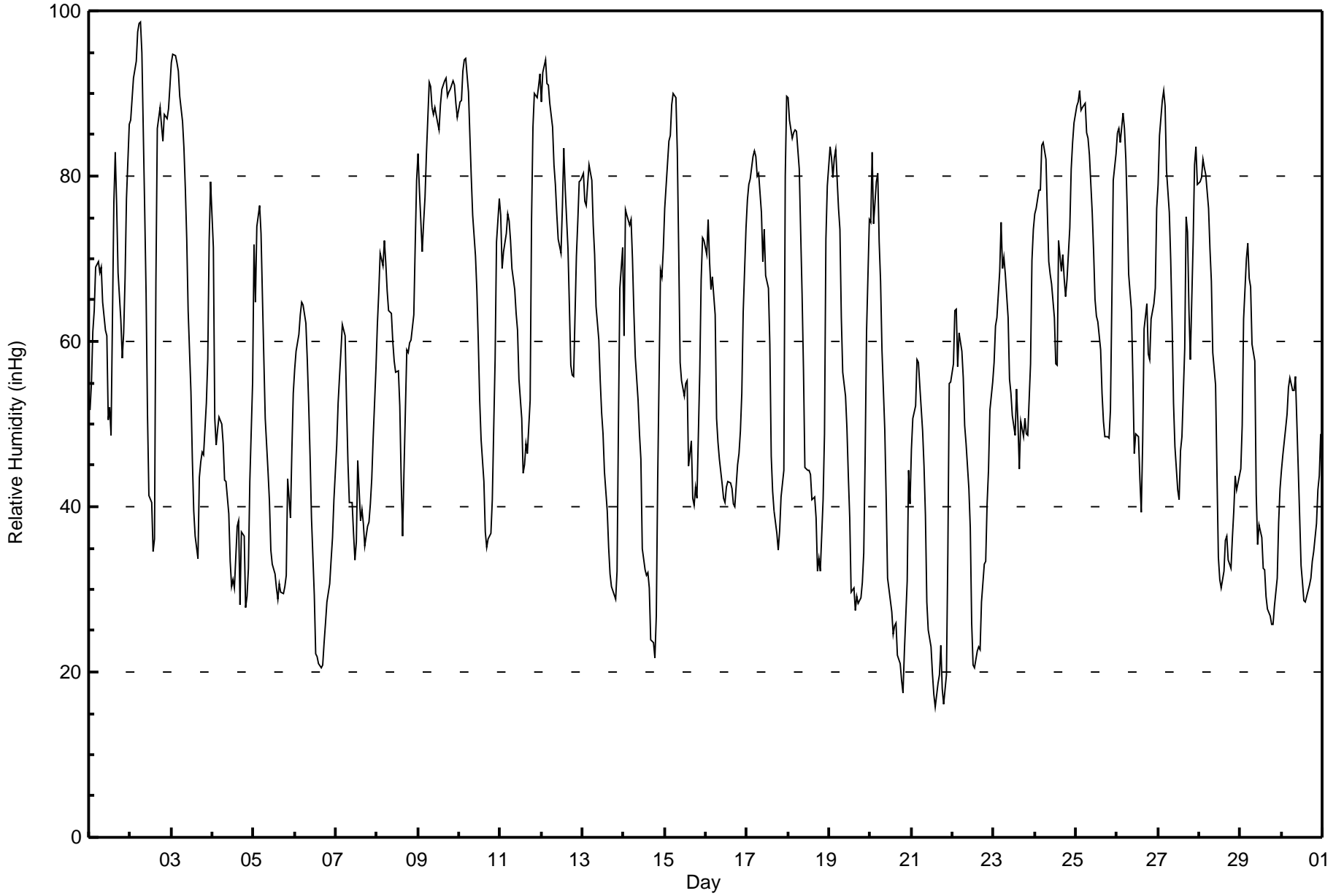




Wood Buffalo Environmental Association
Summary of Hour Averages

Relative Humidity (RH) - inHg
Athabasca Valley - June 2016

Maximum Value: 99 inHg on Jun 2 07:00																			Maximum Daily Average: 86.5 inHg on Jun 9																			Hours in Service: 720						
Minimum Value: 16 inHg on Jun 21 15:00																			Minimum Daily Average: 35.1 inHg on Jun 21																			Hours of Data: 720						
Maximum Diurnal Average: 77.0 inHg at hour 5																			Minimum Diurnal Average: 42.6 inHg at hour 15																			Hours of Missing Data: 0						
Monthly Average: 57.9 inHg																			Percentiles: P ₁ = 20 P ₁₀ = 30 Q ₁ = 41 Median = 58 Q ₃ = 75 P ₉₀ = 86 P ₉₉ = 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-Jun	52	55	61	64	69	70	68	69	65	61	61	51	52	49	77	83	76	68	63	58	61	68	77	86	65.1	86																		
2-Jun	87	89	92	94	97	99	99	95	76	66	51	41	40	35	36	67	86	88	86	84	88	87	88	91	77.6	99																		
3-Jun	94	95	95	94	93	90	87	83	78	72	64	54	46	40	36	34	44	45	47	46	53	58	72	79	66.5	95																		
4-Jun	71	51	48	49	51	50	48	43	43	39	33	30	31	30	38	38	28	37	36	28	29	33	43	55	41.0	71																		
5-Jun	72	65	74	76	73	65	58	51	44	41	35	33	32	30	29	31	30	30	30	32	43	39	47	54	46.3	76																		
6-Jun	57	59	61	63	65	64	62	58	52	46	39	29	22	22	21	20	21	23	26	28	31	34	36	41	40.9	65																		
7-Jun	48	52	56	59	62	61	52	45	41	40	37	34	36	46	38	40	38	35	38	38	40	43	48	57	45.1	62																		
8-Jun	62	66	71	69	72	70	66	64	63	60	58	56	56	52	43	36	44	59	59	60	60	63	72	79	60.9	79																		
9-Jun	83	78	71	74	77	83	91	91	88	88	88	86	86	89	91	92	92	90	90	90	92	91	89	87	86.5	92																		
10-Jun	89	89	93	94	94	90	85	80	75	70	66	60	53	48	43	37	35	36	37	41	49	58	72	77	65.5	94																		
11-Jun	75	69	71	73	75	75	72	69	66	63	61	55	51	44	45	48	46	53	75	86	90	89	91	92	68.1	92																		
12-Jun	89	93	94	91	91	89	86	81	79	75	72	71	76	83	78	71	64	57	56	56	70	75	79	79	77.4	94																		
13-Jun	80	77	76	79	81	80	74	71	64	60	55	51	49	44	40	35	32	30	29	29	32	50	66	71	56.6	81																		
14-Jun	61	76	75	74	75	70	64	58	53	49	46	35	32	32	32	30	24	24	22	27	43	69	68	71	50.3	76																		
15-Jun	76	79	84	85	89	90	90	83	71	58	55	53	55	55	45	48	41	40	42	41	56	68	73	72	64.5	90																		
16-Jun	71	75	70	66	68	63	51	48	46	43	41	40	42	43	43	42	40	40	45	46	49	54	64	74	52.6	75																		
17-Jun	77	79	80	82	83	82	80	80	76	70	74	68	67	60	46	42	39	37	35	37	41	44	80	90	64.5	90																		
18-Jun	89	87	85	85	86	85	81	73	66	57	45	44	44	44	41	41	39	32	34	32	41	49	72	79	59.6	89																		
19-Jun	84	82	80	82	83	76	73	63	56	53	49	44	39	30	30	27	29	28	29	31	34	46	61	75	53.6	84																		
20-Jun	74	83	74	79	80	72	67	59	49	41	31	30	27	25	26	26	22	21	19	17	22	31	44	40	44.3	83																		
21-Jun	47	51	52	58	58	55	49	45	39	28	25	23	20	17	16	19	20	23	18	16	20	34	55	55	35.1	58																		
22-Jun	57	64	64	57	61	59	56	50	48	42	37	26	21	20	23	23	23	28	33	33	40	44	52	55	42.4	64																		
23-Jun	57	62	63	68	74	69	70	68	63	55	54	51	49	54	50	45	50	48	51	49	49	57	70	74	58.3	74																		
24-Jun	75	76	78	78	84	84	82	76	70	68	67	63	57	57	72	68	70	68	65	67	74	81	84	86	73.0	86																		
25-Jun	89	89	90	88	88	89	85	85	83	76	71	65	63	62	59	54	50	49	48	48	52	65	79	83	71.2	90																		
26-Jun	85	86	84	88	86	82	76	68	64	56	46	49	49	43	39	48	62	65	59	58	63	65	66	76	65.0	88																		
27-Jun	79	85	89	90	88	81	76	70	62	53	47	42	41	47	48	59	75	73	64	58	72	81	84	79	68.5	90																		
28-Jun	79	80	82	81	80	76	71	67	59	55	44	34	31	30	32	36	36	34	33	36	39	44	42	44	51.9	82																		
29-Jun	45	50	63	70	72	68	67	60	58	41	35	38	36	32	32	29	28	27	26	26	28	31	38	42	43.4	72																		
30-Jun	44	46	49	51	54	56	54	54	56	50	45	33	31	29	29	30	31	31	33	35	38	42	44	49	42.2	56																		
																			71.6	72.9	74.1	75.5	77.0	74.7	71.3	66.9	61.7	55.9	51.1	46.3	44.4	43.1	42.6	43.3	43.8	44.0	44.2	44.5	50.0	56.4	65.2	69.8	Diurnal Average	
																			94	95	95	94	97	99	99	95	88	88	88	86	86	89	91	92	92	90	90	90	92	91	91	92	Diurnal Maximum	





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Athabasca Valley - June 2016

Maximum Speed: 30 km/h on Jun 17 11:00	Maximum Daily Speed Average: 15.8 km/h on Jun 13	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 26 11:00	Minimum Daily Speed Average: 1.7 km/h on Jun 27	Hours of Data: 720
Maximum Diurnal Speed Average: 4.7 km/h at hour 16	Minimum Diurnal Speed Average: 1.1 km/h at hour 20	Hours of Missing Data: 0
Monthly Average Velocity: 1.3 km/h 260.9 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 5 Median = 8 O ₃ = 13 P ₉₀ = 18 P ₉₉ = 26	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-Jun	S6	S6	SE8	SSE8	SE11	SE12	SE12	SE13	SSE7	SE7	ENE3	ENE3	NNW8	NNW5	SW14	S3	SE6	SSE9	SE10	SE6	SE7	ESE4	SE3	ESE2	SE5.3	SW14
2-Jun	SE4	SSE4	SE3	SE5	SE8	SE7	SE6	SE5	SE5	SE7	S7	SE7	E8	SE6	ENE2	W23	WSW5	ESE7	N5	NW4	SW4	SSW7	SE4	S4	SSE3.3	W23
3-Jun	ESE1	SE4	SSE4	SSW5	SSE5	SSW6	SSW7	SW10	SW9	SW12	SW10	SW18	WSW19	W23	W24	W26	NNW15	N8	N5	N4	NNW9	NW4	W1	SSE2	WSW6.2	W26
4-Jun	SW6	WSW18	WSW19	WSW20	WSW23	WSW23	W20	NNW19	NNW14	NNW20	NNW20	NNW21	NW18	NW22	NNW16	WNW2	NW24	NNW15	NW16	NW20	NW17	NNW13	WNW5	W2	NNW14.3	NW24
5-Jun	ESE2	NW3	W1	ESE3	ESE4	ESE3	ESE5	E8	NE3	N10	NNW16	NNW15	NNW15	NNW12	N13	N12	NNE9	NE6	N6	NE5	ENE3	ESE6	SE10	SE12	NNE4.1	NNW16
6-Jun	SE11	SE11	SE10	SE8	SE11	SE13	SE12	SSE11	SE11	SE11	SE13	ESE16	SSE15	S14	S14	SSE15	S15	S14	S14	SSE15	SSE17	SSE12	S10	SSW9	SSE11.9	SSE17
7-Jun	SSW13	S5	SSW8	SSW8	S4	SE3	WSW8	WSW9	SW6	N9	N8	NNW8	NNW10	N14	N16	N12	NNW9	N13	N14	N10	NNW5	NNW5	NNW6	NW5	NNW4.6	N16
8-Jun	NNW4	WNW3	NW3	NW3	WNW4	NNW7	NNW8	N8	NNW6	NNW8	NNW9	NNW10	NNW9	NNW12	NW12	SSE7	SSE10	E9	E7	ENE6	ENE6	ENE8	NNE10	NNE6	N4.3	NW12
9-Jun	N9	NE9	ENE13	NE14	NNE10	NE13	NNE13	NNE13	NE13	NE12	NE14	NE14	NE14	NNE15	NNE16	N18	N20	N18	N17	N15	NNW16	NNW19	NNW22	NNW17	NNE13.3	NNW22
10-Jun	NNW10	NW6	NNW7	WNW2	WSW5	SE1	NE1	ENE4	NNW4	N9	N12	NNW14	NNW11	N10	N11	NNW10	NNW11	NNW12	NNW9	NNW6	N5	W4	W3	SE2	NNW5.9	NNW14
11-Jun	ESE3	SSE6	ESE4	ESE5	SE6	SE9	SE10	SSE11	SE12	SE12	SE13	SE15	SE18	SE17	SE14	SE10	SE14	SE16	ESE8	ESE5	ENE2	ENE3	SSE4	SE4	SE9.0	SE18
12-Jun	SSE2	SE1	E3	S4	S5	SSE3	SSW7	SW9	SW8	SW12	SW15	SW17	W14	WSW11	SW12	WSW15	W19	W22	WNW22	W15	WSW20	WSW20	WSW18	WSW15	WSW10.7	WNW22
13-Jun	WSW12	WSW17	WSW19	WSW15	SW12	SW14	WSW19	WSW18	SW17	SW23	WSW24	WSW23	WSW24	WSW23	W21	W17	WSW21	WSW19	SW19	WSW16	WSW7	W3	S1	SE4	WSW15.8	WSW24
14-Jun	SSE4	ESE4	SE4	SE5	SE7	SE7	SE8	SE5	SSE1	NNW3	NW5	ESE9	ESE12	ESE16	ESE17	ESE15	SE20	SSE17	SSE13	SSE16	SSE17	ESE5	ESE7	SE11	SE8.3	SE20
15-Jun	SE13	SE10	SE10	SE14	SE11	SE9	ESE7	SE11	SE20	SSE27	SSE26	S29	SSE30	S26	S28	S23	S19	SSW10	S10	SSE10	SW9	SSW5	SE3	SSE6	SSE14.2	SSE30
16-Jun	SSE4	ESE7	SE14	SE15	SE15	SE13	SSE15	S17	SSW17	SSW19	SW18	SW20	WSW19	WSW18	WSW19	WSW17	WSW19	SW14	SW15	SW8	WSW12	WSW14	WSW18	WSW12	SW11.5	SW20
17-Jun	SW8	SW7	SW7	WSW10	WSW11	WSW10	NNW11	W18	NNW23	NW29	NW30	NW28	NW21	NW23	WNW23	WNW24	WNW22	WNW22	W21	WSW14	WSW12	WSW15	NW17	NNW11	WNW15.1	NW30
18-Jun	NNW7	W11	W11	W11	WNW9	W8	NW8	NW8	WNW13	W13	WNW15	WNW8	W4	N8	NNE10	NNW7	NNW6	N3	WNW6	SW4	SW3	SW5	NNW14	W6	WNW6.5	WNW15
19-Jun	NW4	NNW4	WNW7	WNW6	NNW2	NNE0	ENE3	SSW4	N7	N12	N16	N16	N15	NNW23	NNW23	N20	N17	N18	N18	N12	N8	WNW4	WSW3	NNE0	NNW9.1	NNW23
20-Jun	WSW2	E4	SE5	SE3	ESE5	ESE5	E5	ENE4	N3	N3	NE5	N5	NNW7	NNE6	NNW9	N8	N4	N4	E4	SE8	SE6	SSE5	S1	SE6	ENE2.1	NNW9
21-Jun	SSE5	SE5	SE10	ESE10	SE13	SE11	SE10	SE12	SE7	WSW11	WSW13	WSW10	WSW6	WNW4	N6	N7	NNW7	NW5	ESE2	SSE11	S9	SSE3	SSE0	SE3	SSE3.2	WSW13
22-Jun	SE2	SE2	SE2	SSE5	SE6	SE10	SE8	ESE5	E7	ENE5	NE3	E7	E6	S1	SW7	WSW9	WSW10	SW25	WSW17	SW8	W4	W6	SW6	SSW5	SSW3.3	SW25
23-Jun	SW5	SSW4	SSE5	SSW4	SW3	SSW5	S4	SW5	SW2	WSW3	NNW6	NNW4	NNW11	NNW12	NNW7	N11	N11	NNW12	N7	ESE6	SE7	ESE4	NW1	N4	NNW1.9	NNW12
24-Jun	N5	NE2	N5	N6	N5	NNW10	NNW10	NNW10	NNW7	NW8	NNW11	NNW14	NNW14	NE10	SE3	NNW13	NW12	NW13	NE8	N4	NNW10	NNW12	NW8	NNW6	NNW7.5	NNW14
25-Jun	NNW8	N7	N7	N8	NNW10	NNW11	N10	N11	N14	NNW15	N15	NNW21	NNW16	NNW18	NNW18	NNW19	N14	N13	N12	E12	ESE6	WSW3	E0	ESE1	N9.9	NNW21
26-Jun	E3	E3	SE7	SE9	ESE6	SE8	ESE6	ESE6	E8	E5	SW0	WSW9	WNW3	SSW9	S7	NW10	NW7	SSW8	S8	SSE7	SSE3	NW10	NNW1	SSW3	SSE2.1	NW10
27-Jun	SSW2	WNW3	W3	SSE3	SE7	SE5	SW5	SW7	SW9	NW6	NW7	W12	WNW14	NW16	WNW6	NNE7	SSE9	SE7	SSE5	SE2	ESE1	ESE1	ESE2	SE7	WSW1.7	NW16
28-Jun	SE8	SSE5	SE4	SE5	SE5	SE7	E5	E5	E5	NNW7	N8	N8	NNW12	NNW13	N13	N15	N16	NNE14	N14	N11	NNE10	NNE8	NE7	ESE3	NNE5.4	N16
29-Jun	ESE4	ESE4	E1	ENE3	E4	ESE5	ENE5	NE3	WNW3	S8	SE6	N8	NNW7	NNW6	W6	NW4	SSW8	SSE5	SE10	SE11	SE10	SE9	SE11	SE11	SE3.0	SE11
30-Jun	SE10	SE11	SE8	SE11	SE10	SE11	SE9	NE4	NNW4	NNW4	N4	SE8	SE14	SE13	ESE12	SE13	SE15	SE15	ESE9	S8	S5	SSW6	S6	SSE3	SE7.4	SE15

S1.7	S1.9	S2.4	S2.9	SSE3.5	SSE3.6	SSE2.2	S1.6	WSW1.1	W2.7	NNW3.9	NNW3.6	NW4.1	NW4.6	NW4.3	NW4.7	NNW3.2	NNW2.2	NNW1.9	S1.1	SW1.3	WSW2.2	NNW1.2	S1.4	Diurnal Average	
SE13	WSW18	WSW19	WSW20	WSW23	WSW23	W20	WNW19	WNW23	NW29	NW30	S29	SSE30	S26	S28	W26	NW24	SW25	WNW22	NW20	WSW20	WSW20	NNW22	NNW17	Diurnal Maximum	

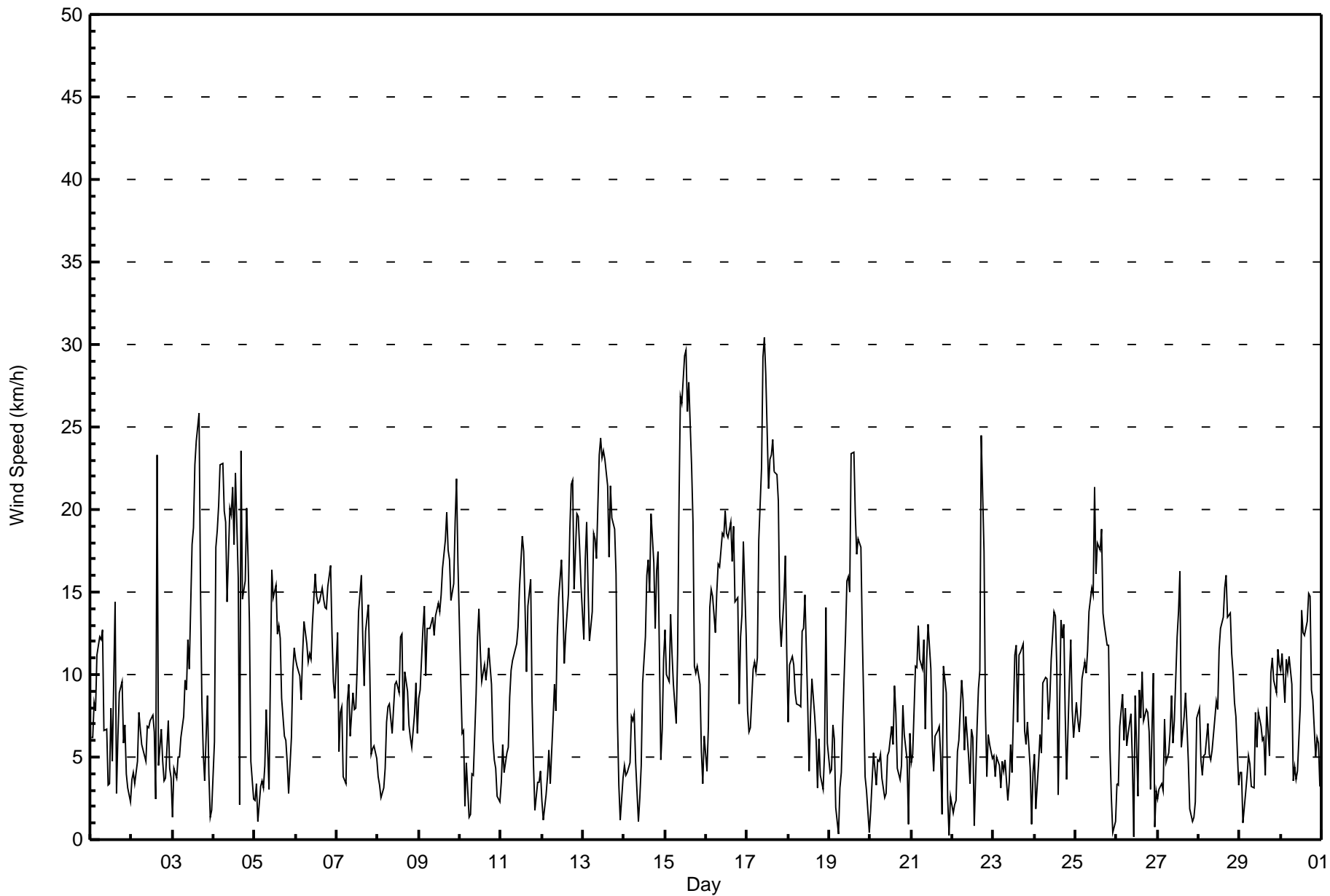
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Athabasca Valley - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 14 km/h on Jun 2 16:00 Minimum Value: 1 km/h on Jun 12 04:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 9																		Hours in Service: 720 Hours of Data: 720 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-Jun	2	2	2	1	3	2	3	2	4	3	1	1	2	5	7	3	2	2	3	2	2	1	1	1	7
2-Jun	2	1	1	2	2	1	1	2	2	2	3	3	3	3	3	14	5	3	2	2	2	3	1	2	14
3-Jun	2	2	1	3	1	3	3	2	2	2	4	5	4	7	6	6	7	3	3	2	5	3	1	1	7
4-Jun	4	5	3	5	4	4	6	6	5	5	6	6	9	8	7	4	7	5	9	3	3	2	2	1	9
5-Jun	1	2	2	2	1	1	2	1	2	3	6	5	4	6	3	4	3	3	2	2	1	2	3	3	6
6-Jun	3	2	2	2	2	2	3	2	3	3	3	6	6	5	5	5	4	4	4	4	5	3	4	2	6
7-Jun	3	3	3	3	3	2	3	2	2	2	2	3	10	5	6	4	4	4	4	3	2	2	1	1	10
8-Jun	2	2	2	2	2	1	1	2	1	2	1	2	2	2	4	3	2	2	2	2	3	3	2	4	4
9-Jun	3	3	3	3	2	4	3	4	4	4	5	4	4	4	4	4	5	4	4	4	4	4	4	4	5
10-Jun	2	1	2	2	2	1	1	1	2	2	3	3	3	3	4	3	3	2	2	2	1	1	1	2	4
11-Jun	1	2	1	1	2	2	3	3	3	3	4	4	6	5	4	4	6	6	4	2	2	2	1	1	6
12-Jun	1	1	1	1	1	2	3	4	2	5	5	5	7	4	5	5	5	5	4	4	4	4	3	3	7
13-Jun	3	4	4	3	3	3	4	5	4	5	5	5	6	6	6	6	5	4	4	4	3	2	2	2	6
14-Jun	1	1	1	2	3	2	2	3	2	1	2	5	4	5	5	5	6	6	4	8	6	2	2	4	8
15-Jun	3	3	4	5	4	5	2	4	6	8	8	9	9	8	10	9	6	4	4	3	9	3	2	2	10
16-Jun	2	3	3	3	3	3	4	5	5	6	6	5	6	5	4	4	4	5	3	3	3	4	4	4	6
17-Jun	2	2	3	2	2	2	3	4	5	6	7	6	7	6	6	7	5	5	6	4	3	4	6	3	7
18-Jun	4	3	2	3	4	3	2	2	3	3	5	4	4	3	2	3	2	2	4	2	2	3	10	3	10
19-Jun	1	2	1	1	2	1	2	3	4	4	4	5	5	7	6	6	5	5	4	4	3	1	2	2	7
20-Jun	2	1	1	1	2	1	1	2	1	1	2	2	2	3	2	2	2	2	2	2	1	2	2	2	3
21-Jun	2	2	2	2	2	2	2	2	3	3	3	4	3	4	3	2	2	1	3	3	2	2	1	3	4
22-Jun	1	2	3	3	3	2	2	2	2	1	1	4	3	4	3	3	4	6	4	3	2	2	4	3	6
23-Jun	2	2	2	2	2	1	1	2	1	2	2	3	5	3	2	3	3	3	2	6	3	1	1	2	6
24-Jun	2	2	2	3	1	3	2	2	2	3	4	3	3	4	3	4	3	2	4	2	4	3	2	2	4
25-Jun	2	2	2	2	3	2	3	3	3	3	3	4	4	3	4	4	4	4	3	5	3	1	2	2	5
26-Jun	2	1	3	2	2	2	2	2	2	2	2	6	2	2	3	7	5	2	4	3	2	6	5	2	7
27-Jun	2	2	2	2	1	2	3	2	2	3	4	5	4	8	3	7	4	3	2	2	1	1	2	2	8
28-Jun	2	1	2	2	2	2	1	1	2	3	2	4	4	4	3	4	5	4	4	3	2	2	2	2	5
29-Jun	2	1	1	1	1	1	1	1	1	4	3	3	2	2	2	3	3	3	3	3	3	2	2	2	4
30-Jun	2	2	2	2	2	2	3	1	2	1	2	6	5	5	5	4	4	4	3	3	2	3	2	2	6
																		Diurnal Maximum							





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Athabasca Valley - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	209	29.03	29.03
6 - 11	270	37.50	66.53
12 - 19	188	26.11	92.64
20 - 28	49	6.81	99.44
29 - 38	4	0.56	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Athabasca Valley - June 2016**

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	15	2	8	12	13	27	31	22	11	9	10	7	8	11	11	12	209
6 - 11	27	10	5	3	8	14	68	13	11	12	17	13	7	7	10	45	270
12 - 19	27	5	6	2	1	7	28	10	7	3	14	28	7	6	8	29	188
20 - 28	2	0	0	0	0	0	2	2	3	0	3	10	8	9	6	4	49
29 - 38	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2	0	4
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	71	17	19	17	22	48	129	48	33	24	44	58	30	33	37	90	720

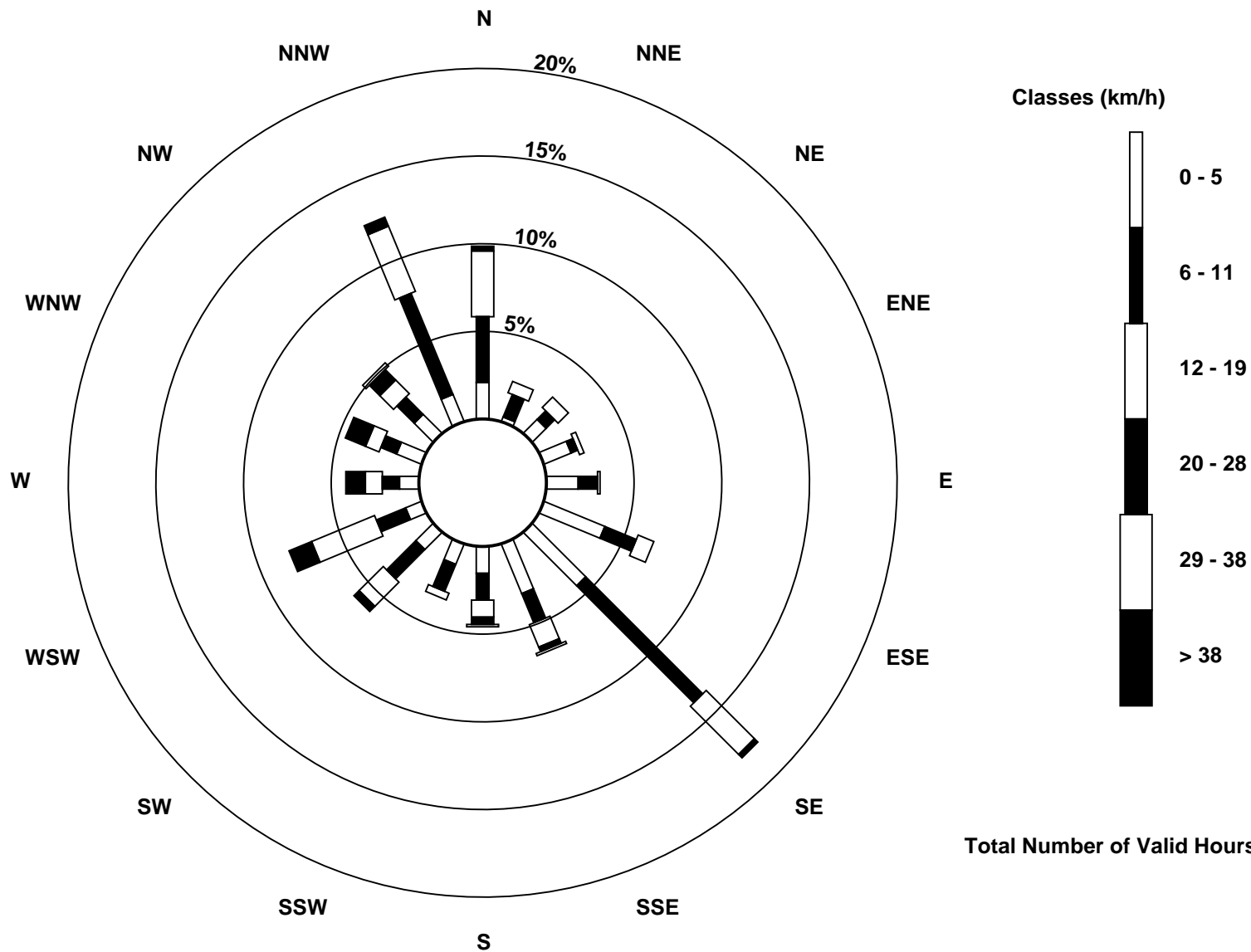
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed (WS) - km/h
Athabasca Valley (AMS 7)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Athabasca Valley - June 2016

Direction of Maximum Speed: 311 deg on Jun 17 11:00 Direction of Maximum Daily Speed Average: 243.4 deg on Jun 13	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0
Direction of Minimum Speed: 231 deg on Jun 26 11:00 Direction of Minimum Daily Speed Average: 1.7 deg on Jun 27	Percent Operational Time: 100.0
Monthly Average Direction: 288.4 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-Jun	179	180	145	148	143	142	138	139	147	131	66	58	347	342	227	170	146	158	134	140	129	123	131	108	145.5
2-Jun	135	152	134	134	146	140	134	139	127	141	170	132	82	145	71	261	238	120	356	315	227	198	134	182	158.2
3-Jun	110	138	147	201	157	196	204	226	218	221	217	228	244	267	271	274	327	351	5	9	337	320	262	159	254.2
4-Jun	222	251	254	254	250	252	268	284	286	294	298	313	321	338	283	318	334	321	308	317	283	302	264	289.3	289.3
5-Jun	120	310	265	116	120	119	102	81	52	360	334	347	337	327	0	350	13	35	2	47	63	113	126	134	17.7
6-Jun	138	139	143	144	141	142	144	150	144	133	131	120	162	169	175	159	173	186	174	157	151	150	171	207	154.2
7-Jun	213	187	203	212	170	133	246	248	225	357	11	347	332	349	353	354	348	355	349	351	341	336	339	320	326.8
8-Jun	338	288	314	311	301	340	339	349	344	345	342	343	345	336	324	157	151	82	89	69	69	70	14	23	1.6
9-Jun	11	39	58	56	28	48	19	25	38	48	49	50	45	29	14	9	5	9	3	2	347	342	340	342	18.3
10-Jun	330	316	328	285	238	136	50	75	337	7	355	346	346	355	352	343	333	335	330	339	351	277	259	138	340.0
11-Jun	115	151	117	119	125	135	145	147	134	135	134	133	137	132	125	124	139	135	120	119	65	66	155	125	131.9
12-Jun	162	133	99	181	185	165	201	224	236	214	235	228	269	246	236	239	263	273	283	265	247	250	238	237	243.9
13-Jun	237	247	251	252	225	225	242	237	232	233	249	246	257	249	265	259	238	238	235	239	253	263	176	134	243.4
14-Jun	157	105	131	137	131	127	126	127	160	293	310	115	109	108	114	117	139	152	157	168	160	116	107	134	133.2
15-Jun	135	127	131	125	133	140	122	129	135	168	168	169	168	177	186	177	169	194	186	149	219	203	128	151	162.1
16-Jun	151	119	138	140	139	137	164	186	199	213	222	235	244	243	242	244	237	223	231	231	241	251	250	247	214.8
17-Jun	234	214	216	239	245	240	284	278	302	310	311	314	311	304	298	292	285	289	266	253	241	238	325	339	287.8
18-Jun	328	272	265	261	287	279	310	317	287	276	289	284	268	11	15	338	348	10	283	231	223	224	341	265	296.2
19-Jun	326	334	291	285	339	29	73	208	355	356	354	352	354	336	344	351	354	1	357	3	10	286	255	21	347.1
20-Jun	239	98	137	127	120	116	84	72	351	353	52	5	346	17	346	356	358	7	86	138	146	150	182	138	67.4
21-Jun	155	144	129	121	133	128	134	131	139	239	242	252	256	283	4	3	344	325	112	147	171	147	154	139	158.0
22-Jun	133	134	146	165	134	132	130	110	81	75	54	80	80	185	225	238	240	233	237	218	261	264	223	197	194.4
23-Jun	229	198	168	207	219	192	191	215	230	251	328	347	345	342	347	352	350	347	352	118	133	107	310	349	329.6
24-Jun	5	56	6	8	4	348	341	342	346	325	340	347	346	54	137	337	316	313	55	2	331	328	325	338	345.3
25-Jun	341	349	351	349	342	339	6	3	350	348	349	342	345	341	338	340	359	353	351	88	114	245	81	119	350.8
26-Jun	85	97	134	132	123	133	121	117	83	85	231	244	285	211	170	318	315	212	171	165	156	310	341	204	160.7
27-Jun	198	300	270	148	136	131	215	220	229	311	306	277	303	313	288	13	152	125	150	140	121	109	121	136	248.8
28-Jun	139	155	144	141	141	132	97	79	80	341	351	359	347	330	357	358	355	13	8	353	14	23	54	122	17.6
29-Jun	119	109	94	60	91	107	78	56	294	182	137	353	343	335	280	319	201	152	124	127	125	137	140	145	125.6
30-Jun	144	139	129	144	142	138	137	45	334	335	9	146	139	141	119	124	129	135	123	169	176	203	188	165	138.3

174.5 179.6 172.2 168.8 159.7 151.8 163.5 189.2 243.7 275.6 299.4 297.8 311.2 309.4 305.0 306.6 295.7 295.5 299.2 188.6 224.0 256.7 287.5 181.0

Diurnal Average

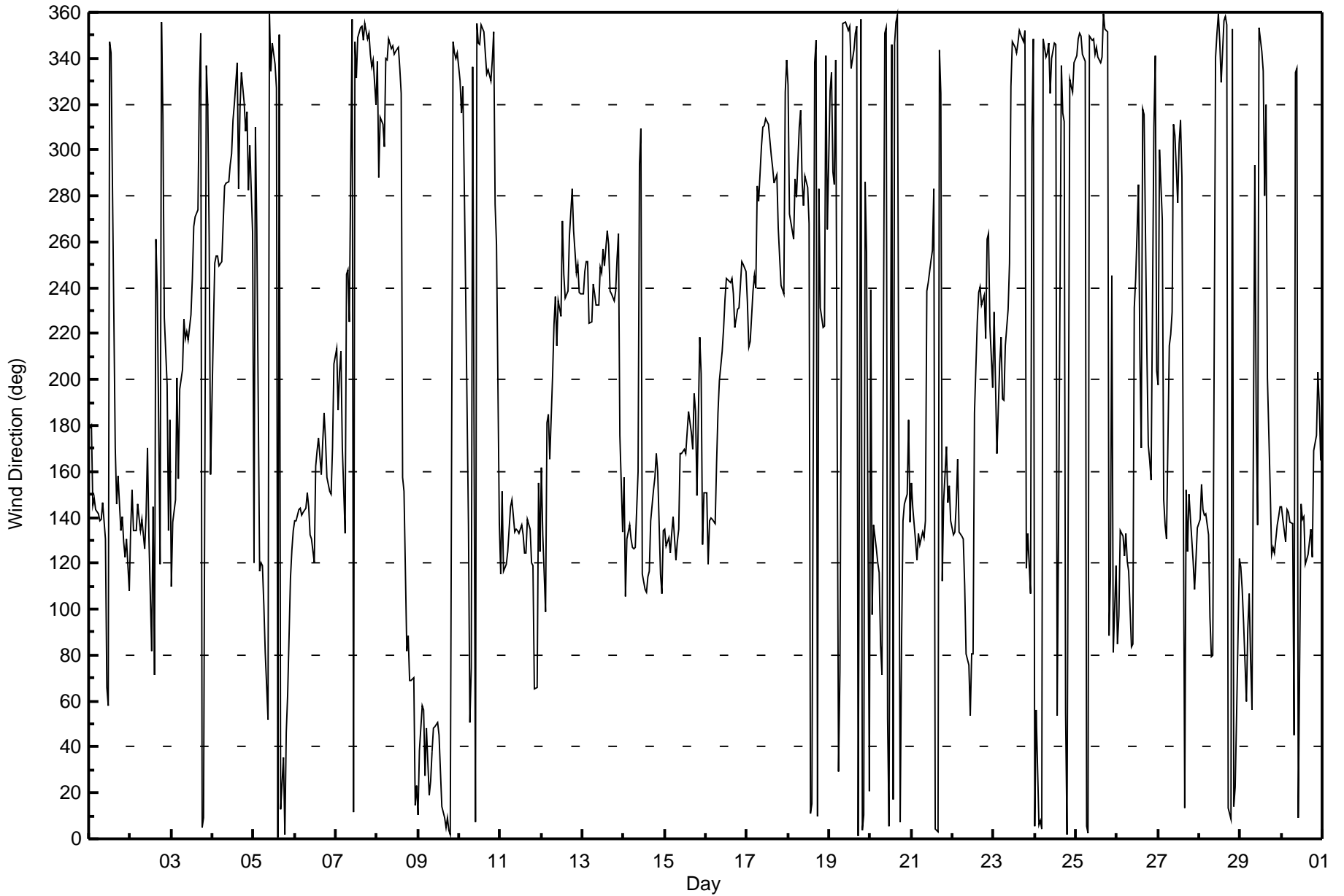
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Athabasca Valley - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 108 deg on Jun 26 11:00 Minimum Value: 9 deg on Jun 8 11:00 Percentiles: P ₁ = 10 P ₁₀ = 13 Q ₁ = 17 Median = 23 Q ₃ = 38 P ₉₀ = 62 P ₉₉ = 89																			Hours in Service: 720 Hours of Data: 720 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-Jun	14	25	11	13	12	11	15	14	45	28	57	50	23	63	24	64	38	24	23	33	23	35	39	34	64
2-Jun	17	32	34	29	14	13	29	27	33	28	50	42	36	53	83	43	73	31	36	39	63	27	21	43	83
3-Jun	89	24	26	38	24	34	28	19	12	13	25	18	18	21	19	16	32	23	51	77	37	61	75	71	89
4-Jun	74	11	11	11	11	11	15	18	21	19	22	21	37	23	25	92	18	23	16	13	10	16	47	82	92
5-Jun	65	68	85	43	43	50	55	11	67	22	25	22	22	31	24	21	25	49	38	41	49	24	20	16	85
6-Jun	16	15	14	14	11	10	12	14	16	18	20	24	38	33	34	28	25	25	19	23	17	17	38	23	38
7-Jun	15	58	36	42	60	49	25	24	52	19	25	24	53	19	18	19	26	20	17	18	13	28	12	17	60
8-Jun	56	58	71	51	40	14	11	15	10	13	9	11	13	11	11	76	26	13	17	16	27	35	28	15	76
9-Jun	15	22	17	19	16	21	18	18	22	22	21	24	21	21	16	18	19	18	19	19	18	12	10	13	24
10-Jun	18	23	25	84	22	74	86	26	37	21	18	15	19	33	31	31	19	16	15	14	17	24	53	53	86
11-Jun	44	28	32	30	24	22	16	14	16	15	18	18	18	16	20	23	20	20	24	39	83	47	46	38	83
12-Jun	46	63	51	22	18	52	32	28	22	23	18	19	48	21	18	23	17	14	12	14	13	12	13	12	63
13-Jun	13	14	12	12	19	16	14	16	15	16	17	18	20	16	20	23	20	14	14	13	19	49	77	55	77
14-Jun	21	31	35	29	23	26	20	42	93	44	31	58	31	26	23	22	23	21	19	17	19	36	21	20	93
15-Jun	18	20	25	21	20	39	23	22	18	16	16	19	18	22	26	27	20	35	33	31	64	43	35	28	64
16-Jun	39	30	12	12	13	15	21	24	26	25	21	19	17	17	18	20	19	27	14	24	12	12	13	13	39
17-Jun	19	32	36	17	12	10	25	10	17	11	12	12	21	20	15	18	16	15	14	15	11	25	21	17	36
18-Jun	40	16	12	14	28	21	21	21	18	19	20	48	79	43	22	23	44	77	28	47	23	68	42	35	79
19-Jun	34	28	13	19	75	71	24	74	59	22	21	24	23	20	19	20	20	21	20	22	19	35	65	103	103
20-Jun	89	20	17	25	18	26	25	41	44	53	42	43	27	55	21	27	63	66	31	20	18	33	82	23	89
21-Jun	50	49	16	15	13	12	11	11	50	16	15	23	58	80	51	30	22	18	82	21	18	86	96	84	96
22-Jun	59	65	73	31	48	12	11	28	18	13	36	45	62	89	35	28	33	12	12	16	40	29	59	39	89
23-Jun	23	57	34	42	67	26	35	37	81	51	19	49	29	10	16	19	16	17	16	67	26	26	87	37	87
24-Jun	29	66	38	29	20	16	11	17	12	20	18	15	14	46	82	21	13	15	53	51	17	12	11	25	82
25-Jun	16	16	17	19	16	16	19	21	16	16	16	13	14	11	13	12	25	21	20	36	22	64	90	69	90
26-Jun	21	26	16	14	14	11	23	25	16	69	108	34	64	29	39	29	53	32	36	29	53	55	99	52	108
27-Jun	73	66	62	63	13	43	37	21	21	47	42	23	29	27	65	64	37	28	41	75	86	58	41	19	86
28-Jun	15	23	32	25	27	20	26	17	49	23	24	43	25	30	20	21	21	25	20	20	15	18	18	61	61
29-Jun	36	39	77	62	25	27	17	43	39	47	66	55	32	34	26	78	34	63	23	19	21	16	15	14	78
30-Jun	15	14	19	14	14	13	15	42	21	19	49	80	27	32	32	26	19	19	21	23	34	34	19	44	80
	89	68	85	84	75	74	86	74	93	69	108	80	79	89	83	92	73	77	82	77	86	86	99	103	
Diurnal Maximum																									





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	June 1, 2016	Last Calibration	May 11-12, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	8:30	End Time (MST)	13:07
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

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-619	-619
Analyzer IP address	192.168.1.103		Lamp voltage	801	801
Calculated slope	0.993163	0.996126	Chamber temp	44.2	44.2
Calculated intercept	1.451854	1.587468	Pressure	582.5	691.4
Analyzer Background	18.8	18.4	Flow	0.428	0.477
Analyzer Coefficient	1.084	1.065	Intensity	43736	43736

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	-0.4	----
as found span	5000	60.7	607.0	600.1	1.011
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	60.7	607.0	608.9	0.997
second point	5000	30.4	304.0	301.7	1.008
third point	5000	15.2	152.0	150.2	1.012
as left zero	5000	0.0	0.0	0.5	----
as left span	5000	60.7	607.0	606.6	1.001
Average Correction Factor					1.005

Corrected As found 600.5 Previous response 609.7 % change 1.5%

Notes:

no maintenance done, filter changed out, span adjusted

Calibration Performed By: Melissa Lemay



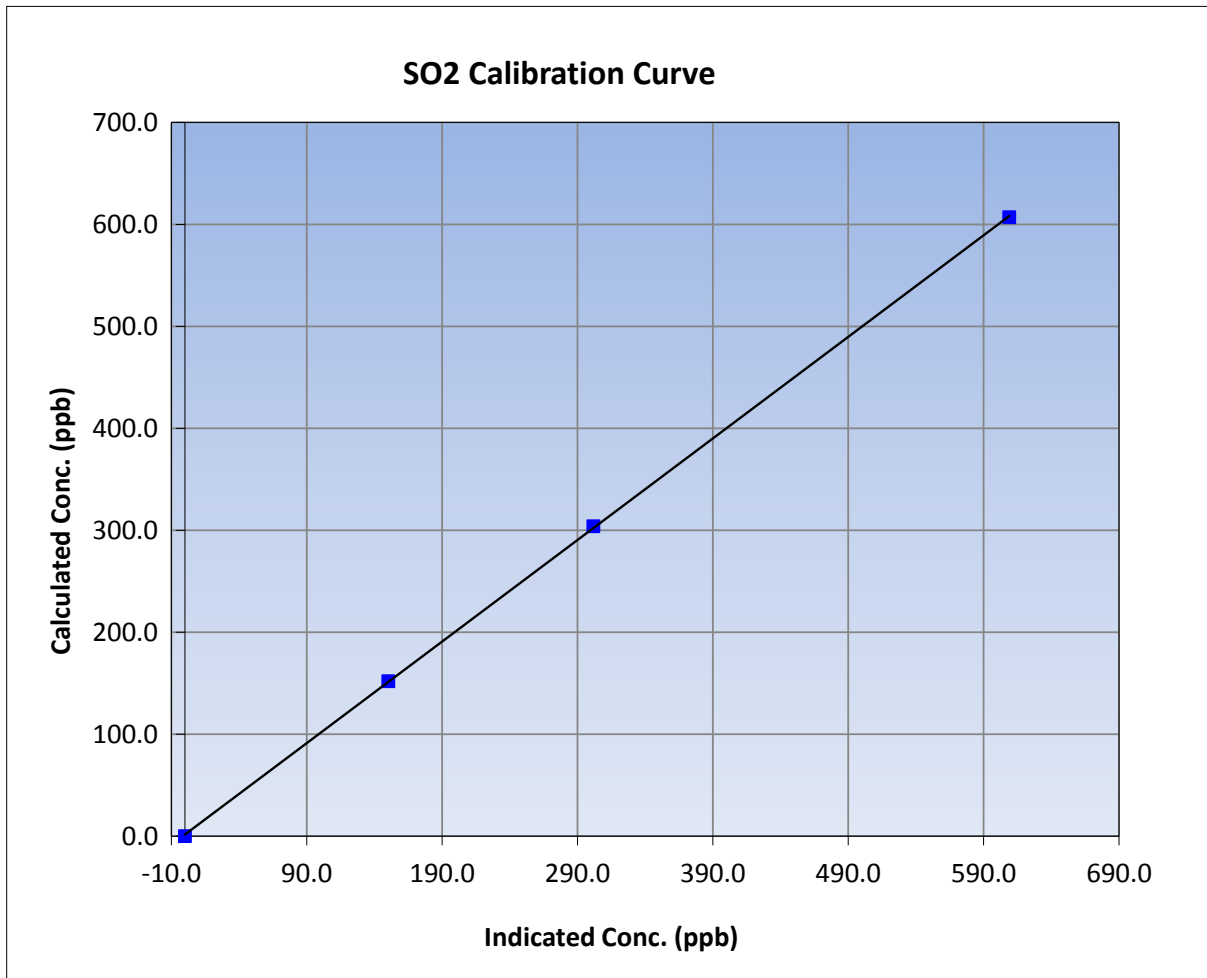
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 11-12, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:30	End Time (MST)	13:07
Analyzer make	Thermo 45C	Analyzer serial #	630718530

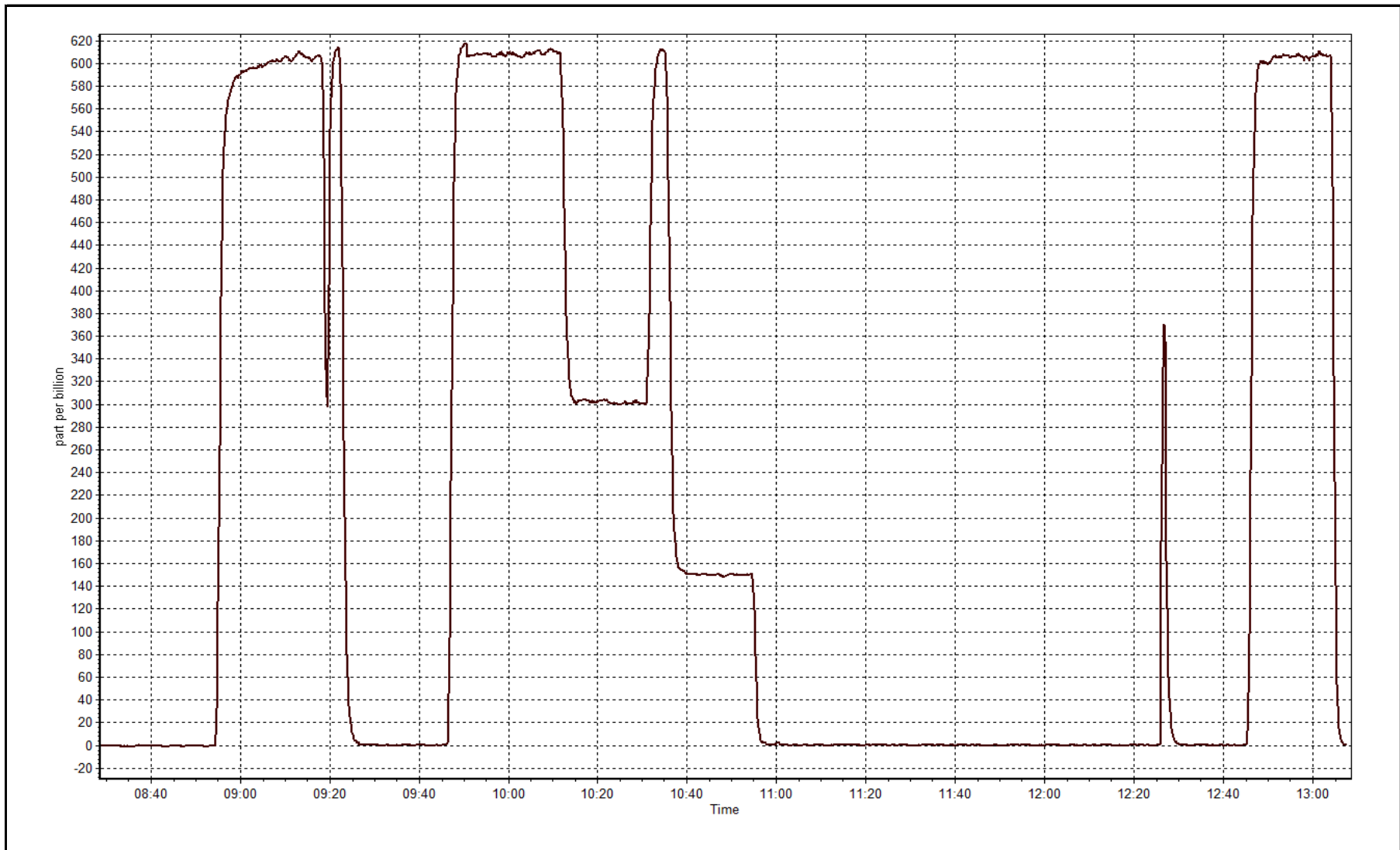
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999961
607.0	608.9	0.9969		
304.0	301.7	1.0076	Slope	0.996126
152.0	150.2	1.0120		
			Intercept	1.587468



SO2 Calibration Plot

Date: June 1, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	June 2, 2016	Last Calibration	May 12, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	10:10	End Time (MST)	12:36
Gas Cert Reference	ALM052589	Station temp.	22 Deg C
Cal Gas Concentration	5.02 ppm	Cal Gas Exp Date	09/09/2017
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 ppm	SO2 gas cert/exp	S970259A 26/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	1106	1106
Calculated slope	0.985350	0.987902	Chamber temp	45	45
Calculated intercept	-0.220885	-0.140503	Pressure	585.2	697.1
Analyzer Background	2.39	2.39	Flow	0.367	0.434
Analyzer Coefficient	1.067	1.067	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	0.2	----
as found span	6000	89.6	75.0	74.6	1.005
SO2 scrubber check	5000	15.2	152.0	0.6	----
calibrator zero	6000	0.0	0.0	0.2	----
high point	6000	89.6	75.0	76.0	0.986
second point	6000	50.2	42.0	42.8	0.981
third point	6000	29.9	25.0	25.3	0.989
as left zero	6000	0.0	0.0	0.4	----
as left span	6000	89.6	75.0	74.8	1.002
Average Correction Factor					0.985

Corrected As found	74.4	Previous response	76.3	% change	2.5%
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Notes:

Inlet filter changed after as found, high point was done after to test sensitivity after filter change out; scrubber checked after high point; no sensitivity loss due to recent local wildfires.

Calibration Performed By:

Melissa Lemay



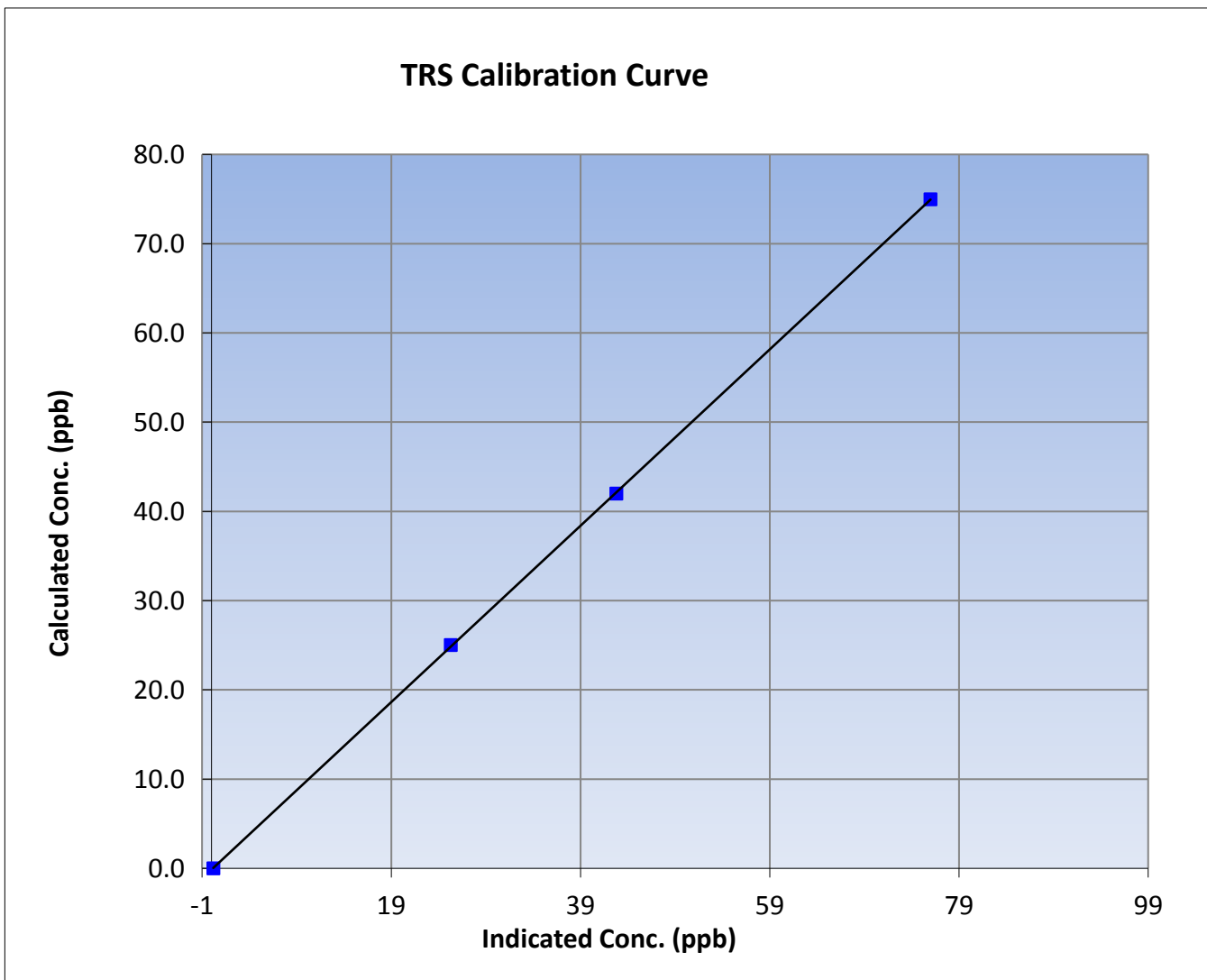
Wood Buffalo Environmental Association TRS Calibration Report

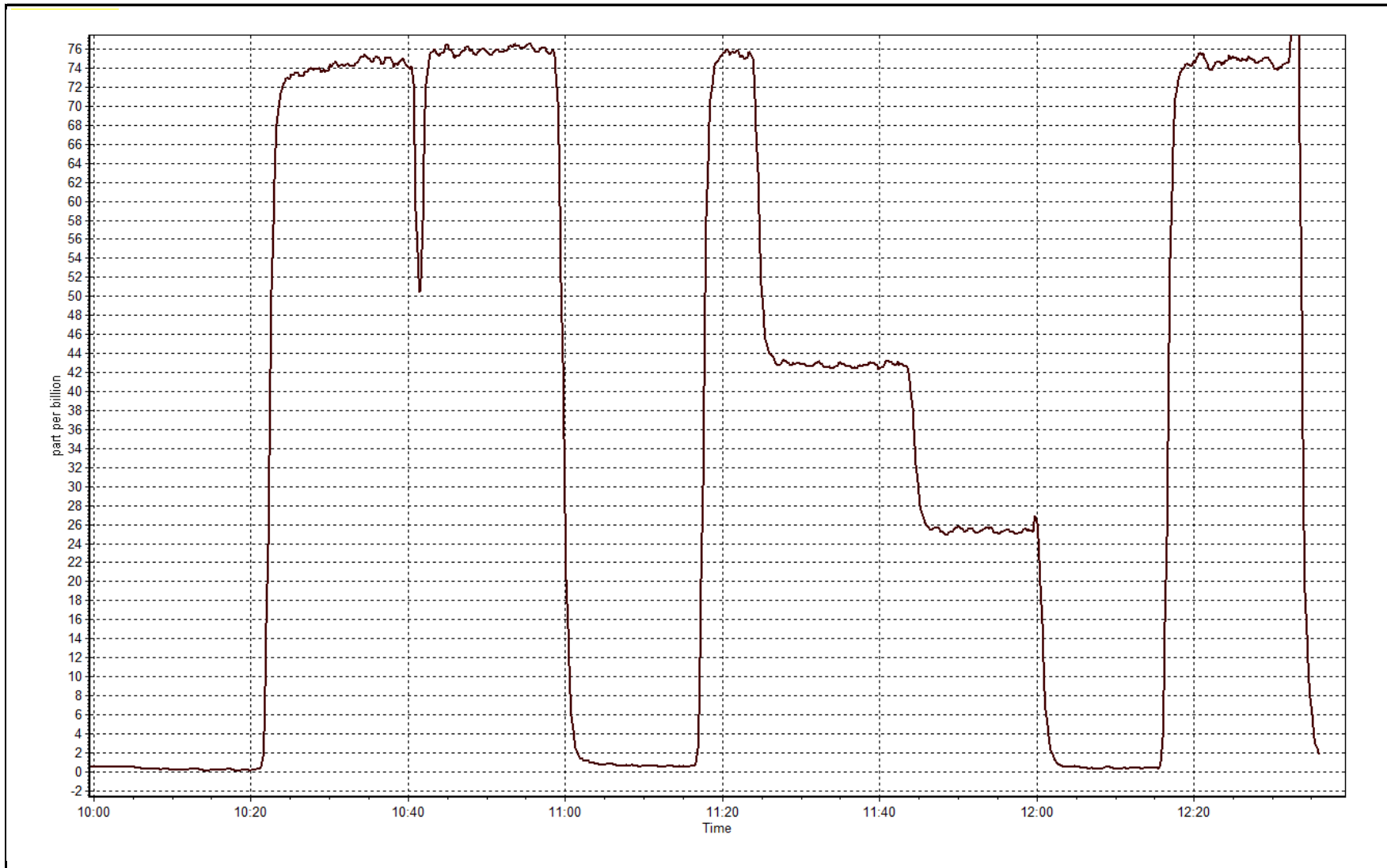
Station Information

Calibration Date	June 2, 2016	Previous Calibration	May 12, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	10:10	End Time (MST)	12:36
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	0.2	----	Correlation Coefficient	0.999983
75.0	76.0	0.9864		
42.0	42.8	0.9813	Slope	0.987902
25.0	25.3	0.9888		
			Intercept	-0.140503







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	June-01-16	Last Calibration	May 11-12, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	8:35	End Time (MST)	13:06
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	75.1
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.0	175.0
Analyzer IP address	192.168.1.55		Flame Temp	388.9	387.8
THC Calc slope	0.996836	1.002419	Carrier Pressure	36.8	36.8
THC Calc intercept	0.042510	0.024322	Fuel Pressure	42.1	42.1
NMHC Calc slope	0.993674	1.002930	Air Pressure	32.2	32.2
NMHC Calc intercept	0.014268	0.002218			

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	12.39	1.019
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	60.7	12.63	12.59	1.003
second point	5000	30.4	6.32	6.25	1.012
third point	5000	15.2	3.16	3.12	1.013
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	60.7	12.63	12.56	1.005
Average Correction Factor					1.009

Corrected As found 12.39 Previous response 12.62 % change 1.9%

Notes:

no maintenance done, filter changed 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	60.7	6.68	6.59	1.013
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	60.7	6.68	6.66	1.003
second point	5000	30.4	3.34	3.32	1.007
third point	5000	15.2	1.67	1.67	1.001
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	60.7	6.68	6.64	1.006
Average Correction Factor					1.004

Corrected As found 6.59 Previous response 6.71 % change 1.7%

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	60.7	5.95	5.80	1.026
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	1.46	1.020
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	60.7	5.95	5.92	1.005
Average Correction Factor					1.013

Corrected As found 5.80 Previous response 5.92 % change 2.0%



Wood Buffalo Environmental Association

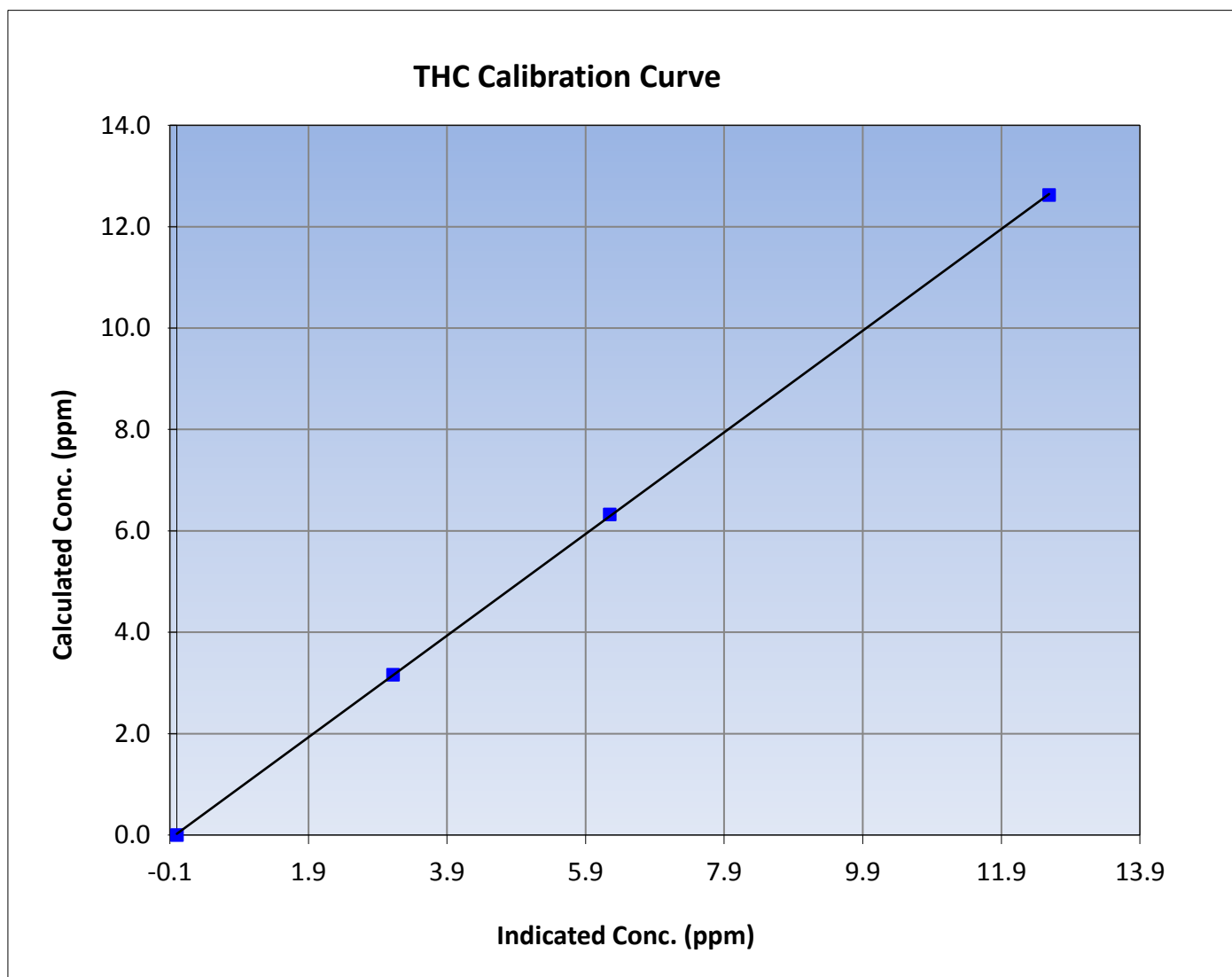
THC Calibration Summary

Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 11-12, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:35	End Time (MST)	13:06
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	0.999975
12.63	12.59	1.0028		
6.32	6.25	1.0117	Slope	1.002419
3.16	3.12	1.0133		
			Intercept	0.024322





Wood Buffalo Environmental Association

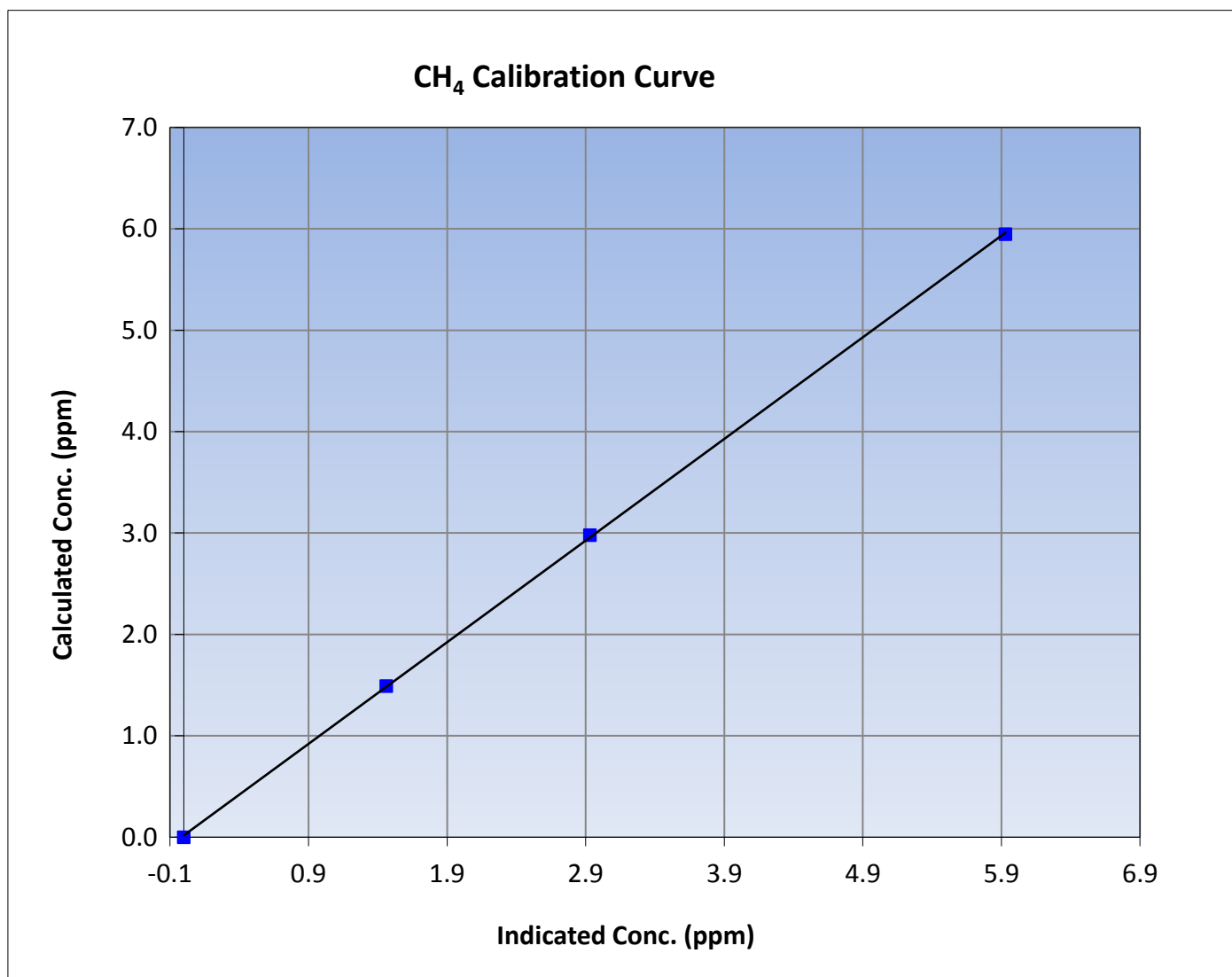
CH₄ Calibration Summary

Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 11-12, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:35	End Time (MST)	13:06
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	0.999940
5.95	5.93	1.0031		
2.98	2.93	1.0168	Slope	1.002409
1.49	1.46	1.0203		
			Intercept	0.018136





Wood Buffalo Environmental Association

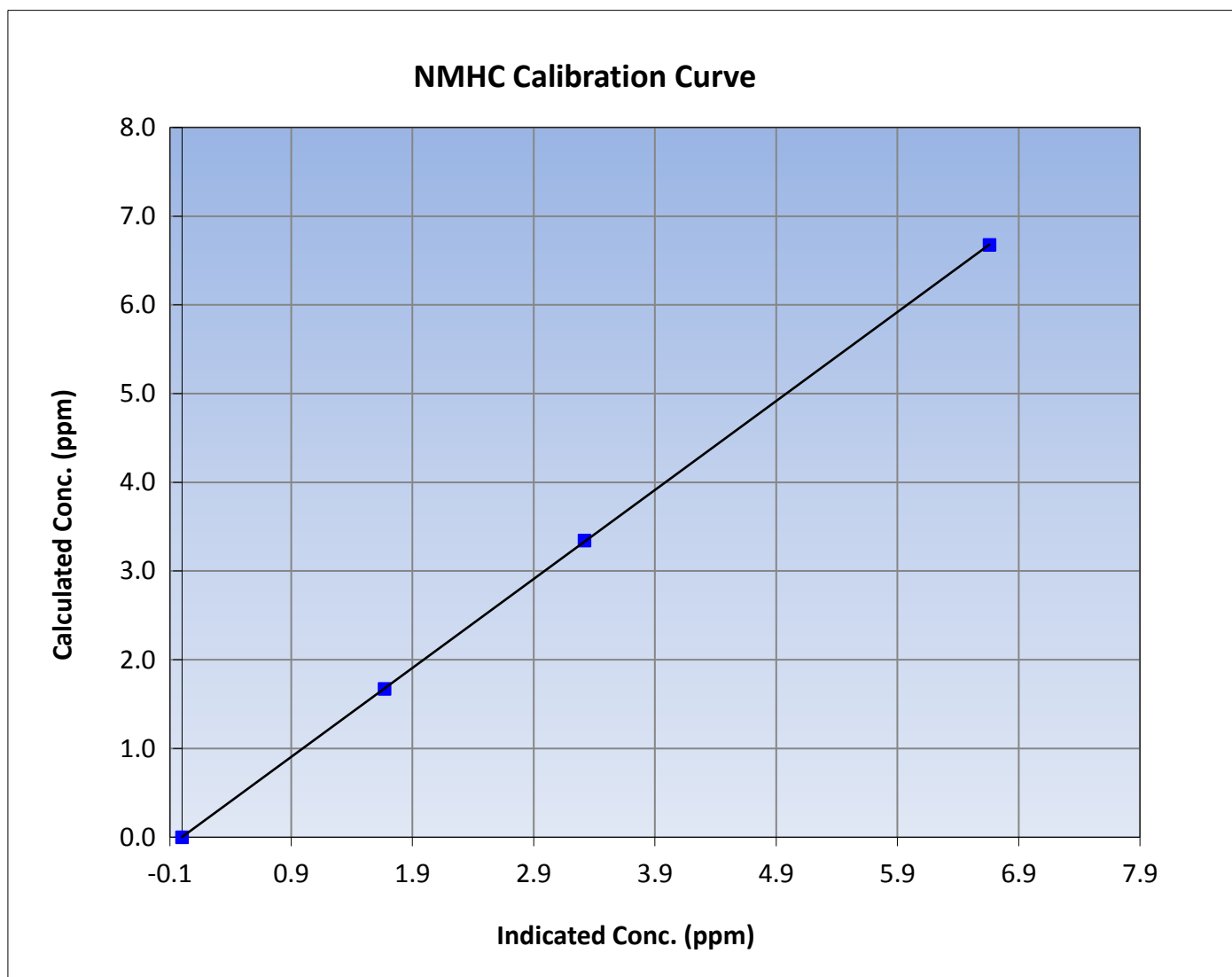
NMHC Calibration Summary

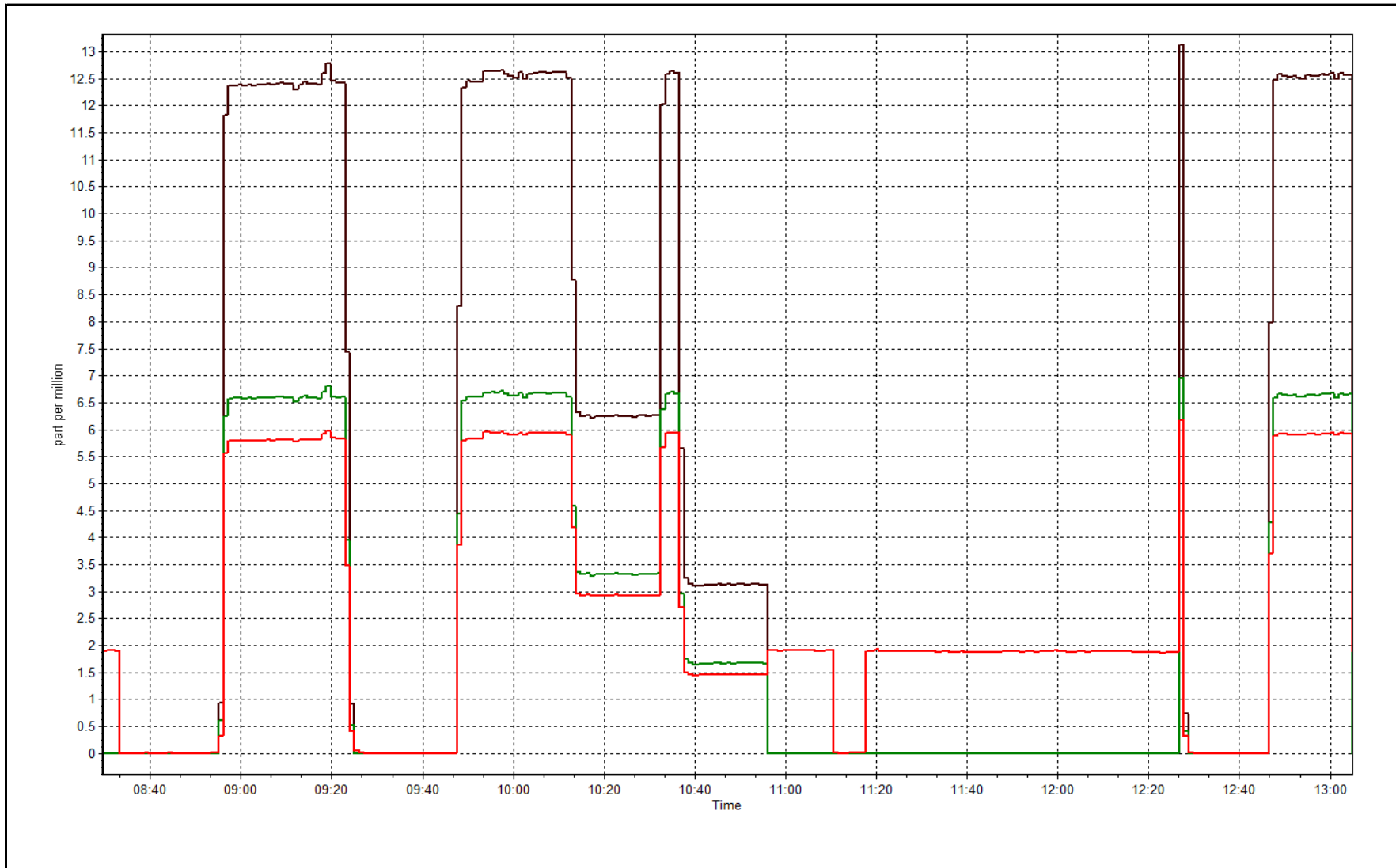
Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 11-12, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:35	End Time (MST)	13:06
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	0.999992
6.68	6.66	1.0026		
3.34	3.32	1.0072	Slope	1.002930
1.67	1.67	1.0012		
			Intercept	0.002218







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	June 2, 2016	Previous Calibration	May 12, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	7:40	End Time (MST)	10:10
NO2 GPT Ref date	May-12-16	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.	27.4	27.4
Analyzer IP address	192.168.1.48		Lamp temp.	67.8	67.8
Calculated slope	1.007193	1.005163	Pressure	555.3	709.3
Calculated intercept	-1.196459	1.354446	Flow cell A	0.634	0.757
Analyzer Background	-0.3	-0.3	Flow cell B	0.654	0.773
Analyzer Coefficient	0.943	0.943	Cell A Intensity	70288	70288
			Cell B Intensity	61820	61820

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	-0.4	----
as found span	5000	1.22	365.0	355.1	1.028
calibrator zero	5000	0.00	0.0	-0.4	----
high point	5000	1.22	365.0	363.7	1.004
second point	5000	0.70	188.0	180.8	1.040
third point	5000	0.43	91.4	91.6	0.998
as left zero	5000	0.00	0.0	-0.6	----
as left span	5000	1.22	365.0	362.6	1.007
Average Correction Factor					1.014

Corrected As found	355.5	Previous response	363.6	% change	2.3%
--------------------	-------	-------------------	-------	----------	------

Notes:

Inlet filter changed after as found; no sensitivity loss due to recent local wildfires. Span not adjusted but increased after filter was changed. Smoke observed in the area today.

Calibration Performed By: Melissa Lemay



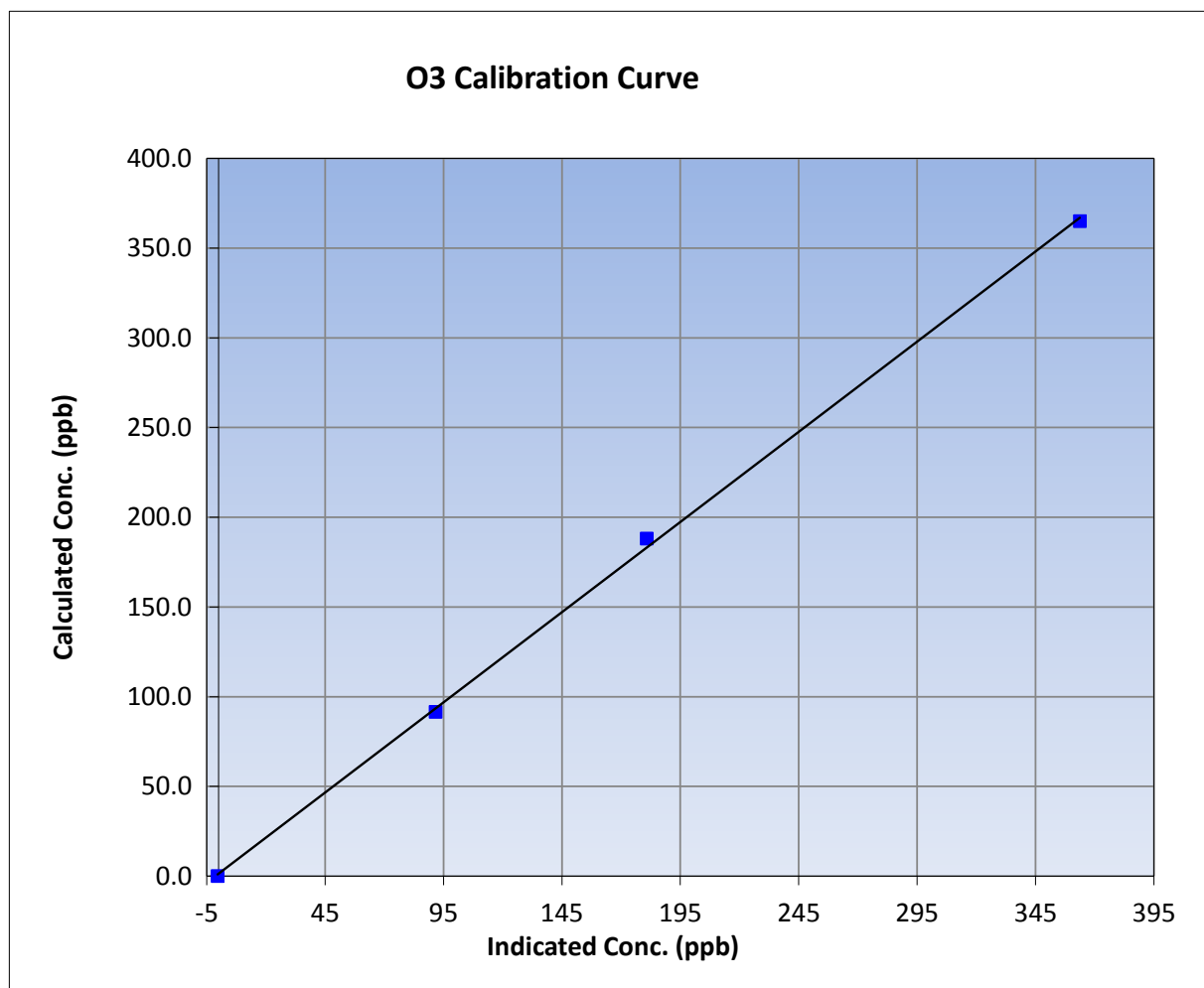
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	June-02-16	Previous Calibration	May 12, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	7:40	End Time (MST)	10:10
Analyzer make	TEI 49i	Analyzer serial #	1507964700

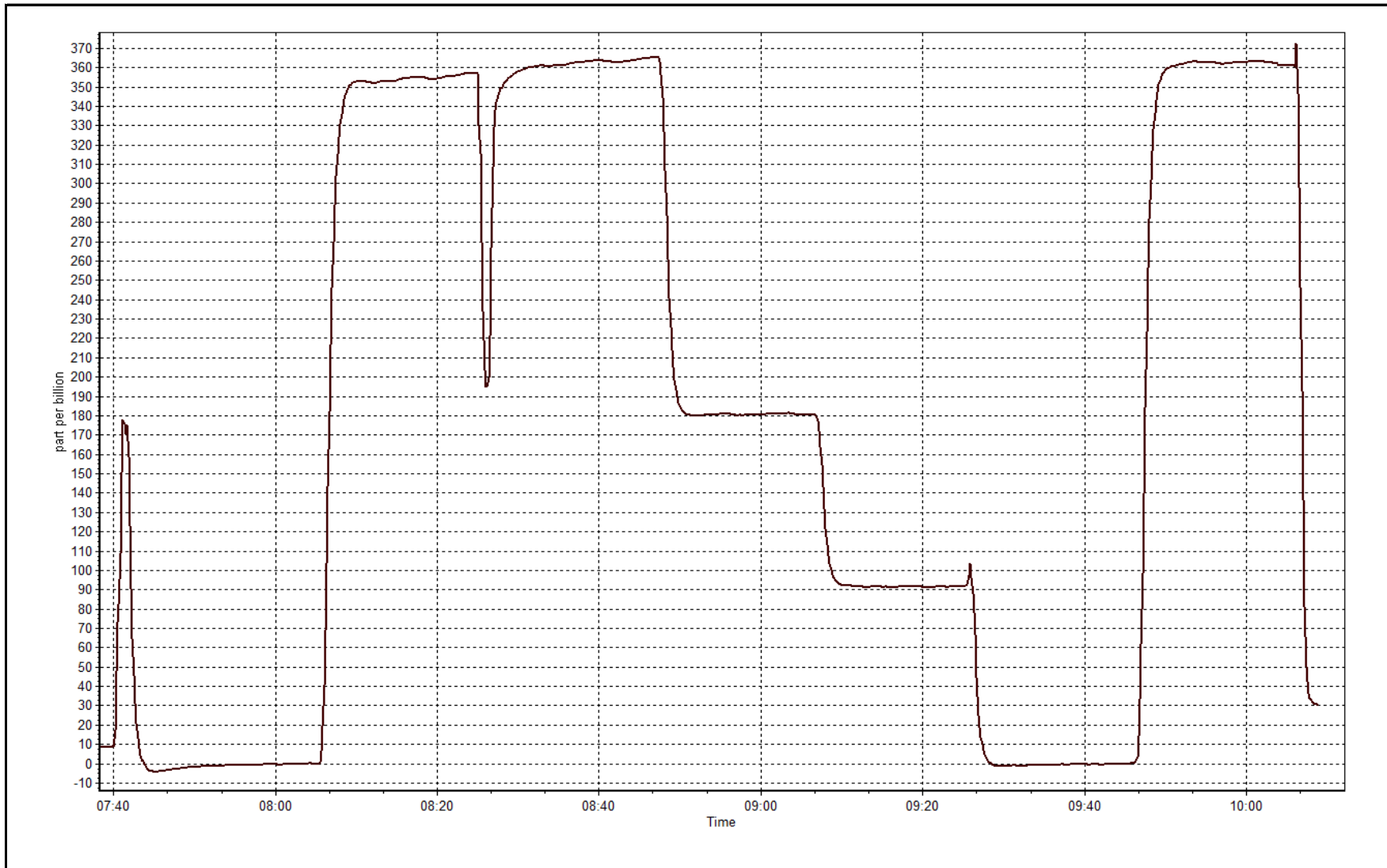
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	----	Correlation Coefficient	0.999550
365.0	363.7	1.0036		
188.0	180.8	1.0398	Slope	1.005163
91.4	91.6	0.9978		
			Intercept	1.354446



O3 Calibration Plot

Date: June 2, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 11-12, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	8:30	End Time (MST)	13:07
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 PAI 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	0.998507	0.998366	1.002109
	Data Offset	1.945736	2.174703	-0.424733
Current Calibration	Data Slope	0.997927	0.997669	0.999175
	Data Offset	2.406507	2.481264	-0.341652

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	1.158		1.244	
NOX coefficient	0.998		0.999	
NO2 coefficient	1.000		1.000	
NO bkgrnd	3.2		4.1	
NOX bkgrnd	3.4		4.8	
Chamber Temp	49.5	Deg C	49.5	Deg C
Moly Temp	324	Deg C	324	Deg C
PMT voltage	-784	V	-784	V
PMT Temp	-3.56	Deg C	-3.56	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	119.5	mmHg	141.9	mmHg
R Cell Press Nox	119.5	mmHg	141.9	mmHg
NO sample flow	0.712	lpm	0.885	lpm
Nox sample Flow	0.712	lpm	0.885	lpm

Notes:

As found was out, changed the filter, flow and pressure increased. Zero and span adjusted



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 1, 2016

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	1.2	0.6	1.2	----	----
as found span	5000	60.7	599.7	599.7	0.0	493.6	492.7	1.0	1.2150	1.2172
calibrator zero	5000	0.0	0.0	0.0	0.0	0.2	-0.1	0.2	----	----
high point	5000	60.7	599.7	599.7	0.0	600.1	600.1	0.3	0.9994	0.9994
second point	5000	30.4	300.4	300.4	0.0	296.4	296.5	0.1	1.0133	1.0130
third point	5000	15.2	150.2	150.2	0.0	146.1	146.2	0.1	1.0279	1.0272
as left zero	5000	0.0	0.0	0.0	0.0	-0.4	-0.1	0.2	----	----
as left span	5000	60.7	599.7	231.8	367.9	590.6	242.4	348.2	1.0154	0.9563
Average Correction Factor									1.0135	1.0132

Corrected As found
Previous Response

NO_x= 492.4
NO_x= 598.7

NO= 492.1
NO= 598.5

Percent Change

NO_x= 21.6%

NO= 21.6%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 60.70 ccm NOx ref calc conc = 599.7 ppb NO ref calc conc = 599.7 ppb

O3 Setpoint (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
1st NO ref point		0.0	567.0	596.8	0.2	1.0577	1.0049	----	----
1st NO2 (300)	231.8	365.0	596.3	231.8	365.7	1.0057	----	0.9981	100.2%
2nd NO2 (200)	408.8	188.0	597.1	408.8	188.2	1.0043	----	0.9989	100.1%
3rd NO2 (100)	505.4	91.4	597.3	505.4	92.2	1.0040	----	0.9913	100.9%
2nd NO ref point		0.0	596.9	597.5	-0.4	1.0047	1.0037	----	----
Average Correction Factor						1.0047		0.9961	100.4%

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association

NO_x Calibration Summary

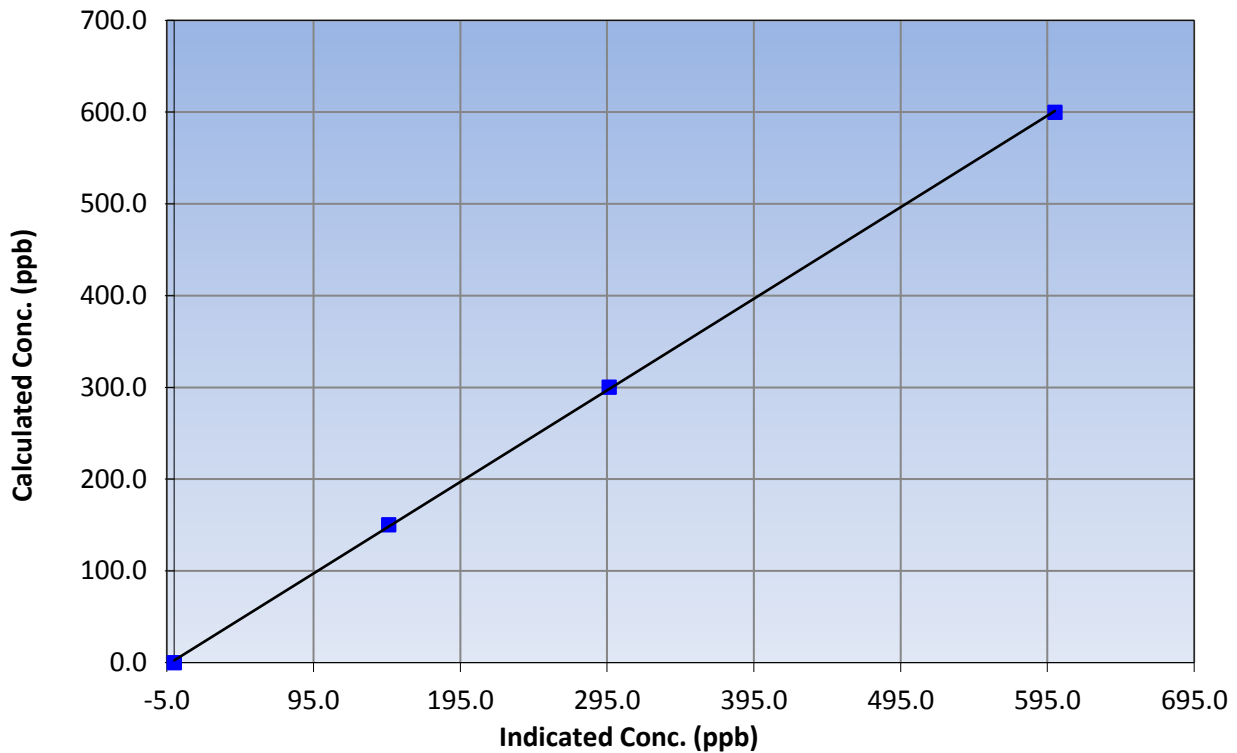
Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 11-12, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:30	End Time (MST)	13:07
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	----	Correlation Coefficient	0.999910
599.7	600.1	0.9994		
300.4	296.4	1.0133	Slope	0.997927
150.2	146.1	1.0279		
			Intercept	2.406507

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

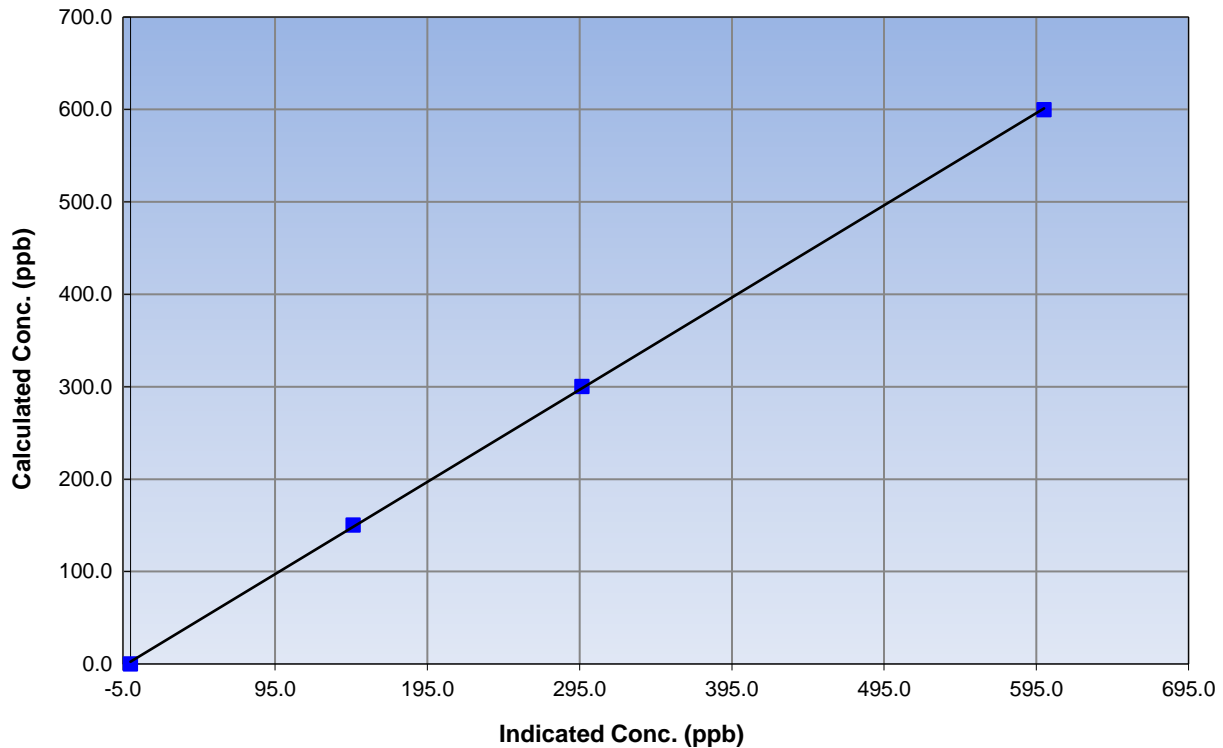
Station Information

Calibration Date	June 1, 2016	Previous Calibration	
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:30	End Time (MST)	13:07
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	0.999920
599.7	600.1	0.9994		
300.4	296.5	1.0130	Slope	0.997669
150.2	146.2	1.0272		
			Intercept	2.481264

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

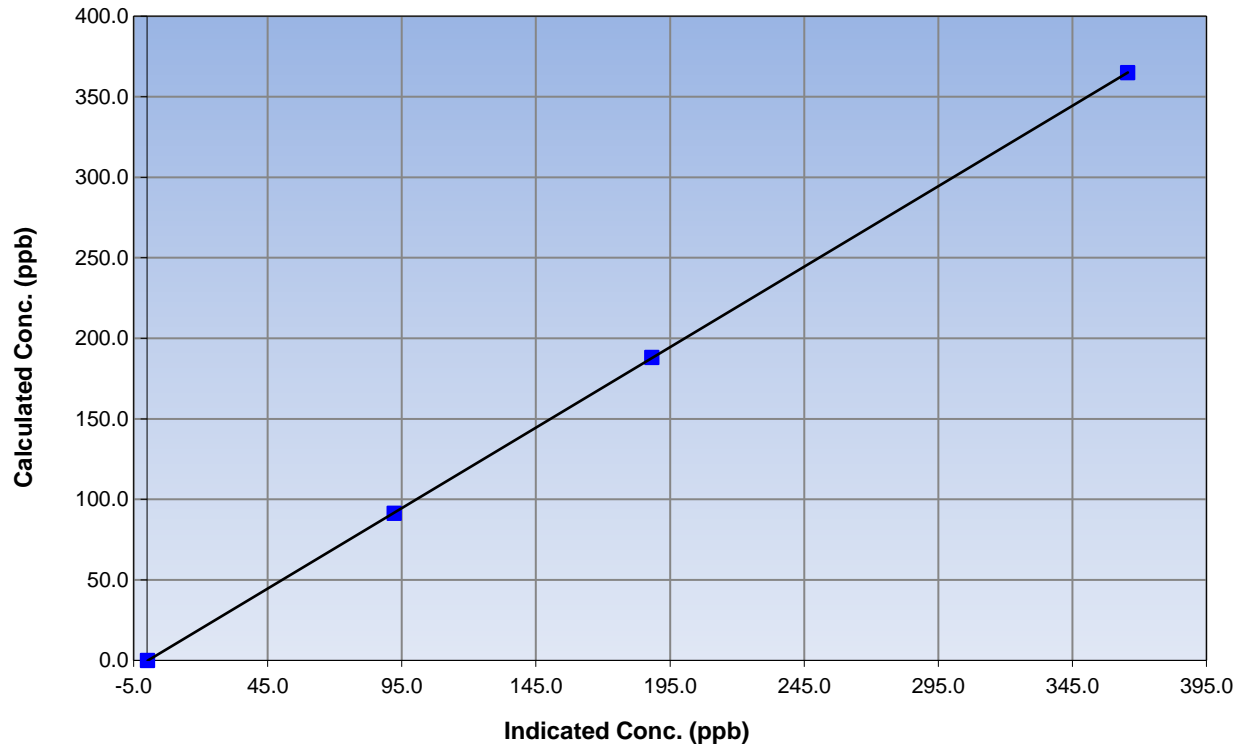
Station Information

Calibration Date	June 1, 2016	Previous Calibration	May 11-12, 2016
Station Number	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	8:30	End Time (MST)	13:07
Analyzer make	Thermo 42C	Analyzer serial #	601114773

Calibration Information

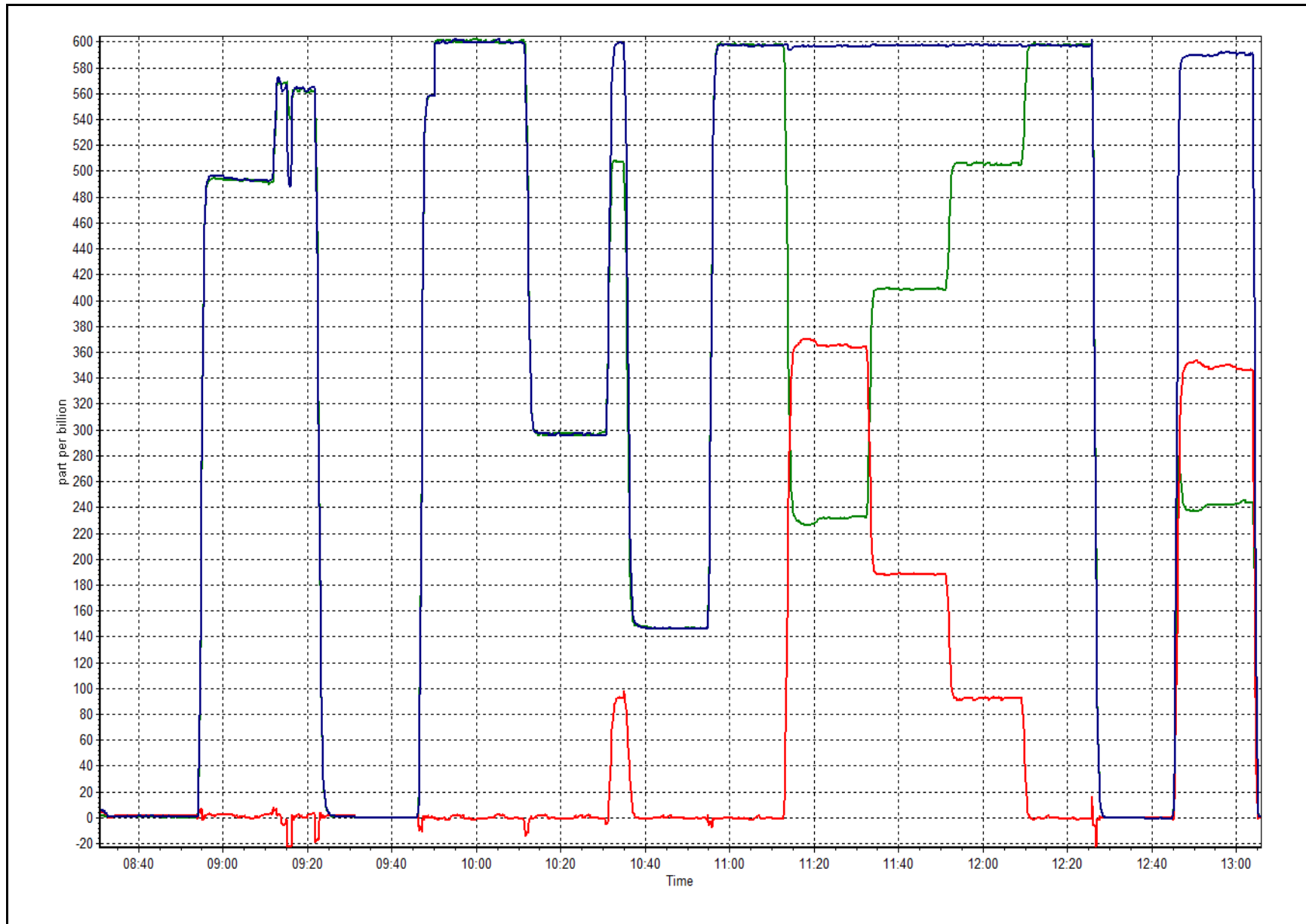
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	N/A	Correlation Coefficient	0.999996
365.0	365.7	0.9981		
188.0	188.2	0.9989	Slope	0.999175
91.4	92.2	0.9913		
			Intercept	-0.341652

NO₂ Calibration Curve



NOX Calibration Plot

Date: June 1, 2016





Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	June 2, 2016	Previous Calibration:	12/05/16
Station Name:	Athabasca Valley	Station Number:	AMS 7
Start Time (MST):	9:00	End Time (MST):	11:17
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	1097

SHARP INFORMATION			
Particulate Fraction:		PM2.5	
Make/Model:		Thermo / SHARP 5030	
Serial Number		E515	
C ₁₄ 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 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	15.0	15.0	0.0	15.0
T2	23.0	24.0	1.0	23.0
T3	24.0	24.0	0.0	24.0
T4	24.0	24.0	0.0	24.0
RH (%)	38.0	na	#VALUE!	15.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	977	978.0	1.0	977

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1000	0	1010	1000

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	237		237
Neph	-0.6		-0.6
C14	23.9		23.9
Indicated Concentration (ug/m3)	-0.4	No	-0.4
Offset 1			
Offset 2			

Leak Check (Quarterly)			
Leak Check Date:	June 2, 2016	Previous Leak Check Date:	April 22, 2016
	Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.67		0.02
*Flow with adaptor (LPM):	16.65		
<i>*Note - do not attach adaptor without shutting off the pump first</i>			

Mass Foil Calibration (Annually)			
Foil Calibration Date:	June 2, 2016	Previous Foil Calibration:	April 22, 2016
Zeroed?:	No		
Foil Mass:	1337		Mass foil set S/N: 5872
Previous Correction Factor:	6853		
New Correction Factor:	6895		

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	02/06/2016
Pump	Good	NA
Filter Tape	Good	NA
Mass Foil Cal Set	na	NA
HEPA filter	Good	15/04/2015

NOTES:

All functions checked during calibration. Cyclone head was cleaned.

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association CO Calibration Report

Station Information

Calibration Date	June 2, 2016	Last Calibration	May 12, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Reason:	Routine		
Start Time (MST)	12:30	End Time (MST)	15:20
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.	48.1	48.1
Analyzer IP address	192.168.1.48		Pressure	615.3	725.0
Calculated slope	1.003299	1.003299	Flow	0.422	0.490
Calculated intercept	0.031307	0.031307	Intensity	199591	199423
Analyzer Background	5.079	5.483	S/R ratio	1.172455	1.172741
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	0.2	----
as found span	5000	69.7	41.4	41.5	0.999
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	69.7	41.4	41.3	1.004
second point	5000	35.2	20.9	20.8	1.006
third point	5000	15.2	9.0	8.9	1.010
as left zero	5000	0.0	0.0	-0.1	----
as left span	5000	69.7	41.4	41.1	1.007
Average Correction Factor					1.006

Corrected As found 41.3 Previous response 41.2 % change -0.1%

Notes:

Inlet filter changed after as found; no sensitivity loss due to recent local wildfires. Zero adjusted

Calibration Performed By: Melissa Lemay



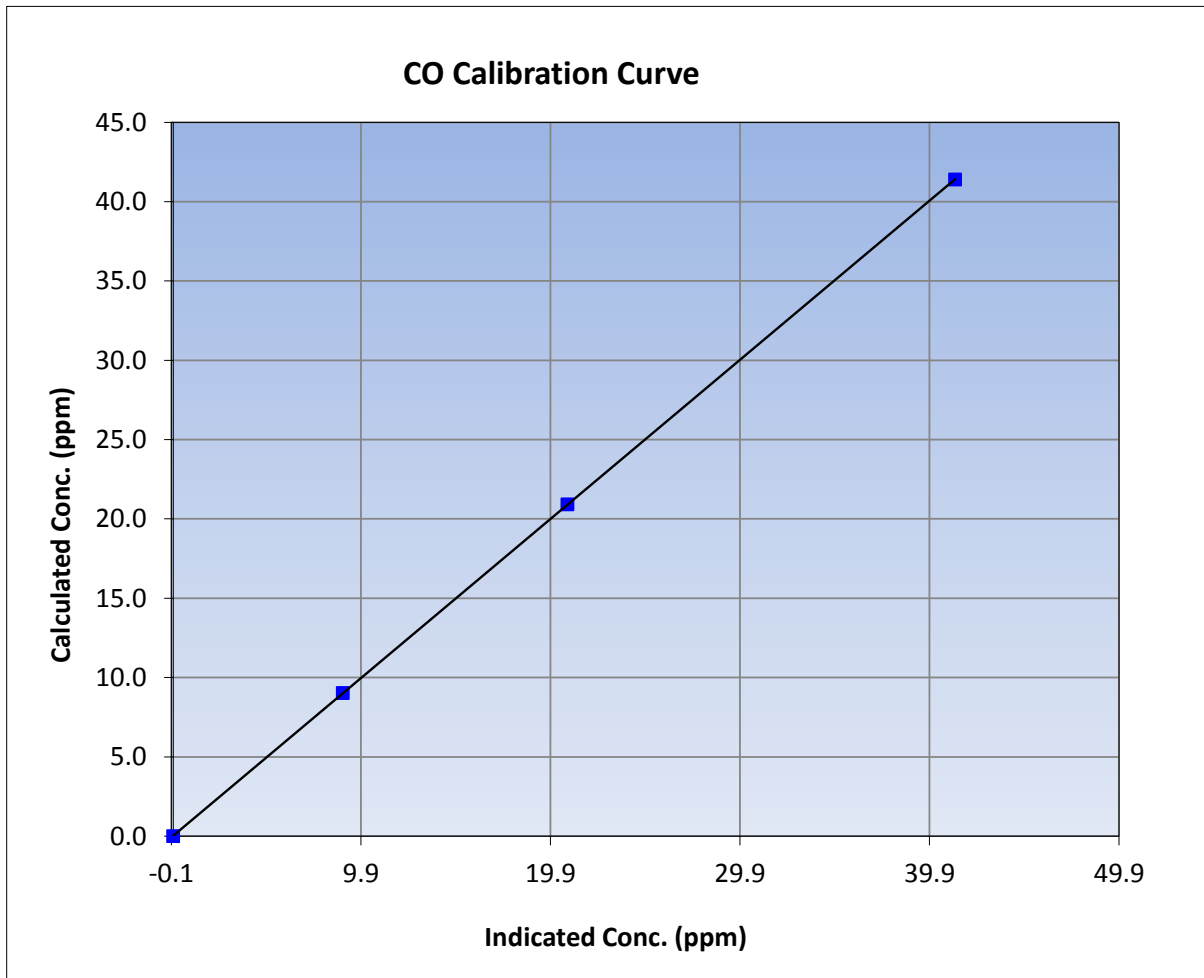
Wood Buffalo Environmental Association CO Calibration Report

Station Information

Calibration Date	June 2, 2016	Previous Calibration	May 12, 2016
Station Name	Athabasca Valley	Station Number	AMS 7
Start Time (MST)	12:30	End Time (MST)	15:20
Analyzer make	Thermo 48i-TLE	Analyzer serial #	1408761381

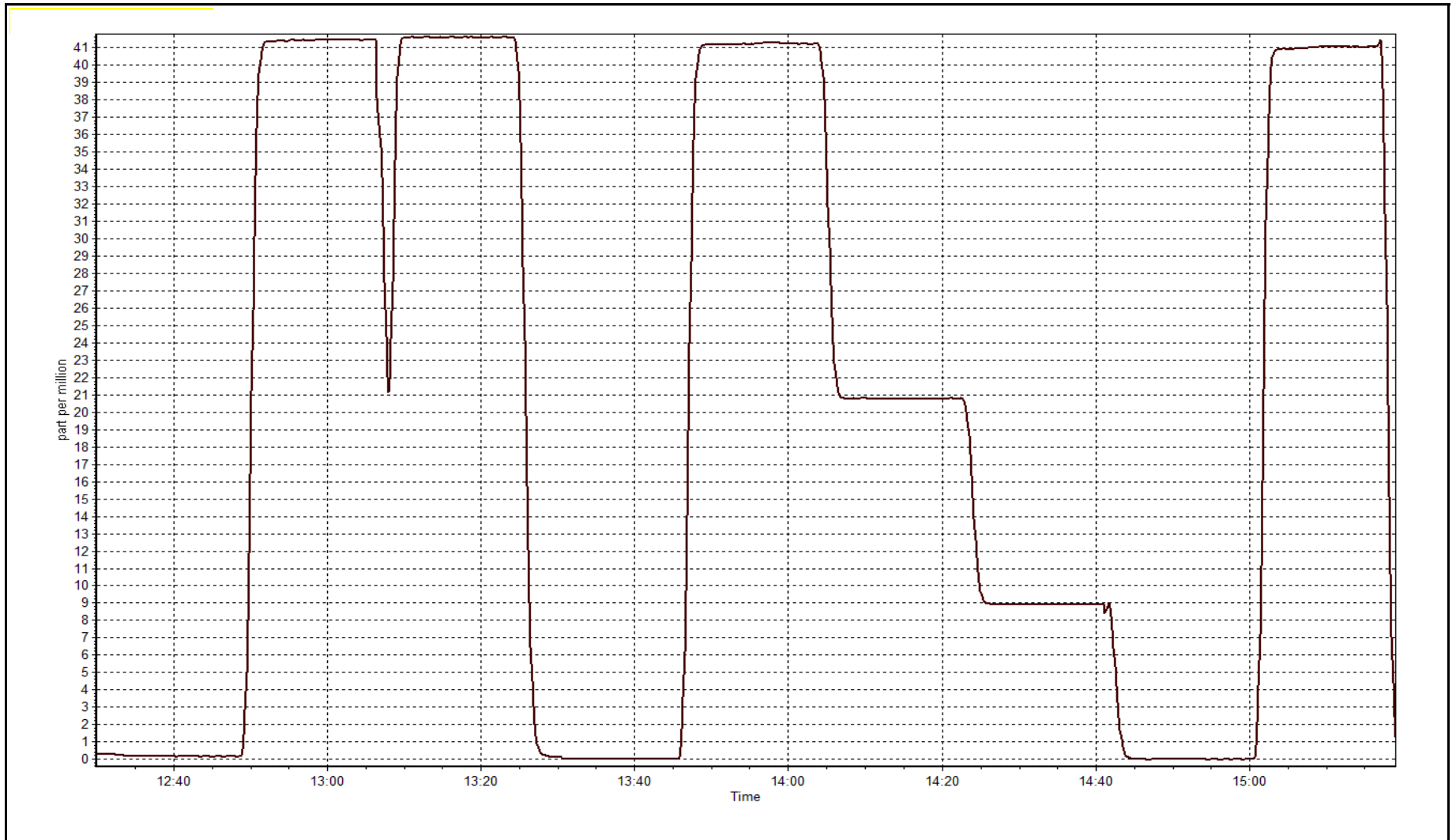
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999998
41.4	41.3	1.0037		
20.9	20.8	1.0057	Slope	1.003299
9.0	8.9	1.0099		
			Intercept	0.031307



CO Calibration Plot

Date: June 2, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

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

**AMS 8
FORT CHIPEWYAN
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)
 JUNE 2016

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	680	39	40	99.86	3	0	1	0
O3(ppb) Average	671	40	49	98.75	53	0	44	-
NO2(ppb) Average	678	39	42	99.58	8	0	2	-
NO(ppb) Average	678	39	42	99.58	1	-	0	-
NOX(ppb) Average	678	39	42	99.58	8	-	2	-
PM2.5(ug/m3) Average	644	5	76	90.14	43.5	-	11.7	0
Wind Speed 10 m (km/h) Average	719	0	1	99.86	51	-	25	-
Wind Direction 10 m (deg) Average	719	0	1	99.86	-	-	-	-
Temperature 2 m (C) Average	720	0	0	100.00	30.8	-	24	-
Relative Humidity (%) Average	720	0	0	100.00	99	-	88	-
Precipitation (mm) Total	720	0	0	100.00	16	-	17.3	-
Leaf Wetness (% of range) Average	566	0	154	78.61	48	-	10	-
Global Solar Radiation (W/m2) Average	592	0	128	82.22	955	-	383	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)
JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile							
					Min	P10	Q1	Median	Q3	P90	Max	
SO2(ppb) Average	680	0.1	0	-	0	0	0	0	0	0	0	3
O3(ppb) Average	671	30.8	8	-	13	21	25	30	35	41	53	53
NO2(ppb) Average	678	0.4	1	-	0	0	0	0	0	1	8	8
NO(ppb) Average	678	0.1	0	-	0	0	0	0	0	0	1	1
NOX(ppb) Average	678	0.4	1	-	0	0	0	0	0	1	8	8
PM2.5(ug/m3) Average	644	4.18	3.5	-	0	1.4	2.6	3.1	4.8	7.7	43.5	43.5
Wind Speed 10 m (km/h) Average	719	14.5	7	-	1	7	9	13	19	24	51	51
Wind Direction 10 m (deg) Average	719	-	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	720	16.78	4.2	-	5.1	11.8	13.7	16.6	19.5	22.1	30.8	30.8
Relative Humidity (%) Average	720	66.6	18	-	17	44	52	65	83	90	99	99
Precipitation (mm) Total	720	-	-	49.78	-	-	-	-	-	-	-	-
Leaf Wetness (% of range) Average	566	2.9	9	-	-2	-1	-1	-1	0	15	48	48
Global Solar Radiation (W/m2) Average	592	290.4	303	-	0	0	5	178	556	778	955	955

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2, O3, PM2.5	15 Jun 2016 06:00	15 Jun 2016 06:00	1	Station power failure
O3	02 Jun 2016 00:00	02 Jun 2016 00:00	1	Unstable Operation - noise outside of specifications
O3	03 Jun 2016 22:00	03 Jun 2016 23:00	2	Unstable Operation - noise outside of specifications
O3	08 Jun 2016 16:00	08 Jun 2016 16:00	1	Unstable Operation - noise outside of specifications
O3	10 Jun 2016 20:00	10 Jun 2016 20:00	1	Unstable Operation - noise outside of specifications
O3	11 Jun 2016 19:00	11 Jun 2016 20:00	2	Unstable Operation - noise outside of specifications
O3	21 Jun 2016 05:00	21 Jun 2016 05:00	1	Unstable Operation - noise outside of specifications
NO2, NO, NOX	15 Jun 2016 06:00	15 Jun 2016 07:00	2	Station power failure
NO2, NO, NOX	15 Jun 2016 08:00	15 Jun 2016 08:00	1	Stabilization following station power failure
PM2.5	18 Jun 2016 13:00	21 Jun 2016 09:00	69	Analyzer Failure - debris in sample chamber
PM2.5	21 Jun 2016 10:00	21 Jun 2016 10:00	1	Maintenance - replace analyzer and verify operation
Wind Speed, Wind Direction	14 Jun 2016 17:00	14 Jun 2016 17:00	1	Maintenance - tower lowered to access camera
Surface Leaf Wetness	01 Jun 2016 01:00	03 Jun 2016 22:00	70	Analyzer Failure - signal wire fault
Surface Leaf Wetness	04 Jun 2016 00:00	04 Jun 2016 00:00	1	Analyzer Failure - signal wire fault
Surface Leaf Wetness	04 Jun 2016 07:00	05 Jun 2016 05:00	23	Analyzer Failure - signal wire fault
Surface Leaf Wetness	05 Jun 2016 07:00	05 Jun 2016 07:00	1	Analyzer Failure - signal wire fault
Surface Leaf Wetness	05 Jun 2016 12:00	06 Jun 2016 21:00	34	Analyzer Failure - signal wire fault
Surface Leaf Wetness	07 Jun 2016 17:00	07 Jun 2016 18:00	2	Analyzer Failure - signal wire fault
Surface Leaf Wetness	08 Jun 2016 06:00	08 Jun 2016 06:00	1	Analyzer Failure - signal wire fault
Surface Leaf Wetness	08 Jun 2016 08:00	08 Jun 2016 16:00	9	Analyzer Failure - signal wire fault
Surface Leaf Wetness	09 Jun 2016 00:00	09 Jun 2016 03:00	4	Analyzer Failure - signal wire fault
Surface Leaf Wetness	12 Jun 2016 01:00	12 Jun 2016 02:00	2	Analyzer Failure - signal wire fault
Surface Leaf Wetness	12 Jun 2016 13:00	12 Jun 2016 17:00	5	Analyzer Failure - signal wire fault
Surface Leaf Wetness	21 Jun 2016 09:00	21 Jun 2016 10:00	2	Analyzer Failure - signal wire fault
Solar Global Radiation	01 Jun 2016 01:00	02 Jun 2016 21:00	45	Analyzer Failure - signal wire fault
Solar Global Radiation	02 Jun 2016 23:00	02 Jun 2016 23:00	1	Analyzer Failure - signal wire fault
Solar Global Radiation	03 Jun 2016 04:00	03 Jun 2016 12:00	9	Analyzer Failure - signal wire fault
Solar Global Radiation	03 Jun 2016 20:00	03 Jun 2016 21:00	2	Analyzer Failure - signal wire fault
Solar Global Radiation	04 Jun 2016 08:00	05 Jun 2016 01:00	18	Analyzer Failure - signal wire fault
Solar Global Radiation	05 Jun 2016 03:00	05 Jun 2016 05:00	3	Analyzer Failure - signal wire fault
Solar Global Radiation	05 Jun 2016 12:00	05 Jun 2016 13:00	2	Analyzer Failure - signal wire fault
Solar Global Radiation	05 Jun 2016 17:00	05 Jun 2016 18:00	2	Analyzer Failure - signal wire fault
Solar Global Radiation	05 Jun 2016 20:00	05 Jun 2016 20:00	1	Analyzer Failure - signal wire fault

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT CHIPEWYAN (AMS 8)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
Solar Global Radiation	05 Jun 2016 23:00	06 Jun 2016 00:00	2	Analyzer Failure - signal wire fault
Solar Global Radiation	06 Jun 2016 03:00	06 Jun 2016 21:00	19	Analyzer Failure - signal wire fault
Solar Global Radiation	07 Jun 2016 17:00	07 Jun 2016 18:00	2	Analyzer Failure - signal wire fault
Solar Global Radiation	08 Jun 2016 06:00	08 Jun 2016 06:00	1	Analyzer Failure - signal wire fault
Solar Global Radiation	08 Jun 2016 08:00	08 Jun 2016 12:00	5	Analyzer Failure - signal wire fault
Solar Global Radiation	08 Jun 2016 14:00	08 Jun 2016 16:00	3	Analyzer Failure - signal wire fault
Solar Global Radiation	09 Jun 2016 00:00	09 Jun 2016 03:00	4	Analyzer Failure - signal wire fault
Solar Global Radiation	12 Jun 2016 01:00	12 Jun 2016 02:00	2	Analyzer Failure - signal wire fault
Solar Global Radiation	12 Jun 2016 13:00	12 Jun 2016 17:00	5	Analyzer Failure - signal wire fault
Solar Global Radiation	21 Jun 2016 09:00	21 Jun 2016 10:00	2	Analyzer Failure - signal wire fault



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

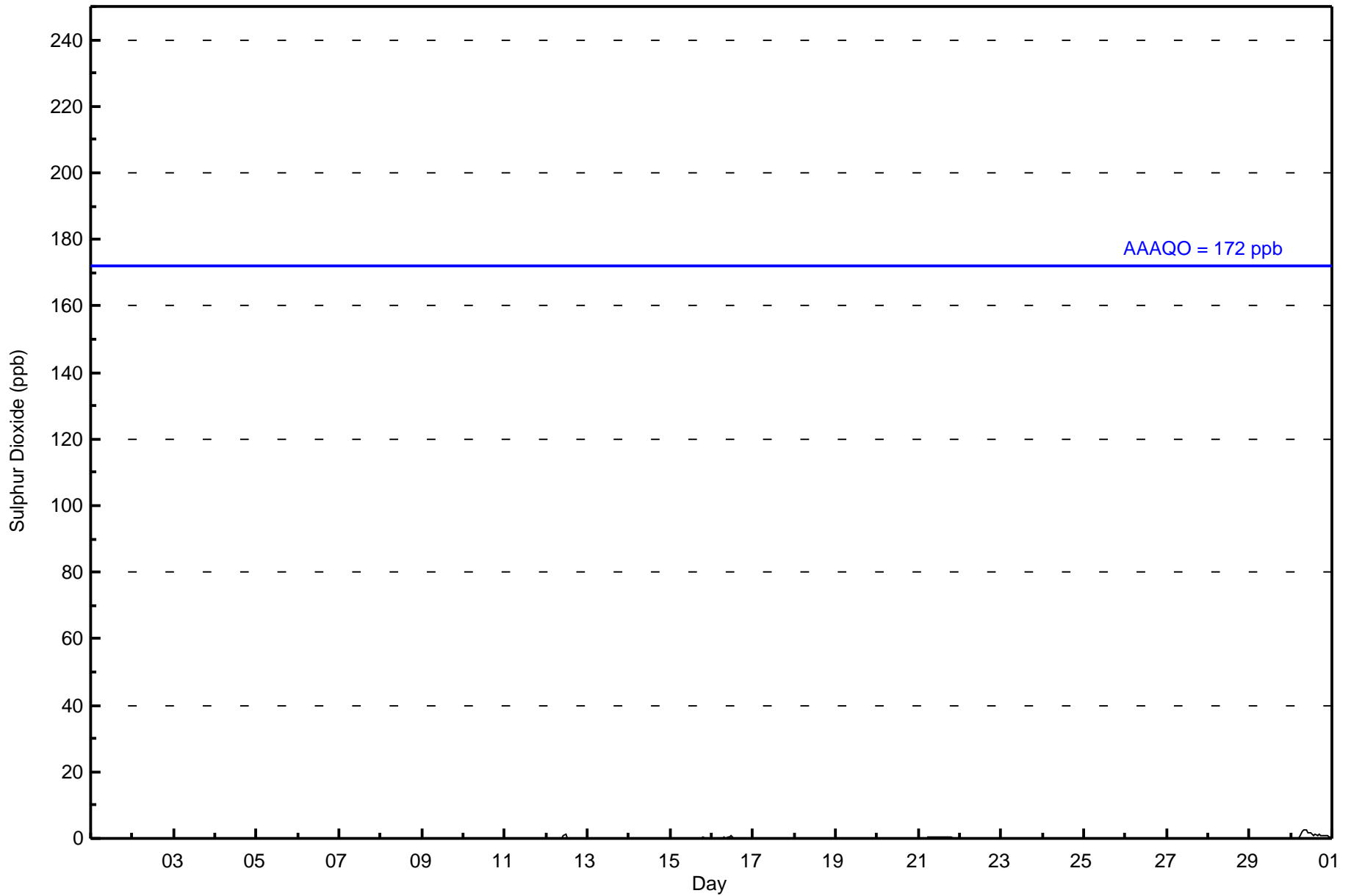
Fort Chipewyan - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0														Hours in Service: 720												
Maximum Value: 3 ppb on Jun 30 09:00														Maximum Daily Average: 1.1 ppb on Jun 30												
Minimum Value: 0 ppb on Jun 2 02:00														Minimum Daily Average: 0.0 ppb on Jun 19												
Maximum Diurnal Average: 0.2 ppb at hour 12														Minimum Diurnal Average: 0.0 ppb at hour 2												
Monthly Average: 0.1 ppb														Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1												
Hours in Service: 720														Hours of Data: 680												
Hours of Missing Data: 40														Hours of Calibration: 39												
Hours of Calibration: 39														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-Jun	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
2-Jun	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
3-Jun	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
4-Jun	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
5-Jun	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
6-Jun	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
7-Jun	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
8-Jun	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
9-Jun	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
10-Jun	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
11-Jun	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
12-Jun	0	Z	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
13-Jun	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
14-Jun	0	0	0	Z	0	0	0	0	0	0	C	C	C	C	C	C	C	C	C	0	0	0	0	0	--	0
15-Jun	0	0	0	0	Z	PF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
16-Jun	0	0	0	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1
17-Jun	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
18-Jun	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
19-Jun	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
20-Jun	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
21-Jun	0	0	0	0	Z	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
22-Jun	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
23-Jun	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
24-Jun	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
25-Jun	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
26-Jun	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
27-Jun	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
28-Jun	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
29-Jun	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
30-Jun	0	Z	0	0	0	0	2	3	3	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	3
																								Diurnal Average		
																								Diurnal Maximum		
Z - zeronspan C - Calibration PF - Power Failure																										
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb																										



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	680	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: 680

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	28	20	49	83	151	37	26	16	25	7	20	24	38	70	46	40	680
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
Totals	28	20	49	83	151	37	26	16	25	7	20	24	38	70	46	40	680

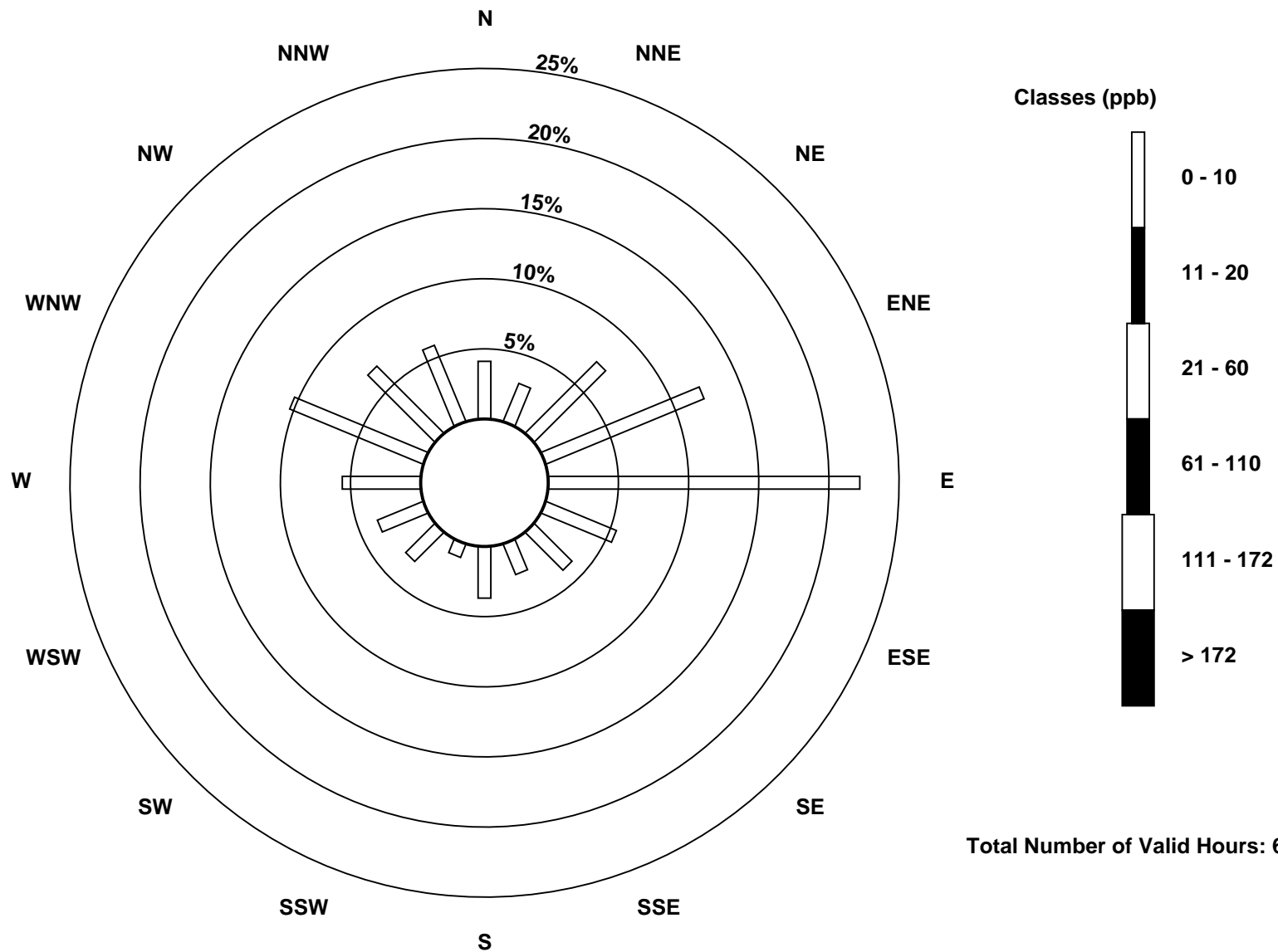
Total Number of Valid Hours: 680

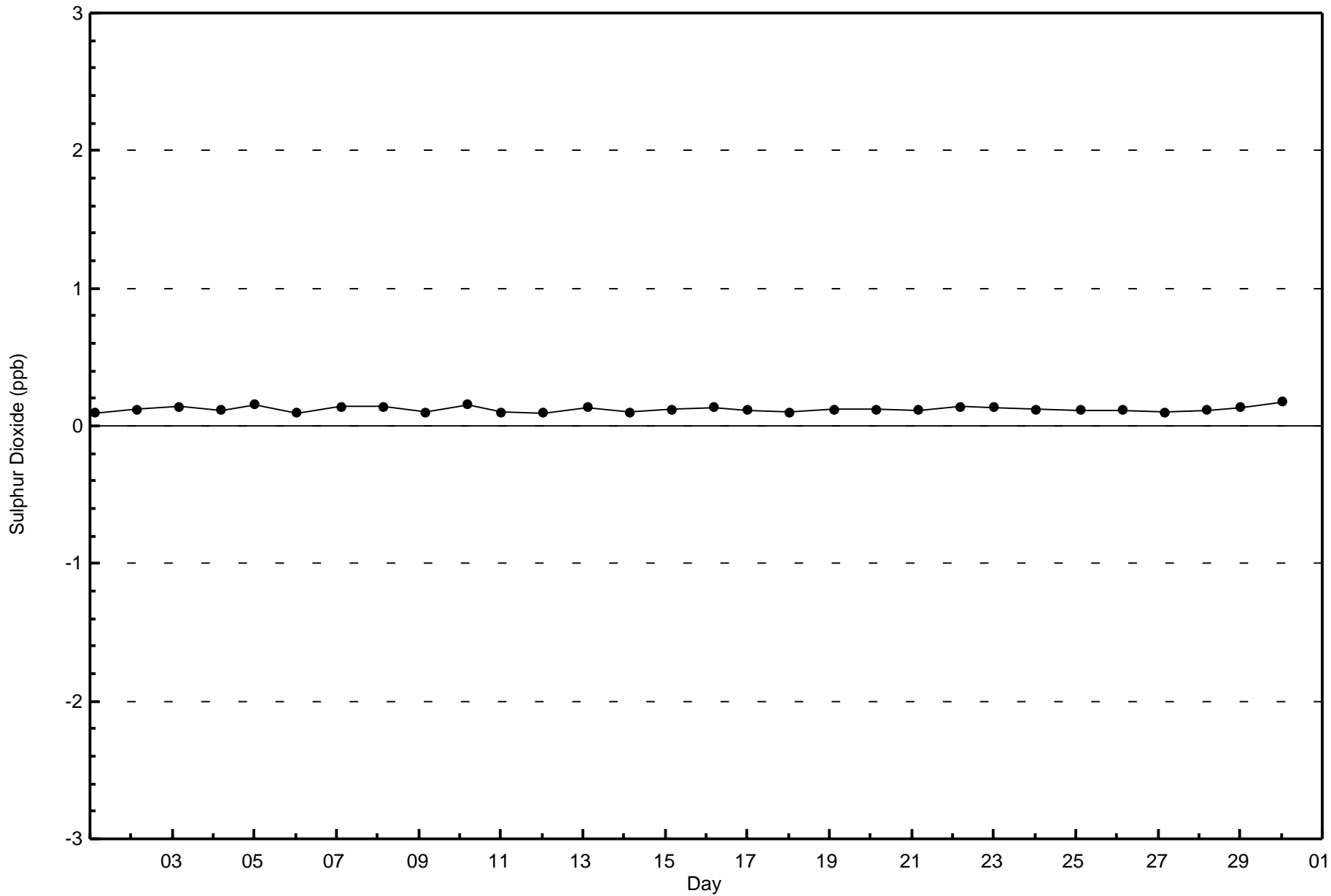
Total Number of Hours: 720

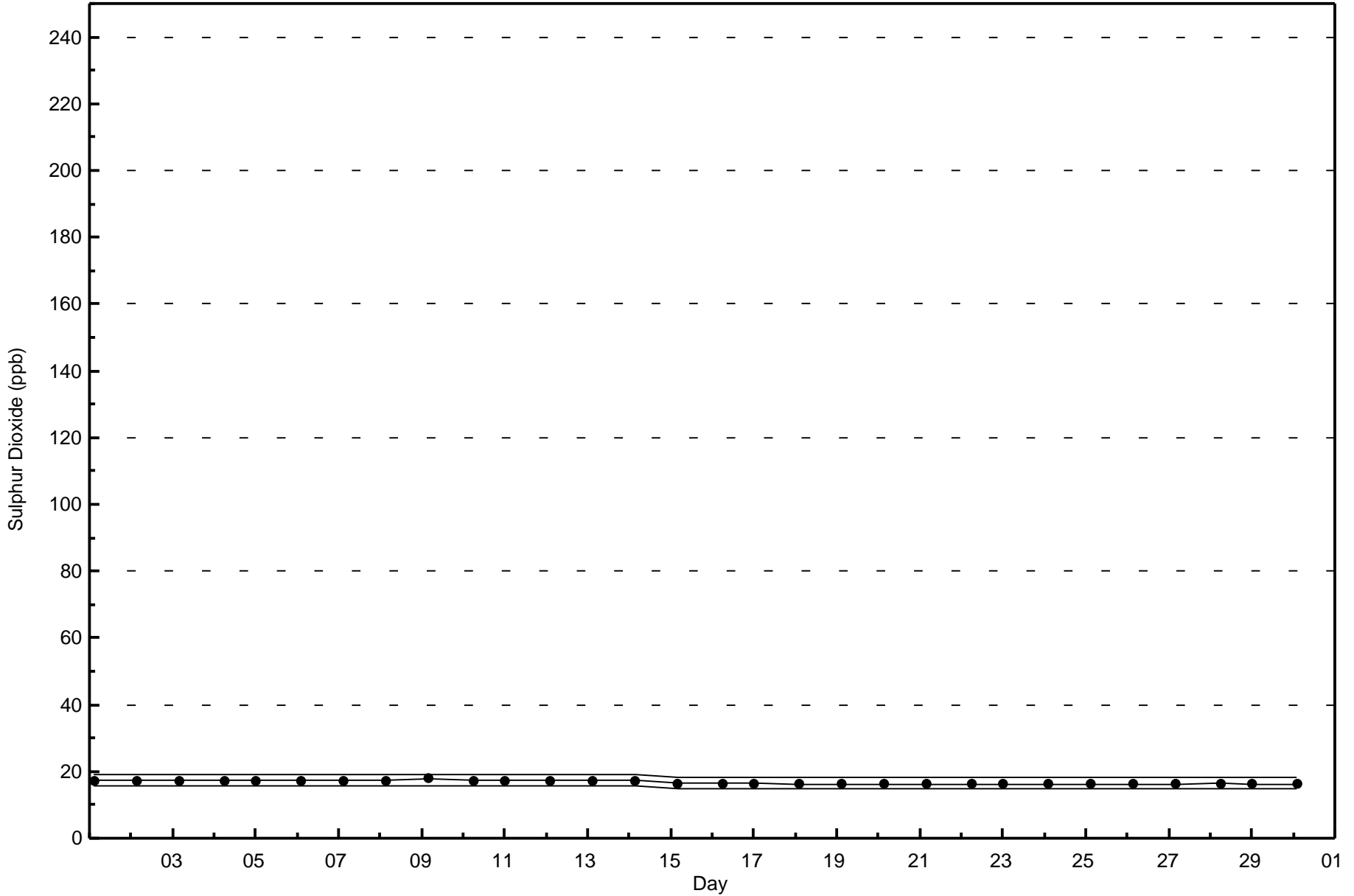


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Sulphur Dioxide (SO₂) - ppb
Fort Chipewyan (AMS 8)









Wood Buffalo Environmental Association
Summary of Hour Averages

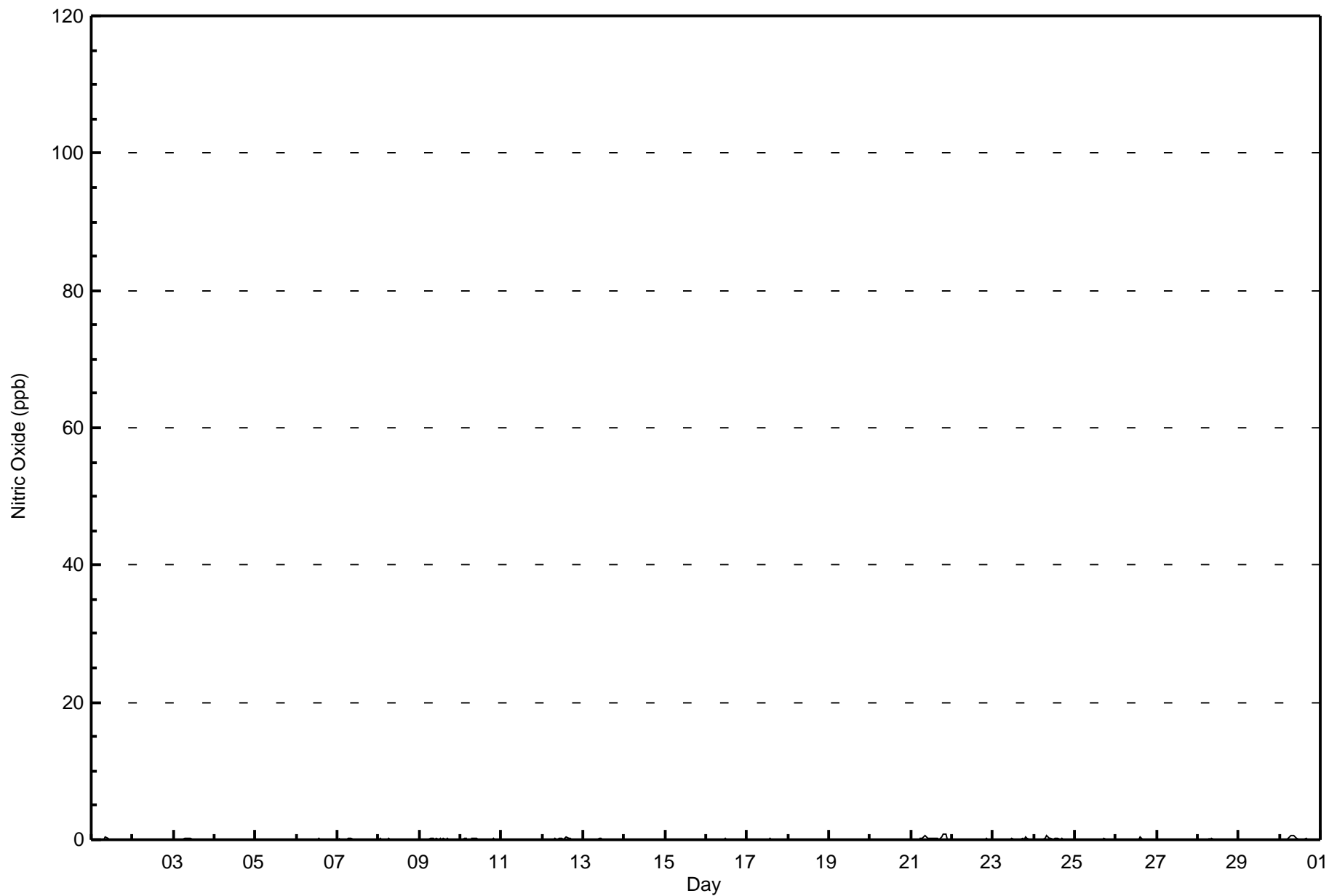
Nitric Oxide (NO) - ppb
Fort Chipewyan - June 2016

Maximum Value: 1 ppb on Jun 21 21:00														Maximum Daily Average: 0.2 ppb on Jun 21														Hours in Service: 720	
Minimum Value: 0 ppb on Jun 1 01:00														Minimum Daily Average: 0.0 ppb on Jun 19														Hours of Data: 678	
Maximum Diurnal Average: 0.1 ppb at hour 9														Minimum Diurnal Average: 0.0 ppb at hour 1														Hours of Missing Data: 42	
Monthly Average: 0.1 ppb														Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1														Hours of Calibration: 39	
																												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-Jun	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			
2-Jun	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			
3-Jun	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			
4-Jun	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			
5-Jun	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			
6-Jun	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			
7-Jun	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			
8-Jun	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			
9-Jun	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			
10-Jun	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			
11-Jun	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			
12-Jun	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			
13-Jun	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			
14-Jun	0	0	0	Z	0	0	0	0	0	0	C	C	C	C	C	C	C	C	C	0	0	0	0	0	--	0			
15-Jun	0	0	0	0	Z	PF	PF	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0			
16-Jun	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			
17-Jun	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			
18-Jun	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			
19-Jun	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			
20-Jun	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			
21-Jun	0	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0.2	1			
22-Jun	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			
23-Jun	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			
24-Jun	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1			
25-Jun	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			
26-Jun	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			
27-Jun	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			
28-Jun	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			
29-Jun	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			
30-Jun	0	Z	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1			
																								Diurnal Average					
																								Diurnal Maximum					
Z - zerospan																													
C - Calibration																													
UO - Unstable Operation																													
PF - Power Failure																													



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Fort Chipewyan - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Fort Chipewyan - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	678	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: 678

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Fort Chipewyan - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	28	19	49	82	151	37	26	16	25	7	20	24	38	70	46	40	678
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
Totals	28	19	49	82	151	37	26	16	25	7	20	24	38	70	46	40	678

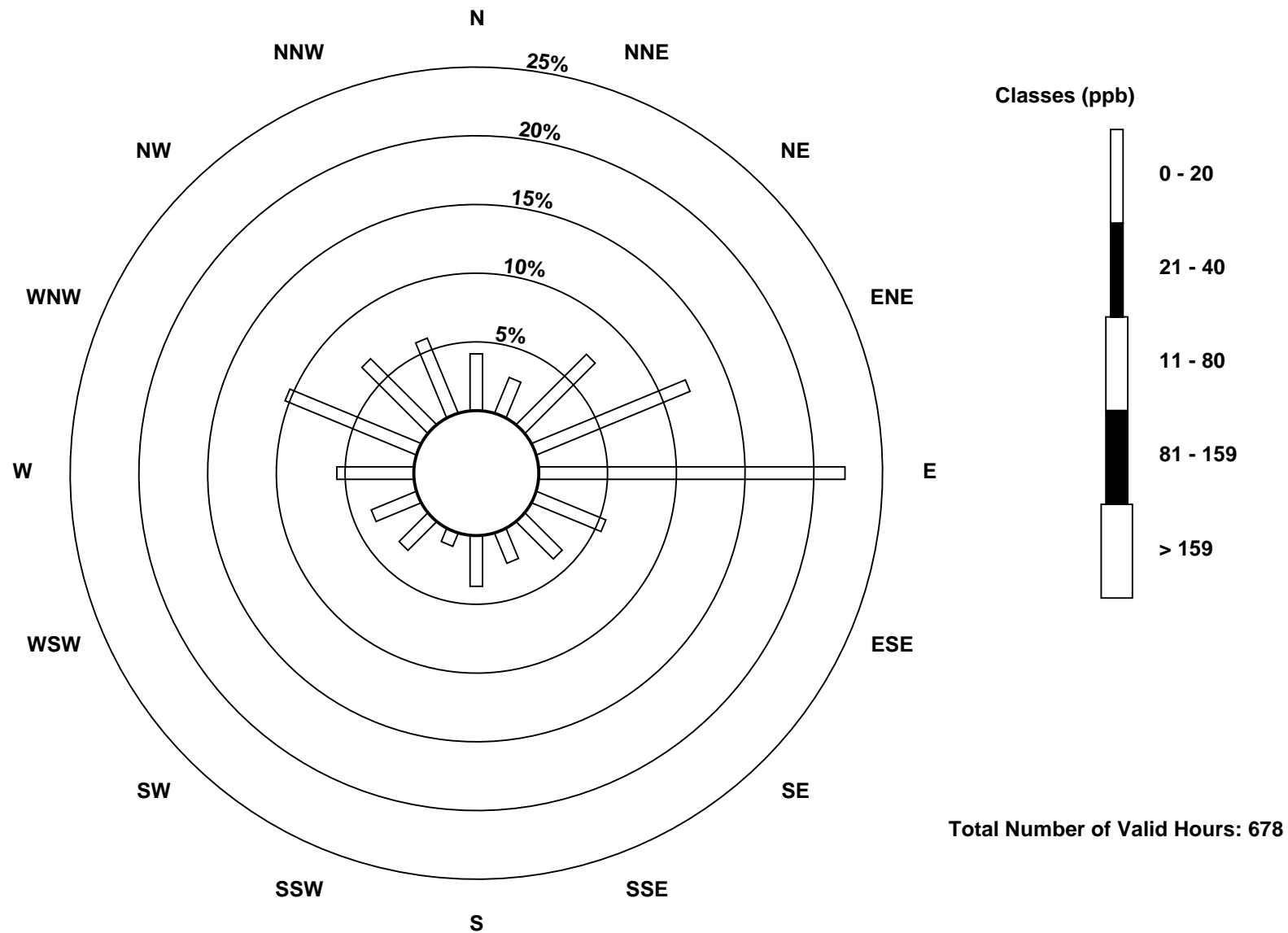
Total Number of Valid Hours: 678

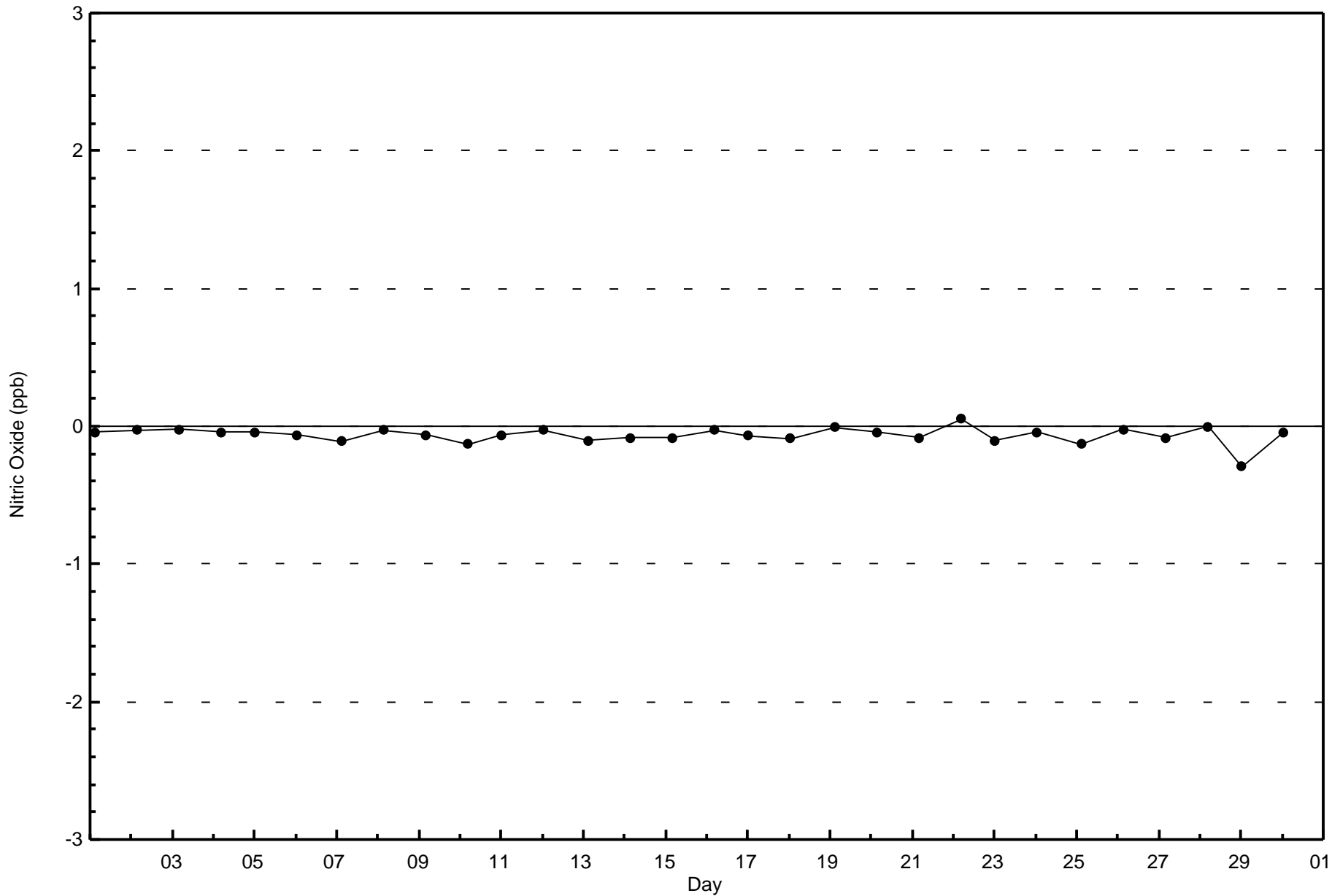
Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitric Oxide (NO) - ppb
Fort Chipewyan (AMS 8)

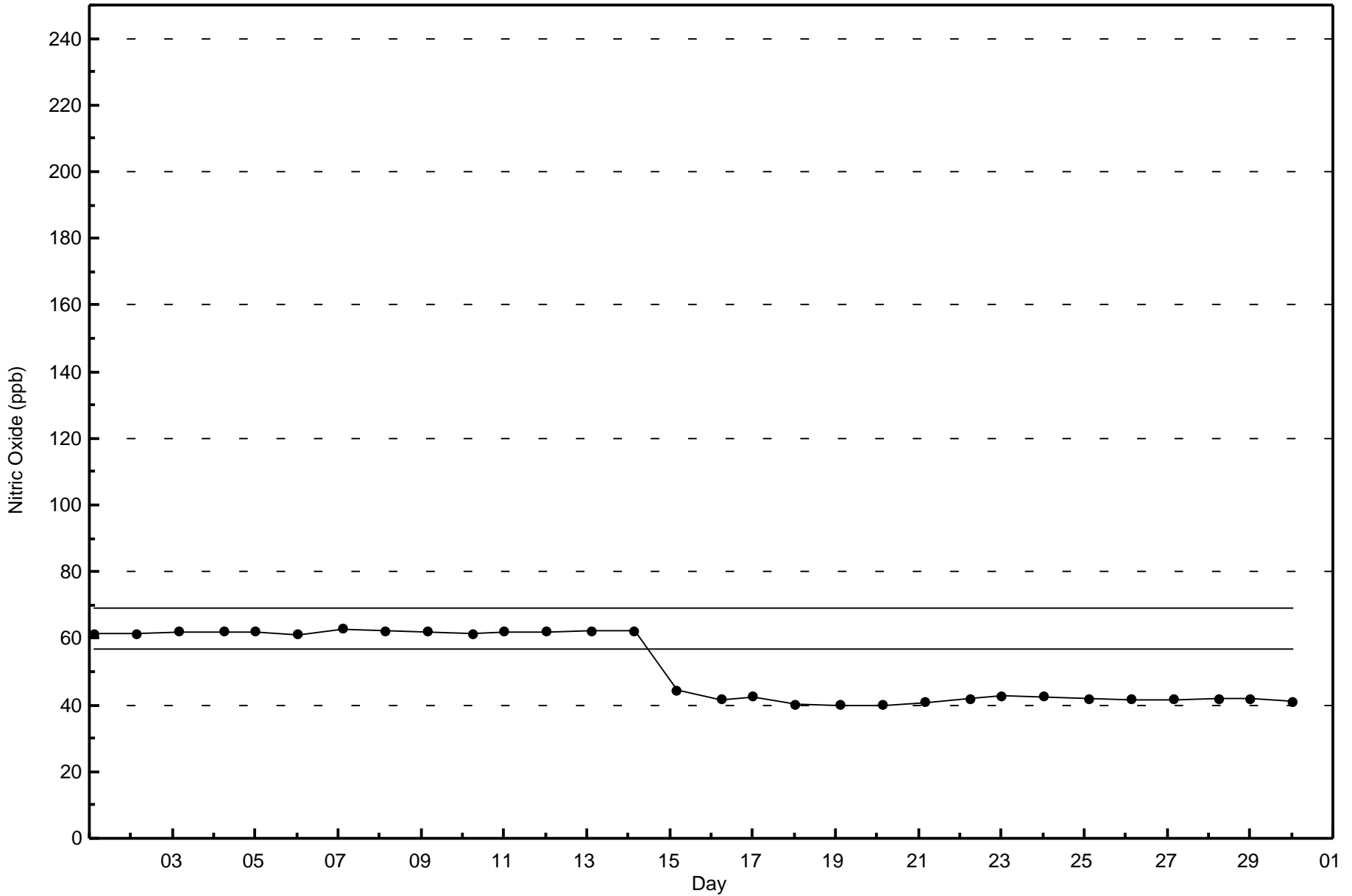






Wood Buffalo Environmental Association
Span Responses

Nitric Oxide (NO) - ppb
Fort Chipewyan - June 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Fort Chipewyan - June 2016

Number of Exceedences (AAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 8 ppb on Jun 8 02:00	Maximum Daily Average: 1.6 ppb on Jun 21		Hours of Data:	678
Minimum Value: 0 ppb on Jun 6 09:00	Minimum Daily Average: 0.1 ppb on Jun 20		Hours of Missing Data:	42
Maximum Diurnal Average: 0.7 ppb at hour 2	Minimum Diurnal Average: 0.2 ppb at hour 16		Hours of Calibration:	39
Monthly Average: 0.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 3		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-Jun	0	1	Z	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0.4	1
2-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0.3	1
3-Jun	0	0	1	1	Z	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0.5	1
4-Jun	0	0	0	1	1	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0.4	1
5-Jun	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
6-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0.2	1
7-Jun	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
8-Jun	0	8	7	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	8
9-Jun	0	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0.3	2
10-Jun	2	1	1	3	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0.5	3
11-Jun	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
12-Jun	1	Z	1	0	0	0	0	0	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	0	0.4	1
13-Jun	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
14-Jun	0	0	0	Z	0	0	0	0	0	0	0	C	C	C	C	C	C	C	C	C	0	0	0	0	--	0
15-Jun	0	0	0	0	Z	PF	PF	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0.3	1
17-Jun	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
18-Jun	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
19-Jun	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
20-Jun	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
21-Jun	0	0	0	0	Z	1	2	2	3	3	2	2	1	1	1	1	0	1	2	5	6	2	1	1	1.6	6
22-Jun	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	0	0.4	2
23-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	2	2	3	1	0.7	3
24-Jun	1	Z	2	8	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0.8	8
25-Jun	0	3	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.3	3
26-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.3	1
27-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.3	1
28-Jun	1	0	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0.3	2
29-Jun	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
30-Jun	1	Z	0	1	1	1	2	2	3	2	2	1	1	1	1	0	0	0	1	1	1	1	0	0	0.9	3

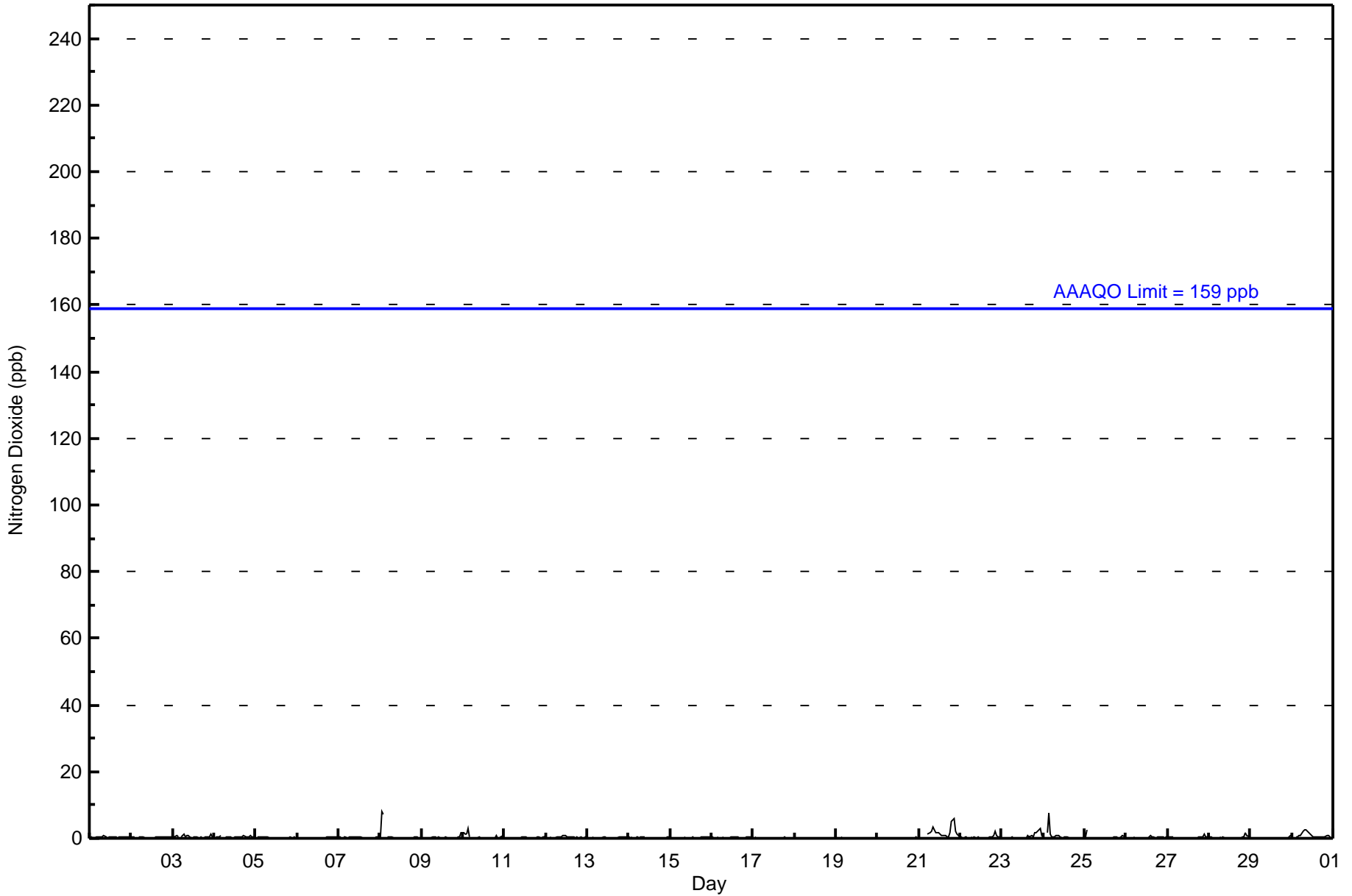
0.4	0.7	0.6	0.7	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.2	0.3	0.3	0.2	0.2	0.3	0.3	0.5	0.6	0.6	0.5	0.4	Diurnal Average	
2	8	7	8	1	1	2	2	3	3	2	2	1	1	1	1	1	1	1	2	5	6	2	3	2	Diurnal Maximum	

Z - zerspan C - Calibration UO - Unstable Operation PF - Power Failure
 Alberta Ambient Air Quality Objectives (AAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	678	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: 678

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	28	19	49	82	151	37	26	16	25	7	20	24	38	70	46	40	678
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
Totals	28	19	49	82	151	37	26	16	25	7	20	24	38	70	46	40	678

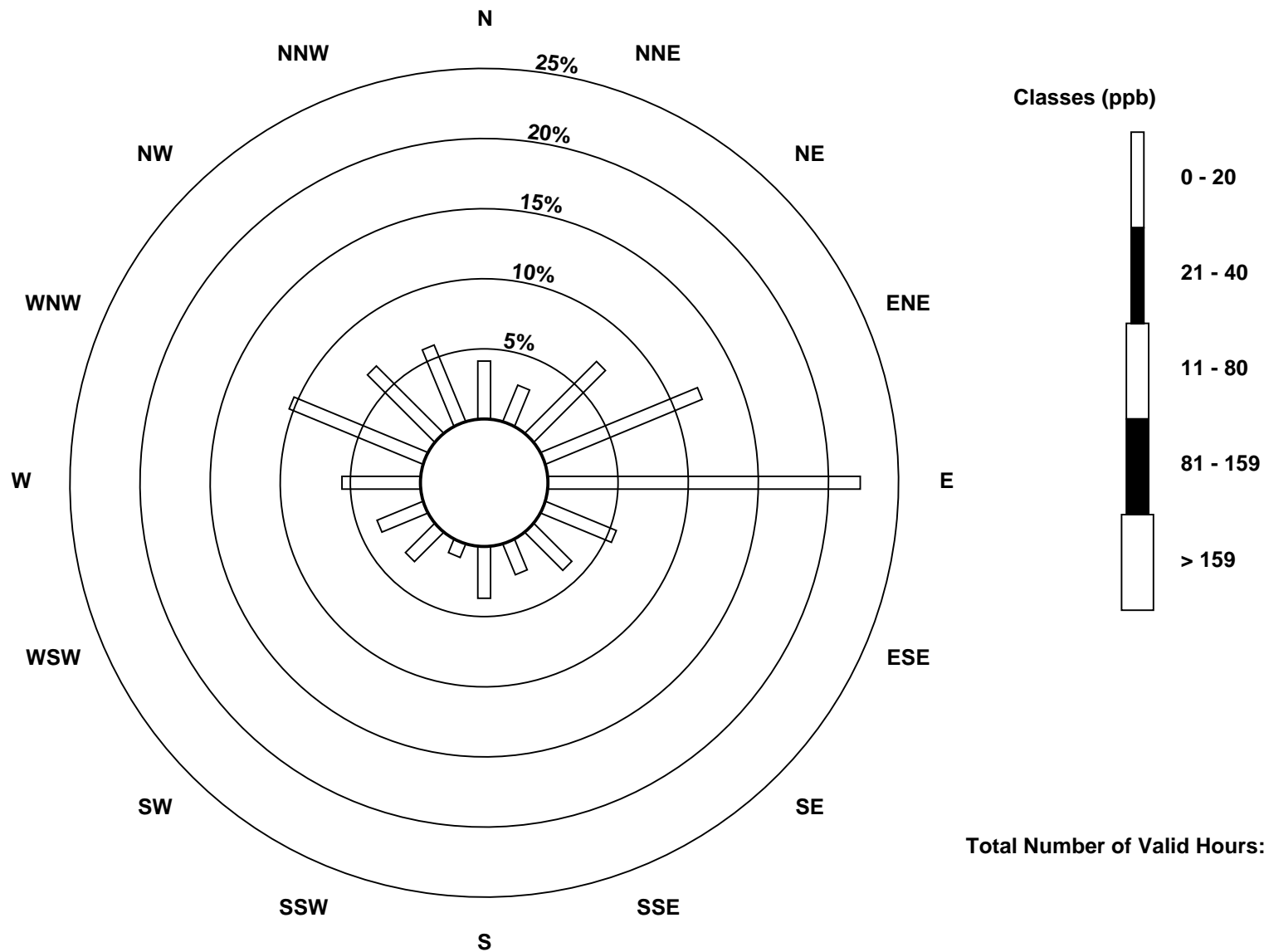
Total Number of Valid Hours: 678

Total Number of Hours: 720

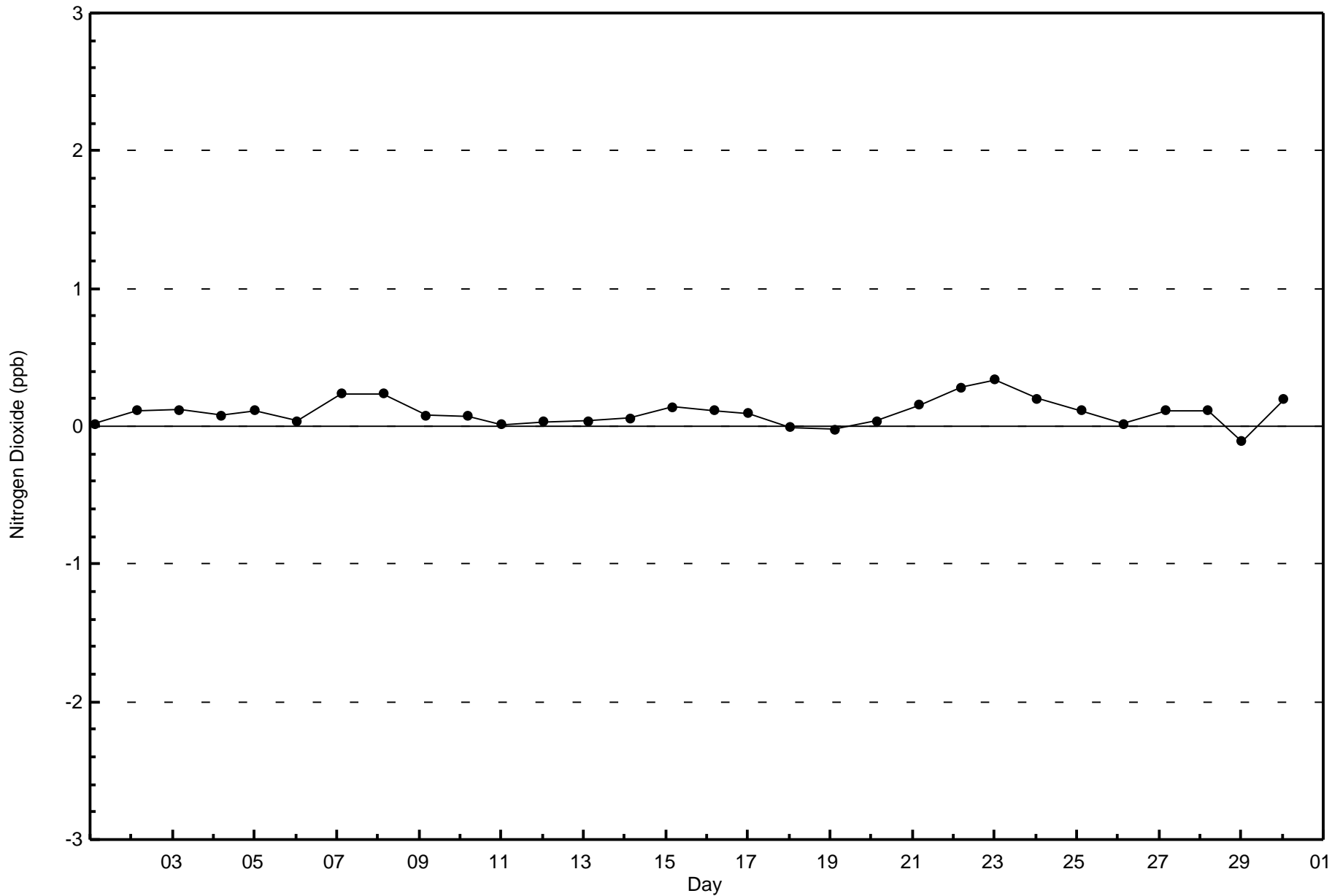


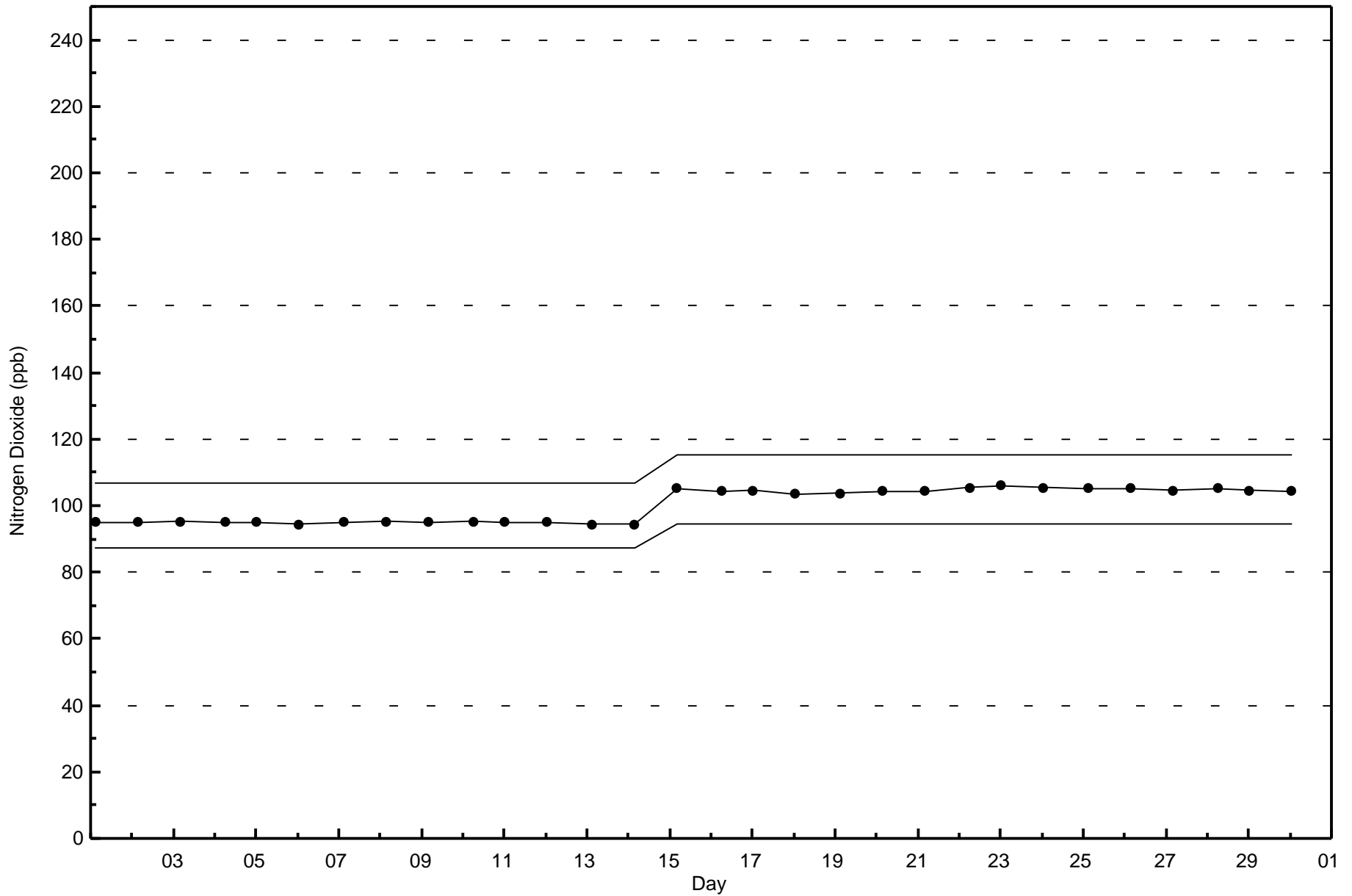
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Dioxide (NO₂) - ppb
Fort Chipewyan (AMS 8)



Total Number of Valid Hours: 678







Wood Buffalo Environmental Association
Summary of Hour Averages

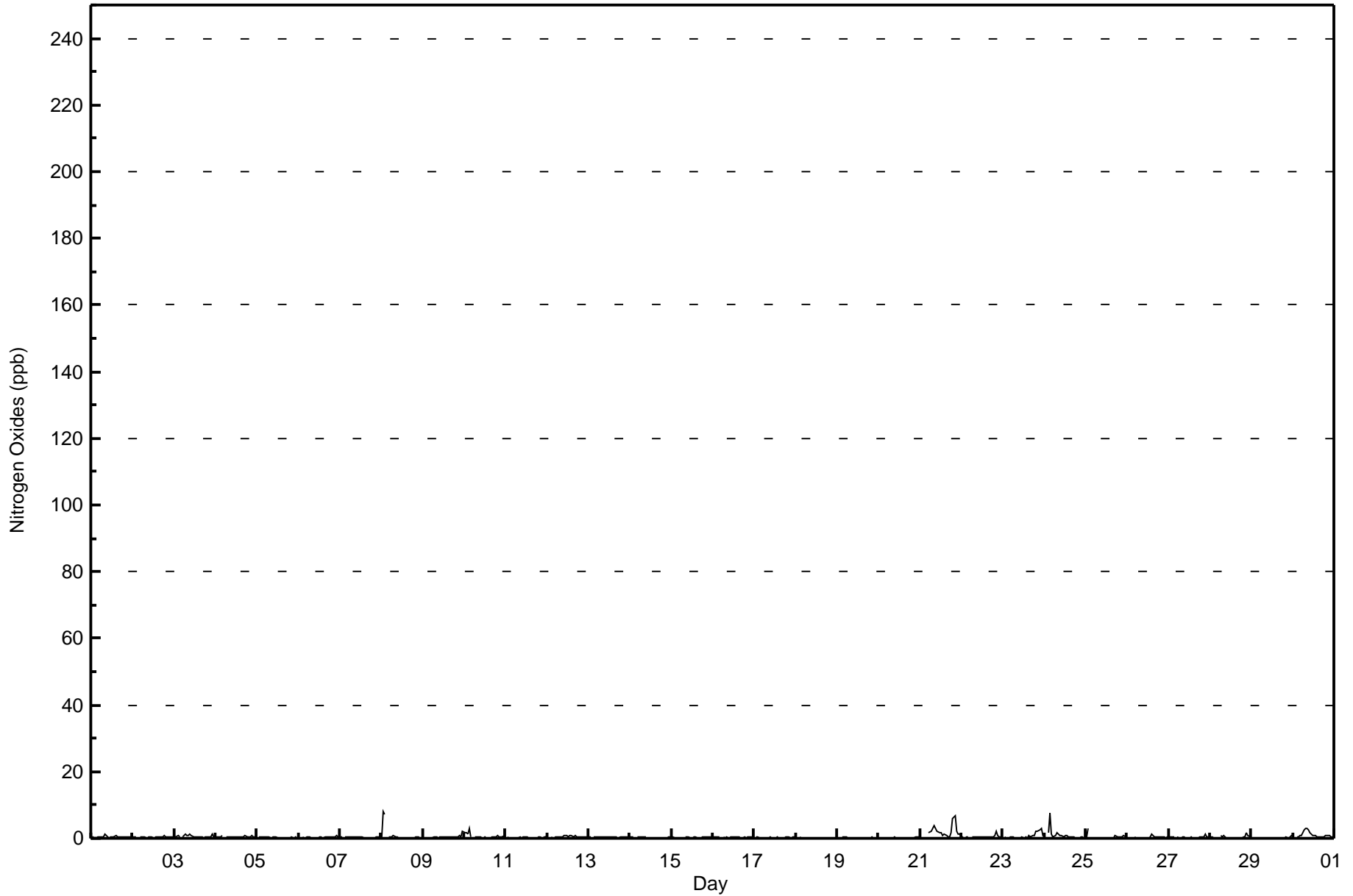
Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - June 2016

Maximum Value: 8 ppb on Jun 8 02:00		Maximum Daily Average: 1.8 ppb on Jun 21		Hours in Service: 720																							
Minimum Value: 0 ppb on Jun 29 12:00		Minimum Daily Average: 0.1 ppb on Jun 20		Hours of Data: 678																							
Maximum Diurnal Average: 0.7 ppb at hour 2		Minimum Diurnal Average: 0.3 ppb at hour 17		Hours of Missing Data: 42																							
Monthly Average: 0.4 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 3		Hours of Calibration: 39																							
				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-Jun	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.4	1	
2-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0.3	1	
3-Jun	0	0	1	1	Z	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0.6	1	
4-Jun	0	0	0	0	1	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	1	1	0.4	1	
5-Jun	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
6-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0.3	1
7-Jun	0	1	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
8-Jun	0	8	7	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	8	
9-Jun	0	0	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0.4	2	
10-Jun	2	2	1	3	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0.6	3	
11-Jun	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	
12-Jun	1	Z	1	0	0	0	0	1	0	0	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0.5	1	
13-Jun	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	
14-Jun	0	0	0	Z	0	0	0	0	0	0	C	C	C	C	C	C	C	C	C	0	0	0	0	0	--	0	
15-Jun	0	0	0	0	Z	PF	PF	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
16-Jun	0	0	0	0	0	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0.3	1	
17-Jun	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	
18-Jun	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	
19-Jun	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	
20-Jun	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	
21-Jun	0	0	0	0	Z	2	2	3	4	3	2	2	2	1	1	1	0	1	2	6	7	2	1	1	1.8	7	
22-Jun	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	0	0.5	2	
23-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	2	2	3	1	0	0.7	3	
24-Jun	1	Z	2	8	1	1	1	2	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	1.0	8	
25-Jun	0	3	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0.3	3	
26-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.3	1	
27-Jun	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	
28-Jun	1	0	0	0	0	Z	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0.3	2	
29-Jun	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	
30-Jun	1	Z	0	1	1	1	3	3	3	3	2	1	1	1	1	1	1	1	1	1	1	1	1	0	1.1	3	
																								Diurnal Average			
																								Diurnal Maximum			
																								Z - zerospan			
																								C - Calibration			
																								UO - Unstable Operation			
																								PF - Power Failure			



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	678	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: 678

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	28	19	49	82	151	37	26	16	25	7	20	24	38	70	46	40	678
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
Totals	28	19	49	82	151	37	26	16	25	7	20	24	38	70	46	40	678

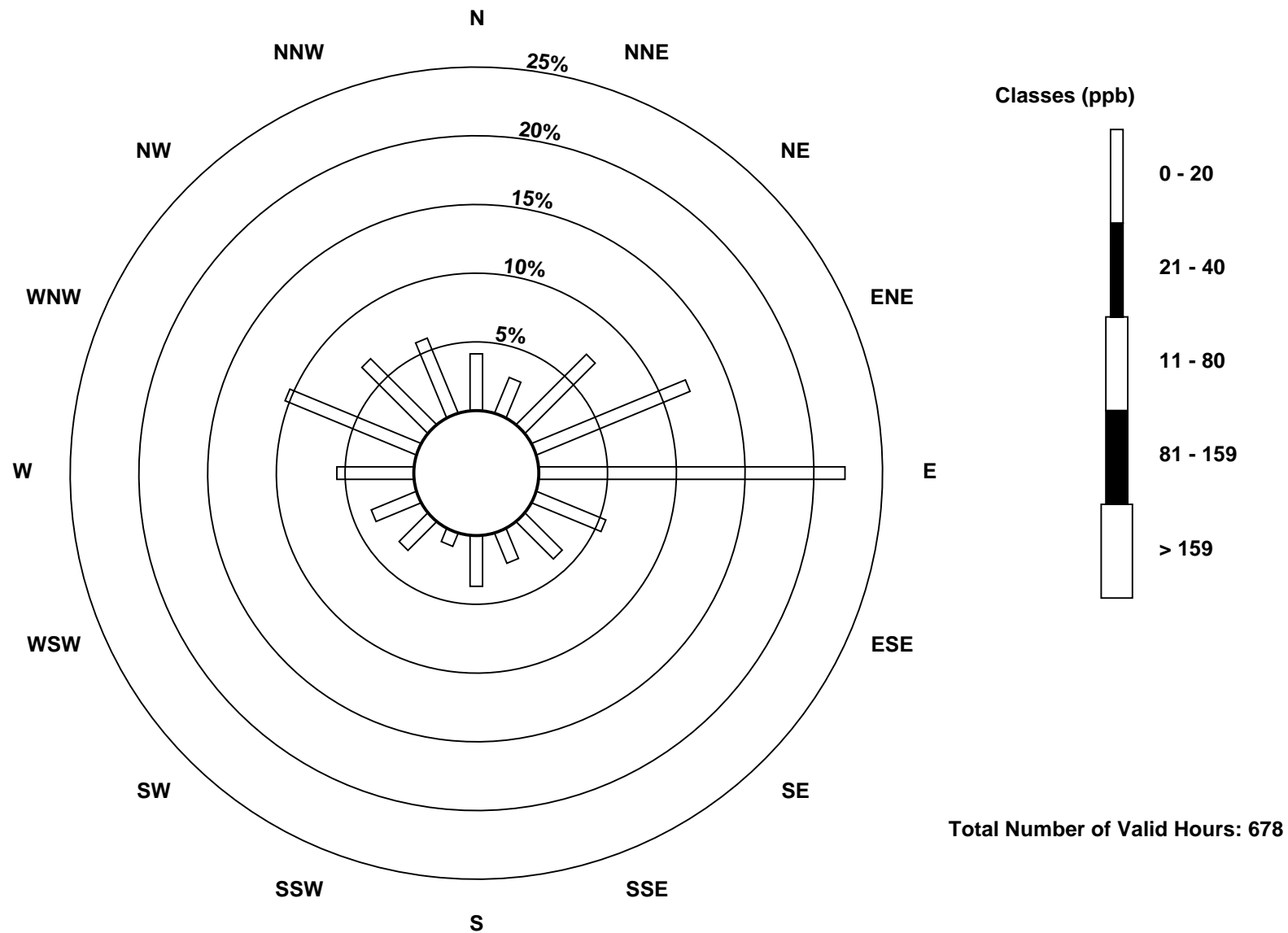
Total Number of Valid Hours: 678

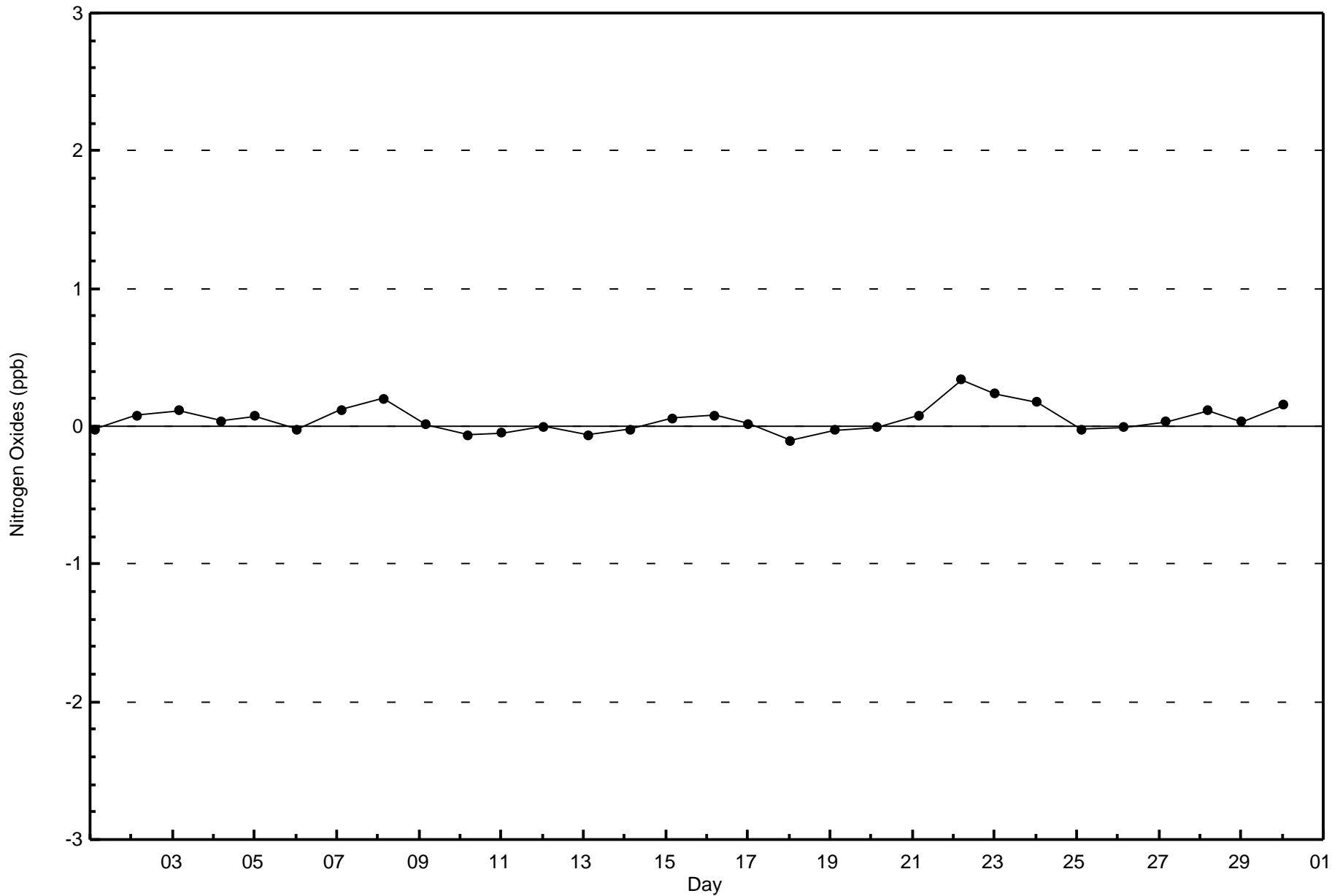
Total Number of Hours: 720

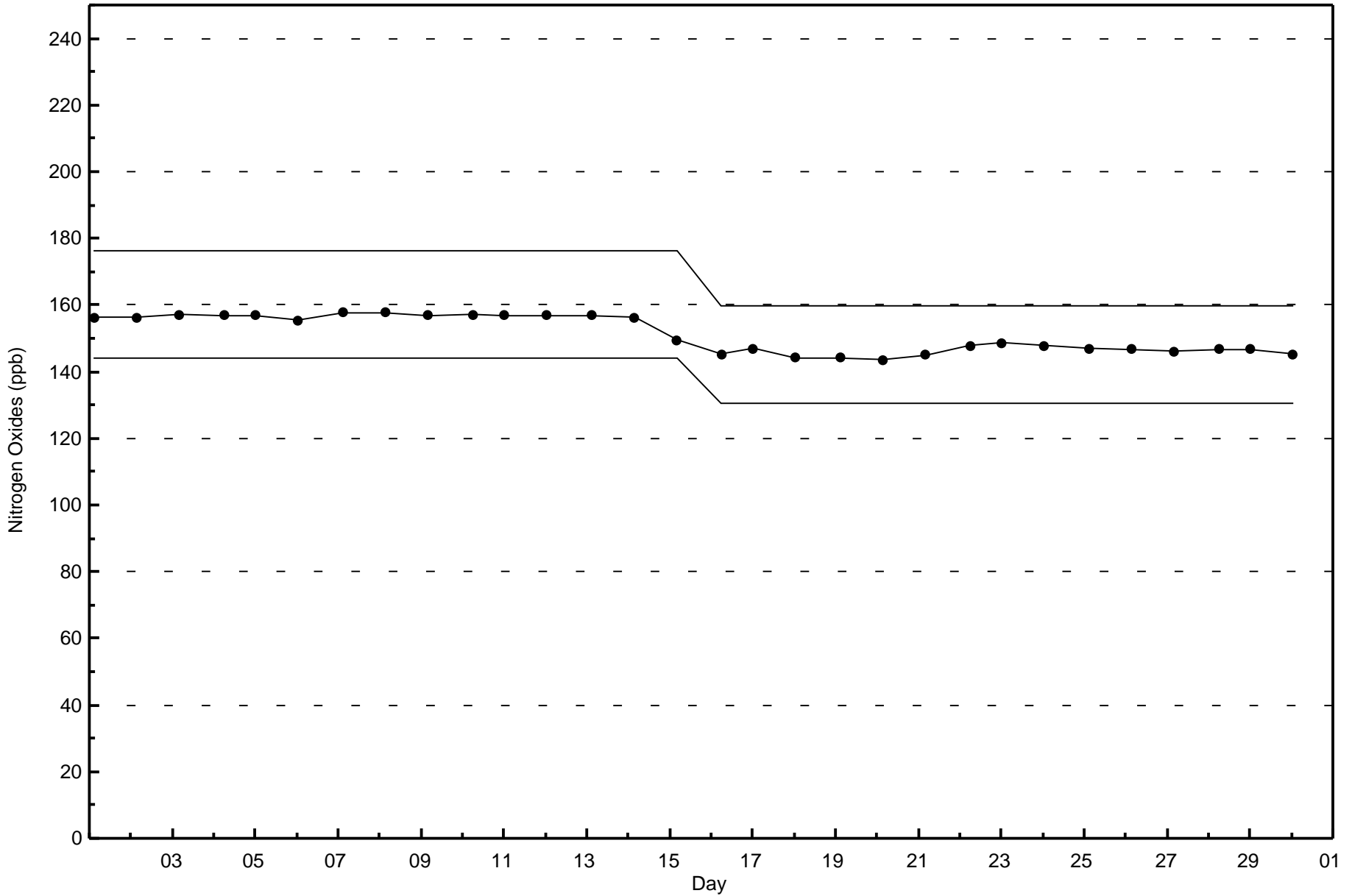


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxides (NO_x) - ppb
Fort Chipewyan (AMS 8)









Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Fort Chipewyan - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 53 ppb on Jun 22 17:00	Maximum Daily Average: 43.6 ppb on Jun 21		Hours of Data:	671
Minimum Value: 13 ppb on Jun 24 07:00	Minimum Daily Average: 22.3 ppb on Jun 24		Hours of Missing Data:	49
Maximum Diurnal Average: 34.8 ppb at hour 16	Minimum Diurnal Average: 23.5 ppb at hour 7		Hours of Calibration:	40
Monthly Average: 30.8 ppb	Percentiles: P ₁ = 17 P ₁₀ = 21 Q ₁ = 25 Median = 30 O ₃ = 35 P ₉₀ = 41 P ₉₉ = 50		Percent Operational Time:	98.8

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-Jun	18	20	22	25	22	Z	21	21	19	18	20	23	30	29	29	29	28	29	31	32	29	28	27	UO		
2-Jun	24	24	22	22	24	24	Z	27	28	28	27	28	28	28	30	32	34	37	38	39	39	38	37	35		
3-Jun	31	30	28	24	22	21	19	Z	23	21	21	23	25	24	24	27	29	27	26	26	25	UO	UO	21		
4-Jun	24	24	20	17	14	17	20	34	Z	36	39	39	39	43	46	42	32	33	36	34	30	31	30	32		
5-Jun	26	26	23	Z	25	25	25	26	26	30	31	28	27	24	24	26	29	31	30	28	27	27	26	27		
6-Jun	26	24	23	22	Z	23	20	20	21	22	24	25	26	29	32	36	40	42	40	40	46	47	52	39		
7-Jun	40	39	34	30	26	Z	22	27	29	34	38	41	41	43	47	45	43	40	42	42	42	41	36	31		
8-Jun	36	29	28	36	31	28	Z	37	39	37	31	26	26	27	32	UO	35	34	34	35	35	34	33	31		
9-Jun	31	30	29	28	26	24	22	Z	19	20	19	18	20	25	29	27	26	32	41	39	35	31	27	23		
10-Jun	22	21	21	18	17	16	18	22	Z	32	33	34	34	34	34	34	34	34	34	34	UO	31	30	29	28	
11-Jun	30	28	28	Z	26	24	23	25	25	30	34	35	35	36	36	36	35	35	UO	UO	36	37	35	29		
12-Jun	30	28	30	32	Z	28	28	30	31	31	32	31	35	32	31	31	32	30	29	29	29	27	27	24		
13-Jun	26	27	28	27	29	Z	30	29	33	38	39	38	37	34	34	34	34	35	33	31	31	27	23	25		
14-Jun	23	20	20	20	19	19	Z	27	31	34	35	C	C	C	C	C	C	C	C	C	C	42	41	40		
15-Jun	36	35	35	34	27	PF	21	Z	33	39	47	49	46	42	41	37	34	36	39	39	46	47	47	48		
16-Jun	46	44	42	40	36	33	32	32	Z	30	30	31	33	35	35	30	28	27	27	26	24	23	22	22		
17-Jun	23	24	27	Z	25	26	24	21	21	22	25	29	29	30	33	32	32	29	27	29	28	26	22	21		
18-Jun	21	21	21	22	Z	23	24	27	30	30	30	30	31	34	34	32	32	31	30	32	31	29	27	23		
19-Jun	23	24	23	18	17	Z	19	26	31	35	37	38	36	35	36	36	38	38	37	37	35	34	33	33		
20-Jun	33	32	31	32	32	29	Z	25	29	32	36	37	37	36	36	36	37	40	41	40	39	38	40	40		
21-Jun	43	42	43	45	UO	39	37	Z	42	47	50	50	47	46	49	47	43	43	43	40	38	41	42	40		
22-Jun	40	38	35	33	32	31	31	37	Z	39	39	43	46	49	52	52	53	53	45	47	44	45	35	27		
23-Jun	23	20	16	Z	17	24	24	20	21	23	21	22	25	28	31	39	34	26	21	25	27	26	27	27		
24-Jun	28	20	22	Z	15	13	15	17	18	18	21	24	25	26	25	27	26	25	25	25	26	24	24	24		
25-Jun	23	19	24	23	21	Z	23	24	24	25	25	24	24	25	26	27	29	29	33	32	31	30	31	32		
26-Jun	32	31	30	29	27	27	Z	27	28	29	30	31	31	33	32	33	34	33	31	31	32	36	33	28		
27-Jun	27	29	29	23	18	16	20	Z	23	23	29	32	33	37	38	37	34	35	35	37	37	36	31	34		
28-Jun	30	30	31	21	19	21	20	24	Z	33	31	29	25	27	28	32	37	35	34	33	32	29	28	29		
29-Jun	28	31	31	Z	28	26	26	26	27	27	29	31	32	33	34	35	36	36	35	35	33	32	32	41		
30-Jun	40	34	30	29	Z	25	26	31	35	41	45	40	42	42	43	43	44	44	45	48	50	48	46	41		

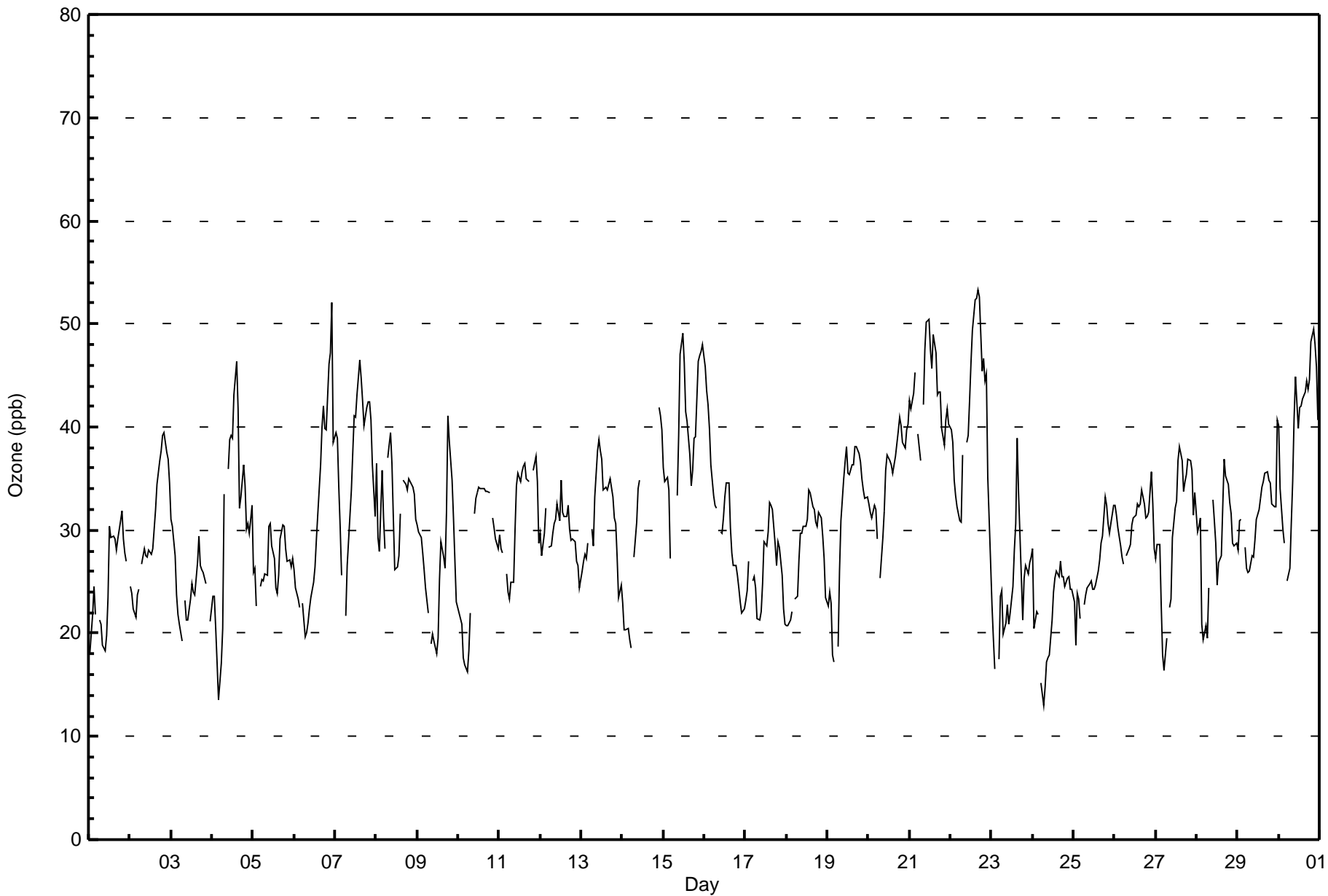
29.4	28.2	27.6	26.9	24.2	24.4	23.5	26.4	27.4	30.1	31.5	32.0	32.5	33.3	34.5	34.8	34.6	34.3	34.4	34.5	34.0	33.9	32.6	30.9	Diurnal Average
46	44	43	45	36	39	37	37	42	47	50	50	47	49	52	52	53	53	45	48	50	48	52	48	Diurnal Maximum

Z - zerospan C - Calibration UO - Unstable Operation PF - Power Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Fort Chipewyan - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ozone (O₃) - ppb
Fort Chipewyan - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	47	7.00	7.00
21 - 50	619	92.25	99.25
51 - 82	5	0.75	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 671

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ozone (O₃) - ppb
Fort Chipewyan - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	8	5	3	7	5	1	0	0	0	0	3	5	0	5	2	3	47
21 - 50	22	15	44	76	141	32	25	16	24	5	20	20	35	64	41	39	619
51 - 82	0	0	0	0	0	1	0	0	0	1	0	0	2	0	1	0	5
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	30	20	47	83	146	34	25	16	24	6	23	25	37	69	44	42	671

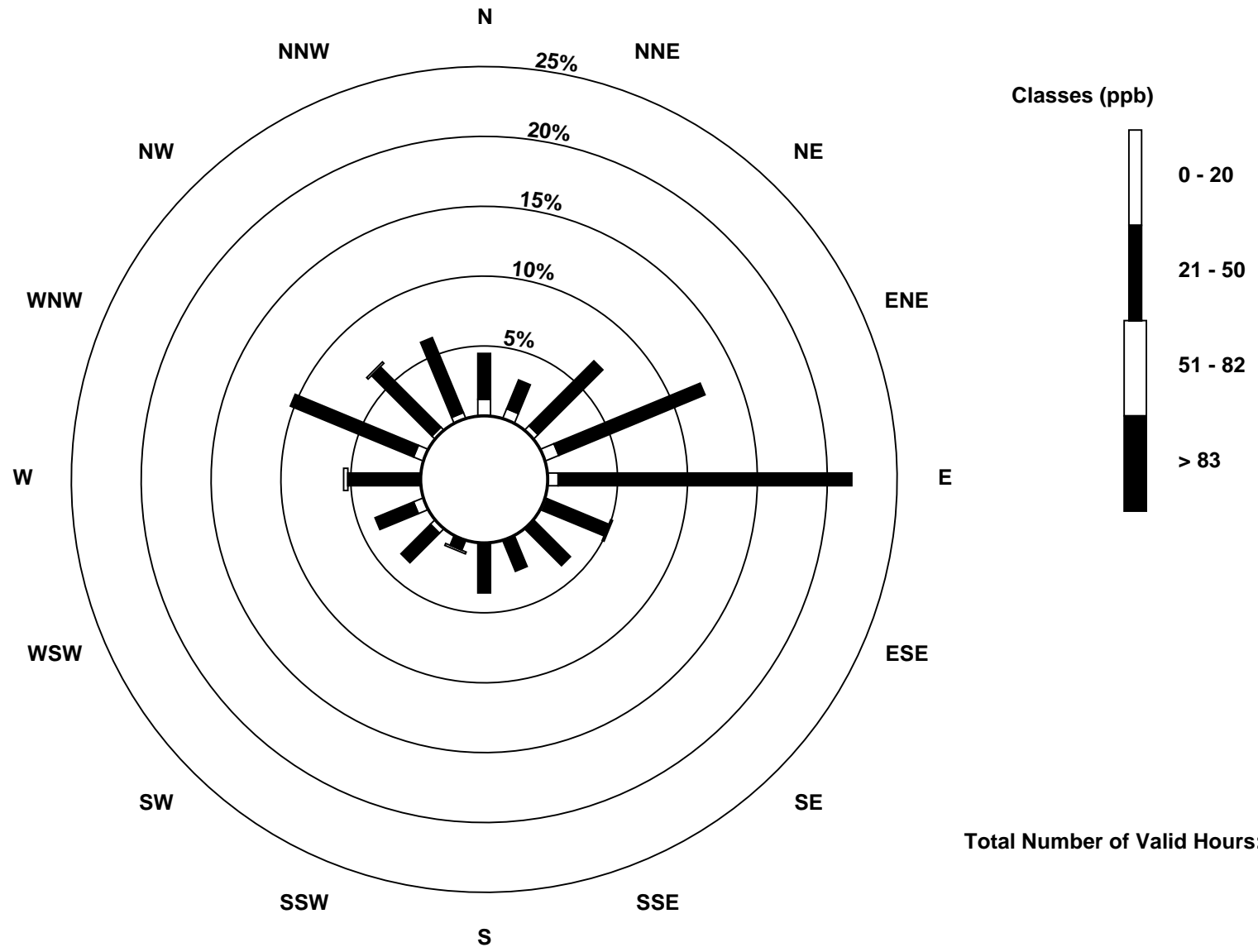
Total Number of Valid Hours: 671

Total Number of Hours: 720

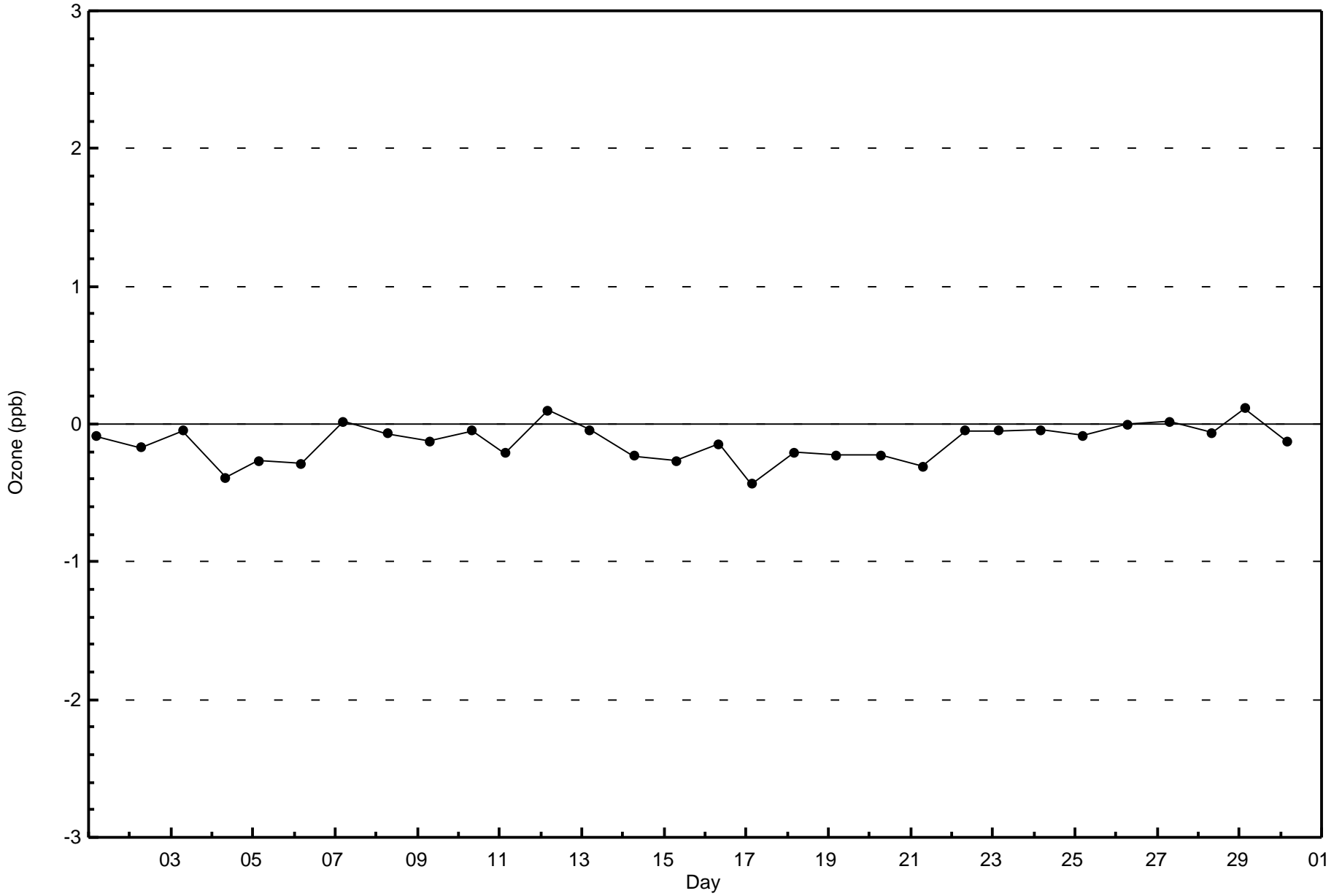


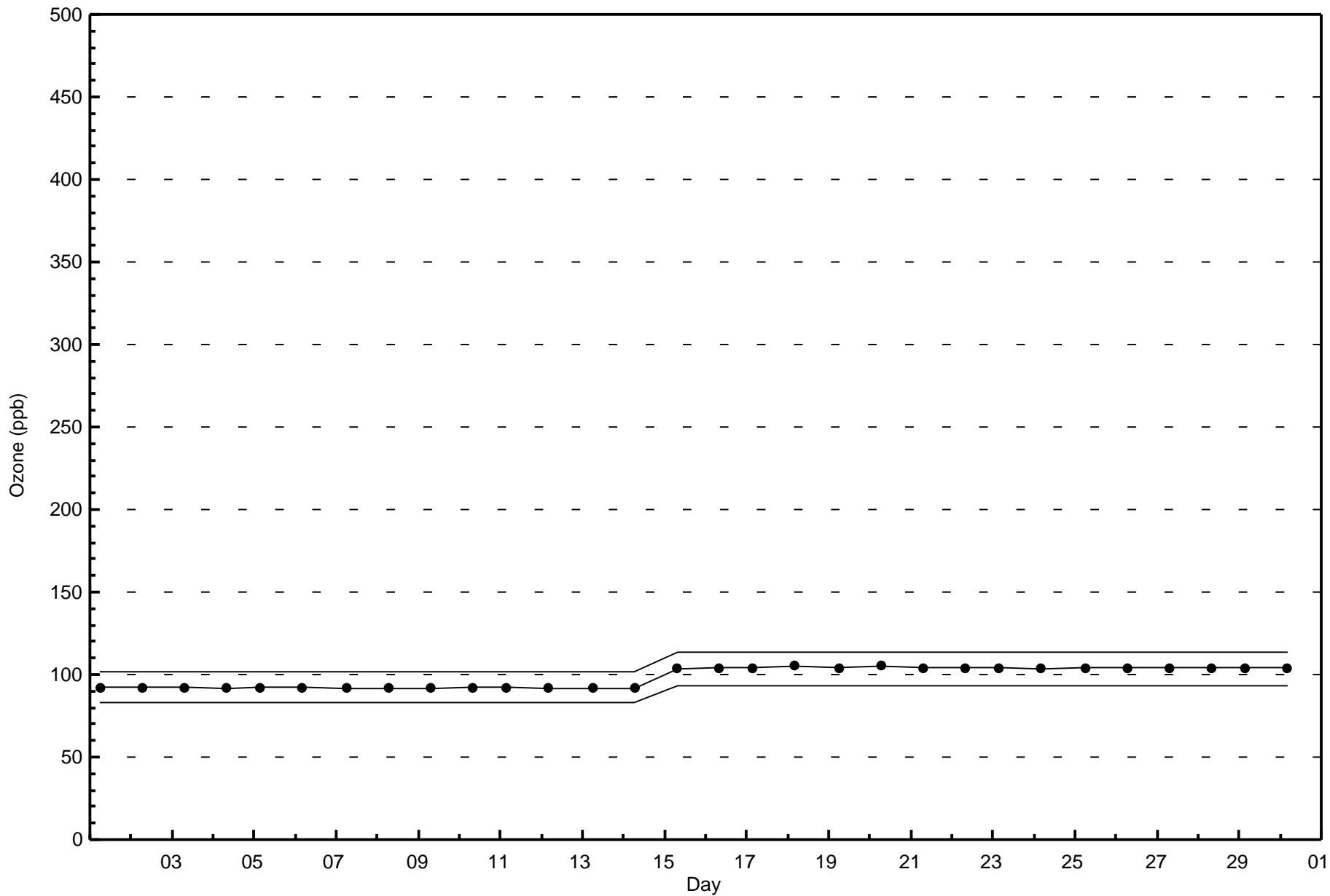
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Ozone (O₃) - ppb
Fort Chipewyan (AMS 8)



Total Number of Valid Hours: 671







Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM_{2.5}) - µg/m³

Fort Chipewyan - June 2016

Number of Exceedences (AAAQO):	24-hr: 0	Hours in Service:	720
Maximum Value: 43.5 µg/m ³ on Jun 30 00:00	Maximum Daily Average: 11.7 µg/m ³ on Jun 30	Hours of Data:	644
Minimum Value: 0.0 µg/m ³ on Jun 16 00:00	Minimum Daily Average: 0.9 µg/m ³ on Jun 16	Hours of Missing Data:	76
Maximum Diurnal Average: 6.1 µg/m ³ at hour 24	Minimum Diurnal Average: 3.0 µg/m ³ at hour 12	Hours of Calibration:	5
Monthly Average: 4.18 µg/m ³	Percentiles: P ₁ = 0.3 P ₁₀ = 1.4 Q ₁ = 2.6 Median = 3.1 Q ₃ = 4.8 P ₉₀ = 7.7 P ₉₉ = 17.4	Percent Operational Time:	90.1

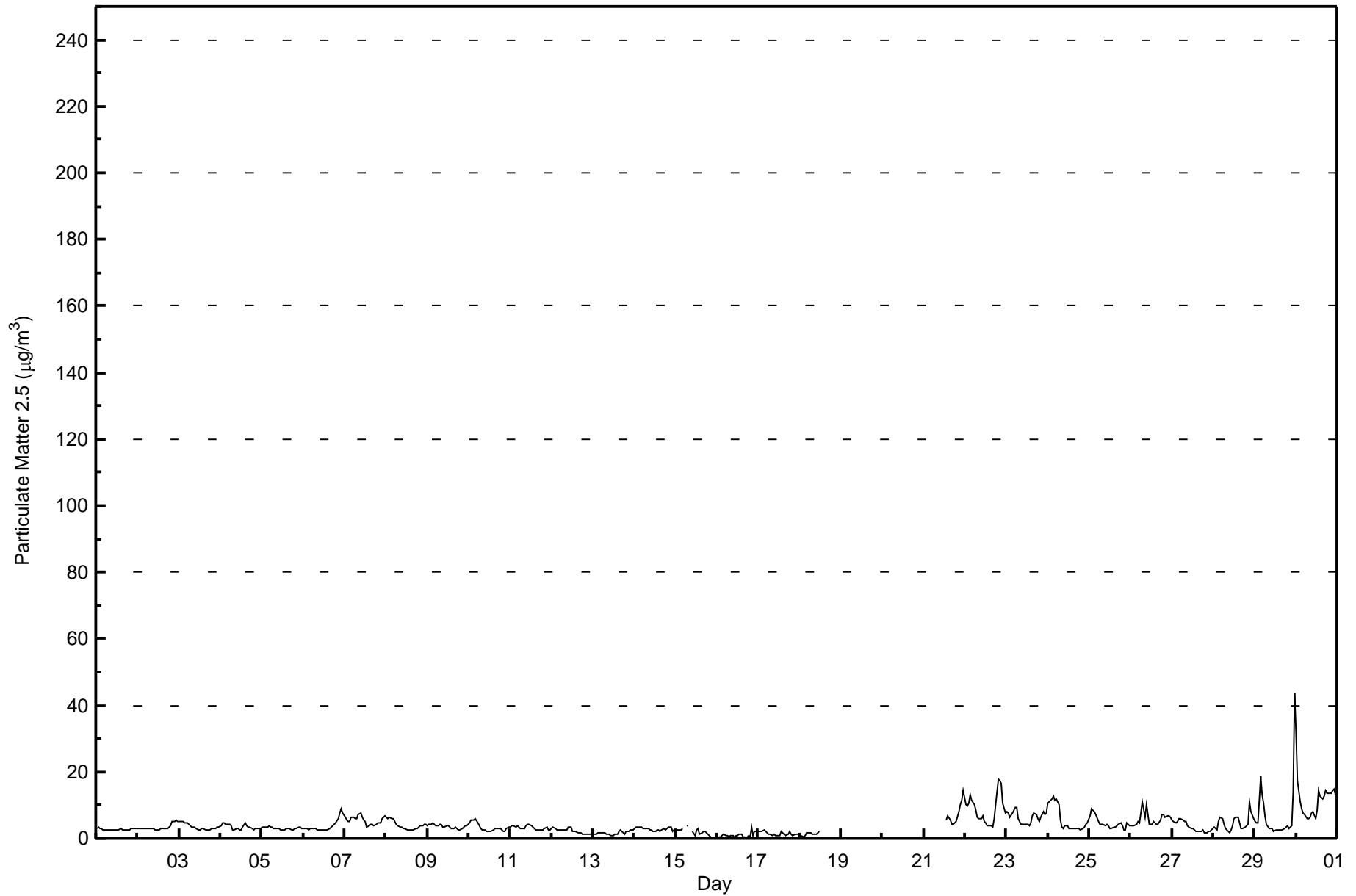
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jun	3.2	3.2	2.9	2.8	2.7	2.7	2.7	2.6	2.6	2.6	2.5	2.6	2.7	2.6	2.8	2.7	2.6	2.7	2.7	2.8	2.9	2.9	2.9	3.0	2.8	3.2	
2-Jun	2.9	2.9	2.9	3.0	3.0	2.9	3.0	3.0	2.9	2.8	2.7	2.7	2.7	2.8	2.9	3.0	3.1	3.0	3.5	4.0	5.0	5.3	5.5	5.0	3.4	5.5	
3-Jun	5.1	5.2	5.2	4.8	4.7	4.5	4.0	3.4	3.3	3.3	2.9	2.7	2.6	2.8	2.8	2.6	2.6	2.6	2.7	2.8	2.9	3.1	3.5	3.4	3.5	5.2	
4-Jun	4.0	4.5	4.7	4.2	4.2	4.3	3.8	2.7	2.6	2.9	2.9	2.7	2.7	3.4	4.5	3.9	3.3	3.5	3.1	2.7	2.9	3.0	3.0	3.0	3.4	4.7	
5-Jun	3.4	3.5	3.4	3.5	3.6	3.5	3.3	3.0	3.1	2.9	2.8	2.7	2.6	2.6	2.8	3.0	2.9	2.7	2.7	2.8	2.9	3.2	3.4	3.1	3.1	3.6	
6-Jun	2.8	3.0	2.8	2.7	2.8	3.1	2.9	2.8	2.6	2.5	2.4	2.3	2.4	2.6	2.6	2.9	3.4	3.9	4.4	4.8	5.8	7.6	8.9	7.4	3.7	8.9	
7-Jun	6.4	5.4	5.2	5.3	6.4	6.5	6.0	6.1	7.2	7.6	6.5	5.6	4.9	3.5	3.9	4.1	4.1	4.0	4.2	4.7	4.5	4.7	6.1	6.6	5.4	7.6	
8-Jun	6.2	6.1	6.5	5.9	5.9	5.0	4.1	3.8	3.2	3.4	2.8	2.9	2.7	2.6	2.6	2.6	2.7	3.1	3.2	3.2	3.9	4.0	4.2	4.2	3.9	6.5	
9-Jun	4.0	4.2	4.1	4.6	4.1	3.8	3.8	4.3	4.2	3.5	3.5	3.7	3.6	3.3	2.8	3.1	3.6	2.9	2.5	2.7	2.9	3.5	3.8	3.9	3.6	4.6	
10-Jun	4.8	5.7	5.4	5.7	5.8	4.6	3.9	2.9	2.5	2.4	2.2	2.0	2.1	1.9	2.3	3.0	3.1	3.1	2.9	2.6	2.1	2.3	3.0	3.4	3.3	5.8	
11-Jun	3.3	3.6	3.6	3.5	4.0	3.2	3.0	3.0	3.0	3.8	4.3	4.1	3.9	3.4	3.1	2.6	2.5	2.5	2.5	2.6	2.9	3.2	2.7	2.6	3.2	4.3	
12-Jun	2.8	3.2	2.8	2.4	2.5	2.5	2.4	2.7	2.6	2.6	3.3	3.5	2.2	2.3	2.1	1.6	1.8	1.7	1.3	1.4	1.3	1.1	1.2	1.1	2.2	3.5	
13-Jun	1.1	1.3	1.5	1.6	1.5	1.5	1.6	1.6	1.3	1.2	0.8	0.7	0.9	1.2	1.4	2.2	2.7	2.2	1.3	2.2	1.9	2.1	2.4	2.7	1.6	2.7	
14-Jun	2.9	3.3	3.3	3.3	3.2	2.9	3.0	2.8	2.8	2.6	2.7	2.3	2.2	2.4	2.4	2.3	2.7	2.9	2.6	3.1	3.5	3.4	2.1	2.4	2.8	3.5	
15-Jun	2.6	2.4	2.4	2.4	2.9	PF	3.6	3.6	C	C	2.0	1.0	2.6	2.9	1.4	1.8	2.0	2.0	1.9	1.1	0.5	0.0	0.1	0.0	1.9	3.6	
16-Jun	0.2	0.4	0.6	0.7	1.1	0.9	0.9	0.6	0.6	0.7	0.2	0.8	1.0	1.3	1.1	0.5	0.4	0.0	0.8	0.3	3.4	1.0	2.1	2.0	0.9	3.4	
17-Jun	2.0	2.2	2.3	2.4	2.0	1.5	1.3	1.1	0.9	1.1	1.0	1.0	0.9	2.2	1.5	1.5	0.7	1.4	1.9	1.3	1.0	1.2	1.1	1.1	1.4	2.4	
18-Jun	1.1	0.8	0.6	1.0	1.8	1.8	1.9	1.5	1.2	1.1	1.3	2.2	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	2.2	
19-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
20-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
21-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	C	C	C	5.6	6.6	5.3	4.1	4.3	4.6	5.0	7.9	10.0	11.6	14.6	--	14.6	
22-Jun	10.3	9.8	10.6	13.0	11.5	10.2	8.6	6.2	5.9	6.1	6.6	5.2	4.5	3.9	3.8	3.6	3.4	6.0	13.9	17.7	17.4	16.7	10.6	7.8	8.9	17.7	
23-Jun	8.2	7.7	6.6	7.7	8.6	9.4	9.4	5.9	4.3	4.3	4.3	4.2	4.3	3.9	4.7	6.7	7.6	7.4	5.9	5.2	6.5	7.9	7.2	7.8	6.5	9.4	
24-Jun	10.6	11.2	11.9	12.6	11.5	11.9	10.3	5.7	3.6	3.1	3.7	3.6	3.0	2.8	2.9	2.8	3.0	2.8	2.9	2.3	2.9	3.4	4.1	4.7	5.7	12.6	
25-Jun	6.7	9.0	8.5	8.0	7.1	5.1	4.4	4.2	4.1	4.0	4.3	3.7	2.9	2.9	3.3	3.2	3.7	4.4	4.6	3.8	2.6	2.5	4.7	4.0	4.6	9.0	
26-Jun	3.8	3.7	3.8	4.2	5.0	4.6	7.8	11.0	6.3	10.0	7.4	4.2	4.3	5.0	4.7	4.4	4.1	5.4	7.2	7.3	6.5	6.8	6.6	6.4	5.9	11.0	
27-Jun	5.6	4.9	4.8	4.9	5.8	6.1	5.4	5.2	4.9	3.9	3.5	3.0	2.9	2.4	2.0	2.1	2.3	2.2	2.5	1.7	1.8	2.0	2.0	2.4	3.5	6.1	
28-Jun	3.2	2.8	2.6	5.2	6.3	6.1	4.2	2.9	2.4	1.7	2.7	3.9	6.1	6.4	6.2	4.9	3.0	3.0	3.3	3.7	4.1	11.2	8.2	5.8	4.6	11.2	
29-Jun	5.0	4.8	4.8	18.8	13.0	10.7	7.0	4.3	2.9	3.1	2.9	2.3	2.8	2.6	2.4	2.5	2.6	3.0	3.5	3.9	3.0	3.8	13.8	43.5	7.0	43.5	
30-Jun	32.0	17.5	11.2	9.0	7.8	7.2	6.0	6.0	6.5	7.5	7.9	6.1	8.4	14.6	12.5	12.0	12.5	14.3	13.5	13.5	13.4	14.3	14.7	13.0	11.7	32.0	
																								Diurnal Average			
																								Diurnal Maximum			

C - Calibration	M - Maintenance	AF - Analyzer Failure	PF - Power Failure
Alberta Ambient Air Quality Objectives (AAAQO):		24-hr	30 µg/m ³



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort Chipewyan - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort Chipewyan - June 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	482	74.84	74.84
6 - 15	122	18.94	93.79
16 - 25	5	0.78	94.57
26 - 80	2	0.31	94.88
> 81.0	0	0.00	94.88

Total Number of Valid Hours: 644

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort Chipewyan - June 2016**

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	17	13	40	74	113	22	9	14	18	4	17	21	31	46	24	18	481
6 - 15	9	7	10	14	24	10	5	0	4	1	5	4	4	8	10	7	122
16 - 25	0	1	1	0	0	1	0	0	1	0	0	0	0	0	0	1	5
26 - 80	0	0	0	0	0	1	1	0	0	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
Totals	26	21	51	88	137	34	15	14	23	5	22	25	35	54	34	26	610

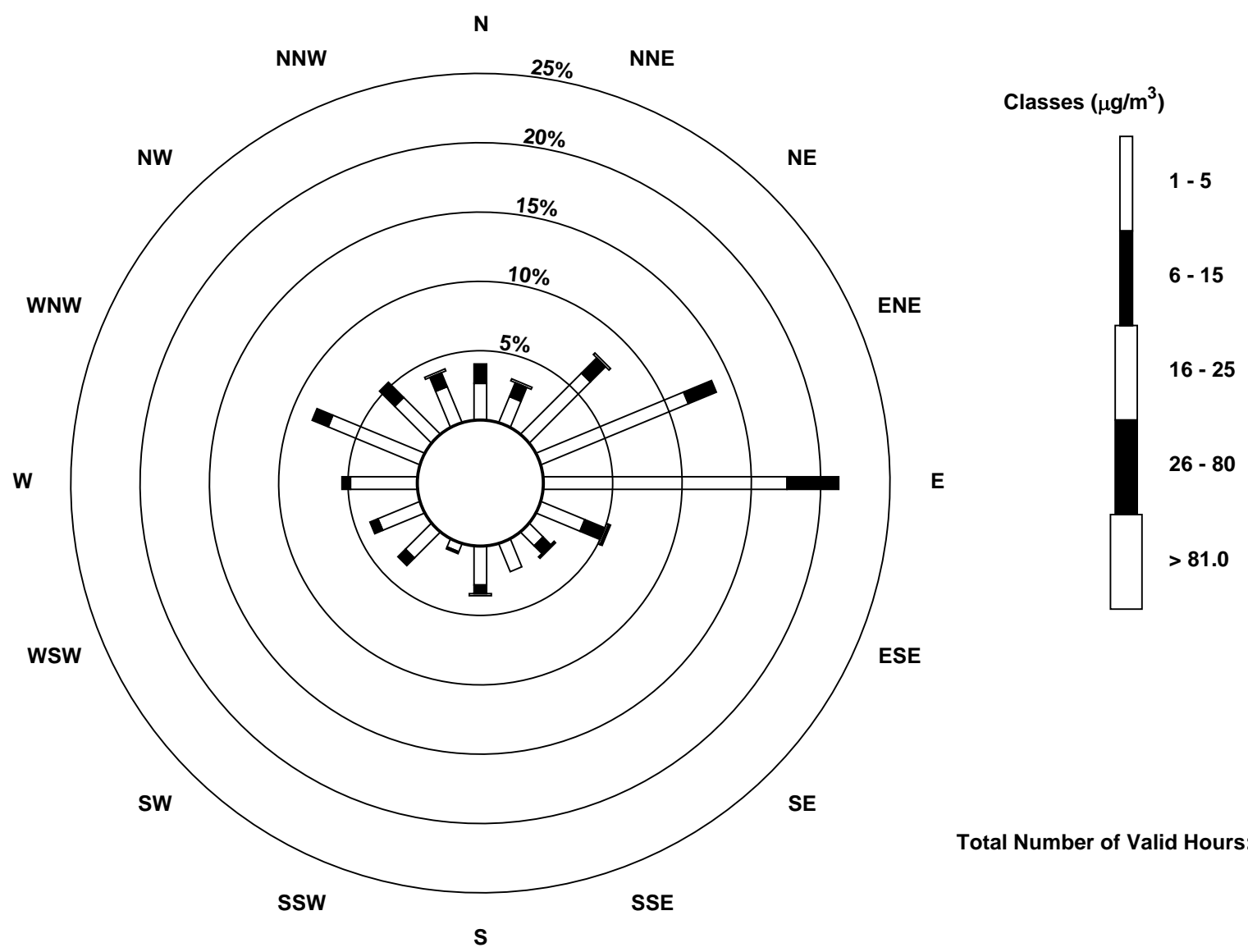
Total Number of Valid Hours: 643

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort Chipewyan (AMS 8)



Total Number of Valid Hours: 643

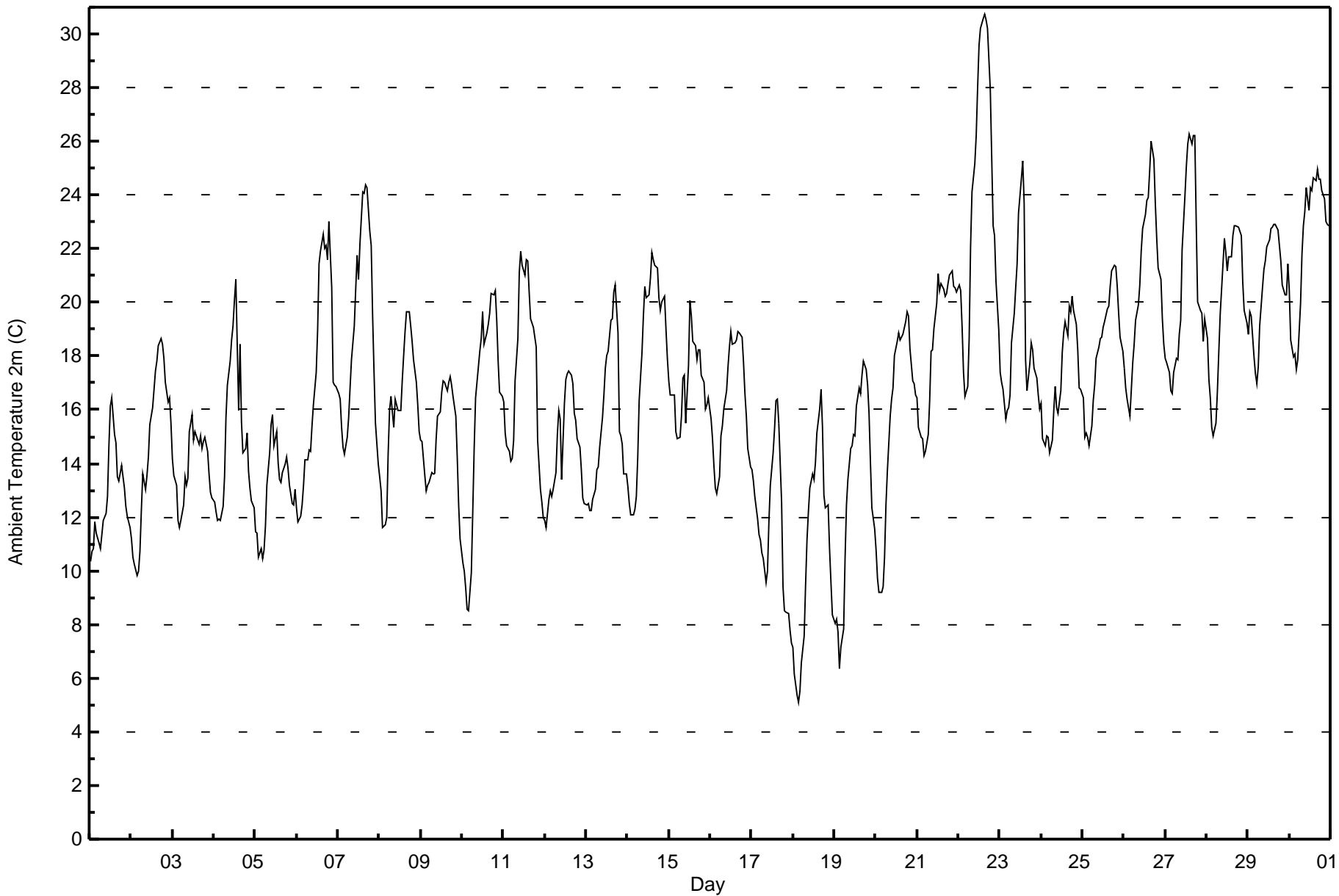


Maximum Value: 30.8 C on Jun 22 16:00		Maximum Daily Average: 24.0 C on Jun 22		Hours in Service: 720																																												
Minimum Value: 5.1 C on Jun 18 04:00		Minimum Daily Average: 10.8 C on Jun 18		Hours of Data: 720																																												
Maximum Diurnal Average: 19.8 C at hour 15		Minimum Diurnal Average: 13.0 C at hour 5		Hours of Missing Data: 0																																												
Monthly Average: 16.78 C		Percentiles: P ₁ = 7.1 P ₁₀ = 11.8 Q ₁ = 13.7 Median = 16.6 Q ₃ = 19.5 P ₉₀ = 22.1 P ₉₉ = 26.9		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-Jun	10.3	10.7	10.8	11.8	11.4	11.0	10.8	11.4	11.8	12.1	12.8	14.7	16.2	16.5	15.1	14.8	13.5	13.3	13.9	13.5	13.1	12.4	12.0	11.6	12.7	16.5																						
2-Jun	11.2	10.5	10.2	9.8	10.0	10.7	12.2	13.6	13.0	13.5	14.2	15.4	16.1	16.8	17.5	17.8	18.4	18.7	18.4	17.9	17.0	16.3	16.5	15.5	14.6	18.7																						
3-Jun	14.2	13.5	13.2	11.9	11.6	11.9	12.5	13.5	13.2	13.5	15.2	15.8	14.9	15.2	15.1	14.7	15.0	14.5	14.8	15.0	14.5	13.6	12.9	12.7	13.9	15.8																						
4-Jun	12.6	12.2	11.9	11.9	11.9	12.4	13.5	15.7	16.9	17.8	18.6	19.2	20.1	20.9	16.0	18.5	15.5	14.4	14.6	15.1	13.7	13.1	12.6	12.4	15.1	20.9																						
5-Jun	11.5	11.4	10.5	10.8	10.4	10.8	11.7	13.2	14.4	15.4	15.8	14.6	15.2	14.0	13.4	13.3	13.7	14.0	14.3	13.8	13.2	12.5	12.4	13.0	13.1	15.8																						
6-Jun	12.4	11.8	12.0	12.4	13.2	14.1	14.1	14.5	14.5	15.4	16.2	17.4	19.0	21.4	21.9	22.5	22.0	22.1	21.6	23.0	20.5	17.0	16.9	16.9	17.2	23.0																						
7-Jun	16.6	16.4	15.4	14.6	14.3	15.0	15.7	16.8	17.8	19.1	20.5	21.7	20.9	22.2	24.1	24.1	24.4	24.3	22.6	22.1	19.5	17.4	15.5	14.0	19.0	24.4																						
8-Jun	13.5	13.0	11.6	11.7	12.0	14.3	16.0	16.5	15.3	16.4	16.2	16.0	16.0	17.1	18.0	18.9	19.6	19.7	19.1	18.5	17.9	17.0	16.2	15.2	16.1	19.7																						
9-Jun	14.8	14.8	13.6	13.0	13.2	13.3	13.7	13.6	13.6	14.9	15.7	15.9	16.7	17.1	17.0	16.7	17.0	17.3	16.9	16.5	15.7	14.2	12.5	11.2	15.0	17.3																						
10-Jun	10.3	10.0	9.4	8.5	8.5	9.9	12.2	14.5	16.5	17.6	18.2	18.7	19.6	18.4	18.9	19.2	19.6	20.3	20.3	20.5	19.4	17.8	16.7	16.5	15.9	20.5																						
11-Jun	16.3	15.1	14.7	14.4	14.1	14.2	14.9	17.1	18.7	21.1	21.9	21.4	21.0	21.6	21.6	20.4	19.4	19.1	18.7	18.3	14.9	13.0	12.6	12.0	17.3	21.9																						
12-Jun	11.9	11.6	12.7	13.0	12.8	13.0	13.7	15.1	16.0	15.7	13.4	16.2	17.1	17.4	17.4	17.3	17.0	15.9	15.6	14.9	14.6	13.8	12.7	12.5	14.6	17.4																						
13-Jun	12.5	12.5	12.3	12.2	12.7	13.0	13.7	13.9	14.6	15.7	16.5	17.6	18.0	18.2	19.3	19.4	20.4	20.7	18.8	15.2	15.0	14.7	13.6	13.6	15.6	20.7																						
14-Jun	13.1	12.5	12.1	12.1	12.3	12.8	14.2	16.3	18.1	19.5	20.6	20.2	20.3	20.9	21.8	21.6	21.4	21.3	20.2	19.7	20.0	20.2	19.0	17.9	17.8	21.8																						
15-Jun	17.1	16.6	16.6	16.6	15.2	14.9	15.0	15.8	17.2	17.3	15.5	17.7	20.0	19.5	18.5	18.4	17.9	18.2	18.2	17.3	17.0	16.0	16.2	16.5	17.0	20.0																						
16-Jun	15.7	14.9	13.9	13.1	12.9	13.5	15.0	15.4	16.0	16.7	17.6	18.3	18.9	18.5	18.5	18.6	18.9	18.9	18.7	17.8	16.6	15.8	14.6	13.8	16.4	18.9																						
17-Jun	13.7	13.4	12.7	11.9	11.4	11.1	10.7	10.5	9.6	10.0	11.8	13.2	14.4	15.3	16.4	16.4	15.5	12.5	9.4	8.5	8.5	8.4	7.8	7.3	11.7	16.4																						
18-Jun	7.1	6.2	5.4	5.1	5.5	6.6	7.6	9.5	11.2	12.2	13.1	13.6	13.4	14.0	15.1	16.0	16.8	15.4	12.8	12.3	12.4	10.8	9.6	8.4	10.8	16.8																						
19-Jun	8.0	8.2	7.7	6.3	7.2	7.8	10.4	12.5	13.4	14.5	14.6	15.1	15.0	16.1	16.8	16.6	17.3	17.8	17.5	16.9	15.9	14.0	12.4	11.5	13.1	17.8																						
20-Jun	10.8	9.7	9.2	9.2	9.4	10.5	12.5	13.7	15.7	16.4	16.8	18.0	18.6	18.8	18.6	18.7	18.8	19.3	19.6	19.5	18.3	17.1	17.0	16.6	15.5	19.6																						
21-Jun	16.4	15.4	15.0	14.9	14.3	14.4	15.1	16.4	18.2	18.2	19.0	19.9	21.1	20.4	20.7	20.5	20.2	20.3	20.7	21.0	21.2	20.6	20.6	20.4	18.5	21.2																						
22-Jun	20.6	20.5	19.1	17.4	16.5	16.9	18.7	22.1	24.1	25.2	26.2	28.0	29.6	30.2	30.6	30.8	30.5	30.2	27.9	25.4	22.9	22.5	20.8	18.9	24.0	30.8																						
23-Jun	17.4	17.0	16.7	15.7	16.0	16.1	16.5	18.5	19.6	20.5	21.4	23.3	24.6	25.3	23.7	17.9	16.7	17.7	18.5	18.2	17.6	17.2	16.6	16.0	18.7	25.3																						
24-Jun	16.2	14.9	14.7	15.0	15.0	14.4	14.9	16.0	16.9	16.1	15.9	16.7	18.1	18.9	19.3	18.7	19.9	19.6	20.2	19.7	19.2	18.2	16.8	16.8	17.2	20.2																						
25-Jun	16.4	15.0	15.1	15.0	14.6	15.4	16.3	16.9	17.9	18.3	18.6	18.7	19.1	19.3	19.8	19.8	20.6	21.2	21.4	21.3	20.6	19.6	18.7	18.2	18.3	21.4																						
26-Jun	17.6	16.8	16.4	15.7	16.7	17.8	18.5	19.3	19.9	20.6	21.9	22.7	23.3	23.8	23.9	24.9	26.0	25.3	23.7	22.4	21.3	20.8	19.4	18.4	20.7	26.0																						
27-Jun	17.9	17.8	17.4	16.7	16.6	17.4	17.9	17.9	18.8	19.3	22.0	24.0	25.1	25.9	26.3	25.9	26.2	26.2	23.0	20.0	19.7	19.6	18.6	19.4	20.8	26.3																						
28-Jun	18.7	17.1	16.5	15.3	15.0	15.5	16.7	18.1	19.5	21.5	22.4	21.8	21.2	21.7	21.7	22.5	22.9	22.9	22.8	22.7	22.5	20.8	19.7	19.2	19.9	22.9																						
29-Jun	18.8	19.7	19.5	18.0	17.3	17.0	17.6	19.1	20.6	21.2	21.6	22.1	22.3	22.8	22.8	22.9	22.9	22.7	22.1	21.6	20.7	20.3	20.3	21.4	20.6	22.9																						
30-Jun	20.4	18.6	18.0	18.1	17.5	17.9	20.0	21.8	22.8	23.4	24.3	23.5	24.3	24.2	24.6	24.5	25.0	24.6	24.6	24.2	23.9	23.0	22.9	22.8	22.3	25.0																						
																								14.5	13.9	13.5	13.1	13.0	13.5	14.4	15.6	16.5	17.3	18.0	18.7	19.3	19.7	19.8	19.7	19.8	19.6	19.0	18.4	17.6	16.6	15.8	15.4	Diurnal Average
																								20.6	20.5	19.5	18.1	17.5	17.9	20.0	22.1	24.1	25.2	26.2	28.0	29.6	30.2	30.6	30.8	30.5	30.2	27.9	25.4	23.9	23.0	22.9	22.8	Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 2m (AT 2m) - C
Fort Chipewyan - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C
Fort Chipewyan - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	35	4.86	4.86
10 - 20	529	73.47	78.33
> 20	156	21.67	100.00

Total Number of Valid Hours: 720

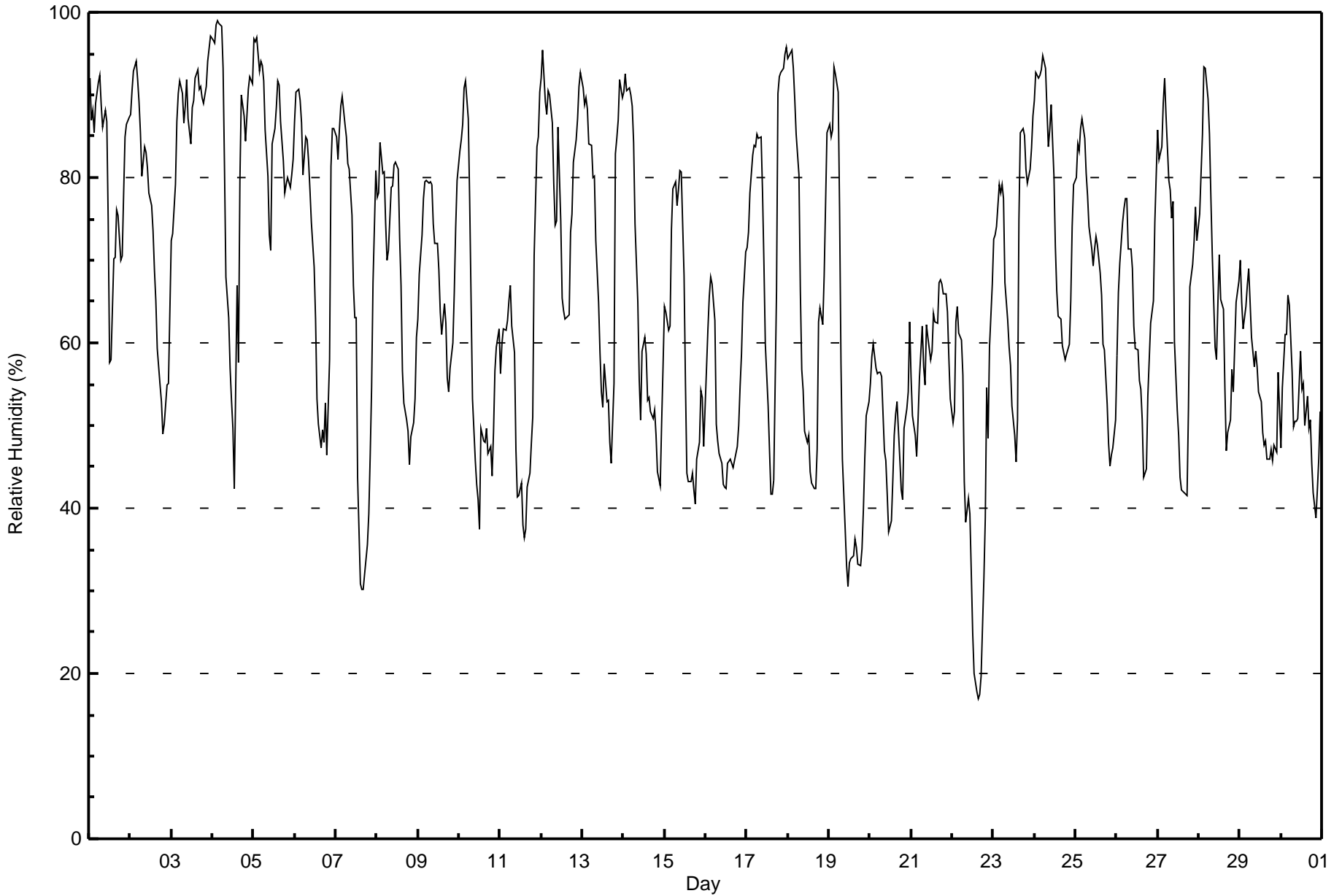
Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

Relative Humidity (RH) - %
Fort Chipewyan - June 2016

Maximum Value: 99 % on Jun 4 04:00 Maximum Daily Average: 88.5 % on Jun 3																		Hours in Service: 720 Hours of Data: 720								
Minimum Value: 17 % on Jun 22 16:00 Minimum Daily Average: 42.4 % on Jun 22 Maximum Diurnal Average: 81.5 % at hour 5 Minimum Diurnal Average: 54.1 % at hour 16 Monthly Average: 66.6 % Percentiles: P ₁ = 30 P ₁₀ = 44 Q ₁ = 52 Median = 65 Q ₃ = 83 P ₉₀ = 90 P ₉₉ = 97																		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-Jun	92	87	88	85	89	91	92	89	86	88	87	75	58	58	70	70	76	75	70	71	78	85	86	87	80.6	92
2-Jun	88	91	93	94	92	89	85	80	84	83	81	78	77	74	69	65	59	55	53	49	50	55	55	64	73.4	94
3-Jun	72	73	79	87	90	92	90	87	89	92	87	84	88	89	92	93	91	91	90	89	91	94	96	97	88.5	97
4-Jun	97	96	98	99	99	98	93	81	68	63	57	53	50	42	67	58	80	90	87	84	88	91	92	91	80.1	99
5-Jun	97	96	97	93	94	93	92	86	80	73	71	84	86	88	92	91	87	82	78	79	80	79	80	82	85.9	97
6-Jun	87	90	91	89	87	80	85	85	82	78	75	69	63	53	50	47	50	48	53	46	58	81	86	86	71.6	91
7-Jun	85	82	86	89	90	86	85	82	81	75	67	63	63	44	31	30	30	32	36	39	47	54	67	81	63.6	90
8-Jun	78	78	84	81	81	75	70	71	79	79	81	82	81	73	67	57	53	51	49	45	49	50	53	61	67.8	84
9-Jun	63	68	73	77	79	80	79	79	79	74	72	72	69	64	61	65	62	56	54	57	60	66	74	80	69.4	80
10-Jun	83	85	87	91	92	87	77	65	53	46	43	41	38	50	48	48	50	47	47	44	49	57	60	62	60.3	92
11-Jun	56	60	62	62	63	65	67	62	59	47	41	42	43	38	37	38	43	44	48	51	71	84	85	90	56.5	90
12-Jun	92	95	89	88	91	90	87	79	74	75	86	75	65	64	63	63	63	73	76	82	85	87	91	93	80.2	95
13-Jun	91	89	90	88	84	84	80	80	72	65	59	54	52	57	53	53	48	46	55	83	85	87	92	90	72.3	92
14-Jun	90	92	91	91	90	89	84	74	65	56	51	59	61	59	53	53	52	51	52	49	44	43	50	57	64.8	92
15-Jun	64	64	62	62	74	79	79	77	78	81	81	68	55	44	43	43	44	42	41	46	48	54	53	47	59.6	81
16-Jun	57	62	66	68	67	63	50	48	47	45	43	43	42	45	46	45	45	46	47	50	55	59	65	71	53.1	71
17-Jun	72	73	78	83	84	84	85	85	85	78	70	60	52	47	42	42	43	66	90	92	93	93	95	96	74.5	96
18-Jun	94	95	95	93	89	85	80	66	57	54	49	48	49	44	43	42	42	47	63	64	62	68	77	85	66.4	95
19-Jun	86	85	86	93	93	90	76	57	46	37	33	31	33	34	34	36	35	33	33	35	40	46	51	53	53.2	93
20-Jun	55	58	60	57	56	56	56	56	47	46	42	37	38	43	49	51	53	46	42	41	50	52	54	62	50.4	62
21-Jun	56	51	49	46	51	56	62	57	55	62	61	58	59	64	63	62	67	68	67	66	66	64	58	53	59.2	68
22-Jun	50	52	63	64	61	60	56	43	38	41	39	32	25	20	18	17	18	20	31	39	55	49	59	67	42.4	67
23-Jun	73	73	74	79	78	79	77	67	63	60	57	52	49	46	51	75	86	86	85	81	79	81	83	87	71.7	87
24-Jun	89	93	92	92	93	95	93	88	84	86	89	80	72	66	63	63	60	59	58	59	60	65	74	79	77.1	95
25-Jun	80	84	83	86	87	85	81	78	74	71	69	71	73	72	68	66	60	59	52	48	45	46	47	51	68.2	87
26-Jun	58	66	70	75	76	77	78	71	71	69	62	59	59	55	54	51	44	45	54	58	62	65	75	80	64.0	80
27-Jun	86	82	84	89	92	88	80	78	75	77	60	52	49	44	42	42	42	41	52	67	70	72	76	72	67.2	92
28-Jun	76	81	85	93	93	89	85	78	71	59	58	65	71	65	64	55	47	49	51	57	54	59	65	67	68.2	93
29-Jun	70	65	62	64	67	69	65	61	57	59	57	54	53	49	48	48	46	46	47	46	48	47	56	52	55.6	70
30-Jun	47	55	61	61	66	65	56	50	50	51	51	59	54	55	50	54	50	51	45	42	39	42	46	52	52.1	66
	76.1	77.4	79.2	80.7	81.5	80.6	77.6	72.1	68.3	65.7	62.6	60.0	57.6	54.9	54.3	54.1	54.1	54.8	56.9	58.6	61.9	65.9	70.1	73.2	Diurnal Average	
	97	96	98	99	99	98	93	89	89	92	89	84	88	89	92	93	91	91	90	92	93	94	96	97	Diurnal Maximum	





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Relative Humidity (RH) - %
Fort Chipewyan - June 2016**

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	5	0.69	0.69
20 - 40	31	4.31	5.00
40 - 60	256	35.56	40.56
60 - 80	212	29.44	70.00
80 - 100	216	30.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Precipitation (PC) - mm

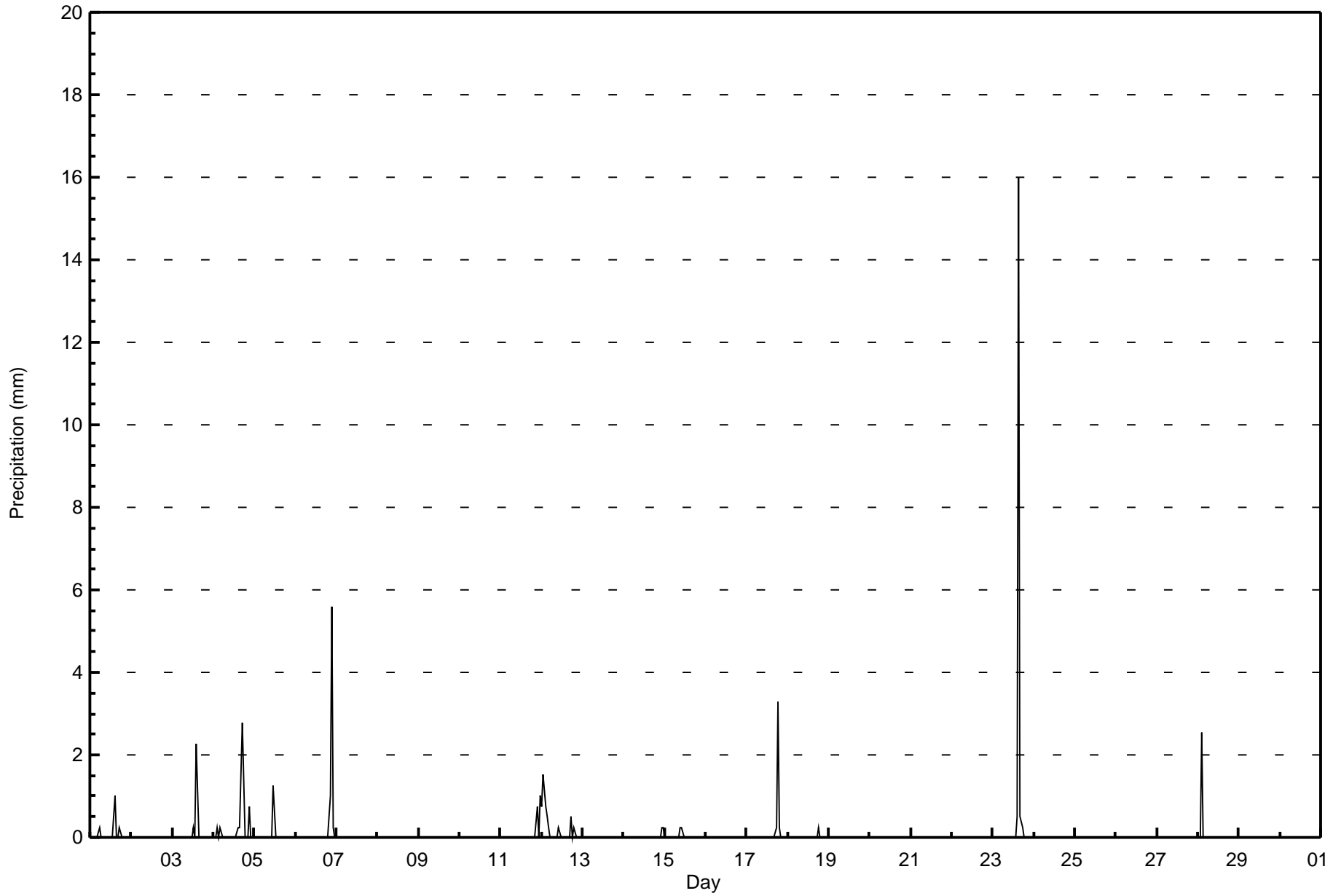
Fort Chipewyan - June 2016

Maximum Value: 16.0 mm on Jun 23 16:00		Maximum Daily Total: 17.3 mm on Jun 23		Hours in Service: 720																						
Minimum Value: 0.0 mm on Jun 1 01:00		Minimum Daily Total: 0.0 mm on Jun 2		Hours of Data: 720																						
Maximum Diurnal Total: 16.3 mm at hour 16		Minimum Diurnal Total: 0.0 mm at hour 7		Hours of Missing Data: 0																						
Monthly Total: 49.78 mm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 1.0		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-Jun	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	1.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.0
2-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	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	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	2.3
4-Jun	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	0.3	1.5	2.8	0.0	0.0	0.0	0.8	0.0	0.0	0.0	6.1	2.8
5-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3
6-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	5.6	0.3	0.0	0.0	6.9	5.6
7-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	1.0	0.0	1.8	1.0
12-Jun	0.8	1.5	0.8	0.5	0.3	0.0	0.0	0.0	0.0	0.0	0.3	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	4.8	1.5
13-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.5	0.3
15-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	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	0.5	0.3
16-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	3.3	0.3	0.0	0.0	0.0	0.0	0.0	3.8	3.3
18-Jun	0.0	0.0	0.0	0.0	0.0	0.0	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	0.3	0.3
19-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	16.0	0.5	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.3	16.0
24-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	2.5	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	0.0	0.0	0.0	0.0	0.0	2.5	2.5
29-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
Fort Chipewyan - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Precipitation (PC) - mm
Fort Chipewyan - June 2016

Concentration Ranges (mm)	Number of Hours	%	Cumulative %
0 - 0.3	700	97.22	97.22
0.4 - 0.5	4	0.56	97.78
0.6 - 0.7	0	0.00	97.78
0.8 - 1.4	8	1.11	98.89
1.5 - 10	7	0.97	99.86
> 10	1	0.14	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Leaf Wetness (SW) - %

Fort Chipewyan - June 2016

Maximum Value: 48 % on Jun 18 04:00	Maximum Daily Average: 9.7 % on Jun 18	Hours in Service: 720
Minimum Value: -2 % on Jun 22 14:00	Minimum Daily Average: -1.1 % on Jun 22	Hours of Data: 566
Maximum Diurnal Average: 8.2 % at hour 3	Minimum Diurnal Average: -0.9 % at hour 14	Hours of Missing Data: 154
Monthly Average: 2.9 %	Percentiles: P ₁ = -1 P ₁₀ = -1 Q ₁ = -1 Median = -1 Q ₃ = 0 P ₉₀ = 15 P ₉₉ = 43	Hours of Calibration: 0
		Percent Operational Time: 78.6

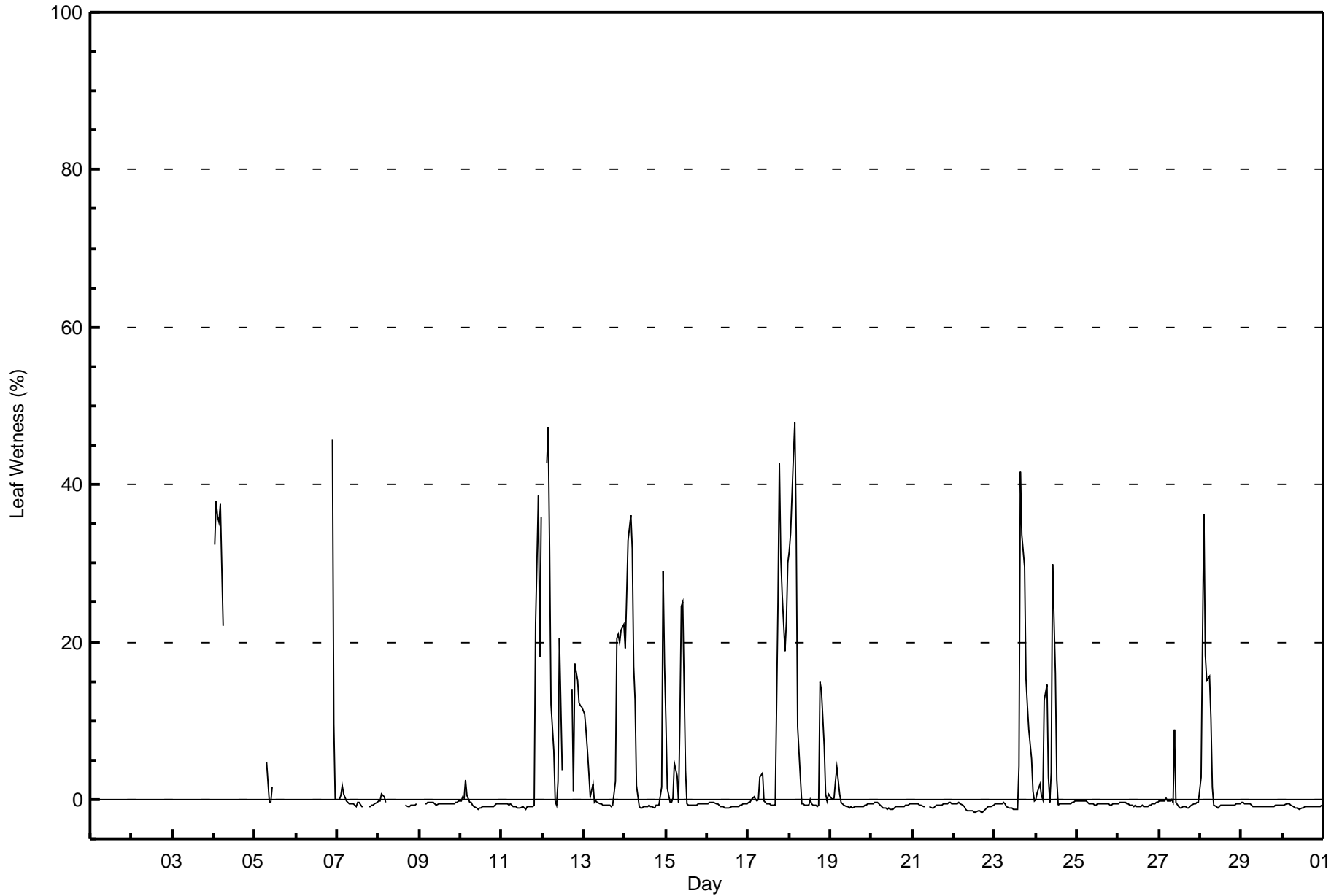
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
1-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--	
2-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--	
3-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	7	7		
4-Jun	32	38	36	35	37	22	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	38	
5-Jun	AF	AF	AF	AF	AF	17	AF	5	0	0	2	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	17	
6-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	46	10	0	46	
7-Jun	0	0	0	2	1	0	0	-1	0	-1	-1	-1	0	0	-1	-1	AF	AF	-1	-1	-1	-1	-1	0	-0.4	2	
8-Jun	0	0	1	0	0	AF	-1	AF	AF	AF	AF	AF	AF	AF	AF	AF	-1	-1	-1	-1	-1	-1	-1	AF	--	1	
9-Jun	AF	AF	AF	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	-0.5	0	
10-Jun	0	0	0	3	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	-0.5	3	
11-Jun	-1	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	22	39	18	36	4.1	39	
12-Jun	AF	AF	43	47	32	12	6	0	-1	2	21	4	AF	AF	AF	AF	AF	14	1	17	15	12	12	12	--	47	
13-Jun	11	9	6	3	0	2	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	2	20	21	20	21	22	5.5	22	
14-Jun	19	26	33	36	32	17	13	2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	2	29	17	8.9	36	
15-Jun	10	1	0	0	0	5	3	0	10	25	25	4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	3.1	25	
16-Jun	-1	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	-0.7	0	
17-Jun	0	0	0	0	0	0	0	3	3	0	0	-1	-1	-1	-1	-1	-1	-1	25	43	31	26	19	22	30	8.2	43
18-Jun	31	34	44	48	34	9	3	0	-1	-1	-1	-1	0	-1	-1	-1	-1	-1	15	14	7	1	0	1	9.7	48	
19-Jun	0	0	0	2	4	1	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-0.3	4
20-Jun	-1	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-0.8	0
21-Jun	-1	-1	-1	-1	-1	-1	-1	-1	AF	AF	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	-1	-0.7	0	
22-Jun	-1	-1	0	0	-1	-1	-1	-1	-1	-1	-2	-2	-2	-1	-1	-2	-2	-1	-1	-1	-1	-1	-1	-1	-1	-1.1	0
23-Jun	-1	-1	-1	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	4	42	34	30	15	12	9	5	1	0	5.8	42	
24-Jun	0	1	2	1	0	13	15	3	0	3	30	16	3	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	3.3	30	
25-Jun	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-0.5	0
26-Jun	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	-0.6	0	
27-Jun	0	0	0	0	0	0	0	0	0	9	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	-0.2	9	
28-Jun	3	20	36	18	15	16	10	2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	4.5	36	
29-Jun	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-0.8	0
30-Jun	-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	-0.9	-1
	4.4	5.4	8.2	7.6	6.0	4.2	1.7	0.0	-0.1	1.0	2.4	0.2	-0.7	-0.9	-0.6	1.1	0.7	2.2	2.5	3.3	3.6	5.3	4.3	4.6		Diurnal Average	
	32	38	44	48	37	22	15	5	10	25	30	16	3	0	4	42	34	30	43	31	26	46	29	36		Diurnal Maximum	

AF - Analyzer Failure



Wood Buffalo Environmental Association
Hourly Averages

Leaf Wetness (SW) - %
Fort Chipewyan - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Leaf Wetness (SW) - %
Fort Chipewyan - June 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	11	8.40	8.40
0.4 - 0.5	3	2.29	10.69
0.6 - 0.7	4	3.05	13.74
0.8 - 1.4	6	4.58	18.32
1.5 - 10	37	28.24	46.56
> 10	70	53.44	100.00

Total Number of Valid Hours: 131

Total Number of Hours: 720



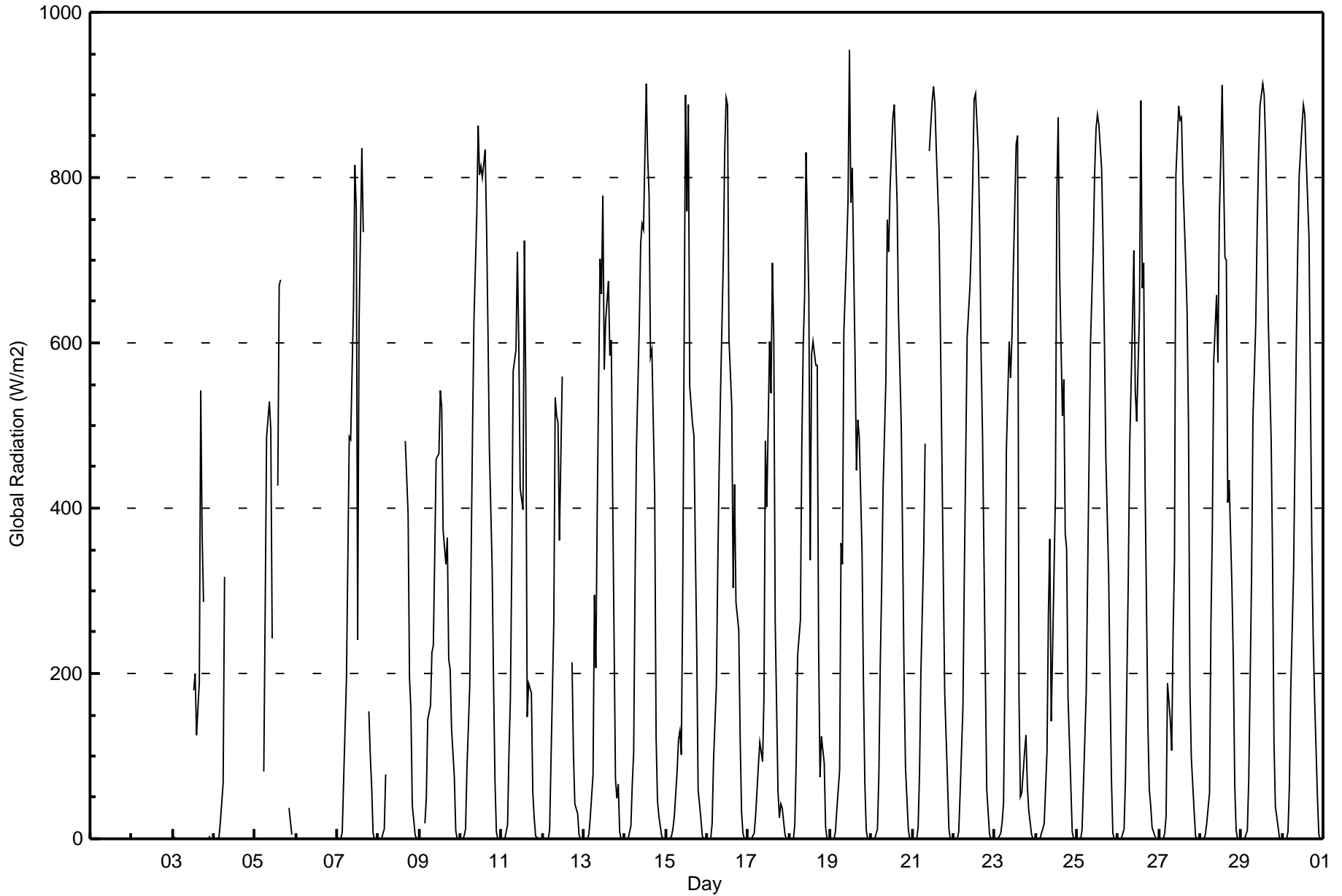
Wood Buffalo Environmental Association

Summary of Hour Averages

Global Radiation (GR) - W/m2

Fort Chipewyan - June 2016

Maximum Value: 955 W/m2 on Jun 19 12:00		Maximum Daily Average: 382.8 W/m2 on Jun 29		Hours in Service: 720																								
Minimum Value: 0 W/m2 on Jun 3 00:00		Minimum Daily Average: 180.0 W/m2 on Jun 17		Hours of Data: 592																								
Maximum Diurnal Average: 746.0 W/m2 at hour 14		Minimum Diurnal Average: 0.0 W/m2 at hour 24		Hours of Missing Data: 128																								
Monthly Average: 290.4 W/m2		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 5 Median = 178 Q ₃ = 556 P ₉₀ = 778 P ₉₉ = 897		Hours of Calibration: 0																								
				Percent Operational Time: 82.2																								
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-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--		
2-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	3	AF	0	--	3
3-Jun	0	1	0	AF	AF	AF	AF	AF	AF	AF	AF	180	201	125	189	542	365	287	AF	AF	AF	3	0	0	--	542		
4-Jun	0	0	0	2	20	68	316	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0	--	316	
5-Jun	AF	0	AF	AF	AF	81	279	486	528	495	242	AF	AF	427	669	677	AF	AF	AF	AF	AF	36	6	AF	AF	--	677	
6-Jun	0	0	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	0	0	0	--	0	
7-Jun	0	0	0	9	71	194	339	486	483	645	816	763	241	625	836	734	AF	AF	AF	155	102	63	8	0	0	298.6	836	
8-Jun	0	0	0	11	77	AF	349	AF	AF	AF	AF	AF	802	AF	AF	AF	482	394	195	157	41	6	0	AF	--	802		
9-Jun	AF	AF	AF	19	49	144	162	225	234	342	460	466	542	523	373	332	364	217	206	134	75	11	0	0	232.2	542		
10-Jun	0	0	3	12	85	184	343	495	628	754	863	804	814	800	835	741	616	472	328	189	71	9	0	0	376.9	863		
11-Jun	0	0	0	18	106	169	335	566	592	710	600	423	398	723	543	148	188	177	56	26	3	0	0	0	240.9	723		
12-Jun	AF	AF	0	1	10	95	263	534	511	503	362	559	AF	AF	AF	AF	AF	213	103	42	31	5	0	0	--	559		
13-Jun	0	0	0	5	26	78	296	207	400	701	660	778	568	626	674	585	603	417	72	49	65	8	0	0	284.1	778		
14-Jun	0	0	1	16	66	105	316	475	621	721	745	737	913	824	780	583	592	417	123	46	26	3	0	0	337.9	913		
15-Jun	0	0	0	3	12	27	82	121	131	101	294	900	760	889	548	502	488	355	233	59	24	4	0	0	230.5	900		
16-Jun	0	0	1	19	95	184	327	448	540	703	834	896	888	605	524	303	429	286	253	121	32	7	0	0	312.4	896		
17-Jun	0	0	0	7	26	58	87	117	93	172	481	402	601	539	696	605	265	58	26	43	37	4	0	0	180.0	696		
18-Jun	0	0	1	16	96	222	264	476	597	656	830	658	337	587	601	574	573	230	74	124	92	13	0	0	292.6	830		
19-Jun	0	0	1	8	36	83	358	332	613	713	772	955	770	811	583	445	506	487	345	186	67	11	1	0	336.8	955		
20-Jun	0	0	1	12	78	212	304	424	554	749	710	788	872	889	829	772	636	499	353	194	86	12	1	0	373.9	889		
21-Jun	0	0	1	13	78	201	347	477	AF	AF	832	892	911	889	832	735	603	461	316	177	70	11	0	0	356.7	911		
22-Jun	0	0	1	9	56	159	320	463	606	667	720	796	895	901	831	735	581	486	197	59	32	5	0	0	355.0	901		
23-Jun	0	0	0	6	20	44	201	469	602	558	608	691	841	851	173	51	56	104	125	62	33	4	0	0	229.2	851		
24-Jun	0	0	0	7	11	19	105	272	363	142	229	416	779	874	684	511	557	369	351	170	64	9	0	0	247.2	874		
25-Jun	0	0	0	10	65	178	319	458	597	717	804	859	876	865	809	722	602	462	321	187	71	7	0	0	372.1	876		
26-Jun	0	0	0	11	73	192	313	474	626	711	543	505	638	893	667	697	429	140	60	41	14	3	0	0	292.9	893		
27-Jun	0	0	0	7	27	187	144	106	249	340	804	886	870	872	797	697	638	498	185	98	33	4	0	0	310.1	886		
28-Jun	0	0	0	4	18	56	259	376	578	657	577	754	822	913	704	700	406	434	304	215	64	11	0	0	327.2	913		
29-Jun	0	0	0	11	72	193	318	510	624	738	825	886	913	900	842	746	623	481	335	117	40	13	0	0	382.8	913		
30-Jun	0	0	0	9	64	183	324	468	607	717	804	863	889	877	823	727	543	358	242	169	51	6	1	0	363.5	889		
																								Diurnal Average				
																								Diurnal Maximum				
AF - Analyzer Failure																												





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Global Radiation (GR) - W/m2
Fort Chipewyan - June 2016

Concentration Ranges (W/m2)	Number of Hours	%	Cumulative %
0 - 20	190	32.09	32.09
21 - 100	71	11.99	44.09
101 - 300	82	13.85	57.94
301 - 600	120	20.27	78.21
601 - 900	123	20.78	98.99
> 900	6	1.01	100.00

Total Number of Valid Hours: 592

Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Fort Chipewyan - June 2016

Maximum Speed: 51 km/h on Jun 15 14:00	Maximum Daily Speed Average: 19.8 km/h on Jun 6	Hours in Service: 720
Minimum Speed Value: 1 km/h on Jun 24 08:00	Minimum Daily Speed Average: 3.9 km/h on Jun 22	Hours of Data: 719
Maximum Diurnal Speed Average: 7.3 km/h at hour 20	Minimum Diurnal Speed Average: 1.3 km/h at hour 8	Hours of Missing Data: 1
Monthly Average Velocity: 4.3 km/h 76.9 deg	Percentiles: P ₁ = 3 P ₁₀ = 7 Q ₁ = 9 Median = 13 Q ₃ = 19 P ₉₀ = 24 P ₉₉ = 38	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-Jun	NNE13	ENE11	E23	ESE20	E5	E11	E15	E12	ENE8	ESE8	E11	ENE9	NE10	ENE8	ENE5	E16	E14	E12	ENE12	ENE15	ENE18	E18	ENE14	NE11	E11.8	E23
2-Jun	ENE13	ENE11	NE10	ENE9	ENE13	ENE12	ENE14	ENE18	E21	E21	E20	E21	E23	E26	E26	ENE26	ENE23	ENE20	ENE18	NE18	NE18	ENE17	ENE20	ENE18	ENE17.6	E26
3-Jun	NNW5	N9	NE7	NW7	N11	NNE11	NE10	NE14	ENE18	ENE13	ENE14	E11	ESE9	E7	E5	ESE11	E16	E17	E14	E13	E11	E8	E8	E10	ENE9.0	ENE18
4-Jun	E9	E7	E7	E4	ENE6	SW7	WSW8	W12	WNW15	WNW17	NW14	WNW17	WNW13	WNW16	WSW15	WNW7	NE10	NE2	SW5	NW2	N10	N3	W5	W4	WNW4.5	WNW17
5-Jun	SW3	WSW8	WNW11	NW8	NNW9	WNW9	WNW11	NW11	WNW11	NW12	NNW7	NNW7	NNE8	E14	E22	E25	E27	E22	E17	E13	ENE10	NE12	ENE16	E19	NE5.8	E27
6-Jun	E16	E15	E17	E18	E18	E20	E23	E25	E27	E29	E29	E29	E26	E24	E24	E22	E19	E18	E15	SE9	NW9	SE6	ESE33	E30	E19.8	ESE33
7-Jun	ESE26	SE16	NE4	ENE8	ENE7	NE3	WNW5	WNW9	WNW14	WNW13	W12	W14	W16	WNW18	W20	W25	W22	W23	WNW12	WNW13	N13	N8	ENE6	NE8	WNW6.3	ESE26
8-Jun	NNE5	NNE5	NW2	NNW6	NNW6	SW1	SSW3	ESE6	E14	E15	E19	E23	E24	E22	E25	E24	E20	ENE21	ENE19	NE23	ENE26	ENE21	ENE20	ENE21	ENE13.9	ENE26
9-Jun	ENE19	ENE19	NE17	ENE18	ENE20	NE22	ENE23	NE21	NE22	NE22	ENE23	ENE21	ENE20	ENE24	ENE26	ENE27	ENE26	NE20	ENE15	NE13	NE9	ENE8	NE7	N5	ENE18.4	ENE27
10-Jun	NNE5	ENE5	NNE6	N8	NNW10	NNW10	N11	NNW10	N12	N13	NNW12	NNW12	N8	ESE18	ESE16	E15	E15	ESE12	ESE11	SSE10	S12	S11	SE6	ESE7	ENE4.3	ESE18
11-Jun	SSE15	S16	S18	S19	SSE16	SSE11	E12	E17	E16	SE18	S29	S28	S27	S29	S31	S30	S28	S18	SSE9	SE15	S22	SE12	NE6	N4	SSE15.9	S31
12-Jun	NNE9	NNE13	E14	ESE22	ESE23	ESE21	SE20	SSE18	SSE11	SSE6	WNW6	SSE7	SW17	WSW17	WSW18	W19	W16	WNW12	W16	W17	WSW15	WSW14	WSW13	WSW11	SW5.0	ESE23
13-Jun	WSW12	W12	W11	W11	W11	W13	WSW19	W20	WNW20	WNW22	WNW23	W21	WNW22	WSW18	WNW14	NNW10	NW7	NW8	WSW12	W10	SW11	SW10	SW11	WSW9	W12.9	WNW23
14-Jun	WSW9	SW8	WSW8	SW8	WSW8	WSW8	WSW9	SW11	SSW9	SW10	SW8	ESE12	E17	E18	E18	E22	M	ENE26	ENE25	ENE30	ENE32	ENE32	NNE13	NE12	E6.6	ENE32
15-Jun	NNW6	N10	N10	NNW7	WNW7	WNW5	NNE8	ENE16	E31	SE30	SSE16	SE24	SE39	SSE51	S48	S51	S48	S44	S39	SSE20	SE28	SE22	ESE23	SSE27	SSE18.3	SSE51
16-Jun	SE22	SE19	SE22	SE23	SE21	SSE19	SSE30	S30	S32	S34	SSW34	SSW33	SW25	WSW16	W12	W11	W10	WSW7	WNW11	WNW13	WNW11	WNW7	WNW10	WNW9	S12.4	S34
17-Jun	NW11	NNW11	NW16	NW18	NW17	NW21	NW22	NW25	NW24	NW23	NW24	NW23	NW24	NW21	NW21	NW19	NNW15	NW12	NNW8	NW6	W9	WNW12	WNW11	NW17.2	NW25	
18-Jun	WNW13	WNW14	WNW13	WNW15	WNW17	WNW15	WNW15	WNW17	W19	W18	W20	WNW21	WNW22	WNW23	NW18	WNW13	WNW11	N14	NNW11	NNW9	NW9	NW6	WNW6	W6	WNW13.5	WNW23
19-Jun	WNW8	WNW8	WNW10	WNW9	WNW8	NW9	WNW10	NW12	NW16	NNW19	NW20	NNW21	NNW21	NNW20	NNW19	NNW15	NNW15	NNW16	NNW16	NNW13	NNW8	NNW7	NW8	NW10	NNW12.7	NNW21
20-Jun	NNW10	NNW10	N11	N11	N4	N4	WNW3	SW7	SSE4	SE7	ESE10	ESE8	E11	E16	E20	E20	E19	E17	E17	E16	E15	E15	E15	E14	E8.3	E20
21-Jun	ENE9	ENE8	ESE9	SE11	SE9	SE8	E8	E9	E10	E16	E16	E16	E17	E18	E19	ESE21	E13	ESE14	ESE13	E9	E8	E8	E9	E8	E11.6	ESE21
22-Jun	E9	E11	ESE7	SW8	WSW9	WSW9	SW8	SW10	SW11	SW11	WSW13	SW14	SW12	SW14	SSW11	W10	W6	NW5	N13	NE15	NNE4	NNW12	NNW13	NNW10	WSW3.9	NE15
23-Jun	NW12	N14	N9	WNW11	NW12	NW10	NW11	NNW8	N7	NW8	WNW9	WNW8	WNW8	NNW8	W11	WNW9	WNW12	NNW6	N8	NE5	N8	NNE10	NE8	NE4	NW7.2	N14
24-Jun	NE5	N6	NNE10	NNE11	NNE9	N7	N3	ENE1	NNE9	NNE7	NNE8	NE13	NE14	NE18	NE19	NE19	ENE22	NE20	ENE20	NE18	NE17	NE14	ENE13	NE12	NE11.8	ENE22
25-Jun	NE10	NNE13	NE15	NE14	NE15	ENE16	ENE17	E17	E17	E22	E24	E24	E24	E25	E25	E26	E22	E18	E18	ENE14	NE10	NE8	ENE9	ENE10	E16.3	E26
26-Jun	ENE8	NE7	NE8	ENE7	ENE7	E10	E12	ESE9	ESE11	E10	E8	E9	E11	E15	E17	E10	SSW3	WNW11	NW13	NW11	NE9	E9	SSW9	W10	E5.2	E17
27-Jun	W9	WNW9	WNW8	WSW9	WSW8	WNW12	WNW9	W13	WNW13	WNW13	WNW13	WNW13	WNW11	WNW14	W17	W20	W19	WNW16	NE15	E13	ENE4	NE4	SW6	E4	WNW8.1	W20
28-Jun	NW4	N6	NNW5	NNW11	NW3	ENE3	N7	NNW6	NW8	NNW7	NNE5	ESE16	E20	E20	E20	ESE14	E16	E18	E12	E10	E14	ENE12	ENE13	ENE13	ENE7.7	E20
29-Jun	ENE14	E18	ESE23	ESE23	ESE21	ESE16	SE14	SE13	ESE13	E17	E22	E25	E26	E26	E28	E27	E25	E24	ENE24	ENE23	ENE18	ENE17	E16	ESE16	E19.3	E28
30-Jun	SE14	S9	S11	S13	ESE10	SE9	S12	S12	SE10	ESE12	E12	E20	E21	E23	E23	E23	E22	E22	ENE18	ENE20	ENE22	ENE19	ENE20	SE16	ESE13.3	E23

ENE3.5	NE3.6	ENE3.8	ENE2.3	NE2.5	ENE1.9	ENE1.5	E1.3	ENE2.9	E2.7	E2.1	E4.2	E4.6	E5.8	ESE6.4	E7.2	E6.0	ENE6.7	ENE6.7	ENE7.3	ENE6.6	ENE6.6	ENE6.1	ENE5.4	Diurnal Average	
ESE26	ENE19	E23	SE23	ESE23	ENE22	SSE30	S30	S32	S34	SSW34	SSW33	SE39	SSE51	S48	S51	S48	S44	S39	ENE30	ENE32	ENE32	ESE33	E30	Diurnal Maximum	

M - Maintenance
 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 - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 10 km/h on Jun 15 16:00	Hours in Service: 720 Hours of Data: 719 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9
Minimum Value: 1 km/h on Jun 26 02:00	
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 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-Jun	3	3	4	4	4	7	3	1	2	1	1	2	2	2	4	3	2	2	2	2	3	2	3	2	7
2-Jun	1	1	1	2	2	2	3	3	2	2	2	2	2	2	3	4	3	4	3	3	3	2	3	3	4
3-Jun	3	3	3	3	4	4	4	4	3	2	2	2	3	4	3	3	3	3	2	2	1	1	2	4	
4-Jun	1	2	2	2	3	2	2	4	4	5	4	4	8	7	4	5	3	3	2	5	2	2	1	8	
5-Jun	2	2	2	2	2	2	3	3	3	4	3	4	3	7	2	2	2	3	3	2	2	2	3	7	
6-Jun	2	2	2	3	3	2	3	3	3	3	3	3	3	3	2	2	2	3	4	3	9	6	4	9	
7-Jun	3	4	3	1	1	1	2	3	4	4	4	4	5	6	6	6	6	6	7	5	5	2	2	1	7
8-Jun	3	3	2	3	2	1	2	3	2	1	2	2	2	2	2	3	3	3	4	4	4	4	3	3	4
9-Jun	3	3	4	4	4	4	4	4	5	5	4	4	5	5	5	5	5	5	3	2	2	1	2	2	5
10-Jun	2	2	3	2	3	3	3	3	4	4	5	5	4	4	3	2	1	2	2	2	1	1	3	3	5
11-Jun	2	2	2	2	2	2	2	2	2	5	4	4	5	5	6	5	5	4	2	2	5	4	2	2	6
12-Jun	3	4	6	4	3	2	2	3	3	4	3	3	5	5	5	5	6	5	4	4	4	3	3	2	6
13-Jun	2	3	3	2	3	4	5	5	5	6	6	6	6	4	6	4	4	3	7	5	3	2	2	2	7
14-Jun	2	1	1	1	1	2	2	2	2	2	3	4	3	2	2	3	4	M	4	5	5	6	7	4	7
15-Jun	2	2	2	2	3	3	3	8	4	6	3	6	9	8	7	10	9	7	7	7	8	6	3	7	10
16-Jun	2	1	2	3	2	3	6	5	5	6	7	7	6	5	4	3	3	2	4	3	3	2	2	2	7
17-Jun	3	3	5	6	5	6	6	7	8	8	8	9	8	7	7	7	6	5	4	2	2	2	2	3	9
18-Jun	3	3	3	3	4	3	4	5	5	5	5	6	7	7	6	5	4	5	4	3	3	1	1	2	7
19-Jun	2	2	1	1	2	2	3	4	7	8	7	8	7	7	7	5	6	6	5	5	3	1	1	1	8
20-Jun	1	1	2	2	3	2	2	2	1	2	2	2	2	4	2	2	3	2	2	2	2	2	2	1	4
21-Jun	2	1	2	2	2	1	1	1	1	3	2	1	2	2	2	2	2	2	1	1	2	3	1	1	3
22-Jun	1	1	2	4	3	3	2	3	2	2	2	3	3	4	3	4	3	4	4	4	5	4	4	2	5
23-Jun	3	4	4	2	2	3	3	3	2	3	3	3	3	3	5	6	3	2	3	3	2	3	2	1	6
24-Jun	1	1	3	2	2	2	1	1	3	2	3	4	4	4	5	5	5	4	4	4	3	3	2	1	5
25-Jun	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	3
26-Jun	1	1	1	1	1	2	2	1	1	1	1	2	2	2	2	2	3	2	4	3	4	4	2	2	4
27-Jun	3	2	1	2	2	3	2	3	4	3	4	4	4	4	5	5	5	4	7	3	2	2	3	2	7
28-Jun	3	3	3	3	3	2	2	2	2	2	3	4	2	3	3	1	4	3	2	2	2	1	2	1	4
29-Jun	2	4	2	2	2	2	2	2	1	3	2	2	2	3	2	3	3	3	4	4	3	3	2	2	4
30-Jun	2	2	5	2	2	1	4	4	2	1	2	2	2	2	2	2	3	3	4	3	4	3	3	3	5

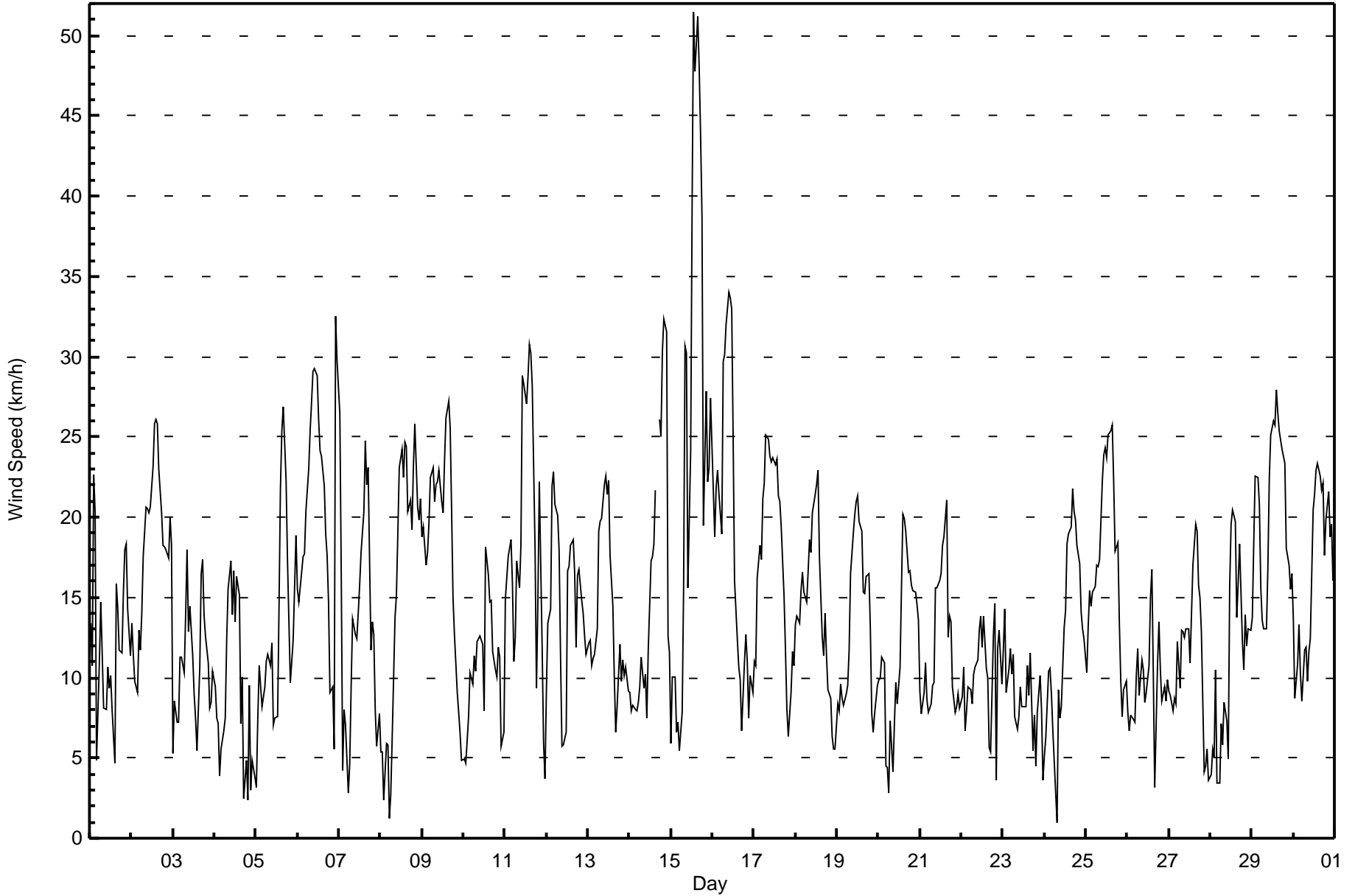
3	4	6	6	5	7	6	8	8	8	8	8	9	9	8	7	10	9	7	7	7	8	9	6	7
Diurnal Maximum																								

M - Maintenance



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Fort Chipewyan - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Fort Chipewyan - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	45	6.26	6.26
6 - 11	250	34.77	41.03
12 - 19	253	35.19	76.22
20 - 28	144	20.03	96.24
29 - 38	20	2.78	99.03
> 38	7	0.97	100.00

Total Number of Valid Hours: 719

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Fort Chipewyan - June 2016**

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	5	7	5	4	0	0	1	0	2	3	0	2	3	5	2	45
6 - 11	19	12	17	19	28	15	9	6	3	3	16	14	13	33	18	25	250
12 - 19	6	4	21	35	65	12	9	5	8	0	4	12	16	31	13	12	253
20 - 28	0	0	6	28	55	10	7	3	4	0	1	0	8	7	12	3	144
29 - 38	0	0	0	3	5	1	1	2	6	2	0	0	0	0	0	0	20
> 38	0	0	0	0	0	0	1	1	5	0	0	0	0	0	0	0	7
Totals	31	21	51	90	157	38	27	18	26	7	24	26	39	74	48	42	719

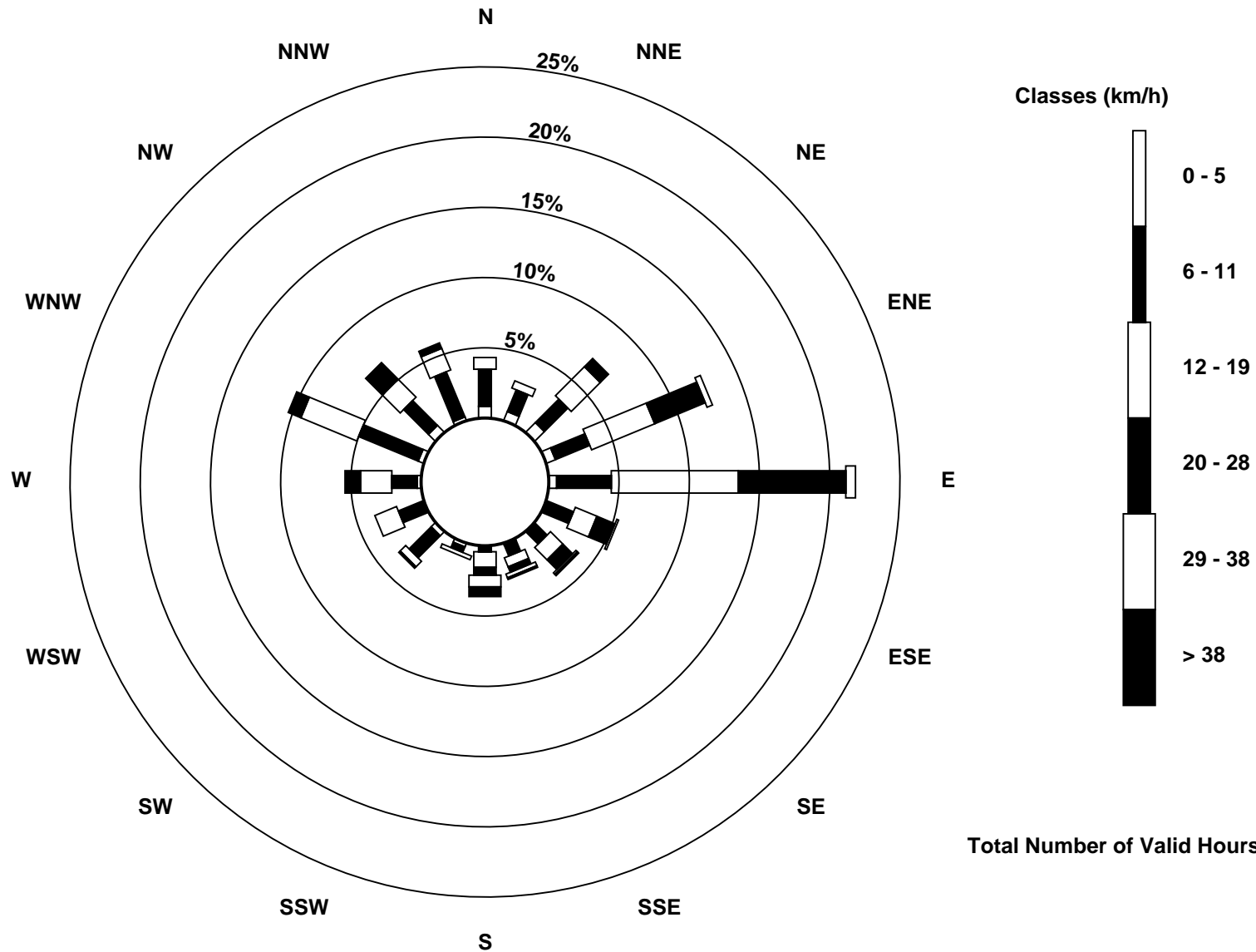
Total Number of Valid Hours: 719

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed (WS) - km/h
Fort Chipewyan (AMS 8)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Fort Chipewyan - June 2016

Direction of Maximum Speed: 168 deg on Jun 15 14:00 Direction of Maximum Daily Speed Average: 90.3 deg on Jun 6	Hours in Service: 720 Hours of Data: 719 Hours of Missing Data: 1
Direction of Minimum Speed: 69 deg on Jun 24 08:00 Direction of Minimum Daily Speed Average: 3.9 deg on Jun 22	Percent Operational Time: 99.9
Monthly Average Direction: 308.8 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-Jun	20	74	90	102	89	96	92	89	75	106	97	78	55	64	72	87	90	79	74	76	72	85	72	37	79.4
2-Jun	59	65	54	68	69	60	66	75	96	95	95	93	93	91	85	77	68	68	62	54	48	57	61	77	74.6
3-Jun	344	7	37	319	0	15	52	56	66	63	71	87	102	100	80	103	98	89	94	95	90	87	79	92	70.4
4-Jun	89	89	88	93	72	215	254	272	286	287	304	287	290	296	238	294	55	54	221	305	352	4	278	261	292.4
5-Jun	227	246	292	321	321	296	289	307	301	306	327	346	22	87	93	94	91	90	81	86	61	53	65	80	53.8
6-Jun	88	84	84	81	90	100	85	86	85	86	87	86	88	88	88	89	91	89	99	137	311	144	105	99	90.3
7-Jun	120	142	48	57	59	37	282	282	292	299	278	262	265	282	274	271	268	261	286	289	7	2	64	55	284.0
8-Jun	20	12	315	342	341	215	197	109	98	96	95	94	94	87	92	82	83	78	59	56	65	58	64	68	76.0
9-Jun	65	64	51	58	61	56	62	56	54	44	62	60	59	60	61	70	60	56	57	55	49	61	42	6	58.0
10-Jun	21	66	27	2	347	345	351	340	351	356	344	341	0	107	106	99	99	109	103	148	179	182	143	113	57.1
11-Jun	164	183	182	176	157	147	100	94	91	140	181	176	185	172	174	169	186	183	150	137	190	139	37	349	164.3
12-Jun	28	22	86	112	112	122	135	166	160	162	294	151	230	257	248	259	273	285	263	268	256	255	247	238	215.5
13-Jun	257	267	272	259	268	266	257	274	282	294	288	277	282	254	290	344	321	304	251	280	231	214	233	248	271.8
14-Jun	241	227	238	227	240	240	241	234	213	222	229	109	98	95	95	92	M	67	58	57	57	64	30	46	81.9
15-Jun	348	359	0	337	288	289	15	73	87	131	159	143	141	168	177	181	189	183	186	164	138	137	120	151	157.1
16-Jun	131	129	130	144	146	151	168	173	176	188	193	194	214	255	262	259	261	250	286	290	286	295	288	296	189.8
17-Jun	319	327	317	321	320	316	314	312	316	316	313	312	309	315	316	321	320	328	320	335	317	276	288	293	314.9
18-Jun	297	285	284	287	291	296	292	285	279	271	273	284	285	295	304	294	296	351	336	345	325	313	287	270	293.8
19-Jun	285	289	299	302	302	317	303	320	324	333	324	329	328	328	328	348	345	348	347	342	334	328	316	326	326.5
20-Jun	332	341	355	351	359	352	287	220	157	130	122	114	100	91	91	93	94	95	92	86	84	83	87	88	82.4
21-Jun	78	72	102	137	132	126	96	92	94	98	94	99	95	98	100	106	100	102	105	101	94	96	88	85	99.8
22-Jun	80	101	103	220	241	237	226	235	234	221	242	227	222	216	207	265	261	320	4	37	29	334	338	341	252.6
23-Jun	314	355	358	302	310	304	316	343	349	316	290	284	294	328	275	288	302	329	5	49	353	22	53	38	325.8
24-Jun	53	351	25	28	19	10	353	69	26	20	24	36	48	46	52	55	69	53	63	56	49	55	59	53	46.0
25-Jun	41	32	48	49	52	64	76	86	96	98	97	97	100	96	93	92	90	95	86	70	50	56	68	68	80.8
26-Jun	61	51	56	70	68	89	95	108	107	99	95	100	96	97	97	97	209	282	306	312	41	88	204	267	83.8
27-Jun	269	297	283	241	256	288	288	279	284	296	296	283	286	283	272	275	278	286	47	85	69	43	227	88	286.1
28-Jun	325	3	330	339	315	61	1	331	318	342	30	103	98	97	98	103	100	90	94	95	91	71	68	69	74.2
29-Jun	67	83	111	119	118	111	132	132	114	90	90	89	89	89	88	87	85	82	77	70	64	64	80	108	91.8
30-Jun	143	172	171	175	123	133	183	182	137	105	93	96	94	93	91	91	88	82	69	66	65	67	73	126	101.6

58.3	48.9	57.0	71.5	55.6	58.0	74.4	82.9	67.8	79.7	85.8	100.8	99.5	99.0	102.6	95.6	91.0	77.0	66.2	63.4	60.9	67.5	70.0	78.0
Diurnal Average																							

M - Maintenance
 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 - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 95 deg on Jun 24 08:00	Hours of Data: 719
Minimum Value: 4 deg on Jun 29 00:00	Hours of Missing Data: 1
Percentiles: P ₁ = 4 P ₁₀ = 6 Q ₁ = 9 Median = 15 Q ₃ = 23 P ₉₀ = 38 P ₉₉ = 79	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-Jun	25	17	7	10	81	29	13	9	12	11	11	20	17	31	61	15	8	11	10	9	13	5	13	15	81
2-Jun	8	7	9	15	10	10	12	14	6	5	5	4	5	5	8	10	10	10	11	12	9	8	8	11	15
3-Jun	43	27	35	38	23	22	18	16	9	11	15	16	15	25	46	10	7	7	8	10	10	10	7	7	46
4-Jun	13	13	19	59	50	41	24	18	19	19	26	18	25	24	20	65	49	84	71	69	31	80	29	31	84
5-Jun	62	25	15	17	19	16	16	20	20	23	33	26	34	49	6	4	5	6	10	9	14	12	9	7	62
6-Jun	6	7	6	7	13	8	6	7	6	6	6	6	6	6	6	6	5	5	26	62	42	74	14	10	74
7-Jun	9	23	74	15	17	56	34	20	19	20	26	26	17	19	19	17	18	16	35	45	23	18	27	14	74
8-Jun	54	25	71	26	62	68	60	33	9	7	6	5	4	9	5	8	10	13	12	9	9	12	12	8	71
9-Jun	8	10	11	11	11	10	10	11	13	13	11	12	16	14	11	11	12	12	12	10	11	13	19	41	41
10-Jun	38	29	28	20	19	22	22	24	27	29	34	39	57	11	12	7	5	15	11	21	9	7	38	37	57
11-Jun	7	6	6	8	8	22	9	8	8	32	11	11	12	12	15	11	9	8	23	8	18	35	29	77	77
12-Jun	23	20	34	7	7	8	9	17	26	63	46	34	18	23	19	18	27	30	16	15	14	13	14	11	63
13-Jun	13	15	17	16	16	19	15	17	18	18	17	18	18	19	41	36	62	36	28	32	12	11	13	16	62
14-Jun	16	10	12	10	16	10	16	22	15	23	49	33	6	6	6	7	M	11	11	10	9	14	24	58	58
15-Jun	37	17	19	41	34	62	34	18	11	28	13	12	18	12	11	10	10	10	9	18	16	12	9	15	62
16-Jun	6	4	7	7	8	10	12	11	11	10	15	13	20	23	24	27	26	37	25	15	15	15	11	14	37
17-Jun	19	18	17	19	19	17	18	17	19	20	19	21	20	20	21	22	20	22	19	21	30	14	13	15	30
18-Jun	15	12	13	13	14	15	15	17	17	20	20	18	20	18	22	29	32	24	25	23	20	22	17	23	32
19-Jun	10	15	7	17	14	16	20	26	24	27	26	27	26	28	27	28	29	28	24	24	20	16	10	10	29
20-Jun	13	13	15	17	83	46	49	14	32	16	12	28	11	9	6	6	5	5	6	6	6	6	7	6	83
21-Jun	12	14	20	18	21	10	8	6	7	6	5	6	6	7	5	7	8	7	6	8	10	15	8	9	21
22-Jun	10	13	20	41	13	16	10	13	13	12	15	13	17	21	38	37	71	62	23	15	60	22	23	18	71
23-Jun	25	22	61	21	15	16	37	37	40	25	38	51	50	29	84	15	50	31	61	19	22	22	54	84	
24-Jun	36	22	19	14	23	24	46	95	25	22	23	22	23	20	20	19	14	14	13	12	10	10	9	7	95
25-Jun	15	16	9	9	10	10	11	8	8	5	6	4	4	5	4	5	5	5	11	12	10	17	7	7	17
26-Jun	8	7	6	12	9	10	9	9	7	8	7	6	7	6	6	16	74	14	22	23	33	31	18	20	74
27-Jun	19	18	17	10	21	15	18	14	16	18	23	25	35	26	20	16	18	22	54	15	67	42	51	51	67
28-Jun	81	40	55	19	59	73	21	27	19	33	58	16	6	6	7	10	12	7	7	9	11	7	7	4	81
29-Jun	6	13	8	7	6	10	11	11	14	6	5	6	6	6	5	6	7	7	9	9	9	11	9	17	17
30-Jun	10	27	34	13	12	21	17	16	17	18	5	4	5	5	6	6	7	8	10	9	9	8	9	39	39

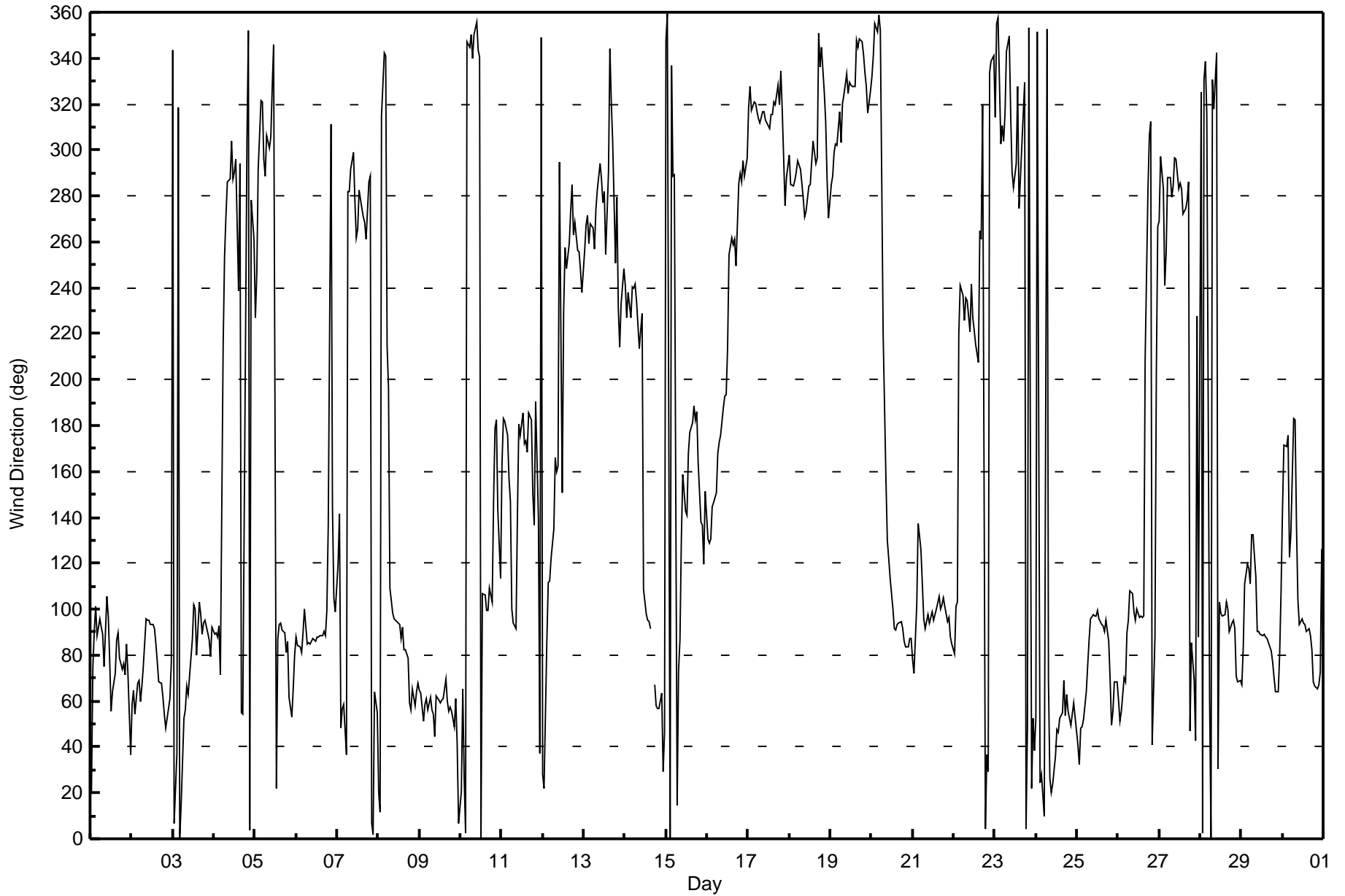
81	40	74	59	83	73	60	95	37	63	58	39	57	50	61	84	74	84	71	69	67	80	51	77	
Diurnal Maximum																								

M - Maintenance



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Fort Chipewyan - June 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 14, 2016	Last Calibration	May 16, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	Routine		
Start Time (MST)	10:40	End Time (MST)	18:55
Gas Cert Reference	LL79696	Station temp.	22 Deg C
Cal Gas Concentration	2.35 ppm	Cal Gas Exp Date	2/13/16
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

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	827	-826
Analyzer IP address	192.168.1.43		Lamp voltage	1006	997
Calculated slope	1.009634	1.003688	Chamber temp	45.0	45.3
Calculated intercept	-0.067626	-0.119590	Pressure	711.6	698.5
Analyzer Background	1.18	1.20	Flow	0.436	0.429
Analyzer Coefficient	1.064	1.067	Intensity	90	90

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	6123	0.0	0.0	0.1	----
as found span	6090	46.2	17.8	17.5	1.020
calibrator zero	6000	0.0	0.0	0.2	----
high point	6000	44.8	17.5	17.6	0.996
second point	6000	29.9	11.7	11.8	0.992
third point	6000	15.0	5.9	5.9	0.992
as left zero	6000	0.0	0.0	0.1	----
as left span	6000	44.8	17.5	17.1	1.026
Average Correction Factor					0.994

Corrected As found 17.4 Previous response 17.7 % change 2.0%

Notes:

As founds completed. Flows verified with bios during as founds. Calibrator relay board power supply cable replaced to fix flow issue. MFC calibration completed afterwards. Span adjusted. Generated 9.4 ppb instead of 5.9 ppb for third point. Another point added with 5.9 ppb generated.

Calibration Performed By: Devin Russell



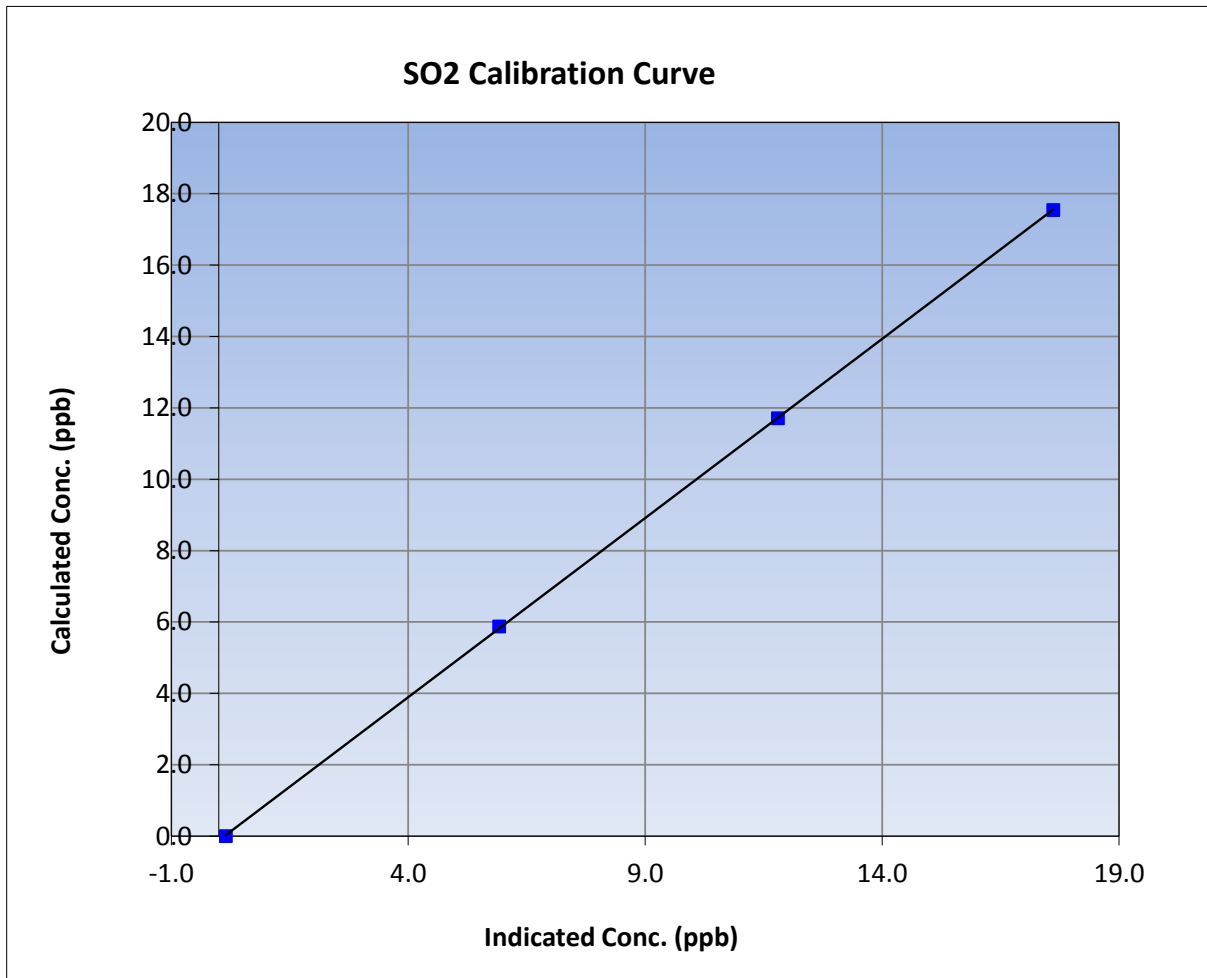
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 14, 2016	Previous Calibration	May 16, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	10:40	End Time (MST)	18:55
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1136451241

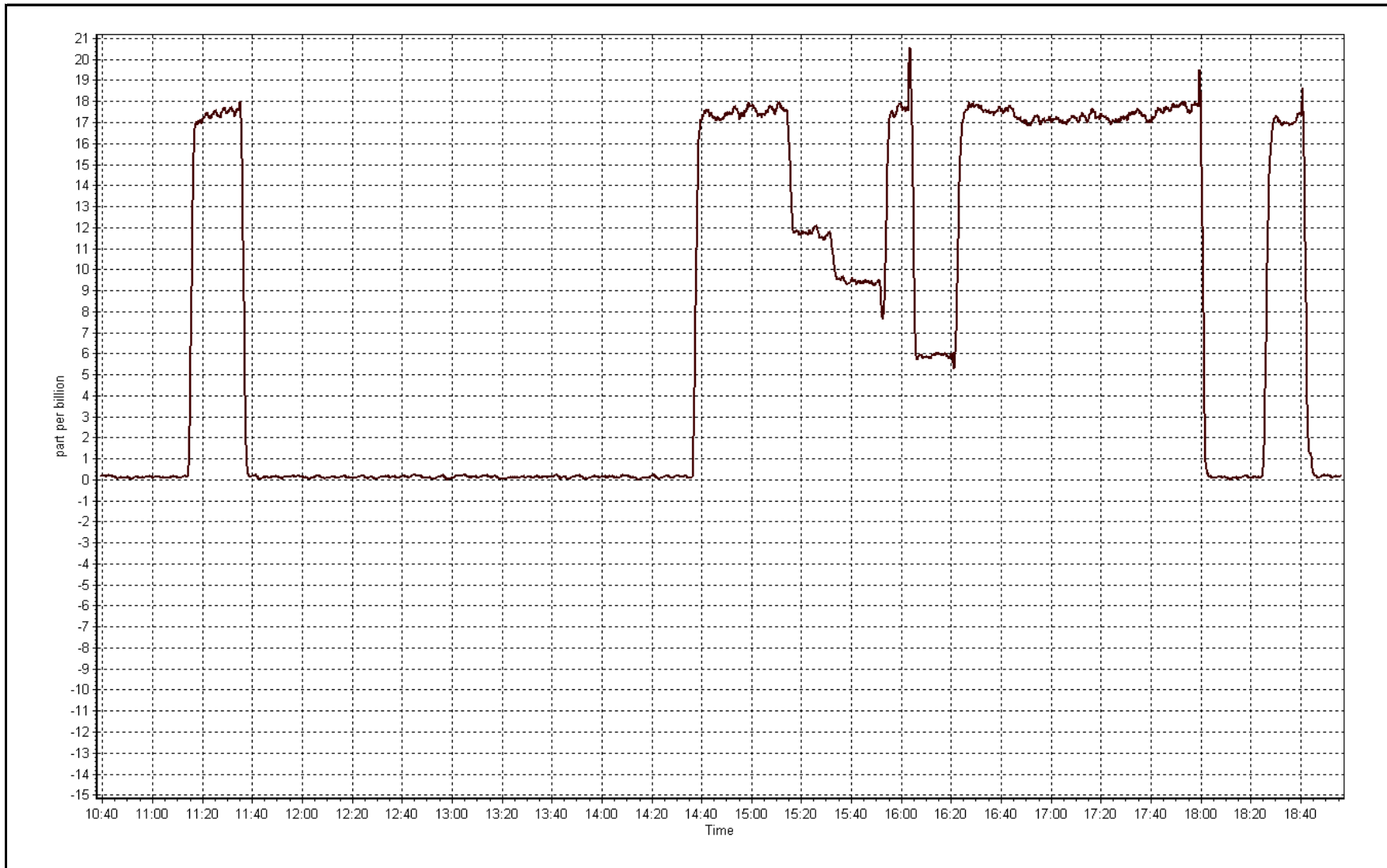
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999977
17.5	17.6	0.9964		
11.7	11.8	0.9924	Slope	1.003688
5.9	5.9	0.9924		
			Intercept	-0.119590



SO2 Calibration Plot

Date: June 14, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	June 14, 2016	Previous Calibration	May 17, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	<input type="text" value="Routine"/>		
Start Time (MST)	11:35	End Time (MST)	21:10
NO2 GPT Ref date	June-14-16	Transfer Standard	NOX GPT
Calibrator Make/Model	Teledyne API 700	Station temp.	23 Deg C
ZAG make/model	Teledyne API 701	Serial Number	735
DACS make/model	Campbell Scientific CR3000	Serial Number	4698
		Serial Number	8205

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	38.8	38.3
Analyzer IP address	192.168.1.79		Lamp temp.	58.0	58.0
Calculated slope	1.018825	0.993372	Pressure	27.2	26.9
Calculated intercept	-0.079584	-0.050648	Flow cell A	768	764
Analyzer Background	-0.4	-0.4	Flow cell B	768	763
Analyzer Coefficient	1.014	1.026	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 O3 generator reference voltage - generator drive voltage (ppb of O3 called from from calibrator)	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
As found zero	6123	0.00	0.0	-0.1	----
As found span	6042	237.0 - 830.8 (100ppb)	103.2	100.5	1.027
calibrator zero	6000	0.00	0.0	0.1	----
high point	6000	237.0 - 830.8 (100ppb)	103.2	103.9	0.993
second point	6000	190.8-799.1 (80 ppb)	83.3	84.0	0.991
third point	6000	115.2-733.3 (50 ppb)	52.7	53.0	0.994
as left zero			0.0		----
as left span			103.2		
Average Correction Factor					0.993

Corrected As found	100.6	Previous response	101.4	% change	0.8%
--------------------	-------	-------------------	-------	----------	------

Notes:

As founds completed. Flows verified with bios during as founds. Calibrator relay board power supply cable replaced to fix flow issue. MFC calibration completed afterwards. Cleaned absorption tube by blowing zero air through it. O3 measurement and reference signal was around 2800 mV. Adjusted the Photo_Det to 4590 mV. Span adjusted slightly. As lefts not completed.

Calibration Performed By: Devin Russell



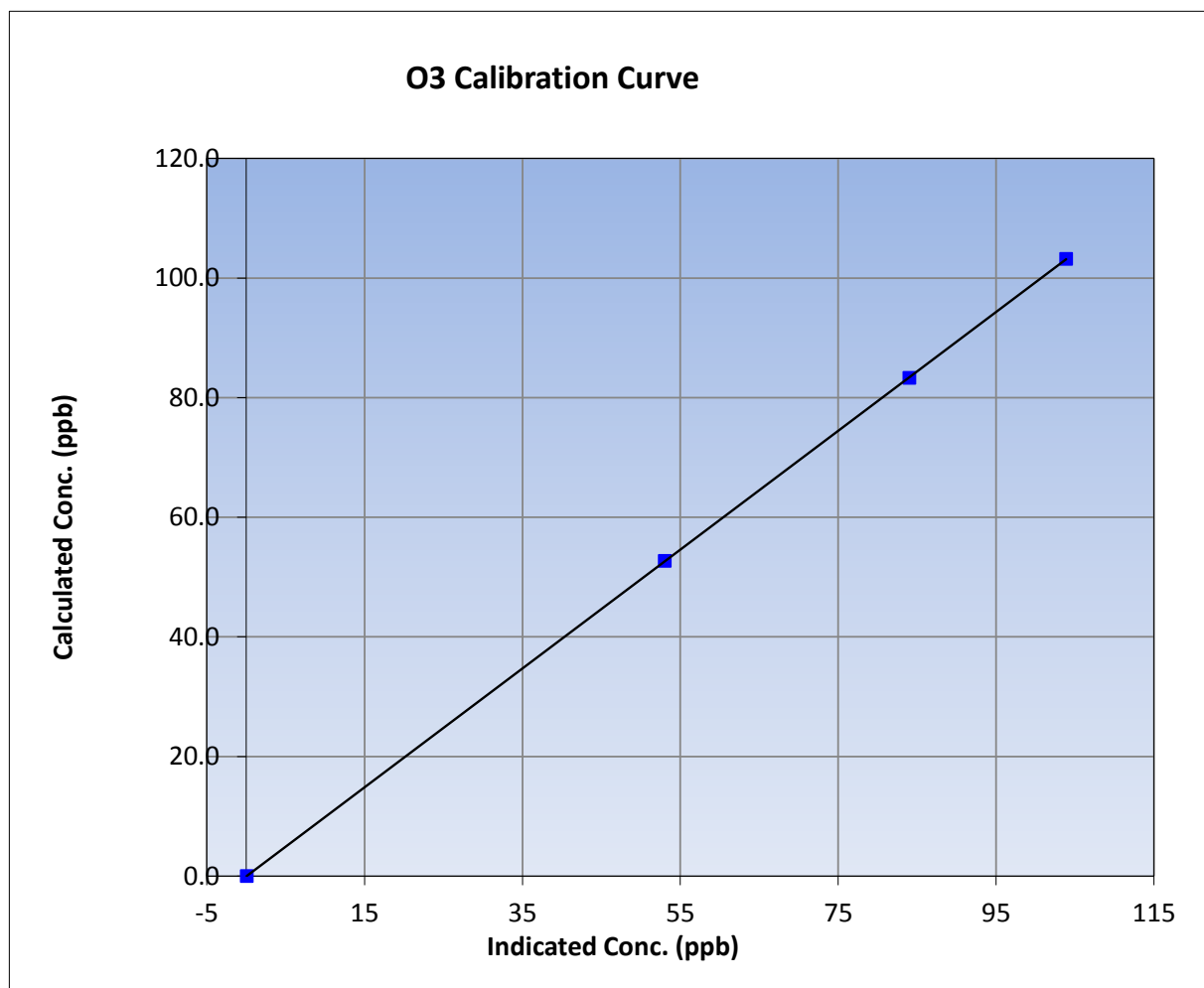
Wood Buffalo Environmental Association O3 Calibration Report

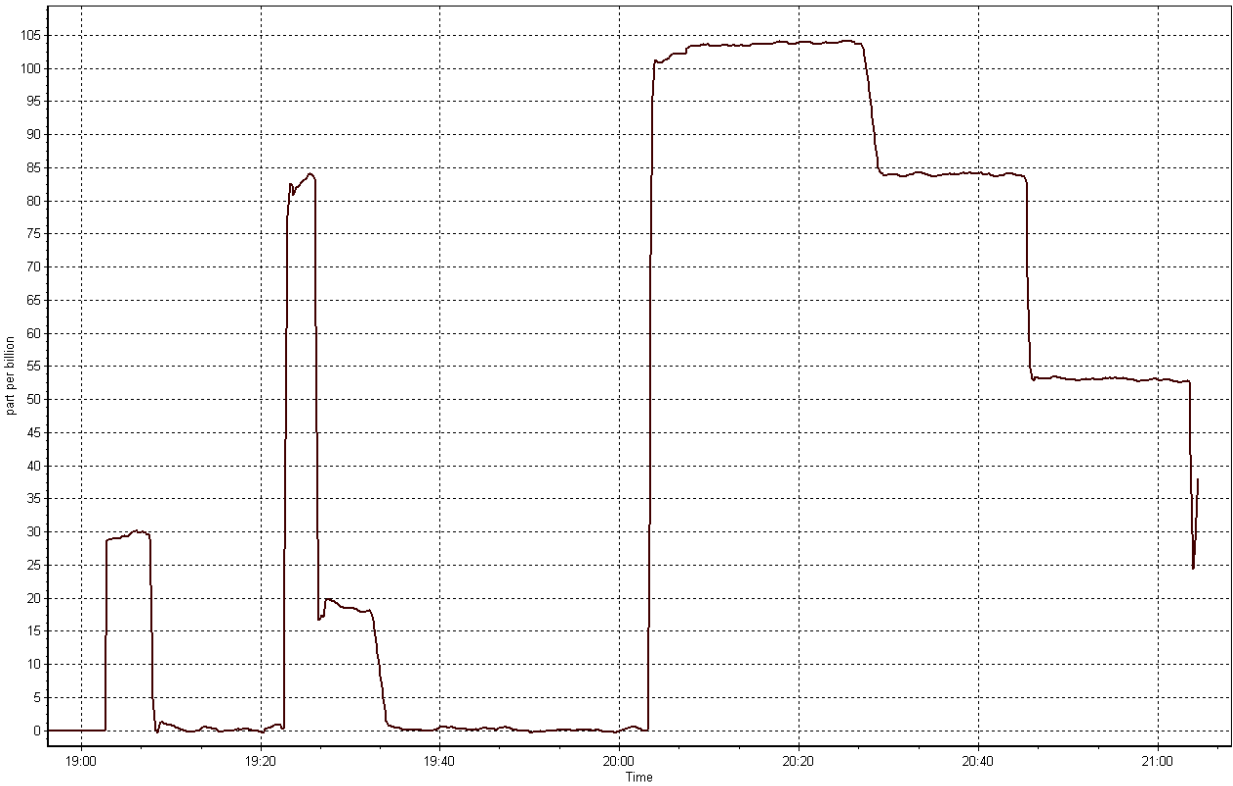
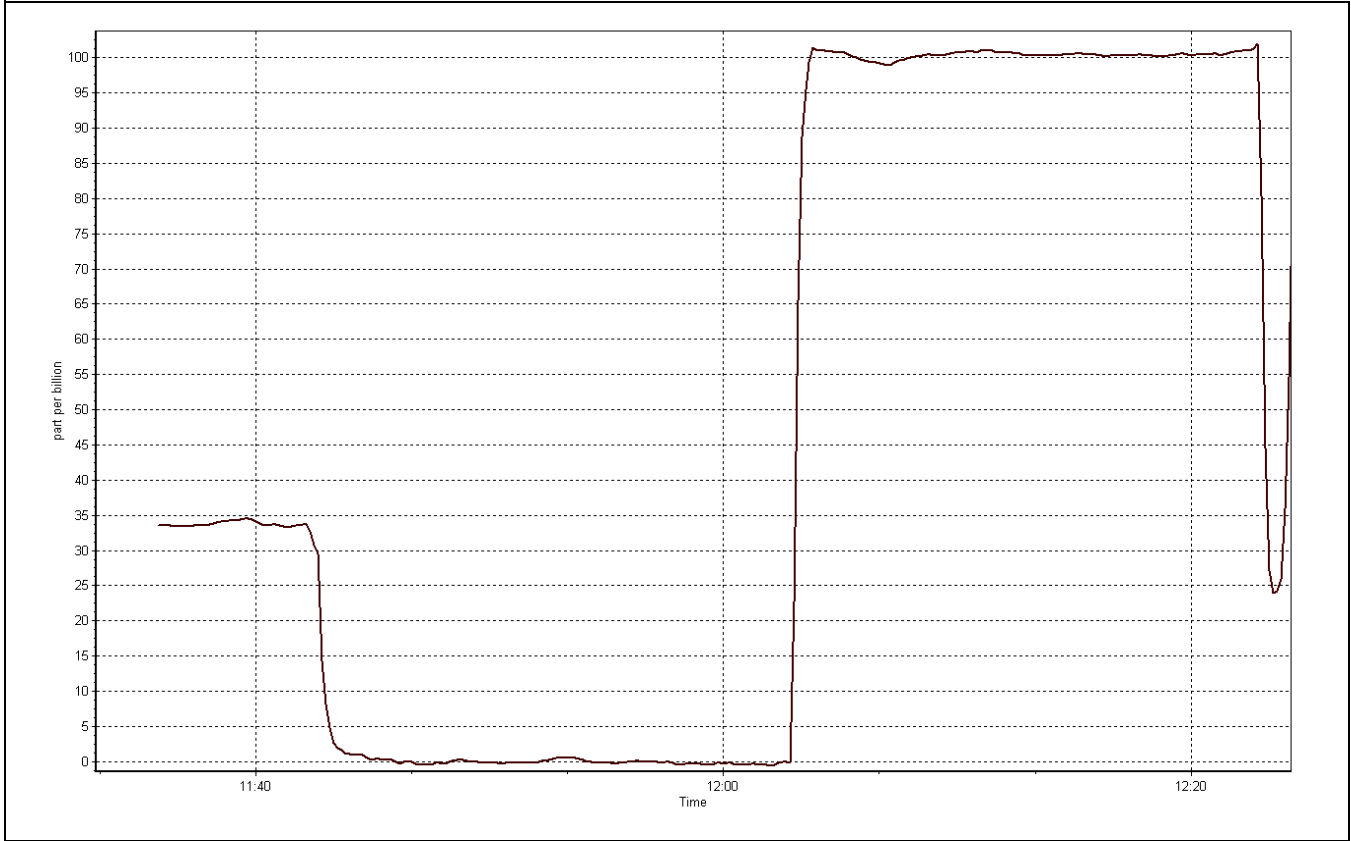
Station Information

Calibration Date	June-14-16	Previous Calibration	May 17, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	11:35	End Time (MST)	21:10
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	0.1	----	Correlation Coefficient	0.999997
103.2	103.9	0.9935		
83.3	84.0	0.9914	Slope	0.993372
52.7	53.0	0.9936		
			Intercept	-0.050648







Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 14, 2016	Previous Calibration	May 16, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Reason:	Routine		
Start Time (MST)	10:40	End Time (MST)	18:55
NO Cal Gas Conc	20.1 ppm	Gas Cert Reference	LL79696
NOx Cal Gas Conc	20.1 ppm	Cal Gas Expiry Date	2/13/18
Calibrator	Teledyne API T700	Serial Number	747
Zero air Generator	Teledyne API 701	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	0.983851	0.980342	1.007871
	Data Offset	0.747482	0.921634	0.244201
Current Calibration	Data Slope	0.999197	1.000619	1.001742
	Data Offset	0.815978	0.922876	0.028589

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	1.234		1.218	
NOx coefficient	1.244		1.229	
NO2 coefficient	1.000		1.000	
NO bkgrnd	0.1		0.1	
NOx bkgrnd	0.2		0.2	
Chamber Temp	40	Deg C	40	Deg C
Moly Temp	314.5	Deg C	315.3	Deg C
PMT voltage	502	V	502	V
PMT Temp	5.1	Deg C	5.1	Deg C
O3 flow	88	ccm	88	ccm
R Cell press NO	3.8	mmHg	3.7	mmHg
R Cell Press Nox	3.8	mmHg	3.7	mmHg
NO sample flow	1111	lpm	1109	lpm
Nox sample Flow	1111.000	lpm	1109.000	lpm

Notes:

As founds completed. Flows verified with bios during as founds. Calibrator relay board power supply cable replaced to fix flow issue. MFC calibration completed afterwards. Span adjusted. Generated 80 ppb instead of 50 ppb for third point. Another point added with 50 ppb generated.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 14, 2016

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	6123	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	----	----
as found span	6090	46.2	152.5	152.5	0.0	152.3	152.6	-0.3	1.0009	0.9992
calibrator zero	6000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
high point	6000	44.8	150.1	150.1	0.0	149.9	149.7	0.3	1.0009	1.0027
second point	6000	29.9	100.2	100.2	0.0	99.1	98.8	0.3	1.0113	1.0141
third point	6000	15.0	50.3	50.3	0.0	48.5	48.2	0.1	1.0354	1.0419
as left zero	6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
as left span	6000	44.8	150.1	45.7	104.4	149.9	45.8	25.3	1.0015	0.9967
Average Correction Factor									1.0159	1.0196

Corrected As found NO_x= 152.3 NO= 152.7 Percent Change NO_x= 1.3% NO= 1.3%
 Previous Response NO_x= 154.2 NO= 154.6

GPT Calibration Data

Dilution Flow (total) 6000 ccm Source Gas Flow 44.80 ccm NOx ref calc conc = 150.1 ppb NO ref calc conc = 150.1 ppb

O3 Setpoint (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
1st NO ref point		0.0	148.9	148.8	0.0	1.0077	1.0083	----	----
1st NO2 (300)	45.7	103.2	148.7	45.7	103.0	1.0096	----	1.0018	99.8%
2nd NO2 (200)	65.6	83.3	148.7	65.6	83.2	1.0091	----	1.0014	99.9%
3rd NO2 (100)	96.1	52.7	148.6	96.1	52.5	1.0100	----	1.0046	99.5%
2nd NO ref point	----	0.0	148.8	148.7	0.1	1.0087	1.0093	----	----
Average Correction Factor						1.0094		1.0026	99.7%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NO_x Calibration Summary

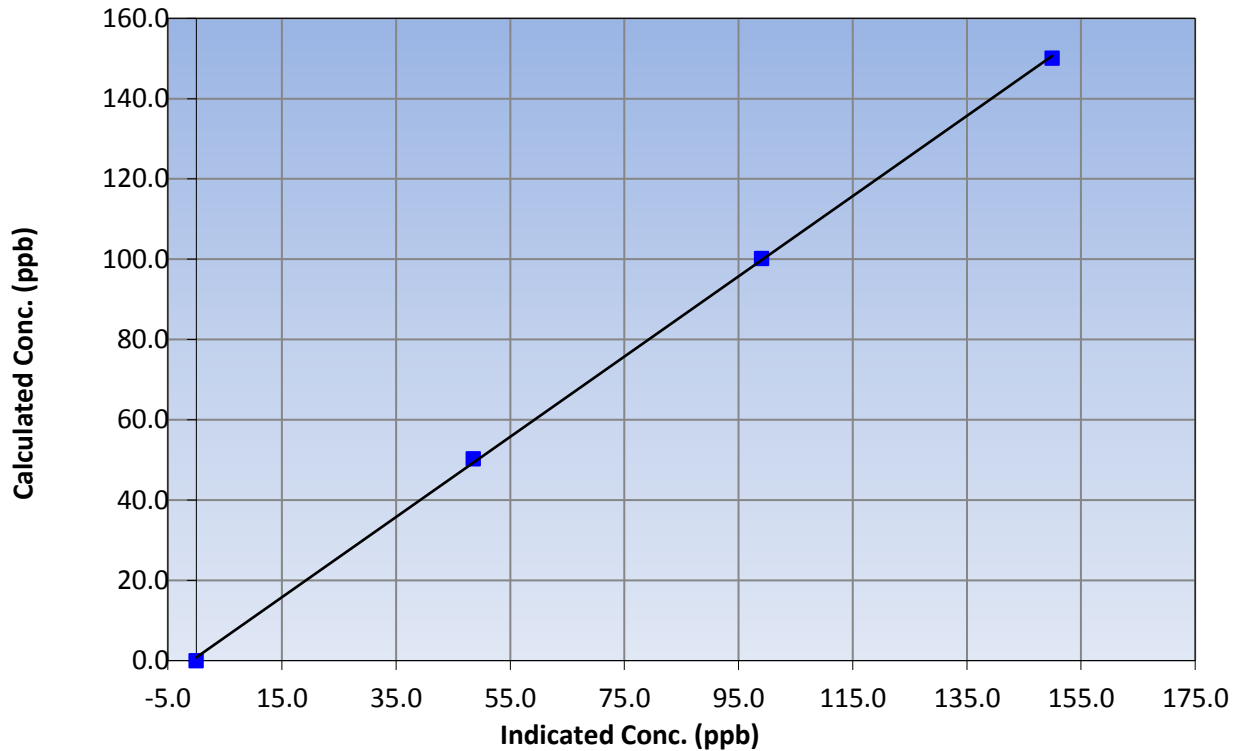
Station Information

Calibration Date	June 14, 2016	Previous Calibration	May 16, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	10:40	End Time (MST)	18:55
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	----	Correlation Coefficient	0.999846
150.1	149.9	1.0009		
100.2	99.1	1.0113	Slope	0.999197
50.3	48.5	1.0354		
			Intercept	0.815978

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

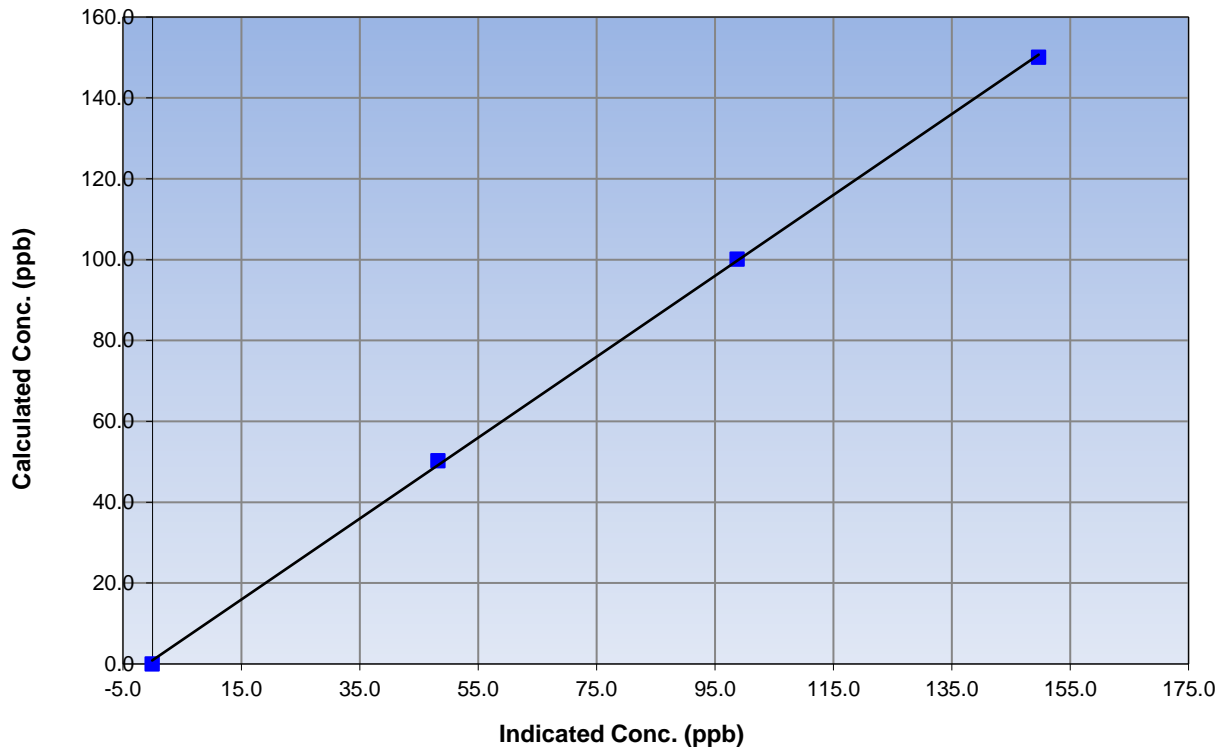
Station Information

Calibration Date	June 14, 2016	Previous Calibration	May 16, 2016
Station Name	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	10:40	End Time (MST)	18:55
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	0.999806
150.1	149.7	1.0027		
100.2	98.8	1.0141	Slope	1.000619
50.3	48.2	1.0419		
			Intercept	0.922876

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

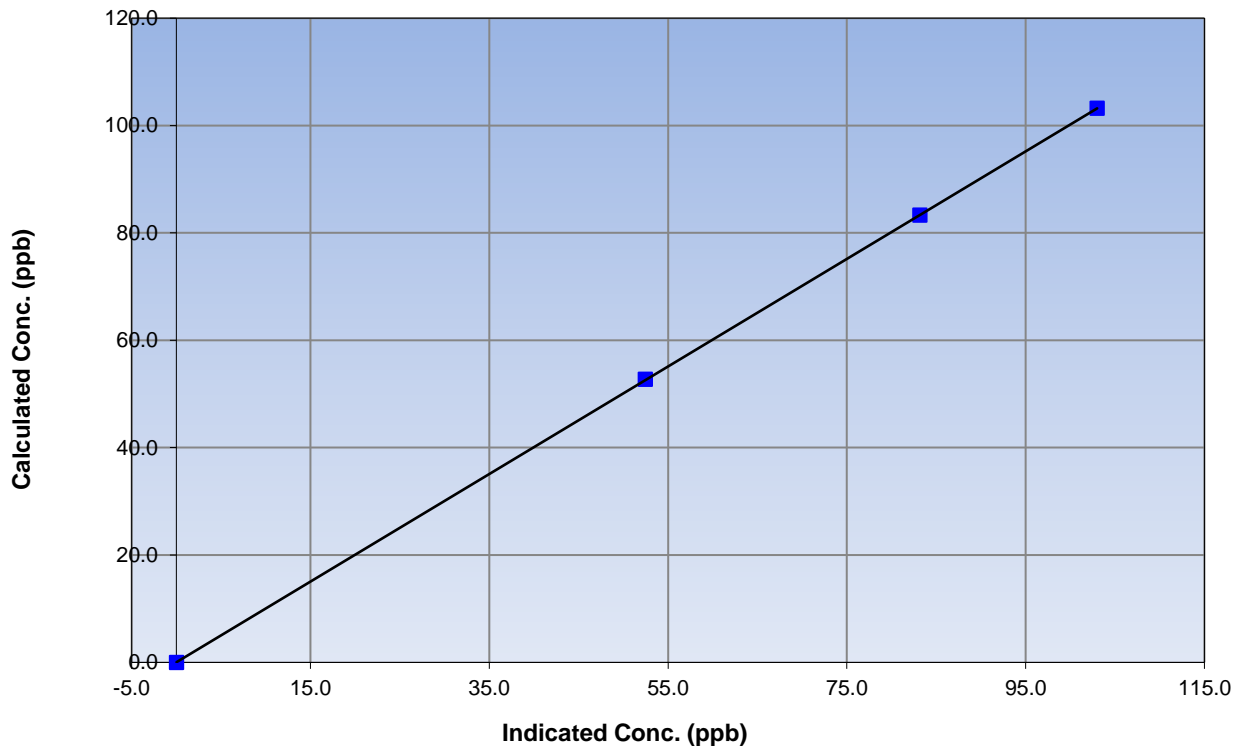
Station Information

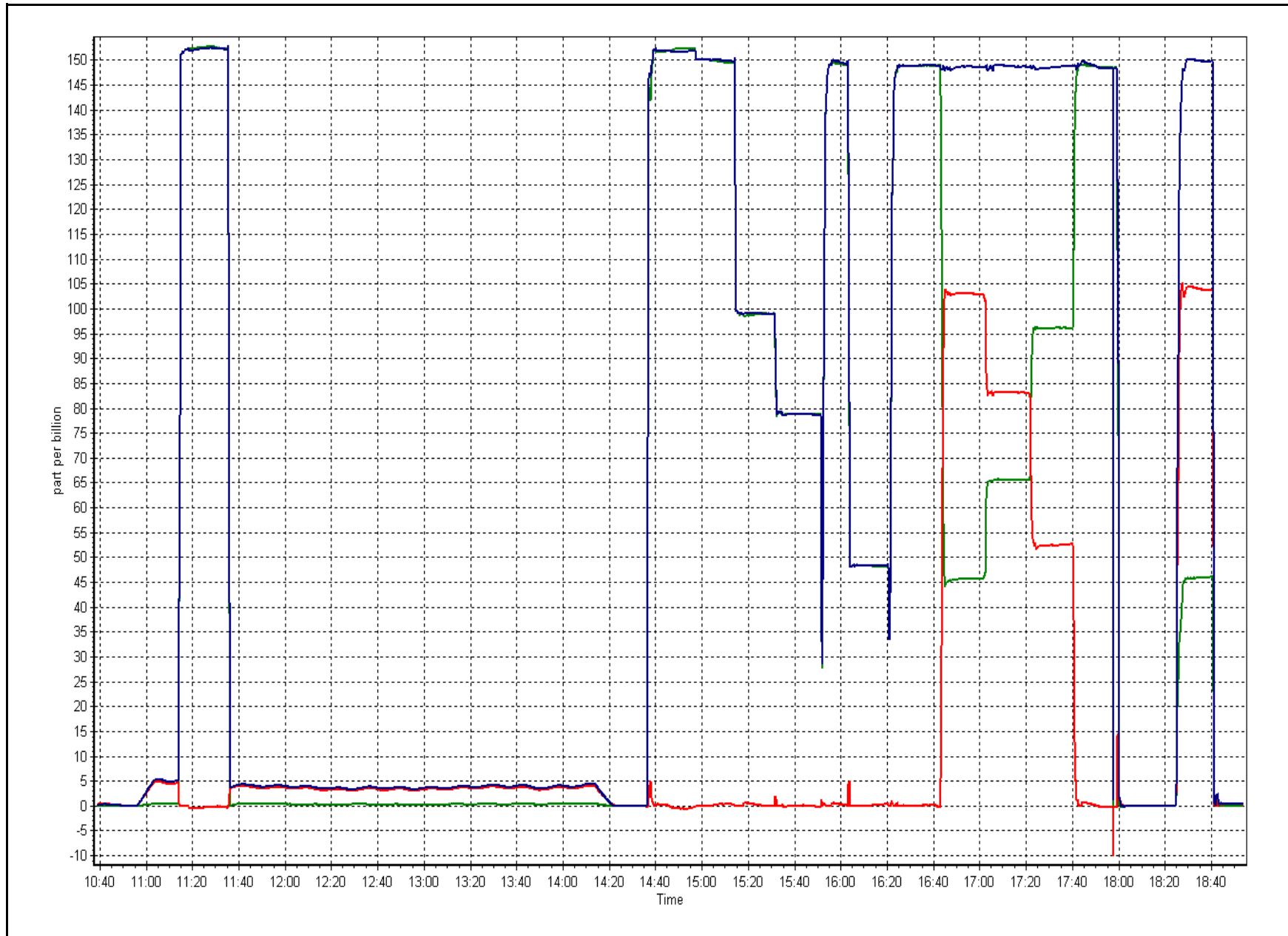
Calibration Date	June 14, 2016	Previous Calibration	May 16, 2016
Station Number	Fort Chipewyan	Station Number	AMS 8
Start Time (MST)	10:40	End Time (MST)	18:55
Analyzer make	Teledyne API T200u	Analyzer serial #	172

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999997
103.2	103.0	1.0018		
83.3	83.2	1.0014	Slope	1.001742
52.7	52.5	1.0046		
			Intercept	0.028589

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION

Calibration Date:	<u>June 15, 2016</u>	Previous Calibration:	<u>April 6, 2016</u>
Station Name:	<u>Fort Chipewyan</u>	Station Number:	<u>AMS 8</u>
Start Time (MST):	<u>8:25</u>	End Time (MST):	<u>9:45</u>
Calibrator Make/Model:	<u>Delta Cal</u>	Calibrator Serial Number:	<u>141228</u>

SHARP INFORMATION

Particulate Fraction:	<u>PM2.5</u>
Make/Model:	<u>Thermo / SHARP 5030</u>
Serial Number	<u>E-2025</u>
C ₁₄ Source SN:	<u>7414</u>
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	16.0	16.3	0.3	16.0
T2	26.0	na	na	26.0
T3	25.0	na	na	25.0
T4	29.0	na	na	29.0
RH (%)	49.0	na	na	49.0

Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	963	965.3	2.3	963

Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1001	1	1001	1000

Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	202		202
Neph	0.3		0.3
C14	-4.1		-4.1
Indicated Concentration (ug/m3)	0.3	no	0.3
Offset 1	201.3		201.3
Offset 2	32.9		32.9

Leak Check (Quarterly)

Leak Check Date: _____ Previous Leak Check Date: March 10, 2016

Measured

Difference LPM (Limit +/- 0.42 LPM)

Flow without adaptor (LPM): _____
 *Flow with adaptor (LPM): _____
 *Note - do not attach adaptor without shutting off the pump first

0.00

Mass Foil Calibration (Annually)

Foil Calibration Date:	Previous Foil Calibration:
Zeroed?:	<u>April 5, 2016</u>
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	15/06/2016
Pump	Good	NA
Filter Tape	Good	NA
Mass Foil Cal Set	Good	05/04/2016
HEPA filter	Good	15/06/2016

NOTES:

Nephelometer zero checked. T1 and P3 checked. Flow is good.

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION

Calibration Date:	<u>June 21, 2016</u>	Previous Calibration:	<u>June 15, 2016</u>
Station Name:	<u>Fort Chipewyan</u>	Station Number:	<u>AMS 8</u>
Start Time (MST):	<u>8:30</u>	End Time (MST):	<u>9:30</u>
Calibrator Make/Model:	<u>Delta Cal</u>	Calibrator Serial Number:	<u>141228</u>

SHARP INFORMATION

Particulate Fraction:	<u>PM2.5</u>
Make/Model:	<u>Thermo / SHARP 5030</u>
Serial Number	<u>E-2025</u>
C ₁₄ Source SN:	<u>7414</u>
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	18.0	17.5	-0.5	NA
T2	25.0	na	na	NA
T3	25.0	na	na	NA
T4	24.0	na	na	NA
RH (%)	38.0	na	na	NA

Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	978	979.9	1.9	NA

Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	997	-3	NA	NA

Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	2043		NA
Neph	19050		NA
C14	54.3		NA
Indicated Concentration (ug/m3)	41927	NA	NA
Offset 1	201.3		NA
Offset 2	32.9		NA

Leak Check (Quarterly)

Leak Check Date: _____ Previous Leak Check Date: March 10, 2016

Measured

Difference LPM (Limit +/- 0.42 LPM)

Flow without adaptor (LPM): _____
 *Flow with adaptor (LPM): _____ Difference: 0.00

**Note - do not attach adaptor without shutting off the pump first*

Mass Foil Calibration (Annually)

Foil Calibration Date:	Previous Foil Calibration:	<u>April 5, 2016</u>
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/Clean	15/06/2016
Pump	Good	NA
Filter Tape	Good	NA
Mass Foil Cal Set	Good	05/04/2016
HEPA filter	Good	15/06/2016

NOTES:

Temperature, pressure and flow checked, no issues. Hepa filter made no difference to high reading. SHARP removed and taken apart on bench for inspection. No dirt or anything found in Nephelometer chamber. Beta attenuation chamber assembly taken apart. Lots of thick black pieces of dirt found on top of filter tape. Also a spider was found directly on the sample spot. Analyzer taken back to the FOC for a more thorough cleaning and inspection.

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION

Calibration Date:	<u>June 21, 2016</u>	Previous Calibration:	NA
Station Name:	<u>Fort Chipewyan</u>	Station Number:	<u>AMS 8</u>
Start Time (MST):	<u>9:30</u>	End Time (MST):	<u>13:10</u>
Calibrator Make/Model:	<u>Delta Cal</u>	Calibrator Serial Number:	<u>141228</u>

SHARP INFORMATION

Particulate Fraction:		<u>PM2.5</u>	
Make/Model:		<u>Thermo / SHARP 5030</u>	
Serial Number		<u>CM-2383</u>	
C ₁₄ Source SN:		<u>10384</u>	
Confirmation of Time settings:		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Paremters 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 checked="" type="checkbox"/>	Neph <input checked="" type="checkbox"/>

CALIBRATION DATA

Temperature (°C)

Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	18.0	17.5	-0.5	18.0
T2	23.0	na	na	23.0
T3	20.0	na	na	20.0
T4	28.0	na	na	28.0
RH (%)	54.0	na	na	54.0

Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	980	979.9	-0.1	980

Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1003	3	1003	1000

Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	NA		141
Neph	NA		-0.5
C14	NA		20.5
Indicated Concentration (ug/m3)	NA	NA	-0.5
Offset 1	NA		141.6
Offset 2	NA		26.8

Leak Check (Quarterly)

Leak Check Date:	<u>June 21, 2016</u>	Previous Leak Check Date:	NA
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	Measured	Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.72	
*Flow with adaptor (LPM):	16.65	0.07

*Note - do not attach adaptor without shutting off the pump first

Mass Foil Calibration (Annually)

Foil Calibration Date:	<u>June 21, 2016</u>	Previous Foil Calibration:	NA
Zeroed?:	<u>yes</u>		
Foil Mass:	<u>1324</u>		<u>Mass foil set S/N:5868</u>
Previous Correction Factor:	<u>7042</u>		
New Correction Factor:	<u>7056</u>		

INSPECTION DATA

Item	Condition	Date of install or rebuild
Cyclone	Good/Cleaned	21/06/2016
Pump	Good	NA
Filter Tape	Good	NA
Mass Foil Cal Set	Good	21/06/2016
HEPA filter	Good	21/06/2016

NOTES:

Installation calibration. Temperature, pressure and flow checked. Flow adjusted to 1000 lph. Leak check completed. Mass foil calibration completed. Nephelometer zeroed.

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
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)
 JUNE 2016

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	674	34	46	98.33	2	0	0	0
THC(ppm) Average	675	33	45	98.33	5.3	-	2.6	-
Temperature (C) Average	720	0	0	100.00	30.6	-	22.5	-
Relative Humidity (%) Average	720	0	0	100.00	99	-	91	-
Wind Speed 10 m (km/h) Average	720	0	0	100.00	24	-	12	-
Wind Direction 10 m (deg) Average	720	0	0	100.00	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile							
					Min	P10	Q1	Median	Q3	P90	Max	
TRS(ppb) Average	674	0.2	0	-	0	0	0	0	0	0	0	2
THC(ppm) Average	675	2.23	0.3	-	2	2	2.1	2.1	2.3	2.5	5.3	
Temperature (C) Average	720	17.47	5.6	-	4.5	10.7	13.1	16.9	21.7	25.1	30.6	
Relative Humidity (%) Average	720	63.5	23	-	19	32	44	63	85	95	99	
Wind Speed 10 m (km/h) Average	720	6.1	4	-	0	2	3	5	8	12	24	
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-	

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BARGE LANDING (AMS 9)
JUNE 2016

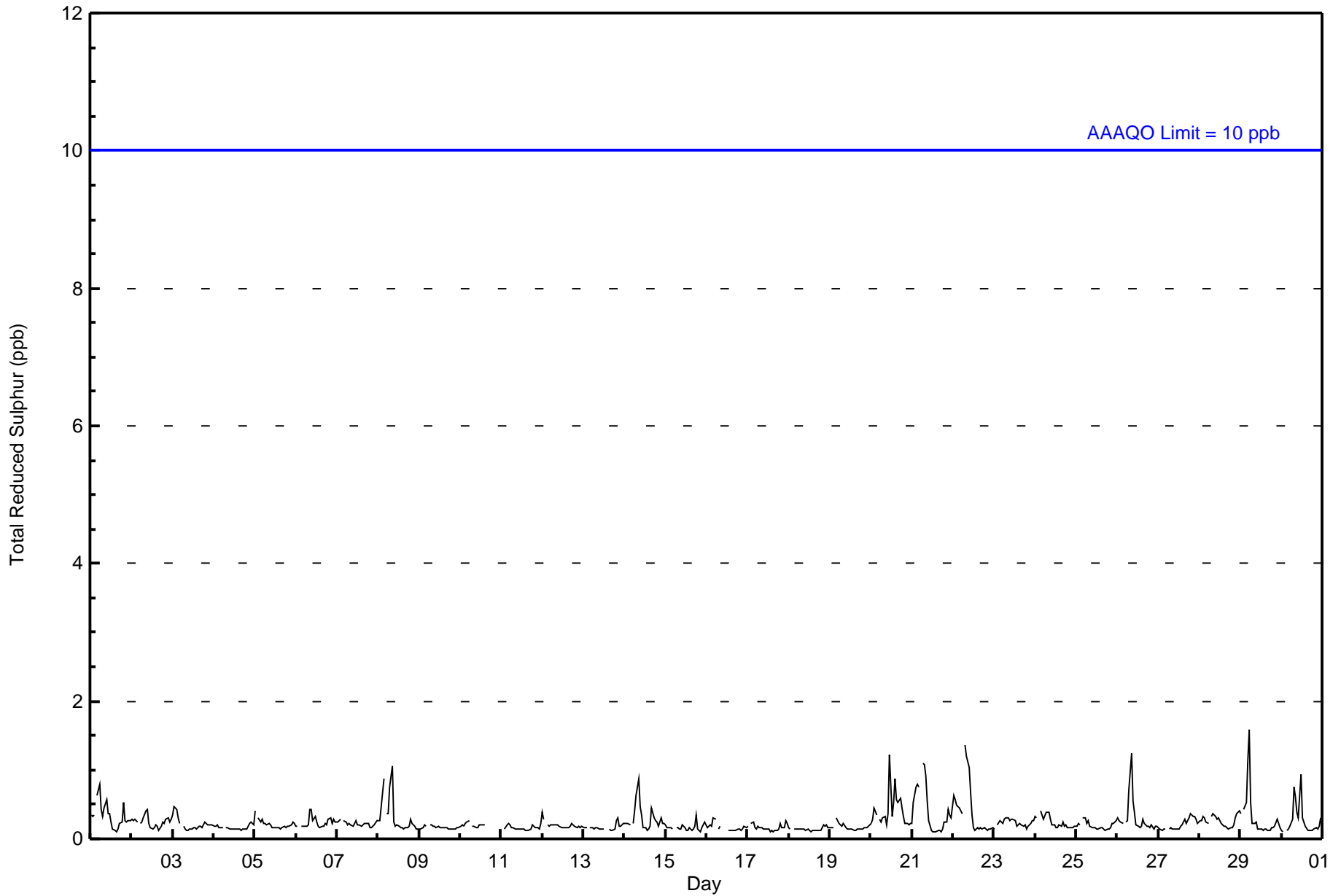
OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
TRS	10 Jun 2016 16:00	11 Jun 2016 01:00	10	Station power failure
TRS	13 Jun 2016 14:00	13 Jun 2016 15:00	2	Maintenance - sample manifold cleaned
THC	10 Jun 2016 16:00	11 Jun 2016 02:00	11	Station power failure
THC	16 Jun 2016 11:00	16 Jun 2016 11:00	1	Maintenance - Zero air generator serviced



Wood Buffalo Environmental Association
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Barge Landing - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Barge Landing - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	674	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: 674

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Barge Landing - June 2016**

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	49	38	32	18	22	52	51	46	50	57	67	40	29	38	50	674
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
Totals	35	49	38	32	18	22	52	51	46	50	57	67	40	29	38	50	674

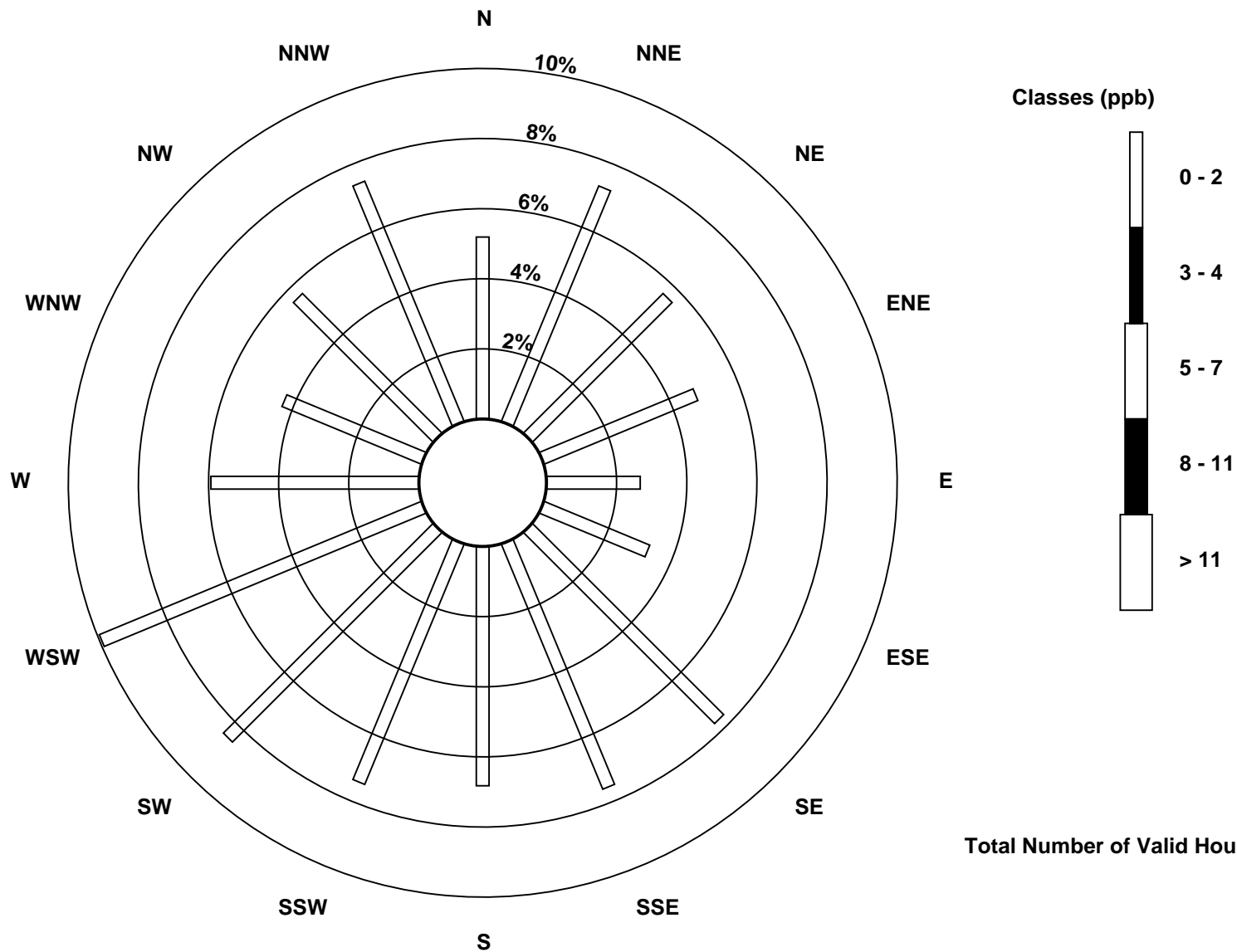
Total Number of Valid Hours: 674

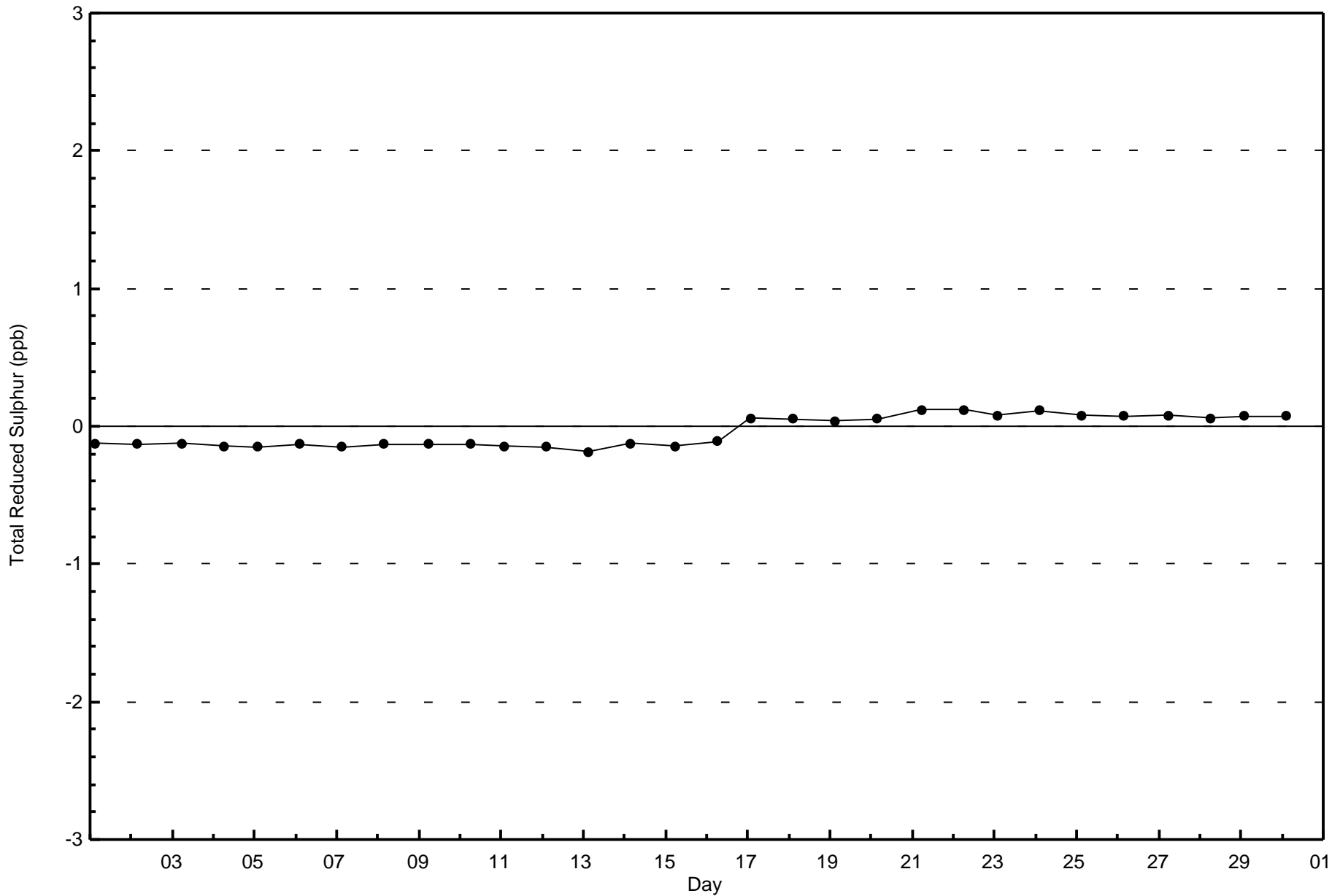
Total Number of Hours: 720

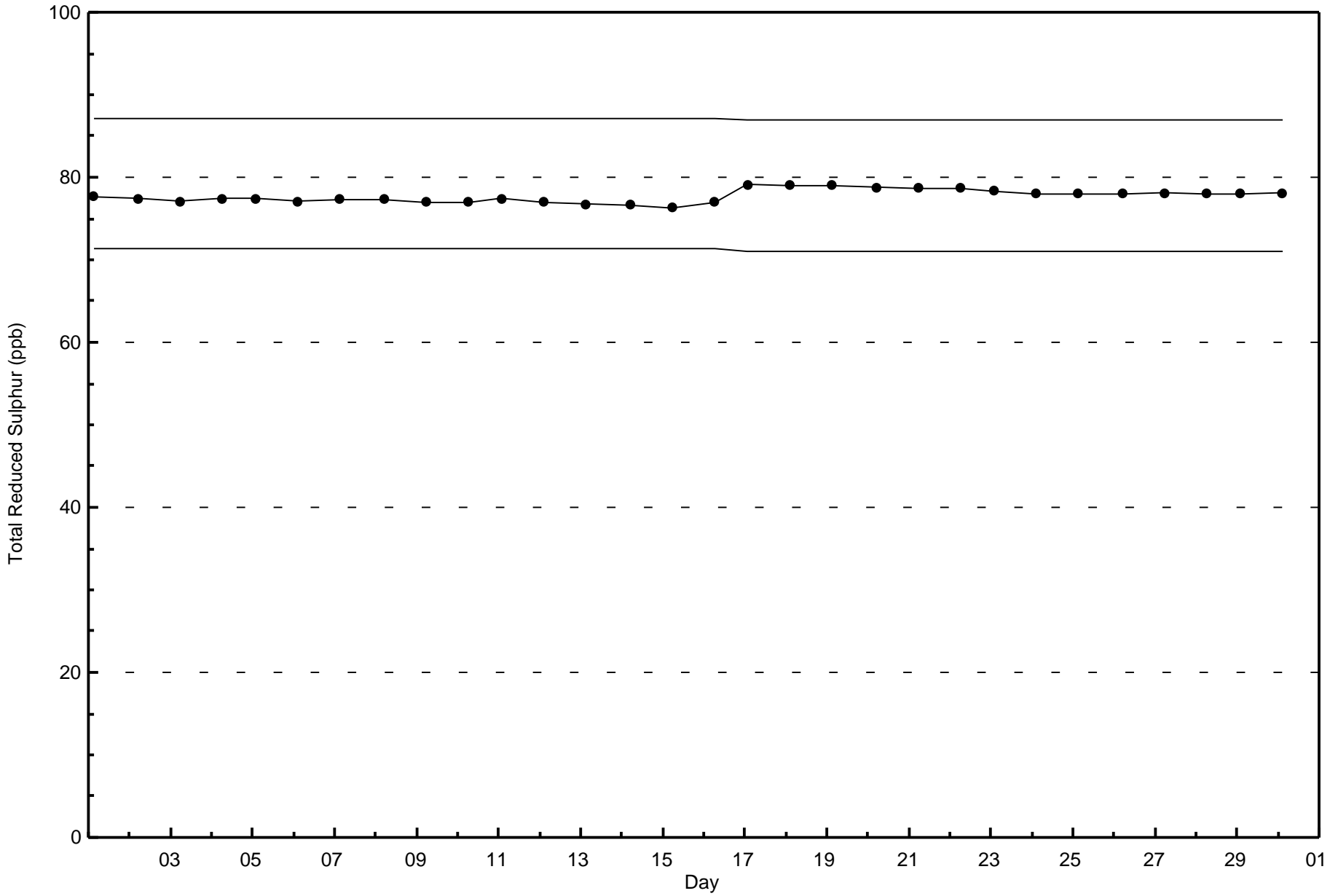


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Total Reduced Sulphur (TRS) - ppb
Barge Landing (AMS 9)









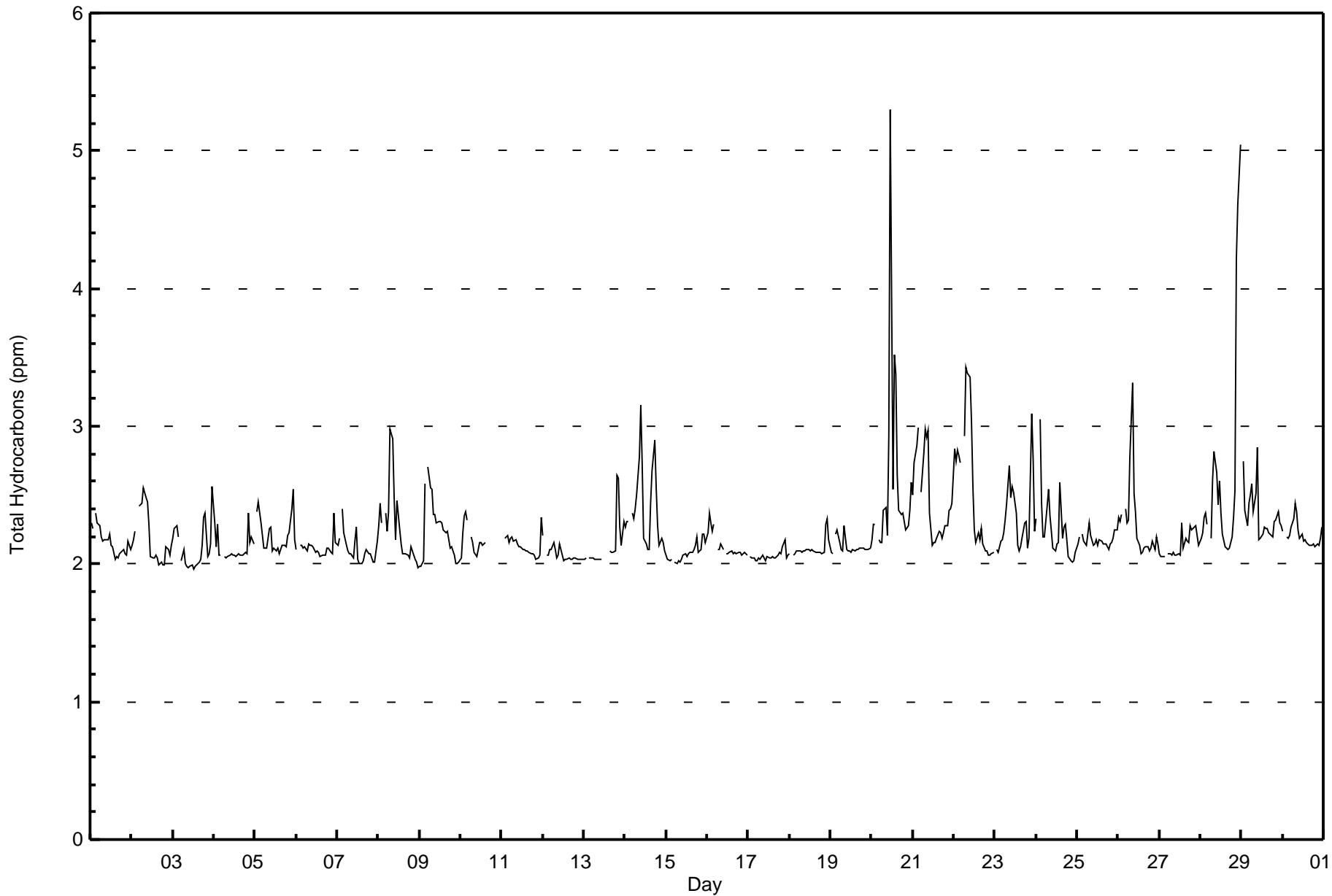
Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

Barge Landing - June 2016

Maximum Value: 5.3 ppm on Jun 20 12:00		Maximum Daily Average: 2.6 ppm on Jun 28		Hours in Service: 720																						
Minimum Value: 2.0 ppm on Jun 3 13:00		Minimum Daily Average: 2.1 ppm on Jun 17		Hours of Data: 675																						
Maximum Diurnal Average: 2.4 ppm at hour 9		Minimum Diurnal Average: 2.1 ppm at hour 16		Hours of Missing Data: 45																						
Monthly Average: 2.23 ppm		Percentiles: P ₁ = 2.0 P ₁₀ = 2.0 Q ₁ = 2.1 Median = 2.1 Q ₃ = 2.3 P ₉₀ = 2.5 P ₉₉ = 3.4		Hours of Calibration: 33																						
				Percent Operational Time: 98.3																						
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-Jun	2.3	2.3	Z	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.4
2-Jun	2.1	2.2	2.2	Z	2.4	2.4	2.4	2.6	2.5	2.5	2.3	2.1	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.6
3-Jun	2.2	2.3	2.3	2.2	Z	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.3	2.4	2.1	2.1	2.1	2.1	2.6	
4-Jun	2.3	2.1	2.3	2.1	2.1	Z	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	2.4	2.2	2.2	2.1	2.4	
5-Jun	Z	2.4	2.4	2.3	2.2	2.1	2.1	2.1	2.3	2.3	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.4	2.5	2.2	
6-Jun	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	2.1	2.1	2.1	2.1	2.4	2.2	2.4	
7-Jun	2.1	2.2	Z	2.4	2.2	2.1	2.1	2.1	2.1	2.0	2.2	2.3	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.2	2.4	
8-Jun	2.3	2.4	2.3	Z	2.4	2.2	2.4	3.0	2.9	2.5	2.2	2.5	2.3	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.0	3.0	
9-Jun	2.0	2.0	2.0	2.6	Z	2.7	2.5	2.5	2.4	2.4	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.0	2.0	2.0	2.7	
10-Jun	2.0	2.2	2.4	2.4	2.3	Z	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.1	2.2	PF	PF	PF	PF	PF	PF	PF	PF	PF	2.4	
11-Jun	PF	PF	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	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.3	2.3	
12-Jun	2.2	Z	2.1	2.1	2.1	2.1	2.2	2.1	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	2.2	
13-Jun	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	C	C	C	C	2.1	2.1	2.1	2.1	2.1	2.6	2.6	2.3	2.1	2.3	2.6	
14-Jun	2.3	2.3	2.3	Z	2.4	2.3	2.4	2.5	2.8	3.1	2.7	2.2	2.2	2.1	2.1	2.4	2.7	2.9	2.6	2.3	2.1	2.2	2.2	2.1	3.1	
15-Jun	2.1	2.0	2.0	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	2.1	2.1	2.2	2.1	2.1	2.2	2.2	2.2	
16-Jun	2.2	2.4	2.3	2.2	2.3	Z	2.1	2.1	2.1	2.1	M	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	2.4	
17-Jun	Z	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.0	2.1	2.2	
18-Jun	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	2.1	2.1	2.1	2.3	2.3	2.2	2.3	
19-Jun	2.1	2.1	Z	2.2	2.2	2.2	2.1	2.1	2.3	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	2.3	
20-Jun	2.2	2.3	2.3	Z	2.2	2.2	2.2	2.4	2.4	2.2	2.9	5.3	2.5	3.5	3.4	2.6	2.4	2.4	2.4	2.3	2.2	2.3	2.4	2.6	5.3	
21-Jun	2.5	2.7	2.9	3.0	Z	2.5	2.8	3.0	2.9	3.0	2.4	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.4	2.4	3.0	
22-Jun	2.8	2.7	2.8	2.8	2.7	Z	2.9	3.4	3.4	3.4	3.0	2.6	2.2	2.2	2.2	2.2	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	3.4	
23-Jun	Z	2.1	2.1	2.2	2.2	2.2	2.3	2.4	2.7	2.5	2.6	2.5	2.4	2.1	2.1	2.2	2.3	2.3	2.3	2.1	2.2	3.1	2.8	2.2	3.1	
24-Jun	2.3	Z	3.0	2.4	2.2	2.2	2.4	2.5	2.3	2.2	2.1	2.1	2.1	2.2	2.6	2.2	2.3	2.3	2.2	2.1	2.0	2.0	2.0	2.1	3.0	
25-Jun	2.1	2.2	Z	2.2	2.2	2.1	2.2	2.3	2.2	2.1	2.1	2.2	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.2	2.3	2.2	2.3	
26-Jun	2.3	2.3	2.4	Z	2.4	2.3	2.3	2.8	3.3	2.5	2.4	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.1	3.3	
27-Jun	2.1	2.1	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.1	2.2	2.2	2.2	2.3	2.2	2.3	2.3	2.2	2.1	2.3	
28-Jun	2.2	2.2	2.3	2.4	2.3	Z	2.2	2.6	2.8	2.7	2.4	2.6	2.4	2.2	2.1	2.1	2.1	2.1	2.2	2.3	2.5	4.2	4.6	5.0	5.0	
29-Jun	Z	2.7	2.4	2.3	2.4	2.5	2.6	2.4	2.5	2.9	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.3	2.4	2.3	2.3	2.9	
30-Jun	2.2	Z	2.2	2.2	2.2	2.3	2.3	2.4	2.4	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.4	
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance PF - Power Failure																										





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Barge Landing - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	90	13.33	13.33
2.1 - 3.0	573	84.89	98.22
3.1 - 10.0	12	1.78	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 675

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Barge Landing - June 2016**

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	0	0	3	4	3	10	2	2	4	10	18	6	6	9	9	90
2.1 - 3.0	32	47	35	29	13	19	43	47	45	45	43	49	35	24	28	39	573
3.1 - 10.0	1	1	3	0	0	0	0	1	3	2	1	0	0	0	0	0	12
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	37	48	38	32	17	22	53	50	50	51	54	67	41	30	37	48	675

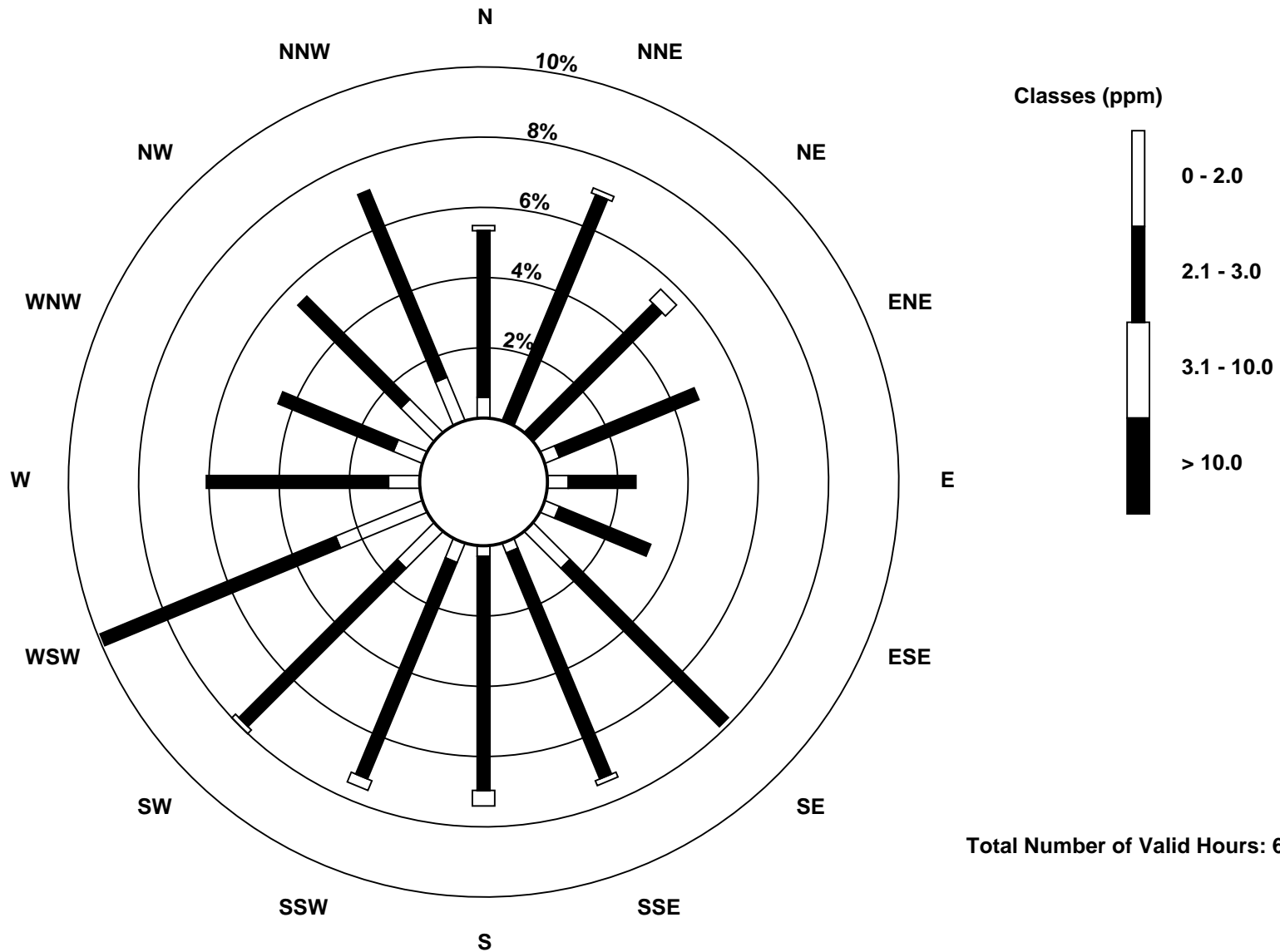
Total Number of Valid Hours: 675

Total Number of Hours: 720

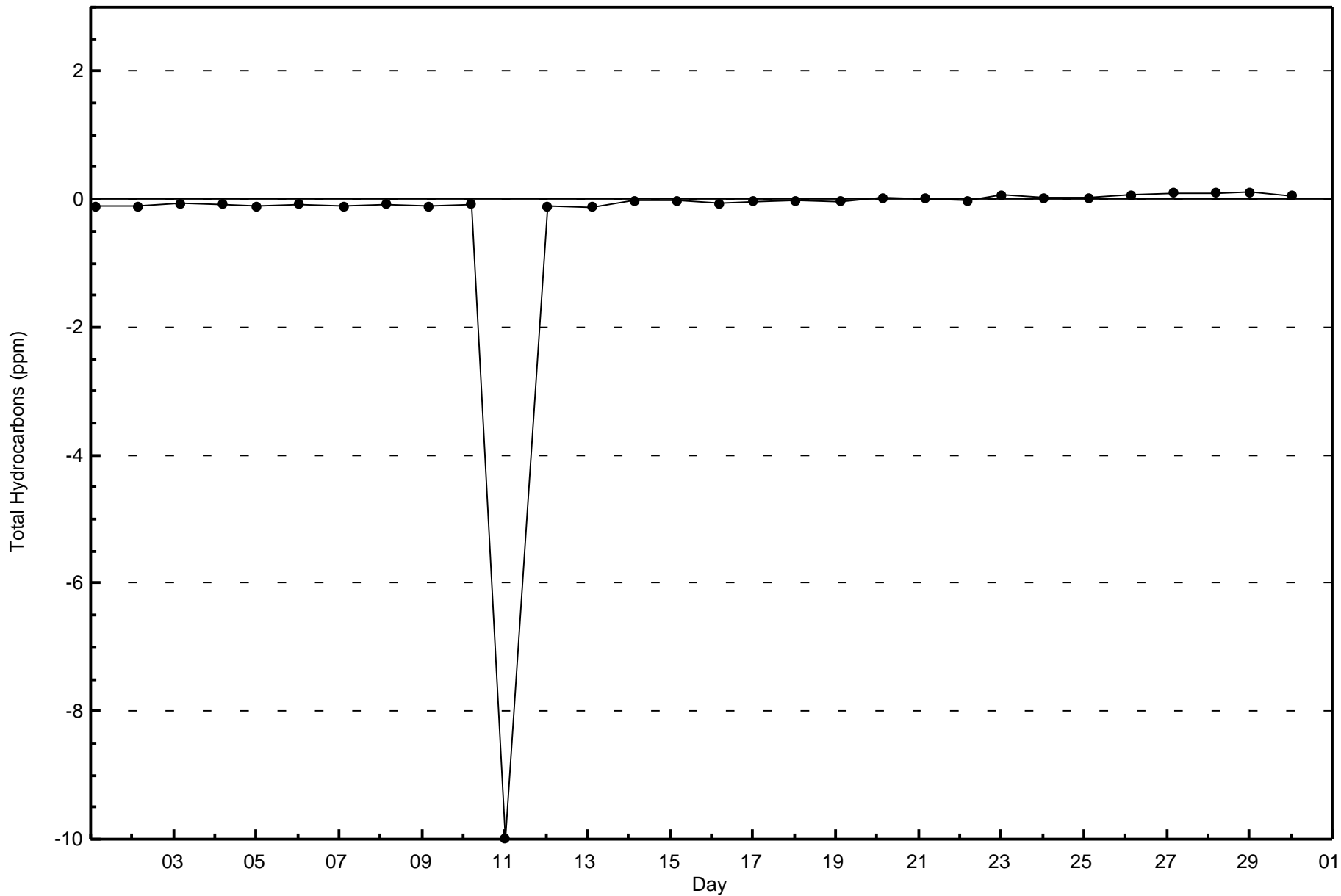


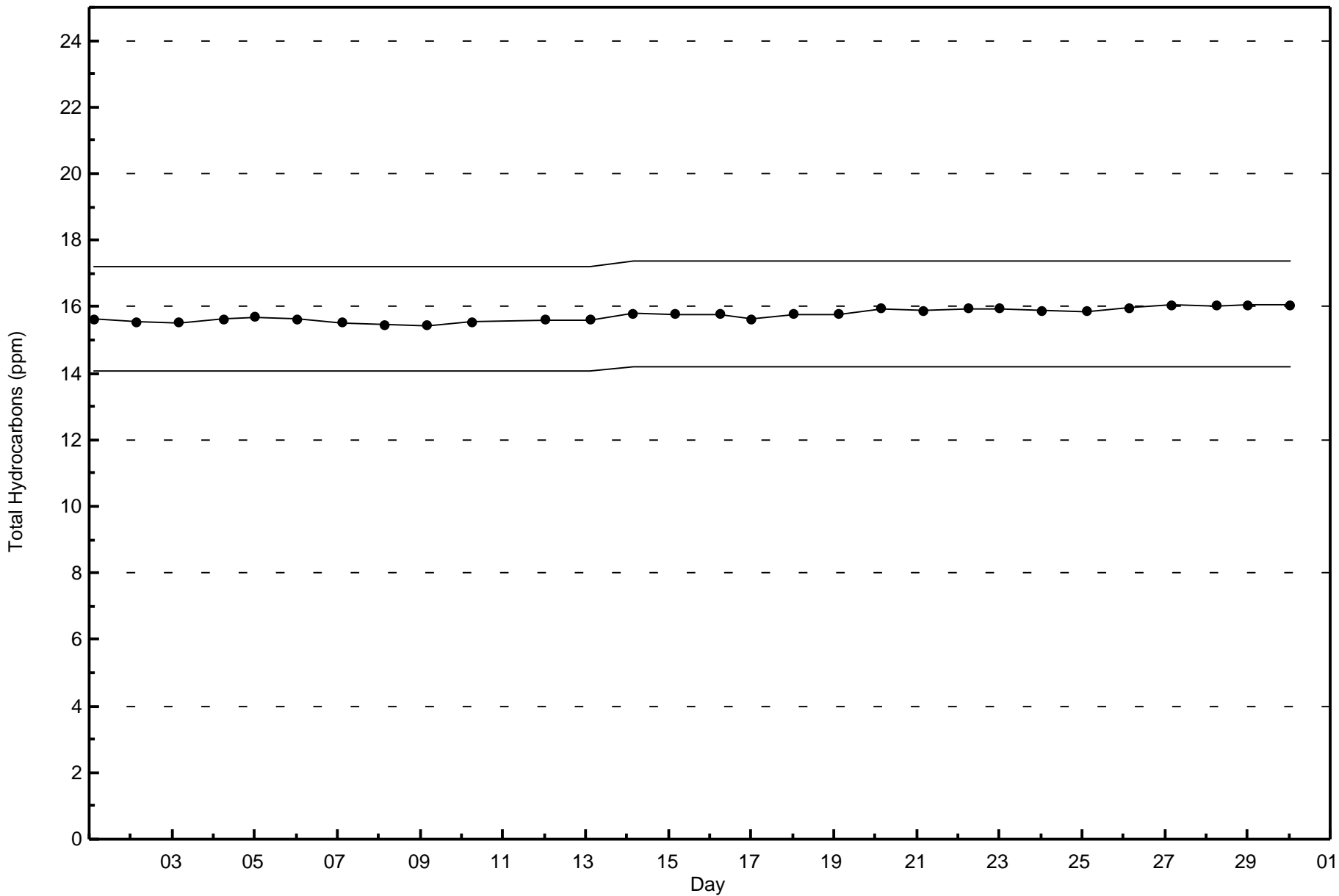
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Total Hydrocarbons (THC) - ppm
Barge Landing (AMS 9)



Total Number of Valid Hours: 675



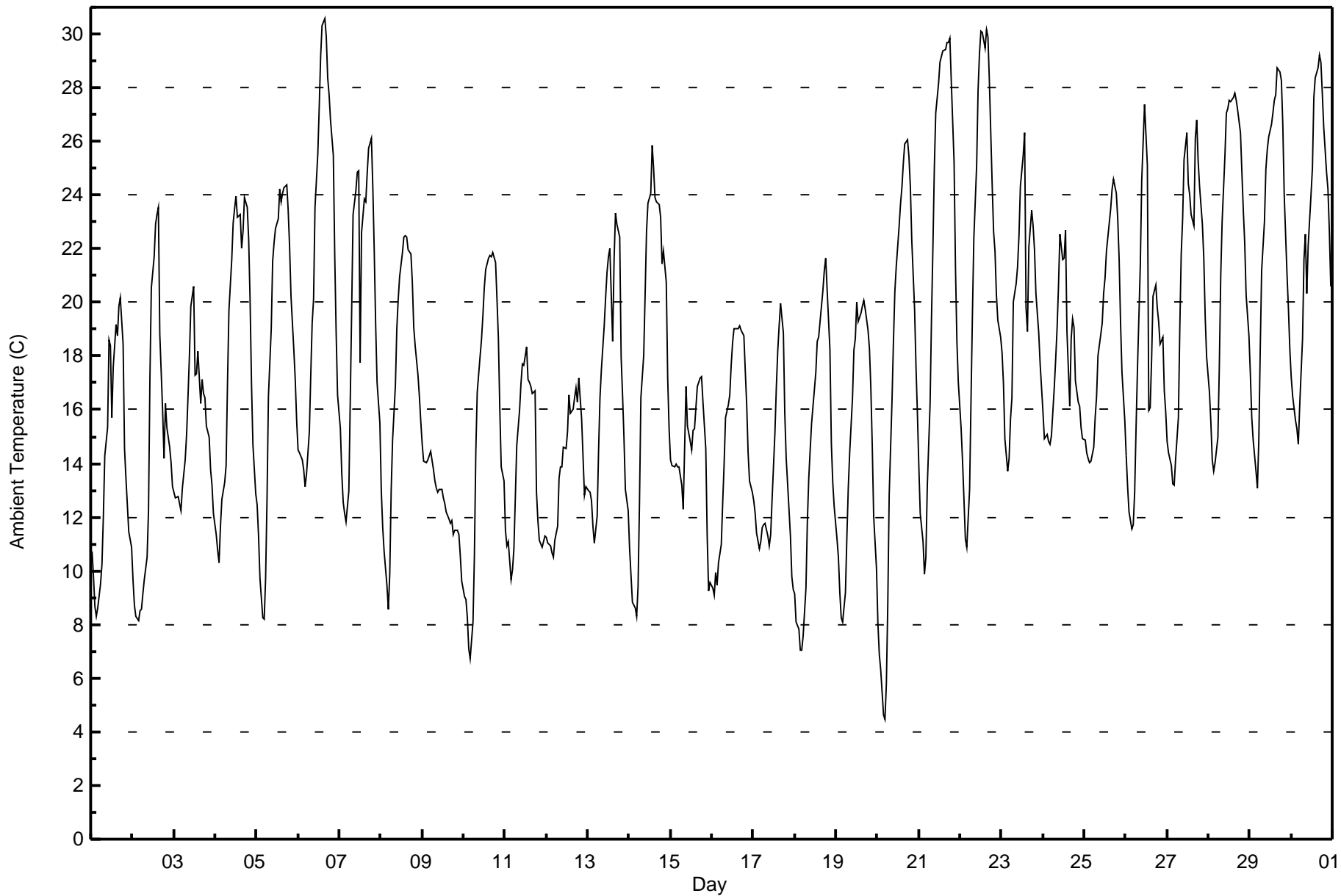




Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Barge Landing - June 2016

Maximum Value: 30.6 C on Jun 6 16:00		Maximum Daily Average: 22.5 C on Jun 30		Hours in Service: 720																						
Minimum Value: 4.5 C on Jun 20 05:00		Minimum Daily Average: 12.7 C on Jun 9		Hours of Data: 720																						
Maximum Diurnal Average: 22.4 C at hour 17		Minimum Diurnal Average: 11.0 C at hour 5		Hours of Missing Data: 0																						
Monthly Average: 17.47 C		Percentiles: P ₁ = 7.0 P ₁₀ = 10.7 Q ₁ = 13.1 Median = 16.9 O ₃ = 21.7 P ₉₀ = 25.1 P ₉₉ = 29.9		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-Jun	10.7	9.8	8.7	8.3	8.6	9.5	10.2	12.0	14.3	15.3	18.6	18.4	15.7	17.6	19.2	18.7	19.9	20.2	18.4	14.5	13.5	12.4	11.4	10.9	14.0	20.2
2-Jun	9.7	8.7	8.3	8.1	8.5	8.6	9.1	9.6	10.5	12.2	17.2	20.5	21.7	22.9	23.3	23.5	18.8	16.0	14.2	16.3	15.3	14.6	14.0	13.1	14.4	23.5
3-Jun	12.9	12.7	12.8	12.5	12.2	13.1	14.2	15.1	16.5	18.0	19.9	20.6	17.3	17.3	18.2	16.2	17.1	16.6	16.4	15.4	15.0	13.8	13.2	12.1	15.4	20.6
4-Jun	11.3	10.8	10.3	11.7	12.7	13.3	13.9	17.0	19.7	21.6	23.0	23.5	23.9	23.2	23.3	22.0	22.6	23.9	23.5	22.3	20.1	17.0	14.7	12.9	18.3	23.9
5-Jun	12.5	11.3	9.7	8.3	8.2	9.7	12.7	16.5	19.0	21.5	22.2	22.8	23.1	24.2	23.8	24.0	24.3	24.4	23.4	22.1	20.3	18.2	17.1	15.6	18.1	24.4
6-Jun	14.5	14.4	14.1	13.8	13.1	13.6	15.2	17.3	19.2	20.1	23.5	25.6	27.3	29.2	30.3	30.6	29.9	28.4	27.7	26.8	25.5	21.8	18.9	16.5	21.6	30.6
7-Jun	15.3	13.6	12.6	12.1	11.8	13.0	16.4	19.7	23.3	24.2	24.9	24.9	17.8	22.6	23.9	23.8	24.8	25.7	26.1	24.3	21.9	19.2	17.0	15.5	19.8	26.1
8-Jun	13.0	11.6	10.7	9.4	8.6	9.9	13.0	14.9	16.9	19.0	20.1	20.9	21.9	22.4	22.5	22.4	22.0	21.8	20.8	19.1	18.4	17.3	16.5	15.6	17.0	22.5
9-Jun	14.7	14.1	14.0	14.1	14.3	14.4	13.8	13.3	13.1	12.9	13.0	13.0	12.7	12.5	12.2	11.9	11.8	11.9	11.3	11.5	11.5	11.4	10.6	9.6	12.7	14.7
10-Jun	9.1	8.9	8.3	7.1	6.7	8.1	10.6	14.4	16.6	18.0	18.6	19.5	20.6	21.2	21.6	21.8	21.7	21.9	21.5	20.1	18.7	16.0	13.9	13.4	15.8	21.9
11-Jun	11.5	10.9	11.1	9.7	10.0	10.8	12.7	14.7	16.0	17.0	17.7	17.6	18.3	17.1	17.0	16.9	16.6	16.7	12.9	11.9	11.2	10.9	11.1	11.3	13.8	18.3
12-Jun	11.2	11.1	10.9	10.7	10.5	11.1	11.7	13.4	13.9	13.9	14.6	14.5	15.2	16.6	15.9	16.0	16.5	16.8	16.3	17.2	15.6	14.2	12.8	13.1	13.9	17.2
13-Jun	13.0	12.9	12.6	11.7	11.0	12.1	14.4	16.4	17.5	19.1	20.2	21.1	21.7	22.0	18.6	21.6	23.4	22.9	22.4	18.0	16.6	15.0	13.0	12.3	17.1	23.4
14-Jun	10.8	9.8	8.8	8.6	8.3	9.4	12.5	16.5	18.0	20.3	22.6	23.7	24.1	25.8	25.0	23.9	23.7	23.6	23.2	21.4	21.9	20.7	17.2	15.3	18.1	25.8
15-Jun	14.1	13.9	13.9	14.0	13.9	13.8	13.2	12.3	14.6	16.9	15.4	14.8	14.5	15.2	15.3	16.9	17.0	17.2	17.2	16.3	14.5	11.3	9.2	9.5	14.4	17.2
16-Jun	9.4	9.1	9.9	9.5	10.3	11.0	12.5	14.0	15.7	16.2	16.6	17.6	18.5	19.0	19.0	19.0	19.2	19.0	18.8	17.4	16.2	14.4	13.4	12.9	14.9	19.2
17-Jun	12.6	12.1	11.4	10.8	11.1	11.6	11.7	11.8	11.3	10.9	11.3	12.6	15.1	16.8	18.2	19.1	20.0	18.9	15.9	14.2	13.2	11.3	9.8	9.3	13.4	20.0
18-Jun	9.1	8.1	7.8	7.0	7.0	7.5	9.3	11.8	13.4	14.5	15.5	16.8	17.4	18.5	18.7	19.8	20.4	21.2	21.7	20.5	18.2	14.8	13.3	12.4	14.4	21.7
19-Jun	11.2	10.5	9.2	8.2	8.1	9.2	11.2	13.1	14.4	16.4	18.2	18.6	20.0	19.3	19.6	19.9	20.1	19.8	19.0	18.3	16.8	14.7	12.1	10.1	14.9	20.1
20-Jun	8.0	6.9	6.3	4.6	4.5	5.8	8.7	12.8	16.3	18.5	20.4	21.4	22.8	23.7	24.3	25.2	25.9	26.0	25.4	24.3	22.3	19.7	17.6	15.9	17.0	26.0
21-Jun	13.9	12.1	11.1	9.9	10.5	13.1	16.2	19.4	22.1	25.0	27.1	28.2	29.0	29.2	29.4	29.4	29.7	29.7	29.8	28.3	25.2	21.3	18.6	17.0	21.9	29.8
22-Jun	15.3	14.1	12.7	11.2	10.9	13.0	16.3	19.6	22.4	25.1	27.9	29.3	30.1	30.1	29.5	30.2	29.9	28.3	24.4	22.6	21.9	20.3	19.3	18.7	21.8	30.2
23-Jun	18.1	17.0	14.9	13.7	14.2	15.7	16.4	20.0	20.7	21.3	22.5	24.3	25.5	26.3	19.8	18.9	22.1	23.4	22.9	22.0	20.3	18.9	17.7	16.8	19.7	26.3
24-Jun	15.9	14.9	15.1	14.8	14.7	15.0	16.8	17.9	19.0	20.6	22.6	21.6	21.6	22.7	18.9	16.1	18.7	19.4	19.1	17.1	16.3	16.1	15.3	14.9	17.7	22.7
25-Jun	14.8	14.4	14.2	14.0	14.1	14.6	15.7	16.5	18.0	18.8	19.3	20.4	20.9	21.9	23.0	23.5	24.2	24.6	24.1	23.1	21.6	19.2	17.4	15.6	18.9	24.6
26-Jun	14.3	13.1	12.2	11.6	11.7	13.0	15.3	17.6	21.4	24.5	26.0	27.4	25.1	16.0	16.1	17.9	20.2	20.7	19.8	19.3	18.5	18.7	16.7	15.9	18.0	27.4
27-Jun	14.8	14.4	13.9	13.2	13.2	14.2	15.7	19.1	21.8	23.1	25.3	26.3	24.4	24.0	23.3	22.9	26.1	26.8	25.3	24.3	22.9	21.6	19.4	17.9	20.6	26.8
28-Jun	16.7	15.5	14.1	13.7	14.0	15.0	17.6	20.9	23.0	25.5	27.0	27.2	27.6	27.5	27.7	27.8	27.5	27.2	26.3	24.9	23.4	22.2	20.3	18.8	22.1	27.8
29-Jun	17.4	15.7	14.9	13.7	13.1	14.9	18.2	21.2	23.0	25.0	25.7	26.2	26.6	27.1	27.5	27.7	28.7	28.6	28.3	26.7	24.0	21.0	19.7	18.2	22.2	28.7
30-Jun	17.2	16.5	15.6	15.3	14.7	16.2	18.6	21.6	22.5	20.3	22.1	24.0	25.0	27.7	28.4	28.8	29.2	29.0	27.8	26.5	24.8	24.2	22.6	20.6	22.5	29.2
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Barge Landing - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	60	8.33	8.33
10 - 20	425	59.03	67.36
> 20	235	32.64	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

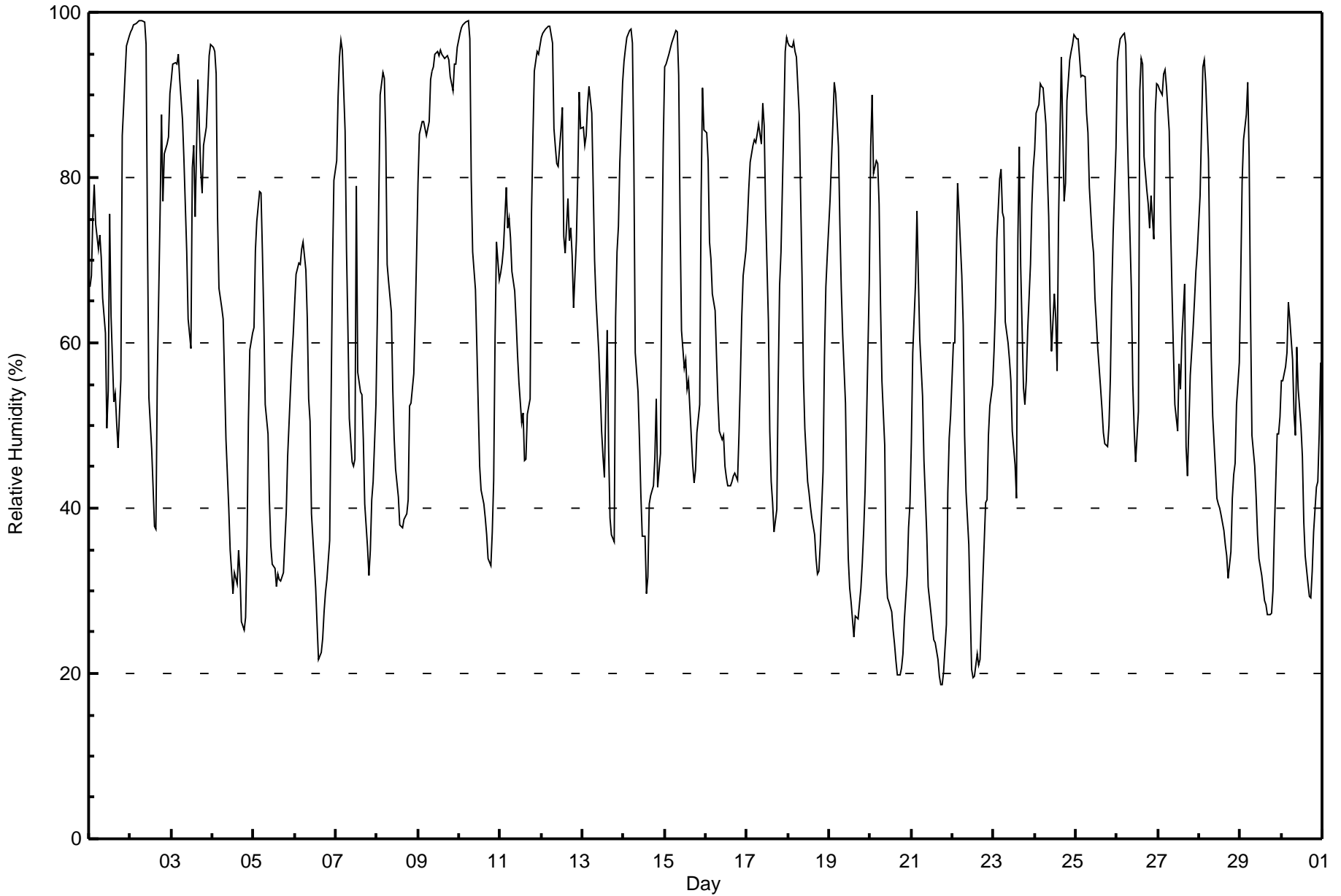
Barge Landing - June 2016

Maximum Value: 99 % on Jun 2 07:00 Maximum Daily Average: 91.4 % on Jun 9																		Hours in Service: 720 Hours of Data: 720								
Minimum Value: 19 % on Jun 21 19:00 Minimum Daily Average: 39.7 % on Jun 21 Maximum Diurnal Average: 86.7 % at hour 4 Minimum Diurnal Average: 44.9 % at hour 18 Monthly Average: 63.5 % Percentiles: P ₁ = 20 P ₁₀ = 32 Q ₁ = 44 Median = 63 Q ₃ = 85 P ₉₀ = 95 P ₉₉ = 99																		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-Jun	67	68	75	79	74	71	73	70	65	61	50	54	76	63	53	54	50	47	56	85	89	92	96	97	69.4	97
2-Jun	98	98	98	99	99	99	99	99	99	96	73	53	47	43	38	37	56	76	88	77	83	84	85	90	79.7	99
3-Jun	92	94	94	94	95	92	87	82	77	71	63	59	81	84	75	92	86	81	78	84	86	90	95	96	84.5	96
4-Jun	96	95	92	75	67	64	63	56	48	40	35	32	30	32	31	35	32	26	25	27	35	50	59	61	50.3	96
5-Jun	62	71	75	78	78	71	63	52	49	41	35	33	33	31	32	31	31	32	36	39	46	54	58	61	49.8	78
6-Jun	65	68	70	69	71	72	69	63	53	50	39	33	30	26	22	23	24	27	30	31	36	53	69	80	49.0	80
7-Jun	82	90	95	97	96	86	71	62	51	46	45	46	79	56	54	54	48	41	35	32	35	41	43	53	59.8	97
8-Jun	63	77	90	93	92	85	70	67	64	54	49	45	41	38	38	38	39	39	41	52	53	56	63	71	59.0	93
9-Jun	79	85	87	87	86	85	87	92	93	93	95	95	95	95	95	94	95	95	94	92	90	94	94	96	91.4	96
10-Jun	97	98	98	99	99	99	97	80	71	66	60	52	45	42	40	39	37	34	33	37	43	61	72	68	65.3	99
11-Jun	68	70	72	79	74	75	73	69	66	63	59	55	50	52	46	46	51	53	76	85	93	95	95	96	69.2	96
12-Jun	97	97	98	98	98	98	96	86	84	82	81	86	89	73	71	77	72	74	71	64	72	80	90	86	84.2	98
13-Jun	86	84	85	89	91	88	79	70	65	59	54	49	46	44	61	47	39	37	36	63	71	74	82	92	66.3	92
14-Jun	94	96	97	98	98	96	82	59	54	48	42	37	37	30	32	41	41	43	46	53	43	47	70	84	61.1	98
15-Jun	93	94	95	96	96	97	98	98	92	75	62	57	58	54	55	49	45	43	45	49	53	77	91	86	73.2	98
16-Jun	85	82	72	70	66	64	58	53	49	48	49	45	44	43	43	43	44	44	43	49	56	63	68	71	56.4	85
17-Jun	75	79	82	84	85	84	85	86	84	89	86	76	63	49	43	41	37	40	55	67	71	87	95	97	72.5	97
18-Jun	96	96	96	96	95	95	88	78	68	56	50	43	42	40	39	37	34	32	32	36	44	58	67	70	62.0	96
19-Jun	77	82	87	91	90	84	74	67	61	53	41	34	30	29	24	27	27	27	30	33	37	42	50	68	52.7	91
20-Jun	84	90	80	82	82	77	65	55	48	32	29	29	28	25	24	22	20	20	21	22	26	32	38	41	44.6	90
21-Jun	48	59	67	76	68	61	54	46	41	37	31	27	26	24	24	22	20	19	19	20	26	42	49	51	39.7	76
22-Jun	60	60	69	79	76	68	62	49	42	36	28	21	20	20	22	21	22	27	36	41	41	49	52	55	43.9	79
23-Jun	59	64	73	80	81	76	75	63	60	58	55	49	45	41	73	84	69	55	52	55	62	70	77	81	64.8	84
24-Jun	83	88	89	91	91	91	86	81	75	64	59	66	63	57	75	95	86	77	79	89	94	95	96	97	82.0	97
25-Jun	97	97	95	92	92	92	88	85	79	73	71	65	62	59	54	52	49	48	47	50	56	66	73	84	72.0	97
26-Jun	94	96	97	97	97	96	86	80	66	55	49	46	52	91	94	94	82	78	77	74	78	73	88	91	80.4	97
27-Jun	91	91	90	93	93	91	86	74	66	59	53	49	57	54	61	67	47	44	50	56	62	65	69	71	68.3	93
28-Jun	78	86	93	94	92	82	69	58	51	45	41	41	40	39	37	36	34	32	35	41	44	45	53	58	55.1	94
29-Jun	68	79	85	88	92	83	64	49	45	41	37	34	32	30	29	28	27	27	27	30	37	49	49	51	49.2	92
30-Jun	55	55	57	59	65	63	58	52	49	60	54	50	46	38	34	31	29	29	32	37	43	43	49	58	47.8	65
	79.7	83.0	85.1	86.7	85.9	82.8	76.8	69.3	63.9	58.3	52.5	48.8	49.5	46.7	47.3	48.5	45.8	44.9	47.5	52.4	56.8	64.3	71.1	75.3	Diurnal Average	
	98	98	98	99	99	99	99	99	99	96	95	95	95	95	95	95	95	95	94	92	94	95	96	97	Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Barge Landing - June 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Barge Landing - June 2016

Maximum Speed: 24 km/h on Jun 15 14:00	Maximum Daily Speed Average: 10.2 km/h on Jun 15	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 21 01:00	Minimum Daily Speed Average: 0.2 km/h on Jun 7	Hours of Data: 720
Maximum Diurnal Speed Average: 2.1 km/h at hour 6	Minimum Diurnal Speed Average: 0.4 km/h at hour 19	Hours of Missing Data: 0
Monthly Average Velocity: 1.0 km/h 219.3 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 3 Median = 5 O ₃ = 8 P ₉₀ = 12 P ₉₉ = 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-Jun	SSW4	SSE4	SSW2	SE3	SSE4	SE5	SSE4	SSE4	SW3	WSW4	SW5	SSW5	S6	SW7	SW10	SSW11	S12	SSE9	S7	NNW3	N4	NE1	N2	NNW2	SSW3.5	S12
2-Jun	WNW1	SE1	SE1	SSE2	W2	NW1	WSW3	NNW2	W2	NW3	NNW4	NW4	NNW4	WNW5	W5	WNW4	SW13	SSE7	SE9	WSW7	W4	W3	SE2	SSE5	WSW1.7	SW13
3-Jun	SW3	SSW2	SSW2	S1	SW3	S4	SW5	SW8	WSW9	SW7	SW8	SW3	NW3	NW3	NNW4	WSW1	WSW4	ENE3	NE4	ESE3	SE5	ESE0	NNE3	ESE3	SW1.9	WSW9
4-Jun	SSW4	SSW4	SSW3	WSW9	WSW13	W11	WNW8	WNW6	WNW10	WNW12	WNW11	NW12	NW14	WNW9	W10	NW10	WNW11	NW14	NW15	NW11	NNW5	NNW2	WSW3	WNW3	WNW7.5	NW15
5-Jun	NNW5	WNW3	W5	W2	WSW4	SW4	WSW4	SW1	NNE4	NNW6	NW10	NNW10	NNW8	N9	NNE7	N6	NNE6	NNE6	ENE6	E6	ENE5	E4	ESE5	SE5	N2.7	NW10
6-Jun	SE5	SSE5	SSE4	SSE5	SE3	SE2	SE3	S3	S8	S7	S10	S11	SSE12	SSE13	S13	SSE12	SSE11	SSE9	S13	SSE12	S14	ESE2	NNE4	ESE6	SSE7.2	S14
7-Jun	NW2	SW4	SW3	SW2	SW3	SSW3	SW3	WSW4	WNW3	N4	ENE4	E4	SSE10	ESE6	SSW7	SE3	ENE8	N4	NNW6	NNW8	NNW5	NNW3	NNW2	WNW2	WNW0.2	SSE10
8-Jun	WSW1	WNW2	NW3	NW2	SSW2	S2	WNW2	NNW3	N4	NE6	NE5	NNE5	NE6	ENE6	ENE5	ENE5	ENE5	E4	SE7	S7	ESE5	SE6	SE12	ESE8	E2.3	SE12
9-Jun	E6	E5	ENE5	NNE6	NNE10	NE9	NE11	NE12	NE14	NE16	NE15	NE14	NE16	NE15	NNE15	NE13	NNE10	NNE9	NE11	NNE8	N8	N7	N6	NNW4	NE9.6	NE16
10-Jun	NNW3	NW4	NW2	E1	SSW2	SW3	WSW3	NW3	N6	N7	NNE8	NNE7	NE8	NNE8	ENE7	ENE6	ENE6	ENE4	NNE4	ENE3	E3	E3	E3	E5	NE2.9	NNE8
11-Jun	S1	SSW2	NNE1	SE2	ESE3	SSE3	SSE4	SSE5	SSE6	SE8	SE9	SSE12	SSE14	SSE12	SE13	SSE11	SE7	SE9	SE13	ESE11	SE4	ENE2	N3	NNW3	SE5.7	SSE14
12-Jun	N4	NNW3	NNW3	NNW2	WSW2	WSW5	SW6	SW7	SW7	SSW8	SW7	SW6	SSW8	SW12	WSW12	WSW10	WSW9	W9	W11	WSW9	WSW6	WSW8	SW10	WSW13	WSW6.3	WSW13
13-Jun	WSW12	WSW13	WSW10	SW7	SSW6	SSW7	WSW9	WSW11	WSW12	WSW14	WSW14	WSW16	WSW18	W15	WNW7	WSW9	WSW13	WSW12	WSW9	N2	N4	ENE2	ESE1	NW3	WSW8.4	WSW18
14-Jun	S2	SSW2	S1	NW2	S2	S2	W3	SW2	NE3	NNE4	NNE5	ENE5	ENE4	SE7	ENE7	ENE6	ENE5	NNE8	N7	N4	SE15	SSE15	SE9	ESE7	E2.7	SSE15
15-Jun	SE7	SE7	E4	ENE5	E6	SE7	ESE7	E5	SE9	SE18	SSE23	SSE23	S22	S24	S20	S19	SSW18	S17	S10	SSW8	S5	S8	SE6	SE6	SSE10.2	S24
16-Jun	SE8	SE9	SE12	SSE11	SSE12	S10	S14	S16	SSW15	SSW14	SW13	SW16	WSW15	SW14	SW13	WSW12	WSW10	SW9	WSW9	W7	WNW4	W2	W4	WNW3	SSW8.2	S16
17-Jun	W5	WSW4	W5	W5	WNW4	W5	W7	NW7	NW8	NW8	NW8	NW8	NW10	NW13	WNW11	WNW10	WNW10	W12	NW8	N4	ENE5	NNE5	N4	SSW2	WNW5.8	NW13
18-Jun	W5	WNW3	NW3	NNW4	WNW4	W3	NW3	W5	W10	W10	WNW9	W9	WNW8	WSW10	WSW8	WSW10	WSW10	WSW8	SW8	SW5	SSW3	NNE10	ENE5	NNE4	W4.7	NNE10
19-Jun	NNW4	NW4	NW3	W3	W6	W5	WNW4	NNW3	NNE2	NNW6	NNW8	NNW10	NNW11	NNW14	N11	N13	NNW12	N12	NNE9	NNE8	N7	N5	NNW3	NW3	NNW6.1	NNW14
20-Jun	NW3	WNW4	W4	WSW4	W3	SW3	WSW3	SW3	WSW4	WSW4	WSW3	S3	SSE6	SSE6	S8	SSE8	S9	S9	SSE10	SSE8	SSE7	SE7	SSE6	SSE6	S4.0	SSE10
21-Jun	S0	SSW1	SSE3	S3	SE5	S7	SSE6	SSW8	SSW9	SSW9	SW10	SW11	SSW9	S9	SSE11	S8	S6	S5	S5	S4	SSW3	ESE2	S3	SSW2	S5.3	SW11
22-Jun	SSE4	ESE4	W2	SE2	SE4	SSW3	SSW5	SSW7	SSW6	SW6	SSW6	SSW5	SSW6	SSW5	SSE8	SSW5	SSE6	W6	W12	WSW9	SW5	SW5	WSW2	SW5	SSW4.3	W12
23-Jun	WSW3	WNW3	SW2	WSW2	SW3	W2	W4	NW4	ENE3	NE4	E2	WSW1	NNW4	W5	NW7	NNW5	NNW2	NNE4	NNE5	ENE7	ENE4	N3	NW4	NNW5	NNW1.8	ENE7
24-Jun	S1	NE2	NNW2	NNW5	NNW4	NNW2	NE4	NNE6	N7	N8	NNW8	NNW6	NNE5	N9	NNE8	WSW3	NNE6	NE8	NE2	NNW8	NNW5	NW4	NNW3	ENE1	N4.1	N9
25-Jun	NNE2	NNW1	NNW5	N5	N4	N5	N6	NNE8	NNE8	NNE8	NNE7	NNE8	NNE8	NNE7	NE8	NNE8	NE7	ENE6	NE6	ENE6	ESE3	W1	WSW1	WNW1	NNE4.8	NE8
26-Jun	W2	WSW2	SSW2	SW2	S3	SSW3	SSW4	S4	S6	SW5	SSE6	WSW3	NW8	SSE4	SSW1	SW1	SSW5	WSW3	SW3	SSW4	WSW5	W6	ESE3	W6	SW2.6	NW8
27-Jun	W4	WSW5	SSW3	SW5	SW5	WSW4	SW5	WSW5	SW5	SW6	WSW7	WSW10	WSW5	ENE4	SE9	S6	SW6	S8	ENE7	ESE5	E4	E4	SE3	S3	SSW3.0	WSW10
28-Jun	SSE3	SW3	SW3	SSW3	SW4	SW5	WSW3	E2	ENE4	W2	SW2	NE7	NNE7	NNE8	NNE9	NNE9	NNE10	NNE9	NE9	NE9	NNE6	NE5	NE2	NE3	NNE3.0	NNE10
29-Jun	NNW2	N3	NNW3	N3	WSW0	E2	NE3	ENE3	NE3	NE3	NE6	NNE5	NE6	NE6	N3	NNW5	WNW5	NW4	N2	E3	E1	ESE4	SE5	SE6	NE2.2	SE6
30-Jun	SE6	SE6	SE6	SE4	NE1	SE4	SSE7	S8	S12	SSW10	SSW2	SSE7	SE6	ENE2	E2	SE8	ESE7	SE9	SE8	SE9	SSE6	SE10	S5	SSW2	SSE5.6	S12

SW0.9 SW1.2 SW1.0 SW1.0 SW1.5 SSW2.1 SW2.0 SW1.6 SW1.5 WSW1.7 WSW1.8 WSW1.5 WSW1.2 SW0.8 SW1.0 SW1.2 SW1.6 SW0.8 S0.4 ESE0.4 SE1.0 ESE1.0 SE1.0 SSE0.7	Diurnal Average
WSW12 WSW13 SE12 SSE11 WSW13 W11 S14 S16 SSW15 SE18 SSE23 SSE23 S22 S24 S20 S19 SSW18 S17 NW15 SSE12 SE15 SSE15 SE12 WSW13	Diurnal Maximum

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

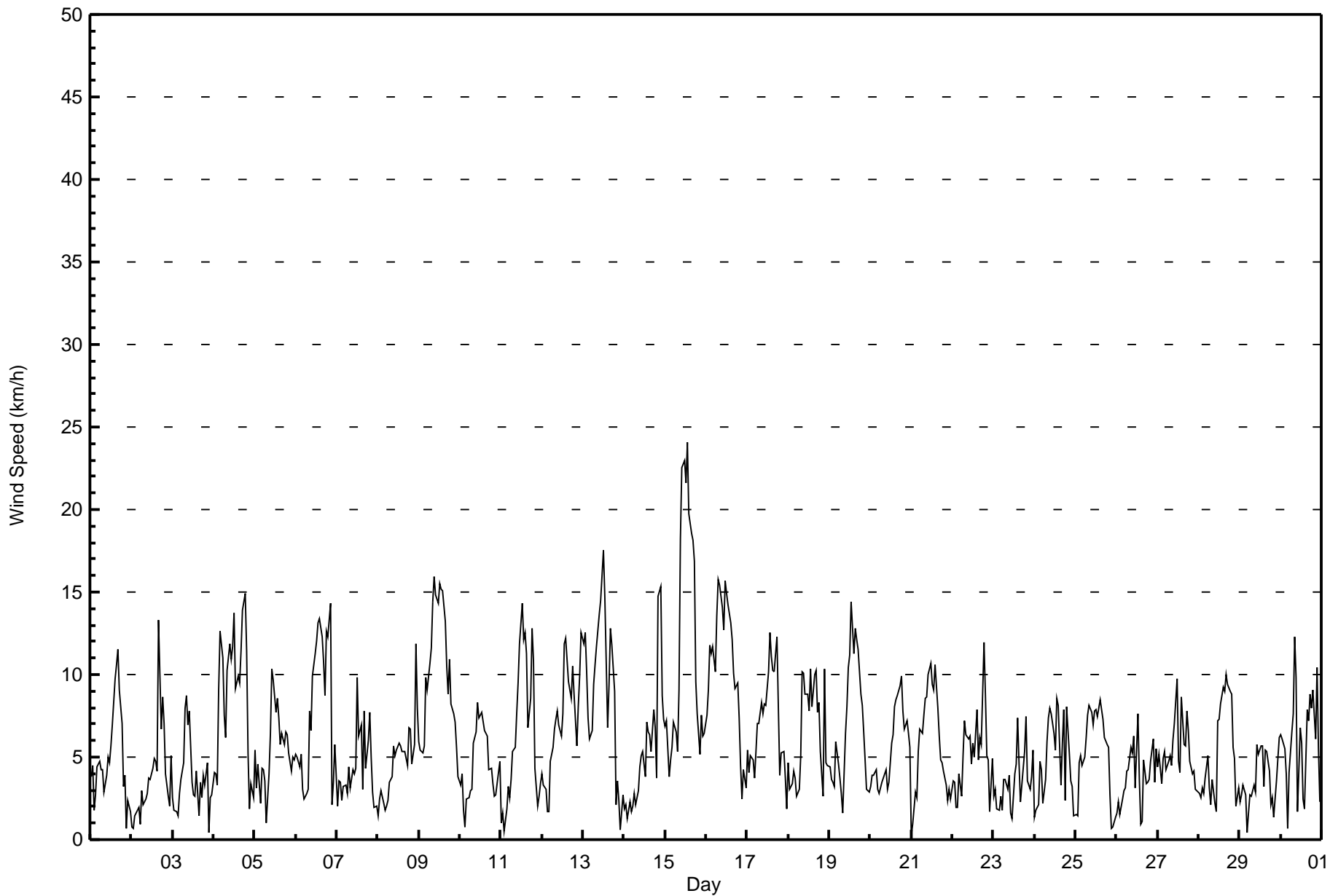
Wind Speed (WS) - km/h
Barge Landing - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 9 km/h on Jun 15 14:00 Minimum Value: 0 km/h on Jun 25 23:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 7																	Hours in Service: 720 Hours of Data: 720 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-Jun	1	1	1	2	1	2	2	1	1	1	2	2	2	3	3	4	4	3	3	3	2	1	1	1	4
2-Jun	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	6	2	4	2	1	1	1	1	6
3-Jun	1	1	1	1	1	1	2	3	3	2	3	2	3	2	2	2	3	2	2	2	1	2	3	2	3
4-Jun	2	1	1	3	4	4	4	3	4	4	5	4	5	4	4	5	5	5	4	3	1	1	1	2	5
5-Jun	1	1	2	1	1	1	2	1	1	3	4	4	3	3	4	2	3	2	2	2	2	1	1	1	4
6-Jun	1	1	1	1	1	1	1	2	3	2	4	4	5	5	5	5	4	3	5	5	6	6	3	2	6
7-Jun	1	1	1	1	1	1	2	2	1	2	2	3	8	3	3	3	3	2	2	2	1	1	1	1	8
8-Jun	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	2	2	3	4	4
9-Jun	2	2	2	2	3	3	4	4	4	5	4	4	4	4	4	4	3	3	4	2	2	2	1	1	5
10-Jun	1	1	1	1	1	1	1	1	2	2	3	2	3	3	3	2	2	2	2	1	1	1	1	1	3
11-Jun	1	1	1	1	1	1	2	2	2	2	4	4	5	5	4	5	3	4	5	3	2	1	1	1	5
12-Jun	1	1	1	1	2	1	2	2	3	3	3	2	3	4	5	4	4	3	4	3	2	4	4	4	5
13-Jun	3	4	3	2	2	2	4	4	4	4	4	5	6	6	5	4	5	4	4	2	1	1	2	1	6
14-Jun	1	1	1	1	1	1	1	1	1	2	2	2	2	3	2	2	2	2	2	2	5	5	3	3	5
15-Jun	2	2	2	2	2	3	2	2	4	7	8	9	8	9	7	7	7	6	4	3	2	7	2	1	9
16-Jun	1	2	3	3	4	3	5	6	6	5	4	5	5	5	5	4	3	3	3	3	2	1	1	1	6
17-Jun	1	1	2	1	1	2	2	3	3	3	3	4	4	5	4	4	5	4	4	1	3	2	3	1	5
18-Jun	2	2	2	2	2	1	2	3	3	4	4	3	3	4	3	3	3	3	3	2	2	5	2	2	5
19-Jun	1	1	1	1	2	1	2	1	1	3	3	4	4	5	4	4	4	4	3	3	2	2	1	1	5
20-Jun	1	1	1	1	1	1	1	2	1	2	2	2	3	3	3	3	3	3	3	3	1	1	1	1	3
21-Jun	1	1	2	1	1	2	2	3	3	3	3	3	3	4	4	3	3	2	2	1	1	1	2	1	4
22-Jun	2	2	1	2	1	1	2	2	2	2	2	3	3	3	3	3	3	3	4	4	2	3	1	2	4
23-Jun	1	2	1	1	1	1	1	1	1	1	2	2	2	2	4	1	2	2	2	3	2	1	2	1	4
24-Jun	1	1	1	1	1	1	2	2	2	3	2	2	2	3	4	2	3	3	1	3	1	1	1	1	4
25-Jun	1	1	1	1	1	2	2	3	2	2	2	2	2	2	3	2	3	2	2	2	1	1	0	1	3
26-Jun	1	1	1	1	1	1	1	2	2	2	3	2	4	3	2	2	2	2	1	1	2	3	2	3	4
27-Jun	1	2	1	2	2	1	1	2	2	2	3	3	4	3	3	3	2	3	3	2	1	1	1	1	4
28-Jun	1	1	1	1	1	1	1	1	1	2	2	2	2	3	3	3	3	3	3	3	2	1	1	1	3
29-Jun	1	1	1	1	1	2	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	2
30-Jun	1	1	1	2	1	2	2	3	4	5	2	2	2	2	2	4	3	3	2	2	2	3	3	1	5
																	Diurnal Maximum								



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Barge Landing - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Barge Landing - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	380	52.78	52.78
6 - 11	266	36.94	89.72
12 - 19	69	9.58	99.31
20 - 28	5	0.69	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: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Barge Landing - June 2016**

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	21	16	15	24	19	15	20	16	21	34	36	35	28	20	22	38	380
6 - 11	14	33	16	12	3	7	29	25	20	16	19	23	13	12	12	12	266
12 - 19	2	1	8	0	0	0	6	9	8	4	6	14	3	1	5	2	69
20 - 28	0	0	0	0	0	0	0	2	3	0	0	0	0	0	0	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
Totals	37	50	39	36	22	22	55	52	52	54	61	72	44	33	39	52	720

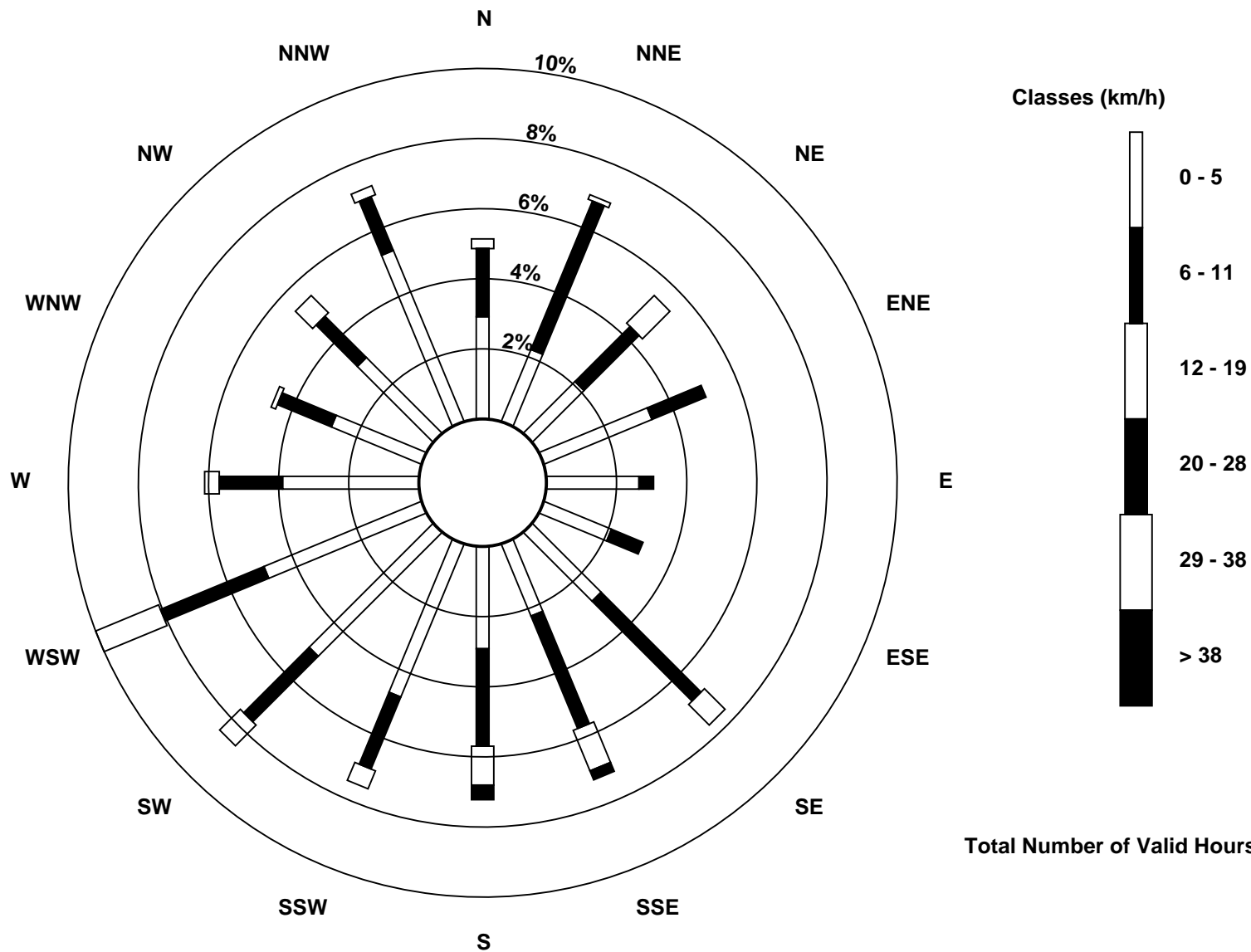
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed (WS) - km/h
Barge Landing (AMS 9)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Barge Landing - June 2016

Direction of Maximum Speed: 180 deg on Jun 15 14:00 Direction of Maximum Daily Speed Average: 164.5 deg on Jun 15	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0
Direction of Minimum Speed: 172 deg on Jun 21 01:00 Direction of Minimum Daily Speed Average: 0.2 deg on Jun 7	Percent Operational Time: 100.0
Monthly Average Direction: 258.3 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-Jun	193	157	206	140	151	142	147	147	229	240	226	213	189	216	227	199	185	168	189	338	349	41	0	336	192.5
2-Jun	282	136	129	165	270	306	244	341	277	326	328	308	344	301	273	301	236	159	132	244	269	279	125	148	251.8
3-Jun	220	208	198	187	214	191	219	231	237	236	236	227	314	315	335	244	258	66	40	118	144	115	15	116	227.3
4-Jun	196	194	206	248	258	259	284	291	294	293	296	320	323	302	278	309	303	310	317	316	336	344	258	302	293.7
5-Jun	343	284	259	261	252	233	240	219	21	332	318	333	345	351	16	6	29	30	72	81	72	80	104	130	0.0
6-Jun	133	152	153	151	143	129	130	189	169	170	169	180	160	148	184	167	166	153	191	165	175	119	25	108	162.8
7-Jun	319	235	232	224	225	200	215	244	303	5	73	95	155	117	193	134	75	349	345	338	346	343	348	293	292.8
8-Jun	249	300	321	304	205	191	287	336	359	47	46	32	45	65	78	70	65	87	142	170	119	136	143	123	89.8
9-Jun	83	99	70	33	31	39	46	38	40	36	38	39	35	35	32	35	31	29	47	20	360	351	355	341	35.0
10-Jun	332	326	313	81	207	227	251	320	350	358	15	31	35	29	68	75	61	70	28	67	83	87	96	101	35.6
11-Jun	184	205	26	130	120	157	153	161	168	141	142	154	163	156	136	151	138	133	141	118	135	66	9	345	143.7
12-Jun	353	343	344	346	253	245	219	233	223	207	218	229	207	223	249	254	255	262	261	258	238	241	234	252	243.7
13-Jun	252	256	255	230	204	212	237	243	241	243	241	243	248	262	287	241	241	243	256	358	3	75	108	325	247.3
14-Jun	185	197	177	318	169	169	273	219	50	30	33	57	73	130	69	71	69	21	351	351	135	156	132	114	97.5
15-Jun	127	125	89	65	94	132	118	82	132	143	162	165	182	180	188	187	192	189	182	200	174	185	142	141	164.5
16-Jun	139	140	140	150	163	175	174	185	195	209	231	221	240	225	230	239	241	236	252	262	301	265	265	288	208.2
17-Jun	268	250	269	271	293	279	266	304	325	309	310	309	318	311	303	299	288	260	313	4	75	22	352	197	300.7
18-Jun	276	287	308	333	300	261	305	277	260	276	282	275	286	254	258	248	242	241	228	216	208	25	70	15	270.6
19-Jun	340	315	307	279	270	262	288	343	20	337	343	345	335	342	350	0	347	0	21	14	9	1	347	310	343.3
20-Jun	310	291	274	257	266	234	243	227	256	253	247	180	165	154	179	168	178	170	159	166	154	144	152	153	185.5
21-Jun	172	195	157	178	145	171	168	199	209	211	219	233	205	171	165	169	180	191	190	191	207	121	186	201	189.4
22-Jun	148	123	271	143	138	206	206	200	196	226	203	205	207	213	162	207	166	262	259	242	219	216	243	227	208.8
23-Jun	241	284	218	252	231	260	273	319	75	50	89	248	328	279	309	337	335	23	26	69	62	4	321	340	337.7
24-Jun	183	48	341	342	331	347	35	27	11	9	331	340	19	10	30	257	22	48	42	337	333	320	327	60	2.0
25-Jun	18	335	348	358	358	350	3	32	25	23	24	20	18	26	37	32	36	60	56	75	104	278	242	298	25.2
26-Jun	259	247	209	229	184	193	195	183	187	225	165	255	315	147	206	234	200	257	231	200	250	267	103	275	221.0
27-Jun	264	243	213	227	236	239	228	253	236	236	248	242	255	77	142	182	216	186	74	102	101	97	144	190	208.5
28-Jun	165	228	215	199	235	235	246	83	71	260	235	53	33	25	16	17	14	17	35	40	24	51	56	40	26.6
29-Jun	346	354	339	4	252	95	44	63	42	40	51	31	37	43	357	342	298	322	6	88	86	115	124	133	33.9
30-Jun	135	129	133	142	47	144	162	170	170	192	201	157	143	64	98	130	112	136	133	134	154	138	172	202	147.1

222.1 217.0 231.4 228.3 218.3 209.4 218.1 228.4 230.7 255.9 250.8 249.0 258.6 231.0 223.5 215.3 225.3 215.2 190.0 112.3 124.6 108.2 125.8 159.6

Diurnal Average

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

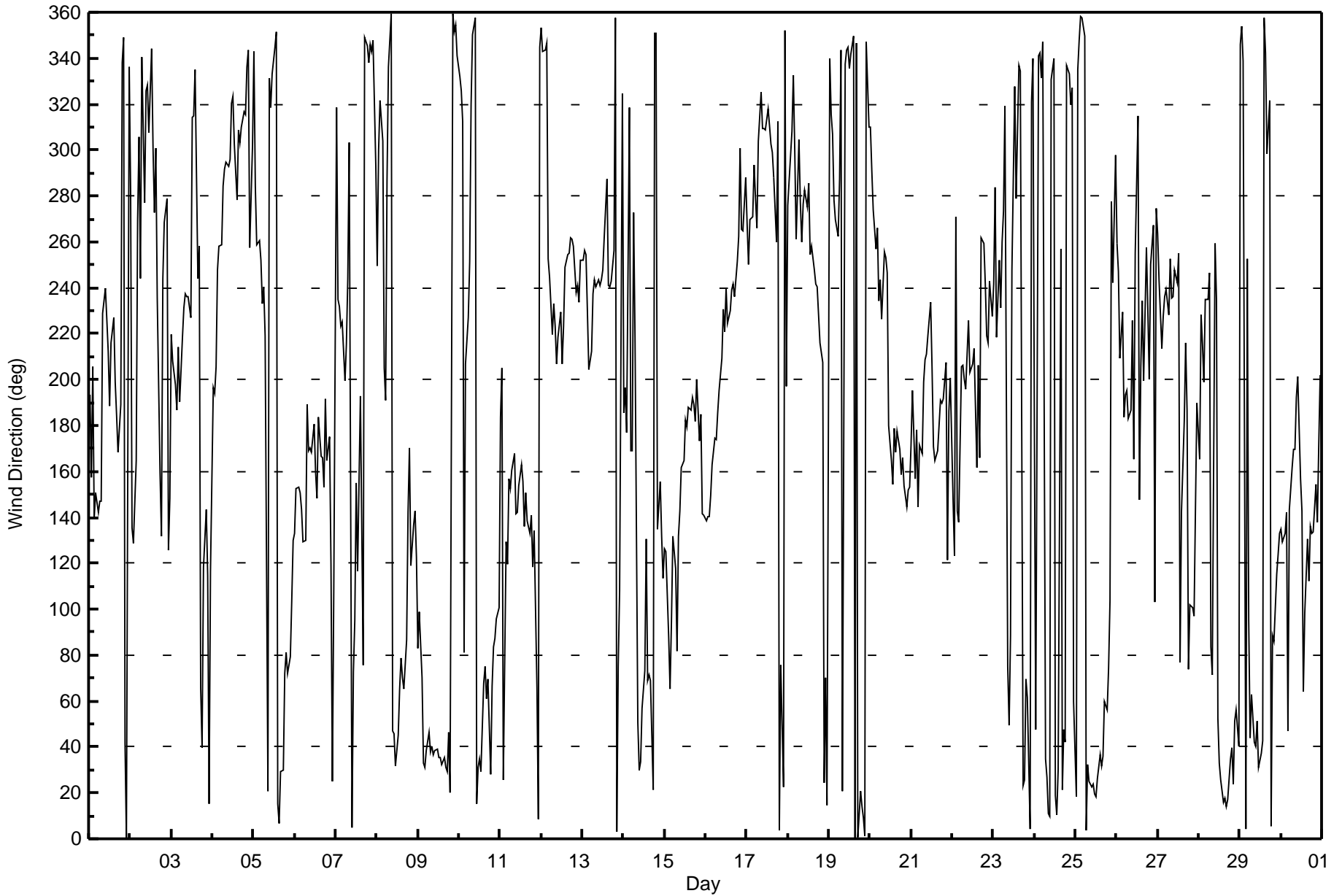
Wind Direction (WD) - deg
Barge Landing - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 107 deg on Jun 26 15:00 Minimum Value: 6 deg on Jun 20 22:00 Percentiles: P ₁ = 11 P ₁₀ = 19 Q ₁ = 24 Median = 31 O ₃ = 44 P ₉₀ = 64 P ₉₉ = 93		Hours in Service: 720 Hours of Data: 720 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-Jun	20	12	82	65	22	13	44	41	50	39	40	53	32	32	29	35	31	31	42	52	26	85	37	49	85	
2-Jun	34	93	57	50	62	90	47	63	55	56	53	51	50	46	39	28	27	37	59	25	29	38	71	24	93	
3-Jun	37	67	53	58	38	29	26	23	24	26	31	63	79	75	40	64	49	64	39	81	41	88	75	78	88	
4-Jun	47	30	39	23	22	28	52	53	37	35	38	27	28	44	37	35	31	31	24	26	48	46	20	40	53	
5-Jun	16	37	19	59	21	22	69	96	47	47	32	27	35	31	37	44	34	44	24	19	19	24	17	16	96	
6-Jun	14	14	20	13	23	16	24	54	34	30	30	32	30	30	35	34	30	22	27	25	27	90	73	22	90	
7-Jun	66	35	38	42	28	42	46	29	51	51	69	53	65	42	43	80	24	43	27	21	18	15	10	27	80	
8-Jun	37	34	15	61	54	48	47	23	33	29	30	28	29	30	30	24	23	21	33	25	42	21	16	32	61	
9-Jun	20	28	31	24	21	22	21	20	21	21	21	21	21	20	20	21	21	24	22	23	21	19	16	14	31	
10-Jun	10	13	68	77	42	32	29	47	28	36	32	31	36	35	37	37	35	48	31	26	24	17	21	18	77	
11-Jun	85	63	82	67	14	33	29	25	31	24	21	26	28	28	19	22	24	26	22	16	40	76	33	23	85	
12-Jun	19	21	22	35	74	21	27	25	28	32	34	35	31	28	30	25	32	27	27	24	20	29	26	21	74	
13-Jun	22	22	24	25	24	25	31	24	24	25	23	22	28	36	46	31	28	26	42	83	36	42	72	19	83	
14-Jun	66	56	77	22	77	67	45	65	65	41	47	45	57	41	31	37	34	24	23	41	21	23	22	17	77	
15-Jun	15	15	28	21	27	27	28	33	23	20	25	26	28	28	29	31	29	28	31	43	44	51	15	12	51	
16-Jun	11	13	13	16	22	29	27	28	32	31	27	28	26	28	28	29	30	32	23	27	32	28	22	35	35	
17-Jun	22	21	23	23	29	30	27	36	22	28	26	36	31	33	33	35	37	26	41	32	36	41	46	45	46	
18-Jun	33	55	40	28	40	49	54	50	27	33	37	37	47	35	38	30	26	37	30	25	48	28	26	42	55	
19-Jun	17	17	23	21	21	29	47	52	75	33	32	29	30	24	30	29	26	30	24	24	21	21	13	26	75	
20-Jun	16	17	15	14	16	18	22	54	47	71	75	82	61	55	39	37	35	29	24	24	16	6	8	9	82	
21-Jun	84	72	60	41	11	25	28	32	32	32	32	29	40	42	32	40	61	64	44	24	16	35	53	54	84	
22-Jun	55	23	54	78	22	45	30	30	36	34	45	66	62	74	33	64	43	52	25	26	29	38	81	31	81	
23-Jun	61	62	57	39	39	57	34	34	52	40	90	99	63	55	35	28	66	34	28	22	40	33	26	18	99	
24-Jun	73	77	52	16	31	38	39	27	30	32	29	30	39	30	46	35	48	26	57	19	17	19	14	29	77	
25-Jun	44	43	18	19	16	23	28	27	29	25	28	26	28	30	28	33	32	31	28	23	23	81	70	55	81	
26-Jun	69	46	43	43	38	31	28	42	39	48	54	88	50	72	107	89	30	48	33	25	29	54	69	38	107	
27-Jun	30	25	49	25	20	35	29	33	40	31	31	28	71	92	33	41	37	34	50	19	23	16	38	30	92	
28-Jun	35	41	26	25	18	19	63	67	51	86	93	31	29	35	27	30	30	30	25	21	23	17	61	41	93	
29-Jun	25	20	29	35	98	77	44	61	51	73	43	55	53	46	78	39	35	37	52	36	20	18	17	10	98	
30-Jun	9	11	12	38	60	22	28	35	29	40	101	30	29	75	92	31	26	23	16	13	38	14	39	38	101	
		85	93	82	78	98	90	69	96	75	86	101	99	79	92	107	89	66	64	59	83	48	90	81	78	
		Diurnal Maximum																								



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Barge Landing - June 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	June 16, 2016	Last Calibration	May 2, 2016
Station Name	Barge Landing	Station Number	AMS 9
Reason:	Routine		
Start Time (MST)	8:45	End Time (MST)	12:35
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	-690
Analyzer IP address	192.168.1.42		Lamp voltage	1017	1005
Calculated slope	0.999362	0.995017	Chamber temp	45	45
Calculated intercept	-0.042191	-0.275464	Pressure	687.6	681.5
Analyzer Background	2.07	1.94	Flow	0.434	0.432
Analyzer Coefficient	1.038	1.065	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	-0.2	----
as found span	5000	83.8	79.9	77.2	1.036
SO2 scrubber check	5000	15.4	147.2	0.1	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	83.8	79.9	80.5	0.994
second point	5000	41.9	40.0	40.7	0.982
third point	5000	21.0	20.0	20.6	0.973
as left zero	6000	0.0	0.0	0.1	----
as left span	5000	83.8	79.9	80.3	0.995
Average Correction Factor					0.983

Corrected As found	77.4	Previous response	80.0	% change	3.5%
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Notes:

Inlet filter changed after as founds. Additional zero/span conducted after as founds to measure the potential impact of smoke on the filter. Scrubber check done after additional zero/span. Adjusted zero and span.

Calibration Performed By:

Evan Magill



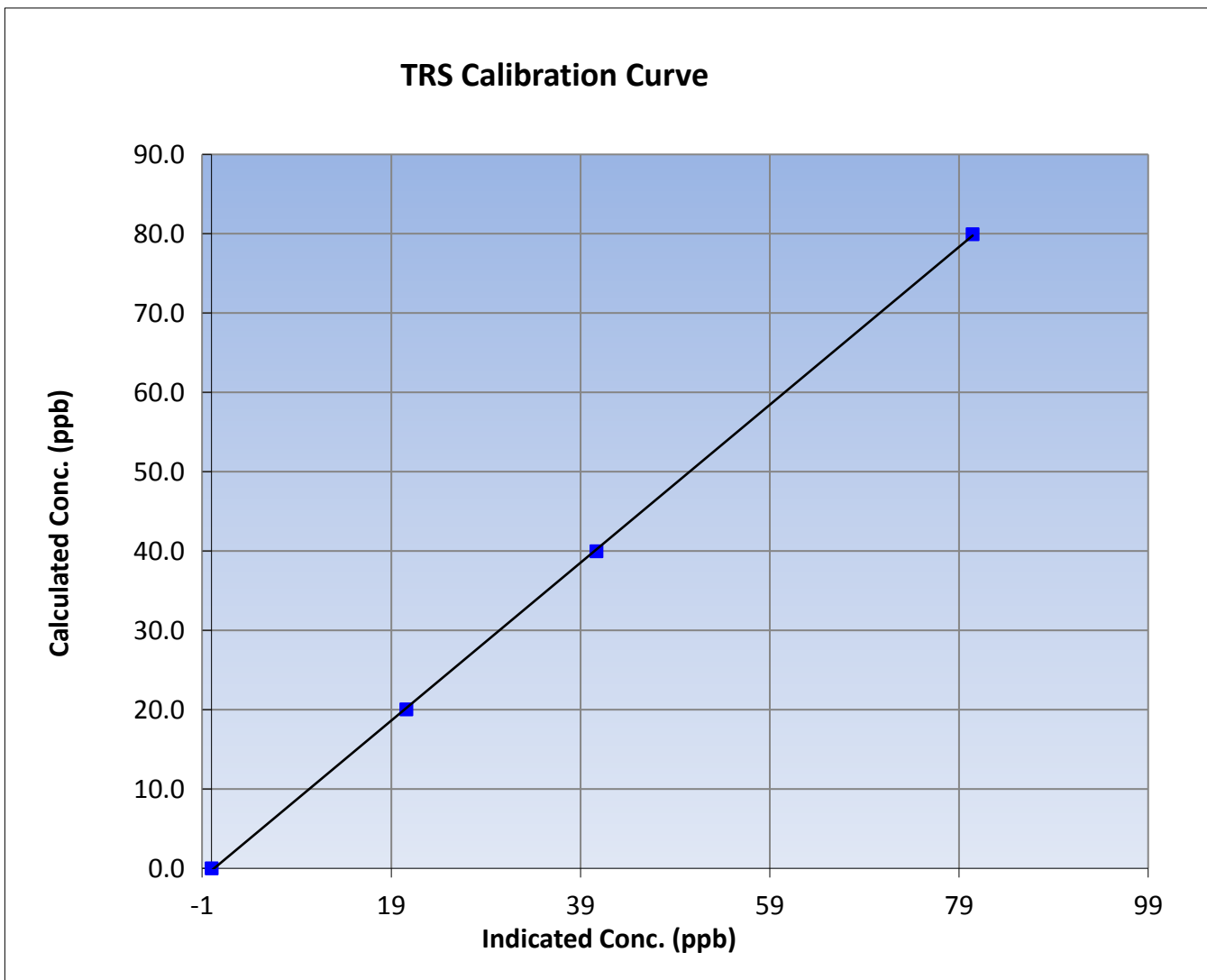
Wood Buffalo Environmental Association TRS Calibration Report

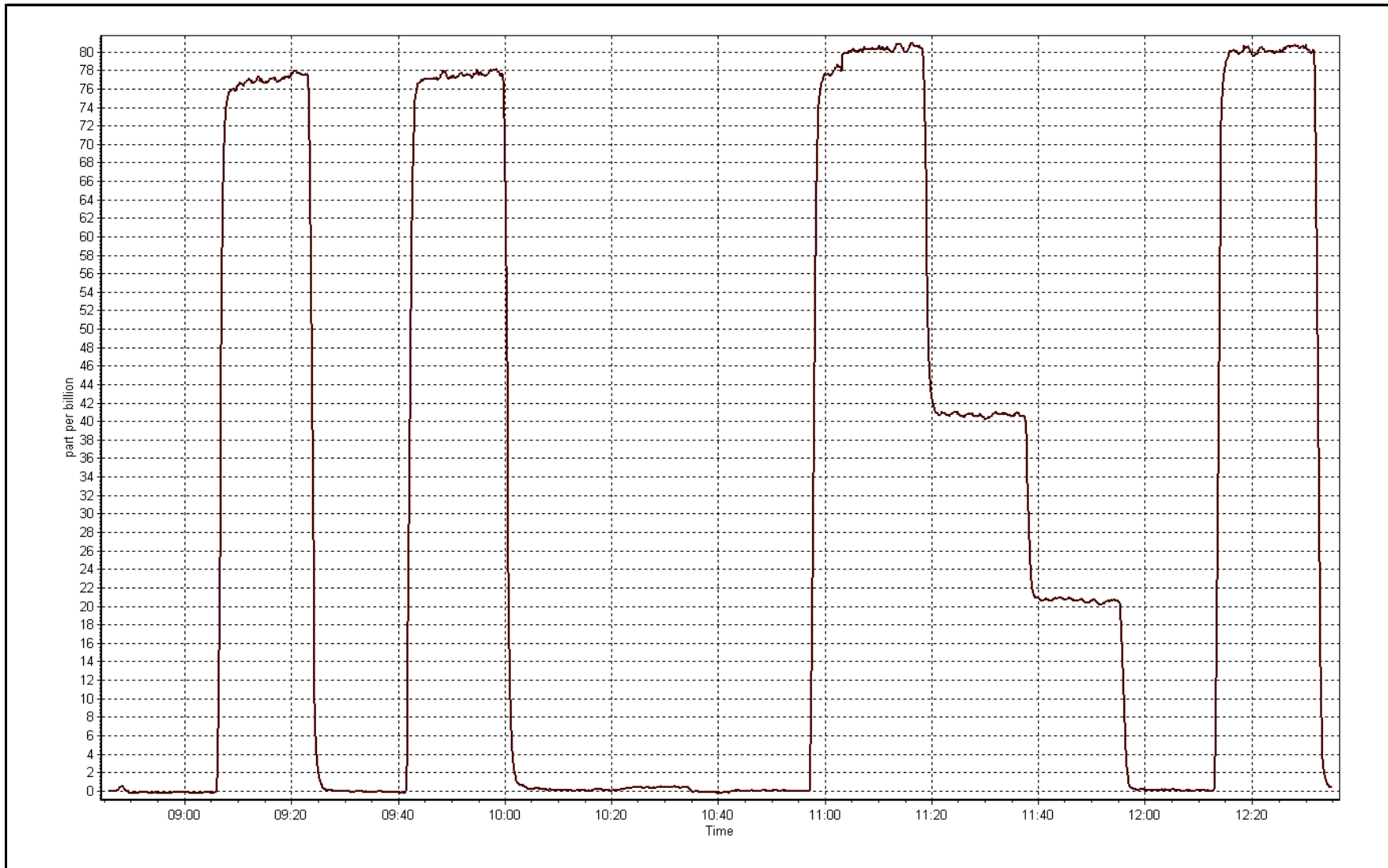
Station Information

Calibration Date	June 16, 2016	Previous Calibration	May 2, 2016
Station Name	Barge Landing	Station Number	AMS 9
Start Time (MST)	8:45	End Time (MST)	12:35
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	0.999946
79.9	80.5	0.9937		
40.0	40.7	0.9821	Slope	0.995017
20.0	20.6	0.9730		
			Intercept	-0.275464







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June-13-16	Last Calibration	May-02-16
Station Name	Barge Landing	Station Number	AMS 9
Reason:	Routine		
Start Time (MST)	11:25	End Time (MST)	15:05
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

	Before	After		Before	After
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	1.002775	1.000402	Fuel Pressure	24.1	24.1
Calculated intercept	-0.015001	-0.043863	Analyzer Coeff	4.264	4.354
			Analyzer BKG	5.62	5.60

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	-0.13	----
as found span	5000	76.7	15.70	15.58	1.008
calibrator zero	5000	0.0	0.00	0.04	----
high point	5000	76.7	15.70	15.73	0.998
second point	5000	41.0	8.39	8.45	0.993
third point	5000	15.4	3.15	3.19	0.988
as left zero	5000	0.0	0.00	0.05	----
as left span	5000	76.7	15.70	15.73	0.998
Average Correction Factor					0.993

Corrected As found	15.71	Previous response	15.67	% change	-0.2%
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Notes:

Inlet filter changed after as founds. Additional zero/span conducted after the inlet filter change to measure the potential impact of smoke on the filter. Attempted to replace scrubbers in zero air generator after additional as founds but could not open the scrubber containers at the station. Adjusted zero and span.

Calibration Performed By:

Evan Magill



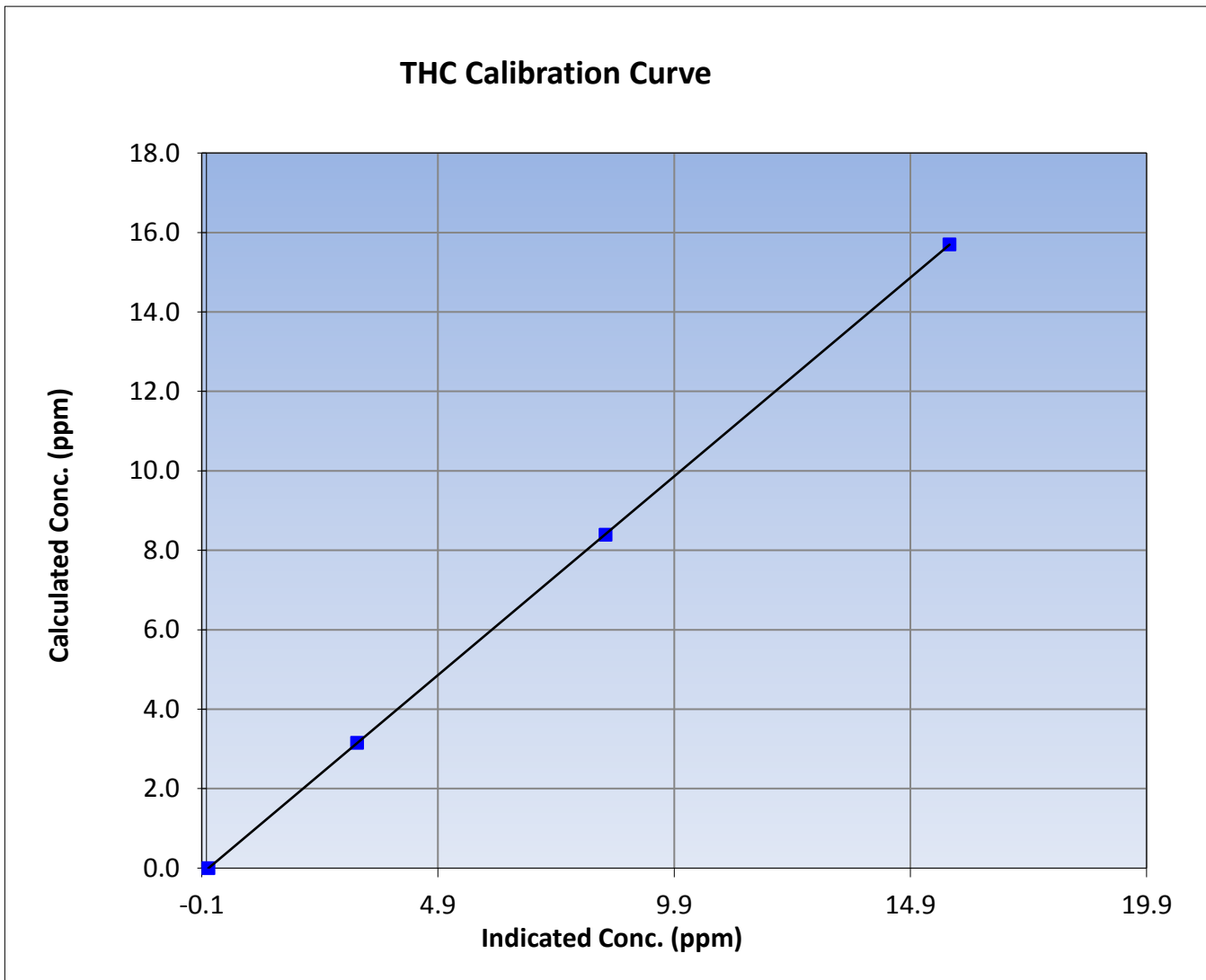
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June 13, 2016	Previous Calibration	May 2, 2016
Station Name	Barge Landing	Station Number	AMS 9
Start Time (MST)	11:25	End Time (MST)	15:05
Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059296

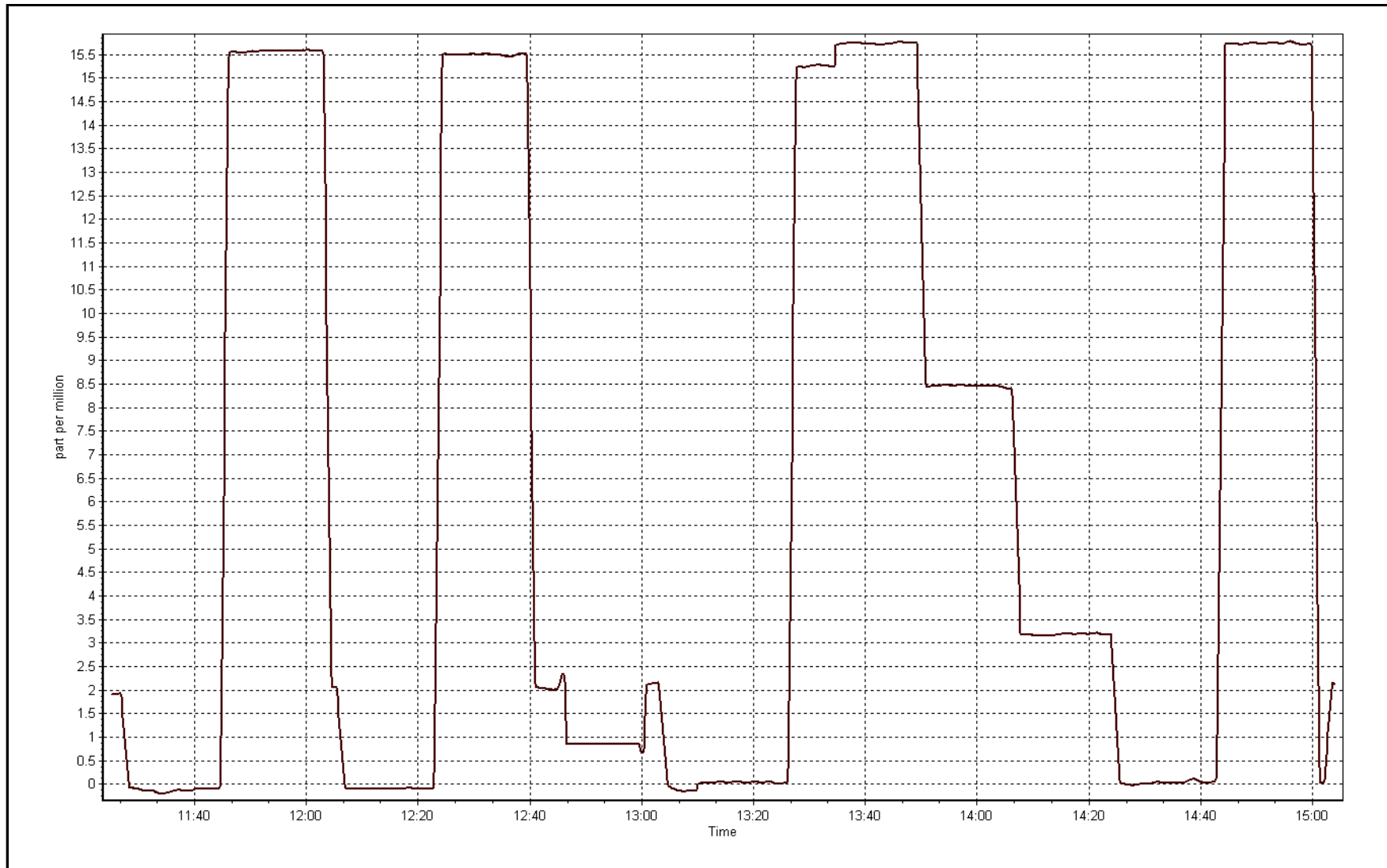
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.04	----	Correlation Coefficient	0.999997
15.70	15.73	0.9981		
8.39	8.45	0.9932	Slope	1.000402
3.15	3.19	0.9882		
			Intercept	-0.043863



THC Calibration Plot

Date: June 13, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

AMS 11 LOWER CAMP JUNE 2016

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)
 JUNE 2016

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	685	35	35	100.00	124	0	17	0
H2S (ppb) Average	687	33	33	100.00	8	0	1	0
THC (ppm) Average	685	35	35	100.00	14.1	-	3.8	-
Temperature (C) Average	720	0	0	100.00	30.5	-	22.9	-
Relative Humidity (%) Average	720	0	0	100.00	99	-	91	-
Wind Speed 10 m (km/h) Average	720	0	0	100.00	26	-	17	-
Wind Direction 10 m (deg) Average	720	0	0	100.00	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	685	4.4	10	-	0	0	0	1	3	14	124
H2S (ppb) Average	687	0.5	1	-	0	0	0	0	0	1	8
THC (ppm) Average	685	2.32	0.6	-	2	2.1	2.1	2.2	2.3	2.6	14.1
Temperature 2 m (C) Average	720	17.88	5.1	-	5.7	11.5	14.1	17.4	21.6	25.1	30.5
Relative Humidity (%) Average	720	64.2	21	-	20	35	46	64	84	92	99
Wind Speed 10 m (km/h) Average	720	8.6	6	-	0	2	4	8	12	17	26
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - LOWER CAMP (AMS 11)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
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No operational issues to report



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Lower Camp - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 124 ppb on Jun 2 12:00	Maximum Daily Average: 16.7 ppb on Jun 2		Hours of Data:	685
Minimum Value: 0 ppb on Jun 24 13:00	Minimum Daily Average: 0.1 ppb on Jun 24		Hours of Missing Data:	35
Maximum Diurnal Average: 9.1 ppb at hour 11	Minimum Diurnal Average: 1.8 ppb at hour 5		Hours of Calibration:	35
Monthly Average: 4.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 3 P ₉₀ = 14 P ₉₉ = 47		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-Jun	0	0	Z	0	1	4	6	3	1	1	1	2	18	4	1	2	1	2	4	0	1	3	0	0	2.5	18
2-Jun	1	1	0	Z	0	2	2	21	21	39	74	124	28	10	14	3	11	4	1	7	2	1	16	1	16.7	124
3-Jun	5	4	2	7	Z	2	1	4	1	1	2	3	1	0	0	0	0	0	0	0	0	14	12	2	2.6	14
4-Jun	6	2	2	1	1	Z	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	7	14	1	1.8	14
5-Jun	Z	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.5	1
6-Jun	0	Z	1	0	0	0	0	1	1	15	5	4	4	13	33	15	23	5	9	7	5	3	5	2	6.6	33
7-Jun	21	2	1	Z	2	5	2	1	1	1	1	1	0	0	1	3	1	0	0	0	0	0	0	0	2.0	21
8-Jun	2	2	2	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	18	5	0	1	0	1.9	18
9-Jun	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
10-Jun	0	0	0	0	1	Z	9	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.9	9
11-Jun	Z	0	0	0	0	0	0	0	0	8	67	22	43	33	43	17	3	49	5	0	0	0	0	0	12.7	67
12-Jun	0	Z	0	0	0	17	23	19	26	10	2	4	27	17	13	4	1	1	0	1	22	1	0	1	8.2	27
13-Jun	0	1	Z	2	1	2	6	1	1	1	3	2	1	1	1	1	0	1	0	1	15	9	7	12	2.9	15
14-Jun	1	1	7	Z	1	1	1	1	2	C	C	C	C	C	14	0	0	0	11	25	16	1	0	4.7	25	
15-Jun	0	0	0	0	Z	2	1	0	7	15	5	11	1	0	3	2	13	14	18	2	25	12	2	1	5.8	25
16-Jun	0	1	6	6	3	Z	1	1	2	5	21	9	2	7	14	11	4	1	1	1	3	1	2	4	4.5	21
17-Jun	Z	1	2	0	0	1	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.4	2
18-Jun	0	Z	0	0	0	0	0	1	4	0	0	0	0	1	1	0	0	0	2	2	0	0	0	0	0.6	4
19-Jun	0	0	Z	0	0	1	1	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3
20-Jun	1	0	1	Z	1	2	13	17	17	24	32	35	43	35	31	35	9	6	3	3	1	1	1	1	13.5	43
21-Jun	0	0	10	2	Z	1	0	0	0	0	4	3	5	1	0	0	1	2	0	0	1	1	0	1	1.5	10
22-Jun	1	1	1	1	1	Z	2	1	0	1	0	2	4	4	4	0	1	4	0	1	22	26	64	21	7.0	64
23-Jun	Z	30	37	9	29	2	13	1	1	2	1	8	48	41	59	0	0	1	0	0	0	0	0	0	12.3	59
24-Jun	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
25-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.2	1
26-Jun	0	0	0	Z	0	0	0	0	1	3	4	3	3	1	1	0	15	15	2	1	3	2	15	8	3.3	15
27-Jun	1	27	30	21	Z	3	1	2	3	7	14	0	0	1	1	14	3	1	1	2	2	1	0	0	5.9	30
28-Jun	3	4	5	2	0	Z	2	4	1	0	19	6	0	0	0	0	0	0	0	0	0	0	0	0	2.1	19
29-Jun	Z	1	0	0	0	0	0	0	1	0	0	0	0	0	0	4	5	6	7	2	2	7	34	21	4.0	34
30-Jun	3	Z	1	5	2	0	1	1	1	7	6	4	13	2	14	15	2	0	21	7	2	1	21	6	5.9	21

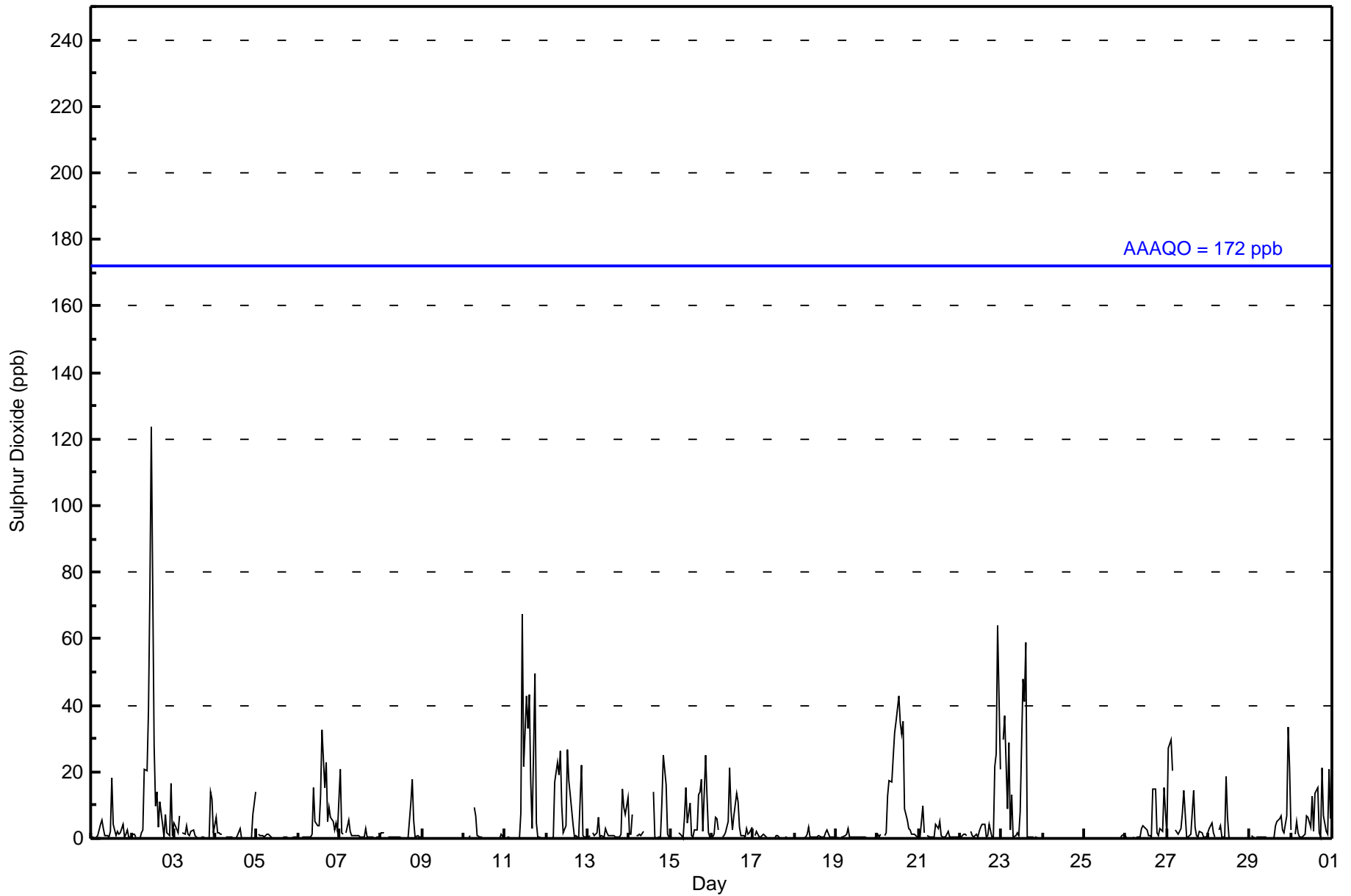
1.9	3.2	4.2	2.4	1.8	1.9	3.0	3.0	3.1	4.9	9.1	8.4	8.3	6.0	8.4	4.4	3.1	4.1	3.1	1.8	4.4	3.4	6.4	3.2	Diurnal Average
21	30	37	21	29	17	23	21	26	39	74	124	48	41	59	35	23	49	21	11	25	26	64	21	Diurnal Maximum

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 (SO₂) - ppb
Lower Camp - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Lower Camp - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	596	87.01	87.01
11 - 20	43	6.28	93.28
21 - 60	42	6.13	99.42
61 - 110	3	0.44	99.85
111 - 172	1	0.15	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Lower Camp - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	55	33	20	14	27	55	85	20	12	4	10	66	44	37	54	60	596
11 - 20	0	0	4	0	1	2	12	3	5	6	4	1	3	2	0	0	43
21 - 60	2	1	2	1	1	2	9	6	2	6	3	2	1	0	2	2	42
61 - 110	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	3
111 - 172	0	1	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
Totals	57	36	26	15	29	59	107	29	19	16	18	69	48	39	56	62	685

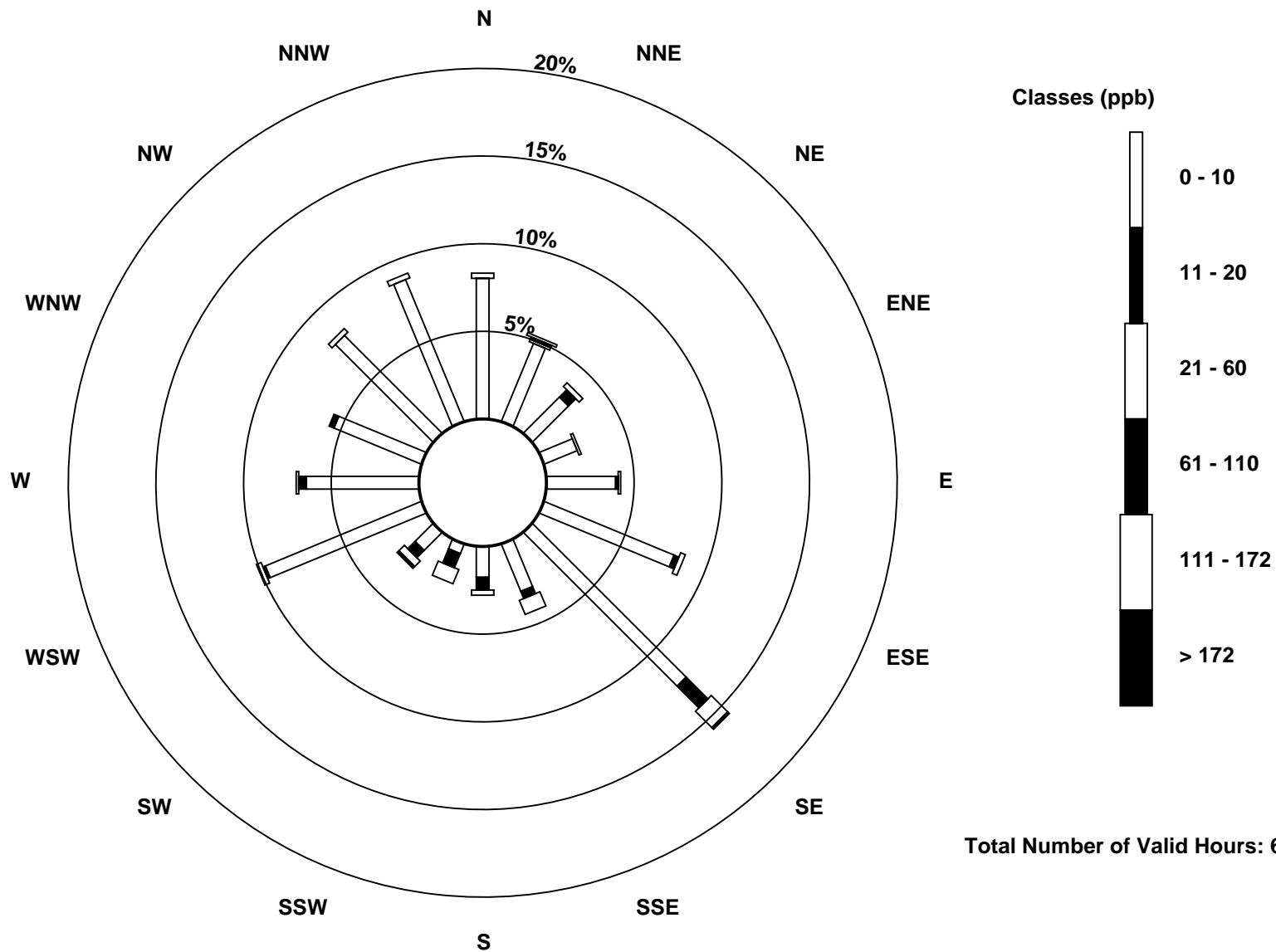
Total Number of Valid Hours: 685

Total Number of Hours: 720

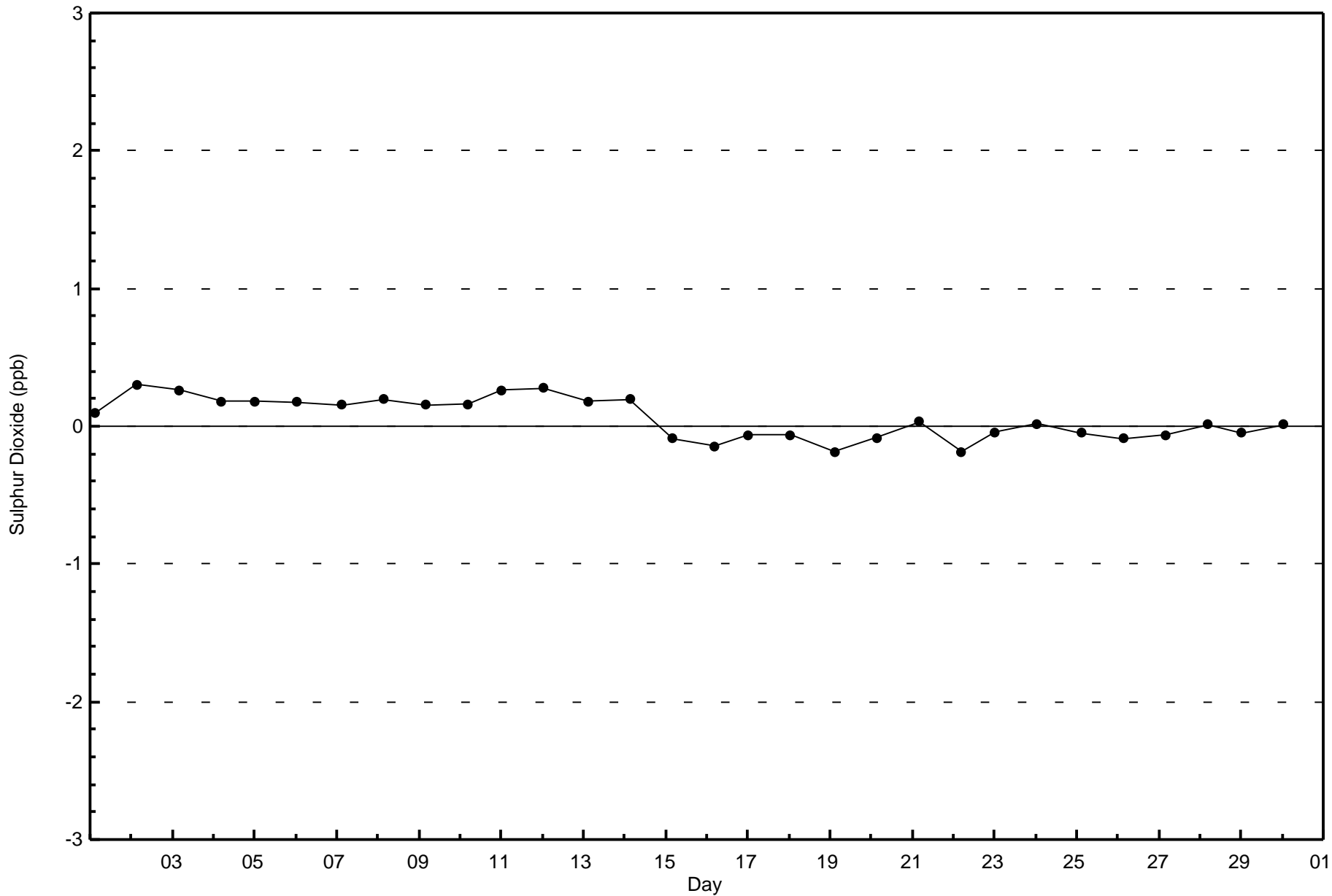


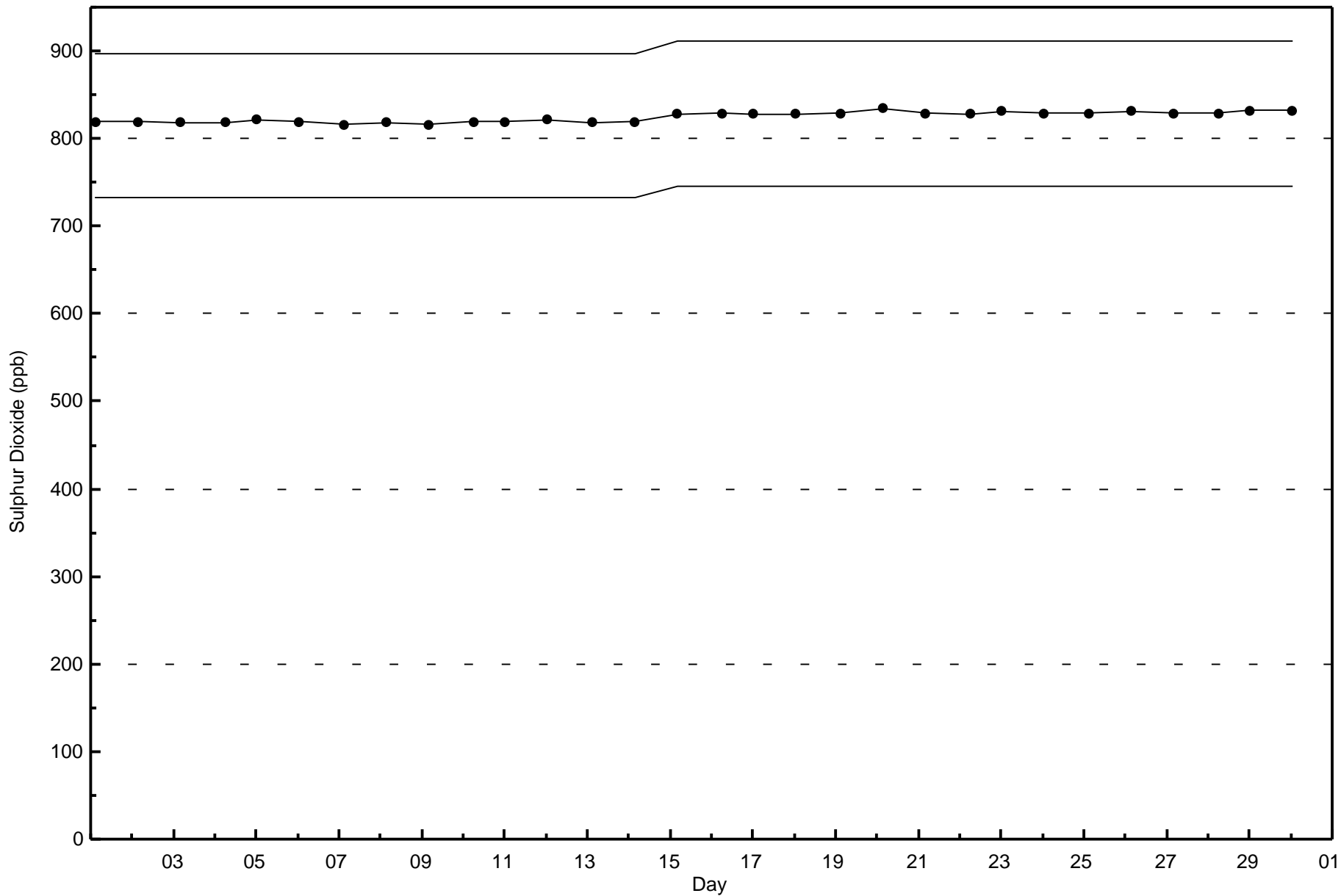
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Sulphur Dioxide (SO₂) - ppb
Lower Camp (AMS 11)



Total Number of Valid Hours: 685







Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 8 ppb on Jun 12 13:00	Maximum Daily Average: 1.2 ppb on Jun 12		Hours of Data:	687
Minimum Value: 0 ppb on Jun 4 21:00	Minimum Daily Average: 0.1 ppb on Jun 9		Hours of Missing Data:	33
Maximum Diurnal Average: 0.8 ppb at hour 3	Minimum Diurnal Average: 0.2 ppb at hour 15		Hours of Calibration:	33
Monthly Average: 0.5 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 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-Jun	0	0	0	Z	0	0	0	0	1	1	0	1	4	1	0	0	0	0	0	0	0	0	0	1	0.5	4
2-Jun	1	2	1	2	Z	1	2	3	1	1	1	2	1	0	0	0	2	0	0	1	0	0	2	0	1.1	3
3-Jun	1	1	1	2	2	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	1	0.7	3
4-Jun	2	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0.4	3
5-Jun	1	Z	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
6-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0.3	1
7-Jun	6	1	2	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	6
8-Jun	1	2	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0.4	2
9-Jun	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
10-Jun	0	0	0	0	1	2	Z	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	3
11-Jun	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
12-Jun	0	0	Z	0	0	2	3	2	2	1	0	1	8	3	1	0	0	0	0	0	2	0	0	0	1.2	8
13-Jun	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	0.4	2
14-Jun	1	1	2	2	Z	0	0	0	0	0	0	0	0	C	C	C	0	0	0	0	1	0	0	0	0.5	2
15-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	0	0.4	1
16-Jun	0	1	1	1	1	1	Z	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	1	0.5	1
17-Jun	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
18-Jun	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
19-Jun	0	0	0	Z	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1
20-Jun	1	1	1	1	Z	1	2	4	4	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.9	4
21-Jun	0	0	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
22-Jun	0	2	1	1	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	4	1	0.7	4
23-Jun	0	Z	3	1	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	3
24-Jun	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.3	1
25-Jun	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.2	1
26-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	2	3	1	0	0	0	1	2	0.6	3	
27-Jun	1	3	2	2	1	Z	0	0	1	1	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0.7	3
28-Jun	1	2	1	1	1	1	Z	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0.5	2
29-Jun	1	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	1
30-Jun	1	1	Z	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	2	1	0	0	2	1	0.6	2

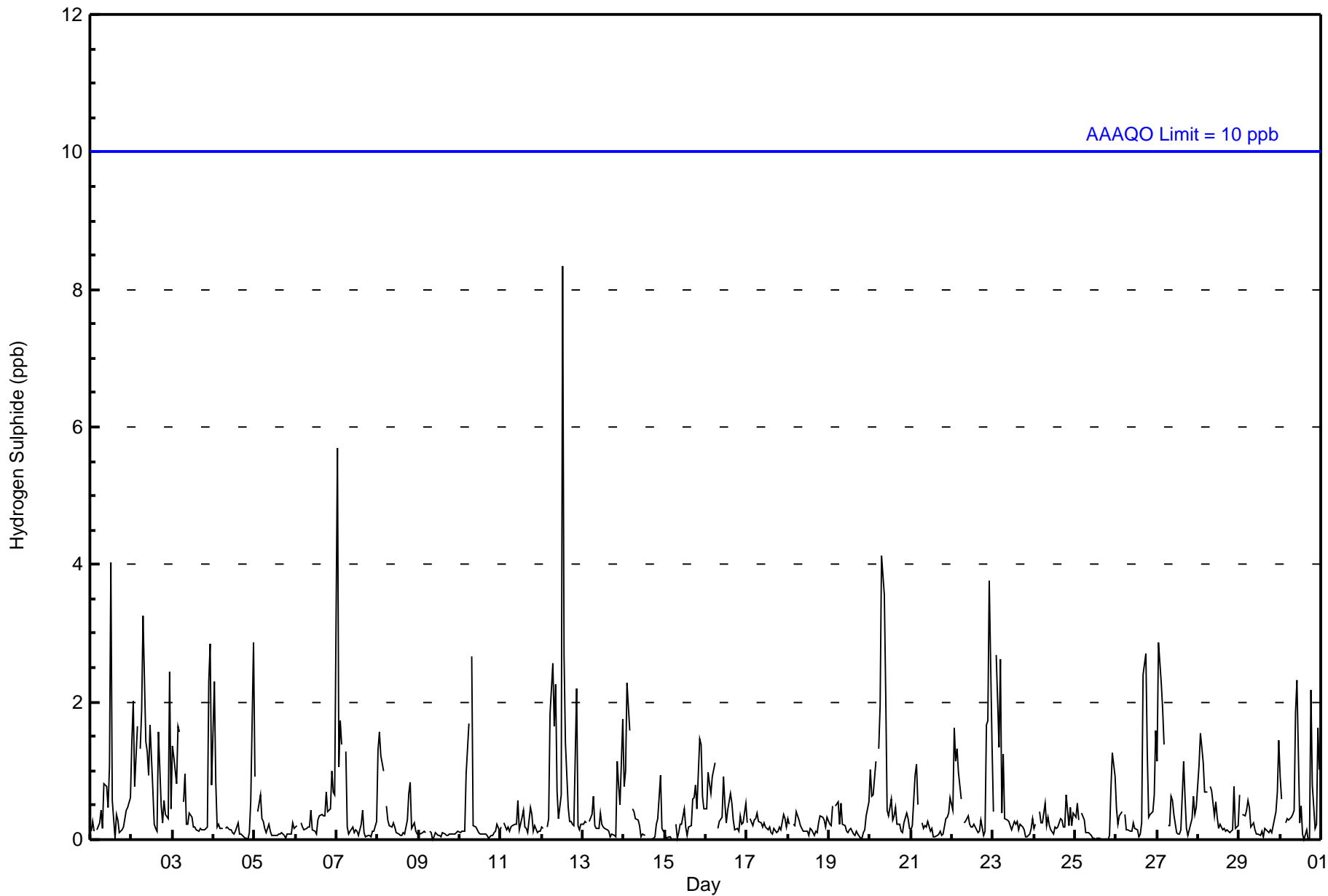
0.8	0.7	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.5	0.4	0.3	0.3	0.6	0.3	0.2	0.2	0.3	0.3	0.3	0.2	0.4	0.5	0.7	0.6	Diurnal Average
6	3	3	2	3	2	3	4	4	4	2	2	2	8	3	1	1	2	3	2	1	2	2	4	3	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Lower Camp - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Lower Camp - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	671	97.67	97.67
3 - 4	14	2.04	99.71
5 - 7	1	0.15	99.85
8 - 11	1	0.15	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 687

Total Number of Hours: 720



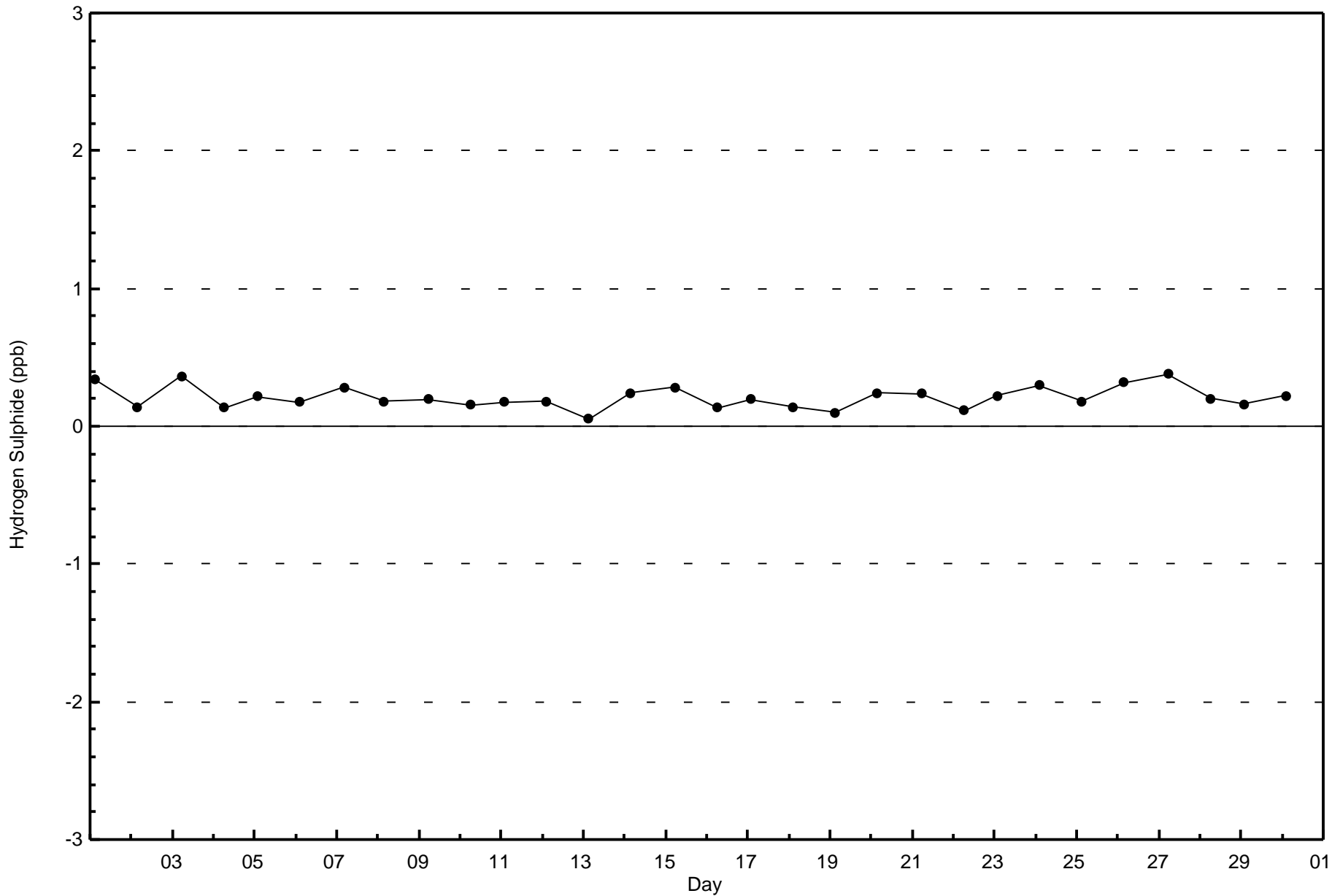
**Wood Buffalo Environmental Association
Frequency Distribution**

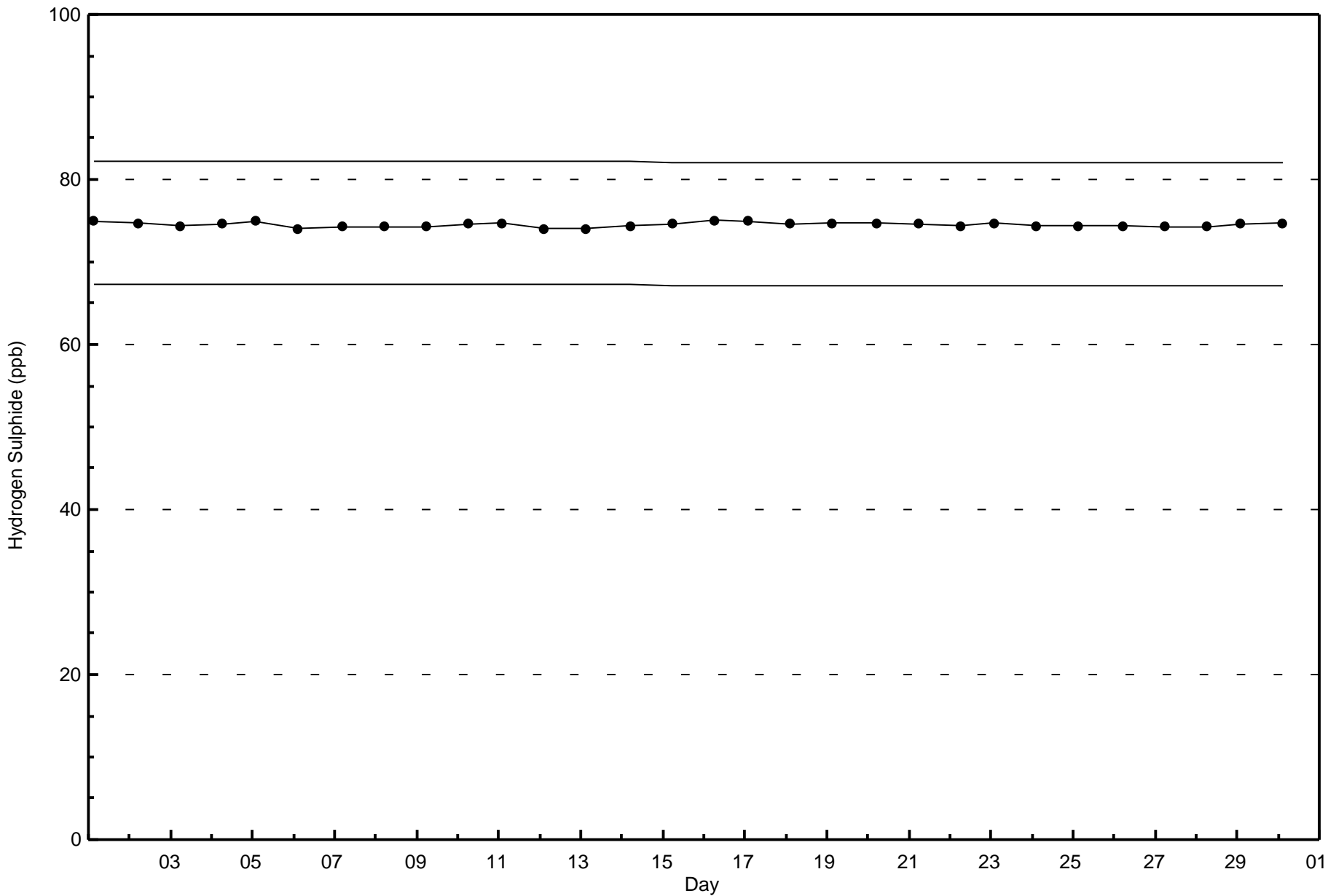
**Hydrogen Sulphide (H₂S) - ppb
Lower Camp - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	57	36	23	13	33	57	105	28	20	11	16	69	48	39	55	61	671
3 - 4	0	0	3	0	1	0	1	1	0	4	2	0	1	1	0	0	14
5 - 7	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
8 - 11	0	0	0	0	0	0	0	0	0	1	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
Totals	57	36	26	13	34	58	106	29	20	16	18	69	49	40	55	61	687

Total Number of Valid Hours: 687

Total Number of Hours: 720







Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

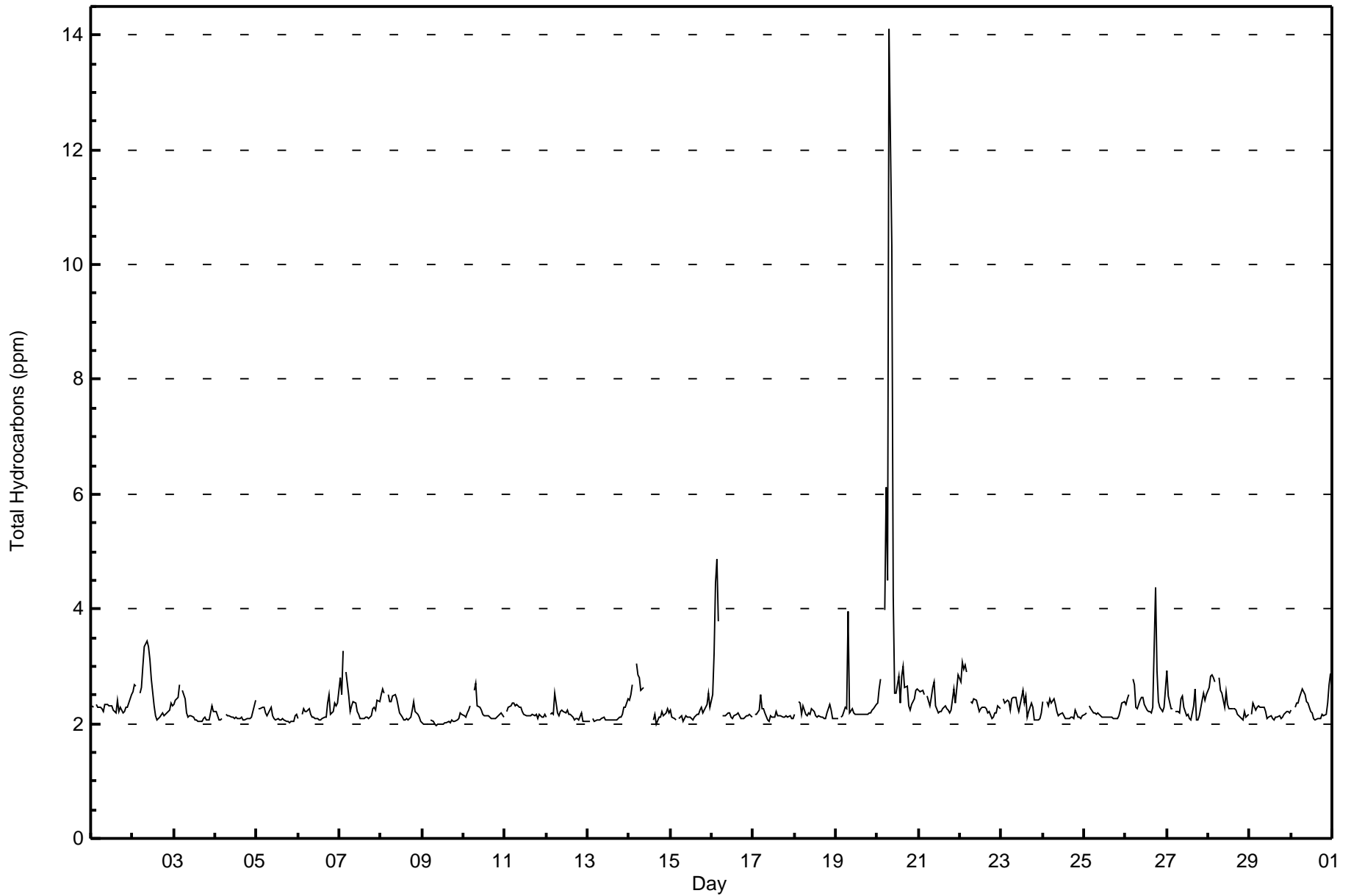
Lower Camp - June 2016

Maximum Value: 14.1 ppm on Jun 20 08:00		Maximum Daily Average: 3.8 ppm on Jun 20		Hours in Service: 720																							
Minimum Value: 2.0 ppm on Jun 9 09:00		Minimum Daily Average: 2.0 ppm on Jun 9		Hours of Data: 685																							
Maximum Diurnal Average: 2.8 ppm at hour 8		Minimum Diurnal Average: 2.1 ppm at hour 14		Hours of Missing Data: 35																							
Monthly Average: 2.32 ppm		Percentiles: P ₁ = 2.0 P ₁₀ = 2.1 Q ₁ = 2.1 Median = 2.2 Q ₃ = 2.3 P ₉₀ = 2.6 P ₉₉ = 4.3		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-Jun	2.3	2.3	Z	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.2	2.2	2.4	2.2	2.3	2.2	2.2	2.2	2.3	2.3	2.4	2.5	2.3	2.5	
2-Jun	2.6	2.7	2.7	Z	2.5	2.6	3.0	3.3	3.4	3.3	3.1	2.8	2.3	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.2	2.2	2.4	2.3	2.5	3.4	
3-Jun	2.3	2.4	2.5	2.7	Z	2.6	2.4	2.2	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	2.2	2.3	2.2	2.2	2.7	
4-Jun	2.2	2.1	2.1	2.1	2.1	Z	2.2	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	2.4	2.1	2.4	
5-Jun	Z	2.3	2.3	2.3	2.3	2.2	2.1	2.2	2.3	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	2.1	2.2	2.1	2.3	
6-Jun	2.1	Z	2.2	2.3	2.2	2.2	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.4	2.5	2.2	2.2	2.4	2.3	2.4	2.2	2.5	
7-Jun	2.8	2.5	3.3	Z	2.9	2.5	2.2	2.3	2.4	2.4	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.3	2.2	2.4	2.4	2.3	3.3	
8-Jun	2.5	2.6	2.5	Z	2.5	2.4	2.4	2.5	2.5	2.4	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.4	2.2	2.2	2.1	2.0	2.3	2.6	
9-Jun	2.0	2.0	2.0	2.0	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	2.1	2.0	2.0	2.1	2.1	2.2	2.2	2.0	2.2	
10-Jun	2.1	2.1	2.2	2.2	2.3	Z	2.6	2.7	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.2	2.7	
11-Jun	Z	2.2	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.3	2.2	2.2	2.1	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.1	2.2	2.2	2.4	
12-Jun	2.1	Z	2.2	2.2	2.2	2.5	2.2	2.1	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	2.0	2.0	2.0	2.2	2.5	
13-Jun	2.0	2.0	Z	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	2.2	2.3	2.3	2.4	2.1	2.4	
14-Jun	2.4	2.5	2.7	Z	3.0	2.8	2.8	2.6	2.6	C	C	C	C	C	2.1	2.2	2.0	2.1	2.1	2.2	2.1	2.2	2.3	2.2	2.4	3.0	
15-Jun	2.2	2.1	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	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.3	2.5	2.3	2.2	2.5
16-Jun	2.5	3.2	4.5	4.9	3.8	Z	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.5	4.9
17-Jun	Z	2.2	2.2	2.2	2.5	2.3	2.3	2.2	2.1	2.0	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	2.2	2.5	
18-Jun	2.2	Z	2.4	2.4	2.2	2.3	2.2	2.1	2.2	2.2	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.3	2.2	2.1	2.1	2.2	2.4	
19-Jun	2.1	2.1	Z	2.1	2.1	2.3	2.3	4.0	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	2.3	2.3	2.3	4.0	
20-Jun	2.4	2.6	2.8	Z	4.0	6.1	4.5	14.1	10.3	4.2	2.5	2.5	2.8	2.4	2.8	3.0	2.6	2.7	2.3	2.2	2.3	2.4	2.6	2.6	3.8	14.1	
21-Jun	2.6	2.6	2.6	2.5	Z	2.5	2.3	2.5	2.6	2.7	2.3	2.2	2.2	2.2	2.3	2.3	2.3	2.2	2.2	2.2	2.6	2.3	2.6	2.8	2.4	2.8	
22-Jun	2.7	3.1	3.0	3.0	2.9	Z	2.4	2.4	2.4	2.4	2.3	2.2	2.3	2.3	2.3	2.3	2.2	2.2	2.1	2.1	2.2	2.2	2.3	2.3	2.4	3.1	
23-Jun	Z	2.4	2.4	2.4	2.4	2.2	2.4	2.5	2.5	2.3	2.2	2.3	2.6	2.4	2.5	2.1	2.2	2.4	2.3	2.1	2.1	2.1	2.1	2.2	2.3	2.6	
24-Jun	2.4	Z	2.4	2.3	2.4	2.4	2.4	2.3	2.2	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.2	2.4	
25-Jun	2.2	2.2	Z	2.3	2.3	2.2	2.2	2.2	2.2	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	2.4	2.4	2.2	2.4	
26-Jun	2.3	2.4	2.5	Z	2.8	2.7	2.3	2.3	2.4	2.5	2.5	2.3	2.2	2.2	2.2	2.2	2.3	4.4	2.9	2.4	2.3	2.2	2.3	2.6	2.5	4.4	
27-Jun	2.9	2.5	2.3	2.3	Z	2.2	2.2	2.2	2.4	2.5	2.3	2.1	2.2	2.1	2.1	2.3	2.6	2.1	2.1	2.1	2.4	2.5	2.4	2.5	2.3	2.9	
28-Jun	2.6	2.8	2.9	2.8	2.7	Z	2.8	2.6	2.5	2.3	2.6	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.1	2.1	2.1	2.2	2.1	2.2	2.4	2.9	
29-Jun	Z	2.2	2.4	2.2	2.3	2.3	2.3	2.3	2.3	2.2	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	2.2	2.2	2.4	
30-Jun	2.2	Z	2.3	2.3	2.4	2.5	2.6	2.5	2.5	2.4	2.4	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.4	2.7	2.9	2.3	2.9	
																								Diurnal Average			
																								Diurnal Maximum			
																								Z - zerospan C - Calibration			



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Lower Camp - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Lower Camp - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	34	4.96	4.96
2.1 - 3.0	633	92.41	97.37
3.1 - 10.0	16	2.34	99.71
> 10.0	2	0.29	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Lower Camp - June 2016**

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	7	9	5	0	1	3	0	0	0	0	0	6	1	1	0	1	34
2.1 - 3.0	50	25	18	13	28	55	106	26	19	15	18	63	46	38	53	60	633
3.1 - 10.0	0	2	1	2	0	1	1	3	0	1	0	0	1	0	3	1	16
> 10.0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Totals	57	36	26	15	29	59	107	29	19	16	18	69	48	39	56	62	685

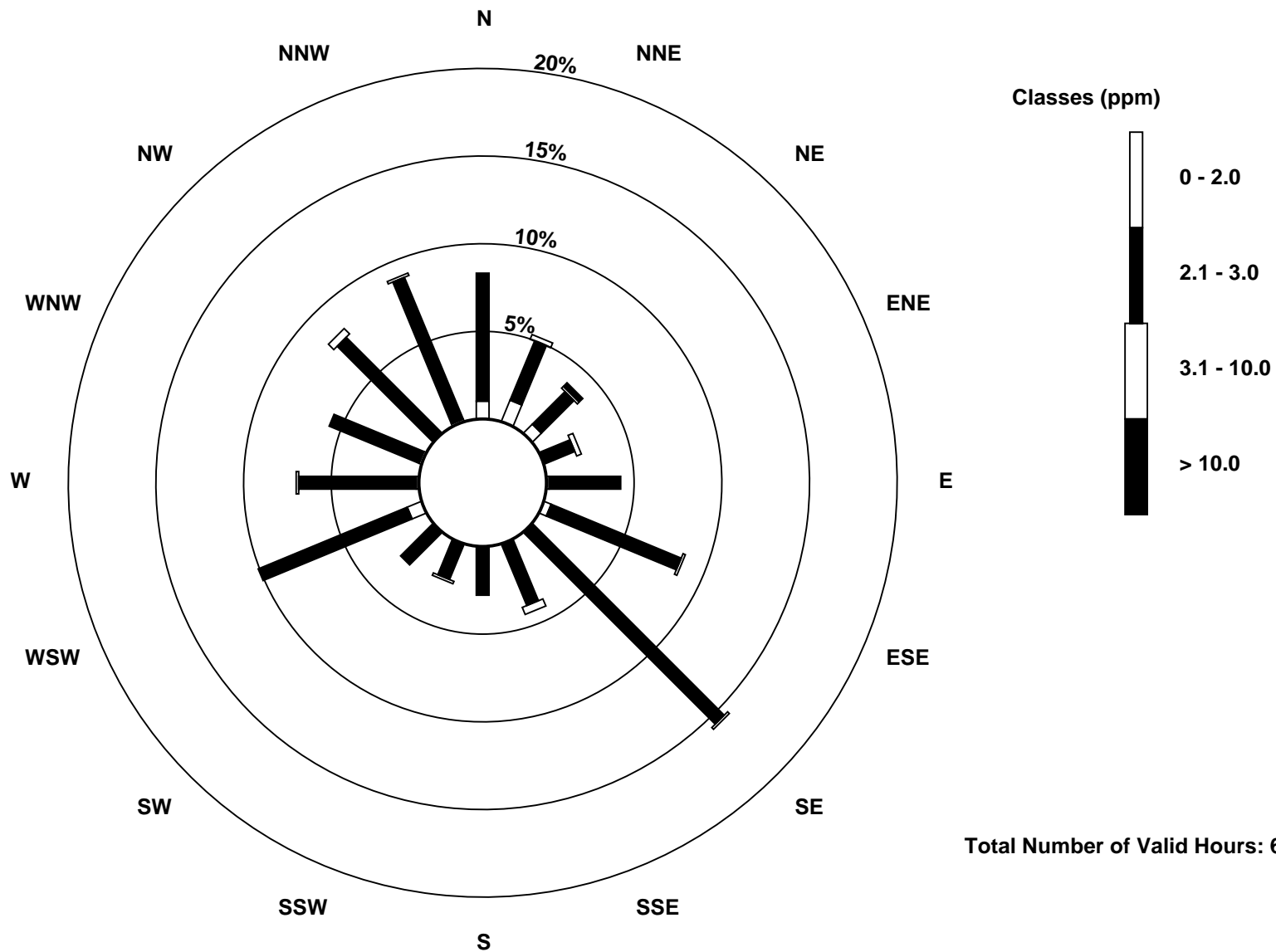
Total Number of Valid Hours: 685

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Total Hydrocarbons (THC) - ppm
Lower Camp (AMS 11)



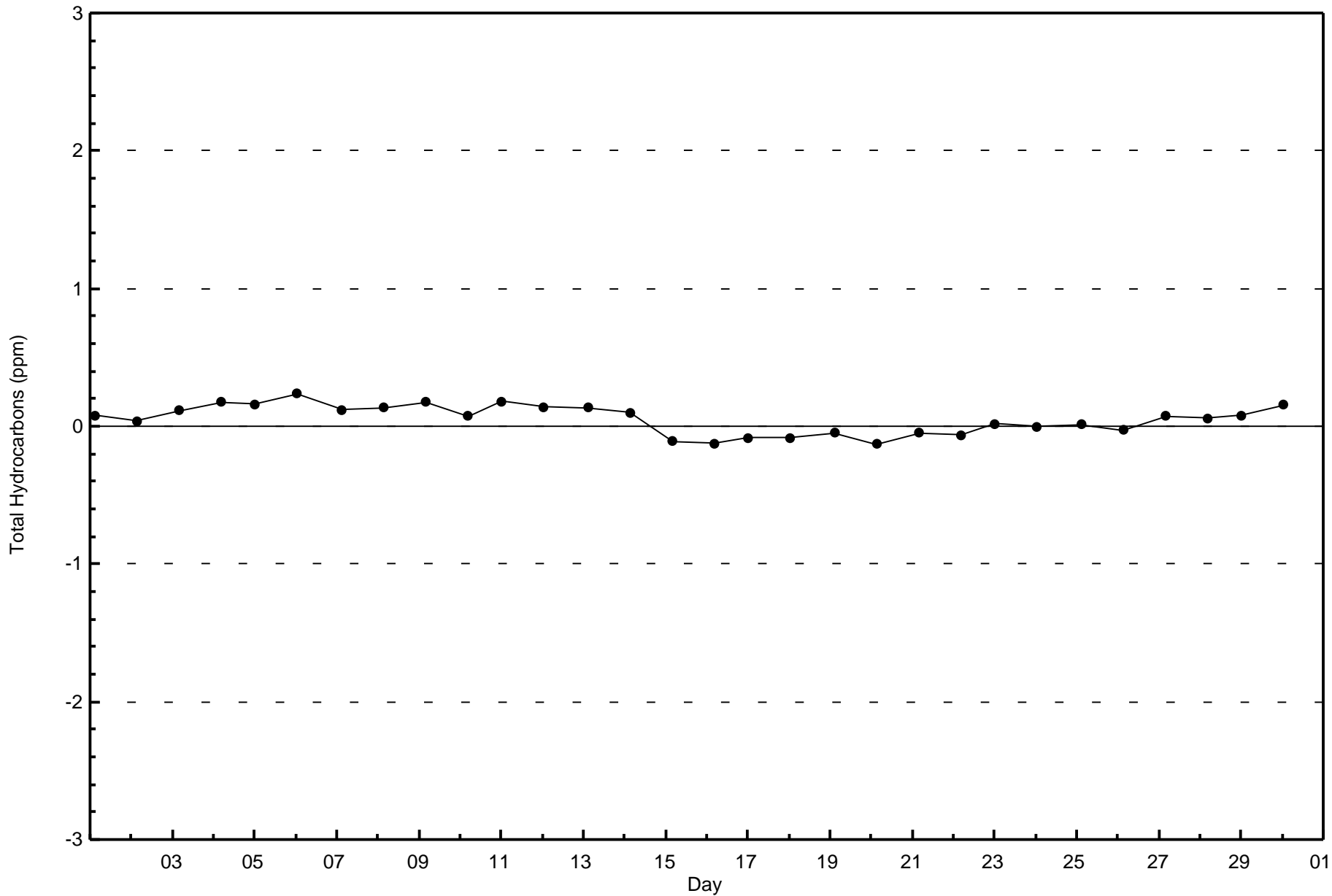


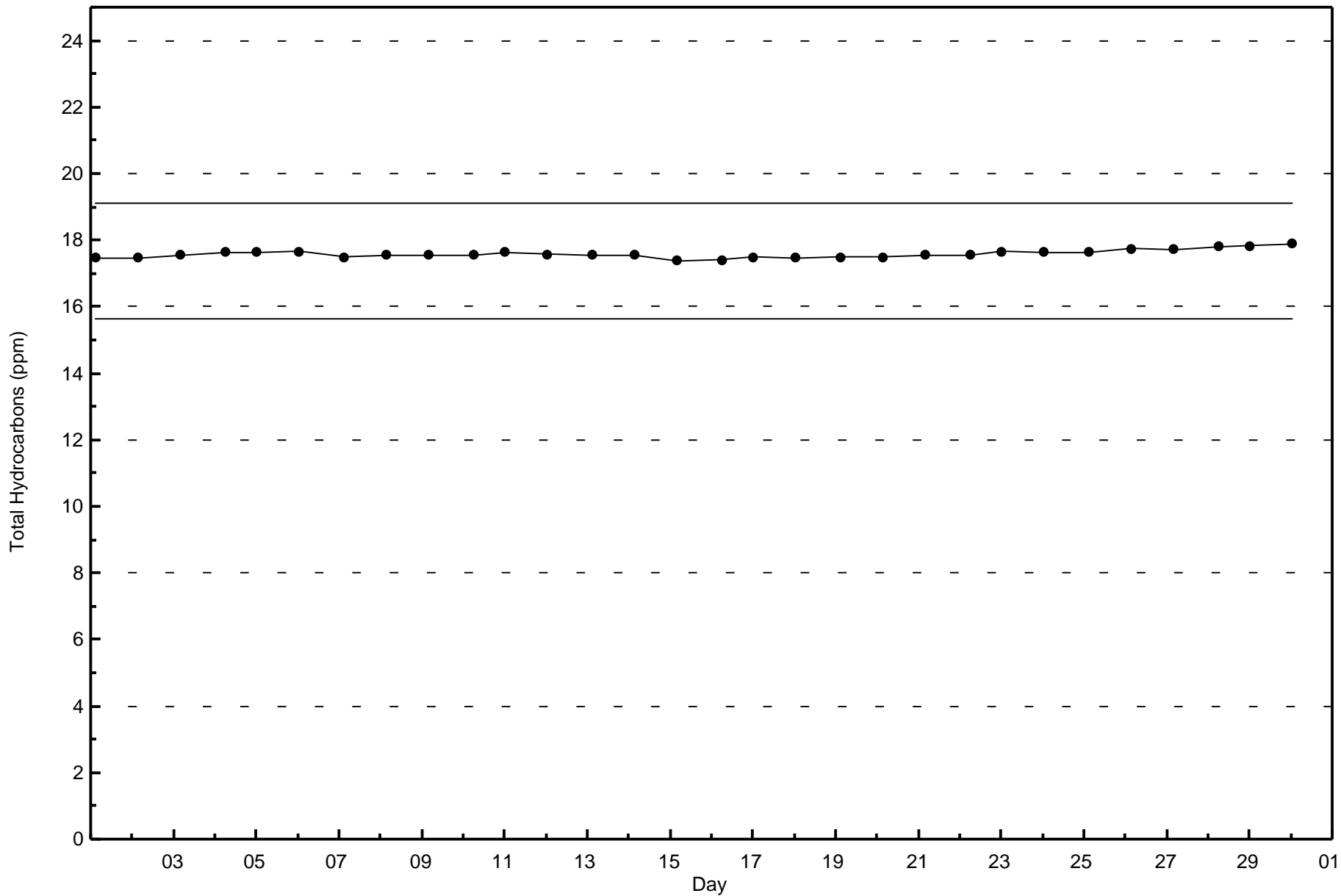
Wood Buffalo Environmental Association

Zero Responses

Total Hydrocarbons (THC) - ppm

Lower Camp - June 2016



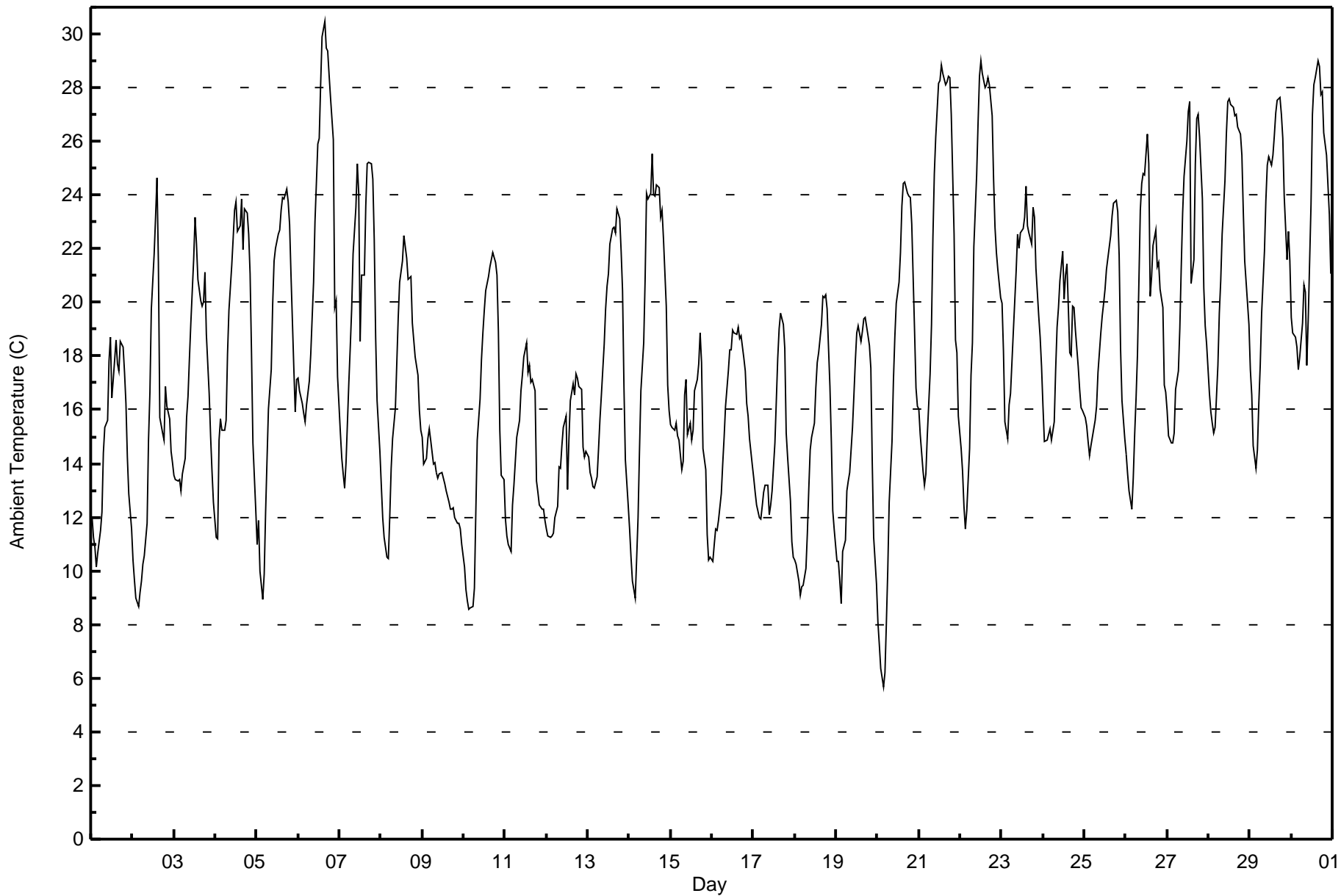




Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Lower Camp - June 2016

Maximum Value: 30.5 C on Jun 6 16:00		Maximum Daily Average: 22.9 C on Jun 30		Hours in Service: 720																						
Minimum Value: 5.7 C on Jun 20 04:00		Minimum Daily Average: 13.2 C on Jun 9		Hours of Data: 720																						
Maximum Diurnal Average: 22.2 C at hour 18		Minimum Diurnal Average: 12.3 C at hour 4		Hours of Missing Data: 0																						
Monthly Average: 17.88 C		Percentiles: P₁ = 8.6 P₁₀ = 11.5 Q₁ = 14.1 Median = 17.4 O₃ = 21.6 P₉₀ = 25.1 P₉₉ = 28.7		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-Jun	12.0	11.2	10.9	10.1	10.7	11.5	12.2	14.4	15.3	15.6	17.8	18.7	16.4	17.1	18.6	17.7	17.5	18.5	18.3	17.4	16.2	14.2	12.9	11.6	14.9	18.7
2-Jun	10.4	9.6	9.0	8.7	9.2	9.6	10.2	10.6	11.8	14.9	16.7	19.7	21.8	23.2	24.7	21.5	15.7	15.1	14.9	16.8	16.1	15.7	14.5	14.1	14.8	24.7
3-Jun	13.5	13.4	13.3	13.4	13.0	13.6	14.2	15.7	16.5	17.9	19.2	21.6	23.1	22.2	20.9	20.1	19.9	20.0	21.1	18.8	16.6	15.0	13.7	12.5	17.1	23.1
4-Jun	11.2	11.2	14.9	15.6	15.2	15.3	15.6	18.1	19.7	21.4	22.4	23.4	23.8	22.7	22.8	23.9	22.0	23.5	23.3	22.5	21.1	18.1	14.8	12.3	18.9	23.9
5-Jun	11.0	11.9	10.0	8.9	9.9	12.2	14.1	16.0	17.5	19.9	21.5	22.0	22.5	22.7	23.4	23.9	23.9	24.2	23.8	22.9	21.0	17.5	15.9	17.2	18.1	24.2
6-Jun	17.2	16.7	16.2	15.9	15.5	16.2	17.1	18.1	19.4	20.8	23.0	25.9	26.1	28.1	29.9	30.5	29.5	29.4	28.5	27.7	26.1	19.8	20.1	17.2	22.3	30.5
7-Jun	15.1	14.2	13.6	13.1	14.1	17.0	18.3	19.8	21.8	23.6	25.2	24.1	18.5	21.0	21.0	23.6	25.2	25.2	25.1	24.6	22.3	18.7	16.3	14.5	19.8	25.2
8-Jun	13.2	12.0	11.3	10.5	10.5	12.0	13.8	14.9	16.1	17.8	19.5	20.7	21.6	22.5	22.1	21.7	20.8	21.0	19.2	18.6	18.0	17.3	16.0	15.3	16.9	22.5
9-Jun	14.9	14.0	14.2	14.9	15.3	14.9	14.0	14.0	13.7	13.5	13.6	13.7	13.5	13.2	13.0	12.5	12.3	12.3	12.3	12.0	11.8	11.8	11.6	11.0	13.2	15.3
10-Jun	10.1	9.3	8.9	8.6	8.6	8.7	9.4	12.2	14.9	16.4	17.9	18.9	19.7	20.4	21.0	21.3	21.6	21.9	21.5	21.0	18.9	15.2	13.5	13.4	15.6	21.9
11-Jun	12.0	11.3	11.0	10.7	12.4	13.2	14.1	15.0	15.6	16.7	17.3	18.0	18.5	17.4	17.6	17.0	17.1	16.7	13.4	12.9	12.5	12.3	12.3	11.9	14.4	18.5
12-Jun	11.6	11.3	11.3	11.3	11.4	12.0	12.4	13.9	13.8	14.6	15.4	15.8	13.0	14.9	16.3	17.0	16.5	17.3	17.2	16.9	16.7	14.6	14.2	14.4	14.3	17.3
13-Jun	14.2	13.7	13.4	13.1	13.1	13.5	14.6	15.7	16.6	18.5	19.7	20.6	21.1	22.2	22.8	22.8	22.6	23.5	23.1	21.9	20.4	16.8	14.2	12.5	17.9	23.5
14-Jun	11.5	10.5	9.6	9.0	10.5	12.0	14.5	16.7	18.5	20.8	24.0	23.9	24.1	25.5	24.0	23.9	24.4	24.3	23.2	23.4	22.4	19.8	16.9	16.0	18.7	25.5
15-Jun	15.4	15.3	15.2	15.5	15.0	14.9	13.7	14.1	16.5	17.1	15.1	15.5	14.9	15.2	16.7	17.1	17.7	18.8	17.7	14.6	13.8	11.4	10.4	10.5	15.1	18.8
16-Jun	10.3	11.0	11.6	11.5	11.9	12.9	14.0	15.0	16.1	17.5	18.2	18.2	19.0	18.9	18.8	19.1	18.6	18.7	17.9	17.4	16.3	15.8	14.9	13.9	15.7	19.1
17-Jun	13.4	12.9	12.5	12.0	11.9	12.4	12.9	13.2	13.2	12.1	12.5	13.0	14.8	16.3	17.9	19.0	19.6	19.2	18.3	15.1	14.3	12.6	11.1	10.5	14.2	19.6
18-Jun	10.4	10.2	9.6	9.1	9.4	9.4	10.1	11.4	13.0	14.5	15.0	15.5	16.8	17.8	18.1	19.2	20.3	20.2	20.3	19.7	16.9	14.8	12.3	11.6	14.4	20.3
19-Jun	10.4	10.3	9.6	8.8	10.7	11.1	13.0	13.4	13.6	15.4	16.5	17.8	18.9	19.1	18.6	18.9	19.4	19.4	18.7	18.4	17.6	14.0	11.3	9.5	14.8	19.4
20-Jun	8.1	7.3	6.3	5.7	6.2	8.0	10.1	12.6	14.8	17.1	18.7	20.0	20.7	21.9	23.6	24.4	24.5	24.1	24.0	23.9	22.9	18.9	16.8	16.2	16.5	24.5
21-Jun	16.0	15.1	13.7	13.2	13.6	15.0	17.3	19.2	22.4	24.8	26.2	28.2	28.3	28.8	28.5	28.1	28.2	28.4	28.4	27.0	22.5	18.6	18.1	15.8	21.9	28.8
22-Jun	14.6	13.7	12.4	11.6	12.3	14.6	17.3	18.5	22.1	24.8	26.7	28.4	29.0	28.5	28.0	28.1	28.4	28.1	26.9	24.6	22.8	21.8	21.2	20.2	21.9	29.0
23-Jun	20.0	18.2	15.6	14.9	16.2	16.6	17.8	18.9	21.2	22.5	22.0	22.6	22.8	23.2	24.3	22.9	22.6	22.2	23.5	23.2	21.3	19.5	18.7	17.6	20.3	24.3
24-Jun	16.1	14.8	14.9	15.1	15.3	14.8	15.6	17.5	19.1	19.8	20.8	21.9	20.1	21.0	21.4	18.1	18.0	19.9	19.8	19.0	17.6	16.7	16.1	16.0	17.9	21.9
25-Jun	15.7	15.4	14.8	14.3	14.7	15.3	15.6	16.2	17.4	18.8	19.5	19.9	20.5	21.2	22.1	22.5	23.2	23.7	23.8	23.4	21.7	18.3	16.3	14.9	18.7	23.8
26-Jun	14.3	13.6	13.0	12.3	13.5	15.1	16.4	18.0	23.5	24.4	24.8	24.7	26.3	25.1	20.2	21.0	22.1	22.7	21.3	21.5	20.5	19.8	16.9	16.6	19.5	26.3
27-Jun	16.0	15.0	14.8	14.7	15.1	16.8	17.4	19.0	21.3	23.3	24.7	26.0	27.1	27.5	20.7	21.6	25.2	26.8	27.0	26.2	23.9	20.6	19.1	18.4	21.2	27.5
28-Jun	16.6	15.9	15.5	15.1	15.3	17.6	19.6	20.8	22.5	24.5	26.3	27.5	27.6	27.4	27.2	26.9	27.0	26.6	26.3	25.5	23.4	21.5	20.7	19.2	22.4	27.6
29-Jun	17.5	16.5	14.7	13.8	14.5	16.2	17.6	19.6	21.9	23.8	25.1	25.4	25.1	25.5	26.2	27.1	27.5	27.7	27.0	26.1	24.0	21.6	22.6	21.5	22.0	27.7
30-Jun	19.4	18.9	18.7	18.3	17.5	18.0	19.2	20.6	20.4	17.6	19.3	23.7	27.0	28.1	28.4	29.0	28.8	27.7	27.8	26.3	25.5	24.4	23.3	21.1	22.9	29.0
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Lower Camp - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	28	3.89	3.89
10 - 20	455	63.19	67.08
> 20	237	32.92	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



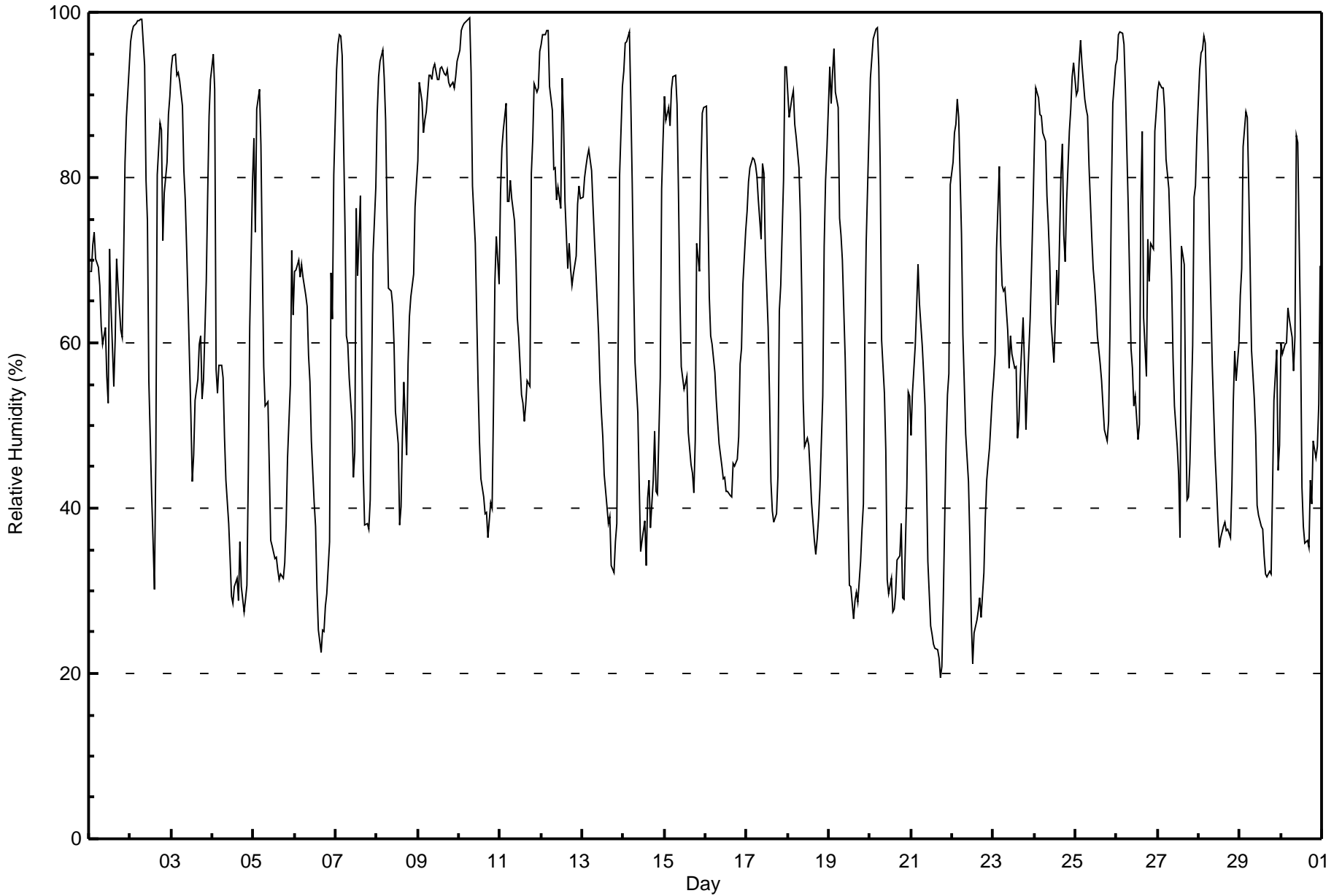
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Lower Camp - June 2016

Maximum Value: 99 % on Jun 10 07:00																		Maximum Daily Average: 91.1 % on Jun 9																		Hours in Service: 720														
Minimum Value: 20 % on Jun 21 18:00																		Minimum Daily Average: 43.9 % on Jun 21																		Hours of Data: 720														
Maximum Diurnal Average: 86.2 % at hour 4																		Minimum Diurnal Average: 46.1 % at hour 18																		Hours of Missing Data: 0														
Monthly Average: 64.2 %																		Percentiles: P ₁ = 23 P ₁₀ = 35 Q ₁ = 46 Median = 64 Q ₃ = 84 P ₉₀ = 92 P ₉₉ = 99																		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-Jun	69	69	72	73	70	69	67	62	60	62	56	53	71	64	55	61	70	67	61	61	70	82	87	93	67.7	93																								
2-Jun	96	98	98	99	99	99	99	99	93	80	75	55	42	36	30	46	80	87	86	72	78	82	88	90	79.5	99																								
3-Jun	93	95	95	92	93	92	89	81	77	71	65	51	43	46	53	56	60	61	53	56	68	78	87	92	72.8	95																								
4-Jun	95	91	57	54	57	57	56	49	43	38	34	29	29	30	32	29	36	30	27	29	31	44	62	80	46.6	95																								
5-Jun	85	73	88	91	84	70	57	52	53	45	36	35	34	34	33	31	32	32	33	38	46	55	71	63	53.0	91																								
6-Jun	69	69	70	68	70	68	66	64	58	55	48	41	38	30	25	23	25	25	28	30	36	69	63	80	50.7	80																								
7-Jun	93	96	97	97	95	74	61	60	56	50	44	47	76	68	78	59	45	38	38	37	41	56	71	79	64.8	97																								
8-Jun	88	92	94	95	92	87	76	67	66	65	60	52	48	38	40	49	55	46	57	63	66	68	76	79	67.5	95																								
9-Jun	82	91	89	85	87	88	92	92	92	93	94	92	92	93	93	93	92	93	92	91	92	91	92	94	91.1	94																								
10-Jun	95	98	98	99	99	99	99	93	79	72	63	55	48	44	41	39	40	36	41	40	52	67	73	67	68.3	99																								
11-Jun	78	84	86	89	77	77	80	77	75	70	63	61	54	53	50	53	55	55	81	85	91	90	91	95	73.7	95																								
12-Jun	96	97	97	98	98	91	88	81	81	77	79	76	92	87	77	69	72	69	67	68	71	77	79	77	81.9	98																								
13-Jun	78	80	81	83	83	81	77	73	69	61	55	52	49	44	40	38	39	33	32	36	38	60	80	91	60.5	91																								
14-Jun	93	96	96	98	89	79	67	58	51	43	35	36	39	33	41	43	38	43	49	42	42	56	79	85	59.6	98																								
15-Jun	90	87	88	86	91	92	92	89	78	66	57	54	55	56	49	45	44	42	48	72	69	80	88	88	71.2	92																								
16-Jun	89	77	66	61	60	56	53	50	48	45	44	44	42	42	41	46	45	46	46	49	57	59	67	74	54.2	89																								
17-Jun	76	80	81	82	82	81	80	77	73	82	81	71	62	53	43	40	38	39	44	64	67	80	93	93	69.3	93																								
18-Jun	90	87	90	91	86	85	81	76	66	53	47	48	48	44	41	36	34	36	39	42	54	72	80	84	62.9	91																								
19-Jun	93	89	93	96	90	88	75	73	70	58	49	40	31	31	27	29	30	29	33	37	40	60	72	86	59.1	96																								
20-Jun	92	94	97	98	98	93	81	60	54	47	31	30	31	27	28	30	34	34	38	29	29	42	54	54	54.5	98																								
21-Jun	49	54	60	64	69	65	60	56	52	44	34	26	25	24	23	23	22	20	21	29	48	54	56	79	43.9	79																								
22-Jun	82	85	86	90	87	73	61	55	49	43	36	27	21	25	26	28	29	27	32	39	43	45	47	54	49.6	90																								
23-Jun	56	59	71	81	72	67	66	67	62	57	61	59	57	57	48	50	56	63	57	50	55	63	69	76	61.6	81																								
24-Jun	84	91	90	88	88	85	84	78	74	70	62	58	63	69	65	80	84	73	70	77	86	88	92	94	78.8	94																								
25-Jun	90	91	94	97	94	89	88	87	82	73	69	67	64	61	57	55	52	49	48	51	62	78	89	94	74.2	97																								
26-Jun	94	97	98	98	96	91	84	77	59	57	52	53	48	50	77	86	63	56	73	68	72	71	86	88	74.7	98																								
27-Jun	90	92	91	91	88	82	79	73	68	58	52	47	44	36	72	69	52	41	41	45	60	78	79	85	67.2	92																								
28-Jun	93	95	95	97	96	83	73	65	57	46	43	39	35	36	38	38	37	37	36	43	53	59	55	60	58.8	97																								
29-Jun	66	69	84	88	87	79	69	59	53	49	40	39	38	37	34	32	32	32	32	42	53	59	45	48	52.8	88																								
30-Jun	60	59	60	60	64	63	61	57	61	85	84	61	43	38	36	36	35	43	40	48	46	47	53	69	54.5	85																								
																								83.4	84.5	85.4	86.2	84.7	80.2	75.4	70.2	65.4	60.5	55.0	49.9	48.7	46.3	46.5	46.9	47.6	46.1	48.2	51.1	57.1	67.0	74.1	79.7	Diurnal Average		
																								96	98	98	99	99	99	99	99	99	93	93	94	92	92	93	93	93	92	93	92	91	92	91	93	95	Diurnal Maximum	





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Lower Camp - June 2016

Maximum Speed: 26 km/h on Jun 13 13:00	Maximum Daily Speed Average: 16.6 km/h on Jun 13	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 8 03:00	Minimum Daily Speed Average: 0.3 km/h on Jun 2	Hours of Data: 720
Maximum Diurnal Speed Average: 3.4 km/h at hour 13	Minimum Diurnal Speed Average: 0.6 km/h at hour 23	Hours of Missing Data: 0
Monthly Average Velocity: 1.0 km/h 264.2 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 4 Median = 8 O ₃ = 12 P ₉₀ = 17 P ₉₉ = 22	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-Jun	SE8	SE6	E7	ESE9	SE9	SE13	SE10	SE11	SE8	ESE10	SE11	SSE9	SE2	NE4	W11	S9	SE10	SE12	SE8	SSE6	SE2	SE4	SE4	WNW2	SE6.2	SE13
2-Jun	NW1	NNW1	WSW1	ENE1	NNW2	NNE1	NNE4	W2	NW6	NW4	NNE6	NNE4	E4	ESE5	ESE4	WSW5	WSW17	ESE13	ESE8	SSE4	W3	W7	SE4	E3	SSE0.3	WSW17
3-Jun	S2	ESE3	SE5	SE4	SSE5	SE5	SE5	SW4	WSW10	WSW14	WSW10	WSW12	WSW20	NNW15	N12	NNW13	NNW8	NNW6	N5	N10	SE3	SW1	NNW1	WNW2	W3.2	WSW20
4-Jun	SSW3	SSW1	WSW15	W19	W22	W21	W17	NNW16	NNW19	W21	NNW17	NNW19	NNW20	W16	WSW16	NNW17	NNW14	NW18	NNW21	NW17	NNW14	NW4	NNW1	E3	NNW13.4	W22
5-Jun	W2	WNW3	E2	E1	NE2	W4	WSW9	W4	NNE5	NNE4	NW14	NNW13	NNW14	N11	NNW13	NNW9	N9	N6	NE7	NE10	NE7	W1	E1	SE7	N4.4	NW14
6-Jun	SE13	ESE14	ESE12	ESE14	SE10	SE8	SE9	SE7	SE11	SE10	SE15	SE14	SE16	SE16	SE14	SSE12	SE12	S10	S10	SSE12	S9	SE7	NW5	NW1	SE10.0	SE16
7-Jun	ESE1	E2	ESE3	WNW2	ESE4	SW1	WSW12	WSW11	WSW9	WSW10	WSW8	WNW4	N8	NE3	SE3	ENE2	NNW8	NNW11	NNW9	NNW9	WNW7	W5	WNW4	WNW1	WNW3.2	WSW12
8-Jun	NW1	WNW2	NW0	NW2	WNW5	NNW3	NW5	NW6	NW5	NW5	NW5	NNW6	NNW6	E9	ENE6	ENE3	ESE1	SE8	SE8	ESE7	NE6	E4	ESE16	ESE10	NE1.8	ESE16
9-Jun	E14	NNE8	NNE8	NE13	NE13	NE14	NE15	NNE17	NNE20	NNE19	NNE16	NNE17	NNE18	NNE18	N20	N21	N19	N15	N17	N14	NNW10	NNW10	NW9	NW7	NNE13.4	N21
10-Jun	WNW6	W6	W5	E4	E1	E5	E3	NE3	N8	NNW11	NNW11	N10	N10	N8	NNE9	NNE7	N8	NNW5	N4	NE7	NE3	W2	S0	E6	N4.2	NNW11
11-Jun	NNW2	WNW3	WNW2	W2	ESE4	SE6	SE7	SE11	ESE12	SE10	SE14	SE14	SE15	SE16	SE21	SE12	ESE12	SE16	ESE15	ESE18	ESE10	ENE7	NNE4	NW3	ESE8.6	SE21
12-Jun	NW4	WNW4	NW3	NW2	WSW2	SSW6	SW9	SW9	SSW7	S7	S7	SSW10	SSW10	SSW10	SSW10	WSW16	W18	WSW18	W15	WSW11	SW9	WSW16	WSW20	WSW20	WSW8.9	WSW20
13-Jun	WSW21	WSW19	WSW18	WSW17	WSW16	WSW15	WSW15	WSW18	WSW18	WSW20	WSW20	WSW24	WSW26	WSW25	WSW23	WSW23	WSW16	W17	W17	WSW15	SW10	W5	SW1	NE0	WSW16.6	WSW26
14-Jun	WSW1	E2	ESE1	ESE3	ENE4	NNW3	E3	SE7	ESE3	E3	SE5	ESE8	SE10	ESE10	SE11	ESE16	ESE17	SE14	SE9	SE9	SSE17	SSE13	ESE10	E10	ESE7.2	ESE17
15-Jun	ESE12	ESE10	ESE13	ESE18	ESE17	ESE16	ESE8	ESE13	SE22	SE22	SSE21	SSE22	SSE20	SSE20	S20	SSE18	S15	S11	S10	SSW4	S4	S8	SE6	SE6	SE12.3	SE22
16-Jun	SE6	SE9	SSE11	SSE11	SSE11	SSE10	SSE11	S13	S14	S13	SSW16	SW17	SW20	SW19	SSW15	SSW10	WSW16	WSW14	WSW13	WSW12	WSW8	WSW10	WSW13	WSW14	SSW9.8	SW20
17-Jun	WSW13	WSW13	WSW12	W7	NW4	W11	W16	NNW19	NNW19	NNW16	NNW17	NNW17	NNW19	NNW20	W20	W19	W20	W18	W13	NNW9	E5	N6	NNW9	NNW2	WNW11.9	W20
18-Jun	WNW6	WNW12	NW7	NNW6	N5	NW7	WNW9	W11	W15	W15	NNW13	W11	WSW13	WSW15	WSW16	W13	W9	NW5	NNE1	SSE6	SE4	N11	ENE6	NW3	W6.6	WSW16
19-Jun	WNW4	NW5	WNW3	W3	N3	NNW4	W5	NW6	N8	N10	N14	NNW14	NW19	NNW20	NNW18	N18	NNW18	NNW17	N16	N13	N7	WNW3	NNE1	NNW2	NNW8.9	NNW20
20-Jun	NW1	WNW1	E1	E1	ENE1	NNW2	NE3	NE3	NE3	ENE4	NNW6	N5	NE7	NE6	SE6	SE8	SE8	SE9	SE7	SE6	SE6	SE6	SE6	SE8	ESE2.8	SE9
21-Jun	SE10	SE9	SE7	SE10	SE6	ESE10	SE9	SE10	SE8	SE9	SE4	SW9	S9	W6	NNW3	E3	ESE6	ENE2	SE5	NNE1	E1	SE6	ESE5	N1	SE4.7	SE10
22-Jun	E2	NNE1	E1	E1	NE1	E5	SE9	ESE12	SE8	SE8	SE8	ESE6	WNW4	N4	NNE6	NW7	ESE5	SW12	WSW21	WSW16	SW13	SW13	SW6	WSW4	SSW2.5	WSW21
23-Jun	WSW9	SSE3	SSE2	E2	SSW2	W6	W3	NW6	SE3	ENE3	N10	N8	NNW4	NNE5	N7	NNW12	NW10	NNW6	NNW3	ENE10	ENE5	NE2	NNW6	NW6	NNW3.1	NNW12
24-Jun	SSE0	E2	NNW1	NNW4	NE3	N4	NW5	NNW8	NW10	NNW11	NNW9	NNW9	NNW12	NNW9	NNW14	NW10	NW5	N8	NNW5	NW8	NNW10	NW9	NW5	NW6	NNW6.5	NNW14
25-Jun	NW6	NW4	NW4	NW3	NW5	NNW7	N10	N11	NNW10	N14	NNE11	N12	N11	N10	N11	N11	NNE11	NE13	NE12	NE8	NNE2	N1	N1	ESE2	N7.0	N14
26-Jun	N1	W2	E3	E3	E3	ESE6	SE10	SE8	SE6	SE6	E4	ESE6	ESE7	NW6	NW7	SSE1	SW12	SSW7	ESE2	SE5	WSW3	W16	W3	SW5	SSE1.5	W16
27-Jun	W3	SSW2	S3	SSE2	S3	WSW7	WSW13	WSW10	WSW8	W8	W9	WSW14	WSW19	WSW22	E12	S4	SSE6	WSW15	WSW11	SW5	SE5	ENE1	SE3	ENE1	WSW5.6	WSW22
28-Jun	ESE1	ESE3	ESE1	E2	ESE3	ESE6	SE4	NNE3	NW6	WNW4	WNW9	NW6	N9	NNW12	NNW13	N14	N14	N15	N14	NNE15	NNE6	N2	N3	NW4	N4.9	NNE15
29-Jun	W2	ENE2	W5	W4	WNW4	WNW3	NNW4	N4	NNW4	N4	NW3	NNE5	NNW2	NNW5	NNE4	N6	NNE4	N4	NNW6	NNE4	NE1	E2	SSE8	SSE8	NNW1.9	SSE8
30-Jun	SE7	SE9	SE12	ESE11	ESE11	ESE3	SE6	SE7	SE7	SSE1	SE3	SSE5	SE9	SE10	ESE14	SE13	ESE11	SE13	SE8	SE9	SSE6	SE4	S3	E2	SE7.3	ESE14

SSW1.2	SSW1.1	S1.1	SE1.3	SE1.3	SSE1.0	SW1.6	SW1.0	W1.1	W1.4	NNW2.2	W2.7	W3.4	NNW2.7	NW1.6	NW2.2	NNW2.2	W1.4	NNW1.5	NNE1.0	SSW0.8	WSW1.6	SSW0.6	SSW0.8			Diurnal Average
WSW21	WSW19	WSW18	W19	W22	W21	W17	WNW19	SE22	SE22	SSE21	WSW24	WSW26	WSW25	WSW23	WSW23	W20	NW18	WNW21	ESE18	SSE17	W16	WSW20	WSW20			Diurnal Maximum

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

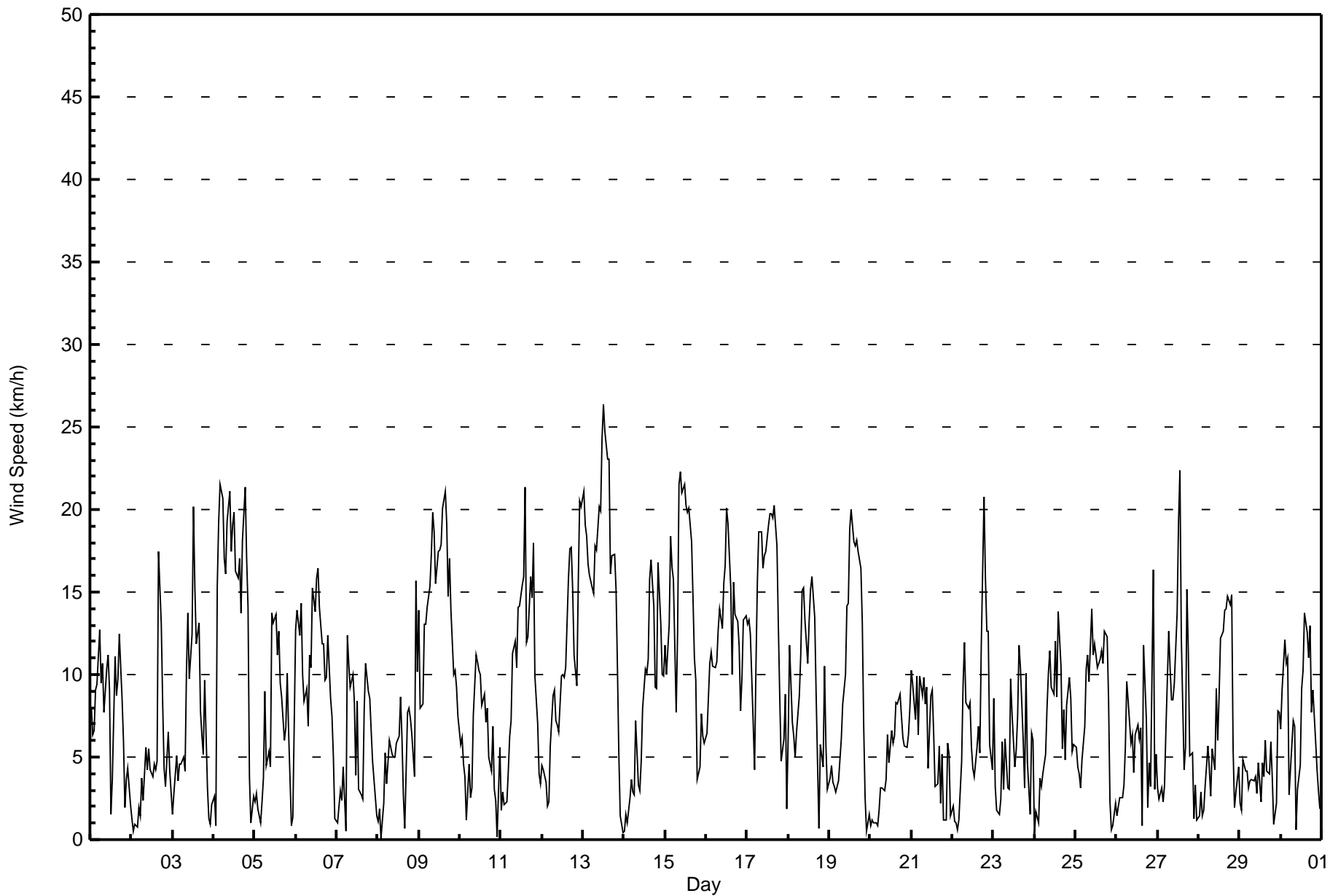
Wind Speed (WS) - km/h
Lower Camp - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 12 km/h on Jun 2 16:00 Minimum Value: 0 km/h on Jun 7 22:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 8																	Hours in Service: 720 Hours of Data: 720 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-Jun	2	2	3	3	3	4	3	3	4	4	4	3	3	1	3	4	3	3	3	2	2	2	1	2	4	
2-Jun	1	1	2	2	1	1	1	1	1	1	1	1	1	2	2	12	8	4	4	2	2	3	2	3	12	
3-Jun	2	1	1	1	2	2	2	2	3	3	4	5	6	6	2	4	4	4	5	3	2	1	2	2	6	
4-Jun	1	4	4	4	5	4	4	4	5	4	4	5	4	6	4	5	6	5	5	4	2	2	1	1	6	
5-Jun	3	1	1	2	2	4	2	2	1	1	4	4	4	4	4	3	4	3	5	2	2	1	1	4	5	
6-Jun	4	3	4	3	3	2	3	2	4	3	4	4	5	5	5	5	4	4	4	4	4	3	6	1	6	
7-Jun	2	1	2	3	1	1	3	2	2	2	2	6	5	3	1	1	3	3	3	2	1	0	1	1	6	
8-Jun	1	2	2	2	1	1	1	1	1	1	1	1	2	2	2	2	1	3	2	3	2	4	3	2	4	
9-Jun	3	2	3	2	3	4	3	3	4	3	3	3	3	3	4	4	4	3	4	3	3	2	2	1	4	
10-Jun	1	1	2	2	2	1	1	1	2	3	3	3	3	3	3	4	3	3	2	1	2	1	1	4	4	
11-Jun	2	2	1	1	2	2	2	3	4	3	5	5	7	5	6	4	6	6	7	6	4	2	2	2	7	
12-Jun	2	1	2	1	1	2	4	3	2	3	2	6	4	3	4	4	4	4	3	4	5	4	4	4	6	
13-Jun	4	4	4	3	3	4	4	4	4	4	5	5	6	6	5	6	5	4	3	3	2	3	2	1	6	
14-Jun	2	2	1	2	2	1	4	3	1	1	2	3	4	4	4	4	4	5	3	6	8	5	3	3	8	
15-Jun	2	3	4	4	3	4	3	4	6	8	8	8	8	8	8	8	8	6	5	4	4	4	7	1	1	8
16-Jun	2	3	3	4	3	4	4	6	5	5	5	5	5	6	6	4	4	4	3	3	5	2	3	2	6	
17-Jun	2	3	2	3	1	3	4	5	4	4	4	4	5	5	5	5	5	4	3	7	2	3	3	3	7	
18-Jun	6	3	3	2	2	2	3	3	3	4	3	4	4	4	4	3	4	2	2	2	1	8	4	1	8	
19-Jun	1	1	1	1	2	1	3	2	2	3	4	5	5	5	5	5	5	5	4	3	2	1	1	1	5	
20-Jun	1	1	1	1	1	1	1	1	1	1	2	2	2	2	3	2	2	2	2	2	1	1	1	2	3	
21-Jun	2	4	4	2	2	3	2	2	2	2	4	4	7	4	3	2	3	1	2	1	1	1	2	1	7	
22-Jun	2	1	1	1	1	2	3	2	2	2	2	2	2	2	2	2	3	8	5	3	2	2	3	3	8	
23-Jun	4	2	1	1	2	3	2	2	2	1	2	2	2	2	5	3	2	2	2	2	3	2	2	2	5	
24-Jun	1	2	2	2	2	1	1	2	2	3	2	2	5	3	4	4	2	3	2	2	2	2	2	1	5	
25-Jun	2	1	1	1	2	3	2	2	2	4	3	4	3	4	3	3	3	4	3	2	2	1	1	1	4	
26-Jun	2	1	1	2	2	2	3	2	1	2	1	2	3	5	4	1	4	3	2	3	5	5	3	3	5	
27-Jun	1	1	2	1	1	4	4	2	2	2	4	4	6	6	8	5	2	4	3	4	1	1	1	2	8	
28-Jun	1	1	1	1	2	1	1	1	1	2	2	3	4	3	3	4	4	4	4	3	3	1	1	1	4	
29-Jun	1	2	1	2	1	1	1	1	1	2	2	3	2	2	3	2	2	2	2	1	1	3	3	3	3	
30-Jun	3	4	4	3	3	2	3	2	3	3	1	2	4	5	5	4	4	4	3	3	3	1	2	1	5	
Diurnal Maximum																										



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Lower Camp - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Lower Camp - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	258	35.83	35.83
6 - 11	259	35.97	71.81
12 - 19	169	23.47	95.28
20 - 28	34	4.72	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: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Lower Camp - June 2016**

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	15	18	13	12	32	21	22	10	5	6	6	6	20	21	30	21	258
6 - 11	26	10	8	4	2	25	67	12	10	8	6	15	12	5	23	26	259
12 - 19	14	7	6	0	2	19	19	5	4	2	5	38	14	14	5	15	169
20 - 28	2	1	0	0	0	0	3	4	1	0	1	13	5	3	0	1	34
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
Totals	57	36	27	16	36	65	111	31	20	16	18	72	51	43	58	63	720

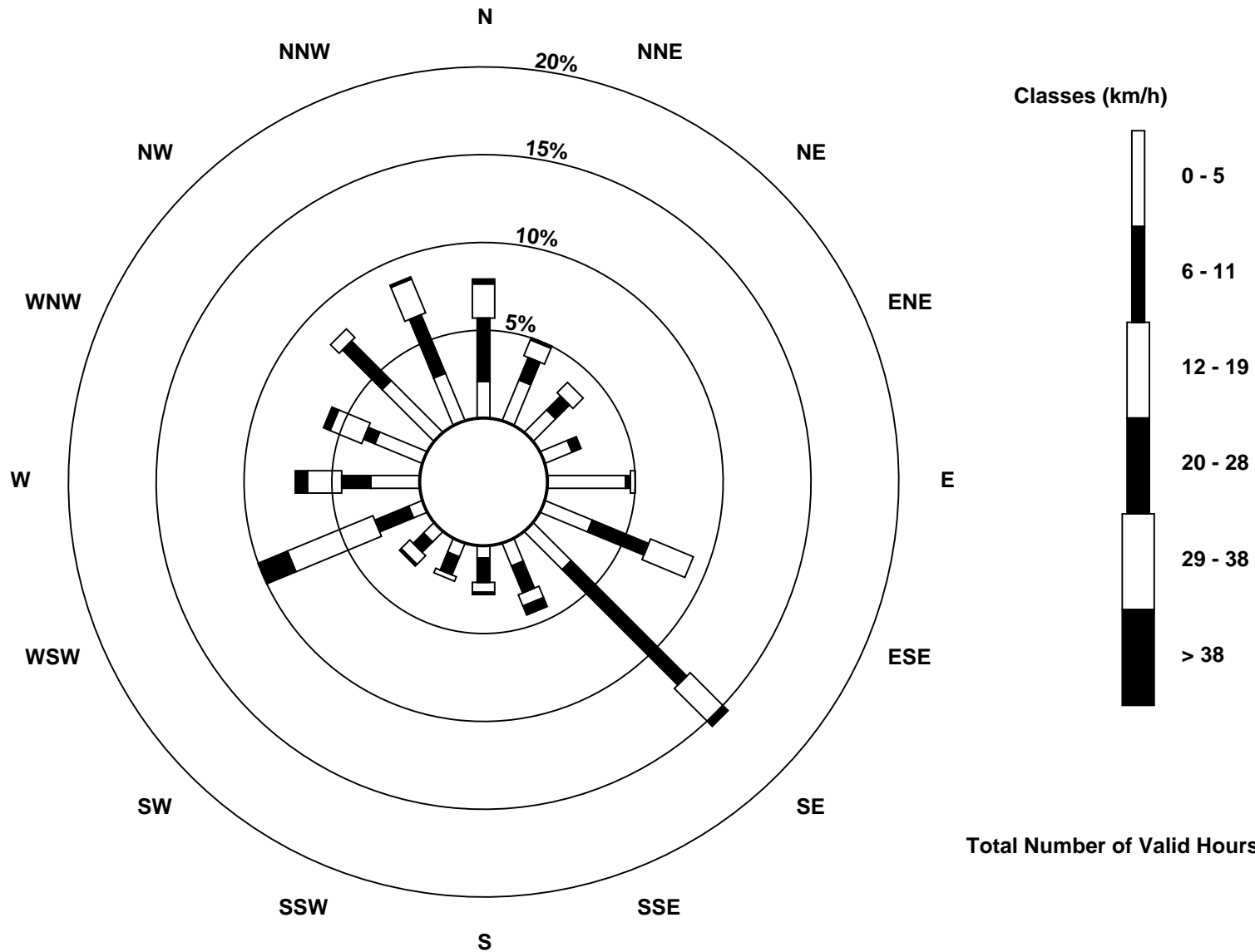
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed (WS) - km/h
Lower Camp (AMS 11)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Lower Camp - June 2016

Direction of Maximum Speed: 251 deg on Jun 13 13:00 Direction of Maximum Daily Speed Average: 249.2 deg on Jun 13	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0
Direction of Minimum Speed: 315 deg on Jun 8 03:00 Direction of Minimum Daily Speed Average: 0.3 deg on Jun 2	Percent Operational Time: 100.0
Monthly Average Direction: 292.7 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-Jun	134	136	88	108	133	128	133	132	134	114	131	154	129	47	276	186	131	130	138	161	144	129	129	303	134.1
2-Jun	312	333	251	76	343	27	13	267	305	309	14	26	96	107	120	244	238	116	108	150	267	271	132	98	155.8
3-Jun	169	121	135	141	150	134	143	216	258	255	249	250	254	298	360	340	334	335	2	356	136	214	293	293	280.6
4-Jun	198	195	256	262	261	263	269	290	283	277	295	283	288	271	252	296	335	307	300	311	298	325	332	100	283.0
5-Jun	266	302	84	81	39	262	256	264	28	21	322	345	346	349	341	338	354	8	47	47	34	272	79	130	351.1
6-Jun	125	120	123	118	125	128	127	133	124	128	126	134	125	133	144	154	143	173	176	155	174	144	313	323	136.1
7-Jun	111	95	111	287	122	218	251	256	256	255	251	303	350	39	126	57	348	343	336	311	296	281	293	301	294.6
8-Jun	316	301	315	313	284	336	319	321	318	314	305	332	346	86	60	64	115	141	142	107	43	83	110	105	53.7
9-Jun	89	19	27	51	38	38	36	25	26	22	27	27	25	17	10	10	6	355	5	353	334	333	324	317	17.1
10-Jun	301	277	267	95	92	90	88	54	350	346	347	350	359	359	19	19	2	345	9	54	39	279	189	101	3.5
11-Jun	346	284	287	281	106	128	129	124	118	125	128	133	136	131	129	126	119	136	123	118	110	78	33	308	123.7
12-Jun	306	293	313	312	251	201	230	219	211	179	171	194	212	211	205	251	264	250	261	258	232	239	240	243	236.9
13-Jun	244	249	252	253	251	237	238	241	246	250	247	246	251	252	252	247	257	259	260	258	233	277	214	45	249.2
14-Jun	258	94	111	116	70	345	91	125	120	87	135	122	128	116	124	120	109	125	128	143	147	150	103	101	122.2
15-Jun	103	109	109	110	111	119	108	108	125	143	157	160	164	161	170	167	182	188	184	194	183	188	143	141	145.2
16-Jun	141	144	148	151	152	158	168	169	173	173	211	225	236	227	212	194	256	249	252	255	245	258	252	239	209.7
17-Jun	244	250	248	274	311	279	276	283	312	303	300	298	297	283	281	280	268	266	277	348	81	349	341	340	286.0
18-Jun	303	292	324	339	7	312	287	270	262	262	290	261	249	247	250	268	269	322	25	149	130	0	71	310	278.7
19-Jun	289	309	298	261	360	340	260	318	353	349	352	334	324	331	334	350	343	345	1	5	356	299	13	345	338.7
20-Jun	323	288	83	92	58	346	53	44	48	64	329	360	36	47	124	134	135	132	130	139	146	142	139	140	107.2
21-Jun	139	142	124	140	129	123	128	127	131	128	127	235	188	270	337	82	108	67	127	17	101	128	123	358	135.3
22-Jun	92	20	80	84	56	98	127	122	130	131	132	122	287	355	17	322	123	221	256	255	234	236	218	258	203.2
23-Jun	251	165	152	79	201	273	272	315	130	76	358	351	328	31	2	338	321	329	331	62	74	49	336	309	342.0
24-Jun	164	90	335	340	41	7	324	333	324	336	331	331	332	337	321	319	9	344	316	309	311	312	312	308	330.5
25-Jun	320	318	314	305	322	348	357	11	337	5	15	356	351	2	0	11	15	46	56	48	14	5	6	114	5.9
26-Jun	355	267	94	95	94	118	124	125	133	128	86	108	104	325	321	151	234	193	115	135	238	277	279	232	160.2
27-Jun	259	210	171	163	179	244	250	254	258	271	263	256	254	240	81	179	160	241	245	228	139	59	142	68	237.4
28-Jun	114	123	117	99	121	121	127	32	308	298	283	307	350	343	342	355	349	1	10	24	26	7	350	304	356.0
29-Jun	276	75	272	277	297	295	331	11	345	355	318	13	328	332	12	4	15	351	348	31	35	101	148	149	348.3
30-Jun	132	131	128	117	116	117	135	136	132	165	143	165	125	124	110	125	122	125	143	129	155	141	191	98	128.5

194.6 199.0 178.0 138.7 129.5 165.3 216.8 229.0 269.8 281.1 291.0 275.6 280.5 286.7 316.3 306.2 297.6 272.6 297.3 12.5 206.1 256.8 192.6 213.8

Diurnal Average

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



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

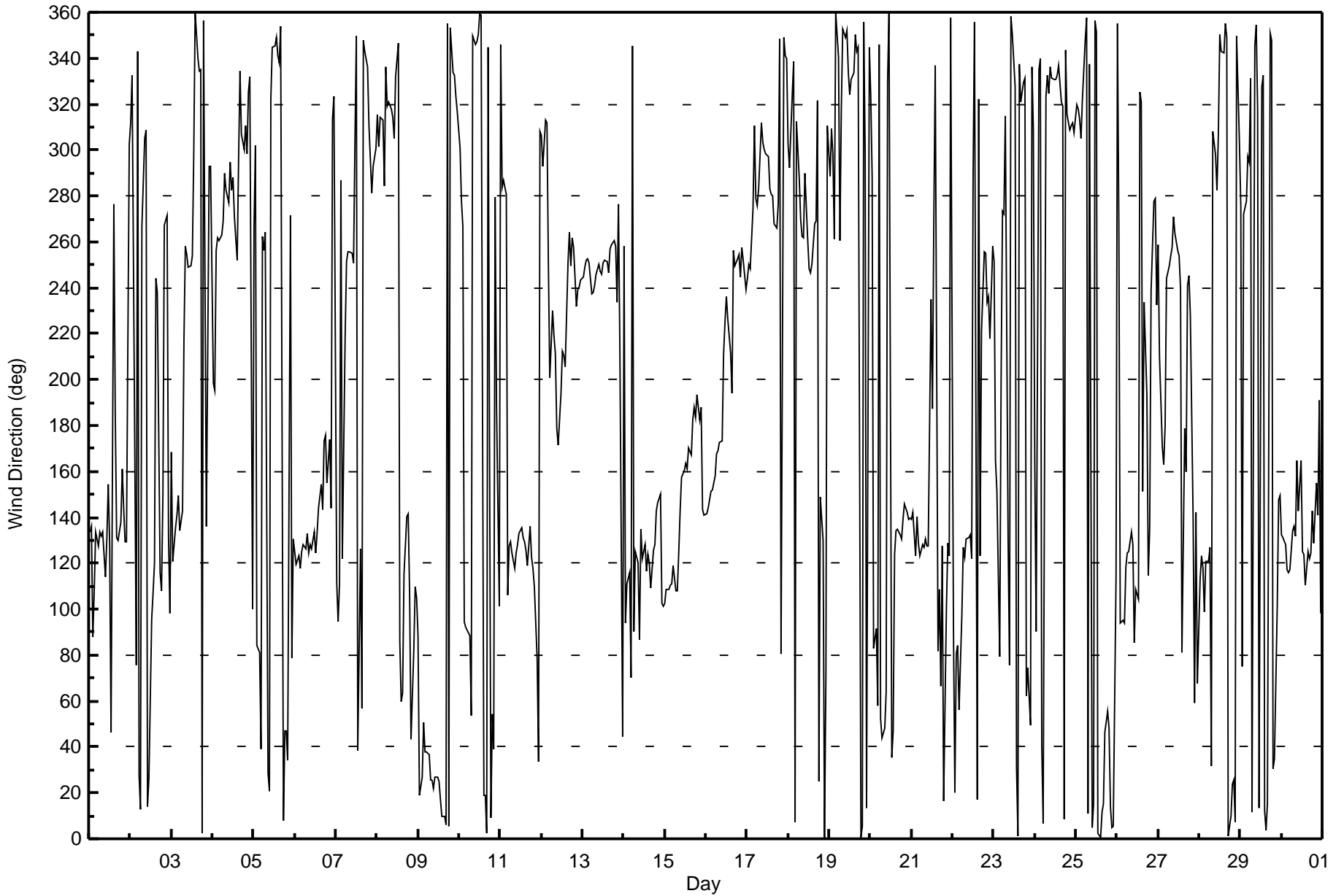
Wind Direction (WD) - deg
Lower Camp - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 100 deg on Jun 30 10:00 Minimum Value: 8 deg on Jun 7 22:00 Percentiles: P ₁ = 11 P ₁₀ = 14 Q ₁ = 19 Median = 28 Q ₃ = 45 P ₉₀ = 73 P ₉₉ = 97																			Hours in Service: 720 Hours of Data: 720 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-Jun	23	35	30	27	22	20	22	21	34	28	30	34	73	36	21	44	23	15	29	33	85	44	22	79	85
2-Jun	65	70	88	97	58	77	43	74	26	49	9	20	39	36	40	91	39	14	48	38	77	39	41	73	97
3-Jun	73	34	24	23	30	33	30	54	17	15	31	30	18	47	15	20	38	53	47	23	41	89	93	80	93
4-Jun	54	77	13	11	11	12	14	17	13	18	18	16	16	28	17	26	21	17	13	13	12	57	63	28	77
5-Jun	94	62	65	88	60	82	17	58	17	28	30	24	25	22	30	27	31	41	44	13	17	91	88	58	94
6-Jun	21	18	23	13	25	26	21	37	23	22	16	23	19	27	32	34	29	34	33	31	60	29	92	89	92
7-Jun	100	46	39	79	31	90	16	14	20	17	26	74	71	75	76	41	37	21	23	19	13	8	11	36	100
8-Jun	74	68	88	75	18	42	24	13	19	15	17	20	30	21	23	54	91	34	28	48	25	82	11	19	91
9-Jun	16	24	25	15	19	27	16	15	14	14	13	14	14	13	15	15	14	18	16	19	20	17	14	12	27
10-Jun	25	13	47	47	96	19	41	24	26	21	23	24	27	40	38	47	30	51	40	15	48	30	98	41	98
11-Jun	59	74	63	67	47	34	37	16	17	22	25	26	27	25	18	26	29	26	27	15	36	25	64	60	74
12-Jun	33	27	55	68	35	30	24	24	27	39	35	43	26	26	30	26	13	12	14	14	18	13	12	12	68
13-Jun	12	13	12	12	13	13	14	14	14	15	21	16	15	14	14	15	16	14	12	13	15	36	71	92	92
14-Jun	89	57	62	26	52	48	87	22	34	38	40	26	26	28	23	16	11	17	24	32	30	30	23	18	89
15-Jun	11	19	11	13	14	24	45	16	15	29	31	32	32	31	35	33	38	39	34	54	45	40	19	20	54
16-Jun	19	25	29	28	29	31	35	36	35	38	29	23	16	20	32	38	26	17	14	15	47	15	11	12	47
17-Jun	11	12	13	26	26	24	11	14	15	14	14	14	18	15	17	16	16	14	16	40	36	61	25	79	79
18-Jun	27	23	26	22	35	27	24	19	17	19	19	28	19	19	22	21	24	41	86	39	19	64	43	61	86
19-Jun	29	30	31	30	58	40	77	39	20	21	19	29	21	22	22	20	22	24	20	16	20	65	79	60	79
20-Jun	66	75	59	65	55	58	28	32	29	21	30	49	40	24	35	21	20	19	19	22	23	17	18	19	75
21-Jun	18	31	36	22	40	24	24	17	16	15	72	54	61	67	77	58	37	43	17	48	64	16	45	49	77
22-Jun	47	62	69	90	78	23	24	14	19	19	16	37	62	58	30	21	68	42	17	13	14	13	50	64	90
23-Jun	59	69	70	75	76	48	64	32	66	41	13	26	49	31	35	20	17	23	58	15	42	92	18	29	92
24-Jun	98	72	81	34	57	32	24	23	19	19	24	26	21	23	25	18	28	42	41	12	14	16	26	24	98
25-Jun	29	22	24	57	34	32	19	22	22	19	24	23	22	30	22	21	24	20	19	17	59	66	81	65	81
26-Jun	53	74	23	53	46	32	24	18	27	27	32	22	22	87	39	85	22	34	85	53	81	25	95	47	95
27-Jun	54	55	39	77	46	30	17	17	21	26	29	17	16	17	45	63	49	18	18	77	22	86	61	100	100
28-Jun	80	38	81	40	28	20	25	59	27	46	23	54	32	24	20	24	21	22	21	18	39	45	57	29	81
29-Jun	56	93	29	28	23	30	37	16	32	62	77	69	78	40	64	39	43	46	17	46	97	76	42	37	97
30-Jun	41	35	31	27	22	81	41	30	36	100	29	44	33	35	20	23	26	20	36	35	41	32	68	64	100
	100	93	88	97	96	90	87	74	66	100	77	74	78	87	77	91	91	53	86	77	97	92	98	100	
Diurnal Maximum																									



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Lower Camp - June 2016





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	June 14, 2016	Last Calibration	May 26, 2016
Station Name	Lower Camp	Station Number	AMS 11
Reason:	Routine		
Start Time (MST)	9:41	End Time (MST)	13:20
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	800	798
Calculated slope	1.014060	0.996666	Chamber temp	44.8	44.9
Calculated intercept	-0.315677	0.227235	Pressure	709.6	699.3
Analyzer Background	11.0	11.6	Flow	0.489	0.476
Analyzer Coefficient	1.014	1.028	Intensity	90	91
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	0.3	----
as found span	5000	80.9	830.0	820.8	1.011
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	80.9	830.0	832.5	0.997
second point	5000	40.9	419.6	421.3	0.996
third point	5000	20.5	210.3	210.1	1.001
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	80.9	830.0	831.2	0.999
Average Correction Factor					0.998

Corrected As found 820.5 Previous response 818.8 % change -0.2%

Notes:

Inlet filter changed after as founds. Additional zero/span conducted to measure the potential impact of the smoke on the filter. Adjusted zero and span.

Calibration Performed By:

Evan Magill



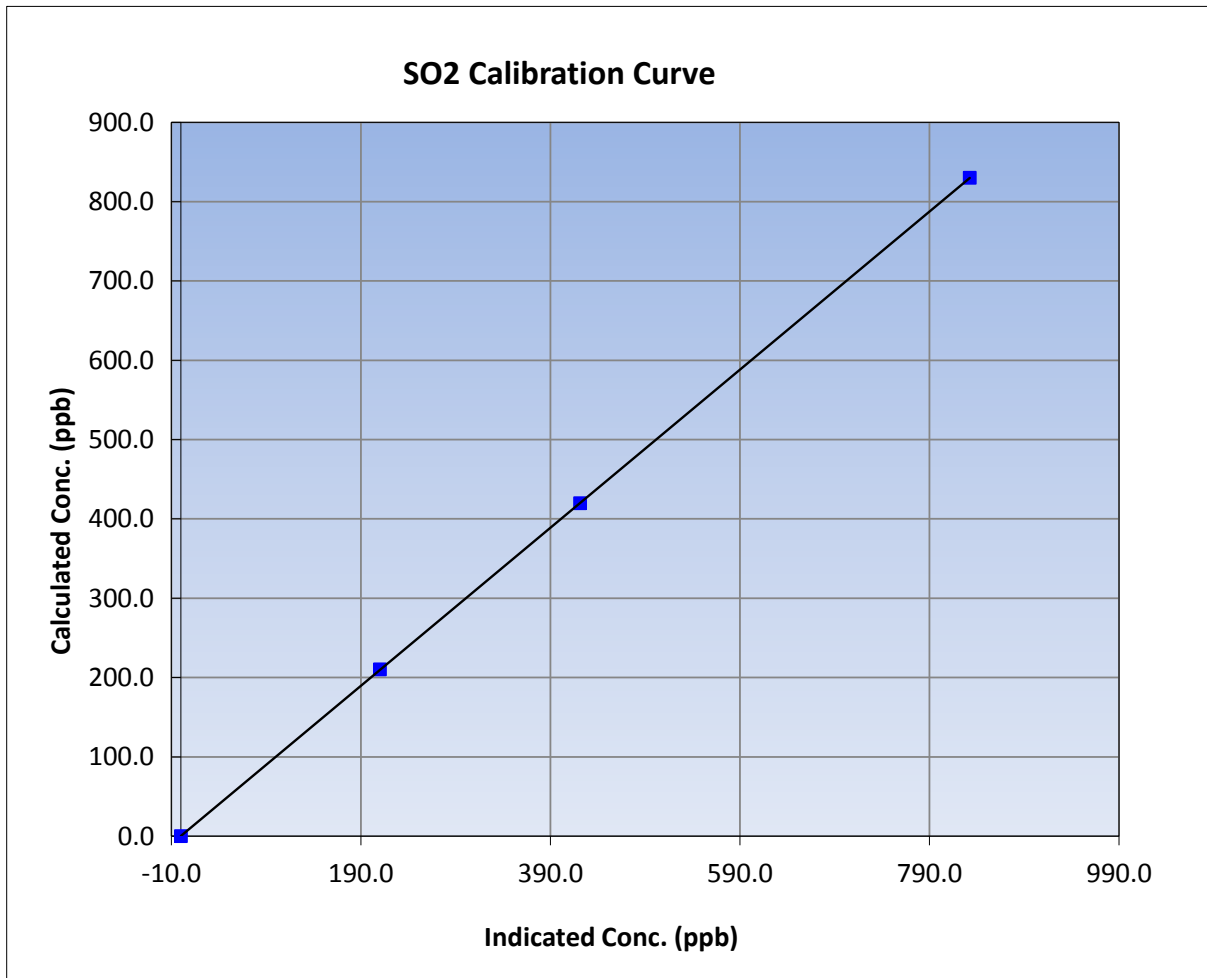
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 14, 2016	Previous Calibration	May 26, 2016
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	9:41	End Time (MST)	13:20
Analyzer make	TEI 43i	Analyzer serial #	100841398

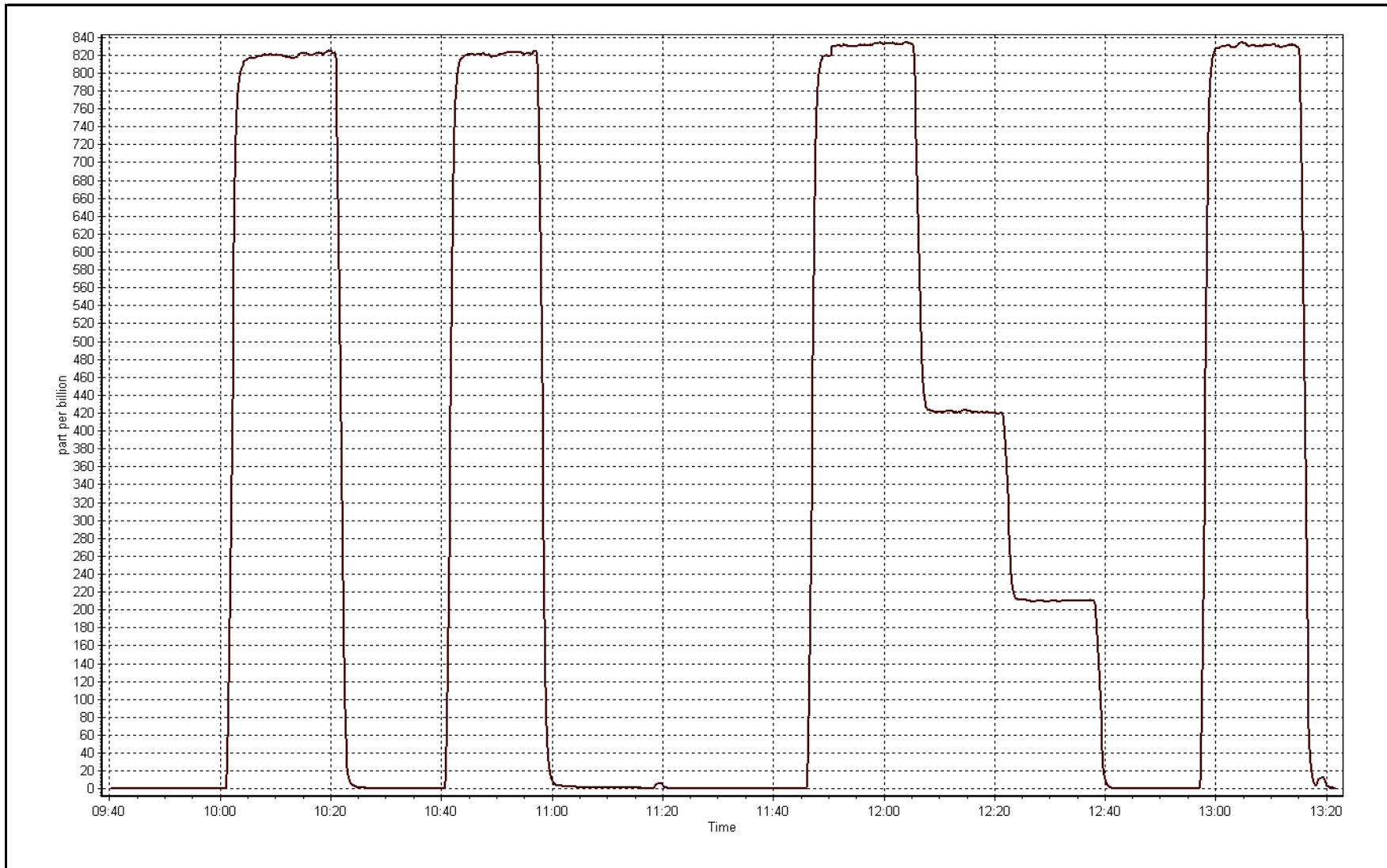
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999998
830.0	832.5	0.9970		
419.6	421.3	0.9960	Slope	0.996666
210.3	210.1	1.0012		
			Intercept	0.227235



SO2 Calibration Plot

Date: June 14, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	June 14, 2016	Last Calibration	May 26, 2016
Station Name	Lower Camp	Station Number	AMS 11
Reason:	Routine		
Start Time (MST)	13:20	End Time (MST)	15:58
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	-671	-671
Analyzer IP address	192.168.1.42		Lamp voltage	797	794
Calculated slope	1.011289	1.003381	Chamber temp	45	45
Calculated intercept	-0.373218	-0.264540	Pressure	567.8	569.3
Analyzer Background	10.7	10.9	Flow	1.022	1.029
Analyzer Coefficient	1.178	1.178	Intensity	90	90
			Converter temp.	325	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	74.8	1.002
SO2 scrubber check	5000	20.5	210.7	1.4	----
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	72.8	75.0	74.8	1.002
second point	5000	38.8	40.0	40.4	0.990
third point	5000	19.4	20.0	20.2	0.988
as left zero	5000	0.0	0.0	0.3	----
as left span	5000	72.8	75.0	75.9	0.988
Average Correction Factor					0.993

Corrected As found	74.7	Previous response	74.5	% change	-0.3%
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Notes:

Scrubber check done after as founds. Inlet filter changed after scrubber check. Additional zero/span conducted to measure the potential impact of smoke on the filter. No adjustments.

Calibration Performed By: Evan Magill



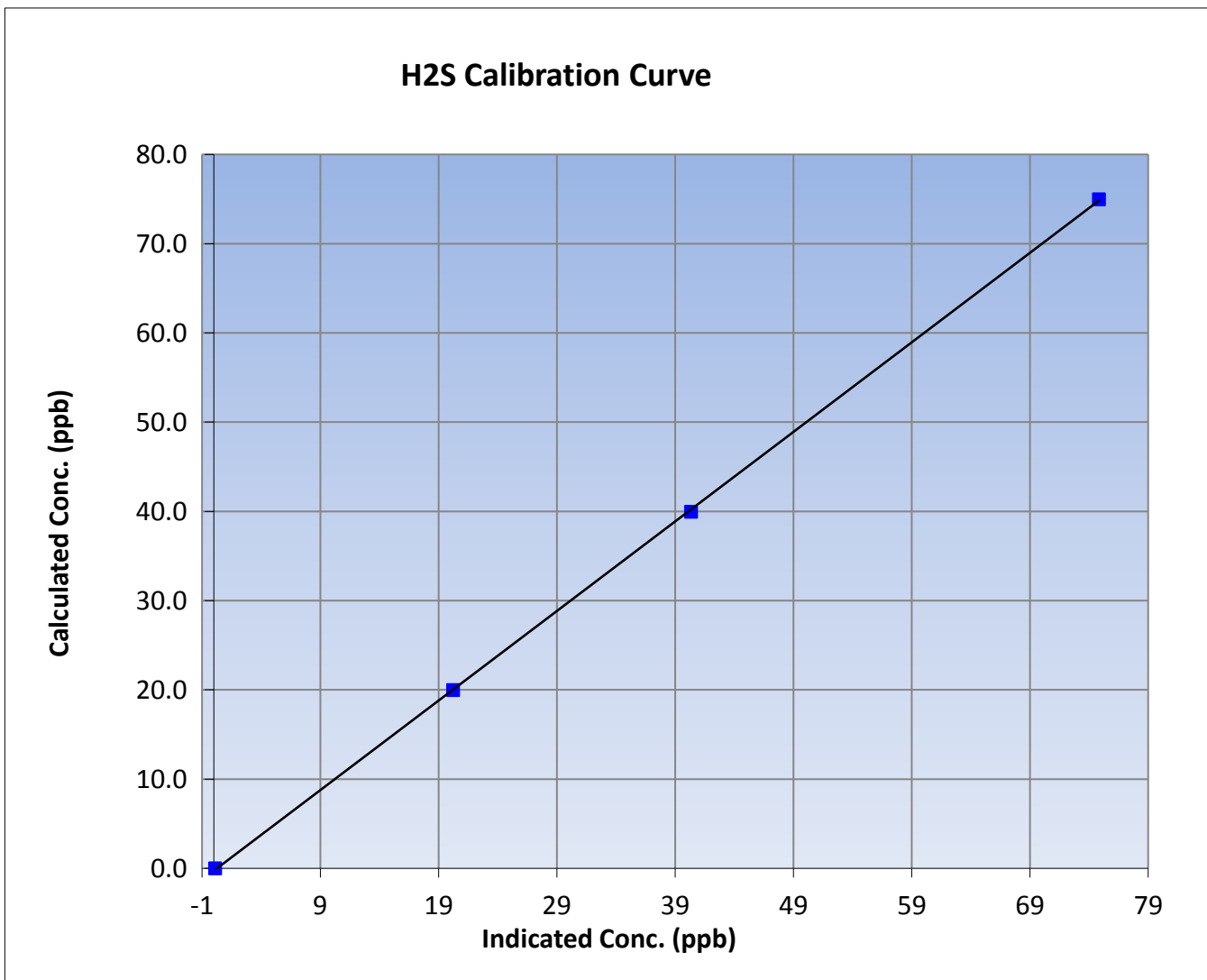
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	June 14, 2016	Previous Calibration	May 26, 2016
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	13:20	End Time (MST)	15:58
Analyzer make	Thermo 450i	Analyzer serial #	1410661328

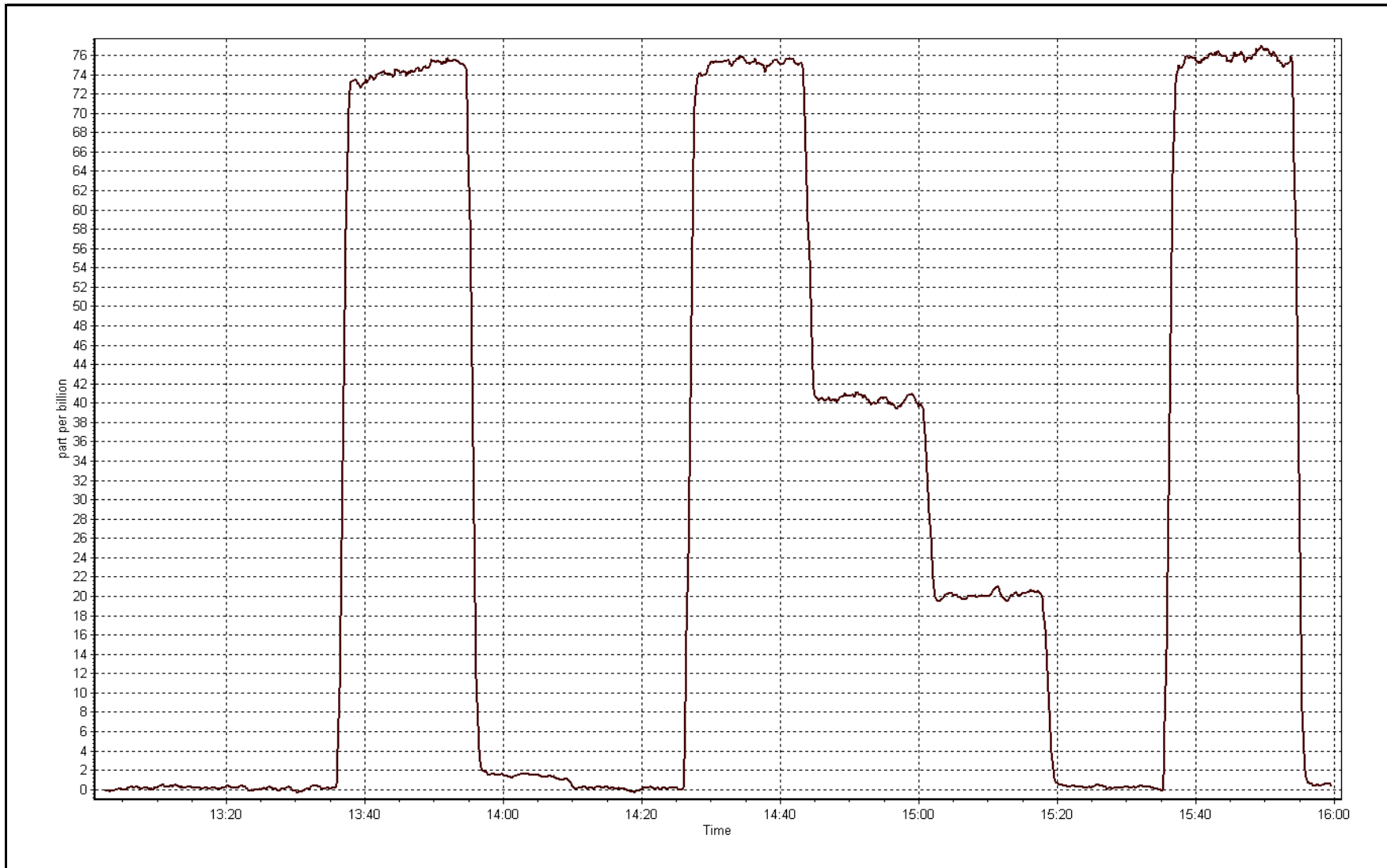
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999960
75.0	74.8	1.0019		
40.0	40.4	0.9902	Slope	1.003381
20.0	20.2	0.9882		
			Intercept	-0.264540



H2S Calibration Plot

Date: June 14, 2016





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June-14-16	Last Calibration	May-26-16
Station Name	Lower Camp	Station Number	AMS 11
Reason:	Routine		
Start Time (MST)	9:41	End Time (MST)	13:20
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	7.8	7.8
Analyzer IP address	192.168.1.51		Air or Bypass Press	40.2	40.2
Calculated slope	1.001884	0.998911	Fuel Pressure	25.1	25.1
Calculated intercept	-0.082870	0.024887	Analyzer Coeff	4.608	4.642
			Analyzer BKG	2.36	2.59

Analyzer make	51i-LT	Analyzer serial #	1218153353
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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	0.19	----
as found span	5000	80.9	17.32	17.50	0.990
calibrator zero	5000	0.0	0.00	-0.03	----
high point	5000	80.9	17.32	17.31	1.001
second point	5000	40.9	8.76	8.75	1.001
third point	5000	20.5	4.39	4.37	1.004
as left zero	5000	0.0	0.00	-0.04	----
as left span	5000	80.9	17.32	17.38	0.997
Average Correction Factor					1.002

Corrected As found	17.31	Previous response	17.37	% change	0.4%
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Notes:

Inlet filter changed after as founds. Additional zero/span conducted to measure the potential impact of the smoke on the filter.
 Changed the zero air generator scrubbers after additional zero/span. Adjusted zero and span.

Calibration Performed By:

Evan Magill



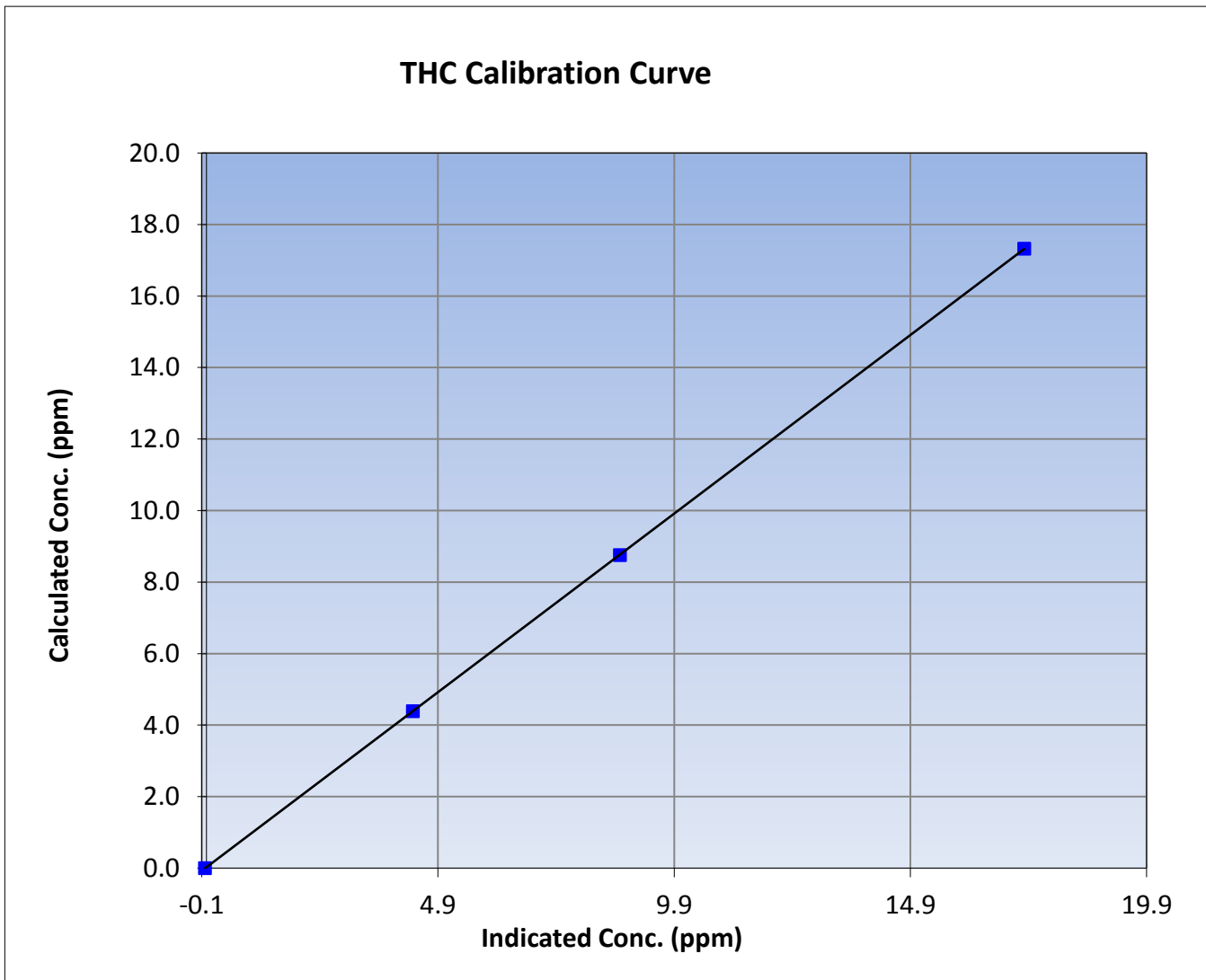
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June 14, 2016	Previous Calibration	May 26, 2016
Station Name	Lower Camp	Station Number	AMS 11
Start Time (MST)	9:41	End Time (MST)	13:20
Analyzer make	51i-LT	Analyzer serial #	1218153353

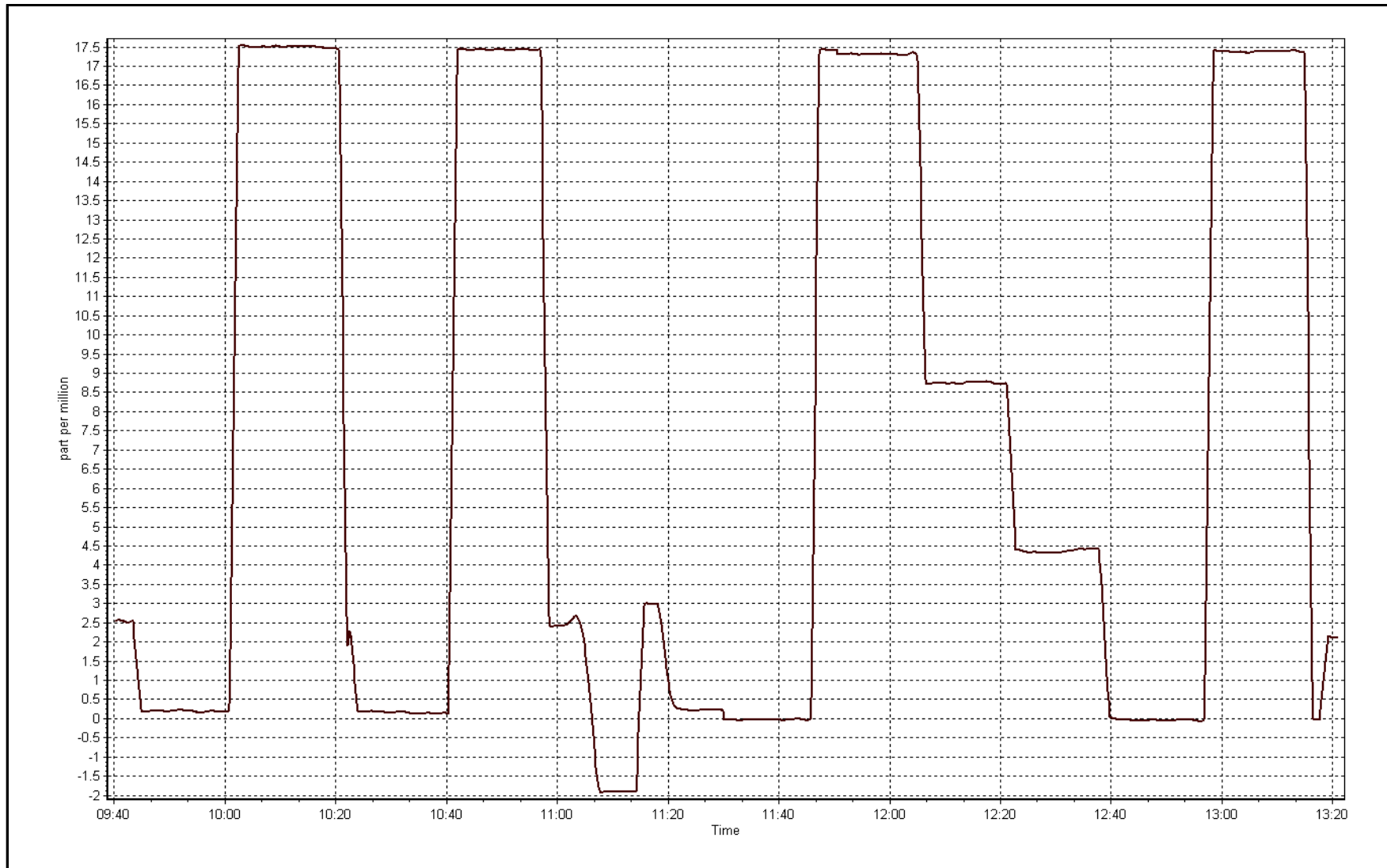
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.03	----	Correlation Coefficient	0.999999
17.32	17.31	1.0006		
8.76	8.75	1.0008	Slope	0.998911
4.39	4.37	1.0044		
			Intercept	0.024887



THC Calibration Plot

Date: June 14, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 13
FORT MCKAY SOUTH
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY SOUTH (AMS 13)
 JUNE 2016

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	682	37	38	99.86	87	0	7	0
TRS(ppb) Average	682	33	38	99.31	5	0	1	0
THC(ppm) Average	683	36	37	99.86	14.3	-	3.9	-
O3(ppb) Average	648	32	72	94.44	66	0	40	-
NO2(ppb) Average	678	36	42	99.17	20	0	5	-
NO(ppb) Average	678	36	42	99.17	12	-	1	-
NOX(ppb) Average	678	36	42	99.17	32	-	6	-
PM2.5(ug/m3) Average	711	4	9	99.31	24.5	-	11.8	0
ET(C) Average	720	0	0	100.00	30.9	-	21.5	-
RH(%) Average	720	0	0	100.00	98	-	91	-
WS(km/h) Average	720	0	0	100.00	36	-	16	-
WD(deg) Average	720	0	0	100.00	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FORT MCKAY SOUTH (AMS 13)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2(ppb) Average	682	1.5	5	-	0	0	0	0	0	3	87
TRS(ppb) Average	682	0.2	0	-	0	0	0	0	0	0	5
THC(ppm) Average	683	2.32	0.6	-	2.1	2.1	2.1	2.2	2.3	2.5	14.3
O3(ppb) Average	648	27.6	15	-	1	7	15	28	38	48	66
NO2(ppb) Average	678	2.2	3	-	0	0	1	1	3	5	20
NO(ppb) Average	678	0.4	1	-	0	0	0	0	0	1	12
NOX(ppb) Average	678	2.6	3	-	0	0	1	2	3	6	32
PM2.5(ug/m3) Average	711	5.28	3.9	-	0	1.5	2.3	4.5	7	10.2	24.5
Temperature 2 m (C) Average	720	16.9	5.9	-	2.3	9.4	12.5	16.5	21.3	25.2	30.9
Relative Humidity (%) Average	720	64.6	23	-	17	32	45	67	86	94	98
Wind Speed 10 m (km/h) Average	720	7.7	6	-	0	2	3	7	11	15	36
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION -FORT McKAY SOUTH (AMS 13)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
TRS, O3, NO2	10 Jun 2016 19:00	10 Jun 2016 19:00	1	Data collection error
SO2, THC, O3	10 Jun 2016 21:00	10 Jun 2016 21:00	1	Data collection error
TRS, NO2	10 Jun 2016 21:00	10 Jun 2016 22:00	2	Data collection error
TRS, O3	07 Jun 2016 10:00	07 Jun 2016 11:00	2	Maintenance - zero air generator serviced
O3	09 Jun 2016 08:00	09 Jun 2016 10:00	3	Maintenance - reinitiated daily QA check
O3	19 Jun 2016 07:00	20 Jun 2016 10:00	28	Analyzer Failure - required reset
O3	20 Jun 2016 11:00	20 Jun 2016 12:00	2	Maintenance - verify operation after reset
O3	28 Jun 2016 11:00	28 Jun 2016 13:00	3	Maintenance - Station operator on site
NO2, NO, NOX	23 Jun 2016 11:00	23 Jun 2016 11:00	1	Maintenance - Station operator on site
NO2, NO, NOX	28 Jun 2016 09:00	28 Jun 2016 10:00	2	Maintenance - Station operator on site
PM2.5	09 Jun 2016 16:00	09 Jun 2016 16:00	1	Unstable Operation - negative baseline
PM2.5	09 Jun 2016 19:00	09 Jun 2016 19:00	1	Unstable Operation - negative baseline
PM2.5	12 Jun 2016 09:00	12 Jun 2016 09:00	1	Unstable Operation - negative baseline
PM2.5	12 Jun 2016 14:00	12 Jun 2016 14:00	1	Unstable Operation - negative baseline
PM2.5	23 Jun 2016 01:00	23 Jun 2016 01:00	1	Unstable Operation - automated tape change



Wood Buffalo Environmental Association

Summary of Hour Averages

**Sulphur Dioxide (SO₂) - ppb
Fort McKay South - June 2016**

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 87 ppb on Jun 14 09:00	Maximum Daily Average: 6.9 ppb on Jun 20		Hours of Data:	682
Minimum Value: 0 ppb on Jun 7 23:00	Minimum Daily Average: 0.0 ppb on Jun 24		Hours of Missing Data:	38
Maximum Diurnal Average: 4.7 ppb at hour 9	Minimum Diurnal Average: 0.2 ppb at hour 2		Hours of Calibration:	37
Monthly Average: 1.5 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 3 P ₉₉ = 27		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-Jun	0	0	Z	0	0	0	1	8	14	23	8	2	1	1	0	0	0	27	35	17	3	2	1	0	6.3	35
2-Jun	0	0	0	Z	0	0	0	0	0	1	2	20	15	13	10	12	1	1	4	1	3	6	2	1	4.1	20
3-Jun	1	1	1	1	Z	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.5	1
4-Jun	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
5-Jun	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
6-Jun	0	Z	1	1	0	0	1	3	3	22	19	23	14	12	1	1	3	1	0	1	0	1	1	0	4.7	23
7-Jun	0	0	Z	0	0	0	0	0	C	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	--	0
8-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	12	3	0	0	1.3	14
9-Jun	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
10-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	DF	0	0	0.0	0
11-Jun	Z	0	0	0	0	0	0	6	6	4	4	14	10	4	0	9	0	1	8	1	0	0	0	0	3.0	14
12-Jun	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
13-Jun	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
14-Jun	0	0	0	Z	0	0	0	1	87	20	3	1	1	0	0	3	0	0	0	0	8	1	6	0	5.8	87
15-Jun	0	0	0	0	Z	0	1	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
16-Jun	0	0	1	0	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
17-Jun	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
18-Jun	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
19-Jun	0	0	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
20-Jun	0	0	0	Z	0	0	0	1	2	2	3	0	1	14	31	16	27	31	17	5	4	1	1	1	6.9	31
21-Jun	1	0	0	0	0	Z	2	1	1	0	0	0	0	0	1	0	1	1	6	5	1	0	0	0	1.0	6
22-Jun	0	0	0	0	0	Z	1	1	7	6	2	8	2	0	7	6	4	1	0	0	0	0	0	0	2.0	8
23-Jun	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
24-Jun	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
25-Jun	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
26-Jun	0	0	0	Z	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.2	1
27-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	2	1	0	0	0	0	0.2	2
28-Jun	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
29-Jun	Z	0	0	0	0	0	0	0	5	0	0	0	0	0	0	1	0	2	8	5	3	1	0	0	1.2	8
30-Jun	0	Z	1	1	1	2	1	2	5	16	2	34	20	18	11	18	2	2	0	0	1	1	1	1	6.1	34

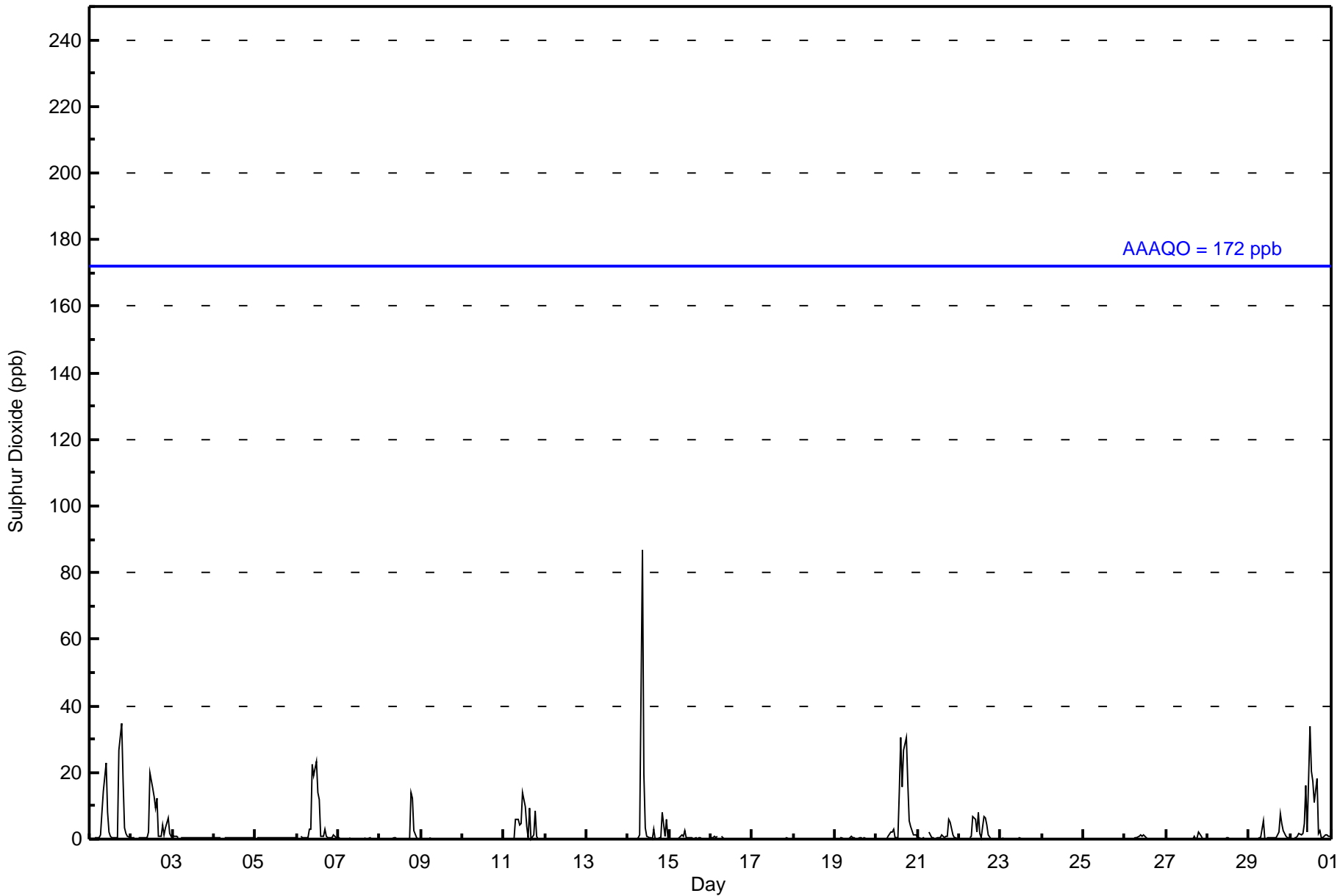
0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.9	4.7	3.5	1.7	3.7	2.3	2.2	2.2	2.3	1.4	2.3	3.2	1.7	1.0	0.5	0.5	0.2	Diurnal Average	
1	1	1	1	1	2	2	8	87	23	19	34	20	18	31	18	27	31	35	17	8	6	6	1	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Fort McKay South - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Fort McKay South - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	651	95.45	95.45
11 - 20	21	3.08	98.53
21 - 60	9	1.32	99.85
61 - 110	1	0.15	100.00
111 - 172	0	0.00	100.00
> 172	0	0.00	100.00

Total Number of Valid Hours: 682

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Fort McKay South - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	44	65	27	10	2	10	30	45	63	57	65	62	47	36	42	46	651
11 - 20	2	1	0	0	0	3	4	8	2	1	0	0	0	0	0	0	21
21 - 60	0	0	0	0	0	1	4	3	1	0	0	0	0	0	0	0	9
61 - 110	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
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
Totals	46	66	28	10	2	14	38	56	66	58	65	62	47	36	42	46	682

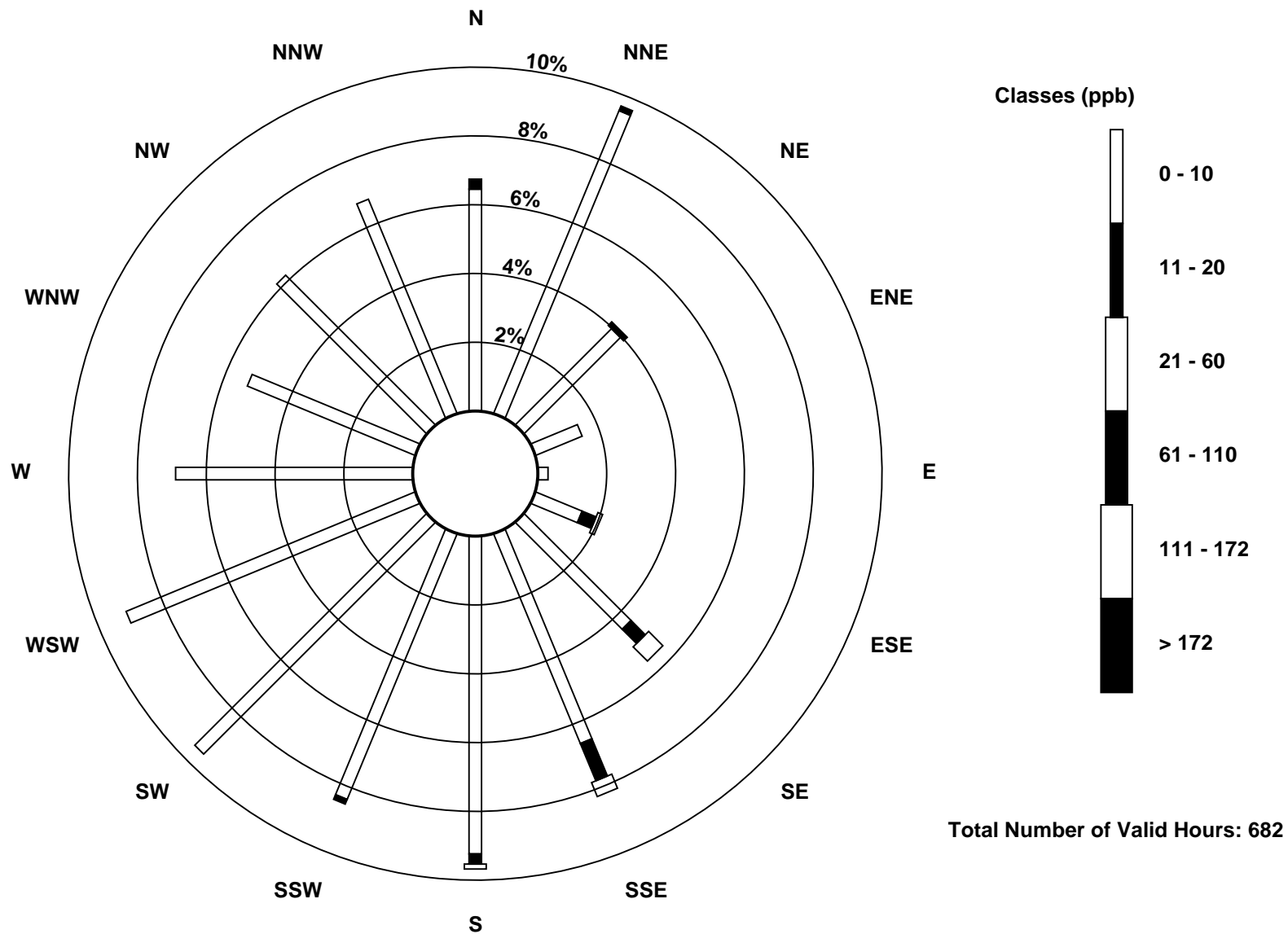
Total Number of Valid Hours: 682

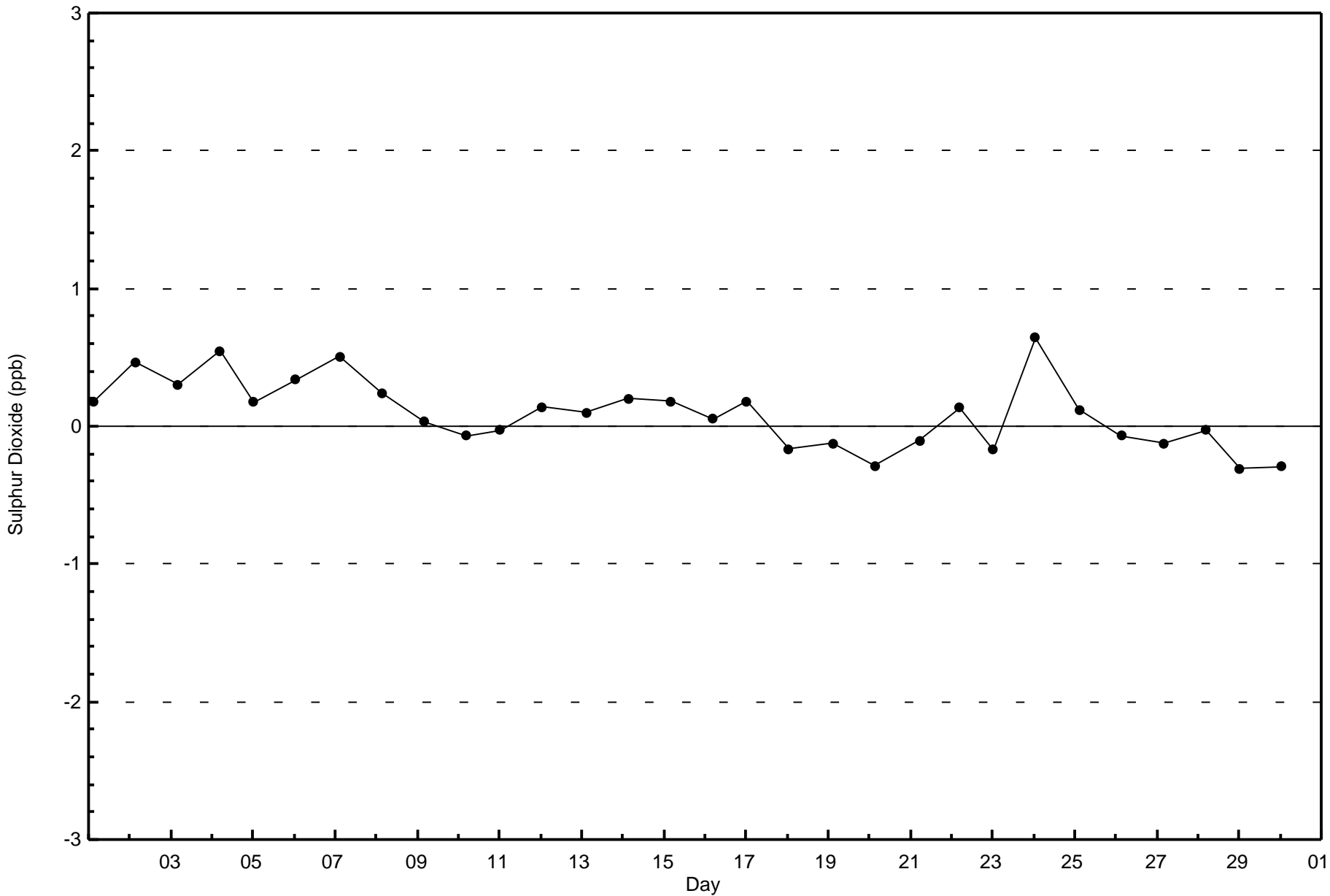
Total Number of Hours: 720

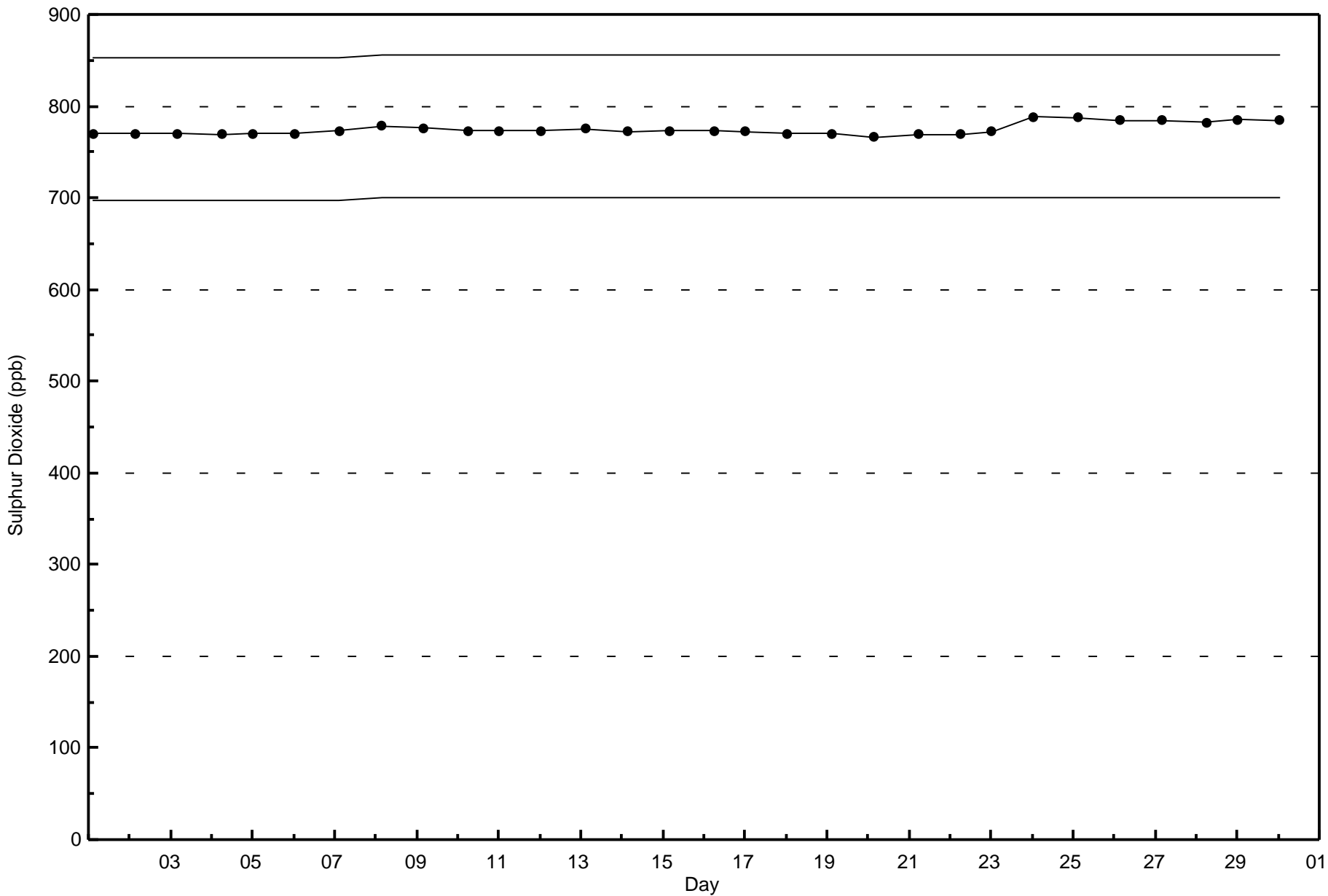


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Sulphur Dioxide (SO₂) - ppb
Fort McKay South (AMS 13)









Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 5 ppb on Jun 20 23:00	Maximum Daily Average: 1.1 ppb on Jun 20		Hours of Data:	682
Minimum Value: 0 ppb on Jun 15 17:00	Minimum Daily Average: 0.1 ppb on Jun 4		Hours of Missing Data:	38
Maximum Diurnal Average: 0.4 ppb at hour 23	Minimum Diurnal Average: 0.2 ppb at hour 17		Hours of Calibration:	33
Monthly Average: 0.2 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1		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-Jun	0	0	0	Z	0	0	0	1	1	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0.3	1	
2-Jun	0	0	0	0	Z	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
3-Jun	1	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	
4-Jun	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	
5-Jun	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	
6-Jun	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
7-Jun	0	0	0	Z	0	0	0	0	0	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	
8-Jun	0	0	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.2	1	
9-Jun	0	0	0	0	0	Z	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	
10-Jun	0	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	DF	0	DF	DF	0	0	0.2	0	
11-Jun	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	
12-Jun	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	
13-Jun	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	
14-Jun	0	0	0	0	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	
15-Jun	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	
16-Jun	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	
17-Jun	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	
18-Jun	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	
19-Jun	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	
20-Jun	0	0	0	0	Z	0	0	0	0	1	4	1	1	1	1	1	1	1	1	0	0	1	3	5	4	1.1	5
21-Jun	2	1	1	1	0	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4	2	
22-Jun	0	0	0	0	0	0	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
23-Jun	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	
24-Jun	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	
25-Jun	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	
26-Jun	0	0	0	0	Z	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
27-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.2	1	
28-Jun	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	
29-Jun	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	
30-Jun	0	1	Z	0	0	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.5	1	

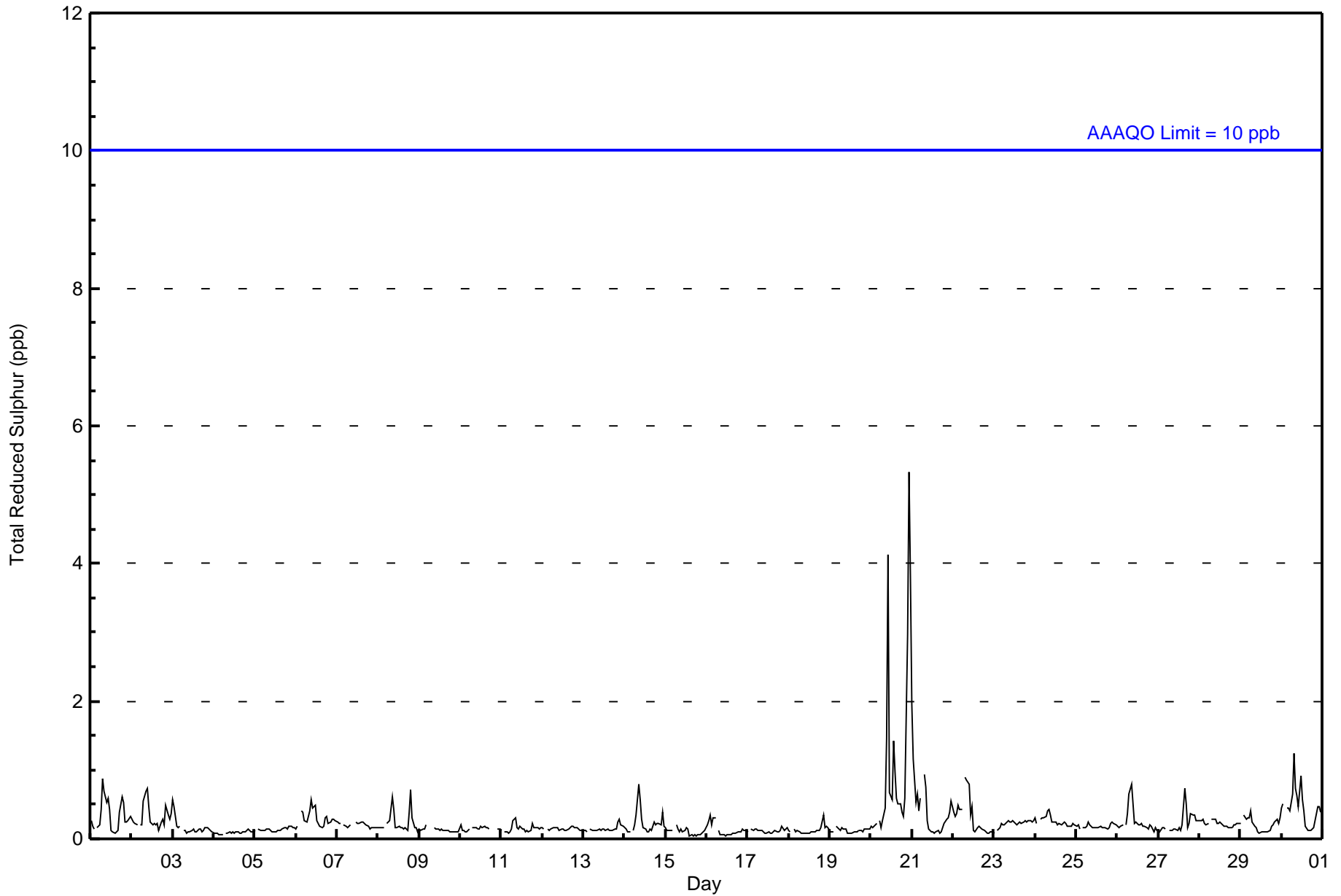
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2	1	1	1	0	1	1	1	1	1	1	4	1	1	1	1	1	1	1	1	1	1	1	3	5	4	Diurnal Maximum	

Z - zerspan C - Calibration M - Maintenance DF - DAS Failure
 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
Fort McKay South - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Fort McKay South - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	678	99.41	99.41
3 - 4	3	0.44	99.85
5 - 7	1	0.15	100.00
8 - 11	0	0.00	100.00
> 11	0	0.00	100.00

Total Number of Valid Hours: 682

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Fort McKay South - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	46	63	29	9	4	14	35	54	69	58	65	64	42	36	43	47	678
3 - 4	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	3
5 - 7	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
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
Totals	46	63	29	9	4	14	36	54	69	58	68	64	42	36	43	47	682

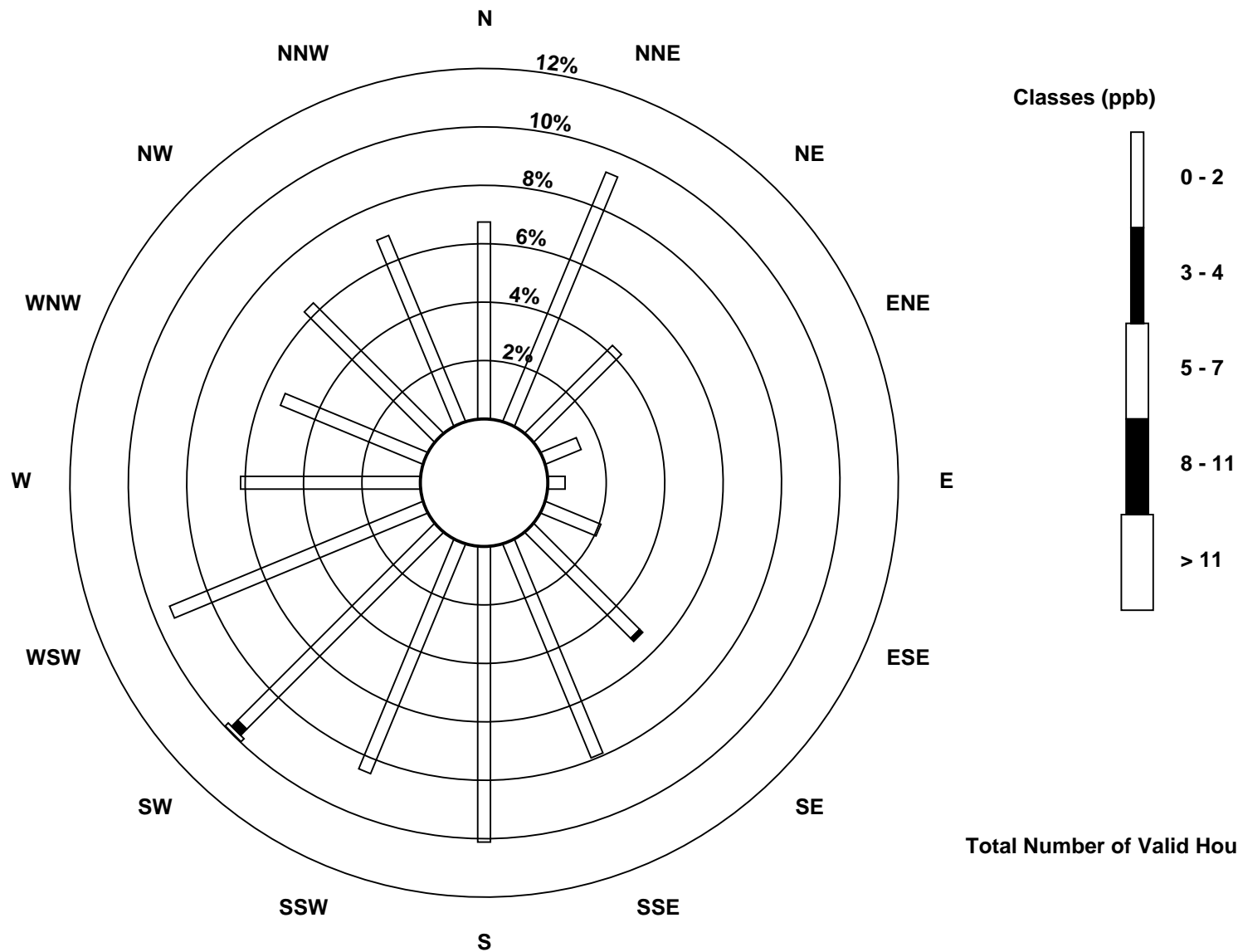
Total Number of Valid Hours: 682

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

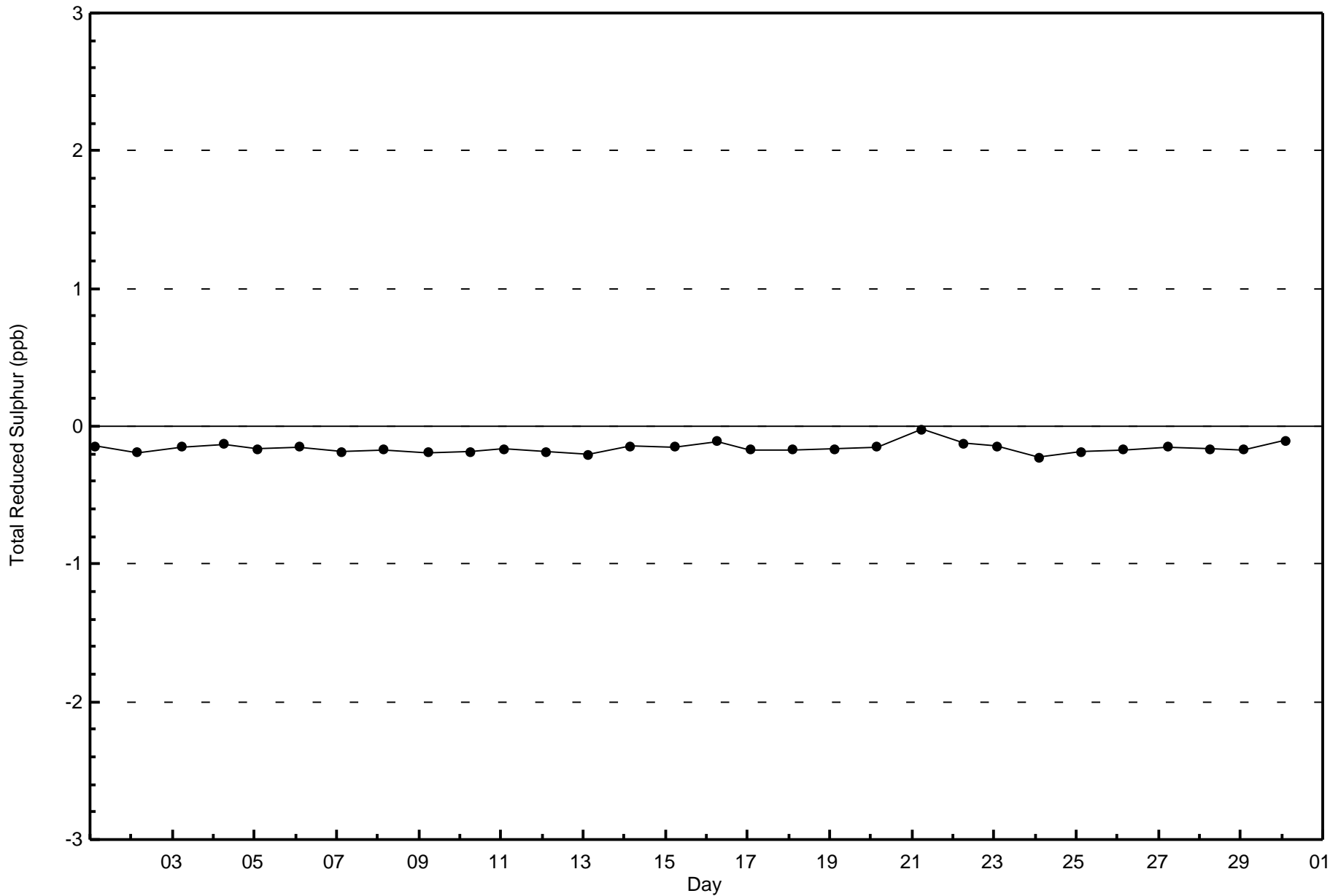
Total Reduced Sulphur (TRS) - ppb
Fort McKay South (AMS 13)

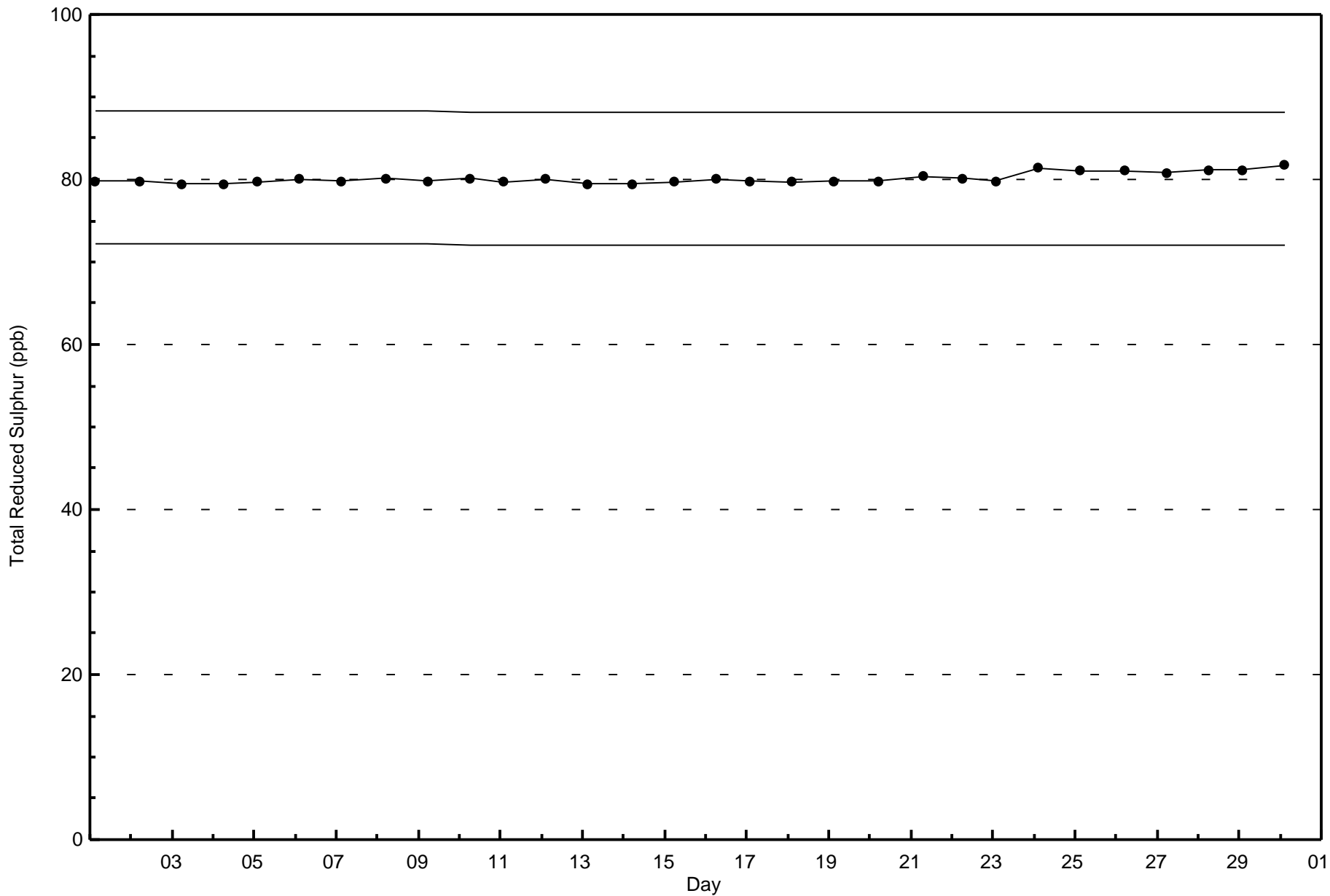


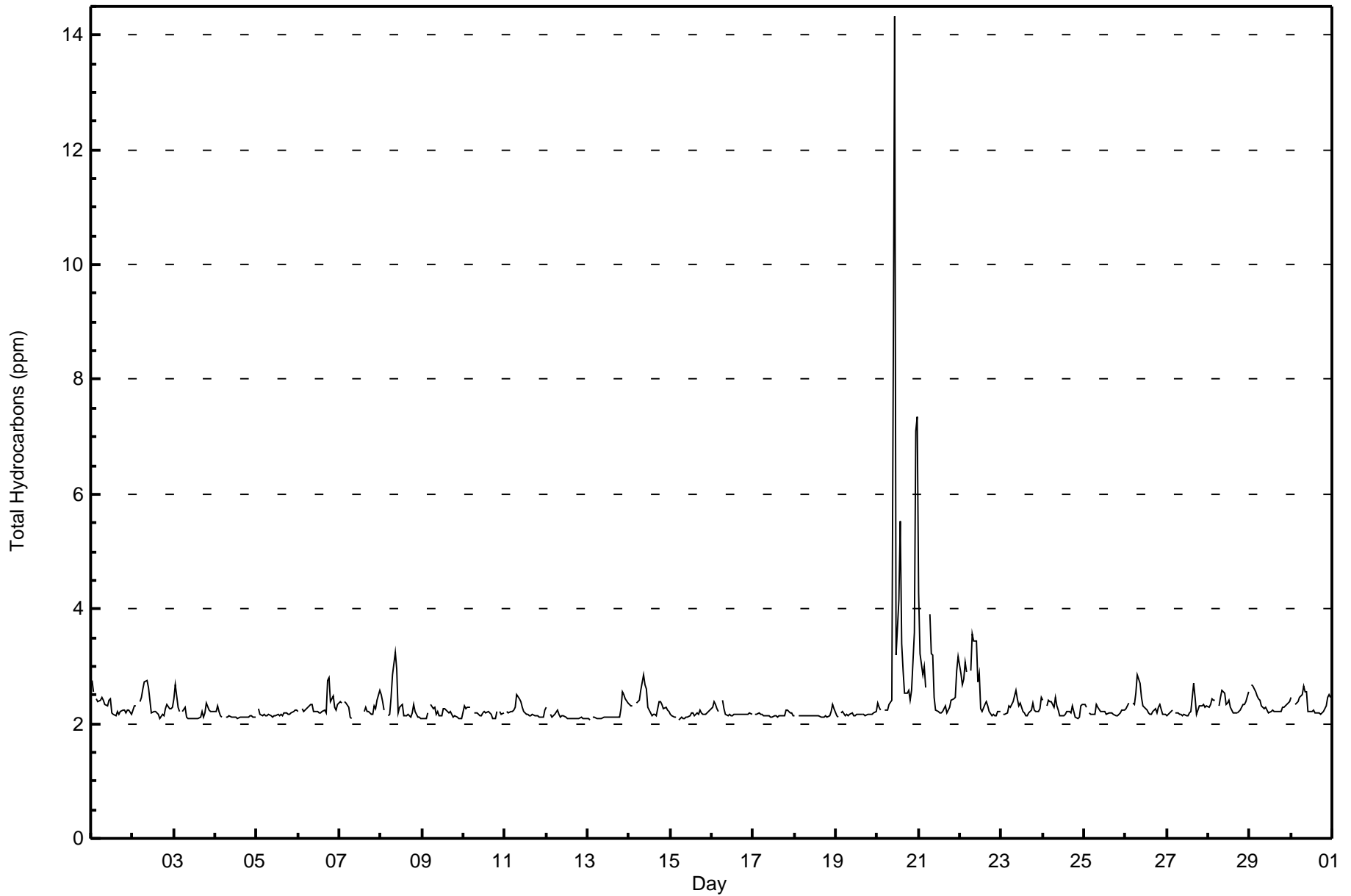


Wood Buffalo Environmental Association
Zero Responses

Total Reduced Sulphur (TRS) - ppb
Fort McKay South - June 2016









Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Fort McKay South - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	0	0.00	0.00
2.1 - 3.0	663	97.07	97.07
3.1 - 10.0	19	2.78	99.85
> 10.0	1	0.15	100.00

Total Number of Valid Hours: 683

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Fort McKay South - June 2016

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	45	66	28	10	2	13	35	52	62	58	61	60	47	36	42	46	663
3.1 - 10.0	1	0	0	0	0	1	2	5	4	0	4	2	0	0	0	0	19
> 10.0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Totals	46	66	28	10	2	14	38	57	66	58	65	62	47	36	42	46	683

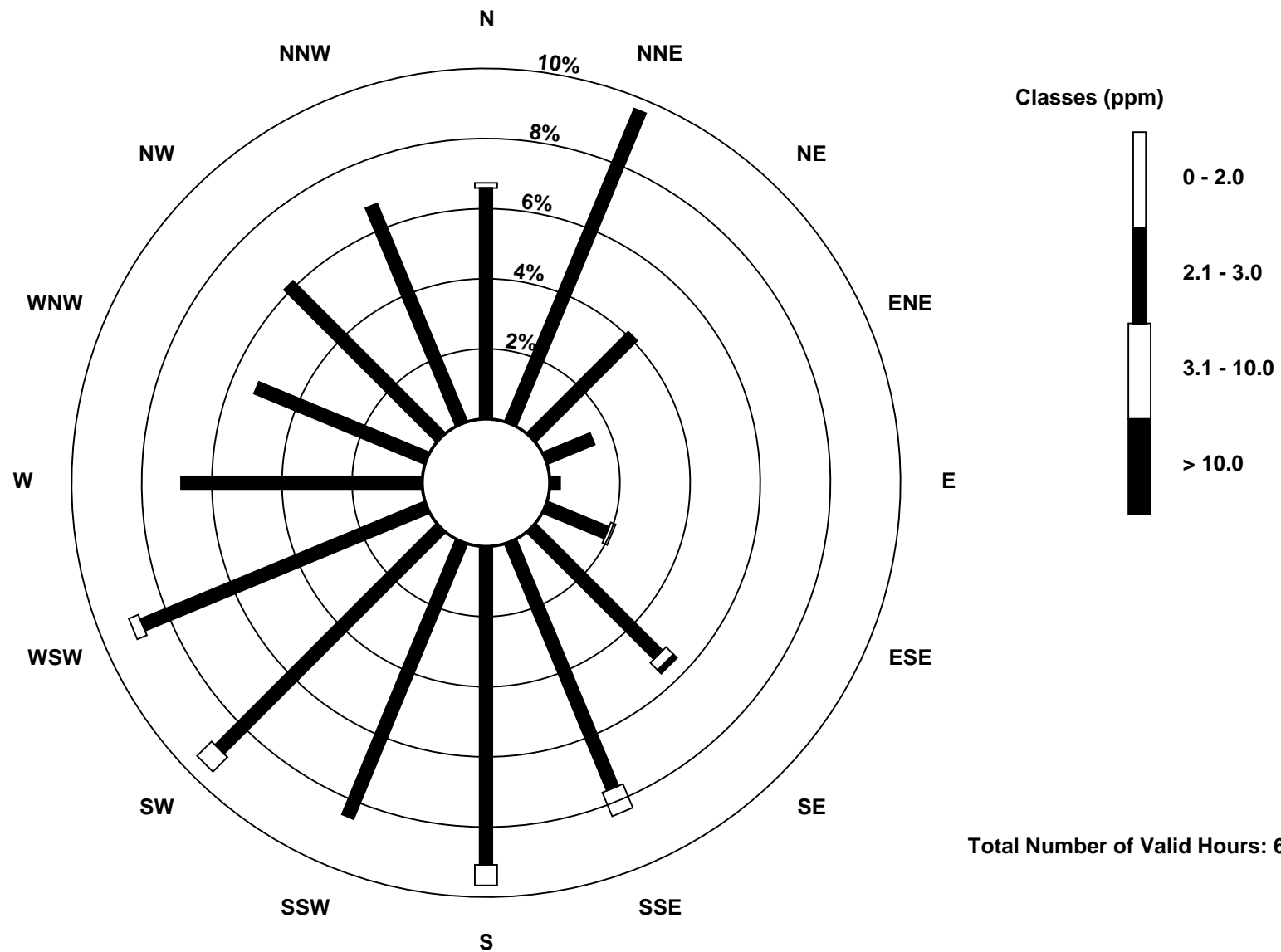
Total Number of Valid Hours: 683

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

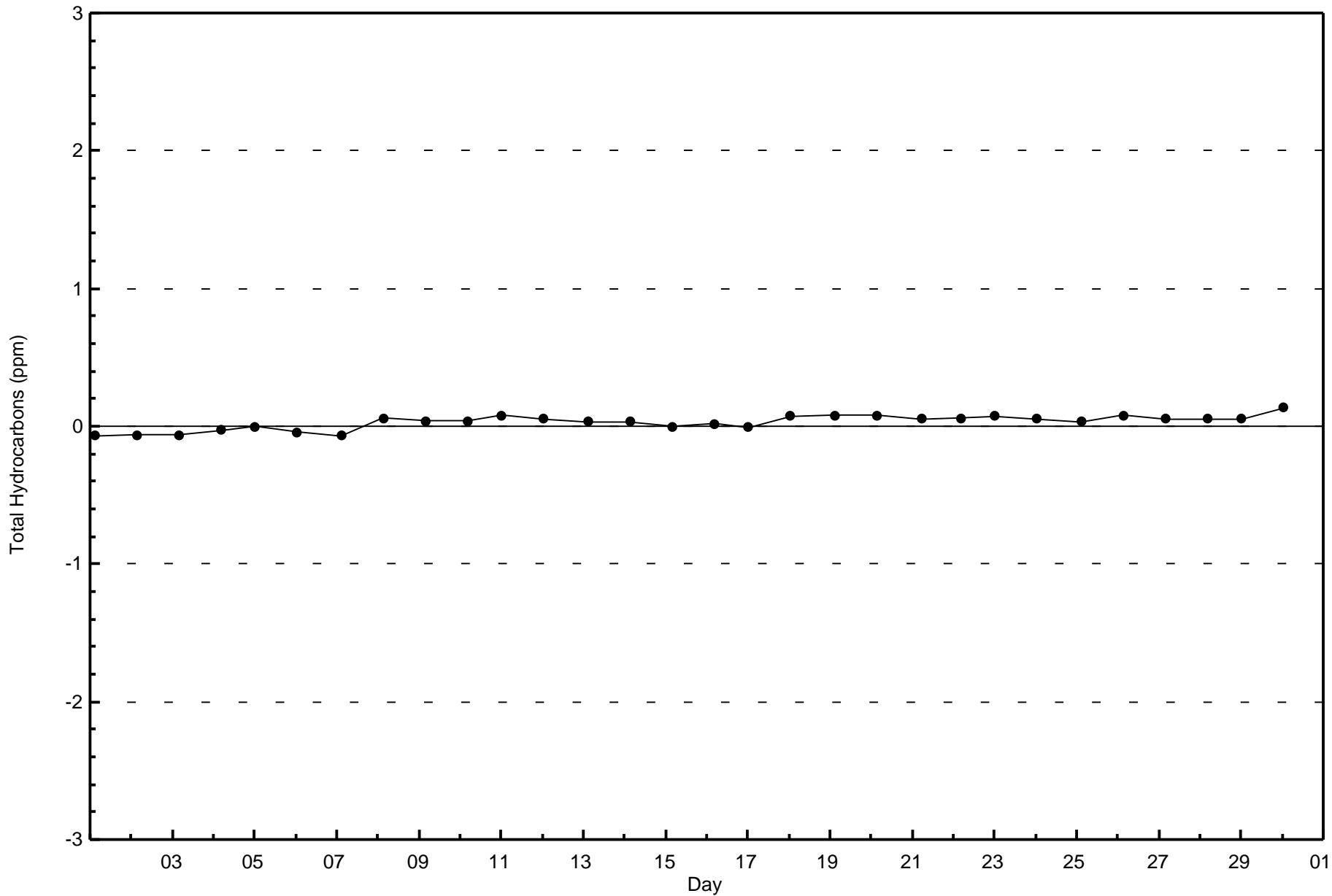
Total Hydrocarbons (THC) - ppm
Fort McKay South (AMS 13)

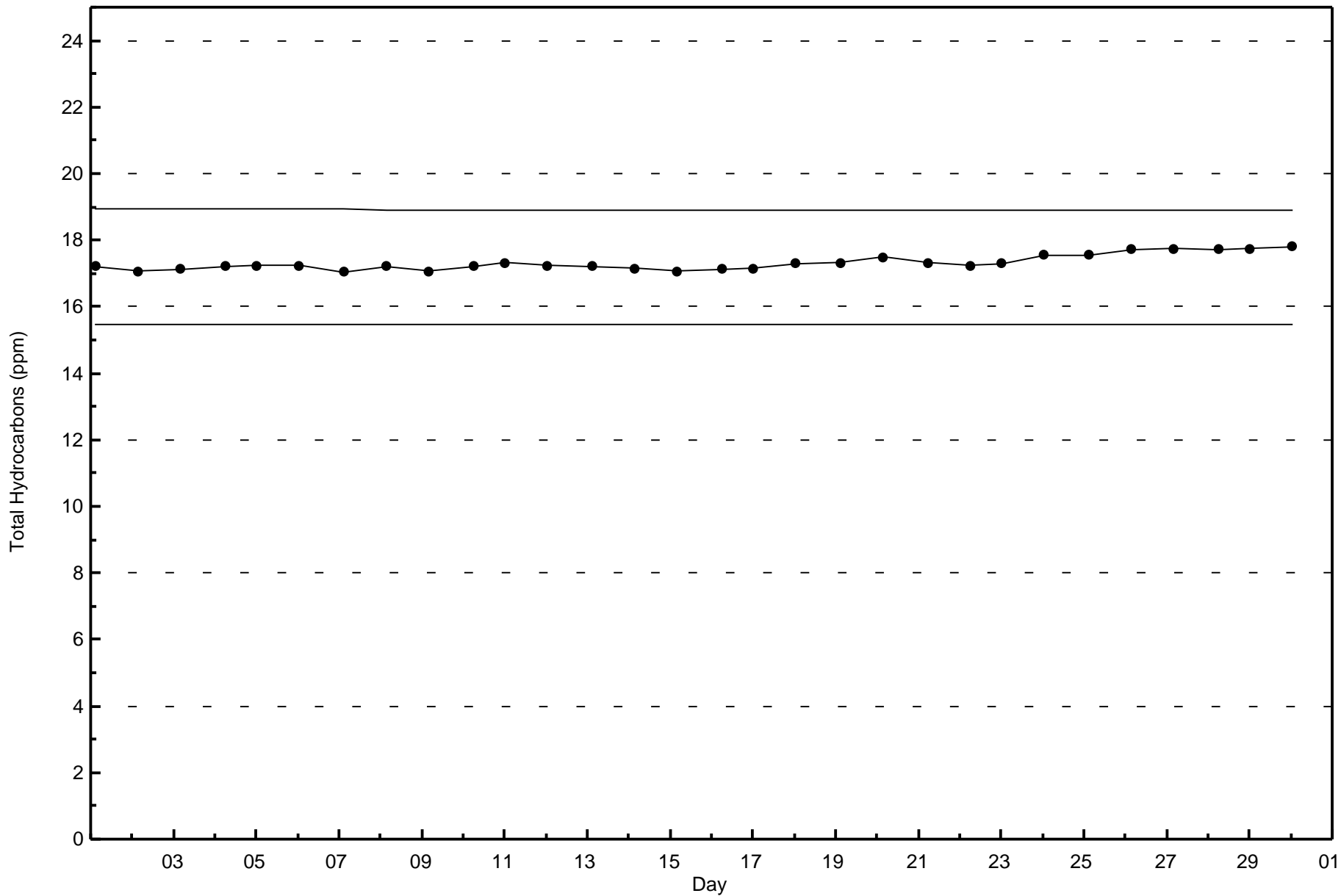




Wood Buffalo Environmental Association
Zero Responses

Total Hydrocarbons (THC) - ppm
Fort McKay South - June 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Fort McKay South - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 66 ppb on Jun 6 17:00	Maximum Daily Average: 40.0 ppb on Jun 6		Hours of Data:	648
Minimum Value: 1 ppb on Jun 25 01:00	Minimum Daily Average: 19.8 ppb on Jun 25		Hours of Missing Data:	72
Maximum Diurnal Average: 40.9 ppb at hour 14	Minimum Diurnal Average: 11.4 ppb at hour 4		Hours of Calibration:	32
Monthly Average: 27.6 ppb	Percentiles: P ₁ = 2 P ₁₀ = 7 Q ₁ = 15 Median = 28 Q ₃ = 38 P ₉₀ = 48 P ₉₉ = 65		Percent Operational Time:	94.4

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-Jun	5	5	4	5	4	Z	9	15	18	23	30	30	38	38	42	42	42	41	35	34	33	23	14	10	23.5	42
2-Jun	8	5	3	5	8	8	Z	9	11	15	29	44	46	49	48	51	43	36	32	34	28	25	14	11	24.4	51
3-Jun	13	12	19	10	9	13	17	Z	28	31	31	34	30	34	33	24	20	34	32	26	14	8	7	12	21.3	34
4-Jun	7	5	21	31	32	34	34	Z	42	47	48	50	47	44	48	48	49	47	45	42	28	20	33	36.5	50	
5-Jun	28	22	27	Z	20	24	27	27	29	38	39	39	39	39	39	39	39	39	39	38	28	18	13	14	30.6	39
6-Jun	14	17	15	12	Z	10	15	24	32	32	39	45	50	57	65	66	66	63	66	66	65	51	35	15	40.0	66
7-Jun	14	16	11	8	6	Z	30	34	46	M	M	48	43	41	42	45	45	51	47	43	38	28	16	11	31.5	51
8-Jun	11	11	14	12	9	11	Z	18	19	21	40	C	C	C	C	44	37	48	41	37	45	34	36	40	27.8	48
9-Jun	35	33	24	26	20	25	35	M	M	M	38	35	36	33	34	36	36	36	43	40	37	29	27	23	32.3	43
10-Jun	17	13	8	3	2	7	10	21	Z	25	27	30	32	34	35	36	37	37	DF	29	DF	10	6	5	20.2	37
11-Jun	5	4	3	Z	2	2	6	8	14	17	24	30	36	38	41	38	34	33	36	34	25	17	17	14	20.8	41
12-Jun	7	10	10	8	Z	10	11	21	23	20	18	18	23	32	30	27	26	27	29	30	23	25	27	28	20.9	32
13-Jun	28	28	25	16	16	Z	23	26	28	30	31	33	37	39	37	38	38	39	40	33	20	13	8	8	27.6	40
14-Jun	6	4	3	3	4	11	Z	20	28	31	39	48	51	53	49	47	44	40	36	31	43	54	49	41	31.9	54
15-Jun	36	35	34	33	35	40	42	Z	40	42	38	37	36	32	31	34	37	39	39	36	31	29	12	6	33.5	42
16-Jun	5	9	16	23	22	25	25	27	Z	27	26	26	25	25	25	24	24	24	24	26	25	21	21	19	22.3	27
17-Jun	17	15	14	Z	14	14	14	17	23	23	24	27	30	34	35	34	33	33	32	30	25	22	24	14	23.8	35
18-Jun	17	20	17	16	Z	15	15	17	21	28	30	31	32	32	33	35	37	38	38	34	17	26	13	13	25.0	38
19-Jun	27	21	17	13	18	Z	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	27
20-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	M	43	46	59	57	64	63	63	55	42	33	16	12	--	64
21-Jun	15	10	6	6	6	7	19	35	Z	43	51	54	55	54	55	57	58	58	58	48	32	20	17	8	33.6	58
22-Jun	3	4	3	4	5	8	14	36	Z	57	54	60	60	60	62	63	62	55	54	55	54	50	38	40	39.2	63
23-Jun	41	36	27	Z	22	20	22	31	35	39	45	51	56	55	39	28	31	40	41	37	19	9	14	18	32.9	56
24-Jun	14	7	5	11	Z	8	13	18	23	33	43	39	28	39	38	28	22	25	14	27	24	18	14	8	21.7	43
25-Jun	1	2	6	6	9	Z	15	13	17	22	24	26	29	32	35	36	36	36	38	35	20	9	4	3	19.8	38
26-Jun	3	3	3	2	3	3	Z	12	24	40	44	46	43	31	17	23	28	26	27	22	22	35	16	22	21.6	46
27-Jun	22	21	16	12	7	12	14	Z	25	28	28	27	28	32	30	31	36	34	31	34	20	11	9	6	22.2	36
28-Jun	5	4	4	3	2	6	13	17	Z	35	M	M	M	38	35	36	37	39	38	34	26	16	16	10	20.8	39
29-Jun	6	5	5	Z	3	6	15	24	31	38	39	41	45	50	50	50	50	51	52	41	33	22	18	16	30.0	52
30-Jun	21	13	10	7	Z	7	19	25	20	20	34	28	39	50	49	45	44	45	43	40	29	18	18	15	27.8	50

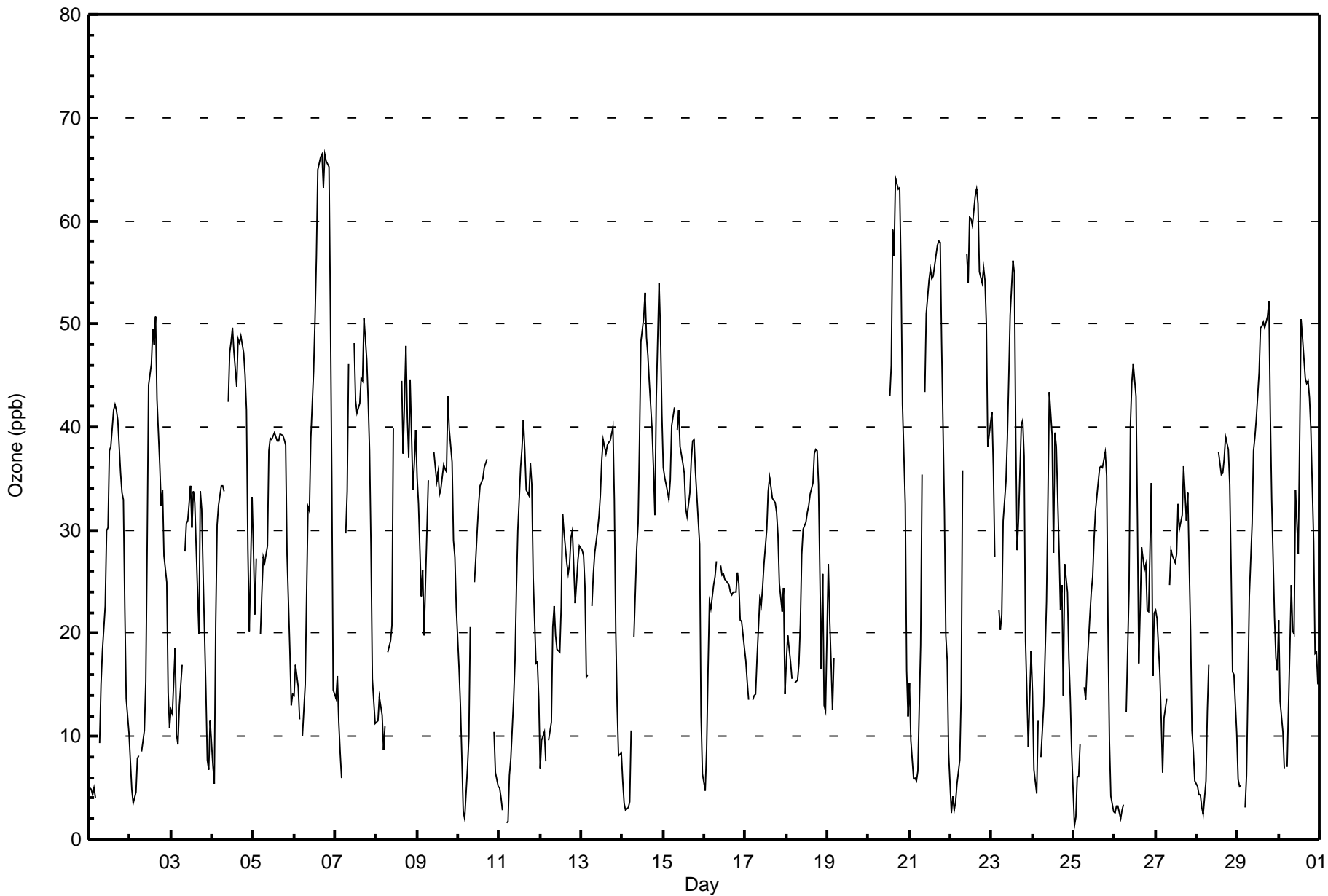
14.9	13.5	12.8	11.4	11.5	13.5	19.1	22.0	25.4	30.7	35.1	37.5	39.2	40.9	40.4	40.0	39.8	40.5	39.8	37.0	30.7	24.2	18.7	16.4	Diurnal Average		
41	36	34	33	35	40	42	36	46	57	54	60	60	60	65	66	66	63	66	66	66	65	54	49	41	Diurnal Maximum	

Z - zerspan C - Calibration M - Maintenance DF - DAS Failure AF - Analyzer Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Fort McKay South - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ozone (O₃) - ppb
Fort McKay South - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	228	35.19	35.19
21 - 50	374	57.72	92.90
51 - 82	46	7.10	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 648

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ozone (O₃) - ppb
Fort McKay South - June 2016**

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	3	3	2	0	1	5	10	30	31	25	30	27	22	15	11	228
21 - 50	26	52	21	4	3	10	23	32	28	23	40	27	18	13	25	29	374
51 - 82	1	1	2	2	0	0	8	12	10	5	1	4	0	0	0	0	46
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	40	56	26	8	3	11	36	54	68	59	66	61	45	35	40	40	648

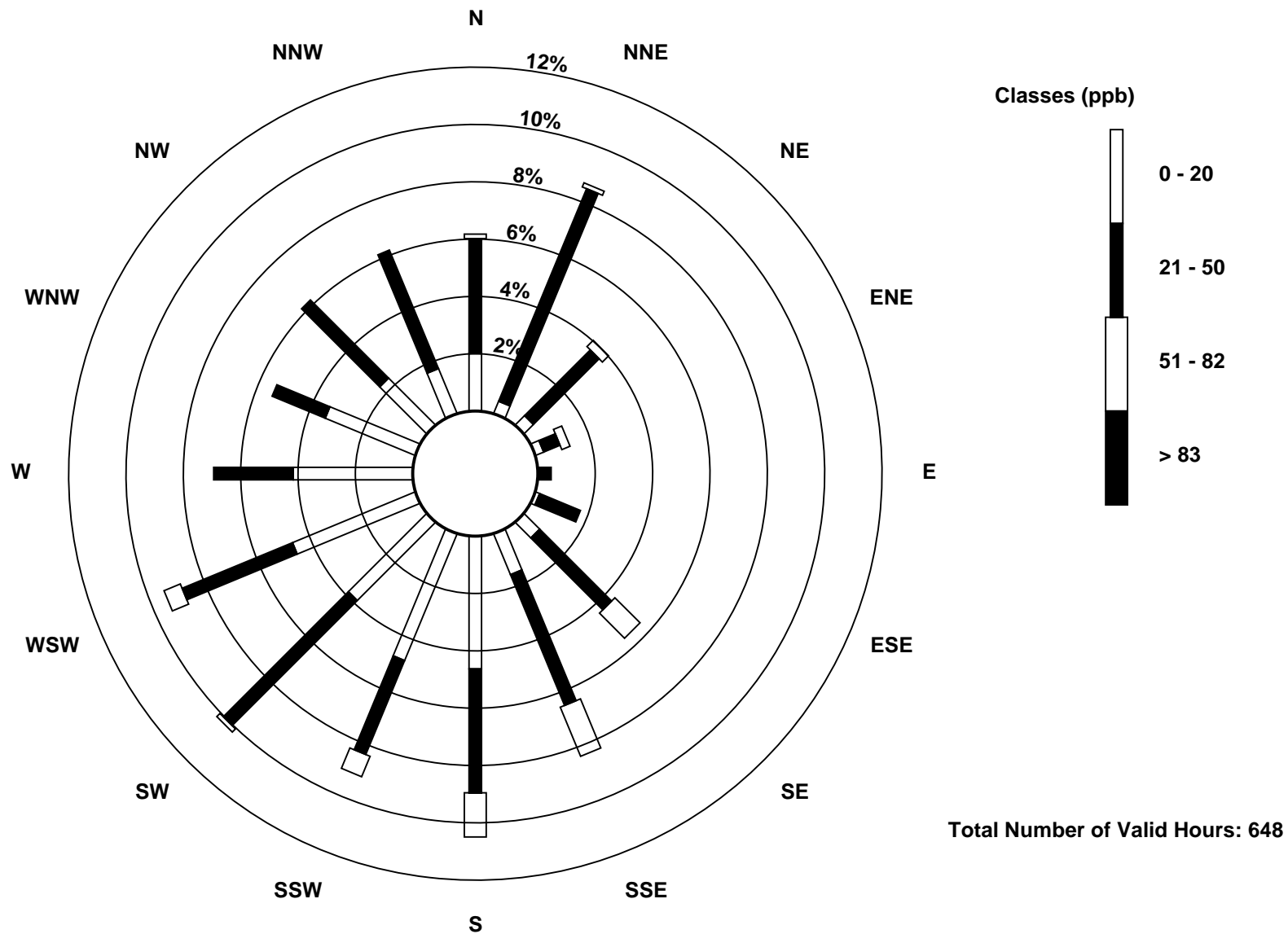
Total Number of Valid Hours: 648

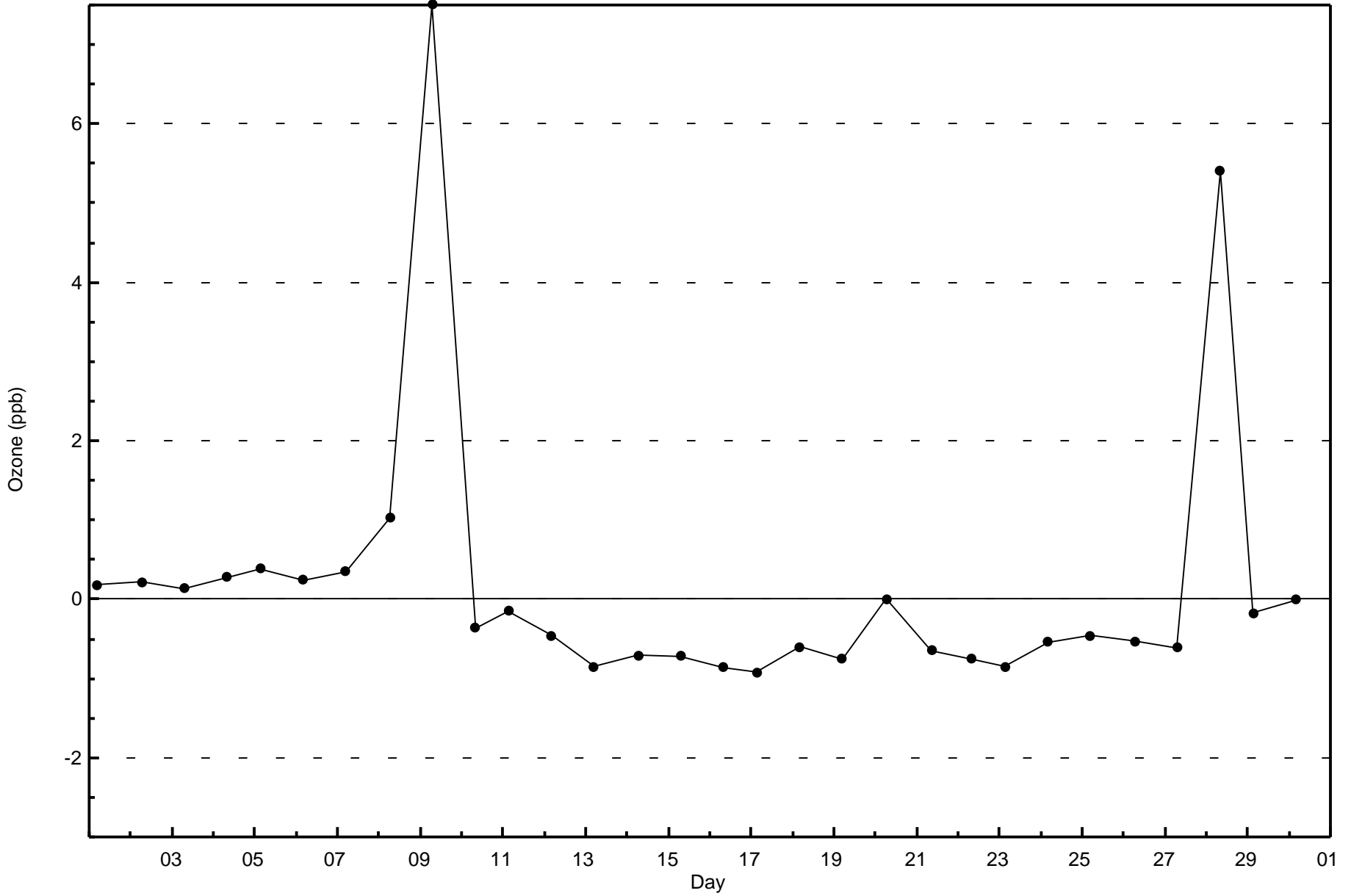
Total Number of Hours: 720

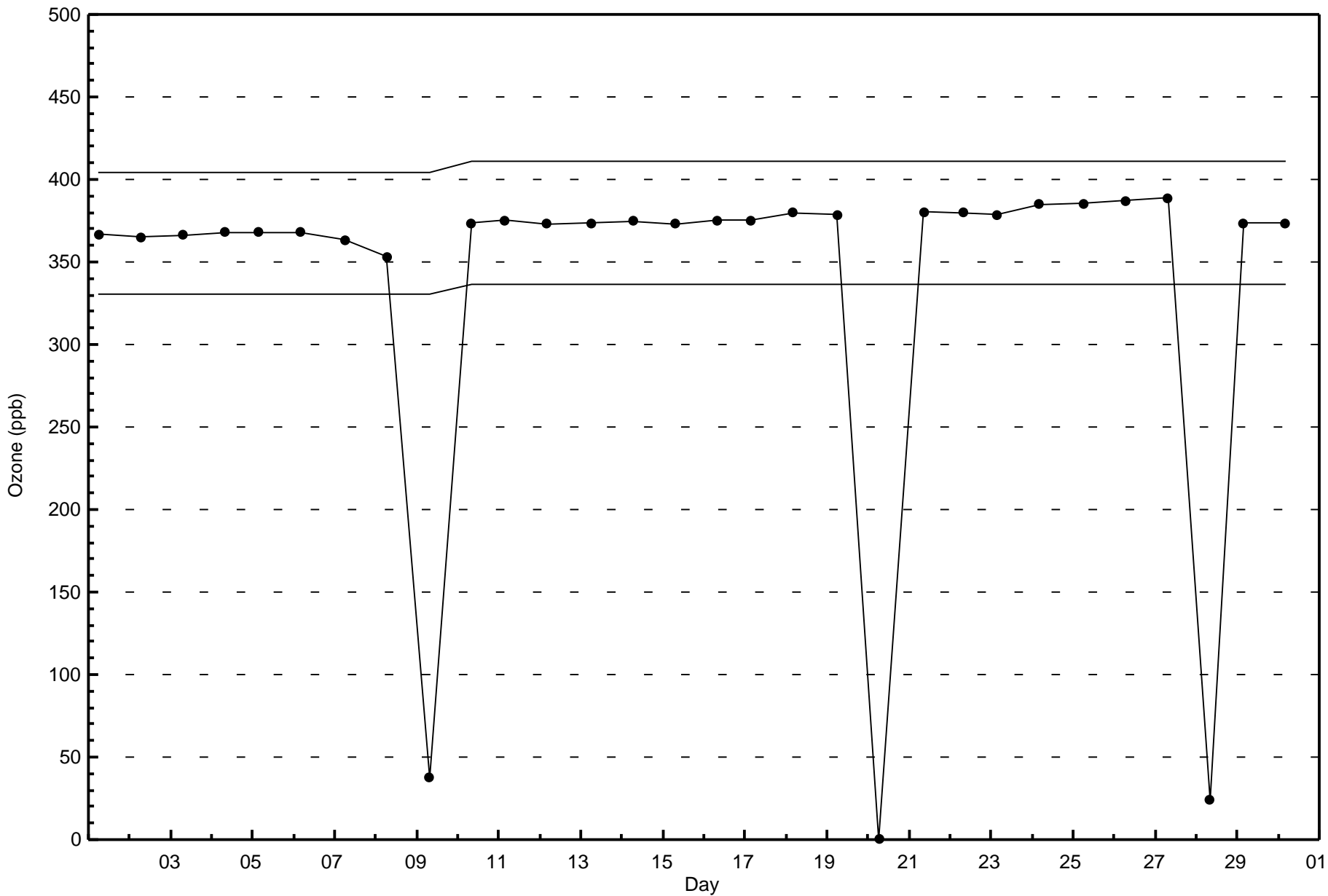


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Ozone (O₃) - ppb
Fort McKay South (AMS 13)







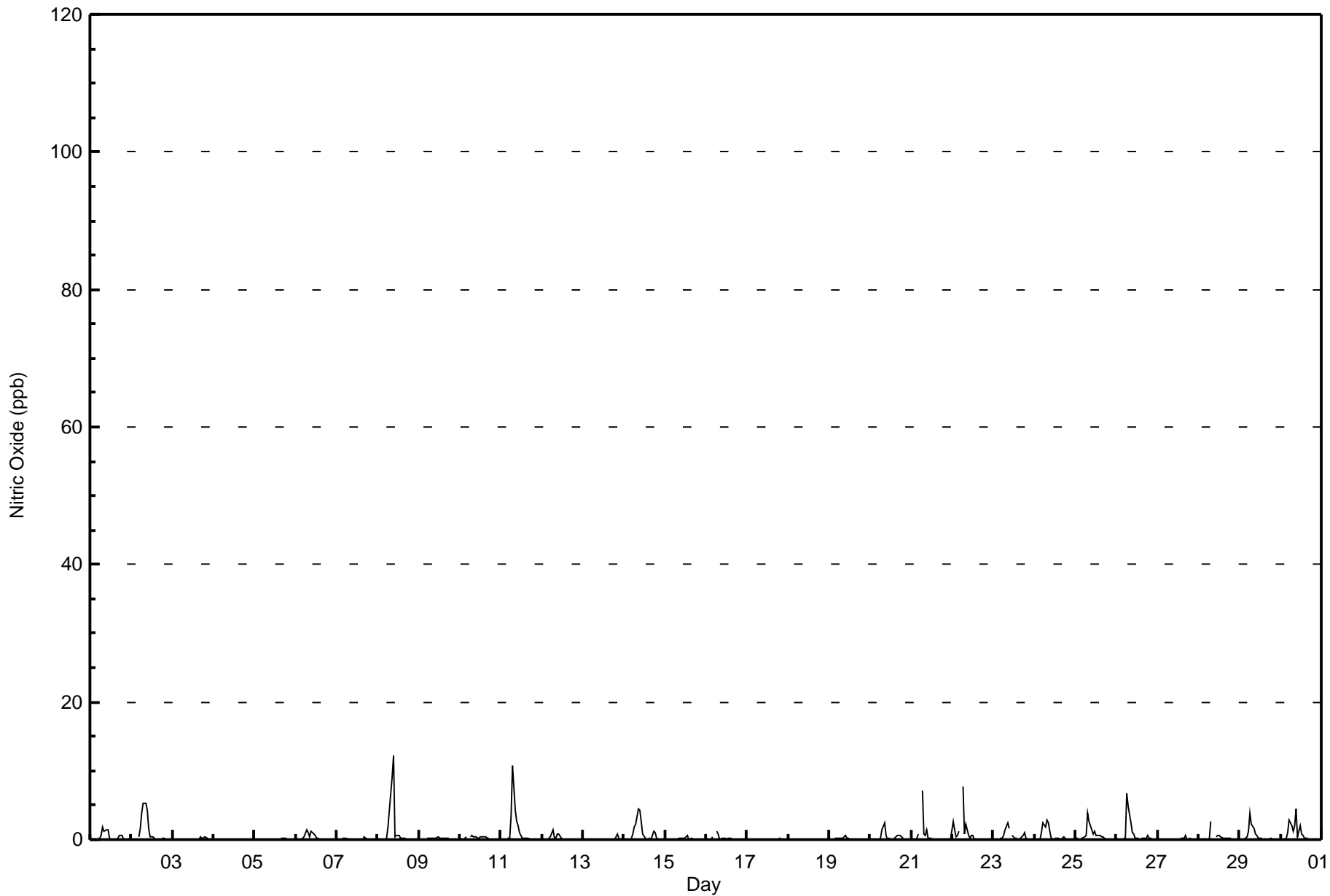


Maximum Value: 12 ppb on Jun 8 10:00																	Maximum Daily Average: 1.3 ppb on Jun 8							Hours in Service: 720																	
Minimum Value: 0 ppb on Jun 2 17:00																	Minimum Daily Average: 0.0 ppb on Jun 4							Hours of Data: 678																	
Maximum Diurnal Average: 1.7 ppb at hour 8																	Minimum Diurnal Average: 0.0 ppb at hour 22							Hours of Missing Data: 42																	
Monthly Average: 0.4 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 5							Hours of Calibration: 36																	
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-Jun	0	0	Z	0	0	0	1	2	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0.4	2															
2-Jun	0	0	0	Z	0	2	4	5	5	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	5															
3-Jun	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															
4-Jun	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															
5-Jun	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															
6-Jun	0	Z	0	0	0	0	2	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2															
7-Jun	0	0	Z	0	0	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	--	0															
8-Jun	0	0	0	Z	0	0	2	4	9	12	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1.3	12															
9-Jun	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																
10-Jun	0	0	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	DF	0	DF	DF	0	0.3	1																
11-Jun	Z	0	0	0	0	0	3	11	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	1.1	11																
12-Jun	0	Z	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																
13-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.1	1																
14-Jun	0	0	0	Z	0	1	2	2	4	4	3	1	0	0	0	0	0	1	1	0	0	0	0	0.9	4																
15-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1	1																
16-Jun	0	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																
17-Jun	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																
18-Jun	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																
19-Jun	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																
20-Jun	0	0	0	Z	0	0	0	1	2	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0.3	2																
21-Jun	0	0	0	0	1	Z	7	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	7																
22-Jun	3	1	0	1	1	Z	8	1	2	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0.8	8																
23-Jun	Z	0	0	0	0	0	1	1	2	2	M	1	0	0	0	0	0	1	1	0	0	0	0	0.4	2																
24-Jun	0	Z	0	0	1	2	2	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	3																
25-Jun	0	0	Z	0	0	0	1	4	3	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0.6	4																
26-Jun	0	0	0	Z	0	0	7	5	2	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0.8	7																
27-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.1	1																
28-Jun	0	0	0	0	0	Z	0	3	M	M	0	1	1	0	0	0	0	0	0	0	0	0	0	0.3	3																
29-Jun	Z	0	0	0	0	1	4	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	4																
30-Jun	0	Z	0	0	1	3	2	1	2	5	0	2	1	1	0	0	0	0	0	0	0	0	0	0.8	5																
																	0.2	0.1	0.1	0.1	0.3	0.5	1.6	1.7	1.6	1.5	0.5	0.4	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.0	0.0	0.0	Diurnal Average
																	3	1	0	1	1	3	8	11	9	12	3	2	1	1	1	0	1	1	1	1	0	1	0	0	Diurnal Maximum
Z - zerospan			C - Calibration			M - Maintenance			DF - DAS Failure																																



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Fort McKay South - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Fort McKay South - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	678	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: 678

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Fort McKay South - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	45	65	27	10	2	13	38	57	66	58	65	62	46	36	42	46	678
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
Totals	45	65	27	10	2	13	38	57	66	58	65	62	46	36	42	46	678

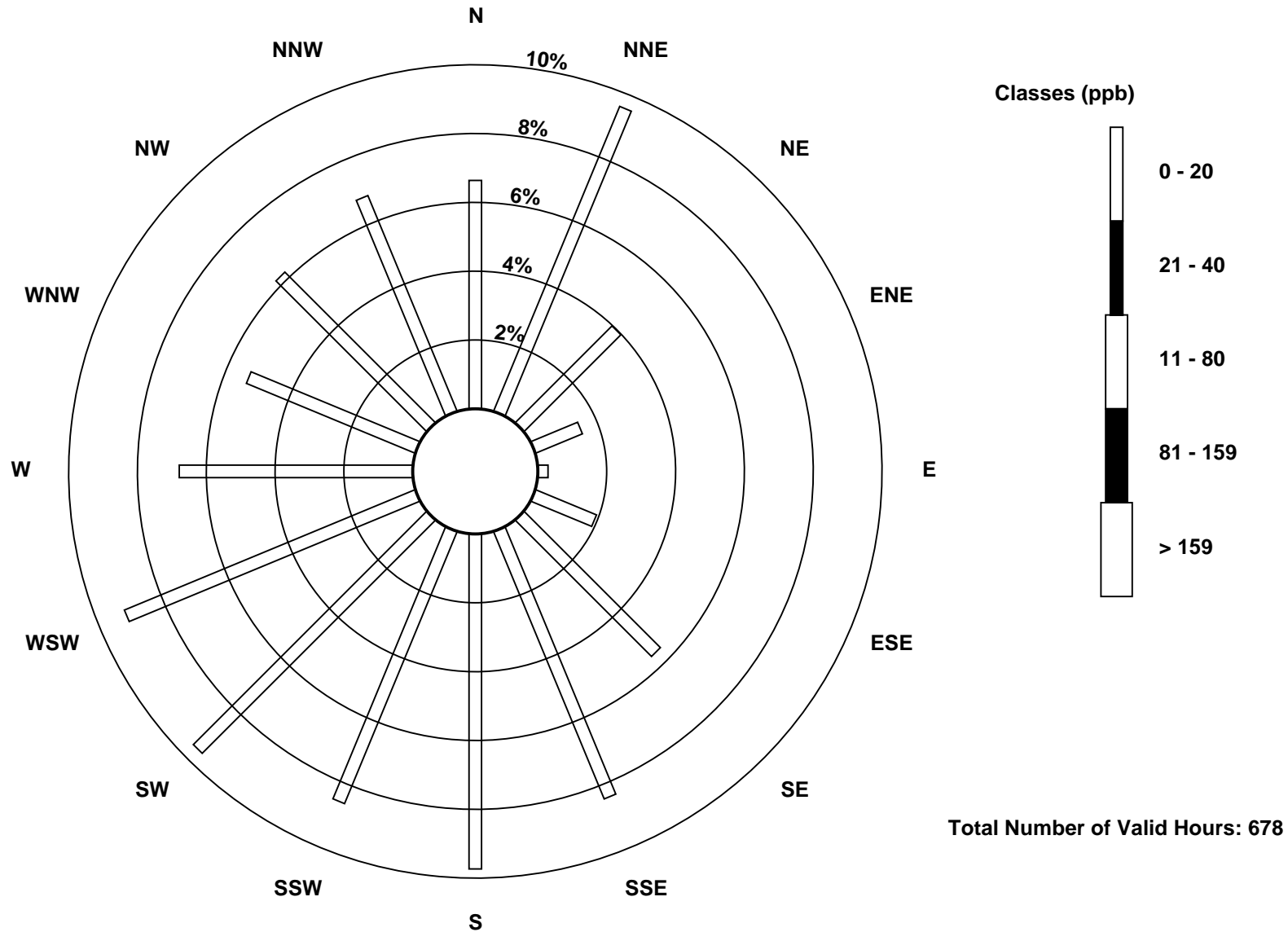
Total Number of Valid Hours: 678

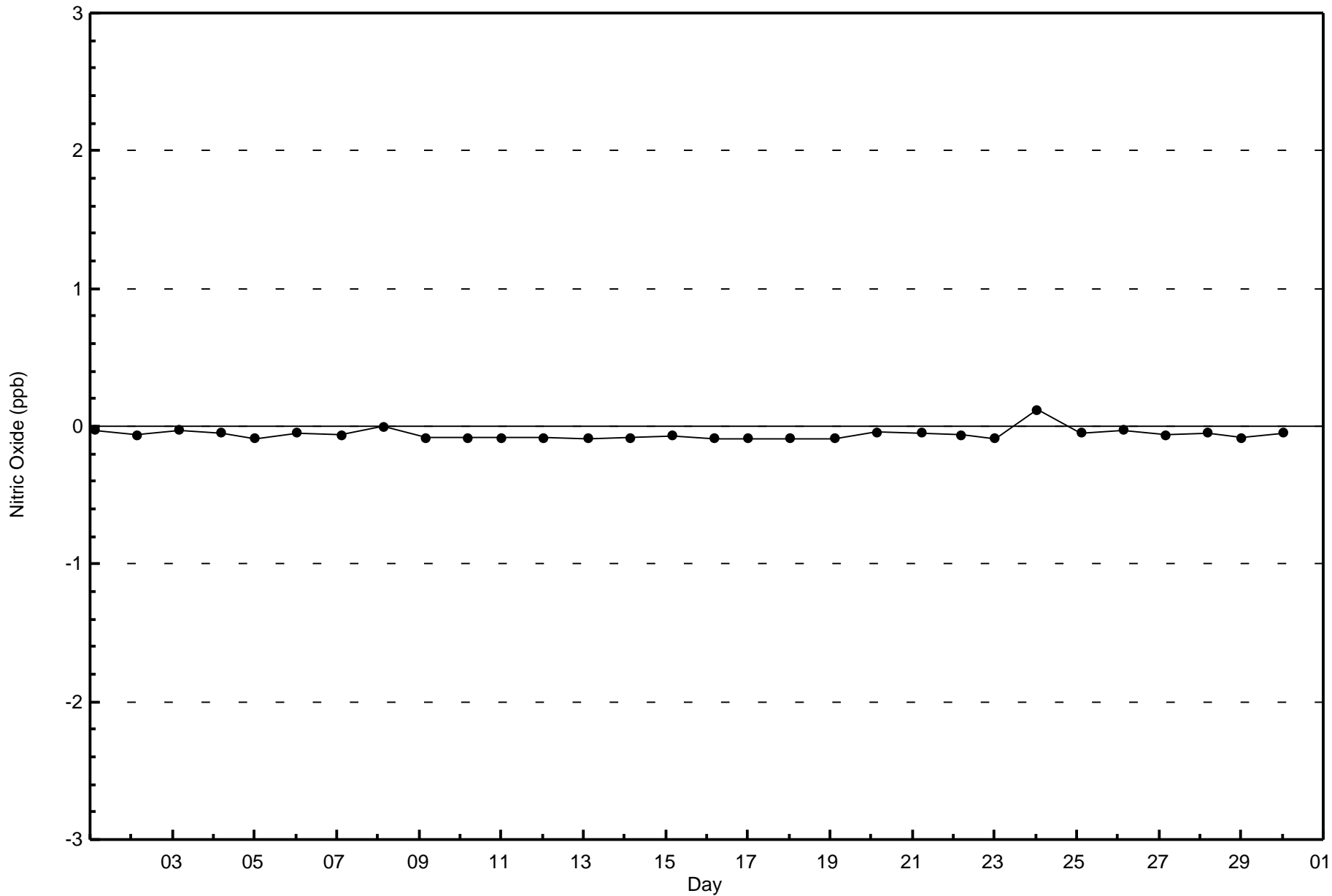
Total Number of Hours: 720

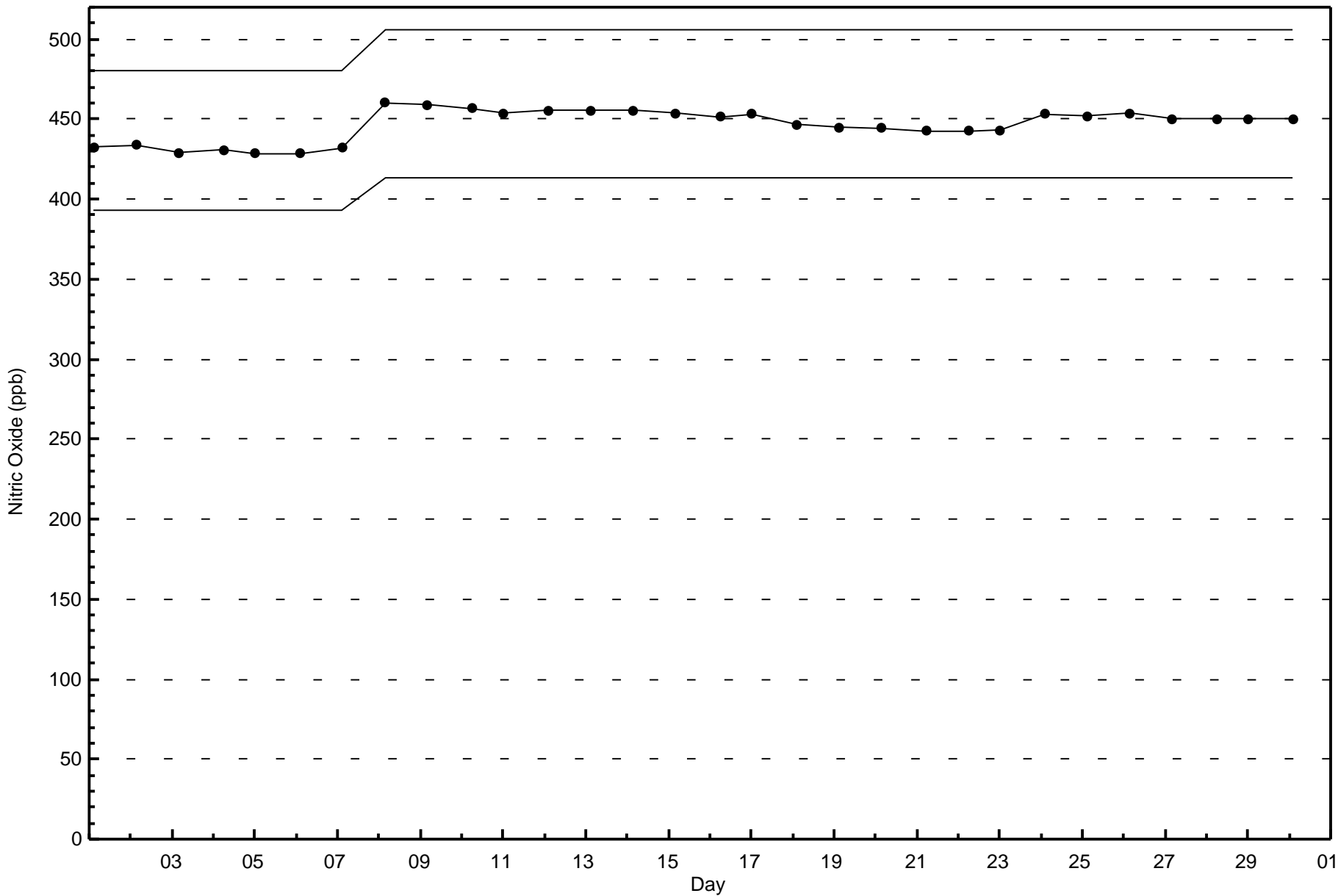


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitric Oxide (NO) - ppb
Fort McKay South (AMS 13)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Fort McKay South - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 20 ppb on Jun 8 10:00	Maximum Daily Average: 5.3 ppb on Jun 22		Hours of Data:	678
Minimum Value: 0 ppb on Jun 18 04:00	Minimum Daily Average: 0.4 ppb on Jun 4		Hours of Missing Data:	42
Maximum Diurnal Average: 4.1 ppb at hour 10	Minimum Diurnal Average: 1.2 ppb at hour 15		Hours of Calibration:	36
Monthly Average: 2.2 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 3 P ₉₀ = 5 P ₉₉ = 14		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-Jun	1	1	Z	1	1	1	3	5	4	4	4	2	1	1	1	1	1	3	6	5	2	2	1	1	2.1	6
2-Jun	1	2	1	Z	3	4	5	5	5	4	3	2	2	2	2	2	1	1	2	2	3	3	1	2	2.5	5
3-Jun	3	2	1	1	Z	1	1	1	1	0	0	1	1	0	1	1	2	1	2	5	3	2	2	2	1.4	5
4-Jun	1	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.4	1
5-Jun	Z	3	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	1	1	2	2	0.9	3
6-Jun	1	Z	2	2	2	2	4	3	2	5	4	3	2	2	1	1	2	2	1	3	2	2	2	3	2.3	5
7-Jun	3	2	Z	2	1	1	1	1	C	C	C	C	C	C	1	1	3	3	1	1	3	2	3	7	--	7
8-Jun	5	2	1	Z	0	0	4	10	17	20	2	4	4	2	2	3	3	2	2	3	3	1	1	0	4.0	20
9-Jun	0	0	0	2	Z	6	4	4	3	3	3	3	2	3	1	2	3	2	1	2	1	1	1	1	2.1	6
10-Jun	4	2	2	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	DF	2	DF	DF	1	1	1.2	4
11-Jun	Z	0	0	0	0	0	4	13	10	8	7	4	1	1	1	2	2	1	2	1	0	0	1	3	2.8	13
12-Jun	3	Z	1	1	1	1	4	1	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0.9	4
13-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	10	7	4	4	1.5	10
14-Jun	3	2	2	Z	1	2	3	4	9	10	8	4	2	1	1	2	2	6	10	7	4	2	3	3	3.9	10
15-Jun	1	1	1	1	Z	1	2	2	1	1	1	1	2	2	1	1	1	1	1	1	4	2	2	2	1.4	4
16-Jun	2	4	2	2	4	Z	3	2	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1.0	4
17-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	5	2	1	0.7	5
18-Jun	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	2	0.4	4
19-Jun	1	0	Z	1	1	0	0	0	1	2	1	1	0	0	0	0	0	0	0	0	1	1	0	1	0.6	2
20-Jun	4	1	0	Z	0	0	1	3	5	3	5	2	2	3	4	4	6	7	7	6	4	3	5	5	3.3	7
21-Jun	4	4	9	6	4	Z	14	4	4	6	2	2	1	1	1	1	1	1	1	2	2	2	4	8	3.6	14
22-Jun	18	15	16	13	5	Z	12	5	11	7	3	4	2	1	2	2	2	1	1	1	1	1	1	1	5.3	18
23-Jun	Z	1	1	1	3	2	3	6	10	8	M	5	3	2	1	1	2	4	6	4	2	1	3	7	3.4	10
24-Jun	4	Z	2	5	10	8	5	7	5	3	1	1	2	2	2	1	1	4	2	1	1	1	4	2	3.1	10
25-Jun	1	1	Z	1	1	1	1	6	5	3	3	3	2	2	2	2	2	2	1	1	1	1	1	1	1.8	6
26-Jun	0	2	2	Z	1	0	5	7	5	4	4	2	2	1	1	1	2	2	1	2	3	1	1	1	2.1	7
27-Jun	0	0	1	2	Z	0	0	0	0	0	0	0	0	1	2	1	3	1	1	3	3	2	2	1	1.1	3
28-Jun	2	2	1	1	1	Z	0	4	M	M	3	4	4	2	1	1	1	1	2	1	4	3	3	4	2.1	4
29-Jun	Z	7	5	3	2	2	7	5	5	4	3	1	1	2	2	2	2	2	3	3	3	2	2	2	3.0	7
30-Jun	1	Z	4	7	7	8	6	6	10	15	3	8	5	4	3	2	1	2	2	2	2	2	3	2	4.4	15

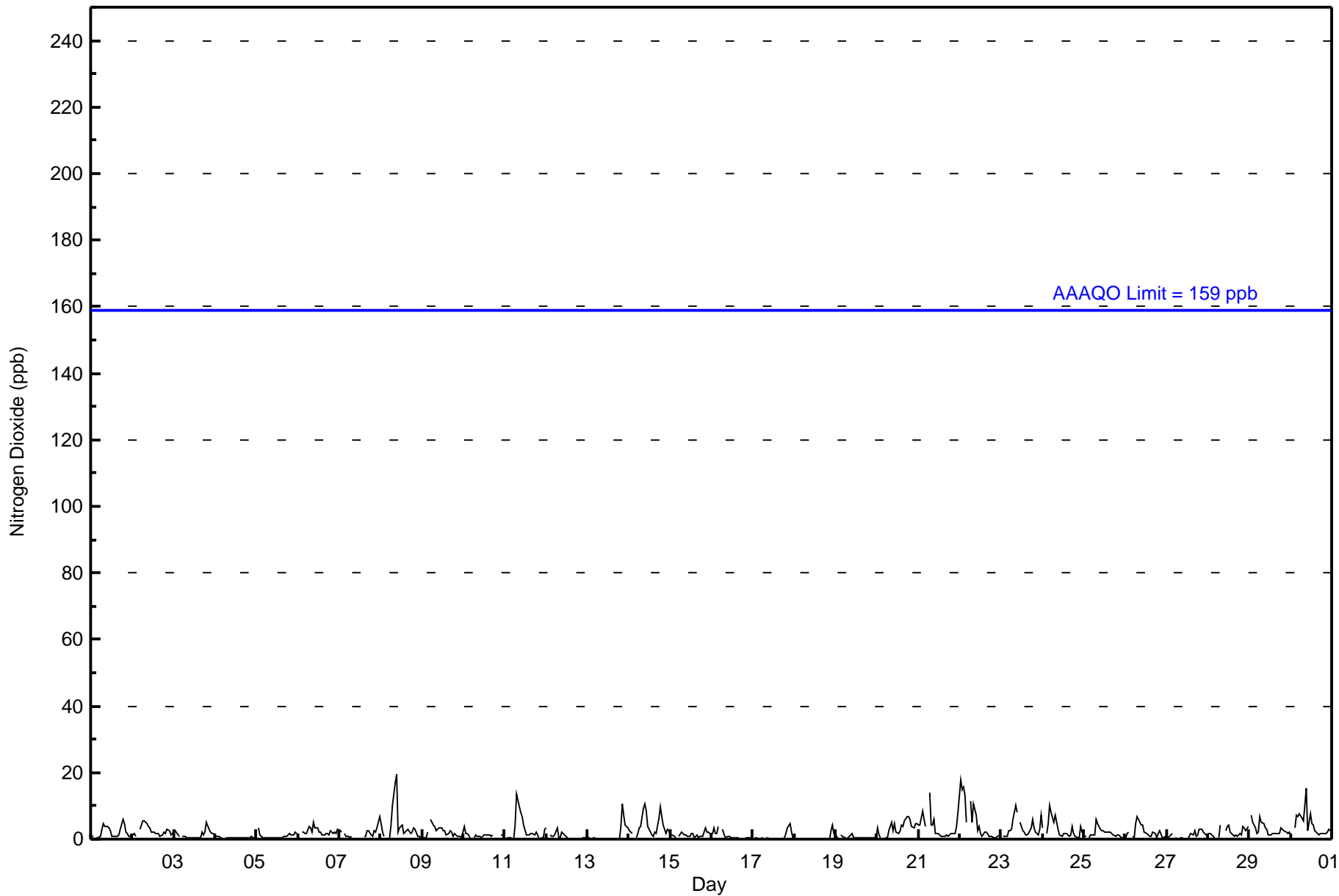
2.5	2.2	2.2	2.1	1.8	1.8	3.1	3.5	4.1	4.1	2.3	2.1	1.5	1.3	1.2	1.2	1.4	1.6	2.0	2.1	2.2	1.8	2.0	2.2	Diurnal Average
18	15	16	13	10	8	14	13	17	20	8	8	5	4	4	4	6	7	10	7	10	7	5	8	Diurnal Maximum

Z - zerospan C - Calibration M - Maintenance DF - DAS Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Fort McKay South - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Fort McKay South - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	678	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: 678

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Fort McKay South - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	45	65	27	10	2	13	38	57	66	58	65	62	46	36	42	46	678
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
Totals	45	65	27	10	2	13	38	57	66	58	65	62	46	36	42	46	678

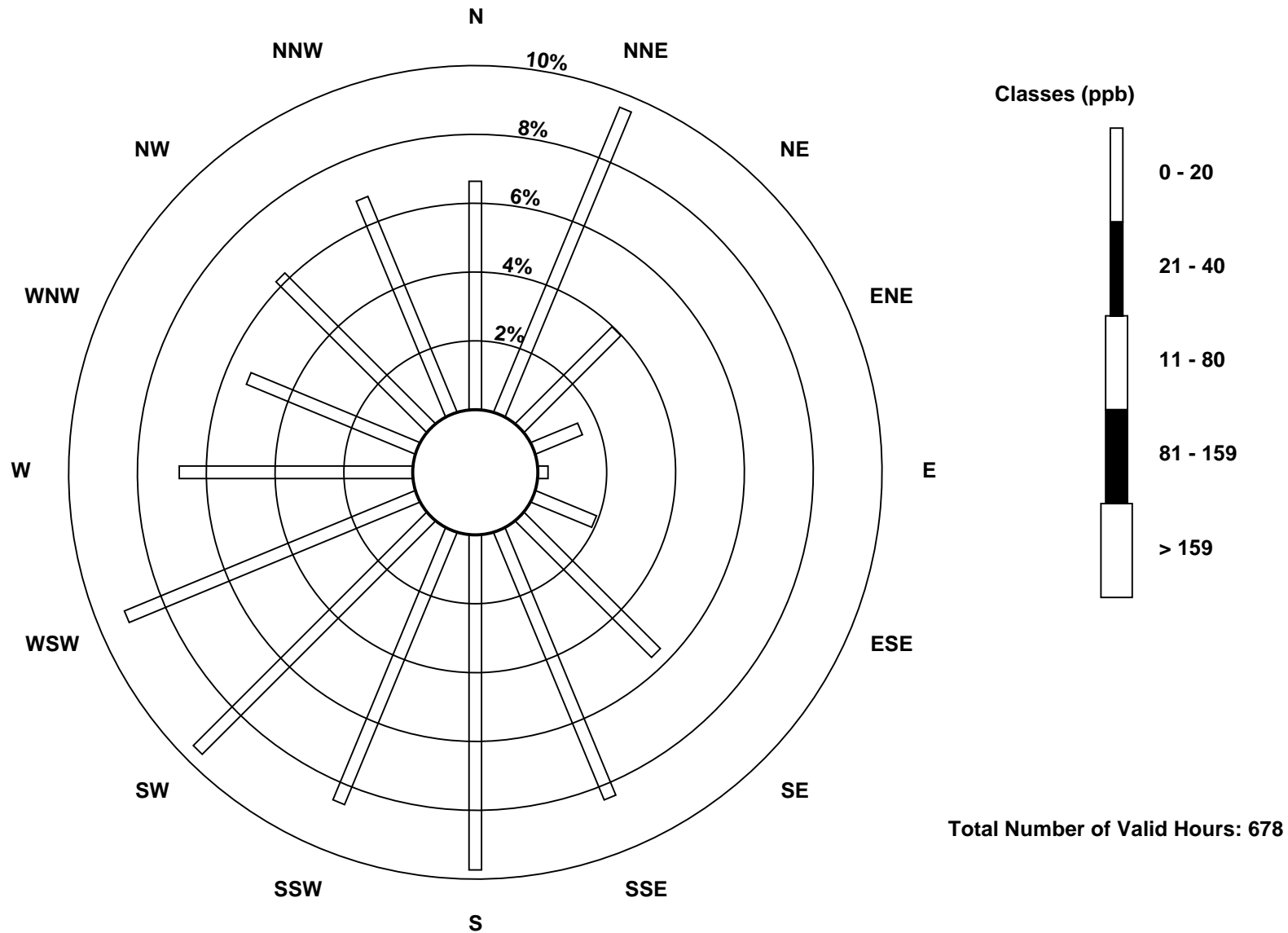
Total Number of Valid Hours: 678

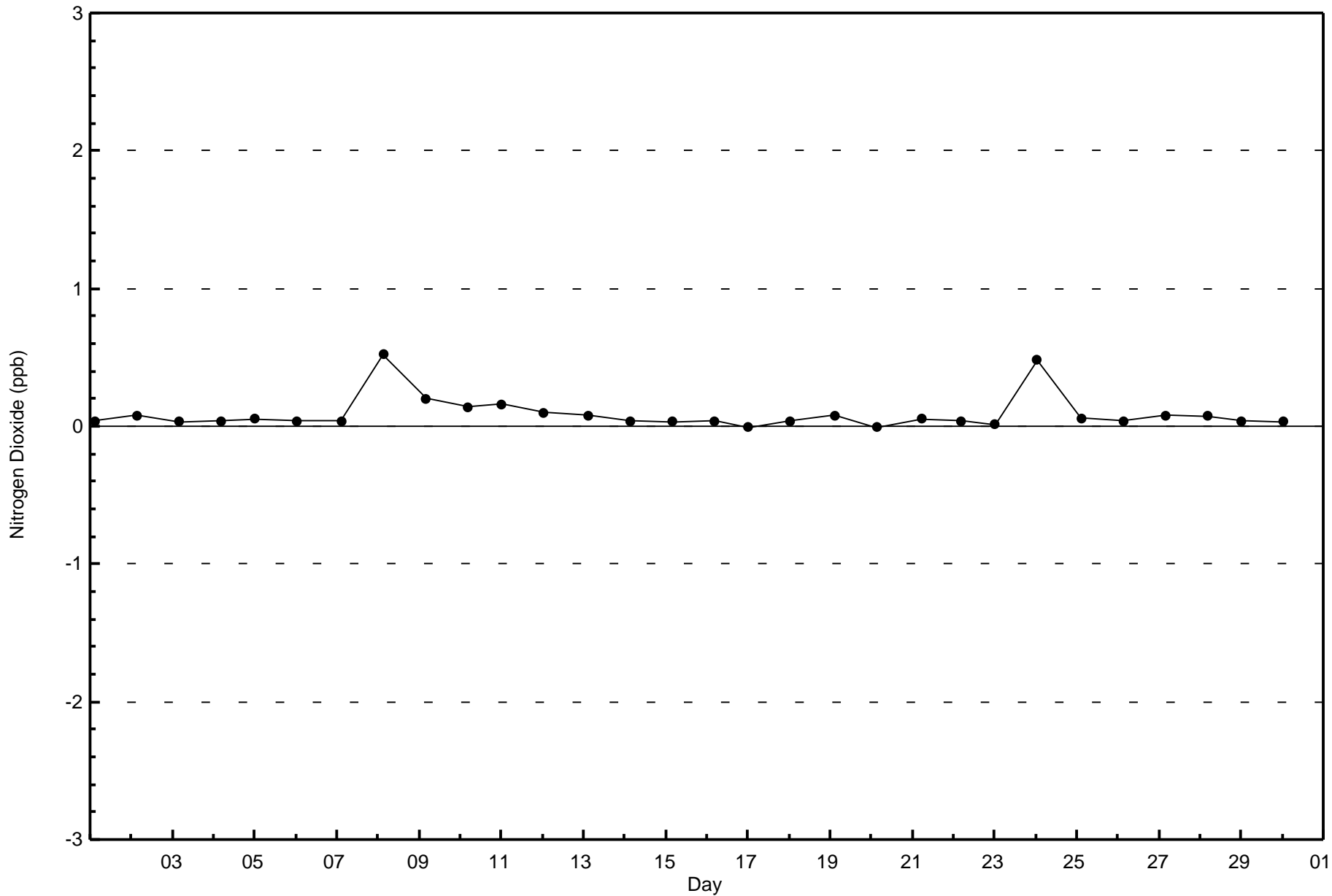
Total Number of Hours: 720

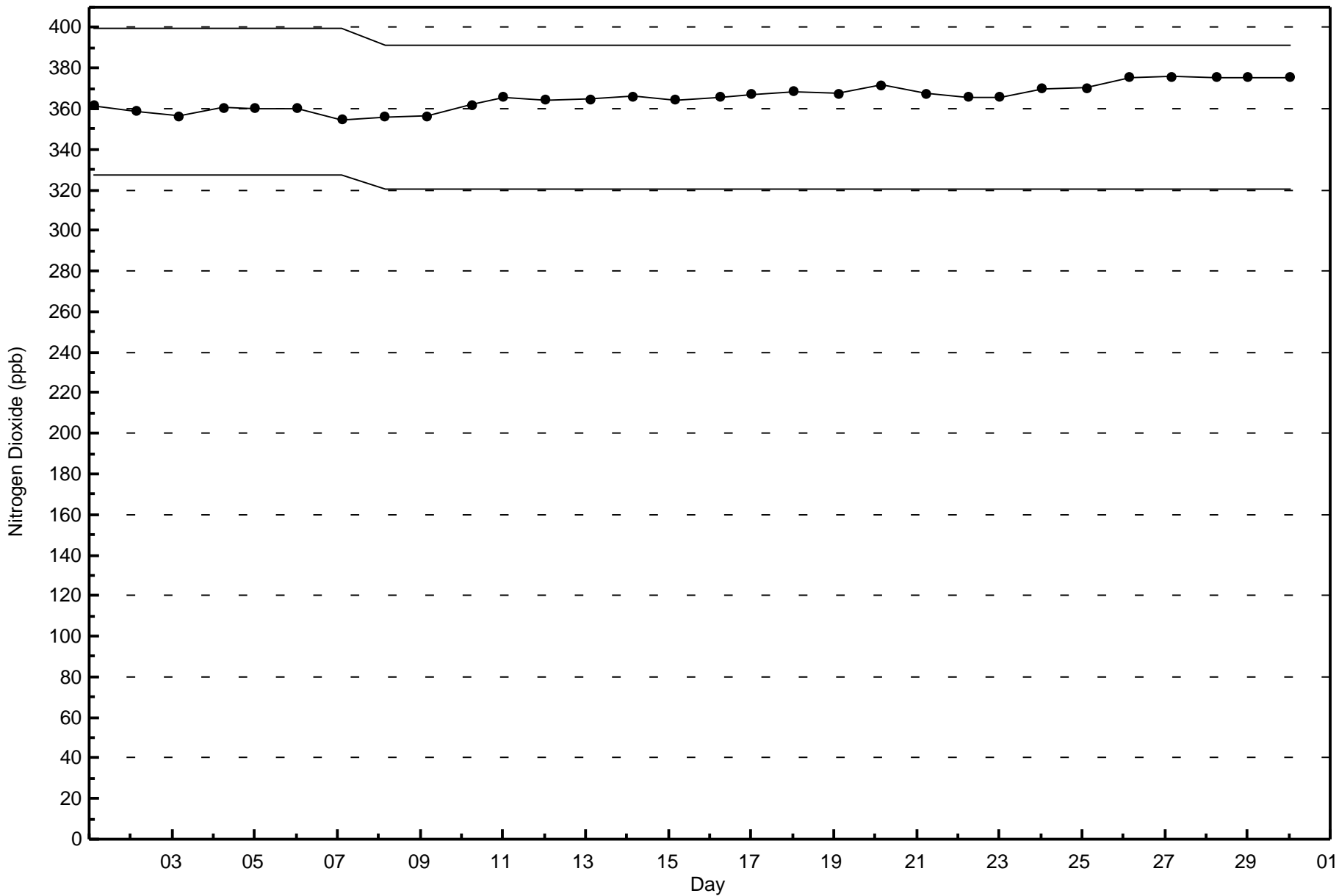


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Dioxide (NO₂) - ppb
Fort McKay South (AMS 13)









Wood Buffalo Environmental Association
Summary of Hour Averages

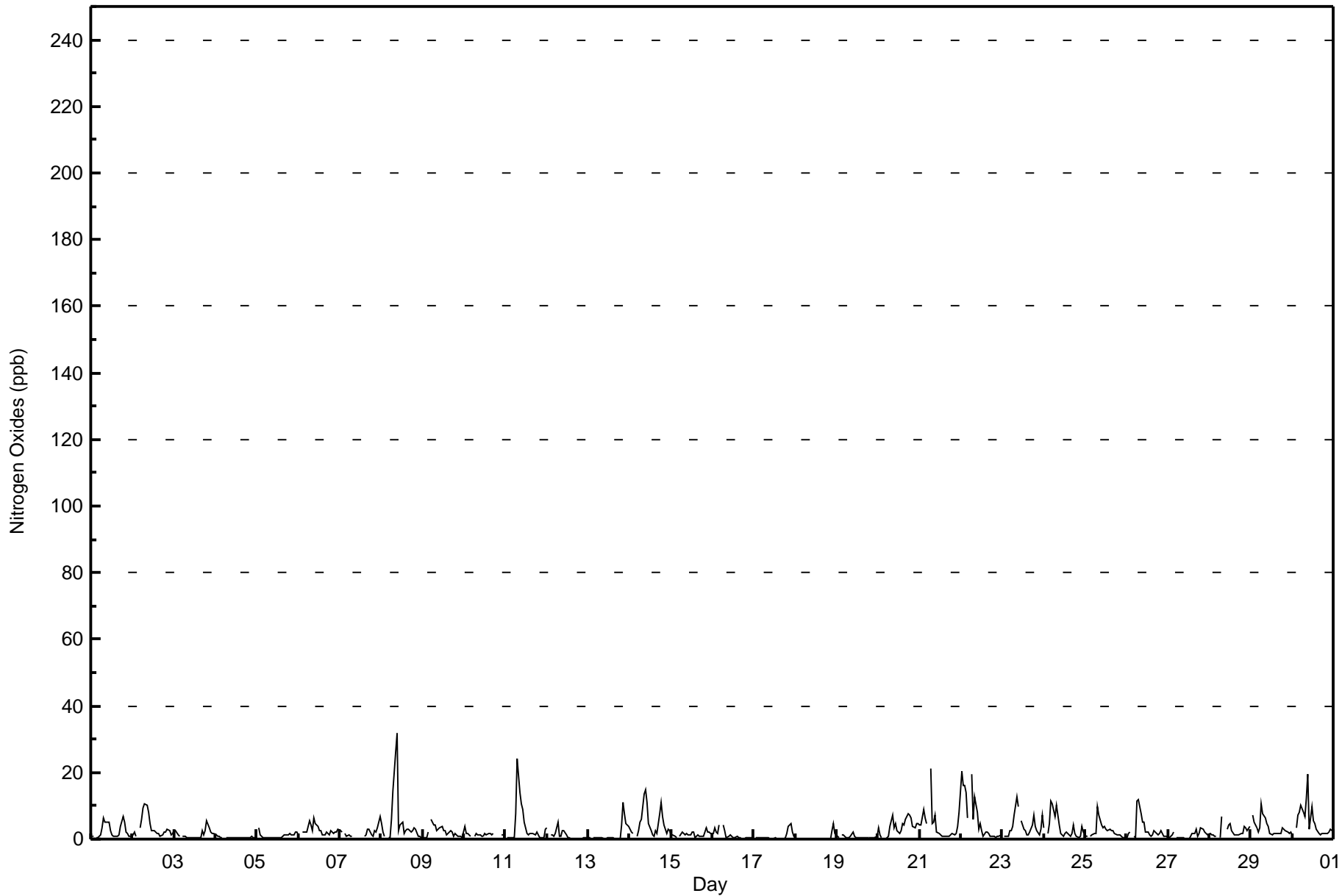
Nitrogen Oxides (NO_x) - ppb
Fort McKay South - June 2016

Maximum Value: 32 ppb on Jun 8 10:00		Maximum Daily Average: 6.1 ppb on Jun 22		Hours in Service: 720																																													
Minimum Value: 0 ppb on Jun 18 17:00		Minimum Daily Average: 0.4 ppb on Jun 4		Hours of Data: 678																																													
Maximum Diurnal Average: 5.7 ppb at hour 9		Minimum Diurnal Average: 1.3 ppb at hour 15		Hours of Missing Data: 42																																													
Monthly Average: 2.6 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 6 P ₉₉ = 19		Hours of Calibration: 36																																													
				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-Jun	1	1	Z	1	1	1	3	6	5	5	5	3	1	1	1	1	1	4	7	5	2	2	1	1	2.5	7																							
2-Jun	1	2	1	Z	3	6	9	10	10	8	5	2	2	2	2	2	1	1	2	2	3	2	1	2	3.5	10																							
3-Jun	3	2	1	1	Z	1	1	1	0	0	0	0	1	0	0	1	2	1	2	6	3	2	2	2	1.4	6																							
4-Jun	1	1	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0.4	1																							
5-Jun	Z	3	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	1	1	2	2	1.0	3																							
6-Jun	1	Z	2	2	2	2	5	4	3	6	5	4	3	2	1	1	2	2	1	3	2	2	2	3	2.6	6																							
7-Jun	3	2	Z	2	1	1	1	1	C	C	C	C	C	C	1	1	3	3	1	1	3	2	3	7	--	7																							
8-Jun	5	2	1	Z	0	0	6	14	26	32	3	4	5	2	2	3	3	2	2	3	3	1	1	0	5.3	32																							
9-Jun	0	0	1	2	Z	6	4	4	3	3	3	4	3	3	1	2	3	2	1	2	1	1	1	1	2.2	6																							
10-Jun	4	2	2	1	1	Z	1	2	1	1	1	1	2	1	2	2	1	2	DF	2	DF	DF	1	1	1.5	4																							
11-Jun	Z	0	0	0	0	1	8	24	14	11	9	5	2	1	1	2	2	1	2	1	0	0	1	3	3.9	24																							
12-Jun	3	Z	1	1	1	2	5	1	1	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	1.1	5																							
13-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	11	7	5	4	1.5	11																							
14-Jun	3	2	2	Z	1	3	5	6	14	15	11	5	2	1	1	2	2	8	11	7	4	2	3	3	4.8	15																							
15-Jun	1	1	1	1	Z	1	2	2	1	2	1	1	2	2	1	1	1	1	1	1	3	2	2	2	1.5	3																							
16-Jun	2	4	2	2	4	Z	4	3	0	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	1.2	4																							
17-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	5	2	1	0.7	5																							
18-Jun	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5	2	0.5	5																							
19-Jun	1	0	Z	1	1	0	0	0	1	2	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0.6	2																							
20-Jun	3	1	0	Z	0	0	1	4	7	3	5	3	2	3	4	4	6	8	7	6	4	3	5	5	3.7	8																							
21-Jun	4	4	9	6	5	Z	21	5	5	7	2	2	1	1	1	1	1	1	1	2	1	2	4	8	4.1	21																							
22-Jun	20	16	16	14	6	Z	19	6	13	8	3	5	2	1	2	2	2	1	1	1	1	1	1	1	6.1	20																							
23-Jun	Z	1	1	1	3	3	4	7	13	10	M	6	3	2	1	1	2	4	7	4	2	1	3	7	3.9	13																							
24-Jun	3	Z	2	5	11	10	7	10	7	4	2	1	2	2	2	1	1	4	2	1	1	1	4	2	3.7	11																							
25-Jun	1	1	Z	1	1	2	2	10	7	4	3	4	3	3	3	3	3	2	2	1	1	1	1	0	0	2.4	10																						
26-Jun	0	2	2	Z	1	1	11	12	8	5	5	2	2	1	1	1	2	2	1	2	3	1	1	1	2.8	12																							
27-Jun	0	0	1	2	Z	0	0	0	0	0	0	0	0	1	2	2	3	1	2	3	3	2	2	1	1.2	3																							
28-Jun	2	1	1	1	1	Z	0	7	M	M	3	4	5	3	1	1	1	1	2	2	4	3	3	4	2.4	7																							
29-Jun	Z	7	5	3	2	3	11	8	6	5	4	2	1	2	2	2	2	2	3	3	3	2	2	2	3.5	11																							
30-Jun	1	Z	4	7	8	10	8	7	12	20	3	10	5	5	3	2	1	2	2	2	2	2	3	2	5.2	20																							
																								2.6	2.3	2.3	2.2	2.1	2.3	4.7	5.2	5.7	5.6	2.8	2.4	1.8	1.4	1.3	1.3	1.6	1.8	2.2	2.2	2.3	1.8	2.0	2.2	Diurnal Average	
																								20	16	16	14	11	10	21	24	26	32	11	10	5	5	4	4	6	8	11	7	11	7	5	8	Diurnal Maximum	
Z - zerospan																								C - Calibration				M - Maintenance				DF - DAS Failure																	



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Fort McKay South - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Fort McKay South - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	674	99.41	99.41
21 - 40	4	0.59	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: 678

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Fort McKay South - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	43	65	27	10	2	13	37	56	66	58	65	62	46	36	42	46	674
21 - 40	2	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	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
Totals	45	65	27	10	2	13	38	57	66	58	65	62	46	36	42	46	678

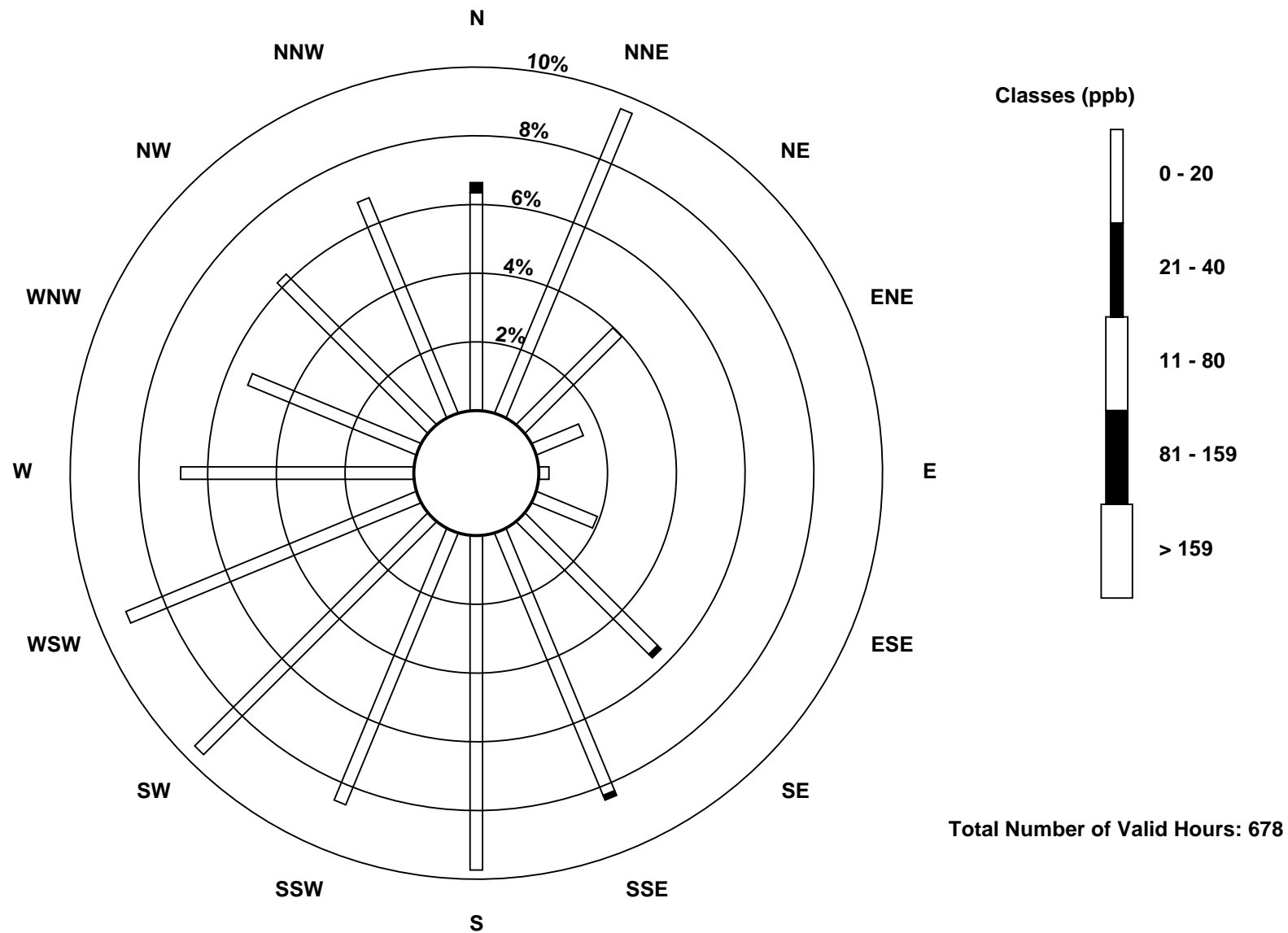
Total Number of Valid Hours: 678

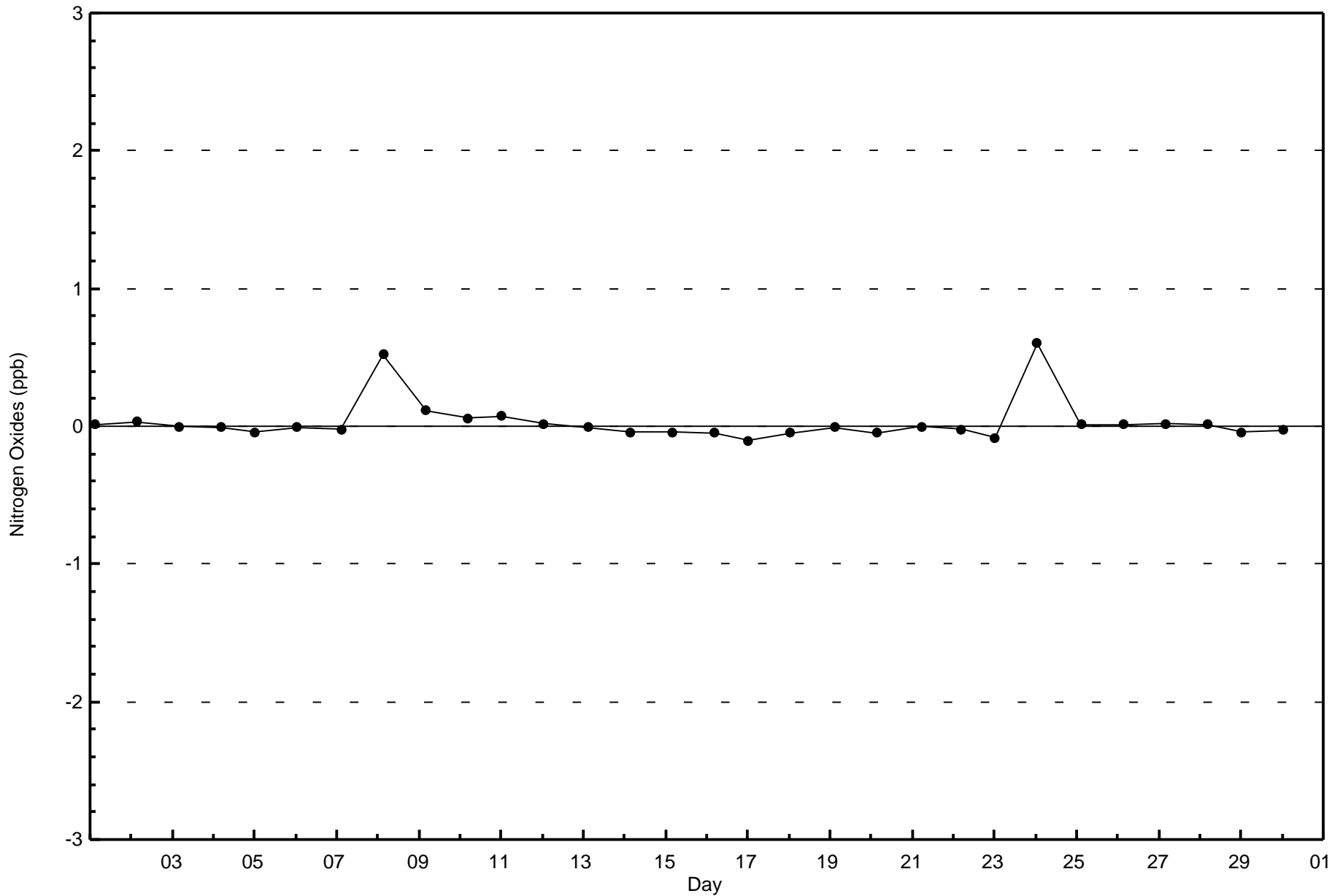
Total Number of Hours: 720

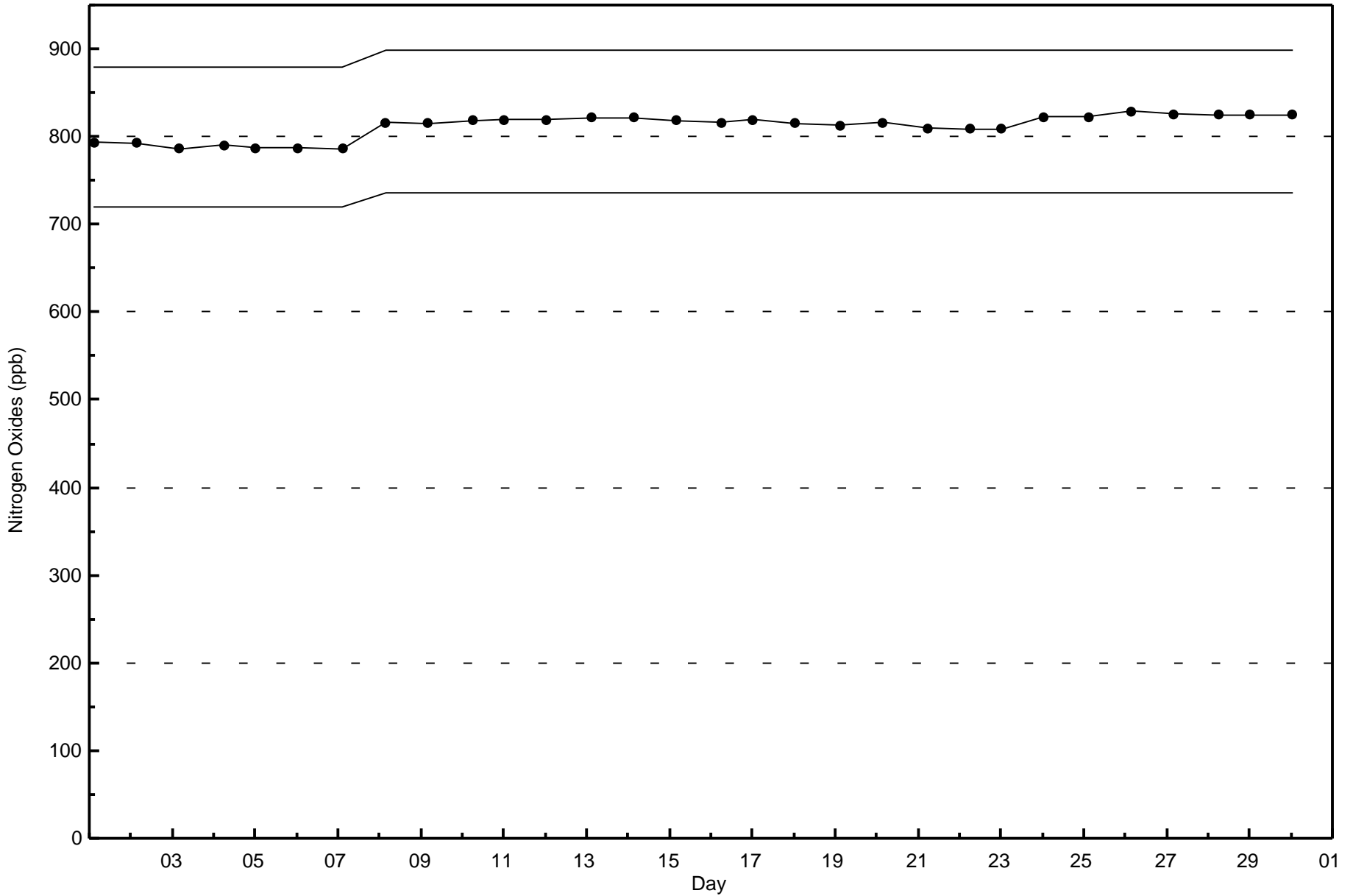


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxides (NO_x) - ppb
Fort McKay South (AMS 13)









Number of Exceedences (AAAQO):	24-hr: 0	Hours in Service:	720
Maximum Value: 24.5 µg/m ³ on Jun 22 01:00	Maximum Daily Average: 11.8 µg/m ³ on Jun 22	Hours of Data:	711
Minimum Value: 0.0 µg/m ³ on Jun 10 12:00	Minimum Daily Average: 1.1 µg/m ³ on Jun 12	Hours of Missing Data:	9
Maximum Diurnal Average: 6.6 µg/m ³ at hour 5	Minimum Diurnal Average: 4.1 µg/m ³ at hour 13	Hours of Calibration:	4
Monthly Average: 5.28 µg/m ³	Percentiles: P ₁ = 0.2 P ₁₀ = 1.5 Q ₁ = 2.3 Median = 4.5 Q ₃ = 7.0 P ₉₀ = 10.2 P ₉₉ = 20.2	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-Jun	6.2	6.3	6.5	6.0	5.4	5.6	5.4	3.5	3.0	4.2	5.4	5.0	2.0	1.4	1.3	1.9	2.3	3.2	4.6	4.4	3.2	2.6	2.7	4.9	4.0	6.5
2-Jun	7.5	9.4	10.7	11.6	9.5	4.5	2.9	2.9	3.0	3.5	3.5	2.8	5.1	6.8	9.2	9.8	9.5	8.5	5.6	2.5	1.9	2.3	2.5	2.7	5.8	11.6
3-Jun	2.9	2.7	2.6	2.7	3.3	4.9	4.1	3.1	2.4	1.7	1.6	1.9	3.8	2.9	2.0	3.6	3.9	2.1	2.0	2.4	2.9	3.6	3.3	4.9	3.0	4.9
4-Jun	7.0	8.6	10.8	9.6	7.5	7.1	6.8	6.7	5.3	2.6	2.2	2.4	2.6	3.1	3.1	1.9	1.8	1.7	1.6	1.9	2.3	3.9	5.5	4.5	4.6	10.8
5-Jun	5.2	6.3	5.9	6.2	6.2	4.6	3.1	2.6	2.1	1.8	1.6	1.6	1.6	1.6	1.7	1.8	1.9	2.0	2.2	2.4	2.5	2.5	2.3	2.2	3.0	6.3
6-Jun	3.0	5.0	3.3	2.4	5.0	5.7	4.1	2.6	2.8	6.5	8.7	9.2	9.2	8.6	7.1	7.6	8.1	10.0	10.9	8.4	15.3	12.4	12.1	9.6	7.4	15.3
7-Jun	7.7	6.8	7.0	8.9	11.8	13.4	9.1	6.3	5.3	4.9	5.0	5.5	8.4	7.4	5.4	4.0	5.0	5.4	4.7	5.4	7.7	9.9	12.5	11.4	7.5	13.4
8-Jun	9.9	10.3	9.7	9.6	9.3	8.4	7.2	6.7	4.8	2.4	1.7	2.5	4.4	5.2	5.9	6.5	7.4	4.1	10.7	20.3	14.0	8.9	12.2	6.1	7.8	20.3
9-Jun	4.5	4.0	4.0	3.8	4.4	4.2	C	C	C	C	0.4	0.3	0.4	0.3	0.1	UO	0.1	0.3	UO	0.2	0.3	0.5	0.3	0.3	1.6	4.5
10-Jun	1.5	2.7	2.3	1.9	3.0	4.1	1.6	0.8	0.7	0.4	0.1	0.0	0.0	0.1	0.2	1.4	2.6	2.7	3.0	4.8	6.1	6.8	6.3	6.0	2.5	6.8
11-Jun	4.9	4.4	4.3	4.0	4.6	5.6	7.6	8.9	6.8	5.5	4.7	3.5	2.8	3.2	2.4	3.0	4.5	4.6	6.1	5.5	4.7	3.6	2.4	1.8	4.6	8.9
12-Jun	1.8	1.9	1.8	1.9	2.4	2.0	1.6	0.7	UO	0.2	0.3	0.5	0.7	UO	0.4	1.1	0.7	0.6	0.6	0.6	0.8	1.2	1.4	1.5	1.1	2.4
13-Jun	1.6	4.7	6.6	5.0	8.0	6.7	2.9	1.6	1.1	1.6	2.2	2.7	2.6	2.8	5.4	2.1	1.3	0.9	0.9	4.7	6.9	5.4	3.6	2.6	3.5	8.0
14-Jun	2.2	2.3	4.1	5.2	6.0	6.2	3.1	2.8	3.4	4.7	6.3	3.5	3.6	2.0	2.6	6.0	4.6	4.4	2.9	2.5	2.2	6.9	5.5	5.8	4.1	6.9
15-Jun	5.4	4.2	3.3	3.2	3.4	3.0	2.9	2.2	1.7	1.5	0.3	0.8	2.0	3.8	4.0	4.4	4.1	4.6	3.2	2.7	3.3	5.4	3.1	2.2	3.1	5.4
16-Jun	1.7	1.8	1.9	2.0	2.6	2.1	1.8	1.5	1.6	1.7	2.1	2.0	1.7	1.7	1.9	1.8	2.1	1.9	2.0	2.3	2.4	2.0	1.8	1.8	1.9	2.6
17-Jun	1.6	1.6	2.6	2.6	2.2	2.0	1.7	1.1	0.5	1.2	1.4	1.3	1.3	1.0	0.9	1.2	1.3	1.7	2.3	3.4	2.8	2.4	1.8	1.5	1.7	3.4
18-Jun	1.6	1.8	3.3	4.6	5.4	5.3	4.9	3.3	2.1	1.5	1.2	1.3	1.3	1.4	1.6	1.6	1.5	1.6	1.8	2.3	3.7	4.4	3.6	2.6	2.7	5.4
19-Jun	1.6	1.7	2.2	3.6	4.7	4.1	3.8	3.0	2.2	1.7	0.9	0.5	0.6	0.6	0.3	0.8	0.7	0.7	1.0	1.5	2.3	5.1	7.4	6.9	2.4	7.4
20-Jun	4.5	3.7	3.2	3.1	3.0	2.3	1.9	1.9	1.7	3.0	9.4	3.7	3.3	5.5	6.5	4.3	7.1	10.1	11.8	12.6	13.4	17.2	22.0	23.8	7.5	23.8
21-Jun	18.7	16.6	16.6	15.5	13.8	12.6	19.9	10.6	10.5	13.1	6.5	6.1	5.7	5.8	5.5	5.2	5.0	4.8	5.4	6.8	9.4	7.6	7.0	13.7	10.1	19.9
22-Jun	24.5	21.3	20.5	19.2	14.6	15.3	13.5	9.7	18.8	22.7	13.7	14.7	6.2	5.2	8.6	9.3	8.6	9.0	8.1	4.6	3.4	3.9	4.0	3.9	11.8	24.5
23-Jun	UO	4.7	6.7	7.6	6.1	5.0	5.2	5.8	7.2	8.3	7.8	9.2	8.3	8.7	8.6	12.2	9.5	6.1	5.0	5.5	6.5	6.9	6.8	7.1	7.2	12.2
24-Jun	6.9	6.6	6.9	7.2	7.0	7.2	7.8	7.8	7.0	6.3	5.2	4.1	6.8	6.8	5.1	6.3	7.3	6.9	7.4	6.8	7.1	6.6	6.8	6.4	6.7	7.8
25-Jun	6.5	7.1	6.5	5.1	4.7	5.5	5.6	6.2	6.1	5.4	4.7	4.2	4.1	4.2	3.9	3.9	4.2	3.8	3.8	4.8	6.1	7.6	7.4	7.0	5.4	7.6
26-Jun	6.0	6.3	7.9	9.6	13.5	12.7	11.4	11.4	10.5	9.5	9.9	8.5	7.0	6.8	8.3	7.4	6.7	6.3	4.9	4.8	5.2	3.6	4.0	3.9	7.8	13.5
27-Jun	2.8	2.4	2.4	2.5	3.1	3.8	3.5	2.9	2.0	1.6	1.6	1.6	1.4	2.1	8.9	6.6	4.7	2.1	2.8	4.2	5.7	7.8	8.6	8.1	3.9	8.9
28-Jun	7.6	7.2	7.3	7.2	7.6	7.0	4.8	4.2	6.2	9.0	7.4	6.4	8.7	5.9	3.6	3.4	4.4	4.9	6.8	9.2	6.3	3.7	2.5	2.3	6.0	9.2
29-Jun	2.2	3.7	6.8	9.4	10.5	7.4	4.5	4.6	8.1	10.9	9.8	9.4	10.2	12.2	12.0	11.5	11.4	11.8	13.7	14.5	12.5	11.4	10.2	8.3	9.5	14.5
30-Jun	6.9	8.5	10.5	10.6	9.5	7.0	6.4	7.0	10.6	19.1	6.2	8.8	7.4	6.6	8.6	11.5	11.7	13.3	13.1	9.1	8.1	8.4	8.6	8.0	9.4	19.1

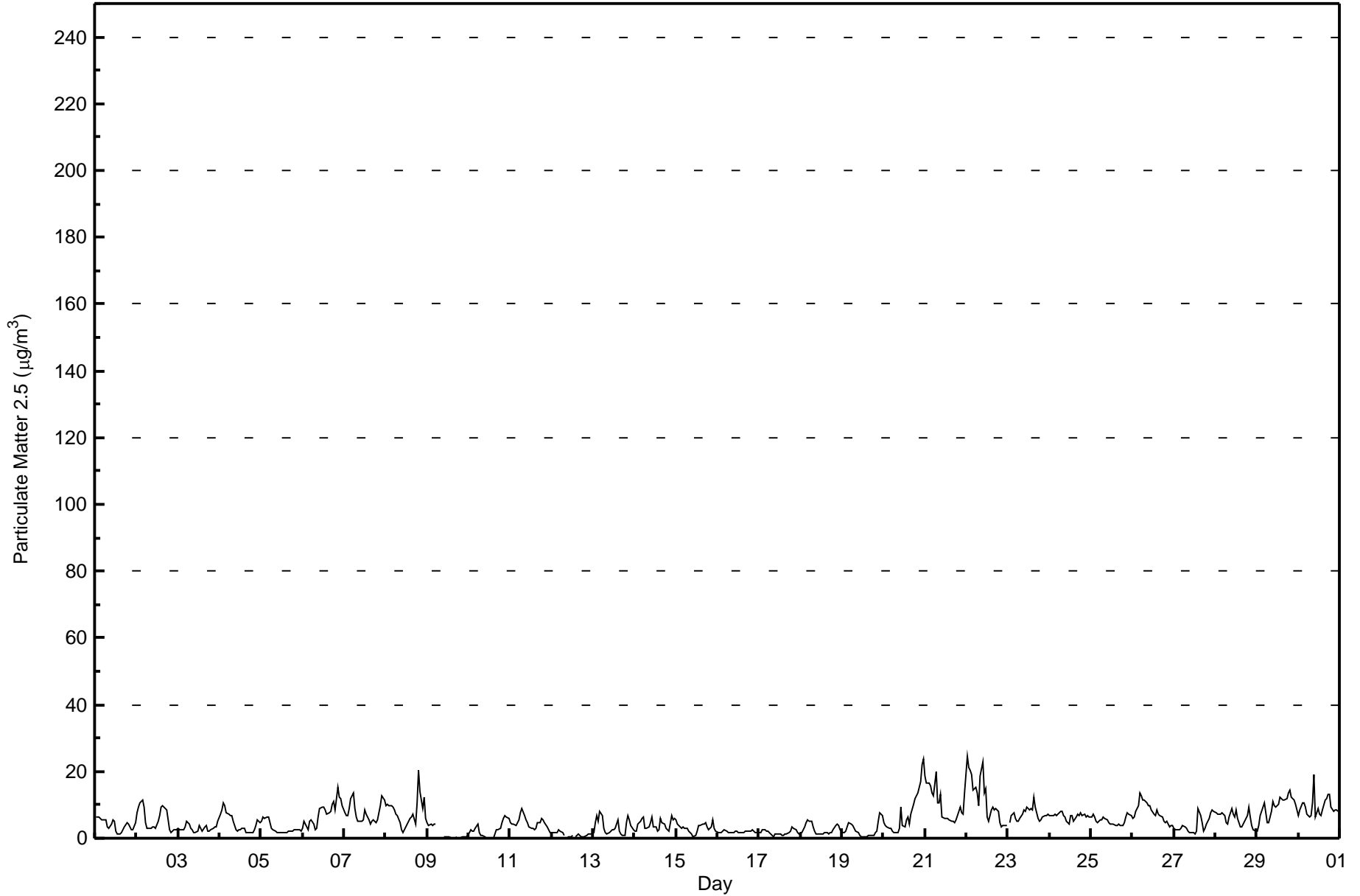
5.7	5.8	6.3	6.4	6.6	6.2	5.5	4.6	4.9	5.4	4.4	4.1	4.1	4.3	4.5	4.9	4.8	4.7	5.1	5.4	5.6	5.8	5.9	5.7	Diurnal Average	
24.5	21.3	20.5	19.2	14.6	15.3	19.9	11.4	18.8	22.7	13.7	14.7	10.2	12.2	12.0	12.2	11.7	13.3	13.7	20.3	15.3	17.2	22.0	23.8	Diurnal Maximum	

C - Calibration UO - Unstable Operation
 Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m³



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort McKay South - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort McKay South - June 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	388	54.57	54.57
6 - 15	263	36.99	91.56
16 - 25	15	2.11	93.67
26 - 80	0	0.00	93.67
> 81.0	0	0.00	93.67

Total Number of Valid Hours: 711

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort McKay South - June 2016

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	25	33	22	10	2	9	14	29	33	31	37	34	34	24	28	23	388
6 - 15	16	17	7	0	2	5	23	25	35	21	25	28	15	13	13	18	263
16 - 25	0	0	0	0	0	0	1	1	5	2	4	1	0	1	0	0	15
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
Totals	41	50	29	10	4	14	38	55	73	54	66	63	49	38	41	41	666

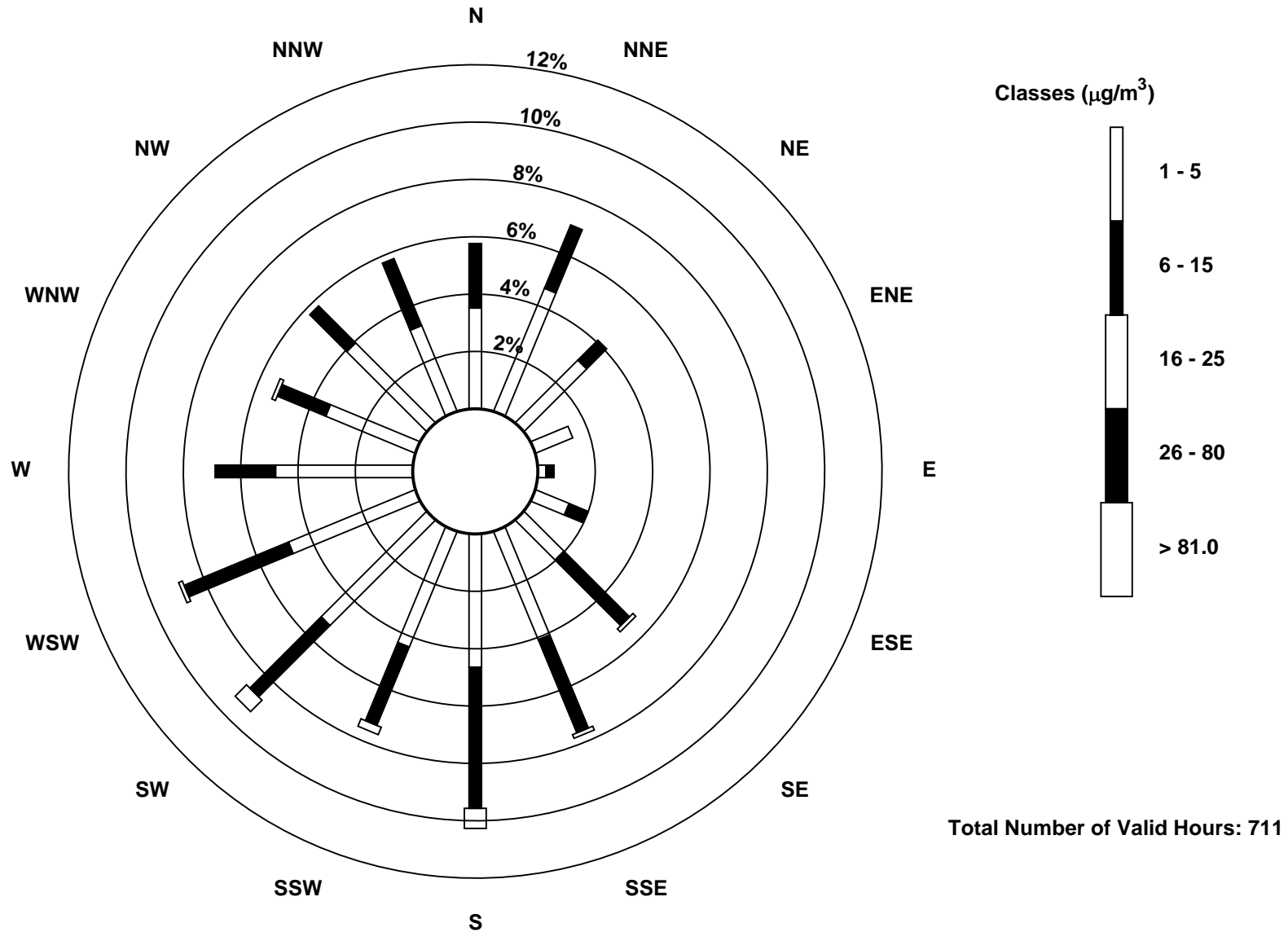
Total Number of Valid Hours: 711

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Fort McKay South (AMS 13)

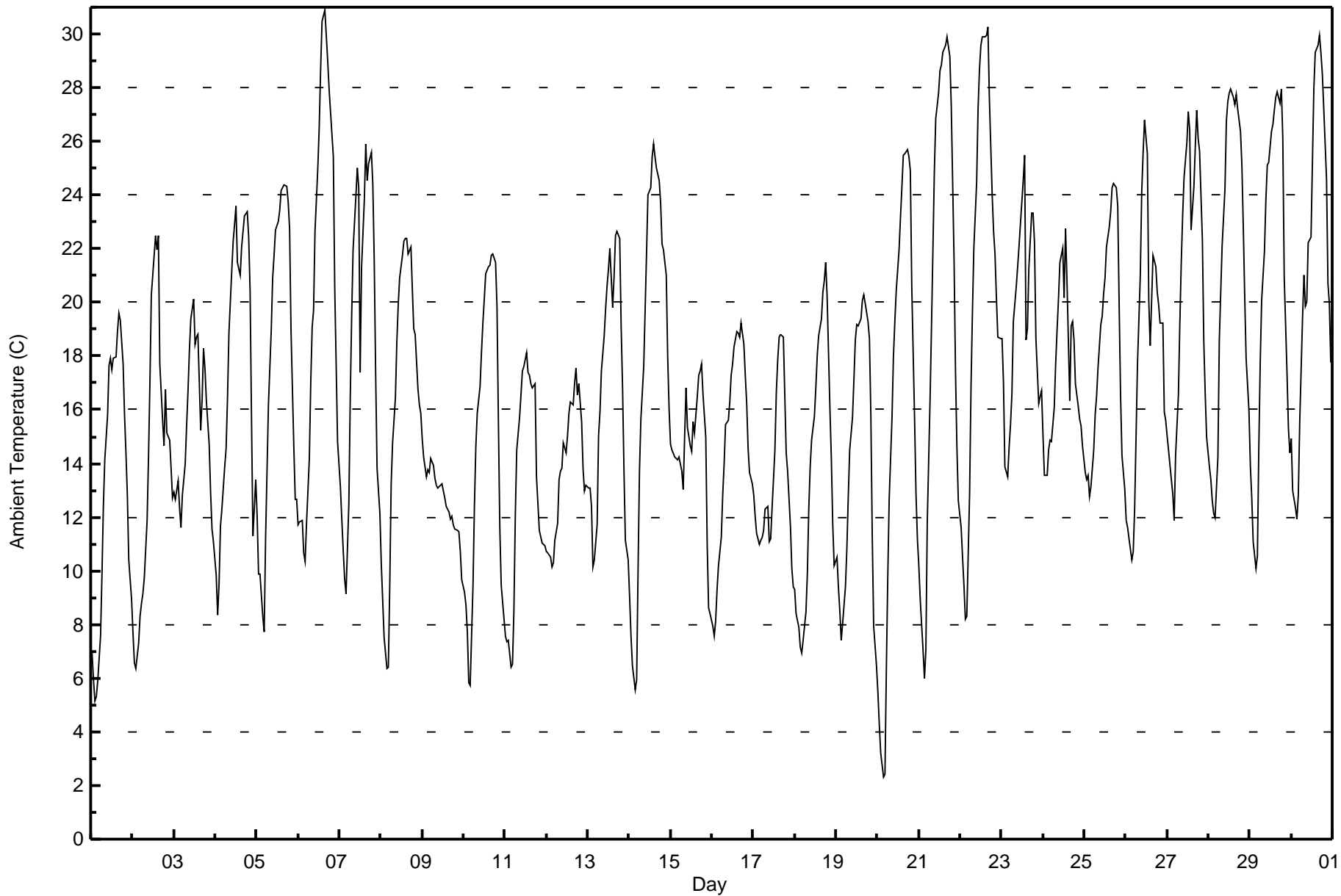




Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Fort McKay South - June 2016

Maximum Value: 30.9 C on Jun 6 16:00		Maximum Daily Average: 21.5 C on Jun 30		Hours in Service: 720																						
Minimum Value: 2.3 C on Jun 20 04:00		Minimum Daily Average: 12.7 C on Jun 9		Hours of Data: 720																						
Maximum Diurnal Average: 22.4 C at hour 18		Minimum Diurnal Average: 9.6 C at hour 4		Hours of Missing Data: 0																						
Monthly Average: 16.90 C		Percentiles: P ₁ = 5.5 P ₁₀ = 9.4 Q ₁ = 12.5 Median = 16.5 Q ₃ = 21.3 P ₉₀ = 25.2 P ₉₉ = 29.9		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-Jun	6.9	5.9	5.2	5.3	5.9	7.6	9.8	12.4	14.1	15.8	17.7	17.9	17.5	17.9	18.0	18.9	19.6	19.3	17.7	15.8	14.4	12.8	10.4	8.9	13.2	19.6
2-Jun	7.7	6.5	6.4	7.3	8.3	8.7	9.1	9.7	11.9	14.2	17.0	20.3	21.7	22.5	22.0	22.5	17.7	15.6	14.7	16.8	15.1	14.9	13.8	12.7	14.0	22.5
3-Jun	12.9	12.7	13.3	12.4	11.6	12.8	14.0	15.4	16.7	18.2	19.4	20.1	18.4	18.7	18.8	15.2	16.4	18.3	17.5	16.4	14.7	12.9	11.5	11.1	15.4	20.1
4-Jun	9.8	8.4	9.5	11.7	12.3	13.9	14.6	16.4	18.9	21.2	22.3	22.9	23.6	21.5	21.0	22.1	22.6	23.2	23.4	22.5	20.4	15.7	11.3	13.4	17.6	23.6
5-Jun	12.1	9.9	9.9	8.3	7.7	11.2	13.7	16.2	19.0	20.9	21.7	22.7	23.0	23.4	24.2	24.3	24.4	24.3	23.8	22.7	19.0	14.6	12.7	12.7	17.6	24.4
6-Jun	11.7	11.8	11.9	10.7	10.4	11.8	14.2	17.0	19.1	19.7	22.6	25.0	26.5	28.7	30.5	30.9	30.0	29.0	28.0	27.1	25.4	20.6	17.7	14.8	20.6	30.9
7-Jun	13.1	11.9	10.8	9.7	9.1	12.5	16.5	19.5	22.0	24.0	25.0	24.3	17.4	21.3	23.8	25.9	24.5	25.2	25.6	24.4	21.6	17.3	13.8	12.2	18.8	25.9
8-Jun	10.2	8.9	7.5	6.4	6.4	9.5	13.2	14.8	16.4	18.5	19.9	20.9	21.8	22.3	22.4	22.4	21.8	22.1	20.5	19.0	18.8	16.8	16.2	15.9	16.4	22.4
9-Jun	14.9	14.3	13.5	13.7	13.7	14.2	13.9	13.5	13.2	13.1	13.2	13.2	13.0	12.7	12.4	12.2	12.0	12.0	11.7	11.5	11.5	11.4	10.7	9.7	12.7	14.9
10-Jun	9.2	8.7	7.7	5.8	5.7	9.5	12.4	14.6	15.9	16.9	18.1	19.3	20.1	21.0	21.4	21.4	21.8	21.8	21.5	19.9	15.6	11.6	9.4	8.2	14.9	21.8
11-Jun	7.6	7.3	7.4	6.4	6.5	8.5	12.1	14.5	15.7	16.5	17.5	17.6	18.1	17.4	17.3	16.9	16.8	17.0	13.5	12.5	11.5	11.0	11.0	10.9	13.0	18.1
12-Jun	10.7	10.6	10.5	10.1	10.3	11.1	11.7	13.4	13.7	13.8	14.8	14.4	15.0	15.9	16.3	16.2	17.0	17.5	16.6	17.0	15.6	13.8	13.0	13.2	13.8	17.5
13-Jun	13.1	13.1	12.4	10.2	10.4	11.7	15.0	15.9	17.5	18.7	19.7	20.6	21.2	22.0	19.8	21.0	22.5	22.6	22.4	19.1	16.9	13.8	11.1	10.4	16.7	22.6
14-Jun	9.0	7.6	6.5	5.6	5.9	10.0	13.7	15.6	17.6	19.7	21.8	24.0	24.3	25.4	25.9	25.4	25.0	24.6	23.7	22.2	22.0	21.0	18.0	16.0	17.9	25.9
15-Jun	14.7	14.5	14.2	14.2	14.2	14.3	13.7	13.0	15.0	16.8	15.3	14.7	14.5	15.5	15.1	16.5	17.3	17.4	17.7	16.6	15.0	11.0	8.6	8.4	14.5	17.7
16-Jun	7.9	7.6	8.1	9.3	10.2	11.3	12.8	14.0	15.4	15.6	16.3	17.3	17.7	18.4	18.9	18.8	18.7	19.2	18.4	17.3	16.3	14.5	13.7	13.2	14.6	19.2
17-Jun	12.8	12.1	11.4	11.0	11.1	11.2	11.5	12.3	12.4	11.1	11.2	12.4	14.5	16.7	17.8	18.7	18.8	18.7	16.5	14.4	13.7	11.7	10.1	9.4	13.4	18.8
18-Jun	9.3	8.4	7.9	7.2	7.0	7.4	8.5	9.9	12.3	13.9	14.9	15.8	16.8	18.0	18.7	19.4	20.4	20.8	21.5	20.2	16.0	14.2	11.7	10.2	13.8	21.5
19-Jun	10.5	9.4	8.5	7.4	8.1	9.4	10.8	12.8	14.5	15.7	17.1	18.6	19.2	19.1	19.4	20.1	20.3	20.0	19.3	18.6	15.8	11.3	7.9	6.4	14.2	20.3
20-Jun	5.5	4.3	3.2	2.3	2.4	6.3	9.8	12.7	15.7	18.0	19.3	20.4	22.0	23.2	24.3	25.5	25.5	25.7	25.4	24.9	20.6	15.6	12.9	11.2	15.7	25.7
21-Jun	10.2	9.0	7.1	6.0	7.0	11.8	16.4	19.1	22.0	24.8	26.8	27.8	28.6	28.8	29.3	29.6	29.9	29.5	29.1	27.3	21.6	17.5	14.6	12.6	20.3	29.9
22-Jun	11.6	10.5	9.5	8.2	8.3	12.8	16.8	19.6	22.0	24.5	27.2	28.7	29.6	29.9	29.9	30.0	30.3	27.6	24.0	22.7	21.8	20.2	18.7	18.6	21.0	30.3
23-Jun	18.6	17.0	13.9	13.5	14.6	15.4	16.6	19.3	20.6	21.3	22.1	22.9	24.6	25.5	18.6	19.0	21.3	23.3	23.3	22.2	18.7	16.2	16.5	16.7	19.2	25.5
24-Jun	15.1	13.5	13.6	14.5	14.8	14.8	16.1	17.7	19.0	20.1	21.5	22.0	20.2	22.7	20.9	16.4	19.1	19.3	18.6	17.0	16.1	15.7	15.4	14.6	17.4	22.7
25-Jun	13.7	13.4	13.5	12.8	13.1	14.5	15.8	16.5	17.6	19.2	19.5	20.3	20.9	22.1	22.8	23.4	24.3	24.5	24.3	23.6	19.9	16.6	14.3	13.0	18.3	24.5
26-Jun	11.9	11.6	11.2	10.4	10.7	12.4	15.1	17.7	21.0	24.1	25.6	26.8	25.5	20.1	18.4	20.0	21.7	21.3	20.4	19.9	19.2	19.2	15.9	15.6	18.2	26.8
27-Jun	15.0	14.5	13.4	12.9	11.9	14.3	16.5	19.2	21.4	23.2	24.6	25.9	27.1	26.4	22.7	24.3	25.8	27.2	26.1	25.7	22.3	18.5	16.6	15.0	20.4	27.2
28-Jun	13.9	13.4	12.6	12.1	12.0	14.2	18.6	20.4	22.1	24.2	26.7	27.5	27.8	28.0	27.6	27.4	27.7	27.2	26.4	25.1	22.8	20.2	17.9	15.9	21.3	28.0
29-Jun	13.9	12.7	11.1	10.1	10.6	14.6	17.8	20.1	21.9	23.8	25.1	25.2	26.4	26.6	27.2	27.6	27.8	27.4	27.9	26.1	21.0	17.4	15.3	14.4	20.5	27.9
30-Jun	14.9	13.0	12.4	11.9	12.8	15.5	19.5	21.0	19.9	20.0	22.2	22.5	25.2	28.0	29.3	29.6	29.9	29.3	28.6	27.3	24.6	20.7	20.0	17.7	21.5	29.9
																								Diurnal Average		
																								Diurnal Maximum		





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ambient Temperature (AT) - C
Fort McKay South - June 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	86	11.94	11.94
10 - 20	413	57.36	69.31
> 20	221	30.69	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720

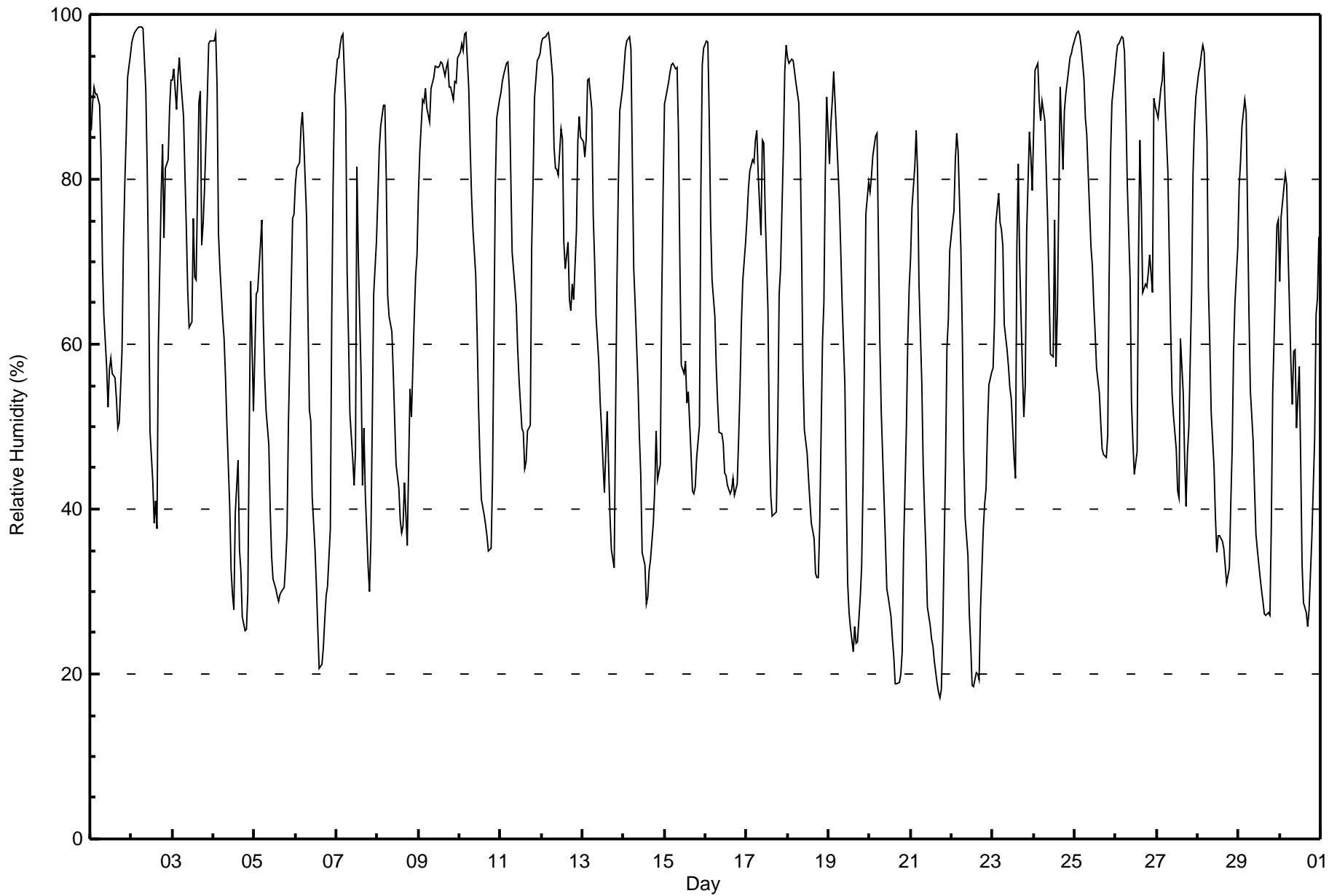


Wood Buffalo Environmental Association

Summary of Hour Averages

**Relative Humidity (RH) - %
Fort McKay South - June 2016**

Maximum Value: 98 % on Jun 2 06:00																			Maximum Daily Average: 90.9 % on Jun 9						Hours in Service: 720																								
Minimum Value: 17 % on Jun 21 18:00																			Minimum Daily Average: 45.7 % on Jun 21						Hours of Data: 720																								
Maximum Diurnal Average: 89.4 % at hour 4																			Minimum Diurnal Average: 43.3 % at hour 18						Hours of Missing Data: 0																								
Monthly Average: 64.6 %																			Percentiles: P ₁ = 19 P ₁₀ = 32 Q ₁ = 45 Median = 67 Q ₃ = 86 P ₉₀ = 94 P ₉₉ = 98						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-Jun	86	89	91	90	90	89	83	70	64	57	52	57	58	56	56	53	50	51	59	72	80	85	92	95	71.9	95																							
2-Jun	97	97	98	98	98	98	98	98	91	82	69	49	43	38	41	38	60	78	84	73	81	82	88	92	78.1	98																							
3-Jun	92	93	89	93	95	92	88	81	74	66	62	63	75	68	68	89	91	72	75	79	90	96	97	97	82.7	97																							
4-Jun	97	98	91	73	69	63	61	56	50	41	33	30	28	39	46	35	33	27	25	25	30	49	68	52	50.8	98																							
5-Jun	59	66	66	72	75	63	56	52	48	40	34	32	30	30	29	30	30	31	33	37	50	67	75	76	49.2	76																							
6-Jun	80	81	82	86	88	85	75	63	52	51	42	35	31	26	21	21	23	27	29	31	38	63	80	90	54.1	90																							
7-Jun	95	95	96	97	98	89	69	61	51	46	43	47	82	71	56	43	50	42	33	30	36	51	66	73	63.2	98																							
8-Jun	78	84	86	89	89	80	66	63	61	57	51	45	42	39	37	38	43	36	45	55	51	63	68	71	59.9	89																							
9-Jun	78	83	90	89	91	89	87	91	92	92	94	93	94	94	94	93	94	94	91	91	90	92	92	95	90.9	95																							
10-Jun	95	96	96	98	98	91	84	78	74	68	61	52	46	41	39	38	37	35	35	44	61	79	87	90	67.7	98																							
11-Jun	90	92	93	94	94	91	81	71	67	65	59	56	50	49	45	46	50	50	72	80	90	94	95	95	73.7	95																							
12-Jun	97	97	97	98	98	97	92	84	81	81	81	86	85	72	69	72	65	64	67	65	74	85	88	85	82.5	98																							
13-Jun	85	83	85	92	92	89	76	70	63	58	53	50	46	42	52	45	39	35	33	51	68	80	88	91	65.2	92																							
14-Jun	93	96	97	97	96	82	69	65	55	49	44	35	33	29	29	32	34	38	42	49	44	45	65	78	58.3	97																							
15-Jun	89	90	92	93	94	94	93	93	85	70	57	56	58	53	54	47	42	42	43	46	50	79	94	96	71.3	96																							
16-Jun	97	97	87	75	68	63	57	53	49	49	48	44	44	43	42	42	44	42	43	48	55	63	68	72	58.1	97																							
17-Jun	75	79	81	82	82	85	86	81	73	85	84	76	64	49	42	39	39	40	50	66	69	84	93	96	70.8	96																							
18-Jun	95	94	95	94	93	92	89	84	72	57	50	47	44	41	38	36	32	32	32	38	60	65	81	90	64.6	95																							
19-Jun	82	87	89	93	89	82	78	72	65	55	42	31	27	26	23	26	24	24	29	33	43	59	76	80	55.6	93																							
20-Jun	78	80	83	85	86	73	60	52	41	36	30	29	27	24	22	19	19	19	20	23	35	50	60	67	46.7	86																							
21-Jun	71	77	81	86	81	67	55	45	40	35	28	26	24	23	22	19	18	17	18	25	46	59	63	71	45.7	86																							
22-Jun	75	76	82	86	83	71	61	47	39	34	27	24	19	19	20	20	19	28	38	41	43	50	55	57	46.4	86																							
23-Jun	57	63	75	78	75	74	72	62	59	57	55	53	46	44	72	82	70	57	51	55	73	86	83	79	65.7	86																							
24-Jun	86	93	94	89	87	89	87	81	75	67	59	58	75	57	64	91	86	81	88	90	93	95	95	96	82.5	96																							
25-Jun	97	98	98	98	96	92	87	85	81	72	69	65	61	57	54	51	47	47	46	49	68	83	89	93	74.3	98																							
26-Jun	95	96	96	97	97	95	88	79	68	53	48	44	47	70	85	77	66	67	67	69	71	66	90	89	75.9	97																							
27-Jun	88	87	91	92	95	89	81	71	62	54	51	47	42	41	61	54	46	40	47	50	66	81	87	90	67.3	95																							
28-Jun	93	94	95	96	95	85	67	60	52	45	39	35	37	37	36	35	33	31	33	41	47	59	65	72	57.6	96																							
29-Jun	79	82	87	90	88	76	64	54	48	42	37	35	32	30	29	27	27	27	27	38	54	68	74	75	53.8	90																							
30-Jun	68	75	79	81	79	71	58	53	59	59	50	57	46	33	29	27	26	28	32	37	49	63	66	73	54.1	81																							
																								84.8	87.3	88.8	89.4	88.7	83.2	75.6	69.2	63.1	57.5	51.8	48.6	47.9	44.7	45.8	45.5	44.6	43.3	46.3	51.0	60.2	71.4	79.6	82.5	Diurnal Average	
																								97	98	98	98	98	98	98	98	98	92	92	94	93	94	94	93	94	94	91	91	93	96	97	97	Diurnal Maximum	





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Fort McKay South - June 2016

Maximum Speed: 36 km/h on Jun 15 14:00	Maximum Daily Speed Average: 13.7 km/h on Jun 9	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 30 06:00	Minimum Daily Speed Average: 1.0 km/h on Jun 2	Hours of Data: 720
Maximum Diurnal Speed Average: 2.5 km/h at hour 1	Minimum Diurnal Speed Average: 0.1 km/h at hour 12	Hours of Missing Data: 0
Monthly Average Velocity: 1.0 km/h 235.4 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 3 Median = 7 O ₃ = 11 P ₉₀ = 15 P ₉₉ = 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-Jun	W2	WSW2	W3	SSW3	SSW3	SW3	S2	SSE4	SSW3	S3	SE5	SSE4	S12	SSW9	SSW12	S16	SSE18	SSE15	SSE11	N9	N7	NW2	WNW3	WSW2	S4.0	SSE18
2-Jun	SW1	S2	WSW2	SW2	W1	SE1	W2	N3	ENE3	NE7	NE6	ESE6	ESE7	SSE3	NNW5	N4	SW16	SSE8	SSE7	SW6	W5	WNW4	ESE2	SSW5	S1.0	SW16
3-Jun	SSW3	SE2	SW2	S1	S2	S5	S6	S7	WSW7	WSW7	SW6	WSW3	N8	NNW8	NNW11	NW5	NW4	NE2	NNE7	NE2	SSW2	WNW3	WNW2	W1	W1.6	NNW11
4-Jun	S3	SSW3	SW6	WSW8	WSW10	WSW13	W13	W13	W11	WNW10	NW15	NW15	WNW15	W10	NW8	NW12	NW14	NW14	NW16	NW12	NW7	NW4	W4	W6	WNW8.6	NW16
5-Jun	NNW6	W3	W5	NNW1	SSW2	SSW1	W4	NE4	ENE6	NNW8	NW12	NNW14	NNW13	NNW11	N12	NNE13	NNE11	NNE10	NE10	NE8	NNW3	WNW2	WSW2	SSW1	N4.9	NNW14
6-Jun	WSW2	S3	S3	SSW1	WNW2	NNW2	N2	SSE6	SSE12	SE12	SSE14	SE15	SE15	SSE17	S18	S18	SSE15	S12	S20	S18	S21	S7	NNW6	NW3	SSE8.6	S21
7-Jun	WSW3	S3	WSW2	SSW2	S3	SSW5	WSW4	WNW4	NNE3	NNE3	NNE6	E2	S5	E5	SSE9	SW2	NNE10	NNE10	NNW9	NNW11	NW7	NW5	WNW2	WNW3	NNW1.4	NNW11
8-Jun	SSW2	WSW1	SW1	SW1	SW2	WSW3	NNW4	N5	N8	N8	NNE9	NNE9	NNE9	NNE9	NE8	NE7	NNE2	E5	SSE11	S5	SE6	S2	SSE8	SE11	ENE2.0	SE11
9-Jun	NNE6	NE4	NW4	N7	N11	NNE11	NNE14	NNE19	NNE22	NNE22	NNE21	NNE22	NNE21	NNE22	NNE22	NNE21	NNE15	N14	NNE15	N13	NNW12	NNW12	NNW9	NW6	NNE13.7	NNE22
10-Jun	NW4	NNW5	WSW1	S2	SW3	S1	ENE2	NW3	NNE8	NNE12	NNE13	NNE13	NNE12	NNE10	NNE11	NE9	NE8	NNE9	N6	NNW4	NW2	W3	W2	WSW3	NNE4.7	NNE13
11-Jun	W2	W3	WNW2	WSW2	W3	WSW2	SSE2	SSE9	SSE11	SSE10	SE13	SSE17	SSE21	SSE17	SE15	SSE15	SE6	SE13	SE15	SE11	SSE4	NNE4	N6	NNW5	SSE6.6	SSE21
12-Jun	NW3	NNW4	NNW4	WNW2	W3	SW4	SSW6	SSW9	SSW9	S11	S9	SSW8	SSW12	SSW15	SW10	WSW11	WSW13	WSW11	W8	WSW7	SSW6	SW8	SW10	SW10	SW6.8	SSW15
13-Jun	SW10	SW9	SW6	S7	SSW6	S6	SW10	WSW10	SW12	SW14	WSW14	SW14	SW18	WSW17	WNW5	SW8	SW11	SW11	SW9	NNW8	N7	NW3	WSW2	NW2	SW7.6	WSW18
14-Jun	SSW3	S3	WSW2	SW1	S3	S3	NE2	NE4	NE4	NNE6	N7	NE6	ENE4	ENE5	ESE7	ESE8	SE7	N10	N8	NNW5	SSE14	SSE21	SSE10	ESE5	ESE2.6	SSE21
15-Jun	E4	ESE5	ENE3	NE5	NE6	SE7	SE8	ENE4	SE9	SSE23	SSE35	SSE34	S32	S36	S31	S32	S29	S24	S14	SW10	S8	S10	SSW3	SW2	S13.7	S36
16-Jun	SSW3	SSE5	S8	S15	SSE16	S16	S19	S22	S22	SSW17	SSW16	SSW18	SW16	SSW17	SSW15	SW12	SW12	SSW12	SW10	WSW8	W4	WSW5	W7	W8	SSW11.3	S22
17-Jun	W7	WSW8	W8	W6	W5	W8	W8	NNW9	NW11	NW11	NW9	WNW9	NW11	WNW14	NW14	NW12	WNW7	W10	NNW10	NNE7	NE5	N9	N7	SSW3	WNW7.0	NW14
18-Jun	WSW6	W7	W7	W7	W8	W9	W9	W10	W10	NNW10	WNW8	W8	SW8	SW13	SW12	SW9	SW9	SW8	SSW8	SSW5	SW4	N15	N3	NNW5	W6.3	N15
19-Jun	NW6	WNW5	WNW5	W6	W8	WSW4	NW2	E3	ENE4	NNE10	N13	NNW18	NNW19	NNW20	N20	N20	NNW20	N22	NNE15	N12	N5	NW4	WNW3	W2	NNW8.6	N22
20-Jun	SW1	S2	WSW2	WSW2	SSE1	SSE2	ESE3	ESE4	SE5	SSE5	SE7	ESE10	SSE9	SE11	SSE12	SSE11	SE14	SE14	SE14	SSE10	S6	SW3	SW4	SW4	SSE5.7	SE14
21-Jun	SW3	WSW2	SSW2	SW3	SSW3	S4	SE6	S10	S13	S14	SSW12	SSW12	S12	SSW12	S13	SSE12	S8	SSE5	SE6	S4	WSW4	SW2	SSW3	SW3	S6.4	S14
22-Jun	S5	SSW4	WNW1	S2	SW3	S1	SSE5	SSE9	S10	SSE8	S8	SE8	SSW8	SSW7	SE10	SE9	SSE8	WSW7	WSW9	WSW9	SW8	SW8	WSW1	SW6	S5.1	SE10
23-Jun	WSW10	WSW3	WSW6	WSW5	SW3	WNW3	WNW4	NNW5	NNE6	NNE6	NNE5	WSW3	SSE5	SE9	NNW13	NNW7	NNW6	N8	N12	NNE8	NNW3	WNW2	NW6	NW6	NNW3.2	NNW13
24-Jun	SE2	NW2	WNW3	NW5	NNW7	NNW4	N3	N9	N12	NNE14	NNE10	N11	SE4	NNE14	NNE15	WNW2	NNW4	NNE5	WNW2	NNW10	NNW4	WNW4	WNW5	NNW3	N5.2	NNE15
25-Jun	WNW3	W3	NW4	NW4	NW5	NNW7	N13	N12	NNE13	N13	N13	NNE14	NNE13	NNE13	NNE13	N14	NE10	NE8	NE5	W2	WSW2	SW3	WSW1	N7.2	N14	
26-Jun	SW2	SW1	SW1	SSW1	S3	S3	S4	SE5	SE7	S7	S8	SE6	NNW5	NW4	SW3	SW2	SSW8	SW3	SSW3	SSW5	WSW7	WSW8	WSW3	W9	SSW2.9	W9
27-Jun	W9	WSW8	SSW5	S3	S2	WSW8	WSW8	WSW6	W4	SSW3	SW7	SW10	SW13	W4	SE10	S7	SSE5	SSW10	ENE2	ENE5	N2	WNW3	WSW3	WSW3	SW3.9	SW13
28-Jun	SSW2	SW2	S3	SSW2	WSW2	S4	SSE4	NE5	NE6	ESE1	SW4	N9	NNE15	NNE15	NNE15	NNE16	NNE18	N16	NNE12	NNE12	N6	NNW4	NNW4	NW3	NNE5.5	NNE18
29-Jun	WNW3	WNW3	W2	NW2	WNW2	NW2	NNE4	NE3	NE4	NNE5	NNE6	NNE7	N10	N8	N7	N4	NE7	NE6	NE2	NNW2	W2	WSW3	W2	SSW3	N3.0	N10
30-Jun	SSW4	S4	W2	SW4	NW2	SSW0	SSE9	S12	S16	S13	S9	ESE5	ESE5	SE10	SSE11	SSE13	SSE13	SE12	SSE9	SSE8	SW3	WSW3	WSW4	SW3	SSE6.1	S16

WSW2.3WSW2.2WSW2.4WSW2.0WSW2.1	SW2.2	SW1.5	SSW0.8	SE0.9	SE0.5	S0.4	E0.1	SW1.4	SSW1.2	ESE0.3	S1.0	SSW1.0	SE0.6	ESE0.4	NNW1.2	WSW1.4	W2.1	W1.8	WSW2.4						Diurnal Average	
WSW10	SW9	S8	S15	SSE16	S16	S19	S22	NNE22	SSE23	SSE35	SSE34	S32	S36	S31	S32	S29	S24	S20	SSE18	S21	SSE21	SW10	SE11			Diurnal Maximum

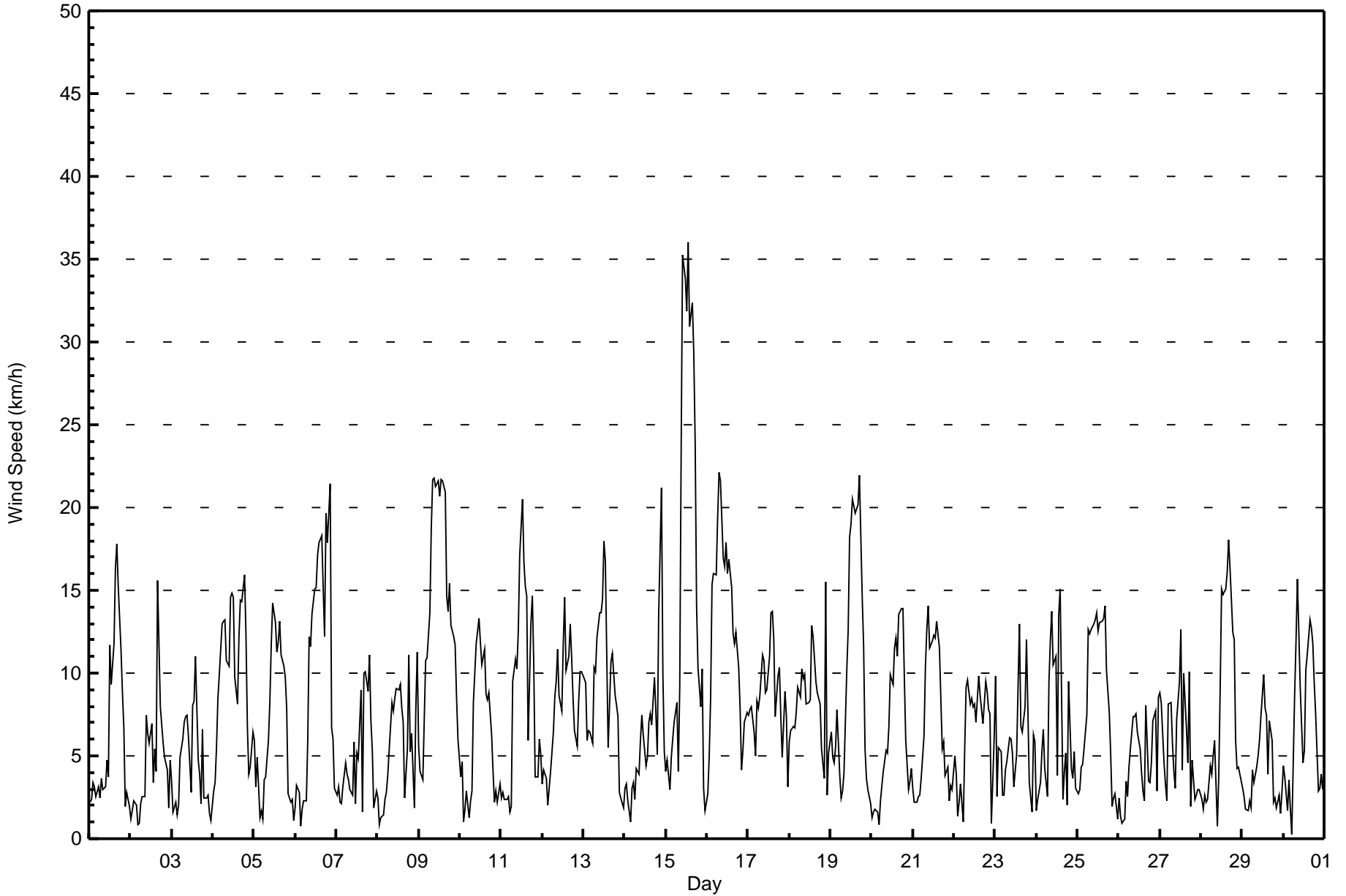
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Fort McKay South - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 11 km/h on Jun 15 22:00 Minimum Value: 0 km/h on Jun 20 06:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 8																		Hours in Service: 720 Hours of Data: 720 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-Jun	1	1	2	1	1	1	2	2	1	2	2	3	3	3	3	5	4	3	4	3	2	2	1	1	5
2-Jun	1	2	2	1	1	1	1	1	2	2	2	2	3	3	2	5	6	3	4	1	1	2	2	1	6
3-Jun	1	1	2	2	1	1	1	2	3	3	4	4	3	3	6	4	4	3	3	1	2	2	1	3	6
4-Jun	2	2	2	2	3	4	5	5	3	4	5	6	5	6	5	5	5	5	6	4	2	2	1	2	6
5-Jun	3	2	3	1	2	2	2	2	3	4	5	5	5	4	4	4	4	3	3	3	1	1	1	2	5
6-Jun	1	1	1	2	1	1	1	5	3	3	2	3	4	4	4	4	4	3	4	4	5	7	3	1	7
7-Jun	1	2	2	1	1	2	2	1	2	3	2	10	7	2	3	3	2	3	4	3	2	1	1	2	10
8-Jun	1	2	1	1	1	1	2	1	2	2	2	2	2	2	2	2	2	3	5	2	3	1	3	3	5
9-Jun	1	1	2	2	2	2	3	4	5	5	5	5	5	5	5	5	3	3	4	3	2	2	2	1	5
10-Jun	1	2	1	1	1	1	1	2	3	3	3	3	4	4	4	4	4	2	2	1	1	1	1	1	4
11-Jun	1	1	1	1	1	1	2	2	3	3	3	5	4	5	5	6	3	10	4	4	3	1	2	2	10
12-Jun	1	1	1	1	2	1	2	2	3	3	2	4	4	4	4	5	4	4	3	2	1	3	3	3	5
13-Jun	3	4	2	1	2	1	4	4	4	5	5	5	5	6	4	3	6	4	3	4	2	1	1	2	6
14-Jun	2	2	1	1	2	2	1	1	2	3	3	3	3	3	3	3	3	5	3	2	8	6	6	2	8
15-Jun	1	2	1	2	2	3	5	2	6	9	8	8	7	9	9	7	8	6	4	4	3	11	1	1	11
16-Jun	1	1	2	3	3	3	5	5	6	5	5	5	5	5	6	4	4	4	4	3	1	1	2	2	6
17-Jun	2	2	2	2	2	3	2	4	4	4	4	3	3	4	5	6	4	3	4	6	2	3	3	5	6
18-Jun	2	2	2	2	2	3	3	3	3	3	3	3	3	5	5	4	4	4	3	2	1	8	3	6	8
19-Jun	2	1	2	2	2	2	2	1	2	3	5	7	6	6	6	5	6	5	4	3	2	1	1	1	7
20-Jun	1	1	1	1	1	0	1	2	2	2	3	3	4	4	4	3	3	3	2	3	2	1	1	1	4
21-Jun	1	1	1	1	1	1	1	3	3	3	4	4	4	5	5	3	3	3	1	2	1	2	2	2	5
22-Jun	1	1	1	1	1	1	1	2	2	2	3	3	4	4	2	3	3	3	3	3	2	2	1	2	4
23-Jun	3	2	2	1	1	1	2	2	2	2	2	2	2	3	6	2	2	2	2	2	1	1	2	2	6
24-Jun	1	1	1	2	2	2	2	3	3	3	3	3	2	5	6	3	3	2	1	4	2	2	2	1	6
25-Jun	1	1	1	2	1	2	4	3	3	3	3	3	3	3	4	4	4	3	3	2	1	1	1	1	4
26-Jun	1	1	1	1	1	1	1	1	2	3	4	3	6	7	2	2	3	2	2	1	3	4	2	3	7
27-Jun	3	3	2	1	2	3	3	2	2	3	3	4	6	5	3	3	3	3	2	2	2	1	1	1	6
28-Jun	1	1	1	2	1	2	2	2	2	2	3	4	4	4	4	4	4	3	4	3	3	1	1	1	4
29-Jun	1	1	1	1	1	1	1	1	2	2	3	3	4	4	4	3	2	2	2	1	1	1	1	2	4
30-Jun	1	2	1	1	1	1	3	3	3	4	7	2	2	3	4	4	3	3	2	2	2	1	2	2	7
																		Diurnal Maximum							





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Fort McKay South - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	314	43.61	43.61
6 - 11	247	34.31	77.92
12 - 19	131	18.19	96.11
20 - 28	21	2.92	99.03
29 - 38	7	0.97	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Fort McKay South - June 2016**

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	8	14	9	4	9	7	14	31	35	34	39	25	29	24	23	314
6 - 11	22	26	15	1	0	5	20	22	18	13	25	23	23	7	11	16	247
12 - 19	13	27	0	0	0	0	11	16	16	12	10	5	2	2	10	7	131
20 - 28	3	8	0	0	0	0	0	3	5	0	0	0	0	0	0	2	21
29 - 38	0	0	0	0	0	0	0	2	5	0	0	0	0	0	0	0	7
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	47	69	29	10	4	14	38	57	75	60	69	67	50	38	45	48	720

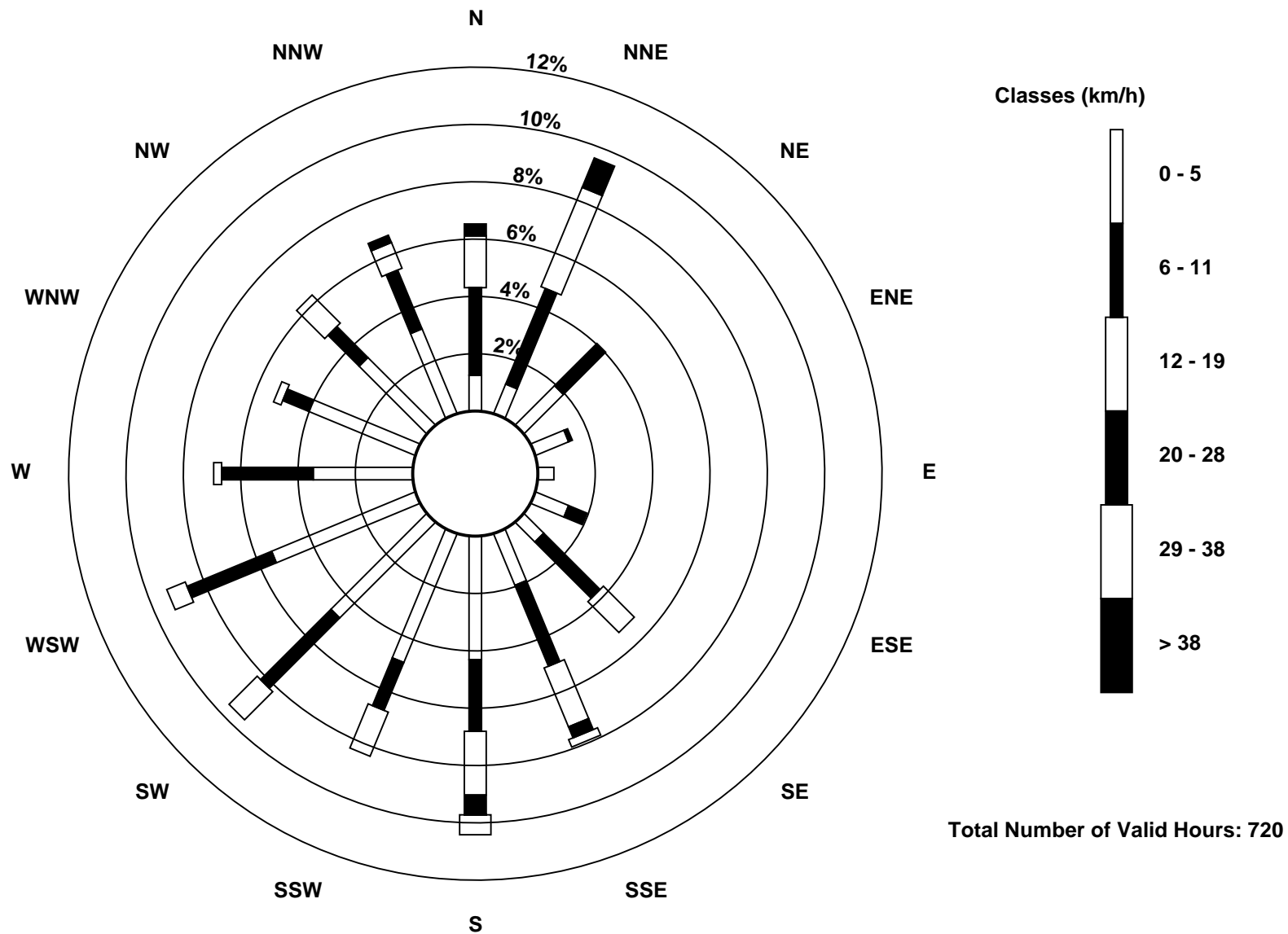
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed (WS) - km/h
Fort McKay South (AMS 13)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Fort McKay South - June 2016

Direction of Maximum Speed: 174 deg on Jun 15 14:00 Direction of Maximum Daily Speed Average: 11.6 deg on Jun 9	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0
Direction of Minimum Speed: 213 deg on Jun 30 06:00 Direction of Minimum Daily Speed Average: 1.0 deg on Jun 2	Percent Operational Time: 100.0
Monthly Average Direction: 254.8 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-Jun	263	255	262	210	210	220	173	166	202	172	126	152	191	197	197	185	164	150	147	359	3	320	302	245	181.8
2-Jun	222	188	245	221	263	131	277	5	69	43	40	110	123	154	328	349	230	152	147	216	271	283	122	200	186.3
3-Jun	210	126	225	186	189	176	169	191	243	244	234	244	351	332	338	306	308	47	17	53	196	289	297	269	271.6
4-Jun	191	207	220	238	250	255	266	271	281	295	312	317	299	279	307	326	326	319	323	319	316	319	264	270	292.9
5-Jun	327	270	261	331	208	199	265	55	65	347	325	331	334	329	354	21	21	19	39	53	344	293	254	196	351.6
6-Jun	258	191	190	209	294	337	355	159	159	144	151	144	142	151	177	174	166	172	182	169	178	176	347	306	166.2
7-Jun	253	186	250	203	174	204	255	284	14	26	33	81	172	94	166	234	14	16	347	339	325	310	300	298	336.0
8-Jun	200	246	225	234	222	243	347	357	6	10	21	13	19	33	41	42	23	101	165	178	128	169	152	145	58.7
9-Jun	20	37	326	354	357	17	19	17	18	19	22	20	20	18	17	16	18	11	20	0	346	337	337	313	11.6
10-Jun	320	339	256	185	227	170	66	320	28	17	29	17	21	29	23	40	38	26	356	342	313	259	269	254	14.0
11-Jun	259	274	286	251	261	241	162	147	156	150	146	153	152	157	146	149	140	145	143	136	153	22	4	337	150.9
12-Jun	321	328	336	298	268	223	206	213	204	187	191	210	199	207	231	244	255	238	264	246	202	226	214	232	225.8
13-Jun	233	235	222	186	192	184	219	238	236	226	239	234	236	238	298	227	230	230	234	348	356	309	249	311	235.9
14-Jun	213	183	239	214	189	172	44	53	49	19	10	52	67	73	104	122	125	5	356	346	160	165	147	122	108.1
15-Jun	101	121	62	44	47	125	135	61	132	154	166	168	174	174	188	181	185	182	184	218	177	190	205	225	170.6
16-Jun	201	168	175	170	168	172	171	173	181	196	201	206	222	213	208	218	224	208	214	248	272	255	259	264	199.2
17-Jun	260	255	273	273	280	272	263	304	324	306	309	302	306	297	312	309	282	264	334	19	37	8	8	194	302.7
18-Jun	253	276	273	275	265	269	272	274	265	288	287	263	234	220	219	230	232	234	205	201	235	5	355	339	259.0
19-Jun	321	289	289	261	266	254	323	91	70	20	357	344	331	330	353	1	342	2	14	8	351	306	282	281	343.6
20-Jun	235	188	246	244	168	159	121	121	134	156	130	113	152	142	148	154	141	145	145	162	189	222	224	218	151.7
21-Jun	228	242	211	215	213	181	138	179	178	180	206	205	188	196	171	163	175	158	128	171	246	221	213	236	185.7
22-Jun	185	202	285	182	228	191	151	167	175	161	178	138	211	199	139	139	156	241	251	241	229	220	256	229	190.6
23-Jun	254	255	239	249	223	287	287	336	23	22	14	255	159	124	330	331	348	356	1	15	332	299	311	320	328.2
24-Jun	134	318	298	318	336	337	8	8	11	19	25	2	138	16	28	289	337	20	282	335	327	292	299	338	358.1
25-Jun	299	268	310	312	326	336	1	11	16	11	8	12	15	15	17	21	8	38	39	48	277	257	215	251	6.6
26-Jun	221	235	218	202	179	176	172	135	140	175	174	129	331	324	215	223	212	236	200	196	239	246	237	270	205.0
27-Jun	263	256	193	177	187	250	257	250	281	204	233	234	236	260	138	183	157	194	75	70	5	291	250	256	226.7
28-Jun	200	229	178	200	238	184	147	40	44	117	219	11	16	19	21	14	12	11	14	16	358	336	328	325	12.9
29-Jun	299	283	280	304	289	325	18	38	36	14	24	23	7	10	0	8	42	48	45	342	268	246	259	201	5.8
30-Jun	194	190	278	217	321	213	160	172	173	174	173	107	108	137	151	155	151	143	147	149	219	254	244	235	163.6

251.9 242.8 250.3 236.3 243.0 227.8 216.7 200.0 144.8 137.7 186.0 91.1 219.1 202.2 117.9 173.9 211.1 138.5 103.9 343.3 253.1 268.1 270.7 256.9

Diurnal Average

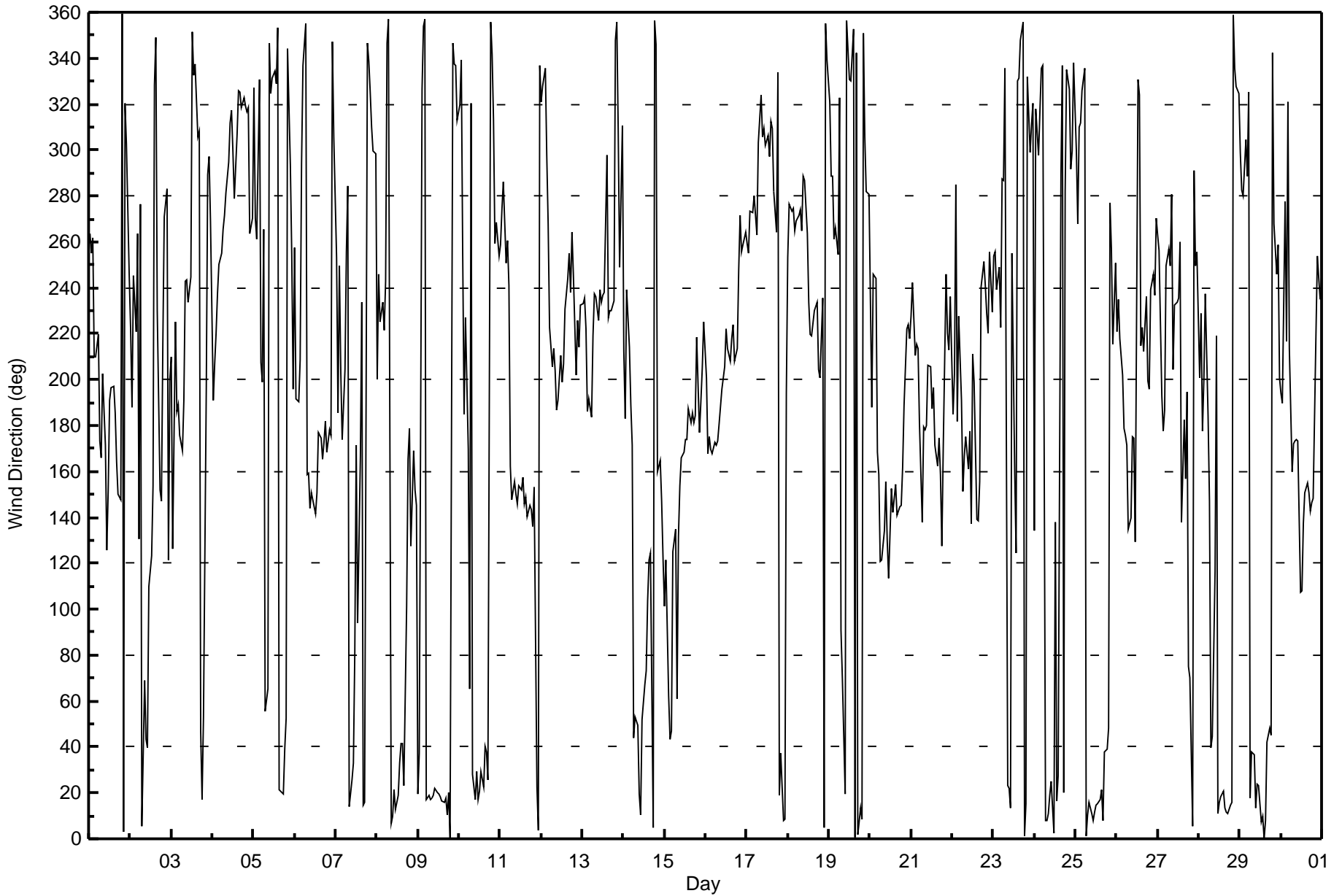
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Fort McKay South - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 105 deg on Jun 4 00:00		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																							
Minimum Value: 7 deg on Jun 21 21:00																									
Percentiles: P ₁ = 10 P ₁₀ = 16 Q ₁ = 21 Median = 29 Q ₃ = 47 P ₉₀ = 67 P ₉₉ = 93																									
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-Jun	18	21	34	39	35	24	66	49	41	55	39	81	19	23	22	21	16	15	16	31	23	52	25	34	81
2-Jun	70	75	44	61	69	77	62	71	73	23	30	51	46	76	34	58	24	38	57	31	18	35	65	15	77
3-Jun	25	62	80	79	60	16	17	22	33	39	81	91	29	23	69	61	73	32	66	74	58	78	105	105	
4-Jun	27	21	18	17	18	23	26	28	32	34	31	28	29	47	41	30	24	25	24	21	28	37	14	17	47
5-Jun	33	46	65	74	86	95	62	51	43	45	32	30	36	34	28	24	24	24	23	24	43	30	35	74	95
6-Jun	30	20	28	74	75	31	24	48	18	14	19	17	18	20	20	20	13	11	12	15	96	55	34	96	
7-Jun	44	41	64	67	33	32	70	52	91	91	54	77	93	51	29	84	22	20	28	16	13	17	47	55	93
8-Jun	37	79	73	69	35	36	44	22	16	19	17	18	21	21	20	60	41	23	24	33	71	25	17	79	
9-Jun	28	39	47	24	18	15	15	16	16	15	16	16	17	15	15	16	15	15	18	20	16	13	13	18	47
10-Jun	32	38	81	62	24	64	42	62	25	26	19	23	32	36	27	47	47	27	29	19	34	16	13	30	81
11-Jun	47	29	30	39	33	61	74	15	17	13	14	15	16	16	14	21	26	19	17	59	42	15	21	74	
12-Jun	18	21	18	52	25	26	20	27	21	14	24	26	19	21	38	34	26	30	32	28	15	27	20	24	52
13-Jun	24	26	28	8	15	16	30	28	32	29	33	33	29	31	69	37	42	29	33	58	14	43	45	65	69
14-Jun	54	32	52	61	84	62	75	36	58	43	33	56	64	68	51	38	32	34	32	37	55	12	26	23	84
15-Jun	30	28	51	29	28	25	45	51	49	19	13	13	13	14	14	15	15	12	14	24	34	55	29	59	59
16-Jun	26	13	14	9	9	11	12	14	18	19	22	22	25	27	30	31	30	28	30	27	28	10	16	21	31
17-Jun	25	19	22	24	35	24	23	34	22	22	24	26	32	30	31	28	37	33	29	17	44	28	54	30	54
18-Jun	22	19	17	18	18	22	24	25	30	33	50	46	51	29	45	45	47	37	26	17	20	40	74	52	74
19-Jun	22	20	18	26	19	44	70	45	53	27	31	26	29	25	25	24	25	21	18	16	25	25	12	66	70
20-Jun	66	61	52	55	76	28	25	42	30	55	59	28	49	29	27	32	16	15	11	15	13	18	15	14	76
21-Jun	39	42	64	42	24	20	14	25	16	19	32	31	24	42	33	28	34	52	29	47	7	51	38	43	64
22-Jun	25	35	64	51	26	84	21	23	22	35	38	45	52	63	24	31	39	39	23	24	24	22	86	24	86
23-Jun	21	79	20	22	48	44	60	43	36	34	48	76	61	43	21	32	36	25	16	21	30	70	16	32	79
24-Jun	72	46	20	19	16	22	86	17	23	19	26	28	48	27	35	65	53	34	79	24	22	38	21	36	86
25-Jun	16	27	16	18	16	17	18	21	18	19	18	20	21	21	21	22	22	29	24	22	33	19	30	67	67
26-Jun	40	73	56	73	27	30	19	19	22	37	62	65	99	88	71	84	19	51	40	22	25	57	62	21	99
27-Jun	20	27	36	45	77	30	31	39	56	89	53	40	41	90	19	49	70	32	82	35	66	43	26	26	90
28-Jun	39	61	46	34	56	19	45	34	32	93	83	48	20	23	19	18	16	17	19	17	18	10	17	14	93
29-Jun	19	36	59	58	53	49	22	56	45	61	66	48	35	54	53	88	46	29	74	32	21	27	40	41	88
30-Jun	10	53	40	20	71	95	14	23	11	16	83	64	32	27	31	23	22	15	14	25	22	10	39	78	95
	72	79	81	79	86	95	86	71	91	93	83	91	99	90	71	88	70	73	82	66	74	96	86	105	
	Diurnal Maximum																								





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 7, 2016	Last Calibration	May 2, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	7:55	End Time (MST)	14:12
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

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 1000 ppb		HVPS voltage	547	547
Analyzer IP address	192.168.1.44		Lamp voltage	1500	1534
Calculated slope	1.002824	0.990534	Box temp	30.4	30.8
Calculated intercept	-0.599428	-0.020861	Pressure	23.1	25.9
Analyzer Background	40.9	41.9	Flow	590	679
Analyzer Coefficient	0.985	0.986	Lamp Ratio	51	52

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	3.0	----
as found span	5000	78.9	785.8	799.9	0.982
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	78.9	785.8	793.4	0.990
second point	5000	39.4	392.4	396.2	0.990
third point	5000	19.7	196.2	198.0	0.991
as left zero	5000	0.0	0.0	0.4	----
as left span	5000	78.9	785.8	787.3	0.998
Average Correction Factor					0.991

Corrected As found 796.9 Previous response 784.2 % change -1.6%

Notes:

zero air scrubbers were changed out, filter changed out, zero adjusted

Calibration Performed By: Melissa Lemay



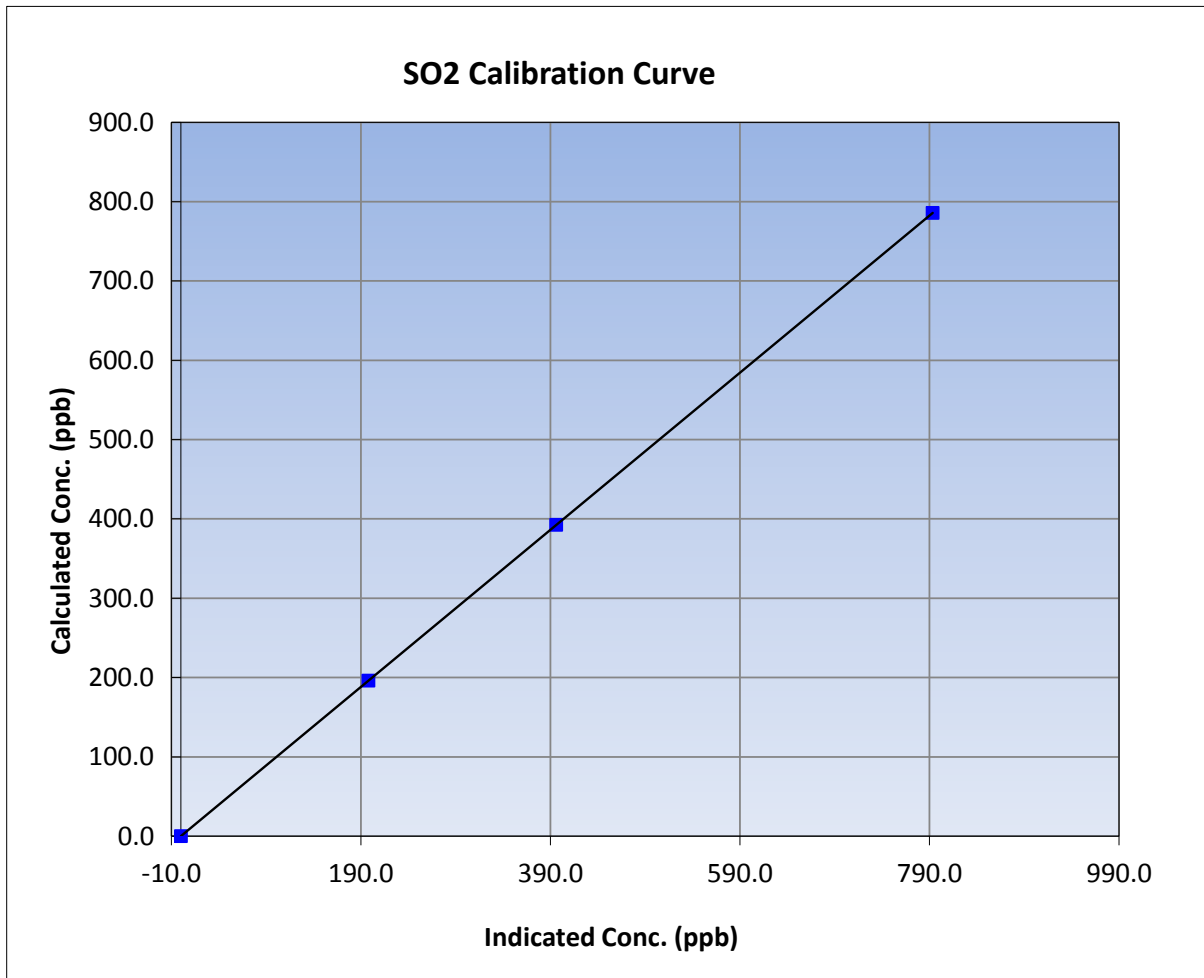
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 7, 2016	Previous Calibration	May 2, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	7:55	End Time (MST)	14:12
Analyzer make	API T100	Analyzer serial #	599

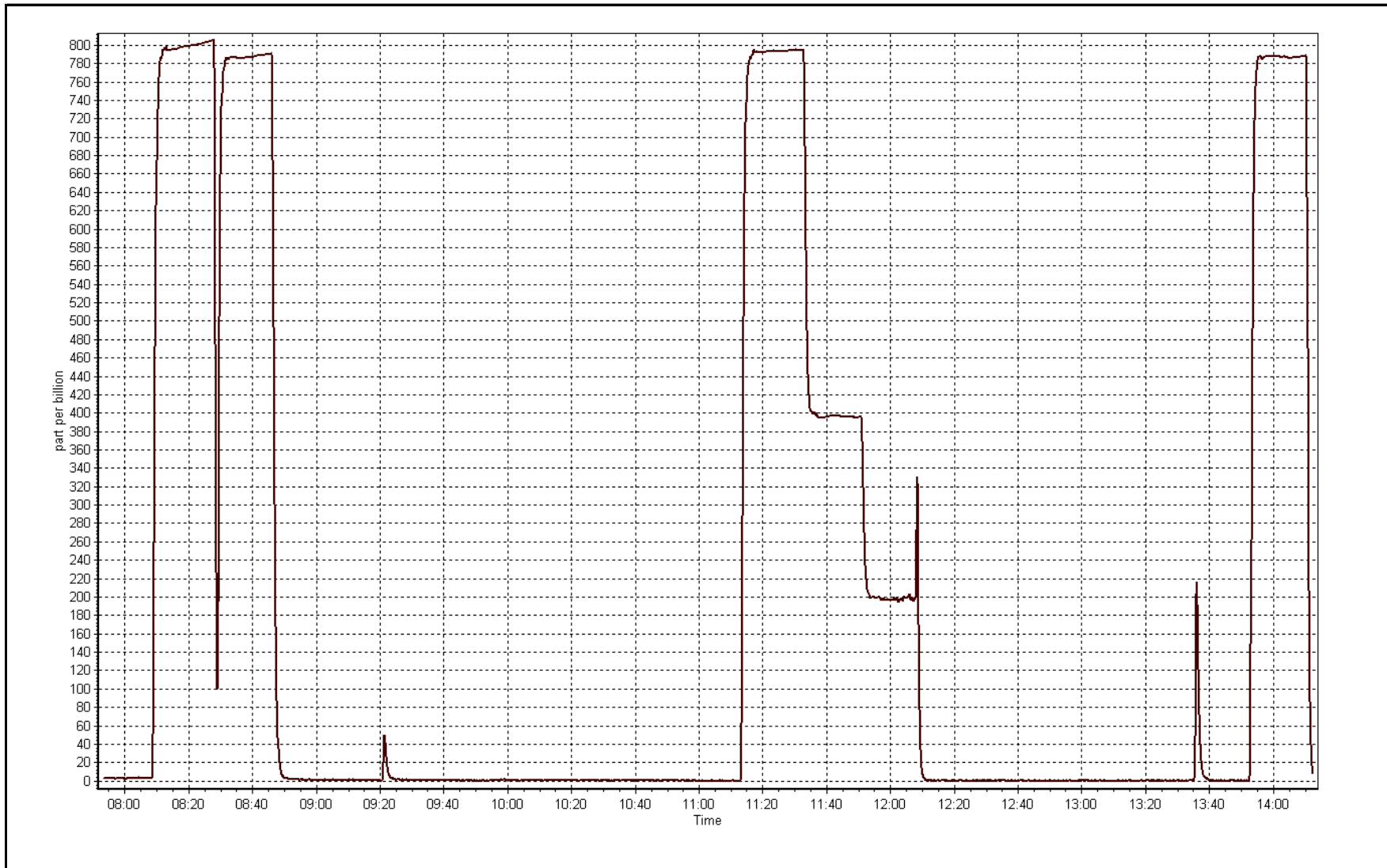
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	1.000000
785.8	793.4	0.9905		
392.4	396.2	0.9905	Slope	0.990534
196.2	198.0	0.9910		
			Intercept	-0.020861



SO2 Calibration Plot

Date: June 7, 2016





Wood Buffalo Environmental Association

TRS Calibration Report

Station Information

Calibration Date	June 9, 2016	Last Calibration	May 3, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	6:00	End Time (MST)	8:55
Gas Cert Reference	CC178364	Station temp.	22 Deg C
Cal Gas Concentration	5.07 ppm	Cal Gas Exp Date	09/09/2017
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	49.8 ppm	SO2 gas cert/exp	LL110515 8/Sep/18

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	1008	1008
Calculated slope	0.993682	0.993965	Chamber temp	45	45
Calculated intercept	0.179289	0.219069	Pressure	679.9	682.3
Analyzer Background	2.13	2.13	Flow	0.444	0.446
Analyzer Coefficient	1.038	1.038	Intensity	89	89
			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	-0.2	----
as found span	5000	78.9	80.0	80.2	0.998
SO2 scrubber check	5000	17.6	175.3	0.0	----
calibrator zero	5000	0.0	0.0	-0.2	----
high point	5000	78.9	80.0	80.2	0.998
second point	5000	39.4	40.0	40.2	0.994
third point	5000	19.7	20.0	19.7	1.014
as left zero	5000	0.0	0.0	-0.1	----
as left span	5000	78.9	80.0	80.5	0.994
Average Correction Factor					1.002

Corrected As found	80.4	Previous response	80.3	% change	-0.1%
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Notes:

no adjustments or maintenance done, filter changed out

Calibration Performed By:

Melissa Lemay



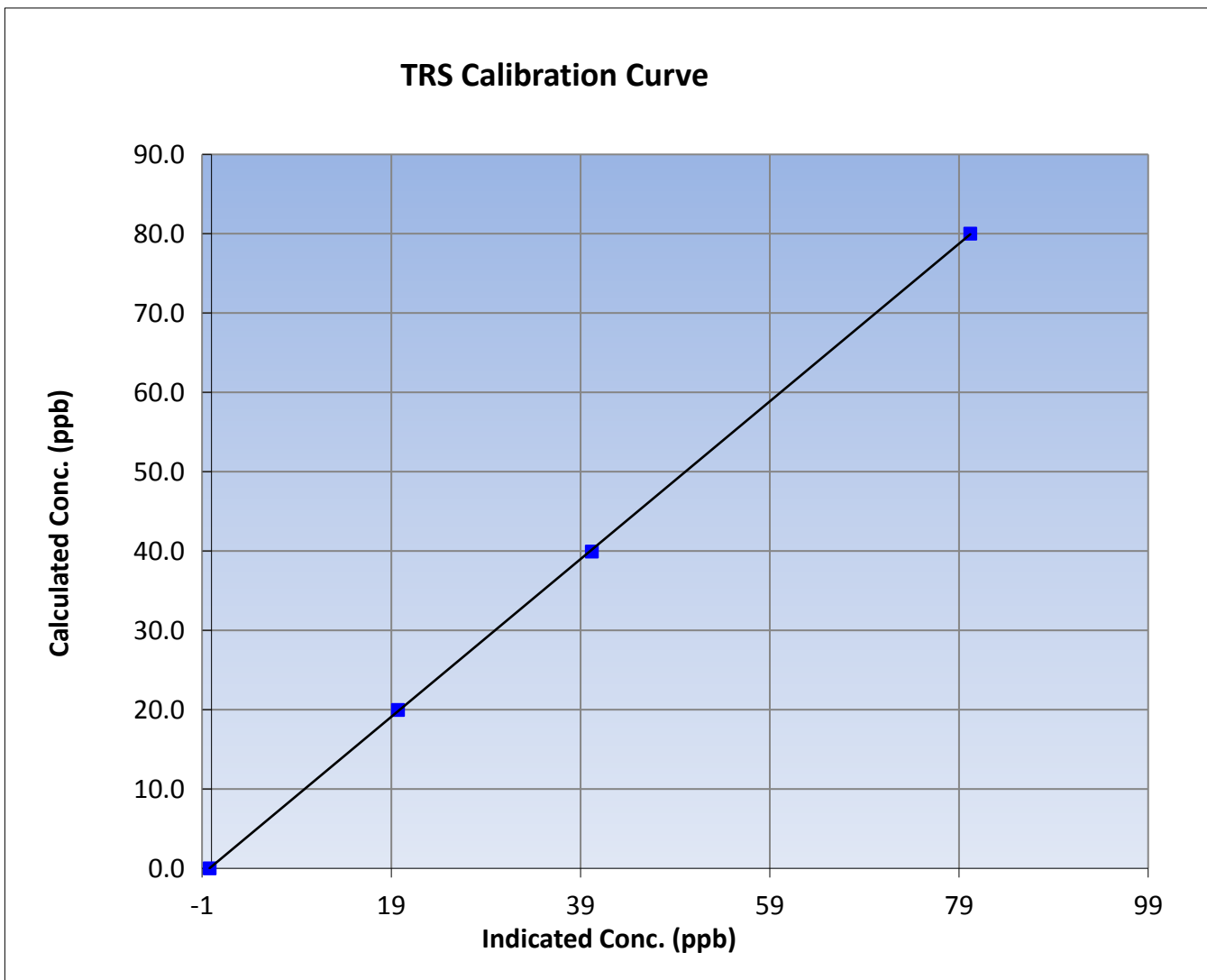
Wood Buffalo Environmental Association TRS Calibration Report

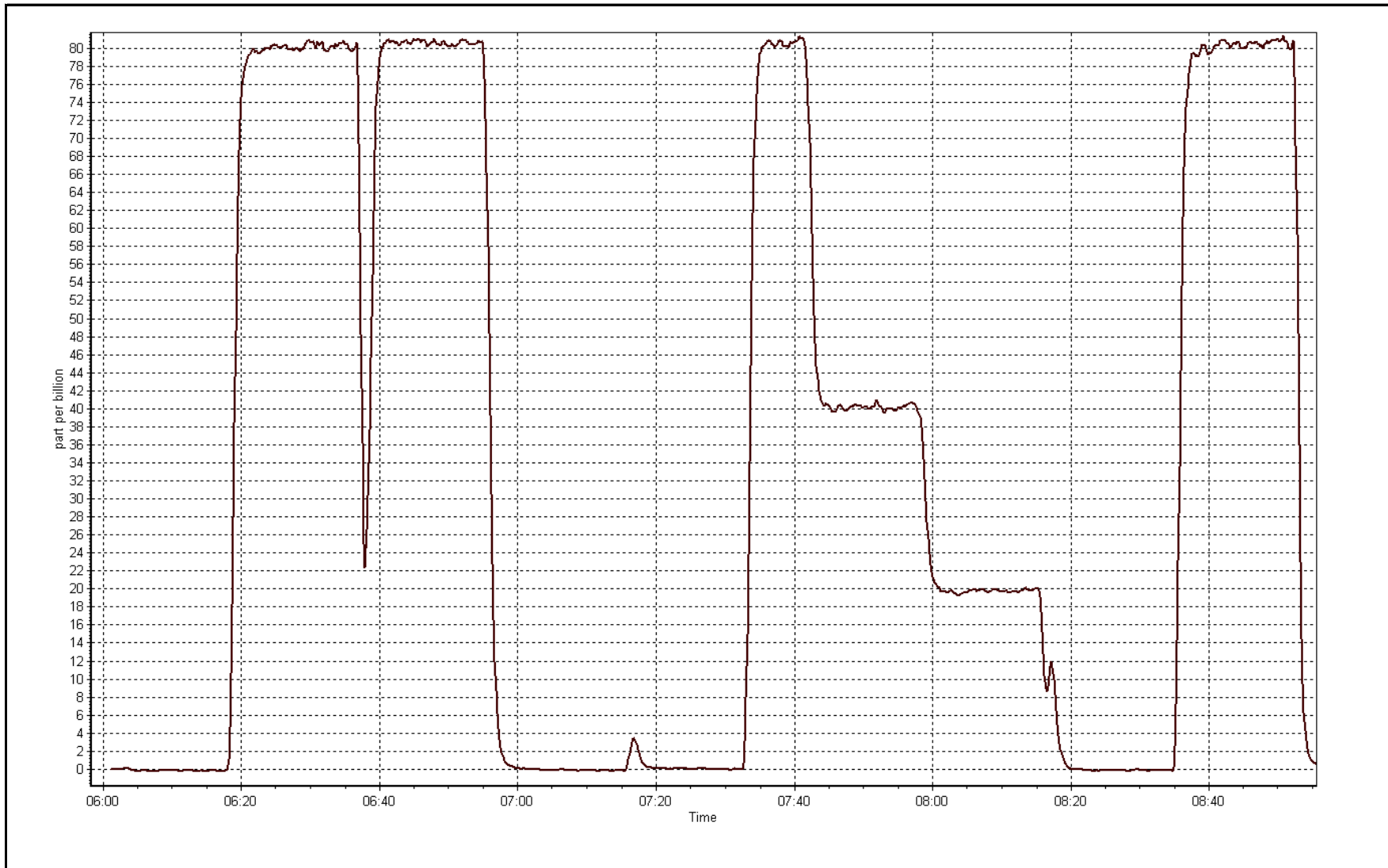
Station Information

Calibration Date	June 9, 2016	Previous Calibration	May 3, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	6:00	End Time (MST)	8:55
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	-0.2	----	Correlation Coefficient	0.999975
80.0	80.2	0.9976		
40.0	40.2	0.9938	Slope	0.993965
20.0	19.7	1.0140		
			Intercept	0.219069







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June-07-16	Last Calibration	May-25-16
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	7:55	End Time (MST)	14:11
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

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
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	0.996441	1.000155	Fuel Pressure	23.1	23.1
Calculated intercept	0.082943	-0.026678	Analyzer Coeff	3.162	3.164
			Analyzer BKG	1.480	1.370

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	-0.10	----
as found span	5000	78.9	16.84	16.87	0.998
calibrator zero	5000	0.0	0.00	0.04	----
high point	5000	78.9	16.84	16.88	0.997
second point	5000	39.4	8.41	8.39	1.002
third point	5000	19.6	4.18	4.22	0.991
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	78.9	16.84	16.98	0.992
Average Correction Factor					0.997

Corrected As found	16.97	Previous response	16.81	% change	-0.9%
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Notes:

Zero air scrubbers were changed out, zero adjusted, filter changed out

Calibration Performed By:

Melissa Lemay



Wood Buffalo Environmental Association THC Calibration Report

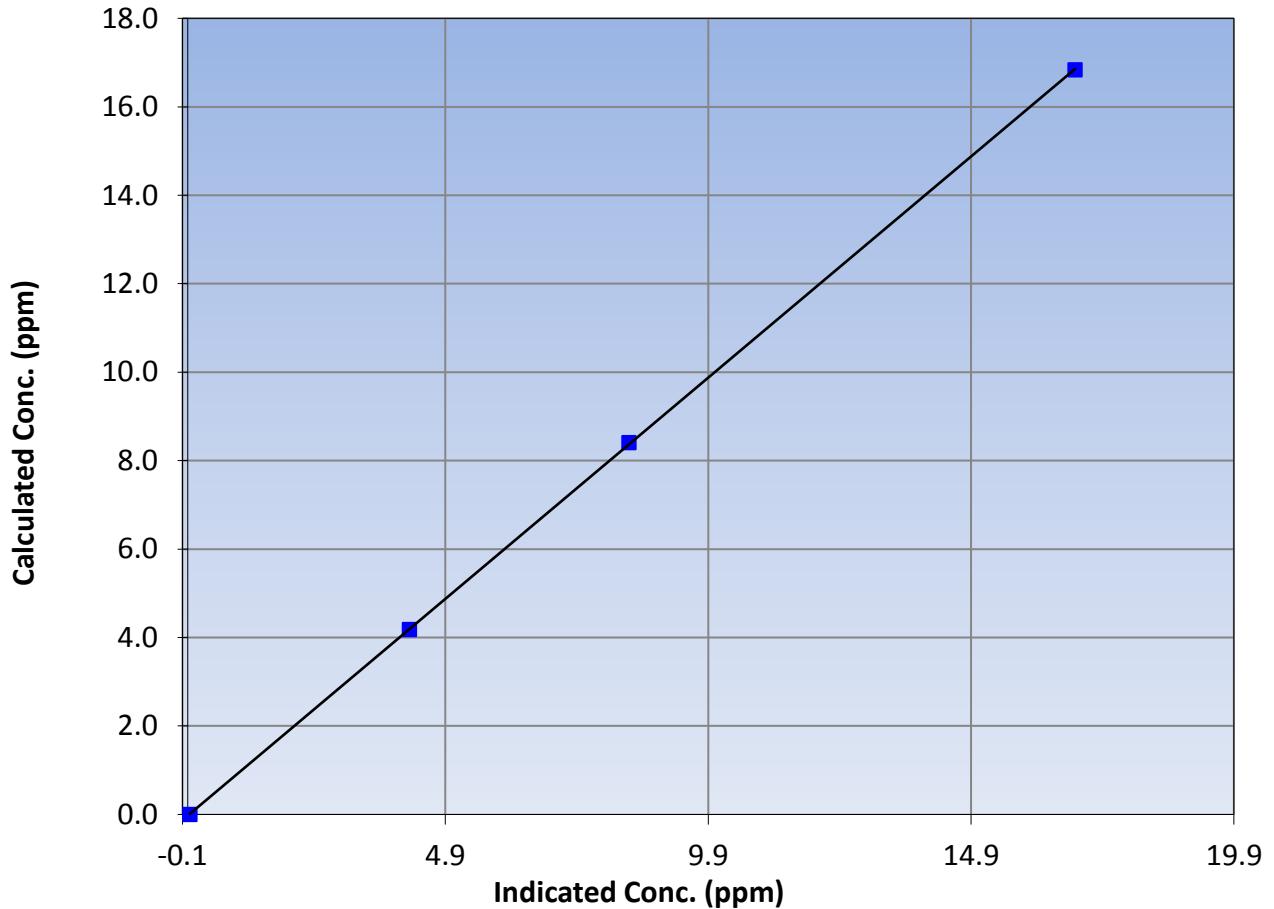
Station Information

Calibration Date	June 7, 2016	Previous Calibration	May 25, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	7:55	End Time (MST)	14:11
Analyzer make	51i-LT	Analyzer serial #	1505164380

Calibration Data

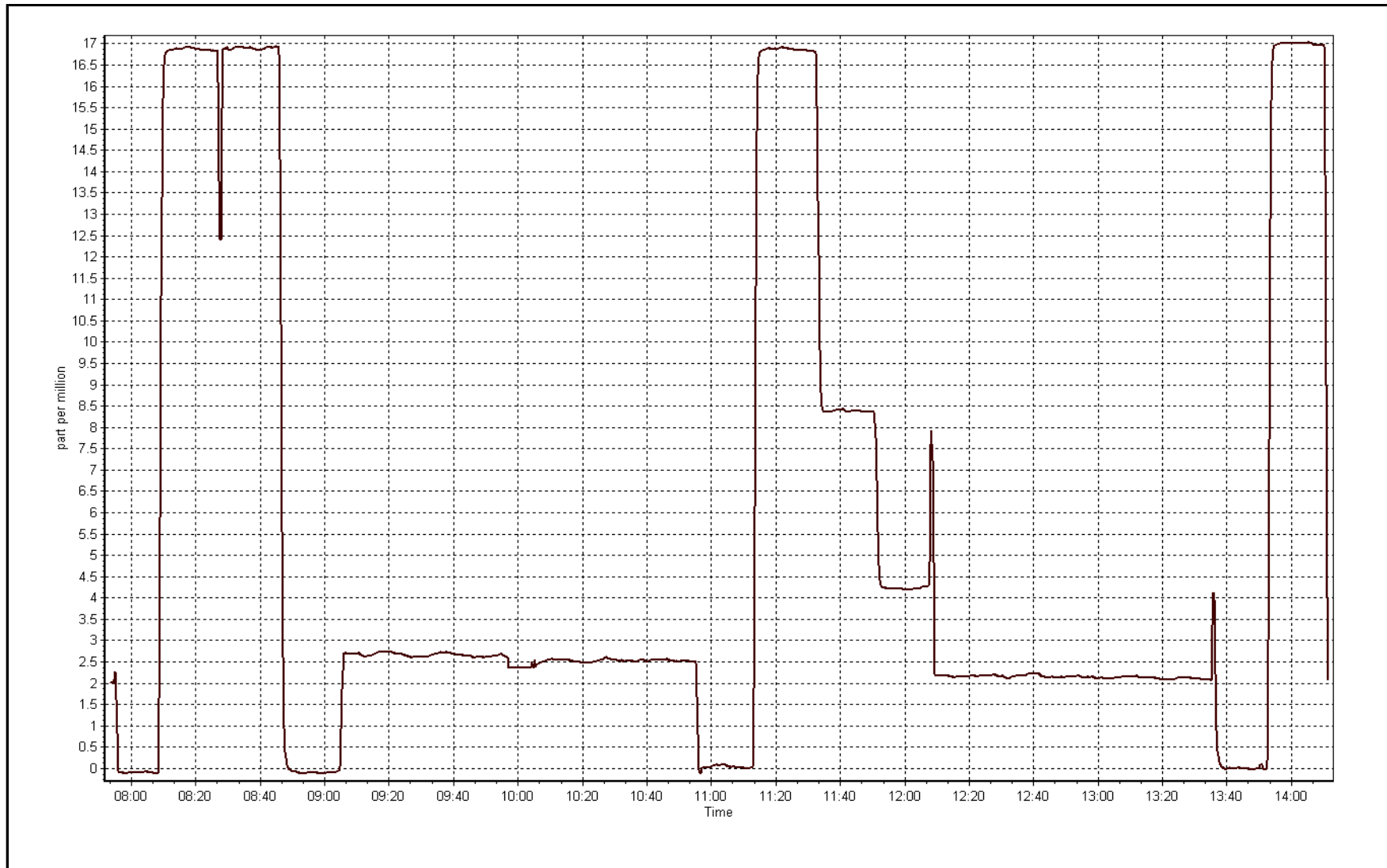
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.04	----	Correlation Coefficient	0.999984
16.84	16.88	0.9975		
8.41	8.39	1.0021		
4.18	4.22	0.9911		
			Slope	1.000155
			Intercept	-0.026678

THC Calibration Curve



THC Calibration Plot

Date: June 7, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	June 8, 2016	Previous Calibration	May 3, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	11:20	End Time (MST)	14:24
NO2 GPT Ref date	June-07-16	Transfer Standard	NOX GPT
		Station temp.	22 Deg C
Calibrator Make/Model	Sabio 4010	Serial Number	11041107
ZAG make/model	Teledyne API 701	Serial Number	3410
DACS make/model	Campbell Scientific CR3000	Serial Number	1850

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Box temp.	24.0	24.0
Analyzer IP address	192.168.1.79		Lamp temp.	58.0	58.0
Calculated slope	0.998799	0.990105	Pressure	23.5	26.3
Calculated intercept	-0.270279	-0.392395	Flow	631.0	752.0
Analyzer Background	0.8	1.3	Intensity	4314.8	4314.8
Analyzer Coefficient	1.029	1.070			

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	-0.1	----
as found span	5000	0.89	346.6	346.5	1.000
calibrator zero	5000	0.00	0.0	0.1	----
high point	5000	0.89	346.6	350.1	0.990
second point	5000	0.47	206.3	209.3	0.986
third point	5000	0.36	109.0	110.6	0.986
as left zero	5000	0.00	0.0	0.2	----
as left span	5000	0.89	346.6	366.7	0.945
Average Correction Factor					0.987

Corrected As found	346.6	Previous response	347.3	% change	0.2%
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Notes:

Inlet filter loading from wildfire appeared to not affect sensitivity; small span adjustment performed.

Calibration Performed By: Melissa Lemay



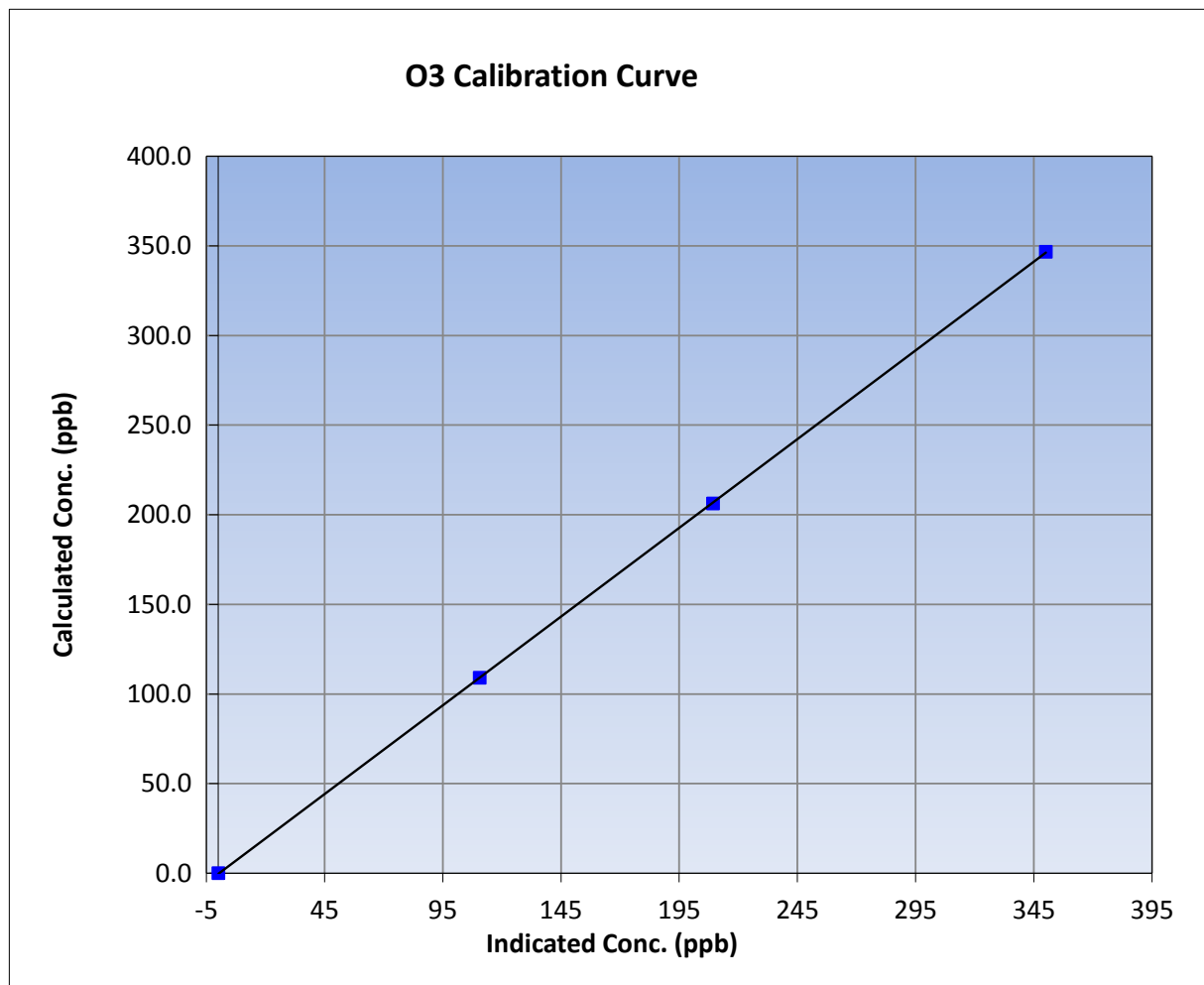
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	June-08-16	Previous Calibration	May 3, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	11:20	End Time (MST)	14:24
Analyzer make	API T400	Analyzer serial #	825

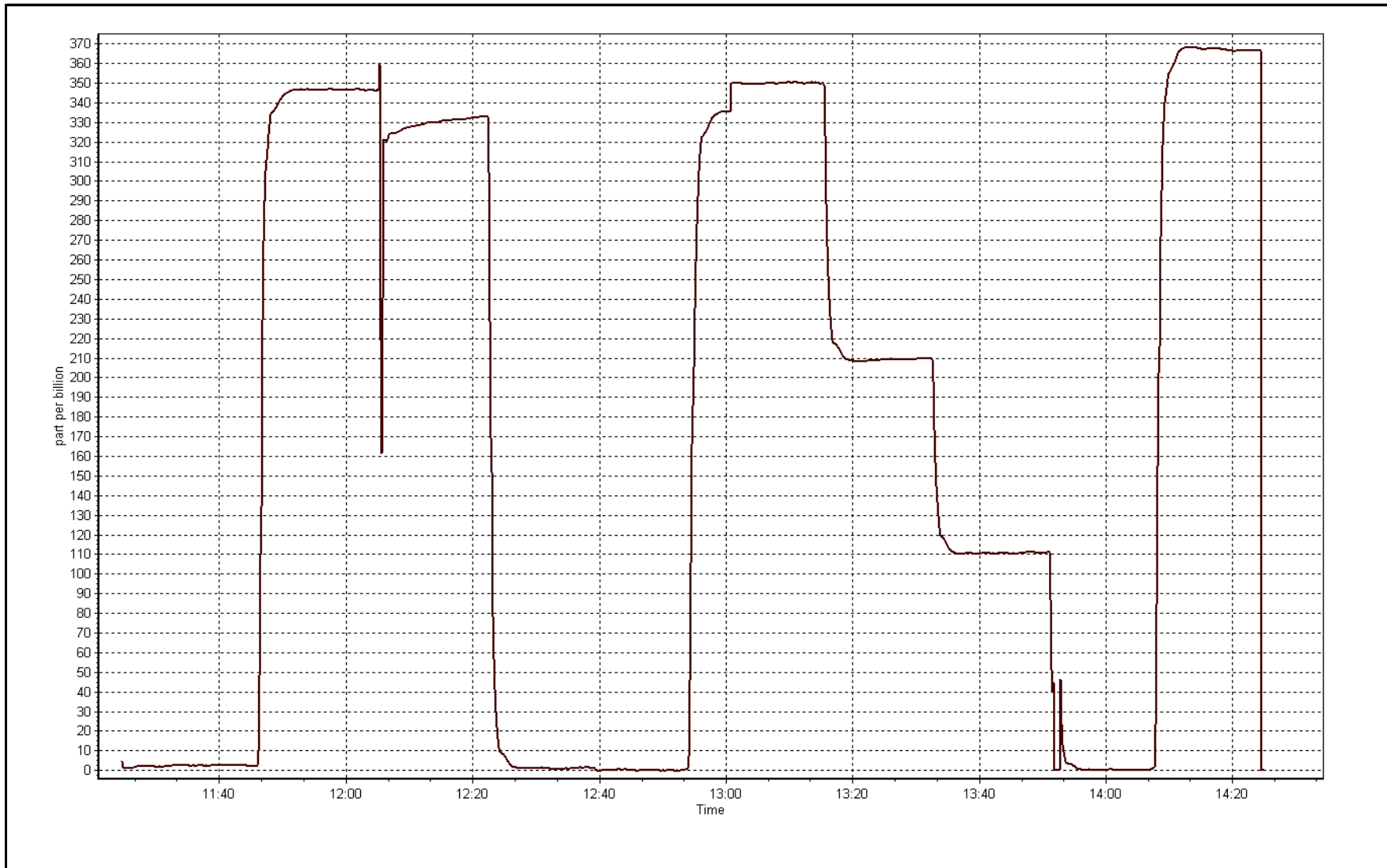
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999992
346.6	350.1	0.9900		
206.3	209.3	0.9857	Slope	0.990105
109.0	110.6	0.9855		
			Intercept	-0.392395



O3 Calibration Plot

Date: June 8, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	June 28, 2016	Previous Calibration	June 8, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	10:05	End Time (MST)	12:38
NO2 GPT Ref date	June-28-16	Transfer Standard	Nox
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.	22.9	24.0
Analyzer IP address	192.168.1.79		Lamp temp.	58.0	58.0
Calculated slope	0.998180	0.998969	Pressure	26.6	26.3
Calculated intercept	0.654889	-0.195016	Flow	762.0	752.0
Analyzer Background	1.3	1.2	Intensity	4372.7	4314.8
Analyzer Coefficient	1.070	1.026			

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	0.2	----
as found span	5000	0.89	364.9	380.5	0.959
calibrator zero	5000	0.00	0.0	0.2	----
high point	5000	0.89	364.9	365.4	0.999
second point	5000	0.47	217.0	217.6	0.997
third point	5000	0.36	114.7	114.9	0.998
as left zero	5000	0.00	0.0	0.3	----
as left span	5000	0.89	364.9	372.7	0.979
Average Correction Factor					0.998

Corrected As found	380.3	Previous response	364.9	% change	-4.0%
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Notes:

span adjusted; calibrated to check and make sure working properly after the reset on June 20,2016

Calibration Performed By:

_____ Melissa Lemay



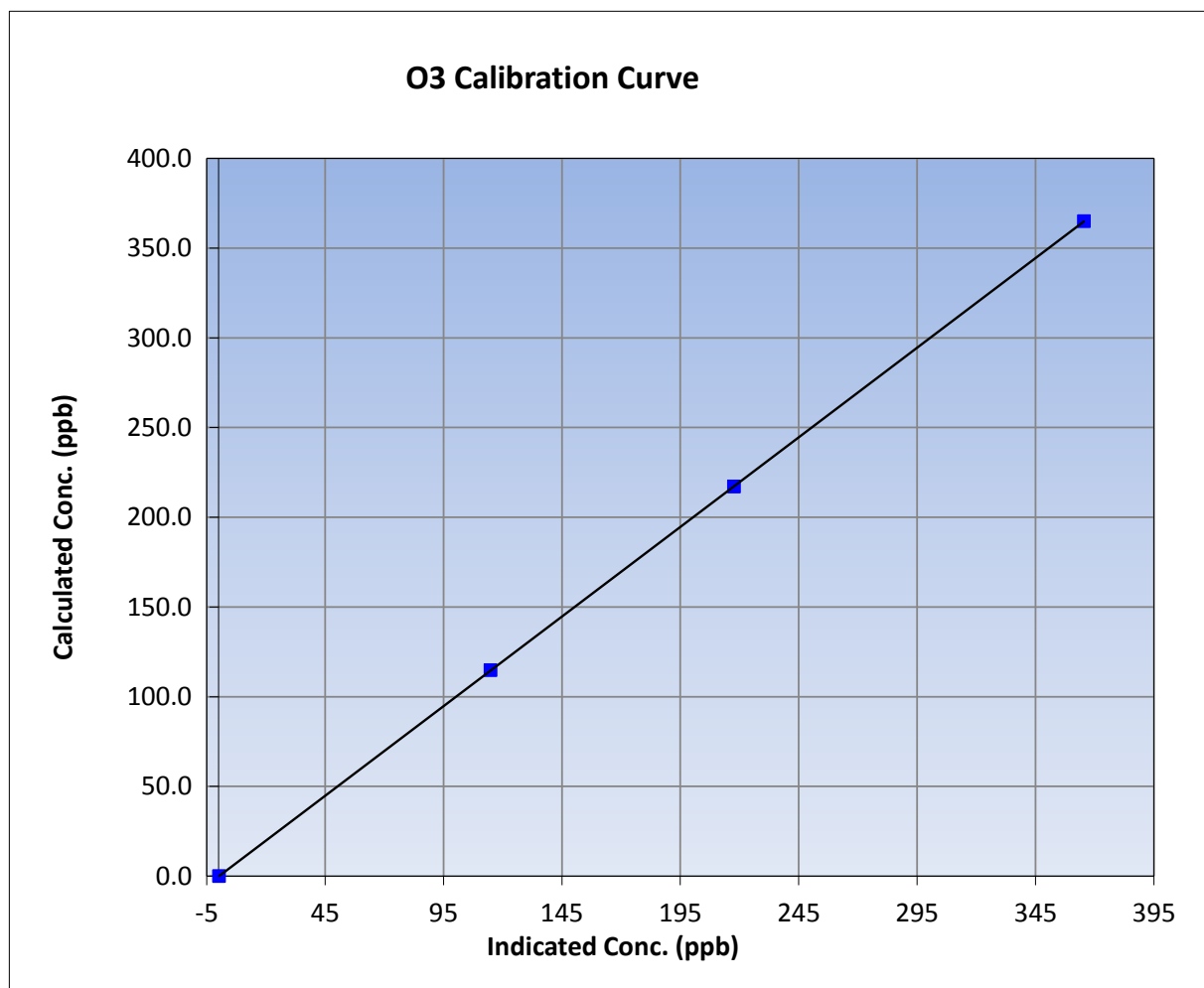
Wood Buffalo Environmental Association O3 Calibration Report

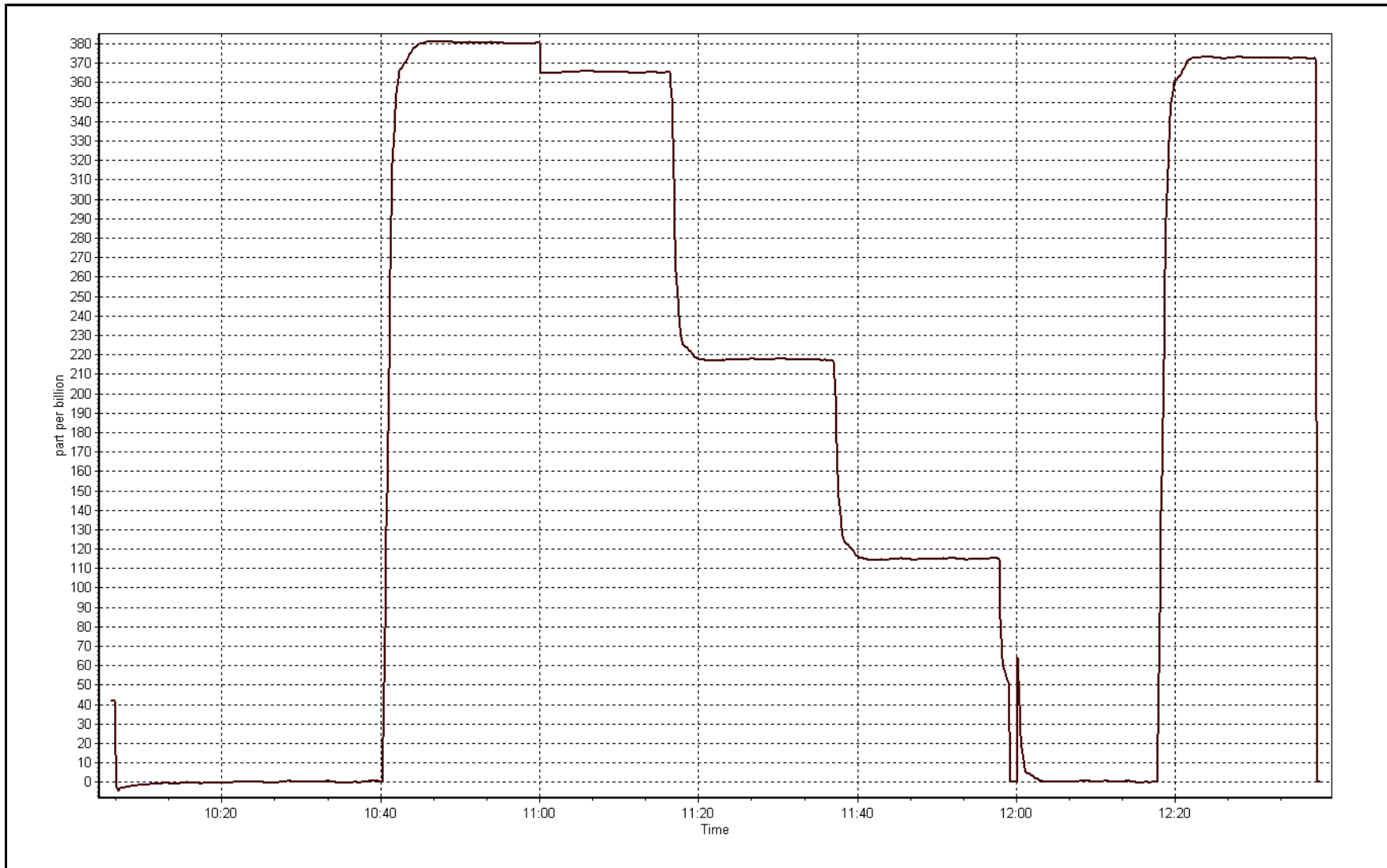
Station Information

Calibration Date	June-28-16	Previous Calibration	June 8, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	10:05	End Time (MST)	12:38
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	0.2	----	Correlation Coefficient	0.999999
364.9	365.4	0.9986		
217.0	217.6	0.9972	Slope	0.998969
114.7	114.9	0.9983		
			Intercept	-0.195016







Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 7, 2016	Previous Calibration	May 2, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Reason:	Routine		
Start Time (MST)	7:55	End Time (MST)	14:12
NO Cal Gas Conc	50.7 ppm	Gas Cert Reference	LL110515
NOx Cal Gas Conc	50.9 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	1.008729	1.009798	1.001636
	Data Offset	0.323601	0.263157	0.085651
Current Calibration	Data Slope	0.998812	0.998163	1.001328
	Data Offset	-0.222067	-0.200825	-0.080662

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1410661329
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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	0.998		1.046	
NOx coefficient	1.002		1.002	
NO2 coefficient	1.000		1.001	
NO bkgrnd	7.4		7.7	
NOx bkgrnd	7.4		7.8	
Chamber Temp	50.6	Deg C	50.5	Deg C
Moly Temp	325.5	Deg C	323.7	Deg C
PMT voltage	-827.7	V	-827.3	V
PMT Temp	-3	Deg C	-3	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	174.3	mmHg	181.2	mmHg
R Cell Press Nox	174.3	mmHg	181.2	mmHg
NO sample flow	0.809	lpm	0.864	lpm
Nox sample Flow	0.809	lpm	0.864	lpm

Notes:

Zero air scrubbers were changed out, filter changed out, span adjusted;



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 7, 2016

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	0.0	-0.1	0.1	----	----
as found span	5000	78.9	803.2	800.0	3.2	753.0	749.0	4.0	1.0667	1.0682
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	----	----
high point	5000	78.9	803.2	800.0	3.2	804.5	801.9	2.6	0.9984	0.9977
second point	5000	39.4	401.1	399.5	1.6	401.1	399.6	1.6	1.0000	0.9998
third point	5000	19.7	200.5	199.8	0.8	201.9	201.3	0.6	0.9933	0.9923
as left zero	5000	0.0	0.0	0.0	0.0	0.2	0.0	0.1	----	----
as left span	5000	78.9	803.2	457.1	346.1	808.9	458.4	350.5	0.9930	0.9972
Average Correction Factor									0.9972	0.9966

Corrected As found
Previous Response

NO_x= 753.0
NO_x= 795.9

NO= 749.1
NO= 792.0

Percent Change

NO_x= 5.7%

NO= 5.7%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 78.90 ccm NOx ref calc conc = 803.2 ppb NO ref calc conc = 800.0 ppb

O3 Setpoint (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
1st NO ref point		3.2	806.5	803.7	0.1	0.9959	0.9955	----	----
1st NO2 (300)	457.1	349.8	806.4	457.1	349.2	0.9960	----	1.0016	99.8%
2nd NO2 (200)	597.4	209.5	807.1	597.4	209.7	0.9952	----	0.9988	100.1%
3rd NO2 (100)	694.7	112.2	806.5	694.7	111.8	0.9959	----	1.0032	99.7%
2nd NO ref point		3.2	804.2	801.5	2.7	0.9988	0.9982	----	----
Average Correction Factor						0.9965		1.0012	99.9%

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association

NO_x Calibration Summary

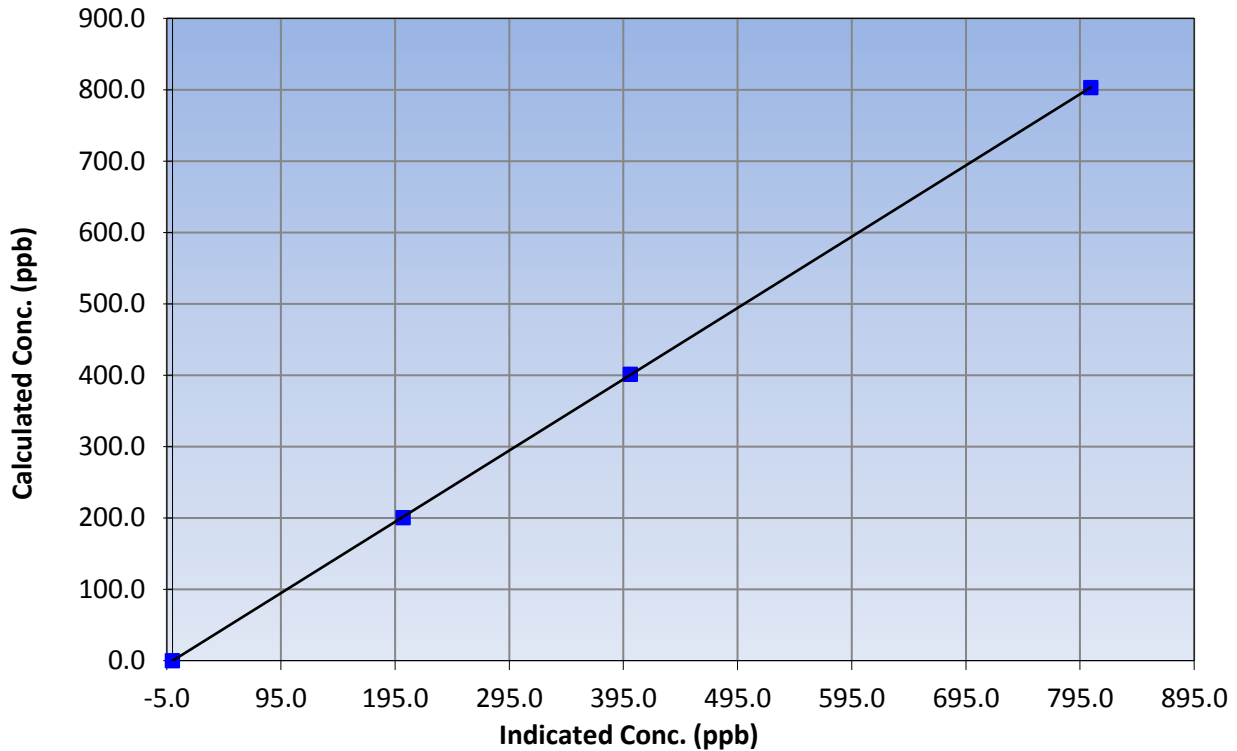
Station Information

Calibration Date	June 7, 2016	Previous Calibration	May 2, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	7:55	End Time (MST)	14:12
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	----	Correlation Coefficient	0.999996
803.2	804.5	0.9984		
401.1	401.1	1.0000	Slope	0.998812
200.5	201.9	0.9933		
			Intercept	-0.222067

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

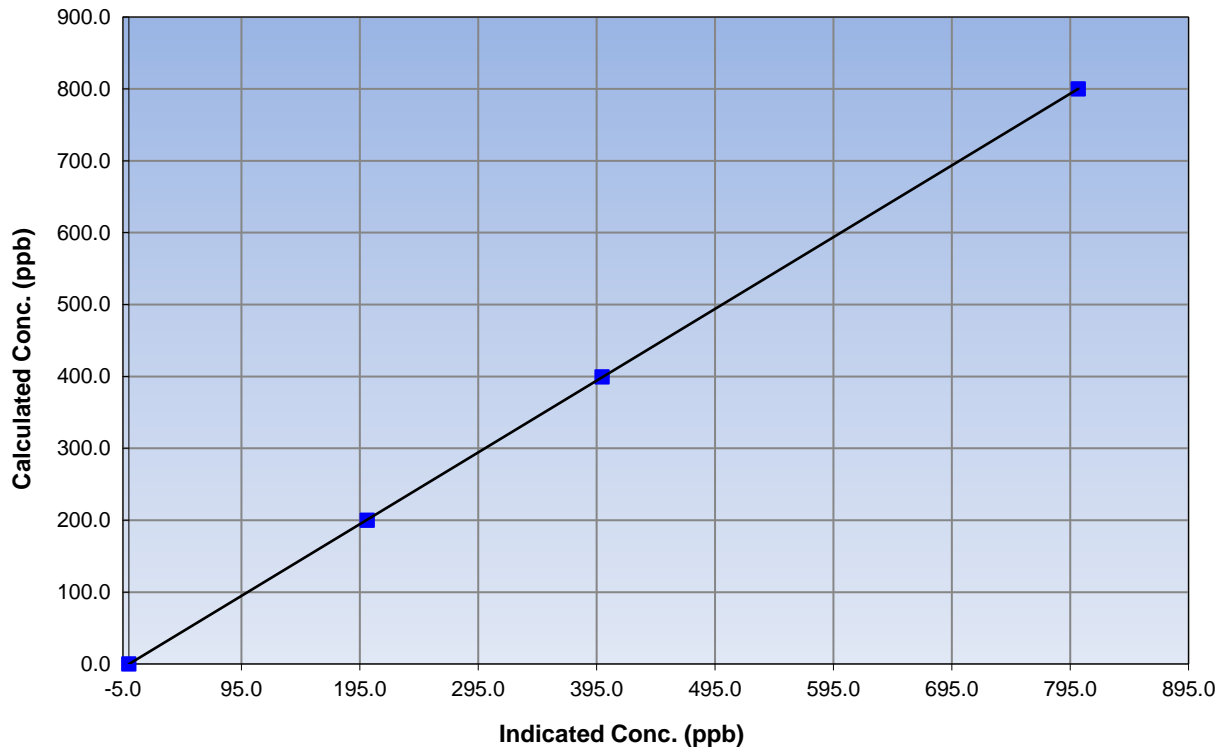
Station Information

Calibration Date	June 7, 2016	Previous Calibration	May 2, 2016
Station Name	Fort McKay South	Station Number	AMS 13
Start Time (MST)	7:55	End Time (MST)	14:12
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	0.999995
800.0	801.9	0.9977		
399.5	399.6	0.9998	Slope	0.998163
199.8	201.3	0.9923		
			Intercept	-0.200825

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

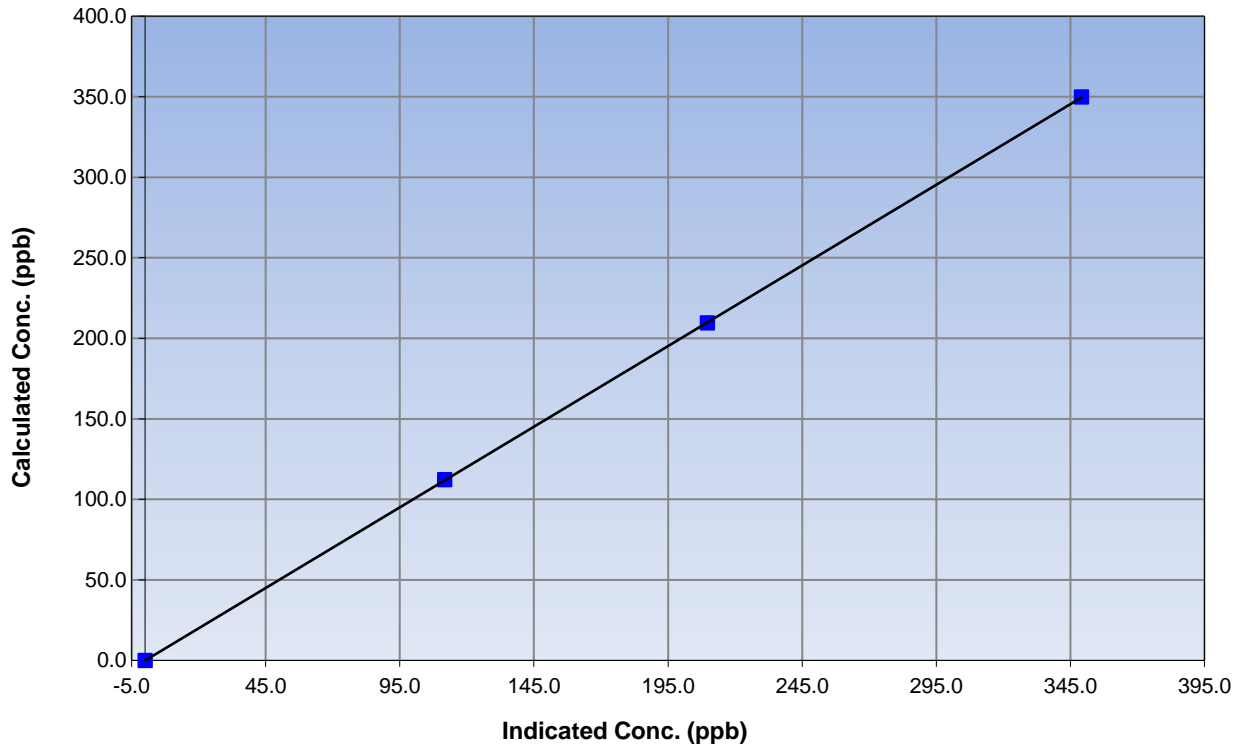
Station Information

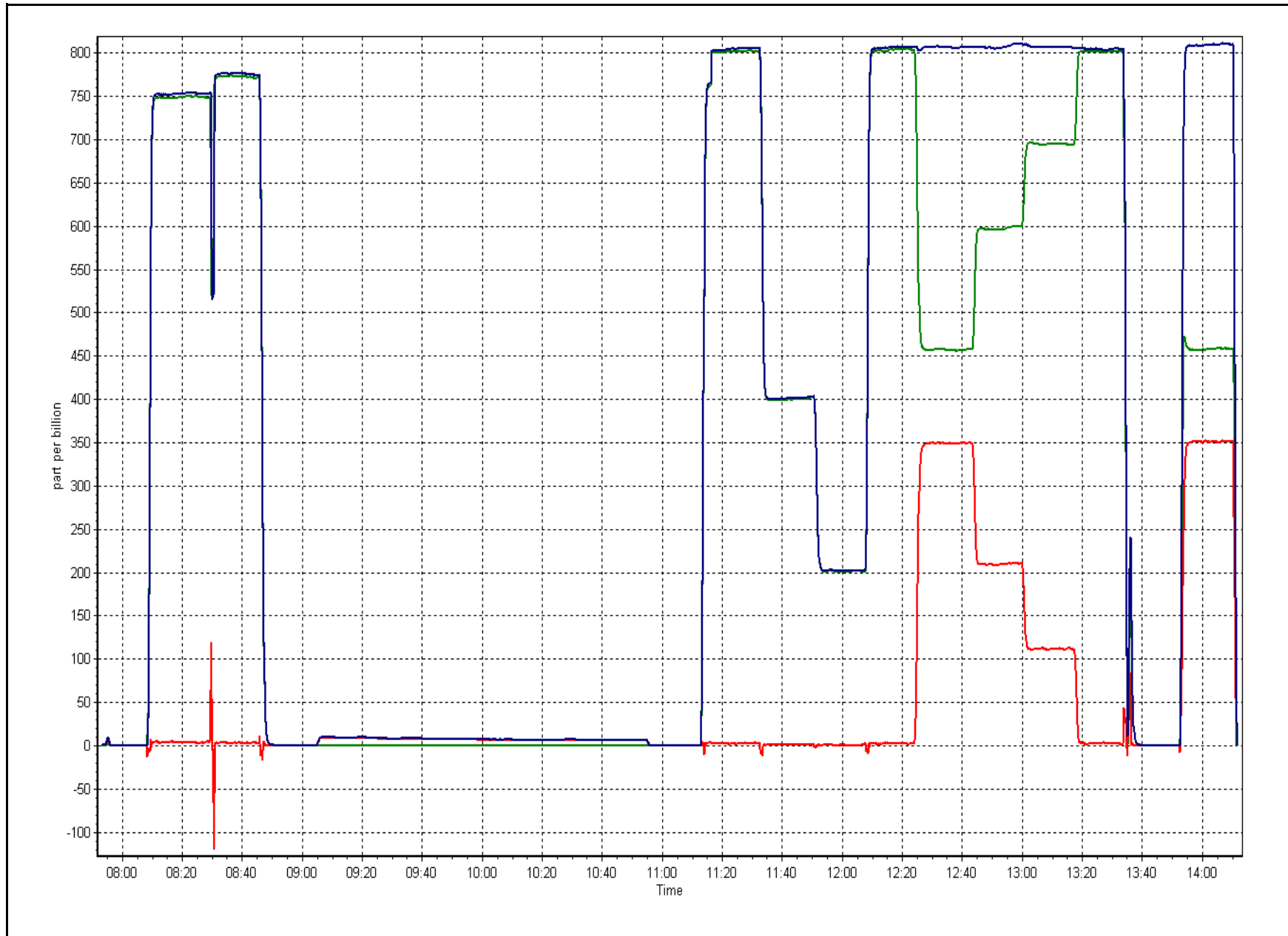
Calibration Date	June 7, 2016	Previous Calibration	May 2, 2016
Station Number	Fort McKay South	Station Number	AMS 13
Start Time (MST)	7:55	End Time (MST)	14:12
Analyzer make	Thermo 42i	Analyzer serial #	1410661329

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999995
349.8	349.2	1.0016		
209.5	209.7	0.9988	Slope	1.001328
112.2	111.8	1.0032		
			Intercept	-0.080662

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

W B E A

STATION INFORMATION

Calibration Date:	<u>June 9, 2016</u>	Previous Calibration:	<u>May 3, 2016</u>
Station Name:	<u>Fort McKay South</u>	Station Number:	<u>AMS 13</u>
Start Time (MST):	<u>6:11</u>	End Time (MST):	<u>9:17</u>
Calibrator Make/Model:	<u>Delta Cal</u>	Calibrator Serial Number:	<u>1097</u>

SHARP INFORMATION

Particulate Fraction:	<u>PM2.5</u>
Make/Model:	<u>Thermo / SHARP 5030</u>
Serial Number	<u>E-803</u>
C ₁₄ Source SN:	<u>4066</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	13.0	13.0	0.0	13.0
T2	25.0	24.0	-1.0	25.0
T3	24.0	24.0	0.0	24.0
T4	24.0	24.0	0.0	24.0
RH (%)	49.0	na	N/A	49.0

Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	969	969.0	0.0	969

Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	990	-10	1000	1000

Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	447		452
Neph	15.1		-0.7
C14	-1.1		5.2
Indicated Concentration (ug/m3)	3.6	Yes	-0.2
Offset 1	452		453.3
Offset 2	58		57.5

Leak Check (Quarterly)

Leak Check Date: June 9, 2015 Previous Leak Check Date: April 18, 2015

	Measured	Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.44	
*Flow with adaptor (LPM):	16.30	0.14

*Note - do not attach adaptor without shutting off the pump first

Mass Foil Calibration (Annually)

Foil Calibration Date:	<u>June 9, 2016</u>	Previous Foil Calibration:	<u>July 14, 2015</u>
Zeroed?:	<u>Yes</u>		
Foil Mass:	<u>1337</u>		
Previous Correction Factor:	<u>7079</u>	Mass foil set S/N:	<u>2587</u>
New Correction Factor:	<u>7150</u>		

INSPECTION DATA

Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	09/06/2016
Pump	Good	
Filter Tape	Good	28/09/2015
Mass Foil Cal Set	na	
HEPA filter	Good	

NOTES:

Flow and nephelometer adjusted

Calibration Performed By: Melissa Lemay



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

**AMS 14
ANZAC
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)
 JUNE 2016

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	590	34	130	86.67	5	0	1	0
TRS(ppb) Average	622	31	98	90.69	1	0	0	0
THC(ppm) Average	638	35	82	93.47	2.6	-	2.1	-
NMHC(ppm) Average	638	35	82	93.47	0.551	-	0.046	-
CH4(ppm) Average	638	35	82	93.47	2.3	-	2	-
NO2(ppb) Average	609	40	111	90.14	7	0	2	-
NO(ppb) Average	609	40	111	90.14	12	-	1	-
NOX(ppb) Average	609	40	111	90.14	18	-	3	-
O3(ppb) Average	664	31	56	96.53	65	0	46	-
PM2.5(ug/m3) Average	699	2	21	97.36	92.8	-	31.2	1
AT 2m(C) Average	720	0	0	100.00	28.6	-	22.6	-
RH(%) Average	720	0	0	100.00	99	-	91	-
Leaf Wetness (% of range) Average	720	0	0	100.00	42	-	20	-
WS(km/h) Average	719	0	1	99.86	30	-	16	-
WD(deg) Average	719	0	1	99.86	-	-	-	-
PC(mm) Total	720	0	0	100.00	18	-	43.7	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2(ppb) Average	590	0.6	1	-	0	0	0	0	1	1	5
TRS(ppb) Average	622	0.2	0	-	0	0	0	0	0	0	1
THC(ppm) Average	638	2	0.1	-	1.9	1.9	2	2	2	2.1	2.6
NMHC (ppm) Average	638	0.012	0.038	-	0	0	0	0	0	0	0.551
CH4(ppm) Average	638	1.99	0	-	1.9	1.9	2	2	2	2	2.3
NO2(ppb) Average	609	1	1	-	0	0	0	1	1	2	7
NO(ppb) Average	609	0.4	1	-	0	0	0	0	0	1	12
NOX(ppb) Average	609	1.4	2	-	0	0	1	1	2	3	18
O3(ppb) Average	664	31.5	11	-	3	16	24	33	39	45	65
PM2.5(ug/m3) Average	699	5.8	8.3	-	0.1	0.8	1.4	3.2	7.2	13.4	92.8
Temperature 2 m (C) Average	720	16.86	5.3	-	4.5	10.2	13	16.1	21.1	24.4	28.6
Relative Humidity (%) Average	720	59.2	23	-	15	30	39	58	79	91	99
Leaf Wetness (% of range) Average	720	2.8	8	-	-1	-1	0	0	1	11	42
Wind Speed 20 m (km/h) Average	719	9.4	5	-	1	4	6	9	12	16	30
Wind Direction 20 m (deg) Average	719	-	-	-	-	-	-	-	-	-	-
Precipitation (mm) Total	720	-	-	81.28	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - ANZAC (AMS 14)

JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2, TRS, THC, NO2	06 Jun 2016 12:00	06 Jun 2016 12:00	1	Maintenance - verify daily QA response
SO2	07 Jun 2016 04:00	09 Jun 2016 04:00	49	Unstable operation - station temperature fluctuations
SO2	25 Jun 2016 17:00	27 Jun 2016 10:00	42	Unstable operation - station temperature fluctuations
SO2	27 Jun 2016 11:00	27 Jun 2016 14:00	4	Maintenance - analyzer shut down due to station temp
TRS	07 Jun 2016 05:00	08 Jun 2016 09:00	29	Unstable operation - station temperature fluctuations
TRS	08 Jun 2016 10:00	08 Jun 2016 10:00	1	Maintenance - verify daily QA response
TRS	14 Jun 2016 09:00	14 Jun 2016 11:00	3	Maintenance - serviced zero air generator
TRS	26 Jun 2016 06:00	26 Jun 2016 20:00	15	Unstable operation - station temperature fluctuations
TRS	26 Jun 2016 21:00	27 Jun 2016 14:00	18	Maintenance - analyzer shut down due to station temp
CH4, NMHC, THC	07 Jun 2016 12:00	08 Jun 2016 09:00	22	Unstable operation - station temperature fluctuations
CH4, NMHC, THC	08 Jun 2016 10:00	08 Jun 2016 10:00	1	Maintenance - verify daily QA response
CH4, NMHC, THC	26 Jun 2016 12:00	26 Jun 2016 20:00	9	Unstable operation - station temperature fluctuations
CH4, NMHC, THC	26 Jun 2016 21:00	27 Jun 2016 10:00	14	Maintenance - analyzer shut down due to station temp
NO2, NO, NOX	07 Jun 2016 11:00	08 Jun 2016 09:00	23	Unstable operation - station temperature fluctuations
NO2, NO, NOX	08 Jun 2016 10:00	08 Jun 2016 10:00	1	Maintenance - verify daily QA response
NO2, NO, NOX	13 Jun 2016 14:00	14 Jun 2016 08:00	19	Maintenance - reaction cell cleaned and stabilization time
NO2, NO, NOX	26 Jun 2016 14:00	26 Jun 2016 20:00	7	Unstable operation - station temperature fluctuations
NO2, NO, NOX	26 Jun 2016 21:00	27 Jun 2016 16:00	20	Maintenance - analyzer shut down due to station temp
O3	06 Jun 2016 12:00	06 Jun 2016 13:00	2	Maintenance - verify daily QA response
O3	08 Jun 2016 10:00	08 Jun 2016 10:00	1	Maintenance - verify daily QA response
O3	14 Jun 2016 09:00	14 Jun 2016 11:00	3	Maintenance - serviced zero air generator
O3	16 Jun 2016 13:00	16 Jun 2016 13:00	1	Maintenance - verify daily QA response
O3	26 Jun 2016 20:00	27 Jun 2016 13:00	18	Maintenance - analyzer shut down due to station temp
PM2.5	26 Jun 2016 20:00	27 Jun 2016 14:00	19	Maintenance - analyzer shut down due to station temp
Wind Speed, Wind Direction	02 Jun 2016 05:00	02 Jun 2016 05:00	1	Flat line in sensor output signal



Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 5 ppb on Jun 20 09:00	Maximum Daily Average: 1.2 ppb on Jun 19
Minimum Value: 0 ppb on Jun 4 12:00	Hours of Data: 590
Maximum Diurnal Average: 0.9 ppb at hour 19	Hours of Missing Data: 130
Monthly Average: 0.6 ppb	Hours of Calibration: 34
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 3	Percent Operational Time: 86.7

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-Jun	1	1	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1	1	0.5	1	
2-Jun	1	1	1	Z	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1	
3-Jun	1	1	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0.5	1		
4-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0.4	1	
5-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	2	2	1	1	0.7	2	
6-Jun	1	Z	1	1	1	1	1	1	1	1	1	M	1	1	1	1	1	1	1	1	1	1	0	1	0.7	1	
7-Jun	1	1	Z	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	1	
8-Jun	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--	
9-Jun	UO	UO	UO	UO	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0.9	1	
10-Jun	0	0	0	0	0	Z	0	0	2	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0.7	3	
11-Jun	Z	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	
12-Jun	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	
13-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	2	1	1	1	1	1	1	1	0	1	0	0.5	2	
14-Jun	0	0	0	Z	1	0	0	C	C	C	C	C	C	C	1	1	1	1	1	1	1	1	1	0	--	1	
15-Jun	0	0	0	0	Z	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.5	1	
16-Jun	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	
17-Jun	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	
18-Jun	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.4	1	
19-Jun	0	0	Z	0	1	1	2	2	1	0	1	2	1	1	1	2	1	3	3	3	2	1	0	0	1.2	3	
20-Jun	0	0	0	Z	0	0	1	3	5	2	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1.1	5	
21-Jun	1	0	0	1	Z	1	1	0	0	0	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1.0	2	
22-Jun	1	1	1	1	0	Z	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0.5	1	
23-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	1	1	1	1	1	1	0.6	2	
24-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1	
25-Jun	0	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	UO	UO	UO	UO	UO	UO	UO	UO	--	1	
26-Jun	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--	
27-Jun	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	M	M	M	0	0	0	0	0	0	0	0	0	0	--	0
28-Jun	0	0	0	0	0	Z	0	0	0	0	1	1	1	1	1	2	3	2	2	2	1	1	1	1	0.9	3	
29-Jun	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0.4	1	
30-Jun	0	Z	0	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0.8	1	

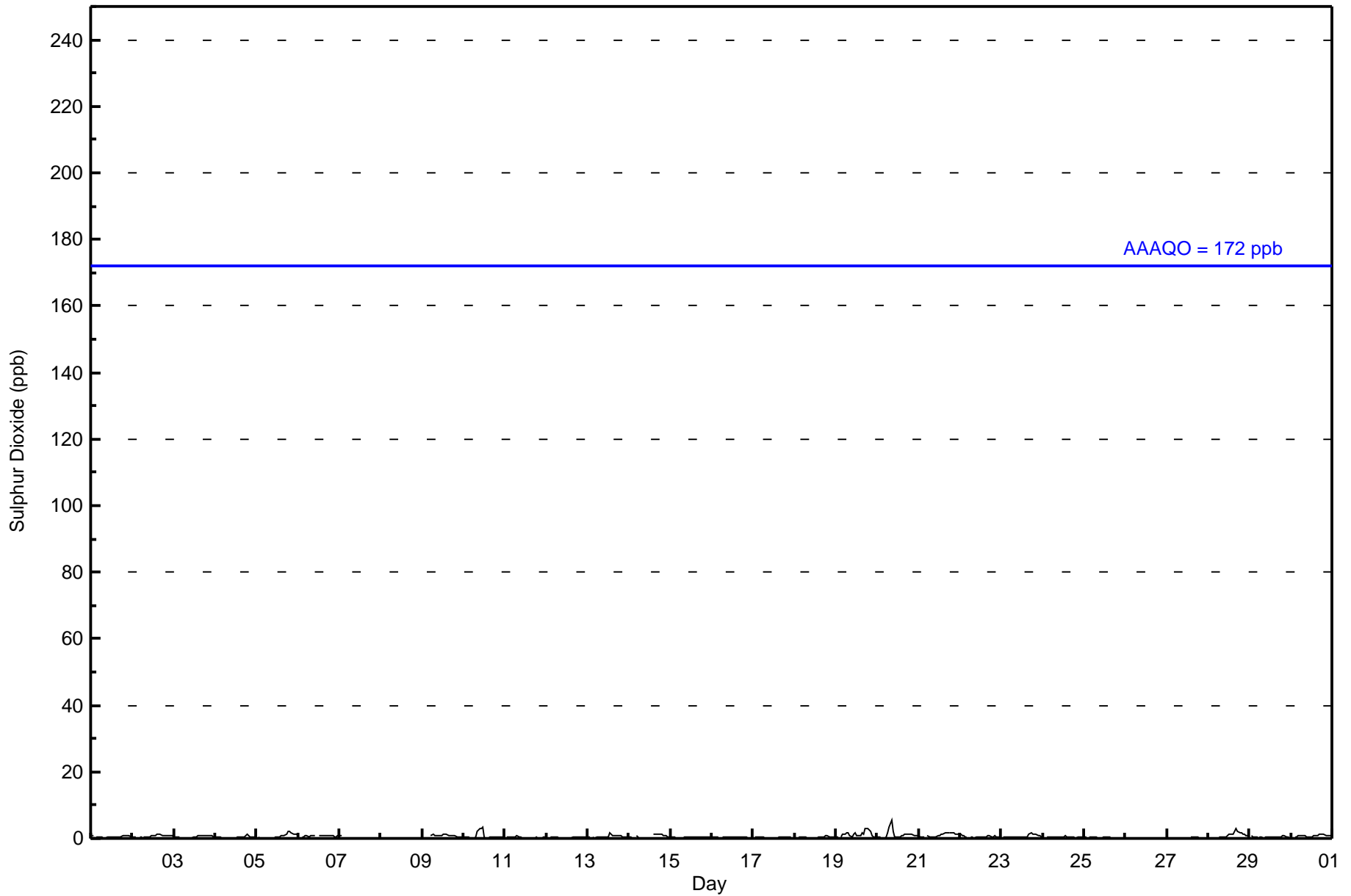
0.5	0.4	0.4	0.3	0.4	0.4	0.4	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.7	0.8	0.9	0.9	0.9	0.8	0.6	0.6	0.5	Diurnal Average
1	1	1	1	1	1	1	2	3	5	3	3	3	3	1	2	1	2	3	3	3	3	2	1	1	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Anzac - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Anzac - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	590	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: 590

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Anzac - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	27	20	20	8	15	10	41	70	53	38	37	38	61	69	43	39	589
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
Totals	27	20	20	8	15	10	41	70	53	38	37	38	61	69	43	39	589

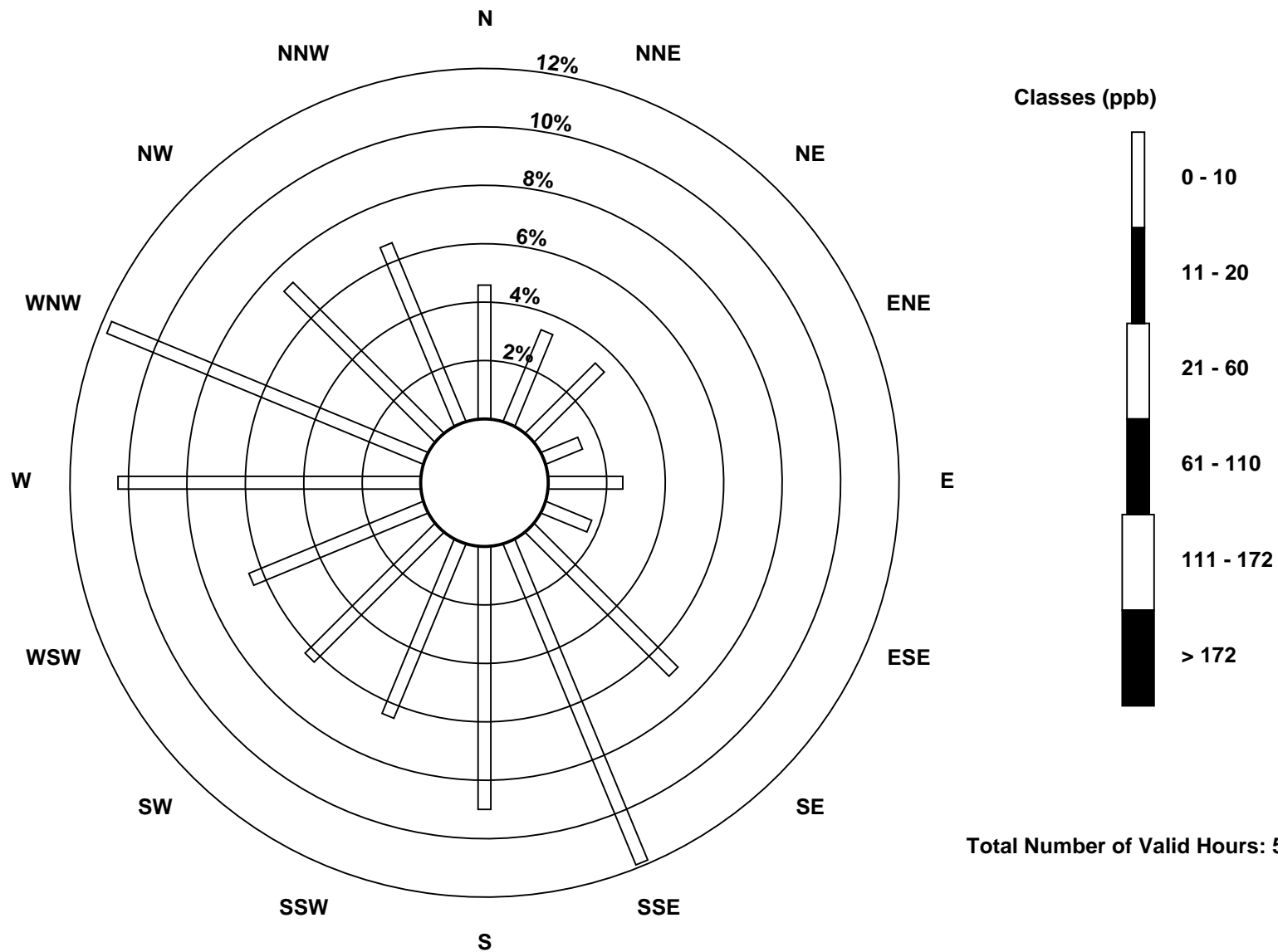
Total Number of Valid Hours: 589

Total Number of Hours: 720

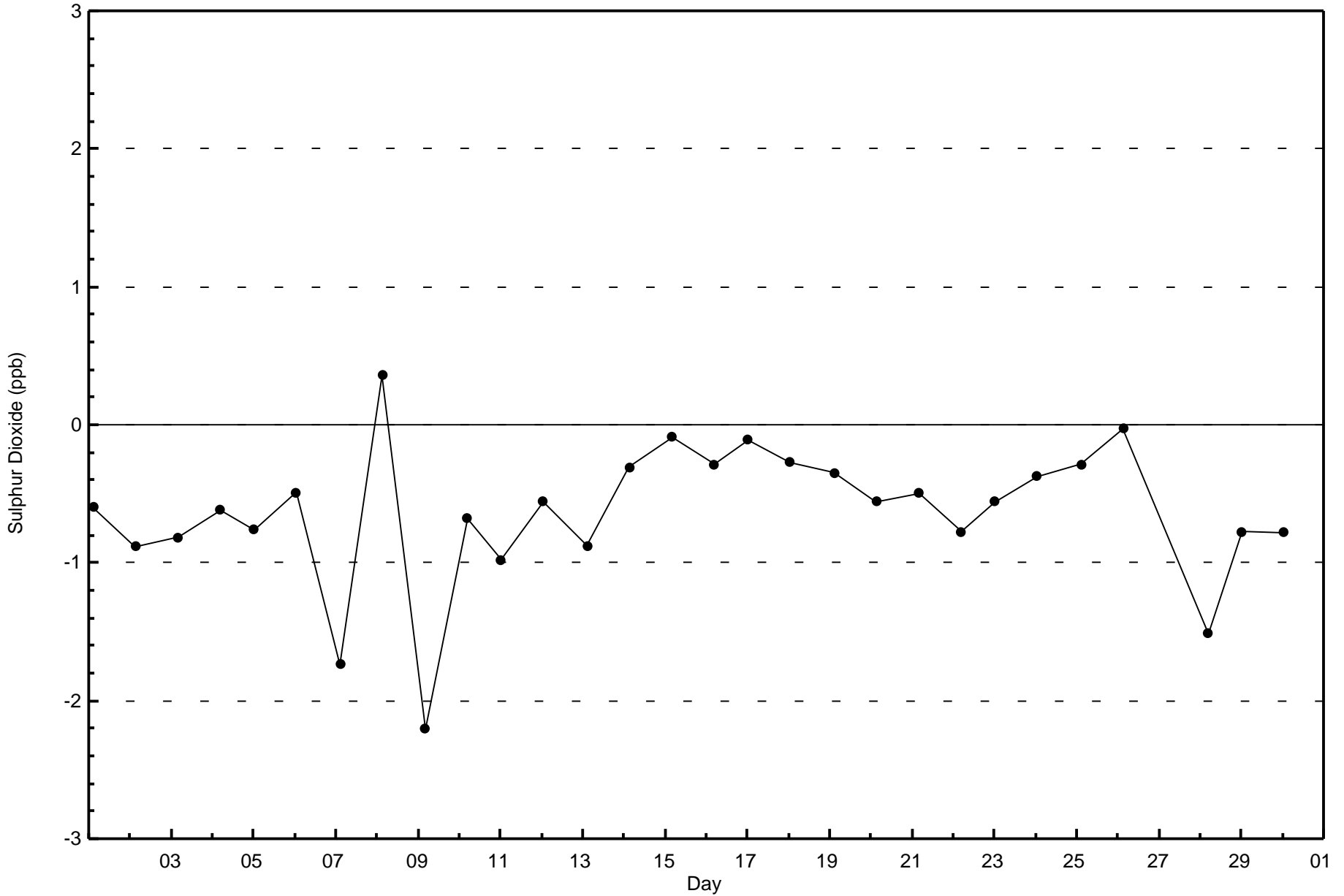


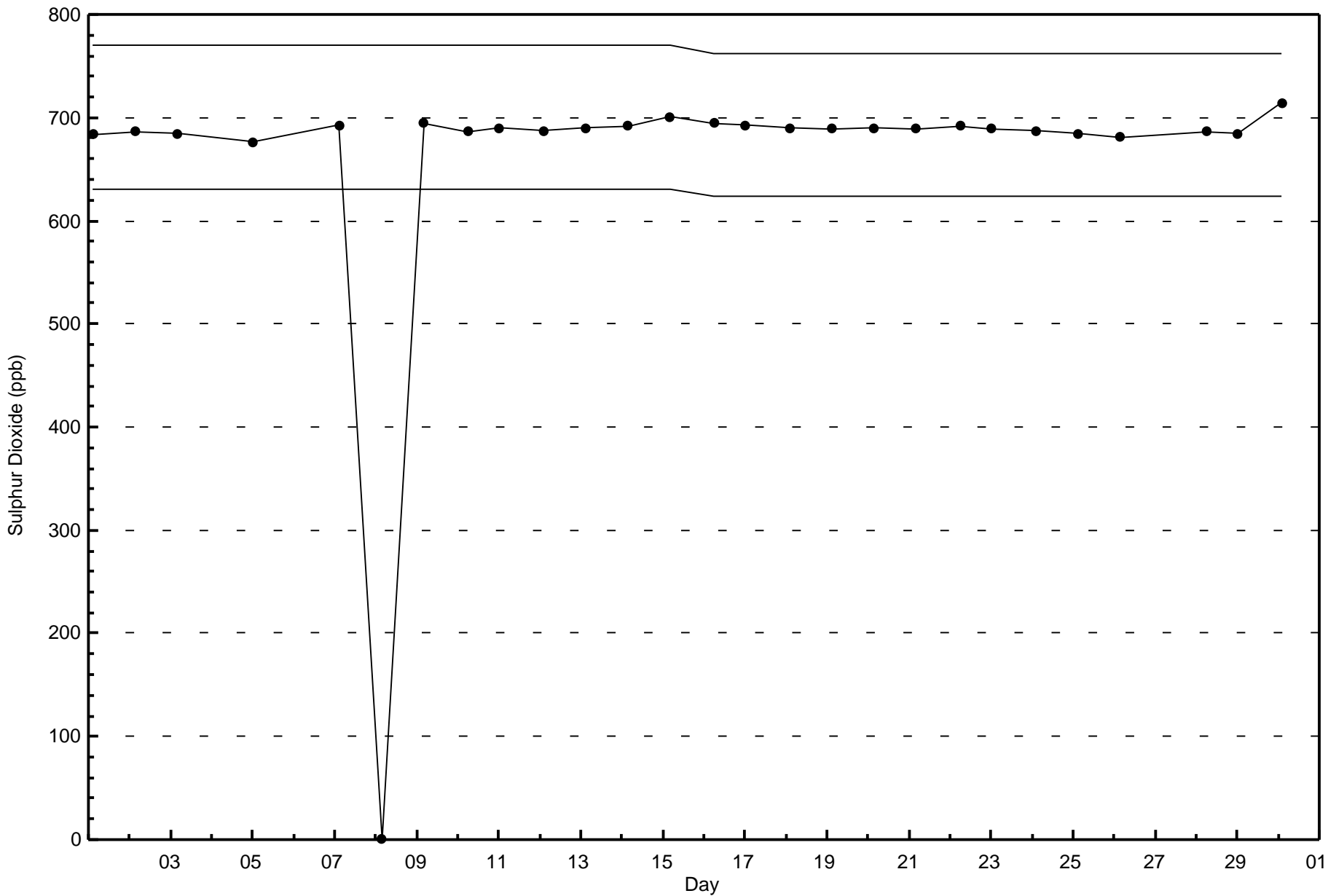
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Sulphur Dioxide (SO₂) - ppb
Anzac (AMS 14)



Total Number of Valid Hours: 589







Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 1 ppb on Jun 29 07:00	Maximum Daily Average: 0.3 ppb on Jun 11		Hours of Data:	622
Minimum Value: 0 ppb on Jun 18 16:00	Minimum Daily Average: 0.2 ppb on Jun 18		Hours of Missing Data:	98
Maximum Diurnal Average: 0.3 ppb at hour 4	Minimum Diurnal Average: 0.2 ppb at hour 15		Hours of Calibration:	31
Monthly Average: 0.2 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1		Percent Operational Time:	90.7

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-Jun	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
2-Jun	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
3-Jun	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
4-Jun	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
5-Jun	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
6-Jun	0	0	Z	0	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
7-Jun	0	0	0	Z	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	0
8-Jun	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	0	0	0	0	0	0	1	0	0	0	1	1	0	0	--	1
9-Jun	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
10-Jun	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
11-Jun	0	Z	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
12-Jun	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
13-Jun	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
14-Jun	0	0	0	0	Z	0	0	0	M	M	M	0	0	0	0	0	0	0	0	0	1	0	0	0	0.3	1
15-Jun	0	0	0	0	0	Z	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.2	0
16-Jun	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
17-Jun	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
18-Jun	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
19-Jun	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
20-Jun	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
21-Jun	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
22-Jun	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
23-Jun	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
24-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1
25-Jun	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
26-Jun	0	0	0	0	Z	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	M	M	--	0
27-Jun	M	M	M	M	M	M	M	M	M	M	M	M	M	M	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	0
28-Jun	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
29-Jun	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
30-Jun	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

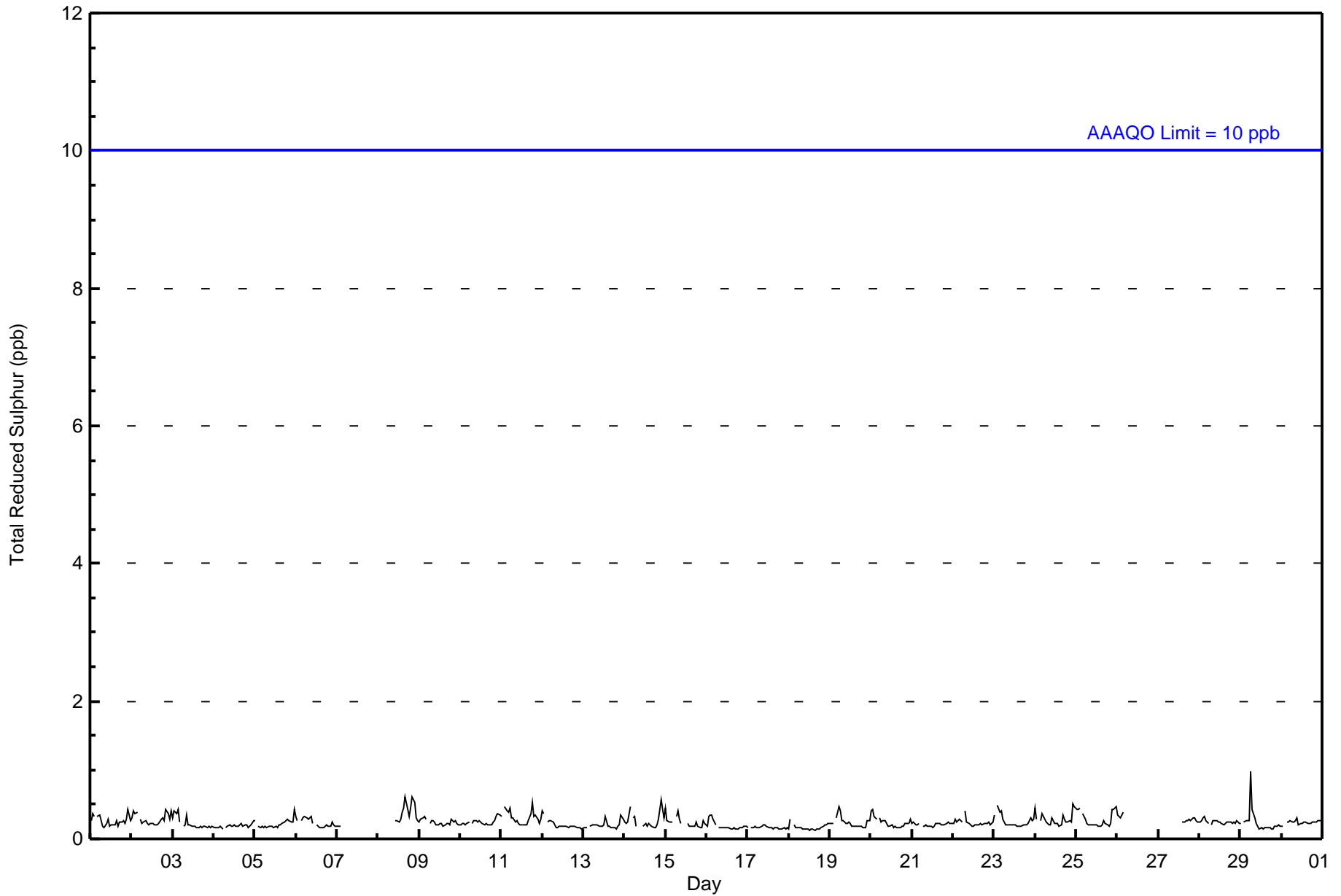
0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	Diurnal Average	
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	0	Diurnal Maximum	

Z - zerspan 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
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Anzac - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Anzac - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	622	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: 622

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Anzac - June 2016

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	20	24	16	16	14	48	71	52	38	39	40	64	70	40	39	622
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
Totals	31	20	24	16	16	14	48	71	52	38	39	40	64	70	40	39	622

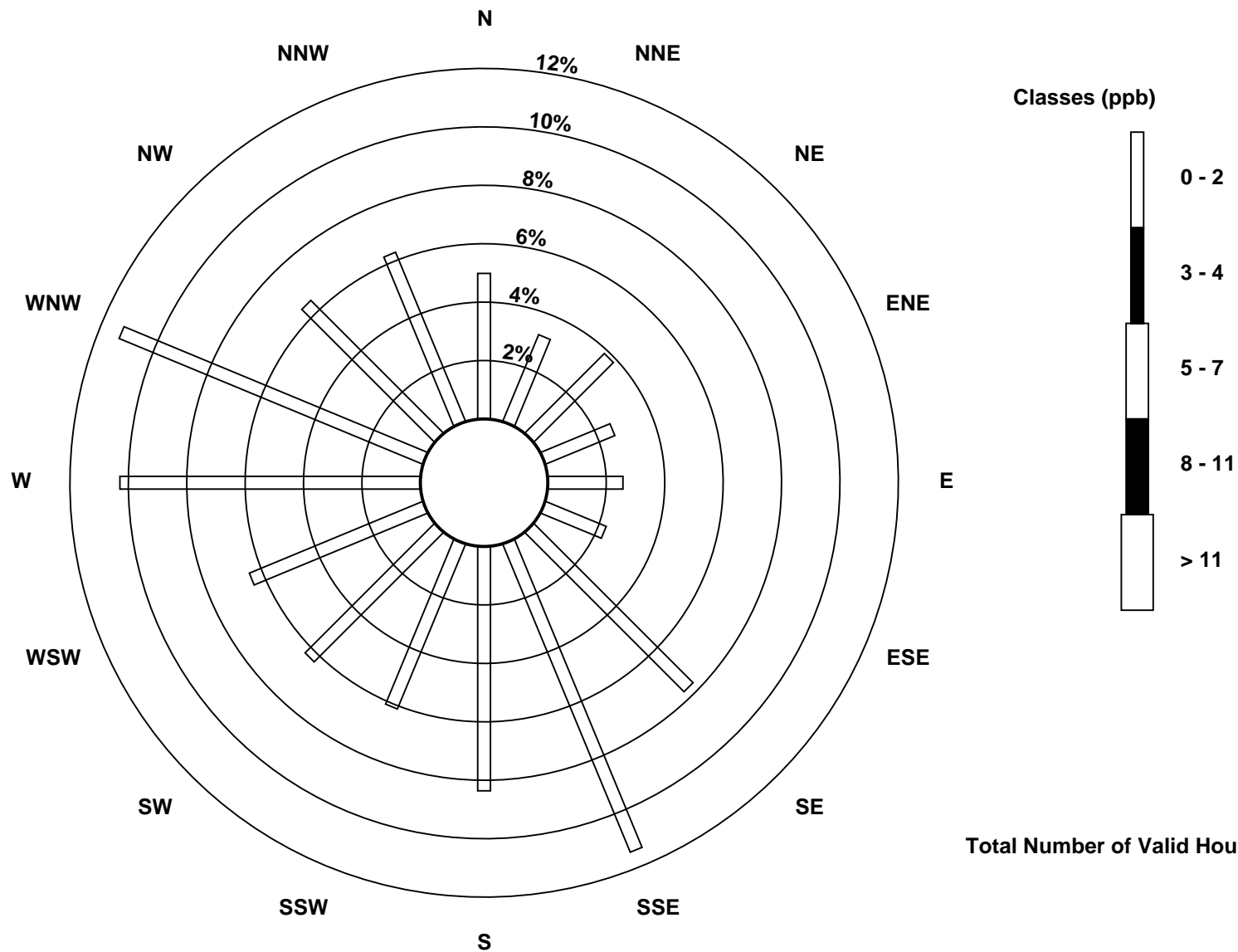
Total Number of Valid Hours: 622

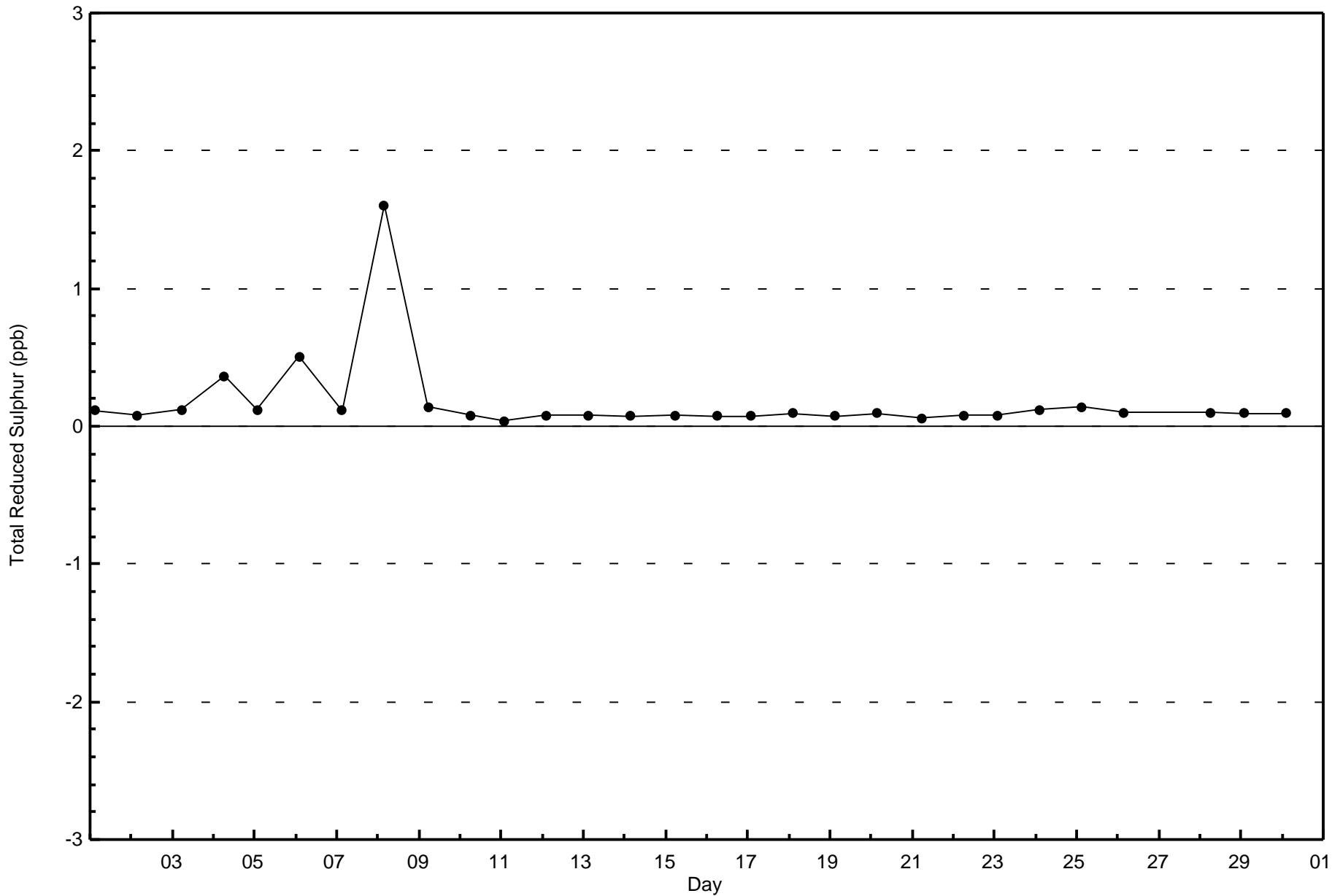
Total Number of Hours: 720

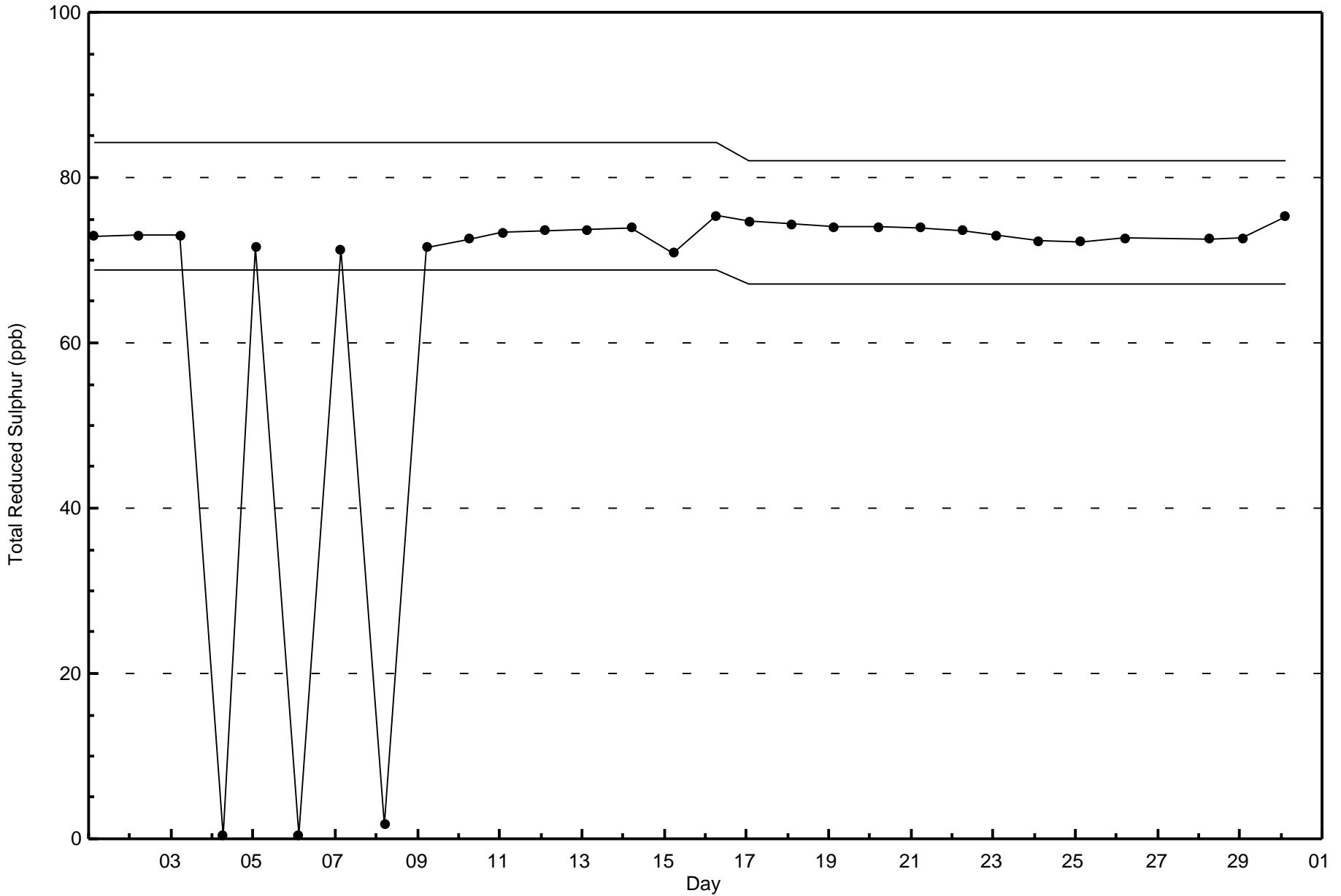


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Total Reduced Sulphur (TRS) - ppb
Anzac (AMS 14)

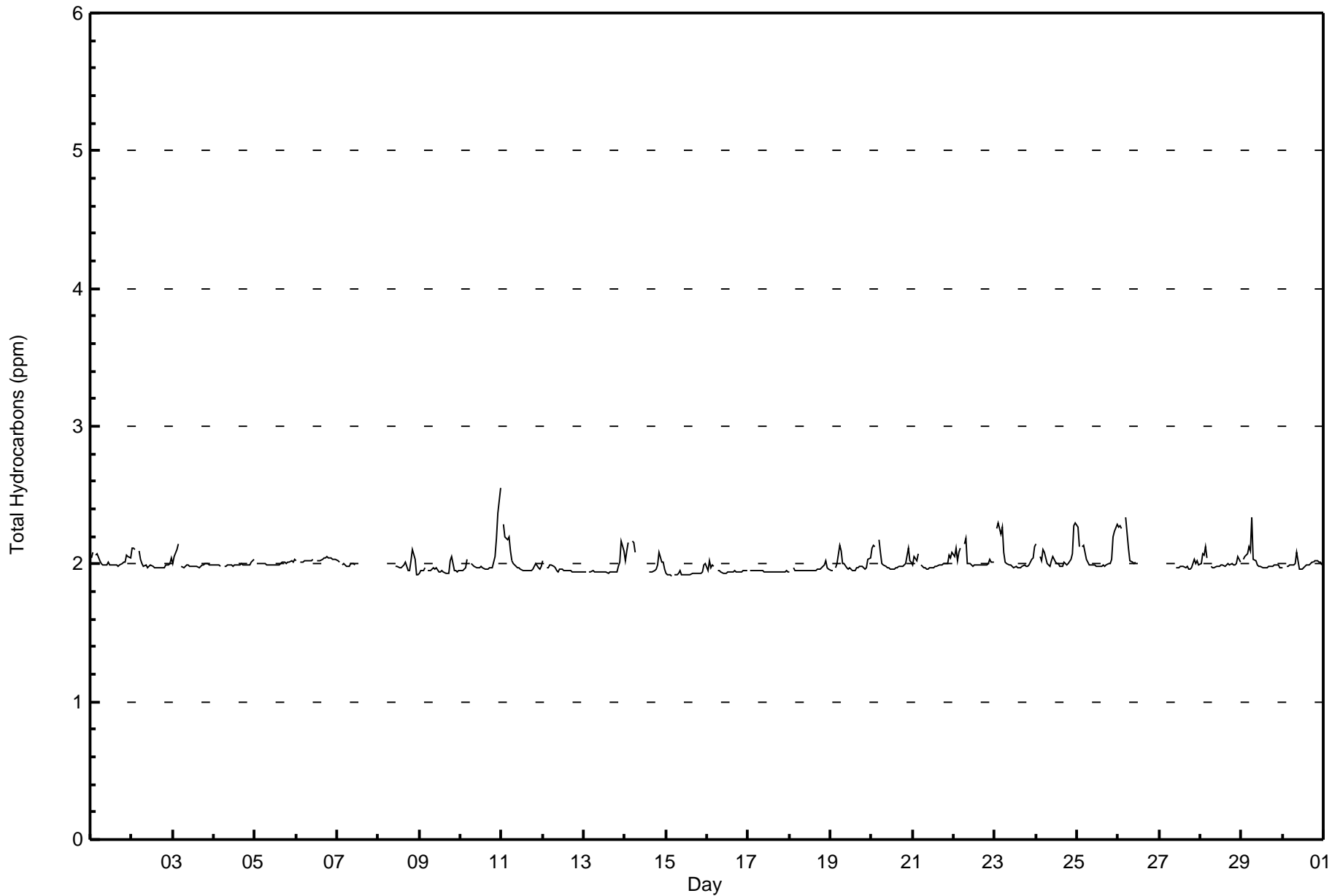








Maximum Value: 2.6 ppm on Jun 11 00:00																				Maximum Daily Average: 2.1 ppm on Jun 25					Hours in Service: 720			
Minimum Value: 1.9 ppm on Jun 15 04:00																				Minimum Daily Average: 1.9 ppm on Jun 15					Hours of Data: 638			
Maximum Diurnal Average: 2.1 ppm at hour 5																				Minimum Diurnal Average: 2.0 ppm at hour 12					Hours of Missing Data: 82			
Monthly Average: 2.00 ppm																				Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 2.0 Median = 2.0 Q ₃ = 2.0 P ₉₀ = 2.1 P ₉₉ = 2.3					Hours of Calibration: 35			
																				Percent Operational Time: 93.5								
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-Jun	2.0	2.1	Z	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	2.1	2.1	2.0	2.0	2.1			
2-Jun	2.1	2.1	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	2.1			
3-Jun	2.0	2.1	2.1	2.1	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	2.1			
4-Jun	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			
5-Jun	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			
6-Jun	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	M	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.1			
7-Jun	2.0	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--			
8-Jun	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	1.9	1.9	1.9	2.1			
9-Jun	1.9	2.0	2.0	2.0	Z	1.9	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.1	1.9	2.0	1.9	2.0	2.1			
10-Jun	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	2.1	2.2	2.4	2.6	2.0	2.6			
11-Jun	Z	2.3	2.2	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	2.0	2.0	2.0	2.0	2.0	2.0	2.3			
12-Jun	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0			
13-Jun	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	2.0	2.0	2.2	2.1	2.0	2.2			
14-Jun	2.0	2.1	2.2	Z	2.2	2.2	2.1	C	C	C	C	C	C	C	1.9	1.9	1.9	1.9	2.0	2.1	2.0	2.0	2.0	--	2.2			
15-Jun	1.9	1.9	1.9	1.9	Z	1.9	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	2.0	2.0	1.9	2.0			
16-Jun	2.0	2.0	2.0	2.0	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	1.9	1.9	1.9	2.0			
17-Jun	Z	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	1.9	1.9	1.9	1.9	2.0	1.9	2.0			
18-Jun	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	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0			
19-Jun	1.9	2.0	Z	2.0	2.0	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	2.1			
20-Jun	2.1	2.1	2.1	Z	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	2.0	2.0	2.1	2.0	2.0	2.0	2.2			
21-Jun	2.0	2.1	2.0	2.1	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	2.0	2.1	2.0	2.1			
22-Jun	2.1	2.1	2.0	2.1	2.1	Z	2.2	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	2.2			
23-Jun	Z	2.3	2.3	2.2	2.3	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	2.3			
24-Jun	2.1	Z	2.0	2.0	2.1	2.1	2.0	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	2.1	2.3	2.3	2.0	2.3			
25-Jun	2.3	2.1	Z	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	2.2	2.2	2.3	2.1	2.3			
26-Jun	2.3	2.3	2.3	Z	2.3	2.2	2.1	2.0	2.0	2.0	2.0	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	M	M	M	--			
27-Jun	M	M	M	M	M	M	M	M	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	2.0			
28-Jun	2.0	2.1	2.1	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	2.0	2.1	2.0	2.0	2.1			
29-Jun	Z	2.0	2.1	2.1	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	2.0	2.0	2.0	2.0	2.0	2.0	2.3			
30-Jun	2.0	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1			
																								Diurnal Average				
																								Diurnal Maximum				
																								Z - zerospan				
																								C - Calibration				
																								M - Maintenance				
																								UO - Unstable Operation				





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Anzac - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	552	86.52	86.52
2.1 - 3.0	86	13.48	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 638

Total Number of Hours: 720



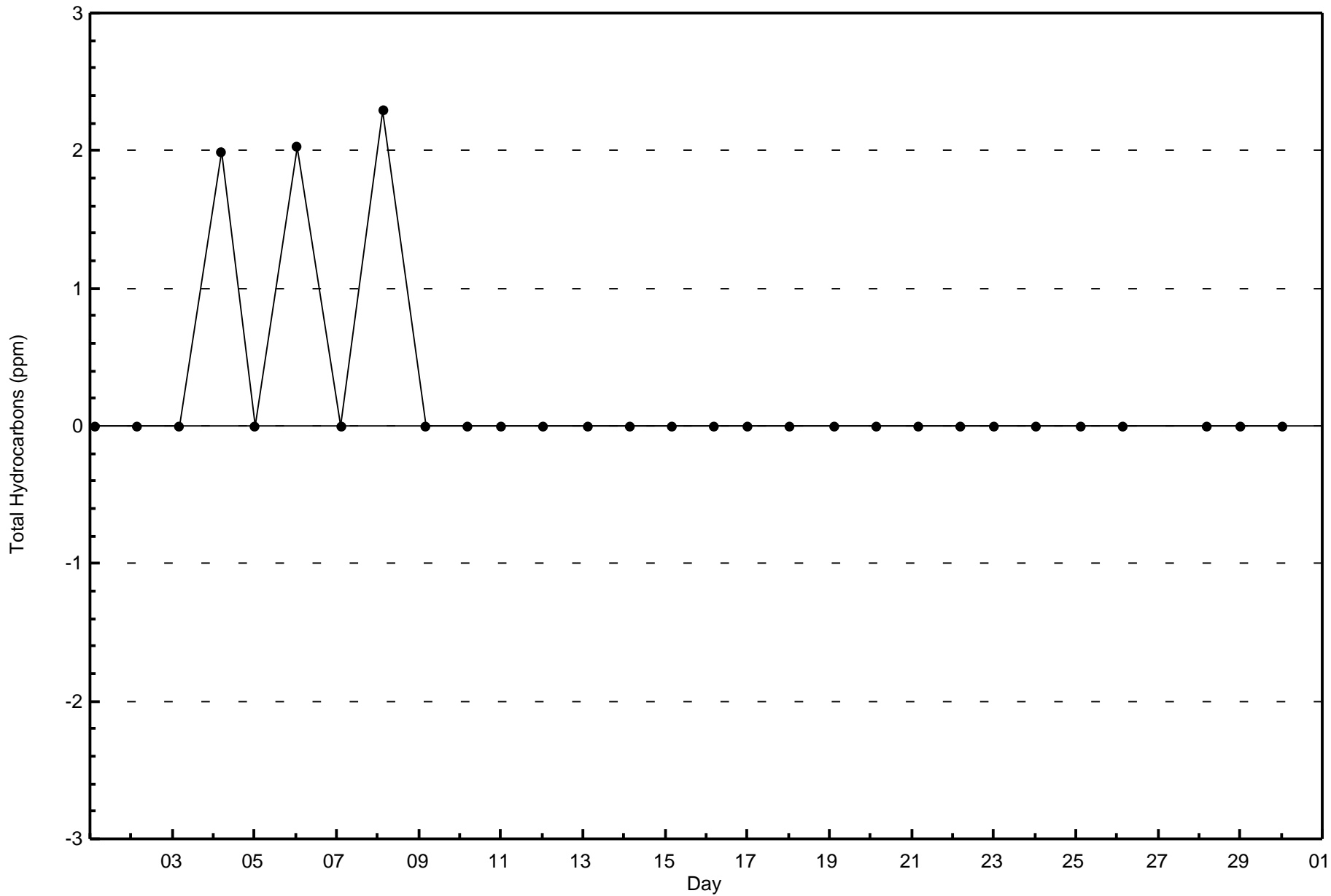
Wood Buffalo Environmental Association
Frequency Distribution

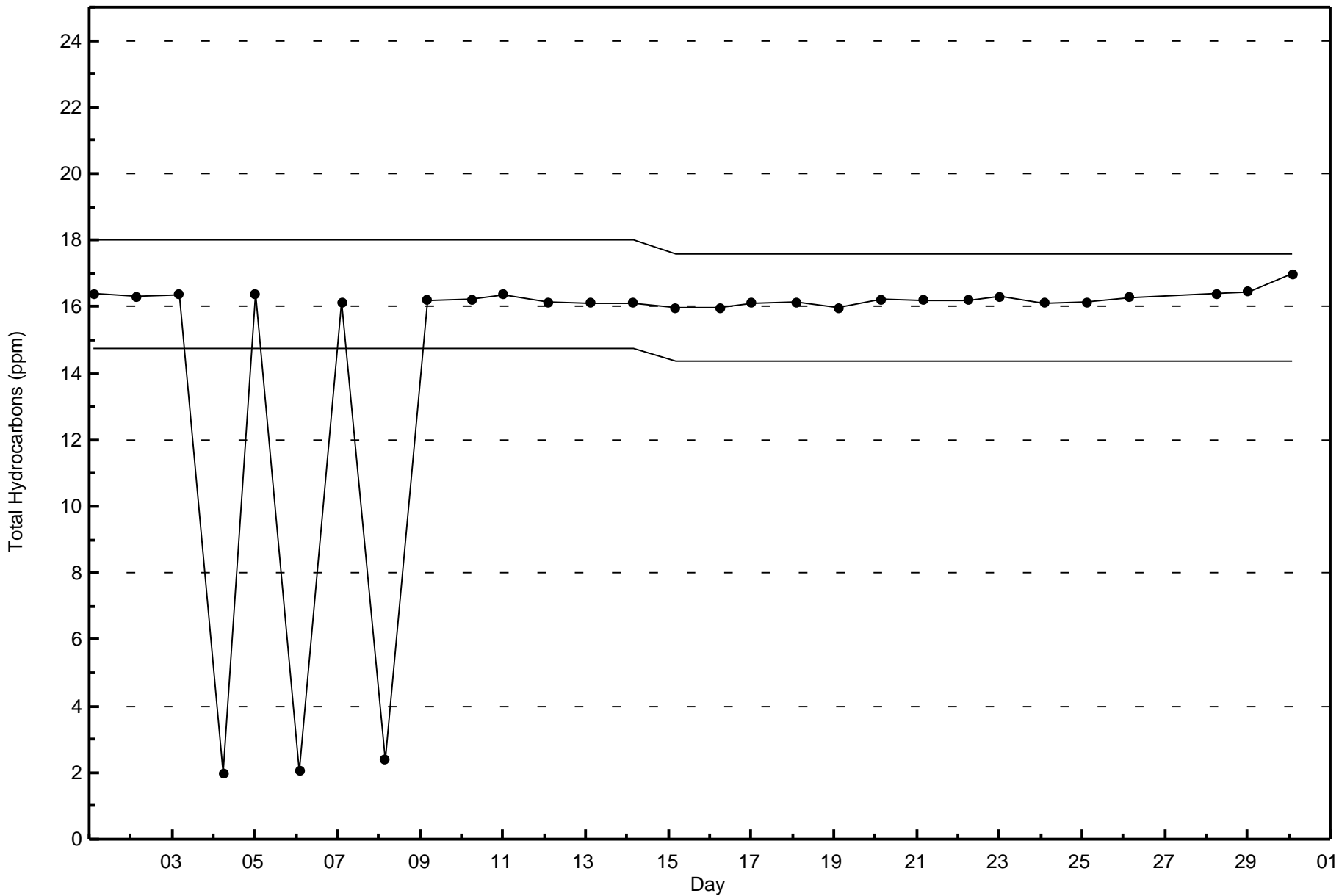
Total Hydrocarbons (THC) - ppm
Anzac - June 2016

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	25	19	25	12	14	7	40	61	44	33	31	35	59	76	38	33	552
2.1 - 3.0	3	2	1	3	3	5	4	9	14	8	8	6	7	1	5	6	85
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
Totals	28	21	26	15	17	12	44	70	58	41	39	41	66	77	43	39	637

Total Number of Valid Hours: 637

Total Number of Hours: 720



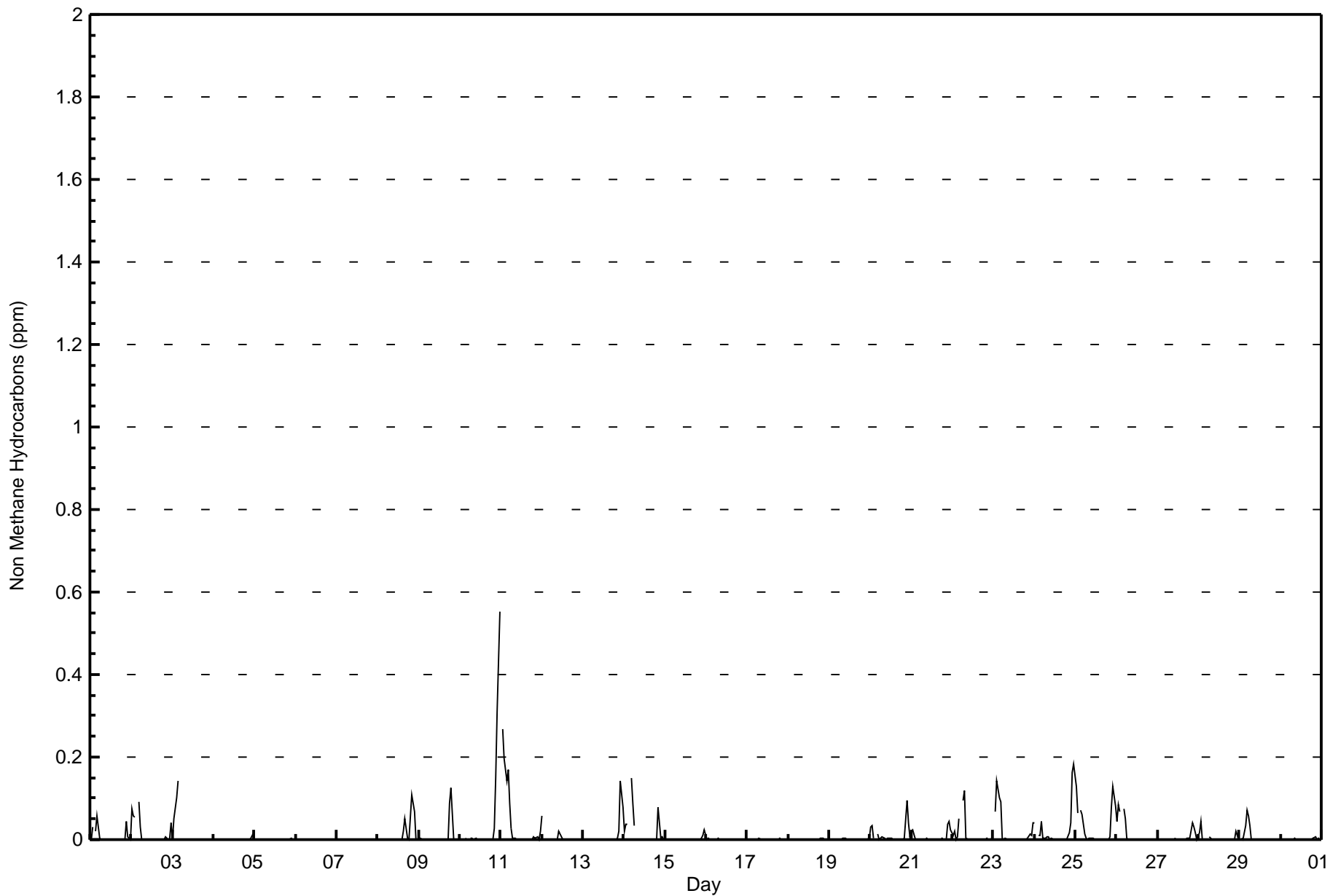




Summary of Hour Averages

Anzac - June 2016

Maximum Value: 0.551 ppm on Jun 11 00:00		Maximum Daily Average: 0.046 ppm on Jun 10		Hours in Service:	720																								
Minimum Value: 0.000 ppm on Jun 1 01:00		Minimum Daily Average: 0.000 ppm on Jun 5		Hours of Data:	638																								
Maximum Diurnal Average: 0.039 ppm at hour 24		Minimum Diurnal Average: 0.000 ppm at hour 14		Hours of Missing Data:	82																								
Monthly Average: 0.012 ppm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 O ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 0.2		Hours of Calibration:	35																								
				Percent Operational Time:	93.5																								
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-Jun	0.000	0.031	Z	0.021	0.058	0.005	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	0.045	0.007	0.000	0.007	0.058			
2-Jun	0.075	0.059	0.054	Z	0.093	0.031	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	0.002	0.003	0.042	0.016	0.093			
3-Jun	0.001	0.050	0.100	0.141	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	0.001	0.013	0.141			
4-Jun	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	0.003	0.016	0.001	0.016			
5-Jun	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	0.004	0.000	0.001	0.000	0.004			
6-Jun	0.000	Z	0.000	0.000	0.000	0.001	0.002	0.000	0.000	0.000	0.000	M	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.002			
7-Jun	0.000	0.000	Z	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	0.001			
8-Jun	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	0.000	0.000	0.000	0.000	0.000	0.020	0.050	0.004	0.001	0.054	0.108	0.067	0.000	0.000	--	0.108			
9-Jun	0.000	0.004	0.001	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	0.088	0.127	0.000	0.000	0.000	0.000	0.010	0.127			
10-Jun	0.000	0.000	0.000	0.000	0.004	Z	0.004	0.003	0.001	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.028	0.151	0.307	0.551	0.046	0.551			
11-Jun	Z	0.268	0.195	0.142	0.169	0.089	0.028	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.007	0.002	0.006	0.000	0.022	0.041	0.268			
12-Jun	0.058	Z	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.019	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.058			
13-Jun	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	0.002	0.019	0.141	0.078	0.010	0.141			
14-Jun	0.022	0.036	0.036	Z	0.149	0.087	0.034	C	C	C	C	C	C	C	0.000	0.000	0.000	0.000	0.000	0.000	0.078	0.005	0.005	0.000	--	0.149			
15-Jun	0.000	0.000	0.000	0.000	Z	0.002	0.001	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	0.002	0.010	0.025	0.002	0.025			
16-Jun	0.000	0.003	0.000	0.000	0.000	Z	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	0.000	0.003			
17-Jun	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	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.003			
18-Jun	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.002	0.000	0.000	0.001	0.000	0.003			
19-Jun	0.000	0.000	Z	0.000	0.000	0.000	0.000	0.001	0.005	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	0.003	0.001	0.005			
20-Jun	0.031	0.034	0.003	Z	0.013	0.000	0.005	0.008	0.005	0.001	0.004	0.002	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.004	0.095	0.040	0.008	0.011	0.095			
21-Jun	0.021	0.023	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	0.002	0.000	0.002	0.038	0.046	0.023	0.007	0.046			
22-Jun	0.010	0.019	0.000	0.007	0.049	Z	0.096	0.120	0.003	0.000	0.000	0.000	0.000	0.002	0.000	0.001	0.001	0.000	0.001	0.002	0.000	0.000	0.004	0.004	0.014	0.120			
23-Jun	Z	0.068	0.143	0.101	0.093	0.002	0.000	0.002	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.004	0.015	0.010	0.042	0.021	0.143			
24-Jun	0.042	Z	0.010	0.011	0.043	0.004	0.002	0.006	0.005	0.001	0.004	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.002	0.018	0.041	0.164	0.184	0.023	0.184			
25-Jun	0.130	0.066	Z	0.072	0.059	0.014	0.003	0.000	0.003	0.003	0.003	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.008	0.077	0.128	0.081	0.028	0.130			
26-Jun	0.046	0.086	0.068	Z	0.076	0.051	0.004	0.001	0.000	0.000	0.000	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	M	M	M	--	0.086			
27-Jun	M	M	M	M	M	M	M	M	M	M	0.003	0.000	0.001	0.000	0.000	0.000	0.000	0.002	0.005	0.005	0.042	0.031	0.015	0.002	--	0.042			
28-Jun	0.017	0.045	0.000	0.000	0.000	Z	0.006	0.003	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.020	0.001	0.004	0.045			
29-Jun	Z	0.003	0.001	0.035	0.072	0.059	0.034	0.000	0.000	0.000	0.000	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	0.009	0.072			
30-Jun	0.000	Z	0.000	0.000	0.000	0.000	0.000	0.002	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.004	0.007	0.000	0.002	0.000	0.001	0.007			
																								Diurnal Average					
																								Diurnal Maximum					
0.020 0.034 0.027 0.022 0.037 0.015 0.008 0.006 0.001 0.001 0.001 0.000 0.000 0.000 0.000 0.001 0.002 0.000 0.004 0.007 0.011 0.021 0.032 0.039																													
0.130 0.268 0.195 0.142 0.169 0.089 0.096 0.120 0.005 0.004 0.019 0.006 0.002 0.001 0.002 0.020 0.050 0.004 0.088 0.127 0.108 0.151 0.307 0.551																													
Z - zerospan																								C - Calibration		M - Maintenance		UO - Unstable Operation	





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Anzac - June 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	528	82.76	82.76
0.006 - 0.05	65	10.19	92.95
0.06 - 0.1	37	5.80	98.75
> 0.1	8	1.25	100.00

Total Number of Valid Hours: 638

Total Number of Hours: 720



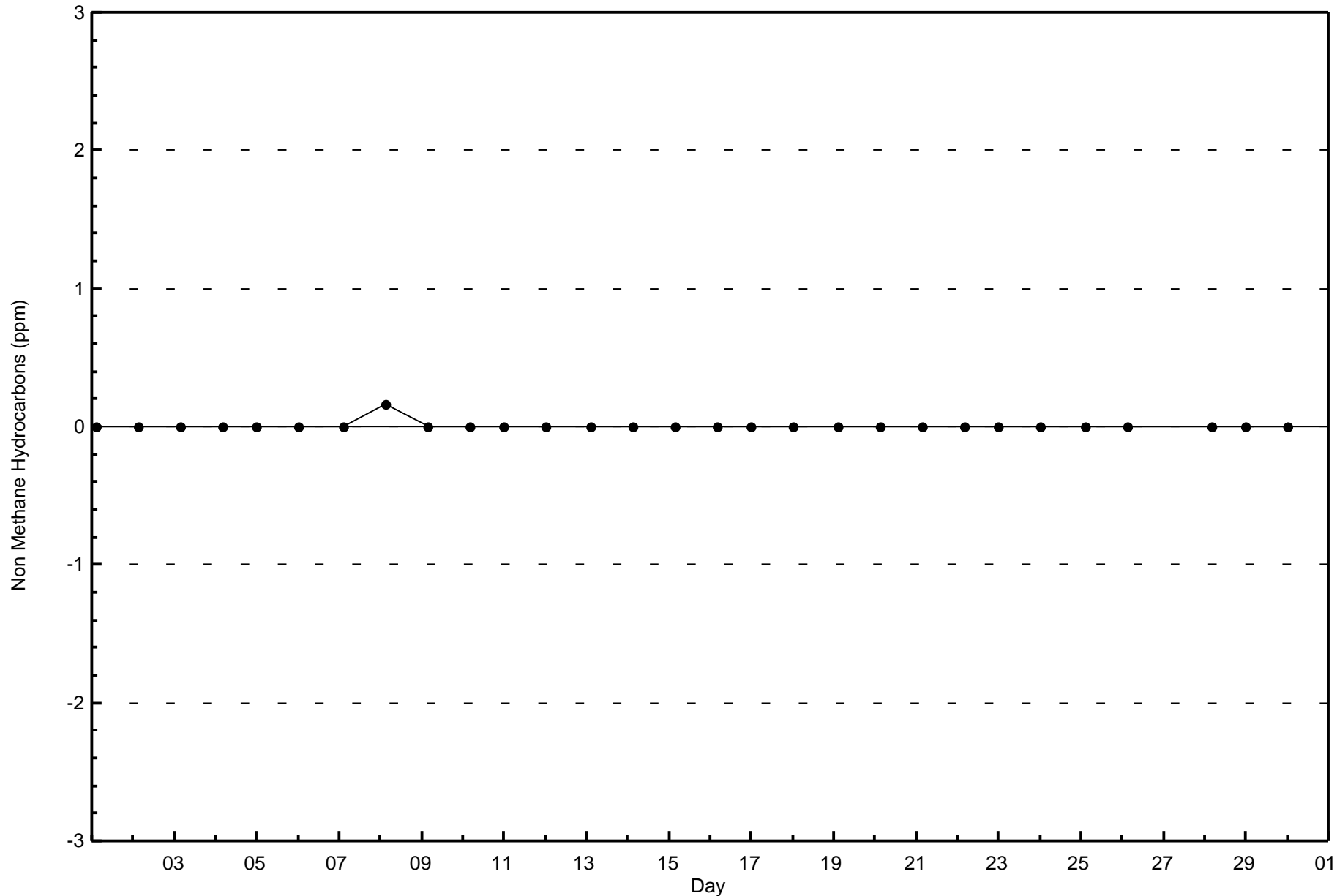
Wood Buffalo Environmental Association
Frequency Distribution

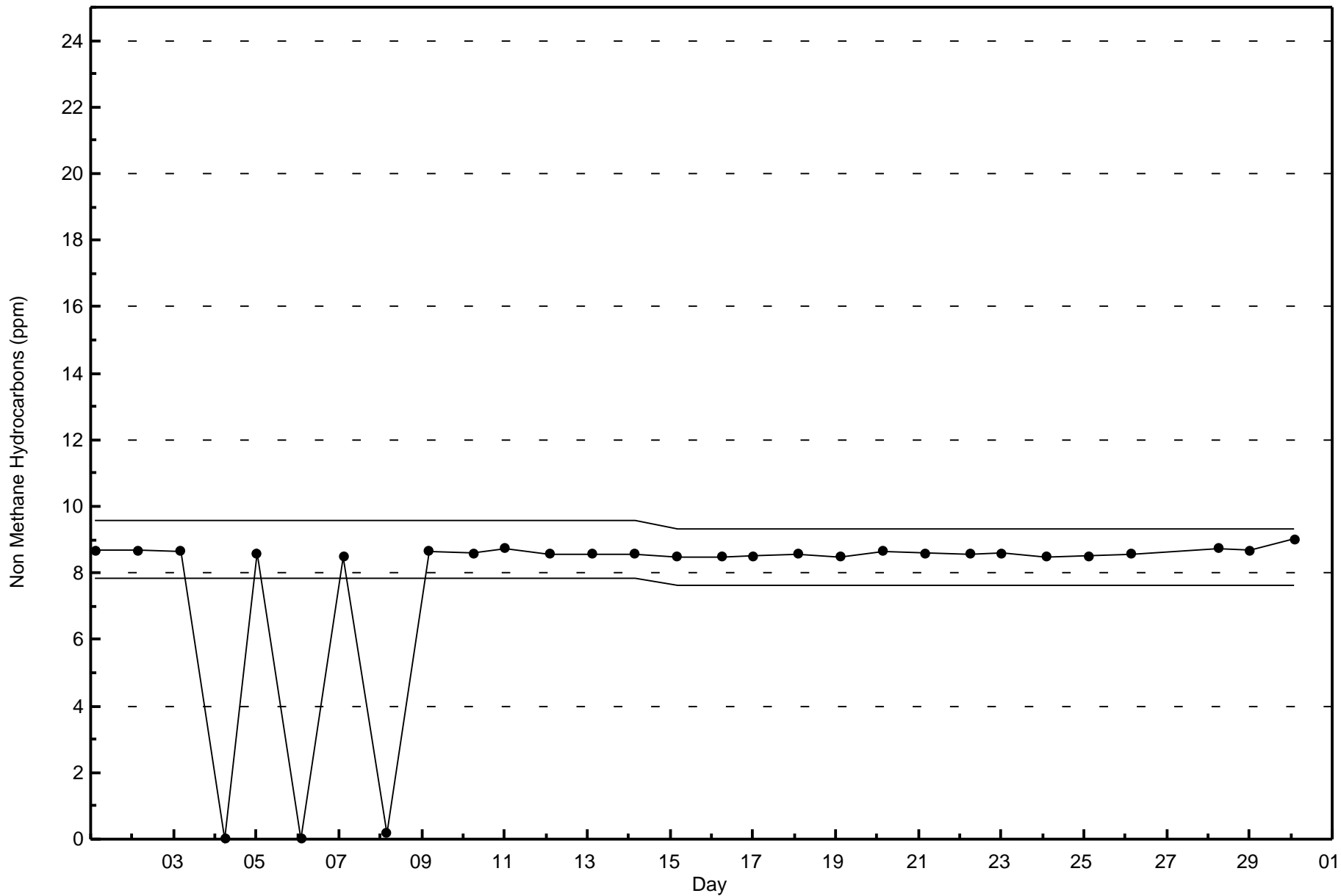
Non Methane Hydrocarbons (NMHC) - ppm
Anzac - June 2016

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	26	17	22	11	14	7	33	58	38	33	31	31	61	74	40	32	528
0.006 - 0.05	1	1	3	4	3	1	7	4	15	3	5	7	4	3	1	3	65
0.06 - 0.1	1	3	1	0	0	2	4	4	5	5	3	3	1	0	2	2	36
> 0.1	0	0	0	0	0	2	0	4	0	0	0	0	0	0	0	2	8
Totals	28	21	26	15	17	12	44	70	58	41	39	41	66	77	43	39	637

Total Number of Valid Hours: 637

Total Number of Hours: 720

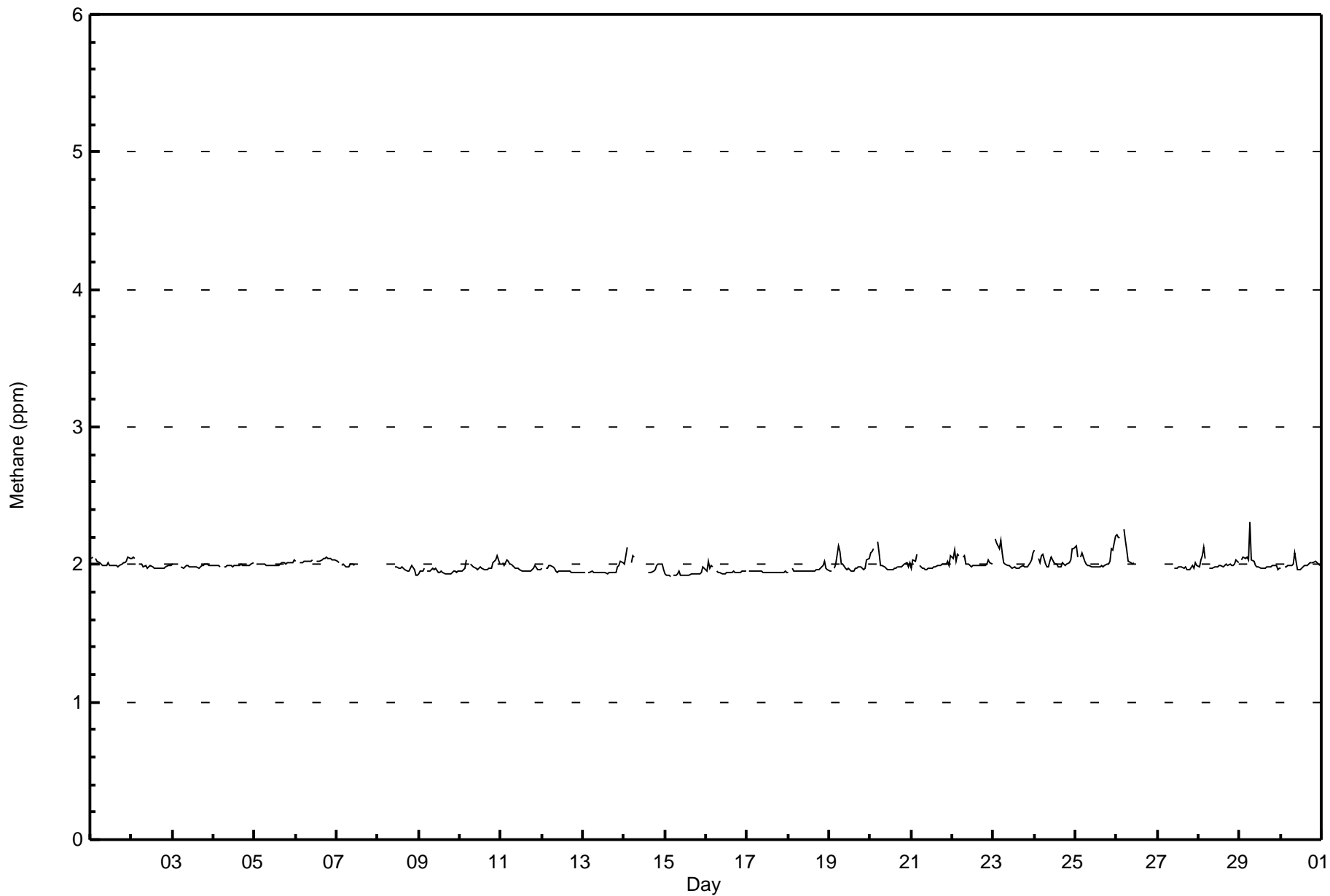






Wood Buffalo Environmental Association
Hourly Averages

Methane (CH₄) - ppm
Anzac - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Methane (CH₄) - ppm
Anzac - June 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	585	91.69	91.69
2.1 - 3.0	53	8.31	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 638

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Methane (CH₄) - ppm
Anzac - June 2016

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	25	21	25	14	15	10	41	69	51	36	33	36	59	77	38	34	584
2.1 - 3.0	3	0	1	1	2	2	3	1	7	5	6	5	7	0	5	5	53
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
Totals	28	21	26	15	17	12	44	70	58	41	39	41	66	77	43	39	637

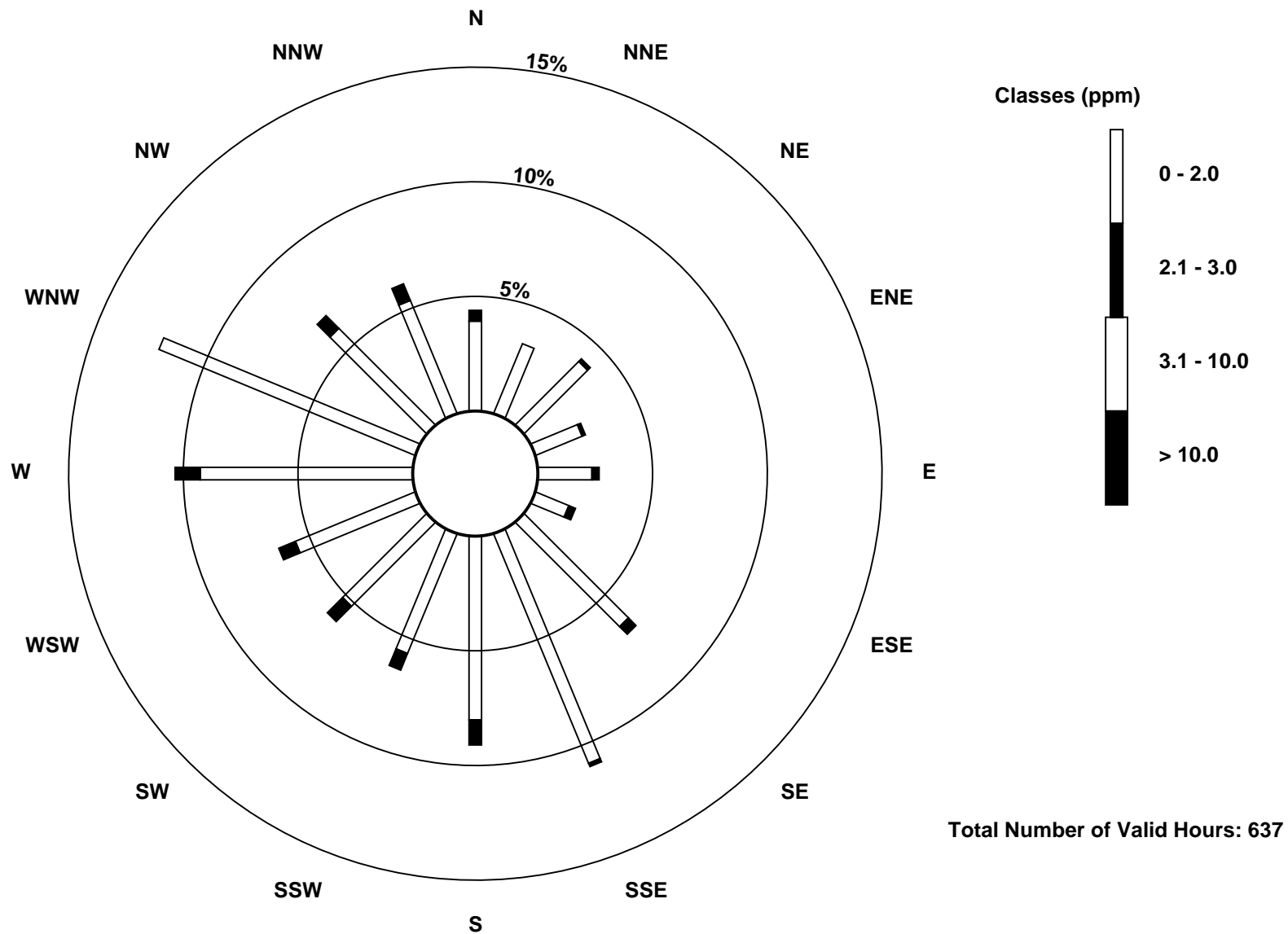
Total Number of Valid Hours: 637

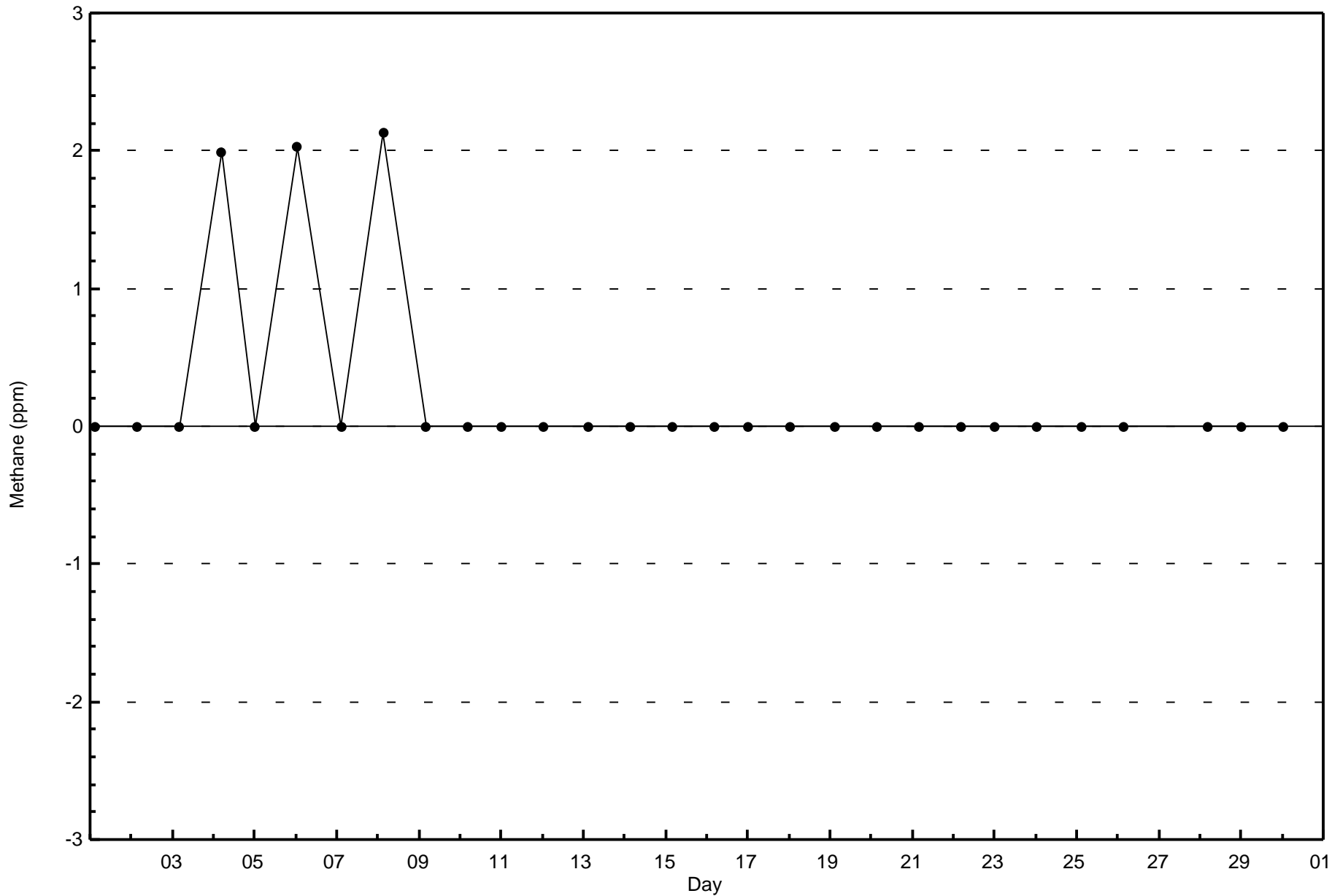
Total Number of Hours: 720

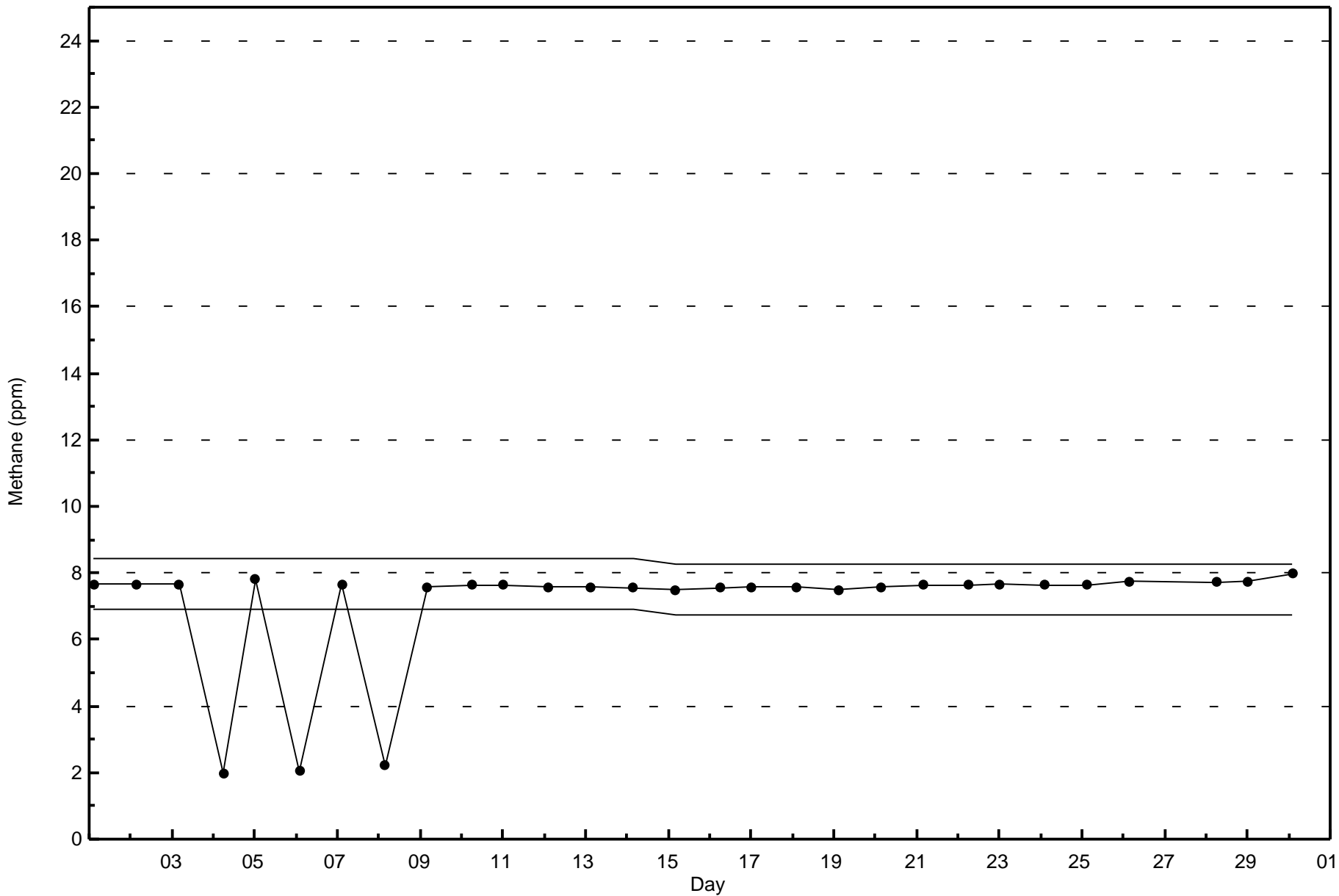


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Methane (CH₄) - ppm
Anzac (AMS 14)









Maximum Value: 12 ppb on Jun 11 03:00	Maximum Daily Average: 1.2 ppb on Jun 11	Hours in Service: 720
Minimum Value: 0 ppb on Jun 3 16:00	Minimum Daily Average: 0.1 ppb on Jun 4	Hours of Data: 609
Maximum Diurnal Average: 2.0 ppb at hour 3	Minimum Diurnal Average: 0.1 ppb at hour 18	Hours of Missing Data: 111
Monthly Average: 0.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 4	Hours of Calibration: 40
		Percent Operational Time: 90.1

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-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0.3	2
2-Jun	1	3	9	Z	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.9	9
3-Jun	1	0	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1
4-Jun	1	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.1	1	
5-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.2	2	
6-Jun	1	Z	1	0	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	1	1	1	0.5	1
7-Jun	0	1	Z	0	0	0	0	0	0	0	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	1
8-Jun	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	0	0	0	0	1	0	0	0	0	0	0	0	0	0	--	1
9-Jun	0	0	3	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	3
10-Jun	0	0	0	0	0	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	5	0.5	5	
11-Jun	Z	8	12	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.2	12
12-Jun	1	Z	3	2	0	0	1	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0.7	3
13-Jun	0	0	Z	0	0	0	0	0	0	0	0	C	C	M	M	M	M	M	M	M	M	M	M	M	--	0
14-Jun	M	M	M	M	M	M	M	M	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	--	0
15-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1
16-Jun	0	0	0	0	0	Z	0	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
17-Jun	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
18-Jun	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
19-Jun	0	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
20-Jun	0	0	0	Z	2	1	0	0	0	0	1	2	0	0	3	0	0	0	0	0	0	1	0	0	0.6	3
21-Jun	0	0	0	0	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
22-Jun	3	1	8	3	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	8
23-Jun	Z	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3
24-Jun	0	Z	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
25-Jun	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
26-Jun	1	1	1	Z	1	1	0	0	0	0	0	0	0	UO	UO	UO	UO	UO	UO	UO	M	M	M	M	--	1
27-Jun	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	0	0	0	0	1	1	2	5	--	5
28-Jun	3	2	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3
29-Jun	Z	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0.3	2
30-Jun	2	Z	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	3	0.8	3

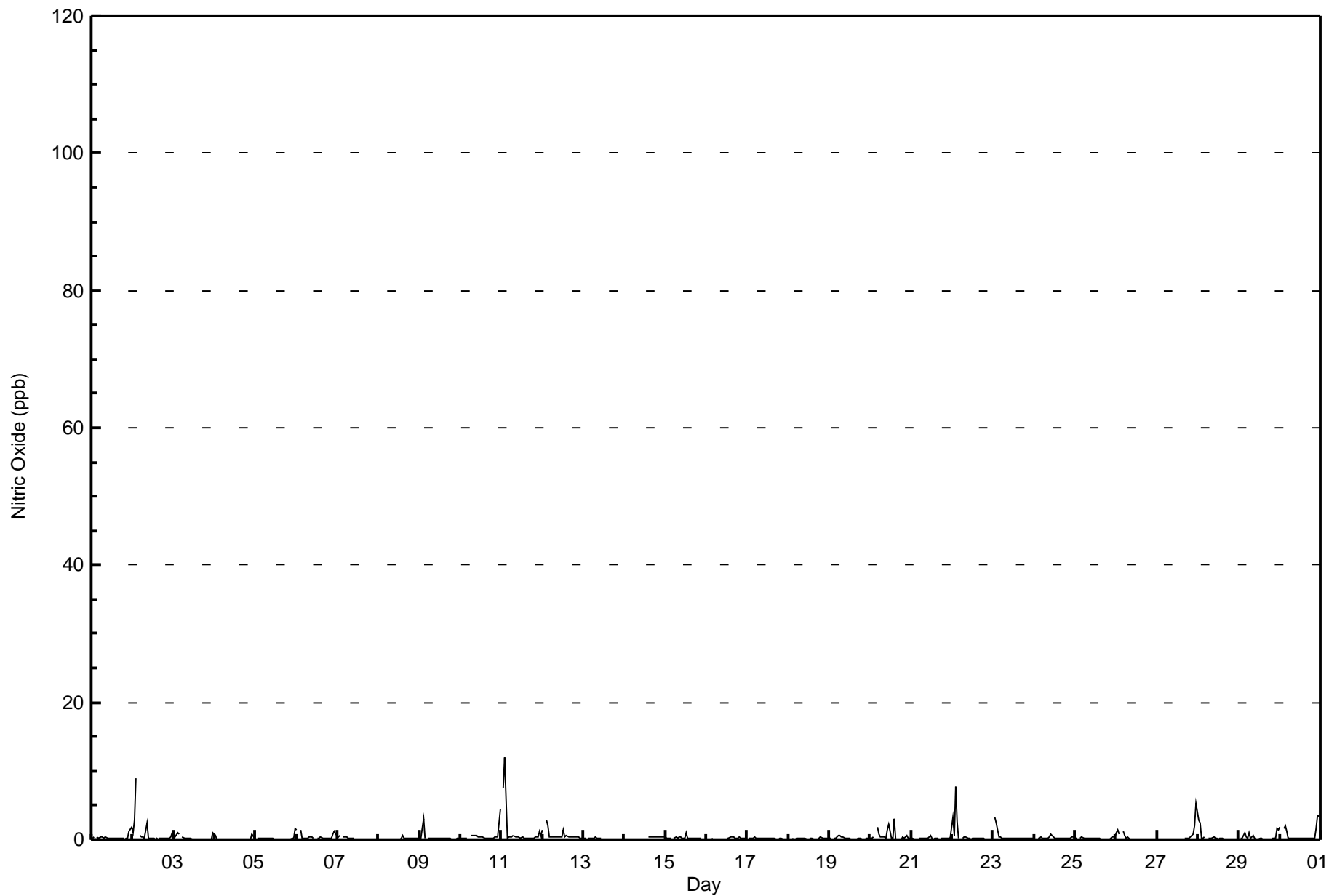
0.7	1.0	2.0	0.5	0.5	0.3	0.3	0.3	0.3	0.4	0.2	0.3	0.3	0.2	0.2	0.3	0.1	0.2	0.1	0.1	0.2	0.2	0.3	0.6	0.9	Diurnal Average
3	8	12	3	2	1	1	1	1	2	1	1	2	2	0	3	0	0	0	0	0	1	2	3	5	Diurnal Maximum

Z - zerospan C - Calibration M - Maintenance UO - Unstable Operation



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Anzac - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Anzac - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	609	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: 609

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Anzac - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	28	19	26	15	17	11	43	69	54	37	37	37	61	71	44	39	608
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
Totals	28	19	26	15	17	11	43	69	54	37	37	37	61	71	44	39	608

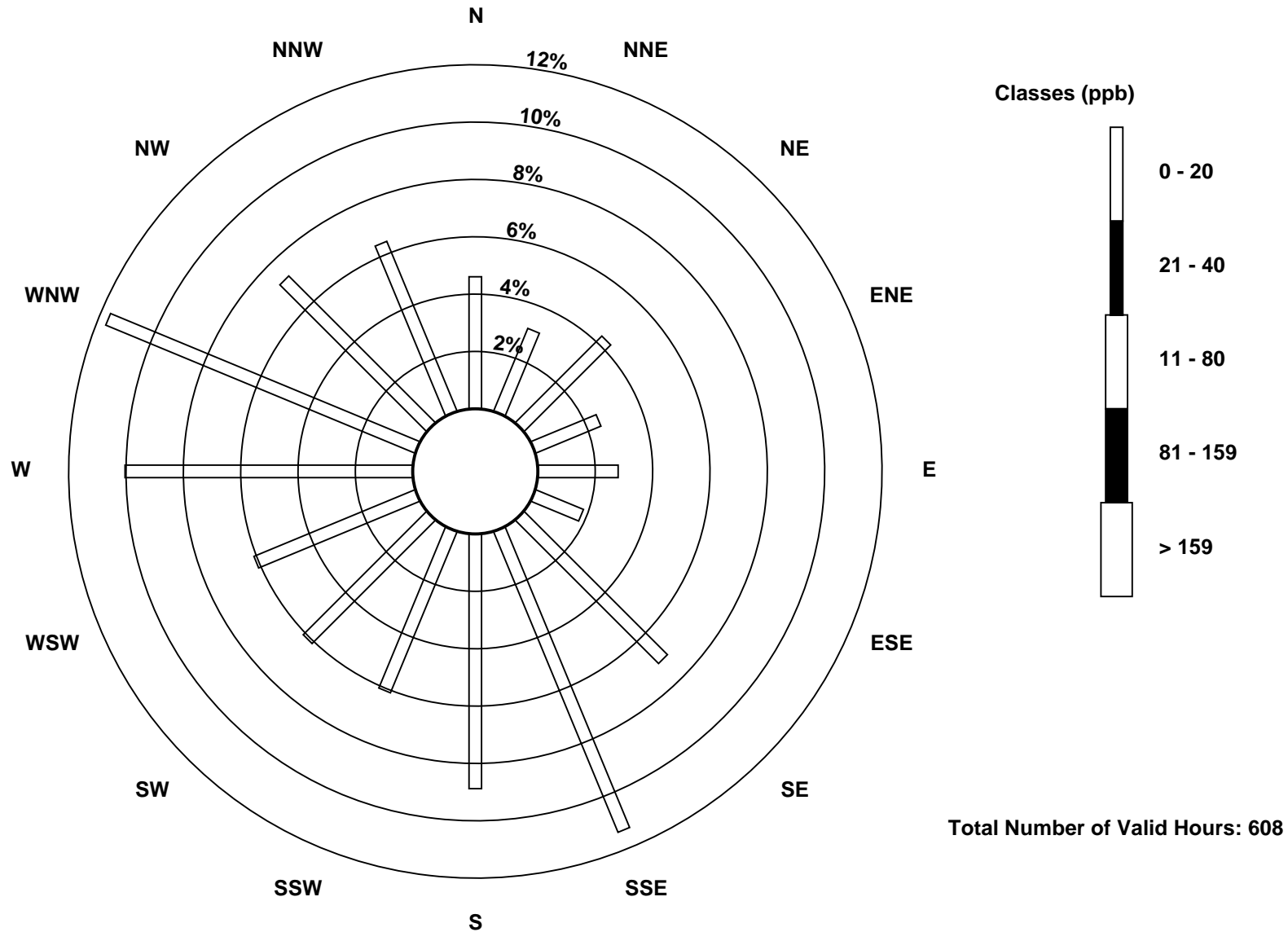
Total Number of Valid Hours: 608

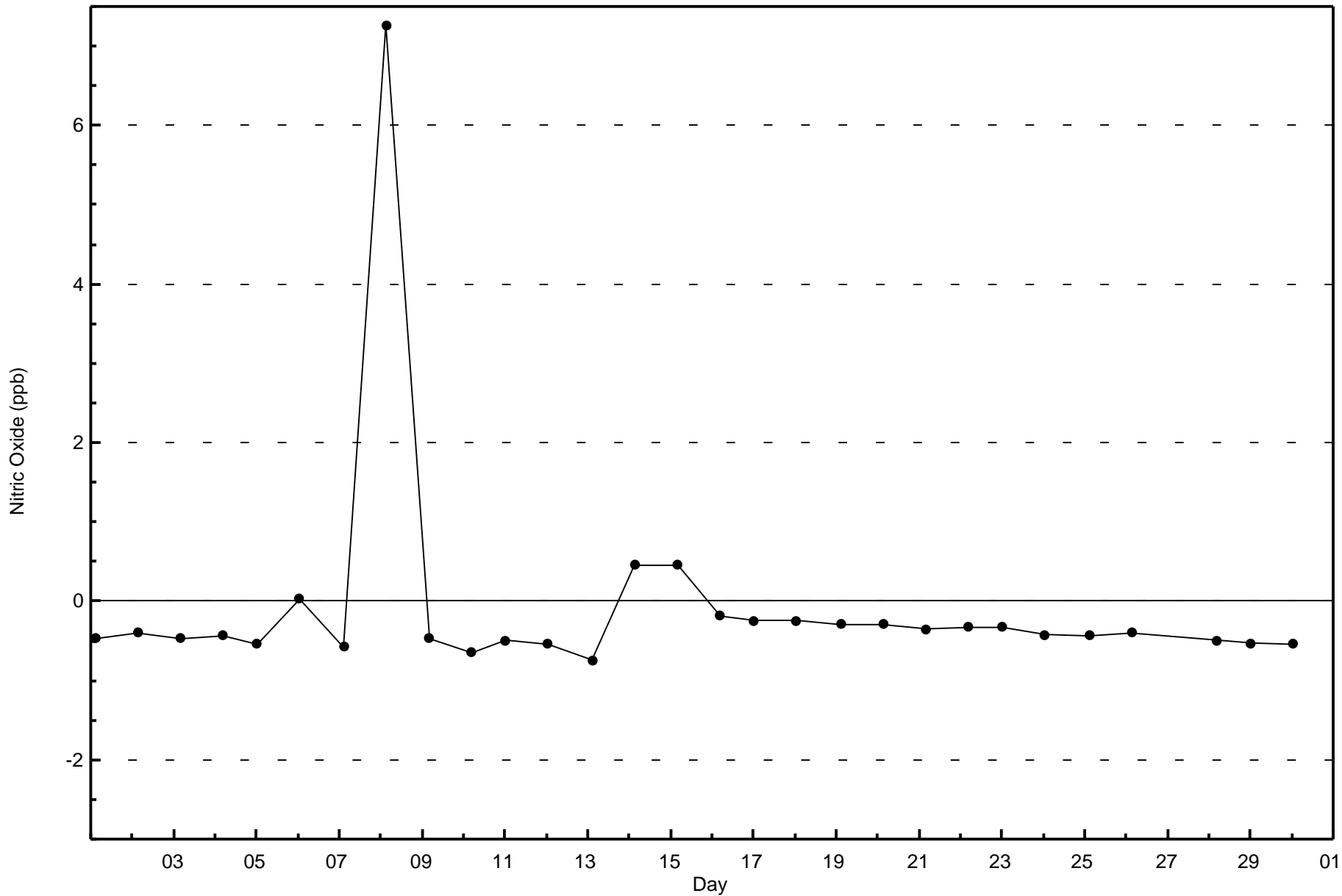
Total Number of Hours: 720

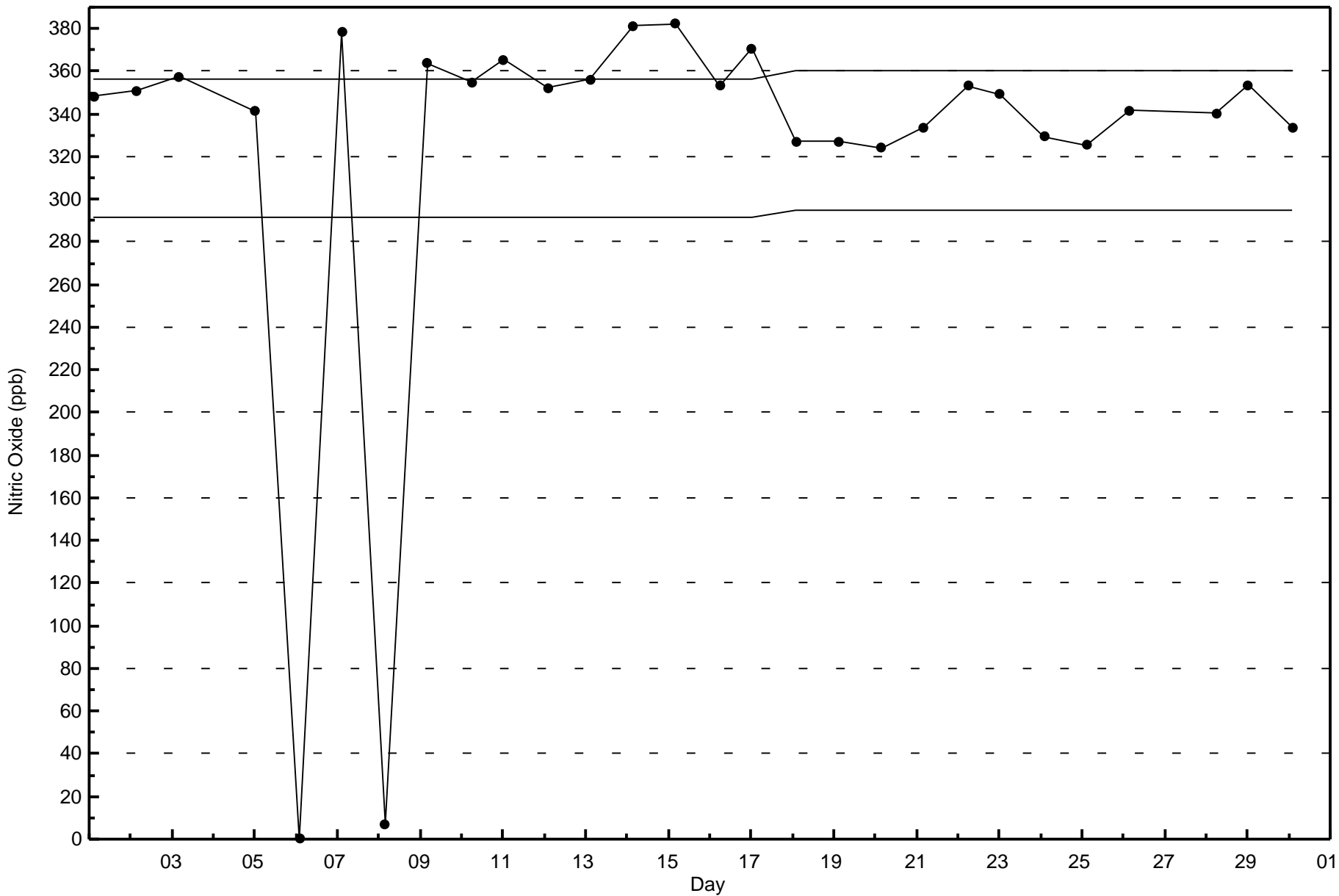


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitric Oxide (NO) - ppb
Anzac (AMS 14)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Anzac - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 7 ppb on Jun 4 00:00	Maximum Daily Average: 1.9 ppb on Jun 30		Hours of Data:	609
Minimum Value: 0 ppb on Jun 9 12:00	Minimum Daily Average: 0.2 ppb on Jun 9		Hours of Missing Data:	111
Maximum Diurnal Average: 1.9 ppb at hour 3	Minimum Diurnal Average: 0.5 ppb at hour 16		Hours of Calibration:	40
Monthly Average: 1.0 ppb	Percentiles: P ₁ =0 P ₁₀ =0 Q ₁ =0 Median=1 Q ₃ =1 P ₉₀ =2 P ₉₉ =5		Percent Operational Time:	90.1

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-Jun	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.9	2	
2-Jun	2	2	4	Z	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1.2	4	
3-Jun	1	1	2	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7	1.1	7		
4-Jun	2	1	1	1	1	Z	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	2	3	0.8	3	
5-Jun	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0.5	2		
6-Jun	2	Z	2	1	1	1	1	1	1	1	1	M	1	1	1	1	1	1	1	1	1	2	3	3	1.3	3	
7-Jun	2	2	Z	1	1	1	1	1	1	1	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	2		
8-Jun	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	0	0	0	1	1	1	1	1	1	1	2	1	1	1	--	2	
9-Jun	0	0	2	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2	
10-Jun	0	0	0	0	1	Z	2	1	1	1	1	1	1	0	0	0	0	0	0	0	1	2	1	3	0.9	3	
11-Jun	Z	3	6	1	1	1	1	2	1	1	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1.1	6	
12-Jun	2	Z	3	3	1	1	1	1	0	1	1	1	1	1	1	1	0	0	1	0	1	0	0	0	0.8	3	
13-Jun	0	0	Z	0	0	0	0	0	0	0	0	C	C	C	M	M	M	M	M	M	M	M	M	M	--	0	
14-Jun	M	M	M	M	M	M	M	M	C	C	C	C	C	C	1	0	0	1	1	1	1	1	1	1	--	1	
15-Jun	1	1	0	1	Z	1	1	1	1	1	1	0	1	0	0	0	1	1	1	1	1	1	2	1	0.6	2	
16-Jun	0	1	0	1	1	Z	1	C	C	C	C	C	0	0	1	1	1	0	0	1	0	1	0	0	0.5	1	
17-Jun	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.2	1	
18-Jun	0	Z	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	1	2	0.5	2	
19-Jun	1	1	Z	2	3	3	2	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	2	1	1.1	3	
20-Jun	1	1	1	Z	2	2	2	2	2	2	1	1	2	0	0	4	0	0	0	0	1	2	2	1	1	1.3	4
21-Jun	1	1	1	1	Z	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	2	2	1	1	0.8	2	
22-Jun	5	2	5	3	2	Z	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.6	5	
23-Jun	Z	3	5	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	2	1.4	5	
24-Jun	2	Z	2	1	2	1	1	1	1	3	4	2	2	1	1	1	2	1	1	1	1	1	1	1	1.5	4	
25-Jun	2	3	Z	3	2	2	1	1	0	0	0	0	1	1	0	0	0	0	0	0	1	1	2	1	1.0	3	
26-Jun	2	2	2	Z	1	1	1	2	1	1	1	1	1	UO	UO	UO	UO	UO	UO	UO	M	M	M	M	--	2	
27-Jun	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	2	2	2	2	3	3	5	5	--	5	
28-Jun	3	3	1	1	2	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1.1	3	
29-Jun	Z	1	1	2	1	1	4	1	1	1	0	0	0	1	0	0	0	0	0	0	1	1	2	2	0.9	4	
30-Jun	4	Z	2	3	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	3	6	6	1.9	6	

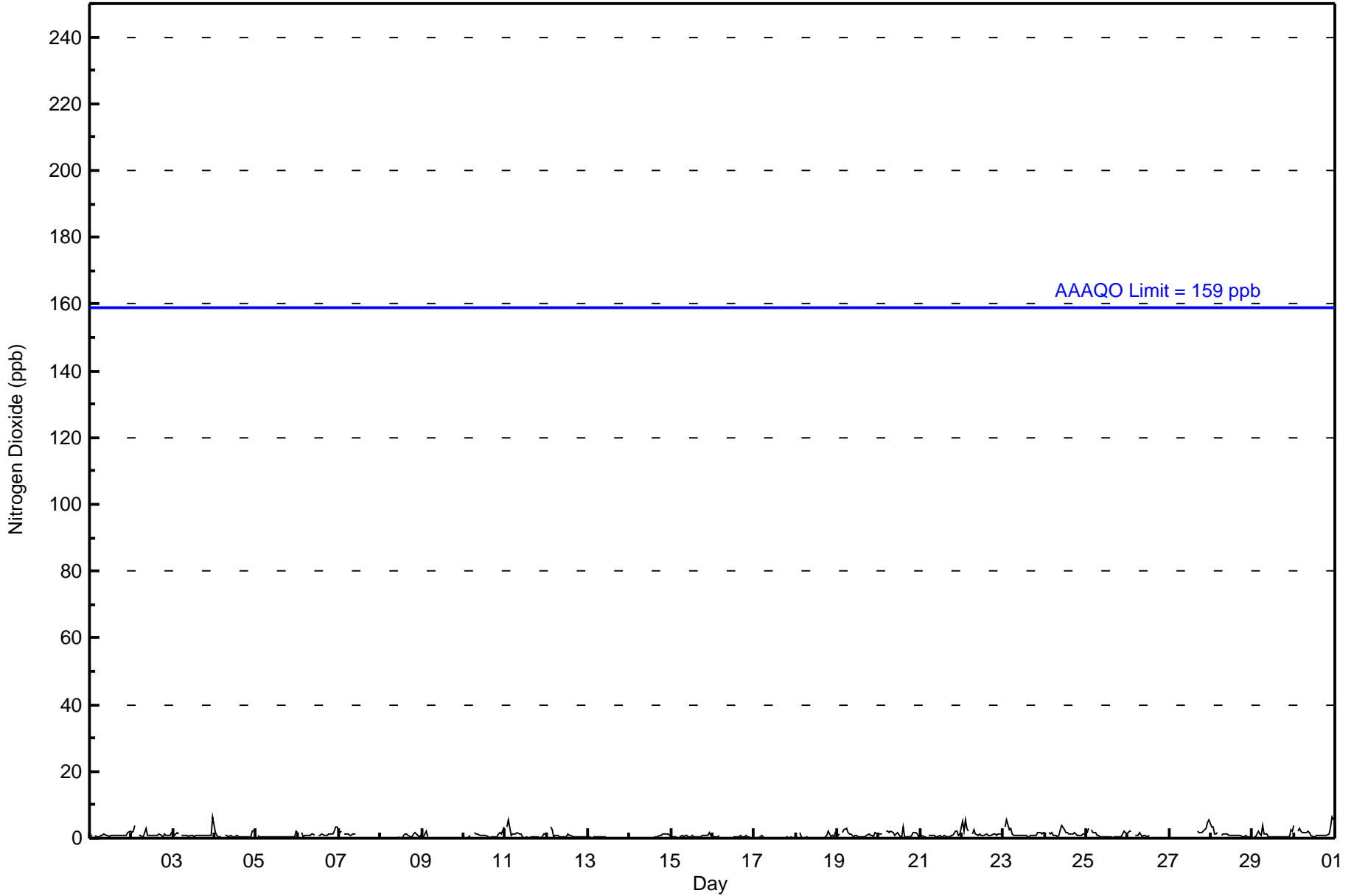
1.5	1.4	1.9	1.2	1.2	1.0	1.0	1.0	1.0	1.0	0.8	0.7	0.6	0.6	0.6	0.7	0.5	0.7	0.6	0.7	0.8	0.9	1.1	1.5	1.9	Diurnal Average	
5	3	6	3	3	3	4	3	3	3	3	4	2	2	2	4	1	2	2	2	2	3	3	6	7	Diurnal Maximum	

Z - zerspan C - Calibration M - Maintenance UO - Unstable Operation
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Anzac - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Anzac - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	609	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: 609

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Anzac - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	28	19	26	15	17	11	43	69	54	37	37	37	61	71	44	39	608
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
Totals	28	19	26	15	17	11	43	69	54	37	37	37	61	71	44	39	608

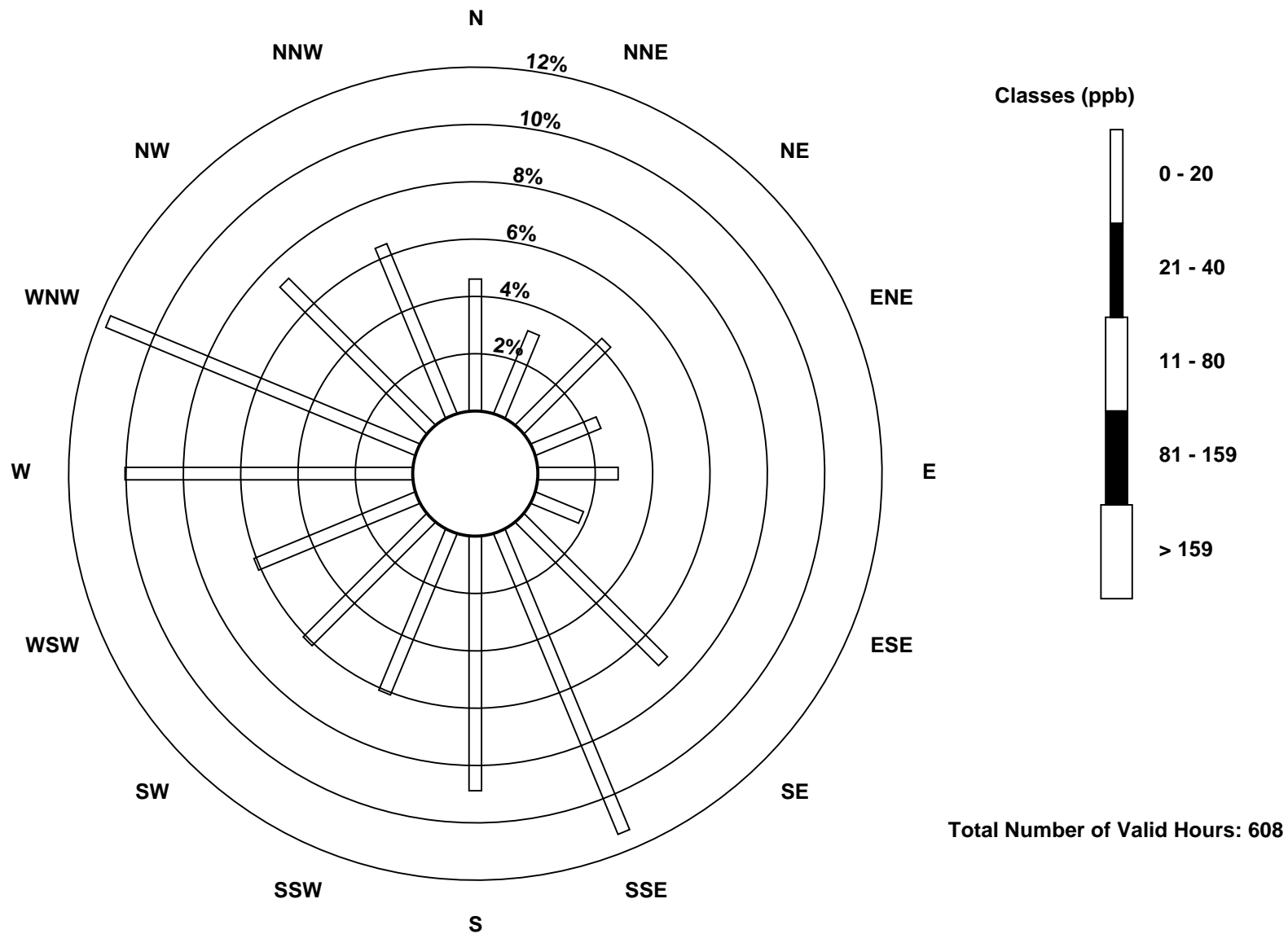
Total Number of Valid Hours: 608

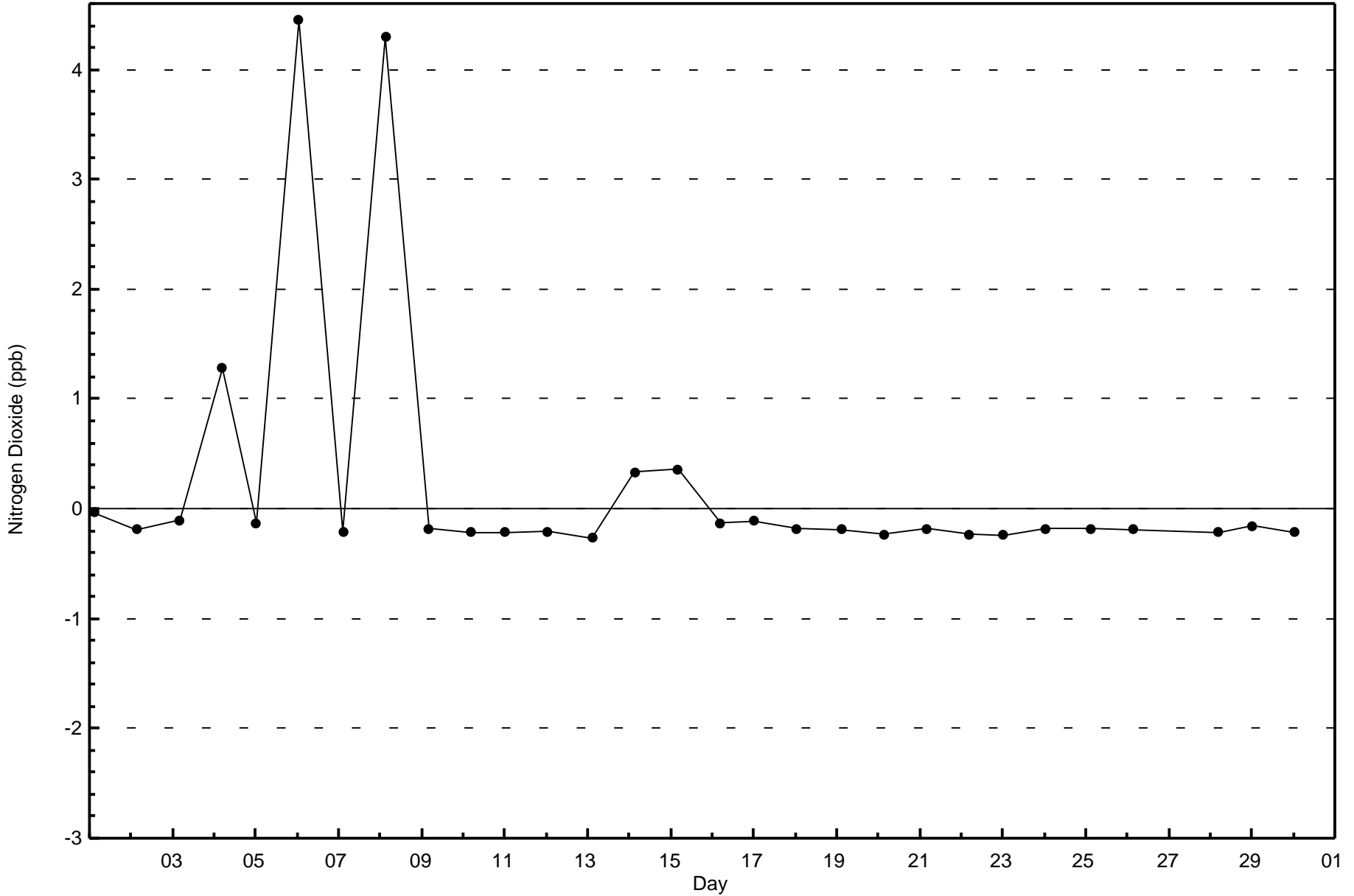
Total Number of Hours: 720

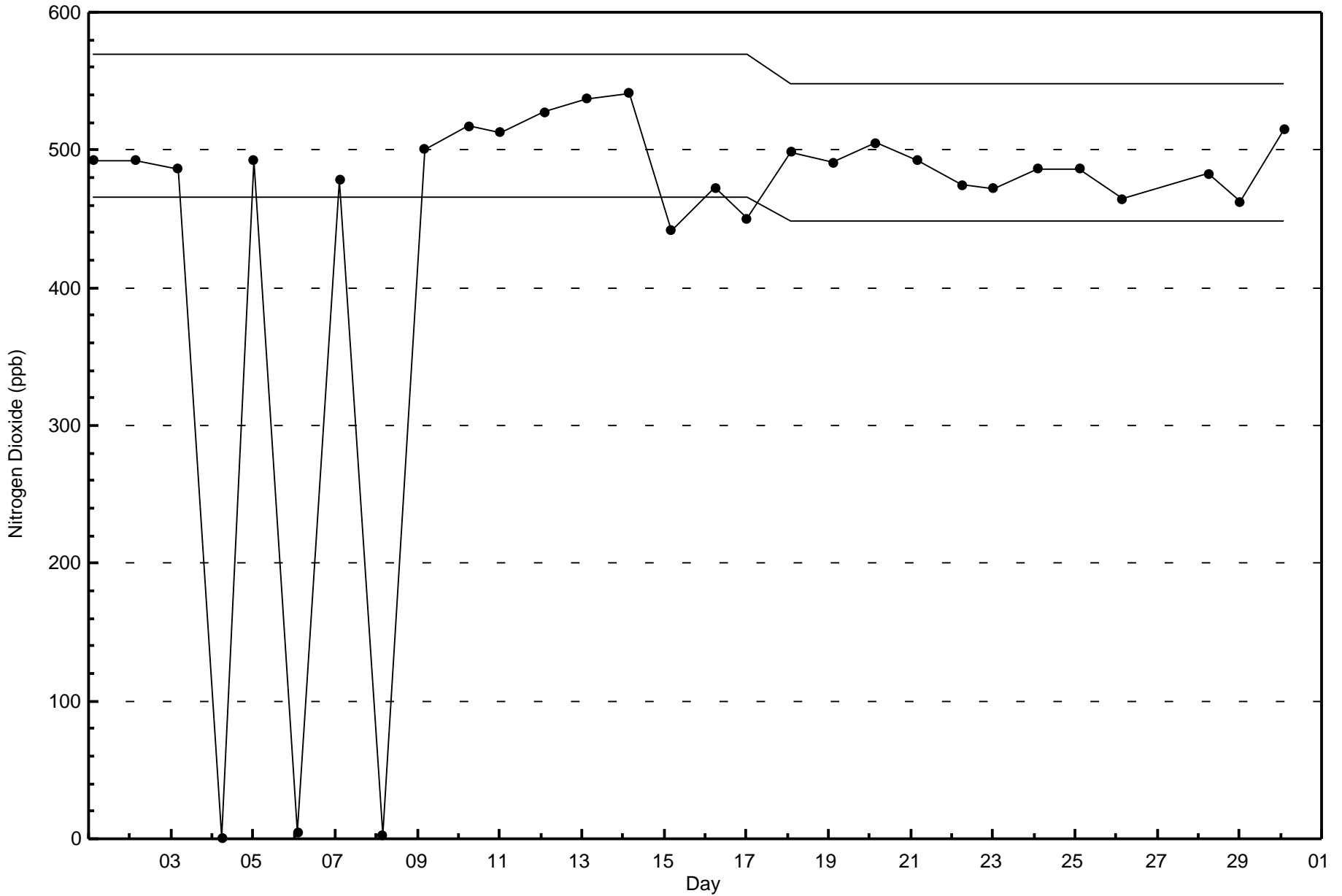


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Dioxide (NO₂) - ppb
Anzac (AMS 14)









Wood Buffalo Environmental Association
Summary of Hour Averages

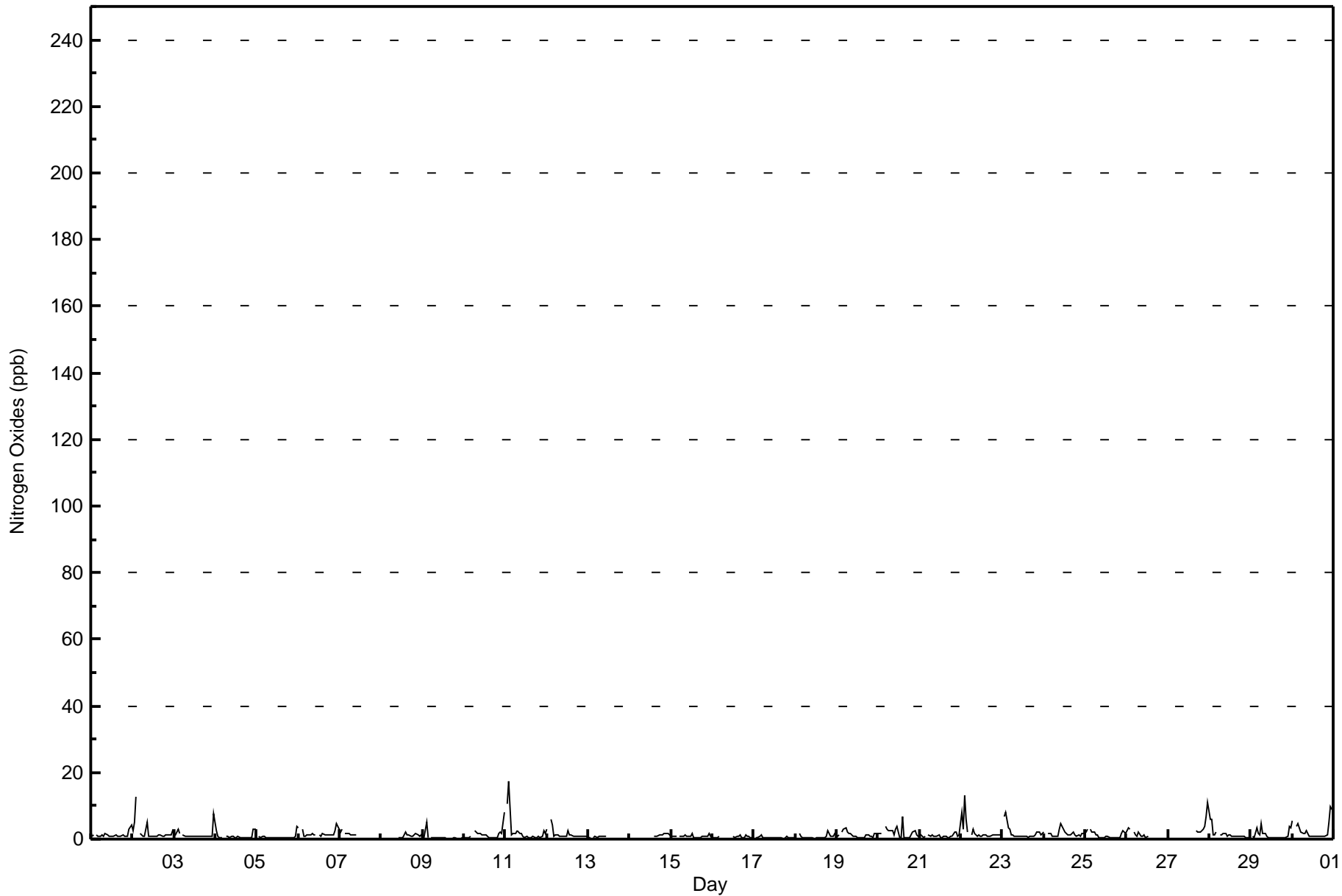
Nitrogen Oxides (NO_x) - ppb
Anzac - June 2016

Maximum Value: 18 ppb on Jun 11 03:00		Maximum Daily Average: 2.7 ppb on Jun 30		Hours in Service: 720																																													
Minimum Value: 0 ppb on Jun 9 17:00		Minimum Daily Average: 0.4 ppb on Jun 17		Hours of Data: 609																																													
Maximum Diurnal Average: 3.9 ppb at hour 3		Minimum Diurnal Average: 0.7 ppb at hour 16		Hours of Missing Data: 111																																													
Monthly Average: 1.4 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 2 P ₉₀ = 3 P ₉₉ = 9		Hours of Calibration: 40																																													
				Percent Operational Time: 90.1																																													
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-Jun	1	1	Z	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3	4	1.2	4																							
2-Jun	3	5	13	Z	2	1	1	1	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2.1	13																							
3-Jun	2	1	3	2	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8	1.3	8																							
4-Jun	2	1	1	1	1	Z	1	1	1	1	1	0	1	0	1	0	0	1	0	1	0	0	3	3	0.9	3																							
5-Jun	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4	0.7	4																								
6-Jun	3	Z	3	1	1	1	1	1	2	1	1	M	1	1	2	1	1	1	1	1	1	3	5	4	1.7	5																							
7-Jun	2	3	Z	1	2	2	1	1	1	1	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	3																							
8-Jun	UO	UO	UO	UO	UO	UO	UO	UO	UO	M	0	0	0	1	2	1	1	1	1	1	2	1	1	1	--	2																							
9-Jun	0	0	5	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	5																							
10-Jun	0	0	0	0	1	Z	2	2	2	2	1	1	1	1	1	0	1	1	1	0	1	2	2	8	1.4	8																							
11-Jun	Z	11	18	1	2	2	2	2	2	2	1	1	1	0	0	0	1	1	1	1	1	1	3	2	2.3	18																							
12-Jun	3	Z	6	4	1	1	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1.5	6																							
13-Jun	1	1	Z	1	1	1	1	1	1	1	1	C	C	M	M	M	M	M	M	M	M	M	M	M	--	1																							
14-Jun	M	M	M	M	M	M	M	M	C	C	C	C	C	C	1	1	1	1	1	1	2	2	2	1	--	2																							
15-Jun	1	1	1	1	Z	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	0.9	2																							
16-Jun	1	1	0	1	1	Z	1	C	C	C	C	C	1	0	1	1	1	1	1	1	1	1	0	0	0.7	1																							
17-Jun	Z	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.4	1																							
18-Jun	0	Z	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	1	2	0.6	3																							
19-Jun	1	1	Z	2	3	3	2	2	2	1	1	1	1	1	0	1	1	1	1	1	1	1	2	2	1.3	3																							
20-Jun	2	2	2	Z	4	3	2	2	2	1	3	4	1	1	7	1	1	0	0	1	2	3	1	1	1.9	7																							
21-Jun	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	2	2	1	1	1.0	2																							
22-Jun	8	3	13	6	2	Z	1	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2.4	13																							
23-Jun	Z	7	8	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	2	1.8	8																							
24-Jun	2	Z	2	2	2	1	1	1	1	3	5	3	2	2	1	1	2	2	1	1	1	1	2	2	1.7	5																							
25-Jun	2	3	Z	3	2	2	1	1	1	1	0	0	1	1	0	0	0	0	0	0	1	1	2	2	1.1	3																							
26-Jun	3	3	3	Z	2	1	1	2	1	1	1	1	1	UO	UO	UO	UO	UO	UO	UO	M	M	M	M	--	3																							
27-Jun	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	2	2	2	2	3	4	7	11	--	11																							
28-Jun	6	6	1	1	2	Z	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1.5	6																							
29-Jun	Z	1	1	3	2	1	5	2	2	1	0	0	1	1	0	0	1	1	0	0	1	1	4	3	1.3	5																							
30-Jun	6	Z	4	5	3	2	2	2	3	2	1	1	1	1	1	1	1	1	1	1	1	5	10	9	2.7	10																							
																								Diurnal Average																									
																								Diurnal Maximum																									
Z - zerspan																								C - Calibration		M - Maintenance		UO - Unstable Operation																					



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Anzac - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Anzac - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	609	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: 609

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Anzac - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	28	19	26	15	17	11	43	69	54	37	37	37	61	71	44	39	608
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
Totals	28	19	26	15	17	11	43	69	54	37	37	37	61	71	44	39	608

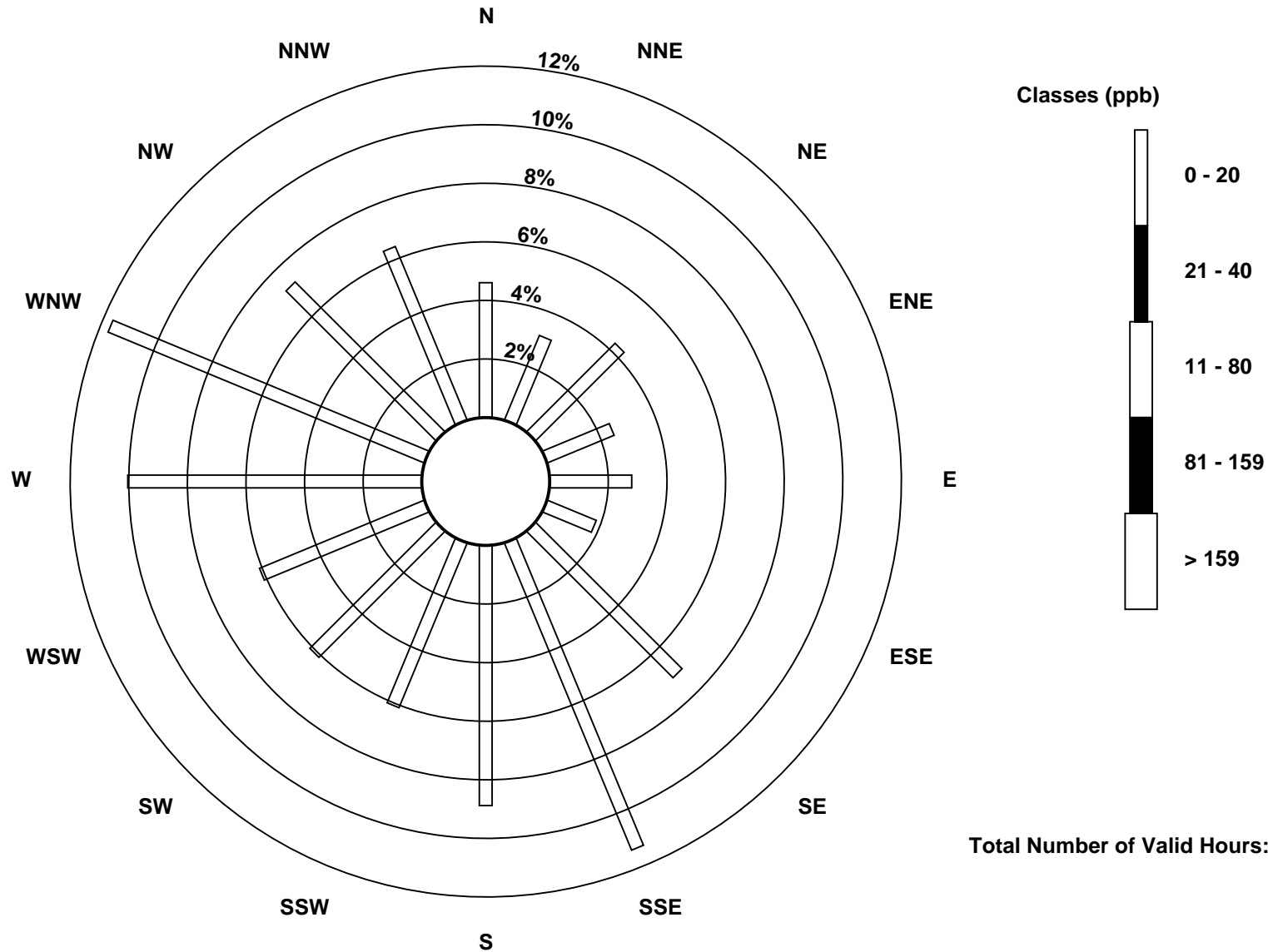
Total Number of Valid Hours: 608

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxides (NO_x) - ppb
Anzac (AMS 14)

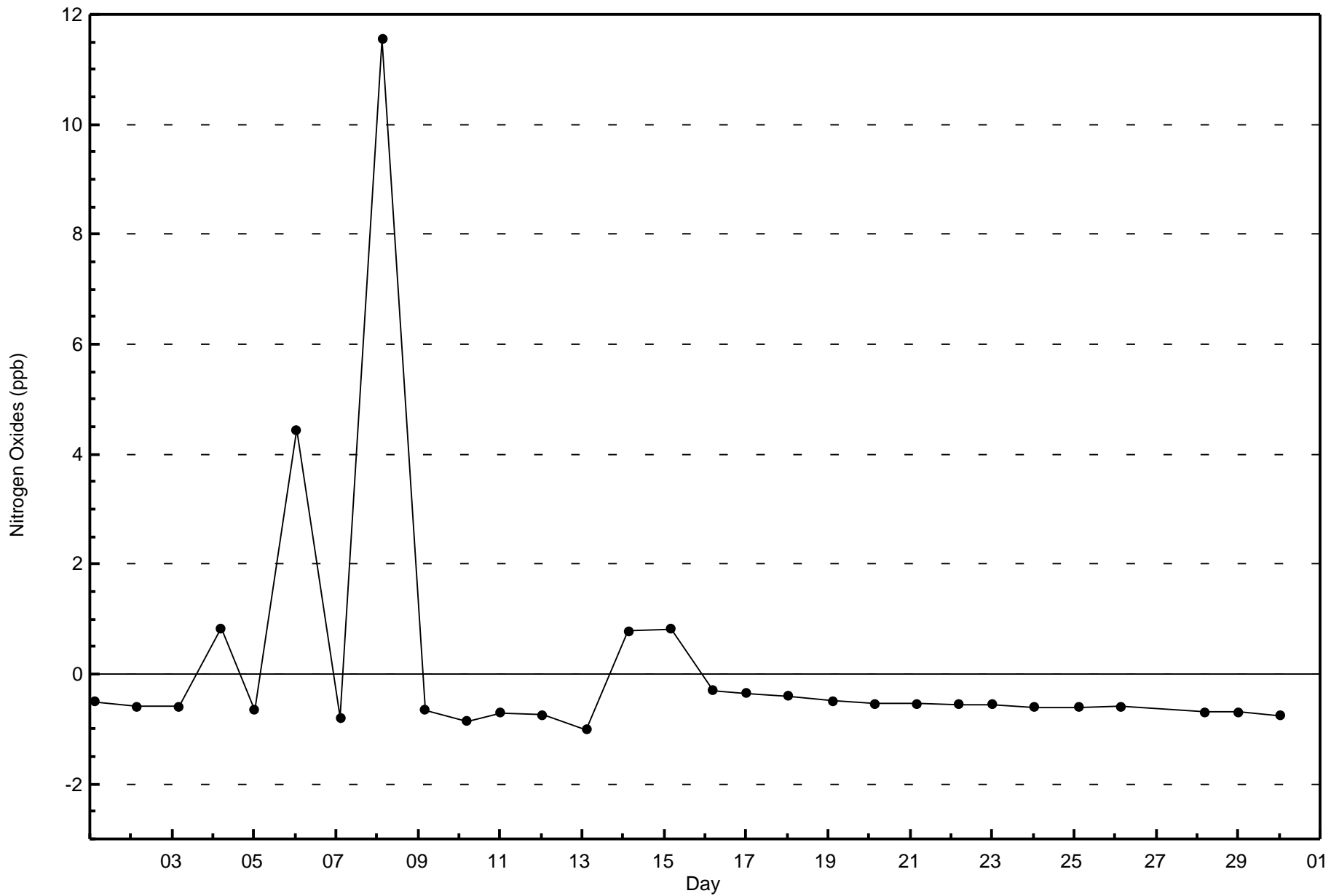


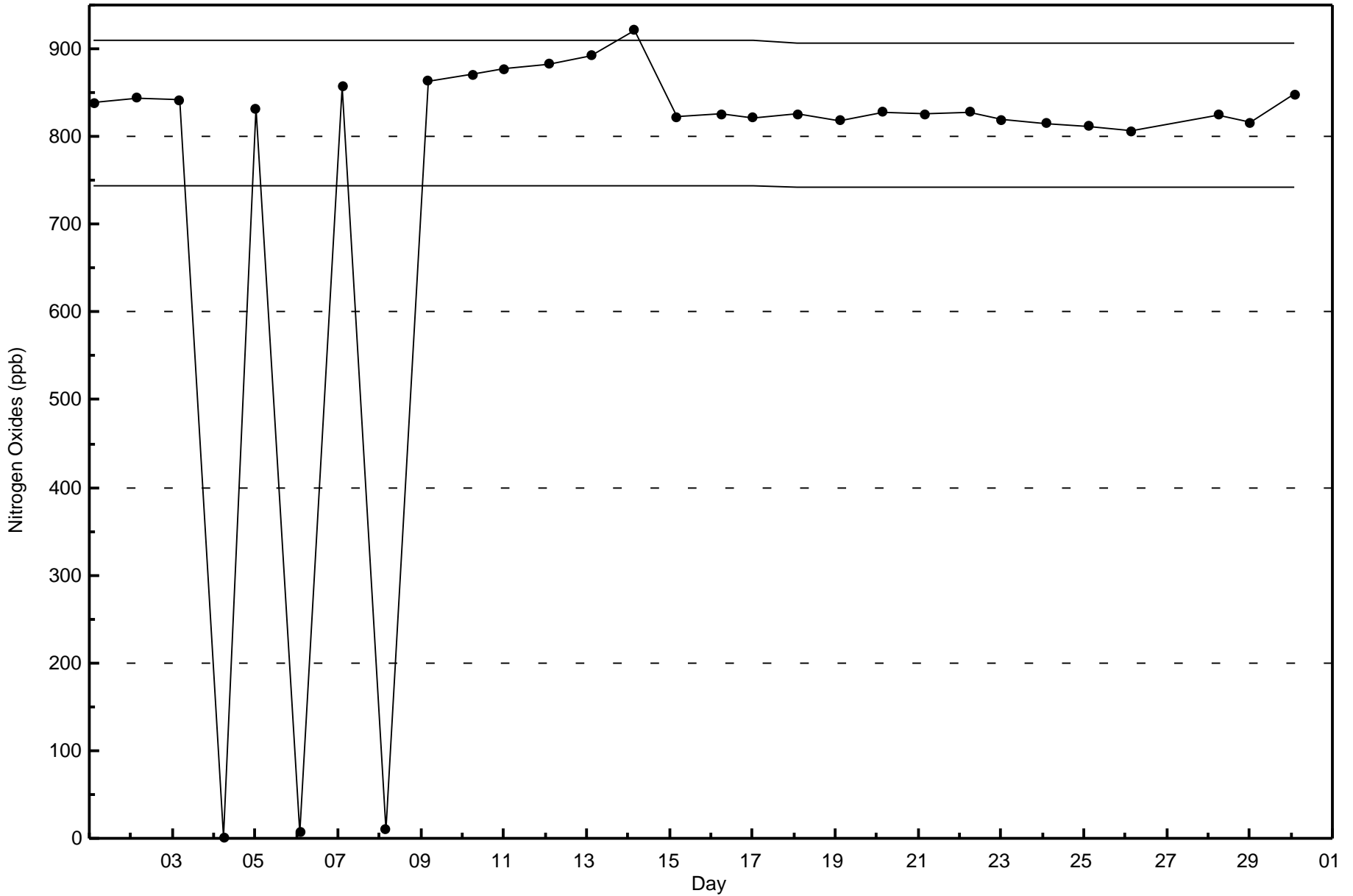
Total Number of Valid Hours: 608



Wood Buffalo Environmental Association
Zero Responses

Nitrogen Oxides (NO_x) - ppb
Anzac - June 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

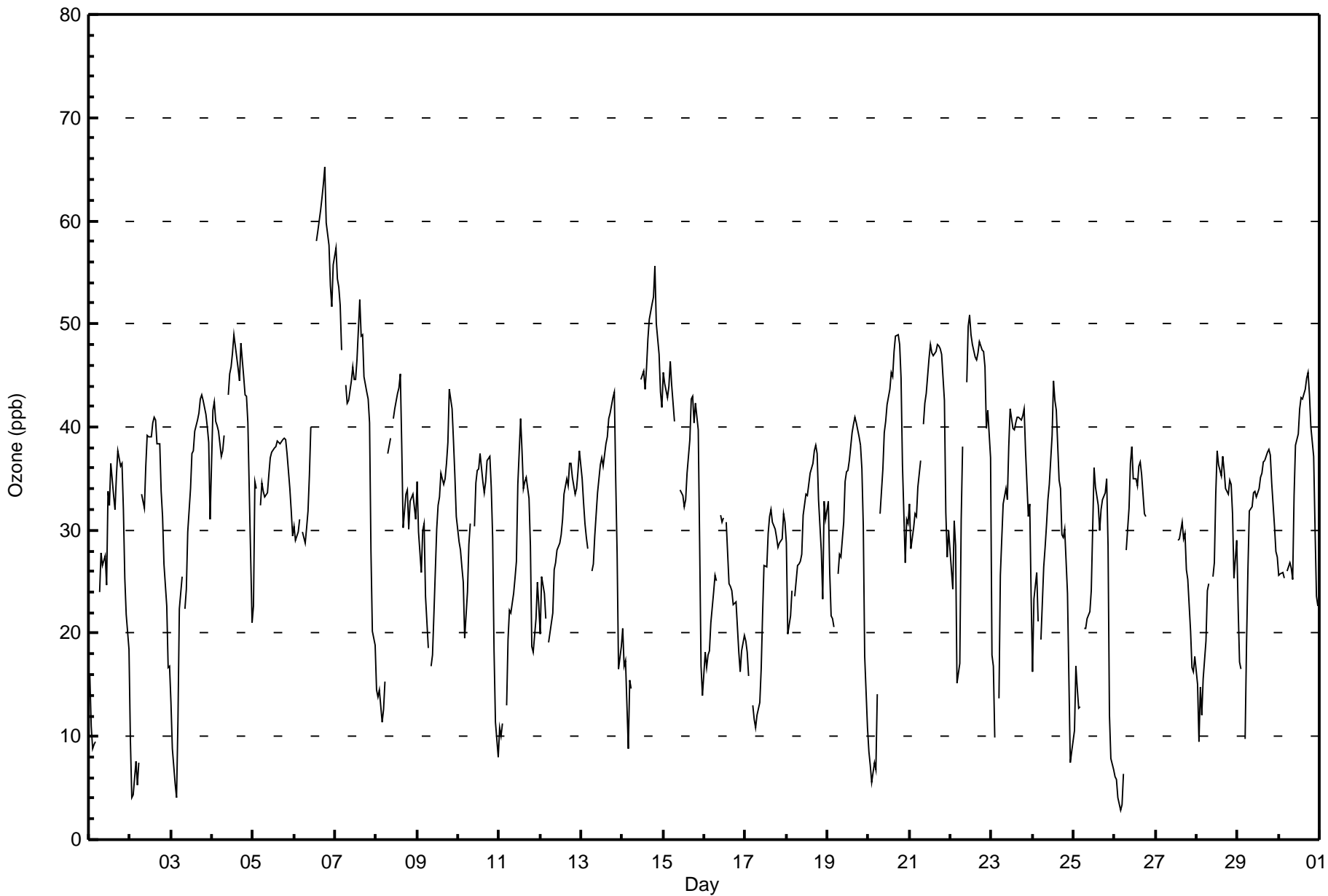
Anzac - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 65 ppb on Jun 6 19:00 Maximum Daily Average: 45.9 ppb on Jun 6																	Hours in Service: 720 Hours of Data: 664																																
Minimum Value: 3 ppb on Jun 26 04:00 Minimum Daily Average: 22.9 ppb on Jun 16 Maximum Diurnal Average: 39.5 ppb at hour 18 Minimum Diurnal Average: 19.8 ppb at hour 5 Monthly Average: 31.5 ppb Percentiles: P ₁ = 5 P ₁₀ = 16 Q ₁ = 24 Median = 33 Q ₃ = 39 P ₉₀ = 45 P ₉₉ = 58																	Hours of Missing Data: 56 Hours of Calibration: 31 Percent Operational Time: 96.5																																
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-Jun	16	11	9	9	10	Z	24	28	27	28	25	34	32	37	33	32	35	38	36	36	32	25	22	19	25.9	38																							
2-Jun	10	4	4	8	5	7	Z	33	32	36	39	39	39	40	41	41	38	38	34	31	27	23	17	17	26.3	41																							
3-Jun	13	9	5	4	12	22	25	Z	22	24	30	34	37	38	40	41	41	43	43	43	41	40	39	31	29.4	43																							
4-Jun	42	42	41	40	40	37	38	39	Z	43	45	46	47	49	47	46	44	48	45	43	43	40	34	21	41.7	49																							
5-Jun	23	35	34	Z	32	35	34	33	34	35	37	38	38	38	39	39	38	39	39	39	37	34	32	29	35.2	39																							
6-Jun	30	29	30	31	Z	30	29	30	32	35	40	M	M	58	59	61	62	64	65	60	58	54	52	56	45.9	65																							
7-Jun	57	54	54	52	47	Z	44	42	43	44	46	45	45	46	52	49	49	45	43	43	40	28	20	19	43.8	57																							
8-Jun	15	14	14	11	13	15	Z	37	39	M	41	42	43	44	45	38	30	34	34	30	33	33	32	31	30.4	45																							
9-Jun	35	30	26	30	31	24	19	Z	17	18	22	30	32	33	36	35	35	36	39	44	42	39	35	31	31.1	44																							
10-Jun	29	28	26	25	19	24	29	31	Z	30	35	36	36	37	35	34	35	37	37	34	29	18	11	8	28.8	37																							
11-Jun	11	10	11	Z	13	19	22	22	24	25	27	34	41	38	34	35	35	33	28	19	18	21	25	23	24.7	41																							
12-Jun	20	25	24	21	Z	19	21	22	26	27	28	29	30	31	33	35	34	37	36	35	33	34	36	38	29.4	38																							
13-Jun	35	33	31	29	28	Z	26	27	29	34	35	36	37	36	38	39	41	41	43	43	35	28	17	19	33.0	43																							
14-Jun	21	17	17	9	15	15	Z	31	M	M	M	M	45	45	44	46	48	50	52	53	56	50	47	43	42	37.3	56																						
15-Jun	45	44	43	44	46	44	41	C	C	C	34	33	32	33	36	39	43	43	40	42	40	29	17	14	37.2	46																							
16-Jun	18	17	18	18	21	24	26	25	Z	31	31	31	M	31	25	24	24	23	23	21	18	16	18	20	22.9	31																							
17-Jun	19	18	16	Z	13	12	11	12	13	17	22	27	26	30	31	32	31	30	29	28	29	29	32	31	23.4	32																							
18-Jun	29	20	22	24	Z	24	27	27	27	28	31	33	33	34	36	36	38	38	37	33	28	23	33	31	30.1	38																							
19-Jun	33	26	22	21	21	Z	26	28	27	31	35	36	36	37	39	40	41	40	39	38	36	30	18	11	30.9	41																							
20-Jun	9	7	6	7	7	14	Z	32	36	40	41	42	44	45	45	47	49	49	48	45	36	27	31	31	32.0	49																							
21-Jun	33	28	30	32	31	34	37	Z	40	42	43	47	48	47	47	47	48	48	48	47	43	32	27	30	39.5	48																							
22-Jun	26	24	31	29	15	17	31	38	Z	44	50	51	49	48	47	47	47	48	47	47	46	40	42	37	39.2	51																							
23-Jun	18	17	10	Z	14	26	29	32	34	33	38	42	40	40	41	41	41	41	41	42	38	31	33	24	32.3	42																							
24-Jun	16	23	26	21	Z	19	26	28	31	33	34	39	44	43	42	35	34	30	29	30	24	16	7	9	27.8	44																							
25-Jun	11	17	15	13	13	Z	20	20	21	22	24	30	36	34	32	30	32	33	34	35	29	12	8	7	22.9	36																							
26-Jun	6	6	4	3	3	6	Z	28	32	36	38	35	35	34	36	37	35	32	31	M	M	M	M	M	24.4	38																							
27-Jun	M	M	M	M	M	M	M	M	M	M	M	M	M	29	29	31	29	30	26	25	20	17	16	18	--	31																							
28-Jun	15	10	15	12	16	19	24	25	Z	26	27	34	38	36	35	37	36	34	33	35	34	32	25	29	27.2	38																							
29-Jun	22	17	16	Z	10	19	26	32	32	34	34	33	34	35	36	37	37	38	38	37	35	30	28	27	29.9	38																							
30-Jun	26	26	26	25	Z	26	27	26	25	33	38	39	42	43	43	44	45	45	43	40	37	30	24	23	33.7	45																							
																								23.5	22.1	21.5	21.6	19.8	22.2	27.5	29.2	29.3	31.9	34.6	37.1	38.5	38.9	39.2	39.2	39.3	39.5	38.8	38.0	34.9	29.6	26.6	24.9	Diurnal Average	
																								57	54	54	52	47	44	44	42	43	44	50	51	49	58	59	61	62	64	65	60	58	54	52	56	Diurnal Maximum	
Z - zerspan C - Calibration M - Maintenance																																																	
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																																																	



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Anzac - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Anzac - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	119	17.92	17.92
21 - 50	525	79.07	96.99
51 - 82	20	3.01	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 664

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ozone (O₃) - ppb
Anzac - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	6	2	5	4	5	3	6	6	14	7	10	15	14	6	7	8	118
21 - 50	27	20	22	16	12	10	43	60	32	30	28	29	52	74	35	35	525
51 - 82	1	0	0	0	0	0	0	3	9	2	5	0	0	0	0	0	20
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	34	22	27	20	17	13	49	69	55	39	43	44	66	80	42	43	663

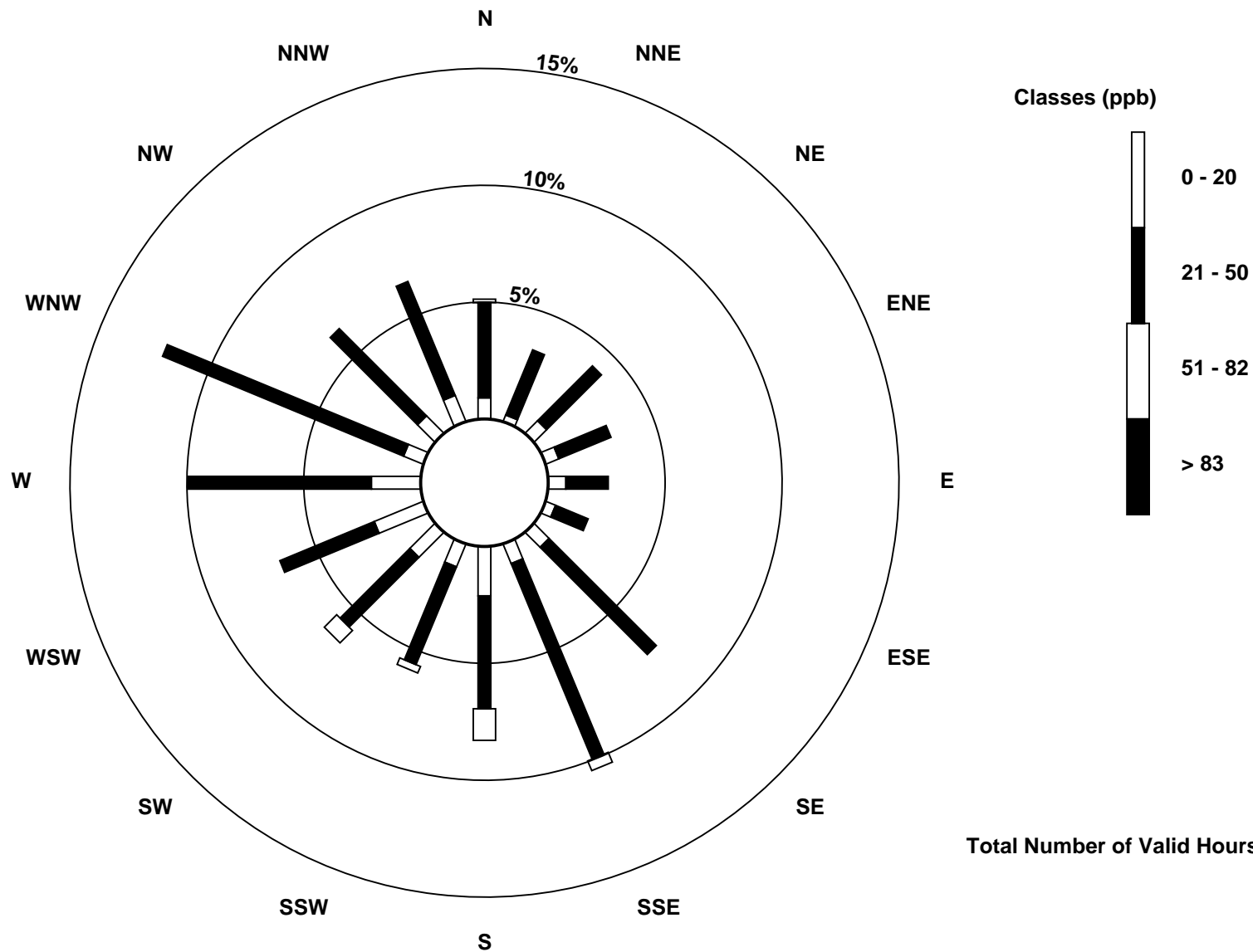
Total Number of Valid Hours: 663

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

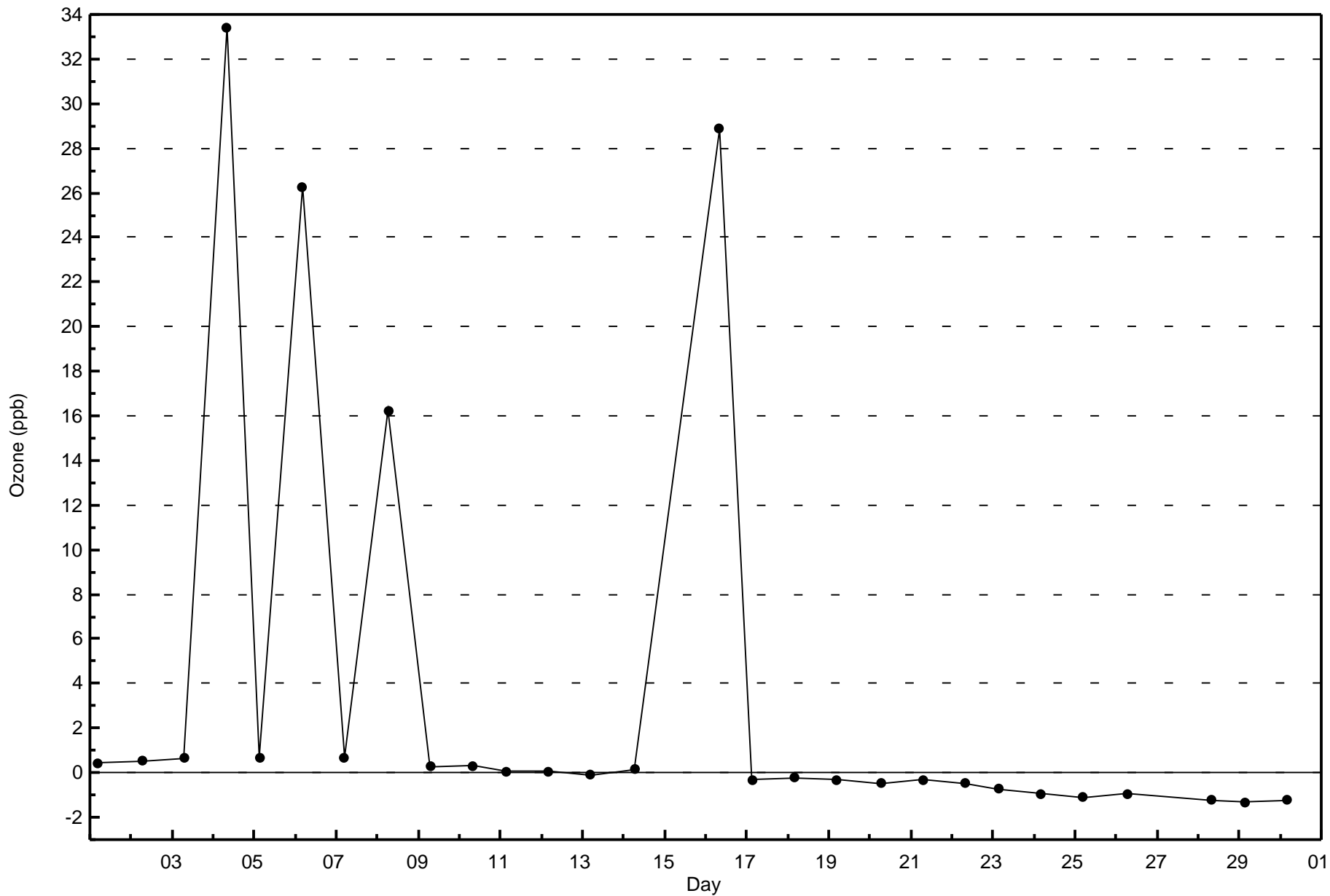
Ozone (O₃) - ppb
Anzac (AMS 14)

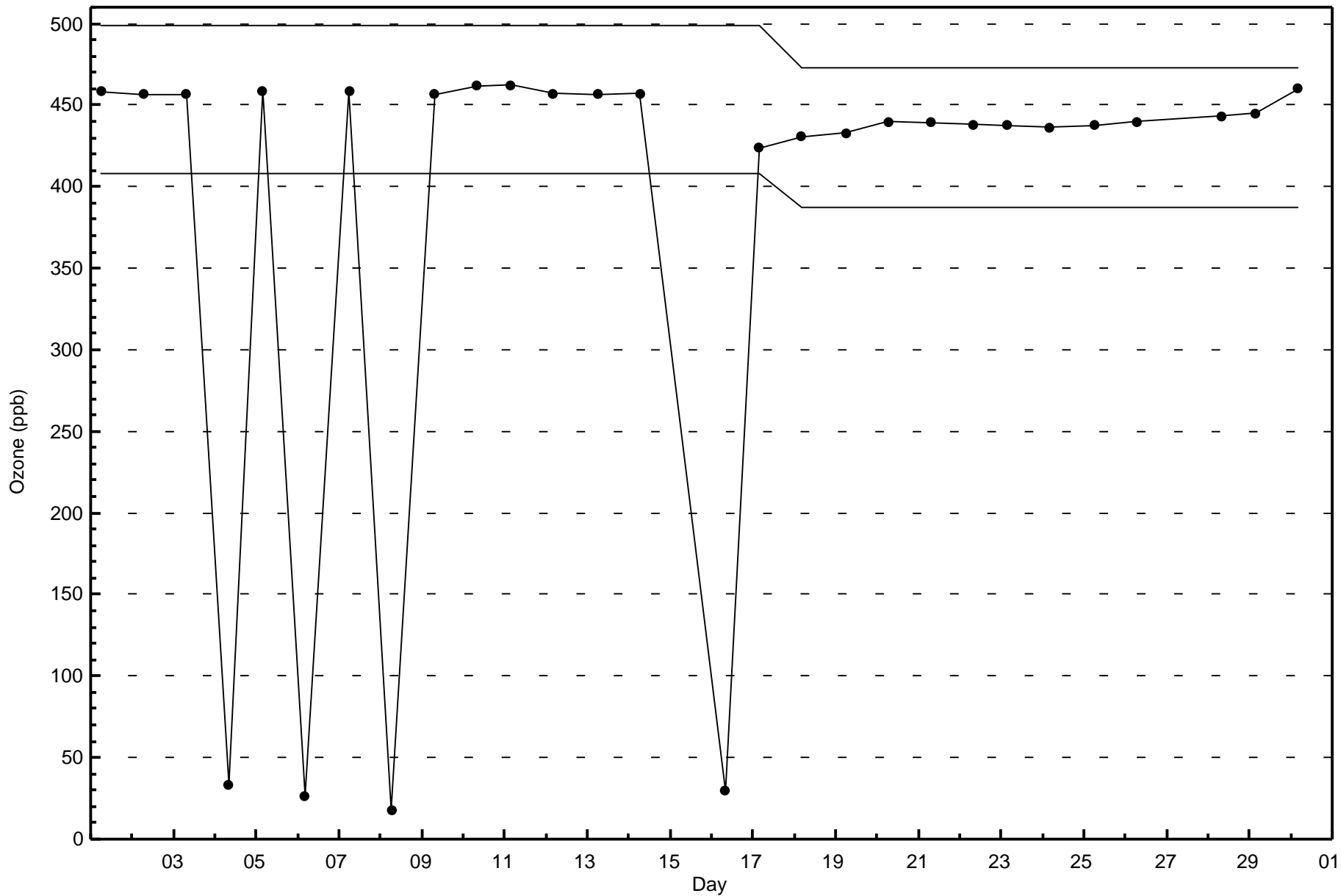




Wood Buffalo Environmental Association
Zero Responses

Ozone (O₃) - ppb
Anzac - June 2016





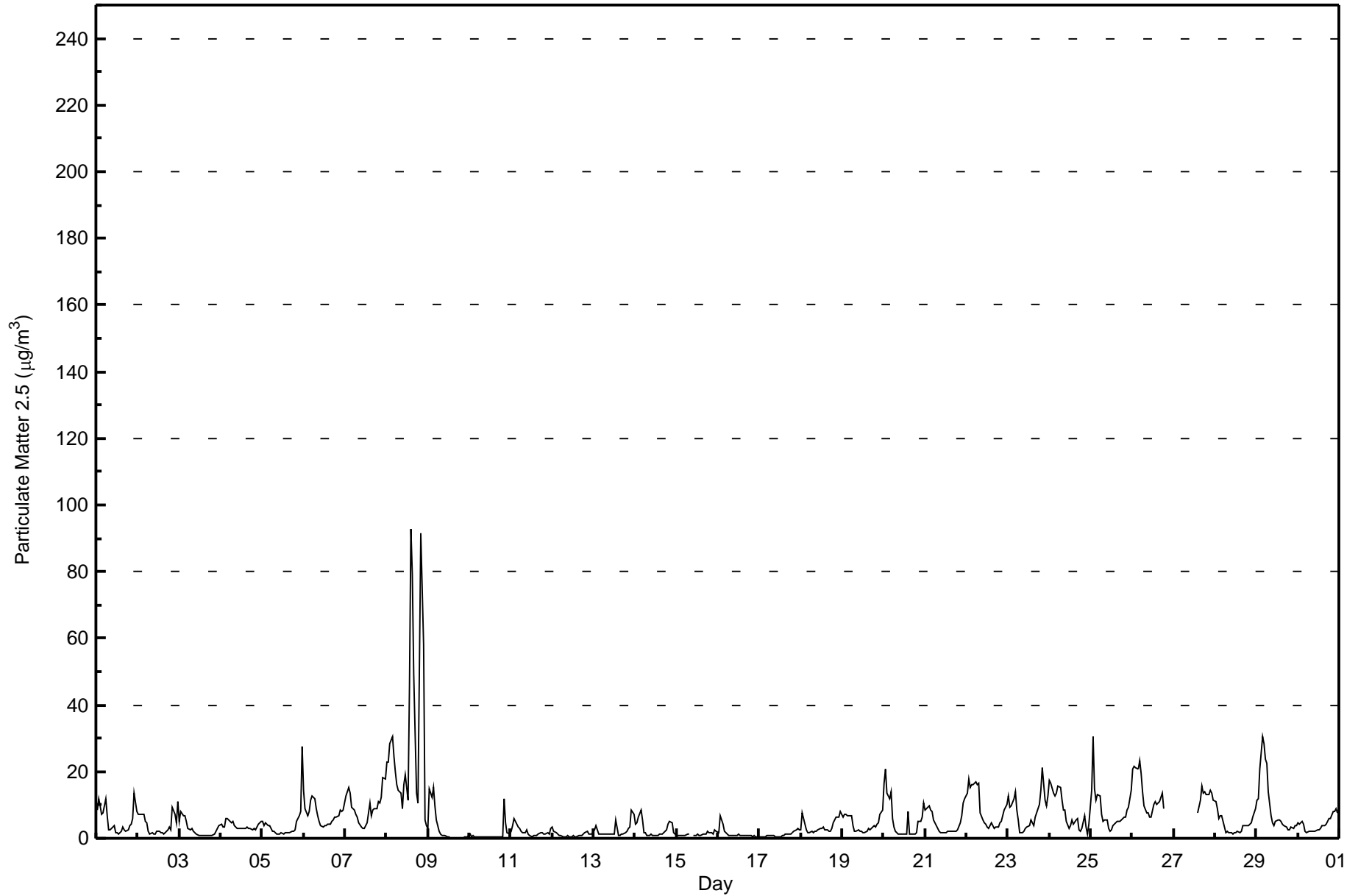


Number of Exceedences (AAAQO): 24-hr: 1 Maximum Value: 92.8 µg/m ³ on Jun 8 15:00 Minimum Value: 0.1 µg/m ³ on Jun 9 17:00 Maximum Diurnal Average: 9.7 µg/m ³ at hour 2 Monthly Average: 5.80 µg/m ³		Maximum Daily Average: 31.2 µg/m ³ on Jun 8 Minimum Daily Average: 1.1 µg/m ³ on Jun 17 Minimum Diurnal Average: 2.6 µg/m ³ at hour 13 Percentiles: P ₁ = 0.2 P ₁₀ = 0.8 Q ₁ = 1.4 Median = 3.2 Q ₃ = 7.2 P ₉₀ = 13.4 P ₉₉ = 43.9		Hours in Service: 720 Hours of Data: 699 Hours of Missing Data: 21 Hours of Calibration: 2 Percent Operational Time: 97.4																						
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-Jun	8.5	11.7	9.9	7.2	7.7	11.8	6.8	2.4	2.5	3.3	3.7	1.7	1.6	1.5	2.0	3.2	2.4	2.3	2.7	3.8	4.2	5.9	13.7	8.2	5.4	13.7
2-Jun	7.4	7.3	7.1	7.1	5.2	4.7	2.3	1.3	1.6	1.4	1.4	2.0	2.0	1.6	1.5	1.2	1.8	2.4	3.2	2.7	9.2	7.4	4.9	11.1	4.1	11.1
3-Jun	5.3	8.0	6.7	6.9	4.9	2.9	2.5	2.8	2.1	1.6	1.1	0.9	0.8	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.4	2.3	3.1	4.0	2.6	8.0
4-Jun	4.2	3.2	3.3	5.9	6.0	5.0	4.8	4.9	3.8	3.1	3.0	3.0	3.0	2.8	2.8	3.4	2.8	2.9	2.5	2.8	2.7	3.5	4.1	5.1	3.7	6.0
5-Jun	5.1	3.9	4.8	3.9	3.7	2.8	2.3	2.2	1.4	1.3	1.5	1.5	1.4	1.6	1.7	1.7	1.8	2.1	2.2	2.4	4.9	6.8	7.9	27.5	4.0	27.5
6-Jun	14.5	8.8	6.9	8.3	11.4	12.8	11.7	8.7	6.9	5.3	3.8	3.4	3.9	3.9	4.0	4.2	4.9	5.5	6.5	6.5	6.8	8.3	8.0	8.6	7.2	14.5
7-Jun	12.6	13.8	15.1	13.6	9.5	8.4	7.2	6.2	4.9	3.3	2.8	3.2	3.9	4.8	10.6	6.8	8.3	8.8	8.9	10.9	10.8	12.5	18.1	17.9	9.3	18.1
8-Jun	22.8	22.8	28.4	30.4	24.4	20.1	16.0	14.2	13.7	9.1	16.2	19.1	11.6	45.7	92.8	79.4	49.3	13.6	10.8	50.3	91.5	58.0	5.5	3.8	31.2	92.8
9-Jun	2.9	14.7	12.4	15.3	9.7	5.5	2.0	1.2	0.8	0.8	0.8	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.5	2.9	15.3
10-Jun	1.1	0.3	0.7	0.6	0.5	0.6	0.6	0.5	0.4	0.4	0.4	0.6	0.5	0.3	0.2	0.2	0.2	0.2	0.2	0.5	11.7	4.7	1.8	1.2	1.2	11.7
11-Jun	1.9	4.0	5.9	4.1	3.2	3.2	1.9	1.8	1.7	2.5	1.3	0.8	0.5	0.7	0.8	0.7	1.2	1.7	1.8	1.2	1.3	1.6	1.4	2.8	2.0	5.9
12-Jun	3.3	2.3	1.5	1.4	1.0	1.0	0.6	0.6	0.6	0.6	0.4	0.5	0.7	0.5	0.5	0.8	0.8	0.9	1.1	1.5	2.3	1.1	1.1	1.4	1.1	3.3
13-Jun	2.5	3.6	2.4	1.4	1.2	1.1	1.2	1.1	1.2	1.3	1.2	1.3	1.3	5.4	1.0	1.0	1.1	1.2	1.5	2.0	2.8	3.4	8.3	7.2	2.3	8.3
14-Jun	4.3	4.5	6.3	8.3	5.6	1.6	1.8	0.8	0.9	1.3	0.7	0.7	0.9	1.0	1.1	1.1	1.2	2.0	2.6	4.3	5.2	4.7	1.8	1.1	2.7	8.3
15-Jun	1.1	0.8	0.7	0.8	0.8	1.0	1.2	1.3	C	C	1.0	0.9	1.1	1.0	1.0	1.2	1.1	1.3	2.2	1.6	1.7	1.3	2.4	1.9	1.3	2.4
16-Jun	1.6	6.8	5.6	4.3	1.9	1.4	0.8	0.8	0.8	0.9	0.9	1.0	1.1	1.0	0.8	0.9	0.9	0.9	0.8	0.7	0.6	0.9	0.6	0.5	1.5	6.8
17-Jun	0.5	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.5	0.3	0.4	0.5	0.7	0.8	1.1	1.2	1.3	1.4	1.7	2.1	2.5	3.1	2.7	1.1	3.1
18-Jun	2.7	7.6	4.4	2.6	1.9	1.8	1.9	1.9	1.9	2.2	2.7	3.0	3.1	3.3	2.7	2.5	2.3	2.3	2.8	4.5	6.5	6.3	6.1	8.0	3.5	8.0
19-Jun	6.2	7.0	7.2	6.9	6.9	6.9	3.7	2.0	2.3	2.4	2.1	1.9	1.8	1.8	2.0	2.9	2.4	3.0	3.7	3.2	4.2	4.6	7.0	8.3	4.2	8.3
20-Jun	16.6	20.8	13.5	12.0	13.8	5.8	3.2	2.0	1.5	1.2	1.1	1.1	1.2	1.2	7.9	1.2	1.3	1.3	1.4	1.7	5.0	5.2	6.3	10.8	5.7	20.8
21-Jun	8.3	8.9	9.6	8.5	8.0	5.4	3.8	2.9	2.0	1.9	1.8	1.7	1.6	2.0	2.2	2.1	2.1	2.2	2.2	2.7	4.5	7.0	10.7	11.7	4.7	11.7
22-Jun	13.4	17.7	15.3	16.0	16.3	17.1	16.1	16.6	7.8	5.5	4.8	4.2	3.3	3.1	4.8	3.8	3.2	3.3	3.3	4.6	5.2	6.9	8.6	10.4	8.8	17.7
23-Jun	12.7	9.4	9.6	11.8	14.1	8.4	5.4	1.8	1.8	2.2	2.9	3.5	3.8	5.4	4.5	3.9	6.2	9.0	10.2	14.6	21.2	11.5	9.8	12.9	8.2	21.2
24-Jun	17.5	16.3	13.7	12.8	13.4	15.7	15.3	11.4	8.6	8.3	4.9	2.9	3.8	5.6	4.3	5.5	5.9	2.6	2.0	3.1	6.8	3.4	1.2	4.0	7.9	17.5
25-Jun	14.6	30.5	14.8	11.4	13.2	12.8	7.1	5.2	5.4	5.4	3.1	2.1	2.4	3.9	4.8	5.1	5.1	5.3	6.0	6.2	6.4	8.5	9.2	14.2	8.4	30.5
26-Jun	20.9	21.6	21.0	20.7	23.4	19.5	13.9	9.7	7.4	7.8	6.5	6.4	10.4	11.0	10.3	10.4	11.0	13.4	8.8	M	M	M	M	M	13.4	23.4
27-Jun	M	M	M	M	M	M	M	M	M	M	M	M	M	M	7.6	11.5	15.7	13.5	14.0	13.1	13.0	14.6	13.7	11.4	--	15.7
28-Jun	11.0	9.0	6.0	6.7	6.8	3.2	1.7	2.0	1.8	1.5	1.4	1.5	1.9	2.0	1.8	2.1	3.8	3.9	3.8	3.8	4.1	4.8	6.4	8.7	4.2	11.0
29-Jun	11.6	11.7	20.6	30.5	28.5	23.6	22.4	14.2	6.6	4.6	3.8	5.1	5.5	5.6	4.9	4.4	3.8	3.2	2.6	2.7	3.2	3.1	3.7	3.8	9.6	30.5
30-Jun	4.5	4.3	5.1	4.3	2.2	1.7	2.0	2.2	2.0	2.2	2.2	2.4	2.6	2.8	3.6	3.9	4.1	5.1	5.9	6.1	7.9	8.1	9.1	7.7	4.2	9.1
																								Diurnal Average		
																								Diurnal Maximum		
8.3 9.7 8.9 9.1 8.5 7.1 5.5 4.3 3.3 2.9 2.7 2.7 2.6 4.2 6.1 5.6 4.9 3.9 3.9 5.5 8.5 7.2 6.1 7.5 22.8 30.5 28.4 30.5 28.5 23.6 22.4 16.6 13.7 9.1 16.2 19.1 11.6 45.7 92.8 79.4 49.3 13.6 14.0 50.3 91.5 58.0 18.1 27.5																										
C - Calibration M - Maintenance Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m ³																										



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Anzac - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Anzac - June 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	363	51.93	51.93
6 - 15	187	26.75	78.68
16 - 25	31	4.43	83.12
26 - 80	11	1.57	84.69
> 81.0	2	0.29	84.98

Total Number of Valid Hours: 699

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Anzac - June 2016

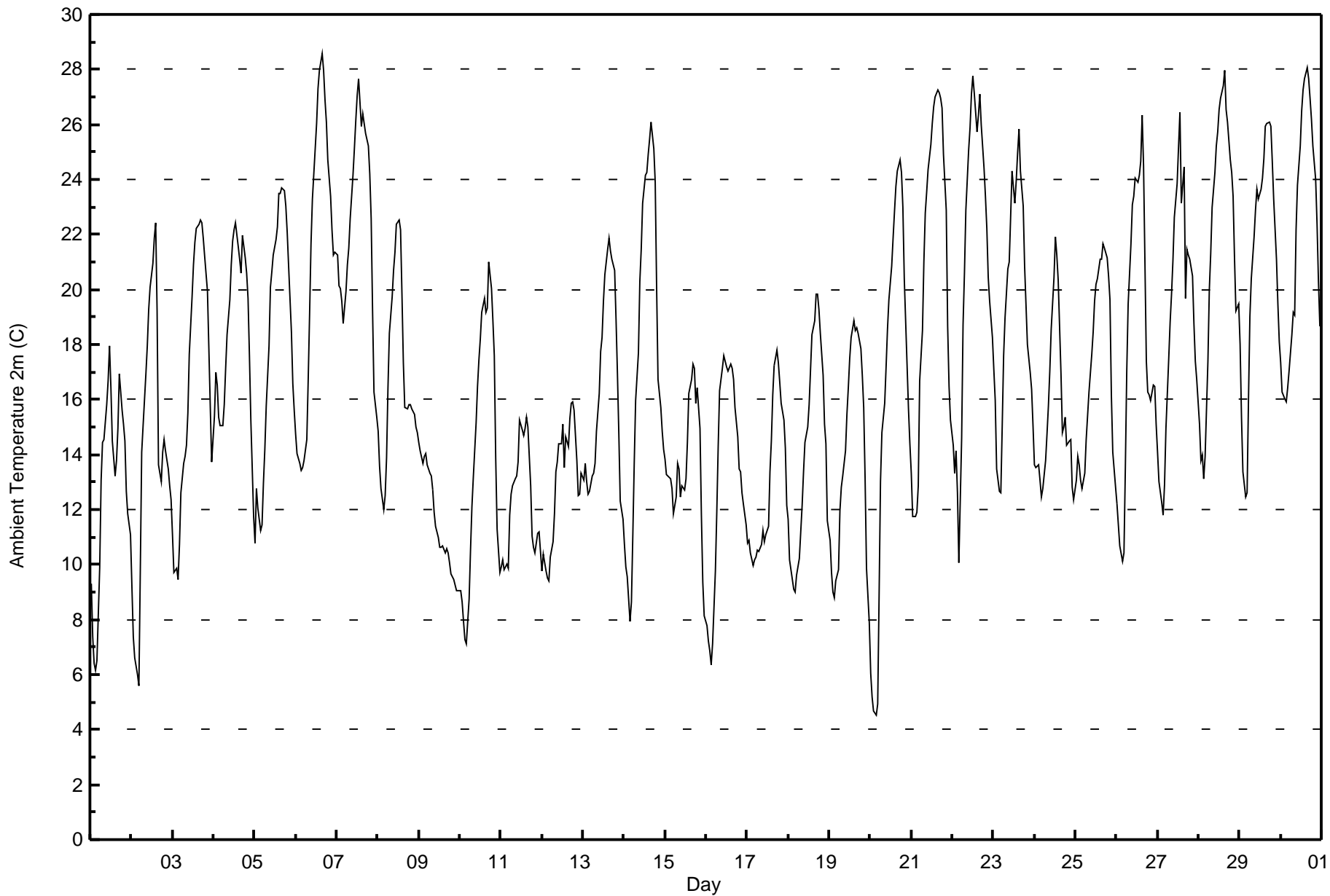
Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	14	14	10	5	6	7	32	49	25	21	15	17	41	62	19	25	362
6 - 15	9	3	7	12	8	2	6	20	25	15	20	17	12	8	10	13	187
16 - 25	5	0	2	2	3	0	4	0	3	2	2	2	3	2	0	1	31
26 - 80	0	0	0	3	1	1	2	1	2	0	0	0	0	0	0	1	11
> 81.0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	2
Totals	28	17	19	22	18	11	44	70	55	39	37	36	56	72	29	40	593

Total Number of Valid Hours: 698

Total Number of Hours: 720



Maximum Value: 28.6 C on Jun 6 16:00		Maximum Daily Average: 22.6 C on Jun 7		Hours in Service: 720																																												
Minimum Value: 4.5 C on Jun 20 04:00		Minimum Daily Average: 11.6 C on Jun 9		Hours of Data: 720																																												
Maximum Diurnal Average: 21.3 C at hour 16		Minimum Diurnal Average: 11.1 C at hour 4		Hours of Missing Data: 0																																												
Monthly Average: 16.86 C		Percentiles: P ₁ = 6.1 P ₁₀ = 10.2 Q ₁ = 13.0 Median = 16.1 Q ₃ = 21.1 P ₉₀ = 24.4 P ₉₉ = 27.6		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-Jun	9.3	7.4	6.4	6.1	6.5	9.9	13.1	14.4	14.6	15.8	16.7	17.9	16.4	14.5	13.2	13.8	15.0	16.9	15.6	15.1	14.5	12.7	11.8	11.1	12.9	17.9																						
2-Jun	9.2	7.4	6.6	6.0	5.6	9.8	14.1	15.0	16.9	17.9	19.3	20.1	21.0	21.9	22.4	19.2	13.6	13.0	14.1	14.6	14.1	13.5	12.8	12.4	14.2	22.4																						
3-Jun	11.1	9.7	9.9	9.4	10.7	12.6	13.7	13.9	14.3	15.5	17.6	19.7	20.9	21.7	22.2	22.3	22.5	22.4	21.9	21.2	19.9	17.8	15.8	13.7	16.7	22.5																						
4-Jun	15.4	17.0	16.5	15.4	15.0	15.1	15.8	17.1	18.4	19.6	20.9	21.8	22.2	22.4	21.5	21.1	20.6	22.0	21.1	20.6	19.7	17.6	15.3	11.7	18.5	22.4																						
5-Jun	10.8	12.8	12.0	11.2	11.4	13.0	14.2	15.8	17.9	20.1	20.7	21.3	21.8	22.3	23.5	23.5	23.7	23.6	23.0	22.1	20.8	18.4	16.6	15.6	18.2	23.7																						
6-Jun	14.7	14.0	13.7	13.4	13.5	13.8	14.5	16.7	19.1	21.6	23.3	25.1	26.0	27.3	28.0	28.6	28.0	26.9	26.1	24.7	23.4	22.1	21.2	21.4	21.1	28.6																						
7-Jun	21.2	20.1	20.0	19.6	18.8	19.9	20.9	21.5	22.6	24.1	25.1	26.2	27.1	27.7	26.0	26.4	26.0	25.7	25.2	24.2	22.6	19.2	16.3	15.3	22.6	27.7																						
8-Jun	14.8	13.6	12.8	12.0	12.5	13.9	16.4	18.4	19.7	20.7	21.3	22.4	22.5	22.2	19.8	17.3	15.7	15.7	15.8	15.8	15.7	15.5	15.0	14.8	16.8	22.5																						
9-Jun	14.4	14.1	13.7	13.9	14.1	13.6	13.3	13.2	12.7	11.9	11.4	11.0	10.6	10.6	10.7	10.4	10.6	10.4	10.1	9.6	9.5	9.2	9.0	9.1	11.6	14.4																						
10-Jun	9.1	8.6	7.9	7.3	7.1	8.8	10.5	12.1	13.1	15.1	16.5	17.4	18.2	19.2	19.7	19.2	19.3	21.0	20.0	18.8	17.6	13.9	11.3	9.7	14.2	21.0																						
11-Jun	9.9	10.2	9.8	10.0	9.8	11.8	12.6	12.8	13.1	13.2	13.8	15.3	14.9	14.7	15.0	15.3	15.0	12.9	11.0	10.7	10.4	11.1	11.2	10.5	12.3	15.3																						
12-Jun	9.8	10.4	9.8	9.5	9.4	10.2	10.8	11.8	13.3	13.7	14.4	14.4	15.1	13.5	14.6	14.3	15.3	15.9	15.9	15.6	13.8	12.5	12.5	13.3	12.9	15.9																						
13-Jun	13.1	13.7	13.0	12.6	12.7	13.2	13.3	13.7	14.8	16.2	17.7	18.2	19.6	20.5	21.5	21.9	21.4	21.1	20.7	18.9	17.0	14.7	12.3	11.6	16.4	21.9																						
14-Jun	10.7	9.9	9.6	7.9	8.7	11.1	13.7	15.9	17.7	20.3	21.5	23.1	24.2	24.3	24.9	25.5	26.1	25.1	23.9	20.1	16.7	15.7	14.8	14.2	17.7	26.1																						
15-Jun	13.8	13.3	13.2	13.1	12.7	11.9	12.5	13.7	13.5	12.4	12.9	12.7	13.1	14.4	16.2	16.7	17.3	17.1	15.8	16.4	15.0	11.8	9.3	8.1	13.6	17.3																						
16-Jun	7.8	7.2	6.8	6.4	7.1	9.8	11.9	14.3	16.3	17.2	17.6	17.4	17.2	17.1	17.3	17.1	16.7	15.7	14.6	13.5	13.4	12.6	12.2	11.4	13.3	17.6																						
17-Jun	10.8	10.9	10.4	10.0	10.2	10.2	10.5	10.5	10.7	11.2	10.8	11.1	11.4	13.4	14.5	16.2	17.3	17.8	17.4	16.6	15.9	15.2	14.2	12.2	12.9	17.8																						
18-Jun	11.6	10.1	9.4	9.1	9.0	9.6	10.2	11.2	12.2	13.4	14.4	15.0	15.8	17.1	18.4	18.9	19.8	19.8	19.3	18.4	16.9	15.1	14.4	11.6	14.2	19.8																						
19-Jun	10.9	9.7	9.0	8.8	9.4	9.8	12.0	12.8	13.2	14.1	15.5	16.4	17.5	18.3	18.9	18.5	18.6	18.4	17.9	16.9	15.7	13.1	9.9	7.9	13.9	18.9																						
20-Jun	6.0	5.2	4.7	4.5	5.0	8.9	13.0	14.8	15.9	17.2	18.5	19.7	20.8	21.9	22.8	23.7	24.3	24.7	24.2	23.0	20.4	17.3	15.7	14.4	16.1	24.7																						
21-Jun	13.3	11.8	11.8	11.9	12.9	16.7	18.5	21.0	22.8	23.6	24.4	25.3	26.0	26.7	27.0	27.2	27.1	27.0	26.6	24.9	22.9	18.6	16.5	15.2	20.8	27.2																						
22-Jun	14.4	13.3	14.2	12.6	10.1	14.6	18.7	20.6	22.9	25.0	25.9	27.1	27.8	27.1	25.7	26.3	27.1	26.0	24.4	23.4	22.2	20.4	19.6	18.3	21.2	27.8																						
23-Jun	17.1	16.0	13.5	12.7	12.6	15.0	17.6	19.0	20.7	21.0	22.6	24.3	23.1	23.9	25.0	25.8	24.3	23.0	20.8	19.4	18.0	17.0	16.4	15.1	19.3	25.8																						
24-Jun	13.6	13.5	13.6	13.0	12.5	12.8	13.8	14.7	15.7	17.0	18.6	20.4	21.9	21.2	20.3	16.9	14.8	15.0	15.3	14.4	14.5	14.5	12.8	12.4	15.6	21.9																						
25-Jun	13.1	13.9	13.7	13.1	12.8	13.3	14.5	15.4	16.3	17.6	18.4	19.6	20.2	20.4	21.1	21.1	21.7	21.5	21.1	20.5	19.6	16.2	14.1	12.8	17.2	21.7																						
26-Jun	12.2	11.4	10.7	10.1	10.4	13.5	17.0	19.5	21.7	23.1	23.4	24.1	23.9	24.1	24.7	26.3	24.5	17.4	16.3	16.2	16.0	16.5	16.5	15.1	18.1	26.3																						
27-Jun	14.1	13.0	12.3	11.8	12.9	15.0	17.5	18.8	19.8	21.1	22.6	23.8	25.2	26.4	23.2	24.5	19.7	21.5	21.3	21.1	20.5	18.8	17.4	16.7	19.1	26.4																						
28-Jun	15.1	13.8	14.0	13.1	13.9	17.4	20.0	21.3	23.0	24.2	25.2	25.7	26.5	27.0	27.4	27.9	26.5	26.1	24.7	24.3	23.4	21.2	19.2	19.5	21.7	27.9																						
29-Jun	18.0	15.4	13.4	12.5	12.6	16.0	19.0	20.4	21.9	22.9	23.6	23.3	23.7	24.0	24.7	25.9	26.0	26.1	25.9	24.7	23.3	21.1	19.5	18.1	20.9	26.1																						
30-Jun	17.3	16.2	16.0	15.9	16.4	17.0	18.4	19.2	19.0	22.2	23.8	25.2	26.5	27.2	27.7	28.1	27.7	27.0	26.2	25.2	24.0	22.4	20.3	18.7	22.0	28.1																						
																								12.8	12.1	11.6	11.1	11.2	12.9	14.7	16.0	17.1	18.3	19.3	20.2	20.7	21.1	21.3	21.3	20.9	20.6	19.9	19.0	17.9	16.2	14.8	13.7	Diurnal Average
																								21.2	20.1	20.0	19.6	18.8	19.9	20.9	21.5	23.0	25.0	25.9	27.1	27.8	27.7	28.0	28.6	28.0	27.0	26.6	25.2	24.0	22.4	21.2	21.4	Diurnal Maximum





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ambient Temperature 2m (AT 2m) - C
Anzac - June 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	64	8.89	8.89
10 - 20	440	61.11	70.00
> 20	216	30.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



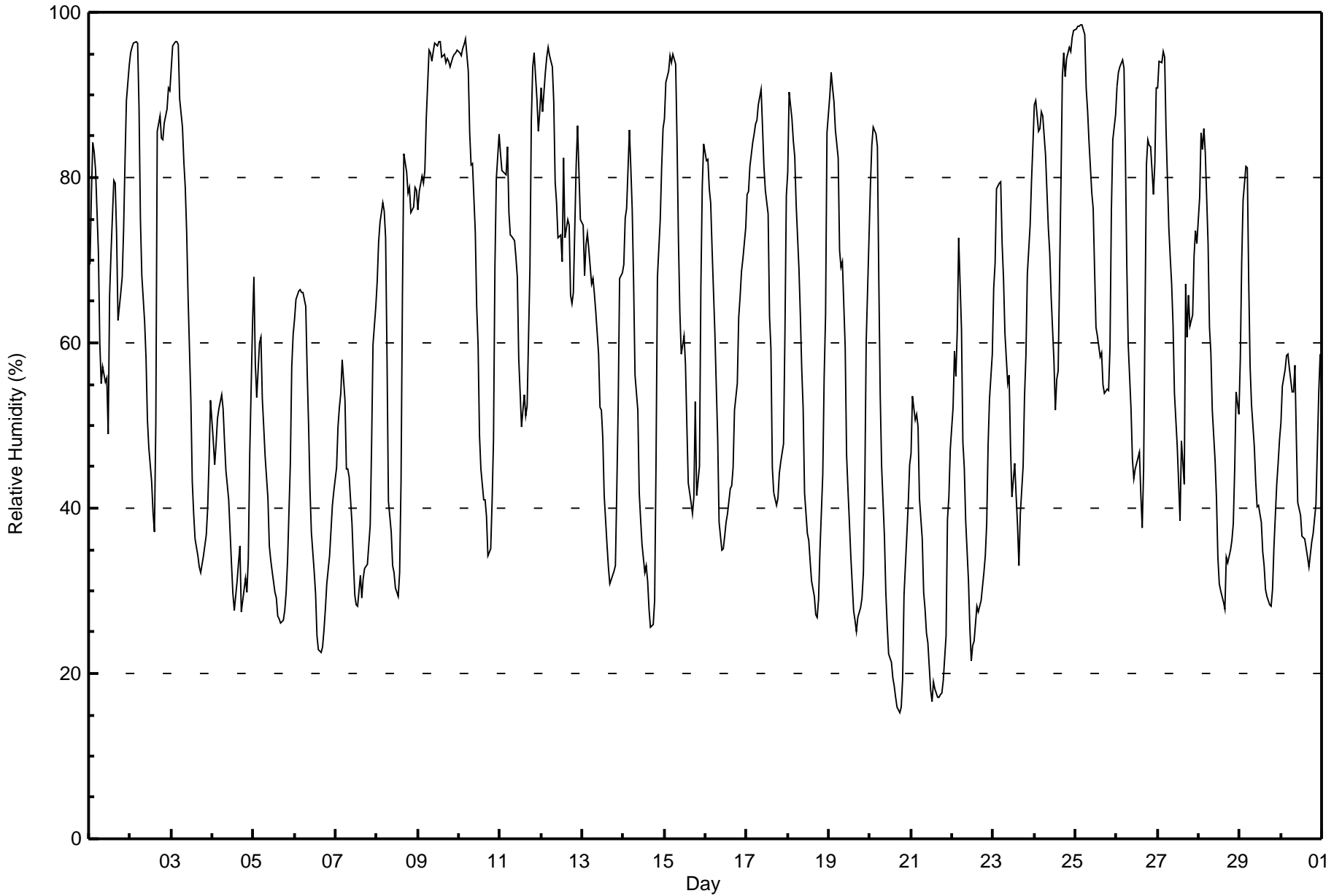
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Anzac - June 2016

Maximum Value: 99 % on Jun 25 05:00 Maximum Daily Average: 91.3 % on Jun 9																			Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0							
Minimum Value: 15 % on Jun 20 18:00 Minimum Daily Average: 31.1 % on Jun 21 Maximum Diurnal Average: 80.0 % at hour 4 Minimum Diurnal Average: 41.6 % at hour 15 Monthly Average: 59.2 % Percentiles: P ₁ = 17 P ₁₀ = 30 Q ₁ = 39 Median = 58 Q ₃ = 79 P ₉₀ = 91 P ₉₉ = 97																										
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-Jun	69	78	84	83	81	71	60	55	57	55	56	49	66	71	80	79	73	63	66	68	74	82	89	94	71.0	94
2-Jun	95	96	96	97	96	88	75	68	63	58	51	47	43	39	37	51	86	87	85	85	87	88	91	91	75.0	97
3-Jun	93	96	97	96	96	89	86	82	79	73	66	53	43	39	36	34	33	32	33	34	37	40	46	53	61.2	97
4-Jun	48	45	48	51	52	54	52	48	45	41	37	33	30	28	31	33	35	27	30	32	30	34	46	62	40.5	62
5-Jun	68	57	53	60	61	53	50	46	41	36	34	32	30	29	27	27	26	26	28	30	34	45	57	61	42.1	68
6-Jun	63	65	66	66	66	66	64	57	50	42	37	32	30	25	23	23	23	25	28	31	34	37	40	42	43.2	66
7-Jun	45	50	52	54	58	53	45	45	44	38	34	29	28	28	32	29	31	33	33	36	38	48	60	64	42.0	64
8-Jun	68	72	75	77	76	73	58	41	37	33	32	30	29	32	43	66	83	81	78	79	76	77	79	78	61.3	83
9-Jun	76	78	80	79	81	87	95	95	94	95	96	96	96	96	95	95	94	94	94	93	95	95	95	95	91.3	96
10-Jun	95	95	96	96	97	93	85	81	82	73	64	60	49	45	41	41	39	34	35	41	48	69	80	85	67.7	97
11-Jun	83	81	81	80	84	76	73	73	72	70	68	58	50	52	54	51	52	69	87	93	95	89	86	88	73.6	95
12-Jun	91	88	93	95	96	95	93	89	79	77	73	73	70	82	73	75	74	66	65	66	82	86	80	75	80.6	96
13-Jun	74	68	72	73	71	67	68	66	64	59	52	52	48	42	36	33	31	31	32	33	42	53	68	68	54.3	74
14-Jun	69	75	76	86	81	76	67	56	52	42	39	36	32	33	31	28	26	26	29	46	68	75	81	86	54.8	86
15-Jun	87	92	93	95	94	95	94	84	72	64	59	61	58	50	43	41	39	41	53	42	45	67	79	84	67.9	95
16-Jun	82	82	79	77	71	61	55	48	38	35	35	37	38	39	42	43	45	52	55	63	66	69	70	74	56.5	82
17-Jun	78	78	81	84	85	87	87	89	91	86	81	79	76	63	59	45	42	40	41	44	46	48	61	78	68.7	91
18-Jun	81	90	87	84	82	77	69	63	57	52	42	37	36	33	31	29	27	27	29	35	44	56	63	85	54.9	90
19-Jun	90	93	91	89	86	82	71	69	70	59	46	42	38	34	28	26	25	27	28	29	32	43	60	73	55.5	93
20-Jun	79	84	86	85	84	68	54	45	37	30	26	22	21	19	18	17	16	15	16	19	29	37	40	45	41.4	86
21-Jun	47	53	51	51	50	41	36	30	28	25	24	18	17	19	18	17	17	18	18	19	25	39	41	47	31.1	53
22-Jun	52	59	56	62	73	62	48	45	38	31	25	22	23	24	28	27	28	29	32	34	38	48	53	59	41.5	73
23-Jun	67	70	79	79	79	72	68	61	55	56	48	41	45	42	38	33	39	45	54	59	68	74	80	84	59.8	84
24-Jun	89	89	86	86	88	88	83	78	74	71	66	58	52	56	57	79	92	95	92	94	96	95	97	98	81.5	98
25-Jun	98	98	98	98	99	97	91	88	84	78	76	69	62	61	58	59	55	54	54	54	59	76	85	88	76.7	99
26-Jun	91	93	93	94	93	82	69	60	52	46	44	45	46	47	42	38	45	82	85	84	84	78	82	91	69.3	94
27-Jun	91	94	94	95	95	86	74	70	67	62	54	48	43	38	48	43	67	61	66	62	63	71	74	72	68.2	95
28-Jun	78	85	83	86	83	72	62	59	52	46	41	34	31	30	29	28	34	33	35	36	38	45	54	51	51.1	86
29-Jun	58	70	77	81	81	67	57	53	48	43	40	40	38	35	33	30	29	28	28	30	35	43	45	48	47.5	81
30-Jun	50	55	57	58	59	57	54	54	57	48	41	39	37	36	36	34	33	34	36	37	41	47	54	59	46.4	59
	75.1	77.7	78.6	80.0	79.9	74.5	68.1	63.3	59.3	54.2	49.5	45.7	43.5	42.3	41.6	41.8	44.7	45.9	48.1	50.3	54.9	61.7	67.9	72.6	Diurnal Average	
	98	98	98	98	99	97	95	95	94	95	96	96	96	96	95	95	94	95	94	94	96	95	97	98	Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Anzac - June 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	16	2.22	2.22
20 - 40	167	23.19	25.42
40 - 60	197	27.36	52.78
60 - 80	165	22.92	75.69
80 - 100	175	24.31	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720

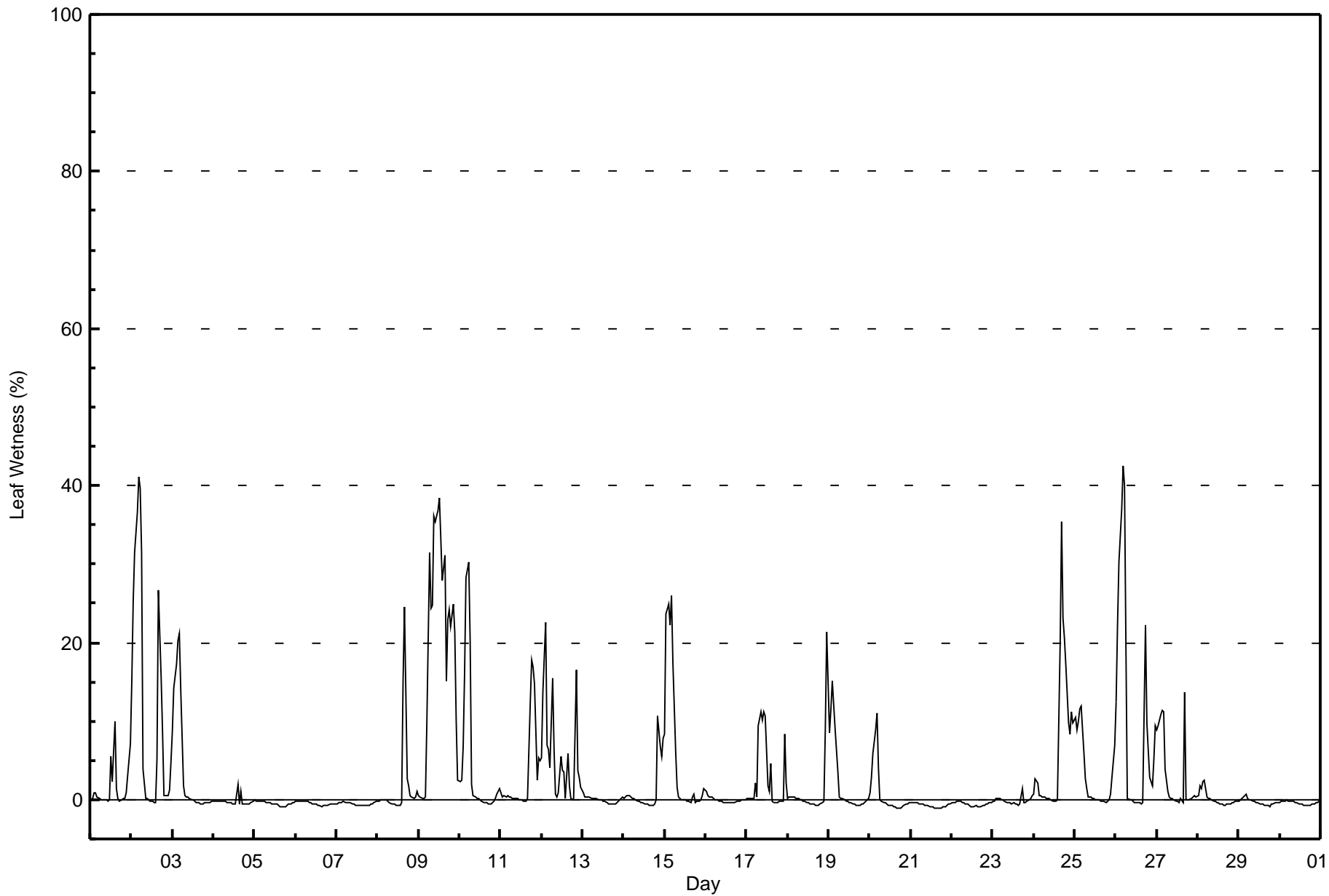


Maximum Value: 42 % on Jun 26 05:00														Maximum Daily Average: 19.7 % on Jun 9														Hours in Service: 720	
Minimum Value: -1 % on Jun 21 18:00														Minimum Daily Average: -0.7 % on Jun 21														Hours of Data: 720	
Maximum Diurnal Average: 7.1 % at hour 5														Minimum Diurnal Average: 0.9 % at hour 14														Hours of Missing Data: 0	
Monthly Average: 2.8 %														Percentiles: P ₁ = -1 P ₁₀ = -1 Q ₁ = 0 Median = 0 O ₃ = 1 P ₉₀ = 11 P ₉₉ = 37														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-Jun	0	0	1	1	0	0	0	0	0	0	0	0	6	2	10	1	0	0	0	0	0	1	3	7	1.4	10			
2-Jun	15	25	31	37	41	40	31	4	0	0	0	0	0	0	0	5	27	16	9	1	1	1	1	5	12.0	41			
3-Jun	9	14	17	20	21	14	2	1	0	0	0	0	0	0	0	0	0	-1	-1	0	0	0	0	0	3.9	21			
4-Jun	0	0	0	0	0	0	0	0	0	0	0	0	-1	-1	2	-1	1	-1	-1	-1	-1	-1	0	0	-0.2	2			
5-Jun	0	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	-0.5	0			
6-Jun	0	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-0.5	0			
7-Jun	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	-0.5	0			
8-Jun	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	0	15	25	3	2	1	0	0	0	1	1.7	25			
9-Jun	0	0	0	0	0	10	32	24	25	36	35	37	38	33	28	31	15	23	24	22	25	21	10	3	19.7	38			
10-Jun	2	2	7	16	28	30	20	2	0	0	0	0	0	0	0	0	0	-1	-1	0	0	0	1	1	4.5	30			
11-Jun	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	18	17	15	3	5	5	3.3	18			
12-Jun	5	14	23	7	6	4	15	6	1	0	1	6	4	4	0	6	2	0	0	0	16	4	3	2	5.4	23			
13-Jun	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	0	0	0	0	0	-0.1	1			
14-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	0	11	7	6	8	1.1	11			
15-Jun	8	24	25	22	26	17	6	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	5.5	26			
16-Jun	1	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	1			
17-Jun	0	0	0	0	0	2	0	9	11	10	11	11	2	1	5	0	0	0	0	0	0	0	8	2	3.0	11			
18-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	0	0	9	21	1.1	21			
19-Jun	9	12	15	12	9	4	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	0	0	0	2.3	15			
20-Jun	1	3	6	9	11	4	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0.9	11			
21-Jun	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-0.7	0			
22-Jun	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	-0.6	0			
23-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	0	1	0	0	0	0	0	1	-0.1	1			
24-Jun	1	3	2	0	0	0	0	0	0	0	0	0	0	0	0	20	35	23	21	17	10	8	11	10	6.8	35			
25-Jun	11	9	10	11	12	6	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	7	3.0	12			
26-Jun	12	22	30	37	42	40	20	0	0	0	0	0	0	0	-1	0	22	10	6	3	2	5	9	10.8	42				
27-Jun	9	9	11	11	11	4	1	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	3.0	14			
28-Jun	0	2	1	2	2	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	0	0	0	0	0	0.1	2			
29-Jun	0	0	0	1	1	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	0	0	0	-0.3	1			
30-Jun	0	0	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	-0.4	0			
2.8														4.6														Diurnal Average	
15														25														Diurnal Maximum	



Wood Buffalo Environmental Association
Hourly Averages

Leaf Wetness (SW) - %
Anzac - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Leaf Wetness (SW) - %
Anzac - June 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	106	32.72	32.72
0.4 - 0.5	27	8.33	41.05
0.6 - 0.7	11	3.40	44.44
0.8 - 1.4	19	5.86	50.31
1.5 - 10	79	24.38	74.69
> 10	81	25.00	99.69

Total Number of Valid Hours: 324

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Anzac - June 2016

Maximum Speed: 30 km/h on Jun 15 13:00	Maximum Daily Speed Average: 13.7 km/h on Jun 15	Hours in Service: 720
Minimum Speed Value: 1 km/h on Jun 8 01:00	Minimum Daily Speed Average: 2.6 km/h on Jun 2	Hours of Data: 719
Maximum Diurnal Speed Average: 3.7 km/h at hour 14	Minimum Diurnal Speed Average: 1.3 km/h at hour 19	Hours of Missing Data: 1
Monthly Average Velocity: 2.4 km/h 250.0 deg	Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 6 Median = 9 O ₃ = 12 P ₉₀ = 16 P ₉₉ = 22	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-Jun	S7	SSW5	SW6	S4	SSE5	S7	SW7	SSW7	S7	SSE7	SE9	SSW7	SSE5	SSW14	SSE4	E6	ESE8	SSE9	SE9	SSE9	SSE7	SSE5	S9	S7	S6.1	SSW14
2-Jun	S2	SSW4	SW4	WSW3	AF	NE3	ENE3	ENE5	SE7	SSE9	SE9	SSE8	SE7	SE9	SSE9	WSW9	WNW12	NNW7	NE2	W3	SSE6	SW5	SSW6	SSW5	S2.6	WNW12
3-Jun	SW5	WNW2	SSW2	WSW3	WNW6	WNW7	WNW9	WNW12	WNW12	WNW12	WNW11	WNW13	WNW14	WNW17	WNW16	WNW17	WNW15	WNW15	WNW14	W12	W9	WSW8	WSW7	WSW6	W9.7	WNW17
4-Jun	W10	W15	WNW17	WNW17	WNW18	WNW18	WNW16	WNW16	WNW15	WNW16	WNW15	WNW15	WNW15	WNW15	NW11	N11	N8	NW17	NNW13	NNW12	NNW12	NW9	NW5	WNW4	NW12.5	WNW18
5-Jun	WNW7	WNW8	NW7	WNW7	WNW8	WNW11	WNW11	WNW10	WNW9	NW12	NNW11	NNW11	NNW11	NNW11	NNW10	N9	N8	NNE7	ENE6	E7	E7	SE10	SE10	SSE10	NNW4.5	NW12
6-Jun	SSE11	SSE11	SSE11	SSE12	SSE12	SSE11	SSE10	SSE10	SSE10	SSE12	SSE12	SSE14	SSE17	S17	S19	S18	S17	S16	S13	SSE14	S15	SSE13	SSE13	SSW13	SSE13.2	S19
7-Jun	SW14	SW13	SW15	SW12	W7	W9	WNW10	WNW12	WNW11	WNW10	WNW13	WNW12	WNW11	WNW13	N14	NNW11	N12	NNW11	NNW9	N9	N7	NE3	ENE4	N2	WNW6.8	SW15
8-Jun	WNW1	ENE3	ENE7	ENE5	E4	WNW1	N2	NE5	ENE5	ENE8	NE8	NE7	NE8	S6	SSW11	S5	SE3	ENE8	E9	ENE6	ESE7	SE9	SE6	ESE5	E3.9	SSW11
9-Jun	E8	ENE8	ENE8	ENE11	ENE10	NE10	NE12	NE13	NE14	NE13	NE17	NE17	NE15	NE18	NE20	NE16	NE15	NNE15	NNE16	NNE15	N13	N11	N10	N8	NE12.2	NE20
10-Jun	N11	N10	NNW8	NNW7	NW5	NW5	NW6	NW7	WNW10	NW9	NW12	N12	N10	N9	NNE9	NNE8	NNW3	W6	NW5	NNW3	ENE4	ESE2	SSE1	ESE4	NNW5.6	NW12
11-Jun	SE6	SSE6	SSE8	SSE6	SSE7	SSE8	SSE9	SSE9	SSE9	SSE11	SSE13	SSE18	SSE19	SSE16	SE14	SE17	SE20	SE14	SE4	NNE2	E2	SE9	SE9	SE6	SSE9.9	SE20
12-Jun	SE8	SSE8	S8	S5	SW6	SW7	SW8	SW8	SW12	SW12	SW16	SW18	WSW17	W14	WSW15	WNW12	WNW11	W15	W12	WSW10	W14	W12	W16	W15	WSW9.6	SW18
13-Jun	WSW15	W19	W18	W16	W16	W17	W17	W16	W13	W15	W16	WNW15	WNW14	W16	W16	W16	W15	WSW15	WSW14	WSW8	SW4	S5	SSW3	SW4	W12.9	W19
14-Jun	WSW3	S5	S5	SW2	NNE1	SE3	ESE3	ESE5	ESE7	ESE10	SE14	SE17	SE19	SE18	SE21	SSE17	SSW14	S14	S20	S10	SE8	SE10	SE13	SSE9.6	SE21	
15-Jun	SE13	ESE12	ESE15	ESE15	SSE12	SE9	SE11	SSE16	S23	S26	S28	SSW25	SSW30	SSW27	SSW27	SSW23	SSW18	S15	SSE9	S14	SW9	SSW4	WSW4	S4	S13.7	SSW30
16-Jun	S7	S7	S9	S9	S10	S8	S10	SSE12	SSW18	SSW21	SSW18	S18	S17	SSW14	WSW11	WSW11	WSW10	W9	WSW11	WSW9	SW8	WSW9	W10	W11	SSW9.6	SSW21
17-Jun	W10	W11	WSW10	W8	W11	WNW12	NW12	NW13	NW14	NW14	NW17	NW17	NW14	NW16	NW17	NW16	NW14	WNW12	W12	WSW12	WSW14	WSW15	W20	WNW12	WNW12.0	W20
18-Jun	NNW10	N8	NW10	NW9	NW10	NW9	NNW10	NW9	WNW9	WNW10	WNW13	WNW13	WNW11	WNW8	WNW9	WNW8	WNW10	NW7	W2	SW2	SSW5	SW8	W12	WNW7	WNW7.7	WNW13
19-Jun	NW7	NW7	NNW7	NW7	NNW6	NW6	NW7	WNW10	WNW10	NW11	NNW15	NNW16	NNW15	NNW17	N19	N20	NNW20	N17	N17	N14	N10	N5	NNW4	W3	NNW10.6	N20
20-Jun	W4	W4	W6	WSW7	WSW6	W4	NW4	W6	W8	W11	W10	W10	W9	W10	WSW10	WNW8	WNW6	W6	W4	SW4	SSW3	SSE6	S9	S7	WSW5.7	W11
21-Jun	S6	SSW5	SW7	SW7	SW9	SW7	SW7	WSW8	W5	W7	WNW7	S6	SSW5	S9	SE5	SSW8	SE7	ESE7	SSE8	SSW9	SSW5	S3	SSE7	S7	SSW5.2	S9
22-Jun	S7	SW7	WSW7	SW5	E3	SE3	S2	SSW5	SSW5	S7	SSW7	SW3	S6	SSW10	SW12	SSW12	SW12	WSW11	W10	WSW8	SW7	WSW6	W6	WSW5	SW5.9	SW12
23-Jun	W4	SW3	WSW3	SSW4	SW5	W4	WNW11	WNW11	WNW8	WNW9	W10	W10	WNW10	W8	WNW10	W12	N5	E5	E13	ESE7	SE3	SE2	ENE7	SE2	W3.0	E13
24-Jun	NNW3	N4	NE5	E4	N2	N3	N4	NNW6	NW6	NW7	NW8	NNW9	NNE9	NNW11	NE7	SW4	NW6	W9	NW3	SSW4	WNW6	NNW5	NNW2	NNW5	NNW4.0	NNW11
25-Jun	NW5	NNW5	N4	NNW4	NW4	NNW7	NNW5	N5	NE7	NNE8	NE13	NNE11	NNE12	NNE13	NNE12	NNE13	NE12	ENE13	ENE10	NE4	NE2	N1	W3	NNE6.8	NNE13	
26-Jun	W5	WSW2	S1	SSW2	S3	WSW2	SSW3	SSW4	S5	WSW1	SW4	NNW5	NW4	WNW10	WSW7	W4	SW8	WSW7	SSW11	S8	SW7	WNW9	WNW6	SSW6	WSW3.8	SSW11
27-Jun	S5	S8	W1	N5	WNW6	W7	WNW9	WNW11	WNW11	WNW10	WNW11	W11	WNW11	WNW12	NNW9	NNE7	N10	SSE5	SSW7	SW6	WSW6	WSW5	WSW7	WSW6	W5.3	WNW12
28-Jun	SE1	S5	SW7	WSW6	W6	WNW6	NW10	WNW10	WNW9	WNW8	NW9	NNW13	NNW13	NNW11	NNW11	N13	NE13	NNE12	NNE9	NNE9	NNE7	NE7	ENE6	E6	NNW5.4	NE13
29-Jun	ESE4	E5	E6	E3	ESE3	SE5	SE7	SSE8	SSE9	SE7	SE8	ENE6	E10	E6	E6	SE7	SSE5	SSE6	SE10	SE10	SE9	SSE11	SSE10	SSE10	SE6.2	SSE11
30-Jun	SSE10	SSE9	SSE11	SSE11	SSE12	SSE11	SSE10	SE5	ENE6	SE7	SSE13	SSE11	SSE12	SSE13	SSE13	SSE12	SSW13	S12	SSW14	S10	S8	S9	S7	S8	SSE9.8	SSW14

SW2.8	SW2.5	SW2.5	SW2.3	WSW2.8	W2.8	W3.2	W3.3	WSW3.6	W3.6	W3.1	W3.1	W2.5	W3.7	W2.6	W2.9	WNW2.1	W2.5	WSW1.3	SSW2.0	SW2.1	SSW2.3	SSW2.6	SSW3.0	Diurnal Average	
WSW15	W19	W18	WNW17	WNW18	WNW18	W17	W16	S23	S26	S28	SSW25	SSW30	SSW27	SSW26	SW23	SE20	N17	N17	S20	S15	WSW15	W20	W15	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 - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 11 km/h on Jun 15 13:00	Hours in Service: 720 Hours of Data: 719 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9
Minimum Value: 0 km/h on Jun 23 01:00	
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 6 P 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-Jun	2	1	1	1	1	2	2	3	2	2	2	4	4	5	3	2	2	3	3	2	2	1	2	2	5
2-Jun	1	1	3	2	AF	1	2	1	2	3	3	3	3	3	3	5	5	3	2	1	3	2	1	2	5
3-Jun	1	2	2	1	2	2	3	4	5	4	4	5	5	5	6	6	6	5	5	4	3	2	2	2	6
4-Jun	4	5	6	6	6	6	6	5	5	6	5	5	5	5	5	4	4	7	5	4	4	2	2	2	7
5-Jun	2	2	2	2	3	4	4	3	3	4	5	4	3	4	4	3	3	4	3	2	2	4	3	2	5
6-Jun	3	3	3	3	3	3	3	3	3	3	4	5	6	6	6	6	6	6	5	4	5	3	4	4	6
7-Jun	3	3	3	5	2	3	3	4	4	4	4	4	4	5	4	5	4	4	3	3	3	1	1	1	5
8-Jun	1	3	2	1	1	1	1	1	2	2	3	3	3	5	4	3	2	2	3	2	2	3	2	2	5
9-Jun	2	3	2	3	4	3	3	4	4	4	6	5	4	5	6	5	5	5	5	5	4	3	3	3	6
10-Jun	3	3	2	2	1	2	2	2	3	3	4	4	3	3	3	3	2	2	2	1	1	1	1	2	4
11-Jun	1	1	1	2	2	2	2	2	3	3	4	8	6	5	5	6	6	4	4	1	2	2	3	2	8
12-Jun	2	2	2	2	2	2	2	3	4	4	5	6	5	6	5	6	4	5	4	3	6	5	6	6	6
13-Jun	5	8	7	6	5	6	6	6	5	6	6	5	5	6	6	6	5	5	5	4	1	2	2	3	8
14-Jun	2	3	2	1	1	1	2	2	3	3	4	6	6	6	6	6	7	5	6	7	5	2	3	4	7
15-Jun	4	4	4	5	5	3	4	5	9	9	10	10	11	9	9	8	7	7	4	5	8	2	2	1	11
16-Jun	1	2	2	2	3	2	3	4	7	7	7	5	5	5	4	4	3	4	4	3	2	2	4	4	7
17-Jun	4	4	3	3	4	4	4	4	5	5	7	5	5	6	6	6	5	5	4	3	4	4	10	4	10
18-Jun	4	3	3	3	3	3	3	3	4	3	4	4	4	3	3	3	3	2	1	1	2	2	8	3	8
19-Jun	2	2	1	2	2	2	2	3	3	4	5	6	6	6	6	6	6	6	5	4	3	1	1	1	6
20-Jun	1	1	1	1	1	1	1	2	2	3	3	3	3	3	3	3	2	2	2	1	1	2	2	1	3
21-Jun	1	1	1	1	1	1	2	2	3	3	2	5	4	4	3	3	4	3	3	3	2	1	1	1	5
22-Jun	1	2	2	2	1	1	1	1	2	3	3	3	4	4	4	5	5	4	4	3	2	2	1	1	5
23-Jun	0	1	1	2	2	2	4	3	2	3	3	3	3	2	3	3	2	3	4	2	1	2	2	2	4
24-Jun	2	1	2	2	1	1	1	2	2	2	3	3	3	4	4	2	3	2	3	2	4	2	1	1	4
25-Jun	1	1	1	1	2	2	2	1	2	3	3	4	4	4	4	4	4	4	4	3	1	1	1	2	4
26-Jun	1	1	1	1	1	1	1	2	2	2	2	2	3	4	3	3	4	4	3	3	1	4	3	2	4
27-Jun	1	1	2	1	2	2	3	4	3	3	3	3	4	4	6	2	5	2	2	1	2	1	1	1	6
28-Jun	1	2	1	1	1	2	3	3	3	3	3	5	4	4	4	5	5	4	3	3	2	2	2	2	5
29-Jun	1	1	1	1	1	1	2	3	3	3	4	4	3	4	3	3	3	3	3	3	3	3	2	2	4
30-Jun	2	2	3	2	3	3	2	2	1	5	4	4	4	5	5	5	4	4	4	3	2	2	1	2	5

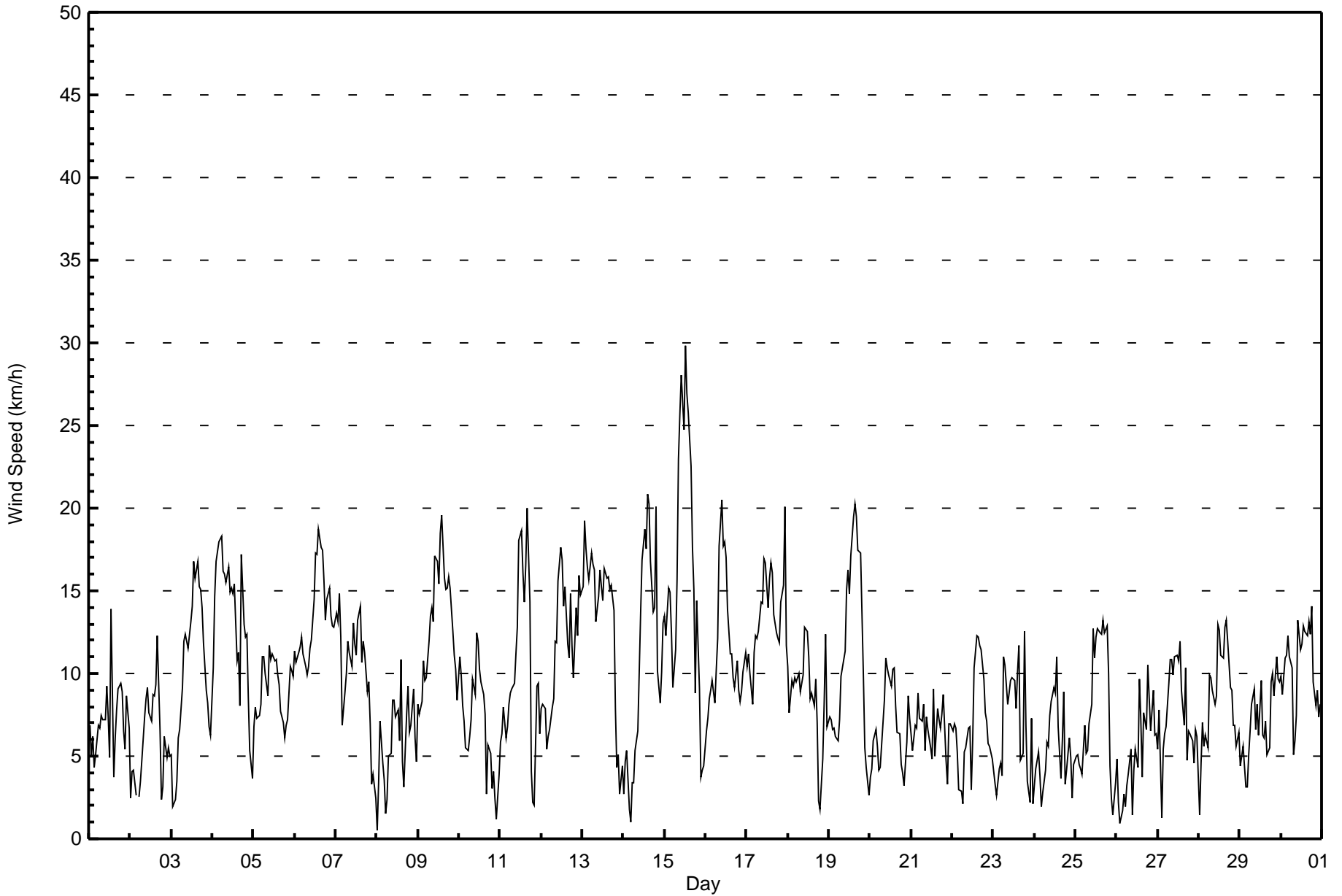
5	8	7	6	6	6	6	6	6	9	9	10	10	11	9	9	8	7	7	6	7	8	5	10	6
Diurnal Maximum																								

AF - Analyzer Failure



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Anzac - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Anzac - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	155	21.56	21.56
6 - 11	352	48.96	70.51
12 - 19	195	27.12	97.64
20 - 28	16	2.23	99.86
29 - 38	1	0.14	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 719

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Anzac - June 2016**

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	2	7	7	7	7	11	7	15	18	14	10	14	4	9	11	155
6 - 11	15	11	7	14	10	6	28	44	30	11	20	27	31	52	23	23	352
12 - 19	9	9	13	1	1	4	8	23	13	10	10	8	26	38	13	9	195
20 - 28	1	0	1	0	0	0	2	1	4	4	1	0	1	0	0	1	16
29 - 38	0	0	0	0	0	0	0	0	0	1	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
Totals	37	22	28	22	18	17	49	75	62	44	45	45	72	94	45	44	719

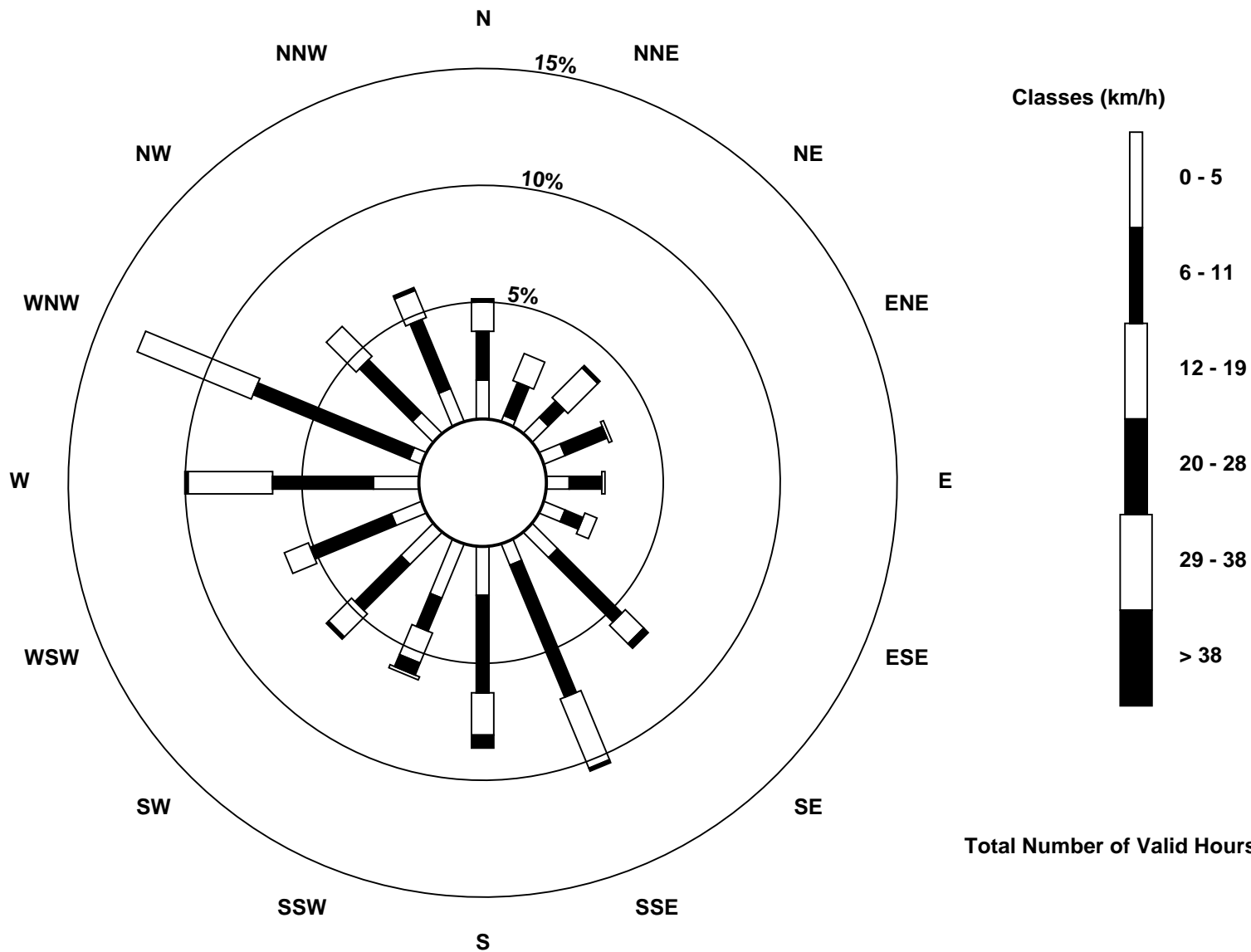
Total Number of Valid Hours: 719

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed (WS) - km/h
Anzac (AMS 14)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Anzac - June 2016

Direction of Maximum Speed: 210 deg on Jun 15 13:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 182.6 deg on Jun 15	Hours of Data: 719
Direction of Minimum Speed: 292 deg on Jun 8 01:00	Hours of Missing Data: 1
Direction of Minimum Daily Speed Average: 2.6 deg on Jun 2	Percent Operational Time: 99.9
Monthly Average Direction: 269.0 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-Jun	179	201	225	182	151	173	221	209	186	160	136	197	165	203	151	94	108	152	138	152	159	162	176	188	170.3
2-Jun	186	208	228	238	AF	41	68	68	131	154	139	151	134	125	160	247	299	348	53	270	154	223	198	192	169.4
3-Jun	217	300	197	257	283	287	288	289	288	285	285	292	283	283	289	290	290	290	289	281	266	245	243	239	280.6
4-Jun	262	279	287	292	289	291	295	300	299	296	295	302	302	319	359	354	320	338	336	330	326	312	288	304.5	
5-Jun	282	294	308	289	295	287	295	294	284	325	333	331	334	343	345	2	353	13	74	96	87	125	136	156	326.8
6-Jun	159	167	165	164	163	157	158	158	150	148	155	167	165	174	172	171	184	181	164	176	157	167	212	167.8	
7-Jun	222	224	225	234	263	275	285	297	299	295	288	289	288	298	356	343	355	339	339	11	1	45	77	11	297.6
8-Jun	292	75	69	59	93	289	356	45	69	61	53	45	50	181	194	186	127	76	85	78	104	131	126	118	89.4
9-Jun	84	64	57	71	61	45	47	53	53	52	51	47	48	51	51	43	37	24	18	20	11	5	355	355	41.0
10-Jun	350	350	348	340	318	315	313	309	299	317	323	354	357	358	16	31	347	281	310	336	66	118	154	105	340.9
11-Jun	128	148	159	161	149	153	152	154	154	147	150	155	157	149	135	144	146	144	142	26	86	126	137	142	146.5
12-Jun	137	150	171	177	221	225	228	226	232	228	234	235	243	269	254	288	293	270	274	251	270	273	265	272	247.6
13-Jun	250	267	271	275	273	277	273	275	279	273	277	288	290	279	280	275	259	243	246	248	222	187	197	230	268.1
14-Jun	246	186	187	214	31	138	103	117	117	110	124	137	142	135	146	150	161	194	183	190	169	135	131	131	150.5
15-Jun	138	120	118	118	151	133	143	153	180	183	188	206	210	208	208	219	199	190	150	182	233	210	242	189	182.6
16-Jun	170	173	175	171	177	170	182	167	200	212	203	180	172	201	252	245	255	266	252	243	227	241	262	261	208.9
17-Jun	263	268	256	261	275	283	305	310	309	315	323	322	322	309	308	309	304	298	260	248	243	238	269	296	289.8
18-Jun	333	352	323	319	313	322	341	323	294	296	297	286	293	295	297	293	299	306	270	221	211	228	274	300	301.6
19-Jun	304	321	330	326	333	325	305	291	292	311	340	348	342	348	349	355	345	355	357	3	354	355	331	265	338.8
20-Jun	268	270	261	249	255	266	306	267	261	266	276	270	265	266	258	284	300	277	270	227	196	159	174	180	257.8
21-Jun	185	209	223	219	227	226	218	239	277	261	295	189	204	186	145	192	143	106	167	198	210	169	168	178	202.0
22-Jun	183	233	239	234	99	129	172	203	203	187	210	225	169	202	227	205	232	245	264	246	232	255	271	253	222.4
23-Jun	259	221	241	194	226	269	302	299	294	295	278	281	284	266	286	266	6	96	96	122	137	142	74	140	276.5
24-Jun	327	357	46	86	353	11	350	339	316	306	314	344	13	344	40	216	325	271	322	192	299	334	346	333	335.4
25-Jun	318	338	356	340	325	345	348	354	36	20	56	33	16	20	20	32	33	45	69	59	47	35	350	277	24.3
26-Jun	263	238	190	201	175	240	206	213	174	248	218	336	306	285	240	262	227	245	210	183	222	287	297	196	238.2
27-Jun	188	187	277	354	286	269	284	296	297	293	287	279	282	293	344	14	3	150	204	225	255	249	244	242	281.1
28-Jun	146	191	230	242	271	286	305	297	293	290	319	347	348	342	346	350	37	15	12	19	23	38	61	92	342.1
29-Jun	104	88	85	100	110	137	136	156	152	143	125	75	84	79	98	132	153	160	138	137	142	152	157	161	129.9
30-Jun	166	162	162	163	163	167	168	136	72	146	158	159	151	150	167	162	196	188	192	181	187	184	175	174	167.0
	216.3	227.7	229.5	234.4	245.5	260.0	273.9	271.6	257.6	259.3	264.0	273.9	266.2	264.1	272.1	274.3	290.5	273.8	238.7	205.6	224.0	199.2	213.1	210.6	
	Diurnal Average																								

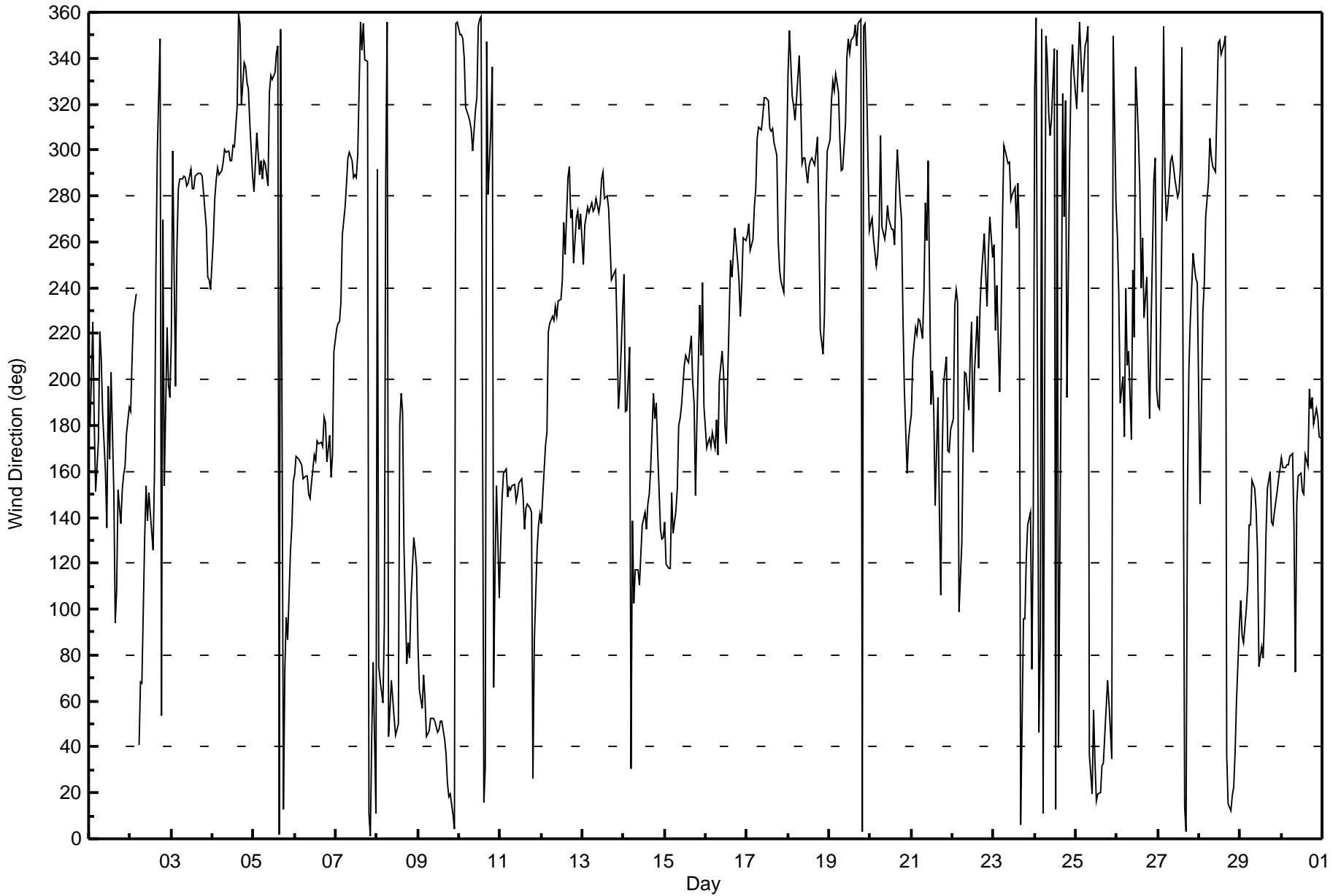
AF - Analyzer Failure
 All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Anzac - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 92 deg on Jun 26 10:00		Hours in Service: 720 Hours of Data: 719 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9																							
Minimum Value: 6 deg on Jun 20 03:00																									
Percentiles: P ₁ = 11 P ₁₀ = 16 Q ₁ = 19 Median = 25 Q ₃ = 30 P ₉₀ = 47 P ₉₉ = 81																									
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-Jun	15	29	13	30	25	19	23	34	26	23	19	55	84	26	51	22	26	24	25	21	22	18	15	20	84
2-Jun	35	12	20	21	AF	35	50	32	30	29	36	47	55	37	39	51	28	31	81	51	31	33	15	37	81
3-Jun	34	39	51	17	17	21	22	23	24	25	29	28	27	28	28	27	26	27	25	26	25	19	20	20	51
4-Jun	25	26	25	25	25	24	25	25	22	22	25	25	28	23	33	33	29	21	19	17	16	13	32	37	37
5-Jun	17	20	18	19	19	22	22	22	32	25	31	28	33	26	39	37	45	50	55	38	23	19	18	18	55
6-Jun	16	17	17	18	15	15	16	18	19	24	28	26	25	27	23	29	24	24	26	20	25	18	19	26	29
7-Jun	16	16	17	25	31	23	23	23	23	29	24	26	29	27	23	35	26	19	21	21	16	30	20	44	44
8-Jun	83	76	10	14	30	58	58	24	28	22	25	36	36	76	25	72	61	27	19	27	27	19	24	38	83
9-Jun	19	21	16	16	25	16	17	17	18	18	19	16	18	16	17	18	17	18	18	18	16	17	16	21	25
10-Jun	16	16	15	15	14	21	22	25	22	29	24	24	27	30	37	25	58	43	38	51	20	32	70	38	70
11-Jun	13	13	11	21	17	15	16	18	24	20	20	23	22	22	25	22	21	19	78	42	66	17	29	15	78
12-Jun	15	24	16	26	24	17	17	21	22	26	20	20	25	27	25	35	26	27	28	27	28	28	26	27	35
13-Jun	25	28	27	27	28	26	26	27	29	29	28	26	28	28	31	30	29	24	27	20	16	17	63	37	63
14-Jun	39	52	14	70	73	18	56	23	27	29	26	27	28	25	24	23	29	26	22	25	21	20	19	20	73
15-Jun	21	20	21	20	34	28	22	22	25	24	28	27	27	26	28	26	29	31	26	26	63	57	26	31	63
16-Jun	15	18	14	14	16	20	26	25	30	29	30	25	23	31	31	27	28	33	28	26	17	19	24	26	33
17-Jun	27	28	24	24	26	26	23	22	20	21	18	19	22	23	23	23	25	26	27	21	18	16	30	33	33
18-Jun	17	19	17	19	19	22	20	32	33	29	26	28	29	38	38	33	28	22	72	44	15	12	29	41	72
19-Jun	25	14	14	13	16	27	23	27	25	32	21	24	26	23	20	19	22	20	19	18	16	12	10	30	32
20-Jun	14	18	6	6	6	13	33	34	26	25	30	33	30	32	24	34	32	35	42	25	37	27	13	14	42
21-Jun	16	23	13	11	11	14	17	24	37	39	40	83	82	47	66	45	50	38	32	24	15	21	13	11	83
22-Jun	15	15	14	56	24	17	61	27	38	39	48	87	70	29	27	28	33	25	27	22	16	28	19	12	87
23-Jun	14	36	38	32	25	37	19	21	30	29	29	33	26	30	26	27	51	55	22	28	36	66	12	71	71
24-Jun	48	16	31	44	53	29	16	17	26	21	25	26	43	24	59	64	30	17	76	30	35	16	13	12	76
25-Jun	13	14	17	12	37	16	22	29	25	26	22	26	23	24	26	23	22	21	25	19	19	17	26	25	37
26-Jun	11	71	75	62	29	44	23	38	39	92	66	54	69	28	35	69	53	57	35	22	30	27	44	22	92
27-Jun	15	11	77	17	26	20	24	24	22	28	29	28	31	29	50	32	26	51	22	18	23	22	11	12	77
28-Jun	76	31	11	19	16	19	20	22	23	30	31	24	25	34	34	29	26	22	17	17	15	18	18	26	76
29-Jun	22	16	14	21	27	19	26	27	30	51	49	67	30	73	52	61	70	59	36	23	20	19	16	16	73
30-Jun	17	16	16	14	16	16	18	38	18	38	23	38	36	31	34	29	30	30	26	22	22	19	13	15	38
	83	76	77	70	73	58	61	38	39	92	66	87	84	76	66	72	70	59	81	51	66	66	70	71	
	Diurnal Maximum																								
AF - Analyzer Failure																									





Wood Buffalo Environmental Association

Summary of Hour Averages

Precipitation (PC) - mm

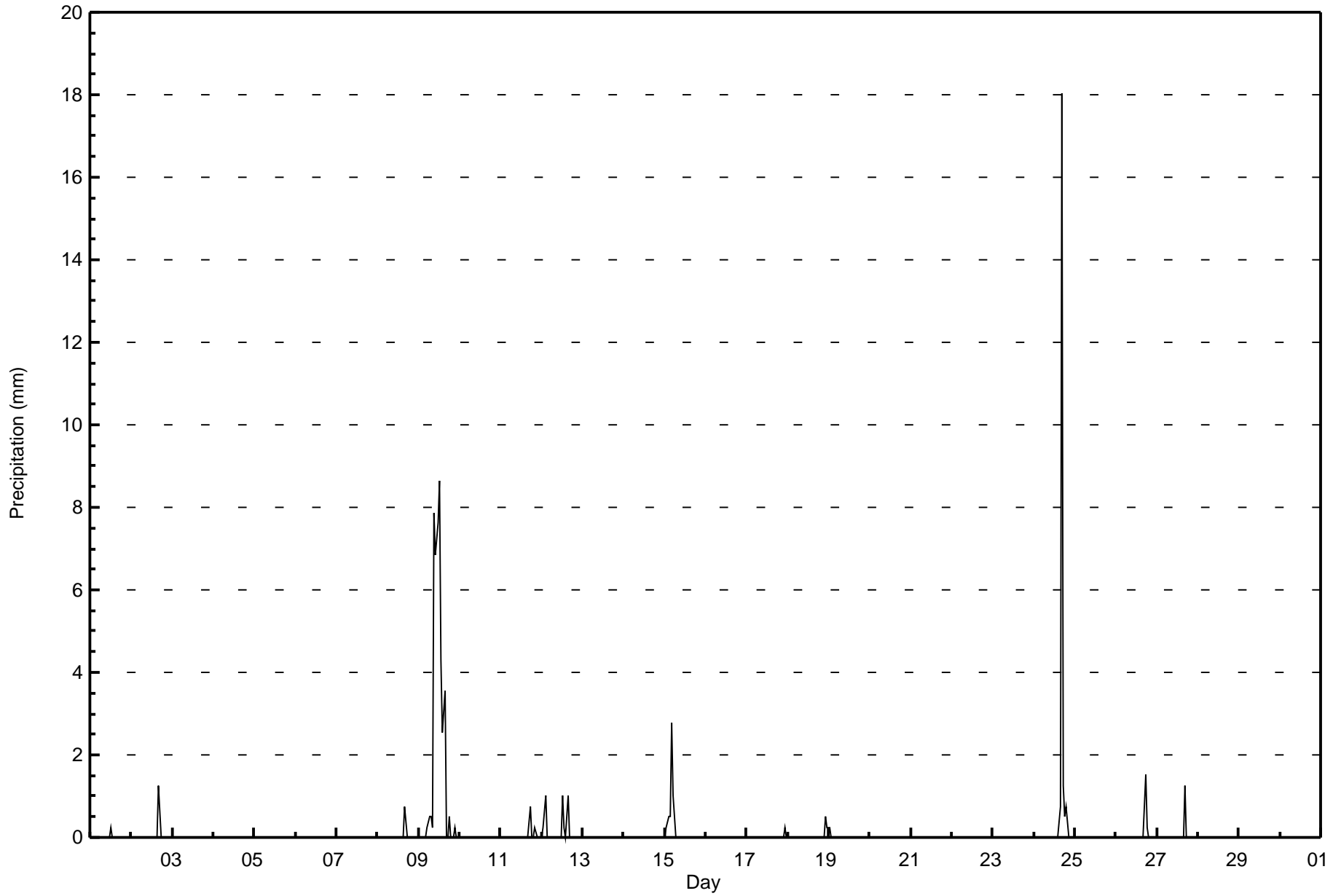
Anzac - June 2016

Maximum Value: 18.0 mm on Jun 24 17:00		Maximum Daily Total: 43.7 mm on Jun 9		Hours in Service: 720																																												
Minimum Value: 0.0 mm on Jun 1 01:00		Minimum Daily Total: 0.0 mm on Jun 3		Hours of Data: 720																																												
Maximum Diurnal Total: 21.3 mm at hour 17		Minimum Diurnal Total: 0.3 mm at hour 1		Hours of Missing Data: 0																																												
Monthly Total: 81.28 mm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 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-Jun	0.0	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																						
2-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3																						
3-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8																						
9-Jun	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.5	0.3	7.9	6.9	7.6	8.6	4.3	2.5	3.6	0.0	0.0	0.5	0.0	0.0	0.3	0.0	0.0	43.7	8.6																						
10-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.3	0.0	0.0	0.0	1.0	0.8	0.8																						
12-Jun	0.0	0.3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	1.0	1.0																						
13-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.3	0.5	0.5	2.8	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	5.1	2.8	2.8																						
16-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.3	0.3	0.3																					
18-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.8	0.5	0.5																						
19-Jun	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	0.3	0.3	0.3																						
20-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	18.0	1.3	0.5	0.8	0.0	0.0	0.0	21.3	18.0	18.0																						
25-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	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	0.3	0.0	0.0	0.0	0.0	1.8	1.5	1.5	1.5																						
27-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	1.3	1.3	1.3	1.3																						
28-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
																								0.3	0.5	1.5	0.5	2.8	1.3	0.5	0.5	0.3	7.9	6.9	7.6	9.9	4.6	2.5	5.3	21.3	3.6	1.3	0.8	0.3	0.3	0.8	0.3	Diurnal Average
																								0.3	0.3	1.0	0.5	2.8	1.0	0.5	0.5	0.3	7.9	6.9	7.6	8.6	4.3	2.5	3.6	18.0	1.5	0.5	0.8	0.3	0.3	0.5	0.3	Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
Anzac - June 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 14, 2016	Last Calibration	May 18, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	7:25	End Time (MST)	13:35
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

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	524	524
Analyzer IP address	192.168.1.43		Lamp voltage	2449	2449
Calculated slope	0.997772	1.006279	Chamber temp	50.0	50.0
Calculated intercept	0.860086	0.141273	Pressure	25.9	25.9
Analyzer Background	20.7	19.7	Flow	484	484
Analyzer Coefficient	1.086	1.086	Intensity	61	61

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	-0.8	----
as found span	5000	74.9	707.1	702.2	1.007
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	74.9	707.1	702.8	1.006
second point	5000	37.5	354.0	350.9	1.009
third point	5000	18.7	176.5	175.6	1.005
as left zero	5000	0.0	0.0	0.7	----
as left span	5000	74.9	707.1	696.6	1.015
Average Correction Factor					1.007

Corrected As found 703.0 Previous response 707.8 % change 0.7%

Notes:

zero air scrubber changed out, filter changed out

Calibration Performed By: Melissa Lemay



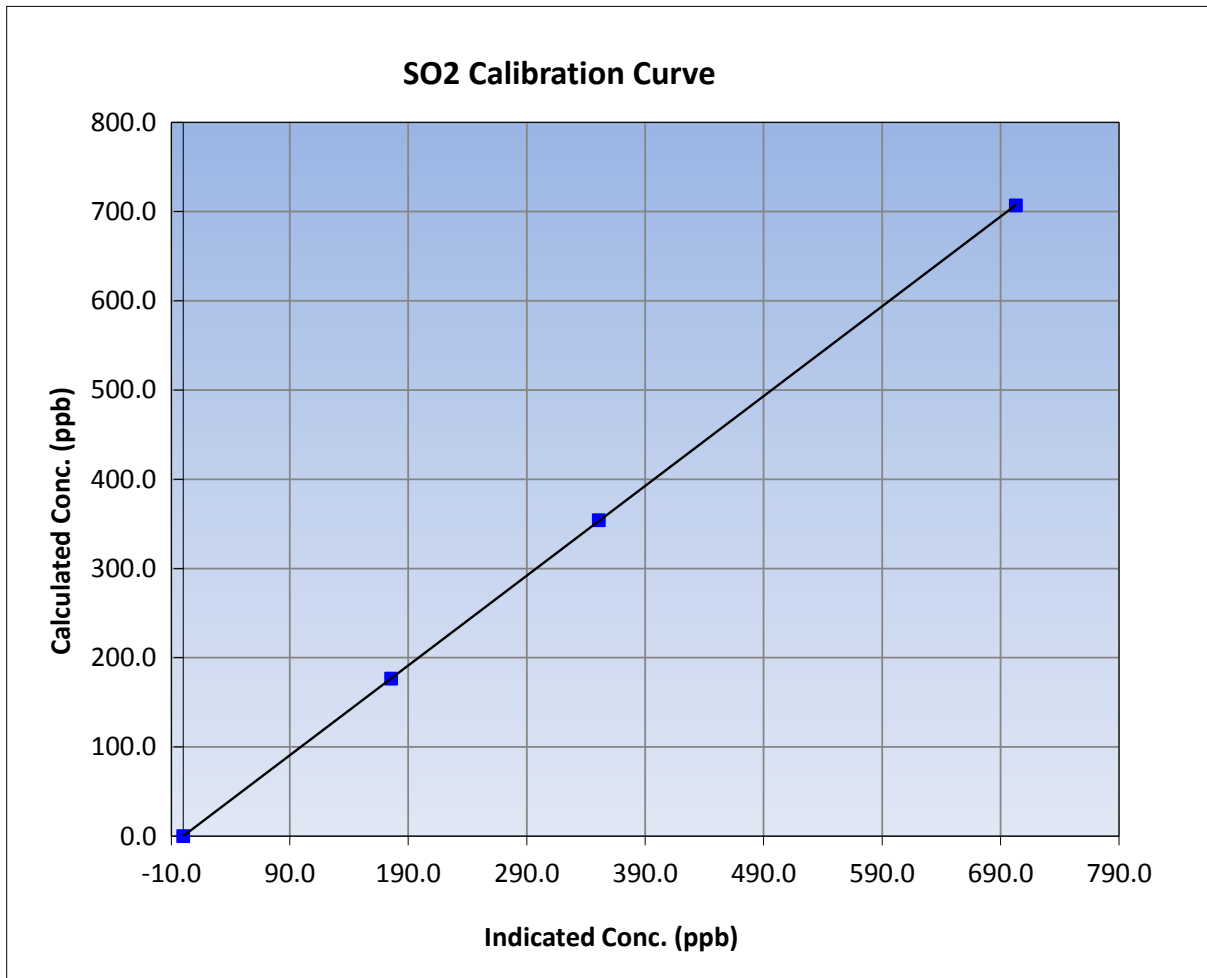
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 14, 2016	Previous Calibration	May 18, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:25	End Time (MST)	13:35
Analyzer make	API T100	Analyzer serial #	723

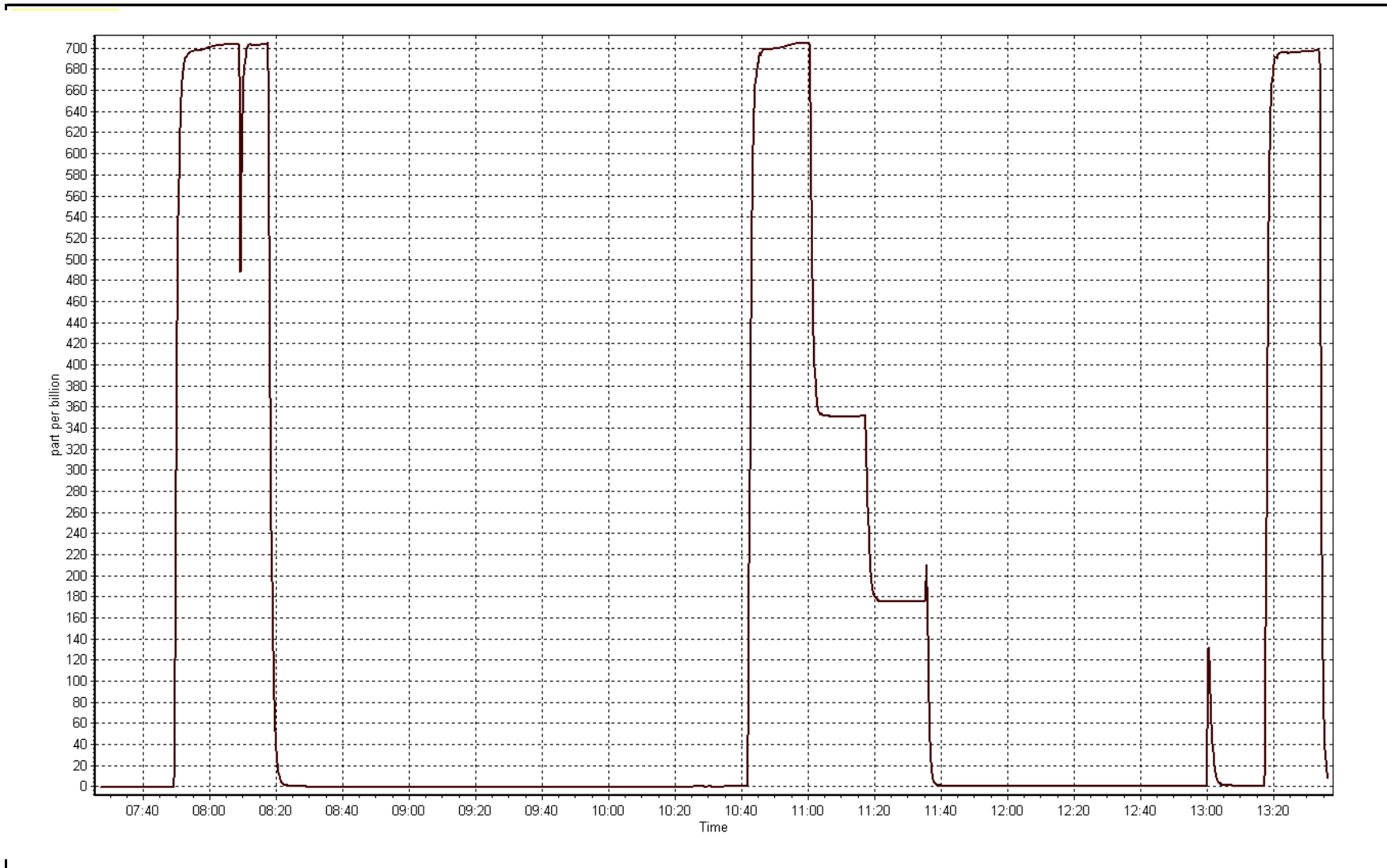
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999997
707.1	702.8	1.0061		
354.0	350.9	1.0088	Slope	1.006279
176.5	175.6	1.0053		
			Intercept	0.141273



SO2 Calibration Plot

Date: June 14, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	June 15, 2016	Last Calibration	May 18, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	10:05	End Time (MST)	12:45
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	-731	-731
Analyzer IP address	192.168.1.42		Lamp voltage	984	984
Calculated slope	1.004182	1.002837	Chamber temp	45	45
Calculated intercept	-0.207205	-0.287069	Pressure	647.4	647.4
Analyzer Background	1.75	1.75	Flow	0.399	0.399
Analyzer Coefficient	1.207	1.207	Intensity	99	99
			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	0.1	----
as found span	5000	74.3	75.0	75.0	1.001
SO2 scrubber check	5000	18.7	176.5	0.6	----
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	74.3	75.0	75.0	1.001
second point	5000	39.6	40.0	40.3	0.992
third point	5000	19.8	20.0	20.4	0.980
as left zero	5000	0.0	0.0	0.3	----
as left span	5000	74.3	75.0	75.9	0.989
Average Correction Factor					0.991

Corrected As found	74.9	Previous response	74.9	% change	0.1%
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Notes:

No adjustments done, filter changed out,

Calibration Performed By:

Melissa Lemay



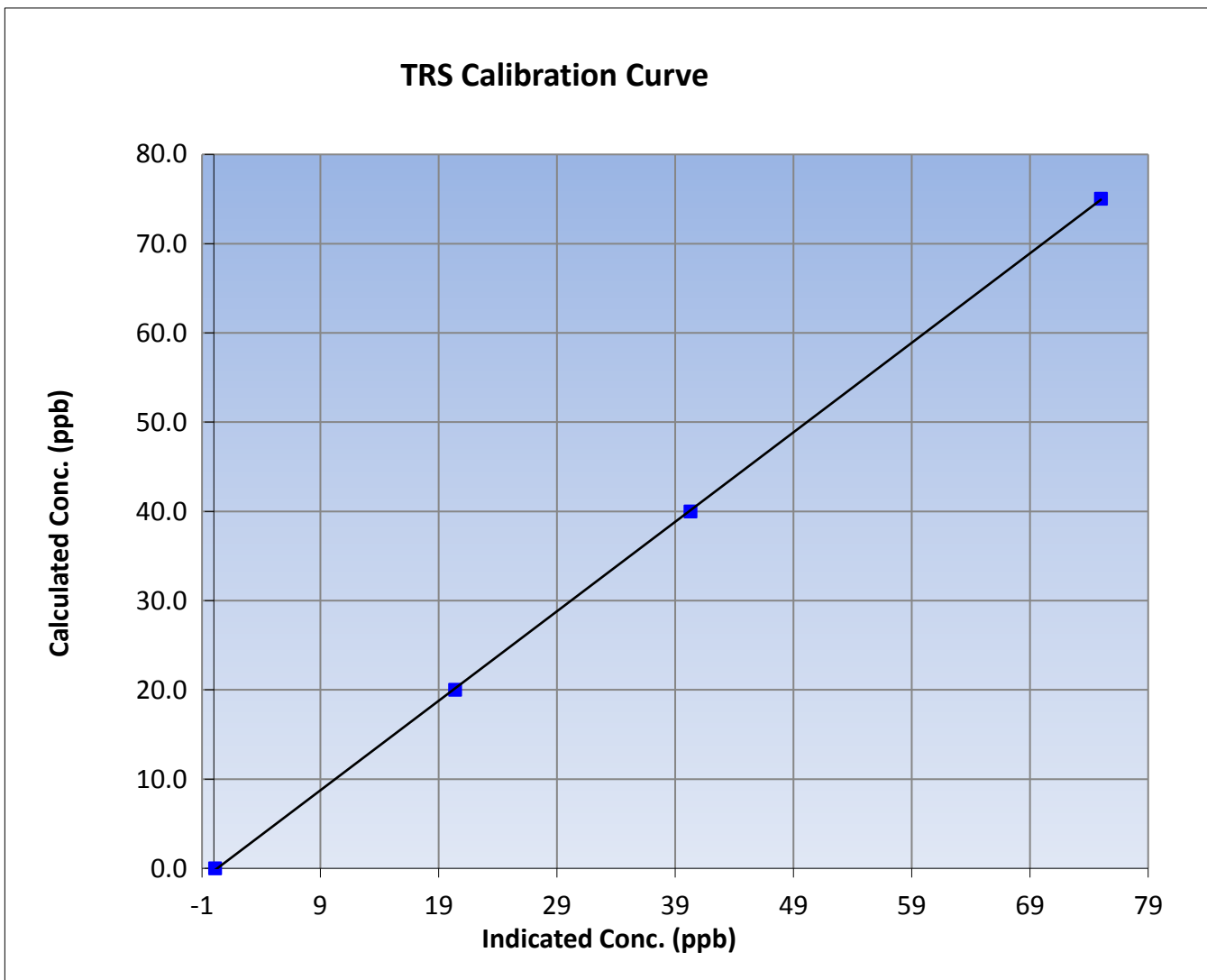
Wood Buffalo Environmental Association TRS Calibration Report

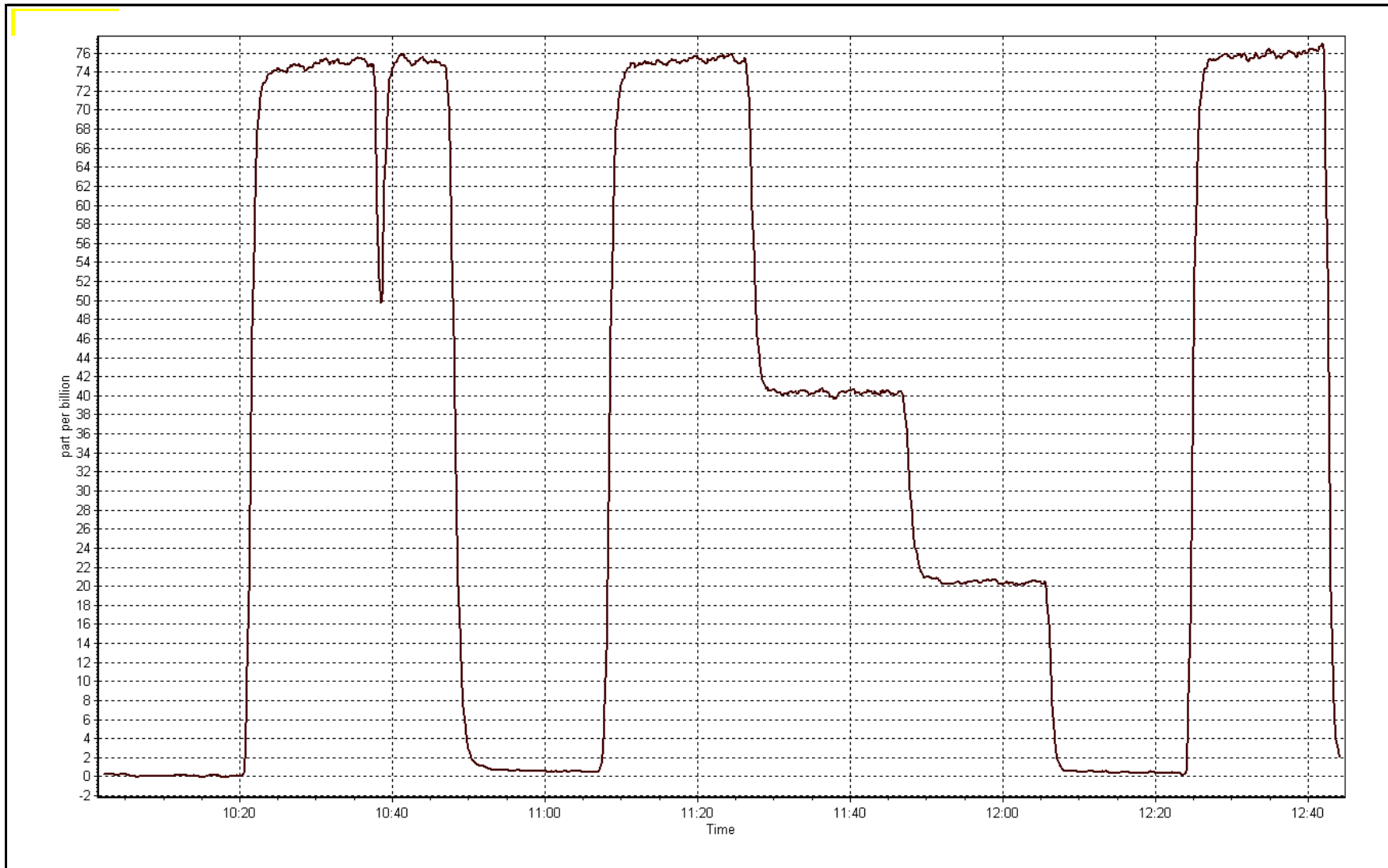
Station Information

Calibration Date	June 15, 2016	Previous Calibration	May 18, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	10:05	End Time (MST)	12:45
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	0.1	----	Correlation Coefficient	0.999969
75.0	75.0	1.0006		
40.0	40.3	0.9925	Slope	1.002837
20.0	20.4	0.9803		
			Intercept	-0.287069







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	June-14-16	Last Calibration	May-18-16
Station Name	Anzac	Station Number	AMS 14
Reason:	Install		
Start Time (MST)	7:25	End Time (MST)	13:35
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

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
THC Range (ppm)	0 - 50 ppm		Column Temp	75.1	75.1
NMHC Range (ppm)	0 - 25 ppm		Detector Temp	175.1	175.1
Analyzer IP address	192.168.1.55		Flame Temp	358.0	358.0
THC Calc slope	0.997364	1.009458	Carrier Pressure	32.0	32.0
THC Calc intercept	0.016078	0.020309	Fuel Pressure	44.6	44.6
NMHC Calc slope	0.998551	1.010352	Air Pressure	32.7	32.7
NMHC Calc intercept	0.004052	0.002090			

Analyzer make Thermo 55i Analyzer serial # 1317958219

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	16.30	1.004
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	74.9	16.36	16.21	1.009
second point	5000	37.5	8.19	8.05	1.018
third point	5000	18.7	4.09	4.03	1.014
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	74.9	16.36	15.93	1.027
Average Correction Factor					1.014

Corrected As found 16.30 Previous response 16.39 % change 0.5%

Notes:

filter changed out, nitrogen changed out, zero air scrubber changed, no adjustments done

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	8.67	1.003
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	74.9	8.69	8.61	1.010
second point	5000	37.5	4.35	4.28	1.017
third point	5000	18.7	2.17	2.16	1.005
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	74.9	8.69	8.38	1.037
Average Correction Factor					1.010

Corrected As found 8.67 Previous response 8.70 % change 0.4%

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	7.63	1.005
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	74.9	7.67	7.61	1.008
second point	5000	37.5	3.84	3.77	1.019
third point	5000	18.7	1.91	1.88	1.019
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	74.9	7.67	7.55	1.016
Average Correction Factor					1.015

Corrected As found 7.63 Previous response 7.69 % change 0.8%



Wood Buffalo Environmental Association

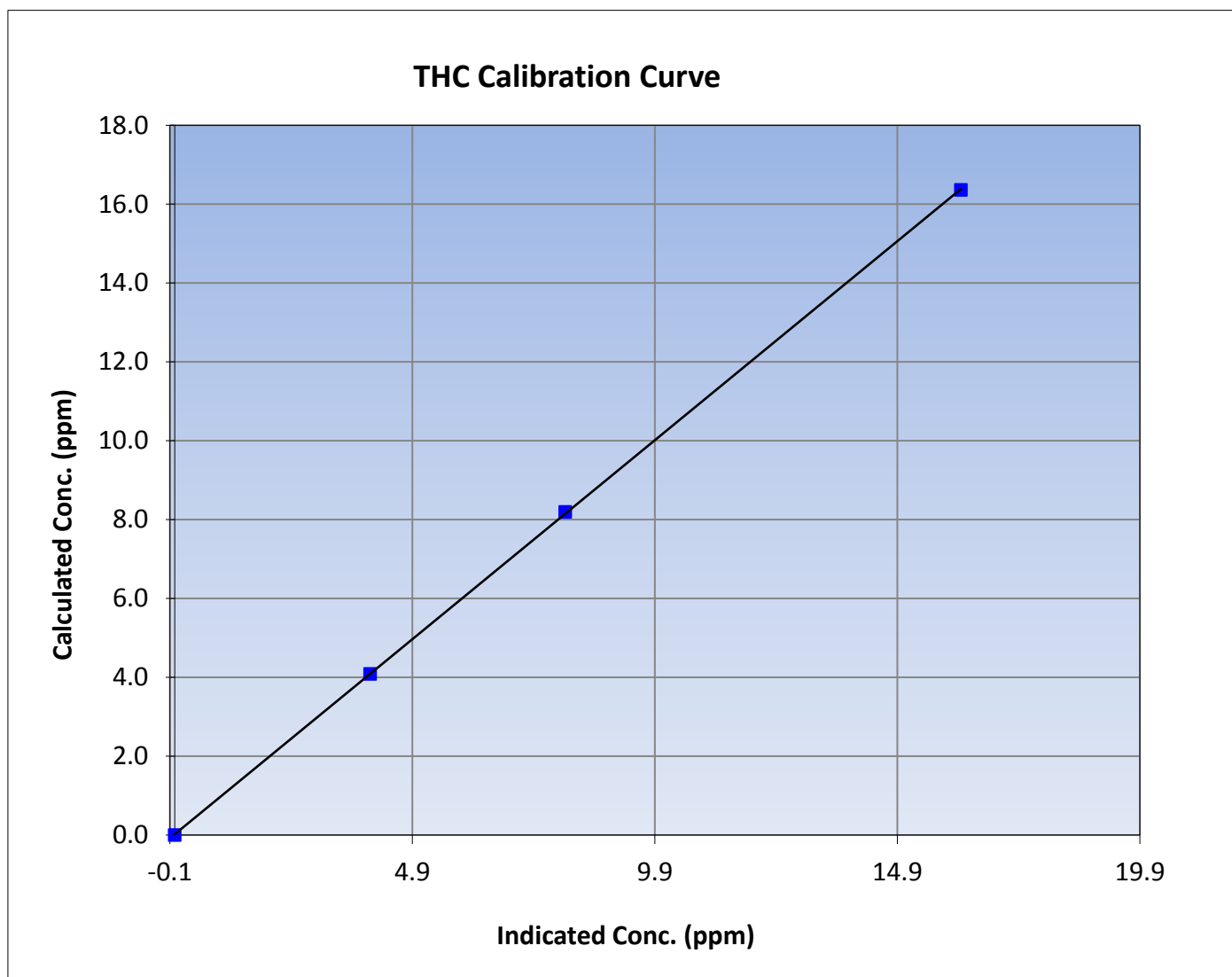
THC Calibration Summary

Station Information

Calibration Date	June 14, 2016	Previous Calibration	May 18, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:25	End Time (MST)	13:35
Analyzer make	Thermo 55i	Analyzer serial #	1317958219

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999980
16.36	16.21	1.0094		
8.19	8.05	1.0176	Slope	1.009458
4.09	4.03	1.0137		
			Intercept	0.020309





Wood Buffalo Environmental Association

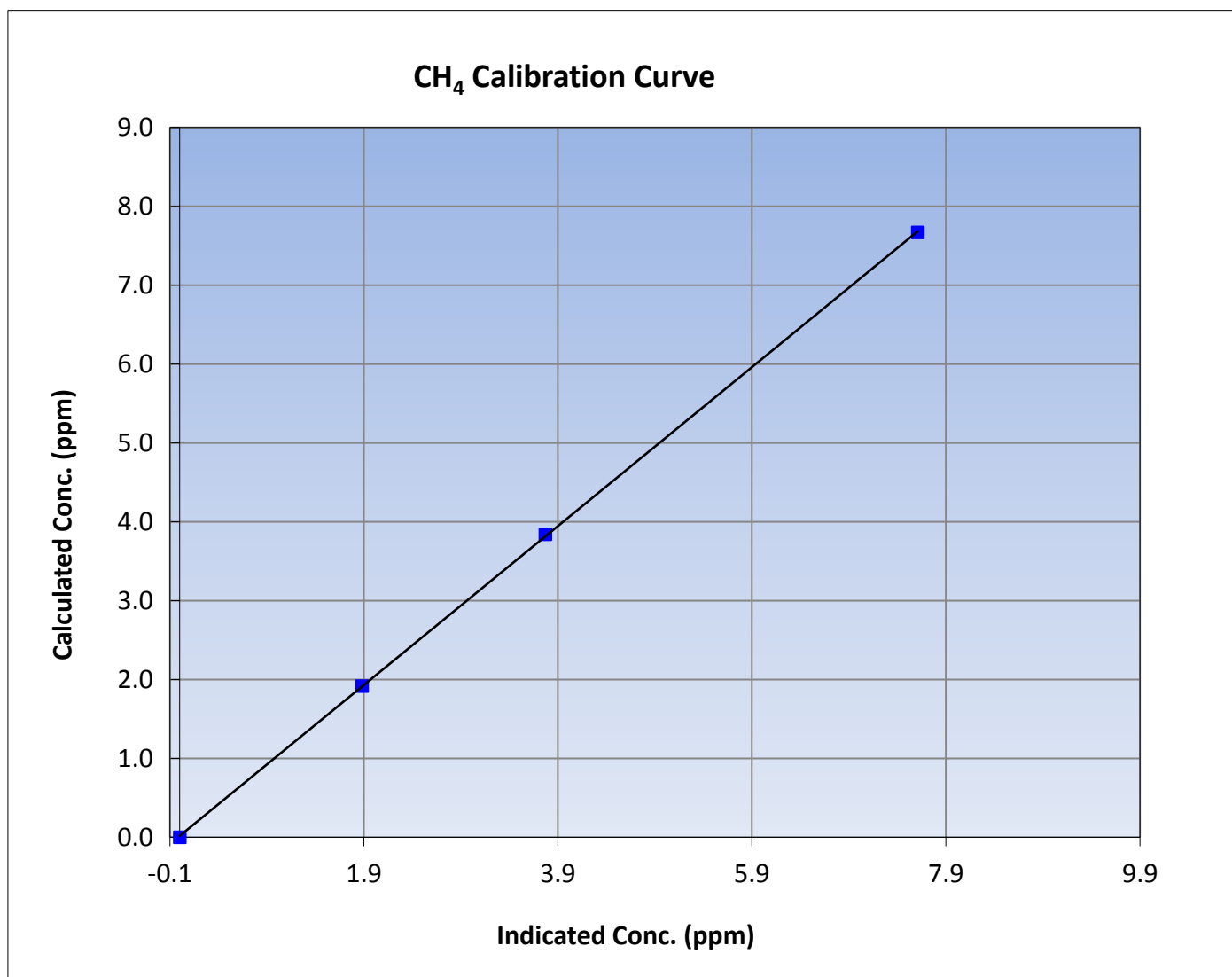
CH₄ Calibration Summary

Station Information

Calibration Date	June 14, 2016	Previous Calibration	May 18, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:25	End Time (MST)	13:35
Analyzer make	Thermo 55i	Analyzer serial #	1317958219

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999965
7.67	7.61	1.0079		
3.84	3.77	1.0186	Slope	1.007522
1.91	1.88	1.0186		
			Intercept	0.016225





Wood Buffalo Environmental Association

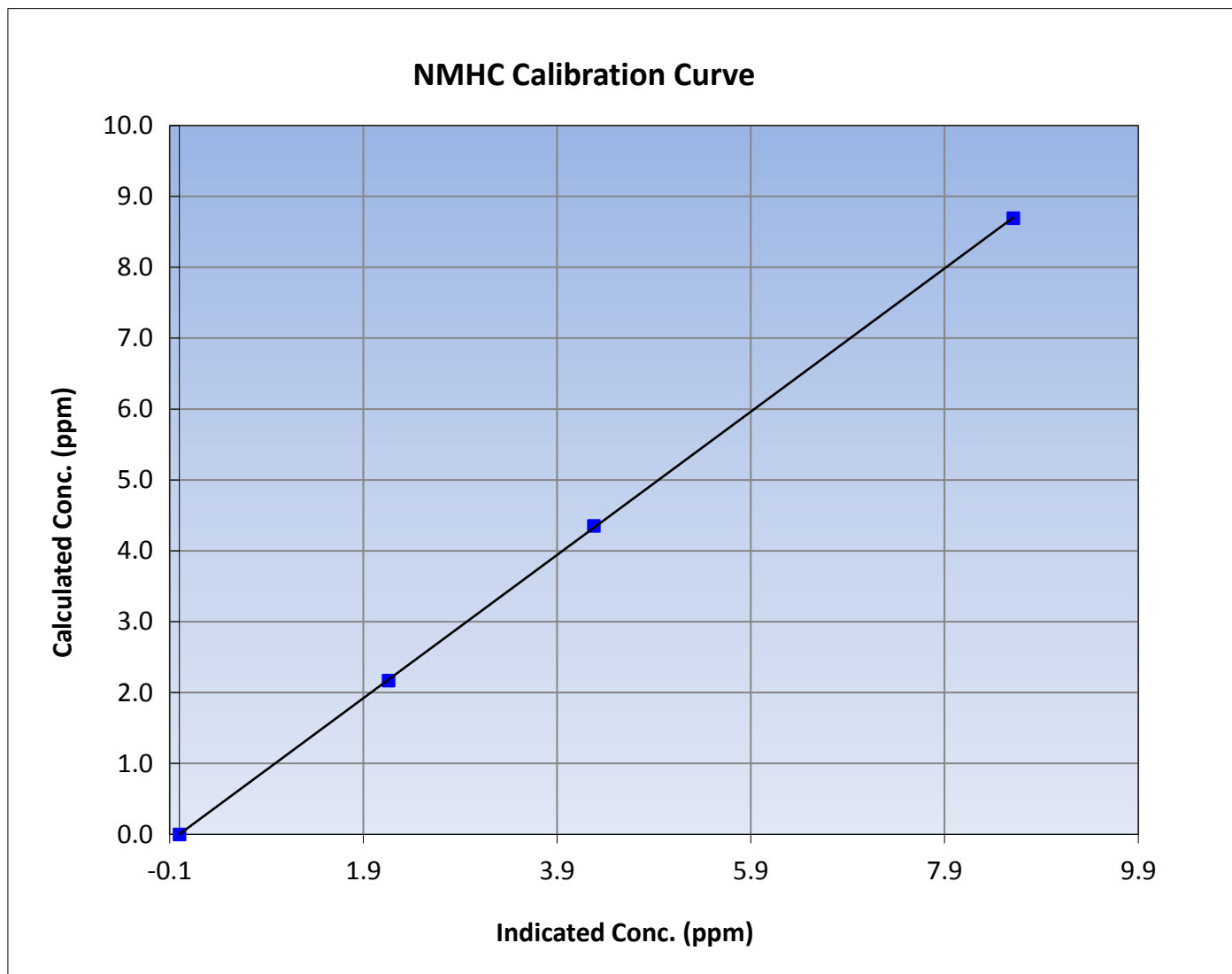
NMHC Calibration Summary

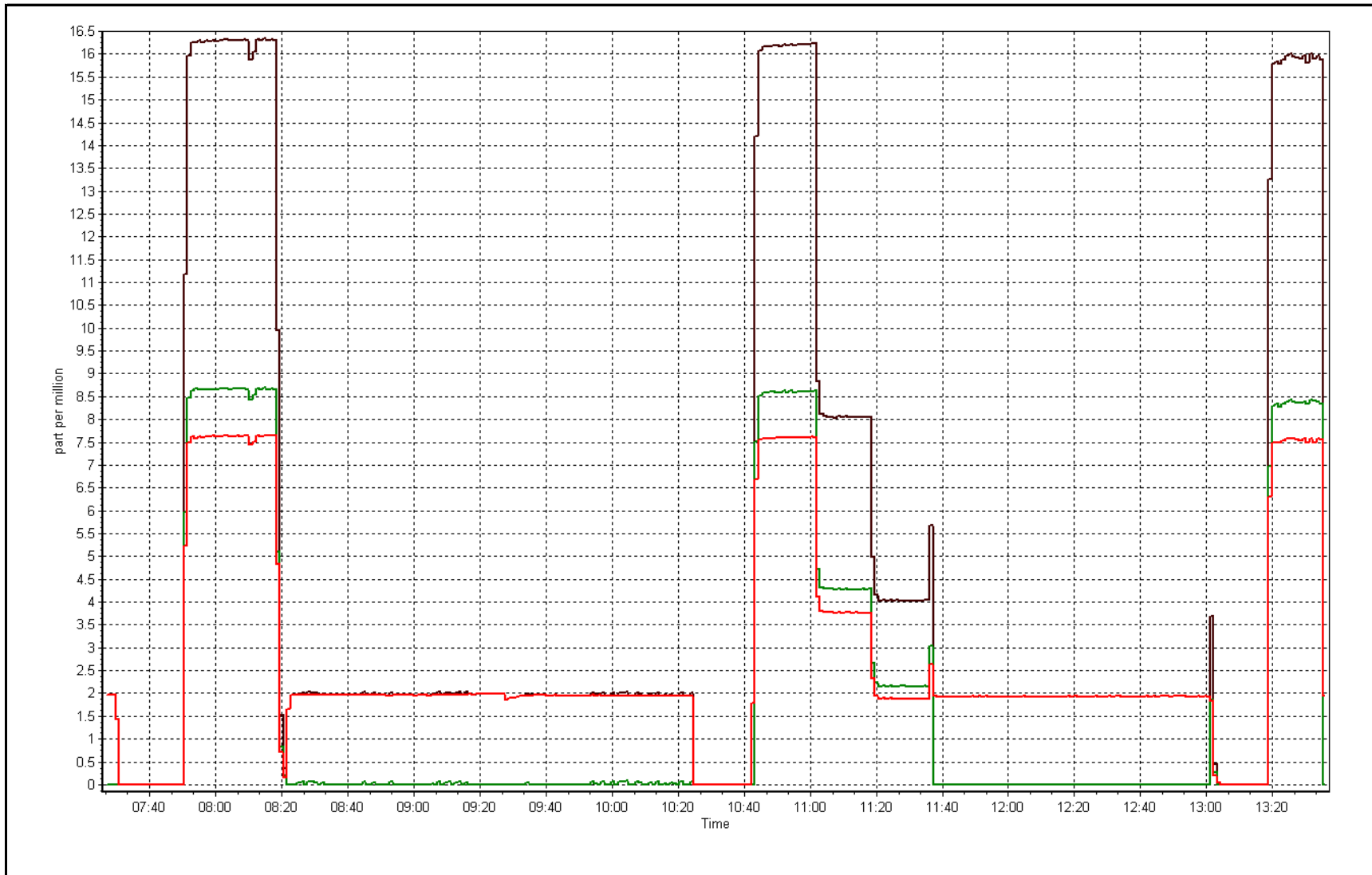
Station Information

Calibration Date	June 14, 2016	Previous Calibration	May 18, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:25	End Time (MST)	13:35
Analyzer make	Thermo 55i	Analyzer serial #	1317958219

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999977
8.69	8.61	1.0095		
4.35	4.28	1.0168	Slope	1.010352
2.17	2.16	1.0047		
			Intercept	0.002090







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	June 15, 2016	Previous Calibration	May 18, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	7:04	End Time (MST)	10:05
NO2 GPT Ref date	June-14-16	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.	25.9	25.9
Analyzer IP address	192.168.1.48		Lamp temp.	53.8	53.8
Calculated slope	0.999935	1.002256	Pressure	643.7	643.7
Calculated intercept	-1.360172	0.949842	Flow cell A	0.697	0.697
Analyzer Background	-2.1	0.4	Flow cell B	0.699	0.699
Analyzer Coefficient	1.030	0.993	Cell A Intensity	103172	103172
			Cell B Intensity	111109	111109

Analyzer make	Thermo 49i	Analyzer serial #	1426262596
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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	2.4	----
as found span	5000	1.19	413.1	430.6	0.959
calibrator zero	5000	0.00	0.0	-0.2	----
high point	5000	1.19	413.1	411.8	1.003
second point	5000	0.85	285.1	283.2	1.007
third point	5000	0.51	149.9	147.6	1.016
as left zero	5000	0.00	0.0	0.2	----
as left span	5000	1.19	413.1	409.0	1.010
Average Correction Factor					1.008

Corrected As found	428.2	Previous response	414.5	% change	-3.2%
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Notes:

zero and span adjusted, filter changed out

Calibration Performed By: Melissa Lemay



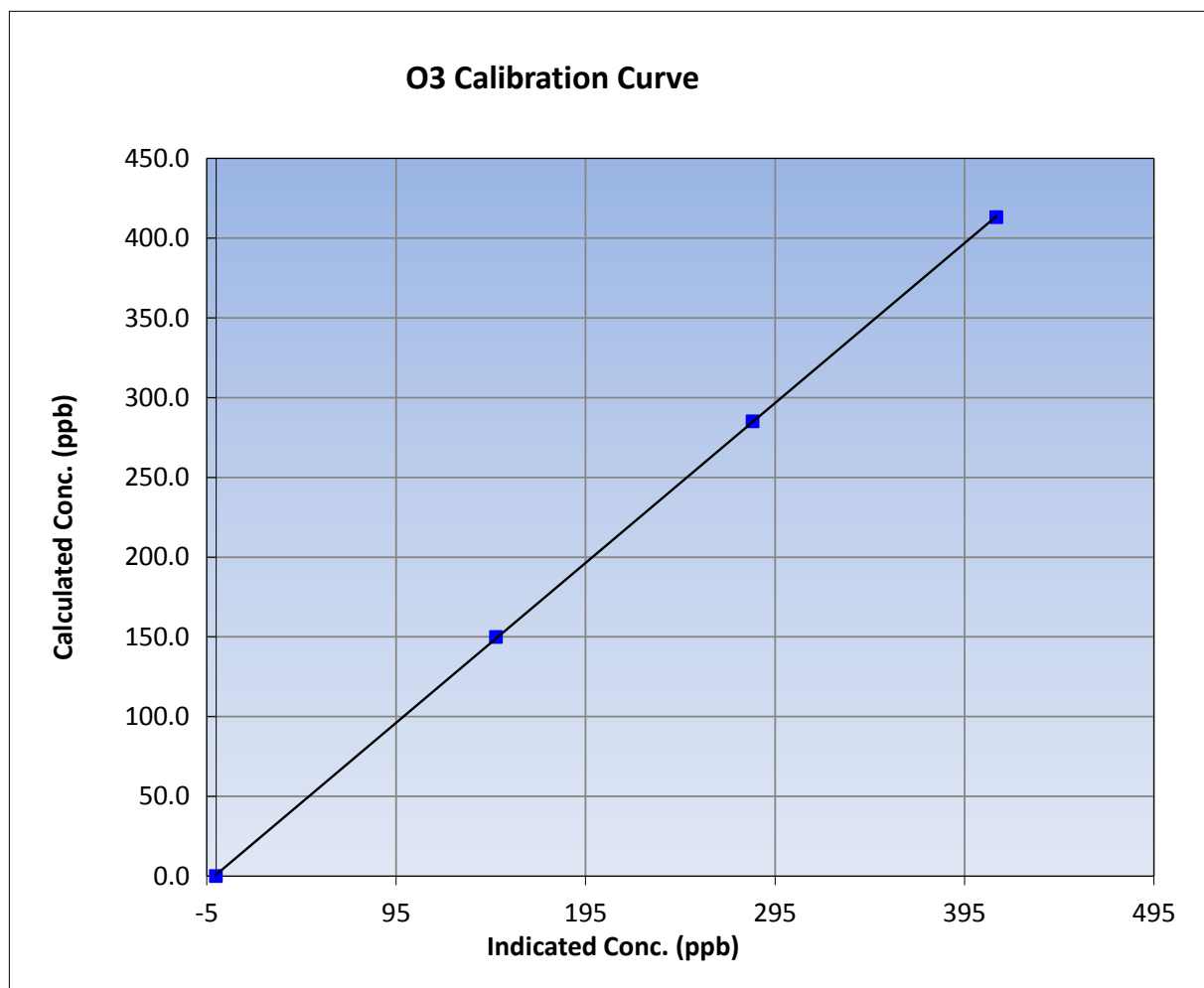
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	June-15-16	Previous Calibration	May 18, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:04	End Time (MST)	10:05
Analyzer make	Thermo 49i	Analyzer serial #	1426262596

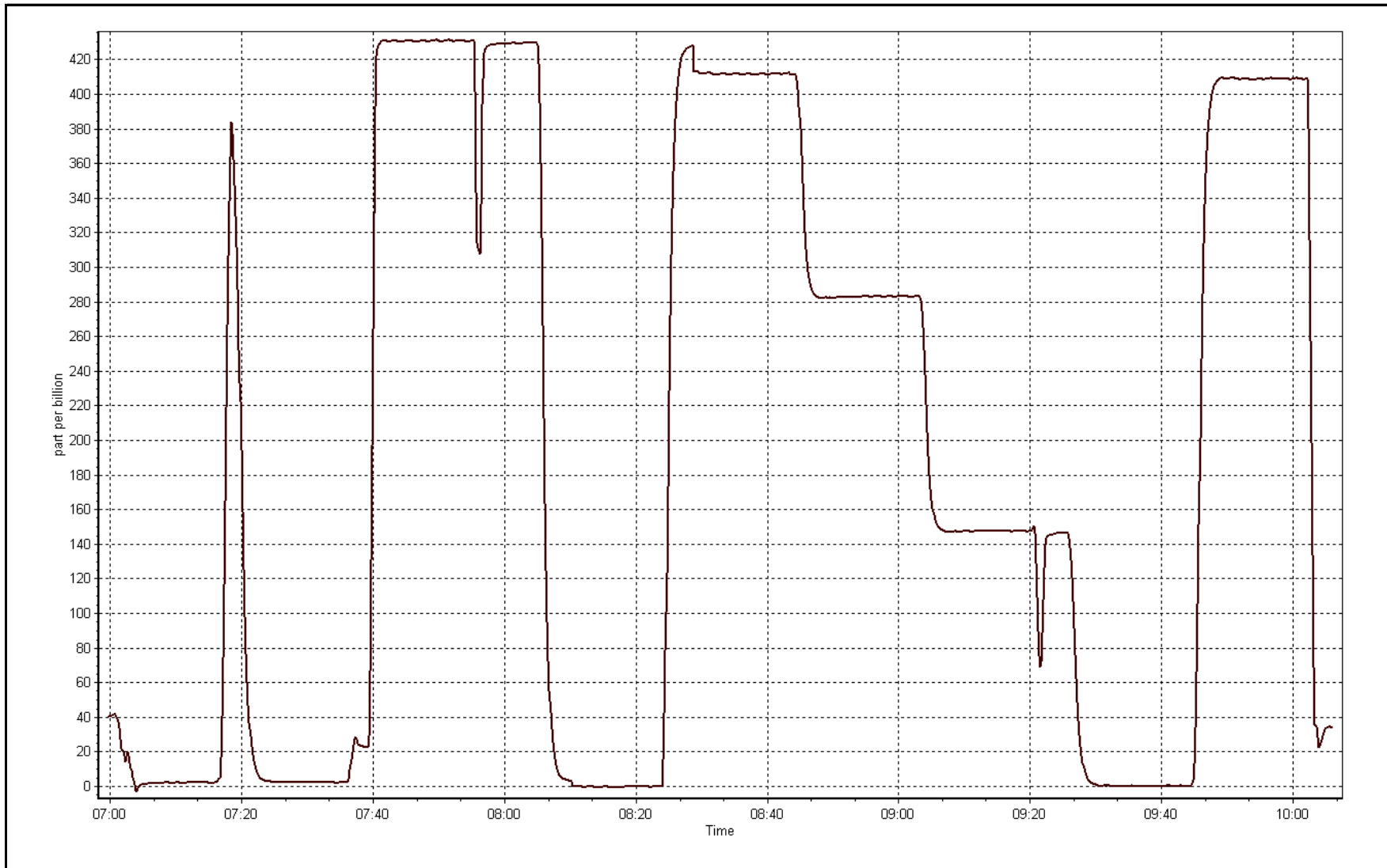
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999979
413.1	411.8	1.0032		
285.1	283.2	1.0067	Slope	1.002256
149.9	147.6	1.0156		
			Intercept	0.949842



O3 Calibration Plot

Date: June 15, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 13, 2016	Previous Calibration	May 18, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Other: Maintenance		
Start Time (MST)	11:35	End Time (MST)	14:30
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 PAI 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	0.998914	0.998020	1.003604
	Data Offset	0.941648	0.679956	0.014809
Current Calibration	Data Slope	0.905720	0.905515	
	Data Offset	-3.713452	-2.897648	

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1426262592
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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	1.115		1.115	
NOX coefficient	1.000		1.000	
NO2 coefficient	0.999		0.999	
NO bkgrnd	5.0		5.0	
NOX bkgrnd	5.4		5.4	
Chamber Temp	50	Deg C	49.9	Deg C
Moly Temp	322.4	Deg C	321.6	Deg C
PMT voltage	-807.3	V	-807.7	V
PMT Temp	-3.1	Deg C	-3.1	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	131.5	mmHg	134.8	mmHg
R Cell Press Nox	131.5	mmHg	134.8	mmHg
NO sample flow	0.781	lpm	0.773	lpm
Nox sample Flow	0.782	lpm	0.774	lpm

Notes:

Filter changed out, reaction cell cleaned



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 13, 2016

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	-0.8	-0.8	-0.1	----	----
as found span	5000	74.9	799.9	799.9	0.0	874.4	871.6	2.8	0.9148	0.9178
calibrator zero	5000	0.0	0.0	0.0	0.0	4.1	3.2	0.8	----	----
high point	5000	74.9	799.9	799.9	0.0	887.3	886.6	0.7	0.9015	0.9022
second point										
third point										
as left zero										
as left span										
									0.9015	0.9022

Corrected As found
Previous Response

NO_x= 875.2
NO_x= 799.9

NO= 872.4
NO= 800.8

Percent Change

NO_x= -8.6%

NO= -8.2%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 74.90 ccm NOx ref calc conc = 799.9 ppb NO ref calc conc = 799.9 ppb

O3 Setpoint (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
1st NO ref point		0.0			0.8			----	
1st NO2 (300)									
2nd NO2 (200)									
3rd NO2 (100)									
2nd NO ref point		0.0							
						Average Correction Factor			

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association

NO_x Calibration Summary

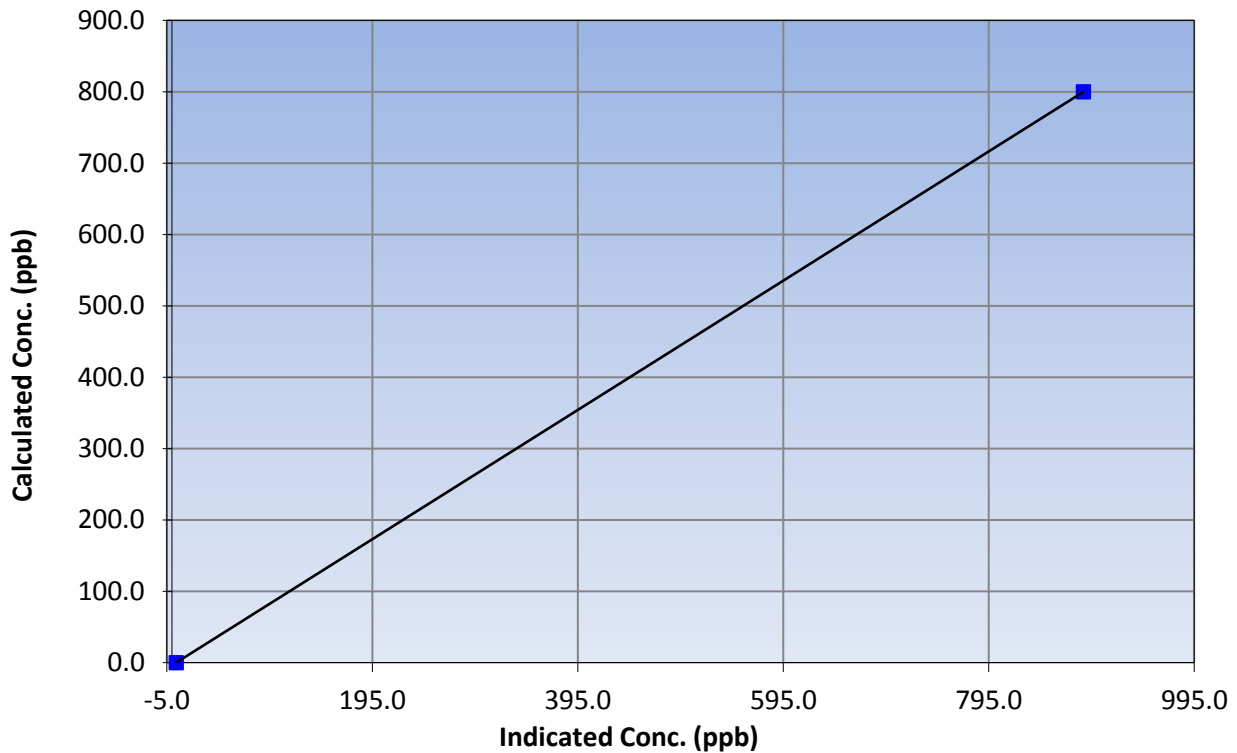
Station Information

Calibration Date	June 13, 2016	Previous Calibration	May 18, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	11:35	End Time (MST)	14:30
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	4.1	----	Correlation Coefficient	1.000000
799.9	887.3	0.9015		
			Slope	0.905720
			Intercept	-3.713452

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

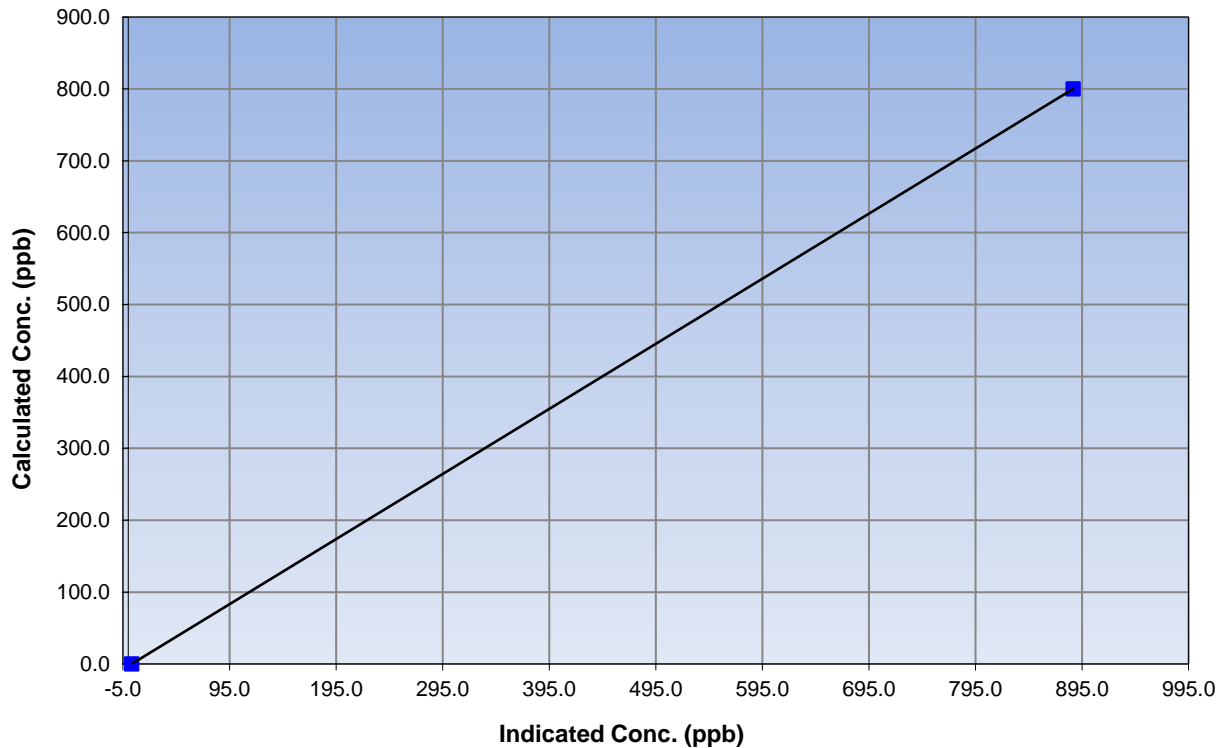
Station Information

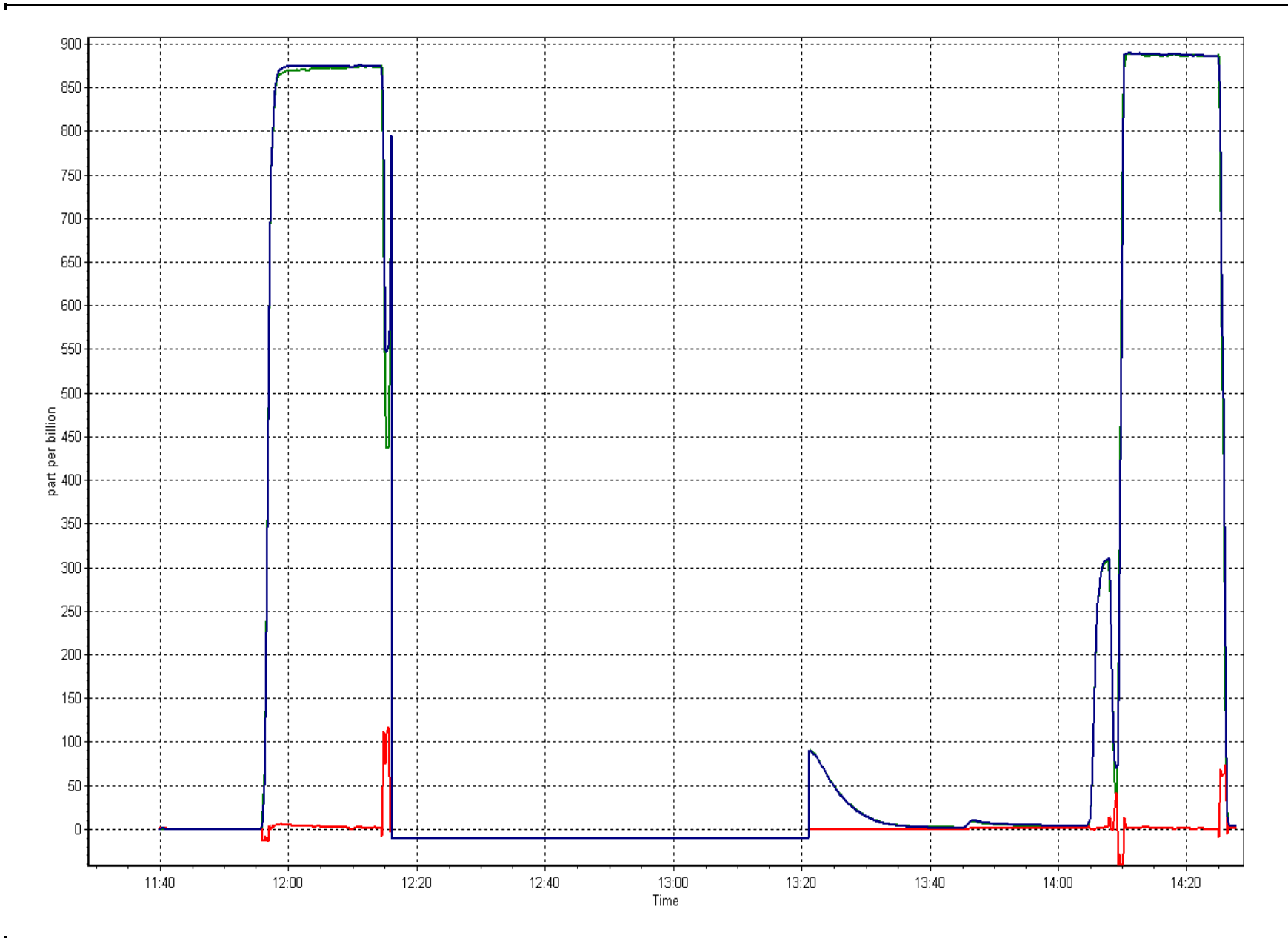
Calibration Date	June 13, 2016	Previous Calibration	May 18, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	11:35	End Time (MST)	14:30
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	3.2	N/A	Correlation Coefficient	1.000000
799.9	886.6	0.9022		
			Slope	0.905515
			Intercept	-2.897648

NO Calibration Curve







Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 14, 2016	Previous Calibration	June 13, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	Routine		
Start Time (MST)	7:25	End Time (MST)	13:35
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 PAI 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	0.999991	0.999992	0.999956
	Data Offset	0.997874	0.996895	1.004502
Current Calibration	Data Slope	0.997874	0.996895	1.004502
	Data Offset	0.980524	0.799610	1.180066

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1426262592
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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	1.115		1.017	
NOx coefficient	1.000		1.000	
NO2 coefficient	0.999		0.997	
NO bkgrnd	5.0		4.0	
NOx bkgrnd	5.4		4.2	
Chamber Temp	49.9	Deg C	49.9	Deg C
Moly Temp	327.4	Deg C	327.4	Deg C
PMT voltage	-807.7	V	-807.7	V
PMT Temp	-2.9	Deg C	-2.9	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	142.4	mmHg	142.4	mmHg
R Cell Press Nox	142.4	mmHg	142.4	mmHg
NO sample flow	0.767	lpm	0.767	lpm
Nox sample Flow	0.768	lpm	0.768	lpm

Notes:

zero air scrubber changed out, zero and span adjusted



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 14, 2016

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	-0.2	-0.6	0.4	----	----
as found span	5000	74.9	799.9	799.9	0.0	903.5	902.5	1.0	0.8854	0.8864
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	----	----
high point	5000	74.9	799.9	799.9	0.0	801.4	802.3	-0.9	0.9982	0.9970
second point	5000	37.5	400.5	400.5	0.0	399.0	399.7	-0.7	1.0038	1.0020
third point	5000	18.7	199.7	199.7	0.0	198.9	199.3	-0.4	1.0041	1.0021
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	385.8	414.1	804.2	393.1	411.1	0.9947	0.9814
									1.0020	1.0004

Corrced As found NO_x= 903.7 NO= 903.1 Percent Change NO_x= -11.6% NO= -11.5%
 Previous Response NO_x= 798.9 NO= 798.9

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 74.90 ccm NOx ref calc conc = 799.9 ppb NO ref calc conc = 799.9 ppb

O3 Setpoint (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
1st NO ref point		0.0	797.6	798.9	-0.1	1.0029	1.0013	----	----
1st NO2 (300)	385.8	413.1	796.6	385.8	410.9	1.0042	----	1.0054	99.5%
2nd NO2 (200)	513.8	285.1	796.0	513.8	282.2	1.0049	----	1.0103	99.0%
3rd NO2 (100)	649.0	149.9	795.9	649.0	146.6	1.0051	----	1.0225	97.8%
2nd NO ref point		0.0	794.4	795.6	-1.2	1.0070	1.0054	----	----
Average Correction Factor						1.0053		1.0127	98.7%

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association

NO_x Calibration Summary

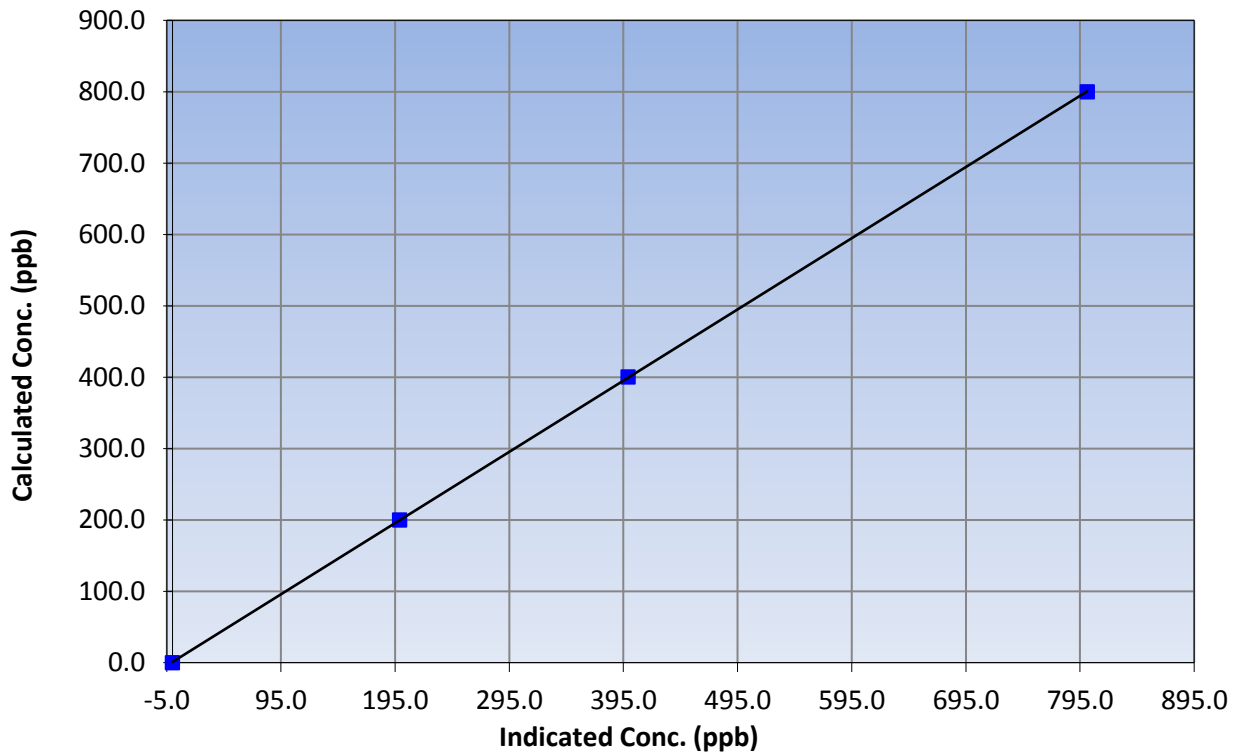
Station Information

Calibration Date	June 14, 2016	Previous Calibration	June 13, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:25	End Time (MST)	13:35
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	-0.1	----	Correlation Coefficient	0.999991
799.9	801.4	0.9982		
400.5	399.0	1.0038	Slope	0.997874
199.7	198.9	1.0041		
			Intercept	0.980524

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

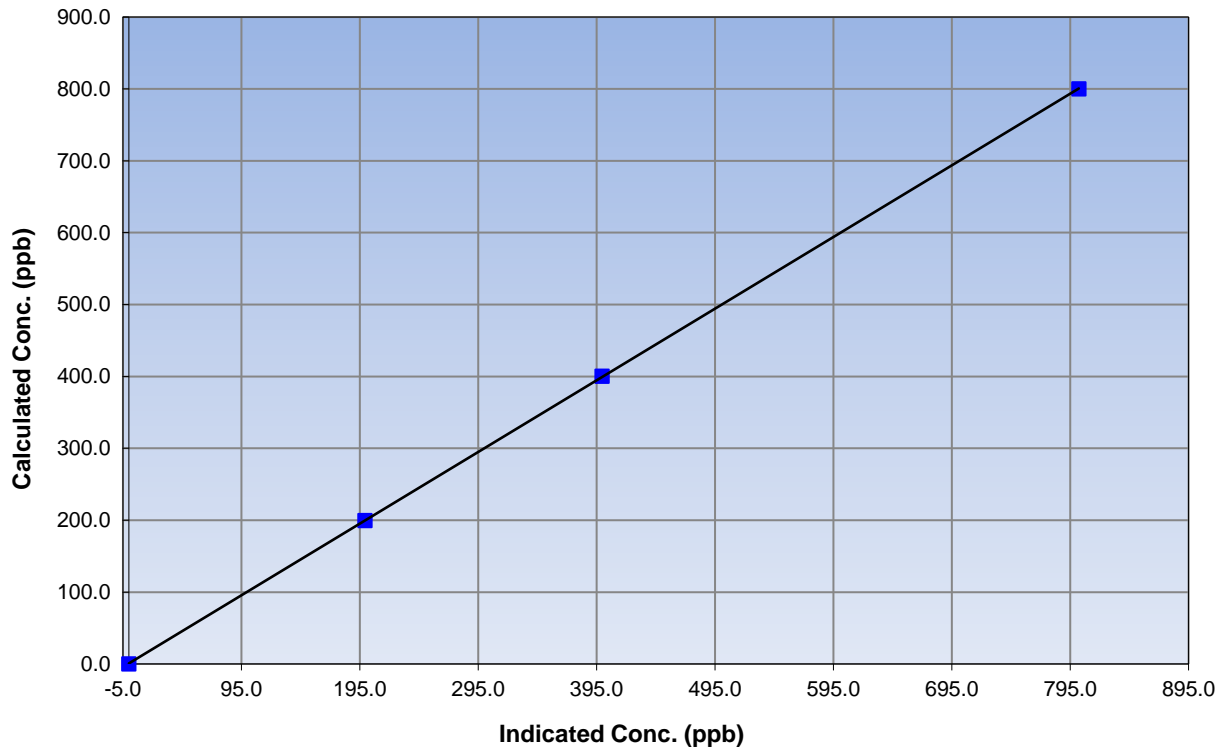
Station Information

Calibration Date	June 14, 2016	Previous Calibration	June 13, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:25	End Time (MST)	13:35
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	0.999992
799.9	802.3	0.9970		
400.5	399.7	1.0020	Slope	0.996895
199.7	199.3	1.0021		
			Intercept	0.799610

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

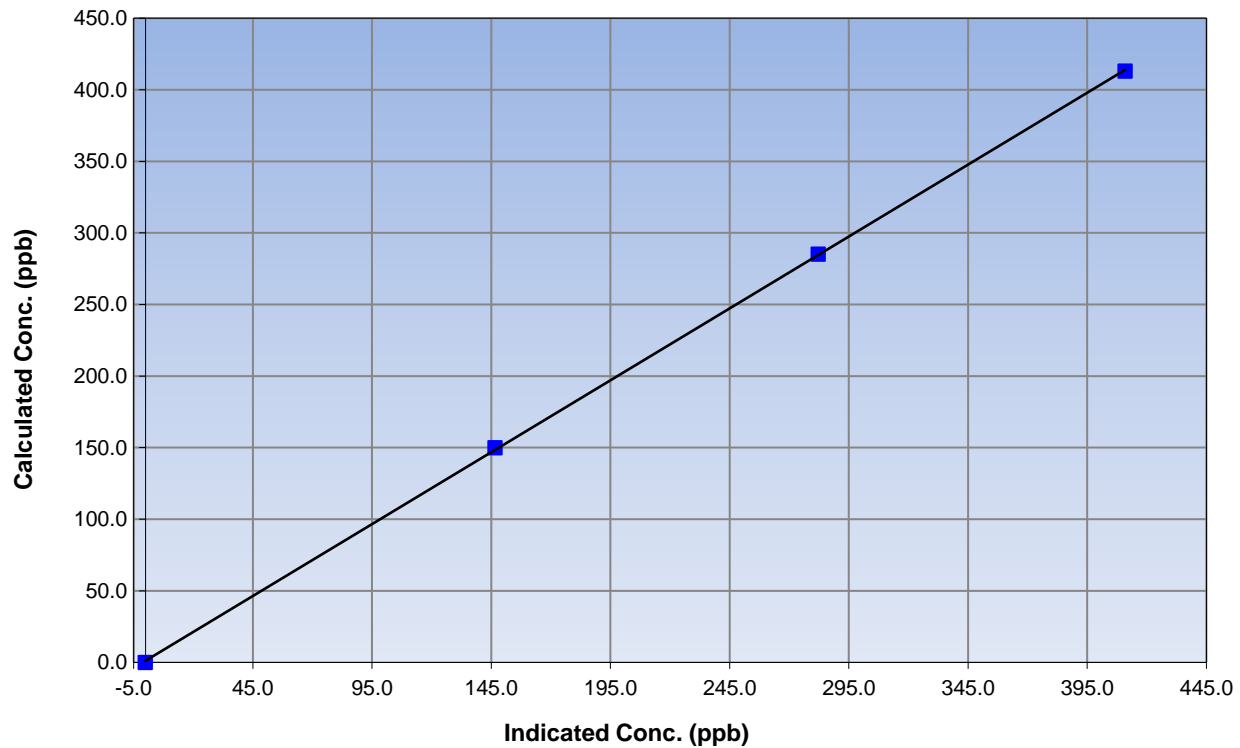
Station Information

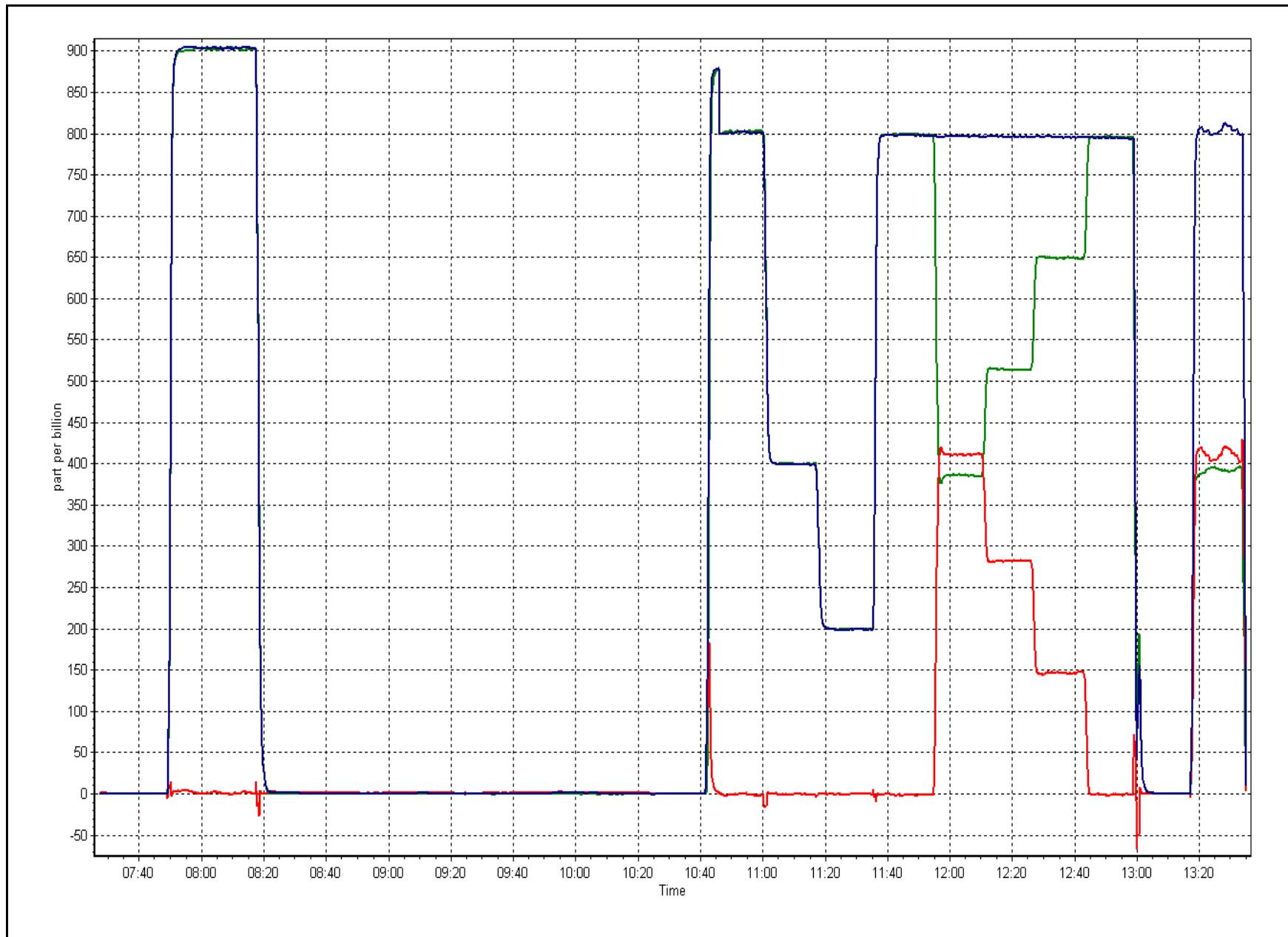
Calibration Date	June 14, 2016	Previous Calibration	June 13, 2016
Station Number	Anzac	Station Number	AMS 14
Start Time (MST)	7:25	End Time (MST)	13:35
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999956
413.1	410.9	1.0054		
285.1	282.2	1.0103	Slope	1.004502
149.9	146.6	1.0225		
			Intercept	1.180066

NO₂ Calibration Curve







Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 16, 2016	Previous Calibration	June 14, 2016
Station Name	Anzac	Station Number	AMS 14
Reason:	<input type="checkbox"/> Other: <input checked="" type="checkbox"/> Repair		
Start Time (MST)	7:30	End Time (MST)	11:48
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 PAI 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	0.997874	0.996895	1.004502
	Data Offset	0.980524	0.799610	1.180066
Current Calibration	Data Slope	0.998421	0.997994	1.001770
	Data Offset	0.639695	0.439672	0.190818

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1426262592
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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	1.017		1.154	
NOX coefficient	1.000		1.000	
NO2 coefficient	0.997		0.998	
NO bkgnd	4.0		4.5	
NOX bkgnd	4.2		4.8	
Chamber Temp	50.3	Deg C	49.9	Deg C
Moly Temp	327.4	Deg C	327.4	Deg C
PMT voltage	-808.1	V	-807.7	V
PMT Temp	-2.9	Deg C	-2.9	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	124.2	mmHg	129	mmHg
R Cell Press Nox	124.2	mmHg	129	mmHg
NO sample flow	0.767	lpm	0.721	lpm
Nox sample Flow	0.767	lpm	0.721	lpm

Notes:

pump pressure unstable, pump switch out with new pump



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 16, 2016

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	-0.4	-0.2	-0.2	----	----
as found span	5000	74.9	799.9	799.9	0.0	809.7	810.8	-1.1	0.9879	0.9866
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.2	0.0	-0.2	----	----
high point	5000	74.9	799.9	799.9	0.0	801.0	801.5	-0.6	0.9987	0.9980
second point	5000	37.5	400.5	400.5	0.0	399.6	400.1	-0.5	1.0023	1.0010
third point	5000	18.7	199.7	199.7	0.0	199.4	199.6	-0.3	1.0016	1.0006
as left zero	5000	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	----	----
as left span	5000	74.9	799.9	377.0	422.9	819.1	384.2	435.5	0.9766	0.9813
									1.0008	0.9999

Corrected As found

NO_x= 810.1

NO= 811.0

Percent Change

NO_x= -1.2%

NO= -1.2%

Previous Response

NO_x= 800.7

NO= 801.6

GPT Calibration Data

Dilution Flow (total) 5000 ccm

Source Gas Flow 74.90 ccm

NOx ref calc conc = 799.9 ppb

NO ref calc conc = 799.9 ppb

O3 Setpoint (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
1st NO ref point		0.0	802.0	802.5	-0.2	0.9974	0.9968	----	----
1st NO2 (300)	377.0	425.5	801.6	377.0	424.6	0.9979	----	1.0021	99.8%
2nd NO2 (200)	509.8	292.7	801.7	509.8	291.9	0.9978	----	1.0027	99.7%
3rd NO2 (100)	650.0	152.5	802.1	650.0	152.1	0.9973	----	1.0026	99.7%
2nd NO ref point		0.0	802.2	803.0	-0.7	0.9972	0.9962	----	----
Average Correction Factor						0.9975		1.0025	99.8%

Calibration Performed By:

Melissa Lemay



Wood Buffalo Environmental Association

NO_x Calibration Summary

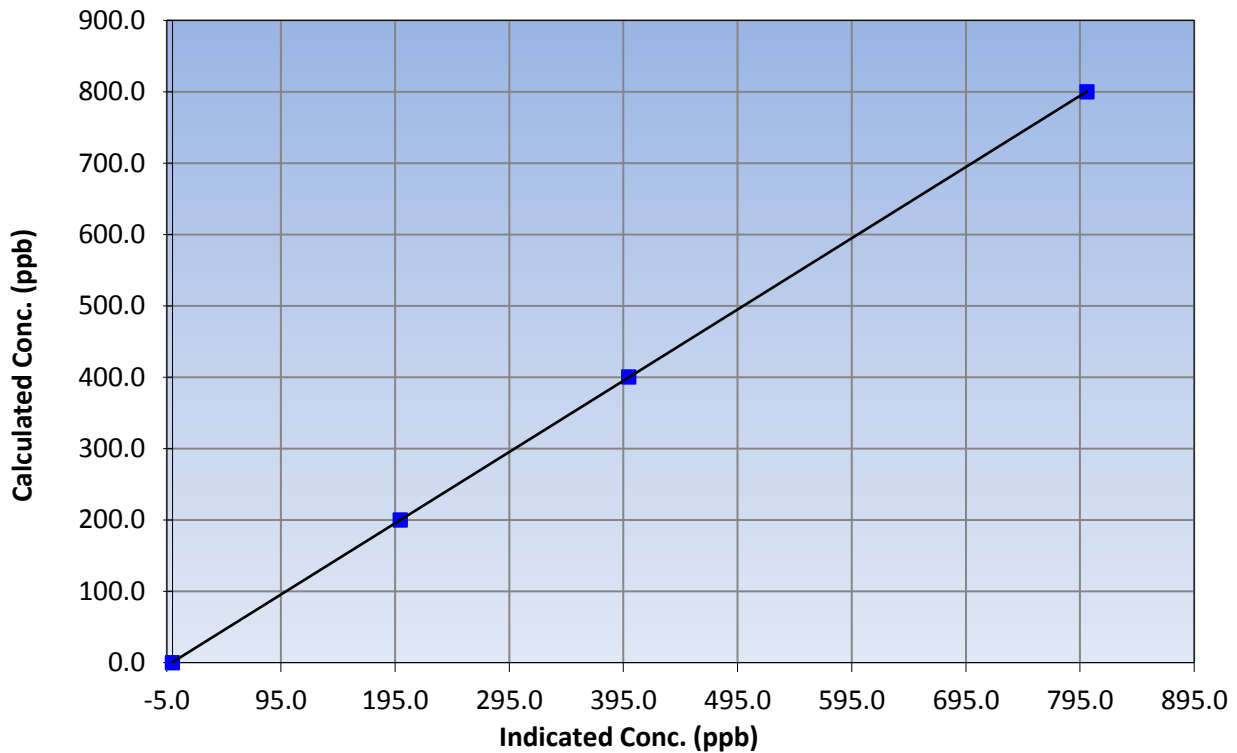
Station Information

Calibration Date	June 16, 2016	Previous Calibration	June 14, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:30	End Time (MST)	11:48
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	-0.2	----	Correlation Coefficient	0.999997
799.9	801.0	0.9987		
400.5	399.6	1.0023	Slope	0.998421
199.7	199.4	1.0016		
			Intercept	0.639695

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

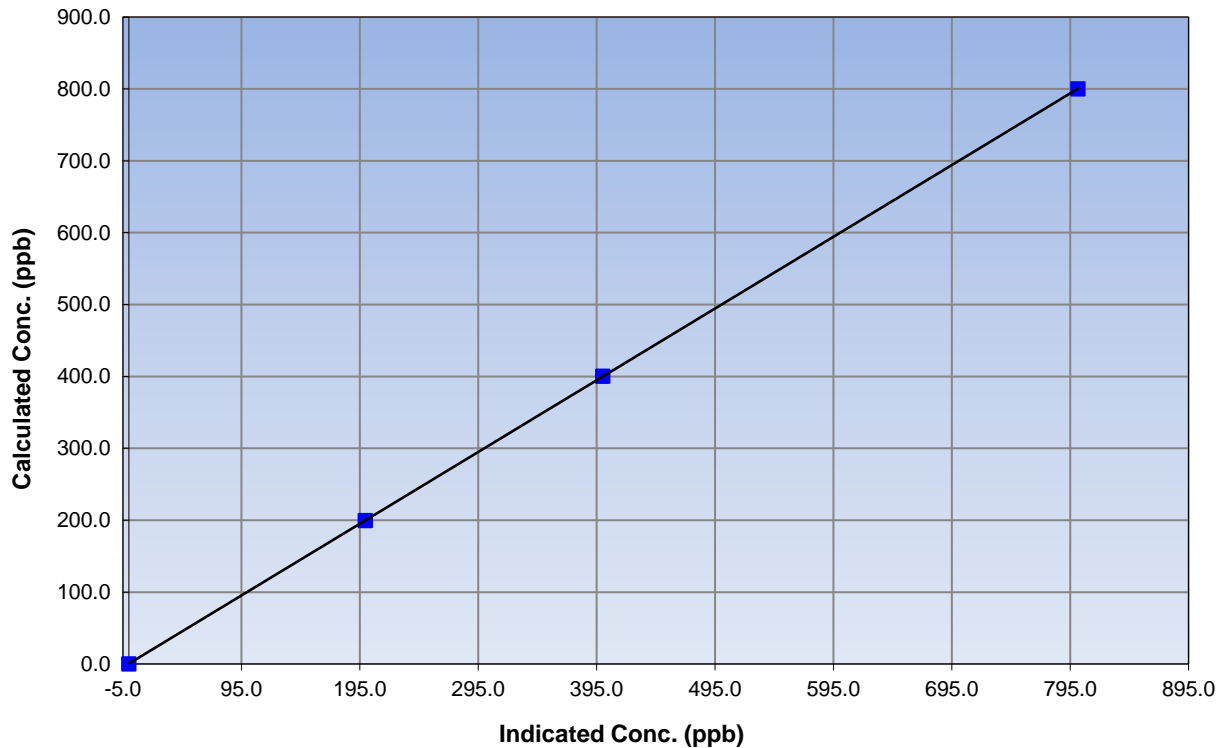
Station Information

Calibration Date	June 16, 2016	Previous Calibration	June 14, 2016
Station Name	Anzac	Station Number	AMS 14
Start Time (MST)	7:30	End Time (MST)	11:48
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	0.999997
799.9	801.5	0.9980		
400.5	400.1	1.0010	Slope	0.997994
199.7	199.6	1.0006		
			Intercept	0.439672

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

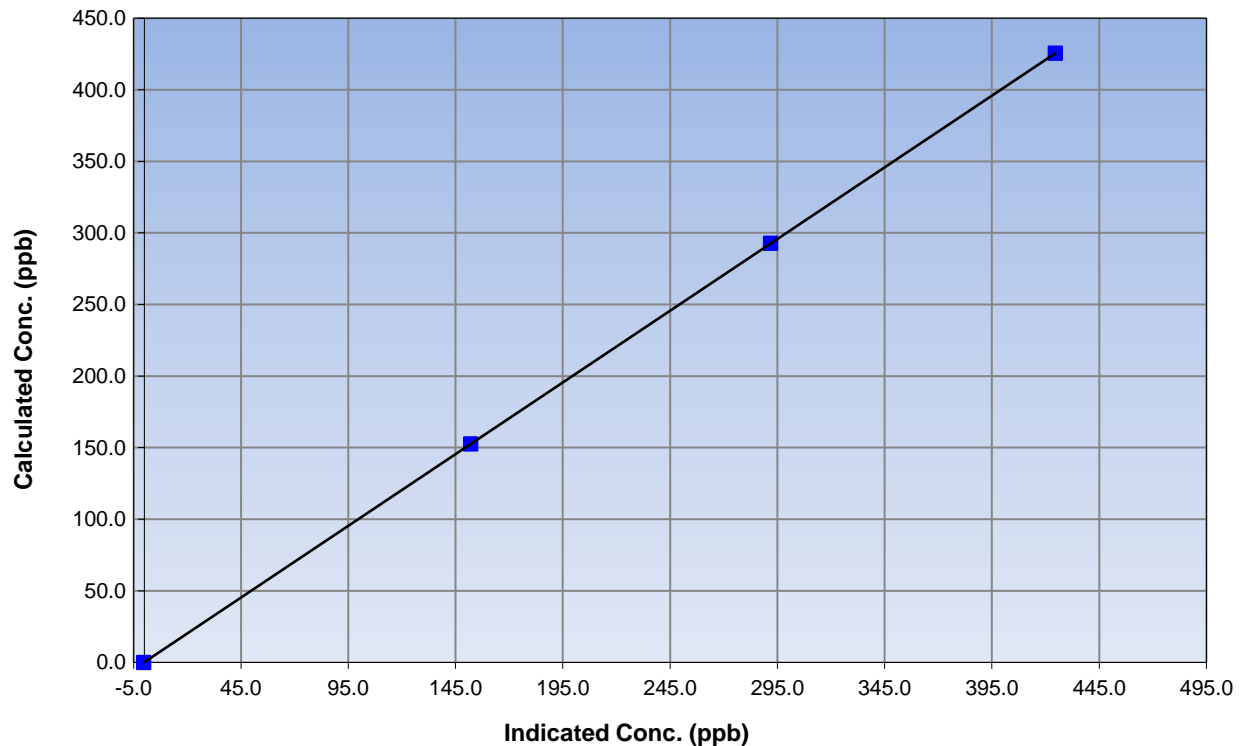
Station Information

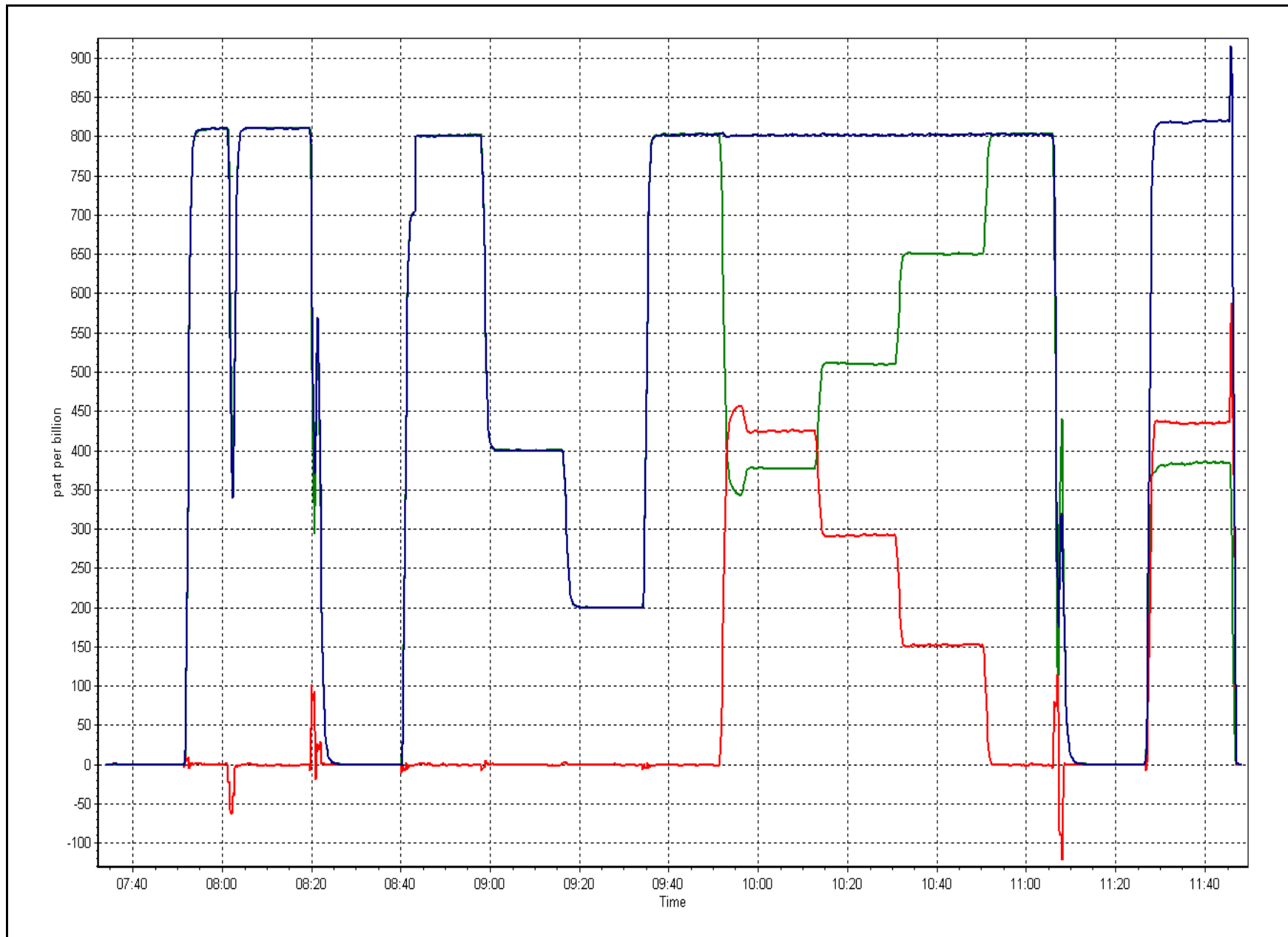
Calibration Date	June 16, 2016	Previous Calibration	June 14, 2016
Station Number	Anzac	Station Number	AMS 14
Start Time (MST)	7:30	End Time (MST)	11:48
Analyzer make	Thermo 42i	Analyzer serial #	1426262592

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	N/A	Correlation Coefficient	1.000000
425.5	424.6	1.0021		
292.7	291.9	1.0027	Slope	1.001770
152.5	152.1	1.0026		
			Intercept	0.190818

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION

Calibration Date: June 15, 2016 Previous Calibration: May 18, 2016
 Station Name: Anzac Station Number: AMS 14
 Start Time (MST): 7:57 End Time (MST): 10:06
 Calibrator Make/Model: Delta Cal Calibrator Serial Number: 1450

SHARP INFORMATION

Particulate Fraction: PM2.5
 Make/Model: Thermo / SHARP 5030
 Serial Number: E1093
 C₁₄ Source SN: 4933
 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	14.0	14.5	0.5	14.0
T2	30.0	25.0	-5.0	25.0
T3	28.0	25.0	-3.0	25.0
T4	23.0	25.0	2.0	25.0
RH (%)	27.0	na	na	27.0

Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	936	935.0	-1.0	936

Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1010	10	1000	1000

Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	190		190
Neph	0		0
C14	163.7		163.7
Indicated Concentration (ug/m3)	0	No	0

Offset 1
Offset 2

Leak Check (Quarterly)

Leak Check Date: June 15, 2016 Previous Leak Check Date: March 1, 2016

	Measured	Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.70	
*Flow with adaptor (LPM):	16.80	-0.10

*Note - do not attach adaptor without shutting off the pump first

Mass Foil Calibration (Annually)

Foil Calibration Date: June 15, 2016 Previous Foil Calibration: March 16, 2016
 Zeroed?:
 Foil Mass: 1337
 Previous Correction Factor: 7124 **Mass foil set S/N:** 5872
 New Correction Factor: 7212

INSPECTION DATA

Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	June 15, 2016
Pump	Good	NA
Filter Tape	Good	March-01-16
Mass Foil Cal Set	na	NA
HEPA filter	Good	NA

NOTES:

T2,T3,T4 and flow adjusted, cyclone head cleaning

Melissa Lemay



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

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

**AMS 15
CNRL HORIZON
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CNRL HORIZON (AMS 15)
 JUNE 2016

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
SO ₂ (ppb) Average	682	37	38	99.86	27	0	4	0
TRS (ppb) Average	686	34	34	100.00	2	0	1	0
THC (ppm) Average	682	37	38	99.86	5.4	-	2.6	-
NO ₂ (ppb) Average	682	37	38	99.86	28	0	7	-
NO (ppb) Average	682	37	38	99.86	53	-	5	-
NO _X (ppb) Average	682	37	38	99.86	67	-	10	-
PM _{2.5} (ug/m ³) Average	716	4	4	100.00	46.7	-	21.4	0
Temperature 2 m (C) Average	720	0	0	100.00	30.6	-	21.9	-
Wind Speed 10 m (km/h) Average	719	0	1	99.86	30	-	15	-
Wind Direction 10 m (deg) Average	719	0	1	99.86	-	-	-	-
Precipitation (mm) Total	720	0	0	100.00	11.9	-	29.7	-
Relative Humidity (%) Average	720	0	0	100.00	99	-	90	-
Global Solar Radiation (W/m ²) Average	720	0	0	100.00	919	-	369	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CNRL HORIZON (AMS 15)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	682	0.7	2	-	0	0	0	0	0	1	27
TRS (ppb) Average	686	0.2	0	-	0	0	0	0	0	0	2
THC (ppm) Average	682	2.16	0.3	-	1.8	1.9	2	2.1	2.2	2.5	5.4
NO2 (ppb) Average	682	2.8	4	-	0	0	0	1	3	8	28
NO (ppb) Average	682	0.8	3	-	0	0	0	0	0	1	53
NOX (ppb) Average	682	3.6	7	-	0	0	0	1	4	9	67
PM2.5 (ug/m3) Average	716	6.89	6.1	-	0.6	1.8	2.9	5	8.9	14.3	46.7
Temperature 2 m (C) Average	720	17.22	5.7	-	3.1	10.2	12.8	16.8	21.6	25.1	30.6
Wind Speed 10 m (km/h) Average	719	9	5	-	0	3	5	8	12	16	30
Wind Direction 10 m (deg) Average	719	-	-	-	-	-	-	-	-	-	-
Precipitation (mm) Total	720	-	-	89.92	-	-	-	-	-	-	-
Relative Humidity (%) Average	720	62.5	23	-	19	31	44	62	83	93	99
Global Solar Radiation (W/m2) Average	720	262.2	287	-	0	0	4	123	472	739	919

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CNRL HORIZON (AMS 15)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2, THC, NO2	20 Jun 2016 12:00	20 Jun 2016 12:00	1	Maintenance - cleaned glass manifold
Wind Speed, Wind Direction	08 Jun 2016 05:00	08 Jun 2016 05:00	1	Flat line in sensor output signal



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

CNRL Horizon - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 27 ppb on Jun 30 13:00	Maximum Daily Average: 3.7 ppb on Jun 20		Hours of Data:	682
Minimum Value: 0 ppb on Jun 1 16:00	Minimum Daily Average: 0.0 ppb on Jun 9		Hours of Missing Data:	38
Maximum Diurnal Average: 1.7 ppb at hour 13	Minimum Diurnal Average: 0.0 ppb at hour 6		Hours of Calibration:	37
Monthly Average: 0.7 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 15		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-Jun	0	0	0	Z	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0.3	1
2-Jun	0	0	0	0	Z	0	0	0	0	0	1	0	0	0	2	4	1	0	0	1	2	0	0	0	0.5	4
3-Jun	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
4-Jun	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
5-Jun	0	Z	0	0	0	0	0	0	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0.2	1
6-Jun	0	1	Z	0	0	0	0	4	3	3	19	13	6	4	2	0	0	6	2	0	0	0	0	0	2.9	19
7-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	0	0	0	0	0.2	3
8-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	6	6	2	0	0.8	6
9-Jun	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
10-Jun	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	1
11-Jun	0	Z	0	0	0	0	1	2	6	19	2	3	11	8	0	1	1	0	0	0	0	0	0	0	2.3	19
12-Jun	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
13-Jun	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
14-Jun	0	0	0	0	Z	0	0	0	1	13	5	2	2	1	0	0	0	0	0	0	0	2	17	4	2.0	17
15-Jun	0	0	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
16-Jun	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
17-Jun	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
18-Jun	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
19-Jun	0	0	0	Z	0	0	0	1	1	2	1	0	1	1	2	2	3	9	7	1	7	0	0	0	1.6	9
20-Jun	0	0	0	0	Z	0	0	1	1	1	0	M	0	0	0	4	1	15	21	22	9	4	2	1	3.7	22
21-Jun	1	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	C	C	0	0	1	3	4	2	0	--	4
22-Jun	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
23-Jun	0	Z	0	0	0	0	0	0	0	0	2	2	1	1	0	1	1	0	0	0	0	1	0	0	0.4	2
24-Jun	0	0	Z	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2
25-Jun	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
26-Jun	0	0	0	0	Z	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0.3	1
27-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	2	2	1	0	0	0.3	2
28-Jun	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0.2	1
29-Jun	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	3	3	3	3	2	1	1.0	3
30-Jun	1	1	Z	0	0	0	0	0	0	0	1	8	27	14	10	2	1	0	0	0	0	0	0	0	2.8	27

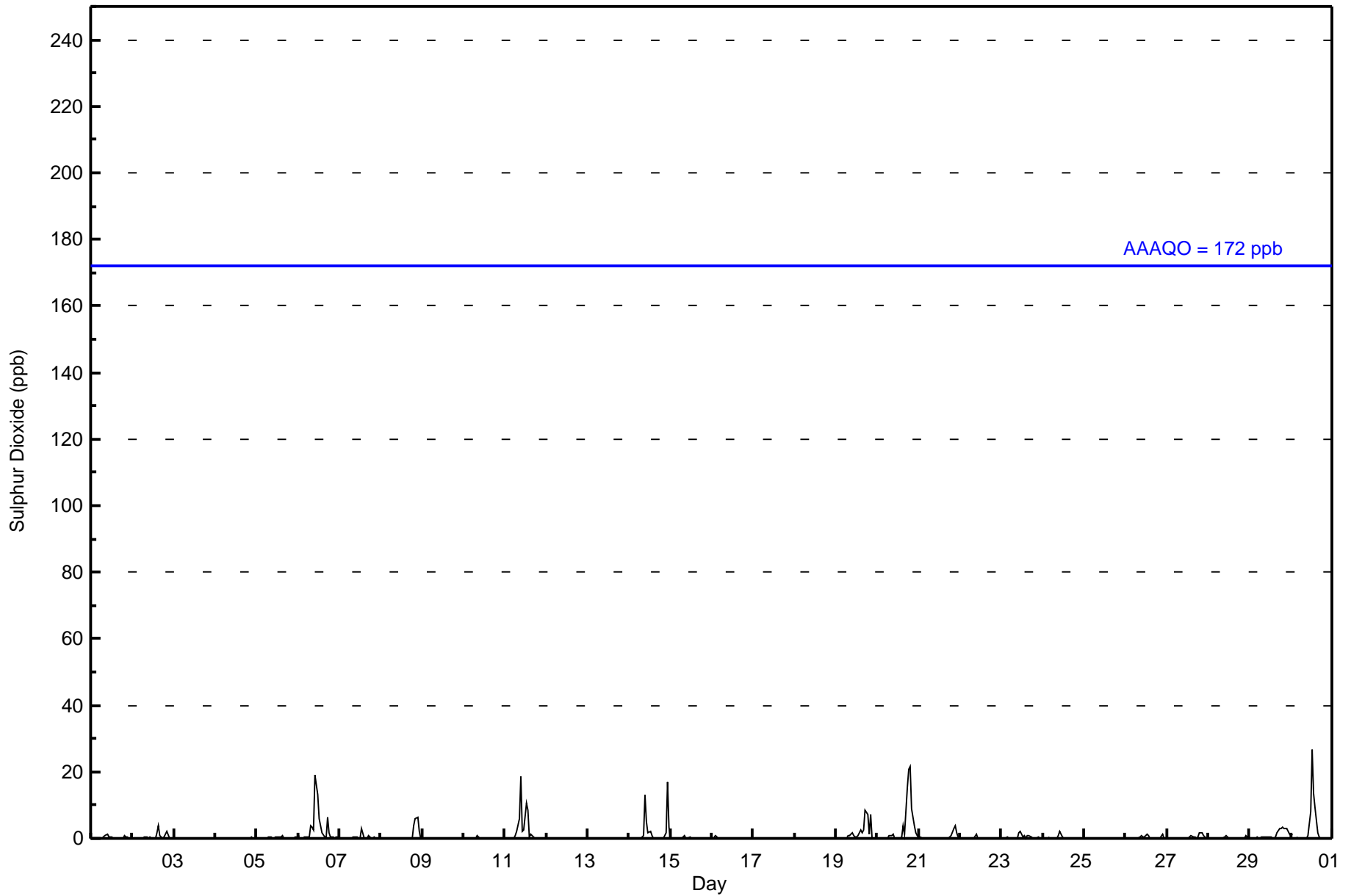
0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.3	0.5	1.4	1.2	1.1	1.7	1.2	0.6	0.5	0.3	1.2	1.1	1.2	1.1	0.7	0.9	0.2	Diurnal Average	
1	1	1	1	0	0	1	4	6	19	19	13	27	14	10	4	3	15	21	22	9	6	17	4	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
CNRL Horizon - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
CNRL Horizon - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	671	98.39	98.39
11 - 20	8	1.17	99.56
21 - 60	3	0.44	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: 682

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
CNRL Horizon - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	54	69	48	27	20	11	19	40	76	77	74	36	33	40	24	23	671
11 - 20	0	0	1	0	0	0	3	4	0	0	0	0	0	0	0	0	8
21 - 60	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3
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
Totals	54	69	49	27	20	11	22	47	76	77	74	36	33	40	24	23	682

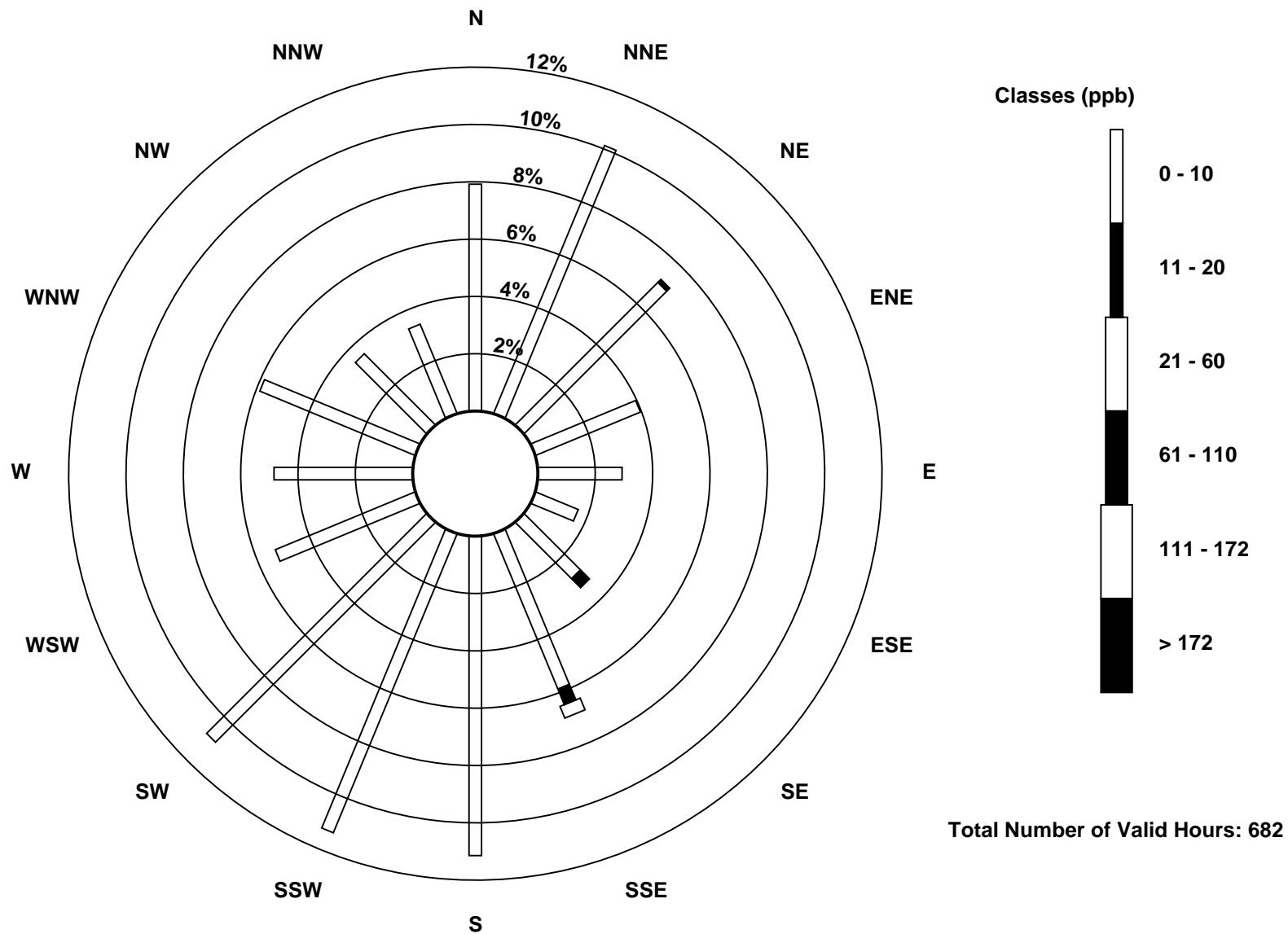
Total Number of Valid Hours: 682

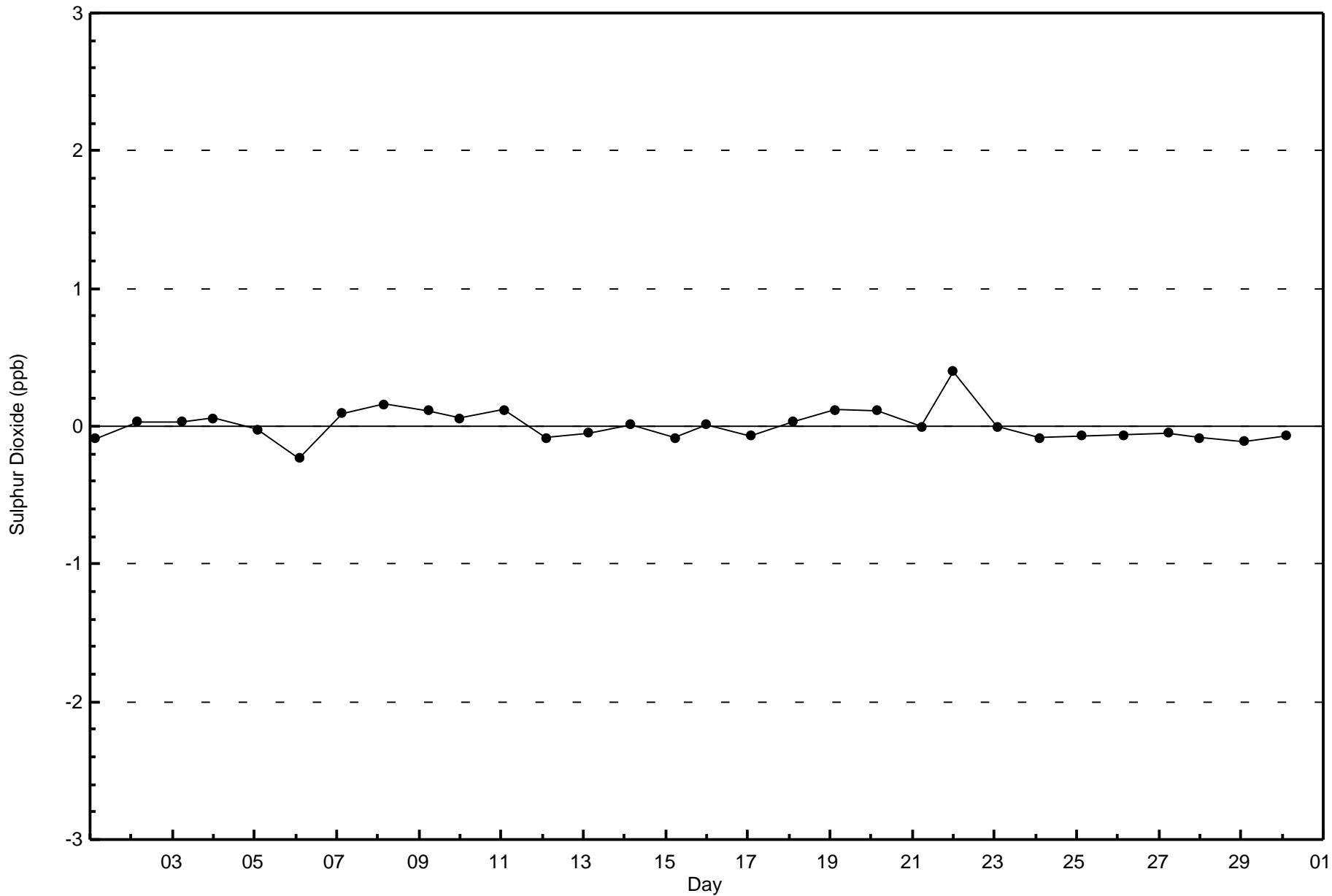
Total Number of Hours: 720

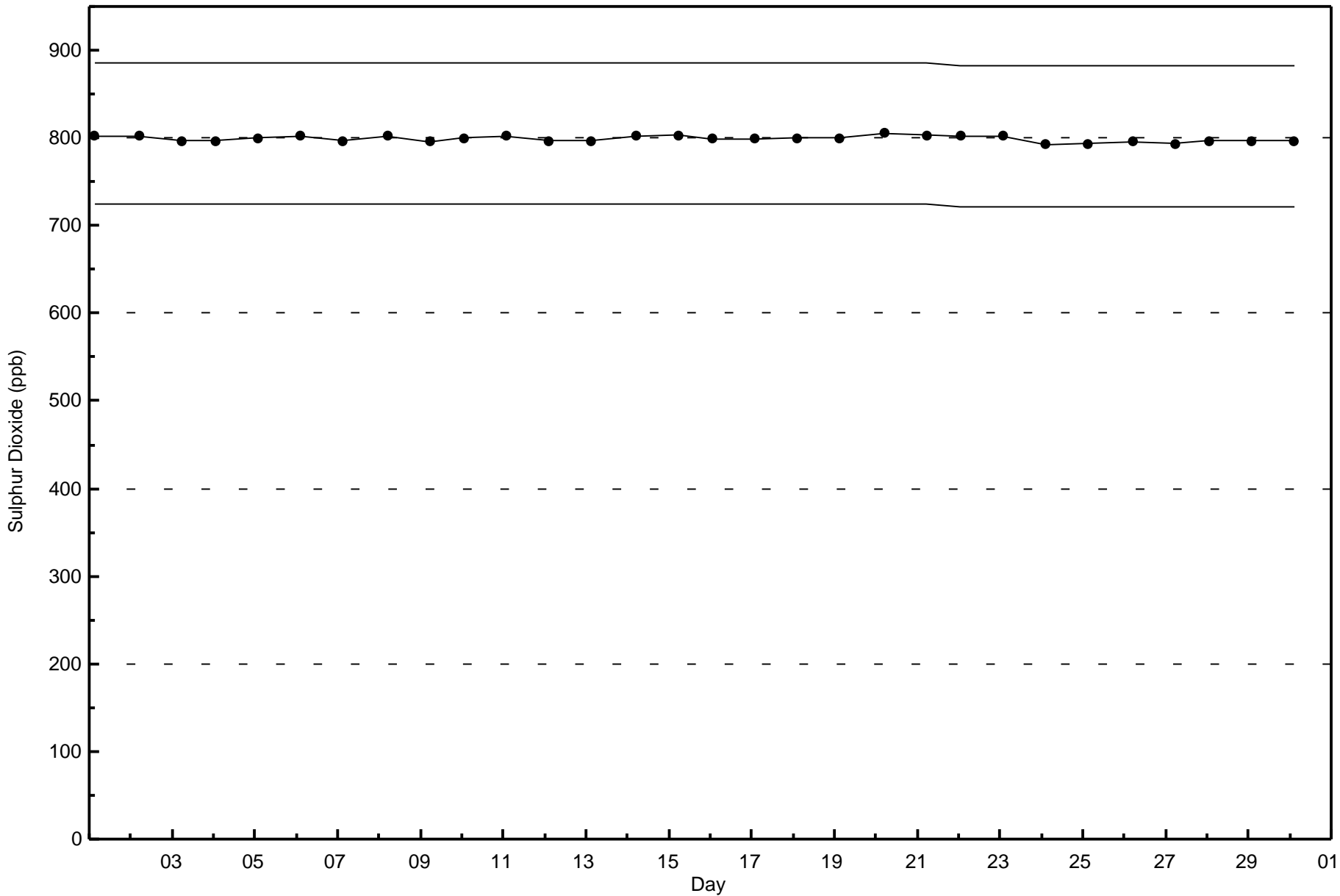


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Sulphur Dioxide (SO₂) - ppb
CNRL Horizon (AMS 15)







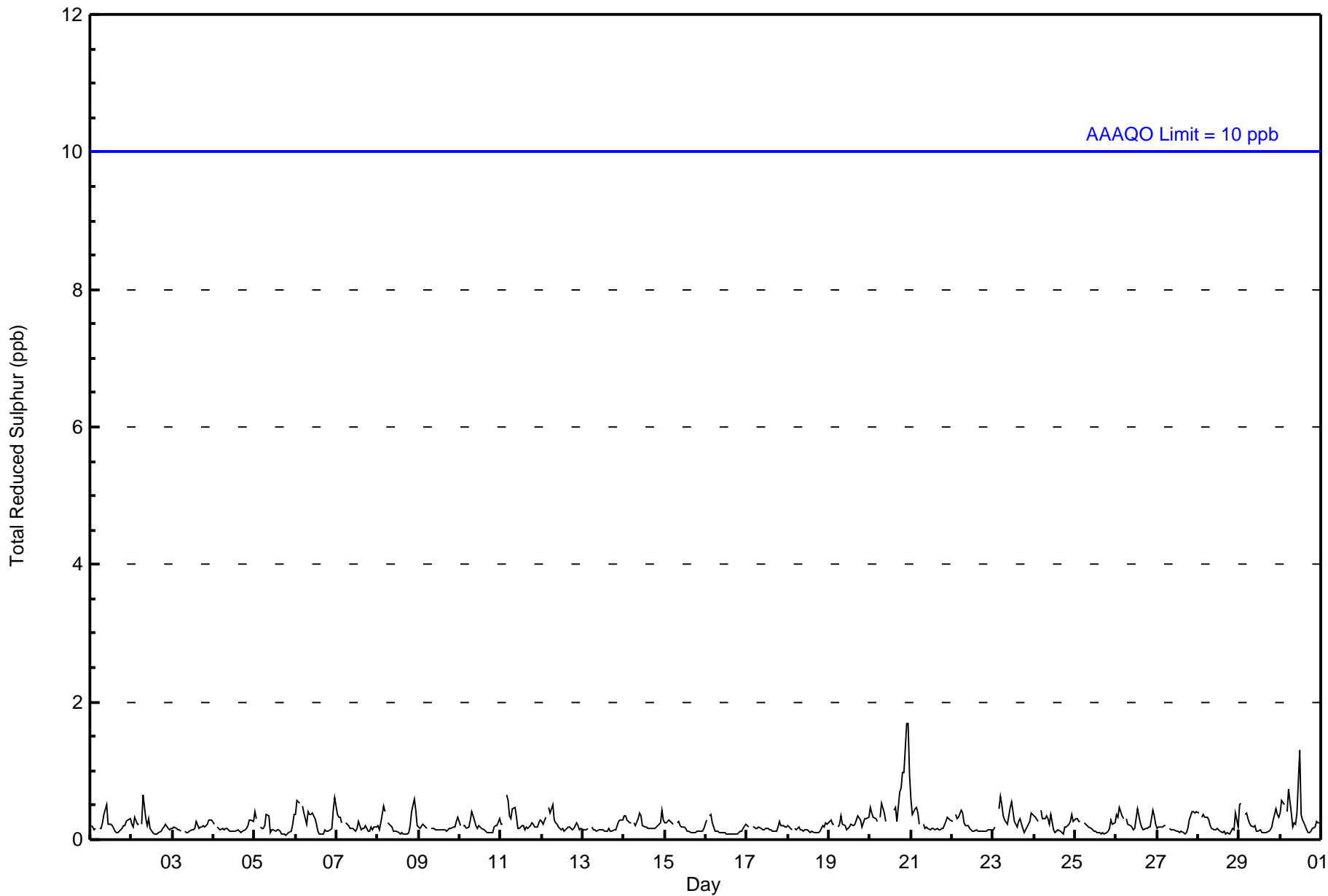


Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 2 ppb on Jun 20 22:00	Maximum Daily Average: 0.6 ppb on Jun 20		Hours of Data:	686
Minimum Value: 0 ppb on Jun 5 19:00	Minimum Daily Average: 0.1 ppb on Jun 16		Hours of Missing Data:	34
Maximum Diurnal Average: 0.3 ppb at hour 23	Minimum Diurnal Average: 0.1 ppb at hour 17		Hours of Calibration:	34
Monthly Average: 0.2 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 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-Jun	0	0	0	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
2-Jun	0	0	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
3-Jun	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
4-Jun	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
5-Jun	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
6-Jun	0	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
7-Jun	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-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1
9-Jun	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
10-Jun	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
11-Jun	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
12-Jun	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
13-Jun	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
14-Jun	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
15-Jun	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
16-Jun	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
17-Jun	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
18-Jun	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
19-Jun	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
20-Jun	0	0	0	0	0	Z	0	1	0	0	C	C	C	C	0	0	0	1	1	1	1	2	2	1	0.6	2
21-Jun	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
22-Jun	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
23-Jun	0	0	Z	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
24-Jun	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
25-Jun	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
26-Jun	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
27-Jun	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
28-Jun	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
29-Jun	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
30-Jun	0	1	1	Z	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1

0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	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	0.3	0.3	0.3	Diurnal Average
1	1	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0	1	1	1	1	2	2	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 - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	686	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: 686

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
CNRL Horizon - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	55	68	51	28	20	9	21	47	80	76	73	41	33	39	24	20	685
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
Totals	55	68	51	28	20	9	21	47	80	76	73	41	33	39	24	20	685

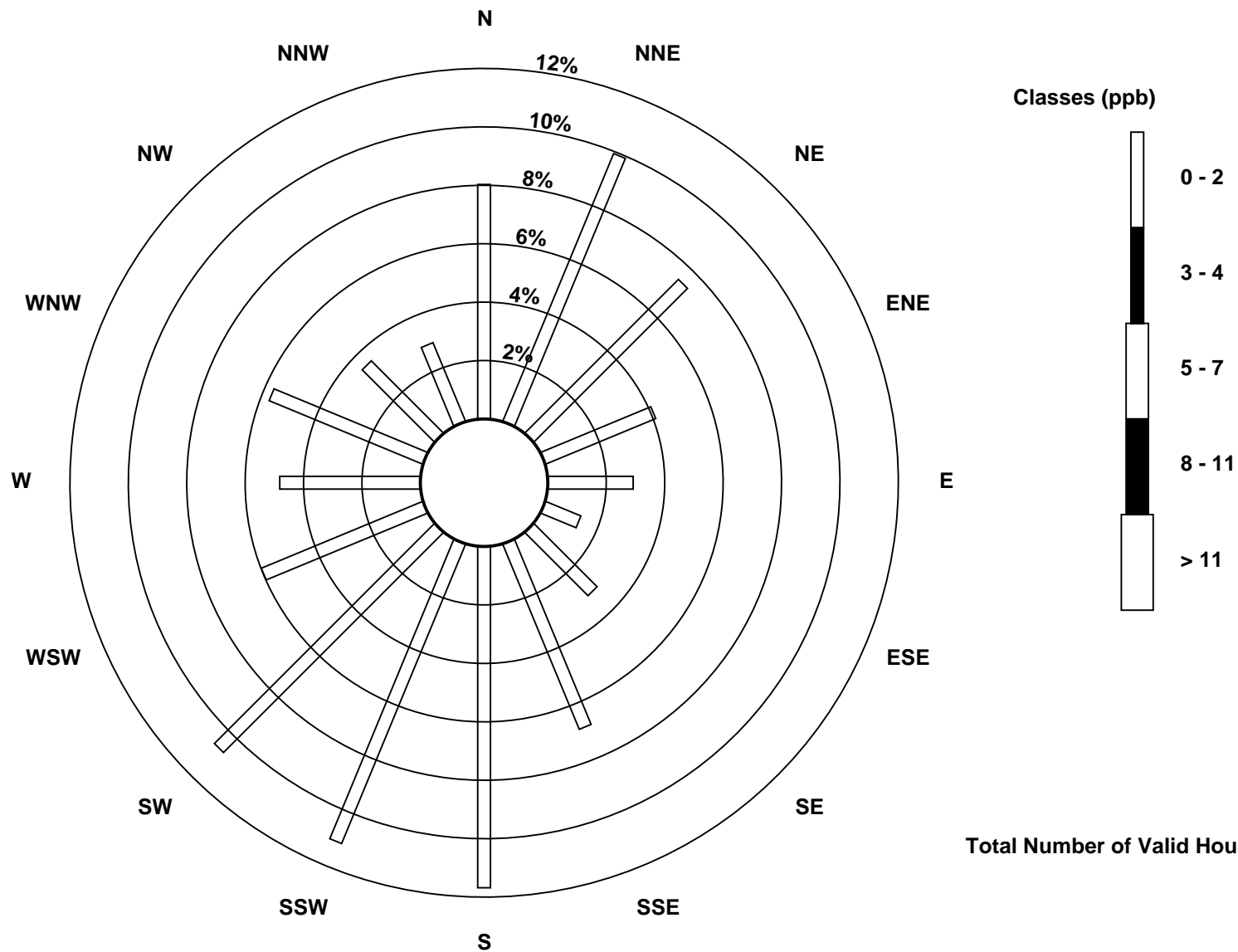
Total Number of Valid Hours: 685

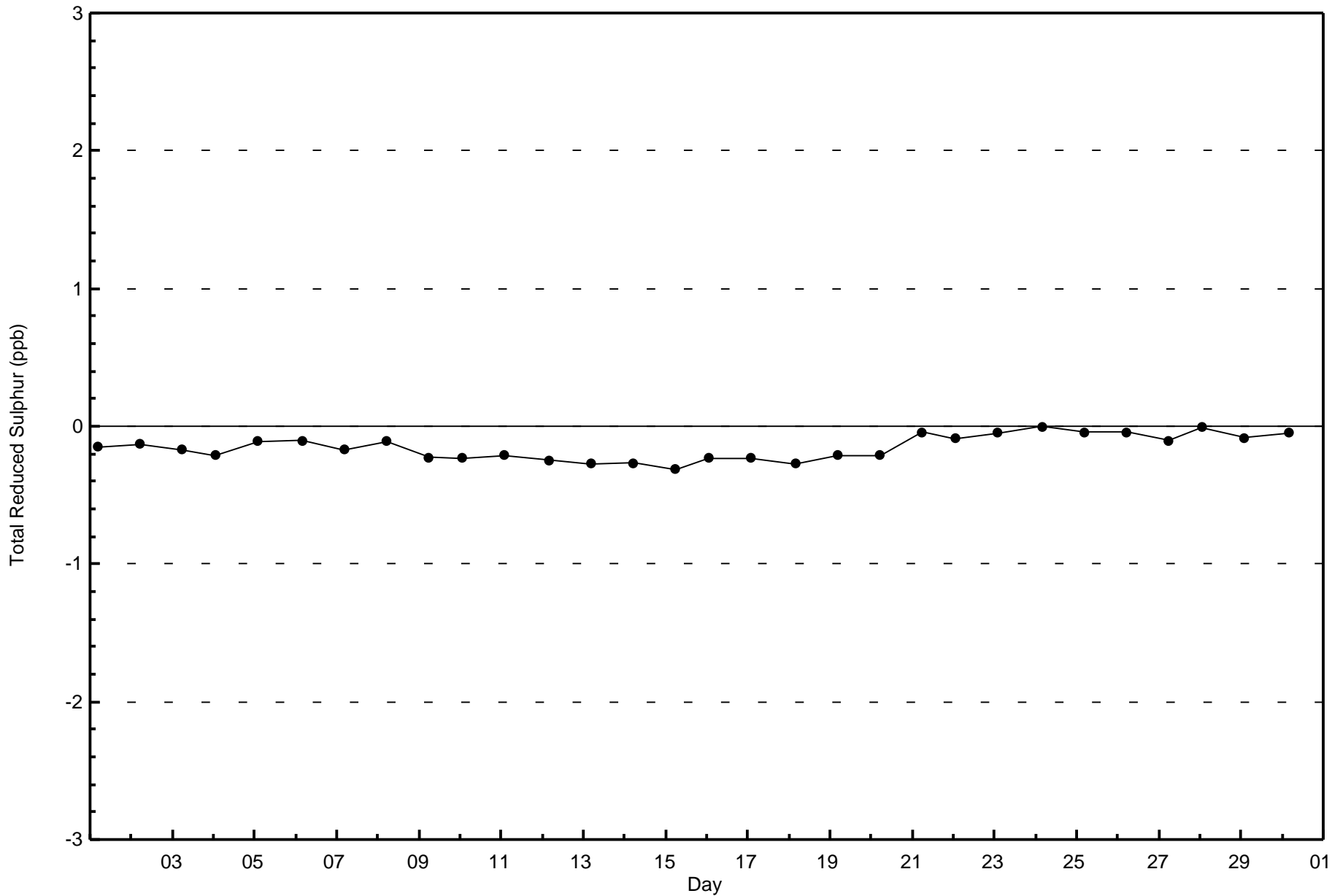
Total Number of Hours: 720

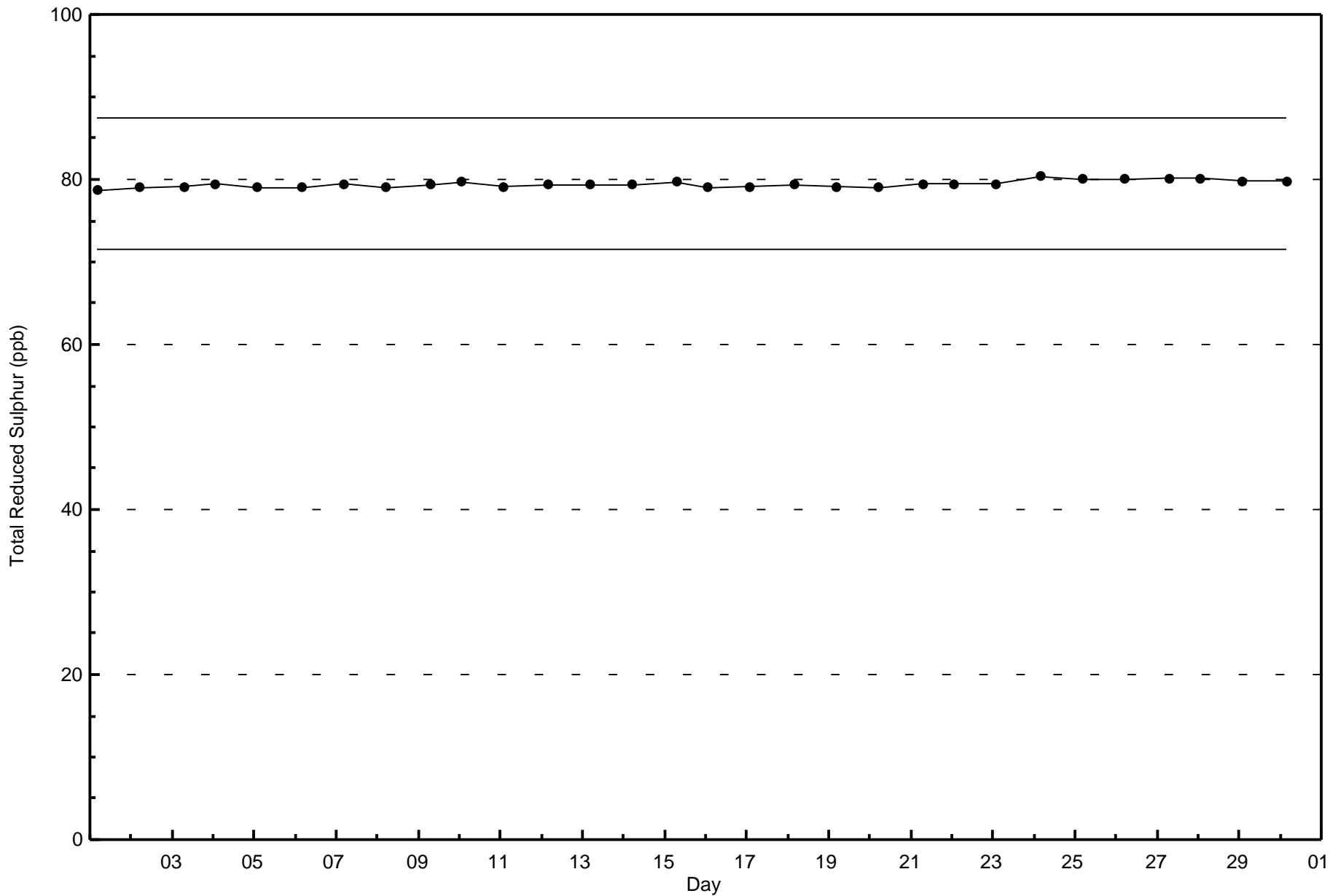


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Total Reduced Sulphur (TRS) - ppb
CNRL Horizon (AMS 15)









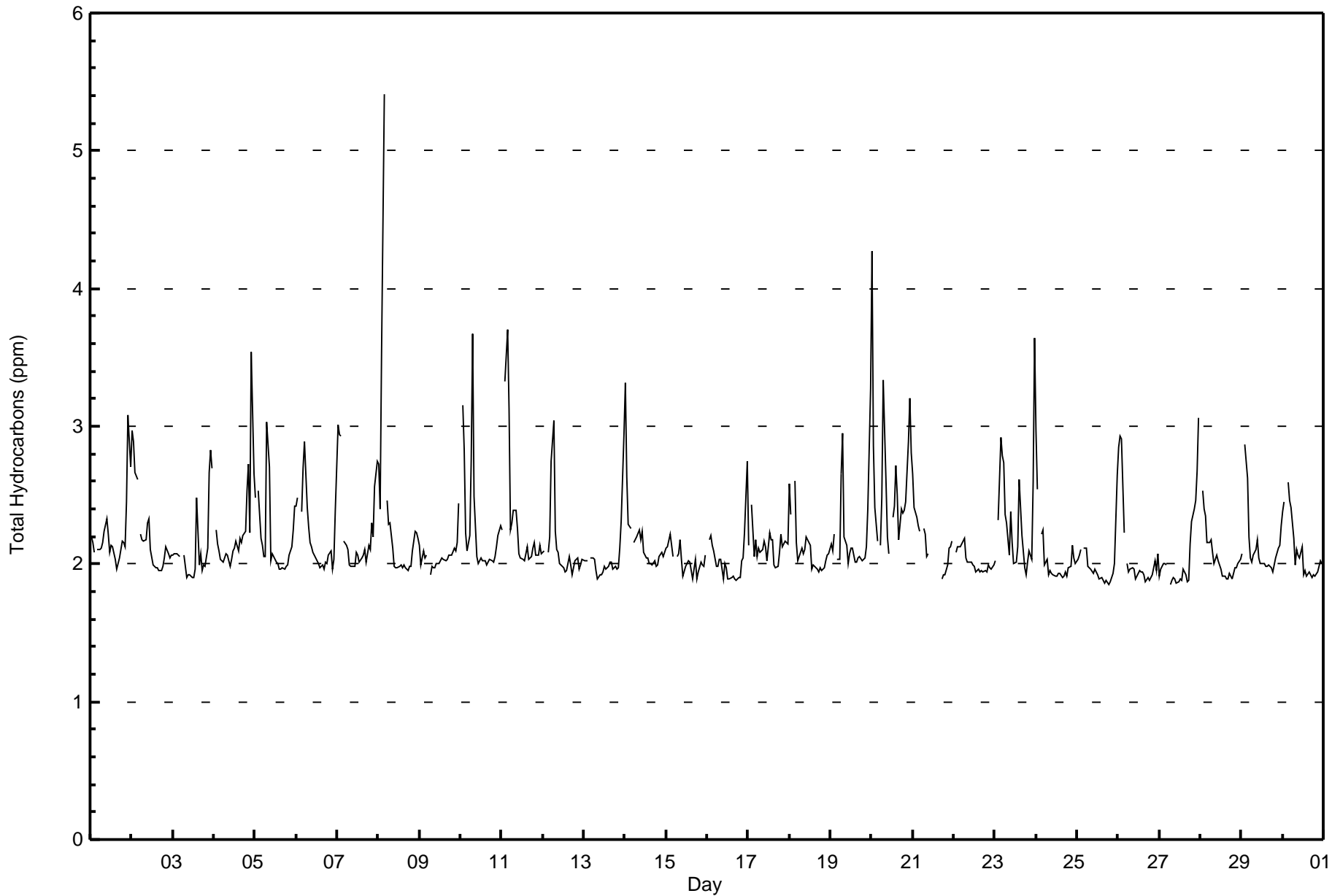
Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

CNRL Horizon - June 2016

Maximum Value: 5.4 ppm on Jun 8 04:00		Maximum Daily Average: 2.6 ppm on Jun 20		Hours in Service: 720																						
Minimum Value: 1.8 ppm on Jun 25 19:00		Minimum Daily Average: 2.0 ppm on Jun 25		Hours of Data: 682																						
Maximum Diurnal Average: 2.5 ppm at hour 1		Minimum Diurnal Average: 2.0 ppm at hour 18		Hours of Missing Data: 38																						
Monthly Average: 2.16 ppm		Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 2.0 Median = 2.1 Q ₃ = 2.2 P ₉₀ = 2.5 P ₉₉ = 3.5		Hours of Calibration: 37																						
				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-Jun	2.2	2.2	2.1	Z	2.1	2.1	2.1	2.2	2.2	2.3	2.2	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.2	2.2	2.1	2.4	3.1	2.7	2.2	3.1
2-Jun	3.0	2.9	2.7	2.6	Z	2.2	2.2	2.2	2.2	2.3	2.3	2.1	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.1	2.1	2.0	2.1	2.2	3.0
3-Jun	2.1	2.1	2.1	2.1	2.0	Z	2.1	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.5	2.0	2.1	1.9	2.0	2.0	2.1	2.7	2.8	2.7	2.1	2.8
4-Jun	Z	2.2	2.1	2.1	2.0	2.0	2.0	2.1	2.1	2.0	2.1	2.1	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.5	2.7	2.2	3.5	2.7	2.2	3.5
5-Jun	2.5	Z	2.5	2.2	2.1	2.1	2.1	3.0	2.7	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.4	2.2	3.0
6-Jun	2.4	2.5	Z	2.4	2.7	2.9	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	2.1	2.1	2.0	2.0	2.4	2.2	2.9
7-Jun	3.0	2.9	2.9	Z	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.1	2.1	2.0	2.1	2.1	2.3	2.2	2.6	2.7	2.2	3.0
8-Jun	2.7	2.4	3.5	5.4	Z	2.5	2.3	2.3	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.3	5.4
9-Jun	2.1	2.0	2.1	2.0	2.1	Z	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2	2.4	2.1	2.4
10-Jun	Z	3.2	2.8	2.2	2.1	2.2	2.8	3.7	2.5	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	2.2	2.3	2.3	3.7
11-Jun	2.2	Z	3.3	3.7	3.1	2.3	2.3	2.4	2.4	2.3	2.1	2.0	2.0	2.0	2.1	2.1	2.0	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.3	3.7
12-Jun	2.1	2.1	Z	2.1	2.2	2.7	3.0	2.2	2.1	2.1	2.0	2.0	2.0	1.9	2.0	2.1	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1	3.0
13-Jun	2.0	2.0	2.0	Z	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	2.0	2.1	2.3	2.9	2.0	2.9
14-Jun	3.3	2.6	2.3	2.3	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.1	2.2	3.3
15-Jun	2.1	2.1	2.2	2.1	2.1	Z	2.1	2.1	2.2	2.0	1.9	2.0	2.0	2.0	2.0	1.9	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.1	2.0	2.2
16-Jun	Z	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	1.9	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.2	2.7	2.0	2.7
17-Jun	2.1	Z	2.4	2.1	2.2	2.1	2.1	2.1	2.1	2.2	2.1	2.0	2.2	2.2	2.2	2.0	2.0	2.0	2.1	2.2	2.1	2.2	2.2	2.1	2.1	2.4
18-Jun	2.6	2.4	Z	2.6	2.2	2.0	2.1	2.1	2.1	2.1	2.2	2.2	2.1	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.6
19-Jun	2.1	2.1	2.2	Z	2.0	2.0	2.7	2.9	2.2	2.1	2.0	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.4	3.3	2.2	3.3
20-Jun	4.3	2.9	2.4	2.2	Z	2.1	2.5	3.3	2.6	2.2	2.1	M	2.3	2.4	2.7	2.5	2.2	2.4	2.4	2.4	2.5	2.9	3.2	2.8	2.6	4.3
21-Jun	2.7	2.4	2.3	2.3	2.2	Z	2.3	2.2	2.1	2.1	C	C	C	C	C	C	C	1.9	1.9	1.9	2.0	2.1	2.1	2.2	--	2.7
22-Jun	Z	2.1	2.1	2.1	2.1	2.2	2.2	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	1.9	2.0	1.9	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.2
23-Jun	2.0	Z	2.3	2.9	2.8	2.7	2.4	2.3	2.1	2.4	2.2	2.0	2.0	2.1	2.6	2.4	2.2	2.0	1.9	2.0	2.1	2.0	2.6	3.6	2.3	3.6
24-Jun	3.0	2.5	Z	2.2	2.2	2.0	2.0	1.9	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	2.1	2.0	2.0	2.1	3.0
25-Jun	2.0	2.1	2.1	Z	2.1	2.1	2.0	2.0	2.0	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.9	1.9	1.9	2.0	2.6	2.0	2.6
26-Jun	2.8	2.9	2.9	2.2	Z	2.0	1.9	2.0	2.0	2.0	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	2.1	2.1	2.9
27-Jun	1.9	2.0	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	1.9	1.9	1.9	1.9	2.1	2.3	2.4	2.5	2.7	2.1	3.1
28-Jun	Z	2.5	2.4	2.3	2.2	2.2	2.2	2.1	2.0	2.1	2.0	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.1	2.5
29-Jun	2.1	Z	2.9	2.6	2.2	2.0	2.0	2.1	2.1	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.1	2.1	2.3	2.1	2.9
30-Jun	2.4	2.5	Z	2.6	2.5	2.4	2.2	2.0	2.1	2.1	2.0	2.1	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.6
																								Diurnal Average		
																								Diurnal Maximum		
																								Z - zerospan C - Calibration M - Maintenance		





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
CNRL Horizon - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	332	48.68	48.68
2.1 - 3.0	334	48.97	97.65
3.1 - 10.0	16	2.35	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 682

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
CNRL Horizon - June 2016

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	25	45	31	17	9	4	9	25	39	37	46	19	7	5	5	9	332
2.1 - 3.0	29	23	18	10	11	7	13	21	37	38	26	17	22	31	19	12	334
3.1 - 10.0	0	1	0	0	0	0	0	1	0	2	2	0	4	4	0	2	16
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	54	69	49	27	20	11	22	47	76	77	74	36	33	40	24	23	682

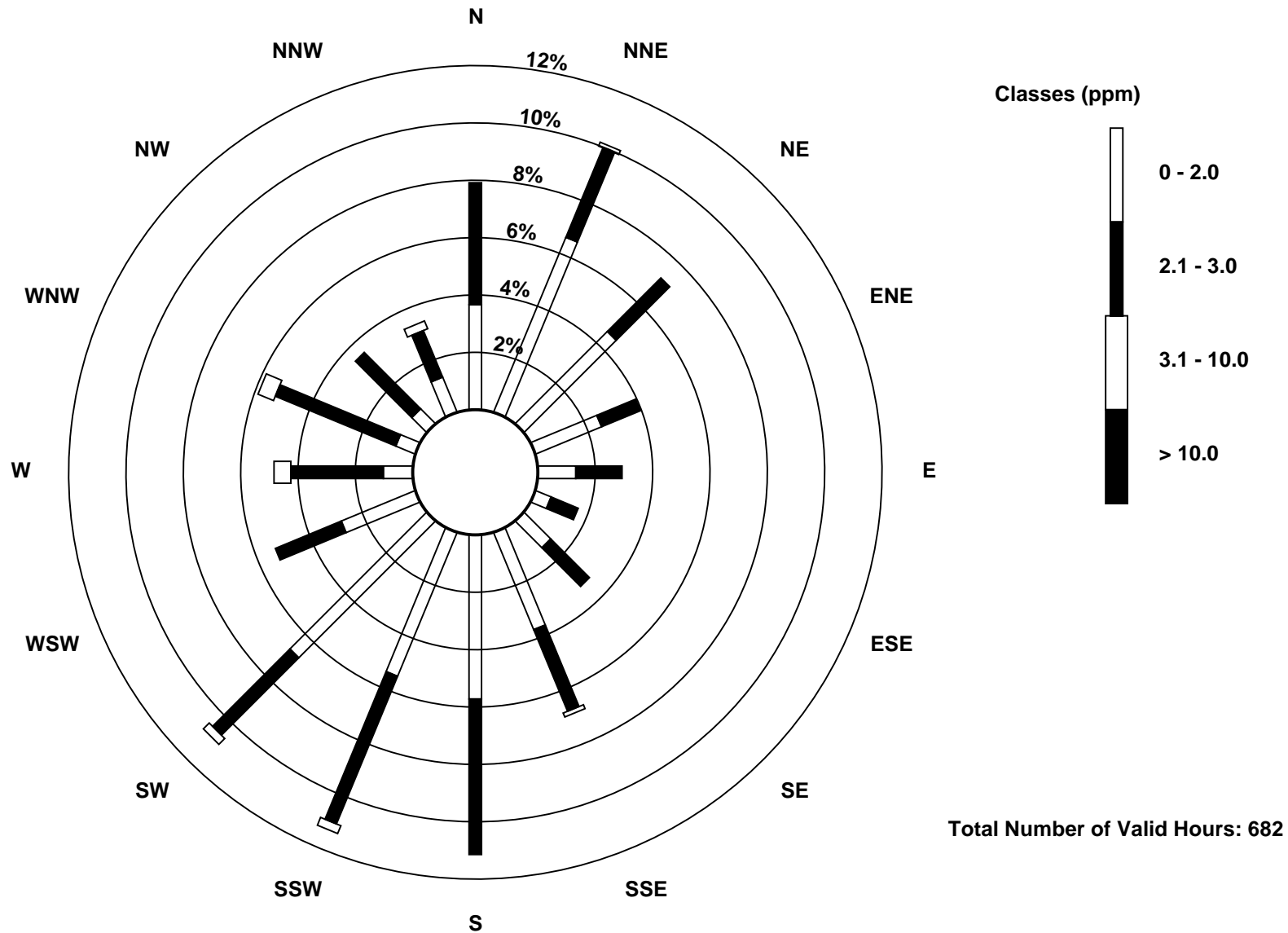
Total Number of Valid Hours: 682

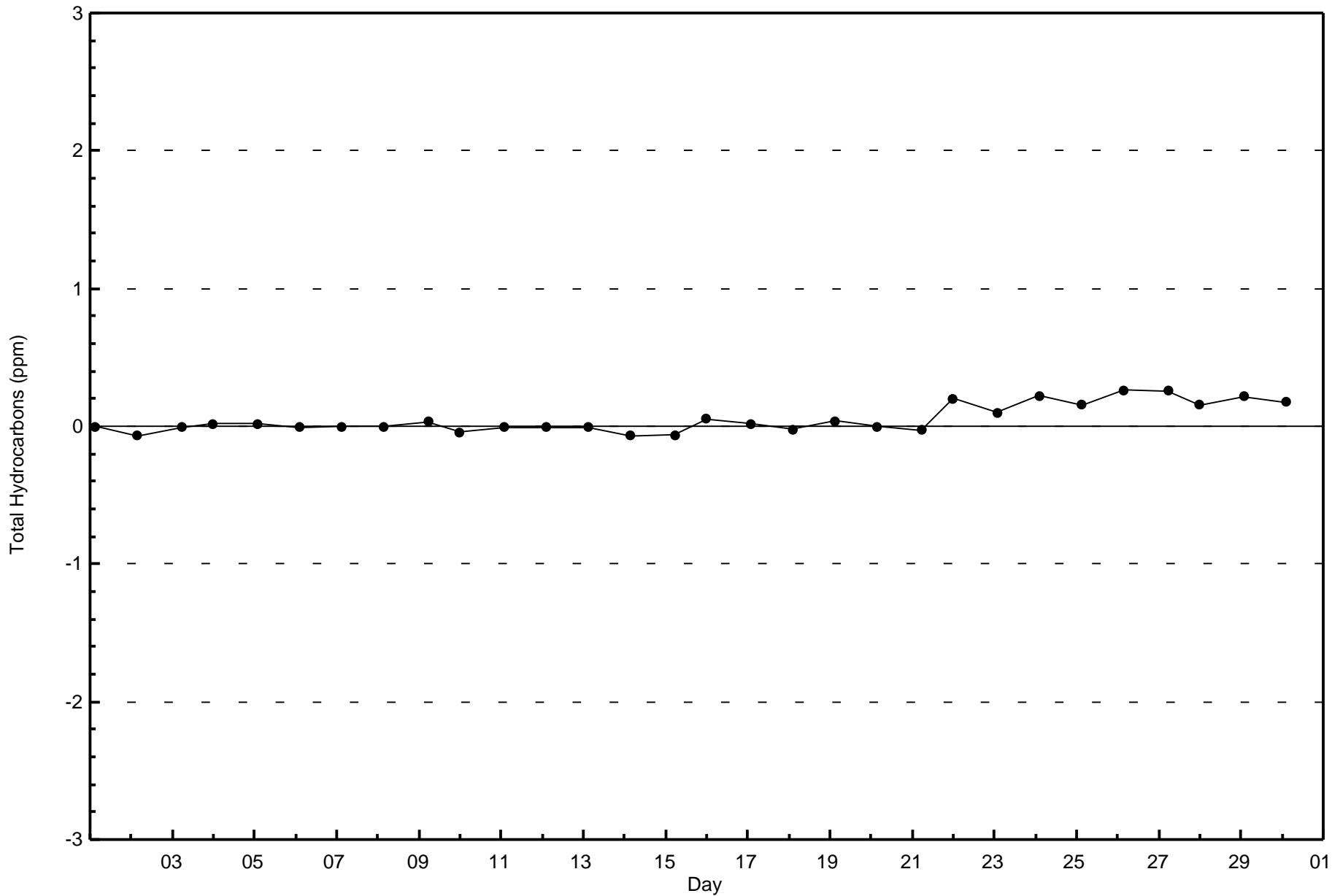
Total Number of Hours: 720

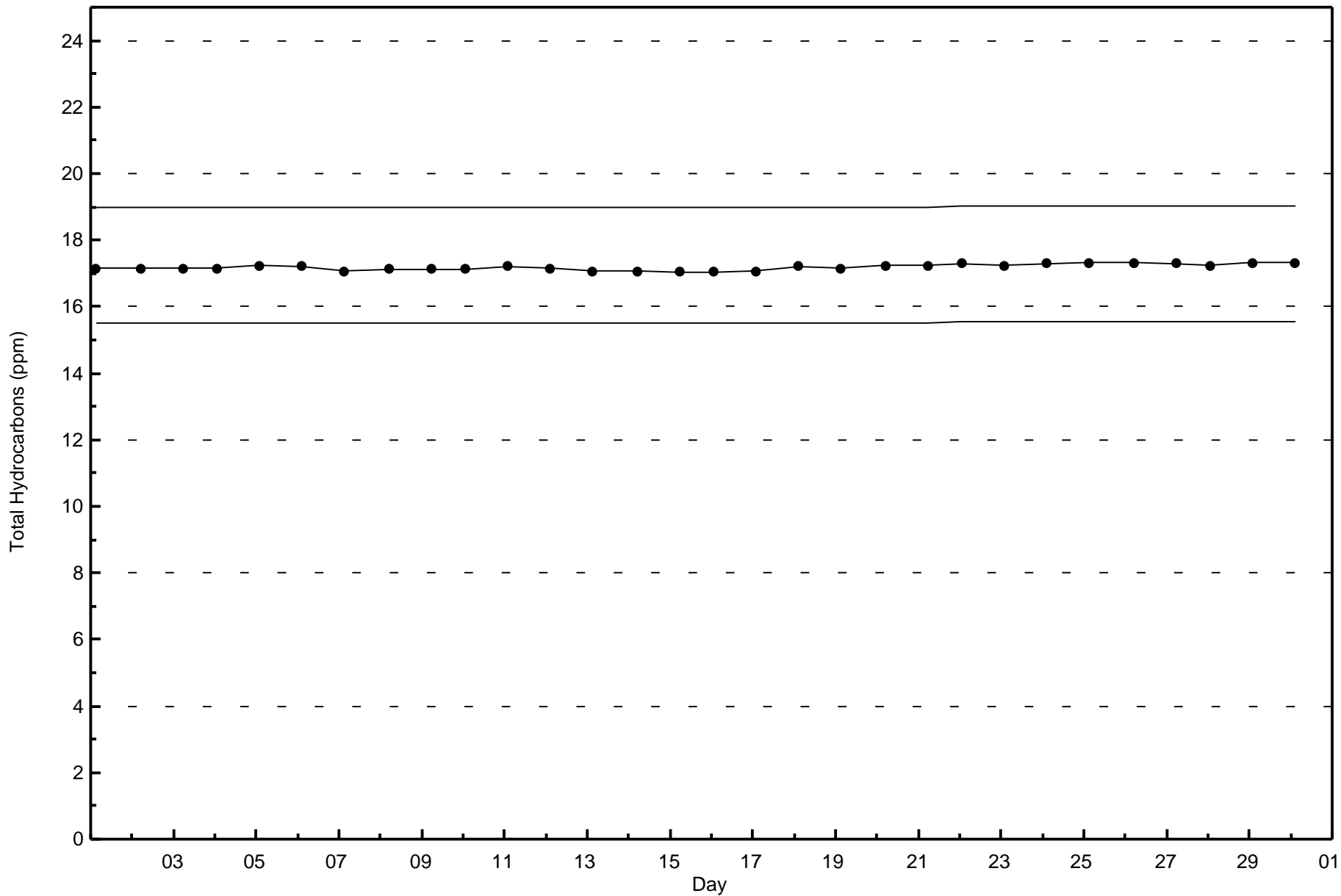


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Total Hydrocarbons (THC) - ppm
CNRL Horizon (AMS 15)









Wood Buffalo Environmental Association
Summary of Hour Averages

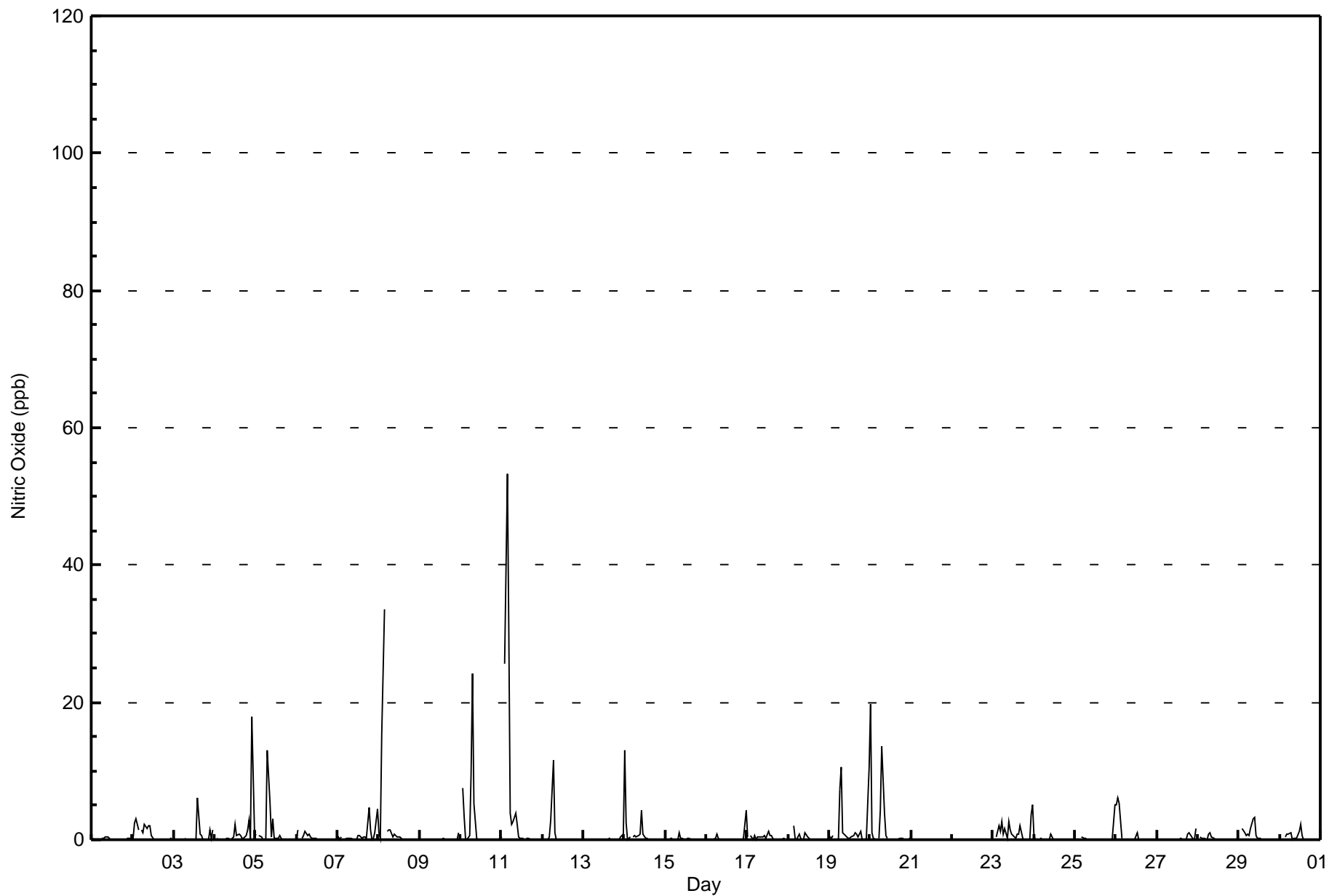
Nitric Oxide (NO) - ppb
CNRL Horizon - June 2016

Maximum Value: 53 ppb on Jun 11 04:00		Maximum Daily Average: 5.5 ppb on Jun 11		Hours in Service: 720																																													
Minimum Value: 0 ppb on Jun 1 14:00		Minimum Daily Average: 0.0 ppb on Jun 22		Hours of Data: 682																																													
Maximum Diurnal Average: 3.8 ppb at hour 4		Minimum Diurnal Average: 0.0 ppb at hour 18		Hours of Missing Data: 38																																													
Monthly Average: 0.8 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 17		Hours of Calibration: 37																																													
				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-Jun	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																							
2-Jun	0	2	3	1	Z	1	1	2	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0.8	3																							
3-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	6	1	1	0	0	0	0	1	0	1	0.5	6																							
4-Jun	Z	0	0	0	0	0	0	0	0	0	0	2	1	1	1	0	0	0	1	1	3	0	18	0	1.3	18																							
5-Jun	1	Z	1	0	0	0	0	13	5	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	1.1	13																							
6-Jun	0	1	Z	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																							
7-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	1	1	0	0	0	0	5	2	0	0	1	4	0.7	5																							
8-Jun	1	0	15	34	Z	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5	34																							
9-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1	1																							
10-Jun	Z	8	3	0	0	1	10	24	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.2	24																							
11-Jun	0	Z	26	53	30	4	2	3	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.5	53																							
12-Jun	0	0	Z	0	0	3	12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	12																							
13-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1	1																							
14-Jun	13	2	0	0	Z	0	1	0	1	1	4	1	0	0	0	0	0	0	0	0	0	0	0	0	1.1	13																							
15-Jun	0	0	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1																							
16-Jun	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.3	4																							
17-Jun	0	Z	1	0	1	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0.3	1																							
18-Jun	0	0	Z	2	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2																							
19-Jun	0	0	1	Z	0	0	7	11	1	1	0	0	0	0	1	1	1	0	1	0	0	0	11	1.6	11																								
20-Jun	20	1	0	0	Z	0	4	14	4	1	0	M	0	0	0	0	0	0	0	0	0	0	0	2.0	20																								
21-Jun	0	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	C	C	0	0	0	0	0	0	0	--	0																							
22-Jun	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																							
23-Jun	0	Z	0	2	1	3	1	2	0	3	1	1	0	0	1	1	2	0	0	0	0	0	4	5	1.2	5																							
24-Jun	1	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1																							
25-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0.3	5																								
26-Jun	5	6	5	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.8	6																							
27-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0.2	2																								
28-Jun	Z	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1																							
29-Jun	0	Z	2	1	1	1	1	2	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	3																							
30-Jun	0	0	Z	0	1	1	1	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0.3	2																							
																								1.7	0.9	2.3	3.8	1.4	0.7	1.5	2.5	1.0	0.5	0.6	0.2	0.3	0.1	0.4	0.2	0.1	0.0	0.2	0.1	0.1	0.1	0.8	1.2	Diurnal Average	
																								20	8	26	53	30	4	12	24	5	3	4	1	2	1	6	1	2	0	5	2	3	1	18	11	Diurnal Maximum	
Z - zerospan																								C - Calibration				M - Maintenance																					



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
CNRL Horizon - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
CNRL Horizon - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	677	99.27	99.27
21 - 40	4	0.59	99.85
41 - 80	1	0.15	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 682

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
CNRL Horizon - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	54	68	49	27	20	11	22	47	76	77	73	36	32	40	24	21	677
21 - 40	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	1	4
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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
Totals	54	69	49	27	20	11	22	47	76	77	74	36	33	40	24	23	682

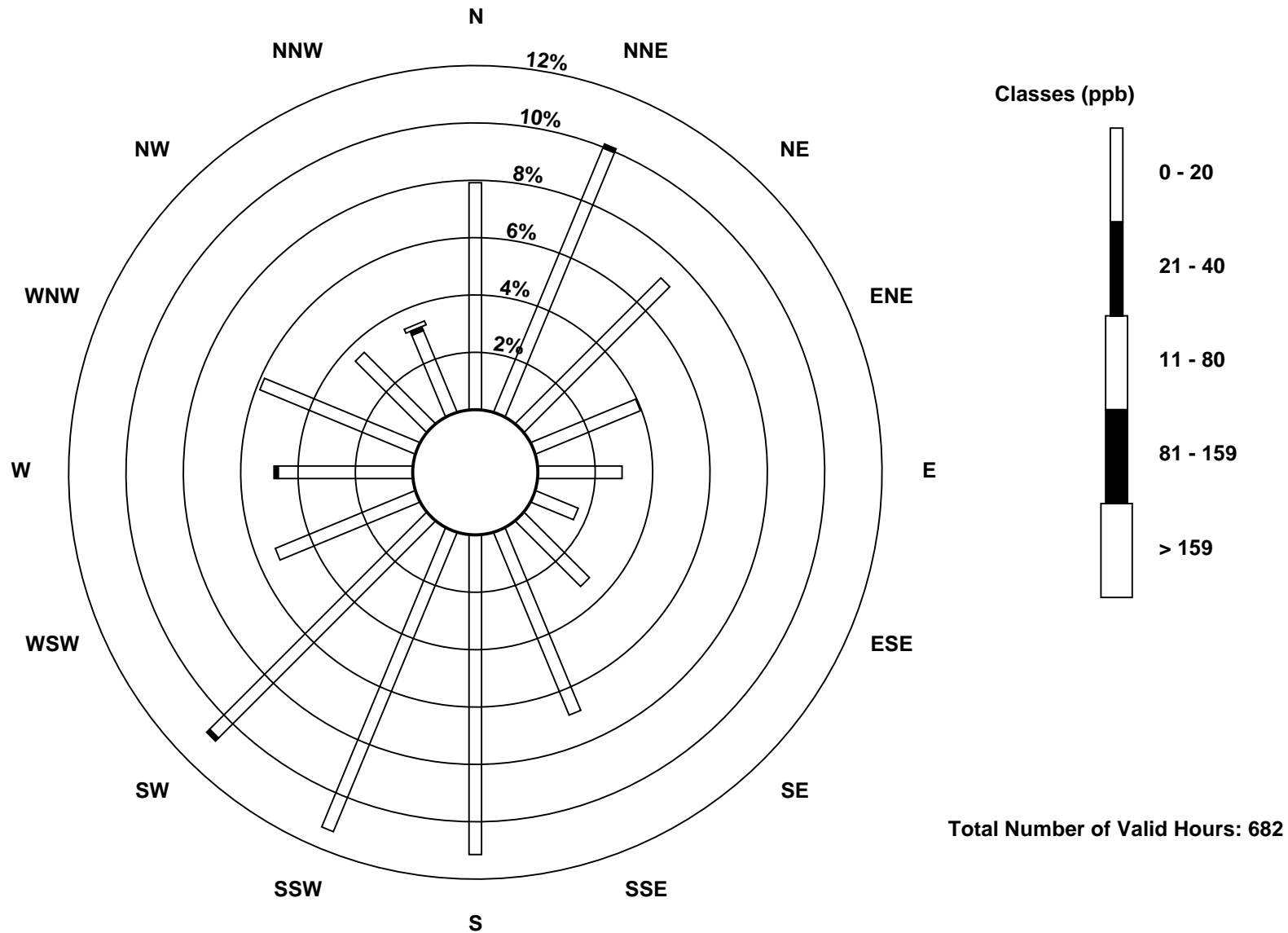
Total Number of Valid Hours: 682

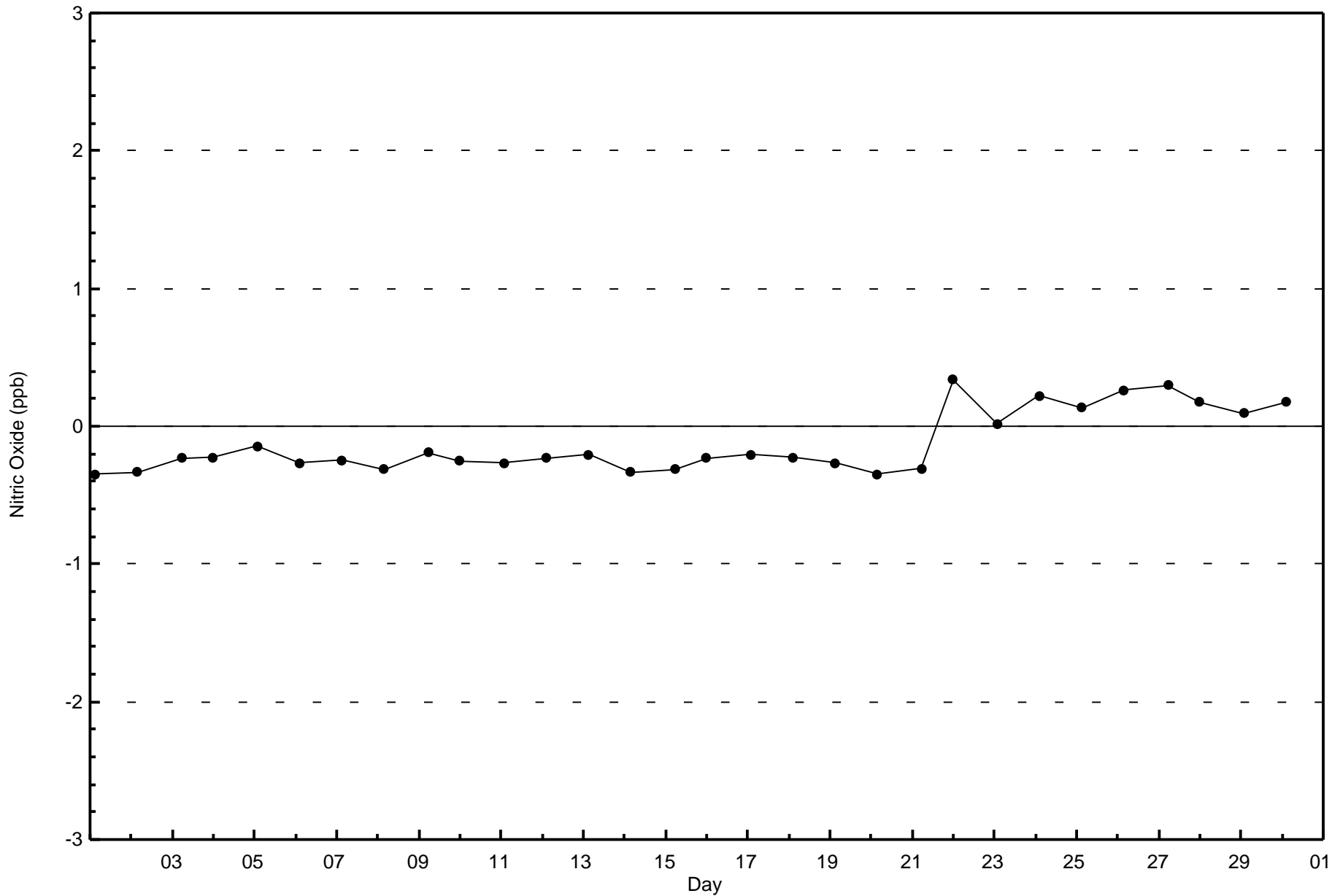
Total Number of Hours: 720

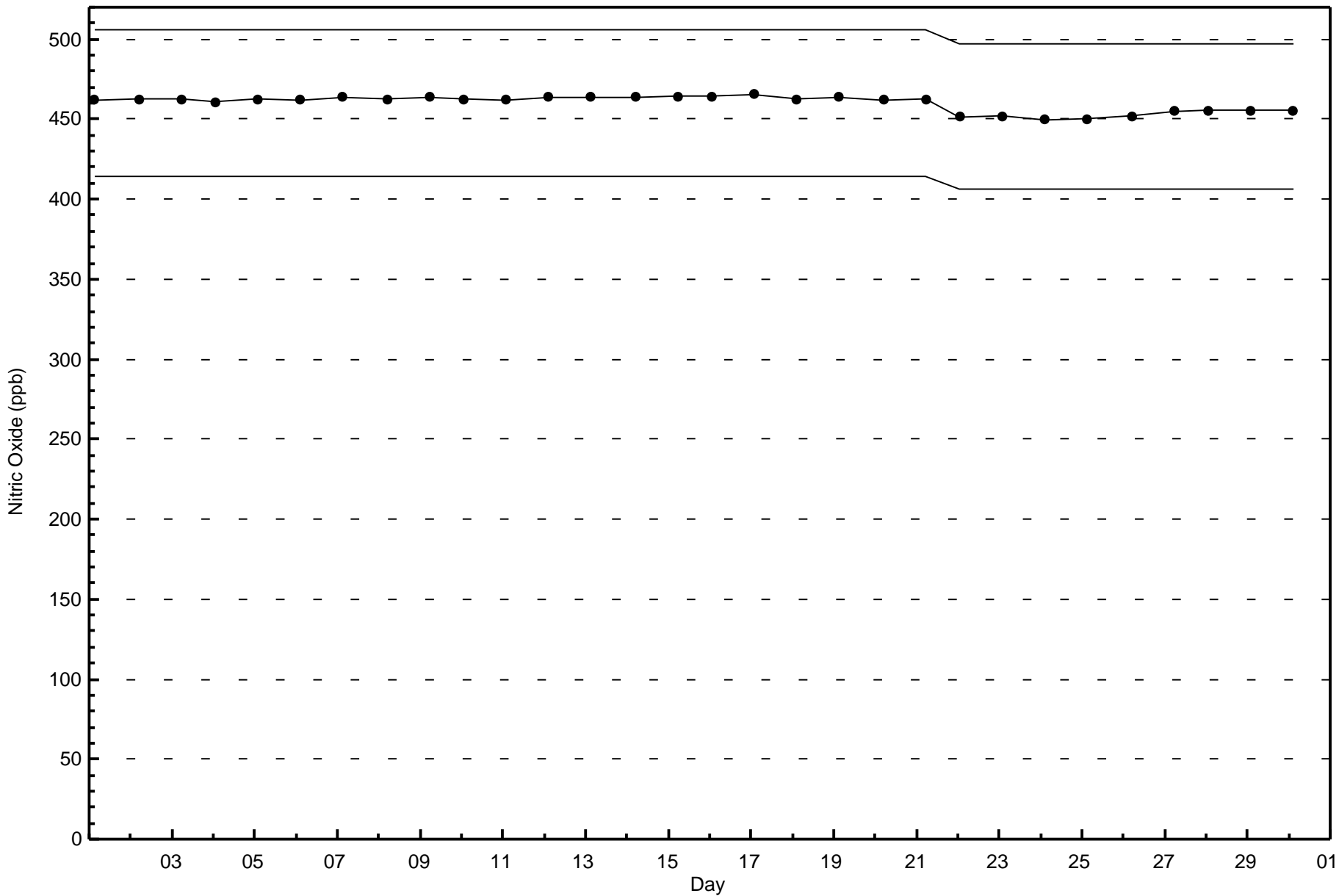


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitric Oxide (NO) - ppb
CNRL Horizon (AMS 15)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

CNRL Horizon - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 28 ppb on Jun 4 23:00	Maximum Daily Average: 7.0 ppb on Jun 23		Hours of Data:	682
Minimum Value: 0 ppb on Jun 3 11:00	Minimum Daily Average: 0.4 ppb on Jun 22		Hours of Missing Data:	38
Maximum Diurnal Average: 6.4 ppb at hour 24	Minimum Diurnal Average: 0.9 ppb at hour 18		Hours of Calibration:	37
Monthly Average: 2.8 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 3 P ₉₀ = 8 P ₉₉ = 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-Jun	1	0	0	Z	0	0	0	1	1	1	1	1	1	1	0	1	1	2	2	1	7	8	8	1.7	8	
2-Jun	7	6	9	8	Z	3	2	5	4	4	5	3	1	1	1	1	0	0	1	1	1	0	1	2	2.8	9
3-Jun	1	1	0	0	0	Z	0	0	0	0	0	0	0	8	3	4	1	2	1	4	14	11	6	2.5	14	
4-Jun	Z	2	1	0	0	0	0	1	1	1	2	2	4	3	4	5	2	2	4	12	18	8	28	13	5.0	28
5-Jun	12	Z	8	3	1	0	1	15	10	2	2	1	1	1	2	1	0	0	0	1	1	1	5	3.0	15	
6-Jun	6	13	Z	7	8	5	3	3	3	2	3	2	1	1	1	1	2	1	1	1	2	3	5	3.2	13	
7-Jun	6	3	9	Z	1	1	1	1	2	2	2	3	3	3	2	3	5	3	6	2	3	6	16	23	4.5	23
8-Jun	10	3	12	17	Z	3	4	6	2	3	3	3	2	2	1	2	2	2	2	2	3	3	4	3	4.1	17
9-Jun	8	3	4	3	1	Z	1	1	1	0	0	0	0	0	1	1	1	1	1	1	2	2	2	4	1.6	8
10-Jun	Z	8	5	2	0	1	9	19	6	0	0	0	0	0	0	0	0	0	0	1	1	1	5	9	2.9	19
11-Jun	7	Z	13	14	12	6	5	7	9	6	2	2	2	1	1	2	2	1	1	1	0	2	4	1	4.3	14
12-Jun	1	2	Z	3	3	7	12	2	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1.5	12
13-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	2	1	0	1	0	1	2	7	10	1.1	10
14-Jun	13	5	2	2	Z	1	1	1	2	3	11	4	2	2	1	2	2	1	1	1	2	2	3	2	2.9	13
15-Jun	1	1	4	2	2	Z	2	2	5	1	1	1	1	1	0	0	0	0	0	0	0	1	1	2	1.3	5
16-Jun	Z	4	4	3	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	13	1.6	13
17-Jun	4	Z	6	1	3	1	3	3	4	3	3	1	3	1	1	1	0	0	1	2	1	2	2	1	1.9	6
18-Jun	11	6	Z	14	3	0	2	1	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	1	1.8	14
19-Jun	4	2	8	Z	0	0	8	12	3	1	1	1	1	1	1	2	2	2	4	1	2	2	6	22	3.7	22
20-Jun	27	13	8	4	Z	1	6	14	7	2	0	M	0	1	1	1	1	3	5	7	5	4	5	7	5.3	27
21-Jun	6	2	1	1	1	Z	0	1	0	0	C	C	C	C	C	C	C	0	0	0	0	1	1	0	--	6
22-Jun	Z	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	2	0	0	0	0.4	2
23-Jun	1	Z	7	19	12	12	4	5	2	12	6	5	4	4	12	9	7	2	2	2	4	4	11	18	7.0	19
24-Jun	14	9	Z	5	5	1	1	0	0	1	2	0	0	0	0	1	0	0	0	1	1	2	2	2	2.1	14
25-Jun	1	2	1	Z	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	12	1.1	12
26-Jun	13	14	8	1	Z	0	0	1	1	1	0	1	8	4	1	1	0	0	0	0	0	5	2	2	2.8	14
27-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	2	1	0	1	6	12	11	10	15	14	3.3	15
28-Jun	Z	4	3	2	1	0	2	3	2	2	2	1	0	0	0	0	0	0	0	1	1	1	3	5	1.5	5
29-Jun	4	Z	14	12	3	3	2	4	7	8	3	2	3	2	2	2	2	2	2	2	2	3	3	3	3.8	14
30-Jun	4	5	Z	6	5	3	4	1	3	2	2	5	7	4	2	1	1	1	3	3	1	2	2	1	2.9	7

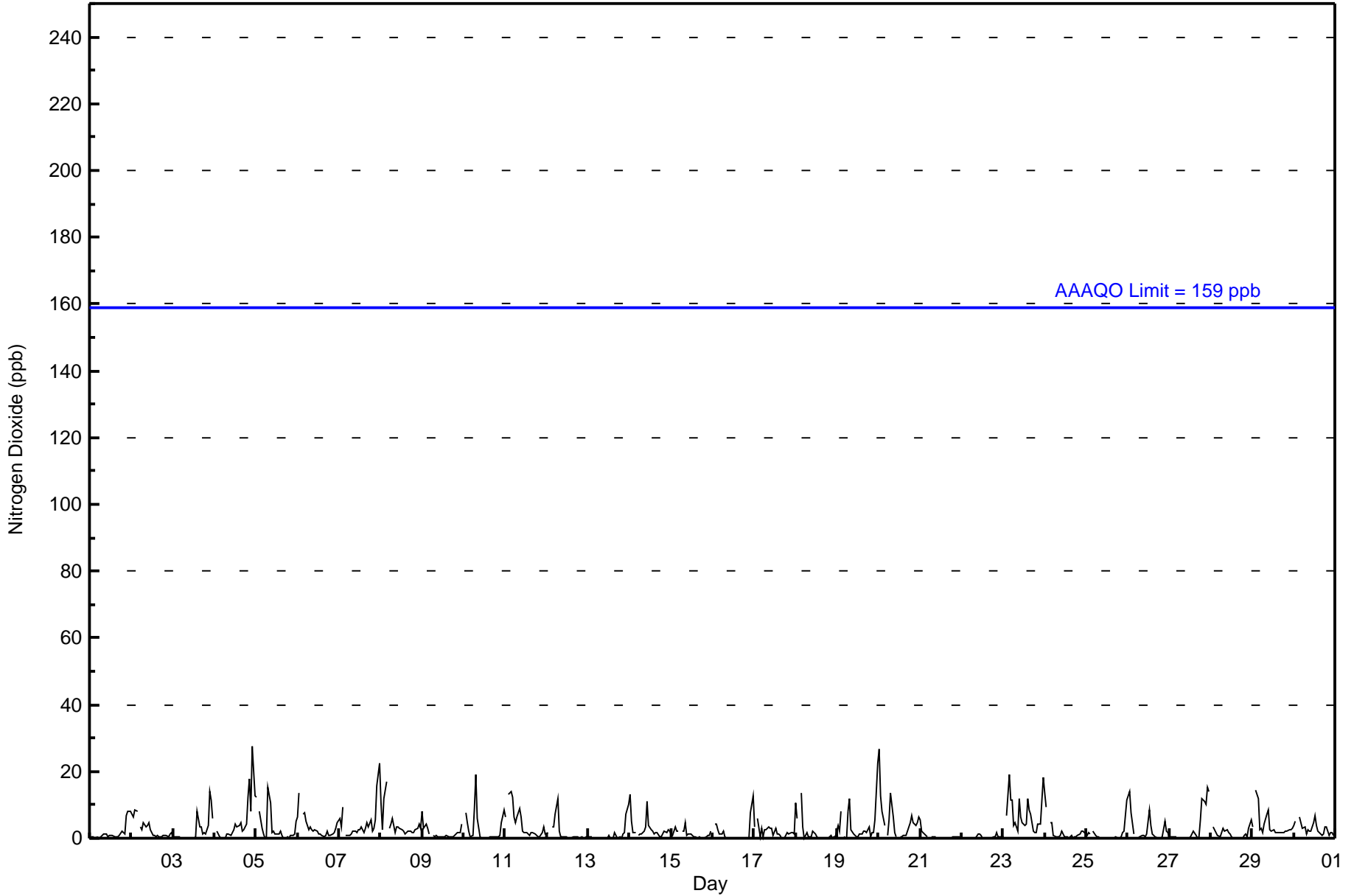
6.4	4.3	5.1	5.2	2.6	2.0	2.4	3.6	2.5	2.0	1.9	1.4	1.7	1.2	1.6	1.4	1.2	0.9	1.5	1.8	2.3	2.9	5.1	6.4	Diurnal Average	
27	14	14	19	12	12	12	19	10	12	11	5	8	4	12	9	7	3	6	12	18	14	28	23	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	678	99.41	99.41
21 - 40	4	0.59	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: 682

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	54	69	49	27	20	11	22	47	76	77	74	35	31	39	24	23	678
21 - 40	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	4
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
Totals	54	69	49	27	20	11	22	47	76	77	74	36	33	40	24	23	682

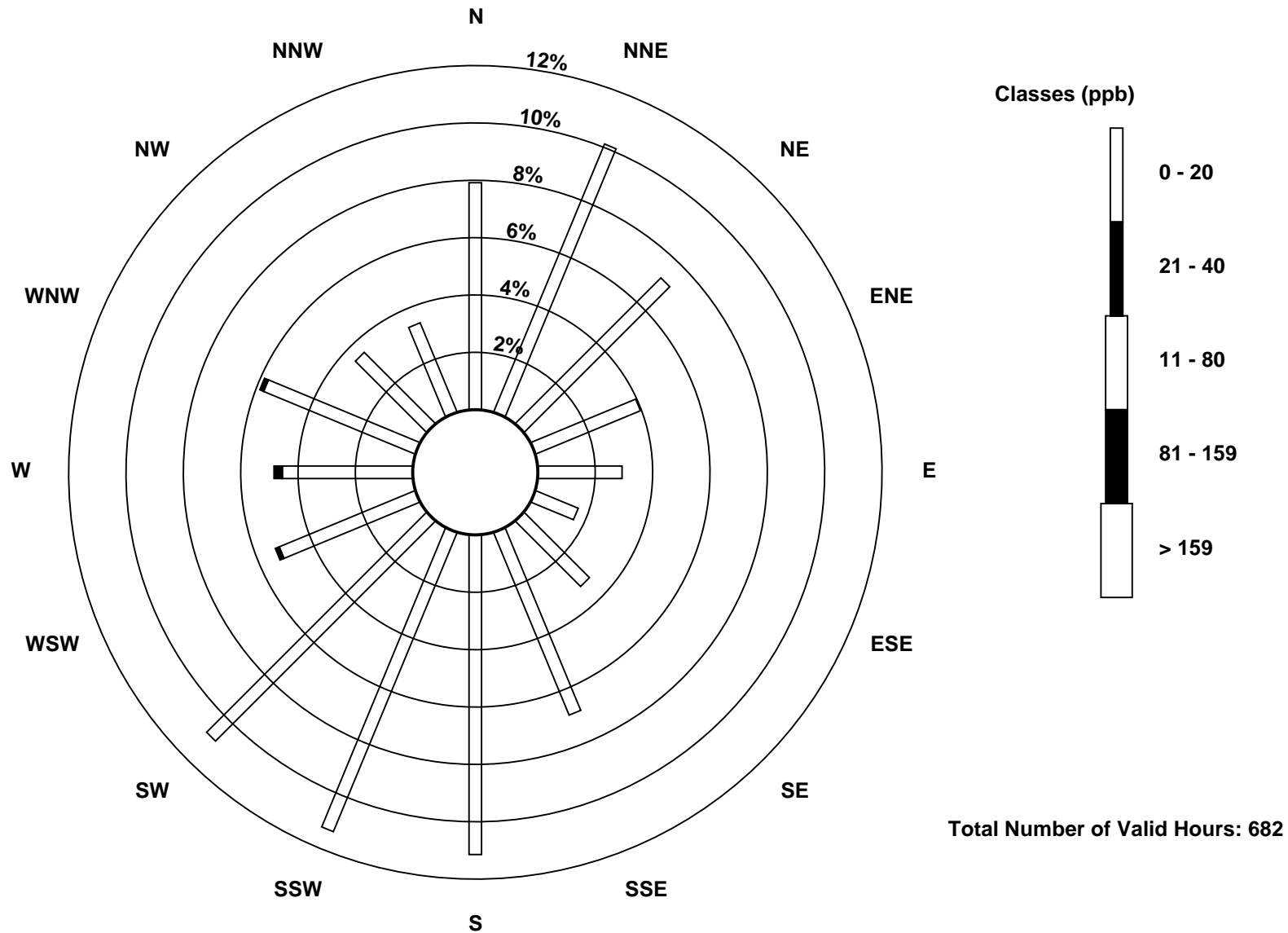
Total Number of Valid Hours: 682

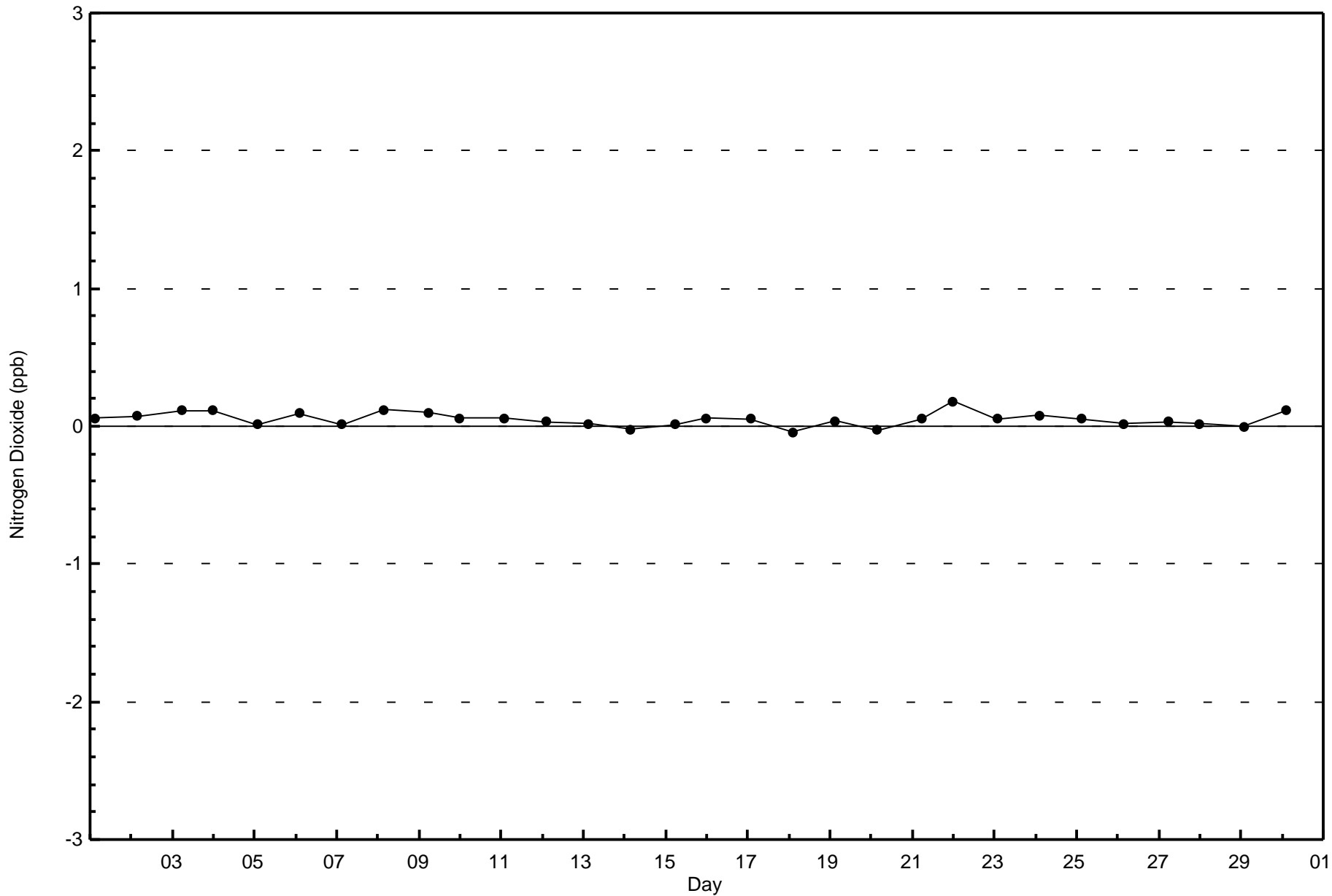
Total Number of Hours: 720

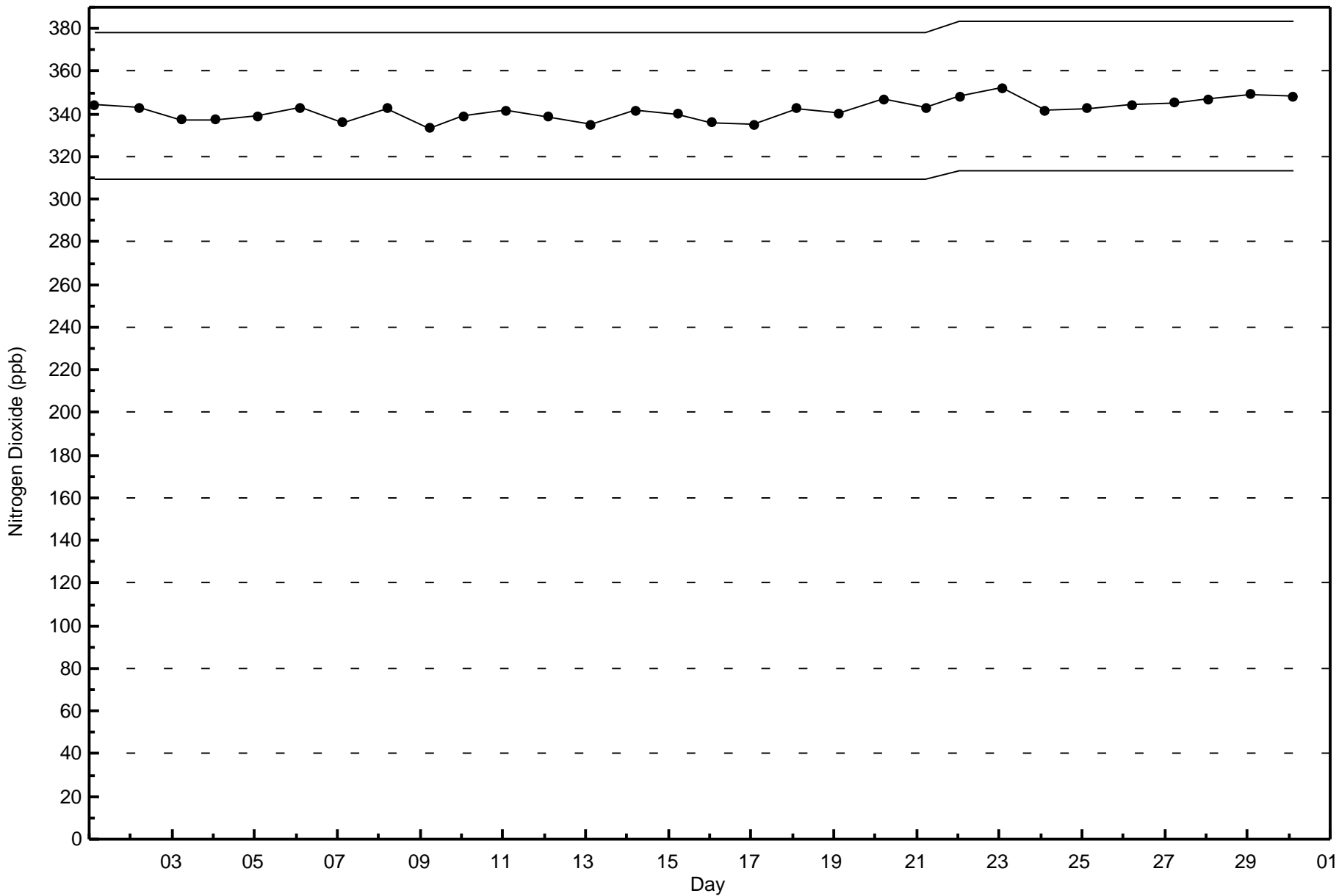


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Dioxide (NO₂) - ppb
CNRL Horizon (AMS 15)









Wood Buffalo Environmental Association
Summary of Hour Averages

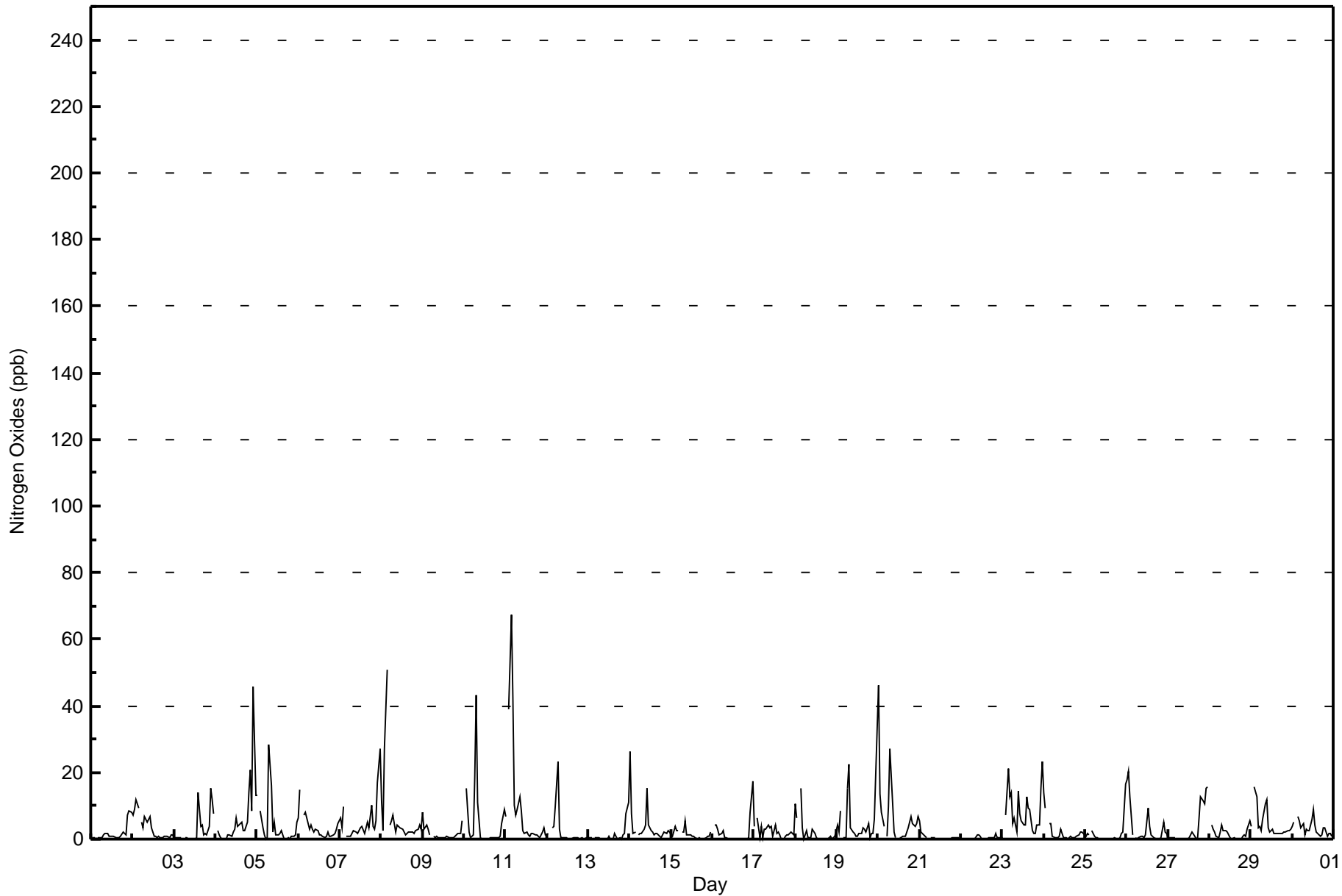
Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - June 2016

Maximum Value: 67 ppb on Jun 11 04:00		Maximum Daily Average: 9.8 ppb on Jun 11		Hours in Service: 720																																												
Minimum Value: 0 ppb on Jun 16 13:00		Minimum Daily Average: 0.4 ppb on Jun 22		Hours of Data: 682																																												
Maximum Diurnal Average: 9.0 ppb at hour 4		Minimum Diurnal Average: 1.0 ppb at hour 18		Hours of Missing Data: 38																																												
Monthly Average: 3.6 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 4 P ₉₀ = 9 P ₉₉ = 38		Hours of Calibration: 37																																												
				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-Jun	1	0	0	Z	0	0	0	1	2	2	1	1	1	1	1	0	1	1	2	2	1	7	8	8	1.8	8																						
2-Jun	7	9	12	9	Z	5	3	7	5	6	7	3	1	1	1	1	0	0	1	1	1	1	1	1	3.6	12																						
3-Jun	1	1	0	0	0	Z	0	0	0	0	0	0	0	14	4	4	1	2	1	4	15	12	7	3.0	15																							
4-Jun	Z	2	1	0	0	0	0	1	1	1	2	3	6	4	5	5	3	3	5	14	21	9	46	13	6.3	46																						
5-Jun	13	Z	9	3	1	0	0	28	16	2	5	1	1	2	3	1	0	0	0	1	1	1	5	4.1	28																							
6-Jun	6	15	Z	7	8	6	3	4	3	2	3	2	1	1	1	1	2	1	1	1	2	3	5	3.5	15																							
7-Jun	6	3	10	Z	1	1	1	2	2	2	2	3	3	4	2	3	5	3	10	4	3	6	17	27	5.2	27																						
8-Jun	11	3	27	51	Z	4	6	7	2	4	4	3	3	2	1	2	2	2	2	2	2	3	4	3	6.5	51																						
9-Jun	8	3	4	3	1	Z	1	1	1	0	0	0	0	0	1	1	1	0	0	1	2	2	2	5	1.6	8																						
10-Jun	Z	15	8	2	0	1	18	43	11	0	0	0	0	0	0	0	0	0	0	1	1	1	4	9	5.1	43																						
11-Jun	7	Z	39	67	42	10	7	9	13	9	2	2	2	1	1	2	2	1	1	1	1	2	4	1	9.8	67																						
12-Jun	1	2	Z	3	4	10	23	3	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2.2	23																						
13-Jun	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	2	1	0	0	0	1	2	8	11	1.2	11																							
14-Jun	26	8	2	2	Z	1	2	2	3	4	15	4	3	2	1	2	2	1	1	1	2	2	2	2	3.9	26																						
15-Jun	1	1	4	2	2	Z	2	2	5	1	1	1	1	1	1	0	0	0	0	0	0	1	1	2	1.4	5																						
16-Jun	Z	4	4	3	1	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	17	1.9	17																						
17-Jun	4	Z	7	1	4	1	3	3	4	3	4	1	4	2	2	1	0	0	1	1	1	2	2	1	2.2	7																						
18-Jun	11	6	Z	15	3	0	3	1	0	0	3	2	0	0	0	0	0	0	0	0	1	0	0	1	2.0	15																						
19-Jun	4	2	8	Z	0	0	15	22	4	2	2	1	1	2	2	3	3	2	5	0	2	2	6	33	5.3	33																						
20-Jun	46	14	8	4	Z	1	10	27	10	2	1	M	0	1	1	1	1	4	5	7	5	4	5	7	7.4	46																						
21-Jun	6	2	1	1	1	Z	1	1	0	0	C	C	C	C	C	C	C	0	0	0	0	0	1	0	--	6																						
22-Jun	Z	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	2	0	0	0	0.4	2																						
23-Jun	0	Z	7	21	13	14	5	6	2	14	8	6	4	4	13	9	9	2	2	2	4	4	15	23	8.2	23																						
24-Jun	14	9	Z	5	5	1	1	0	0	1	3	0	0	0	0	1	0	0	0	1	1	2	2	1	2.2	14																						
25-Jun	1	2	1	Z	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	17	1.3	17																							
26-Jun	18	20	13	1	Z	0	0	1	1	1	0	1	9	4	1	1	0	0	0	0	0	5	2	2	3.5	20																						
27-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	2	1	0	1	6	13	11	10	15	16	3.5	16																						
28-Jun	Z	4	3	2	1	1	2	4	3	3	2	1	0	0	0	0	0	0	0	1	1	1	3	6	1.6	6																						
29-Jun	4	Z	16	13	3	4	2	6	10	12	3	2	3	2	2	2	2	2	2	2	2	3	3	3	4.4	16																						
30-Jun	4	5	Z	7	6	4	4	1	3	2	2	6	9	4	2	1	1	1	4	3	1	1	2	1	3.2	9																						
																								8.1	5.2	7.4	9.0	4.0	2.7	3.9	6.1	3.4	2.5	2.5	1.6	2.0	1.4	1.9	1.5	1.3	1.0	1.7	2.0	2.4	3.0	5.9	7.6	Diurnal Average
																								46	20	39	67	42	14	23	43	16	14	15	6	9	4	14	9	9	4	10	14	21	15	46	33	Diurnal Maximum
Z - zerospan																								C - Calibration				M - Maintenance																				



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	664	97.36	97.36
21 - 40	12	1.76	99.12
41 - 80	6	0.88	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 682

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
CNRL Horizon - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	52	68	48	27	20	11	22	46	76	75	73	35	30	36	24	21	664
21 - 40	2	0	1	0	0	0	0	1	0	2	0	1	0	4	0	1	12
11 - 80	0	1	0	0	0	0	0	0	0	0	1	0	3	0	0	1	6
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
Totals	54	69	49	27	20	11	22	47	76	77	74	36	33	40	24	23	682

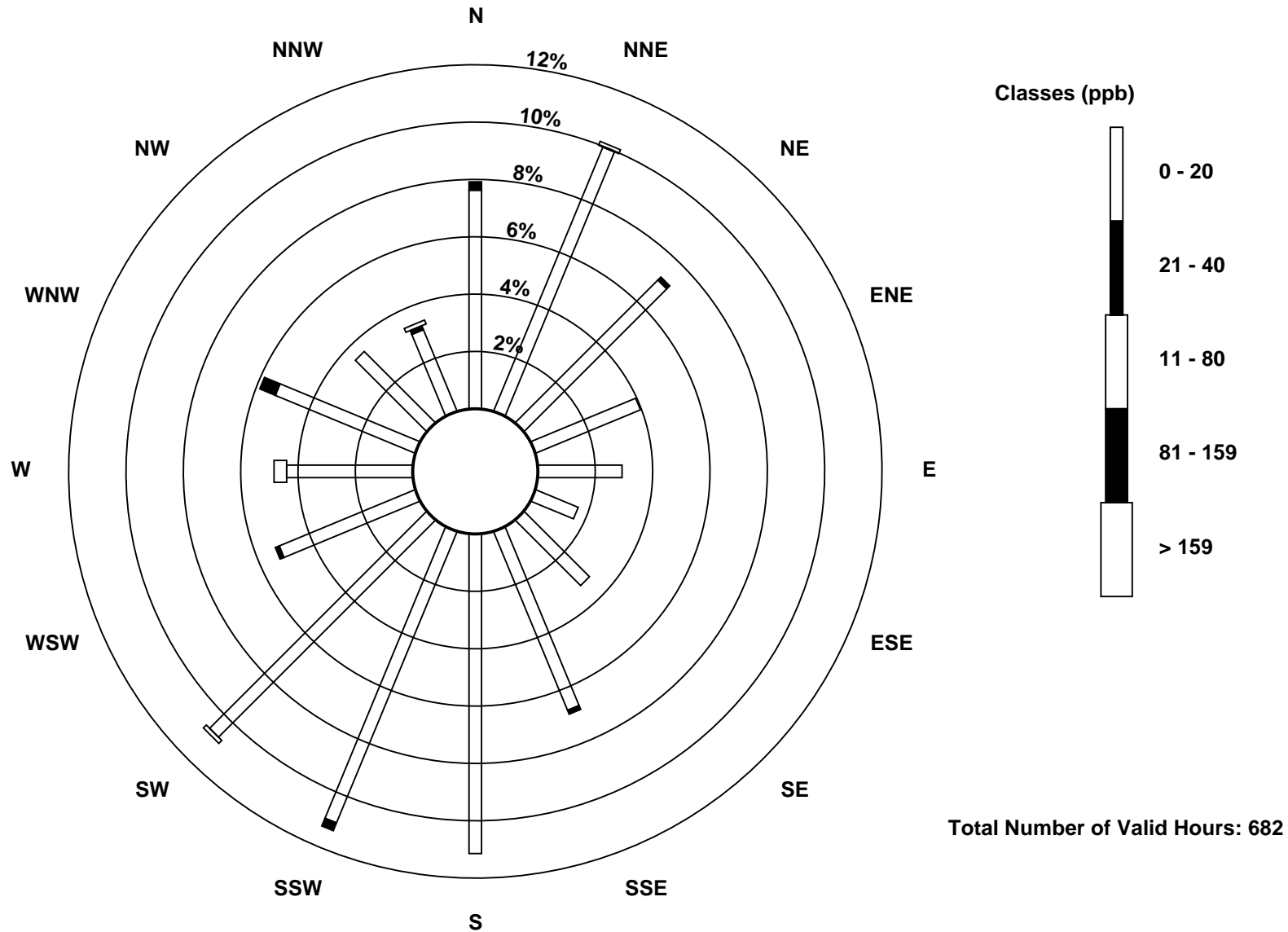
Total Number of Valid Hours: 682

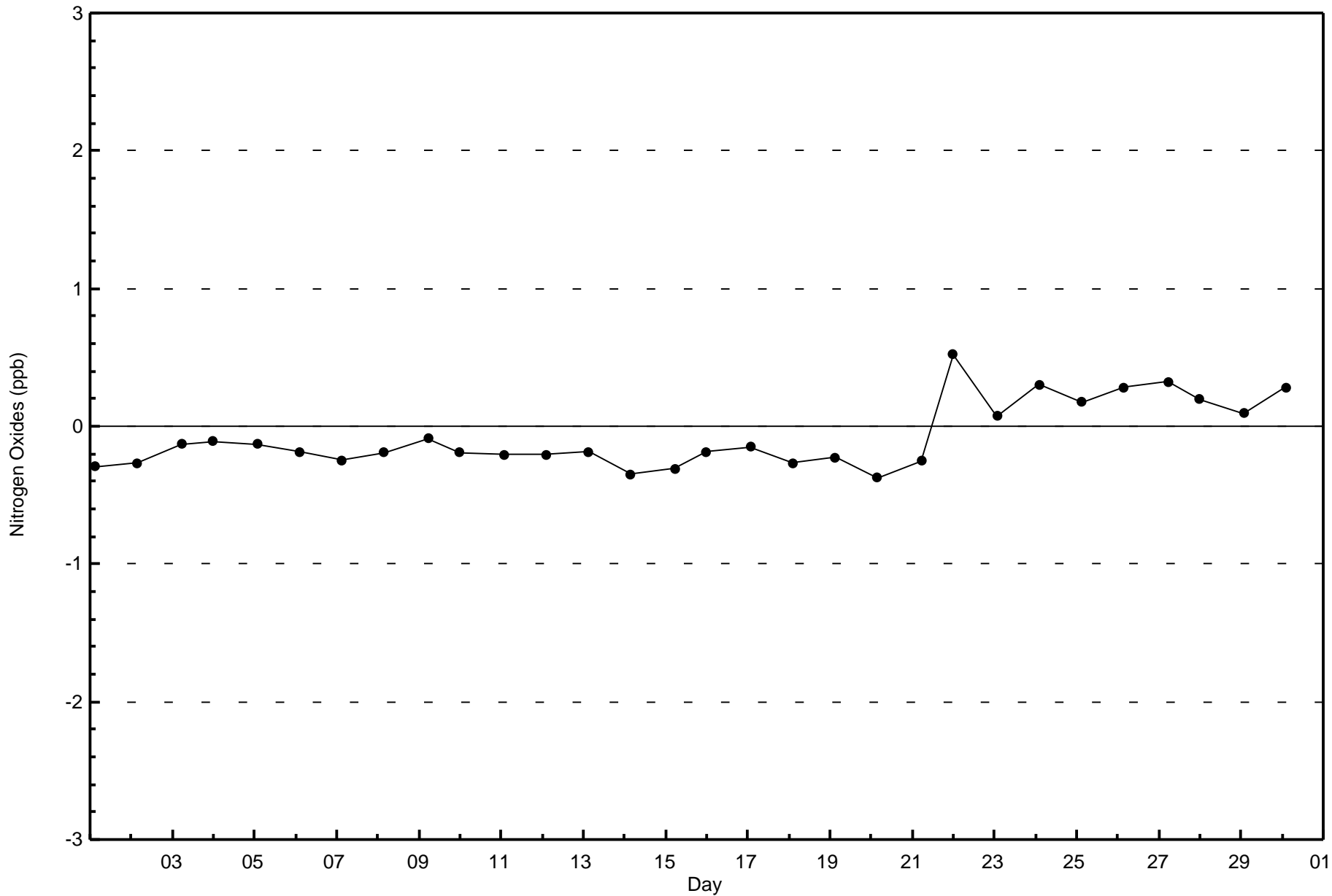
Total Number of Hours: 720

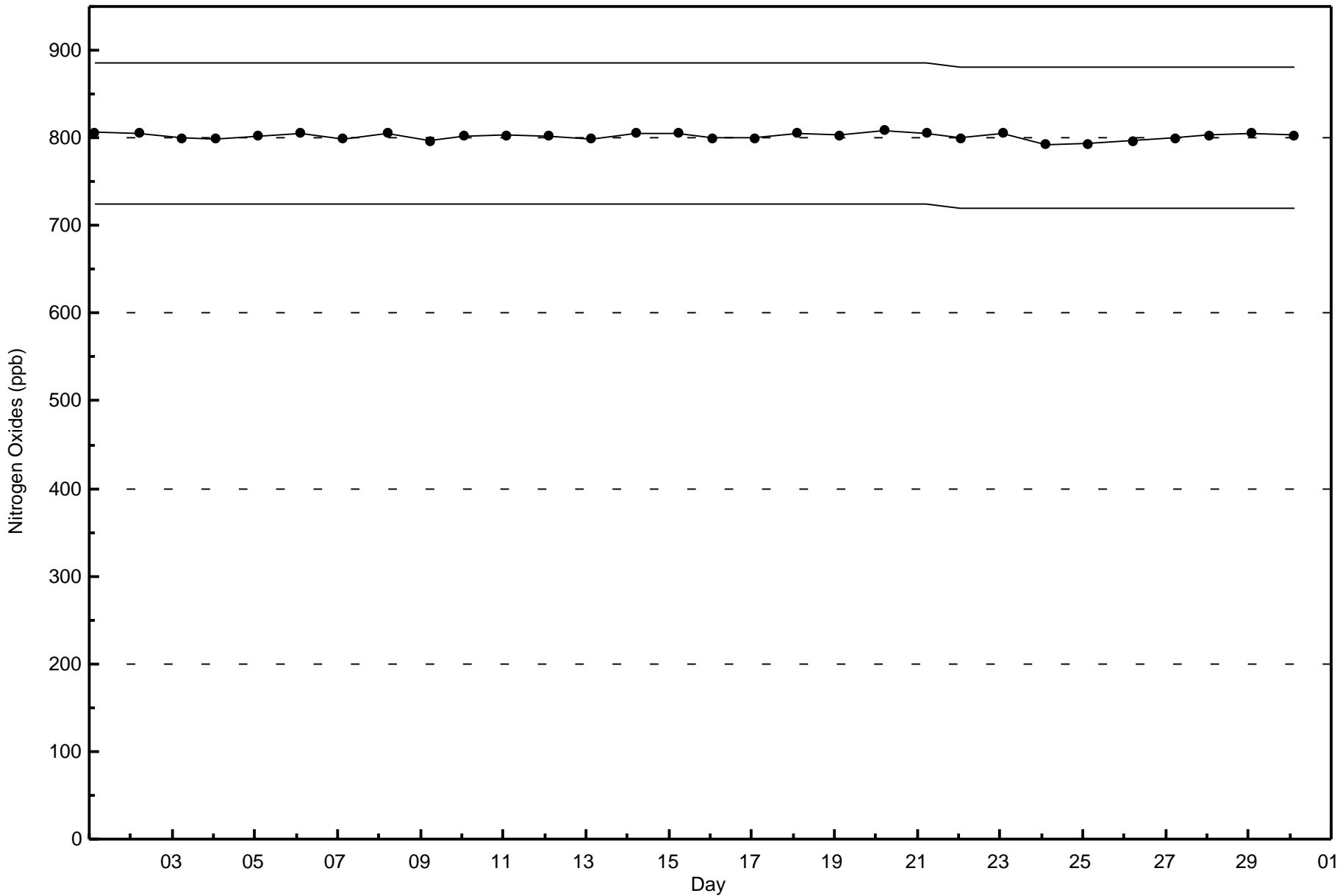


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxides (NO_x) - ppb
CNRL Horizon (AMS 15)









Number of Exceedences (AAAQO): 24-hr: 0	Hours in Service: 720
Maximum Value: 46.7 µg/m ³ on Jun 8 22:00	Maximum Daily Average: 21.4 µg/m ³ on Jun 29
Minimum Value: 0.6 µg/m ³ on Jun 12 16:00	Hours of Data: 716
Maximum Diurnal Average: 9.2 µg/m ³ at hour 21	Hours of Missing Data: 4
Monthly Average: 6.89 µg/m ³	Hours of Calibration: 4
Minimum Daily Average: 1.9 µg/m ³ on Jun 16	Percent Operational Time: 100.0
Minimum Diurnal Average: 5.0 µg/m ³ at hour 15	
Percentiles: P ₁ = 0.9 P ₁₀ = 1.8 Q ₁ = 2.9 Median = 5.0 Q ₃ = 8.9 P ₉₀ = 14.3 P ₉₉ = 29.5	

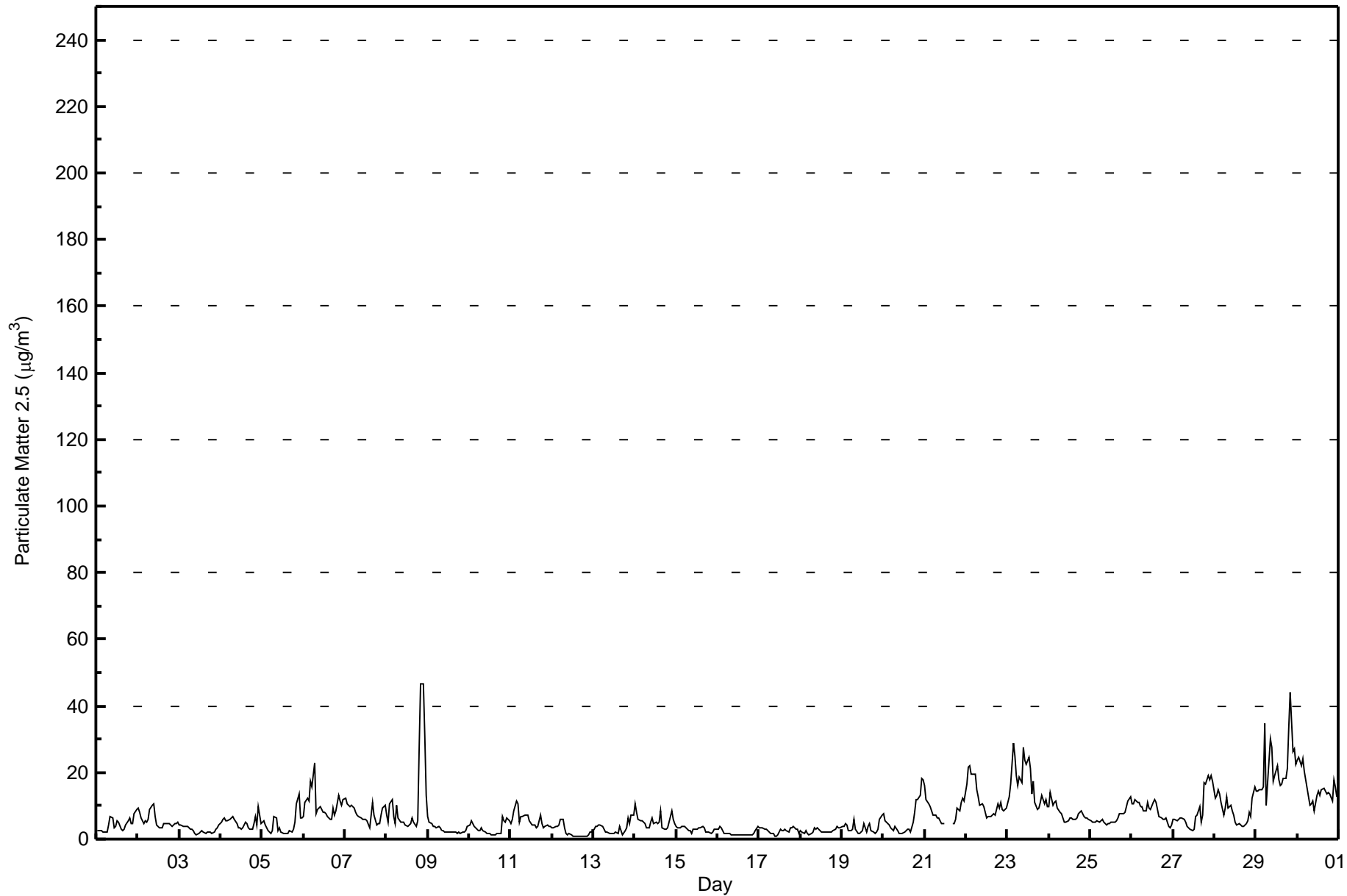
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Jun	2.4	2.6	2.6	2.5	2.3	2.1	2.2	4.4	6.6	6.3	3.4	3.9	5.3	5.2	2.9	2.5	3.0	4.1	5.5	6.5	4.7	4.7	7.5	8.8	4.2	8.8																						
2-Jun	9.4	7.9	6.3	4.5	5.4	4.9	5.8	8.7	10.0	10.5	6.8	4.4	3.6	3.4	3.4	4.5	4.5	4.9	4.8	4.4	3.9	4.5	4.7	4.9	5.7	10.5																						
3-Jun	4.2	4.0	3.8	3.7	3.9	3.8	3.1	2.9	2.7	1.8	1.4	1.6	1.9	2.7	2.2	1.8	2.3	2.2	2.0	1.9	2.1	2.9	3.4	4.2	2.8	4.2																						
4-Jun	4.9	5.8	6.2	5.5	5.3	5.8	6.3	6.7	5.8	4.6	3.4	3.3	3.1	3.4	5.2	4.5	3.5	3.1	3.0	4.6	6.7	4.1	9.8	4.5	5.0	9.8																						
5-Jun	5.1	5.6	4.1	2.5	2.0	1.8	2.3	6.6	6.4	2.6	3.2	2.1	1.8	1.8	1.6	1.5	2.4	2.1	3.0	5.0	10.6	13.6	6.5	6.5	4.2	13.6																						
6-Jun	6.9	11.0	12.1	11.3	17.4	15.7	22.9	7.8	8.9	9.2	9.9	8.0	8.0	7.7	6.8	6.1	6.1	9.2	7.4	8.4	12.9	11.3	10.3	12.0	10.3	22.9																						
7-Jun	12.5	10.6	10.1	9.9	10.0	9.3	8.2	7.3	6.7	6.3	6.1	5.9	6.0	5.5	3.5	7.2	11.0	7.4	4.4	4.7	4.6	7.2	9.4	10.2	7.7	12.5																						
8-Jun	7.2	5.2	10.7	11.8	6.8	4.8	10.4	6.6	5.1	5.2	5.0	4.2	3.9	4.1	4.8	6.3	5.0	3.8	5.5	27.3	46.5	46.7	30.9	12.9	11.7	46.7																						
9-Jun	6.7	5.2	4.6	3.9	3.8	3.5	3.7	3.3	2.7	2.5	2.3	2.1	2.3	2.2	2.1	1.9	2.0	1.9	1.9	1.7	2.1	2.1	2.5	3.7	2.9	6.7																						
10-Jun	4.1	5.4	4.5	3.9	3.3	2.7	2.7	3.4	2.7	2.2	1.8	1.8	1.5	1.4	1.4	1.4	1.5	1.8	1.6	6.9	5.5	5.1	6.4	5.4	3.3	6.9																						
11-Jun	4.8	6.0	8.3	11.2	10.5	5.0	6.7	6.7	7.3	7.4	7.2	5.7	4.4	4.4	4.4	3.2	3.7	7.3	4.7	3.6	3.6	4.3	3.7	3.6	5.7	11.2																						
12-Jun	3.3	3.5	3.7	3.7	4.4	6.0	5.9	3.2	1.6	1.4	1.7	1.4	1.0	0.8	0.7	0.6	0.7	0.7	0.9	0.9	0.9	1.5	2.3	2.3	2.2	6.0																						
13-Jun	3.1	3.6	4.0	4.3	4.3	3.9	2.9	2.2	1.9	1.8	1.8	1.7	1.9	1.9	1.7	3.8	2.4	1.3	2.4	3.5	6.2	4.5	7.2	7.3	3.3	7.3																						
14-Jun	10.8	8.0	5.9	5.4	5.6	5.1	4.6	3.3	3.5	4.9	6.4	4.5	5.0	4.5	5.2	8.7	3.2	2.9	2.8	3.2	4.9	8.3	6.0	4.7	5.3	10.8																						
15-Jun	3.8	3.2	3.5	3.8	3.8	3.9	3.1	2.7	2.6	1.8	3.0	3.1	2.9	3.3	3.5	4.0	3.4	2.1	1.9	2.0	1.7	2.3	2.8	3.1	3.0	4.0																						
16-Jun	2.9	3.7	3.5	2.6	1.6	1.8	1.6	1.5	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.3	1.3	1.4	1.5	2.5	4.0	1.9	4.0																						
17-Jun	3.2	3.3	3.3	3.0	3.2	2.5	2.3	1.6	1.8	1.0	0.9	1.3	2.8	2.4	2.6	2.9	2.6	2.2	3.3	3.2	4.0	3.0	2.9	1.8	2.5	4.0																						
18-Jun	2.4	2.2	1.6	2.7	1.6	1.2	1.5	2.0	3.3	2.9	3.3	2.7	2.3	2.1	2.1	2.1	2.2	2.2	2.3	2.4	3.1	3.7	3.3	3.5	2.5	3.7																						
19-Jun	3.7	3.6	4.6	4.1	2.5	2.5	2.9	5.9	2.8	1.7	1.7	1.9	2.5	4.5	2.1	3.8	4.5	2.5	2.0	1.7	2.0	3.0	6.0	7.2	3.3	7.2																						
20-Jun	7.7	5.4	4.9	4.3	3.4	2.9	2.6	3.7	2.4	1.7	1.7	1.5	2.0	2.4	2.8	2.8	2.3	5.3	8.1	11.7	12.1	13.2	18.3	17.9	5.9	18.3																						
21-Jun	16.3	11.8	10.4	9.7	8.5	7.0	7.1	6.3	6.5	5.5	4.8	4.8	C	C	C	C	4.8	4.8	6.1	9.3	8.4	10.9	12.1	11.4	8.3	16.3																						
22-Jun	16.5	21.5	22.2	19.5	19.7	19.4	14.7	12.6	10.3	10.5	9.6	7.9	6.3	6.8	6.6	7.2	7.5	7.4	10.8	9.2	11.0	8.8	8.3	9.2	11.8	22.2																						
23-Jun	10.9	12.9	16.7	28.8	24.9	19.3	15.9	18.6	17.0	27.6	23.6	22.5	24.5	21.2	13.6	17.3	10.9	8.7	9.2	10.9	13.0	10.6	12.1	9.6	16.7	28.8																						
24-Jun	9.7	14.0	10.2	11.0	11.5	9.1	8.0	7.6	6.2	5.1	5.1	5.7	6.3	6.5	6.1	5.9	6.4	7.8	7.9	8.4	6.6	6.3	6.3	5.9	7.7	14.0																						
25-Jun	5.5	5.2	5.2	5.0	5.5	5.1	5.6	5.7	4.9	4.3	4.6	4.7	4.9	4.9	5.2	5.4	6.5	7.8	7.7	7.7	8.1	9.9	11.4	12.5	6.4	12.5																						
26-Jun	10.4	10.5	11.8	11.1	11.2	9.7	9.7	8.3	8.6	10.9	9.4	8.9	10.9	11.8	11.1	9.0	6.6	6.5	6.0	6.0	6.3	3.8	3.6	4.3	8.6	11.8																						
27-Jun	5.9	5.7	5.7	5.8	6.5	6.5	6.1	5.2	4.0	3.3	3.1	2.7	2.8	6.8	7.4	9.9	5.0	7.1	16.8	16.6	19.1	17.9	18.9	17.2	8.6	19.1																						
28-Jun	12.3	13.2	14.7	13.6	11.0	7.1	9.3	12.9	9.5	10.0	8.6	7.1	5.3	4.4	4.5	4.1	3.9	3.9	4.6	5.4	7.9	6.6	12.4	15.5	8.7	15.5																						
29-Jun	14.3	14.4	14.9	15.0	15.8	34.6	10.0	17.0	30.0	27.4	17.3	19.1	22.0	18.0	16.3	16.4	18.4	18.3	21.3	33.3	43.9	26.4	27.3	22.6	21.4	43.9																						
30-Jun	23.5	24.7	22.2	24.2	20.2	17.9	12.7	10.1	10.8	11.3	8.3	13.1	14.4	13.0	14.7	15.2	14.3	13.7	14.2	13.8	11.6	17.9	15.8	12.6	15.4	24.7																						
																								7.8	8.0	8.1	8.3	7.9	7.5	6.7	6.5	6.5	6.4	5.6	5.3	5.6	5.5	5.0	5.6	5.1	5.1	5.8	7.5	9.2	8.9	9.2	8.3	Diurnal Average
																								23.5	24.7	22.2	28.8	24.9	34.6	22.9	18.6	30.0	27.6	23.6	22.5	24.5	21.2	16.3	17.3	18.4	18.3	21.3	33.3	46.5	46.7	30.9	22.6	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
CNRL Horizon - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
CNRL Horizon - June 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	388	54.19	54.19
6 - 15	256	35.75	89.94
16 - 25	50	6.98	96.93
26 - 80	13	1.82	98.74
> 81.0	0	0.00	98.74

Total Number of Valid Hours: 716

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
CNRL Horizon - June 2016

Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	25	41	34	15	8	6	10	23	34	41	51	28	22	22	17	11	388
6 - 15	27	21	13	10	5	3	11	21	43	33	19	9	10	16	5	9	255
16 - 25	3	6	4	3	4	1	2	3	4	9	4	0	1	0	2	4	50
26 - 80	3	1	1	0	3	1	0	1	1	0	0	0	1	1	0	0	13
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	58	69	52	28	20	11	23	48	82	83	74	37	34	39	24	24	706

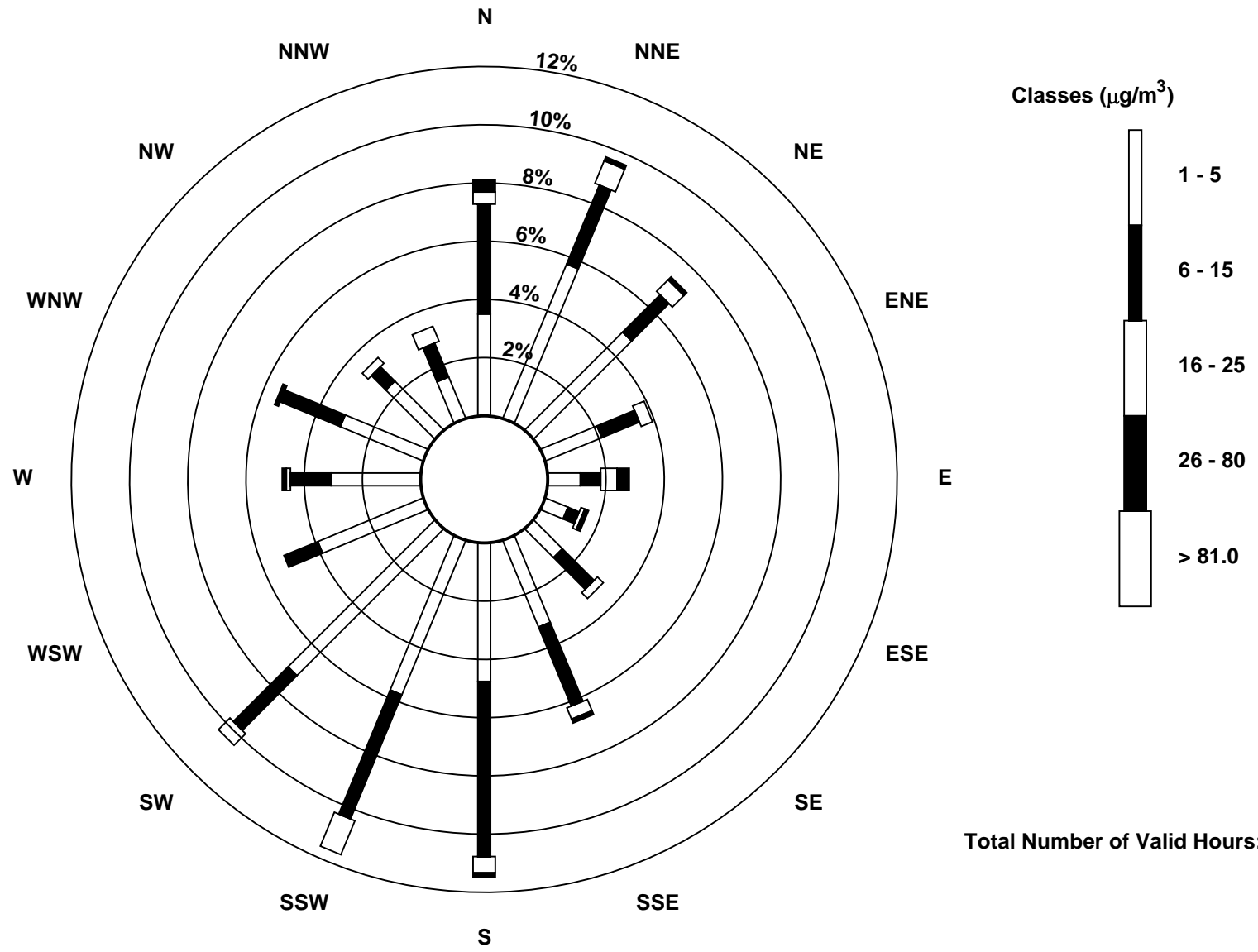
Total Number of Valid Hours: 715

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
CNRL Horizon (AMS 15)



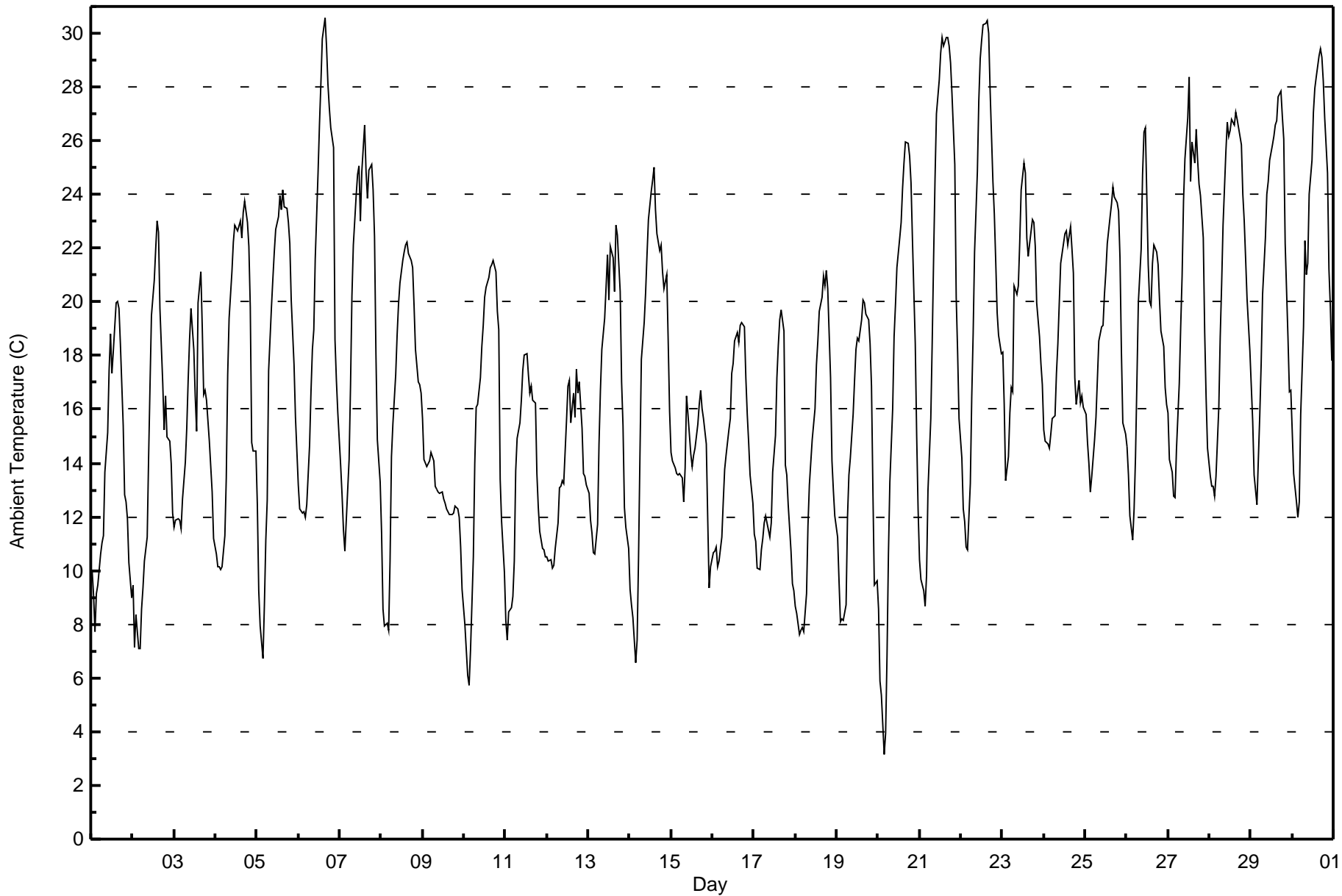
Total Number of Valid Hours: 715



Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
CNRL Horizon - June 2016

Maximum Value: 30.6 C on Jun 6 16:00 Maximum Daily Average: 21.9 C on Jun 30																				Hours in Service: 720						
Minimum Value: 3.1 C on Jun 20 04:00 Minimum Daily Average: 12.8 C on Jun 9																				Hours of Data: 720						
Maximum Diurnal Average: 22.5 C at hour 16 Minimum Diurnal Average: 10.2 C at hour 4																				Hours of Missing Data: 0						
Monthly Average: 17.22 C Percentiles: P₁ = 6.7 P₁₀ = 10.2 Q₁ = 12.8 Median = 16.8 O₃ = 21.6 P₉₀ = 25.1 P₉₉ = 29.8																				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-Jun	10.0	9.1	7.7	9.2	9.4	10.6	11.1	11.3	13.7	15.1	17.4	18.8	17.3	18.2	20.0	20.0	19.7	18.4	15.4	12.8	12.6	11.9	10.3	9.0	13.7	20.0
2-Jun	9.4	7.1	8.3	7.1	7.1	8.5	9.3	10.4	11.3	14.2	16.9	19.5	20.8	22.0	23.0	22.6	19.8	17.0	15.3	16.5	15.0	14.8	14.0	12.1	14.3	23.0
3-Jun	11.6	11.9	11.9	11.9	11.6	12.7	14.0	15.3	17.1	18.6	19.8	18.2	16.5	15.2	19.9	21.1	19.0	16.6	16.7	16.4	14.8	13.9	12.9	11.2	15.4	21.1
4-Jun	10.6	10.2	10.1	10.0	10.2	11.3	13.5	17.3	19.4	21.1	22.2	22.8	22.6	22.6	23.0	22.4	23.3	23.8	22.9	22.1	19.8	14.8	14.4	14.4	17.7	23.8
5-Jun	12.5	9.3	7.9	6.7	8.7	11.1	12.6	17.5	19.8	20.8	21.9	22.7	23.2	24.0	23.4	24.2	23.5	23.5	23.0	22.2	20.1	17.6	15.7	14.5	17.8	24.2
6-Jun	13.2	12.3	12.1	12.2	12.0	12.5	14.7	16.6	18.3	19.0	21.6	24.8	26.6	28.1	29.8	30.6	29.5	28.1	27.2	26.5	25.8	18.6	17.1	15.9	20.5	30.6
7-Jun	13.9	12.8	11.5	10.7	11.9	14.1	16.9	20.2	22.1	24.0	24.7	25.1	23.0	24.9	26.6	24.8	23.9	24.9	25.1	24.1	22.4	18.1	14.9	13.3	19.7	26.6
8-Jun	11.4	8.6	7.9	8.0	7.8	10.3	14.2	15.4	17.3	18.8	19.9	20.7	21.5	21.9	22.1	22.2	21.8	21.5	21.3	19.8	18.2	17.0	16.9	16.6	16.7	22.2
9-Jun	15.6	14.1	13.9	14.0	14.1	14.4	14.1	13.2	13.1	12.9	12.9	12.9	12.7	12.5	12.3	12.1	12.1	12.1	12.1	12.4	12.3	12.0	10.9	9.3	12.8	15.6
10-Jun	8.0	7.0	6.1	5.7	7.0	10.5	14.0	16.1	16.2	17.2	18.3	19.1	20.2	20.5	20.9	21.3	21.4	21.5	21.1	19.7	19.0	13.4	11.8	10.0	15.3	21.5
11-Jun	8.2	7.4	8.5	8.6	9.1	10.3	13.7	14.9	15.5	16.4	17.4	18.0	18.1	17.3	16.6	16.8	16.3	16.3	13.6	12.3	11.4	10.8	10.8	10.5	13.3	18.1
12-Jun	10.5	10.4	10.4	10.1	10.2	10.8	11.8	13.1	13.1	13.3	13.2	15.6	16.8	17.1	15.5	16.6	15.7	17.5	16.6	17.0	15.3	13.6	13.5	13.2	13.8	17.5
13-Jun	12.9	11.9	11.4	10.6	10.6	11.7	14.7	16.7	18.3	19.4	20.5	21.7	20.1	22.1	21.6	20.4	22.8	22.5	20.4	17.0	15.4	12.3	11.6	10.8	16.6	22.8
14-Jun	9.3	8.7	8.3	6.6	7.4	10.4	14.3	17.8	19.2	20.3	21.7	23.1	24.1	24.5	25.0	23.4	22.6	21.9	22.1	21.1	20.5	21.0	18.5	15.9	17.8	25.0
15-Jun	14.4	14.1	13.8	13.6	13.5	13.6	13.4	12.5	13.8	16.5	15.8	14.3	13.9	14.3	14.6	15.5	16.2	16.7	16.0	15.6	14.7	11.9	9.4	10.1	14.1	16.7
16-Jun	10.7	10.7	10.9	10.2	10.4	11.2	12.6	13.8	14.3	15.2	15.6	17.4	17.7	18.6	18.9	18.5	19.1	19.3	19.1	17.2	15.8	14.8	13.6	12.5	14.9	19.3
17-Jun	11.3	11.1	10.1	10.0	10.8	11.2	11.8	12.1	11.5	11.2	11.8	13.7	15.0	17.2	18.4	19.3	19.7	18.9	13.9	13.6	12.5	10.7	9.5	9.2	13.1	19.7
18-Jun	8.7	8.4	7.6	7.8	7.9	7.7	9.2	11.6	13.2	14.0	14.9	16.0	17.7	18.5	19.7	20.2	21.0	20.6	21.2	20.5	17.2	14.1	13.0	12.0	14.3	21.2
19-Jun	11.2	9.6	8.1	8.2	8.2	8.7	12.0	13.6	14.2	15.8	17.1	18.2	18.6	18.5	19.4	20.1	20.0	19.5	19.3	18.4	16.9	13.0	9.5	9.6	14.5	20.1
20-Jun	8.6	5.9	5.4	3.1	3.9	6.8	10.6	13.3	16.0	18.7	19.9	21.3	22.4	22.9	24.2	25.2	26.0	25.9	25.5	24.4	22.3	18.4	15.0	12.3	16.6	26.0
21-Jun	10.4	9.7	9.2	8.7	9.8	13.0	15.7	18.5	21.7	24.6	27.0	28.3	29.3	29.8	29.5	29.8	29.8	29.5	28.9	27.7	25.1	20.2	18.1	15.7	21.3	29.8
22-Jun	14.2	12.3	11.8	10.9	10.8	13.3	16.4	18.8	21.9	24.8	27.5	29.0	29.8	30.3	30.3	30.5	30.0	27.9	24.5	23.3	21.5	19.6	18.7	18.1	21.5	30.5
23-Jun	18.1	16.2	13.3	14.2	15.9	16.8	16.7	20.6	20.3	20.6	22.2	24.2	25.2	24.8	22.4	21.7	22.2	23.1	23.0	22.1	20.0	18.7	17.7	16.9	19.9	25.2
24-Jun	15.2	14.8	14.7	14.5	15.1	15.7	15.8	17.4	18.4	20.0	21.4	22.2	22.5	22.7	22.1	22.8	22.0	21.1	17.2	16.2	17.1	16.3	16.5	16.1	18.2	22.8
25-Jun	15.8	14.7	14.0	12.9	13.5	14.8	15.7	17.2	18.5	19.1	19.1	20.3	21.1	22.2	23.2	23.6	24.3	23.9	23.7	23.4	21.7	18.2	15.5	15.1	18.8	24.3
26-Jun	14.6	13.6	12.0	11.1	12.3	14.3	17.1	20.0	22.0	24.7	26.3	26.5	21.4	20.0	19.9	21.4	22.1	21.9	21.4	20.1	18.9	18.3	16.8	16.2	18.9	26.5
27-Jun	15.9	14.1	13.7	12.8	12.7	14.5	17.0	19.1	21.0	23.7	25.3	26.8	28.4	24.5	25.9	25.2	26.4	25.3	24.4	24.0	22.4	18.9	16.5	14.6	20.5	28.4
28-Jun	13.5	13.2	13.1	12.8	13.5	16.1	18.7	20.6	22.8	25.6	26.7	26.2	26.4	26.8	26.6	27.1	26.8	26.5	25.9	24.0	23.0	21.6	20.1	18.2	21.5	27.1
29-Jun	16.9	15.6	13.6	12.5	14.1	15.8	17.7	20.3	22.4	24.0	24.5	25.3	25.8	26.2	26.6	26.8	27.6	27.8	26.9	26.0	22.2	18.6	16.7	16.7	21.3	27.8
30-Jun	15.2	13.6	12.5	12.0	12.5	15.8	19.1	22.3	21.0	21.4	24.0	25.3	27.1	28.0	28.4	29.1	29.4	29.1	28.2	26.8	24.8	21.2	19.8	17.8	21.9	29.4
																								Diurnal Average		
																								Diurnal Maximum		





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
CNRL Horizon - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	65	9.03	9.03
10 - 20	421	58.47	67.50
> 20	234	32.50	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

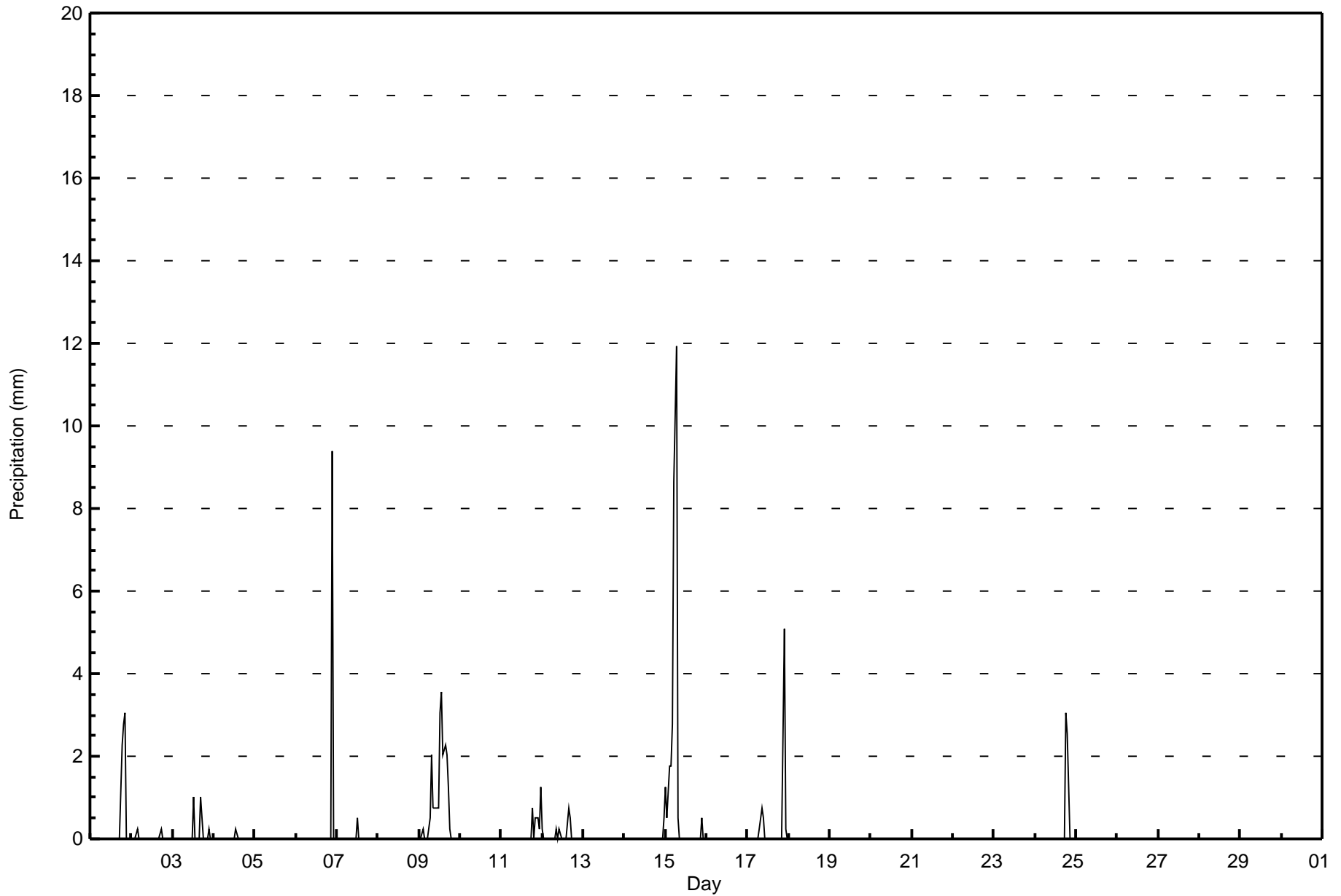
Precipitation (PC) - mm
CNRL Horizon - June 2016

Maximum Value: 11.9 mm on Jun 15 07:00																				Maximum Daily Total: 29.7 mm on Jun 15					Hours in Service: 720																							
Minimum Value: 0.0 mm on Jun 1 01:00																				Minimum Daily Total: 0.0 mm on Jun 5					Hours of Data: 720																							
Maximum Diurnal Total: 15.7 mm at hour 22																				Minimum Diurnal Total: 0.5 mm at hour 2					Hours of Missing Data: 0																							
Monthly Total: 89.92 mm																				Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.0 P ₉₉ = 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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	2.8	3.0	0.0	0.0	0.0	8.1	3.0																						
2-Jun	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	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.3																						
3-Jun	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	0.5	0.0	0.0	0.0	0.3	0.0	0.0	2.8	1.0																						
4-Jun	0.0	0.0	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	0.3	0.3																						
5-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.4	0.0	0.0	9.4	9.4																						
7-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5																						
8-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.3	0.0	0.0	0.0	0.5	2.0	0.8	0.8	0.8	0.8	3.0	3.6	2.0	2.3	2.0	1.3	0.3	0.0	0.0	0.0	0.0	0.0	20.3	3.6																						
10-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.5	0.5	0.3	1.3	3.3	1.3																							
12-Jun	0.3	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	0.8	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.8																						
13-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.5																						
15-Jun	1.3	0.5	1.8	1.8	2.8	8.6	11.9	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	0.5	0.0	0.0	29.7	11.9																						
16-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.8	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	0.3	0.0	6.9	5.1																						
18-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	2.5	0.0	0.0	0.0	5.6	3.0																						
25-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.5	2.0	2.0	2.8	8.6	12.4	2.8	1.8	1.3	1.0	0.8	4.6	3.8	2.0	3.0	3.6	2.0	6.4	5.3	3.6	15.7	0.5	1.8	Diurnal Average
																								1.3	0.5	1.8	1.8	2.8	8.6	11.9	2.0	0.8	0.8	0.8	0.8	3.0	3.6	2.0	2.3	2.0	1.3	3.0	2.8	3.0	9.4	0.3	1.3	Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
CNRL Horizon - June 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

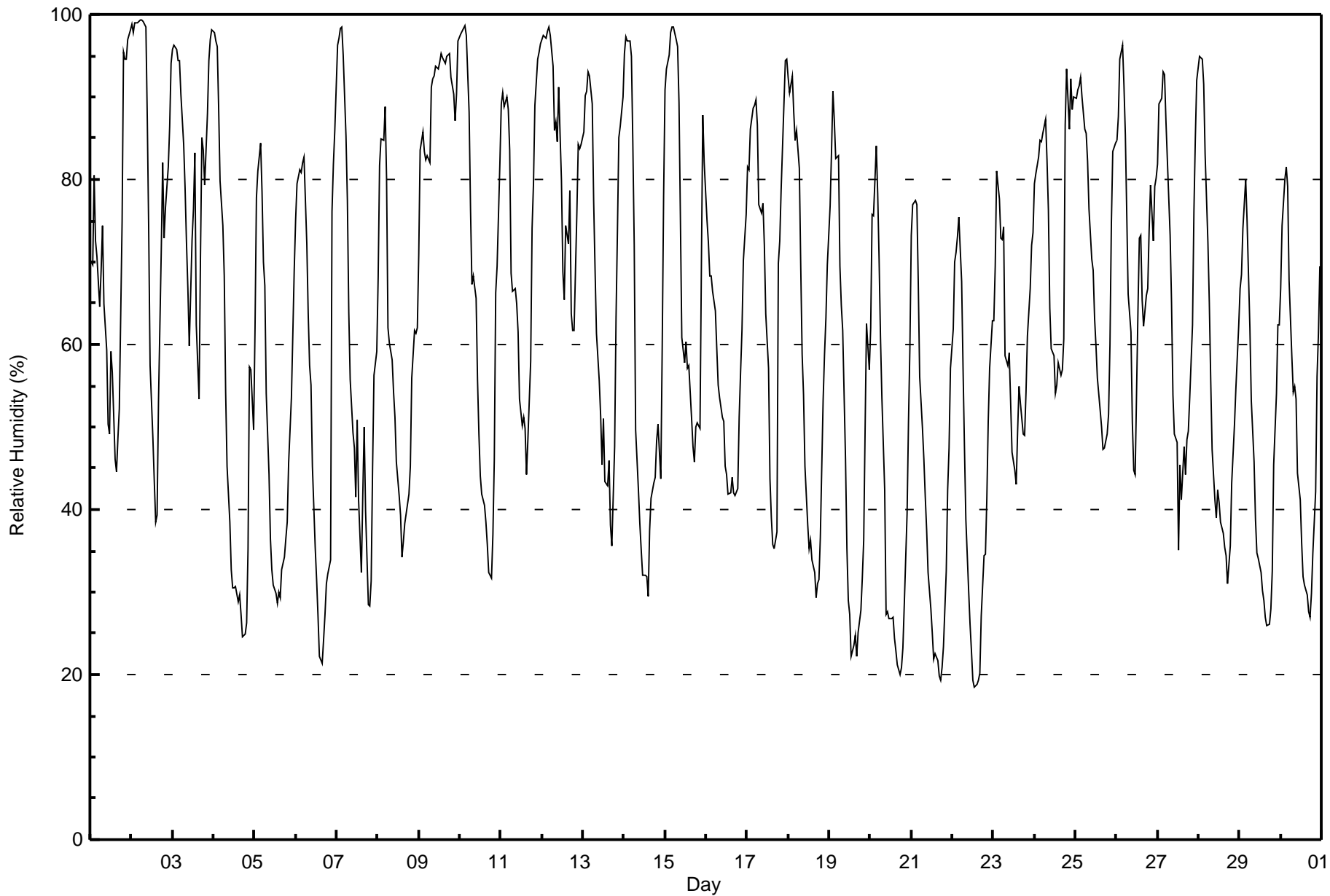
Relative Humidity (RH) - %
CNRL Horizon - June 2016

Maximum Value: 99 % on Jun 2 07:00 Maximum Daily Average: 89.8 % on Jun 9																		Hours in Service: 720 Hours of Data: 720								
Minimum Value: 19 % on Jun 22 14:00 Minimum Daily Average: 42.4 % on Jun 21 Maximum Diurnal Average: 87.5 % at hour 4 Minimum Diurnal Average: 41.5 % at hour 16 Monthly Average: 62.5 % Percentiles: P ₁ = 20 P ₁₀ = 31 Q ₁ = 44 Median = 62 Q ₃ = 83 P ₉₀ = 93 P ₉₉ = 99																		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-Jun	70	70	80	73	71	65	69	74	65	59	50	49	59	57	46	45	49	52	75	95	95	95	97	98	69.0	98
2-Jun	99	98	99	99	99	99	99	99	99	87	74	58	49	43	39	39	53	71	82	73	77	81	86	94	79.0	99
3-Jun	96	96	96	94	94	90	84	79	72	67	60	73	76	83	62	53	71	85	84	79	88	94	97	98	82.2	98
4-Jun	98	97	96	89	80	74	68	54	45	39	33	31	30	31	29	30	27	25	25	26	35	57	57	50	51.0	98
5-Jun	62	78	81	84	78	70	67	54	44	36	33	31	30	29	30	29	33	34	36	39	46	53	61	69	50.3	84
6-Jun	75	80	81	81	82	83	72	64	58	55	45	36	32	27	22	21	24	27	31	32	34	76	82	86	54.4	86
7-Jun	96	97	98	99	95	85	77	64	56	49	47	42	51	41	32	42	50	40	28	28	31	45	56	59	58.8	99
8-Jun	68	82	85	85	89	80	62	60	58	54	51	46	42	39	34	36	38	41	42	45	56	62	61	62	57.4	89
9-Jun	71	84	86	83	82	83	82	91	92	93	94	93	94	95	95	94	95	95	95	92	90	87	90	97	89.8	97
10-Jun	98	98	98	99	97	88	76	67	68	66	56	49	44	42	40	38	36	32	32	37	46	66	69	82	63.6	99
11-Jun	89	91	89	90	89	84	69	66	67	65	61	53	50	51	50	44	48	58	74	79	89	95	95	96	72.6	96
12-Jun	97	98	97	98	98	97	94	86	87	85	91	80	69	65	74	72	79	64	62	62	76	84	84	84	82.6	98
13-Jun	86	90	91	93	93	89	77	69	61	56	51	45	51	43	43	46	38	36	48	63	74	85	87	90	66.9	93
14-Jun	95	97	97	97	95	84	72	50	42	38	35	32	32	32	29	38	41	43	44	48	50	44	60	78	57.3	97
15-Jun	91	93	95	98	98	98	97	96	89	75	61	58	60	57	57	51	48	46	50	50	50	70	88	82	73.3	98
16-Jun	75	72	68	68	66	64	60	55	54	51	51	45	44	42	42	44	42	42	42	51	57	62	70	76	56.0	76
17-Jun	82	81	86	89	89	90	87	77	76	77	72	64	57	44	39	36	35	37	70	73	79	89	94	95	71.5	95
18-Jun	92	91	93	88	85	86	81	70	59	54	45	38	35	36	34	32	29	31	32	37	53	59	63	70	58.0	93
19-Jun	77	83	91	87	83	83	70	65	62	46	35	29	27	22	24	25	22	25	28	32	36	50	63	57	50.8	91
20-Jun	62	76	76	84	78	70	61	54	42	27	28	27	27	27	24	23	21	20	21	23	28	40	50	60	43.7	84
21-Jun	73	77	77	77	67	56	50	46	41	38	32	28	25	22	23	22	20	19	21	23	33	42	47	57	42.4	77
22-Jun	62	70	71	73	75	68	57	48	39	30	26	23	19	19	19	19	20	27	34	35	41	51	57	63	43.6	75
23-Jun	63	69	81	78	73	73	74	59	57	59	53	47	45	43	49	55	53	49	49	54	61	67	72	74	60.7	81
24-Jun	79	81	83	85	85	86	87	82	76	64	60	59	54	55	58	56	57	61	87	93	86	92	89	90	75.2	93
25-Jun	90	91	91	92	90	86	86	82	76	70	69	63	60	56	52	50	47	47	49	52	60	75	83	84	70.9	92
26-Jun	85	88	95	96	91	85	76	66	62	50	45	44	64	73	73	65	62	66	67	74	79	73	79	80	72.4	96
27-Jun	82	89	90	93	93	87	78	73	65	54	49	48	35	45	41	48	44	48	49	54	62	76	85	92	65.9	93
28-Jun	95	95	95	92	83	72	65	56	47	41	39	42	41	39	37	35	34	31	36	43	47	50	55	62	55.5	95
29-Jun	67	68	74	80	75	68	62	53	46	39	35	34	32	30	29	27	26	26	28	33	45	54	62	62	48.2	80
30-Jun	67	74	80	82	79	68	58	54	55	53	44	41	36	32	31	30	28	27	30	35	42	56	61	69	51.4	82
81.3 85.1 87.3 87.5 85.1 80.4 73.9 67.1 62.1 56.0 50.9 46.9 45.7 44.0 42.0 41.5 42.4 43.5 48.3 52.0 58.2 67.6 73.4 77.2																								Diurnal Average		
99 98 99 99 99 99 99 99 99 99 93 94 93 94 95 95 94 95 95 95 95 95 95 97 98																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
CNRL Horizon - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
CNRL Horizon - June 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	6	0.83	0.83
20 - 40	140	19.44	20.28
40 - 60	190	26.39	46.67
60 - 80	177	24.58	71.25
80 - 100	207	28.75	100.00

Total Number of Valid Hours: 720

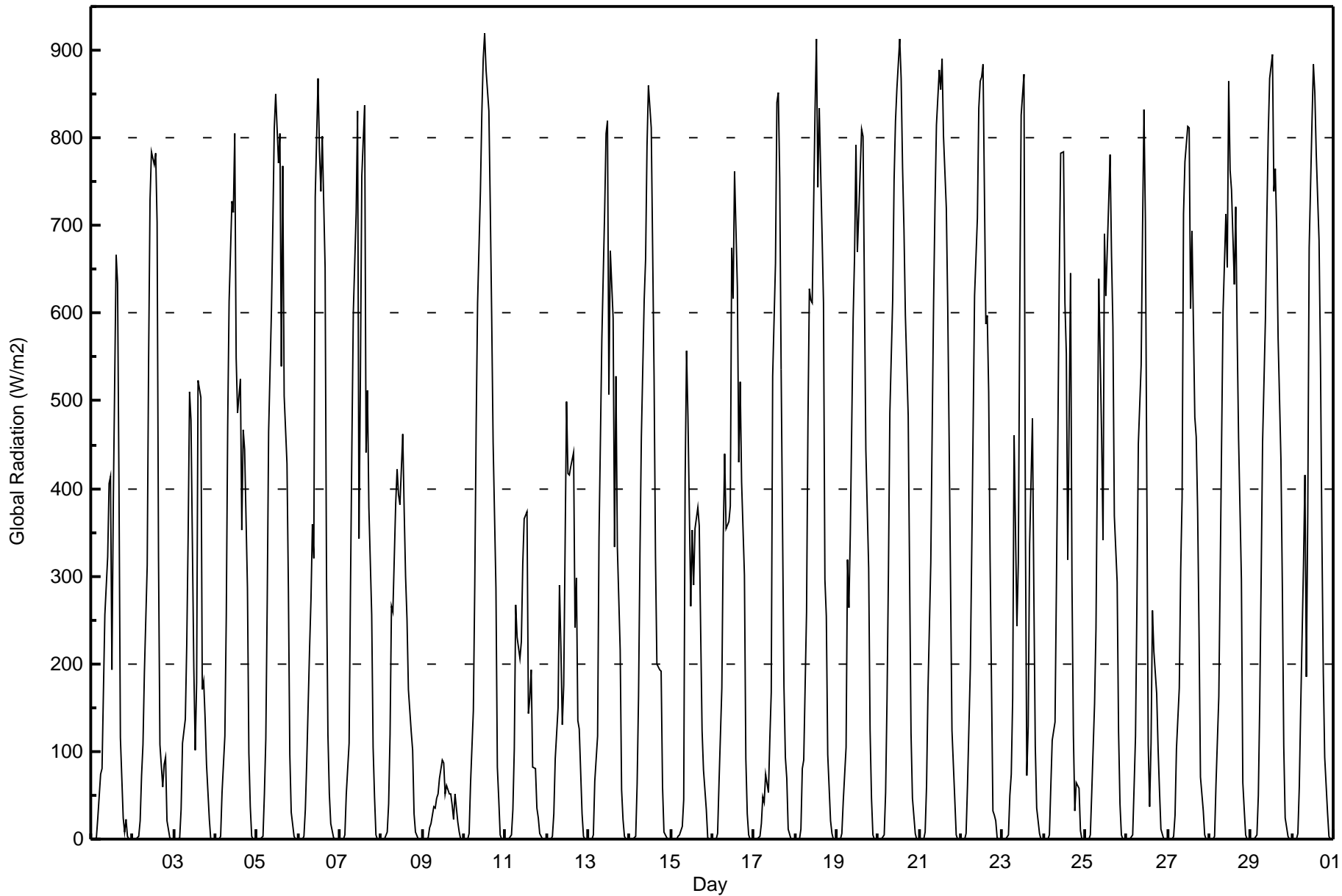
Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

Global Radiation (GR) - W/m2
CNRL Horizon - June 2016

Maximum Value: 919 W/m2 on Jun 10 13:00		Maximum Daily Average: 369.1 W/m2 on Jun 10		Hours in Service: 720																							
Minimum Value: 0 W/m2 on Jun 1 01:00		Minimum Daily Average: 33.6 W/m2 on Jun 9		Hours of Data: 720																							
Maximum Diurnal Average: 674.2 W/m2 at hour 12		Minimum Diurnal Average: 0.0 W/m2 at hour 1		Hours of Missing Data: 0																							
Monthly Average: 262.2 W/m2		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 4 Median = 123 Q ₃ = 472 P ₉₀ = 739 P ₉₉ = 880		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-Jun	0	0	0	1	24	75	81	169	256	323	406	414	192	387	667	634	404	117	25	8	22	3	0	0	175.3	667	
2-Jun	0	0	0	3	22	73	107	191	313	549	729	784	769	782	703	321	107	60	85	93	20	1	0	0	238.0	784	
3-Jun	0	0	0	2	34	109	137	222	348	510	478	196	101	178	523	504	170	180	138	86	23	0	0	0	164.2	523	
4-Jun	0	0	0	3	54	118	255	472	613	727	715	804	549	486	525	353	467	444	286	99	38	3	0	0	292.1	804	
5-Jun	0	0	0	4	52	114	271	466	603	703	811	851	771	804	539	769	505	429	285	96	30	3	0	0	337.8	851	
6-Jun	0	0	0	3	34	89	218	274	359	320	733	867	787	740	802	651	298	119	51	18	2	0	0	0	265.3	867	
7-Jun	0	0	0	4	52	110	290	456	603	714	831	343	528	757	837	442	513	378	256	105	48	5	0	0	303.0	837	
8-Jun	0	0	0	8	41	119	265	259	384	421	394	381	462	375	299	251	170	123	101	29	8	0	0	0	170.4	462	
9-Jun	0	0	0	1	13	18	37	36	46	52	69	90	87	52	61	51	52	39	22	51	20	8	0	0	33.6	90	
10-Jun	0	0	0	6	62	147	290	474	611	739	827	891	919	877	832	719	594	452	286	83	45	5	0	0	369.1	919	
11-Jun	0	0	0	4	33	103	267	229	206	225	314	365	374	143	162	192	83	80	36	25	6	0	0	0	118.6	374	
12-Jun	0	0	0	4	30	92	150	290	219	131	175	500	418	416	426	441	242	298	135	126	29	3	0	0	171.9	500	
13-Jun	0	0	0	5	66	118	344	456	570	717	805	820	507	671	594	334	527	333	215	56	22	4	0	0	298.5	820	
14-Jun	0	0	0	4	62	162	324	459	616	662	790	860	812	671	528	322	199	194	192	59	7	1	0	0	288.5	860	
15-Jun	0	0	0	0	3	4	15	45	410	557	481	266	353	290	355	379	357	238	124	78	34	1	0	0	166.3	557	
16-Jun	0	0	0	6	65	173	345	440	355	363	380	674	616	761	629	429	522	407	301	91	29	5	0	0	274.6	761	
17-Jun	0	0	0	2	18	48	42	75	54	114	167	527	656	840	852	753	536	174	93	69	11	0	0	0	209.7	852	
18-Jun	0	0	0	11	80	90	260	477	629	616	612	831	913	744	833	689	612	296	254	96	21	6	0	0	336.3	913	
19-Jun	0	0	0	6	44	105	319	264	349	595	664	793	670	714	809	802	622	445	309	123	47	5	0	0	320.2	809	
20-Jun	0	0	0	5	53	159	304	487	614	751	820	857	913	868	766	695	597	482	299	121	46	6	0	0	368.5	913	
21-Jun	0	0	0	9	61	169	315	470	614	726	815	878	855	891	802	721	607	455	289	123	45	4	0	0	368.7	891	
22-Jun	0	0	0	6	61	195	328	472	620	709	834	865	870	884	588	598	510	319	33	27	20	1	0	0	330.9	884	
23-Jun	0	0	0	4	50	73	161	460	243	316	602	825	873	362	72	129	336	480	280	107	36	6	0	0	225.6	873	
24-Jun	0	0	0	5	60	112	134	293	459	646	783	784	612	553	318	645	293	120	32	64	58	9	0	0	249.2	784	
25-Jun	0	0	0	5	52	155	240	435	639	459	342	691	620	673	780	667	584	369	292	123	40	4	0	0	298.8	780	
26-Jun	0	0	0	5	60	117	269	451	542	699	833	706	109	36	110	261	214	166	104	55	10	0	0	0	197.8	833	
27-Jun	0	0	0	3	27	103	173	308	389	714	772	813	812	605	694	481	458	376	235	70	32	5	0	0	294.6	813	
28-Jun	0	0	0	4	63	162	305	458	602	714	653	865	763	741	633	721	577	457	296	65	35	5	0	0	338.2	865	
29-Jun	0	0	0	5	49	156	300	452	592	706	804	868	896	739	765	696	572	433	289	106	24	4	0	0	352.3	896	
30-Jun	0	0	0	7	59	150	315	415	186	371	674	817	884	852	783	683	547	348	191	94	31	3	0	0	308.7	884	
		0.0	0.0	0.0	4.5	46.2	113.9	228.6	348.4	434.7	528.2	610.5	674.2	623.1	596.4	576.3	511.1	409.2	293.6	184.6	78.3	28.0	3.3	0.0	0.0	Diurnal Average	
		0	0	0	11	80	195	345	487	639	751	834	891	919	891	852	802	622	482	309	126	58	9	0	0	Diurnal Maximum	





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
CNRL Horizon - June 2016

Maximum Speed: 30 km/h on Jun 15 16:00	Maximum Daily Speed Average: 12.3 km/h on Jun 9	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 23 12:00	Minimum Daily Speed Average: 1.1 km/h on Jun 2	Hours of Data: 719
Maximum Diurnal Speed Average: 3.3 km/h at hour 6	Minimum Diurnal Speed Average: 0.3 km/h at hour 20	Hours of Missing Data: 1
Monthly Average Velocity: 1.5 km/h 236.5 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 5 Median = 8 O ₃ = 12 P ₉₀ = 16 P ₉₉ = 26	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-Jun	SSW8	SW4	S7	S7	S7	S8	S7	SE2	SSE5	S6	SSW6	S7	SSW9	SSW7	S11	SSW13	SSE15	SSE10	W5	SW7	ENE2	NNW4	WNW1	NW4	S5.5	SSE15
2-Jun	WNW6	NW4	N5	W3	NE2	NNE4	NE2	N3	NNE4	SW2	N5	ENE2	SE3	E3	S3	S3	SW13	SSW2	S5	WSW4	WSW6	WSW7	W3	SE5	WSW1.1	SW13
3-Jun	SSW6	SSW8	SW3	SW7	SW7	SSW6	SSW7	SW8	SW8	SW9	SW9	SSW7	SW8	WSW7	NNW9	WSW3	SSW10	E4	ENE5	E5	S4	W2	SSW2	S5	SW4.5	SSW10
4-Jun	SW6	SSW8	SW10	SW12	SW14	WSW13	WSW14	W14	W15	W14	WNW17	WNW17	WNW16	W16	WNW16	WNW19	W18	WNW22	WNW23	WNW16	NW7	WNW2	W7	W8	W12.1	WNW23
5-Jun	NW6	W4	SW8	SW7	SW9	SSW7	S4	N2	N7	WNW17	NW17	NW14	NW13	N12	NNE10	NE10	NE11	NE10	ENE8	E7	NE6	NE4	NNE5	NNW4.5	WNW17	
6-Jun	N4	N4	N5	N6	N4	NE2	SE4	S5	SSE7	SSE6	SE7	SSE11	SSE12	SSE13	S14	S15	S14	SE9	SSE13	SSE14	S17	ESE3	ENE9	N5	SSE5.5	S17
7-Jun	WNW5	WSW4	SW7	SW8	SSW9	SSW7	S6	S5	S4	S3	NNW1	NW6	W12	WNW5	NW20	N7	ENE8	N3	NW17	NW17	NW12	WNW7	WNW6	WSW4	WNW4.5	NW20
8-Jun	SW6	WSW4	W7	W4	AF	SSW3	NE2	NNE4	NNE7	NE6	NE7	NE8	NE9	NE10	E8	ENE9	NE8	NE9	ENE8	SSE10	W2	WNW1	ESE6	E7	NE3.3	NE10
9-Jun	E7	NE6	NNE6	NNE9	NNE12	NE13	NE14	NNE15	NNE17	NNE22	NNE22	NNE20	NNE21	NNE20	NNE20	NNE17	NNE13	NNE11	NNE9	N11	N10	N10	NNW5	W5	NNE12.3	NNE22
10-Jun	W5	W6	WSW4	SSW5	SW3	SSW1	S1	SW1	NE7	NNE9	NE11	NE10	NE11	NE12	NE11	ENE9	NE9	NE6	ENE6	ENE6	NE4	ENE3	NNE2	NE1	NE3.9	NE12
11-Jun	WNW3	WSW2	NNW3	NNW2	NNE3	NNE3	SE4	S6	S7	SSE8	SE8	SE14	SSE15	SSE13	SE10	SE13	SSE6	E1	SE11	ESE13	ESE6	NE5	N9	N9	SE4.5	SSE15
12-Jun	NNE6	N6	N7	N5	NW5	WSW4	SW8	SW10	SSW12	SSW11	S8	SW12	SW14	SW16	SW15	SW12	WSW11	WSW13	WSW17	W10	WSW4	SSW8	SW15	SW14	SW7.8	WSW17
13-Jun	SW13	SSW11	SSW13	SSW11	SSW11	SSW14	SW15	SW15	SW17	SW18	SW20	SW24	WSW13	SW19	SW17	WNW10	SW12	WSW15	NNW8	NE8	NE2	SW2	NW4	W4	SW10.3	SW24
14-Jun	SSW3	SSW7	SSW6	WSW3	S7	S6	S5	S4	E3	NE8	ENE9	NE8	ENE10	E9	ENE10	NE13	NE11	NNE14	NNE13	NNE9	E9	SSE15	SE11	E7	E4.2	SSE15
15-Jun	ESE6	ENE5	NE8	NNE11	N7	ENE7	ESE9	ENE7	ENE5	ESE14	SSE26	SSE24	SSE27	S27	S28	S30	S25	SSW18	S12	SSW13	S13	SSE13	SSE6	SSE7	SSE10.9	S30
16-Jun	SE8	SE10	SSE12	SSE12	SSE12	S10	SSE13	S16	S19	SSW19	SSW19	SSW22	SSW18	SSW19	SW16	SSW15	SSW16	SW13	SW11	WSW8	WSW7	WSW7	W7	W5	SSW11.3	SSW22
17-Jun	SW8	WSW8	SW6	SSW6	WSW6	SW7	WSW7	NW20	NW21	WNW20	WNW19	NW23	WNW27	WNW26	WNW24	W23	W18	WSW17	WNW17	N3	ENE6	N9	SSW4	WSW6	WNW11.3	WNW27
18-Jun	W7	W10	WSW9	W11	W12	WSW13	W13	WSW13	WSW15	WSW15	WNW15	WNW17	WSW14	SW13	SW15	SW13	SW11	SW6	WSW9	SW6	NNW7	NNE14	NE5	NNE10	W8.7	WNW17
19-Jun	N7	NW4	W6	WSW9	SW8	S3	W3	NE4	NE7	N12	NW15	NW21	NW24	NW26	N21	NNW24	NNW26	NNW21	N16	N12	N9	N5	WNW6	W9	NNW10.2	NW26
20-Jun	W7	WSW7	SW6	SW5	SSW6	S5	S4	SSE5	SSE7	S5	SSE5	SSE4	SE8	ESE10	SE10	SSE10	SSE11	SSE13	SSE13	SSE11	SSE9	SSE7	SW4	SW5	S6.0	SSE13
21-Jun	SSW6	SSW7	S8	SSW9	SSW10	S12	S12	S12	S12	S13	S12	S12	S12	S9	SSE11	S12	S10	S9	SSE6	SSE6	S6	SSW7	SW7	SSW7	S9.3	S13
22-Jun	SSW8	SSW7	SSW9	SSW8	S7	S8	S7	S9	S8	S8	S7	S6	WSW8	SSW9	S9	S9	SSW6	W11	SW15	SW14	WSW10	SSW8	SSW10	SW11	SSW8.1	SW15
23-Jun	SW10	WSW5	NNW2	N5	NW1	S5	SSW6	SE1	ENE5	E5	NNE3	SW0	ENE3	NW9	W13	NNW12	NNW6	NNE6	ENE8	ENE9	NE6	N5	WNW9	WNW6	NNW2.2	WNW13
24-Jun	SW3	NNE6	N5	NNW3	NNW6	NNE6	NNE7	NNE11	NNE13	N12	N11	N14	NNE15	N16	N16	N16	NNE17	NNE13	N13	N9	N8	WNW5	N8	N8	N9.4	NNE17
25-Jun	N6	NNW4	NNW6	N4	N7	N7	N12	NNE12	NNE13	NNE13	NNE13	NNE13	NNE12	NNE12	NNE12	NE12	NE11	NE11	NNE9	N6	NE4	S2	WNW4	WNW6	NNE7.9	NNE13
26-Jun	NW6	W4	S6	SSW5	SSW6	S5	SSW5	S6	S8	S8	SSW8	NNW1	NNW8	S5	SSW7	SSW5	SSW8	SW7	S5	S8	S6	NNW9	SSW3	WSW11	SSW4.4	WSW11
27-Jun	SW9	SSW9	SSW9	SSW8	SW13	SW10	SSW9	SW10	SW8	SW6	SSW11	SSW13	W14	NE13	ESE6	SSE12	SSW10	ENE8	E10	ESE5	NNE2	NNW2	W3	SSW4	SSW4.9	W14
28-Jun	SW3	SW4	SSW6	SSW7	SSW7	S6	E3	NE8	ENE4	S6	ENE5	NE14	NE12	NNE13	NNE13	NNE15	NNE15	NNE17	NNE15	N11	NNE8	NNE6	N7	NNE6	NNE5.3	NNE17
29-Jun	N6	NNW5	WNW5	NNE4	N6	N5	N5	NNE5	NE4	E6	E9	E6	ENE6	NNE8	NE9	NE6	SSE3	SSW3	E5	E3	NNE3	N1	S5	SSE5	NE3.0	NE9
30-Jun	NNE2	N4	NE2	NNW3	SW2	S6	S8	S12	S9	S5	S8	SSE8	SSE12	SE11	ESE8	SSE9	SE8	SE9	SE7	SE7	SSE7	SSE4	SW7	SW6	SSE5.3	S12

WSW2.7	WSW2.7	WSW2.8	WSW2.8	WSW3.3	SSW3.3	SSW3.1	SW1.9	SW1.4	SW1.8	WSW1.5	WSW1.5	W2.2	W1.2	W1.3	SW1.0	SSW1.9	NW0.8	NNW1.5	E0.3	ESE0.4	NNW0.6	WSW1.6	WSW2.2	Diurnal Average
SW13	SSW11	SSW13	SW12	SW14	SSW14	SW15	NW20	NW21	NNE22	SSE26	SW24	SSE27	S27	S28	S30	NNW26	WNW22	WNW23	NW17	S17	SSE15	SW15	SW14	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 - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 11 km/h on Jun 13 16:00	Hours in Service: 720 Hours of Data: 719 Hours of Missing Data: 1 Hours of Calibration: 0 Percent Operational Time: 99.9
Minimum Value: 1 km/h on Jun 23 04:00	
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 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-Jun	1	1	2	1	1	2	2	3	2	2	2	3	3	3	4	4	5	4	4	3	3	2	2	1	5
2-Jun	1	2	1	2	2	1	1	1	1	2	1	2	2	2	3	2	6	3	3	2	1	2	2	1	6
3-Jun	1	2	3	2	2	2	2	3	3	3	3	2	4	2	5	3	4	4	2	2	2	4	2	2	5
4-Jun	2	2	2	3	3	3	4	4	4	5	5	6	5	5	7	6	6	6	6	5	4	2	2	3	7
5-Jun	2	1	1	2	1	2	2	2	4	4	5	5	4	4	4	4	3	3	3	2	2	1	1	1	5
6-Jun	1	1	1	1	1	1	2	2	3	2	3	3	4	4	6	5	4	2	4	4	5	5	2	2	6
7-Jun	1	2	1	2	2	2	1	2	1	2	2	3	7	6	4	5	3	3	4	3	3	2	1	1	7
8-Jun	2	1	1	3	AF	2	2	1	2	2	2	2	3	3	3	3	2	2	2	2	2	1	3	2	3
9-Jun	2	1	3	2	3	3	3	4	4	6	5	5	5	5	5	5	3	3	2	3	2	2	2	1	6
10-Jun	1	1	1	1	2	1	1	1	3	2	3	3	4	4	4	3	4	4	2	1	1	1	2	1	4
11-Jun	2	1	2	1	2	1	2	2	2	3	4	4	5	4	4	4	4	1	5	4	4	2	2	2	5
12-Jun	2	1	1	1	1	1	3	3	3	3	2	4	4	5	4	4	3	5	5	5	1	2	4	3	5
13-Jun	3	2	3	2	2	3	4	5	5	5	5	6	8	7	5	11	8	6	4	3	2	2	2	2	11
14-Jun	2	1	1	2	2	2	2	1	2	3	3	4	4	3	4	4	3	4	4	2	4	5	5	2	5
15-Jun	2	2	2	2	2	2	5	3	3	5	9	7	9	8	8	8	7	5	3	4	4	9	2	2	9
16-Jun	2	2	3	3	3	2	4	4	5	5	5	5	5	5	5	5	4	4	4	3	3	1	2	1	5
17-Jun	3	2	1	1	1	1	3	4	5	4	4	6	5	5	5	6	5	4	9	2	3	3	2	2	9
18-Jun	2	2	2	2	2	2	3	3	4	5	4	5	5	4	5	5	4	4	3	2	9	7	2	3	9
19-Jun	2	1	1	1	3	2	3	2	2	4	5	5	6	8	5	6	7	6	5	4	2	2	1	2	8
20-Jun	2	1	1	1	1	1	1	2	2	2	3	3	3	3	4	4	3	4	4	3	2	1	2	2	4
21-Jun	1	1	1	1	1	2	2	3	3	3	3	4	4	4	4	4	4	3	2	2	1	1	1	2	4
22-Jun	2	2	3	3	2	2	2	2	2	3	3	3	5	5	3	4	6	3	4	5	2	2	3	2	6
23-Jun	2	3	2	1	1	2	2	2	2	2	2	2	6	6	4	3	2	2	2	2	1	2	3	6	
24-Jun	3	2	1	2	3	2	2	3	4	4	3	4	4	4	4	5	3	5	4	2	1	2	2	5	5
25-Jun	1	1	2	1	2	3	3	3	4	3	3	3	4	4	4	4	3	3	3	2	1	1	1	1	4
26-Jun	1	3	1	1	1	1	1	2	2	3	3	6	6	2	3	2	3	3	2	2	3	8	3	2	8
27-Jun	2	1	2	2	2	2	2	2	2	2	4	3	6	5	3	3	3	6	3	2	2	1	2	1	6
28-Jun	1	1	2	1	1	1	2	2	2	3	5	3	3	4	5	5	4	4	4	3	2	1	1	2	5
29-Jun	1	1	1	3	1	1	1	1	2	3	3	4	4	4	3	3	3	3	2	1	1	1	2	2	4
30-Jun	1	1	2	2	1	2	2	3	3	2	3	4	4	4	4	3	3	3	2	2	2	1	1	1	4

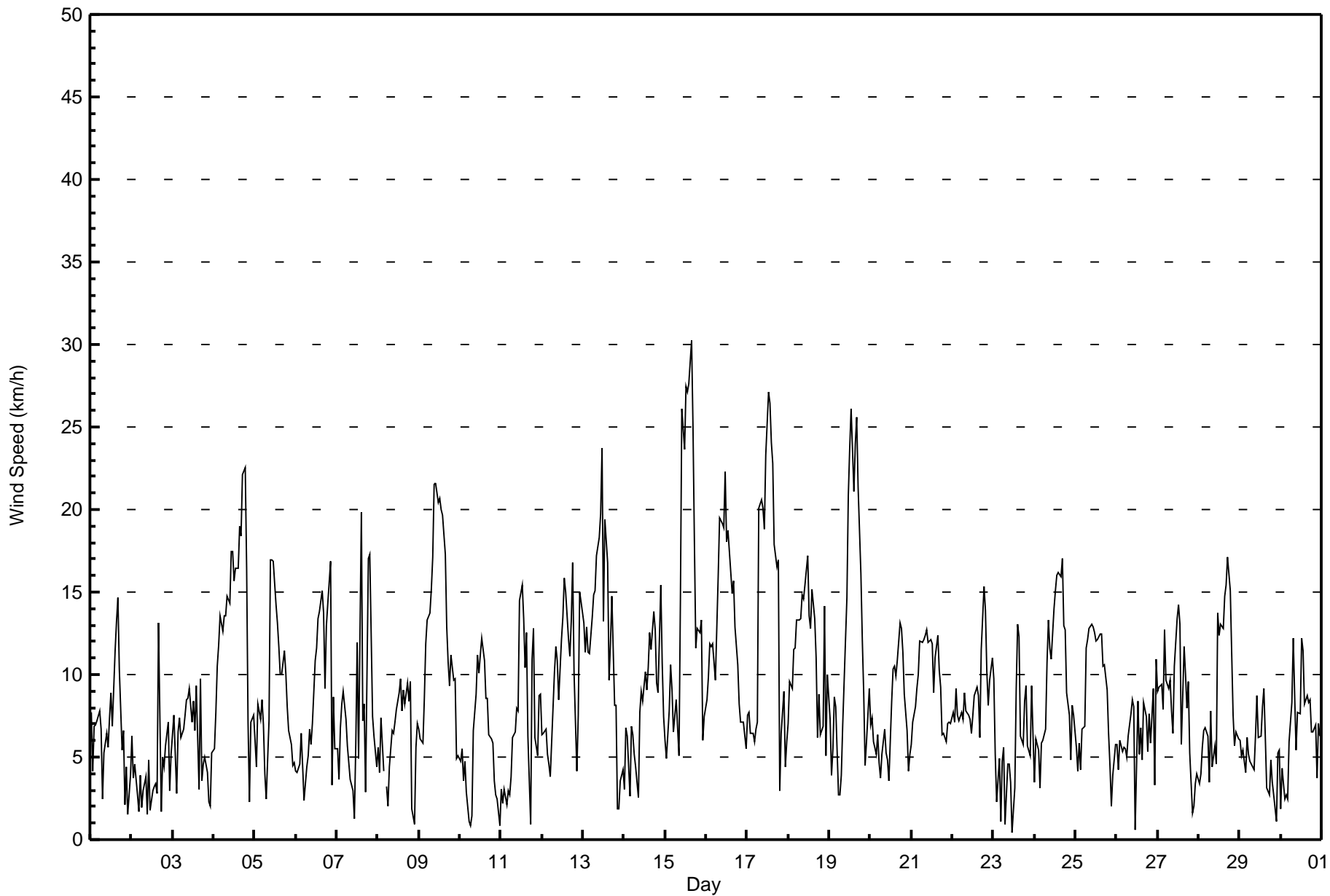
3	3	3	3	3	3	5	5	5	6	9	7	9	8	8	11	8	6	9	5	9	9	5	3
Diurnal Maximum																							

AF - Analyzer Failure



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
CNRL Horizon - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
CNRL Horizon - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	185	25.73	25.73
6 - 11	334	46.45	72.18
12 - 19	166	23.09	95.27
20 - 28	33	4.59	99.86
29 - 38	1	0.14	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 719

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
CNRL Horizon - June 2016**

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	20	14	14	10	9	2	6	7	24	13	14	11	14	9	6	12	185
6 - 11	26	23	30	18	11	7	15	22	39	56	35	18	11	11	4	8	334
12 - 19	11	26	8	0	0	2	2	17	18	13	26	12	9	14	7	1	166
20 - 28	1	6	0	0	0	0	0	3	3	1	2	0	1	6	7	3	33
29 - 38	0	0	0	0	0	0	0	0	1	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
Totals	58	69	52	28	20	11	23	49	85	83	77	41	35	40	24	24	719

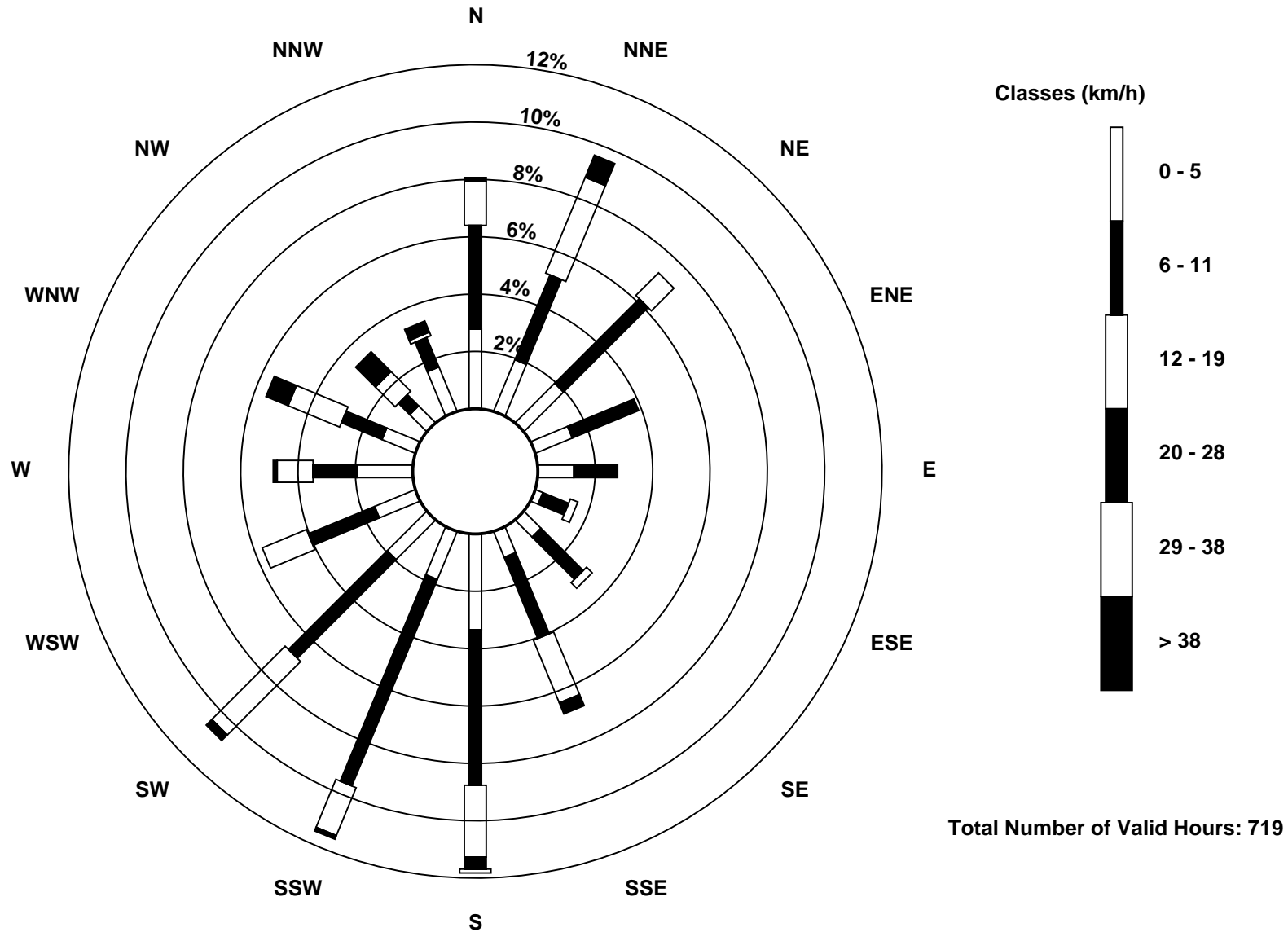
Total Number of Valid Hours: 719

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed (WS) - km/h
CNRL Horizon (AMS 15)





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
CNRL Horizon - June 2016

Direction of Maximum Speed: 174 deg on Jun 15 16:00 Direction of Maximum Daily Speed Average: 21.9 deg on Jun 9	Hours in Service: 720 Hours of Data: 719 Hours of Missing Data: 1
Direction of Minimum Speed: 217 deg on Jun 23 12:00 Direction of Minimum Daily Speed Average: 1.1 deg on Jun 2	Percent Operational Time: 99.9
Monthly Average Direction: 238.8 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-Jun	204	223	179	186	175	179	173	127	151	177	206	171	195	209	188	194	166	164	271	229	63	328	297	312	189.0
2-Jun	296	313	5	273	37	18	48	9	33	232	349	71	127	85	173	179	226	201	175	253	250	247	274	145	255.4
3-Jun	206	203	225	220	217	204	208	221	223	221	228	208	234	244	331	255	200	101	59	96	171	270	213	185	215.9
4-Jun	223	213	223	227	235	238	241	263	268	281	300	289	288	281	299	286	278	298	303	293	304	299	275	276	275.3
5-Jun	313	271	234	236	221	202	172	355	357	296	304	320	314	324	355	17	36	40	55	60	82	55	36	19	336.7
6-Jun	11	360	10	2	2	42	131	174	151	149	135	160	160	150	171	174	171	142	167	162	169	121	57	351	150.5
7-Jun	303	247	214	222	209	207	181	180	171	191	338	304	266	288	311	354	68	3	309	317	325	301	291	244	285.1
8-Jun	218	247	281	265	AF	195	35	13	17	39	45	43	39	43	82	75	40	39	67	155	276	292	103	84	52.9
9-Jun	91	47	14	27	25	35	34	21	25	21	22	27	24	24	24	30	25	17	13	5	355	356	335	272	21.9
10-Jun	266	280	252	207	218	208	169	222	34	27	34	43	40	45	49	60	52	54	70	67	54	64	23	55	43.1
11-Jun	291	253	346	346	12	25	144	170	171	154	126	133	154	148	127	136	151	88	134	110	114	43	10	3	127.3
12-Jun	16	357	356	4	321	258	214	218	211	193	189	216	222	233	232	236	237	253	255	262	240	206	221	232	235.2
13-Jun	226	212	210	199	192	209	222	234	229	227	226	253	230	217	290	220	241	343	38	41	221	308	281		228.8
14-Jun	200	192	206	243	190	182	188	189	84	52	75	53	66	83	71	56	36	21	21	21	99	159	141	97	86.0
15-Jun	105	77	54	30	34	63	109	63	70	121	155	160	166	171	178	174	173	199	178	195	174	162	149	150	156.4
16-Jun	139	144	149	152	166	169	166	173	190	196	195	199	206	204	218	213	213	226	231	241	252	253	263	263	197.5
17-Jun	228	246	228	213	246	219	253	308	304	301	303	310	291	293	291	277	270	238	303	354	77	8	211	238	285.1
18-Jun	276	266	257	272	262	256	264	255	258	256	288	293	254	229	222	226	229	234	237	224	337	14	48	15	262.9
19-Jun	353	320	259	250	226	188	262	38	38	3	319	311	322	326	350	333	332	345	349	6	9	3	285	281	330.7
20-Jun	267	251	230	217	208	183	182	155	162	179	166	161	130	117	137	153	150	150	162	164	160	161	216	215	168.9
21-Jun	203	199	188	195	193	191	181	178	189	190	188	182	178	190	168	180	182	169	163	148	189	202	215	197	185.2
22-Jun	209	193	199	206	187	186	181	184	181	183	173	179	248	192	191	191	205	259	230	223	237	198	209	220	205.5
23-Jun	236	256	348	354	315	188	205	135	62	90	15	217	74	305	281	329	333	15	63	76	56	8	296	291	331.7
24-Jun	227	22	1	330	344	16	33	20	21	9	356	1	15	10	9	10	12	32	8	356	354	286	353	4	7.5
25-Jun	3	334	343	1	2	10	10	23	27	12	23	33	30	24	29	35	25	48	12	2	49	174	287	299	17.9
26-Jun	306	278	189	204	200	190	192	184	176	181	207	341	336	175	213	193	203	224	188	180	191	327	197	250	211.0
27-Jun	229	209	212	199	224	214	208	225	221	223	208	201	264	51	108	164	194	61	83	115	21	329	265	207	202.8
28-Jun	225	233	195	192	199	191	101	53	74	184	58	34	38	21	16	20	26	24	21	11	12	17	3	17	28.5
29-Jun	355	338	299	16	7	11	10	19	49	98	93	79	74	12	37	43	152	204	80	86	13	7	174	153	45.5
30-Jun	30	7	45	333	223	190	179	175	184	185	186	153	157	138	122	147	136	131	125	137	168	161	214	217	160.2

248.8 244.6 230.7 230.0 221.6 202.6 193.7 217.0 216.5 227.1 246.8 253.4 263.3 272.7 271.2 228.5 211.4 309.3 339.4 98.0 114.4 301.1 258.3 257.9

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 (WD) - deg
CNRL Horizon - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 101 deg on Jun 7 11:00	Hours of Data: 719
Minimum Value: 8 deg on Jun 10 02:00	Hours of Missing Data: 1
Percentiles: P ₁ = 10 P ₁₀ = 14 Q ₁ = 19 Median = 23 O ₃ = 34 P ₉₀ = 54 P ₉₉ = 92	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-Jun	14	45	20	12	12	16	19	87	34	27	43	39	32	38	28	27	23	22	62	33	85	53	92	39	92
2-Jun	10	31	43	53	63	21	53	38	31	86	39	97	85	83	79	80	27	89	53	32	17	20	48	33	97
3-Jun	14	13	73	16	16	23	22	25	31	35	35	22	29	25	37	76	27	63	47	32	51	75	71	36	76
4-Jun	44	16	16	17	18	19	22	22	22	23	22	22	24	21	31	22	21	22	19	18	56	59	22	36	59
5-Jun	30	32	16	15	13	19	45	68	38	22	25	26	26	32	30	41	31	20	21	16	15	11	19	15	68
6-Jun	20	15	15	13	15	46	21	27	34	34	40	30	31	27	37	25	20	22	17	18	19	88	24	29	88
7-Jun	22	48	12	18	13	12	22	40	49	67	101	51	53	96	16	67	31	78	12	11	14	14	14	46	101
8-Jun	42	20	15	41	AF	25	80	23	24	24	25	23	25	22	28	25	16	13	30	20	73	87	53	19	87
9-Jun	23	15	19	17	18	15	16	18	19	19	20	19	19	19	18	18	18	19	20	20	18	18	39	13	39
10-Jun	19	8	26	11	43	59	87	73	39	28	26	31	33	27	32	41	40	48	38	14	14	30	23	63	87
11-Jun	38	26	65	22	27	20	42	24	26	29	28	24	22	23	24	26	29	37	30	20	26	29	18	17	65
12-Jun	24	17	18	18	31	21	17	18	19	18	22	19	24	26	21	35	20	22	19	21	25	14	15	15	35
13-Jun	16	14	14	15	16	14	19	20	20	21	22	19	51	22	20	77	48	20	60	21	31	73	55	45	77
14-Jun	32	19	11	36	14	19	22	34	70	33	35	42	44	31	38	20	17	20	19	20	46	21	26	17	70
15-Jun	24	41	19	16	16	40	38	35	52	27	22	21	19	18	18	19	17	17	20	24	33	27	21	21	52
16-Jun	18	19	20	20	18	19	23	21	18	19	17	19	21	24	23	28	21	22	21	18	17	14	16	28	28
17-Jun	18	15	19	12	13	15	29	12	10	9	11	17	12	15	13	19	22	19	27	63	26	29	41	34	63
18-Jun	15	18	12	13	14	14	17	17	24	27	22	20	33	32	26	30	35	58	23	16	56	21	39	24	58
19-Jun	19	40	22	15	22	45	70	47	27	25	36	18	16	19	26	21	21	23	23	21	21	43	22	8	70
20-Jun	20	10	14	20	9	13	23	40	30	51	63	93	50	31	40	34	24	22	18	15	13	12	44	25	93
21-Jun	17	11	9	10	12	14	16	17	21	19	25	26	30	37	34	28	37	26	30	21	10	10	34	20	37
22-Jun	16	23	16	25	14	16	20	19	22	29	37	56	57	62	36	36	63	19	19	21	26	23	19	17	63
23-Jun	13	35	49	19	81	21	19	88	32	31	70	100	81	45	33	28	46	49	25	18	21	16	18	16	100
24-Jun	82	26	19	29	33	24	21	22	21	28	31	28	23	24	22	26	22	24	25	24	20	14	20	19	82
25-Jun	16	19	15	20	22	22	22	22	23	22	19	23	26	25	25	25	29	25	21	20	32	50	20	10	50
26-Jun	13	45	17	20	15	15	24	20	29	28	43	97	53	40	43	27	23	23	22	16	75	80	63	16	97
27-Jun	14	12	14	15	12	16	15	16	21	45	27	23	48	24	60	28	22	54	25	21	83	52	26	21	83
28-Jun	21	18	23	11	10	15	64	24	50	65	94	21	28	26	26	24	25	20	22	20	18	18	15	13	94
29-Jun	12	19	8	45	13	19	22	31	51	47	37	69	69	44	34	52	80	83	37	24	34	65	19	28	83
30-Jun	58	23	42	35	54	19	20	19	31	40	32	45	26	32	51	43	33	28	25	17	19	30	18	9	58

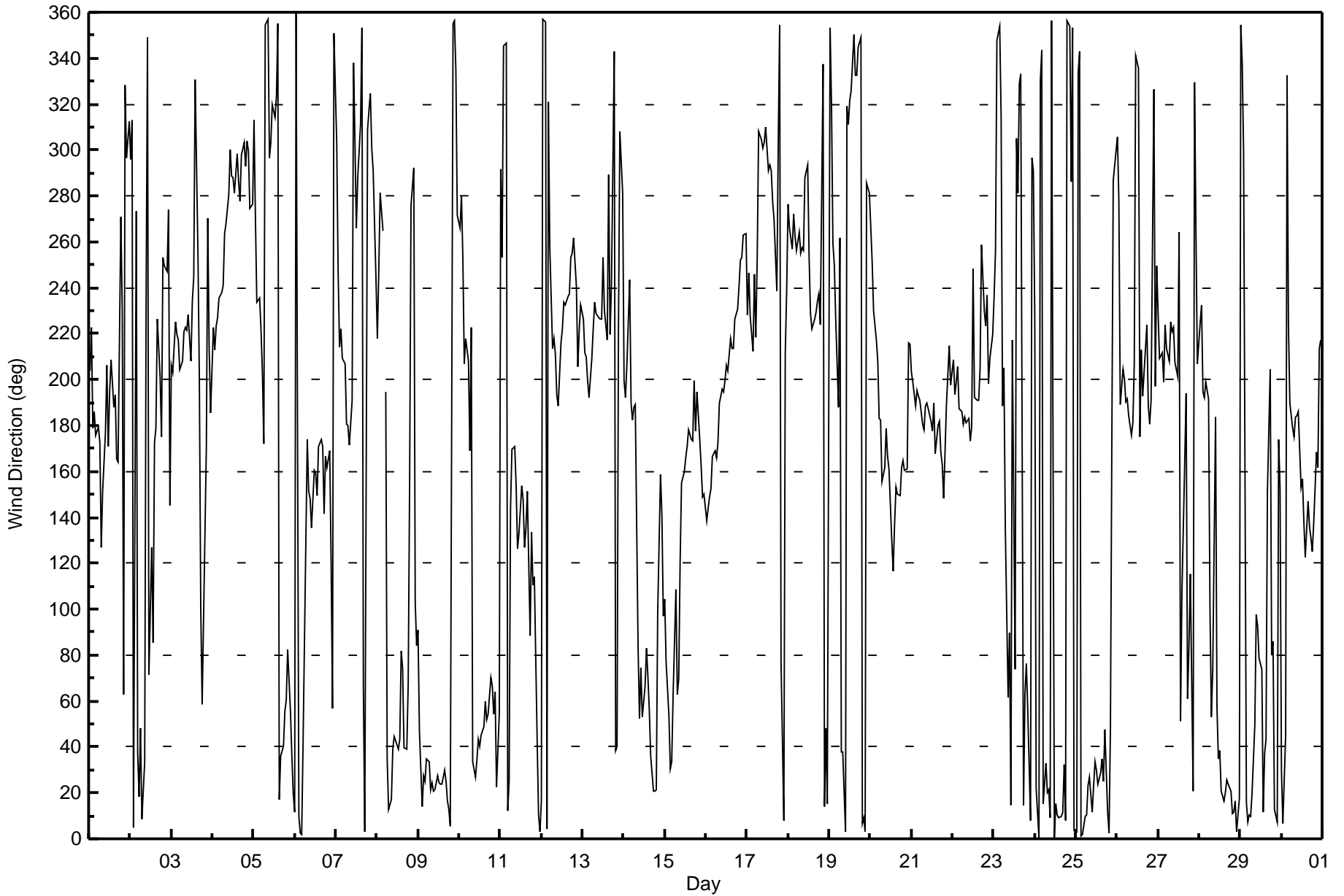
82	48	73	53	81	59	87	88	70	86	101	100	85	96	79	80	80	89	62	63	85	88	92	63	
Diurnal Maximum																								

AF - Analyzer Failure



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
CNRL Horizon - June 2016





Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 21, 2016	Last Calibration	May 26, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	9:50	End Time (MST)	16:21
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	-623
Analyzer IP address	192.168.1.43		Lamp voltage	855	853
Calculated slope	1.000870	0.997067	Chamber temp	45.3	45.3
Calculated intercept	0.118386	0.603787	Pressure	705.7	702.4
Analyzer Background	18.7	18.8	Flow	0.426	0.426
Analyzer Coefficient	1.012	1.005	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	0.0	----
as found span	5000	81.5	815.0	814.1	1.001
calibrator zero	5000	0.0	0.0	0.3	----
high point	5000	81.5	815.0	817.1	0.997
second point	5000	40.7	407.0	407.5	0.999
third point	5000	20.3	203.0	202.0	1.005
as left zero	5000	0.0	0.0	0.9	----
as left span	5000	81.5	815.0	813.9	1.001
Average Correction Factor					1.001

Corrected As found 814.1 Previous response 814.2 % change 0.0%

Notes:

Sample inlet filter replaced after as founds. Charcoal and purafill material for ZAG unit replaced after as founds. Slightly adjusted span. As left began at 15:37 MST.

Calibration Performed By:

Asad Hidayat



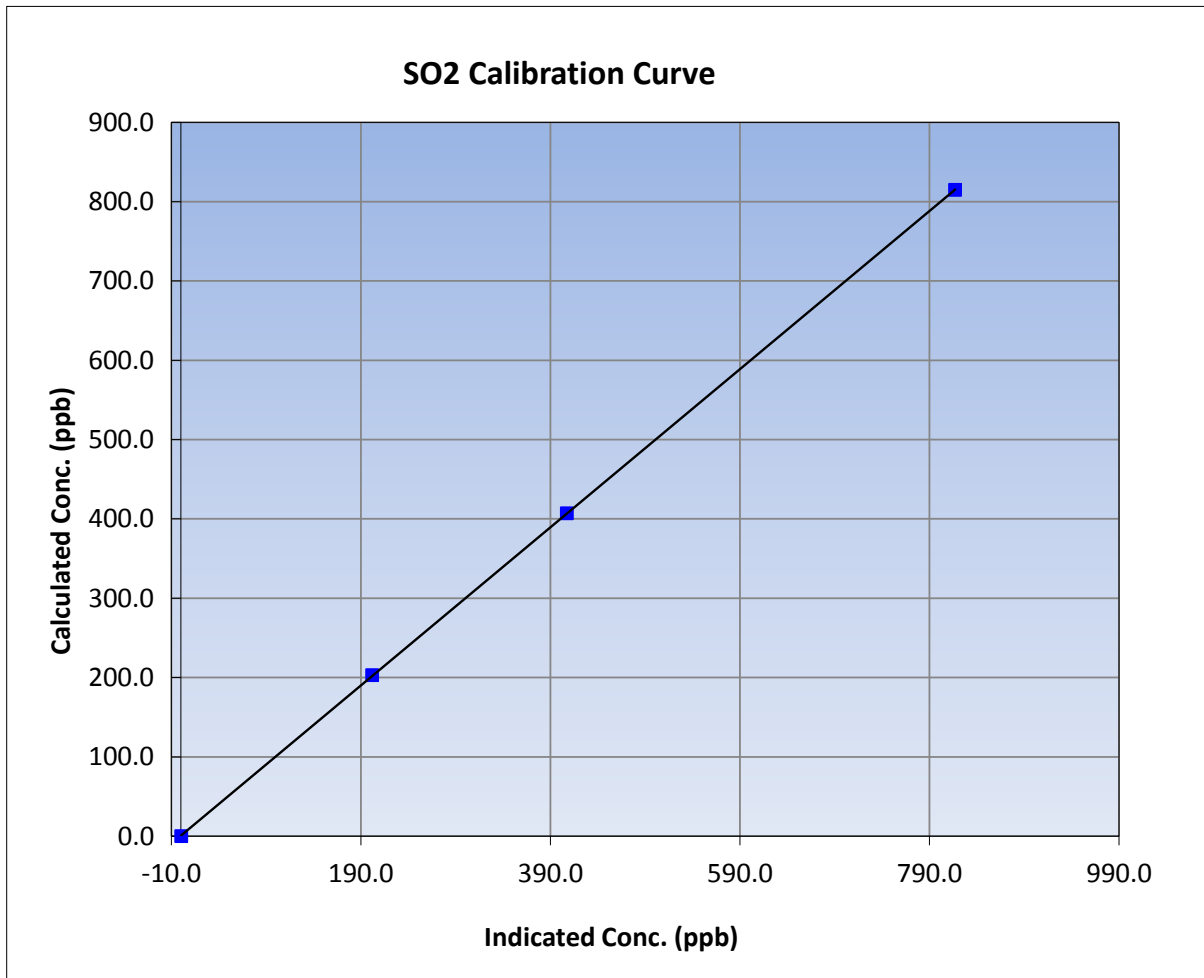
Wood Buffalo Environmental Association SO2 Calibration Report

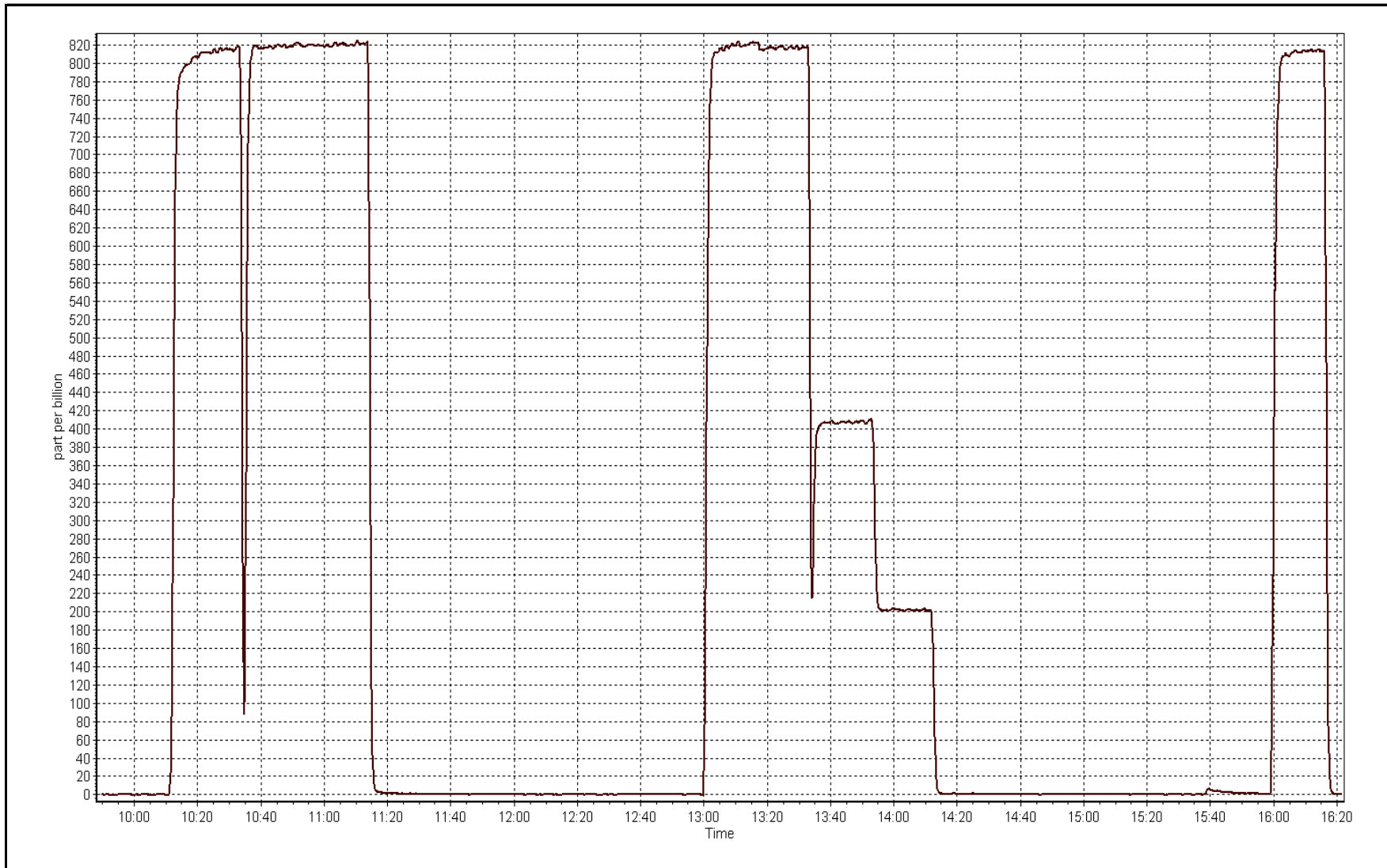
Station Information

Calibration Date	June 21, 2016	Previous Calibration	May 26, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:50	End Time (MST)	16:21
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	0.3	----	Correlation Coefficient	0.999995
815.0	817.1	0.9974		
407.0	407.5	0.9989	Slope	0.997067
203.0	202.0	1.0052		
			Intercept	0.603787







Wood Buffalo Environmental Association Repair TRS Calibration Report

Station Information

Calibration Date	June 20, 2016	Last Calibration	May 26, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	10:25	End Time (MST)	13:15
Gas Cert Reference	LL82745	Station temp.	22 Deg C
Cal Gas Concentration	9.6 ppm	Cal Gas Exp Date	2/22/16
Calibrator Make/Model	API T700	Serial Number	1223
Dil air Make/Model	API 701	Serial Number	1004
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	-685	-685
Analyzer IP address	192.168.1.44		Lamp voltage	989	989
Calculated slope	1.000312	0.998932	Chamber temp	45	45
Calculated intercept	-0.602019	-0.046347	Pressure	638.0	643.8
Analyzer Background	2.3	2.11	Flow	0.402	0.404
Analyzer Coefficient	1.196	1.196	Intensity	91	91
			Converter temp.	800	800
Analyzer make/model	Thermo 43i TLE		Analyzer serial #	1151680032	
Converter make/model	CDN-101		Converter serial #	531	

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	41.5	79.7	79.6	1.002
SO2 scrubber check	5000	20.4	204.0	0.6	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	41.5	79.7	79.8	0.999
second point	5000	20.6	39.6	39.7	0.996
third point	5000	10.2	19.6	19.7	0.995
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	41.5	79.7	80.1	0.994
Average Correction Factor					0.997

Corrected As found	79.8	Previous response	80.3	% change	0.6%
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Notes:

Sample inlet filter replaced after as founds. Scrubber check done after as founds. Slightly adjusted zero.

Calibration Performed By: Asad Hidayat



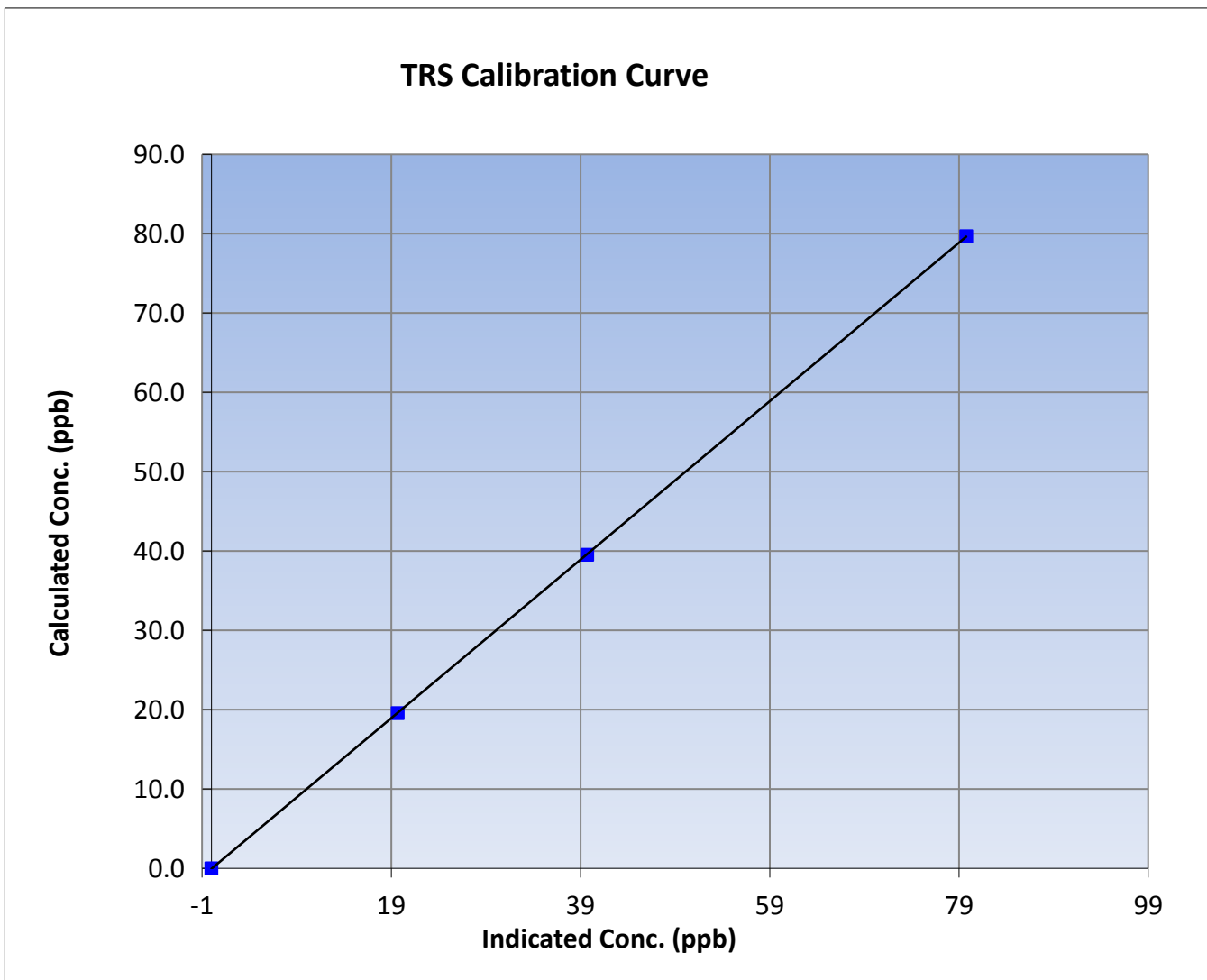
Wood Buffalo Environmental Association TRS Calibration Report

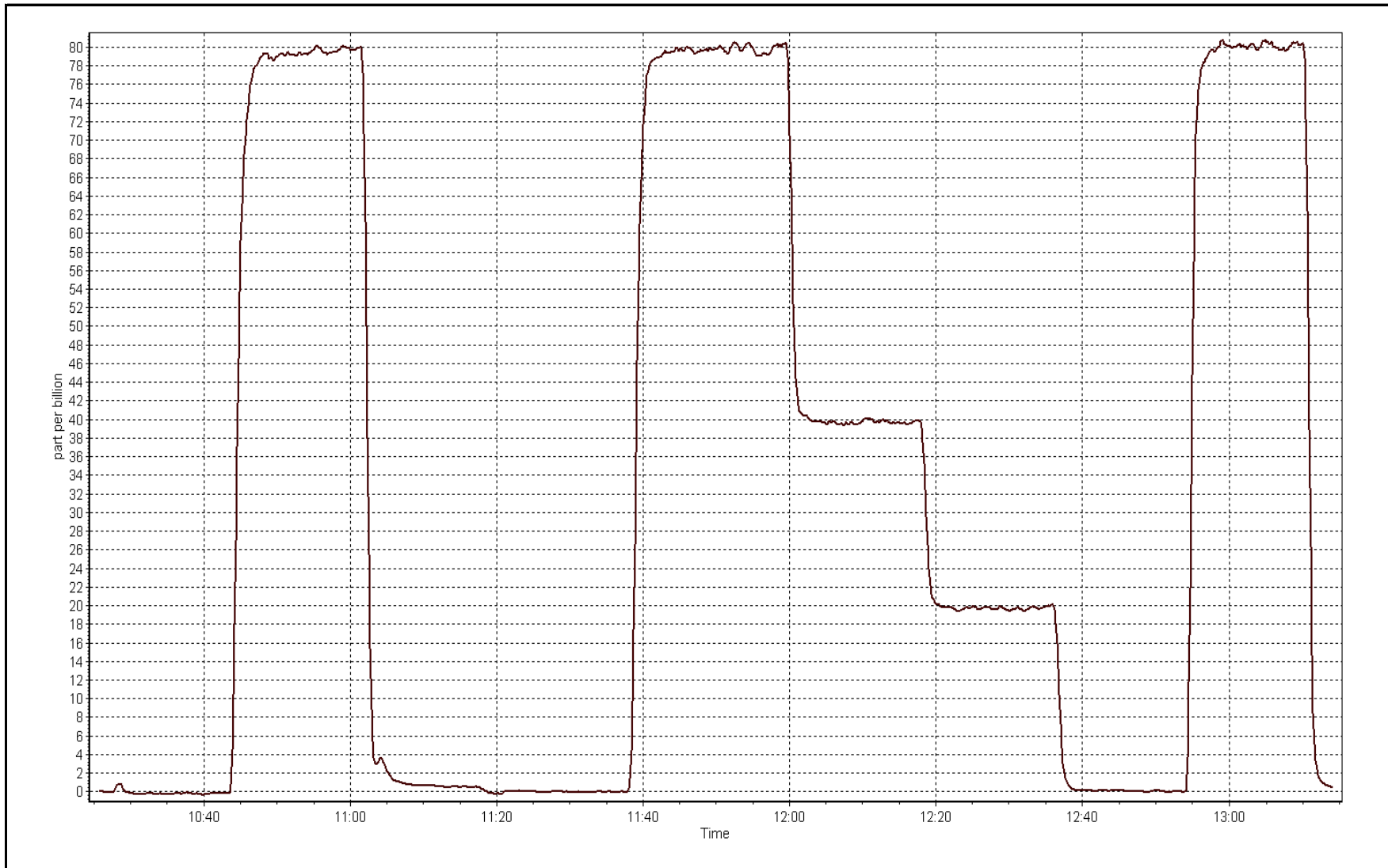
Station Information

Calibration Date	June 20, 2016	Previous Calibration	May 26, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	10:25	End Time (MST)	13:15
Analyzer make	Thermo 43i TLE	Analyzer serial #	1151680032

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999997
79.7	79.8	0.9989		
39.6	39.7	0.9960	Slope	0.998932
19.6	19.7	0.9951		
			Intercept	-0.046347







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June-21-16	Last Calibration	May-26-16
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	9:50	End Time (MST)	16:20
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	8.8
Analyzer IP address	192.168.1.51		Air or Bypass Press	38.0	38.0
Calculated slope	0.998939	0.990043	Fuel Pressure	26.3	26.3
Calculated intercept	0.003033	0.025344	Analyzer Coeff	3.1	3.3
			Analyzer BKG	2.060	2.030

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	-0.11	----
as found span	5000	81.5	17.06	16.97	1.005
calibrator zero	5000	0.0	0.00	-0.05	----
high point	5000	81.5	17.06	17.20	0.992
second point	5000	40.7	8.52	8.58	0.993
third point	5000	20.3	4.25	4.30	0.988
as left zero	5000	0.0	0.00	0.90	----
as left span	5000	81.5	17.06	17.29	0.987
Average Correction Factor					0.991

Corrected As found 17.08 Previous response 17.08 % change 0.0%

Notes:

Sample inlet filter, hydrogen cylinder and charcoal/purafill canisters inside ZAG unit, replaced after as founds. Span reponse changed after doing PM on ZAG unit. Adjusted both zero and span.

Calibration Performed By:

Asad Hidayat



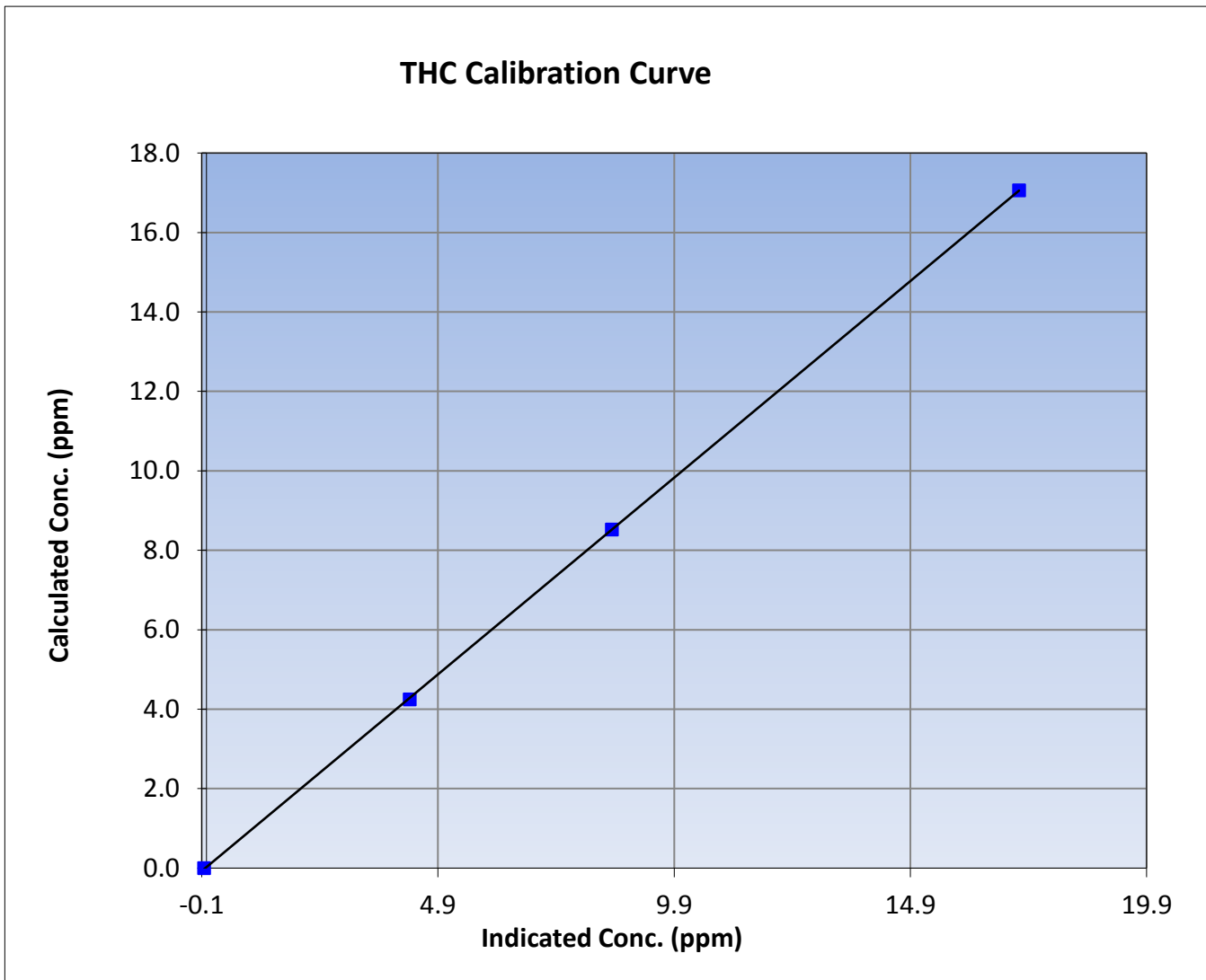
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June 21, 2016	Previous Calibration	May 26, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:50	End Time (MST)	16:20
Analyzer make	Thermo 51i-LT	Analyzer serial #	1327059295

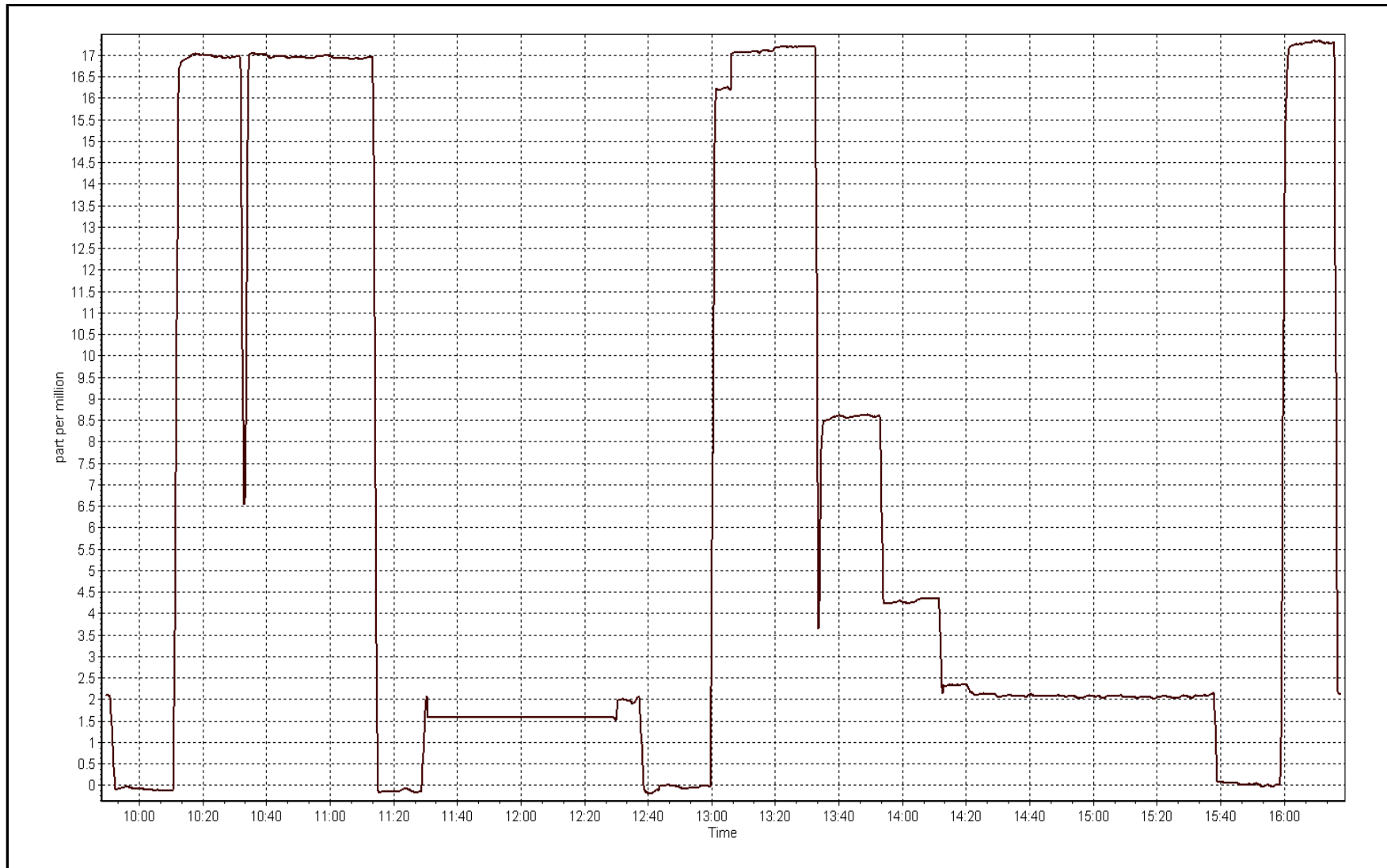
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.05	----	Correlation Coefficient	0.999989
17.06	17.20	0.9920		
8.52	8.58	0.9931	Slope	0.990043
4.25	4.30	0.9883		
			Intercept	0.025344



THC Calibration Plot

Date: June 21, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 21, 2016	Previous Calibration	May 26, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Reason:	Routine		
Start Time (MST)	9:50	End Time (MST)	16:20
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	0.996449	0.997457	0.996646
	Data Offset	-0.342854	0.020547	-0.272533
Current Calibration	Data Slope	0.999122	0.999521	0.995753
	Data Offset	0.168555	0.259304	-0.201629

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	0.977		1.004	
NOX coefficient	1.000		1.001	
NO2 coefficient	1.000		1.000	
NO bkgrnd	11.5		11.5	
NOX bkgrnd	11.5		11.6	
Chamber Temp	50	Deg C	50	Deg C
Moly Temp	326	Deg C	326.3	Deg C
PMT voltage	-779.2	V	-779.2	V
PMT Temp	-3	Deg C	-2.9	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	182.1	mmHg	175.5	mmHg
R Cell Press Nox	182.1	mmHg	175.5	mmHg
NO sample flow	0.681	lpm	0.616	lpm
Nox sample Flow	0.680	lpm	0.618	lpm

Notes:

Sample inlet filter replaced after as founds. Replacing filter caused a drop in high point (see docit note). Charcoal/purafill material changed after as founds. Adjusted both zero and span.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 21, 2016

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	-0.4	-0.5	0.1	----	----
as found span	5000	81.5	797.1	797.1	0.0	808.3	806.7	1.6	0.9862	0.9881
calibrator zero	5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
high point	5000	81.5	797.1	797.1	0.0	797.3	796.9	0.4	0.9997	1.0002
second point	5000	40.7	398.0	398.0	0.0	399.3	399.1	0.2	0.9969	0.9973
third point	5000	20.3	198.5	198.5	0.0	197.6	197.3	0.3	1.0046	1.0063
as left zero	5000	0.0	0.0	0.0	0.0	1.9	1.9	0.0	----	----
as left span	5000	81.5	797.1	450.3	346.8	798.1	451.0	347.1	0.9987	0.9984
Average Correction Factor									1.0004	1.0013

Corrected As found
Previous Response

NO_x= 808.6
NO_x= 800.3

NO= 807.1
NO= 799.1

Percent Change

NO_x= -1.0%

NO= -1.0%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 81.50 ccm NOx ref calc conc = 797.1 ppb NO ref calc conc = 797.1 ppb

O3 Setpoint (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
1st NO ref point		0.0	797.3	795.2	0.0	0.9997	1.0023	----	----
1st NO2 (300)	450.3	344.9	797.0	450.3	346.7	1.0001	----	0.9948	100.5%
2nd NO2 (200)	560.0	235.3	796.0	560.0	236.0	1.0014	----	0.9968	100.3%
3rd NO2 (100)	672.1	123.1	796.5	672.1	124.4	1.0008	----	0.9900	101.0%
2nd NO ref point		0.0	796.9	794.3	2.6	1.0002	1.0035	----	----
Average Correction Factor						1.0006		0.9939	100.6%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

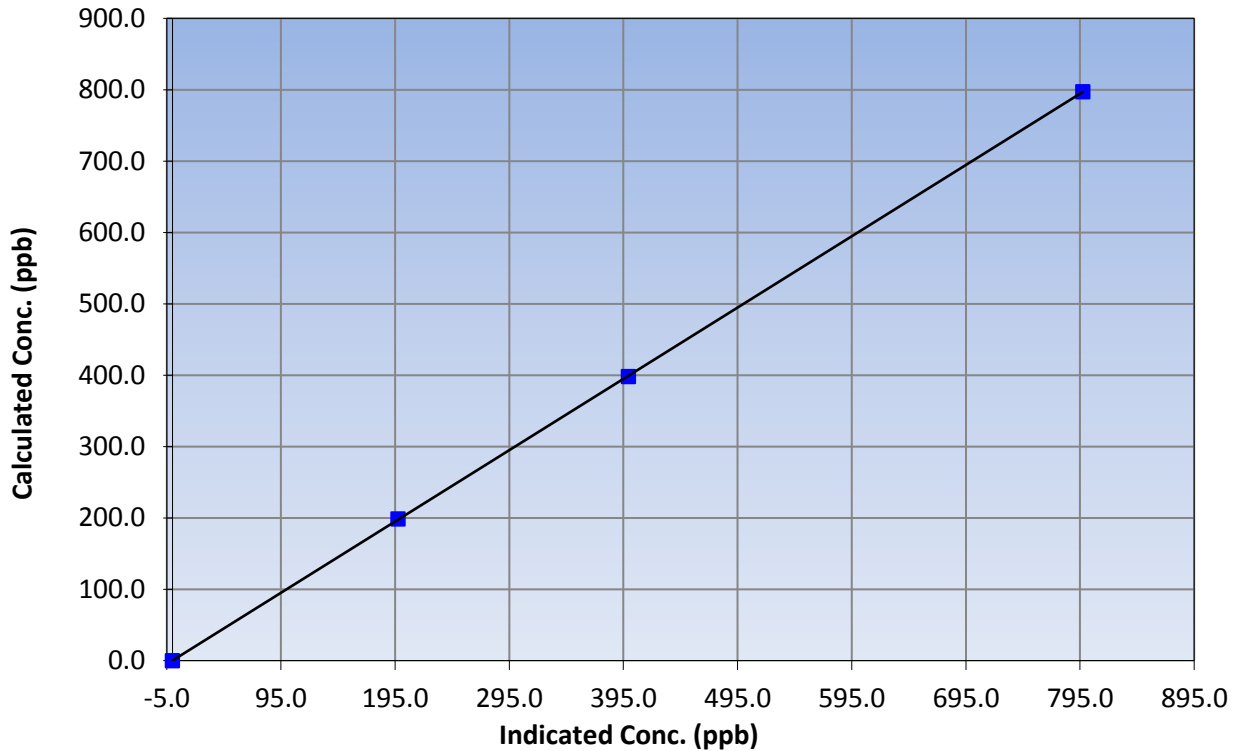
Station Information

Calibration Date	June 21, 2016	Previous Calibration	May 26, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:50	End Time (MST)	16:20
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	0.0	----	Correlation Coefficient	0.999994
797.1	797.3	0.9997		
398.0	399.3	0.9969	Slope	0.999122
198.5	197.6	1.0046		
			Intercept	0.168555

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

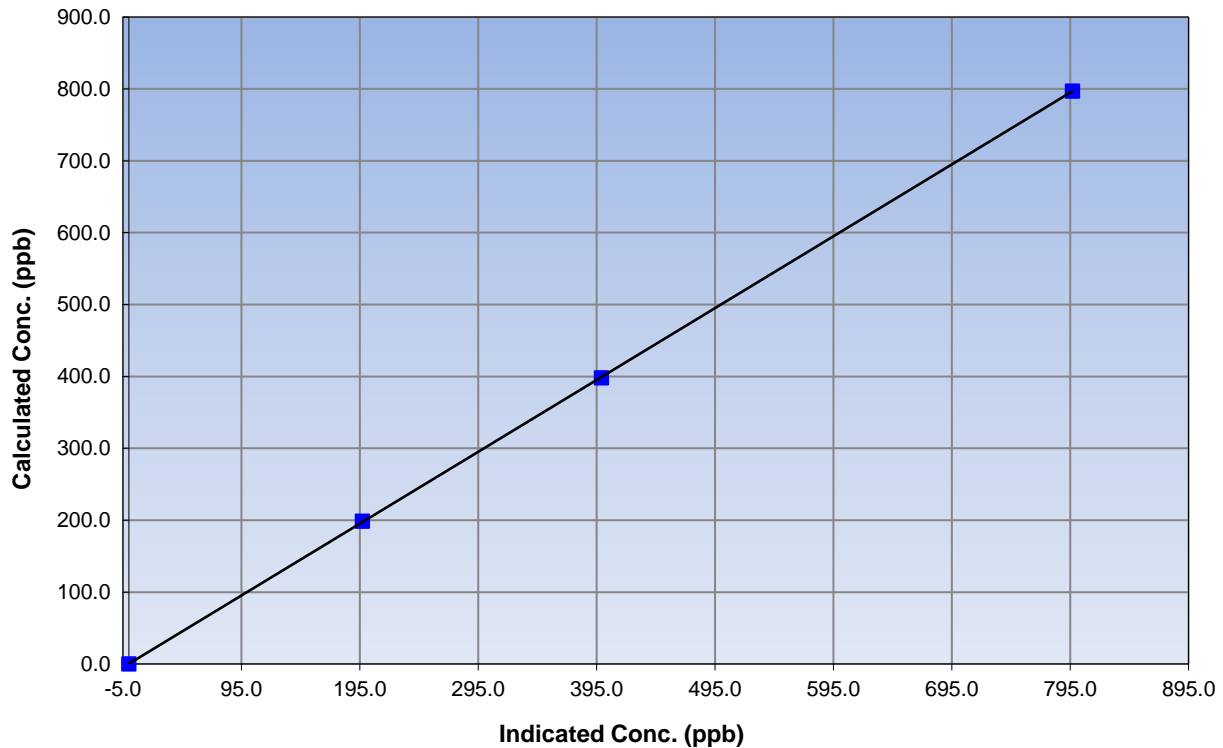
Station Information

Calibration Date	June 21, 2016	Previous Calibration	May 26, 2016
Station Name	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:50	End Time (MST)	16:20
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	0.0	N/A	Correlation Coefficient	0.999993
797.1	796.9	1.0002		
398.0	399.1	0.9973	Slope	0.999521
198.5	197.3	1.0063		
			Intercept	0.259304

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

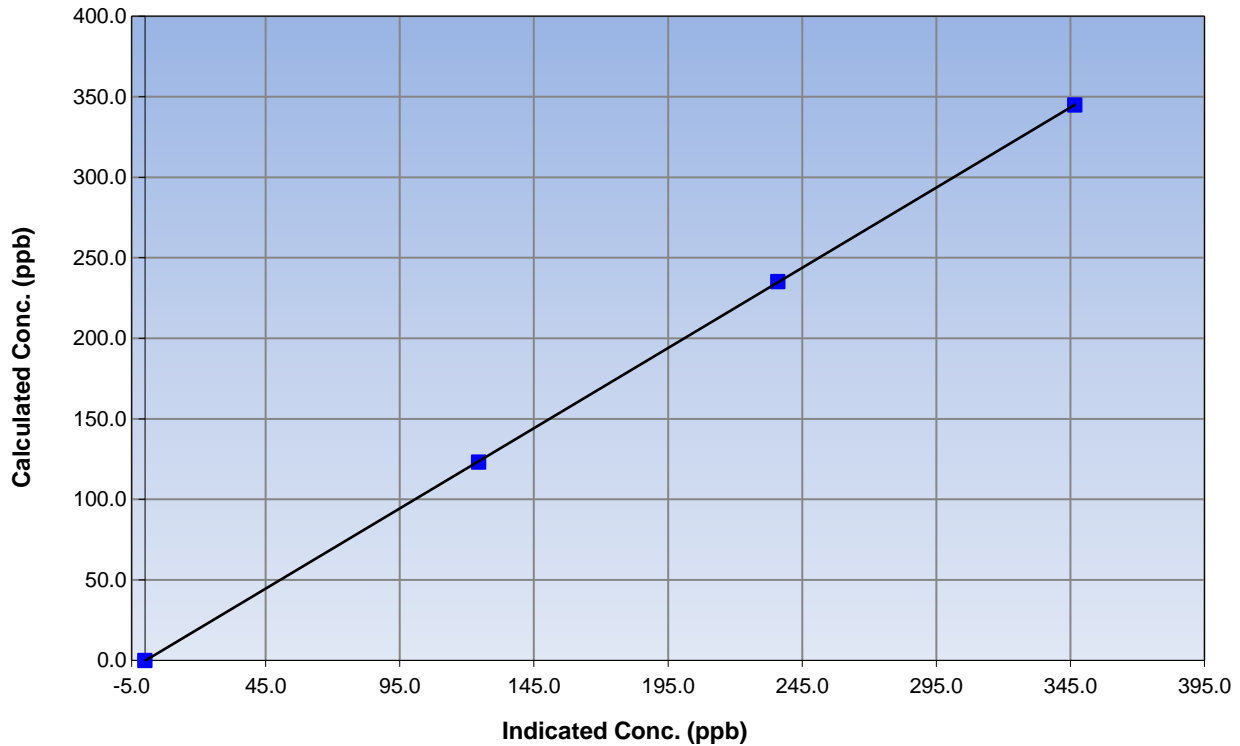
Station Information

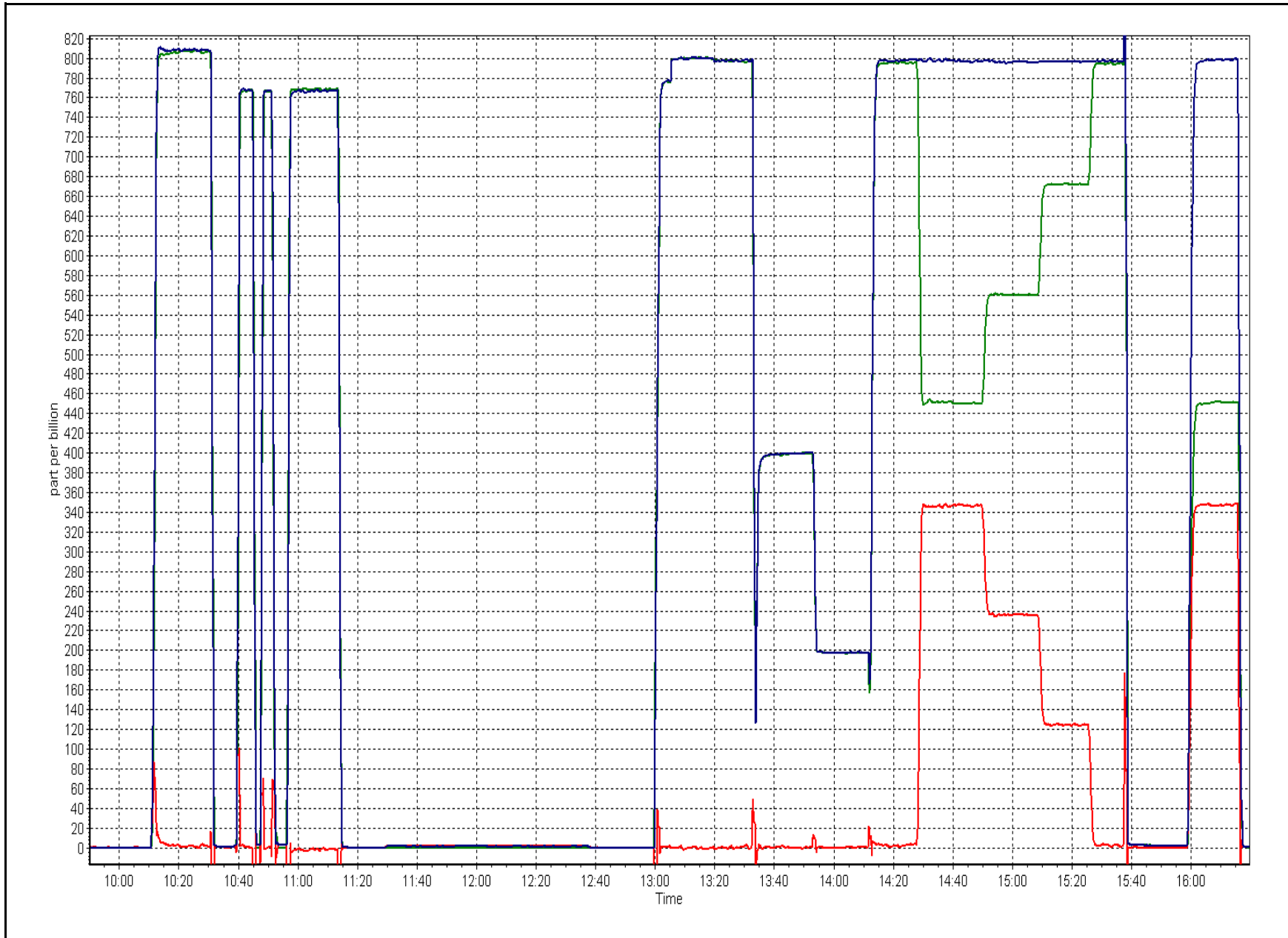
Calibration Date	June 21, 2016	Previous Calibration	May 26, 2016
Station Number	CNRL Horizon	Station Number	AMS 15
Start Time (MST)	9:50	End Time (MST)	16:20
Analyzer make	Thermo 42i	Analyzer serial #	710321429

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999992
344.9	346.7	0.9948		
235.3	236.0	0.9968	Slope	0.995753
123.1	124.4	0.9900		
			Intercept	-0.201629

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	<u>June 21, 2016</u>	Previous Calibration:	<u>May 26, 2016</u>
Station Name:	<u>CNRL Horizon</u>	Station Number:	<u>AMS 15</u>
Start Time (MST):	<u>12:00</u>	End Time (MST):	<u>15:15</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 ₁₄ 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	28.0	28.5	0.5	28.0
T2	27.0	24.0	-3.0	27.0
T3	24.0	24.0	0.0	24.0
T4	24.0	24.0	0.0	24.0
RH (%)	32.0	32.0	0.0	32.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	971	973.0	2.0	971

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1001	1005	4	1005	1001

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	165		165
Neph	1.3		1.3
C14	30		30
Indicated Concentration (ug/m3)	0.7	no	0.7
Offset 1			
Offset 2			

Leak Check (Quarterly)			
Leak Check Date:	<u>April 28, 2016</u>	Previous Leak Check Date:	<u>January 13, 2016</u>
	Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.76		0.06
*Flow with adaptor (LPM):	16.70		
<i>*Note - do not attach adaptor without shutting off the pump first</i>			

Mass Foil Calibration (Annually)			
Foil Calibration Date:	<u>June 21, 2016</u>	Previous Foil Calibration:	<u>June 22, 2015</u>
Zeroed?:	<u>Yes</u>		
Foil Mass:	<u>1265</u>		Mass foil set S/N: 2598
Previous Correction Factor:	<u>7029</u>		
New Correction Factor:	<u>9992</u>		

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	21/06/2016
Pump	Good	09/06/2014
Filter Tape	Good	09/06/2014
Mass Foil Cal Set	Good	21/06/2016
HEPA filter	Good	15/03/2016

NOTES:

No adjustments. Cleaned cyclone head. Verified T1, T2, T3, T4, RH. Mass foil cal done; accepted new factor.

Calibration Performed By:	Asad Hidayat
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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 16
SHELL MUSKEG RIVER
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SHELL MUSKEG RIVER (AMS 16)
 JUNE 2016

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	683	36	37	99.86	24	0	6	0
THC (ppm) Average	683	36	37	99.86	4.7	-	2.9	-
NO2 (ppb) Average	683	36	37	99.86	41	0	12	-
NO (ppb) Average	683	36	37	99.86	83	-	10	-
NOX (ppb) Average	683	36	37	99.86	125	-	22	-
PM2.5 (ug/m3) Average	716	4	4	100.00	71.4	-	16.9	0
Temperature 2 m (C) Average	720	0	0	100.00	30.1	-	22.2	-
Relative Humidity (%) Average	720	0	0	100.00	100	-	87	-
Barometric Pressure (inHg) Average	720	0	0	100.00	29.1	-	29.1	-
Wind Speed 10 m (km/h) Average	720	0	0	100.00	40	-	22	-
Wind Direction 10 m (deg) Average	720	0	0	100.00	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SHELL MUSKEG RIVER (AMS 16)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	683	1.1	3	-	0	0	0	0	0	2	24
THC (ppm) Average	683	2.44	0.3	-	1.9	2.1	2.2	2.4	2.5	2.8	4.7
NO2 (ppb) Average	683	4.8	6	-	0	0	1	2	6	13	41
NO (ppb) Average	683	3.1	7	-	0	0	0	0	3	10	83
NOX (ppb) Average	683	8	12	-	0	0	1	3	10	22	125
PM2.5 (ug/m3) Average	716	7.83	6.5	-	1	2.1	3.5	6.3	10	14.4	71.4
Temperature 2 m (C) Average	720	16.95	5.5	-	3.6	10.1	12.8	16.6	20.9	24.4	30.1
Relative Humidity (%) Average	720	64.1	22	-	20	34	46	63	84	93	100
Barometric Pressure (inHg) Average	720	28.75	0.2	-	28.3	28.5	28.6	28.7	28.9	29	29.1
Wind Speed 10 m (km/h) Average	720	10.8	6	-	1	4	6	9	14	19	40
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - SHELL MUSKEG RIVER (AMS 16)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
AIR QUALITY ANALYZERS	28 Jun 2016 15:00	28 Jun 2016 15:00	1	Maintenance - replace sample manifold stack



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Shell Muskeg River - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 24 ppb on Jun 20 19:00	Maximum Daily Average: 6.1 ppb on Jun 22		Hours of Data:	683
Minimum Value: 0 ppb on Jun 9 02:00	Minimum Daily Average: 0.1 ppb on Jun 11		Hours of Missing Data:	37
Maximum Diurnal Average: 2.8 ppb at hour 9	Minimum Diurnal Average: 0.2 ppb at hour 2		Hours of Calibration:	36
Monthly Average: 1.1 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 2 P ₉₉ = 20		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-Jun	0	0	0	Z	0	0	1	3	6	12	12	7	1	0	0	0	4	4	0	10	4	1	2	1	3.1	12
2-Jun	0	0	0	0	Z	0	0	0	1	1	2	2	1	2	3	3	1	0	2	0	2	5	2	2	1.3	5
3-Jun	1	0	0	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
4-Jun	Z	0	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
5-Jun	1	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
6-Jun	0	0	Z	0	0	0	0	1	7	7	1	1	3	1	3	2	3	1	1	4	1	5	0	0	1.8	7
7-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1
8-Jun	0	0	0	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
9-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	1	0	1	0	0	1	0	0	0	0	0.3	1
10-Jun	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
11-Jun	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
12-Jun	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
13-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.2	1
14-Jun	0	0	0	0	Z	0	0	21	23	10	1	2	3	0	0	0	1	1	0	0	0	0	0	0	2.8	23
15-Jun	0	0	0	0	0	Z	0	0	0	0	0	1	4	5	1	4	0	0	2	1	0	0	1	0.9	5	
16-Jun	Z	0	2	1	2	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	4
17-Jun	0	Z	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
18-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1
19-Jun	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
20-Jun	0	0	0	0	Z	0	0	0	0	1	1	0	0	0	1	10	12	13	24	21	9	2	1	1	4.3	24
21-Jun	0	1	1	0	0	Z	4	4	5	3	3	2	1	2	2	4	4	4	6	13	22	16	5	1	4.5	22
22-Jun	Z	1	0	0	0	0	4	16	24	23	13	19	14	1	5	2	4	11	0	0	0	0	0	0	6.1	24
23-Jun	0	Z	0	0	0	0	0	0	0	C	C	C	C	C	C	1	0	1	1	0	0	0	0	0	--	1
24-Jun	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.3	1
25-Jun	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
26-Jun	0	0	0	0	Z	0	0	0	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2
27-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	1	1	0	0.5	2
28-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0.1	0
29-Jun	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
30-Jun	0	0	Z	0	0	0	3	7	9	8	4	13	0	0	0	0	0	0	0	0	0	0	0	0	2.0	13

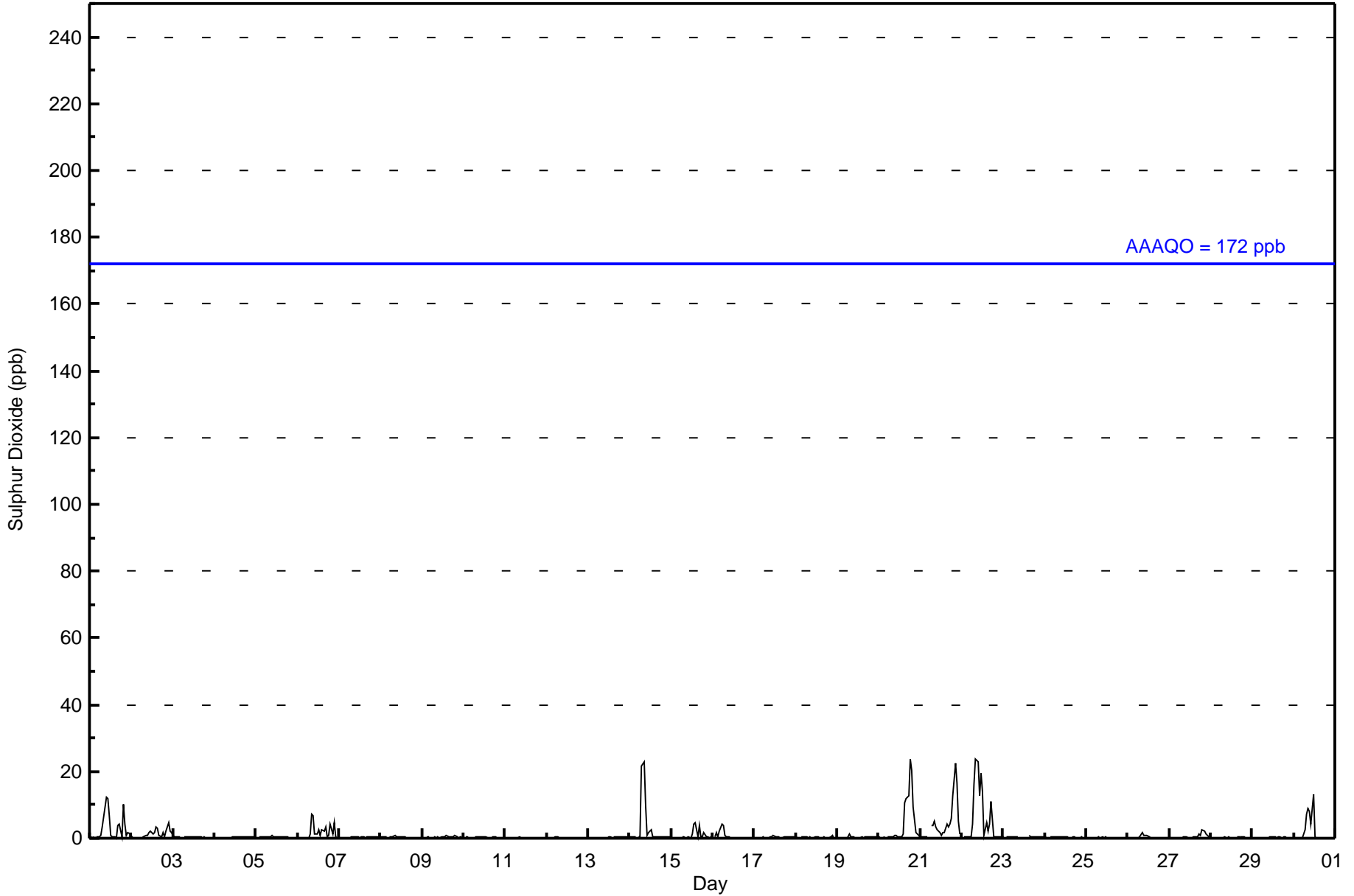
0.2	0.2	0.3	0.2	0.3	0.4	0.7	2.0	2.8	2.4	1.5	1.8	1.0	0.5	0.8	0.9	1.3	1.4	1.3	1.9	1.5	1.1	0.5	0.3	Diurnal Average	
1	1	2	1	2	4	4	21	24	23	13	19	14	4	5	10	12	13	24	21	22	16	5	2	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Shell Muskeg River - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Shell Muskeg River - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	664	97.22	97.22
11 - 20	12	1.76	98.98
21 - 60	7	1.02	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: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Shell Muskeg River - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	28	48	74	31	20	15	25	66	78	80	55	41	33	26	21	23	664
11 - 20	0	0	0	0	0	0	0	0	4	5	3	0	0	0	0	0	12
21 - 60	0	0	0	0	0	0	0	0	2	2	2	0	0	0	1	0	7
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
Totals	28	48	74	31	20	15	25	66	84	87	60	41	33	26	22	23	683

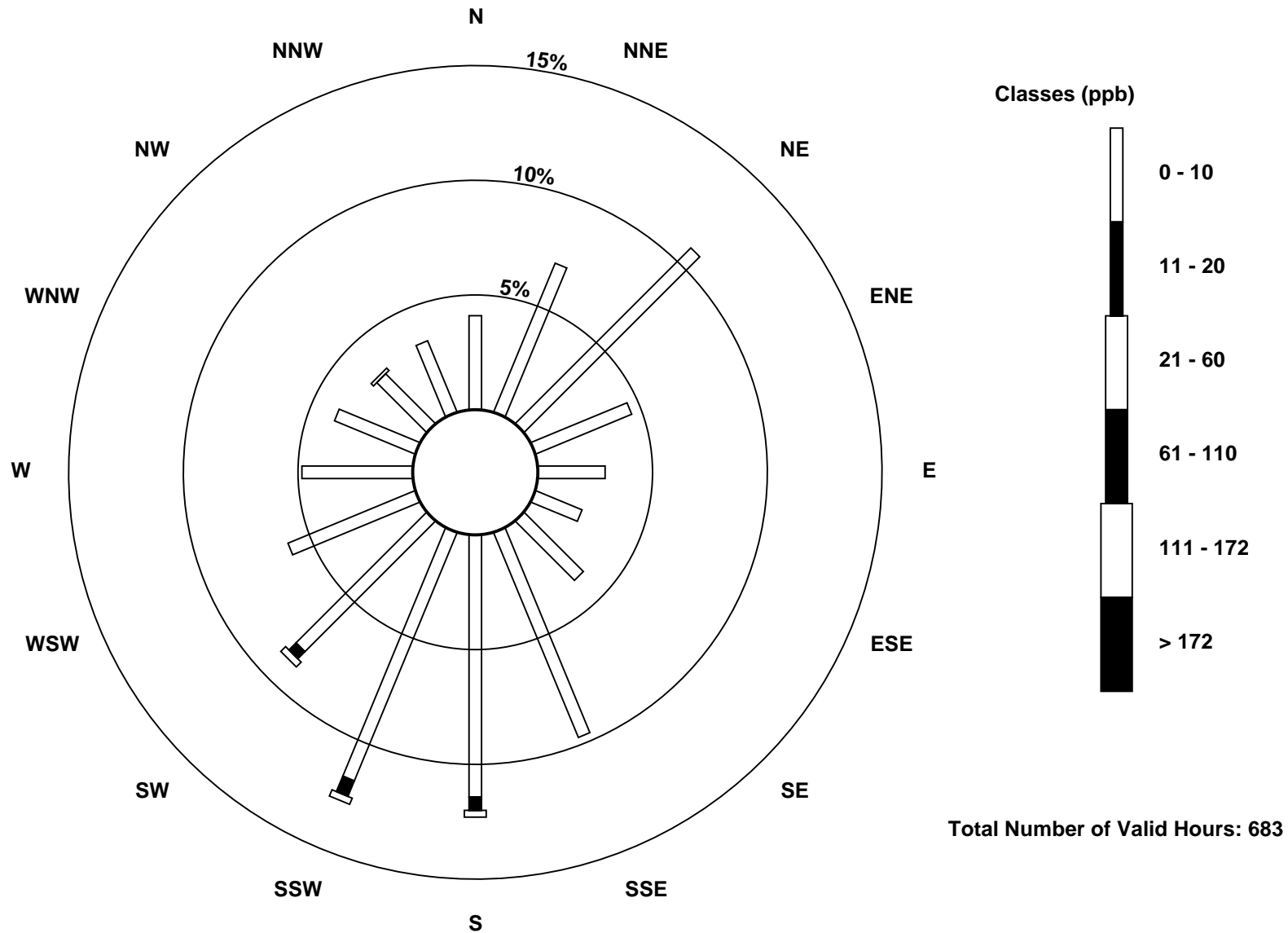
Total Number of Valid Hours: 683

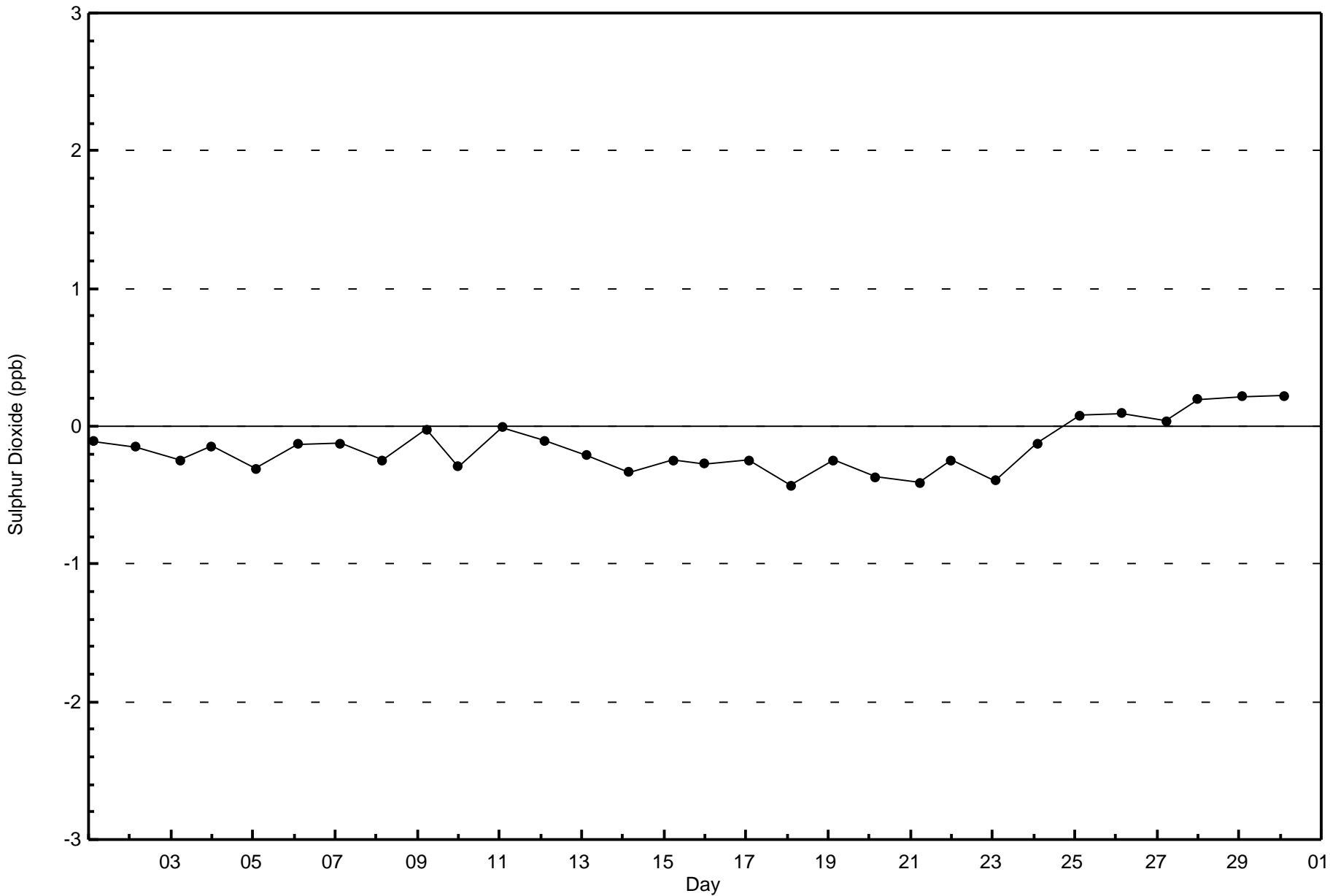
Total Number of Hours: 720

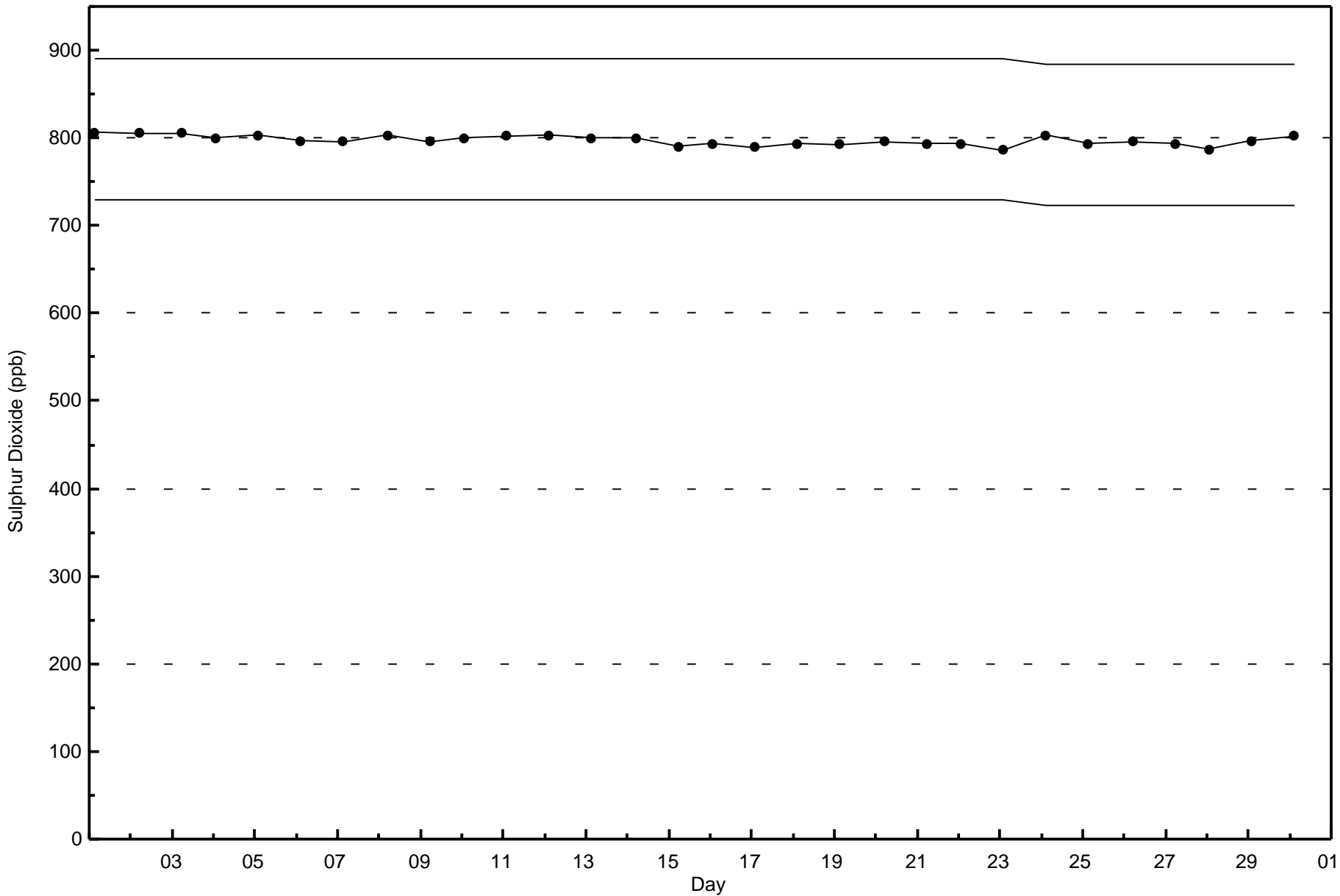


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Sulphur Dioxide (SO₂) - ppb
Shell Muskeg River (AMS 16)



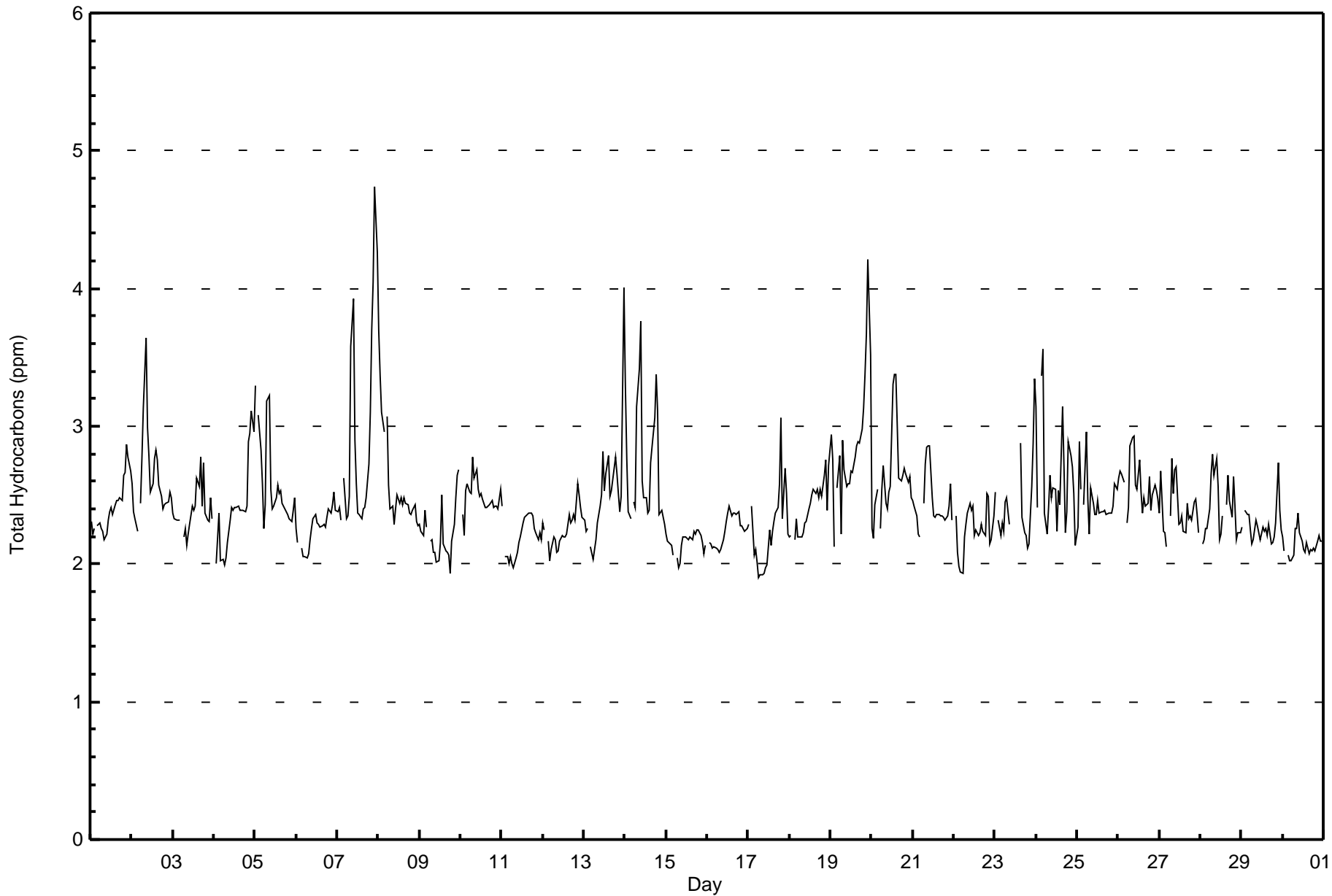






Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Shell Muskeg River - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Shell Muskeg River - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	31	4.54	4.54
2.1 - 3.0	612	89.60	94.14
3.1 - 10.0	40	5.86	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 683

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Shell Muskeg River - June 2016

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	3	1	0	0	2	3	4	7	0	3	3	3	2	0	31
2.1 - 3.0	20	45	68	30	20	15	23	62	78	77	58	35	29	21	17	14	612
3.1 - 10.0	8	3	3	0	0	0	0	1	2	3	2	3	1	2	3	9	40
> 10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	28	48	74	31	20	15	25	66	84	87	60	41	33	26	22	23	683

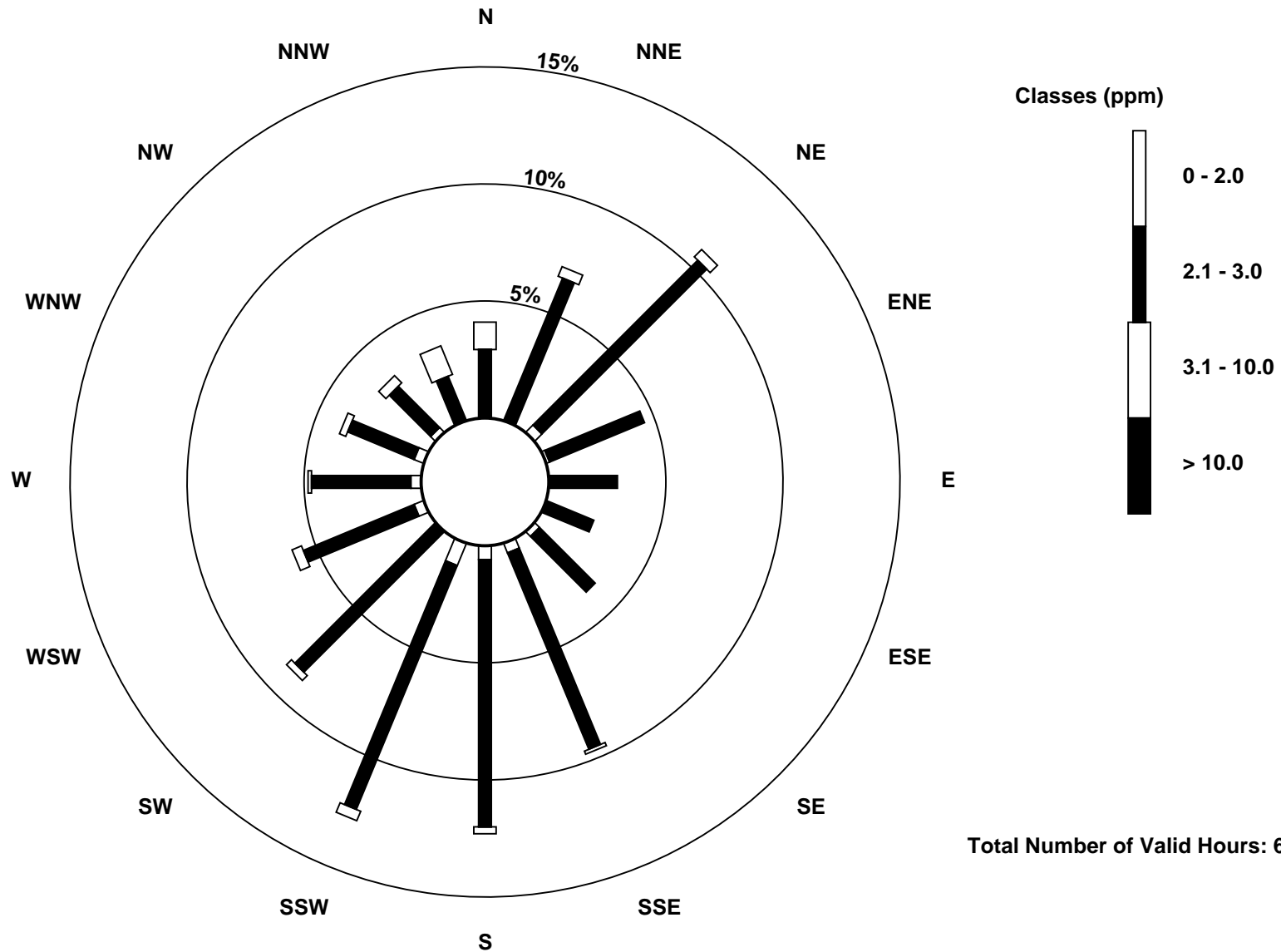
Total Number of Valid Hours: 683

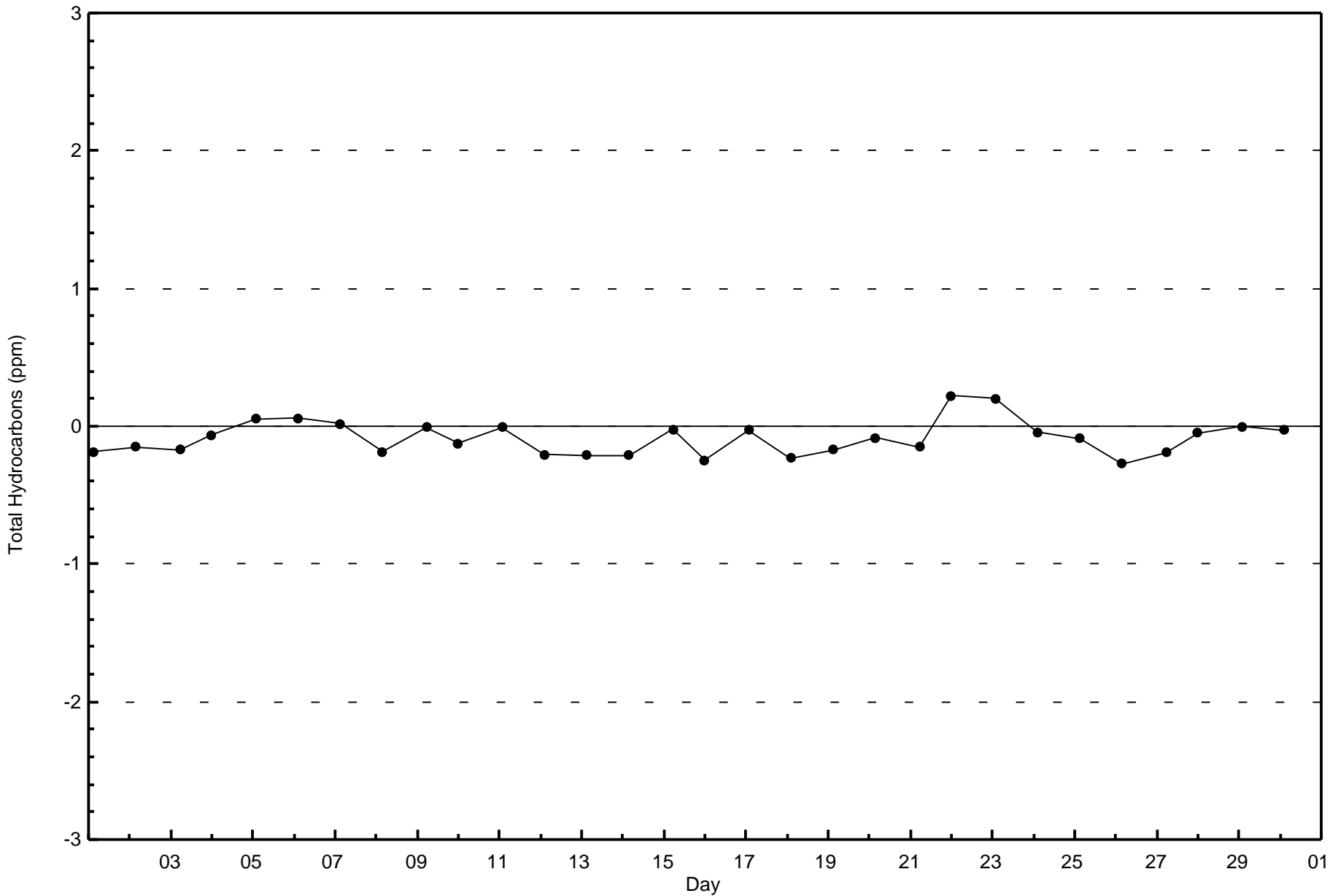
Total Number of Hours: 720

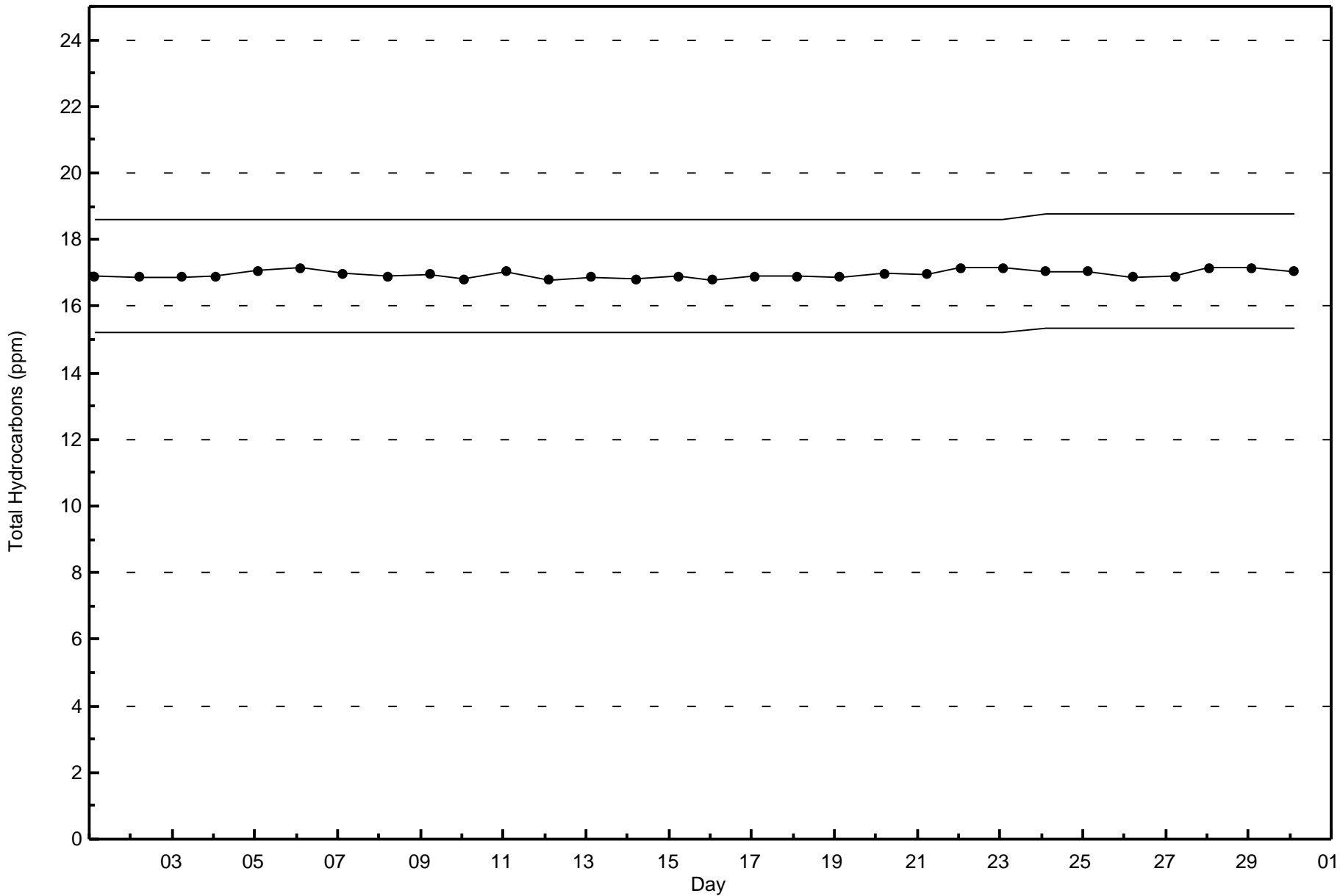


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Total Hydrocarbons (THC) - ppm
Shell Muskeg River (AMS 16)







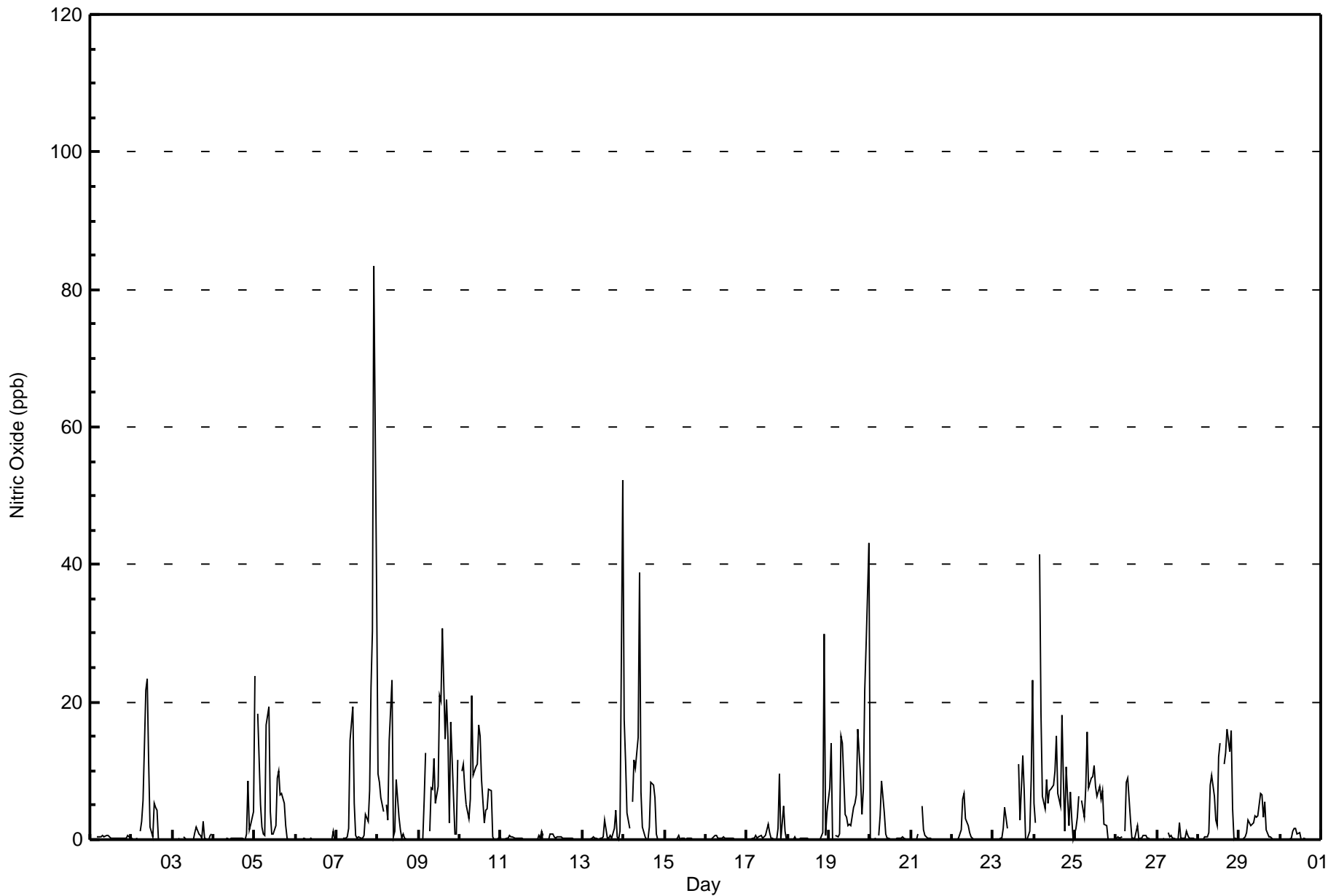


Maximum Value: 83 ppb on Jun 7 23:00		Maximum Daily Average: 10.0 ppb on Jun 7		Hours in Service: 720																						
Minimum Value: 0 ppb on Jun 4 03:00		Minimum Daily Average: 0.1 ppb on Jun 15		Hours of Data: 683																						
Maximum Diurnal Average: 5.9 ppb at hour 24		Minimum Diurnal Average: 1.5 ppb at hour 6		Hours of Missing Data: 37																						
Monthly Average: 3.1 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 3 P ₉₀ = 10 P ₉₉ = 29		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-Jun	0	0	0	Z	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1
2-Jun	0	0	0	0	Z	1	3	6	22	23	11	2	0	5	5	4	0	0	0	0	0	0	0	0	3.6	23
3-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	2	1	1	0	3	0	0	0	1	1	0.4	3
4-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	9	1	2	4	0.8	9
5-Jun	24	Z	18	5	2	1	1	17	19	4	1	1	2	9	10	6	7	5	2	0	0	0	0	0	5.8	24
6-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.1	1
7-Jun	0	0	0	Z	0	0	0	2	14	19	5	1	0	0	0	1	4	3	7	22	30	83	36	10.0	83	
8-Jun	10	8	6	4	Z	5	3	14	23	0	1	9	3	1	0	1	0	0	0	0	0	0	0	0	3.9	23
9-Jun	0	0	0	6	13	Z	1	7	7	12	5	8	21	20	31	15	20	15	3	17	6	1	1	12	9.5	31
10-Jun	Z	10	11	8	5	3	6	21	9	10	11	17	15	9	2	4	4	7	7	0	0	0	0	0	7.0	21
11-Jun	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.2	1
12-Jun	1	1	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
13-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	3	0	0	1	0	2	4	0	0	1	52	2.9	52
14-Jun	18	11	4	2	Z	5	12	10	15	39	7	2	0	0	0	2	8	8	6	1	0	0	0	0	6.5	39
15-Jun	0	0	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
16-Jun	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
17-Jun	0	Z	0	0	0	1	0	0	1	0	0	1	2	1	0	0	0	0	2	10	0	5	1	0	1.1	10
18-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	30	1	4	1.6	30
19-Jun	8	14	0	Z	1	0	1	15	14	4	3	2	2	2	5	5	6	16	9	4	7	22	28	43	9.2	43
20-Jun	0	0	0	0	Z	1	4	9	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	9
21-Jun	0	0	0	0	1	Z	5	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	5
22-Jun	Z	0	0	0	0	1	6	7	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	7
23-Jun	0	Z	0	0	0	0	2	5	2	C	C	C	C	C	C	11	3	12	7	0	0	1	9	23	--	23
24-Jun	5	2	Z	42	18	6	5	9	5	7	7	8	10	15	7	5	18	9	1	11	2	7	3	0	8.8	42
25-Jun	2	3	6	Z	6	3	8	16	8	9	9	11	8	6	8	6	7	2	2	0	0	0	0	0	5.2	16
26-Jun	0	0	0	1	Z	1	8	9	3	0	0	0	2	0	0	0	1	1	0	0	0	0	0	0	1.2	9
27-Jun	0	0	0	0	0	Z	1	0	1	0	0	0	0	2	0	0	0	1	1	0	0	0	0	0	0.4	2
28-Jun	Z	0	0	0	0	0	1	8	9	6	3	2	12	14	M	11	13	16	13	16	5	0	0	0	5.9	16
29-Jun	0	Z	0	0	1	3	2	2	3	3	3	3	7	7	3	5	1	0	0	0	0	0	0	0	2.0	7
30-Jun	0	0	Z	0	0	0	0	1	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerospan C - Calibration M - Maintenance																										



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Shell Muskeg River - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitric Oxide (NO) - ppb
Shell Muskeg River - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	664	97.22	97.22
21 - 40	15	2.20	99.41
41 - 80	3	0.44	99.85
81 - 159	1	0.15	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Shell Muskeg River - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	25	44	72	31	20	15	25	66	84	87	60	40	32	25	20	18	664
21 - 40	2	4	2	0	0	0	0	0	0	0	0	1	1	1	1	3	15
11 - 80	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3
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
Totals	28	48	74	31	20	15	25	66	84	87	60	41	33	26	22	23	683

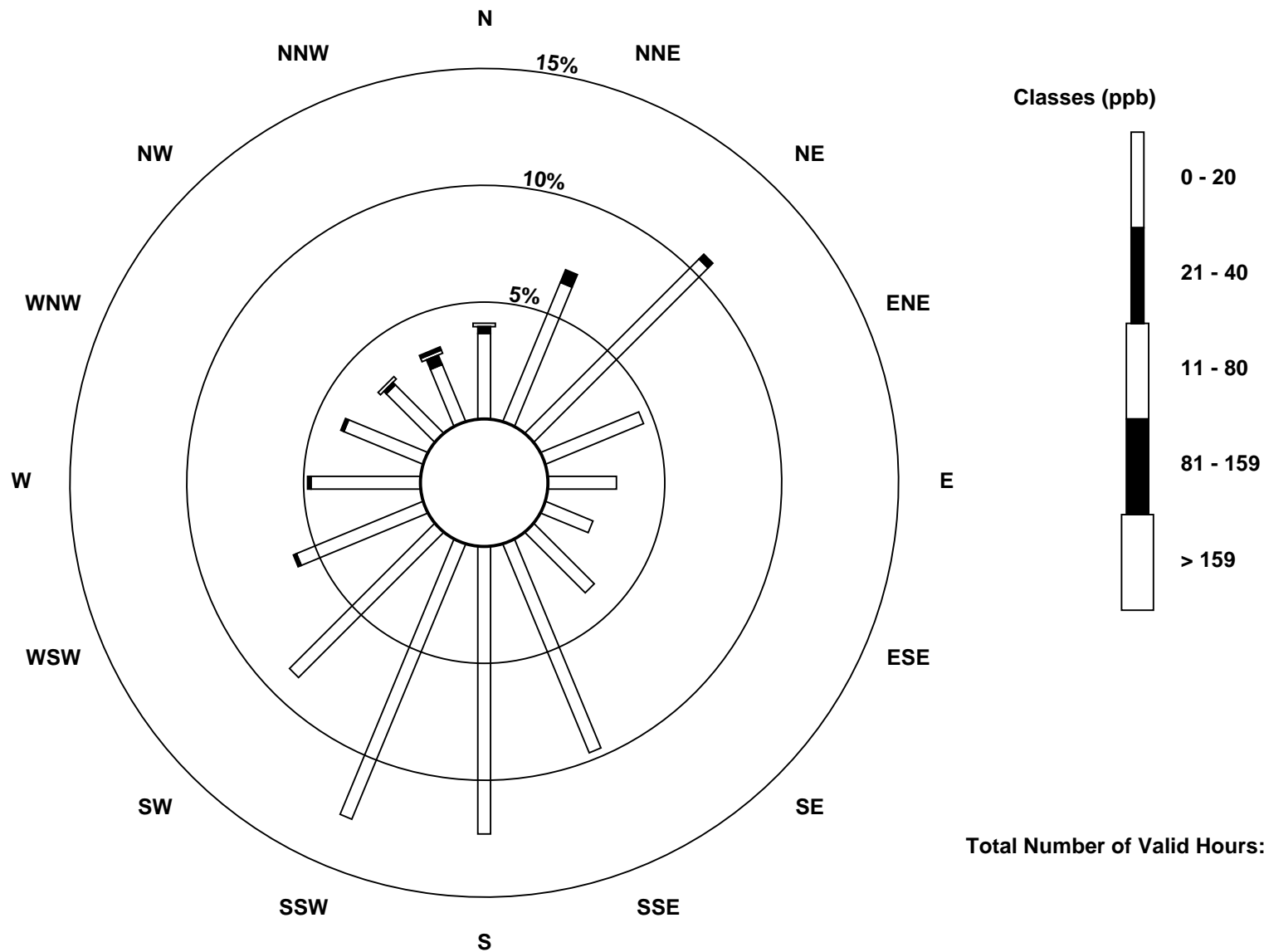
Total Number of Valid Hours: 683

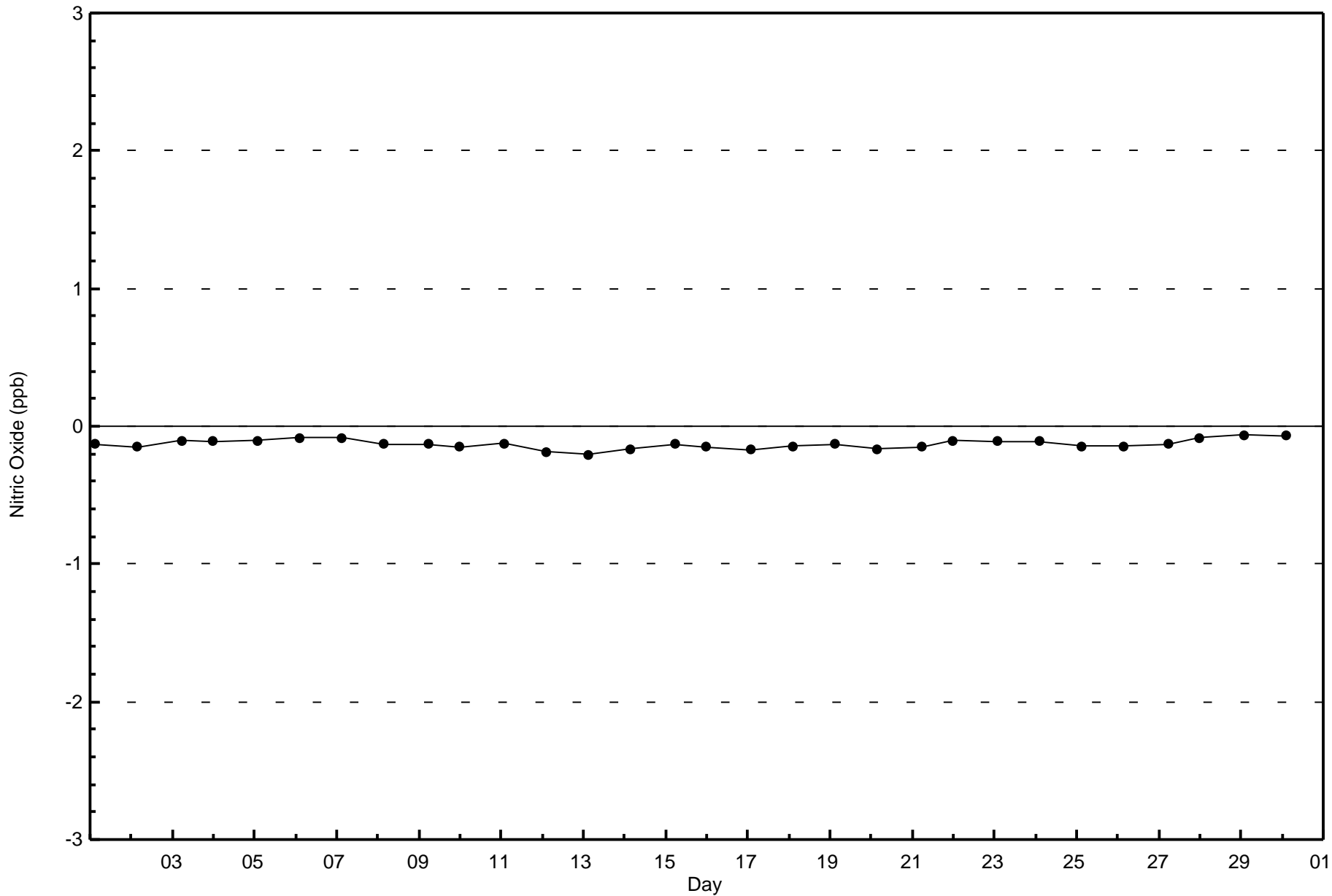
Total Number of Hours: 720

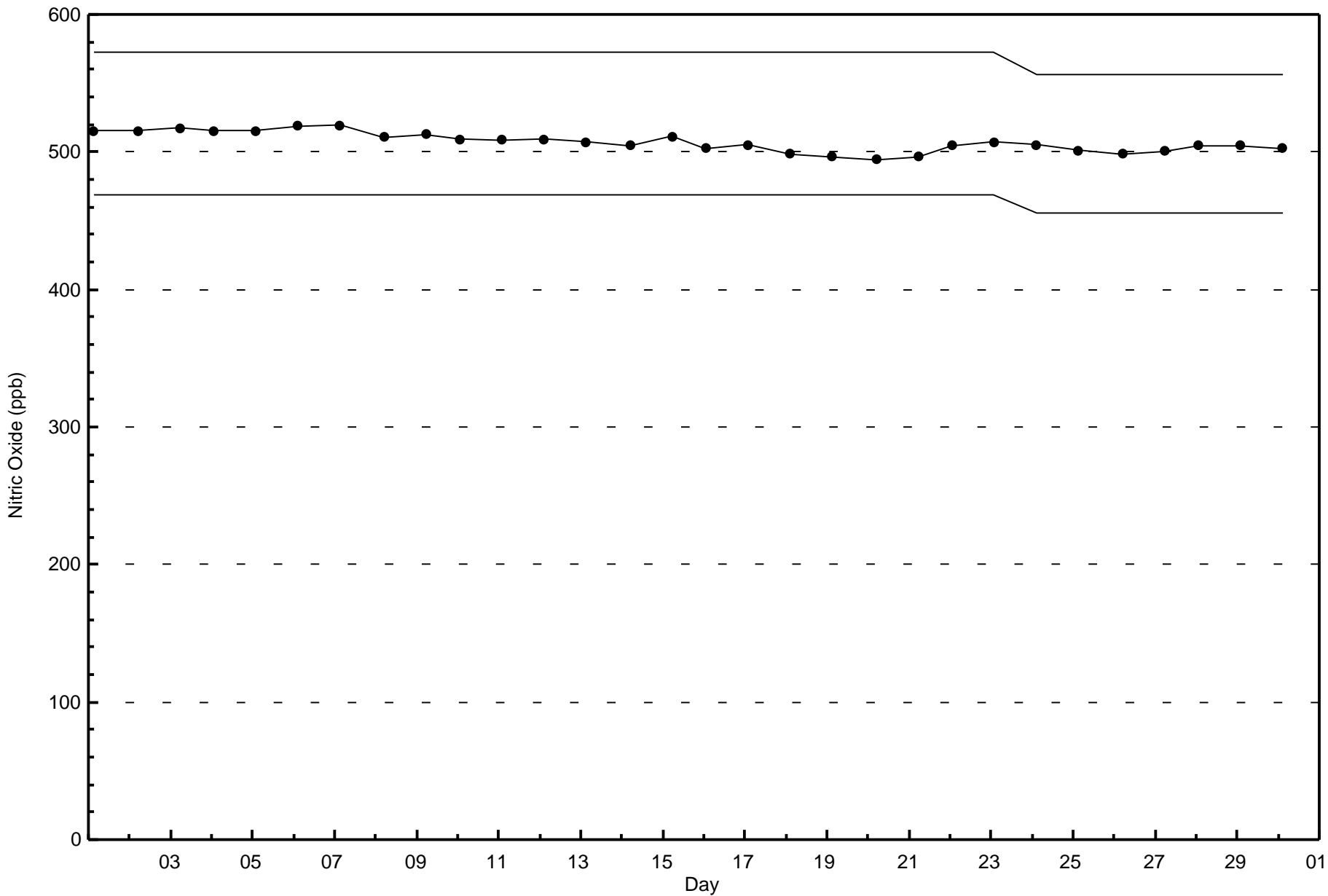


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitric Oxide (NO) - ppb
Shell Muskeg River (AMS 16)









Wood Buffalo Environmental Association
Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Maximum Value: 41 ppb on Jun 7 23:00	Maximum Daily Average: 12.4 ppb on Jun 7	Hours in Service: 720
Minimum Value: 0 ppb on Jun 6 07:00	Minimum Daily Average: 1.0 ppb on Jun 30	Minimum Diurnal Average: 2.7 ppb at hour 6	Hours of Data: 683
Maximum Diurnal Average: 8.2 ppb at hour 24	Monthly Average: 4.8 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 2 Q ₃ = 6 P ₉₀ = 13 P ₉₉ = 25	Hours of Missing Data: 37
			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-Jun	2	3	3	Z	5	2	2	2	2	2	2	1	1	1	1	1	1	1	1	4	3	7	18	16	3.5	18
2-Jun	10	4	2	1	Z	3	4	7	16	16	15	5	2	12	13	13	2	1	1	1	1	2	2	3	5.9	16
3-Jun	2	2	4	3	2	Z	2	1	0	0	0	0	1	4	6	6	3	2	7	2	2	3	8	10	3.1	10
4-Jun	Z	2	2	1	0	1	0	0	0	0	1	0	1	1	1	1	1	0	0	3	15	14	20	16	3.4	20
5-Jun	25	Z	17	12	7	2	1	13	19	7	2	2	4	9	9	8	6	4	2	1	1	1	7	9	7.3	25
6-Jun	2	0	Z	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	2	4	6	7	1.4	7
7-Jun	5	1	2	Z	3	2	2	5	23	32	14	5	2	2	1	2	2	7	10	22	38	40	41	29	12.4	41
8-Jun	22	19	14	11	Z	6	5	15	19	1	4	14	6	4	1	3	2	1	1	2	2	7	1	1	7.0	22
9-Jun	6	6	7	11	14	Z	4	11	11	15	7	10	17	16	20	15	18	15	4	20	10	6	5	22	11.6	22
10-Jun	Z	15	13	8	6	3	5	15	8	7	7	10	10	6	2	4	4	8	10	2	1	2	2	17	7.2	17
11-Jun	10	Z	2	3	2	2	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	1	5	3	1.4	10
12-Jun	6	6	Z	2	1	3	2	1	0	1	1	1	0	0	0	0	0	0	0	0	1	2	1	1	1.2	6
13-Jun	1	1	1	Z	1	1	1	0	0	0	0	1	5	1	0	2	0	3	6	2	1	3	23	2.2	23	
14-Jun	13	12	10	8	Z	7	12	14	17	32	9	3	3	1	1	5	16	14	13	7	1	3	2	1	8.8	32
15-Jun	1	1	2	6	2	Z	1	3	2	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1.3	6
16-Jun	Z	4	4	3	4	3	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	2	1.2	4
17-Jun	4	Z	2	2	2	3	1	2	3	1	1	1	4	1	1	0	0	0	6	21	1	6	7	2	3.0	21
18-Jun	1	2	Z	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	21	1	10	1.8	21
19-Jun	18	19	2	Z	5	2	2	15	14	6	5	3	4	4	7	8	9	15	12	11	19	23	24	26	10.9	26
20-Jun	10	6	6	4	Z	1	4	10	6	1	0	0	0	0	0	1	2	1	3	6	7	4	5	2	3.4	10
21-Jun	8	10	11	8	8	Z	11	5	4	3	2	1	0	0	0	0	0	1	1	1	2	3	4	6	3.8	11
22-Jun	Z	15	7	4	3	5	14	15	10	9	8	4	2	1	1	1	1	1	1	0	1	0	1	2	4.5	15
23-Jun	1	Z	6	3	4	2	5	8	5	C	C	C	C	C	C	20	5	13	8	0	0	5	8	25	--	25
24-Jun	20	9	Z	21	14	7	3	7	6	8	10	10	10	15	7	11	15	8	3	24	9	13	7	1	10.2	24
25-Jun	5	5	6	Z	5	4	4	6	4	6	6	7	7	4	6	5	6	2	2	0	0	0	1	3	4.1	7
26-Jun	3	5	4	3	Z	2	6	10	6	2	2	2	10	2	2	1	3	3	1	2	2	2	5	3	3.5	10
27-Jun	2	1	1	1	1	Z	1	1	1	0	0	0	0	3	1	0	1	2	4	4	9	12	6	2	2.2	12
28-Jun	Z	1	5	4	2	1	2	9	12	12	8	3	7	10	M	11	12	13	12	16	6	1	2	2	6.7	16
29-Jun	3	Z	7	6	7	8	6	5	6	6	4	5	10	9	4	10	5	3	4	3	4	3	3	0	5.1	10
30-Jun	0	0	Z	0	1	0	1	4	5	5	2	3	0	0	1	0	0	0	0	1	0	0	0	1	1.0	5

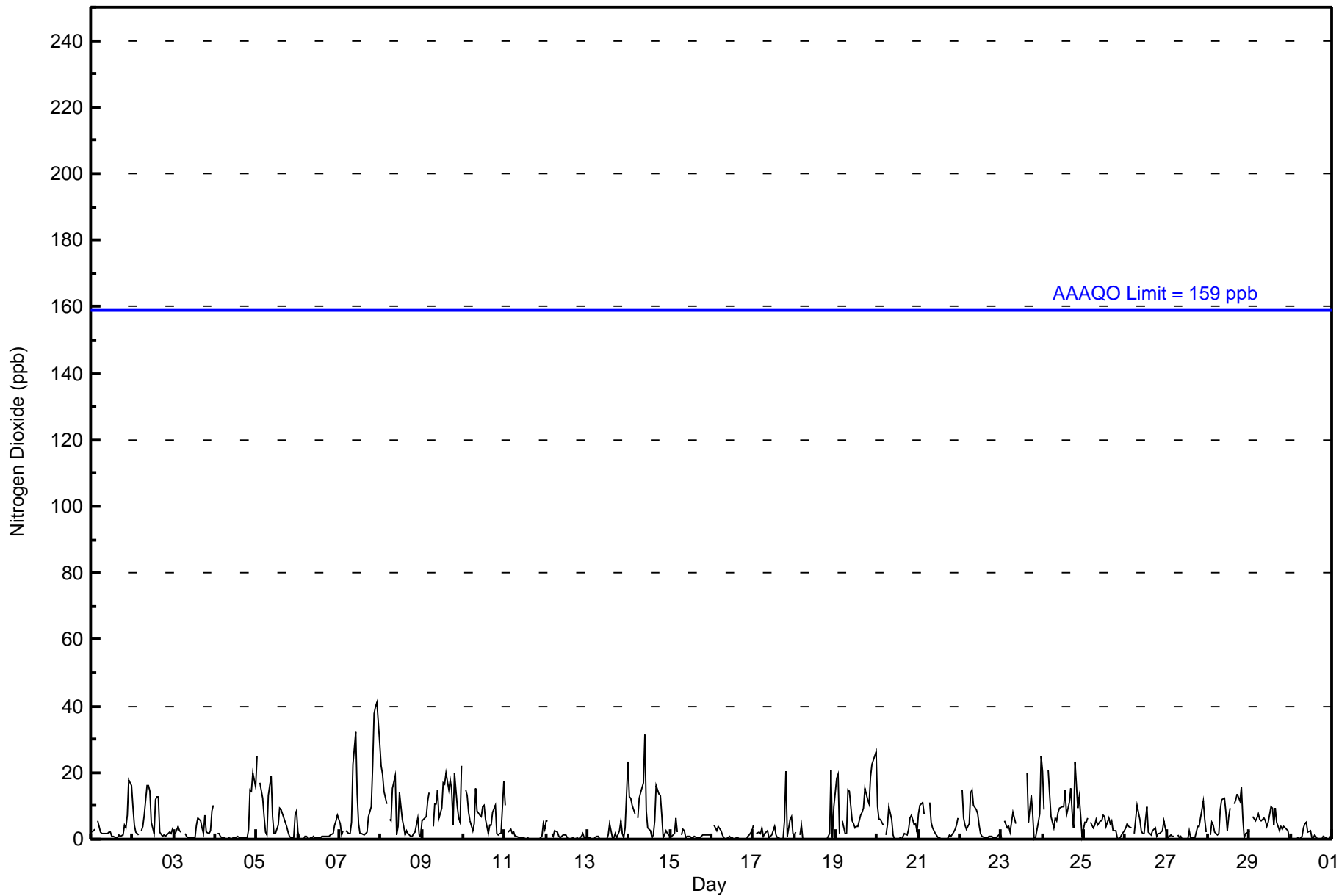
7.0	5.9	5.5	5.1	4.1	2.7	3.5	6.1	6.7	6.0	3.7	3.2	3.5	3.8	3.1	4.2	3.9	3.9	3.7	5.3	4.7	6.2	6.5	8.2	Diurnal Average	
25	19	17	21	14	8	14	15	23	32	15	14	17	16	20	20	18	15	13	24	38	40	41	29	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	663	97.07	97.07
21 - 40	19	2.78	99.85
41 - 80	1	0.15	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	23	46	73	31	20	15	25	66	84	87	59	41	32	26	21	14	663
21 - 40	5	2	1	0	0	0	0	0	0	0	1	0	1	0	1	8	19
11 - 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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
Totals	28	48	74	31	20	15	25	66	84	87	60	41	33	26	22	23	683

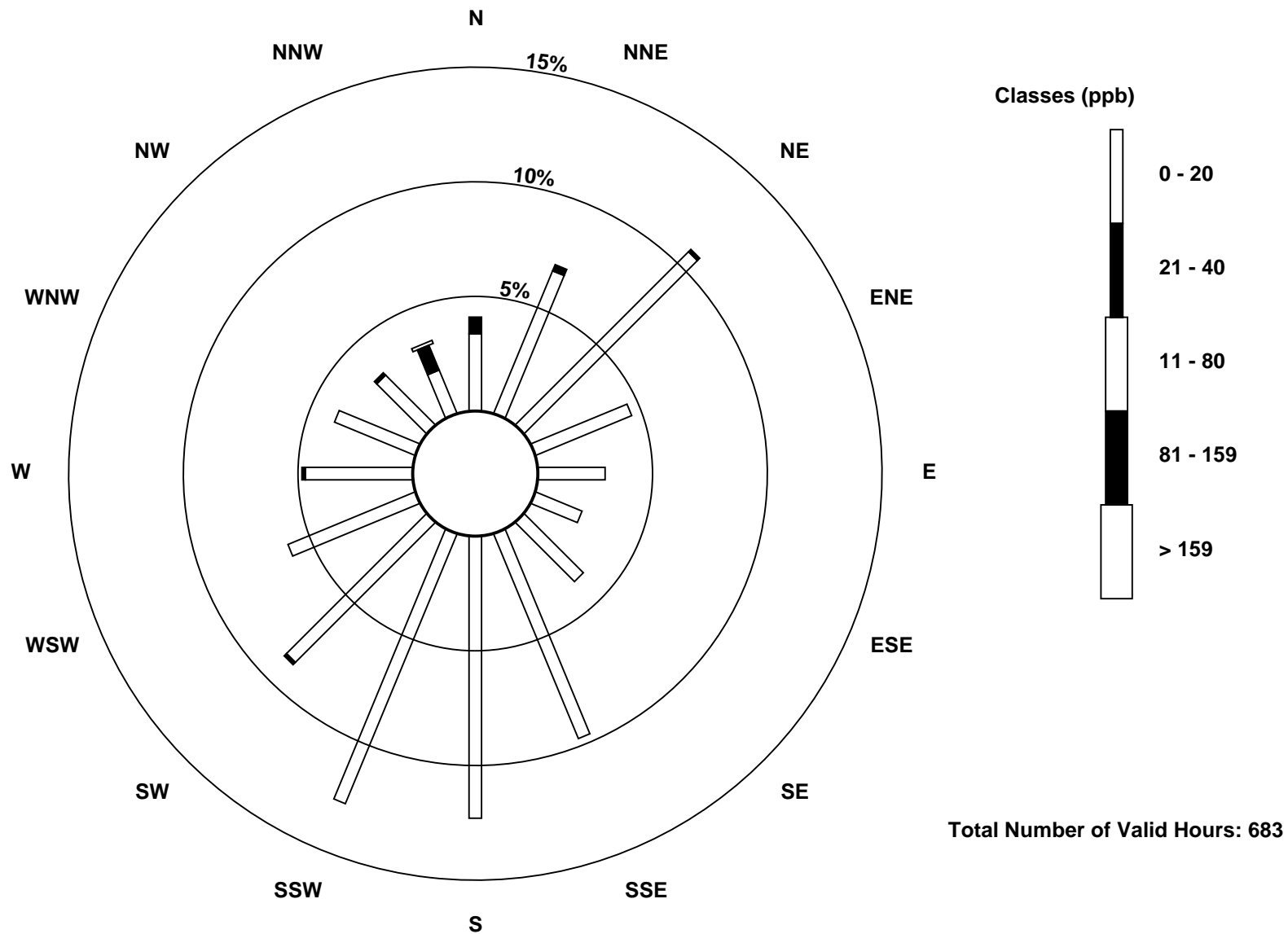
Total Number of Valid Hours: 683

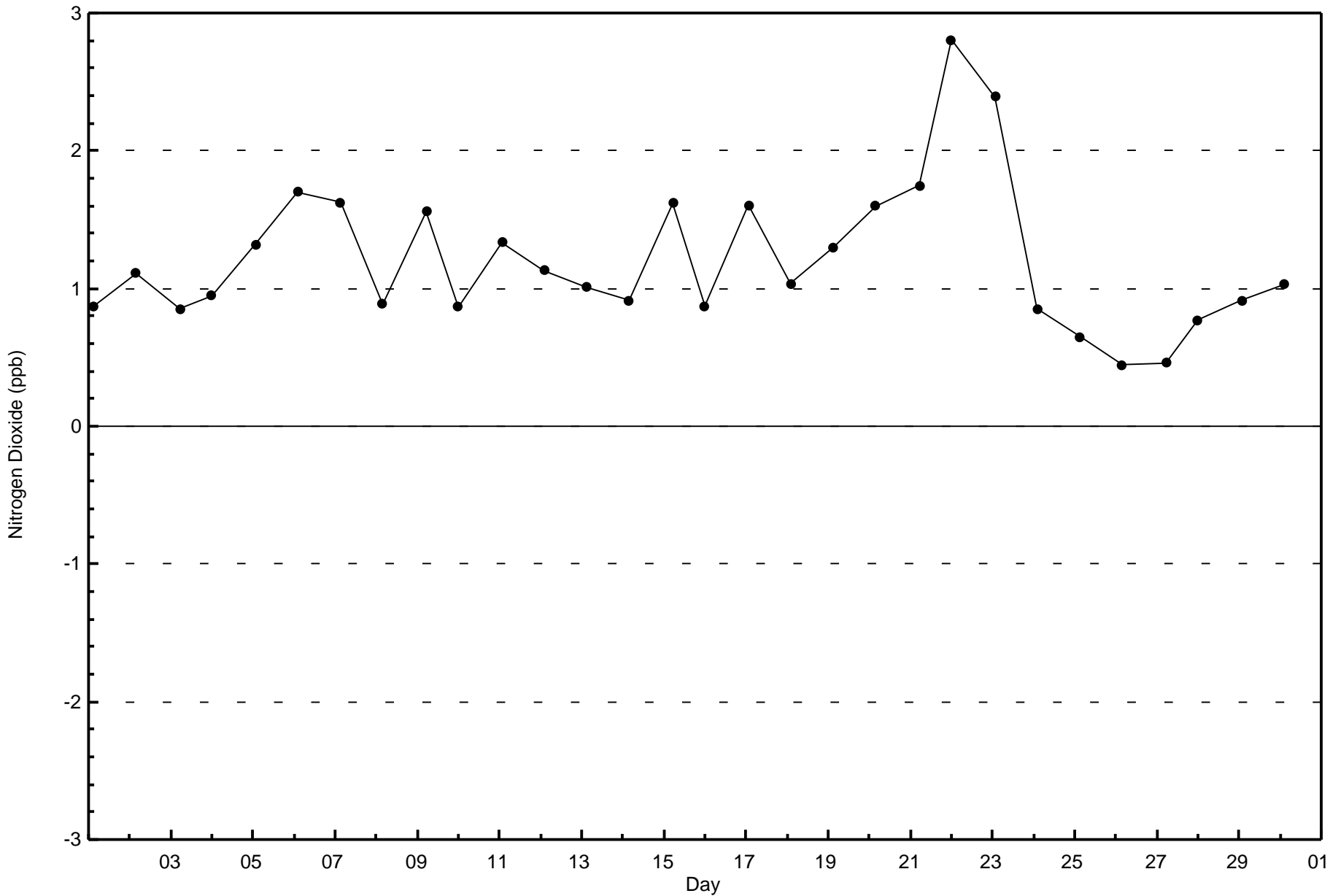
Total Number of Hours: 720

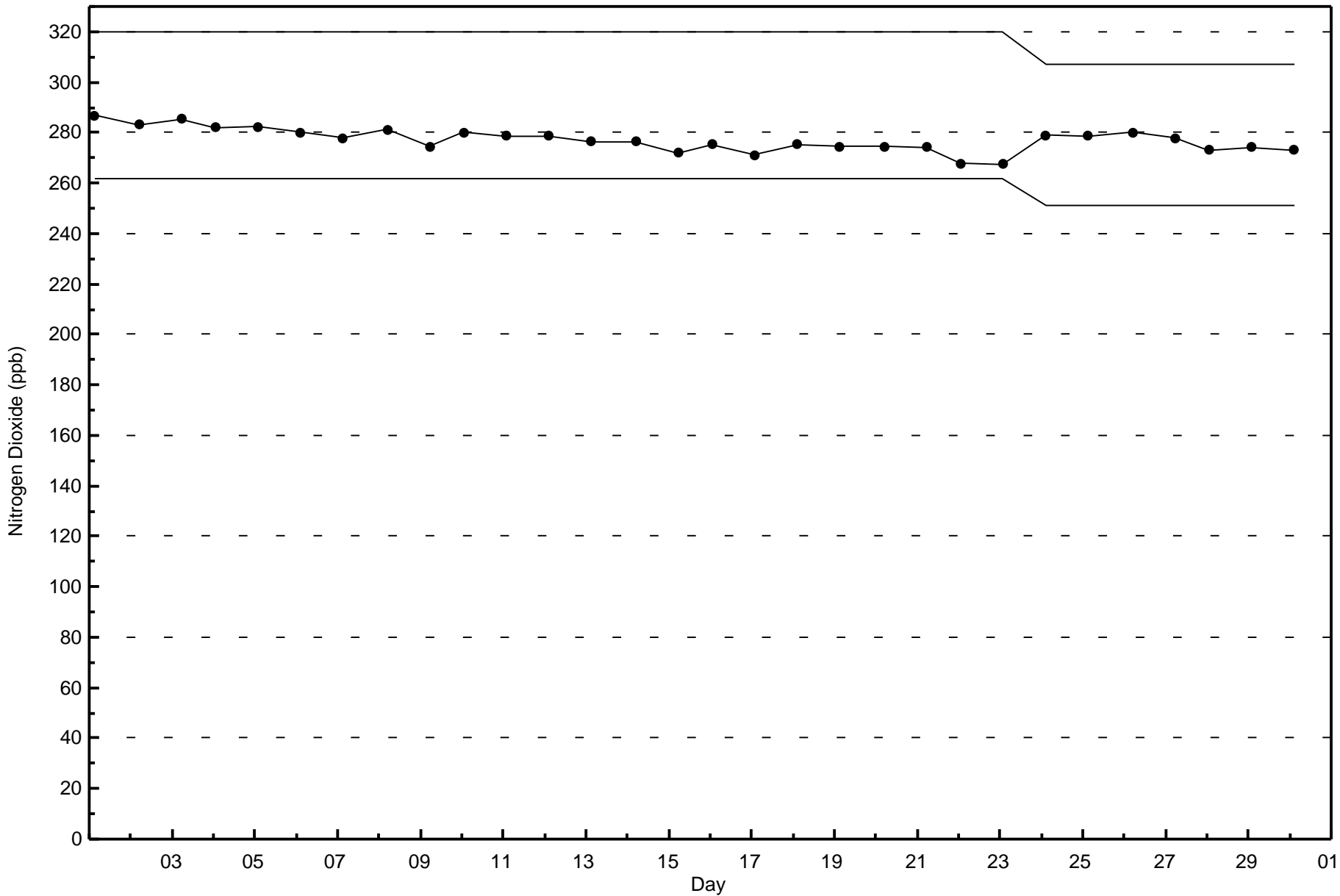


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Dioxide (NO₂) - ppb
Shell Muskeg River (AMS 16)









Wood Buffalo Environmental Association
Summary of Hour Averages

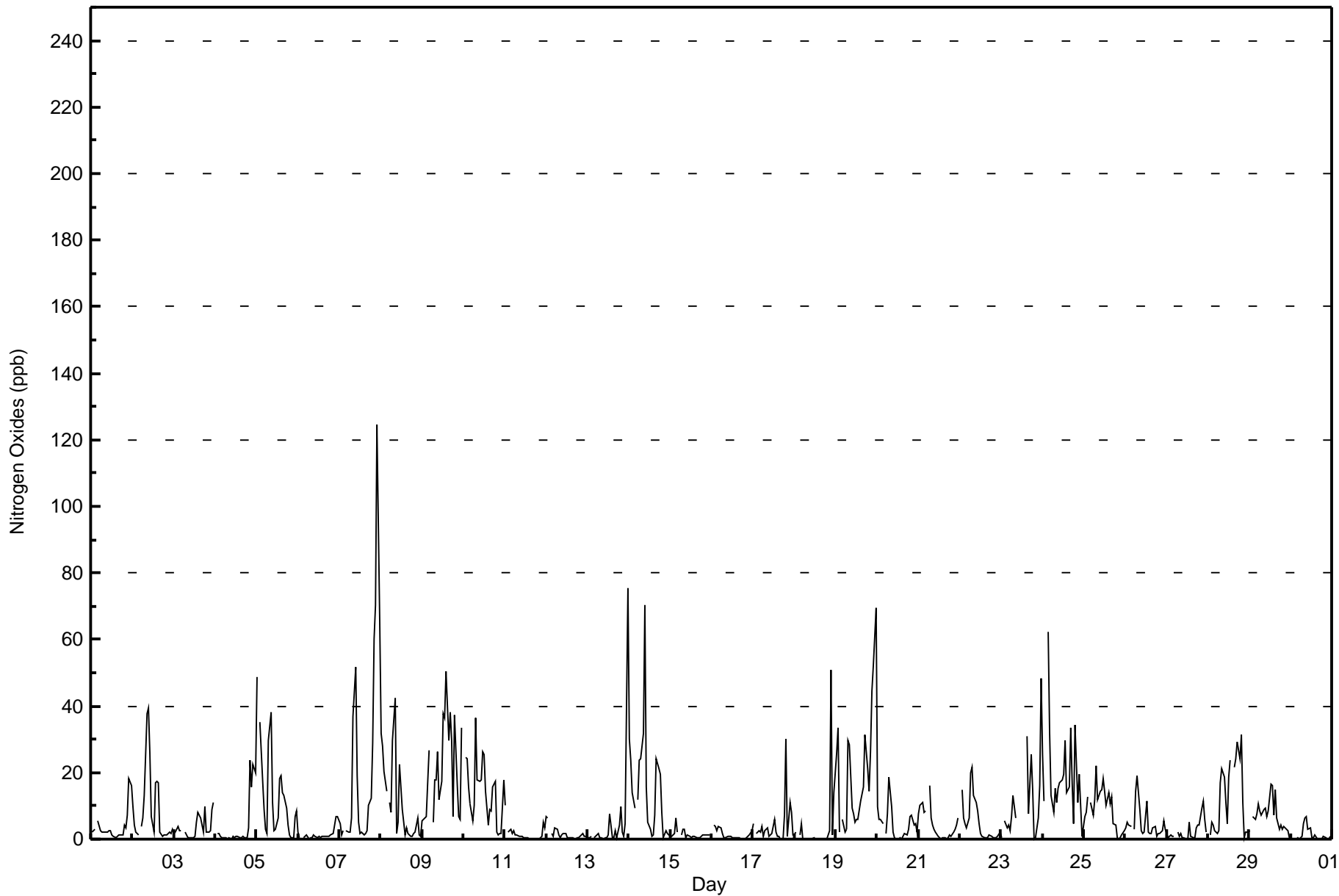
Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River - June 2016

Maximum Value: 125 ppb on Jun 7 23:00																		Maximum Daily Average: 22.4 ppb on Jun 7						Hours in Service: 720			
Minimum Value: 0 ppb on Jun 30 04:00																		Minimum Daily Average: 1.3 ppb on Jun 16						Hours of Data: 683			
Maximum Diurnal Average: 14.1 ppb at hour 24																		Minimum Diurnal Average: 4.2 ppb at hour 6						Hours of Missing Data: 37			
Monthly Average: 8.0 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 3 Q ₃ = 10 P ₉₀ = 22 P ₉₉ = 61						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-Jun	2	3	3	Z	6	3	2	2	2	2	3	3	1	1	1	1	1	1	1	4	3	7	18	16	3.7	18	
2-Jun	10	4	2	1	Z	4	7	13	38	39	26	7	2	17	18	17	2	1	1	1	2	2	3	9.5	39		
3-Jun	2	2	4	3	3	Z	2	1	0	0	0	0	1	5	8	6	4	2	10	2	2	3	9	11	3.5	11	
4-Jun	Z	2	2	1	0	0	0	0	1	0	1	1	1	1	1	1	1	1	0	4	24	16	22	20	4.2	24	
5-Jun	49	Z	35	17	9	3	2	30	38	11	2	3	6	18	19	14	13	9	4	1	1	7	9	13.1	49		
6-Jun	2	0	Z	0	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	2	4	7	7	1.5	7	
7-Jun	4	1	2	Z	3	2	2	7	37	52	19	5	2	2	1	2	3	10	12	29	60	70	125	65	22.4	125	
8-Jun	32	28	20	15	Z	11	8	30	42	2	5	23	9	5	1	3	2	1	1	2	2	6	1	1	10.9	42	
9-Jun	5	6	7	17	27	Z	5	18	18	26	12	17	38	37	51	30	38	30	7	37	16	7	6	34	21.2	51	
10-Jun	Z	25	24	16	11	6	10	36	18	18	18	26	25	15	4	9	8	16	17	2	1	2	2	18	14.2	36	
11-Jun	10	Z	2	3	2	3	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	5	3	1.6	10	
12-Jun	7	6	Z	2	1	3	3	1	0	1	2	1	1	0	0	0	0	0	0	0	1	2	1	1	1.5	7	
13-Jun	1	1	1	Z	1	1	1	0	0	0	0	0	1	7	1	1	3	0	4	10	2	1	5	76	5.1	76	
14-Jun	30	24	14	9	Z	12	24	24	32	70	16	5	3	1	1	1	7	24	21	19	8	1	3	2	1	15.3	70
15-Jun	1	1	2	6	2	Z	1	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.4	6	
16-Jun	Z	4	4	3	4	3	2	0	0	1	1	1	1	0	1	1	0	0	0	0	0	1	1	2	1.3	4	
17-Jun	5	Z	2	2	2	4	1	2	3	1	1	2	6	2	1	1	0	0	7	30	1	11	8	1	4.1	30	
18-Jun	1	2	Z	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	51	1	14	3.4	51	
19-Jun	26	34	2	Z	6	2	3	30	28	9	8	5	6	6	12	14	16	31	21	14	26	44	52	69	20.2	69	
20-Jun	10	6	6	5	Z	2	8	18	10	2	0	0	0	0	0	1	2	1	3	7	7	4	5	2	4.3	18	
21-Jun	8	10	11	8	9	Z	16	6	4	3	2	1	0	0	0	0	0	1	1	1	2	3	4	6	4.2	16	
22-Jun	Z	15	6	5	3	6	20	21	13	11	9	5	2	1	1	0	1	1	1	0	0	0	1	2	5.4	21	
23-Jun	0	Z	6	3	4	3	7	13	6	C	C	C	C	C	C	31	8	25	15	0	0	7	16	48	--	48	
24-Jun	26	11	Z	62	32	13	8	15	11	15	17	18	20	30	14	16	33	17	5	34	11	19	10	1	19.1	62	
25-Jun	7	8	13	Z	11	7	12	22	12	14	15	18	15	10	14	11	13	5	4	0	0	0	1	3	9.3	22	
26-Jun	3	5	4	4	Z	3	14	19	9	3	2	2	12	2	2	2	3	4	1	2	2	2	5	3	4.7	19	
27-Jun	2	0	1	1	1	Z	2	1	2	0	0	0	0	5	1	0	1	3	4	4	9	12	6	2	2.5	12	
28-Jun	Z	1	5	4	3	2	3	17	21	19	11	4	19	24	M	21	24	29	24	31	11	0	2	2	12.6	31	
29-Jun	3	Z	7	6	8	10	8	7	9	9	7	9	16	16	7	15	6	3	4	3	4	3	3	0	7.1	16	
30-Jun	0	0	Z	0	1	0	1	5	6	7	3	4	0	0	1	0	0	0	0	1	0	0	0	1	1.3	7	
																		Diurnal Average									
																		Diurnal Maximum									
Z - zerospan																		C - Calibration						M - Maintenance			



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	608	89.02	89.02
21 - 40	59	8.64	97.66
41 - 80	15	2.20	99.85
81 - 159	1	0.15	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	20	26	63	31	20	15	25	66	82	85	57	39	32	24	13	10	608
21 - 40	5	18	10	0	0	0	0	0	2	2	3	2	0	2	8	7	59
11 - 80	3	4	1	0	0	0	0	0	0	0	0	0	1	0	1	5	15
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
Totals	28	48	74	31	20	15	25	66	84	87	60	41	33	26	22	23	683

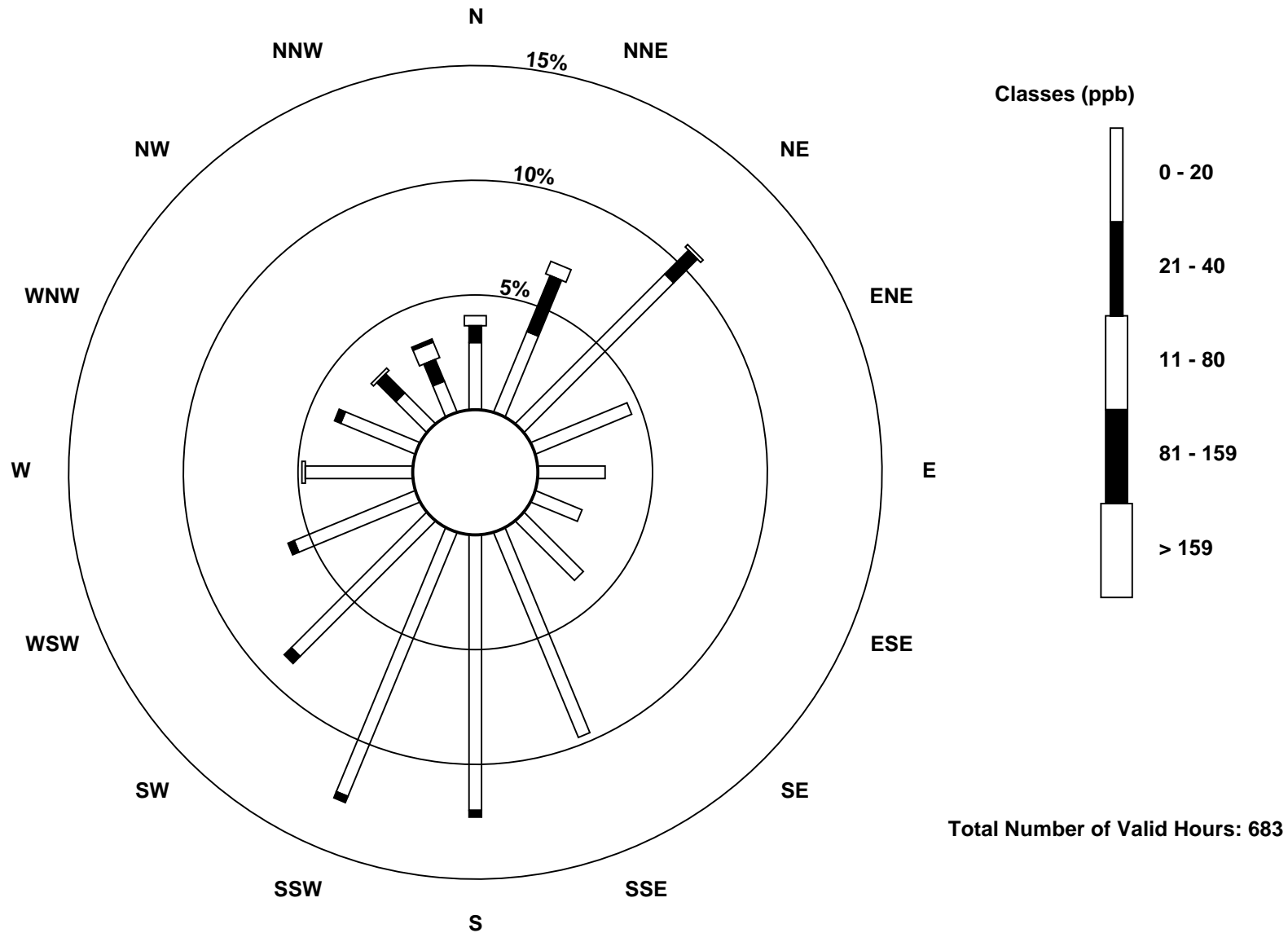
Total Number of Valid Hours: 683

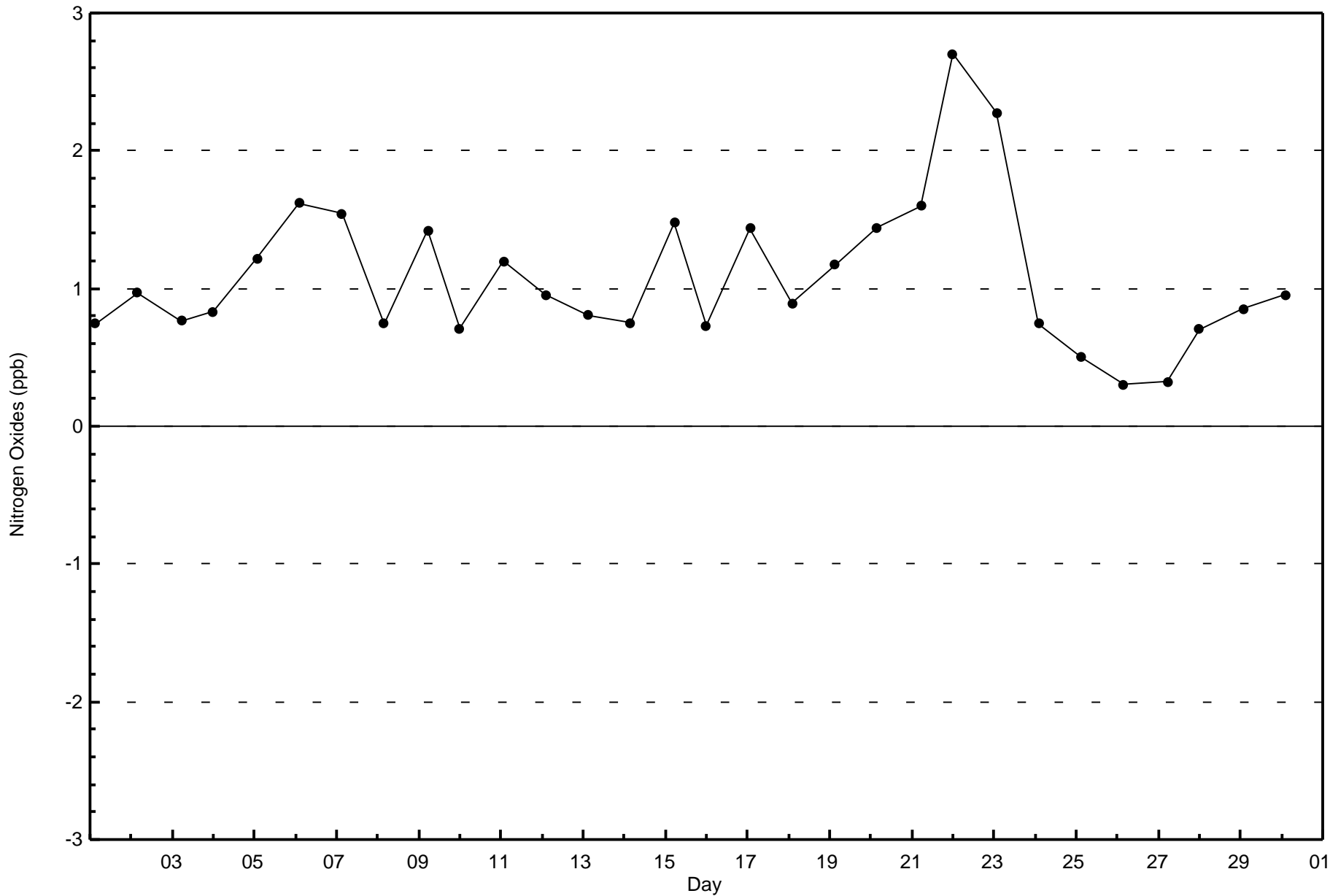
Total Number of Hours: 720

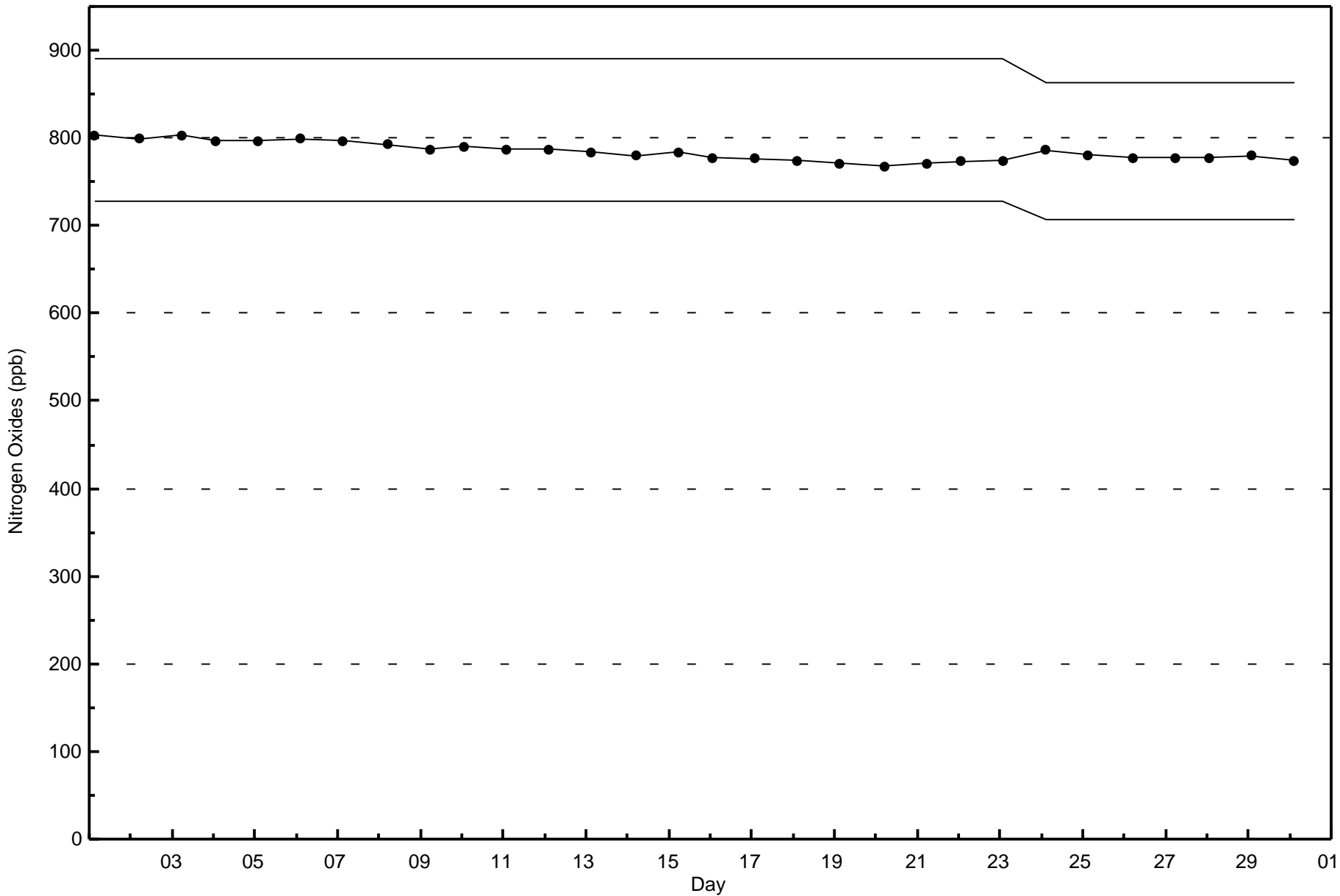


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxides (NO_x) - ppb
Shell Muskeg River (AMS 16)









Number of Exceedences (AAAQO): 24-hr: 0	Hours in Service: 720
Maximum Value: 71.4 µg/m ³ on Jun 29 02:00	Maximum Daily Average: 16.9 µg/m ³ on Jun 29
Minimum Value: 1.0 µg/m ³ on Jun 15 01:00	Hours of Data: 716
Maximum Diurnal Average: 11.5 µg/m ³ at hour 22	Hours of Missing Data: 4
Monthly Average: 7.83 µg/m ³	Hours of Calibration: 4
Minimum Daily Average: 2.8 µg/m ³ on Jun 17	Percent Operational Time: 100.0
Minimum Diurnal Average: 4.9 µg/m ³ at hour 7	
Percentiles: P ₁ = 1.3 P ₁₀ = 2.1 Q ₁ = 3.5 Median = 6.3 Q ₃ = 10.0 P ₉₀ = 14.4 P ₉₉ = 30.9	

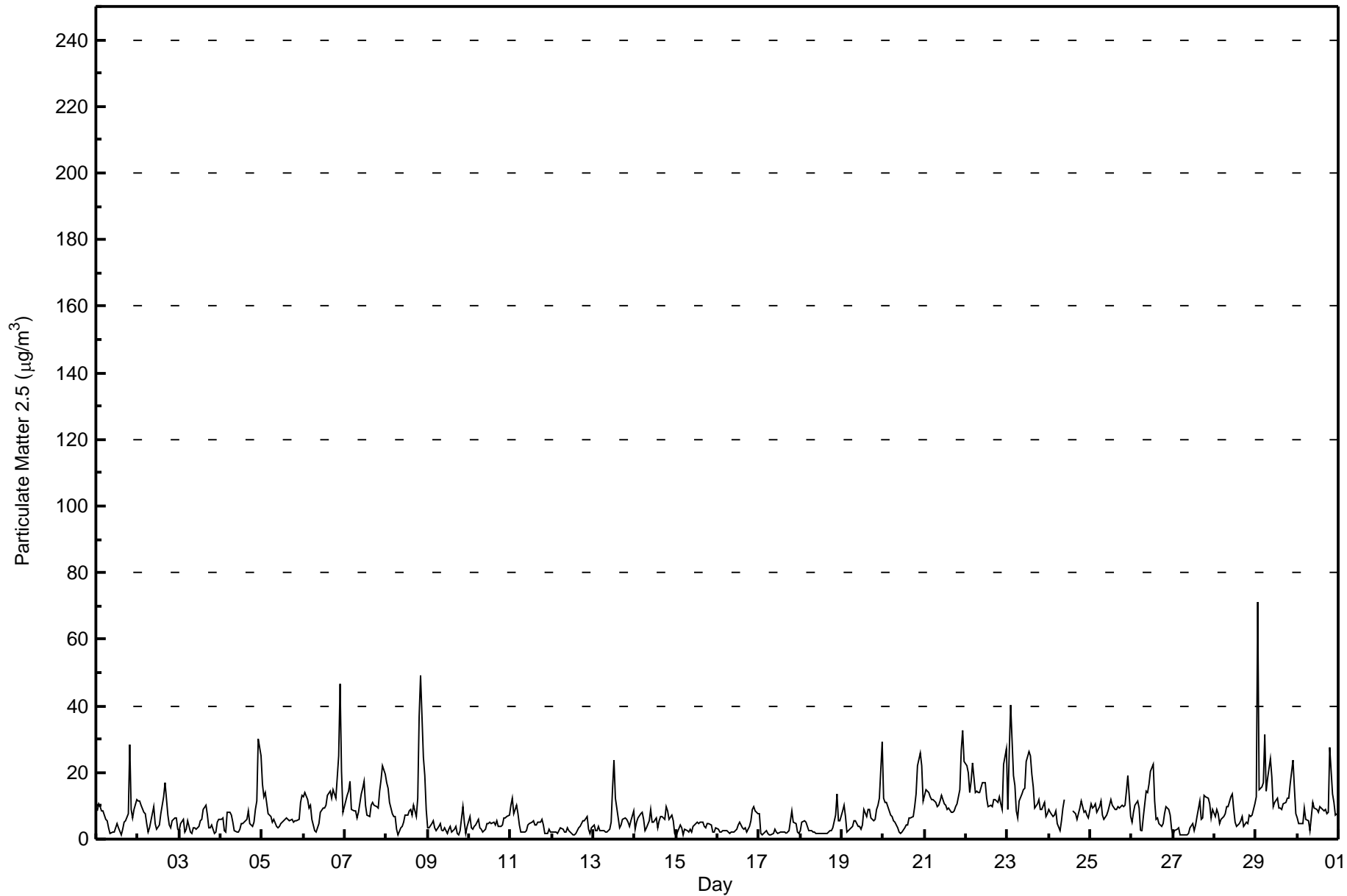
Day	Hourly Period Ending At (MST)																								Daily Average	Daily Maximum																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																								
1-Jun	8.5	10.6	9.6	8.4	8.5	6.1	5.4	3.3	1.7	2.0	2.0	3.5	4.8	3.4	1.5	3.0	5.2	5.7	7.5	28.2	9.0	6.3	9.1	12.0	6.9	28.2																						
2-Jun	11.3	11.3	10.3	8.1	7.8	4.8	2.1	3.2	7.5	9.6	4.5	2.9	4.3	7.8	10.4	12.9	16.9	7.1	4.3	3.5	5.6	6.5	6.3	2.9	7.2	16.9																						
3-Jun	2.4	4.8	5.9	2.3	2.9	5.4	2.0	1.8	3.4	3.3	3.0	3.8	5.4	6.0	9.0	10.2	7.0	3.2	3.6	4.4	1.7	2.2	5.2	5.9	4.4	10.2																						
4-Jun	6.0	6.2	2.7	2.2	8.1	8.0	7.1	5.0	2.5	2.0	2.2	3.2	4.6	4.6	5.6	5.8	8.7	4.7	3.9	5.2	8.7	11.3	30.0	25.0	7.2	30.0																						
5-Jun	16.5	12.8	13.8	7.5	7.2	6.9	5.2	5.9	3.8	3.3	3.6	4.7	5.4	5.8	6.3	5.9	5.6	6.1	5.1	5.7	5.7	5.8	11.0	13.3	7.2	16.5																						
6-Jun	12.8	14.0	12.0	9.5	10.2	5.8	2.3	2.0	3.2	4.8	7.9	9.5	9.2	10.2	13.1	14.4	12.4	14.9	13.7	12.3	24.8	46.4	20.2	8.2	12.3	46.4																						
7-Jun	11.5	13.1	14.3	17.6	9.0	8.5	8.4	6.5	8.1	13.5	15.2	17.5	10.3	7.4	6.8	10.2	10.9	10.0	9.6	9.5	14.4	17.7	21.9	19.3	12.1	21.9																						
8-Jun	17.0	15.2	10.9	7.7	6.9	7.0	2.8	1.5	3.3	3.9	5.2	7.1	7.1	8.5	8.8	7.3	10.0	6.8	12.4	37.1	49.2	24.7	19.2	9.0	12.0	49.2																						
9-Jun	3.6	3.3	4.7	5.4	3.4	2.8	3.8	4.8	2.4	2.5	3.4	1.7	2.8	3.8	2.0	3.0	3.8	1.6	1.2	2.6	9.6	5.2	1.5	3.6	3.4	9.6																						
10-Jun	6.8	3.3	3.0	3.8	4.3	6.0	3.5	2.8	2.2	3.1	4.7	4.8	4.9	4.6	4.9	4.4	5.4	3.9	3.7	4.4	6.3	6.5	6.9	7.0	4.6	7.0																						
11-Jun	10.2	12.5	7.6	10.0	7.6	4.4	2.3	2.2	2.0	2.7	4.2	4.7	5.3	5.7	4.1	4.3	4.9	5.1	6.1	4.1	1.7	1.8	2.9	2.0	4.9	12.5																						
12-Jun	2.1	2.1	2.1	1.9	2.5	3.3	3.0	2.0	2.1	3.4	2.7	1.5	1.5	1.4	1.7	3.6	4.0	4.5	5.3	5.4	6.6	2.8	1.9	3.4	3.0	6.6																						
13-Jun	4.1	2.6	2.7	3.8	2.6	2.5	2.5	2.3	2.2	3.1	5.1	15.2	23.9	12.4	6.2	3.6	4.3	6.0	6.5	6.1	4.9	3.9	5.6	8.6	5.9	23.9																						
14-Jun	2.9	5.3	6.4	7.8	7.9	5.8	2.6	3.3	5.7	8.9	5.2	5.0	6.5	3.5	5.7	6.7	6.8	5.9	9.7	8.4	5.9	7.1	5.4	1.8	5.8	9.7																						
15-Jun	1.0	2.1	4.2	3.4	1.4	2.9	2.4	2.2	2.9	2.1	3.7	4.5	4.9	4.6	4.9	5.0	3.8	3.6	4.6	4.6	4.4	2.0	2.3	3.3	3.4	5.0																						
16-Jun	3.0	2.0	2.3	2.6	2.6	2.3	1.9	1.8	2.0	2.1	2.4	3.1	4.3	4.9	3.6	3.0	3.3	2.3	3.7	5.4	8.8	9.6	8.3	7.6	3.9	9.6																						
17-Jun	7.6	1.5	1.1	2.1	2.7	1.5	1.2	1.3	1.8	2.8	2.1	1.7	2.1	2.2	2.2	2.3	1.7	2.4	5.6	8.4	4.9	4.8	2.0	1.5	2.8	8.4																						
18-Jun	2.7	5.2	5.4	5.3	3.7	2.7	2.6	2.1	2.0	1.9	1.8	1.9	1.7	1.6	1.7	1.7	2.1	2.6	2.4	3.3	7.4	13.4	5.4	5.7	3.6	13.4																						
19-Jun	8.6	10.3	6.8	2.0	2.7	3.5	3.8	5.3	5.4	3.7	3.8	3.0	4.4	8.7	6.7	8.8	8.9	6.5	5.5	5.8	9.0	10.2	12.2	29.1	7.3	29.1																						
20-Jun	12.1	10.8	11.2	8.4	7.1	6.7	5.3	5.1	3.3	2.1	1.8	1.9	3.2	4.0	4.2	6.4	6.3	6.7	9.9	13.6	22.0	26.0	22.0	11.4	8.8	26.0																						
21-Jun	13.0	14.7	13.9	12.5	11.7	12.0	11.0	9.8	10.2	11.3	13.0	10.6	10.3	9.0	9.5	8.1	8.2	8.5	9.8	10.8	14.8	26.5	32.4	23.4	13.1	32.4																						
22-Jun	22.2	19.9	14.0	17.4	23.0	14.0	14.6	14.1	13.9	16.8	17.1	17.1	12.5	9.9	10.1	9.8	11.9	11.9	11.2	12.8	10.6	8.8	22.4	27.2	15.1	27.2																						
23-Jun	8.7	26.4	40.3	19.0	16.3	8.5	6.4	11.7	13.4	14.6	15.4	23.1	26.5	25.1	19.4	15.7	9.1	10.5	12.0	9.1	8.8	11.1	6.7	7.6	15.2	40.3																						
24-Jun	8.8	8.2	6.9	7.4	8.3	4.7	2.5	5.3	9.2	11.7	C	C	C	C	8.4	7.4	5.8	7.6	9.4	11.5	8.2	8.5	7.3	6.5	7.7	11.7																						
25-Jun	10.5	9.4	9.9	10.5	8.2	9.6	11.4	7.3	5.9	7.1	8.6	10.1	12.1	10.3	8.8	9.1	9.8	9.1	10.1	9.9	10.0	14.4	19.2	6.7	9.9	19.2																						
26-Jun	5.3	8.1	10.1	11.7	9.1	2.5	2.4	6.9	14.3	13.8	16.3	20.3	22.3	11.3	5.9	6.5	4.9	3.9	4.5	7.4	9.7	8.7	7.4	3.0	9.0	22.3																						
27-Jun	1.5	2.4	3.1	3.4	1.4	1.1	1.3	1.3	1.3	1.9	3.2	4.8	2.7	4.1	6.8	11.5	6.0	6.3	13.2	12.7	12.2	10.5	6.3	8.9	5.3	13.2																						
28-Jun	6.7	8.8	7.7	4.8	5.7	6.8	7.4	9.9	9.9	12.9	13.6	8.7	5.0	3.7	4.6	5.5	6.6	3.8	5.1	4.6	7.3	6.9	7.4	10.6	7.3	13.6																						
29-Jun	12.7	71.4	14.9	15.6	16.9	31.5	14.2	18.1	24.0	18.8	9.6	11.1	12.2	9.4	9.1	8.7	10.6	10.9	12.1	12.2	16.3	23.6	15.3	7.4	16.9	71.4																						
30-Jun	6.5	4.8	4.7	4.6	9.4	5.8	5.4	2.7	6.6	11.2	9.5	8.7	8.1	9.5	9.4	8.4	9.1	7.5	8.1	27.7	13.5	11.1	7.3	7.7	8.6	27.7																						
																								8.2	10.8	8.8	7.6	7.3	6.5	4.9	5.0	5.9	6.7	6.6	7.4	7.9	7.0	6.7	7.1	7.1	6.3	7.3	9.9	10.7	11.5	11.0	9.7	Diurnal Average
																								22.2	71.4	40.3	19.0	23.0	31.5	14.6	18.1	24.0	18.8	17.1	23.1	26.5	25.1	19.4	15.7	16.9	14.9	13.7	37.1	49.2	46.4	32.4	29.1	Diurnal Maximum

C - Calibration
 Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m³



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Shell Muskeg River - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Shell Muskeg River - June 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	313	43.72	43.72
6 - 15	345	48.18	91.90
16 - 25	42	5.87	97.77
26 - 80	16	2.23	100.00
> 81.0	0	0.00	100.00

Total Number of Valid Hours: 716

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Shell Muskeg River - June 2016

Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	7	16	31	11	7	7	8	31	30	40	40	28	21	15	13	8	313
6 - 15	20	31	40	17	13	8	13	32	56	45	17	12	10	11	9	11	345
16 - 25	0	1	4	4	0	1	3	6	5	4	4	3	3	0	1	3	42
26 - 80	0	0	0	3	1	0	1	3	2	1	1	1	1	1	0	1	16
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	27	48	75	35	21	16	25	72	93	90	62	44	35	27	23	23	716

Total Number of Valid Hours: 716

Total Number of Hours: 720

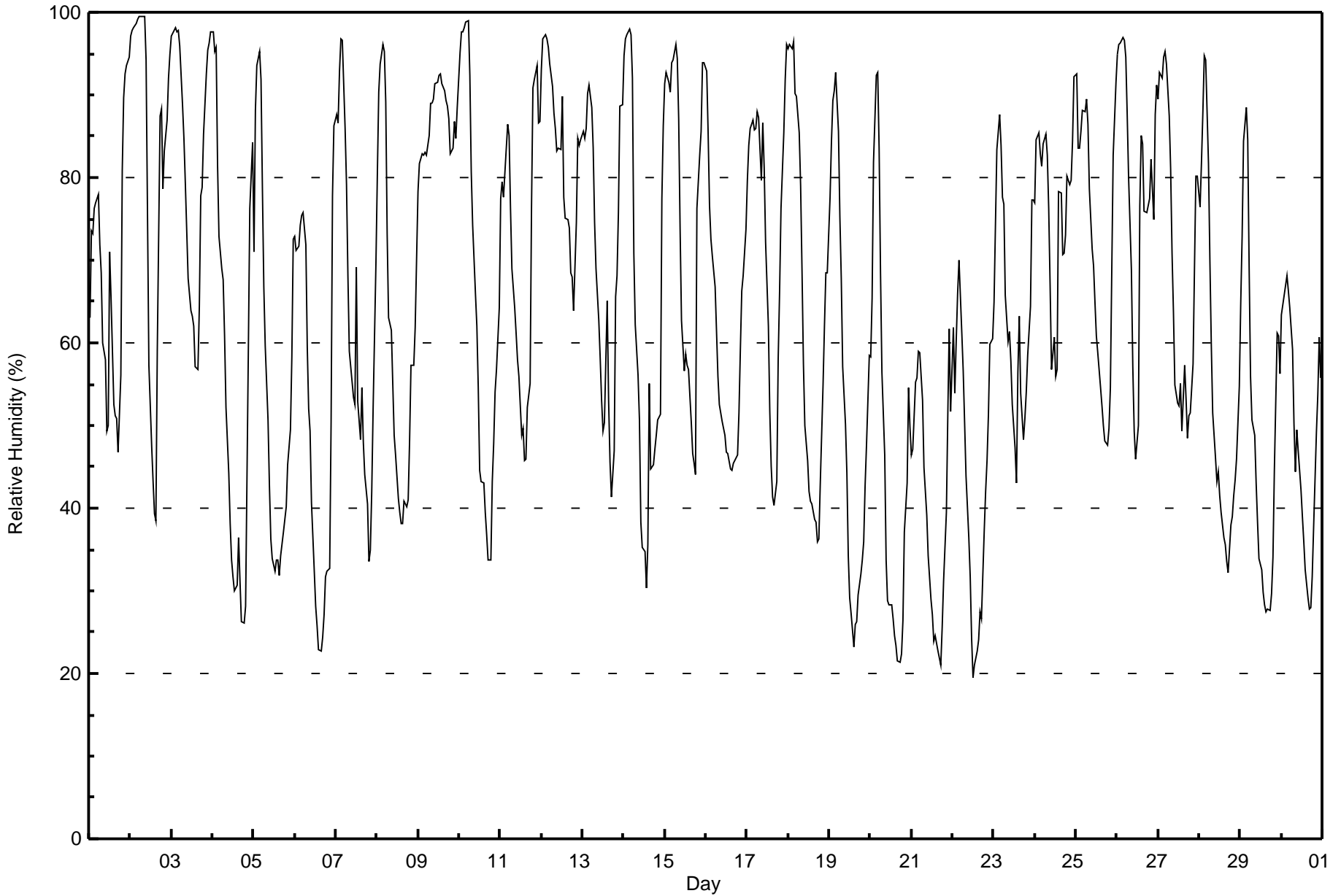


Wood Buffalo Environmental Association

Summary of Hour Averages

**Relative Humidity (RH) - %
Shell Muskeg River - June 2016**

Maximum Value: 100 % on Jun 2 07:00														Maximum Daily Average: 86.9 % on Jun 9														Hours in Service: 720	
Minimum Value: 20 % on Jun 22 13:00														Minimum Daily Average: 40.3 % on Jun 21														Hours of Data: 720	
Maximum Diurnal Average: 87.2 % at hour 4														Minimum Diurnal Average: 45.2 % at hour 17														Hours of Missing Data: 0	
Monthly Average: 64.1 %														Percentiles: P ₁ = 23 P ₁₀ = 34 Q ₁ = 46 Median = 63 Q ₃ = 84 P ₉₀ = 93 P ₉₉ = 99														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-Jun	63	74	73	76	77	78	72	68	60	58	49	50	71	65	53	51	51	47	56	81	90	93	94	95	68.5	95			
2-Jun	97	98	98	99	99	99	100	100	99	94	76	57	47	43	39	38	59	87	88	79	83	87	92	95	81.5	100			
3-Jun	97	98	98	98	98	96	89	85	79	74	68	64	63	62	57	57	64	78	79	85	93	95	96	98	82.1	98			
4-Jun	98	95	96	81	73	69	68	61	52	44	38	34	32	30	31	36	31	26	26	28	44	60	76	84	54.7	98			
5-Jun	71	88	93	95	92	79	67	60	51	43	36	34	32	34	34	32	34	37	39	40	45	50	58	73	54.8	95			
6-Jun	73	71	72	74	75	76	72	60	52	49	41	32	28	26	23	23	24	27	32	32	33	50	78	86	50.4	86			
7-Jun	88	87	93	97	97	86	79	68	59	55	53	53	69	53	48	55	48	44	40	34	35	42	52	70	62.7	97			
8-Jun	80	90	94	96	95	89	73	63	62	55	49	46	41	40	38	38	41	40	41	48	57	57	62	70	61.1	96			
9-Jun	78	82	83	83	83	83	85	89	89	90	91	91	92	92	91	90	89	89	87	83	83	87	85	89	86.9	92			
10-Jun	95	98	98	98	99	99	92	81	74	66	62	55	45	43	43	39	37	34	34	43	48	54	57	64	64.9	99			
11-Jun	77	80	78	84	86	85	76	69	64	61	58	56	49	50	46	46	52	55	76	91	92	94	87	87	70.7	94			
12-Jun	93	97	97	97	96	94	91	88	86	83	84	83	90	78	75	75	74	68	68	64	75	85	84	85	83.7	97			
13-Jun	86	85	86	90	91	88	84	75	69	63	58	53	49	50	65	53	46	41	47	66	68	76	89	89	69.4	91			
14-Jun	95	97	97	98	97	92	71	62	56	51	38	35	35	30	36	55	45	45	47	49	51	51	77	86	62.4	98			
15-Jun	91	93	91	90	94	94	96	94	87	74	63	57	59	57	57	50	47	45	44	76	83	86	94	94	75.7	96			
16-Jun	93	86	77	72	71	67	61	56	53	50	50	49	47	47	45	45	45	46	46	51	59	66	68	74	59.3	93			
17-Jun	80	84	86	87	86	86	88	87	80	87	81	72	62	52	45	41	40	43	58	66	76	85	92	96	73.4	96			
18-Jun	96	96	96	96	90	90	85	79	69	57	50	46	42	41	40	39	38	36	36	43	55	62	69	68	63.3	96			
19-Jun	78	84	89	91	93	86	75	68	57	50	44	34	29	27	23	26	26	30	32	34	36	43	48	58	52.5	93			
20-Jun	58	65	82	92	93	84	68	57	46	34	29	28	28	27	25	23	22	21	22	26	37	43	55	50	46.5	93			
21-Jun	46	47	55	56	59	59	53	45	42	39	34	29	27	24	25	23	22	21	26	31	40	51	62	52	40.3	62			
22-Jun	62	54	60	66	70	61	57	50	44	36	32	24	20	21	23	24	27	27	37	42	46	51	60	60	43.9	70			
23-Jun	65	74	83	88	84	78	77	66	60	61	58	53	47	43	56	63	54	48	51	54	58	64	77	77	64.2	88			
24-Jun	77	85	85	83	81	84	85	83	76	67	57	61	56	57	78	78	71	71	73	80	79	80	84	92	76.0	92			
25-Jun	92	84	84	86	88	88	90	87	79	71	69	65	61	59	55	52	50	48	48	50	55	69	83	91	70.9	92			
26-Jun	95	96	96	97	97	95	88	80	69	57	49	46	50	77	85	84	76	76	77	77	82	75	88	91	79.2	97			
27-Jun	90	93	92	95	95	94	87	81	71	64	55	53	52	55	49	57	53	49	51	51	57	69	80	80	69.7	95			
28-Jun	77	82	88	95	94	82	70	60	52	46	43	44	41	39	36	36	34	32	38	39	41	43	46	55	54.7	95			
29-Jun	65	73	84	89	85	69	56	51	49	43	38	34	33	30	28	27	28	28	30	34	45	61	61	56	49.8	89			
30-Jun	63	65	67	68	66	64	59	50	44	49	47	42	39	36	33	29	28	28	32	38	49	54	61	56	48.6	68			
	80.6	83.2	85.7	87.2	86.8	83.1	77.1	70.7	64.3	59.1	53.4	49.3	47.9	46.2	46.0	46.2	45.2	45.6	48.7	53.9	59.8	66.1	73.7	77.4	Diurnal Average				
	98	98	98	99	99	99	100	100	99	94	91	91	92	92	91	90	89	89	88	91	93	95	96	98	Diurnal Maximum				





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Shell Muskeg River - June 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	1	0.14	0.14
20 - 40	117	16.25	16.39
40 - 60	213	29.58	45.97
60 - 80	166	23.06	69.03
80 - 100	223	30.97	100.00

Total Number of Valid Hours: 720

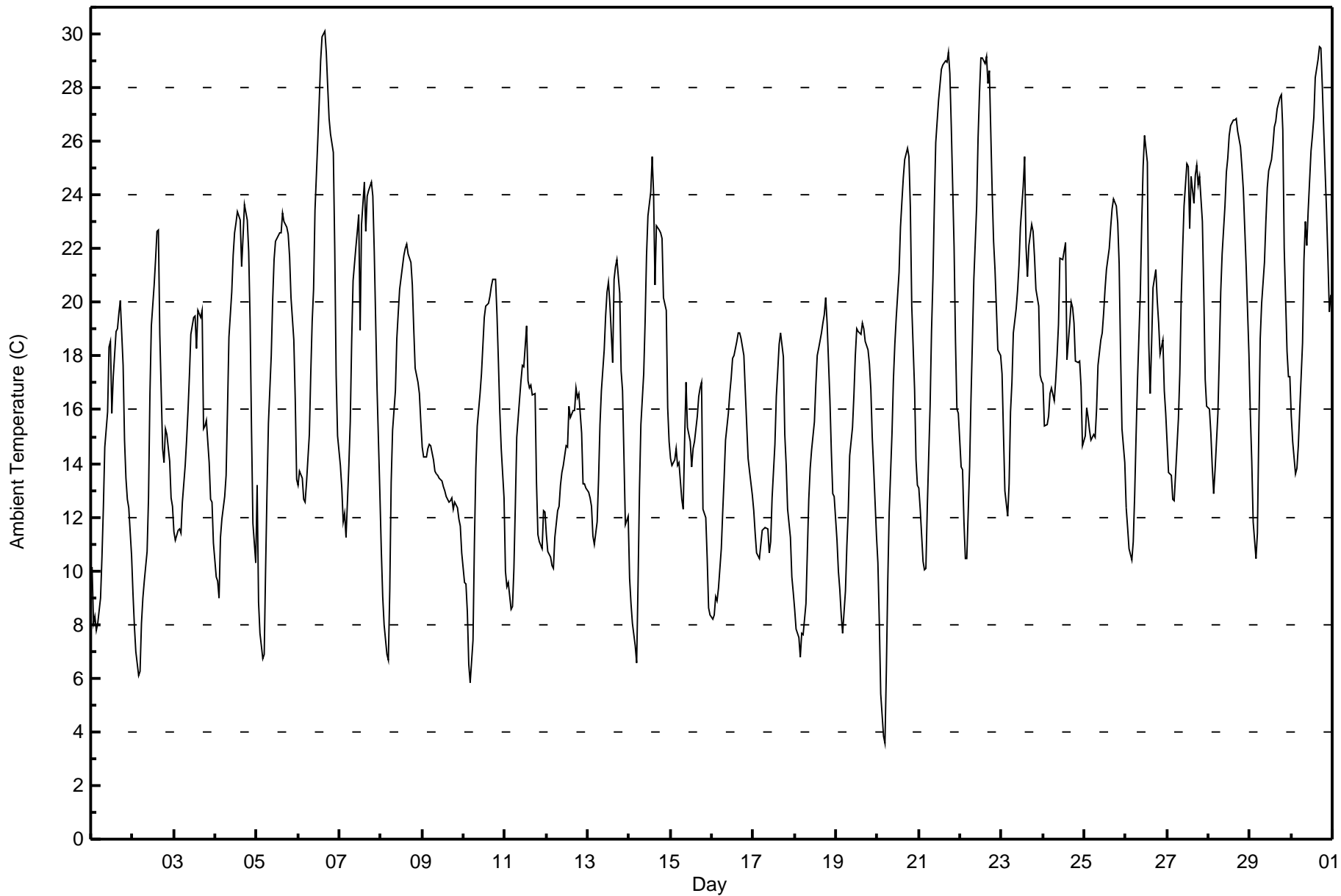
Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Shell Muskeg River - June 2016

Maximum Value: 30.1 C on Jun 6 16:00		Maximum Daily Average: 22.2 C on Jun 30		Hours in Service: 720																																												
Minimum Value: 3.6 C on Jun 20 05:00		Minimum Daily Average: 13.0 C on Jun 17		Hours of Data: 720																																												
Maximum Diurnal Average: 21.9 C at hour 17		Minimum Diurnal Average: 10.3 C at hour 4		Hours of Missing Data: 0																																												
Monthly Average: 16.95 C		Percentiles: P ₁ = 6.5 P ₁₀ = 10.1 Q ₁ = 12.8 Median = 16.6 Q ₃ = 20.9 P ₉₀ = 24.4 P ₉₉ = 29.1		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-Jun	10.1	8.1	8.3	7.8	8.0	9.0	10.5	12.3	14.6	15.9	18.3	18.6	15.9	17.2	18.9	19.0	19.6	20.1	17.7	14.9	13.5	12.7	12.3	10.6	13.9	20.1																						
2-Jun	9.1	7.9	7.0	6.1	6.3	8.0	9.0	9.6	10.7	12.7	16.6	19.1	20.6	21.6	22.6	22.7	18.8	14.6	14.0	15.3	15.1	14.1	12.7	12.4	13.6	22.7																						
3-Jun	11.5	11.1	11.5	11.6	11.4	12.6	13.9	14.8	16.0	17.3	18.8	19.4	19.5	18.3	19.7	19.4	19.7	15.3	15.4	15.6	14.0	12.7	12.6	11.0	15.1	19.7																						
4-Jun	9.8	9.6	9.0	11.2	11.9	12.8	13.5	16.0	18.7	20.4	21.7	22.6	23.0	23.4	23.1	21.3	22.4	23.6	23.1	21.9	19.4	15.3	11.8	10.3	17.3	23.6																						
5-Jun	13.2	8.8	7.6	6.7	6.9	10.1	13.0	15.5	18.0	20.1	21.6	22.3	22.5	22.6	22.6	23.3	23.0	22.8	22.5	21.7	20.2	18.6	16.4	13.4	17.2	23.3																						
6-Jun	13.2	13.7	13.4	12.7	12.5	13.3	15.1	17.4	19.3	20.5	23.5	26.1	27.5	29.0	29.9	30.1	29.3	28.1	26.9	26.3	25.6	22.0	17.3	15.0	21.1	30.1																						
7-Jun	13.9	13.1	11.8	12.1	11.2	13.9	15.6	18.5	20.8	22.0	22.6	23.3	19.0	22.9	24.5	22.6	24.0	24.2	24.5	24.0	21.9	19.3	16.8	12.9	19.0	24.5																						
8-Jun	10.8	9.1	8.0	6.9	6.7	9.3	13.3	15.2	16.7	18.7	19.6	20.5	21.3	21.8	22.0	22.2	21.8	21.5	20.6	19.0	17.5	17.0	16.6	15.6	16.3	22.2																						
9-Jun	14.6	14.2	14.2	14.5	14.7	14.7	14.1	13.7	13.6	13.5	13.5	13.3	13.1	13.0	12.8	12.6	12.6	12.7	12.3	12.6	12.4	11.9	11.7	10.7	13.2	14.7																						
10-Jun	9.6	9.5	8.4	6.5	5.8	7.4	11.0	13.8	15.4	16.6	17.4	18.4	19.4	19.9	20.0	20.2	20.6	20.9	20.9	19.5	17.8	15.9	14.6	12.7	15.1	20.9																						
11-Jun	10.0	9.4	9.6	8.6	8.7	10.1	12.5	15.0	16.4	17.1	17.7	17.6	19.1	17.1	16.8	16.9	16.6	16.6	13.3	11.3	11.1	10.8	12.2	12.2	13.6	19.1																						
12-Jun	11.4	10.7	10.5	10.2	10.1	11.2	12.3	12.4	13.2	13.7	13.9	14.7	14.6	16.1	15.7	16.0	15.9	16.8	16.4	16.6	15.1	13.2	13.3	13.1	13.6	16.8																						
13-Jun	12.9	12.7	12.4	11.3	11.0	11.8	13.4	15.5	16.7	18.2	19.5	20.4	20.8	20.0	17.8	20.9	21.3	21.6	20.3	17.5	16.7	14.2	11.7	12.0	16.3	21.6																						
14-Jun	9.7	8.8	8.0	7.2	6.6	9.6	13.0	15.4	17.4	19.3	21.8	23.2	24.1	25.4	24.0	20.6	22.8	22.7	22.6	22.4	20.2	19.7	16.1	14.8	17.3	25.4																						
15-Jun	14.2	13.9	14.1	14.5	13.9	14.0	12.7	12.3	14.8	17.0	15.3	14.8	13.9	14.6	14.8	15.8	16.5	16.8	17.0	12.3	12.0	10.4	8.6	8.3	13.9	17.0																						
16-Jun	8.2	8.4	9.1	8.9	9.4	10.8	12.2	13.5	14.8	15.9	16.6	17.2	17.9	18.0	18.6	18.8	18.9	18.7	18.0	16.7	15.4	14.2	13.7	12.8	14.4	18.9																						
17-Jun	12.2	11.4	10.7	10.4	11.0	11.5	11.6	11.6	11.6	10.7	11.1	12.7	14.7	16.5	17.5	18.4	18.8	18.0	15.1	13.9	12.3	11.3	9.8	9.2	13.0	18.8																						
18-Jun	8.6	7.8	7.5	6.8	7.7	7.6	8.8	10.7	12.7	13.8	14.5	15.5	16.9	18.0	18.3	18.9	19.2	19.5	20.2	19.2	16.3	14.5	12.9	12.8	13.7	20.2																						
19-Jun	11.2	10.0	9.3	8.4	7.7	9.3	10.9	12.2	14.3	15.3	16.6	18.0	19.0	18.9	18.8	19.2	19.0	18.5	18.2	17.7	16.8	15.0	13.8	11.3	14.6	19.2																						
20-Jun	10.3	8.1	5.4	3.8	3.6	6.3	9.6	12.2	15.1	17.2	18.4	19.4	21.1	22.8	23.7	24.6	25.4	25.8	25.4	23.5	19.9	16.8	14.1	13.2	16.1	25.8																						
21-Jun	13.1	12.3	10.4	10.0	10.1	12.4	16.2	18.9	20.9	23.6	25.9	27.5	28.1	28.7	28.8	29.0	29.0	29.3	28.5	26.6	22.1	18.5	16.1	15.9	20.9	29.3																						
22-Jun	13.9	13.8	11.8	10.4	10.5	13.9	16.5	18.6	20.9	23.6	26.1	27.8	29.1	29.1	28.9	29.2	28.2	28.6	24.1	22.3	21.2	19.8	18.3	18.0	21.0	29.2																						
23-Jun	17.3	15.1	13.0	12.0	13.2	15.9	17.0	18.8	19.8	20.4	21.4	22.8	24.3	25.4	22.1	21.0	22.1	22.9	22.6	21.7	20.5	19.9	17.3	17.1	19.3	25.4																						
24-Jun	17.0	15.4	15.4	15.7	16.6	16.8	16.4	17.1	18.0	19.2	21.6	21.6	21.9	22.2	17.9	19.2	20.0	19.8	19.2	17.8	17.7	17.8	16.9	14.6	18.2	22.2																						
25-Jun	15.0	16.1	15.7	15.2	14.9	15.1	15.0	16.0	17.7	18.6	18.9	19.6	20.5	21.2	22.0	22.8	23.5	23.8	23.6	23.0	21.4	18.1	15.3	14.1	18.6	23.8																						
26-Jun	12.3	11.6	10.8	10.4	11.1	12.8	15.0	17.1	20.3	23.0	25.0	26.2	25.2	18.5	16.6	18.5	20.5	21.2	20.1	19.2	18.1	18.6	16.7	15.9	17.7	26.2																						
27-Jun	14.8	13.6	13.5	12.7	12.6	13.6	15.6	17.3	20.2	22.0	23.6	25.2	25.1	22.7	24.7	23.7	24.8	25.1	24.4	24.7	23.0	20.3	17.1	16.1	19.9	25.2																						
28-Jun	16.0	15.1	13.9	12.9	13.8	15.9	18.0	20.4	21.8	23.6	24.8	25.4	26.2	26.6	26.8	26.8	26.9	26.4	25.8	25.0	24.2	22.8	21.4	18.1	21.6	26.9																						
29-Jun	15.8	14.1	11.8	10.5	11.4	15.2	18.6	20.0	21.5	23.0	24.3	24.9	25.3	25.9	26.5	26.7	27.2	27.6	27.7	26.4	22.0	18.2	17.2	17.2	20.8	27.7																						
30-Jun	15.8	14.8	13.6	13.8	14.7	16.0	18.5	21.6	23.0	22.1	23.5	25.6	26.2	26.9	28.4	29.0	29.5	29.5	28.1	26.4	23.4	21.6	19.6	20.3	22.2	29.5																						
																								12.5	11.6	10.9	10.3	10.5	12.0	13.8	15.5	17.2	18.5	19.8	20.8	21.2	21.5	21.5	21.7	21.9	21.8	21.0	19.8	18.2	16.5	14.8	13.7	Diurnal Average
																								17.3	16.1	15.7	15.7	16.6	16.8	18.6	21.6	23.0	23.6	26.1	27.8	29.1	29.1	29.9	30.1	29.5	29.5	28.5	26.6	25.6	22.8	21.4	20.3	Diurnal Maximum





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Shell Muskeg River - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	68	9.44	9.44
10 - 20	442	61.39	70.83
> 20	210	29.17	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Barometric Pressure (BP) - inHg

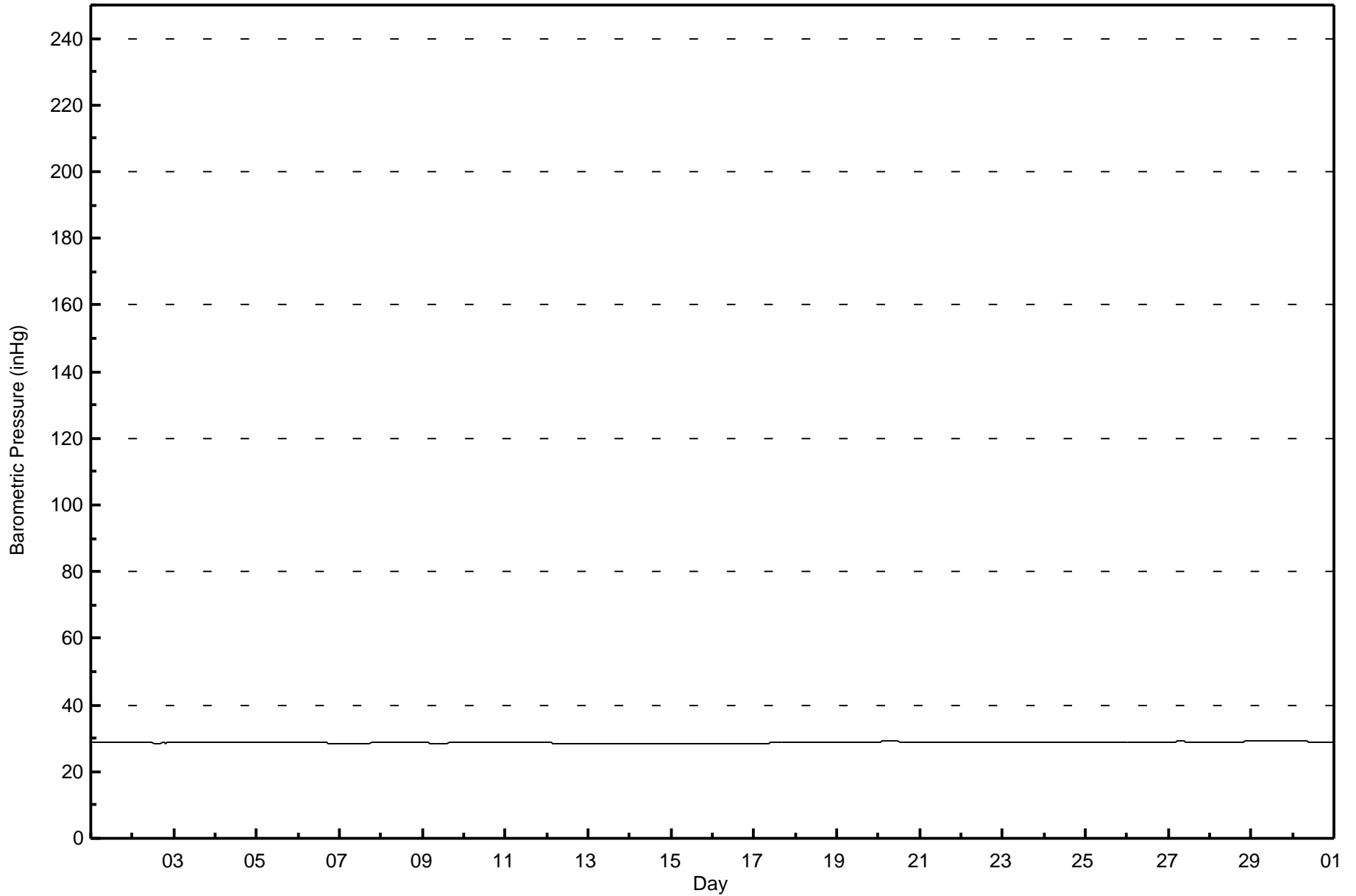
Shell Muskeg River - June 2016

Maximum Value: 29.1 inHg on Jun 29 09:00 Maximum Daily Average: 29.1 inHg on Jun 29																						Hours in Service: 720 Hours of Data: 720								
Minimum Value: 28.3 inHg on Jun 15 10:00 Minimum Daily Average: 28.4 inHg on Jun 15 Maximum Diurnal Average: 28.8 inHg at hour 8 Minimum Diurnal Average: 28.7 inHg at hour 18 Monthly Average: 28.75 inHg Percentiles: P ₁ = 28.4 P ₁₀ = 28.5 Q ₁ = 28.6 Median = 28.7 Q ₃ = 28.9 P ₉₀ = 29.0 P ₉₉ = 29.1																						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-Jun	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	28.6	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.8	28.8	
2-Jun	28.6	28.6	28.6	28.6	28.6	28.6	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	28.6	28.6	28.6	28.6	28.6	28.6	28.7	28.7
3-Jun	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	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
4-Jun	28.8	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	28.9	28.9	28.9	28.9	28.9	28.9
5-Jun	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	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	29.0
6-Jun	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.9
7-Jun	28.5	28.5	28.5	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	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7
8-Jun	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	28.7	28.7	28.7	28.7	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.7
9-Jun	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	28.6	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
10-Jun	28.7	28.7	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
11-Jun	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	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.9
12-Jun	28.7	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	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.7
13-Jun	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.6	28.6	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	28.5	28.5	28.5	28.6
14-Jun	28.5	28.5	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	28.4	28.4	28.4	28.5
15-Jun	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	28.4	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
16-Jun	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	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5
17-Jun	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	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	28.7	28.7	28.7	28.7	28.7	28.8
18-Jun	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	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.9
19-Jun	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	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	29.0
20-Jun	29.0	29.0	29.0	29.0	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	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	29.0
21-Jun	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	28.8	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	28.9
22-Jun	28.7	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.7	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	28.7	28.8
23-Jun	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	28.7	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
24-Jun	28.7	28.6	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	28.6	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7
25-Jun	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	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	28.9
26-Jun	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	29.0	28.9	28.9	29.0	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
27-Jun	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	29.0	29.0	29.0	29.0	29.0	29.0	29.0
28-Jun	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	29.0	29.0	29.0	29.0	29.0	29.0	29.1
29-Jun	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	29.1	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	29.1	29.1
30-Jun	29.1	29.1	29.0	29.0	29.1	29.1	29.1	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	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	29.1
																								Diurnal Average						
																								Diurnal Maximum						



Wood Buffalo Environmental Association
Hourly Averages

Barometric Pressure (BP) - inHg
Shell Muskeg River - June 2016





Maximum Speed: 40 km/h on Jun 15 12:00	Maximum Daily Speed Average: 21.3 km/h on Jun 9	Hours in Service: 720
Minimum Speed Value: 1 km/h on Jun 11 03:00	Minimum Daily Speed Average: 1.0 km/h on Jun 7	Hours of Data: 720
Maximum Diurnal Speed Average: 3.5 km/h at hour 5	Minimum Diurnal Speed Average: 0.4 km/h at hour 16	Hours of Missing Data: 0
Monthly Average Velocity: 1.0 km/h 197.1 deg	Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 6 Median = 9 O ₃ = 14 P ₉₀ = 19 P ₉₉ = 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-Jun	SSW9	S8	SSW4	S7	S7	SSE5	S7	SSE5	SSE5	SW5	SSW8	SSW8	S9	SSW9	SW13	SSW14	S16	SSE12	S8	W8	WNW5	E4	ENE7	SE5	S6.1	S16	
2-Jun	SSE6	S4	SSW4	S5	S5	SSW4	SSW5	WSW1	WSW4	WNW5	NW6	WNW5	NW5	N5	NNW4	ENE6	SW23	SSW14	SSE17	S3	W9	WSW7	S2	SSE6	SSW3.4	SW23	
3-Jun	SSW5	S5	SSE5	S6	S6	S5	SSW7	SSW9	SW11	SW12	SW11	SW10	W7WNW11	NW11	NW7	SW11	NE9	NNE10	ENE8	SSE6	SSW1	ESE2	S7	SW3.6	SW12		
4-Jun	SSE7	SSW8	SW10	WSW20	WSW20	WSW18	WSW12	W13	W18	W21	WNW18	WNW22	WNW21	WNW23	WNW21	WNW18	WNW22	WNW24	WNW25	NW20	NNE12	NE1	WNW5	W4	WNW13.8	WNW25	
5-Jun	NNE7	S4	WSW6	WSW5	SSW5	SSW6	SW7	NW2	NNW5	NW11	NW14	NW14	NNW13	N13	NNE11	N12	NE14	NE16	NE13	ENE12	ENE12	E9	SE5	NNE4.5	NE16		
6-Jun	SSE6	S7	S9	SSE11	S7	SSW3	SSW4	S8	S10	S8	SSE11	SSE14	S16	SSE18	SSE19	SSE18	S17	SSE13	S14	S19	S22	E8	NE15	ESE5	SSE10.3	S22	
7-Jun	S5	SSW8	SW8	SSW6	SSW6	SSE5	SSW5	SSW4	NNW4	NNW6	NE9	NE11	SSE15	SE7	SSE8	ENE13	NE11	NE10	NNE8	NNW11	NNW9	NNW8	NNW7	W2	ENE1.0	SSE15	
8-Jun	SW2	SW3	WNW3	WNW4	SSE3	S4	S1	NE12	NE11	NE12	NE13	NE12	NE12	NE15	NE10	NE12	NE13	ENE9	SE9	SSE9	ENE1	SE9	ESE8	E8	ENE5.4	NE15	
9-Jun	E8	ENE9	ENE11	NE17	NE22	NE21	NE23	NE25	NE30	NE33	NE32	NE32	NE30	NE30	NNE31	NE26	NNE24	NNE23	NE24	NNE22	N18	N16	N13	N8	NE21.3	NE33	
10-Jun	NW9	NW9	NW4	SSE3	SSW6	SSW5	SW4	NW6	N12	N14	NNE13	NNE13	NNE15	NE17	NE15	NE11	NE12	NE9	NE8	E6	E7	ENE11	ENE11	E7	NNE6.3	NE17	
11-Jun	ESE4	SSE5	SE1	SSE2	SSW4	SW4	S3	SSE8	SSE10	SSE12	SE13	SSE16	SSE18	SSE18	SSE17	SE16	SE8	SE11	SE15	ESE11	ESE10	E2	NE11	NE9	SE8.1	SSE18	
12-Jun	ENE2	E1	ESE5	SE8	S7	SSW6	SW11	SW11	SSW11	SSW11	SSW9	SSW11	SSW11	SSW16	SW16	WSW19	W17	W16	WSW17	W15	SW10	SW11	SW18	WSW19	SW9.9	WSW19	
13-Jun	WSW18	WSW19	WSW17	SW13	SSW11	SSW8	SW10	SW18	SW18	SW21	SW22	SW27	WSW23	WSW19	WSW17	SW16	SW10	SW19	W9	NE14	NE12	E6	NE1	NW2	SW11.6	SW27	
14-Jun	S5	S7	S6	SSW3	S5	S4	SW4	SSW5	NW3	NE9	NE10	EAE9	ESE7	ESE11	E12	NNE14	NNE15	NNE18	NNE12	NE12	SE20	SSE28	SE11	ESE10	E4.7	SSE28	
15-Jun	SSE10	ESE8	E7	ENE10	E7	ENE11	SE8	ENE9	SE13	SSE24	SSE37	SSE40	S36	SSE37	S29	S29	S28	S23	SSW16	SSE12	S7	SSW12	SE11	SSE6	SSE15.4	SSE40	
16-Jun	SSE8	SSE13	SSE18	SSE20	SSE16	S16	S18	S21	SSW20	SSW20	SSW19	SW22	SW25	SW24	SW21	SW17	WSW17	SW16	WSW16	WSW12	W10	W9	W11	W10	SSW13.6	SW25	
17-Jun	W8	WSW7	WSW8	W9	WSW7	W9	W11	WNW12	NW16	WNW17	NW17	WNW17	NW15	WNW19	WNW18	WNW21	W18	WSW18	WNW15	N7	ENE11	NNE14	NNW5	SW4	WNW10.3	WNW21	
18-Jun	WSW8	W9	W10	W9	W10	W11	WNW15	W15	WSW16	W18	W16	W13	WSW16	WSW17	WSW15	WSW16	SW13	WSW12	SW9	SSW7	WSW3	NNE23	ENE11	NNE14	W8.8	NNE23	
19-Jun	NNW8	NW4	NW9	WNW6	WSW10	SW6	WSW7	NW6	NNW11	N14	NNW12	NNW17	NNW19	NNW23	NNW21	N22	N23	NNE21	N18	N18	N16	N11	N10	NNW8	NNW11.6	N23	
20-Jun	NW9	WNW6	SW4	S5	S6	S4	SSE5	SSE6	SSW5	WSW6	SW5	NNW2	SSW2	SSE6	SSW7	S9	S10	S10	S12	S11	SSE9	SSE9	S7	S8	S5.2	S12	
21-Jun	SSW8	S6	SSE7	S9	S9	S10	S9	SSW9	SSW12	SSW12	SSW12	SSW13	SSW12	S8	SSW11	SSE9	S5	SSE4	S5	SSW5	SSW6	S6	S7	SSW7	S8.0	SSW13	
22-Jun	SSE8	S8	SSW6	S6	SSE8	S7	S8	SSW8	SW10	SW10	SW10	SSW9	SSW8	W6	SSW9	S7	SSE9	SW10	WSW21	SW19	SW9	SSW8	SSE5	SSW7	SSW8.0	WSW21	
23-Jun	SSW3	SW4	SSE4	S4	SSE5	SW3	SSE3	NE4	NE9	E7	ENE6	ENE3	WSW4	WSW6	W15	NNW10	NE10	NE13	NE14	ENE11	ENE8	NE10	N2	NNW9	NE2.7	W15	
24-Jun	NE6	NE11	NNE6	N8	N16	NNE16	NE13	NNE12	N15	NNE13	N13	NNE15	NNE17	NNE21	NNW15	N15	NNE21	NE15	NNE9	NNW15	N11	NNE13	NE9	ENE5	NNE12.3	NNE21	
25-Jun	NE5	NNE13	NNE15	NNE16	NNE10	N12	NNE16	NNE18	N13	NNE16	NNE16	NNE15	NNE16	NE16	NE17	NE15	NE13	NE12	ENE11	ENE10	E7	ESE4	WSW3	W2	NNE11.1	NNE18	
26-Jun	WSW3	SSW2	SSE4	S6	S6	S6	SSW7	S7	SW9	SSW8	SSE6	NW9	SSW8	SSW6	SSW5	S5	SSW4	SW8	SSW6	SW10	W12	ESE5	W9	SSW4.9	W12		
27-Jun	WSW7	SSW7	SSW8	SSW7	SSW8	SSW6	SSW7	SSW6	WSW7	SW9	SW10	SW14	SW13	ENE12	SSE16	S10	S8	SE4	E11	ESE7	E7	ESE6	SSE6	SW7	S5.3	SSE16	
28-Jun	SSW7	SSW6	S8	SSW7	SSW7	SSW7	SSW4	NE5	NNE5	SW5	NE7	NE15	NE17	NNE17	NNE16	NNE18	NNE19	NNE21	NE20	NNE20	NE16	NE14	NE14	ENE12	NE7.6	NNE21	
29-Jun	E7	ENE6	ENE1	SE2	ENE3	ENE5	E3	NE4	NE4	NE7	NE10	NE8	NNE10	NNE11	N8	NE6	WNW4	SW5	WSW4	E4	ENE7	SE7	SSE9	S7	ENE3.5	NNE11	
30-Jun	SSW6	S7	SSE12	S9	SSW7	SSW6	S8	S12	S18	S13	S11	S13	SSE10	E4	S3	SE11	SE11	SE11	SE11	SE11	SE11	SE9	SSE7	S9	S9	SSE8.7	S18

SSW2.3SSW3.0SSW3.0SSW3.3SSW3.5SSW2.8SSW3.2	SW1.6WSW1.7WSW2.1WSW1.3	SW1.2WSW1.8	NW0.7WSW1.9	NNW0.4	SW0.5	ENE0.9	ENE0.6	NE1.6	E2.3	E2.3	E2.3	S1.1	Diurnal Average									
WSW18WSW19	SSE18WSW20	NE22	NE21	NE23	NE25	NE30	NE33	SSE37	SSE40	S36	SSE37	NNE31	S29	S28	WNW24	WNW25	NNE22	S22	SSE28	SW18	WSW19	Diurnal Maximum

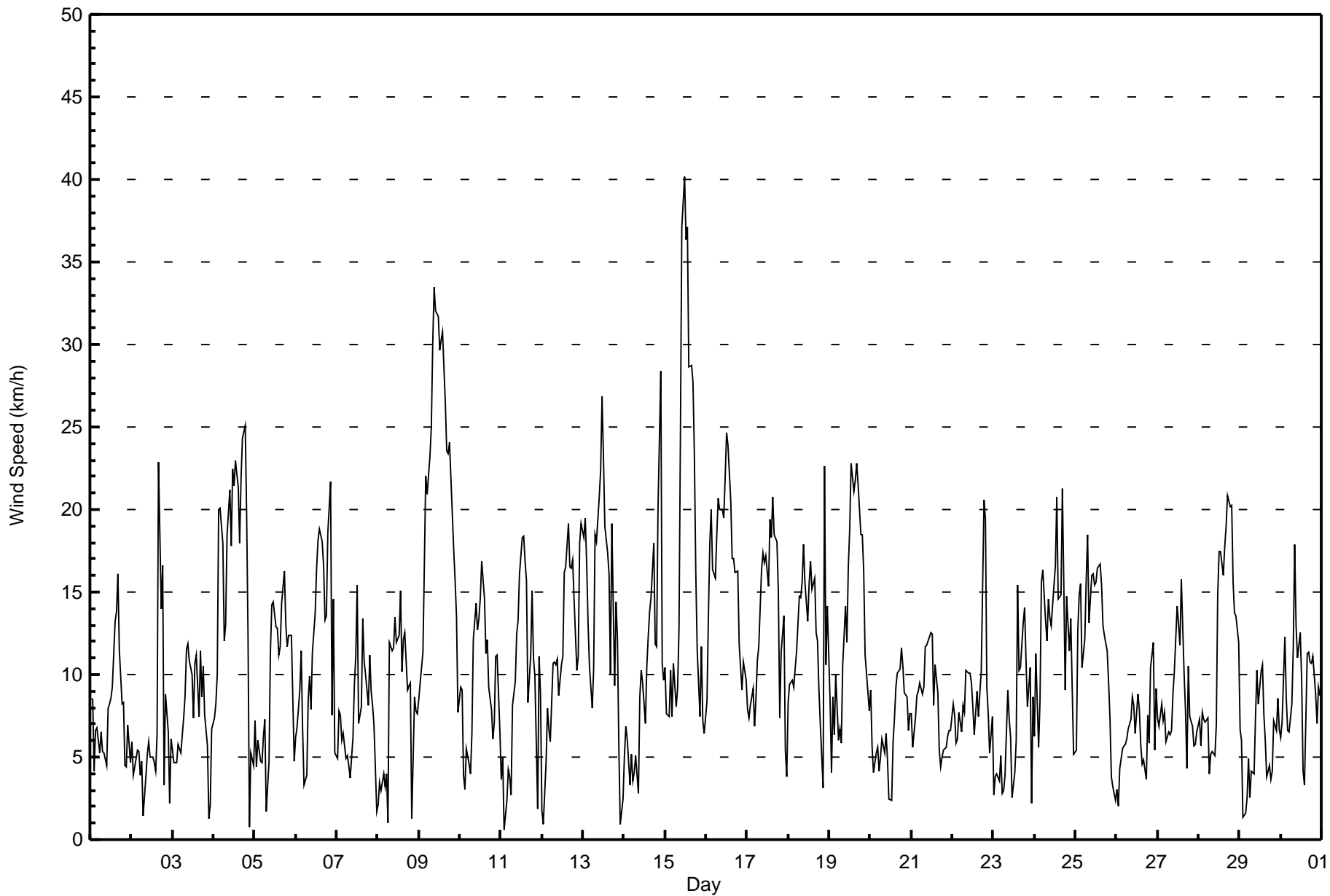
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Shell Muskeg River - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 12 km/h on Jun 2 17:00 Minimum Value: 1 km/h on Jun 20 03:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 6 P ₉₉ = 10																	Hours in Service: 720 Hours of Data: 720 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-Jun	2	2	2	1	1	1	2	2	1	2	3	3	3	3	5	5	5	4	3	4	4	2	1	1	5
2-Jun	1	1	1	1	2	1	1	1	1	1	2	2	2	2	2	2	12	4	4	5	2	2	2	3	12
3-Jun	2	2	1	1	1	2	2	3	3	3	3	3	4	4	3	8	8	6	4	2	3	2	2	8	
4-Jun	2	2	3	3	4	3	3	4	4	5	6	6	6	6	6	9	5	6	7	6	4	2	2	3	9
5-Jun	4	1	2	2	2	2	3	2	2	7	5	5	5	6	4	5	5	3	3	3	3	2	2	1	7
6-Jun	2	2	2	2	3	1	1	3	2	3	3	4	5	6	6	6	5	3	4	5	6	7	6	4	7
7-Jun	2	2	2	2	2	2	2	1	2	3	2	3	9	3	3	6	3	3	4	4	3	2	1	2	9
8-Jun	1	1	1	1	2	1	2	2	2	3	2	2	2	3	4	3	3	3	3	4	3	3	3	3	4
9-Jun	2	3	4	4	4	4	4	5	6	6	5	5	6	5	5	6	5	5	5	4	4	4	4	3	6
10-Jun	2	2	3	1	1	2	1	2	4	3	4	3	4	4	4	4	3	3	3	2	1	2	2	3	4
11-Jun	2	2	2	2	2	1	1	2	3	3	5	4	5	7	6	4	3	5	6	4	3	2	2	3	7
12-Jun	1	2	1	2	2	2	4	4	4	4	2	4	4	6	6	4	5	5	4	3	3	6	4	3	6
13-Jun	3	3	3	3	3	3	5	4	4	5	6	6	10	10	8	5	7	6	4	5	3	2	3	3	10
14-Jun	3	1	2	1	3	2	1	1	1	2	3	4	4	5	4	5	4	4	4	3	6	8	4	3	8
15-Jun	3	2	2	4	2	4	5	4	6	6	9	10	10	10	11	10	8	8	6	7	4	9	2	2	11
16-Jun	2	4	3	4	4	4	5	7	7	7	6	6	6	7	6	6	4	5	4	3	2	2	2	2	7
17-Jun	2	2	2	2	1	3	2	4	4	4	5	7	6	5	6	6	5	4	8	2	3	3	5	2	8
18-Jun	2	1	2	2	3	2	4	3	3	4	4	4	5	4	5	4	5	5	5	3	7	7	4	4	7
19-Jun	3	1	2	1	2	3	2	2	4	4	4	6	7	8	6	7	6	5	5	5	4	3	3	2	8
20-Jun	2	2	1	1	1	1	1	1	2	2	2	2	2	3	4	3	3	3	3	2	1	1	1	2	4
21-Jun	2	1	1	1	1	2	2	3	3	3	4	4	4	4	5	4	3	2	2	2	1	1	2	2	5
22-Jun	1	2	1	2	1	2	3	2	2	2	2	3	4	2	3	2	2	5	4	4	3	3	1	2	5
23-Jun	2	1	2	2	2	1	1	3	3	3	2	2	2	3	6	4	3	3	3	3	3	1	3	3	6
24-Jun	4	6	4	3	4	3	3	2	4	4	4	5	4	6	8	5	6	5	4	5	3	3	3	3	8
25-Jun	3	3	3	3	5	3	3	3	3	4	3	3	4	3	3	4	3	3	3	3	1	1	1	2	5
26-Jun	2	1	2	1	2	1	2	2	2	2	3	3	7	3	3	2	2	2	2	2	5	5	4	5	7
27-Jun	3	2	2	2	2	2	2	2	2	3	3	4	3	6	5	3	2	5	4	2	2	2	1	2	6
28-Jun	1	2	1	1	1	2	3	3	3	2	4	3	4	4	4	6	5	5	4	4	3	2	4	2	6
29-Jun	4	2	2	1	1	2	1	1	1	4	4	4	4	4	4	3	3	3	2	2	2	1	2	2	4
30-Jun	1	2	2	3	1	2	2	3	6	5	3	4	3	2	4	4	4	3	3	2	2	2	4	3	6
Diurnal Maximum																									





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Shell Muskeg River - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	137	19.03	19.03
6 - 11	319	44.31	63.33
12 - 19	199	27.64	90.97
20 - 28	52	7.22	98.19
29 - 38	12	1.67	99.86
> 38	1	0.14	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Shell Muskeg River - June 2016**

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	2	5	8	5	7	5	16	22	23	13	8	3	7	6	5	137
6 - 11	7	10	24	21	15	9	15	31	52	54	26	12	19	3	11	10	319
12 - 19	17	29	33	6	1	0	4	19	12	11	15	20	12	9	5	6	199
20 - 28	2	9	7	0	0	0	1	3	4	2	8	4	1	8	1	2	52
29 - 38	0	1	6	0	0	0	0	2	3	0	0	0	0	0	0	0	12
> 38	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Totals	28	51	75	35	21	16	25	72	93	90	62	44	35	27	23	23	720

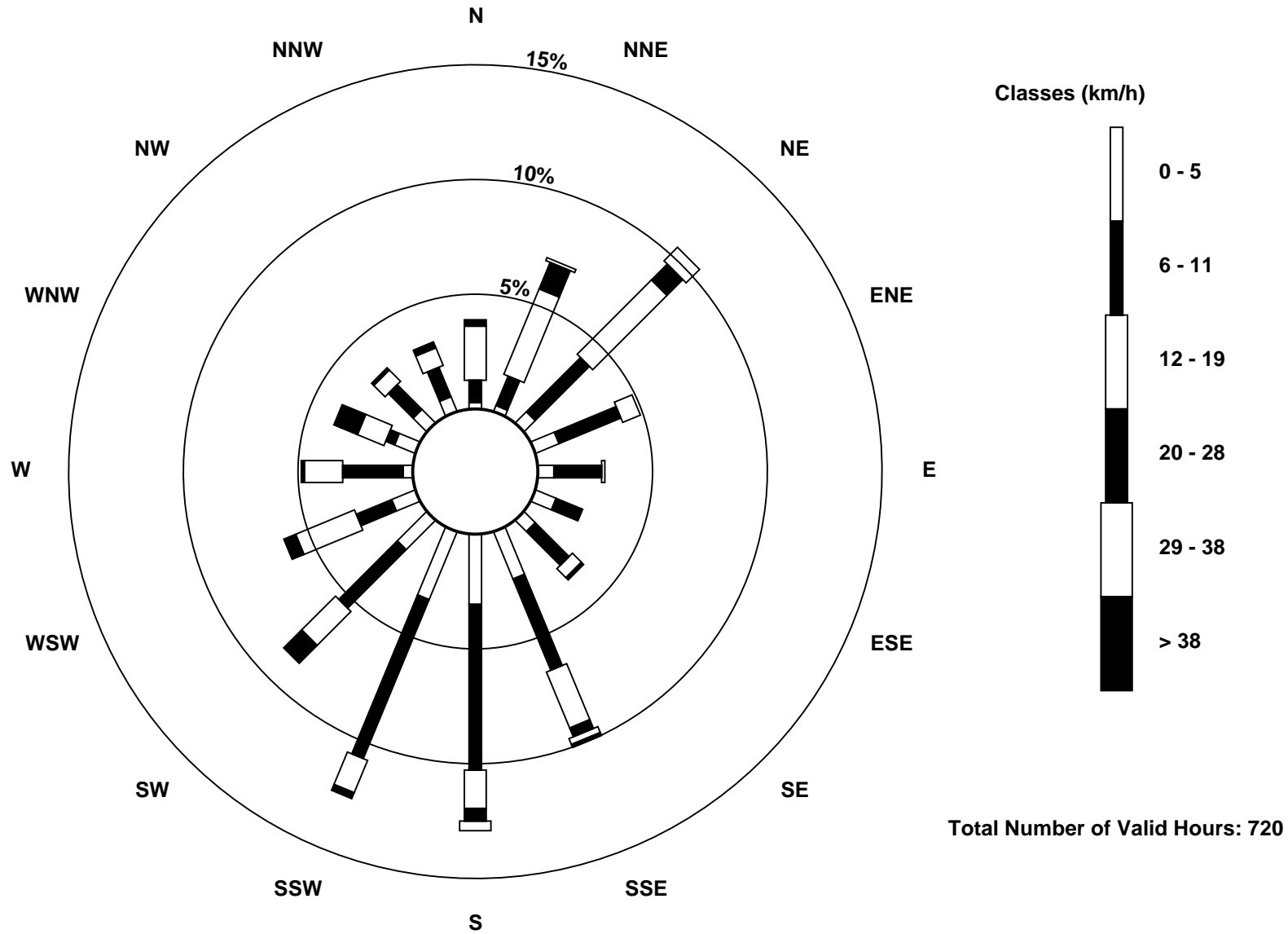
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

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 - June 2016

Direction of Maximum Speed: 165 deg on Jun 15 12:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 35.2 deg on Jun 9	Hours of Data: 720
Direction of Minimum Speed: 144 deg on Jun 11 03:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 1.0 deg on Jun 7	Percent Operational Time: 100.0
Monthly Average Direction: 224.4 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-Jun	194	189	212	170	170	155	169	153	156	216	213	203	181	194	215	207	175	168	175	267	298	86	71	125	185.6
2-Jun	147	171	192	189	188	193	202	237	248	296	313	295	319	4	327	68	222	194	150	176	265	253	181	151	210.4
3-Jun	207	176	160	187	173	185	205	208	215	214	214	220	260	284	321	314	230	50	32	73	151	212	106	188	215.8
4-Jun	168	200	226	246	254	250	256	269	278	278	287	298	298	297	289	284	287	302	303	313	16	37	286	277	282.0
5-Jun	19	188	238	237	208	196	215	323	334	312	312	319	333	7	14	10	37	41	56	69	65	70	79	128	15.6
6-Jun	164	182	179	164	172	206	201	172	171	169	153	166	171	155	167	167	172	154	172	170	172	92	42	109	162.8
7-Jun	185	193	215	212	202	164	196	201	339	338	45	54	167	141	161	68	54	49	14	330	330	337	336	269	69.7
8-Jun	229	218	298	284	163	184	179	43	34	46	44	44	49	44	55	50	50	68	134	166	70	138	108	84	64.7
9-Jun	88	78	69	35	36	37	43	39	39	38	40	38	35	35	31	35	32	33	42	31	8	359	2	352	35.2
10-Jun	322	319	314	162	211	203	229	310	353	7	14	31	31	38	46	43	46	45	47	87	84	77	78	100	33.2
11-Jun	121	156	144	165	194	219	180	161	162	149	142	148	158	163	147	145	133	131	142	115	108	93	45	46	141.2
12-Jun	63	93	103	143	177	205	216	230	208	207	201	204	200	211	236	237	264	261	254	262	232	228	226	240	227.0
13-Jun	239	244	243	226	213	207	216	236	229	227	226	231	244	253	238	235	216	231	279	41	40	80	34	317	235.6
14-Jun	175	178	179	210	170	189	227	206	316	34	48	64	105	107	83	32	26	22	21	44	134	165	135	117	96.2
15-Jun	147	123	87	67	98	74	131	64	133	148	168	165	170	168	179	183	181	182	192	167	179	192	166	161	162.0
16-Jun	156	151	157	154	159	172	173	186	194	195	213	221	226	226	219	218	237	227	237	256	272	274	262	273	207.4
17-Jun	269	241	245	261	255	275	266	296	313	303	308	300	306	296	295	282	274	258	293	353	71	25	335	234	292.3
18-Jun	258	270	280	275	272	274	283	270	253	262	273	270	251	244	237	245	222	240	217	202	240	27	64	23	264.2
19-Jun	343	306	305	284	251	221	257	307	347	353	344	342	336	330	348	349	357	14	6	0	360	354	356	330	342.6
20-Jun	324	303	226	177	184	171	165	155	193	243	226	329	201	165	202	181	181	181	180	175	157	158	173	187	187.1
21-Jun	195	186	156	173	179	184	182	194	202	194	203	197	205	185	206	161	188	156	181	197	202	182	176	208	189.0
22-Jun	165	182	192	174	155	190	185	201	216	221	228	200	198	262	204	182	168	232	251	232	214	199	163	198	206.5
23-Jun	207	226	164	175	166	215	158	49	50	79	74	69	255	249	266	345	44	34	44	74	60	41	11	333	40.1
24-Jun	46	51	32	7	7	30	45	30	3	17	360	12	26	18	347	358	21	49	30	345	6	19	43	70	19.3
25-Jun	39	12	21	17	26	0	23	30	8	27	31	31	30	38	39	43	47	54	57	77	81	115	239	275	32.6
26-Jun	256	199	164	169	169	187	179	197	178	226	197	165	315	213	208	197	179	205	223	201	232	265	119	276	209.3
27-Jun	243	199	207	199	201	203	198	210	240	227	222	229	229	66	151	191	185	127	81	104	95	112	154	216	187.8
28-Jun	199	192	182	202	203	205	196	56	30	234	42	47	36	28	15	19	22	27	37	26	39	48	45	70	38.1
29-Jun	84	69	66	127	77	77	90	56	45	39	46	54	31	25	357	34	288	233	240	92	71	127	148	174	62.2
30-Jun	197	169	161	178	208	196	180	184	176	189	183	170	165	101	169	135	138	129	140	144	130	153	174	179	164.9

197.0 192.4 193.8 193.3 193.2 198.0 199.2 213.8 246.0 255.7 243.1 228.2 242.5 311.2 252.4 283.6 222.9 63.2 58.4 53.4 79.3 79.0 83.9 179.2

Diurnal Average

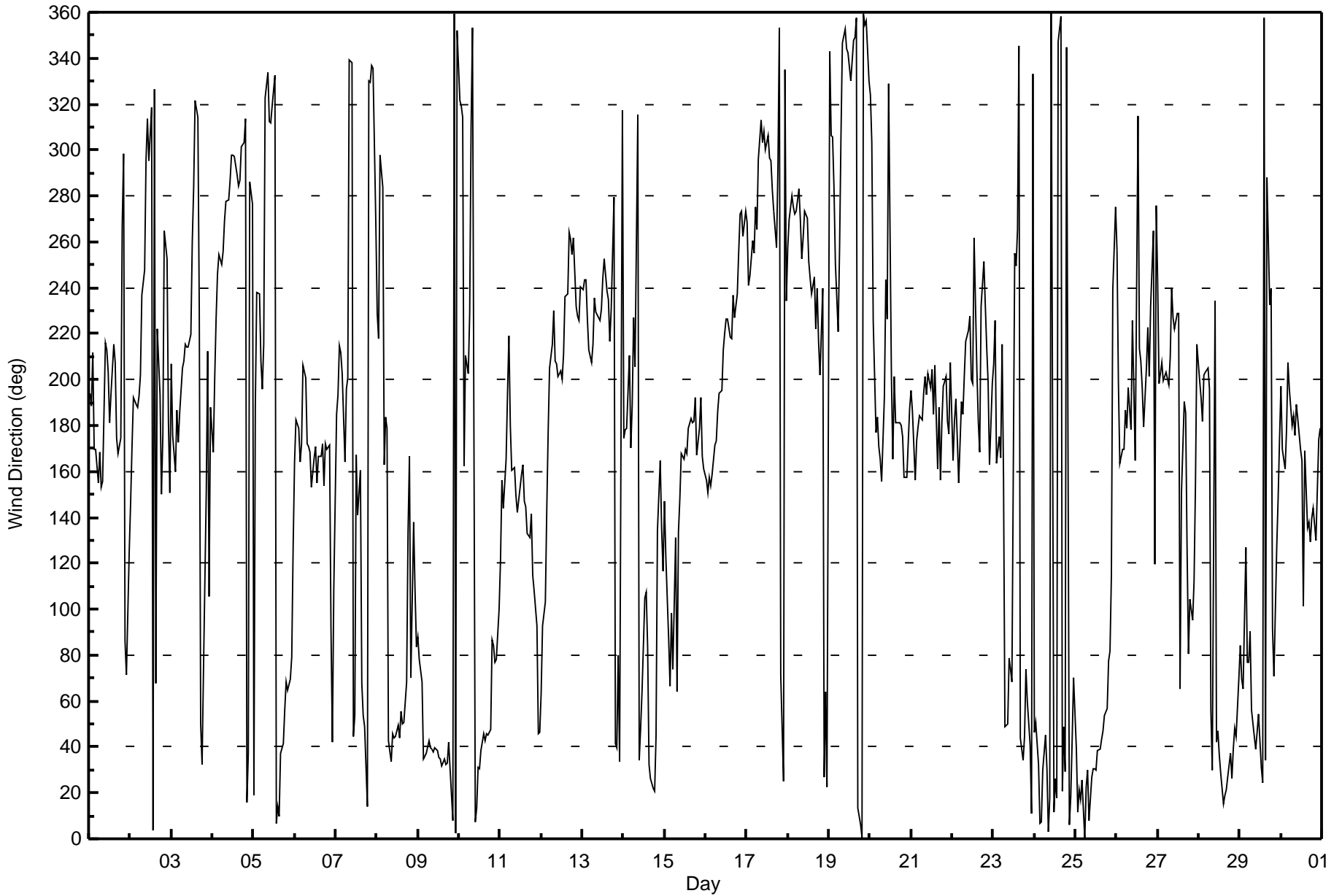
All monthly, daily, and diurnal averages have been calculated using vector methods



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Shell Muskeg River - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 102 deg on Jun 4 22:00		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0																								
Minimum Value: 7 deg on Jun 20 22:00																										
Percentiles: P ₁ = 10 P ₁₀ = 13 Q ₁ = 17 Median = 22 Q ₃ = 31 P ₉₀ = 53 P ₉₉ = 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-Jun	17	17	45	22	12	13	26	41	24	39	34	29	29	28	27	26	22	24	31	18	66	66	14	34	66	
2-Jun	11	17	18	14	19	28	29	87	34	36	34	53	52	58	68	36	39	23	24	80	17	18	69	17	87	
3-Jun	19	27	13	19	16	30	23	24	21	23	25	24	41	20	25	28	17	59	38	58	31	91	80	25	91	
4-Jun	25	20	20	9	11	11	15	18	14	15	21	18	22	17	22	22	18	18	16	28	21	102	20	48	102	
5-Jun	40	31	30	54	46	18	30	78	72	36	30	27	30	34	43	38	26	12	20	15	10	10	14	21	78	
6-Jun	23	21	18	12	23	20	26	20	21	23	24	23	25	20	21	25	19	14	18	16	19	71	46	50	71	
7-Jun	45	23	17	42	39	32	23	34	60	38	16	18	33	59	39	30	23	17	34	27	25	16	14	71	71	
8-Jun	61	34	43	39	72	28	77	13	12	20	12	12	19	13	24	18	13	12	30	18	96	25	33	25	96	
9-Jun	23	18	25	14	11	10	10	10	10	11	9	10	11	11	11	12	12	13	10	12	17	14	18	26	26	
10-Jun	13	21	58	43	10	23	29	23	27	21	28	25	24	20	15	20	20	18	18	17	10	9	12	30	58	
11-Jun	42	22	85	66	27	13	31	13	18	16	16	14	18	20	17	18	23	20	17	20	19	89	14	14	89	
12-Jun	82	89	16	11	26	24	20	22	24	25	27	28	25	23	28	13	19	16	14	13	10	13	16	13	89	
13-Jun	11	10	10	14	19	26	26	12	13	16	17	14	39	52	20	28	71	17	60	18	13	42	79	69	79	
14-Jun	43	15	25	34	28	26	32	33	62	16	22	38	47	35	32	24	16	12	23	31	17	15	20	22	62	
15-Jun	17	33	21	24	25	20	47	25	23	15	14	14	16	15	21	21	20	20	23	40	36	32	23	25	47	
16-Jun	18	15	11	11	12	15	18	23	25	24	22	19	17	17	20	27	18	19	16	16	12	10	10	12	27	
17-Jun	12	21	23	10	17	16	12	23	20	14	16	21	32	21	20	20	17	12	40	38	16	23	43	39	43	
18-Jun	12	11	10	11	14	13	14	15	17	17	23	27	24	24	22	23	28	26	26	21	57	14	27	24	57	
19-Jun	25	47	14	17	16	34	28	28	28	22	29	25	26	26	26	25	21	19	18	17	17	18	19	14	47	
20-Jun	19	39	25	16	19	13	20	20	44	36	75	83	91	71	49	30	22	23	17	15	10	7	20	19	91	
21-Jun	21	24	15	11	13	16	19	25	26	26	28	28	28	61	36	38	66	45	23	22	14	13	30	23	66	
22-Jun	16	15	17	30	8	18	21	23	18	19	18	27	44	49	31	33	16	38	11	13	20	24	24	27	49	
23-Jun	74	40	44	33	21	45	66	69	27	35	40	91	61	47	20	39	34	21	22	17	21	11	79	23	91	
24-Jun	53	35	70	24	19	11	23	21	20	23	29	32	18	18	41	21	16	21	38	19	20	19	29	53	70	
25-Jun	71	20	15	14	47	19	16	15	21	23	19	18	24	14	17	17	20	24	22	16	13	52	19	55	71	
26-Jun	60	66	33	19	20	20	24	21	24	22	35	57	67	50	64	48	36	54	19	21	16	38	59	60	67	
27-Jun	27	22	19	23	20	26	25	24	27	24	24	21	16	44	26	23	27	65	25	20	19	30	24	19	65	
28-Jun	17	17	11	15	15	17	58	62	53	55	75	13	19	21	24	25	23	17	13	11	13	12	13	11	75	
29-Jun	30	13	91	85	49	29	46	21	37	32	33	45	32	36	49	83	69	56	40	29	11	32	12	23	91	
30-Jun	19	19	8	17	18	21	19	24	21	29	25	26	22	65	89	26	21	17	18	11	14	33	22	17	89	
		82	89	91	85	72	45	77	87	72	55	75	91	91	71	89	83	71	65	60	80	96	102	80	71	
		Diurnal Maximum																								





Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	June 23, 2016	Last Calibration	May 27, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Routine		
Start Time (MST)	9:30	End Time (MST)	15:10
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	813	801
Calculated slope	0.995105	0.995096	Chamber temp	45.0	45.0
Calculated intercept	1.697493	1.419396	Pressure	703.8	700.9
Analyzer Background	9.0	8.7	Flow	0.444	0.440
Analyzer Coefficient	1.050	1.059	Intensity	108	108

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	-0.3	----
as found span	5000	83.6	807.6	789.1	1.023
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	83.6	807.6	811.0	0.996
second point	5000	42.0	405.7	405.3	1.001
third point	5000	21.1	203.8	202.0	1.009
as left zero	5000	0.0	0.0	0.4	----
as left span	5000	83.6	807.6	802.2	1.007
Average Correction Factor					1.002

Corrected As found 789.4 Previous response 809.9 % change 2.6%

Notes:

Changed inlet filter after as founds. Additional zero/span conducted after inlet filter change to measure the potential impact of smoke on the filter. Adjusted zero and span.

Calibration Performed By: Evan Magill



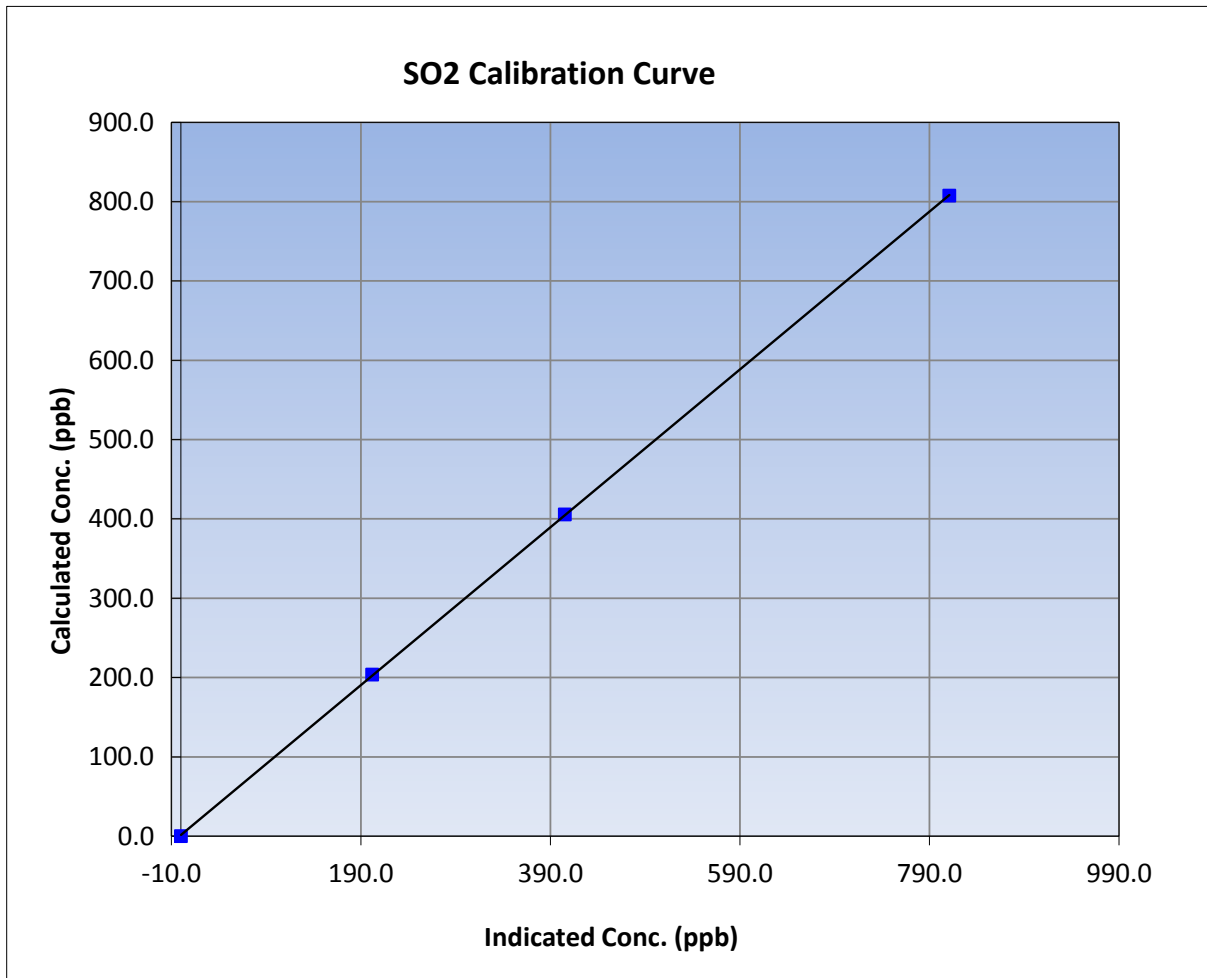
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 23, 2016	Previous Calibration	May 27, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	9:30	End Time (MST)	15:10
Analyzer make	Thermo 43i	Analyzer serial #	1118148498

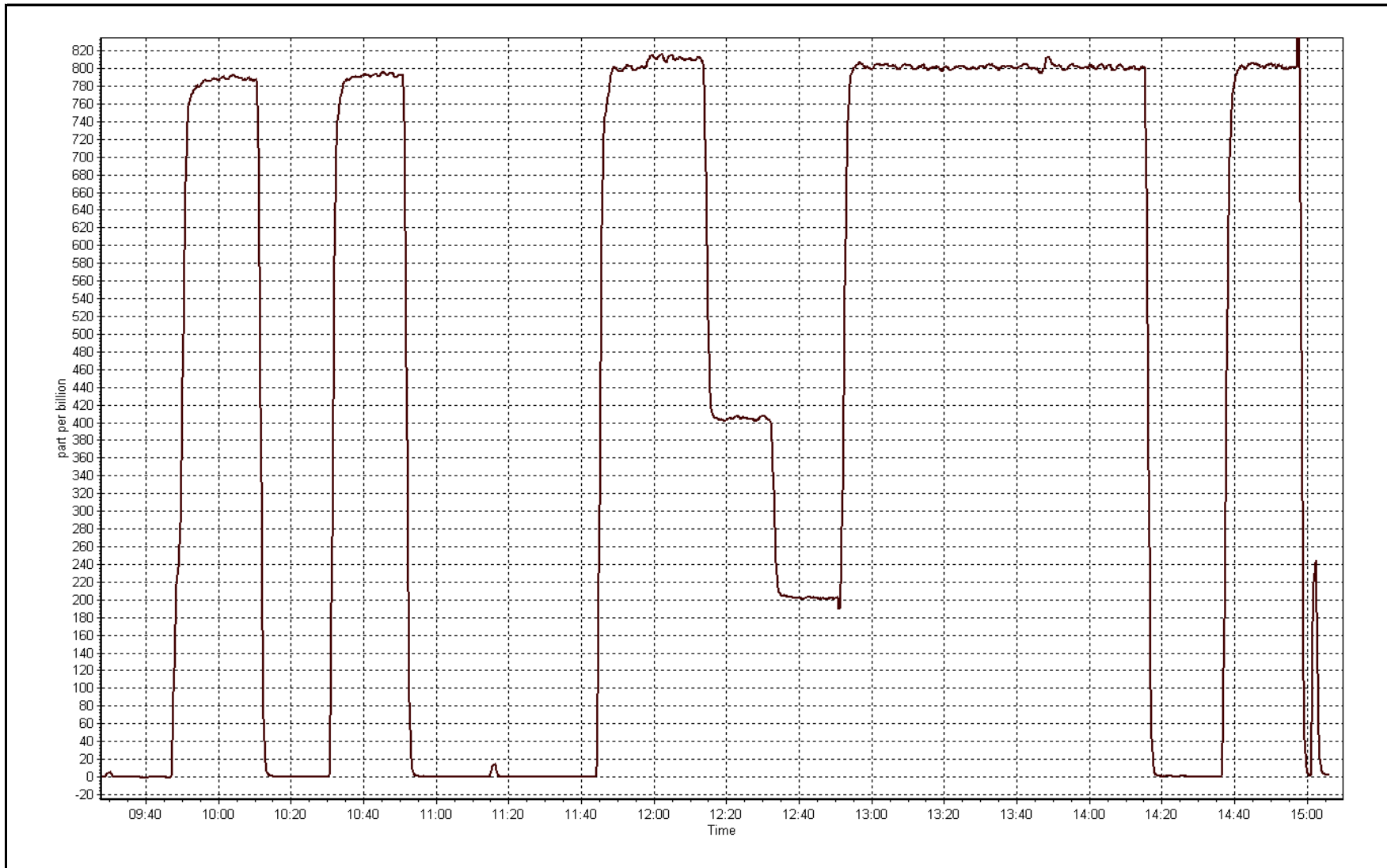
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999983
807.6	811.0	0.9958		
405.7	405.3	1.0011	Slope	0.995096
203.8	202.0	1.0090		
			Intercept	1.419396



SO2 Calibration Plot

Date: June 23, 2016





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June-23-16	Last Calibration	May-27-16
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Routine		
Start Time (MST)	9:30	End Time (MST)	15:10
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

	<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	34.9	34.9
Calculated slope	1.003133	0.997609	Fuel Pressure	24.2	24.2
Calculated intercept	-0.090906	0.020536	Analyzer Coeff	4.476	4.494
			Analyzer BKG	2.60	2.89

Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153458
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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	0.24	----
as found span	5000	83.6	17.02	17.12	0.994
calibrator zero	5000	0.0	0.00	-0.04	----
high point	5000	83.6	17.02	17.03	0.999
second point	5000	42.0	8.55	8.55	1.000
third point	5000	21.1	4.29	4.31	0.996
as left zero	5000	0.0	0.00	0.04	----
as left span	5000	83.6	17.02	17.10	0.995
Average Correction Factor					0.999

Corrected As found	16.88	Previous response	17.05	% change	1.0%
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Notes:

Changed inlet filter after as founds. Additional zero/span conducted after the inlet filter change to measure the potential impact of smoke on the filter.
 Changed the zero air generator scrubbers after additional zero/span. Adjusted zero and span.

Calibration Performed By:

_____ Evan Magill



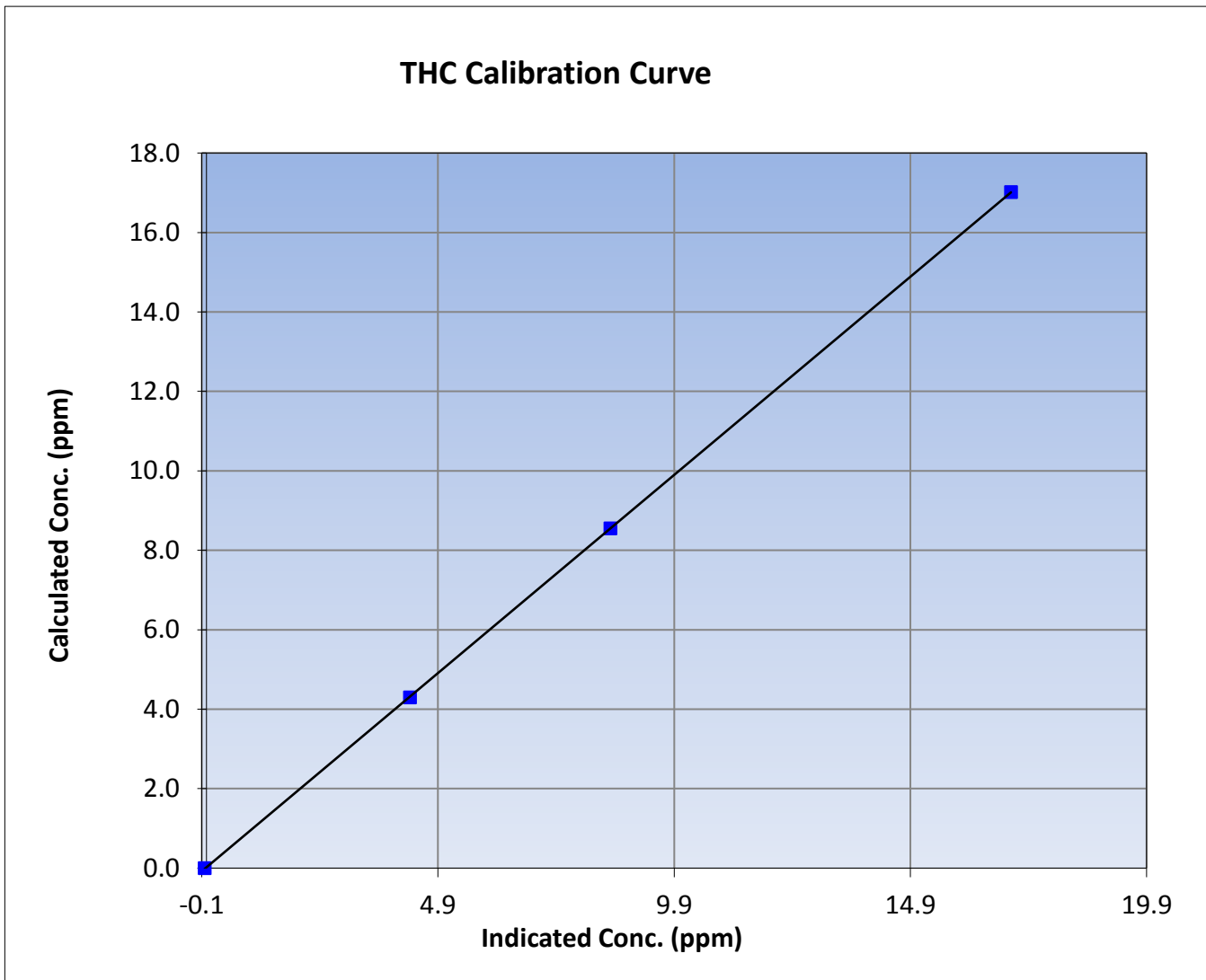
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June 23, 2016	Previous Calibration	May 27, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	9:30	End Time (MST)	15:10
Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153458

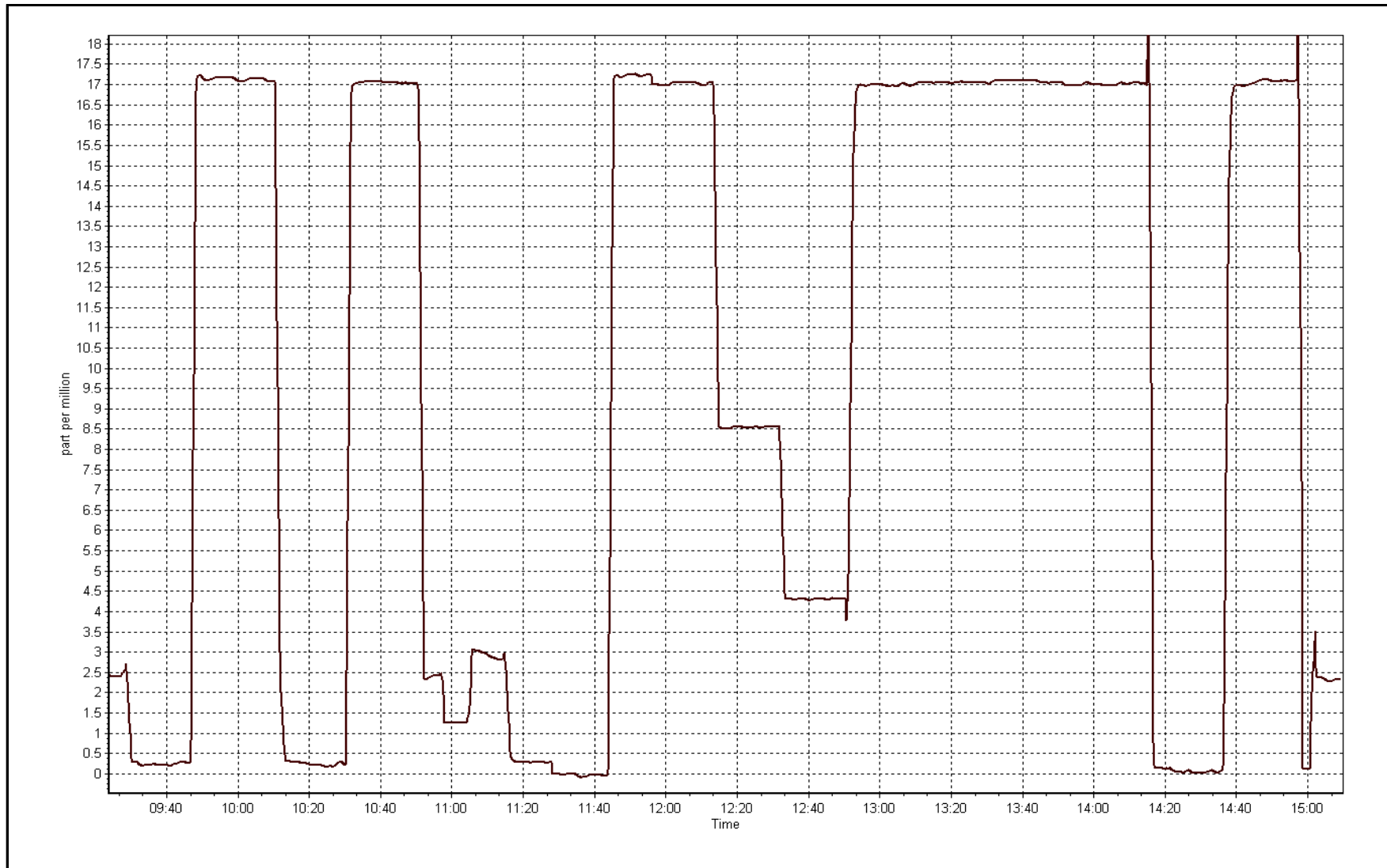
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.04	----	Correlation Coefficient	0.999993
17.02	17.03	0.9992		
8.55	8.55	0.9999	Slope	0.997609
4.29	4.31	0.9965		
			Intercept	0.020536



THC Calibration Plot

Date: June 23, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 23, 2016	Previous Calibration	May 27, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Reason:	Routine		
Start Time (MST)	9:30	End Time (MST)	15:10
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	0.999800	0.999480	0.991269
	Data Offset	0.697664	1.505058	-0.218043
Current Calibration	Data Slope	1.000771	0.999935	0.996226
	Data Offset	0.466606	1.065473	0.754531

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1426262593
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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	1.073		1.094	
NOx coefficient	1.000		1.000	
NO2 coefficient	0.998		0.998	
NO bkgrnd	8.9		9.1	
NOx bkgrnd	9.1		9.2	
Chamber Temp	50.5	Deg C	50.2	Deg C
Moly Temp	327.4	Deg C	326.3	Deg C
PMT voltage	-744.4	V	-744.4	V
PMT Temp	-2.7	Deg C	-2.7	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	168.6	mmHg	169.8	mmHg
R Cell Press Nox	168.6	mmHg	169.5	mmHg
NO sample flow	0.898	lpm	0.87	lpm
Nox sample Flow	0.899	lpm	0.872	lpm

Notes:

Changed inlet filter after as founds. Additional zero/span conducted after inlet filter change to measure the potential impact of smoke on the filter.
Changed the zero air generator scrubbers after the additional zero/span. Adjusted span.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 23, 2016

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	0.1	-0.1	0.3	----	----
as found span	5000	83.6	802.6	802.6	0.0	775.5	773.8	1.7	1.0349	1.0371
calibrator zero	5000	0.0	0.0	0.0	0.0	0.1	-0.1	0.3	----	----
high point	5000	83.6	802.6	802.6	0.0	801.9	802.1	-0.2	1.0008	1.0006
second point	5000	42.0	403.2	403.2	0.0	401.8	401.5	0.3	1.0035	1.0043
third point	5000	21.1	202.6	202.6	0.0	201.6	200.7	0.9	1.0050	1.0093
as left zero	5000	0.0	0.0	0.0	0.0	1.5	0.0	1.6	----	----
as left span	5000	83.6	802.6	523.4	279.2	798.3	518.4	279.9	1.0053	1.0097
Average Correction Factor									1.0031	1.0047

Corrcctd As found NO_x= 775.3 NO= 773.9 Percent Change NO_x= 3.4% NO= 3.6%
 Previous Response NO_x= 802.0 NO= 801.5

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			0.3			N/A	
1st NO2 (300)	----	523.4	276.9	801.4	523.4	278.0	0.9849	1.0000	0.9958	100.4%
2nd NO2 (200)	----	609.5	190.8	799.6	609.5	190.1	0.9872	1.0000	1.0035	99.6%
3rd NO2 (100)	----	700.4	99.8	798.6	700.4	98.2	0.9884	1.0000	1.0167	98.4%
4th NO2 (0)	800.3	----	1.4	801.7	800.3	1.4	0.9847	1.0000	N/A	----
Average Correction Factor							0.9863	1.0000	1.0053	99.5%

Calibration Performed By: Evan Magill



Wood Buffalo Environmental Association

NO_x Calibration Summary

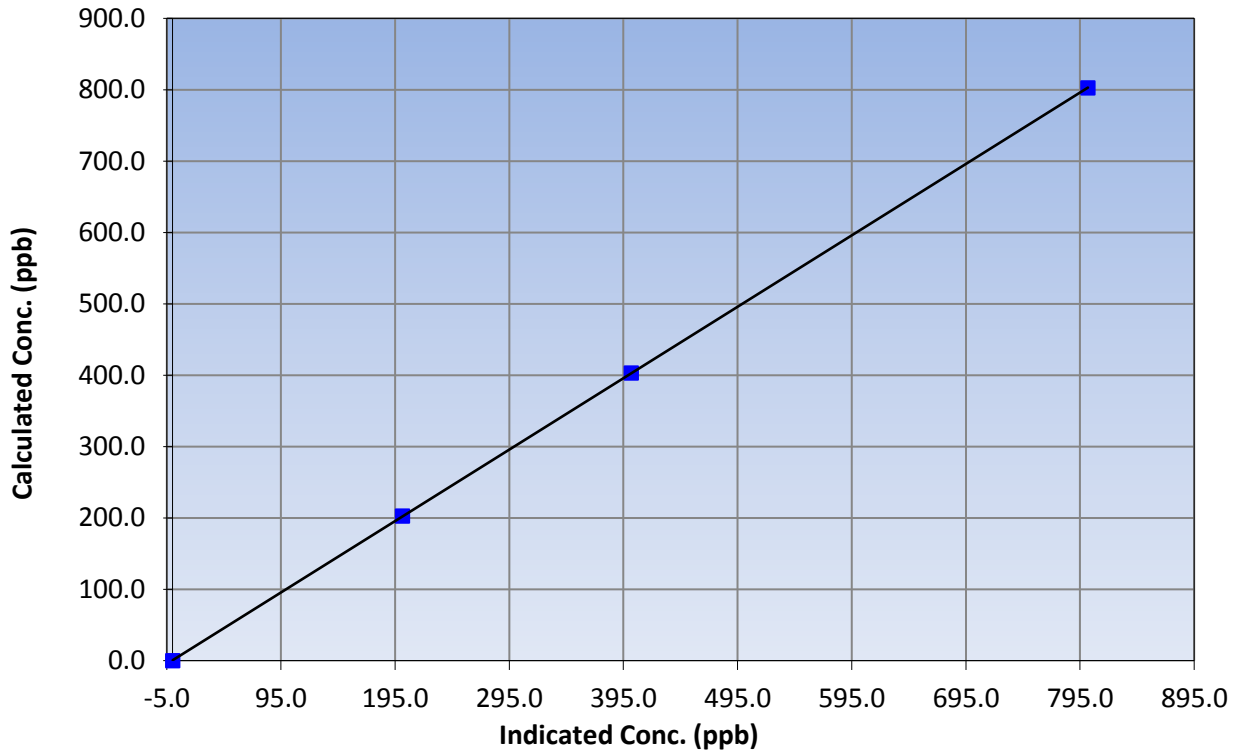
Station Information

Calibration Date	June 23, 2016	Previous Calibration	May 27, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	9:30	End Time (MST)	15:10
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	----	Correlation Coefficient	0.999997
802.6	801.9	1.0008		
403.2	401.8	1.0035	Slope	1.000771
202.6	201.6	1.0050		
			Intercept	0.466606

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

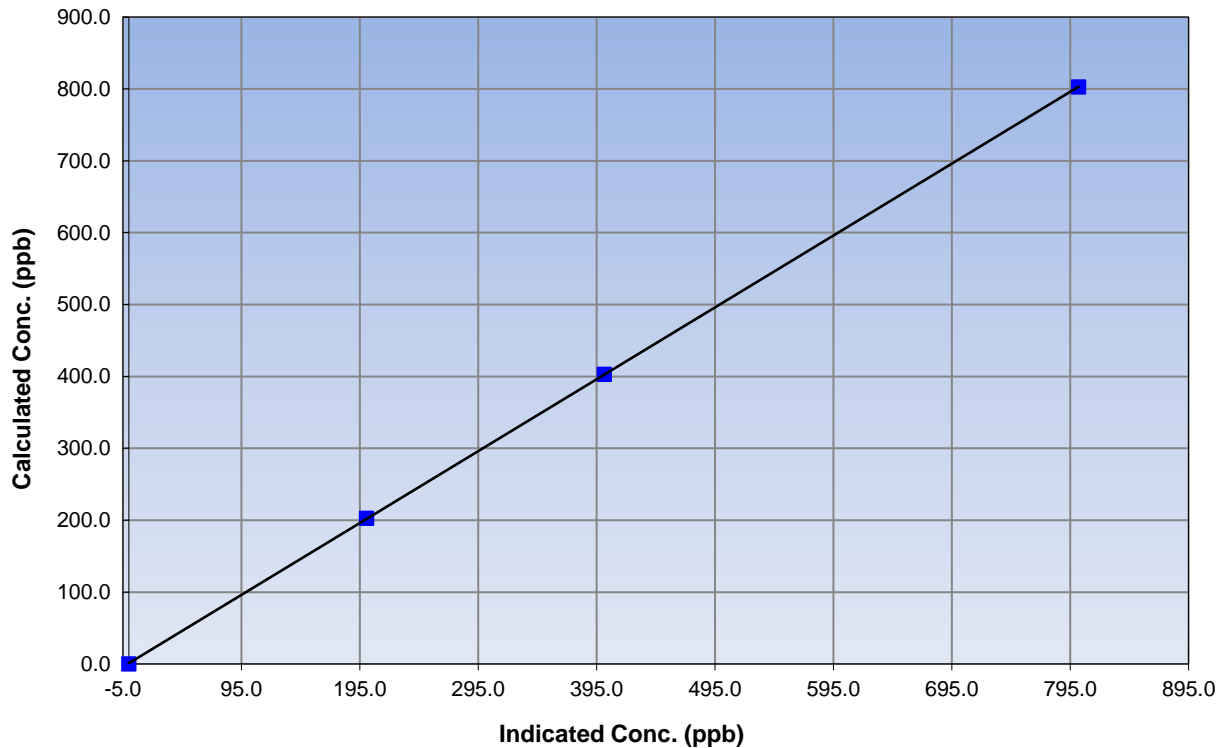
Station Information

Calibration Date	June 23, 2016	Previous Calibration	May 27, 2016
Station Name	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	9:30	End Time (MST)	15:10
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	0.999993
802.6	802.1	1.0006		
403.2	401.5	1.0043	Slope	0.999935
202.6	200.7	1.0093		
			Intercept	1.065473

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

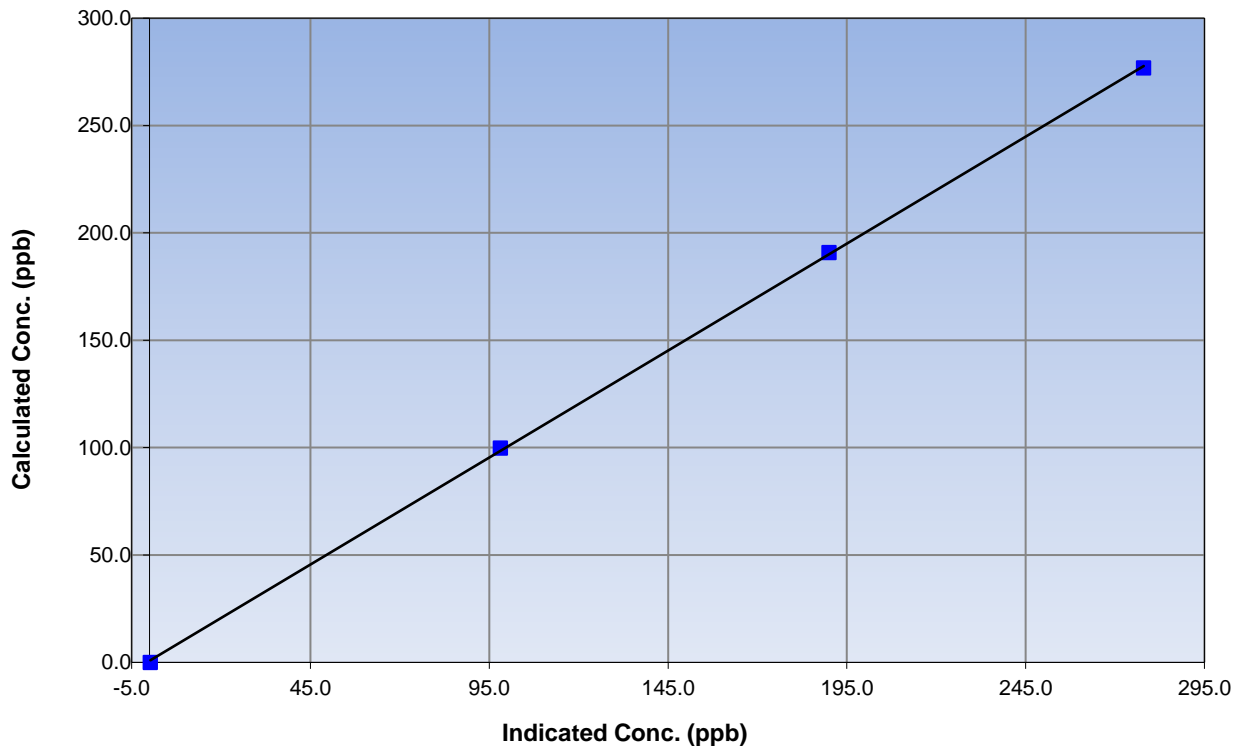
Station Information

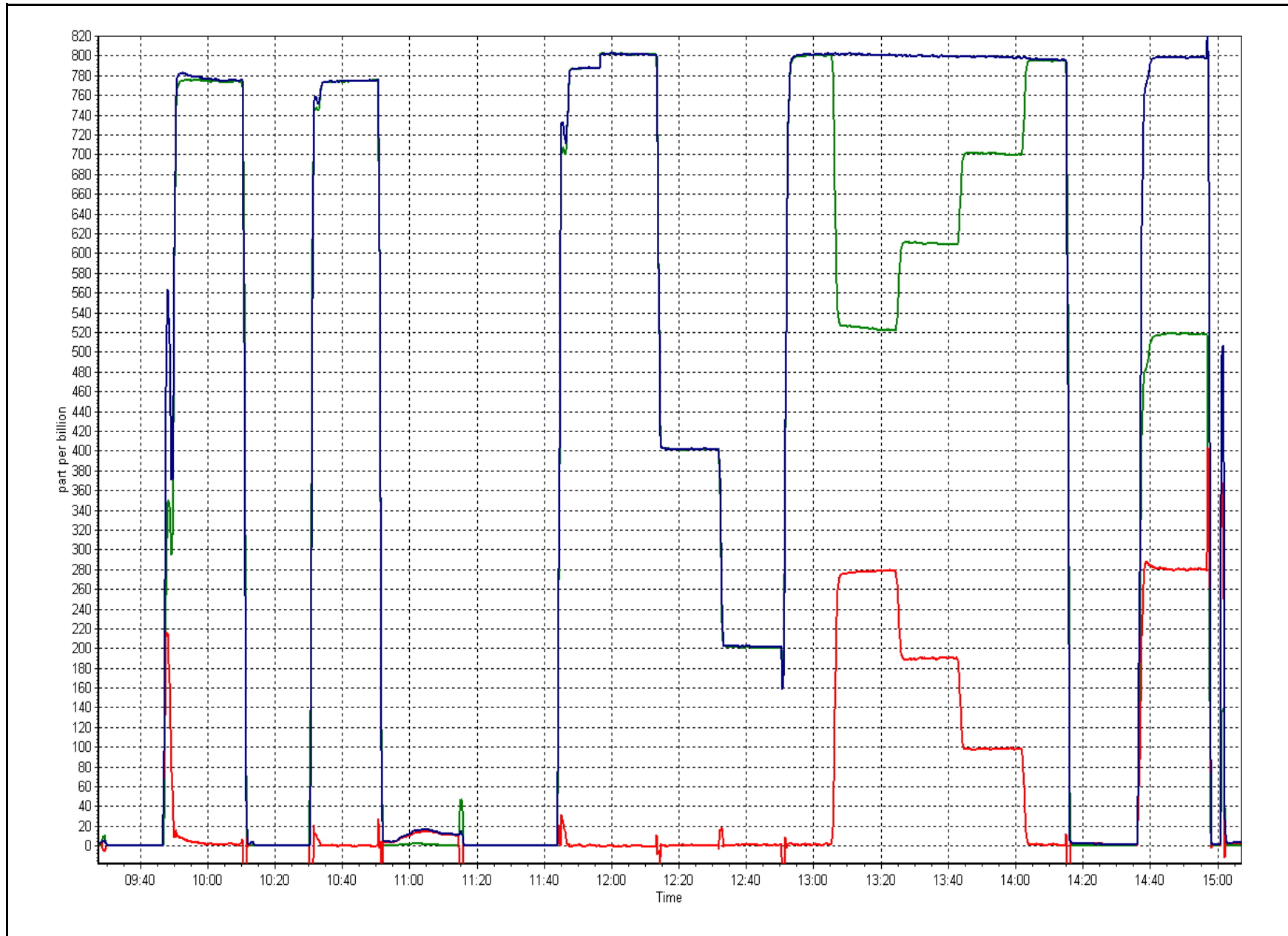
Calibration Date	June 23, 2016	Previous Calibration	May 27, 2016
Station Number	Shell Muskeg River	Station Number	AMS 16
Start Time (MST)	9:30	End Time (MST)	15:10
Analyzer make	Thermo 42i	Analyzer serial #	1426262593

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	N/A	Correlation Coefficient	0.999911
276.9	278.0	0.9958		
190.8	190.1	1.0035	Slope	0.996226
99.8	98.2	1.0167		
			Intercept	0.754531

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	June 24, 2016	Previous Calibration:	May 27, 2016
Station Name:	Shell Muskeg River	Station Number:	AMS 16
Start Time (MST):	10:08	End Time (MST):	13:20
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	954

SHARP INFORMATION			
Particulate Fraction:	PM2.5		
Make/Model:	Thermo / SHARP 5030		
Serial Number	E-798		
C ₁₄ 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 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 type="checkbox"/> Neph <input checked="" type="checkbox"/>

CALIBRATION DATA				
Temperature (°C)				
Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	22.2	22.4	0.2	22.4
T2	27.0	27.0	0.0	27.0
T3	28.0	27.0	-1.0	28.0
T4	21.0	22.0	1.0	21.0
RH (%)	42.0	44.0	2.0	42.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	975	975.9	0.9	975

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1002	1016	14	1016	1002

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	547		546
Neph	2.6		-0.6
C14	-7.5		-2.3
Indicated Concentration (ug/m3)	1.2	yes	-0.2
Offset 1	546.6		
Offset 2	69.2		

Leak Check (Quarterly)			
Leak Check Date:	June 24, 2016	Previous Leak Check Date:	January 25, 2016
	Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.94		0.28
*Flow with adaptor (LPM):	16.66		
<i>*Note - do not attach adaptor without shutting off the pump first</i>			

Mass Foil Calibration (Annually)			
Foil Calibration Date:	June 24, 2016	Previous Foil Calibration:	May 25, 2015
Zeroed?:	yes		
Foil Mass:	1336		Mass foil set S/N: 2519
Previous Correction Factor:	7066		
New Correction Factor:	6936		

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	24/06/2016
Pump	Good	
Filter Tape	Good	April 19, 2016
Mass Foil Cal Set	Good	June 24, 2016
HEPA filter	Good	

NOTES:

Measured T1-T4 and RH using a temp/RH primary standard, no adjustments needed. Leak check and mass foil calibration conducted. Cleaned the cyclone head at the station. Adjusted zero.

Calibration Performed By: Evan Magill



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY MONITORING PROGRAM MONTHLY REPORT

**AMS 17
WAPASU
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)
 JUNE 2016

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	684	34	36	99.72	23	0	3	0
H2S (ppb) Average	686	34	34	100.00	1	0	0	0
THC (ppm) Average	683	34	37	99.58	2.9	-	2.3	-
O3 (ppb) Average	682	33	38	99.31	59	0	47	-
NO2 (ppb) Average	661	34	59	96.53	9	0	2	-
NO (ppb) Average	661	34	59	96.53	5	-	1	-
NOX (ppb) Average	661	34	59	96.53	13	-	3	-
PM2.5 (ug/m3) Average	692	3	28	96.53	70.6	-	13.1	0
Temperature 2 m (C) Average	720	0	0	100.00	27.9	-	22.4	-
Relative Humidity (%) Average	720	0	0	100.00	99	-	95	-
Precipitation (mm) Total	719	0	1	99.86	6.5	-	40.9	-
Wind Speed 10 m (km/h) Average	720	0	0	100.00	29	-	17	-
Wind Direction 10 m (deg) Average	720	0	0	100.00	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	684	0.6	2	-	0	0	0	0	0	1	23
H2S (ppb) Average	686	0.1	0	-	0	0	0	0	0	0	1
THC (ppm) Average	683	2.11	0.1	-	2	2	2.1	2.1	2.1	2.2	2.9
O3 (ppb) Average	682	31.4	12	-	2	16	24	32	39	46	59
NO2 (ppb) Average	661	0.9	1	-	0	0	0	0	1	2	9
NO (ppb) Average	661	0.4	0	-	0	0	0	0	1	1	5
NOX (ppb) Average	661	1.2	2	-	0	0	0	1	1	3	13
PM2.5 (ug/m3) Average	692	4.8	4.7	-	0.9	2	2.5	3.7	5.6	8.2	70.6
Temperature 2 m (C) Average	720	16.01	5.5	-	-0.6	9.6	11.8	15.8	20.1	23.3	27.9
Relative Humidity (%) Average	720	61.8	23	-	16	31	43	60	85	95	99
Precipitation (mm) Total	719	-	-	99.94	-	-	-	-	-	-	-
Wind Speed 10 m (km/h) Average	720	9	5	-	0	4	5	8	12	15	29
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - WAPASU (AMS 17)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2, THC, O3, NO2	23 Jun 2016 10:00	23 Jun 2016 11:00	2	Maintenance - cleaned glass manifold
THC, O3	15 Jun 2016 14:00	15 Jun 2016 14:00	1	Power spike
O3	16 Jun 2016 10:00	16 Jun 2016 11:00	2	Maintenance - analyzer restart
NO2, NO, NOX	15 Jun 2016 12:00	16 Jun 2016 10:00	23	Analyzer failure - power cord replaced
PM2.5	22 Jun 2016 10:00	22 Jun 2016 14:00	5	Maintenance - cleaned sample chambers
PM2.5	22 Jun 2016 15:00	23 Jun 2016 10:00	20	Unstable operation - sample leak
Precipitation Collector	23 Jun 2016 13:00	23 Jun 2016 13:00	1	Maintenance - operational check



Summary of Hour Averages

Wapasu - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 23 ppb on Jun 2 07:00	Maximum Daily Average: 3.5 ppb on Jun 2		Hours of Data:	684
Minimum Value: 0 ppb on Jun 2 01:00	Minimum Daily Average: 0.1 ppb on Jun 24		Hours of Missing Data:	36
Maximum Diurnal Average: 1.4 ppb at hour 7	Minimum Diurnal Average: 0.2 ppb at hour 1		Hours of Calibration:	34
Monthly Average: 0.6 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 7		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-Jun	0	0	Z	0	0	0	0	1	2	0	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0.5	2
2-Jun	0	0	0	Z	0	1	23	20	8	6	5	3	2	1	2	1	1	5	0	0	0	0	0	0	3.5	23
3-Jun	0	0	1	1	Z	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
4-Jun	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
5-Jun	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
6-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0.4	1
7-Jun	0	0	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
8-Jun	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
9-Jun	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
10-Jun	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
11-Jun	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
12-Jun	0	Z	0	0	0	0	0	3	7	2	0	0	0	1	3	2	2	0	0	0	0	0	1	1	1.0	7
13-Jun	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
14-Jun	0	1	0	Z	6	1	0	0	0	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	6
15-Jun	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
16-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	1	1	2	1	0	0	0	1	0	0	0	0	0.4	2
17-Jun	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
18-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1
19-Jun	0	0	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
20-Jun	0	0	0	Z	0	0	0	0	1	1	0	1	1	0	0	0	0	1	2	2	3	2	1	1	0.8	3
21-Jun	1	1	1	1	Z	1	6	7	3	0	0	0	0	1	1	1	1	0	1	0	0	0	1	0	1.2	7
22-Jun	0	0	0	0	0	Z	1	2	0	C	C	C	C	0	1	1	1	3	4	1	1	10	11	4	2.2	11
23-Jun	Z	2	1	1	0	1	1	1	0	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
24-Jun	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
25-Jun	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
26-Jun	0	0	0	Z	0	0	0	1	7	5	4	2	1	0	0	0	1	1	4	4	2	1	0	0	1.5	7
27-Jun	0	0	0	0	Z	2	3	2	1	0	0	0	0	0	1	1	1	2	1	1	0	0	0	0	0.7	3
28-Jun	0	0	0	1	2	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
29-Jun	Z	1	1	0	1	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0.5	1
30-Jun	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

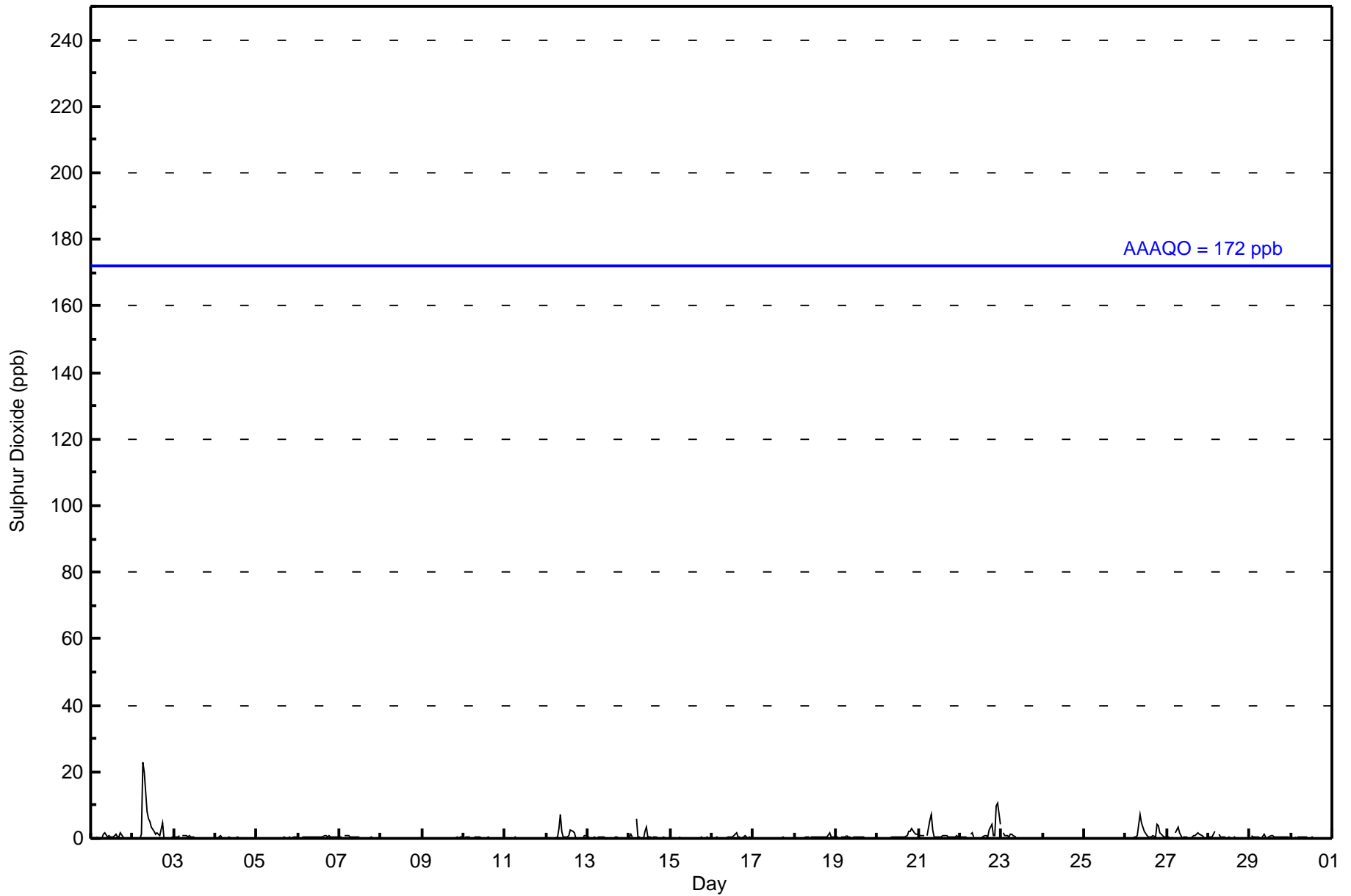
0.2	0.3	0.3	0.4	0.5	0.5	1.4	1.4	1.2	0.8	0.6	0.4	0.3	0.3	0.5	0.4	0.4	0.6	0.6	0.4	0.4	0.6	0.6	0.3	Diurnal Average	
1	2	1	1	6	2	23	20	8	6	5	3	2	1	3	2	2	5	4	4	3	10	11	4	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Wapasu - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Wapasu - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	681	99.56	99.56
11 - 20	2	0.29	99.85
21 - 60	1	0.15	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Wapasu - June 2016**

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	31	33	25	23	53	123	52	53	46	47	31	33	30	27	43	681
11 - 20	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	2
21 - 60	0	0	0	0	0	0	1	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
Totals	31	31	33	25	23	54	124	52	53	47	47	31	33	30	27	43	684

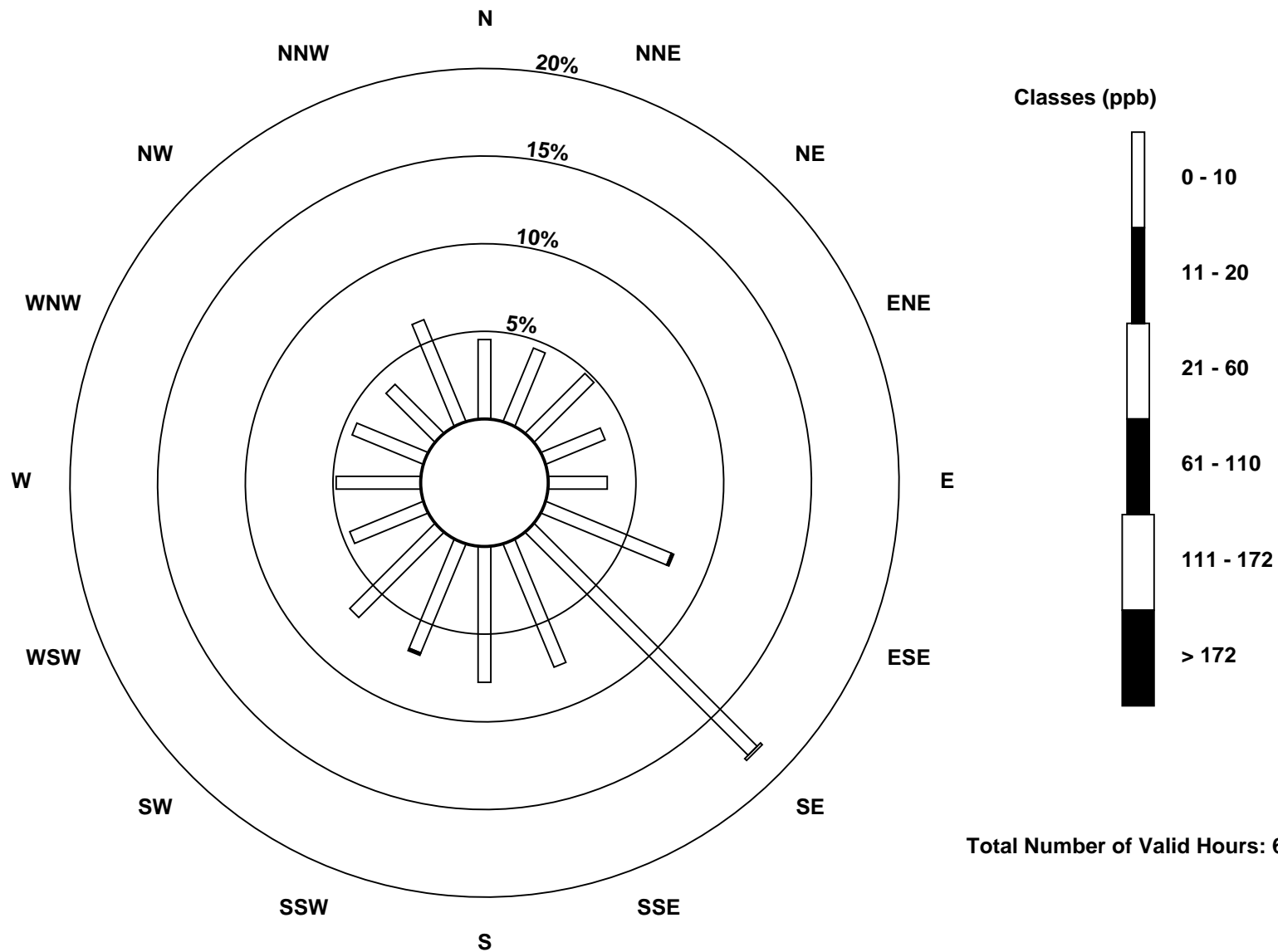
Total Number of Valid Hours: 684

Total Number of Hours: 720

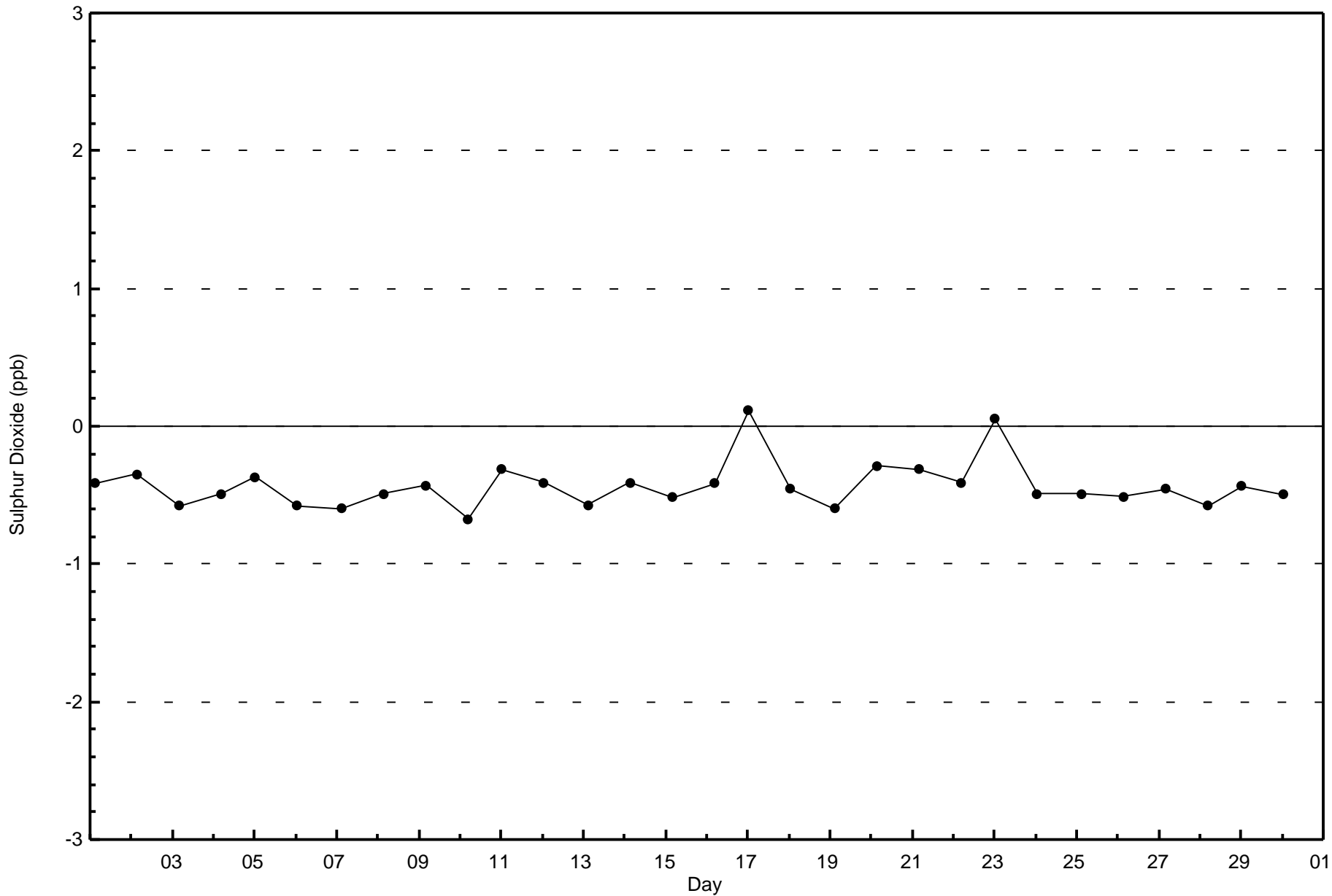


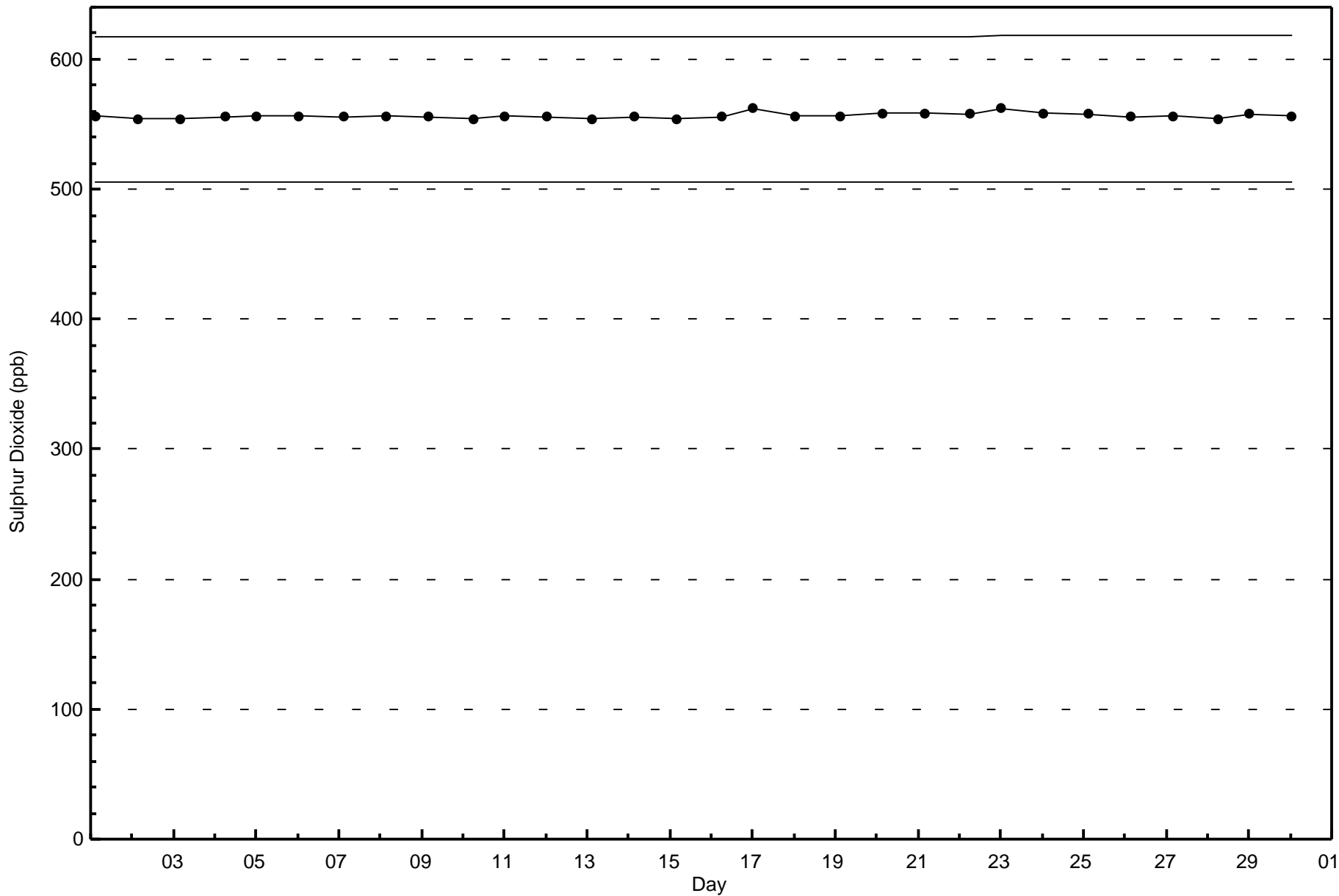
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Sulphur Dioxide (SO₂) - ppb
Wapasu (AMS 17)



Total Number of Valid Hours: 684

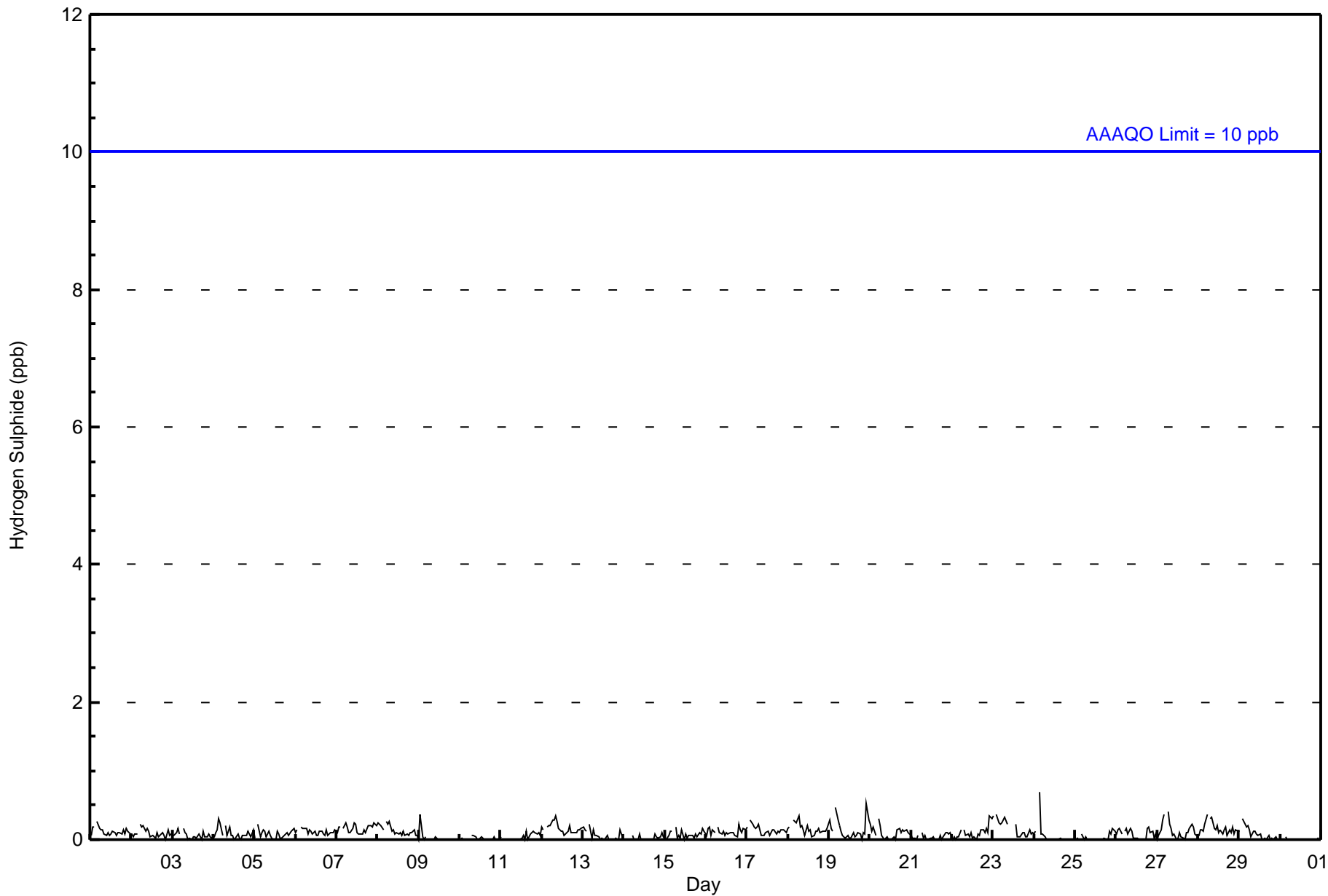






Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Wapasu - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Wapasu - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	686	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: 686

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Wapasu - June 2016**

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	32	33	26	22	55	123	54	52	48	49	31	32	30	26	42	686
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
Totals	31	32	33	26	22	55	123	54	52	48	49	31	32	30	26	42	686

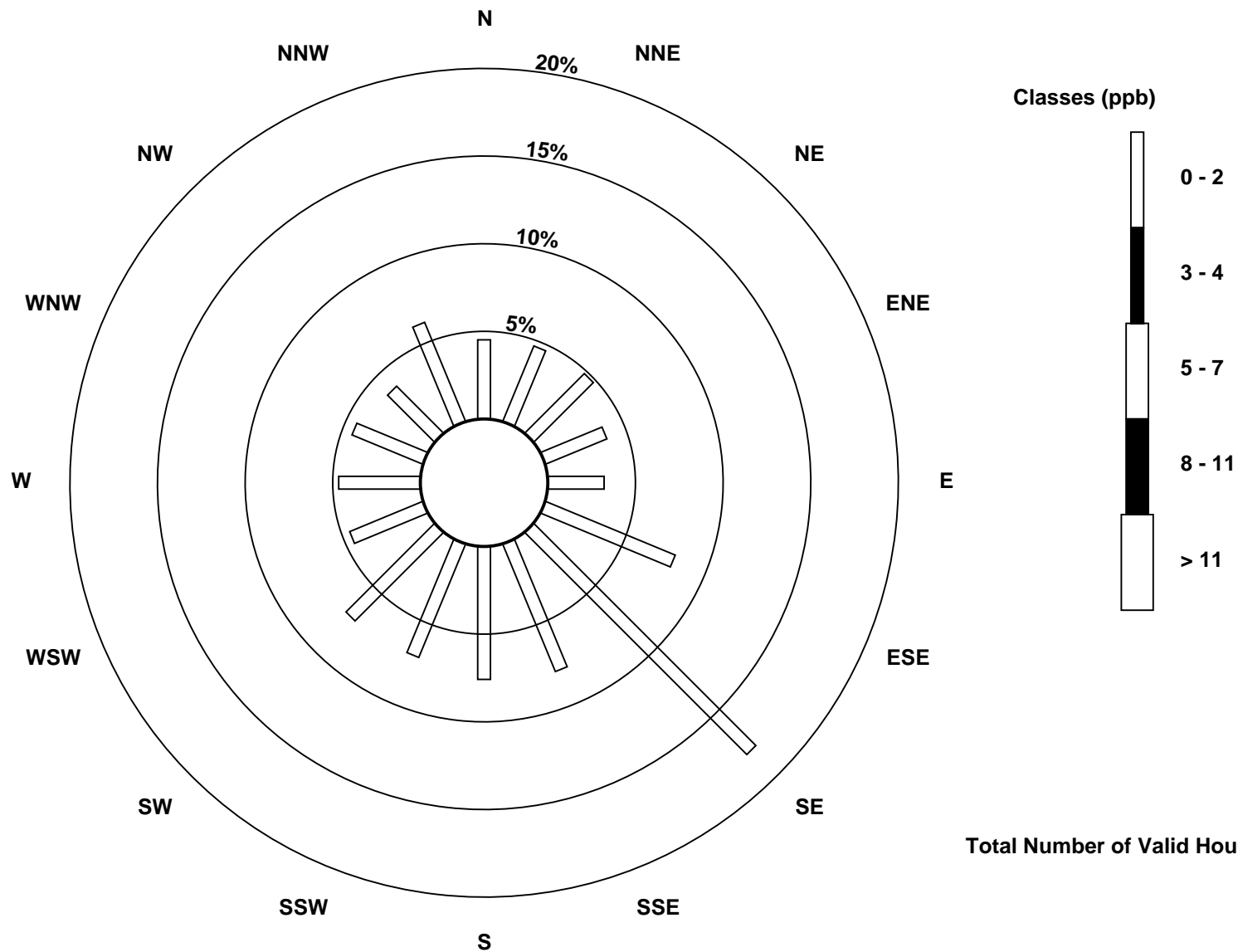
Total Number of Valid Hours: 686

Total Number of Hours: 720

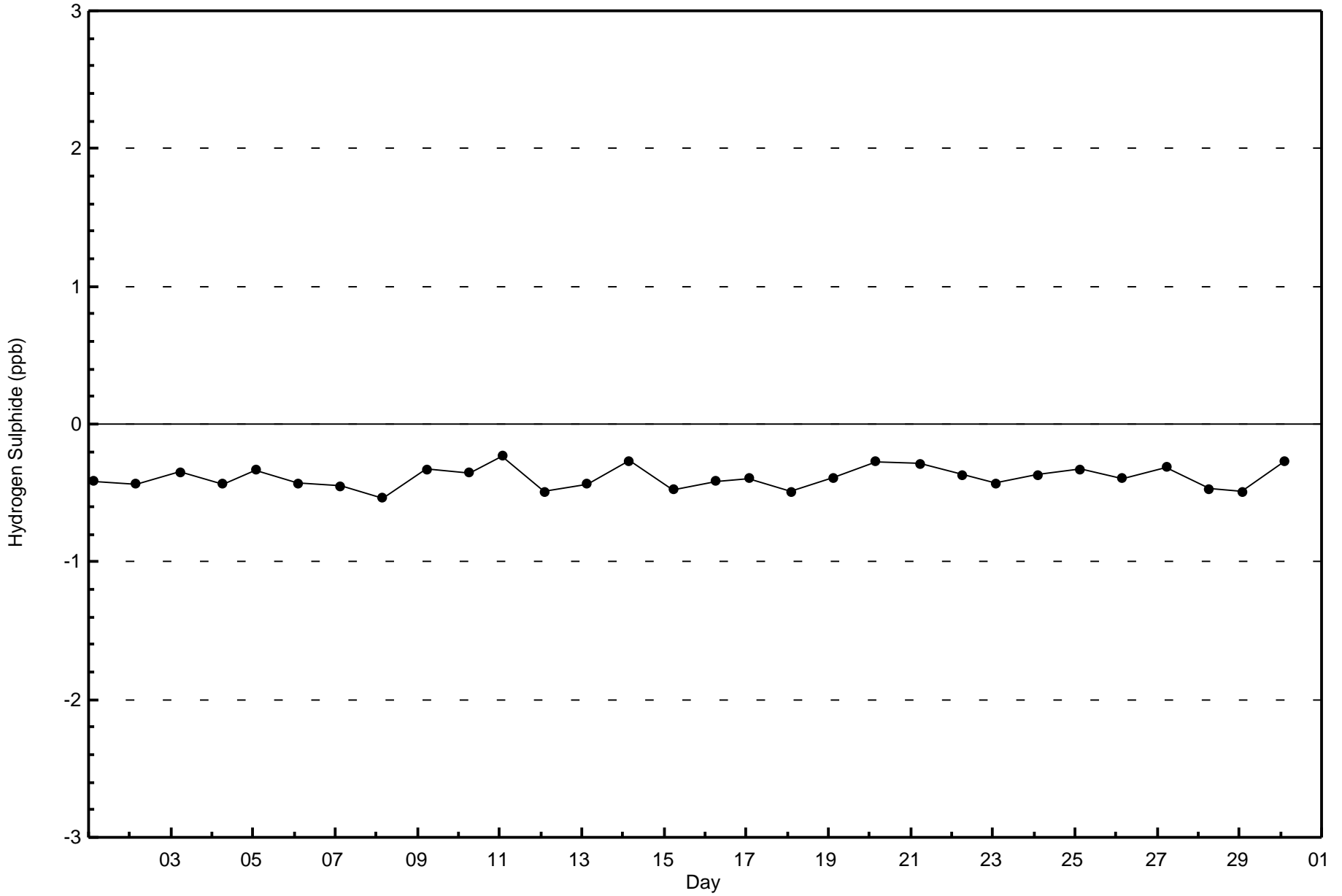


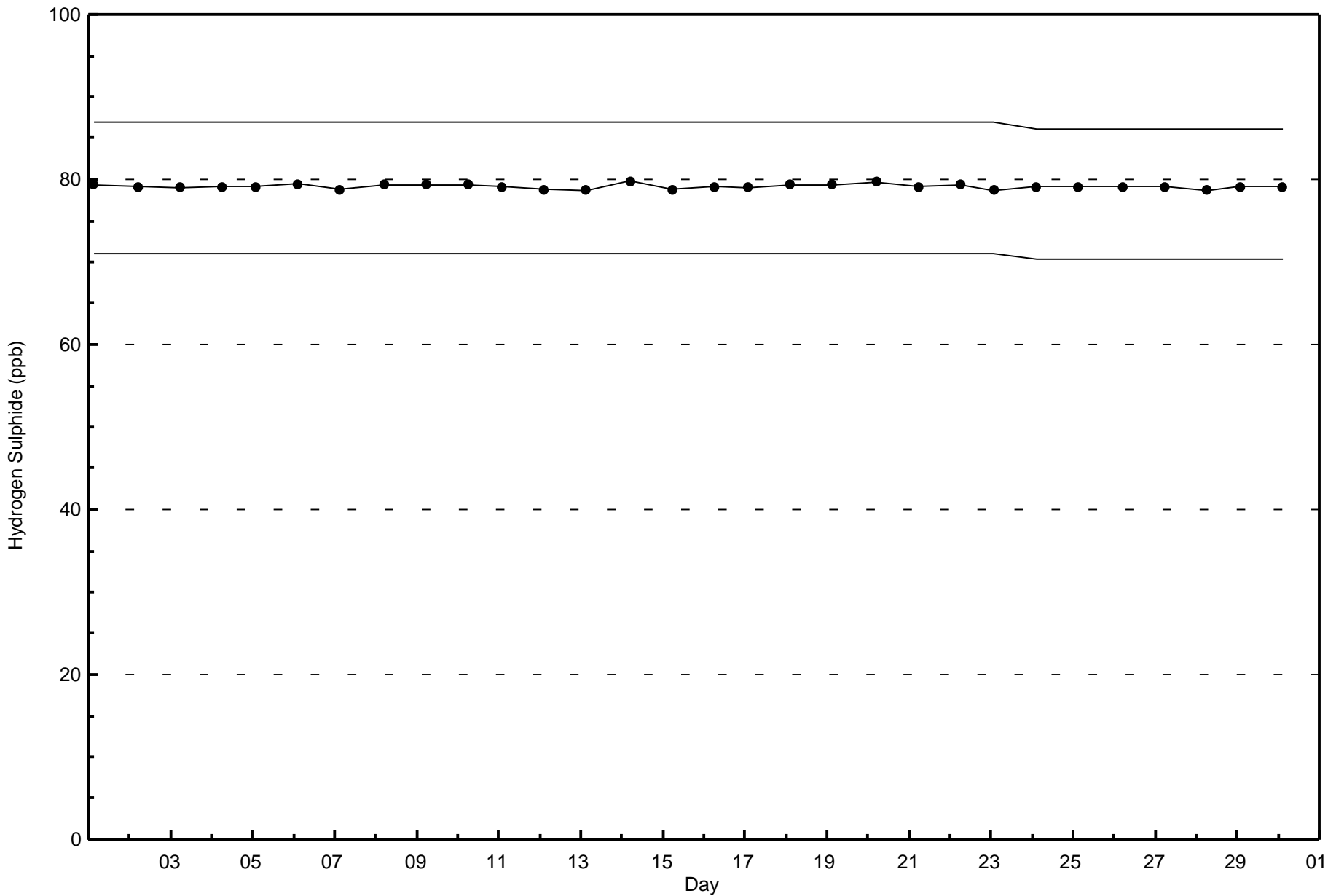
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Hydrogen Sulphide (H₂S) - ppb
Wapasu (AMS 17)



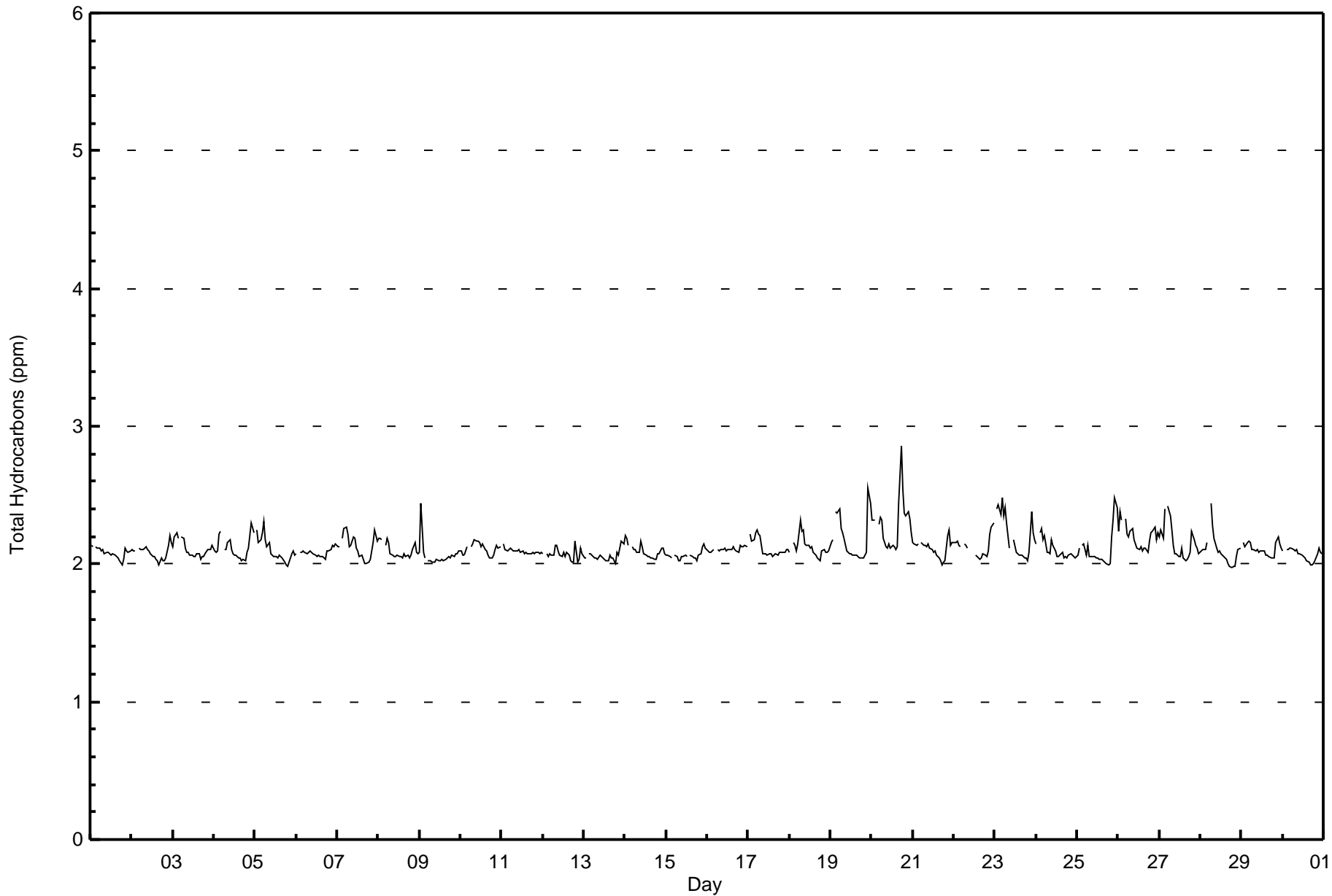
Total Number of Valid Hours: 686







Maximum Value: 2.9 ppm on Jun 20 18:00		Maximum Daily Average: 2.3 ppm on Jun 20		Hours in Service: 720																								
Minimum Value: 2.0 ppm on Jun 28 19:00		Minimum Daily Average: 2.1 ppm on Jun 13		Hours of Data: 683																								
Maximum Diurnal Average: 2.2 ppm at hour 2		Minimum Diurnal Average: 2.1 ppm at hour 17		Hours of Missing Data: 37																								
Monthly Average: 2.11 ppm		Percentiles: P ₁ = 2.0 P ₁₀ = 2.0 Q ₁ = 2.1 Median = 2.1 Q ₃ = 2.1 P ₉₀ = 2.2 P ₉₉ = 2.4		Hours of Calibration: 34																								
				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-Jun	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	2.1	2.1	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-Jun	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.2	2.1	2.2
3-Jun	2.1	2.2	2.2	2.2	Z	2.2	2.2	2.1	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	2.1	2.1	2.1	2.1	2.1	2.1	2.2
4-Jun	2.1	2.1	2.1	2.2	2.2	Z	2.1	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.3	2.2	2.1	2.3	
5-Jun	Z	2.2	2.2	2.2	2.2	2.3	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.3
6-Jun	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	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
7-Jun	2.1	2.1	Z	2.2	2.3	2.3	2.2	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.1	2.1	2.1	2.3
8-Jun	2.2	2.2	2.2	Z	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.0	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.2
9-Jun	2.1	2.4	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	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.4
10-Jun	2.1	2.1	2.1	2.1	2.1	Z	2.1	2.1	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2
11-Jun	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	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
12-Jun	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	2.0	2.0	2.0	2.2	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2
13-Jun	2.0	2.0	Z	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.2
14-Jun	2.2	2.2	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.0	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2
15-Jun	2.1	2.1	2.1	2.0	Z	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1	PF	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	2.1
16-Jun	2.1	2.1	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	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
17-Jun	Z	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	2.1	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
18-Jun	2.1	Z	2.2	2.1	2.1	2.1	2.3	2.2	2.2	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	2.3
19-Jun	2.2	2.2	Z	2.4	2.4	2.4	2.3	2.2	2.2	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	2.6	2.4	2.2	2.6	
20-Jun	2.3	2.3	2.3	Z	2.3	2.3	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.4	2.9	2.5	2.4	2.4	2.4	2.3	2.2	2.3	2.3	2.9	
21-Jun	2.2	2.2	2.1	2.1	Z	2.2	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	2.2	2.3	2.1	2.2	2.1	2.1	2.3	
22-Jun	2.2	2.2	2.2	2.1	2.1	Z	2.1	2.1	2.1	2.1	C	C	C	C	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.3	2.3	2.1	2.1	2.3	
23-Jun	Z	2.4	2.4	2.4	2.5	2.4	2.4	2.3	2.1	2.1	M	M	2.2	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.4	2.2	2.2	2.2	2.2	2.5	
24-Jun	2.2	Z	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.2	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	2.0	2.1	2.3	
25-Jun	2.1	2.1	Z	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2	2.3	2.5	2.4	2.1	2.1	2.5	
26-Jun	2.2	2.4	2.3	Z	2.3	2.2	2.2	2.2	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.4	
27-Jun	2.2	2.2	2.2	2.4	Z	2.4	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.1	2.1	2.1	2.1	2.4	
28-Jun	2.1	2.1	2.1	2.1	2.2	Z	2.4	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	2.1	2.1	2.1	2.1	2.1	2.4	
29-Jun	Z	2.2	2.1	2.2	2.2	2.2	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	2.2	2.2	2.1	2.1	2.1	2.1	2.2	
30-Jun	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	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
																								Diurnal Average				
																								Diurnal Maximum				
Z - zerospan C - Calibration M - Maintenance PF - Power Failure																												





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Wapasu - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	127	18.59	18.59
2.1 - 3.0	556	81.41	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 683

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Wapasu - June 2016

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	14	15	4	5	9	10	5	6	8	16	4	3	3	5	10	127
2.1 - 3.0	21	17	18	21	18	45	114	47	46	39	31	27	30	27	22	33	556
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
Totals	31	31	33	25	23	54	124	52	52	47	47	31	33	30	27	43	683

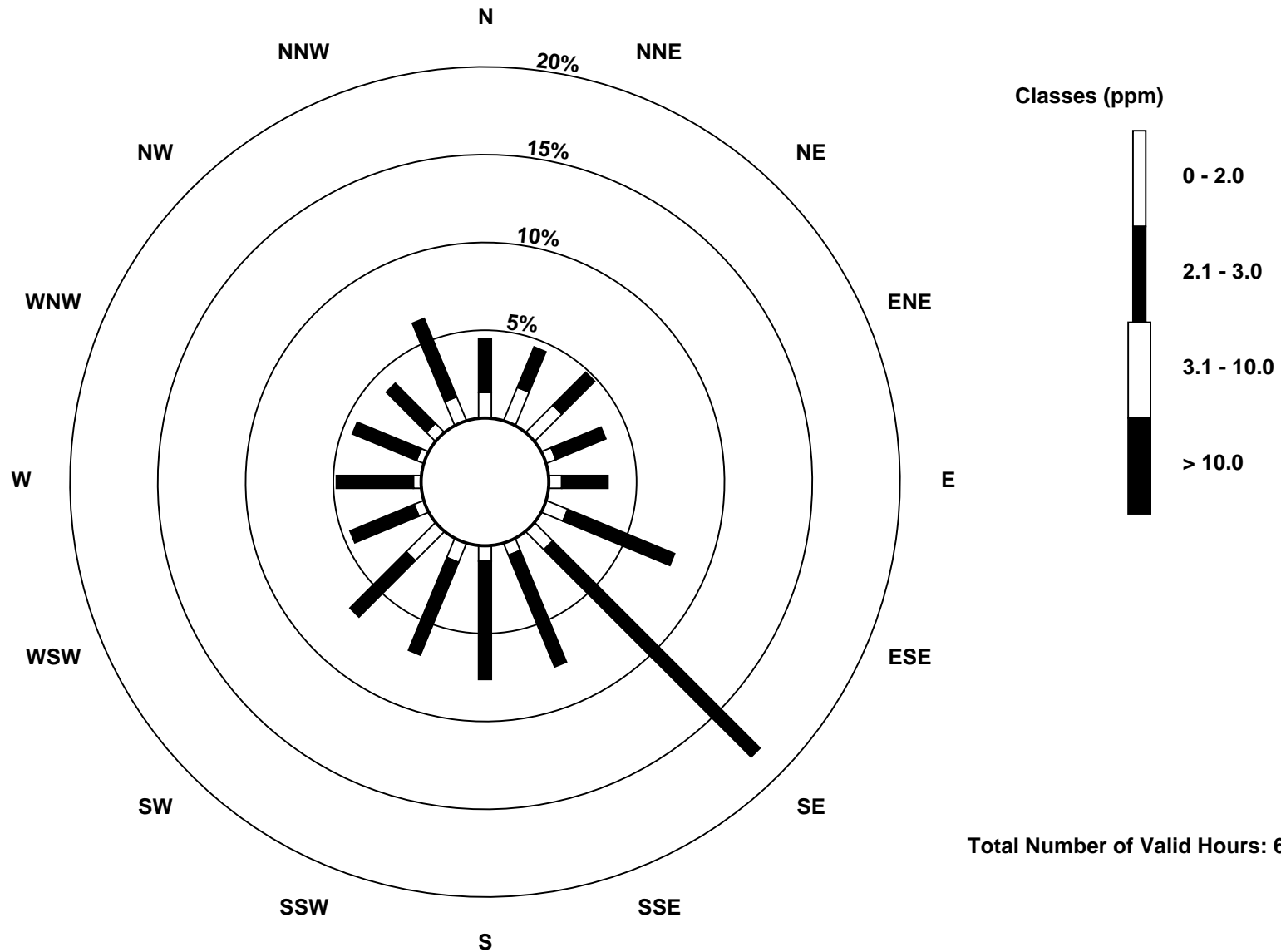
Total Number of Valid Hours: 683

Total Number of Hours: 720

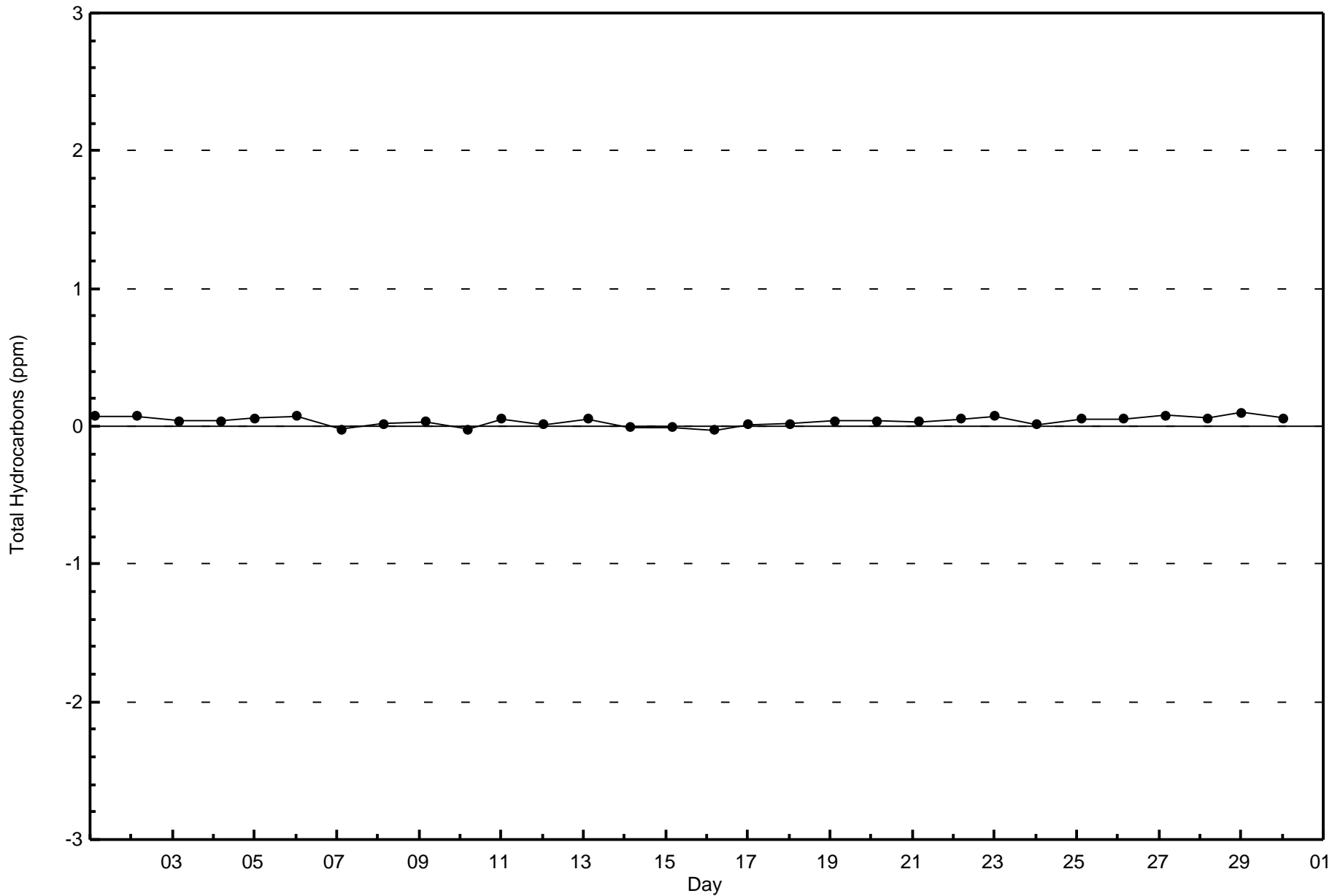


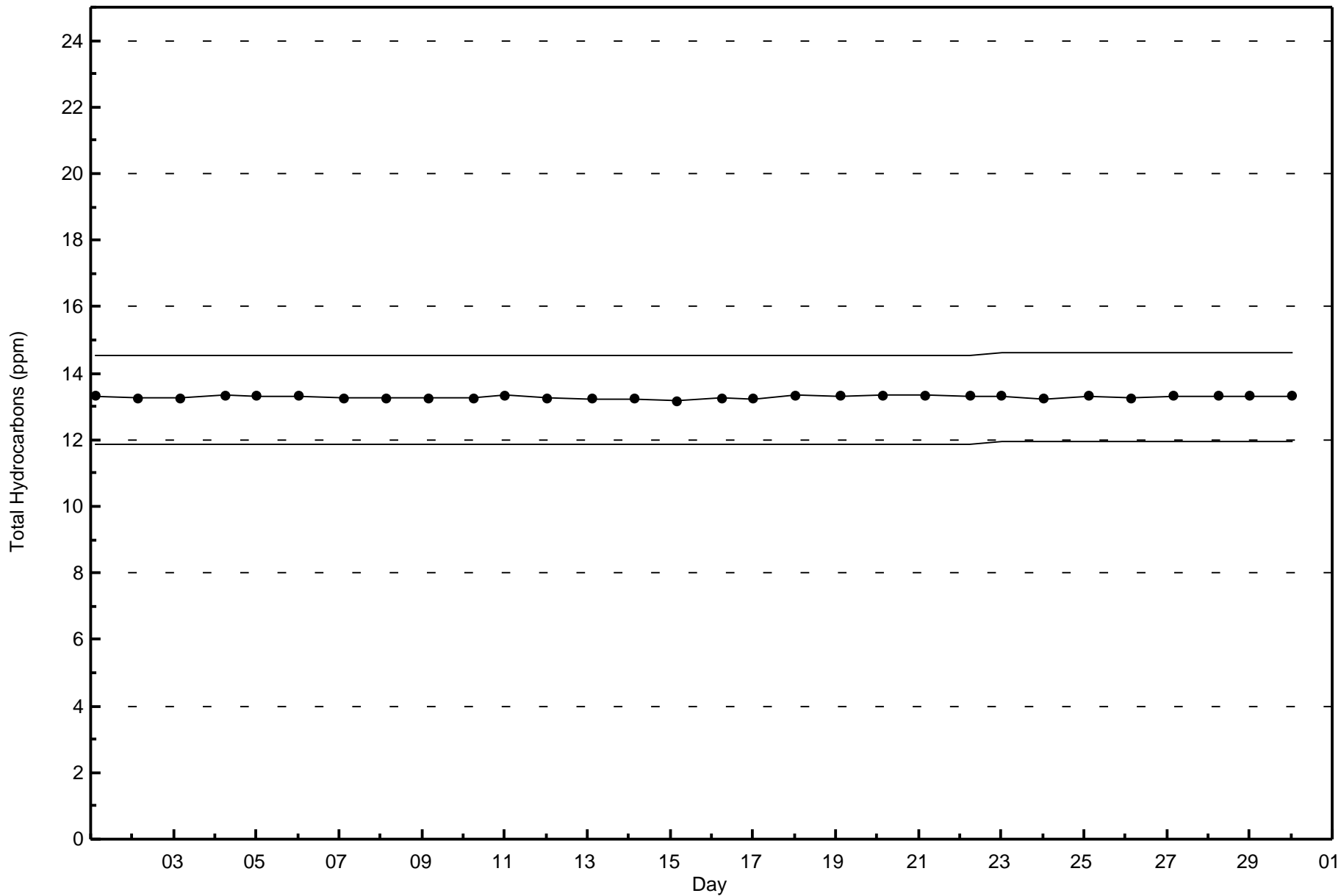
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Total Hydrocarbons (THC) - ppm
Wapasu (AMS 17)



Total Number of Valid Hours: 683







Wood Buffalo Environmental Association
Summary of Hour Averages

Ozone (O₃) - ppb
Wapasu - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 59 ppb on Jun 22 15:00	Maximum Daily Average: 47.2 ppb on Jun 22		Hours of Data:	682
Minimum Value: 2 ppb on Jun 26 00:00	Minimum Daily Average: 21.0 ppb on Jun 17		Hours of Missing Data:	38
Maximum Diurnal Average: 39.8 ppb at hour 16	Minimum Diurnal Average: 20.0 ppb at hour 5		Hours of Calibration:	33
Monthly Average: 31.4 ppb	Percentiles: P ₁ = 4 P ₁₀ = 16 Q ₁ = 24 Median = 32 Q ₃ = 39 P ₉₀ = 46 P ₉₉ = 58		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-Jun	26	26	25	23	21	Z	21	24	30	32	37	39	37	35	40	41	37	39	36	33	26	24	23	26	30.4	41
2-Jun	22	18	18	16	15	16	Z	30	27	33	36	39	41	38	38	43	41	35	33	24	14	14	7	12	26.5	43
3-Jun	12	7	12	16	14	15	20	Z	32	30	33	35	35	35	37	39	39	43	32	26	20	16	18	11	25.0	43
4-Jun	19	26	25	25	24	27	29	31	Z	37	43	46	47	47	48	47	47	48	44	38	35	26	12	12	34.1	48
5-Jun	21	6	6	Z	6	17	30	35	35	39	37	37	37	37	38	37	37	37	36	35	31	28	30	30	29.7	39
6-Jun	31	31	31	32	Z	32	32	31	32	38	40	43	50	50	54	58	58	57	59	57	56	54	46	40	44.0	59
7-Jun	38	30	35	41	38	Z	39	45	48	50	51	50	46	45	46	47	42	42	43	42	35	31	18	24	40.4	51
8-Jun	18	12	11	12	10	12	Z	40	42	41	42	43	43	43	44	43	41	46	49	44	39	35	39	38	34.2	49
9-Jun	37	32	35	30	36	43	39	Z	44	36	31	30	30	32	35	39	38	36	38	35	31	28	27	23	34.0	44
10-Jun	25	23	20	18	18	16	27	24	Z	22	23	26	30	33	34	35	35	35	36	33	21	14	23	26	25.9	36
11-Jun	26	28	29	Z	25	24	26	27	29	31	33	34	36	37	35	33	32	33	30	28	30	28	25	25	29.8	37
12-Jun	25	25	25	25	Z	21	22	20	21	23	23	22	23	26	27	26	25	22	20	22	22	19	15	18	22.5	27
13-Jun	23	24	21	20	18	Z	19	22	24	26	29	31	32	35	34	32	33	34	34	29	26	22	19	22	26.5	35
14-Jun	21	23	28	30	28	32	Z	39	43	36	43	44	45	46	45	46	46	46	44	34	42	47	39	40	38.5	47
15-Jun	42	42	42	41	36	32	36	Z	43	39	38	37	36	PF	33	34	36	39	40	44	43	38	27	27	37.5	44
16-Jun	30	30	30	30	29	29	30	29	Z	M	M	27	28	27	26	23	24	24	21	18	18	17	18	16	24.9	30
17-Jun	10	9	9	Z	8	8	10	13	24	C	C	C	24	29	33	33	33	31	30	27	20	20	26	24	21.0	33
18-Jun	25	20	17	18	Z	18	15	18	22	28	31	32	35	36	34	33	34	34	35	35	31	32	32	29	27.9	36
19-Jun	25	16	10	3	3	Z	25	25	27	30	33	35	36	39	40	40	37	37	37	35	32	29	10	5	26.6	40
20-Jun	5	5	5	5	5	9	Z	34	40	41	43	48	51	55	58	56	50	47	48	48	46	45	49	50	36.6	58
21-Jun	48	46	44	41	39	37	36	Z	44	44	46	50	52	54	55	55	55	55	55	53	42	33	41	40	46.2	55
22-Jun	40	39	39	39	38	36	37	40	Z	51	51	53	57	57	59	59	57	58	54	50	49	44	41	37	47.2	59
23-Jun	38	32	20	Z	11	19	20	30	34	M	M	37	42	50	49	46	44	42	43	39	36	21	18	12	32.6	50
24-Jun	16	12	19	23	Z	28	34	34	34	36	33	36	42	43	33	28	32	23	21	16	18	23	22	26	27.5	43
25-Jun	21	17	11	10	12	Z	12	17	17	21	22	25	27	29	31	32	34	36	38	36	23	8	3	2	21.0	38
26-Jun	7	3	3	3	11	18	Z	25	29	37	38	43	40	42	41	40	38	41	39	36	28	24	25	18	27.2	43
27-Jun	16	15	17	15	13	11	15	Z	27	32	35	35	30	25	27	31	33	30	31	24	22	21	18	20	23.7	35
28-Jun	22	23	22	19	16	16	21	27	Z	29	29	33	35	35	35	37	38	36	36	35	34	28	25	28	28.6	38
29-Jun	29	29	29	Z	26	27	29	32	35	36	38	40	43	45	45	44	46	46	46	43	35	30	30	30	36.2	46
30-Jun	32	33	32	32	Z	29	28	31	32	34	35	37	37	37	38	39	39	39	38	35	32	31	30	29	33.7	39

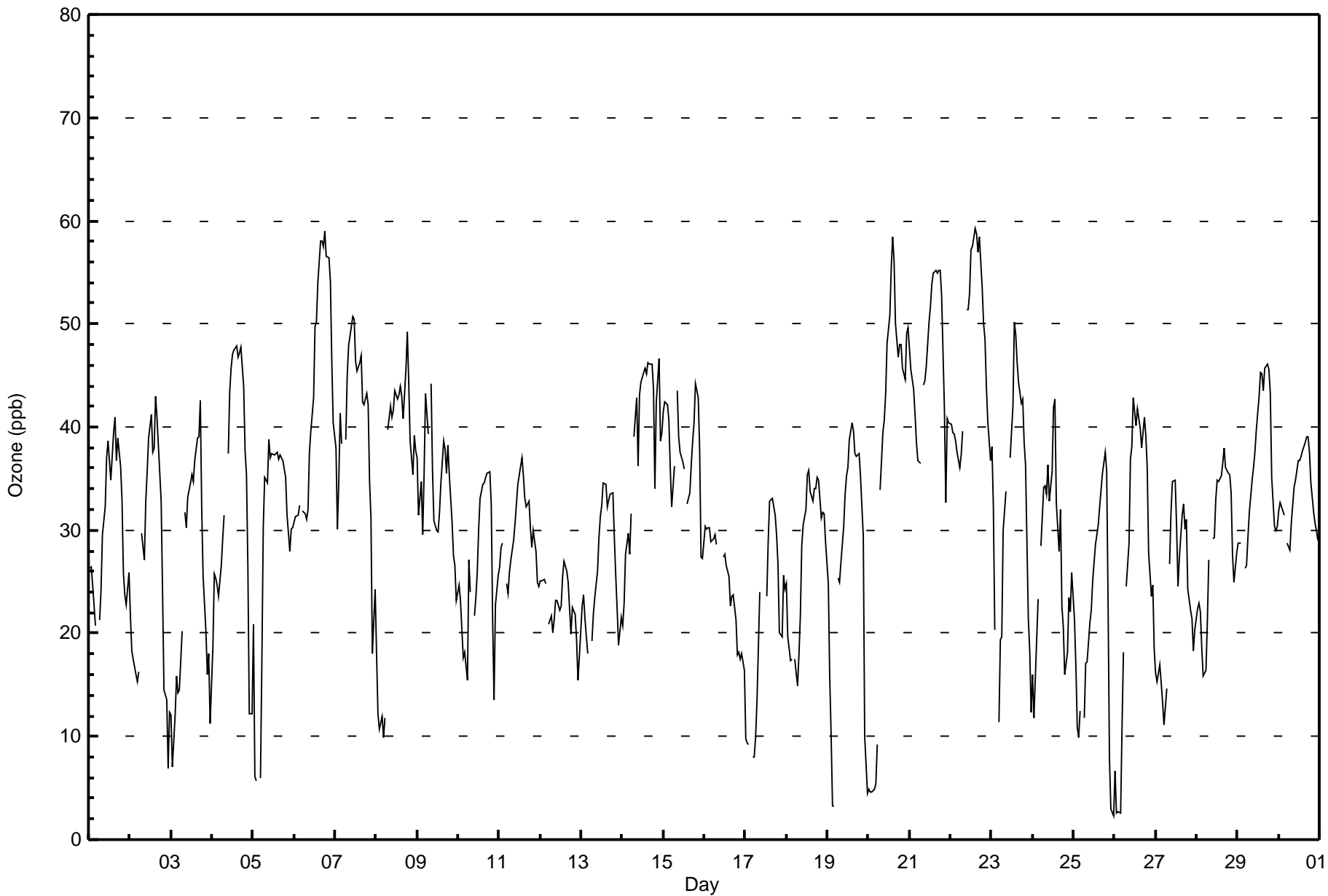
25.0	22.7	22.3	22.5	20.0	22.8	26.1	28.9	32.5	34.6	36.0	37.5	38.2	39.3	39.7	39.8	39.4	39.0	38.1	35.1	31.3	27.6	25.2	24.7	Diurnal Average	
48	46	44	41	39	43	39	45	48	51	51	53	57	57	59	59	58	58	59	57	56	54	49	50	Diurnal Maximum	

Z - zerospan C - Calibration M - Maintenance PF - Power Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Wapasu - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ozone (O₃) - ppb
Wapasu - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	120	17.60	17.60
21 - 50	531	77.86	95.45
51 - 82	31	4.55	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 682

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ozone (O₃) - ppb
Wapasu - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	4	3	7	8	7	9	35	11	7	9	7	6	3	3	1	0	120
21 - 50	26	29	25	18	18	45	89	41	39	31	33	21	27	24	24	41	531
51 - 82	0	0	0	0	0	0	3	5	1	7	7	4	2	1	0	1	31
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	30	32	32	26	25	54	127	57	47	47	47	31	32	28	25	42	682

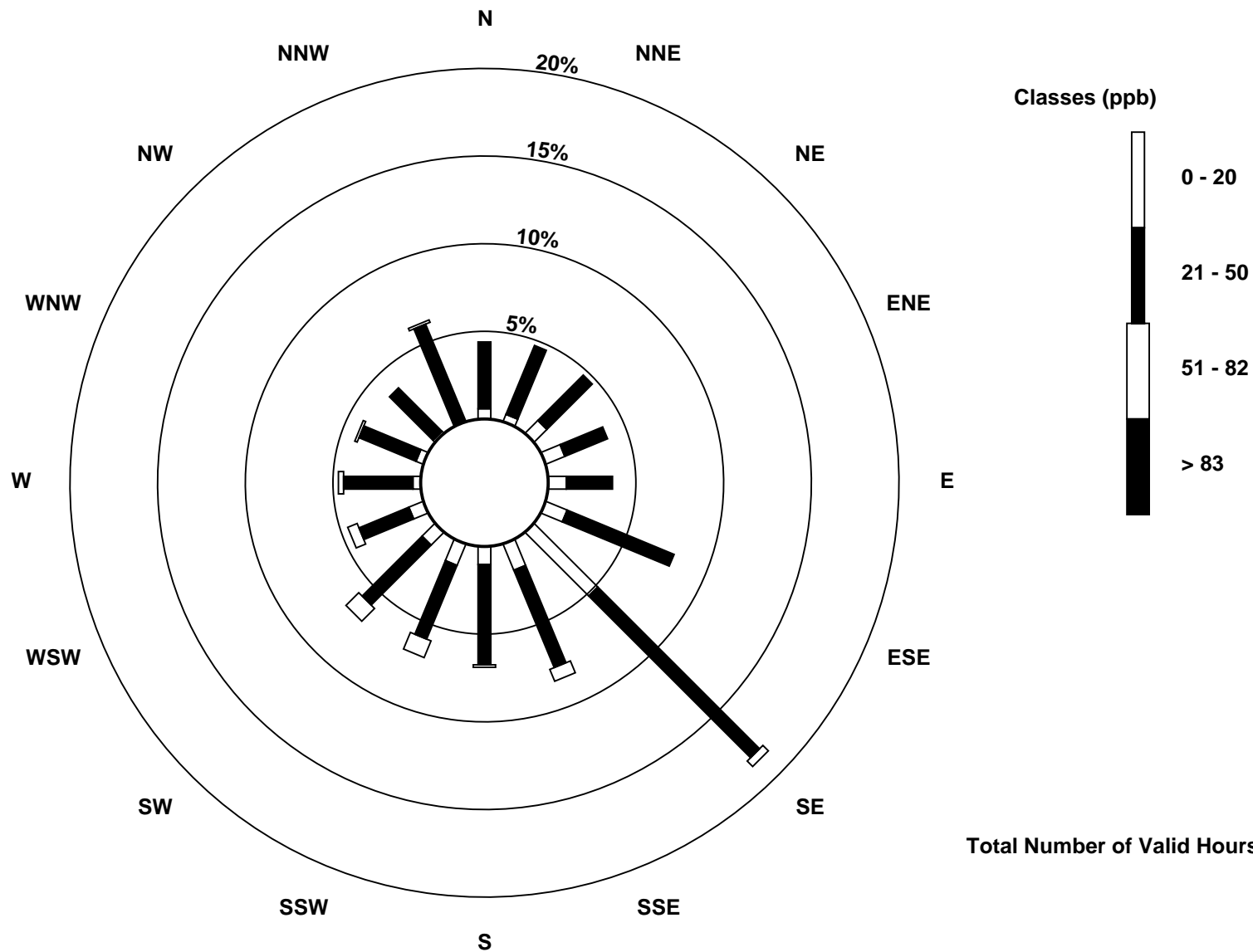
Total Number of Valid Hours: 682

Total Number of Hours: 720

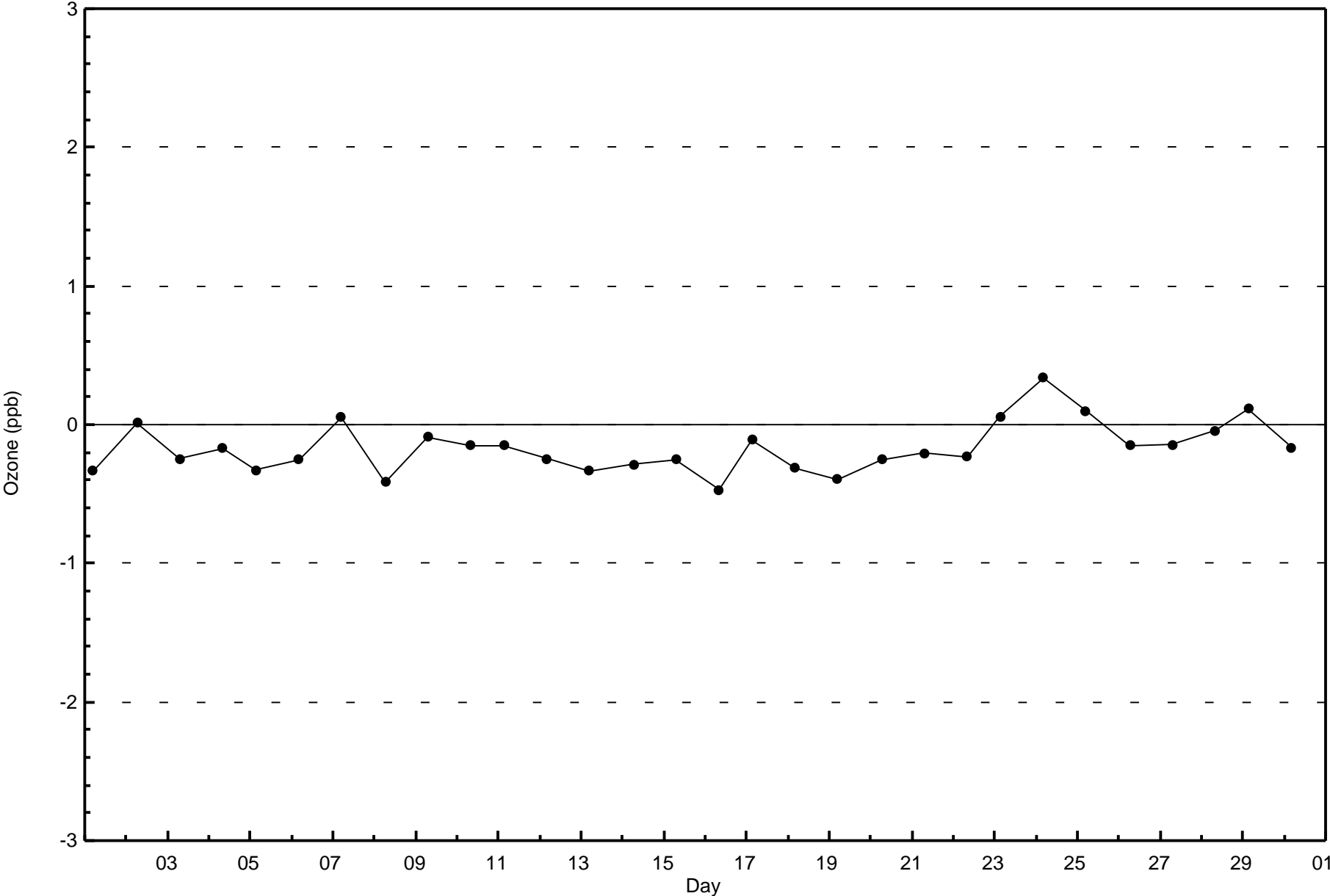


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Ozone (O₃) - ppb
Wapasu (AMS 17)



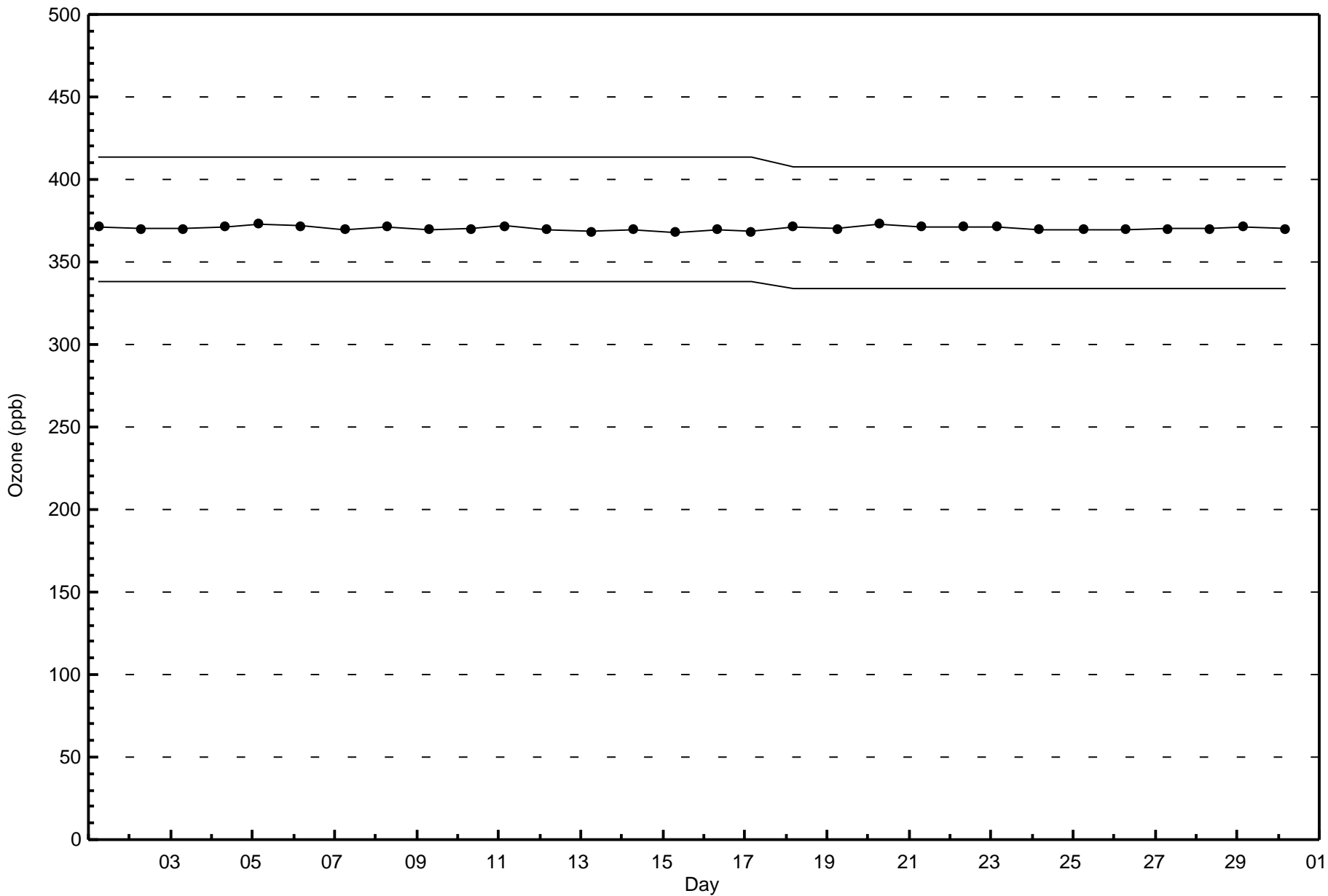
Total Number of Valid Hours: 682





Wood Buffalo Environmental Association
Span Responses

Ozone (O₃) - ppb
Wapasu - June 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

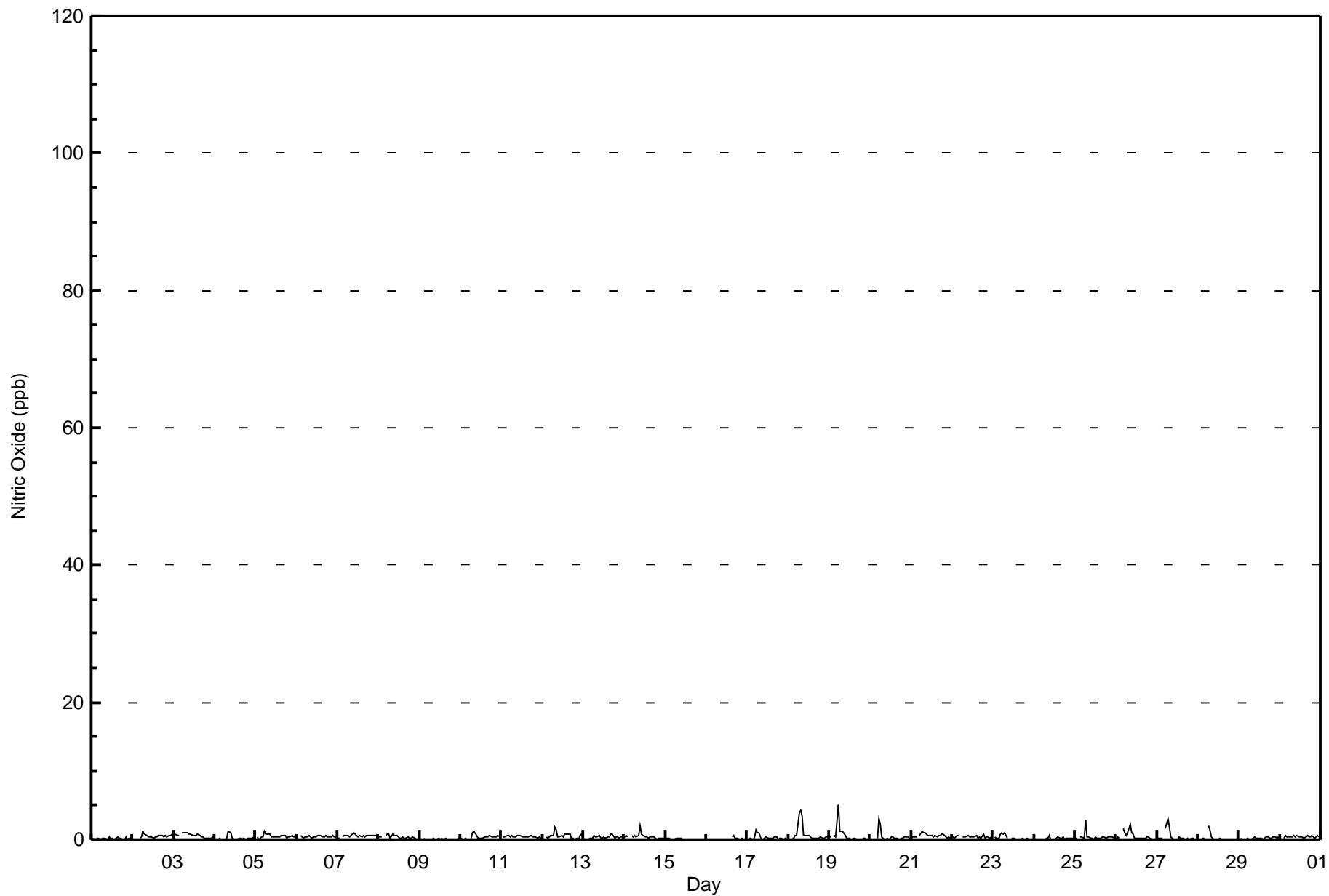
Nitric Oxide (NO) - ppb
Wapasu - June 2016

Maximum Value: 5 ppb on Jun 19 06:00		Maximum Daily Average: 0.8 ppb on Jun 18		Hours in Service: 720																						
Minimum Value: 0 ppb on Jun 1 02:00		Minimum Daily Average: 0.1 ppb on Jun 9		Hours of Data: 661																						
Maximum Diurnal Average: 1.0 ppb at hour 7		Minimum Diurnal Average: 0.2 ppb at hour 1		Hours of Missing Data: 59																						
Monthly Average: 0.4 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 3		Hours of Calibration: 34																						
				Percent Operational Time: 96.5																						
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-Jun	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
2-Jun	0	0	0	Z	0	0	1	1	1	0	0	0	0	0	1	1	1	1	1	1	0	1	1	1	0.5	1
3-Jun	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.6	1
4-Jun	0	0	0	0	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
5-Jun	Z	0	0	0	0	1	1	1	1	0	0	1	0	0	1	1	1	1	0	0	1	1	0	1	0.5	1
6-Jun	0	Z	1	0	0	0	1	0	0	0	0	1	1	1	0	0	1	0	0	0	1	0	0	0	0.4	1
7-Jun	0	0	Z	0	1	1	1	0	1	1	1	1	0	1	0	1	0	1	1	1	1	1	1	1	0.6	1
8-Jun	0	0	0	Z	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
9-Jun	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
10-Jun	0	0	0	0	0	Z	0	1	1	1	0	0	0	0	1	0	1	0	1	0	0	0	1	0	0.4	1
11-Jun	Z	0	0	1	1	0	1	0	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0.4	1
12-Jun	0	Z	0	0	0	1	1	2	1	0	0	1	0	1	1	1	1	0	0	0	0	0	1	1	0.5	2
13-Jun	0	0	Z	0	0	0	1	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0.3	1
14-Jun	0	1	1	Z	1	0	1	0	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2
15-Jun	0	0	0	0	Z	0	0	0	0	0	0	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	0
16-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	C	C	C	0	1	0	0	0	0	0	0	0	--	1
17-Jun	Z	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.3	1
18-Jun	0	Z	0	0	1	1	4	4	4	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0.8	4
19-Jun	0	0	Z	1	0	5	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	5
20-Jun	0	0	0	Z	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.4	3
21-Jun	0	0	0	0	Z	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	0	0	0.6	1
22-Jun	0	0	0	1	1	Z	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0.4	1
23-Jun	Z	0	0	0	1	1	1	1	0	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
24-Jun	0	Z	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
25-Jun	0	0	Z	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3
26-Jun	0	0	0	Z	2	1	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2
27-Jun	0	0	0	0	Z	2	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3
28-Jun	0	0	0	0	0	Z	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2
29-Jun	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
30-Jun	0	Z	0	1	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1	0	0	1	0	0.4	1
		0.2	0.2	0.2	0.3	0.4	0.9	1.0	0.8	0.7	0.5	0.4	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	Diurnal Average
		1	1	1	1	2	5	4	4	4	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Diurnal Maximum
Z - zerospan		C - Calibration			M - Maintenance			AF - Analyzer Failure																		



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Wapasu - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Wapasu - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	661	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: 661

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Wapasu - June 2016**

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	31	33	25	23	53	116	47	46	46	46	31	33	30	27	43	661
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
Totals	31	31	33	25	23	53	116	47	46	46	46	31	33	30	27	43	661

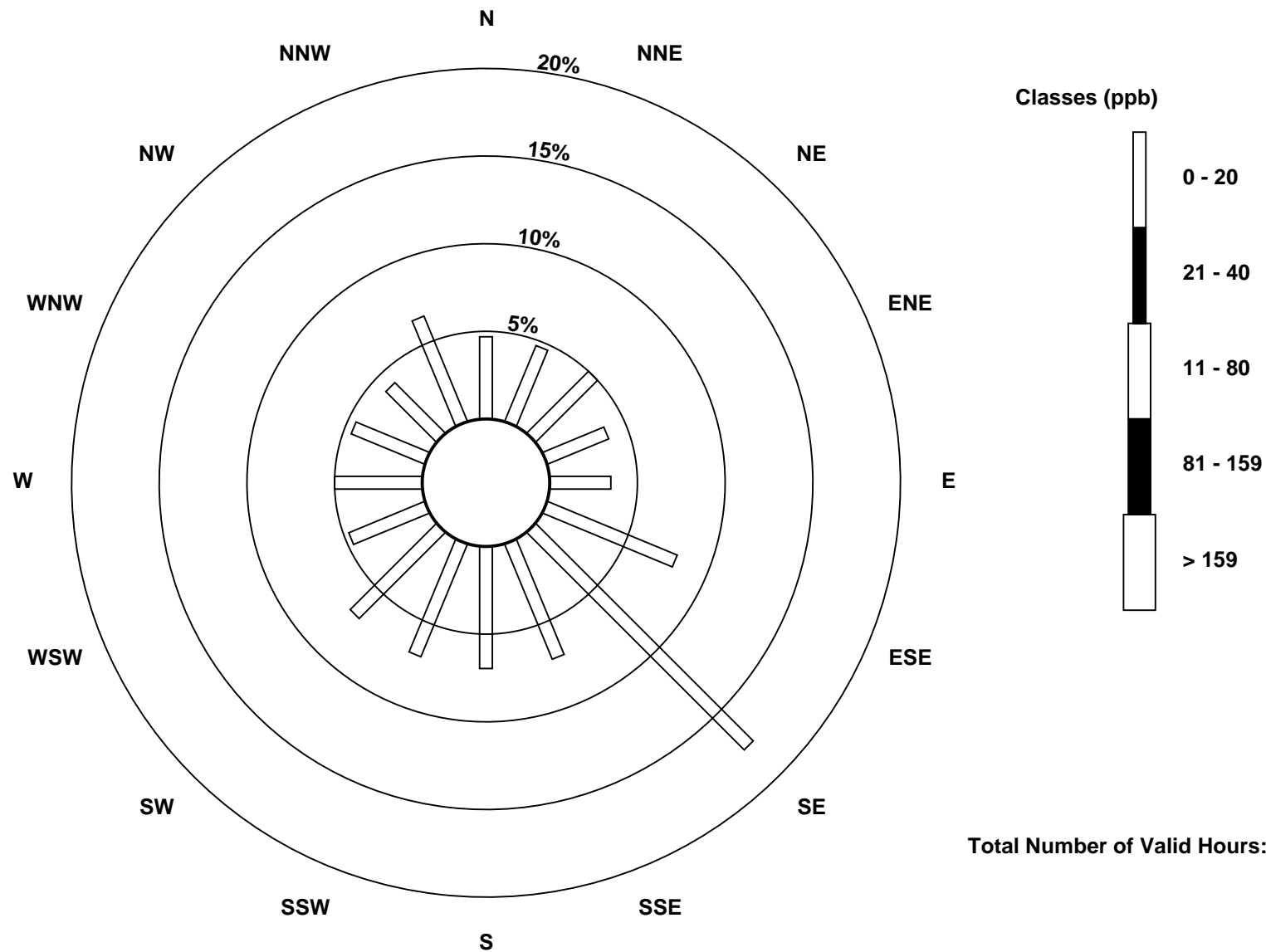
Total Number of Valid Hours: 661

Total Number of Hours: 720

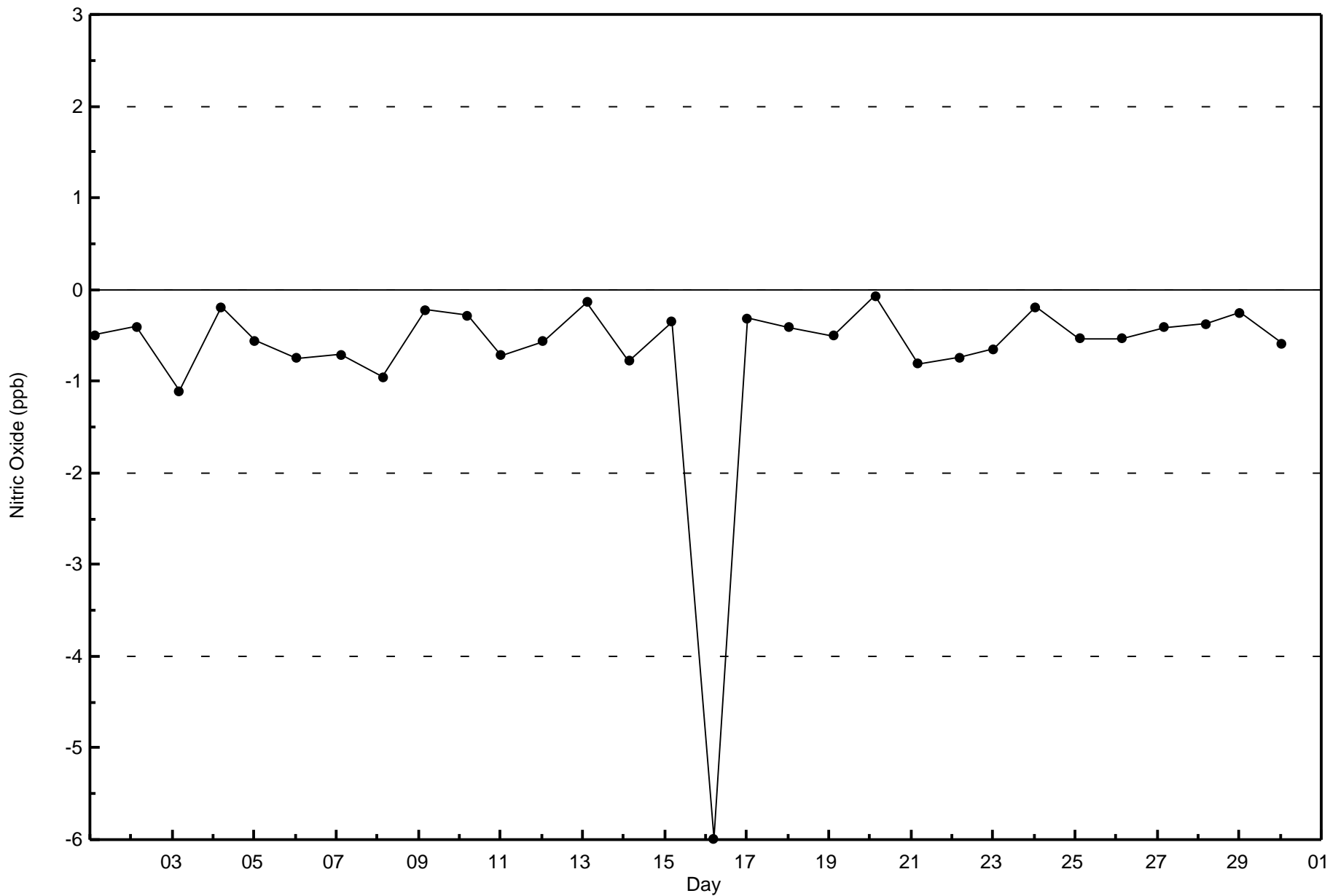


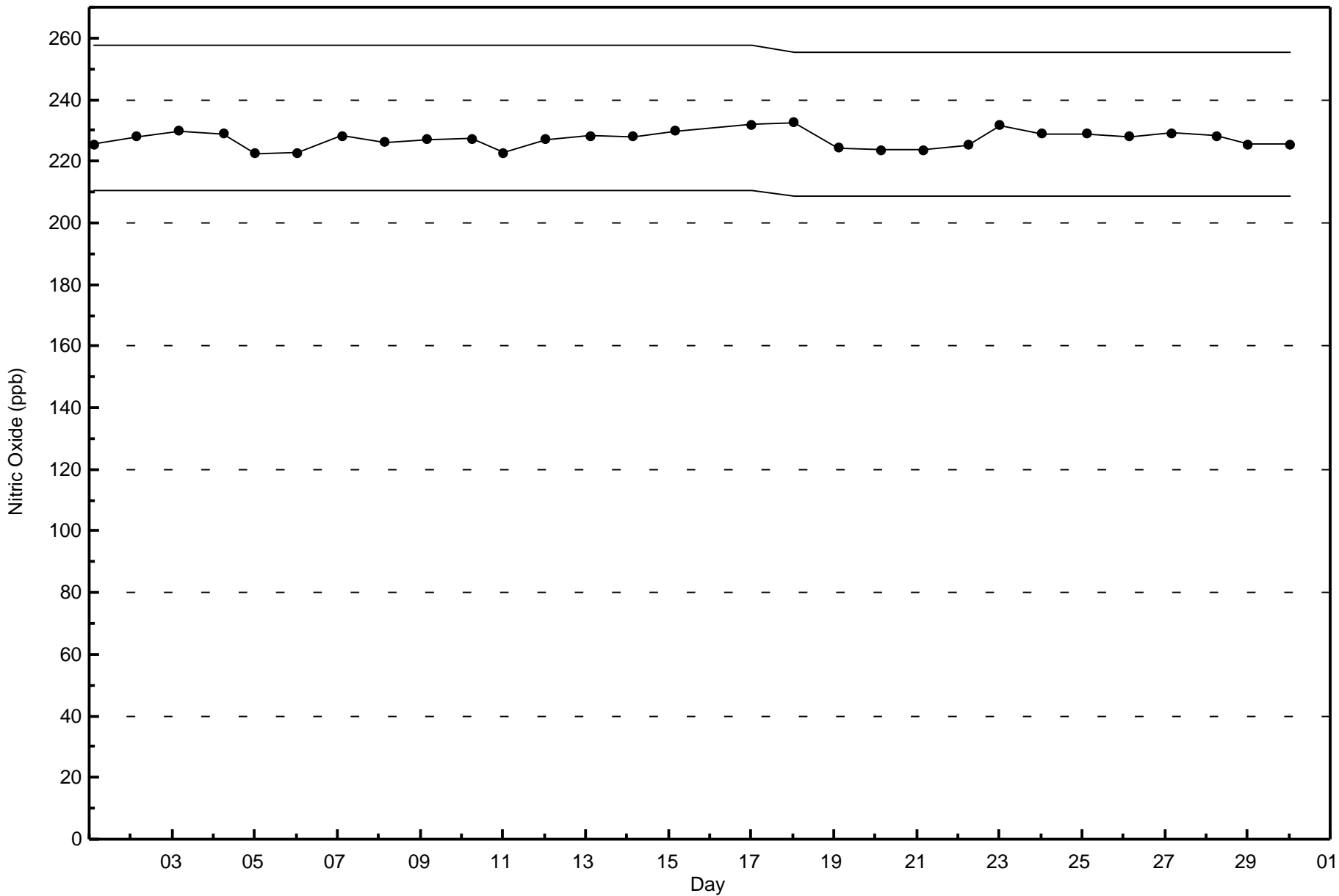
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitric Oxide (NO) - ppb
Wapasu (AMS 17)



Total Number of Valid Hours: 661







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Wapasu - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 9 ppb on Jun 13 00:00	Maximum Daily Average: 2.5 ppb on Jun 26		Hours of Data:	661
Minimum Value: 0 ppb on Jun 2 20:00	Minimum Daily Average: 0.0 ppb on Jun 11		Hours of Missing Data:	59
Maximum Diurnal Average: 2.3 ppb at hour 7	Minimum Diurnal Average: 0.3 ppb at hour 12		Hours of Calibration:	34
Monthly Average: 0.9 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 8		Percent Operational Time:	96.5

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-Jun	0	0	Z	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	2	1	0	0	0.7	2
2-Jun	0	0	1	Z	0	1	3	2	2	1	1	1	0	0	0	0	2	0	0	0	1	1	1	1	0.8	3
3-Jun	0	0	0	1	Z	1	2	1	0	1	0	0	0	1	1	0	1	0	1	1	0	0	0	0	0.6	2
4-Jun	0	0	1	3	3	Z	1	1	3	3	1	0	0	0	0	0	0	0	0	1	2	2	1	2	1.1	3
5-Jun	Z	3	1	0	1	3	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	3
6-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0.2	1
7-Jun	0	0	Z	1	2	1	1	1	1	2	2	1	1	0	0	0	0	0	0	0	0	3	8	1	1.1	8
8-Jun	0	0	0	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1
9-Jun	0	2	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2
10-Jun	0	0	0	0	0	Z	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2
11-Jun	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
12-Jun	0	Z	0	0	0	0	1	5	4	1	1	1	2	2	2	2	1	1	0	0	0	1	9	9	1.8	9
13-Jun	4	1	Z	2	4	1	2	1	1	1	0	0	1	0	0	0	2	2	1	1	1	0	0	1	1.1	4
14-Jun	1	3	2	Z	1	0	0	0	0	5	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0.7	5
15-Jun	0	0	0	0	Z	1	2	0	0	0	0	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	2
16-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	C	C	C	3	2	1	1	1	1	1	2	1	--	3
17-Jun	Z	1	2	2	3	5	4	4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1.1	5
18-Jun	0	Z	3	4	3	2	6	5	4	0	1	1	1	1	0	0	0	0	0	1	1	0	0	0	1.5	6
19-Jun	0	0	Z	0	0	8	3	3	3	1	0	0	0	0	0	0	1	0	0	0	2	3	2	2	1.3	8
20-Jun	3	2	1	Z	1	5	7	2	1	0	0	1	2	1	1	1	1	1	1	0	0	0	0	0	1.3	7
21-Jun	0	0	0	0	Z	0	2	2	1	1	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0.5	2
22-Jun	0	0	0	0	0	Z	1	0	0	0	0	0	1	0	0	0	1	1	3	1	2	3	6	4	1.0	6
23-Jun	Z	4	3	4	8	8	7	4	1	M	M	1	1	1	1	1	1	1	1	0	1	1	0	0	2.2	8
24-Jun	1	Z	2	1	0	0	0	1	1	2	1	0	0	0	1	1	0	0	0	0	0	0	1	0	0.6	2
25-Jun	0	0	Z	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	5
26-Jun	0	0	0	Z	8	3	2	3	6	3	4	1	0	1	1	1	1	1	3	3	6	5	2	1	2.5	8
27-Jun	2	3	2	3	Z	6	6	3	1	0	0	1	1	2	1	1	1	1	2	2	2	1	0	0	1.7	6
28-Jun	0	0	0	1	2	Z	6	5	2	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0.8	6
29-Jun	Z	1	0	1	2	1	0	0	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0.4	2
30-Jun	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

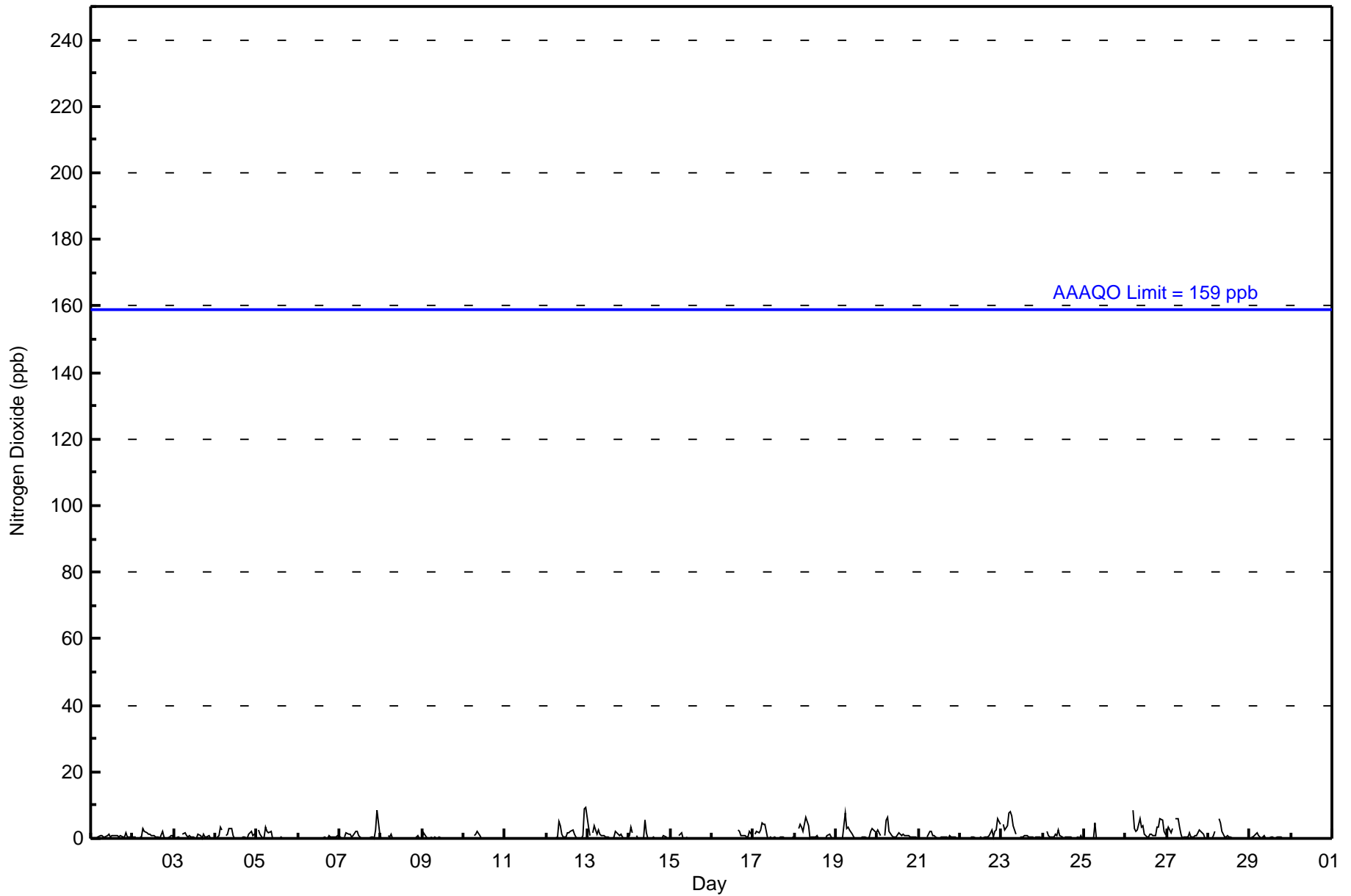
0.4	0.9	0.8	0.9	1.6	2.0	2.3	1.7	1.2	0.9	0.6	0.3	0.4	0.4	0.4	0.5	0.4	0.5	0.4	0.5	0.5	0.5	0.7	0.8	1.2	0.8	Diurnal Average
4	4	3	4	8	8	7	5	6	5	4	1	2	2	2	3	2	2	2	3	3	3	6	5	9	9	Diurnal Maximum

Z - zerospan C - Calibration M - Maintenance AF - Analyzer Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Wapasu - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Wapasu - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	661	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: 661

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Wapasu - June 2016**

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	31	33	25	23	53	116	47	46	46	46	31	33	30	27	43	661
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
Totals	31	31	33	25	23	53	116	47	46	46	46	31	33	30	27	43	661

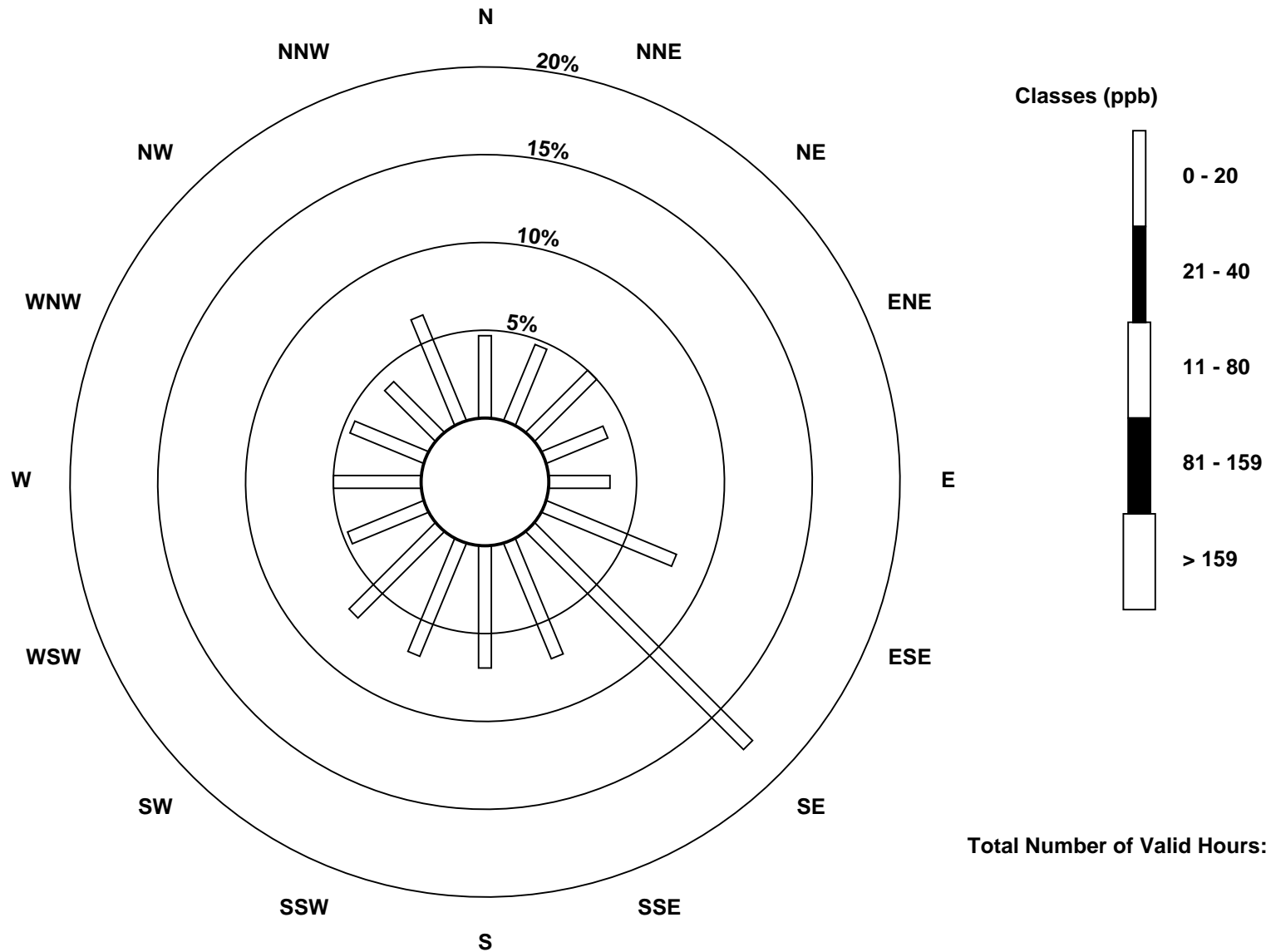
Total Number of Valid Hours: 661

Total Number of Hours: 720

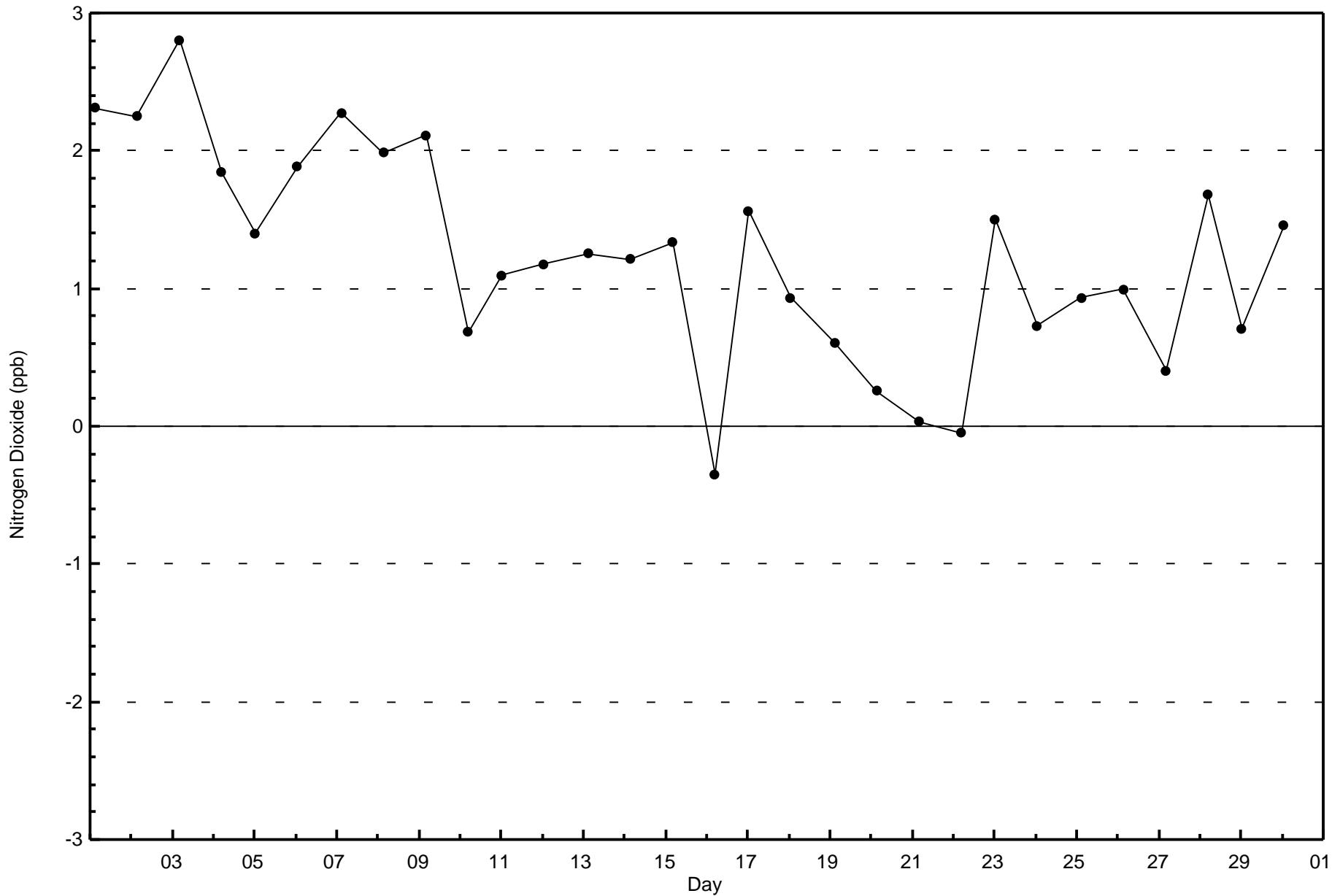


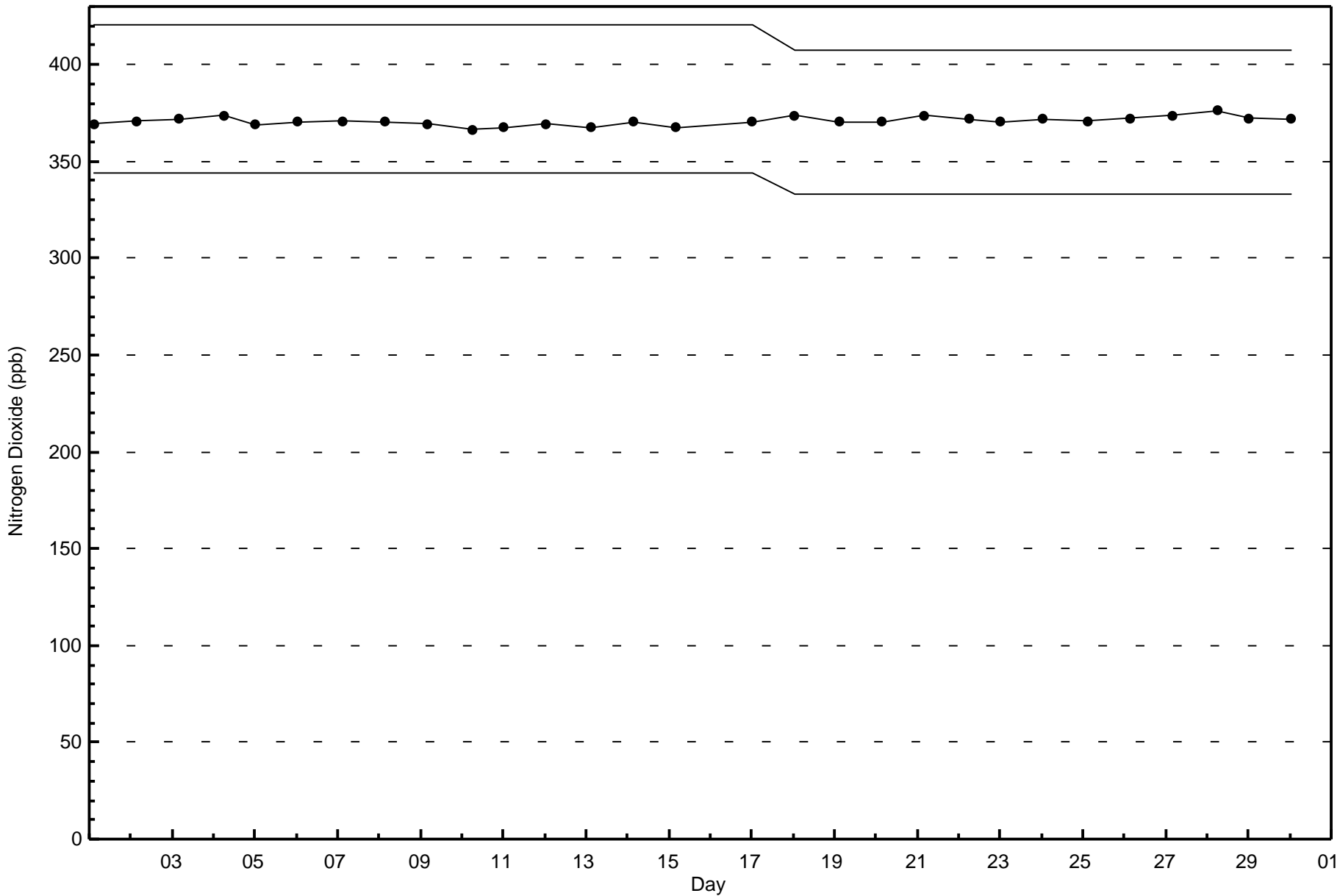
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Dioxide (NO₂) - ppb
Wapasu (AMS 17)



Total Number of Valid Hours: 661







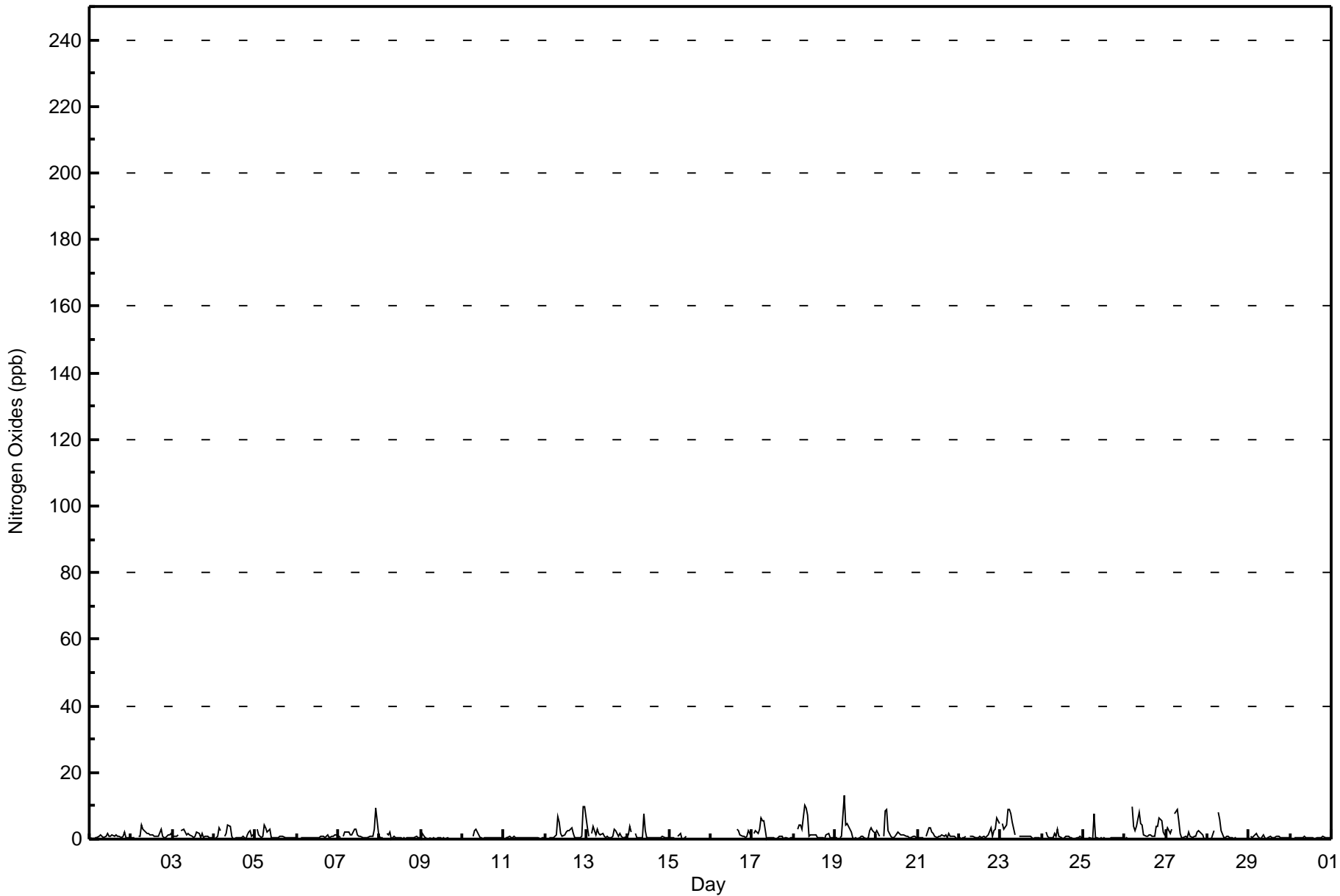
Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb

Wapasu - June 2016

Maximum Value: 13 ppb on Jun 19 06:00																	Maximum Daily Average: 2.9 ppb on Jun 26																	Hours in Service: 720	
Minimum Value: 0 ppb on Jun 9 10:00																	Minimum Daily Average: 0.2 ppb on Jun 9																	Hours of Data: 661	
Maximum Diurnal Average: 3.2 ppb at hour 7																	Minimum Diurnal Average: 0.6 ppb at hour 1																	Hours of Missing Data: 59	
Monthly Average: 1.2 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 3 P ₉₉ = 9																	Hours of Calibration: 34	
																																		Percent Operational Time: 96.5	
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-Jun	0	0	Z	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	0.8	2									
2-Jun	0	0	0	Z	1	1	4	3	2	2	2	1	1	1	1	1	1	3	1	1	0	1	1	2	1.3	4									
3-Jun	1	1	1	1	Z	2	3	2	1	2	1	1	1	2	2	1	2	1	1	1	0	1	0	1.2	3										
4-Jun	0	0	1	3	3	Z	1	1	4	4	1	0	0	0	0	0	0	1	0	1	2	2	1	2	1.3	4									
5-Jun	Z	3	1	0	1	4	3	2	3	0	0	1	0	0	1	1	1	1	0	0	0	1	1	0	1.1	4									
6-Jun	0	Z	1	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1									
7-Jun	1	0	Z	1	2	2	2	1	1	3	3	1	1	1	1	1	0	1	1	1	1	3	9	2	1.7	9									
8-Jun	0	0	0	Z	2	1	2	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0.6	2									
9-Jun	0	2	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2									
10-Jun	0	0	0	0	0	Z	1	2	3	1	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0.6	3									
11-Jun	Z	0	0	1	1	0	1	0	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0.5	1									
12-Jun	0	Z	0	0	1	1	1	7	5	2	1	1	2	2	3	3	2	0	0	0	0	1	10	10	2.3	10									
13-Jun	3	1	Z	2	4	1	3	2	1	2	1	1	1	0	1	1	3	2	1	2	1	0	0	1	1.4	4									
14-Jun	1	4	2	Z	2	1	1	0	1	7	3	1	0	0	1	0	0	0	0	0	1	1	0	0	1.1	7									
15-Jun	0	0	0	0	Z	1	2	0	0	0	1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	2									
16-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	C	C	C	3	2	1	1	1	0	1	2	1	--	3									
17-Jun	Z	2	2	2	3	6	5	5	0	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	1.4	6									
18-Jun	0	Z	3	4	4	3	10	9	7	1	1	1	1	1	0	0	0	0	0	1	2	1	0	1	2.3	10									
19-Jun	0	0	Z	1	1	13	4	5	4	2	0	0	0	0	0	1	1	0	0	0	3	3	2	2	1.9	13									
20-Jun	2	2	1	Z	1	8	9	3	1	0	0	1	2	2	1	1	1	1	1	1	0	1	1	0	1.7	9									
21-Jun	0	0	0	0	Z	1	3	3	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	0	1.1	3									
22-Jun	0	0	0	1	1	Z	1	1	1	1	0	0	1	1	1	1	1	1	1	3	1	2	3	6	5	1.4	6								
23-Jun	Z	5	3	4	9	9	7	5	1	M	M	1	1	1	1	1	1	1	1	0	1	1	0	0	2.4	9									
24-Jun	1	Z	2	1	0	0	0	2	1	3	1	0	0	1	1	1	0	1	0	0	0	0	1	0	0.7	3									
25-Jun	0	0	Z	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	8									
26-Jun	0	0	0	Z	10	4	3	4	8	5	4	1	1	1	1	1	1	1	4	4	6	5	2	1	2.9	10									
27-Jun	1	4	2	3	Z	8	9	5	2	0	0	1	1	2	1	1	1	1	2	3	2	1	0	0	2.1	9									
28-Jun	0	0	0	1	2	Z	8	6	2	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1.0	8									
29-Jun	Z	1	0	1	2	1	0	0	1	1	0	0	1	1	0	0	1	1	1	1	1	0	0	0	0.6	2									
30-Jun	0	Z	0	1	0	0	0	1	1	0	1	0	0	0	0	0	1	0	0	1	0	0	1	0	0.4	1									
																	Diurnal Average																		
																	Diurnal Maximum																		
Z - zerospan			C - Calibration			M - Maintenance			AF - Analyzer Failure																										





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Wapasu - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	661	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: 661

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Wapasu - June 2016**

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	31	33	25	23	53	116	47	46	46	46	31	33	30	27	43	661
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
Totals	31	31	33	25	23	53	116	47	46	46	46	31	33	30	27	43	661

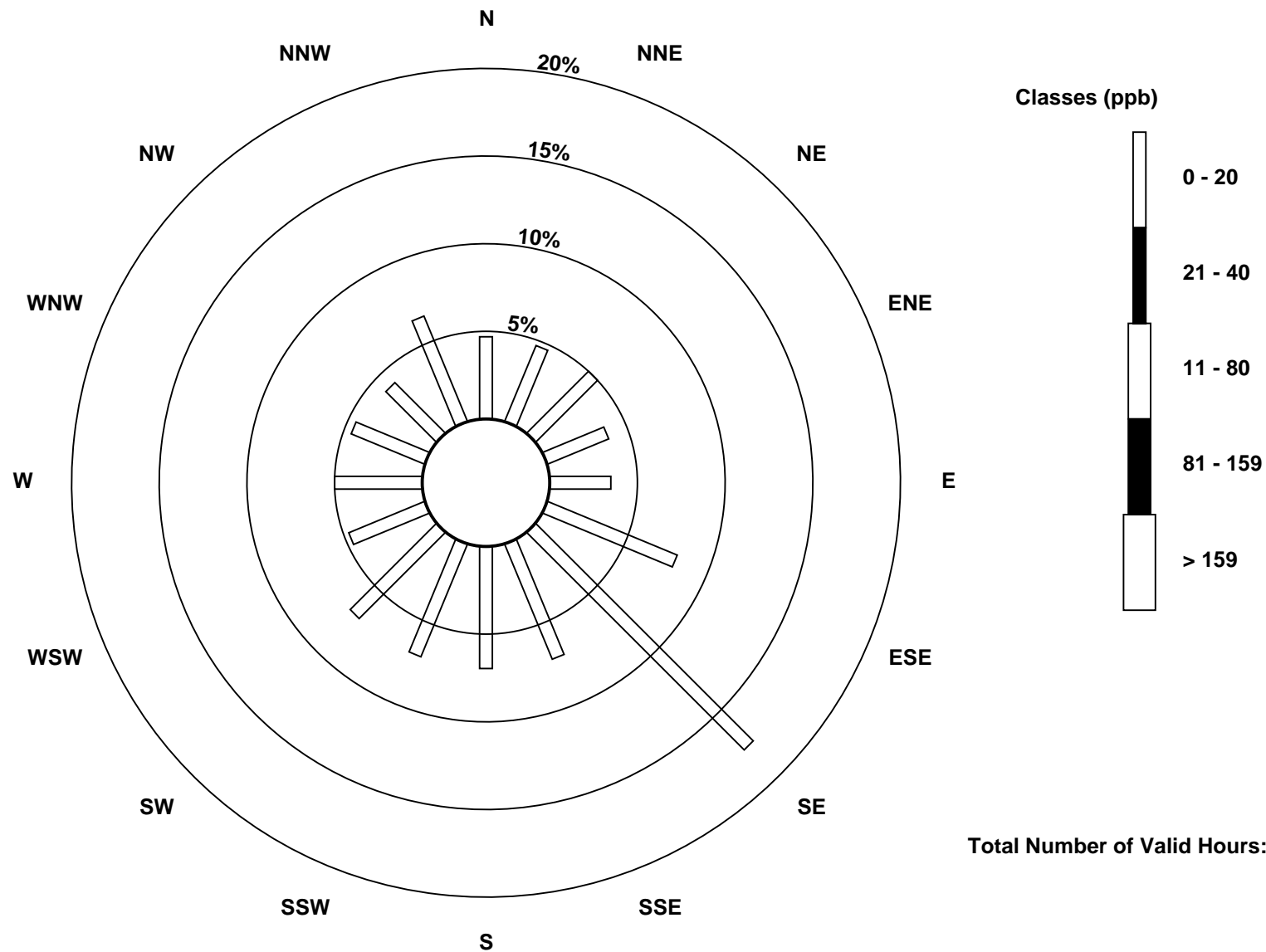
Total Number of Valid Hours: 661

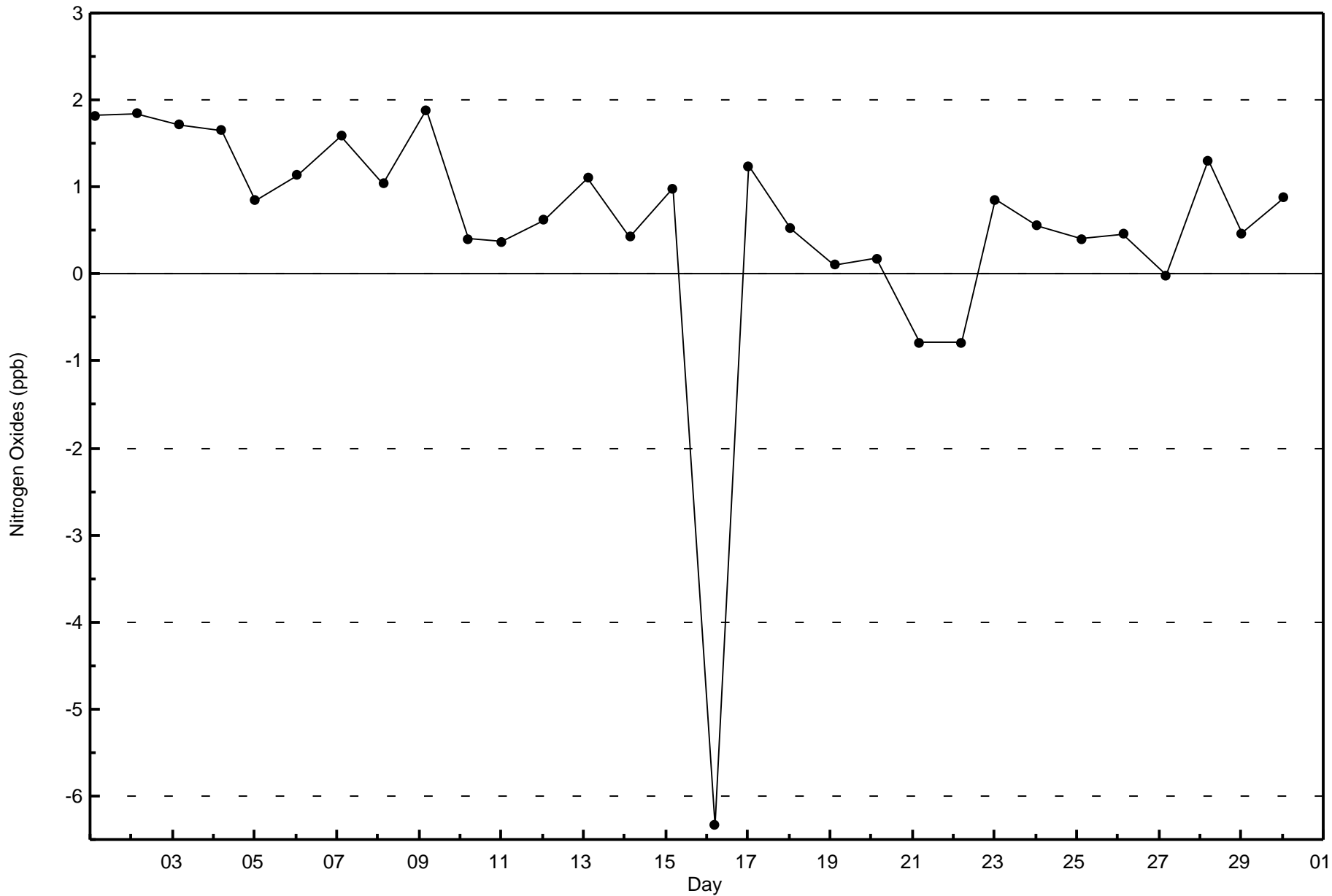
Total Number of Hours: 720

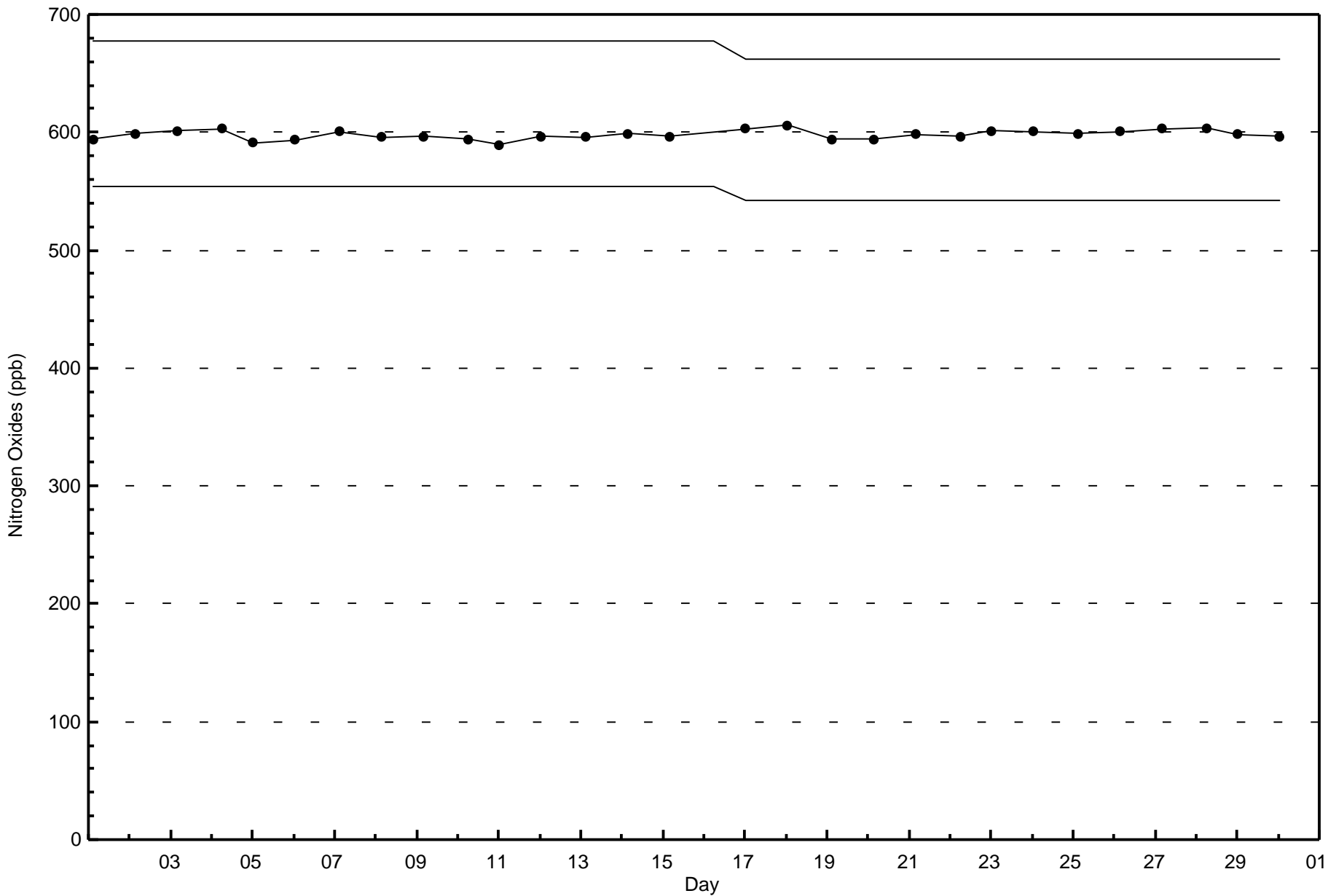


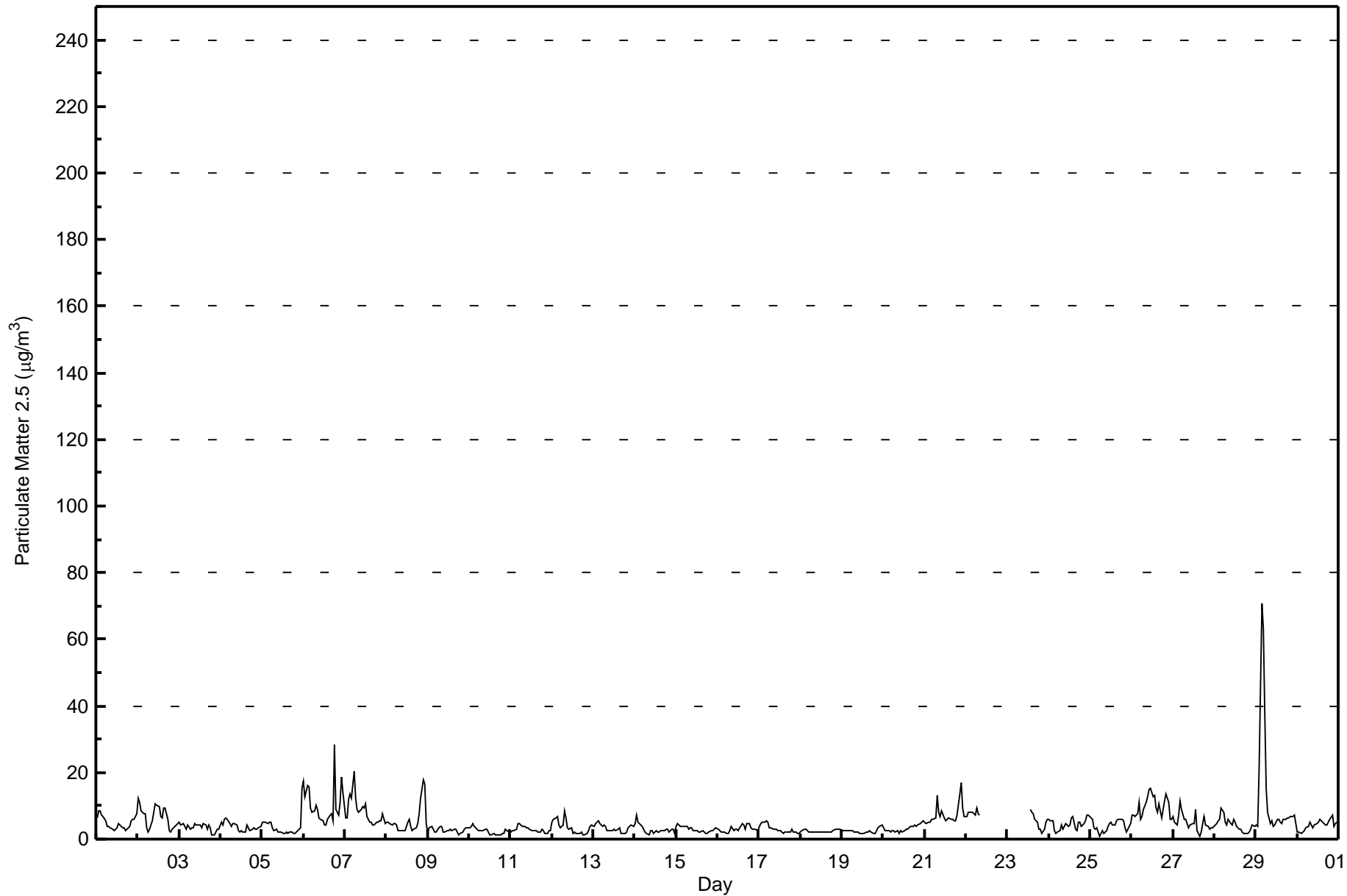
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxides (NO_x) - ppb
Wapasu (AMS 17)











Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Wapasu - June 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	513	74.13	74.13
6 - 15	164	23.70	97.83
16 - 25	9	1.30	99.13
26 - 80	4	0.58	99.71
> 81.0	0	0.00	99.71

Total Number of Valid Hours: 692

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Wapasu - June 2016

Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	27	26	26	23	21	40	82	34	35	27	40	24	28	23	21	36	513
6 - 15	2	5	7	4	4	9	43	23	16	16	5	5	6	7	6	6	164
16 - 25	0	1	0	0	0	2	5	0	1	0	0	0	0	0	0	0	9
26 - 80	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	4
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	29	32	33	27	25	54	131	57	52	43	45	29	34	30	27	42	690

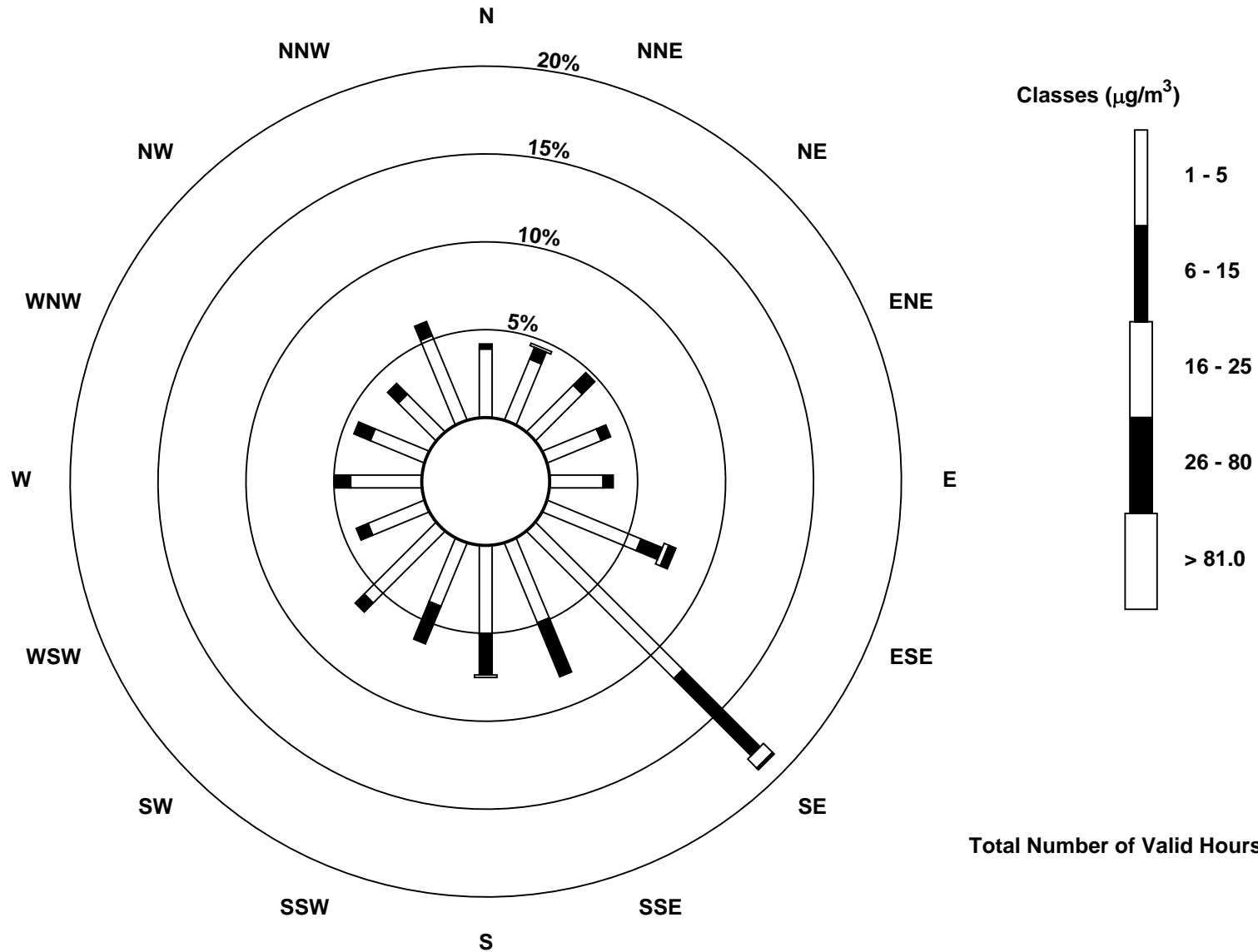
Total Number of Valid Hours: 692

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Wapasu (AMS 17)



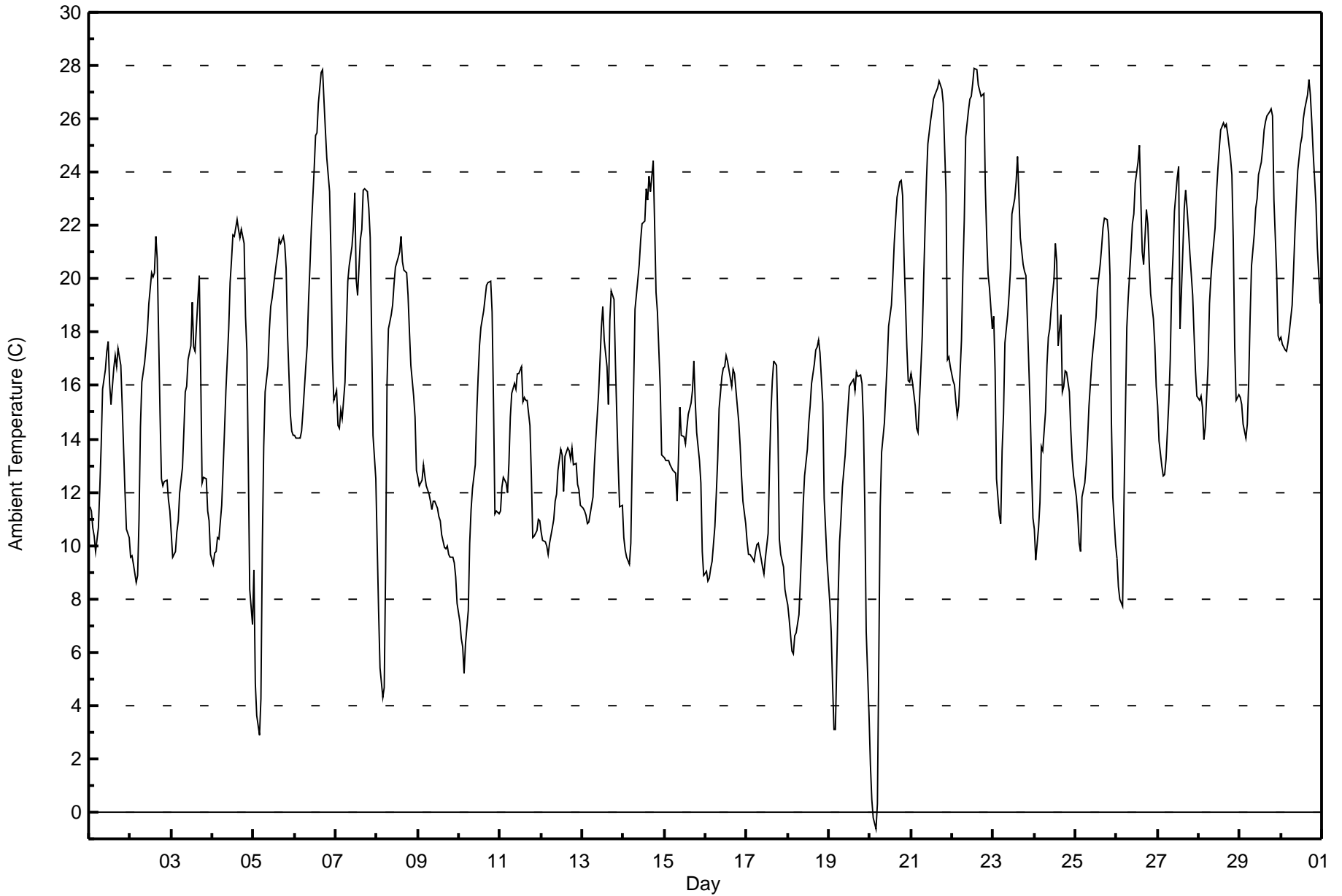
Total Number of Valid Hours: 692



Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Wapasu - June 2016

Maximum Value: 27.9 C on Jun 22 14:00		Maximum Daily Average: 22.4 C on Jun 22		Hours in Service: 720																																													
Minimum Value: -0.6 C on Jun 20 04:00		Minimum Daily Average: 10.9 C on Jun 9		Hours of Data: 720																																													
Maximum Diurnal Average: 20.5 C at hour 17		Minimum Diurnal Average: 10.1 C at hour 4		Hours of Missing Data: 0																																													
Monthly Average: 16.01 C		Percentiles: P₁ = 2.9 P₁₀ = 9.6 Q₁ = 11.8 Median = 15.8 Q₃ = 20.1 P₉₀ = 23.3 P₉₉ = 27.2		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-Jun	11.5	11.3	10.6	10.3	9.8	10.7	12.1	13.7	15.9	16.6	17.3	17.7	16.1	15.3	16.7	17.1	16.7	17.4	16.7	15.2	13.6	12.0	10.6	10.3	14.0	17.7																							
2-Jun	9.6	9.6	9.3	8.6	8.9	11.0	14.4	16.1	16.8	17.4	18.1	19.1	20.2	20.1	20.2	21.6	20.8	14.9	12.5	12.3	12.4	12.4	11.7	11.3	14.6	21.6																							
3-Jun	10.5	9.6	9.8	10.5	11.0	12.0	12.9	14.3	15.7	16.0	17.0	17.5	19.1	17.5	17.3	19.2	20.1	16.6	12.4	12.6	12.5	11.3	10.9	9.7	14.0	20.1																							
4-Jun	9.3	9.7	9.8	10.3	10.2	11.5	12.9	14.3	15.8	18.1	19.8	20.7	21.7	21.6	22.2	21.9	21.5	21.8	21.3	18.6	17.3	13.0	8.3	7.0	15.8	22.2																							
5-Jun	9.1	4.8	3.6	2.9	4.3	10.0	13.7	15.8	16.7	18.1	19.0	19.3	20.2	20.6	20.9	21.5	21.3	21.6	21.3	20.4	17.9	14.9	14.3	14.1	15.3	21.6																							
6-Jun	14.1	14.0	14.0	14.0	14.3	15.0	16.7	17.5	19.2	20.5	21.9	24.1	25.4	25.5	26.6	27.8	27.8	26.7	25.6	24.5	23.3	20.9	17.1	15.5	20.5	27.8																							
7-Jun	15.8	14.5	14.4	15.1	14.8	16.1	18.2	19.9	20.5	21.2	22.0	23.2	19.9	19.4	21.5	21.8	23.3	23.4	23.3	22.7	21.5	18.0	14.1	12.5	19.0	23.4																							
8-Jun	10.0	7.5	5.4	4.3	4.7	9.1	16.1	18.2	18.7	19.0	19.8	20.5	20.8	21.0	21.6	20.7	20.3	20.2	19.4	18.0	16.7	15.6	14.8	12.8	15.6	21.6																							
9-Jun	12.6	12.2	12.4	13.0	12.6	12.2	11.9	11.7	11.4	11.7	11.7	11.4	11.1	10.9	10.4	9.9	9.9	10.0	9.7	9.6	9.6	9.4	8.8	7.8	10.9	13.0																							
10-Jun	7.1	6.5	6.2	5.2	6.3	7.6	10.1	11.3	12.2	13.0	14.9	16.3	17.5	18.2	18.8	19.3	19.8	19.9	19.9	18.7	15.3	11.2	11.3	11.2	13.2	19.9																							
11-Jun	11.3	12.2	12.5	12.4	12.0	13.1	14.8	15.7	16.1	15.9	16.5	16.4	16.7	15.4	15.5	15.5	15.4	14.5	12.7	10.3	10.4	10.6	11.0	10.9	13.7	16.7																							
12-Jun	10.5	10.2	10.2	10.0	9.7	10.1	10.7	11.0	11.7	11.9	12.8	13.6	13.4	12.0	13.4	13.7	13.6	13.2	13.7	13.0	13.1	12.3	12.1	11.5	12.0	13.7																							
13-Jun	11.4	11.3	11.1	10.8	10.9	11.5	11.8	13.0	14.0	15.7	16.9	18.2	19.0	17.7	16.7	15.3	18.4	19.5	19.2	16.9	14.8	13.0	11.5	11.5	14.6	19.5																							
14-Jun	10.3	9.8	9.6	9.3	10.1	13.2	15.9	18.8	20.0	20.5	21.4	22.0	22.2	23.4	23.0	23.8	23.3	24.4	22.0	19.5	18.8	15.9	13.4	13.3	17.7	24.4																							
15-Jun	13.3	13.2	13.2	13.0	12.9	12.8	12.7	11.7	13.3	15.2	14.1	14.1	13.8	14.4	14.9	15.3	15.8	16.9	15.4	14.3	13.2	12.4	9.8	8.9	13.5	16.9																							
16-Jun	9.0	8.7	8.8	9.2	9.4	10.7	11.9	13.2	15.1	16.3	16.7	16.7	17.1	16.9	16.3	16.0	16.6	16.4	15.2	14.7	13.8	12.6	11.7	10.8	13.5	17.1																							
17-Jun	10.1	9.7	9.7	9.5	9.4	9.8	10.1	10.1	9.5	9.2	9.0	9.5	10.4	13.0	15.0	16.2	16.9	16.8	14.4	10.2	9.7	9.2	8.3	8.0	11.0	16.9																							
18-Jun	7.8	7.2	6.1	6.0	6.6	6.7	7.4	8.7	10.1	11.5	12.6	13.6	14.6	15.3	16.1	16.8	17.3	17.4	17.7	17.2	15.3	11.8	10.6	9.4	11.8	17.7																							
19-Jun	7.9	6.8	4.8	3.1	3.1	8.2	10.1	11.0	12.2	13.4	14.4	15.1	16.0	16.1	16.2	15.8	16.5	16.3	16.4	16.1	14.7	11.5	6.8	3.7	11.5	16.5																							
20-Jun	1.8	0.5	-0.2	-0.6	0.3	5.8	11.5	13.5	14.6	15.8	16.9	18.2	19.0	20.0	21.4	22.2	23.1	23.6	23.7	23.1	20.8	17.4	16.2	16.1	14.4	23.7																							
21-Jun	16.4	16.1	15.2	14.4	14.2	15.4	17.9	20.0	21.9	23.7	25.1	25.9	26.3	26.7	26.9	27.2	27.4	27.3	27.1	26.6	23.2	17.0	17.1	16.7	21.5	27.4																							
22-Jun	16.2	16.0	15.4	14.9	15.2	17.7	20.2	22.2	25.3	26.3	26.8	26.9	27.3	27.9	27.9	27.3	27.1	26.9	27.0	23.5	21.6	20.2	19.6	18.2	22.4	27.9																							
23-Jun	18.6	16.5	12.5	11.2	10.8	13.5	14.9	17.6	18.7	19.4	20.4	22.4	23.0	23.6	24.6	23.1	21.5	20.5	20.3	20.1	18.5	15.2	13.0	11.0	18.0	24.6																							
24-Jun	10.6	9.5	10.7	11.6	13.7	13.5	15.0	16.8	17.8	18.1	18.8	20.0	21.3	20.6	17.5	18.6	15.8	16.0	16.6	16.5	15.8	14.4	13.2	12.6	15.6	21.3																							
25-Jun	11.8	11.2	10.1	9.8	11.8	12.4	13.0	14.0	15.2	16.9	17.5	18.0	18.5	19.6	20.5	21.2	21.9	22.3	22.2	21.7	20.1	14.7	11.8	10.0	16.1	22.3																							
26-Jun	9.5	8.5	8.0	7.7	11.7	15.0	18.2	19.3	21.1	22.1	22.4	23.6	24.4	25.0	23.0	21.0	20.5	22.6	22.1	20.6	19.4	18.5	17.5	16.0	18.2	25.0																							
27-Jun	15.2	13.9	13.0	12.6	12.6	13.3	15.4	17.0	19.7	20.9	22.5	23.8	24.2	18.1	19.5	22.6	23.3	22.7	21.9	20.9	19.4	17.9	16.5	15.6	18.4	24.2																							
28-Jun	15.4	15.6	15.2	14.0	14.5	16.8	19.1	20.0	20.7	21.9	23.2	24.1	24.9	25.6	25.9	25.7	25.8	25.4	24.5	23.9	21.4	17.5	15.4	15.6	20.5	25.9																							
29-Jun	15.6	15.3	14.6	14.0	14.5	16.1	18.5	20.5	21.7	22.6	23.0	23.9	24.4	24.9	25.6	25.9	26.1	26.3	26.4	26.1	23.0	20.1	17.9	17.7	21.0	26.4																							
30-Jun	17.8	17.6	17.3	17.3	17.6	18.0	19.0	20.3	21.7	23.0	24.0	25.1	25.3	26.0	26.4	26.9	27.5	26.9	25.9	24.8	22.8	21.2	20.1	19.0	22.2	27.5																							
																								11.7	11.0	10.4	10.1	10.6	12.3	14.2	15.6	16.8	17.7	18.5	19.4	19.8	19.7	20.1	20.4	20.5	20.3	19.5	18.4	17.0	14.7	13.2	12.3	Diurnal Average	
																								18.6	17.6	17.3	17.3	17.6	18.0	20.2	22.2	25.3	26.3	26.8	26.9	27.3	27.9	27.9	27.8	27.8	27.3	27.1	26.6	23.3	21.2	20.1	19.0	Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ambient Temperature (AT) - C
Wapasu - June 2016

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	2	0.28	0.28
0 - 10	92	12.78	13.06
10 - 20	441	61.25	74.31
> 20	185	25.69	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



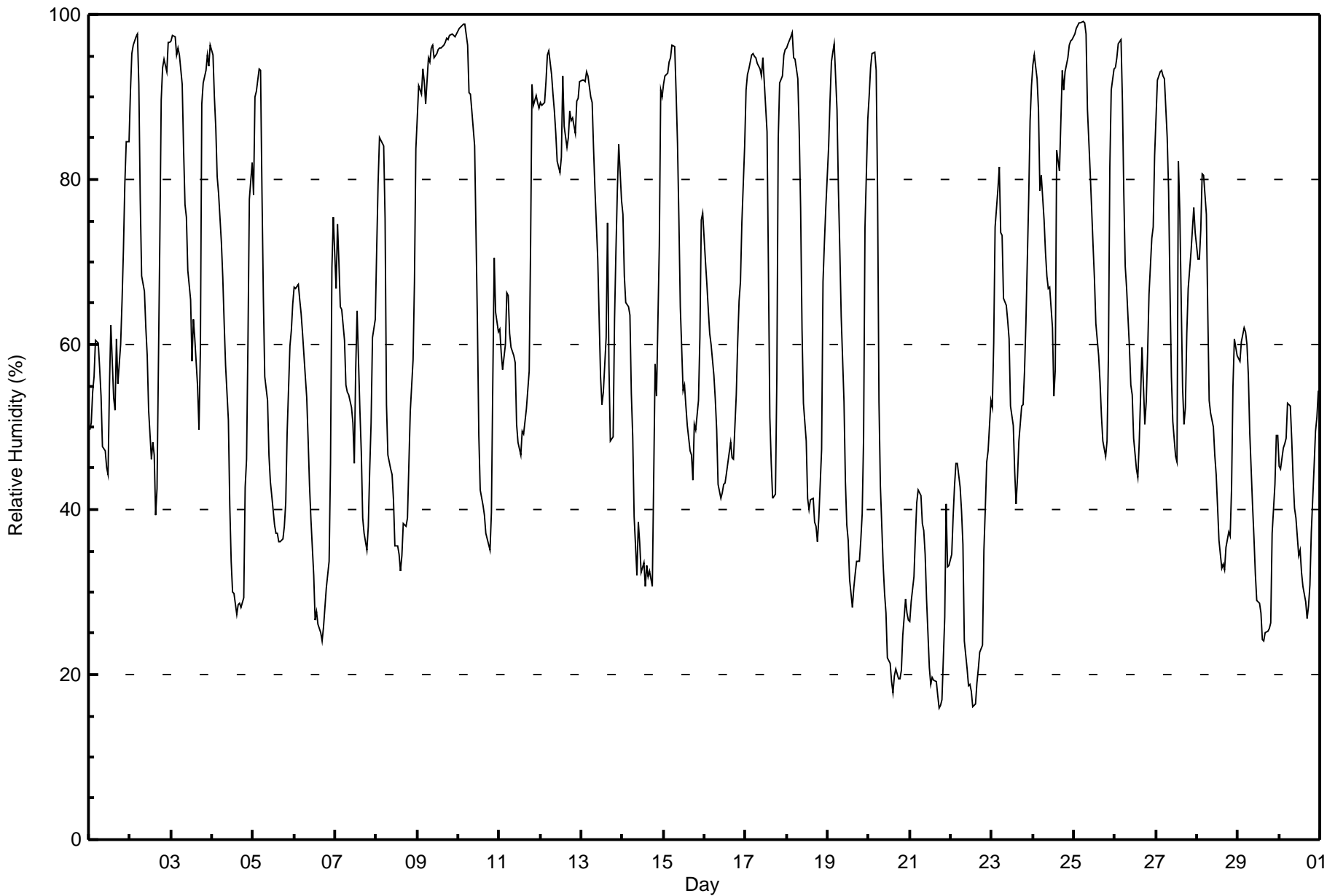
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Wapasu - June 2016

Maximum Value: 99 % on Jun 25 06:00																		Maximum Daily Average: 94.9 % on Jun 9																		Hours in Service: 720			
Minimum Value: 16 % on Jun 21 18:00																		Minimum Daily Average: 28.6 % on Jun 21																		Hours of Data: 720			
Maximum Diurnal Average: 80.2 % at hour 4																		Minimum Diurnal Average: 44.2 % at hour 17																		Hours of Missing Data: 0			
Monthly Average: 61.8 %																		Percentiles: P ₁ = 18 P ₁₀ = 31 Q ₁ = 43 Median = 60 Q ₃ = 85 P ₉₀ = 95 P ₉₉ = 98																		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-Jun	50	51	54	56	60	60	57	54	48	47	45	44	55	62	54	52	61	55	60	65	71	79	85	85	58.8	85													
2-Jun	91	95	96	97	98	92	78	68	66	62	59	52	46	48	47	39	43	73	90	94	95	93	97	97	75.5	98													
3-Jun	97	97	97	95	96	95	91	84	77	75	69	65	58	63	61	55	50	60	89	92	93	95	94	96	81.0	97													
4-Jun	95	90	86	80	78	72	68	63	58	51	40	34	30	30	27	29	28	29	43	46	60	78	82	55.2	95														
5-Jun	78	90	91	93	93	79	66	56	53	47	43	42	38	37	37	36	36	36	38	41	49	60	62	65	56.9	93													
6-Jun	67	67	67	65	64	61	56	54	48	43	39	32	27	28	26	25	24	26	28	31	34	46	69	75	45.9	75													
7-Jun	67	75	70	65	64	61	55	54	54	52	51	46	57	64	52	47	39	37	35	38	45	51	61	63	54.2	75													
8-Jun	72	79	85	84	84	75	53	47	45	44	41	36	36	35	33	34	38	38	39	45	52	58	68	84	54.4	85													
9-Jun	87	91	90	93	92	89	95	94	96	96	95	95	96	96	96	96	97	97	97	97	98	98	97	98	94.9	98													
10-Jun	98	98	99	99	99	96	91	90	88	84	73	63	49	42	40	39	37	36	35	40	56	71	64	62	68.7	99													
11-Jun	62	59	57	60	66	66	61	60	59	58	50	48	47	49	49	51	52	57	72	91	89	90	89	89	63.8	91													
12-Jun	89	89	89	92	95	96	93	90	88	86	82	81	83	93	86	84	85	88	87	87	86	89	90	92	88.3	96													
13-Jun	92	92	92	93	93	90	89	84	79	70	63	56	53	54	61	75	57	48	49	63	71	79	84	77	73.5	93													
14-Jun	76	68	65	65	64	54	49	39	32	38	36	32	33	31	33	32	33	31	44	58	54	72	91	90	50.8	91													
15-Jun	92	93	93	94	95	96	96	91	84	75	65	54	55	53	50	47	47	43	50	50	53	61	75	76	70.3	96													
16-Jun	70	67	64	61	60	56	53	50	43	41	42	43	43	44	47	48	46	46	54	60	65	68	75	84	55.5	84													
17-Jun	91	93	93	95	95	95	95	94	93	93	95	92	86	69	51	46	41	42	56	85	92	93	95	96	82.3	96													
18-Jun	96	96	97	98	95	95	92	86	76	62	53	48	41	40	41	41	38	38	36	39	47	68	72	77	65.6	98													
19-Jun	84	89	94	95	96	89	79	72	63	53	43	38	36	32	28	30	32	34	34	36	40	49	74	87	58.7	96													
20-Jun	90	94	95	95	93	78	53	43	33	30	27	22	21	19	18	20	21	19	19	21	25	29	27	27	42.5	95													
21-Jun	27	29	32	37	41	42	42	38	38	35	29	21	19	20	19	19	17	16	16	17	27	41	33	33	28.6	42													
22-Jun	35	39	43	46	46	43	40	36	24	21	19	19	18	16	16	19	21	23	23	35	40	46	47	53	31.9	53													
23-Jun	52	60	74	79	82	74	73	66	65	63	61	53	50	45	41	44	48	53	53	57	63	78	87	91	62.9	91													
24-Jun	94	95	92	89	79	81	75	71	68	67	67	62	54	57	84	81	87	93	91	93	95	96	97	97	81.8	97													
25-Jun	98	98	99	99	99	99	99	98	88	81	77	72	68	63	59	55	51	48	46	48	59	82	91	93	77.9	99													
26-Jun	94	95	96	97	89	78	70	67	60	55	54	49	45	44	48	54	60	50	53	59	66	73	74	83	67.2	97													
27-Jun	87	92	93	93	93	92	85	79	67	56	51	47	46	82	76	55	50	52	61	67	71	74	77	74	71.6	93													
28-Jun	70	70	74	81	80	76	64	53	52	50	47	44	40	36	33	33	33	35	37	37	42	55	61	59	52.6	81													
29-Jun	58	58	60	62	61	60	56	49	40	37	32	29	29	27	24	24	25	25	26	26	37	43	49	49	41.2	62													
30-Jun	45	45	47	48	49	53	53	49	44	40	39	34	35	32	31	29	27	28	31	37	45	49	51	54	41.5	54													
	76.8	78.5	79.6	80.2	80.0	76.4	70.9	65.9	61.0	57.1	52.9	48.4	46.5	47.0	45.6	44.7	44.2	45.2	49.3	55.1	60.2	68.1	73.8	76.2	Diurnal Average														
	98	98	99	99	99	99	99	98	96	96	95	95	96	96	96	96	96	97	97	97	97	98	98	97	98	Diurnal Maximum													





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Relative Humidity (RH) - %
Wapasu - June 2016**

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	19	2.64	2.64
20 - 40	131	18.19	20.83
40 - 60	213	29.58	50.42
60 - 80	147	20.42	70.83
80 - 100	210	29.17	100.00

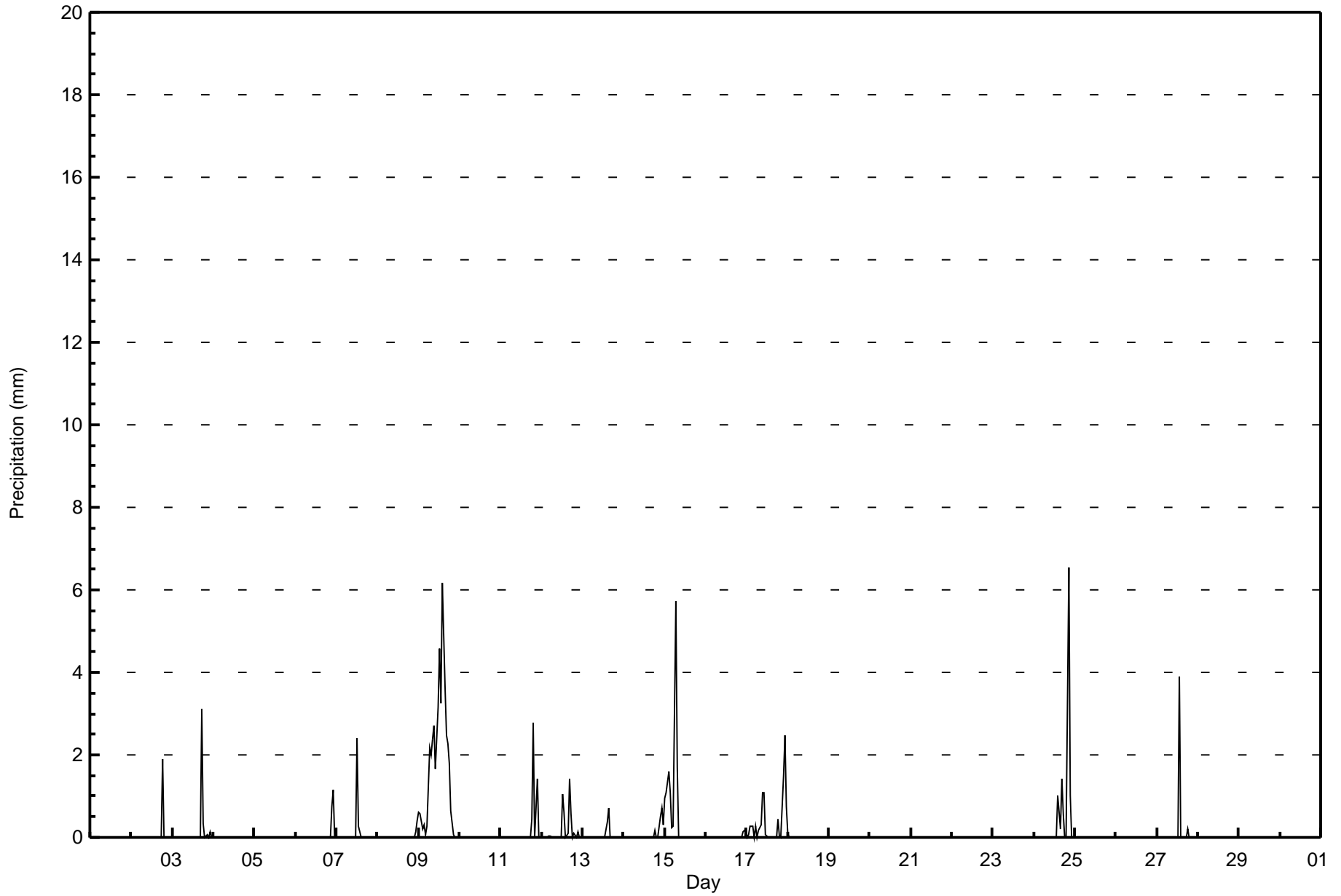
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
Wapasu - June 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

Wapasu - June 2016

Maximum Speed: 29 km/h on Jun 15 12:00	Maximum Daily Speed Average: 15.1 km/h on Jun 15	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 20 07:00	Minimum Daily Speed Average: 1.7 km/h on Jun 7	Hours of Data: 720
Maximum Diurnal Speed Average: 6.2 km/h at hour 3	Minimum Diurnal Speed Average: 0.6 km/h at hour 19	Hours of Missing Data: 0
Monthly Average Velocity: 2.3 km/h 166.6 deg	Percentiles: P ₁ = 2 P ₁₀ = 4 Q ₁ = 5 Median = 8 O ₃ = 12 P ₉₀ = 15 P ₉₉ = 21	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-Jun	SSE11	SSE12	SSE10	SSE8	SSE7	SSE8	SSE9	S8	S9	SSW11	SSW11	S12	S12	S8	SW12	S12	SSE12	SSE10	SE9	S4	S3	SE3	SE6	SE7	S8.2	SW12
2-Jun	SE7	SE6	SE6	SE5	SE6	SE5	SE2	ESE1	NW6	WNW5	WNW4	W4	N5	ENE11	ESE11	E6	S5	SSW16	S10	E3	ESE3	S2	SSE4	SE5	SE2.9	SSW16
3-Jun	SE5	SE4	SSE4	SSE4	S5	SSW6	SSW8	SW10	SW11	SW10	SW13	SW13	SW14	WSW10	N5	NW8	NNW9	NW6	ENE6	NNE5	ESE4	SE5	E3	ESE4	SW3.4	SW14
4-Jun	SE7	SSE7	S6	SSW7	S5	SSW6	SW11	WSW11	W11	W12	W16	WNW17	WNW17	WNW16	W20	W17	W16	WNW15	NW16	NNW10	NNW7	NE1	SE4	NE4	W7.4	W20
5-Jun	NNE4	SE5	ESE4	SE4	SSE4	WSW7	WNW8	NW12	WNW12	WNW12	WNW10	NW14	NW13	NNW9	NNW12	N10	N8	N7	NE7	ENE5	ESE7	ESE9	SE12	NNW3.2	NW14	
6-Jun	SE13	SE13	SE14	SE15	SE14	SE13	SE13	SE11	SE11	SSE10	SE12	SSE14	SSE16	SE16	SSE17	SSE15	SSE14	SSE14	SE14	SE16	SE17	SSE16	NNE7	E13	SE12.9	SE17
7-Jun	ESE11	SE13	SE10	S8	S6	S5	WSW5	NNW8	NNW11	NNW10	NNW9	NW8	SW8	ESE6	NNE10	NE6	N7	N7	NNW8	NNW3	NW3	NNW5	NNE4	ENE4	N1.7	SE13
8-Jun	NE3	ESE4	ESE4	E3	E5	ENE4	NE6	NNE8	NE9	NE9	ENE7	ENE5	ENE6	E7	E8	E7	E7	E7	ESE7	ESE6	ENE4	ESE5	SE10	ESE13	E5.5	ESE13
9-Jun	ESE14	E10	E13	E16	ENE18	ENE18	NE17	NE21	NE17	NE17	NE18	NE17	NE19	NE19	NNE18	NNE14	NNE12	NNE12	NNE11	NNE10	N9	N9	N7	NNW5	NE12.6	NE21
10-Jun	NNE5	NE5	NE4	ENE3	E3	W3	W5	W7	NW10	NNW11	N11	NNW11	NNW12	NNW12	NW11	NNW8	NNW8	NNW5	NNW4	N5	NE3	ENE5	E8	E8	N4.9	NNW12
11-Jun	ESE9	ESE11	ESE11	ESE10	SE9	SE8	SE9	SE10	SE12	SE12	SE14	SE16	SE19	SE16	SE13	SE10	SE16	SE14	SE10	SE9	ESE12	ESE12	ESE13	ESE12	SE11.9	SE19
12-Jun	ESE12	ESE12	SE11	SE8	S3	S6	SSW9	SW12	SSW11	SSW12	SSW11	SSW13	SSW15	S11	SSW15	SSW16	SW11	SW9	SW9	SW9	SW9	SSW6	SSW11	SSW14	SSW9.0	SSW16
13-Jun	SW13	SW11	SW11	SW10	SW13	SW14	SW13	SW15	SW16	SW16	SW19	SW21	SW23	WNW12	SW13	SSW8	SSW14	SSW10	NW5	N6	ENE5	ESE5	SE6	SE7	SW9.7	SW23
14-Jun	SE4	SE8	SE7	SE6	SE7	SE6	SE7	SE8	SSW2	NW3	ENE5	SSE11	SE12	E13	ESE11	SE17	SE12	SE16	SE10	ESE5	S10	SSE15	SE9	SE9	SE8.0	ESE17
15-Jun	SE13	SE13	ESE15	ESE13	ESE9	E9	ESE11	SE12	SE18	SE22	SSE26	SSE29	SSE26	S25	S26	S25	S21	SE17	SE16	SE14	ESE16	SSE10	SSE4	SE6	SSE15.1	SSE29
16-Jun	SE7	SE10	SE11	SE14	SE15	SSE15	S16	S18	S19	S18	SSW21	SW19	SW16	SW14	SW12	SSW12	SSW11	S9	WSW5	SW2	S2	W2	SSW4	WSW2	S9.8	SSW21
17-Jun	SSE3	SE4	SSW4	SW6	WSW6	W5	WSW6	WNW8	NW8	WNW10	WNW10	WNW8	W9	WNW10	WNW13	W13	W15	WSW13	W11	N8	ENE6	N5	NNW5	W4	W5.9	W15
18-Jun	W5	WNW6	NW4	WNW5	W6	WSW7	WSW8	WSW10	WSW12	WSW14	W14	W13	W13	WSW14	WSW13	WSW13	WSW13	SW14	SW10	SW9	S6	N12	NE6	NNE3	WSW7.6	SW14
19-Jun	N4	ENE1	SSE3	SSE3	SE4	SW5	WSW7	WNW7	NW13	NNW14	NW17	NNW18	NW19	NW22	NNW22	NNW19	NNW16	NNW18	NW15	NNW13	NNW9	NNW5	N2	SE3	NNW9.0	NW22
20-Jun	SE4	SE4	SE5	SE6	SE5	SE4	NNW0	WNW4	W8	WNW7	WNW5	NW6	WSW6	WNW8	W7	W6	WSW5	SSW7	S7	SSE6	SE7	SE9	SE10	SE10	S2.4	SE10
21-Jun	SSE12	SSE11	SSE10	SSE10	SSE9	SSE9	S8	S10	SSW11	SSW12	SSW12	SSW11	SW9	SSW9	SW6	SSW7	SSW6	WSW4	SSW6	SSW5	SSW4	SE5	SE7	SE7	S7.3	SSW12
22-Jun	SSE7	SSE7	SE7	SE7	SE7	SE6	SSE5	SSE6	S6	S8	SW10	SW9	SW11	S8	SW8	WSW8	WSW7	SW7	SSW12	SW14	SSW8	S8	SSW7	SSW2	SSW6.4	SW14
23-Jun	SSW6	SSE3	ESE3	ESE4	SE4	SSE4	ESE2	NE4	N7	N7	NNE2	NNW5	WNW8	W7	W10	NW17	NE9	NE8	ENE11	ENE8	E4	ESE4	E4	NE3	NNE1.7	NW17
24-Jun	ENE4	ENE5	E6	ENE5	ENE3	NE3	NNE5	N6	N10	NNW14	NNW12	N11	N12	NNW11	NW7	NW8	NE8	NNE2	N3	SSW1	NNE4	NE4	NE5	NE5	N5.0	NNW14
25-Jun	NE4	NE5	NE3	NE4	NNE2	N4	N5	N7	NE9	NNE9	NNE10	NNE10	NNE11	NNE12	NNE10	NNE10	NNE10	NNE10	NE9	N5	NE2	ESE2	SE4	SE4	NNE6.0	NNE12
26-Jun	E4	SE4	SE5	SE6	SE8	SE6	S5	S5	WSW7	WSW8	WNW7	WNW7	WNW7	WNW9	W10	SE6	SSE7	S7	SSW9	S5	S6	W6	SW6	SE5	SSW3.3	W10
27-Jun	SW6	S5	S6	S6	SSE5	S5	SSW8	SSW6	WSW8	WNW8	WSW10	W12	W10	WSW3	S9	S10	SW13	WSW6	W2	SE3	S4	SSE5	SE7	SE8	SSW4.9	SW13
28-Jun	SE7	SSE6	SSE6	SE6	SE6	SSE5	W5	NNW8	NW8	W9	NNW13	NNW12	NNW12	NW13	NNW14	NNW16	NNW14	N12	N11	N9	NNE6	ENE4	ENE6	E8	NNW4.6	NNW16
29-Jun	E9	ESE8	ESE8	ESE7	ESE8	ESE7	ESE8	SE8	ESE8	E8	ESE6	NNE4	NE4	SE7	SW4	ENE2	WSW6	NNE3	NW4	WNW4	SSE1	SSE6	SE11	SE13	ESE4.5	SE13
30-Jun	SE14	SE15	SE14	SE14	SSE13	SSE10	S9	S11	SSW14	S14	S12	S11	SE9	SE8	ESE10	SE9	SE10	ESE10	ESE11	ESE9	ESE7	ESE9	ESE11	SE11	SE9.7	SE15

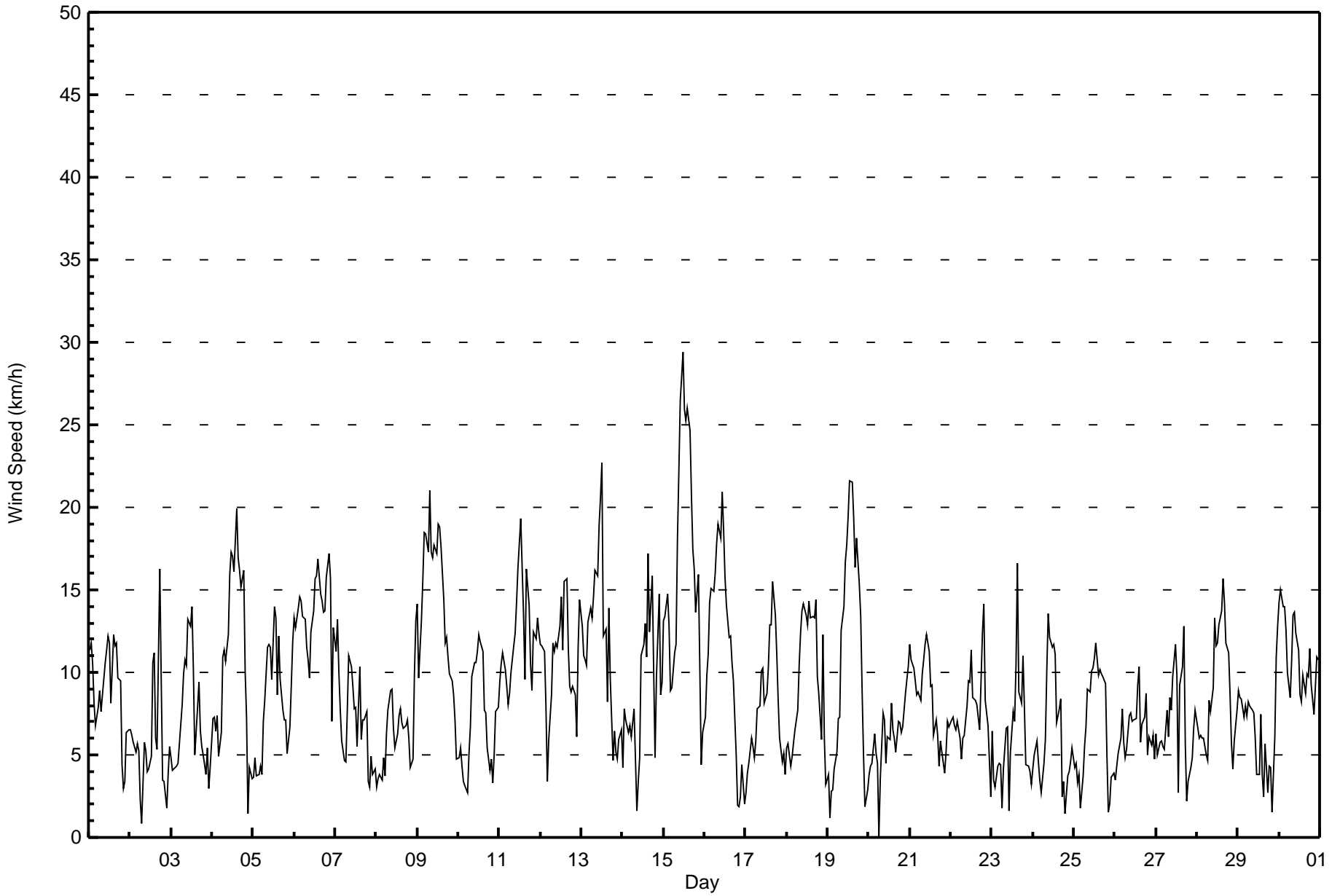
SE5.4 SE6.1 SE6.2 SE5.7 SE5.4 SSE4.6 S3.7SSW2.5WSW2.5WSW2.9WSW3.4WSW3.6WSW3.6WSW1.7WSW2.9WSW2.1 SW1.8SSW1.9 SSE0.6 E0.9 ESE2.6 ESE3.1 ESE3.9 SE5.1	Diurnal Average
SE14 SE15 ESE15 E16 ENE18 ENE18 NE17 NE21 S19 SE22 SSE26 SSE29 SSE26 S25 S26 S25 S21 NNW18 SE16 SE16 SE17 SSE16 ESE13 SSW14	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Wapasu - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Wapasu - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	183	25.42	25.42
6 - 11	341	47.36	72.78
12 - 19	181	25.14	97.92
20 - 28	14	1.94	99.86
29 - 38	1	0.14	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Wapasu - June 2016**

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	10	13	16	17	8	15	28	16	15	7	3	6	9	6	5	9	183
6 - 11	19	15	10	8	13	30	64	26	27	28	25	18	14	17	11	16	341
12 - 19	3	5	7	2	4	12	39	14	9	13	21	7	10	8	10	17	181
20 - 28	0	0	1	0	0	0	1	2	4	1	2	0	1	0	1	1	14
29 - 38	0	0	0	0	0	0	0	1	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
Totals	32	33	34	27	25	57	132	59	55	49	51	31	34	31	27	43	720

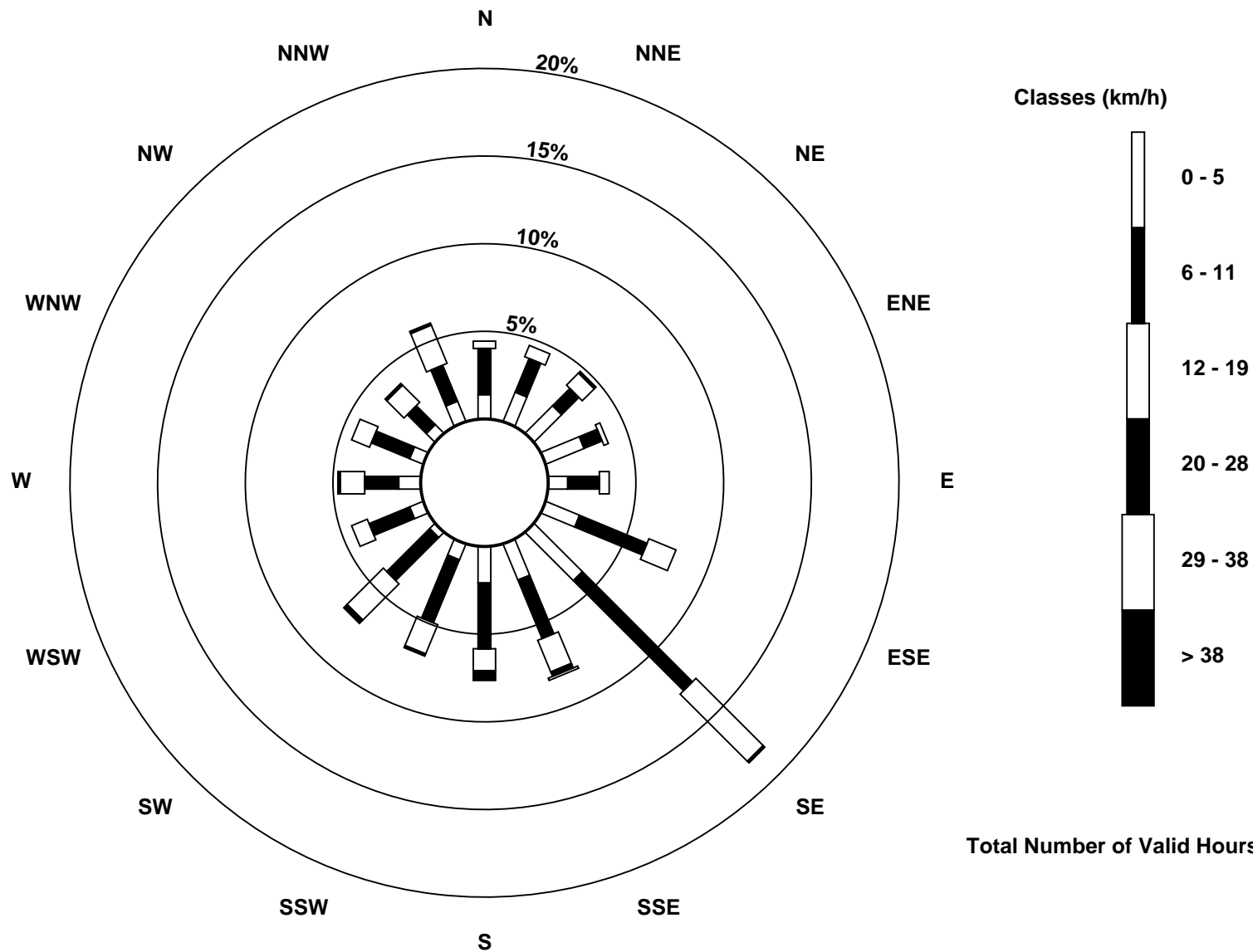
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed (WS) - km/h
Wapasu (AMS 17)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Wapasu - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 10 km/h on Jun 15 14:00																	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 1 km/h on Jun 8 02:00																									
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 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-Jun	3	3	3	3	2	2	3	2	3	3	4	4	4	3	4	5	4	3	3	2	2	1	2	1	5
2-Jun	1	1	1	1	1	1	1	1	2	2	3	3	3	3	4	3	8	6	3	2	2	2	1	1	8
3-Jun	1	1	1	1	1	2	2	3	3	3	4	3	5	4	2	3	4	5	3	2	2	1	2	1	5
4-Jun	1	2	1	2	1	2	3	3	3	4	5	6	6	5	6	6	6	6	6	4	3	1	1	2	6
5-Jun	2	1	1	1	1	1	2	2	4	4	4	3	5	4	4	4	4	3	2	2	1	1	2	3	5
6-Jun	3	3	3	4	4	4	4	3	3	3	4	5	5	5	6	5	5	4	4	4	5	6	9	4	9
7-Jun	5	3	3	3	1	2	2	3	3	3	3	3	8	2	5	3	3	3	3	2	2	1	1	1	8
8-Jun	1	1	1	1	1	1	2	3	3	3	2	2	2	3	3	2	2	3	2	2	1	2	3	3	3
9-Jun	4	3	4	5	6	6	5	7	6	6	6	6	6	6	6	5	4	4	4	4	3	3	2	1	7
10-Jun	1	1	1	1	1	1	2	2	3	3	3	4	4	4	4	4	3	3	3	2	1	1	1	1	4
11-Jun	2	2	3	2	3	2	2	3	3	3	5	5	7	7	5	3	5	5	4	2	5	3	3	3	7
12-Jun	3	3	3	2	1	2	3	4	4	4	4	4	5	4	5	5	4	3	3	2	2	1	4	4	5
13-Jun	3	2	3	3	3	4	4	4	4	5	5	6	7	6	7	5	5	4	4	3	1	1	1	1	7
14-Jun	2	1	1	1	1	1	2	2	2	3	3	4	5	5	5	6	4	5	8	3	5	5	2	2	8
15-Jun	4	4	4	4	2	3	4	4	6	7	9	10	9	10	10	9	7	6	7	4	4	7	2	2	10
16-Jun	2	2	3	3	4	5	6	6	7	7	6	5	5	5	3	4	4	4	2	2	2	2	2	2	7
17-Jun	1	1	1	1	1	1	2	3	2	4	3	3	3	3	5	5	5	5	6	4	2	3	4	2	6
18-Jun	2	1	1	1	2	2	2	3	4	4	4	4	4	4	5	5	5	4	3	3	2	6	2	2	6
19-Jun	1	2	1	1	1	2	2	2	4	5	5	5	6	6	7	6	5	5	5	4	3	2	1	1	7
20-Jun	1	1	1	1	1	1	1	2	2	2	3	3	3	3	3	3	3	3	2	2	1	1	2	2	3
21-Jun	3	3	3	2	2	2	3	3	3	3	4	4	4	4	3	3	4	3	3	2	1	1	1	1	4
22-Jun	1	1	1	1	1	1	1	2	2	3	4	3	5	4	5	3	2	2	5	4	3	2	2	3	5
23-Jun	2	1	1	1	2	2	1	3	2	2	2	3	3	3	4	6	4	2	3	2	1	1	1	1	6
24-Jun	2	1	1	1	1	1	1	2	3	4	4	4	4	5	3	6	5	1	2	1	2	2	1	1	6
25-Jun	1	1	1	1	1	1	2	2	3	3	3	3	4	4	3	3	3	3	3	2	1	1	1	1	4
26-Jun	1	1	1	1	1	1	2	2	2	3	2	3	4	3	4	3	2	2	3	1	2	2	3	3	4
27-Jun	3	1	2	1	1	1	2	2	2	3	3	4	4	5	3	3	4	2	3	1	2	2	1	1	5
28-Jun	1	2	1	1	1	1	2	2	3	3	4	4	4	5	4	5	5	4	4	3	2	1	1	2	5
29-Jun	2	2	2	1	2	2	2	2	3	4	3	3	3	3	3	3	4	3	2	2	2	2	3	3	4
30-Jun	3	4	3	3	3	3	3	3	4	5	4	4	3	4	4	3	4	4	4	3	1	2	3	2	5
																	Diurnal Maximum								



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Wapasu - June 2016

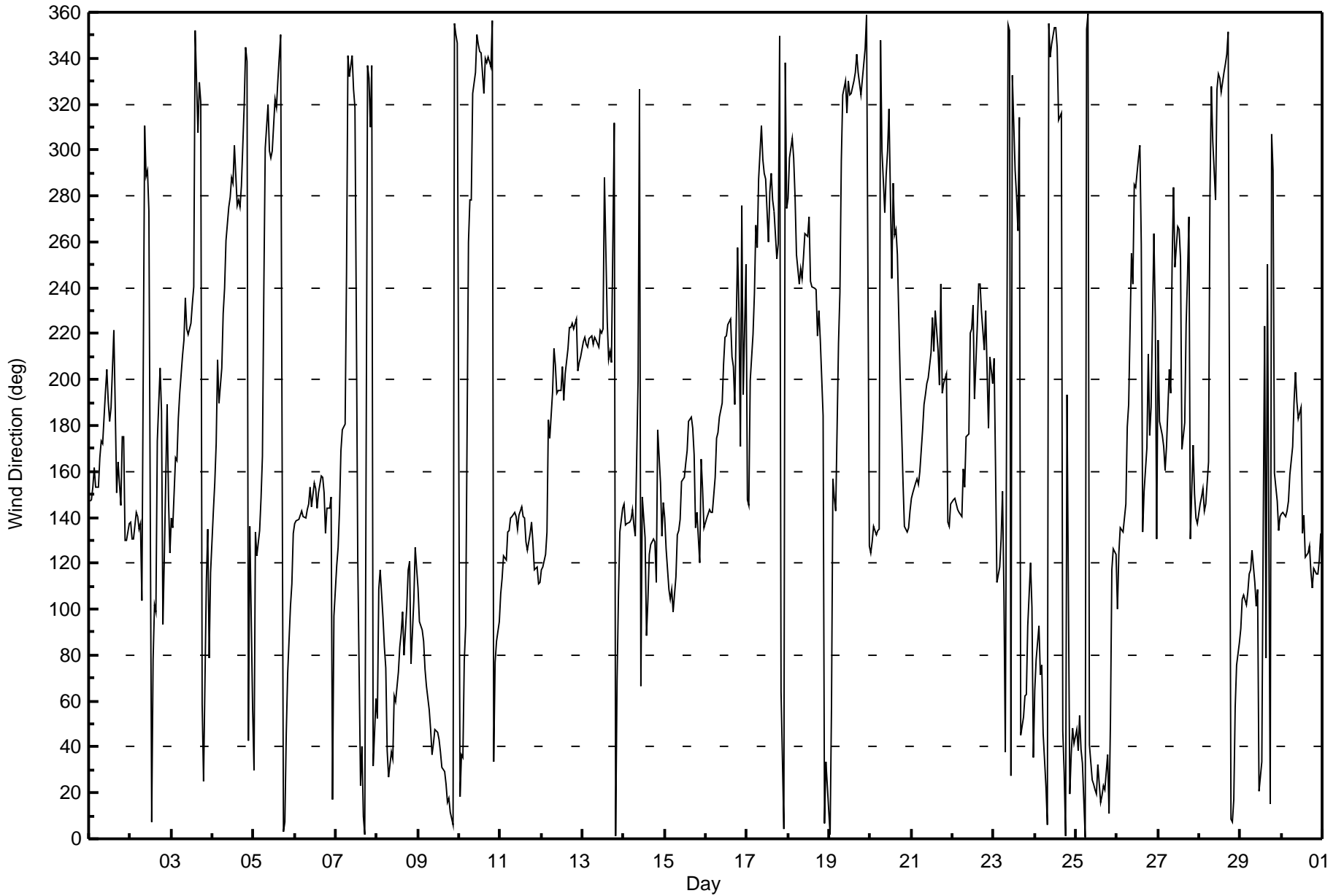
Direction of Maximum Speed: 158 deg on Jun 15 12:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 148.7 deg on Jun 15	Hours of Data: 720
Direction of Minimum Speed: 348 deg on Jun 20 07:00	Hours of Missing Data: 0
Direction of Minimum Daily Speed Average: 1.7 deg on Jun 7	Percent Operational Time: 100.0
Monthly Average Direction: 221.9 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-Jun	147	147	153	162	153	153	166	173	172	195	204	191	182	188	221	187	150	164	145	175	175	130	130	138	169.4
2-Jun	138	131	131	142	140	135	137	104	311	289	291	273	8	78	102	99	174	205	186	93	123	189	148	124	142.8
3-Jun	140	135	166	165	183	194	210	217	236	222	220	225	233	240	352	308	330	321	58	25	112	135	79	116	219.7
4-Jun	143	155	172	209	189	205	229	240	260	275	280	288	285	302	276	278	275	285	320	345	339	42	136	56	273.2
5-Jun	30	134	123	134	148	166	239	301	320	300	297	300	322	319	330	341	350	3	7	46	72	102	111	133	339.0
6-Jun	137	138	139	141	143	141	140	143	146	153	145	155	153	144	151	158	157	151	133	144	144	149	17	97	143.0
7-Jun	119	127	143	169	178	180	247	341	332	341	327	319	226	122	23	40	10	2	337	331	310	337	32	61	10.7
8-Jun	53	108	117	96	83	74	38	27	38	35	62	60	72	83	90	99	80	101	117	121	76	104	127	118	83.4
9-Jun	109	94	91	86	74	67	56	47	36	42	48	46	43	38	31	29	24	16	18	12	6	355	350	346	45.6
10-Jun	18	37	36	78	93	260	278	278	325	334	350	346	343	342	324	340	338	341	336	356	34	77	86	94	352.0
11-Jun	107	113	123	122	134	135	140	140	142	140	135	141	145	140	140	130	125	133	138	129	117	119	111	112	130.3
12-Jun	117	119	124	134	183	174	195	214	206	194	195	195	206	191	203	213	222	223	224	222	227	204	207	210	195.3
13-Jun	216	218	215	214	218	219	215	219	217	214	222	220	222	288	225	209	212	208	312	1	69	106	134	144	217.6
14-Jun	146	137	137	138	139	143	137	132	200	326	67	149	131	89	104	124	128	130	129	111	178	155	132	146	131.9
15-Jun	140	126	109	105	108	99	114	133	134	139	156	158	163	169	182	183	179	167	136	142	120	165	152	135	148.7
16-Jun	140	141	143	142	142	157	174	177	184	190	207	218	219	224	227	210	206	189	258	229	171	276	193	250	188.2
17-Jun	148	145	200	220	238	268	258	287	310	296	290	288	260	282	290	278	273	253	259	349	64	4	338	275	278.5
18-Jun	279	297	305	296	279	254	242	248	244	253	263	262	271	243	240	240	239	219	230	217	185	7	34	23	254.1
19-Jun	2	58	157	149	143	216	238	296	324	330	316	330	324	325	330	334	342	334	324	330	337	344	359	127	326.5
20-Jun	125	129	136	132	134	135	348	299	273	289	300	318	244	285	263	265	254	200	179	156	136	133	136	143	190.8
21-Jun	148	151	155	157	154	160	178	189	193	198	201	212	227	212	230	213	198	242	194	198	203	138	136	146	183.3
22-Jun	147	149	146	143	142	140	161	153	175	176	221	222	233	191	223	242	242	230	213	230	204	179	210	198	196.5
23-Jun	209	163	111	119	131	151	107	38	354	352	28	333	291	280	265	314	45	53	63	63	93	120	101	35	26.2
24-Jun	65	78	93	72	76	46	23	6	355	341	346	354	353	345	313	316	47	29	1	193	19	37	48	42	9.4
25-Jun	48	39	54	39	33	0	353	359	41	26	24	21	20	32	16	19	23	21	37	11	50	117	127	124	27.9
26-Jun	100	125	135	134	140	146	179	189	255	241	285	284	296	302	259	134	151	170	211	176	188	264	227	131	204.4
27-Jun	217	182	176	171	160	171	204	194	250	284	249	266	265	253	169	181	224	245	271	131	171	150	140	138	206.9
28-Jun	146	149	153	143	146	164	280	328	304	278	327	333	332	325	334	338	342	352	9	7	17	58	76	85	344.9
29-Jun	91	105	106	102	107	116	117	126	111	101	108	21	34	136	224	78	250	15	307	291	159	147	134	140	115.5
30-Jun	141	142	140	143	147	159	171	191	203	191	183	188	133	141	122	125	128	116	109	118	115	115	122	133	146.1

133.2 133.0 135.7 138.7 142.0 153.3 178.9 197.9 239.8 244.5 241.0 242.3 242.9 256.8 245.0 241.8 218.9 200.1 154.0 99.7 123.3 123.5 121.4 125.2

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
Wapasu - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 102 deg on Jun 20 07:00 Minimum Value: 3 deg on Jun 20 05:00 Percentiles: P ₁ = 6 P ₁₀ = 16 Q ₁ = 21 Median = 27 Q ₃ = 34 P ₉₀ = 53 P ₉₉ = 88																	Hours in Service: 720 Hours of Data: 720 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-Jun	21	22	23	25	23	24	29	30	32	29	27	30	30	32	25	35	29	30	26	25	53	31	25	16	53		
2-Jun	16	13	9	11	13	17	42	99	41	54	78	72	66	32	27	58	73	23	25	49	55	89	24	17	99		
3-Jun	35	23	29	20	23	26	19	20	26	25	20	21	25	31	49	45	33	74	46	53	50	17	72	27	74		
4-Jun	10	18	20	20	23	29	18	22	34	32	29	30	30	31	29	32	30	32	34	30	26	68	10	56	68		
5-Jun	44	12	24	20	13	32	29	29	29	35	36	39	33	32	53	35	40	48	40	25	18	12	17	17	53		
6-Jun	18	19	18	18	19	19	19	22	24	29	27	31	29	26	28	31	32	27	20	20	23	31	71	25	71		
7-Jun	33	18	21	25	24	32	58	33	26	28	41	47	67	40	59	61	47	43	30	52	61	26	28	16	67		
8-Jun	40	26	16	21	16	18	23	31	29	30	35	43	46	34	38	24	26	26	22	20	37	28	19	17	46		
9-Jun	20	24	24	25	25	25	25	23	25	25	23	25	24	25	27	27	29	29	30	31	31	30	29	22	31		
10-Jun	21	15	23	23	15	61	27	31	28	28	29	31	31	34	34	54	48	56	75	31	22	12	11	14	75		
11-Jun	14	18	16	16	20	17	20	19	22	20	22	23	25	24	24	26	23	22	24	22	19	19	19	19	26		
12-Jun	17	18	19	16	27	28	31	20	26	27	27	28	23	28	24	21	24	19	19	18	16	20	22	19	31		
13-Jun	17	16	16	16	18	19	20	18	18	23	18	19	21	33	29	35	20	30	60	36	27	17	11	11	60		
14-Jun	64	7	8	7	7	16	18	23	80	85	68	30	34	28	37	24	24	25	40	53	33	26	17	23	85		
15-Jun	21	19	19	20	24	23	29	22	21	22	27	28	30	32	32	30	32	31	21	23	20	50	45	19	50		
16-Jun	14	16	18	19	18	28	33	30	30	32	23	21	28	24	25	22	28	31	41	65	75	53	29	68	75		
17-Jun	59	25	23	16	26	27	26	40	22	25	26	31	29	29	28	32	30	26	36	37	22	55	62	38	62		
18-Jun	28	28	22	29	30	25	25	28	26	31	31	32	36	31	35	33	33	19	24	19	28	39	27	55	55		
19-Jun	23	60	24	25	8	30	24	33	23	30	26	26	24	23	22	25	29	24	21	19	22	26	48	17	60		
20-Jun	11	9	7	4	3	6	102	51	38	48	83	56	63	40	60	66	61	45	35	24	12	10	13	17	102		
21-Jun	22	22	23	20	19	25	30	28	29	27	30	37	47	54	67	55	76	64	41	30	30	11	8	15	76		
22-Jun	16	15	14	10	10	13	29	26	39	40	41	38	37	51	51	28	28	26	22	19	28	28	25	62	62		
23-Jun	20	22	26	26	24	33	68	57	32	38	93	78	52	51	40	29	44	28	25	26	25	18	23	37	93		
24-Jun	31	11	19	22	41	35	32	36	29	25	28	33	32	34	25	24	36	60	49	64	41	37	17	22	64		
25-Jun	22	21	26	24	68	29	35	28	30	35	32	31	33	33	36	38	35	34	30	34	44	40	6	6	68		
26-Jun	37	14	4	4	8	15	31	34	37	41	39	45	49	39	34	38	28	30	28	27	25	42	45	34	49		
27-Jun	37	20	25	23	23	28	23	33	33	36	36	35	34	81	30	30	22	28	95	27	40	49	7	7	95		
28-Jun	12	19	14	9	9	30	56	26	39	31	25	33	33	36	29	29	29	34	34	34	25	18	13	14	56		
29-Jun	15	16	14	14	17	16	19	22	34	54	75	89	85	52	76	86	68	82	71	47	89	27	14	18	89		
30-Jun	18	18	18	19	22	26	33	28	24	30	32	33	38	52	34	34	42	24	21	19	15	16	16	16	52		
																	64 60 29 29 68 61 102 99 80 85 93 89 85 81 76 86 76 82 95 65 89 89 72 68										
Diurnal Maximum																											



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	June 22, 2016	Last Calibration	May 3, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	9:05	End Time (MST)	12:35
Gas Cert Reference	SA130010A	Station temp.	22 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	-654	-653
Analyzer IP address	192.168.1.43		Lamp voltage	996	990
Calculated slope	1.001416	1.002785	Chamber temp	44.9	45.0
Calculated intercept	1.984724	1.691844	Pressure	693.4	685.3
Analyzer Background	8.8	8.9	Flow	0.455	0.450
Analyzer Coefficient	1.004	1.008	Intensity	93	92

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	569.6	1.014
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	60.4	577.4	574.9	1.004
second point	5000	30.2	288.7	285.5	1.011
third point	5000	15.2	145.3	141.4	1.028
as left zero	5000	0.0	0.0	-0.2	----
as left span	5000	60.4	577.4	574.2	1.006
Average Correction Factor					1.014

Corrected As found 570.0 Previous response 574.6 % change 0.8%

Notes:

Inlet filter changed after as founds. Second zero and span point completed to document any change. Span adjusted.

Calibration Performed By: Devin Russell



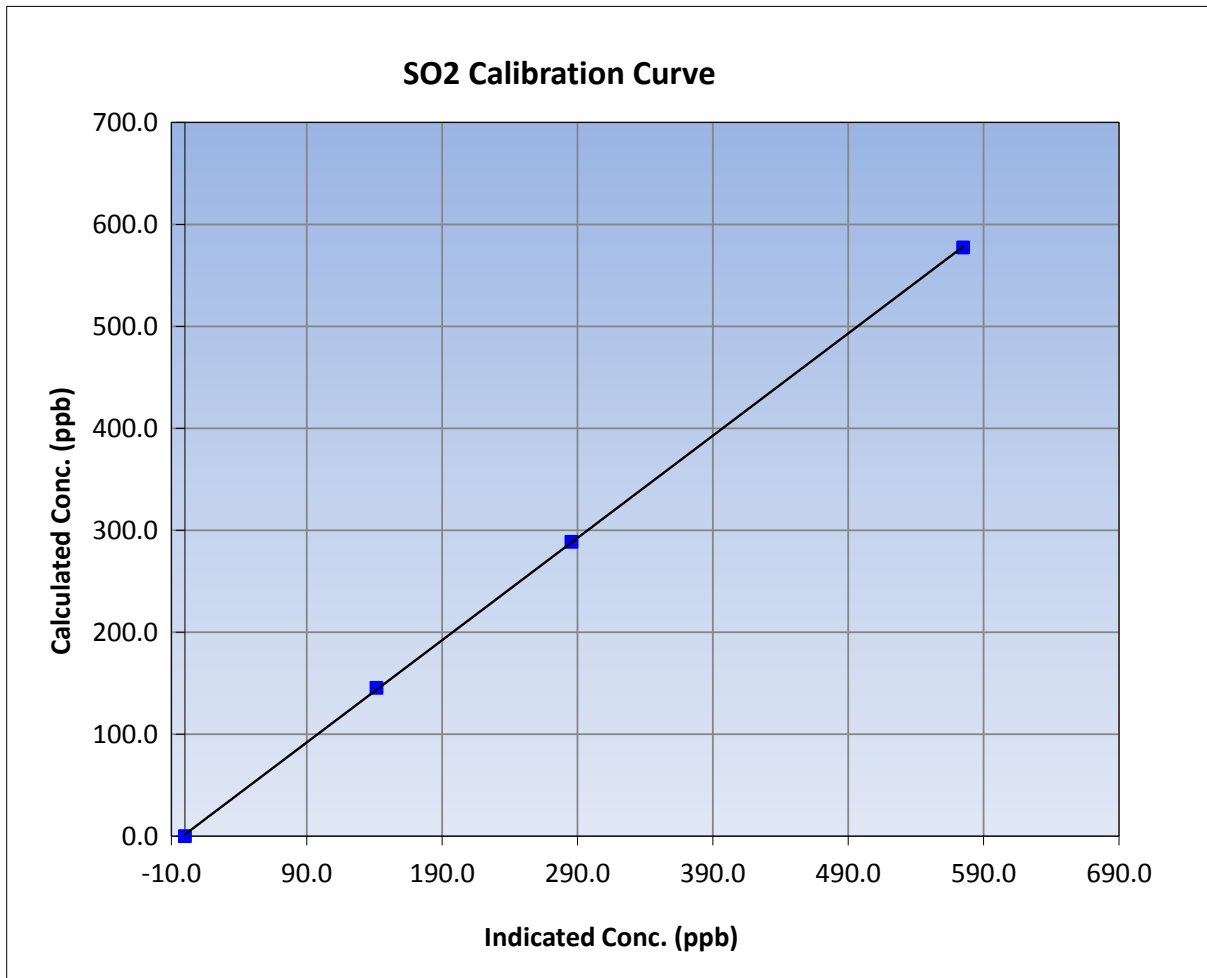
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 22, 2016	Previous Calibration	May 3, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	9:05	End Time (MST)	12:35
Analyzer make	Thermo 43i	Analyzer serial #	1218153459

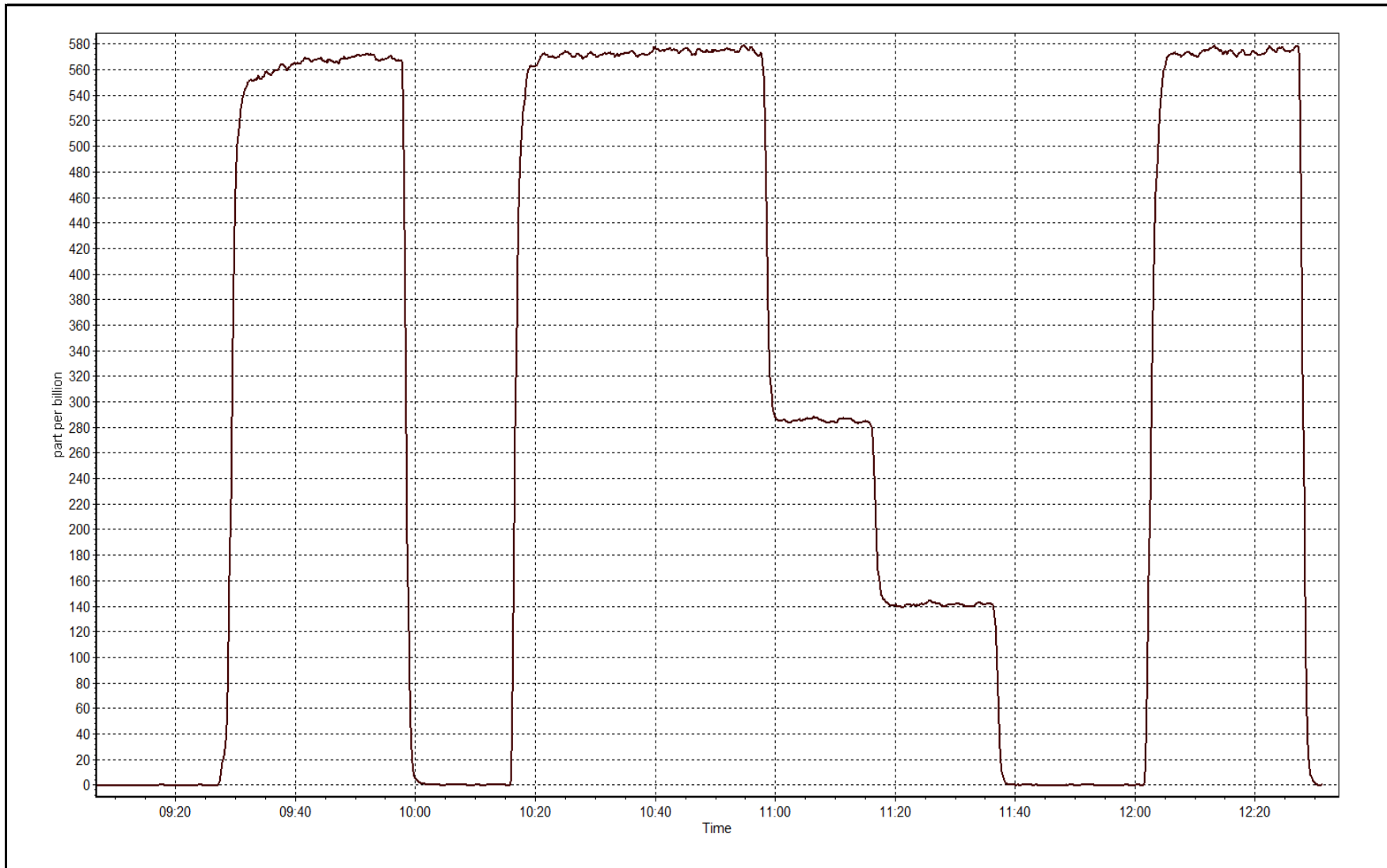
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999959
577.4	574.9	1.0043		
288.7	285.5	1.0112	Slope	1.002785
145.3	141.4	1.0275		
			Intercept	1.691844



SO2 Calibration Plot

Date: June 22, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	June 23, 2016	Last Calibration	May 2, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	9:30	End Time (MST)	13:00
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	796	791
Calculated slope	1.007866	1.003881	Chamber temp	45	45
Calculated intercept	-0.895953	-0.036098	Pressure	554.6	551.0
Analyzer Background	14.7	14.7	Flow	984.000	0.994
Analyzer Coefficient	1.225	1.225	Intensity	112	112
			Converter temp.	342	339

Analyzer make/model	Thermo 450i	Analyzer serial #	1218153583
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	78.4	80.0	79.9	1.001
SO2 scrubber check	5000	20.9	199.8	1.6	----
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	78.4	80.0	79.6	1.004
second point	5000	39.3	40.1	40.2	0.997
third point	5000	19.7	20.1	19.9	1.012
as left zero	5000	0.0	0.0	-0.2	----
as left span	5000	78.5	80.1	80.0	1.001
Average Correction Factor					1.004

Corrected As found	80.2	Previous response	80.2	% change	0.1%
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Notes:

Inlet filter changed after as founds. Span adjusted. Scrubber check completed at the end of the calibration.

Calibration Performed By: Devin Russell



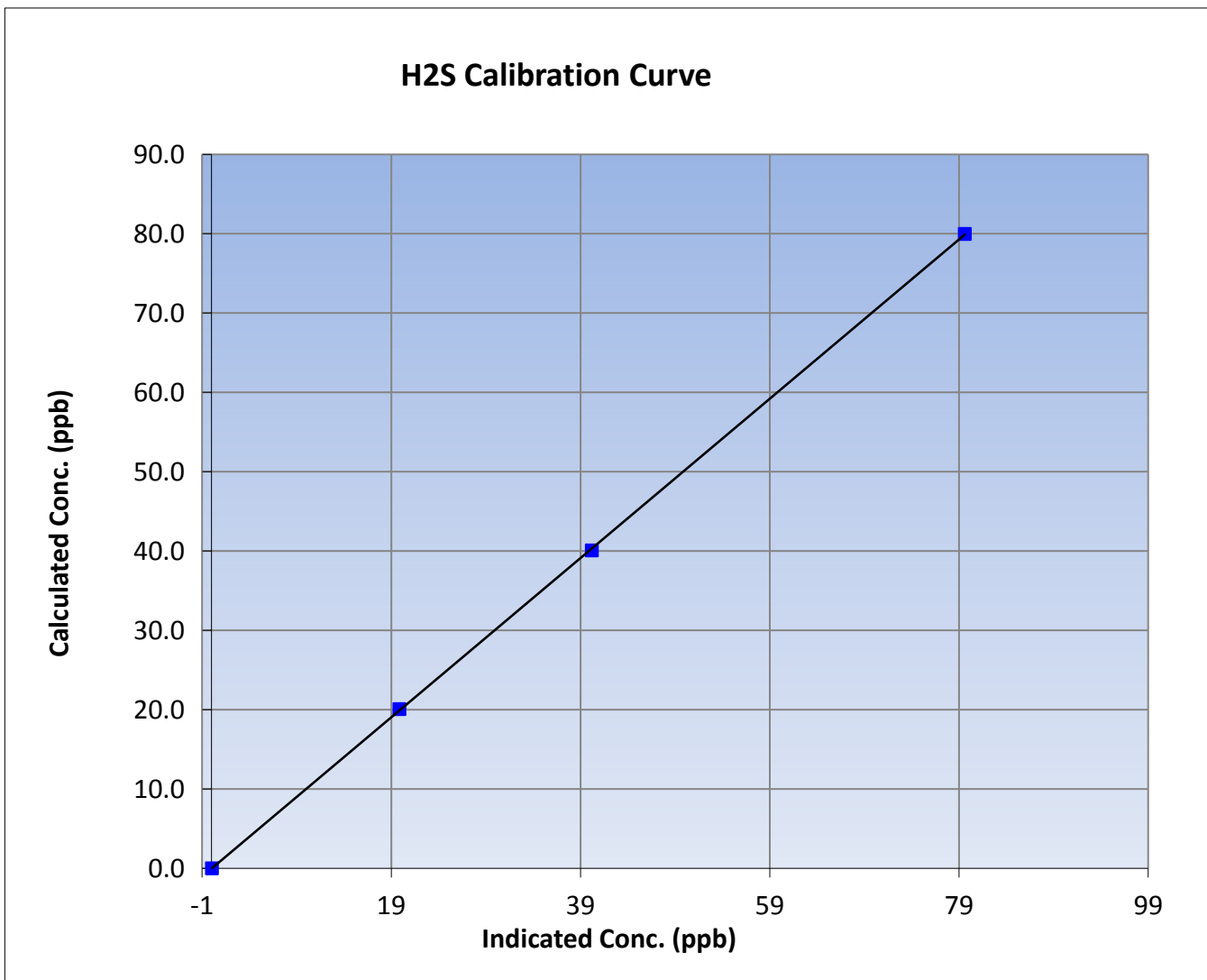
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	June 23, 2016	Previous Calibration	May 2, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	9:30	End Time (MST)	13:00
Analyzer make	Thermo 450i	Analyzer serial #	1218153583

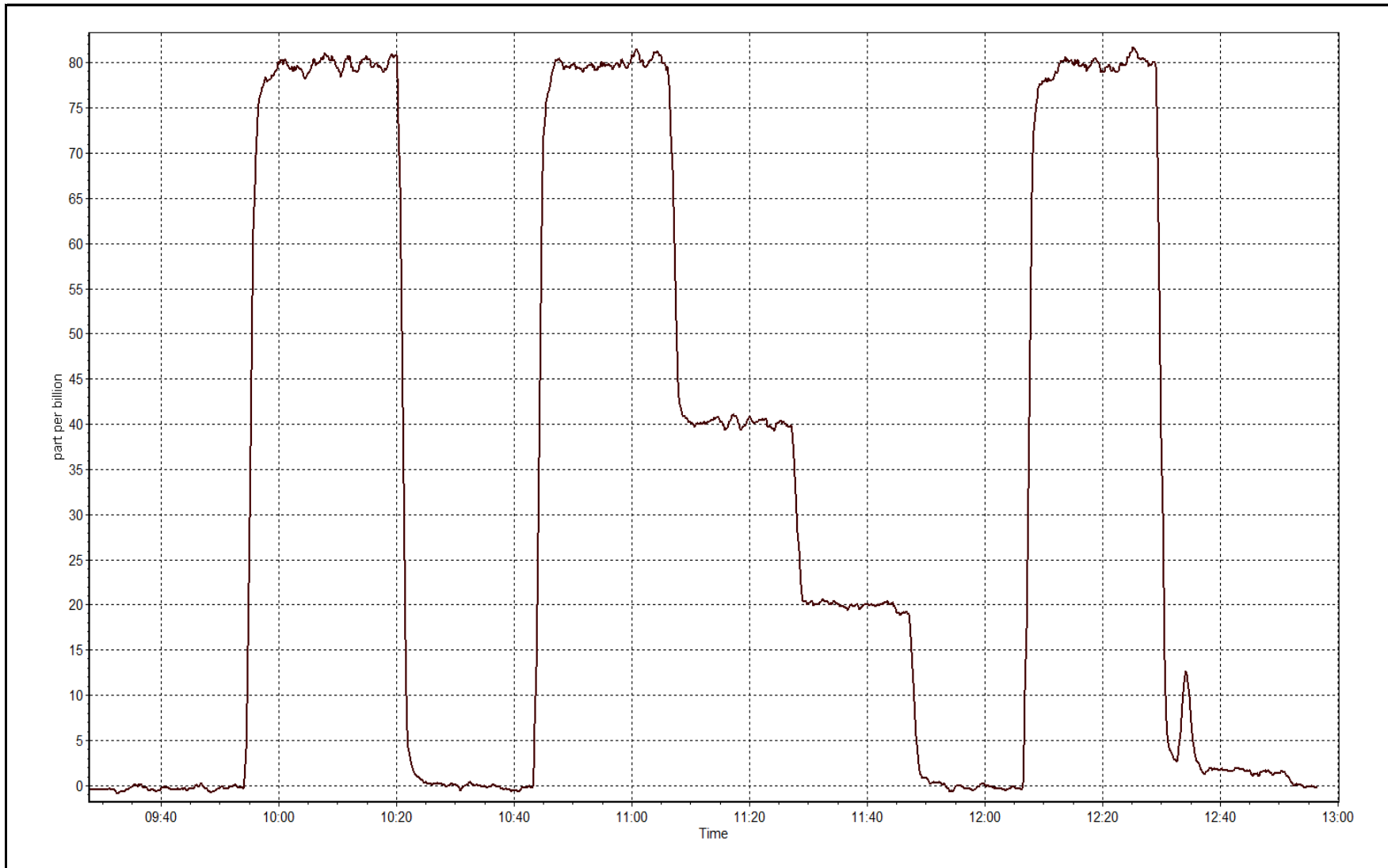
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999971
80.0	79.6	1.0044		
40.1	40.2	0.9969	Slope	1.003881
20.1	19.9	1.0118		
			Intercept	-0.036098



H2S Calibration Plot

Date: June 23, 2016





Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June 22, 2016	Last Calibration	May 3, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	9:05	End Time (MST)	12:35
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	41.0	41.0
Calculated slope	0.994609	1.001953	Fuel Pressure	24.8	24.8
Calculated intercept	0.036620	-0.033324	Analyzer Coeff	4.3	4.3
			Analyzer BKG	2.940	2.920

Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153352
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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	0.04	----
as found span	5000	60.4	13.19	13.25	0.996
calibrator zero	5000	0.0	0.00	0.05	----
high point	5000	60.4	13.19	13.21	0.999
second point	5000	30.2	6.60	6.61	0.998
third point	5000	15.2	3.32	3.33	0.997
as left zero	5000	0.0	0.00	0.06	----
as left span	5000	60.4	13.19	13.22	0.998
Average Correction Factor					0.998

Corrected As found	13.21	Previous response	13.23	% change	0.1%
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Notes:

Inlet filter changed after as founds. Second zero and span point completed to document any change. Span adjusted slightly.

Calibration Performed By:

Devin Russell



Wood Buffalo Environmental Association THC Calibration Report

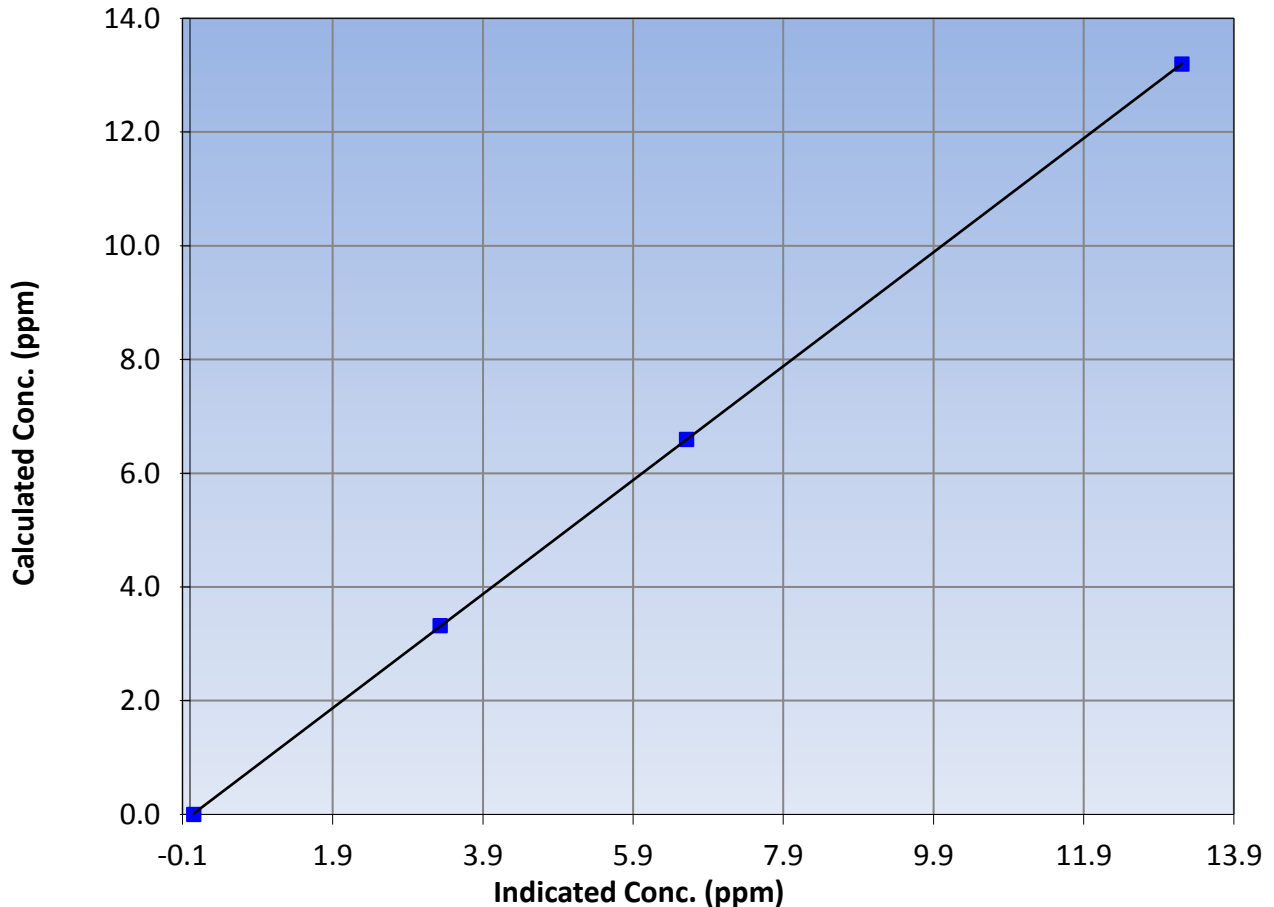
Station Information

Calibration Date	June 22, 2016	Previous Calibration	May 3, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	9:05	End Time (MST)	12:35
Analyzer make	Thermo 51i-LT	Analyzer serial #	1218153352

Calibration Data

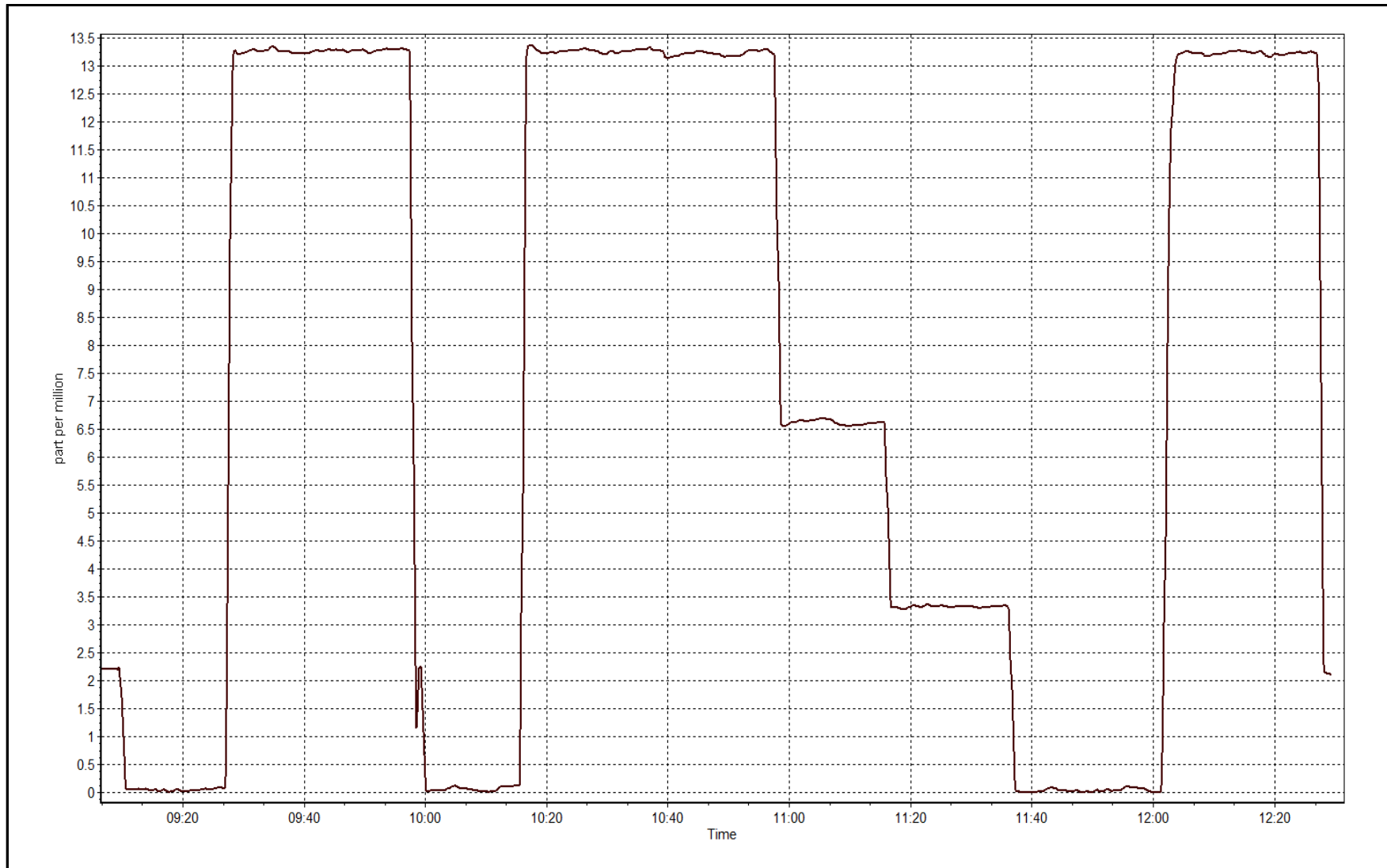
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.05	----	Correlation Coefficient	0.999993
13.19	13.21	0.9988		
6.60	6.61	0.9981	Slope	1.001953
3.32	3.33	0.9971		
			Intercept	-0.033324

THC Calibration Curve



THC Calibration Plot

Date: June 22, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	June 17, 2016	Previous Calibration	May 17, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	8:50	End Time (MST)	11:25
NO2 GPT Ref date	June 16, 2016	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.	27.4	27.3
Analyzer IP address	192.168.1.72		Lamp temp.	58.0	58.0
Calculated slope	0.991434	0.997746	Pressure	26.0	25.9
Calculated intercept	-0.703441	-0.630062	Flow cell A	717	707
Analyzer Background	6.2	6.2	Flow cell B	717	707
Analyzer Coefficient	0.986	0.986	O3 measure	4536	4422.3
			O3 reference	4538	4428.2

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	0.2	----
as found span	5000	713.6/1082.0	366.7	367.3	0.998
calibrator zero	5000		0.0	0.3	----
high point	5000	713.6/1082.0	366.7	367.7	0.997
second point	5000	496.5/973.6	247.4	249.2	0.993
third point	5000	260.3/849.3	126.9	128.1	0.991
as left zero	5000		0.0	0.7	----
as left span	5000	713.6/1082.0	366.7	370.1	0.991
Average Correction Factor					0.994

Corrected As found	367.1	Previous response	370.6	% change	1.0%
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Notes:

As founds completed. Inlet filter changed. Second zero and span point completed to document any change. No adjustments made.

Calibration Performed By: Devin Russell



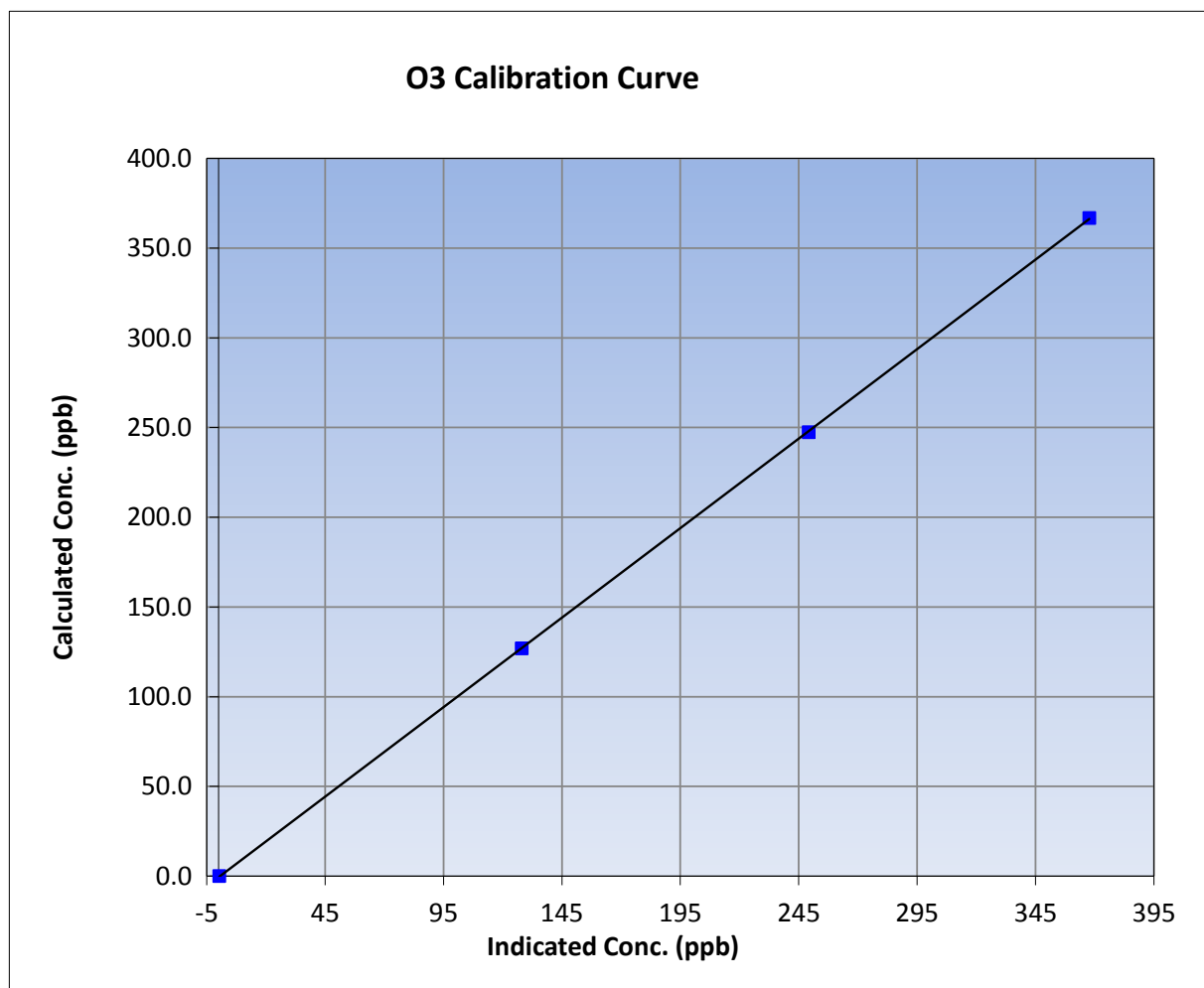
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	June-17-16	Previous Calibration	May 17, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	8:50	End Time (MST)	11:25
Analyzer make	Teledyne API T400	Analyzer serial #	824

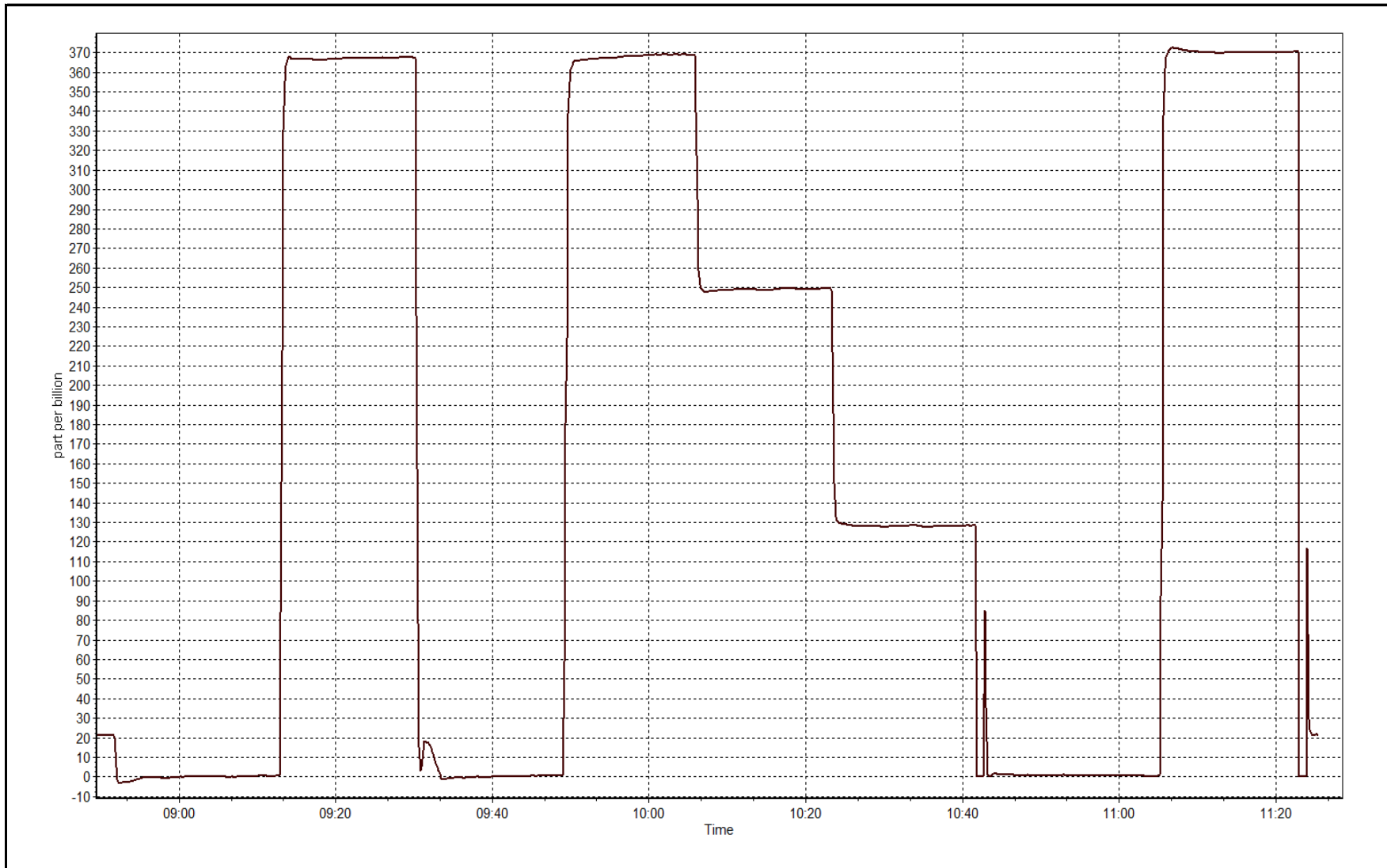
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999990
366.7	367.7	0.9973		
247.4	249.2	0.9929	Slope	0.997746
126.9	128.1	0.9909		
			Intercept	-0.630062



O3 Calibration Plot

Date: June 17, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 16, 2016	Previous Calibration	May 3, 2016
Station Name	Wapasu	Station Number	AMS 17
Reason:	Routine		
Start Time (MST)	10:00	End Time (MST)	14:35
NO Cal Gas Conc	49.7 ppm	Gas Cert Reference	SA130010A
NOx Cal Gas Conc	49.7 ppm	Cal Gas Expiry Date	12/12/2016
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	0.998357	0.998388	1.002798
	Data Offset	2.890889	3.122420	-0.447583
Current Calibration	Data Slope	1.003459	1.002991	1.003593
	Data Offset	2.277131	2.087607	0.137361

Analyzer Information

Analyzer make/model	API T200	Analyzer serial #	722
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.72		192.168.1.72	
NO coefficient	1.001		1.016	
NOx coefficient	0.999		1.016	
NO2 coefficient	1.000		1.000	
NO bkgrnd	0.7		0.7	
NOx bkgrnd	1.4		1.4	
Chamber Temp	50	Deg C	50	Deg C
Moly Temp	314.1	Deg C	315.9	Deg C
PMT voltage	781	V	781	V
PMT Temp	7	Deg C	7	Deg C
O3 flow	71	ccm	71	ccm
R Cell press NO	5.8	mmHg	6.1	mmHg
R Cell Press Nox	5.8	mmHg	6.1	mmHg
NO sample flow	0.442	lpm	0.44	lpm
Nox sample Flow	0.442	lpm	0.435	lpm

Notes:

Flatlined since yesterday. Many alarms present. Analyzer unresponsive; therefore no as founds completed. Power cable replaced and alarms were no longer present. Inlet filter changed. Span adjusted.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 16, 2016

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										
as found span										
calibrator zero	5000	0.0	0.0	0.0	0.0	0.2	0.6	-0.5	----	----
high point	5000	60.4	600.4	600.4	0.0	597.4	598.2	-0.9	1.0050	1.0036
second point	5000	30.2	300.2	300.2	0.0	295.2	294.6	0.5	1.0169	1.0189
third point	5000	15.2	151.1	151.1	0.0	146.2	146.7	-0.5	1.0332	1.0300
as left zero	5000	0.0	0.0	0.0	0.0	-0.5	-0.2	-0.3	----	----
as left span	5000	60.4	600.4	229.0	371.3	589.6	226.3	363.8	1.0183	1.0120
Average Correction Factor									1.0184	1.0175

Corrected As found
Previous Response

NO_x= NA
NO_x= NA

NO= NA
NO= NA

Percent Change

NO_x= N/A

NO= N/A

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 60.40 ccm NOx ref calc conc = 600.4 ppb NO ref calc conc = 600.4 ppb

O3 Setpoint (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
1st NO ref point		0.0	596.3	595.7	-0.5	1.0069	1.0078	----	----
1st NO2 (300)	229.0	366.7	594.0	229.0	364.9	1.0108	----	1.0048	99.5%
2nd NO2 (200)	348.3	247.4	594.9	348.3	246.6	1.0092	----	1.0033	99.7%
3rd NO2 (100)	468.8	126.9	595.6	468.8	126.8	1.0081	----	1.0012	99.9%
2nd NO ref point	----	0.0	593.2	593.7	-0.4	1.0120	1.0112	----	----
Average Correction Factor						1.0100		1.0031	99.7%

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

NO_x Calibration Summary

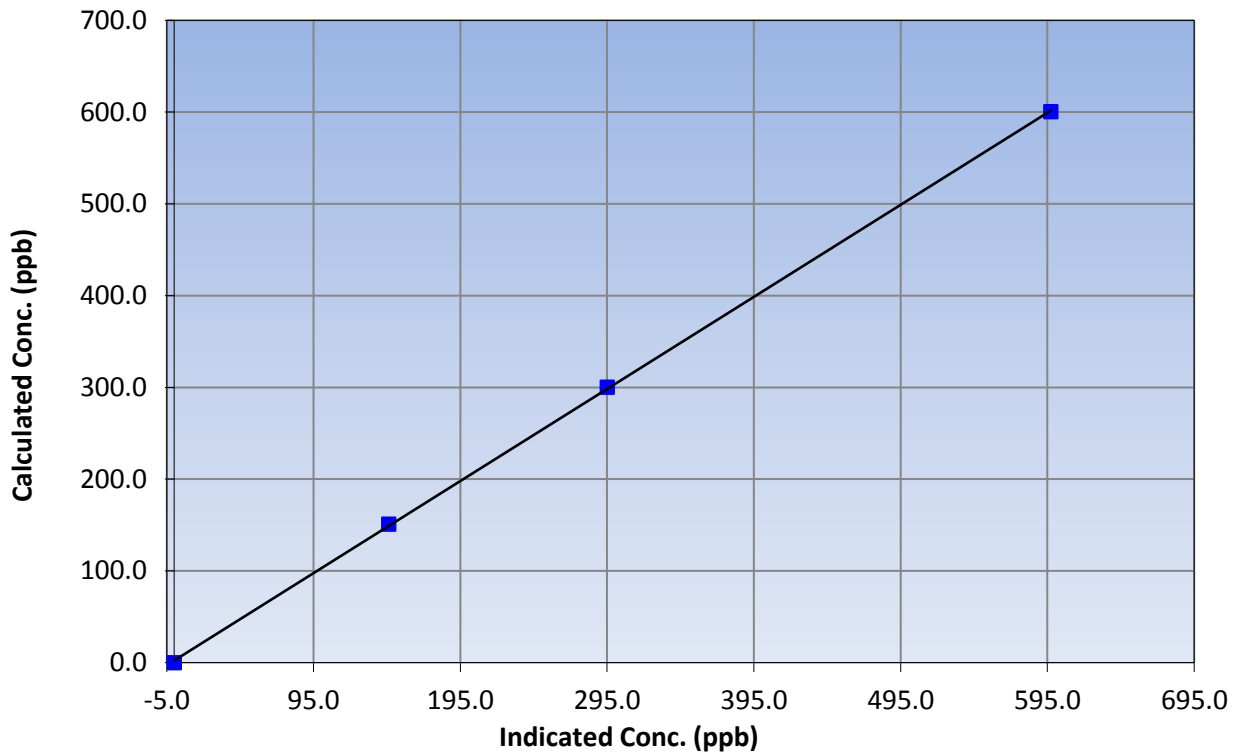
Station Information

Calibration Date	June 16, 2016	Previous Calibration	May 3, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	10:00	End Time (MST)	14:35
Analyzer make	API T200	Analyzer serial #	722

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999924
600.4	597.4	1.0050		
300.2	295.2	1.0169	Slope	1.003459
151.1	146.2	1.0332		
			Intercept	2.277131

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

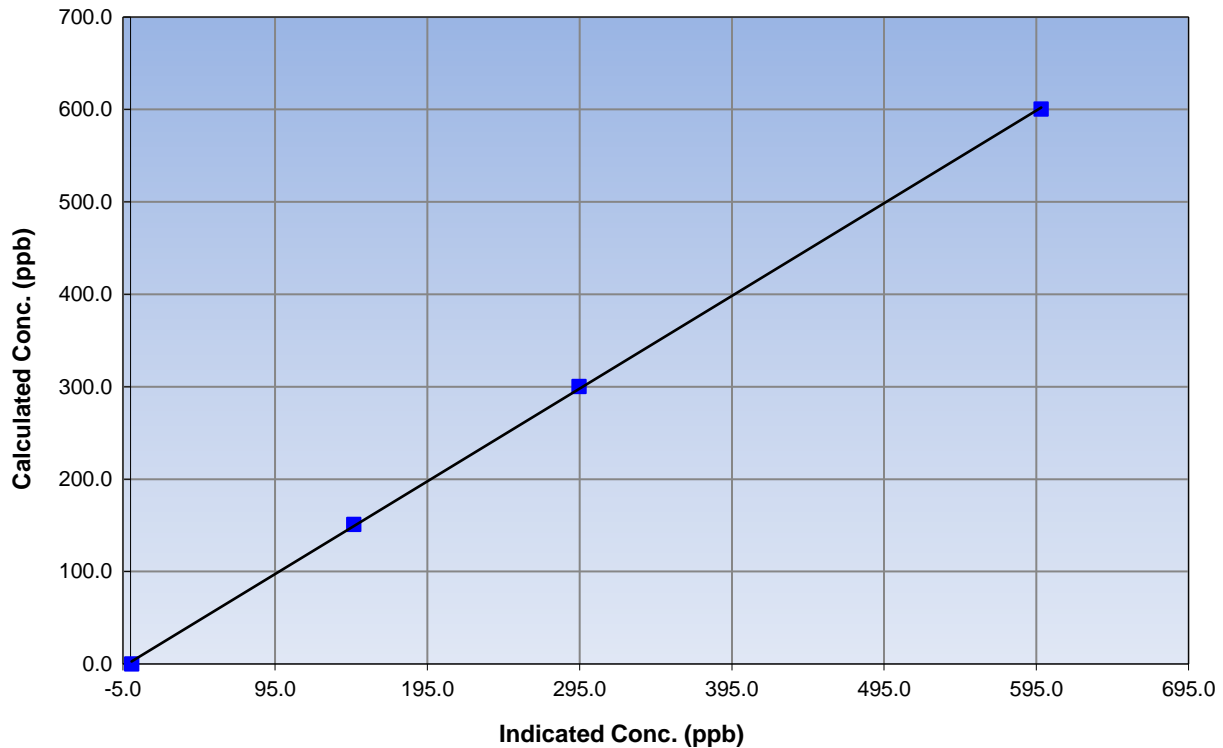
Station Information

Calibration Date	June 16, 2016	Previous Calibration	May 3, 2016
Station Name	Wapasu	Station Number	AMS 17
Start Time (MST)	10:00	End Time (MST)	14:35
Analyzer make	API T200	Analyzer serial #	722

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.6	N/A	Correlation Coefficient	0.999895
600.4	598.2	1.0036		
300.2	294.6	1.0189	Slope	1.002991
151.1	146.7	1.0300		
			Intercept	2.087607

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

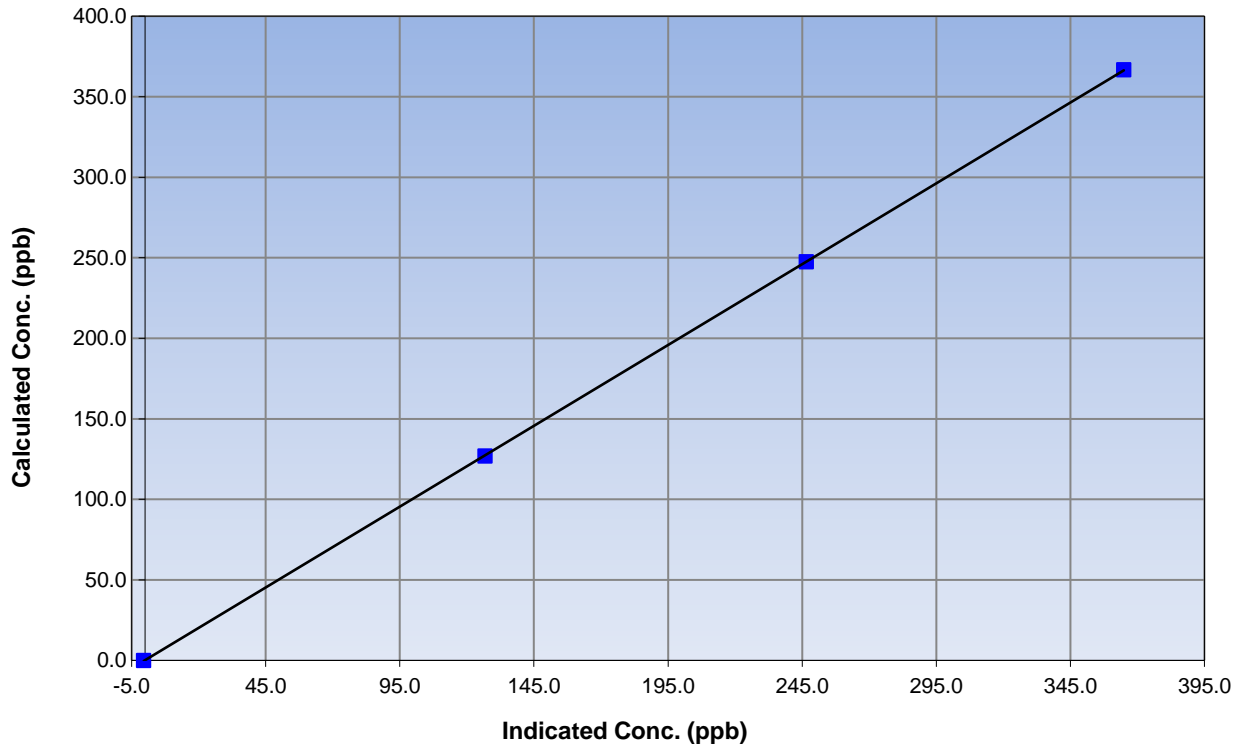
Station Information

Calibration Date	June 16, 2016	Previous Calibration	May 3, 2016
Station Number	Wapasu	Station Number	AMS 17
Start Time (MST)	10:00	End Time (MST)	14:35
Analyzer make	API T200	Analyzer serial #	722

Calibration Information

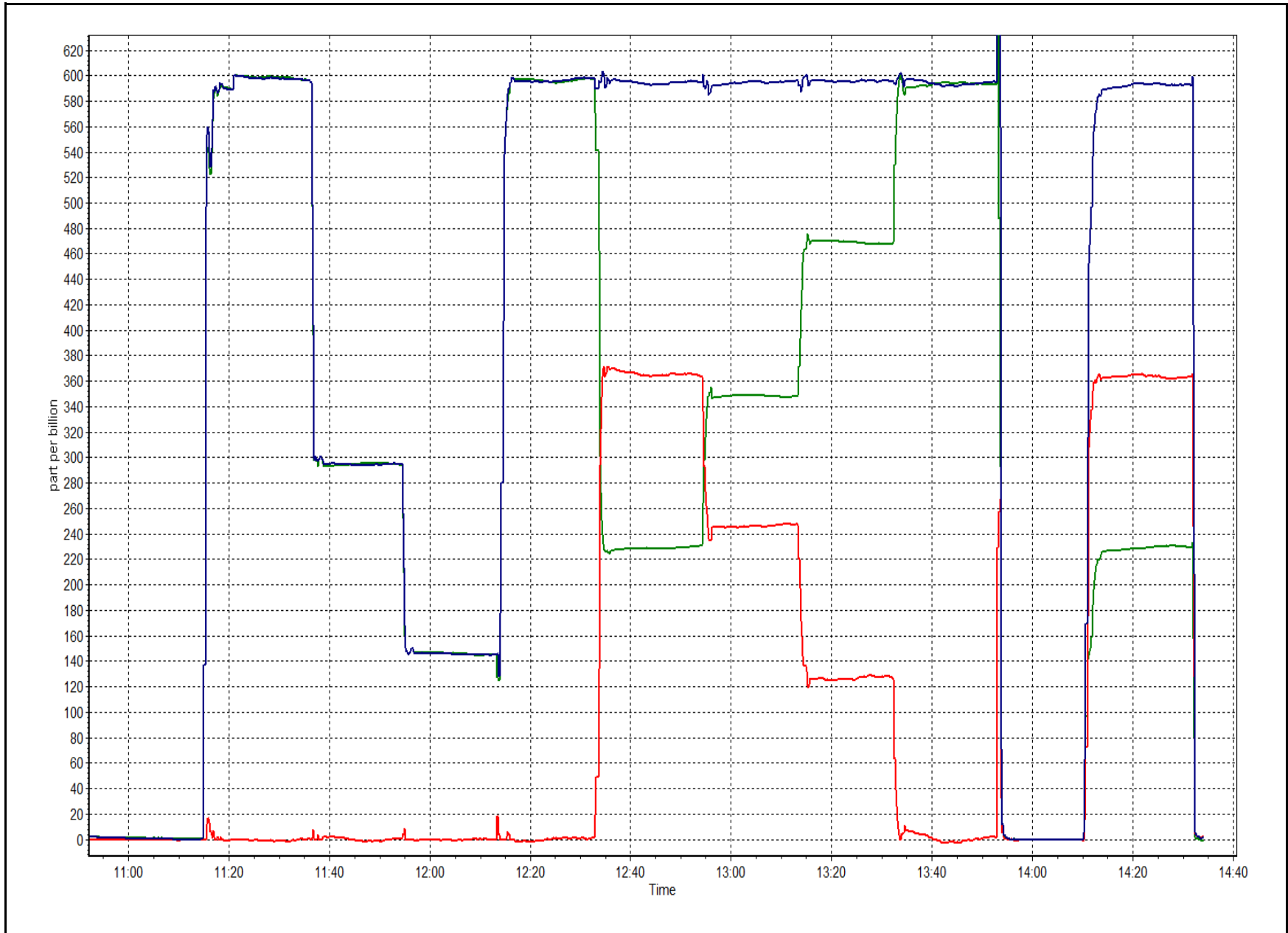
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.5	N/A	Correlation Coefficient	0.999994
366.7	364.9	1.0048		
247.4	246.6	1.0033	Slope	1.003593
126.9	126.8	1.0012		
			Intercept	0.137361

NO₂ Calibration Curve



NOX Calibration Plot

Date: June 16, 2016





Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION

Calibration Date:	June 22, 2016	Previous Calibration:	May 3, 2016
Station Name:	Wapasu	Station Number:	AMS 17
Start Time (MST):	9:10	End Time (MST):	13:35
Calibrator Make/Model:	Delta Cal	Calibrator Serial Number:	141228

SHARP INFORMATION

Particulate Fraction:	PM2.5		
Make/Model:	Thermo / SHARP 5030		
Serial Number:	E-1107		
C ₁₄ 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 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 type="checkbox"/>	Neph <input checked="" type="checkbox"/>

CALIBRATION DATA

Temperature (°C)

Sensor	Indicated	Measured	Difference (Limit +/- 2.0°C)	Final Indicated
T1	26.0	24.5	-1.5	26.0
T2	23.9	23.3	-0.6	23.9
T3	23.0	23.3	-0.3	23.0
T4	25.1	23.3	-1.8	25.1
RH (%)	25.0	26.6	1.6	25.0

Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	950	949.3	-0.8	950

Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	998	-2	998	1000

Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	203		211
Neph	3.1		0.1
C14	224.6		-69.6
Indicated Concentration (ug/m3)	1.8	yes	0
Offset 1	199.8		211.1
Offset 2	32		33.6

Leak Check (Quarterly)

Leak Check Date:	June 22, 2016	Previous Leak Check Date:	March 29, 2016
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	Measured		
Flow without adaptor (LPM):	16.63		
*Flow with adaptor (LPM):	16.62		Difference LPM (Limit +/- 0.42 LPM)
			0.01

*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 / clean	03/05/2016
Pump	Good	
Filter Tape	Good	
Mass Foil Cal Set	na	
HEPA filter	Good	

NOTES:

All temperature, pressure and humidity sensors checked. Flow checked. Nephelometer as founds zero was high, 1.8 ug/m3. Cleaned nephelometer and beta attenuation chamber. Both chambers had build up of dirt particles and pieces of rubber from O-rings used to seal the adapters to the sample tubing. After cleaning C14 value was very high and unstable. Tech support suggested completing an FC+Z and reset and let stabilize over night. Nephelometer zeroed. Will check zero again tomorrow.

Calibration Performed By: Devin Russell



Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION

Calibration Date:	<u>June 23, 2016</u>	Previous Calibration:	<u>June 22, 2016</u>
Station Name:	<u>Wapasu</u>	Station Number:	<u>AMS 17</u>
Start Time (MST):	<u>9:10</u>	End Time (MST):	<u>12:45</u>
Calibrator Make/Model:	<u>Delta Cal</u>	Calibrator Serial Number:	<u>141228</u>

SHARP INFORMATION

Particulate Fraction:	<u>PM2.5</u>
Make/Model:	<u>Thermo / SHARP 5030</u>
Serial Number:	<u>E-1107</u>
C ₁₄ Source SN:	<u>2518</u>
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	20.0	20.6	0.6	26.0
T2	27.0	NA	NA	27.0
T3	24.0	NA	NA	24.0
T4	37.0	NA	NA	37.0
RH (%)	39.0	NA	NA	39.0

Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	949	947.9	-1.1	949

Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	998	-2	1006	1000

Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	211		210
Neph	0.2		-0.3
C14	2.4		50.8
Indicated Concentration (ug/m3)	0.3	no	-0.1
Offset 1	211.1		211.1
Offset 2	33.6		33.6

Leak Check (Quarterly)

Leak Check Date:	<u>June 23, 2016</u>	Previous Leak Check Date:	<u>June 22, 2016</u>
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	Measured	Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.77	
*Flow with adaptor (LPM):	16.67	0.10

**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 / clean	03/05/2016
Pump	Good	
Filter Tape	Good	
Mass Foil Cal Set	na	
HEPA filter	Good	

NOTES:

As found Nephelometer zero was 0.3 ug/m3. As found flow was 16.63 LPM. Inlet connector tube replaced due to worn o-rings. Leak check completed afterwards, which did not pass (15.7 LPM). Cause of leak was the Nephelometer chamber was not creating a full seal on the tube connecting it to the beta attenuation chamber. Nephelometer chamber adjusted to create a better seal. Leak check completed again and passed.

Calibration Performed By:	Devin Russell
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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 18
STONY MOUNTAIN
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN LOOKOUT (AMS 18)
 JUNE 2016

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	679	36	41	99.31	2	0	1	0
TRS(ppb) Average	680	33	40	99.03	0	0	0	0
THC(ppm) Average	679	36	41	99.31	2.3	-	2.1	-
NMHC(ppm) Average	679	36	41	99.31	0.162	-	0.112	-
CH4(ppm) Average	679	36	41	99.31	2.2	-	2	-
O3 (ppb) Average	681	31	39	98.89	73	0	57	-
NO2 (ppb) Average	678	36	42	99.17	5	0	1	-
NO (ppb) Average	678	36	42	99.17	1	-	0	-
NOX (ppb) Average	678	36	42	99.17	6	-	1	-
PM2.5 (ug/m3) Average	713	3	7	99.44	36.3	-	15.6	0
Wind Speed 10 m (km/h) Average	720	0	0	100.00	23	-	13	-
Wind Direction 10 m (deg) Average	720	0	0	100.00	-	-	-	-
Temperature 2 m (C) Average	720	0	0	100.00	27.8	-	22.3	-
Relative Humidity (%) Average	720	0	0	100.00	99	-	99.0	-
Precipitation (mm) Total	719	0	1	99.86	7.7	-	61.0	-
Leaf Wetness (% of range) Average	720	0	0	100.00	65	-	26.0	-
Global Solar Radiation (W/m2) Average	720	0	0	100.00	1020	-	365.0	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN LOOKOUT (AMS 18)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile							
					Min	P10	Q1	Median	Q3	P90	Max	
SO2 (ppb) Average	679	0.2	0	-	0	0	0	0	0	0	0	2
TRS (ppb) Average	680	0.3	0	-	0	0	0	0	0	0	0	0
THC (ppm) Average	679	2.01	0	-	1.9	1.9	2	2	2	2.1	2.3	
NMHC(ppm) Average	679	0.053	0.039	-	0	0	0	0	0.1	0.1	0.162	
CH4(ppm) Average	679	1.96	0	-	1.9	1.9	1.9	2	2	2	2.2	
O3 (ppb) Average	681	38.7	9	-	16	28	33	38	44	50	73	
NO2 (ppb) Average	678	0.6	0	-	0	0	0	1	1	1	5	
NO (ppb) Average	678	0	0	-	0	0	0	0	0	0	1	
NOX (ppb) Average	678	0.7	0	-	0	0	0	1	1	1	6	
PM2.5 (ug/m3) Average	713	4.55	4.2	-	1.1	1.9	2.3	3.5	5.3	7.3	36.3	
Wind Speed 10 m (km/h) Average	720	7.7	4	-	0	3	5	7	10	13	23	
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-	
Temperature 2 m (C) Average	720	15.77	4.9	-	6.1	9.5	12	15.1	19.4	23.2	27.8	
Relative Humidity (%) Average	720	63.3	22	-	20	33	44	64	81	95	99	
Precipitation (mm) Total	719	-	-	130.68	-	-	-	-	-	-	-	
Surface Wetness (% of range) Average	720	4.6	9	-	0	0	1	1	2	15	65	
Global Solar Radiation (W/m2) Average	720	256.6	304	-	0	0	2	99	491	774	1020	

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - STONY MOUNTAIN (AMS 18)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2, TRS, THC, O3, NO2	03 Jun 2016 09:00	03 Jun 2016 13:00	5	Station power failure
TRS	21 Jun 2016 09:00	21 Jun 2016 10:00	2	Maintenance - serviced zero air generator
O3	21 Jun 2016 08:00	21 Jun 2016 10:00	3	Maintenance - serviced zero air generator
NO2, NO, NOX	10 Jun 2016 10:00	10 Jun 2016 10:00	1	Power spike
PM2.5	03 Jun 2016 09:00	03 Jun 2016 12:00	4	Station power failure
Precipitation Collector	17 Jun 2016 11:00	17 Jun 2016 11:00	1	Maintenance - operational check



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Stony Mountain - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 2 ppb on Jun 14 08:00	Maximum Daily Average: 0.6 ppb on Jun 8		Hours of Data:	679
Minimum Value: 0 ppb on Jun 1 01:00	Minimum Daily Average: 0.0 ppb on Jun 17		Hours of Missing Data:	41
Maximum Diurnal Average: 0.3 ppb at hour 8	Minimum Diurnal Average: 0.2 ppb at hour 18		Hours of Calibration:	36
Monthly Average: 0.2 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1		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-Jun	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
2-Jun	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
3-Jun	0	0	0	0	0	Z	0	0	PF	PF	PF	PF	PF	0	0	0	0	0	0	0	0	0	0	0	0.1	0
4-Jun	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
5-Jun	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
6-Jun	0	1	Z	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.5	1
7-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3	1
8-Jun	1	1	1	1	Z	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0.6	1
9-Jun	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
10-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0.4	1
11-Jun	0	Z	0	0	0	1	1	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.4	1
12-Jun	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
13-Jun	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
14-Jun	0	0	0	0	Z	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2
15-Jun	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
16-Jun	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
17-Jun	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
18-Jun	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
19-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1	1
20-Jun	1	1	2	2	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2
21-Jun	0	0	0	0	0	Z	0	C	C	C	C	C	C	0	0	0	0	1	1	0	0	0	0	0	--	1
22-Jun	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
23-Jun	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	1
24-Jun	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
25-Jun	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
26-Jun	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
27-Jun	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
28-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.1	1
29-Jun	0	Z	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2
30-Jun	0	1	Z	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1

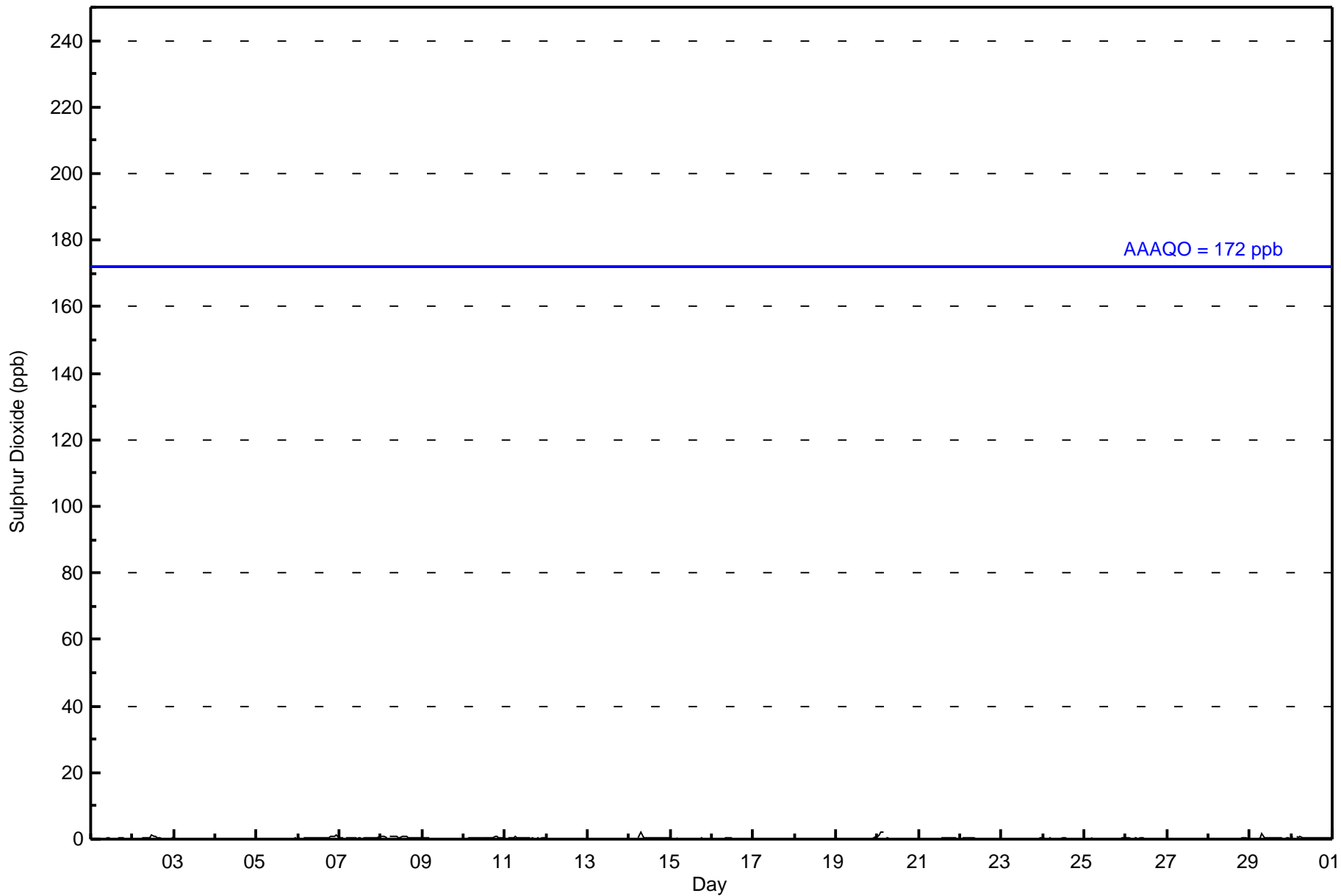
0.2	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	Diurnal Average
1	1	2	2	0	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Diurnal Maximum

Z - zeronspan C - Calibration PF - Power Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Stony Mountain - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Stony Mountain - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	679	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: 679

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Stony Mountain - June 2016**

Concentration Ranges (ppb)	Wind Direction																
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Totals
0 - 10	19	21	38	15	27	28	28	28	49	79	71	60	64	87	48	17	679
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
Totals	19	21	38	15	27	28	28	28	49	79	71	60	64	87	48	17	679

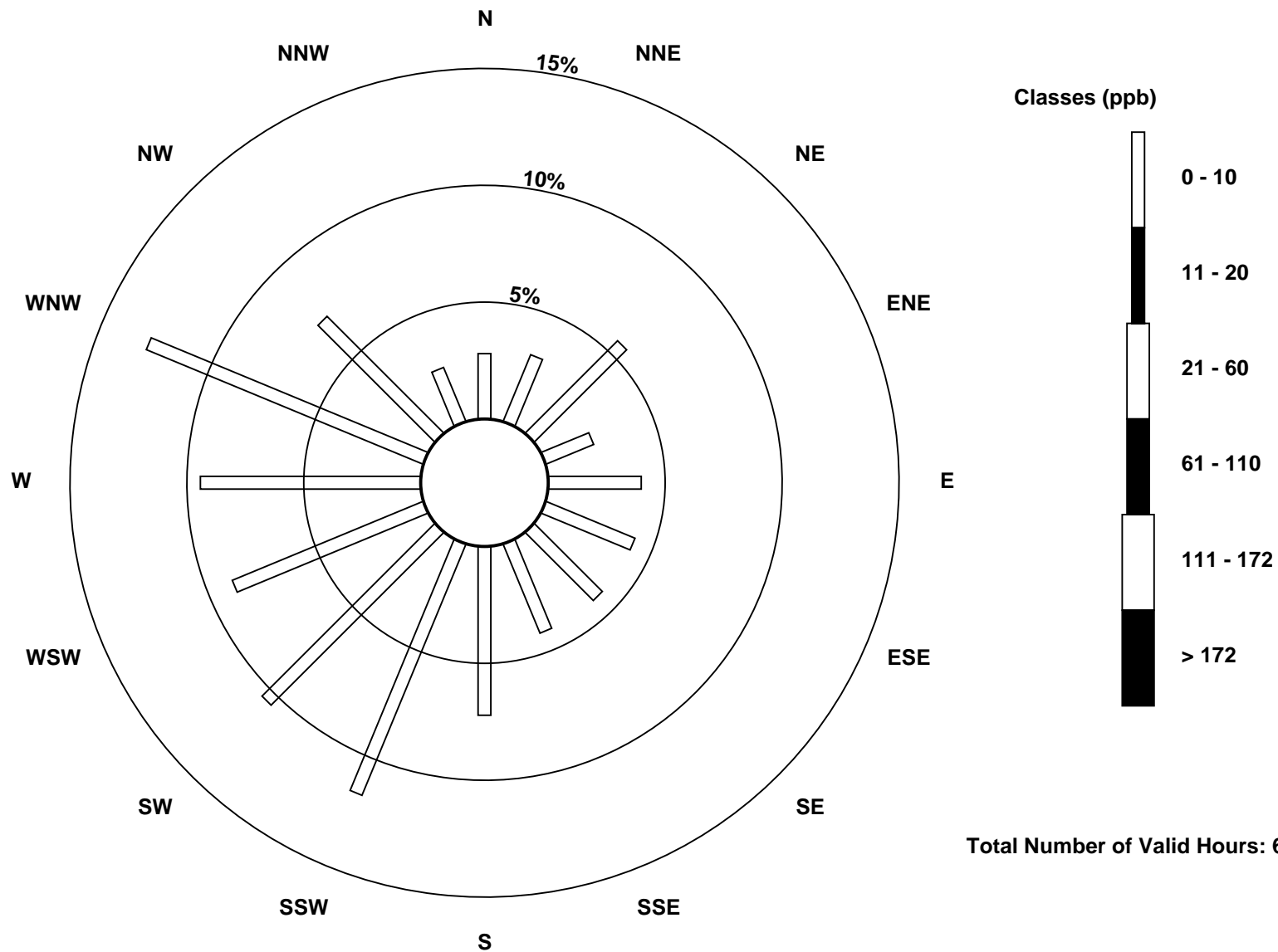
Total Number of Valid Hours: 679

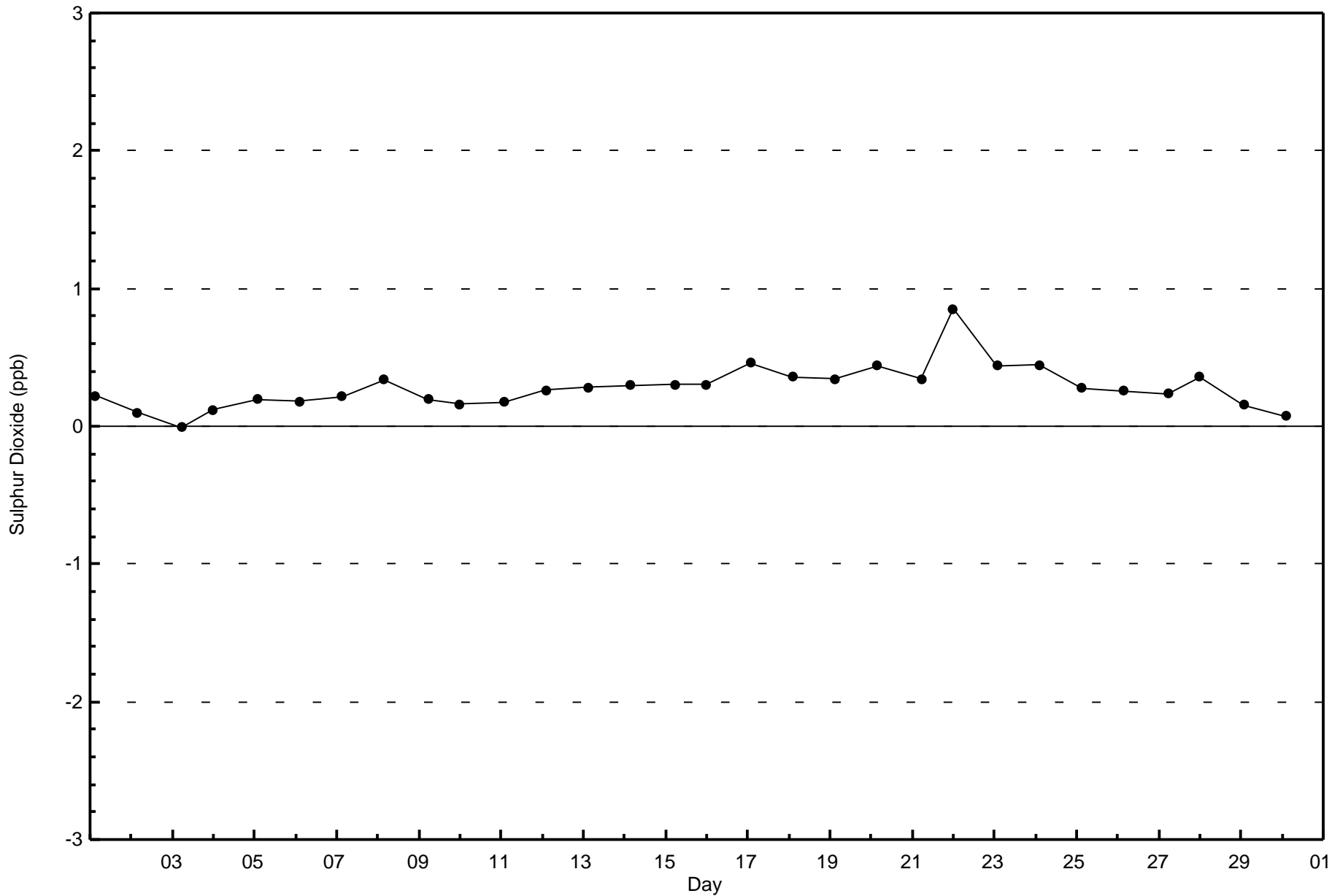
Total Number of Hours: 720

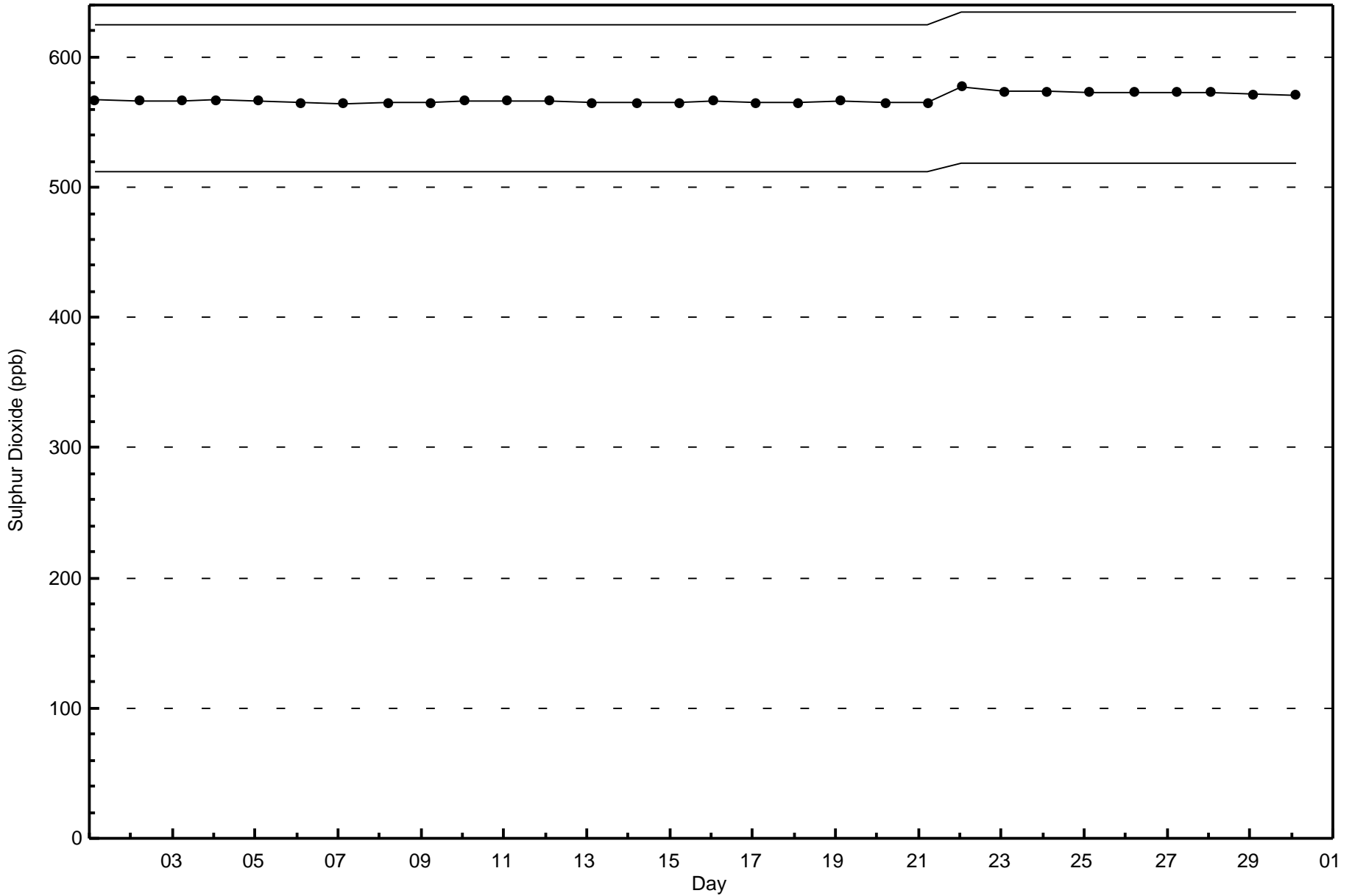


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Sulphur Dioxide (SO₂) - ppb
Stony Mountain (AMS 18)



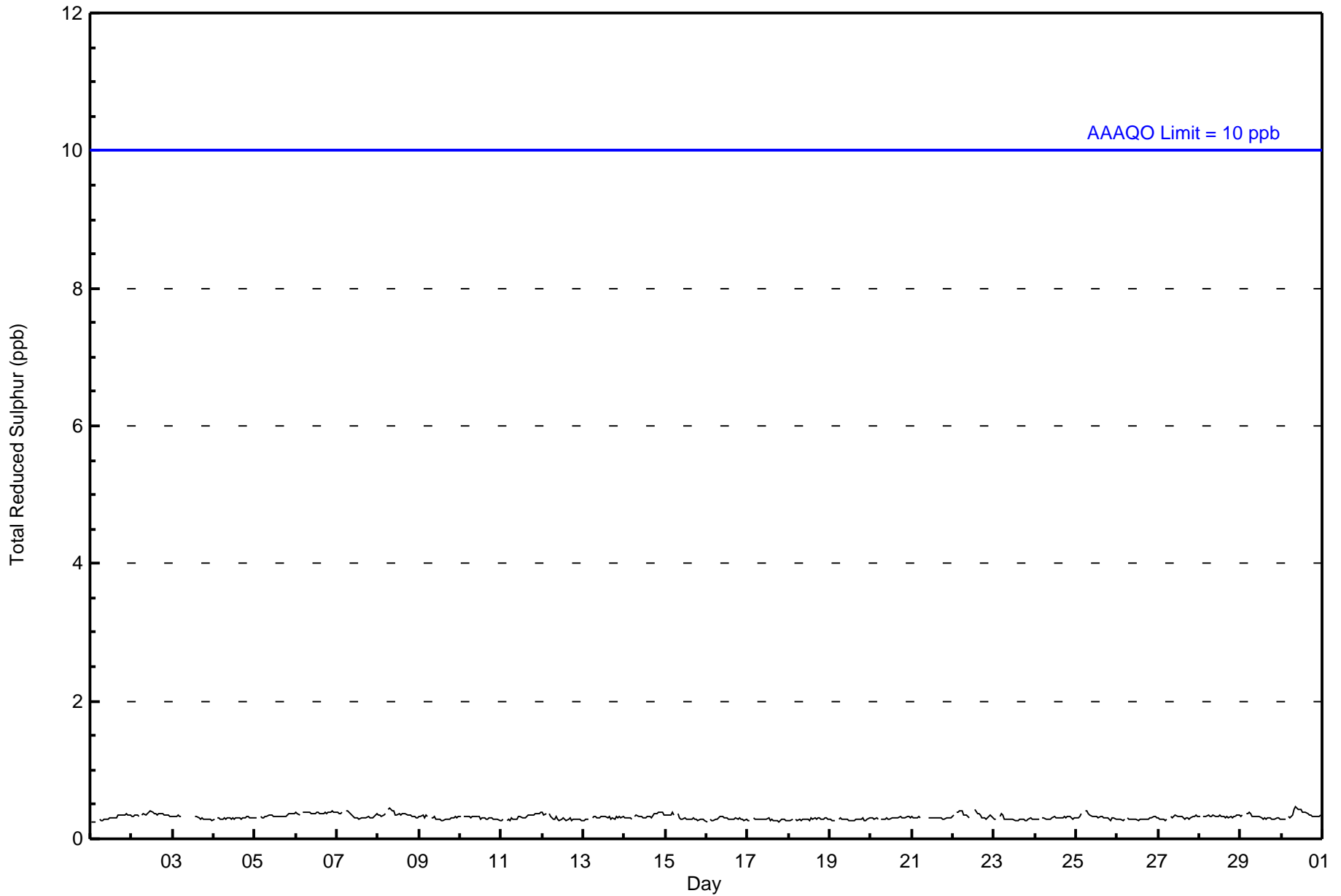






Wood Buffalo Environmental Association
Hourly Averages

Total Reduced Sulphur (TRS) - ppb
Stony Mountain - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Reduced Sulphur (TRS) - ppb
Stony Mountain - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	680	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: 680

Total Number of Hours: 720



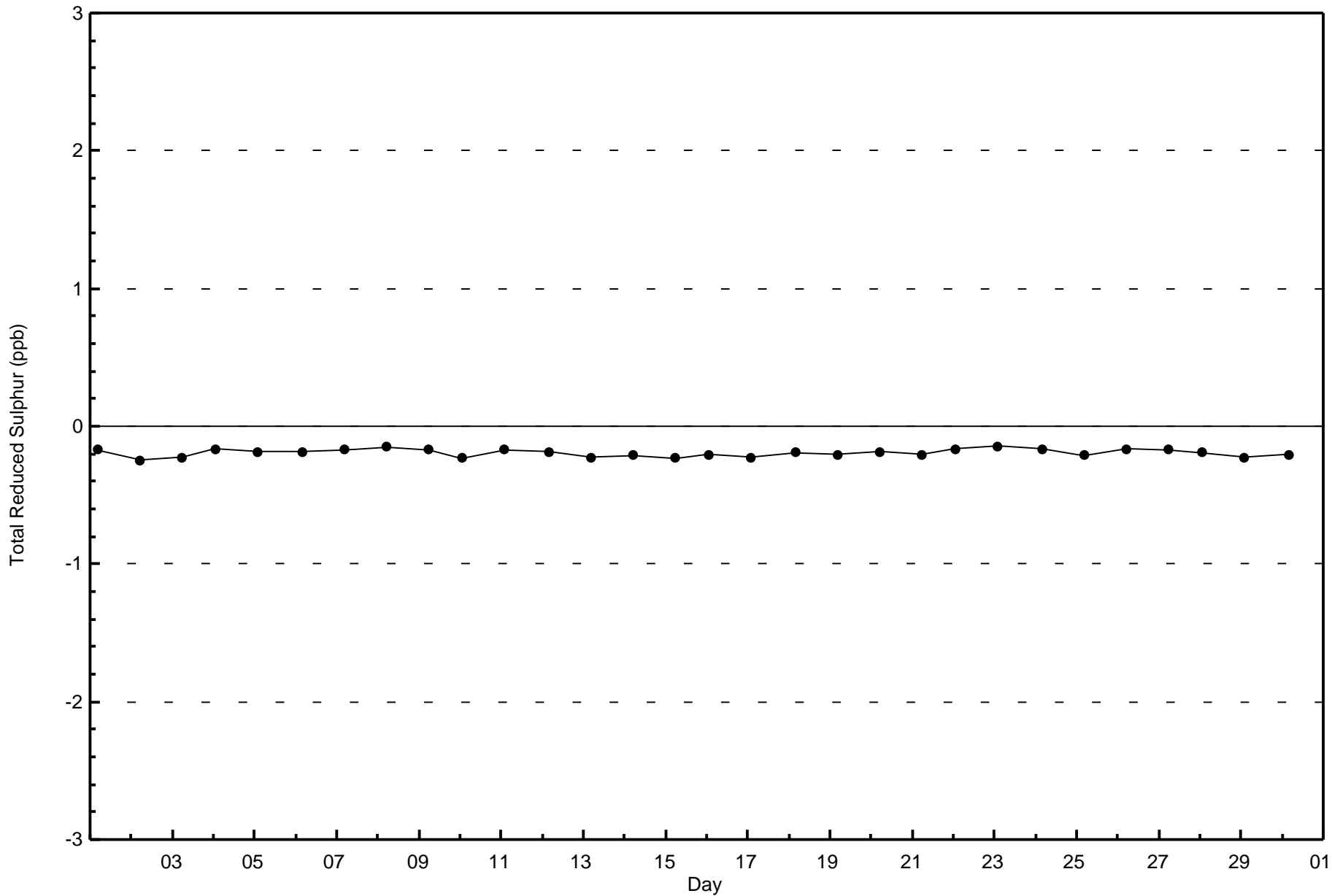
**Wood Buffalo Environmental Association
Frequency Distribution**

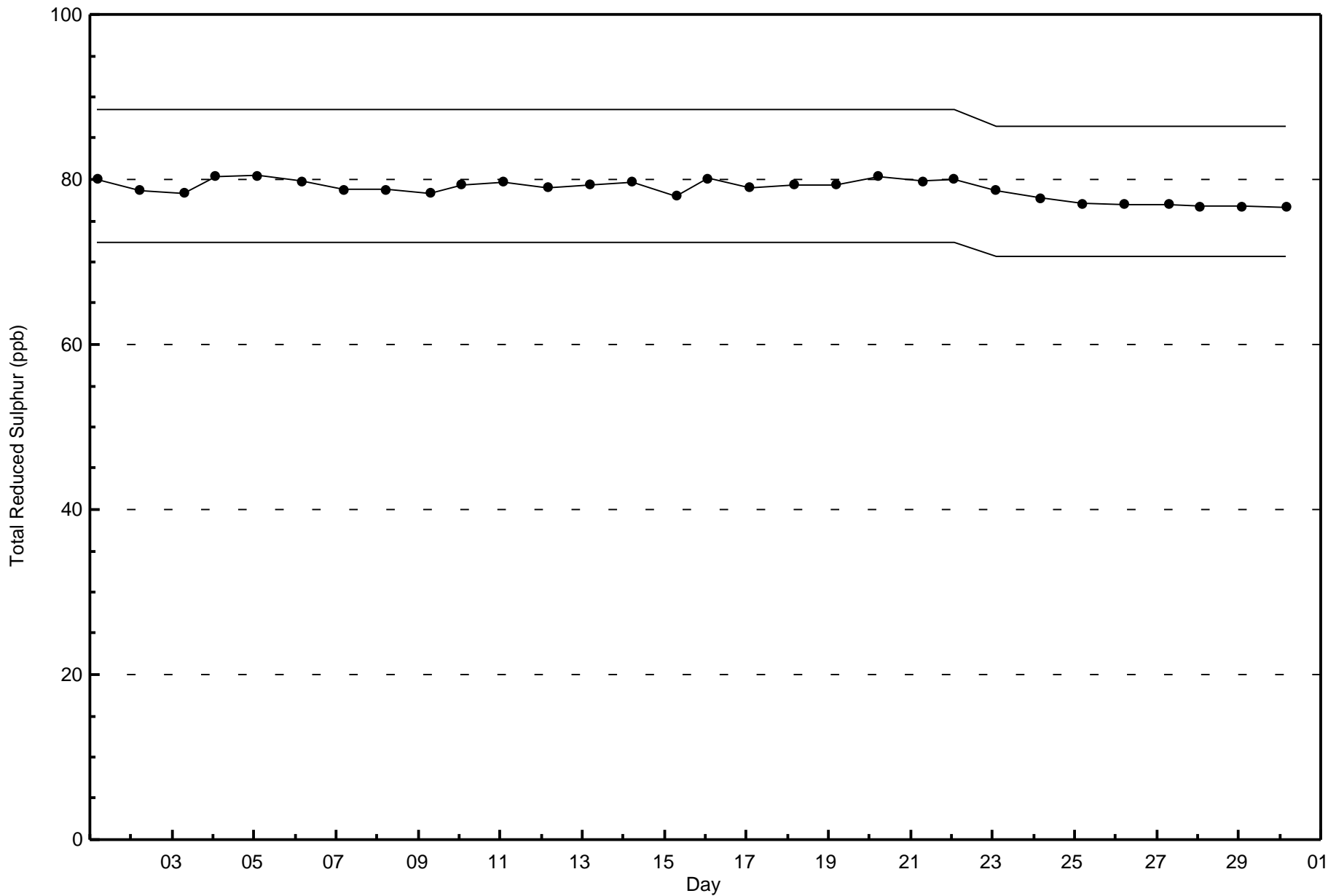
**Total Reduced Sulphur (TRS) - ppb
Stony Mountain - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	18	22	37	14	28	29	28	30	48	80	68	61	62	88	49	18	680
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
Totals	18	22	37	14	28	29	28	30	48	80	68	61	62	88	49	18	680

Total Number of Valid Hours: 680

Total Number of Hours: 720







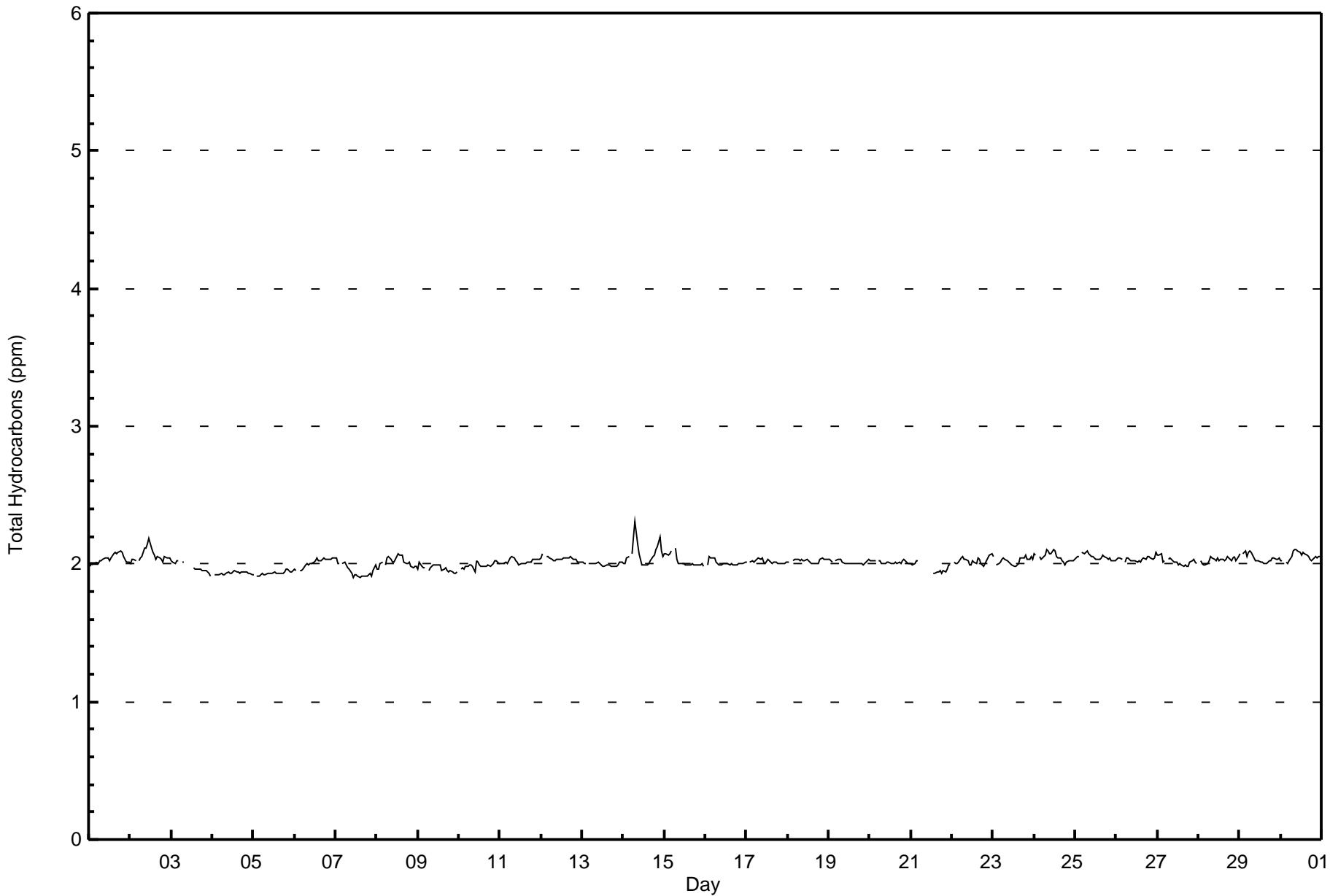
Wood Buffalo Environmental Association

Summary of Hour Averages

Total Hydrocarbons (THC) - ppm

Stony Mountain - June 2016

Maximum Value: 2.3 ppm on Jun 14 08:00		Maximum Daily Average: 2.1 ppm on Jun 14		Hours in Service: 720																														
Minimum Value: 1.9 ppm on Jun 7 15:00		Minimum Daily Average: 1.9 ppm on Jun 4		Hours of Data: 679																														
Maximum Diurnal Average: 2.0 ppm at hour 8		Minimum Diurnal Average: 2.0 ppm at hour 15		Hours of Missing Data: 41																														
Monthly Average: 2.01 ppm		Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 2.0 Median = 2.0 Q ₃ = 2.0 P ₉₀ = 2.1 P ₉₉ = 2.1		Hours of Calibration: 36																														
				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-Jun	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	2.1	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	2.1	2.1				
2-Jun	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.1	2.1	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	2.1	2.2				
3-Jun	2.0	2.0	2.0	2.0	2.0	Z	2.0	2.0	PF	PF	PF	PF	PF	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	2.0					
4-Jun	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	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				
5-Jun	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	2.0	2.0	1.9	1.9	2.0	1.9	1.9	2.0	2.0					
6-Jun	2.0	2.0	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0				
7-Jun	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	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				
8-Jun	2.0	2.0	2.0	2.0	Z	2.0	2.0	2.1	2.0	2.0	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	2.0	2.0	2.0	2.0	2.0	2.0	2.1				
9-Jun	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0				
10-Jun	Z	2.0	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	2.0	2.0	2.0	2.0	2.0	2.0				
11-Jun	2.0	Z	2.0	2.0	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1				
12-Jun	2.0	2.1	Z	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1			
13-Jun	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	2.0	2.0	2.0	2.0			
14-Jun	2.0	2.0	2.0	2.1	Z	2.1	2.2	2.3	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	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3				
15-Jun	2.1	2.1	2.1	2.1	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	2.0	2.0	2.0	2.0	2.1			
16-Jun	Z	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1			
17-Jun	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	2.0	2.0	2.0	2.0	2.0	2.0			
18-Jun	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	2.0	2.0	2.0	2.0	2.0			
19-Jun	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	2.0	2.0	2.0	2.0			
20-Jun	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	2.0	2.0	2.0	2.0	2.0			
21-Jun	2.0	2.0	2.0	2.0	2.0	Z	2.0	C	C	C	C	C	C	1.9	1.9	1.9	1.9	2.0	1.9	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	--	2.0			
22-Jun	Z	2.0	2.0	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	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		
23-Jun	2.1	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	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1		
24-Jun	2.1	2.1	Z	2.1	2.0	2.0	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	2.0	2.0	2.0	2.1	2.1		
25-Jun	2.0	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	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1		
26-Jun	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	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1		
27-Jun	2.1	2.1	2.1	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	2.0	2.0	2.1	2.1	
28-Jun	Z	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	
29-Jun	2.1	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	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1
30-Jun	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	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	
																								Diurnal Average										
																								Diurnal Maximum										
Z - zerspan C - Calibration PF - Power Failure																																		





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Stony Mountain - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	575	84.68	84.68
2.1 - 3.0	104	15.32	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 679

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Stony Mountain - June 2016**

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	14	17	30	10	18	18	19	24	36	69	65	57	62	78	44	14	575
2.1 - 3.0	5	4	8	5	9	10	9	4	13	10	6	3	2	9	4	3	104
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
Totals	19	21	38	15	27	28	28	28	49	79	71	60	64	87	48	17	679

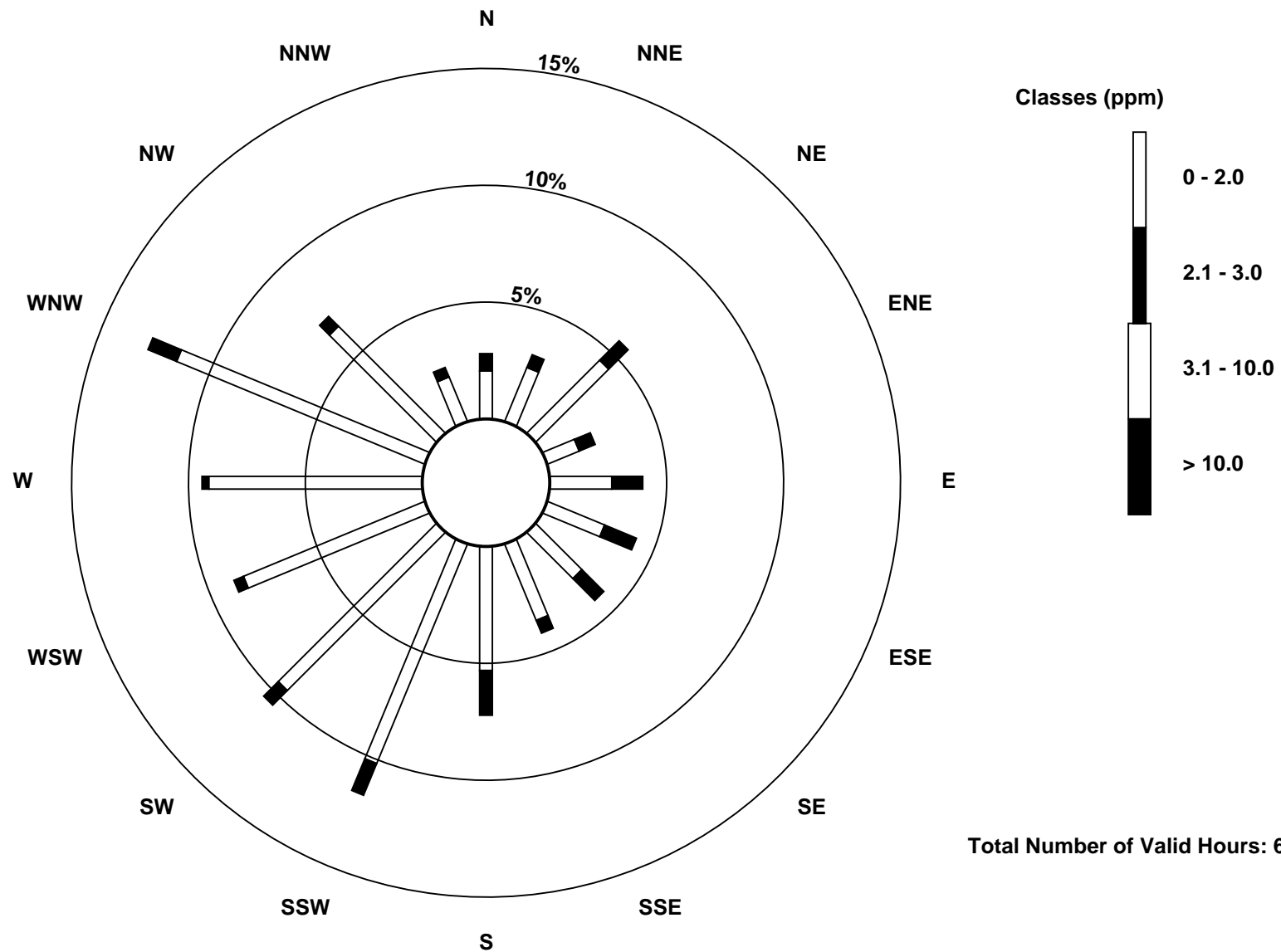
Total Number of Valid Hours: 679

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Total Hydrocarbons (THC) - ppm
Stony Mountain (AMS 18)



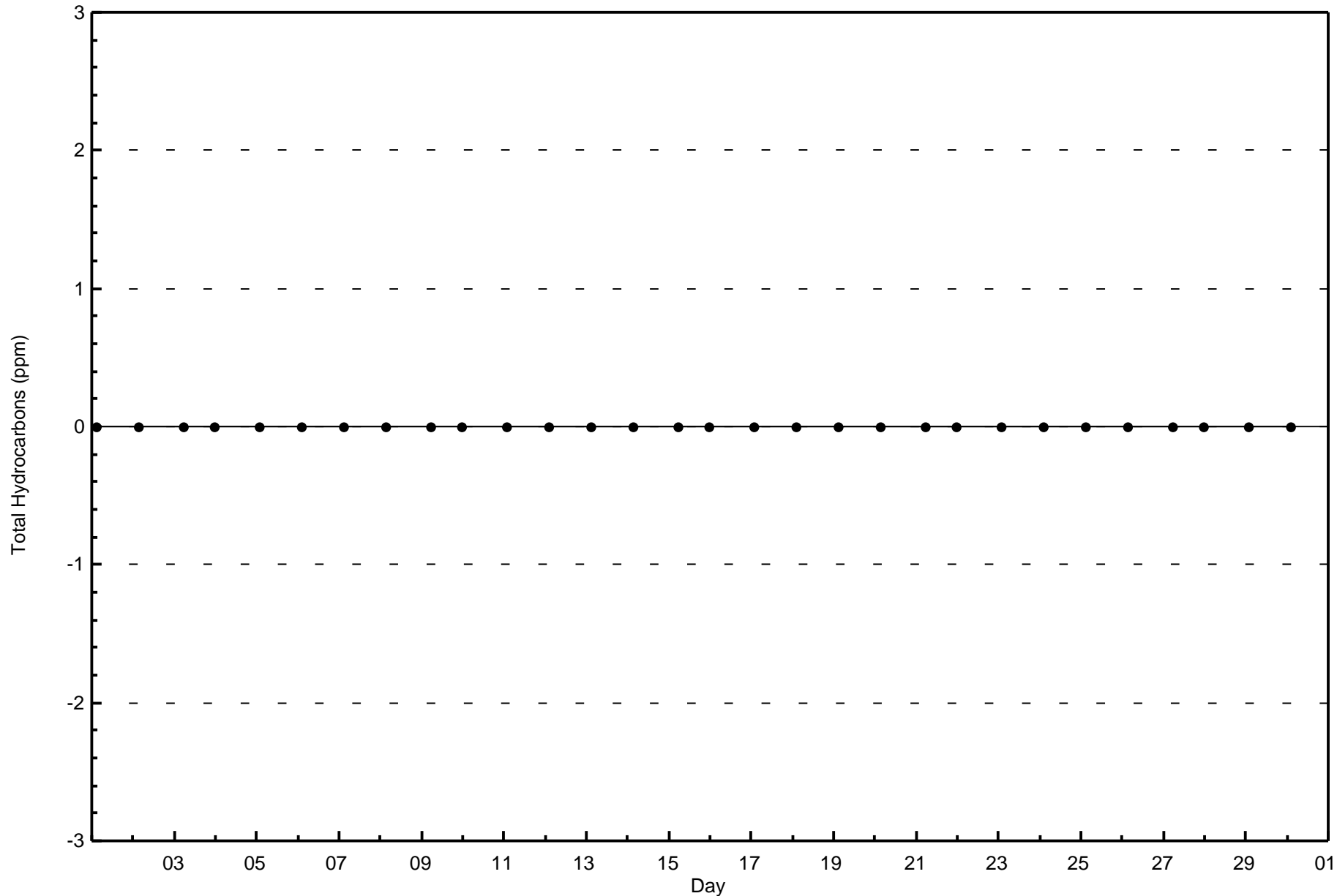


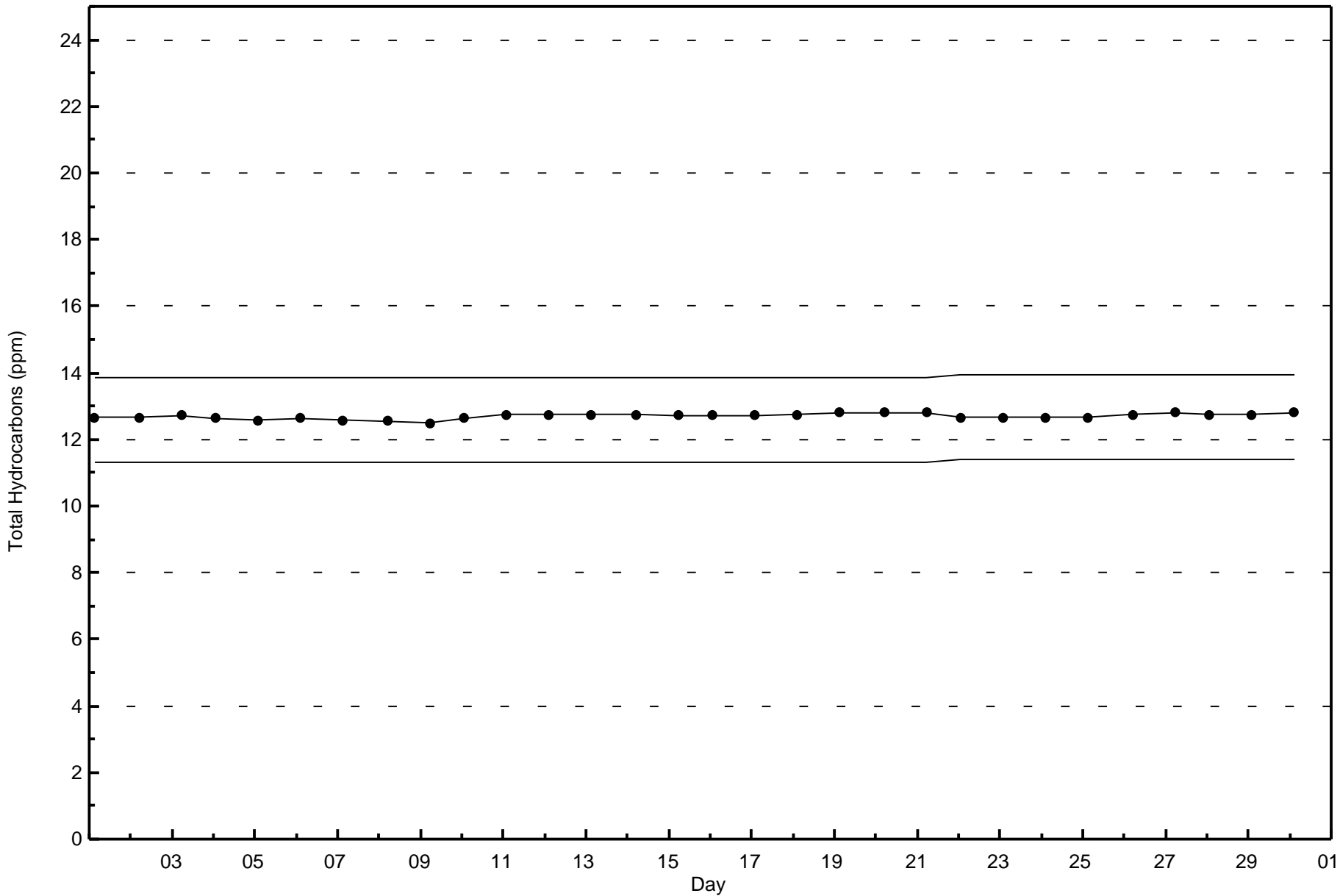
Wood Buffalo Environmental Association

Zero Responses

Total Hydrocarbons (THC) - ppm

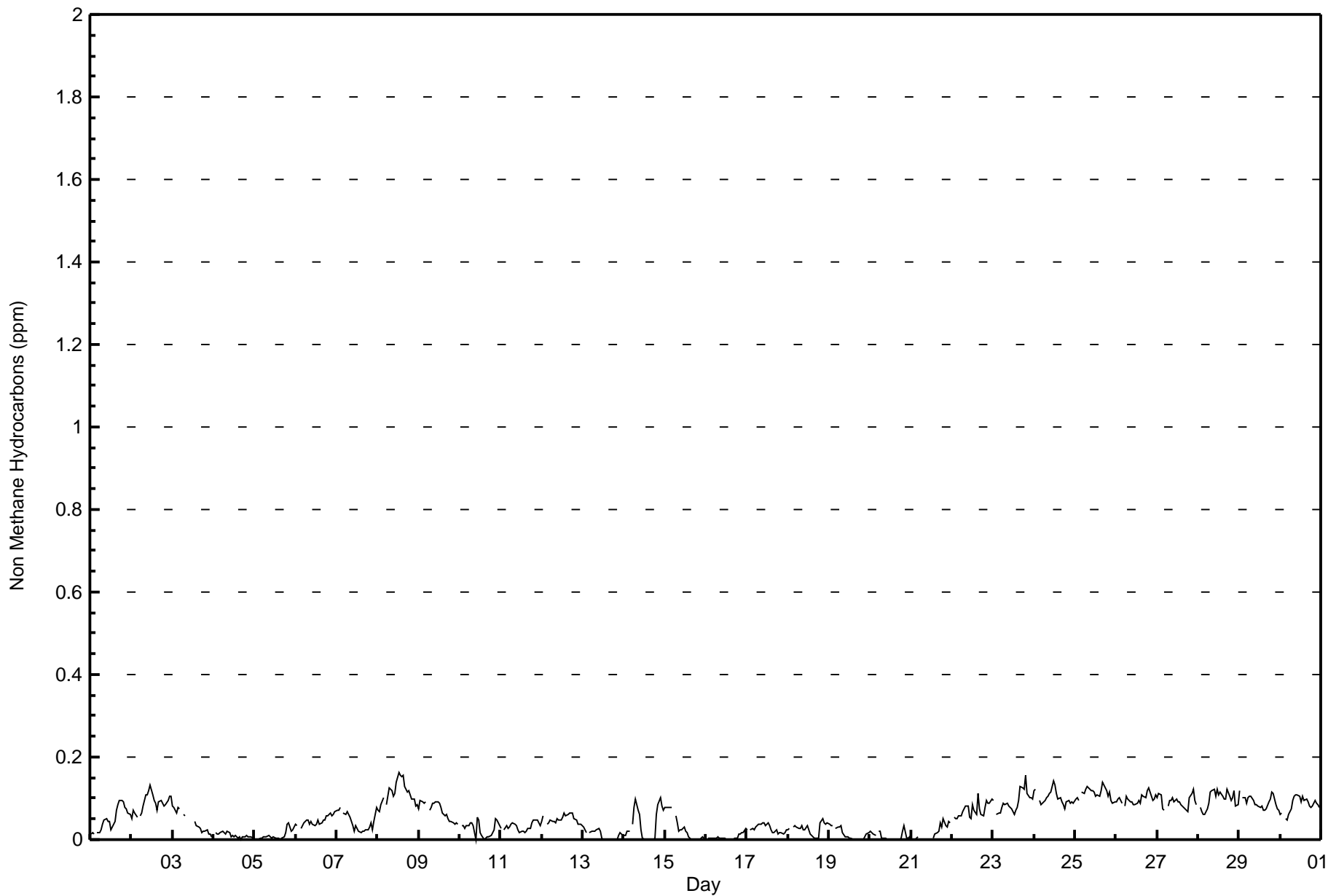
Stony Mountain - June 2016







Maximum Value: 0.162 ppm on Jun 8 13:00		Maximum Daily Average: 0.112 ppm on Jun 8		Hours in Service:	720																																												
Minimum Value: 0.000 ppm on Jun 10 10:00		Minimum Daily Average: 0.006 ppm on Jun 16		Hours of Data:	679																																												
Maximum Diurnal Average: 0.062 ppm at hour 8		Minimum Diurnal Average: 0.046 ppm at hour 15		Hours of Missing Data:	41																																												
Monthly Average: 0.053 ppm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.1 P ₉₀ = 0.1 P ₉₉ = 0.1		Hours of Calibration:	36																																												
				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-Jun	0.013	0.018	0.013	Z	0.018	0.018	0.025	0.036	0.047	0.050	0.043	0.043	0.025	0.032	0.043	0.072	0.084	0.095	0.097	0.092	0.079	0.074	0.064	0.060	0.050	0.097																							
2-Jun	0.050	0.070	0.065	0.053	Z	0.059	0.064	0.080	0.110	0.109	0.117	0.133	0.110	0.096	0.087	0.072	0.092	0.095	0.087	0.081	0.086	0.095	0.106	0.104	0.088	0.133																							
3-Jun	0.081	0.078	0.064	0.077	0.075	Z	0.062	0.059	PF	PF	PF	PF	PF	0.043	0.035	0.030	0.026	0.018	0.020	0.020	0.023	0.015	0.013	0.005	0.041	0.081																							
4-Jun	Z	0.018	0.014	0.014	0.015	0.022	0.017	0.014	0.020	0.018	0.008	0.010	0.007	0.009	0.004	0.005	0.002	0.005	0.005	0.011	0.007	0.008	0.007	0.003	0.011	0.022																							
5-Jun	0.005	Z	0.002	0.002	0.005	0.008	0.007	0.008	0.011	0.006	0.003	0.006	0.004	0.003	0.004	0.002	0.005	0.007	0.016	0.039	0.042	0.019	0.024	0.031	0.011	0.042																							
6-Jun	0.036	0.035	Z	0.028	0.033	0.041	0.046	0.047	0.037	0.043	0.037	0.035	0.037	0.046	0.039	0.040	0.047	0.049	0.058	0.058	0.063	0.057	0.059	0.068	0.045	0.068																							
7-Jun	0.073	0.070	0.077	Z	0.065	0.060	0.068	0.060	0.056	0.035	0.021	0.033	0.027	0.019	0.016	0.019	0.020	0.025	0.025	0.030	0.042	0.024	0.043	0.077	0.043	0.077																							
8-Jun	0.071	0.067	0.086	0.101	Z	0.083	0.105	0.126	0.119	0.106	0.111	0.139	0.162	0.157	0.151	0.154	0.128	0.117	0.118	0.110	0.097	0.099	0.082	0.085	0.112	0.162																							
9-Jun	0.075	0.095	0.093	0.088	0.092	Z	0.071	0.078	0.088	0.088	0.090	0.090	0.088	0.079	0.064	0.059	0.060	0.050	0.045	0.045	0.042	0.038	0.040	0.038	0.069	0.095																							
10-Jun	Z	0.032	0.035	0.028	0.036	0.034	0.042	0.041	0.035	0.000	0.053	0.047	0.019	0.009	0.002	0.004	0.006	0.006	0.009	0.016	0.024	0.052	0.048	0.035	0.027	0.053																							
11-Jun	0.029	Z	0.023	0.032	0.027	0.031	0.036	0.041	0.037	0.034	0.024	0.016	0.020	0.021	0.018	0.019	0.029	0.028	0.039	0.048	0.049	0.046	0.040	0.035	0.031	0.049																							
12-Jun	0.042	0.057	Z	0.036	0.042	0.046	0.044	0.044	0.039	0.052	0.049	0.046	0.054	0.064	0.057	0.062	0.063	0.065	0.065	0.052	0.046	0.038	0.037	0.037	0.049	0.065																							
13-Jun	0.029	0.022	0.018	Z	0.016	0.019	0.019	0.019	0.025	0.029	0.020	0.005	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.009	0.017	0.009	0.011	0.029																							
14-Jun	0.011	0.011	0.021	0.020	Z	0.037	0.077	0.098	0.070	0.061	0.023	0.004	0.002	0.001	0.001	0.001	0.000	0.000	0.004	0.061	0.084	0.102	0.080	0.072	0.037	0.102																							
15-Jun	0.079	0.077	0.077	0.079	0.079	Z	0.057	0.040	0.019	0.022	0.025	0.031	0.021	0.018	0.008	0.002	0.000	0.000	0.000	0.000	0.004	0.004	0.006	0.002	0.028	0.079																							
16-Jun	Z	0.005	0.003	0.003	0.004	0.002	0.006	0.006	0.002	0.003	0.003	0.002	0.000	0.001	0.000	0.000	0.001	0.004	0.003	0.014	0.014	0.016	0.016	0.028	0.006	0.028																							
17-Jun	0.022	Z	0.024	0.026	0.024	0.031	0.033	0.037	0.036	0.042	0.039	0.034	0.041	0.034	0.025	0.016	0.019	0.022	0.015	0.017	0.016	0.014	0.015	0.022	0.026	0.042																							
18-Jun	0.025	0.028	Z	0.029	0.035	0.031	0.027	0.026	0.036	0.024	0.025	0.033	0.023	0.012	0.012	0.002	0.005	0.005	0.002	0.040	0.050	0.042	0.039	0.041	0.026	0.050																							
19-Jun	0.038	0.035	0.033	Z	0.027	0.031	0.031	0.033	0.017	0.005	0.006	0.006	0.004	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.006	0.015	0.018	0.013	0.038																							
20-Jun	0.019	0.017	0.014	0.012	Z	0.020	0.020	0.002	0.003	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.020	0.035	0.003	0.005	0.006	0.008	0.035																							
21-Jun	0.002	0.001	0.001	0.002	0.007	Z	0.012	C	C	C	C	C	C	0.004	0.013	0.019	0.021	0.041	0.031	0.050	0.035	0.030	0.046	0.041	--	0.050																							
22-Jun	Z	0.053	0.049	0.051	0.059	0.059	0.068	0.076	0.083	0.080	0.056	0.051	0.084	0.070	0.061	0.111	0.074	0.060	0.056	0.078	0.094	0.088	0.087	0.099	0.072	0.111																							
23-Jun	0.093	Z	0.060	0.065	0.063	0.077	0.089	0.086	0.087	0.083	0.079	0.074	0.062	0.070	0.077	0.095	0.129	0.125	0.123	0.157	0.112	0.101	0.101	0.097	0.092	0.157																							
24-Jun	0.120	0.123	Z	0.094	0.086	0.088	0.096	0.101	0.104	0.112	0.114	0.142	0.132	0.111	0.098	0.102	0.091	0.085	0.076	0.090	0.095	0.089	0.090	0.087	0.101	0.142																							
25-Jun	0.098	0.103	0.096	Z	0.115	0.112	0.121	0.129	0.126	0.117	0.119	0.116	0.105	0.109	0.104	0.120	0.138	0.132	0.119	0.104	0.114	0.094	0.088	0.092	0.112	0.138																							
26-Jun	0.091	0.100	0.103	0.089	Z	0.080	0.104	0.097	0.090	0.091	0.085	0.085	0.089	0.094	0.088	0.107	0.105	0.100	0.118	0.125	0.114	0.097	0.097	0.107	0.098	0.125																							
27-Jun	0.103	0.112	0.110	0.073	0.072	Z	0.081	0.094	0.097	0.100	0.091	0.097	0.092	0.093	0.086	0.078	0.076	0.072	0.069	0.100	0.110	0.122	0.094	0.084	0.092	0.122																							
28-Jun	Z	0.077	0.068	0.060	0.060	0.074	0.090	0.117	0.118	0.121	0.107	0.122	0.108	0.114	0.105	0.098	0.099	0.121	0.104	0.096	0.102	0.119	0.083	0.086	0.098	0.122																							
29-Jun	0.117	Z	0.102	0.102	0.088	0.101	0.107	0.106	0.094	0.084	0.083	0.080	0.078	0.082	0.072	0.072	0.076	0.093	0.097	0.115	0.111	0.084	0.074	0.070	0.091	0.117																							
30-Jun	0.060	0.064	Z	0.050	0.047	0.061	0.074	0.095	0.106	0.110	0.107	0.105	0.093	0.104	0.095	0.097	0.093	0.081	0.080	0.083	0.096	0.088	0.085	0.080	0.085	0.110																							
																								0.055	0.055	0.050	0.049	0.048	0.049	0.057	0.062	0.061	0.058	0.055	0.056	0.053	0.050	0.046	0.049	0.050	0.050	0.049	0.058	0.059	0.056	0.053	0.054	Diurnal Average	
																								0.120	0.123	0.110	0.102	0.115	0.112	0.121	0.129	0.126	0.121	0.119	0.142	0.162	0.157	0.151	0.154	0.138	0.132	0.123	0.157	0.114	0.122	0.106	0.107	Diurnal Maximum	
Z - zerspan		C - Calibration				PF - Power Failure																																											





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Stony Mountain - June 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	96	14.14	14.14
0.006 - 0.05	269	39.62	53.76
0.06 - 0.1	309	45.51	99.26
> 0.1	5	0.74	100.00

Total Number of Valid Hours: 679

Total Number of Hours: 720



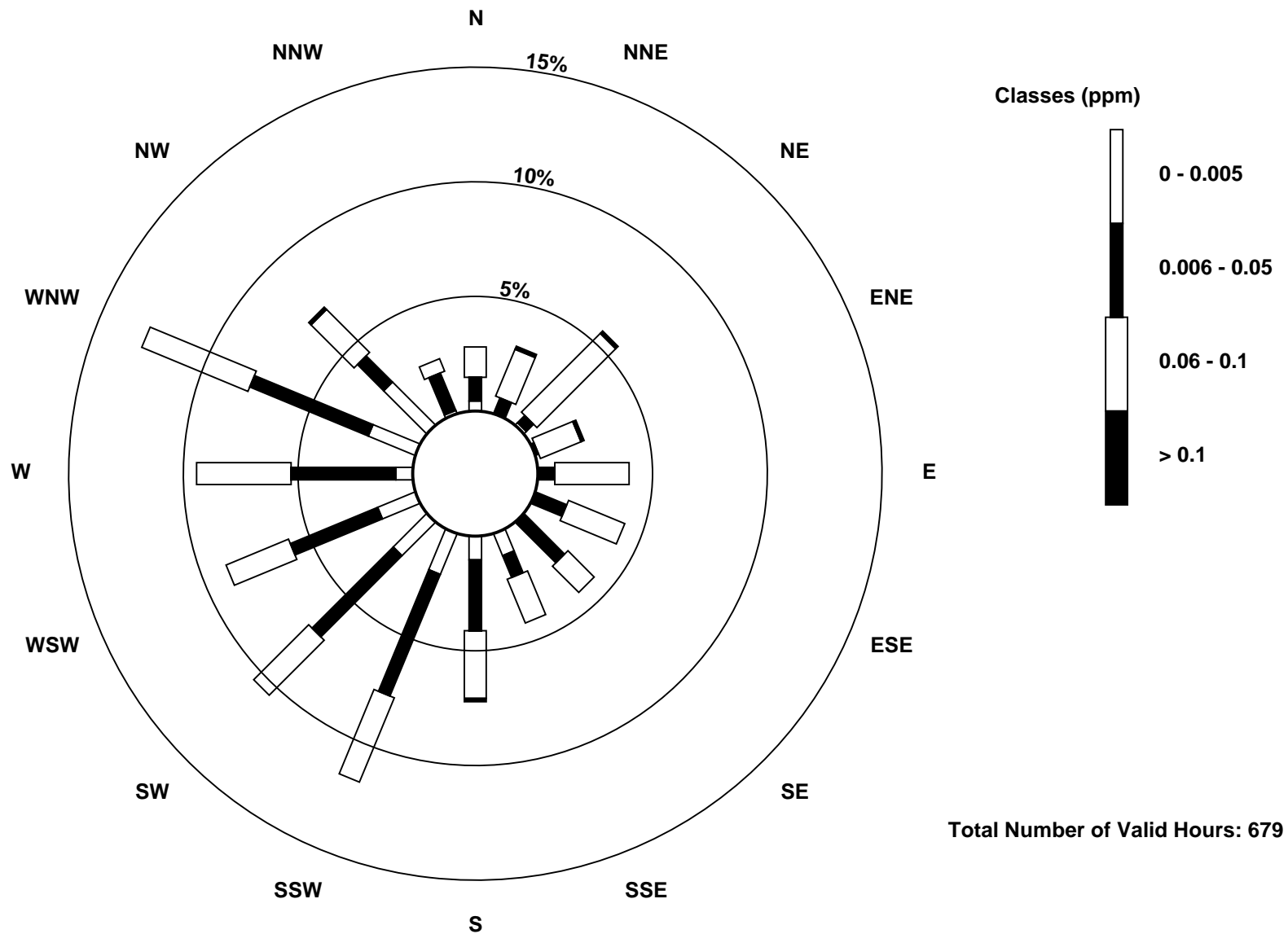
**Wood Buffalo Environmental Association
Frequency Distribution**

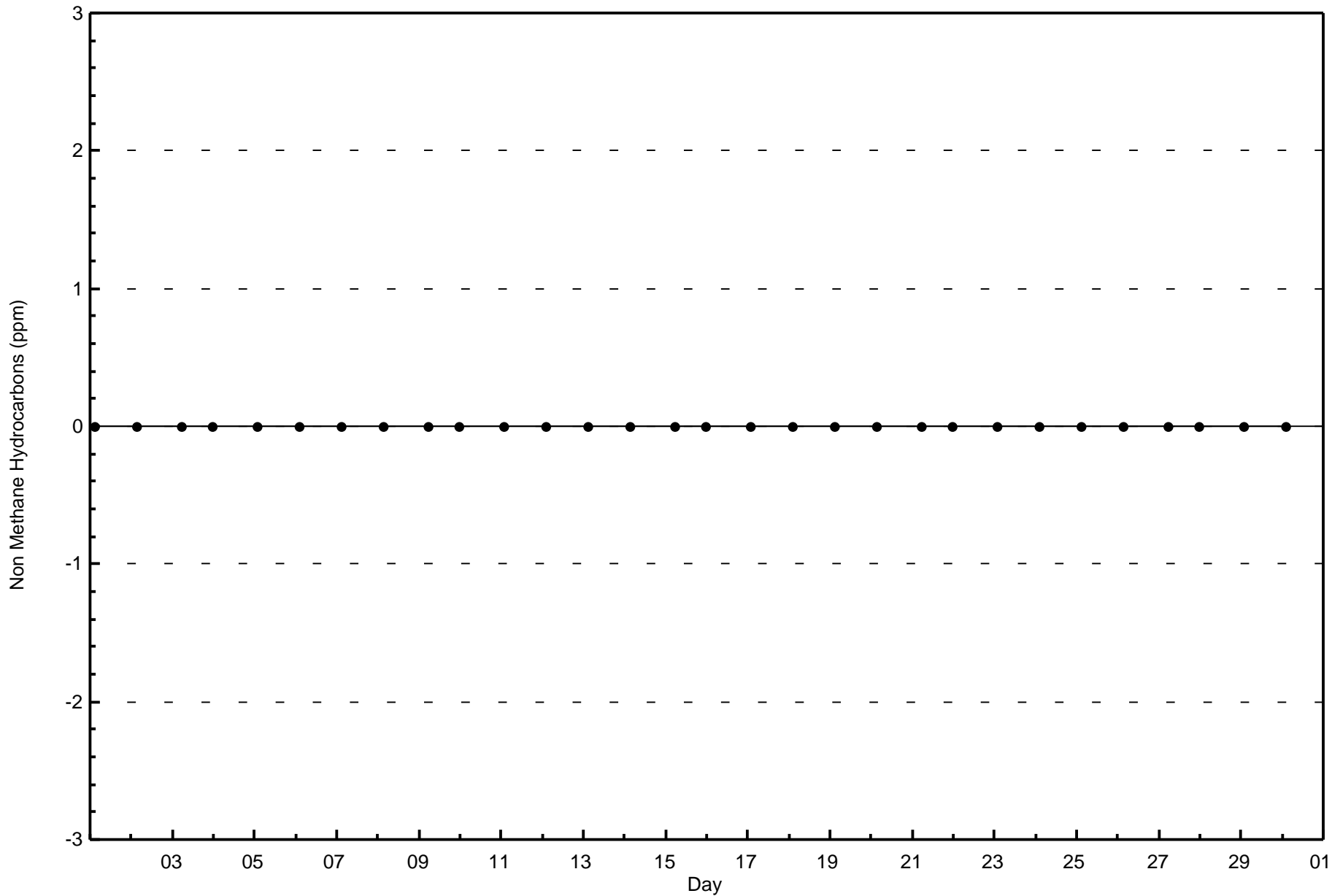
**Non Methane Hydrocarbons (NMHC) - ppm
Stony Mountain - June 2016**

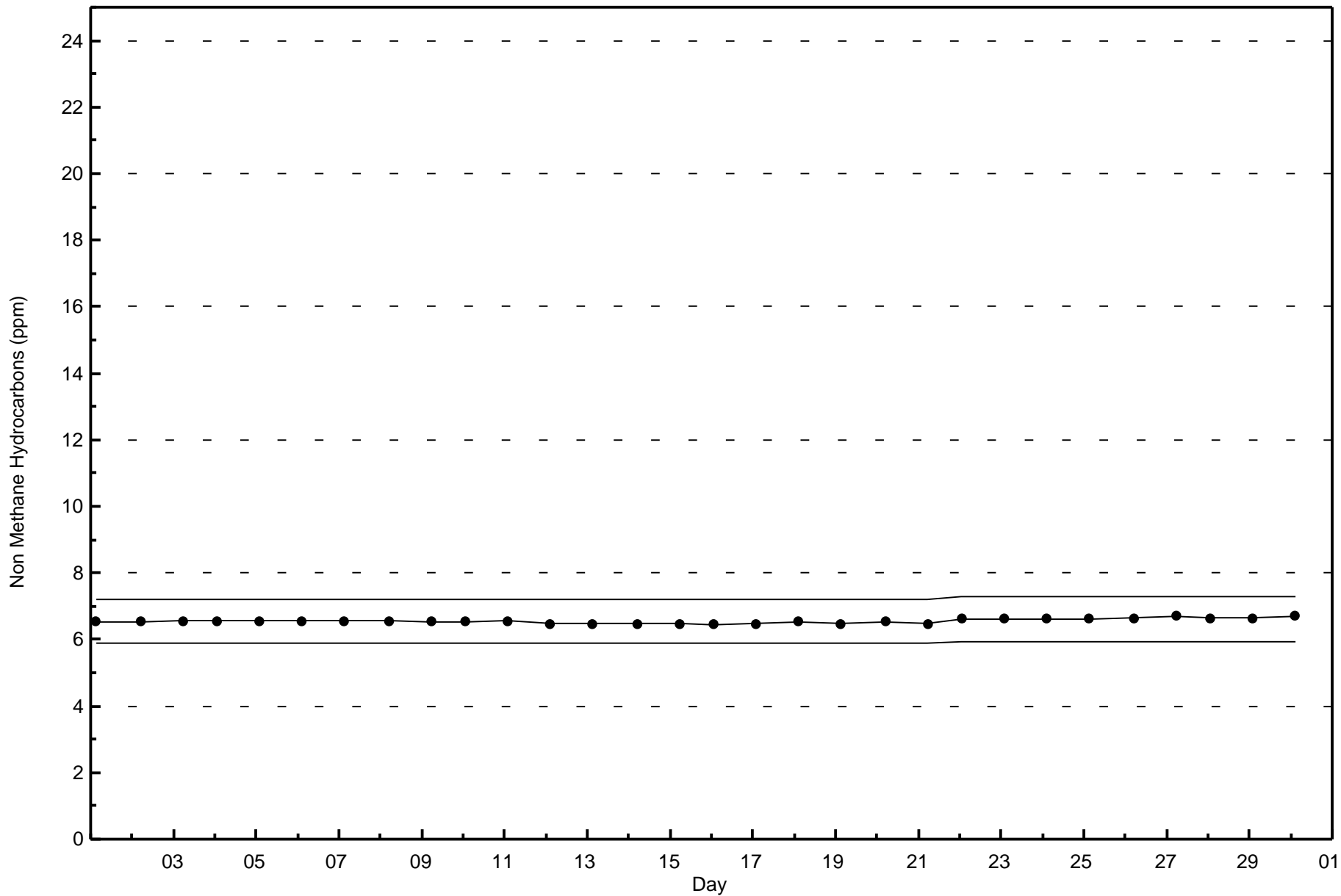
Concentration Ranges (ppm)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 0.005	3	0	1	0	0	0	0	7	7	13	14	12	5	15	18	1	96
0.006 - 0.05	7	5	3	1	5	10	17	7	21	39	34	28	31	38	11	12	269
0.06 - 0.1	9	15	33	13	22	18	11	14	20	27	23	20	28	34	18	4	309
> 0.1	0	1	1	1	0	0	0	0	1	0	0	0	0	0	1	0	5
Totals	19	21	38	15	27	28	28	28	49	79	71	60	64	87	48	17	679

Total Number of Valid Hours: 679

Total Number of Hours: 720









Wood Buffalo Environmental Association

Summary of Hour Averages

Methane (CH₄) - ppm

Stony Mountain - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 2.2 ppm on Jun 14 08:00	Maximum Daily Average: 2.0 ppm on Jun 14		Hours of Data:	679
Minimum Value: 1.9 ppm on Jun 8 22:00	Minimum Daily Average: 1.9 ppm on Jun 9		Hours of Missing Data:	41
Maximum Diurnal Average: 2.0 ppm at hour 7	Minimum Diurnal Average: 2.0 ppm at hour 20		Hours of Calibration:	36
Monthly Average: 1.96 ppm	Percentiles: P ₁ = 1.9 P ₁₀ = 1.9 Q ₁ = 1.9 Median = 2.0 Q ₃ = 2.0 P ₉₀ = 2.0 P ₉₉ = 2.1		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-Jun	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	1.9	2.0	2.0	2.0
2-Jun	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	1.9	1.9	2.0	2.0	1.9	1.9	2.0	2.0
3-Jun	1.9	1.9	1.9	1.9	1.9	Z	2.0	2.0	PF	PF	PF	PF	PF	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
4-Jun	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	1.9
5-Jun	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
6-Jun	1.9	1.9	Z	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0
7-Jun	2.0	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	2.0
8-Jun	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
9-Jun	1.9	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
10-Jun	Z	1.9	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	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
11-Jun	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	2.0
12-Jun	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
13-Jun	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
14-Jun	2.0	2.0	2.0	2.0	Z	2.0	2.1	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.1	2.0	2.0	2.2	2.0
15-Jun	2.0	2.0	2.0	2.0	2.0	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	2.1
16-Jun	Z	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	2.0	2.0	2.0	2.1
17-Jun	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	2.0
18-Jun	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
19-Jun	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
20-Jun	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
21-Jun	2.0	2.0	2.0	2.0	2.0	Z	2.0	C	C	C	C	C	C	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	--	2.0
22-Jun	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	1.9	2.0	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0
23-Jun	2.0	Z	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	1.9	1.9	1.9	1.9	1.9	1.9	2.0	1.9	1.9	2.0
24-Jun	2.0	1.9	Z	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	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
25-Jun	1.9	1.9	2.0	Z	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	1.9	1.9	1.9	1.9	1.9	1.9	2.0
26-Jun	1.9	1.9	1.9	1.9	Z	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	2.0	1.9	2.0
27-Jun	2.0	2.0	2.0	1.9	1.9	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	1.9	1.9	2.0
28-Jun	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	2.0	1.9	2.0
29-Jun	2.0	Z	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	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0
30-Jun	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	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0

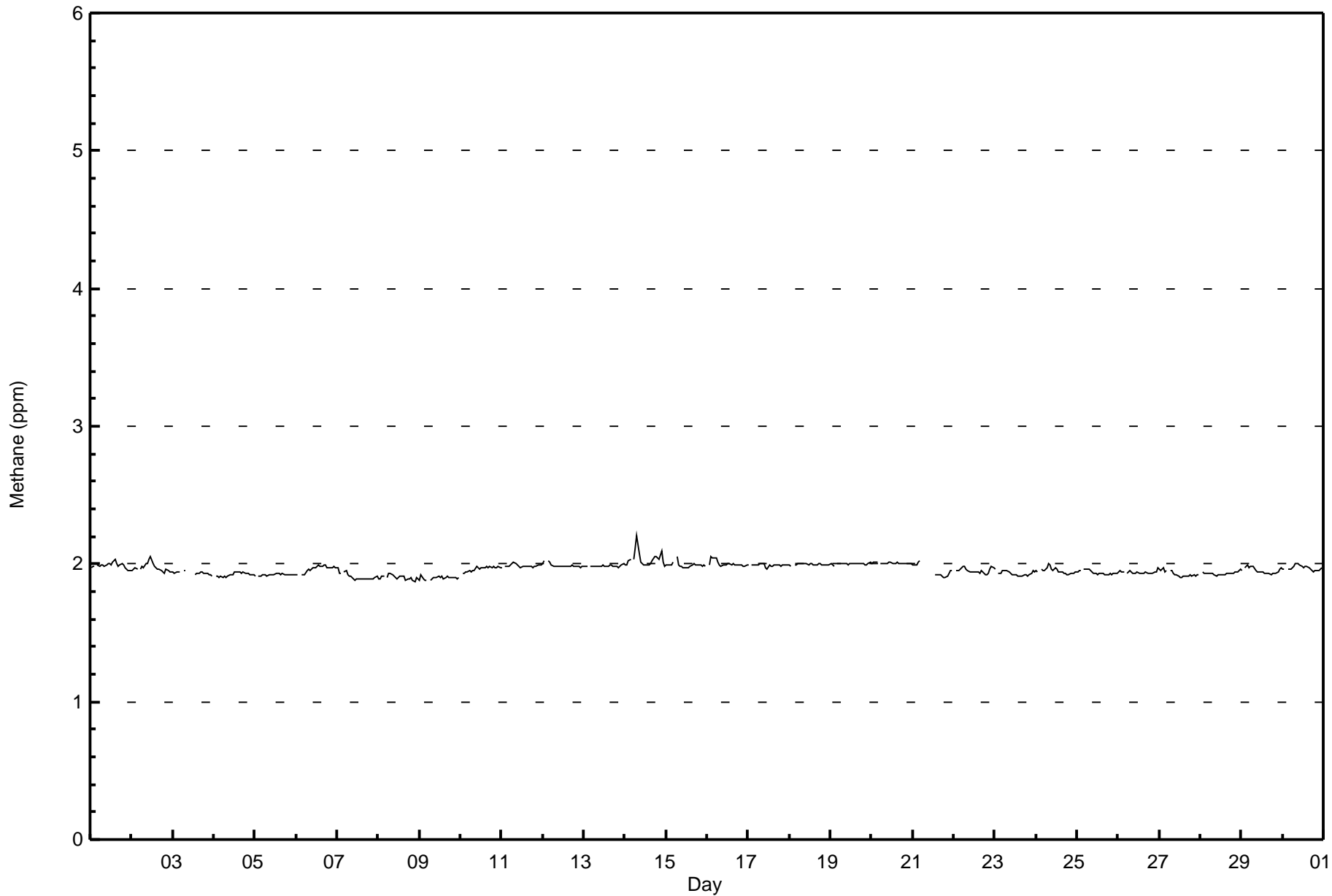
2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	Diurnal Average
2.0	2.0	2.1	2.0	2.0	2.0	2.1	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.1	2.0	2.0	2.0	2.0	Diurnal Maximum

Z - zerspan C - Calibration PF - Power Failure



Wood Buffalo Environmental Association
Hourly Averages

Methane (CH₄) - ppm
Stony Mountain - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Methane (CH₄) - ppm
Stony Mountain - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	671	98.82	98.82
2.1 - 3.0	8	1.18	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 679

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Methane (CH₄) - ppm
Stony Mountain - June 2016**

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	19	21	38	14	26	26	28	28	47	77	71	60	64	87	48	17	671
2.1 - 3.0	0	0	0	1	1	2	0	0	2	2	0	0	0	0	0	0	8
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
Totals	19	21	38	15	27	28	28	28	49	79	71	60	64	87	48	17	679

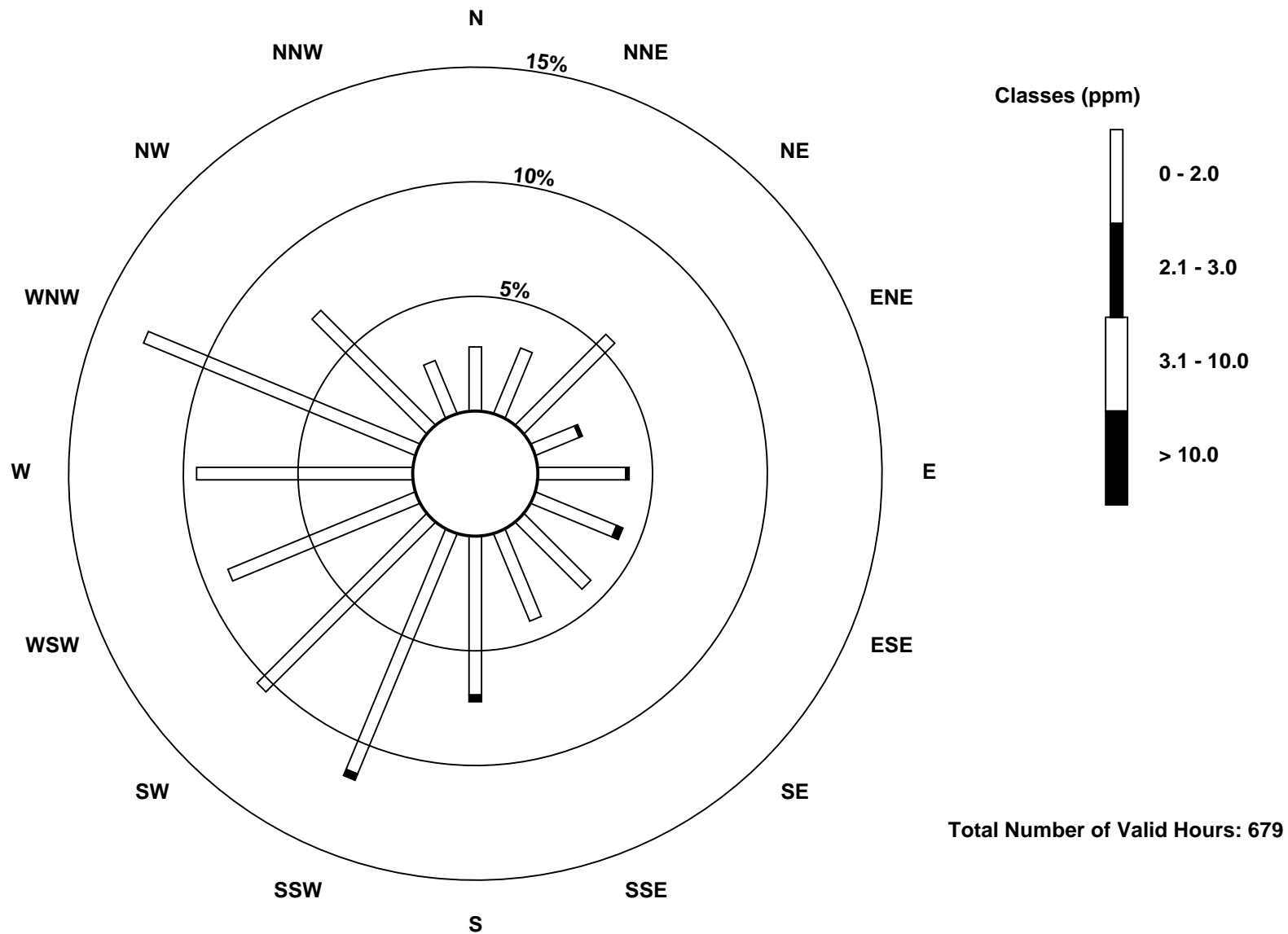
Total Number of Valid Hours: 679

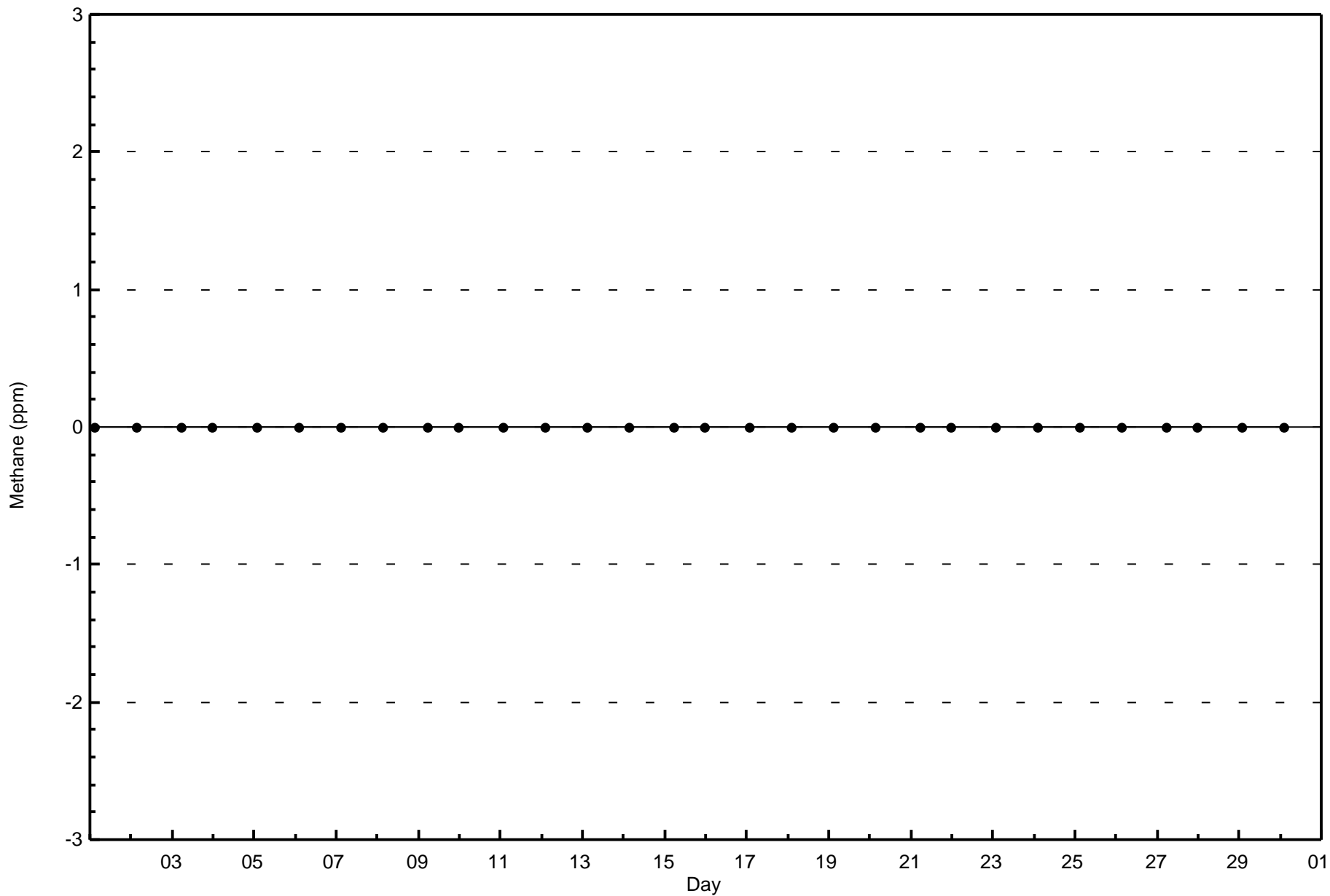
Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Methane (CH₄) - ppm
Stony Mountain (AMS 18)

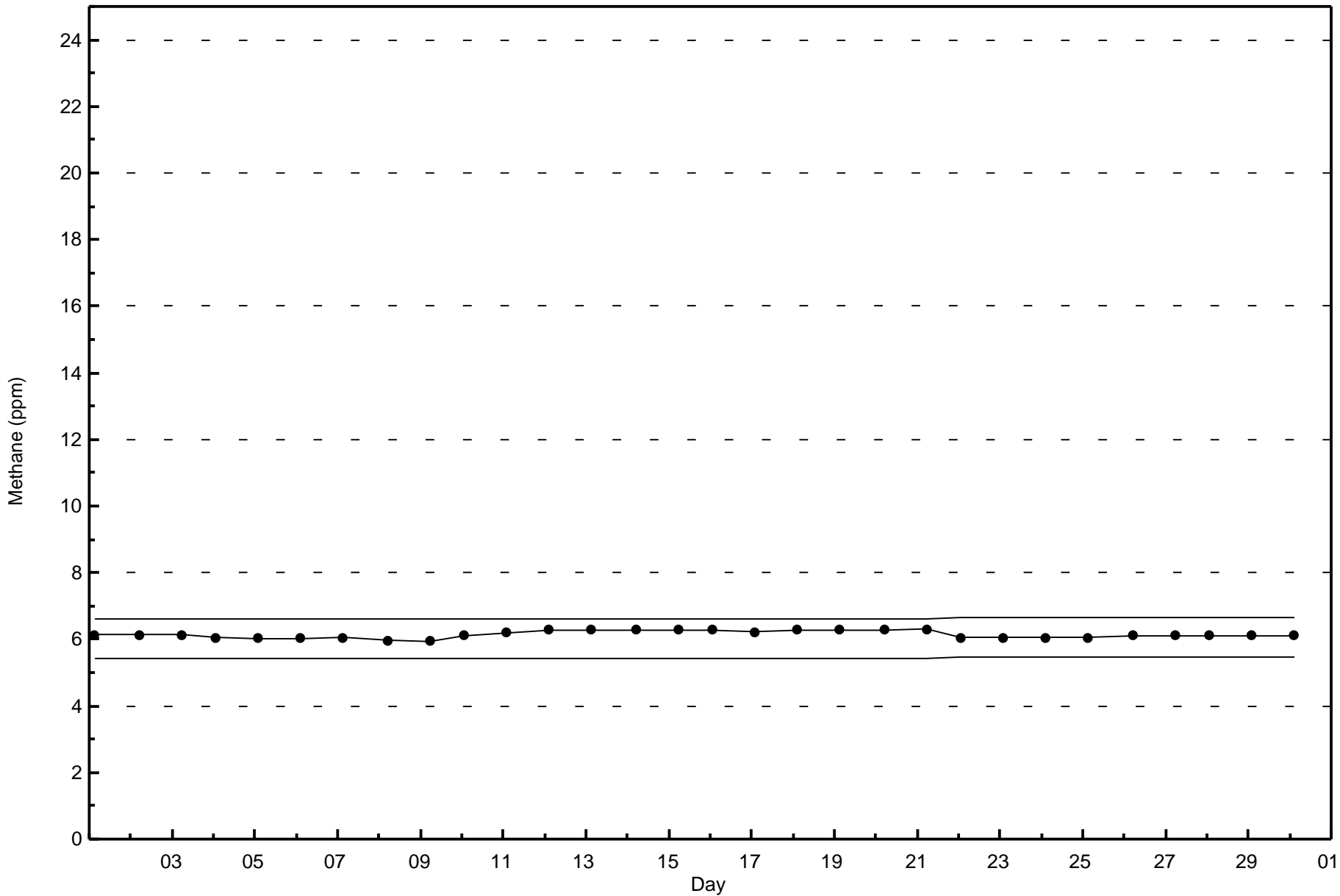






Wood Buffalo Environmental Association
Span Responses

Methane (CH₄) - ppm
Stony Mountain - June 2016



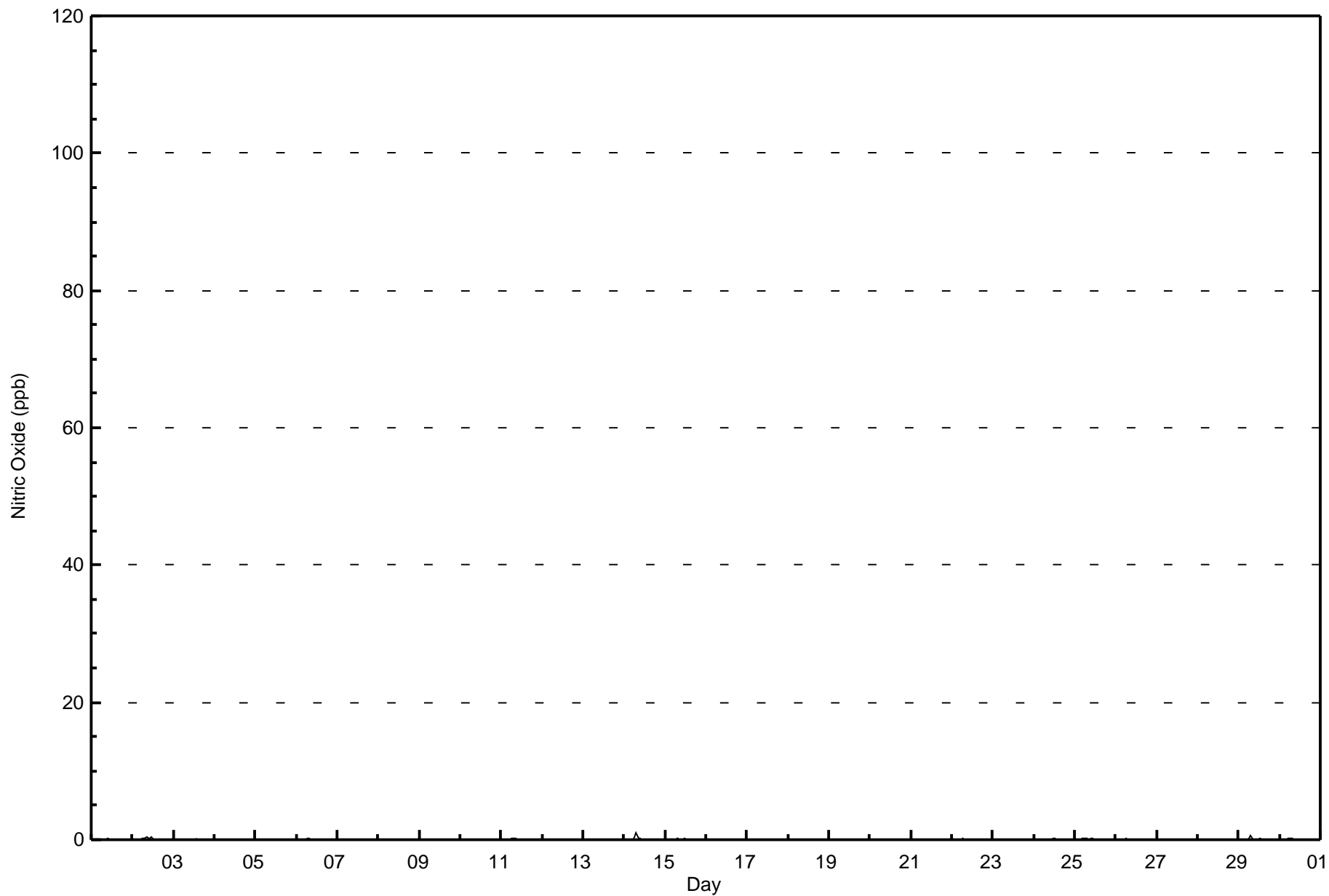


Maximum Value: 1 ppb on Jun 14 08:00		Maximum Daily Average: 0.1 ppb on Jun 2		Hours in Service: 720																						
Minimum Value: 0 ppb on Jun 1 01:00		Minimum Daily Average: 0.0 ppb on Jun 18		Hours of Data: 678																						
Maximum Diurnal Average: 0.1 ppb at hour 8		Minimum Diurnal Average: 0.0 ppb at hour 23		Hours of Missing Data: 42																						
Monthly Average: 0.0 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 0		Hours of Calibration: 36																						
				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-Jun	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
2-Jun	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
3-Jun	0	0	0	0	0	Z	0	0	PF	PF	PF	PF	PF	0	0	0	0	0	0	0	0	0	0	0	0.0	0
4-Jun	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
5-Jun	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
6-Jun	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
7-Jun	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
8-Jun	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
9-Jun	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
10-Jun	Z	0	0	0	0	0	0	0	0	PF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0
11-Jun	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
12-Jun	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
13-Jun	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
14-Jun	0	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
15-Jun	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
16-Jun	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
17-Jun	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
18-Jun	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
19-Jun	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
20-Jun	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
21-Jun	0	0	0	0	0	Z	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	--	0
22-Jun	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
23-Jun	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
24-Jun	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
25-Jun	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
26-Jun	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
27-Jun	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
28-Jun	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
29-Jun	0	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
30-Jun	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
																								Diurnal Average		
																								Diurnal Maximum		
																								Z - zerospan C - Calibration PF - Power Failure		



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Stony Mountain - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Stony Mountain - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	678	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: 678

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Stony Mountain - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	19	21	38	15	27	28	28	28	49	79	71	60	64	87	48	16	678
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
Totals	19	21	38	15	27	28	28	28	49	79	71	60	64	87	48	16	678

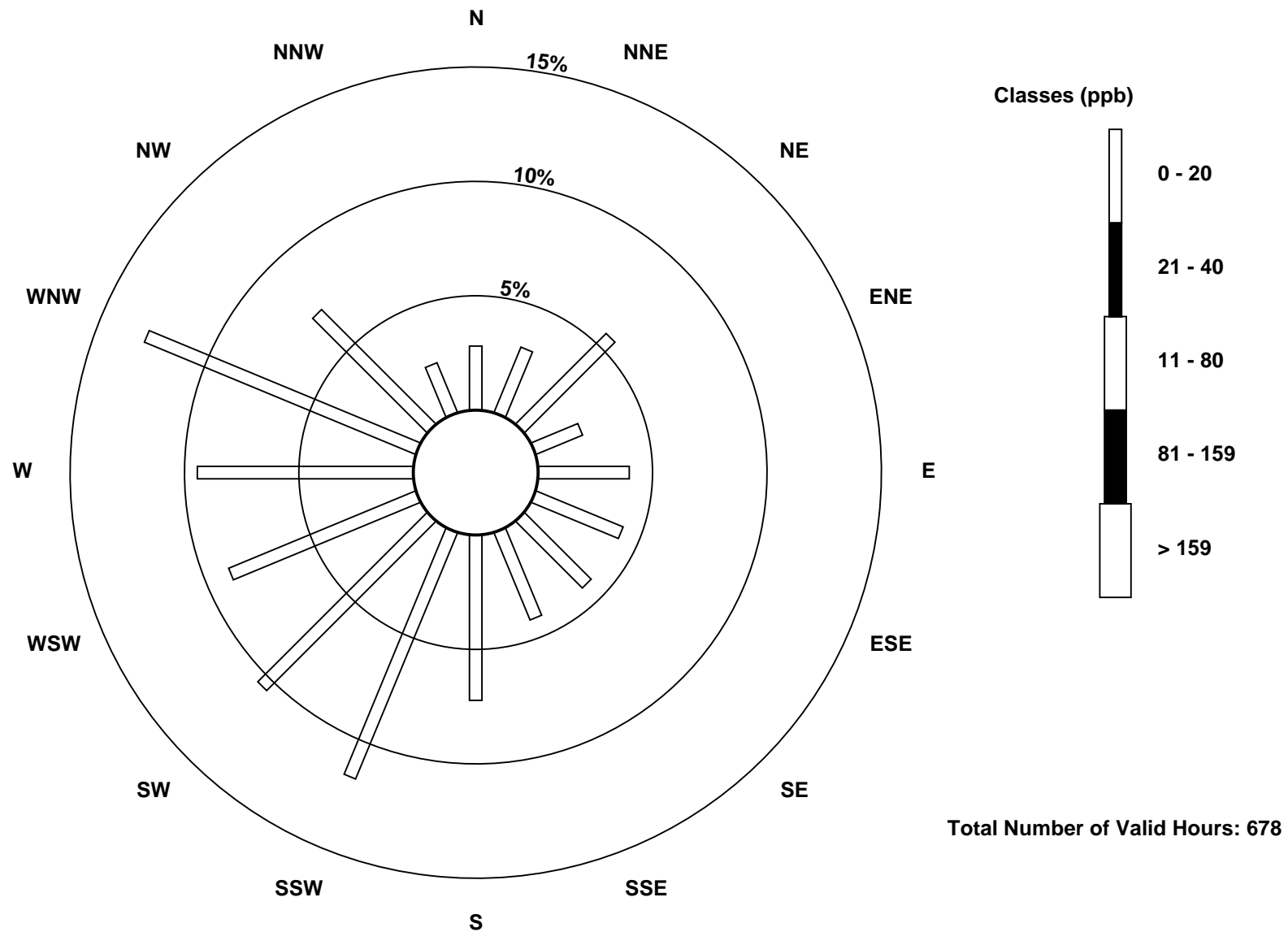
Total Number of Valid Hours: 678

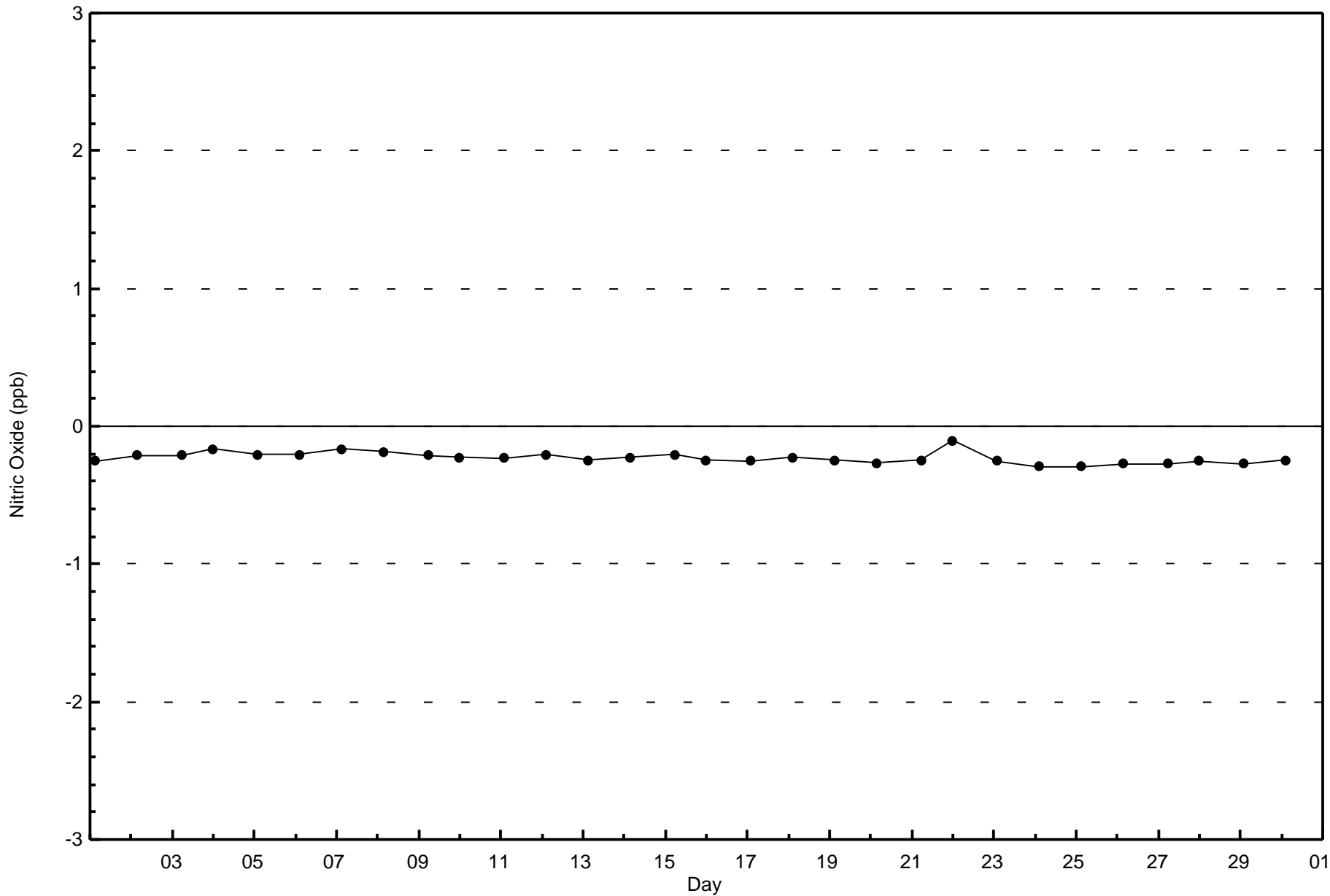
Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitric Oxide (NO) - ppb
Stony Mountain (AMS 18)

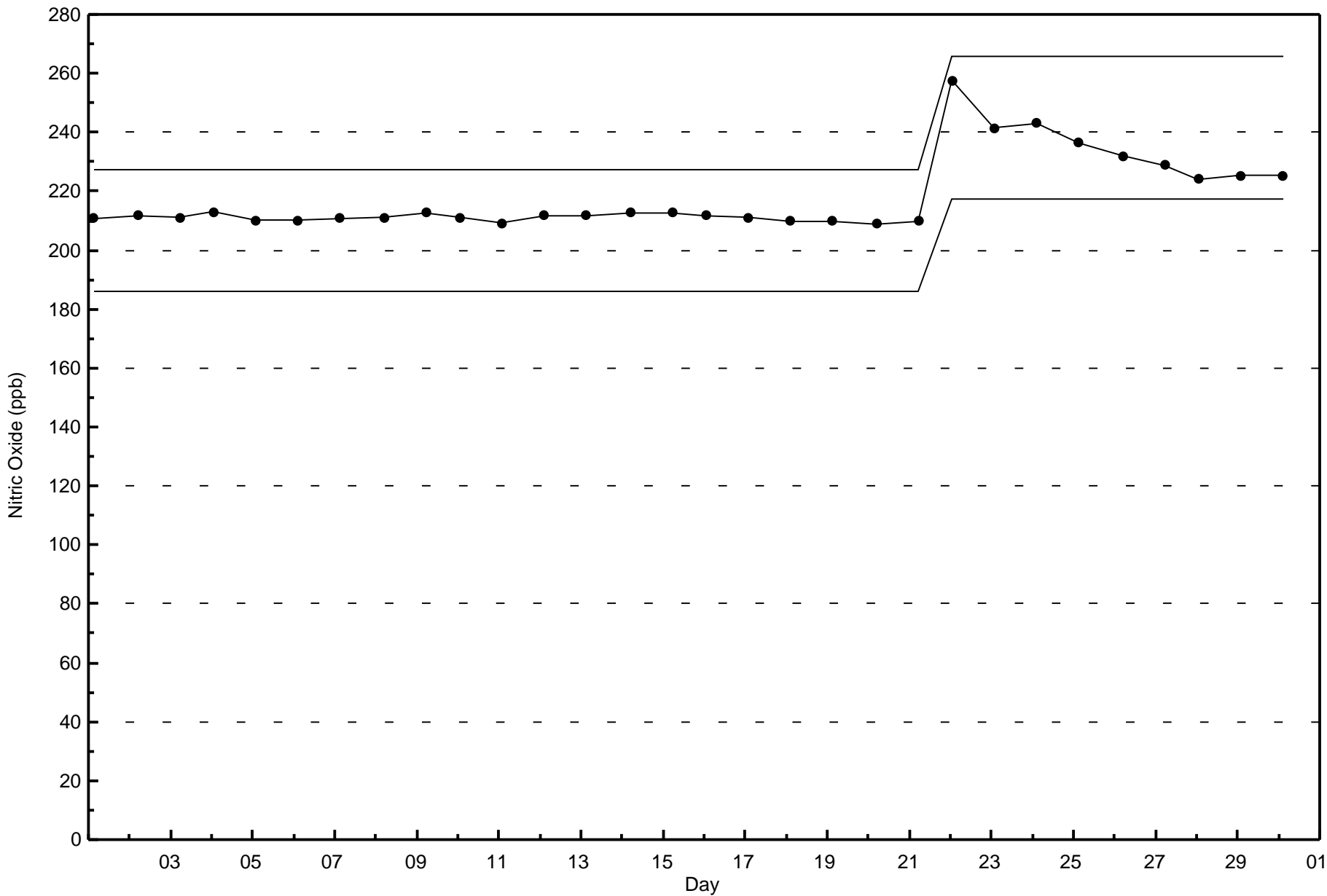






Wood Buffalo Environmental Association
Span Responses

Nitric Oxide (NO) - ppb
Stony Mountain - June 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb
Stony Mountain - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 5 ppb on Jun 14 08:00	Maximum Daily Average: 1.3 ppb on Jun 6
Minimum Value: 0 ppb on Jun 17 16:00	Hours of Data: 678
Maximum Diurnal Average: 1.0 ppb at hour 4	Hours of Missing Data: 42
Monthly Average: 0.6 ppb	Hours of Calibration: 36
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 2	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-Jun	0	0	1	Z	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
2-Jun	1	1	1	1	Z	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1.0	2
3-Jun	1	1	1	1	1	Z	1	1	PF	PF	PF	PF	PF	0	0	0	0	0	0	0	0	0	0	0	0.5	1
4-Jun	Z	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
5-Jun	0	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.4	1
6-Jun	1	2	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1.3	2
7-Jun	2	1	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	0.8	2
8-Jun	1	1	2	3	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	3
9-Jun	1	2	2	1	1	Z	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.6	2
10-Jun	Z	1	1	0	1	1	0	0	0	PF	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0.5	1
11-Jun	1	Z	1	1	1	2	2	2	1	1	1	0	1	0	0	0	1	0	0	1	1	1	1	1	0.9	2
12-Jun	1	1	Z	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1
13-Jun	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
14-Jun	1	1	1	1	Z	1	3	5	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1.1	5
15-Jun	1	1	1	1	2	Z	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	0	0.7	2
16-Jun	Z	0	0	1	1	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1
17-Jun	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
18-Jun	0	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
19-Jun	1	1	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.4	1
20-Jun	1	1	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
21-Jun	0	0	0	1	1	Z	1	C	C	C	C	C	C	1	1	1	1	1	1	1	1	1	1	1	--	1
22-Jun	Z	2	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
23-Jun	1	Z	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0.7	1
24-Jun	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	1
25-Jun	1	1	1	Z	2	1	1	1	1	1	1	1	0	0	1	0	0	0	0	0	1	0	0	1	0.7	2
26-Jun	1	1	1	1	Z	1	1	1	0	0	1	0	0	1	0	0	0	0	0	1	1	1	0	1	0.5	1
27-Jun	1	0	0	1	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.4	1
28-Jun	Z	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.5	1
29-Jun	1	Z	1	3	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0.9	3
30-Jun	1	2	Z	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	2

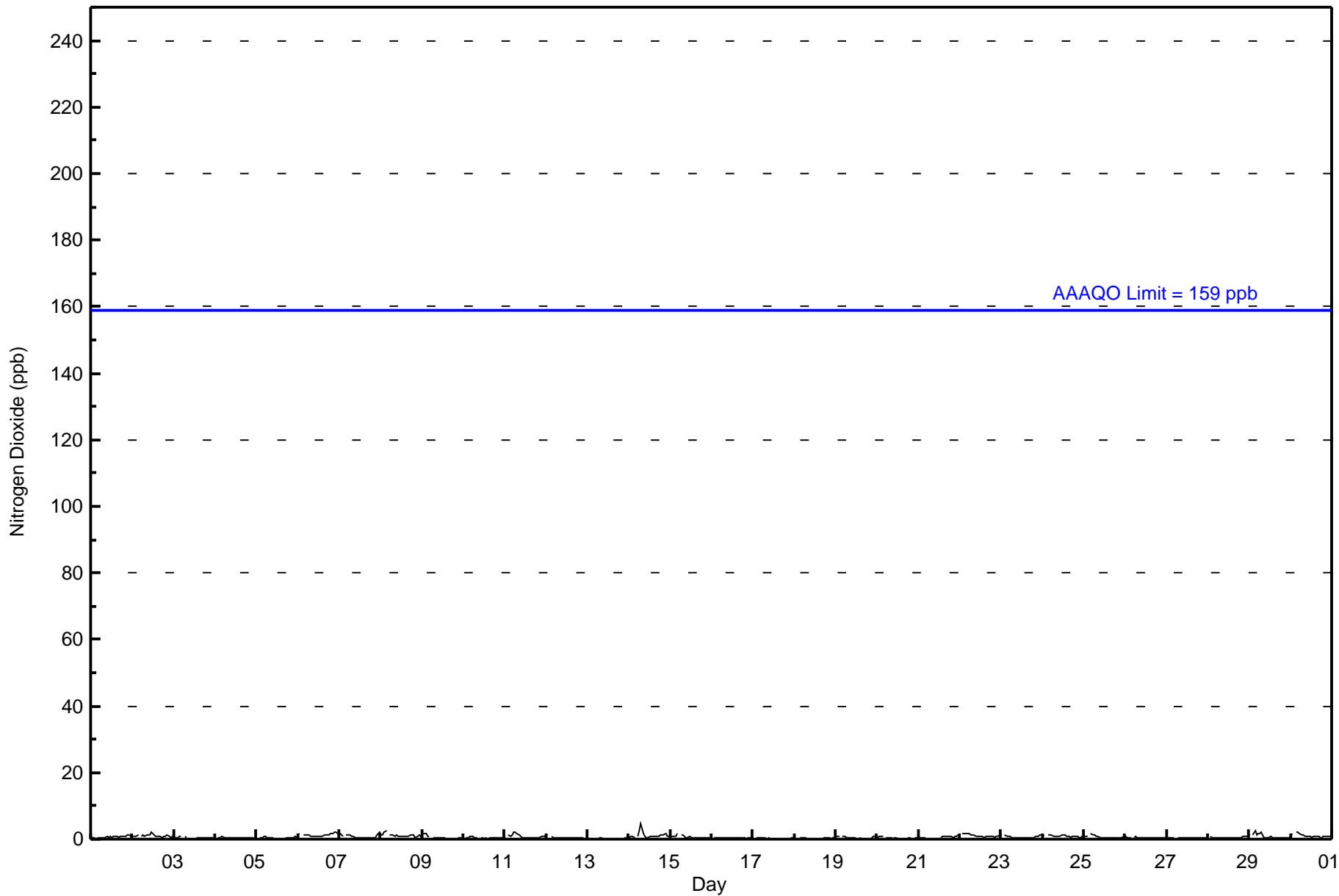
0.8	0.8	0.8	1.0	0.9	0.9	0.9	0.9	0.9	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.7	0.7	Diurnal Average
2	2	2	3	2	2	3	5	2	1	1	1	2	1	1	1	1	1	1	1	1	2	2	2	2	2	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Stony Mountain - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Stony Mountain - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	678	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: 678

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Stony Mountain - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	19	21	38	15	27	28	28	28	49	79	71	60	64	87	48	16	678
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
Totals	19	21	38	15	27	28	28	28	49	79	71	60	64	87	48	16	678

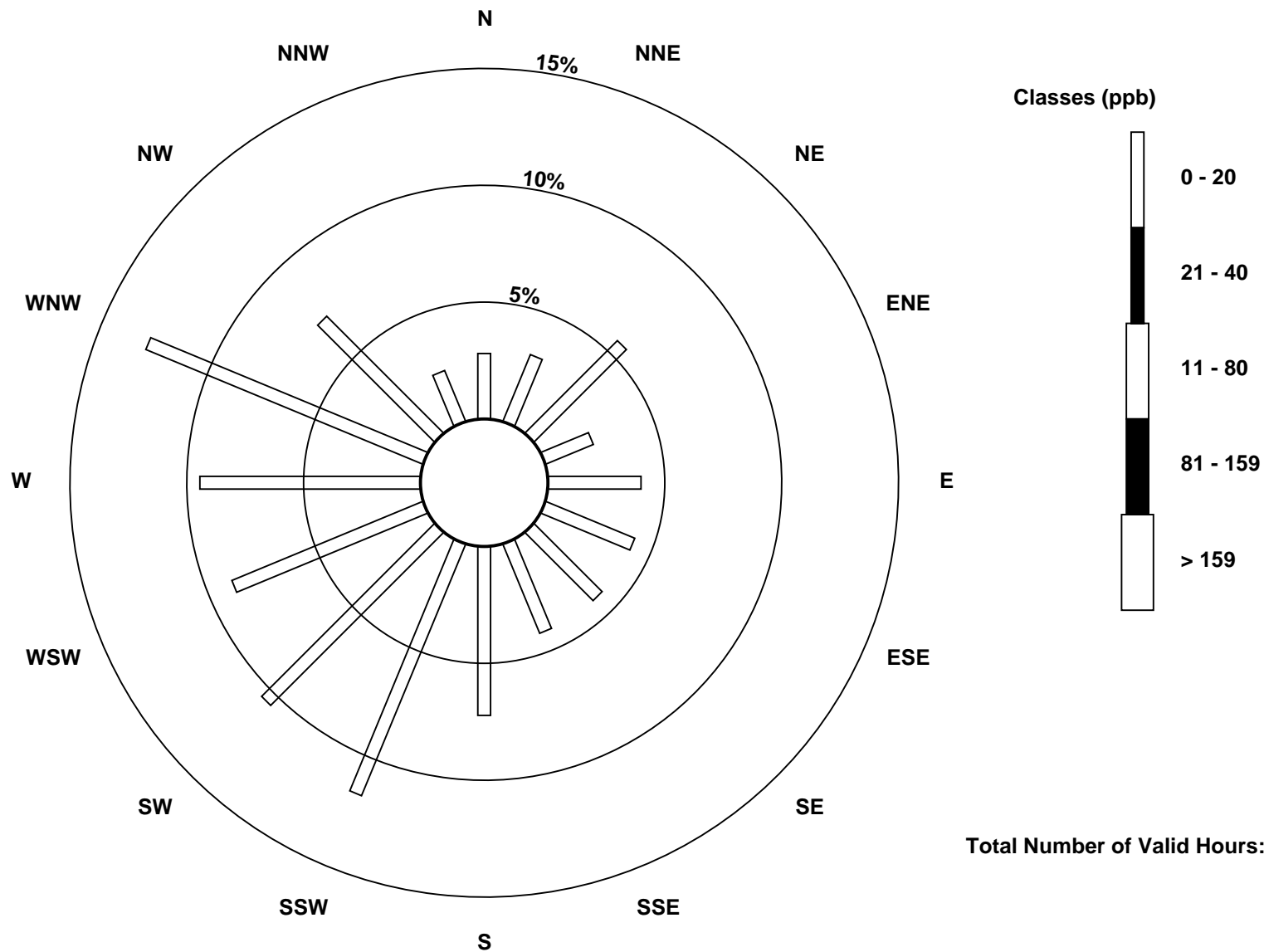
Total Number of Valid Hours: 678

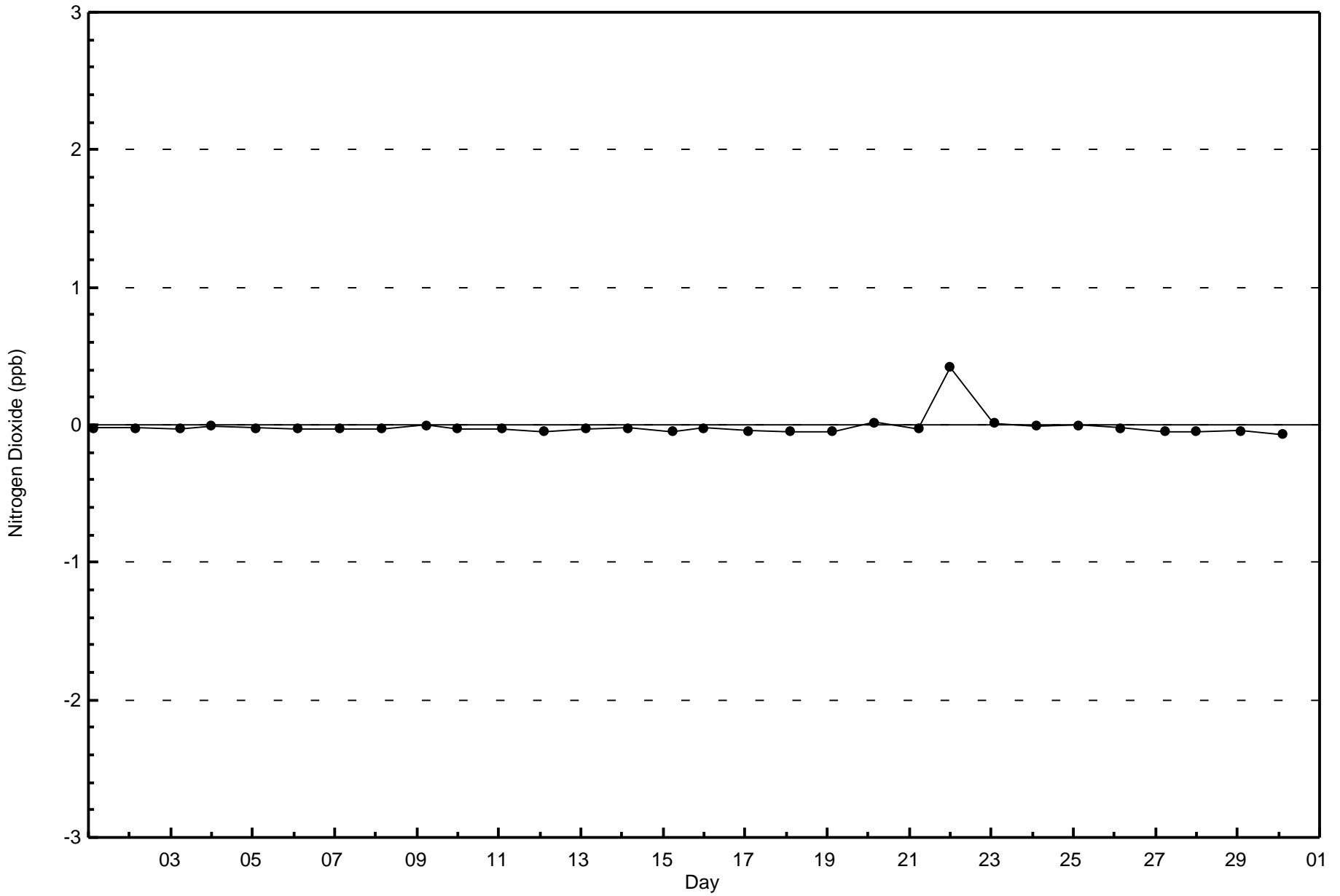
Total Number of Hours: 720

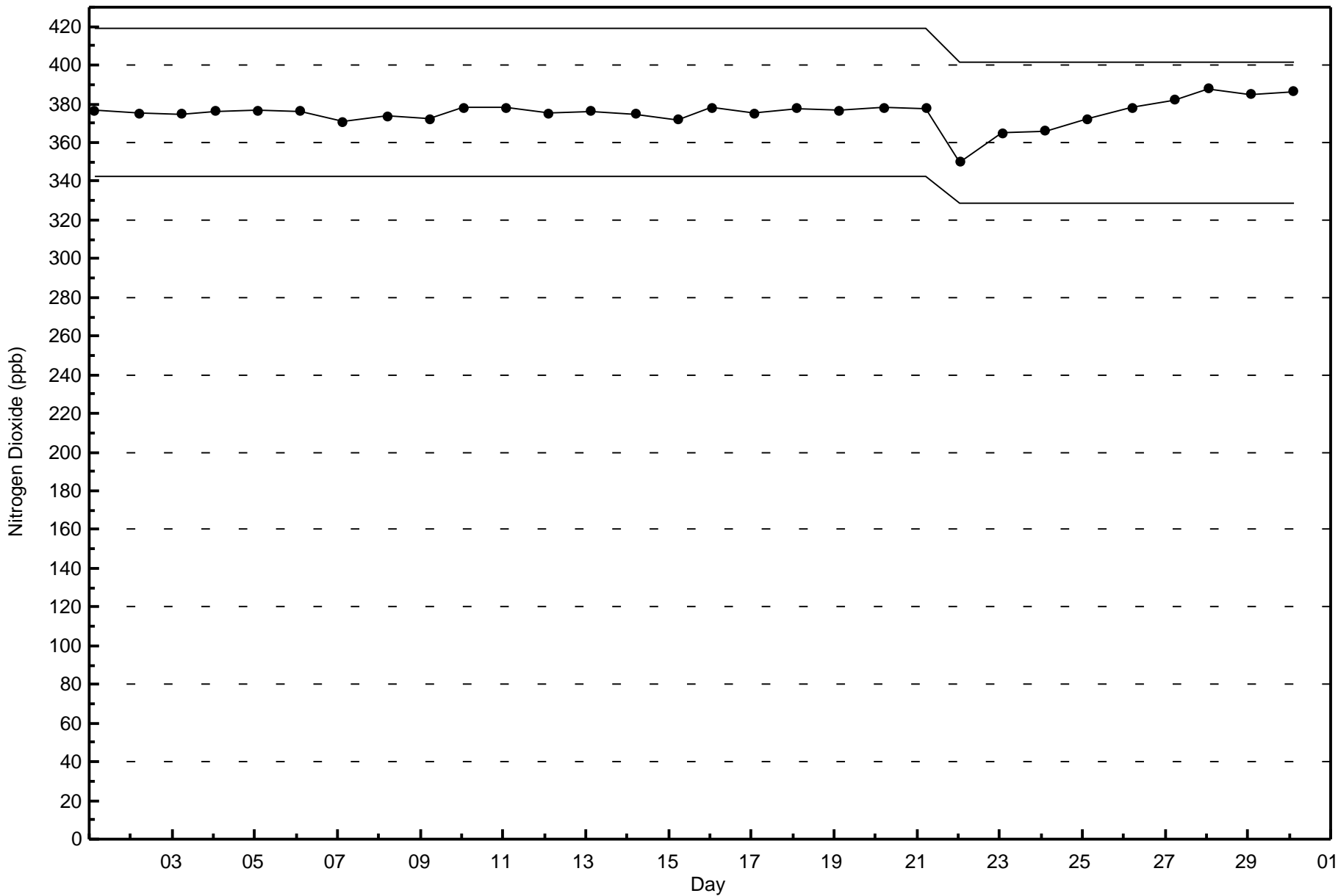


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Dioxide (NO₂) - ppb
Stony Mountain (AMS 18)









Wood Buffalo Environmental Association
Summary of Hour Averages

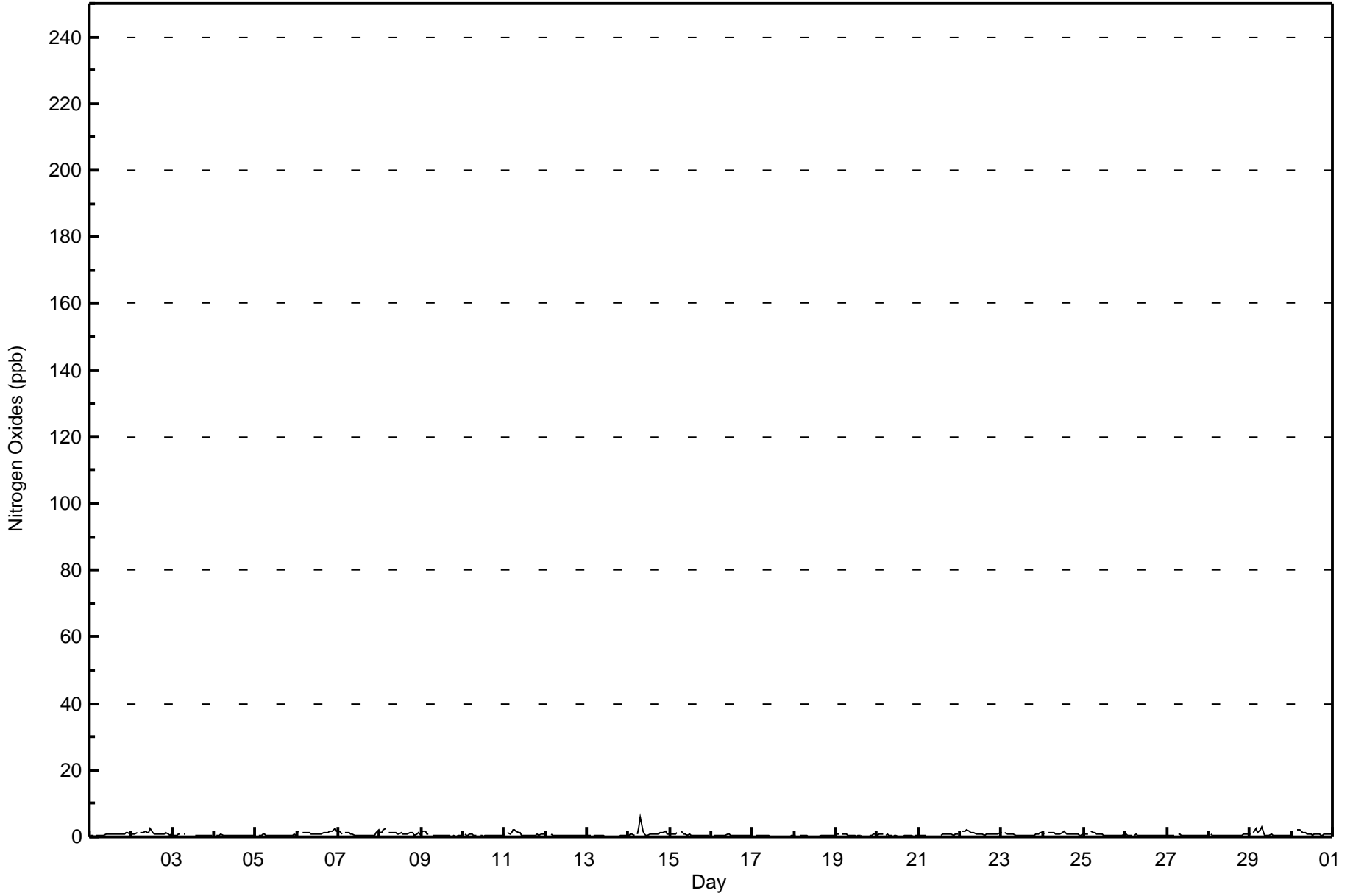
Nitrogen Oxides (NO_x) - ppb
Stony Mountain - June 2016

Maximum Value: 6 ppb on Jun 14 08:00																	Maximum Daily Average: 1.3 ppb on Jun 6							Hours in Service: 720																										
Minimum Value: 0 ppb on Jun 17 20:00																	Minimum Daily Average: 0.2 ppb on Jun 17							Hours of Data: 678																										
Maximum Diurnal Average: 1.0 ppb at hour 8																	Minimum Diurnal Average: 0.5 ppb at hour 15							Hours of Missing Data: 42																										
Monthly Average: 0.7 ppb																	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 2							Hours of Calibration: 36																										
																	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-Jun	0	0	1	Z	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1																								
2-Jun	1	1	1	1	Z	1	1	1	2	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1.1	3																								
3-Jun	1	1	1	1	1	Z	1	1	PF	PF	PF	PF	PF	0	0	0	0	0	0	0	0	0	0	0	0.5	1																								
4-Jun	Z	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																								
5-Jun	0	Z	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.4	1																								
6-Jun	1	2	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1.3	2																								
7-Jun	1	1	1	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0.8	2																								
8-Jun	1	1	2	3	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1.1	3																								
9-Jun	1	2	2	1	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2																								
10-Jun	Z	1	1	0	1	1	0	1	0	PF	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0.5	1																							
11-Jun	1	Z	1	1	1	2	2	2	1	1	1	0	1	0	0	0	1	0	0	1	1	1	1	1	0.9	2																								
12-Jun	1	1	Z	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1																								
13-Jun	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																								
14-Jun	1	1	1	1	Z	1	3	6	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1.2	6																								
15-Jun	1	1	1	1	1	Z	2	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	0	0.7	2																								
16-Jun	Z	0	0	0	1	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																								
17-Jun	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																								
18-Jun	0	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1																								
19-Jun	1	1	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.4	1																								
20-Jun	1	1	1	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																								
21-Jun	0	0	0	0	1	Z	1	C	C	C	C	C	C	1	1	1	1	1	1	1	1	1	1	1	--	1																								
22-Jun	Z	2	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																								
23-Jun	1	Z	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0.7	1																								
24-Jun	1	1	Z	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1.0	2																								
25-Jun	1	1	1	Z	2	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	0	0	1	0.7	2																								
26-Jun	1	0	1	1	Z	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.5	1																								
27-Jun	1	0	0	0	1	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.4	1																								
28-Jun	Z	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																								
29-Jun	1	Z	1	3	1	2	2	3	0	1	1	1	1	0	1	1	0	1	1	0	0	1	0	0	0.9	3																								
30-Jun	1	2	Z	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	2																								
																								0.8	0.9	0.8	1.0	0.9	0.9	1.0	1.0	0.7	0.6	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.7	0.7	Diurnal Average	
																								1	2	2	3	2	2	3	6	2	1	1	3	2	1	1	1	1	1	1	1	1	2	2	2	2	2	Diurnal Maximum
Z - zerospan																								C - Calibration				PF - Power Failure																						



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Stony Mountain - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Stony Mountain - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	678	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: 678

Total Number of Hours: 720



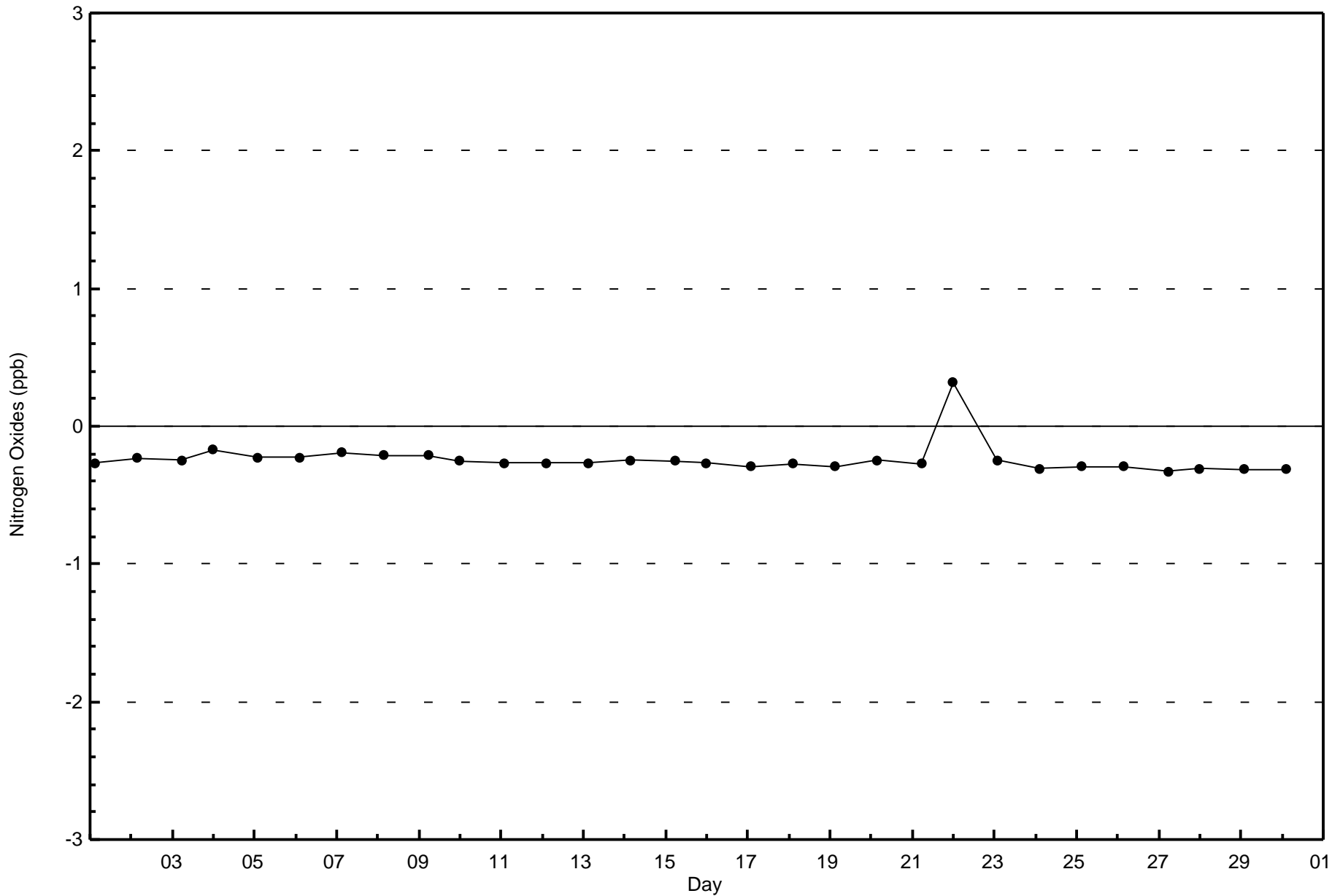
**Wood Buffalo Environmental Association
Frequency Distribution**

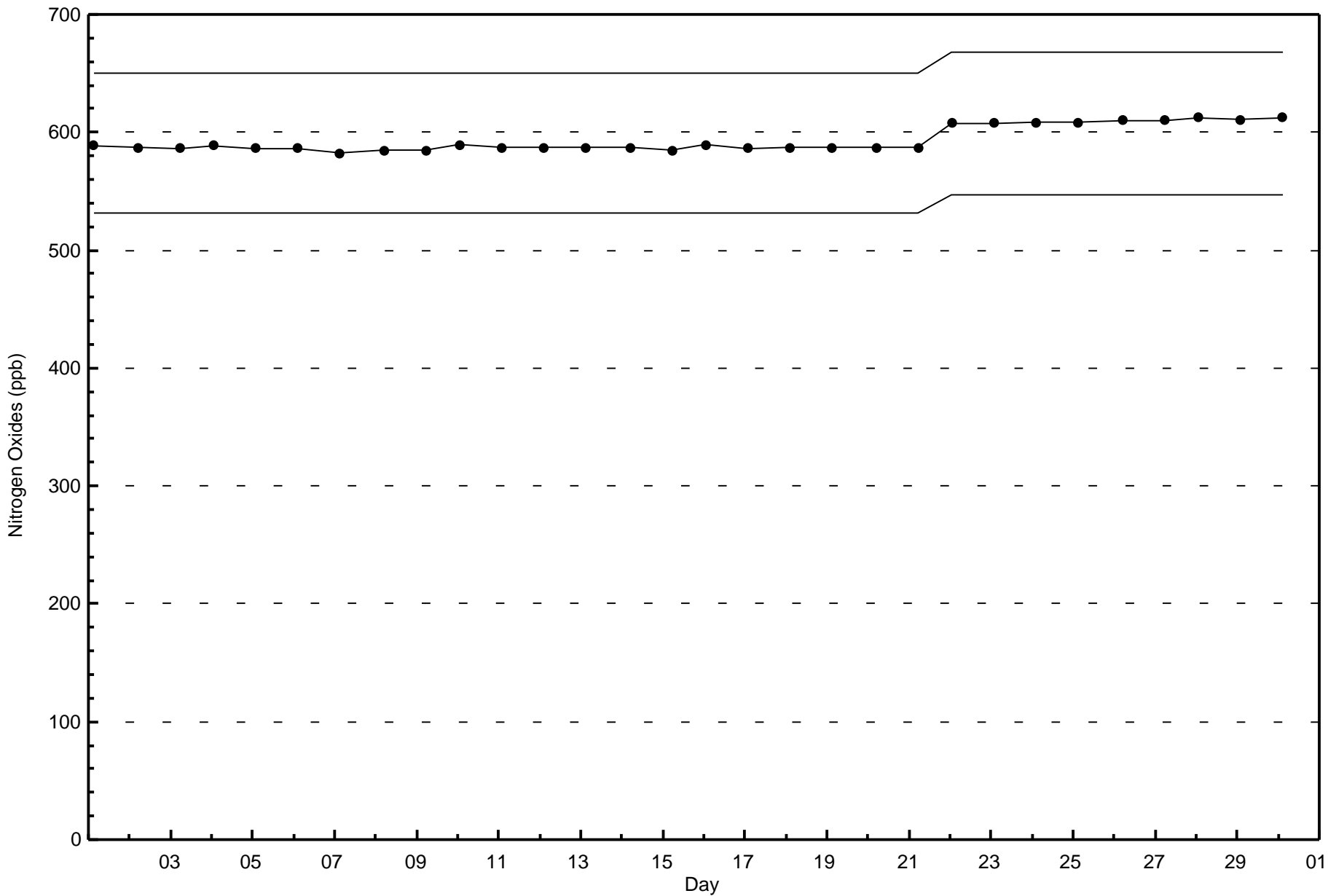
**Nitrogen Oxides (NO_x) - ppb
Stony Mountain - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	19	21	38	15	27	28	28	28	49	79	71	60	64	87	48	16	678
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
Totals	19	21	38	15	27	28	28	28	49	79	71	60	64	87	48	16	678

Total Number of Valid Hours: 678

Total Number of Hours: 720







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

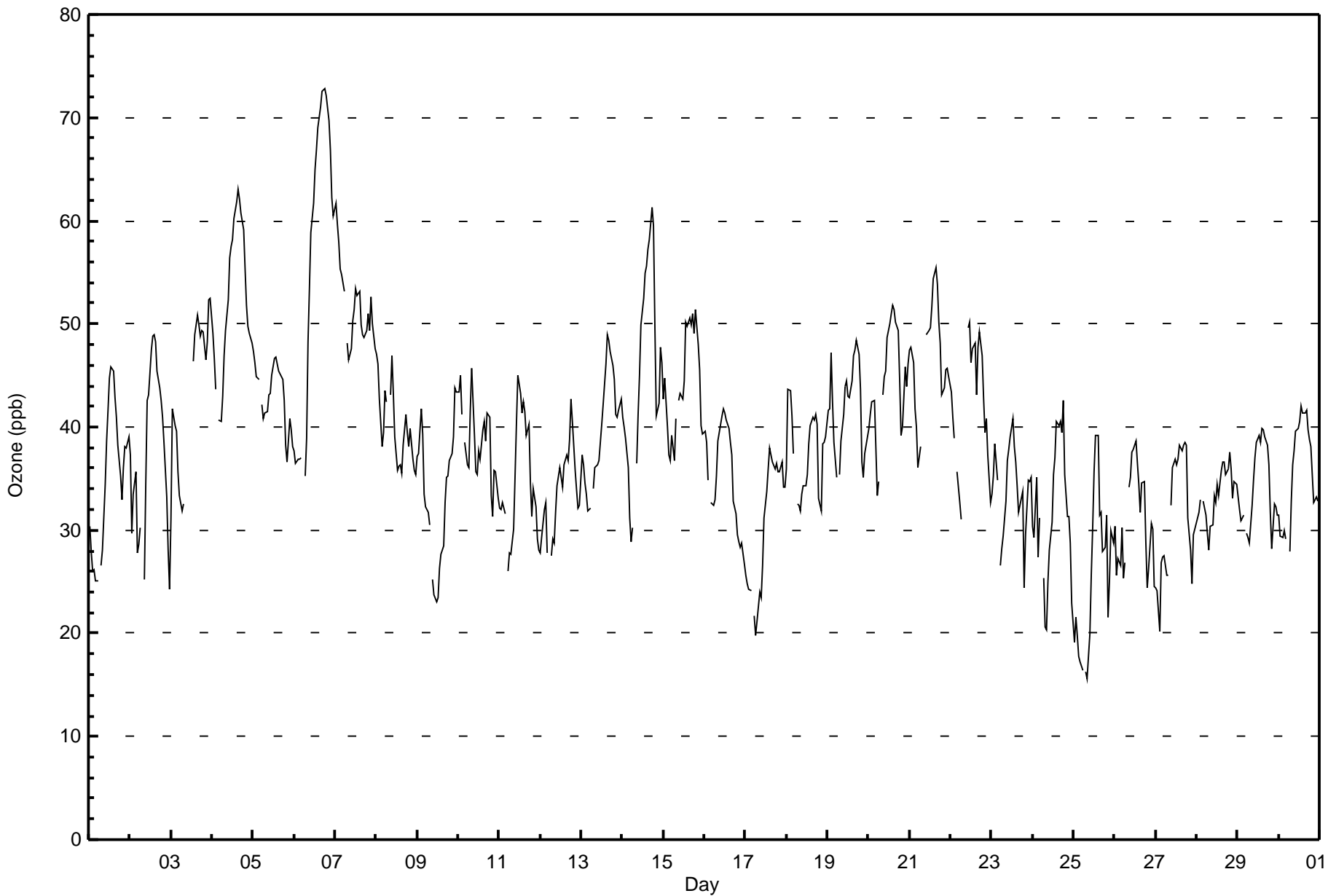
Stony Mountain - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0										Hours in Service: 720																																								
Maximum Value: 73 ppb on Jun 6 19:00										Maximum Daily Average: 56.7 ppb on Jun 6										Hours of Data: 681																														
Minimum Value: 16 ppb on Jun 25 09:00										Minimum Daily Average: 25.7 ppb on Jun 25										Hours of Missing Data: 39																														
Maximum Diurnal Average: 44.3 ppb at hour 15										Minimum Diurnal Average: 31.8 ppb at hour 7										Hours of Calibration: 31																														
Monthly Average: 38.7 ppb										Percentiles: P ₁ = 20 P ₁₀ = 28 Q ₁ = 33 Median = 38 Q ₃ = 44 P ₉₀ = 50 P ₉₉ = 69										Percent Operational Time: 98.9																														
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-Jun	30	28	26	26	25	25	Z	27	28	34	39	42	45	46	45	43	41	38	35	33	36	38	38	39	35.1	46																								
2-Jun	37	30	34	36	28	29	30	Z	25	35	43	43	47	49	49	48	45	44	43	41	39	33	28	24	37.3	49																								
3-Jun	31	42	40	40	36	33	32	33	PF	PF	PF	PF	PF	46	49	51	50	49	49	49	47	48	52	53	43.6	53																								
4-Jun	49	47	44	Z	41	41	43	47	49	52	56	57	58	60	62	63	62	61	59	55	52	50	49	48	52.4	63																								
5-Jun	47	46	45	45	Z	42	41	41	42	43	43	45	47	47	46	45	45	45	43	38	37	41	40	38	43.1	47																								
6-Jun	38	37	37	37	37	Z	35	39	48	53	59	62	65	67	69	71	73	73	73	72	70	67	62	60	56.7	73																								
7-Jun	62	60	58	55	55	53	Z	48	46	48	50	51	53	53	53	50	49	49	49	51	49	53	50	48	51.9	62																								
8-Jun	47	46	43	38	39	44	42	Z	43	47	43	39	36	36	36	36	38	41	39	38	40	37	36	35	40.0	47																								
9-Jun	37	37	42	39	34	32	32	31	Z	25	24	23	24	26	28	28	33	35	35	37	37	39	44	43	33.3	44																								
10-Jun	43	45	41	Z	39	36	36	42	46	39	36	35	38	37	40	41	39	41	41	33	31	36	36	33	38.4	46																								
11-Jun	32	32	33	32	Z	26	28	28	30	35	40	45	43	41	42	41	39	40	35	31	34	32	29	28	34.7	45																								
12-Jun	28	29	32	33	28	Z	28	29	29	32	34	36	35	34	36	37	37	39	43	40	36	34	32	32	33.6	43																								
13-Jun	37	36	35	33	32	32	Z	34	36	36	37	39	40	42	46	49	48	47	46	45	41	41	42	43	39.9	49																								
14-Jun	41	40	39	36	31	29	30	Z	37	41	45	50	52	55	56	57	58	61	59	50	41	42	48	46	45.4	61																								
15-Jun	43	45	40	37	37	39	37	41	Z	43	43	43	45	50	50	51	50	51	49	51	48	46	40	39	44.2	51																								
16-Jun	40	39	35	Z	33	32	33	35	39	40	41	42	41	41	40	39	37	33	32	30	29	28	29	27	35.3	42																								
17-Jun	26	25	24	24	Z	22	20	21	24	23	27	31	34	36	38	37	37	36	37	36	36	37	34	34	30.3	38																								
18-Jun	36	44	43	41	37	Z	33	32	32	33	34	34	35	38	40	41	41	41	40	33	32	38	39	39	37.3	44																								
19-Jun	42	42	47	42	39	35	Z	35	39	41	44	44	43	43	44	47	47	48	47	44	37	35	37	39	41.8	48																								
20-Jun	40	41	42	43	38	33	35	Z	43	45	45	49	50	51	52	51	50	49	45	39	40	46	44	46	44.2	52																								
21-Jun	47	48	46	42	40	36	38	M	M	M	49	49	50	52	54	55	54	50	48	43	44	46	46	45	46.8	55																								
22-Jun	43	41	39	Z	36	33	31	C	C	C	50	50	46	48	48	43	48	49	47	43	39	41	37	33	42.2	50																								
23-Jun	33	35	38	35	Z	27	28	29	33	37	38	39	41	38	37	34	32	33	34	24	30	35	35	35	33.9	41																								
24-Jun	30	29	35	27	31	Z	25	21	20	25	28	31	35	37	41	40	41	39	43	35	31	31	29	23	31.7	43																								
25-Jun	19	22	20	18	17	16	Z	16	16	20	26	30	36	39	39	31	32	28	28	31	22	25	30	29	25.7	39																								
26-Jun	30	26	27	27	30	25	27	Z	34	35	38	38	39	36	34	32	35	35	29	24	26	31	30	25	31.0	39																								
27-Jun	24	24	20	27	27	28	26	26	Z	32	36	37	36	37	38	38	38	38	38	31	28	25	30	30	31.1	38																								
28-Jun	31	32	33	Z	33	31	30	28	30	30	33	33	34	33	36	37	37	35	36	38	36	33	35	34	33.4	38																								
29-Jun	33	32	31	31	Z	30	29	29	32	35	37	39	39	38	40	40	39	38	36	32	28	33	32	31	34.1	40																								
30-Jun	31	29	29	30	29	Z	28	33	36	38	40	40	41	42	41	41	42	40	39	38	33	33	33	33	35.6	42																								
																								37.0	36.9	36.6	34.9	34.0	32.4	31.8	32.3	34.9	37.0	39.9	41.2	42.4	43.3	44.3	43.9	43.8	43.6	42.6	39.6	37.6	38.4	38.2	37.1	Diurnal Average		
																								62	60	58	55	55	53	43	48	49	53	59	62	65	67	69	71	73	73	73	73	72	70	67	62	60	Diurnal Maximum	
Z - zerospan C - Calibration M - Maintenance PF - Power Failure																																																		
Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb																																																		



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Stony Mountain - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Ozone (O₃) - ppb
Stony Mountain - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	11	1.62	1.62
21 - 50	611	89.72	91.34
51 - 82	59	8.66	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 681

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ozone (O₃) - ppb
Stony Mountain - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals	
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW		
0 - 20	1	1	0	0	0	0	0	0	0	0	0	1	1	0	2	3	2	11
21 - 50	15	20	38	14	27	27	28	19	34	73	70	56	59	73	44	14	611	
51 - 82	1	0	0	1	0	1	1	11	14	4	3	2	5	15	1	0	59	
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Totals	17	21	38	15	27	28	29	30	48	77	74	59	64	90	48	16	681	

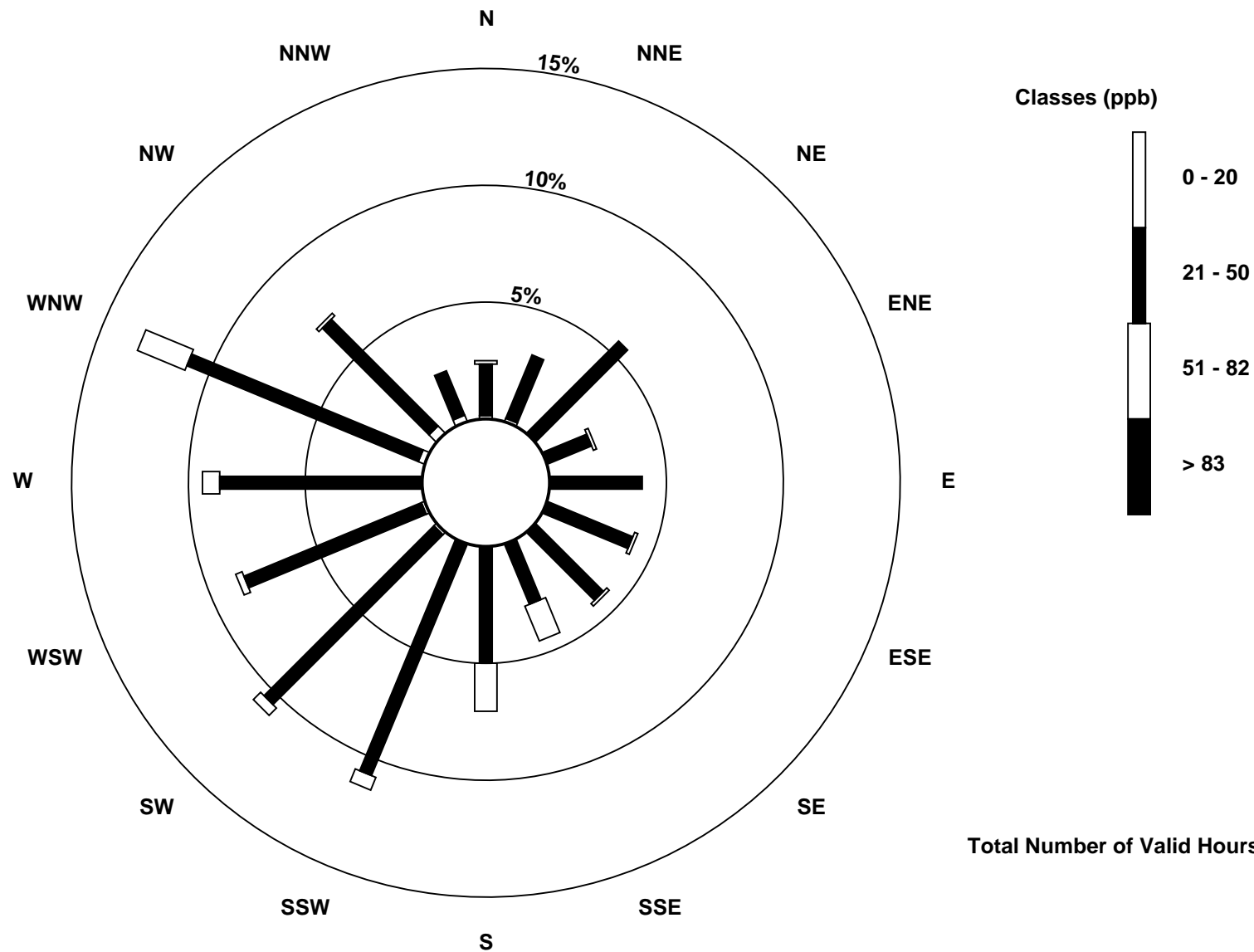
Total Number of Valid Hours: 681

Total Number of Hours: 720

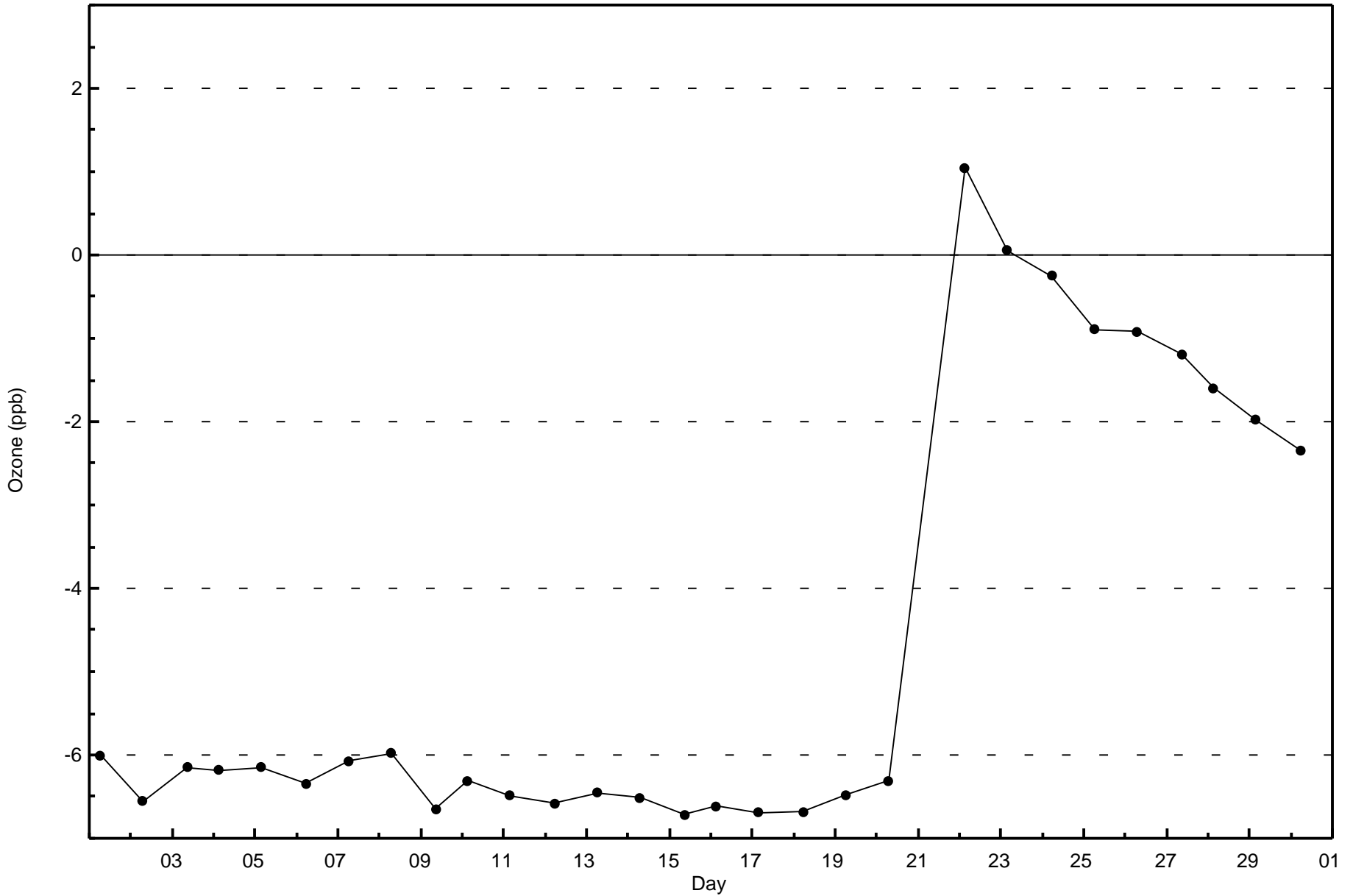


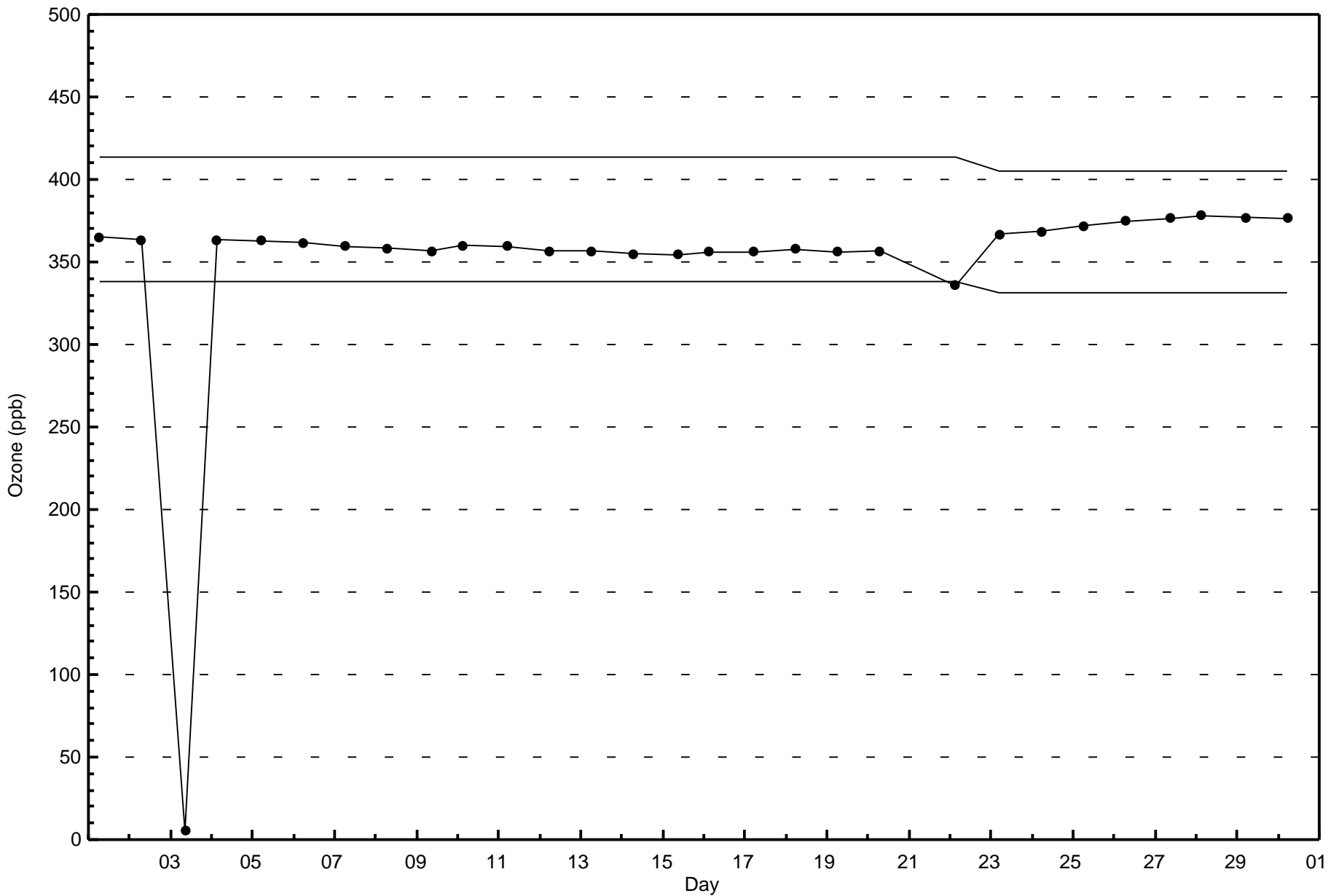
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Ozone (O₃) - ppb
Stony Mountain (AMS 18)



Total Number of Valid Hours: 681







Number of Exceedences (AAAQO):	24-hr: 0	Hours in Service:	720
Maximum Value: 36.3 µg/m ³ on Jun 29 05:00	Maximum Daily Average: 15.6 µg/m ³ on Jun 8	Hours of Data:	713
Minimum Value: 1.1 µg/m ³ on Jun 5 10:00	Minimum Daily Average: 2.0 µg/m ³ on Jun 16	Hours of Missing Data:	7
Maximum Diurnal Average: 5.5 µg/m ³ at hour 5	Minimum Diurnal Average: 3.9 µg/m ³ at hour 22	Hours of Calibration:	3
Monthly Average: 4.55 µg/m ³	Percentiles: P ₁ = 1.4 P ₁₀ = 1.9 Q ₁ = 2.3 Median = 3.5 Q ₃ = 5.3 P ₉₀ = 7.3 P ₉₉ = 24.9	Percent Operational Time:	99.4

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-Jun	1.6	1.7	1.7	1.8	1.8	1.9	2.1	2.3	2.5	2.5	2.4	2.3	3.2	3.7	4.7	6.2	5.0	3.6	4.5	4.4	3.5	2.5	2.0	1.9	2.9	6.2
2-Jun	1.9	1.8	1.9	2.0	2.0	2.1	2.4	2.4	2.3	3.0	3.4	4.5	5.4	6.2	6.6	6.8	8.2	7.2	6.6	5.2	3.8	2.8	2.6	2.6	3.9	8.2
3-Jun	3.6	4.4	4.2	3.9	3.8	3.4	3.0	2.7	PF	PF	PF	PF	4.0	3.9	3.9	3.9	4.0	4.1	4.0	4.1	4.2	4.3	4.7	5.0	4.0	5.0
4-Jun	4.9	4.8	4.8	4.5	4.6	5.0	5.5	6.4	6.5	6.5	5.1	4.1	4.8	5.0	5.4	6.0	6.1	5.4	4.9	4.3	3.8	3.2	2.4	1.7	4.8	6.5
5-Jun	1.5	1.5	1.5	1.6	1.8	1.8	1.6	1.4	1.3	1.1	1.2	2.1	2.9	3.1	3.5	3.5	3.4	3.6	3.5	3.9	4.3	3.4	2.4	2.6	2.4	4.3
6-Jun	2.7	2.9	3.0	3.1	3.2	3.2	3.3	3.3	3.3	3.3	5.0	6.7	8.2	8.8	9.0	9.1	9.3	8.9	8.9	8.8	7.7	7.0	6.7	6.6	5.9	9.3
7-Jun	6.8	6.4	6.2	6.4	6.1	5.6	4.7	4.0	4.0	4.3	5.4	6.5	5.7	5.4	5.2	5.6	5.8	5.7	5.5	5.5	5.6	5.6	9.0	25.5	6.5	25.5
8-Jun	14.9	8.5	7.4	16.3	24.1	22.0	24.1	26.6	21.3	20.4	15.2	9.4	13.6	14.9	18.6	23.3	14.2	19.3	19.3	12.9	8.2	7.0	6.6	6.7	15.6	26.6
9-Jun	7.7	6.4	5.3	5.7	6.3	5.6	3.5	3.6	3.3	3.1	2.7	2.2	2.2	2.0	1.9	1.7	1.7	1.7	1.5	1.4	1.4	1.4	1.4	1.4	3.1	7.7
10-Jun	1.6	1.9	1.9	2.1	2.3	2.2	2.3	2.0	1.9	2.2	2.7	3.5	3.8	4.4	4.2	4.7	5.5	4.9	4.9	6.3	7.2	7.2	5.8	4.0	3.7	7.2
11-Jun	3.6	3.4	3.0	3.0	3.1	3.4	3.4	3.2	3.4	2.8	2.2	2.6	2.8	2.6	2.6	2.9	3.0	2.7	2.7	2.6	2.1	2.0	1.9	2.0	2.8	3.6
12-Jun	2.6	3.4	3.5	3.5	3.4	3.3	3.2	2.6	2.3	2.5	2.3	2.4	2.9	2.9	2.7	3.0	4.0	4.4	4.1	3.5	3.5	3.1	2.8	2.6	3.1	4.4
13-Jun	3.0	3.2	2.9	2.5	2.2	1.8	1.7	1.6	1.7	1.8	2.1	2.8	3.3	4.1	4.3	4.1	4.2	4.4	3.9	3.9	4.1	3.2	2.1	1.9	3.0	4.4
14-Jun	1.9	1.9	2.0	2.1	2.2	2.2	2.2	2.3	2.3	2.0	2.4	3.5	4.7	5.3	5.7	5.8	5.8	6.2	6.7	7.1	6.1	4.4	2.5	2.3	3.7	7.1
15-Jun	2.7	3.5	3.5	3.5	3.0	3.1	3.2	2.6	2.1	1.8	1.7	1.7	1.6	1.6	1.5	1.5	1.4	1.6	2.1	2.1	2.0	1.8	1.8	1.7	2.2	3.5
16-Jun	1.7	1.8	1.9	1.9	1.9	1.8	1.8	1.7	1.7	1.7	1.7	1.6	1.7	2.1	2.5	2.9	3.2	2.9	2.1	2.0	2.1	2.1	2.1	2.3	2.0	3.2
17-Jun	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.3	2.2	2.1	2.1	2.2	2.3	2.6	2.4	2.8	2.5	2.2	2.3	2.3	2.8
18-Jun	2.3	2.7	2.8	2.6	2.7	2.7	2.1	2.0	2.0	1.9	1.9	2.3	2.4	2.0	2.1	2.8	3.7	4.2	4.8	5.5	5.7	4.7	3.4	2.9	3.0	5.7
19-Jun	2.4	2.1	1.9	2.0	2.0	2.1	2.1	1.9	1.8	1.7	1.7	2.1	2.6	3.2	3.8	3.5	3.2	3.0	2.7	2.7	3.1	3.1	2.3	2.3	2.5	3.8
20-Jun	2.4	2.4	2.5	2.5	2.4	2.1	2.0	1.8	1.7	2.0	3.0	4.3	4.7	5.0	5.1	4.8	4.8	5.0	5.0	5.0	5.4	4.4	3.2	2.3	3.5	5.4
21-Jun	2.3	2.4	2.0	2.4	2.4	2.4	2.2	2.1	1.9	2.2	3.3	3.2	2.5	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.7	3.3	3.9	3.5	2.5	3.9
22-Jun	4.2	4.7	4.8	5.4	5.3	5.2	5.5	C	C	C	2.2	2.9	4.1	3.8	3.4	4.0	4.3	4.6	3.4	3.7	3.6	4.4	6.1	5.3	4.3	6.1
23-Jun	5.5	8.1	6.8	5.5	5.3	5.7	4.1	3.2	3.9	3.9	3.7	3.9	3.3	3.6	5.0	2.3	1.5	2.8	3.8	4.8	4.0	5.0	9.7	10.7	4.8	10.7
24-Jun	8.2	9.9	10.0	10.4	9.1	9.5	7.4	7.2	9.0	7.6	8.9	8.8	7.9	7.0	6.6	6.4	4.5	5.8	3.5	3.3	2.8	3.8	5.0	3.7	6.9	10.4
25-Jun	5.3	5.9	8.3	12.9	9.8	10.7	11.5	10.4	8.0	5.8	5.7	4.7	3.1	2.5	2.7	3.3	1.8	3.4	4.7	4.6	5.0	3.5	4.1	4.5	5.9	12.9
26-Jun	4.4	3.5	3.6	5.4	7.1	5.8	4.1	4.4	4.6	6.6	7.1	6.8	7.4	7.3	6.0	5.6	5.3	5.2	5.6	4.9	5.1	6.4	7.3	4.3	5.6	7.4
27-Jun	2.8	4.0	4.0	2.0	2.3	2.3	2.1	1.5	1.1	1.6	1.9	2.2	2.5	2.6	2.3	2.4	2.0	2.2	2.5	3.1	2.5	2.1	2.7	4.6	2.5	4.6
28-Jun	5.3	5.6	4.9	5.0	4.7	3.8	3.6	2.6	2.4	3.5	3.7	4.5	3.5	3.6	2.7	2.5	2.7	2.5	2.7	3.5	6.1	6.1	5.2	18.3	4.5	18.3
29-Jun	22.6	31.4	36.2	36.1	36.3	31.3	23.3	15.4	10.0	9.1	5.9	6.0	6.6	5.4	5.1	4.8	4.6	4.5	4.2	3.7	4.1	4.4	4.8	4.3	13.3	36.3
30-Jun	4.1	4.6	3.6	2.9	2.7	2.6	2.2	3.6	4.2	5.6	7.1	7.8	7.7	8.0	8.1	7.3	6.5	6.1	5.3	4.9	4.3	3.1	3.8	4.2	5.0	8.1

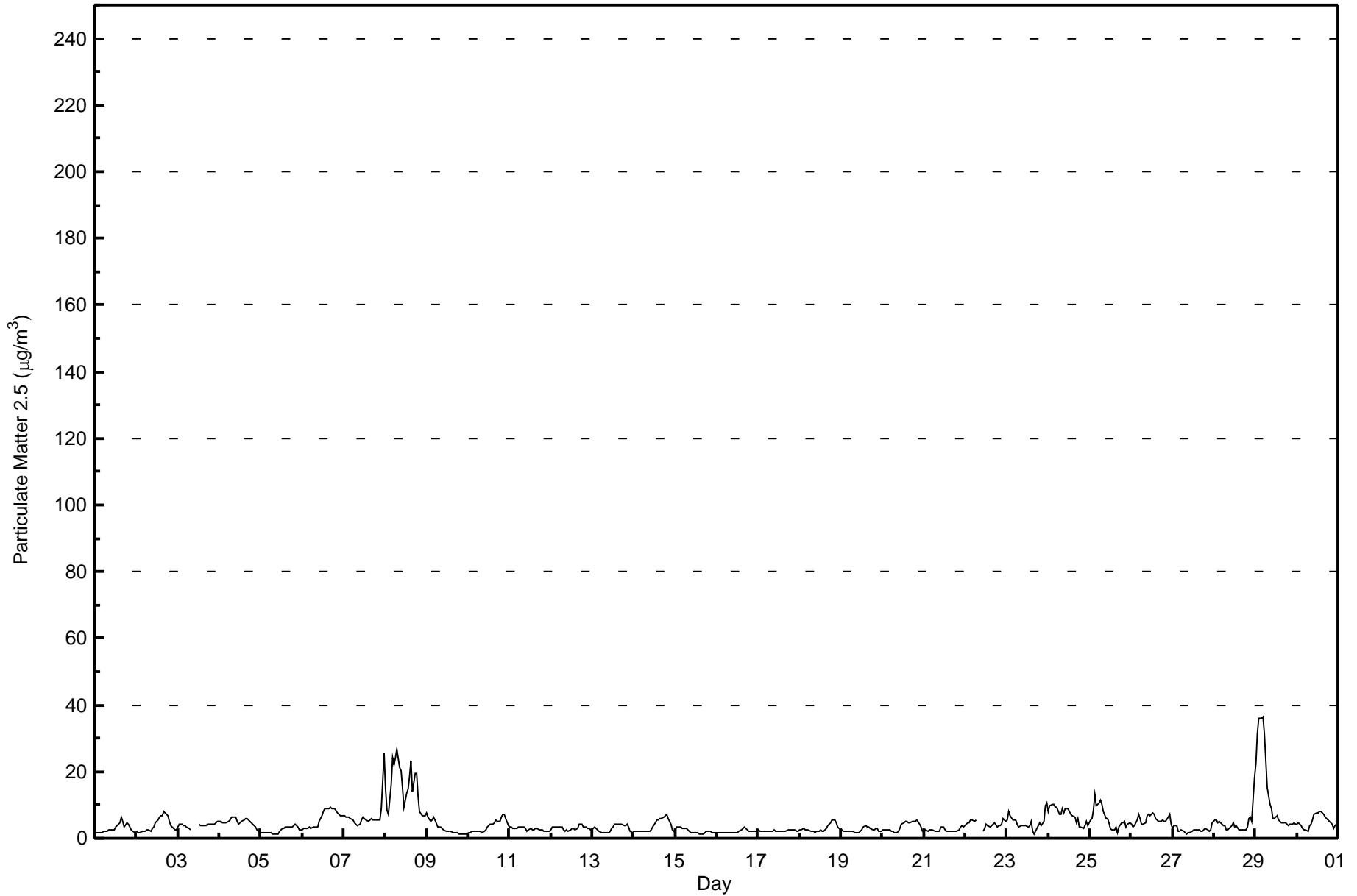
4.6	4.9	4.9	5.4	5.5	5.2	4.7	4.4	4.0	4.0	3.9	4.1	4.4	4.5	4.6	4.8	4.5	4.7	4.6	4.4	4.2	3.9	4.0	4.8	Diurnal Average	
22.6	31.4	36.2	36.1	36.3	31.3	24.1	26.6	21.3	20.4	15.2	9.4	13.6	14.9	18.6	23.3	14.2	19.3	19.3	12.9	8.2	7.2	9.7	25.5	Diurnal Maximum	

C - Calibration PF - Power Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m³



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Stony Mountain - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Stony Mountain - June 2016

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	557	78.12	78.12
6 - 15	136	19.07	97.19
16 - 25	13	1.82	99.02
26 - 80	7	0.98	100.00
> 81.0	0	0.00	100.00

Total Number of Valid Hours: 713

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Stony Mountain - June 2016

Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	15	15	22	7	16	17	26	17	37	70	69	59	55	74	44	14	557
6 - 15	4	5	6	6	9	11	3	13	14	13	10	3	12	18	5	4	136
16 - 25	0	2	7	1	2	1	0	0	0	0	0	0	0	0	0	0	13
26 - 80	0	0	5	1	1	0	0	0	0	0	0	0	0	0	0	0	7
> 81.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	19	22	40	15	28	29	29	30	51	83	79	62	67	92	49	18	713

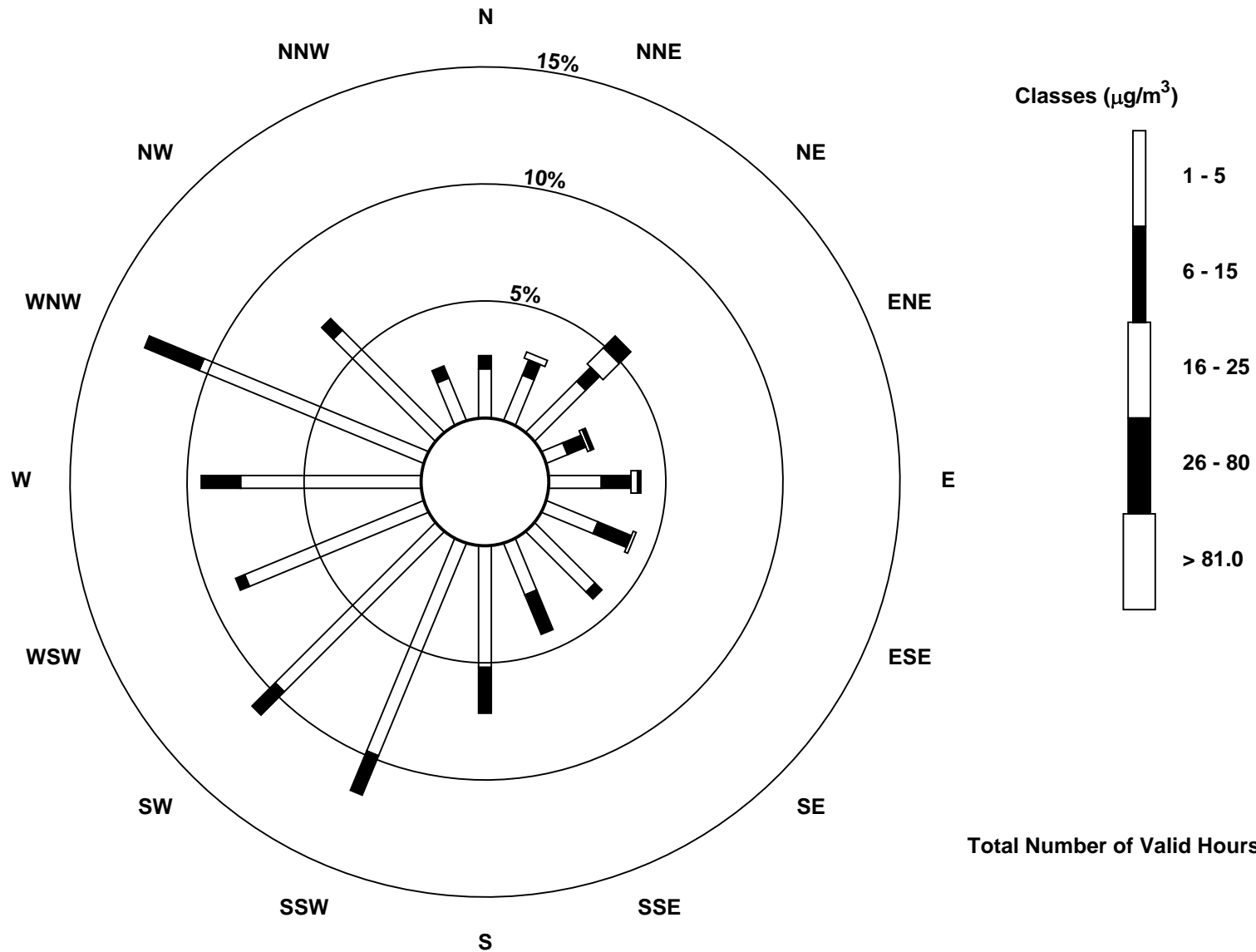
Total Number of Valid Hours: 713

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Stony Mountain (AMS 18)



Total Number of Valid Hours: 713

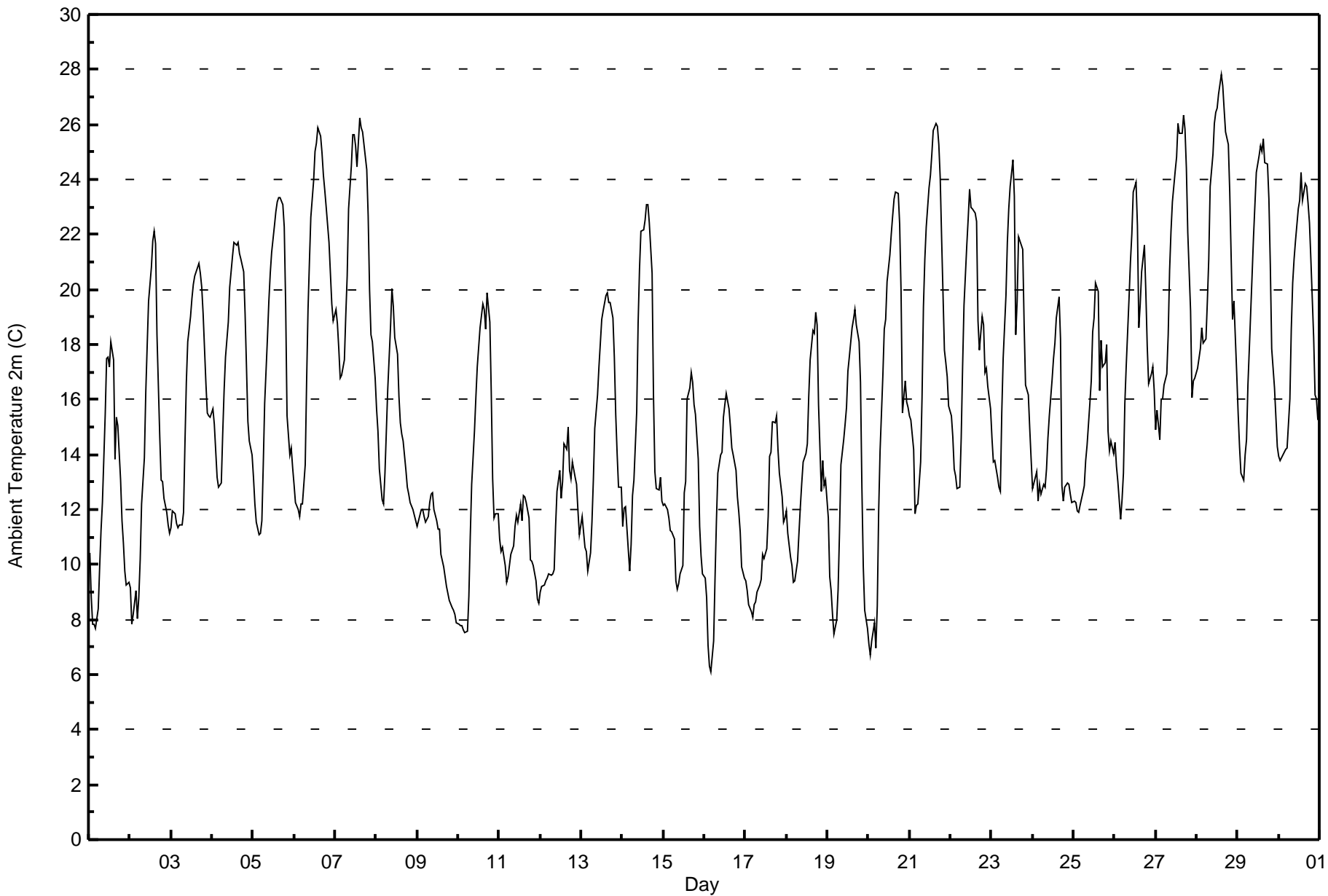


Maximum Value: 27.8 C on Jun 28 15:00		Maximum Daily Average: 22.3 C on Jun 28		Hours in Service: 720																																												
Minimum Value: 6.1 C on Jun 16 05:00		Minimum Daily Average: 10.6 C on Jun 9		Hours of Data: 720																																												
Maximum Diurnal Average: 20.1 C at hour 15		Minimum Diurnal Average: 11.2 C at hour 5		Hours of Missing Data: 0																																												
Monthly Average: 15.77 C		Percentiles: P ₁ = 7.1 P ₁₀ = 9.5 Q ₁ = 12.0 Median = 15.1 Q ₃ = 19.4 P ₉₀ = 23.2 P ₉₉ = 26.3		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-Jun	10.4	8.8	7.8	7.8	7.7	8.4	9.9	11.2	12.3	15.4	17.5	17.5	17.2	18.1	17.4	13.8	15.3	15.1	13.0	11.6	10.8	9.8	9.2	9.4	12.3	18.1																						
2-Jun	9.2	7.9	8.2	9.0	8.0	8.8	10.2	12.2	13.9	16.3	17.9	19.6	20.8	21.8	22.1	21.6	18.4	14.6	13.1	13.0	12.4	11.9	11.4	11.1	13.9	22.1																						
3-Jun	11.3	12.0	11.9	11.5	11.3	11.4	11.4	11.9	14.4	16.6	18.1	19.0	19.7	20.2	20.5	20.8	21.0	20.6	20.1	19.1	16.6	15.5	15.4	15.4	16.1	21.0																						
4-Jun	15.6	15.1	14.1	13.2	12.8	13.0	14.7	16.3	17.5	18.8	20.1	20.6	21.2	21.7	21.6	21.7	21.3	21.1	20.7	19.1	17.2	15.2	14.5	14.0	17.6	21.7																						
5-Jun	13.2	12.2	11.5	11.1	11.1	11.6	13.6	15.9	18.3	19.6	20.6	21.3	22.3	22.8	23.2	23.3	23.3	23.1	22.3	19.5	15.4	14.0	14.2	13.5	17.4	23.3																						
6-Jun	12.9	12.3	12.0	11.7	12.2	12.2	13.6	16.7	19.3	21.0	22.6	23.9	25.0	25.3	25.9	25.6	24.9	24.1	23.6	23.0	21.7	20.6	19.5	18.8	19.5	25.9																						
7-Jun	19.2	18.8	17.8	16.8	16.9	17.4	19.1	20.5	22.9	24.5	25.6	25.6	25.2	24.5	26.2	25.9	25.7	25.3	24.3	22.7	20.0	18.4	18.1	16.8	21.6	26.2																						
8-Jun	15.7	14.9	13.5	12.4	12.2	13.3	14.9	16.3	18.7	20.1	19.4	18.3	17.6	16.1	15.2	14.8	14.5	13.4	12.8	12.6	12.2	12.0	11.8	11.6	14.8	20.1																						
9-Jun	11.4	11.6	12.0	12.0	11.8	11.5	11.8	12.2	12.5	12.6	12.0	11.6	11.3	11.3	10.4	9.9	9.6	9.2	9.0	8.7	8.4	8.3	8.2	7.9	10.6	12.6																						
10-Jun	7.8	7.8	7.8	7.6	7.5	7.6	8.8	11.0	12.9	14.9	16.1	17.2	17.9	18.6	19.5	19.2	18.6	19.9	18.8	16.3	13.1	11.7	11.9	11.9	13.5	19.9																						
11-Jun	11.0	10.5	10.6	10.0	9.3	9.6	10.0	10.4	10.7	11.4	11.8	11.5	12.2	11.6	12.5	12.4	12.3	11.7	10.2	10.1	10.0	9.4	8.7	8.6	10.7	12.5																						
12-Jun	9.0	9.2	9.3	9.4	9.5	9.7	9.6	9.7	9.8	11.4	12.6	13.4	12.4	13.0	14.4	14.2	15.0	13.4	13.1	13.7	13.2	12.9	11.9	11.1	11.7	15.0																						
13-Jun	11.8	11.2	10.6	10.5	9.8	10.4	11.5	13.1	14.9	16.2	17.2	18.1	18.9	19.2	19.8	19.9	19.5	19.5	19.0	17.6	15.4	14.0	12.8	12.8	15.2	19.9																						
14-Jun	11.4	12.0	12.1	10.5	9.8	10.8	12.5	13.1	15.5	18.8	20.7	22.1	22.2	22.5	23.1	23.1	22.4	20.6	16.1	13.4	12.8	12.7	13.2	12.3	16.0	23.1																						
15-Jun	12.2	12.2	12.0	11.7	11.3	11.2	10.9	9.4	9.1	9.3	9.7	10.0	12.6	13.0	16.0	16.4	17.0	16.6	15.8	15.5	13.8	11.4	10.3	9.7	12.4	17.0																						
16-Jun	9.5	8.8	7.1	6.3	6.1	7.2	9.5	11.6	13.3	14.0	14.1	15.4	15.8	16.2	15.7	15.0	14.3	14.0	13.4	12.5	11.9	11.2	9.9	9.5	11.8	16.2																						
17-Jun	9.4	9.1	8.5	8.3	8.1	8.5	8.7	9.0	9.3	9.4	10.4	10.2	10.6	11.7	14.0	14.1	15.2	15.1	15.4	14.2	13.3	12.4	11.5	11.7	11.2	15.4																						
18-Jun	12.0	11.1	10.3	10.0	9.4	9.4	10.1	11.1	12.1	13.0	13.7	14.0	14.4	16.1	17.4	18.5	18.4	19.2	18.7	15.8	12.7	13.8	12.9	13.1	13.6	19.2																						
19-Jun	11.7	9.6	9.1	8.2	7.5	8.0	9.1	11.2	13.6	14.6	15.1	15.7	17.0	17.6	18.6	18.9	19.3	18.7	18.1	16.6	12.8	9.9	8.3	7.7	13.2	19.3																						
20-Jun	7.1	6.7	7.2	7.9	7.0	8.5	11.9	14.2	16.9	18.5	18.9	20.3	21.3	22.0	22.7	23.3	23.5	23.5	22.4	20.0	15.5	16.7	15.9	15.7	16.1	23.5																						
21-Jun	15.4	15.2	14.2	11.9	12.1	12.2	13.7	16.1	19.4	21.1	22.3	23.7	24.1	24.9	25.8	26.0	25.9	25.3	24.1	21.8	17.8	17.4	16.8	15.7	19.3	26.0																						
22-Jun	15.4	14.6	13.5	13.2	12.8	12.8	14.6	17.2	19.4	21.6	22.6	23.6	23.0	22.9	22.8	22.5	18.9	17.8	19.0	18.7	17.0	17.1	16.5	15.6	18.1	23.6																						
23-Jun	14.6	13.7	13.8	13.2	12.8	12.7	15.5	17.5	19.8	21.7	22.9	23.7	24.7	23.4	18.3	19.6	21.9	21.6	21.5	18.7	16.5	16.2	15.0	13.9	18.0	24.7																						
24-Jun	12.8	13.0	13.4	12.3	12.9	12.6	12.9	12.8	13.5	14.6	15.4	16.7	17.5	18.1	19.0	19.7	18.2	12.8	12.3	12.8	12.9	12.9	12.6	12.2	14.3	19.7																						
25-Jun	12.3	12.3	11.9	11.9	12.2	12.6	12.9	13.8	14.3	15.9	16.7	18.4	19.0	20.2	20.0	16.3	18.1	17.2	17.3	18.0	14.9	14.1	14.5	14.0	15.4	20.2																						
26-Jun	14.5	13.6	13.0	11.6	12.4	13.3	15.9	17.2	19.7	21.0	22.0	23.5	23.9	22.3	18.6	19.5	20.6	21.6	19.9	17.9	16.6	16.9	17.2	16.3	17.9	23.9																						
27-Jun	14.9	15.6	14.5	16.0	16.0	16.5	16.9	18.4	20.7	22.1	23.2	24.3	24.8	26.0	25.7	25.7	26.4	25.8	24.4	22.1	19.2	16.1	16.7	16.8	20.4	26.4																						
28-Jun	17.1	17.5	17.8	18.6	18.1	18.2	19.6	21.1	23.8	24.9	26.1	26.4	26.6	27.1	27.8	27.4	26.5	25.7	25.3	23.5	21.2	18.9	19.6	17.0	22.3	27.8																						
29-Jun	15.5	14.3	13.3	13.1	14.0	14.5	16.5	17.9	20.5	21.9	23.1	24.3	24.9	25.2	25.0	25.5	24.6	24.5	23.3	20.9	17.8	16.4	15.4	14.3	19.5	25.5																						
30-Jun	13.9	13.8	14.0	14.1	14.2	14.2	16.0	18.6	20.2	21.1	21.8	22.9	23.2	24.3	23.2	23.8	23.7	23.2	22.4	21.1	18.3	16.1	16.0	15.3	19.0	24.3																						
																								12.6	12.2	11.8	11.4	11.2	11.6	12.9	14.3	16.0	17.4	18.3	19.1	19.6	19.9	20.1	19.9	19.8	19.1	18.3	17.0	15.1	14.1	13.7	13.1	Diurnal Average
																								19.2	18.8	17.8	18.6	18.1	18.2	19.6	21.1	23.8	24.9	26.1	26.4	26.6	27.1	27.8	27.4	26.5	25.8	25.3	23.5	21.7	20.6	19.6	18.8	Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature 2m (AT 2m) - C
Stony Mountain - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature 2m (AT 2m) - C
Stony Mountain - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	93	12.92	12.92
10 - 20	472	65.56	78.47
> 20	155	21.53	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



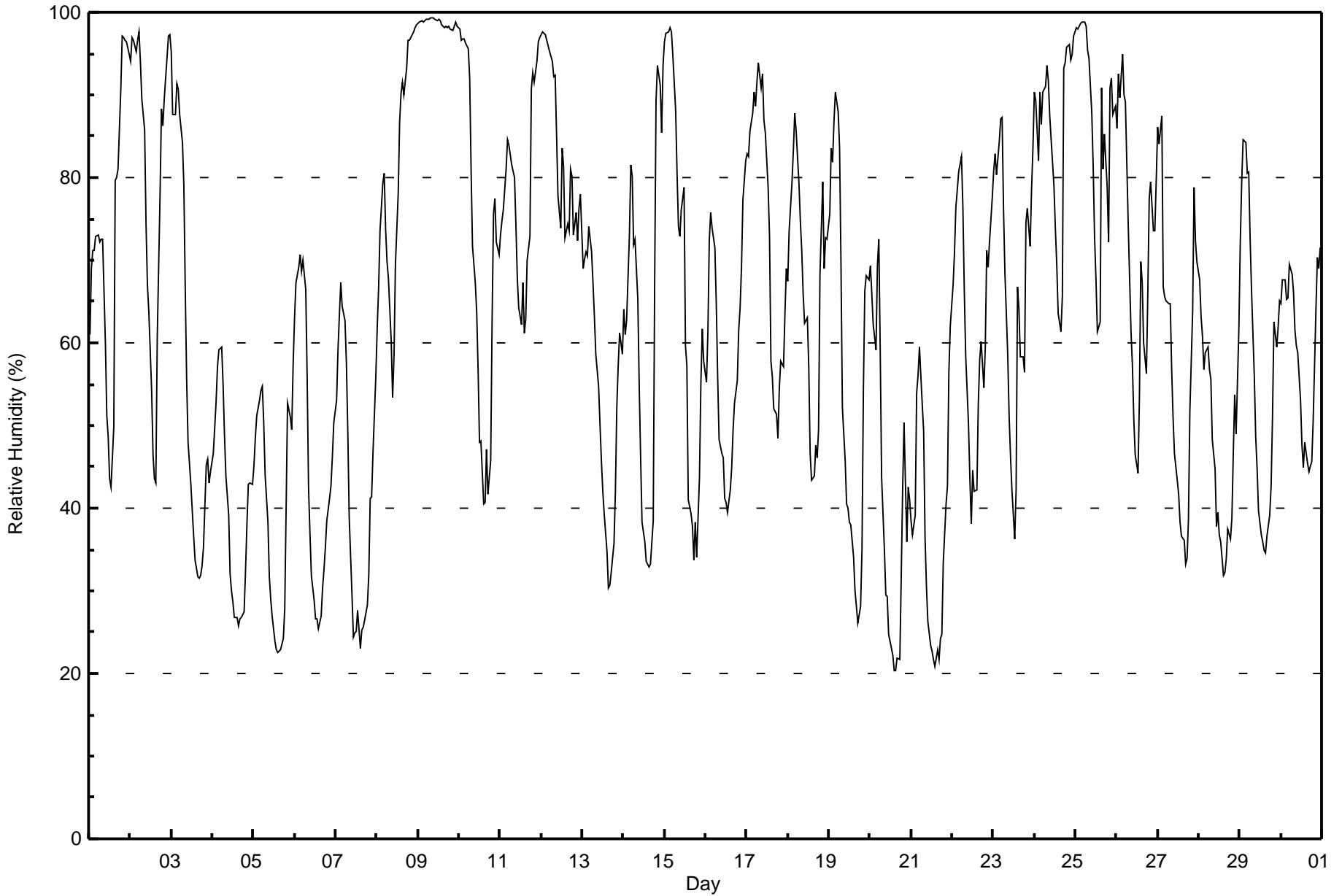
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Stony Mountain - June 2016

Maximum Value: 99 % on Jun 9 08:00 Maximum Daily Average: 98.7 % on Jun 9																		Hours in Service: 720 Hours of Data: 720								
Minimum Value: 20 % on Jun 20 15:00 Minimum Daily Average: 37.4 % on Jun 21 Maximum Diurnal Average: 79.9 % at hour 5 Minimum Diurnal Average: 45.7 % at hour 15 Monthly Average: 63.3 % Percentiles: P ₁ = 22 P ₁₀ = 33 Q ₁ = 44 Median = 64 Q ₃ = 81 P ₉₀ = 95 P ₉₉ = 99																		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-Jun	61	69	71	71	73	73	72	73	73	60	51	49	43	43	50	80	80	81	91	97	97	97	97	95	72.7	97
2-Jun	94	97	97	95	97	98	94	89	86	74	67	64	54	46	44	43	61	78	88	86	89	95	97	97	80.4	98
3-Jun	95	88	88	91	91	88	84	79	66	55	48	43	40	37	34	32	32	33	35	45	46	43	44	57.0	95	
4-Jun	47	50	53	57	59	60	55	49	44	39	32	30	29	27	27	26	27	27	32	38	43	43	43	40.1	60	
5-Jun	45	48	51	53	54	55	50	44	38	32	29	27	24	23	22	23	23	24	28	40	53	51	50	57	39.4	57
6-Jun	63	67	69	71	69	70	66	56	42	37	32	29	27	27	25	27	30	33	35	38	41	43	46	50	45.6	71
7-Jun	53	59	63	67	64	63	58	49	39	29	24	25	25	28	23	25	26	27	28	32	41	41	47	56	41.4	67
8-Jun	62	67	74	79	80	74	70	68	60	53	58	69	78	87	90	92	90	93	97	97	97	98	98	99	80.4	99
9-Jun	99	99	99	99	99	99	99	99	99	99	99	99	99	99	98	98	98	98	98	98	98	98	99	98	98.7	99
10-Jun	98	97	97	97	96	96	92	81	72	67	64	57	48	48	40	41	47	42	46	63	76	77	72	71	70.1	98
11-Jun	73	75	76	81	85	84	83	82	80	74	68	64	62	67	61	63	70	73	91	93	92	94	96	97	78.5	97
12-Jun	97	98	97	97	96	95	94	92	92	85	78	74	84	81	73	74	74	81	80	73	76	72	76	78	84.1	98
13-Jun	69	70	71	71	74	71	67	63	59	55	50	46	42	39	35	30	31	32	36	42	52	57	61	59	53.4	74
14-Jun	64	61	63	73	82	80	72	73	65	55	46	38	36	34	33	33	39	67	89	94	91	85	94	62.5	94	
15-Jun	97	97	98	98	98	95	88	80	74	73	76	79	60	57	41	39	38	34	38	34	44	55	62	58	67.2	98
16-Jun	55	61	72	76	74	71	65	56	48	47	46	41	41	39	42	45	50	53	55	62	64	69	77	82	58.0	82
17-Jun	83	82	86	88	90	89	92	94	91	93	87	85	79	73	58	56	52	51	49	55	58	57	64	69	74.1	94
18-Jun	67	74	79	83	88	86	79	75	71	66	62	63	57	47	43	44	48	46	50	68	79	69	73	73	66.2	88
19-Jun	76	84	82	87	90	88	84	70	52	46	41	40	38	38	34	30	28	26	28	35	54	66	68	68	56.3	90
20-Jun	69	66	62	59	69	73	59	44	35	30	29	25	23	22	20	20	22	22	32	42	50	36	43	41	41.4	73
21-Jun	38	37	39	54	56	60	53	49	36	30	26	23	23	22	21	23	22	24	25	33	40	43	56	62	37.4	62
22-Jun	67	71	76	79	81	83	76	67	58	50	44	38	45	42	42	53	58	60	55	59	71	69	72	78	62.2	83
23-Jun	81	83	80	84	87	87	76	69	59	51	46	42	36	42	67	64	58	58	56	75	76	72	78	84	67.2	87
24-Jun	90	89	82	90	86	90	91	94	92	87	85	79	74	69	64	61	66	93	94	96	96	94	95	97	85.6	97
25-Jun	98	98	98	99	99	99	98	95	94	88	81	73	68	61	63	91	81	85	79	72	91	92	88	89	86.6	99
26-Jun	86	93	90	95	90	89	82	74	61	57	51	46	44	53	70	67	60	56	66	77	80	74	74	80	71.5	95
27-Jun	86	84	87	67	66	65	65	65	57	51	47	43	42	38	37	36	33	34	39	52	64	79	72	70	57.4	87
28-Jun	68	63	61	57	59	59	57	56	48	45	38	40	37	36	32	32	34	37	36	39	47	54	49	62	47.7	68
29-Jun	72	80	84	84	80	81	73	66	56	49	45	40	37	36	35	35	37	39	43	51	62	59	62	65	57.1	84
30-Jun	65	68	68	65	65	70	68	66	62	60	59	53	48	45	48	45	44	45	46	51	64	70	69	72	58.9	72
	73.9	75.8	77.1	78.9	79.9	79.6	75.4	70.5	63.7	57.9	53.6	50.8	48.0	46.9	45.7	47.6	48.3	50.8	54.5	60.6	67.7	68.7	70.4	72.8	Diurnal Average	
	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	98	98	98	98	98	98	98	99	99	Diurnal Maximum	



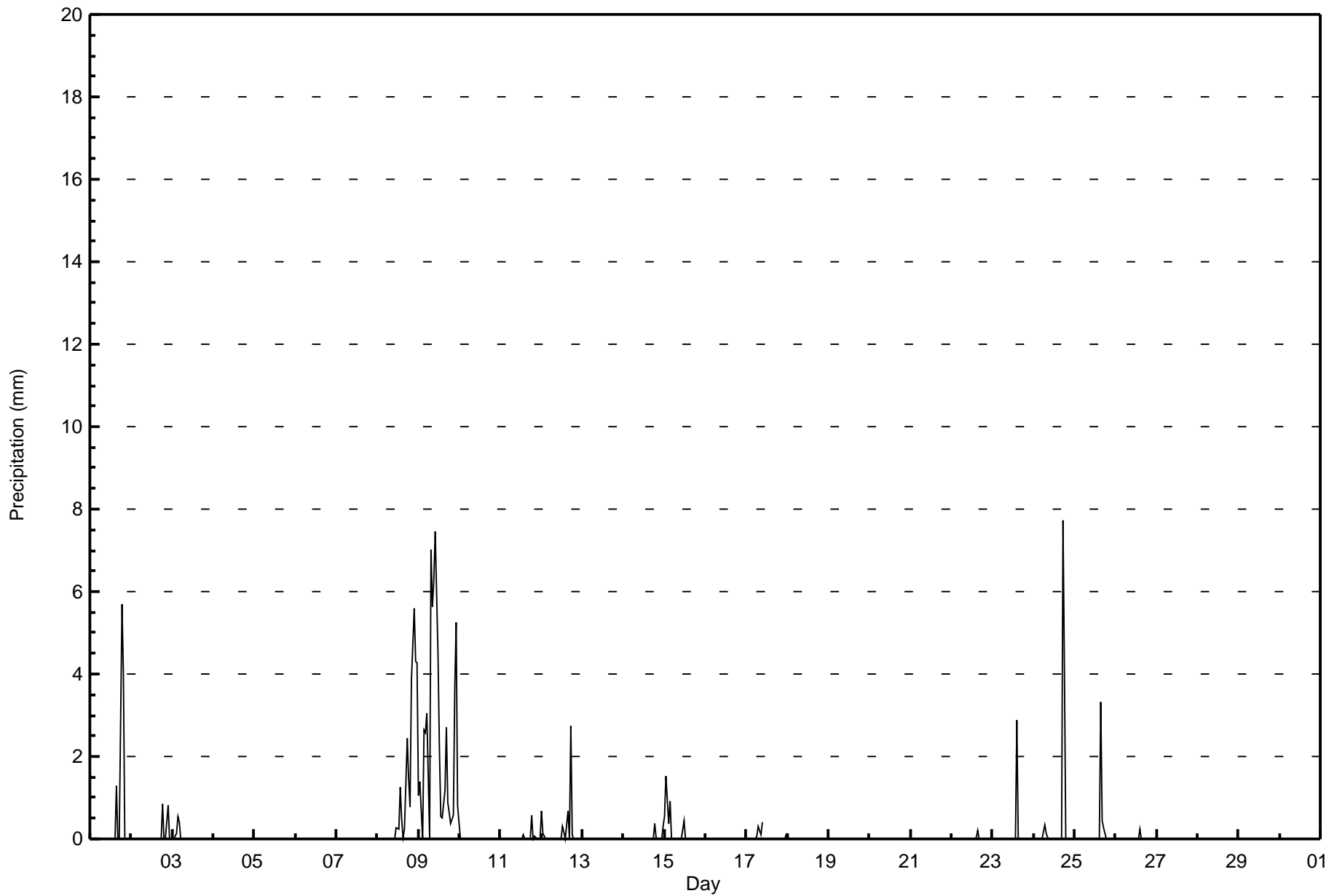


Maximum Value: 7.7 mm on Jun 24 18:00		Maximum Daily Total: 61.0 mm on Jun 9		Hours in Service: 720																							
Minimum Value: 0.0 mm on Jun 1 01:00		Minimum Daily Total: 0.0 mm on Jun 4		Hours of Data: 719																							
Maximum Diurnal Total: 14.1 mm at hour 18		Minimum Diurnal Total: 0.5 mm at hour 7		Hours of Missing Data: 1																							
Monthly Total: 130.68 mm		Percentiles: P ₁ = 0.0 P ₁₀ = 0.0 Q ₁ = 0.0 Median = 0.0 Q ₃ = 0.0 P ₉₀ = 0.1 P ₉₉ = 5.5		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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	5.7	4.0	0.0	0.0	0.0	0.0	11.0	5.7	
2-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.8	0.0	0.0	1.7	0.9	
3-Jun	0.0	0.0	0.1	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.5	
4-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	1.3	0.5	0.0	0.2	2.4	1.5	0.8	3.9	5.6	4.3	4.3	25.2	5.6	
9-Jun	1.0	1.4	0.0	2.6	2.6	3.1	0.1	7.0	5.6	6.3	7.5	4.5	2.2	0.5	0.5	1.2	2.7	0.9	0.7	0.4	0.6	3.7	5.3	0.8	61.0	7.5	
10-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	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	0.6	0.0	0.1	0.0	0.0	0.0	0.7	0.6	
12-Jun	0.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.7	0.0	2.8	0.1	0.0	0.0	0.0	0.0	0.0	4.8	2.8	
13-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.1	0.0	0.0	0.0	0.3	0.7	0.4	
15-Jun	0.5	1.5	0.4	0.9	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	0.0	0.0	0.0	0.0	0.0	0.0	3.8	1.5	
16-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.4	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	0.4	
18-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	
23-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	2.9	
24-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	4.2	0.0	0.0	0.0	0.0	0.0	12.4	7.7	
25-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	4.0	3.3	
26-Jun	0.0	0.0	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	0.3	0.3	
27-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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-Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		2.3	3.1	0.5	4.1	3.0	3.1	0.5	7.5	5.8	6.7	7.5	5.2	2.7	2.1	4.1	6.7	3.4	14.1	13.9	5.2	4.5	10.1	9.6	5.5	Diurnal Average	
		1.0	1.5	0.4	2.6	2.6	3.1	0.3	7.0	5.6	6.3	7.5	4.5	2.2	1.3	2.9	3.3	2.7	7.7	5.7	4.0	3.9	5.6	5.3	4.3	Diurnal Maximum	
M - Maintenance																											



Wood Buffalo Environmental Association
Hourly Averages

Precipitation (PC) - mm
Stony Mountain - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Precipitation (PC) - mm
Stony Mountain - June 2016**

Concentration Ranges (mm)	Number of Hours	%	Cumulative %
0 - 0.3	665	92.49	92.49
0.4 - 0.5	12	1.67	94.16
0.6 - 0.7	5	0.70	94.85
0.8 - 1.4	11	1.53	96.38
1.5 - 10	25	3.48	99.86
> 10	0	0.00	99.86

Total Number of Valid Hours: 719

Total Number of Hours: 720



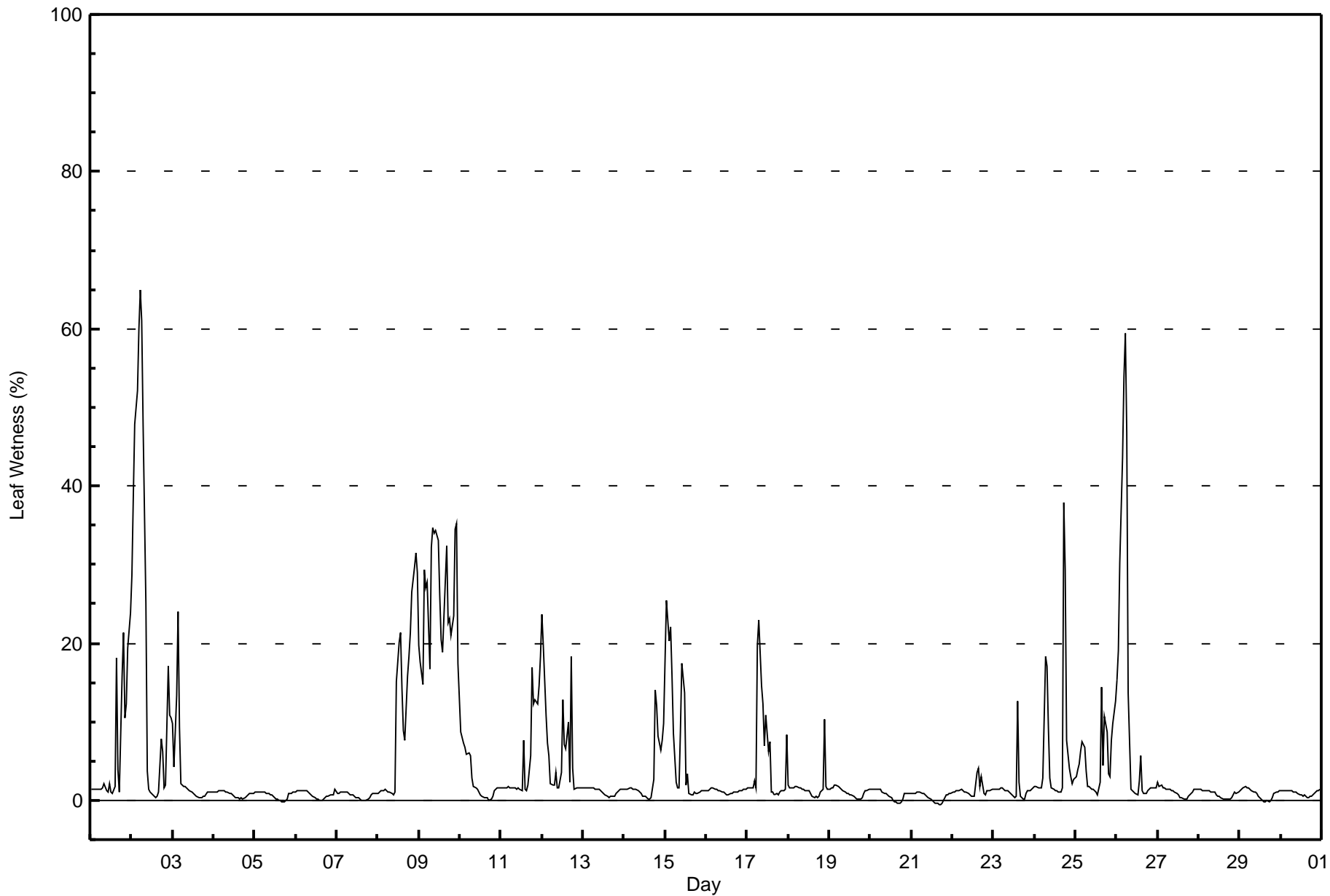
Wood Buffalo Environmental Association

Summary of Hour Averages

Leaf Wetness (LW) - %

Stony Mountain - June 2016

Maximum Value: 65 % on Jun 2 06:00 Maximum Daily Average: 26.0 % on Jun 9																	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0									
Minimum Value: 0 % on Jun 21 18:00 Minimum Daily Average: 0.4 % on Jun 21 Maximum Diurnal Average: 7.4 % at hour 4 Minimum Diurnal Average: 2.1 % at hour 17 Monthly Average: 4.6 % Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 2 P ₉₀ = 15 P ₉₉ = 45																										
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-Jun	1	1	1	1	1	1	1	2	2	1	1	2	1	1	2	18	4	1	16	21	11	12	19	24	6.2	24
2-Jun	29	39	48	52	60	65	61	48	25	4	1	1	1	1	0	1	1	8	6	2	2	17	11	10	20.5	65
3-Jun	10	4	13	24	9	2	2	2	2	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	3.3	24
4-Jun	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	0.8	1
5-Jun	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	0.6	1
6-Jun	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0.7	1
7-Jun	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.6	1
8-Jun	1	1	1	1	1	1	1	1	1	1	1	15	20	21	14	9	8	16	18	21	27	30	31	29	11.3	31
9-Jun	20	18	15	29	27	28	17	32	35	34	34	33	26	20	19	28	32	23	23	21	24	34	35	17	26.0	35
10-Jun	9	8	7	7	6	6	6	3	2	2	1	1	1	1	0	0	0	0	0	1	1	1	2	2	2.8	9
11-Jun	2	2	2	2	2	2	2	2	2	1	2	1	1	8	1	1	2	6	17	12	13	12	15	18	5.2	18
12-Jun	24	20	11	7	6	2	2	2	4	2	2	4	13	7	7	10	2	18	4	1	2	2	2	2	6.3	24
13-Jun	2	2	2	2	2	2	2	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1.1	2
14-Jun	1	1	1	1	2	1	1	1	1	1	1	1	1	0	0	0	0	3	14	12	8	6	8	10	3.2	14
15-Jun	18	26	20	22	16	9	2	2	2	9	17	14	2	3	1	1	1	1	1	1	1	1	1	1	7.1	26
16-Jun	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.2	2
17-Jun	2	2	2	2	2	2	20	23	15	12	7	11	6	8	1	1	1	1	1	1	1	1	1	8	5.4	23
18-Jun	2	2	2	2	2	2	2	1	1	1	1	1	1	1	0	1	0	0	1	1	10	2	1	1	1.6	10
19-Jun	1	2	2	2	2	2	2	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1.1	2
20-Jun	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	0.7	1
21-Jun	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.4	1
22-Jun	1	1	1	1	1	1	1	1	1	1	1	0	0	0	3	4	2	3	1	1	1	1	1	1	1.4	4
23-Jun	1	1	1	1	2	2	1	1	1	1	1	0	1	13	2	1	0	0	1	1	1	1	2	1.6	13	
24-Jun	2	2	2	2	2	3	18	17	9	3	2	1	1	1	1	2	38	29	8	4	3	2	3	6.4	38	
25-Jun	3	4	5	6	7	7	4	2	2	1	1	1	1	1	2	14	4	11	9	3	3	8	10	13	5.1	14
26-Jun	15	19	30	44	54	59	47	14	1	1	1	1	1	3	6	1	1	1	1	1	2	2	2	2	12.8	59
27-Jun	2	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1.1	2
28-Jun	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	0.8	1
29-Jun	1	1	2	2	2	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	0.8	2
30-Jun	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	1	1	1	1	1	1	1.0	1
																	Diurnal Average									
																	Diurnal Maximum									





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Leaf Wetness (LW) - %
Stony Mountain - June 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 0.3	55	7.91	7.91
0.4 - 0.5	45	6.47	14.39
0.6 - 0.7	37	5.32	19.71
0.8 - 1.4	281	40.43	60.14
1.5 - 10	162	23.31	83.45
> 10	98	14.10	97.55

Total Number of Valid Hours: 695

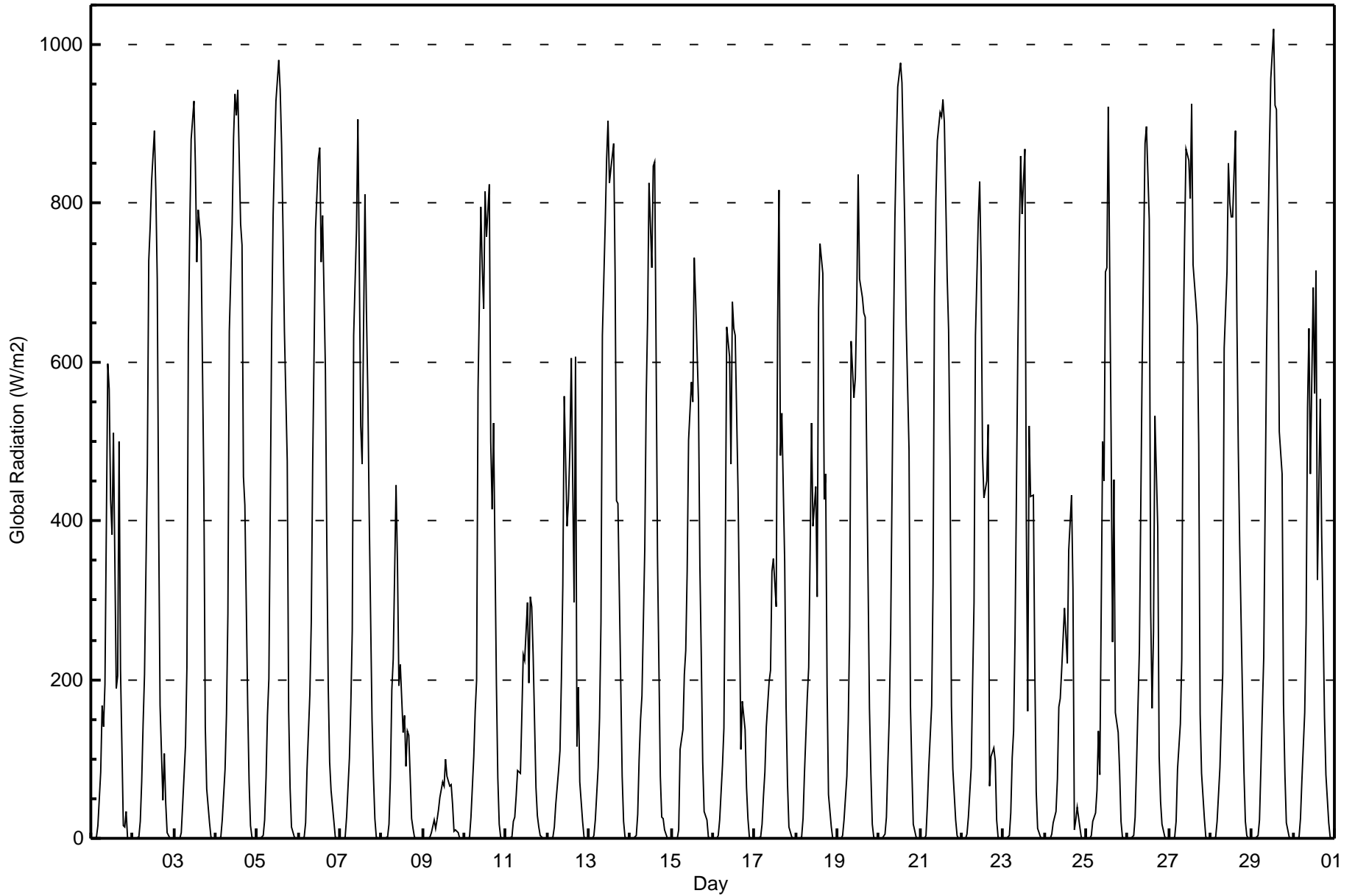
Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

Global Radiation (GR) - W/m2
Stony Mountain - June 2016

Maximum Value: 1020 W/m2 on Jun 29 13:00 Maximum Daily Average: 364.7 W/m2 on Jun 21																				Hours in Service: 720 Hours of Data: 720						
Minimum Value: 0 W/m2 on Jun 1 01:00 Minimum Daily Average: 28.0 W/m2 on Jun 9 Maximum Diurnal Average: 674.2 W/m2 at hour 12 Minimum Diurnal Average: 0.0 W/m2 at hour 24 Monthly Average: 256.6 W/m2 Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 2 Median = 99 Q ₃ = 491 P ₉₀ = 774 P ₉₉ = 942																				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-Jun	0	0	0	2	16	84	166	141	194	597	566	426	383	511	188	204	500	214	16	13	33	0	0	0	177.4	597
2-Jun	0	0	0	2	20	72	145	206	471	729	771	827	892	814	706	399	168	49	106	45	7	0	0	0	267.8	892
3-Jun	0	0	0	0	8	43	117	216	625	767	881	928	848	726	792	753	597	439	140	63	20	1	0	0	331.9	928
4-Jun	0	0	0	3	23	88	156	283	638	775	883	939	911	942	774	748	456	420	168	70	16	1	0	0	345.6	942
5-Jun	0	0	0	3	23	77	155	201	645	785	861	930	980	944	874	767	639	475	160	65	14	1	0	0	358.2	980
6-Jun	0	0	0	2	19	87	182	272	471	617	767	855	870	726	784	590	372	192	95	61	22	1	0	0	291.0	870
7-Jun	0	0	0	2	27	101	169	261	633	767	905	719	520	472	812	667	563	408	150	78	25	1	0	0	303.4	905
8-Jun	0	0	0	2	17	77	188	225	445	346	193	218	133	154	91	136	131	25	12	2	0	0	0	0	99.9	445
9-Jun	0	0	0	0	1	7	23	13	23	35	52	71	65	100	77	66	68	43	9	10	7	0	0	0	28.0	100
10-Jun	0	0	0	2	27	103	159	200	565	795	718	667	816	758	825	500	415	524	197	77	17	2	0	0	306.9	825
11-Jun	0	0	0	2	21	27	54	85	82	156	232	223	298	195	305	293	231	65	28	15	4	0	0	0	96.5	305
12-Jun	0	0	0	1	13	42	86	110	201	318	557	393	425	492	604	298	606	116	191	72	22	2	0	0	189.6	606
13-Jun	0	0	0	3	23	89	151	272	633	774	856	904	826	843	876	713	425	423	195	78	21	1	0	0	337.8	904
14-Jun	0	0	0	3	30	100	149	180	365	554	655	825	719	847	852	616	356	79	28	25	11	0	0	0	266.5	852
15-Jun	0	0	0	0	11	113	136	206	237	337	502	575	550	731	677	551	344	228	97	34	23	2	0	0	223.1	731
16-Jun	0	0	0	3	23	92	140	358	644	607	472	676	643	634	437	287	113	173	137	64	24	2	0	0	230.5	676
17-Jun	0	0	0	1	18	53	84	140	198	212	336	352	291	648	817	481	536	349	165	70	14	1	0	0	198.6	817
18-Jun	0	0	0	2	24	83	178	216	361	523	394	442	305	668	748	712	428	459	193	56	14	1	0	0	242.0	748
19-Jun	0	0	0	4	23	79	147	268	627	556	580	676	836	704	682	661	657	489	163	83	18	3	0	0	302.3	836
20-Jun	0	0	0	5	27	93	154	258	631	781	873	947	977	952	866	770	647	490	168	86	18	2	0	0	364.3	977
21-Jun	0	0	0	4	44	91	167	320	682	804	879	915	910	932	903	707	640	477	167	87	23	3	0	0	364.7	932
22-Jun	0	0	0	5	27	89	196	296	633	780	827	719	483	428	450	521	66	104	114	97	24	3	0	0	244.3	827
23-Jun	0	0	0	4	32	101	136	252	617	755	859	787	868	400	159	520	431	433	214	58	13	1	0	0	276.7	868
24-Jun	0	0	0	1	6	19	34	75	166	176	212	290	256	221	362	432	316	10	23	40	12	1	0	0	110.5	432
25-Jun	0	0	0	4	22	32	60	136	79	501	450	713	719	923	506	248	453	158	134	85	21	2	0	0	218.5	923
26-Jun	0	0	0	4	27	92	166	237	601	733	875	898	779	288	163	260	532	391	104	47	17	1	0	0	258.9	898
27-Jun	0	0	0	3	22	88	144	225	617	755	869	854	805	926	723	675	646	496	156	82	24	2	0	0	338.0	926
28-Jun	0	0	0	3	22	88	151	208	617	714	850	800	783	783	892	656	491	369	177	84	21	3	0	0	321.3	892
29-Jun	0	0	0	3	24	88	162	227	613	751	869	958	1020	925	919	768	513	459	170	80	20	2	0	0	357.1	1020
30-Jun	0	0	0	2	24	72	158	271	542	642	459	694	560	715	326	553	382	274	153	80	19	2	0	0	247.1	715
																								Diurnal Average		
																								Diurnal Maximum		





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Global Radiation (GR) - W/m2
Stony Mountain - June 2016

Concentration Ranges (W/m2)	Number of Hours	%	Cumulative %
0 - 20	249	34.58	34.58
21 - 100	113	15.69	50.28
101 - 300	119	16.53	66.81
301 - 600	92	12.78	79.58
601 - 900	125	17.36	96.94
> 900	22	3.06	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Stony Mountain - June 2016

Maximum Speed: 23 km/h on Jun 15 11:00	Maximum Daily Speed Average: 11.7 km/h on Jun 4	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 19 22:00	Minimum Daily Speed Average: 1.4 km/h on Jun 2	Hours of Data: 720
Maximum Diurnal Speed Average: 5.0 km/h at hour 3	Minimum Diurnal Speed Average: 0.6 km/h at hour 20	Hours of Missing Data: 0
Monthly Average Velocity: 3.2 km/h 237.5 deg	Percentiles: P ₁ = 1 P ₁₀ = 3 Q ₁ = 5 Median = 7 O ₃ = 10 P ₉₀ = 13 P ₉₉ = 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-Jun	SW7	SSW7	SSW8	SSW8	SSW8	SSW10	SSW10	SSW10	SSW9	SSW11	S10	SSW11	SSW12	S11	SSW7	W5	ESE5	E5	N4	E2	SE6	SSE6	S6	SSW7	SSW6.4	SSW12
2-Jun	SSW6	SW3	SW4	SW7	SSW3	SSW4	S3	ESE2	ENE5	E4	E5	E6	ESE7	ESE6	SE6	SE5	N6	NNW5	NE9	NE5	ENE3	NW1	N0	W2	ESE1.4	NE9
3-Jun	WSW4	W7	W8	W9	WSW8	W11	W12	WNW11	WNW11	W12	W12	W12	W12	W12	W12	W14	WNW12	W12	WNW11	WNW8	W5	WSW6	WSW8	WSW10	W9.9	W14
4-Jun	WSW12	WSW12	W15	W14	W13	W13	W13	WNW14	W14	W14	W13	WNW14	W14	W14	WNW14	WNW16	WNW11	WNW12	WNW12	WNW7	WNW6	WNW6	WNW6	WNW7	W11.7	WNW16
5-Jun	WNW7	WNW7	WNW6	W8	W9	WNW8	WNW7	WNW8	WNW8	WNW11	NW10	NW10	NW10	NW9	NW8	NW7	NW6	NW5	NW3	SW1	N2	E3	SE6	SSE6	WNW5.4	NW11
6-Jun	S6	S6	S6	S6	SSW9	SSW9	SSW9	S8	SSW9	S10	S11	S11	S11	S12	S12	S13	SSE12	SSE10	SSE8	SSE8	SSE9	SSE9	S9	S8	S8.9	S13
7-Jun	SSW14	SW14	SSW12	SSW11	SW13	SW13	WSW9	W9	W8	W12	W14	WNW12	WNW11	WNW9	WNW11	W12	W13	WNW10	WNW8	WNW6	W4	WNW3	NE5	ENE6	W7.7	W14
8-Jun	E6	ESE6	ENE3	NNE4	NE5	NE8	NE8	NE6	NE7	E6	ESE3	SSW3	S1	ENE3	NNE7	NE10	NNE10	NE13	NE9	NE10	E9	E6	ENE7	ENE8	ENE5.8	NE13
9-Jun	E8	ESE9	E7	ENE7	NNE9	NNE9	NE12	NE11	NNE8	NE10	NE14	NNE10	NNE10	NNE13	NNE15	NNE14	NNE11	NNE12	NNE9	NNE10	NNE10	NNE7	N8	N7	NE9.3	NNE15
10-Jun	NNW6	N7	NNW5	NNW5	N5	NNW4	NNW4	N5	NNW5	NNW6	NNW6	N7	NE9	NE6	N4	NE6	E4	ESE6	ESE6	E4	ESE3	SSE3	S4	SSW7	NNE2.8	NE9
11-Jun	SSW7	SSW7	SSW6	S4	S4	SE5	SSE6	SE7	SE8	SE8	SE12	SSE11	SE13	SE11	SE14	SE15	SE12	SE10	ESE3	ESE5	ESE9	SE5	SE4	SSE4	SE7.4	SE15
12-Jun	S4	SSW7	SW10	SW10	SW10	SW10	SW12	SW13	SSW13	SW14	SW16	SW14	SW14	SW15	WSW14	WSW12	WSW11	WSW9	WSW11	W11	WSW11	WSW13	SW10	SW10	SW10.9	SW16
13-Jun	WSW13	SW12	WSW14	WSW13	SW12	WSW12	WSW13	WSW10	WSW11	WSW13	WSW13	WSW14	WSW13	WSW13	WSW13	WSW12	WSW12	SW11	SSW9	SW8	SSW6	SSW6	SSW6	SSW6	WSW10.7	WSW14
14-Jun	SSW5	SSW6	SSW7	S3	ESE1	SE3	ESE5	E5	ENE6	E7	ESE10	SSE10	SSE11	SSE12	SSE11	SSE10	SSE10	S8	SSW12	SSE4	ESE4	ESE6	SE10	ESE7	SSE5.9	SSW12
15-Jun	ESE6	SSE9	SE6	SE8	SE8	SSE11	S13	S18	S19	S23	SSW23	SSW22	SSW19	SSW19	SSW16	S16	S12	S13	SSE9	S10	SW6	W7	W5	WSW7	S11.1	SSW23
16-Jun	SW8	SW7	SSW7	SSW7	SSW7	SSW9	SSW10	SSW13	SSW15	SSW14	S11	SSW12	SSW12	SSW13	SW12	SW11	SW9	SW10	WSW9	WSW7	WSW7	WSW7	WSW9	SW9	SW9.4	SSW15
17-Jun	SW11	SW11	SW10	WSW9	SW9	WSW9	WSW11	W11	W12	W12	WNW15	WNW14	WNW13	WNW16	WNW15	WNW9	W10	WSW11	WSW10	SW9	SW10	SW11	SW14	SW13	W10.2	WNW16
18-Jun	WSW13	W11	WNW9	W8	WNW6	NW5	NW4	NW5	NW5	WNW6	WSW7	WSW8	W6	WNW5	WNW6	W6	WNW5	WNW4	WSW4	WNW2	WSW3	SW8	WSW8	W9	W5.9	WSW13
19-Jun	NNW4	WNW3	WNW6	WNW5	WNW5	NW4	NNW4	NNW3	NNW5	NW6	NW9	NW10	NW10	NW9	NW10	NW11	NW11	NW9	NW7	NW4	SW2	WNW0	WNW1	NNW2	NW5.6	NW11
20-Jun	NNW1	W2	SW3	SW5	WNW3	W2	WSW2	WNW4	WNW4	NW5	WNW3	NW4	W5	N4	NW5	WNW2	N3	WNW2	WSW1	SE1	SSW2	SW7	SW8	SW8	W2.5	SW8
21-Jun	SW8	WSW8	SW8	SW8	SW8	SW8	SW9	SSW7	SW8	SSW7	SSE7	SE5	SSW5	S6	SE4	ENE4	ESE4	E6	E5	E3	ESE3	S7	SSW10	SSW13	SSW4.9	SSW13
22-Jun	SW12	SW11	SSW9	SW9	SW7	SSW10	SSW10	SSW7	SSW6	SSW8	SSW9	SW6	S6	S5	SW4	WNW3	SSW10	SW8	SSW7	SSW5	SSW5	SSW7	SSW8	SSW8	SSW7.3	SW12
23-Jun	SSW10	SW10	SW11	SW9	SW7	SSW8	WSW8	W7	W7	W7	W7	WNW7	WNW6	WSW5	W7	WSW7	NW4	NE6	NE3	NW1	NE4	NE6	E4	ESE4	WSW3.7	SW11
24-Jun	NNW3	N4	NE4	ENE0	E2	SSW2	SW4	WNW5	WNW6	WNW8	WNW8	WNW7	WNW6	WNW3	W4	W6	WNW7	WNW7	WNW10	WNW5	NW4	WNW5	WNW5	NW3	WNW4.1	WNW10
25-Jun	NW3	NW4	NW5	NW4	WNW5	NNW3	N3	NNW3	N3	NNE8	NNE9	NE10	NE11	NE13	N7	NNE5	NNE6	NE5	NE6	NE6	SE3	SW5	SW6	WSW5	NNE3.5	NE13
26-Jun	W5	WNW5	WNW5	NW2	WNW3	W3	WNW5	N2	W3	W2	SW2	WSW3	NW3	NW4	WSW6	SW8	WSW9	W9	W4	WSW2	SW4	SW7	SSW7	WSW4	W3.7	WSW9
27-Jun	SW4	SW7	SW8	W9	W10	W9	WNW8	WNW8	WNW8	WNW8	WNW8	WNW6	NW5	NW5	W7	W5	W7	W9	W8	N4	NNE4	SSE2	SSW5	SW5	W5.4	W10
28-Jun	SW5	SW7	WSW7	WSW7	W7	W7	WNW6	WNW5	WNW5	W6	WNW7	NW5	WNW6	NW6	NW7	NW5	NW5	NW3	NE6	NE7	NE6	NE5	NE7	ESE5	WNW3.2	SW7
29-Jun	E3	E3	NE3	NE5	NE6	NE5	E4	ESE5	E6	ESE7	ESE7	E6	E7	ENE6	NE8	ENE7	E3	E4	E5	ESE4	E3	SE4	SE4	S4	E4.4	NE8
30-Jun	S4	S7	S9	SSW9	SSW9	S5	S7	S7	S9	SSW8	S8	SSW10	S9	S10	S8	SE10	SSE8	SSE8	SSE7	SSE6	SSE3	SSE3	S4	S4	S6.9	S10

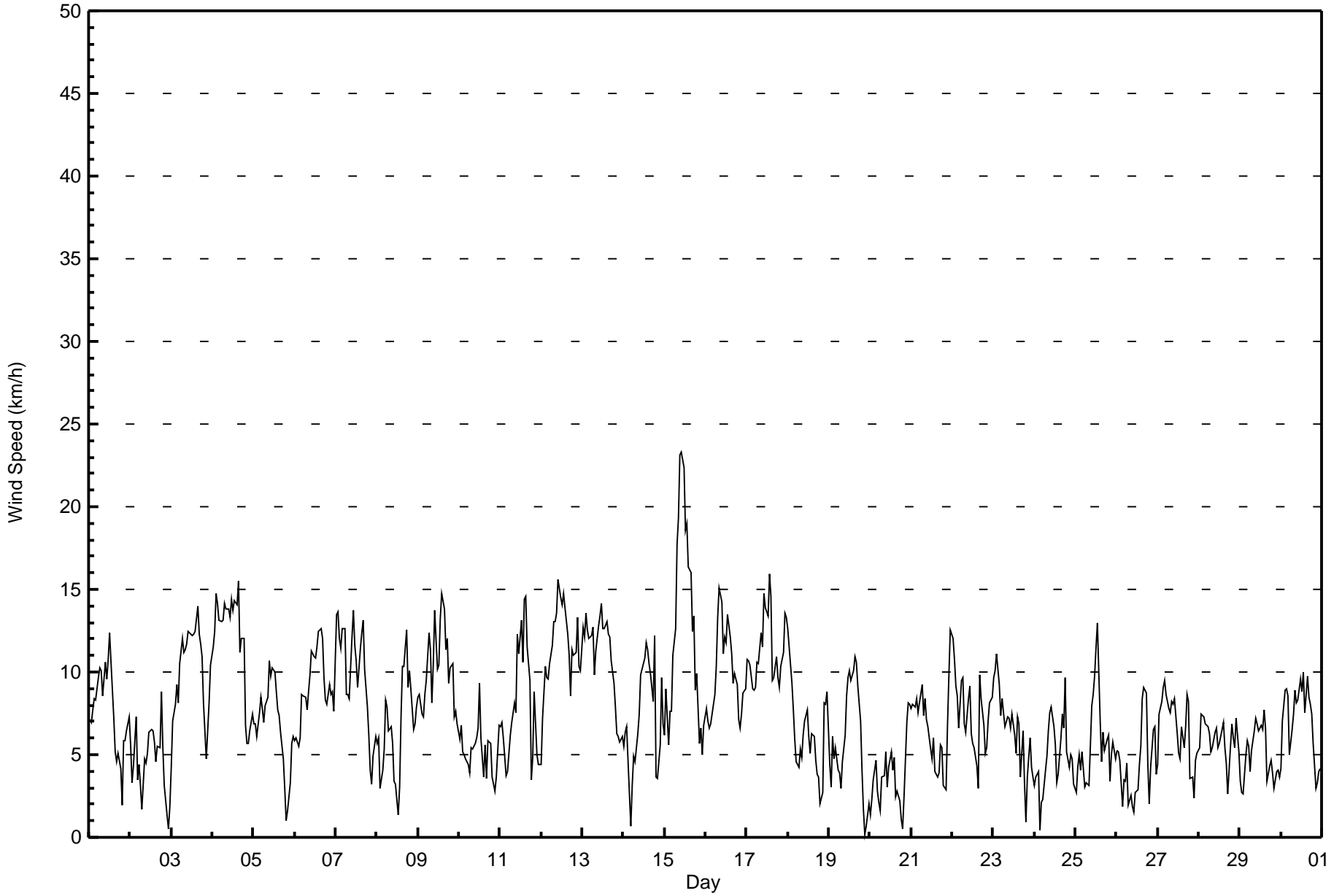
SW4.2 SW4.8 SW5.0WSW4.8WSW4.0 SW3.9WSW3.8WSW3.4WSW3.7WSW3.8WSW3.9WSW3.9WSW3.4WSW2.9WSW3.8WSW3.1WSW2.8WSW1.9 W1.7WSW0.6 S1.1SSW2.5SSW3.2 SW3.6	Diurnal Average
SSW14 SW14 W15 W14 W13 W13 W13 S18 S19 SSW23 SSW23 SSW22 SSW19 SSW19 SSW16 S16 W13 S13 SSW12 W11WSW11WSW13 SW14 SW13	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Stony Mountain - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Wind Speed (WS) - km/h
Stony Mountain - June 2016

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	219	30.42	30.42
6 - 11	386	53.61	84.03
12 - 19	112	15.56	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: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Stony Mountain - June 2016**

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	13	3	11	8	16	16	11	6	13	11	13	10	14	30	29	15	219
6 - 11	6	15	25	7	12	13	13	22	29	57	50	33	32	49	20	3	386
12 - 19	0	4	4	0	0	0	5	2	9	15	16	19	24	14	0	0	112
20 - 28	0	0	0	0	0	0	0	0	0	3	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
Totals	19	22	40	15	28	29	29	30	51	86	79	62	70	93	49	18	720

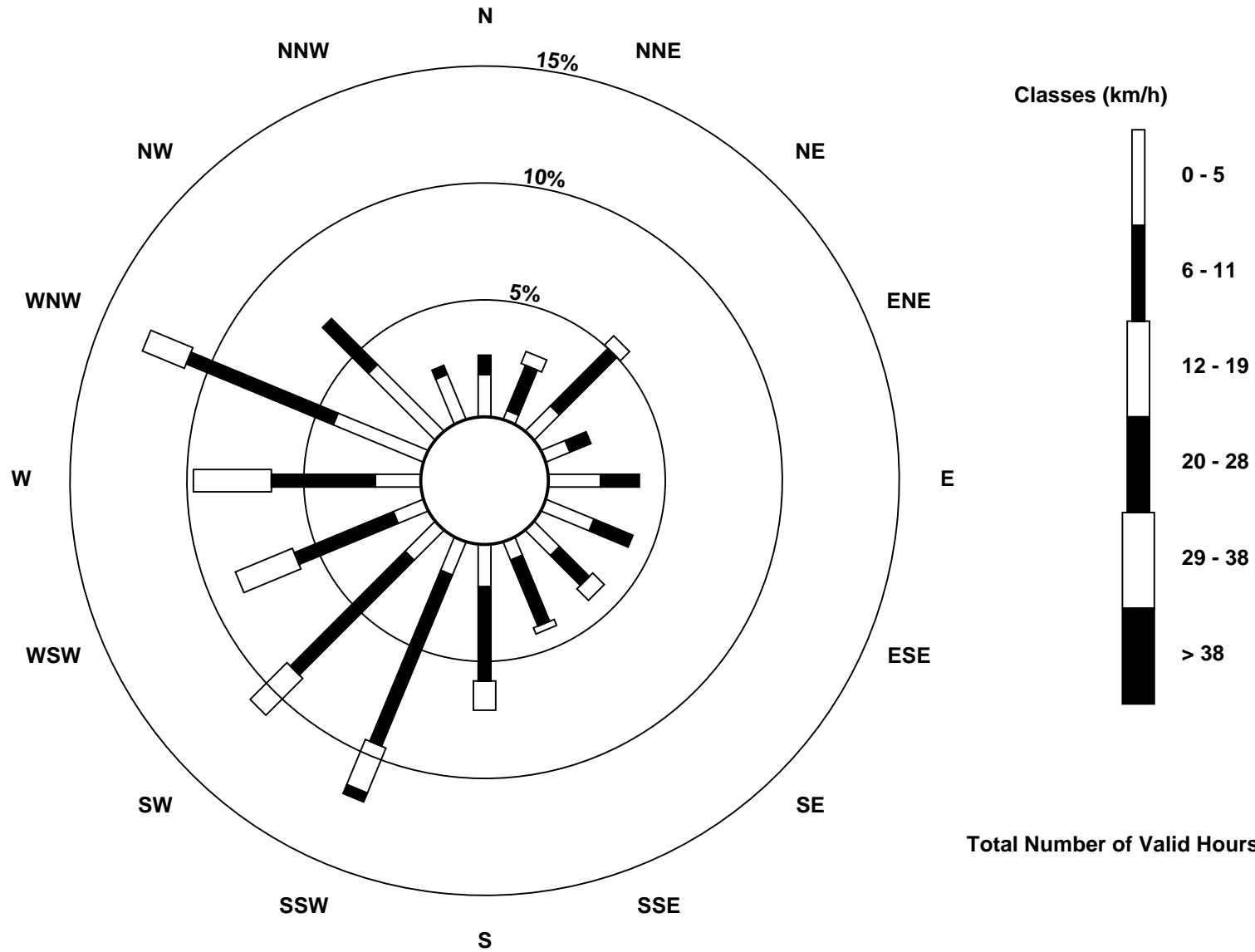
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed (WS) - km/h
Stony Mountain (AMS 18)



Total Number of Valid Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Stony Mountain - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 9 km/h on Jun 15 11:00 Minimum Value: 1 km/h on Jun 21 21:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 7																	Hours in Service: 720 Hours of Data: 720 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-Jun	2	1	2	2	2	2	3	3	2	4	3	4	5	4	3	5	2	2	2	2	2	2	2	2	5
2-Jun	1	2	2	3	1	1	1	1	1	2	2	3	3	3	3	2	3	3	3	3	2	2	1	2	3
3-Jun	1	2	3	3	3	4	4	4	4	5	5	4	5	5	5	5	5	4	5	4	1	2	2	4	5
4-Jun	4	4	5	4	5	5	5	6	6	5	5	6	5	6	5	6	5	5	5	2	2	2	2	2	6
5-Jun	2	2	2	2	3	3	2	3	3	4	4	5	4	4	4	4	2	2	2	1	1	1	2	2	5
6-Jun	2	2	2	2	2	2	3	3	3	4	4	4	4	5	5	5	5	4	3	3	3	3	3	3	5
7-Jun	4	4	3	3	3	3	3	3	3	4	5	4	4	3	4	5	5	4	3	2	1	1	3	2	5
8-Jun	2	2	1	1	2	2	2	2	2	2	1	1	1	1	2	3	4	4	3	4	4	3	2	3	4
9-Jun	3	3	3	2	3	3	4	5	3	4	5	4	4	5	5	6	5	5	4	4	4	3	4	3	6
10-Jun	3	3	2	2	2	2	2	2	3	3	3	3	3	4	2	3	2	2	2	2	1	1	1	2	4
11-Jun	2	2	2	1	2	1	2	2	3	3	5	4	6	5	6	6	5	4	2	3	4	2	2	2	6
12-Jun	1	3	3	3	3	3	4	4	4	4	5	5	5	5	5	4	4	4	4	5	4	5	3	3	5
13-Jun	4	4	4	4	3	4	4	3	4	5	5	5	5	5	5	4	5	4	3	3	1	1	1	1	5
14-Jun	1	2	2	1	2	1	2	2	2	3	4	4	5	5	4	4	4	4	6	2	1	2	3	3	6
15-Jun	2	3	2	3	3	4	6	7	7	8	9	8	7	8	6	6	5	6	4	6	3	2	2	2	9
16-Jun	2	2	1	1	2	2	3	4	5	5	4	5	4	4	4	4	3	3	4	3	2	3	3	3	5
17-Jun	3	3	3	3	3	3	4	4	5	4	6	5	5	6	6	4	4	4	4	3	3	3	4	5	6
18-Jun	5	4	3	3	2	2	2	2	2	2	2	2	2	2	3	3	2	2	2	1	1	2	2	4	5
19-Jun	3	2	2	2	2	2	1	1	2	3	4	4	5	4	5	4	4	4	3	2	1	1	1	1	5
20-Jun	1	1	1	1	1	1	1	2	1	2	3	3	2	2	2	2	2	2	2	1	2	1	2	2	3
21-Jun	2	2	2	2	1	2	2	2	3	3	3	3	3	3	3	3	3	3	2	1	1	4	3	3	4
22-Jun	3	3	2	2	2	2	3	2	2	3	3	2	3	3	3	2	4	2	2	1	1	1	2	2	4
23-Jun	2	2	3	2	2	3	2	2	2	3	3	3	3	3	5	2	2	3	1	1	2	2	1	1	5
24-Jun	1	2	2	1	1	1	2	2	2	2	3	3	2	1	1	3	4	4	3	2	1	2	1	1	4
25-Jun	1	1	2	1	2	1	2	1	2	3	3	4	4	5	4	2	3	3	2	2	1	2	1	1	5
26-Jun	1	2	1	1	2	2	2	1	2	2	2	2	1	3	1	4	3	3	2	1	2	1	2	3	4
27-Jun	2	2	2	3	3	3	3	3	3	3	3	3	2	2	3	3	3	4	3	3	3	1	1	1	4
28-Jun	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	3	3	2	1	2	2	3
29-Jun	1	1	1	1	1	2	1	2	2	3	3	3	3	3	3	3	2	3	2	1	1	1	1	1	3
30-Jun	1	3	2	2	2	2	2	3	4	3	3	4	4	4	3	4	3	3	3	2	1	1	1	1	4
																	Diurnal Maximum								



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Stony Mountain - June 2016

Direction of Maximum Speed: 201 deg on Jun 15 11:00 Direction of Maximum Daily Speed Average: 278.7 deg on Jun 4	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0
Direction of Minimum Speed: 302 deg on Jun 19 22:00 Direction of Minimum Daily Speed Average: 1.4 deg on Jun 2	Percent Operational Time: 100.0
Monthly Average Direction: 255.6 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-Jun	227	210	208	207	201	207	206	205	195	192	175	194	200	188	206	260	116	86	357	94	132	164	190	207	195.1
2-Jun	209	222	224	223	212	197	169	118	62	85	100	89	103	106	127	143	352	342	34	46	65	317	360	265	108.7
3-Jun	255	275	261	266	258	272	280	286	285	274	276	271	272	281	266	271	283	278	282	283	263	244	242	249	271.6
4-Jun	253	253	268	271	267	271	276	284	280	281	274	282	278	277	285	285	296	291	290	298	293	290	291	287	278.7
5-Jun	293	290	285	275	281	282	292	297	293	309	312	308	310	315	322	307	307	320	305	231	3	91	129	151	299.8
6-Jun	177	182	183	191	197	200	195	189	193	185	185	175	176	170	182	174	168	163	159	159	156	168	188	181	178.4
7-Jun	206	215	213	213	220	224	243	264	275	274	274	285	282	284	288	280	298	290	287	273	287	40	74	259.6	
8-Jun	89	105	58	31	44	45	53	39	47	90	111	201	172	58	25	52	31	52	55	47	97	98	62	71	60.5
9-Jun	97	111	100	57	32	29	41	42	29	36	46	29	24	31	30	27	22	25	17	19	26	21	2	7	35.0
10-Jun	344	352	337	341	350	344	337	359	348	329	347	3	34	40	5	40	84	103	109	101	112	147	172	198	16.4
11-Jun	196	195	194	181	188	139	148	143	137	137	137	148	141	133	132	136	131	136	123	115	117	136	136	152	143.2
12-Jun	171	203	218	224	219	218	225	220	212	220	221	216	220	223	246	248	238	256	258	270	251	248	235	229	229.9
13-Jun	239	235	238	239	233	242	240	254	254	242	243	241	252	244	245	247	241	222	211	216	212	213	213	210	237.2
14-Jun	205	205	211	173	113	132	107	97	69	93	121	148	155	150	166	163	164	176	192	159	102	110	139	120	150.1
15-Jun	123	147	141	128	131	149	171	186	186	191	201	207	204	203	199	186	181	174	158	174	223	274	277	242	186.9
16-Jun	229	226	211	205	202	202	207	211	212	205	190	193	197	211	215	226	226	230	249	244	252	255	243	234	217.5
17-Jun	231	232	233	238	232	244	252	280	278	280	288	293	292	292	295	291	265	256	254	235	235	227	217	234	259.5
18-Jun	253	267	283	279	291	308	311	305	305	285	255	252	270	293	288	280	294	288	246	288	245	225	238	280	273.1
19-Jun	347	287	297	302	297	307	332	342	327	325	307	313	312	304	307	305	319	326	324	304	217	302	303	331	312.7
20-Jun	331	274	231	230	299	259	255	302	294	306	296	315	280	360	323	298	9	285	237	139	196	220	223	232	271.0
21-Jun	235	238	230	225	219	217	216	213	215	208	166	141	194	190	145	71	121	99	91	98	115	184	204	213	197.2
22-Jun	223	221	213	225	220	207	209	211	207	196	207	214	181	170	227	294	204	225	213	197	200	210	209	209	210.9
23-Jun	207	218	229	229	221	211	251	269	262	281	271	284	288	238	259	255	314	47	49	317	53	55	86	115	248.0
24-Jun	328	3	56	69	84	203	216	290	300	297	293	299	297	284	266	275	283	287	284	302	307	303	303	309	294.5
25-Jun	309	307	308	306	302	328	353	330	7	32	31	40	44	49	6	21	28	34	37	47	125	218	234	254	13.1
26-Jun	269	288	301	308	292	281	303	0	274	261	232	250	305	305	250	226	242	269	278	248	222	214	213	247	260.7
27-Jun	228	219	224	259	266	266	289	285	285	297	284	303	312	310	280	281	273	267	273	350	33	162	209	214	271.2
28-Jun	225	227	241	257	267	279	292	292	282	279	296	323	298	307	311	320	316	324	36	47	42	36	50	105	302.7
29-Jun	79	87	51	41	49	54	90	103	97	103	103	93	96	78	48	65	93	79	94	104	98	128	143	171	86.7
30-Jun	176	191	191	196	194	183	183	172	184	193	190	199	174	188	177	144	160	166	168	158	165	165	173	174	179.1

225.8 226.8 232.6 237.6 239.3 234.6 238.6 248.2 247.7 244.3 237.1 243.9 242.4 240.3 256.3 254.1 254.9 258.0 262.5 249.9 183.6 211.2 209.8 216.7

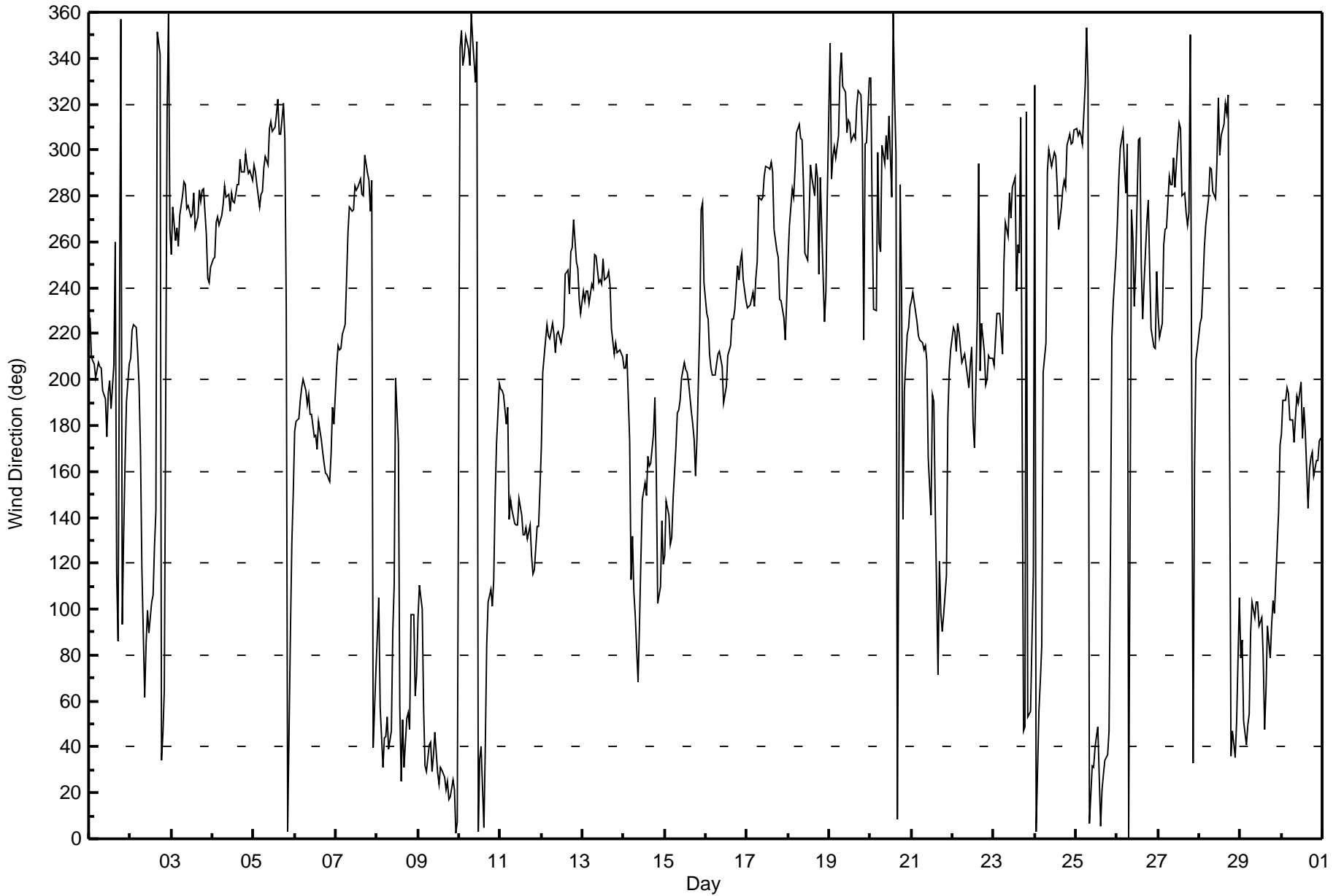
Diurnal Average

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Stony Mountain - June 2016





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Stony Mountain - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 97 deg on Jun 26 11:00 Minimum Value: 11 deg on Jun 22 21:00 Percentiles: P ₁ = 14 P ₁₀ = 20 Q ₁ = 26 Median = 33 Q ₃ = 40 P ₉₀ = 57 P ₉₉ = 86		Hours in Service: 720 Hours of Data: 720 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-Jun	19	16	16	16	16	20	21	21	22	32	40	36	31	39	38	63	42	32	60	75	35	29	21	20	75	
2-Jun	20	36	30	26	32	13	40	82	31	45	53	39	42	46	49	66	56	56	30	38	52	77	86	32	86	
3-Jun	25	29	33	32	32	31	31	28	33	35	37	36	35	37	39	35	36	37	34	32	26	22	26	29	39	
4-Jun	32	32	33	29	32	31	35	34	34	34	37	38	35	38	34	33	38	37	36	40	36	27	28	26	40	
5-Jun	29	27	31	30	30	28	34	37	40	47	51	52	47	56	62	57	49	66	86	77	40	21	22	27	86	
6-Jun	29	29	28	22	17	16	20	29	32	34	37	41	40	40	39	37	38	39	39	35	33	36	27	35	41	
7-Jun	26	21	20	20	21	23	29	32	34	34	36	35	34	34	38	34	35	37	35	28	23	40	49	27	49	
8-Jun	28	23	48	26	15	20	24	21	29	37	38	33	61	43	22	24	26	26	29	24	32	32	24	28	61	
9-Jun	31	26	33	25	24	26	24	27	31	26	25	28	29	27	26	31	39	33	38	37	30	45	52	61	61	
10-Jun	67	60	68	66	60	57	57	55	61	65	60	57	34	50	75	51	48	34	28	21	22	20	29	18	75	
11-Jun	19	22	25	36	31	25	31	29	27	34	31	36	35	32	31	31	33	33	39	34	27	29	27	37	39	
12-Jun	37	25	23	24	24	23	27	26	25	26	26	26	27	26	33	34	33	43	34	33	30	30	28	26	43	
13-Jun	28	26	27	27	25	30	31	39	37	34	36	35	37	37	34	37	33	28	26	21	15	13	11	14	39	
14-Jun	12	16	18	27	75	43	23	27	33	36	37	38	40	36	41	41	40	42	36	45	25	25	27	25	75	
15-Jun	26	31	43	29	30	32	39	33	32	30	30	26	28	30	34	35	37	38	37	44	36	28	28	22	44	
16-Jun	21	18	17	16	20	20	25	27	28	28	36	33	36	28	31	28	24	28	33	32	31	32	30	27	36	
17-Jun	26	27	26	27	25	32	32	33	31	33	32	33	34	29	35	38	39	33	35	26	25	24	23	33	39	
18-Jun	32	32	33	31	29	36	52	48	55	42	39	38	33	53	49	50	62	57	43	37	40	20	24	33	62	
19-Jun	61	42	24	28	30	42	46	71	60	66	51	49	56	49	51	44	53	54	61	77	74	75	39	24	77	
20-Jun	28	33	17	14	35	27	42	44	56	52	84	73	66	62	58	94	87	82	74	54	53	15	18	21	94	
21-Jun	20	24	21	16	16	18	20	21	27	39	54	65	66	63	73	79	84	35	31	21	20	38	21	21	84	
22-Jun	22	20	18	21	17	19	20	25	33	39	34	41	49	41	57	46	28	24	17	17	11	15	19	20	57	
23-Jun	19	19	23	23	22	20	34	39	36	38	48	42	68	52	61	31	51	33	49	60	34	19	25	21	68	
24-Jun	18	31	40	92	65	33	44	32	26	27	28	41	34	35	39	36	56	48	28	31	24	28	27	29	92	
25-Jun	36	25	26	24	23	57	52	55	63	28	27	38	28	30	57	37	36	39	23	28	23	27	17	17	63	
26-Jun	23	19	16	25	28	29	27	61	82	94	97	75	68	55	27	22	32	30	46	44	25	13	16	66	97	
27-Jun	54	15	23	32	33	32	27	30	33	44	39	51	58	68	52	58	51	34	33	64	65	48	15	12	68	
28-Jun	15	17	25	29	25	26	25	27	35	42	48	65	51	63	56	72	66	90	52	21	19	17	19	24	90	
29-Jun	29	18	26	22	15	18	26	34	36	37	41	52	51	49	39	44	68	51	34	20	15	22	22	28	68	
30-Jun	34	24	22	19	20	25	29	38	38	40	40	36	39	37	38	36	42	38	43	36	32	31	39	30	43	
		67	60	68	92	75	57	57	82	82	94	97	75	68	68	75	94	87	90	86	77	74	77	86	66	
		Diurnal Maximum																								



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	June 21, 2016	Last Calibration	May 18, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	7:05	End Time (MST)	12:57
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	-608
Analyzer IP address	192.168.1.43		Lamp voltage	891	894
Calculated slope	1.000866	0.998851	Chamber temp	45.1	44.9
Calculated intercept	0.428029	-0.735203	Pressure	662.2	655.0
Analyzer Background	21.6	21.0	Flow	0.378	0.389
Analyzer Coefficient	0.918	0.910	Intensity	86	85

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	0.4	----
as found span	5000	58.6	574.3	572.7	1.003
calibrator zero	5000	0.0	0.0	0.4	----
high point	5000	58.6	574.3	575.5	0.998
second point	5000	29.3	287.1	288.4	0.996
third point	5000	14.6	143.1	144.3	0.992
as left zero	5000	0.0	0.0	0.5	----
as left span	5000	58.6	574.3	580.5	0.989
Average Correction Factor					0.995

Corrected As found 572.3 Previous response 573.4 % change 0.2%

Notes:

Zero air scrubber changed out, filter changed out, span adjusted

Calibration Performed By: Melissa Lemay



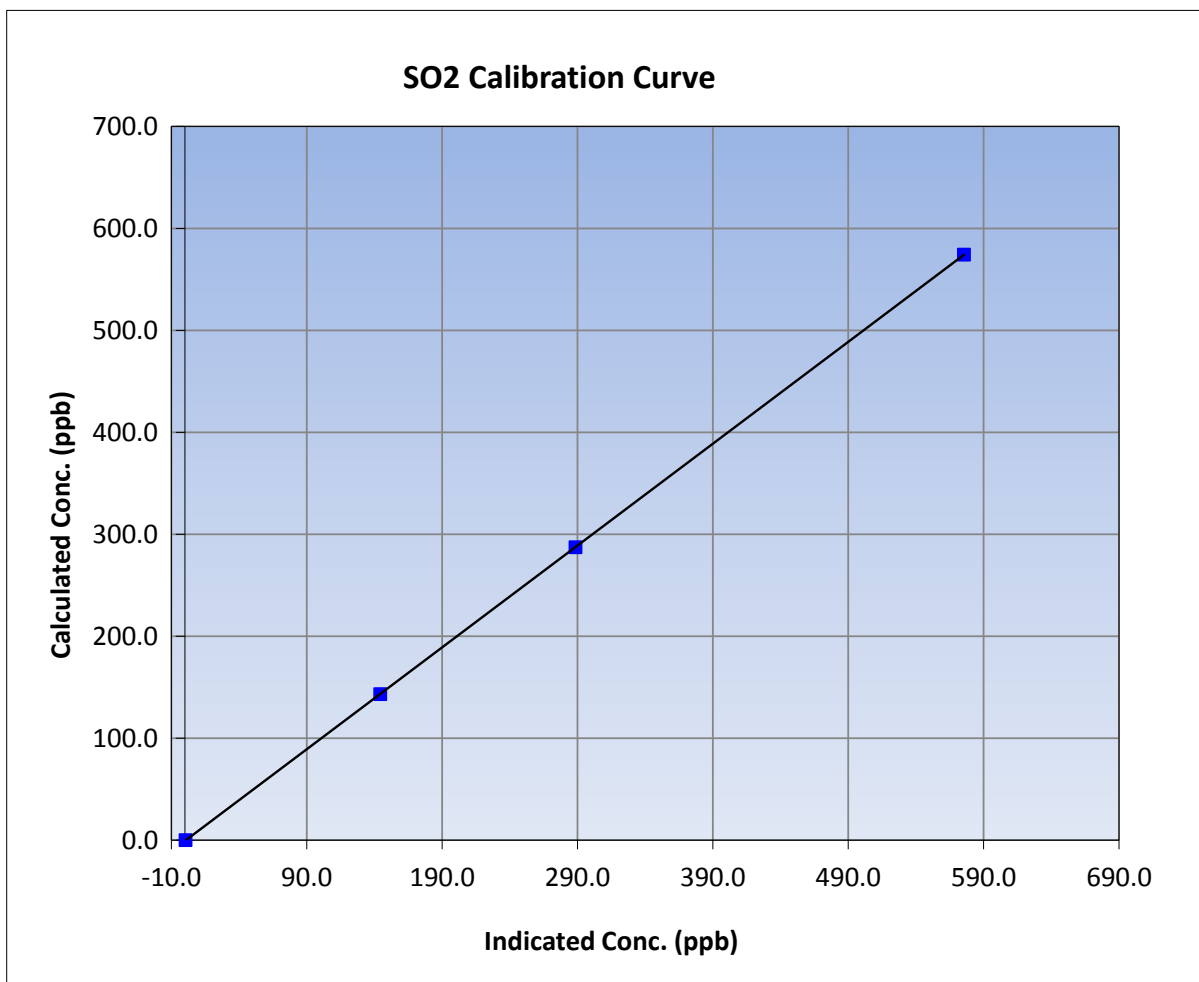
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 21, 2016	Previous Calibration	May 18, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	7:05	End Time (MST)	12:57
Analyzer make	Thermo 43i	Analyzer serial #	JC1501301453

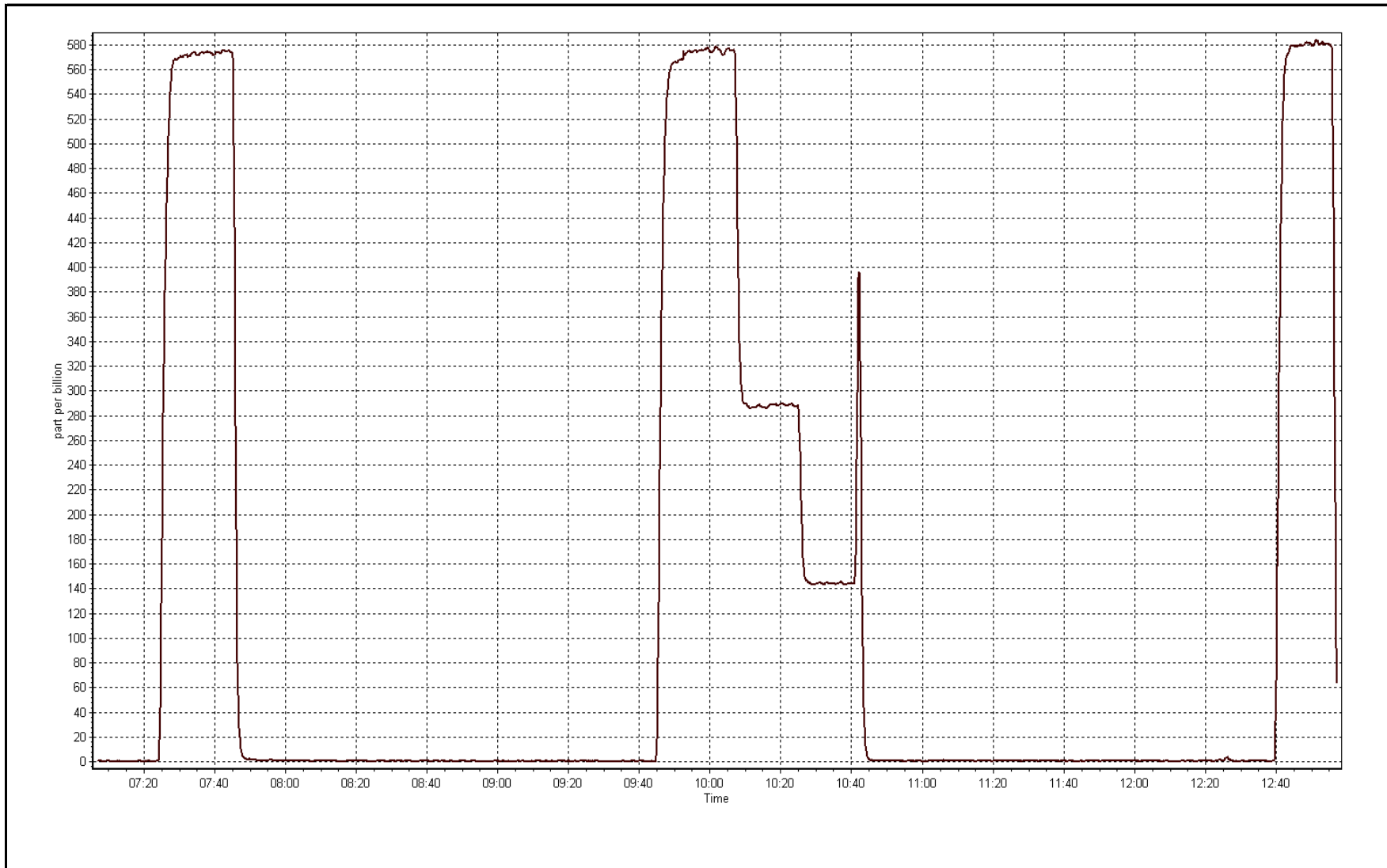
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.4	----	Correlation Coefficient	0.999998
574.3	575.5	0.9979		
287.1	288.4	0.9956	Slope	0.998851
143.1	144.3	0.9915		
			Intercept	-0.735203



SO2 Calibration Plot

Date: June 21, 2016





Wood Buffalo Environmental Association

TRS Calibration Report

Station Information

Calibration Date	June 22, 2016	Last Calibration	May 17, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	9:57	End Time (MST)	12:45
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	1006	1006
Calculated slope	1.010643	0.996196	Chamber temp	45	45
Calculated intercept	-0.080571	0.052502	Pressure	633.3	635.1
Analyzer Background	2.99	2.84	Flow	0.410	0.410
Analyzer Coefficient	1.121	1.086	Intensity	92	92
			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	80.9	0.989
SO2 scrubber check	5000	19.5	191.1	0.8	----
calibrator zero	5000	0.0	0.0	-0.2	----
high point	5000	82.0	80.0	80.2	0.998
second point	5000	41.0	40.0	40.2	0.995
third point	5000	20.5	20.0	20.2	0.990
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	82.0	80.0	81.6	0.981
Average Correction Factor					0.995

Corrected As found	81.1	Previous response	79.3	% change	-2.3%
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Notes:

no maintenance done, span adjusted, filter changed out,

Calibration Performed By:

Melissa Lemay



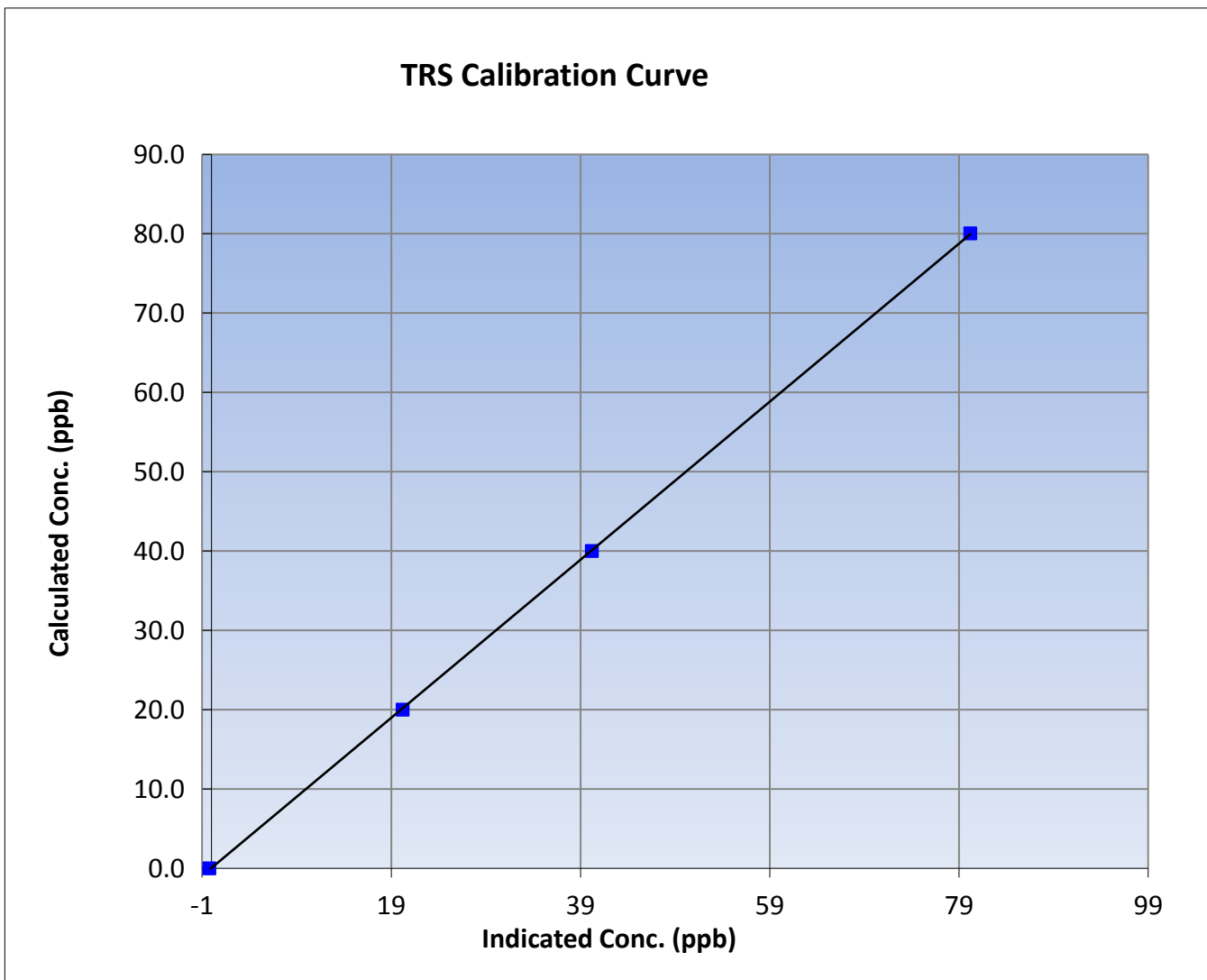
Wood Buffalo Environmental Association TRS Calibration Report

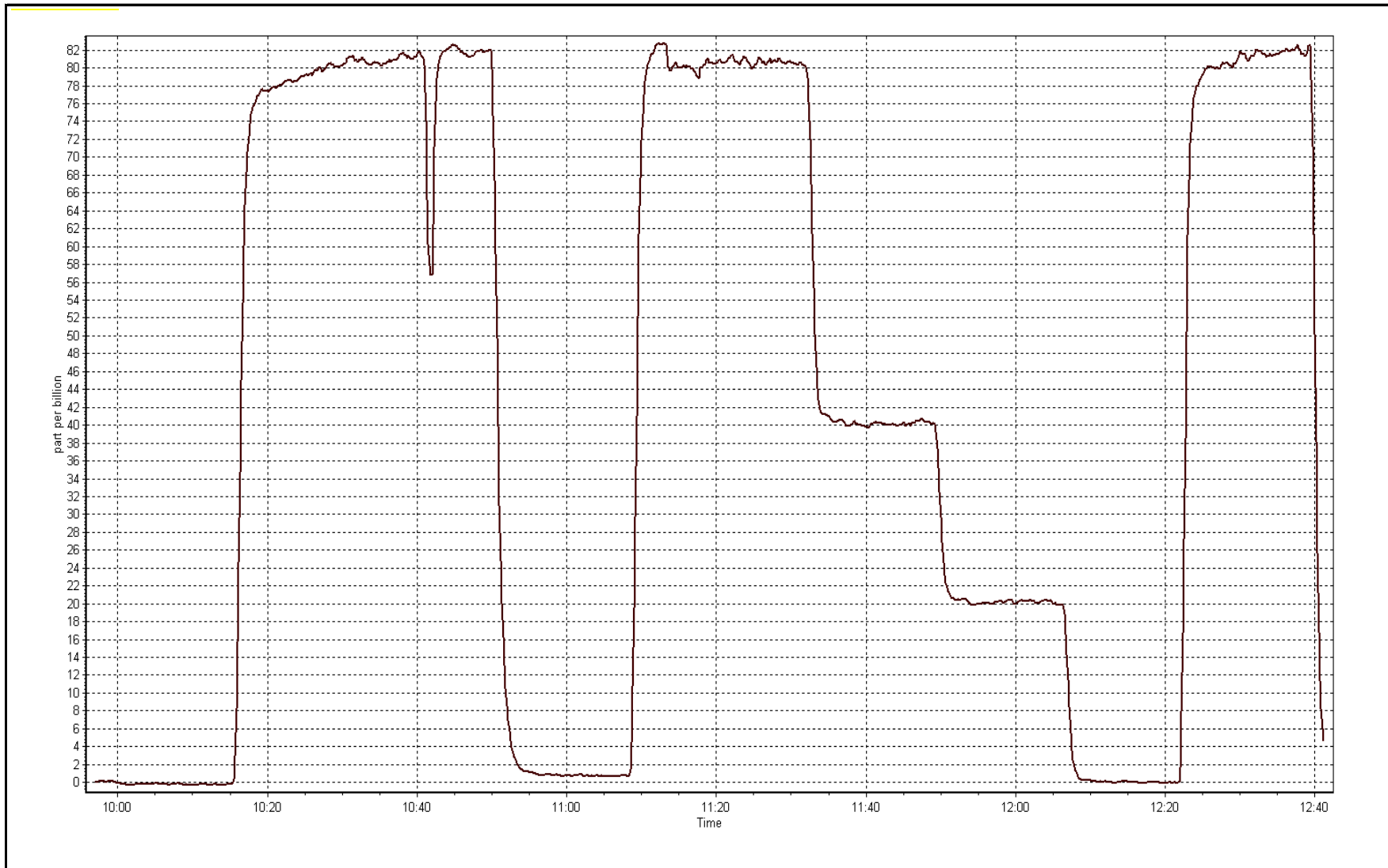
Station Information

Calibration Date	June 22, 2016	Previous Calibration	May 17, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	9:57	End Time (MST)	12:45
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	0.999980
80.0	80.2	0.9979		
40.0	40.2	0.9954	Slope	0.996196
20.0	20.2	0.9905		
			Intercept	0.052502







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	June 21, 2016	Last Calibration	May 19, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	7:05	End Time (MST)	12:57
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	75.0	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	1.005873	0.997402	Carrier Pressure	30.9	30.0
THC Calc intercept	0.000000	0.010913	Fuel Pressure	44.3	44.0
NMHC Calc slope	1.000411	0.995947	Air Pressure	34.4	34.0
NMHC Calc intercept	0.000000	-0.009182			

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	12.69	0.994
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	58.6	12.61	12.64	0.998
second point	5000	29.3	6.31	6.31	0.999
third point	5000	14.8	3.19	3.17	1.005
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	58.6	12.61	12.64	0.998
Average Correction Factor					1.001

Corrected As found 12.69 Previous response 12.54 % change -1.2%

Notes:

Zero air scrubber changed out, filter changed 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	58.6	6.54	6.46	1.013
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	58.6	6.54	6.57	0.996
second point	5000	29.3	3.27	3.31	0.988
third point	5000	14.8	1.65	1.67	0.989
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	58.6	6.54	6.61	0.990
Average Correction Factor					0.991

Corrected As found 6.46 Previous response 6.54 % change 1.2%

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	6.23	0.974
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	58.6	6.07	6.07	1.000
second point	5000	29.3	3.04	3.01	1.008
third point	5000	14.8	1.53	1.50	1.022
as left zero	5000	0.0	0.00	0.00	----
as left span	5000	58.6	6.07	6.03	1.007
Average Correction Factor					1.010

Corrected As found 6.23 Previous response 6.00 % change -3.7%



Wood Buffalo Environmental Association

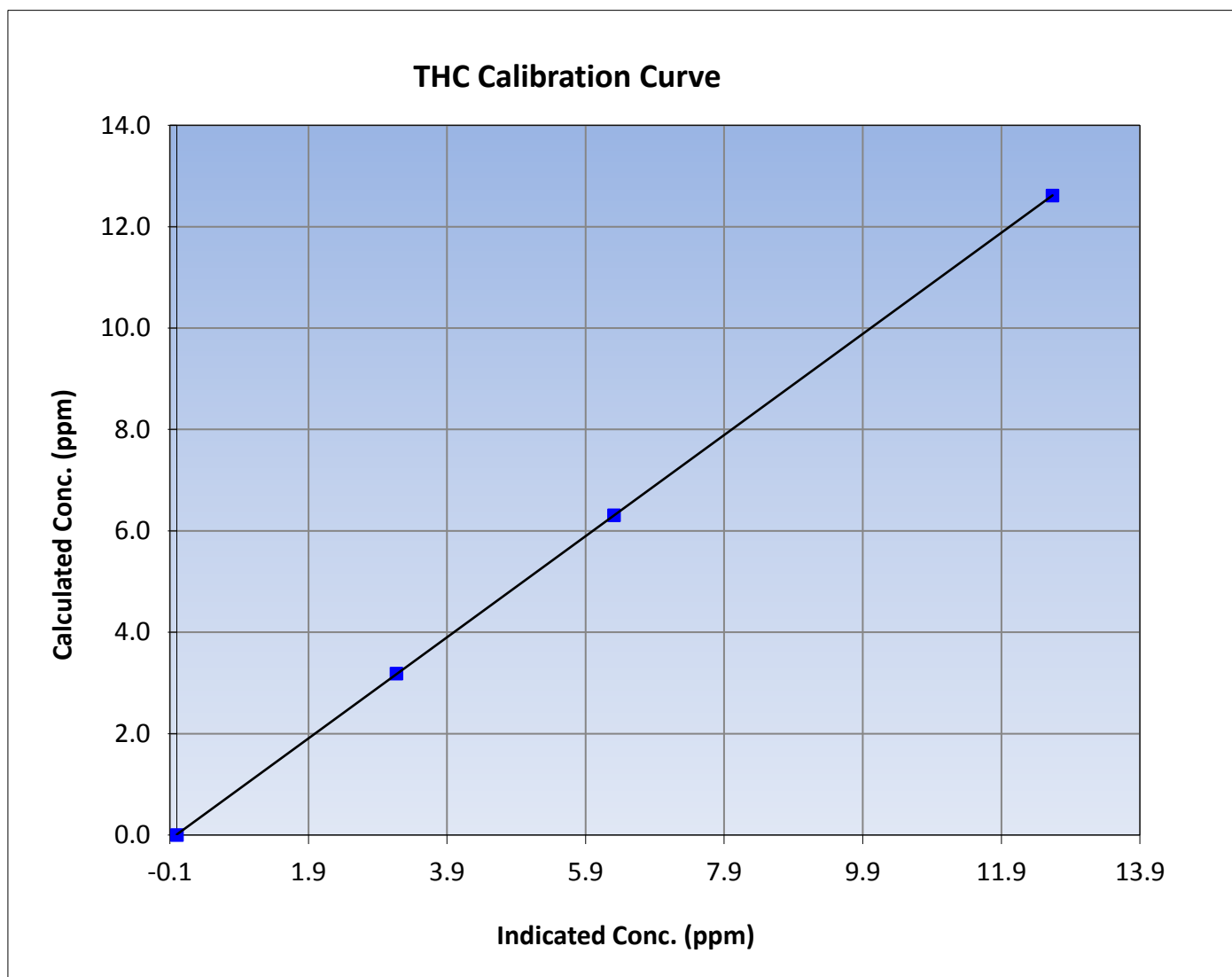
THC Calibration Summary

Station Information

Calibration Date	June 21, 2016	Previous Calibration	May 19, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	7:05	End Time (MST)	12:57
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	0.999996
12.61	12.64	0.9979		
6.31	6.31	0.9995	Slope	0.997402
3.19	3.17	1.0050		
			Intercept	0.010913





Wood Buffalo Environmental Association

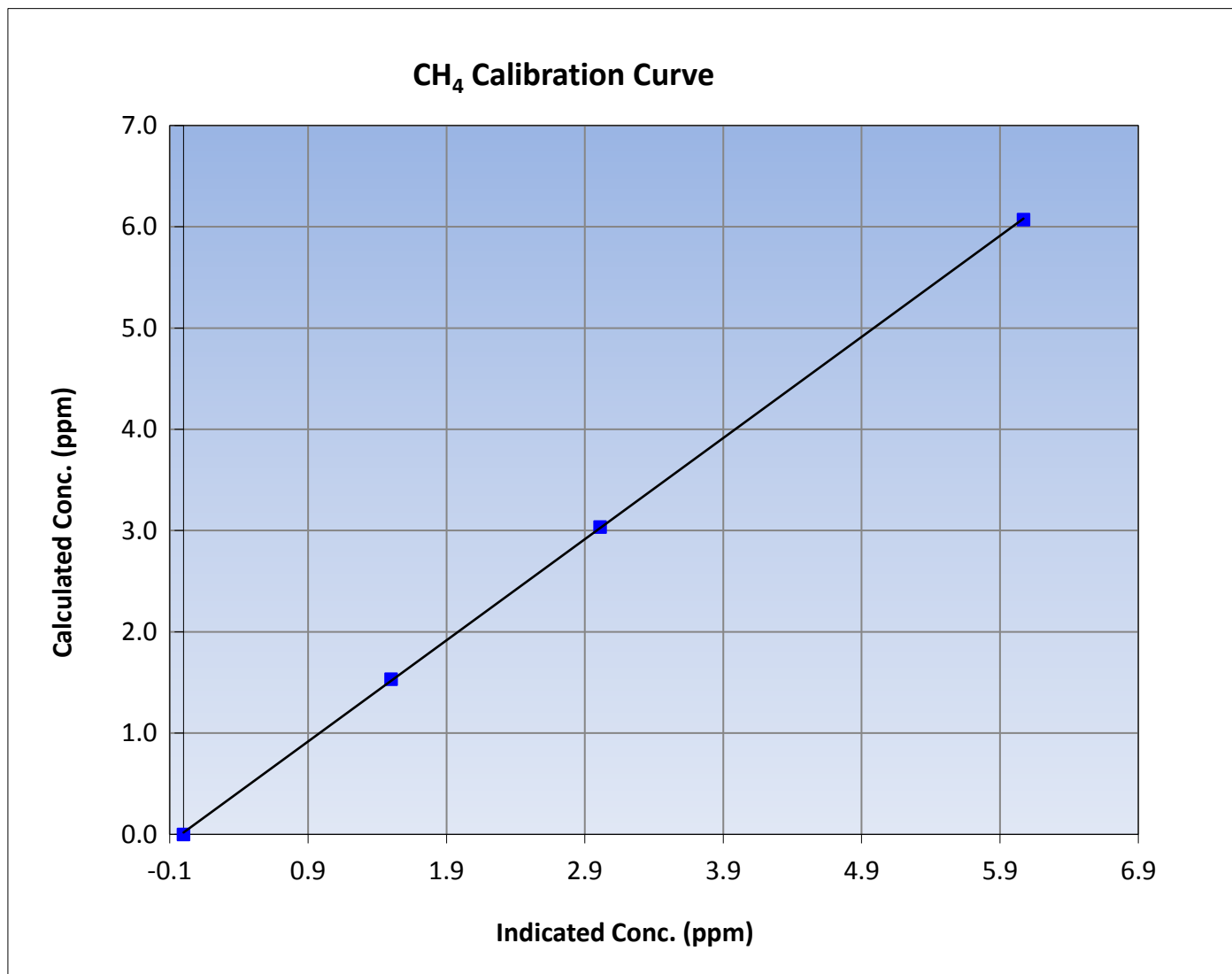
CH₄ Calibration Summary

Station Information

Calibration Date	June 21, 2016	Previous Calibration	May 19, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	7:05	End Time (MST)	12:57
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	0.999959
6.07	6.07	1.0002		
3.04	3.01	1.0085	Slope	0.998735
1.53	1.50	1.0222		
			Intercept	0.018276





Wood Buffalo Environmental Association

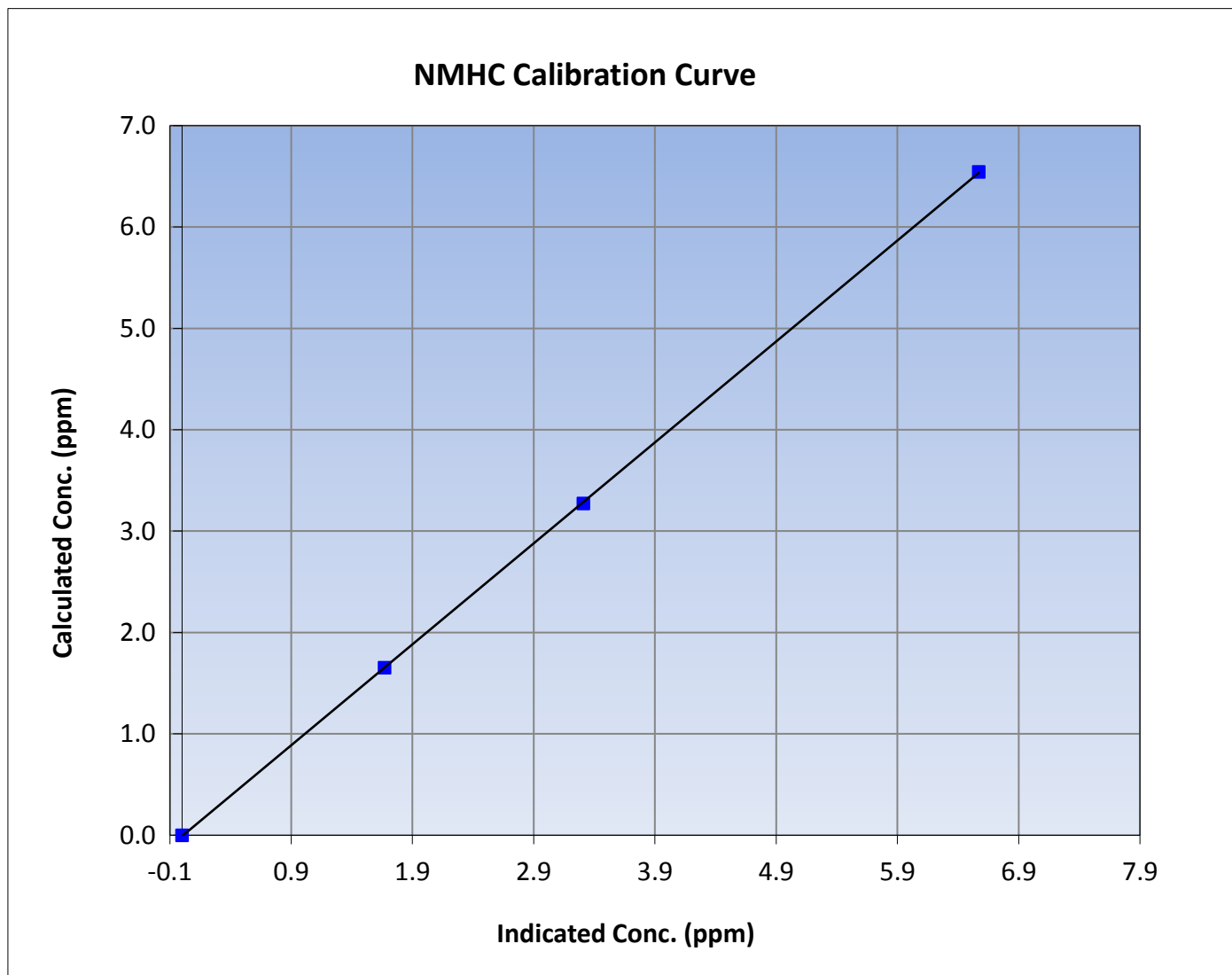
NMHC Calibration Summary

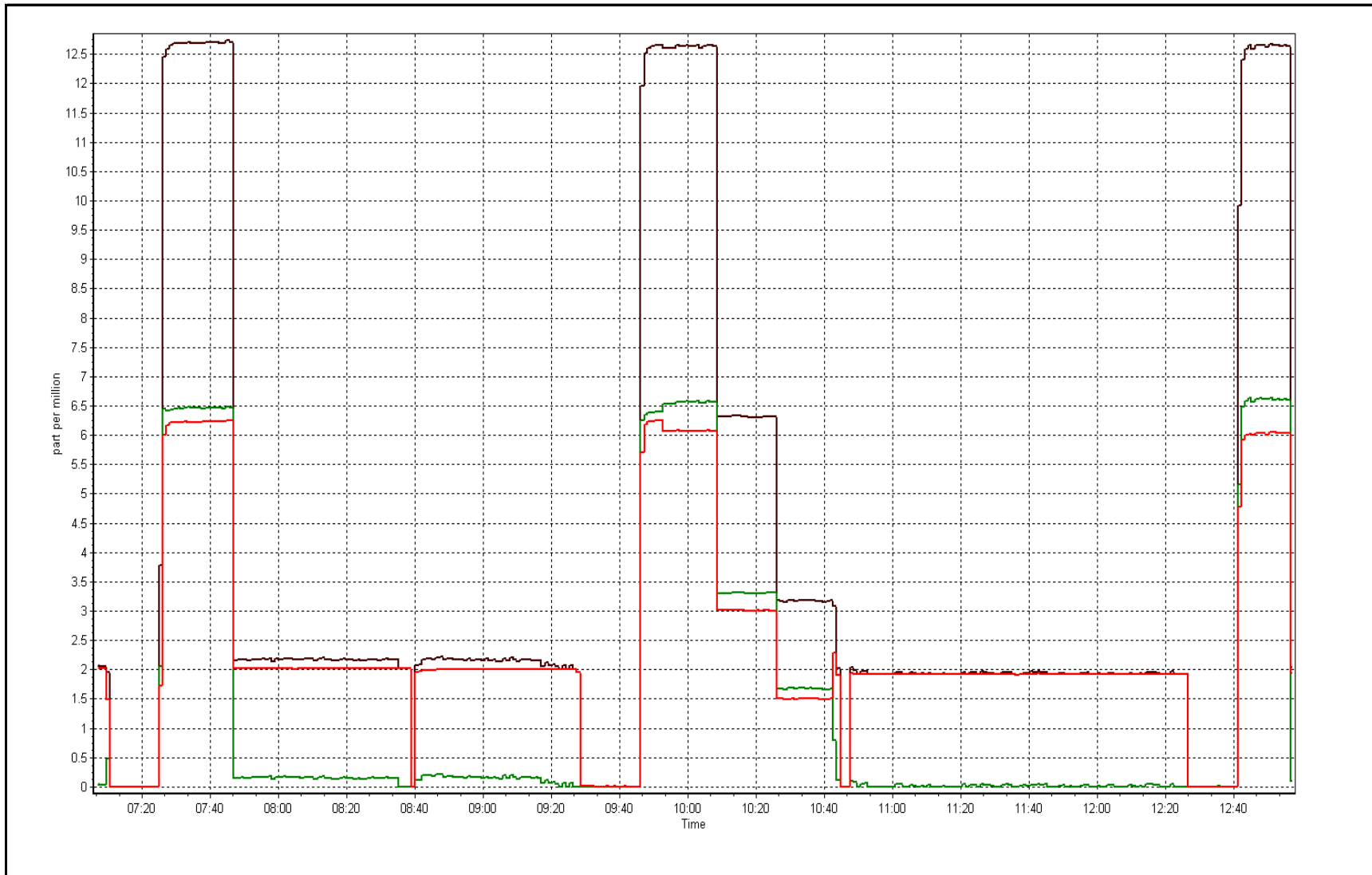
Station Information

Calibration Date	June 21, 2016	Previous Calibration	May 19, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	7:05	End Time (MST)	12:57
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	0.999982
6.54	6.57	0.9958		
3.27	3.31	0.9883	Slope	0.995947
1.65	1.67	0.9895		
			Intercept	-0.009182







Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	June 22, 2016	Previous Calibration	May 18, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	7:10	End Time (MST)	10:00
NO2 GPT Ref date	June-21-16	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.	28.5	28.5
Analyzer IP address	192.168.1.48		Lamp temp.	53.3	53.3
Calculated slope	1.004992	0.999413	Pressure	614.3	612.5
Calculated intercept	0.487897	-0.416034	Flow cell A	0.691	0.691
Analyzer Background	-1.1	-0.2	Flow cell B	0.691	0.691
Analyzer Coefficient	1.213	1.281	Cell A Intensity	61963	61963
			Cell B Intensity	60562	60562

Analyzer make	Thermo 49i	Analyzer serial #	1501663733
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Calibration Data

Set Point	Dilution air flow rate (cc/min)	Calibrator Lamp O3 Gen Drive	Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)
as found zero	5000	0.00	0.0	1.0	----
as found span	5000	1076	365.1	343.6	1.063
calibrator zero	5000	0.00	0.0	0.3	----
high point	5000	1076	365.1	365.7	0.998
second point	5000	968	248.5	249.0	0.998
third point	5000	816	127.1	127.8	0.995
as left zero	5000	0.00	0.0	0.5	----
as left span	5000	1076	365.1	369.9	0.987
Average Correction Factor					0.997

Corrected As found	342.6	Previous response	362.8	% change	5.9%
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Notes:

Zero and span adjusted, filter changed out

Calibration Performed By: Melissa Lemay



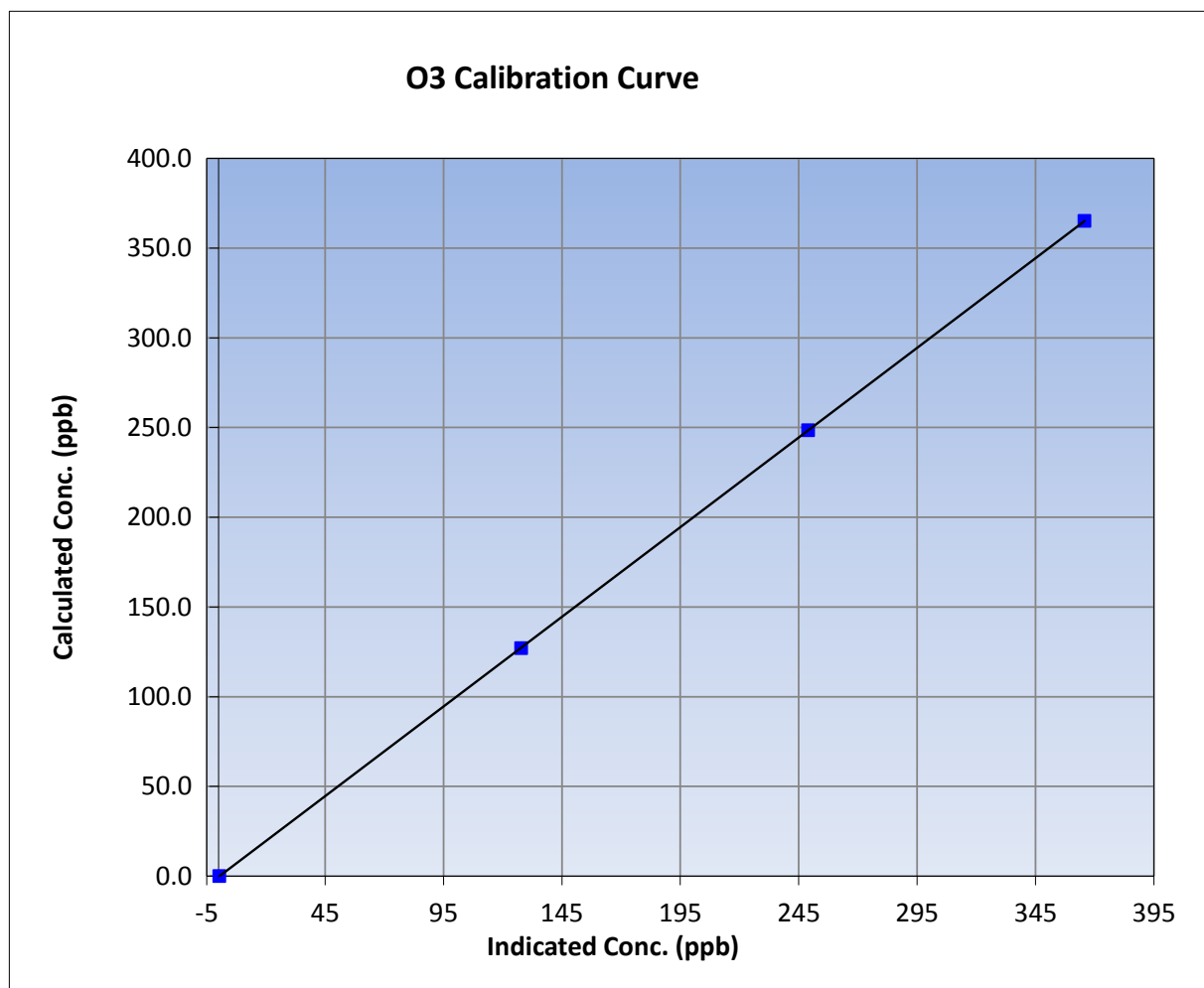
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	June-22-16	Previous Calibration	May 18, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	7:10	End Time (MST)	10:00
Analyzer make	Thermo 49i	Analyzer serial #	1501663733

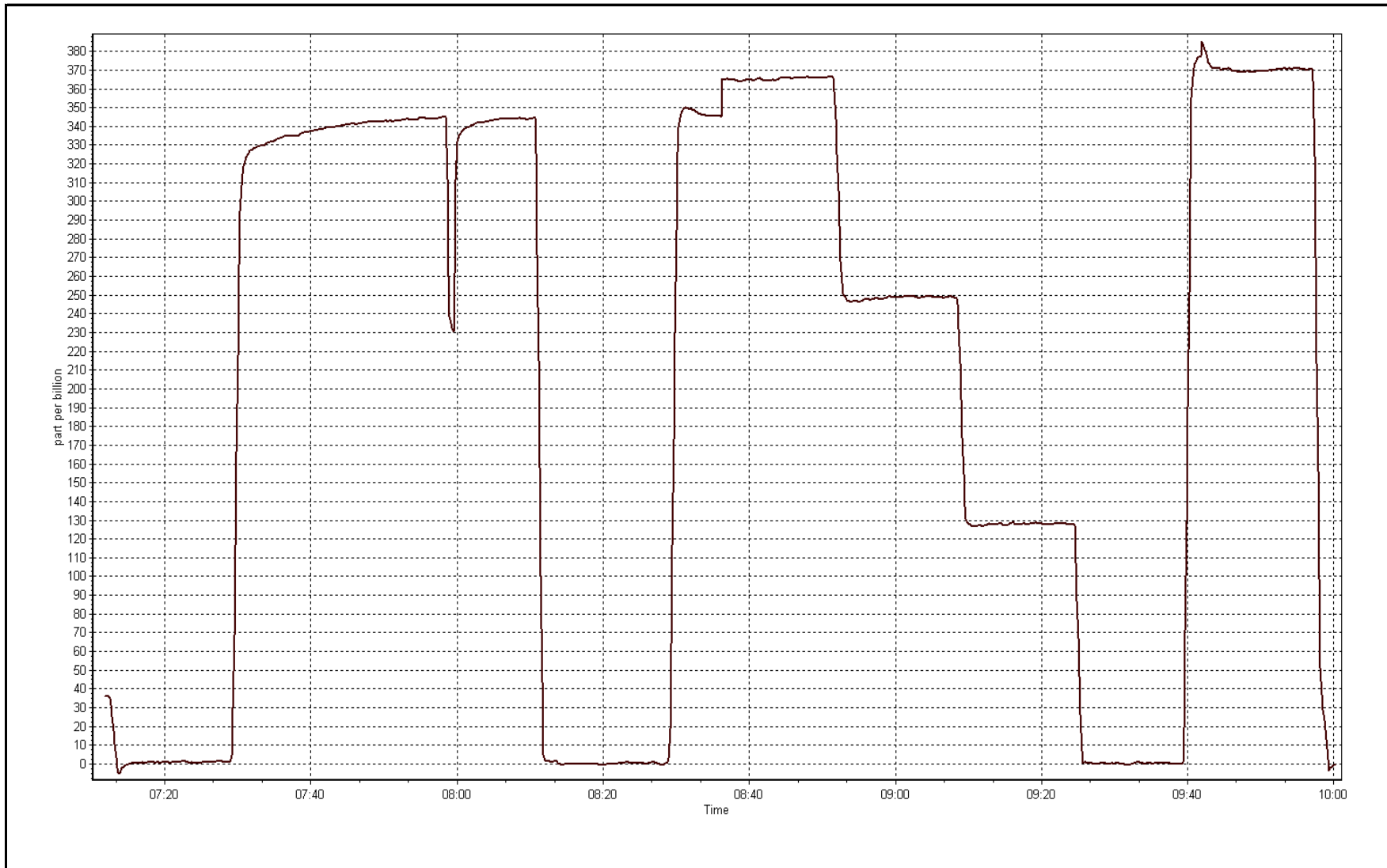
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999999
365.1	365.7	0.9984		
248.5	249.0	0.9980	Slope	0.999413
127.1	127.8	0.9945		
			Intercept	-0.416034



O3 Calibration Plot

Date: June 22, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 21, 2016	Previous Calibration	May 18, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Reason:	Routine		
Start Time (MST)	7:05	End Time (MST)	12:56
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	0.995282	0.995631	0.999892
	Data Offset	0.125700	0.464546	-0.118796
Current Calibration	Data Slope	1.002565	1.001026	0.996260
	Data Offset	-1.199459	-1.062481	-0.293798

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1336160088
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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	1.014		1.033	
NOx coefficient	0.999		0.999	
NO2 coefficient	0.997		0.996	
NO bkgrnd	1.8		1.9	
NOx bkgrnd	1.9		2.0	
Chamber Temp	50.2	Deg C	50.5	Deg C
Moly Temp	326.6	Deg C	322.4	Deg C
PMT voltage	-814	V	-813.6	V
PMT Temp	-2.7	Deg C	-2.9	Deg C
O3 flow	Ok	ccm	ok	ccm
R Cell press NO	153.6	mmHg	153.3	mmHg
R Cell Press Nox	153.6	mmHg	153.3	mmHg
NO sample flow	0.972	lpm	0.979	lpm
Nox sample Flow	0.972	lpm	0.978	lpm

Notes:

Zero air scrubber changed out, filter changed out, span adjusted



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 21, 2016

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	-0.2	-0.3	0.0	----	----
as found span	5000	58.6	600.1	600.1	0.0	603.0	602.8	0.2	0.9951	0.9955
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.2	0.3	0.1	----	----
high point	5000	58.6	600.1	600.1	0.0	598.7	599.7	-1.0	1.0023	1.0006
second point	5000	29.3	300.0	300.0	0.0	302.1	302.4	-0.3	0.9932	0.9922
third point	5000	14.6	149.5	149.5	0.0	151.1	150.4	0.7	0.9894	0.9940
as left zero	5000	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	----	----
as left span	5000	58.6	600.1	243.6	356.5	610.4	238.1	372.3	0.9831	1.0231
Average Correction Factor									0.9950	0.9956

Corrected As found
Previous Response

NO_x= 603.2
NO_x= 602.8

NO= 603.1
NO= 602.2

Percent Change

NO_x= -0.1%

NO= -0.1%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 58.60 ccm NOx ref calc conc = 600.1 ppb NO ref calc conc = 600.1 ppb

O3 Setpoint (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
1st NO ref point		0.0	607.4	608.7	0.1	0.9879	0.9858	----	----
1st NO2 (300)	243.6	365.1	610.1	243.6	366.5	0.9836	----	0.9962	100.4%
2nd NO2 (200)	360.2	248.5	610.2	360.2	250.0	0.9834	----	0.9940	100.6%
3rd NO2 (100)	481.6	127.1	609.7	481.6	128.1	0.9842	----	0.9922	100.8%
2nd NO ref point		0.0	609.2	608.8	-0.4	0.9850	0.9857	----	----
Average Correction Factor						0.9840		0.9941	100.6%

Calibration Performed By: Melissa Lemay



Wood Buffalo Environmental Association

NO_x Calibration Summary

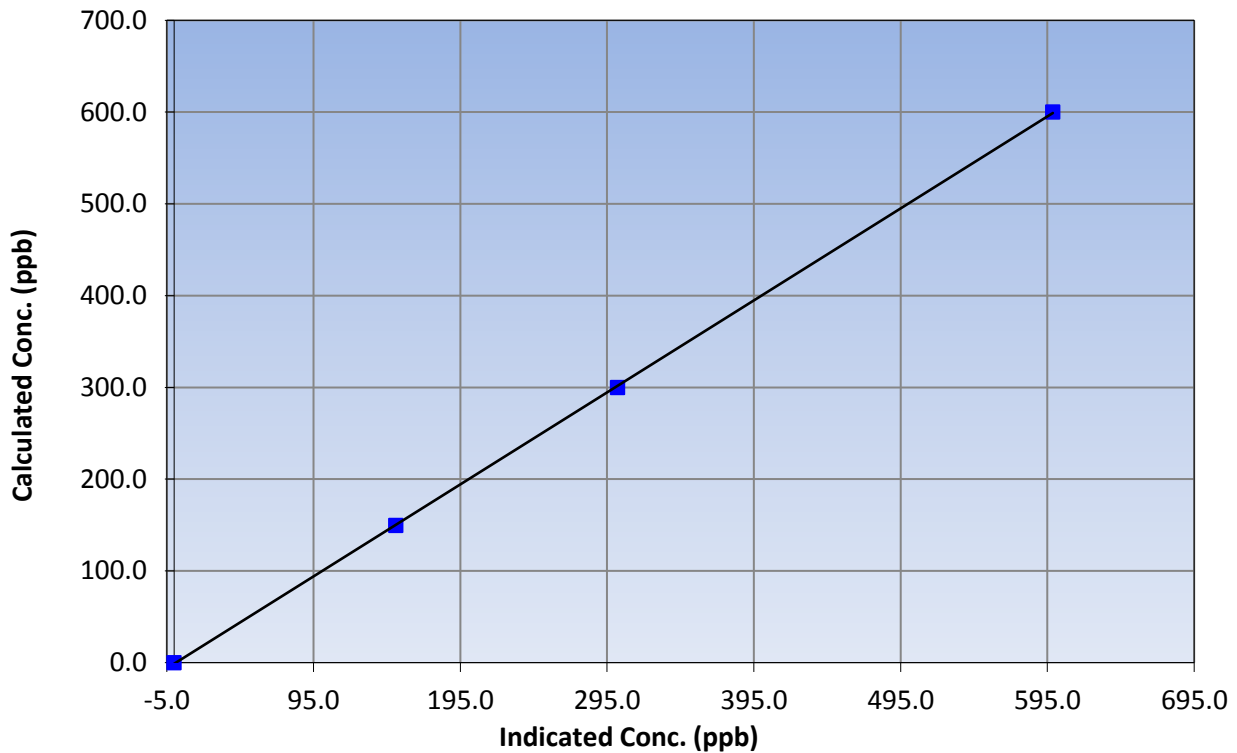
Station Information

Calibration Date	June 21, 2016	Previous Calibration	May 18, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	7:05	End Time (MST)	12:56
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	-0.2	----	Correlation Coefficient	0.999968
600.1	598.7	1.0023		
300.0	302.1	0.9932	Slope	1.002565
149.5	151.1	0.9894		
			Intercept	-1.199459

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

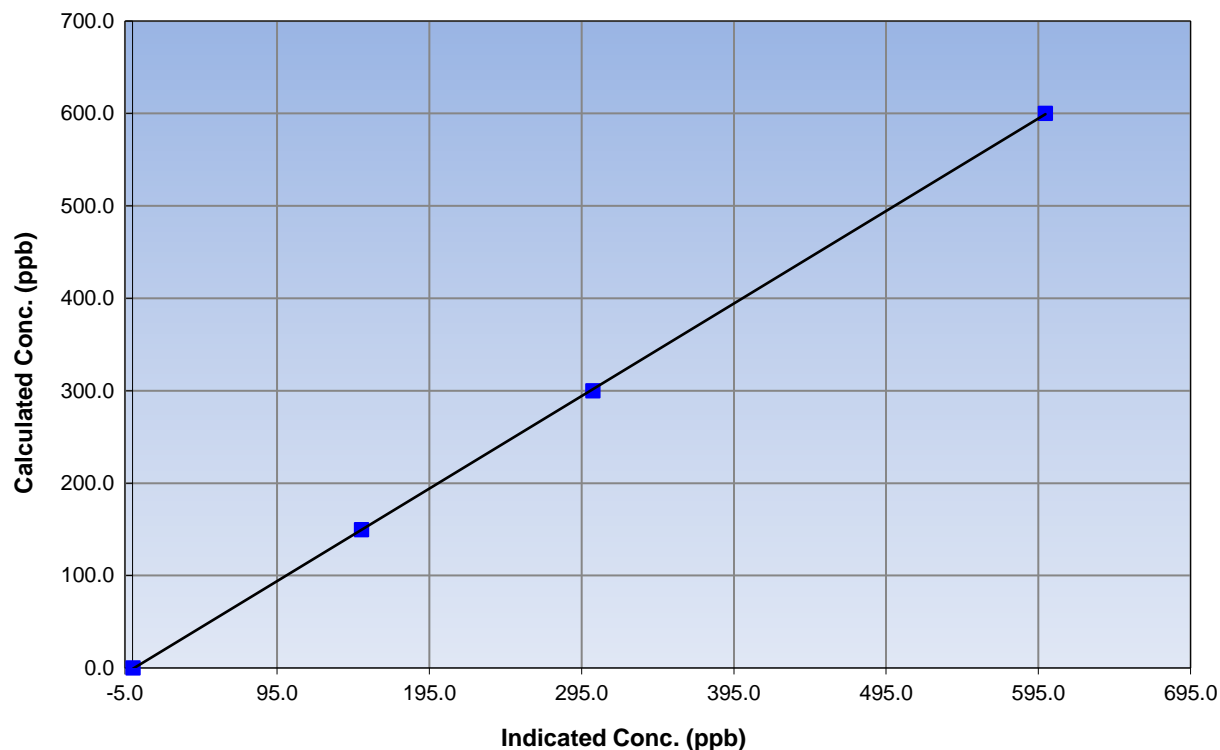
Station Information

Calibration Date	June 21, 2016	Previous Calibration	May 18, 2016
Station Name	Stony Mountain	Station Number	AMS 18
Start Time (MST)	7:05	End Time (MST)	12:56
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	0.3	N/A	Correlation Coefficient	0.999980
600.1	599.7	1.0006		
300.0	302.4	0.9922	Slope	1.001026
149.5	150.4	0.9940		
			Intercept	-1.062481

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

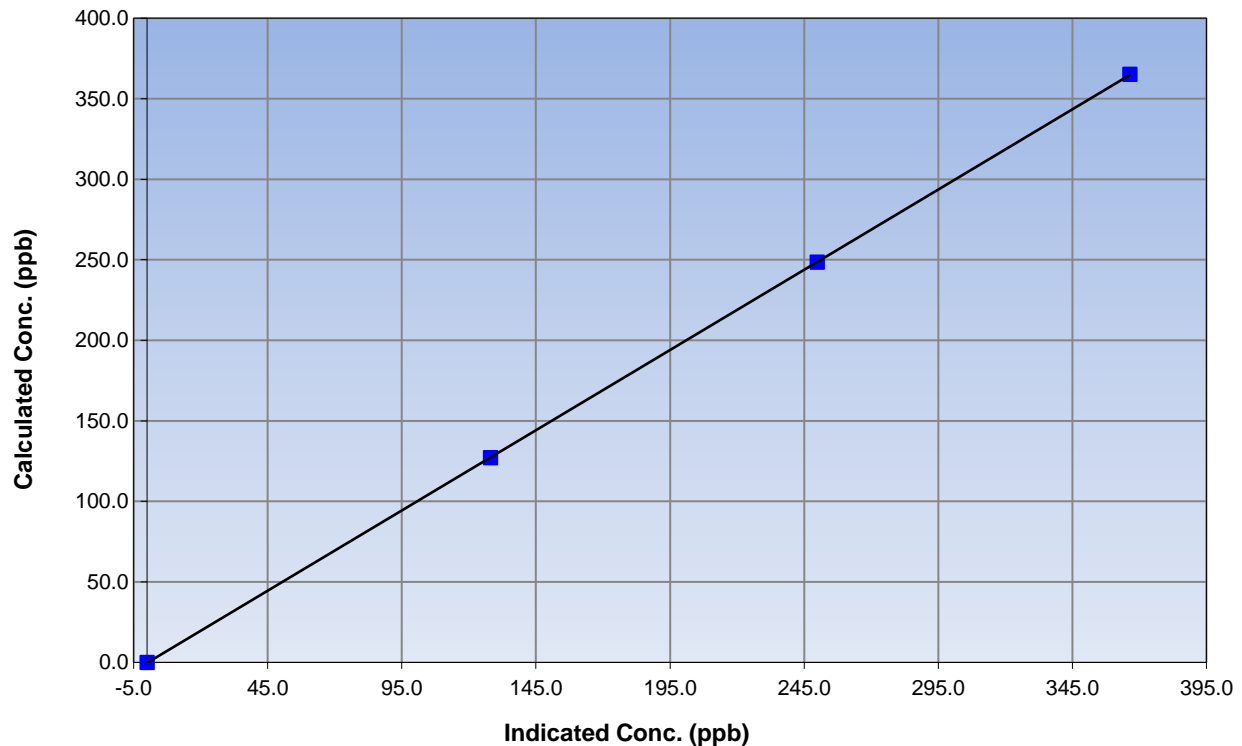
Station Information

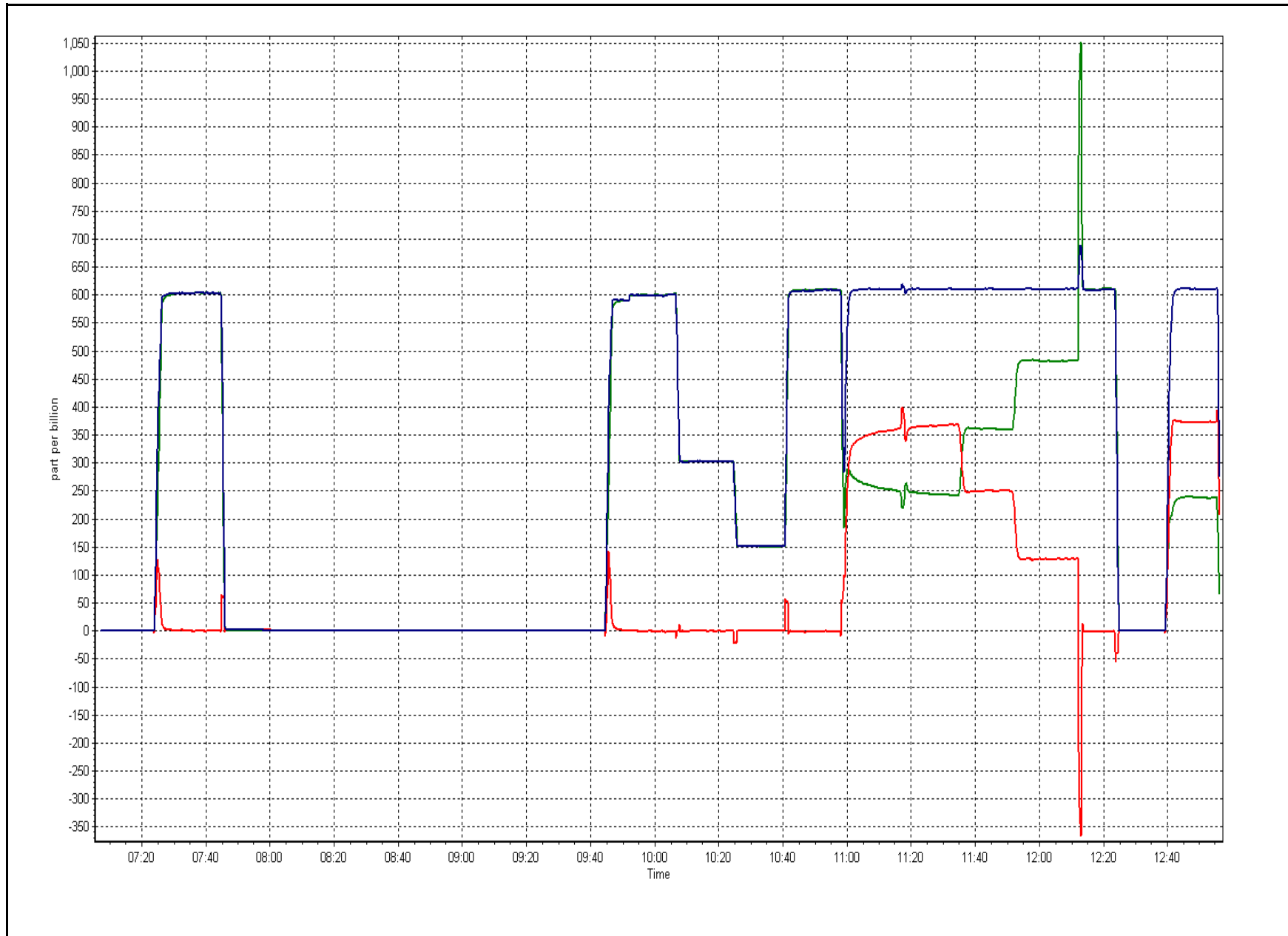
Calibration Date	June 21, 2016	Previous Calibration	May 18, 2016
Station Number	Stony Mountain	Station Number	AMS 18
Start Time (MST)	7:05	End Time (MST)	12:56
Analyzer make	Thermo 42i	Analyzer serial #	1336160088

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	N/A	Correlation Coefficient	0.999997
365.1	366.5	0.9962		
248.5	250.0	0.9940	Slope	0.996260
127.1	128.1	0.9922		
			Intercept	-0.293798

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	<u>June 22, 2016</u>	Previous Calibration:	<u>April 27, 2016</u>
Station Name:	<u>Stony Mountain</u>	Station Number:	<u>AMS 18</u>
Start Time (MST):	<u>7:29</u>	End Time (MST):	<u>9:44</u>
Calibrator Make/Model:	<u>Delta Cal</u>	Calibrator Serial Number:	<u>1450</u>

SHARP INFORMATION			
Particulate Fraction:	<u>PM2.5</u>		
Make/Model:	<u>Thermo / SHARP 5030</u>		
Serial Number:	<u>E-781</u>		
C ₁₄ Source SN:			
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	18.0	19.0	1.0	18.0
T2	24.0	25.0	1.0	25.0
T3	30.0	25.0	-5.0	25.0
T4	23.0	25.0	2.0	25.0
RH (%)	45.0	na	na	25.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	937	936.0	-1.0	937

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1000	1015	15	1000	1000

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	303		303
Neph	7.5		-0.9
C14	767.3		747.5
Indicated Concentration (ug/m3)	2.6	Yes	-0.4
Offset 1	305		305
Offset 2	44		43.8

Leak Check (Quarterly)			
Leak Check Date:	<u>June 22, 2016</u>	Previous Leak Check Date:	<u>March 13, 2016</u>
	Measured		Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.99		0.09
*Flow with adaptor (LPM):	16.90		
<i>*Note - do not attach adaptor without shutting off the pump first</i>			

Mass Foil Calibration (Annually)			
Foil Calibration Date:	<u>June 22, 2016</u>	Previous Foil Calibration:	<u>March 13, 2016</u>
Zeroed?:	<u>Yes</u>		
Foil Mass:	<u>1337</u>		<u>Mass foil set S/N:</u> 5872
Previous Correction Factor:	<u>7027</u>		
New Correction Factor:	<u>6985</u>		

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	22-Jun-16
Pump	Good	Jun 30,2015
Filter Tape	Good	13-Mar-16
Mass Foil Cal Set	na	NA
HEPA filter	Good	Jun 30,2015

NOTES:

T2-T4, flow and Nephelometer adjusted cyclone head cleaned

Calibration Performed By: Melissa Lemay



WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 19
SUNCOR FIREBAG
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)
 JUNE 2016

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	682	34	38	99.44	16	0	2	0
H2S (ppb) Average	683	36	37	99.86	1	0	0	0
THC (ppm) Average	682	34	38	99.44	2.8	-	2.3	-
NO2 (ppb) Average	681	35	39	99.44	14	0	3	-
NO (ppb) Average	681	35	39	99.44	8	-	1	-
NOX (ppb) Average	681	35	39	99.44	19	-	4	-
Temperature 2 m (C) Average	720	0	0	100.00	26.9	-	22	-
Relative Humidity (%) Average	720	0	0	100.00	100	-	95	-
Wind Speed 10 m (km/h) Average	719	0	1	99.86	51	-	27	-
Wind Direction 10 m (deg) Average	719	0	1	99.86	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	682	0.5	1	-	0	0	0	0	0	1	16
H2S (ppb) Average	683	0.2	0	-	0	0	0	0	0	0	1
THC (ppm) Average	682	2.17	0.1	-	2	2.1	2.1	2.2	2.2	2.3	2.8
NO2 (ppb) Average	681	1.2	1	-	0	0	1	1	1	2	14
NO (ppb) Average	681	0.3	0	-	0	0	0	0	0	1	8
NOX (ppb) Average	681	1.6	2	-	0	0	1	1	2	3	19
Temperature 2 m (C) Average	720	15.72	4.8	-	4.6	9.8	12	15.3	19.4	22.5	26.9
Relative Humidity (%) Average	720	61.6	23	-	15	32	44	59	83	94	100
Wind Speed 10 m (km/h) Average	719	13.5	7	-	0	5	8	12	17	22	51
Wind Direction 10 m (deg) Average	719	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - FIREBAG (AMS 19)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2, THC, NO2	27 Jun 2016 11:00	27 Jun 2016 14:00	4	Maintenance - service zero air generator, change inlet filters
H2S	28 Jun 2016 10:00	28 Jun 2016 10:00	1	Maintenance - manifold cleaning
Wind Speed, Wind Direction	08 Jun 2016 03:00	08 Jun 2016 03:00	1	Flat line in sensor output signal



Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 16 ppb on Jun 2 15:00	Maximum Daily Average: 2.3 ppb on Jun 2		Hours of Data:	682
Minimum Value: 0 ppb on Jun 7 11:00	Minimum Daily Average: 0.1 ppb on Jun 9		Hours of Missing Data:	38
Maximum Diurnal Average: 1.0 ppb at hour 15	Minimum Diurnal Average: 0.3 ppb at hour 2		Hours of Calibration:	34
Monthly Average: 0.5 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 5		Percent Operational Time:	99.4

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-Jun	0	0	0	Z	0	0	0	0	1	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0.4	1
2-Jun	0	0	0	0	Z	1	6	5	10	4	1	2	2	1	16	1	2	1	0	0	0	0	0	0	2.3	16
3-Jun	1	2	2	2	1	Z	1	1	1	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.7	2
4-Jun	Z	0	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1
5-Jun	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
6-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0.2	1
7-Jun	1	0	0	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
8-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0.2	2
9-Jun	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
10-Jun	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
11-Jun	0	Z	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
12-Jun	0	0	Z	0	0	0	0	10	3	0	0	0	0	1	5	3	2	0	0	0	0	0	0	2	1.3	10
13-Jun	1	0	0	Z	0	0	1	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.5	2
14-Jun	1	1	0	2	Z	3	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0.5	3
15-Jun	0	0	0	0	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
16-Jun	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
17-Jun	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
18-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0.4	4
19-Jun	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
20-Jun	0	0	0	0	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1	1	2	2	0.5	2
21-Jun	1	1	1	0	0	Z	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	4
22-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	14	10	1.8	14
23-Jun	4	Z	2	1	1	2	3	2	0	0	0	0	0	0	1	0	0	0	0	0	3	1	0	0	0.9	4
24-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0.3	1
25-Jun	0	0	0	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
26-Jun	0	0	0	0	Z	0	0	0	1	3	3	2	2	0	0	1	1	1	1	2	2	1	1	0	0.9	3
27-Jun	0	0	0	1	3	Z	3	2	1	0	M	M	M	M	0	1	1	2	2	2	2	1	0	0	1.1	3
28-Jun	Z	0	0	0	3	3	1	1	0	C	C	C	C	0	0	0	0	0	0	0	0	0	0	0	0.6	3
29-Jun	0	Z	0	0	0	0	0	0	1	1	2	2	2	2	2	1	0	0	0	0	0	0	0	0	0.7	2
30-Jun	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

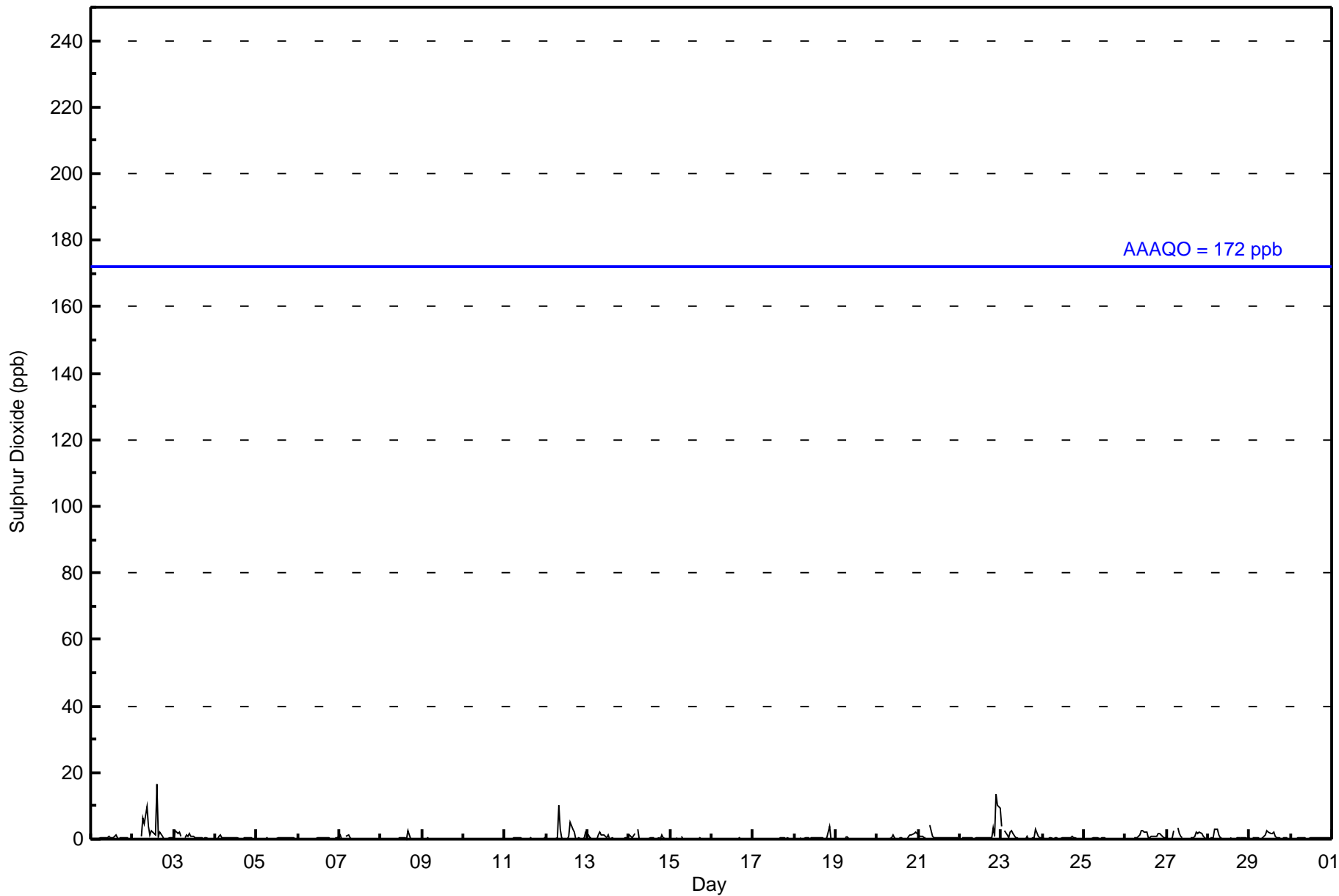
0.5	0.3	0.3	0.4	0.5	0.6	0.9	1.0	0.8	0.6	0.4	0.4	0.4	0.3	1.0	0.4	0.5	0.3	0.3	0.5	0.5	0.7	0.6	0.6	Diurnal Average	
4	2	2	2	3	3	6	10	10	4	3	2	2	2	16	3	2	2	2	3	4	14	10	9	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Firebag - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Firebag - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	680	99.71	99.71
11 - 20	2	0.29	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: 682

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Firebag - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	32	48	32	20	20	27	46	59	73	54	54	63	36	42	32	41	679
11 - 20	0	0	0	0	0	1	0	0	0	0	1	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
Totals	32	48	32	20	20	28	46	59	73	54	55	63	36	42	32	41	681

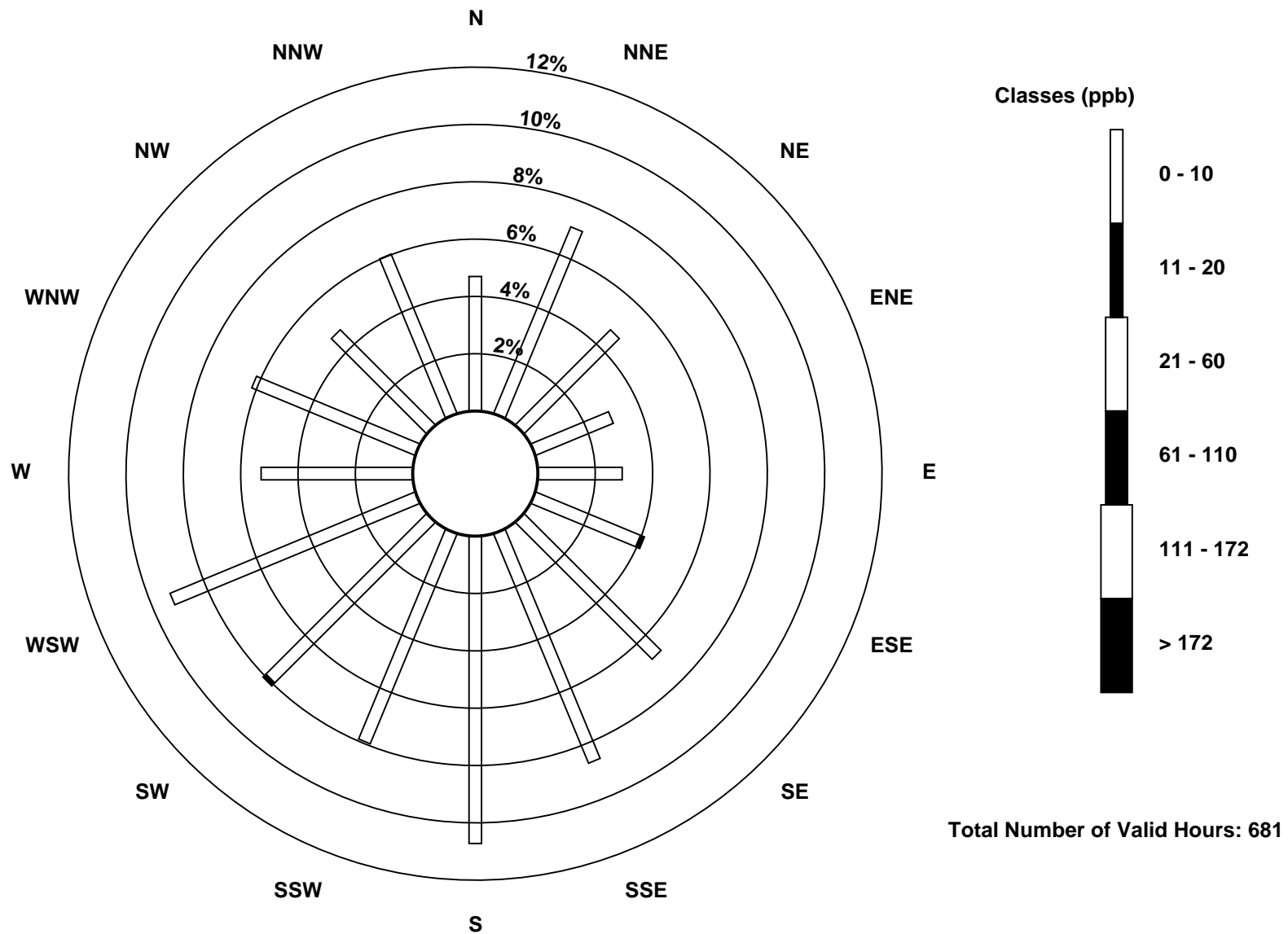
Total Number of Valid Hours: 681

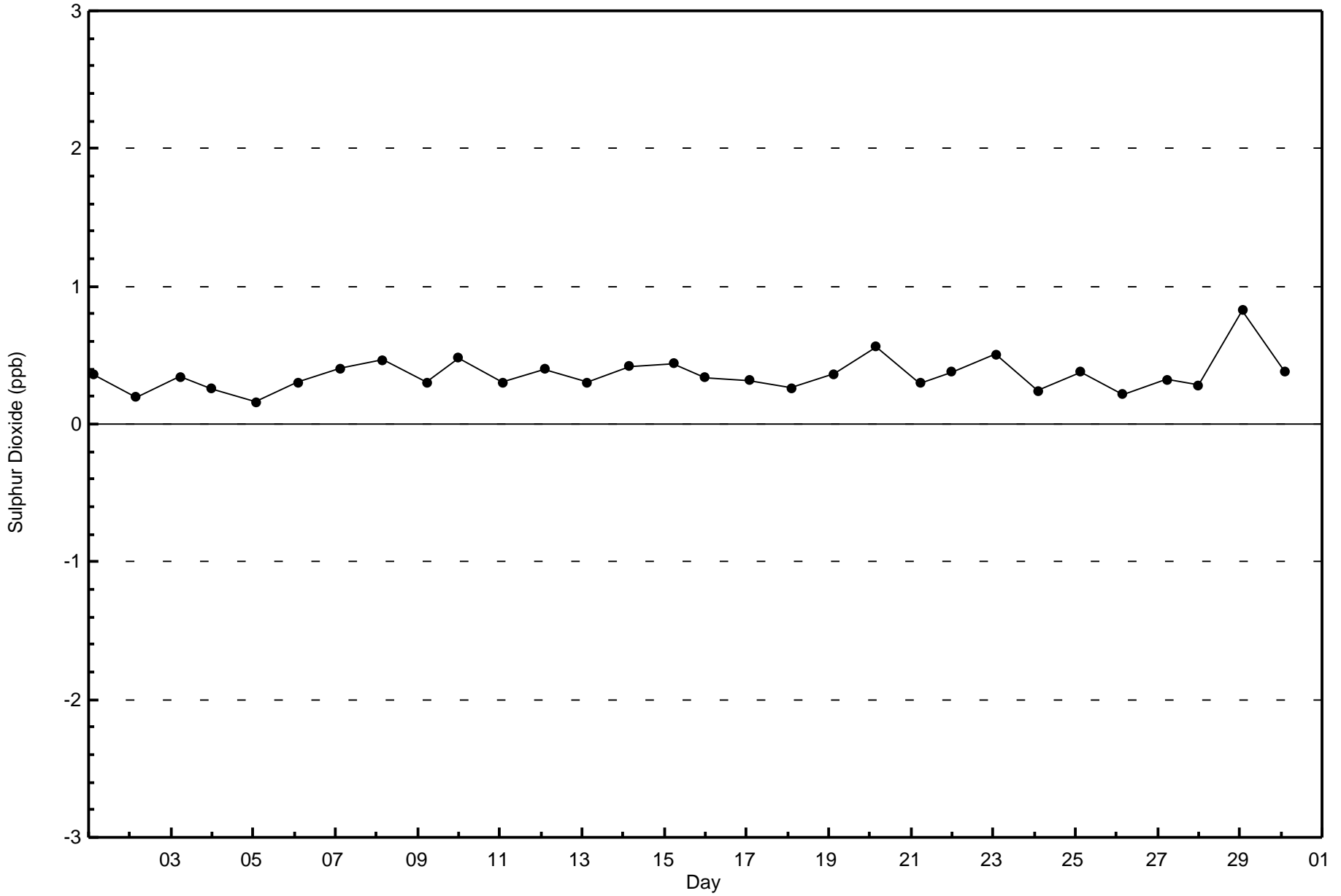
Total Number of Hours: 720

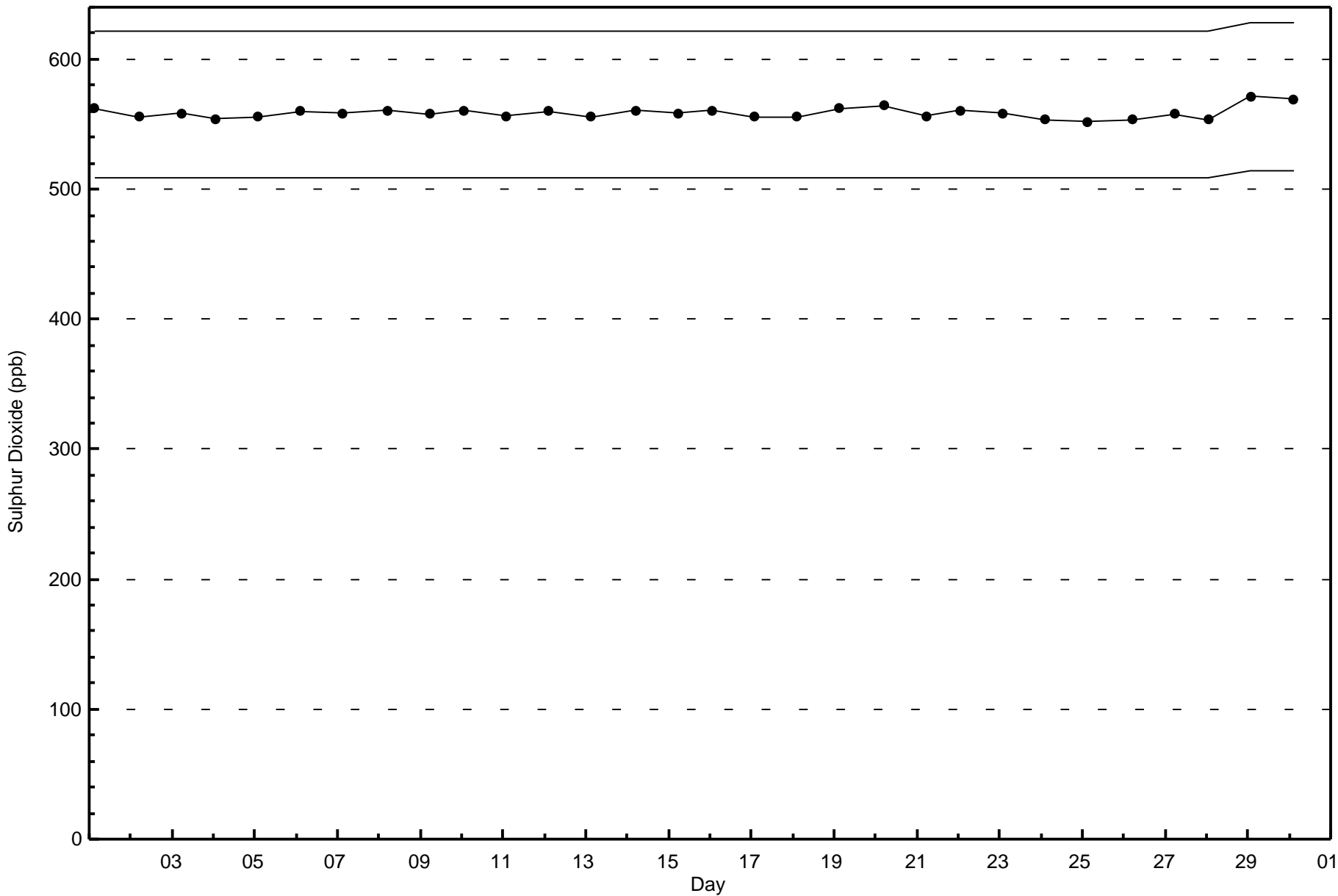


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Sulphur Dioxide (SO₂) - ppb
Firebag (AMS 19)









Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 1 ppb on Jun 25 06:00	Maximum Daily Average: 0.3 ppb on Jun 25		Hours of Data:	683
Minimum Value: 0 ppb on Jun 1 10:00	Minimum Daily Average: 0.1 ppb on Jun 1		Hours of Missing Data:	37
Maximum Diurnal Average: 0.3 ppb at hour 6	Minimum Diurnal Average: 0.1 ppb at hour 13		Hours of Calibration:	36
Monthly Average: 0.2 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1		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-Jun	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-Jun	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
3-Jun	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
4-Jun	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-Jun	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
6-Jun	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
7-Jun	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-Jun	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
9-Jun	0	0	1	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
10-Jun	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-Jun	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
12-Jun	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-Jun	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
14-Jun	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
15-Jun	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
16-Jun	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
17-Jun	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
18-Jun	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
19-Jun	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
20-Jun	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
21-Jun	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
22-Jun	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-Jun	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
24-Jun	0	0	1	Z	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
25-Jun	0	0	0	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
26-Jun	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
27-Jun	0	0	0	1	1	0	Z	0	0	0	C	C	C	C	C	C	0	0	0	0	0	0	0	0	--	1
28-Jun	0	Z	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
29-Jun	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
30-Jun	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

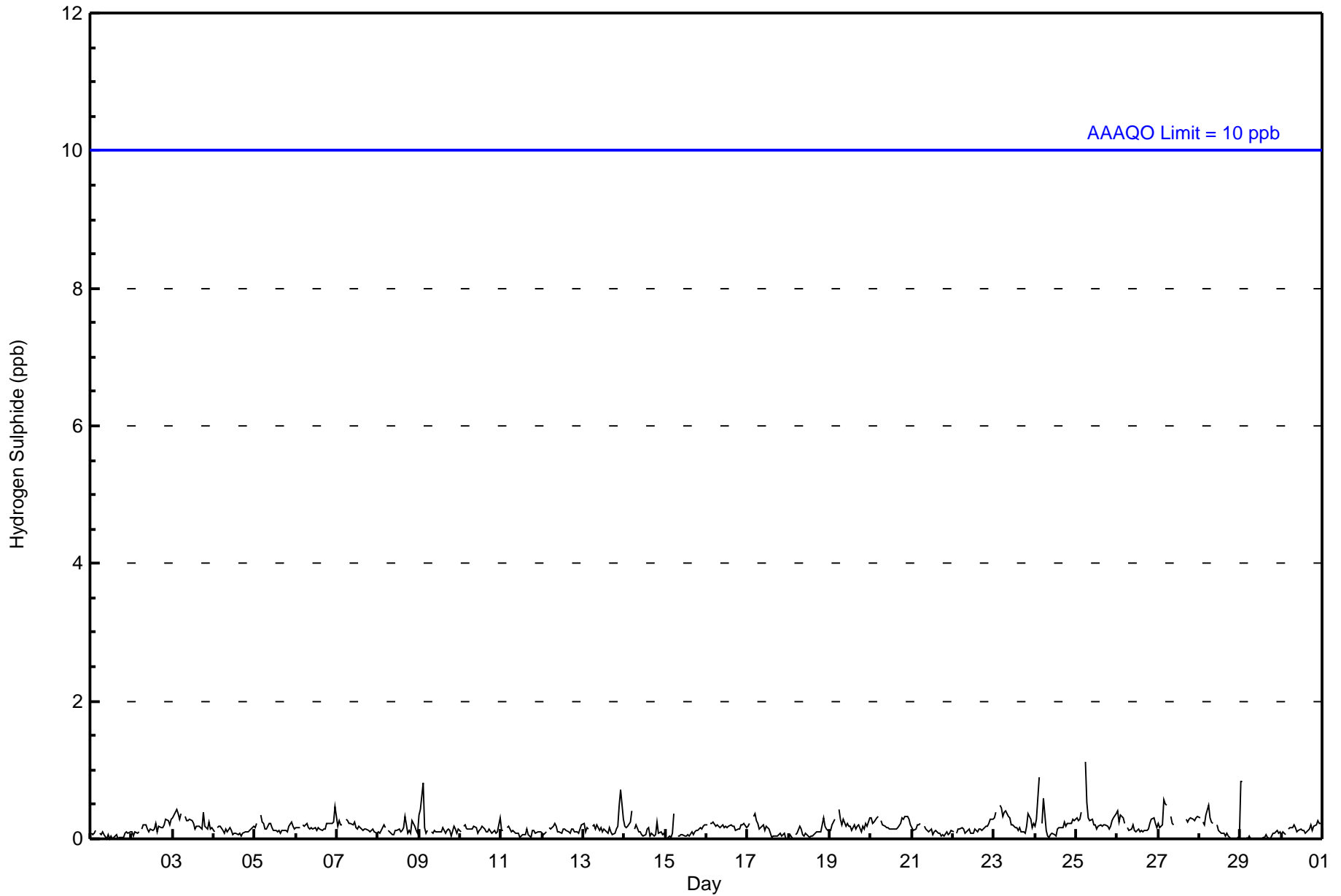
0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	Diurnal Average
1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Firebag - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Hydrogen Sulphide (H₂S) - ppb
Firebag - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	683	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: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Firebag - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	33	48	32	18	20	31	44	61	74	52	54	62	36	40	33	44	682
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
Totals	33	48	32	18	20	31	44	61	74	52	54	62	36	40	33	44	682

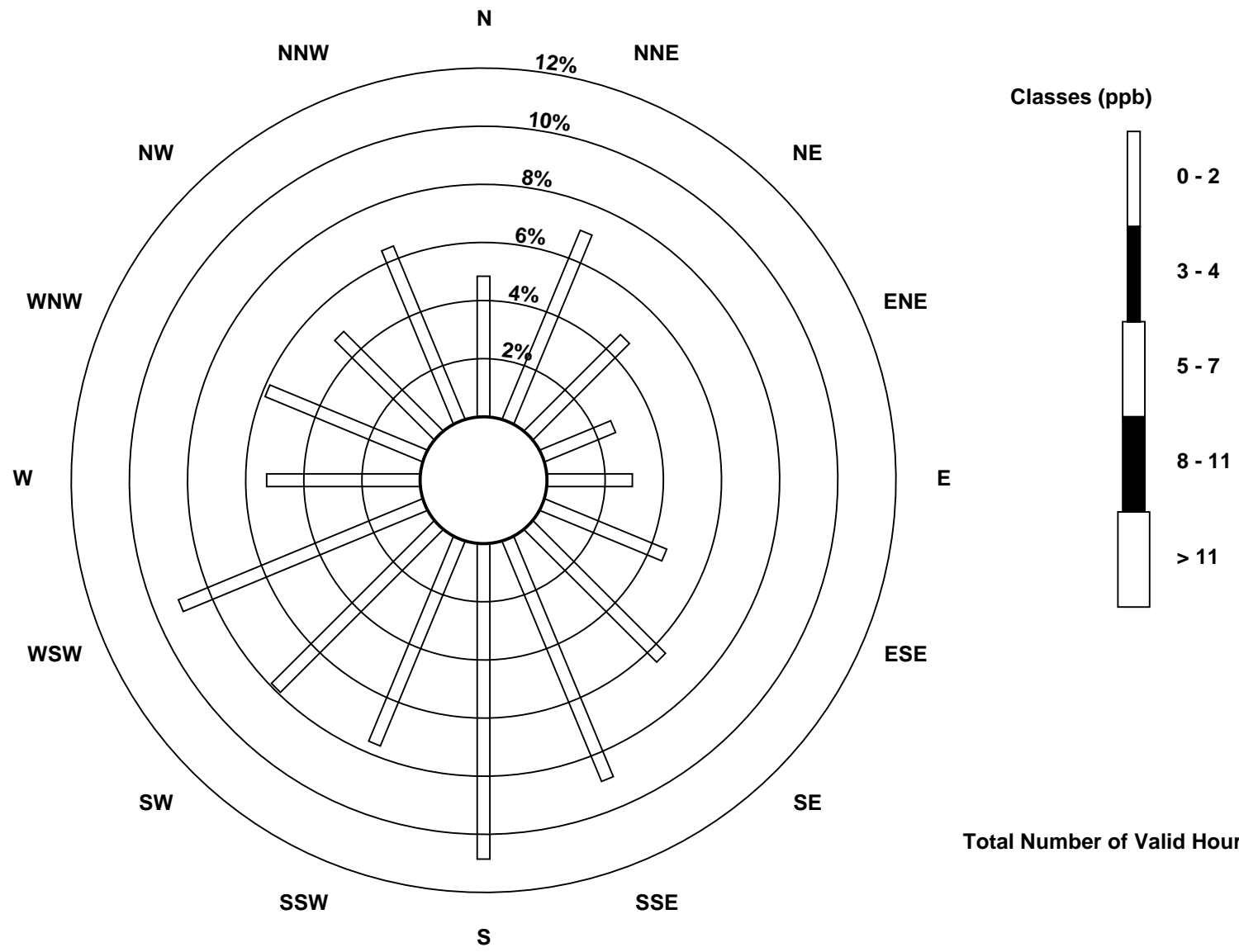
Total Number of Valid Hours: 682

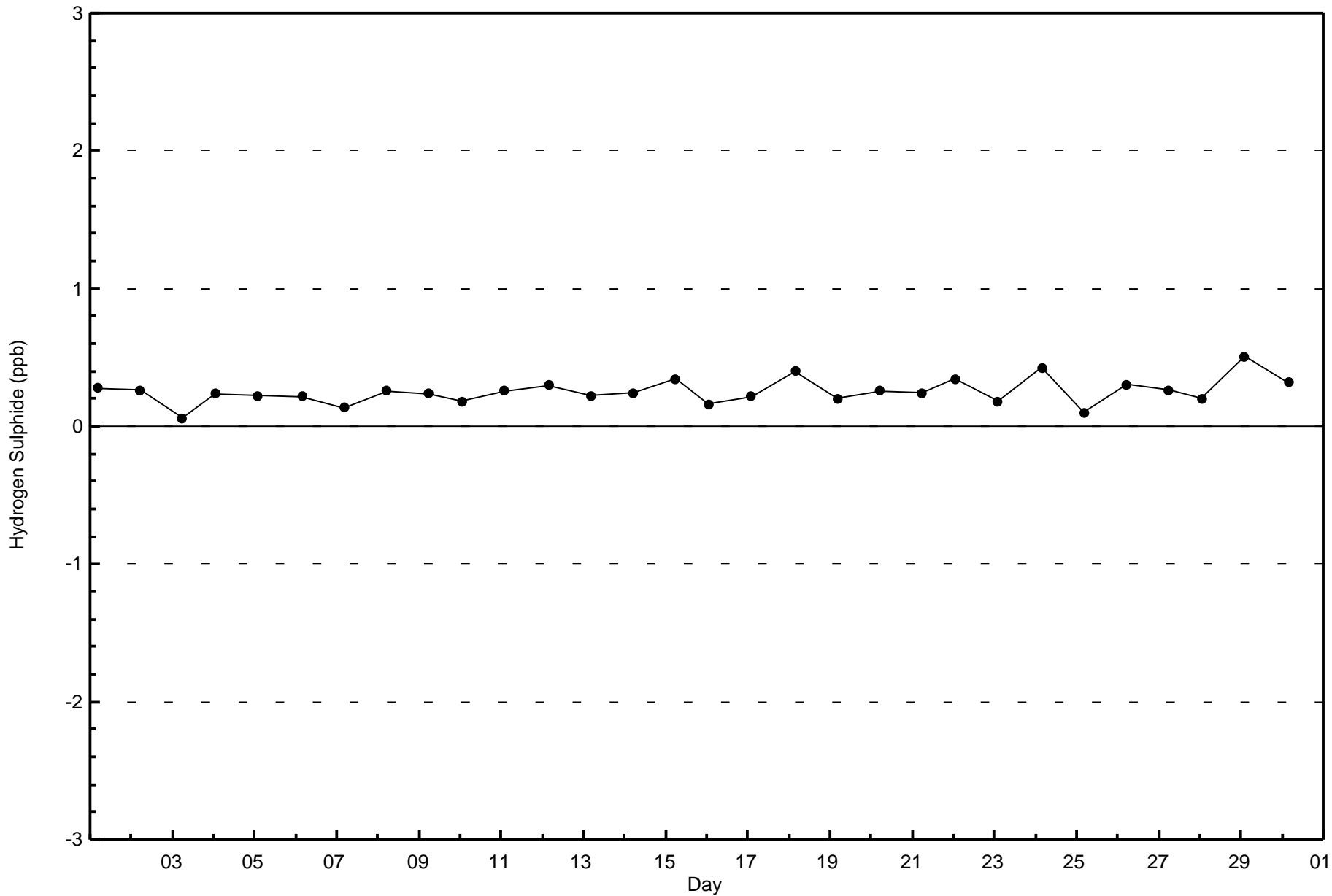
Total Number of Hours: 720

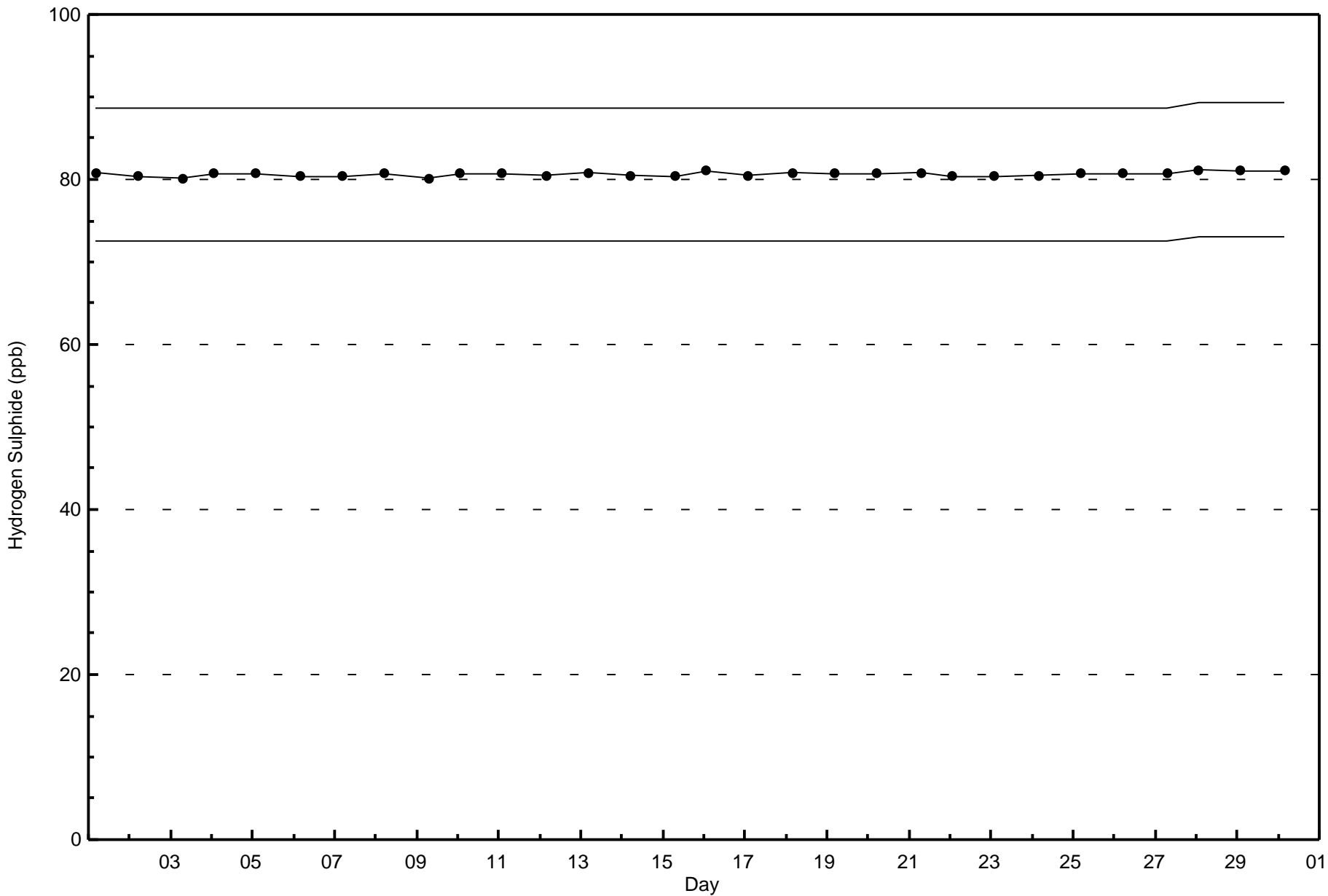


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Hydrogen Sulphide (H₂S) - ppb
Firebag (AMS 19)

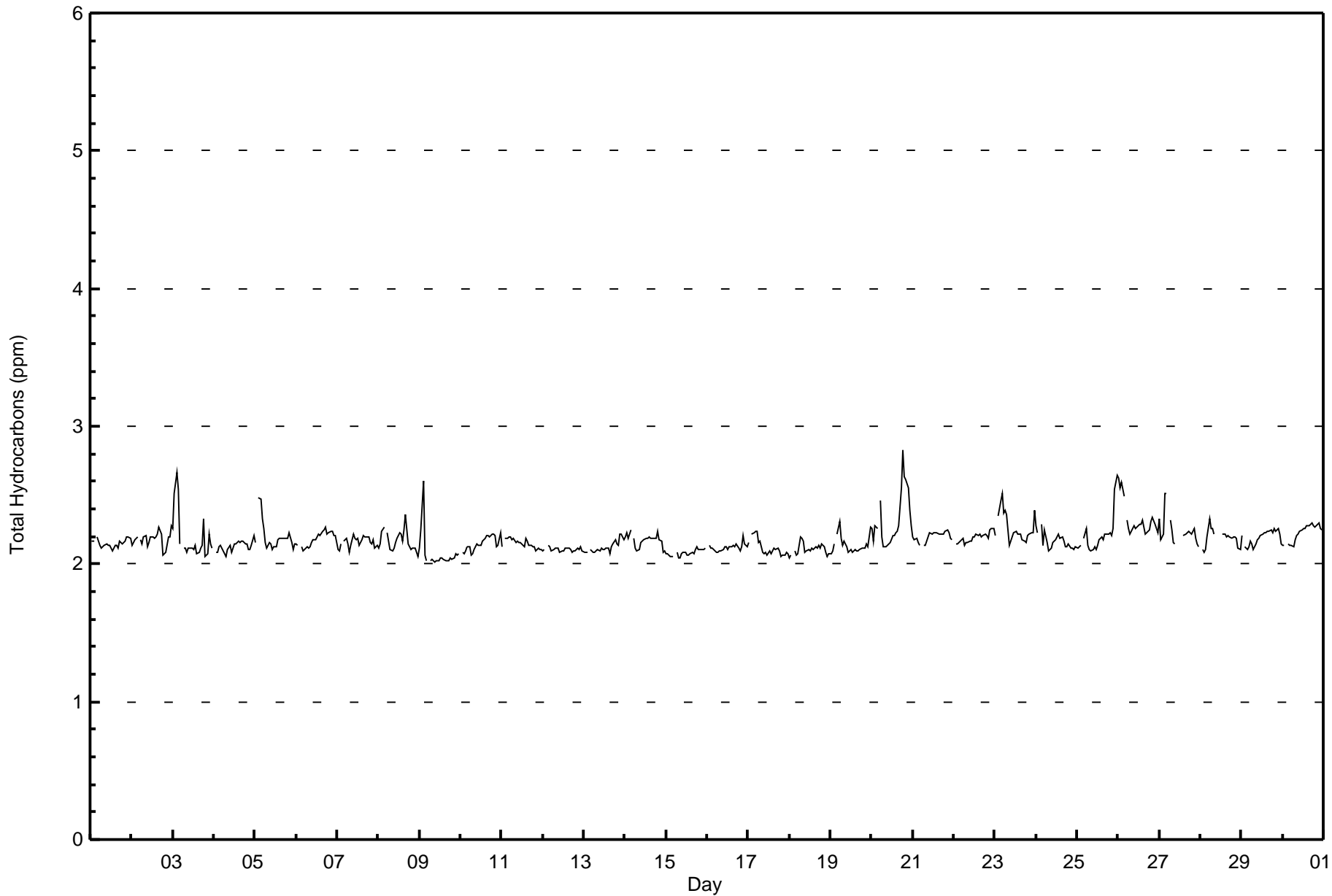








Maximum Value: 2.8 ppm on Jun 20 19:00																				Maximum Daily Average: 2.3 ppm on Jun 26					Hours in Service: 720				
Minimum Value: 2.0 ppm on Jun 9 10:00																				Minimum Daily Average: 2.1 ppm on Jun 9					Hours of Data: 682				
Maximum Diurnal Average: 2.2 ppm at hour 3																				Minimum Diurnal Average: 2.1 ppm at hour 9					Hours of Missing Data: 38				
Monthly Average: 2.17 ppm																				Percentiles: P ₁ = 2.0 P ₁₀ = 2.1 Q ₁ = 2.1 Median = 2.2 Q ₃ = 2.2 P ₉₀ = 2.3 P ₉₉ = 2.6					Hours of Calibration: 34				
																									Percent Operational Time: 99.4				
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-Jun	2.2	2.2	2.2	Z	2.2	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	2.1	2.2	2.2	2.2	2.2	2.2	2.1	2.2			
2-Jun	2.1	2.2	2.2	2.2	Z	2.2	2.1	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.1	2.1	2.1	2.2	2.2	2.3	2.2	2.3			
3-Jun	2.3	2.5	2.7	2.5	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	2.3	2.1	2.1	2.2	2.1	2.1	2.2	2.7			
4-Jun	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	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.2	2.1	2.2	2.2			
5-Jun	2.2	Z	2.5	2.5	2.3	2.3	2.2	2.1	2.2	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	2.1	2.1	2.2	2.5			
6-Jun	2.1	2.1	Z	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	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3			
7-Jun	2.1	2.1	2.2	Z	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.2			
8-Jun	2.1	2.1	2.2	2.3	Z	2.2	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.4	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.4			
9-Jun	2.1	2.2	2.6	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	2.0	2.0	2.1	2.1	2.1	2.6			
10-Jun	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	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.1	2.2			
11-Jun	2.1	Z	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	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2			
12-Jun	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	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1			
13-Jun	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	2.1	2.1	2.2	2.2	2.1	2.1	2.2	2.2	2.2	2.2	2.2			
14-Jun	2.2	2.2	2.2	2.3	Z	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	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.3			
15-Jun	2.1	2.1	2.1	2.1	2.1	Z	2.1	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			
16-Jun	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	2.1	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.2			
17-Jun	2.2	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2			
18-Jun	2.0	2.1	Z	2.1	2.1	2.1	2.2	2.2	2.2	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			
19-Jun	2.1	2.1	2.1	Z	2.2	2.3	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.3			
20-Jun	2.3	2.2	2.3	2.3	Z	2.5	2.2	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.6	2.8	2.6	2.6	2.5	2.4	2.3	2.8	2.8			
21-Jun	2.2	2.2	2.2	2.2	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	2.2	2.2	2.2	2.2	2.2			
22-Jun	Z	2.1	2.1	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	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3			
23-Jun	2.2	Z	2.3	2.5	2.5	2.4	2.4	2.4	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	2.4	2.5	2.5			
24-Jun	2.3	2.2	Z	2.3	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	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.3			
25-Jun	2.1	2.1	2.1	Z	2.2	2.3	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	2.3	2.5	2.6	2.6	2.6			
26-Jun	2.6	2.6	2.6	2.5	Z	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.2	2.2	2.6			
27-Jun	2.3	2.2	2.2	2.5	2.5	Z	2.3	2.2	2.2	2.1	M	M	M	M	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.1	2.1	2.5				
28-Jun	Z	2.1	2.1	2.1	2.2	2.3	2.3	2.3	2.2	C	C	C	C	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.3				
29-Jun	2.2	Z	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.2	2.3	2.2	2.3	2.2	2.1	2.3				
30-Jun	2.1	2.1	Z	2.1	2.1	2.1	2.1	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	2.3	2.3	2.3	2.3	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
Firebag - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	19	2.79	2.79
2.1 - 3.0	663	97.21	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 682

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Firebag - June 2016**

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	4	5	7	0	0	0	2	0	0	0	0	0	1	0	0	19
2.1 - 3.0	32	44	27	13	20	28	46	57	73	54	55	63	36	41	32	41	662
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
Totals	32	48	32	20	20	28	46	59	73	54	55	63	36	42	32	41	681

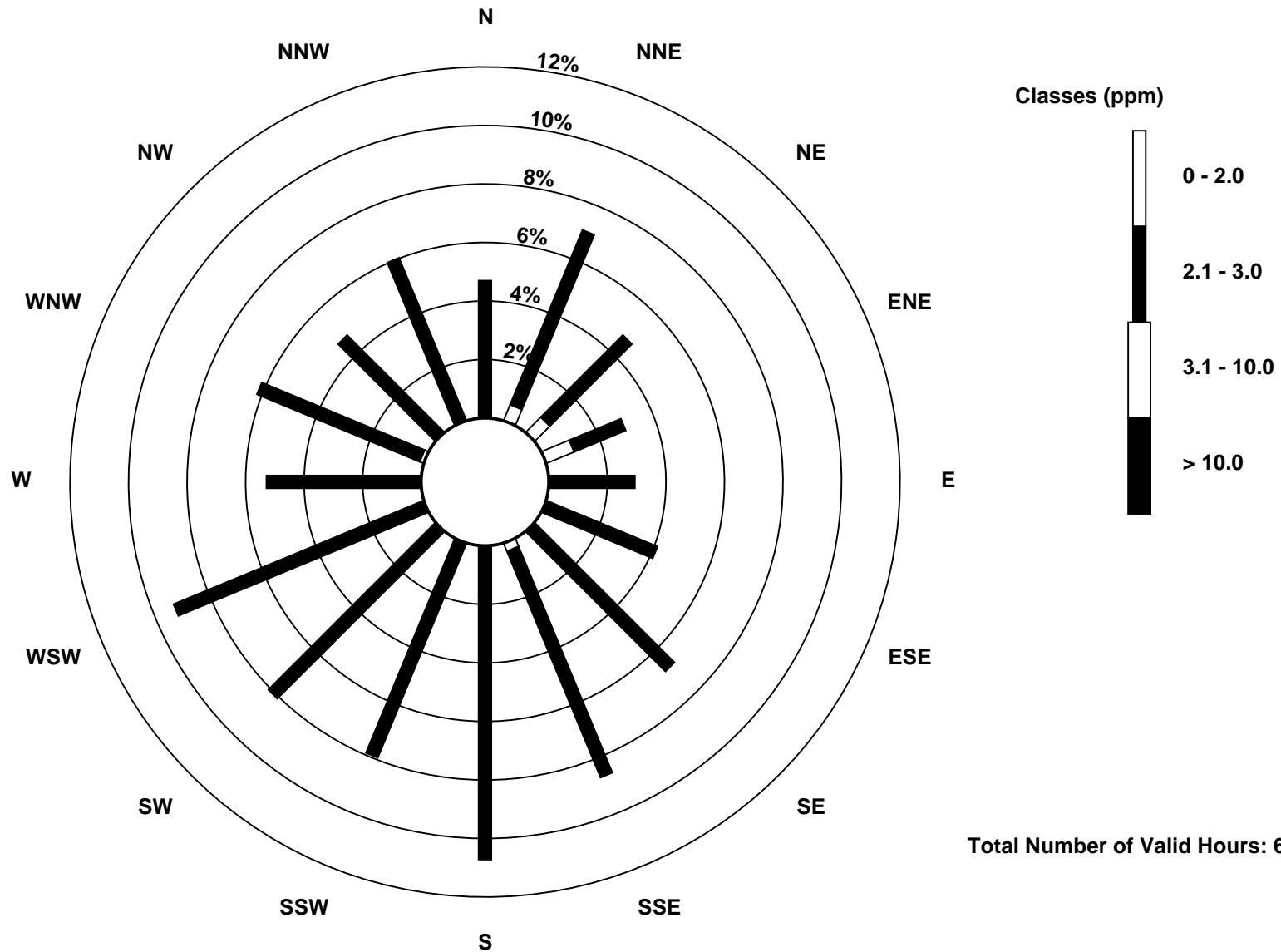
Total Number of Valid Hours: 681

Total Number of Hours: 720

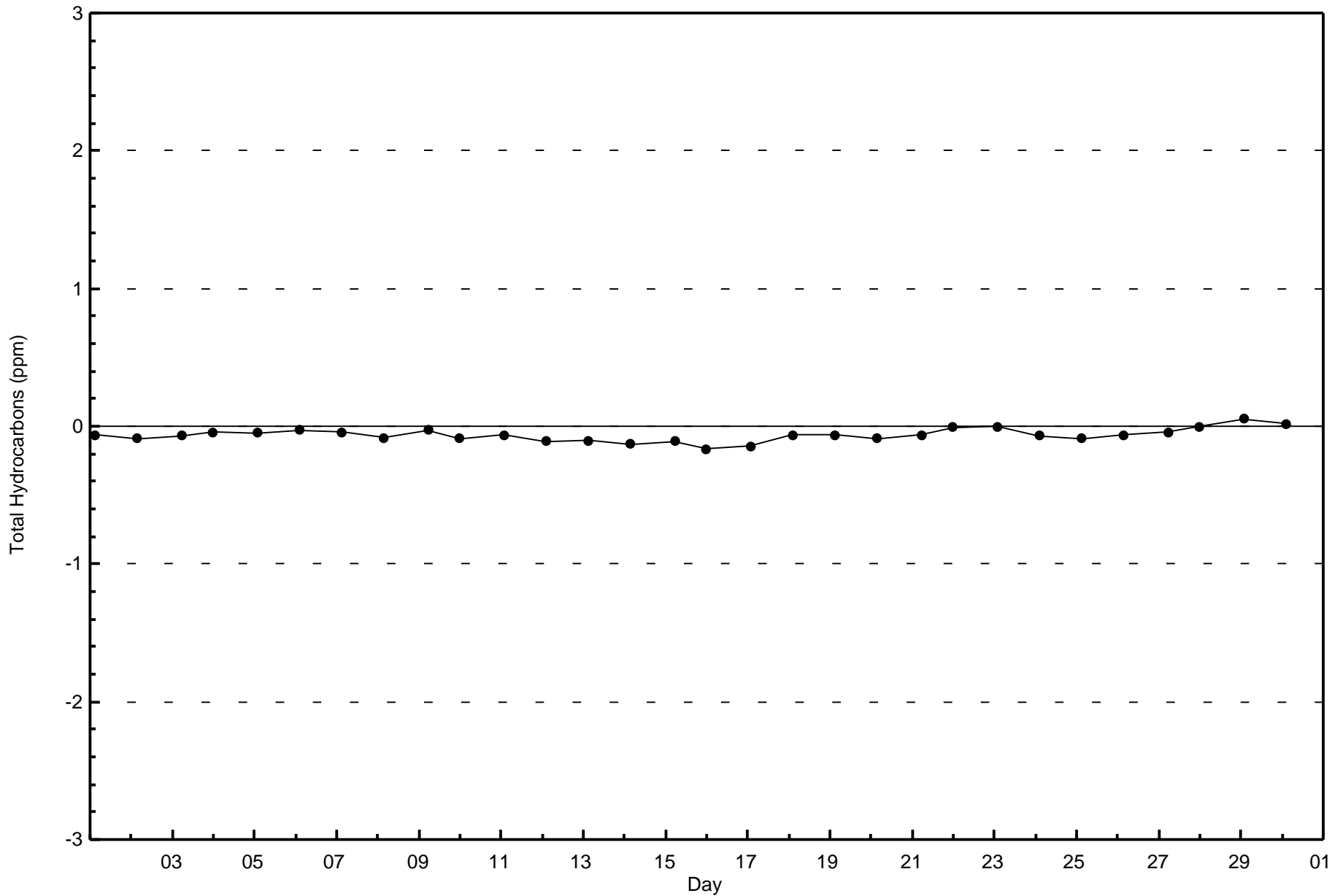


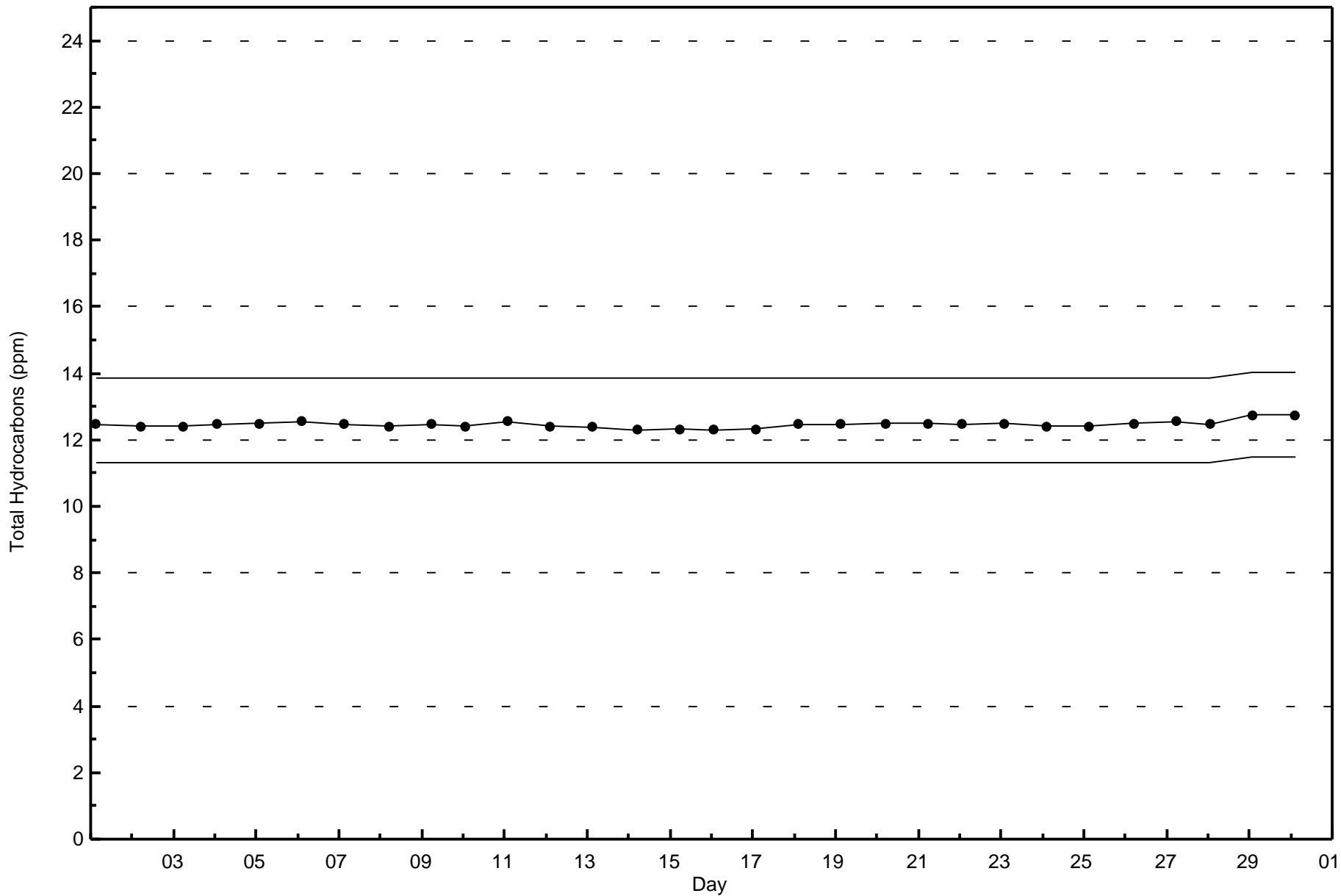
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Total Hydrocarbons (THC) - ppm
Firebag (AMS 19)



Total Number of Valid Hours: 681





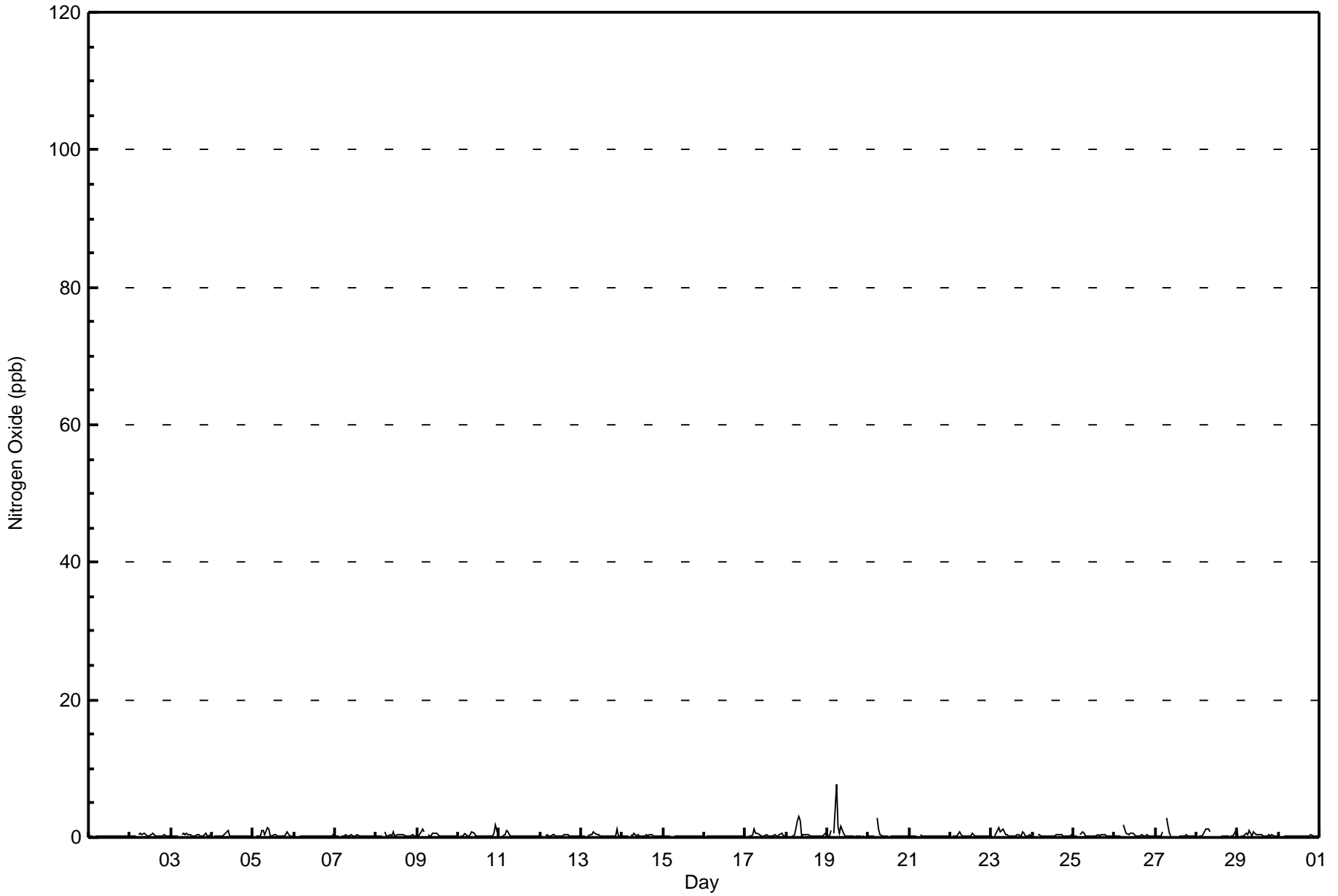


Maximum Value: 8 ppb on Jun 19 06:00														Maximum Daily Average: 0.7 ppb on Jun 19														Hours in Service: 720			
Minimum Value: 0 ppb on Jun 19 23:00														Minimum Daily Average: 0.2 ppb on Jun 16														Hours of Data: 681			
Maximum Diurnal Average: 1.0 ppb at hour 6														Minimum Diurnal Average: 0.2 ppb at hour 2														Hours of Missing Data: 39			
Monthly Average: 0.3 ppb														Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 1 P ₉₉ = 2														Hours of Calibration: 35			
																												Percent Operational Time: 99.4			
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-Jun	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					
2-Jun	0	0	0	0	Z	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1					
3-Jun	0	0	0	0	0	Z	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1						
4-Jun	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						
5-Jun	0	Z	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0.4	1						
6-Jun	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						
7-Jun	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-Jun	0	0	0	0	Z	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0.3	1						
9-Jun	0	0	1	1	1	Z	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	1						
10-Jun	Z	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	2	0.3	2						
11-Jun	0	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1						
12-Jun	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						
13-Jun	0	0	0	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1						
14-Jun	0	0	0	0	Z	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1						
15-Jun	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						
16-Jun	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						
17-Jun	0	Z	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	1						
18-Jun	0	0	Z	0	0	0	2	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.6	3						
19-Jun	0	0	1	Z	1	8	2	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	8						
20-Jun	0	0	0	0	Z	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3						
21-Jun	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						
22-Jun	Z	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.3	1						
23-Jun	0	Z	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0.5	1						
24-Jun	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						
25-Jun	0	0	0	Z	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1						
26-Jun	0	0	0	0	Z	2	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.4	2						
27-Jun	0	0	0	0	1	Z	3	2	1	0	M	M	M	M	0	0	0	0	0	0	0	0	0	0.5	3						
28-Jun	Z	0	0	0	0	1	1	1	1	C	C	C	C	C	0	0	0	0	0	0	0	0	1	0.4	1						
29-Jun	0	Z	0	0	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1						
30-Jun	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						
																								Diurnal Average							
																								Diurnal Maximum							
Z - zerospan C - Calibration M - Maintenance																															



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxide (NO) - ppb
Firebag - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Oxide (NO) - ppb
Firebag - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	681	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: 681

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Firebag - June 2016**

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	48	32	20	20	28	46	59	73	54	55	63	36	42	32	40	680
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
Totals	32	48	32	20	20	28	46	59	73	54	55	63	36	42	32	40	680

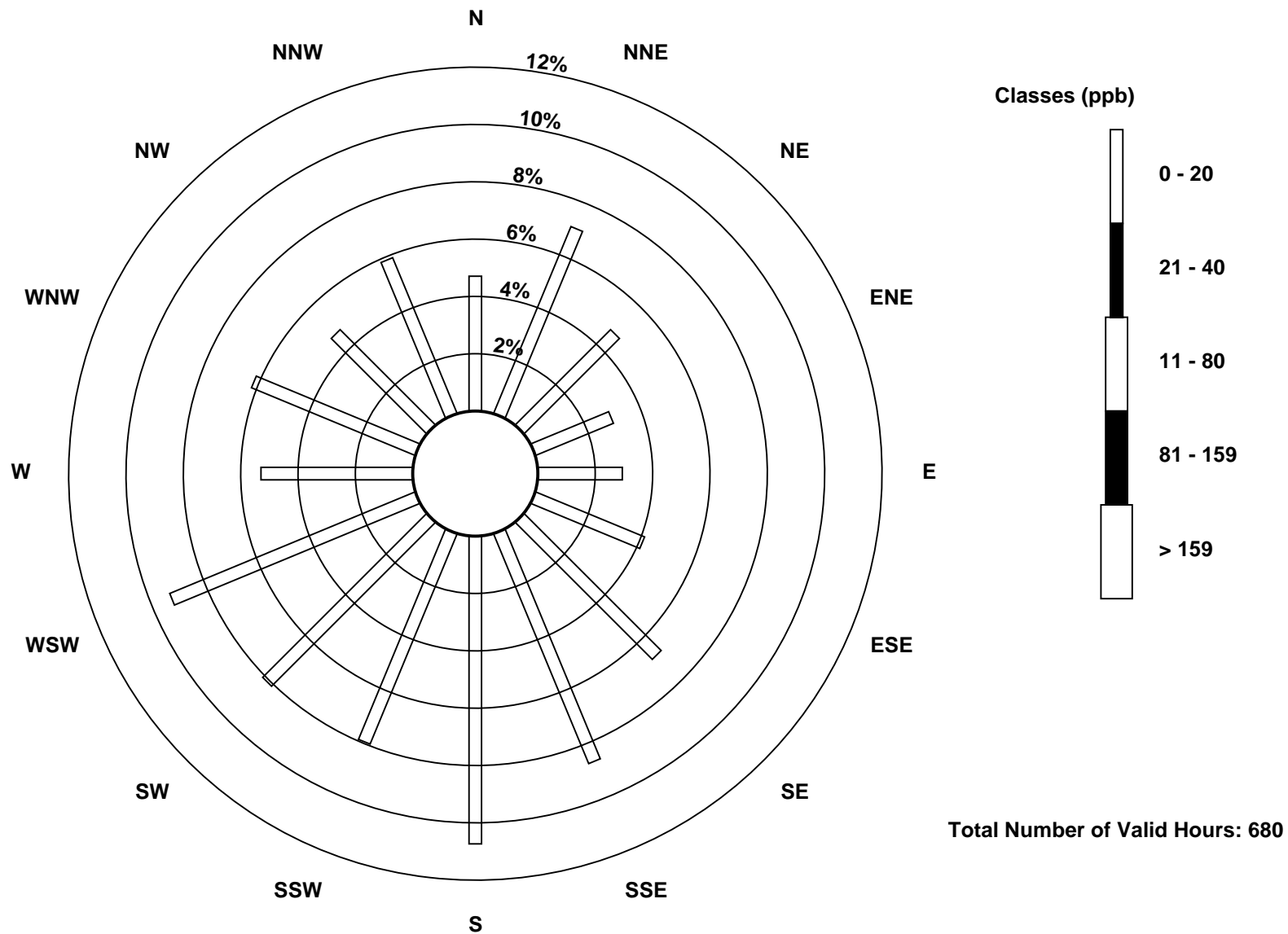
Total Number of Valid Hours: 680

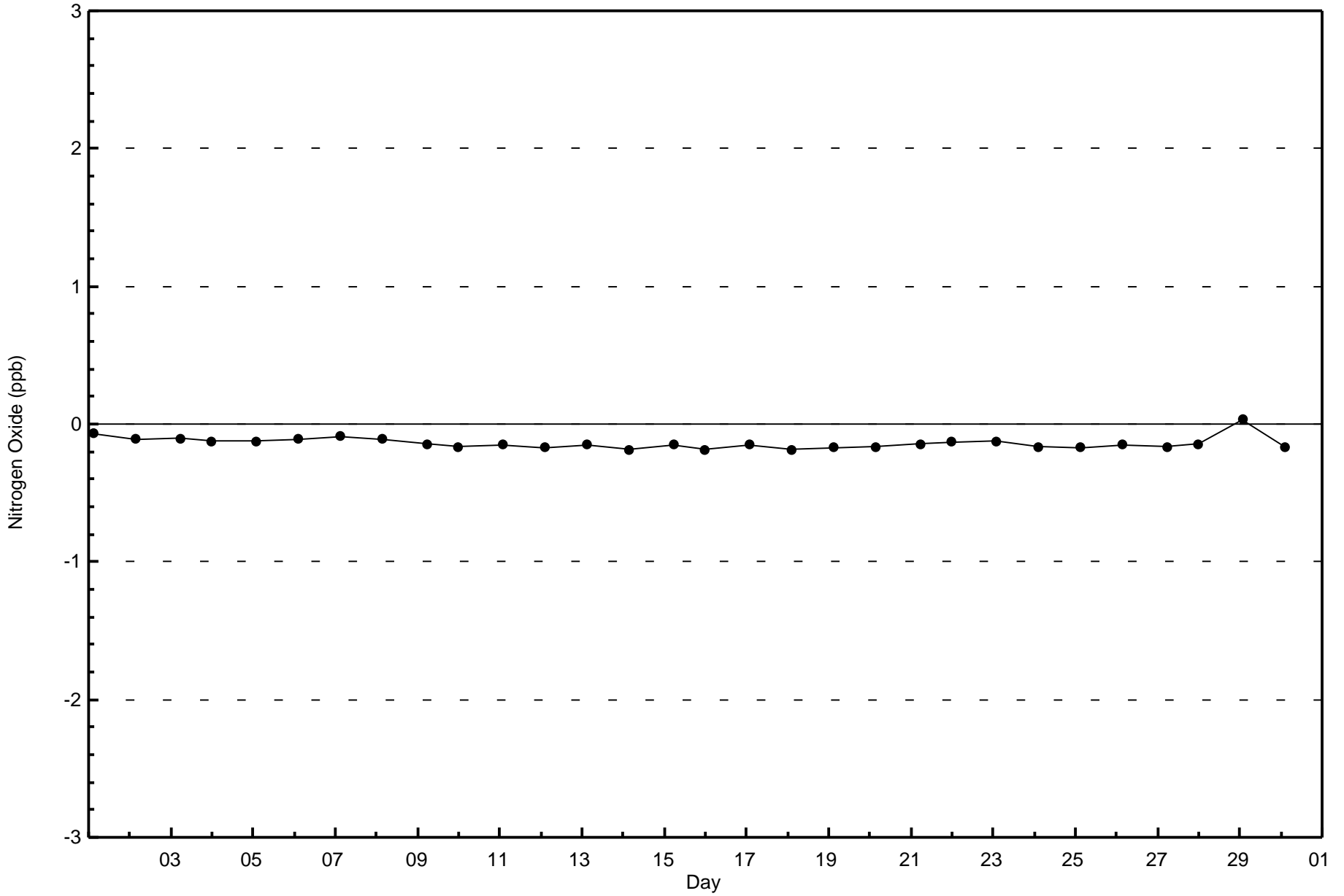
Total Number of Hours: 720

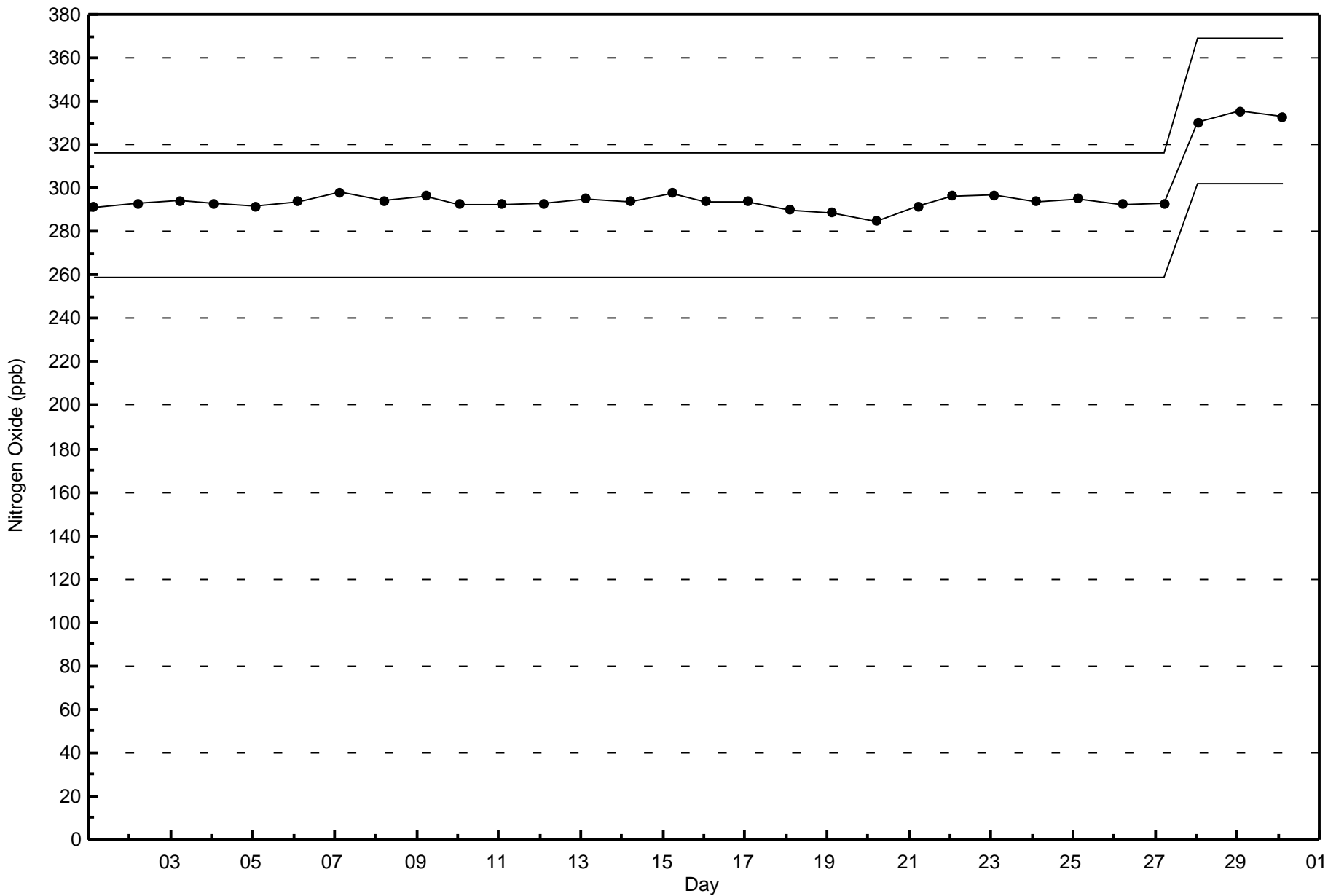


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxide (NO) - ppb
Firebag (AMS 19)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Firebag - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 14 ppb on Jun 20 00:00	Maximum Daily Average: 3.3 ppb on Jun 23		Hours of Data:	681
Minimum Value: 0 ppb on Jun 10 21:00	Minimum Daily Average: 0.5 ppb on Jun 16		Hours of Missing Data:	39
Maximum Diurnal Average: 3.0 ppb at hour 6	Minimum Diurnal Average: 0.7 ppb at hour 12		Hours of Calibration:	35
Monthly Average: 1.2 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 8		Percent Operational Time:	99.4

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-Jun	1	0	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	0.8	2
2-Jun	1	1	1	1	Z	1	2	1	2	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1.1	2
3-Jun	2	3	2	2	1	Z	2	2	1	2	1	1	1	1	1	1	2	1	2	1	2	2	1	3	1.7	3
4-Jun	Z	1	1	2	2	1	1	1	2	3	1	1	1	1	1	0	1	1	0	0	0	0	0	2	0.9	3
5-Jun	5	Z	2	1	1	4	3	1	3	3	1	1	1	1	1	0	0	0	0	0	1	3	1	1	1.5	5
6-Jun	1	1	Z	0	0	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	2	2	1.0	2
7-Jun	1	1	1	Z	1	2	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0.9	2
8-Jun	0	0	2	4	Z	4	1	1	1	1	2	1	1	1	1	1	2	1	1	2	2	2	1	1	1.4	4
9-Jun	1	1	5	7	2	Z	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1.1	7
10-Jun	Z	0	0	0	2	0	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	2	6	0.8	6
11-Jun	1	Z	1	1	3	2	1	1	1	1	0	0	0	0	0	1	0	1	0	0	1	1	0	1	0.7	3
12-Jun	1	1	Z	1	2	1	1	2	1	1	1	0	1	1	1	1	1	0	0	0	0	0	1	2	0.7	2
13-Jun	2	1	1	Z	1	1	2	2	1	1	1	1	1	1	1	0	1	1	1	1	1	3	1	1	1.0	3
14-Jun	4	5	2	3	Z	2	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.3	5
15-Jun	1	1	1	1	2	Z	2	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1	0.7	2
16-Jun	Z	1	1	0	0	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1	0	0.5	1
17-Jun	1	Z	2	2	2	4	2	3	2	1	0	1	1	0	0	0	1	1	0	0	1	1	0	0	1.2	4
18-Jun	1	1	Z	1	1	2	4	4	3	0	1	1	1	1	1	0	0	0	0	1	1	1	1	3	1.2	4
19-Jun	0	0	4	Z	2	12	4	2	3	1	0	0	1	0	0	0	0	0	0	0	0	0	0	14	1.9	14
20-Jun	11	3	1	2	Z	8	4	1	1	1	0	1	1	1	2	1	1	1	1	1	1	2	1	3	2.0	11
21-Jun	1	1	1	1	1	Z	2	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	0	0.6	2
22-Jun	Z	1	1	1	1	4	2	1	1	1	0	1	1	1	1	1	1	1	1	1	1	3	4	5	1.4	5
23-Jun	4	Z	4	12	12	8	7	5	2	1	1	1	1	1	1	2	2	1	2	3	2	2	3	1	3.3	12
24-Jun	3	3	Z	2	4	2	1	1	1	1	0	1	1	1	1	1	1	1	2	1	1	0	1	1	1.1	4
25-Jun	0	0	0	Z	2	3	1	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	1	0.6	3
26-Jun	1	2	2	4	Z	6	4	2	2	3	3	2	1	1	2	2	2	1	1	3	3	4	2	2	2.3	6
27-Jun	2	1	2	5	7	Z	5	4	2	1	M	M	M	M	1	1	1	1	2	2	2	1	1	1	2.0	7
28-Jun	Z	1	0	1	3	5	4	4	2	C	C	C	C	C	0	0	0	0	0	0	0	0	1	5	1.5	5
29-Jun	2	Z	1	2	3	3	1	2	1	2	2	1	1	2	1	1	0	1	1	1	2	1	1	0	1.3	3
30-Jun	0	0	Z	0	0	1	1	1	1	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	0.5	1

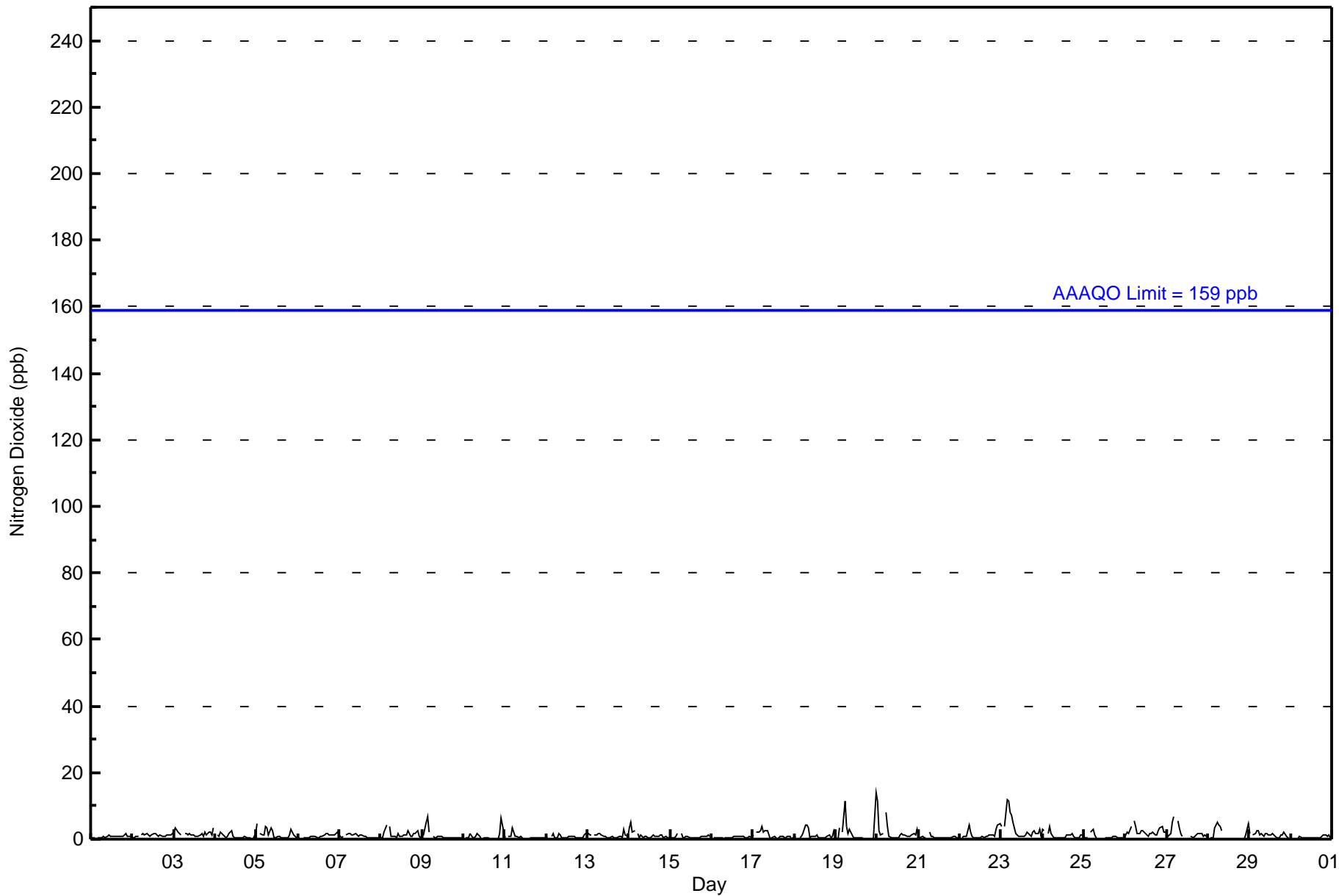
1.7	1.1	1.5	2.1	2.2	3.0	2.0	1.5	1.3	1.0	0.8	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	1.0	1.1	1.3	1.8	Diurnal Average	
11	5	5	12	12	12	7	5	3	3	3	3	2	2	2	2	2	2	2	2	2	3	3	4	6	14	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Firebag - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Firebag - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	681	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: 681

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Firebag - June 2016**

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	48	32	20	20	28	46	59	73	54	55	63	36	42	32	40	680
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
Totals	32	48	32	20	20	28	46	59	73	54	55	63	36	42	32	40	680

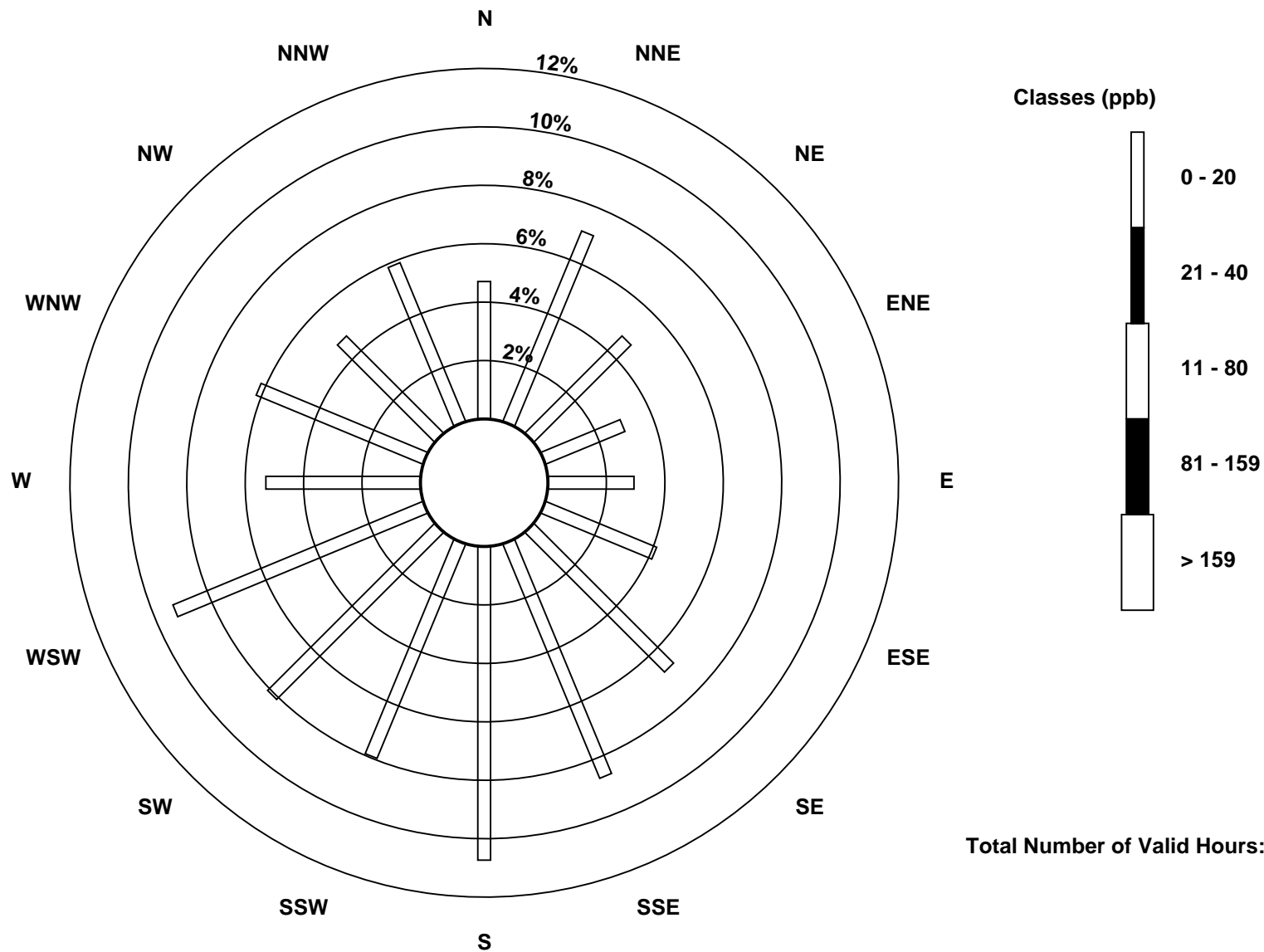
Total Number of Valid Hours: 680

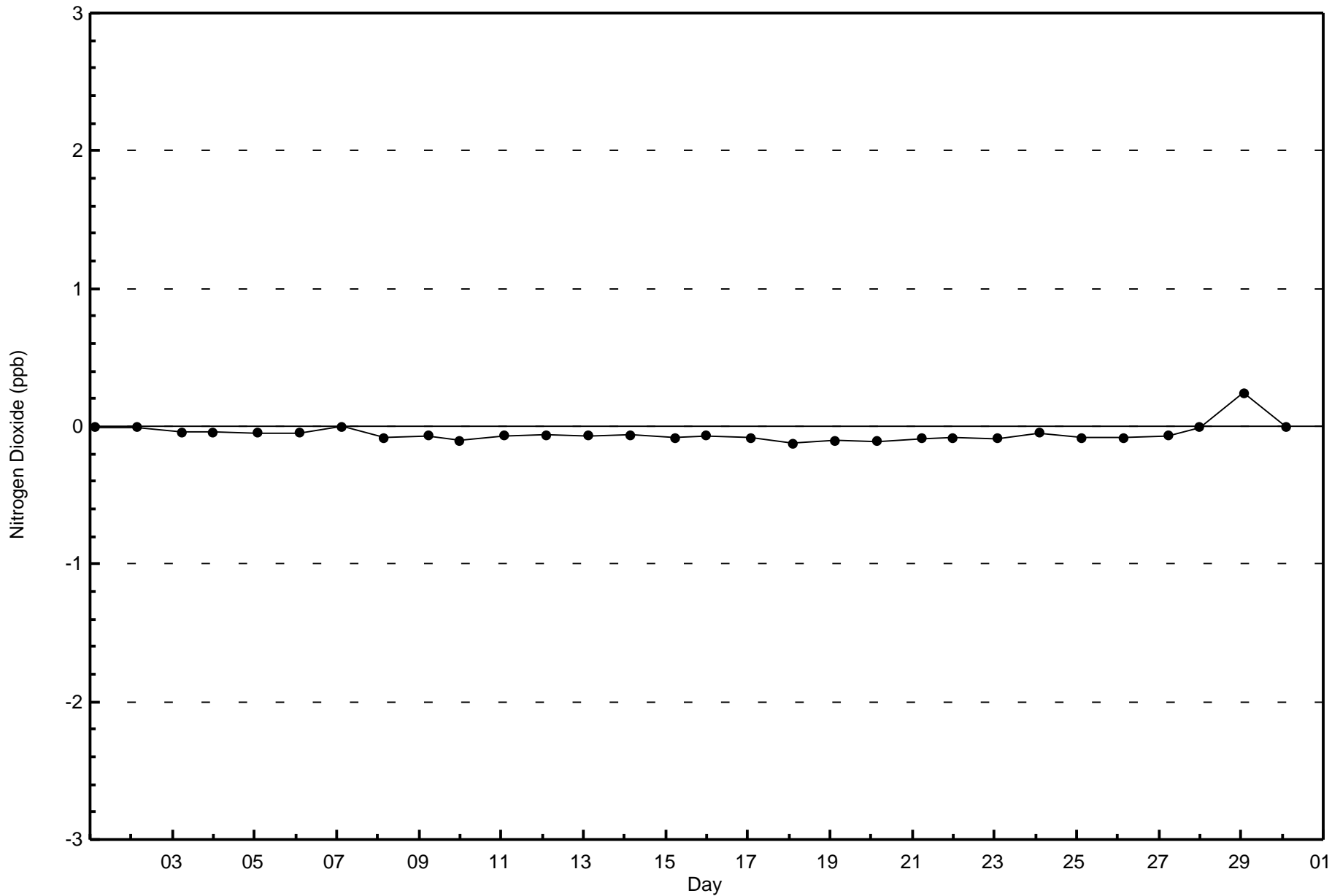
Total Number of Hours: 720

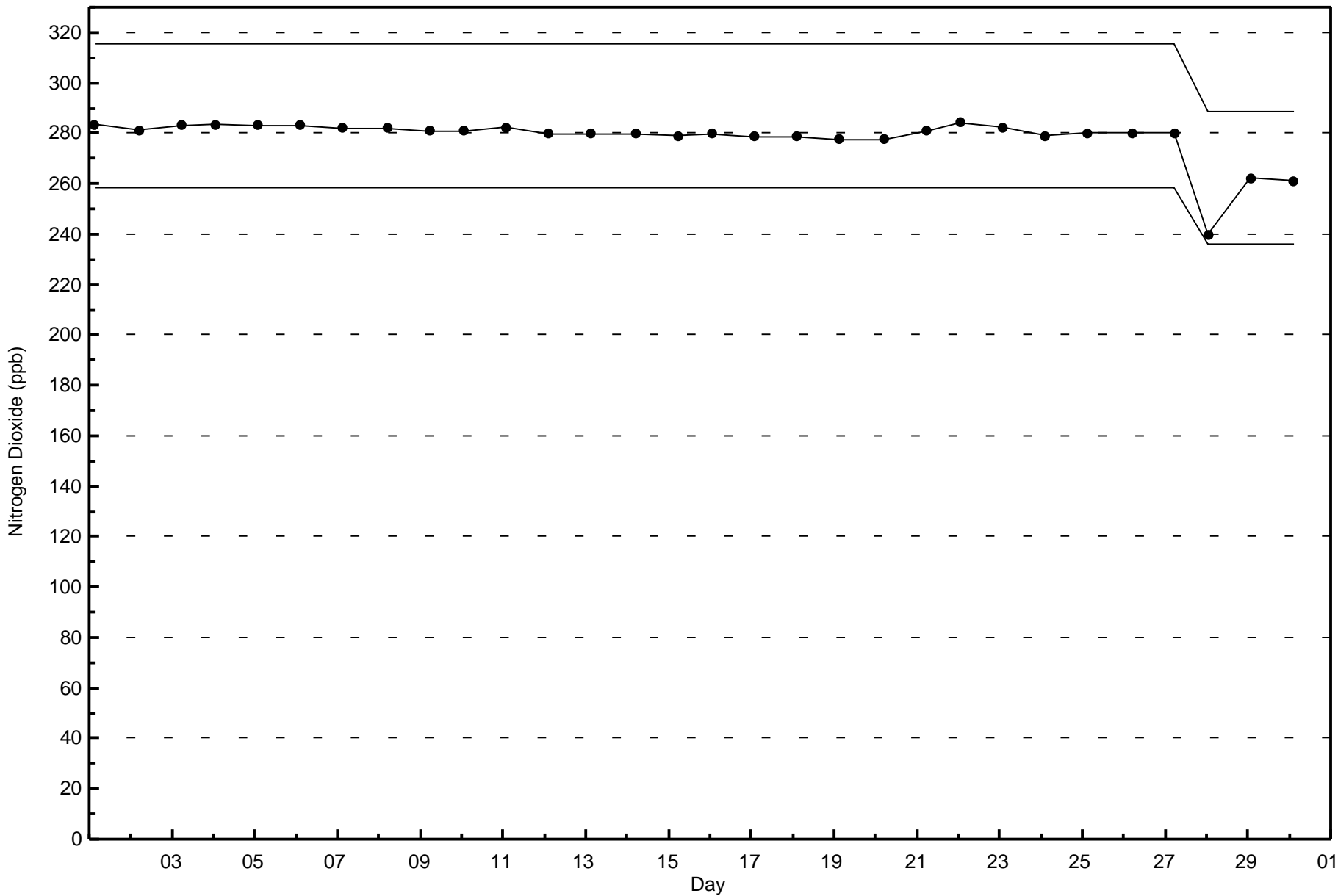


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Dioxide (NO₂) - ppb
Firebag (AMS 19)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxides (NO_x) - ppb

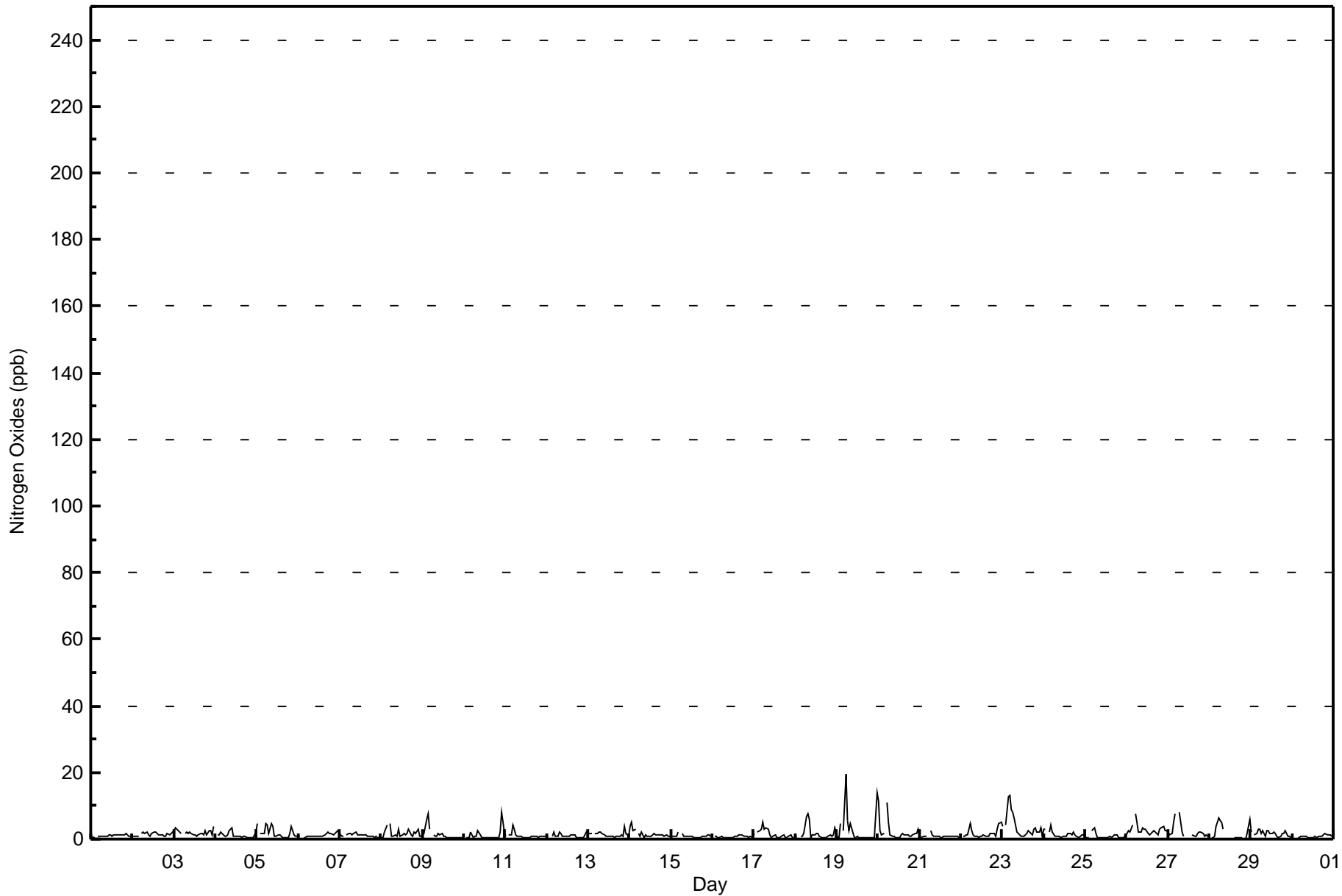
Firebag - June 2016

Maximum Value: 19 ppb on Jun 19 06:00																		Maximum Daily Average: 3.8 ppb on Jun 23																		Hours in Service: 720	
Minimum Value: 0 ppb on Jun 30 02:00																		Minimum Daily Average: 0.7 ppb on Jun 16																		Hours of Data: 681	
Maximum Diurnal Average: 3.9 ppb at hour 6																		Minimum Diurnal Average: 0.9 ppb at hour 13																		Hours of Missing Data: 39	
Monthly Average: 1.6 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 2 P ₉₀ = 3 P ₉₉ = 8																		Hours of Calibration: 35	
																																				Percent Operational Time: 99.4	
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-Jun	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1.0	2											
2-Jun	1	1	1	1	Z	2	2	2	2	1	1	2	2	2	2	1	1	1	1	1	2	1	2	2	1.5	2											
3-Jun	2	3	2	2	2	Z	2	2	2	2	2	1	1	1	1	2	2	1	2	1	3	2	1	4	2.0	4											
4-Jun	Z	1	1	2	2	1	1	1	2	4	1	1	1	1	1	1	1	1	1	1	0	0	0	2	1.1	4											
5-Jun	5	Z	2	2	2	5	4	2	5	4	1	1	1	1	1	1	1	1	1	2	4	1	1	1	1.9	5											
6-Jun	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	2	2	3	1.2	3											
7-Jun	1	1	1	Z	1	2	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.1	2											
8-Jun	0	1	2	4	Z	5	1	1	1	1	3	1	1	2	1	2	3	1	1	2	2	3	1	1	1.7	5											
9-Jun	1	1	6	8	3	Z	1	1	1	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1.4	8											
10-Jun	Z	0	0	0	2	0	1	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	2	8	2	1.1	8										
11-Jun	1	Z	1	1	4	3	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1.0	4											
12-Jun	1	1	Z	1	2	1	1	2	2	1	1	1	1	1	1	1	1	0	0	0	1	1	1	2	1.0	2											
13-Jun	2	2	2	Z	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	4	2	1	1.4	4											
14-Jun	4	5	2	3	Z	2	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1.6	5											
15-Jun	1	1	1	1	2	Z	2	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	0.9	2											
16-Jun	Z	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0.7	1											
17-Jun	2	Z	2	3	3	5	3	3	3	1	0	1	1	1	0	0	1	1	0	1	1	1	0	1	1.5	5											
18-Jun	1	1	Z	1	1	2	7	7	6	1	1	1	2	2	1	1	1	0	0	1	1	1	1	3	1.8	7											
19-Jun	0	0	5	Z	3	19	6	2	5	2	1	1	1	1	1	0	0	0	0	0	0	0	0	14	2.7	19											
20-Jun	11	3	1	2	Z	11	5	1	1	1	0	1	1	1	2	1	1	1	1	1	1	2	2	3	2.4	11											
21-Jun	1	1	1	1	1	Z	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	2											
22-Jun	Z	1	1	1	1	5	3	1	1	1	1	1	1	1	1	1	1	2	2	2	1	3	4	5	1.7	5											
23-Jun	4	Z	4	13	13	9	8	6	2	2	1	1	1	1	2	3	2	1	3	3	2	2	3	1	3.8	13											
24-Jun	3	3	Z	2	4	2	1	1	1	1	1	1	1	1	2	2	1	2	1	1	1	1	1	1	1.4	4											
25-Jun	1	1	1	Z	2	3	2	1	0	0	0	0	0	1	1	1	1	1	1	1	0	0	1	1	0.9	3											
26-Jun	2	3	2	4	Z	7	5	2	2	3	3	3	2	1	2	2	2	2	2	1	3	3	4	2	2	2.8	7										
27-Jun	2	1	2	5	8	Z	8	5	2	1	M	M	M	M	1	1	1	2	2	2	2	1	1	1	2.5	8											
28-Jun	Z	1	0	1	4	6	6	5	3	C	C	C	C	C	0	0	0	0	0	0	0	0	2	6	1.9	6											
29-Jun	2	Z	1	2	3	3	2	3	1	2	2	2	1	2	2	1	1	1	2	2	3	1	1	0	1.7	3											
30-Jun	0	0	Z	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	2	1	1	1	0.7	2											
																		Diurnal Average		Diurnal Maximum																	
																		1.9		11																	
																		1.3		5																	
																		1.7		6																	
																		2.4		13																	
																		2.6		13																	
																		3.9		19																	
																		2.6		8																	
																		2.1		7																	
																		1.8		6																	
																		1.4		4																	
																		1.1		3																	
																		0.9		3																	
																		0.9		2																	
																		1.0		2																	
																		1.0		2																	
																		1.0		3																	
																		1.1		3																	
																		1.0		2																	
																		1.0		3																	
																		1.1		3																	
																		1.3		4																	
																		1.4		4																	
																		1.5		8																	
																		2.1		14																	
Z - zerospan C - Calibration M - Maintenance																																					



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Firebag - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Oxides (NO_x) - ppb
Firebag - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	681	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: 681

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Firebag - June 2016**

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	48	32	20	20	28	46	59	73	54	55	63	36	42	32	40	680
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
Totals	32	48	32	20	20	28	46	59	73	54	55	63	36	42	32	40	680

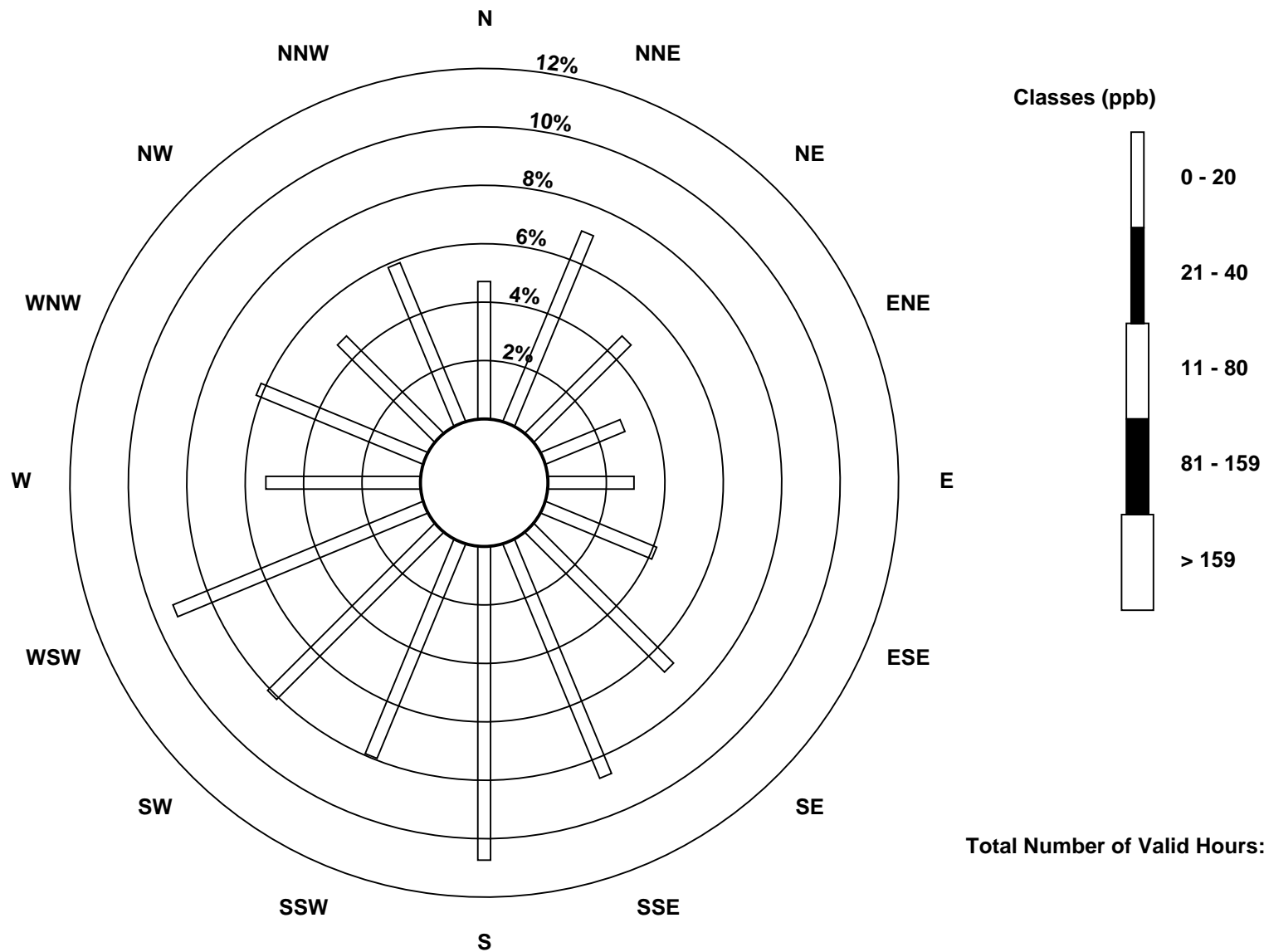
Total Number of Valid Hours: 680

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

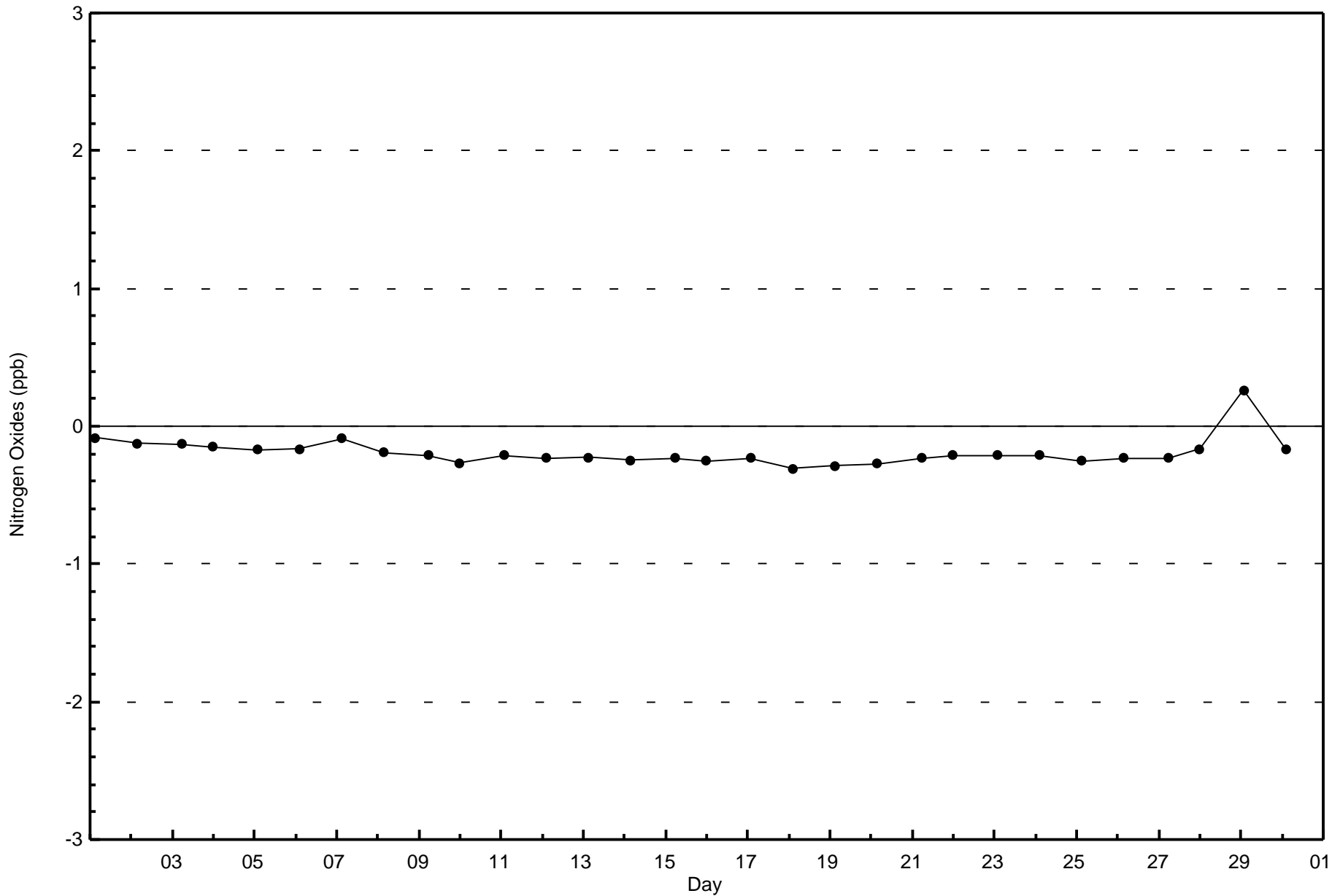
Nitrogen Oxides (NO_x) - ppb
Firebag (AMS 19)

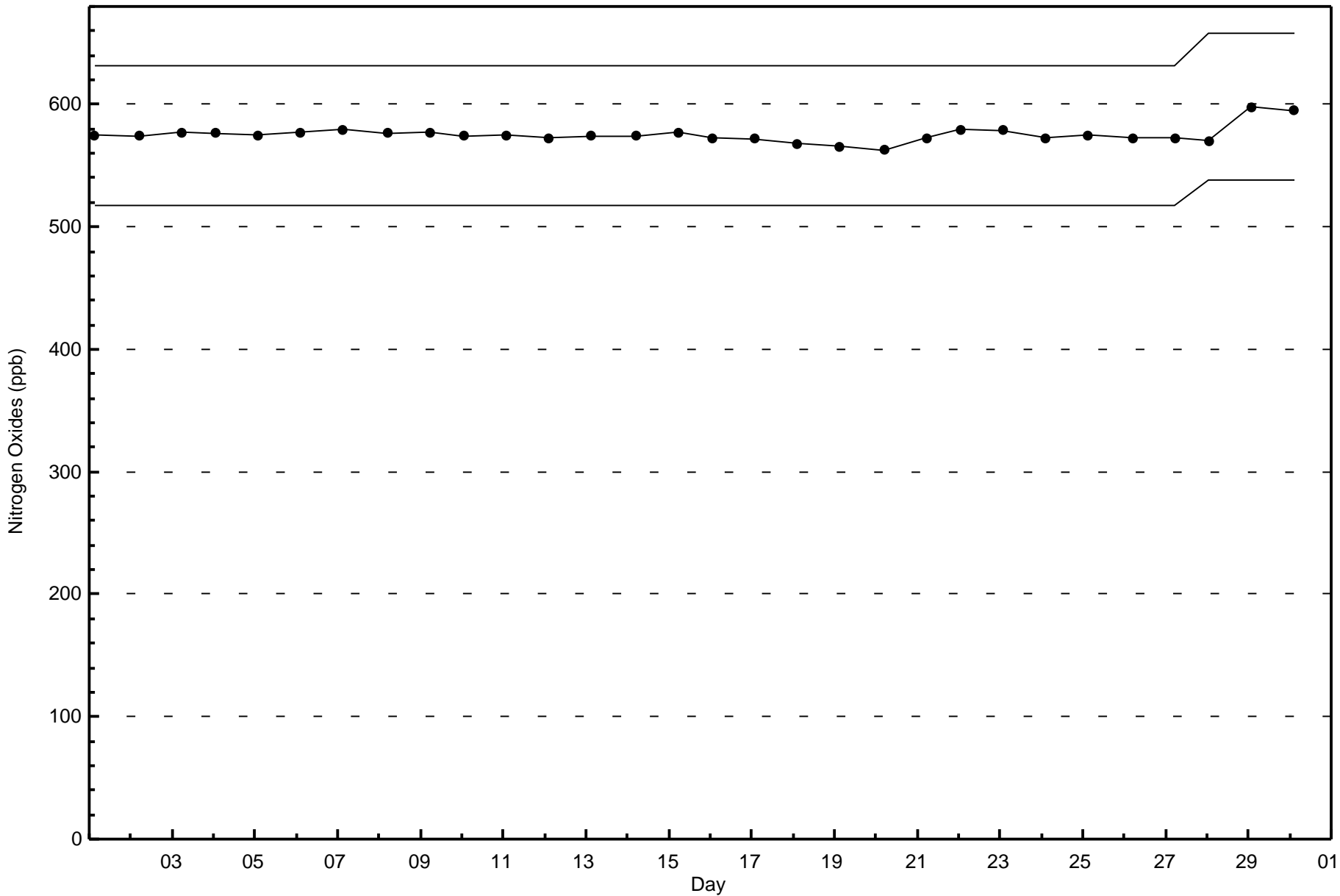




Wood Buffalo Environmental Association
Zero Responses

Nitrogen Oxides (NO_x) - ppb
Firebag - June 2016



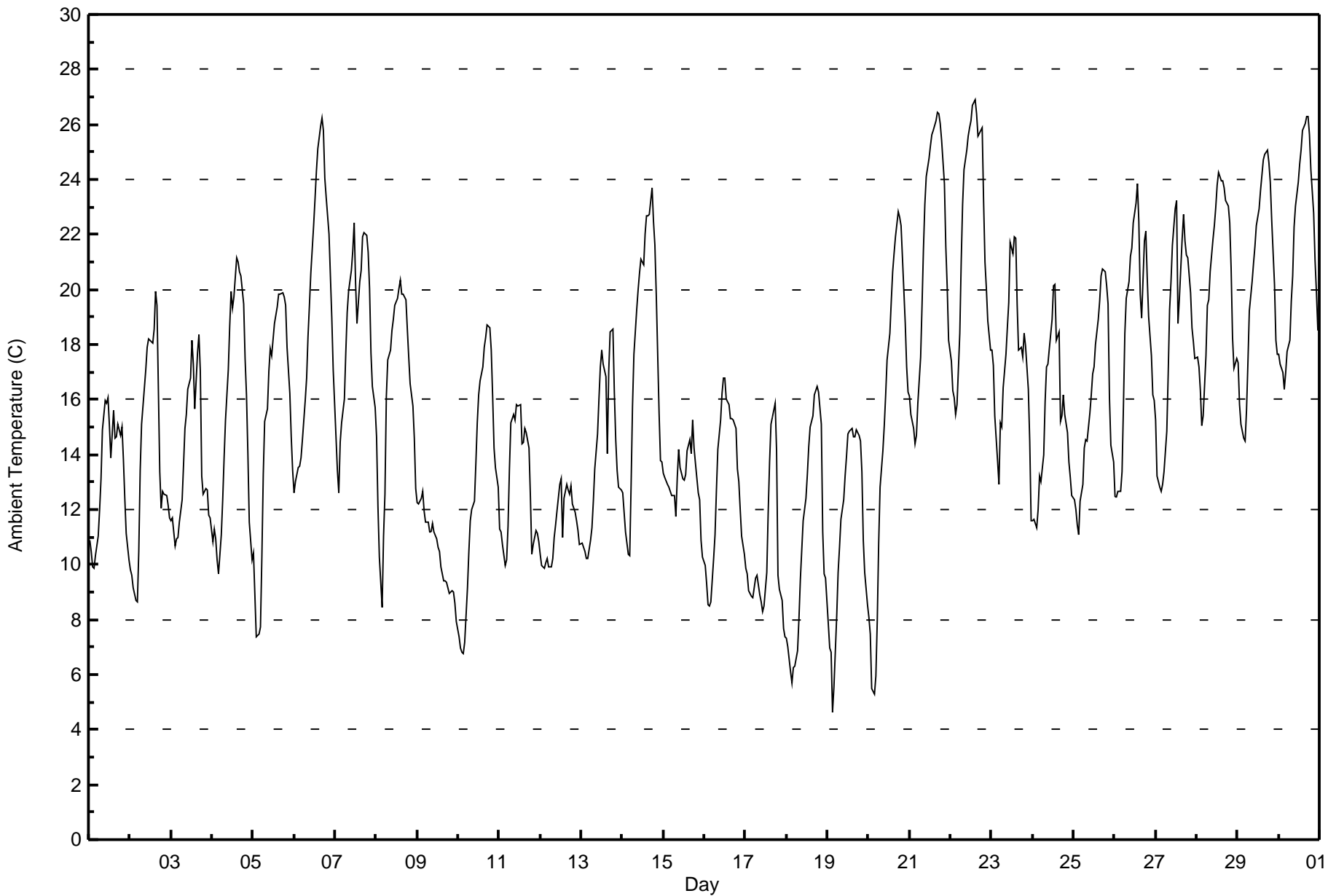




Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Firebag - June 2016

Maximum Value: 26.9 C on Jun 22 15:00		Maximum Daily Average: 22.0 C on Jun 22		Hours in Service: 720																																													
Minimum Value: 4.6 C on Jun 19 04:00		Minimum Daily Average: 10.3 C on Jun 17		Hours of Data: 720																																													
Maximum Diurnal Average: 19.2 C at hour 17		Minimum Diurnal Average: 10.9 C at hour 4		Hours of Missing Data: 0																																													
Monthly Average: 15.72 C		Percentiles: P₁ = 6.2 P₁₀ = 9.8 Q₁ = 12.0 Median = 15.3 Q₃ = 19.4 P₉₀ = 22.5 P₉₉ = 26.3		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-Jun	10.9	10.5	9.9	9.9	10.3	11.0	12.0	13.1	14.9	15.9	15.9	16.1	15.1	13.9	15.6	14.6	14.6	15.1	14.7	15.0	13.8	12.4	11.1	10.2	13.2	16.1																							
2-Jun	9.8	9.6	9.2	8.7	8.6	10.5	13.4	15.1	16.4	17.1	17.9	18.2	18.1	18.0	18.5	19.9	19.4	13.4	12.1	12.7	12.6	12.5	12.2	11.7	14.0	19.9																							
3-Jun	11.6	11.7	10.7	10.9	11.0	11.5	12.4	13.6	15.0	15.4	16.3	16.8	18.2	17.3	15.7	17.7	18.3	17.0	13.2	12.6	12.7	12.7	11.8	11.7	14.0	18.3																							
4-Jun	10.8	11.3	10.9	10.2	9.6	11.1	12.3	13.9	15.2	17.1	18.7	19.9	19.3	19.7	21.1	21.0	20.6	20.5	19.5	17.5	16.1	14.0	11.6	10.2	15.5	21.1																							
5-Jun	10.4	8.9	7.4	7.5	7.7	10.3	13.3	15.2	15.7	17.0	17.8	17.6	18.8	19.0	19.4	19.9	19.8	19.9	19.7	19.4	17.9	16.2	14.6	13.4	15.3	19.9																							
6-Jun	12.6	13.0	13.5	13.6	13.9	14.5	16.0	16.8	18.3	19.4	20.6	22.3	23.3	24.3	25.1	25.9	26.3	25.8	24.0	23.3	22.0	20.5	19.0	17.1	19.6	26.3																							
7-Jun	14.7	13.4	12.6	14.5	15.2	16.0	17.7	19.2	19.9	20.7	21.4	22.4	20.2	18.8	20.3	20.7	21.9	22.1	21.9	21.4	20.0	17.7	16.5	15.7	18.5	22.4																							
8-Jun	14.6	12.1	10.3	8.4	11.0	12.6	16.1	17.5	17.8	18.5	18.9	19.4	19.7	20.0	20.3	19.8	19.9	19.6	18.6	17.5	16.6	15.8	14.6	12.8	16.4	20.3																							
9-Jun	12.2	12.2	12.4	12.7	11.9	11.5	11.5	11.2	11.2	11.5	11.2	10.9	10.6	10.5	9.9	9.4	9.4	9.4	9.2	9.0	9.1	9.0	8.6	7.9	10.5	12.7																							
10-Jun	7.4	7.0	6.8	6.8	7.2	9.2	10.5	11.6	12.0	12.3	13.7	15.2	16.2	16.7	17.2	17.9	18.3	18.7	18.6	17.8	16.1	14.2	13.5	12.8	13.2	18.7																							
11-Jun	11.3	11.2	10.7	10.0	10.2	11.4	13.5	15.1	15.4	15.2	15.8	15.8	15.8	14.4	14.4	15.0	14.8	14.2	12.5	10.4	10.7	11.2	11.2	10.8	13.0	15.8																							
12-Jun	10.4	9.9	9.9	10.1	10.2	9.9	9.9	10.2	11.0	11.4	11.9	12.9	13.1	11.0	12.4	12.9	12.7	12.6	12.9	12.2	11.9	11.6	11.2	10.8	11.4	13.1																							
13-Jun	10.8	10.6	10.5	10.2	10.2	10.9	11.3	12.3	13.5	14.8	16.0	17.2	17.8	17.3	16.9	14.0	17.0	18.4	18.6	16.3	14.5	13.4	12.8	12.7	14.1	18.6																							
14-Jun	12.6	11.9	11.2	10.4	10.3	12.9	15.8	17.6	19.3	20.0	20.6	21.1	20.9	22.0	22.7	22.7	22.7	23.7	22.5	21.6	19.8	15.5	13.8	13.7	17.7	23.7																							
15-Jun	13.3	13.2	12.9	12.8	12.7	12.5	12.5	11.8	13.2	14.2	13.5	13.1	13.1	13.3	14.1	14.5	14.0	15.2	14.3	13.7	12.6	12.4	10.9	10.3	13.1	15.2																							
16-Jun	10.0	9.3	8.5	8.5	8.7	10.2	11.1	12.7	14.2	15.3	16.2	16.8	16.8	16.0	15.8	15.3	15.3	15.3	14.9	13.5	13.0	12.0	11.1	10.4	12.9	16.8																							
17-Jun	9.9	9.7	9.1	8.8	8.8	9.2	9.5	9.6	8.9	8.6	8.3	8.5	9.7	11.9	13.7	15.1	15.4	15.9	14.1	9.6	9.1	8.7	7.7	7.4	10.3	15.9																							
18-Jun	7.3	7.0	6.1	5.7	6.2	6.3	6.9	8.1	9.4	10.5	11.6	12.4	13.3	14.3	15.0	15.4	16.2	16.3	16.5	16.2	15.1	11.2	9.7	9.5	11.1	16.5																							
19-Jun	7.8	7.0	6.8	4.6	5.5	8.1	9.7	10.6	11.7	12.4	13.2	13.9	14.7	14.8	15.0	14.7	14.7	14.9	14.7	14.5	13.4	10.9	9.7	8.5	11.3	15.0																							
20-Jun	8.1	7.5	5.5	5.3	5.9	8.0	10.8	12.8	14.1	15.1	16.2	17.4	18.4	19.6	20.6	21.3	21.9	22.8	22.6	22.3	21.1	18.7	17.2	16.3	15.4	22.8																							
21-Jun	16.1	15.5	14.9	14.4	14.7	15.8	17.5	19.4	21.5	23.1	24.1	24.8	25.2	25.6	25.8	26.1	26.4	26.4	26.1	25.4	23.9	21.6	20.1	18.2	21.4	26.4																							
22-Jun	17.4	16.3	16.1	15.5	15.8	18.4	21.0	23.1	24.4	25.1	25.6	25.9	26.2	26.7	26.9	26.4	25.6	25.7	25.9	23.2	21.0	20.1	18.9	17.8	22.0	26.9																							
23-Jun	17.8	17.2	15.4	13.8	12.9	15.1	15.0	16.4	17.7	18.6	19.5	21.7	21.3	21.9	21.9	19.5	17.8	17.9	17.5	18.4	18.0	16.4	14.5	11.6	17.4	21.9																							
24-Jun	11.6	11.7	11.3	12.0	13.2	13.0	14.0	15.9	17.2	17.3	17.8	18.9	20.2	20.2	18.1	18.5	15.2	15.4	16.2	15.5	14.8	13.7	13.2	12.5	15.3	20.2																							
25-Jun	12.3	12.0	11.4	11.1	12.3	12.9	14.2	14.6	14.5	15.5	16.2	16.9	17.2	18.0	18.9	19.6	20.5	20.7	20.7	20.1	19.5	16.0	14.3	13.7	16.0	20.7																							
26-Jun	12.4	12.4	12.7	12.7	13.4	15.8	18.4	19.7	20.3	21.2	21.5	22.4	23.1	23.8	22.4	19.8	19.0	21.8	22.1	20.5	19.0	17.6	16.2	16.0	18.5	23.8																							
27-Jun	15.2	13.2	12.8	12.7	12.9	13.4	14.8	16.9	19.2	20.3	21.6	22.9	23.2	18.8	19.7	21.9	22.7	21.7	21.2	21.2	19.9	18.6	18.1	17.5	18.4	23.2																							
28-Jun	17.5	17.2	16.3	15.0	15.4	17.6	19.4	19.6	20.6	21.8	22.3	23.0	23.8	24.2	24.0	24.0	23.7	23.2	23.0	22.4	20.8	18.2	17.1	17.5	20.3	24.2																							
29-Jun	17.3	15.8	15.1	14.6	14.5	15.6	17.3	19.2	20.3	21.0	21.5	22.3	23.0	23.6	24.1	24.7	24.9	25.1	24.6	23.9	22.5	20.2	18.2	17.7	20.3	25.1																							
30-Jun	17.6	17.3	17.0	16.4	17.0	17.8	18.1	19.6	20.5	22.2	23.0	23.9	24.6	25.1	25.8	26.0	26.3	26.3	25.6	24.4	22.8	21.0	19.9	18.5	21.5	26.3																							
																								12.4	11.9	11.3	10.9	11.2	12.4	13.9	15.1	16.1	17.0	17.6	18.4	18.7	18.7	19.0	19.1	19.2	19.2	18.6	17.7	16.7	15.1	14.0	13.2	Diurnal Average	
																								17.8	17.3	17.0	16.4	17.0	18.4	21.0	23.1	24.4	25.1	25.6	25.9	26.2	26.7	26.9	26.4	26.4	26.4	26.4	26.1	25.4	23.9	21.6	20.1	18.5	Diurnal Maximum





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Firebag - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	83	11.53	11.53
10 - 20	490	68.06	79.58
> 20	147	20.42	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



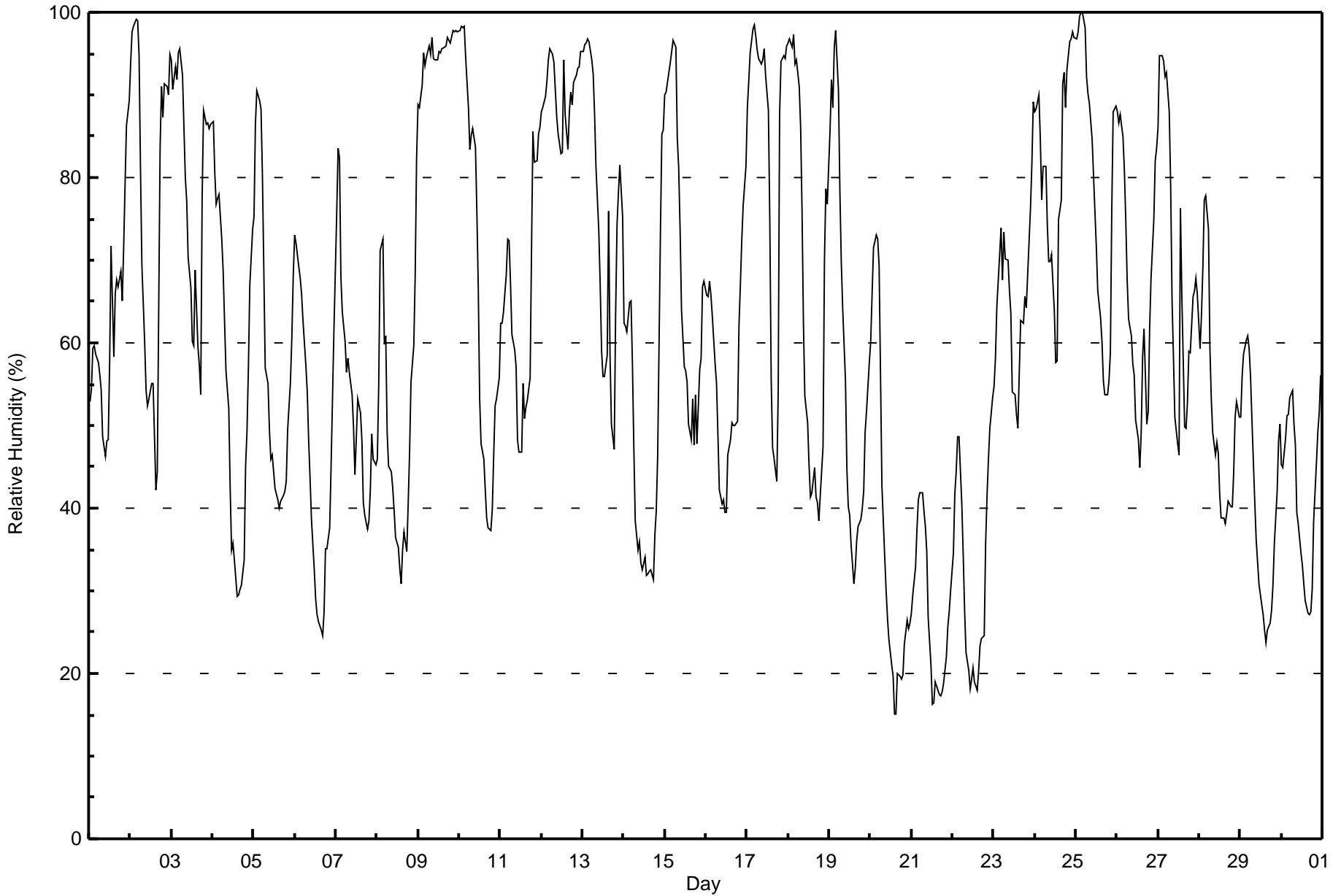
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Firebag - June 2016

Maximum Value: 100 % on Jun 25 04:00																		Maximum Daily Average: 95.0 % on Jun 9																		Hours in Service: 720	
Minimum Value: 15 % on Jun 20 15:00																		Minimum Daily Average: 27.4 % on Jun 21																		Hours of Data: 720	
Maximum Diurnal Average: 79.1 % at hour 4																		Minimum Diurnal Average: 46.5 % at hour 16																		Hours of Missing Data: 0	
Monthly Average: 61.6 %																		Percentiles: P ₁ = 18 P ₁₀ = 32 Q ₁ = 44 Median = 59 Q ₃ = 83 P ₉₀ = 94 P ₉₉ = 98																		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-Jun	53	54	59	60	59	58	56	54	49	46	48	48	58	72	58	66	68	67	69	65	72	79	86	89	62.2	89											
2-Jun	94	98	98	99	99	95	81	70	60	54	52	53	55	55	49	42	44	83	91	87	91	91	90	95	76.2	99											
3-Jun	94	91	93	92	95	96	92	86	80	77	70	67	60	60	69	59	57	54	78	88	86	87	86	86	79.3	96											
4-Jun	87	81	77	77	78	73	69	63	57	52	42	35	36	34	29	30	30	31	34	45	49	57	67	74	54.3	87											
5-Jun	75	86	91	89	88	80	69	57	55	49	46	46	42	42	41	40	41	41	42	43	49	55	61	68	58.3	91											
6-Jun	73	72	69	68	66	63	57	54	48	44	39	32	29	27	26	25	25	28	35	35	38	45	53	61	46.3	73											
7-Jun	76	83	82	68	64	60	56	58	56	54	50	44	48	53	51	48	41	39	37	38	42	49	46	45	53.8	83											
8-Jun	46	55	71	73	60	61	49	45	44	42	40	36	35	33	31	35	37	35	41	47	55	60	68	82	49.2	82											
9-Jun	89	88	91	95	94	95	96	95	97	94	94	94	95	95	96	96	96	97	97	96	98	98	98	98	95.0	98											
10-Jun	98	98	98	98	95	89	83	85	86	84	76	67	53	48	46	42	39	38	37	40	46	52	53	56	67.0	98											
11-Jun	62	62	64	68	73	72	67	61	59	57	48	47	47	55	51	52	53	56	71	86	82	82	85	86	64.5	86											
12-Jun	88	88	90	92	94	96	95	94	90	87	85	83	83	94	88	83	88	90	89	92	92	93	93	95	90.1	96											
13-Jun	95	96	96	97	96	94	93	88	81	74	67	59	56	56	58	76	59	50	47	63	74	78	81	75	75.4	97											
14-Jun	62	62	61	65	65	57	47	38	35	36	33	33	34	32	32	32	33	31	37	40	46	74	85	86	48.2	86											
15-Jun	90	90	93	94	95	97	96	85	81	74	64	57	57	55	50	48	53	48	54	48	57	58	67	67	69.9	97											
16-Jun	66	66	67	66	63	57	55	49	42	40	41	40	39	46	48	50	50	50	51	62	67	72	77	81	56.1	81											
17-Jun	88	92	95	98	98	97	95	94	94	94	96	92	88	75	56	47	46	43	54	88	94	95	94	96	83.8	98											
18-Jun	96	97	96	97	94	94	91	86	76	62	53	50	45	41	42	45	41	41	38	42	48	70	79	77	66.7	97											
19-Jun	86	92	88	96	98	91	79	70	64	55	45	40	39	36	31	33	36	38	39	40	42	49	52	58	58.1	98											
20-Jun	60	66	72	73	73	69	56	43	34	30	27	24	21	20	15	15	20	20	19	20	23	26	25	26	36.6	73											
21-Jun	27	30	33	37	41	42	42	40	38	35	27	21	16	16	19	18	17	17	18	19	22	26	27	30	27.4	42											
22-Jun	35	42	44	49	49	41	34	28	23	20	18	19	21	19	18	20	23	24	25	36	42	46	50	53	32.4	53											
23-Jun	55	58	64	71	74	68	73	70	70	66	63	54	54	51	50	56	63	62	66	64	68	76	82	89	65.4	89											
24-Jun	88	88	90	85	77	81	81	74	70	70	71	64	58	58	75	77	91	93	88	93	96	97	98	97	81.7	98											
25-Jun	97	98	99	100	100	98	92	90	89	85	80	76	71	66	63	60	55	54	54	55	59	76	88	89	78.9	100											
26-Jun	88	87	88	85	81	75	67	63	61	57	56	51	48	45	49	58	62	50	52	62	68	75	82	83	66.3	88											
27-Jun	86	95	95	94	92	93	88	79	65	58	51	48	46	76	66	50	50	53	59	59	66	66	68	66	69.5	95											
28-Jun	59	63	69	77	78	74	59	53	49	47	48	47	42	39	39	38	39	41	40	40	44	51	53	51	51.7	78											
29-Jun	51	56	59	60	61	59	56	51	41	36	33	31	28	27	25	24	25	26	28	31	36	42	48	50	41.0	61											
30-Jun	45	45	48	51	51	53	54	50	48	40	38	35	33	31	29	27	27	27	30	38	45	49	51	56	41.9	56											
	73.7	76.0	78.1	79.1	78.3	75.9	71.1	65.8	61.4	57.4	53.4	49.8	48.0	48.6	46.6	46.5	47.0	47.6	50.6	55.4	60.0	65.8	69.8	72.3	Diurnal Average												
	98	98	99	100	100	98	96	95	97	94	96	94	95	95	96	96	96	97	97	97	96	98	98	98	98	Diurnal Maximum											





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Firebag - June 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	19	2.64	2.64
20 - 40	117	16.25	18.89
40 - 60	237	32.92	51.81
60 - 80	148	20.56	72.36
80 - 100	197	27.36	99.72

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Speed: 51 km/h on Jun 15 14:00	Maximum Daily Speed Average: 25.1 km/h on Jun 15	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 23 12:00	Minimum Daily Speed Average: 1.7 km/h on Jun 23	Hours of Data: 719
Maximum Diurnal Speed Average: 6.2 km/h at hour 3	Minimum Diurnal Speed Average: 0.8 km/h at hour 20	Hours of Missing Data: 1
Monthly Average Velocity: 3.1 km/h 206.5 deg	Percentiles: P ₁ = 2 P ₁₀ = 5 Q ₁ = 8 Median = 12 Q ₃ = 17 P ₉₀ = 22 P ₉₉ = 37	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-Jun	S15	S17	S16	SSW14	SSW12	SSW14	SSW17	SSW15	SW13	SSW21	SSW18	SSW21	SSW19	SSW10	WSW17	SSW17	S14	SSE14	SSE14	S11	SSW6	S9	SSE9	SSE9	SSW13.6	SSW21
2-Jun	S10	S9	S7	S7	S6	S4	SE3	ESE5	SE4	SSW3	W2	NW4	NE8	ESE14	ESE13	S7	SSW11	SW24	WSW17	SSE2	N0	WNW2	WSW6	S5	S4.2	SW24
3-Jun	SSE4	SSE3	SSW6	SW8	WSW10	SW9	SW8	WSW11	WSW15	WSW14	WSW16	WSW19	WSW20	W20	NNW5	NW11	NW7	NNW15	ENE7	NNE8	NE5	SSE6	NW1	ENE2	WSW5.8	W20
4-Jun	S9	SSW13	SW15	WSW12	WSW11	WSW16	W17	W19	WNW20	WNW21	WNW24	WNW26	NW20	NW22	WNW25	WNW26	WNW27	WNW23	NNW22	N18	N11	N7	WNW5	NNW7	WNW13.8	WNW27
5-Jun	N6	S3	WNW2	W4	W8	W9	W13	NW15	NNW18	NW20	NNW19	NW15	NW17	NNW17	NNW13	NNW14	NNE14	NNE13	NNE10	ENE10	E8	ESE10	SE12	SSE14	NNW6.3	NW20
6-Jun	SSE14	SSE16	SSE18	S19	S21	S19	SSE19	SSE17	SSE17	S17	S18	S22	S25	S26	SSE26	S24	S24	SSE21	SE22	SSE19	SSE23	S26	ESE13	E19	SSE19.4	S26
7-Jun	ESE20	SE11	SSE14	SSW14	SW14	SW11	WNW10	NNW14	NNW15	NNW13	N12	NNW11	WSW9	S8	NNE16	NE7	NNE13	N12	N11	N8	NNW3	NNW9	NNE10	N7	NNW3.6	ESE20
8-Jun	N7	N5	AF	NNW3	N4	NE4	NE8	NE12	NE12	NE12	ENE10	ESE9	ESE9	E10	ESE12	E11	E13	SE16	SE11	E4	SE6	SE10	SE16	SE14	E6.7	SE16
9-Jun	ESE15	E16	E18	E21	ENE26	ENE23	ENE25	NE31	NE27	ENE29	ENE29	ENE30	ENE31	ENE33	NE32	NE28	NE24	NNE22	NNE22	NNE21	NNE20	NNE19	NNE17	N13	NE22.1	ENE33
10-Jun	NNE11	NNE11	NNE10	NE6	NE4	NNW4	NW9	NW11	NNW14	N17	N15	N15	N17	N17	N14	NNE11	NNE8	N7	NNE5	NNE7	NE8	ENE10	E10	ESE10	N8.9	N17
11-Jun	ESE11	SE13	SE12	SE11	SSE11	SSE11	SSE12	SSE13	SSE18	SSE18	SSE22	SSE25	SSE30	SSE26	SSE22	SE17	SSE25	SSE21	SSE19	SSE12	SE15	SE18	SE18	ESE17	SSE16.8	SSE30
12-Jun	SE14	SE13	SE12	SE11	SSE7	SSW13	SW16	SW16	SW18	SW20	SW21	SW22	SW24	SW19	SW23	SW23	WSW18	W14	WSW13	WSW13	WSW10	SW9	SW14	SW19	SW13.3	SW24
13-Jun	WSW18	WSW15	WSW15	WSW16	WSW17	WSW21	WSW22	WSW23	WSW23	WSW24	WSW26	WSW29	WSW29	W19	WNW14	WSW11	WSW17	WSW15	W13	NNE5	NE7	E4	SE10	S9	WSW14.4	WSW29
14-Jun	SSW10	S9	S9	S4	SSE6	S7	S8	SE10	SSE6	SSE10	SSE13	SSE18	SE15	ESE20	SE23	SE26	SE21	SSE22	SE16	ESE11	SSW22	S27	S14	S19	SSE12.9	S27
15-Jun	S21	SSE18	ESE18	ESE15	ESE12	ESE16	SE16	SSE18	SSE26	SSE35	S45	S51	S49	S51	SSW51	SSW42	S33	S30	SSE27	SSE25	SE20	S18	SSE9	S11	S25.1	S51
16-Jun	S12	S15	S16	SSE20	SSE22	S26	S31	S32	S39	SSW35	SSW25	SSW26	SSW23	SW18	WSW16	WSW16	SW14	SW13	SSW10	S10	S4	WSW5	SW9	W6	SSW16.7	S39
17-Jun	WNW6	WSW5	WSW9	WSW10	WSW9	WNW10	WNW12	WNW15	NNW18	NW17	NW18	NW16	WNW15	WNW16	WNW19	WNW21	WNW18	W21	W20	NNW14	NE7	NNE10	NNW13	NW9	WNW11.6	W21
18-Jun	WNW13	NW13	NW12	WNW11	WNW11	WNW13	W14	W15	W17	W19	WNW21	WNW20	W20	W20	W18	W17	W17	WSW17	WSW15	WSW11	SSW10	NNE17	NE8	NE4	W12.2	WNW21
19-Jun	N9	NE8	E3	W8	W8	W10	W13	NW12	NNW16	NNW20	NNW25	NNW25	NNW27	NNW28	NNW30	NNW28	N24	NNW26	N20	NNW20	NNW15	NNW9	NNW8	NW9	NNW15.1	NNW30
20-Jun	NW9	WNW7	W7	WSW6	WSW4	W5	NNW6	NW8	NW9	WNW9	WNW8	NW6	NNW6	NW7	WSW7	WNW7	WNW6	WSW4	SW9	SSW9	SSE9	SSE11	SSE12	S14	W3.9	S14
21-Jun	S17	S16	S14	SSW13	SSW14	SSW13	SW14	SW14	SW15	SW18	SSW17	SW15	SSW10	SSW11	SSW13	SW11	SSW5	WSW4	WSW10	SW8	SW7	SSW9	S8	S12	SSW11.6	SW18
22-Jun	S12	S8	S7	S7	SSW7	S6	S8	SSW10	SSW11	SSW12	SSW12	SW8	WSW11	SW10	SW9	WSW12	W11	WSW12	SW14	WSW21	WSW14	SW14	WSW10	W8	SW9.5	WSW21
23-Jun	WSW9	SW6	SW4	S4	SSW3	SW5	NW3	N5	N9	NNE8	N6	W0	NW6	WNW4	SW3	E7	ENE15	NE10	ENE14	E10	ESE6	SE6	ESE4	N3	NE1.7	ENE15
24-Jun	N5	ENE6	ESE8	ENE8	E6	ENE3	NNE8	NNE13	NNE17	N17	N17	NNE19	NNE16	NE15	NNW11	NNW12	NNE10	NW3	NNE2	NW6	NNE8	NE8	NE6	NNE8	NNE8.3	NNE19
25-Jun	NNE9	NNE9	NNE7	NE7	E5	E5	NE8	NE12	NNE13	NNE14	NNE18	NNE16	NNE18	NE15	NE14	NNE15	NNE16	NE15	ENE13	NE8	NNE4	NW4	W3	WSW2	NNE9.5	NNE18
26-Jun	NW3	WNW5	SW3	S5	S5	SSW5	SW7	SW7	W8	W9	WNW11	WNW11	NW8	NW8	WNW14	S14	S12	SSW12	SW13	SW9	SW11	W10	WSW11	SSE4	WSW5.6	S14
27-Jun	WSW7	SW10	SW11	SW11	SW11	SW11	WSW10	WSW8	WNW12	WNW10	WNW12	WNW15	WNW13	WNW9	SSW15	SSW20	WSW18	W9	W5	WSW4	SW8	SW6	S5	SSW7	WSW8.8	SSW20
28-Jun	SSW11	SSW12	SW13	SW8	SW6	WSW6	NW10	NNW11	NW12	NW16	NNW18	NNW17	NNW17	NNW19	N17	N18	NNE19	NNE18	NNE17	NNE14	NNE10	NE8	ENE11	E12	NNW7.4	NNE19
29-Jun	E11	ESE9	SE10	ESE11	ESE12	ESE11	SE11	SE12	SE11	E8	ESE8	S8	SE7	WNW2	E4	ESE3	SE8	ESE10	SE10	SE10	SE11	SSE12	SSE14	SSE16	SE8.7	SSE16
30-Jun	S19	S20	SSE19	SSE15	S17	S17	S14	SSW15	SSW15	SSW18	SSW18	SSW15	S13	SSE13	SE13	ESE16	ESE17	SE16	SE16	SE12	SE9	SE11	SE12	SSE13	SSE13.2	S20

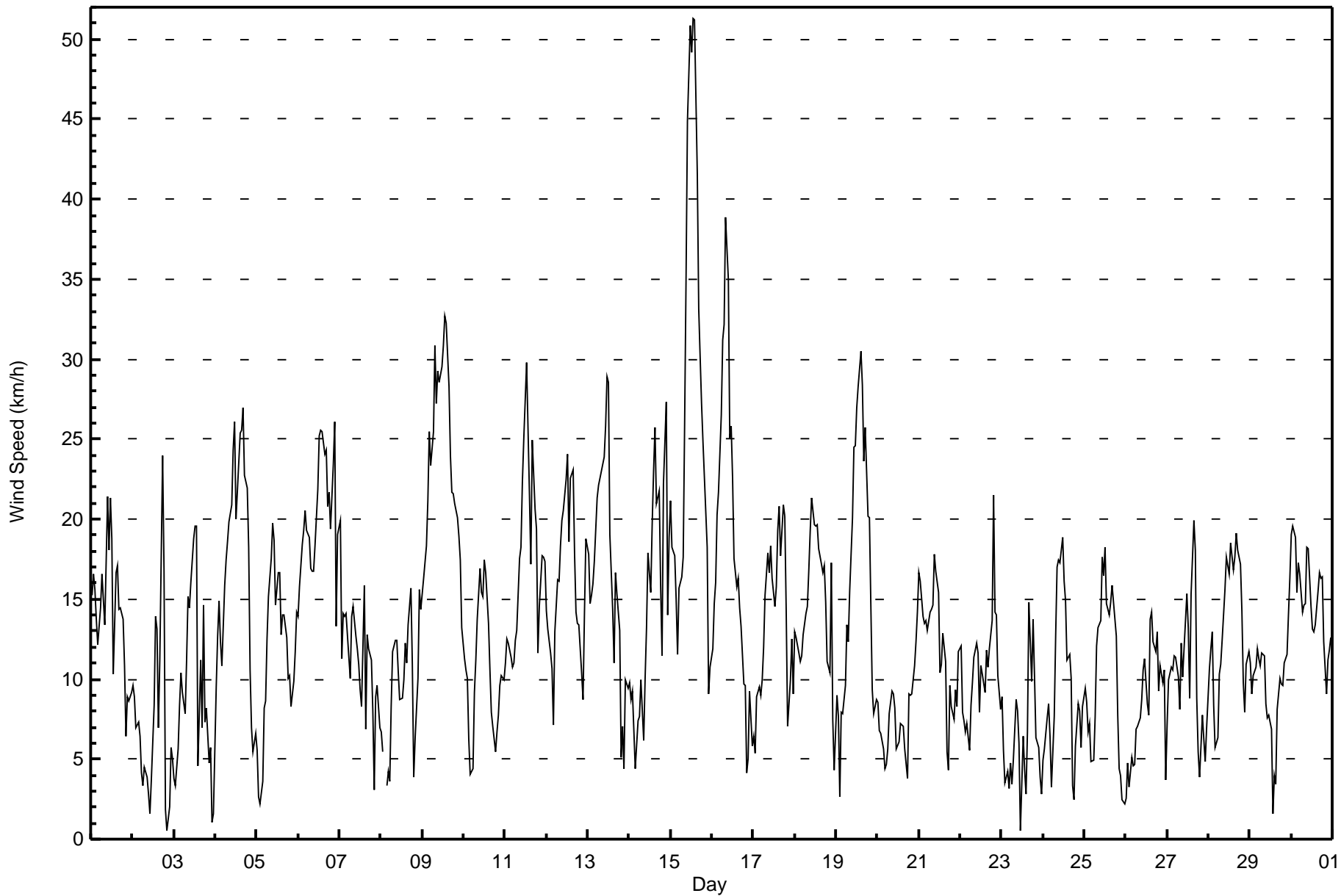
S4.5	S5.2	S6.2	S5.5	S5.3	SSW5.7	SW4.9	WSW3.7	WSW3.7	WSW4.7	WSW4.8	WSW5.4	WSW4.9	WSW2.8	WSW3.0	WSW3.1	SW1.7	SW2.7	S1.5	ESE0.8	SE2.4	SSE3.2	SSE3.5	SSE4.0	Diurnal Average	
S21	S20	SSE19	E21	ENE26	S26	S31	S32	S39	SSW35	S45	S51	S49	S51	SSW51	SSW42	SSW33	S30	SSE27	SSE25	SSE23	S27	SE18	E19	Diurnal Maximum	

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
Firebag - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Firebag - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	77	10.71	10.71
6 - 11	247	34.35	45.06
12 - 19	275	38.25	83.31
20 - 28	96	13.35	96.66
29 - 38	17	2.36	99.03
> 38	7	0.97	100.00

Total Number of Valid Hours: 719

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Firebag - June 2016**

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	4	4	3	5	3	2	4	9	4	4	8	5	6	6	4	77
6 - 11	11	19	16	7	9	13	19	12	24	16	27	22	13	15	14	10	247
12 - 19	14	22	8	3	5	13	22	29	27	27	20	26	14	14	11	20	275
20 - 28	2	4	3	3	1	2	5	15	11	7	7	8	5	11	3	9	96
29 - 38	0	0	2	5	0	0	0	2	3	2	0	2	0	0	0	1	17
> 38	0	0	0	0	0	0	0	0	5	2	0	0	0	0	0	0	7
Totals	33	49	33	21	20	31	48	62	79	58	58	66	37	46	34	44	719

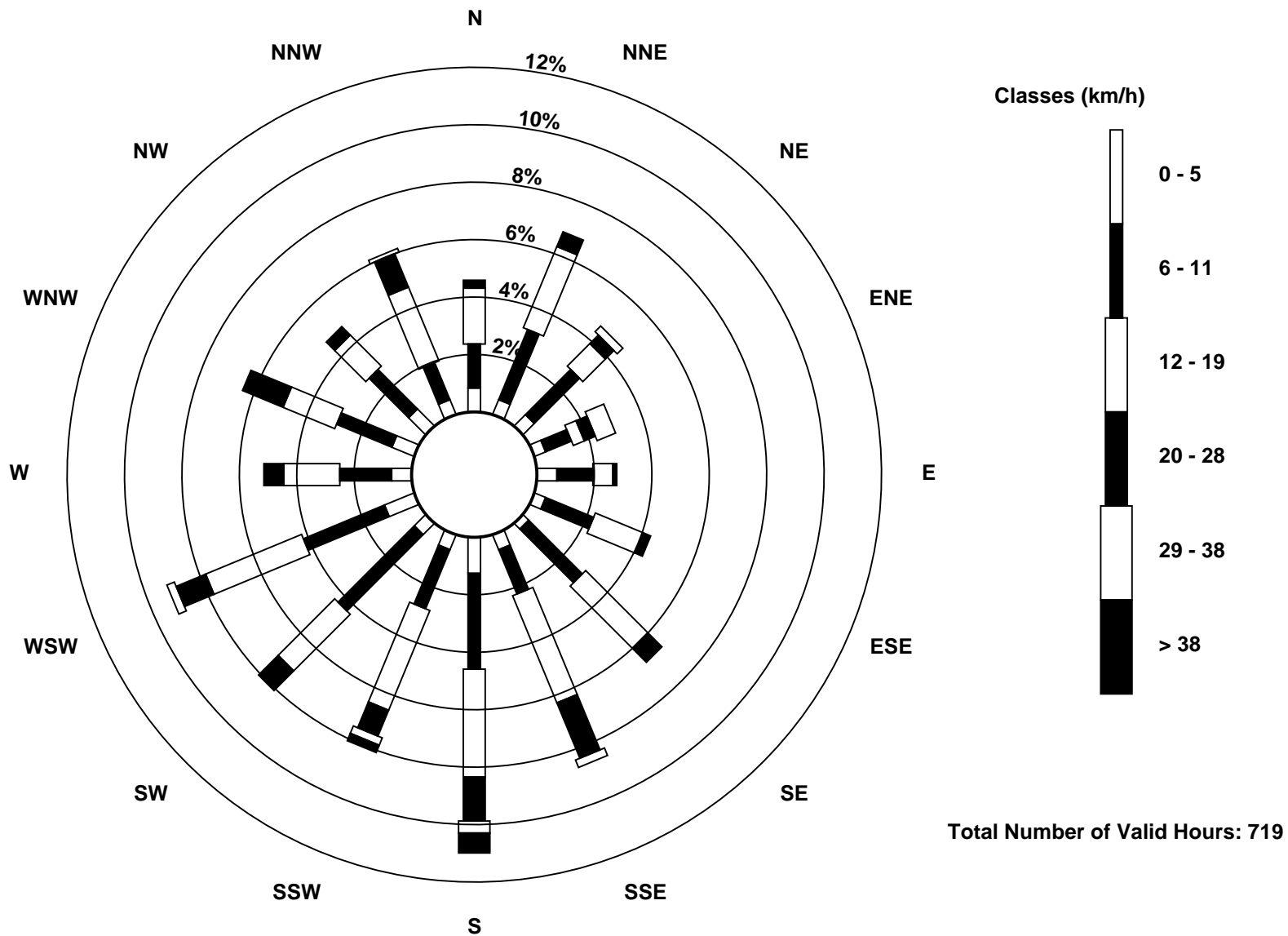
Total Number of Valid Hours: 719

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed (WS) - km/h
Firebag (AMS 19)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Firebag - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 11 km/h on Jun 2 17:00	Hours of Data: 719
Minimum Value: 0 km/h on Jun 26 00:00	Hours of Missing Data: 1
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 6 P ₉₉ = 9	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-Jun	2	2	2	1	2	3	3	3	3	5	5	5	4	2	5	5	4	3	3	2	1	1	1	1	5
2-Jun	1	1	1	2	1	1	2	2	3	2	2	3	3	3	4	3	11	4	4	2	1	2	2	2	11
3-Jun	2	2	2	2	1	2	1	3	3	3	4	4	5	6	2	4	5	5	3	3	2	2	3	1	6
4-Jun	3	1	2	2	2	2	3	4	3	5	6	6	6	6	8	6	7	6	6	4	2	2	1	3	8
5-Jun	3	2	1	1	1	1	3	3	3	5	6	4	5	5	4	5	5	4	3	2	1	2	2	2	6
6-Jun	2	3	2	3	3	3	3	3	3	3	3	5	5	5	6	5	5	4	4	5	4	7	9	3	9
7-Jun	4	3	3	2	2	2	2	3	3	3	3	4	9	4	6	4	4	3	3	2	2	4	1	1	9
8-Jun	1	1	AF	2	1	1	2	2	2	3	3	3	3	3	2	3	4	5	2	2	5	3	3	5	
9-Jun	4	3	3	4	5	5	5	6	5	6	6	6	6	6	6	6	5	4	4	4	4	4	4	2	6
10-Jun	2	1	2	1	1	1	2	2	3	3	4	4	4	4	4	4	3	3	3	2	1	1	1	2	4
11-Jun	2	2	2	2	2	2	2	2	3	4	5	5	6	8	4	6	6	4	6	3	4	6	3	4	8
12-Jun	3	3	3	2	1	4	3	3	4	3	4	4	4	3	4	4	4	4	3	3	2	2	3	3	4
13-Jun	3	2	2	2	3	4	4	4	4	4	5	5	6	9	7	6	5	4	6	2	2	2	2	1	9
14-Jun	1	1	2	1	2	2	1	3	3	5	6	3	5	4	6	6	5	6	8	3	9	8	3	5	9
15-Jun	4	4	3	3	2	4	5	4	8	6	9	8	8	8	9	10	6	7	10	9	6	10	2	1	10
16-Jun	2	2	2	3	3	4	5	6	6	7	6	7	5	4	3	3	3	3	3	5	1	1	1	1	7
17-Jun	2	2	1	1	1	2	3	5	5	4	5	4	3	4	5	6	5	5	8	6	2	5	6	3	8
18-Jun	2	3	3	2	2	2	3	3	4	5	5	6	6	5	6	6	5	4	4	2	2	8	3	3	8
19-Jun	1	2	2	2	1	2	3	3	4	5	5	5	6	7	7	6	5	5	4	4	3	1	1	1	7
20-Jun	1	1	1	1	1	1	1	2	3	4	3	3	3	3	4	4	3	3	2	2	1	1	1	2	4
21-Jun	2	2	1	2	1	2	2	2	2	3	5	5	5	5	5	5	4	3	3	1	1	1	1	2	5
22-Jun	2	1	1	1	1	1	1	2	2	4	4	5	4	5	6	5	2	4	5	5	4	2	2	3	6
23-Jun	3	1	3	3	1	2	1	3	2	2	2	2	2	2	4	6	6	2	3	2	2	2	1	1	6
24-Jun	2	2	2	2	2	2	2	4	3	3	3	4	4	4	3	4	6	2	1	1	2	2	1	2	6
25-Jun	1	1	1	1	1	1	3	2	3	3	4	3	4	4	3	3	4	4	3	2	1	1	2	0	4
26-Jun	2	1	1	1	1	1	1	2	3	3	4	4	3	3	6	4	2	2	2	2	1	2	3	2	6
27-Jun	5	2	2	2	2	2	2	3	3	4	4	5	4	4	4	4	3	4	3	1	2	2	2	1	5
28-Jun	1	1	2	2	1	1	3	2	3	4	5	5	5	5	4	4	5	4	4	3	2	1	1	2	5
29-Jun	2	2	2	2	2	2	2	2	3	4	4	3	5	3	4	3	4	3	2	2	2	2	2	2	5
30-Jun	3	3	3	2	2	2	2	3	5	3	4	5	5	5	4	4	4	4	3	2	1	2	2	2	5

5	4	3	4	5	5	5	6	8	7	9	8	9	9	9	10	11	7	10	9	9	10	9	5	
Diurnal Maximum																								

AF - Analyzer Failure



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Firebag - June 2016

Direction of Maximum Speed: 189 deg on Jun 15 14:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 169.3 deg on Jun 15	Hours of Data: 719
Direction of Minimum Speed: 269 deg on Jun 23 12:00	Hours of Missing Data: 1
Direction of Minimum Daily Speed Average: 1.7 deg on Jun 23	Percent Operational Time: 99.9
Monthly Average Direction: 246.7 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-Jun	177	179	179	192	202	206	205	212	214	213	202	203	207	205	238	194	183	167	168	175	192	173	163	166	194.5
2-Jun	180	170	170	174	183	190	132	112	126	206	273	305	50	104	117	169	201	227	246	155	11	282	251	172	182.0
3-Jun	159	162	207	230	242	231	225	245	238	244	239	245	250	266	334	325	318	339	72	17	53	152	321	66	255.3
4-Jun	179	196	218	238	252	254	263	277	283	286	293	295	320	315	297	295	291	288	331	1	356	358	284	334	290.4
5-Jun	10	184	289	261	269	259	281	323	334	314	331	306	325	341	343	341	21	18	19	62	85	122	131	161	337.4
6-Jun	163	166	167	171	171	170	166	162	166	174	172	175	175	169	163	170	171	162	141	155	163	169	119	95	163.1
7-Jun	121	132	156	205	225	233	289	342	348	339	351	327	258	184	29	34	16	7	350	351	343	342	14	9	346.7
8-Jun	353	352	AF	327	5	47	38	36	46	49	67	117	102	87	108	91	100	146	138	95	128	132	144	127	92.4
9-Jun	114	95	85	80	73	67	59	55	52	63	64	66	61	57	47	39	39	29	30	27	22	21	12	9	53.0
10-Jun	16	19	32	42	34	348	326	320	331	355	356	356	352	3	7	15	12	351	15	19	38	63	82	107	9.3
11-Jun	123	131	135	133	147	153	161	165	168	164	155	157	157	163	161	140	148	151	151	160	129	132	128	117	148.7
12-Jun	128	127	139	140	149	202	219	228	220	219	214	216	224	228	221	228	239	264	258	245	247	231	225	231	217.6
13-Jun	239	244	238	241	245	249	246	244	244	239	241	240	241	281	285	252	242	241	278	30	41	87	143	185	244.9
14-Jun	199	189	185	179	167	181	177	143	151	168	163	153	138	112	125	144	135	150	134	118	203	187	177	186	157.9
15-Jun	173	149	118	118	113	104	132	161	155	162	173	173	182	189	192	200	191	179	157	164	135	182	158	176	169.3
16-Jun	178	170	174	163	163	173	184	190	188	194	209	208	205	235	237	240	231	233	199	175	180	253	231	273	197.2
17-Jun	287	251	238	246	254	290	294	300	327	320	309	321	292	298	302	297	289	280	268	344	55	22	348	311	300.9
18-Jun	302	307	316	303	301	285	281	273	267	268	282	287	280	275	271	263	264	248	248	244	213	12	55	35	280.2
19-Jun	7	39	96	267	266	264	277	305	333	334	330	337	339	332	331	339	351	344	350	345	347	339	331	320	333.6
20-Jun	319	295	278	244	239	259	333	315	310	301	294	315	329	320	248	297	287	245	218	197	167	158	159	173	260.2
21-Jun	183	184	190	196	200	205	216	220	214	215	213	215	192	198	212	220	205	239	239	231	230	197	190	172	205.5
22-Jun	179	187	188	190	194	176	187	208	204	203	209	232	251	229	223	254	270	244	227	253	237	220	240	264	223.4
23-Jun	257	217	230	189	206	218	306	359	354	20	7	269	304	285	217	96	62	52	70	81	110	145	122	10	52.2
24-Jun	8	67	112	70	93	64	21	30	20	6	10	22	23	37	342	327	26	325	27	308	29	42	55	33	23.8
25-Jun	21	18	26	43	79	92	47	40	28	31	19	17	15	39	34	31	33	53	59	52	24	325	263	248	32.5
26-Jun	325	294	217	171	170	192	219	230	273	280	289	296	312	324	283	171	173	199	225	220	223	272	256	165	241.5
27-Jun	245	236	223	224	223	233	252	245	292	296	289	291	289	303	212	213	239	262	273	252	224	233	185	198	247.5
28-Jun	207	211	216	221	224	246	306	339	316	313	332	335	332	340	358	9	15	19	29	26	27	49	64	82	348.2
29-Jun	94	118	129	121	117	121	127	134	133	83	113	183	129	283	94	118	133	122	125	141	137	152	154	168	130.7
30-Jun	169	171	168	166	173	188	190	213	202	210	209	193	179	161	141	120	121	130	127	140	125	131	141	152	165.3

171.4 170.4 173.7 181.5 189.2 202.9 222.7 241.6 251.9 249.7 253.1 242.2 245.0 256.6 244.8 236.9 215.3 224.9 181.3 119.2 142.3 151.7 147.9 155.3

Diurnal Average

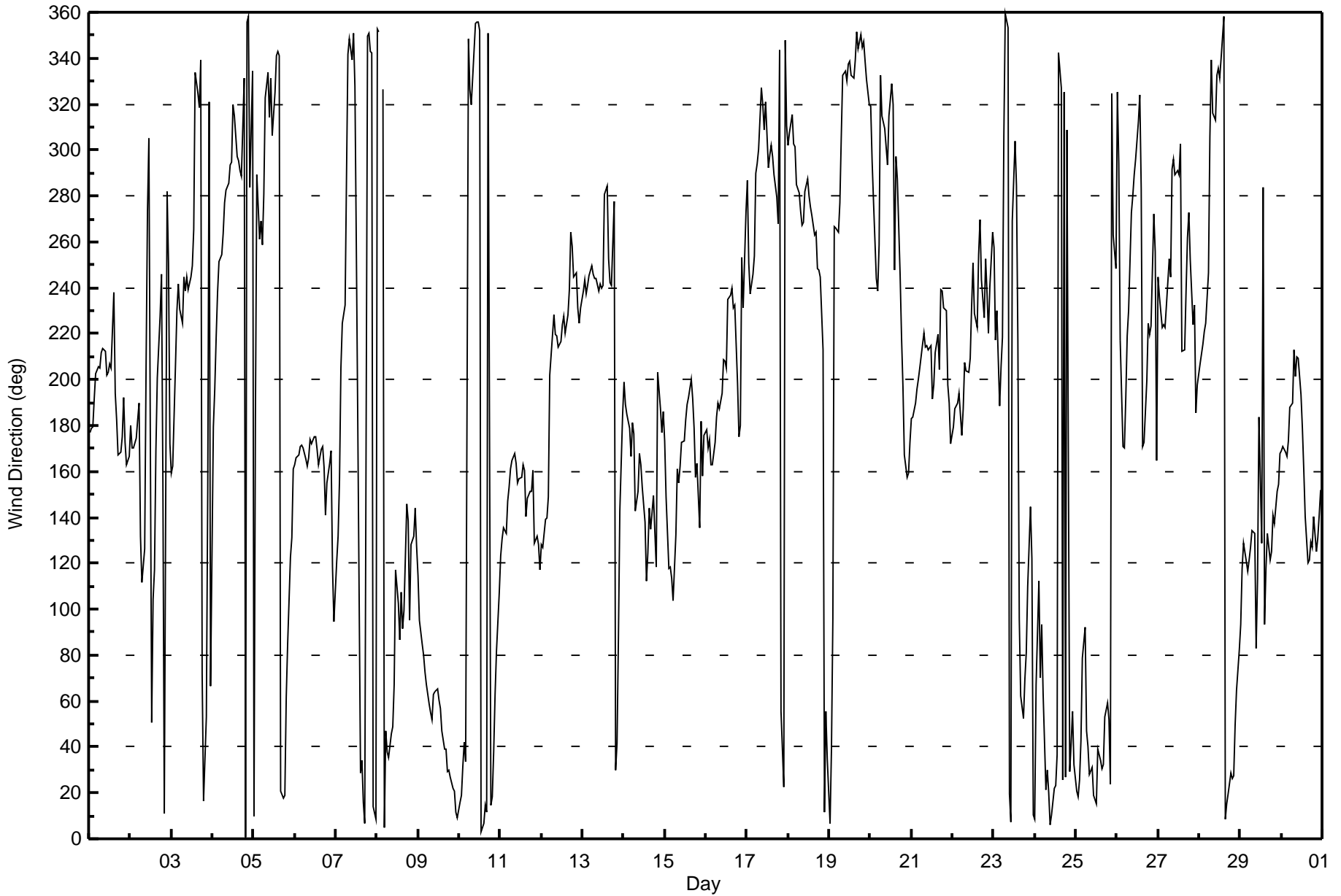
AF - Analyzer Failure

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
Firebag - June 2016





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
Firebag - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 107 deg on Jun 23 12:00	Hours of Data: 719
Minimum Value: 4 deg on Jun 14 01:00	Hours of Missing Data: 1
Percentiles: P ₁ = 5 P ₁₀ = 9 Q ₁ = 11 Median = 15 Q ₃ = 24 P ₉₀ = 40 P ₉₉ = 88	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-Jun	8	7	8	7	11	10	10	11	14	12	13	14	12	12	20	36	14	13	12	9	10	12	9	10	36
2-Jun	10	9	9	9	10	20	37	47	74	77	89	86	57	28	21	41	38	10	15	68	99	65	48	42	99
3-Jun	26	29	22	9	10	9	14	17	15	17	15	17	19	62	35	59	24	48	51	61	29	99	72	99	
4-Jun	7	10	8	9	9	10	12	14	14	16	17	16	18	17	17	14	16	28	15	14	14	28	47	47	
5-Jun	13	64	55	29	9	10	16	18	17	19	21	25	21	25	39	29	29	26	25	17	19	11	13	10	64
6-Jun	9	10	8	8	9	9	9	10	11	13	11	14	16	15	18	16	15	16	11	15	11	17	66	27	66
7-Jun	11	19	17	15	8	10	29	14	17	21	23	36	55	22	31	53	27	27	23	29	34	18	13	10	55
8-Jun	10	8	AF	8	27	20	11	13	18	17	20	40	31	26	23	13	28	16	23	45	31	36	13	12	45
9-Jun	14	10	12	11	13	12	11	10	11	12	12	12	11	11	10	11	11	11	11	11	11	12	12	10	14
10-Jun	9	9	10	16	27	14	14	16	22	16	18	22	21	22	25	39	41	40	46	28	10	9	10	15	46
11-Jun	12	11	12	11	10	10	8	9	10	12	12	13	11	11	12	18	13	14	12	22	15	14	12	13	22
12-Jun	12	13	17	14	22	19	11	11	11	11	12	13	13	13	11	12	19	17	12	11	10	15	9	9	22
13-Jun	12	10	9	9	11	11	9	12	12	14	13	14	15	35	24	34	14	16	27	38	20	37	14	10	38
14-Jun	4	5	6	11	7	9	15	12	50	48	37	16	25	18	23	18	19	16	18	20	25	11	11	10	50
15-Jun	9	15	11	12	18	13	26	15	13	12	11	11	12	11	10	13	11	17	14	26	13	34	34	12	34
16-Jun	11	8	8	8	8	10	10	10	10	14	20	15	17	16	14	15	19	15	21	13	18	38	8	27	38
17-Jun	13	40	12	8	15	14	15	21	12	13	15	15	18	18	15	18	20	16	20	21	25	36	16	13	40
18-Jun	12	14	11	12	12	12	13	16	17	21	20	21	23	20	25	18	24	20	18	14	8	59	25	30	59
19-Jun	15	8	65	13	10	12	13	18	22	18	16	19	17	14	16	19	17	16	16	14	11	8	5	6	65
20-Jun	5	9	6	18	9	20	24	26	35	39	36	79	58	41	48	66	62	74	24	15	8	8	8	9	79
21-Jun	7	6	6	7	5	7	10	12	13	15	17	24	44	33	36	35	55	84	18	17	12	9	8	9	84
22-Jun	10	6	7	7	7	12	10	15	15	23	30	66	45	49	68	33	15	22	16	11	16	10	13	32	68
23-Jun	21	19	32	35	37	26	31	50	19	28	39	107	42	49	91	62	11	13	15	13	20	27	26	40	107
24-Jun	14	41	19	18	30	72	14	15	19	16	17	17	23	21	29	25	55	49	78	28	18	14	10	17	78
25-Jun	9	8	10	22	24	23	26	16	14	17	14	18	15	20	24	16	27	22	18	10	20	13	42	37	42
26-Jun	64	25	21	13	15	13	15	28	29	33	34	28	36	43	24	31	11	14	12	10	7	30	12	58	64
27-Jun	42	9	13	10	10	9	16	28	17	30	24	23	27	51	13	11	15	19	38	23	12	62	15	5	62
28-Jun	7	9	8	10	12	14	25	17	21	17	18	19	27	18	19	21	18	17	20	17	10	5	9	11	27
29-Jun	11	13	11	10	10	11	14	15	21	49	51	37	75	92	82	91	46	30	23	21	18	12	10	9	92
30-Jun	9	8	8	10	9	8	9	16	16	17	18	25	28	32	30	19	21	25	16	11	13	13	11	11	32

64	64	65	35	37	72	37	50	74	77	89	107	75	92	91	91	62	84	78	68	99	65	99	72	
Diurnal Maximum																								

AF - Analyzer Failure



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	June 28, 2016	Last Calibration	June 27, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	8:55	End Time (MST)	13:10
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

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-605	-605
Analyzer IP address	192.168.1.43		Lamp voltage	789	788
Calculated slope	1.030989	0.999974	Chamber temp	44.9	44.9
Calculated intercept	-0.463945	-0.094047	Pressure	687.1	687.1
Analyzer Background	7.5	7.7	Flow	0.453	0.453
Analyzer Coefficient	0.974	0.993	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	0.6	----
as found span	5000	58.3	574.8	565.4	1.017
calibrator zero	5000	0.0	0.0	0.6	----
high point	5000	58.3	574.8	575.6	0.999
second point	5000	29.3	288.9	287.6	1.004
third point	5000	14.7	144.9	145.3	0.998
as left zero	5000	0.0	0.0	0.7	----
as left span	5000	58.3	574.8	567.3	1.013
Average Correction Factor					1.000

Corrected As found 564.8 Previous response 558.0 % change -1.2%

Notes:

Span adjusted. No maintenance completed.

Calibration Performed By:

Devin Russell



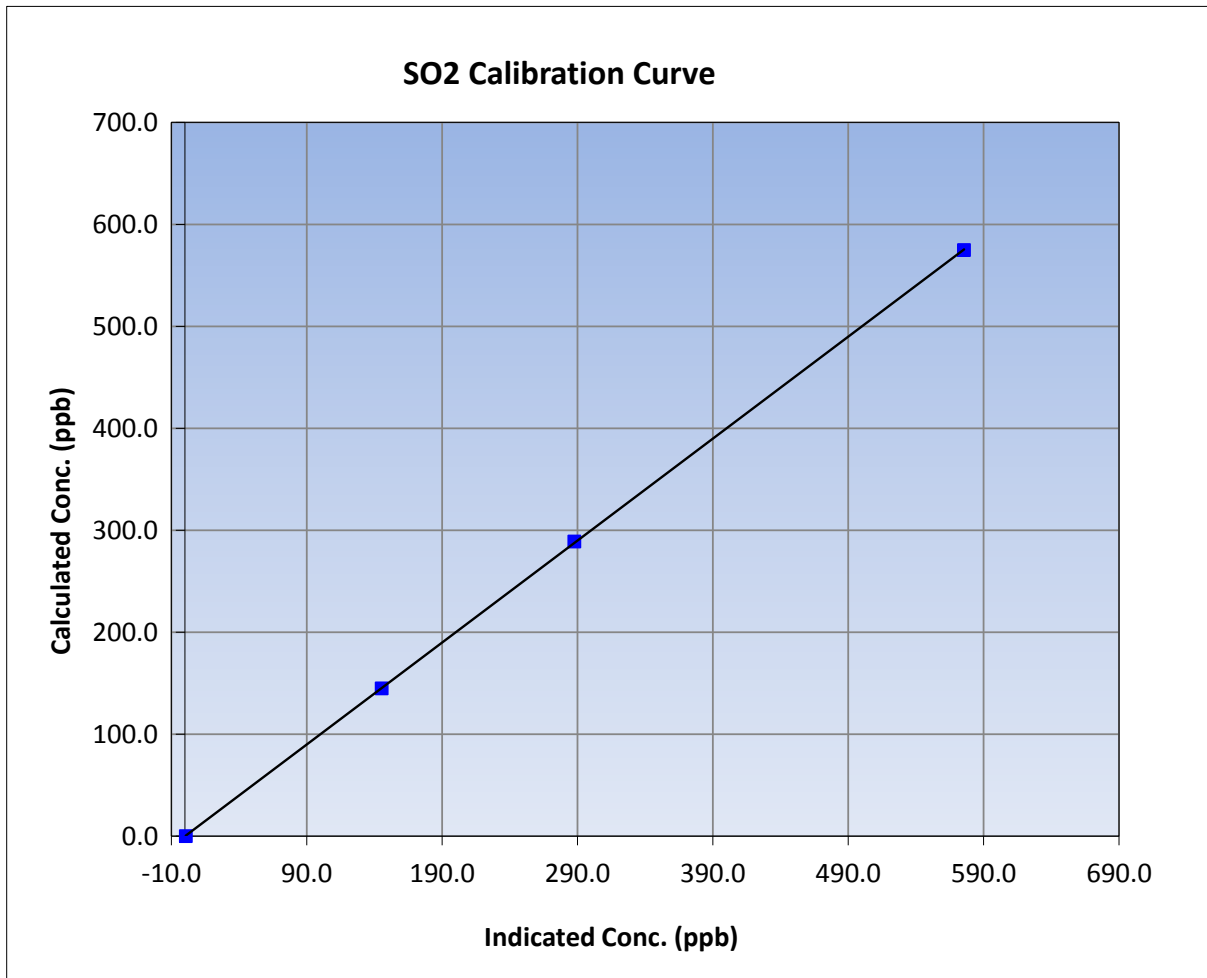
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 28, 2016	Previous Calibration	June 27, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	8:55	End Time (MST)	13:10
Analyzer make	Thermo 43i	Analyzer serial #	1410661308

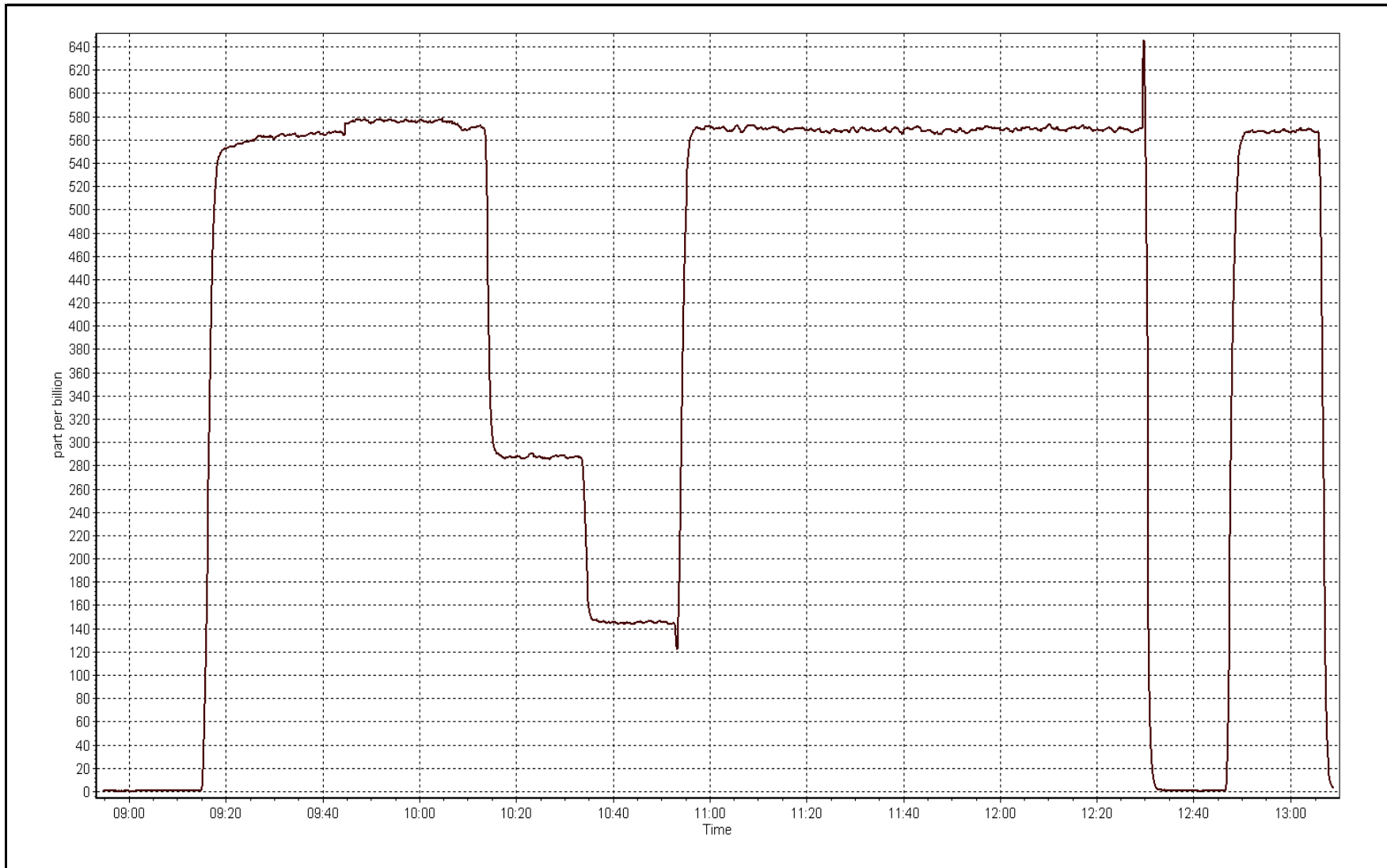
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.6	----	Correlation Coefficient	0.999986
574.8	575.6	0.9987		
288.9	287.6	1.0044	Slope	0.999974
144.9	145.3	0.9978		
			Intercept	-0.094047



SO2 Calibration Plot

Date: June 28, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	June 27, 2016	Last Calibration	May 19, 2016	
Station Name	Firebag	Station Number	AMS 19	
Reason:	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Routine</td> </tr> </table>			Routine
Routine				
Start Time (MST)	10:00	End Time (MST)	15:30	
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	932	932
Calculated slope	1.000142	0.998713	Chamber temp	45	45
Calculated intercept	-0.085784	-0.409581	Pressure	534.0	542.5
Analyzer Background	13.1	13	Flow	0.949	0.958
Analyzer Coefficient	1.164	1.164	Intensity	85	84
			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	83.3	80.8	81.1	0.996
SO2 scrubber check	5000	15.2	149.9	1.3	----
calibrator zero	5000	0.0	0.0	0.3	----
high point	5000	83.3	80.8	81.3	0.994
second point	5000	41.8	40.5	40.9	0.990
third point	5000	21.0	20.4	21.0	0.970
as left zero	5000	0.0	0.0	0.3	----
as left span	5000	83.4	80.9	82.0	0.987
Average Correction Factor					0.985

Corrected As found	80.8	Previous response	80.9	% change	0.1%
--------------------	------	-------------------	------	----------	------

Notes:

Inlet filter changed after as founds. Zero air generator purafil and charcoal scrubber replaced after as founds. Second zero and span point completed to document any change. No adjustments made. Scrubber check completed after third point.

Calibration Performed By: Devin Russell



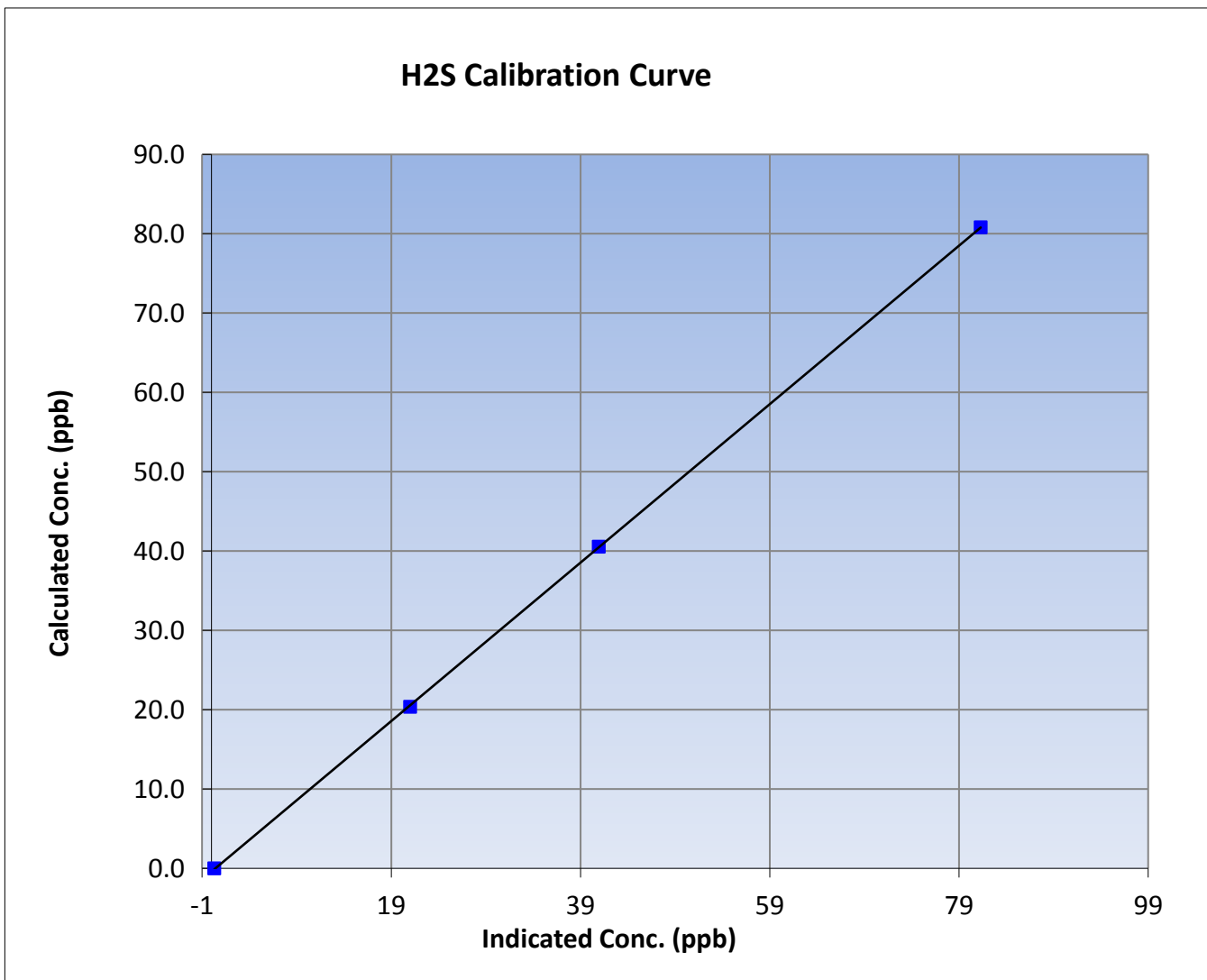
Wood Buffalo Environmental Association H2S Calibration Report

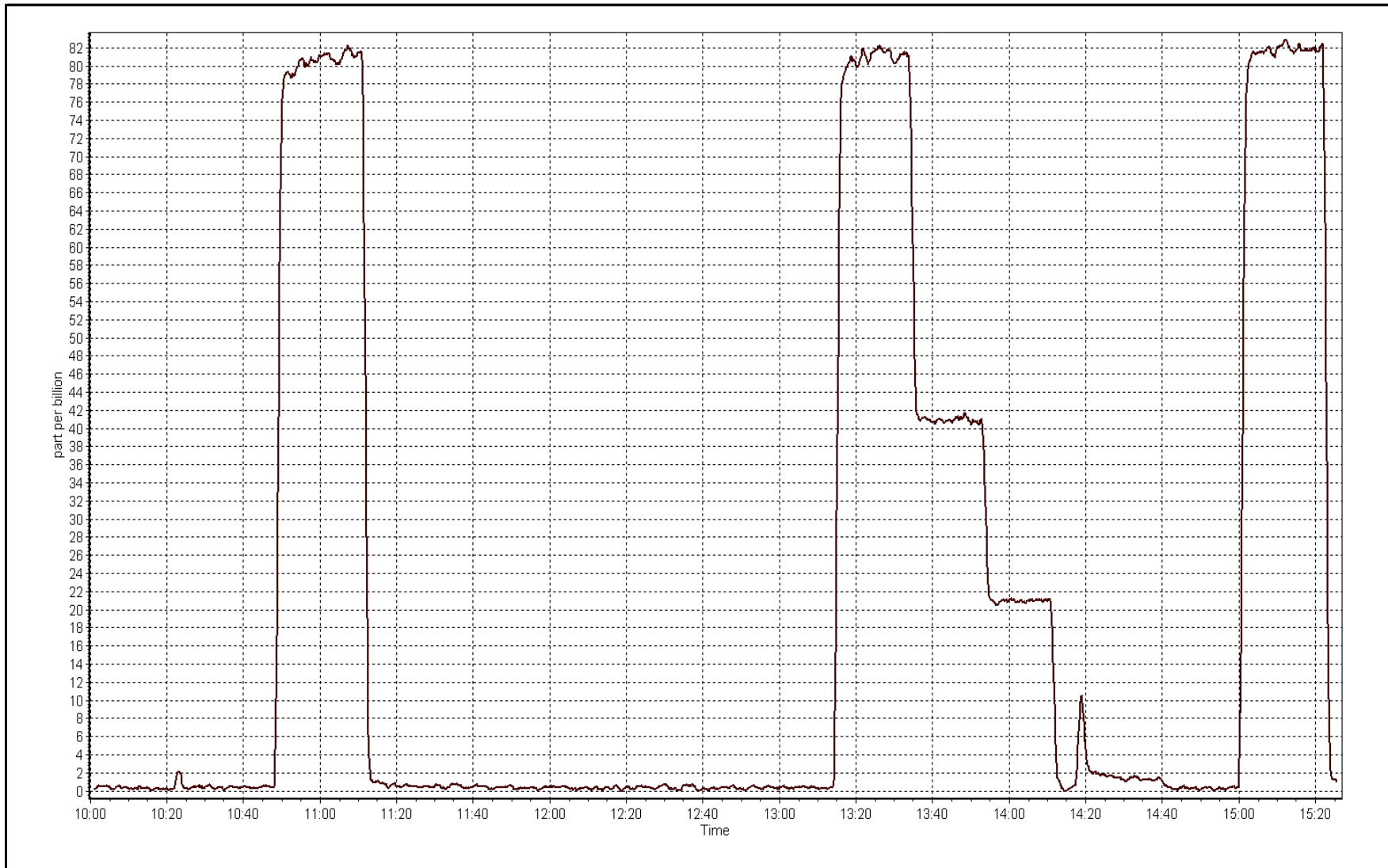
Station Information

Calibration Date	June 27, 2016	Previous Calibration	May 19, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	10:00	End Time (MST)	15:30
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	0.999985
80.8	81.3	0.9939		
40.5	40.9	0.9904	Slope	0.998713
20.4	21.0	0.9700		
			Intercept	-0.409581







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June 28, 2016	Last Calibration	June 27, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	8:55	End Time (MST)	13:10
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

	<i>Before</i>	<i>After</i>		<i>Before</i>	<i>After</i>
Analyzer Range	0 - 50 ppm		Sample Pressure	8.6	8.6
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.9	34.9
Calculated slope	1.019667	1.005393	Fuel Pressure	23.0	23.0
Calculated intercept	-0.163147	-0.088585	Analyzer Coeff	3.514	3.6
			Analyzer BKG	4.840	4.940

Analyzer make Thermo 51i-LT Analyzer serial # 1336160089

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	0.04	----
as found span	5000	58.3	12.74	12.49	1.020
calibrator zero	5000	0.0	0.00	0.04	----
high point	5000	58.3	12.74	12.73	1.000
second point	5000	29.3	6.40	6.48	0.988
third point	5000	14.7	3.21	3.33	0.964
as left zero	5000	0.0	0.00	0.14	----
as left span	5000	58.3	12.74	12.79	0.996
Average Correction Factor					0.984

Corrected As found 12.45 Previous response 12.65 % change 1.6%

Notes:

Span adjusted. No maintenance completed.

Calibration Performed By:

Devin Russell



Wood Buffalo Environmental Association THC Calibration Report

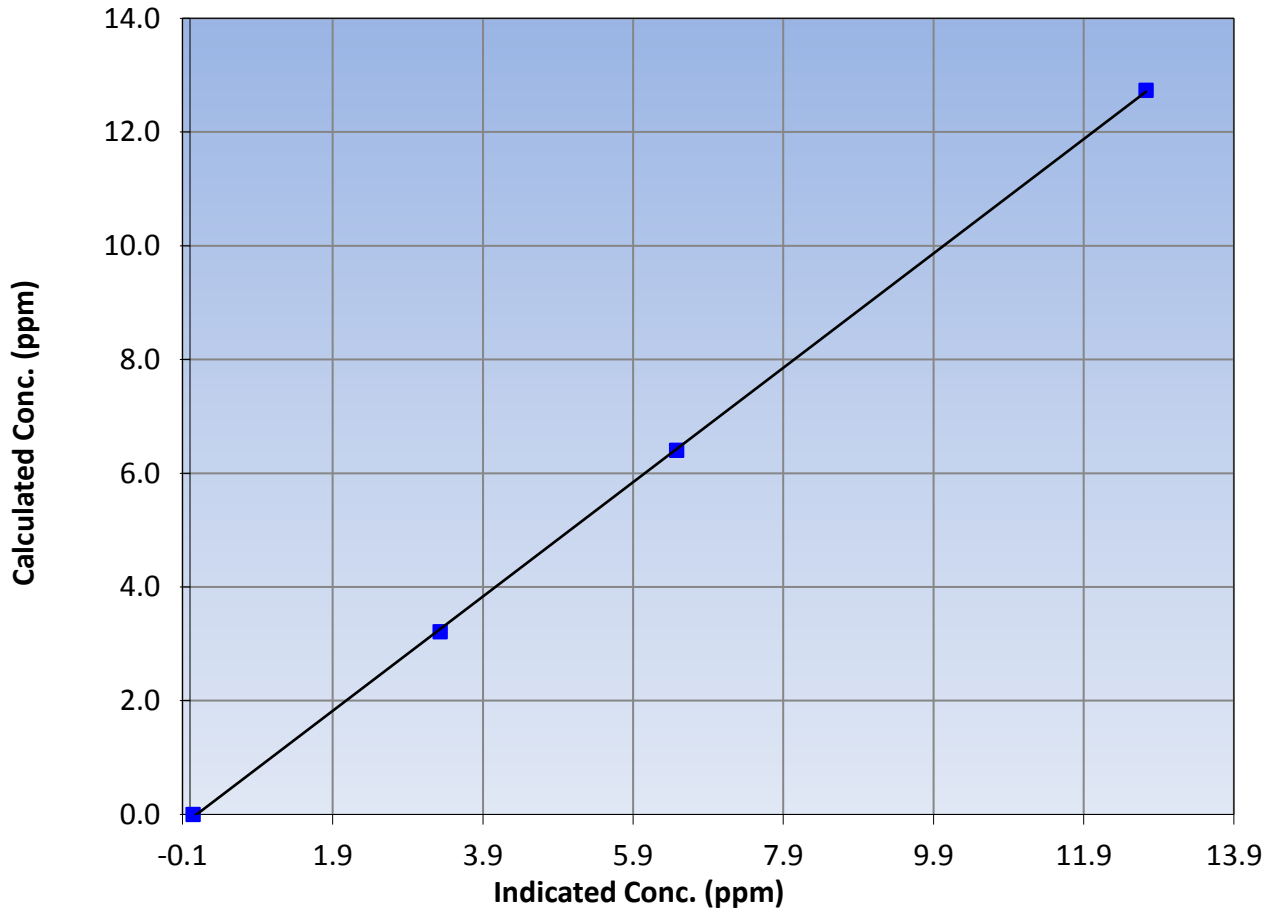
Station Information

Calibration Date	June 28, 2016	Previous Calibration	June 27, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	8:55	End Time (MST)	13:10
Analyzer make	Thermo 51i-LT	Analyzer serial #	1336160089

Calibration Data

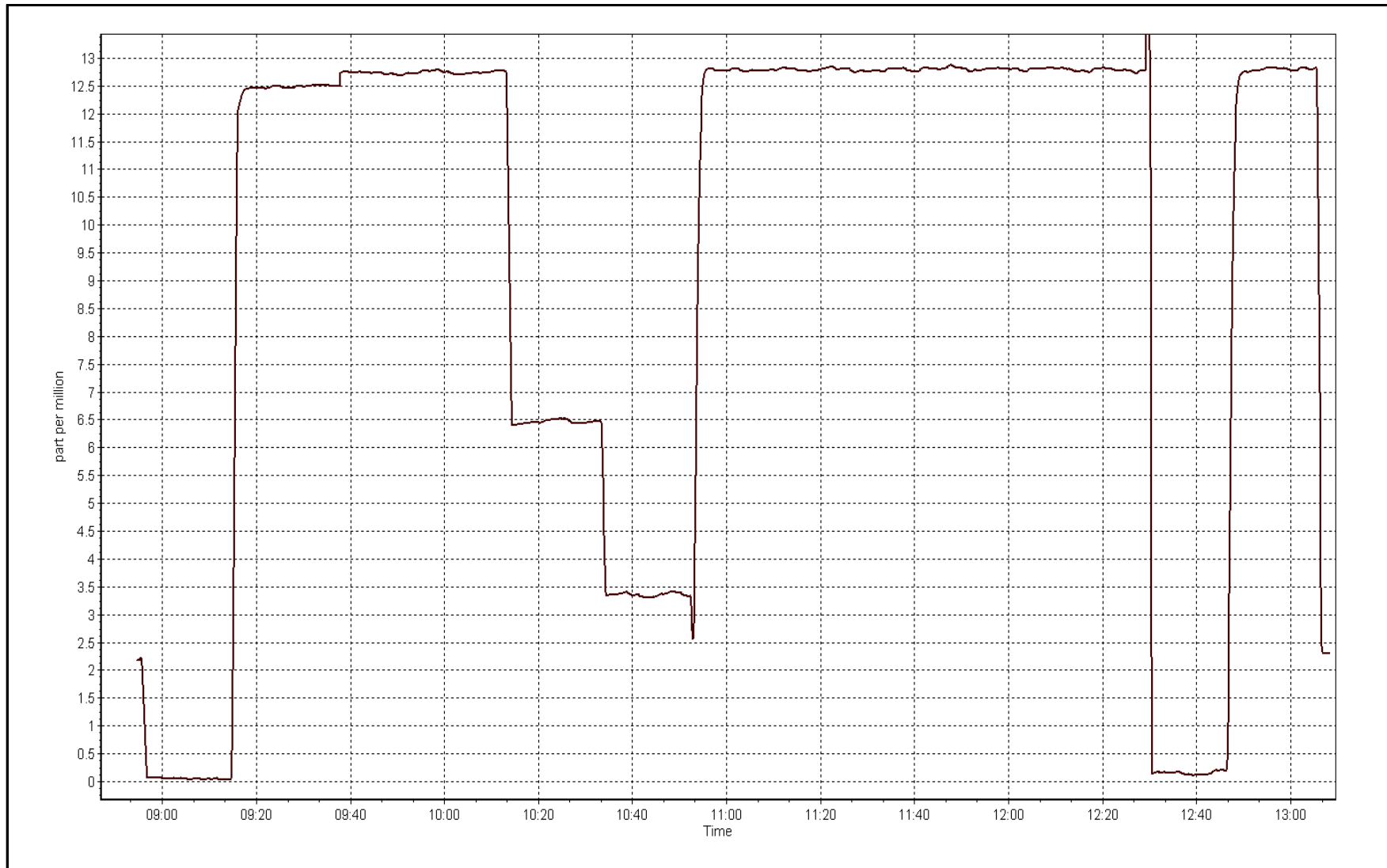
Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.04	----	Correlation Coefficient	0.999933
12.74	12.73	1.0004		
6.40	6.48	0.9877	Slope	1.005393
3.21	3.33	0.9643		
			Intercept	-0.088585

THC Calibration Curve



THC Calibration Plot

Date: June 28, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 28, 2016	Previous Calibration	June 27, 2016
Station Name	Firebag	Station Number	AMS 19
Reason:	Routine		
Start Time (MST)	8:55	End Time (MST)	13:10
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	1.040837	1.039468	0.999055
	Data Offset	0.062450	0.093552	-0.602309
Current Calibration	Data Slope	1.002722	1.001726	1.002150
	Data Offset	-2.333903	-1.989767	-0.507402

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	1.013		1.066	
NOX coefficient	0.999		0.999	
NO2 coefficient	1.000		1.000	
NO bkgrnd	4.6		4.8	
NOX bkgrnd	4.7		5.0	
Chamber Temp	50.4	Deg C	50.7	Deg C
Moly Temp	323.5	Deg C	326	Deg C
PMT voltage	-780.3	V	-780.3	V
PMT Temp	-3	Deg C	-2.8	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	179.4	mmHg	180.6	mmHg
R Cell Press Nox	179.4	mmHg	180.6	mmHg
NO sample flow	0.561	lpm	0.561	lpm
Nox sample Flow	0.563	lpm	0.561	lpm

Notes:

Span adjusted. Second high NO point used for GPT reference.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 28, 2016

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	-0.1	-0.1	0.0	----	----
as found span	5000	58.3	600.5	600.5	0.0	562.4	561.8	0.6	1.0677	1.0689
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	----	----
high point	5000	58.3	600.5	600.5	0.0	599.7	600.1	-0.4	1.0014	1.0007
second point	5000	29.3	301.8	301.8	0.0	305.4	305.2	0.2	0.9883	0.9890
third point	5000	14.7	151.4	151.4	0.0	155.2	154.7	0.5	0.9756	0.9787
as left zero	5000	0.0	0.0	0.0	0.0	0.1	0.1	0.0	----	----
as left span	5000	58.3	600.5	356.1	244.4	603.0	346.5	256.5	0.9959	1.0277
Average Correction Factor									0.9884	0.9895

Corrected As found

NO_x= 562.5

NO= 561.9

Percent Change

NO_x= 2.6%

NO= 2.8%

Previous Response

NO_x= 576.9

NO= 577.6

GPT Calibration Data

Dilution Flow (total) 5000 ccm

Source Gas Flow 58.30 ccm

NOx ref calc conc = 600.5 ppb

NO ref calc conc = 600.5 ppb

O3 Setpoint (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
1st NO ref point		0.0	609.4	608.2	0.0	0.9854	0.9874	----	----
1st NO2 (300)	356.1	252.1	607.7	356.1	251.6	0.9881	----	1.0019	99.8%
2nd NO2 (200)	437.0	171.2	608.7	437.0	171.7	0.9866	----	0.9971	100.3%
3rd NO2 (100)	521.0	87.2	609.0	521.0	88.0	0.9860	----	0.9902	101.0%
2nd NO ref point	----	0.0	607.1	606.0	1.1	0.9891	0.9910	----	----
Average Correction Factor						0.9874		0.9964	100.4%

Calibration Performed By:

Devin Russell



Wood Buffalo Environmental Association

NO_x Calibration Summary

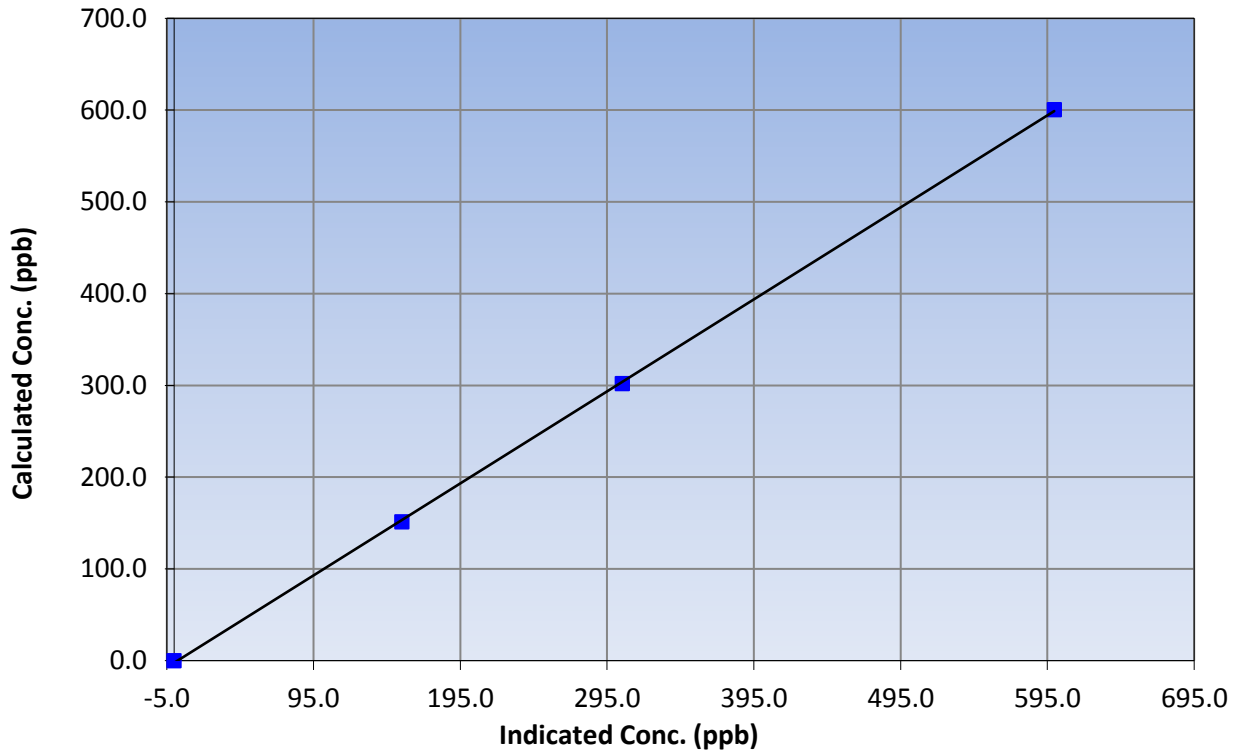
Station Information

Calibration Date	June 28, 2016	Previous Calibration	June 27, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	8:55	End Time (MST)	13:10
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	----	Correlation Coefficient	0.999919
600.5	599.7	1.0014		
301.8	305.4	0.9883	Slope	1.002722
151.4	155.2	0.9756		
			Intercept	-2.333903

NO_x Calibration Curve





Wood Buffalo Environmental Association

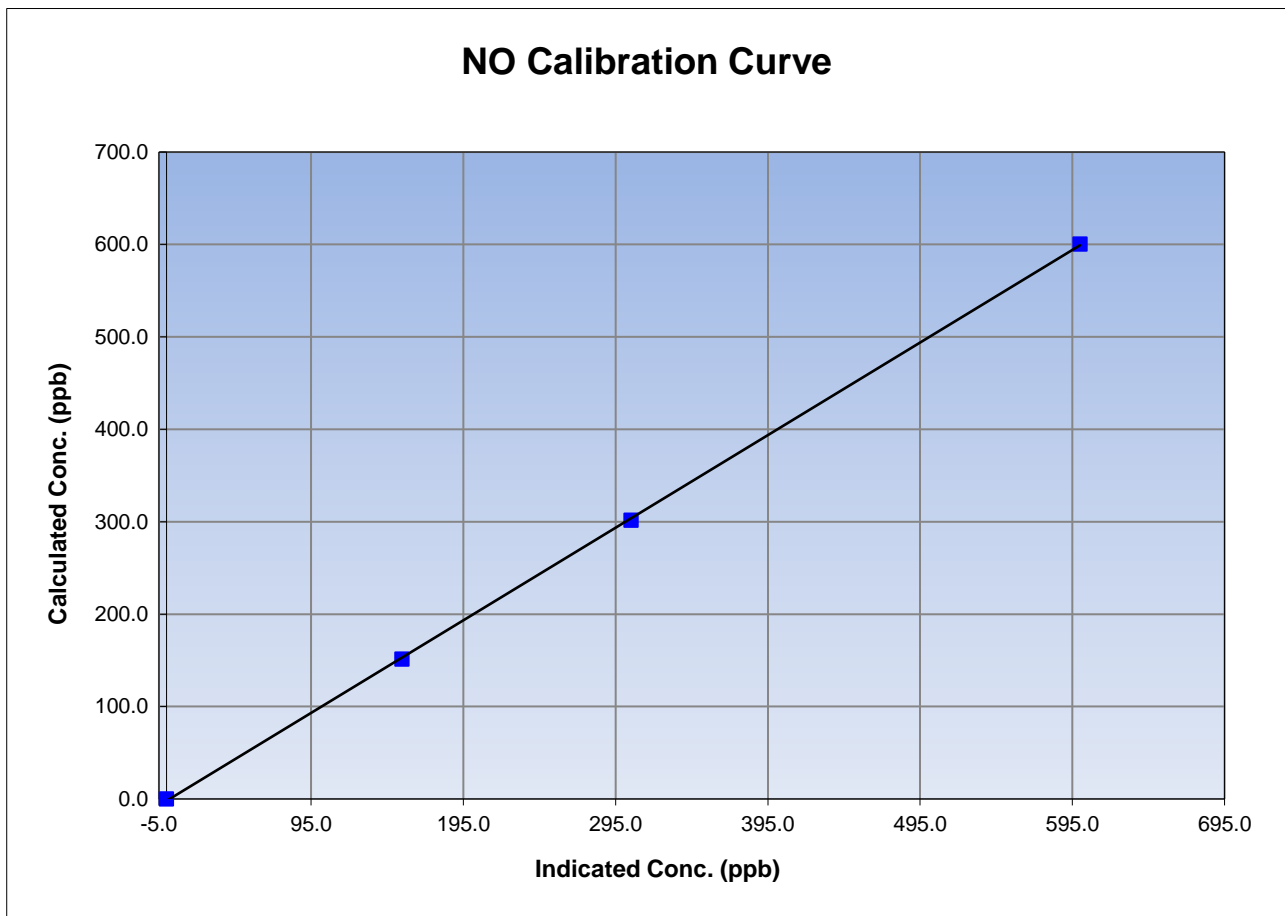
NO Calibration Summary

Station Information

Calibration Date	June 28, 2016	Previous Calibration	June 27, 2016
Station Name	Firebag	Station Number	AMS 19
Start Time (MST)	8:55	End Time (MST)	13:10
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	0.999937
600.5	600.1	1.0007		
301.8	305.2	0.9890	Slope	1.001726
151.4	154.7	0.9787		
			Intercept	-1.989767





Wood Buffalo Environmental Association

NO₂ Calibration Summary

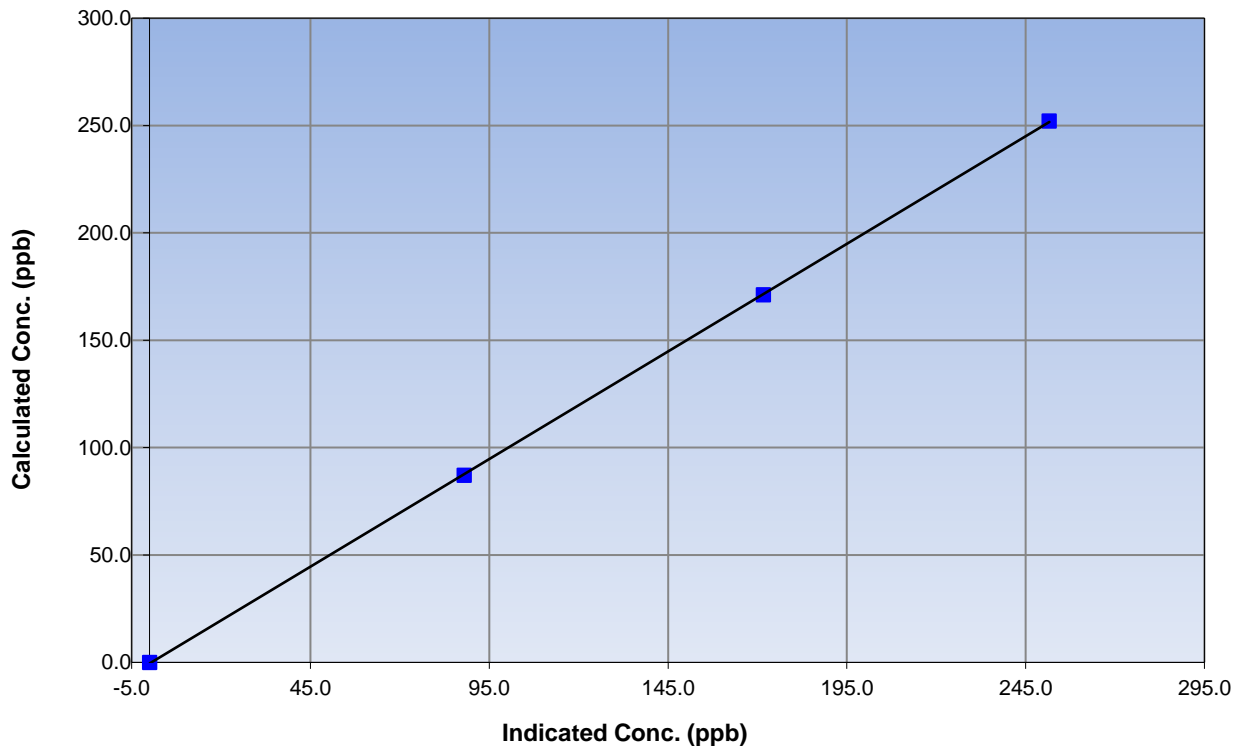
Station Information

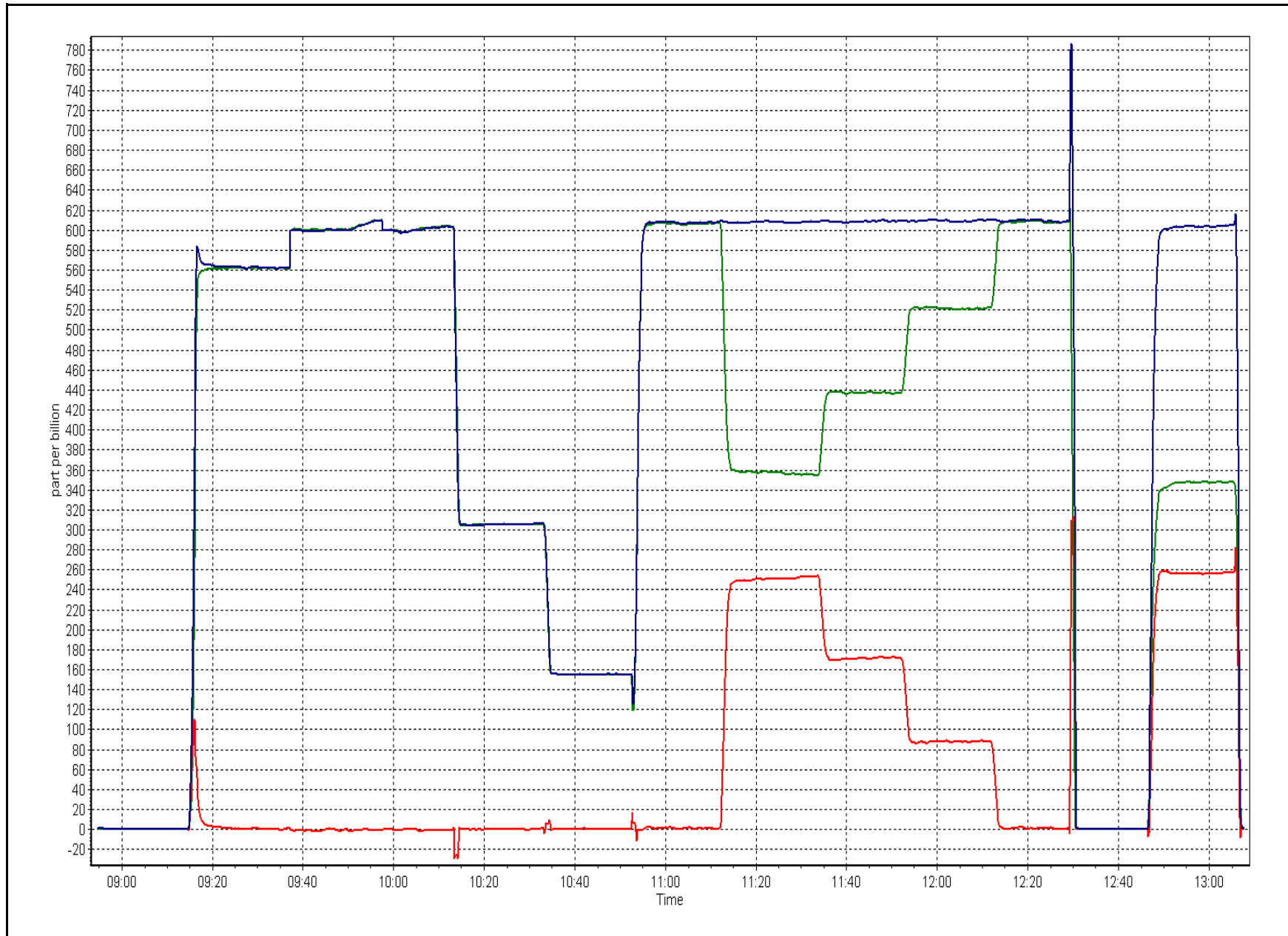
Calibration Date	June 28, 2016	Previous Calibration	June 27, 2016
Station Number	Firebag	Station Number	AMS 19
Start Time (MST)	8:55	End Time (MST)	13:10
Analyzer make	Thermo 42i	Analyzer serial #	1410661309

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999976
252.1	251.6	1.0019		
171.2	171.7	0.9971	Slope	1.002150
87.2	88.0	0.9902		
			Intercept	-0.507402

NO₂ Calibration Curve







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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

AMS 20
BRION MACKAY RIVER
JUNE 2016

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BRION MACKAY RIVER (AMS 20)
 JUNE 2016

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	683	36	37	99.86	11	0	2	0
H2S (ppb) Average	679	35	41	99.17	1	0	0	0
THC (ppm) Average	683	36	37	99.86	2.6	-	2.2	-
NO2 (ppb) Average	683	36	37	99.86	7	0	2	-
NO (ppb) Average	683	36	37	99.86	3	-	0	-
NOX (ppb) Average	683	36	37	99.86	7	-	2	-
Temperature 2 m (C) Average	719	0	1	99.86	28.2	-	21.2	-
Relative Humidity (%) Average	719	0	1	99.86	99	-	96	-
Wind Speed 10 m (km/h) Average	718	0	2	99.72	23	-	14	-
Wind Direction 10 m (deg) Average	718	0	2	99.72	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BRION MACKAY RIVER (AMS 20)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile							
					Min	P10	Q1	Median	Q3	P90	Max	
SO2 (ppb) Average	683	0.2	1	-	0	0	0	0	0	0	0	11
H2S (ppb) Average	679	0.2	0	-	0	0	0	0	0	0	0	1
THC (ppm) Average	683	2.1	0.1	-	1.9	2	2	2.1	2.2	2.2	2.2	2.6
NO2 (ppb) Average	683	0.7	1	-	0	0	0	1	1	2	2	7
NO (ppb) Average	683	0.1	0	-	0	0	0	0	0	0	0	3
NOX (ppb) Average	683	0.8	1	-	0	0	0	1	1	2	2	7
Temperature 2 m (C) Average	719	15.97	5.9	-	-0.2	8.8	11.6	15.5	20.8	24.2	24.2	28.2
Relative Humidity (%) Average	719	61.2	24	-	16	29	41	59	83	95	95	99
Wind Speed 10 m (km/h) Average	718	7.3	4	-	0	2	4	7	10	13	13	23
Wind Direction 10 m (deg) Average	718	-	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - BRION MACKAY RIVER (AMS 20)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
ALL PARAMETERS	29 Jun 2016 13:00	29 Jun 2016 13:00	1	Maintenance - datalogger reset
H2S	23 Jun 2016 12:00	23 Jun 2016 12:00	1	Maintenance - manifold cleaning
H2S	27 Jun 2016 00:00	27 Jun 2016 01:00	2	Intermittent unstable operation - excessive baseline drift
H2S	30 Jun 2016 05:00	30 Jun 2016 06:00	2	Intermittent unstable operation - excessive baseline drift
Wind Speed, Wind Direction	20 Jun 2016 06:00	20 Jun 2016 06:00	1	Flat line in sensor output signal



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb
Brion MacKay River - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 11 ppb on Jun 9 04:00	Maximum Daily Average: 1.5 ppb on Jun 8		Hours of Data:	683
Minimum Value: 0 ppb on Jun 3 01:00	Minimum Daily Average: 0.0 ppb on Jun 12		Hours of Missing Data:	37
Maximum Diurnal Average: 0.5 ppb at hour 4	Minimum Diurnal Average: 0.0 ppb at hour 1		Hours of Calibration:	36
Monthly Average: 0.2 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 3		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-Jun	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
2-Jun	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
3-Jun	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
4-Jun	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
5-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	1
6-Jun	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
7-Jun	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
8-Jun	0	0	0	Z	0	0	0	0	0	3	9	10	8	2	2	0	0	0	0	0	0	0	0	0	1.5	10
9-Jun	0	0	1	11	Z	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	11
10-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	1	0	0.4	3
11-Jun	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
12-Jun	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
13-Jun	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
14-Jun	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
15-Jun	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
16-Jun	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
17-Jun	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
18-Jun	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
19-Jun	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
20-Jun	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
21-Jun	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
22-Jun	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
23-Jun	Z	0	0	0	0	0	0	0	0	0	C	C	C	C	C	C	0	0	0	0	2	9	3	1	--	9
24-Jun	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
25-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	2	0	0	0	0.4	4
26-Jun	0	0	0	Z	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
27-Jun	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
28-Jun	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
29-Jun	Z	0	0	0	0	0	0	0	0	0	0	DF	0	1	1	0	0	0	0	0	0	0	0	0	0.1	1
30-Jun	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

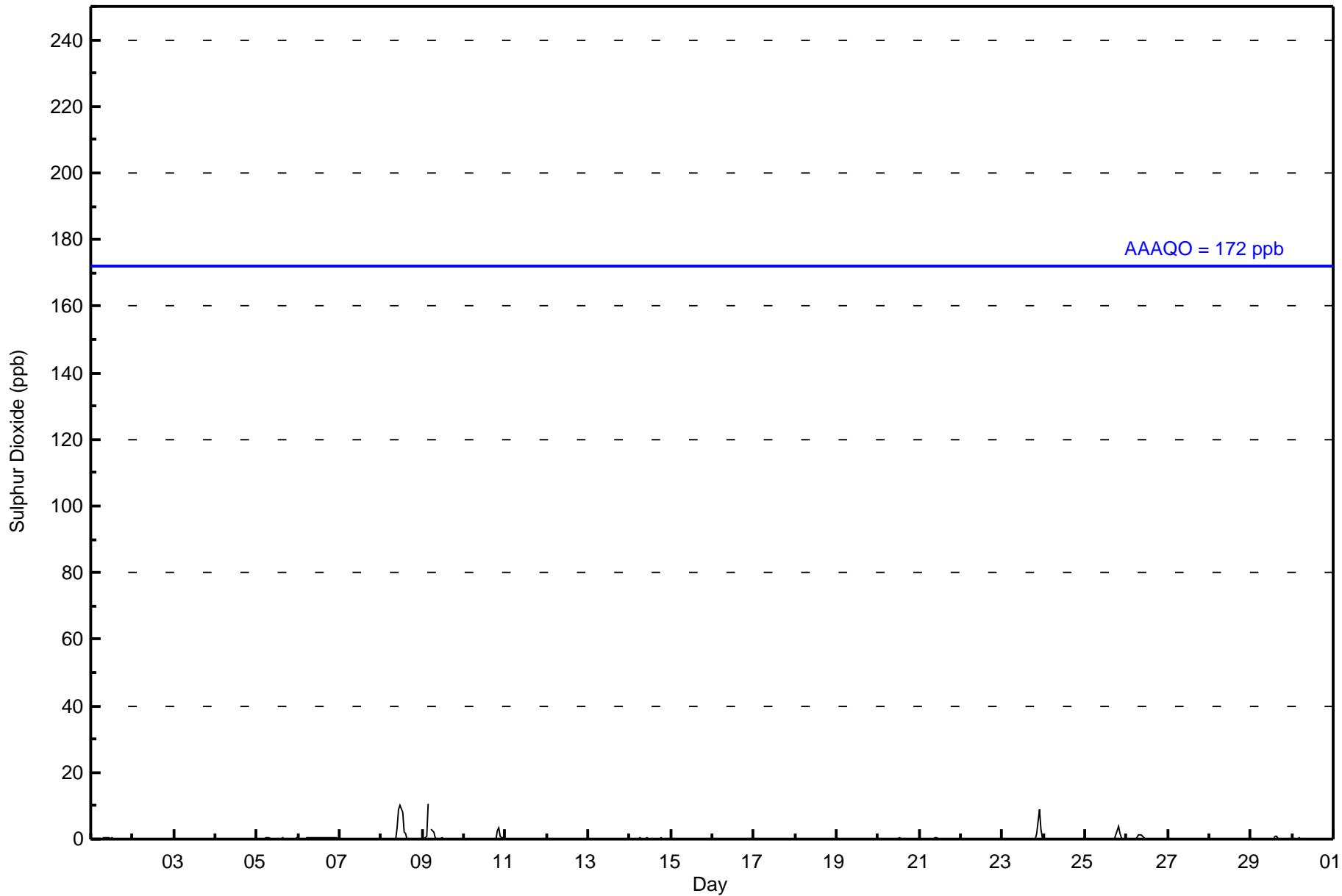
0.0	0.0	0.1	0.5	0.1	0.2	0.1	0.1	0.1	0.1	0.2	0.4	0.4	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.3	0.4	0.2	0.1	Diurnal Average
0	0	1	11	0	3	2	1	1	3	9	10	8	2	2	1	0	0	3	4	3	9	3	1	Diurnal Maximum		

Z - zerspan C - Calibration DF - DAS Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 172 ppb 24-hr 48 ppb



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Brion MacKay River - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Brion MacKay River - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	682	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: 683

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Brion MacKay River - June 2016

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	21	31	36	15	17	42	61	74	47	44	51	62	63	38	46	33	681
11 - 20	0	0	1	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
Totals	21	31	37	15	17	42	61	74	47	44	51	62	63	38	46	33	682

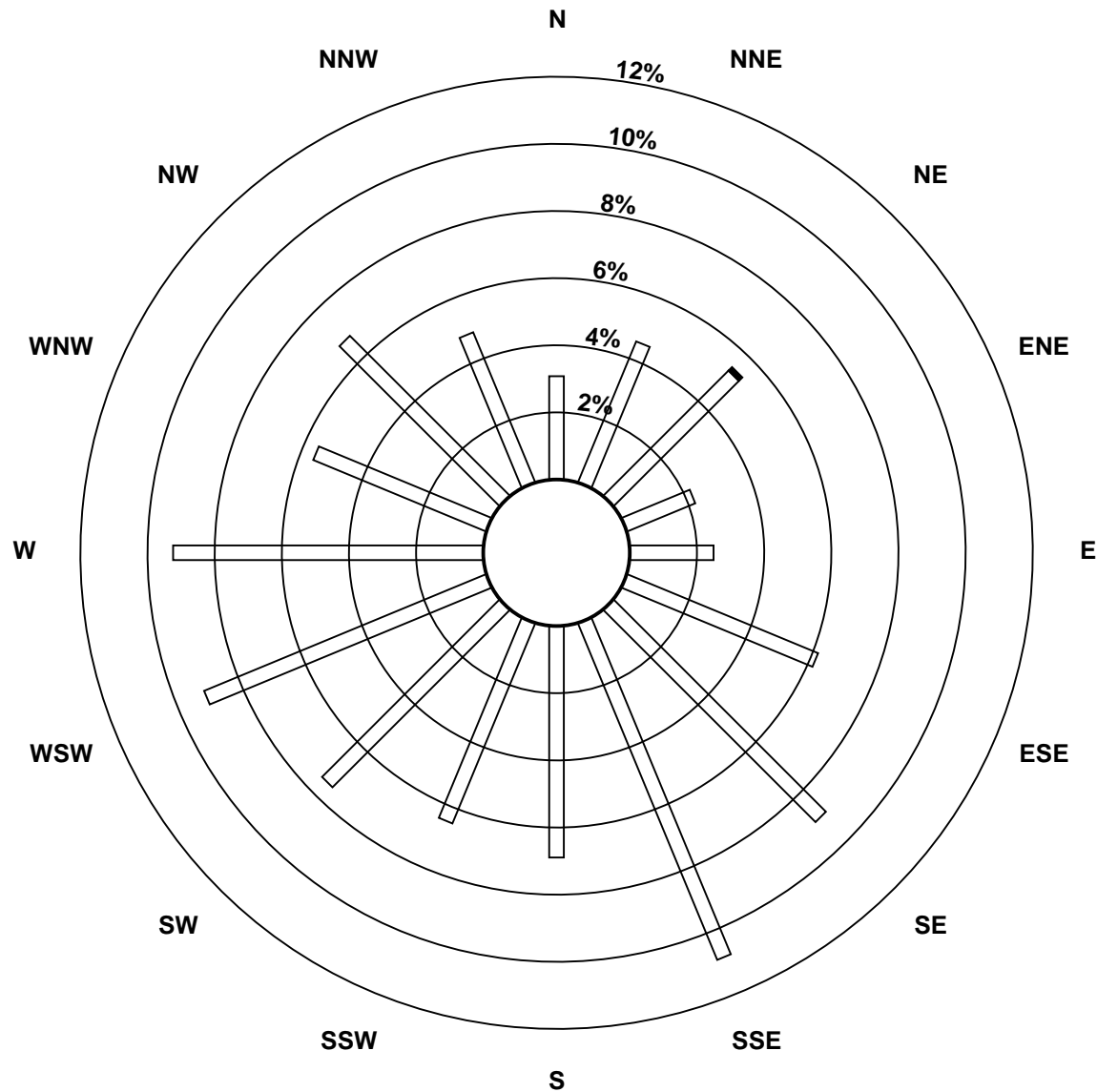
Total Number of Valid Hours: 682

Total Number of Hours: 720

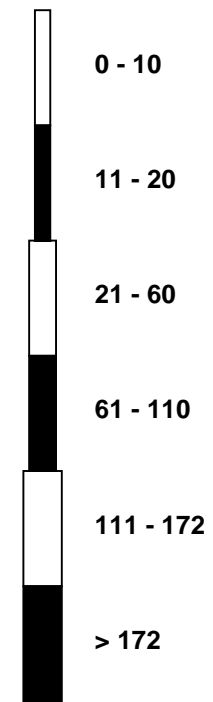


Wood Buffalo Environmental Association
Wind Rose Jun 2016

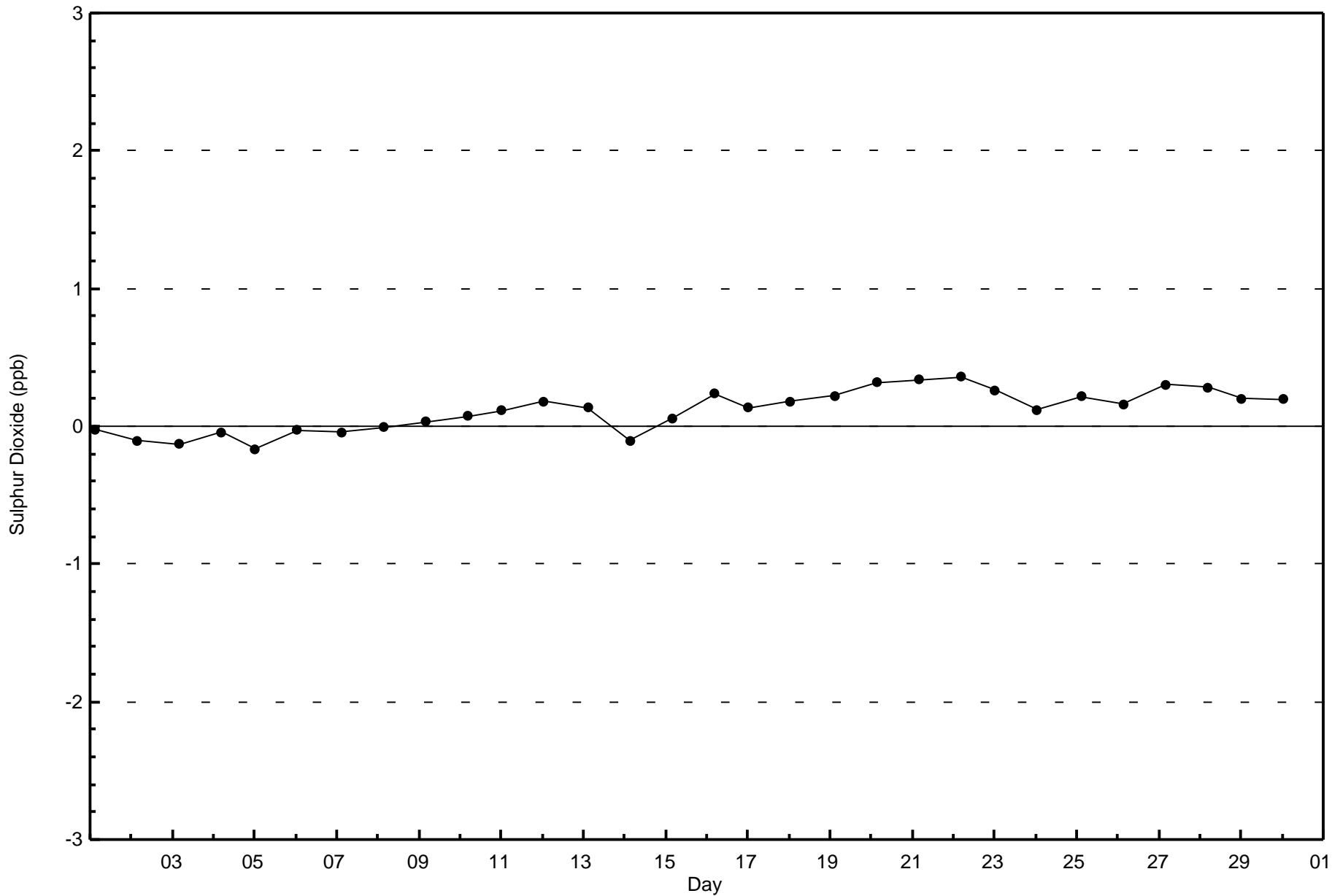
Sulphur Dioxide (SO₂) - ppb
Brion MacKay River (AMS 20)



Classes (ppb)



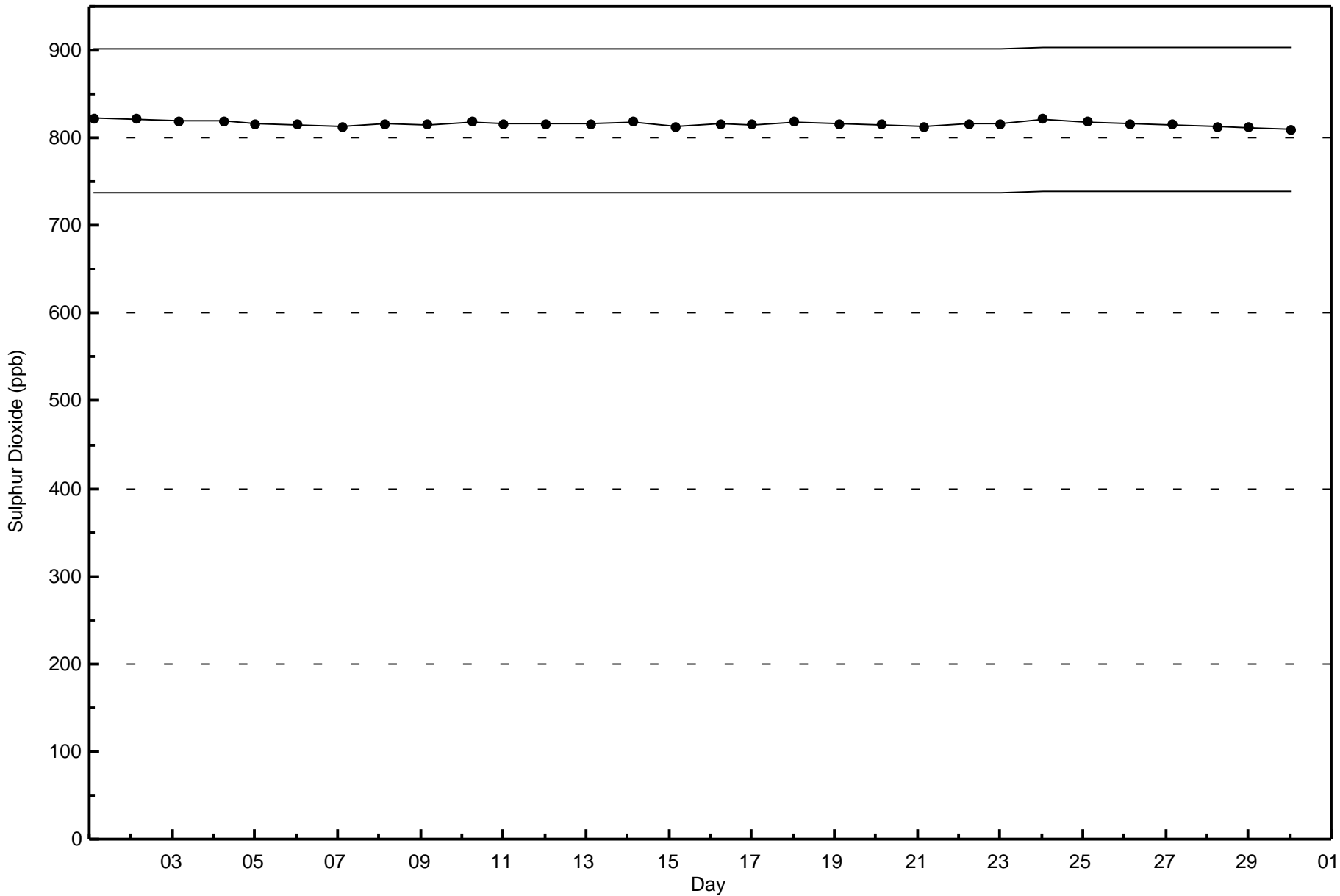
Total Number of Valid Hours: 682





Wood Buffalo Environmental Association
Span Responses

Sulphur Dioxide (SO₂) - ppb
Brion MacKay River - June 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 1 ppb on Jun 22 17:00	Maximum Daily Average: 0.3 ppb on Jun 24
Minimum Value: 0 ppb on Jun 3 15:00	Hours of Data: 679
Maximum Diurnal Average: 0.2 ppb at hour 7	Hours of Missing Data: 41
Monthly Average: 0.2 ppb	Hours of Calibration: 35
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 0	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-Jun	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
2-Jun	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
3-Jun	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
4-Jun	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
5-Jun	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
6-Jun	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
7-Jun	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
8-Jun	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
9-Jun	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
10-Jun	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
11-Jun	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
12-Jun	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
13-Jun	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
14-Jun	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
15-Jun	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
16-Jun	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
17-Jun	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
18-Jun	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
19-Jun	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
20-Jun	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
21-Jun	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
22-Jun	0	0	0	0	0	0	Z	0	0	0	0	C	C	C	C	C	1	0	0	0	0	0	0	0	0.2	1
23-Jun	0	Z	0	0	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
24-Jun	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
25-Jun	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
26-Jun	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
27-Jun	UO	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
28-Jun	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
29-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	DF	0	0	0	0	0	0	0	0	0	0	0	0.2	0
30-Jun	0	0	Z	0	UO	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0

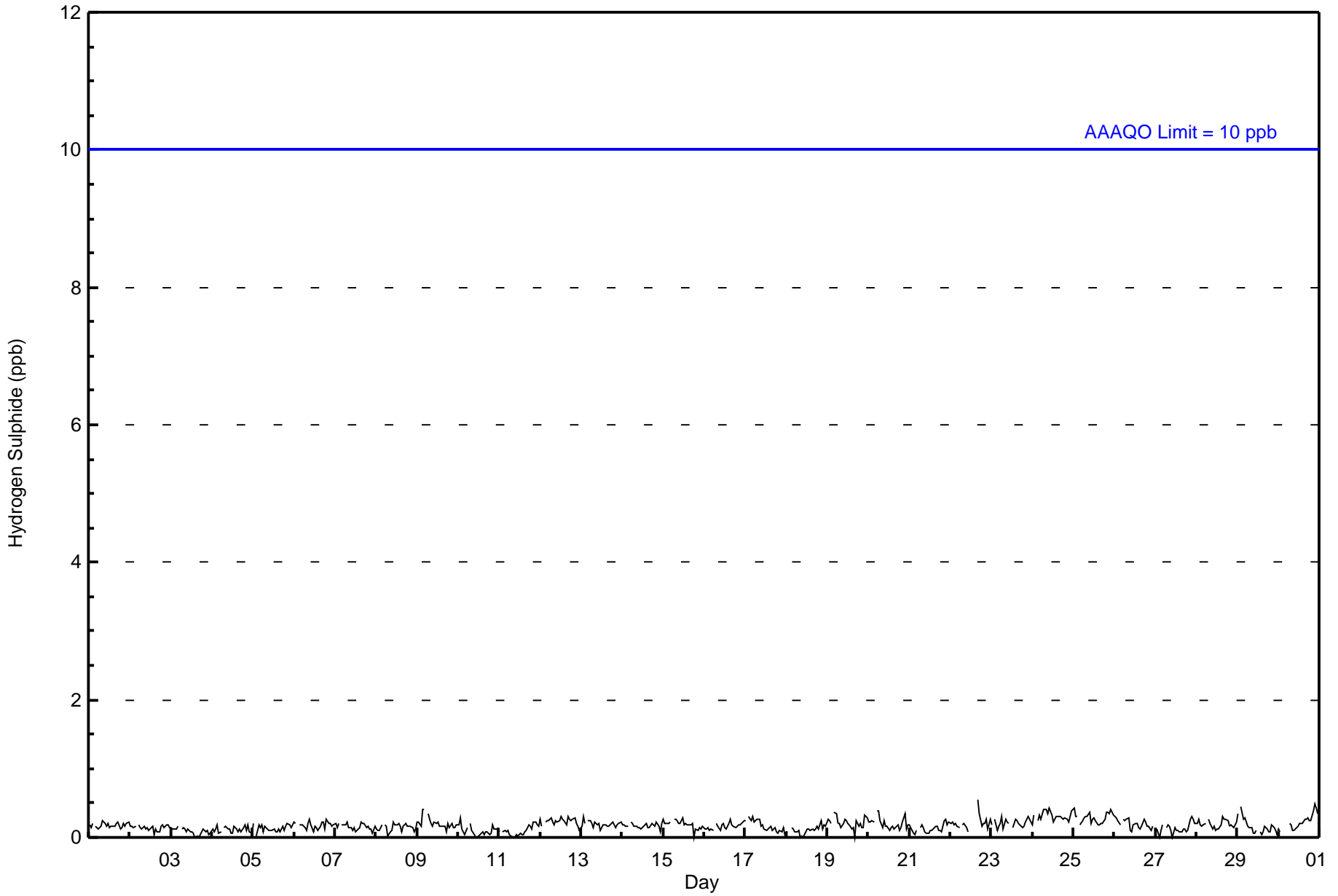
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	Diurnal Average
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Diurnal Maximum

Z - zerospan C - Calibration M - Maintenance DF - DAS Failure UO - Unstable Operation
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 10 ppb 24-hr 3 ppb



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	679	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: 679

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	21	30	38	15	17	44	61	71	48	43	47	64	64	36	45	34	678
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
Totals	21	30	38	15	17	44	61	71	48	43	47	64	64	36	45	34	678

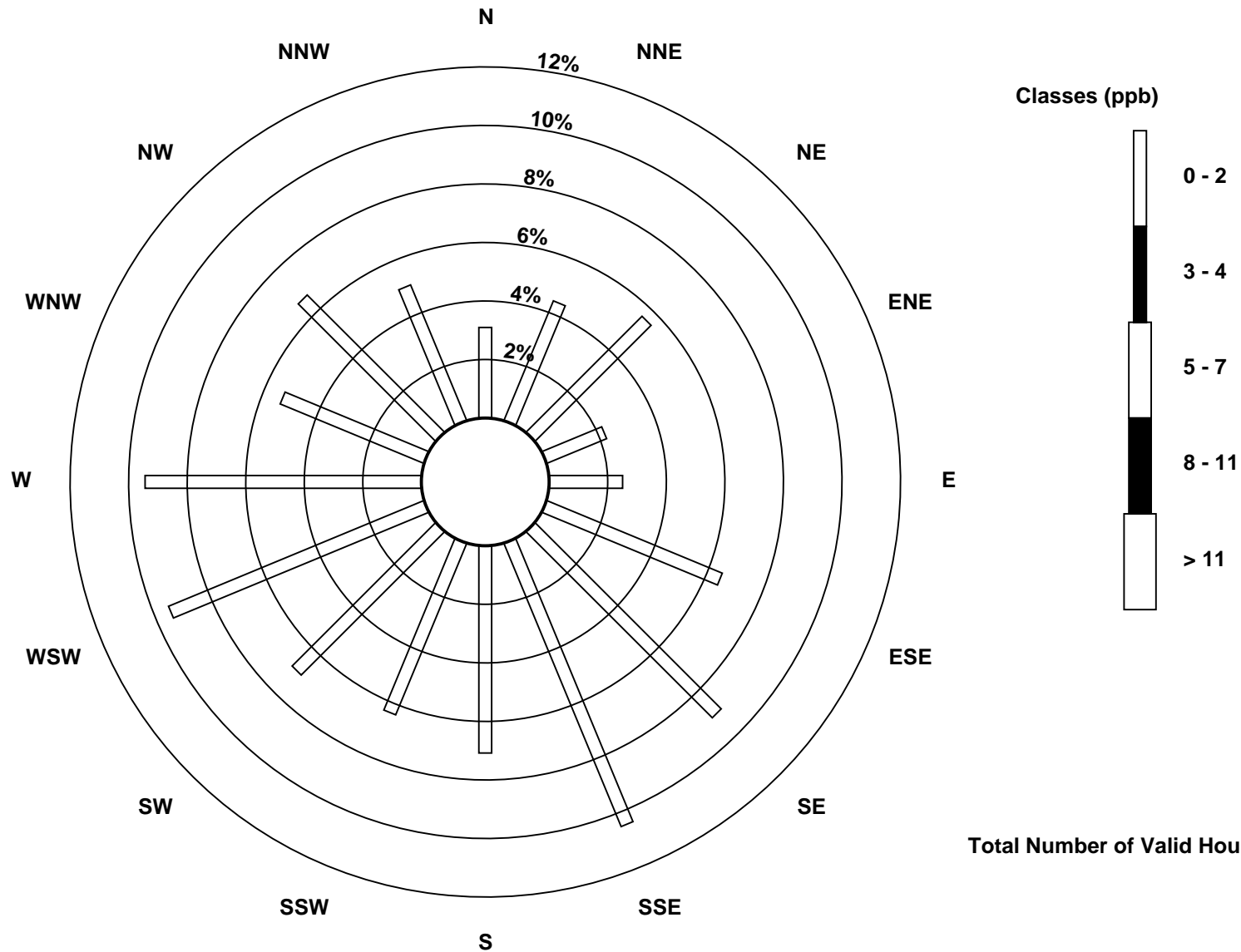
Total Number of Valid Hours: 678

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River (AMS 20)

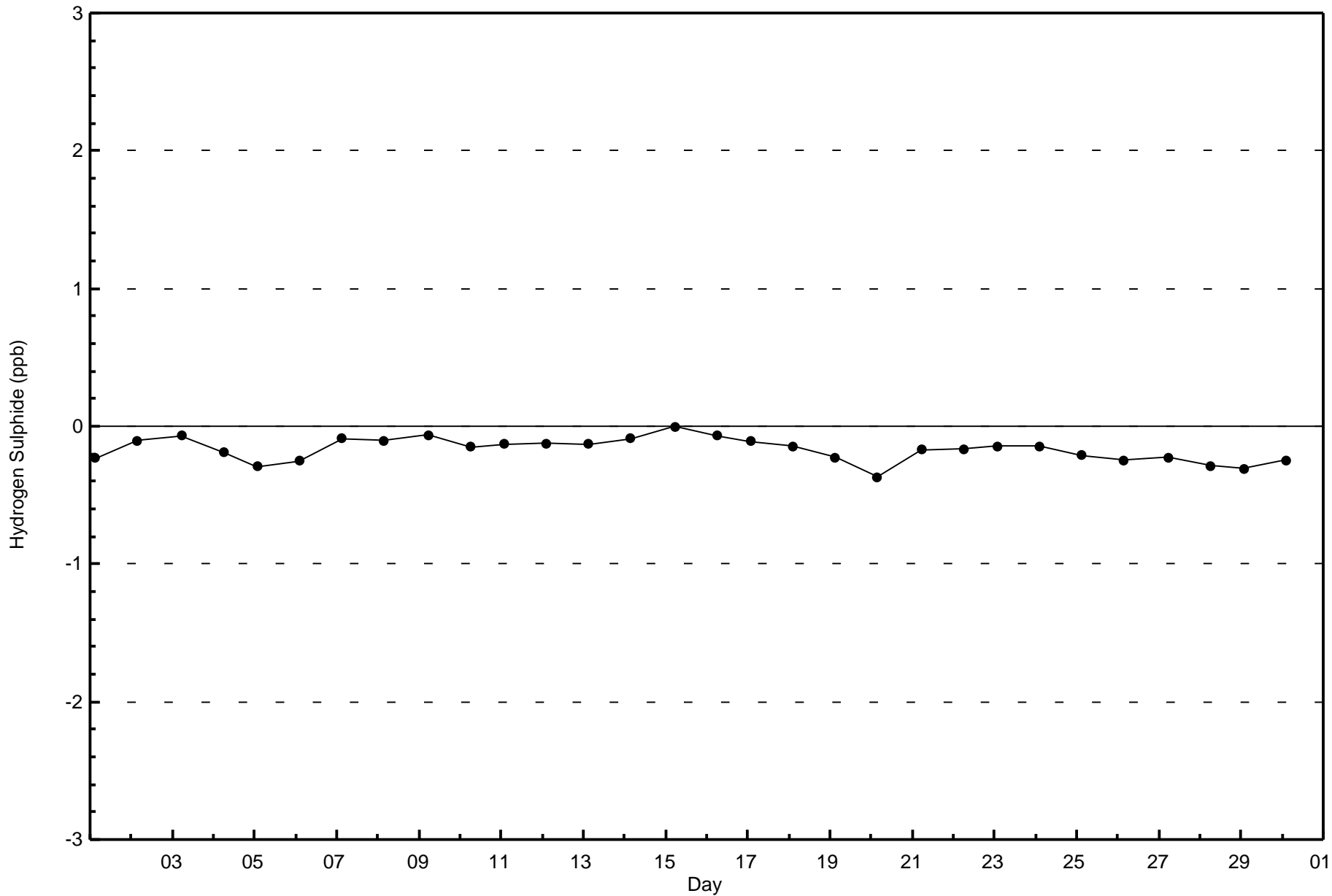


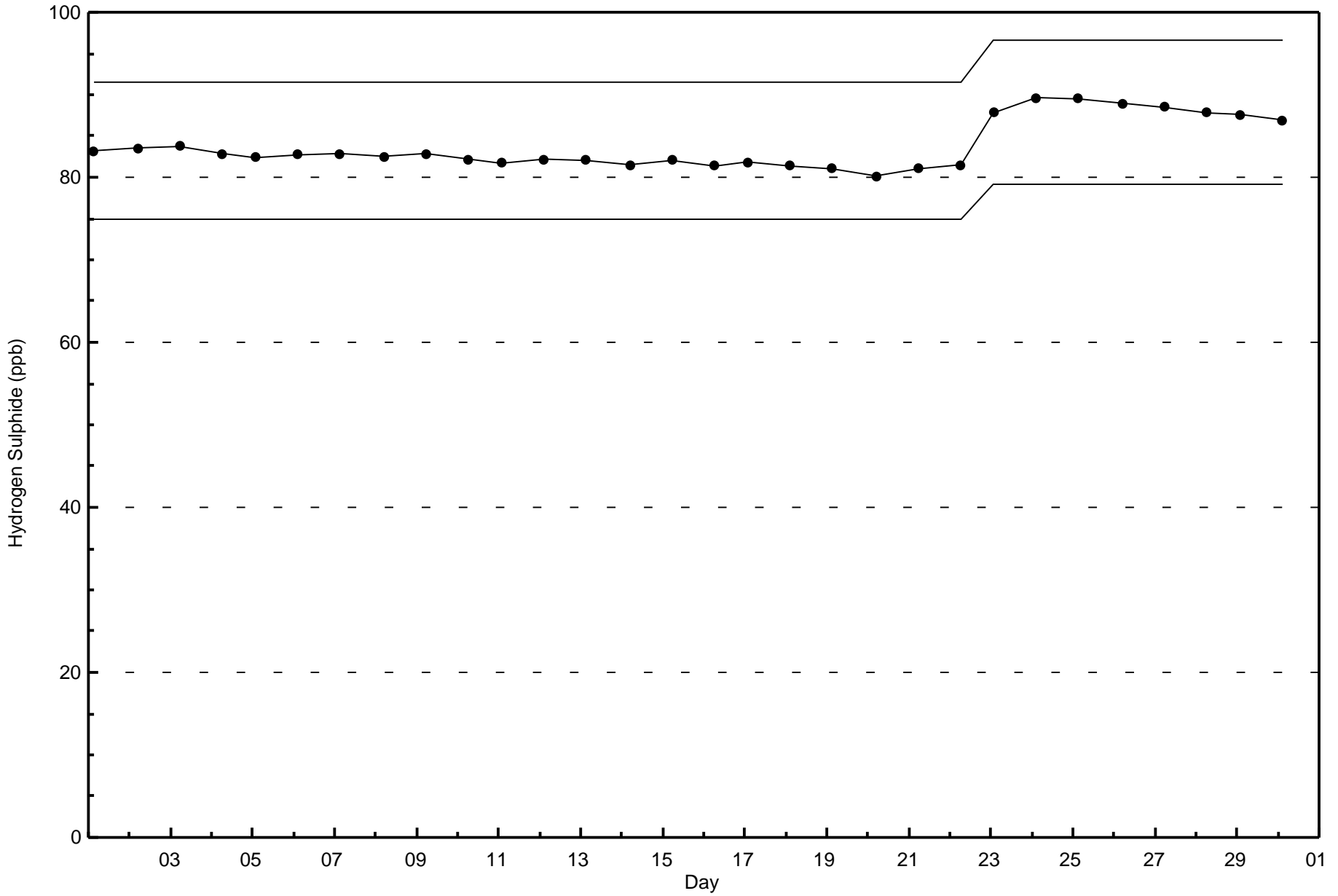
Total Number of Valid Hours: 678



Wood Buffalo Environmental Association
Zero Responses

Hydrogen Sulphide (H₂S) - ppb
Brion MacKay River - June 2016







Wood Buffalo Environmental Association
Summary of Hour Averages

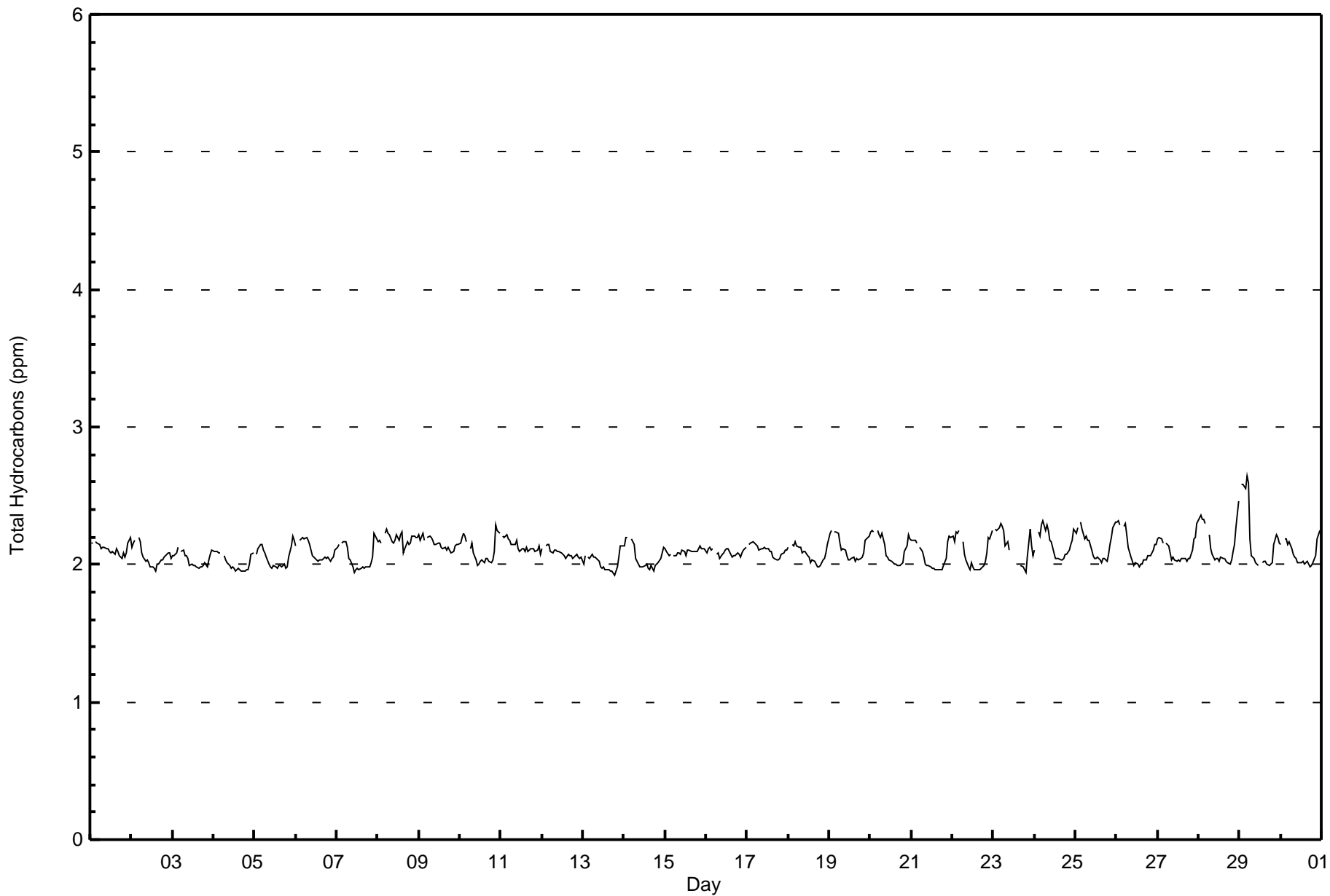
Total Hydrocarbons (THC) - ppm
Brion MacKay River - June 2016

Maximum Value: 2.6 ppm on Jun 29 05:00		Maximum Daily Average: 2.2 ppm on Jun 8		Hours in Service: 720																						
Minimum Value: 1.9 ppm on Jun 13 19:00		Minimum Daily Average: 2.0 ppm on Jun 13		Hours of Data: 683																						
Maximum Diurnal Average: 2.2 ppm at hour 5		Minimum Diurnal Average: 2.0 ppm at hour 18		Hours of Missing Data: 37																						
Monthly Average: 2.10 ppm		Percentiles: P ₁ = 2.0 P ₁₀ = 2.0 Q ₁ = 2.0 Median = 2.1 Q ₃ = 2.2 P ₉₀ = 2.2 P ₉₉ = 2.3		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-Jun	2.2	2.2	Z	2.2	2.2	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	2.1	2.1	2.1	2.2	2.2	2.1	2.2
2-Jun	2.1	2.2	2.2	Z	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	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.1	2.2
3-Jun	2.1	2.1	2.1	2.1	Z	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	2.1	2.0	2.1
4-Jun	2.1	2.1	2.1	2.1	2.1	Z	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.0	2.1
5-Jun	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	2.1	2.1	2.2	2.2	2.0	2.2
6-Jun	2.1	Z	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.2
7-Jun	2.1	2.1	Z	2.2	2.2	2.2	2.1	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	2.1	2.2	2.2	2.0	2.2
8-Jun	2.2	2.2	2.2	Z	2.2	2.3	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	2.2	2.2	2.2	2.2	2.2	2.2	2.3
9-Jun	2.2	2.2	2.2	2.2	Z	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.2	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
10-Jun	2.2	2.2	2.2	2.2	2.2	Z	2.1	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	2.1	2.3	2.2	2.2	2.1	2.3
11-Jun	Z	2.2	2.2	2.2	2.2	2.2	2.2	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	2.1	2.1	2.1	2.1	2.1	2.2
12-Jun	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	2.0	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.0	2.1	2.1	2.1
13-Jun	2.0	2.1	Z	2.1	2.0	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	1.9	2.0	2.0	2.1	2.1	2.1	2.0	2.1
14-Jun	2.1	2.2	2.2	Z	2.2	2.2	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	2.1	2.1	2.1	2.2
15-Jun	2.1	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	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
16-Jun	2.1	2.1	2.1	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	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
17-Jun	Z	2.1	2.2	2.2	2.2	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	2.1	2.1	2.1	2.1	2.1	2.2
18-Jun	2.1	Z	2.1	2.1	2.2	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	2.1	2.1	2.2
19-Jun	2.2	2.2	Z	2.2	2.2	2.2	2.2	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	2.1	2.2	2.2	2.2	2.1	2.2
20-Jun	2.2	2.2	2.2	Z	2.2	2.2	2.2	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	2.1	2.2	2.2	2.1	2.2
21-Jun	2.2	2.2	2.2	2.2	Z	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	2.2	2.2	2.2	2.1	2.2
22-Jun	2.2	2.2	2.2	2.2	2.2	Z	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	2.1	2.2	2.2	2.2	2.1	2.2
23-Jun	Z	2.3	2.2	2.3	2.3	2.3	2.2	2.1	2.2	2.1	C	C	C	C	C	C	2.0	2.0	2.0	1.9	2.1	2.3	2.1	2.1	--	2.3
24-Jun	2.1	Z	2.2	2.2	2.3	2.3	2.2	2.3	2.2	2.2	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.2	2.3	2.1	2.1	2.3
25-Jun	2.2	2.3	Z	2.3	2.3	2.2	2.2	2.2	2.2	2.1	2.1	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.3	2.3	2.1	2.3
26-Jun	2.3	2.3	2.3	Z	2.3	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	2.1	2.1	2.1	2.1	2.1	2.3
27-Jun	2.2	2.2	2.2	2.2	Z	2.2	2.1	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	2.1	2.2	2.2	2.3	2.1	2.3
28-Jun	2.3	2.4	2.3	2.3	2.3	Z	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.3	2.5	2.1	2.5
29-Jun	Z	2.6	2.6	2.6	2.6	2.6	2.2	2.1	2.0	2.0	2.0	2.0	DF	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.2	2.6
30-Jun	2.1	Z	2.2	2.2	2.1	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	2.0	2.0	2.1	2.2	2.2	2.2	2.1	2.2
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerspan C - Calibration DF - DAS Failure																										



Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Brion MacKay River - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Total Hydrocarbons (THC) - ppm
Brion MacKay River - June 2016

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	247	36.16	36.16
2.1 - 3.0	436	63.84	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 683

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Total Hydrocarbons (THC) - ppm
Brion MacKay River - June 2016

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	9	11	14	5	12	17	12	13	10	15	20	29	26	16	23	15	247
2.1 - 3.0	12	20	23	10	5	25	49	61	37	29	31	33	37	22	23	18	435
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
Totals	21	31	37	15	17	42	61	74	47	44	51	62	63	38	46	33	682

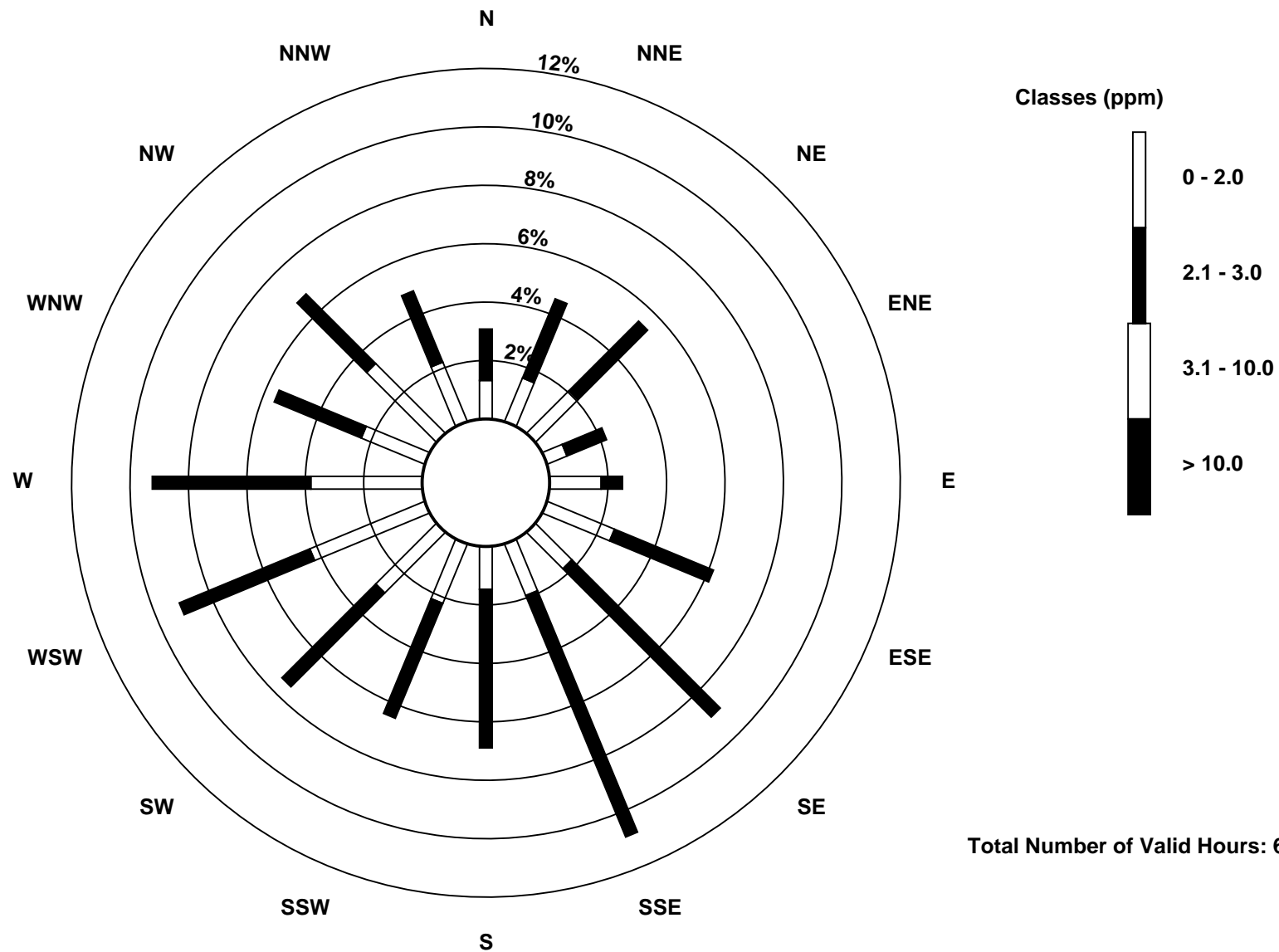
Total Number of Valid Hours: 682

Total Number of Hours: 720

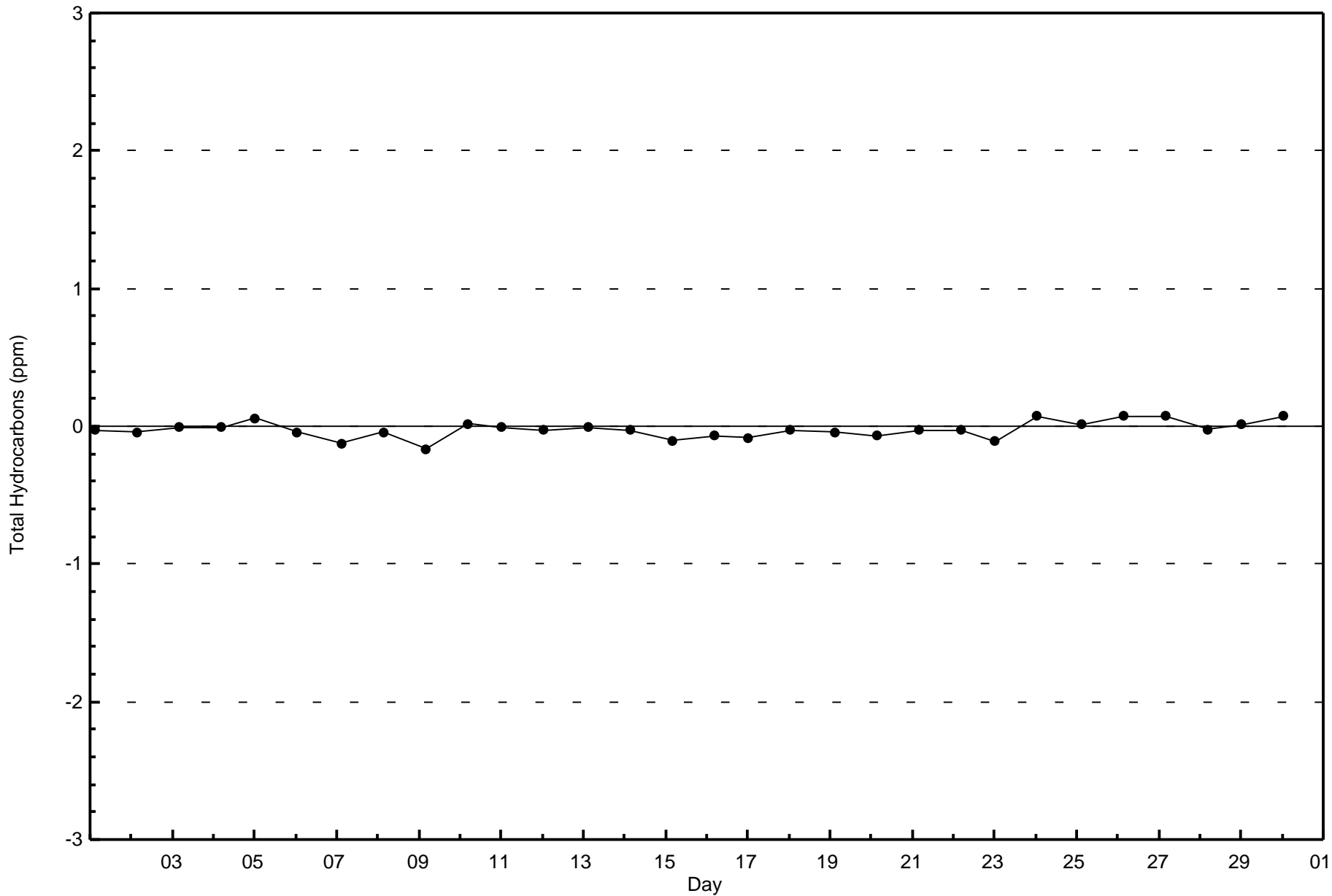


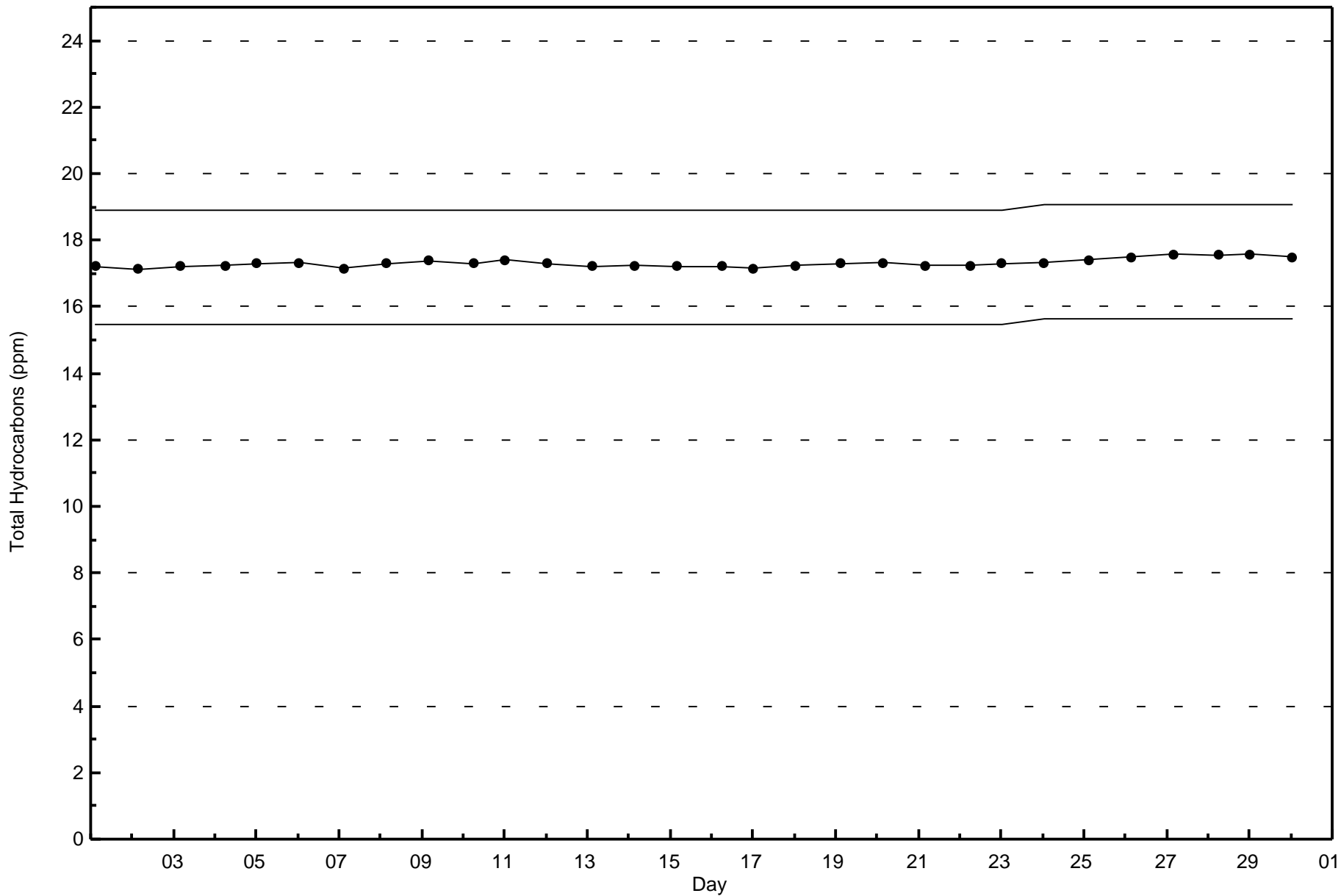
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Total Hydrocarbons (THC) - ppm
Brion MacKay River (AMS 20)



Total Number of Valid Hours: 682

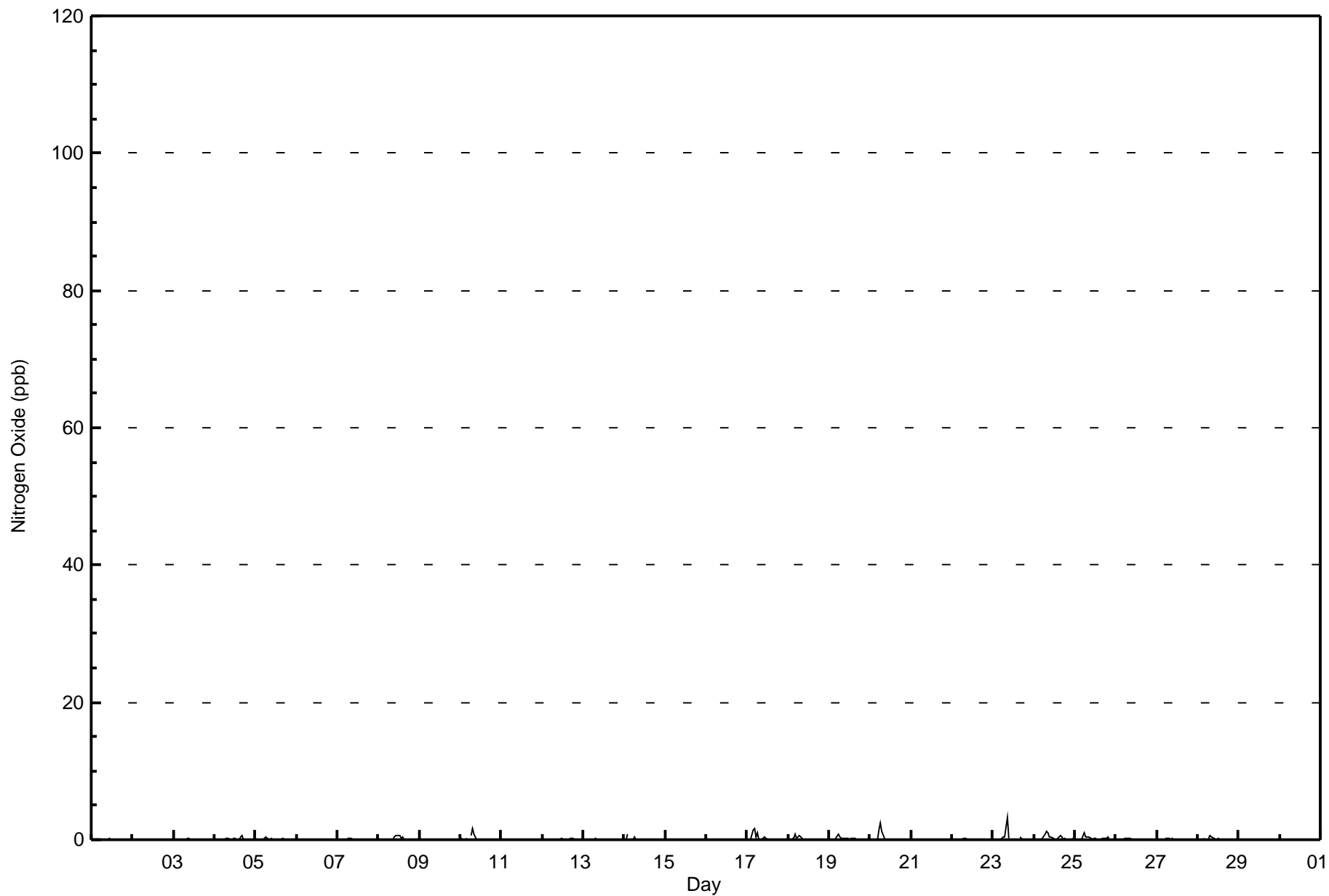






Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxide (NO) - ppb
Brion MacKay River - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Oxide (NO) - ppb
Brion MacKay River - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	683	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: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Brion MacKay River - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	21	31	37	15	17	42	61	74	47	44	51	62	63	38	46	33	682
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
Totals	21	31	37	15	17	42	61	74	47	44	51	62	63	38	46	33	682

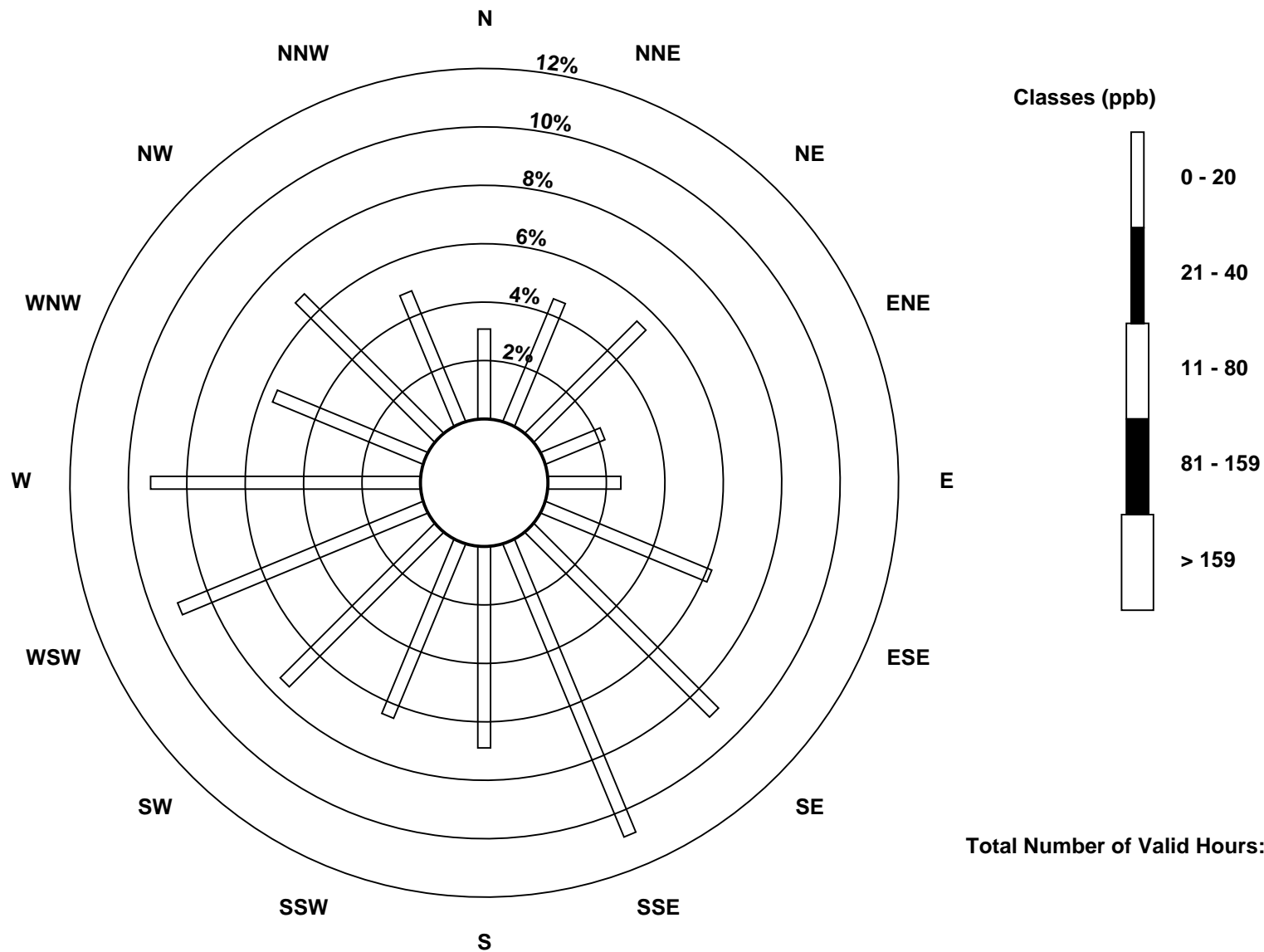
Total Number of Valid Hours: 682

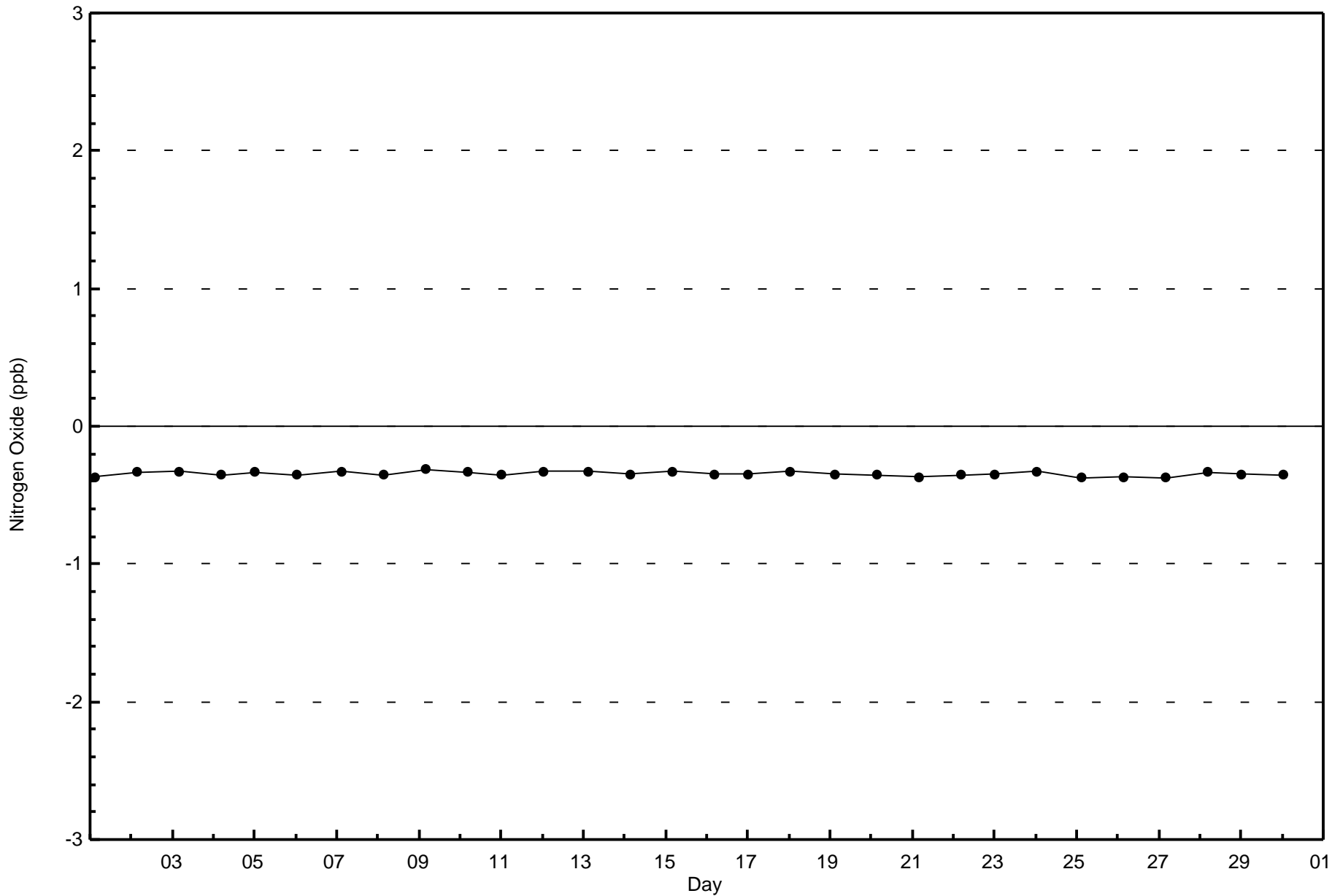
Total Number of Hours: 720

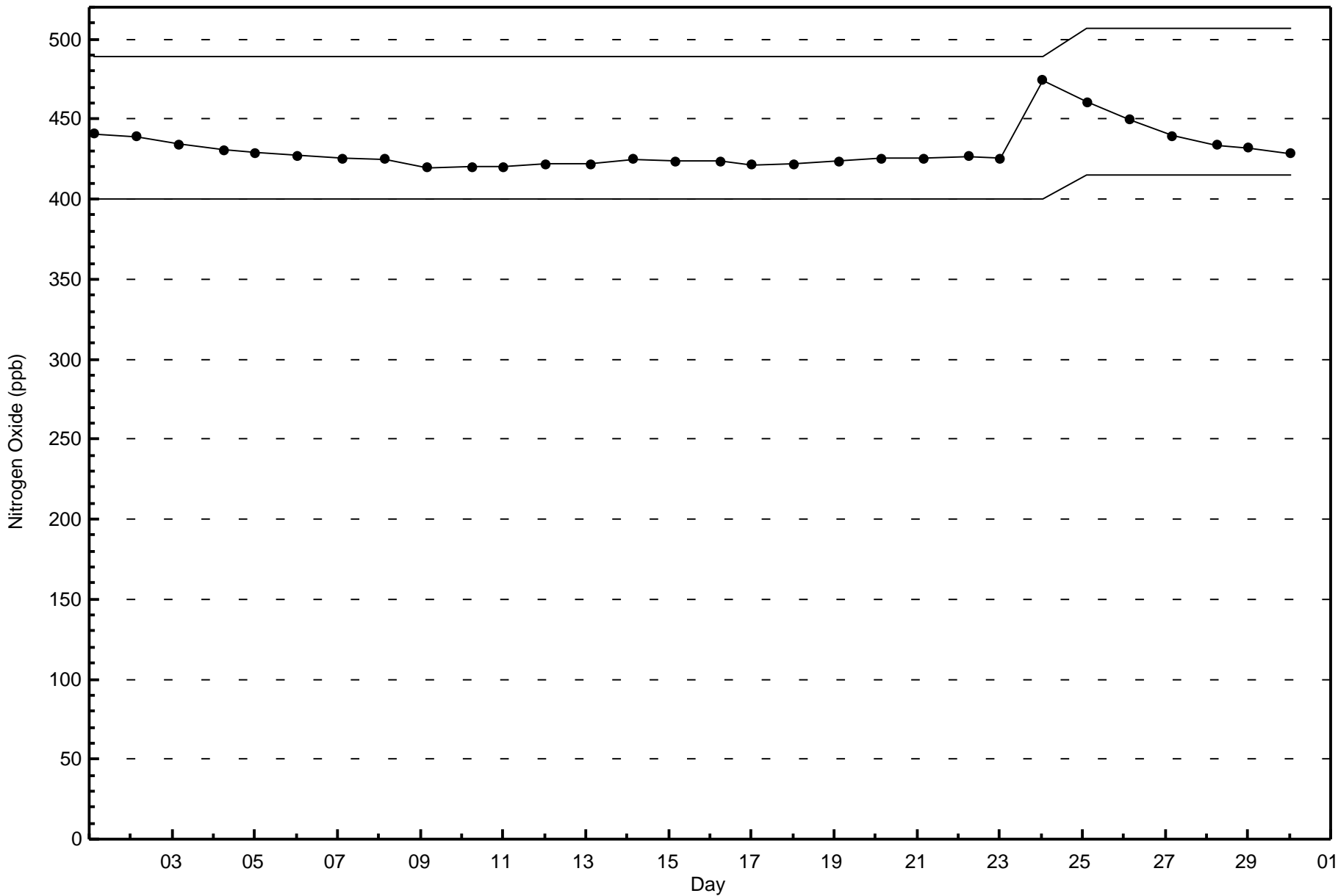


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxide (NO) - ppb
Brion MacKay River (AMS 20)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Brion MacKay River - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 7 ppb on Jun 10 01:00	Maximum Daily Average: 1.9 ppb on Jun 24		Hours of Data:	683
Minimum Value: 0 ppb on Jun 1 01:00	Minimum Daily Average: 0.2 ppb on Jun 16		Hours of Missing Data:	37
Maximum Diurnal Average: 1.2 ppb at hour 7	Minimum Diurnal Average: 0.5 ppb at hour 18		Hours of Calibration:	36
Monthly Average: 0.7 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 4		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-Jun	0	0	Z	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0.6	1
2-Jun	0	0	0	Z	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	2	1	1	0	0.4	2
3-Jun	1	2	1	0	Z	0	1	1	1	1	0	0	0	0	1	0	1	0	1	1	1	0	0	1	0.5	2
4-Jun	1	1	0	1	1	Z	1	1	1	0	0	1	1	0	0	1	2	1	1	1	2	0	1	1	0.7	2
5-Jun	Z	1	2	2	0	1	1	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0.6	2	
6-Jun	0	Z	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1	
7-Jun	1	1	Z	1	1	1	2	1	1	1	1	0	1	1	0	1	1	0	0	0	0	0	0	0.6	2	
8-Jun	0	0	0	Z	0	0	0	1	1	3	4	4	4	4	4	1	1	1	1	1	1	1	1	1.5	4	
9-Jun	1	1	1	1	Z	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.9	2	
10-Jun	7	6	1	2	1	Z	1	2	2	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1.3	7	
11-Jun	Z	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.5	1	
12-Jun	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1	0.5	1	
13-Jun	1	0	Z	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	0	1	0.5	1	
14-Jun	0	0	0	Z	0	0	2	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0.6	2	
15-Jun	1	1	0	0	Z	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
16-Jun	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	1	
17-Jun	Z	1	0	4	3	1	2	0	0	1	1	1	0	0	0	0	0	0	0	1	0	0	2	0.9	4	
18-Jun	1	Z	4	4	4	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1.0	4	
19-Jun	1	1	Z	1	1	2	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0.6	2	
20-Jun	0	0	0	Z	0	2	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	4	
21-Jun	0	0	0	0	Z	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
22-Jun	0	0	0	0	0	Z	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	0.7	2	
23-Jun	Z	0	0	1	2	2	2	2	2	1	C	C	C	C	C	C	2	0	0	0	2	3	2	--	3	
24-Jun	2	Z	1	1	1	1	4	4	4	2	2	1	1	1	1	2	2	1	4	1	0	1	4	1.9	4	
25-Jun	2	0	Z	1	1	2	1	1	1	1	0	1	1	1	0	1	2	1	2	4	2	1	1	1.1	4	
26-Jun	0	0	0	Z	0	1	1	1	1	1	1	0	0	1	1	2	0	0	0	1	0	0	0	0.6	2	
27-Jun	1	2	3	1	Z	1	1	1	0	1	0	0	0	0	0	0	0	0	1	0	1	1	0	0.6	3	
28-Jun	0	0	0	1	2	Z	1	2	1	1	0	0	1	1	0	1	1	1	1	1	1	1	2	0.9	2	
29-Jun	Z	2	1	1	0	0	0	0	1	0	0	0	DF	1	1	1	1	0	0	0	0	0	0	0.6	2	
30-Jun	0	Z	0	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	1	1	1	1	0	0.5	1	

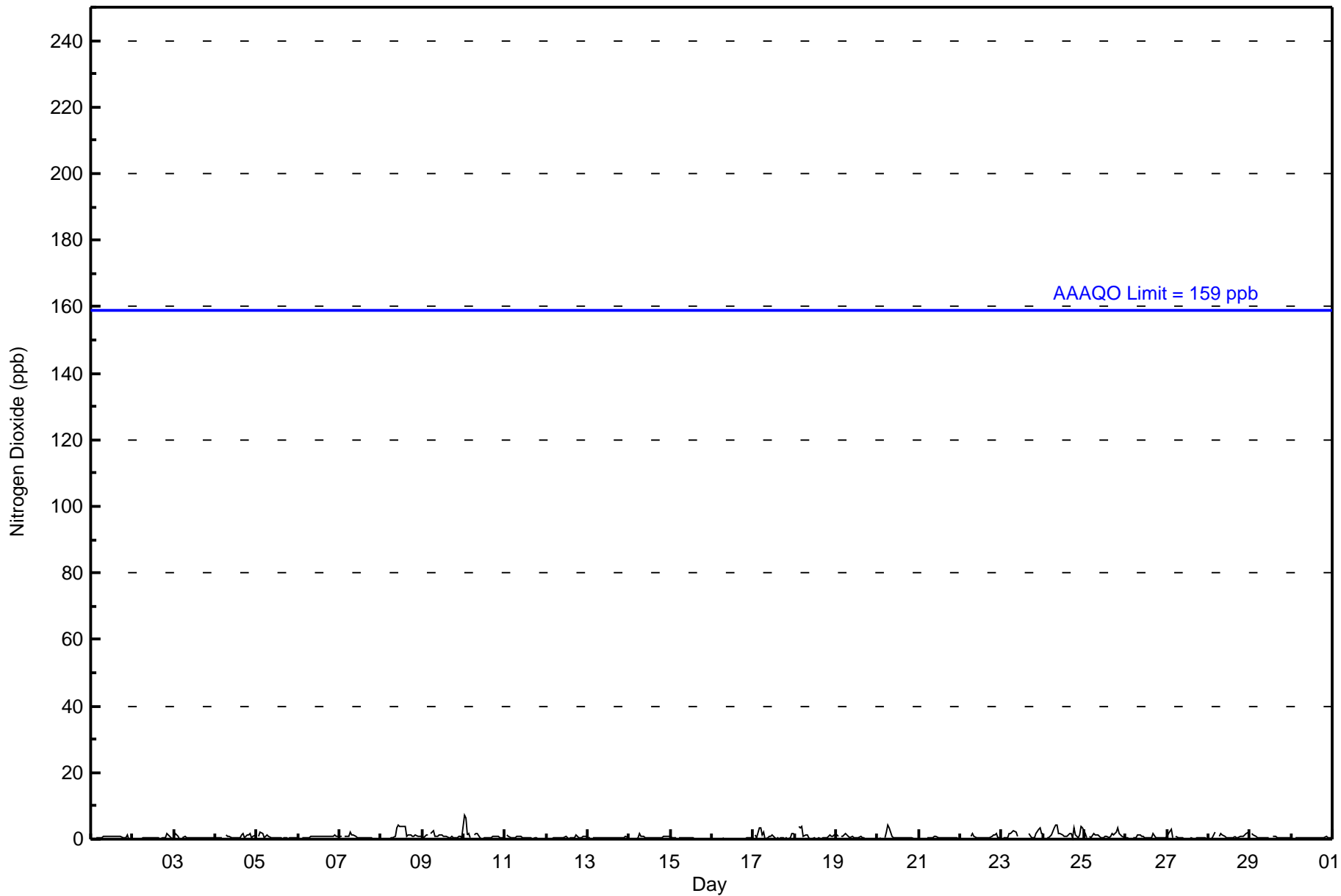
0.8	0.8	0.8	0.9	0.8	0.8	1.2	1.0	0.9	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.6	0.5	0.7	0.6	0.7	0.7	0.8	0.7	Diurnal Average
7	6	4	4	4	2	4	4	4	3	4	4	4	4	4	2	2	1	4	4	2	3	4	4	Diurnal Maximum

Z - zeronspan C - Calibration DF - DAS Failure
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	683	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: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	21	31	37	15	17	42	61	74	47	44	51	62	63	38	46	33	682
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
Totals	21	31	37	15	17	42	61	74	47	44	51	62	63	38	46	33	682

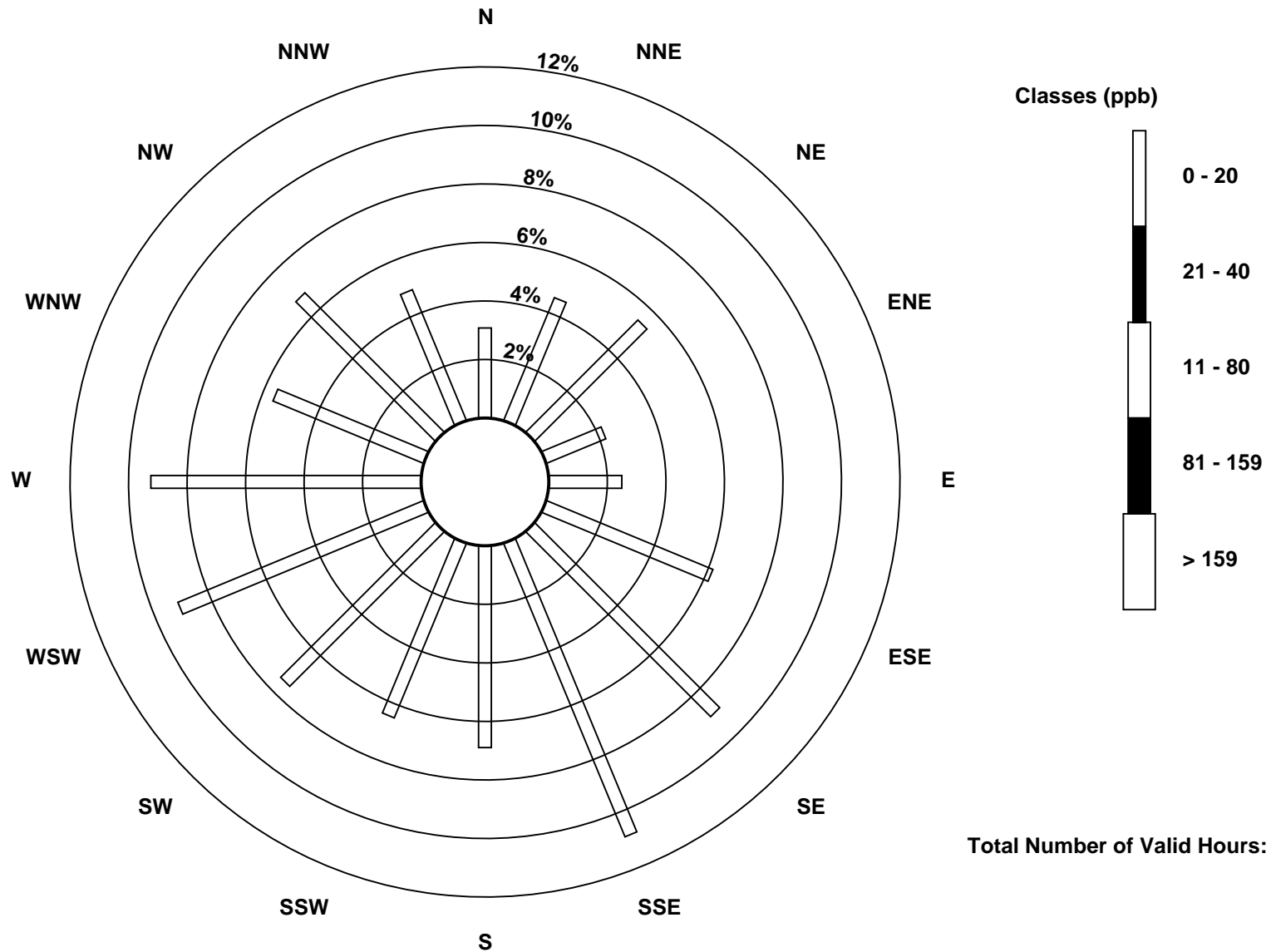
Total Number of Valid Hours: 682

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River (AMS 20)

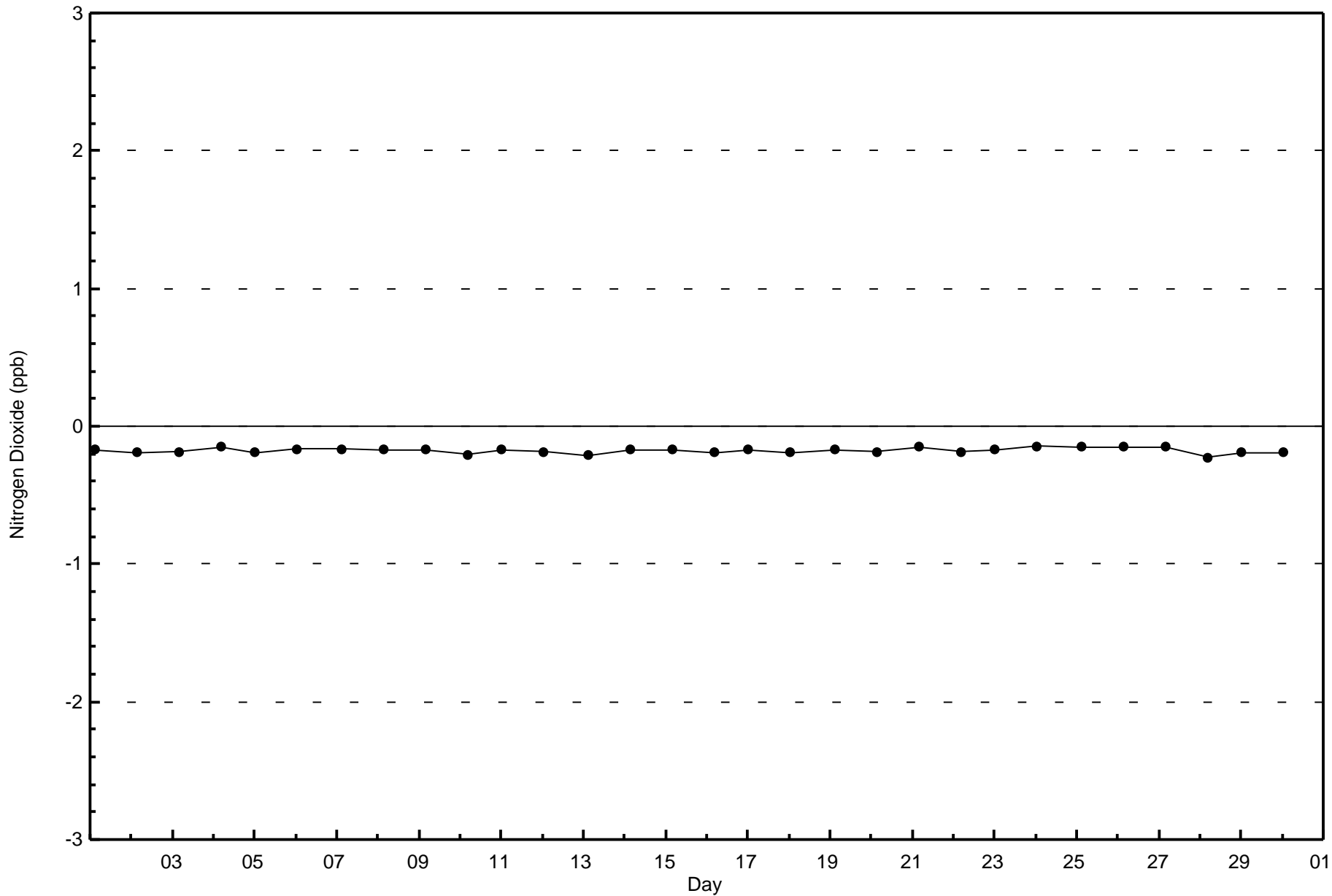


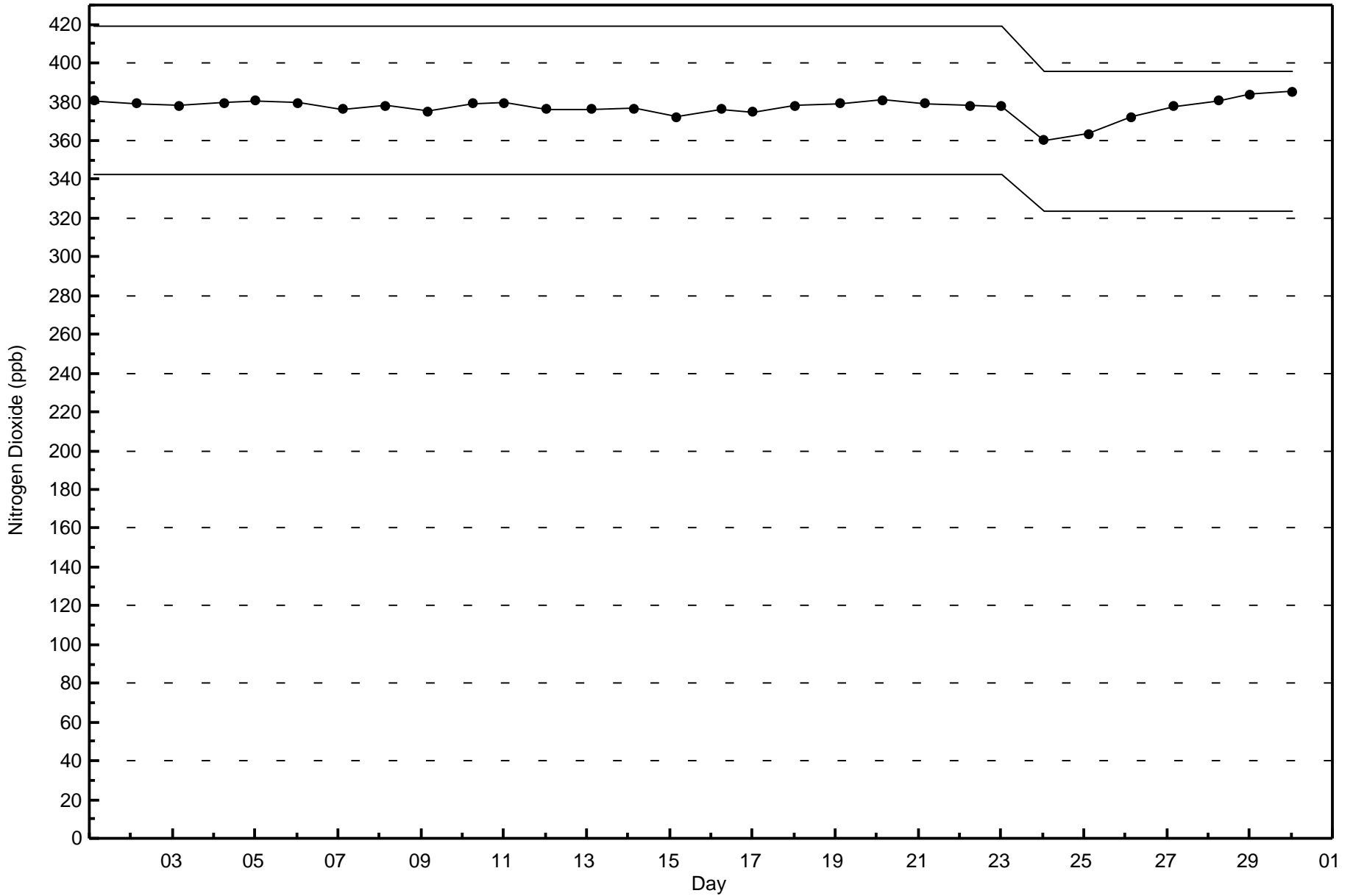
Total Number of Valid Hours: 682



Wood Buffalo Environmental Association
Zero Responses

Nitrogen Dioxide (NO₂) - ppb
Brion MacKay River - June 2016







Wood Buffalo Environmental Association
Summary of Hour Averages

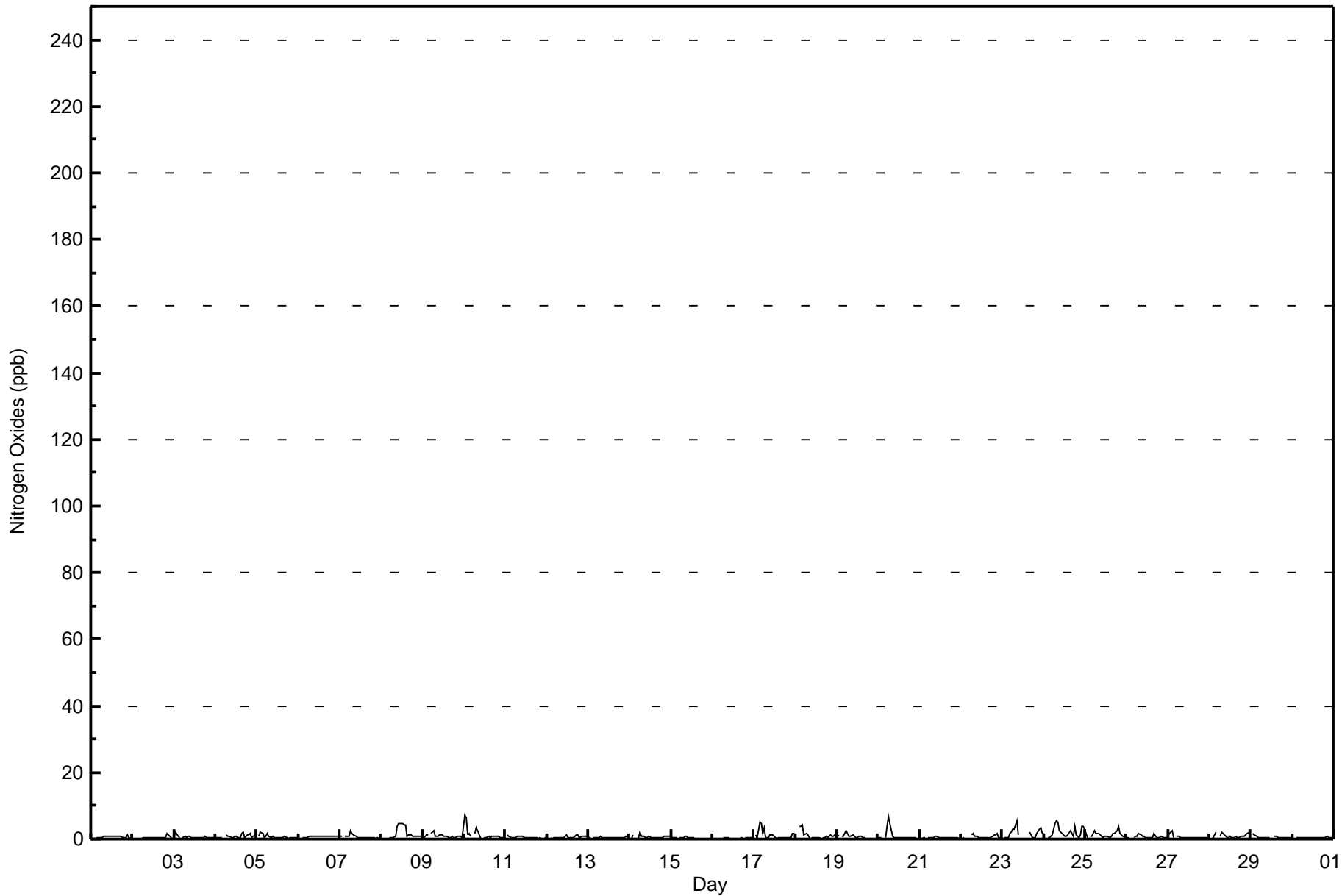
Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - June 2016

Maximum Value: 7 ppb on Jun 10 01:00		Maximum Daily Average: 2.1 ppb on Jun 24		Hours in Service: 720																																												
Minimum Value: 0 ppb on Jun 2 03:00		Minimum Daily Average: 0.2 ppb on Jun 16		Hours of Data: 683																																												
Maximum Diurnal Average: 1.5 ppb at hour 7		Minimum Diurnal Average: 0.6 ppb at hour 18		Hours of Missing Data: 37																																												
Monthly Average: 0.8 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 5		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-Jun	0	0	Z	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0.6	1																						
2-Jun	0	0	0	Z	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	2	1	1	0	0.4	2																						
3-Jun	1	2	1	0	Z	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	0	0	1	0.6	2																						
4-Jun	1	1	0	1	0	Z	1	1	1	1	0	1	1	0	0	2	2	0	1	1	2	0	1	1	0.8	2																						
5-Jun	Z	1	2	2	0	1	2	1	1	1	0	0	0	0	0	1	1	0	0	0	0	0	1	0.7	2																							
6-Jun	0	Z	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.8	1																						
7-Jun	1	1	Z	1	1	1	3	2	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0.6	3																						
8-Jun	0	0	0	Z	0	0	0	1	1	4	5	5	5	4	4	1	1	1	1	1	1	1	1	1	1.6	5																						
9-Jun	1	1	1	1	Z	2	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.9	3																						
10-Jun	7	6	1	2	1	Z	2	3	3	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1.4	7																							
11-Jun	Z	1	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1																						
12-Jun	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	0	1	1	1	1	0.5	1																						
13-Jun	1	0	Z	1	1	1	1	1	1	1	0	0	1	1	0	0	0	0	0	0	1	0	1	1	0.5	1																						
14-Jun	0	0	1	Z	0	1	2	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	0.6	2																						
15-Jun	1	1	0	0	Z	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																						
16-Jun	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																						
17-Jun	Z	1	0	5	5	2	3	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	2	1.2	5																						
18-Jun	1	Z	4	4	4	1	2	1	1	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1.1	4																						
19-Jun	1	1	Z	1	1	2	2	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0.7	2																						
20-Jun	0	0	0	Z	0	4	7	5	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	7																						
21-Jun	0	0	0	0	Z	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1																						
22-Jun	0	0	0	0	0	Z	1	2	1	1	1	0	1	1	1	1	1	1	1	1	1	2	1	1	0.7	2																						
23-Jun	Z	0	0	0	1	2	3	3	5	1	C	C	C	C	C	C	2	0	0	0	2	3	3	2	--	5																						
24-Jun	2	Z	1	1	1	1	4	5	5	2	2	1	1	1	1	3	2	1	4	1	0	1	4	4	2.1	5																						
25-Jun	2	0	Z	1	1	3	2	2	2	1	0	1	1	1	1	1	2	2	2	4	2	1	1	1	1.3	4																						
26-Jun	0	0	0	Z	0	1	1	2	1	1	1	0	0	1	1	2	0	0	0	1	0	0	0	0	0.6	2																						
27-Jun	1	2	3	1	Z	1	1	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0.6	3																						
28-Jun	0	0	0	1	2	Z	1	2	2	1	0	1	1	0	1	1	1	1	1	1	1	1	2	2	1.0	2																						
29-Jun	Z	2	1	1	0	0	0	0	1	0	0	0	DF	1	1	1	1	0	0	0	0	0	0	0	0.6	2																						
30-Jun	0	Z	0	0	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0.5	1																						
																								0.9	0.8	0.8	1.0	0.9	1.0	1.5	1.3	1.1	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.7	0.6	0.7	0.6	0.7	0.7	0.8	0.7	Diurnal Average
																								7	6	4	5	5	4	7	5	5	4	5	5	5	4	4	3	2	2	4	4	2	3	4	4	Diurnal Maximum
Z - zerospan C - Calibration DF - DAS Failure																																																



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	683	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: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Brion MacKay River - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	21	31	37	15	17	42	61	74	47	44	51	62	63	38	46	33	682
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
Totals	21	31	37	15	17	42	61	74	47	44	51	62	63	38	46	33	682

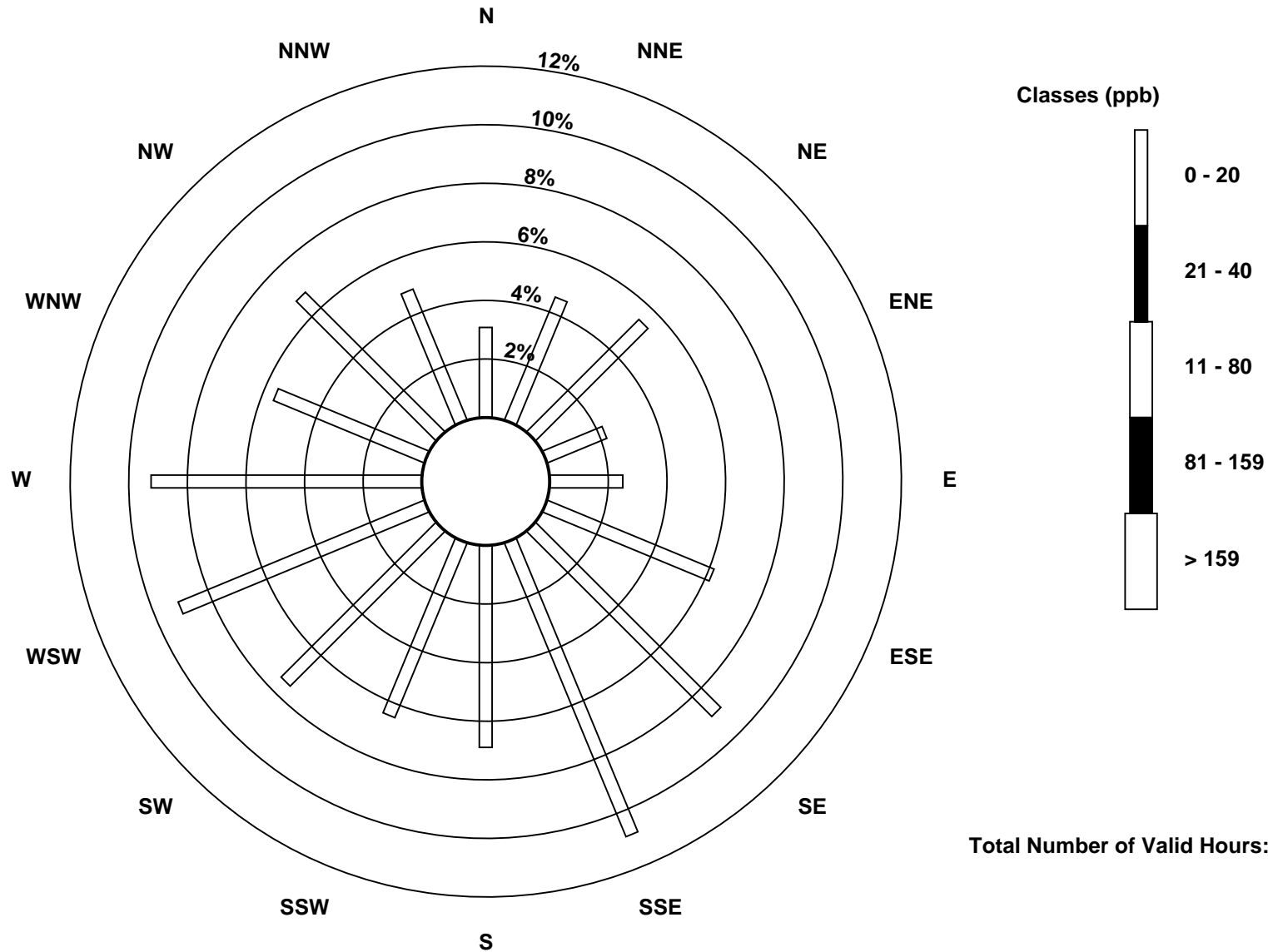
Total Number of Valid Hours: 682

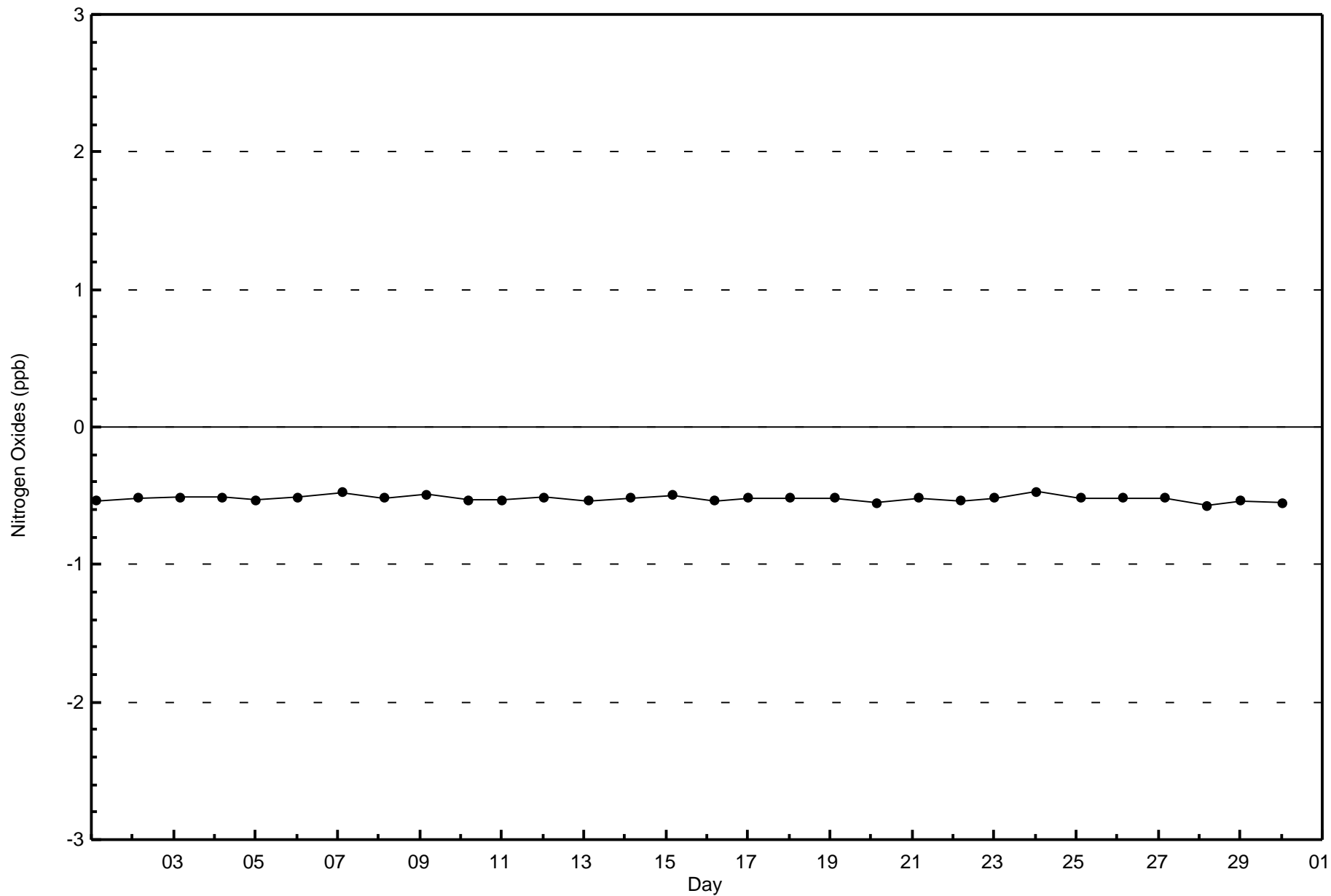
Total Number of Hours: 720

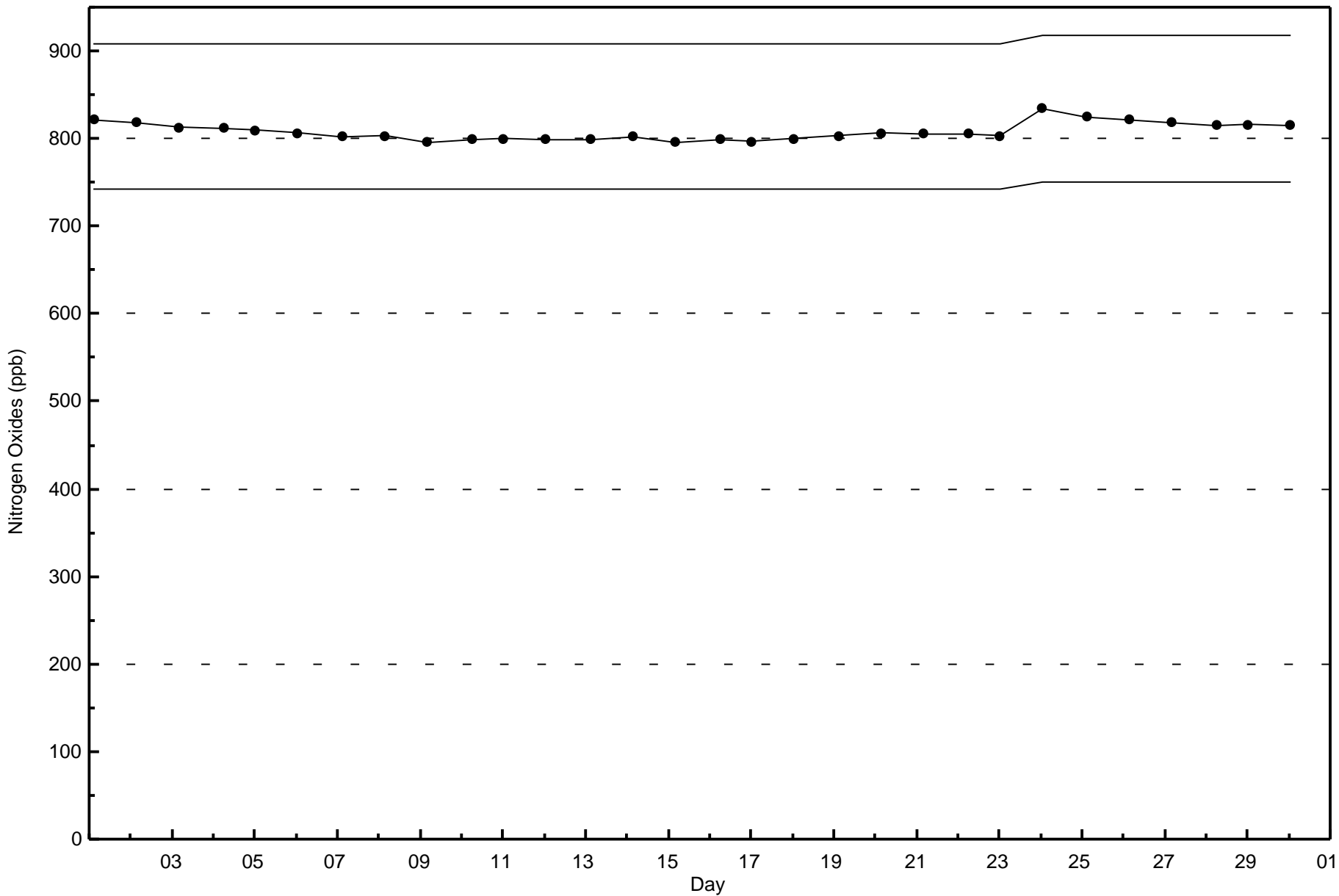


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxides (NO_x) - ppb
Brion MacKay River (AMS 20)









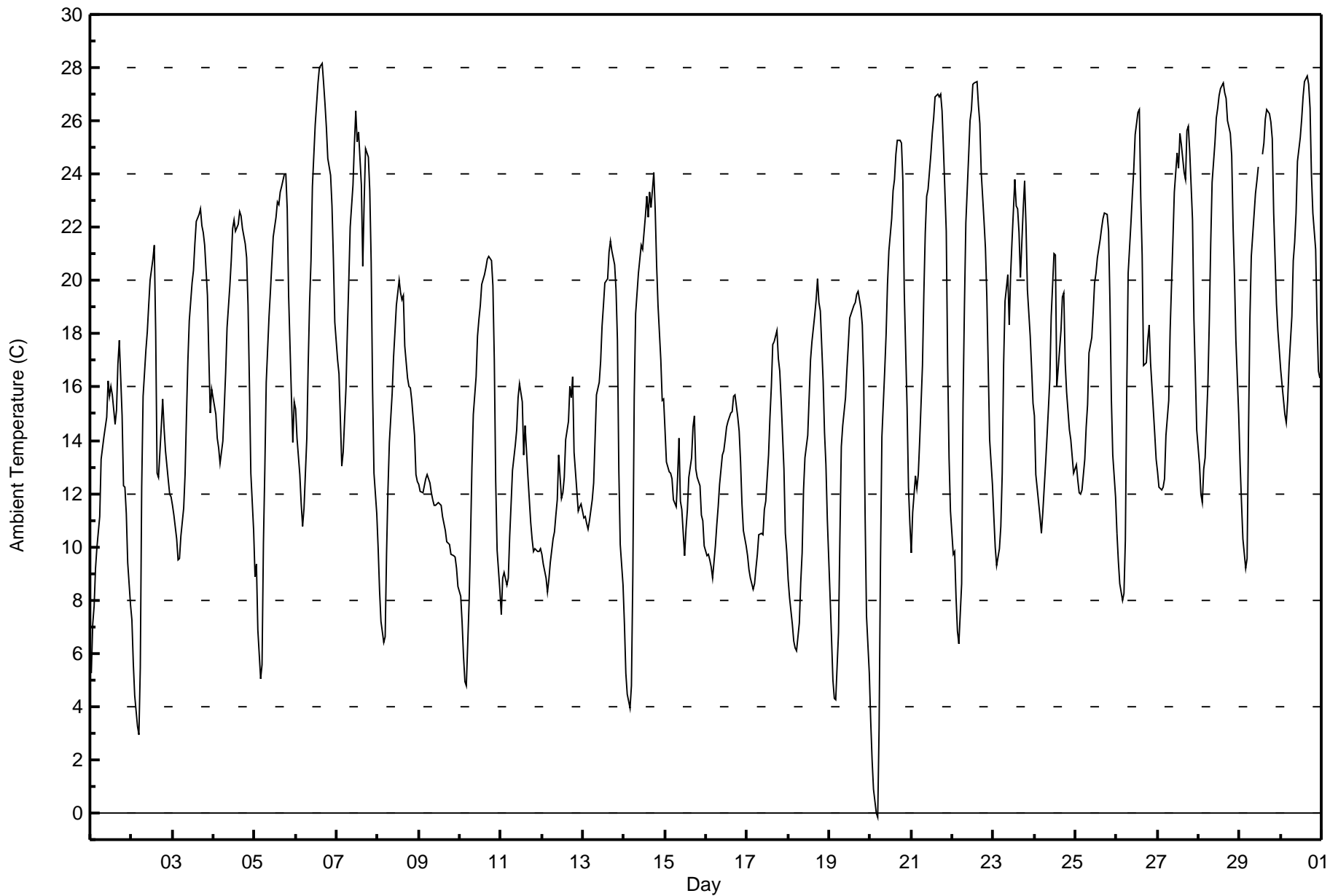
Wood Buffalo Environmental Association
Summary of Hour Averages

Ambient Temperature (AT) - C
Brion MacKay River - June 2016

Maximum Value: 28.2 C on Jun 6 16:00	Maximum Daily Average: 21.2 C on Jun 30	Hours in Service: 720
Minimum Value: -0.2 C on Jun 20 05:00	Minimum Daily Average: 11.1 C on Jun 9	Hours of Data: 719
Maximum Diurnal Average: 20.7 C at hour 18	Minimum Diurnal Average: 9.0 C at hour 4	Hours of Missing Data: 1
Monthly Average: 15.97 C	Percentiles: P ₁ = 3.3 P ₁₀ = 8.8 Q ₁ = 11.6 Median = 15.5 Q ₃ = 20.8 P ₉₀ = 24.2 P ₉₉ = 27.4	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-Jun	5.3	7.1	7.8	9.2	10.0	11.1	13.3	13.7	14.1	14.9	16.2	15.7	16.0	15.7	14.6	15.2	16.9	17.7	14.9	12.3	12.2	11.2	9.4	7.8	12.6	17.7																						
2-Jun	7.3	5.6	4.4	3.3	2.9	5.5	12.2	15.6	17.4	18.0	19.0	20.0	20.8	21.4	18.1	12.8	12.6	14.5	15.6	14.4	13.6	12.5	12.0	11.9	13.0	21.4																						
3-Jun	11.6	11.2	10.3	9.5	9.5	10.4	11.4	12.7	14.9	16.9	18.5	19.9	20.4	21.4	22.2	22.5	22.7	22.1	21.8	21.3	19.4	17.1	15.0	15.9	16.6	22.7																						
4-Jun	15.3	15.0	14.1	13.7	13.2	14.0	15.3	16.6	18.2	19.8	20.8	21.9	22.3	21.9	22.1	22.6	22.4	22.0	21.4	20.9	19.1	16.1	12.8	10.6	18.0	22.6																						
5-Jun	8.9	9.4	6.9	5.0	5.6	10.1	12.9	16.2	18.7	19.6	20.6	21.6	22.4	22.9	22.9	23.3	23.5	24.0	24.0	22.7	19.5	15.6	13.9	15.5	16.9	24.0																						
6-Jun	15.2	14.1	12.7	11.6	10.8	11.5	14.1	16.9	19.2	20.8	23.5	25.9	26.6	27.4	28.0	28.2	27.4	26.7	25.7	24.6	24.0	22.8	20.8	18.4	20.7	28.2																						
7-Jun	17.0	16.5	14.8	13.0	13.5	16.0	18.1	19.9	22.0	23.6	25.1	26.4	25.2	25.6	23.6	20.6	23.0	24.9	24.7	23.4	20.7	15.9	12.8	11.2	19.9	26.4																						
8-Jun	9.9	8.4	7.2	6.4	6.6	9.8	12.2	13.9	15.8	17.1	18.1	19.1	20.0	19.5	19.3	19.4	17.5	16.3	16.0	16.0	15.5	14.2	12.7	12.5	14.3	20.0																						
9-Jun	12.4	12.1	12.0	12.3	12.5	12.7	12.4	12.0	11.8	11.6	11.6	11.7	11.6	11.6	11.1	10.6	10.2	10.1	10.1	9.7	9.7	9.6	9.2	8.5	11.1	12.7																						
10-Jun	8.1	7.1	5.9	4.9	4.8	7.9	10.3	13.0	15.0	16.4	17.9	18.6	19.1	19.9	20.2	20.5	20.8	20.9	20.7	19.8	17.0	12.4	9.9	8.4	14.1	20.9																						
11-Jun	7.5	8.8	9.1	8.6	8.8	10.4	11.6	12.9	13.8	14.4	15.6	16.2	15.4	13.5	14.6	13.6	12.7	10.9	10.3	9.8	9.9	9.8	9.8	9.9	11.6	16.2																						
12-Jun	9.7	9.4	8.9	8.3	8.8	9.4	10.3	10.6	11.2	11.8	13.4	11.8	12.1	12.6	14.0	14.7	16.0	15.6	16.4	13.5	12.1	11.4	11.5	11.6	11.9	16.4																						
13-Jun	11.1	11.1	10.9	10.7	11.0	11.8	12.4	14.0	15.7	16.2	17.0	18.3	19.1	19.9	20.1	21.1	21.5	21.1	20.6	19.6	17.8	12.9	10.1	8.6	15.5	21.5																						
14-Jun	7.1	5.3	4.5	4.0	4.8	8.9	15.7	18.8	20.3	20.8	21.4	21.2	22.4	23.2	22.4	23.3	22.8	24.0	22.6	20.6	19.1	17.0	15.5	15.6	16.7	24.0																						
15-Jun	14.4	13.2	12.8	12.8	12.5	11.8	11.5	12.6	14.1	11.7	11.4	9.7	10.7	11.4	12.6	13.3	14.5	14.9	12.9	12.6	12.3	11.2	11.0	10.0	12.3	14.9																						
16-Jun	9.7	9.7	9.5	9.2	8.8	10.0	10.8	11.5	12.4	13.5	13.6	14.0	14.5	14.7	15.0	15.1	15.6	15.7	14.9	14.3	13.2	11.6	10.6	10.1	12.4	15.7																						
17-Jun	9.7	9.1	8.8	8.4	8.6	9.2	9.7	10.5	10.5	10.5	11.4	11.7	13.4	14.9	16.0	17.6	17.7	18.1	17.1	16.6	15.5	12.9	10.5	9.8	12.4	18.1																						
18-Jun	8.8	8.1	7.1	6.5	6.2	6.1	7.2	8.6	9.8	12.1	13.3	14.2	15.6	17.0	17.7	18.7	19.3	20.1	19.2	18.9	16.3	14.3	13.1	11.1	12.9	20.1																						
19-Jun	8.1	6.6	5.0	4.3	4.3	6.8	10.4	13.8	14.6	15.6	16.6	17.6	18.6	18.8	19.1	19.2	19.5	19.6	19.0	18.3	16.4	11.2	7.4	5.3	13.2	19.6																						
20-Jun	3.4	2.0	0.9	0.0	-0.2	3.2	9.4	14.1	16.6	18.0	19.8	21.1	22.3	23.4	23.8	24.7	25.3	25.2	25.2	23.8	19.5	15.2	12.3	10.9	15.0	25.3																						
21-Jun	9.8	11.3	12.7	12.2	12.7	14.0	16.8	19.5	21.8	23.2	23.4	24.7	25.5	26.1	26.9	27.0	26.9	27.0	26.4	25.0	21.9	16.8	13.4	11.4	19.9	27.0																						
22-Jun	9.7	9.8	8.1	6.9	6.4	8.6	15.4	19.1	22.2	24.7	26.0	26.4	27.4	27.4	27.5	26.6	25.9	24.1	22.2	21.2	19.4	16.7	14.0	12.3	18.7	27.5																						
23-Jun	11.1	10.0	9.3	9.9	10.7	12.8	16.8	19.2	20.2	18.3	20.2	21.5	23.8	22.8	22.7	21.8	20.1	22.7	23.7	22.1	19.7	17.9	16.7	15.4	17.9	23.8																						
24-Jun	14.9	12.7	11.7	11.1	10.5	11.3	13.1	14.2	15.2	16.3	18.7	21.0	21.0	16.0	16.7	18.1	19.4	19.5	16.9	15.8	14.4	14.0	13.4	12.8	15.4	21.0																						
25-Jun	13.1	12.5	12.0	12.0	12.1	13.3	14.5	15.4	17.3	17.9	18.8	19.9	20.3	20.9	21.5	22.0	22.3	22.6	22.5	21.8	19.2	15.5	13.5	11.9	17.2	22.6																						
26-Jun	10.5	9.4	8.6	8.0	8.3	10.2	15.8	20.3	22.2	23.2	24.2	25.5	26.3	26.4	23.1	21.0	16.8	16.9	17.8	18.4	16.9	15.1	14.3	13.3	17.2	26.4																						
27-Jun	12.8	12.2	12.2	12.3	12.6	14.2	15.5	18.1	19.8	21.6	23.3	24.8	24.2	25.5	25.1	24.1	23.8	25.6	25.8	24.8	22.3	18.6	16.5	14.4	19.6	25.8																						
28-Jun	13.1	12.0	11.7	12.9	13.4	16.1	18.5	21.4	23.7	25.2	26.1	26.5	27.0	27.2	27.4	27.1	26.8	26.0	25.5	24.7	22.0	20.1	17.8	15.0	21.1	27.4																						
29-Jun	13.1	11.7	10.3	9.2	9.6	14.3	18.5	20.9	22.5	23.3	23.8	24.3	DF	24.8	25.2	26.1	26.4	26.3	25.9	25.3	22.6	19.1	18.1	17.4	19.9	26.4																						
30-Jun	16.7	16.1	15.0	14.6	15.5	16.8	18.7	20.8	21.4	22.5	24.5	25.4	26.1	26.9	27.5	27.7	27.3	26.5	24.0	22.5	21.2	18.5	16.6	16.3	21.2	27.7																						
																								10.8	10.2	9.5	9.0	9.2	10.9	13.5	15.6	17.1	18.0	19.1	19.9	20.3	20.7	20.7	20.6	20.6	20.7	20.1	19.2	17.4	14.9	13.1	12.1	Diurnal Average
																								17.0	16.5	15.0	14.6	15.5	16.8	18.7	21.4	23.7	25.2	26.1	26.5	27.4	27.4	28.0	28.2	27.4	27.0	26.4	25.3	24.0	22.8	20.8	18.4	Diurnal Maximum

DF - DAS Failure





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Brion MacKay River - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	1	0.14	0.14
0 - 10	115	15.99	16.13
10 - 20	403	56.05	72.18
> 20	200	27.82	100.00

Total Number of Valid Hours: 719

Total Number of Hours: 720

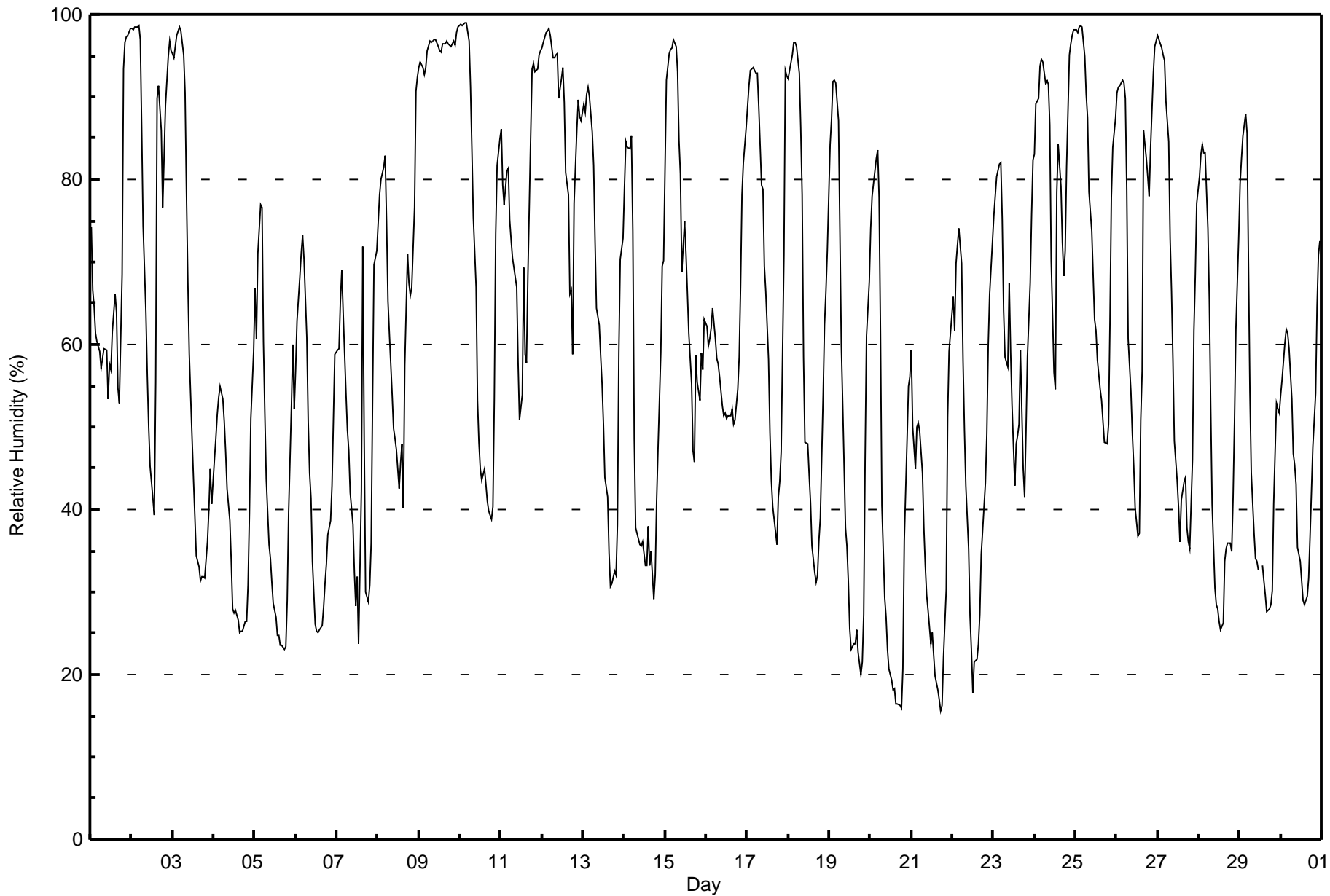


Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %
Brion MacKay River - June 2016

Maximum Value: 99 % on Jun 10 04:00																		Maximum Daily Average: 95.9 % on Jun 9																		Hours in Service: 720													
Minimum Value: 16 % on Jun 21 18:00																		Minimum Daily Average: 35.8 % on Jun 21																		Hours of Data: 719													
Maximum Diurnal Average: 83.3 % at hour 5																		Minimum Diurnal Average: 43.3 % at hour 14																		Hours of Missing Data: 1													
Monthly Average: 61.2 %																		Percentiles: P ₁ = 18 P ₁₀ = 29 Q ₁ = 41 Median = 59 Q ₃ = 83 P ₉₀ = 95 P ₉₉ = 99																		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-Jun	74	67	65	61	60	59	57	58	59	59	53	58	57	62	66	64	55	53	69	93	97	97	97	98	68.3	98																							
2-Jun	98	98	98	98	99	97	86	74	64	56	50	45	41	39	55	90	91	86	77	83	89	95	97	96	79.3	99																							
3-Jun	95	95	97	98	99	98	95	90	78	68	59	49	44	39	34	33	31	32	32	32	36	40	45	41	60.8	99																							
4-Jun	46	49	52	53	55	53	51	47	43	39	34	28	27	28	27	25	25	25	26	26	31	39	51	59	39.1	59																							
5-Jun	67	61	71	77	77	60	52	44	36	34	31	29	27	25	25	24	24	23	23	29	40	53	60	52	43.4	77																							
6-Jun	57	63	68	71	73	70	61	51	44	41	34	26	25	25	25	26	28	31	33	37	39	43	51	59	45.1	73																							
7-Jun	59	59	65	69	64	54	50	47	42	38	32	28	32	24	42	72	49	30	29	31	36	53	70	71	47.8	72																							
8-Jun	75	78	80	82	83	75	65	61	54	50	49	47	43	46	48	40	58	71	68	66	67	77	91	92	65.1	92																							
9-Jun	94	94	94	93	94	96	97	97	97	97	97	96	96	95	96	96	97	96	96	96	97	96	98	99	95.9	99																							
10-Jun	99	99	99	99	99	97	91	83	75	67	53	48	45	44	45	43	41	40	39	40	53	73	82	85	68.3	99																							
11-Jun	86	79	77	81	81	75	73	71	68	67	58	51	54	69	59	58	68	85	93	94	93	93	95	96	76.0	96																							
12-Jun	96	97	98	98	98	98	95	95	95	95	90	92	94	89	81	78	66	67	59	77	86	90	88	87	87.8	98																							
13-Jun	89	88	90	91	90	86	82	73	64	62	59	55	50	44	41	35	31	31	32	32	38	59	70	73	61.1	91																							
14-Jun	79	84	84	84	85	74	49	38	36	36	36	36	33	33	38	33	35	29	32	41	47	59	70	70	51.7	85																							
15-Jun	81	92	95	96	96	97	96	93	85	81	69	75	71	66	61	55	47	46	59	55	53	59	57	63	72.9	97																							
16-Jun	62	60	61	62	64	61	58	58	56	53	51	52	51	51	51	52	50	51	55	58	67	78	82	86	59.6	86																							
17-Jun	89	91	93	93	93	93	93	89	79	79	70	67	58	49	44	40	39	36	41	43	47	71	93	93	70.1	93																							
18-Jun	92	93	95	97	97	96	93	86	78	59	48	48	44	41	36	32	31	32	36	39	54	62	67	71	63.7	97																							
19-Jun	84	87	92	92	92	87	74	60	53	38	36	31	26	23	24	24	25	23	20	21	27	46	61	68	50.5	92																							
20-Jun	74	78	79	83	84	78	61	40	29	27	23	21	19	18	18	16	16	16	16	21	36	48	55	56	42.3	84																							
21-Jun	59	50	45	50	51	49	44	38	33	30	28	24	25	22	20	18	17	16	16	22	30	51	59	61	35.8	61																							
22-Jun	66	62	70	72	74	70	58	50	43	35	27	23	18	22	22	24	27	35	40	43	49	60	66	72	46.9	74																							
23-Jun	76	78	80	82	82	75	64	58	57	67	59	53	43	48	49	50	59	45	41	50	58	68	76	82	62.6	82																							
24-Jun	83	89	90	94	95	94	92	92	92	87	70	57	55	78	84	79	72	68	71	82	95	97	97	98	83.8	98																							
25-Jun	98	98	98	99	98	95	90	88	79	74	68	63	62	58	55	53	51	48	48	50	63	78	84	87	74.4	99																							
26-Jun	90	91	91	92	92	90	79	61	54	49	45	40	37	37	51	57	86	82	80	78	84	93	96	97	73.0	97																							
27-Jun	97	97	96	95	94	90	85	73	66	58	48	44	40	36	41	43	44	38	36	35	46	62	68	77	62.9	97																							
28-Jun	80	83	84	83	83	74	65	52	41	31	29	28	26	25	26	34	35	36	36	35	42	51	62	73	50.6	84																							
29-Jun	80	83	85	88	86	70	54	44	37	34	34	33	DF	33	31	30	28	28	28	30	41	53	52	52	49.3	88																							
30-Jun	54	56	60	62	61	60	53	47	45	43	35	34	31	29	29	29	32	37	42	48	54	65	71	73	47.9	73																							
																								79.3	80.0	81.8	83.1	83.3	79.0	72.1	65.2	59.5	55.1	49.1	46.0	43.9	43.3	44.2	45.2	45.3	44.5	45.9	49.6	56.5	66.9	73.7	76.2	Diurnal Average	
																								99	99	99	99	99	98	97	97	97	97	97	96	96	95	96	96	96	97	96	96	97	97	98	99	Diurnal Maximum	
DF - DAS Failure																																																	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Brion MacKay River - June 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	13	1.81	1.81
20 - 40	154	21.42	23.23
40 - 60	201	27.96	51.18
60 - 80	147	20.45	71.63
80 - 100	204	28.37	100.00

Total Number of Valid Hours: 719

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

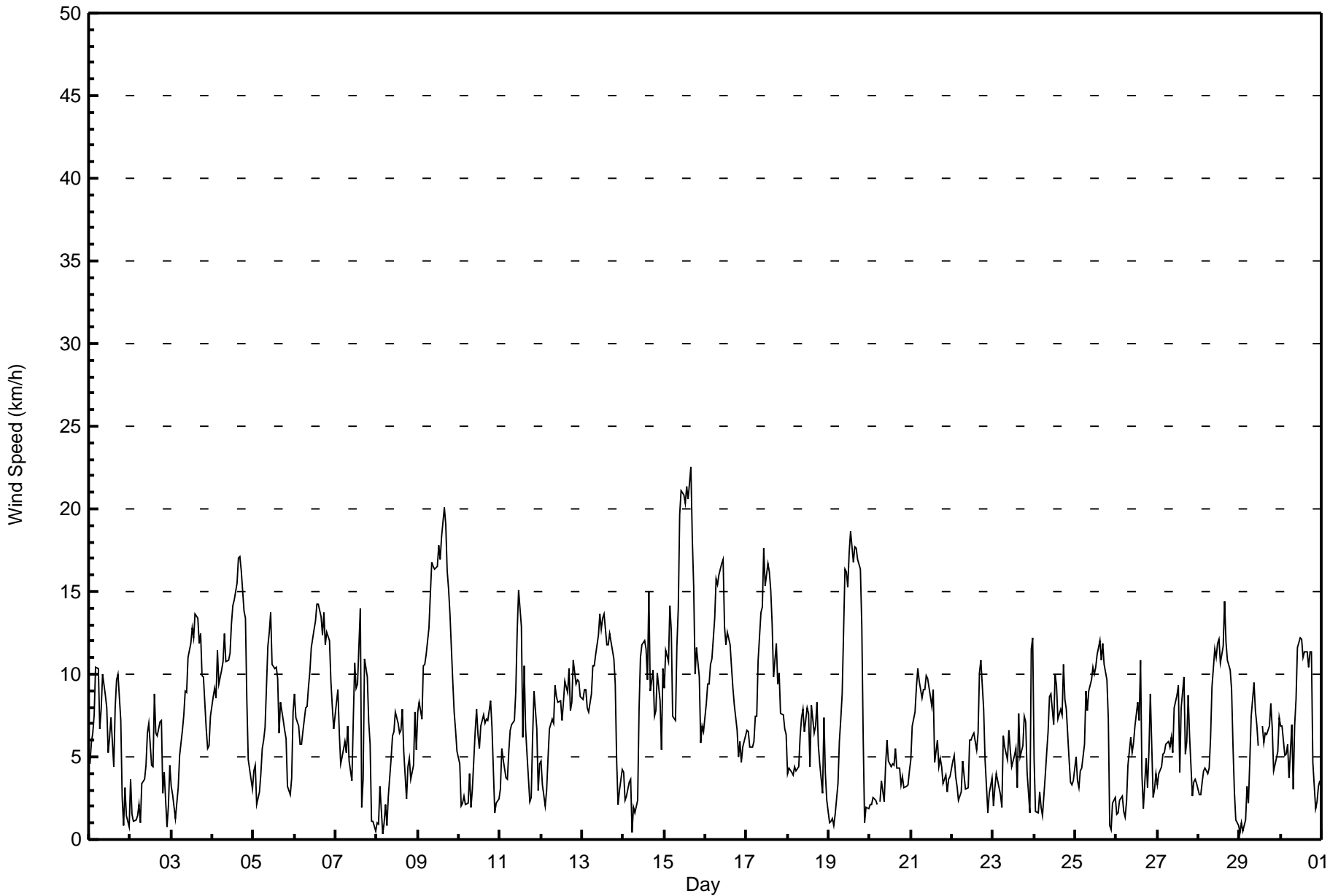
Brion MacKay River - June 2016

Maximum Speed: 23 km/h on Jun 15 16:00	Maximum Daily Speed Average: 12.6 km/h on Jun 9	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 8 04:00	Minimum Daily Speed Average: 1.5 km/h on Jun 20	Hours of Data: 718
Maximum Diurnal Speed Average: 2.7 km/h at hour 14	Minimum Diurnal Speed Average: 0.6 km/h at hour 20	Hours of Missing Data: 2
Monthly Average Velocity: 1.4 km/h 232.5 deg	Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 4 Median = 7 Q ₃ = 10 P ₉₀ = 13 P ₉₉ = 20	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-Jun	SSE5	S6	S6	S8	S10	SSW10	SSE7	S8	S10	S9	S8	WSW5	WSW6	WNW7	W4	ESE8	SE10	SE10	SSW7	SE3	N1	SSE3	SE1	SSE1	S5.0	S10
2-Jun	SSE4	SE2	SE1	SSE1	SE1	SSE2	SE1	NE3	ENE4	SE5	SE6	SE7	SSE4	SE4	SW9	SSE6	ESE6	SE7	ESE7	NE3	W4	NNW1	SW2	SW4	SE2.5	SW9
3-Jun	WSW3	W3	SW1	SW2	SSW3	SW5	WSW7	WSW8	W9	WSW9	WSW11	WSW12	W13	W12	W14	W13	W12	WSW12	W10	WSW10	WSW7	SW5	SW6	SW7	WSW7.7	W14
4-Jun	SW9	WSW9	SW9	WSW11	WSW9	WSW10	W11	W12	W11	W11	NNW11	NNW13	W14	NNW15	NNW15	NNW17	NNW17	NNW16	NW14	NW13	NW8	NNW5	NNW4	W3	W10.4	NNW17
5-Jun	WSW4	W4	W2	SSW3	WSW4	W5	W6	WNW7	NW12	NW13	NW14	NNW11	NW10	NW10	NW10	NW6	NW8	NW7	N7	NE6	ENE3	ESE3	ESE4	SE8	NW4.7	NW14
6-Jun	SE9	SE7	SE7	SE6	SSE6	SSE6	SSE8	SSE8	SSE9	SE10	SSE12	S13	SSE13	S14	SSE14	SSE13	S12	S14	SSE12	SSE13	S12	S10	S8	SSW7	SSE9.8	SSE14
7-Jun	S8	S9	S6	SW5	WSW5	W6	W5	WNW7	NW5	W4	W7	WSW11	WNW9	W9	NNW14	E2	N4	N11	NNW10	N7	NNE6	N1	N1	NNW1	WNW3.3	NNW14
8-Jun	SSE1	SW1	SSE3	SSE0	S1	N2	N1	NE3	NE5	NE6	NE7	NE8	ENE7	NE6	ESE7	SE8	SE5	E2	E4	ENE5	NE4	ENE5	ENE8	ENE5	ENE3.5	SE8
9-Jun	ENE8	NE8	NNE7	NE10	NE11	NNE11	NE13	NNE15	NNE17	NE17	NNE16	NE17	NE18	NE17	NNE18	NNE20	NNE19	NNE16	NNE15	NNE14	N10	NNW8	NNW7	NW5	NNE12.6	NNE20
10-Jun	NW5	NNW2	NW2	W3	W2	W2	WNW4	W2	WNW3	NNW7	N8	NNE6	N6	NNE7	ENE8	NE7	E7	ENE7	ENE8	E7	ESE4	ESE2	SE2	SE2	NNE2.4	ENE8
11-Jun	SE3	SE5	SE5	SE4	SE4	SE5	SE7	SE7	SE7	ESE9	SE13	SE15	SSE13	SE6	ESE11	SE7	SE5	SSW2	ESE3	ESE6	SE9	ESE7	E3	ESE5	SE6.4	SE15
12-Jun	SE5	SE3	SSE2	S3	SSW5	SSW7	SSW7	SSW7	SSW9	SSW9	SW8	WSW8	SW7	WSW8	WSW10	WSW9	W10	WNW8	W8	WSW11	WSW9	SW10	WSW10	SW9	SW6.4	WSW11
13-Jun	WSW8	WSW9	WSW9	WSW8	WSW8	WSW9	WSW10	WSW11	WSW11	SW12	WSW14	WSW13	W13	W14	WSW12	WSW12	WSW12	SW12	SW11	SW9	WSW5	S2	SSE3	SSE4	WSW9.1	W14
14-Jun	SSE4	ESE2	SE3	SSE3	SSE4	S0	ENE2	E2	NE2	ESE8	ESE11	E12	ESE12	E12	E10	ESE15	ESE9	SE10	SE7	SSE8	S10	SE8	E5	ESE10	ESE6.4	ESE15
15-Jun	ESE9	ESE11	ESE11	ESE14	ESE13	ESE7	ESE7	ESE12	SE14	SSE20	SSE21	S21	S20	S21	S21	SSW23	SSW18	SSW15	SSW10	S12	S10	SSE6	SSE7	SE7	SSE11.5	SSW23
16-Jun	SSE8	SSE9	SSE9	S11	S11	S13	S16	S15	SSW16	SSW17	SSW17	SSW12	SSW13	SW12	SW10	SW9	WSW8	SW7	SW5	WSW6	SW5	SW6	SW6	SSW9.8	SSW17	
17-Jun	WSW7	WSW7	W6	W6	W6	W7	W7	NNW11	NW14	NW14	NW18	NNW15	NNW17	NNW16	NNW15	NNW13	W10	WSW12	WSW9	SW10	SW8	W8	NW7	NW6	WNW9.3	NW18
18-Jun	WNW4	W4	W4	W4	W4	WSW4	W4	W6	W7	WNW8	WNW6	W8	NW8	WNW4	W8	WSW6	W7	W8	W6	SW5	SW3	SW7	N4	ENE2	W4.8	W8
19-Jun	SSE1	SSE1	SSW1	SSE1	SSE2	W3	W6	W7	WNW9	NW16	NW16	NNW15	NNW17	NW19	NW17	NW18	NNW18	NNW17	NNW16	NNW13	N6	SE1	SSE2	SSE2	NW8.0	NW19
20-Jun	SSE2	SE2	SSE3	SE2	SE2	AF	SW2	SW4	WSW2	WSW5	NW6	NW5	N4	NNW5	WSW4	W5	WNW4	SW4	SW3	S4	SSE3	SSE3	SSE3	SSE4	SW1.5	NW6
21-Jun	SSE5	S7	S8	S9	S10	SSW10	SSW9	SSW9	SSW9	SSW10	SSW10	SSW9	SSE8	S9	E5	SSW6	S4	ESE5	SSE4	SSW3	SSW4	SSE3	SSE4	SSE4	S6.1	S10
22-Jun	SSE5	SSE5	SSE4	SSE3	SSE2	S3	SW5	SW4	SSW3	SW3	W6	WSW6	SW6	SW6	SSW5	SSE6	SSW10	SW11	SW8	W5	W3	WSW2	SSE3	S4	SSW4.0	SW11
23-Jun	SSE2	SSE3	S4	SW3	W3	WNW2	WNW6	NW6	WNW5	WSW7	WSW5	W4	W5	W5	SW3	N8	NNW5	NNE6	NNE7	N7	NE4	NE2	NNW12	NNW12	NW2.9	NNW12
24-Jun	NNE5	ESE2	N2	NNW3	NNW2	W1	NNW4	NW5	NNW6	NNW9	N9	NNE7	NNW10	NNW9	NW7	NW8	NW8	NNW11	NW8	NNW8	NNW5	NNW3	NNW3	NW4	NNW5.3	NNW11
25-Jun	NNW5	N4	NNW3	NW4	NNW4	NNW6	N9	NNE8	NE9	NNE10	NNE10	NNE10	NNE10	NNE11	NE12	NE11	NE12	NE11	NE10	NE7	NNE1	SE1	SSE2	SE3	NNE6.2	NE12
26-Jun	SE1	SE2	SSE2	SSE3	S2	SSE1	S2	WSW4	WSW6	SSW5	SW6	SSW7	SW8	WSW7	NNE11	NNE4	SSE2	SSE5	SSW3	S5	WNW9	SE3	S3	SSW4	SSW2.3	NNE11
27-Jun	WSW3	SW4	WSW4	WSW5	WSW5	W6	W6	W6	WSW6	WNW5	W8	WNW9	W9	NNW4	WSW8	N10	N5	W6	WNW9	WNW6	WSW3	SSW4	SSW4	SSW3	W4.3	NNE10
28-Jun	S3	SSW3	SSW4	SW4	WSW4	W4	WNW4	NW6	NW9	NW12	NW11	NNW12	NW12	NW11	NNW12	NNE14	NE12	NE11	NE10	NE9	NNE6	NE3	NE1	NE1	NNW4.6	NNE14
29-Jun	ESE0	SSE1	SE1	ENE1	ESE3	NNE2	E5	ESE7	ESE10	E8	E7	ESE6	DF	NE7	NE6	ENE6	E6	E7	ESE8	ESE7	ESE4	SE5	SE5	SE7	E4.6	ESE10
30-Jun	SE7	SE7	SE5	SSE5	SSE6	SSE4	S7	ESE3	SE7	SE8	SE12	SE12	ESE12	ESE11	ESE11	ESE11	ESE10	SE11	S11	SSE5	SSW2	SSE2	SSE3	S4	SE6.9	SE12

S2.1	S2.4	S2.3	S2.3	SSW2.5	SW2.6	SW2.3	WSW2.1	WSW2.0	WSW2.0	WSW2.1	W2.4	W2.4	NNW2.7	NNW2.1	NW0.8	NNW1.0	WSW1.3	NNW1.1	WSW0.6	SW1.3	S1.5	SSW1.1	S1.7		Diurnal Average
ESE9	ESE11	ESE11	ESE14	ESE13	S13	S16	S15	NNE17	SSE20	SSE21	S21	S20	S21	S21	SSW23	NNE19	NNW17	NNW16	NNE14	S12	SW10	NNW12	NNW12		Diurnal Maximum

DF - DAS Failure 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
Brion MacKay River - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	279	38.86	38.86
6 - 11	320	44.57	83.43
12 - 19	111	15.46	98.89
20 - 28	8	1.11	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 718

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Brion MacKay River - June 2016**

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	4	11	8	8	13	34	53	15	18	24	19	27	12	8	14	279
6 - 11	11	17	19	7	7	26	27	17	24	19	25	41	33	16	20	11	320
12 - 19	0	9	8	0	2	6	5	7	9	8	3	8	9	10	18	9	111
20 - 28	0	1	0	0	0	0	0	2	4	1	0	0	0	0	0	0	8
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
Totals	22	31	38	15	17	45	66	79	52	46	52	68	69	38	46	34	718

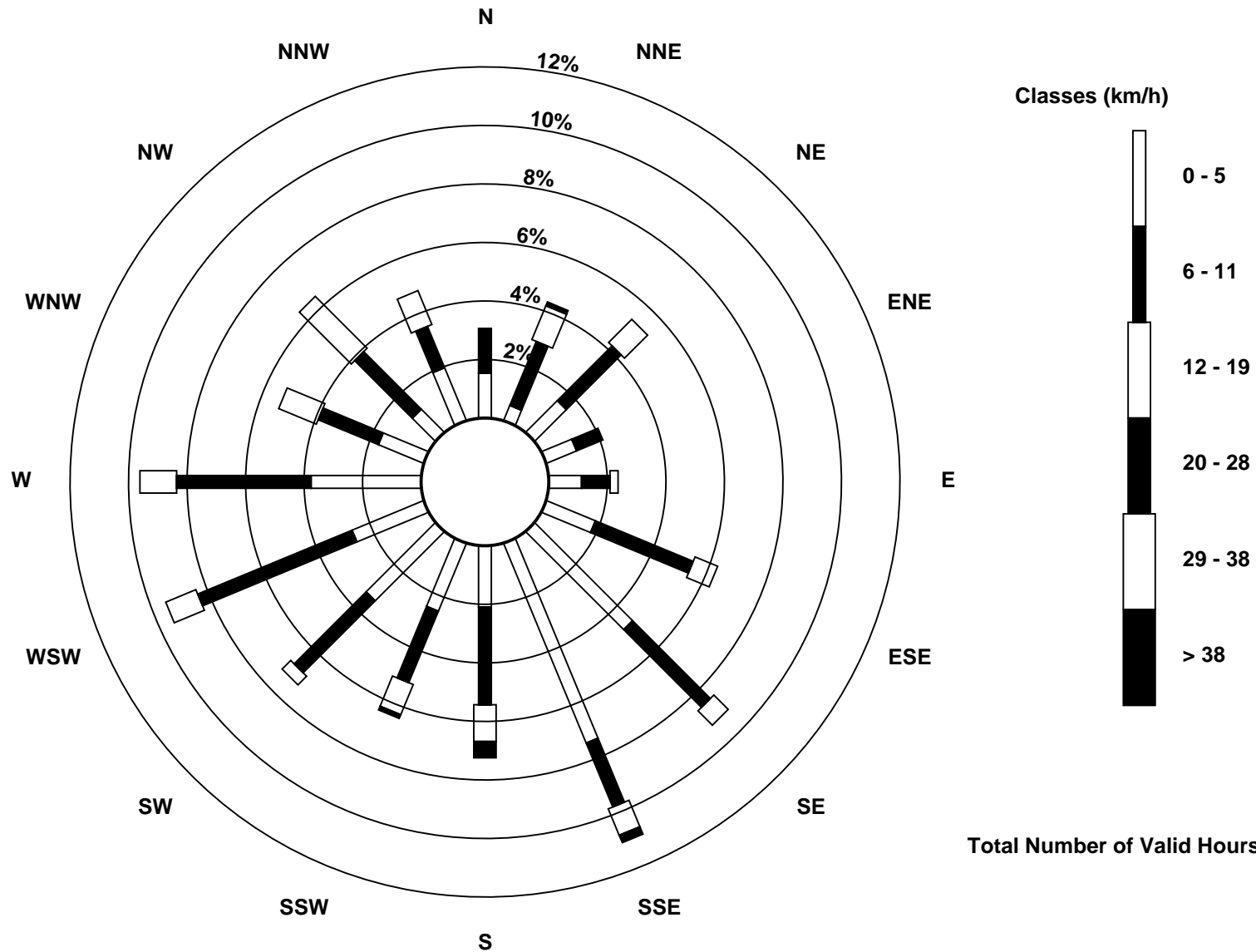
Total Number of Valid Hours: 718

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed (WS) - km/h
Brion MacKay River (AMS 20)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Brion MacKay River - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 8 km/h on Jun 15 16:00	Hours of Data: 718
Minimum Value: 0 km/h on Jun 19 23:00	Hours of Missing Data: 2
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 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-Jun	1	1	2	2	3	3	2	3	3	3	3	3	3	3	2	3	3	3	5	1	1	2	1	1	5
2-Jun	2	1	1	1	1	1	2	2	2	2	3	3	3	3	7	4	3	3	3	2	1	1	2	1	7
3-Jun	1	1	1	1	2	2	2	3	4	4	5	5	5	6	6	6	6	5	4	4	3	2	2	2	6
4-Jun	3	4	3	5	4	4	4	5	4	4	5	5	6	5	6	6	7	6	5	5	3	2	1	1	7
5-Jun	1	2	1	1	2	2	2	2	4	4	5	5	5	4	4	4	4	3	3	3	1	1	2	2	5
6-Jun	2	2	2	1	1	2	3	3	3	3	4	5	5	5	5	5	5	4	4	4	4	3	2	2	5
7-Jun	2	2	2	1	2	2	2	3	3	3	3	4	4	4	5	2	4	4	3	2	2	1	1	1	5
8-Jun	1	1	1	2	1	2	1	1	1	2	2	3	3	2	4	3	2	1	2	2	1	2	3	3	4
9-Jun	3	2	2	4	4	4	4	5	6	6	6	6	6	6	7	7	7	6	5	5	3	2	2	1	7
10-Jun	1	1	2	1	1	1	1	1	2	2	3	3	2	3	3	3	3	3	3	2	2	1	1	1	3
11-Jun	1	1	1	1	1	1	2	2	2	3	5	5	5	4	3	2	2	2	2	2	3	2	1	1	5
12-Jun	1	1	1	1	1	2	2	2	3	3	3	4	3	3	4	4	5	3	4	5	4	4	4	3	5
13-Jun	3	4	3	3	3	3	5	5	5	5	6	5	6	6	6	5	5	5	4	4	2	1	1	1	6
14-Jun	1	1	0	1	1	2	1	1	2	3	4	4	4	4	4	6	4	4	3	5	4	3	2	3	6
15-Jun	3	3	3	4	4	3	3	3	4	8	8	7	7	8	8	8	6	6	4	4	4	2	3	2	8
16-Jun	3	3	3	4	4	4	5	5	5	6	6	5	5	4	4	4	4	3	2	2	3	2	2	2	6
17-Jun	2	2	2	2	2	3	3	4	5	5	5	5	6	6	5	5	4	5	4	4	2	3	3	4	6
18-Jun	2	2	2	2	2	1	2	3	3	3	3	4	4	3	4	4	3	4	3	2	1	4	3	2	4
19-Jun	1	1	1	1	1	2	2	3	4	5	5	5	6	6	6	6	5	6	5	4	2	1	0	1	6
20-Jun	1	1	0	0	0	AF	1	1	1	2	3	3	3	3	3	3	3	2	2	1	1	1	1	1	3
21-Jun	1	2	2	2	3	3	2	3	3	4	4	4	3	4	3	3	3	3	2	1	1	0	1	1	4
22-Jun	1	1	1	1	1	1	2	2	1	2	3	3	4	4	3	4	5	4	3	2	1	1	1	2	5
23-Jun	1	1	2	2	1	1	2	2	2	2	2	2	3	3	1	3	2	2	3	2	2	1	5	4	5
24-Jun	3	2	2	1	2	1	2	1	2	3	3	3	5	4	2	2	3	4	2	2	2	1	1	1	5
25-Jun	1	1	1	1	1	2	3	2	3	3	3	4	4	4	4	4	4	4	3	3	1	1	1	1	4
26-Jun	1	1	0	1	1	1	1	3	2	3	3	3	4	3	5	4	2	2	2	2	4	2	2	1	5
27-Jun	1	1	1	2	2	2	3	2	2	2	3	4	4	4	4	4	3	3	3	2	1	2	1	1	4
28-Jun	1	1	1	1	1	2	2	2	3	4	4	4	4	4	5	6	4	4	4	3	2	1	1	1	6
29-Jun	1	1	1	1	1	1	2	2	3	3	4	4	DF	3	3	3	3	3	3	2	1	1	1	2	4
30-Jun	2	2	1	1	2	2	2	2	2	3	4	4	4	4	4	4	3	4	4	2	1	1	1	1	4

3	4	3	5	4	4	5	5	6	8	8	7	7	8	8	8	8	7	6	5	5	4	4	5	4	
Diurnal Maximum																									

DF - DAS Failure AF - Analyzer Failure



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Brion MacKay River - June 2016

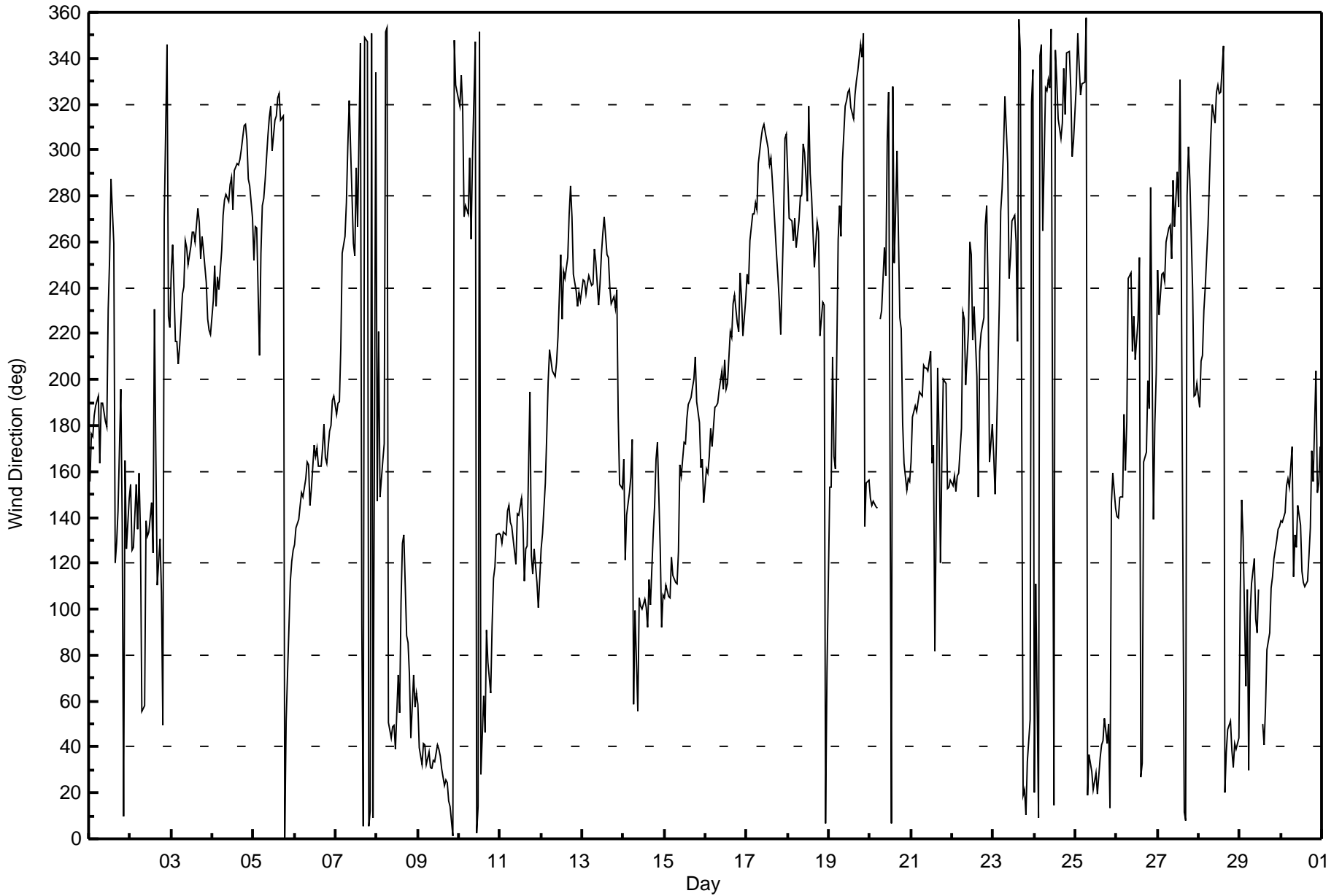
Direction of Maximum Speed: 192 deg on Jun 15 16:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 28.0 deg on Jun 9	Hours of Data: 718
Direction of Minimum Speed: 164 deg on Jun 8 04:00	Hours of Missing Data: 2
Direction of Minimum Daily Speed Average: 1.5 deg on Jun 20	Percent Operational Time: 99.7
Monthly Average Direction: 247.7 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-Jun	155	176	175	184	189	193	164	190	190	182	179	231	253	287	259	120	129	143	196	137	10	165	127	148	180.7
2-Jun	155	126	127	154	135	159	133	55	58	138	132	133	147	125	231	167	110	130	108	49	270	346	227	223	141.5
3-Jun	247	259	217	217	207	215	237	241	261	257	250	258	264	264	260	274	269	253	262	256	242	227	222	219	252.2
4-Jun	235	249	232	245	239	256	272	278	280	278	285	288	274	291	294	294	296	300	311	311	305	287	284	271	280.8
5-Jun	252	267	266	210	255	276	279	287	306	314	319	300	313	315	323	325	313	315	1	51	72	112	121	125	309.8
6-Jun	128	135	139	145	151	149	157	164	163	145	153	171	166	170	162	163	170	181	166	163	178	180	191	193	163.5
7-Jun	185	190	191	214	255	262	277	302	322	280	259	254	292	267	346	93	5	349	347	5	12	351	9	333	292.8
8-Jun	147	221	149	164	172	351	354	50	44	49	49	39	71	55	103	129	133	88	85	71	44	72	58	64	72.2
9-Jun	58	40	33	42	41	32	38	31	31	34	33	41	39	36	31	23	26	24	17	14	1	348	328	325	28.0
10-Jun	319	333	318	271	276	272	296	261	296	347	2	14	351	28	62	47	91	77	63	93	114	118	133	133	32.3
11-Jun	132	129	133	132	143	145	138	136	125	120	142	141	148	138	112	126	127	195	123	115	127	111	101	113	131.2
12-Jun	126	133	155	176	199	213	204	202	201	208	218	254	226	247	244	254	272	284	271	246	239	232	238	235	231.5
13-Jun	243	243	237	242	245	241	242	257	251	233	242	254	263	271	254	253	241	233	236	231	239	184	154	153	243.8
14-Jun	165	122	141	151	158	174	58	99	55	105	102	100	104	101	92	113	102	133	145	165	173	126	92	106	117.4
15-Jun	105	110	105	105	123	115	112	111	125	163	158	172	172	183	189	192	197	200	210	190	182	162	165	146	161.0
16-Jun	161	159	166	179	171	188	188	190	195	204	196	209	196	199	221	219	233	237	225	221	247	235	219	235	199.8
17-Jun	246	242	261	272	272	277	274	294	305	309	311	307	301	294	296	287	276	254	245	234	220	268	305	307	283.6
18-Jun	289	271	269	260	270	258	269	279	281	302	299	277	319	290	280	249	259	268	264	219	234	233	7	72	274.9
19-Jun	153	153	210	167	161	261	276	262	295	319	322	325	327	318	314	324	330	334	346	340	351	136	155	156	321.2
20-Jun	148	145	147	144	144	AF	227	230	258	245	304	325	7	328	251	273	300	227	222	181	163	152	157	155	232.8
21-Jun	164	184	189	186	190	195	193	206	205	205	204	212	164	172	82	205	174	120	166	200	199	152	153	156	185.6
22-Jun	153	158	151	158	159	179	230	226	198	221	260	255	217	232	201	149	212	220	227	267	276	239	164	181	209.9
23-Jun	167	150	175	233	273	283	301	324	294	244	253	269	271	260	217	357	343	19	21	11	34	52	321	335	313.5
24-Jun	20	111	9	341	346	265	327	326	331	327	353	14	344	331	314	305	312	336	315	342	343	327	297	304	332.6
25-Jun	329	351	337	324	329	329	358	19	37	29	21	25	29	19	35	41	42	52	41	50	13	146	159	144	24.8
26-Jun	140	140	149	149	185	160	182	244	247	212	228	209	225	253	27	33	164	168	200	187	284	139	181	203	212.3
27-Jun	248	228	246	246	243	260	266	267	252	287	267	291	275	331	238	11	8	280	301	287	239	193	194	198	270.6
28-Jun	188	208	211	230	240	267	287	307	320	312	325	328	325	325	345	20	38	48	51	38	31	41	39	44	346.3
29-Jun	108	148	131	67	109	30	97	111	122	96	90	108	DF	50	41	57	83	90	109	114	122	130	135	136	99.6
30-Jun	138	138	142	154	157	153	171	114	133	127	145	137	117	111	110	112	123	136	169	156	204	151	155	171	136.5

172.6 175.4 179.7 191.1 196.7 223.3 232.8 247.8 254.8 251.4 254.3 259.0 270.1 282.7 293.7 304.9 283.5 258.0 285.2 255.3 231.3 182.6 192.1 176.0

Diurnal Average

DF - DAS Failure 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
Brion MacKay River - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 100 deg on Jun 14 06:00	Hours of Data: 718
Minimum Value: 6 deg on Jun 21 23:00	Hours of Missing Data: 2
Percentiles: P ₁ = 10 P ₁₀ = 19 Q ₁ = 25 Median = 33 Q ₃ = 46 P ₉₀ = 62 P ₉₉ = 84	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-Jun	16	18	18	22	21	22	28	26	22	23	29	44	48	34	66	24	28	29	48	54	94	48	68	84	94
2-Jun	19	50	46	42	42	37	65	37	55	67	50	52	78	68	64	48	37	26	24	64	36	72	48	32	78
3-Jun	38	43	52	33	38	27	36	38	44	49	45	46	44	48	47	47	49	43	50	45	45	29	30	25	52
4-Jun	36	44	35	43	41	50	47	39	41	43	40	40	44	35	36	34	34	27	28	24	20	20	22	28	50
5-Jun	23	38	67	26	38	48	43	41	33	29	29	48	41	43	38	59	37	42	39	44	29	29	13	18	67
6-Jun	18	18	18	21	20	20	24	27	29	25	34	33	33	35	33	31	30	25	27	26	26	28	19	16	35
7-Jun	14	15	15	22	42	47	52	33	66	79	50	49	48	47	27	65	64	30	29	24	21	68	46	85	85
8-Jun	62	48	13	87	62	38	95	35	27	29	26	28	38	31	41	21	23	64	37	34	28	39	31	40	95
9-Jun	30	23	24	24	25	24	24	25	25	25	25	26	26	25	26	25	24	26	26	25	24	23	18	17	30
10-Jun	18	22	35	22	22	40	34	76	76	42	42	60	56	47	53	54	48	41	38	35	16	36	31	13	76
11-Jun	16	20	12	21	22	19	19	21	25	22	25	26	29	48	21	21	20	84	32	22	23	22	34	23	84
12-Jun	20	24	39	22	23	24	26	24	24	25	35	41	35	37	49	47	48	48	43	41	39	30	42	35	49
13-Jun	39	43	34	45	41	38	46	47	47	39	42	47	46	50	46	47	41	38	39	35	36	30	11	10	50
14-Jun	11	43	17	8	26	100	41	57	84	36	31	31	30	36	34	25	28	32	27	33	28	26	33	23	100
15-Jun	23	19	24	23	29	33	23	20	26	27	29	27	28	26	27	25	27	27	27	23	28	32	28	24	33
16-Jun	26	28	26	27	26	24	25	26	26	29	26	33	31	31	36	38	43	42	33	29	50	32	25	33	50
17-Jun	41	34	45	44	46	38	43	34	25	24	22	25	28	33	35	39	45	44	41	36	28	46	26	29	46
18-Jun	35	35	39	52	43	43	43	39	43	46	55	46	55	79	50	62	54	46	49	31	28	38	75	63	79
19-Jun	59	70	47	51	54	44	38	48	49	24	27	29	28	26	28	26	24	25	24	24	27	70	24	18	70
20-Jun	45	42	8	10	17	AF	46	48	89	64	57	78	81	72	70	60	62	66	70	19	14	14	18	12	89
21-Jun	14	15	16	16	18	20	22	27	32	33	33	41	42	43	65	73	66	65	37	23	16	10	6	11	73
22-Jun	8	19	14	16	28	19	32	51	69	68	53	51	63	69	61	42	34	32	35	48	36	56	16	21	69
23-Jun	50	20	36	69	46	71	31	36	46	34	49	65	77	45	44	39	37	52	42	25	22	68	28	24	77
24-Jun	51	40	86	19	43	68	31	24	26	22	40	50	51	22	31	27	27	25	22	25	26	29	24	17	86
25-Jun	21	19	16	16	17	20	24	28	32	28	30	37	40	34	30	32	32	33	29	26	78	62	39	9	78
26-Jun	16	20	13	10	48	74	49	48	42	61	66	62	56	49	43	74	74	41	45	33	40	78	57	27	78
27-Jun	34	23	31	38	38	42	52	52	46	55	52	49	44	78	43	40	56	53	35	32	38	26	20	19	78
28-Jun	26	24	21	34	43	63	42	29	28	28	34	33	34	37	29	29	32	27	31	27	21	31	57	35	63
29-Jun	81	44	85	42	33	22	36	25	23	39	50	69	DF	50	50	57	55	46	27	20	15	13	14	18	85
30-Jun	18	19	18	23	25	57	28	64	38	36	31	32	37	34	33	29	27	28	27	37	66	17	13	23	66

81	70	86	87	62	100	95	76	89	79	66	78	81	79	70	74	74	84	70	64	94	78	75	85	
Diurnal Maximum																								

DF - DAS Failure AF - Analyzer Failure



Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 23, 2016	Last Calibration	May 24, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	9:55	End Time (MST)	16:00
Gas Cert Reference	EY0000372	Station temp.	22 Deg C
Cal Gas Concentration	50.7 ppm	Cal Gas Exp Date	10-Jun-16
Calibrator Make/Model	API T700	Serial Number	1220
ZAG Make/Model	API 701	Serial Number	4766
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9627

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-633	-633
Analyzer IP address	192.168.1.43		Lamp voltage	833	828
Calculated slope	0.988129	0.990985	Chamber temp	45	45.4
Calculated intercept	0.510167	0.596384	Pressure	665.0	661.2
Analyzer Background	12.4	12.3	Flow	0.482	0.476
Analyzer Coefficient	0.987	0.972	Intensity	88	88

Analyzer make Thermo 43i Analyzer serial # 1501301450

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	79.9	810.2	819.9	0.988
calibrator zero	5000	0.0	0.0	0.3	----
high point	5000	79.9	810.2	817.2	0.991
second point	5000	40.1	406.6	409.9	0.992
third point	5000	20.1	203.8	203.7	1.000
as left zero	5000	0.0	0.0	0.4	----
as left span	5000	79.9	810.2	821.1	0.987
Average Correction Factor					0.995

Corrected As found 819.8 Previous response 819.4 % change 0.0%

Notes:

Sample inlet filter replaced after as founds. Charcoal/purafill material inside ZAG unit replaced after as founds. Adjusted span. As lefts began at 15:21 MST.

Calibration Performed By: Asad Hidayat



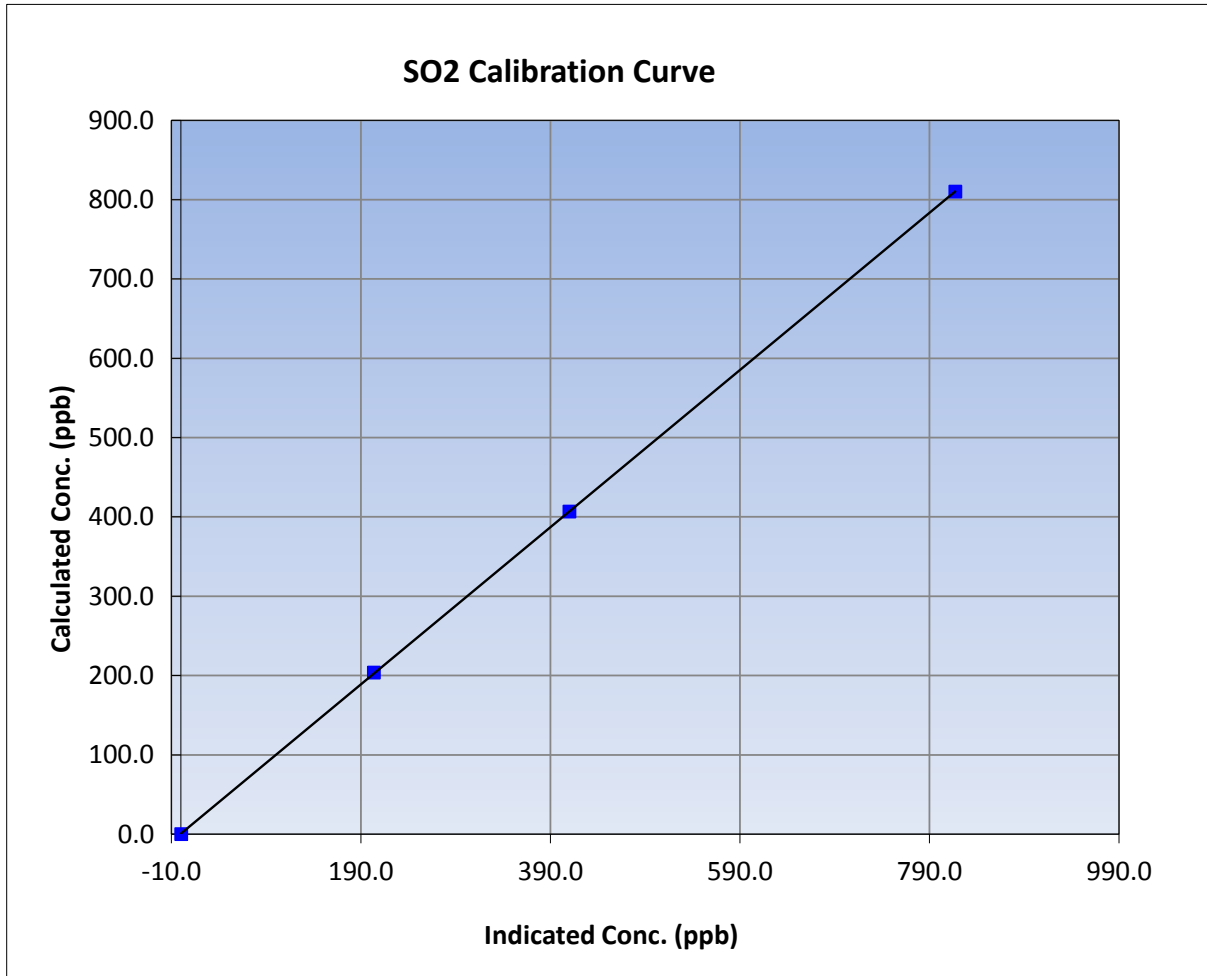
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 23, 2016	Previous Calibration	May 24, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	9:55	End Time (MST)	16:00
Analyzer make	Thermo 43i	Analyzer serial #	1501301450

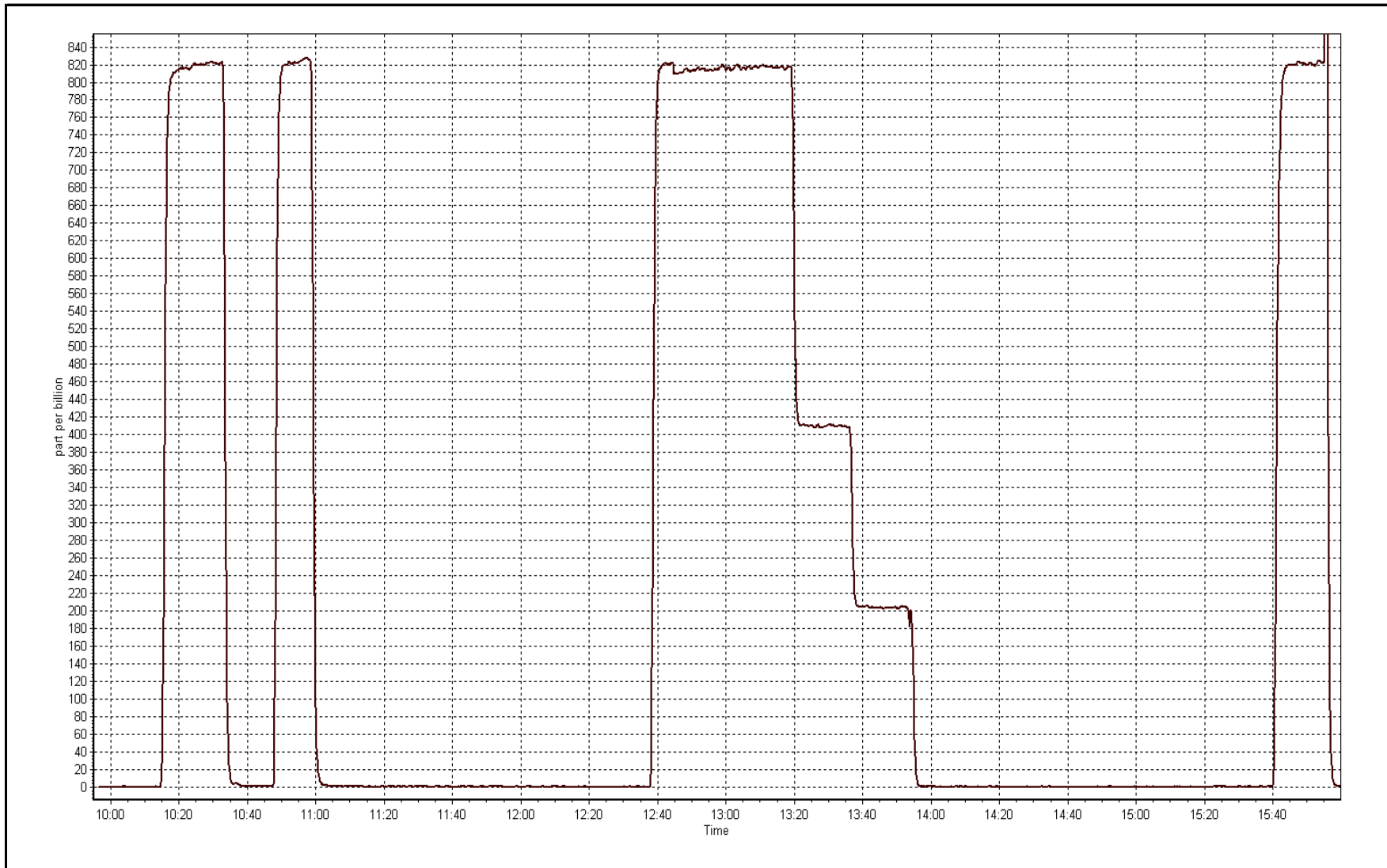
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.3	----	Correlation Coefficient	0.999993
810.2	817.2	0.9914		
406.6	409.9	0.9920	Slope	0.990985
203.8	203.7	1.0004		
			Intercept	0.596384



SO2 Calibration Plot

Date: June 23, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	June 22, 2016	Last Calibration	May 24, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	10:50	End Time (MST)	15:00
Gas Cert Reference	LL119508	Station temp.	22 Deg C
Cal Gas Concentration	5.35 ppm	Cal Gas Exp Date	13/02/2018
Calibrator Make/Model	API 700	Serial Number	1220
ZAG air Make/Model	API 701	Serial Number	4766
DACS make/model	Campbell Scientific CR3000	Serial Number	9627
SO2 gas concentration	50.7 ppm	SO2 gas cert/exp	EY0000372 10-Jun-16

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	504	505
Analyzer IP address	192.168.1.75		Lamp voltage	3133	2907
Calculated slope	1.001472	0.995554	Chamber temp	50	50
Calculated intercept	0.427275	0.365409	Pressure	23.0	23.0
Analyzer Background	25.2	25.2	Flow	0.608	0.609
Analyzer Coefficient	1.072	1.125	Intensity	74	72
			Converter temp.	317	317

Analyzer make/model	API T101	Analyzer serial #	196
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	75.6	80.9	80.9	1.000
SO2 scrubber check	5000	19.8	200.8	3.7	----
calibrator zero	5000	0.0	0.0	-0.2	----
high point	5000	75.6	80.9	81.0	0.999
second point	5000	37.9	40.6	40.2	1.009
third point	5000	19.0	20.3	19.9	1.020
as left zero	5000	0.0	0.0	0.4	----
as left span	5000	75.6	80.9	76.1	1.063
Average Correction Factor					1.009

Corrected As found	81.1	Previous response	80.3	% change	-0.9%
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Notes:

Sample inlet filter replaced after as founds. Span reponse changed after replacing the inlet filter. As left span was slow to stabilize and under target by 6.3%. No changes diagnostically.

Calibration Performed By: Asad Hidayat



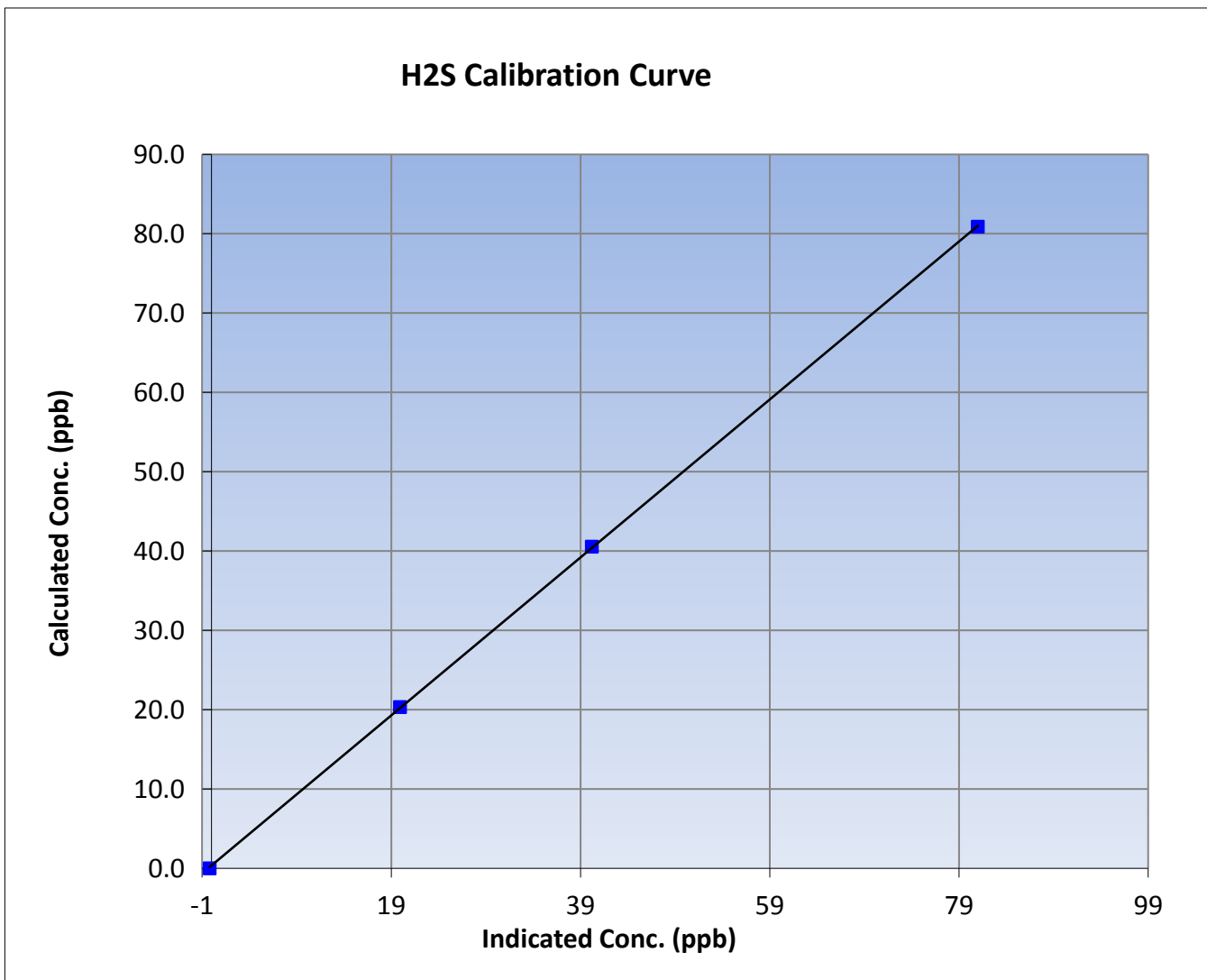
Wood Buffalo Environmental Association H2S Calibration Report

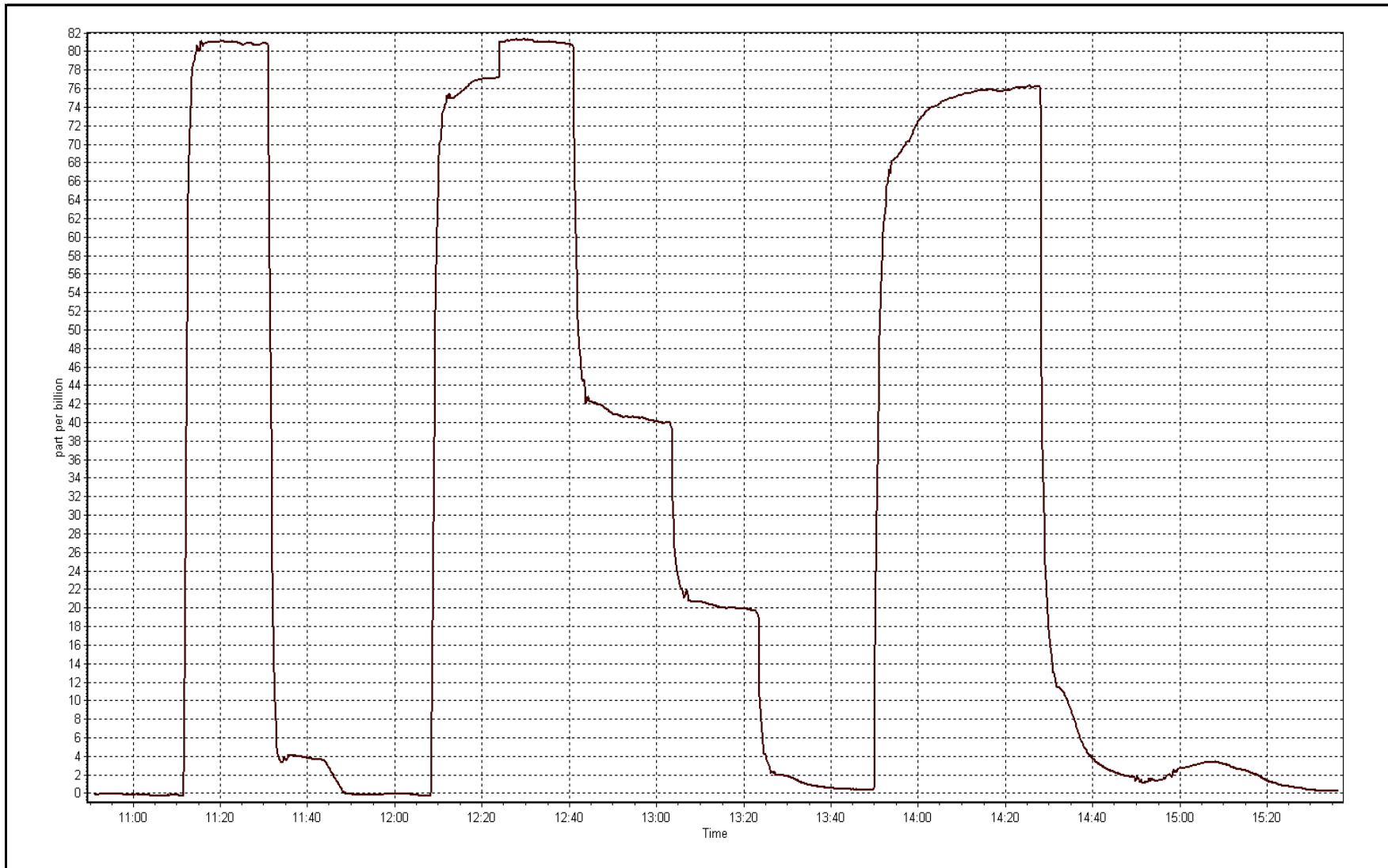
Station Information

Calibration Date	June 22, 2016	Previous Calibration	May 24, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	10:50	End Time (MST)	15:00
Analyzer make	API T101	Analyzer serial #	196

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	0.999976
80.9	81.0	0.9987		
40.6	40.2	1.0088	Slope	0.995554
20.3	19.9	1.0201		
			Intercept	0.365409







Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June-23-16	Last Calibration	May-24-16
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	9:55	End Time (MST)	16:00
Gas Cert Reference	EY0000372	Cal Gas Expiry Date	10/06/2016
CH4 Cal Gas Conc.	517 ppm	CH4 Equiv Conc.	1072.5 ppm
C3H8 Cal Gas Conc.	202 ppm	Station temp.	22 Deg C
Calibrator Make/Model	API T700	Serial Number	1220
ZAG make/model	Teledyne API 701	Serial Number	4766
DACS make/model	Campbell Scientific CR3000	Serial Number	9627

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 50 ppm		Sample Pressure	8.6	8.6
Analyzer IP address	192.168.1.51		Air or Bypass Press	34.3	34.3
Calculated slope	0.984789	0.997564	Fuel Pressure	23.9	23.9
Calculated intercept	0.143742	0.071038	Analyzer Coeff	4.5	4.5
			Analyzer BKG	2.100	1.970

Analyzer make	51i-LT	Analyzer serial #	1501663727
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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	-0.20	----
as found span	5000	79.9	17.14	17.14	1.000
calibrator zero	5000	0.0	0.00	-0.05	----
high point	5000	79.9	17.14	17.12	1.001
second point	5000	40.1	8.60	8.54	1.007
third point	5000	20.1	4.31	4.23	1.019
as left zero	5000	0.0	0.00	-0.10	----
as left span	5000	79.9	17.14	17.16	0.999
Average Correction Factor					1.009

Corrected As found	17.34	Previous response	17.26	% change	-0.5%
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Notes:

Sample inlet filter replaced after as founds. Scrubber/Purafill material inside ZAG replaced. High point dropped after doing PM on ZAG. Adjusted both zero and span.

Calibration Performed By:

Asad Hidayat



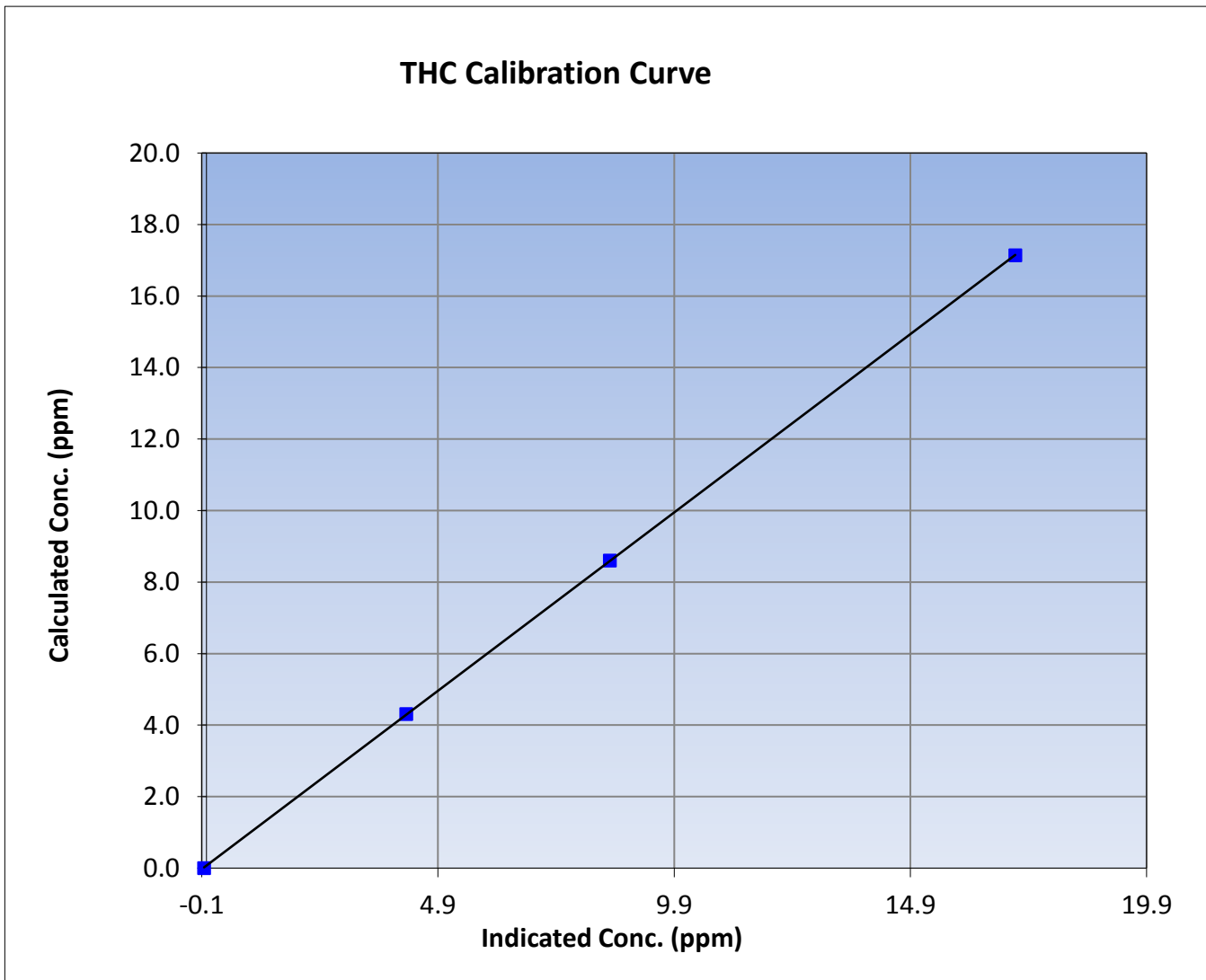
Wood Buffalo Environmental Association THC Calibration Report

Station Information

Calibration Date	June 23, 2016	Previous Calibration	May 24, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	9:55	End Time (MST)	16:00
Analyzer make	51i-LT	Analyzer serial #	1501663727

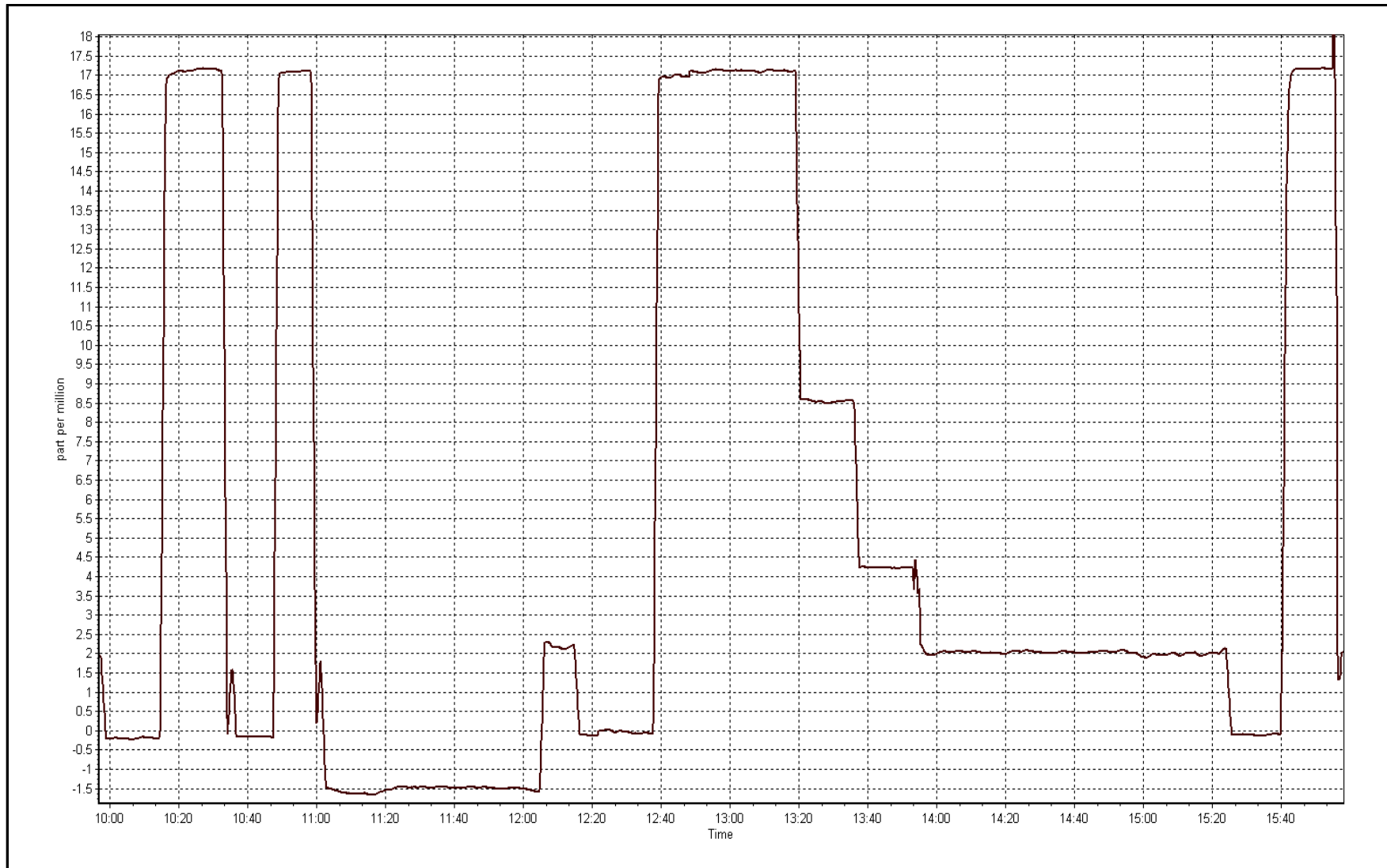
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	-0.05	----	Correlation Coefficient	0.999993
17.14	17.12	1.0011		
8.60	8.54	1.0072	Slope	0.997564
4.31	4.23	1.0193		
			Intercept	0.071038



THC Calibration Plot

Date: June 23, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 23, 2016	Previous Calibration	May 24, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Reason:	Routine		
Start Time (MST)	9:55	End Time (MST)	16:00
NO Cal Gas Conc	50.1 ppm	Gas Cert Reference	EY0000372
NOX Cal Gas Conc	50.4 ppm	Cal Gas Expiry Date	June 10, 2016
Calibrator	API T700	Serial Number	1220
Zero air Generator	Teledyne API T701	Serial Number	4766

DACS Information

DACS make & model	Cambell Scientific CR3000	DACS serial No.	9627
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.998988	0.997924	1.001559
	Data Offset	-0.781749	-0.604062	-0.758571
Current Calibration	Data Slope	0.996186	0.994298	0.993256
	Data Offset	-0.616301	-0.402050	-0.451134

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1505164379
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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	1.128		1.143	
NOX coefficient	1.003		1.003	
NO2 coefficient	0.995		0.995	
NO bkgrnd	3.4		3.5	
NOX bkgrnd	3.7		3.7	
Chamber Temp	50.3	Deg C	50.6	Deg C
Moly Temp	323.4	Deg C	325.6	Deg C
PMT voltage	-767.4	V	-767.4	V
PMT Temp	-2.7	Deg C	-2.8	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	170.8	mmHg	171.1	mmHg
R Cell Press Nox	170.8	mmHg	171.1	mmHg
NO sample flow	0.806	lpm	0.807	lpm
Nox sample Flow	0.806	lpm	0.806	lpm

Notes:

Sample inlet filter and Charcoal/purafill material for ZAG unit replaced after as founds. Span response dropped after PM on ZAG. Span adjusted. Nox drifted during GPT; second high NO point used for GPT reference.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 23, 2016

Station Number:

AMS 20

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	-0.3	-0.2	----	----
as found span	5000	79.9	805.4	800.6	4.8	798.0	793.4	4.6	1.0093	1.0091
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.2	-0.1	----	----
high point	5000	79.9	805.4	800.6	4.8	808.2	804.9	3.4	0.9966	0.9947
second point	5000	40.1	404.2	401.8	2.4	408.2	406.1	2.2	0.9902	0.9895
third point	5000	20.1	202.6	201.4	1.2	204.0	202.8	1.3	0.9931	0.9934
as left zero	5000	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	----	----
as left span	5000	79.9	805.4	486.5	318.9	830.8	485.9	345.0	0.9694	1.0013
Average Correction Factor									0.9933	0.9925

Corrected As found
Previous Response

NO_x= 798.5
NO_x= 807.0

NO= 793.7
NO= 802.9

Percent Change

NO_x= 1.1%

NO= 1.2%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 79.90 ccm NOx ref calc conc = 805.4 ppb NO ref calc conc = 800.6 ppb

O3 Setpoint (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
1st NO ref point		4.8	825.5	820.1	-0.1	0.9757	0.9763	----	----
1st NO2 (300)	486.5	338.4	827.1	486.5	340.6	0.9738	----	0.9935	100.7%
2nd NO2 (200)	591.1	233.8	827.3	591.1	236.3	0.9735	----	0.9896	101.0%
3rd NO2 (100)	703.2	121.7	826.8	703.2	123.6	0.9741	----	0.9842	101.6%
2nd NO ref point		4.8	825.5	820.1	5.4	0.9757	0.9763	----	----
Average Correction Factor						0.9743		0.9891	101.1%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

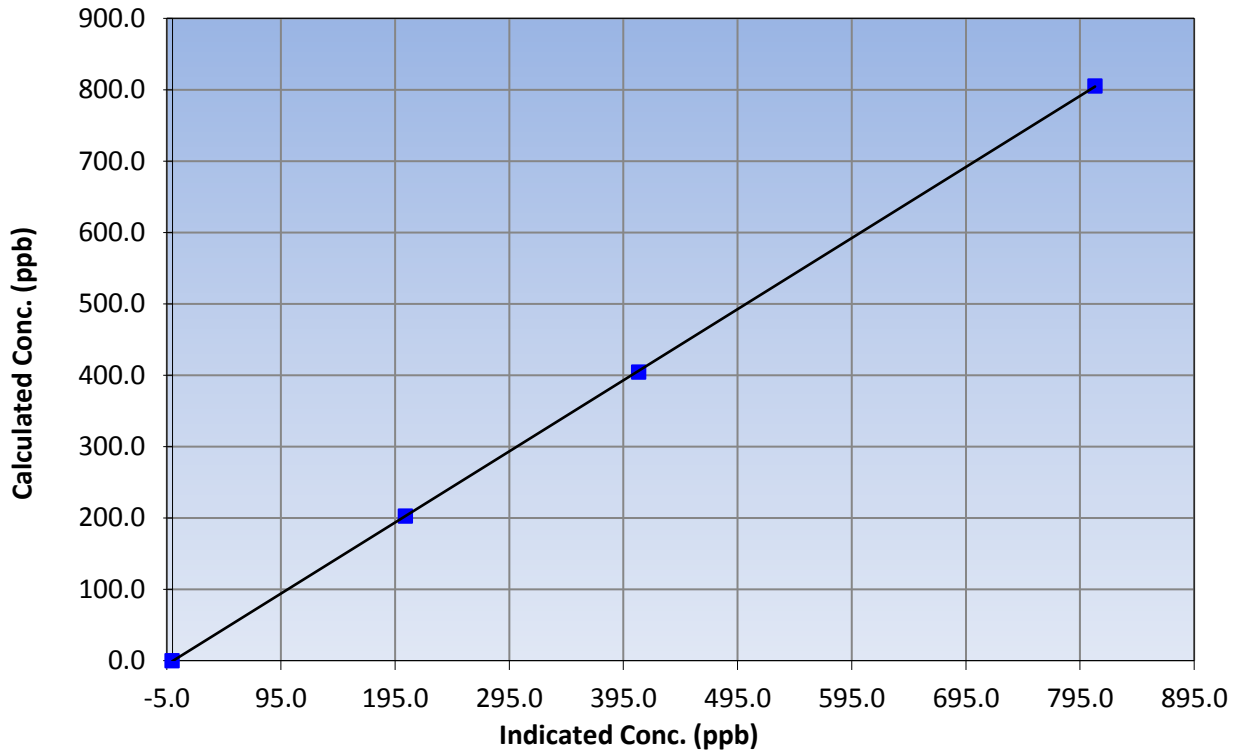
Station Information

Calibration Date	June 23, 2016	Previous Calibration	May 24, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	9:55	End Time (MST)	16:00
Analyzer make	Thermo 42i	Analyzer serial #	1505164379

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.3	----	Correlation Coefficient	0.999986
805.4	808.2	0.9966		
404.2	408.2	0.9902	Slope	0.996186
202.6	204.0	0.9931		
			Intercept	-0.616301

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

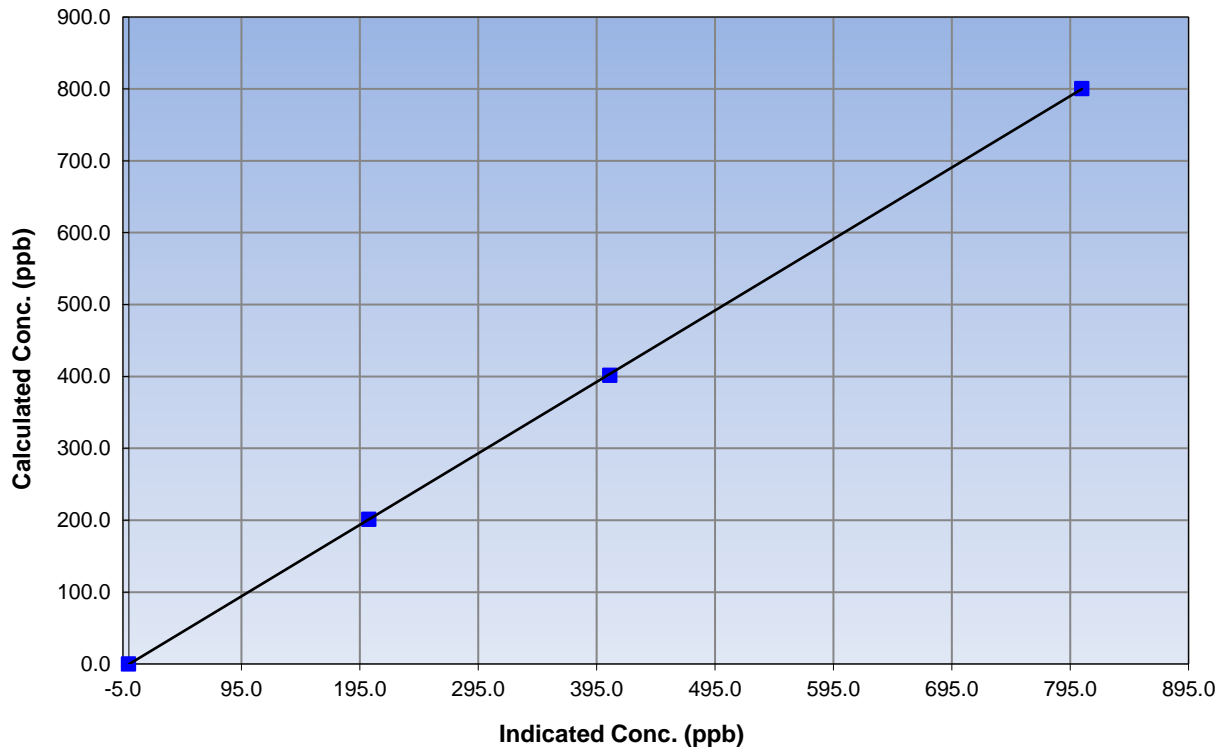
Station Information

Calibration Date	June 23, 2016	Previous Calibration	May 24, 2016
Station Name	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	9:55	End Time (MST)	16:00
Analyzer make	Thermo 42i	Analyzer serial #	1505164379

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	N/A	Correlation Coefficient	0.999990
800.6	804.9	0.9947		
401.8	406.1	0.9895	Slope	0.994298
201.4	202.8	0.9934		
			Intercept	-0.402050

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

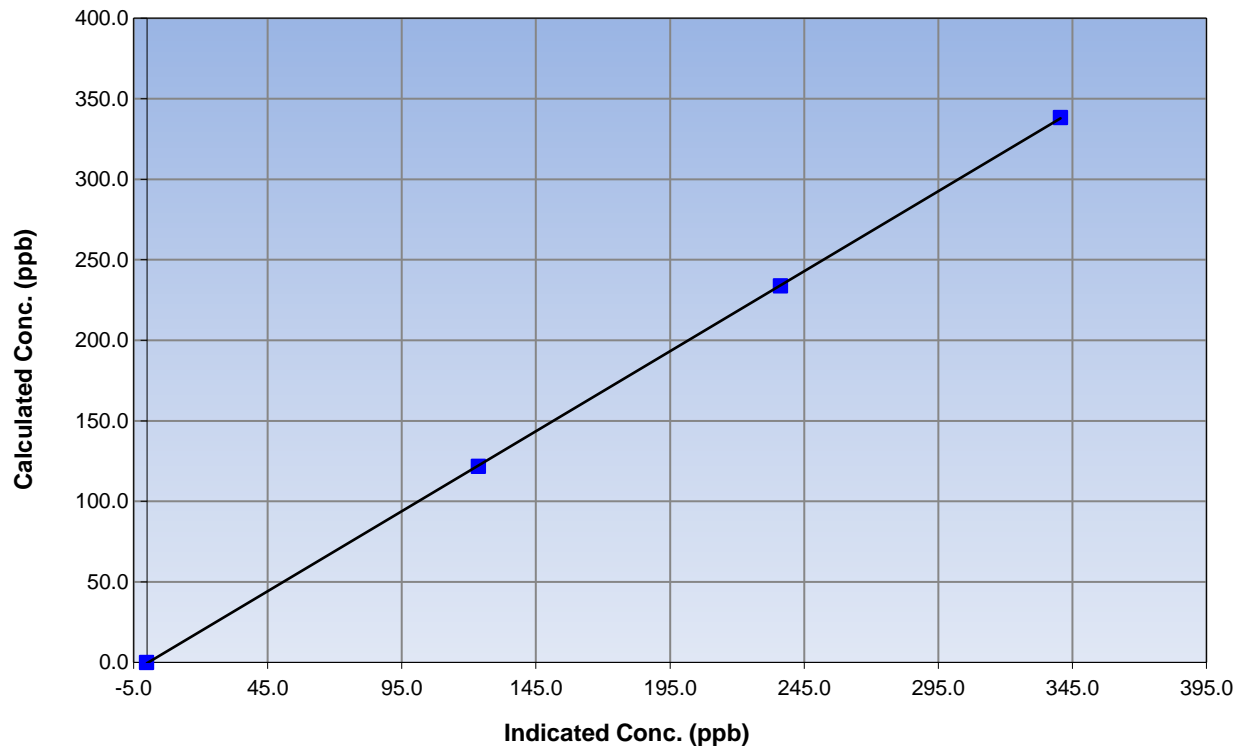
Station Information

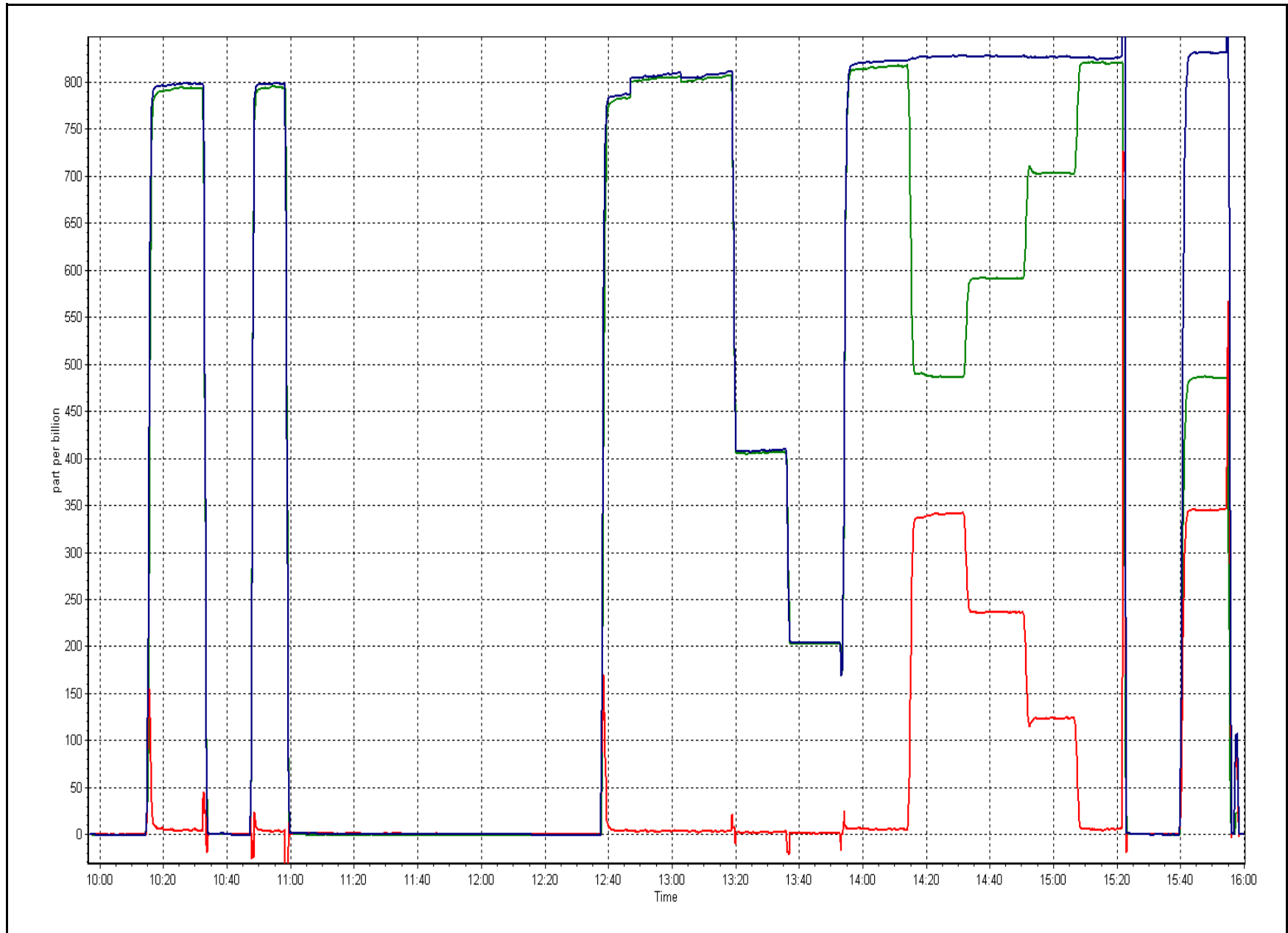
Calibration Date	June 23, 2016	Previous Calibration	May 24, 2016
Station Number	Brion Mackay River	Station Number	AMS 20
Start Time (MST)	9:55	End Time (MST)	16:00
Analyzer make	Thermo 42i	Analyzer serial #	1505164379

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	N/A	Correlation Coefficient	0.999981
338.4	340.6	0.9935		
233.8	236.3	0.9896	Slope	0.993256
121.7	123.6	0.9842		
			Intercept	-0.451134

NO₂ Calibration Curve







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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

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

**AMS 21
CONKLIN COMMUNITY
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN COMMUNITY (AMS 21)
 JUNE 2016

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	682	37	38	99.86	1	0	0	0
TRS(ppb) Average	488	36	232	72.78	1	0	1	0
THC(ppm) Average	677	36	43	99.03	2.6	-	2	-
NMHC(ppm) Average	677	36	43	99.03	0.099	-	0.014	-
CH4(ppm) Average	677	36	43	99.03	2.6	-	2	-
O3 (ppb) Average	685	34	35	99.86	69	0	47	-
NO2 (ppb) Average	679	37	41	99.44	6	0	2	-
NO (ppb) Average	679	37	41	99.44	5	-	0	-
NOX (ppb) Average	679	37	41	99.44	11	-	2	-
PM2.5 (ug/m3) Average	668	5	52	93.47	221.6	-	74.3	1
Wind Speed 10 m (km/h) Average	716	0	4	99.44	27	-	14	-
Wind Direction 10 m (deg) Average	716	0	4	99.44	-	-	-	-
Temperature 2 m (C) Average	720	0	0	100.00	27.7	-	22.2	-
Relative Humidity (%) Average	720	0	0	100.00	99	-	97.0	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN COMMUNITY (AMS 21)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile							
					Min	P10	Q1	Median	Q3	P90	Max	
SO2 (ppb) Average	682	0.2	0	-	0	0	0	0	0	0	0	1
TRS (ppb) Average	488	0.4	0	-	0	0	0	0	0	1	1	1
THC (ppm) Average	677	1.9	0.1	-	1.8	1.8	1.8	1.9	1.9	2	2	2.6
NMHC(ppm) Average	677	0.002	0.009	-	0	0	0	0	0	0	0	0.099
CH4(ppm) Average	677	1.9	0.1	-	1.8	1.8	1.8	1.9	1.9	2	2	2.6
O3 (ppb) Average	685	32.7	14	-	4	11	23	35	42	48	48	69
NO2 (ppb) Average	679	0.8	1	-	0	0	0	1	1	2	2	6
NO (ppb) Average	679	0.1	0	-	0	0	0	0	0	0	0	5
NOX (ppb) Average	679	1	1	-	0	0	0	1	1	2	2	11
PM2.5 (ug/m3) Average	668	6.26	19.8	-	0	0.8	1.6	2.7	4.5	8	8	221.6
Wind Speed 10 m (km/h) Average	716	7.6	5	-	0	2	4	7	11	14	14	27
Wind Direction 10 m (deg) Average	716	-	-	-	-	-	-	-	-	-	-	-
Temperature 2 m (C) Average	720	15.66	5.8	-	0.5	8.6	11.2	14.6	20.2	24	24	27.7
Relative Humidity (%) Average	720	64.7	25	-	18	29	42	67	88	96	96	99

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONKLIN COMMUNITY (AMS 21)
JUNE 2016

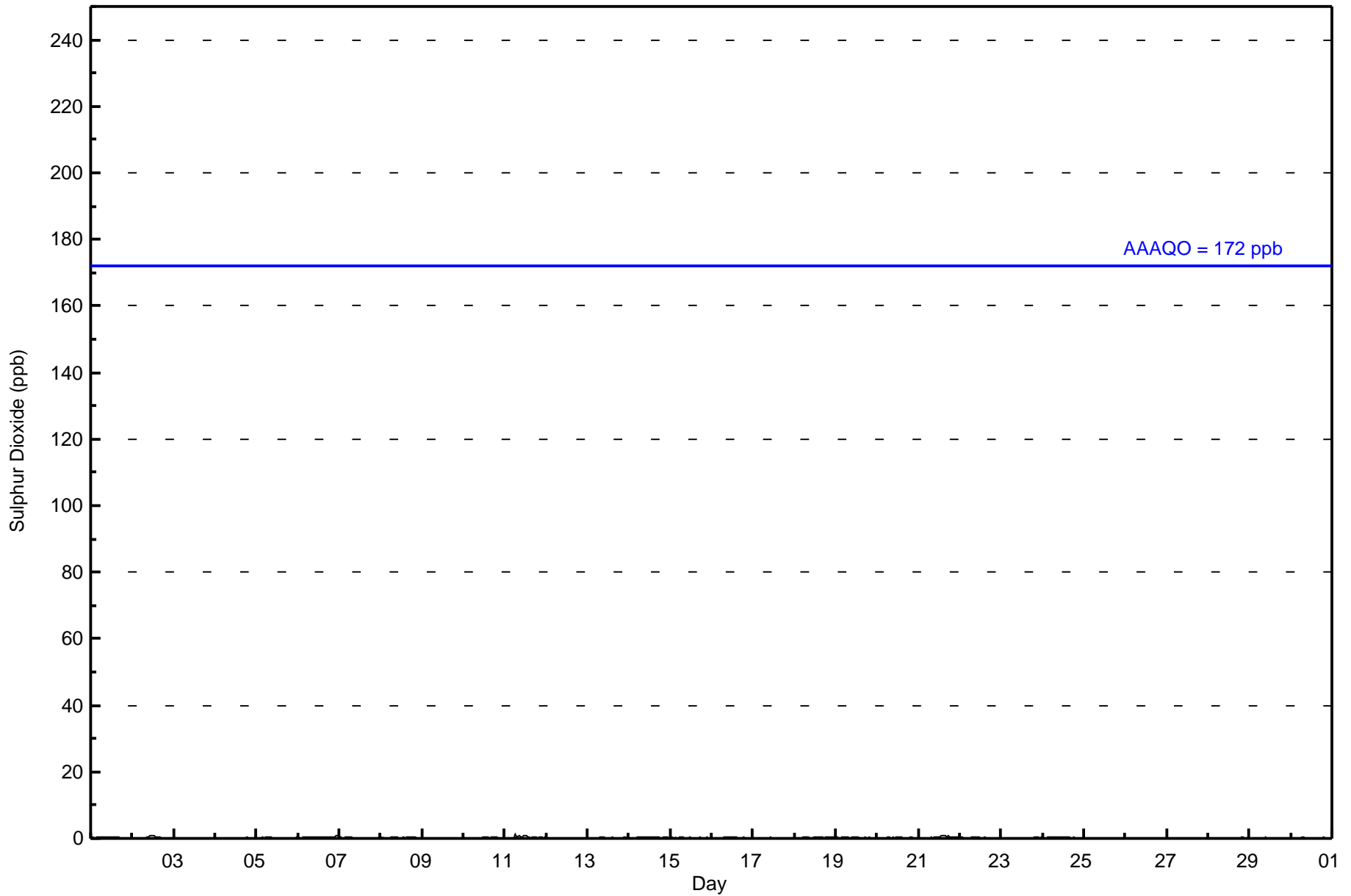
OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2, THC, O3, NO2	08 Jun 2016 12:00	08 Jun 2016 12:00	1	Maintenance - manifold cleaning
TRS	07 Jun 2016 10:00	07 Jun 2016 16:00	7	Maintenance - diagnostics/repairs
TRS	07 Jun 2016 17:00	08 Jun 2016 10:00	18	Analyzer Failure - operating outside of AMD criteria
TRS	10 Jun 2016 08:00	17 Jun 2016 10:00	171	Analyzer Failure - operating outside of AMD criteria
NMHC, CH4, THC	09 Jun 2016 12:00	09 Jun 2016 17:00	6	Maintenance - zero air generator serviced
NO2, NO, NOX	14 Jun 2016 09:00	14 Jun 2016 11:00	3	Maintenance - confirmed calibration points for Ozone
PM2.5	05 Jun 2016 10:00	05 Jun 2016 12:00	3	Unstable operation - excessive baseline drift
PM2.5	09 Jun 2016 10:00	10 Jun 2016 02:00	17	Unstable operation - excessive baseline drift
PM2.5	15 Jun 2016 11:00	16 Jun 2016 10:00	24	Analyzer Failure - sample pump failure
PM2.5	16 Jun 2016 11:00	16 Jun 2016 13:00	3	Maintenance - Flow and zero check
Wind Speed, Wind Direction	21 Jun 2016 21:00	21 Jun 2016 21:00	1	Flat line in sensor output signal
Wind Speed, Wind Direction	29 Jun 2016 03:00	29 Jun 2016 05:00	3	Flat line in sensor output signal



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Conklin Community - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Conklin Community - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	682	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: 682

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Conklin Community - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	32	21	6	8	16	39	39	57	54	63	52	45	41	61	66	78	678
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
Totals	32	21	6	8	16	39	39	57	54	63	52	45	41	61	66	78	678

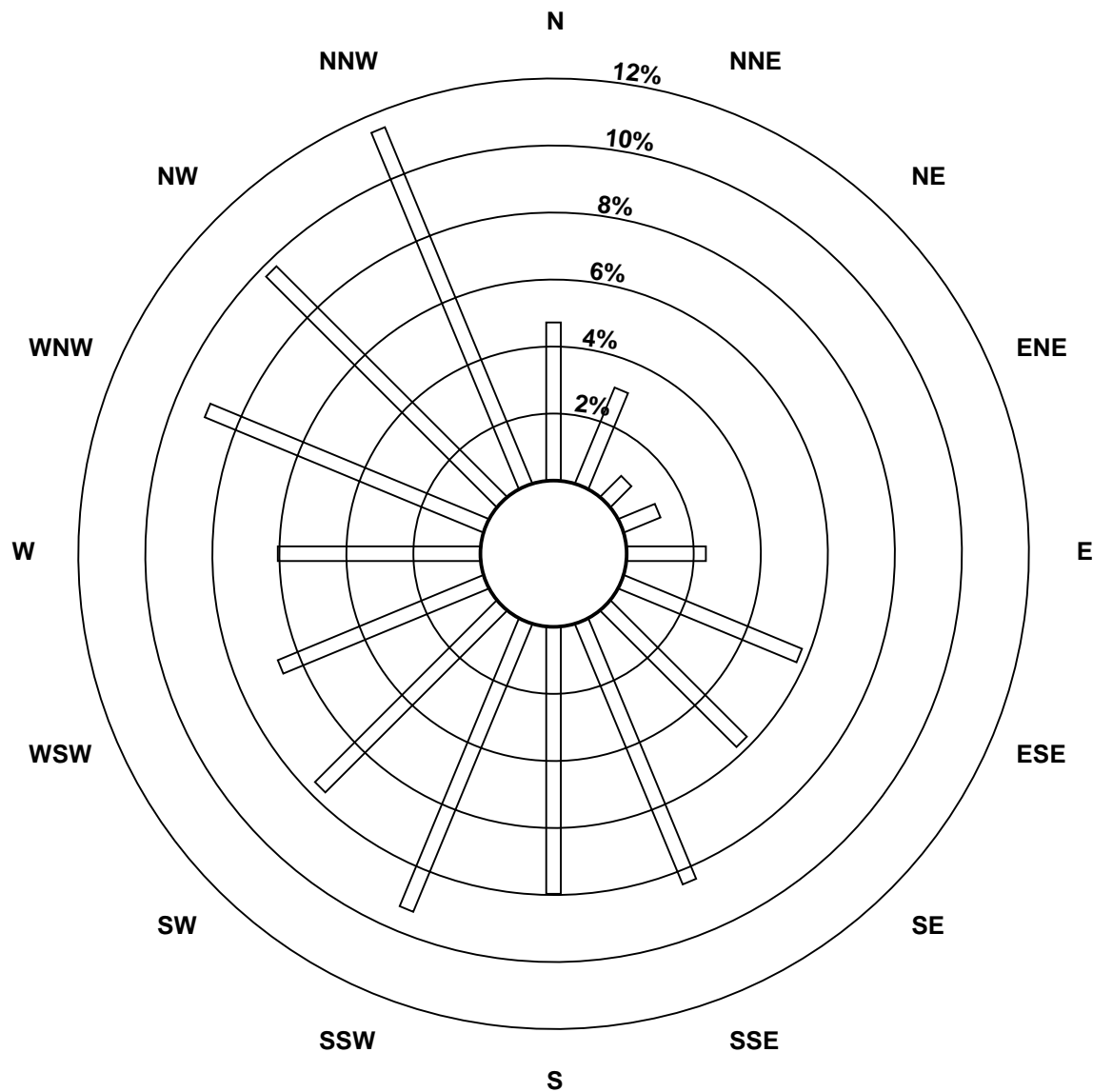
Total Number of Valid Hours: 678

Total Number of Hours: 720

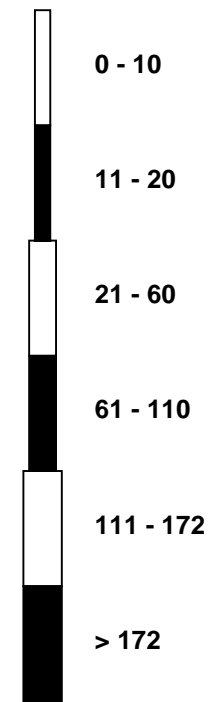


Wood Buffalo Environmental Association
Wind Rose Jun 2016

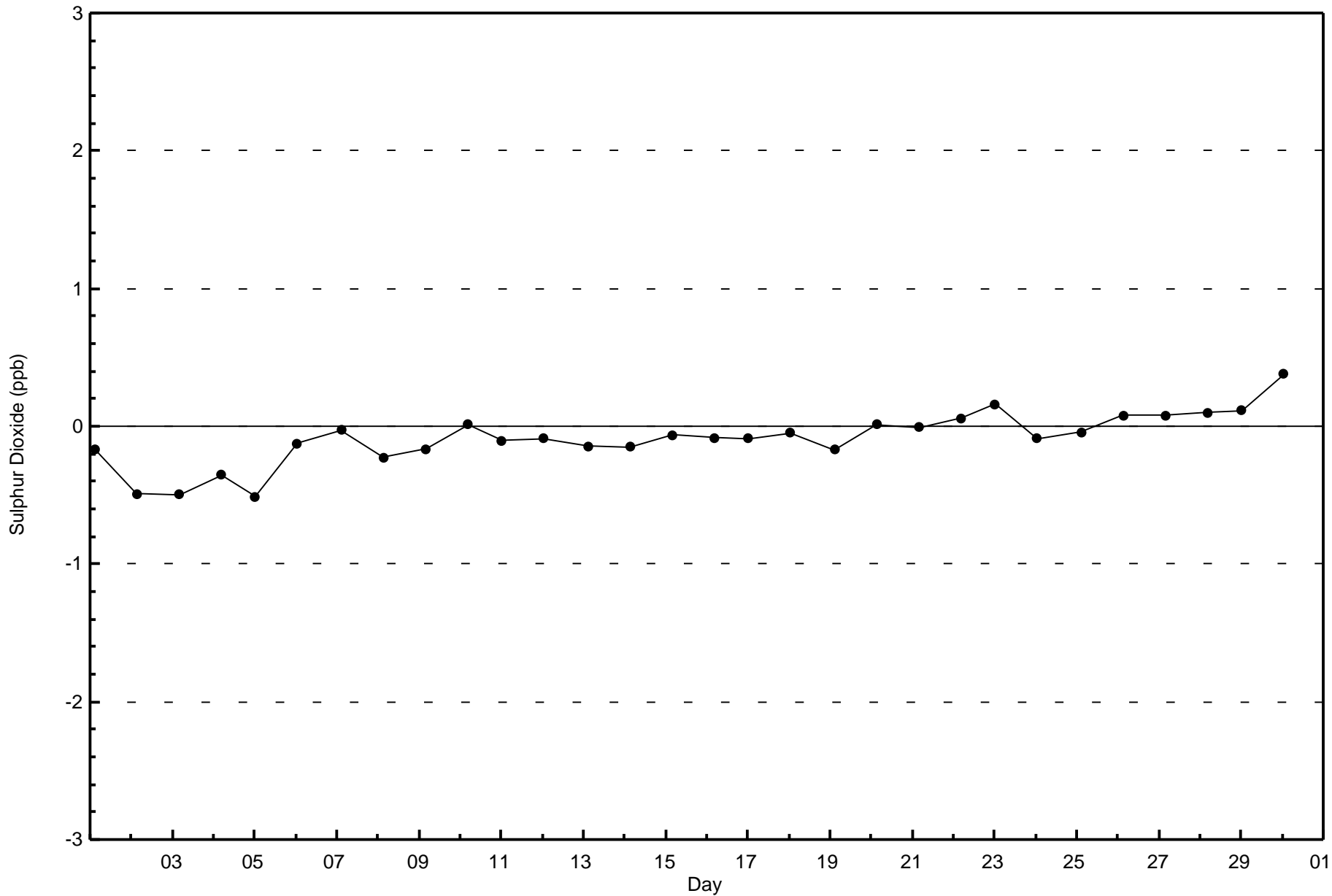
Sulphur Dioxide (SO₂) - ppb
Conklin Community (AMS 21)

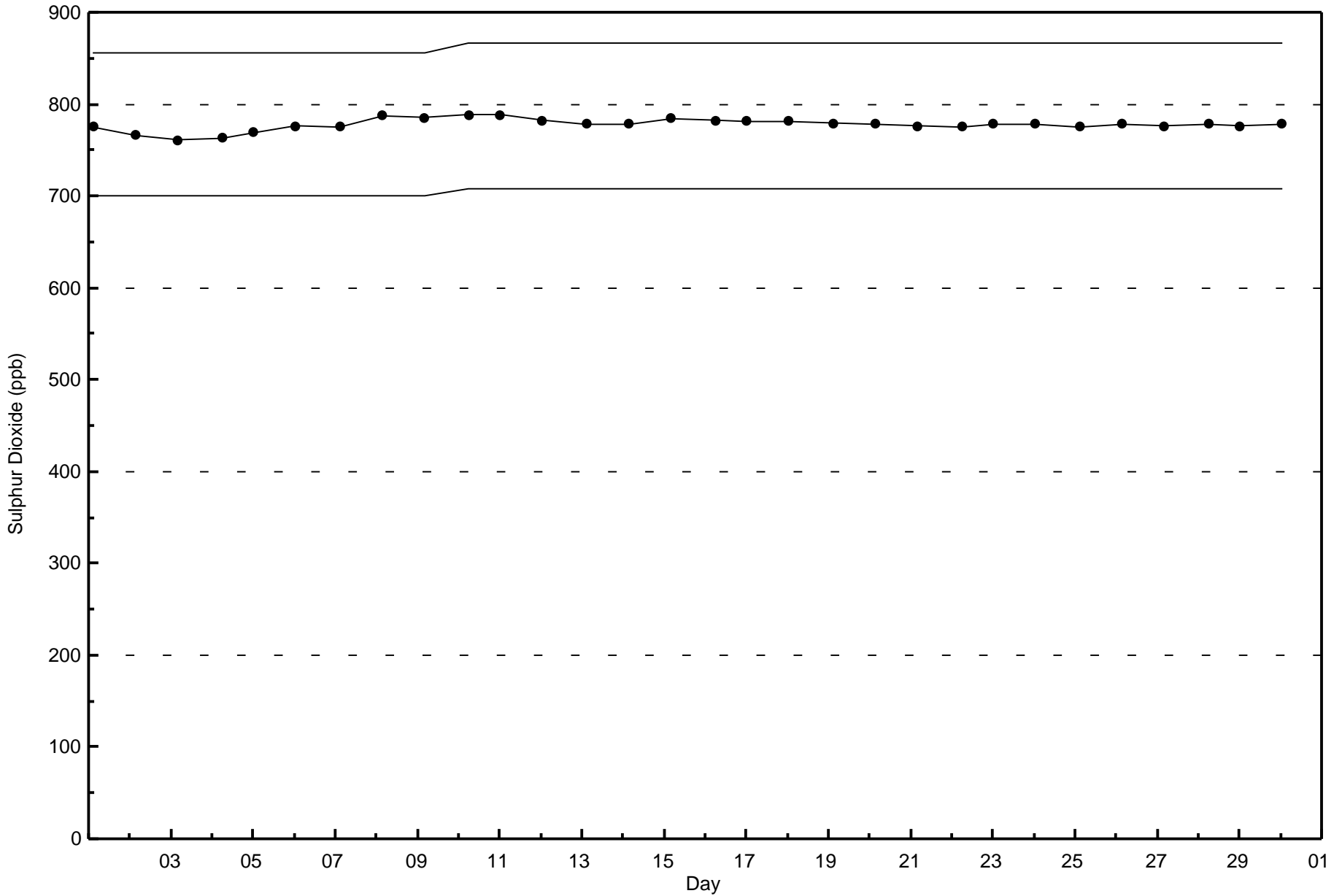


Classes (ppb)



Total Number of Valid Hours: 678







Wood Buffalo Environmental Association

Summary of Hour Averages

Total Reduced Sulphur (TRS) - ppb

Conklin Community - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 1 ppb on Jun 25 22:00	Maximum Daily Average: 0.7 ppb on Jun 25		Hours of Data:	488
Minimum Value: 0 ppb on Jun 26 06:00	Minimum Daily Average: 0.2 ppb on Jun 3		Hours of Missing Data:	232
Maximum Diurnal Average: 0.6 ppb at hour 22	Minimum Diurnal Average: 0.3 ppb at hour 4		Hours of Calibration:	36
Monthly Average: 0.4 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 1 P ₉₉ = 1		Percent Operational Time:	72.8

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-Jun	0	0	0	Z	0	0	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	0.5	1	
2-Jun	0	0	0	0	Z	0	0	0	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	0	0.5	1
3-Jun	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
4-Jun	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
5-Jun	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	0.3	1
6-Jun	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
7-Jun	0	0	0	Z	0	0	0	0	0	M	M	M	M	M	M	M	M	AF	AF	AF	AF	AF	AF	AF	AF	--	0
8-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	C	C	C	C	C	C	C	0	0	0	0	0	0	--	0
9-Jun	0	1	0	1	1	Z	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1
10-Jun	1	0	0	0	0	0	Z	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	1
11-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
12-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
13-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
14-Jun	AF	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-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
16-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	--
17-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	C	C	C	C	C	C	C	0	0	0	0	0	0	0	0	--	0
18-Jun	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
19-Jun	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
20-Jun	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
21-Jun	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
22-Jun	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	0.4	1
23-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	1	1	1	0.5	1
24-Jun	0	0	Z	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1
25-Jun	1	1	1	Z	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
26-Jun	1	0	0	0	Z	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0.6	1
27-Jun	1	1	1	1	0	Z	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	0.5	1
28-Jun	1	1	1	1	0	0	Z	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0.5	1
29-Jun	1	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.4	1
30-Jun	1	0	Z	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	0.5	1

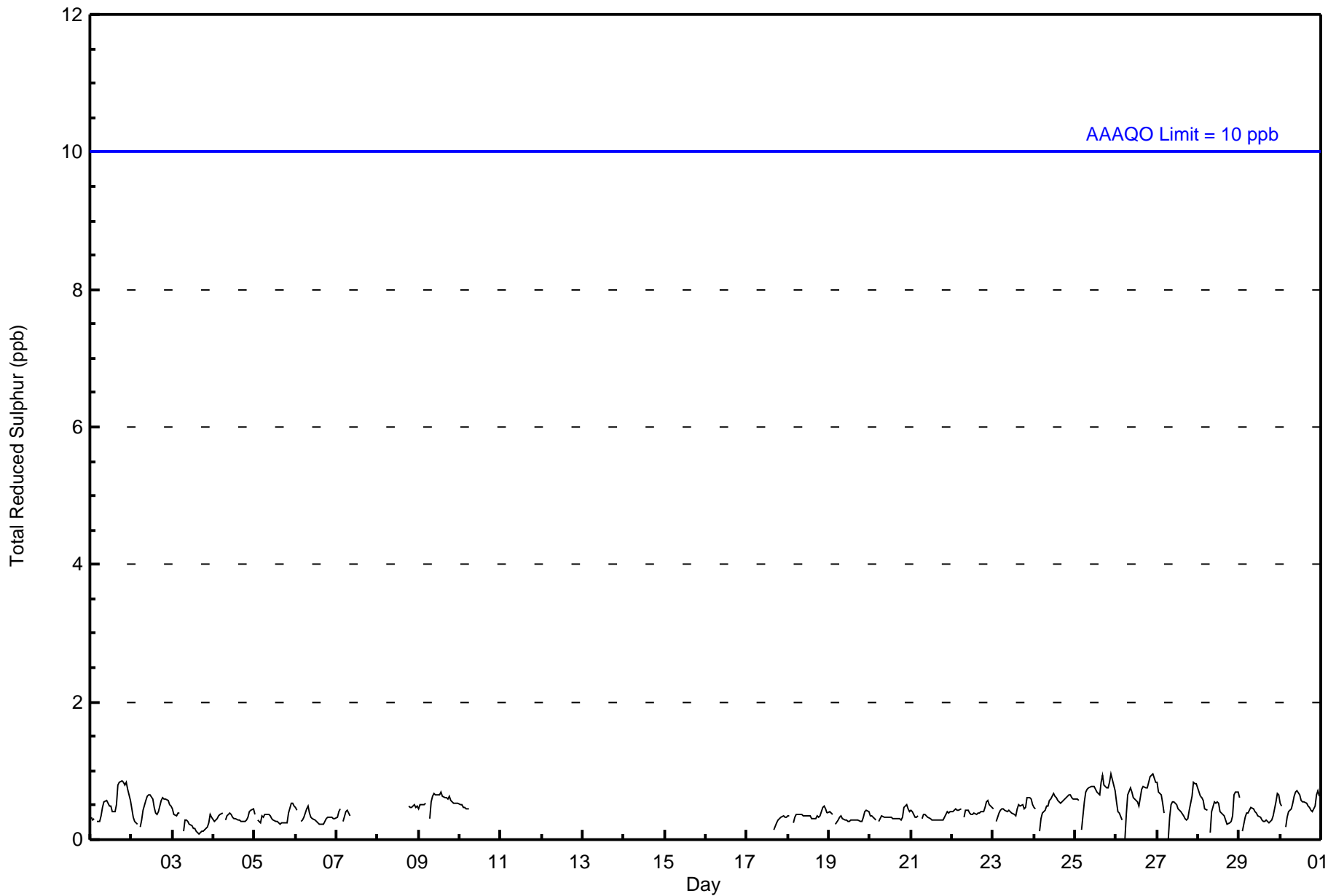
0.5	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.6	0.6	0.5	Diurnal Average	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Diurnal Maximum	

Z - zerspan C - Calibration M - Maintenance AF - Analyzer Failure
 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 Community - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Conklin Community - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	488	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: 488

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Reduced Sulphur (TRS) - ppb
Conklin Community - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	29	16	4	6	13	27	15	41	40	41	22	18	33	47	65	67	484
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
Totals	29	16	4	6	13	27	15	41	40	41	22	18	33	47	65	67	484

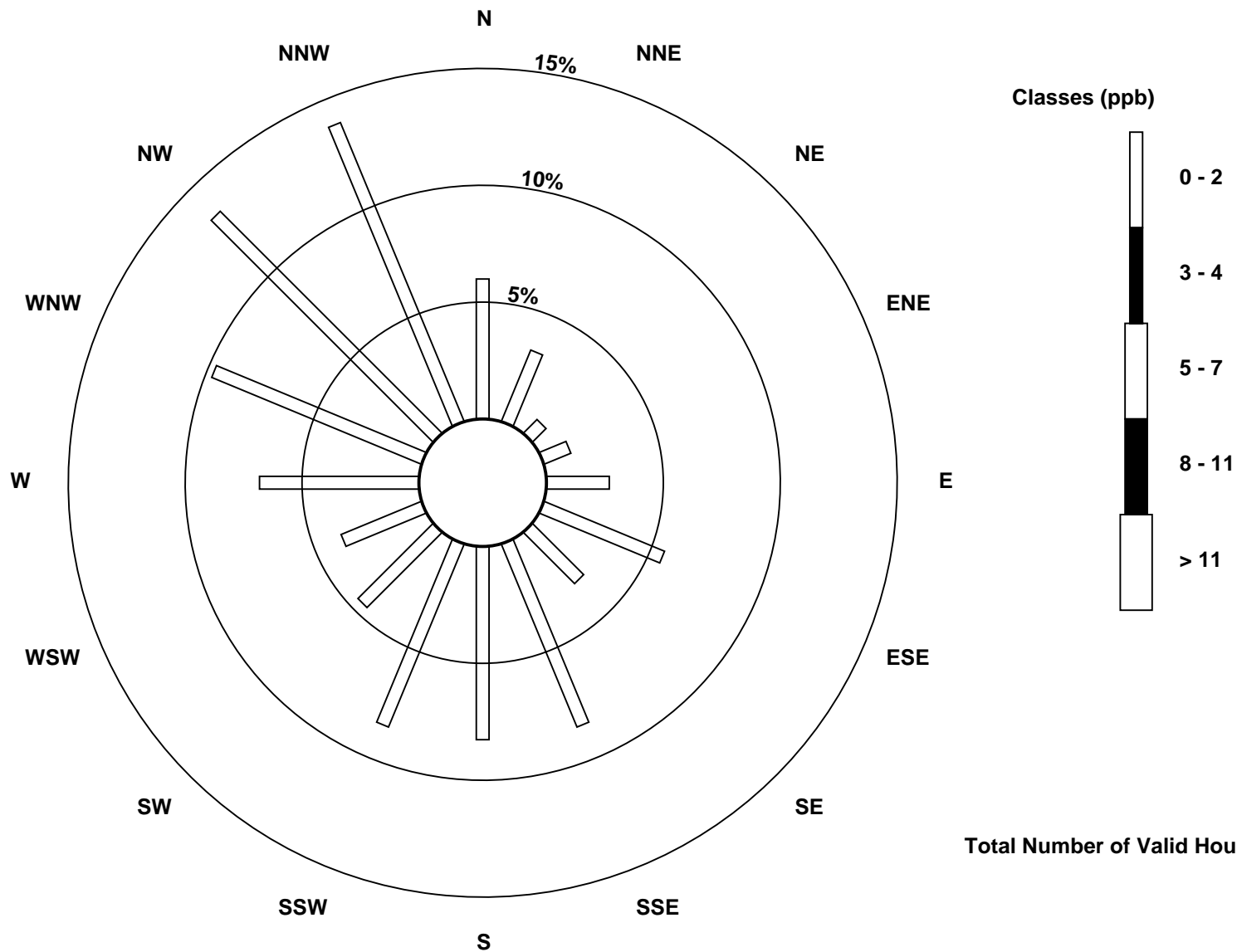
Total Number of Valid Hours: 484

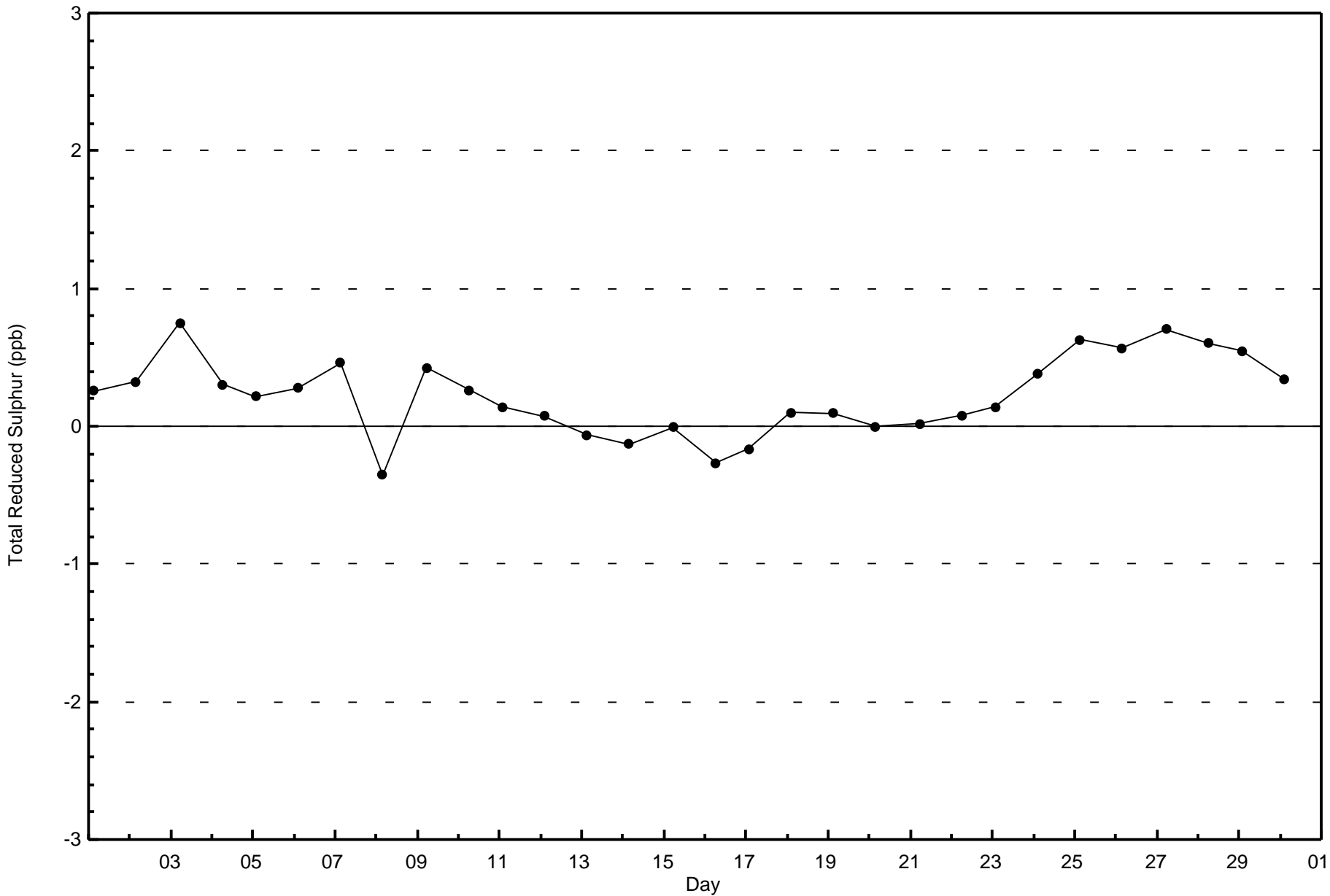
Total Number of Hours: 720

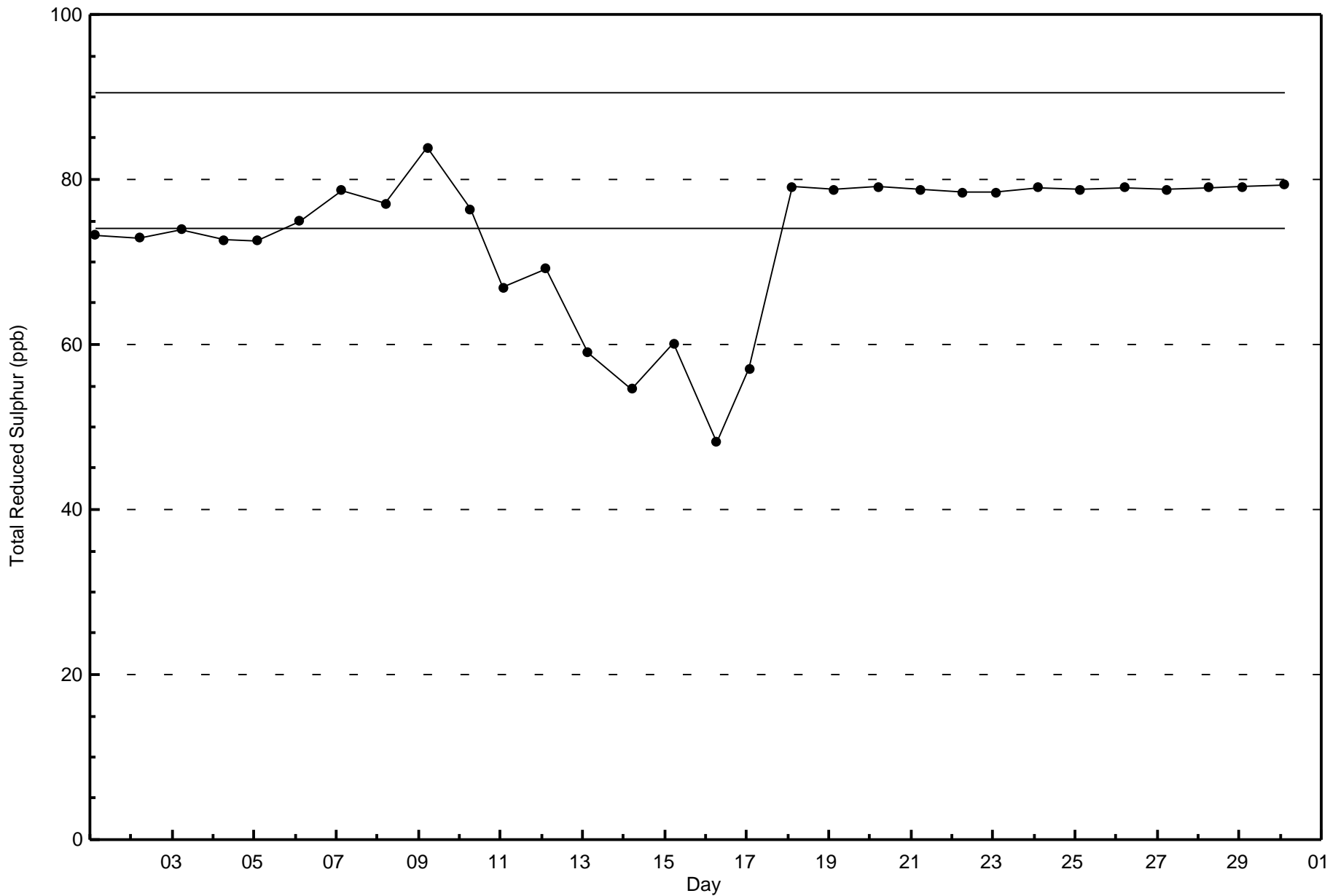


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Total Reduced Sulphur (TRS) - ppb
Conklin Community (AMS 21)



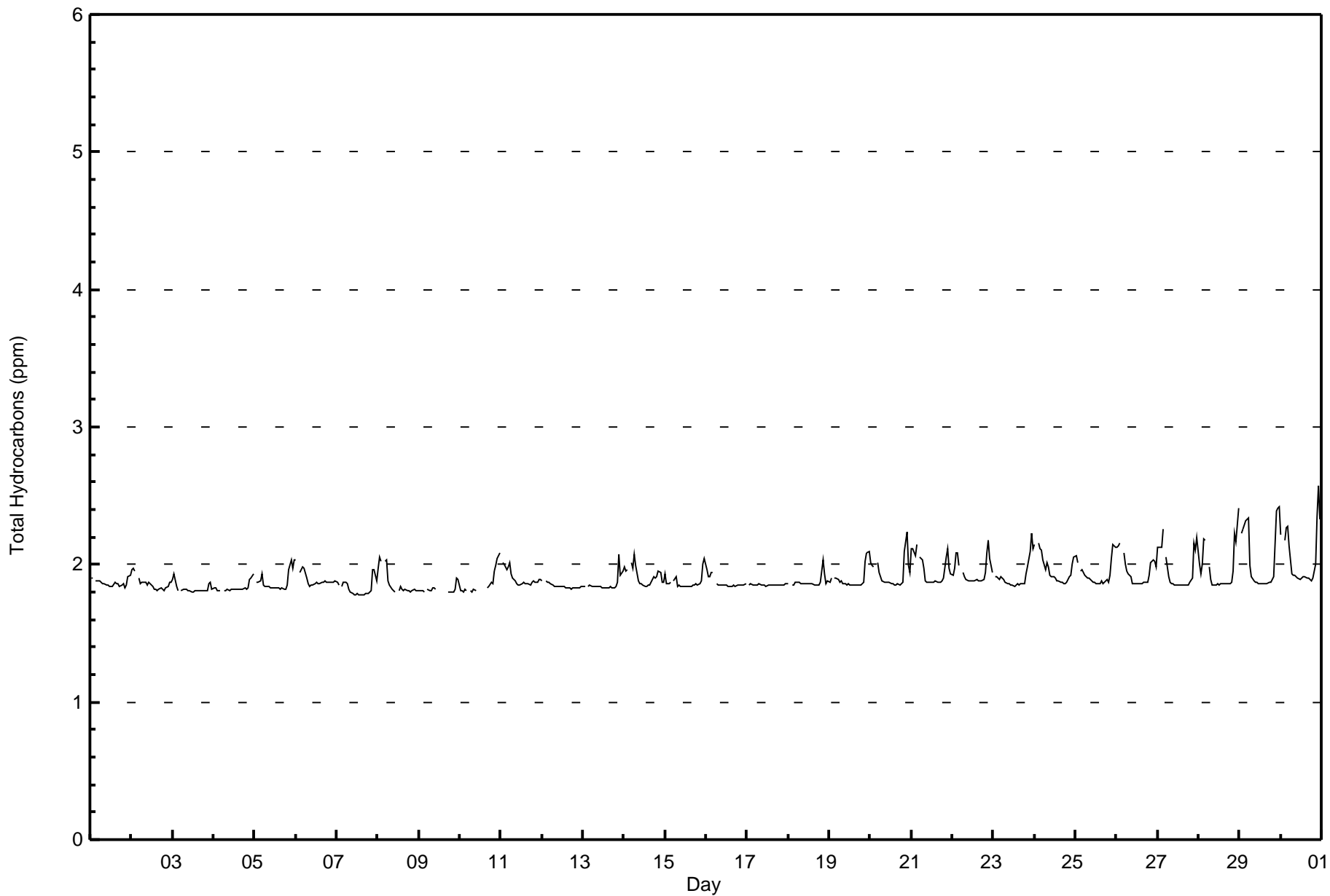






Wood Buffalo Environmental Association
Hourly Averages

Total Hydrocarbons (THC) - ppm
Conklin Community - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Conklin Community - June 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	614	90.69	90.69
2.1 - 3.0	63	9.31	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 677

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Total Hydrocarbons (THC) - ppm
Conklin Community - June 2016**

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	26	20	5	6	16	35	34	51	46	58	51	45	41	56	60	64	614
2.1 - 3.0	4	0	0	2	0	4	5	6	8	5	1	0	0	5	6	13	59
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
Totals	30	20	5	8	16	39	39	57	54	63	52	45	41	61	66	77	673

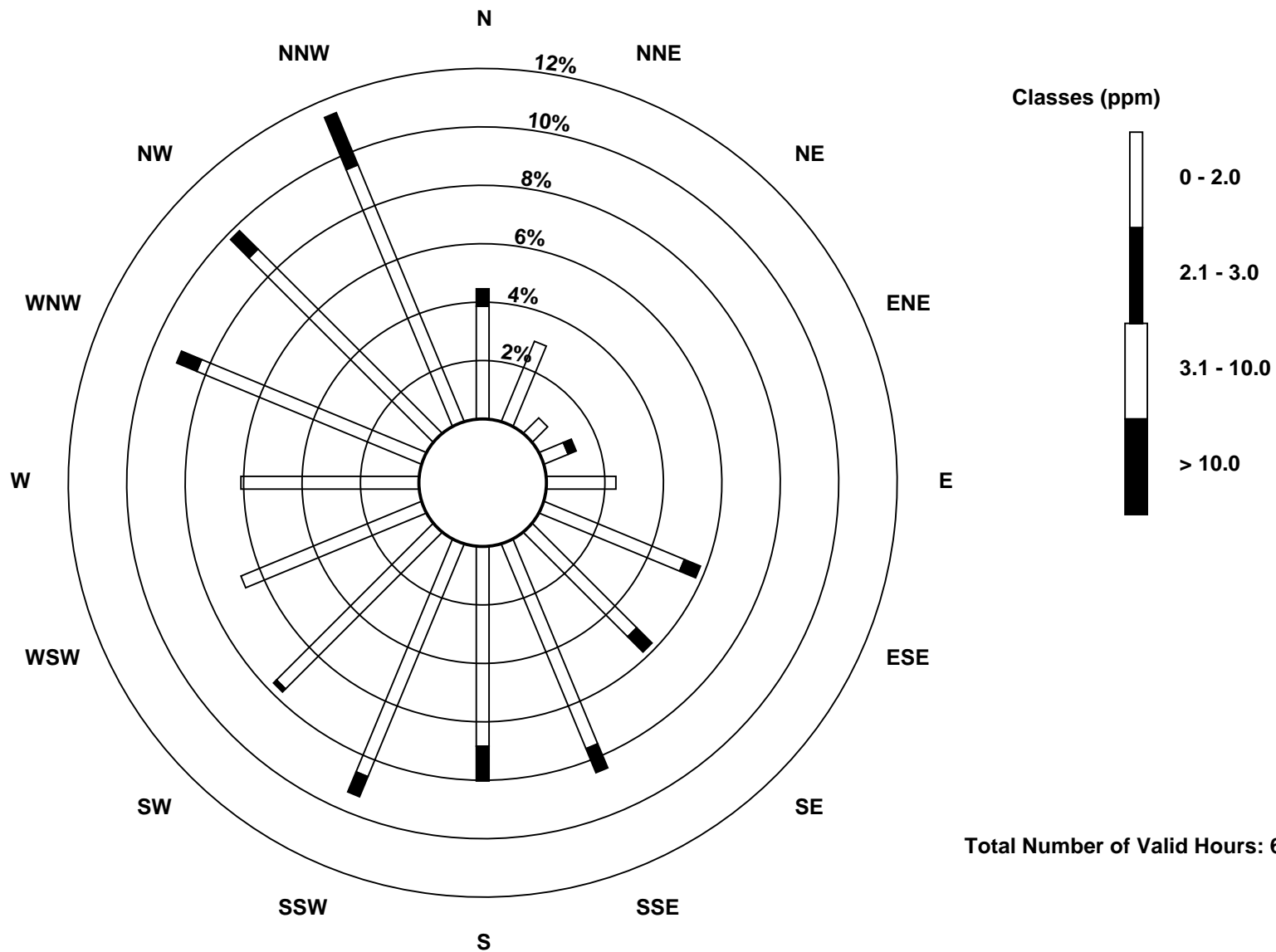
Total Number of Valid Hours: 673

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

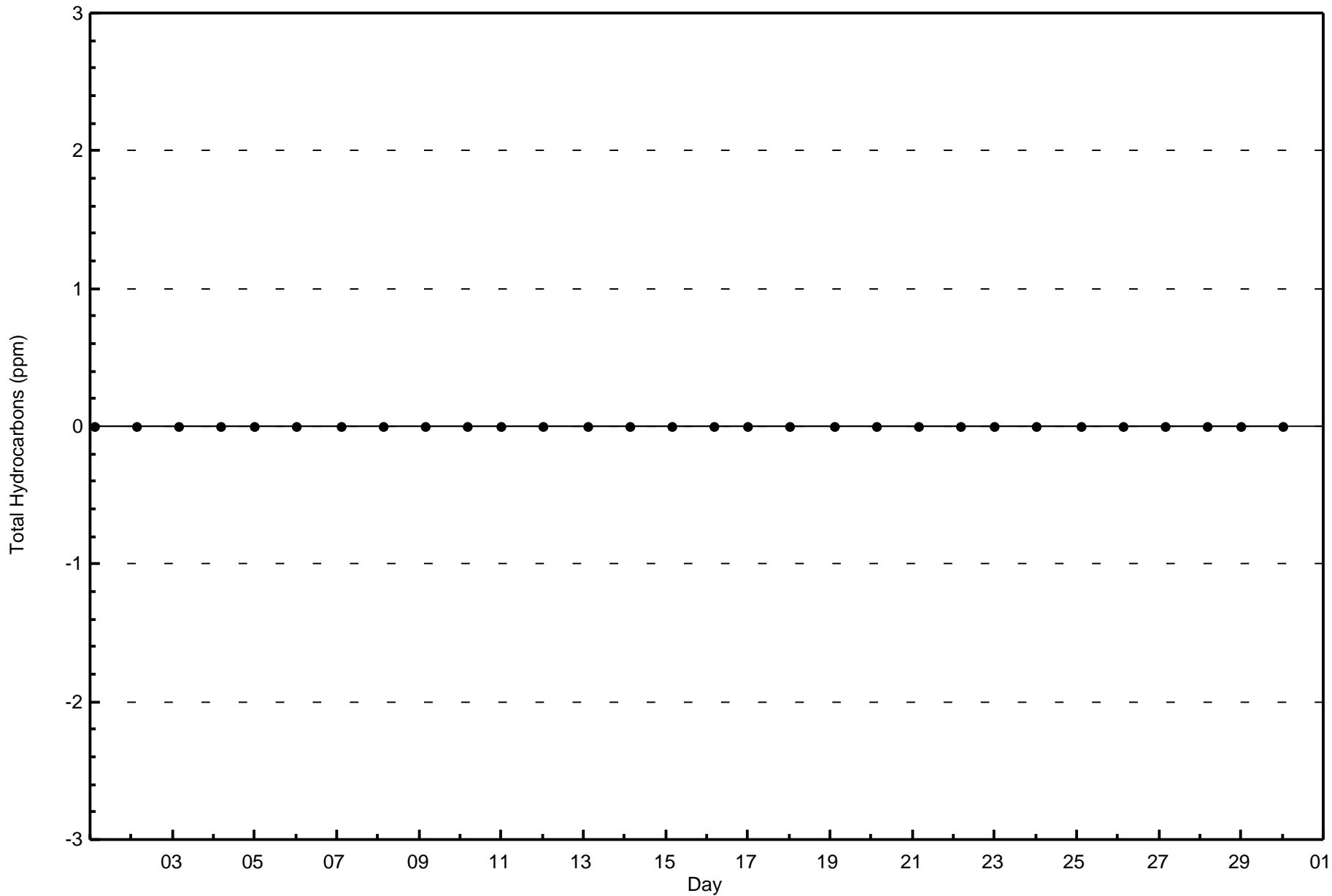
Total Hydrocarbons (THC) - ppm
Conklin Community (AMS 21)

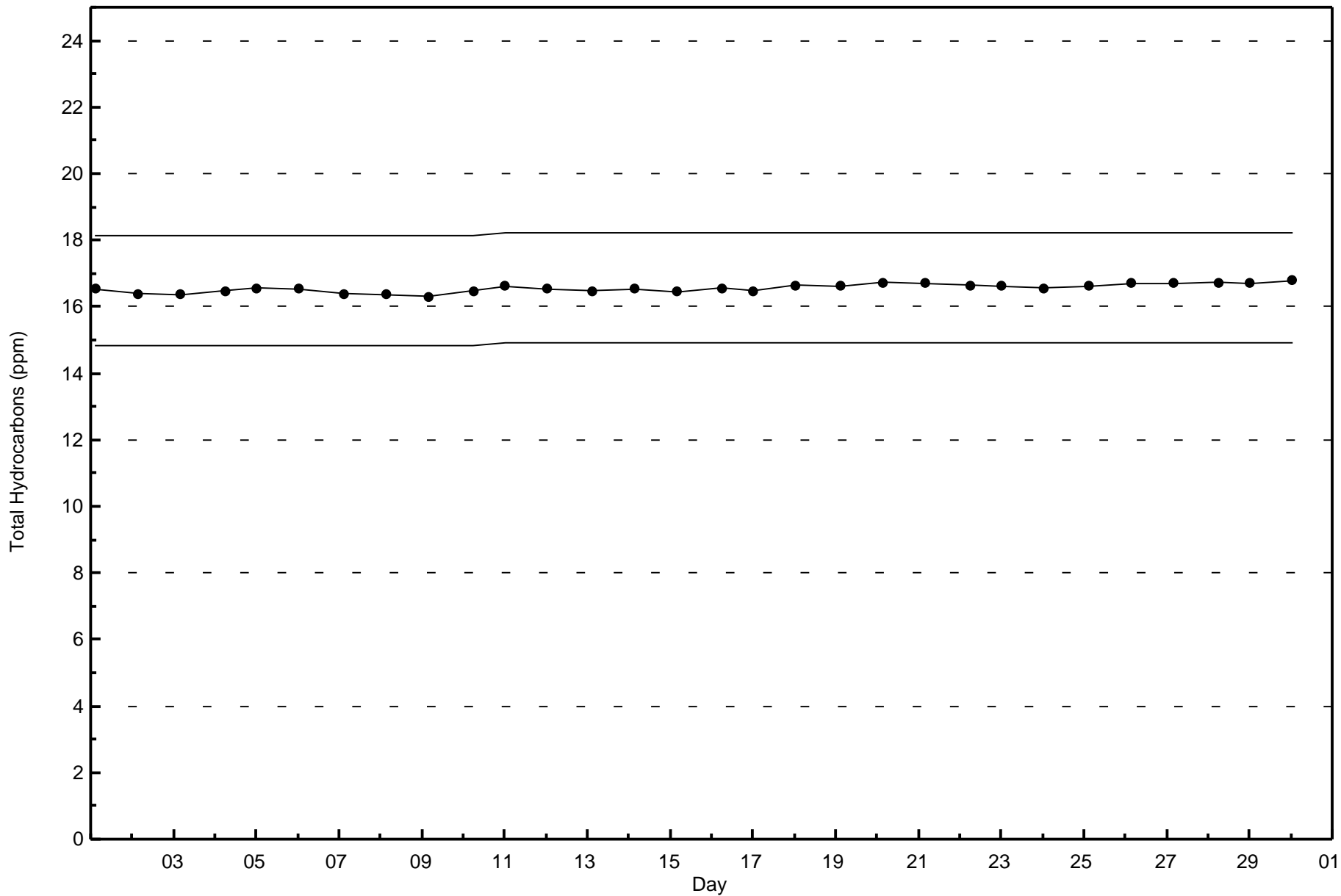




Wood Buffalo Environmental Association
Zero Responses

Total Hydrocarbons (THC) - ppm
Conklin Community - June 2016

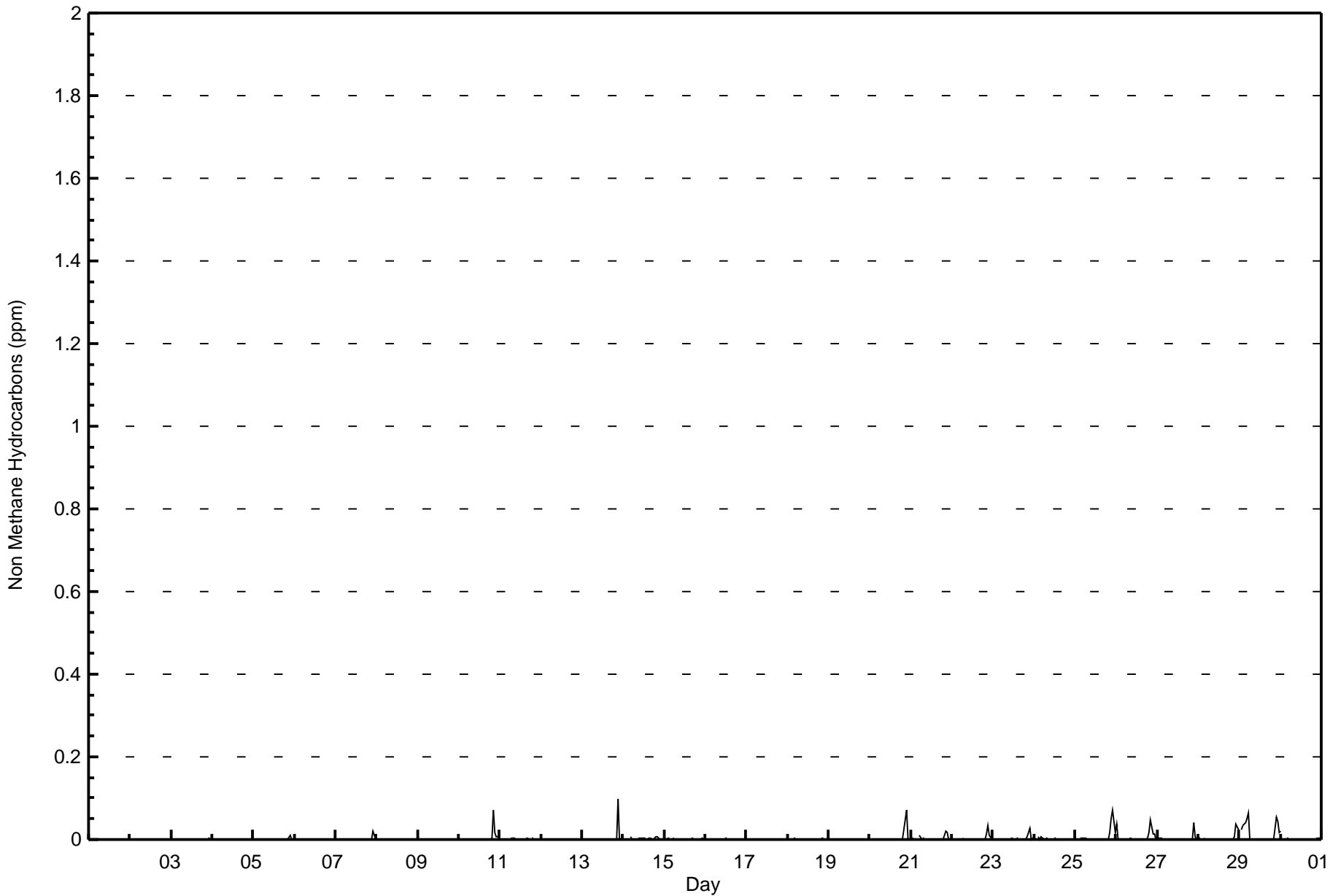






Wood Buffalo Environmental Association
Hourly Averages

Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community - June 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 0.005	633	93.50	93.50
0.006 - 0.05	38	5.61	99.11
0.06 - 0.1	6	0.89	100.00
> 0.1	0	0.00	100.00

Total Number of Valid Hours: 677

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community - June 2016**

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	28	19	4	6	16	36	37	55	50	54	50	45	40	58	62	73	633
0.006 - 0.05	2	1	1	0	0	3	1	2	3	8	2	0	1	3	3	4	34
0.06 - 0.1	0	0	0	2	0	0	1	0	1	1	0	0	0	0	1	0	6
> 0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	30	20	5	8	16	39	39	57	54	63	52	45	41	61	66	77	673

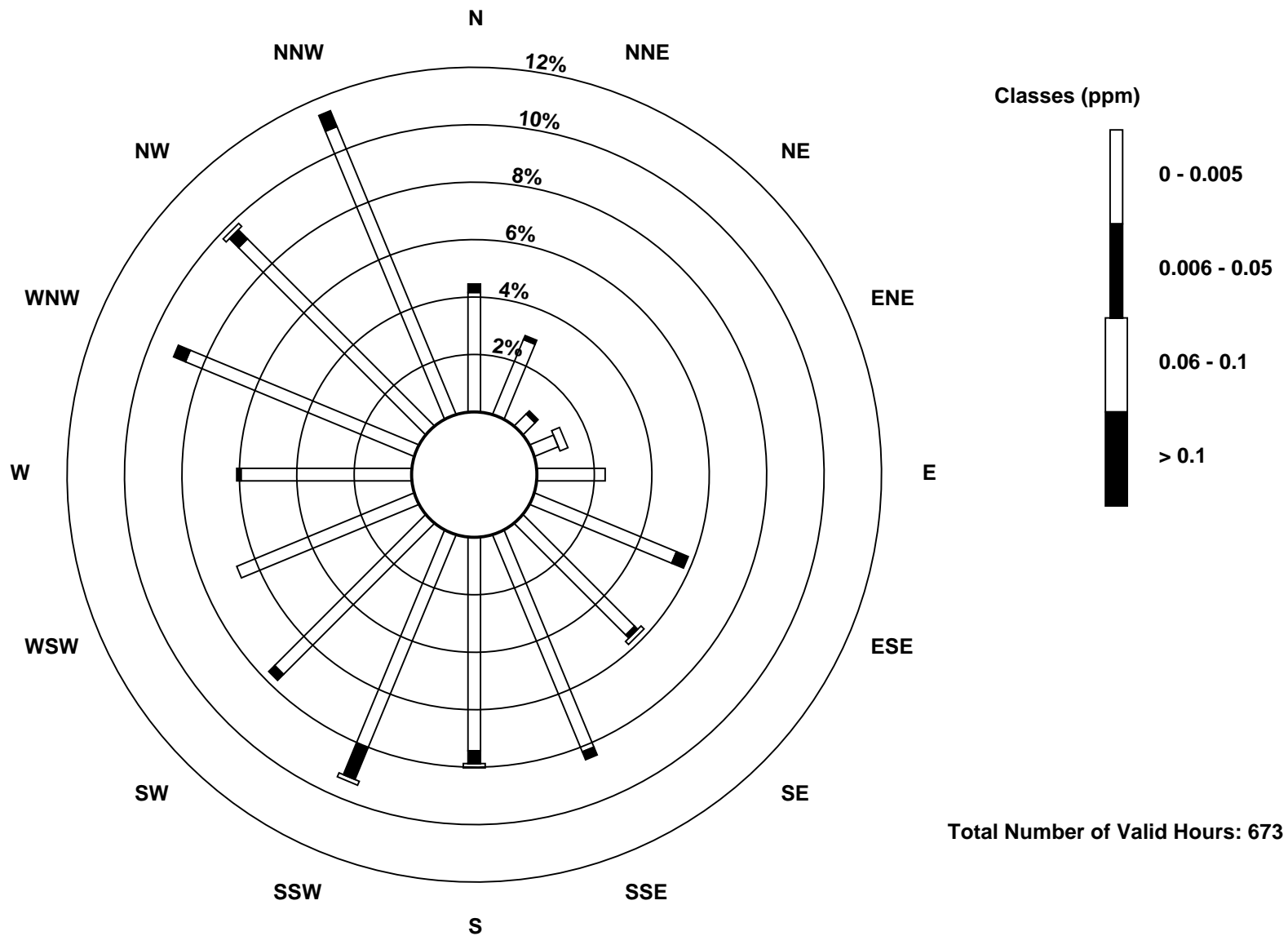
Total Number of Valid Hours: 673

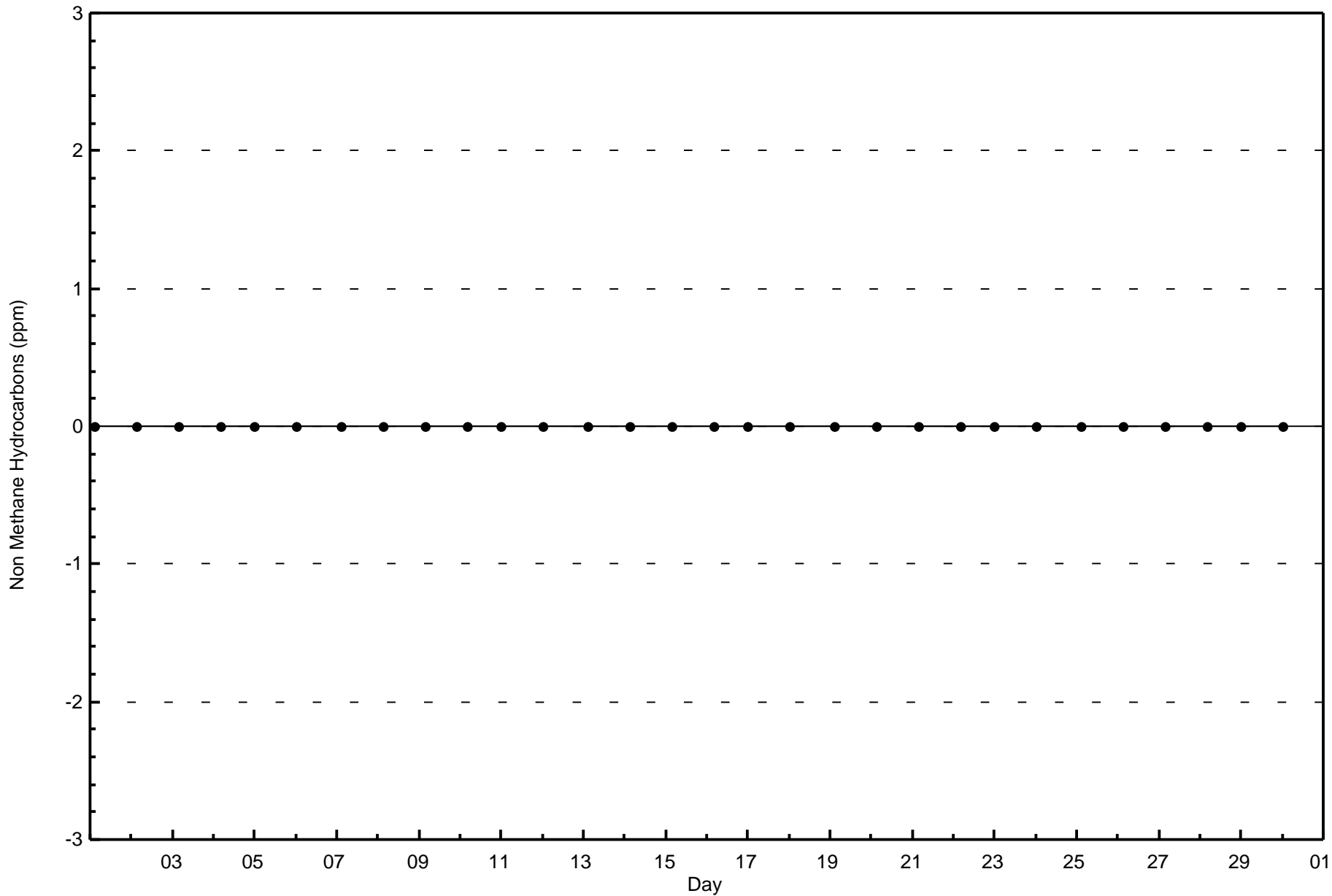
Total Number of Hours: 720

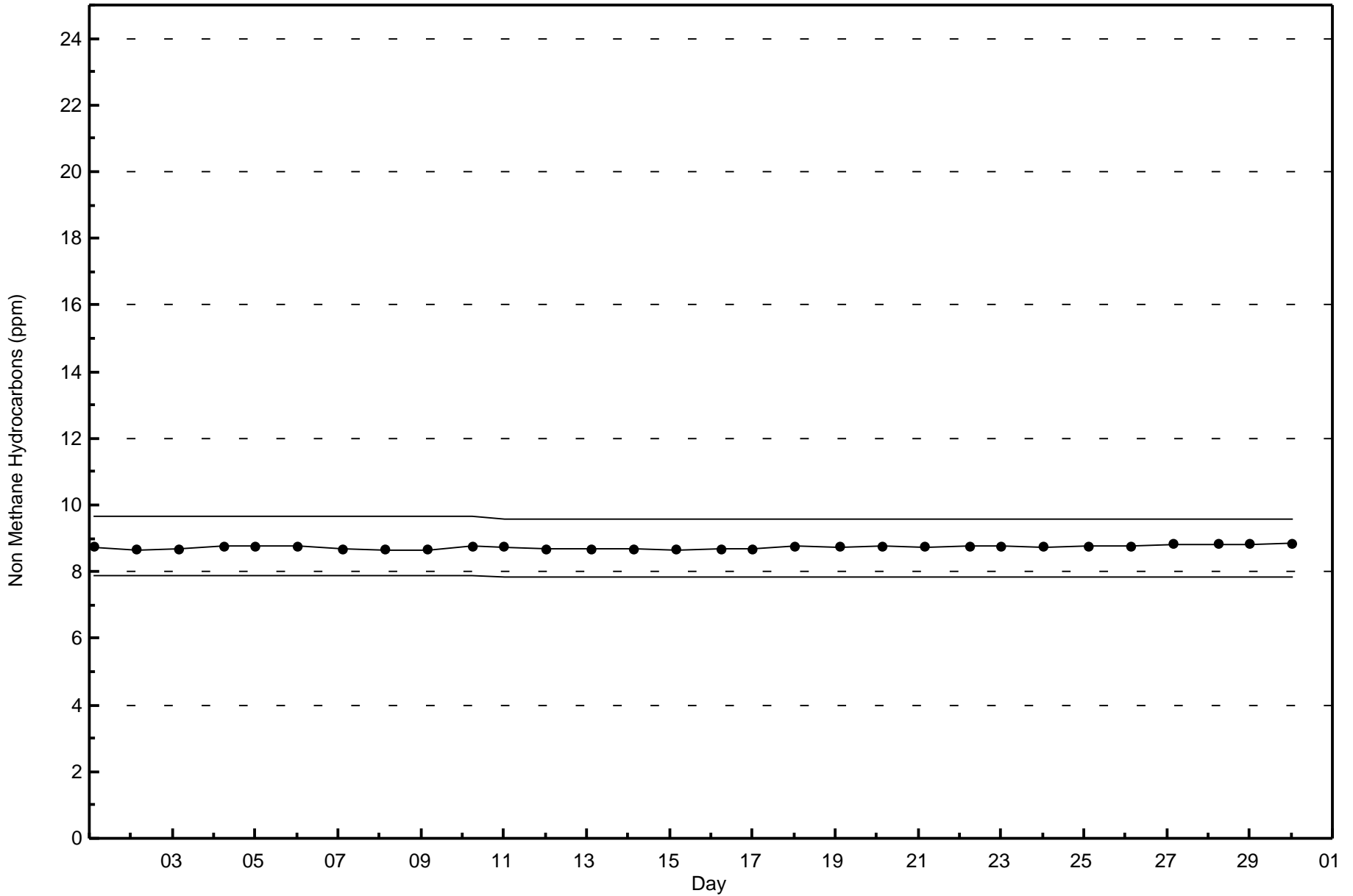


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Non Methane Hydrocarbons (NMHC) - ppm
Conklin Community (AMS 21)



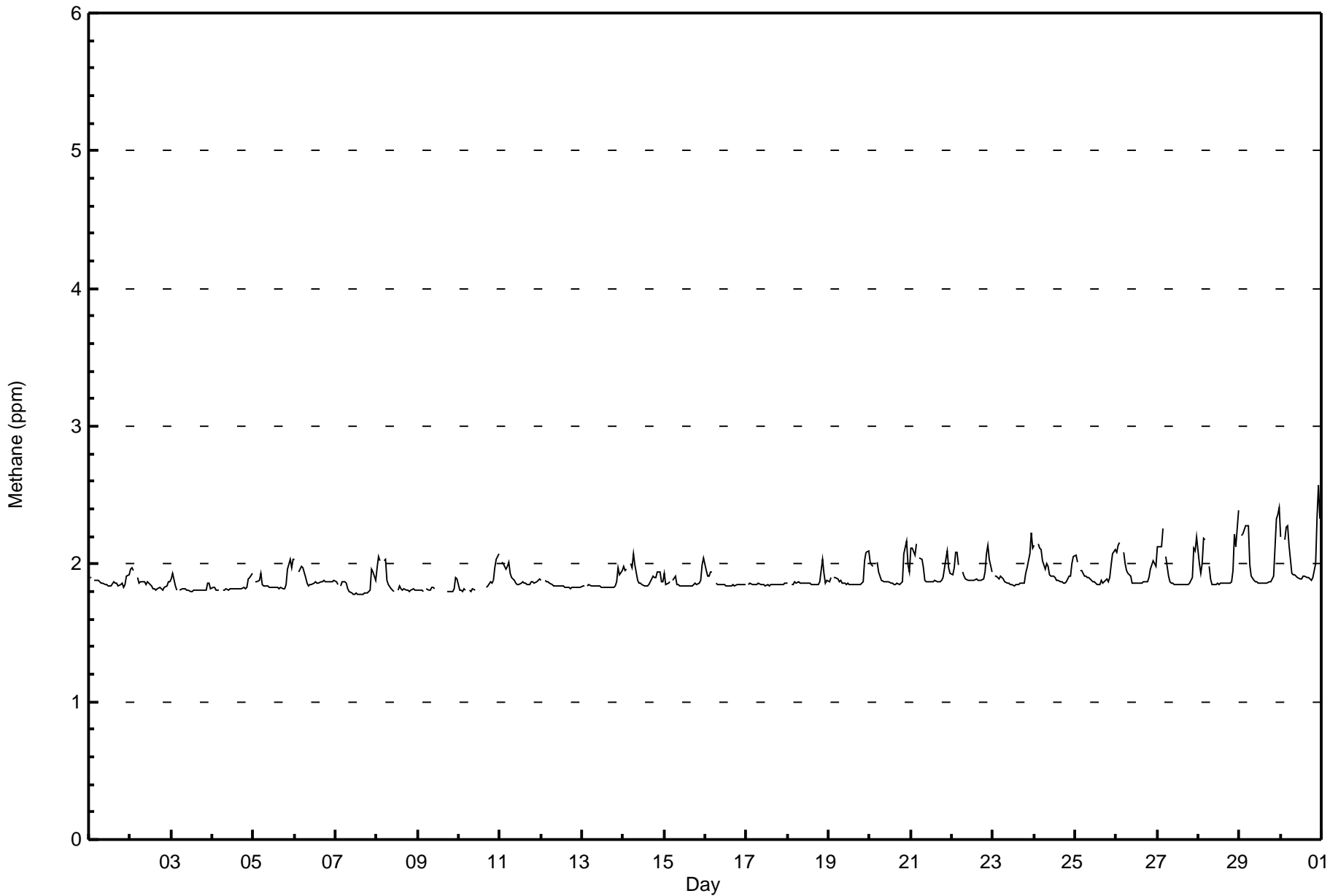






Wood Buffalo Environmental Association
Hourly Averages

Methane (CH₄) - ppm
Conklin Community - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Methane (CH₄) - ppm
Conklin Community - June 2016**

Concentration Ranges (ppm)	Number of Hours	%	Cumulative %
0 - 2.0	617	91.14	91.14
2.1 - 3.0	60	8.86	100.00
3.1 - 10.0	0	0.00	100.00
> 10.0	0	0.00	100.00

Total Number of Valid Hours: 677

Total Number of Hours: 720



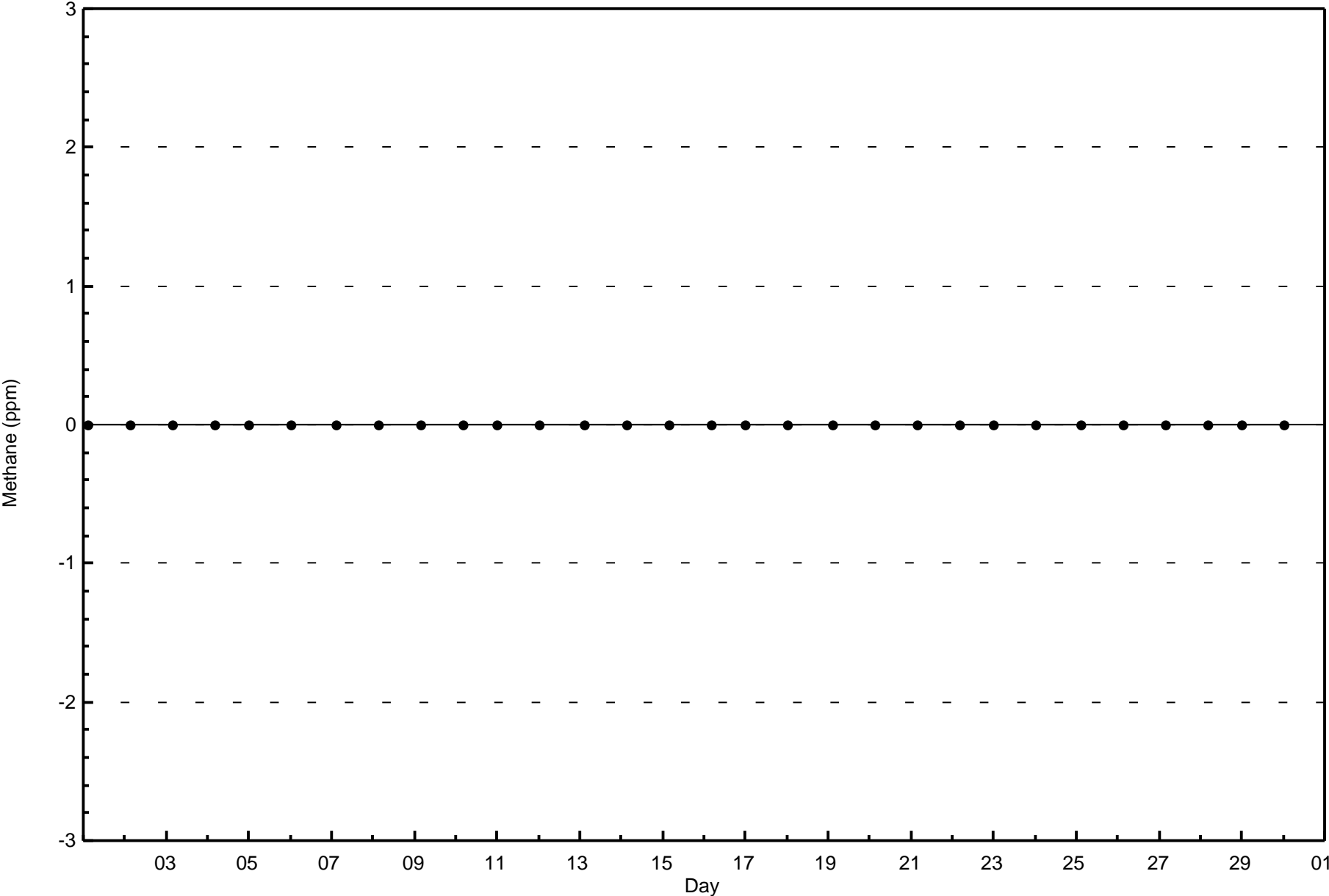
**Wood Buffalo Environmental Association
Frequency Distribution**

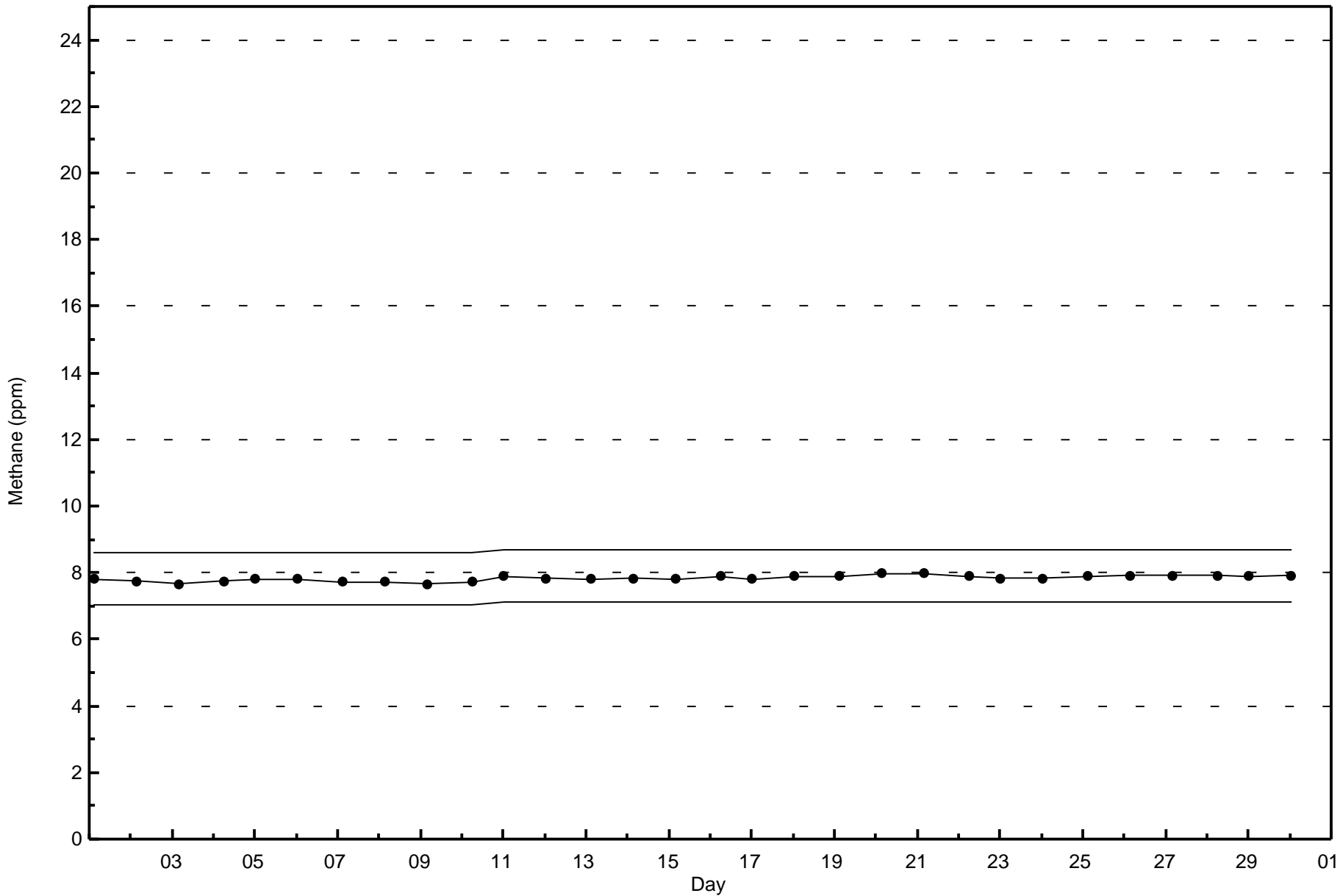
**Methane (CH₄) - ppm
Conklin Community - June 2016**

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	26	20	5	6	16	36	34	51	47	58	51	45	41	56	60	64	616
2.1 - 3.0	4	0	0	2	0	3	5	6	7	5	1	0	0	5	6	13	57
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
Totals	30	20	5	8	16	39	39	57	54	63	52	45	41	61	66	77	673

Total Number of Valid Hours: 673

Total Number of Hours: 720





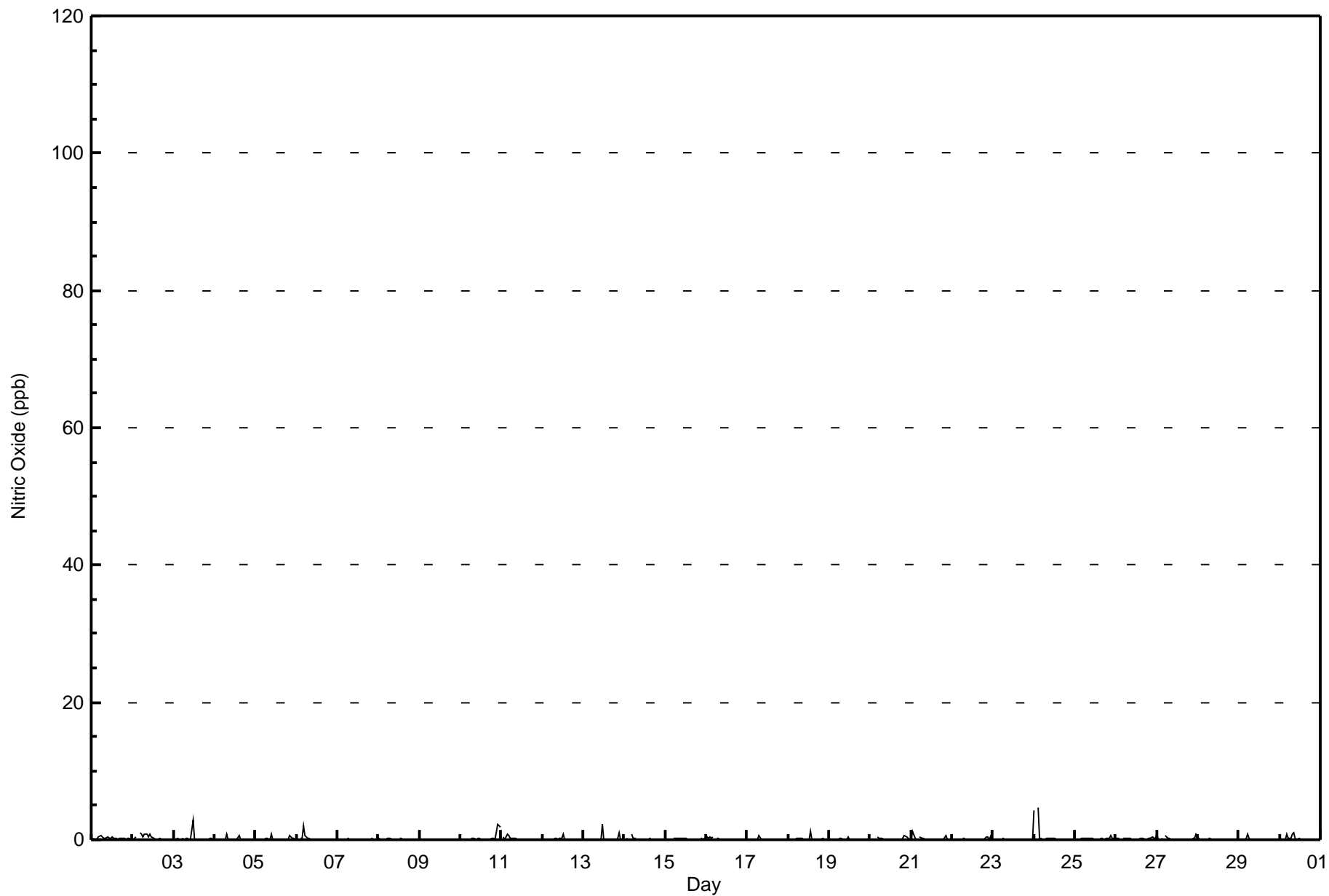


Maximum Value: 5 ppb on Jun 24 03:00		Maximum Daily Average: 0.5 ppb on Jun 24		Hours in Service: 720																						
Minimum Value: 0 ppb on Jun 3 15:00		Minimum Daily Average: 0.0 ppb on Jun 7		Hours of Data: 679																						
Maximum Diurnal Average: 0.3 ppb at hour 5		Minimum Diurnal Average: 0.0 ppb at hour 18		Hours of Missing Data: 41																						
Monthly Average: 0.1 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 2		Hours of Calibration: 37																						
				Percent Operational Time: 99.4																						
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-Jun	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
2-Jun	0	0	0	Z	1	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
3-Jun	0	0	0	0	Z	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0.2	3
4-Jun	0	0	0	0	0	Z	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.1	1
5-Jun	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1	1
6-Jun	0	Z	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2
7-Jun	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
8-Jun	0	0	0	Z	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
9-Jun	0	0	0	0	Z	0	0	0	0	0	0	C	C	C	C	C	C	C	0	0	0	0	0	0	--	0
10-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	0.3	2
11-Jun	Z	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
12-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1	1
13-Jun	0	0	Z	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0.2	2
14-Jun	0	0	0	Z	1	0	0	0	M	M	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
15-Jun	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
16-Jun	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
17-Jun	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
18-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1	1
19-Jun	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
20-Jun	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1	1
21-Jun	0	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.2	1
22-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.1	1
23-Jun	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
24-Jun	4	Z	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	5
25-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.2	1
26-Jun	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
27-Jun	1	0	0	0	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.2	1
28-Jun	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
29-Jun	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
30-Jun	0	Z	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
																								Diurnal Average		
																								Diurnal Maximum		
																								Z - zerospan C - Calibration M - Maintenance		



Wood Buffalo Environmental Association
Hourly Averages

Nitric Oxide (NO) - ppb
Conklin Community - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitric Oxide (NO) - ppb
Conklin Community - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	679	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: 679

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitric Oxide (NO) - ppb
Conklin Community - June 2016**

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	21	6	8	15	37	39	57	54	63	52	45	41	61	66	78	675
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
Totals	32	21	6	8	15	37	39	57	54	63	52	45	41	61	66	78	675

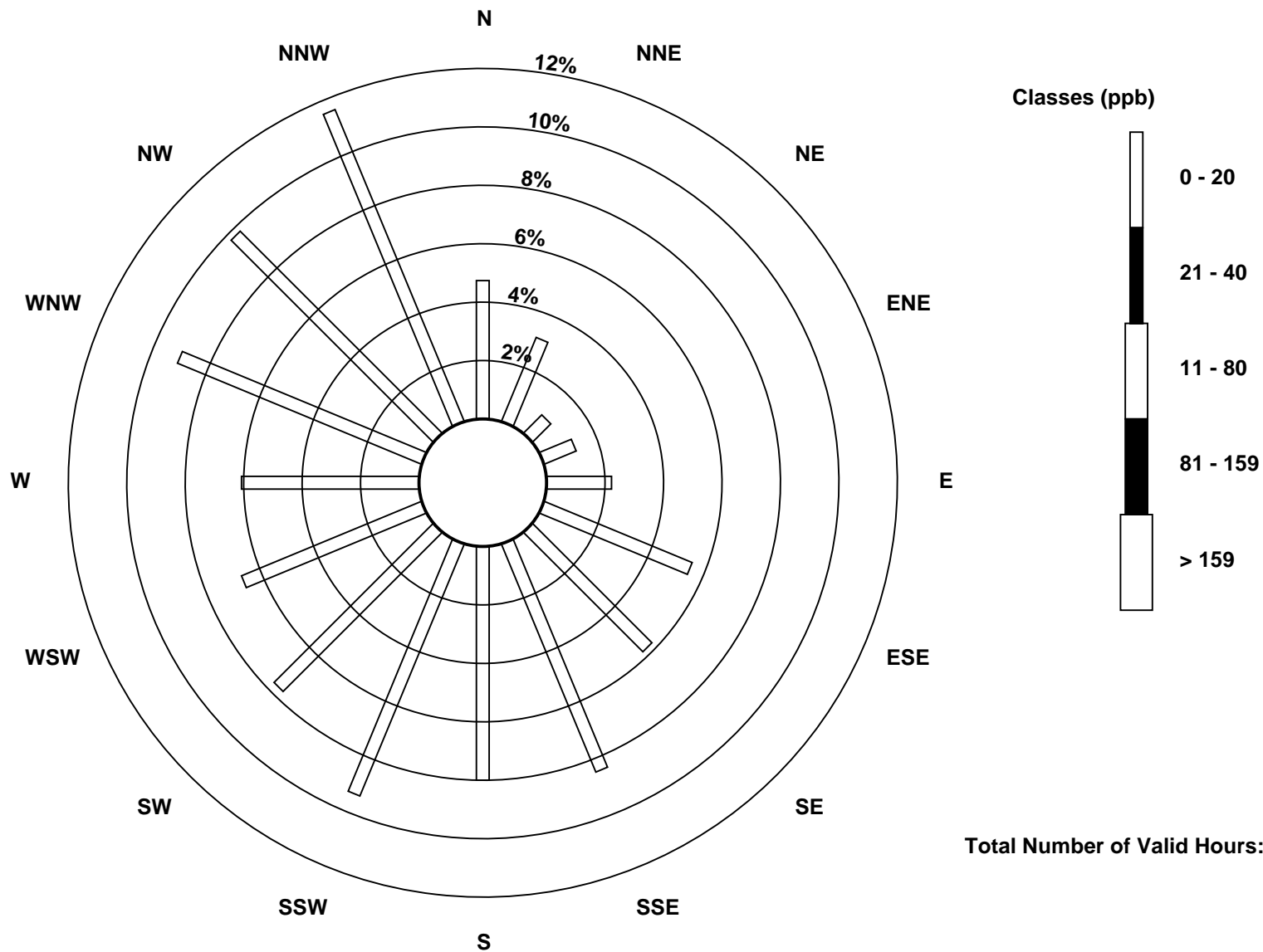
Total Number of Valid Hours: 675

Total Number of Hours: 720

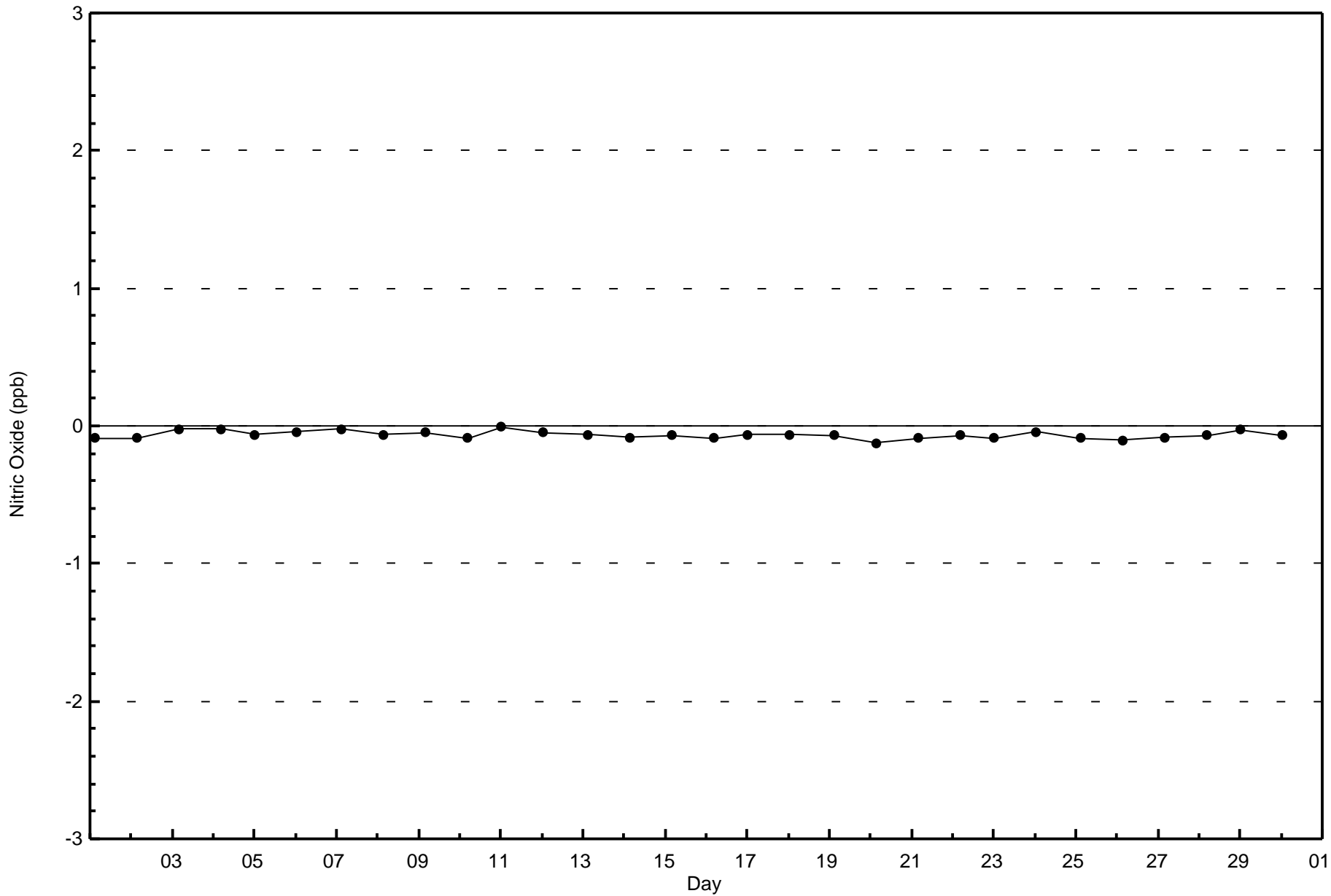


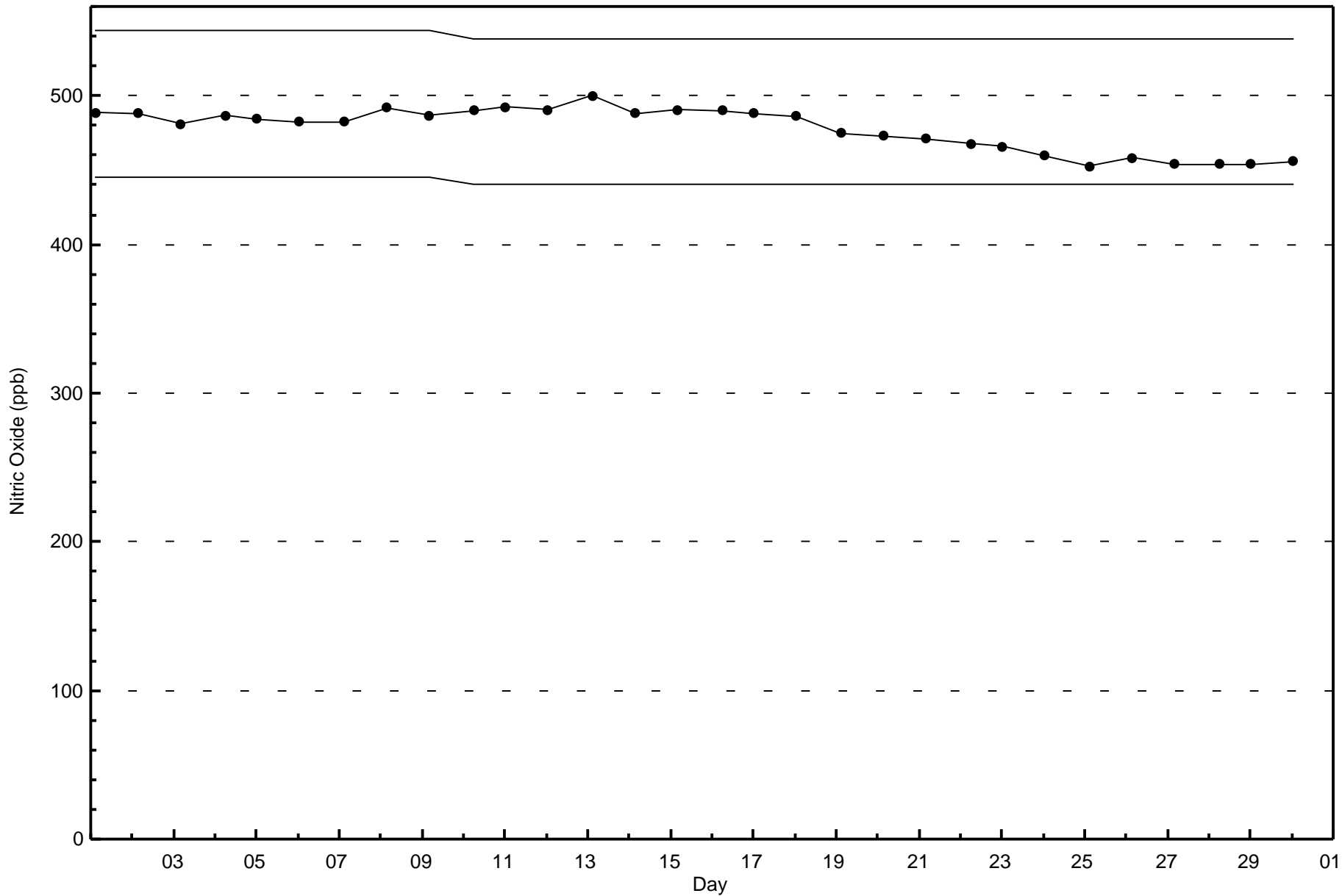
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitric Oxide (NO) - ppb
Conklin Community (AMS 21)



Total Number of Valid Hours: 675







Wood Buffalo Environmental Association
Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb
Conklin Community - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 6 ppb on Jun 28 01:00	Maximum Daily Average: 1.6 ppb on Jun 24
Minimum Value: 0 ppb on Jun 13 12:00	Hours of Data: 679
Maximum Diurnal Average: 1.8 ppb at hour 22	Hours of Missing Data: 41
Monthly Average: 0.8 ppb	Hours of Calibration: 37
Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 4	Percent Operational Time: 99.4

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-Jun	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2	1	1.0	2
2-Jun	1	1	1	Z	1	1	1	1	2	1	2	2	1	1	1	1	1	2	1	1	1	1	2	1	1.1	2
3-Jun	1	1	1	1	Z	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	1	3	2	1	0.7	3
4-Jun	0	0	1	1	1	Z	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0.6	1
5-Jun	Z	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	4	3	2	0.9	4
6-Jun	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1.2	2
7-Jun	2	1	Z	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	2	2	1	2	0.9	2
8-Jun	2	1	1	Z	1	1	1	1	1	1	1	M	2	1	1	1	1	1	1	0	1	1	1	1	0.9	2
9-Jun	1	0	0	1	Z	1	0	0	0	0	0	C	C	C	C	C	C	C	0	0	0	1	3	3	--	3
10-Jun	1	1	1	1	1	Z	1	1	1	0	0	1	0	0	0	0	0	0	1	1	2	2	3	2	0.9	3
11-Jun	Z	1	1	1	2	1	2	2	2	1	1	1	1	1	0	1	1	1	1	1	1	1	1	2	1.0	2
12-Jun	1	Z	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0.6	1
13-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	4	1	1	0.6	4
14-Jun	0	0	1	Z	1	1	1	2	M	M	M	1	1	1	1	1	1	1	1	2	2	2	1	1	0.9	2
15-Jun	1	1	1	1	Z	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	3	2	2	0.9	3
16-Jun	1	1	1	1	1	Z	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0.6	1
17-Jun	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
18-Jun	1	Z	1	1	1	1	1	1	0	0	0	0	0	2	0	0	0	0	0	0	2	1	0	0	0.6	2
19-Jun	1	1	Z	1	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	1	2	1	1	0.7	2
20-Jun	1	0	0	Z	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	4	4	2	1	0.8	4
21-Jun	1	1	1	0	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	6	2	1	1	1.1	6
22-Jun	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	3	1	3	1.3	3
23-Jun	Z	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
24-Jun	2	Z	6	3	2	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	2	2	1	1.6	6
25-Jun	1	1	Z	1	1	2	1	1	1	1	1	0	0	0	0	1	1	0	1	1	1	2	1	1	0.8	2
26-Jun	0	0	0	Z	0	0	0	1	1	1	0	0	0	0	1	1	0	0	1	1	1	2	1	2	0.6	2
27-Jun	3	1	0	1	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	5	0.8	5
28-Jun	6	3	1	1	0	Z	1	1	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	0.8	6
29-Jun	Z	1	1	1	0	1	1	1	0	1	1	0	0	0	0	0	1	1	1	0	1	2	1	0	0.6	2
30-Jun	0	Z	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	0	1	1	2	1	0.8	2

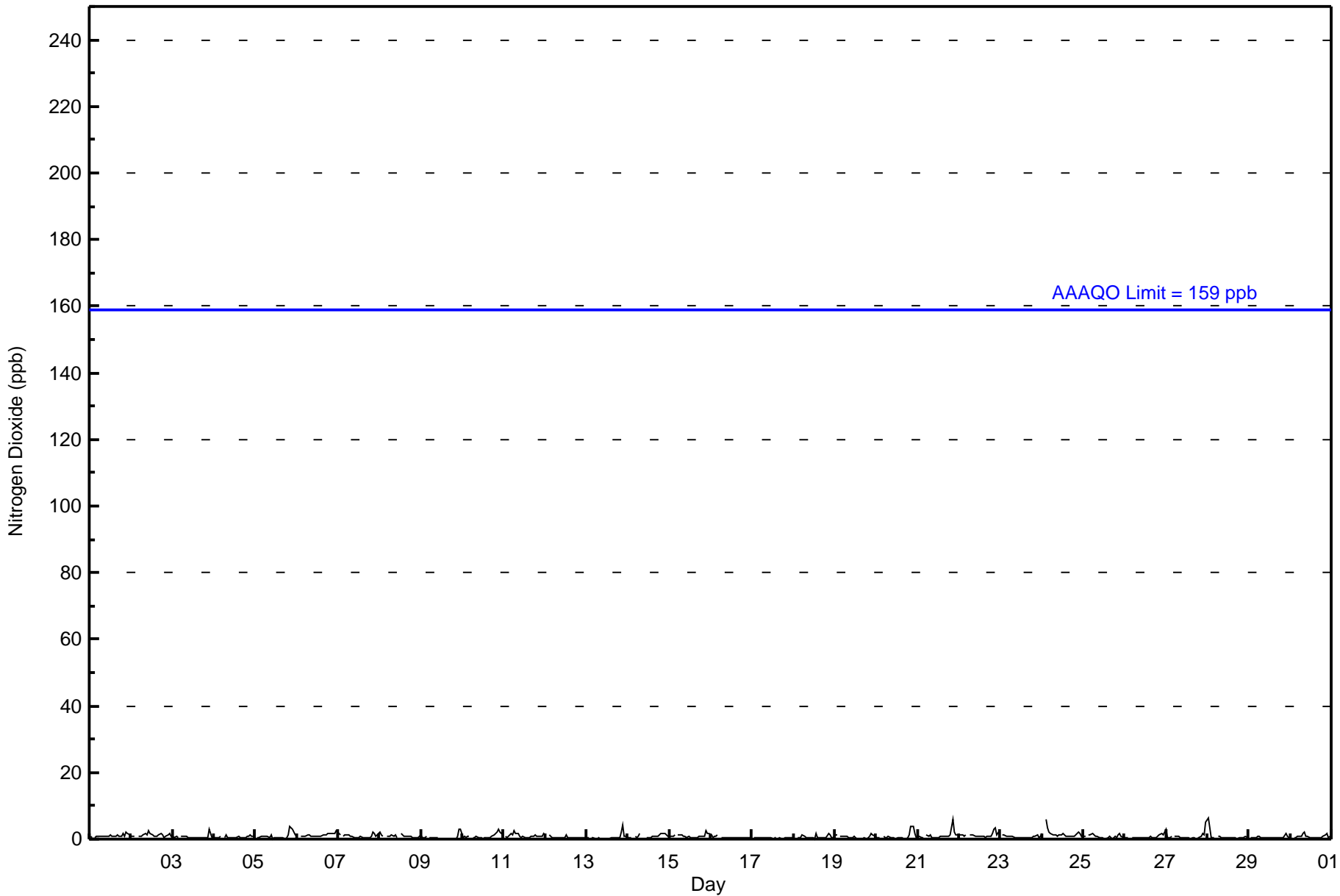
1.2	0.8	0.9	0.9	0.9	0.8	0.8	0.9	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.6	0.6	0.8	1.5	1.8	1.2	1.2	Diurnal Average
6	3	6	3	2	2	2	2	2	1	2	2	2	2	2	1	1	1	2	2	2	6	4	3	5	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Conklin Community - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Conklin Community - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	679	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: 679

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Conklin Community - June 2016**

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	21	6	8	15	37	39	57	54	63	52	45	41	61	66	78	675
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
Totals	32	21	6	8	15	37	39	57	54	63	52	45	41	61	66	78	675

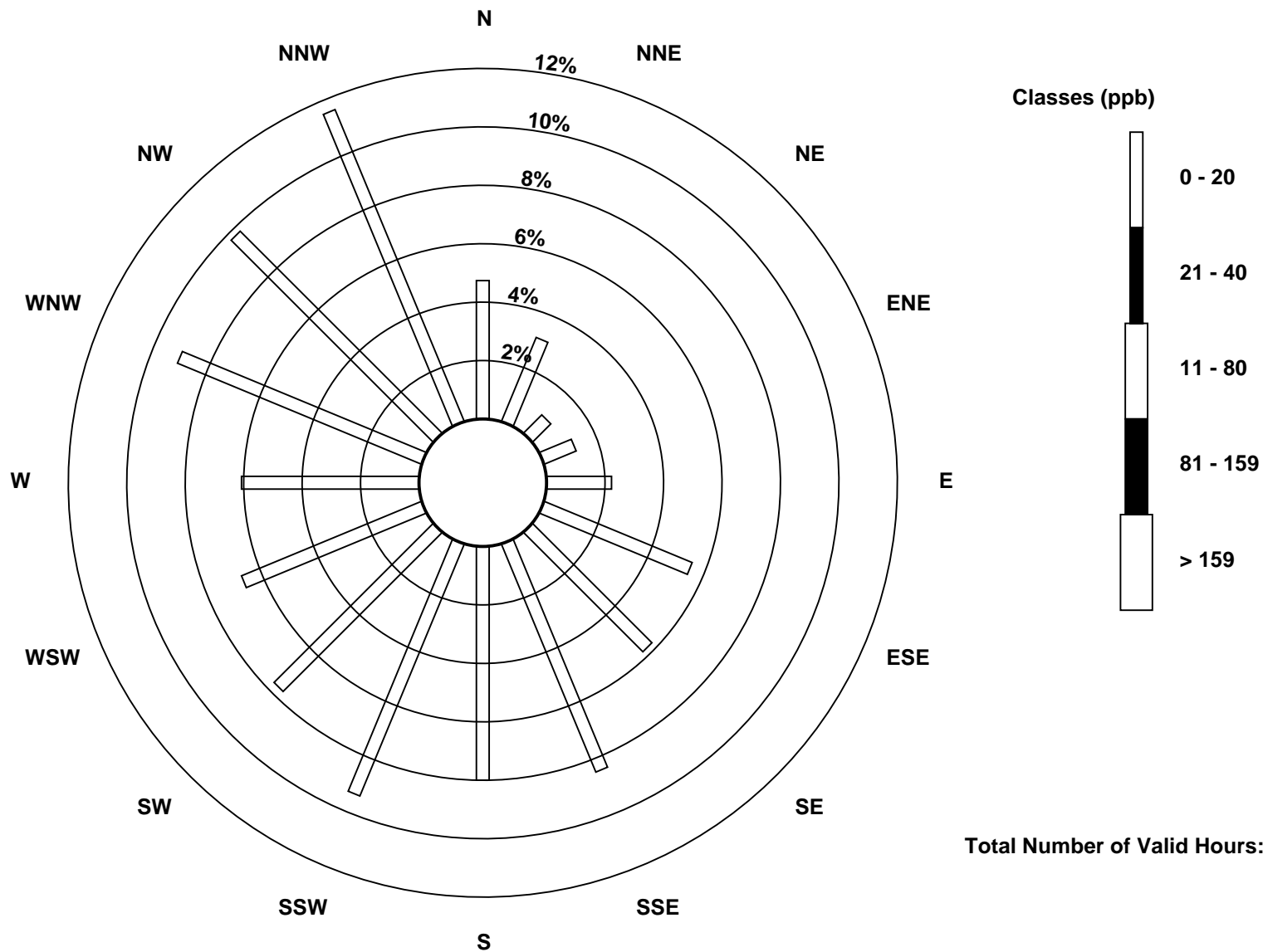
Total Number of Valid Hours: 675

Total Number of Hours: 720

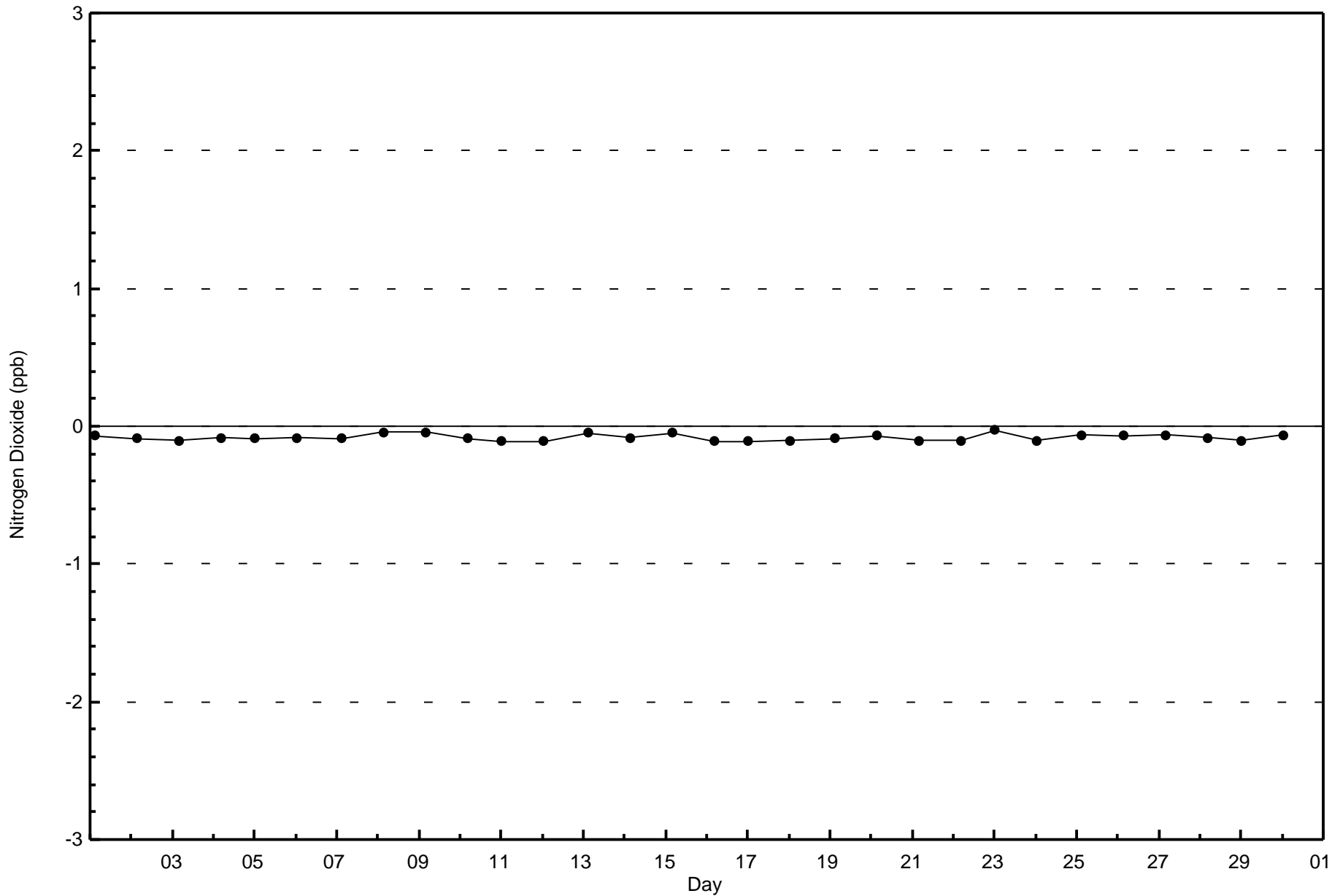


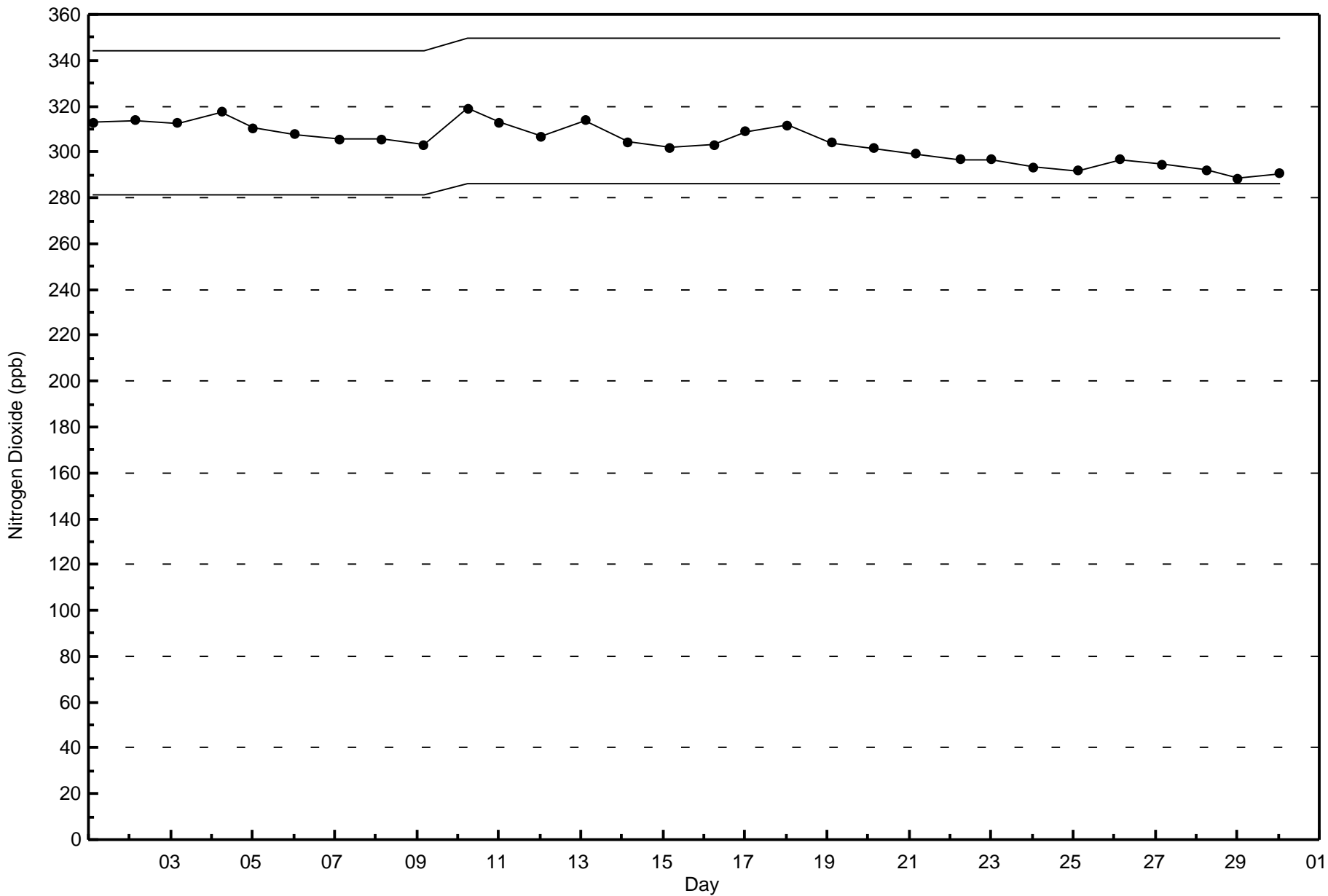
Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Dioxide (NO₂) - ppb
Conklin Community (AMS 21)



Total Number of Valid Hours: 675







Wood Buffalo Environmental Association
Summary of Hour Averages

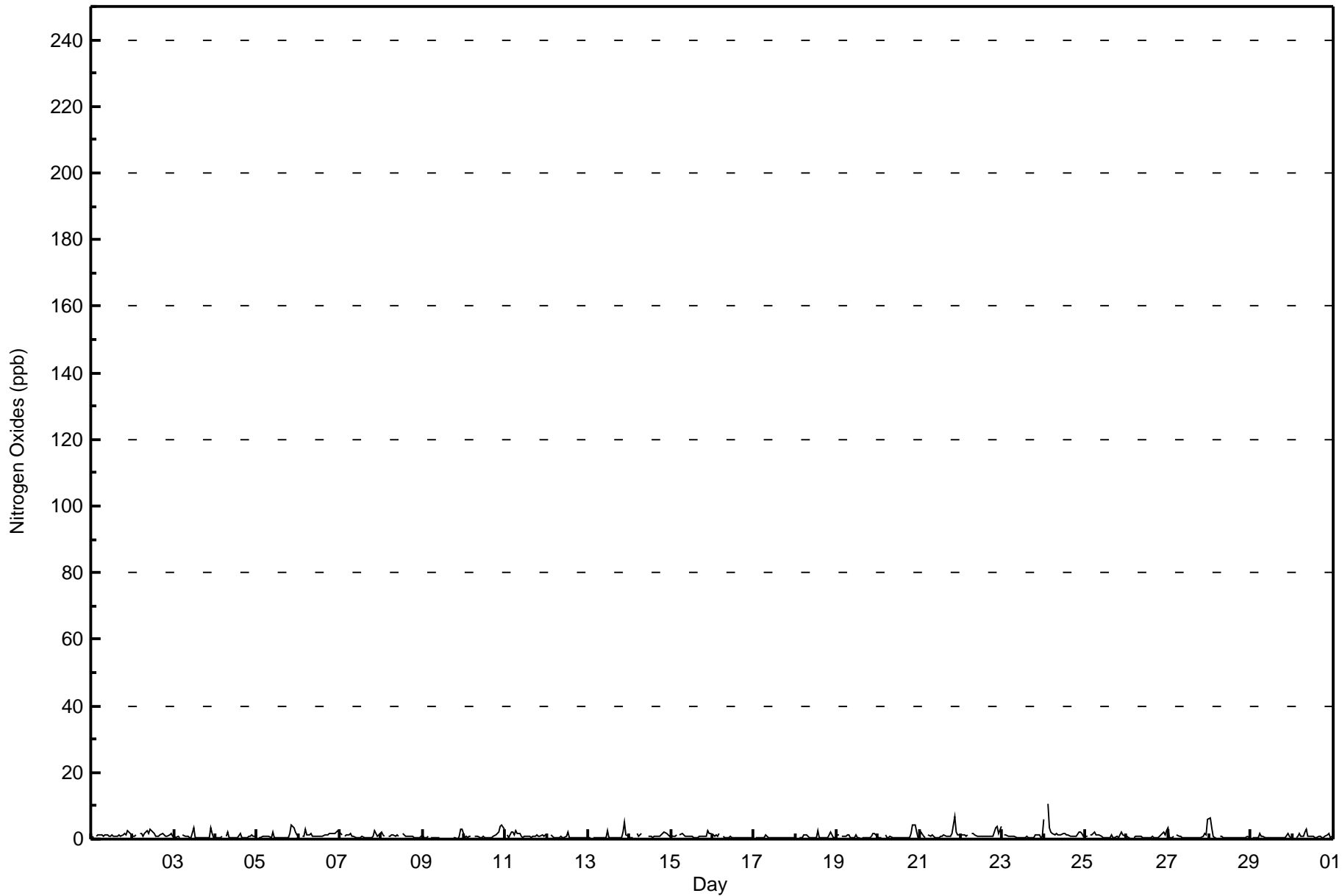
Nitrogen Oxides (NO_x) - ppb
Conklin Community - June 2016

Maximum Value: 11 ppb on Jun 24 03:00		Maximum Daily Average: 2.0 ppb on Jun 24		Hours in Service: 720																							
Minimum Value: 0 ppb on Jun 9 21:00		Minimum Daily Average: 0.4 ppb on Jun 17		Hours of Data: 679																							
Maximum Diurnal Average: 1.9 ppb at hour 22		Minimum Diurnal Average: 0.6 ppb at hour 16		Hours of Missing Data: 41																							
Monthly Average: 1.0 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 4		Hours of Calibration: 37																							
				Percent Operational Time: 99.4																							
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-Jun	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2	1	1.2	2	
2-Jun	1	1	1	Z	2	2	1	2	2	2	3	2	2	1	1	1	1	2	1	1	1	1	2	1	1.4	3	
3-Jun	1	1	1	1	Z	1	1	1	1	1	0	3	0	0	0	0	0	0	0	0	1	3	2	1	0.9	3	
4-Jun	0	0	0	1	1	Z	1	2	1	1	0	0	0	0	2	1	1	0	1	1	1	1	1	1	0.7	2	
5-Jun	Z	0	0	1	1	1	1	1	1	2	0	0	0	0	0	0	0	0	0	2	4	3	2	1	1.0	4	
6-Jun	1	Z	1	1	3	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1.4	3	
7-Jun	2	1	Z	1	1	1	1	1	1	1	0	1	0	1	1	0	0	0	0	1	3	2	1	2	1.0	3	
8-Jun	2	1	1	Z	1	1	1	1	1	1	1	M	2	1	1	1	1	1	1	0	1	1	0	1	1.0	2	
9-Jun	1	0	0	1	Z	0	0	0	0	0	0	C	C	C	C	C	C	C	0	0	0	1	3	3	--	3	
10-Jun	1	1	1	1	1	Z	1	1	1	0	1	1	0	0	0	0	0	0	1	1	2	2	4	4	3	1.1	4
11-Jun	Z	1	0	2	2	1	3	2	2	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1.2	3	
12-Jun	1	Z	1	1	1	1	1	1	1	1	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0.6	2	
13-Jun	0	0	Z	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	2	5	1	1	0.8	5	
14-Jun	0	1	1	Z	2	1	1	2	1	M	M	M	1	1	1	1	1	1	1	2	2	2	1	1	1.1	2	
15-Jun	1	1	1	1	Z	1	2	1	1	1	1	1	1	1	0	1	1	1	1	1	1	3	2	2	1.0	3	
16-Jun	1	1	1	1	2	Z	1	1	0	1	1	1	1	0	1	1	1	1	0	0	1	0	0	0	0.7	2	
17-Jun	Z	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1	
18-Jun	1	Z	1	1	1	1	1	1	1	0	0	0	0	3	0	0	0	0	0	0	2	1	0	0	0.7	3	
19-Jun	1	1	Z	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	1	2	2	1	0.8	2	
20-Jun	1	0	0	Z	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	2	4	4	2	1	0.9	4	
21-Jun	1	2	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7	2	1	1	1.2	7	
22-Jun	1	1	1	1	1	Z	2	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	4	1.5	4	
23-Jun	Z	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1	0	1	1	1	1	1	0.7	1	
24-Jun	6	Z	11	4	2	2	1	2	1	1	1	1	2	1	1	1	1	1	1	2	2	2	1	1	2.0	11	
25-Jun	1	1	Z	1	1	2	1	1	1	1	1	0	0	0	0	1	1	0	1	1	1	2	1	1	1.0	2	
26-Jun	1	1	1	Z	1	1	1	1	1	1	0	0	0	0	1	1	1	0	1	1	1	2	1	2	0.8	2	
27-Jun	4	1	0	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	2	1	6	1.0	6	
28-Jun	6	3	1	1	0	Z	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0.9	6	
29-Jun	Z	1	1	1	1	2	1	1	0	1	0	1	0	0	0	0	0	0	1	0	1	2	1	0	0.6	2	
30-Jun	0	Z	1	1	2	1	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1.0	3	
																								Diurnal Average			
																								Diurnal Maximum			
Z - zerospan C - Calibration M - Maintenance																											



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Conklin Community - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Conklin Community - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	679	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: 679

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Conklin Community - June 2016**

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	21	6	8	15	37	39	57	54	63	52	45	41	61	66	78	675
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
Totals	32	21	6	8	15	37	39	57	54	63	52	45	41	61	66	78	675

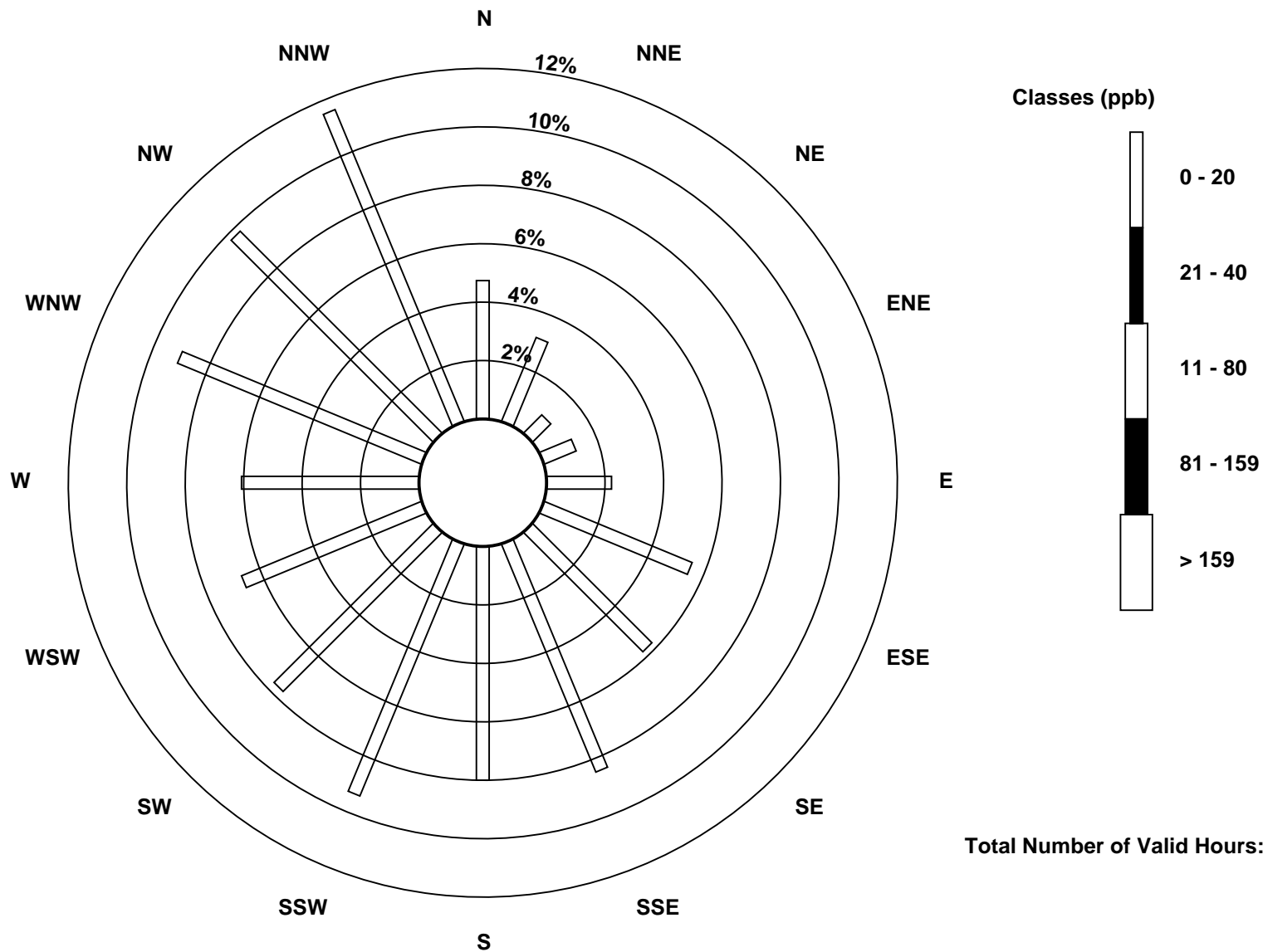
Total Number of Valid Hours: 675

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxides (NO_x) - ppb
Conklin Community (AMS 21)

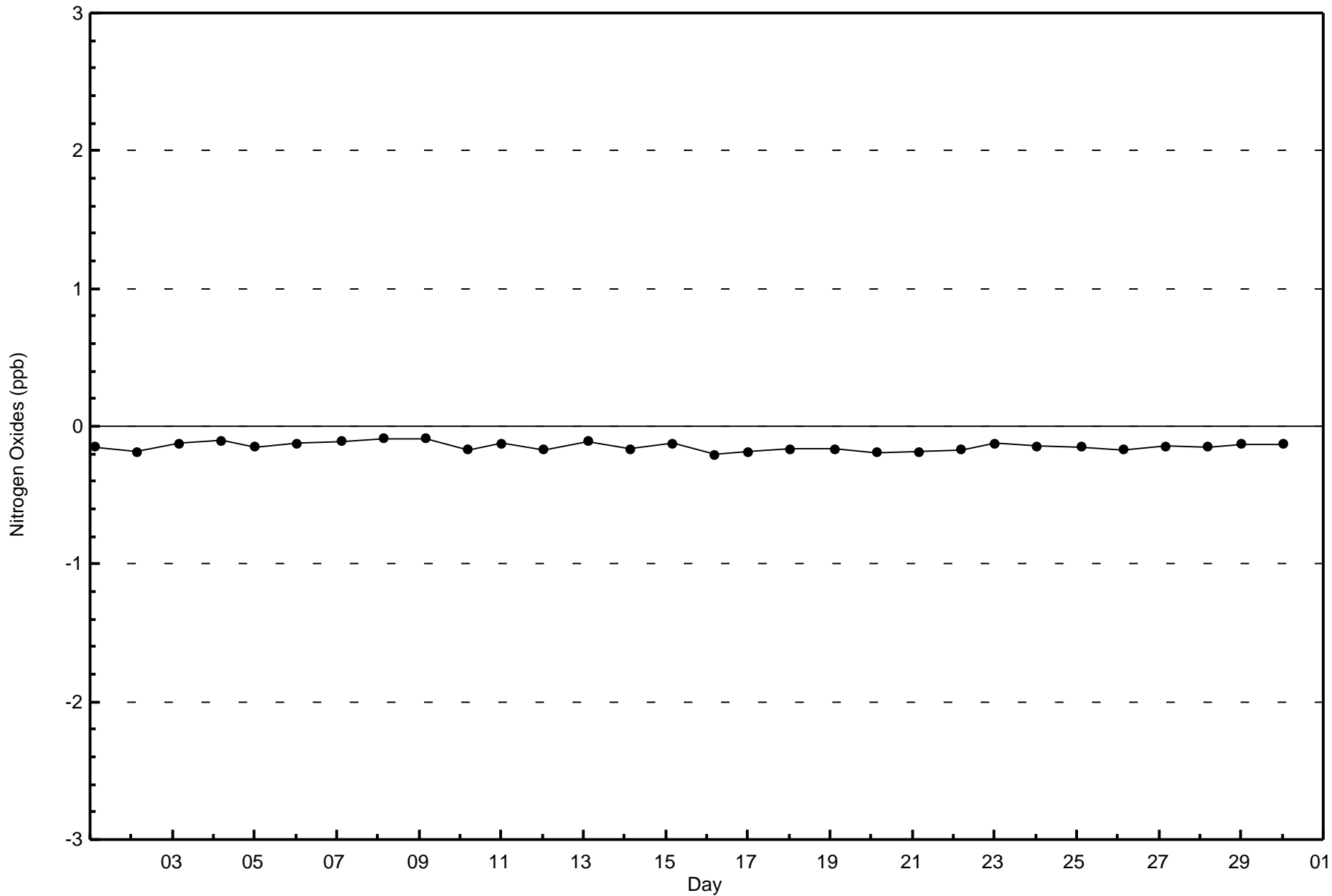


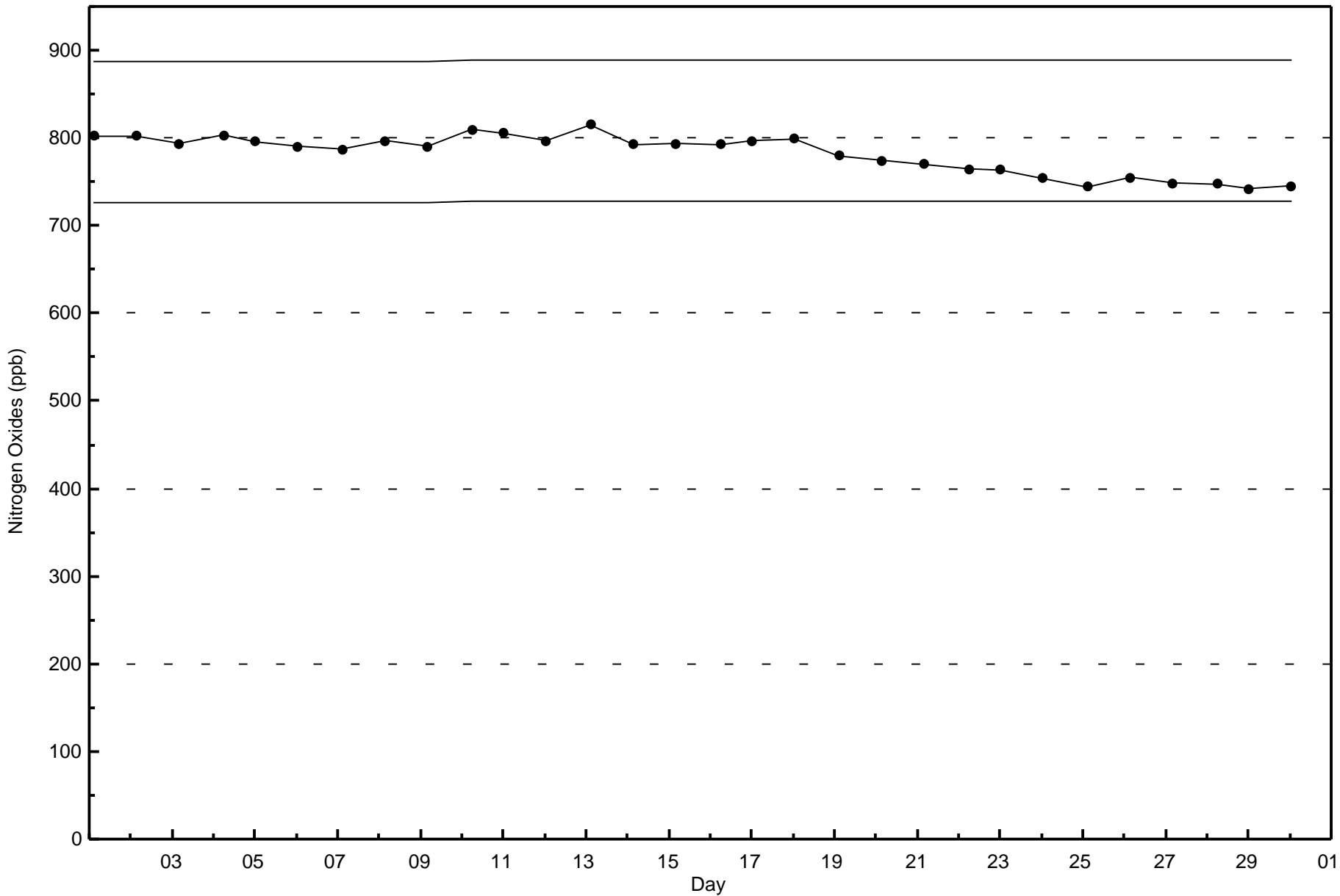
Total Number of Valid Hours: 675



Wood Buffalo Environmental Association
Zero Responses

Nitrogen Oxides (NO_x) - ppb
Conklin Community - June 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Ozone (O₃) - ppb

Conklin Community - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 69 ppb on Jun 6 18:00	Maximum Daily Average: 47.3 ppb on Jun 6		Hours of Data:	685
Minimum Value: 4 ppb on Jun 26 01:00	Minimum Daily Average: 25.1 ppb on Jun 24		Hours of Missing Data:	35
Maximum Diurnal Average: 44.0 ppb at hour 16	Minimum Diurnal Average: 19.9 ppb at hour 6		Hours of Calibration:	34
Monthly Average: 32.7 ppb	Percentiles: P ₁ = 5 P ₁₀ = 11 Q ₁ = 23 Median = 35 Q ₃ = 42 P ₉₀ = 48 P ₉₉ = 65		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-Jun	10	13	13	14	15	Z	17	24	27	31	36	39	41	43	43	40	37	35	29	33	32	30	16	11	27.4	43
2-Jun	8	6	5	5	5	10	Z	15	21	34	37	43	46	47	46	46	43	37	35	33	26	27	18	12	26.4	47
3-Jun	12	9	17	27	24	25	28	Z	30	35	38	40	42	43	45	47	46	45	46	45	44	29	26	41	34.1	47
4-Jun	36	35	39	38	37	37	38	42	Z	48	53	54	54	56	58	59	59	57	54	52	46	32	24	25	45.0	59
5-Jun	36	36	35	Z	27	38	37	37	39	40	41	42	43	43	42	42	41	41	41	39	23	13	11	8	34.6	43
6-Jun	11	10	10	9	Z	8	21	36	46	51	55	58	61	64	65	68	68	69	69	69	65	62	59	55	47.3	69
7-Jun	58	57	54	51	49	Z	46	45	43	44	47	48	50	50	51	47	46	46	47	48	39	24	24	36	45.6	58
8-Jun	26	15	12	10	9	8	Z	32	42	48	46	M	41	31	30	34	35	38	38	35	37	32	29	30	29.8	48
9-Jun	33	35	37	36	29	28	27	Z	23	21	19	18	19	23	24	24	28	32	32	34	34	35	37	39	29.0	39
10-Jun	40	41	40	40	35	33	34	39	Z	40	34	33	35	34	38	40	40	38	34	35	24	11	6	5	32.5	41
11-Jun	5	9	8	Z	8	11	20	26	31	36	41	43	40	39	41	39	36	37	28	25	33	30	26	25	27.8	43
12-Jun	26	26	29	31	Z	24	25	27	27	29	32	34	32	31	33	35	34	38	39	38	32	30	28	26	30.7	39
13-Jun	29	31	30	29	28	Z	29	31	33	34	34	35	37	39	43	47	46	45	44	42	33	20	22	16	33.9	47
14-Jun	14	14	13	11	8	9	Z	28	38	42	C	C	C	C	54	56	57	60	57	47	38	42	47	44	35.8	60
15-Jun	43	41	37	34	32	36	34	Z	38	40	41	41	43	48	48	49	48	48	48	49	46	35	22	14	39.9	49
16-Jun	16	19	17	13	17	24	30	33	Z	37	39	39	40	39	38	37	36	31	29	27	26	25	25	23	28.7	40
17-Jun	22	21	21	Z	19	18	16	17	20	20	22	27	30	33	35	35	34	33	34	33	32	32	30	31	26.8	35
18-Jun	31	39	40	38	Z	29	30	30	30	31	32	32	33	35	39	39	40	40	39	36	20	21	34	31	33.3	40
19-Jun	38	36	31	36	31	Z	30	33	39	40	43	43	42	42	44	46	46	48	46	44	39	26	15	13	36.9	48
20-Jun	14	16	14	8	10	17	Z	35	43	46	46	48	50	53	52	53	52	52	51	45	24	16	22	27	34.5	53
21-Jun	15	12	12	9	13	15	20	Z	44	51	53	54	54	58	63	60	55	56	53	49	30	26	41	47	38.6	63
22-Jun	47	40	25	24	32	32	34	38	Z	50	53	54	51	53	52	52	54	52	48	39	24	16	21	34	40.3	54
23-Jun	39	39	36	Z	32	30	29	33	36	40	42	43	44	42	38	39	36	40	42	34	26	18	8	7	33.5	44
24-Jun	8	5	4	9	Z	12	17	18	22	23	27	32	37	41	43	45	45	43	41	35	25	23	13	10	25.1	45
25-Jun	11	12	19	16	15	Z	20	20	21	26	28	33	38	43	43	35	38	38	37	38	29	15	7	6	25.6	43
26-Jun	4	5	5	5	6	8	Z	21	30	40	41	43	44	44	40	37	38	38	34	31	22	18	16	20	25.6	44
27-Jun	11	10	9	7	6	11	24	Z	32	35	38	41	41	41	41	41	41	41	39	33	28	17	16	9	26.6	41
28-Jun	10	16	18	8	6	9	18	29	Z	33	34	34	37	37	37	40	42	42	39	40	33	17	16	9	26.3	42
29-Jun	8	8	7	Z	5	8	24	33	36	38	40	42	42	42	42	43	42	42	41	38	35	20	13	8	28.5	43
30-Jun	9	9	11	10	Z	16	30	34	37	40	42	42	43	44	44	45	43	42	40	39	33	19	11	11	30.3	45

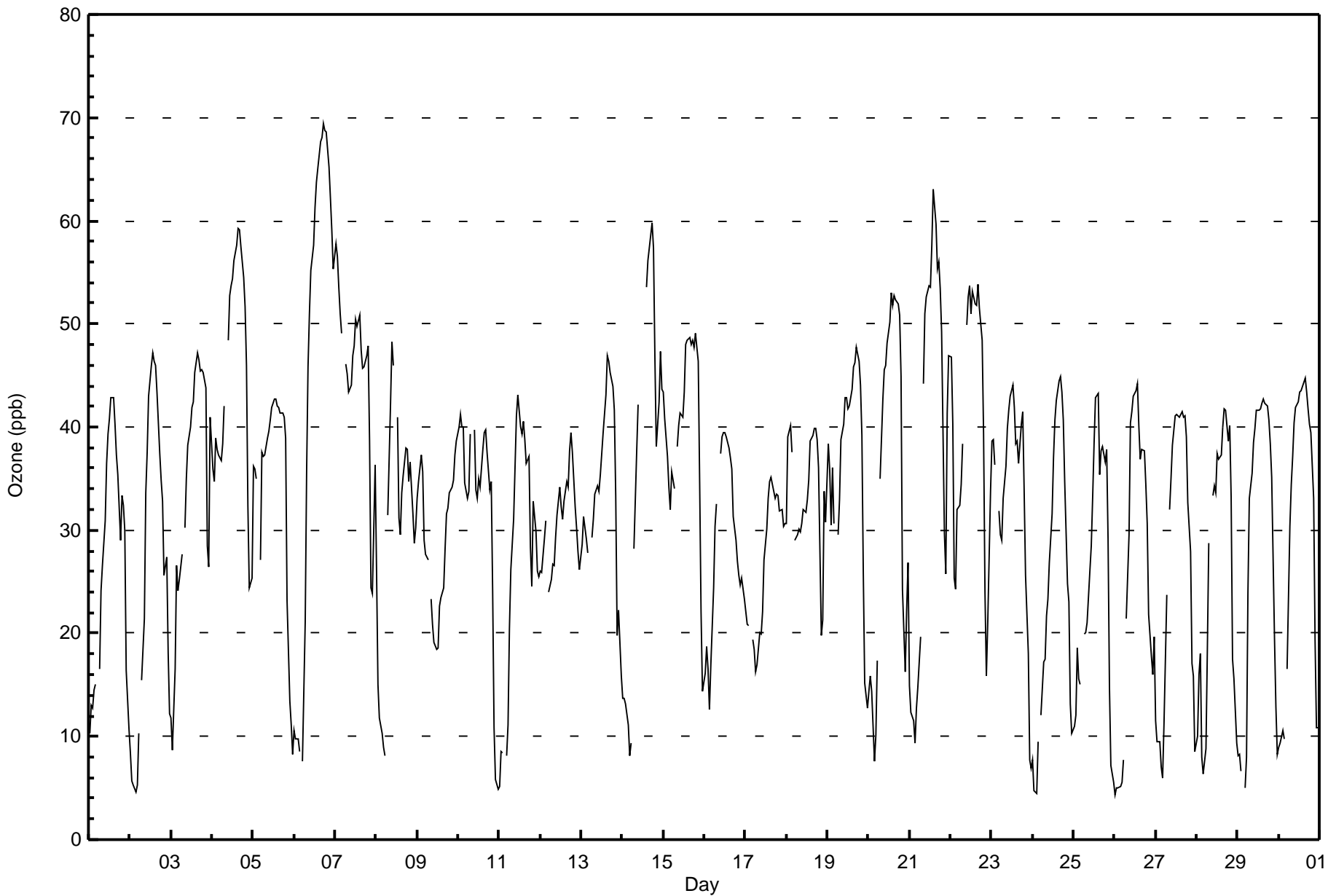
22.4	22.1	21.6	20.7	19.9	19.9	27.2	30.3	33.1	37.5	39.1	40.5	41.7	42.6	43.7	44.0	43.7	43.5	41.8	39.4	32.6	25.4	22.8	22.4	Diurnal Average		
58	57	54	51	49	38	46	45	46	51	55	58	61	64	65	68	68	69	69	69	69	65	62	59	55	Diurnal Maximum	

Z - zerospan C - Calibration M - Maintenance
 Alberta Ambient Air Quality Objectives (AAAQO): 1-hr 82 ppb



Wood Buffalo Environmental Association
Hourly Averages

Ozone (O₃) - ppb
Conklin Community - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ozone (O₃) - ppb
Conklin Community - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	149	21.75	21.75
21 - 50	477	69.64	91.39
51 - 82	59	8.61	100.00
> 83	0	0.00	100.00

Total Number of Valid Hours: 685

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Ozone (O₃) - ppb
Conklin Community - June 2016**

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	2	1	2	1	5	12	17	23	21	4	5	2	9	11	25	147
21 - 50	33	18	4	5	14	28	25	23	25	33	47	39	36	40	53	53	476
51 - 82	0	0	0	1	1	5	1	17	6	8	2	1	4	10	3	0	59
> 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	40	20	5	8	16	38	38	57	54	62	53	45	42	59	67	78	682

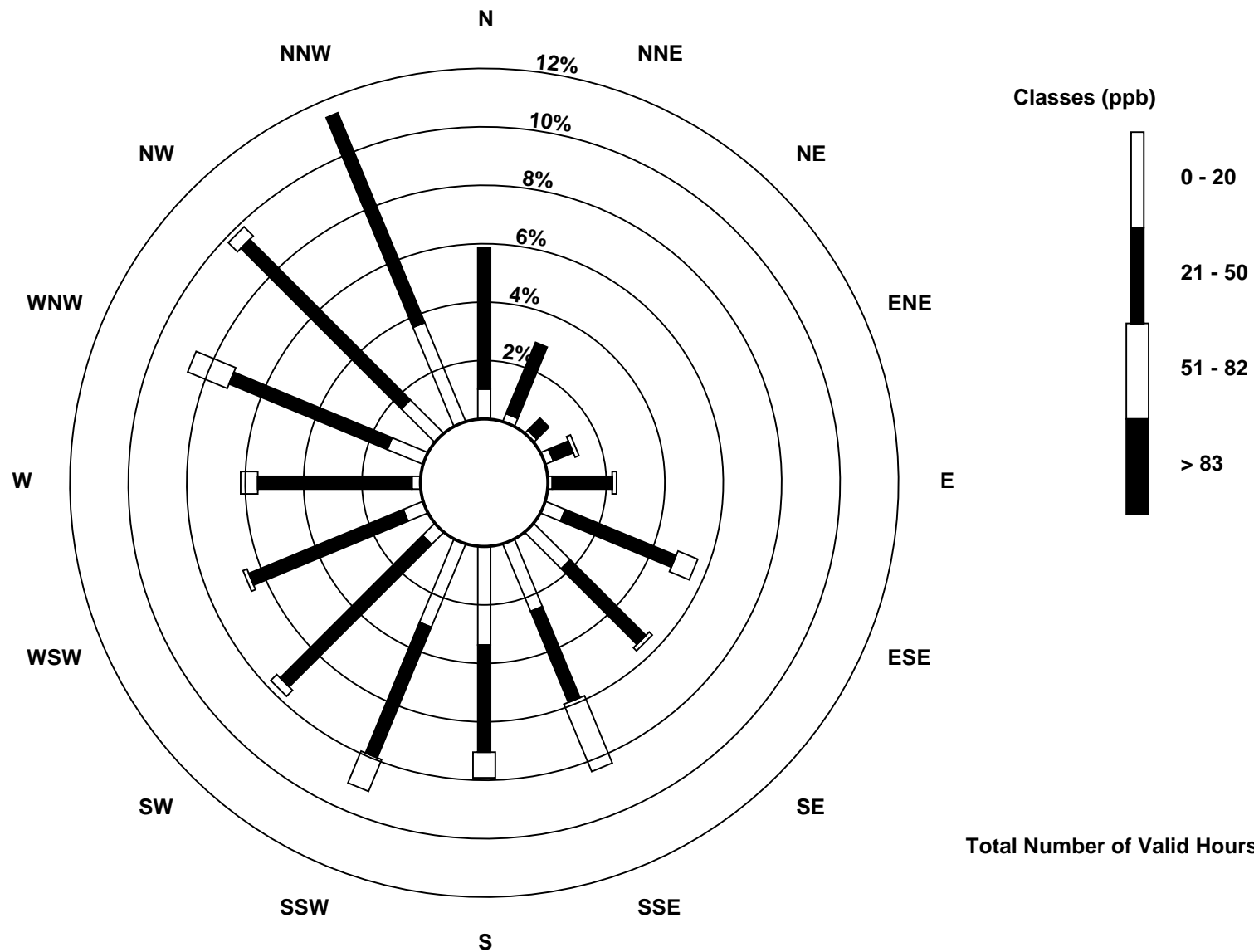
Total Number of Valid Hours: 682

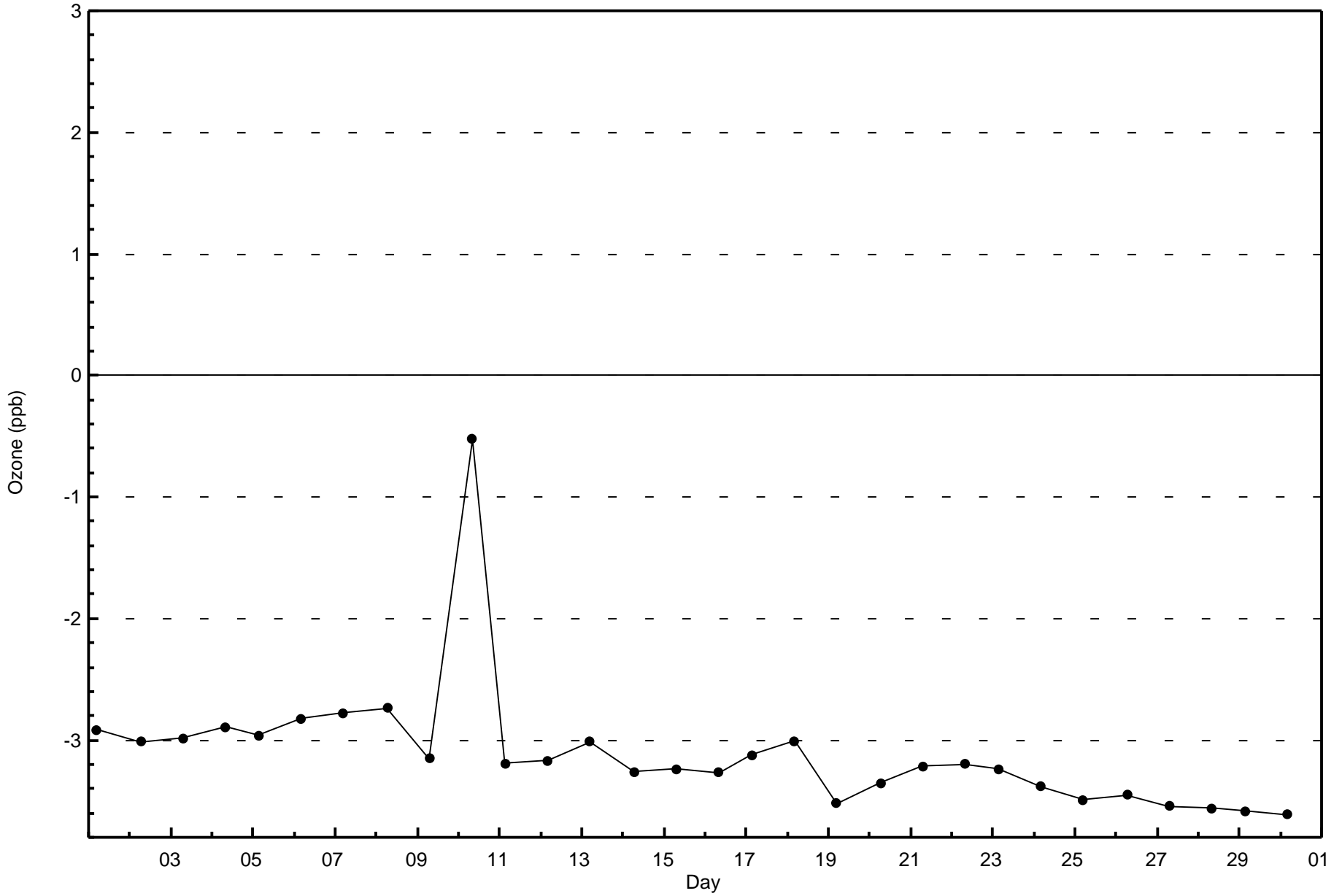
Total Number of Hours: 720

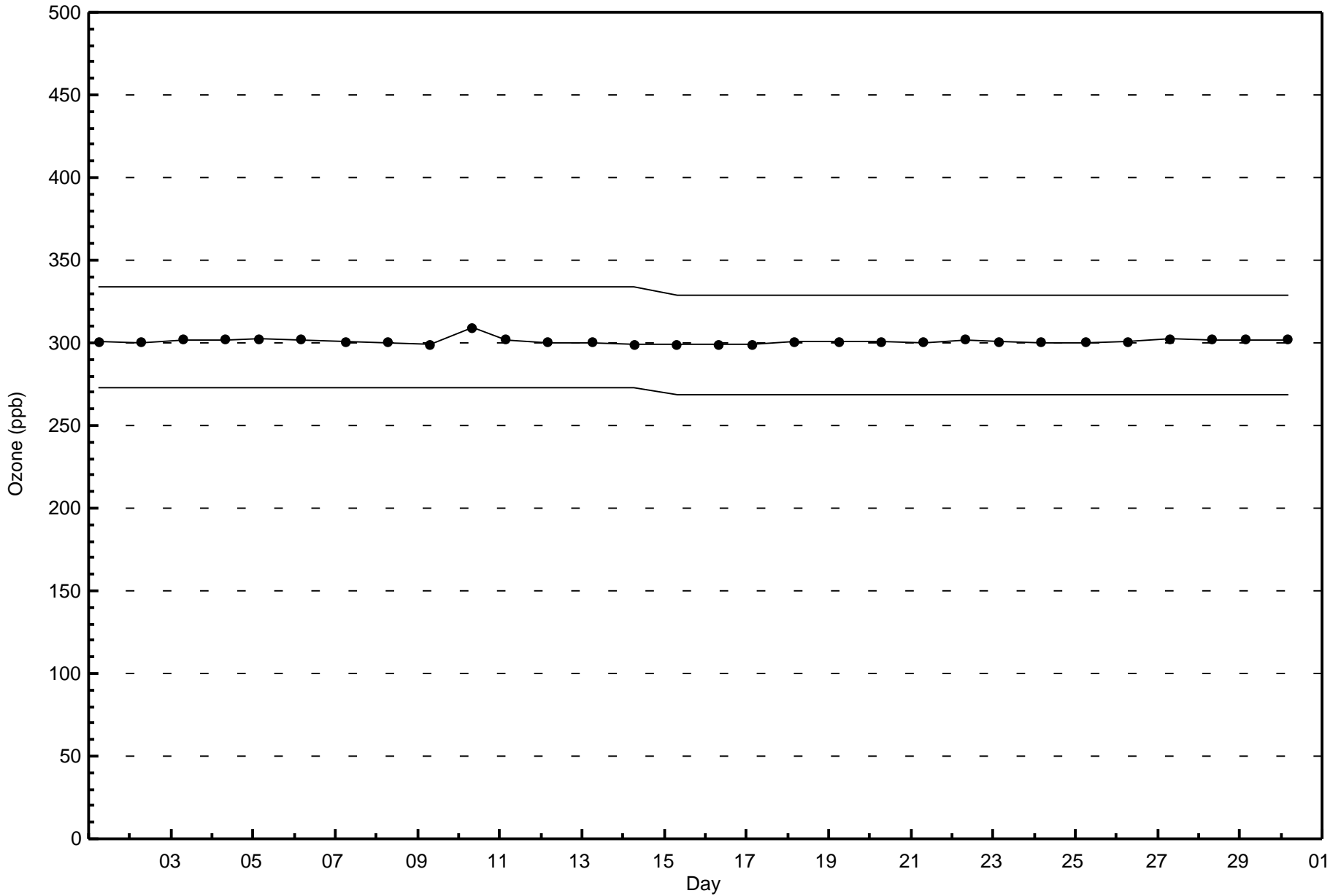


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Ozone (O₃) - ppb
Conklin Community (AMS 21)









Wood Buffalo Environmental Association

Summary of Hour Averages

Particulate Matter 2.5 (PM_{2.5}) - µg/m³

Conklin Community - June 2016

Number of Exceedences (AAAQO):	24-hr: 1	Hours in Service:	720
Maximum Value: 221.6 µg/m ³ on Jun 8 04:00	Maximum Daily Average: 74.3 µg/m ³ on Jun 8	Hours of Data:	668
Minimum Value: 0.0 µg/m ³ on Jun 2 01:00	Minimum Daily Average: 0.9 µg/m ³ on Jun 12	Hours of Missing Data:	52
Maximum Diurnal Average: 10.8 µg/m ³ at hour 22	Minimum Diurnal Average: 3.5 µg/m ³ at hour 14	Hours of Calibration:	5
Monthly Average: 6.26 µg/m ³	Percentiles: P ₁ = 0.1 P ₁₀ = 0.8 Q ₁ = 1.6 Median = 2.7 Q ₃ = 4.5 P ₉₀ = 8.0 P ₉₉ = 107.8	Percent Operational Time:	93.5

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-Jun	9.4	2.7	1.5	0.9	1.1	1.9	3.0	3.8	3.1	3.4	2.3	2.2	2.7	2.4	3.4	4.4	3.3	2.9	2.8	3.2	1.8	1.1	0.6	0.2	2.7	9.4
2-Jun	0.0	1.8	4.8	1.2	1.0	0.8	0.4	0.9	1.6	2.2	2.7	3.4	3.4	3.2	3.2	3.2	3.5	2.6	2.6	1.7	1.8	1.7	2.2	2.4	2.2	4.8
3-Jun	2.9	2.3	2.1	2.0	1.8	1.6	1.2	0.9	0.8	0.5	0.3	0.4	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.3	28.7	11.6	3.2	2.5	28.7
4-Jun	3.6	3.1	1.7	1.2	1.4	1.6	1.8	3.7	4.0	4.1	12.8	5.9	5.0	5.3	10.5	9.4	7.9	7.0	4.6	5.2	4.2	14.2	8.1	8.4	5.6	14.2
5-Jun	2.2	2.1	2.2	3.6	3.7	3.0	2.6	1.6	0.6	UO	UO	UO	1.4	1.1	0.8	0.7	0.3	0.1	0.1	0.1	27.8	58.4	28.5	9.3	7.1	58.4
6-Jun	5.5	2.6	1.9	1.9	3.4	5.6	3.4	2.5	2.5	3.7	4.4	4.8	4.9	6.0	5.1	5.5	7.3	6.6	7.9	7.8	9.3	9.5	7.7	8.1	5.3	9.5
7-Jun	8.4	6.6	5.2	5.4	5.5	8.6	7.6	6.8	6.4	5.8	7.0	11.7	9.9	5.1	4.7	5.2	5.4	5.6	5.7	5.6	10.1	22.7	18.1	54.6	9.9	54.6
8-Jun	43.4	30.6	189.5	221.6	187.0	163.2	215.5	185.1	100.9	116.2	28.2	24.9	30.3	28.6	41.2	50.8	23.2	33.4	26.4	13.7	8.8	7.4	6.7	6.6	74.3	221.6
9-Jun	8.0	5.8	3.0	4.5	11.5	6.1	0.8	0.8	0.6	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	11.5
10-Jun	UO	UO	0.2	0.3	0.8	1.4	1.5	1.2	0.9	2.1	2.6	2.6	1.7	2.2	2.0	2.0	2.8	3.5	6.9	6.1	13.8	13.3	10.1	6.1	3.8	13.8
11-Jun	6.5	7.5	4.6	4.7	2.8	2.3	1.4	1.2	1.1	0.9	0.7	0.6	1.0	0.9	1.0	1.2	1.4	1.7	2.2	1.2	0.8	0.7	0.5	0.6	2.0	7.5
12-Jun	0.6	1.1	1.0	0.8	0.4	0.5	0.5	0.4	0.1	0.3	0.4	0.4	0.4	0.3	0.4	0.6	1.0	1.8	1.5	1.4	1.8	2.2	2.3	2.1	0.9	2.3
13-Jun	1.8	1.3	1.1	0.8	0.6	0.4	0.2	0.3	0.4	0.2	0.1	0.6	0.1	0.2	0.3	0.5	0.5	0.4	0.8	0.8	4.7	7.1	2.8	2.7	1.2	7.1
14-Jun	1.9	1.8	1.6	3.3	2.7	2.5	2.5	1.9	1.3	C	C	C	C	C	2.9	3.4	3.2	4.1	3.6	2.2	2.4	2.7	1.2	1.2	2.4	4.1
15-Jun	1.3	1.6	1.3	1.3	1.6	2.2	3.4	2.1	0.9	1.1	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	--	3.4
16-Jun	AF	AF	AF	AF	AF	AF	AF	AF	AF	AF	M	M	M	0.8	1.1	2.7	2.8	2.6	1.9	1.9	1.6	1.3	1.4	1.3	--	2.8
17-Jun	1.8	1.6	1.6	1.1	1.3	1.2	0.8	0.6	0.7	1.2	0.9	0.3	0.1	0.8	1.5	0.8	0.9	1.2	1.7	2.4	4.1	3.6	3.0	3.1	1.5	4.1
18-Jun	3.2	2.5	2.4	2.6	2.7	2.3	1.8	2.1	2.3	2.1	2.3	3.0	3.0	3.3	2.0	2.3	2.6	3.2	3.3	3.6	24.8	8.0	3.3	2.6	3.8	24.8
19-Jun	2.2	2.1	1.8	1.6	1.7	1.9	1.9	1.5	1.2	1.4	1.5	1.6	1.4	1.1	1.2	1.1	1.0	1.0	0.9	1.1	1.1	2.8	6.2	4.0	1.8	6.2
20-Jun	3.9	3.0	4.3	3.2	3.5	2.9	2.0	1.9	1.5	1.5	1.0	0.8	1.0	1.0	1.1	1.0	1.1	1.1	2.0	7.5	27.9	24.5	5.3	3.6	4.4	27.9
21-Jun	4.8	4.4	3.4	3.0	4.3	6.7	3.7	3.9	1.6	1.2	1.5	1.7	1.8	2.2	2.2	2.2	2.5	2.7	3.0	5.1	29.0	10.1	6.6	3.8	4.6	29.0
22-Jun	3.4	3.4	4.3	3.4	3.1	2.5	2.0	1.4	1.5	1.7	2.1	2.2	2.6	3.2	2.8	2.6	3.6	3.1	3.6	6.7	11.6	9.7	4.2	4.3	3.7	11.6
23-Jun	4.0	3.9	3.9	3.6	3.4	3.5	3.6	3.2	2.7	2.4	2.9	3.5	3.1	3.5	3.7	2.4	2.4	2.4	2.0	2.5	3.6	4.2	2.8	3.1	3.2	4.2
24-Jun	3.4	3.9	4.7	5.5	5.0	5.8	6.8	5.6	5.2	4.4	4.3	4.9	4.2	4.0	3.8	3.5	3.5	2.9	2.1	1.6	2.2	2.4	2.3	1.6	3.9	6.8
25-Jun	1.6	1.8	2.2	4.2	6.3	5.1	5.1	4.5	3.4	3.1	3.3	2.6	1.8	1.7	2.3	2.3	1.5	2.2	2.4	2.4	3.5	4.8	3.6	2.7	3.1	6.3
26-Jun	3.0	2.9	2.8	2.8	3.0	3.1	1.9	2.2	2.3	2.8	3.4	3.9	4.4	5.1	4.9	5.4	4.8	3.6	3.5	5.8	5.6	13.9	5.2	3.7	4.2	13.9
27-Jun	4.7	3.5	3.5	3.9	4.1	3.5	1.8	1.6	1.5	1.6	1.6	1.7	1.8	1.9	2.0	1.9	2.1	2.0	2.4	2.7	6.3	11.0	6.4	4.0	3.2	11.0
28-Jun	3.5	3.2	3.2	3.0	3.2	4.7	2.6	1.7	1.5	1.8	1.8	2.1	2.0	1.8	1.6	1.7	1.7	1.8	2.4	3.2	5.6	5.4	6.8	7.2	3.1	7.2
29-Jun	6.7	8.9	11.5	13.0	10.7	22.6	22.8	11.5	6.8	6.1	4.6	5.6	5.2	4.7	4.5	4.6	4.5	4.4	4.4	4.2	4.5	15.6	6.2	3.6	8.2	22.8
30-Jun	3.7	3.5	3.4	3.0	2.4	1.9	2.1	2.1	3.7	2.6	2.9	3.2	3.7	4.3	4.0	3.6	3.7	4.0	3.8	3.6	9.4	15.4	3.6	3.6	4.0	15.4

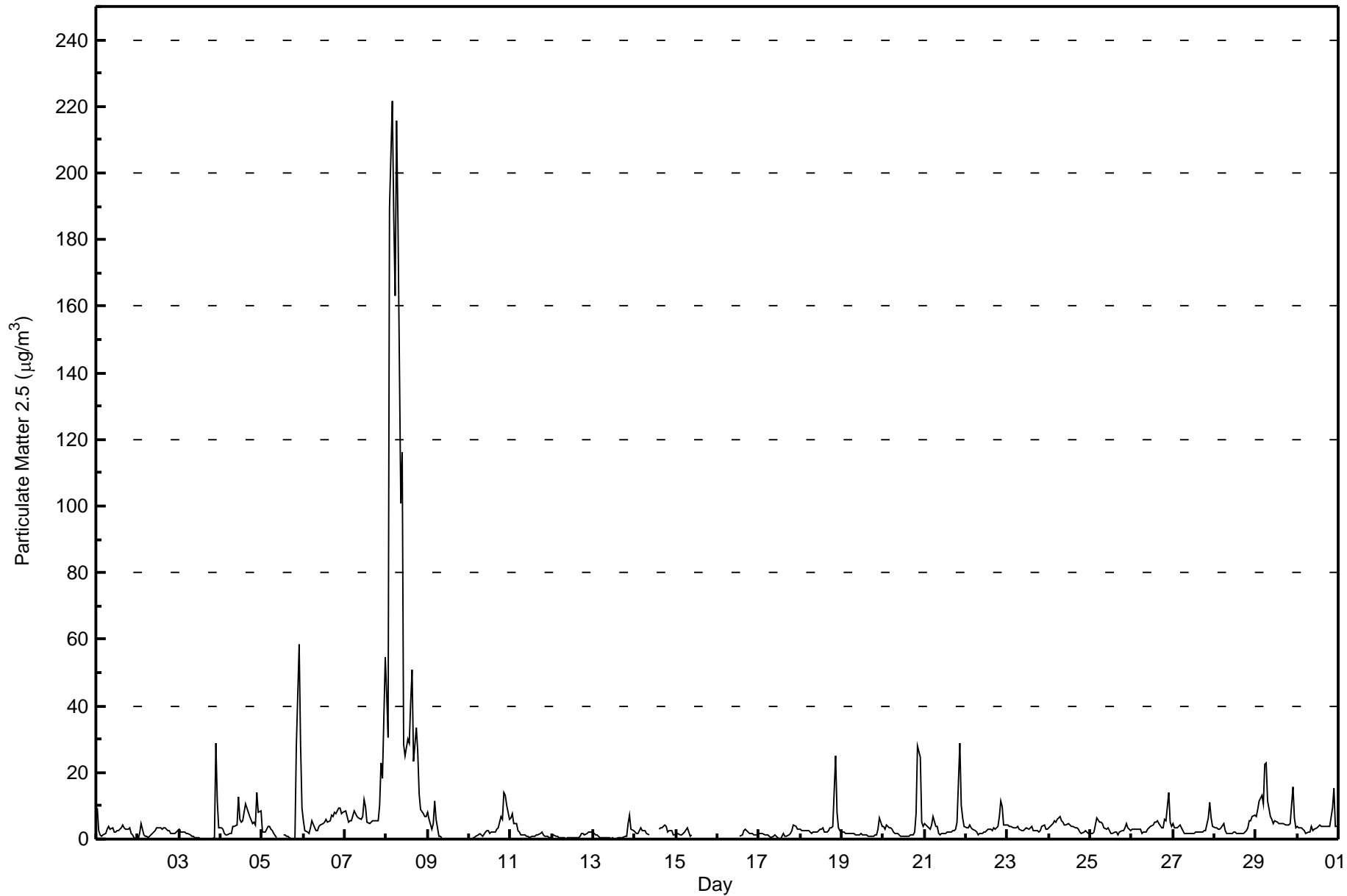
5.2	4.3	9.5	10.6	9.7	9.3	10.5	8.9	5.6	6.7	3.8	3.8	3.7	3.5	4.1	4.5	3.5	3.9	3.7	3.7	8.2	10.8	6.0	5.6	Diurnal Average	
43.4	30.6	189.5	221.6	187.0	163.2	215.5	185.1	100.9	116.2	28.2	24.9	30.3	28.6	41.2	50.8	23.2	33.4	26.4	13.7	29.0	58.4	28.5	54.6	Diurnal Maximum	

C - Calibration M - Maintenance AF - Analyzer Failure UO - Unstable Operation
 Alberta Ambient Air Quality Objectives (AAAQO): 24-hr 30 µg/m³



Wood Buffalo Environmental Association
Hourly Averages

Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Conklin Community - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Particulate Matter 2.5 (PM_{2.5}) - $\mu\text{g}/\text{m}^3$
Conklin Community - June 2016**

Concentration Ranges ($\mu\text{g}/\text{m}^3$)	Number of Hours	%	Cumulative %
1 - 5	453	67.81	67.81
6 - 15	88	13.17	80.99
16 - 25	9	1.35	82.34
26 - 80	16	2.40	84.73
> 81.0	8	1.20	85.93

Total Number of Valid Hours: 668

Total Number of Hours: 720



Wood Buffalo Environmental Association
Frequency Distribution

Particulate Matter 2.5 (PM_{2.5}) - μg/m³
Conklin Community - June 2016

Concentration Ranges (μg/m ³)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1 - 5	14	13	4	6	14	27	26	35	43	41	26	31	25	37	54	57	453
6 - 15	6	2	0	1	3	9	1	13	7	7	8	1	6	11	6	4	85
16 - 25	3	0	0	0	0	0	1	0	2	1	0	0	0	0	1	1	9
26 - 80	4	2	1	0	0	1	0	2	0	0	3	0	0	0	0	2	15
> 81.0	0	0	0	1	0	1	0	0	0	1	0	0	1	0	0	4	8
Totals	27	17	5	8	17	38	28	50	52	50	37	32	32	48	61	68	570

Total Number of Valid Hours: 664

Total Number of Hours: 720



Wood Buffalo Environmental Association
Summary of Hour Averages

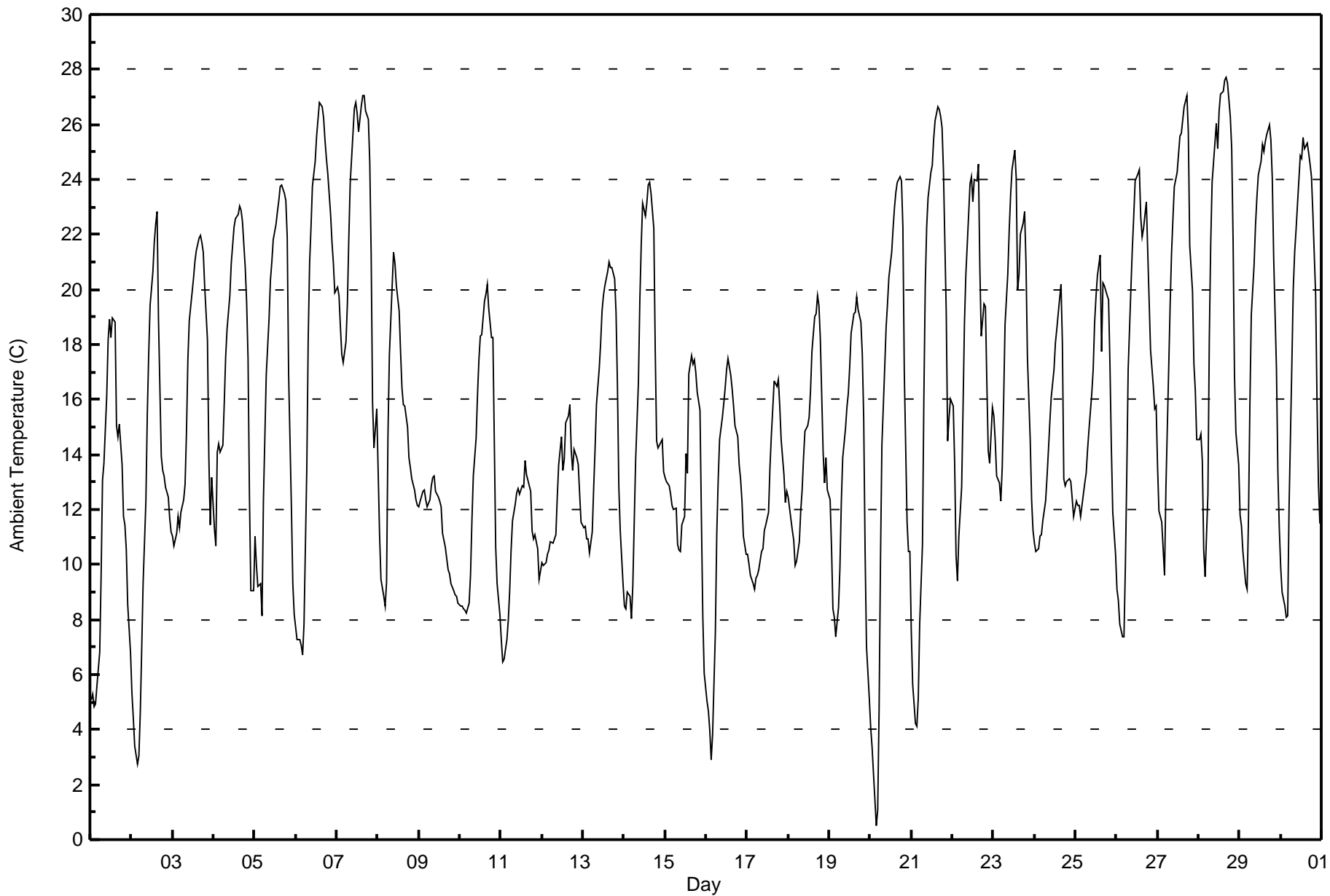
Ambient Temperature (AT) - C
Conklin Community - June 2016

Maximum Value: 27.7 C on Jun 28 17:00		Maximum Daily Average: 22.2 C on Jun 7		Hours in Service: 720																						
Minimum Value: 0.5 C on Jun 20 04:00		Minimum Daily Average: 10.8 C on Jun 11		Hours of Data: 720																						
Maximum Diurnal Average: 20.9 C at hour 16		Minimum Diurnal Average: 9.0 C at hour 5		Hours of Missing Data: 0																						
Monthly Average: 15.66 C		Percentiles: P ₁ = 3.3 P ₁₀ = 8.6 Q ₁ = 11.2 Median = 14.6 Q ₃ = 20.2 P ₉₀ = 24.0 P ₉₉ = 27.0		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-Jun	5.1	5.3	4.8	4.9	5.6	6.8	9.6	13.1	13.7	16.1	18.2	18.9	18.2	19.0	18.8	15.1	14.7	15.1	13.6	11.7	11.4	10.5	8.5	6.8	11.9	19.0
2-Jun	5.3	4.4	3.4	2.7	3.0	4.6	6.9	9.3	12.3	15.4	17.6	19.4	20.7	21.7	22.4	22.9	18.9	13.9	13.4	13.2	12.8	12.4	11.7	11.2	12.5	22.9
3-Jun	11.0	10.7	11.1	11.8	11.4	11.9	12.3	12.9	14.8	17.4	18.8	19.9	20.4	21.0	21.4	21.9	22.0	21.7	21.4	20.2	18.2	13.9	11.4	13.2	16.3	22.0
4-Jun	11.3	10.7	14.1	14.4	14.1	14.3	15.9	17.5	18.6	19.8	20.9	21.6	22.2	22.6	22.7	23.0	22.9	22.5	20.8	19.5	17.5	12.5	9.0	9.1	17.4	23.0
5-Jun	11.0	10.0	9.2	9.3	8.1	12.4	14.6	16.9	18.9	20.3	21.0	21.8	22.4	22.8	23.2	23.8	23.8	23.5	23.3	21.9	16.9	12.0	9.3	8.2	16.9	23.8
6-Jun	7.8	7.3	7.3	7.0	6.7	7.8	13.5	18.2	20.9	22.3	23.8	24.6	25.6	26.2	26.8	26.6	26.2	25.4	24.7	24.2	22.7	21.7	21.0	19.9	19.1	26.8
7-Jun	20.1	19.8	18.7	17.6	17.3	18.1	19.5	21.8	23.9	25.7	26.6	26.8	26.4	25.7	26.7	27.1	27.0	26.5	26.2	24.6	21.3	15.9	14.3	15.6	22.2	27.1
8-Jun	13.4	11.1	9.4	8.9	8.5	9.4	14.7	17.6	20.1	21.3	20.9	20.1	19.2	17.7	16.4	15.8	15.8	15.0	13.9	13.5	13.1	12.7	12.4	12.1	14.7	21.3
9-Jun	12.1	12.3	12.7	12.7	12.4	12.1	12.4	12.9	13.2	13.2	12.7	12.5	12.3	12.1	11.1	10.6	10.2	9.8	9.7	9.3	9.0	8.9	8.8	8.6	11.3	13.2
10-Jun	8.5	8.5	8.4	8.3	8.2	8.6	9.6	11.6	13.2	14.6	16.2	17.4	18.3	18.4	19.6	19.8	20.2	19.3	18.3	18.3	14.5	10.7	9.3	8.2	13.7	20.2
11-Jun	7.3	6.4	6.6	7.3	8.0	9.0	10.5	11.6	12.2	12.6	12.7	12.6	12.9	12.8	13.8	13.3	13.1	12.7	11.2	10.9	11.1	10.6	9.5	9.8	10.8	13.8
12-Jun	10.1	10.0	10.1	10.4	10.5	10.8	10.8	10.9	11.1	12.5	13.6	14.6	13.4	13.8	15.2	15.4	15.8	14.1	13.4	14.2	13.9	13.6	12.6	11.6	12.6	15.8
13-Jun	11.3	11.4	10.9	10.9	10.4	11.2	12.8	14.2	15.8	17.1	18.1	19.2	19.8	20.1	20.7	21.0	20.8	20.8	20.4	19.2	16.5	12.8	11.2	9.3	15.7	21.0
14-Jun	8.5	8.4	9.0	8.8	8.0	9.2	11.6	13.8	16.6	19.6	21.6	23.1	22.7	23.2	23.8	23.9	23.5	22.2	17.9	14.5	14.2	14.4	14.6	13.4	16.1	23.9
15-Jun	13.2	13.0	12.8	12.6	12.2	12.0	12.0	10.7	10.6	10.5	11.4	11.8	14.0	13.3	16.9	17.6	17.3	17.5	17.0	16.2	15.6	11.7	8.2	6.0	13.1	17.6
16-Jun	5.0	4.7	4.0	2.9	3.8	7.6	11.2	13.1	14.6	15.4	15.8	16.4	17.1	17.5	16.9	16.4	15.8	15.0	14.6	13.7	13.1	12.3	11.0	10.4	12.0	17.5
17-Jun	10.4	10.0	9.6	9.3	9.1	9.5	9.6	9.8	10.5	10.6	11.3	11.4	11.9	13.5	14.7	15.7	16.7	16.5	16.7	15.8	14.6	13.3	12.3	12.6	12.3	16.7
18-Jun	12.4	12.1	11.2	10.9	10.0	10.1	10.8	12.0	12.7	13.9	14.8	15.0	15.3	16.3	17.7	19.0	19.1	19.8	19.4	18.2	14.1	13.0	13.9	12.7	14.4	19.8
19-Jun	12.4	10.6	8.4	8.1	7.4	8.4	9.9	12.2	13.9	15.0	15.7	16.2	17.2	18.4	19.1	19.2	19.8	19.3	18.8	17.7	15.3	10.5	7.0	5.2	13.6	19.8
20-Jun	4.0	3.4	2.4	0.5	1.1	4.8	10.2	14.3	17.2	18.6	19.5	20.4	21.4	22.2	23.0	23.5	23.9	24.1	24.0	22.3	17.1	11.5	10.5	10.5	14.6	24.1
21-Jun	7.6	5.6	4.2	4.1	5.2	7.8	10.7	16.0	20.2	22.2	23.3	24.2	24.5	25.5	26.1	26.7	26.5	26.3	25.9	24.3	19.1	14.5	15.4	16.0	17.6	26.7
22-Jun	15.8	13.7	10.3	9.4	11.1	12.8	15.7	18.8	20.6	22.7	23.9	24.1	23.2	24.0	24.0	24.6	20.8	18.3	19.5	19.4	16.6	14.1	13.7	15.7	18.0	24.6
23-Jun	15.4	14.5	13.2	13.0	12.3	13.5	15.9	18.7	20.6	22.2	23.4	24.3	25.1	24.0	20.0	20.6	22.0	22.4	22.8	21.0	17.5	14.6	12.3	11.2	18.4	25.1
24-Jun	10.8	10.5	10.6	11.0	11.1	11.6	12.3	13.2	14.1	15.1	16.1	17.1	18.1	18.5	19.1	20.2	18.0	13.1	12.9	13.0	13.1	13.0	12.4	11.8	14.0	20.2
25-Jun	12.3	12.2	12.1	11.7	12.1	13.0	13.3	14.2	14.9	16.2	17.1	18.8	19.7	20.5	21.3	17.8	20.2	20.2	19.8	19.7	17.2	14.2	11.9	10.4	15.9	21.3
26-Jun	9.1	8.7	7.8	7.4	7.4	9.9	13.2	17.1	20.1	21.5	22.7	23.9	24.2	24.3	22.6	21.9	22.2	23.2	21.3	19.6	17.8	16.5	15.6	15.8	17.2	24.3
27-Jun	13.6	12.0	11.5	10.6	9.6	12.8	17.2	19.4	21.3	22.6	23.8	24.2	24.9	25.6	25.7	26.6	26.8	27.1	25.7	21.6	20.0	17.3	16.3	14.6	19.6	27.1
28-Jun	14.6	14.8	13.8	10.5	9.6	12.5	18.2	21.6	23.9	25.3	26.0	25.1	26.5	27.1	27.2	27.6	27.7	27.5	26.3	25.1	21.8	16.9	14.8	13.6	20.7	27.7
29-Jun	11.8	11.4	10.5	9.3	9.1	11.7	15.8	19.0	20.9	22.3	23.3	24.2	24.7	25.3	25.0	25.3	25.6	26.0	25.4	24.0	21.2	17.1	13.4	11.3	18.9	26.0
30-Jun	9.9	9.0	8.5	8.1	8.1	12.1	17.3	20.0	21.4	22.2	23.1	24.9	24.7	25.5	25.1	25.3	24.9	24.5	24.1	22.8	19.8	15.8	12.9	11.5	18.4	25.5
																								Diurnal Average		
																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Conklin Community - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Conklin Community - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	117	16.25	16.25
10 - 20	413	57.36	73.61
> 20	190	26.39	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

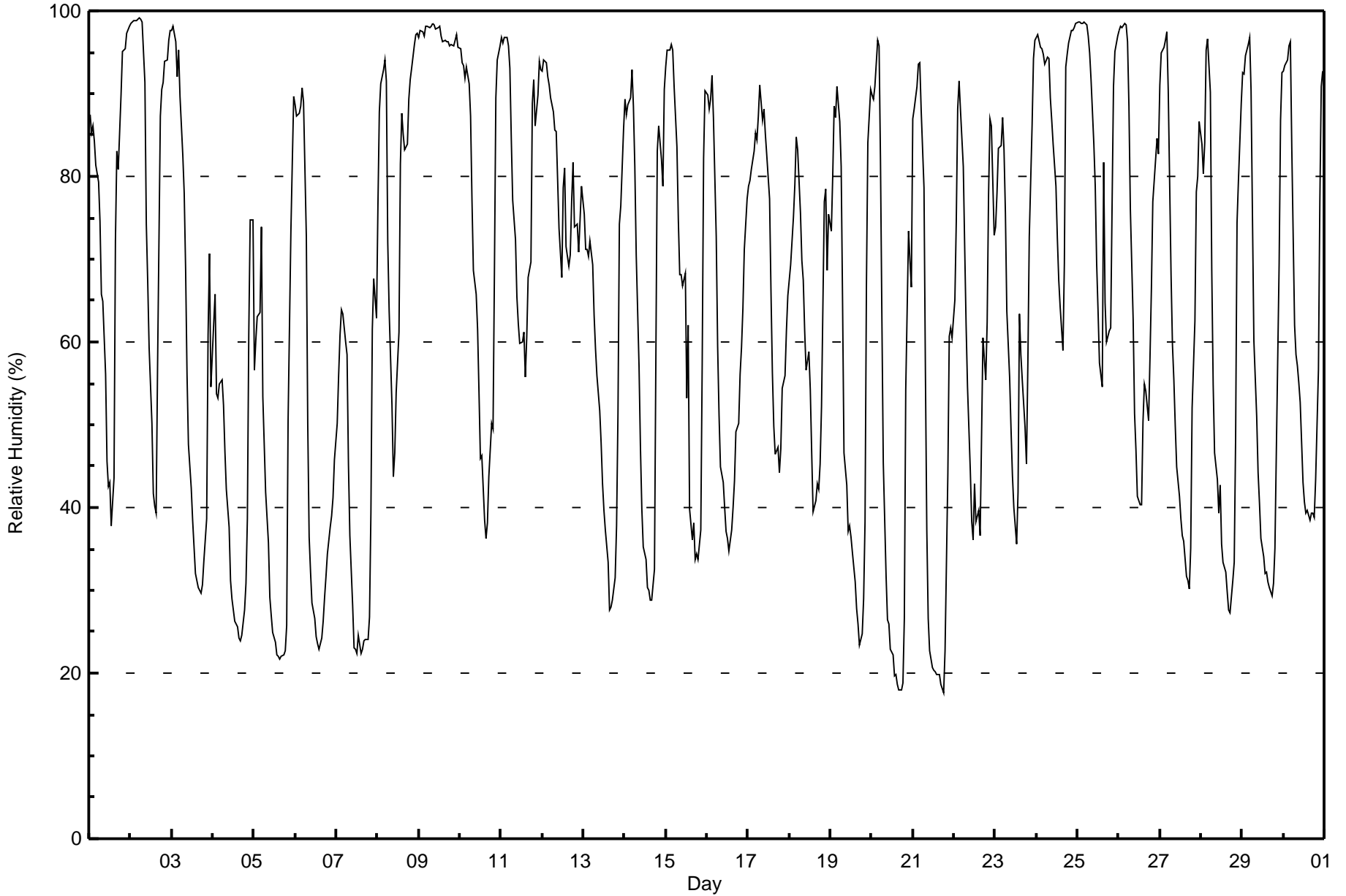
**Relative Humidity (RH) - %
Conklin Community - June 2016**

Maximum Value: 99 % on Jun 2 06:00 Maximum Daily Average: 97.1 % on Jun 9																		Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0 Hours of Calibration: 0 Percent Operational Time: 100.0								
Minimum Value: 18 % on Jun 21 19:00 Minimum Daily Average: 41.3 % on Jun 7 Maximum Diurnal Average: 89.4 % at hour 5 Minimum Diurnal Average: 42.6 % at hour 15 Monthly Average: 64.7 % Percentiles: P ₁ = 20 P ₁₀ = 29 Q ₁ = 42 Median = 67 Q ₃ = 88 P ₉₀ = 96 P ₉₉ = 99																										
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-Jun	87	85	86	84	81	79	74	66	65	56	46	42	43	38	44	72	83	81	90	95	95	95	97	98	74.4	98
2-Jun	98	99	99	99	99	99	99	99	91	74	67	59	50	42	40	39	57	87	90	91	94	94	97	98	81.7	99
3-Jun	98	98	96	92	95	90	83	78	69	56	48	42	39	35	32	30	30	30	31	34	39	61	71	55	59.6	98
4-Jun	62	66	54	53	55	55	52	47	42	38	31	29	28	26	24	24	25	28	31	39	61	75	75	43.5	75	
5-Jun	57	60	63	64	74	53	48	42	36	29	27	25	24	22	22	22	22	22	23	26	51	73	82	90	43.9	90
6-Jun	89	87	88	88	91	89	73	50	36	32	28	27	24	24	23	24	26	29	32	34	38	39	41	46	48.3	91
7-Jun	50	56	61	64	63	60	59	45	37	28	23	23	22	25	22	23	24	24	24	27	39	62	68	63	41.3	68
8-Jun	77	88	91	93	94	92	72	64	52	44	47	54	61	82	88	85	83	84	89	92	93	96	97	97	79.7	97
9-Jun	97	98	97	97	98	98	98	98	98	98	98	98	98	97	96	96	96	96	96	96	96	97	97	96	97.1	98
10-Jun	95	94	93	92	93	91	87	77	69	66	62	54	46	46	38	36	38	44	50	50	69	89	94	96	69.6	96
11-Jun	97	96	97	97	96	93	85	77	72	65	62	60	60	61	56	61	68	70	89	92	86	90	94	93	79.8	97
12-Jun	93	94	94	92	91	89	88	86	86	80	74	68	79	81	72	69	70	77	82	74	74	71	75	79	80.6	94
13-Jun	75	71	71	70	72	69	63	59	56	52	48	43	40	37	33	28	28	29	32	38	51	74	77	86	54.3	86
14-Jun	89	87	89	90	93	88	81	71	57	47	40	35	34	30	30	29	29	33	58	83	86	82	79	90	63.8	93
15-Jun	93	95	95	96	95	91	83	75	68	68	67	68	53	62	40	36	38	34	34	34	37	57	82	90	66.4	96
16-Jun	90	88	89	92	87	73	60	51	45	43	40	37	36	35	37	40	43	49	50	56	59	64	71	77	58.9	92
17-Jun	79	79	81	83	85	84	87	91	87	88	85	82	77	66	56	50	46	47	44	47	54	56	61	66	70.2	91
18-Jun	67	69	75	79	85	83	76	70	67	61	57	59	54	47	40	41	43	42	45	52	77	78	69	75	63.0	85
19-Jun	73	80	89	87	91	87	81	65	47	43	37	38	36	34	31	28	26	23	25	29	38	67	84	91	55.4	91
20-Jun	90	89	91	96	96	82	63	45	32	26	26	23	22	20	20	19	18	18	19	27	54	73	70	67	49.4	96
21-Jun	87	88	91	94	94	88	79	57	37	27	23	21	20	20	20	20	19	18	18	23	44	61	62	60	48.7	94
22-Jun	65	75	88	92	88	81	71	62	55	44	38	36	43	38	40	37	49	61	55	62	78	87	86	73	62.6	92
23-Jun	74	78	83	84	87	83	76	64	56	50	44	40	36	42	63	58	55	50	45	57	73	86	94	96	65.6	96
24-Jun	97	97	96	95	95	94	94	94	90	87	84	79	73	67	64	59	69	93	95	96	98	98	98	98	87.9	98
25-Jun	99	99	99	98	99	98	97	95	92	84	79	70	64	57	55	82	65	60	61	62	77	91	95	97	82.2	99
26-Jun	98	98	98	98	98	96	88	76	63	51	47	41	40	40	50	55	54	51	58	66	77	82	85	83	70.6	98
27-Jun	91	95	96	97	97	90	68	60	55	50	45	41	39	37	36	32	31	30	35	52	63	78	80	87	61.8	97
28-Jun	84	80	84	95	97	90	69	55	47	43	39	43	36	33	32	30	28	27	31	33	48	74	80	89	57.0	97
29-Jun	93	92	95	96	97	90	75	60	51	44	40	36	34	32	32	31	30	29	31	35	47	70	87	93	59.2	97
30-Jun	93	93	94	96	96	84	62	58	57	55	53	43	41	39	40	39	39	39	39	43	57	77	91	93	63.4	96
84.5 85.9 87.4 88.4 89.4 84.7 76.4 67.9 60.5 54.3 50.1 47.2 45.0 43.9 42.6 43.1 44.4 46.7 50.0 54.6 64.3 76.1 81.2 83.1																								Diurnal Average		
99 99 99 99 99 99 99 99 98 98 98 98 98 97 96 96 96 96 96 96 96 98 98 98 98																								Diurnal Maximum		



Wood Buffalo Environmental Association
Hourly Averages

Relative Humidity (RH) - %
Conklin Community - June 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Speed (WS) - km/h
Conklin Community - June 2016

Maximum Speed: 27 km/h on Jun 15 11:00	Maximum Daily Speed Average: 13.3 km/h on Jun 15	Hours in Service: 720
Minimum Speed Value: 0 km/h on Jun 21 08:00	Minimum Daily Speed Average: 1.6 km/h on Jun 2	Hours of Data: 716
Maximum Diurnal Speed Average: 3.5 km/h at hour 11	Minimum Diurnal Speed Average: 0.6 km/h at hour 21	Hours of Missing Data: 4
Monthly Average Velocity: 2.3 km/h 245.2 deg	Percentiles: P ₁ = 0 P ₁₀ = 2 Q ₁ = 4 Median = 7 Q ₃ = 11 P ₉₀ = 14 P ₉₉ = 19	Percent Operational Time: 99.4

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-Jun	SSW7	S7	SSW6	SSW8	SSW7	S6	S5	SSW7	S8	S12	S13	SSE15	S14	S13	S12	SW4	E6	E4	NNW6	SSW0	SE7	SSE6	SSE3	NNW2	S6.0	SSE15
2-Jun	NW1	S0	NW1	NW1	SW2	SE2	NE0	N1	E1	SE5	ESE7	ESE8	E7	ESE8	E9	ESE8	NNW12	NNW10	N4	NW2	ENE1	NNW4	SSW1	WSW1	ENE1.6	NNW12
3-Jun	WSW2	ESE1	SW5	SW6	SW4	WSW6	W8	WNW7	WNW8	WNW9	W12	WNW11	WNW11	W11	W12	W13	WNW11	W13	WNW9	WNW6	W5	SW6	SW7	SW8	W7.0	W13
4-Jun	SSW9	SSW8	W11	W12	W11	W11	WNW9	WNW11	WNW11	WNW12	W15	WNW14	WNW13	WNW12	WNW14	WNW14	WNW12	WNW12	NW11	NW7	NW4	NW1	N1	NNW3	WNW8.9	W15
5-Jun	NNW4	NNW5	NNW5	NNW3	N2	NW6	NW7	NW8	NW10	NW14	NNW15	NW14	NNW13	NW13	NNW12	NW10	NW10	NNW9	NNW8	NNW4	NNW1	SSE2	SSE2	WNW1	NW7.0	NNW15
6-Jun	S1	S2	SSE2	SSE2	SE3	SSE4	SE4	S7	S9	S11	S14	SSE15	SSE16	SSE15	SSE17	SSE18	SSE16	SSE14	SSE11	SSE11	SSE11	SSE11	SSE8	SSE7	SSE9.4	SSE18
7-Jun	SSW10	SW8	SSW8	SSW10	SSW10	SW13	SW11	WSW9	W9	W10	W13	WNW11	WNW10	WNW8	WNW11	W13	WNW10	NW10	NW8	NW4	WNW2	NNW2	N3	N3	W6.8	W13
8-Jun	NNW2	N0	NNW4	NNW2	NNW2	NNW2	W1	SSW2	ENE5	ESE8	ESE5	S4	SW3	N3	N6	NNE8	N9	NNE10	NE7	NNE8	ESE9	E3	N5	NNE5	NE2.8	NNE10
9-Jun	E6	ESE9	E6	NNE5	N7	N10	NNE11	NNE10	N9	NNE11	NNE12	N12	N12	N14	N17	N15	N15	N14	N15	N15	N12	N12	NNW13	NNW14	N10.2	N17
10-Jun	NNW12	NNW12	NNW11	NNW12	NNW9	NNW8	NNW9	NNW11	NNW10	NNW10	NNW10	N10	N11	N7	NNE7	NE4	ESE6	ESE4	E4	ESE4	ENE1	SW0	SSE2	SE2	N5.6	NNW12
11-Jun	ESE2	SW2	NNW3	NW2	S2	SSE2	SE4	SSE8	SE11	SE12	SE15	SE15	SE16	SE14	SE18	SE17	SE13	SE11	NNE1	SSE1	SE8	SE4	SE4	SE5	SE7.3	SE18
12-Jun	SSE7	S6	SW7	SW9	SSW9	SW8	SW12	SW13	SSW13	SW13	SW14	SW16	SW13	SW13	WSW16	WSW15	WSW15	W9	WSW11	W11	WSW12	WSW14	SW9	SW10	SW10.6	SW16
13-Jun	SW10	SW11	SW12	SW12	SW12	SW13	WSW15	WSW14	WSW14	WSW16	WSW17	WSW15	W14	WSW15	WSW15	WSW16	WSW14	SW12	SW11	SSW6	SSW3	S4	SSW6	S5	WSW11.3	WSW17
14-Jun	SE5	SSE4	SE4	SSW1	SSW1	SSW1	ESE3	E4	E6	ESE11	ESE14	SE15	SE16	SSE15	SSE14	SSE15	S13	S14	S16	ESE3	NE1	ESE7	SE13	E5	SE7.5	S16
15-Jun	ESE10	SE10	SE6	SE8	SE8	SE14	SSE18	S22	S23	S24	SSW27	SSW22	SSW22	SSW19	S20	S20	SSE17	SSE18	SSE13	SSE13	S5	W2	SSE1	S2	S13.3	SSW27
16-Jun	S5	SSW6	SSW6	SSW5	SSW4	SW3	SSW8	SW12	SSW15	SSW14	SSW15	SSW15	S14	SW15	SW14	SW13	SW11	WSW11	WSW13	WSW10	WSW8	WSW8	WSW9	SW8	SW9.3	SW15
17-Jun	WSW9	SW9	SW10	WSW10	WSW10	WSW11	WSW12	W9	WNW9	WNW9	WNW11	WNW12	NW10	WNW13	NW15	NW12	W11	W11	WSW13	WSW11	WSW10	SW9	SW9	SW12	W9.4	NW15
18-Jun	WSW11	W10	W7	WNW6	NW3	NW6	NNW7	NW7	NW6	NW6	WSW7	WSW10	W7	WNW6	WNW7	WNW7	WNW7	WSW6	W3	WSW2	S1	SSW5	W6	WNW5	W5.3	WSW11
19-Jun	NNW8	W2	NW3	NNW4	NNW5	NNW5	NNW6	NNW5	NNW7	NNW13	NW14	NW15	NW14	NW15	NW17	NW15	NNW19	NNW18	NNW15	NNW12	NNW6	WNW1	S1	S2	NNW8.9	NNW19
20-Jun	S3	SE2	SE1	NW1	S2	S3	S2	WSW1	WNW5	WNW7	WNW7	NW8	WNW6	NW4	W6	W5	WNW3	W4	WSW4	SW3	SW1	SSW5	SSW6	S5	WSW2.5	NW8
21-Jun	ESE2	SSE4	SSE4	ESE3	E3	ESE3	SE4	E0	WSW7	SSW7	SSE8	SE8	ESE8	ESE8	ENE5	E7	ESE8	ESE8	ESE7	ESE5	AF	NW1	SW5	SSW7	SE3.7	ESE8
22-Jun	SW9	SSE5	SE1	SSW2	S4	S6	SSW7	SW5	SSW7	SSW10	SSW8	SSW5	SSW8	SSE9	S6	WNW6	SSW11	SW10	SSW6	S3	S2	SSW2	SSW4	SSW6	SSW5.5	SSW11
23-Jun	SSW7	SSW5	WSW6	SSW6	S4	SSW7	SW7	W5	WSW7	WNW7	W8	W9	WNW8	W3	WSW6	W9	NNW6	NNE9	N5	NW3	NNE2	WNW1	NNW2	NNW4	W3.6	W9
24-Jun	NNW2	NW1	NNW1	WNW1	SSW2	S2	W3	WNW3	NW3	NW7	NW5	W4	WSW6	NW5	NW8	WNW6	NW6	NNW4	NNW5	NNW5	NE1	N2			NW3.0	NW8
25-Jun	NW1	NNW2	NNW6	NNW4	NNW5	NNW6	NNW7	NNW7	N7	N11	NNE11	NNE11	NNE12	NNE13	N14	NNW8	N8	NNE10	N7	ENE6	SSE2	SSE2	ENE1	WNW1	N5.9	N14
26-Jun	NNW1	SSE3	WNW1	S2	S1	SSE2	S1	ESE2	SE1	SSW5	W3	SW2	NW5	NW6	WNW5	SW8	SW12	W8	WNW5	W2	SSW2	S3	SSW4	WNW2	WSW2.3	SW12
27-Jun	SSE2	S4	SE4	SE3	SSE2	SSE3	NW4	NW7	NW8	NW8	NW9	NW9	NW9	NW9	WNW8	WNW8	NW8	WNW6	NW7	N6	NNW2	SSW1	S3	S3	WNW3.6	NW9
28-Jun	SSW3	SSW6	S3	NNW1	NW2	SE2	NNE1	NW4	NW5	WNW7	NW6	NW6	NW9	NNW14	NNW13	NNW13	NNW13	N9	NNE7	NNE8	N3	NNW3	N3	NW2	NNW4.5	NNW14
29-Jun	NW2	WNW0	AF	AF	AF	NW1	N2	ESE6	ESE9	ESE10	ESE12	ESE10	ESE7	E6	NE6	ENE6	E6	ESE6	ESE8	ESE6	E4	SE1	NNW0	NW2	ESE4.3	ESE12
30-Jun	NNW2	NNW2	N3	NNW3	NNW4	ENE0	SSE7	SSE8	S11	S11	S10	SSE14	SSE12	SSE12	SSE12	SSE15	SSE12	S12	SSE12	SSE8	SSE5	SSE1	NNW3	NNW2	SSE6.0	SSE15

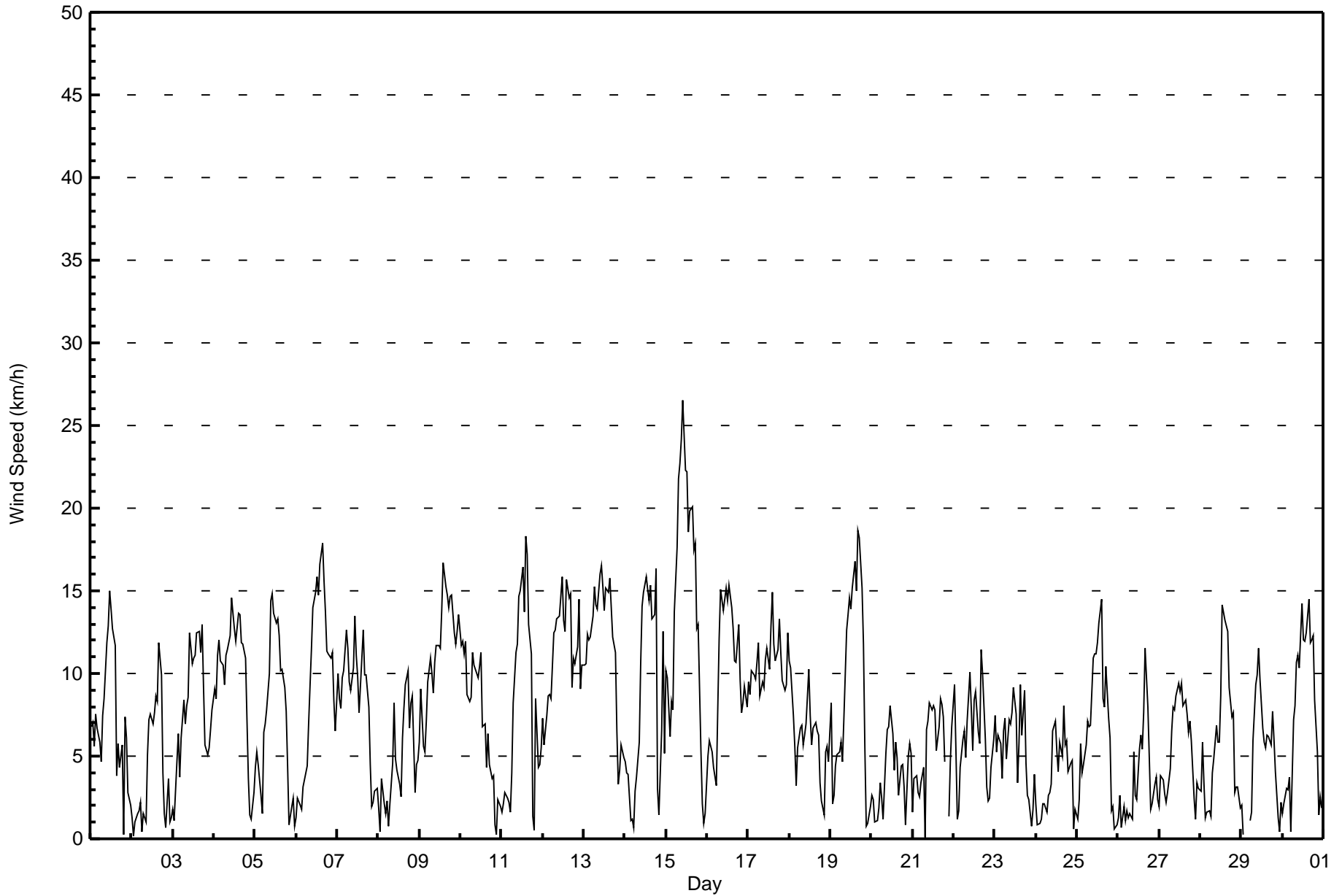
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NNW12 NNW12 SW12 W12 SW12 SE14 SSE18 S22 S23 S24 SSW27 SSW22 SSW22 SSW19 S20 S20 NNW19 NNW18 S16 N15 N12 WSW14 SE13 NNW14	Diurnal Maximum

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
Conklin Community - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Conklin Community - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	264	36.87	36.87
6 - 11	290	40.50	77.37
12 - 19	154	21.51	98.88
20 - 28	8	1.12	100.00
29 - 38	0	0.00	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 716

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Conklin Community - June 2016**

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	14	5	4	6	9	13	20	21	32	24	13	5	13	15	28	42	264
6 - 11	14	13	2	2	8	25	9	14	11	34	23	23	21	36	32	23	290
12 - 19	12	3	0	0	0	2	12	23	11	6	19	18	9	10	11	18	154
20 - 28	0	0	0	0	0	0	0	0	5	3	0	0	0	0	0	0	8
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
Totals	40	21	6	8	17	40	41	58	59	67	55	46	43	61	71	83	716

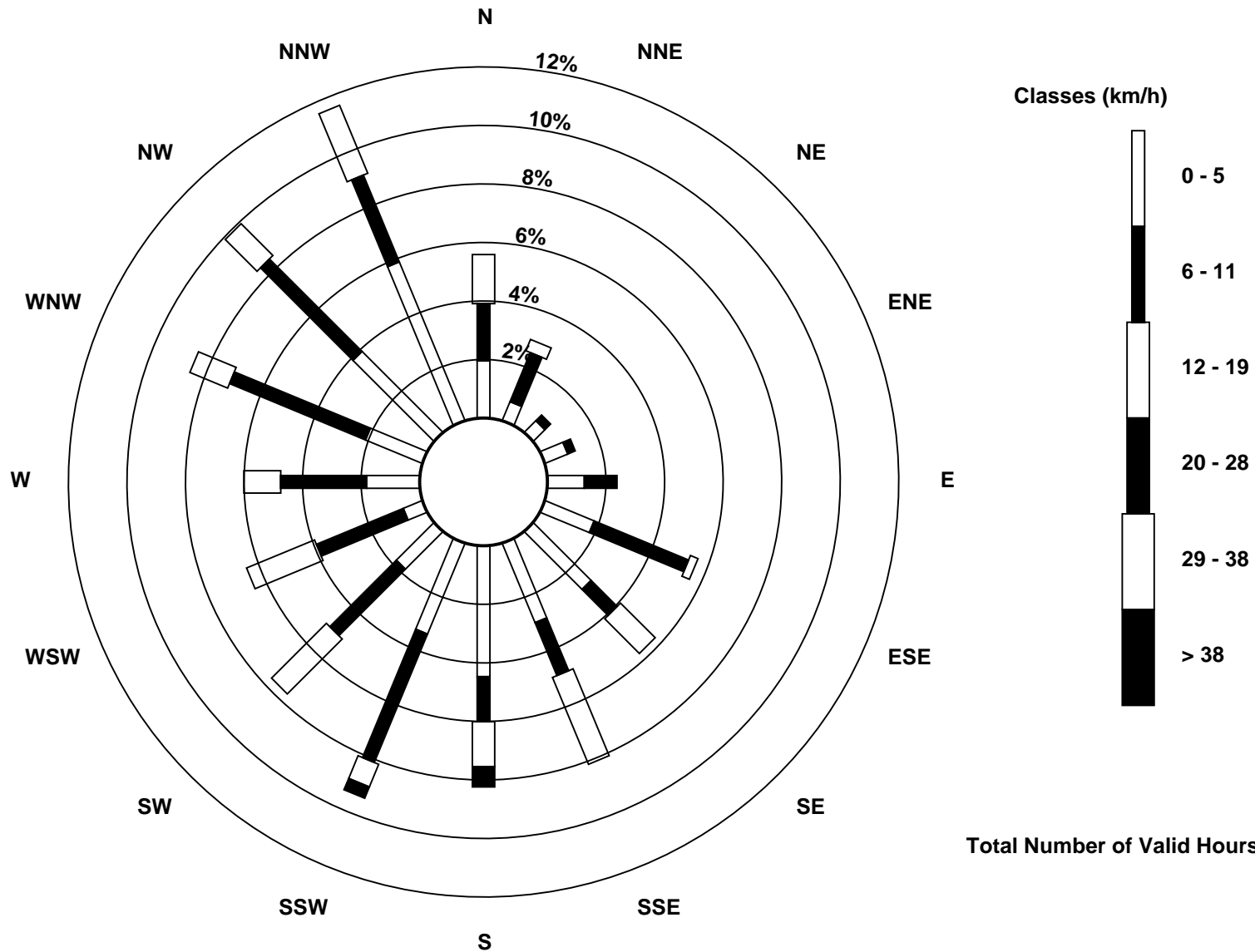
Total Number of Valid Hours: 716

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed (WS) - km/h
Conklin Community (AMS 21)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Conklin Community - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 9 km/h on Jun 15 11:00	Hours of Data: 716
Minimum Value: 0 km/h on Jun 10 23:00	Hours of Missing Data: 4
Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 8	Hours of Calibration: 0
	Percent Operational Time: 99.4

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-Jun	1	1	1	2	1	1	1	3	2	3	4	5	4	3	4	5	2	2	2	2	2	1	1	1	5
2-Jun	1	1	1	1	1	1	1	1	1	2	2	3	2	3	3	3	6	4	2	2	1	2	2	1	6
3-Jun	2	1	3	2	1	2	4	3	3	4	6	4	5	5	6	5	5	6	4	3	2	1	1	2	6
4-Jun	2	2	5	5	4	4	4	5	5	5	7	5	5	5	6	6	5	5	3	4	2	1	1	1	7
5-Jun	1	1	1	1	2	3	2	4	5	5	5	5	5	6	5	5	4	4	3	2	1	1	1	1	6
6-Jun	1	1	1	1	1	1	1	2	3	4	4	4	4	5	6	5	5	4	3	3	3	3	3	2	6
7-Jun	4	3	2	3	2	5	3	4	4	5	6	4	5	3	5	6	4	4	4	2	1	2	2	1	6
8-Jun	1	1	1	1	1	1	1	1	3	3	2	1	2	2	1	3	4	4	3	3	4	2	1	2	4
9-Jun	3	3	2	2	2	3	4	4	3	4	4	3	3	4	5	5	4	4	4	4	3	4	4	4	5
10-Jun	3	3	3	3	2	2	2	3	3	3	4	4	4	3	3	3	2	2	2	2	1	1	0	1	4
11-Jun	1	1	1	2	1	2	1	2	3	4	5	4	5	4	6	6	4	5	1	4	3	4	2	2	6
12-Jun	2	2	3	3	3	3	4	4	4	4	5	5	4	5	5	6	4	5	4	4	4	4	3	3	6
13-Jun	2	3	3	3	3	4	5	5	4	5	5	6	6	6	5	5	5	4	4	3	1	1	1	1	6
14-Jun	0	1	1	1	2	1	2	2	3	4	4	5	4	4	4	4	4	4	9	2	1	4	4	3	9
15-Jun	3	3	2	2	2	4	6	7	7	8	9	8	7	8	6	8	8	5	4	7	3	2	1	1	9
16-Jun	1	1	1	1	1	1	4	4	5	5	5	5	5	5	4	4	3	3	4	3	2	3	3	2	5
17-Jun	3	2	3	3	3	3	3	4	4	4	5	5	4	6	6	4	5	4	4	3	3	2	3	5	6
18-Jun	3	4	3	2	2	2	3	3	3	2	3	3	3	2	3	3	3	3	2	1	1	1	4	3	4
19-Jun	4	1	2	2	1	1	2	2	3	4	5	5	6	6	7	6	6	6	5	4	2	1	1	1	7
20-Jun	1	1	1	1	1	1	1	1	2	3	4	4	3	3	3	3	2	2	2	1	1	2	1	1	4
21-Jun	1	1	1	1	1	1	1	2	2	3	4	3	3	3	3	4	3	2	2	1	AF	2	2	2	4
22-Jun	3	2	1	1	1	2	2	2	2	3	3	3	3	3	2	3	4	3	2	1	1	1	1	2	4
23-Jun	2	3	4	3	2	2	2	2	3	3	4	4	3	3	4	3	2	3	2	1	2	1	1	2	4
24-Jun	2	2	2	2	2	2	2	2	1	1	2	3	2	2	2	2	5	3	2	2	1	1	1	1	5
25-Jun	1	2	1	1	1	2	2	2	2	3	4	4	4	5	4	3	3	3	2	3	2	2	1	1	5
26-Jun	1	1	1	1	1	1	1	1	2	2	2	2	2	3	2	3	4	4	2	2	2	1	2	4	4
27-Jun	1	1	1	1	1	1	2	3	3	3	4	4	4	4	3	4	3	3	3	3	3	1	1	1	4
28-Jun	2	2	2	1	1	1	1	2	2	3	3	3	5	5	5	4	4	4	3	3	1	1	1	1	5
29-Jun	1	1	AF	AF	AF	1	1	2	3	3	3	4	3	4	3	3	4	2	2	2	1	2	1	1	4
30-Jun	1	1	1	1	1	2	2	3	3	3	4	4	4	3	3	4	3	4	4	2	1	1	1	1	4

4	4	5	5	4	5	6	7	7	8	9	8	7	8	7	8	8	6	9	7	4	4	4	5	
Diurnal Maximum																								

AF - Analyzer Failure



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Conklin Community - June 2016

Direction of Maximum Speed: 194 deg on Jun 15 11:00	Hours in Service: 720
Direction of Maximum Daily Speed Average: 172.9 deg on Jun 15	Hours of Data: 716
Direction of Minimum Speed: 98 deg on Jun 21 08:00	Hours of Missing Data: 4
Direction of Minimum Daily Speed Average: 1.6 deg on Jun 2	Percent Operational Time: 99.4
Monthly Average Direction: 274.9 deg	

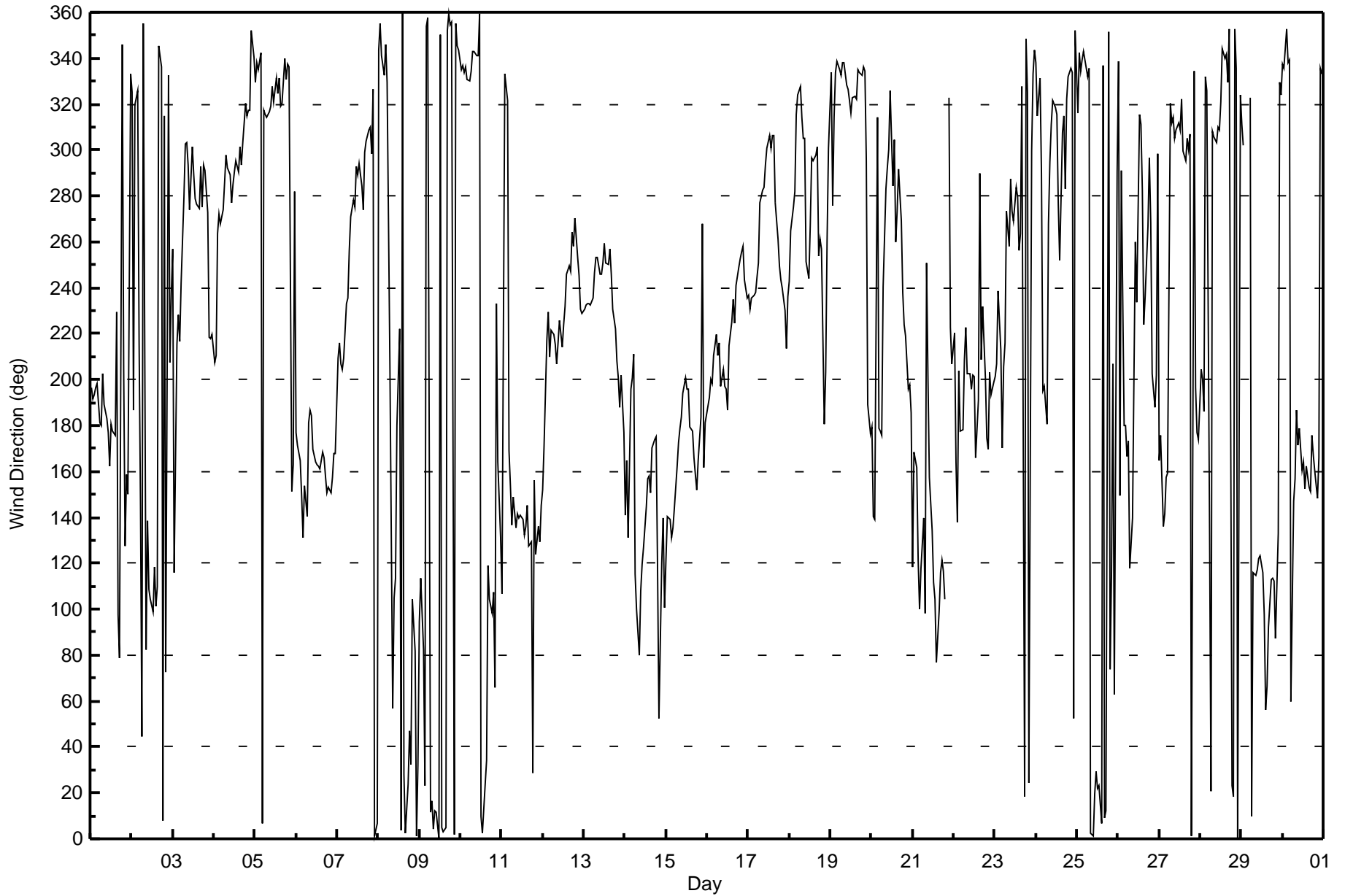
Day	Hourly Period Ending At (MST)																								Daily Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1-Jun	196	191	193	196	198	181	180	203	189	183	177	162	181	178	176	230	98	79	346	204	128	159	150	333	177.3
2-Jun	325	187	320	326	216	145	45	355	82	138	109	104	99	118	101	110	345	336	8	315	73	333	208	237	71.7
3-Jun	257	116	216	228	217	242	280	303	303	294	274	302	289	279	277	274	293	275	294	291	272	219	218	219	272.9
4-Jun	208	210	263	272	268	274	286	298	292	289	277	285	290	296	291	301	294	303	320	315	317	317	352	341	286.1
5-Jun	330	338	335	343	7	318	316	314	317	319	327	321	331	324	331	319	320	340	331	338	336	151	163	282	325.3
6-Jun	177	171	165	149	131	154	140	181	187	184	170	164	163	162	161	168	166	158	151	153	151	157	168	168	163.6
7-Jun	209	216	207	205	209	233	235	256	271	278	275	293	289	294	284	274	299	304	309	310	298	327	1	7	265.4
8-Jun	344	355	341	333	346	330	269	207	57	105	113	180	222	3	360	28	2	24	47	32	105	82	1	33	36.3
9-Jun	94	113	83	23	354	358	12	16	4	12	12	0	350	5	3	5	352	360	355	356	2	355	346	343	4.7
10-Jun	335	337	334	336	331	330	335	343	343	341	341	359	10	2	24	34	119	104	98	107	66	233	164	131	352.8
11-Jun	107	221	333	321	169	154	137	149	136	141	140	141	139	133	136	145	127	129	29	156	124	136	130	145	137.5
12-Jun	152	171	217	229	210	221	219	215	207	216	226	214	224	232	246	249	247	264	258	270	253	245	231	229	230.1
13-Jun	231	232	233	233	233	235	246	253	253	246	246	251	259	251	250	257	246	231	222	208	201	188	202	177	239.9
14-Jun	141	165	131	196	201	211	116	100	80	108	120	127	144	157	158	151	171	174	175	119	52	120	140	101	143.0
15-Jun	122	141	139	131	136	144	162	173	179	183	194	201	196	196	180	177	166	159	152	165	184	268	162	181	172.9
16-Jun	188	192	200	198	211	220	210	216	197	204	197	196	186	215	225	235	225	241	249	253	256	258	243	236	218.2
17-Jun	237	231	236	237	238	245	250	277	282	284	293	301	306	301	306	306	277	261	250	243	240	230	214	236	263.1
18-Jun	243	265	275	282	315	324	328	314	305	305	251	244	267	296	295	298	301	254	261	257	181	203	261	301	277.9
19-Jun	334	276	314	334	339	335	333	338	338	329	326	321	316	323	324	322	335	334	333	337	334	295	189	176	327.9
20-Jun	179	140	139	315	179	178	176	241	283	292	300	326	284	305	260	273	292	269	238	224	219	196	198	186	254.9
21-Jun	119	168	162	121	100	118	140	98	251	201	157	134	112	104	77	99	116	121	117	104	AF	323	223	207	136.2
22-Jun	220	164	138	204	178	178	208	223	202	203	196	202	202	166	191	290	209	232	201	174	170	203	193	199	201.1
23-Jun	202	207	239	213	170	206	216	273	258	287	273	269	284	280	256	264	328	19	349	325	24	300	333	344	266.2
24-Jun	338	315	331	290	195	197	180	268	295	311	321	318	315	277	252	307	315	283	322	332	336	334	52	352	306.3
25-Jun	316	343	335	339	343	336	332	335	2	1	19	29	22	23	7	337	9	12	352	74	117	207	63	290	4.4
26-Jun	338	150	291	180	180	166	173	118	139	201	260	234	315	311	282	224	236	267	296	268	202	188	202	299	244.9
27-Jun	165	176	136	141	157	159	321	312	314	305	309	312	309	322	300	296	305	300	307	1	334	197	177	174	303.4
28-Jun	204	200	186	332	326	132	21	308	305	303	310	309	321	344	340	341	330	353	23	18	353	336	0	324	333.7
29-Jun	311	302	AF	AF	AF	323	10	116	115	117	122	123	116	98	56	67	92	113	114	112	87	133	329	324	104.6
30-Jun	338	336	353	338	340	60	147	157	187	172	179	161	164	153	163	153	151	176	167	161	148	166	336	333	163.4

217.2 203.9 239.2 247.2 232.4 235.7 241.6 251.4 246.8 240.4 237.0 237.7 246.0 259.3 264.4 263.3 274.6 278.0 281.2 295.9 199.8 218.1 208.8 235.1

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
Conklin Community - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 102 deg on Jun 26 09:00 Minimum Value: 9 deg on Jun 20 23:00 Percentiles: P ₁ = 13 P ₁₀ = 19 Q ₁ = 23 Median = 32 Q ₃ = 47 P ₉₀ = 68 P ₉₉ = 94		Hours in Service: 720 Hours of Data: 716 Hours of Missing Data: 4 Hours of Calibration: 0 Percent Operational Time: 99.4																							
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-Jun	10	14	15	16	19	20	27	29	22	23	27	25	23	22	24	79	40	47	42	99	27	18	71	43	99
2-Jun	31	92	63	59	64	66	94	49	95	39	32	33	44	40	32	35	57	25	71	83	102	45	88	90	102
3-Jun	55	93	40	27	36	33	44	49	43	45	43	44	42	42	40	40	42	37	42	42	28	20	14	16	93
4-Jun	15	17	37	32	31	36	41	43	41	42	41	39	41	42	40	40	42	39	25	31	30	35	55	57	57
5-Jun	27	18	20	70	84	34	32	39	36	32	32	33	33	32	37	37	42	32	30	17	33	65	54	76	84
6-Jun	78	40	57	63	16	24	22	27	26	25	25	25	27	26	25	23	21	20	18	17	15	17	19	30	78
7-Jun	34	29	24	20	19	20	18	31	40	43	39	42	41	49	41	40	44	40	43	39	35	30	48	65	65
8-Jun	55	56	10	32	43	26	76	72	59	26	34	33	53	60	20	32	29	32	39	35	36	63	22	36	76
9-Jun	54	21	40	37	23	21	23	28	25	24	24	23	18	23	23	26	21	22	21	20	22	21	19	20	54
10-Jun	17	18	18	17	16	18	22	21	24	30	31	34	35	48	47	61	44	36	43	36	55	86	30	35	86
11-Jun	50	61	26	53	61	74	42	17	19	19	21	21	20	18	21	19	22	22	76	88	26	73	52	44	88
12-Jun	15	23	25	23	24	27	23	23	22	26	25	25	27	27	25	22	20	45	21	31	20	17	22	20	45
13-Jun	19	19	18	19	18	20	21	26	26	25	25	31	39	33	27	26	30	29	27	22	34	22	12	18	39
14-Jun	12	26	23	90	90	94	48	44	46	32	22	24	23	22	24	25	23	20	20	56	72	31	18	44	94
15-Jun	20	18	35	20	19	17	18	19	21	21	23	24	26	25	24	25	24	20	19	32	57	72	94	88	94
16-Jun	14	14	15	14	30	51	40	26	27	29	26	26	25	27	26	23	23	20	23	19	18	21	19	19	51
17-Jun	20	24	20	18	18	17	18	41	41	45	44	42	47	45	37	39	44	28	20	16	18	20	20	31	47
18-Jun	20	29	39	42	37	21	30	37	46	41	48	23	41	42	47	54	48	50	54	45	77	23	50	48	77
19-Jun	39	56	45	30	21	17	23	52	42	27	26	29	31	30	28	26	24	22	21	18	18	38	94	57	94
20-Jun	54	56	94	61	68	33	52	86	43	46	52	50	58	81	61	68	92	53	43	21	75	24	9	13	94
21-Jun	62	17	24	37	29	22	19	95	25	47	54	44	48	50	73	58	42	28	22	23	AF	72	33	24	95
22-Jun	23	29	85	93	38	25	26	37	38	31	44	56	34	28	47	48	23	19	29	26	36	47	20	24	93
23-Jun	22	64	49	41	52	26	29	47	37	47	49	43	51	77	64	29	28	27	25	15	69	57	36	49	77
24-Jun	32	83	82	74	72	93	94	60	58	47	28	31	33	35	26	41	46	44	36	18	11	14	69	43	94
25-Jun	42	19	20	17	19	19	17	20	25	22	26	34	29	30	26	23	43	27	27	51	86	80	84	68	86
26-Jun	28	55	59	61	91	74	87	78	102	57	88	89	50	46	43	24	23	42	43	58	77	33	25	75	102
27-Jun	67	30	39	61	68	41	68	41	38	43	46	43	43	42	41	40	41	45	45	37	82	88	37	36	88
28-Jun	64	17	65	27	30	63	69	50	44	41	67	43	39	26	28	29	26	46	25	24	28	13	42	35	69
29-Jun	48	37	AF	AF	AF	57	72	39	26	25	25	43	58	66	64	69	54	59	22	21	30	94	41	28	94
30-Jun	18	19	24	29	22	90	23	35	25	24	29	29	26	26	22	21	20	21	20	20	10	86	17	61	90
Diurnal Maximum																									
78 93 94 93 91 94 94 95 102 57 88 89 58 81 73 79 92 59 76 99 102 94 94 90																									
AF - Analyzer Failure																									



Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 9, 2016	Last Calibration	May 19, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	11:35	End Time (MST)	17:20
Gas Cert Reference	EY0000359	Station temp.	22 Deg C
Cal Gas Concentration	51.4 ppm	Cal Gas Exp Date	Feb-09-2018
Calibrator Make/Model	API T700	Serial Number	1221
ZAG Make/Model	API 701	Serial Number	5611
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9628

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-656	-655
Analyzer IP address	192.168.1.43		Lamp voltage	844	839
Calculated slope	1.017486	0.993535	Chamber temp	45.0	45.0
Calculated intercept	0.454339	0.926258	Pressure	655.2	651.1
Analyzer Background	20.7	20.6	Flow	0.482	0.480
Analyzer Coefficient	0.916	0.910	Intensity	92	92

Analyzer make Thermo 43i Analyzer serial # JC1428701363

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	76.5	786.4	791.2	0.994
calibrator zero	5000	0.0	0.0	-0.1	----
high point	5000	76.5	786.4	790.8	0.994
second point	5000	38.2	392.7	394.5	0.995
third point	5000	19.2	197.4	196.5	1.005
as left zero	5000	0.0	0.0	0.2	----
as left span	5000	76.5	786.4	792.5	0.992
Average Correction Factor					0.998

Corrected As found 791.3 Previous response 772.5 % change -2.4%

Notes:

Sample inlet filter replaced after as founds. Replaced charoal/scrubber material inside zero air gen after as founds. Slightly adjusted span.

Calibration Performed By: Asad Hidayat



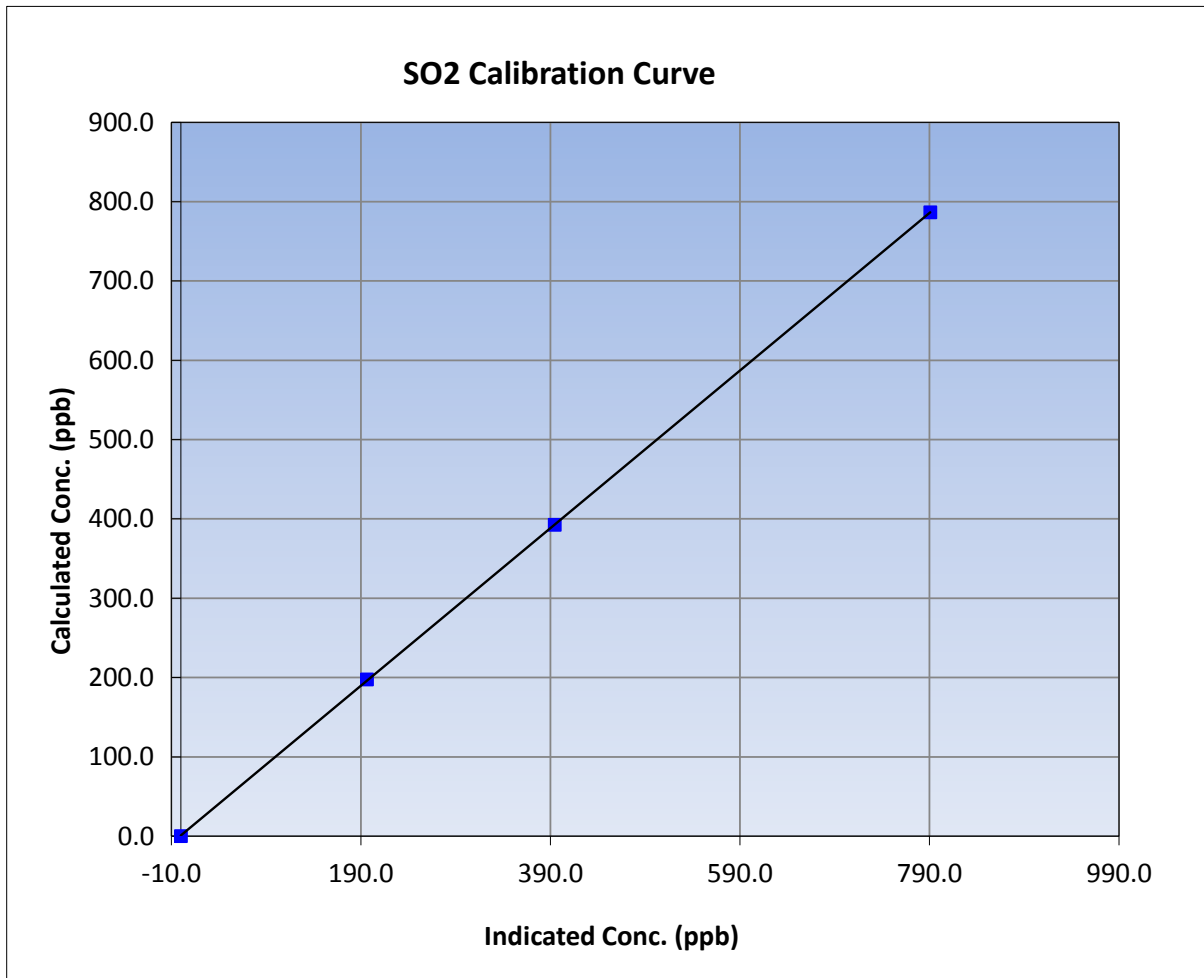
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 9, 2016	Previous Calibration	May 19, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	11:35	End Time (MST)	17:20
Analyzer make	Thermo 43i	Analyzer serial #	JC1428701363

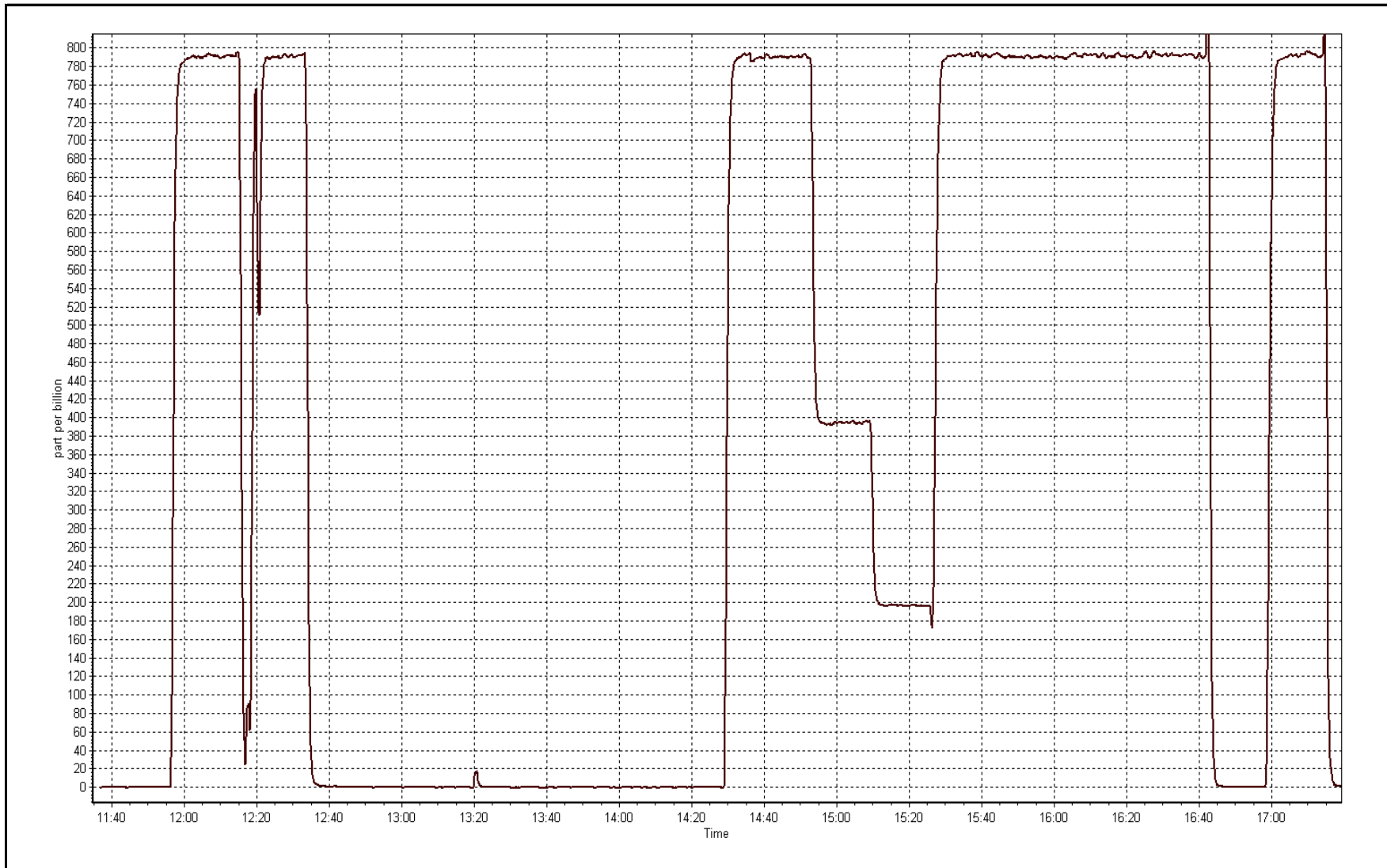
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.1	----	Correlation Coefficient	0.999993
786.4	790.8	0.9944		
392.7	394.5	0.9954	Slope	0.993535
197.4	196.5	1.0047		
			Intercept	0.926258



SO2 Calibration Plot

Date: June 9, 2016





Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	June 7, 2016	Last Calibration	May 20, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	8:50	End Time (MST)	15:43
Gas Cert Reference	LL119411	Station temp.	22 Deg C
Cal Gas Concentration	4.97 ppm	Cal Gas Exp Date	12/02/2019
Calibrator Make/Model	API T700	Serial Number	1221
Dil air Make/Model	API 701	Serial Number	5611
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9628
SO2 gas concentration	51.4 ppm	SO2 gas cert/exp	EY0000359 9/Feb/18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-636	-636
Analyzer IP address	192.168.1.44		Lamp voltage	922	914
Calculated slope	0.982319	0.994902	Chamber temp	45	45
Calculated intercept	0.462760	0.497982	Pressure	665.5	655.6
Analyzer Background	2.9	3.36	Flow	0.427	0.422
Analyzer Coefficient	1.078	0.991	Intensity	90	90
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1410661331	
Converter make/model	CDN-101		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	80.6	80.1	76.2	1.051
SO2 scrubber check	5000	19.4	199.4	0.7	----
calibrator zero	5000	0.0	0.0	0.2	----
high point	5000	80.6	80.1	80.4	0.997
second point	5000	40.3	40.1	39.4	1.017
third point	5000	20.1	20.0	19.0	1.053
as left zero	5000	0.0	0.0	-0.4	----
as left span	5000	80.6	80.1	74.8	1.072
Average Correction Factor					1.022

Corrected As found	75.9	Previous response	81.1	% change	6.8%
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Notes:

Sample inlet filter replaced after as founds. Replaced goose neck line from cylinder and also installed new 1/8 inch line from calibrator to regulator but it did not improve span response. Replaced converter; improved response. Adjusted both zero and span. Scrubber check done after 3rd point. As left zero began at 15:06 MST.

Calibration Performed By:

Asad Hidayat



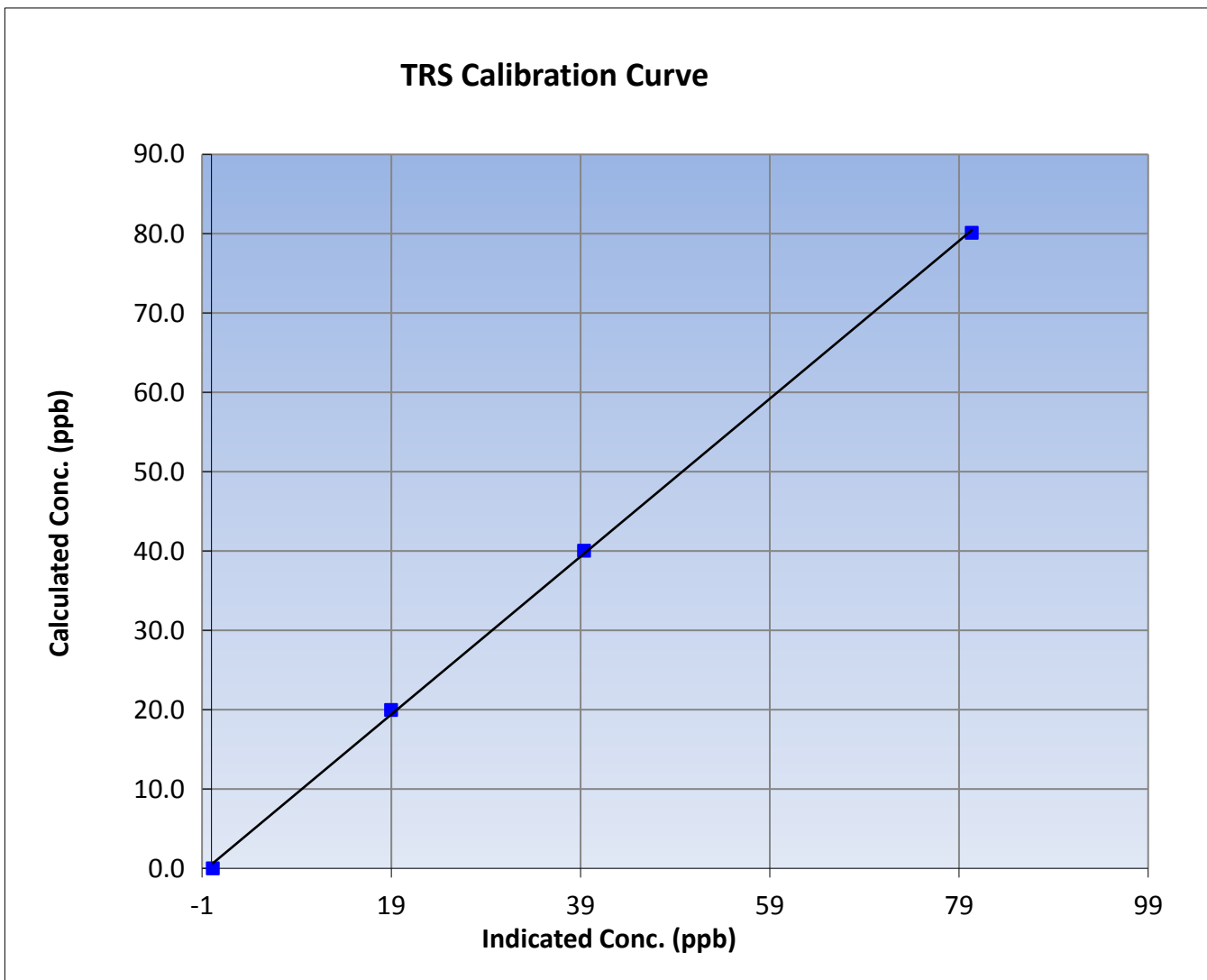
Wood Buffalo Environmental Association TRS Calibration Report

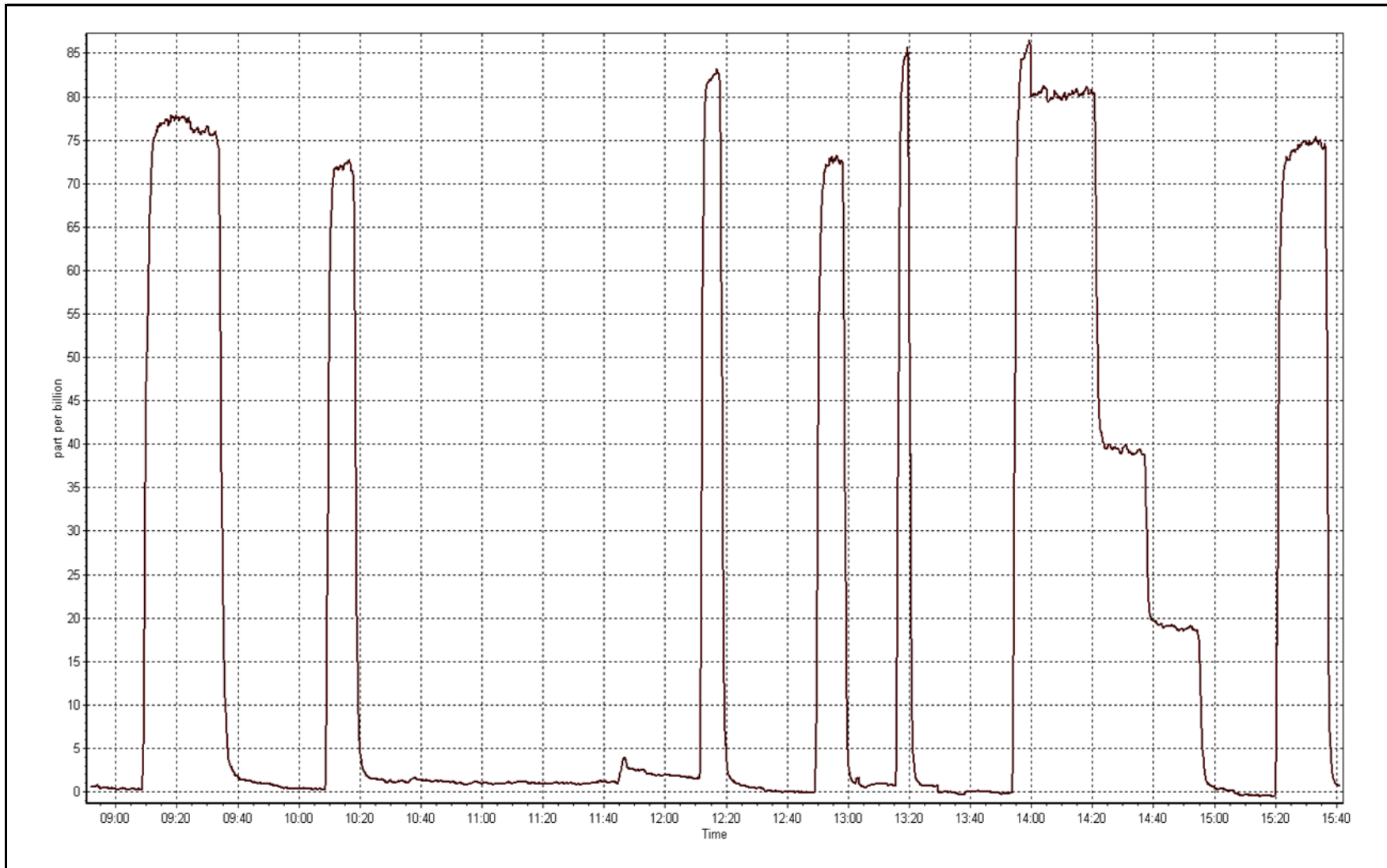
Station Information

Calibration Date	June 7, 2016	Previous Calibration	May 20, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	8:50	End Time (MST)	15:43
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1410661331

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.2	----	Correlation Coefficient	0.999710
80.1	80.4	0.9971		
40.1	39.4	1.0170	Slope	0.994902
20.0	19.0	1.0527		
			Intercept	0.497982







Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	June 8, 2016	Last Calibration	June 7, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	9:10	End Time (MST)	16:10
Gas Cert Reference	LL119411	Station temp.	22 Deg C
Cal Gas Concentration	4.97 ppm	Cal Gas Exp Date	12/02/2019
Calibrator Make/Model	API T700	Serial Number	1221
Dil air Make/Model	API 701	Serial Number	5611
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9628
SO2 gas concentration	51.4 ppm	SO2 gas cert/exp	EY0000359 9/Feb/18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-636	-637
Analyzer IP address	192.168.1.44		Lamp voltage	914	916
Calculated slope	0.994902	0.992678	Chamber temp	45	45
Calculated intercept	0.497982	0.381611	Pressure	655.6	659.8
Analyzer Background	3.36	3.45	Flow	0.422	0.425
Analyzer Coefficient	0.991	1.187	Intensity	90	91
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1410661331	
Converter make/model	CDN-101		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	80.6	80.1	77.7	1.032
SO2 scrubber check	5000	19.4	199.4	0.7	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	80.6	80.1	80.5	0.995
second point	5000	40.2	40.0	39.8	1.004
third point	5000	20.1	20.0	19.3	1.037
as left zero	5000	0.0	0.0	-0.2	----
as left span	5000	80.6	80.1	79.6	1.007
Average Correction Factor					1.012

Corrected As found	78.0	Previous response	80.0	% change	2.6%
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Notes:

Recalibrating equipment since 3rd point had failed yesterday. Reattached goose neck, reponse dropped. Adjusted zero and span. Span reponse kept dropping, found one of the fittings inside converter a bit loose. Generated high point; seemed much stable. Adjusted span again. Scrubber check done after 3rd point. As lefts began at 15:35 MST.

Calibration Performed By:

Asad Hidayat



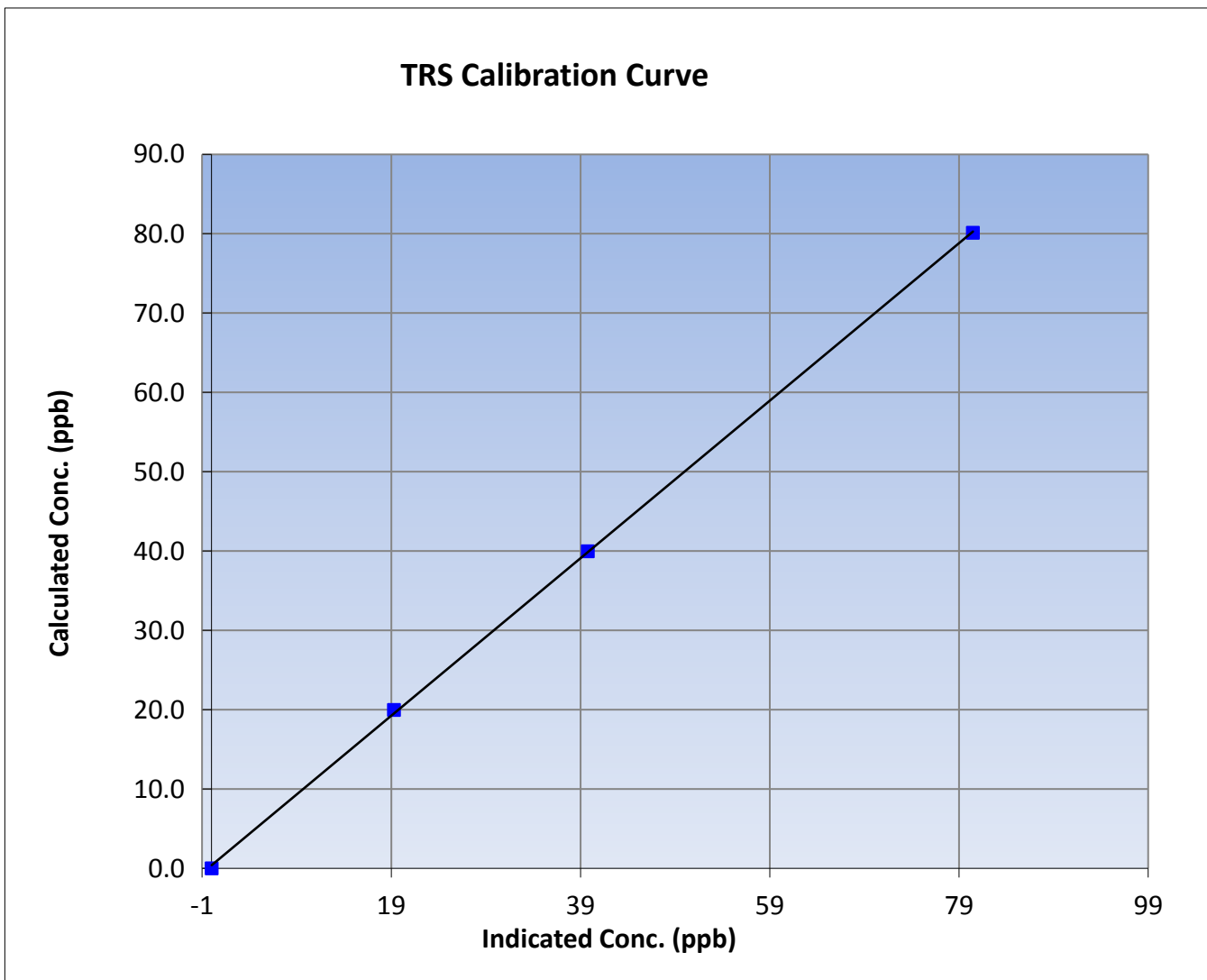
Wood Buffalo Environmental Association TRS Calibration Report

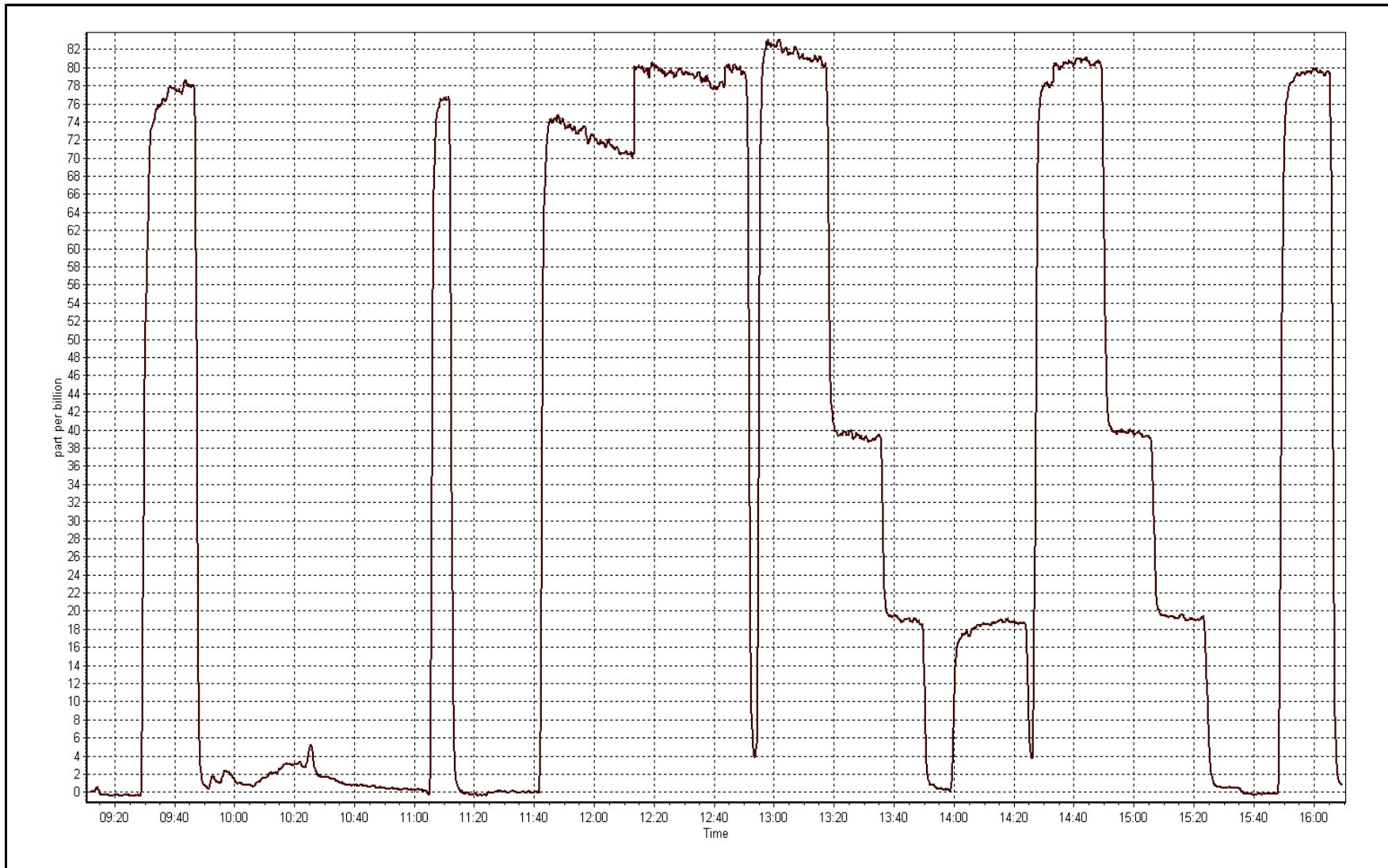
Station Information

Calibration Date	June 8, 2016	Previous Calibration	June 7, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	9:10	End Time (MST)	16:10
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1410661331

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999882
80.1	80.5	0.9955		
40.0	39.8	1.0045	Slope	0.992678
20.0	19.3	1.0368		
			Intercept	0.381611







Wood Buffalo Environmental Association TRS Calibration Report

Station Information

Calibration Date	June 17, 2016	Last Calibration	June 8, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Removal		
Start Time (MST)	9:58	End Time (MST)	10:40
Gas Cert Reference	LL119411	Station temp.	22 Deg C
Cal Gas Concentration	4.97 ppm	Cal Gas Exp Date	12/02/2019
Calibrator Make/Model	API T700	Serial Number	1221
Dil air Make/Model	API 701	Serial Number	5611
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9628
SO2 gas concentration	51.4 ppm	SO2 gas cert/exp	EY0000359 9/Feb/18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-637	-637
Analyzer IP address	192.168.1.44		Lamp voltage	916	914
Calculated slope	0.992678	1.371152	Chamber temp	45	45
Calculated intercept	0.381611	0.205673	Pressure	659.8	658.6
Analyzer Background	3.45	3.45	Flow	0.425	0.424
Analyzer Coefficient	1.187	1.187	Intensity	91	91
			Converter temp.	800	800
Analyzer make/model	Thermo 43i-TLE		Analyzer serial #	1410661331	
Converter make/model	CDN-101		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	80.6	80.1	58.3	1.375
SO2 scrubber check					
calibrator zero	5000	0.0	0.0	-0.2	----
high point	5000	80.6	80.1	58.3	1.375
second point					
third point					
as left zero					
as left span					
Average Correction Factor					1.375

Corrected As found	58.4	Previous response	80.3	% change	37.5%
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Notes:

Removal cal. Instrument reduced its reponse over past few weeks. Will take it back to shop for servicing. No adjustments.

Calibration Performed By:

Asad Hidayat



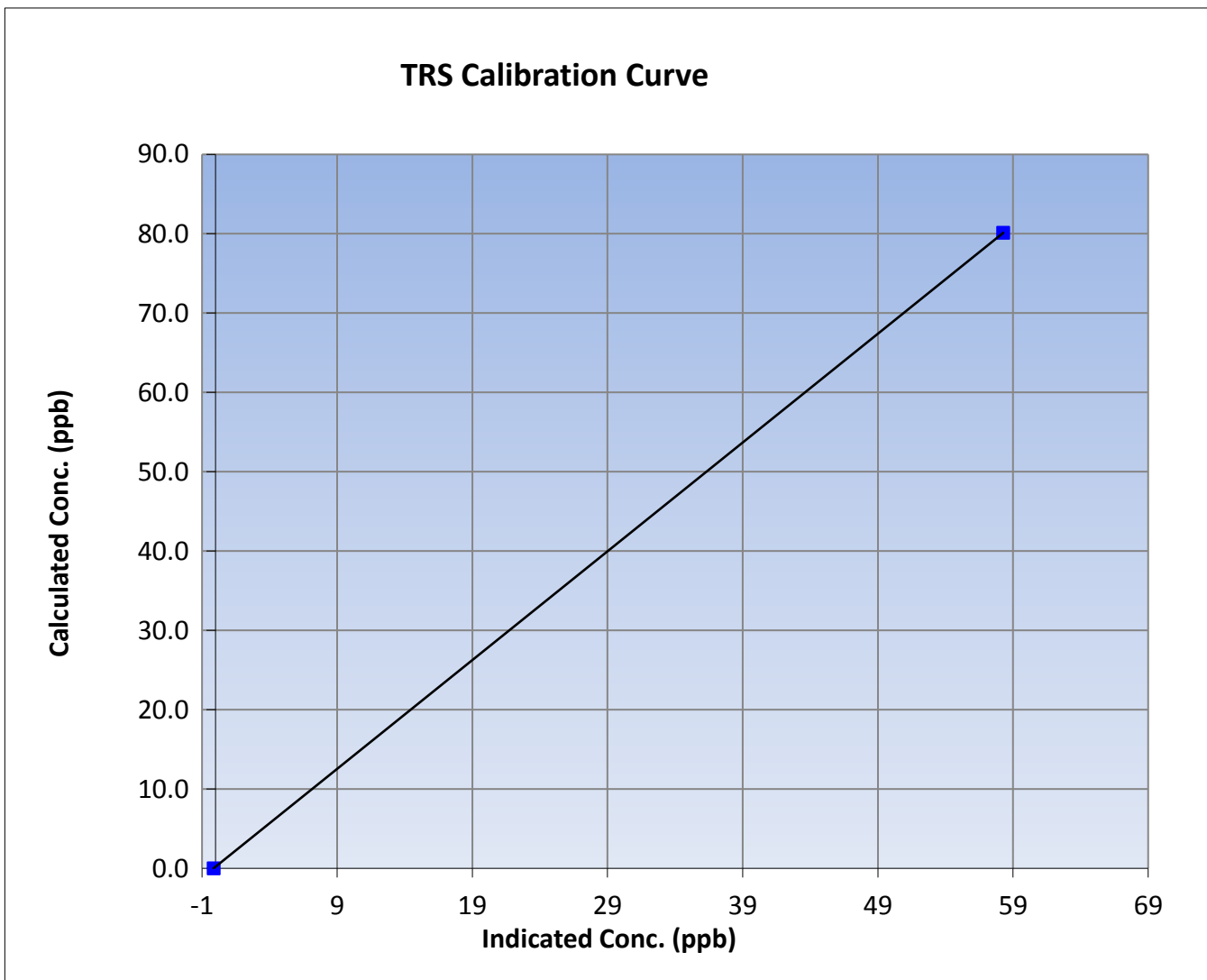
Wood Buffalo Environmental Association TRS Calibration Report

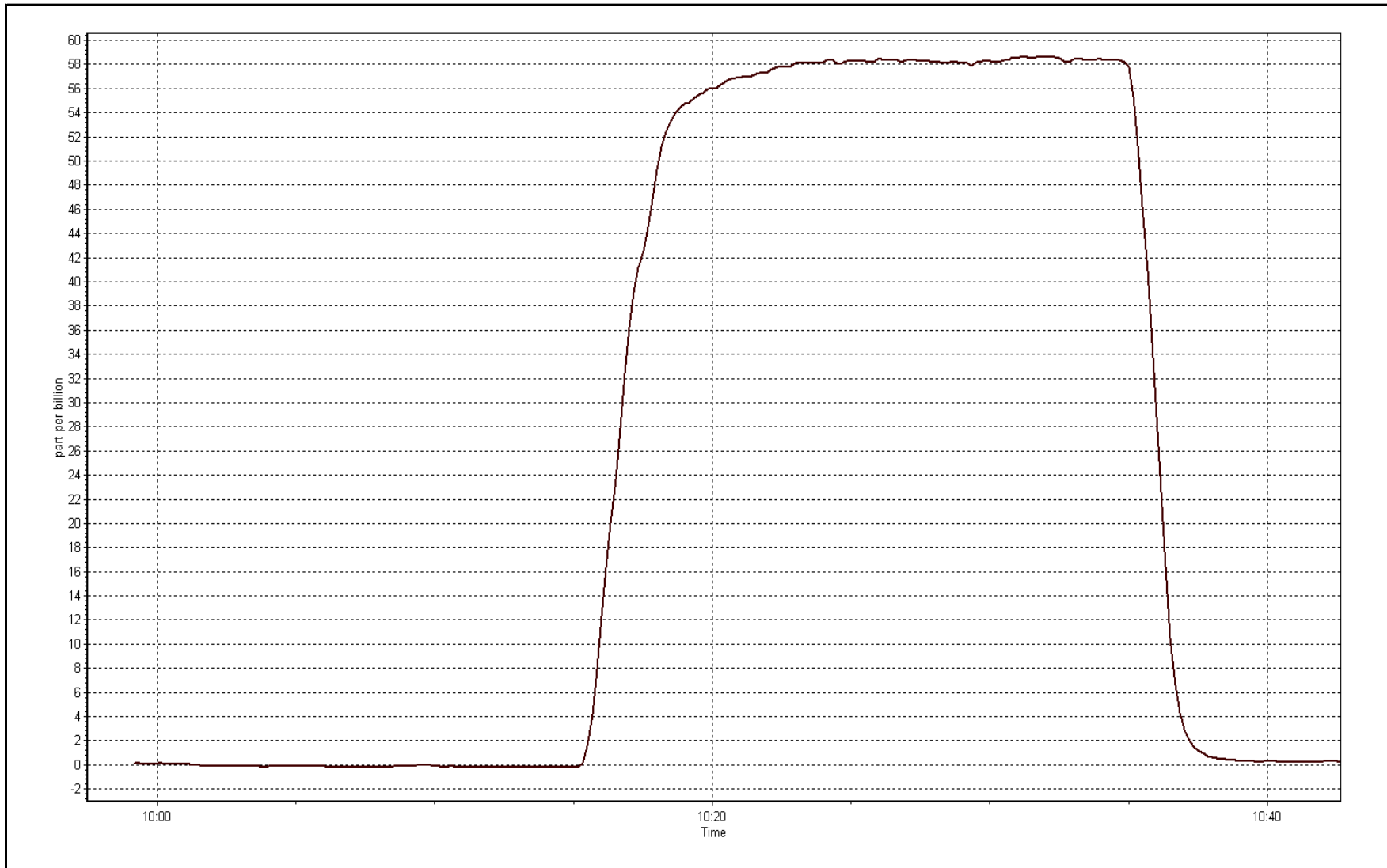
Station Information

Calibration Date	June 17, 2016	Previous Calibration	June 8, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	9:58	End Time (MST)	10:40
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1410661331

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	----	Correlation Coefficient	1.000000
80.1	58.3	1.3747		
			Slope	1.371152
			Intercept	0.205673







Wood Buffalo Environmental Association

TRS Calibration Report

Station Information

Calibration Date	June 17, 2016	Last Calibration	June 8, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Install		
Start Time (MST)	13:00	End Time (MST)	15:25
Gas Cert Reference	LL119411	Station temp.	22 Deg C
Cal Gas Concentration	4.97 ppm	Cal Gas Exp Date	12/02/2019
Calibrator Make/Model	API T700	Serial Number	1221
Dil air Make/Model	API 701	Serial Number	5611
DACS make/model	Campbell Scientific CR3000	DACS serial No.	9628
SO2 gas concentration	51.4 ppm	SO2 gas cert/exp	EY0000359 9/Feb/18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	NA	-732
Analyzer IP address	192.168.1.44		Lamp voltage	NA	995
Calculated slope	NA	0.988277	Chamber temp	NA	45
Calculated intercept	NA	0.154923	Pressure	NA	660.0
Analyzer Background	NA	1.61	Flow	NA	0.425
Analyzer Coefficient	NA	1.01	Intensity	NA	92
			Converter temp.	NA	800

Analyzer make/model	Thermo 43i-TLE	Analyzer serial #	1236656116
Converter make/model	CDN-101	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					
as found span					
SO2 scrubber check	5000	19.5	200.5	0.5	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	80.6	80.1	81.0	0.989
second point	5000	40.3	40.1	40.4	0.993
third point	5000	20.2	20.1	20.0	1.006
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	80.6	80.1	80.4	0.996
Average Correction Factor					0.996

Corrected As found	NA	Previous response	NA	% change	NA
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Notes:

Install cal. Performed PMT before doing "calibrator zero" due to sensitivity being too high. PMT adjusted to -732v from -835v. Adjusted zero and span. Scrubber check done after 3rd point. As left zero began at 14:50 MST.

Calibration Performed By:

Asad Hidayat



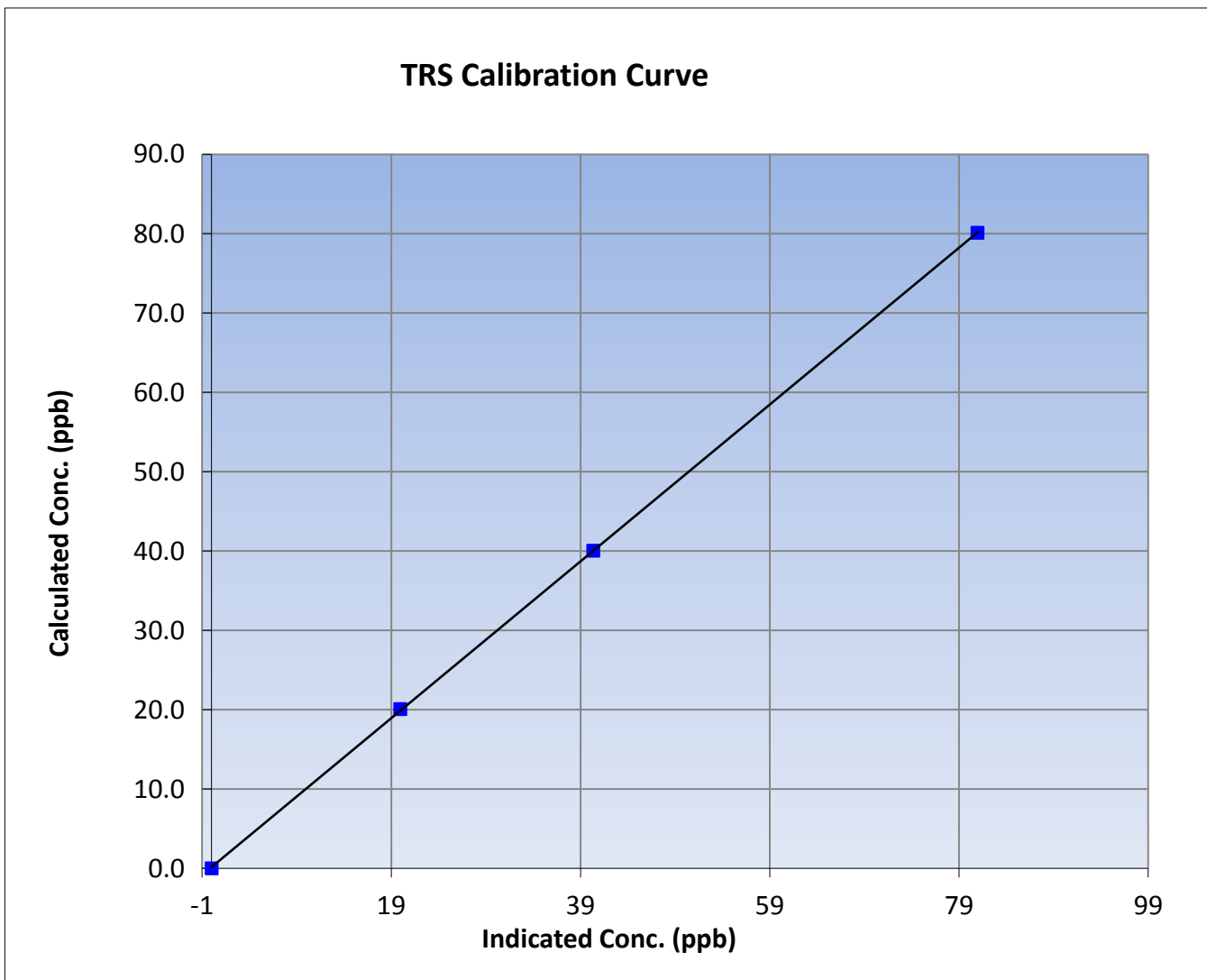
Wood Buffalo Environmental Association TRS Calibration Report

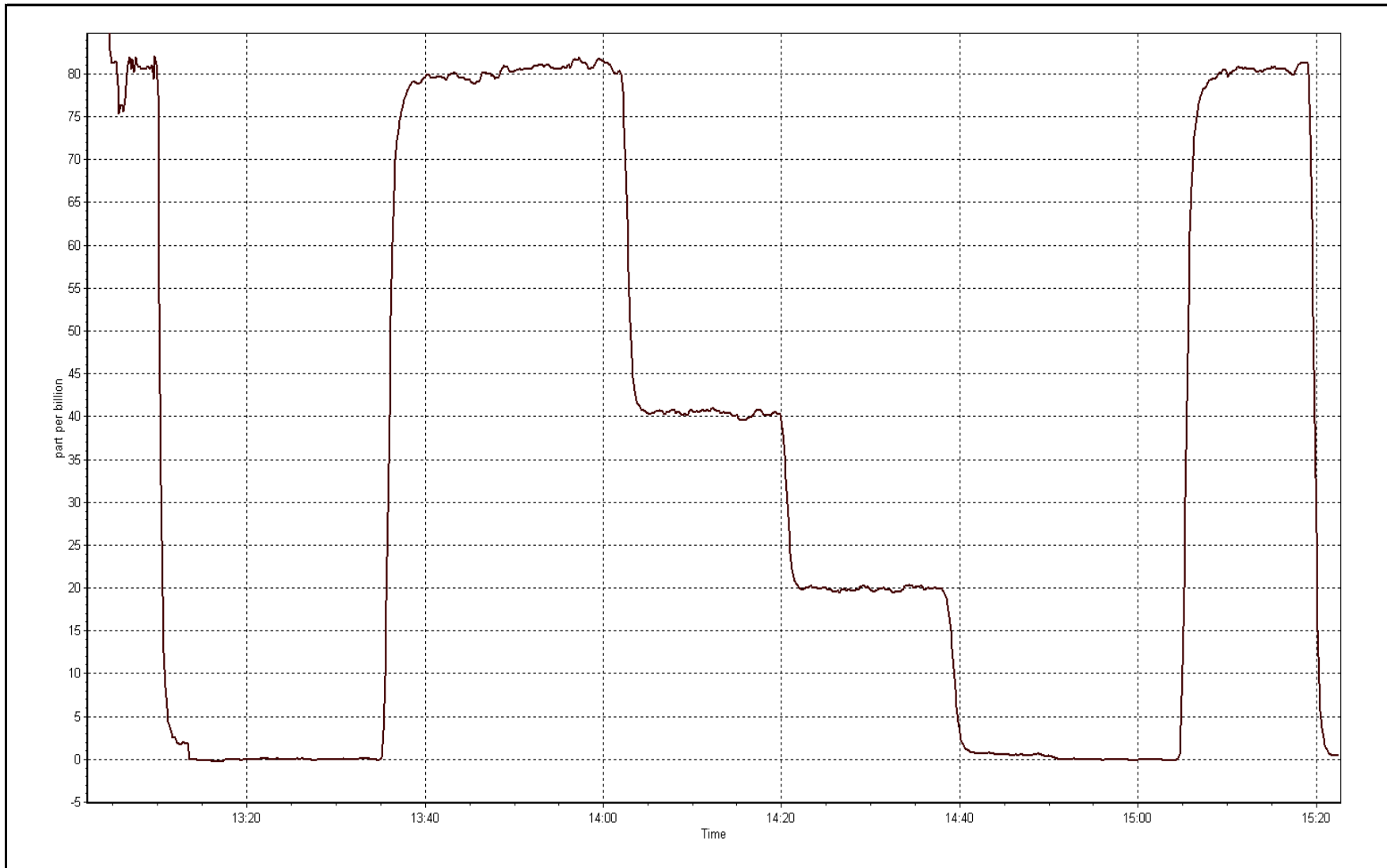
Station Information

Calibration Date	June 17, 2016	Previous Calibration	June 8, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	13:00	End Time (MST)	15:25
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1236656116

Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999979
80.1	81.0	0.9895		
40.1	40.4	0.9925	Slope	0.988277
20.1	20.0	1.0065		
			Intercept	0.154923







Wood Buffalo Environmental Association THC / NMHC Calibration Report

Station Information

Calibration Date	June-10-16	Last Calibration	May-19-16
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	10:15	End Time (MST)	15:20
Gas Cert Reference	EY0000359	Cal Gas Expiry Date	Feb-09-2018
CH4 Cal Gas Conc.	512.0 ppm	CH4 Equiv Conc.	1084.0 ppm
C3H8 Cal Gas Conc.	208.0 ppm	Station temp.	21 Deg C
Calibrator Model	API T700	Serial Number	1221
ZAG make/model	Teledyne API 701	Serial Number	5611
DACS make/model	Campbell Scientific CR3000	Serial Number	9628

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	175.1	175.1
Analyzer IP address	192.168.1.55		Flame Temp	405.0	405.0
THC Calc slope	1.001328	1.000030	Carrier Pressure	37.0	37.0
THC Calc intercept	0.069105	0.064245	Fuel Pressure	49.6	49.6
NMHC Calc slope	0.996038	1.000863	Air Pressure	34.3	34.3
NMHC Calc intercept	0.038506	0.025901			

Analyzer make Thermo 55i Analyzer serial # 1152430011

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					
as found span					
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	76.5	16.59	16.56	1.002
second point	5000	38.2	8.28	8.16	1.015
third point	5000	19.1	4.14	4.03	1.028
as left zero					
as left span					
Average Correction Factor					1.015

Corrected As found NA Previous response NA % change NA

Notes:

Finishing up cal that was aborted yesterday due to NM readings appearing while doing a zero. Noise levels remained the same ever after a day. Old scrubber/charcoal material was put back into zero air gen; made no difference. Gave the instrument a hard reset but noise still appears on all 3 points. Cal passed; will monitor data for next few days and decide what steps should be taken.

Calibration Performed By: Asad Hidayat



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)
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	76.5	8.75	8.73	1.002
second point	5000	38.2	4.37	4.33	1.009
third point	5000	19.1	2.19	2.13	1.026
as left zero					
as left span					
Average Correction Factor					1.013

Corrected As found NA Previous response NA % change NA

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)
calibrator zero	5000	0.0	0.00	0.00	----
high point	5000	76.5	7.83	7.82	1.002
second point	5000	38.2	3.91	3.84	1.019
third point	5000	19.1	1.96	1.89	1.035
as left zero					
as left span					
Average Correction Factor					1.018

Corrected As found NA Previous response NA % change NA



Wood Buffalo Environmental Association

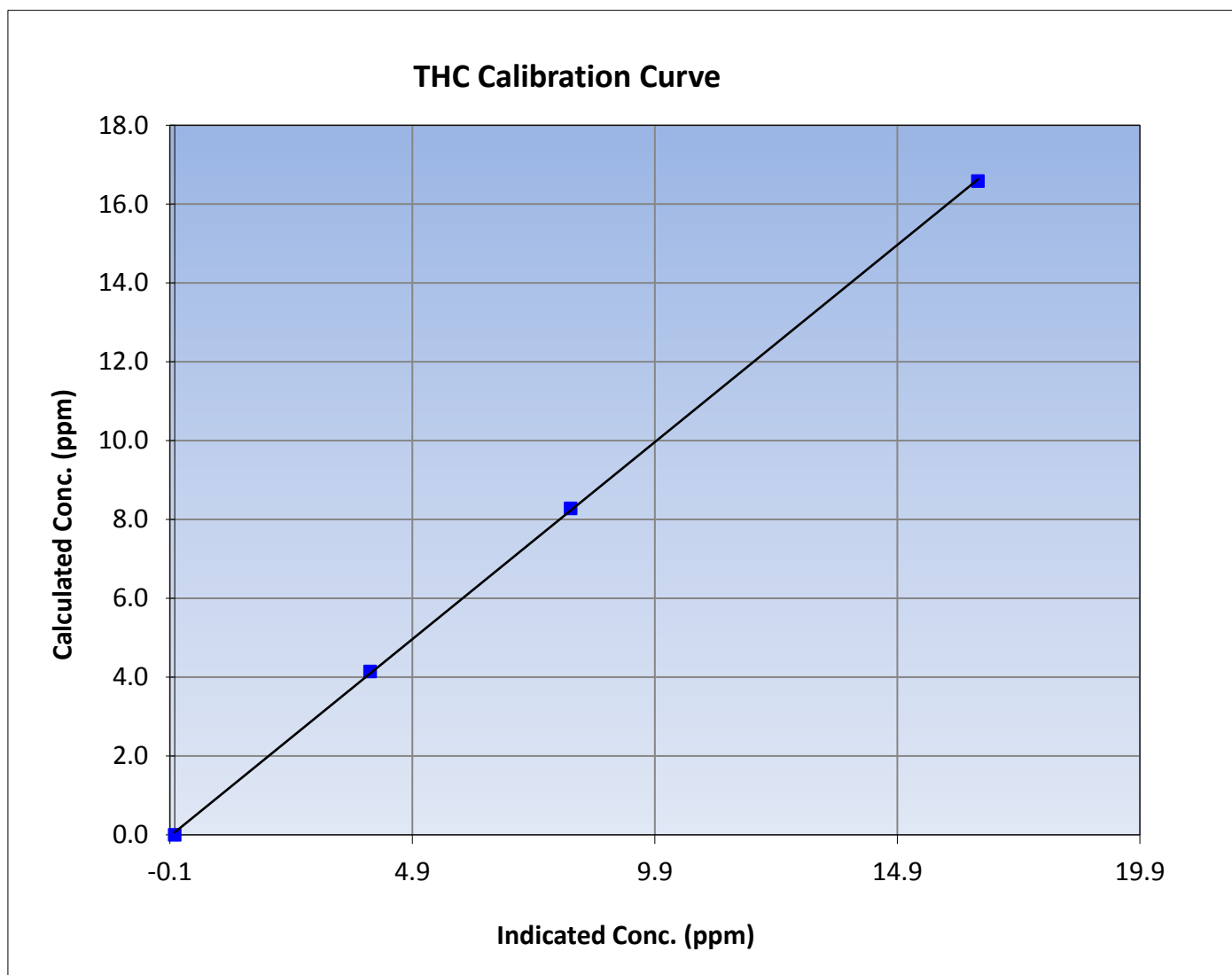
THC Calibration Summary

Station Information

Calibration Date	June 10, 2016	Previous Calibration	May 19, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	10:15	End Time (MST)	15:20
Analyzer make	Thermo 55i	Analyzer serial #	1152430011

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999926
16.59	16.56	1.0015		
8.28	8.16	1.0149	Slope	1.000030
4.14	4.03	1.0275		
			Intercept	0.064245





Wood Buffalo Environmental Association

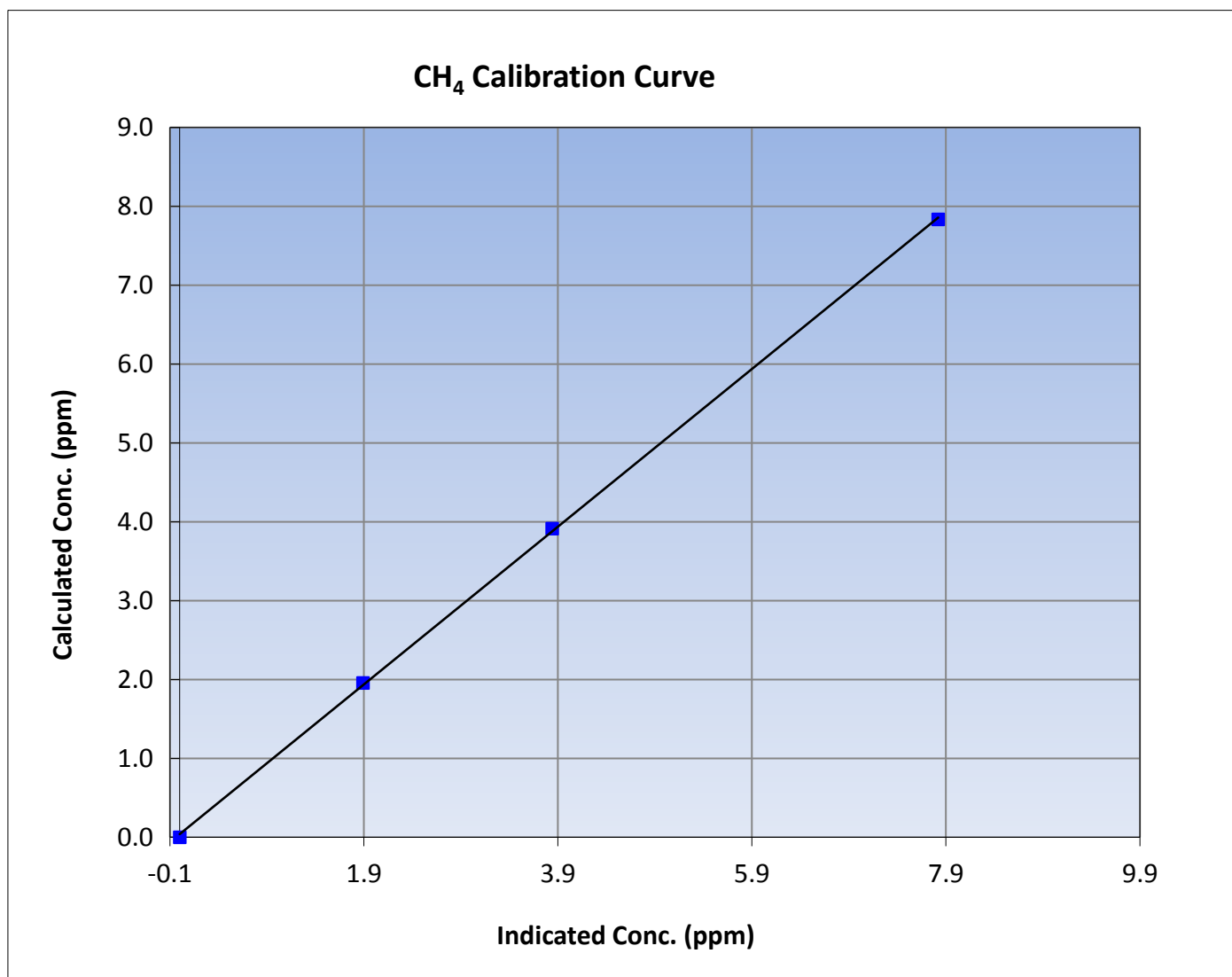
CH₄ Calibration Summary

Station Information

Calibration Date	June 10, 2016	Previous Calibration	May 19, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	10:15	End Time (MST)	15:20
Analyzer make	Thermo 55i	Analyzer serial #	1152430011

Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999882
7.83	7.82	1.0017		
3.91	3.84	1.0187	Slope	0.999825
1.96	1.89	1.0348		
			Intercept	0.038373





Wood Buffalo Environmental Association

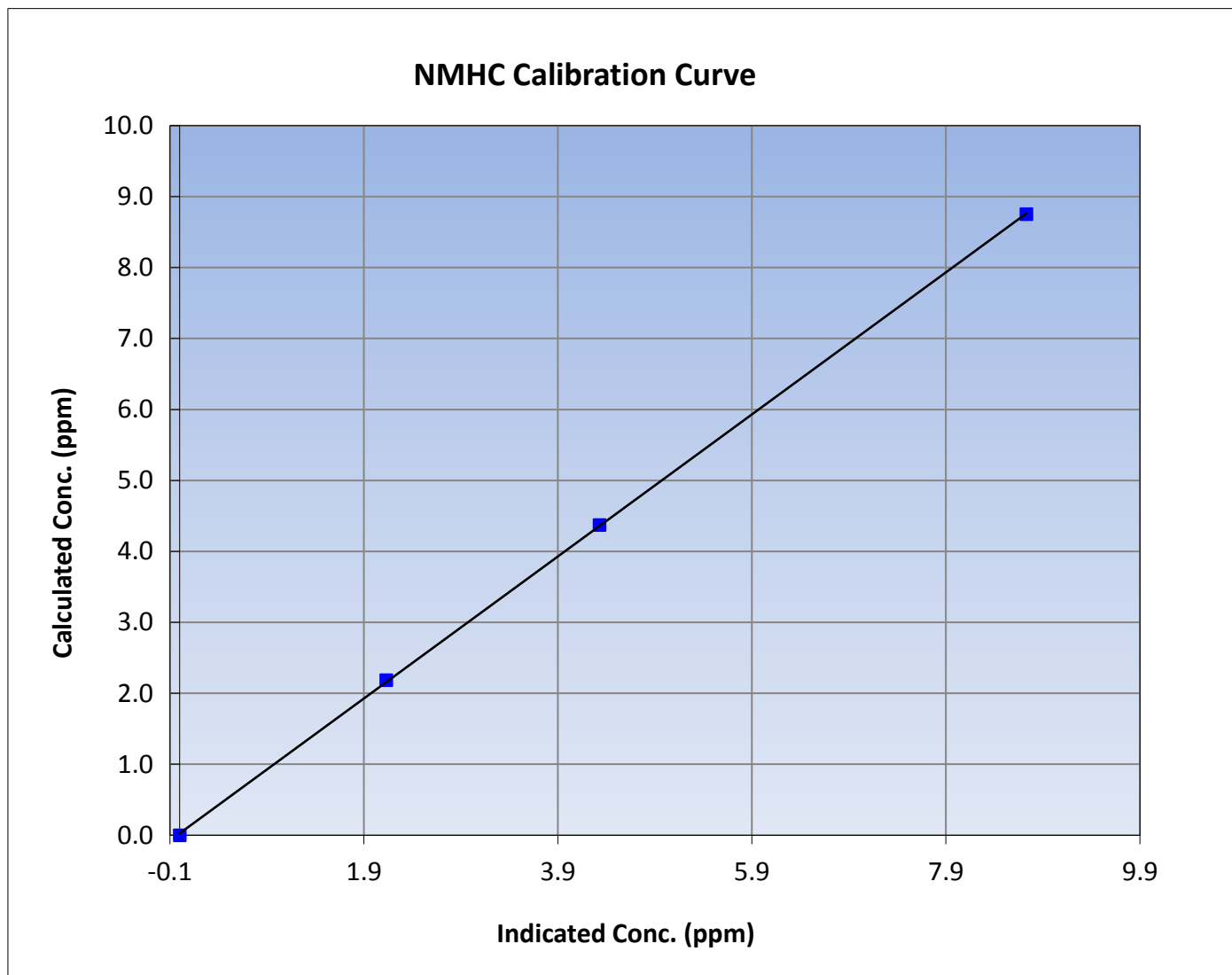
NMHC Calibration Summary

Station Information

Calibration Date	June 10, 2016	Previous Calibration	May 19, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	10:15	End Time (MST)	15:20
Analyzer make	Thermo 55i	Analyzer serial #	1152430011

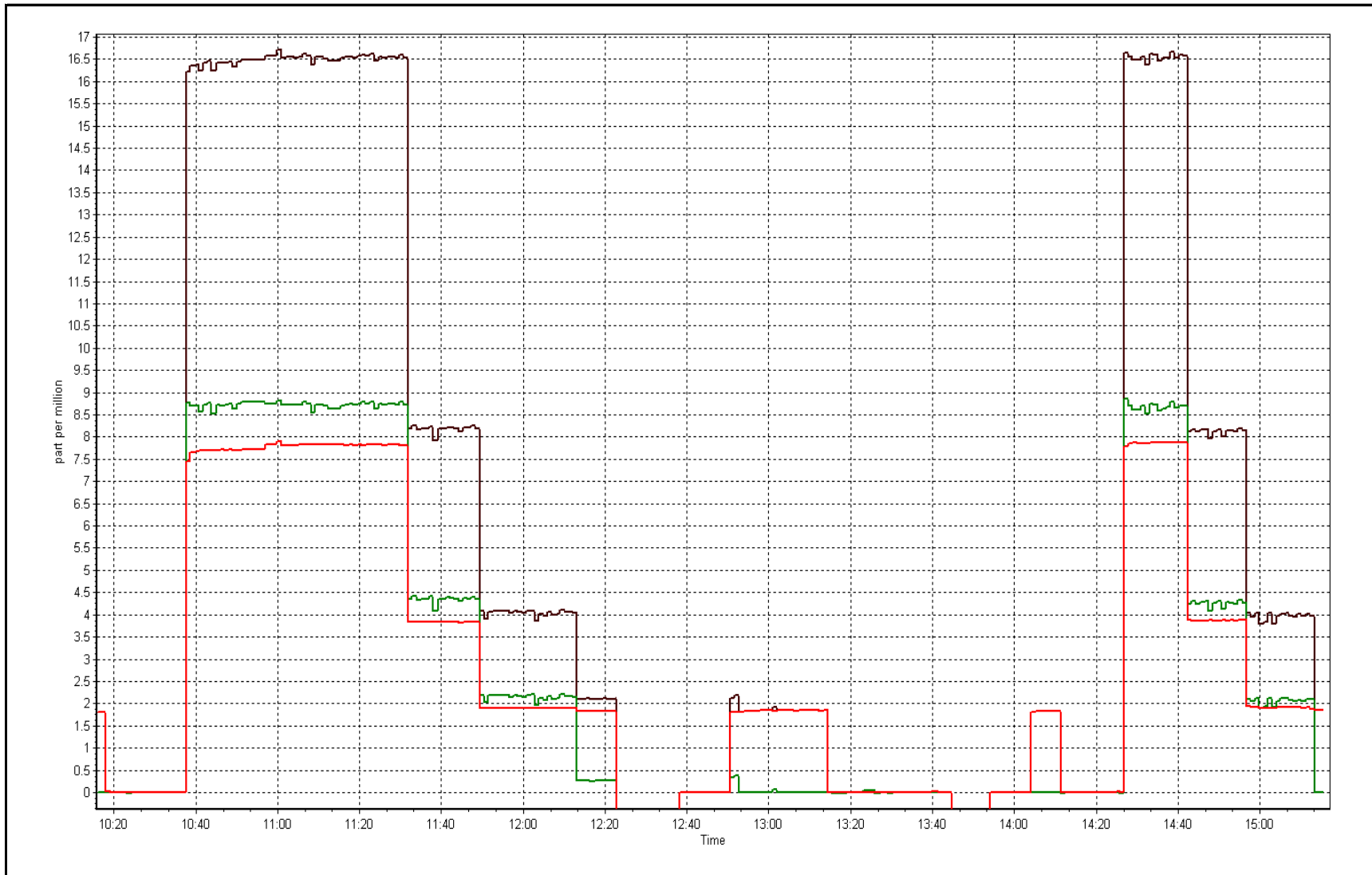
Calibration Data

Calculated concentration (ppm) (Cc)	Indicated concentration (ppm) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.00	0.00	----	Correlation Coefficient	0.999960
8.75	8.73	1.0025		
4.37	4.33	1.0093	Slope	1.000863
2.19	2.13	1.0258		
			Intercept	0.025901



THC Calibration Plot

Date: June 10, 2016





Wood Buffalo Environmental Association

O₃ Calibration Report

Station Information

Calibration Date	June 14, 2016	Previous Calibration	May 20, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	10:29	End Time (MST)	13:20
NO2 GPT Ref date	June-14-16	Transfer Standard	23
		Station temp.	21 Deg C
Calibrator Make/Model	Teledyne API 700	Serial Number	1221
ZAG make/model	Teledyne API 701	Serial Number	5611
DACS make/model	Campbell Scientific CR3000	Serial Number	9628

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 500 ppb		Bench temp.	27.7	28.0
Analyzer IP address	192.168.1.48		Lamp temp.	53.4	53.4
Calculated slope	1.048894	1.012329	Pressure	645.8	642.5
Calculated intercept	-0.504763	-0.522372	Flow cell A	0.726	0.722
Analyzer Background	-0.6	-0.6	Flow cell B	0.726	0.726
Analyzer Coefficient	1.012	1.012	Cell A Intensity	73075	72689
			Cell B Intensity	75905	74412

Analyzer make	Thermo 49i	Analyzer serial #	1501663734
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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	187.8/800	0.0	-1.1	----
as found span	5000	569.3/1000.8	301.9	298.4	1.012
calibrator zero	5000	187.8/800	0.0	-0.4	----
high point	5000	569.3/1000.8	301.9	299.2	1.009
second point	5000	381.6/912.9	202.1	198.3	1.019
third point	5000	191.5/803	98.2	99.8	0.984
as left zero	6000	187.8/800	0.0	-0.7	----
as left span	5000	569.3/1000.8	301.9	300.7	1.004
Average Correction Factor					1.004

Corrected As found	299.5	Previous response	288.4	% change	-3.7%
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Notes:

Did not make any adjustments; however, used new average for "calibrator zero" and "high point" after replacing the filter.
Sample inlet filter replaced after as founds.

Calibration Performed By: Asad Hidayat



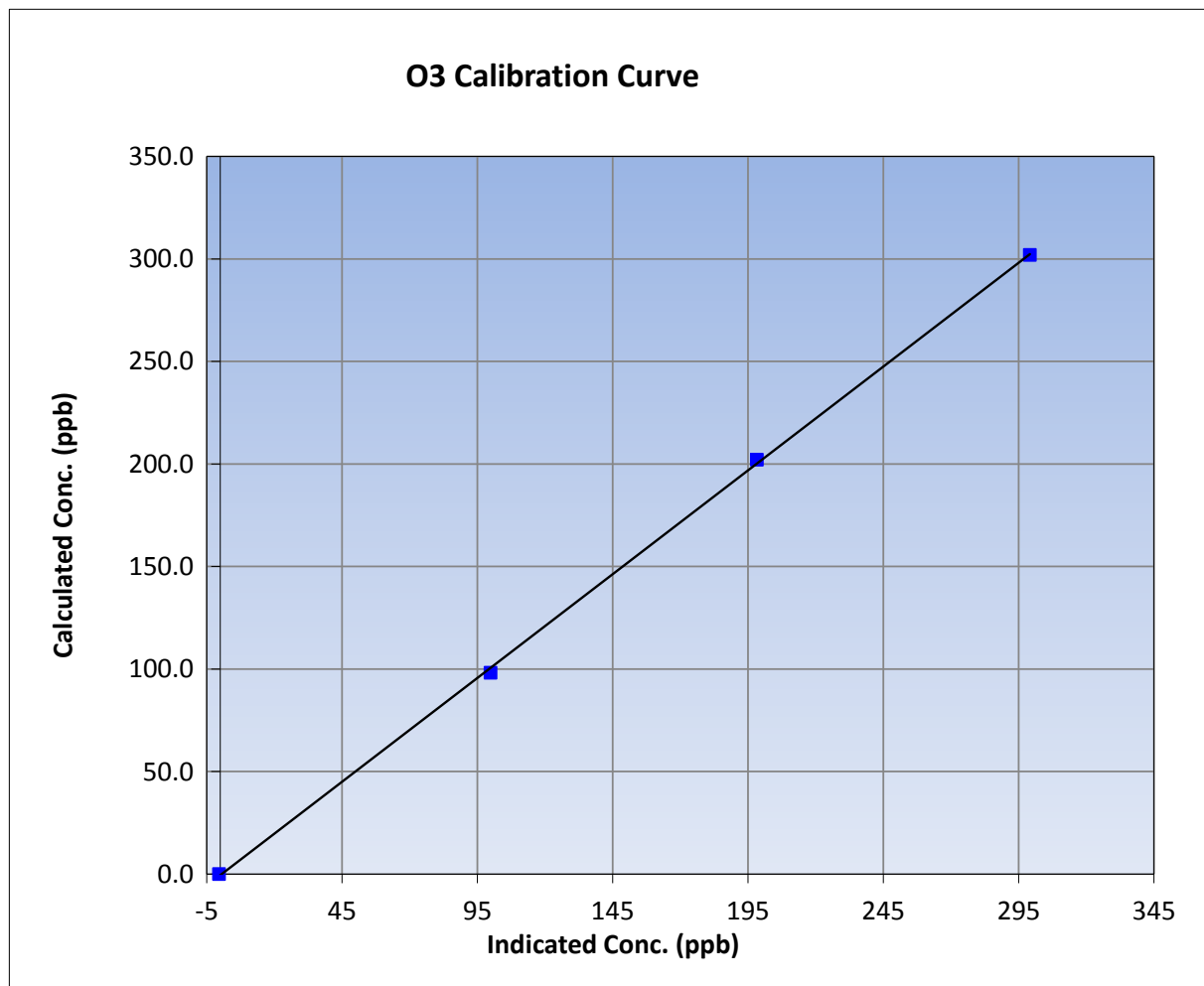
Wood Buffalo Environmental Association O3 Calibration Report

Station Information

Calibration Date	June-14-16	Previous Calibration	May 20, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	10:29	End Time (MST)	13:20
Analyzer make	Thermo 49i	Analyzer serial #	1501663734

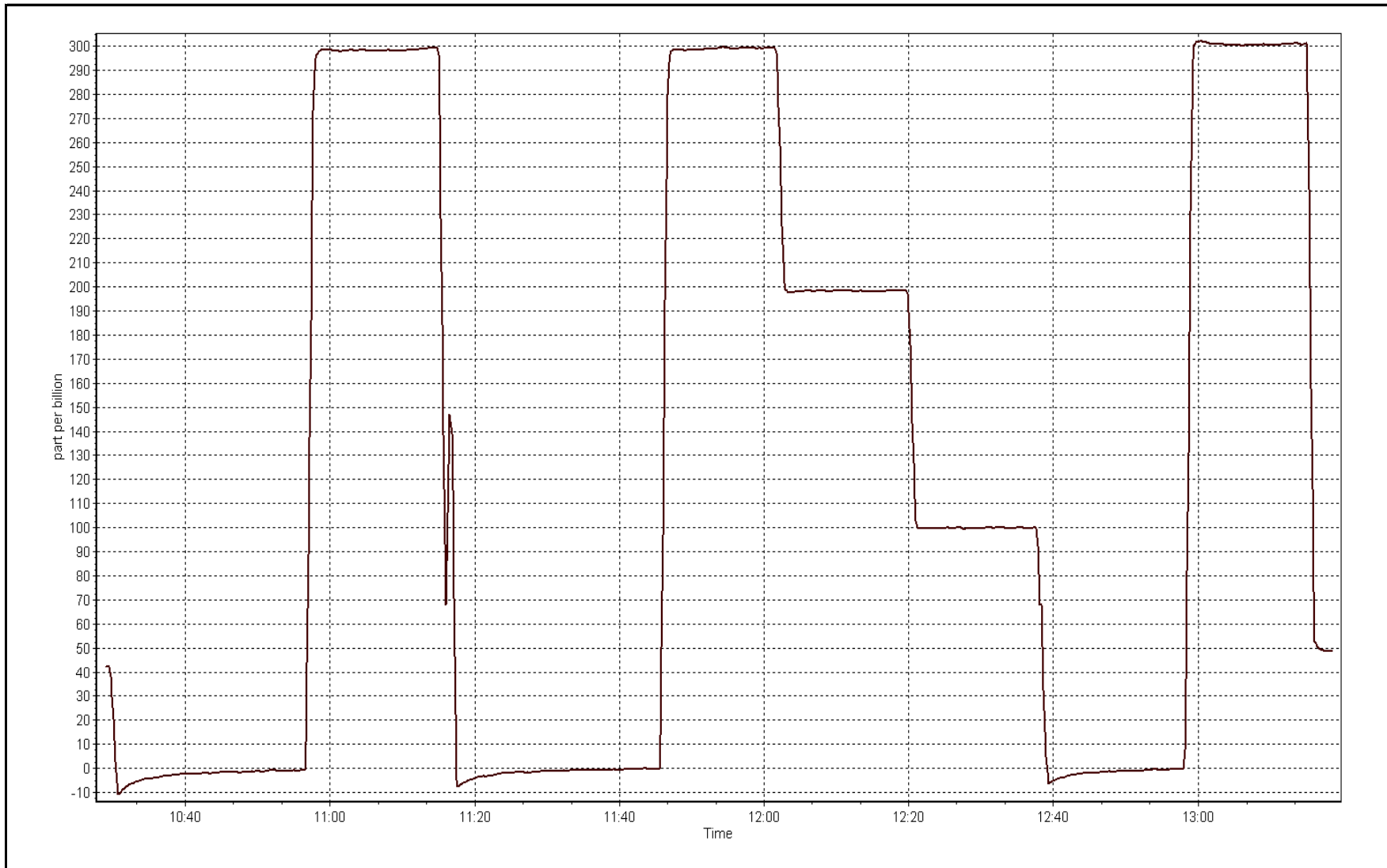
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	----	Correlation Coefficient	0.999807
301.9	299.2	1.0092		
202.1	198.3	1.0188		
98.2	99.8	0.9836		
			Slope	1.012329
			Intercept	-0.522372



O3 Calibration Plot

Date: June 14, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 9, 2016	Previous Calibration	May 19, 2016
Station Name	Conklin Community	Station Number	AMS 21
Reason:	Routine		
Start Time (MST)	11:35	End Time (MST)	17:20
NO Cal Gas Conc	52.4 ppm	Gas Cert Reference	EY0000359
NOX Cal Gas Conc	52.4 ppm	Cal Gas Expiry Date	Feb-09-2018
Calibrator	API T700	Serial Number	1221
Zero air Generator	API 701	Serial Number	5611

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	9628
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	0.997622	0.997793	1.024054
	Data Offset	0.715099	1.403368	-2.005212
Current Calibration	Data Slope	0.993499	0.993065	0.989944
	Data Offset	1.185989	1.693580	-0.002251

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1501663731
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000 ppb		0-1000 ppb	
Analyzer IP	192.168.1.43		192.168.1.43	
NO coefficient	1.066		1.087	
NOX coefficient	0.999		0.998	
NO2 coefficient	1.000		1.000	
NO bkgrnd	6.9		7.1	
NOX bkgrnd	7.0		7.1	
Chamber Temp	49.7	Deg C	49.7	Deg C
Moly Temp	323.4	Deg C	326.3	Deg C
PMT voltage	-841	V	-840.6	V
PMT Temp	-2.8	Deg C	-2.8	Deg C
O3 flow	ok	ccm	-3	ccm
R Cell press NO	167	mmHg	170.6	mmHg
R Cell Press Nox	167	mmHg	170.6	mmHg
NO sample flow	0.655	lpm	0.647	lpm
Nox sample Flow	0.655	lpm	0.648	lpm

Notes:

Sample inlet filter after as founds. Scrubber/charcoal material inside zero air gen replaced after as founds. Adjusted span.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 9, 2016

Station Number:

AMS 21

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	0.0	0.0	----	----
as found span	5000	76.5	801.7	801.7	0.0	787.1	786.4	0.6	1.0186	1.0195
calibrator zero	5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	----	----
high point	5000	76.5	801.7	801.7	0.0	806.3	806.4	-0.1	0.9943	0.9942
second point	5000	38.2	400.3	400.3	0.0	401.4	400.8	0.5	0.9973	0.9988
third point	5000	19.2	201.2	201.2	0.0	200.0	199.0	0.9	1.0063	1.0110
as left zero	5000	0.0	0.0	0.0	0.0	0.1	0.1	0.0	----	----
as left span	5000	76.5	801.7	492.0	309.8	803.4	490.6	312.9	0.9979	1.0029
Average Correction Factor									0.9993	1.0013

Corrected As found

NO_x= 787.1

NO= 786.3

Percent Change

NO_x= 2.0%

NO= 2.0%

Previous Response

NO_x= 802.9

NO= 802.1

GPT Calibration Data

Dilution Flow (total) 5000 ccm

Source Gas Flow 76.50 ccm

NOx ref calc conc = 801.7 ppb

NO ref calc conc = 801.7 ppb

O3 Setpoint (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
1st NO ref point		0.0	803.8	802.4	0.0	0.9974	0.9991	----	----
1st NO2 (300)	492.0	310.4	805.0	492.0	313.0	0.9959	----	0.9917	100.8%
2nd NO2 (200)	598.4	204.0	805.6	598.4	207.2	0.9952	----	0.9845	101.6%
3rd NO2 (100)	698.5	103.9	802.8	698.5	104.4	0.9986	----	0.9952	100.5%
2nd NO ref point		0.0	805.0	803.0	1.3	0.9959	0.9984	----	----
Average Correction Factor						0.9964		0.9905	101.0%

Calibration Performed By:

Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

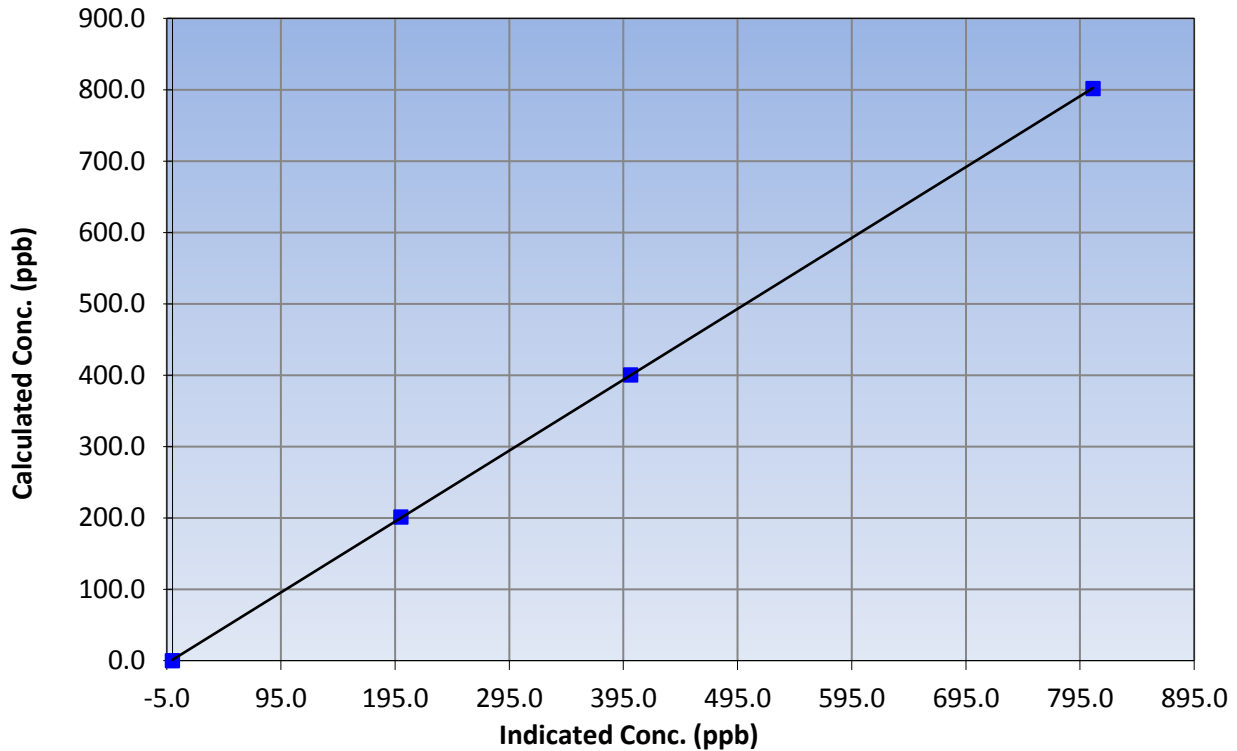
Station Information

Calibration Date	June 9, 2016	Previous Calibration	May 19, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	11:35	End Time (MST)	17:20
Analyzer make	Thermo 42i	Analyzer serial #	1501663731

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999990
801.7	806.3	0.9943		
400.3	401.4	0.9973	Slope	0.993499
201.2	200.0	1.0063		
			Intercept	1.185989

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

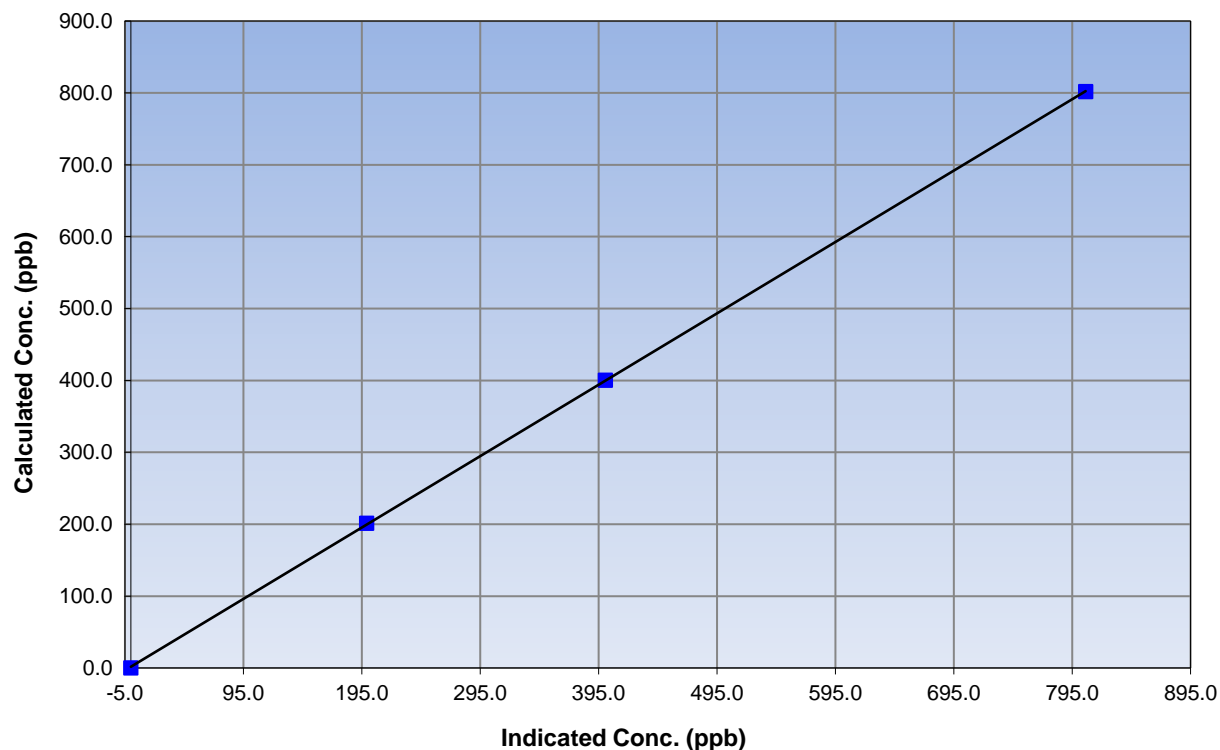
Station Information

Calibration Date	June 9, 2016	Previous Calibration	May 19, 2016
Station Name	Conklin Community	Station Number	AMS 21
Start Time (MST)	11:35	End Time (MST)	17:20
Analyzer make	Thermo 42i	Analyzer serial #	1501663731

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
801.7	806.4	0.9942		
400.3	400.8	0.9988	Slope	0.993065
201.2	199.0	1.0110		
			Intercept	1.693580

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

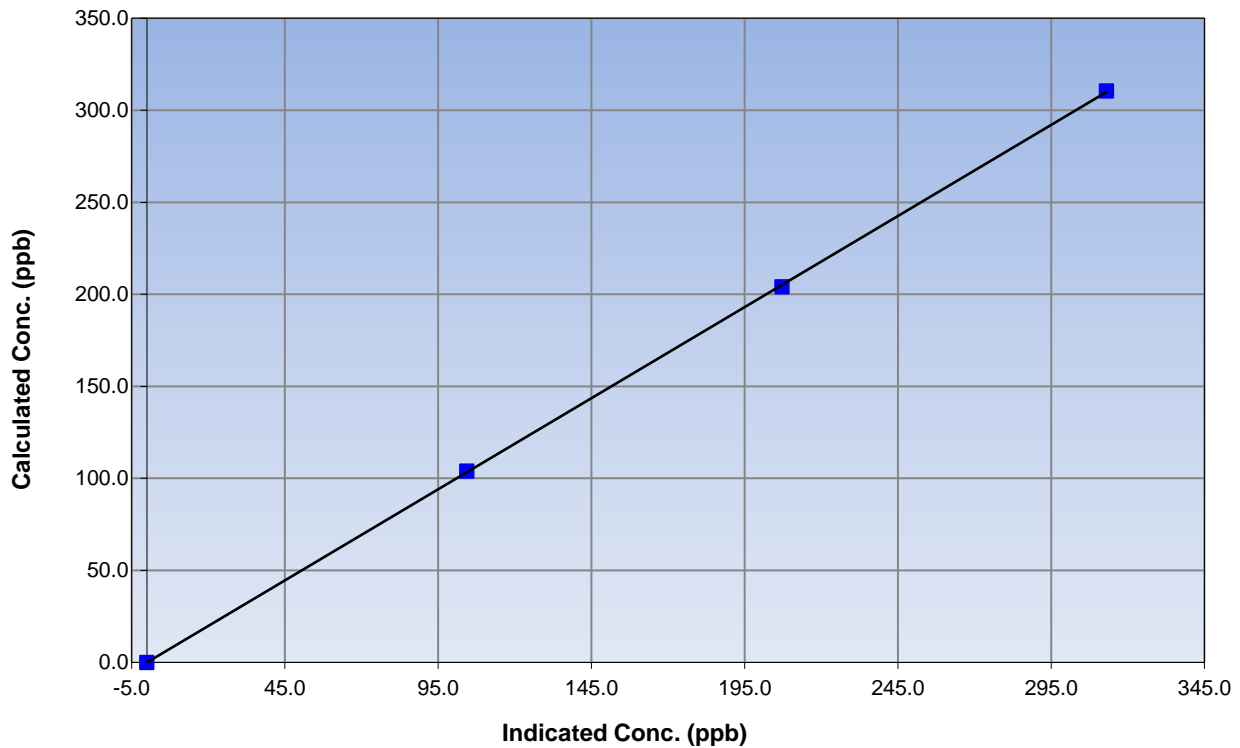
Station Information

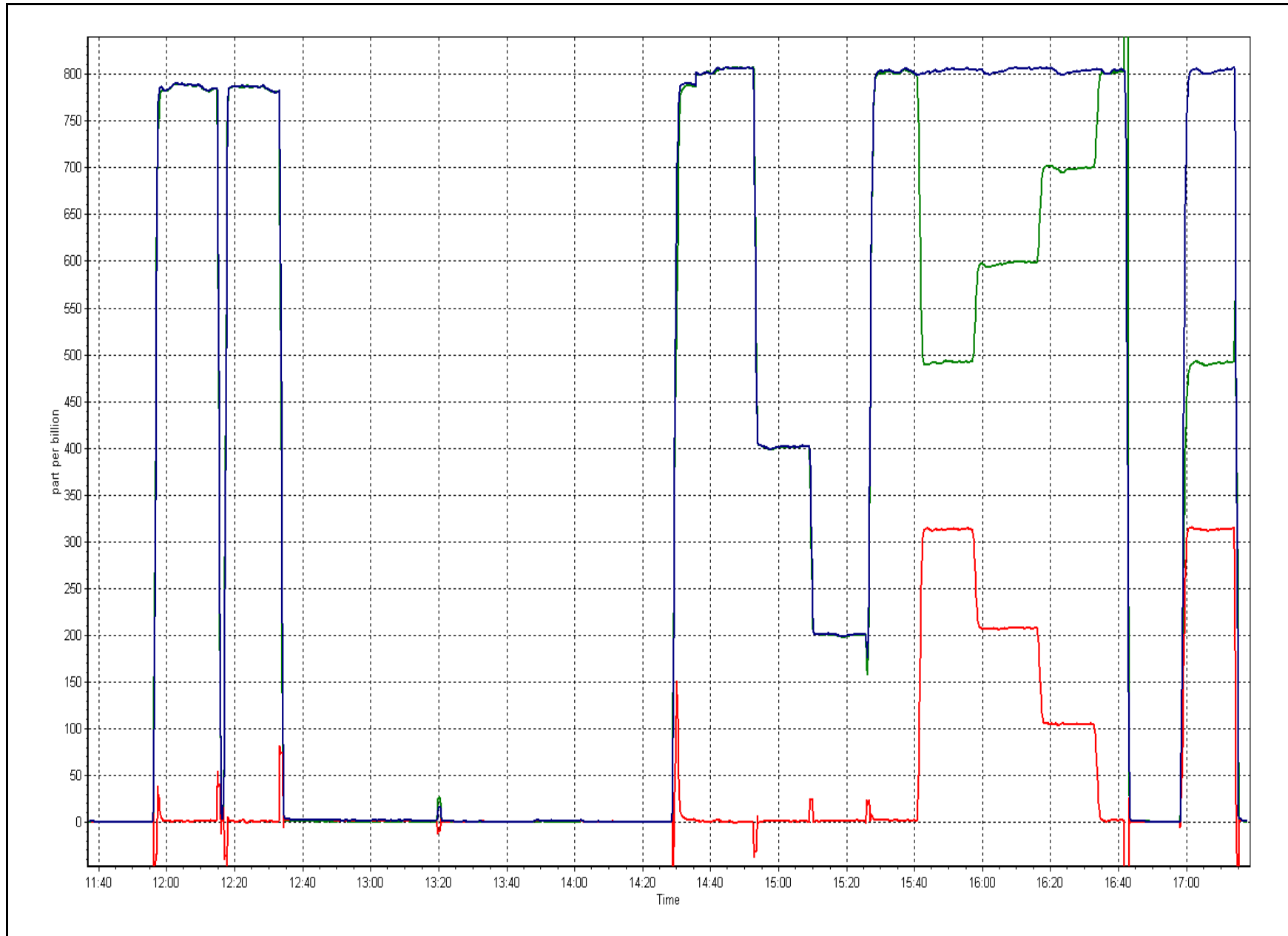
Calibration Date	June 9, 2016	Previous Calibration	May 19, 2016
Station Number	Conklin Community	Station Number	AMS 21
Start Time (MST)	11:35	End Time (MST)	17:20
Analyzer make	Thermo 42i	Analyzer serial #	1501663731

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999965
310.4	313.0	0.9917		
204.0	207.2	0.9845	Slope	0.989944
103.9	104.4	0.9952		
			Intercept	-0.002251

NO₂ Calibration Curve







Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION			
Calibration Date:	<u>June 14, 2016</u>	Previous Calibration:	<u>May 11, 2016</u>
Station Name:	<u>Conklin Community</u>	Station Number:	<u>AMS 21</u>
Start Time (MST):	<u>9:08</u>	End Time (MST):	<u>14:03</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>7494</u>	
C ₁₄ Source SN:		<u>CM-0404</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	19.0	19.4	0.4	19.0
T2	25.0	na	na	25.0
T3	24.0	na	na	24.0
T4	31.0	na	na	31.0
RH (%)	58.0	na	na	58.0

Pressure (Hpa)				
Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	940	936.0	-4.0	940

Main Flow (Lph)				
Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1001	1005	4	1005	1001

Nephelometer Calibration			
Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	169		169
Neph	-0.6		-0.1
C14	24.7		19.7
Indicated Concentration (ug/m3)	-1.1	yes	-0.3
Offset 1			169
Offset 2			27

Leak Check (Quarterly)			
Leak Check Date:	<u>June 14, 2016</u>	Previous Leak Check Date:	<u>March 24, 2016</u>

	Measured	Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.75	
*Flow with adaptor (LPM):	16.71	0.04

**Note - do not attach adaptor without shutting off the pump first*

Mass Foil Calibration (Annualy)			
Foil Calibration Date:	<u>June 14, 2016</u>	Previous Foil Calibration:	<u>March 24, 2016</u>
Zeroed?:			
Foil Mass:	<u>2805</u>	<u>Mass foil set S/N:</u>	<u>2598</u>
Previous Correction Factor:	<u>7056</u>		
New Correction Factor:	<u>5603</u>		

INSPECTION DATA		
Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	14/06/2016
Pump	Good	21/03/2016
Filter Tape	Good	21/03/2016
Mass Foil Cal Set	na	14/06/2016
HEPA filter	Good	24/03/2016

NOTES:

Cyclone Head cleaned. Leak check done; passed. Verified T1, T2, T3 and T4; all working fine. Mass Foil Cal completed; accepted new correction factor value.

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

SHARP CALIBRATION

STATION INFORMATION

Calibration Date:	<u>June 16, 2016</u>	Previous Calibration:	<u>June 14, 2016</u>
Station Name:	<u>Conklin Townsite</u>	Station Number:	<u>AMS 21</u>
Start Time (MST):	<u>9:55</u>	End Time (MST):	<u>13:11</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>7494</u>
C ₁₄ Source SN:	<u>CM-0404</u>
Confirmation of Time settings:	Yes <input type="checkbox"/> No <input type="checkbox"/>
Parameters Checked:	<input checked="" type="checkbox"/> T1 <input checked="" type="checkbox"/> T2 <input checked="" type="checkbox"/> T3 <input checked="" type="checkbox"/> T4 <input type="checkbox"/> P3 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	16.0	16.4	0.4	16.0
T2	24.0	na	na	24.0
T3	24.0	na	na	24.0
T4	28.0	na	na	28.0
RH (%)	48.0	na	na	48.0

Pressure (Hpa)

Sensor	Indicated	Measured	Difference (Limit +/- 13.33 hPa)	Final Indicated
P3	940	936.0	-4.0	936

Main Flow (Lph)

Indicated	Measured	Difference LPH (Limit +/- 7% or 70 Lph)	Final Measured	Final Indicated
1001	1005	4	1005	1001

Nephelometer Calibration

Parameter	As Found	Zeroed (Limit +/- 2.0ug/m3)	As Left
Analog	169		169
Neph	-0.04		-0.04
C14	69.2		69.2
Indicated Concentration (ug/m3)	-0.6	no	-0.6
Offset 1			
Offset 2			

Leak Check (Quarterly)

Leak Check Date:	<u>June 14, 2016</u>	Previous Leak Check Date:	<u>March 24, 2016</u>
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	Measured	Difference LPM (Limit +/- 0.42 LPM)
Flow without adaptor (LPM):	16.75	
*Flow with adaptor (LPM):	16.71	0.04

**Note - do not attach adaptor without shutting off the pump first*

Mass Foil Calibration (Annualy)

Foil Calibration Date:	<u>June 14, 2016</u>	Previous Foil Calibration:	<u>March 24, 2016</u>
Zeroed?:			
Foil Mass:	<u>2805</u>		
Previous Correction Factor:	<u>7056</u>	Mass foil set S/N:	<u>2598</u>
New Correction Factor:	<u>5603</u>		

INSPECTION DATA

Item	Condition	Date of install or rebuild
Cyclone	Good / cleaned	16/06/2016
Pump	Good	16/06/2016
Filter Tape	Good	21/03/2016
Mass Foil Cal Set	na	14/06/2016
HEPA filter	Good	24/03/2016

NOTES:

Pump was off upon arrival, switched it back on and delta cal was reading about 990 l/h flow (instrument reading 1000l/h). Replaced pump. Cyclone head cleaned.

Calibration Performed By:	Asad Hidayat
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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 500
CENOVUS
CHRISTINA LAKE
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CENOVUS CHRISTINA LAKE (AMS 500)
 JUNE 2016

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	684	36	36	100	11	0	3	0
H2S (ppb) Average	683	35	37	99.72	1	0	0	0
NO2 (ppb) Average	684	36	36	100	14	0	5	-
NO (ppb) Average	684	36	36	100	11	-	3	-
NOX (ppb) Average	684	36	36	100	20	-	7	-
Temperature 2 m (C) Average	720	0	0	100	27.8	-	22.8	-
Relative Humidity (%) Average	720	0	0	100	98	-	96	-
Wind Speed 10 m (km/h) Average	720	0	0	100	31	-	18	-
Wind Direction 10 m (deg) Average	720	0	0	100	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CENOVUS CHRISTINA LAKE (AMS 500)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	684	0.9	2	-	0	0	0	0	1	3	11
H2S (ppb) Average	683	0.1	0	-	0	0	0	0	0	0	1
NO2 (ppb) Average	684	1.8	2	-	0	0	1	1	3	4	14
NO (ppb) Average	684	0.9	1	-	0	0	0	0	1	2	11
NOX (ppb) Average	684	2.7	3	-	0	1	1	2	3	6	20
Temperature 2 m (C) Average	720	16.43	5.2	-	3	10.2	12.5	15.7	20.6	23.9	27.8
Relative Humidity (%) Average	720	59.9	22	-	16	30	40	60	78	91	98
Wind Speed 10 m (km/h) Average	720	10.8	6	-	1	4	7	10	15	19	31
Wind Direction 10 m (deg) Average	720	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CENOVUS CHRISTINA LAKE (AMS 500)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
H2S	10 Jun 2016 10:00	10 Jun 2016 11:00	2	Maintenance - sample manifold cleaned



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

Cenovus - Christina Lake - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 11 ppb on Jun 17 15:00	Maximum Daily Average: 2.7 ppb on Jun 27		Hours of Data:	684
Minimum Value: 0 ppb on Jun 11 16:00	Minimum Daily Average: 0.1 ppb on Jun 11		Hours of Missing Data:	36
Maximum Diurnal Average: 1.6 ppb at hour 10	Minimum Diurnal Average: 0.3 ppb at hour 5		Hours of Calibration:	36
Monthly Average: 0.9 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 3 P ₉₉ = 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-Jun	0	0	1	8	Z	0	1	1	0	3	1	1	0	1	1	0	1	1	0	1	0	0	0	0	1.0	8
2-Jun	0	0	0	0	0	Z	0	1	2	1	0	0	0	0	0	0	0	1	2	1	0	1	0	0	0.6	2
3-Jun	Z	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	5	2	2	0	0	0	0	0.9	5
4-Jun	0	Z	0	0	0	0	0	2	2	5	1	6	3	4	3	1	6	4	9	2	3	0	0	0	2.7	9
5-Jun	3	5	Z	0	0	0	4	3	6	6	4	3	4	3	2	2	3	1	0	0	0	0	0	0	2.3	6
6-Jun	0	0	0	Z	0	4	5	5	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	3	1.2	5
7-Jun	1	1	1	1	Z	2	0	0	0	0	4	6	9	5	4	3	3	6	6	1	1	1	0	0	2.4	9
8-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.3	1
9-Jun	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
10-Jun	0	Z	0	0	0	0	0	C	C	C	C	C	C	1	1	1	1	1	1	0	0	0	0	0	--	1
11-Jun	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
12-Jun	0	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.1	1
13-Jun	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
14-Jun	1	0	2	1	1	Z	0	0	0	0	0	1	1	1	1	1	3	2	0	0	0	0	0	0	0.7	3
15-Jun	Z	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	2	1	0	3	0	1	1	0	0.6	3
16-Jun	0	Z	0	0	2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2
17-Jun	0	0	Z	0	0	0	0	0	0	0	2	5	5	10	11	11	3	0	0	0	0	0	0	0	2.2	11
18-Jun	0	0	0	Z	0	1	0	3	3	4	1	0	0	2	5	2	2	0	0	0	0	0	0	0	1.1	5
19-Jun	1	1	1	3	Z	1	0	0	0	1	3	4	9	4	3	10	1	4	0	0	1	2	2	1	2.2	10
20-Jun	0	0	0	0	0	Z	1	1	2	1	1	0	1	0	2	1	1	1	0	0	0	0	0	0	0.6	2
21-Jun	Z	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	1	2	0.4	2
22-Jun	0	Z	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0.8	1
23-Jun	1	0	Z	0	1	1	1	0	0	0	1	0	2	0	0	0	1	0	0	0	0	0	0	0	0.5	2
24-Jun	0	0	0	Z	0	0	0	0	0	0	0	2	1	1	0	2	0	0	1	3	2	2	0	2	0.8	3
25-Jun	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
26-Jun	0	0	0	0	0	Z	0	2	1	3	0	1	0	0	1	1	0	0	0	2	0	0	0	0	0.5	3
27-Jun	Z	0	0	0	0	0	1	3	9	7	9	10	4	2	2	6	4	2	3	0	0	0	0	0	2.7	10
28-Jun	0	Z	0	0	0	0	3	3	2	4	2	0	1	1	1	0	0	0	0	1	1	0	0	0	0.9	4
29-Jun	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
30-Jun	0	1	0	Z	0	1	1	3	2	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0.6	3

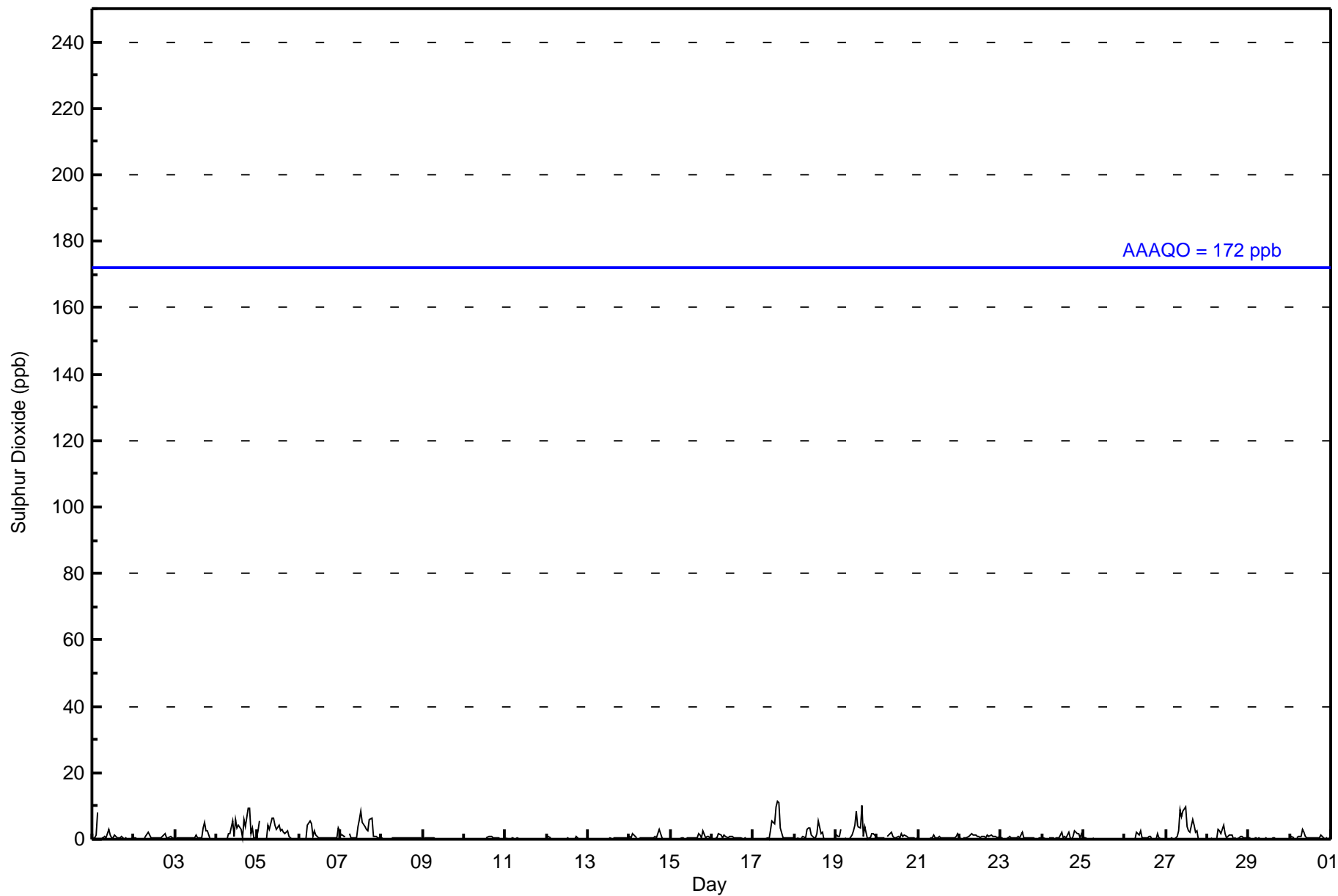
0.4	0.5	0.4	0.7	0.3	0.5	0.8	1.1	1.3	1.6	1.2	1.5	1.5	1.3	1.4	1.5	1.1	1.2	1.1	0.9	0.4	0.5	0.3	0.5	Diurnal Average	
3	5	2	8	2	4	5	5	9	7	9	10	9	10	11	11	6	6	9	9	2	3	2	3	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	682	99.71	99.71
11 - 20	2	0.29	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 10	18	24	19	27	33	33	46	67	75	49	64	57	61	45	45	19	682
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	2	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
Totals	18	24	19	27	33	33	46	67	75	49	64	57	61	47	45	19	684

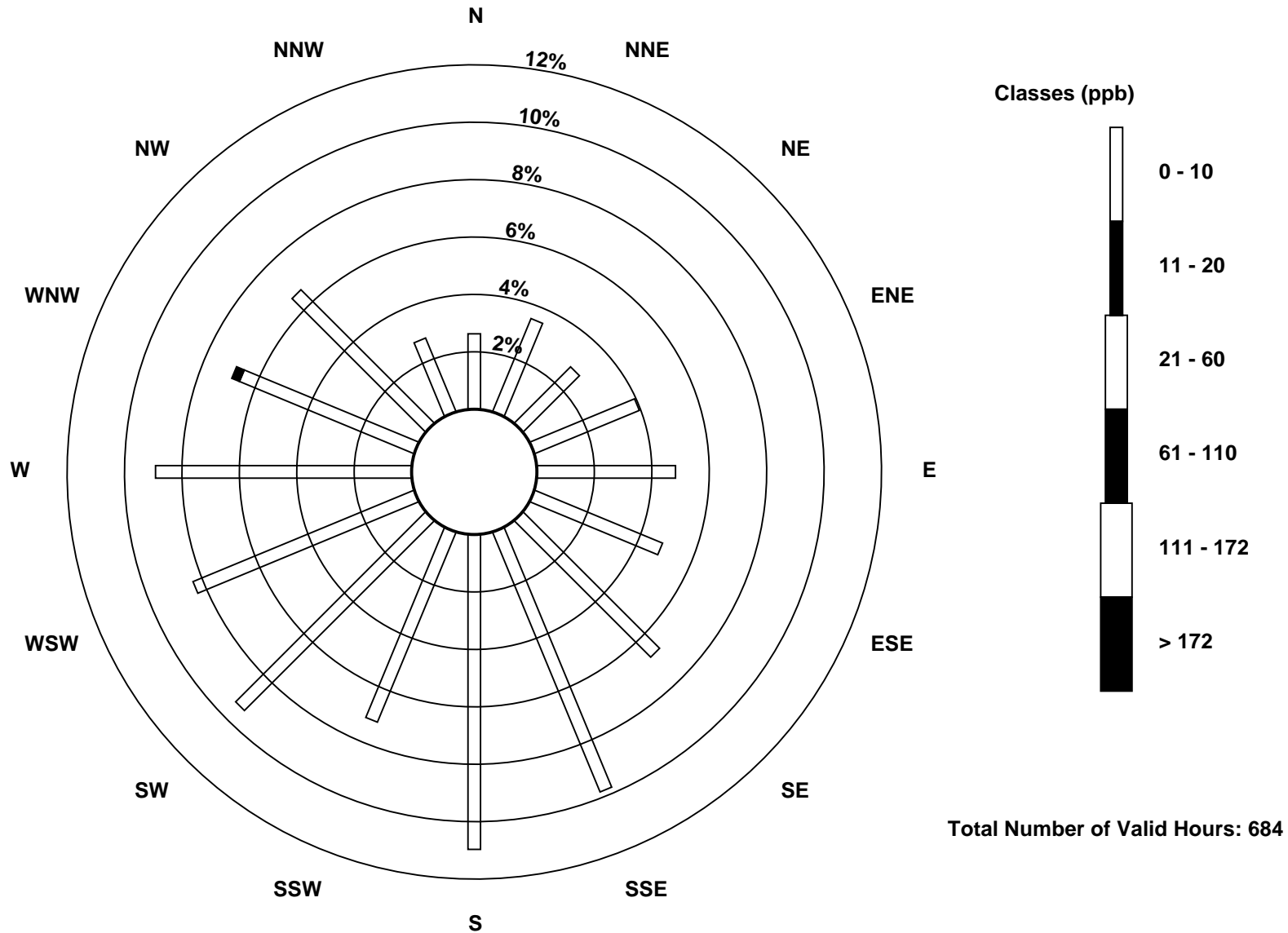
Total Number of Valid Hours: 684

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

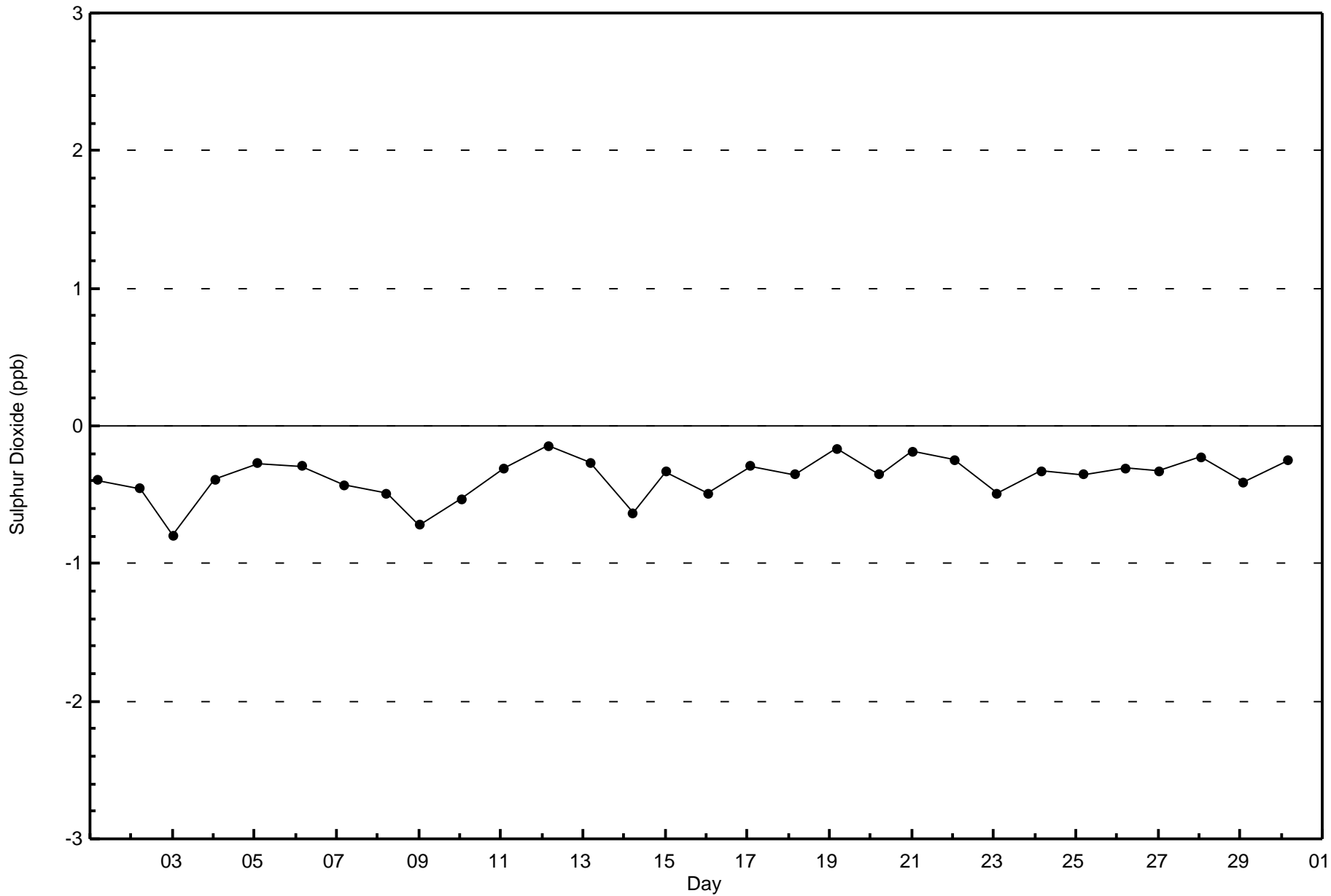
Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake (AMS500)

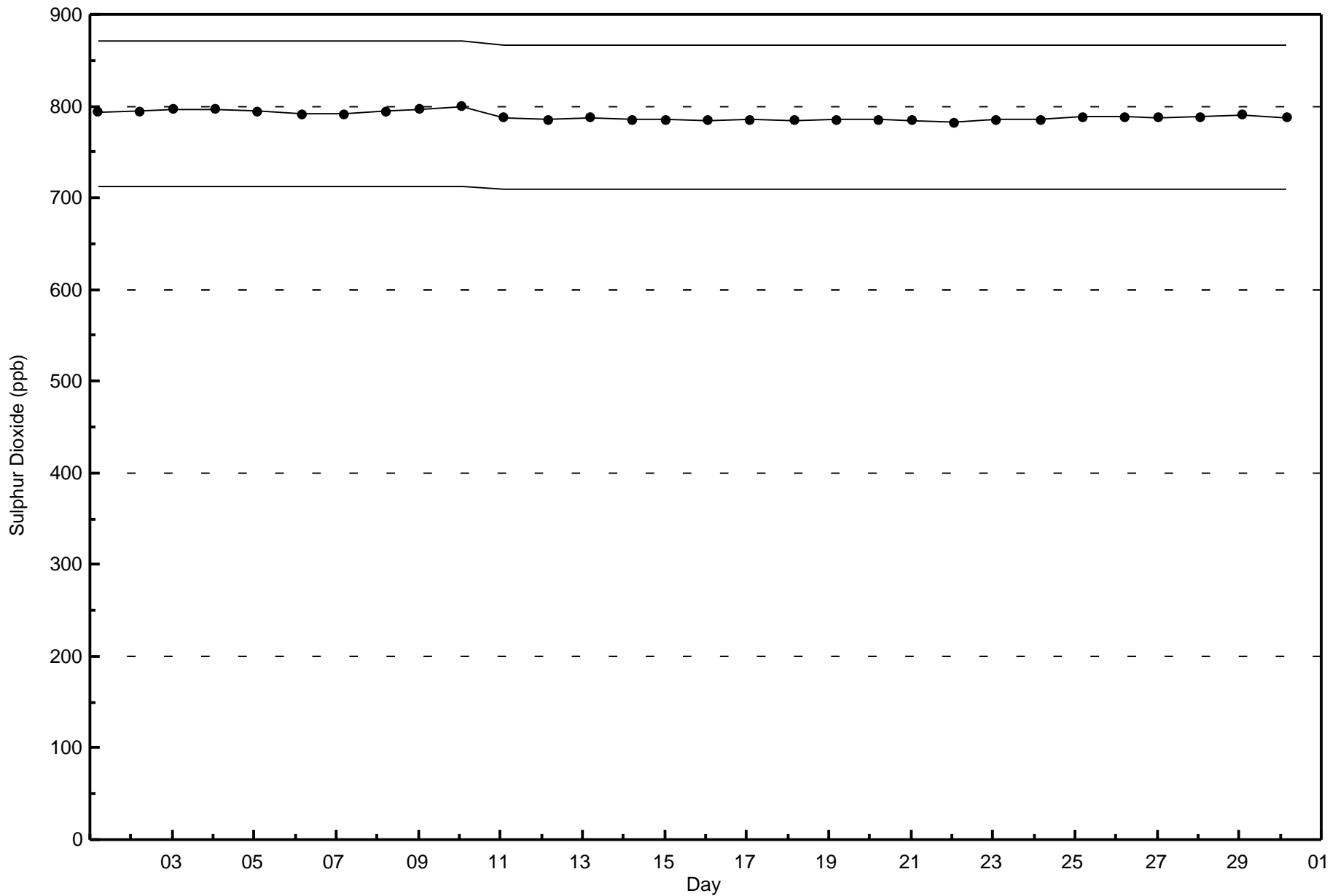




Wood Buffalo Environmental Association
Zero Responses

Sulphur Dioxide (SO₂) - ppb
Cenovus - Christina Lake - June 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 1 ppb on Jun 4 22:00	Maximum Daily Average: 0.3 ppb on Jun 25		Hours of Data:	683
Minimum Value: 0 ppb on Jun 23 15:00	Minimum Daily Average: 0.0 ppb on Jun 13		Hours of Missing Data:	37
Maximum Diurnal Average: 0.2 ppb at hour 2	Minimum Diurnal Average: 0.1 ppb at hour 15		Hours of Calibration:	35
Monthly Average: 0.1 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 1		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-Jun	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-Jun	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
3-Jun	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
4-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0.2	1
5-Jun	1	1	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
6-Jun	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-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0.3	1
8-Jun	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
9-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	C	C	C	C	C	0	0	0	0	0	0	0.1	0
10-Jun	0	0	Z	0	0	0	0	0	0	M	M	0	0	0	C	C	C	C	0	0	0	0	0	0	0.1	0
11-Jun	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-Jun	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-Jun	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-Jun	0	1	0	1	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
15-Jun	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-Jun	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-Jun	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-Jun	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-Jun	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-Jun	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
21-Jun	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
22-Jun	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
23-Jun	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-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.1	1
25-Jun	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
26-Jun	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
27-Jun	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-Jun	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-Jun	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
30-Jun	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

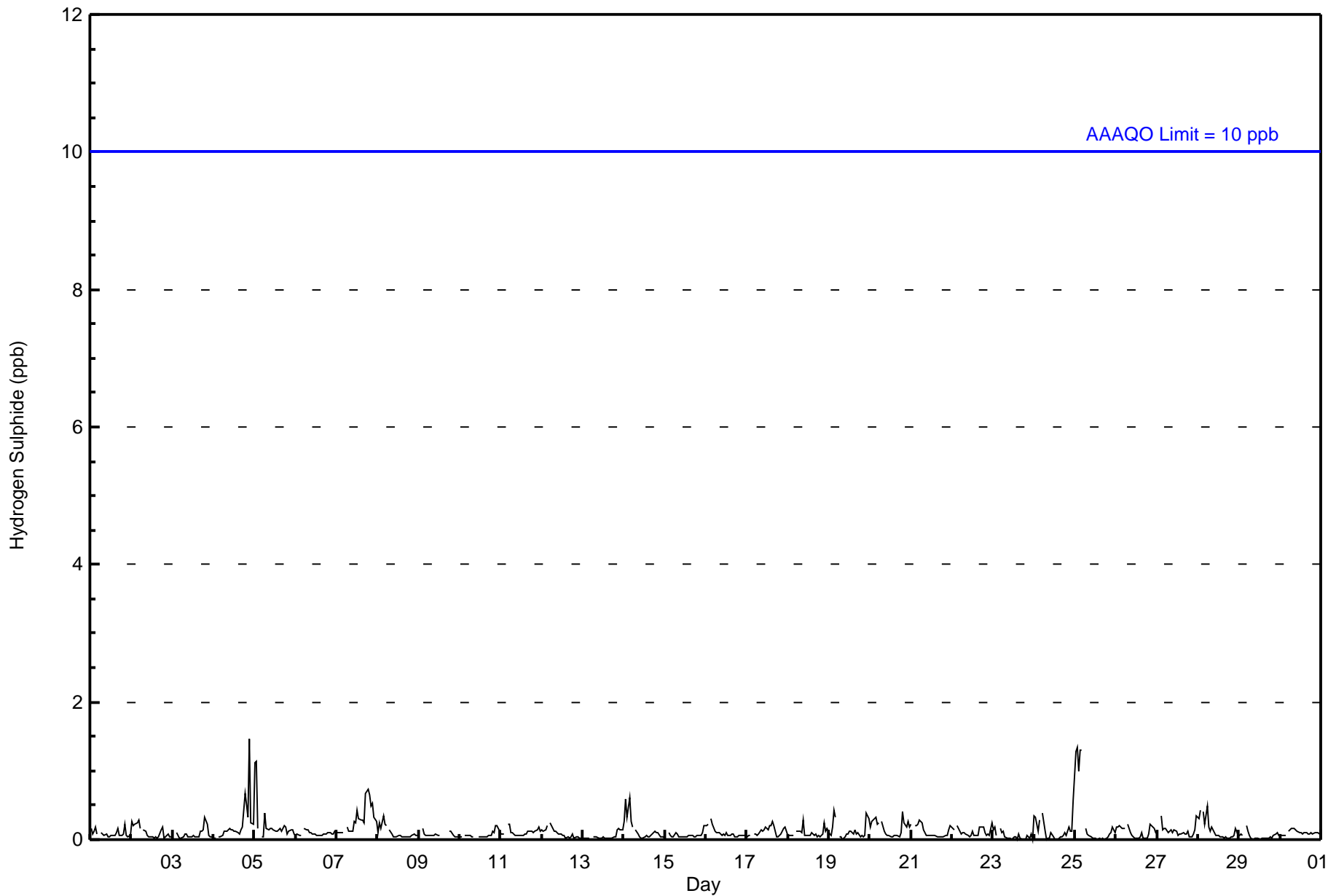
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	Diurnal Average			
1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	1	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	683	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: 683

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 2	15	24	19	25	32	32	45	72	76	46	68	55	61	49	44	20	683
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
Totals	15	24	19	25	32	32	45	72	76	46	68	55	61	49	44	20	683

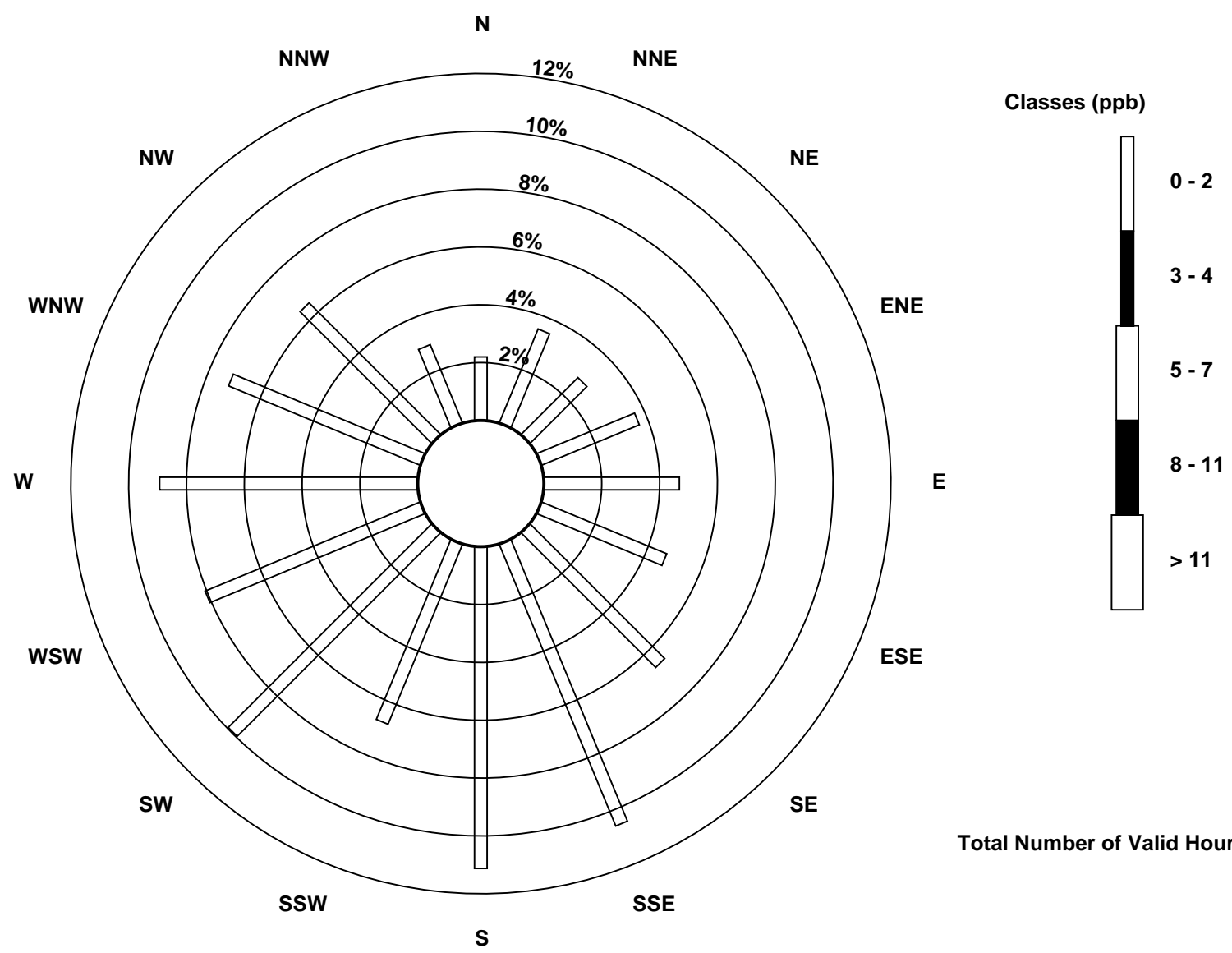
Total Number of Valid Hours: 683

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake (AMS500)

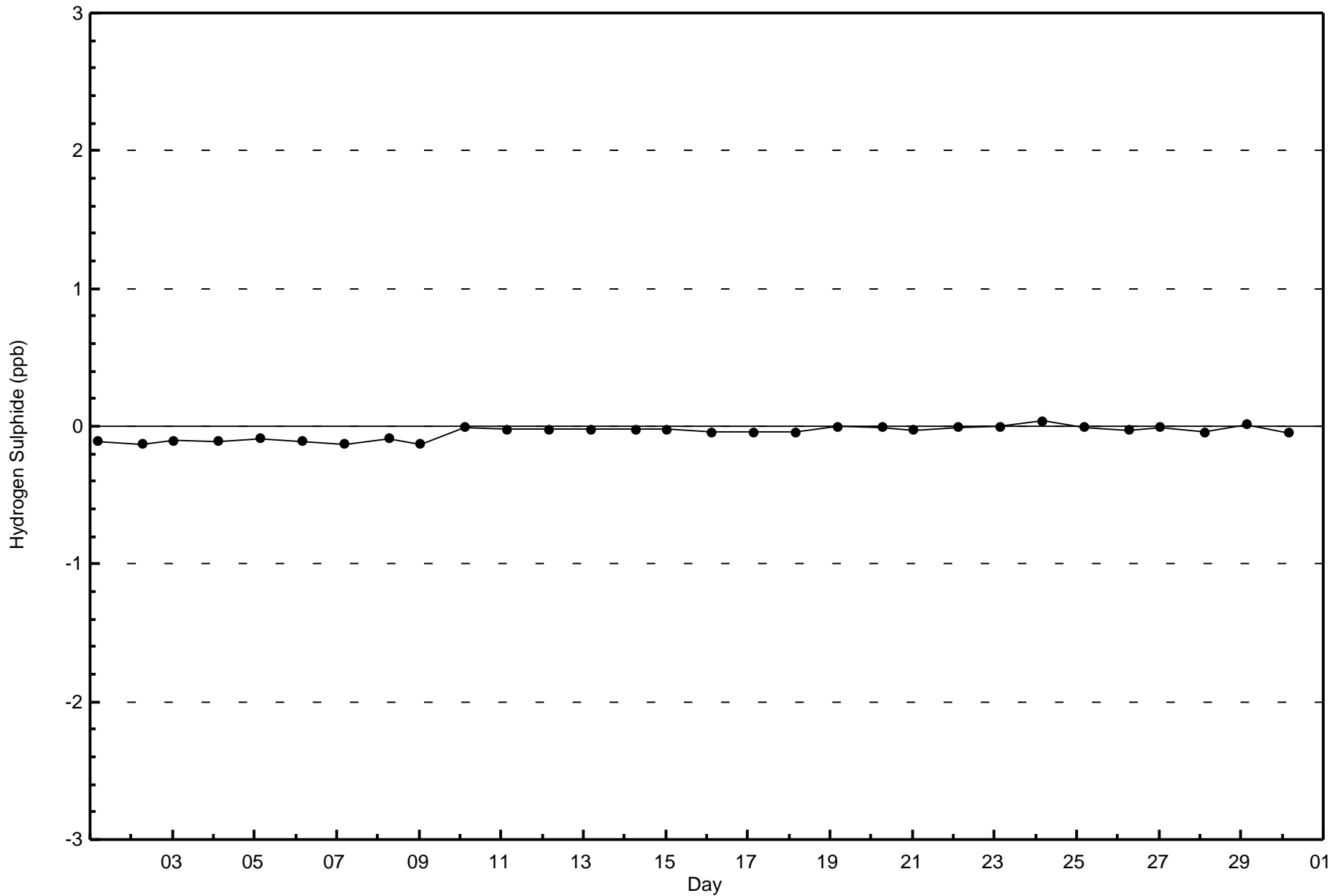


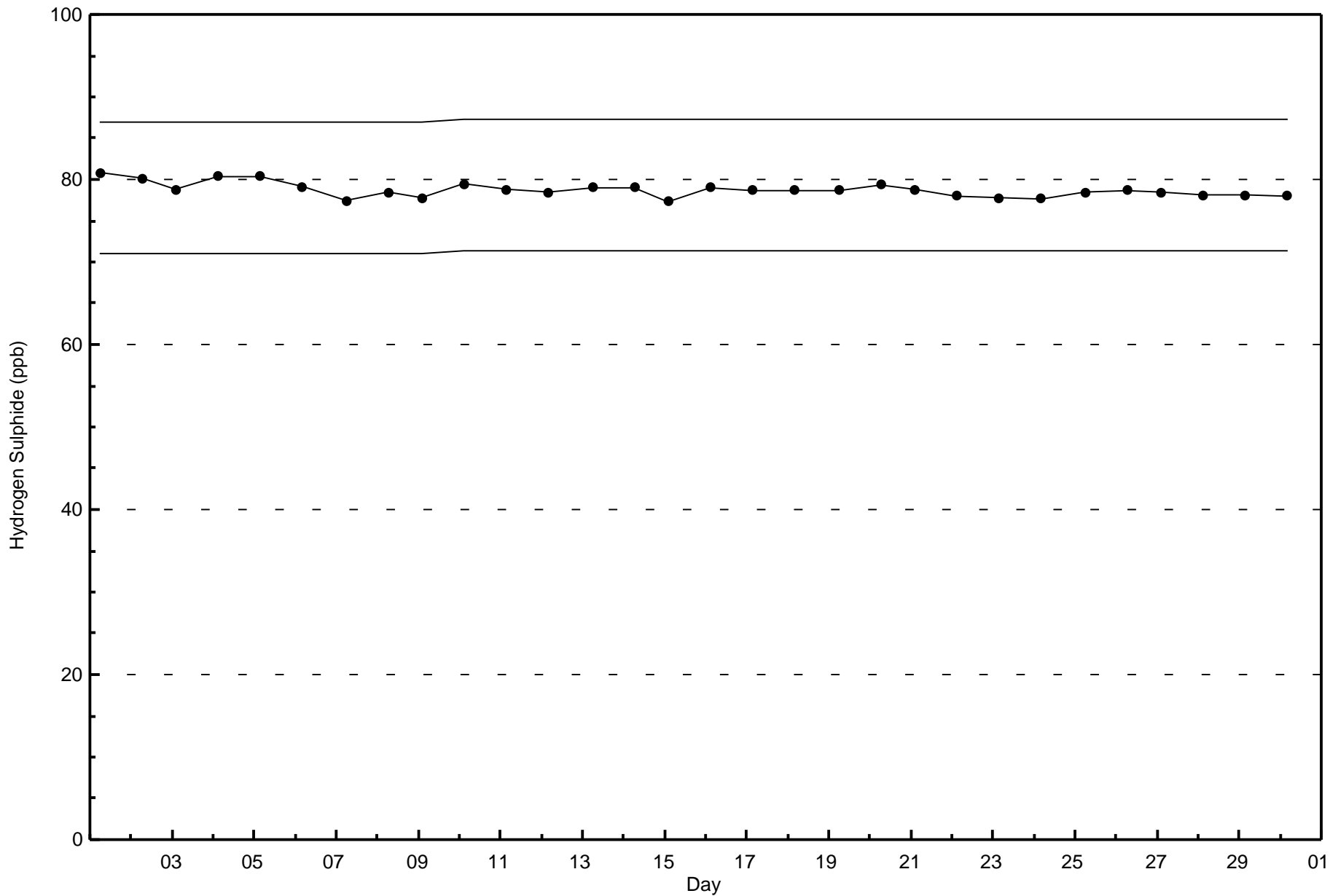
Total Number of Valid Hours: 683



Wood Buffalo Environmental Association
Zero Responses

Hydrogen Sulphide (H₂S) - ppb
Cenovus - Christina Lake - June 2016





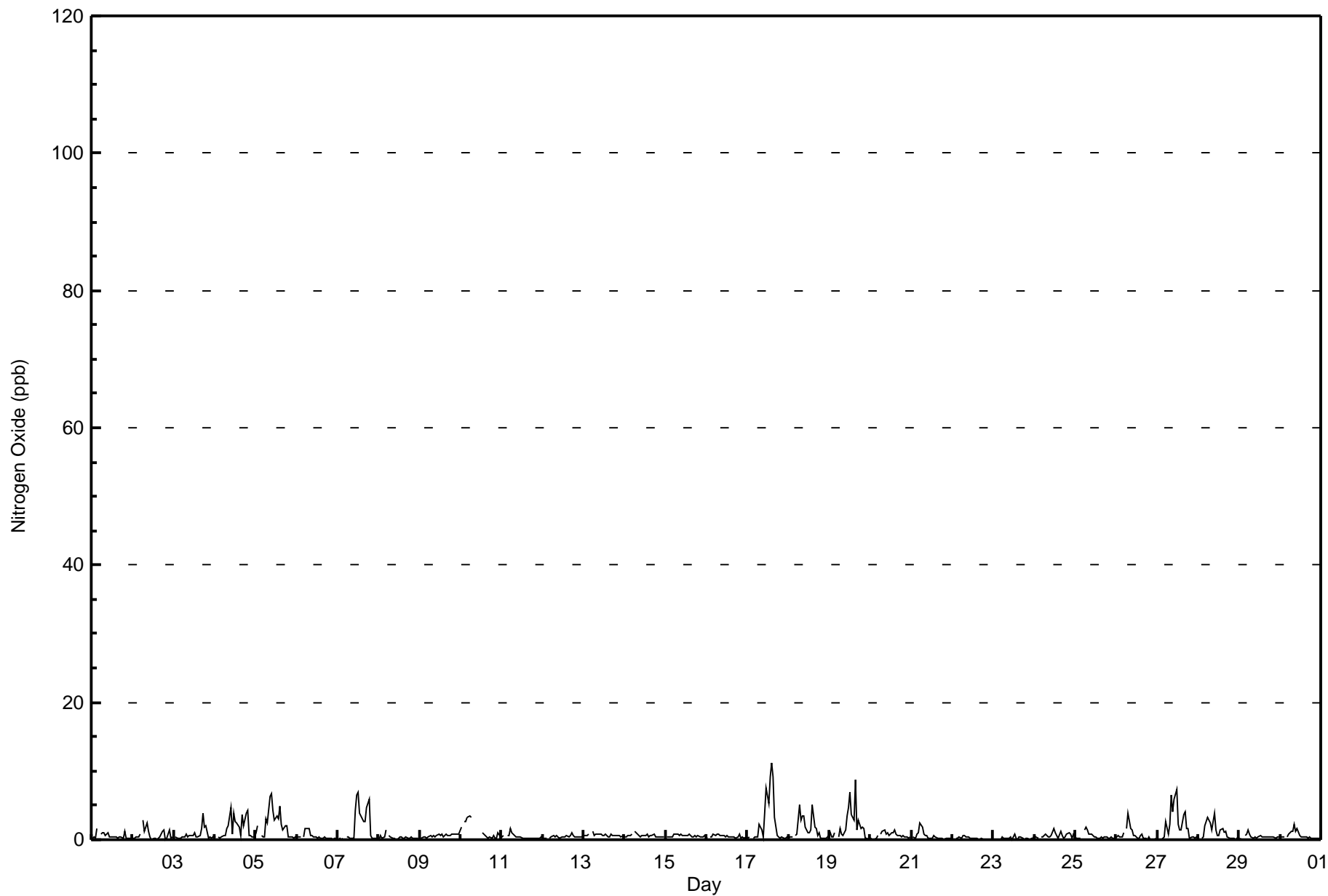


Maximum Value: 11 ppb on Jun 17 15:00																		Maximum Daily Average: 2.5 ppb on Jun 17																		Hours in Service: 720			
Minimum Value: 0 ppb on Jun 20 03:00																		Minimum Daily Average: 0.2 ppb on Jun 22																		Hours of Data: 684			
Maximum Diurnal Average: 1.5 ppb at hour 12																		Minimum Diurnal Average: 0.3 ppb at hour 23																		Hours of Missing Data: 36			
Monthly Average: 0.9 ppb																		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 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-Jun	0	0	0	2	Z	1	1	1	1	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0.5	2													
2-Jun	0	0	0	0	1	Z	3	1	2	1	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0.7	3													
3-Jun	Z	0	0	0	0	0	0	1	0	1	1	1	1	0	0	1	2	4	2	2	0	0	0	0	0.8	4													
4-Jun	0	Z	0	0	0	1	1	2	2	5	1	4	3	3	2	1	4	2	4	4	1	1	0	0	1.7	5													
5-Jun	1	2	Z	1	0	0	3	2	6	7	4	3	3	3	5	2	2	2	2	0	0	0	0	2.2	7														
6-Jun	0	0	0	Z	0	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2													
7-Jun	0	0	0	0	Z	0	0	0	0	0	4	6	7	4	3	3	3	5	6	1	0	0	0	0	1.9	7													
8-Jun	0	1	0	0	1	Z	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1													
9-Jun	Z	0	0	0	0	0	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0.6	1													
10-Jun	2	Z	3	3	3	3	3	C	C	C	C	C	C	1	1	0	0	0	0	1	0	0	1	0	--	3													
11-Jun	0	1	Z	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2													
12-Jun	0	0	0	Z	0	0	1	0	1	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0.4	1													
13-Jun	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	0.7	1													
14-Jun	0	0	1	1	1	Z	1	1	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.6	1													
15-Jun	Z	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0	1	0	0	0	1	0.6	1													
16-Jun	0	Z	0	0	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0.5	1													
17-Jun	0	0	Z	0	0	0	1	2	2	0	4	7	5	9	11	9	3	1	0	0	0	0	0	0	2.5	11													
18-Jun	0	0	0	Z	1	1	5	3	3	3	2	1	1	1	5	2	2	1	1	0	0	0	0	0	1.5	5													
19-Jun	1	0	0	1	Z	0	2	1	1	2	3	5	7	4	3	9	1	3	2	2	2	0	0	0	2.1	9													
20-Jun	0	0	0	0	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0.6	1													
21-Jun	Z	0	0	1	1	3	2	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.5	3													
22-Jun	0	Z	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1													
23-Jun	0	0	Z	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1													
24-Jun	1	0	0	Z	0	0	1	1	0	0	1	2	1	1	0	1	1	0	0	1	1	1	0	1	0.6	2													
25-Jun	0	0	0	0	Z	1	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2													
26-Jun	0	1	0	0	1	Z	2	4	2	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0.7	4													
27-Jun	Z	0	0	0	0	3	1	2	7	4	6	7	2	1	1	4	4	2	2	0	0	0	0	0	2.1	7													
28-Jun	0	Z	0	0	2	3	3	2	1	4	1	1	1	1	2	1	1	0	0	0	0	0	0	0	1.1	4													
29-Jun	0	0	Z	1	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.5	1													
30-Jun	0	0	0	Z	0	1	1	1	2	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0.6	2													
																		Diurnal Average				Diurnal Maximum																	
																		0.4				0.4																	
																		2				3																	
																		0.4				0.5																	
																		0.7				1.1																	
																		1.3				1.3																	
																		1.3				1.3																	
																		1.3				1.3																	
																		1.5				1.4																	
																		1.4				1.2																	
																		1.4				1.4																	
																		1.3				1.0																	
																		0.9				0.9																	
																		0.9				0.6																	
																		0.4				0.3																	
																		0.3				0.3																	
																		0.4				0.4																	
																		Z - zerospan				C - Calibration																	



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxide (NO) - ppb
Cenovus - Christina Lake - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Cenovus - Christina Lake - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	684	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
Cenovus - Christina Lake - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	18	24	19	27	33	33	46	67	75	49	64	57	61	47	45	19	684
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
Totals	18	24	19	27	33	33	46	67	75	49	64	57	61	47	45	19	684

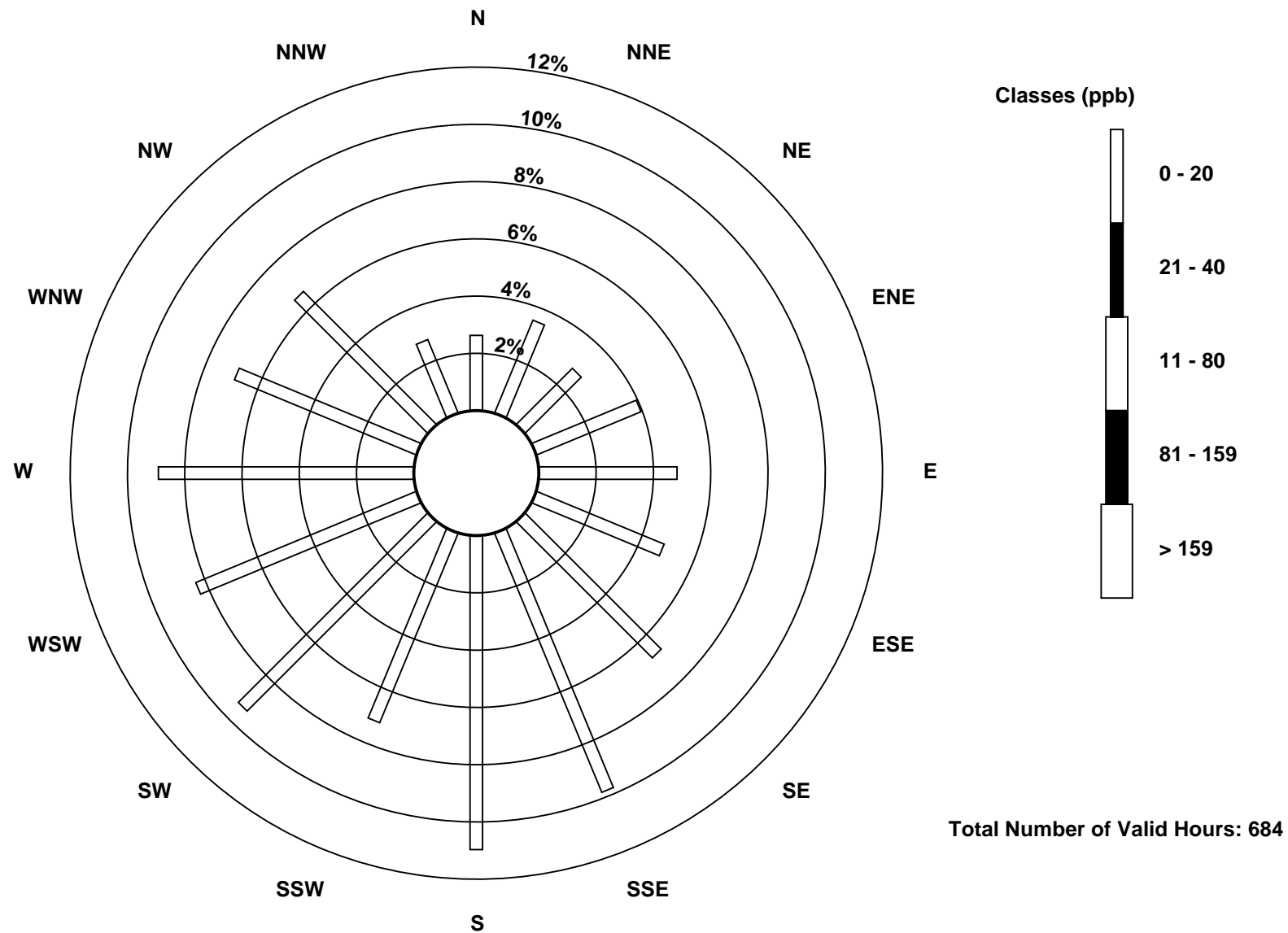
Total Number of Valid Hours: 684

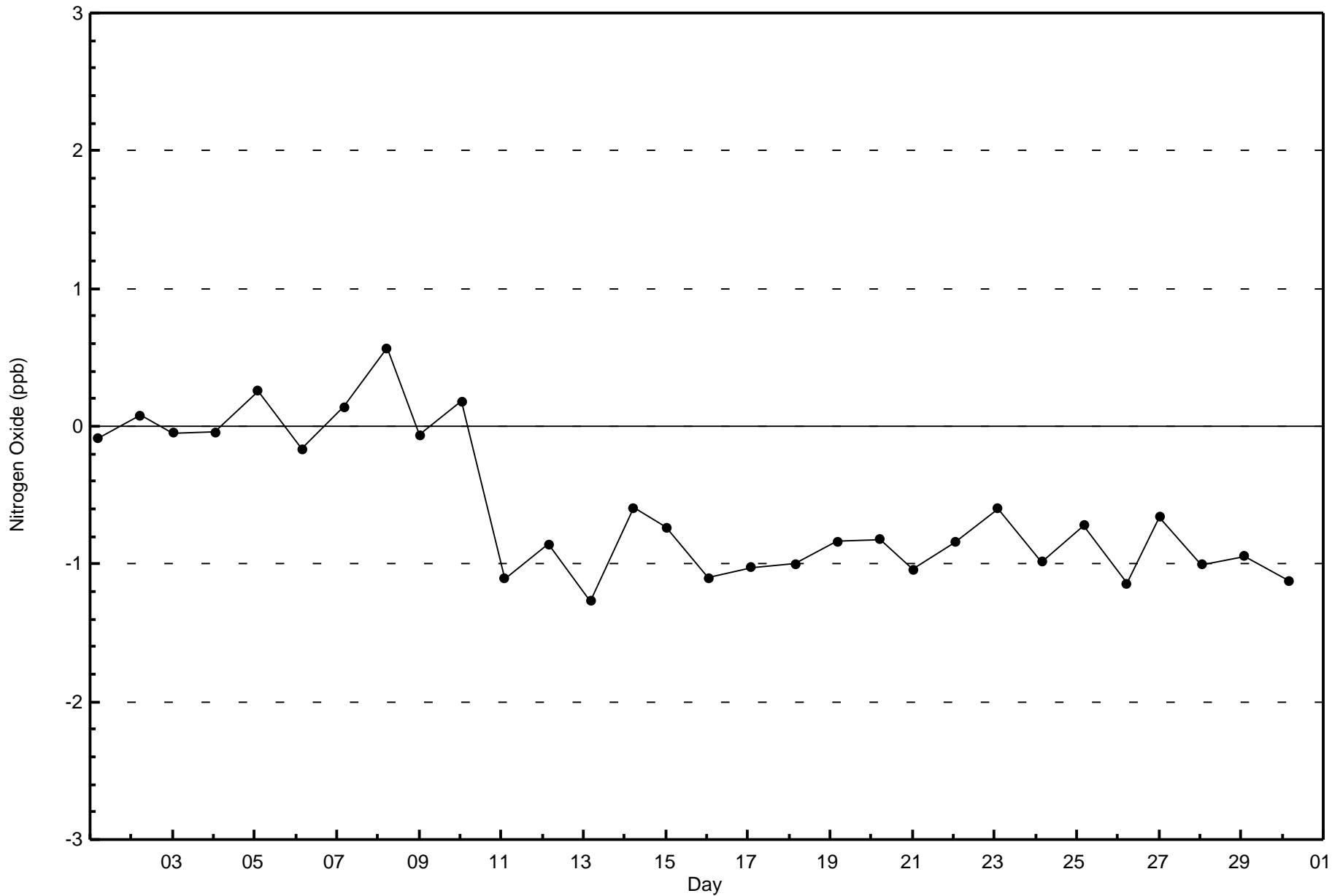
Total Number of Hours: 720

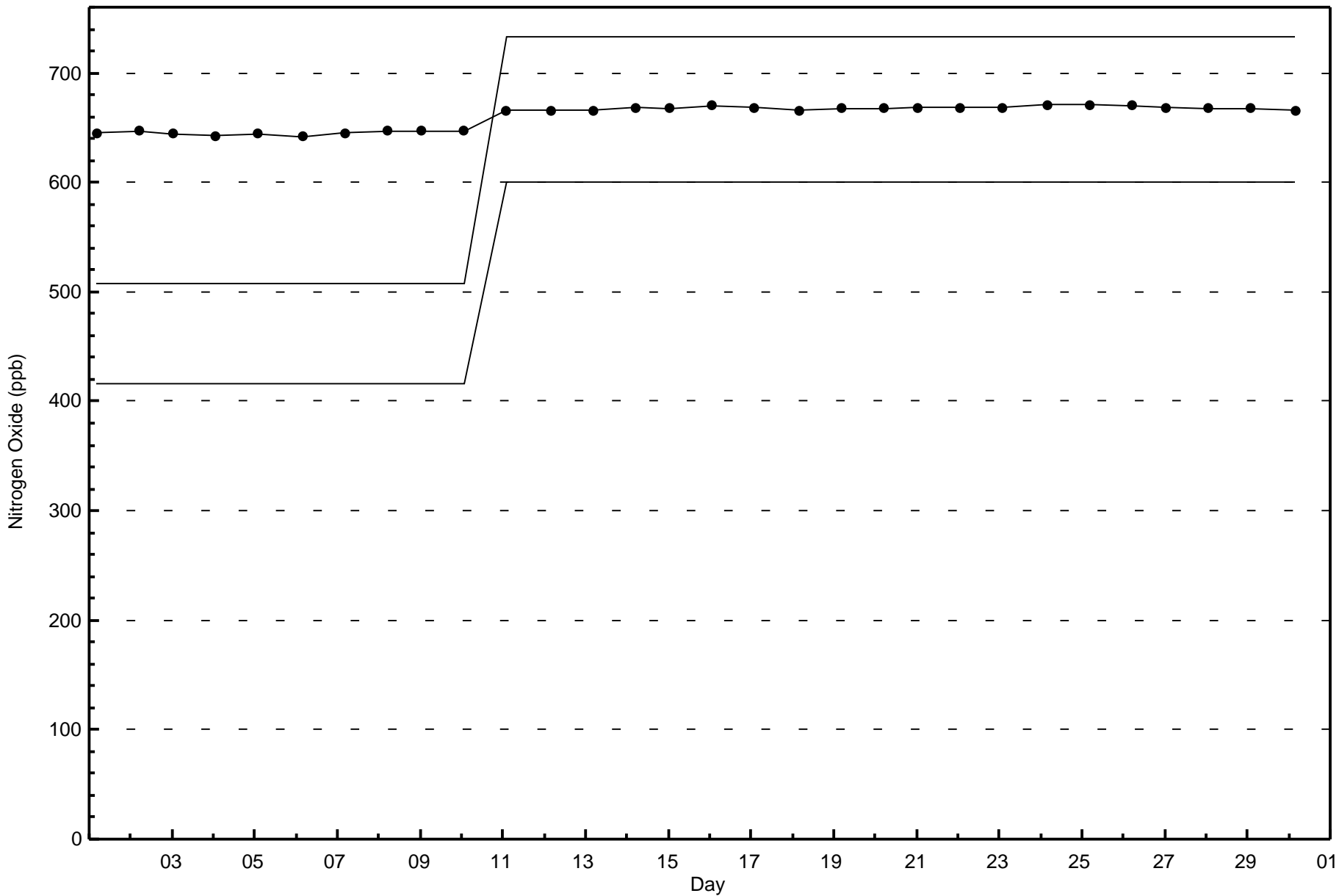


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxide (NO) - ppb
Cenovus - Christina Lake (AMS500)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

Cenovus - Christina Lake - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 14 ppb on Jun 4 20:00	Maximum Daily Average: 4.6 ppb on Jun 19		Hours of Data:	684
Minimum Value: 0 ppb on Jun 8 22:00	Minimum Daily Average: 0.2 ppb on Jun 9		Hours of Missing Data:	36
Maximum Diurnal Average: 2.5 ppb at hour 7	Minimum Diurnal Average: 1.2 ppb at hour 23		Hours of Calibration:	36
Monthly Average: 1.8 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 3 P ₉₀ = 4 P ₉₉ = 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-Jun	1	1	2	8	Z	2	2	2	1	2	1	1	1	1	1	1	2	1	1	3	1	3	4	2	1.8	8
2-Jun	2	2	3	3	2	Z	3	2	4	3	1	1	1	0	0	0	1	4	4	1	1	4	1	2	1.9	4
3-Jun	Z	1	1	0	1	1	1	1	1	1	1	1	2	1	1	1	3	6	3	4	1	1	1	1	1.3	6
4-Jun	0	Z	1	1	0	1	1	2	3	6	2	6	5	5	4	1	7	5	11	14	2	9	4	3	4.1	14
5-Jun	9	12	Z	1	0	1	6	4	8	7	4	3	4	3	4	3	2	4	4	1	0	0	1	2	3.7	12
6-Jun	4	2	1	Z	1	6	5	4	1	2	1	1	1	1	1	1	1	1	1	3	2	1	1	4	1.9	6
7-Jun	3	2	2	2	Z	4	3	2	1	1	5	8	9	8	5	4	4	8	10	3	5	4	1	1	4.0	10
8-Jun	1	4	1	1	3	Z	3	1	1	1	1	1	1	2	1	0	1	1	2	0	0	0	0	0	1.1	4
9-Jun	Z	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
10-Jun	3	Z	6	7	7	5	4	C	C	C	C	C	C	2	1	1	1	1	0	1	1	1	2	1	--	7
11-Jun	0	2	Z	2	3	5	3	3	2	1	1	1	1	1	1	1	1	1	0	2	1	1	1	2	1.4	5
12-Jun	2	3	2	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	0	1.0	3
13-Jun	0	1	1	1	Z	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1	2	0.5	2
14-Jun	1	1	4	3	2	Z	2	2	0	0	0	0	1	1	1	1	1	3	2	2	1	1	1	0	1.3	4
15-Jun	Z	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	2	1	3	1	1	1	1.2	3
16-Jun	2	Z	1	2	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1.1	3
17-Jun	1	1	Z	1	1	1	1	1	1	1	2	5	5	7	9	8	4	1	1	0	1	1	1	1	2.2	9
18-Jun	1	1	1	Z	2	2	4	4	4	4	2	1	2	3	6	3	3	1	3	1	1	1	1	3	2.2	6
19-Jun	5	3	3	4	Z	2	4	2	1	3	6	7	9	5	4	11	4	5	5	7	7	2	3	3	4.6	11
20-Jun	2	2	1	2	3	Z	3	4	3	2	3	2	3	2	4	2	2	2	1	1	1	1	2	1	2.1	4
21-Jun	Z	1	1	2	3	5	4	2	2	1	1	1	1	1	1	0	1	0	0	1	1	2	3	1.4	5	
22-Jun	2	Z	3	3	3	3	3	2	2	2	1	1	2	2	1	1	3	3	2	2	2	2	1	2	1.9	3
23-Jun	1	1	Z	1	2	2	2	1	1	1	1	1	2	1	1	1	1	1	0	0	1	0	1	1	1.2	2
24-Jun	4	2	1	Z	2	2	4	2	2	1	2	4	3	2	1	3	3	1	2	6	4	3	3	3	2.6	6
25-Jun	2	1	2	1	Z	3	3	3	1	1	1	0	0	0	0	1	0	0	0	0	0	2	1	0	0.9	3
26-Jun	1	0	0	0	0	Z	1	5	2	3	1	1	0	0	1	2	0	0	1	2	1	1	0	1	1.0	5
27-Jun	Z	1	2	2	1	4	2	3	7	5	7	8	3	2	2	5	5	2	3	0	1	0	0	0	2.8	8
28-Jun	0	Z	1	1	3	5	5	3	2	4	2	1	1	2	2	1	3	0	0	0	0	0	0	0	1.5	5
29-Jun	1	1	Z	1	2	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0.6	3
30-Jun	0	1	1	Z	1	2	1	3	2	1	2	1	0	0	1	1	1	0	1	1	1	6	1	2	1.2	6

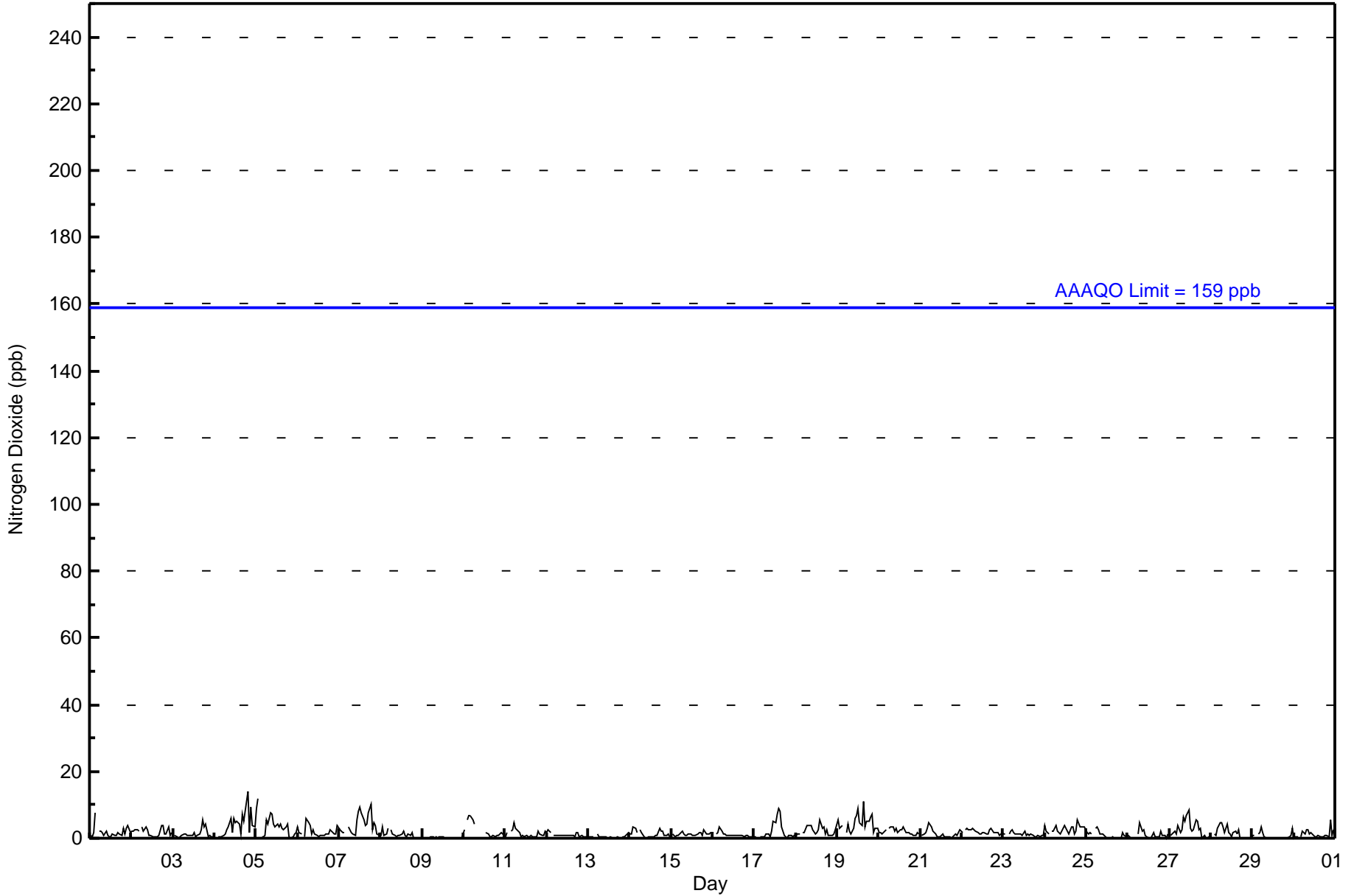
1.8	1.8	1.5	1.9	1.8	2.5	2.5	2.1	1.9	1.9	1.8	2.0	2.0	1.8	1.9	1.9	1.8	1.8	2.0	1.9	1.2	1.6	1.2	1.5	Diurnal Average	
9	12	6	8	7	6	6	5	8	7	7	8	9	8	9	11	7	8	11	14	7	9	4	4	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	684	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	18	24	19	27	33	33	46	67	75	49	64	57	61	47	45	19	684
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
Totals	18	24	19	27	33	33	46	67	75	49	64	57	61	47	45	19	684

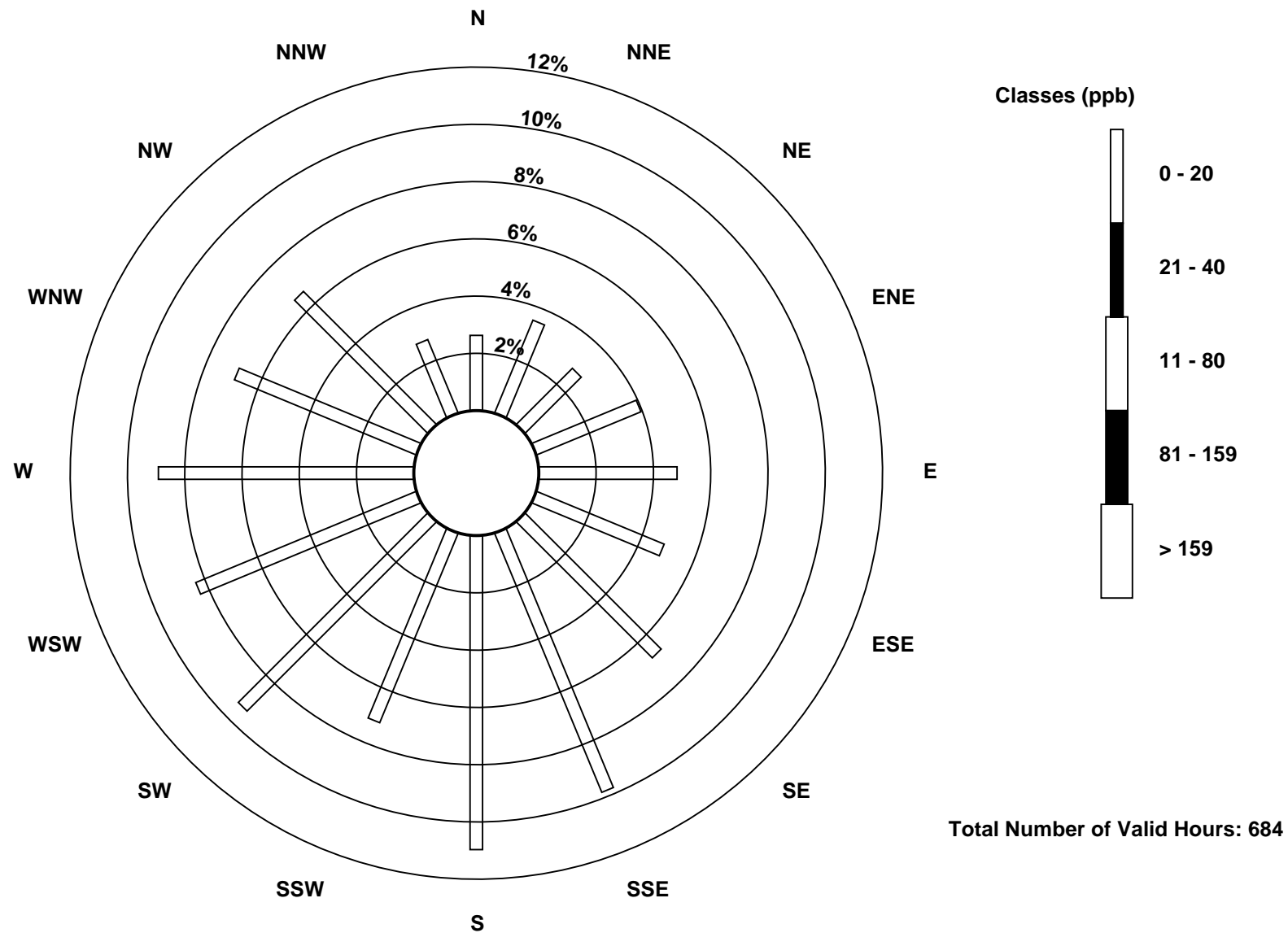
Total Number of Valid Hours: 684

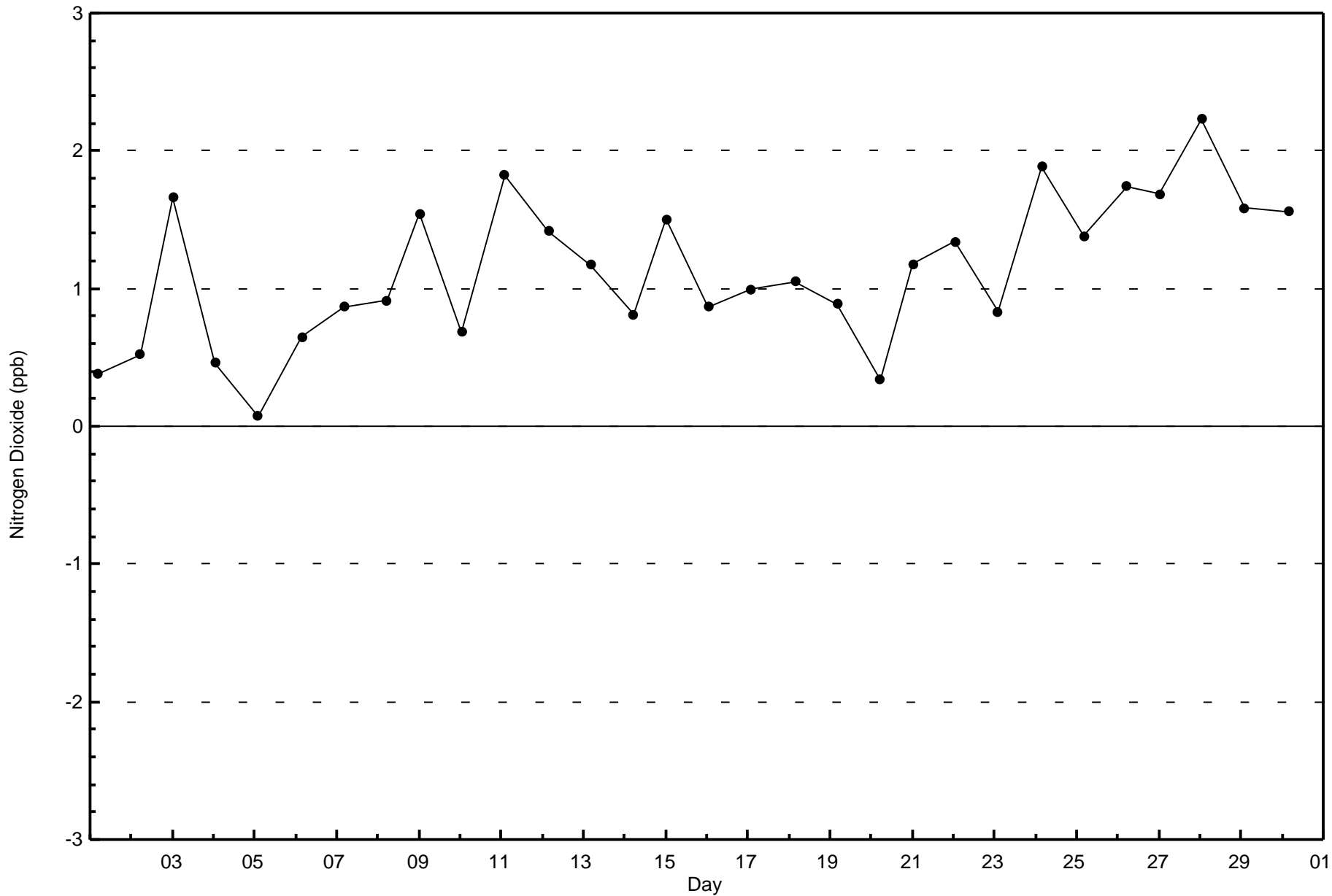
Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake (AMS500)

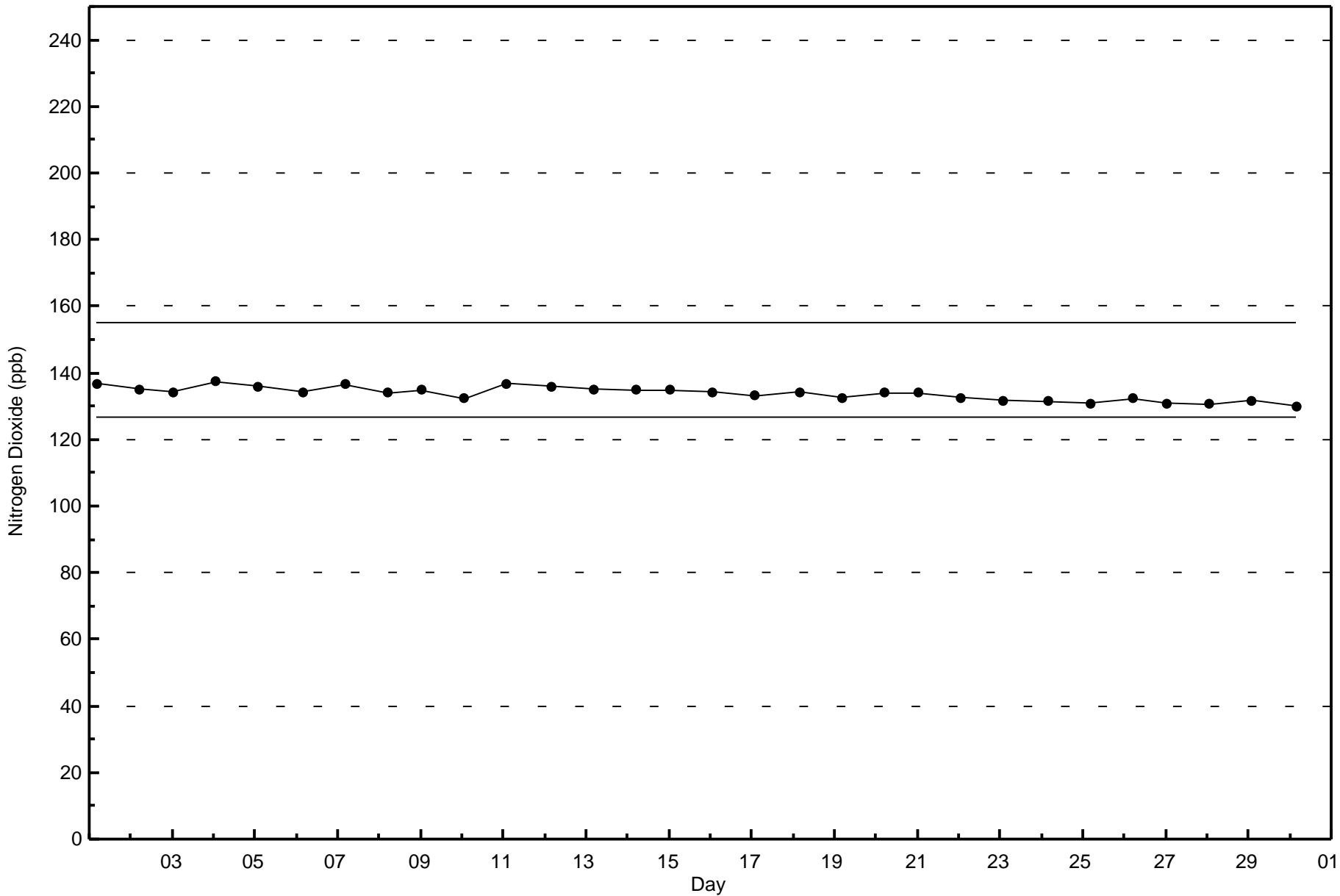






Wood Buffalo Environmental Association
Span Responses

Nitrogen Dioxide (NO₂) - ppb
Cenovus - Christina Lake - June 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

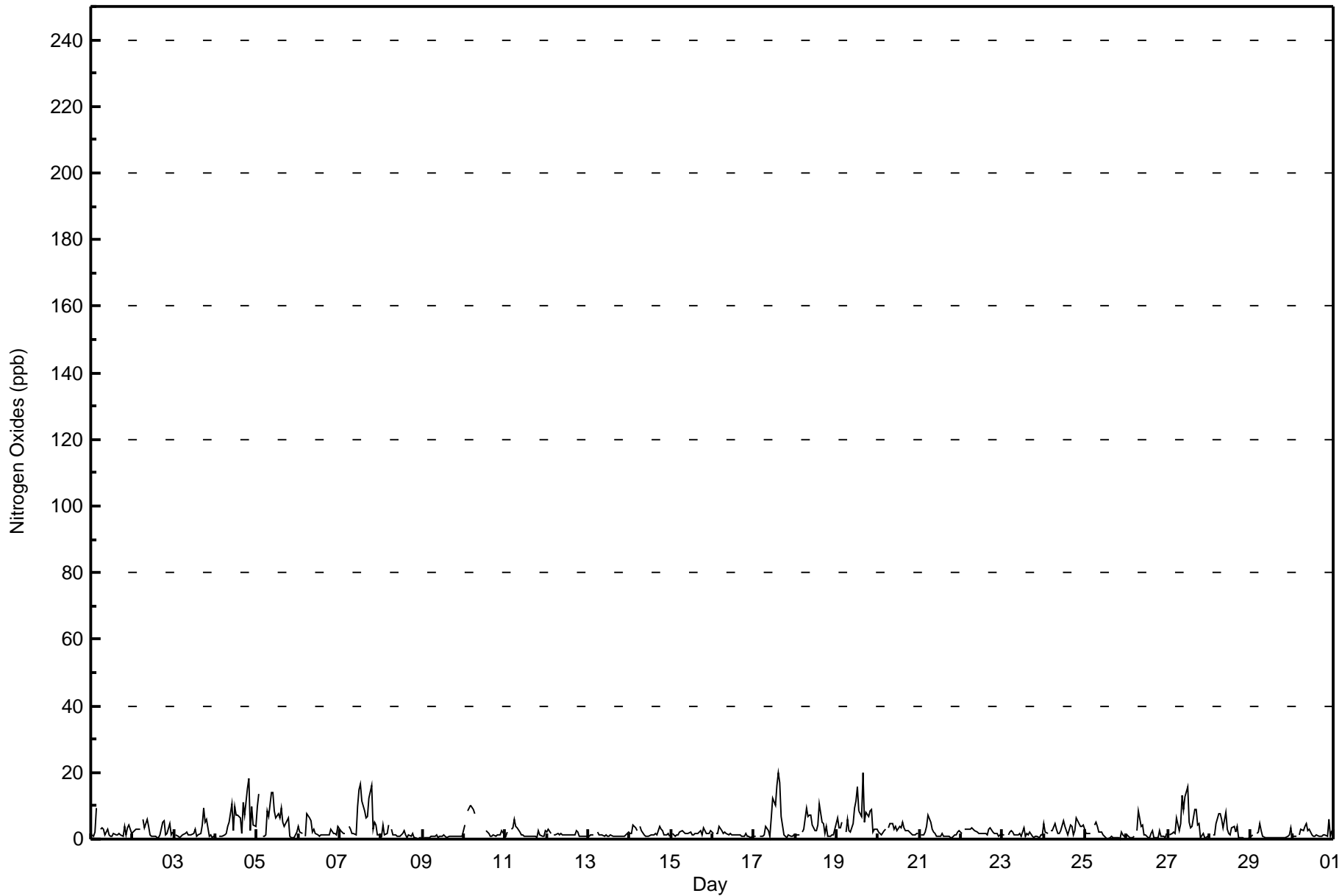
Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake - June 2016

Maximum Value: 20 ppb on Jun 17 15:00		Maximum Daily Average: 6.6 ppb on Jun 19		Hours in Service: 720																						
Minimum Value: 0 ppb on Jun 28 22:00		Minimum Daily Average: 0.7 ppb on Jun 9		Hours of Data: 684																						
Maximum Diurnal Average: 3.8 ppb at hour 7		Minimum Diurnal Average: 1.5 ppb at hour 23		Hours of Missing Data: 36																						
Monthly Average: 2.7 ppb		Percentiles: P ₁ = 0 P ₁₀ = 1 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 6 P ₉₉ = 16		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-Jun	1	1	2	9	Z	3	3	3	1	3	1	1	1	2	1	1	2	1	1	4	1	3	4	2	2.3	9
2-Jun	2	2	3	3	3	Z	6	3	6	4	1	1	1	1	0	1	1	5	5	1	2	5	1	2	2.5	6
3-Jun	Z	1	1	0	1	1	2	2	1	1	1	2	3	1	1	2	4	9	5	6	1	1	1	1	2.1	9
4-Jun	1	Z	1	1	1	1	2	4	5	11	2	10	7	7	6	2	11	7	15	18	2	10	4	4	5.8	18
5-Jun	10	14	Z	1	1	1	9	7	14	14	9	6	8	6	9	5	4	5	6	1	1	1	1	2	5.9	14
6-Jun	4	2	2	Z	1	8	6	5	2	3	2	1	1	1	1	1	1	1	1	3	2	1	1	4	2.4	8
7-Jun	3	2	2	2	Z	4	3	2	2	1	10	15	16	12	8	6	7	12	16	3	5	4	1	1	5.9	16
8-Jun	1	4	1	2	4	Z	3	1	1	1	1	1	2	2	1	1	1	1	2	1	0	0	0	0	1.4	4
9-Jun	Z	0	1	0	0	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0.7	1
10-Jun	4	Z	8	9	10	9	7	C	C	C	C	C	C	2	2	1	1	1	1	1	1	1	3	1	--	10
11-Jun	1	2	Z	3	3	6	4	3	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1.8	6
12-Jun	2	3	2	Z	1	1	2	1	2	1	1	1	1	1	1	1	1	3	2	1	1	1	1	1	1.4	3
13-Jun	1	1	1	1	Z	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1.1	2
14-Jun	2	2	4	3	3	Z	4	2	1	1	1	1	1	1	1	2	1	4	3	2	1	1	2	1	1.9	4
15-Jun	Z	2	1	1	1	2	3	2	2	2	2	2	1	1	2	2	2	2	1	3	2	2	2	2	1.8	3
16-Jun	2	Z	2	2	4	3	2	2	2	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1.5	4
17-Jun	1	1	Z	1	1	1	1	4	3	1	6	12	10	16	20	17	7	1	1	1	1	1	1	1	4.7	20
18-Jun	1	1	1	Z	2	3	9	7	7	7	4	2	3	4	11	5	5	2	4	1	1	1	1	3	3.7	11
19-Jun	6	3	4	5	Z	2	6	3	2	5	9	12	16	8	7	20	5	8	7	8	9	2	3	3	6.6	20
20-Jun	2	2	1	2	3	Z	4	5	5	3	4	2	4	4	5	3	2	2	2	2	1	1	2	2	2.7	5
21-Jun	Z	1	1	2	4	7	5	3	2	2	1	1	1	2	1	1	1	1	0	0	1	1	2	3	1.9	7
22-Jun	2	Z	3	3	3	3	3	3	3	2	2	2	2	2	2	1	3	3	2	2	2	2	1	1	2.1	3
23-Jun	1	1	Z	1	2	3	2	1	1	1	2	1	3	1	2	1	2	1	0	1	1	1	1	1	1.4	3
24-Jun	4	2	1	Z	3	2	5	3	2	2	3	5	4	3	1	4	4	1	3	6	5	4	4	4	3.3	6
25-Jun	2	2	2	1	Z	4	5	4	2	2	1	1	0	0	0	1	0	0	0	0	0	2	1	1	1.5	5
26-Jun	1	1	0	0	1	Z	3	8	4	4	1	1	0	0	2	3	1	0	1	3	1	1	0	2	1.7	8
27-Jun	Z	1	2	2	2	6	2	5	13	9	13	16	5	3	4	9	9	4	5	0	2	1	0	1	4.9	16
28-Jun	1	Z	1	1	5	8	8	6	3	8	3	2	1	3	4	2	4	0	0	0	0	0	0	0	2.7	8
29-Jun	1	1	Z	2	2	5	3	1	0	0	0	0	1	0	1	0	0	0	0	0	0	1	1	3	1.1	5
30-Jun	1	1	1	Z	1	3	3	4	5	3	3	1	1	1	1	1	1	1	1	1	1	6	1	3	1.9	6
																								Diurnal Average		
																								Diurnal Maximum		
																								Z - zerospan C - Calibration		



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	684	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: 684

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake - June 2016**

Concentration Ranges (ppb)	Wind Direction																Totals
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
0 - 20	18	24	19	27	33	33	46	67	75	49	64	57	61	47	45	19	684
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
Totals	18	24	19	27	33	33	46	67	75	49	64	57	61	47	45	19	684

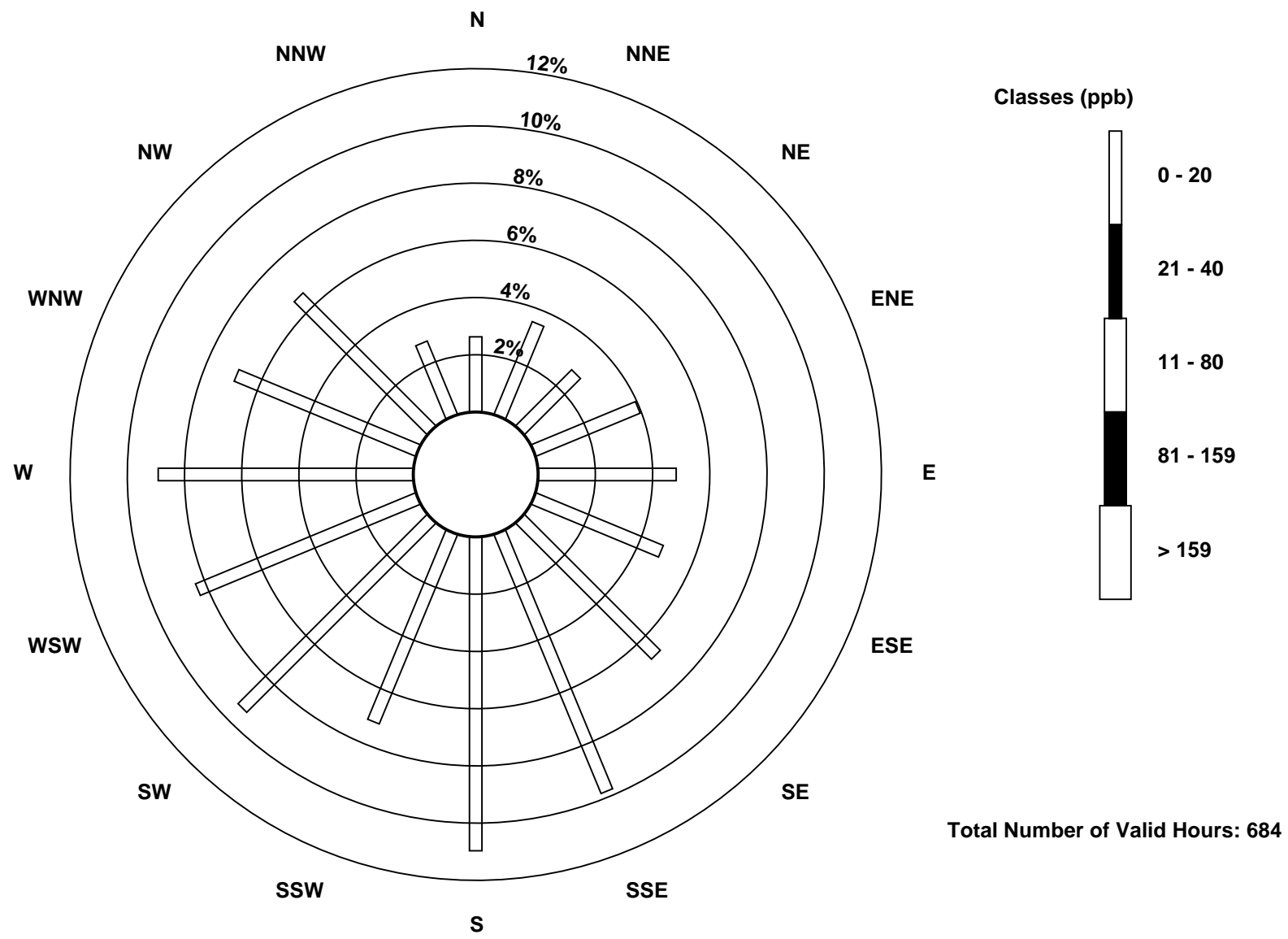
Total Number of Valid Hours: 684

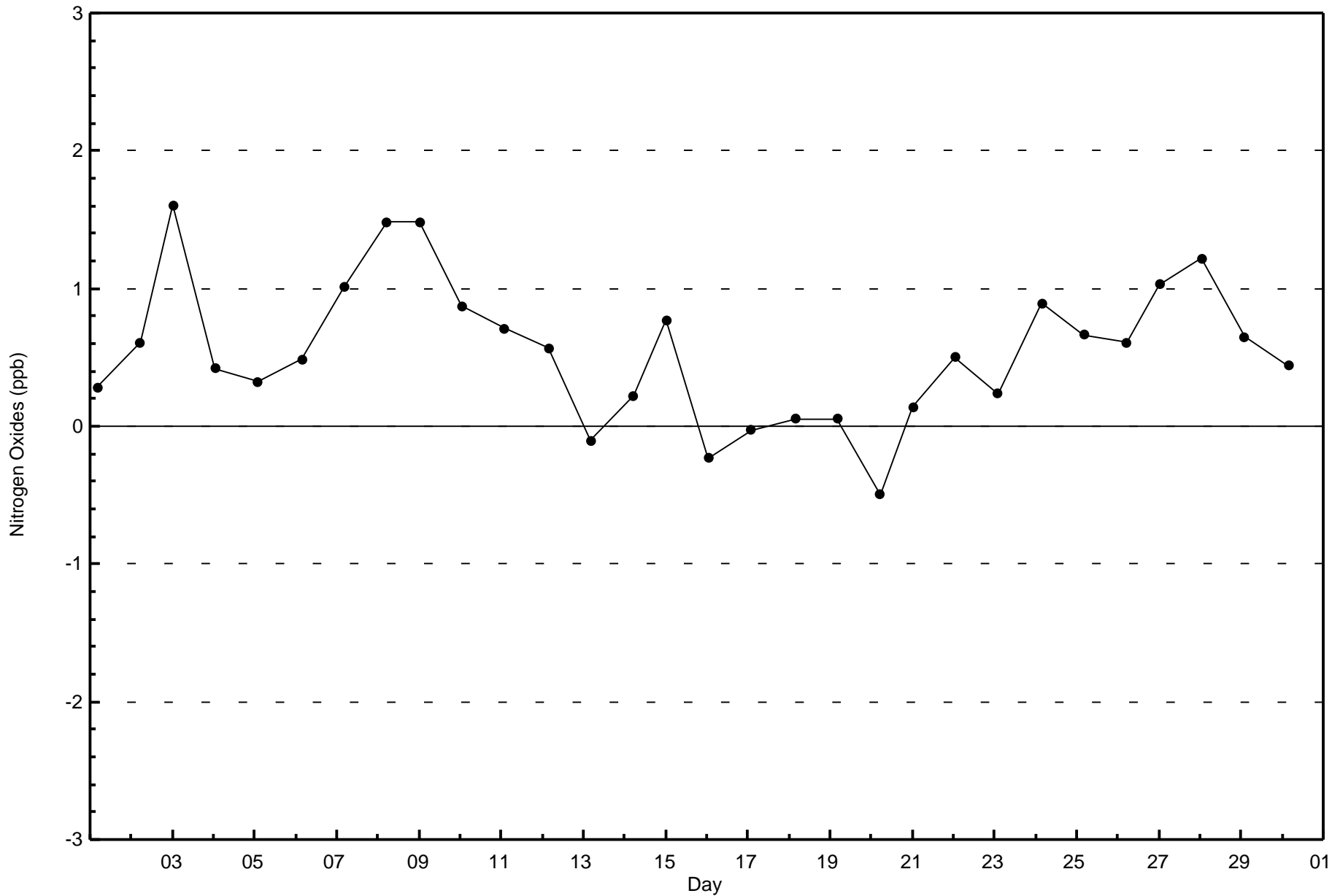
Total Number of Hours: 720

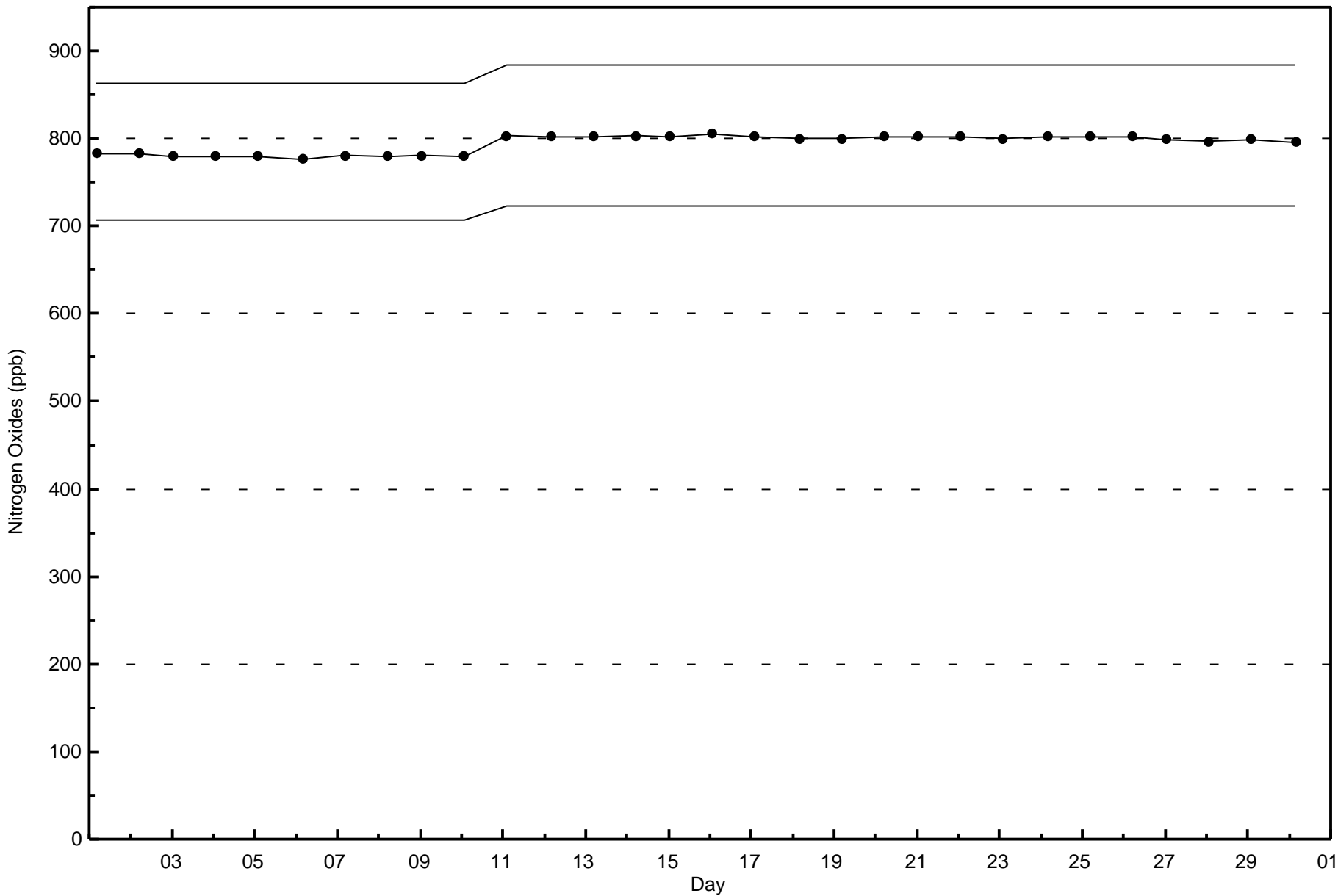


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxides (NO_x) - ppb
Cenovus - Christina Lake (AMS500)









Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature (AT) - C

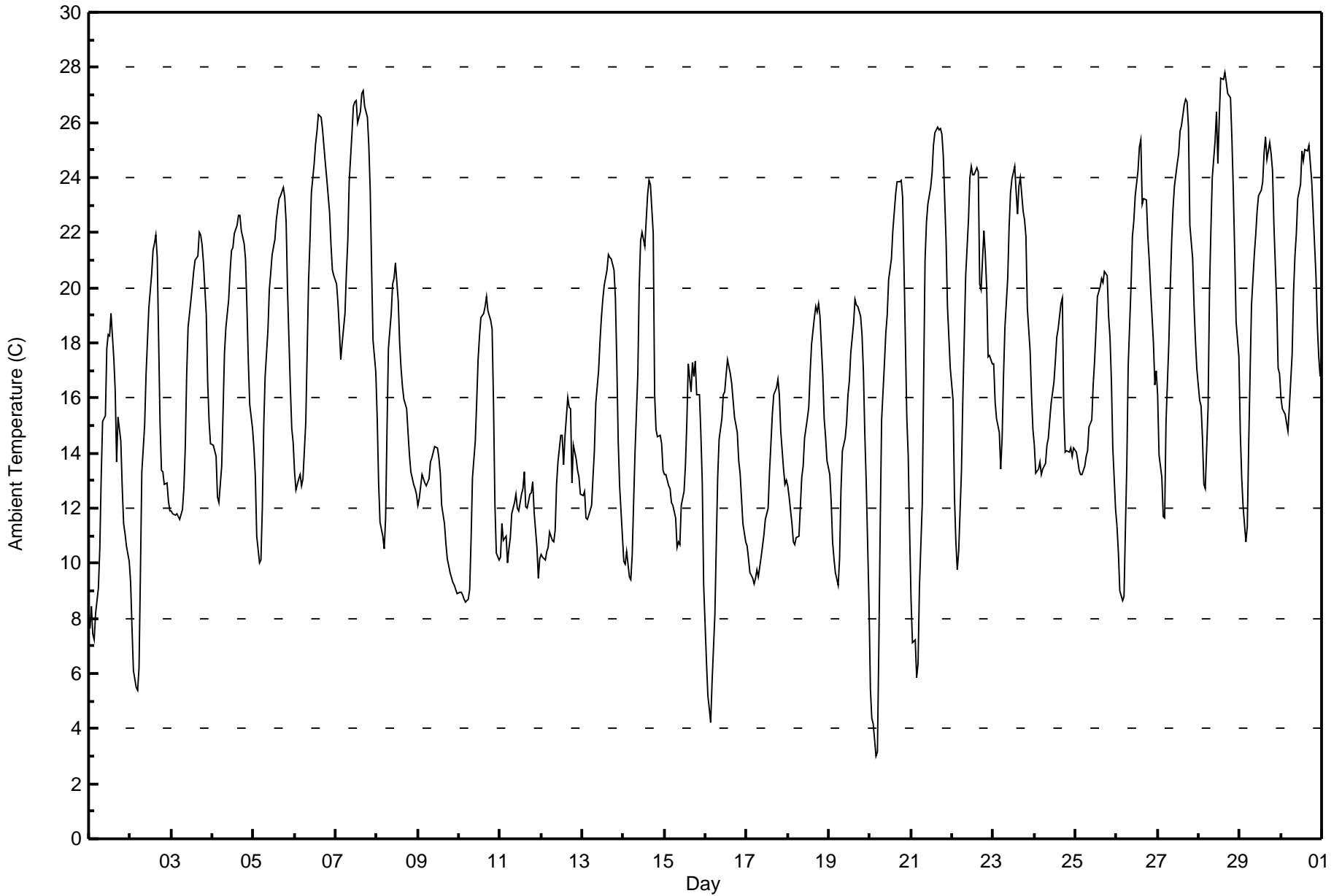
Cenovus - Christina Lake - June 2016

Maximum Value: 27.8 C on Jun 28 16:00		Maximum Daily Average: 22.8 C on Jun 7		Hours in Service: 720																																												
Minimum Value: 3.0 C on Jun 20 04:00		Minimum Daily Average: 11.6 C on Jun 11		Hours of Data: 720																																												
Maximum Diurnal Average: 21.0 C at hour 16		Minimum Diurnal Average: 10.6 C at hour 5		Hours of Missing Data: 0																																												
Monthly Average: 16.43 C		Percentiles: P ₁ = 5.4 P ₁₀ = 10.2 Q ₁ = 12.5 Median = 15.7 Q ₃ = 20.6 P ₉₀ = 23.9 P ₉₉ = 27.0		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-Jun	7.6	8.4	7.4	7.2	8.2	9.1	10.5	13.1	15.1	15.4	17.8	18.3	18.3	19.1	17.4	16.3	13.7	15.3	14.5	12.8	11.4	11.1	10.6	10.1	12.9	19.1																						
2-Jun	9.3	7.6	6.1	5.5	5.4	6.2	9.7	13.3	15.0	16.8	18.0	19.3	20.5	21.3	21.6	21.9	21.1	15.1	13.4	13.3	12.8	12.9	12.2	11.9	13.8	21.9																						
3-Jun	11.9	11.8	11.8	11.8	11.7	11.6	11.9	12.7	14.2	16.8	18.5	19.5	20.0	20.6	21.0	21.2	22.0	21.9	21.6	20.9	19.0	16.6	15.2	14.4	16.6	22.0																						
4-Jun	14.3	14.1	13.9	12.4	12.2	13.6	15.6	17.6	18.6	19.6	20.6	21.4	21.5	22.0	22.3	22.6	22.6	22.1	21.6	21.0	19.3	17.3	15.8	14.9	18.2	22.6																						
5-Jun	14.2	13.2	11.0	10.0	10.1	12.0	15.0	16.8	18.5	19.9	20.5	21.2	21.7	22.5	22.9	23.2	23.4	23.7	23.3	22.4	19.9	16.4	14.9	14.4	18.0	23.7																						
6-Jun	13.3	12.6	13.1	13.2	12.8	13.1	15.1	17.6	20.2	21.7	23.4	24.5	25.2	25.7	26.3	26.2	25.7	25.1	24.5	23.9	22.7	21.6	20.7	20.4	20.4	26.3																						
7-Jun	20.2	19.4	18.5	17.4	18.0	19.1	20.5	21.7	23.9	25.6	26.6	26.7	26.8	26.0	26.4	27.0	27.1	26.6	26.2	25.2	23.6	20.7	18.1	16.9	22.8	27.1																						
8-Jun	15.3	12.9	11.5	11.0	10.5	11.6	14.9	17.8	19.1	20.1	20.4	20.9	19.5	18.0	17.1	16.4	16.0	15.6	14.8	14.0	13.3	12.9	12.7	12.5	15.4	20.9																						
9-Jun	12.1	12.3	13.2	13.1	12.9	12.8	13.1	13.7	13.8	14.0	14.2	14.2	13.8	13.3	12.1	11.5	10.7	10.2	9.9	9.7	9.3	9.2	9.1	8.9	12.0	14.2																						
10-Jun	9.0	8.9	8.8	8.7	8.6	8.7	9.1	10.9	13.1	14.5	15.9	17.4	18.2	18.9	19.1	19.3	19.7	19.2	18.8	18.5	15.8	12.1	10.4	10.1	13.9	19.7																						
11-Jun	10.2	11.5	10.8	11.0	10.0	10.6	10.9	11.8	12.2	12.5	12.0	11.9	12.5	12.7	13.3	12.0	12.0	12.5	12.6	13.0	11.9	10.6	9.4	10.2	11.6	13.3																						
12-Jun	10.3	10.2	10.1	10.4	10.6	11.1	10.8	10.8	11.2	12.8	13.7	14.6	14.7	13.6	14.6	16.0	15.6	15.6	12.9	14.3	13.8	13.4	13.1	12.5	12.8	16.0																						
13-Jun	12.5	12.6	11.6	11.6	11.7	12.1	13.1	14.1	15.8	17.0	18.0	18.9	19.6	20.1	20.6	21.2	21.1	21.0	20.6	19.6	17.3	14.4	12.8	11.0	16.2	21.2																						
14-Jun	10.1	10.0	10.4	9.5	9.4	10.3	12.2	14.0	16.9	20.1	21.7	22.0	21.5	22.5	23.4	23.9	23.7	22.0	16.1	14.9	14.6	14.6	14.4	13.4	16.3	23.9																						
15-Jun	13.2	13.2	12.8	12.7	12.2	12.1	11.7	10.6	10.8	10.7	12.1	12.6	13.6	15.1	17.2	16.2	17.3	16.8	17.3	16.1	16.1	14.7	12.9	9.2	13.6	17.3																						
16-Jun	6.4	5.2	4.7	4.2	5.7	8.1	10.7	13.1	14.5	15.2	16.1	16.2	16.9	17.4	16.9	16.5	15.9	15.3	14.7	13.8	13.3	12.4	11.4	10.8	12.3	17.4																						
17-Jun	10.6	10.2	9.7	9.4	9.2	9.5	9.8	9.5	10.2	10.6	11.0	11.6	12.0	13.3	14.4	15.4	16.1	16.4	16.7	16.1	14.8	13.4	12.9	13.0	12.3	16.7																						
18-Jun	12.8	12.4	11.4	10.8	10.7	10.9	11.0	12.1	13.1	13.5	14.5	15.2	15.7	16.9	17.9	18.9	19.3	19.1	19.4	19.0	16.8	15.3	14.6	13.7	14.8	19.4																						
19-Jun	13.2	12.3	10.8	10.2	9.6	9.2	10.2	12.7	14.1	14.6	15.1	16.1	16.6	17.6	18.7	19.6	19.3	19.3	19.0	18.3	17.0	14.7	13.0	8.5	14.6	19.6																						
20-Jun	5.4	4.4	4.2	3.0	3.1	6.9	11.4	15.2	17.2	18.3	19.0	20.3	21.1	22.1	22.7	23.4	23.8	23.9	23.9	23.3	20.7	15.2	13.9	11.1	15.6	23.9																						
21-Jun	8.7	7.1	7.2	5.9	6.4	9.1	12.1	16.6	21.0	22.4	23.1	23.7	24.2	25.2	25.6	25.9	25.7	25.8	25.6	24.8	21.7	19.3	18.2	17.1	18.4	25.9																						
22-Jun	15.9	12.4	10.8	9.8	10.4	13.4	16.1	18.2	20.4	22.5	24.0	24.4	24.1	24.1	24.4	24.2	20.1	19.9	22.1	21.2	20.0	17.5	17.5	17.3	18.8	24.4																						
23-Jun	17.2	15.8	15.2	14.8	13.4	14.5	16.8	18.6	20.3	22.2	23.4	23.9	24.4	23.5	22.7	23.7	24.0	22.8	22.5	21.9	19.3	17.7	16.1	14.8	19.6	24.4																						
24-Jun	14.3	13.3	13.4	13.7	13.2	13.4	13.7	14.3	14.6	15.2	15.8	16.6	17.3	18.2	18.5	19.4	19.6	15.7	14.1	14.1	14.0	14.2	13.9	14.2	15.2	19.6																						
25-Jun	14.0	13.8	13.4	13.2	13.2	13.5	13.9	14.1	14.9	15.2	16.5	17.3	18.4	19.7	20.0	20.4	20.2	20.6	20.5	19.0	18.2	16.6	14.2	11.9	16.4	20.6																						
26-Jun	11.3	10.4	9.0	8.7	8.8	11.3	13.6	17.2	20.0	21.9	22.4	23.4	24.3	25.1	25.4	23.0	23.2	23.2	21.8	21.0	19.9	18.0	16.5	17.0	18.2	25.4																						
27-Jun	16.1	13.9	13.1	11.7	11.6	15.2	18.0	20.0	21.6	22.9	23.7	24.5	24.9	25.7	25.9	26.6	26.8	26.8	25.8	22.3	21.1	19.3	18.0	17.0	20.5	26.8																						
28-Jun	15.9	15.7	14.5	12.9	12.7	15.7	19.8	22.0	24.0	25.3	26.4	24.5	26.2	27.6	27.6	27.8	27.5	27.1	26.9	25.4	23.6	21.3	18.8	17.5	21.9	27.8																						
29-Jun	14.7	13.1	12.0	10.8	11.4	14.4	17.0	19.4	21.2	21.9	22.8	23.4	23.6	23.9	24.9	25.5	24.6	25.3	24.9	24.2	22.3	19.4	17.1	16.9	19.8	25.5																						
30-Jun	16.0	15.6	15.4	15.1	14.8	15.6	17.6	19.8	21.1	22.0	23.2	23.7	25.0	24.6	25.0	25.0	25.2	24.5	23.8	22.8	20.5	18.6	17.5	16.8	20.4	25.2																						
																								12.5	11.8	11.2	10.7	10.6	11.8	13.5	15.3	16.9	18.0	19.0	19.6	20.1	20.5	20.9	21.0	20.8	20.3	19.7	18.9	17.5	15.7	14.5	13.6	Diurnal Average
																								20.2	19.4	18.5	17.4	18.0	19.1	20.5	22.0	24.0	25.6	26.6	26.7	26.8	27.6	27.6	27.8	27.5	27.1	26.9	25.4	23.6	21.6	20.7	20.4	Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
Cenovus - Christina Lake - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
Cenovus - Christina Lake - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	62	8.61	8.61
10 - 20	456	63.33	71.94
> 20	202	28.06	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



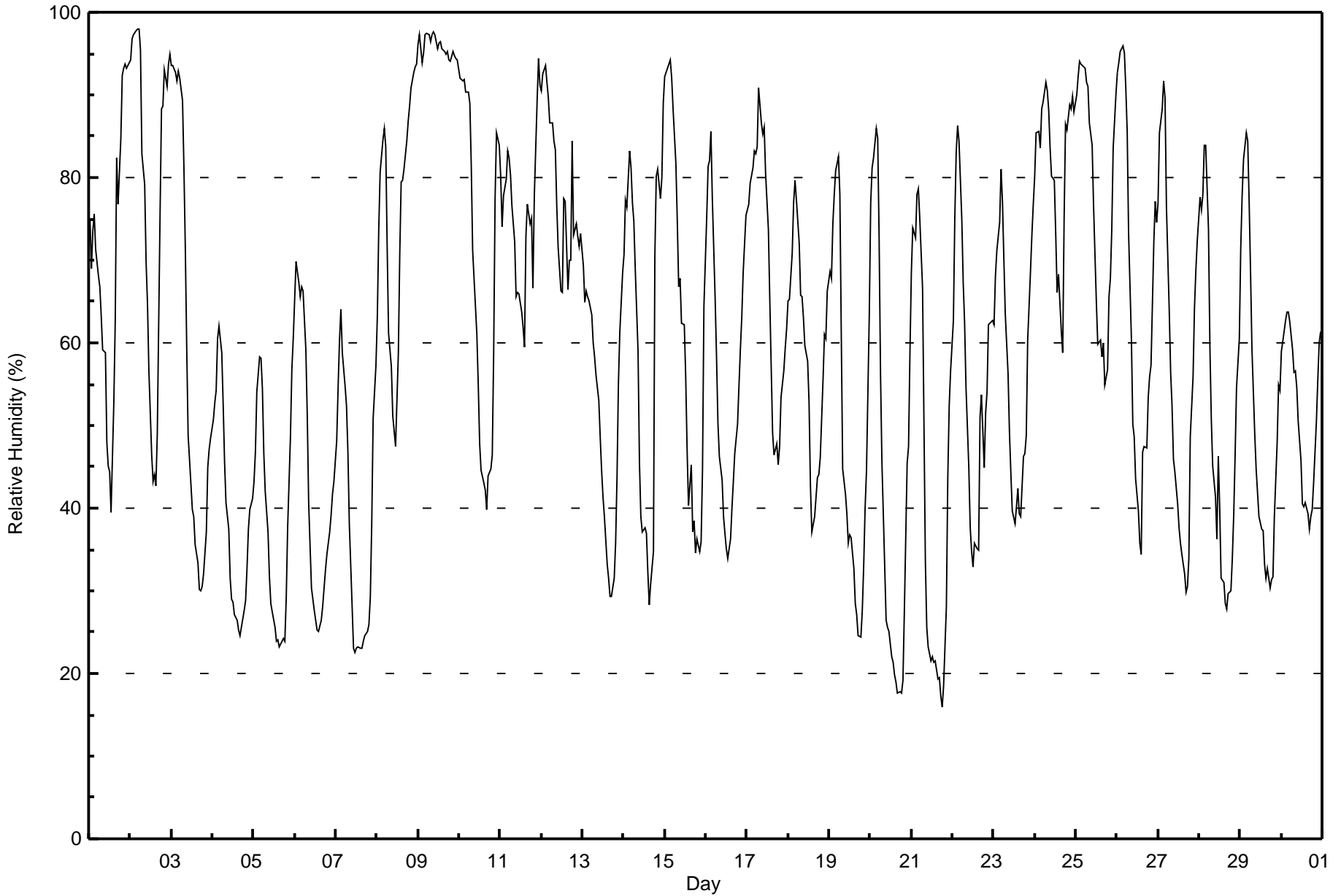
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

Cenovus - Christina Lake - June 2016

Maximum Value: 98 % on Jun 2 05:00																			Maximum Daily Average: 95.8 % on Jun 9						Hours in Service: 720	
Minimum Value: 16 % on Jun 21 19:00																			Minimum Daily Average: 38.3 % on Jun 7						Hours of Data: 720	
Maximum Diurnal Average: 81.5 % at hour 4																			Minimum Diurnal Average: 42.2 % at hour 16						Hours of Missing Data: 0	
Monthly Average: 59.9 %																			Percentiles: P ₁ = 19 P ₁₀ = 30 Q ₁ = 40 Median = 60 Q ₃ = 78 P ₉₀ = 91 P ₉₉ = 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-Jun	75	69	73	76	71	68	67	63	59	59	48	45	44	39	53	63	82	77	85	92	93	94	93	94	70.1	94
2-Jun	94	97	97	98	98	98	95	83	79	70	65	57	46	43	44	43	49	76	88	89	93	91	94	95	78.4	98
3-Jun	94	94	93	92	93	92	89	81	71	59	49	43	40	39	36	33	30	30	30	32	37	45	47	48	58.2	94
4-Jun	51	53	54	60	62	59	53	46	41	37	31	29	29	27	26	25	26	28	28	29	33	37	40	41	39.2	62
5-Jun	43	47	54	58	58	54	47	42	37	32	28	27	26	24	24	23	23	24	24	29	38	49	57	60	38.7	60
6-Jun	65	70	67	66	67	66	59	51	41	35	30	28	26	25	25	26	28	30	33	34	37	39	42	43	43.1	70
7-Jun	48	55	60	64	59	55	52	47	38	28	23	23	23	23	23	23	24	25	25	26	29	38	51	57	38.3	64
8-Jun	63	74	81	85	86	84	72	61	57	51	49	47	59	71	79	80	81	84	87	89	91	93	93	94	75.4	94
9-Jun	96	97	94	95	97	97	97	96	97	98	97	96	96	96	96	95	95	95	94	94	95	95	94	94	95.8	98
10-Jun	92	92	92	92	90	90	89	82	71	64	61	55	48	44	43	42	40	44	45	46	59	77	85	84	67.8	92
11-Jun	80	74	78	80	83	82	80	77	72	66	66	66	64	62	59	73	77	74	75	67	78	89	94	91	75.3	94
12-Jun	90	93	94	92	90	87	87	84	83	77	72	66	66	77	77	66	70	70	84	73	74	73	72	73	78.8	94
13-Jun	69	65	66	66	65	63	60	58	56	53	49	45	41	39	33	32	29	29	32	36	44	55	61	69	50.6	69
14-Jun	71	77	76	83	81	77	75	69	59	46	39	37	38	37	32	28	31	35	70	80	81	78	80	89	61.2	89
15-Jun	92	93	94	94	92	88	82	75	67	68	62	62	56	47	40	45	37	38	35	36	35	36	45	64	61.8	94
16-Jun	75	81	82	86	77	65	58	50	46	43	39	37	35	34	36	40	43	47	50	55	59	63	69	75	56.1	86
17-Jun	76	77	79	81	83	83	84	91	87	85	86	81	74	65	57	49	46	48	45	47	53	57	59	62	69.0	91
18-Jun	65	65	71	77	80	77	72	66	66	63	60	58	53	43	37	39	41	44	44	46	56	61	60	66	58.7	80
19-Jun	69	68	74	78	81	83	78	61	45	42	39	36	37	36	33	28	27	25	24	28	33	40	45	63	48.9	83
20-Jun	77	81	82	86	85	73	56	46	33	27	26	25	22	21	20	19	18	18	18	19	27	45	47	59	42.9	86
21-Jun	68	74	73	78	79	75	67	50	34	26	23	22	22	21	21	19	20	17	16	18	28	44	52	57	41.8	79
22-Jun	63	75	83	86	84	75	67	62	55	45	38	35	33	36	35	35	51	54	45	51	54	62	62	63	56.2	86
23-Jun	62	68	71	75	81	77	70	64	56	49	44	40	38	40	42	39	39	46	47	49	60	69	73	77	57.4	81
24-Jun	80	86	86	84	88	89	92	90	88	84	80	80	73	66	68	61	59	75	86	86	89	88	90	88	81.5	92
25-Jun	90	92	94	94	94	93	91	91	87	84	77	71	65	60	60	58	60	55	57	66	68	74	83	90	77.2	94
26-Jun	93	94	95	96	95	91	86	73	61	50	49	44	40	36	34	47	47	47	53	56	57	72	77	75	65.3	96
27-Jun	77	85	88	92	90	76	64	56	52	46	44	40	38	36	34	32	30	30	34	49	56	64	69	72	56.5	92
28-Jun	78	76	78	84	84	74	60	51	45	41	36	46	40	32	31	28	28	30	30	34	39	46	55	61	50.2	84
29-Jun	71	78	82	85	84	77	69	59	49	45	42	39	37	37	33	31	33	30	31	32	39	48	55	54	51.8	85
30-Jun	59	60	63	64	64	63	59	56	57	55	51	46	41	40	41	39	37	39	40	43	50	56	60	61	51.8	64
	74.2	76.9	79.2	81.5	81.4	77.7	72.5	66.1	59.6	54.2	50.1	47.4	45.0	43.3	42.5	42.2	43.4	45.4	48.5	51.0	56.2	62.6	66.8	70.7	Diurnal Average	
	96	97	97	98	98	98	97	96	97	98	97	96	96	96	96	95	95	95	94	94	95	95	94	95	Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
Cenovus - Christina Lake - June 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	11	1.53	1.53
20 - 40	163	22.64	24.17
40 - 60	185	25.69	49.86
60 - 80	189	26.25	76.11
80 - 100	172	23.89	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Maximum Speed: 31 km/h on Jun 15 11:00	Maximum Daily Speed Average: 16.6 km/h on Jun 15	Hours in Service: 720
Minimum Speed Value: 1 km/h on Jun 1 17:00	Minimum Daily Speed Average: 1.8 km/h on Jun 2	Hours of Data: 720
Maximum Diurnal Speed Average: 5.4 km/h at hour 13	Minimum Diurnal Speed Average: 1.3 km/h at hour 20	Hours of Missing Data: 0
Monthly Average Velocity: 3.2 km/h 233.1 deg	Percentiles: P ₁ = 1 P ₁₀ = 4 Q ₁ = 7 Median = 10 Q ₃ = 15 P ₉₀ = 19 P ₉₉ = 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-Jun	S4	S8	S7	S9	S11	S10	S9	SSW10	S11	S12	S18	SSE17	S18	SSE17	S11	SSW7	SSE1	ESE8	ENE8	NW13	ESE9	SE10	SE7	S4	S7.8	S18
2-Jun	SW1	S2	ESE3	WNW1	ESE3	SE2	NE2	NE3	NE5	NE5	E6	ESE7	ESE6	E6	ESE7	ESE6	E6	NW21	NW12	NNW1	E5	NW9	ESE3	SW3	ENE1.8	NW21
3-Jun	SW5	SW7	SW7	WSW10	SW7	WSW9	WSW10	W13	W13	W13	W17	W19	W18	WSW17	W17	W18	W18	W20	W18	W14	WSW10	SW8	SW9	SW9	WSW12.1	W20
4-Jun	SW10	SW11	WSW13	WSW11	WSW11	WSW14	W17	W22	W21	W22	W23	W22	W22	W22	W24	W23	WNW21	WNW17	WNW16	NW16	WNW7	W8	W10	W16.1	W24	
5-Jun	WNW8	W8	WSW5	WSW4	WSW10	WSW8	WNW10	NW15	NW17	WNW21	NW20	WNW19	NW20	WNW19	NW16	NW17	NW13	NW11	NW12	NNE6	ENE4	E6	SE8	SE9	WNW8.8	WNW21
6-Jun	SE8	SE7	SE10	SSE8	SE6	SSE7	S11	S11	S14	S15	SSE16	SSE18	SSE18	SSE20	SSE21	SSE23	SSE21	SSE21	SSE15	SE14	SSE14	SSE14	SSE14	SSE11	SSE13.9	SSE23
7-Jun	S14	SSW12	SSW8	SSW8	SSW10	SSW8	SW10	WSW11	WSW11	W16	W20	WNW21	WNW20	W15	WNW15	W19	W20	WNW19	W15	WSW11	WSW6	SSW1	NE9	ENE6	W9.7	WNW21
8-Jun	E4	ESE2	ESE1	NE1	ESE1	NE3	ENE4	NE9	ENE9	ENE11	NE10	ENE2	SSW6	NNW7	NNE10	NNE16	NE14	NNE15	NE15	NE17	ENE9	E11	NE9	NE10	NE7.1	NE17
9-Jun	E14	E10	E10	NE8	NNE11	NNE13	NNE15	NE19	NNE9	NNE12	ENE14	ENE15	NE11	NNE17	N21	N21	N19	N20	N19	N19	N17	N16	N16	NNW19	NNE13.3	N21
10-Jun	NNW19	NNW20	NNW17	NW15	NW16	NNW15	NNW12	NW13	NNW11	NNW12	NNW12	NNE14	NNE15	NNW9	NNE7	N9	ENE3	E9	E9	ENE10	ESE5	SSE4	SSE3	SSE6	N7.7	NNW20
11-Jun	SSE8	SSE9	SSE6	E5	S4	ESE6	SE8	SE9	SE12	SE14	SE16	SE14	SE16	ESE16	SE18	SE9	ESE10	ESE10	E6	SE10	SE17	ESE14	E6	SE9	SE10.0	SE18
12-Jun	SSE10	S13	SSW11	SSW10	SSW11	SW14	SW15	SSW15	SSW16	SSW17	SSW15	SSW17	SW15	SSW15	SW16	SW17	SW15	WSW13	WSW9	WSW12	SW10	SW12	SW13	SW12	SW12.8	SSW17
13-Jun	SW13	SW15	SW15	SW14	SW14	WSW16	WSW16	WSW15	WSW13	WSW16	WSW17	WSW18	WSW19	SW17	WSW17	SW16	SW15	WSW13	SW12	SW8	S6	S6	S7	S7	SW13.1	WSW19
14-Jun	S6	ESE3	E3	ENE3	E4	SSE3	ENE6	ENE7	ENE11	E17	SE19	SE19	SSE19	SE18	SE17	SSE16	S15	S19	SSE17	ESE6	E8	ESE11	SE13	E9	SE9.5	SE19
15-Jun	ESE13	SE12	ESE9	SE10	SE12	SE16	SSE24	S28	S29	S26	S31	SSW25	SSW26	SSW23	S23	S16	SSE23	SSE20	SSE20	SSE12	SSE14	S10	SW7	S4	S16.6	S31
16-Jun	S6	S5	SSE6	SSE4	SSE7	S10	S10	SSW12	SSW13	S15	SW13	SSW14	SSW14	S14	S13	SW10	SW10	SW12	SW11	WSW10	SW7	SW9	WSW11	SW11	SSW9.3	S15
17-Jun	SW12	SW13	SW13	SW11	SW12	WSW12	WSW12	WSW13	W16	W17	W18	W22	W24	W22	WNW25	WNW22	W18	WSW14	WSW14	SW11	SW11	SSW11	SSW15	SW16	WSW14.2	WNW25
18-Jun	SW13	WSW10	WSW9	WSW9	WSW9	NW13	NW10	NW12	WNW9	WNW9	WSW6	WSW9	W10	W7	NW14	WNW10	WNW10	SW7	WSW7	SW8	SSW6	SSW7	SW8	W8	W7.6	NW14
19-Jun	NW15	NW6	WSW7	NW14	WNW13	NW9	NNW8	N6	NNW9	NW16	NW20	NW23	NW23	WNW20	NW24	NW24	NW25	NW25	NW21	NW17	NNW10	N6	NNW5	SW3	NW14.0	NW25
20-Jun	S4	SSW4	SSW2	SSE3	S4	SSE2	E2	NNE3	W6	WNW9	NW11	WNW8	WNW8	WNW5	WNW6	W7	WNW4	WNW6	W6	WSW5	S6	S8	SSW6	SSE5	WSW3.0	NW11
21-Jun	SE4	S4	S3	SE3	S3	SE3	SSE3	SSE3	SSW5	S7	SSE8	SE10	ESE7	SSE6	ENE6	E10	ENE11	E8	ESE8	SSE6	SSE5	S12	SSW9	SSW8	SE4.7	S12
22-Jun	S4	SSE5	ESE4	SSE4	SSE6	S8	S7	S9	S10	S12	S9	S9	SSW13	SSW12	SW10	SW10	SW13	SSW8	SSW8	SW4	S6	S6	S9	SSW8	SSW7.5	SW13
23-Jun	SW15	SSW10	SW7	SSW4	SSE6	S7	SW8	WSW9	SW8	WSW8	WSW9	WSW12	W11	WSW9	SW10	W13	NNW9	N15	NNE6	NE5	NE5	NNE6	E4	ESE1	WSW4.4	N15
24-Jun	W3	SW1	SE2	SW4	SSW3	WSW3	SSE5	S8	SW8	WSW8	W12	NW10	NW10	WNW5	SW7	W9	NNW9	W12	W11	WNW8	NW10	NW12	NW8	WNW11	W5.7	NW12
25-Jun	WNW10	WNW10	NNW9	WNW9	WNW9	NW12	NNW13	N11	N13	N13	NNW17	N17	NNE20	NNE19	NNE20	N18	NNE16	NNE14	NE12	ENE12	ENE5	SW3	SSW3	S3	N9.2	NNE20
26-Jun	SE1	S2	SSE3	SSE4	SSE3	S3	SSW4	ESE2	ENE3	S3	W2	SE2	SSW2	SW6	SW6	WSW12	WSW12	WSW12	SW9	WNW7	WSW3	SSW6	S7	WSW2	SW3.6	WSW12
27-Jun	SSE4	S5	SE4	SSE5	SSW4	S3	W7	W12	WNW13	WNW14	WNW16	WNW16	W13	W14	W13	WNW14	WNW13	WNW12	WNW8	NNE8	NNW6	SE2	SSW5	SSW4	W6.5	WNW16
28-Jun	SSE2	SSW4	SSW2	E2	SE3	S4	W4	WNW7	W8	WNW11	WNW11	WNW8	W11	NW14	NW16	NNW17	NNW14	N13	N11	NNE14	NNE9	NNE6	E7	E3	NNW5.0	NNW17
29-Jun	ESE1	S3	S3	SSE2	SE3	ESE2	ENE6	ENE9	E11	E12	ENE11	ENE9	E6	E9	E8	ENE8	E9	ENE7	E10	E9	ESE7	ESE7	ESE7	SE9	E6.3	E12
30-Jun	SSE9	SSE9	SSE11	SSE12	SE11	SE8	SSE10	S12	S16	SSE15	S13	S15	SSE17	SE16	SE18	SE16	SSE15	SSE16	S16	SSE12	SSE8	SE8	SSE9	SSE7	SSE12.2	SE18

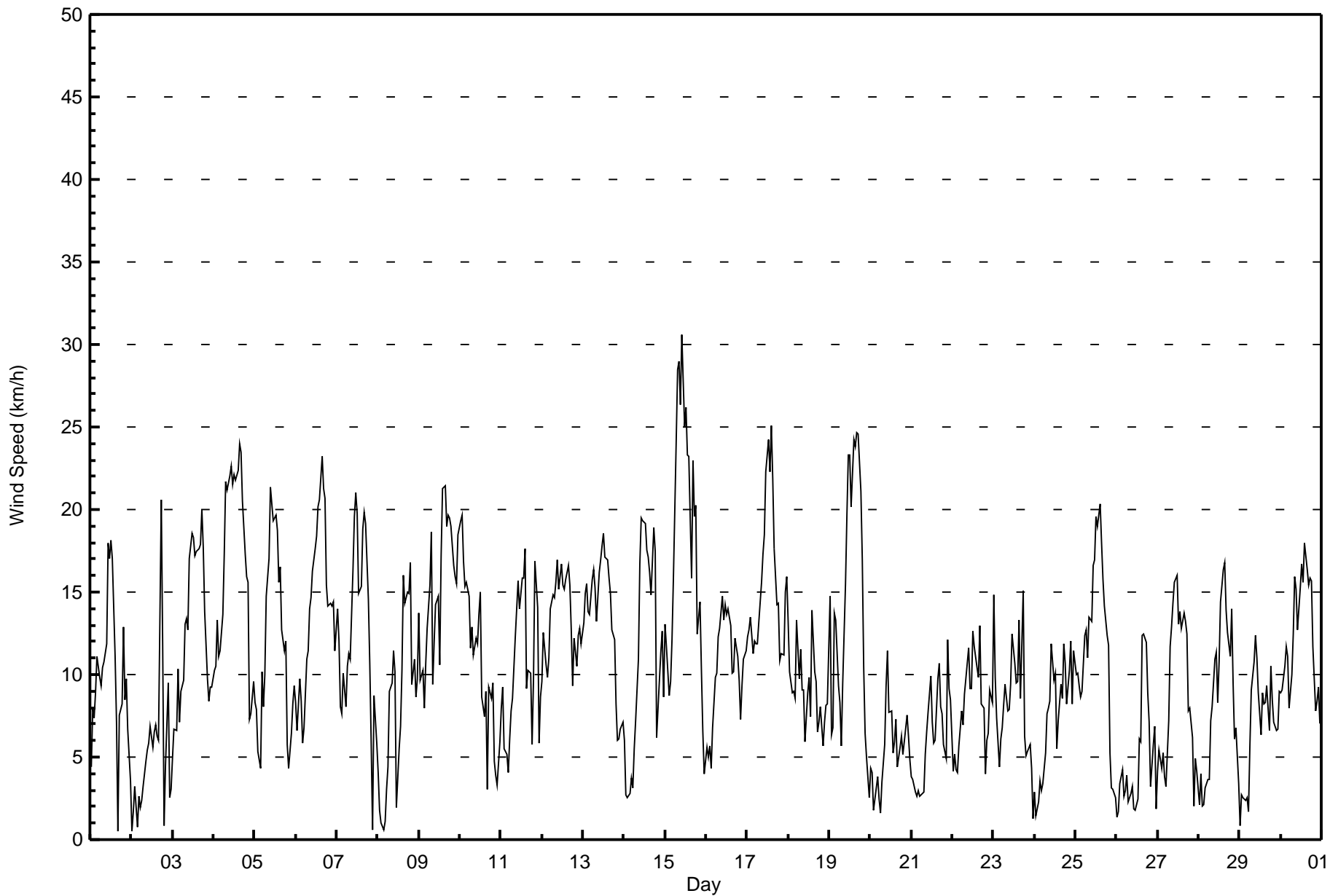
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NNW19	NNW20	NNW17	NW15	NW16	SE16	SSE24	S28	S29	S26	S31	SSW25	SSW26	SSW23	WNW25	W24	NW25	NW25	NW21	N19	SE17	N16	N16	NNW19	Diurnal Maximum

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Speed (WS) - km/h
Cenovus - Christina Lake - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Wind Speed (WS) - km/h
Cenovus - Christina Lake - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	128	17.78	17.78
6 - 11	297	41.25	59.03
12 - 19	238	33.06	92.08
20 - 28	55	7.64	99.72
29 - 38	2	0.28	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
Cenovus - Christina Lake - June 2016**

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	0	1	8	7	8	14	11	21	21	14	8	6	3	4	0	2	128
6 - 11	5	10	7	17	23	17	19	22	34	21	34	29	15	24	13	7	297
12 - 19	11	12	5	3	3	3	18	22	19	14	28	24	27	14	22	13	238
20 - 28	2	3	0	0	0	0	0	9	3	3	0	0	16	7	11	1	55
29 - 38	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	18	26	20	27	34	34	48	74	79	52	70	59	61	49	46	23	720

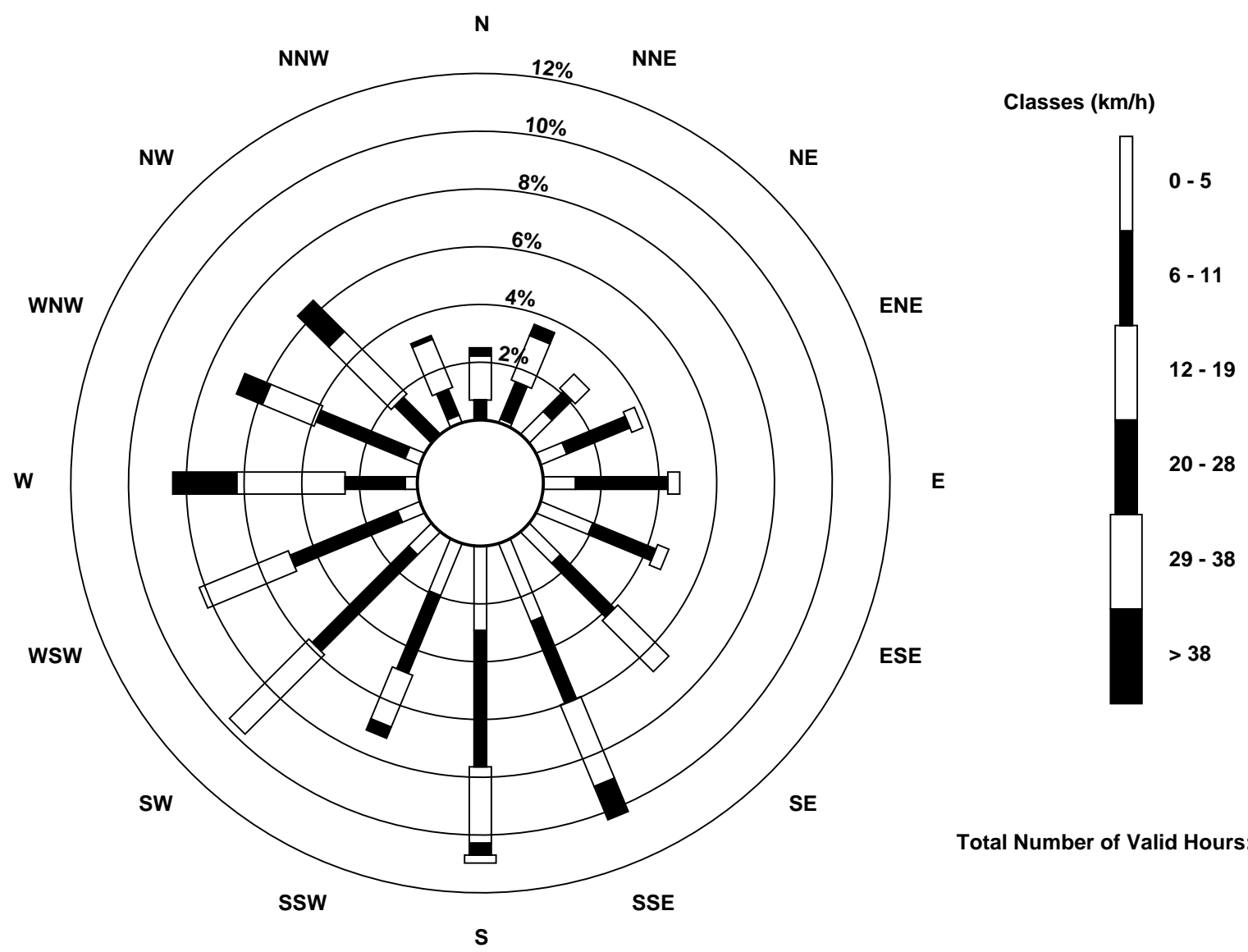
Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed (WS) - km/h
Cenovus - Christina Lake (AMS500)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
Cenovus - Christina Lake - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 11 km/h on Jun 15 18:00 Minimum Value: 1 km/h on Jun 21 04:00 Percentiles: P ₁ = 1 P ₁₀ = 1 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 9																		Hours in Service: 720 Hours of Data: 720 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-Jun	1	1	2	2	3	2	2	3	3	4	5	4	5	4	8	6	2	3	2	4	4	2	1	1	8
2-Jun	1	1	1	2	1	1	1	1	2	2	3	3	3	3	3	3	4	4	4	3	2	4	2	2	4
3-Jun	2	2	1	3	2	2	3	4	4	4	5	6	6	6	5	5	5	7	5	4	3	2	2	2	7
4-Jun	3	3	4	3	3	4	5	6	6	6	7	7	6	7	7	7	7	5	5	5	4	2	2	3	7
5-Jun	2	1	2	2	2	2	3	4	4	6	5	6	6	6	5	5	5	5	5	2	1	1	2	2	6
6-Jun	2	1	2	2	1	3	3	3	3	4	4	5	5	5	6	6	5	5	3	3	3	3	3	3	6
7-Jun	4	4	2	2	3	3	4	3	4	5	6	6	6	4	6	6	5	6	5	3	3	2	2	2	6
8-Jun	1	1	1	1	1	2	2	2	3	3	3	2	2	2	3	3	4	4	3	5	4	3	3	4	5
9-Jun	3	3	4	2	2	3	4	5	3	2	3	3	3	4	5	5	5	5	4	4	4	4	4	5	5
10-Jun	5	5	4	3	3	3	3	3	3	3	4	5	5	4	4	4	3	3	2	3	2	1	1	1	5
11-Jun	2	2	1	1	2	1	1	4	3	3	4	3	4	5	5	5	2	3	2	2	5	4	1	2	5
12-Jun	3	3	3	2	3	4	4	4	4	5	5	5	5	5	5	6	5	5	4	4	3	4	4	3	6
13-Jun	4	4	5	4	4	5	5	5	4	5	5	6	6	6	5	5	5	4	4	3	1	1	1	1	6
14-Jun	1	1	2	1	2	1	1	2	3	5	5	5	4	4	5	5	5	7	9	1	2	3	4	2	9
15-Jun	3	4	2	2	3	4	6	8	9	9	9	9	8	9	7	8	9	11	8	4	3	4	3	2	11
16-Jun	1	2	2	2	2	2	3	4	4	4	4	4	4	5	4	4	4	4	4	4	2	3	4	4	5
17-Jun	4	4	4	3	4	4	4	4	5	5	6	6	6	6	6	6	6	5	5	3	3	3	4	5	6
18-Jun	4	3	3	2	2	3	3	4	3	3	2	3	3	4	4	4	3	3	3	3	1	2	2	2	4
19-Jun	5	4	3	5	3	2	2	2	4	5	5	5	7	6	6	6	6	6	5	4	3	1	2	1	7
20-Jun	1	1	2	2	1	1	1	1	3	4	4	4	4	3	4	3	4	3	3	2	1	1	1	1	4
21-Jun	1	2	1	1	1	1	1	1	3	3	4	4	3	4	4	4	3	3	3	1	1	3	3	3	4
22-Jun	2	2	1	1	1	2	1	2	3	3	4	4	5	4	4	3	4	3	3	1	1	2	2	3	5
23-Jun	5	3	3	1	2	2	2	2	2	3	3	4	5	4	3	4	6	4	2	1	3	2	2	2	6
24-Jun	1	3	1	2	2	2	2	2	2	2	3	3	3	2	2	3	4	3	3	2	2	2	2	2	4
25-Jun	2	2	2	2	2	3	3	2	3	3	4	4	5	4	5	4	4	4	3	2	2	2	2	1	5
26-Jun	1	1	1	1	1	1	2	1	1	3	3	3	3	3	3	4	4	4	2	4	1	1	1	3	4
27-Jun	3	2	1	1	1	1	3	4	4	5	5	5	5	5	4	4	5	5	4	2	4	2	2	1	5
28-Jun	1	1	1	2	1	1	2	2	3	4	4	5	5	5	5	5	5	4	3	4	2	1	2	2	5
29-Jun	1	1	2	1	1	1	1	2	3	3	4	4	3	3	5	4	4	3	2	2	1	1	1	2	5
30-Jun	1	1	2	2	2	2	2	3	4	3	4	4	5	4	4	4	4	4	4	3	1	1	1	1	5
Diurnal Maximum																								5	



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
Cenovus - Christina Lake - June 2016

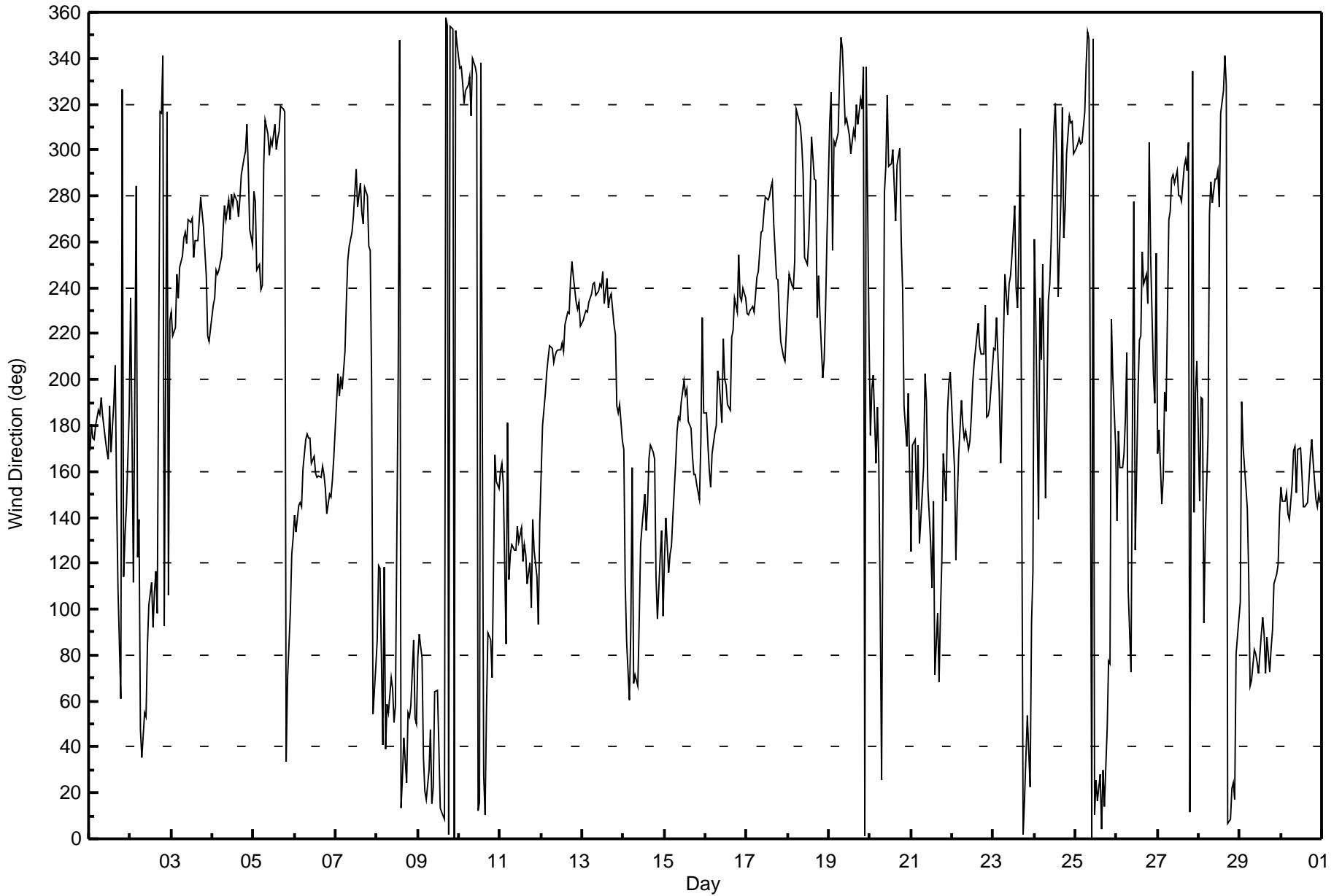
Direction of Maximum Speed: 190 deg on Jun 15 11:00 Direction of Maximum Daily Speed Average: 171.1 deg on Jun 15	Hours in Service: 720 Hours of Data: 720 Hours of Missing Data: 0
Direction of Minimum Speed: 149 deg on Jun 1 17:00 Direction of Minimum Daily Speed Average: 1.8 deg on Jun 2	Percent Operational Time: 100.0
Monthly Average Direction: 241.0 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-Jun	169	181	175	174	180	187	185	193	184	174	169	165	188	168	190	206	149	108	61	326	114	132	145	186	171.4
2-Jun	236	176	112	285	123	139	48	35	55	53	85	102	111	92	107	116	98	316	316	341	93	316	106	226	56.6
3-Jun	230	219	222	246	236	249	254	262	264	259	270	268	271	253	260	261	270	279	273	267	246	219	216	222	257.0
4-Jun	233	235	248	246	248	254	265	276	270	278	270	281	276	281	277	271	279	289	296	299	311	291	265	259	273.5
5-Jun	282	277	248	250	239	241	294	313	307	298	305	302	311	300	305	308	319	318	317	33	69	99	124	131	301.2
6-Jun	141	133	145	147	145	161	174	176	175	175	164	166	159	157	158	157	163	159	152	142	150	149	156	166	158.4
7-Jun	190	202	193	201	196	212	234	252	258	264	271	282	292	275	286	273	268	284	280	258	256	199	54	75	259.4
8-Jun	86	119	118	41	118	39	59	55	70	65	50	58	204	348	14	27	44	25	55	53	58	86	53	50	50.0
9-Jun	80	89	79	36	21	17	30	48	15	23	64	65	40	13	11	8	357	355	2	354	353	0	352	346	19.3
10-Jun	336	336	329	320	326	328	332	315	340	336	332	12	16	338	27	10	57	90	86	70	118	167	155	153	349.9
11-Jun	161	164	155	85	181	113	124	128	126	126	136	129	135	121	128	124	111	120	100	139	126	114	94	137	127.9
12-Jun	159	180	194	203	209	215	214	208	210	213	213	213	216	212	224	229	229	243	252	245	234	231	234	224	217.3
13-Jun	226	228	230	229	234	237	241	242	237	239	242	241	247	233	244	231	236	237	224	219	189	185	189	173	232.0
14-Jun	170	111	86	60	91	162	67	72	66	95	128	136	150	134	146	166	171	169	166	113	96	123	134	97	132.9
15-Jun	121	140	116	124	127	140	164	177	183	182	190	200	193	196	182	178	167	159	159	154	148	173	227	185	171.1
16-Jun	186	172	160	153	168	177	180	204	199	181	218	200	198	189	187	218	222	236	229	254	236	234	240	236	205.9
17-Jun	229	228	230	232	229	237	245	247	264	265	273	280	278	280	283	286	268	244	243	228	217	210	208	221	252.8
18-Jun	234	246	241	240	252	318	313	311	302	289	253	250	261	281	305	287	287	227	245	228	201	208	231	262	265.9
19-Jun	313	325	256	304	302	307	331	349	344	312	313	310	306	298	309	306	319	311	322	318	336	1	336	219	313.4
20-Jun	176	196	202	163	188	164	101	26	281	293	324	293	294	300	284	269	293	301	260	239	188	171	194	161	257.6
21-Jun	125	171	174	143	171	129	150	162	203	190	153	129	109	147	72	98	69	98	122	168	147	185	198	203	144.7
22-Jun	175	162	122	148	167	191	180	175	178	170	173	184	199	207	219	224	214	211	211	233	184	184	187	204	191.4
23-Jun	214	213	227	194	163	191	219	246	228	242	246	254	276	240	231	259	309	2	17	36	54	23	94	117	245.8
24-Jun	261	228	139	236	209	250	148	190	235	242	260	309	321	295	236	280	319	262	275	298	315	312	312	298	277.5
25-Jun	301	303	305	303	303	317	338	351	349	1	348	10	25	17	28	5	30	14	48	78	76	226	202	172	0.5
26-Jun	138	178	162	161	168	183	212	108	72	179	278	126	195	217	219	256	242	246	233	303	254	202	190	255	222.0
27-Jun	168	178	146	157	194	186	270	273	287	289	286	291	280	280	278	293	296	291	303	12	335	142	194	208	278.7
28-Jun	147	192	192	94	133	177	272	286	277	288	288	291	275	316	326	341	328	7	9	22	24	17	80	96	329.3
29-Jun	103	190	171	153	144	115	67	69	82	80	77	72	89	96	89	72	88	73	83	91	111	115	119	141	92.5
30-Jun	153	147	147	151	142	139	155	169	171	151	169	170	159	145	144	146	156	166	174	164	148	145	150	147	155.5

201.7 203.4 200.1 211.2 209.5 222.8 227.5 238.0 238.9 240.5 243.3 245.2 246.0 244.1 254.8 268.4 267.2 276.7 268.0 301.3 149.3 170.8 180.3 194.5

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
Cenovus - Christina Lake - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0 Maximum Value: 101 deg on Jun 26 11:00 Minimum Value: 5 deg on Jun 14 00:00 Percentiles: P ₁ = 8 P ₁₀ = 14 Q ₁ = 17 Median = 21 Q ₃ = 29 P ₉₀ = 49 P ₉₉ = 85		Hours in Service: 720 Hours of Data: 720 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-Jun	32	9	11	10	12	14	15	17	16	19	17	21	19	18	40	60	94	22	21	22	56	14	12	37	94	
2-Jun	79	59	21	67	34	38	41	36	34	38	39	41	49	54	36	35	57	17	35	94	50	37	70	37	94	
3-Jun	61	16	15	20	20	16	18	17	18	23	20	21	20	24	22	21	24	21	18	19	17	14	13	17	61	
4-Jun	19	20	19	16	18	19	17	18	19	21	19	23	20	20	21	18	20	23	18	19	12	19	26	21	26	
5-Jun	17	12	39	52	13	26	25	16	18	18	23	20	21	27	29	31	29	27	21	47	34	17	25	12	52	
6-Jun	12	12	10	11	13	20	15	16	14	17	19	22	20	19	18	16	17	13	13	14	11	11	10	18	22	
7-Jun	18	18	16	16	16	25	23	22	26	22	24	20	22	21	29	21	20	23	21	20	36	88	23	22	88	
8-Jun	16	64	86	56	46	20	63	21	15	14	15	78	30	25	14	14	21	21	23	15	30	20	33	29	86	
9-Jun	18	15	20	19	13	14	14	15	26	16	12	11	29	15	18	19	21	19	19	20	19	19	19	17	29	
10-Jun	15	15	16	13	14	15	20	14	26	24	27	29	27	49	58	36	86	25	20	13	20	11	35	7	86	
11-Jun	10	9	15	27	36	20	18	18	16	18	16	16	17	17	16	23	15	15	22	13	23	14	15	15	36	
12-Jun	17	14	18	17	17	18	19	19	18	20	22	22	22	22	22	22	22	35	29	20	20	20	20	17	35	
13-Jun	18	20	19	21	23	21	21	23	26	24	26	26	25	25	26	25	23	24	24	18	10	9	6	5	26	
14-Jun	8	38	52	36	49	49	16	15	14	20	17	17	15	18	21	25	23	15	16	20	24	18	16	15	52	
15-Jun	16	20	16	19	12	15	14	14	17	18	20	19	18	21	20	24	16	15	17	15	12	33	52	58	58	
16-Jun	20	34	17	21	13	12	18	22	21	18	24	23	23	22	20	26	21	22	21	19	19	21	21	22	34	
17-Jun	19	21	21	21	20	20	22	21	17	17	20	19	17	21	18	20	25	23	21	21	17	16	17	24	25	
18-Jun	19	21	18	18	28	14	23	24	38	38	51	32	27	60	23	34	37	41	36	20	16	17	26	21	60	
19-Jun	25	39	33	21	12	12	23	43	41	24	20	18	19	22	18	20	17	16	16	14	26	15	23	36	43	
20-Jun	9	35	40	47	17	27	51	44	68	42	37	53	55	68	70	50	79	70	39	28	22	11	17	25	79	
21-Jun	22	24	25	33	8	20	22	24	44	60	48	44	48	76	66	34	28	28	18	17	20	17	16	21	76	
22-Jun	36	17	26	37	17	16	14	15	19	21	43	37	34	24	35	26	18	19	19	21	8	7	13	17	43	
23-Jun	19	18	22	26	23	18	26	24	32	36	36	23	38	26	20	20	53	20	23	18	41	18	39	70	70	
24-Jun	47	84	72	40	61	63	35	18	22	23	17	22	17	46	21	34	40	22	25	26	17	11	13	9	84	
25-Jun	9	12	12	11	10	14	19	20	19	22	19	22	19	19	15	23	24	22	39	14	18	54	45	57	57	
26-Jun	60	54	25	16	40	30	38	69	62	96	101	99	91	54	63	22	23	21	20	35	65	13	12	82	101	
27-Jun	61	31	31	14	20	32	30	23	24	24	25	27	30	31	28	27	33	30	56	20	48	78	24	16	78	
28-Jun	45	20	66	49	44	25	51	30	31	34	38	51	33	34	26	25	24	21	19	15	11	19	14	39	66	
29-Jun	64	18	45	27	26	54	14	15	26	23	33	42	64	34	52	51	43	45	17	14	10	8	12	11	64	
30-Jun	8	10	11	11	11	14	18	18	19	15	29	22	19	19	18	18	19	15	17	16	9	9	8	11	29	
		79	84	86	67	61	63	63	69	68	96	101	99	91	76	70	60	94	70	56	94	65	88	70	82	
		Diurnal Maximum																								



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	June 10, 2016	Last Calibration	May 26, 2016
Station Name	Cenovus - Christina Lake	Station Number	AMS 500
Reason:	Routine		
Start Time (MST)	7:20	End Time (MST)	12:30
Gas Cert Reference	LL107928	Station temp.	22 Deg C
Cal Gas Concentration	50 ppm	Cal Gas Exp Date	Sep-8-2018
Calibrator Make/Model	API T700	Serial Number	451
ZAG Make/Model	API 701	Serial Number	404
DACS make/model	Campbell Scientific CR3000	DACS serial No.	2575

Analyzer Information

	Before	After		Before	After
Analyzer Range	0 - 1000 ppb		PMT voltage	-698	-697
Analyzer IP address	192.168.1.43		Lamp voltage	834	834
Calculated slope	0.996124	0.997676	Chamber temp	45.1	45.3
Calculated intercept	0.580368	0.651923	Pressure	677.0	674.6
Analyzer Background	12.8	12.6	Flow	0.591	0.596
Analyzer Coefficient	1.017	1.004	Intensity	90	91

Analyzer make Thermo 43i Analyzer serial # 118148497

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	79.3	793.0	804.7	0.985
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	79.3	793.0	794.8	0.998
second point	5000	39.7	397.0	396.3	1.002
third point	5000	19.8	198.0	197.5	1.003
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	79.3	793.0	792.4	1.001
Average Correction Factor					1.001

Corrected As found 805.2 Previous response 795.5 % change -1.2%

Notes:

Inlet filter changed after as founds. Additional zero/span conducted after inlet filter change to measure the potential impact of the smoke on the filter. Adjusted zero and span.

Calibration Performed By: Evan Magill



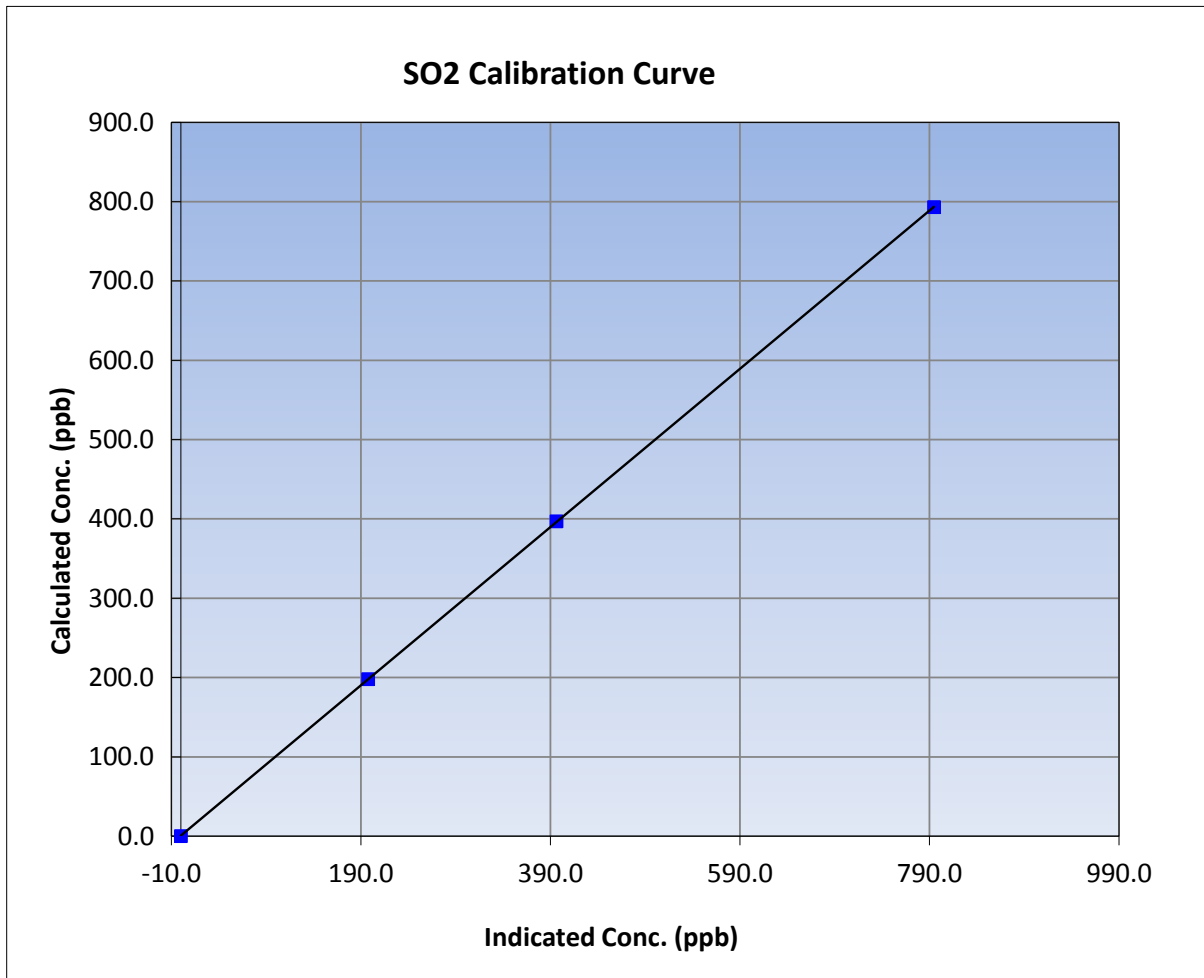
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 10, 2016	Previous Calibration	May 26, 2016
Station Name	Cenovus - Christina Lake	Station Number	AMS 500
Start Time (MST)	7:20	End Time (MST)	12:30
Analyzer make	Thermo 43i	Analyzer serial #	118148497

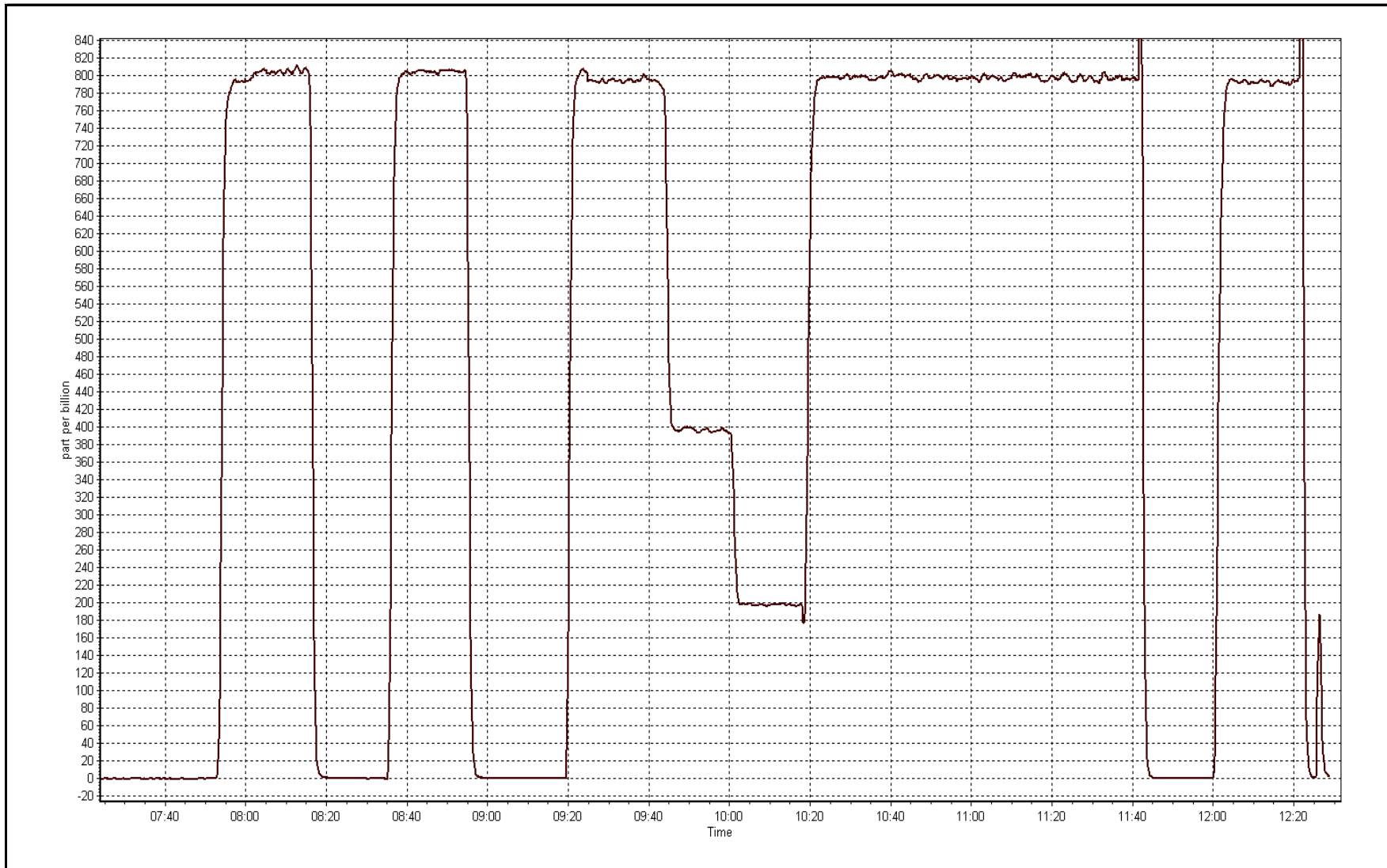
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999995
793.0	794.8	0.9978		
397.0	396.3	1.0017	Slope	0.997676
198.0	197.5	1.0025		
			Intercept	0.651923



SO2 Calibration Plot

Date: June 10, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	June 9, 2016	Last Calibration	May 26, 2016
Station Name	Cenovus	Station Number	AMS 500
Reason:	Routine		
Start Time (MST)	13:20	End Time (MST)	17:50
Gas Cert Reference	LL23598	Station temp.	22 Deg C
Cal Gas Concentration	10.2 ppm	Cal Gas Exp Date	5/30/2016
Calibrator Make/Model	API 700	Serial Number	451
ZAG air Make/Model	API 701	Serial Number	404
DACS make/model	Campbell Scientific CR3000	Serial Number	2575
SO2 gas concentration	50 ppm	SO2 gas cert/exp	LL107928 09-Aug-18

Analyzer Information

	Before	After		Before	After
Analyzer Range (ppb)	0 - 100 ppb		PMT voltage	-681	-681
Analyzer IP address	192.168.1.42		Lamp voltage	977	972
Calculated slope	0.991460	0.995414	Chamber temp	45	45
Calculated intercept	0.020073	0.091501	Pressure	673.0	651.7
Analyzer Background	1.72	1.53	Flow	0.319	0.434
Analyzer Coefficient	0.882	0.861	Intensity	91	90
			Converter temp.	310	310

Analyzer make/model	Thermo 43i-TLE	Analyzer serial #	1008841400
Converter make/model	Thermo 340	Converter serial #	328702539

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	39.3	80.2	82.1	0.976
SO2 scrubber check	5000	20.0	200.0	1.4	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	39.3	80.2	80.4	0.997
second point	5000	19.7	40.2	40.4	0.995
third point	6000	11.9	20.2	20.1	1.009
as left zero	5000	0.0	0.0	0.0	----
as left span	5000	39.3	80.2	80.4	0.997
Average Correction Factor					1.000

Corrected As found	82.3	Previous response	80.8	% change	-1.7%
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Notes:

Inlet filter changed after as founds. Additional zero/span conducted to measure the potential impact of smoke on the filter. Low flow alarm present, changed pump after additional as founds. Scrubber check done after as founds. Adjusted zero and span.

Calibration Performed By: Evan Magill



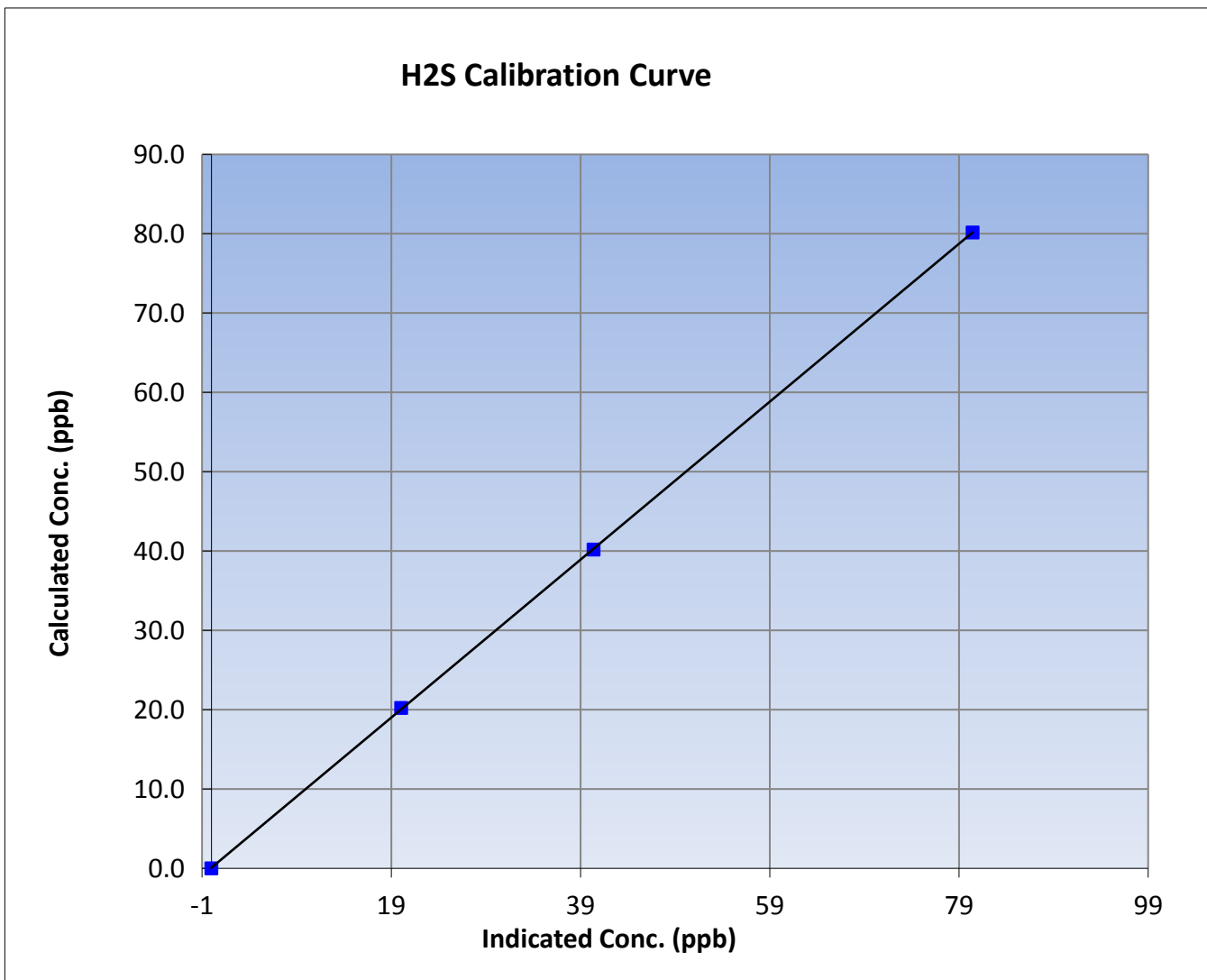
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	June 9, 2016	Previous Calibration	May 26, 2016
Station Name	Cenovus	Station Number	AMS 500
Start Time (MST)	13:20	End Time (MST)	17:50
Analyzer make	Thermo 43i-TLE	Analyzer serial #	1008841400

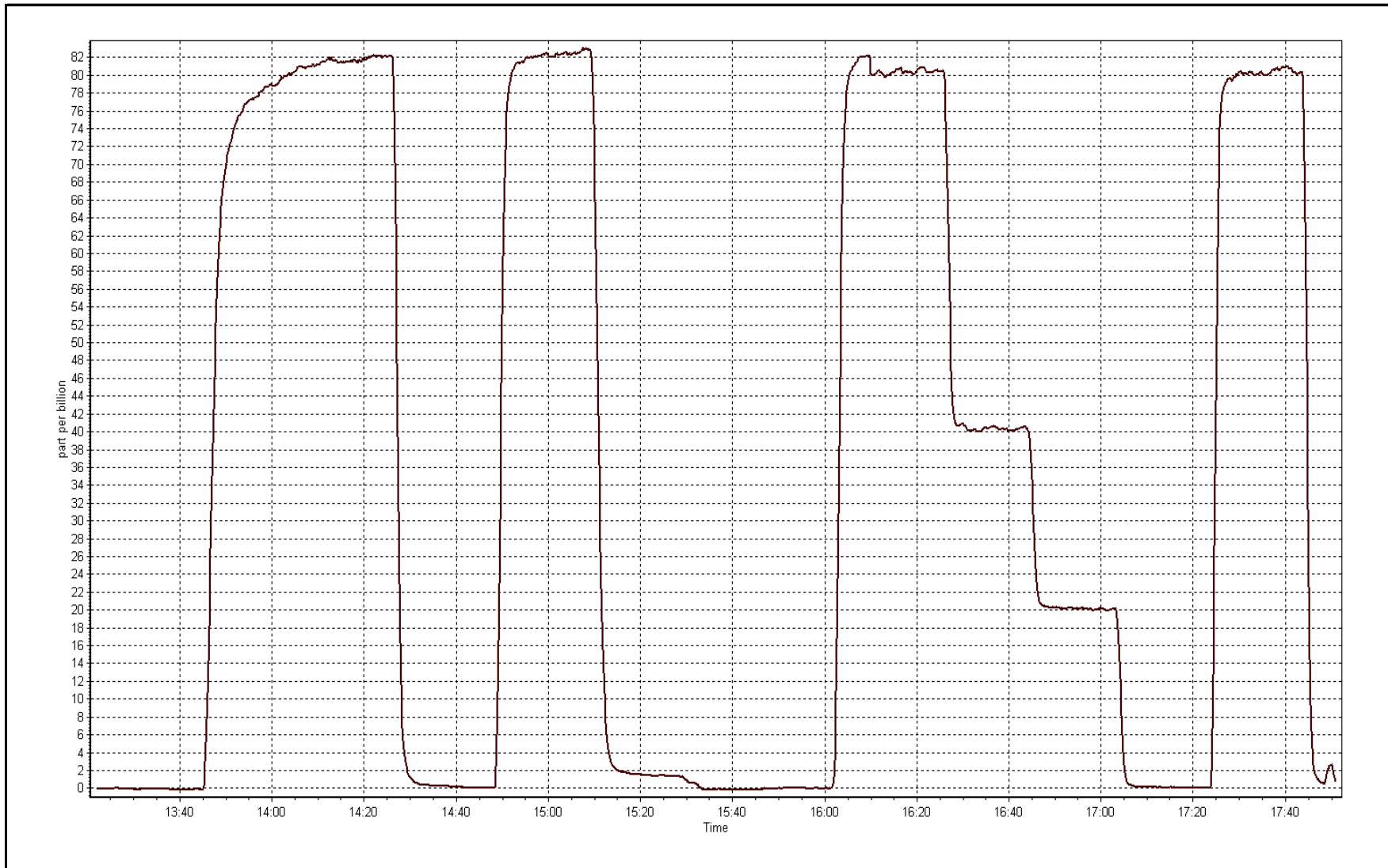
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999985
80.2	80.4	0.9967		
40.2	40.4	0.9950	Slope	0.995414
20.2	20.1	1.0090		
			Intercept	0.091501



H2S Calibration Plot

Date: June 9, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 10, 2016	Previous Calibration	May 26, 2016
Station Name	Cenovus	Station Number	AMS 500
Reason:	Routine		
Start Time (MST)	7:20	End Time (MST)	12:30
NO Cal Gas Conc	50.5 ppm	Gas Cert Reference	LL107928
NOx Cal Gas Conc	50.8 ppm	Cal Gas Expiry Date	Sep-8-2018
Calibrator	API T700	Serial Number	451
Zero air Generator	Teledyne API T701	Serial Number	4604

DACS Information

DACS make & model	Campbell Scientific CR3000	DACS serial No.	2575
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Calibration Statistics

Parameter		NOx	NO	NO2
As Found (last calibration results)	Data Slope	1.019696	1.022837	1.000883
	Data Offset	1.566051	0.908503	-0.464784
Current Calibration	Data Slope	0.996416	0.995867	1.011125
	Data Offset	1.983109	1.793378	0.235027

Analyzer Information

Analyzer make/model	API T200	Analyzer serial #	723
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Test Point	before		after	
		ppb		ppb
Concentration range	0-1000		0-1000	
Analyzer IP	192.168.1.72		192.168.1.72	
NO coefficient	0.876		0.905	
NOx coefficient	0.879		0.907	
NO2 coefficient	1.000		1.000	
NO bkgrnd	-0.1		1.9	
NOx bkgrnd	2.4		2.6	
Chamber Temp	50	Deg C	50	Deg C
Moly Temp	315.3	Deg C	315.4	Deg C
PMT voltage	827	V	826	V
PMT Temp	6.9	Deg C	6.9	Deg C
O3 flow	85	ccm	85	ccm
R Cell press NO	4.2	mmHg	4.2	mmHg
R Cell Press Nox	4.2	mmHg	4.2	mmHg
NO sample flow	0.488	lpm	0.485	lpm
Nox sample Flow	0.488	lpm	0.479	lpm

Notes:

Inlet filter changed after as founds. Additional zero/span conducted after inlet filter change to measure the potential impact of the smoke on the filter. Adjusted zero and span. Doubled GPT O3 points because calibrator is only producing roughly half of the expected O3. 2nd GPT points were used. As Left NO/NO2 values should be disregarded because the AL is producing 300 O3, whereas 600 O3 was used for the calibration.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 10, 2016

Station Number:

AMS 500

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	0.2	-0.3	----	----
as found span	5000	79.3	805.7	800.9	4.8	779.4	775.2	4.3	1.0337	1.0333
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.6	-0.2	-0.4	----	----
high point	5000	79.3	805.7	800.9	4.8	807.0	802.9	4.1	0.9984	0.9975
second point	5000	39.6	402.3	400.0	2.4	401.9	399.9	2.0	1.0011	1.0001
third point	5000	19.8	201.2	200.0	1.2	198.0	196.9	1.1	1.0161	1.0157
as left zero	5000	0.0	0.0	0.0	0.0	-0.8	-0.6	-0.2	----	----
as left span	5000	79.3	805.7	566.1	239.6	803.2	669.2	134.0	1.0031	0.8459
Average Correction Factor									1.0052	1.0045

Corrected As found

NO_x= 779.6

NO= 775.0

Percent Change

NO_x= 1.2%

NO= 0.9%

Previous Response

NO_x= 788.6

NO= 782.1

GPT Calibration Data

Dilution Flow (total) 5000 ccm

Source Gas Flow 79.30 ccm

NOx ref calc conc = 805.7 ppb

NO ref calc conc = 800.9 ppb

O3 Setpoint (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
1st NO ref point		4.8	808.2	802.8	-0.4	0.9970	0.9976	----	----
1st NO2 (600)	566.1	241.5	804.9	566.1	238.8	1.0010	----	1.0112	98.9%
2nd NO2 (400)	645.1	162.4	805.0	645.1	159.8	1.0009	----	1.0165	98.4%
3rd NO2 (200)	719.4	88.1	806.9	719.4	87.5	0.9985	----	1.0078	99.2%
2nd NO ref point		4.8	808.2	802.8	5.3	0.9970	0.9976	----	----
Average Correction Factor						0.9993		1.0118	98.8%

Calibration Performed By:

Evan Magill



Wood Buffalo Environmental Association

NO_x Calibration Summary

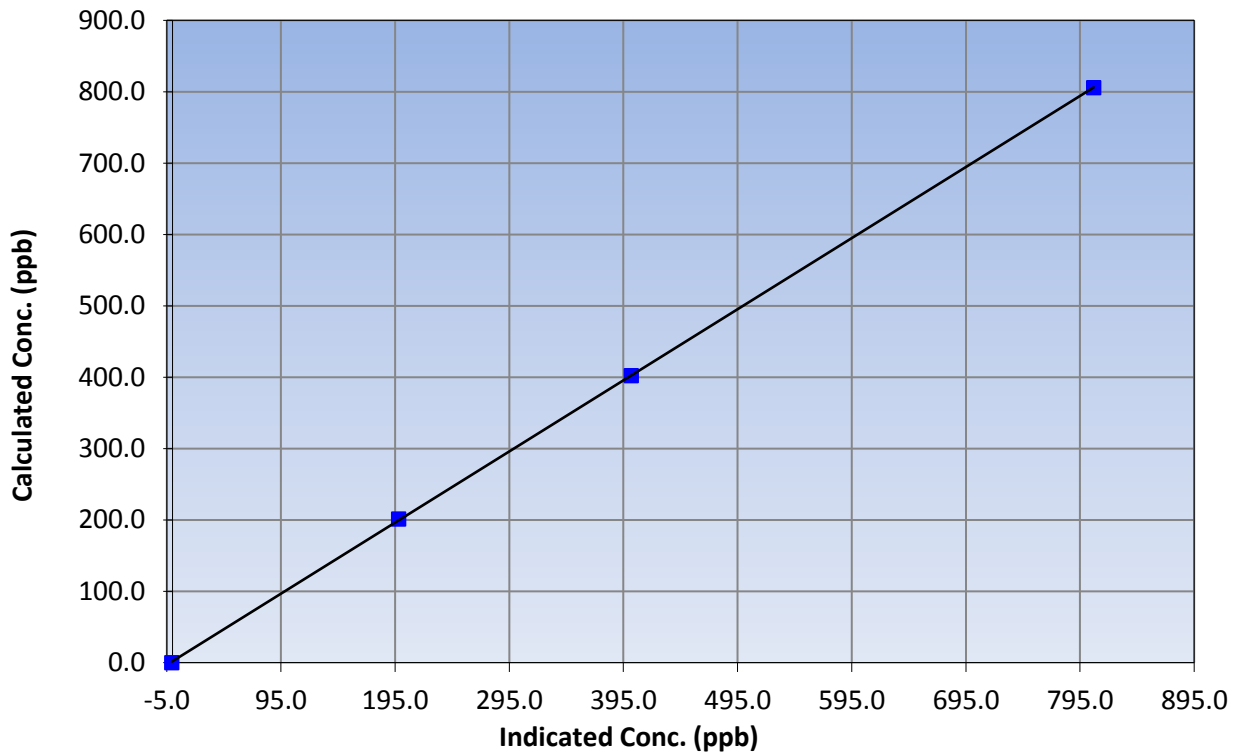
Station Information

Calibration Date	June 10, 2016	Previous Calibration	May 26, 2016
Station Name	Cenovus	Station Number	AMS 500
Start Time (MST)	7:20	End Time (MST)	12:30
Analyzer make	API T200	Analyzer serial #	723

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.6	----	Correlation Coefficient	0.999984
805.7	807.0	0.9984		
402.3	401.9	1.0011	Slope	0.996416
201.2	198.0	1.0161		
			Intercept	1.983109

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

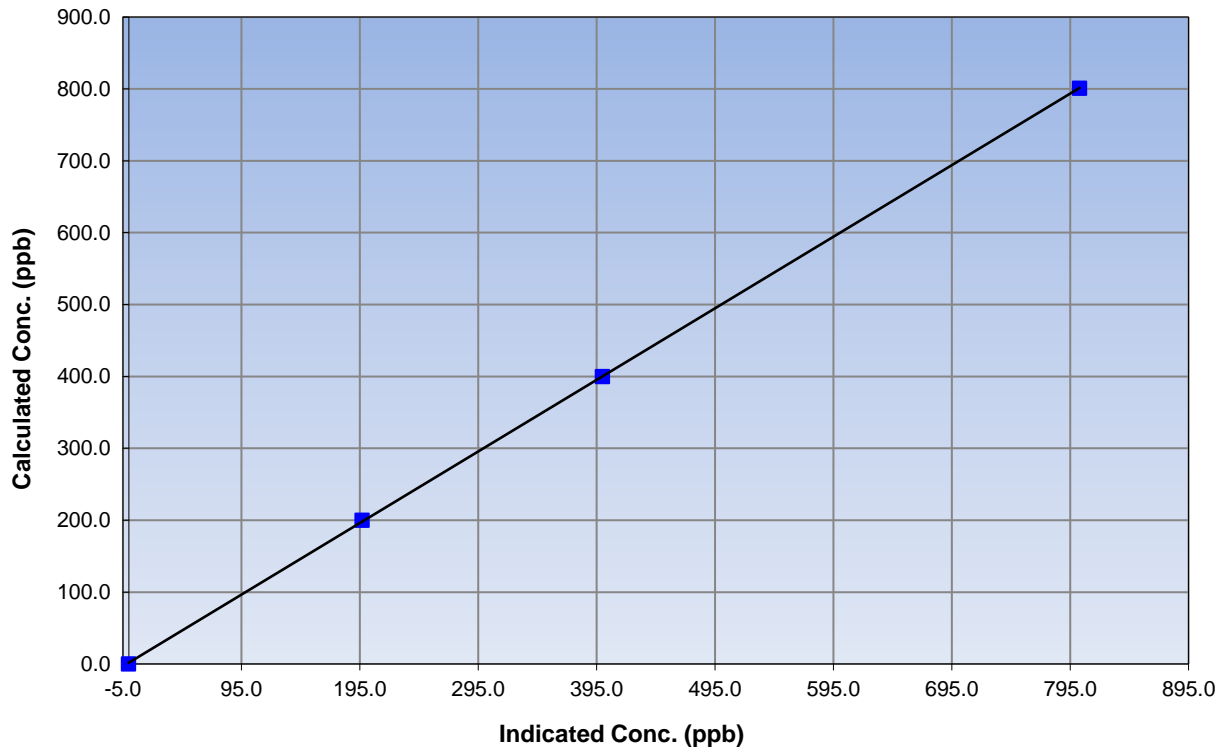
Station Information

Calibration Date	June 10, 2016	Previous Calibration	May 26, 2016
Station Name	Cenovus	Station Number	AMS 500
Start Time (MST)	7:20	End Time (MST)	12:30
Analyzer make	API T200	Analyzer serial #	723

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.2	N/A	Correlation Coefficient	0.999980
800.9	802.9	0.9975		
400.0	399.9	1.0001	Slope	0.995867
200.0	196.9	1.0157		
			Intercept	1.793378

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

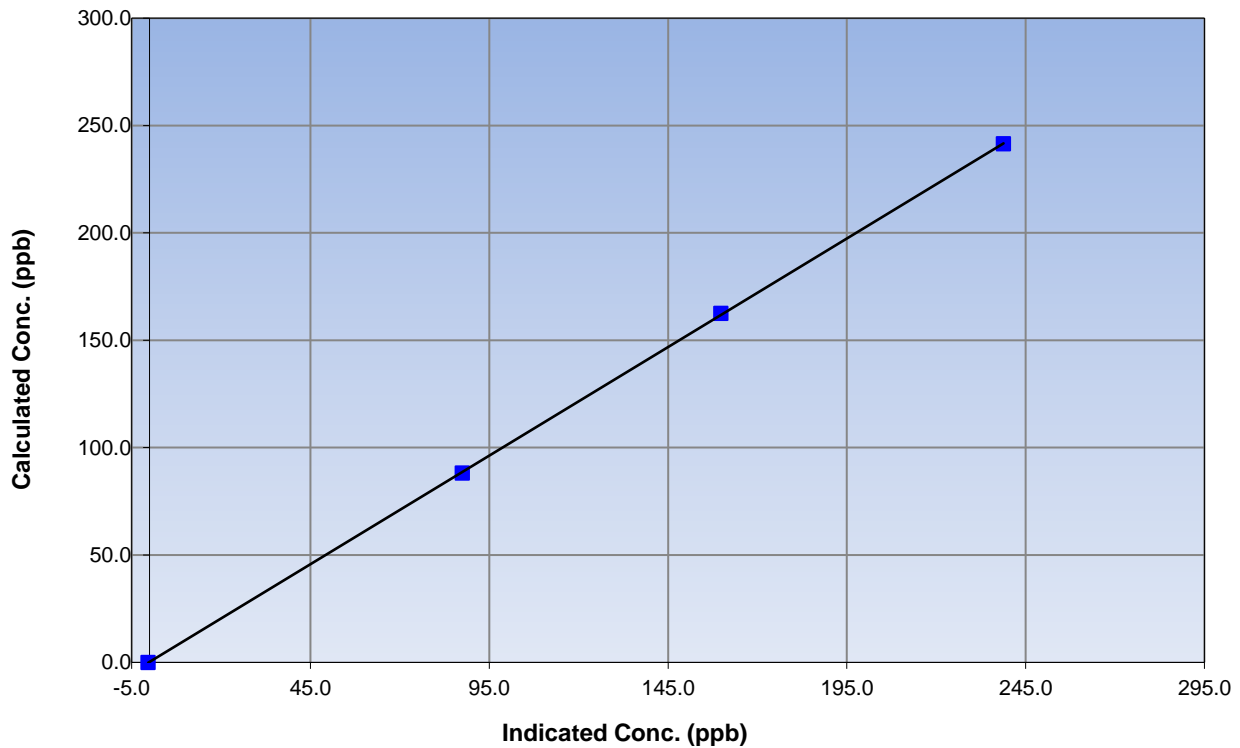
Station Information

Calibration Date	June 10, 2016	Previous Calibration	May 26, 2016
Station Number	Cenovus	Station Number	AMS 500
Start Time (MST)	7:20	End Time (MST)	12:30
Analyzer make	API T200	Analyzer serial #	723

Calibration Information

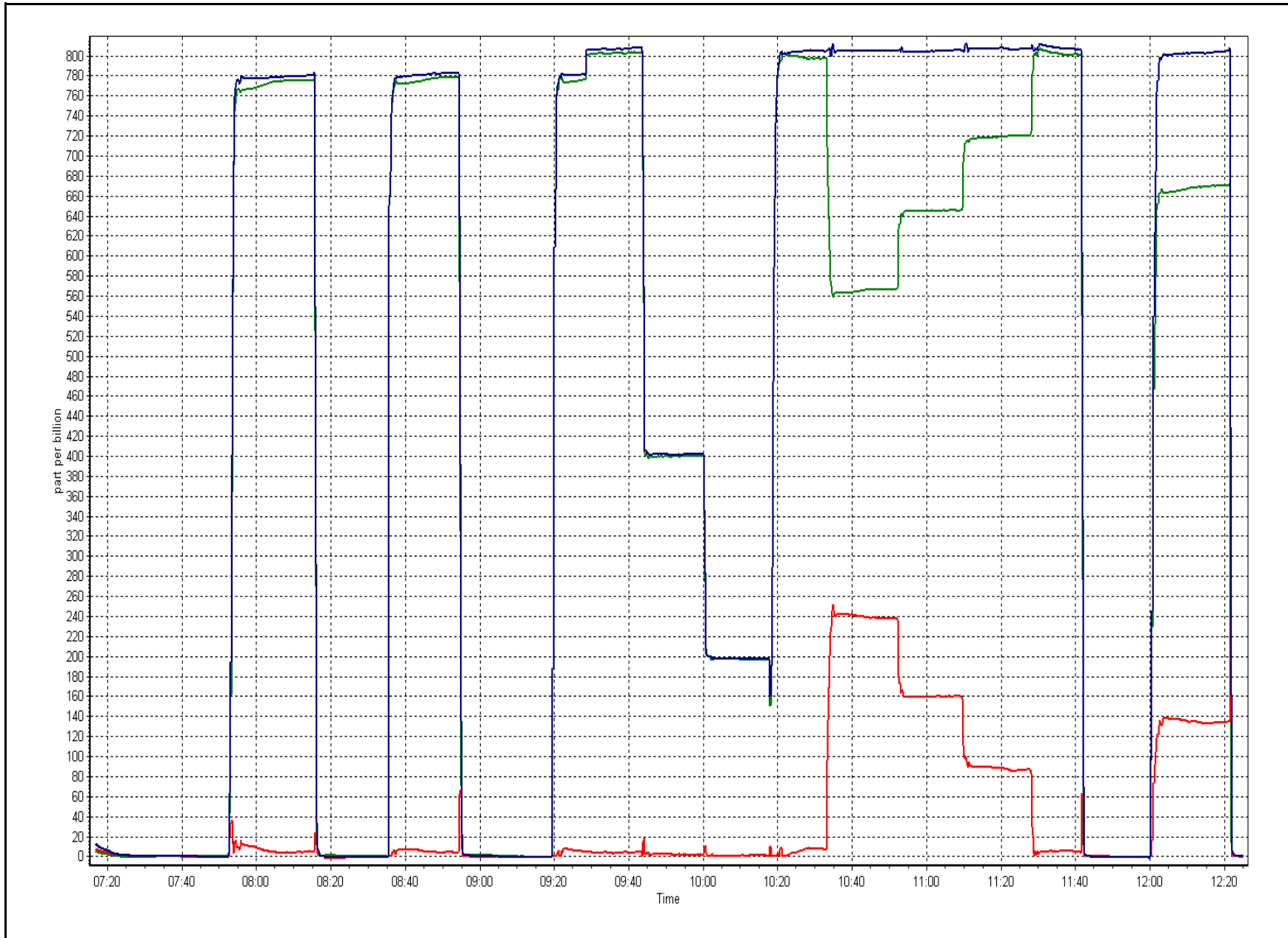
Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	-0.4	N/A	Correlation Coefficient	0.999977
241.5	238.8	1.0112		
162.4	159.8	1.0165	Slope	1.011125
88.1	87.5	1.0078		
			Intercept	0.235027

NO₂ Calibration Curve



NOX Calibration Plot

Date: June 10, 2016





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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

CONTINUOUS AMBIENT AIR QUALITY
MONITORING PROGRAM
MONTHLY REPORT

**AMS 502
CONOCOPHILLIPS
SURMONT
JUNE 2016**

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

July 29, 2016



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WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONOCOPHILLIPS SURMONT (AMS 502)
 JUNE 2016

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	634	35	86	92.92	13	0	5	0
H2S (ppb) Average	667	33	53	97.22	3	0	1	0
NO2 (ppb) Average	674	36	46	98.61	9	0	4	-
NO (ppb) Average	674	36	46	98.61	14	-	5	-
NOX (ppb) Average	674	36	46	98.61	21	-	8	-
Temperature 2 m (C) Average	720	0	0	100.00	26.3	-	22.1	-
Relative Humidity (%) Average	720	0	0	100.00	100	-	98	-
Wind Speed 10 m (km/h) Average	718	0	2	99.72	36	-	23	-
Wind Direction 10 m (deg) Average	718	0	2	99.72	-	-	-	-

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

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONOCOPHILLIPS SURMONT (AMS 502)
 JUNE 2016

MONTHLY SUMMARY FOR AIR QUALITY/ METEOROLOGICAL MONITORING MEASUREMENTS

Parameter	Number	Mean	StnDev	Total	Percentile						
					Min	P10	Q1	Median	Q3	P90	Max
SO2 (ppb) Average	634	1	2	-	0	0	0	1	1	2	13
H2S (ppb) Average	667	0.3	0	-	0	0	0	0	0	0	3
NO2 (ppb) Average	674	1.5	2	-	0	0	1	1	2	4	9
NO (ppb) Average	674	1.2	2	-	0	0	0	1	1	3	14
NOX (ppb) Average	674	2.7	3	-	0	0	1	2	3	6	21
Temperature 2 m (C) Average	720	16.27	4.6	-	7.7	10.4	12.8	15.8	19.8	23.2	26.3
Relative Humidity (%) Average	720	60.1	22	-	18	32	42	59	80	91	100
Wind Speed 10 m (km/h) Average	718	13.5	6	-	1	6	9	13	17	22	36
Wind Direction 10 m (deg) Average	718	-	-	-	-	-	-	-	-	-	-

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION - CONOCOPHILLIPS SURMONT (AMS 502)
JUNE 2016

OPERATIONAL NOTES

Parameter	Period Start	Period End	Duration (Hours)	Notes
SO2, H2S, NO2	13 Jun 2016 11:00	13 Jun 2016 18:00	8	Station power failure
SO2, H2S, NO2	15 Jun 2016 13:00	15 Jun 2016 14:00	2	Station power failure
SO2	13 Jun 2016 19:00	15 Jun 2016 04:00	34	Stabilization following power failure
SO2	15 Jun 2016 15:00	15 Jun 2016 21:00	7	Stabilization following power failure
H2S	01 Jun 2016 01:00	01 Jun 2016 01:00	1	Unstable operation - excessive baseline drift
H2S	04 Jun 2016 10:00	04 Jun 2016 10:00	1	Unstable operation - excessive baseline drift
H2S	06 Jun 2016 00:00	06 Jun 2016 01:00	2	Unstable operation - excessive baseline drift
H2S	11 Jun 2016 09:00	11 Jun 2016 09:00	1	Unstable operation - excessive baseline drift
H2S	13 Jun 2016 19:00	13 Jun 2016 19:00	1	Unstable operation - excessive baseline drift
H2S	15 Jun 2016 15:00	15 Jun 2016 16:00	2	Unstable operation - excessive baseline drift
H2S	28 Jun 2016 12:00	28 Jun 2016 13:00	2	Maintenance - sample manifold cleaned
Wind Speed, Wind Direction	05 Jun 2016 21:00	05 Jun 2016 21:00	1	Flat line in sensor output signal
Wind Speed, Wind Direction	26 Jun 2016 08:00	26 Jun 2016 08:00	1	Flat line in sensor output signal



Wood Buffalo Environmental Association

Summary of Hour Averages

Sulphur Dioxide (SO₂) - ppb

ConocoPhillips - Surmont - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 13 ppb on Jun 27 12:00	Maximum Daily Average: 4.7 ppb on Jun 19		Hours of Data:	634
Minimum Value: 0 ppb on Jun 5 07:00	Minimum Daily Average: 0.3 ppb on Jun 12		Hours of Missing Data:	86
Maximum Diurnal Average: 2.2 ppb at hour 12	Minimum Diurnal Average: 0.5 ppb at hour 4		Hours of Calibration:	35
Monthly Average: 1.0 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 2 P ₉₉ = 10		Percent Operational Time:	92.9

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-Jun	0	0	Z	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0.4	1
2-Jun	0	0	1	Z	1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0.4	1
3-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1
4-Jun	1	0	0	0	0	Z	0	0	0	0	0	1	1	1	1	1	1	1	2	2	1	0	0	0	0.7	2
5-Jun	Z	0	0	0	0	0	0	1	1	3	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0.6	3
6-Jun	0	Z	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7	1
7-Jun	1	1	Z	1	1	1	1	0	0	0	0	1	1	1	0	3	2	3	3	0	1	1	1	0	1.0	3
8-Jun	0	0	0	Z	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.7	1
9-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.4	1
10-Jun	0	0	0	0	1	Z	1	1	2	3	2	2	2	4	4	1	1	1	1	0	1	1	0	0	1.3	4
11-Jun	Z	1	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2
12-Jun	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
13-Jun	0	0	Z	0	0	0	0	0	0	1	PF	PF	PF	PF	PF	PF	PF	PF	UO	UO	UO	UO	UO	UO	--	1
14-Jun	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	--
15-Jun	UO	UO	UO	UO	Z	1	1	1	1	1	0	1	PF	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO	--	1
16-Jun	1	1	1	1	0	Z	1	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0.6	1
17-Jun	Z	0	0	0	0	0	0	1	1	1	2	5	3	6	1	1	2	1	1	1	1	1	0	1	1.3	6
18-Jun	0	Z	4	1	2	2	4	5	5	6	10	7	4	4	3	3	1	0	1	1	1	1	1	5	3.1	10
19-Jun	1	1	Z	1	1	2	3	5	6	1	10	11	12	7	9	11	8	4	3	4	2	2	3	1	4.7	12
20-Jun	1	1	1	Z	1	1	1	4	2	4	3	5	2	2	1	2	1	1	0	0	1	1	1	1	1.5	5
21-Jun	1	1	0	0	Z	0	0	0	0	0	0	1	1	1	0	1	1	0	1	1	1	1	1	1	0.6	1
22-Jun	1	1	1	1	1	Z	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.7	1
23-Jun	Z	1	1	0	0	0	0	1	2	1	2	1	2	1	0	1	1	1	1	1	1	1	1	1	0.8	2
24-Jun	2	Z	1	1	1	1	1	1	1	3	1	3	7	3	3	1	1	3	1	2	1	1	1	1	1.7	7
25-Jun	1	1	Z	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.6	1
26-Jun	1	1	0	Z	0	1	0	1	1	1	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0.6	1
27-Jun	0	0	0	0	Z	1	2	0	0	3	10	13	11	3	3	1	1	1	1	1	1	1	1	1	2.4	13
28-Jun	0	0	0	0	0	Z	1	0	1	2	C	C	C	C	C	C	3	2	1	0	0	1	1	1	--	3
29-Jun	Z	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
30-Jun	0	Z	0	1	1	1	2	2	2	1	1	1	0	0	1	0	1	1	0	0	1	1	1	1	0.8	2

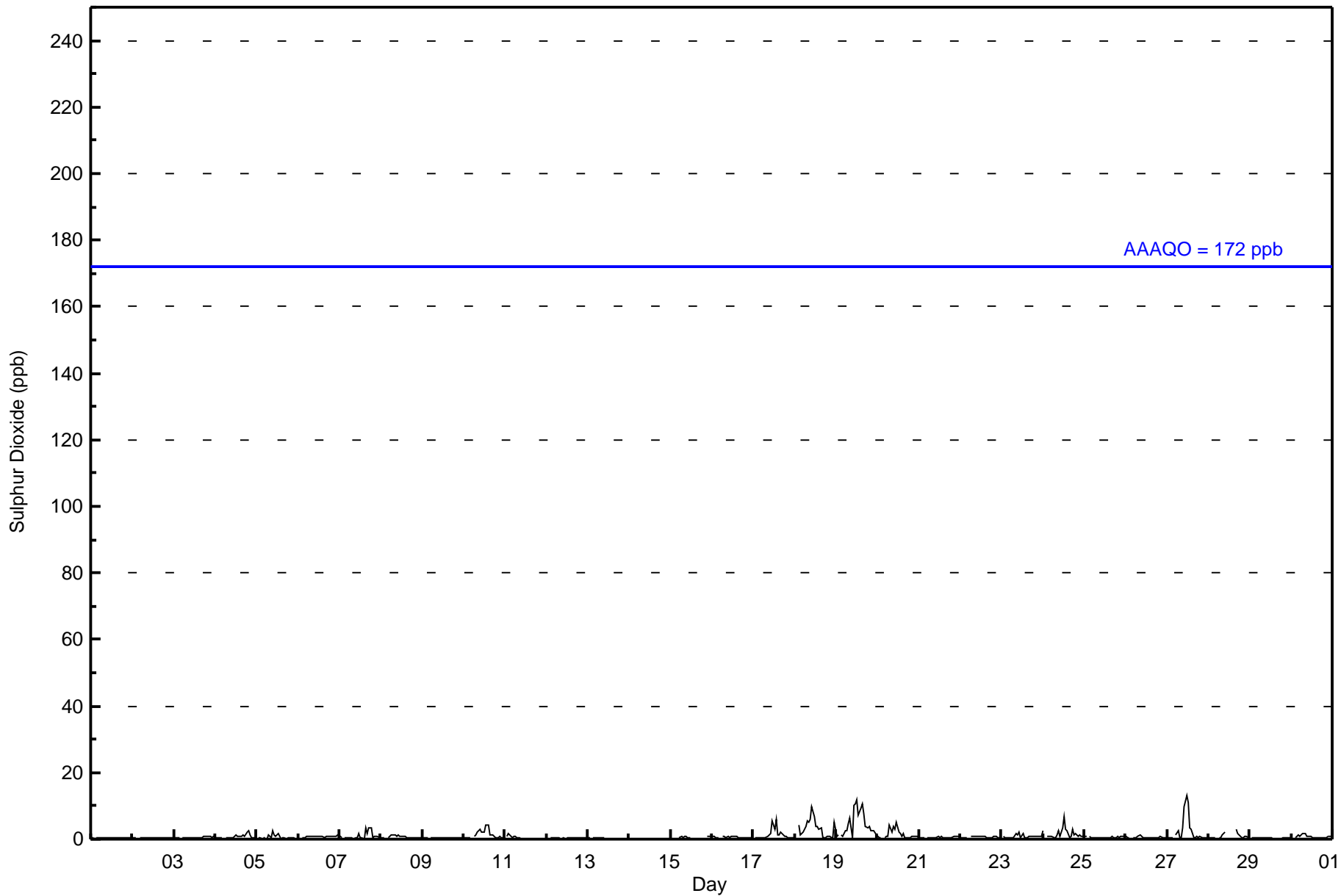
0.6	0.5	0.7	0.5	0.6	0.7	0.8	1.0	1.1	1.3	1.9	2.2	2.1	1.5	1.3	1.2	1.0	0.9	0.8	0.7	0.7	0.7	0.6	0.7	Diurnal Average	
2	1	4	1	2	2	4	5	6	6	10	13	12	7	9	11	8	4	3	4	2	2	3	5	Diurnal Maximum	

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



Wood Buffalo Environmental Association
Hourly Averages

Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surrmont - June 2016





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont - June 2016

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 10	629	99.21	99.21
11 - 20	5	0.79	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: 634

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont - June 2016**

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	24	20	10	10	27	51	41	47	25	38	87	62	77	29	48	627
11 - 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	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
Totals	31	24	20	10	10	27	51	41	47	25	38	87	62	77	33	49	632

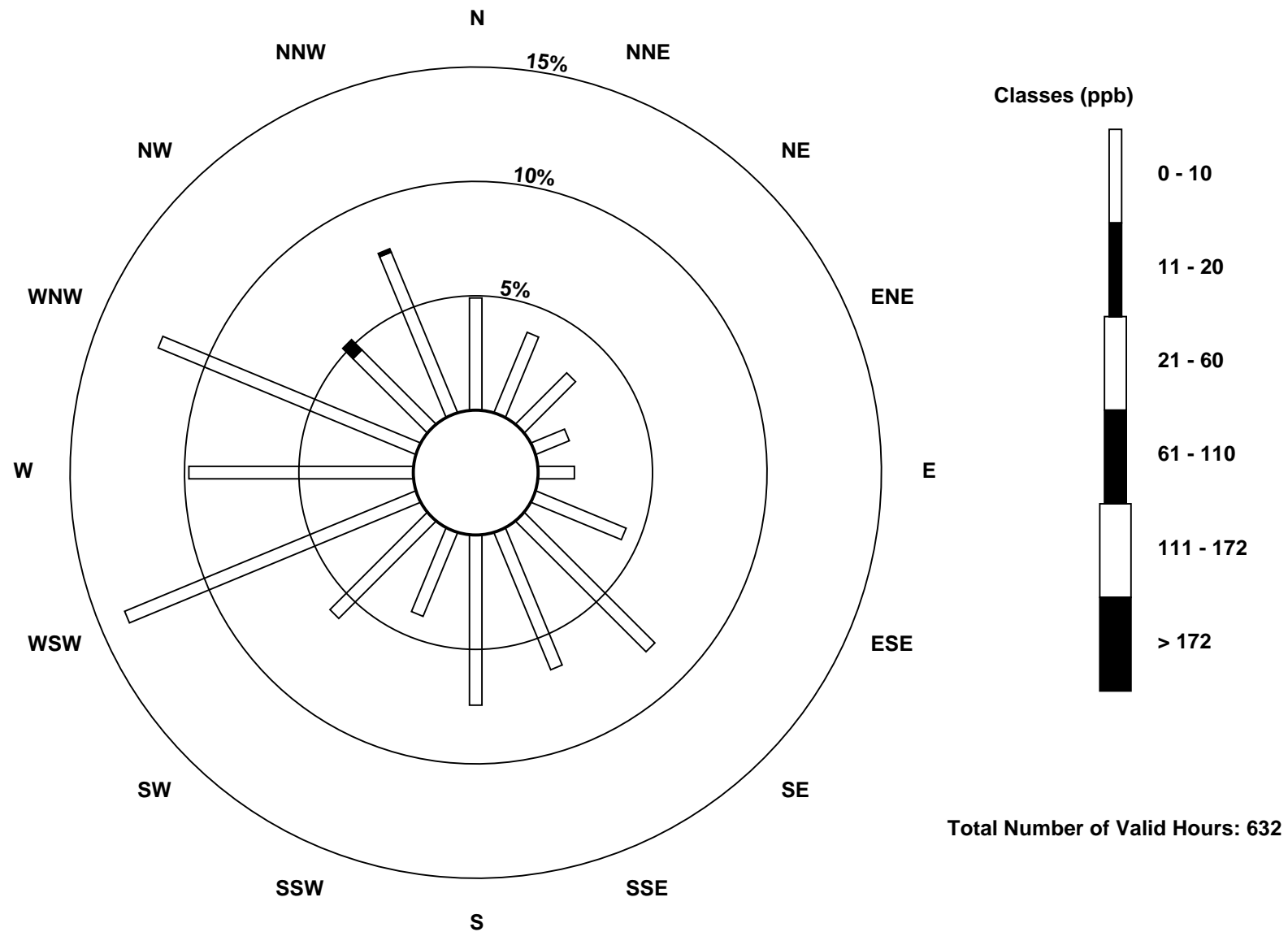
Total Number of Valid Hours: 632

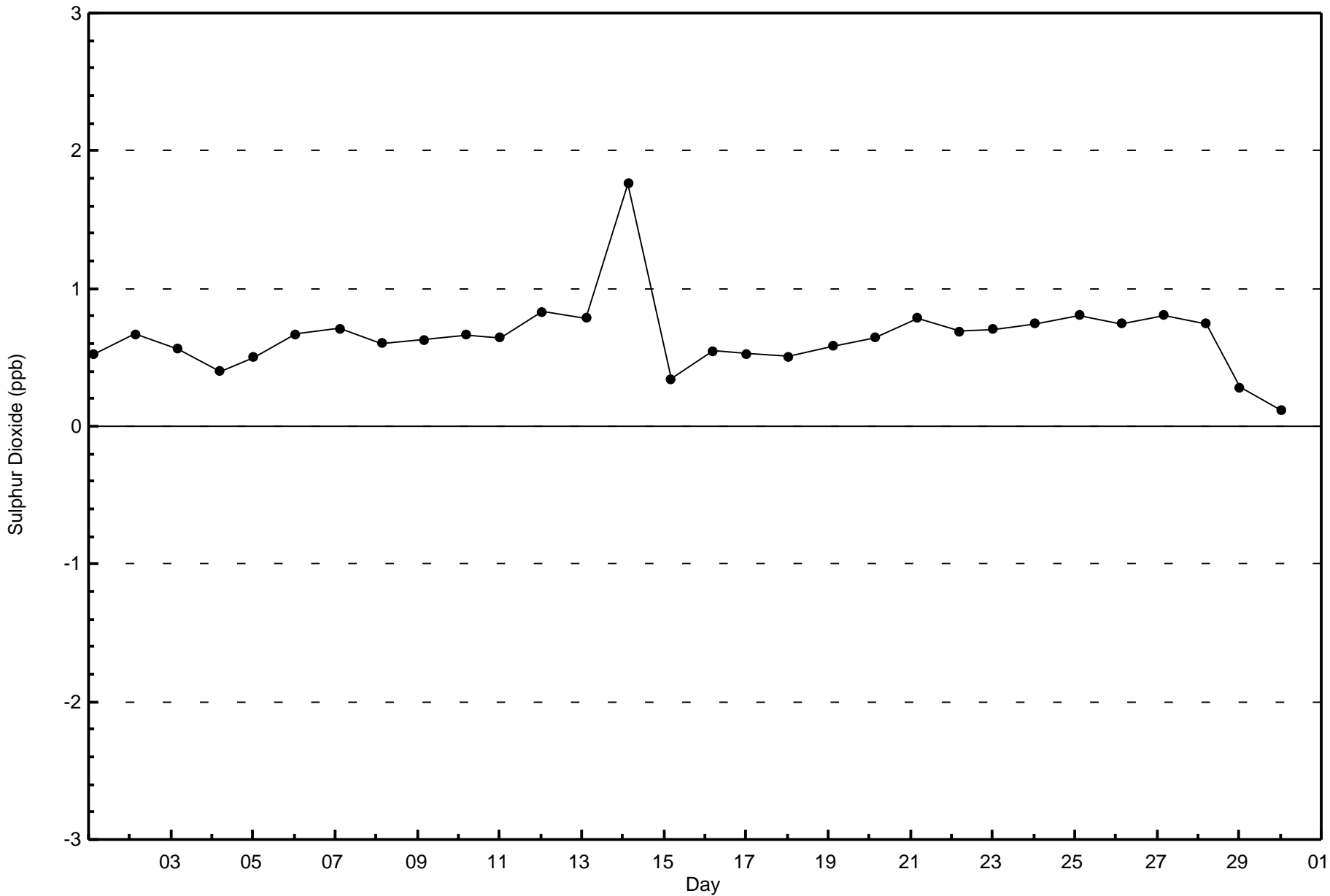
Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont (AMS502)

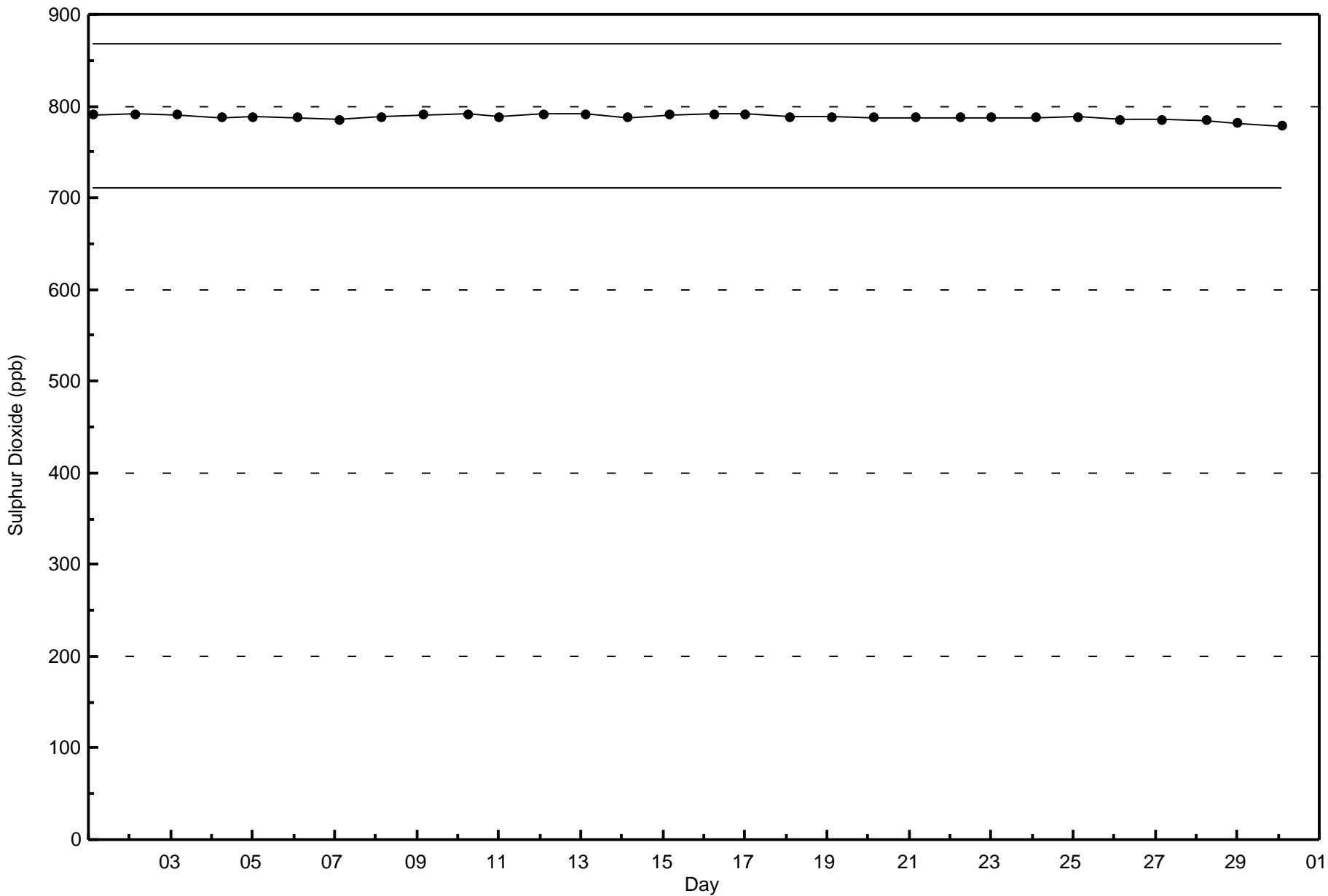






Wood Buffalo Environmental Association
Span Responses

Sulphur Dioxide (SO₂) - ppb
ConocoPhillips - Surmont - June 2016





Wood Buffalo Environmental Association
Summary of Hour Averages

Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surmont - June 2016

Number of Exceedences (AAAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 3 ppb on Jun 8 06:00	Maximum Daily Average: 0.7 ppb on Jun 24		Hours of Data:	667
Minimum Value: 0 ppb on Jun 3 23:00	Minimum Daily Average: 0.1 ppb on Jun 3		Hours of Missing Data:	53
Maximum Diurnal Average: 0.4 ppb at hour 6	Minimum Diurnal Average: 0.2 ppb at hour 14		Hours of Calibration:	33
Monthly Average: 0.3 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 0 Q ₃ = 0 P ₉₀ = 0 P ₉₉ = 2		Percent Operational Time:	97.2

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-Jun	UO	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-Jun	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
3-Jun	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
4-Jun	0	0	0	0	0	0	Z	0	0	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
5-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	UO	0.3	0
6-Jun	UO	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
7-Jun	0	0	0	Z	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	2	1	0	0	0.6	2
8-Jun	0	0	2	2	Z	3	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	3
9-Jun	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
10-Jun	0	0	1	0	1	1	Z	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.3	1
11-Jun	0	Z	0	0	0	0	0	0	UO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
12-Jun	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
13-Jun	0	0	0	Z	0	0	0	0	0	0	PF	PF	PF	PF	PF	PF	PF	PF	UO	0	0	0	0	0	--	0
14-Jun	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
15-Jun	0	0	0	0	0	Z	0	0	0	0	0	0	PF	PF	UO	UO	0	0	0	0	0	0	0	0	0.2	0
16-Jun	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
17-Jun	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
18-Jun	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	1
19-Jun	0	0	0	Z	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	1	2	0	0	0	0.5	2
20-Jun	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
21-Jun	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
22-Jun	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
23-Jun	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.2	1
24-Jun	1	1	Z	2	1	1	1	0	1	1	1	1	1	0	1	0	0	1	0	0	1	0	1	1	0.7	2
25-Jun	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
26-Jun	0	0	0	0	Z	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.2	1
27-Jun	0	0	0	0	1	Z	0	0	0	0	0	C	C	C	0	0	0	0	0	0	0	0	0	0	0.2	1
28-Jun	0	0	0	0	0	0	Z	0	0	1	0	M	M	0	1	0	1	0	0	1	1	2	1	0	0.4	2
29-Jun	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
30-Jun	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

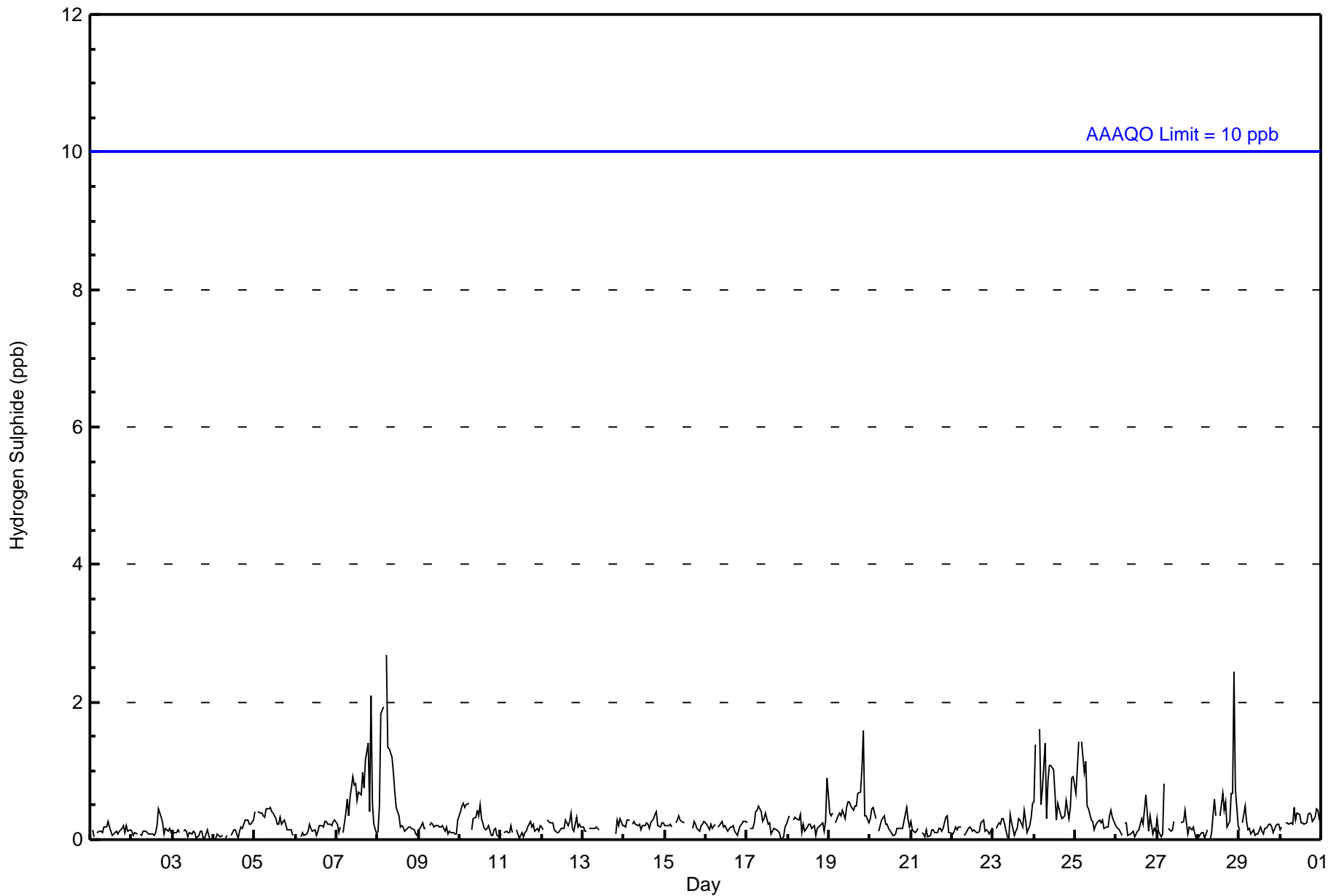
0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.3	0.3	0.2	0.2	Diurnal Average
1	1	2	2	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	Diurnal Maximum

Z - zerospan C - Calibration M - Maintenance UO - Unstable Operation 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 (H₂S) - ppb
ConocoPhillips - Surmont - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surmont - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 2	666	99.85	99.85
3 - 4	1	0.15	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: 667

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surmont - June 2016**

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	24	20	10	11	35	57	47	49	28	40	92	61	76	33	50	664
3 - 4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
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
Totals	32	24	20	10	11	35	57	47	49	28	40	92	61	76	33	50	665

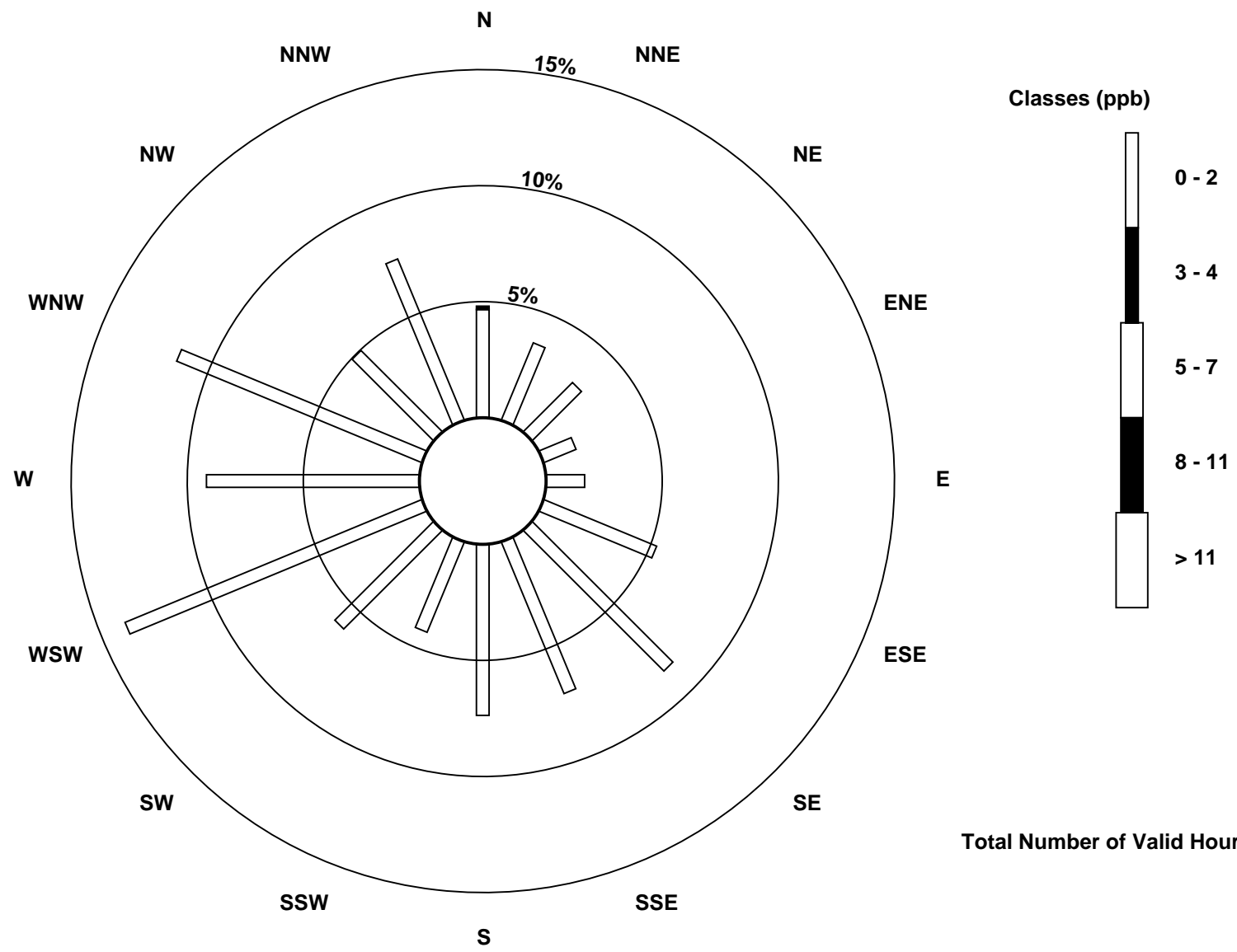
Total Number of Valid Hours: 665

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

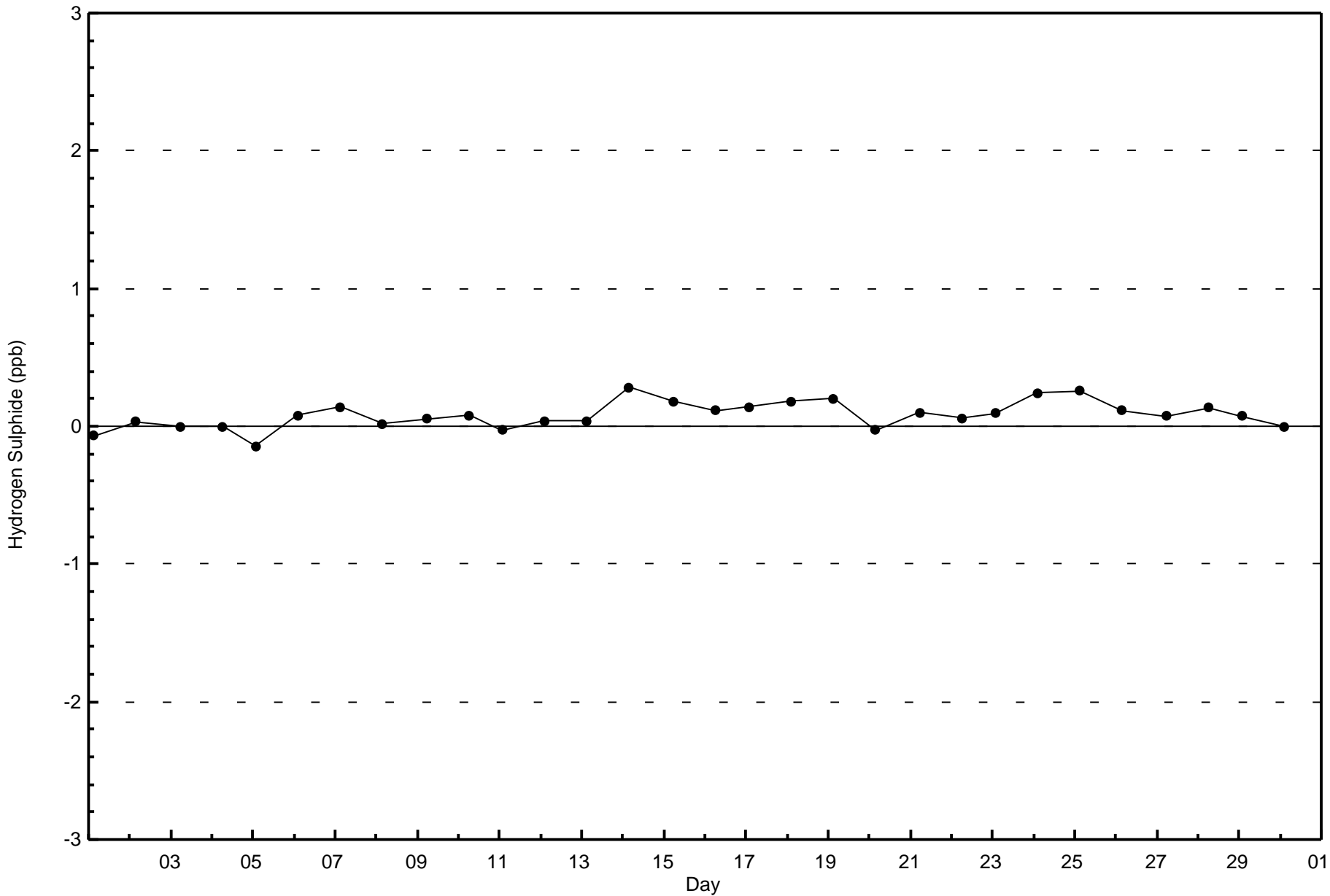
Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surmont (AMS502)

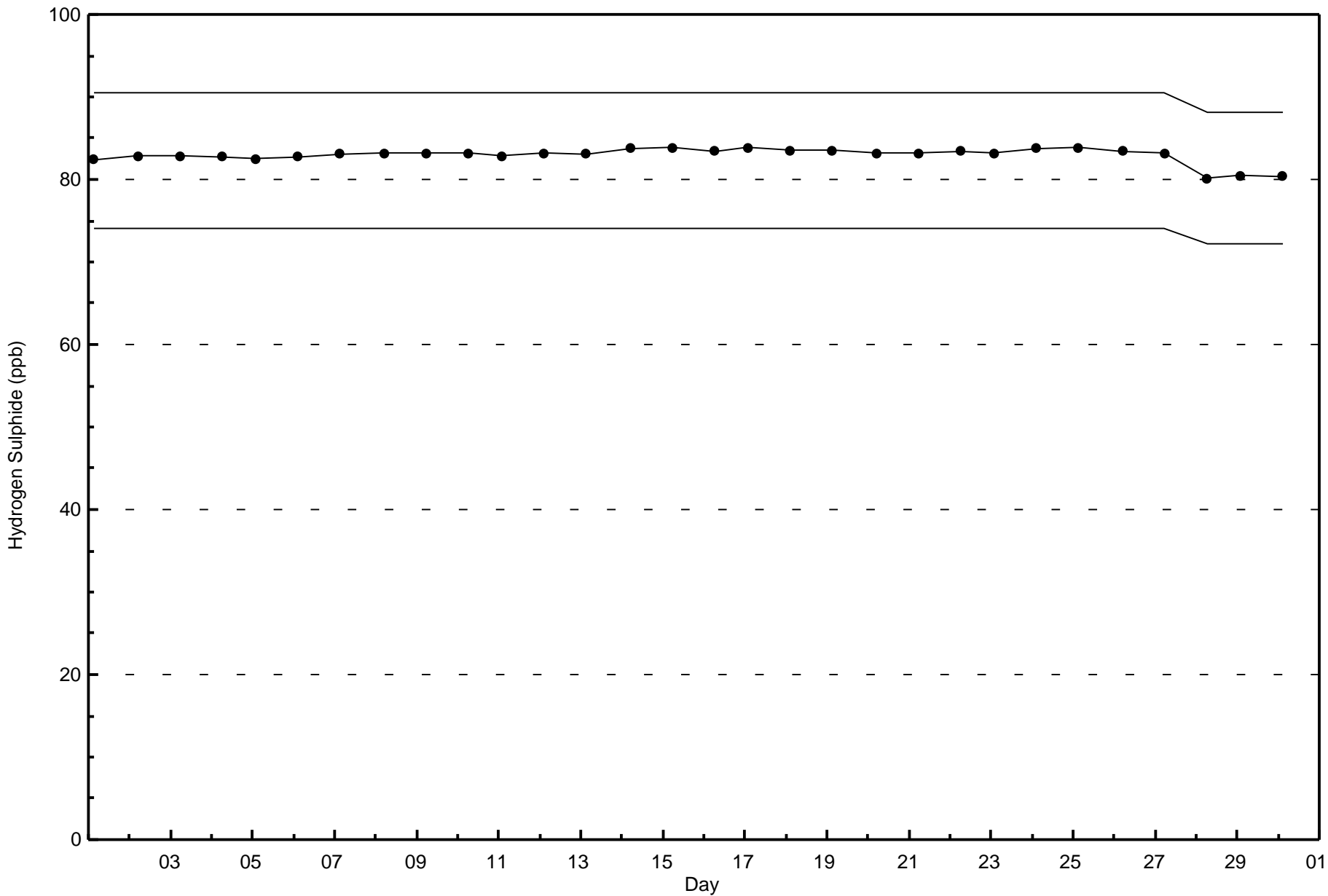




Wood Buffalo Environmental Association
Zero Responses

Hydrogen Sulphide (H₂S) - ppb
ConocoPhillips - Surrmont - June 2016







Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Oxide (NO) - ppb

ConocoPhillips - Surmont - June 2016

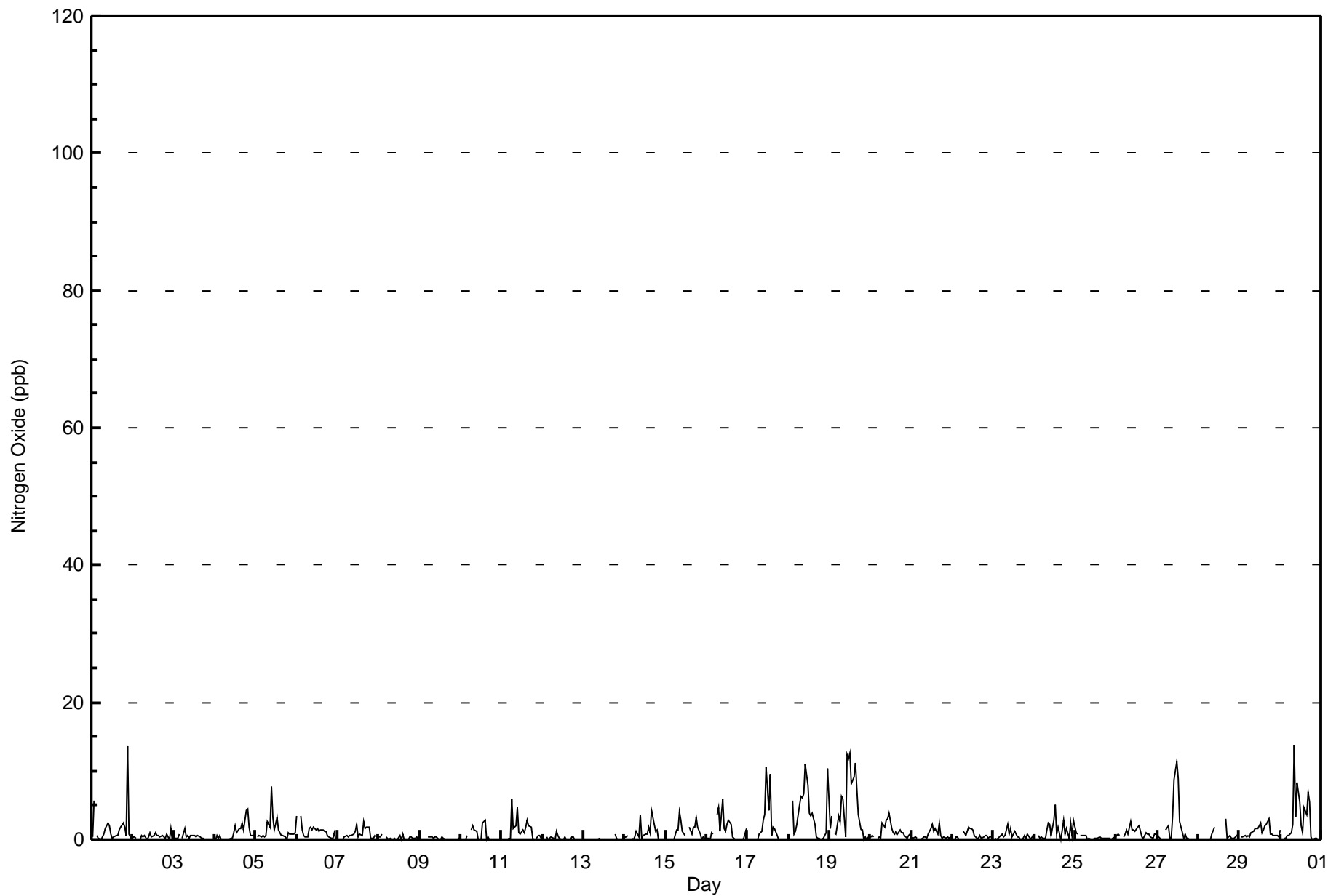
Maximum Value: 14 ppb on Jun 30 09:00		Maximum Daily Average: 4.6 ppb on Jun 19		Hours in Service: 720																						
Minimum Value: 0 ppb on Jun 2 05:00		Minimum Daily Average: 0.1 ppb on Jun 9		Hours of Data: 674																						
Maximum Diurnal Average: 2.6 ppb at hour 12		Minimum Diurnal Average: 0.3 ppb at hour 21		Hours of Missing Data: 46																						
Monthly Average: 1.2 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 0 Median = 1 Q ₃ = 1 P ₉₀ = 3 P ₉₉ = 11		Hours of Calibration: 36																						
				Percent Operational Time: 98.6																						
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-Jun	0	6	Z	1	0	0	0	1	2	2	2	1	0	0	1	1	1	2	3	2	1	14	1	0	1.7	14
2-Jun	0	0	0	Z	0	1	1	1	0	0	1	0	1	1	1	1	0	1	0	0	1	0	2	0	0.5	2
3-Jun	0	0	0	1	Z	0	2	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0.4	2
4-Jun	0	1	0	1	0	Z	0	0	0	0	0	1	2	1	2	2	1	4	4	2	1	1	1	1	1.1	4
5-Jun	Z	0	1	0	1	0	1	3	2	8	3	1	3	1	1	1	1	0	0	1	1	1	1	1	1.4	8
6-Jun	3	Z	3	1	1	0	0	2	2	1	2	1	2	1	1	2	1	1	1	0	0	0	1	0	1.3	3
7-Jun	0	0	Z	0	0	1	0	1	1	1	1	2	0	1	1	3	2	2	2	0	0	0	1	0	0.8	3
8-Jun	0	0	1	Z	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0.2	1
9-Jun	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
10-Jun	0	0	0	0	1	Z	1	2	1	1	0	0	0	2	3	0	0	0	0	0	0	0	0	0	0.5	3
11-Jun	Z	0	0	0	0	0	6	2	2	5	1	1	1	1	2	3	2	2	0	0	0	1	1	0	1.3	6
12-Jun	0	Z	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
13-Jun	0	0	Z	0	0	0	0	0	0	0	PF	PF	PF	PF	PF	PF	PF	PF	1	0	0	0	0	0	--	1
14-Jun	0	0	1	Z	0	0	0	1	1	4	0	1	1	1	2	1	4	2	1	1	0	0	0	0	0.9	4
15-Jun	0	0	0	0	Z	0	1	1	4	3	1	1	PF	PF	2	1	2	2	3	2	1	0	0	0	1.1	4
16-Jun	0	0	0	1	1	Z	4	5	1	6	2	1	2	3	2	0	0	0	0	0	0	0	0	2	1.3	6
17-Jun	Z	0	0	0	0	0	0	1	1	3	4	11	4	10	1	2	2	1	0	0	0	0	0	0	1.7	11
18-Jun	0	Z	6	1	1	2	5	6	6	7	11	8	4	3	4	2	0	0	0	0	0	1	1	10	3.5	11
19-Jun	2	3	Z	1	1	4	3	6	6	0	12	12	13	8	9	11	7	4	1	1	0	0	0	1	4.6	13
20-Jun	0	1	0	Z	0	1	0	2	2	3	3	4	2	1	1	1	1	1	1	1	1	0	1	1	1.2	4
21-Jun	0	0	0	0	Z	0	0	0	0	0	1	2	2	1	2	1	2	1	0	0	0	0	0	0	0.7	2
22-Jun	0	0	0	0	0	Z	1	1	1	2	2	2	1	1	0	0	1	0	0	1	1	0	0	0	0.6	2
23-Jun	Z	0	0	0	1	1	1	1	2	1	2	0	1	1	0	0	0	0	1	0	1	0	0	1	0.6	2
24-Jun	1	Z	1	0	0	0	0	1	2	2	1	3	5	1	2	0	1	3	1	2	0	2	1	3	1.4	5
25-Jun	1	1	Z	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
26-Jun	1	1	1	Z	0	1	1	1	3	1	1	1	2	2	1	0	0	1	1	1	0	0	1	1	1.0	3
27-Jun	1	0	0	0	Z	1	2	0	0	3	9	11	9	3	2	0	1	0	0	0	0	0	0	0	1.9	11
28-Jun	0	0	0	0	0	Z	0	0	1	2	C	C	C	C	C	C	3	0	1	0	0	0	0	1	--	3
29-Jun	Z	0	0	1	0	1	0	1	1	2	2	2	2	1	1	2	2	3	1	1	1	1	1	0	1.1	3
30-Jun	1	Z	0	0	1	1	1	2	14	3	8	5	2	1	5	4	7	6	0	0	0	0	0	0	2.7	14
																								Diurnal Average		
																								Diurnal Maximum		
																								0.5 3		
																								0.6 6		
																								0.6 6		
																								0.4 1		
																								0.4 1		
																								0.6 4		
																								1.1 6		
																								1.4 6		
																								1.9 14		
																								2.1 8		
																								2.5 12		
																								2.6 12		
																								2.3 13		
																								1.7 10		
																								1.7 9		
																								1.4 11		
																								1.6 7		
																								1.2 6		
																								0.8 4		
																								0.7 4		
																								0.3 2		
																								0.7 14		
																								0.4 2		
																								0.8 10		

Z - zerospan C - Calibration PF - Power Failure



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxide (NO) - ppb
ConocoPhillips - Surmont - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
ConocoPhillips - Surmont - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	674	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: 674

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxide (NO) - ppb
ConocoPhillips - Surmont - June 2016**

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	24	20	10	13	35	57	46	53	27	44	89	64	77	33	49	672
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
Totals	31	24	20	10	13	35	57	46	53	27	44	89	64	77	33	49	672

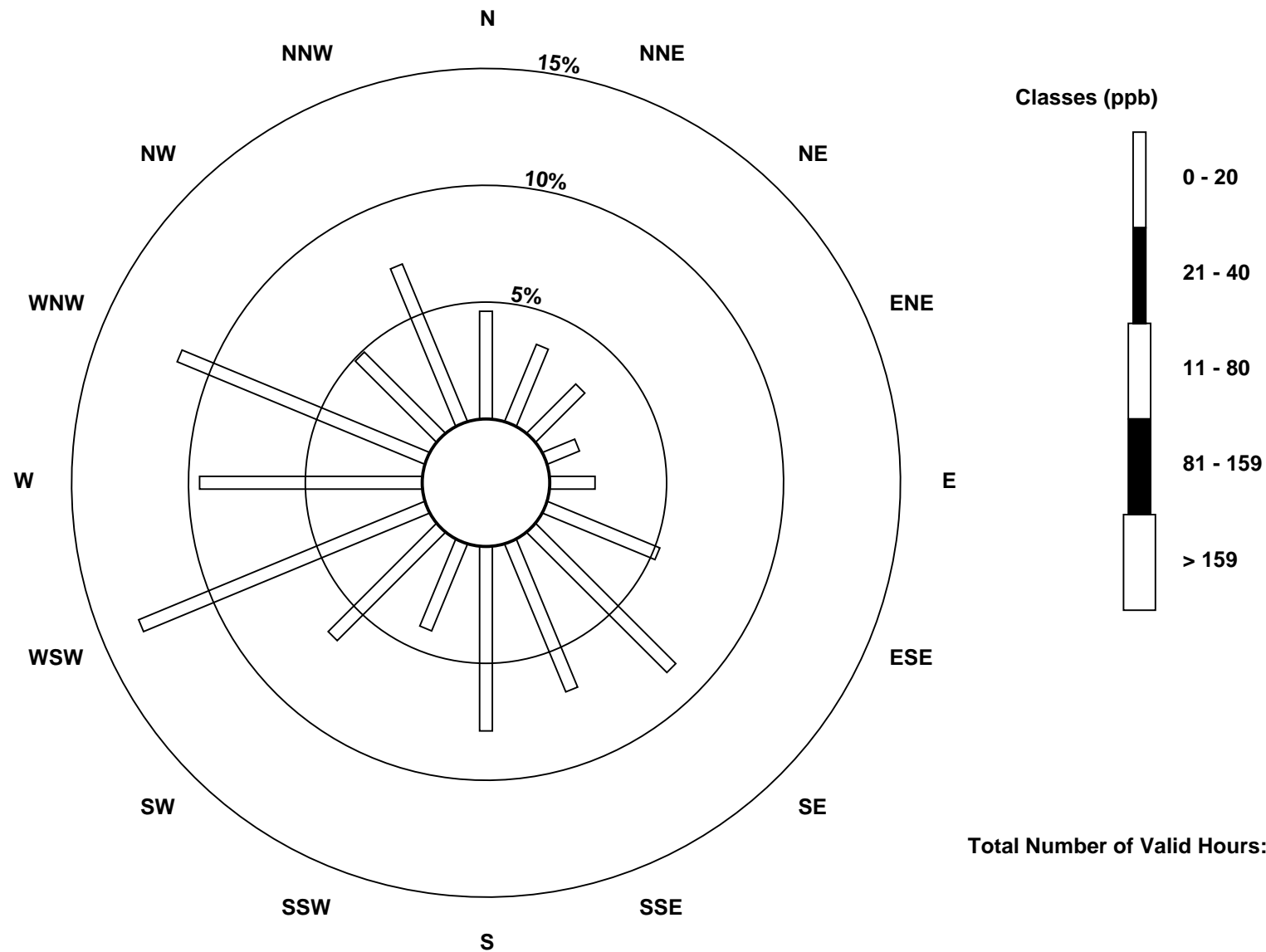
Total Number of Valid Hours: 672

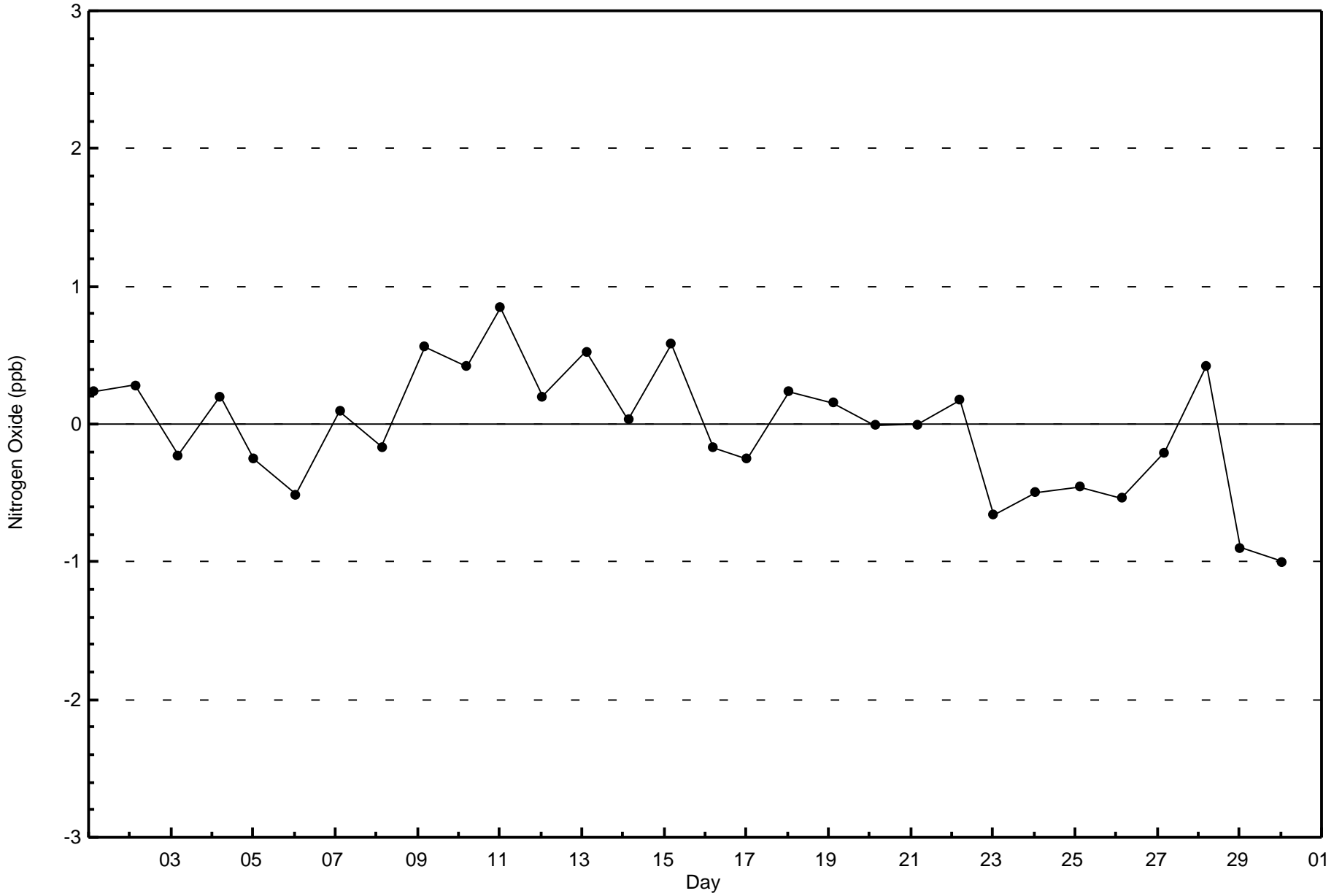
Total Number of Hours: 720

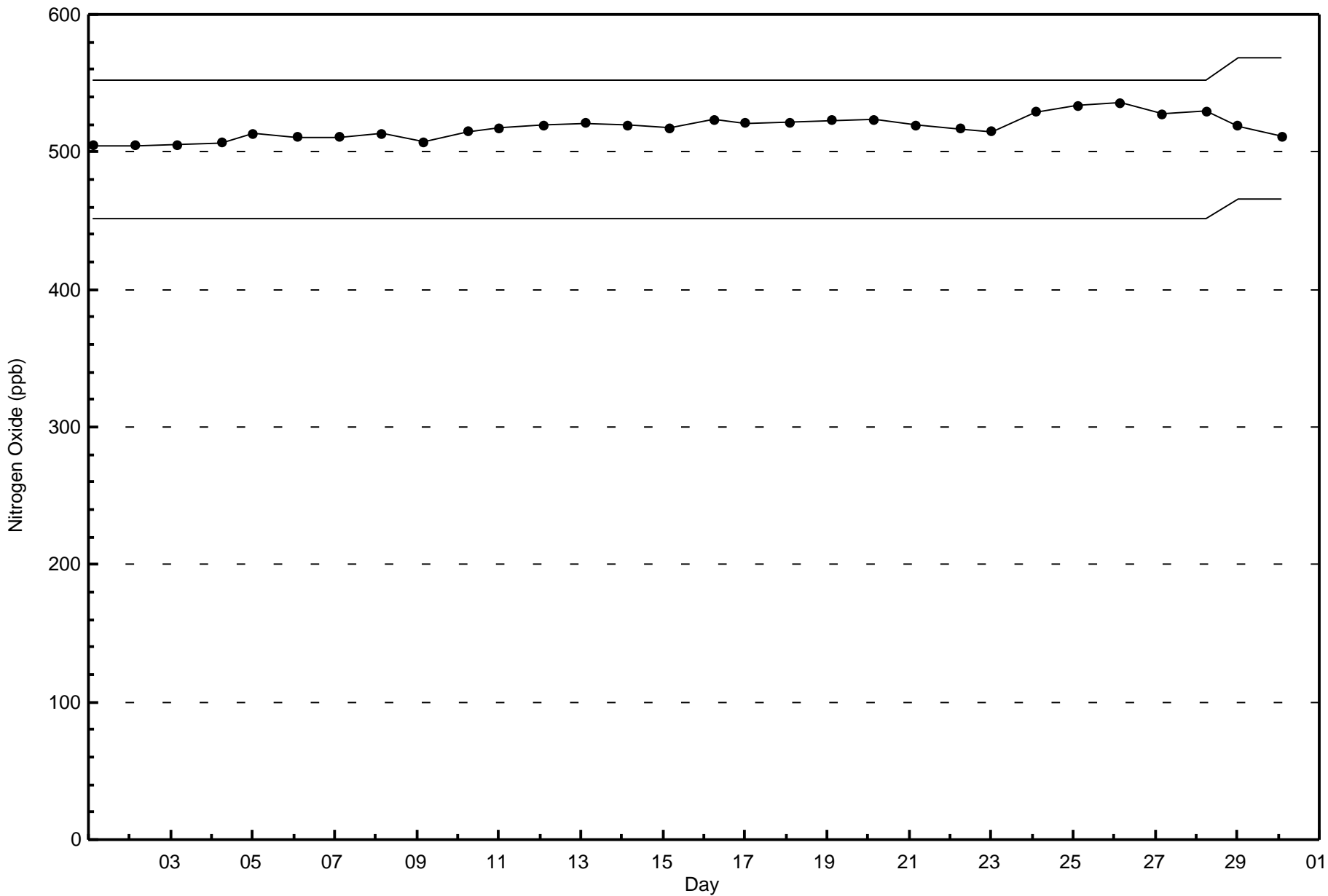


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxide (NO) - ppb
ConocoPhillips - Surmont (AMS502)









Wood Buffalo Environmental Association

Summary of Hour Averages

Nitrogen Dioxide (NO₂) - ppb

ConocoPhillips - Surmont - June 2016

Number of Exceedences (AAQO):	1-hr: 0	24-hr: 0	Hours in Service:	720
Maximum Value: 9 ppb on Jun 6 23:00	Maximum Daily Average: 3.8 ppb on Jun 6		Hours of Data:	674
Minimum Value: 0 ppb on Jun 3 19:00	Minimum Daily Average: 0.5 ppb on Jun 3		Hours of Missing Data:	46
Maximum Diurnal Average: 2.3 ppb at hour 12	Minimum Diurnal Average: 0.9 ppb at hour 22		Hours of Calibration:	36
Monthly Average: 1.5 ppb	Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 1 Q ₃ = 2 P ₉₀ = 4 P ₉₉ = 8		Percent Operational Time:	98.6

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-Jun	0	5	Z	1	1	1	1	2	3	3	3	1	1	1	1	1	1	1	2	1	1	6	1	1	1.6	6
2-Jun	1	1	2	Z	1	3	2	1	1	1	3	1	1	1	1	1	1	2	1	1	2	0	2	1	1.3	3
3-Jun	0	1	1	1	Z	1	1	1	1	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0.5	1
4-Jun	0	1	1	1	0	Z	1	1	0	0	0	1	2	1	1	1	2	1	3	4	2	0	1	0	1.1	4
5-Jun	Z	1	1	1	1	1	1	3	2	4	2	1	3	2	1	1	1	1	1	2	1	1	1	1	1.2	4
6-Jun	7	Z	9	4	1	1	2	2	4	4	3	3	3	3	3	3	7	6	6	2	1	1	9	2	3.8	9
7-Jun	2	1	Z	1	1	1	1	1	1	1	3	1	1	0	3	3	3	3	3	1	1	1	1	1	1.4	3
8-Jun	1	1	1	Z	2	3	7	7	5	3	3	2	2	2	1	2	2	1	1	1	1	0	1	0	2.1	7
9-Jun	0	0	1	0	Z	1	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0.5	1
10-Jun	0	0	0	0	1	Z	2	2	2	2	1	1	1	3	4	2	2	1	1	1	0	0	1	1	1.2	4
11-Jun	Z	1	2	1	1	2	8	4	4	1	1	1	2	1	0	1	2	2	1	1	0	1	1	1	1.6	8
12-Jun	1	Z	2	1	1	1	1	1	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2
13-Jun	0	0	Z	0	0	0	0	0	0	1	PF	PF	PF	PF	PF	PF	PF	PF	0	0	0	0	0	0	--	1
14-Jun	0	1	1	Z	1	1	1	1	1	6	1	0	1	1	2	2	5	5	6	5	1	1	1	1	1.9	6
15-Jun	0	0	0	1	Z	1	1	4	6	4	2	2	PF	PF	1	2	4	5	8	4	4	1	1	1	2.3	8
16-Jun	1	2	1	3	3	Z	5	5	2	5	2	2	3	4	4	1	1	0	0	0	0	0	1	1	1.8	5
17-Jun	Z	0	0	0	0	0	0	1	1	2	1	4	2	4	1	2	1	1	0	0	0	0	0	0	0.9	4
18-Jun	0	Z	4	1	2	2	2	3	3	4	5	4	3	3	3	3	0	0	0	0	0	0	0	8	2.2	8
19-Jun	1	3	Z	1	2	3	2	4	4	1	6	6	6	4	5	7	4	2	1	1	1	1	2	1	3.1	7
20-Jun	1	1	1	Z	1	1	1	3	2	3	3	4	2	2	1	2	1	2	1	1	1	1	1	1	1.6	4
21-Jun	0	1	1	1	Z	1	1	0	1	0	1	2	2	2	1	1	2	1	1	1	1	1	1	1	0.9	2
22-Jun	1	1	1	1	1	Z	3	3	1	2	3	3	2	1	1	1	2	1	1	1	1	1	1	1	1.4	3
23-Jun	Z	3	1	1	1	1	1	1	3	2	3	1	2	1	1	2	1	1	1	1	2	1	1	2	1.5	3
24-Jun	4	Z	2	1	2	2	1	3	4	2	2	3	6	3	3	1	2	4	2	3	1	2	1	2	2.5	6
25-Jun	2	3	Z	2	2	2	1	1	1	0	0	0	0	0	0	0	0	1	0	0	1	2	1	1	0.9	3
26-Jun	1	1	0	Z	2	1	1	1	3	3	2	1	2	3	3	1	1	1	2	2	2	0	1	2	1.4	3
27-Jun	1	0	0	0	Z	2	2	0	1	2	4	9	6	2	2	1	1	1	1	1	1	0	0	0	1.6	9
28-Jun	0	0	0	1	1	Z	0	0	1	2	C	C	C	C	C	C	2	1	1	1	1	1	1	1	--	2
29-Jun	Z	2	2	3	2	2	1	1	1	1	1	1	2	1	2	1	3	2	1	0	0	1	2	1	1.4	3
30-Jun	3	Z	1	1	2	2	2	3	8	4	4	4	2	2	5	3	5	4	1	1	2	1	1	1	2.5	8

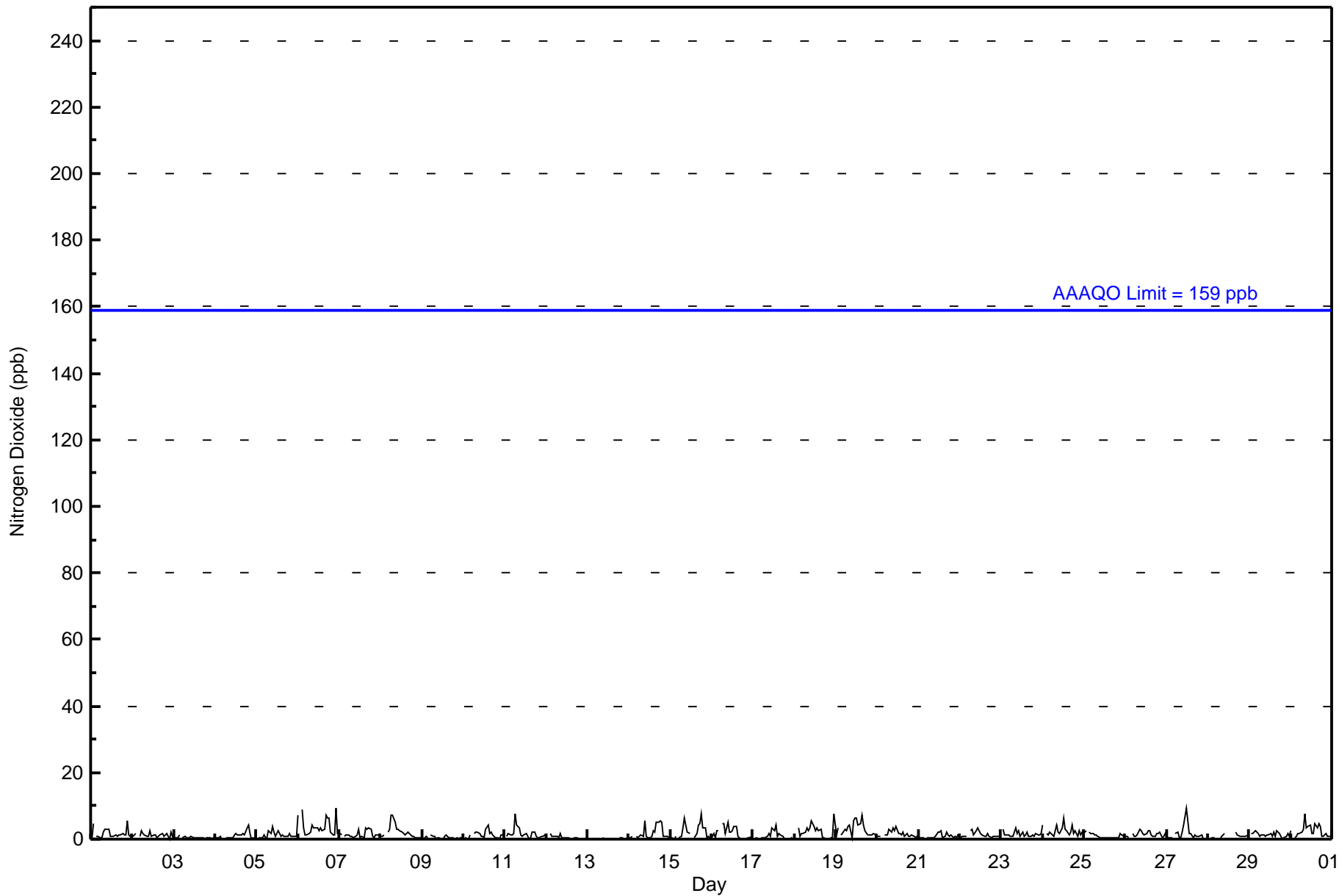
1.1	1.1	1.3	1.1	1.2	1.3	1.7	2.0	2.2	2.1	2.1	2.3	2.0	1.8	1.7	1.6	2.0	1.8	1.5	1.2	0.9	0.9	1.1	1.1	Diurnal Average
7	5	9	4	3	3	8	7	8	6	6	9	6	4	5	7	7	6	8	5	4	6	9	8	Diurnal Maximum

Z - zerspan C - Calibration PF - Power Failure
 Alberta Ambient Air Quality Objectives (AAQO): 1-hr 159 ppb



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	674	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: 674

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont - June 2016**

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	24	20	10	13	35	57	46	53	27	44	89	64	77	33	49	672
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
Totals	31	24	20	10	13	35	57	46	53	27	44	89	64	77	33	49	672

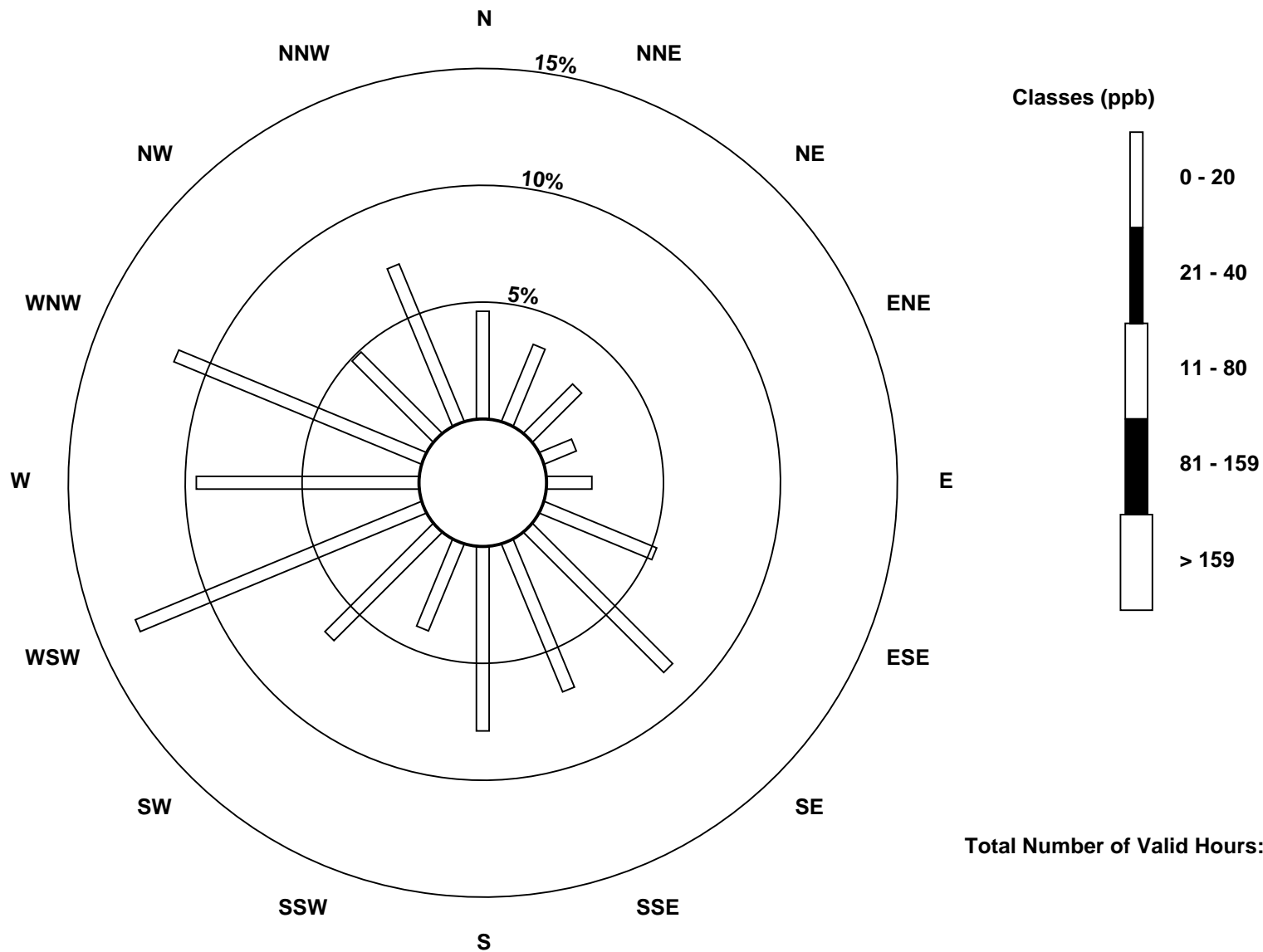
Total Number of Valid Hours: 672

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

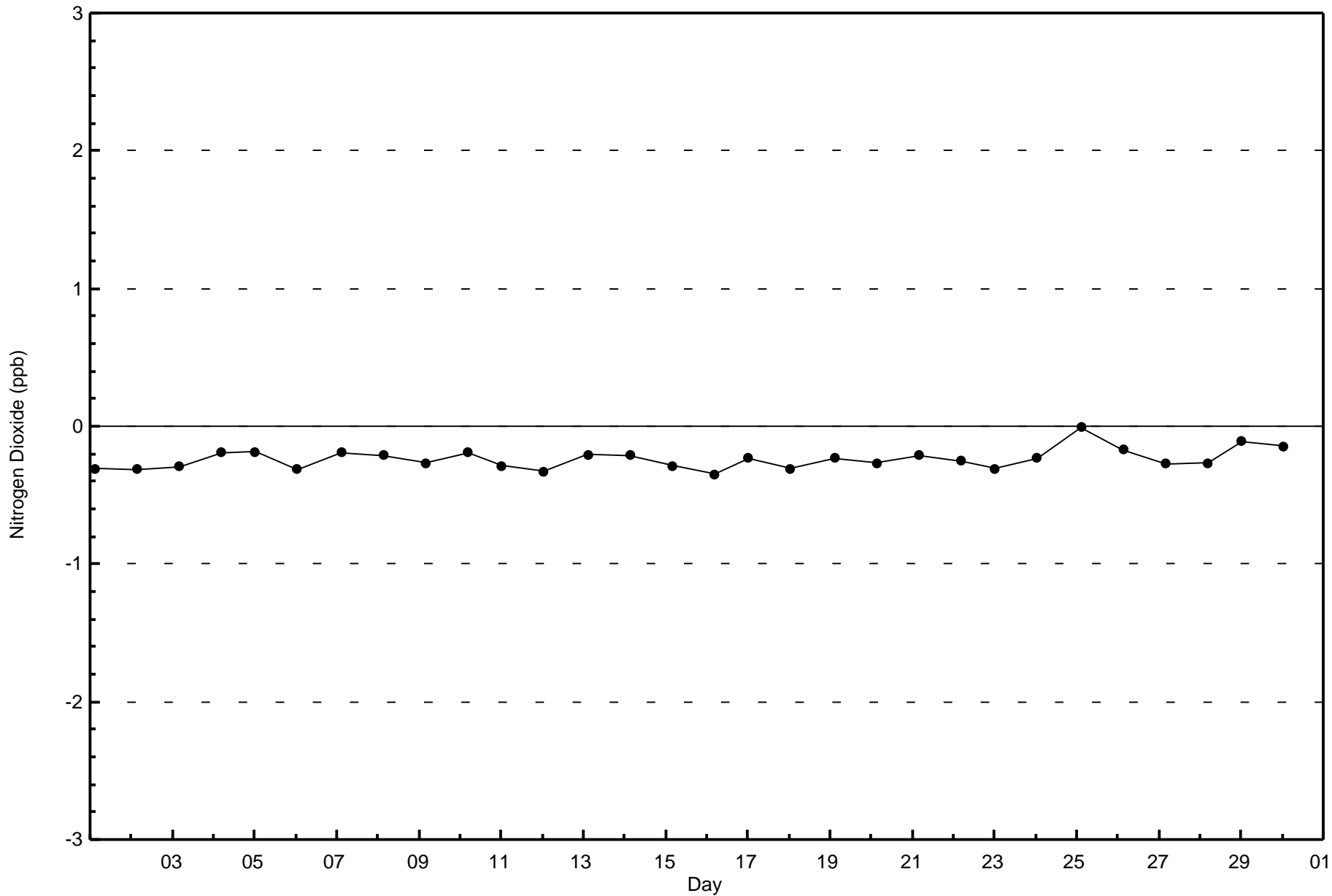
Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surmont (AMS502)

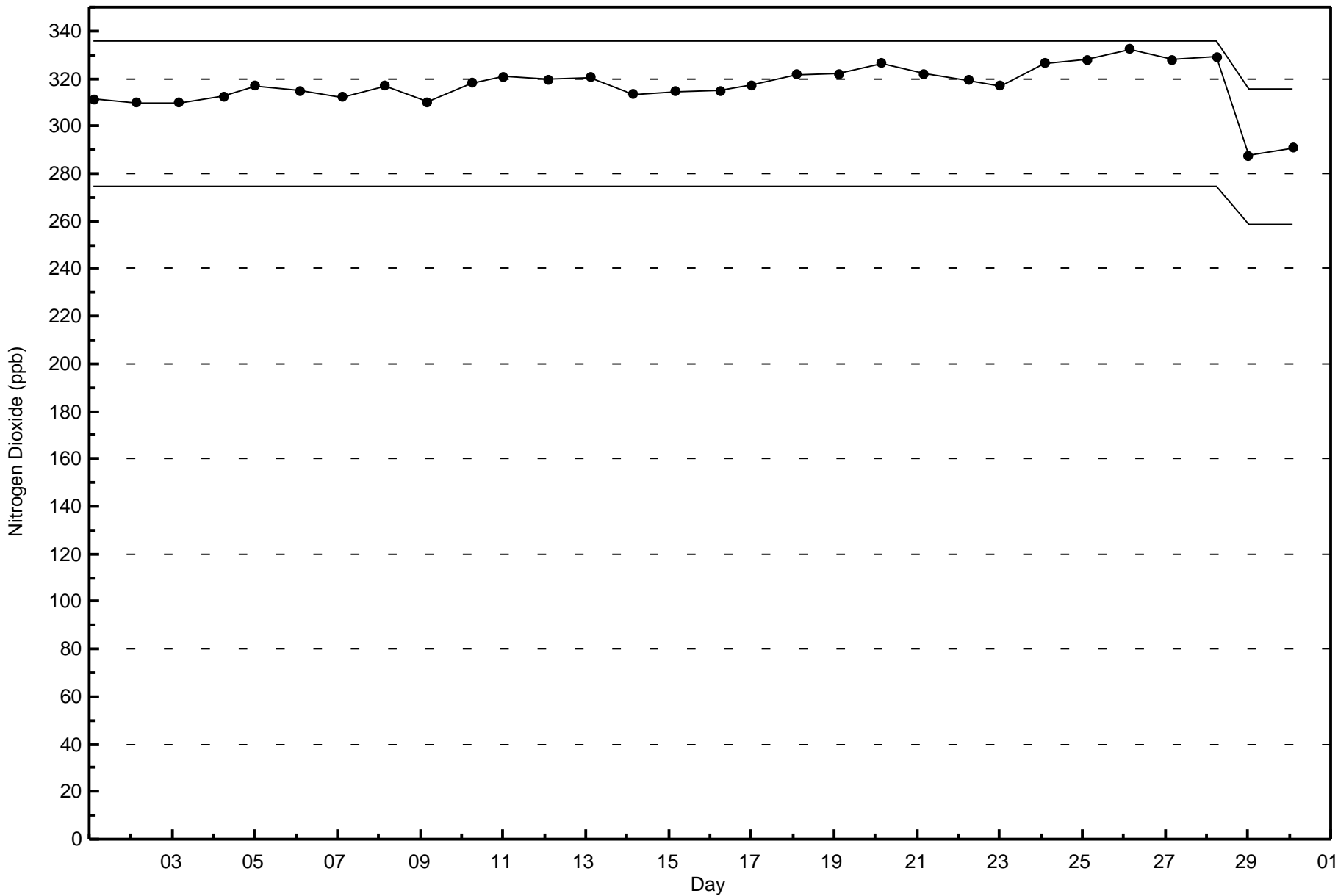




Wood Buffalo Environmental Association
Zero Responses

Nitrogen Dioxide (NO₂) - ppb
ConocoPhillips - Surrmont - June 2016







Wood Buffalo Environmental Association
Summary of Hour Averages

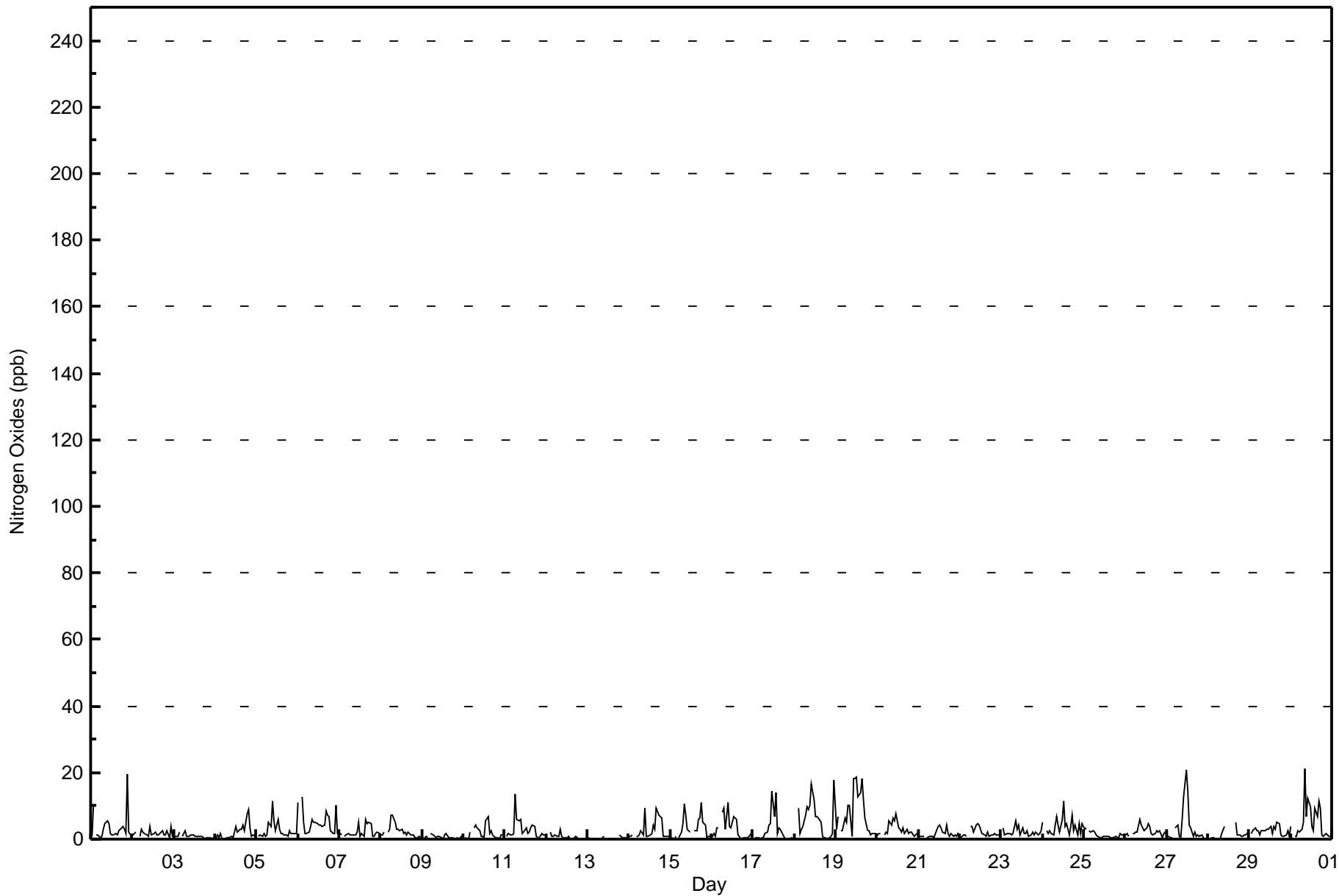
Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont - June 2016

Maximum Value: 21 ppb on Jun 30 09:00		Maximum Daily Average: 7.7 ppb on Jun 19		Hours in Service: 720																						
Minimum Value: 0 ppb on Jun 3 23:00		Minimum Daily Average: 0.6 ppb on Jun 9		Hours of Data: 674																						
Maximum Diurnal Average: 4.8 ppb at hour 12		Minimum Diurnal Average: 1.3 ppb at hour 21		Hours of Missing Data: 46																						
Monthly Average: 2.7 ppb		Percentiles: P ₁ = 0 P ₁₀ = 0 Q ₁ = 1 Median = 2 Q ₃ = 3 P ₉₀ = 6 P ₉₉ = 18		Hours of Calibration: 36																						
				Percent Operational Time: 98.6																						
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-Jun	1	10	Z	1	1	1	1	3	4	6	5	2	1	1	2	1	3	3	4	3	2	19	2	1	3.4	19
2-Jun	1	2	2	Z	1	3	2	2	1	1	4	1	2	2	1	1	2	2	1	1	3	0	4	1	1.8	4
3-Jun	0	1	1	2	Z	1	2	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.8	2
4-Jun	0	1	1	1	0	Z	1	1	0	1	1	2	4	2	3	3	4	3	8	9	4	1	1	1	2.2	9
5-Jun	Z	1	1	1	2	1	1	5	4	11	5	3	6	3	2	2	1	1	1	3	1	2	2	2	2.6	11
6-Jun	11	Z	13	5	2	2	2	4	6	5	5	5	4	4	4	4	8	7	7	3	1	2	10	2	5.0	13
7-Jun	2	1	Z	1	1	2	1	1	1	1	2	5	1	2	1	6	4	5	5	1	1	2	2	2	2.2	6
8-Jun	1	1	2	Z	2	3	7	7	5	3	3	2	3	2	2	1	2	1	1	1	1	0	1	0	2.4	7
9-Jun	0	0	1	0	Z	2	1	1	0	1	1	0	0	1	2	0	0	0	0	0	0	0	0	1	0.6	2
10-Jun	0	0	0	0	2	Z	3	4	3	3	1	1	1	5	7	2	2	1	0	1	0	0	1	1	1.7	7
11-Jun	Z	1	2	1	1	2	13	6	6	6	2	2	3	2	2	3	4	4	1	1	0	2	1	1	2.9	13
12-Jun	1	Z	2	1	1	1	1	1	3	1	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0.7	3
13-Jun	0	0	Z	0	0	0	0	0	0	1	PF	PF	PF	PF	PF	PF	PF	PF	1	1	0	0	0	0	--	1
14-Jun	1	1	1	Z	1	1	1	3	1	9	1	1	1	2	4	3	10	7	6	1	1	1	1	1	2.8	10
15-Jun	0	0	0	1	Z	1	2	5	11	7	3	2	PF	PF	2	3	6	7	11	5	4	1	1	1	3.4	11
16-Jun	1	2	1	3	3	Z	8	9	3	11	4	4	5	7	6	1	1	0	0	0	0	0	1	2	3.2	11
17-Jun	Z	0	0	0	0	0	0	2	2	4	5	14	7	14	2	3	3	1	0	0	0	0	0	0	2.6	14
18-Jun	0	Z	9	2	3	4	7	10	9	10	16	12	7	7	6	5	1	1	0	0	0	1	1	18	5.6	18
19-Jun	3	7	Z	2	2	6	5	10	10	1	18	18	19	13	14	18	12	6	3	3	1	2	2	2	7.7	19
20-Jun	1	1	1	Z	1	2	2	6	4	6	5	8	3	3	2	3	2	3	2	2	2	1	1	1	2.8	8
21-Jun	1	1	1	1	Z	1	1	1	1	1	2	4	4	4	2	2	4	2	1	2	1	1	1	2	1.6	4
22-Jun	1	1	1	1	1	Z	4	4	2	4	5	4	3	2	1	1	2	1	1	1	2	1	1	1	2.0	5
23-Jun	Z	3	1	2	2	2	1	2	6	3	4	1	3	2	1	2	1	1	2	1	2	1	2	2	2.1	6
24-Jun	5	Z	2	2	3	2	1	4	7	4	2	6	11	4	5	1	4	7	3	4	1	5	2	5	3.9	11
25-Jun	3	3	Z	3	2	2	2	1	1	0	0	1	1	1	1	1	0	1	1	1	1	2	1	1	1.3	3
26-Jun	1	2	1	Z	2	2	2	2	6	4	3	3	3	5	4	2	1	2	2	2	3	1	2	2	2.4	6
27-Jun	1	1	1	0	Z	3	4	1	1	6	13	21	14	4	4	1	2	1	1	1	1	0	0	0	3.5	21
28-Jun	0	0	0	1	1	Z	0	0	2	4	C	C	C	C	C	C	5	1	1	1	1	1	1	2	--	5
29-Jun	Z	2	2	3	3	2	1	2	2	2	3	3	4	2	4	3	5	5	1	1	1	1	2	1	2.5	5
30-Jun	4	Z	1	1	3	2	3	5	21	7	12	10	4	3	9	7	11	9	1	1	2	1	1	1	5.2	21
																								Diurnal Average		
																								Diurnal Maximum		
Z - zerspan C - Calibration PF - Power Failure																										



Wood Buffalo Environmental Association
Hourly Averages

Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surrmont - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont - June 2016**

Concentration Ranges (ppb)	Number of Hours	%	Cumulative %
0 - 20	672	99.70	99.70
21 - 40	2	0.30	100.00
11 - 80	0	0.00	100.00
81 - 159	0	0.00	100.00
> 159	0	0.00	100.00

Total Number of Valid Hours: 674

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont - June 2016**

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	24	20	10	13	35	57	46	52	27	44	89	64	77	32	49	670
21 - 40	0	0	0	0	0	0	0	0	1	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
Totals	31	24	20	10	13	35	57	46	53	27	44	89	64	77	33	49	672

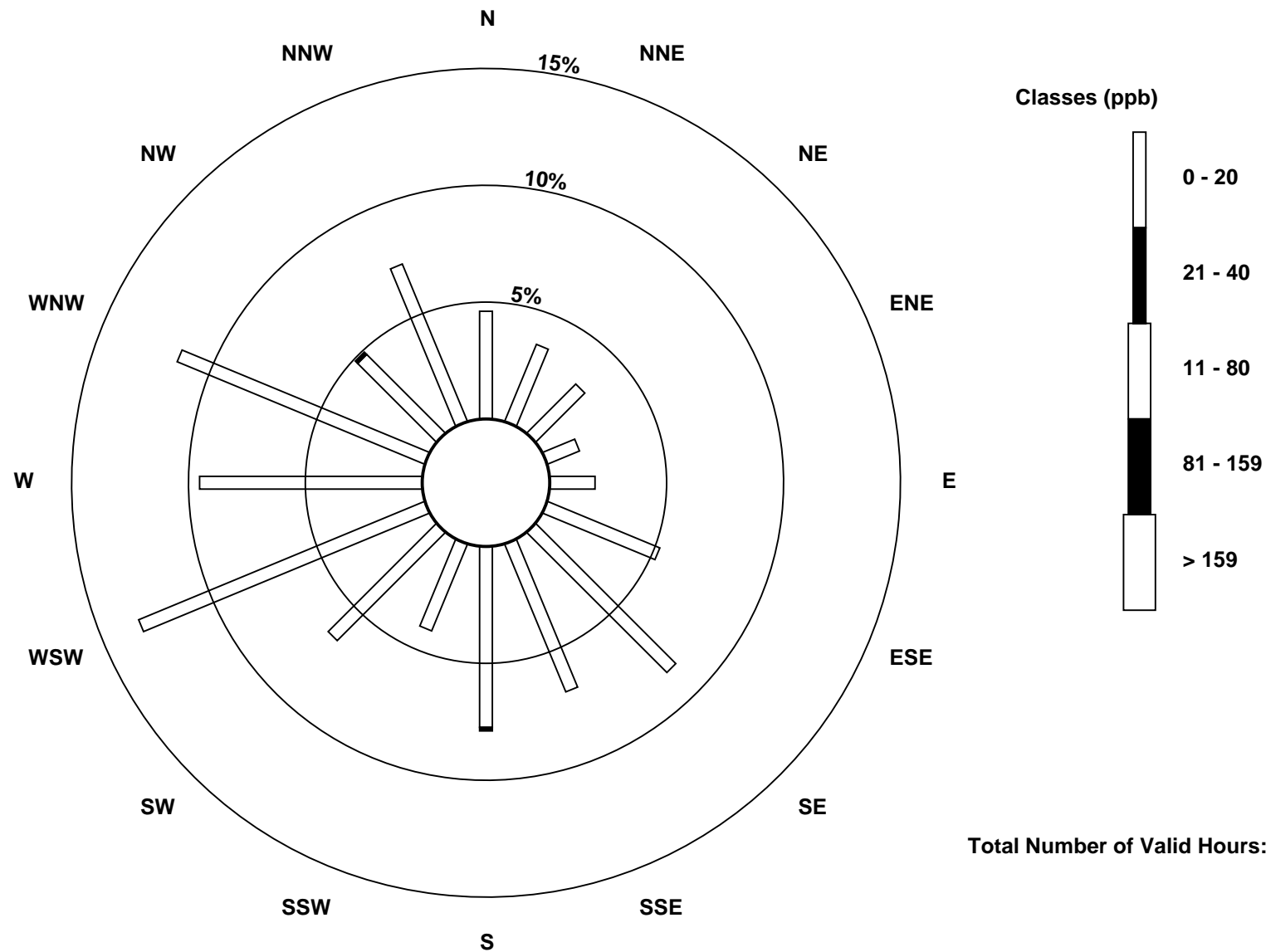
Total Number of Valid Hours: 672

Total Number of Hours: 720

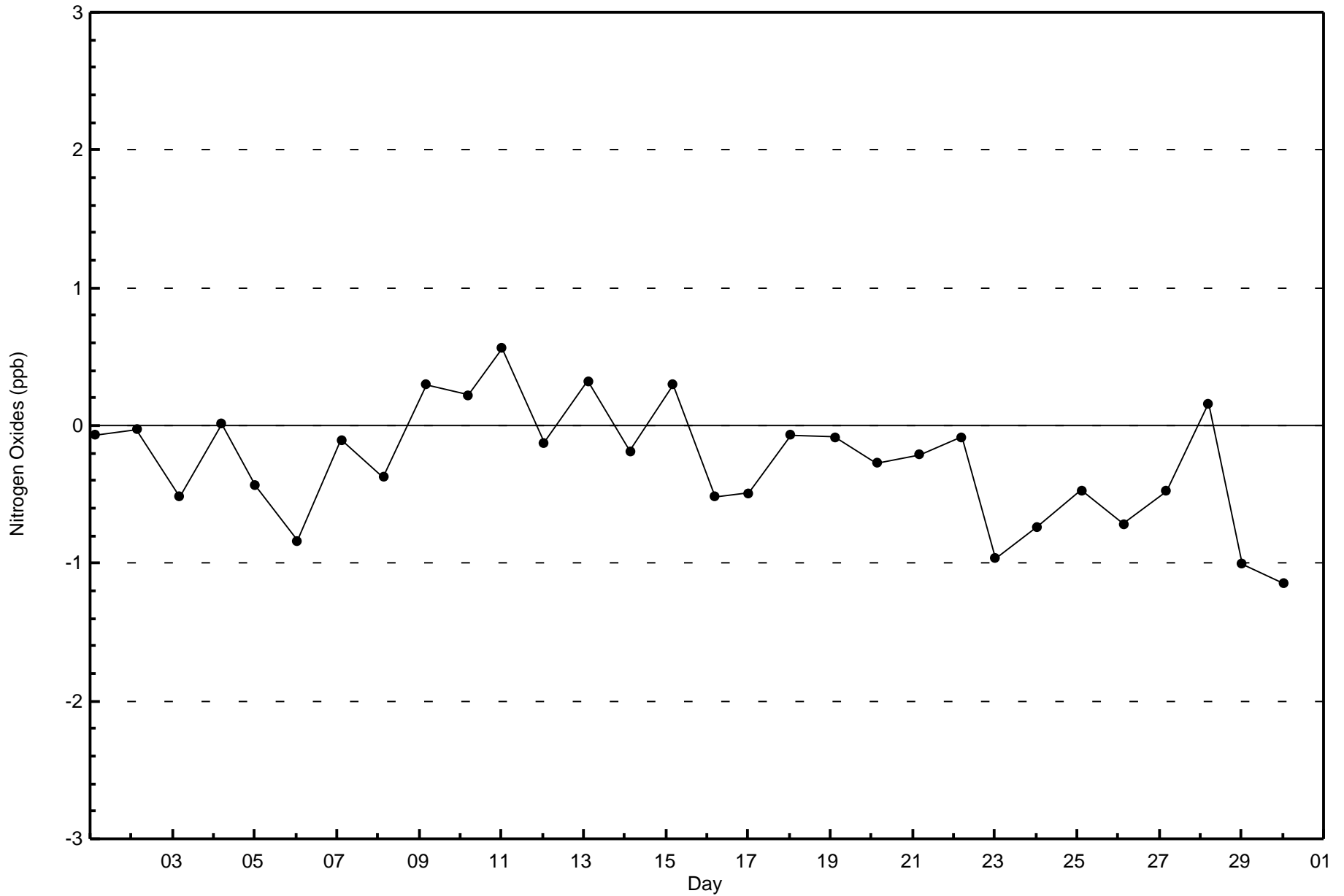


Wood Buffalo Environmental Association
Wind Rose Jun 2016

Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont (AMS502)



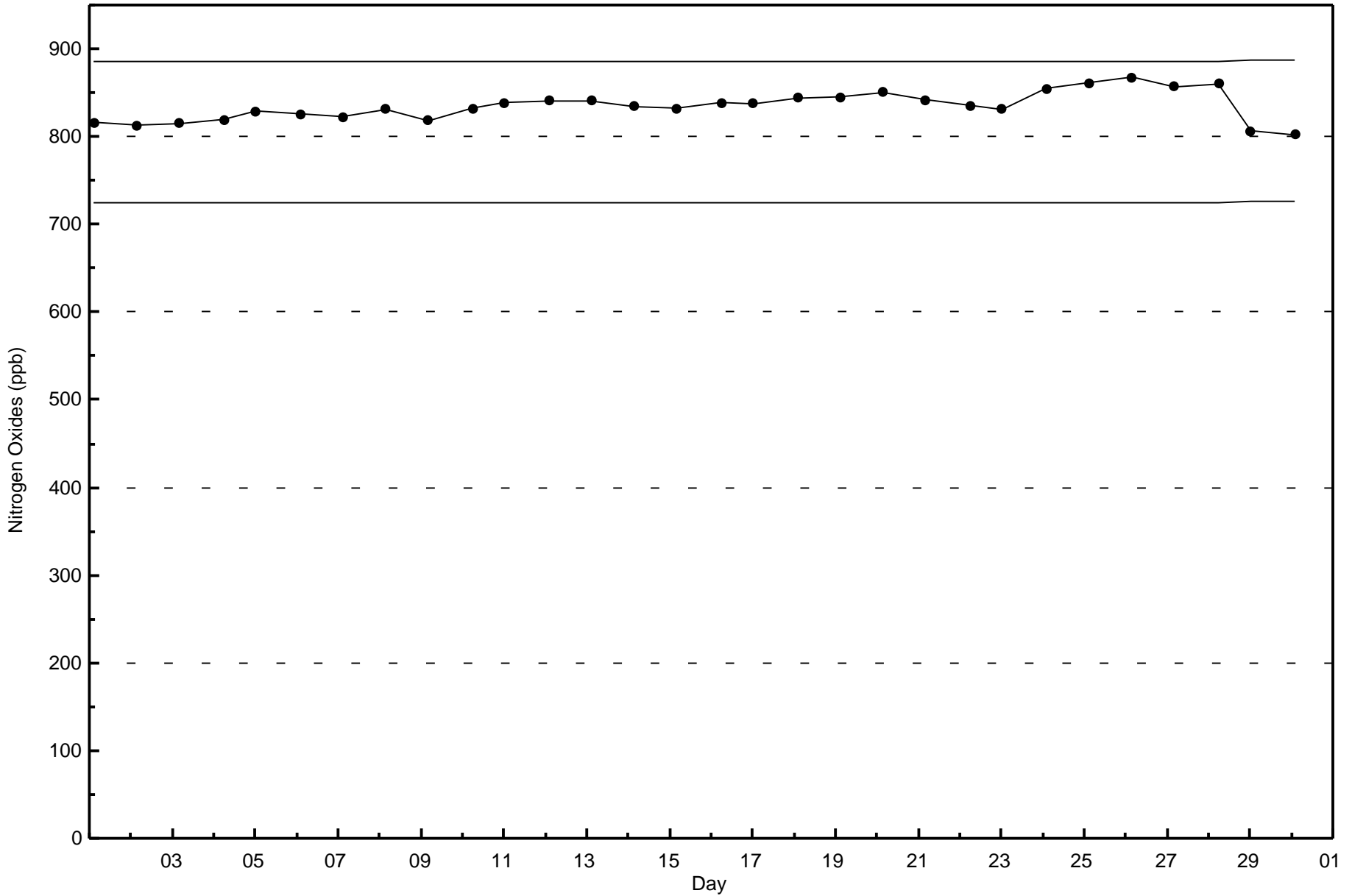
Total Number of Valid Hours: 672





Wood Buffalo Environmental Association
Span Responses

Nitrogen Oxides (NO_x) - ppb
ConocoPhillips - Surmont - June 2016





Wood Buffalo Environmental Association

Summary of Hour Averages

Ambient Temperature (AT) - C

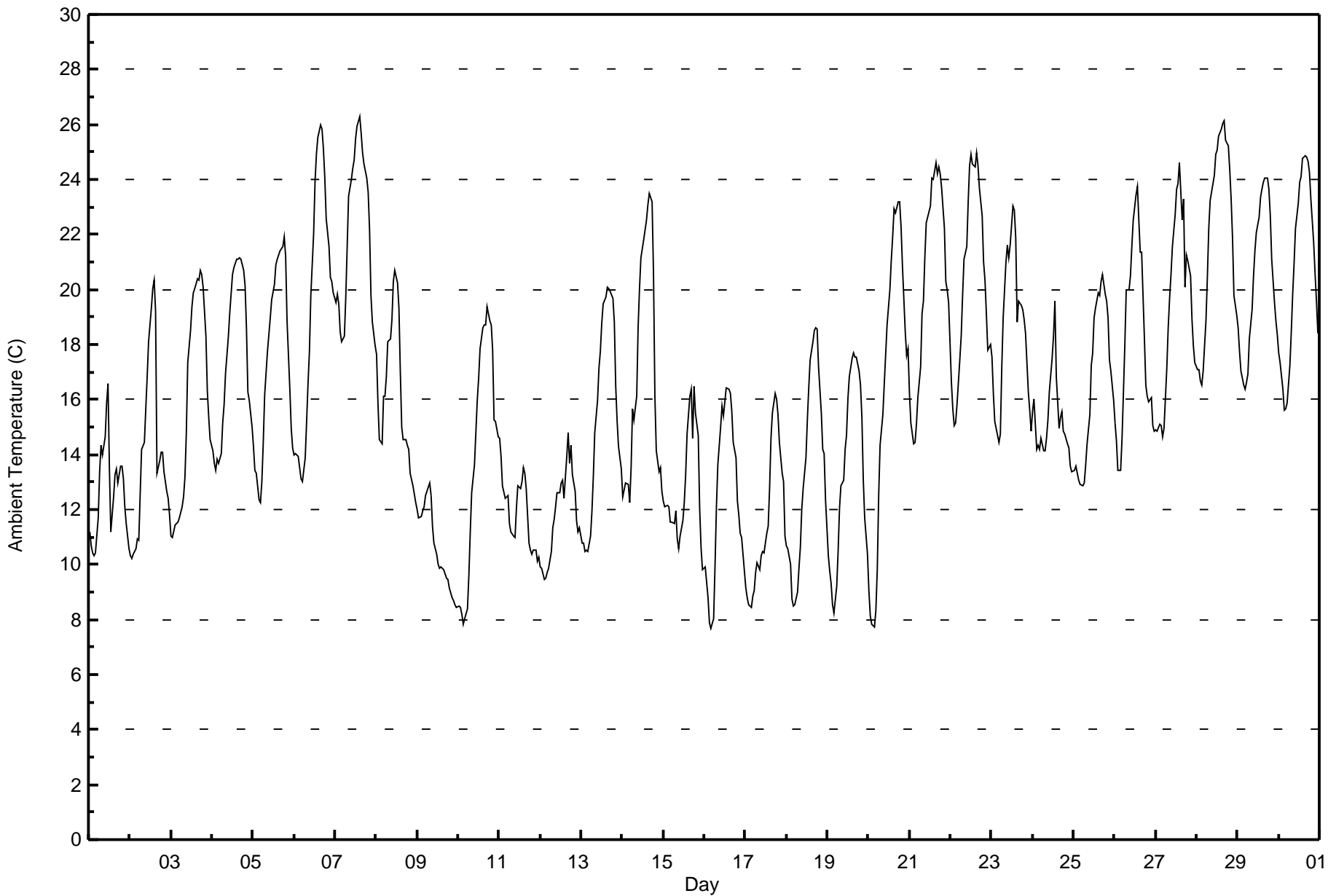
ConocoPhillips - Surmont - June 2016

Maximum Value: 26.3 C on Jun 7 15:00		Maximum Daily Average: 22.1 C on Jun 7		Hours in Service: 720																																												
Minimum Value: 7.7 C on Jun 16 05:00		Minimum Daily Average: 10.6 C on Jun 9		Hours of Data: 720																																												
Maximum Diurnal Average: 19.7 C at hour 15		Minimum Diurnal Average: 12.4 C at hour 4		Hours of Missing Data: 0																																												
Monthly Average: 16.27 C		Percentiles: P ₁ = 8.1 P ₁₀ = 10.4 Q ₁ = 12.8 Median = 15.8 Q ₃ = 19.8 P ₉₀ = 23.2 P ₉₉ = 25.8		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-Jun	11.2	10.7	10.4	10.3	10.4	11.7	13.4	14.3	14.0	14.6	15.9	16.6	13.5	11.2	12.5	13.3	13.5	13.0	13.6	13.6	13.1	12.1	11.5	10.6	12.7	16.6																						
2-Jun	10.3	10.2	10.4	10.6	10.9	10.9	12.6	14.2	14.5	15.7	16.8	18.1	19.3	20.0	20.3	19.2	13.3	13.8	14.1	14.1	13.4	12.6	12.4	11.8	14.1	20.3																						
3-Jun	11.0	11.0	11.5	11.5	11.5	11.7	12.1	12.5	13.2	14.8	17.3	18.5	19.4	19.9	20.0	20.4	20.3	20.7	20.5	20.1	18.3	16.3	15.4	14.5	15.9	20.7																						
4-Jun	14.1	13.7	13.4	13.8	13.7	14.0	15.1	15.8	16.9	18.3	19.1	19.8	20.5	20.8	21.1	21.1	21.1	21.1	20.7	20.1	18.6	16.3	15.9	15.0	17.5	21.1																						
5-Jun	14.3	13.4	13.3	12.3	12.2	13.0	14.4	16.2	17.7	18.4	19.0	19.6	20.2	20.9	21.1	21.3	21.4	21.6	21.9	21.2	18.9	16.4	14.9	14.2	17.4	21.9																						
6-Jun	14.0	14.0	13.9	13.5	13.1	13.0	13.9	15.2	16.6	17.7	19.8	22.0	23.9	24.9	25.5	26.0	25.8	25.1	24.0	22.6	21.6	20.4	20.3	19.9	19.5	26.0																						
7-Jun	19.5	19.8	19.5	18.4	18.1	18.3	19.7	21.5	23.4	24.0	24.4	24.7	25.5	25.9	26.3	25.7	24.9	24.5	24.0	23.6	22.2	19.8	18.8	18.0	22.1	26.3																						
8-Jun	17.7	15.9	14.5	14.4	16.1	16.1	16.8	18.1	18.2	18.9	20.3	20.7	20.2	19.3	17.0	15.0	14.6	14.6	14.3	14.2	13.3	12.9	12.6	12.2	16.2	20.7																						
9-Jun	12.0	11.7	11.7	12.0	12.1	12.5	12.8	13.0	12.5	11.4	10.8	10.4	10.0	9.9	9.9	9.8	9.7	9.5	9.5	9.2	8.8	8.7	8.5	8.5	10.6	13.0																						
10-Jun	8.5	8.4	8.2	7.8	8.0	8.4	9.6	11.2	12.6	13.6	14.8	16.0	16.8	17.9	18.6	18.7	18.7	19.4	18.8	18.7	17.8	15.3	15.2	14.7	14.1	19.4																						
11-Jun	14.6	13.9	12.9	12.4	12.5	12.5	11.5	11.2	11.0	11.0	12.0	12.9	12.8	13.0	13.5	13.3	12.7	10.8	10.5	10.4	10.5	10.5	10.1	10.3	12.0	14.6																						
12-Jun	9.9	9.9	9.5	9.5	9.7	9.9	10.5	11.3	11.6	12.1	12.6	12.6	13.0	13.1	12.4	13.9	14.8	13.7	14.3	13.3	12.7	11.6	11.2	11.3	11.8	14.8																						
13-Jun	10.8	10.8	10.5	10.5	10.5	11.0	12.0	13.2	14.8	16.0	17.1	17.8	18.7	19.5	19.7	20.1	20.1	20.0	19.7	18.8	16.5	15.2	14.3	13.5	15.5	20.1																						
14-Jun	12.5	12.7	13.0	12.9	12.3	13.5	15.7	15.2	16.1	18.6	20.0	21.1	21.8	22.2	22.5	23.1	23.5	23.2	20.6	16.1	14.1	13.4	13.5	12.7	17.1	23.5																						
15-Jun	12.3	12.1	12.1	12.1	11.5	11.5	11.5	12.0	10.9	10.6	11.1	11.6	12.2	13.3	14.7	16.1	16.4	14.6	16.5	15.5	14.7	12.0	10.6	9.8	12.7	16.5																						
16-Jun	9.9	9.4	8.8	7.9	7.7	8.0	10.0	12.1	13.6	15.0	15.8	15.4	15.9	16.4	16.4	16.2	15.5	14.4	13.9	12.3	11.8	11.1	11.0	9.8	12.4	16.4																						
17-Jun	9.2	8.8	8.5	8.4	8.8	9.0	9.7	10.1	9.8	10.3	10.5	10.4	11.1	11.4	12.8	14.6	15.5	16.2	16.0	15.4	14.4	13.3	13.0	11.0	11.6	16.2																						
18-Jun	10.7	10.6	10.0	8.7	8.5	8.5	9.0	9.9	10.6	12.0	12.8	13.9	15.2	16.4	17.4	18.1	18.5	18.6	18.6	17.2	15.5	14.2	14.1	12.3	13.4	18.6																						
19-Jun	10.3	9.8	9.3	8.6	8.2	9.2	10.5	12.1	12.9	13.1	14.2	14.7	16.0	16.9	17.5	17.7	17.5	17.5	17.0	16.5	15.3	13.1	11.7	10.4	13.3	17.7																						
20-Jun	9.1	8.1	7.9	7.7	8.3	9.8	12.5	14.4	15.5	16.6	17.6	18.7	20.0	21.1	21.9	22.9	22.8	23.2	23.2	22.3	20.9	18.4	17.6	17.8	16.6	23.2																						
21-Jun	16.2	15.1	14.4	14.4	15.1	16.1	17.2	19.1	19.6	21.2	22.4	22.8	23.1	24.0	24.0	24.6	24.2	24.5	24.2	23.7	22.2	20.3	20.0	19.5	20.3	24.6																						
22-Jun	16.6	15.7	15.0	15.1	15.8	17.5	18.3	19.8	21.1	21.6	23.2	24.5	24.9	24.5	24.5	25.0	24.5	23.7	22.7	21.0	20.3	19.1	17.8	18.0	20.4	25.0																						
23-Jun	17.5	16.2	15.2	14.7	14.5	14.7	17.2	18.9	21.0	21.6	21.1	21.6	23.0	22.9	21.9	18.8	19.6	19.4	19.3	18.9	18.4	16.3	15.6	14.8	18.5	23.0																						
24-Jun	15.6	16.0	14.2	14.4	14.2	14.6	14.1	14.1	14.6	15.2	16.3	17.5	18.3	19.6	16.9	14.9	15.4	15.5	14.9	14.8	14.4	14.2	13.6	13.4	15.3	19.6																						
25-Jun	13.4	13.6	13.3	13.0	12.9	12.9	13.0	13.6	14.4	15.5	17.2	17.7	18.9	19.3	19.9	19.8	20.3	20.6	19.8	19.6	18.9	17.4	17.0	16.0	16.6	20.6																						
26-Jun	15.2	14.5	13.4	13.4	14.6	16.2	18.0	20.0	20.0	20.5	21.5	22.5	23.5	23.8	22.5	21.4	21.4	18.2	16.5	16.1	15.9	16.1	15.0	14.8	18.1	23.8																						
27-Jun	14.9	14.9	15.1	15.1	14.7	14.9	17.1	18.6	19.7	20.6	21.6	22.7	23.6	23.8	24.6	22.5	23.3	20.1	21.2	21.1	20.5	18.9	18.0	17.4	19.4	24.6																						
28-Jun	17.1	17.1	16.7	16.5	17.0	18.9	20.4	22.2	23.2	23.8	24.2	24.9	25.1	25.6	25.8	26.0	26.1	25.4	25.2	24.4	23.3	21.9	19.8	19.1	22.1	26.1																						
29-Jun	18.6	17.7	17.1	16.5	16.4	16.6	17.0	18.2	19.2	20.5	21.4	22.1	22.6	23.3	23.7	23.9	24.0	24.1	23.6	22.7	21.1	19.5	18.9	18.4	20.3	24.1																						
30-Jun	17.7	17.3	16.4	15.6	15.7	15.9	17.2	18.5	19.8	21.0	22.2	23.2	23.9	24.1	24.7	24.9	24.8	24.7	24.3	23.3	21.7	20.6	19.6	18.4	20.6	24.9																						
																								13.5	13.1	12.7	12.4	12.5	13.0	14.1	15.2	16.0	16.8	17.8	18.5	19.1	19.5	19.7	19.6	19.5	19.1	18.8	18.0	17.0	15.6	14.9	14.3	Diurnal Average
																								19.5	19.8	19.5	18.4	18.1	18.9	20.4	22.2	23.4	24.0	24.4	24.9	25.5	25.9	26.3	26.0	26.1	25.4	25.2	24.4	23.3	21.9	20.3	19.9	Diurnal Maximum



Wood Buffalo Environmental Association
Hourly Averages

Ambient Temperature (AT) - C
ConocoPhillips - Surmont - June 2016





**Wood Buffalo Environmental Association
Cumulative Frequency Distribution**

**Ambient Temperature (AT) - C
ConocoPhillips - Surmont - June 2016**

Concentration Ranges (C)	Number of Hours	%	Cumulative %
-50 - -20	0	0.00	0.00
-20 - 0	0	0.00	0.00
0 - 10	57	7.92	7.92
10 - 20	493	68.47	76.39
> 20	170	23.61	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



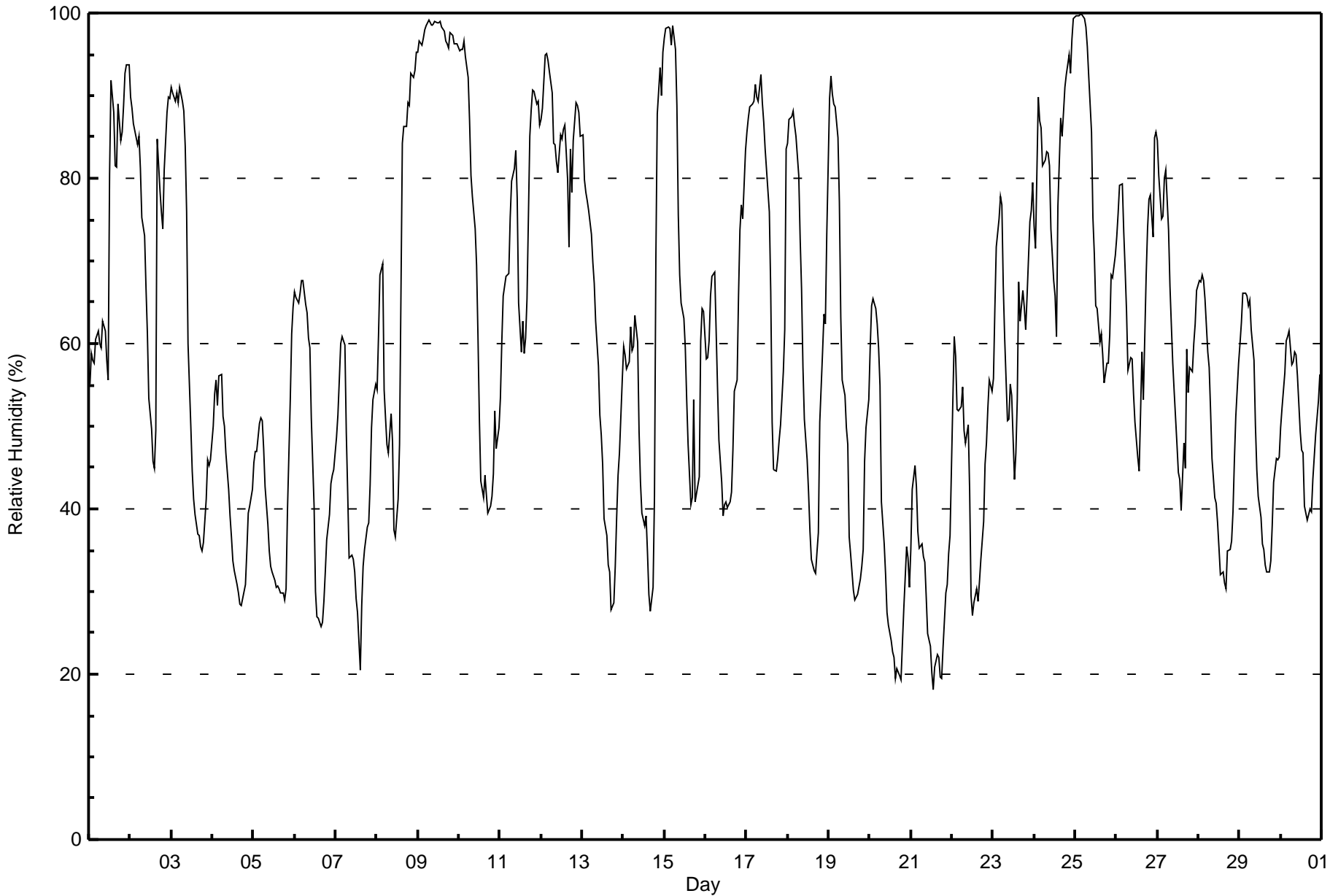
Wood Buffalo Environmental Association

Summary of Hour Averages

Relative Humidity (RH) - %

ConocoPhillips - Surmont - June 2016

Maximum Value: 100 % on Jun 25 05:00																			Maximum Daily Average: 97.5 % on Jun 9						Hours in Service: 720																			
Minimum Value: 18 % on Jun 21 14:00																			Minimum Daily Average: 29.9 % on Jun 21						Hours of Data: 720																			
Maximum Diurnal Average: 74.1 % at hour 4																			Minimum Diurnal Average: 46.1 % at hour 15						Hours of Missing Data: 0																			
Monthly Average: 60.1 %																			Percentiles: P ₁ = 20 P ₁₀ = 32 Q ₁ = 42 Median = 59 Q ₃ = 80 P ₉₀ = 91 P ₉₉ = 99						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-Jun	55	59	58	58	60	61	60	59	63	62	58	56	80	92	88	82	81	89	85	86	89	93	94	94	73.3	94																		
2-Jun	90	88	87	85	84	85	81	75	73	67	61	53	50	46	45	50	85	79	76	74	81	88	90	90	74.2	90																		
3-Jun	91	90	89	90	89	91	89	88	84	76	60	50	45	41	39	37	37	35	35	36	41	46	45	46	61.3	91																		
4-Jun	50	54	56	53	56	56	51	50	47	42	39	37	34	33	31	30	29	28	30	31	35	40	40	42	41.4	56																		
5-Jun	46	47	47	50	51	51	47	43	38	35	33	32	31	30	31	30	30	30	29	30	40	53	61	64	40.8	64																		
6-Jun	66	66	65	66	68	68	65	64	61	59	51	40	30	27	27	26	26	29	32	36	39	43	44	45	47.6	68																		
7-Jun	49	51	56	60	61	60	49	42	34	34	34	32	29	27	20	28	33	35	38	38	43	50	53	55	42.2	61																		
8-Jun	54	61	68	70	54	51	48	47	51	48	37	37	41	48	66	84	86	86	89	89	93	92	93	95	66.2	95																		
9-Jun	95	97	96	97	98	99	99	99	99	99	99	99	99	99	98	98	97	96	96	98	97	96	96	96	97.5	99																		
10-Jun	95	96	96	97	95	92	87	80	78	74	69	61	51	43	41	44	42	40	40	41	44	52	47	50	64.8	97																		
11-Jun	53	60	66	68	68	68	75	80	81	83	78	65	59	63	59	61	65	85	88	91	91	89	89	87	73.8	91																		
12-Jun	87	88	95	95	94	93	90	84	84	82	81	85	85	86	86	80	72	84	78	85	89	89	88	85	86.1	95																		
13-Jun	85	80	78	77	76	73	70	67	63	57	51	49	45	39	37	33	32	28	29	33	39	44	47	56	53.7	85																		
14-Jun	60	59	57	58	62	59	60	63	60	49	43	39	38	39	35	30	28	30	42	70	88	93	90	95	56.1	95																		
15-Jun	97	98	98	98	96	98	96	89	76	68	65	63	59	53	48	41	41	53	41	42	44	60	64	64	68.9	98																		
16-Jun	58	58	60	66	68	69	62	55	48	43	39	40	41	40	41	42	47	54	56	66	74	77	75	83	56.8	83																		
17-Jun	86	87	89	89	89	91	90	89	93	89	87	84	78	76	66	50	45	45	46	48	50	57	62	84	73.7	93																		
18-Jun	84	87	87	88	86	85	80	73	67	57	51	46	42	37	34	33	32	35	37	51	59	64	62	73	60.4	88																		
19-Jun	90	92	90	89	89	85	77	63	56	54	50	48	37	35	30	29	29	30	32	33	35	46	50	53	55.0	92																		
20-Jun	60	65	65	64	62	60	55	41	36	32	27	26	24	23	22	19	21	20	19	24	28	35	34	31	37.2	65																		
21-Jun	35	42	45	43	37	35	36	34	34	29	25	23	20	18	21	22	22	20	19	23	30	31	35	37	29.9	45																		
22-Jun	53	61	58	52	52	52	55	49	48	50	42	30	27	29	30	29	31	34	38	45	48	52	56	54	44.9	61																		
23-Jun	56	64	72	75	78	77	67	61	51	51	55	54	44	47	53	67	63	66	64	62	66	75	76	80	63.4	80																		
24-Jun	74	71	90	87	86	82	83	83	82	74	68	66	61	77	87	85	88	91	93	95	93	97	99	99	83.0	99																		
25-Jun	100	100	100	100	100	99	98	96	92	86	75	71	65	64	60	61	59	55	58	58	61	68	68	71	77.6	100																		
26-Jun	73	76	79	79	74	69	64	57	58	58	54	50	46	45	52	59	53	68	74	78	78	73	85	86	66.1	86																		
27-Jun	84	80	75	75	80	81	74	67	62	58	54	48	44	44	40	48	45	59	54	57	57	60	62	66	61.5	84																		
28-Jun	68	67	68	68	65	59	57	52	46	41	41	38	35	32	32	31	30	35	35	36	40	46	51	58	47.2	68																		
29-Jun	60	63	66	66	66	65	65	62	58	50	45	41	39	36	35	33	32	32	34	38	43	46	46	46	48.6	66																		
30-Jun	50	52	56	60	61	62	57	58	59	59	56	49	47	47	40	39	39	40	40	43	49	51	53	56	51.0	62																		
																			70.1	72.0	73.8	74.1	73.6	72.5	69.6	65.7	62.7	59.2	54.5	50.5	47.7	46.6	46.1	46.8	47.3	50.3	50.8	54.5	58.8	63.4	65.1	68.0	Diurnal Average	
																			100	100	100	100	100	99	99	99	99	99	99	99	99	99	98	98	97	96	96	98	97	96	97	99	Diurnal Maximum	





Wood Buffalo Environmental Association
Cumulative Frequency Distribution

Relative Humidity (RH) - %
ConocoPhillips - Surmont - June 2016

Concentration Ranges (%)	Number of Hours	%	Cumulative %
0 - 20	6	0.83	0.83
20 - 40	148	20.56	21.39
40 - 60	228	31.67	53.06
60 - 80	161	22.36	75.42
80 - 100	177	24.58	100.00

Total Number of Valid Hours: 720

Total Number of Hours: 720



Wood Buffalo Environmental Association

Summary of Hour Averages

Wind Speed (WS) - km/h

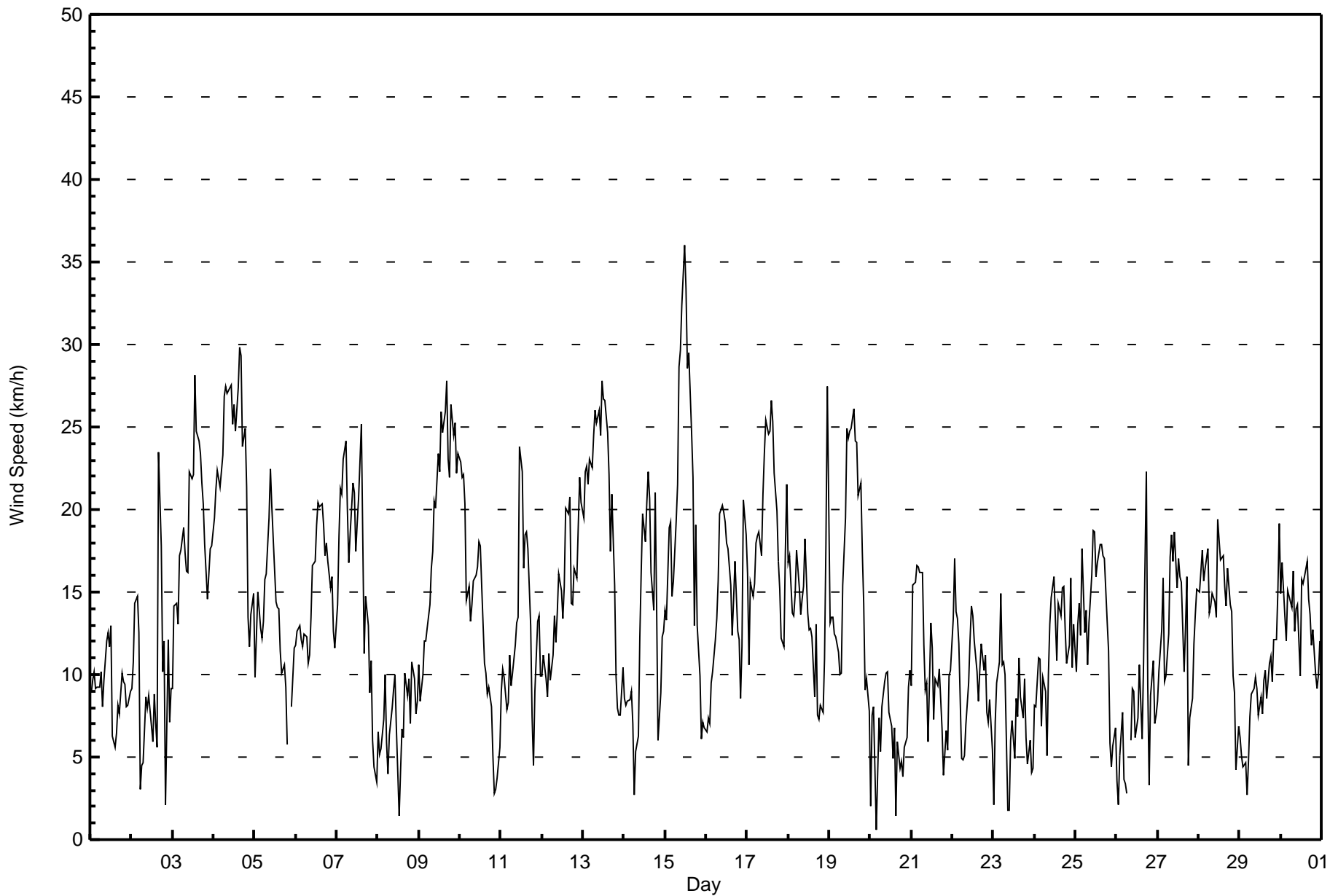
ConocoPhillips - Surmont - June 2016

Maximum Speed: 36 km/h on Jun 15 12:00	Maximum Daily Speed Average: 22.5 km/h on Jun 4	Hours in Service: 720
Minimum Speed Value: 1 km/h on Jun 20 04:00	Minimum Daily Speed Average: 1.7 km/h on Jun 20	Hours of Data: 718
Maximum Diurnal Speed Average: 8.1 km/h at hour 5	Minimum Diurnal Speed Average: 2.4 km/h at hour 20	Hours of Missing Data: 2
Monthly Average Velocity: 4.7 km/h 259.7 deg	Percentiles: P ₁ = 2 P ₁₀ = 6 Q ₁ = 9 Median = 13 Q ₃ = 17 P ₉₀ = 22 P ₉₉ = 29	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-Jun	SW9	WSW10	WSW10	SW9	SW9	SW9	SW10	SSW8	S10	S12	SSE13	SE12	WNW13	WNW6	NNE6	NE6	SE8	ESE8	SE10	SE10	SE9	SE8	S8	SW9	S5.4	WNW13
2-Jun	SW9	WSW11	WSW14	WSW15	WSW13	ENE3	E4	ESE5	ESE9	ESE8	SE9	SE8	SE6	SE9	ESE7	WNW6	WNW23	WNW18	WNW10	S12	W2	W12	SSE7	SSW9	SW3.6	WNW23
3-Jun	SW9	WSW14	WSW14	WSW13	WSW17	WSW18	W19	W17	W16	W16	W22	W22	W22	W28	W25	W24	W23	W22	W20	W18	WSW15	WSW16	WSW18	WSW18	W18.3	W28
4-Jun	WSW19	WSW21	W22	W22	W21	W23	W27	W27	W27	W27	W28	W25	WNW26	WNW25	WNW27	WNW30	WNW29	WNW24	WNW25	WNW21	WNW14	W12	W14	W15	W22.5	WNW30
5-Jun	WNW10	WNW12	WNW15	WNW13	WNW12	WNW13	WNW16	WNW16	WNW19	WNW22	WNW20	WNW18	WNW14	WNW14	WNW14	N11	N10	N11	N9	NNE6	AF	ESE8	SE10	SE12	WNW9.6	WNW22
6-Jun	SSE12	S13	S13	S12	S12	S12	S12	S11	S11	SSE13	SSE17	SSE17	SSE19	SSE20	SSE20	SSE20	S19	S17	SSE18	SSE17	SSE15	SSE16	SSE13	SW12	SSE14.5	SSE20
7-Jun	SW14	WSW18	WSW21	WSW21	WSW23	WSW24	W20	WSW17	W19	WNW22	WNW21	WNW17	W19	W21	W25	WNW18	NNW11	NNW15	NNW13	N9	NNW11	NE6	E4	ESE4	W12.8	W25
8-Jun	SE7	SW5	NW6	WNW7	NNW10	N6	ENE4	ENE6	NNE8	NNE9	NE10	ENE7	SSE1	SE4	ESE7	NE6	NNE10	NE9	NE10	ENE7	ESE11	ESE10	ESE8	ESE8	ENE4.0	ESE11
9-Jun	E11	ENE8	NE10	ENE12	NE12	NE13	NE14	NE16	NE17	NE20	NNE20	NNE23	NNE22	NNE26	NNE25	NE26	NNE28	NNE23	NNE22	N26	N25	N25	N22	NNW23	NNE18.3	NNE28
10-Jun	NNW23	NNW22	NNW22	NNW20	NNW14	NNW15	NNW13	NW14	NNW16	NNW16	NNW17	NNW18	NNW18	NNW15	NW11	N10	NNW9	N9	NE8	NNE5	ENE3	S3	SSE4	SSE6	NNW11.5	NNW23
11-Jun	S9	S10	S10	SSW8	SSW8	S11	SSE9	SSE10	SSE12	SE13	SE13	SE24	SSE22	SE16	SE18	SE19	SE18	SE13	ESE7	E5	ESE9	SE13	SE14	SE10	SSE11.7	SE24
12-Jun	SE10	SSE11	S10	SW9	WSW11	SW10	SW11	SW14	SW12	SW14	SSW16	SW15	SW13	WSW15	WSW20	WSW20	WSW21	W14	W14	WSW16	W16	W19	WSW22	WSW20	WSW12.9	WSW22
13-Jun	WSW20	WSW22	WSW23	WSW22	WSW23	W23	W25	W26	W25	W26	W25	WSW28	WSW27	WSW27	WSW25	WSW22	WSW17	WSW21	W15	W10	WSW8	SSW8	SW8	WSW10	WSW19.9	WSW28
14-Jun	SW9	SW8	SW8	SW8	SW9	SW7	E3	E5	E6	ESE12	ESE16	ESE20	ESE18	SE20	SE22	SSE21	S16	SSE14	S21	S14	SE6	ESE9	SE12	ESE13	SSE9.6	SE22
15-Jun	SE14	ESE13	ESE19	SE19	SE15	SE16	SE19	SSE22	S29	S30	S32	S36	SSW33	S29	S29	S25	SSE22	S13	SSE19	SSE13	SSW10	WSW6	SW7	SW7	SSE17.7	S36
16-Jun	S7	SSW7	S7	SSE10	SSE10	SSE12	S13	S16	S20	S20	S20	S19	S18	S18	S15	SSW12	WSW14	WSW17	WSW13	WSW12	WSW9	WSW12	WSW21	W18	SSW11.4	WSW21
17-Jun	WSW16	WSW11	WSW16	WSW15	W16	W18	W18	WNW19	WNW17	WNW21	WNW23	WNW25	WNW25	WNW25	WNW27	WNW25	WNW22	WNW20	WSW17	WSW15	WSW12	SW12	WSW17	W22	W17.6	WNW27
18-Jun	W17	WNW17	WNW14	WNW14	WNW15	WNW18	WNW15	NW14	WNW15	WNW15	WNW18	WNW14	WNW13	NW13	WNW12	NW9	W13	WSW8	WSW7	WSW8	SW8	WSW11	W18	WNW27	WNW12.9	WNW27
19-Jun	W13	NW13	NW14	WNW12	WNW12	NW11	NW10	NW10	NW15	WNW20	NW25	NW24	NW25	NW25	NNW26	NNW24	NNW24	NNW21	NNW22	NNW17	NNW14	NW9	WNW10	W8	NW16.1	NNW26
20-Jun	WSW2	WSW8	WSW8	S1	SW4	WSW7	W5	NW8	N10	NNW10	N10	NNW8	N7	NW5	NE7	WSW1	E6	E4	NE5	ENE4	SSE6	SSW6	SSW9	SSW10	WNW1.7	SSW10
21-Jun	SW9	WSW15	WSW16	WSW17	WSW17	WSW16	WSW16	WSW12	SW9	SW10	S6	SSE13	SE12	SE7	SE10	SE9	SE10	SE9	ESE7	SSE4	SW7	SSE5	SE10	SSE10	SSW6.8	WSW17
22-Jun	SW13	WSW17	WSW14	WSW13	WSW12	WSW5	E5	E5	ESE7	SSE9	SSE12	SSE14	SE14	SSE12	SSW10	SSW8	SW10	SW12	SW10	WSW11	SW8	SW7	WSW8	WSW5	SSW7.4	WSW17
23-Jun	SSE2	SW7	WSW10	WSW11	WSW15	WSW11	W11	WNW10	W2	W2	NNW6	NE7	WNW5	NNE9	NNE7	S11	SSW9	S7	N10	NNE6	SE5	SSW6	SSW4	W4	WSW3.4	WSW15
24-Jun	WNW8	NNW8	NNW11	NNW11	WNW7	NW10	N9	NNW5	NNW10	NNW13	NNW15	NNW16	NW13	WNW11	WNW14	WNW14	WNW15	WNW15	WNW13	NW11	WNW12	WNW16	N10	NW13	NW10.7	NNW16
25-Jun	NNW10	NNW13	NNW14	NNW12	NNW12	NNW13	NNW14	N11	N13	N16	N19	NNE19	NNE16	N17	N18	N18	N17	NNE17	NE13	NNE11	N6	WNW4	WNW6	WNW7	N12.4	N19
26-Jun	WNW4	WSW2	WSW5	WSW8	W4	W3	WNW3	AF	ESE6	ESE9	SE9	SSE6	S7	SSE11	SSW8	SSW6	SSW11	W22	NW9	SSW3	SW9	WSW11	WNW7	WSW8	SW4.1	W22
27-Jun	SSW8	SW10	WSW13	WSW16	WNW10	NW10	WNW12	WNW17	WNW18	WNW17	NW19	NW15	NW17	WNW16	WNW16	N10	N13	N16	NE4	SW7	WSW9	WSW12	WSW14	WSW15	WNW10.0	NW19
28-Jun	WSW15	WSW16	WSW18	WSW16	WSW16	W18	W14	W14	WNW15	NNW14	NW13	NW19	NNW18	NNW17	NNW17	N15	NNW14	N16	N14	N14	N10	NNW9	ENE4	SE7	NW9.8	NW19
29-Jun	SE6	E5	NNE4	NNE5	NE3	E5	ESE7	ESE9	SE9	ESE10	ESE9	ESE8	ESE9	ESE8	ESE10	SE10	ESE9	SE11	SE11	SE10	SE12	SE12	SE15	SE19	ESE8.1	SE19
30-Jun	SSE15	S17	S14	S12	S15	S15	S14	S16	S13	SE14	SSE14	S10	SE16	SE16	SSE16	SSE17	SSE15	S14	S12	S13	SSW10	SSW9	SSW10	SSW12	S12.7	SSE17

SW5.9	WSW7.3	WSW7.9	WSW7.8	WSW8.1	W6.9	W6.0	W5.4	W4.6	W4.0	W3.9	W3.2	W4.4	W3.8	W4.2	W3.5	W4.3	WNW4.5	WNW2.7	W2.4	WSW2.8	SW4.0	SW4.8	WSW5.9	Diurnal Average
NNW23	WSW22	WSW23	W22	WSW23	WSW24	W27	W27	S29	S30	S32	S36	SSW33	S29	S29	WNW30	WNW29	WNW24	WNW25	N26	N25	N25	N22	WNW27	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 - June 2016**

Wind Speed Ranges (km/h)	Number of Hours	%	Cumulative %
0 - 5	55	7.66	7.66
6 - 11	247	34.40	42.06
12 - 19	289	40.25	82.31
20 - 28	118	16.43	98.75
29 - 38	9	1.25	100.00
> 38	0	0.00	100.00

Total Number of Valid Hours: 718

Total Number of Hours: 720



**Wood Buffalo Environmental Association
Frequency Distribution**

**Wind Speed (WS) - km/h
ConocoPhillips - Surmont - June 2016**

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	0	3	3	5	10	2	2	5	2	2	2	6	7	4	1	1	55
6 - 11	17	9	10	4	3	26	28	12	15	22	33	25	3	15	12	13	247
12 - 19	11	4	6	1	0	6	26	25	29	4	10	52	27	40	17	31	289
20 - 28	4	8	2	0	0	1	3	7	5	0	0	22	30	20	6	10	118
29 - 38	0	0	0	0	0	0	0	0	6	1	0	0	0	2	0	0	9
> 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	32	24	21	10	13	35	59	49	57	29	45	105	67	81	36	55	718

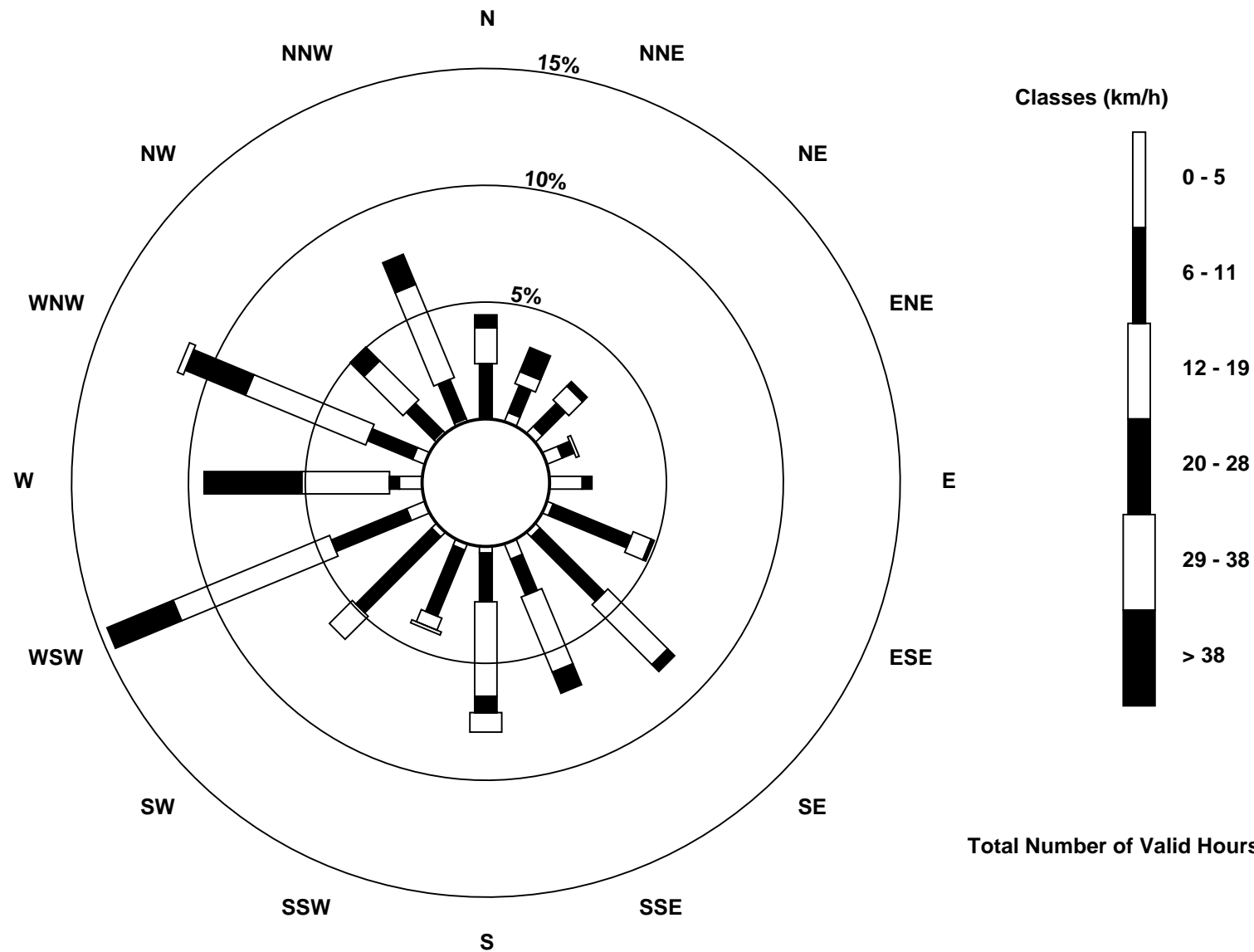
Total Number of Valid Hours: 718

Total Number of Hours: 720



Wood Buffalo Environmental Association
Wind Rose Jun 2016

Wind Speed (WS) - km/h
ConocoPhillips - Surmont (AMS502)





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Speed (WS) - km/h
ConocoPhillips - Surmont - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 14 km/h on Jun 2 16:00	Hours of Data: 718
Minimum Value: 1 km/h on Jun 13 21:00	Hours of Missing Data: 2
Percentiles: P ₁ = 1 P ₁₀ = 2 Q ₁ = 2 Median = 3 Q ₃ = 4 P ₉₀ = 5 P ₉₉ = 8	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-Jun	2	2	2	2	2	2	3	2	2	3	3	5	6	5	2	2	4	3	2	2	3	2	2	2	6
2-Jun	1	2	2	2	4	3	2	3	2	2	3	4	4	3	4	14	5	3	4	5	4	3	4	2	14
3-Jun	2	3	2	3	3	2	4	3	4	3	5	5	5	6	5	6	6	4	5	4	2	2	2	2	6
4-Jun	3	3	4	4	4	4	6	5	5	6	5	5	6	6	6	6	7	5	6	6	3	1	2	3	7
5-Jun	3	4	2	2	3	3	3	4	5	6	5	5	5	6	5	6	5	4	3	2	AF	2	3	2	6
6-Jun	2	3	3	3	3	3	3	2	2	3	3	4	5	5	5	6	5	4	4	3	3	2	3	3	6
7-Jun	3	4	4	3	4	4	3	3	4	4	5	5	4	6	6	7	5	3	3	2	2	3	1	1	7
8-Jun	2	1	2	1	1	2	1	1	2	2	2	2	2	3	1	1	2	2	3	2	2	2	2	2	3
9-Jun	2	2	2	3	3	3	3	4	5	6	4	5	5	5	5	6	6	6	5	6	6	6	5	4	6
10-Jun	5	4	4	4	3	3	3	3	4	4	4	5	4	5	6	4	3	3	2	1	1	1	2	2	6
11-Jun	2	2	2	2	3	3	3	2	3	3	4	5	6	3	5	4	4	3	2	2	3	4	3	2	6
12-Jun	2	3	3	2	3	3	4	4	4	4	5	5	4	4	4	5	5	3	3	5	4	5	3	3	5
13-Jun	4	4	4	3	4	4	5	6	5	6	6	6	7	6	6	6	5	5	5	2	1	1	1	2	7
14-Jun	1	1	1	2	1	1	2	1	2	4	4	4	5	5	5	5	5	4	6	5	2	2	3	2	6
15-Jun	2	3	4	4	3	4	4	6	7	8	9	10	10	10	9	7	6	7	6	4	6	3	2	1	10
16-Jun	2	2	2	2	2	3	3	4	6	5	6	5	5	5	4	3	5	3	4	5	2	4	4	5	6
17-Jun	4	4	3	3	5	4	4	3	3	4	5	5	5	5	5	5	5	5	4	4	3	3	8	5	8
18-Jun	3	3	2	2	2	3	4	3	3	4	4	5	4	4	4	4	4	3	2	3	2	1	9	7	9
19-Jun	4	2	3	2	2	2	2	3	3	5	6	6	7	7	6	6	6	4	4	4	3	2	1	1	7
20-Jun	2	2	2	2	4	2	2	2	3	3	4	5	3	4	3	3	2	2	2	1	2	2	1	2	5
21-Jun	2	2	2	2	2	2	3	3	2	2	3	4	4	4	3	5	3	2	2	2	1	3	1	3	5
22-Jun	3	3	2	2	1	3	1	1	2	3	3	5	4	3	3	3	6	4	3	3	2	1	2	2	6
23-Jun	2	1	3	2	3	1	3	2	2	2	3	3	3	4	4	4	3	3	4	3	3	2	2	2	4
24-Jun	2	2	4	3	2	4	3	2	2	2	3	3	3	3	6	3	2	2	3	2	2	3	2	2	6
25-Jun	2	3	3	3	3	3	3	2	3	4	4	4	4	4	5	4	4	4	4	3	2	1	1	1	5
26-Jun	1	2	2	2	1	1	2	AF	2	2	3	3	4	4	5	2	3	7	4	2	2	2	4	2	7
27-Jun	3	2	3	2	3	2	3	3	4	3	4	4	5	3	4	4	7	6	2	3	2	2	2	2	7
28-Jun	2	2	2	2	2	2	2	2	3	4	5	5	4	4	4	4	4	4	3	3	2	1	2	1	5
29-Jun	1	1	1	1	1	1	1	1	2	3	4	3	3	4	4	3	4	3	2	1	3	2	3	3	4
30-Jun	5	4	3	2	3	3	3	3	3	4	5	3	4	4	5	5	4	4	3	3	4	2	2	3	5

5	4	4	4	5	4	6	6	7	8	9	10	10	10	9	14	7	7	6	6	6	6	6	9	7
Diurnal Maximum																								

AF - Analyzer Failure



Wood Buffalo Environmental Association
Summary of Hour Averages

Wind Direction (WD) - deg
ConocoPhillips - Surmont - June 2016

Direction of Maximum Speed: 183 deg on Jun 15 12:00		Hours in Service:	720
Direction of Maximum Daily Speed Average: 278.9 deg on Jun 4		Hours of Data:	718
Direction of Minimum Speed: 180 deg on Jun 20 04:00		Hours of Missing Data:	2
Direction of Minimum Daily Speed Average: 1.7 deg on Jun 20		Percent Operational Time:	99.7
Monthly Average Direction: 265.2 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-Jun	233	238	238	221	217	221	220	200	179	174	151	134	285	289	23	37	125	115	142	140	141	142	188	218	187.4
2-Jun	221	237	245	245	250	65	95	108	103	110	132	130	130	128	106	291	293	301	286	183	278	269	164	200	225.8
3-Jun	231	246	248	256	258	258	267	267	276	268	277	276	268	266	274	281	274	277	271	265	258	251	251	246	265.1
4-Jun	251	256	262	270	267	271	279	278	271	273	275	281	286	282	285	287	293	292	300	303	296	270	277	277	278.9
5-Jun	298	282	288	283	296	289	292	313	325	313	317	332	320	329	339	349	3	3	5	22	AF	120	130	141	319.0
6-Jun	154	172	171	180	186	185	185	179	172	148	152	154	155	156	151	155	170	173	154	148	148	148	166	222	163.6
7-Jun	236	241	244	245	248	255	260	256	271	285	283	283	270	274	268	309	344	338	339	8	343	36	90	108	275.5
8-Jun	145	235	312	302	333	3	59	64	19	13	39	67	148	138	118	46	23	48	35	77	113	108	122	111	57.1
9-Jun	91	61	41	61	55	37	43	45	51	49	30	32	18	27	25	34	33	30	27	4	1	2	356	347	27.4
10-Jun	345	344	341	340	336	342	331	320	337	344	346	345	344	339	323	358	343	10	34	32	71	183	149	156	344.1
11-Jun	186	182	188	203	193	179	158	156	159	140	134	141	147	137	131	125	134	133	123	93	121	131	141	141	146.3
12-Jun	134	152	182	215	237	222	230	227	223	219	210	221	230	240	255	248	258	262	263	258	272	261	255	254	238.4
13-Jun	245	249	253	257	257	259	262	269	265	261	262	257	255	258	256	256	248	256	263	273	247	210	224	249	256.3
14-Jun	227	229	220	229	224	225	97	88	85	107	112	115	123	124	139	147	169	164	176	179	139	122	132	120	148.1
15-Jun	125	122	117	126	145	128	139	152	171	174	177	183	197	188	183	182	164	175	159	156	203	253	234	220	167.9
16-Jun	190	197	190	159	149	155	169	171	181	176	184	180	176	174	179	208	244	253	242	247	243	246	258	260	200.6
17-Jun	256	245	251	251	261	268	280	291	294	295	296	303	298	302	284	290	288	285	256	250	237	226	248	262	276.3
18-Jun	276	297	302	293	295	297	300	315	298	293	303	296	295	310	299	304	261	253	247	241	234	246	263	302	288.7
19-Jun	277	306	310	303	302	310	308	304	308	290	306	315	322	320	331	327	334	338	342	341	343	305	301	276	317.1
20-Jun	256	255	256	180	233	238	272	314	349	337	355	340	7	325	45	240	95	86	55	74	153	209	212	198	300.4
21-Jun	223	243	243	245	245	247	244	237	227	235	170	151	139	139	130	124	135	125	114	168	224	148	134	167	199.2
22-Jun	231	244	244	244	256	246	90	85	108	166	166	156	142	166	204	199	217	227	220	242	225	220	245	258	210.1
23-Jun	158	226	243	251	249	256	270	282	269	267	327	51	282	24	24	189	208	191	355	16	128	203	211	273	257.8
24-Jun	297	336	328	341	300	325	349	337	335	341	345	336	319	282	288	284	289	297	292	310	288	300	351	323	314.8
25-Jun	317	334	346	348	343	348	348	5	360	4	8	18	19	11	11	0	7	24	35	25	0	282	301	296	359.8
26-Jun	299	246	248	253	261	262	301	AF	122	118	125	152	170	148	201	207	205	276	304	200	223	240	301	243	224.3
27-Jun	211	225	242	246	297	304	295	285	283	297	304	310	309	291	290	5	355	359	36	227	241	243	244	245	284.9
28-Jun	246	247	248	251	257	266	269	268	295	347	324	306	334	346	336	350	345	11	2	349	351	338	69	128	309.5
29-Jun	125	96	17	13	36	95	115	118	129	114	109	119	120	111	118	126	122	126	132	127	133	138	143	146	122.2
30-Jun	167	191	187	187	187	188	185	181	174	143	149	178	136	128	156	150	161	186	188	187	195	196	200	194	173.3

234.2 246.3 254.7 255.3 258.4 261.3 264.9 264.2 267.9 271.2 277.7 268.4 268.8 270.8 268.1 277.5 277.9 292.7 291.4 268.5 244.0 231.8 228.4 238.2

Diurnal Average

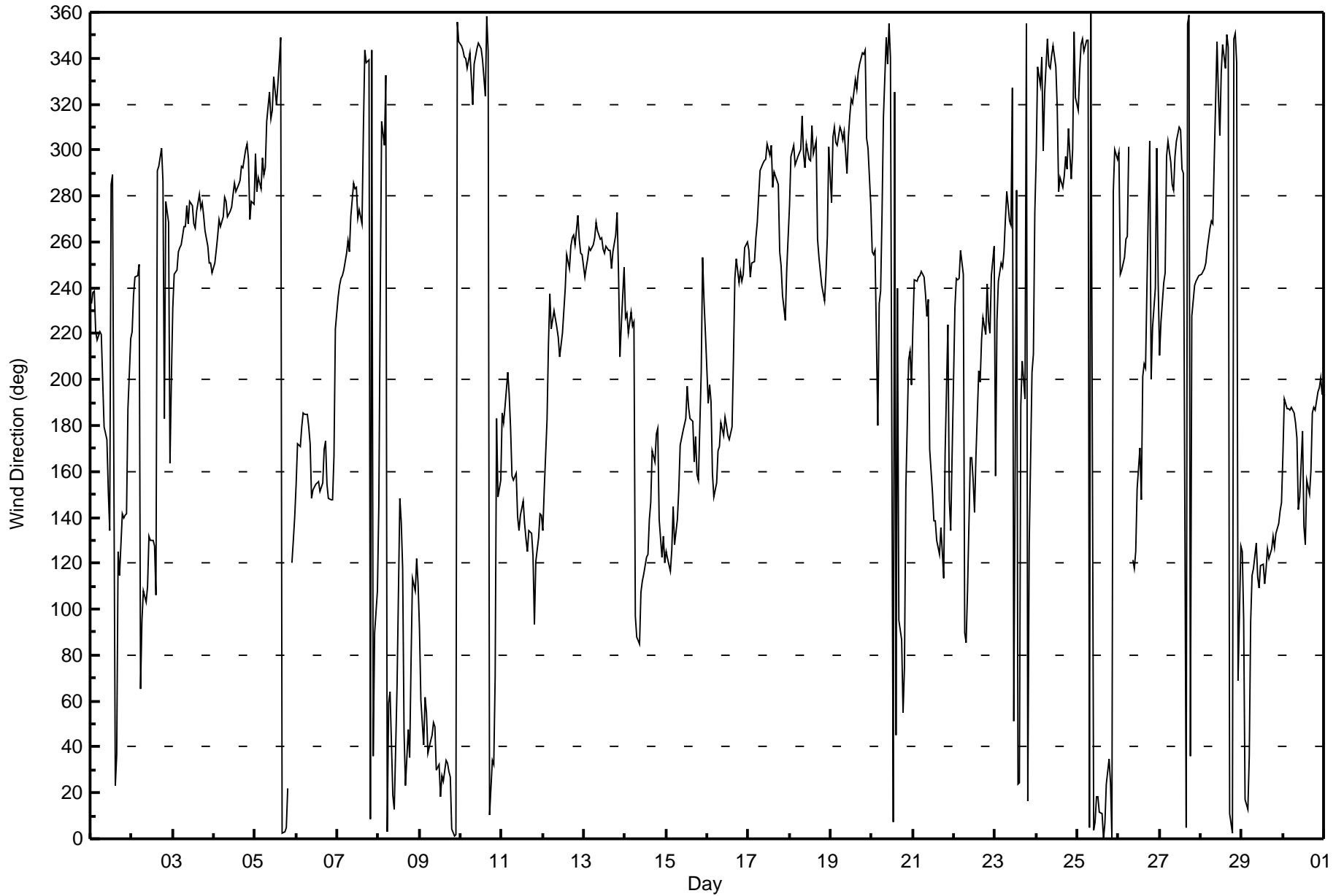
AF - Analyzer Failure

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



Wood Buffalo Environmental Association
Hourly Averages

Wind Direction (WD) - deg
ConocoPhillips - Surmont - June 2016





Wood Buffalo Environmental Association
Summary of Hour Standard Deviations

Wind Direction (WD) - deg
ConocoPhillips - Surmont - June 2016

Number of Exceedences (AAAQO): 1-hr: 0 24-hr: 0	Hours in Service: 720
Maximum Value: 99 deg on Jun 20 01:00	Hours of Data: 718
Minimum Value: 6 deg on Jun 22 05:00	Hours of Missing Data: 2
Percentiles: P ₁ = 8 P ₁₀ = 10 Q ₁ = 13 Median = 17 Q ₃ = 23 P ₉₀ = 35 P ₉₉ = 92	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-Jun	18	15	14	17	16	19	19	28	16	16	18	40	29	63	28	23	36	22	16	13	18	16	17	16	63
2-Jun	14	15	10	9	29	29	33	30	19	29	28	30	37	31	42	91	9	10	30	34	92	14	48	22	92
3-Jun	17	12	9	10	9	8	9	10	13	15	16	18	15	15	15	16	15	13	14	10	9	7	7	7	18
4-Jun	8	7	9	10	10	10	12	12	13	14	16	18	17	17	16	16	13	19	14	14	12	8	10	9	19
5-Jun	18	10	11	10	11	11	12	20	20	20	24	24	28	35	32	32	28	21	20	16	AF	12	10	10	35
6-Jun	12	14	13	14	15	15	16	16	16	12	15	18	20	19	17	17	16	16	14	11	9	9	17	30	30
7-Jun	18	14	11	10	9	10	9	10	18	15	17	21	20	21	17	35	33	23	21	14	14	29	18	23	35
8-Jun	15	30	28	15	12	31	19	18	17	17	22	20	86	46	32	15	13	15	21	27	13	13	14	18	86
9-Jun	14	17	16	15	16	14	14	14	17	18	14	13	17	12	20	13	13	14	15	18	18	18	17	15	20
10-Jun	15	14	11	12	15	13	16	21	20	19	18	19	17	26	44	35	37	33	19	18	47	27	21	28	47
11-Jun	16	14	17	22	21	15	21	21	26	11	14	13	15	13	14	13	14	13	19	23	14	13	17	14	26
12-Jun	12	17	17	25	17	21	20	20	20	23	25	24	22	19	13	16	15	14	11	11	12	11	9	9	25
13-Jun	11	10	9	8	8	9	11	11	13	15	16	13	17	15	16	20	20	16	16	11	17	16	11	12	20
14-Jun	12	11	14	16	14	11	69	16	21	20	20	15	18	17	16	16	21	22	22	18	33	12	12	11	69
15-Jun	12	11	11	20	15	13	12	17	16	18	18	20	21	21	21	20	20	29	21	26	55	20	17	22	55
16-Jun	22	25	24	19	16	16	17	18	21	19	23	19	20	21	23	28	16	12	15	15	13	13	9	11	28
17-Jun	13	21	12	13	14	12	13	12	10	11	11	13	19	15	15	13	15	15	15	13	16	17	25	11	25
18-Jun	10	11	13	10	10	10	16	19	18	22	15	24	34	32	34	46	26	37	24	21	15	9	11	11	46
19-Jun	13	13	13	12	12	15	19	24	20	12	18	21	21	25	18	22	18	17	17	14	13	18	11	14	25
20-Jun	99	16	14	98	92	11	23	35	27	35	33	72	44	69	53	93	47	34	31	44	34	28	15	19	99
21-Jun	18	10	11	8	8	8	10	16	18	20	47	29	30	59	29	38	20	18	14	44	9	43	8	30	59
22-Jun	16	10	9	8	6	84	18	30	23	28	25	25	30	28	27	32	39	25	21	13	21	15	12	23	84
23-Jun	79	17	16	11	8	10	14	13	93	93	52	43	64	49	29	33	22	45	27	16	53	29	56	62	93
24-Jun	16	30	24	14	17	20	24	45	26	19	14	16	24	20	27	10	13	11	10	21	9	12	16	18	45
25-Jun	19	20	12	14	10	14	13	17	16	17	21	19	22	25	21	19	26	22	16	13	40	31	24	21	40
26-Jun	24	71	46	13	26	47	50	AF	40	24	29	70	53	38	74	55	20	23	48	65	13	15	44	18	74
27-Jun	19	14	12	8	46	10	14	12	13	16	18	23	19	20	18	23	20	19	35	20	12	10	9	8	46
28-Jun	8	8	7	8	7	9	9	13	19	21	33	24	26	27	20	24	26	19	16	15	15	11	49	9	49
29-Jun	8	12	27	19	36	17	13	18	22	25	37	41	32	41	34	34	38	23	13	10	10	10	9	9	41
30-Jun	24	17	16	15	15	17	17	16	21	19	29	36	17	18	24	24	27	25	22	20	22	18	18	18	36

99	71	46	98	92	84	69	45	93	93	52	72	86	69	74	93	47	45	48	65	92	43	56	62	
Diurnal Maximum																								

AF - Analyzer Failure



Wood Buffalo Environmental Association

SO2 Calibration Report

Station Information

Calibration Date	June 28, 2016	Last Calibration	May 27, 2016
Station Name	ConocoPhillips - Surmont	Station Number	AMS 502
Reason:	Routine		
Start Time (MST)	9:51	End Time (MST)	13:35
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	518
Analyzer IP address	192.168.1.43		Lamp voltage	1851	1795
Calculated slope	0.993759	1.000499	Chamber temp	49.9	50.0
Calculated intercept	1.391122	0.328797	Pressure	21.5	21.6
Analyzer Background	21.1	22.5	Flow	0.532	0.537
Analyzer Coefficient	1.020	1.003	Intensity	46	44
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	804.4	0.999
calibrator zero	5000	0.0	0.0	0.1	----
high point	5000	83.2	803.7	803.1	1.001
second point	5000	41.6	401.9	401.5	1.001
third point	5000	20.8	200.9	199.8	1.005
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	83.2	803.7	798.6	1.006
Average Correction Factor					1.002

Corrected As found 803.7 Previous response 807.4 % change 0.5%

Notes:

Sample inlet filter replaced after as founds. Purafill and charcoal in ZAG unit replaced after as founds. Adjusted zero and span. As lefts began at 14:56 MST.

Calibration Performed By:

Asad Hidayat



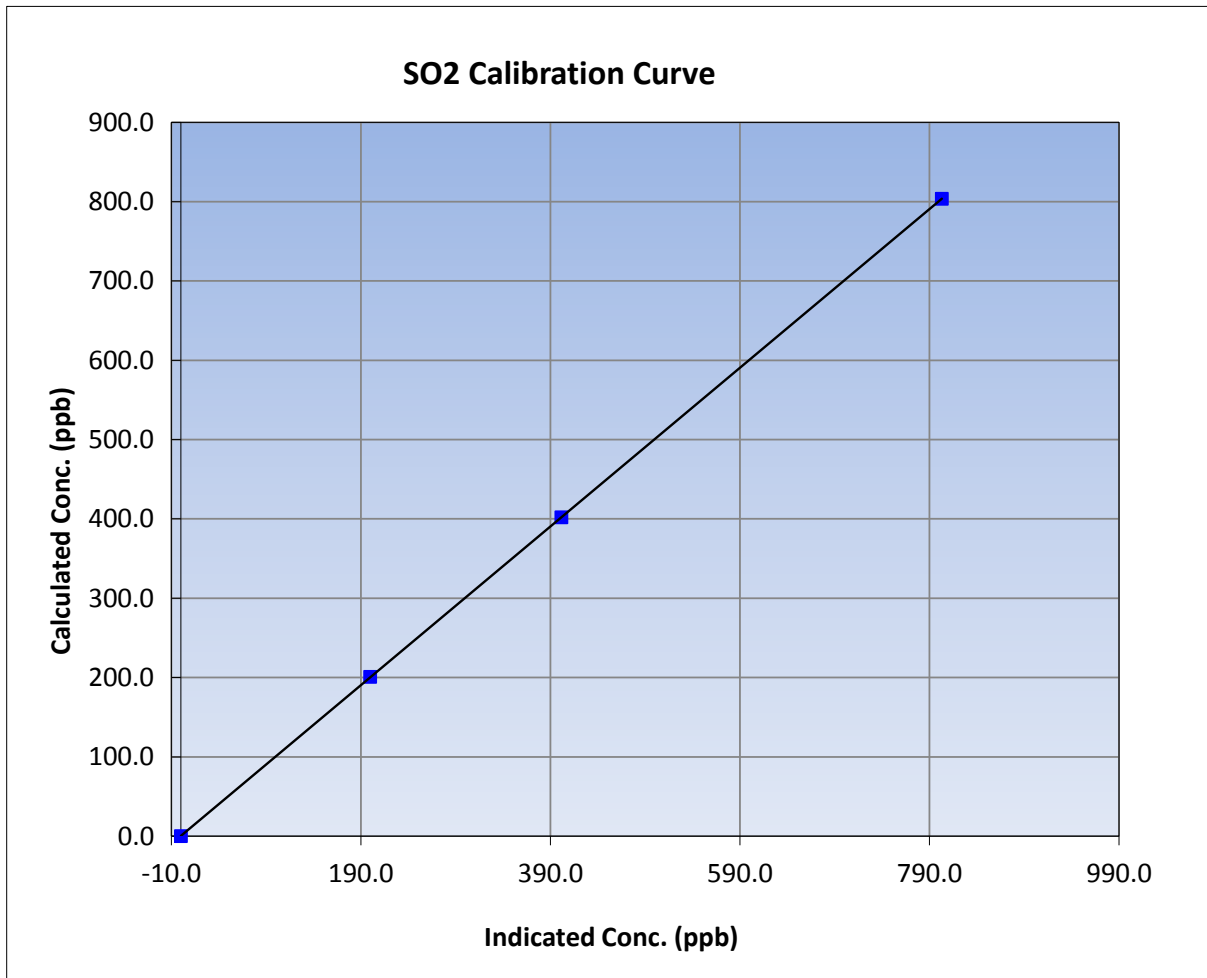
Wood Buffalo Environmental Association SO2 Calibration Report

Station Information

Calibration Date	June 28, 2016	Previous Calibration	May 27, 2016
Station Name	ConocoPhillips - Surmont	Station Number	AMS 502
Start Time (MST)	9:51	End Time (MST)	13:35
Analyzer make	API T100	Analyzer serial #	598

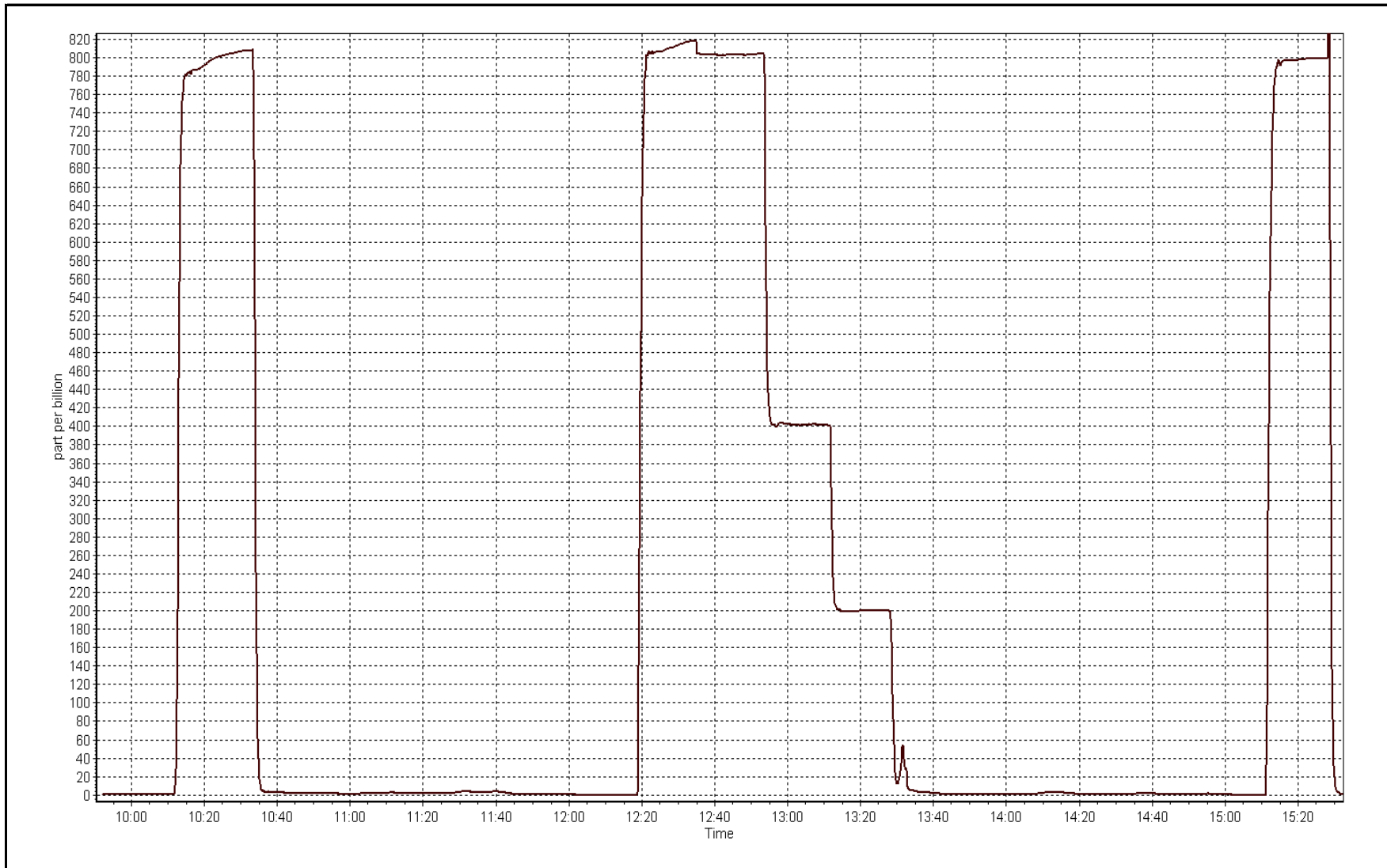
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.1	----	Correlation Coefficient	0.999998
803.7	803.1	1.0008		
401.9	401.5	1.0008	Slope	1.000499
200.9	199.8	1.0054		
			Intercept	0.328797



SO2 Calibration Plot

Date: June 28, 2016





Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	June 27, 2016	Last Calibration	May 28, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Reason:	Routine		
Start Time (MST)	10:55	End Time (MST)	13:45
Gas Cert Reference	LL34303	Station temp.	21 Deg C
Cal Gas Concentration	10.4 ppm	Cal Gas Exp Date	30/05/2016
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	497	497
Analyzer IP address	192.168.1.75		Lamp voltage	2447	2420
Calculated slope	0.966664	0.995396	Chamber temp	50.0	50.0
Calculated intercept	0.115033	0.080731	Pressure	23.3	23.5
Analyzer Background	19.2	19.2	Flow (SLPM)	0.616	0.639
Analyzer Coefficient	1.010	0.969	Intensity	54	54
			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	0.0	----
as found span	5000	38.5	80.1	83.8	0.956
SO2 scrubber check	5000	20.7	200.0	3.5	----
calibrator zero	5000	0.0	0.0	0.0	----
high point	5000	38.5	80.1	80.5	0.995
second point	5000	19.3	40.1	40.1	1.001
third point	5000	12.1	25.2	25.2	1.001
as left zero	5000	0.0	0.0	0.1	----
as left span	5000	38.5	80.1	80.2	0.999
Average Correction Factor					0.999

Corrected As found	83.8	Previous response	82.7	% change	-1.2%
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Notes:

Sample inlet filter replaced after as founds. Scrubber check done following as founds. Adjusted span.

Calibration Performed By: Asad Hidayat



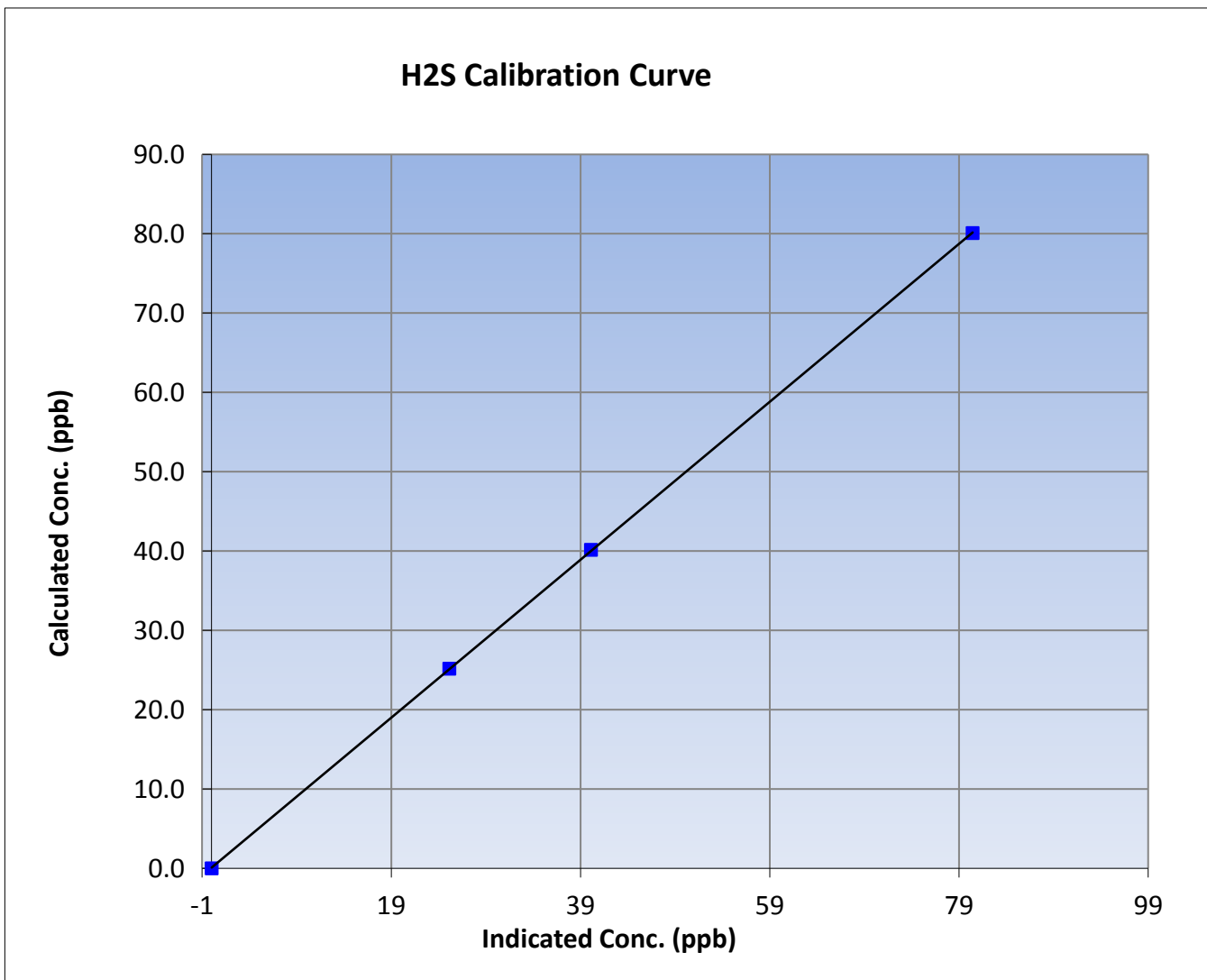
Wood Buffalo Environmental Association H2S Calibration Report

Station Information

Calibration Date	June 27, 2016	Previous Calibration	May 28, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	10:55	End Time (MST)	13:45
Analyzer make	API T101	Analyzer serial #	197

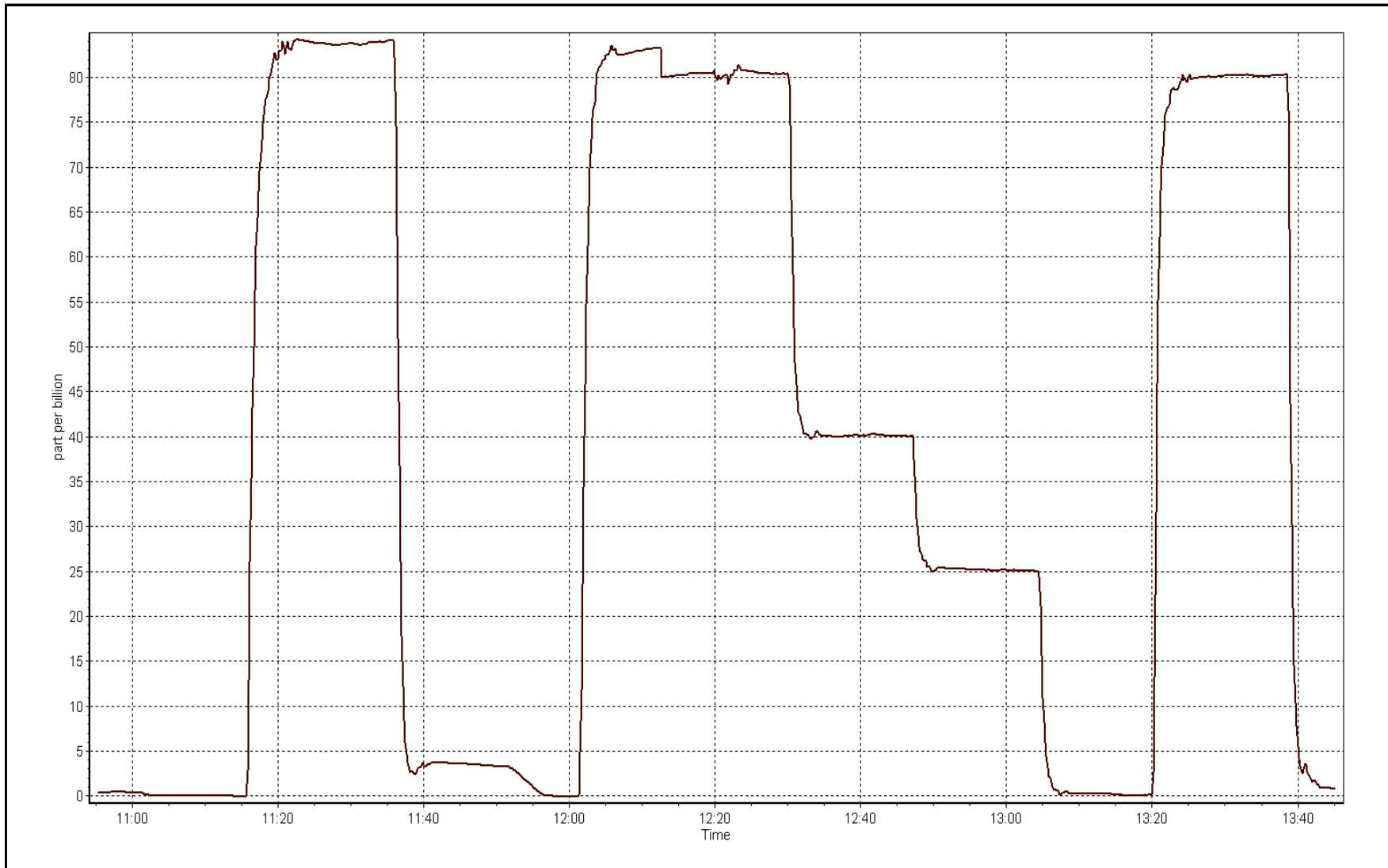
Calibration Data

Calculated concentration (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	----	Correlation Coefficient	0.999989
80.1	80.5	0.9954		
40.1	40.1	1.0006	Slope	0.995396
25.2	25.2	1.0007		
			Intercept	0.080731



H2S Calibration Plot

Date: June 27, 2016





Wood Buffalo Environmental Association NOX-NO-NO2 Calibration Report

Station Information

Calibration Date	June 28, 2016	Previous Calibration	May 27, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Reason:	Routine		
Start Time (MST)	9:51	End Time (MST)	15:35
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	0.995733	0.991459	1.007386
	Data Offset	1.571671	1.372604	0.993460
Current Calibration	Data Slope	0.992112	0.992369	0.994480
	Data Offset	1.502614	1.466982	-0.765034

Analyzer Information

Analyzer make/model	Thermo 42i	Analyzer serial #	1218153356
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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	1.161		1.091	
NOX coefficient	0.996		1.001	
NO2 coefficient	1.000		1.000	
NO bkgrnd	6.2		6.3	
NOX bkgrnd	6.5		6.5	
Chamber Temp	50.3	Deg C	50.3	Deg C
Moly Temp	323.9	Deg C	324.5	Deg C
PMT voltage	-867.3	V	-867.3	V
PMT Temp	-2.7	Deg C	-2.7	Deg C
O3 flow	ok	ccm	ok	ccm
R Cell press NO	164.1	mmHg	163.8	mmHg
R Cell Press Nox	164.1	mmHg	163.5	mmHg
NO sample flow	0.661	lpm	0.666	lpm
Nox sample Flow	0.661	lpm	0.670	lpm

Notes:

Replaced sample inlet filter after as founds. Charcoal and purafill in ZAG gen replaced after as founds. Adjusted both zero and span.



Wood Buffalo Environmental Association

NOX-NO-NO2 Calibration Report

Station Information

Calibration Date:

June 28, 2016

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	0.1	-0.3	0.4	----	----
as found span	5000	83.2	800.4	800.4	0.0	862.4	865.2	-2.7	0.9281	0.9251
calibrator zero	5000	0.0	0.0	0.0	0.0	-0.3	-0.4	0.0	----	----
high point	5000	83.2	800.4	800.4	0.0	805.6	805.3	0.3	0.9936	0.9939
second point	5000	41.6	400.2	400.2	0.0	402.1	402.1	0.0	0.9954	0.9952
third point	5000	20.8	200.1	200.1	0.0	198.4	198.5	0.0	1.0083	1.0082
as left zero	5000	0.0	0.0	0.0	0.0	-0.9	-0.8	-0.2	----	----
as left span	5000	83.2	800.4	530.4	270.0	810.6	528.8	281.4	0.9874	1.0030
Average Correction Factor									0.9991	0.9991

Corrected As found
Previous Response

NO_x= 862.3
NO_x= 802.2

NO= 865.5
NO= 805.9

Percent Change

NO_x= -7.0%

NO= -6.9%

GPT Calibration Data

Dilution Flow (total) 5000 ccm Source Gas Flow 83.20 ccm NOx ref calc conc = 800.4 ppb NO ref calc conc = 800.4 ppb

O3 Setpoint (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
1st NO ref point		0.0	807.4	805.2	0.0	0.9913	0.9941	----	----
1st NO2 (300)	530.4	274.8	806.4	530.4	276.0	0.9926	----	0.9956	100.4%
2nd NO2 (200)	614.9	190.3	808.2	614.9	193.3	0.9903	----	0.9843	101.6%
3rd NO2 (100)	704.0	101.2	807.1	704.0	103.1	0.9917	----	0.9813	101.9%
2nd NO ref point		0.0	806.3	803.8	2.6	0.9926	0.9958	----	----
Average Correction Factor						0.9918		0.9870	101.3%

Calibration Performed By: Asad Hidayat



Wood Buffalo Environmental Association

NO_x Calibration Summary

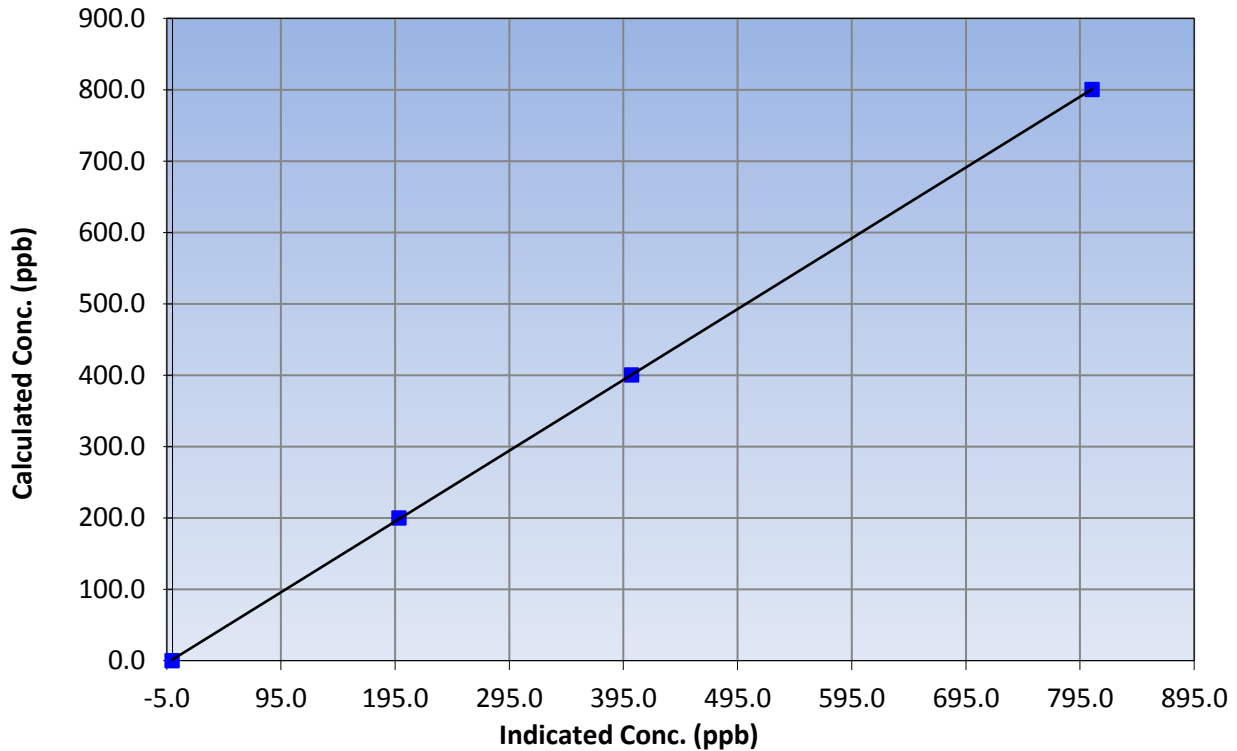
Station Information

Calibration Date	June 28, 2016	Previous Calibration	May 27, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	9:51	End Time (MST)	15:35
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	-0.3	----	Correlation Coefficient	0.999987
800.4	805.6	0.9936		
400.2	402.1	0.9954	Slope	0.992112
200.1	198.4	1.0083		
			Intercept	1.502614

NO_x Calibration Curve





Wood Buffalo Environmental Association

NO Calibration Summary

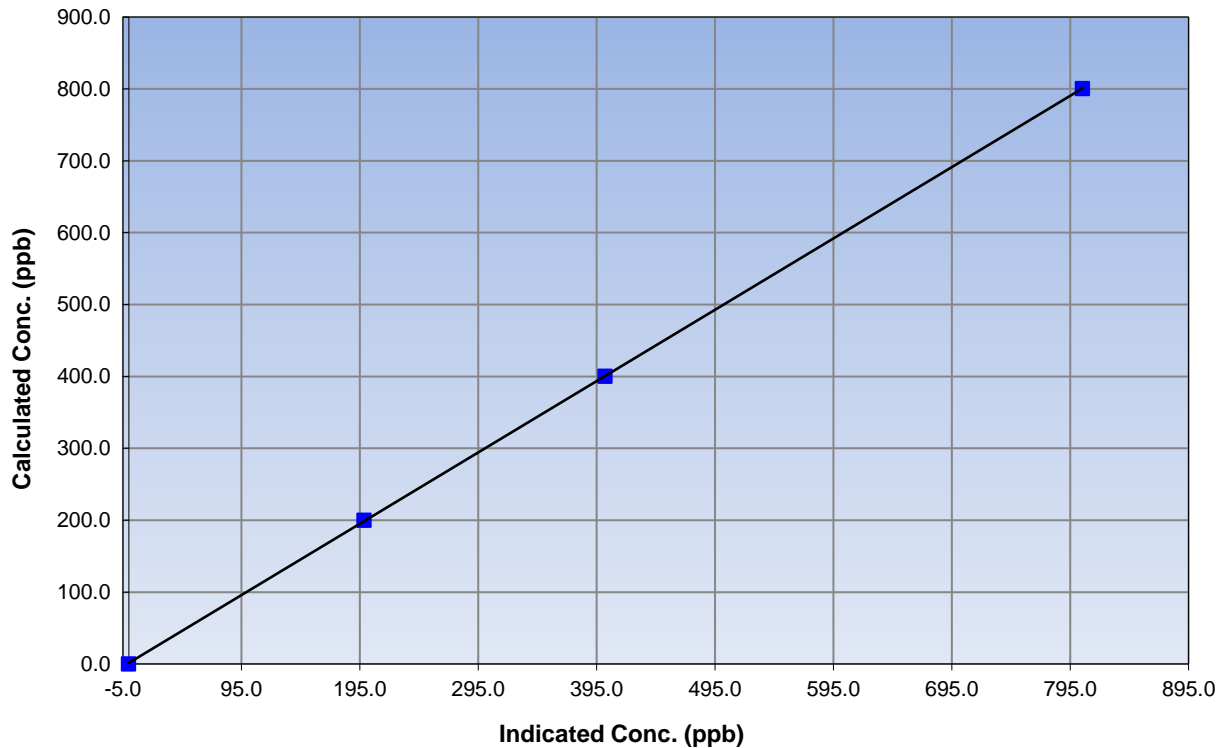
Station Information

Calibration Date	June 28, 2016	Previous Calibration	May 27, 2016
Station Name	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	9:51	End Time (MST)	15:35
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	N/A	Correlation Coefficient	0.999988
800.4	805.3	0.9939		
400.2	402.1	0.9952	Slope	0.992369
200.1	198.5	1.0082		
			Intercept	1.466982

NO Calibration Curve





Wood Buffalo Environmental Association

NO₂ Calibration Summary

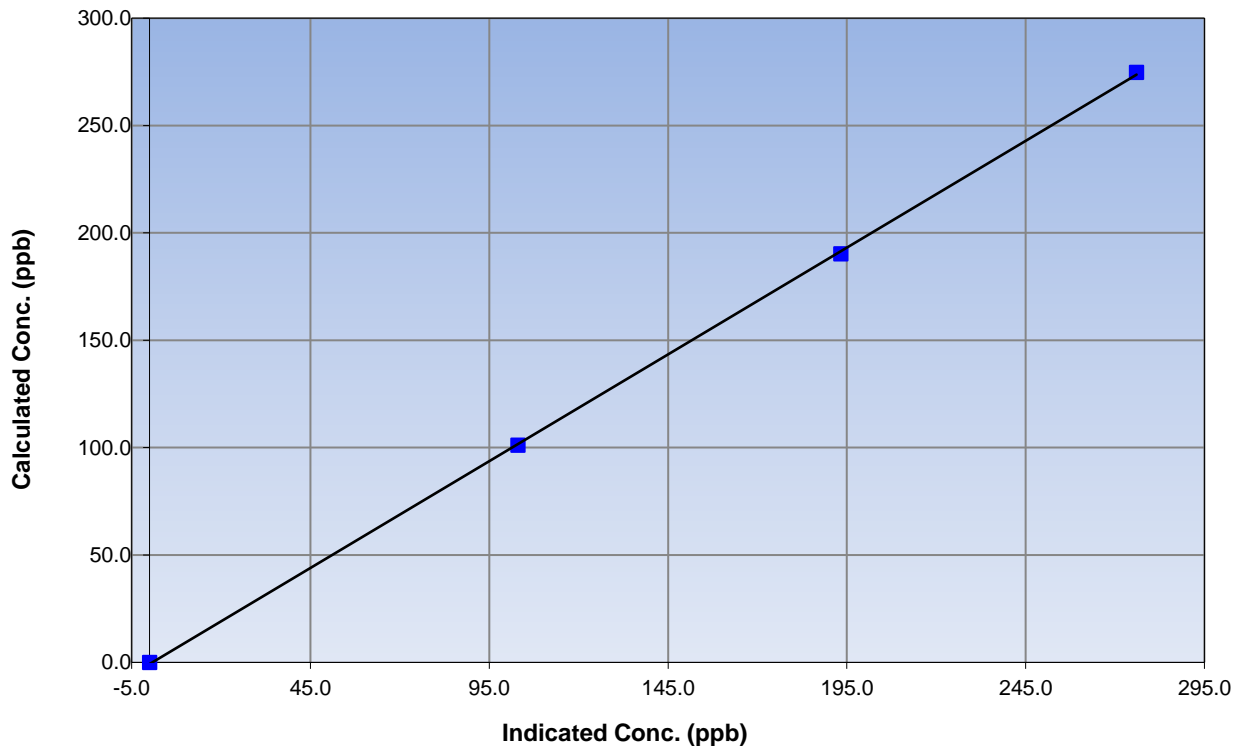
Station Information

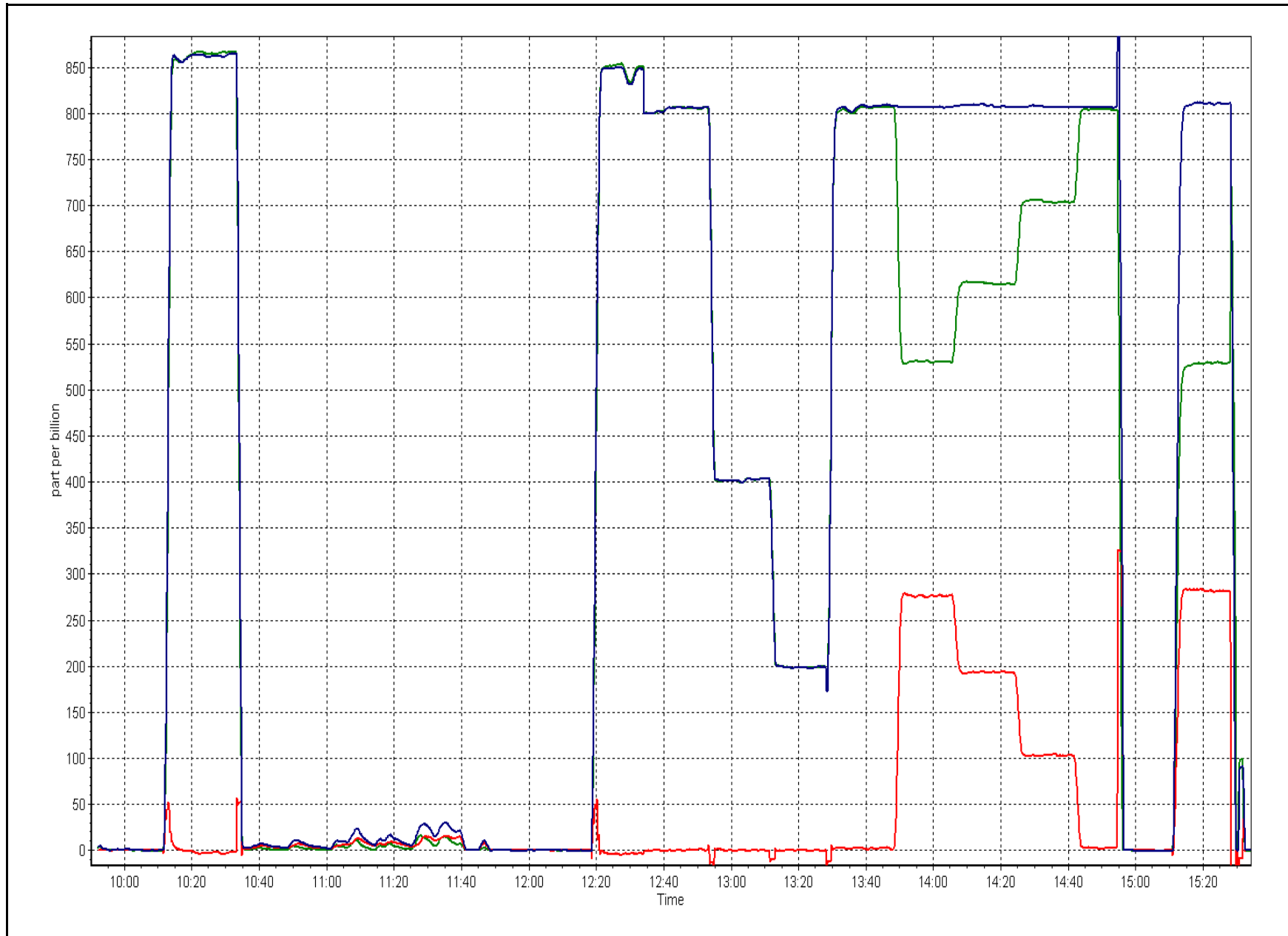
Calibration Date	June 28, 2016	Previous Calibration	May 27, 2016
Station Number	ConocoPhillips	Station Number	AMS 502
Start Time (MST)	9:51	End Time (MST)	15:35
Analyzer make	Thermo 42i	Analyzer serial #	1218153356

Calibration Information

Calculated conc (ppb) (Cc)	Indicated concentration (ppb) (Ic)	Correction factor (Cc/Ic)	Statistical Evaluation	
0.0	0.0	N/A	Correlation Coefficient	0.999916
274.8	276.0	0.9956		
190.3	193.3	0.9843	Slope	0.994480
101.2	103.1	0.9813		
			Intercept	-0.765034

NO₂ Calibration Curve







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