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Ambient Air Quality Monitoring Report
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1.0 Introduction

EastLink is a 39-kilometre motorway running between Donvale in Melbourne's north east to Frankston in Melbourne's south east with two tunnels under the Mullum Mullum Valley. Transfield Services, who are responsible for operation and maintenance of the road, commissioned A.W.N. (Air Water Noise) Consultants to provide ambient air quality monitoring services for the EastLink Road project. The services provided include:

- Operational and maintenance services of the EastLink ambient air monitoring stations.
- NATA endorsed ambient air quality monitoring reports

Monitoring commenced on the 29th June 2008 with the opening of the EastLink motorway. Results for the monitoring period 29th June 2008 to 30th September 2008 inclusive are contained in the following report.

2.0 Monitoring Locations

Three ambient air quality monitoring stations (AAQMS) are located along the Mullum Mullum valley in close proximity to the tunnel portals and ventilation stacks. The locations are described in Table 1 and depicted in Figure 1.

Table 1 Site Locations

STATION NAME	LOCATION	GPS CO-ORDINATES (AMG)
Chaim Court	Chaim Court, Donvale	342532E, 5814022S
Craig Road	Corner Craig Rd. and Beckett Rd. Donvale	341971E, 5814450S
Heads Road	Hillcrest Reserve, Heads Road, Donvale	341195E, 5814923S

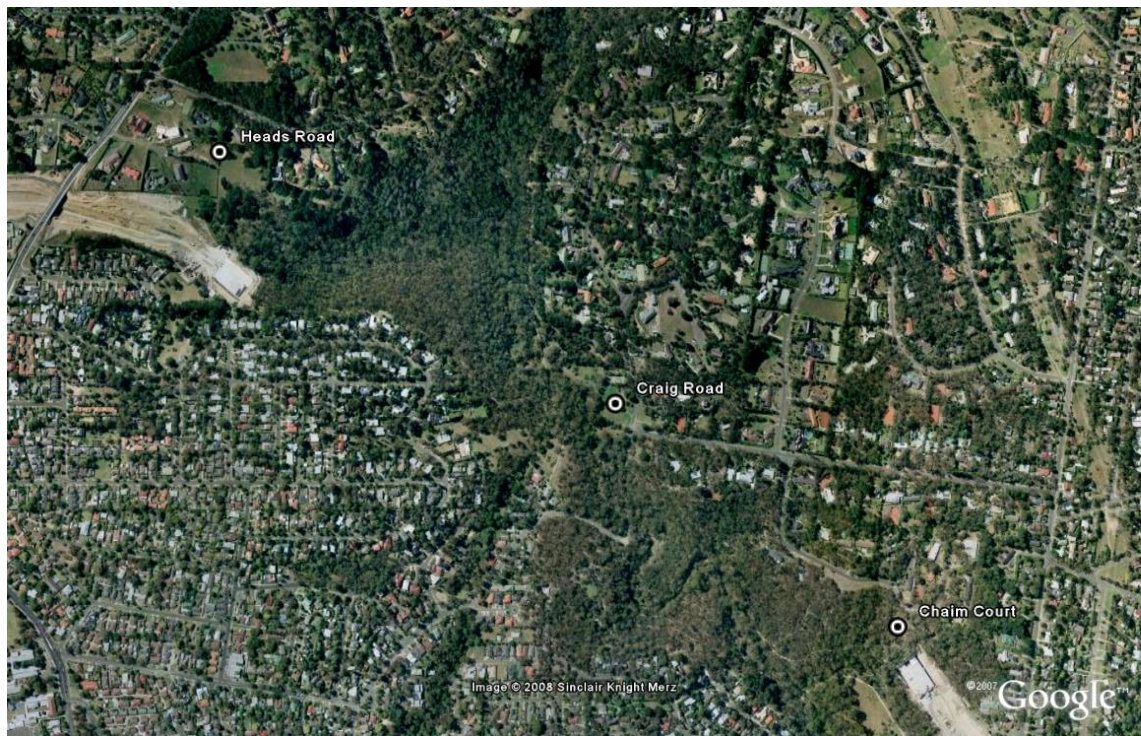


Figure 1 Ambient Air Monitoring Stations

3.0 Ambient Air Quality Monitoring Parameters

The following ambient air quality parameters are monitored continuously and averages logged at 5 minute intervals.

- Particulate matter with an equivalent aerodynamic diameter less than 2.5 microns (PM_{2.5});
- Particulate matter with an equivalent aerodynamic diameter less than 10 microns (PM₁₀);
- Total oxides of nitrogen (NO_x);
- Nitric oxide (NO);
- Nitrogen dioxide (NO₂);
- Carbon monoxide (CO);
- Wind speed;
- Wind direction;
- Relative humidity;
- Ambient temperature and
- Total solar radiation.

4.0 Methods

4.1 PM_{2.5}

PM_{2.5} concentration in ambient air was determined in real time using a Tapered Element Oscillating Microbalance (TEOM) analyser fitted with Flow Dynamics Measurement System (TEOM-FDMS).

Ambient air is drawn through a PM_{2.5} size selective inlet (PM₁₀ WINS head fitted with a PM_{2.5} sharp cut cyclone (SSC)) at 1 m³/h. The PM_{2.5} fraction passes through the FDMS unit which compensates for loss of volatile material from the TEOM filter. Measurements are made in real-time (2 s intervals) with the 5-minute averages logged. 1-hour and 24-hour averages are then calculated from the logged data

4.2 PM₁₀

PM₁₀ concentration in ambient air drawn through the sample inlet at 1 m³/h is measured in real-time (2 s intervals) with the 5-minute averages logged. From the logged data 1-hour and 24-hour averages are then calculated.

The sample stream is heated to 50°C to maintain a low and therefore relatively constant humidity.

PM₁₀ monitoring was conducted in accordance with Australian Standard AS 3580.9.8, “*Methods for Sampling and Analysis of Ambient Air: Determination of Suspended Particulate Matter – PM₁₀ Continuous Direct Mass Method Using a Tapered Element Oscillating Microbalance Analyser*”.

4.3 Carbon Monoxide

Carbon monoxide monitoring was conducted in accordance with Australian Standard AS 3580.7.1-1992, “*Determination of Carbon Monoxide – Direct Reading Instrumental Method*”

4.4 Oxides of Nitrogen

Oxides of nitrogen (NO, NO₂ and NO_x) monitoring was conducted in accordance with Australian Standard AS 3580.5.1-1993, “*Determination of Oxides of Nitrogen – Chemiluminescence Method*”

4.5 Meteorological Parameters

4.5.1 Wind Speed and Direction

Wind speed and direction was measured by ultrasonic anemometer located 10 meters above ground level. The calibration and operational procedures were conducted in accordance with AS2923-1987 “*Ambient Air – Guide for Measurement of Horizontal Wind for Air Quality Applications*”

4.5.2 Temperature and Relative Humidity

Temperature and relative humidity were measured by combined temperature- humidity sensor. The sensors comprise a platinum resistance thermometer (PRT) to measure temperature and a capacitive thin-film polymer sensor to measure humidity.

Maintenance and calibration are carried out in accordance with NATA requirements.

5.0 Air Quality Goals

The Environment Protection Act of 1970 provides a legislative framework for the protection of the environment in Victoria. Section 16(1) details the provision for environment protection policies to stipulate environment protection for any element or segment of the environment. The State Environment Protection Policy (Air Quality Management) {SEPP (AQM)} is relevant to the ambient air quality objectives of the EastLink monitoring programme.

The intention of the SEPP (AQM) is to manage emissions to the air environment so that “beneficial uses of the air environment are protected, Victoria’s air quality goals and objectives are met”, with an overall emphasis on continual improvement, with regard to the economic and social development of the State.

The SEPP (AQM) provides the framework for this objective through the classification of air quality indicators and the stipulation of management strategies and criteria. Applicable to the EastLink ambient monitoring programme are the assessment criteria for local or neighbourhood air monitoring data contained within Schedule B. The criteria are listed as intervention levels which are used to determine whether the beneficial users of the air environment are protected.

The Schedule B intervention levels for Class 1 indicators, carbon monoxide, nitrogen dioxide and PM₁₀ and Class 2 indicator, PM_{2.5} are displayed in Table 2.

Table 2 SEPP (AQM) Schedule B Intervention Levels

ATMOSPHERIC CONTAMINANT		INTERVENTION LEVEL	UNITS
Carbon monoxide	1 hour	29	ppm
Nitrogen dioxide	1 hour	140	ppb
PM ₁₀	24 hour	60	µg/m ³
PM _{2.5}	24 hour	36	µg/m ³

6.0 Ambient Air Quality Monitoring Period: 29/06/2008 – 31/07/2008

6.1 Data Capture

Data capture is defined as the number of valid data periods collected divided by the number of available data periods. Valid data excludes periods where the instrument is unavailable due to calibration and maintenance and excludes periods where the data has been rejected due to quality assurance procedures.

The data capture statistics for the reporting period 29th June to 31st July 2008 are shown in Tables 3-5. Averages were only collected for those periods where the 5-minute data constituted 75% data capture.

Table 3 Data Capture Statistics – 1 hour Averages

PARAMETER	STATION	COLLECTED PERIODS	AVAILABLE PERIODS	DATA CAPTURE
PM _{2.5}	Chaim Crt.	790	792	99.7%
PM ₁₀	Chaim Crt	790	792	99.7%
	Craig Rd.	790	792	99.7%
	Heads Rd.	791	792	99.9%
NO, NO ₂	Chaim Crt	756	792	95.5%
	Craig Rd.	759	792	95.8%
	Heads Rd.	759	792	95.8%
CO	Chaim Crt	754	792	95.2%
	Craig Rd.	759	792	95.8%
	Heads Rd.	759	792	95.8%

Table 4 Data Capture Statistics – 8 Hour Rolling Averages

PARAMETER	STATION	COLLECTED PERIODS	AVAILABLE PERIODS	DATA CAPTURE
CO	Chaim Crt	778	785	99.1%
	Craig Rd.	785	785	100.0%
	Heads Rd.	785	785	100.0%

Table 5 Data Capture Statistics – 24 hour Averages

PARAMETER	STATION	COLLECTED PERIODS	AVAILABLE PERIODS	DATA CAPTURE
PM _{2.5}	Chaim Crt.	33	33	100.0%
PM ₁₀	Chaim Crt	33	33	100.0%
	Craig Rd.	33	33	100.0%
	Heads Rd.	33	33	100.0%

6.2 Results

6.2.1 PM_{2.5}

PM_{2.5} was continuously monitored and 5-minute averages logged. The 5-minute average data was then transformed to 1-hour and 24-hour averages for reporting.

PM_{2.5} (1-hour average) concentration statistics for the reporting period are given in Table 6. A plot of PM_{2.5} (1-hour average) concentration for the reporting period is presented in Figure 2.

Table 6 PM_{2.5} Concentration Percentiles (1-Hour Average)

STATION	PM _{2.5} CONCENTRATION (µg/m ³) (1-HOUR AVERAGE)						
	MAXIMUM	99 TH	98 TH	95 TH	90 TH	75 TH	50 TH
Chaim Crt.	15	13	12	9.7	8.1	6.5	3.9

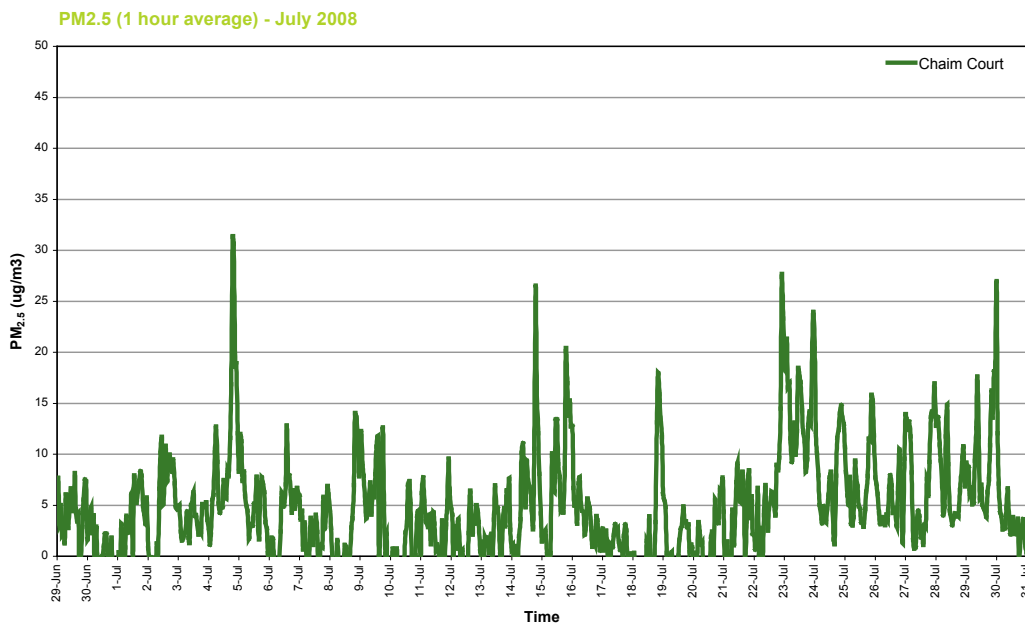


Figure 2 PM_{2.5} Concentration (1 Hour Average)

PM_{2.5} (24-hour average) concentration statistics for the reporting period are given in Table 7. A plot of PM_{2.5} (24-hour average) concentration for the reporting period is presented in Figure 3.



Table 7 PM_{2.5} Concentration Percentiles (24-Hour Average)

STATION	PM _{2.5} CONCENTRATION (µg/m ³) (24-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt.	15	13	12	9.7	8.1	6.5	3.9

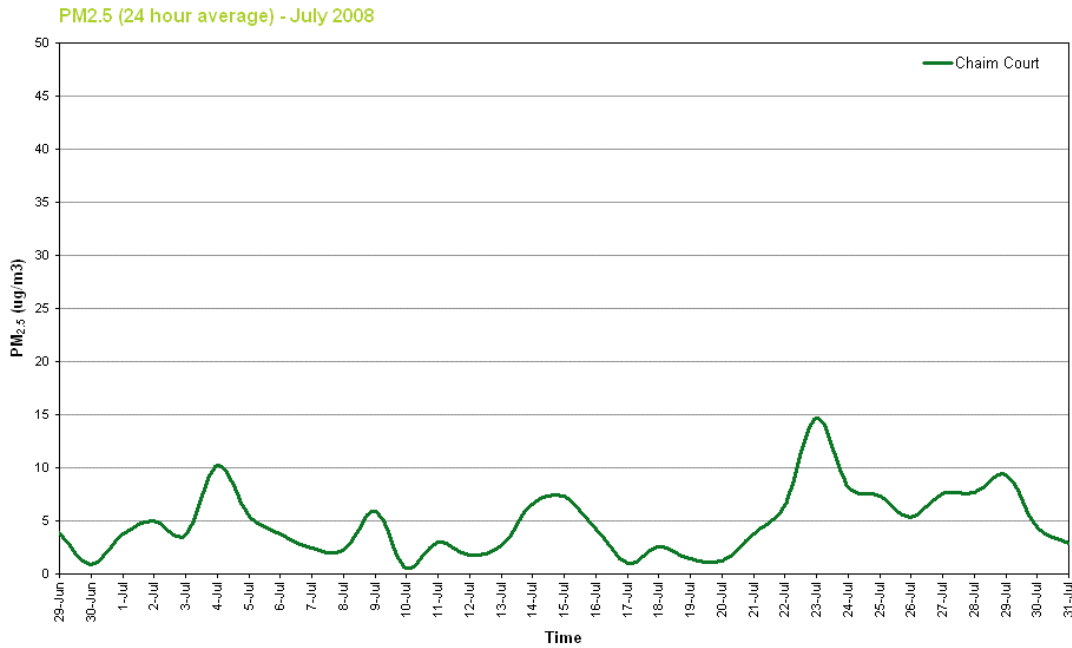


Figure 3 PM_{2.5} Concentration (24-Hour Average)

6.2.2 PM₁₀

PM₁₀ was continuously monitored and 5-minute averages logged. The 5-minute average data was then transformed to 1-hour and 24-hour averages for reporting.

PM₁₀ (1-hour average) concentration statistics for the reporting period are given in Table 8. A plot of PM₁₀ (1-hour average) concentration for the reporting period is presented in Figure 4.



Table 8 PM₁₀ Concentration Percentiles (1-Hour Average)

STATION	PM ₁₀ CONCENTRATION (µg/m ³) (24-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	49	27	25	20	17	13	9.2
Craig Rd	33	29	27	22	18	14	10
Heads Rd	130	49	33	27	22	15	10

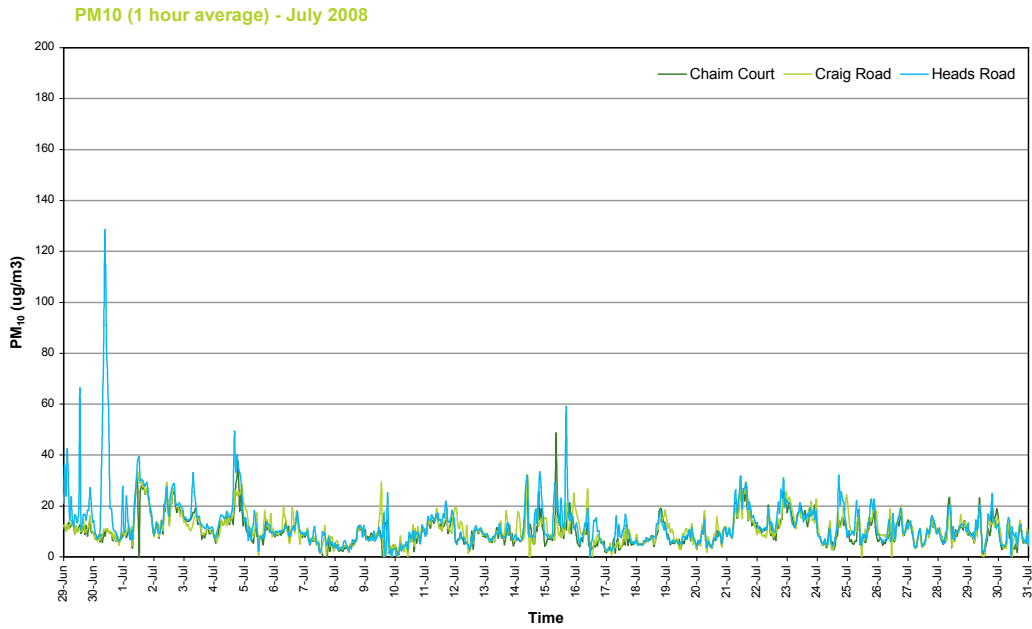


Figure 4 PM₁₀ Concentration (1-Hour Average)

PM₁₀ (24-hour average) concentration statistics for the reporting period are given in Table 9. A plot of PM₁₀ (24-hour average) concentration for the reporting period is presented in Figure 5.



Table 9 PM₁₀ Concentration Percentiles (24-Hour Average)

STATION	PM ₁₀ CONCENTRATION (µg/m ³) (24-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	18	18	17	17	16	13	9.2
Craig Rd.	29	27	24	21	20	15	11
Heads Rd	19	19	18	17	17	13	10

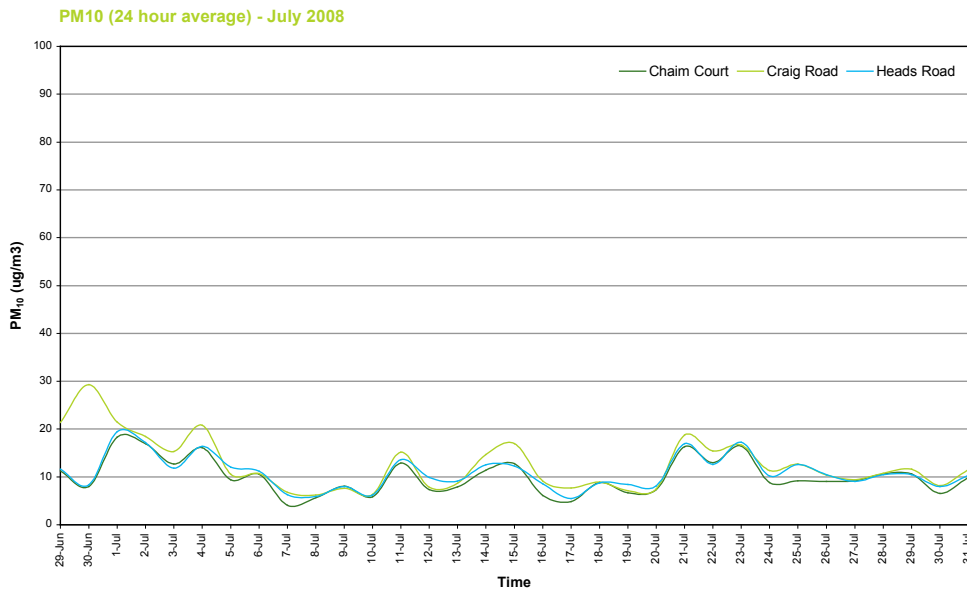


Figure 5 PM₁₀ Concentration (24 Hour Average)

6.2.3 Carbon Monoxide

6.2.3.1 1-Hour Average

Carbon monoxide (1-hour average) concentration statistics for the reporting period are given in Table 10. A plot of carbon monoxide (1-hour average) concentration for the reporting period is presented in Figure 6.



Table 10 Carbon Monoxide Concentration Percentiles (1-Hour Average)

STATION	CARBON MONOXIDE CONCENTRATION (ppm) (1-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	1.5	0.90	0.70	0.50	0.30	0.20	0.00
Craig Rd	2.0	1.3	1.00	0.80	0.60	0.30	0.10
Heads Rd	1.8	1.2	0.90	0.60	0.40	0.20	0.10

Carbon Monoxide (1 hour average) - July 2008

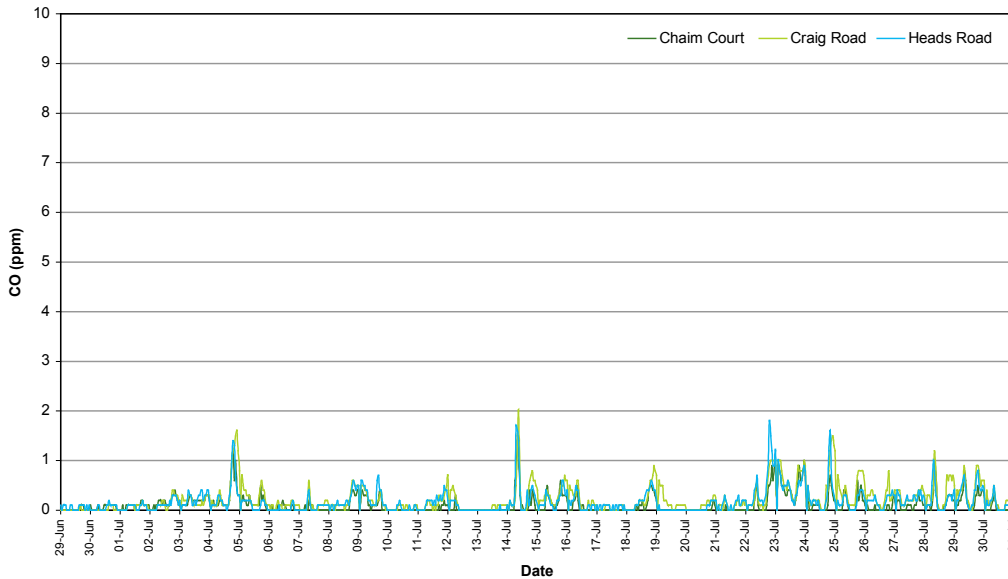


Figure 6 Carbon Monoxide Concentration (1-Hour Average)

6.2.3.2 8-Hour Rolling Average

Carbon monoxide (8-hour rolling average) concentration statistics for the reporting period are given in Table 11. A plot of carbon monoxide (8-hour rolling average) concentration for the reporting period is presented in Figure 7.



Table 11 Carbon Monoxide Concentration Percentiles (8-Hour Rolling Average)

STATION	CARBON MONOXIDE CONCENTRATION (ppm) (8-HOUR ROLLING AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	0.8	0.7	0.6	0.4	0.3	0.2	0.1
Craig Rd	1.2	1.0	1.0	0.7	0.5	0.3	0.2
Heads Rd	1.2	0.8	0.7	0.6	0.4	0.3	0.1

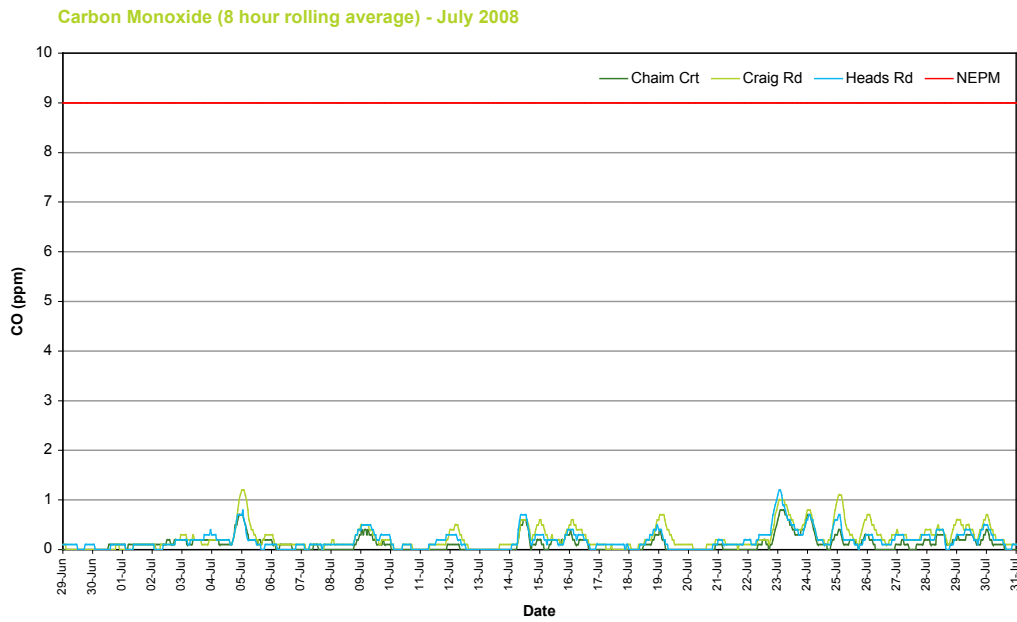


Figure 7 Carbon Monoxide Concentration (8-Hour Rolling Average)

6.2.4 Oxides Of Nitrogen

6.2.4.1 Nitric Oxide

Nitric oxide (1-hour average) concentration statistics for the reporting period are given in Table 12. A plot of nitric oxide (1-hour average) concentration for the reporting period is presented in Figure 8.

Table 12 Nitric Oxide Concentration Percentiles (1-Hour Average)

STATION	NITRIC OXIDE CONCENTRATION (ppm) (1-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	170	62	50	24	13	2.3	0.1
Craig Rd	170	75	52	39	21	5.0	0.1
Heads Rd	180	92	48	29	18	6.2	0.4

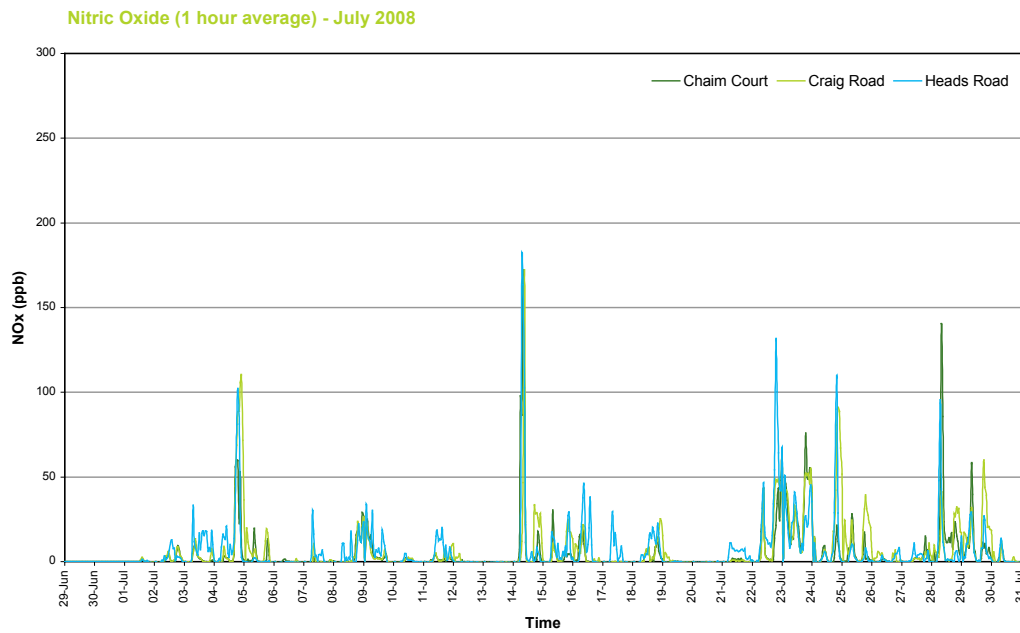


Figure 8 Nitric Oxide Concentration (1-Hour Average)

6.2.4.2 Nitrogen Dioxide

Nitrogen dioxide (1-hour average) concentration statistics for the reporting period are given in Table 13. A plot of nitrogen dioxide (1-hour average) concentration for the reporting period is presented in Figure 9.



Table 13 Nitrogen Dioxide Concentration Percentiles (1-Hour Average)

STATION	NITROGEN DIOXIDE CONCENTRATION (ppb) (1-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	31	21	4.9	2.6	1.8	0.0	0.0
Craig Rd	30	22	20	17	15	10	5.5
Heads Rd	29	26	24	22	19	14	5.9

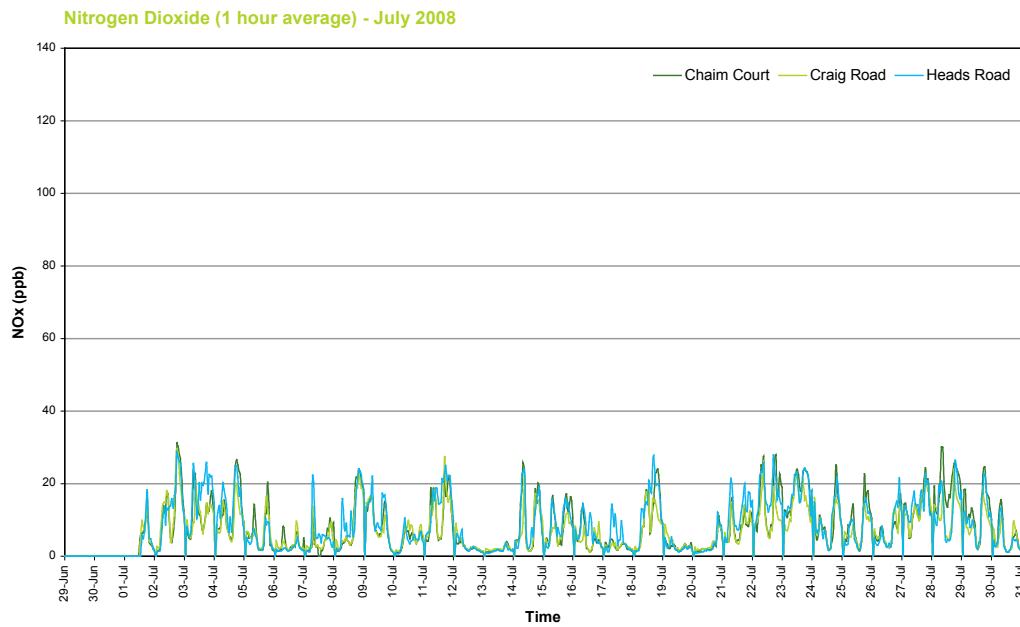


Figure 9 Nitrogen Dioxide Concentration (1-Hour Average)

6.2.5 Meteorological Data

Wind speed and direction for each of the monitoring stations are presented as wind roses in Figures 10 – 12.

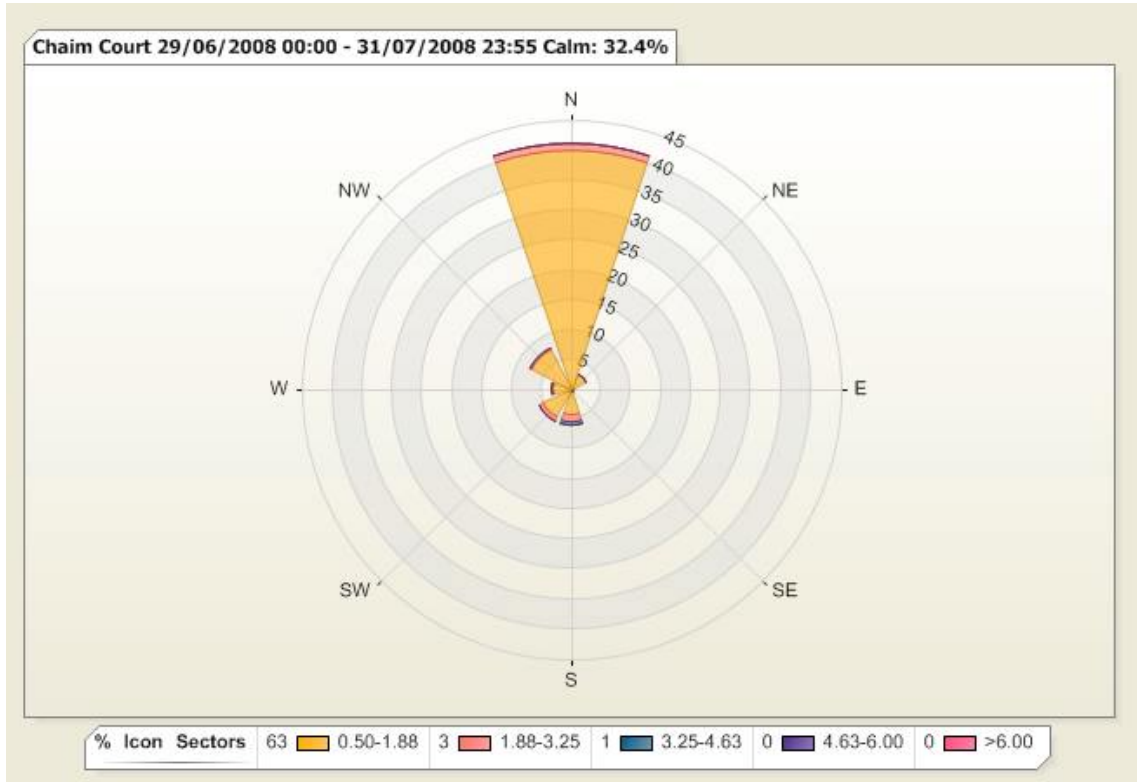


Figure 10 Chaim Court Wind Rose

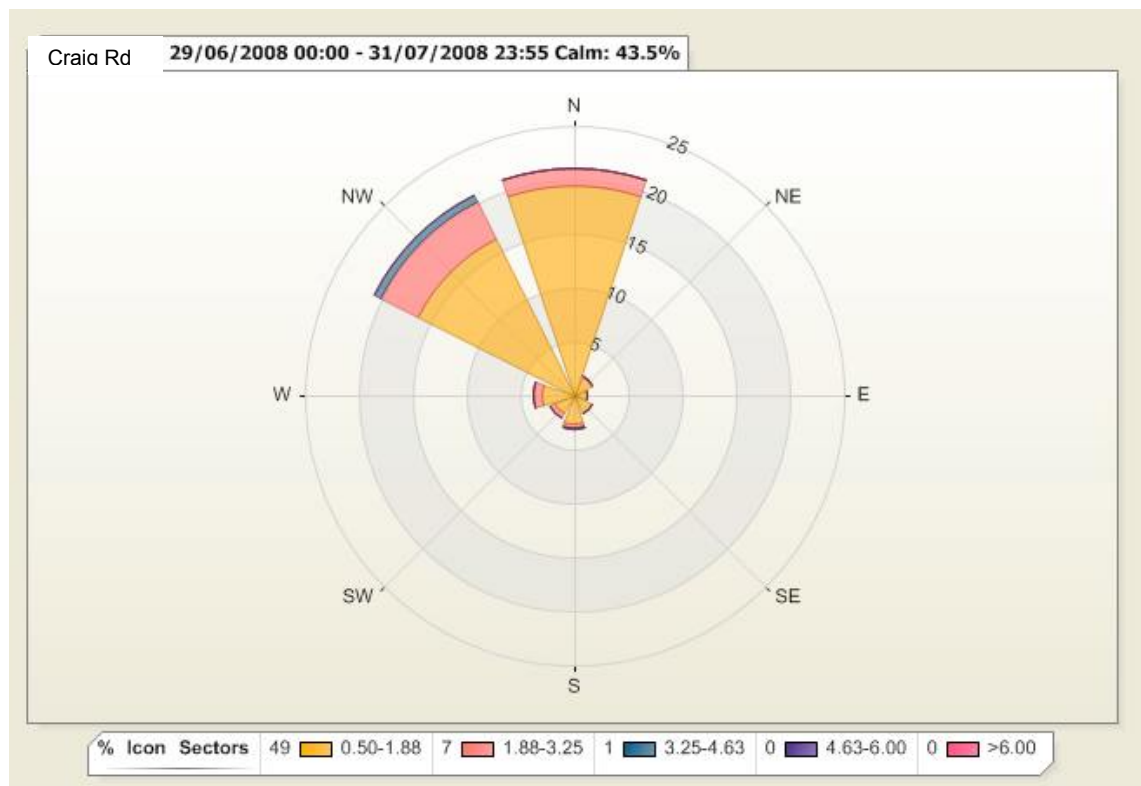


Figure 11 Craig Road Wind Rose

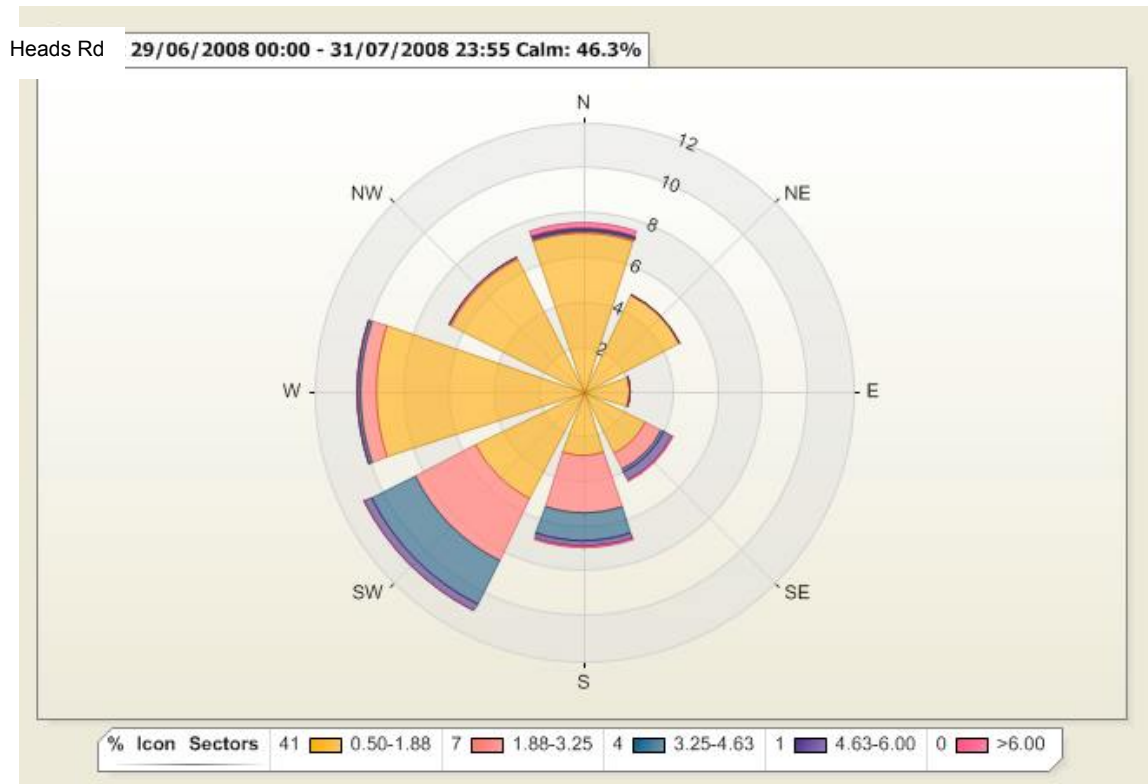


Figure 12 Heads Road Wind Rose

6.3 Data Validation and Exception

Data contained in the report has been validated against performance and calibration requirements for each instrument. Data during maintenance and calibration periods has been removed from the validated data sets. Tables 14 – 16 list the data exceptions for Chaim Court, Craig Road and Heads Road monitoring stations respectively. Data during automatic calibrations of the gaseous analyses has also been removed from the data sets.

Table 14 Data Exceptions – Chaim Court

START	END	PARAMETER	REASON
1/07/2008 12:20	1/07/2008 13:05	All Parameters	Maintenance/ calibration
7/07/2008 12:20	7/07/2008 13:45	NO, NO ₂ , NO _x	Maintenance/ calibration
7/07/2008 12:20	7/07/2008 16:00	CO	Maintenance/ calibration
9/07/2008 15:20	9/07/2008 16:20	PM _{2.5} , PM ₁₀	Maintenance/ calibration

Table 15 Data Exceptions – Craig Road

START	END	PARAMETER	REASON
1/07/2008 13:25	1/07/2008 13:30	All Parameters	Maintenance/ calibration
9/07/2008 15:20	9/07/2008 16:20	PM ₁₀	Maintenance/ calibration

Table 16 Data Exceptions – Heads Road

START	END	PARAMETER	REASON
1/07/2008 13:55	1/07/2008 14:05	All Parameters	Maintenance/ Calibration
9/07/2008 16:05	9/07/2008 16:35	PM ₁₀	Maintenance/ Calibration

7.0 Ambient Air Quality Monitoring Period: 01/08/2008 – 31/08/2008

7.1 Data Capture

Data capture is defined as the number of valid data periods collected divided by the number of available data periods. Valid data excludes periods where the instrument is unavailable due to calibration and maintenance and excludes periods where the data has been rejected due to quality assurance procedures.

The data capture statistics for the reporting period 1st August to 31st August 2008 are shown in Tables 17-19. Averages were only collected for those periods where the 5-minute data constituted 75% data capture.

Table 17 Data Capture Statistics – 1 hour Averages

PARAMETER	STATION	COLLECTED PERIODS	AVAILABLE PERIODS	DATA CAPTURE
PM _{2.5}	Chaim Crt.	744	744	100.0%
PM ₁₀	Chaim Crt	741	744	96.9%
	Craig Rd.	721	744	99.6%
	Heads Rd.	737	744	99.1%
NO, NO ₂	Chaim Crt	713	744	95.8%
	Craig Rd.	705	744	94.8%
	Heads Rd.	707	744	95.0%
CO	Chaim Crt	712	744	95.7%
	Craig Rd.	705	744	94.8%
	Heads Rd.	686	744	92.2%

Table 18 Data Capture Statistics – 8 Hour Rolling Averages

PARAMETER	STATION	COLLECTED PERIODS	AVAILABLE PERIODS	DATA CAPTURE
CO	Chaim Crt	744	744	100.0%
	Craig Rd.	730	744	98.1%
	Heads Rd.	716	744	96.2%

Table 19 Data Capture Statistics – 24 hour Averages

PARAMETER	STATION	COLLECTED PERIODS	AVAILABLE PERIODS	DATA CAPTURE
PM _{2.5}	Chaim Crt.	31	31	100.0%
PM ₁₀	Chaim Crt	29	31	93.5%
	Craig Rd.	31	31	100.0%
	Heads Rd.	31	31	100.0%

7.2 Results

7.2.1 PM_{2.5}

PM_{2.5} was continuously monitored and 5-minute averages logged. The 5-minute average data was then transformed to 1-hour and 24-hour averages for reporting.

PM_{2.5} (1-hour average) concentration statistics for the reporting period are given in Table 20. A plot of PM_{2.5} (1-hour average) concentration for the reporting period is presented in Figure 13.

Table 20 PM_{2.5} Concentration Percentiles (1-Hour Average)

STATION	PM _{2.5} CONCENTRATION (µg/m ³) (1-HOUR AVERAGE)						
	MAXIMUM	99 TH	98 TH	95 TH	90 TH	75 TH	50 TH
Chaim Crt.	34	26	25	21	17	10	6.1

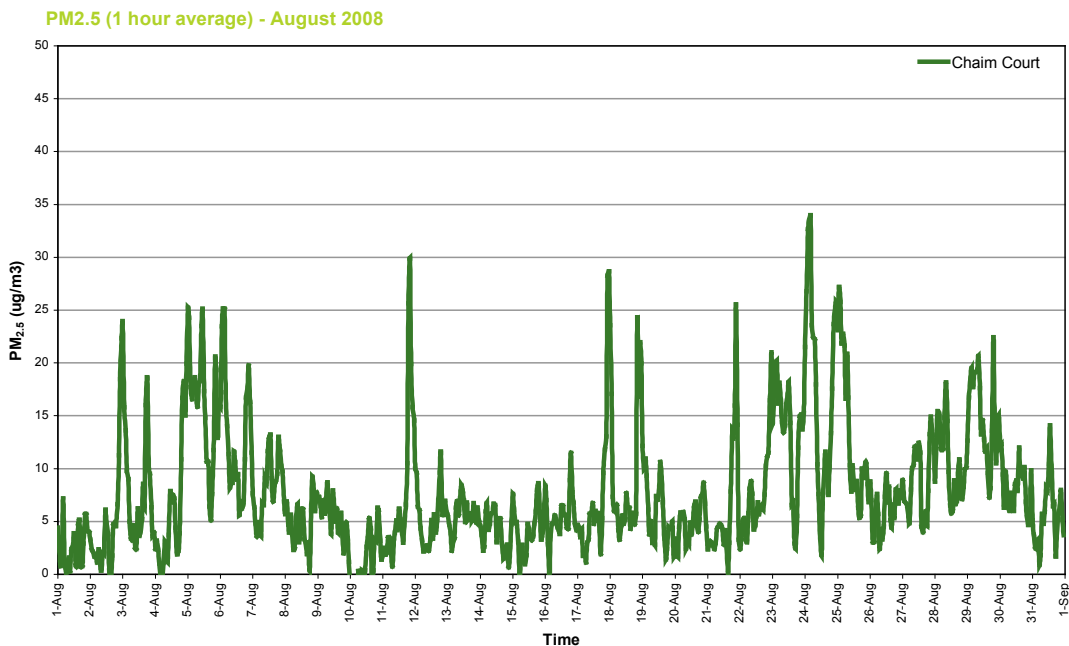


Figure 13 PM_{2.5} Concentration (1 Hour Average)

PM_{2.5} (24-hour average) concentration statistics for the reporting period are given in Table 21. A plot of PM_{2.5} (24-hour average) concentration for the reporting period is presented in Figure 14.



Table 21 PM_{2.5} Concentration Percentiles (24-Hour Average)

STATION	PM _{2.5} CONCENTRATION (µg/m ³) (24-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt.	17	17	17	16	13	9.1	6.2

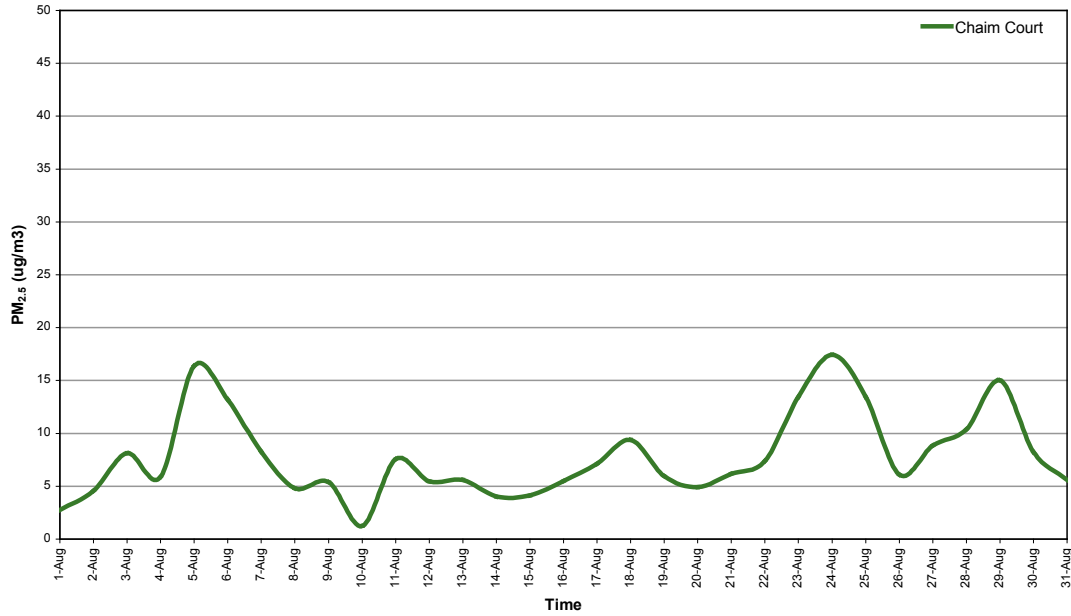


Figure 14 PM_{2.5} Concentration (24 Hour Average)

7.3 PM₁₀

PM₁₀ was continuously monitored and 5-minute averages logged. The 5-minute average data was then transformed to 1-hour and 24-hour averages for reporting.

PM₁₀ (1-hour average) concentration statistics for the reporting period are given in Table 22. A plot of PM₁₀ (1-hour average) concentration for the reporting period is presented in Figure 15.



Table 22 PM₁₀ Concentration Percentiles (1-Hour Average)

STATION	PM ₁₀ CONCENTRATION (µg/m ³) (24-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	27	22	20	17	15	12	8.3
Craig Rd	32	24	22	19	16	12	8.9
Heads Rd	28	23	22	19	17	14	10

PM₁₀ (1 hour average) - August 2008

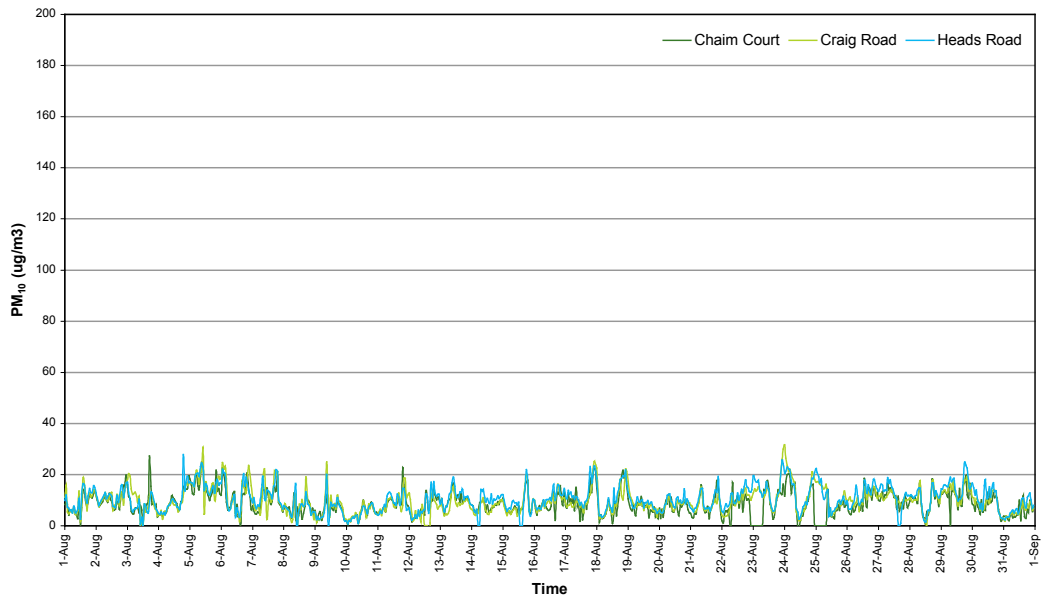


Figure 15 PM₁₀ Concentration (1 Hour Average)

PM₁₀ (24-hour average) concentration statistics for the reporting period are given in Table 23. A plot of PM₁₀ (24-hour average) concentration for the reporting period is presented in Figure 16.

Table 23 PM₁₀ Concentration Percentiles (24-Hour Average)

STATION	PM ₁₀ CONCENTRATION (µg/m ³) (24-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	16	15	14	12	11	10	8.8
Craig Rd.	17	16	15	14	13	11	9.5
Heads Rd	17	17	16	15	14	12	11

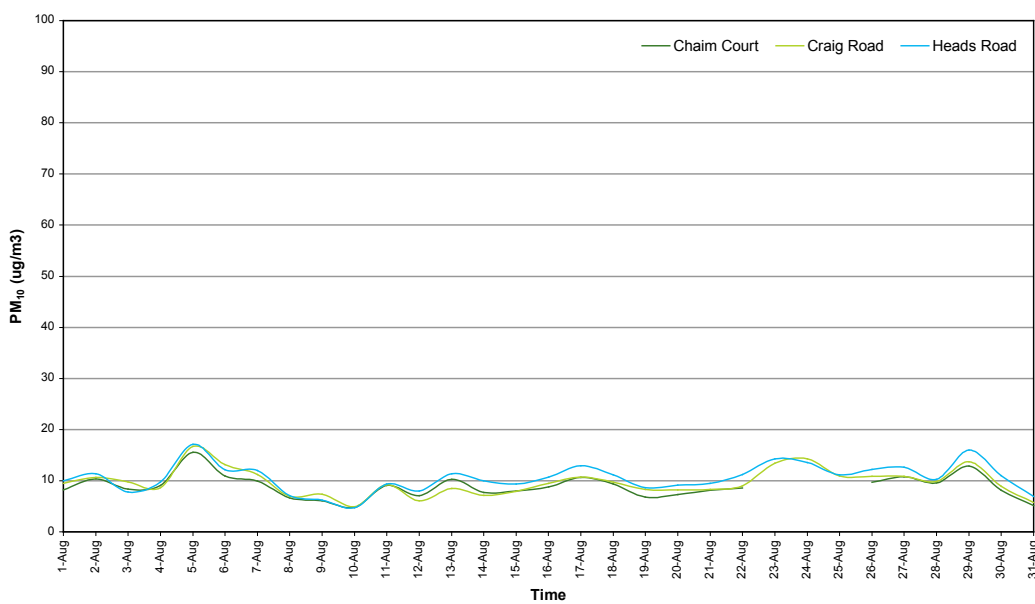


Figure 16 PM₁₀ Concentration (24 Hour Average)

7.3.1 Carbon Monoxide

7.3.1.1 1-Hour Average

Carbon monoxide (1-hour average) concentration statistics for the reporting period are given in Table 24. A plot of carbon monoxide (1-hour average) concentration for the reporting period is presented in Figure 17.



Table 24 Carbon Monoxide Concentration Percentiles (1-Hour Average)

STATION	CARBON MONOXIDE CONCENTRATION (ppm) (1-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	1.1	0.90	0.82	0.65	0.44	0.17	0.06
Craig Rd	1.5	1.2	1.2	0.94	0.80	0.39	0.18
Heads Rd	1.3	1.0	1.0	0.89	0.59	0.32	0.19

Carbon Monoxide (1 hour average) - August 2008

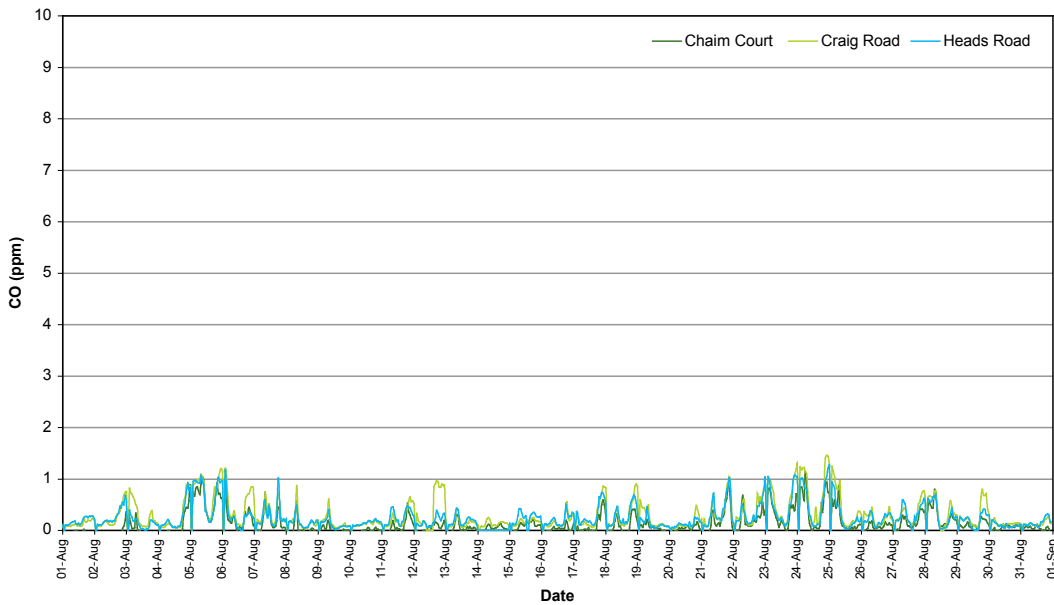


Figure 17 Carbon Monoxide Concentration (1 Hour Average)

7.3.1.2 8-Hour Rolling Average

Carbon monoxide (8-hour rolling average) concentration statistics for the reporting period are given in Table 25. A plot of carbon monoxide (8-hour rolling average) concentration for the reporting period is presented in Figure 18.



Table 25 Carbon Monoxide Concentration Percentiles (8-Hour Rolling Average)

STATION	CARBON MONOXIDE CONCENTRATION (ppm) (8-HOUR ROLLING AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	0.8	0.8	0.7	0.6	0.4	0.2	0.1
Craig Rd	1.3	1.2	1.0	0.9	0.7	0.4	0.2
Heads Rd	1.0	1.0	0.9	0.8	0.6	0.3	0.2

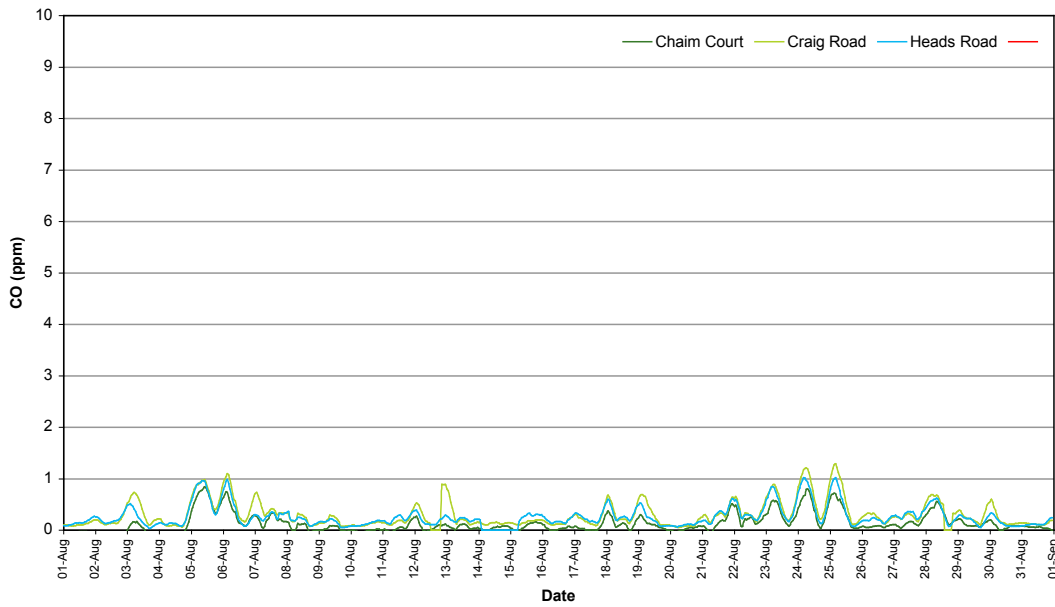


Figure 18 Carbon Monoxide Concentration (8 Hour Rolling Average)

7.3.2 Oxides Of Nitrogen

7.3.2.1 Nitric Oxide

Nitric oxide (1-hour average) concentration statistics for the reporting period are given in Table 26. A plot of nitric oxide (1-hour average) concentration for the reporting period is presented in Figure 19.

Table 26 Nitric Oxide Concentration Percentiles (1-Hour Average)

STATION	NITRIC OXIDE CONCENTRATION (ppm) (1-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	85	55	49	27	17	3.1	0.38
Craig Rd	83	56	47	32	22	5.4	0.38
Heads Rd	78	60	54	33	18	5.8	1.2

Nitric Oxide (1 hour average) - August 2008

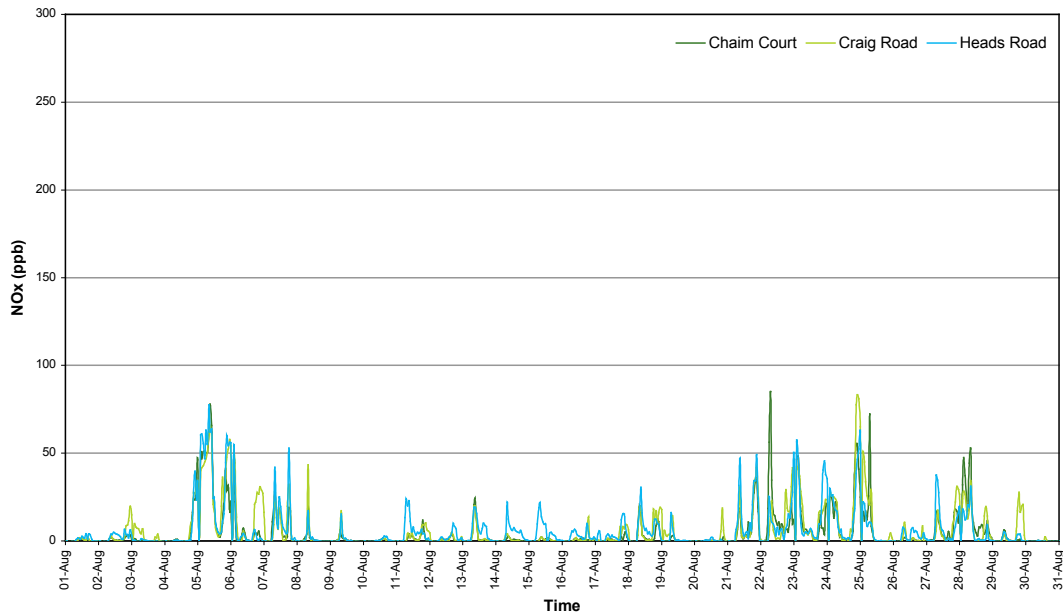


Figure 19 Nitric Oxide Concentration (1 Hour Average)

7.3.2.2 Nitrogen Dioxide

Nitrogen dioxide (1-hour average) concentration statistics for the reporting period are given in Table 27. A plot of nitrogen dioxide (1-hour average) concentration for the reporting period is presented in Figure 20.

Table 27 Nitrogen Dioxide Concentration Percentiles (1-Hour Average)

STATION	NITROGEN DIOXIDE CONCENTRATION (ppb) (1-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	29	27	26	24	21	14	7.8
Craig Rd	25	23	22	20	17	12	7.2
Heads Rd	30	27	26	23	21	15	9.1

Nitrogen Dioxide (1 hour average) - August 2008

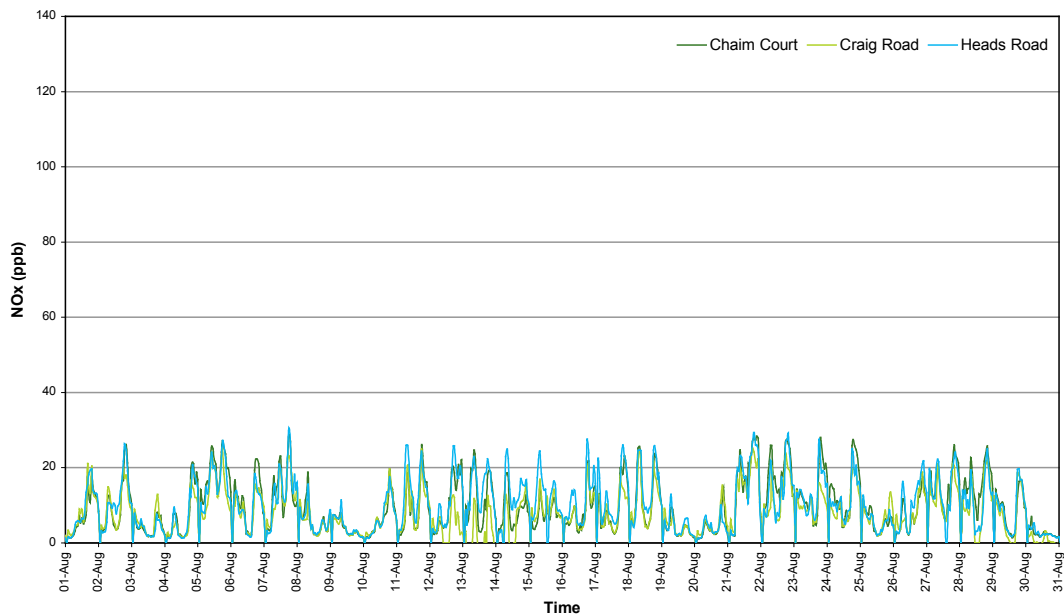


Figure 20 Nitrogen Dioxide Concentration (1 Hour Average)

7.3.3 Meteorological Data

Wind speed and direction for each of the monitoring stations are presented as wind roses in Figures 21 – 23.

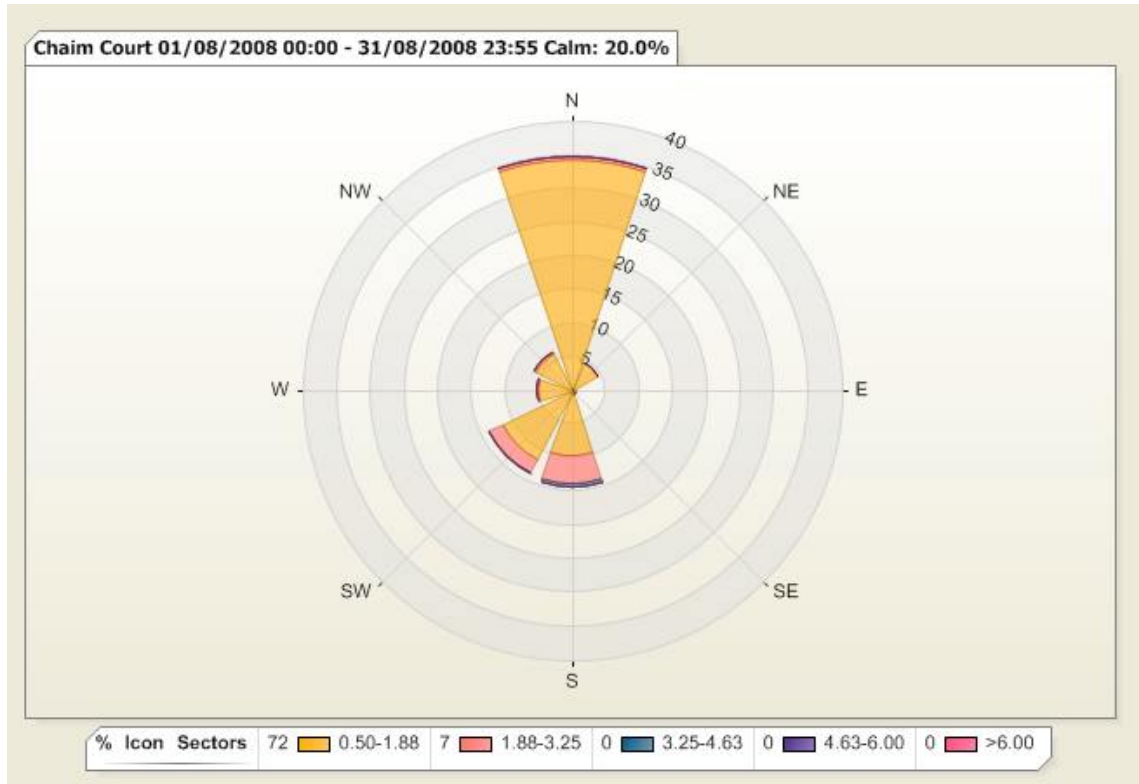


Figure 21 Chaim Court Wind Rose

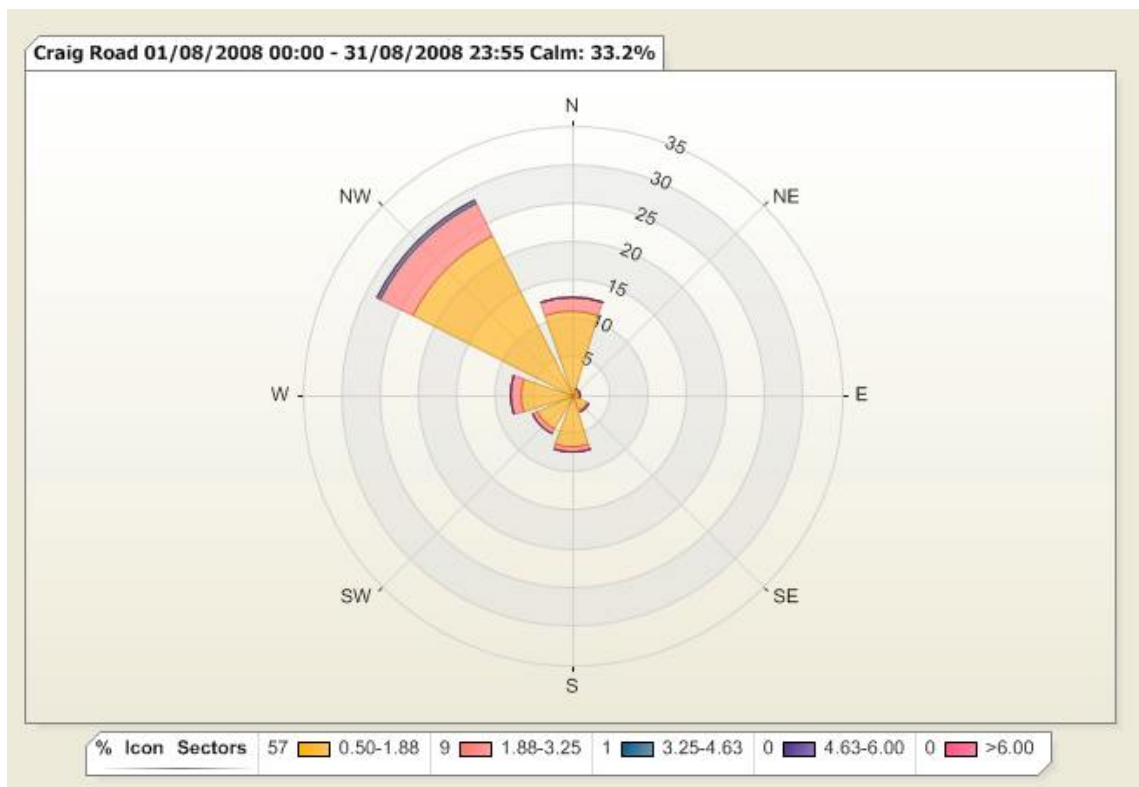


Figure 22 Craig Road Wind Rose

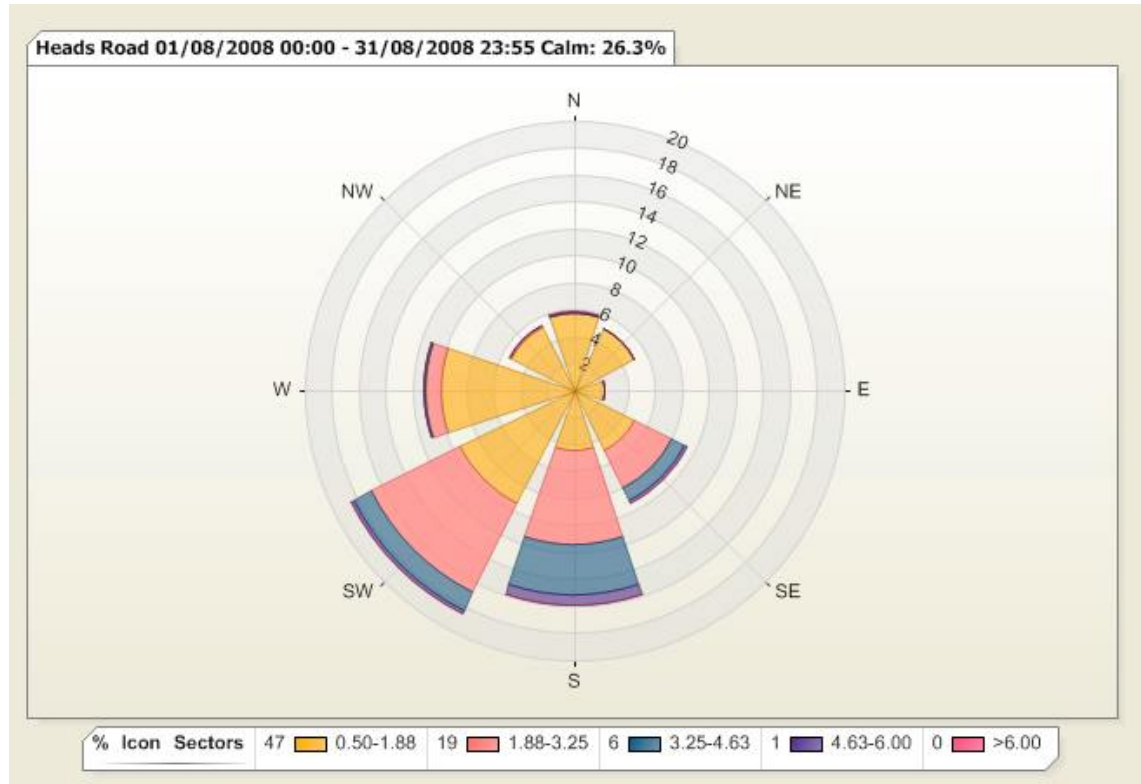


Figure 23 Heads Road Wind Rose

7.4 Data Validation and Exception

Data contained in the report has been validated against performance and calibration requirements for each instrument. Data during maintenance and calibration periods has been removed from the validated data sets. Tables 28 – 30 list the data exceptions for Chaim Court, Craig Road and Heads Road monitoring stations respectively. Data during automatic calibrations of the gaseous analyses has also been removed from the data sets.

Table 28 Data Exceptions – Chaim Court

START	END	PARAMETER	REASON
18/08/2008 11:50	18/08/2008 0:15	Temp, CO, NO, PM ₁₀ , PM _{2.5}	Data error
22/08/2008 5:50	22/08/2008 7:45	PM ₁₀	Flow error
22/08/2008 22:00	23/08/2008 7:40	PM ₁₀	Flow error
24/08/2008 22:45	25/08/2008 8:45	PM ₁₀	Flow error
29/08/2008 7:00	29/08/2008 8:10	PM ₁₀	Flow error

Table 29 Data Exceptions – Craig Road

START	END	PARAMETER	REASON
12/08/2008 10:35	12/08/2008 14:20	CO, NO, NO ₂ , NO _x	Maintenance/calibration
12/08/2008 10:40	12/08/2008 15:05	PM ₁₀	Maintenance/calibration
14/08/2008 12:55	14/08/2008 14:30	NO, NO ₂ , NO _x	Maintenance/calibration
28/08/2008 11:05	28/08/2008 14:35	NO, NO ₂ , NO _x	Yearly maintenance
28/08/2008 12:40	28/08/2008 14:35	CO	Maintenance/calibration
28/08/2008 13:15	28/08/2008 14:35	PM ₁₀	Maintenance/calibration

Table 30 Data Exceptions – Heads Road

START	END	PARAMETER	REASON
14/08/2008 5:20	14/08/2008 6:55	All Parameters	Power failure
14/08/2008 6:55	14/08/2008 23:55	CO	Unstable zero after power failure
15/08/2008 12:45	15/08/2008 15:50	CO, NO, NO ₂ , NO _x	Maintenance/calibration
15/08/2008 13:20	15/08/2008 15:15	PM ₁₀	Maintenance/calibration
18/08/2008 13:20	18/08/2008 13:25	CO, NO, NO ₂ , NO _x , PM ₁₀	Data error
19/08/2008 11:30	19/08/2008 11:35	All Parameters	Data error
27/08/2008 13:50	27/08/2008 13:55	PM ₁₀	Maintenance/calibration
27/08/2008 15:40	27/08/2008 16:35	PM ₁₀	Maintenance/calibration

8.0 Ambient Air Quality Monitoring Period: 01/09/2008 – 30/09/2008

8.1 Data Capture

Data capture is defined as the number of valid data periods collected divided by the number of available data periods. Valid data excludes periods where the instrument is unavailable due to calibration and maintenance and excludes periods where the data has been rejected due to quality assurance procedures.

The data capture statistics for the reporting period 1st September to 30th September 2008 are shown in Tables 31-33. Averages were only collected for those periods where the 5-minute data constituted 75% data capture.

Table 31 Data Capture Statistics – 1 hour Averages

PARAMETER	STATION	COLLECTED PERIODS	AVAILABLE PERIODS	DATA CAPTURE
PM _{2.5}	Chaim Crt.	719	720	99.9%
PM ₁₀	Chaim Crt	699	720	97.1%
	Craig Rd.	706	720	98.1%
	Heads Rd.	719	720	99.9%
NO, NO ₂	Chaim Crt	682	720	94.7%
	Craig Rd.	676	720	93.9%
	Heads Rd.	687	720	95.4%
CO	Chaim Crt	684	720	95.0%
	Craig Rd.	674	720	93.6%
	Heads Rd.	690	720	95.8%

Table 32 Data Capture Statistics – 8 Hour Rolling Averages

PARAMETER	STATION	COLLECTED PERIODS	AVAILABLE PERIODS	DATA CAPTURE
CO	Chaim Crt	710	720	98.6%
	Craig Rd.	698	720	96.9%
	Heads Rd.	720	720	100.0%

Table 33 Data Capture Statistics – 24 hour Averages

PARAMETER	STATION	COLLECTED PERIODS	AVAILABLE PERIODS	DATA CAPTURE
PM _{2.5}	Chaim Crt.	30	30	100.0%
PM ₁₀	Chaim Crt	29	30	96.7%
	Craig Rd.	28	30	93.3%
	Heads Rd.	30	30	100.0%

8.2 Results

8.2.1 PM_{2.5}

PM_{2.5} was continuously monitored and 5-minute averages logged. The 5-minute average data was then transformed to 1-hour and 24-hour averages for reporting.

PM_{2.5} (1-hour average) concentration statistics for the reporting period are given in Table 34. A plot of PM_{2.5} (1-hour average) concentration for the reporting period is presented in Figure 24.

Table 34 PM_{2.5} Concentration Percentiles (1-Hour Average)

STATION	PM _{2.5} CONCENTRATION (µg/m ³) (1-HOUR AVERAGE)						
	MAXIMUM	99 TH	98 TH	95 TH	90 TH	75 TH	50 TH
Chaim Crt.	31	23	22	18	16	12	9.2

PM_{2.5} (1 hour average) - September 2008

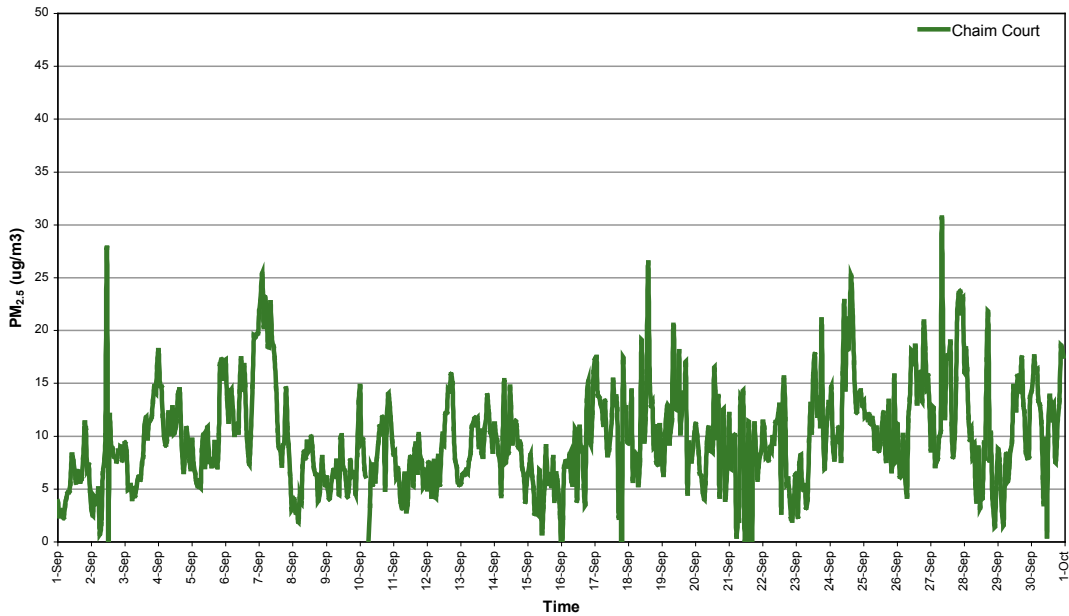


Figure 24 PM_{2.5} Concentration (1 Hour Average)

PM_{2.5} (24-hour average) concentration statistics for the reporting period are given in Table 35. A plot of PM_{2.5} (24-hour average) concentration for the reporting period is presented in Figure 25.



Table 35 PM_{2.5} Concentration Percentiles (24-Hour Average)

STATION	PM _{2.5} CONCENTRATION (µg/m ³) (24-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt.	15	15	15	15	14	11	9.2

PM_{2.5} (24 hour average) - September 2008

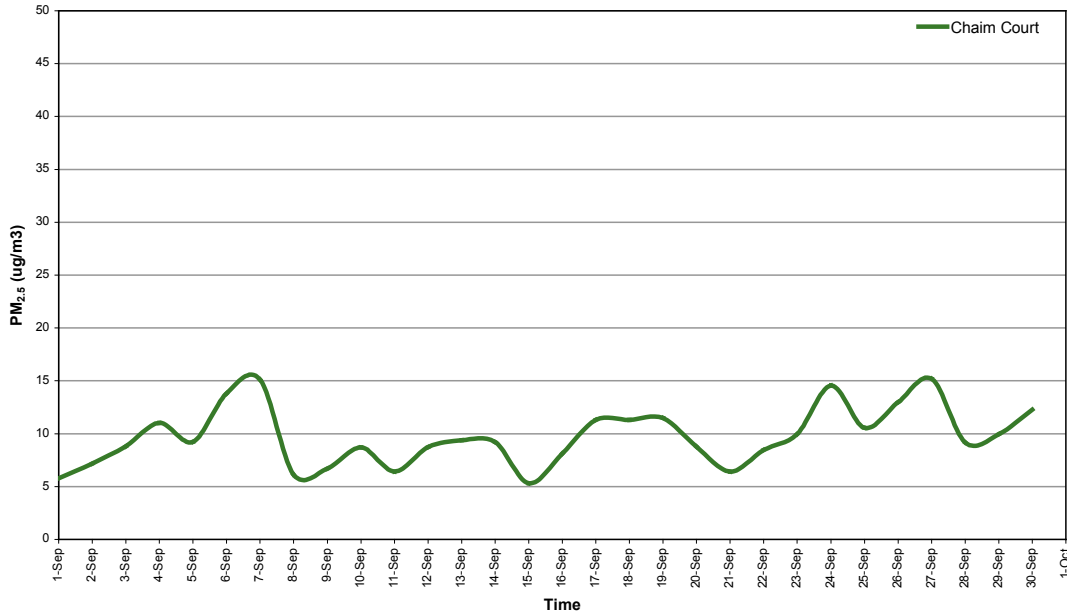


Figure 25 PM_{2.5} Concentration (24 Hour Average)

8.3 PM₁₀

PM₁₀ was continuously monitored and 5-minute averages logged. The 5-minute average data was then transformed to 1-hour and 24-hour averages for reporting.

PM₁₀ (1-hour average) concentration statistics for the reporting period are given in Table 36. A plot of PM₁₀ (1-hour average) concentration for the reporting period is presented in Figure 26.



Table 36 PM₁₀ Concentration Percentiles (1-Hour Average)

STATION	PM ₁₀ CONCENTRATION (µg/m ³) (24-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	47	33	29	22	19	14	11
Craig Rd	56	35	31	24	20	16	12
Heads Rd	61	40	31	25	22	18	13

PM₁₀ (1 hour average) - September 2008

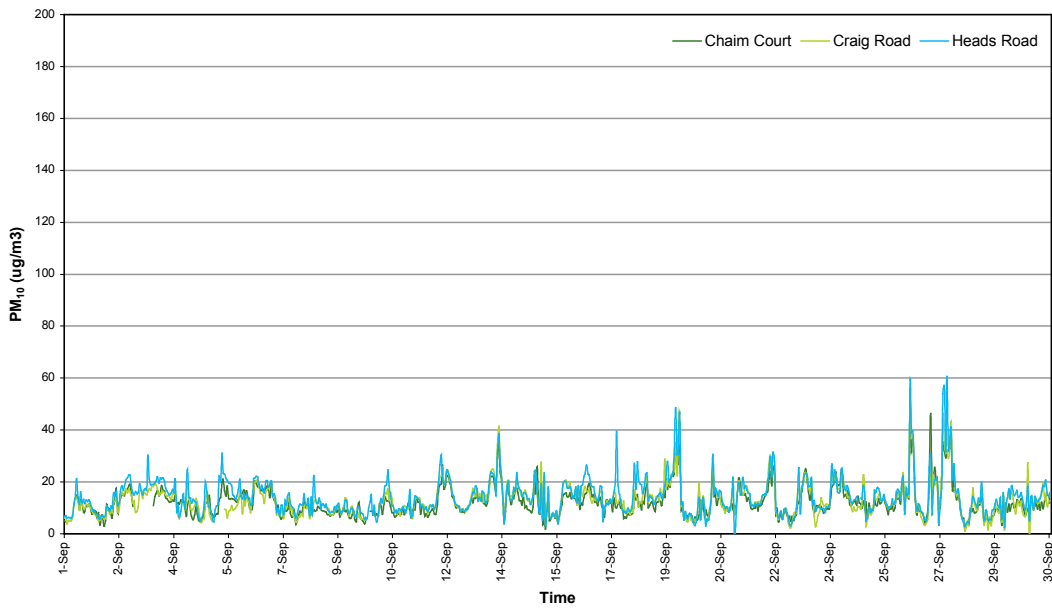


Figure 26 PM₁₀ Concentration (1 Hour Average)

PM₁₀ (24-hour average) concentration statistics for the reporting period are given in Table 37. A plot of PM₁₀ (24-hour average) concentration for the reporting period is presented in Figure 27.



Table 37 PM₁₀ Concentration Percentiles (24-Hour Average)

STATION	PM ₁₀ CONCENTRATION (µg/m ³) (24-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	20	19	18	17	16	13	12
Craig Rd.	20	20	20	19	18	15	13
Heads Rd	23	22	21	20	19	16	14

PM10 (24 hour average) - September 2008

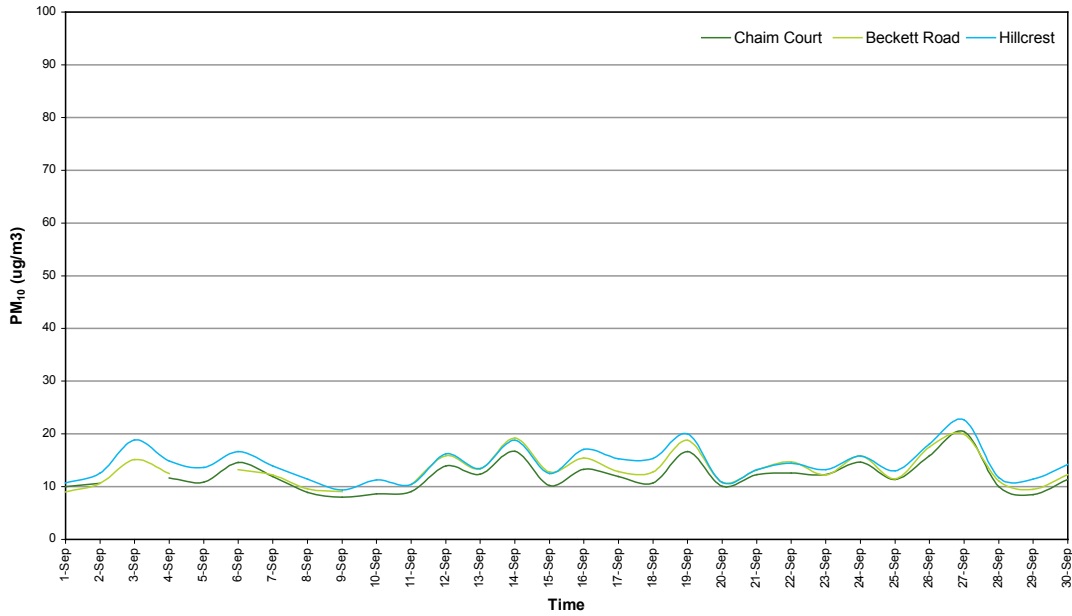


Figure 27 PM₁₀ Concentration (24 Hour Average)

8.3.1 Carbon Monoxide

8.3.1.1 1-Hour Average

Carbon monoxide (1-hour average) concentration statistics for the reporting period are given in Table 38. A plot of carbon monoxide (1-hour average) concentration for the reporting period is presented in Figure 28.



Table 38 Carbon Monoxide Concentration Percentiles (1-Hour Average)

STATION	CARBON MONOXIDE CONCENTRATION (ppm) (1-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	0.97	0.69	0.60	0.52	0.43	0.33	0.24
Craig Rd	1.1	0.83	0.70	0.57	0.48	0.32	0.21
Heads Rd	0.79	0.52	0.49	0.40	0.32	0.21	0.12

Carbon Monoxide (1 hour average) - September 2008

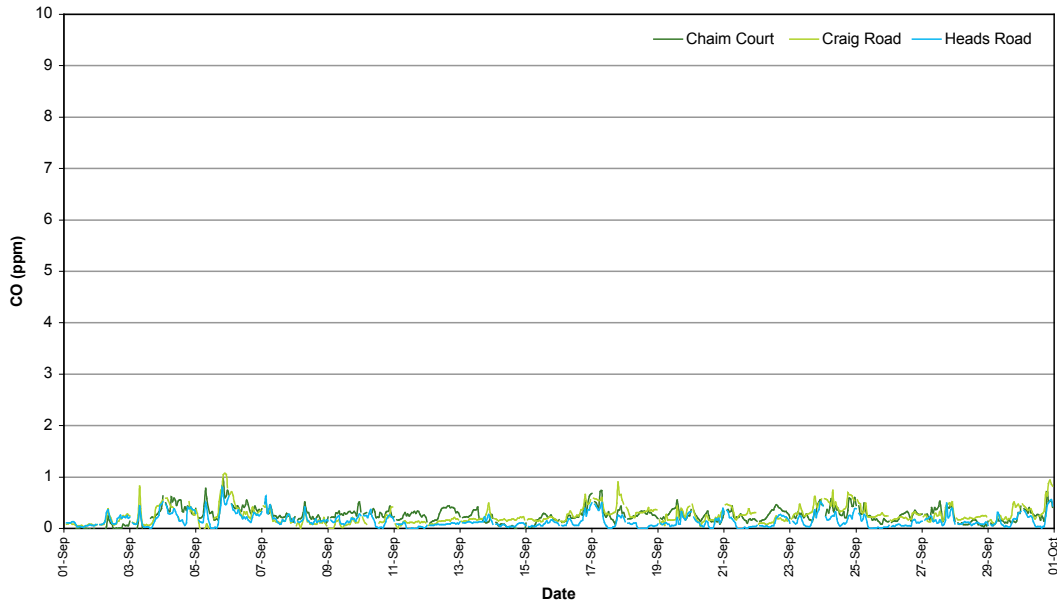


Figure 28 Carbon Monoxide Concentration (1 Hour Average)

8.3.1.2 8-Hour Rolling Average

Carbon monoxide (8-hour rolling average) concentration statistics for the reporting period are given in Table 39. A plot of carbon monoxide (8-hour rolling average) concentration for the reporting period is presented in Figure 29.



Table 39 Carbon Monoxide Concentration Percentiles (8-Hour Rolling Average)

STATION	CARBON MONOXIDE CONCENTRATION (ppm) (8-HOUR ROLLING AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	0.7	0.6	0.5	0.5	0.4	0.3	0.3
Craig Rd	0.9	0.7	0.6	0.5	0.5	0.3	0.2
Heads Rd	0.6	0.4	0.4	0.4	0.3	0.2	0.1

Carbon Monoxide (8 hour average) - September 2008

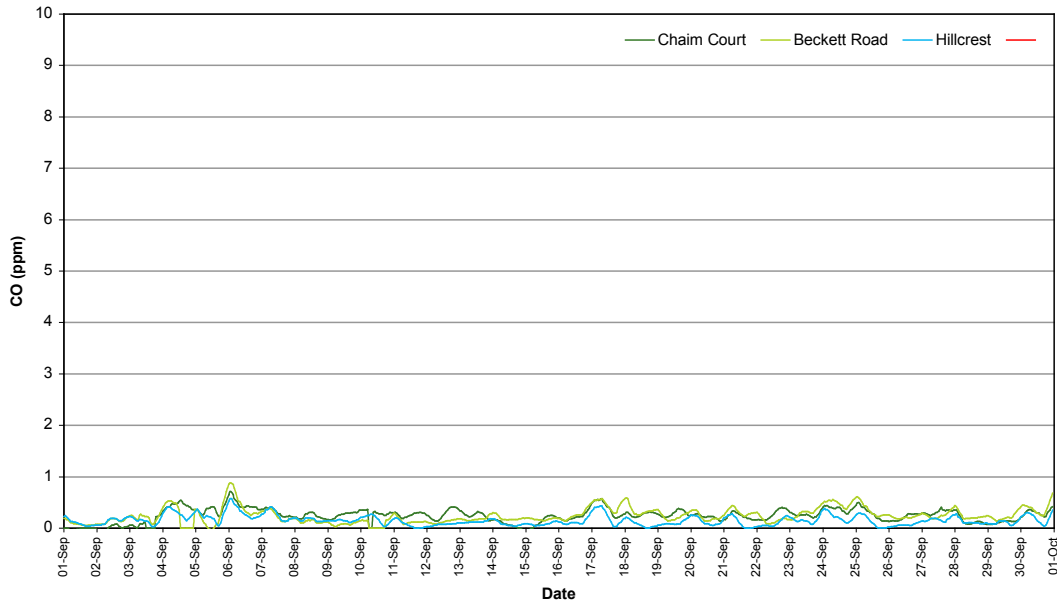


Figure 29 Carbon Monoxide Concentration (8 Hour Rolling Average)

8.3.2 Oxides Of Nitrogen

8.3.2.1 Nitric Oxide

Nitric oxide (1-hour average) concentration statistics for the reporting period are given in Table 40. A plot of nitric oxide (1-hour average) concentration for the reporting period is presented in Figure 30.

Table 40 Nitric Oxide Concentration Percentiles (1-Hour Average)

STATION	NITRIC OXIDE CONCENTRATION (ppm) (1-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	58	26	18	12	6.7	2.8	1.4
Craig Rd	66	33	23	14	9.7	2.8	0.4
Heads Rd	38	18	14	8.2	5.4	2.0	0

Nitric Oxide (1 hour average) - September 2008

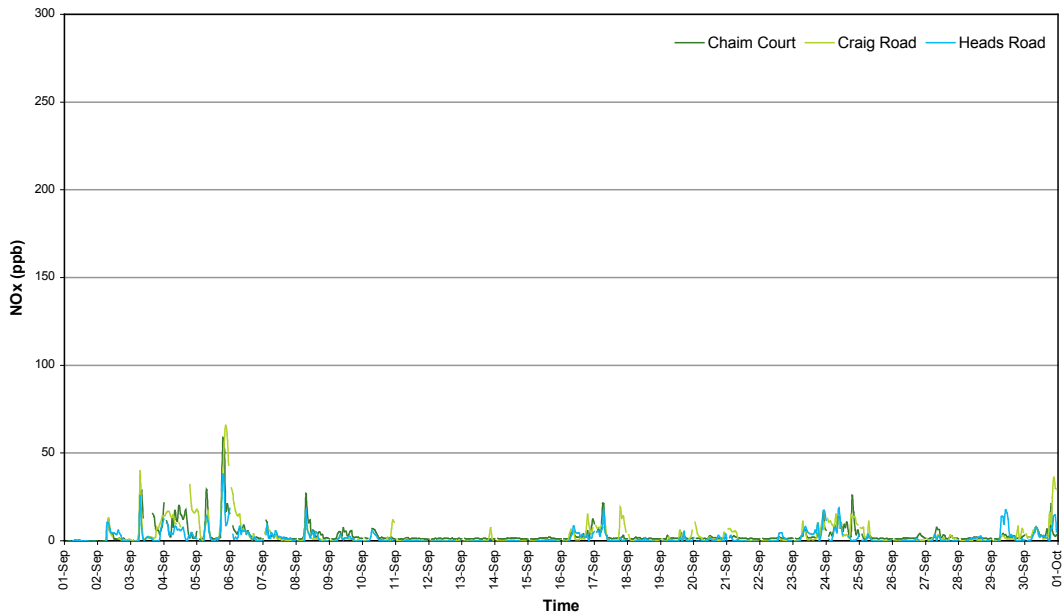


Figure 30 Nitric Oxide Concentration (1 Hour Average)

8.3.2.2 Nitrogen Dioxide

Nitrogen dioxide (1-hour average) concentration statistics for the reporting period are given in Table 41. A plot of nitrogen dioxide (1-hour average) concentration for the reporting period is presented in Figure 31.

Table 41 Nitrogen Dioxide Concentration Percentiles (1-Hour Average)

STATION	NITROGEN DIOXIDE CONCENTRATION (ppb) (1-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	30	25	22	19	15	9.2	3.8
Craig Rd	24	21	19	16	14	7.9	3.3
Heads Rd	29	23	21	18	15	10	5.3

Nitrogen Dioxide (1 hour average) - September 2008

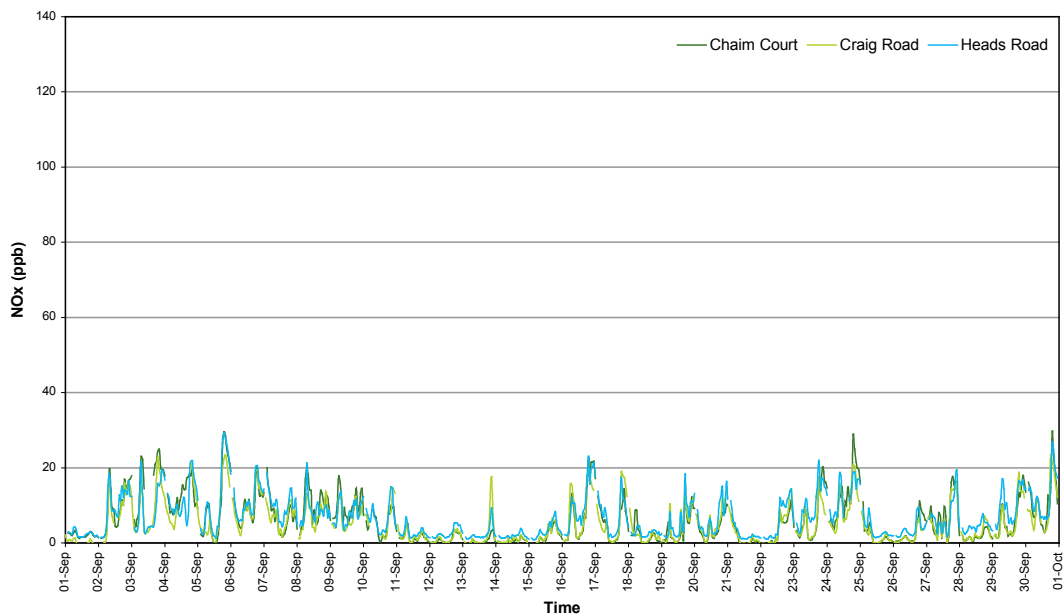


Figure 31 Nitrogen Dioxide Concentration (1 Hour Average)

8.4 Meteorological Data

Wind speed and direction for each of the monitoring stations are presented as wind roses in Figures 32 – 34.

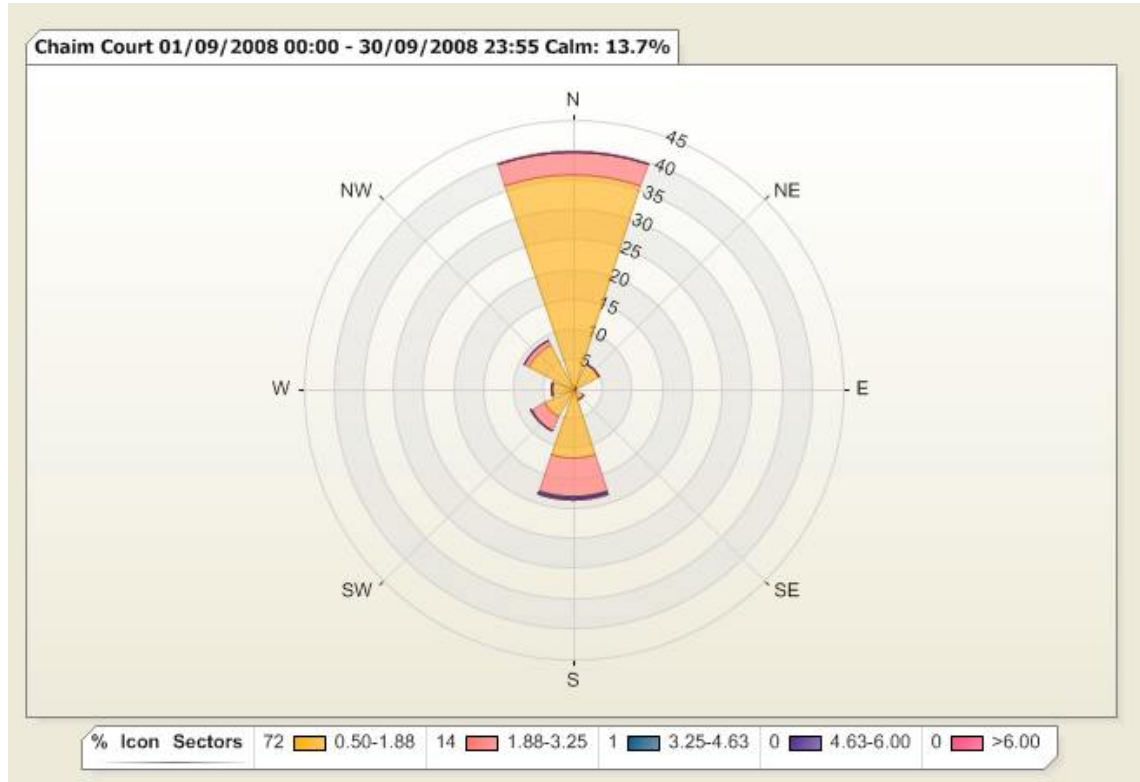


Figure 32 Chaim Court Wind Rose

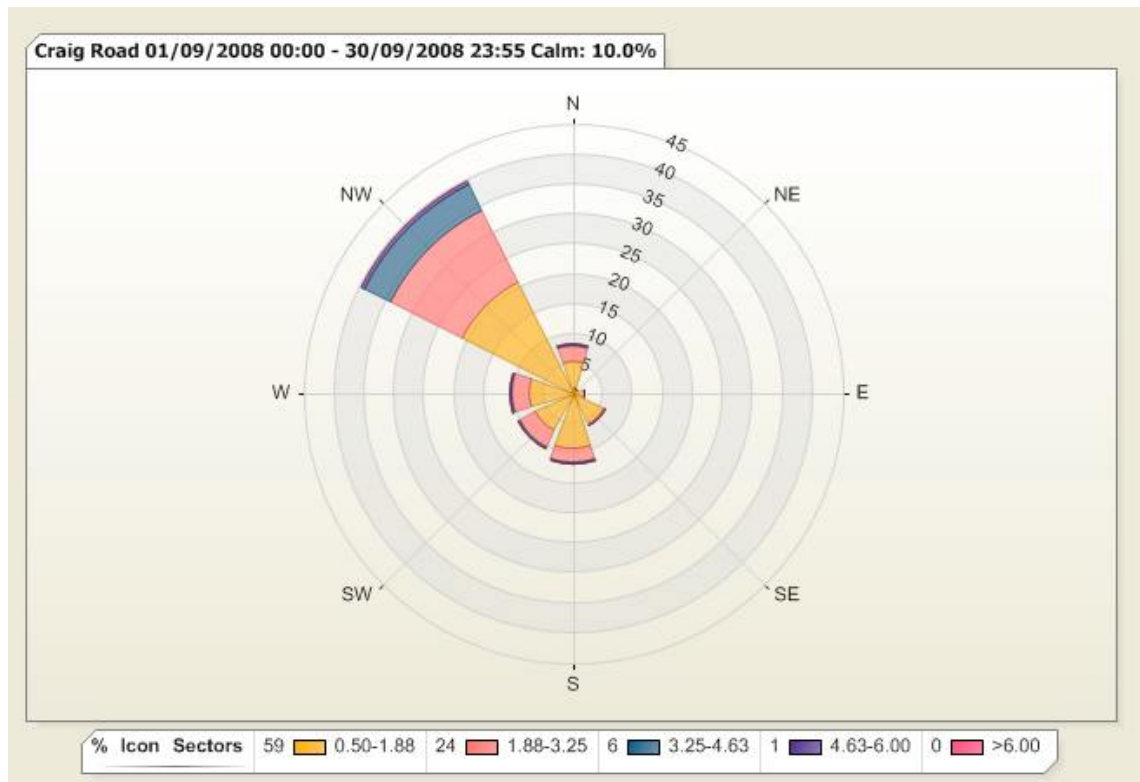


Figure 33 Craig Road Wind Rose

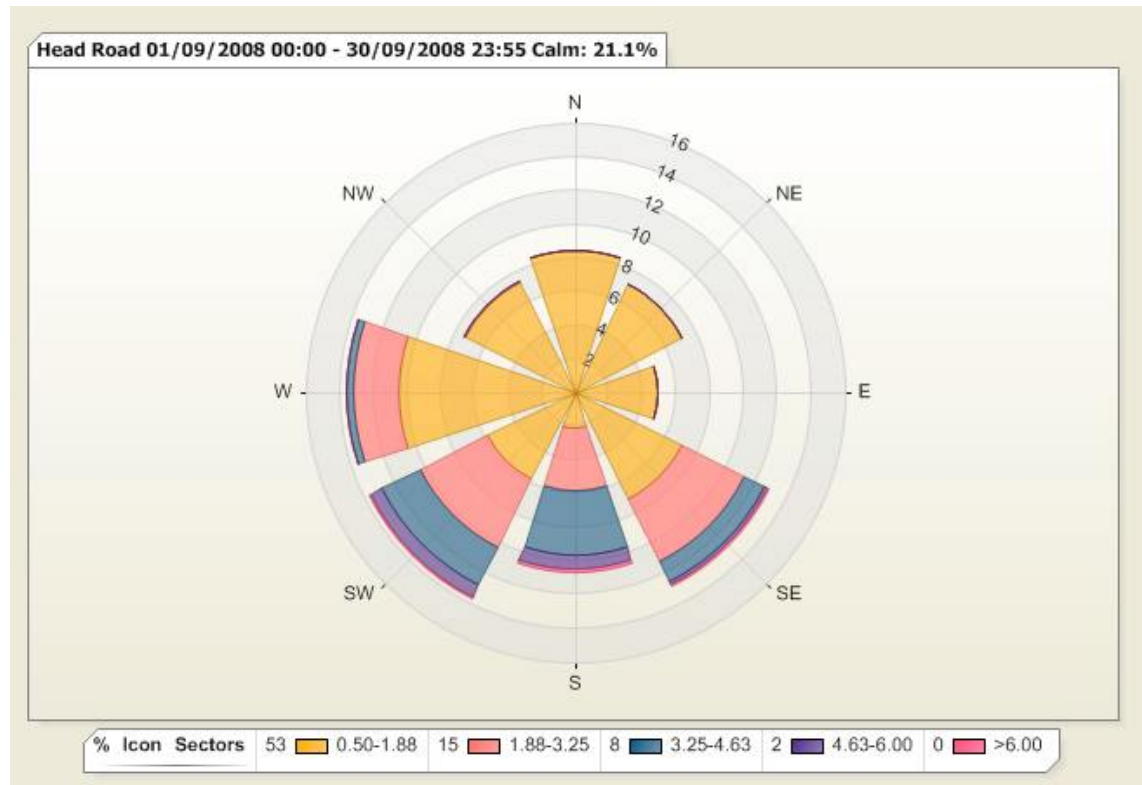


Figure 34 Heads Road Wind Rose

8.5 Data Validation and Exception

Data contained in the report has been validated against performance and calibration requirements for each instrument. Data during maintenance and calibration periods has been removed from the validated data sets. Tables 42 – 44 list the data exceptions for Chaim Court, Craig Road and Heads Road monitoring stations respectively. Data during automatic calibrations of the gaseous analyses has also been removed from the data sets.

Table 42 Data Exceptions – Chaim Court

START	END	PARAMETER	REASON
1/09/2008 3:00	1/09/2008 7:50	PM ₁₀	Flow error
3/09/2008 9:55	3/09/2008 15:20	CO, NO, NO ₂ , NO _x	Maintenance/ calibration
1/09/2008 3:25	1/09/2008 8:45	PM ₁₀	Flow error
3/09/2008 10:25	3/09/2008 16:20	PM ₁₀	Maintenance/ calibration
6/10/2008 10:35	6/10/2008 10:40	All parameters	Power failure
10/09/2008 5:30	10/09/2008 6:05	All parameters	Power failure

Table 43 Data Exceptions – Craig Road

START	END	PARAMETER	REASON
2/09/2008 12:35	2/09/2008 14:20	NO, NO ₂ , NO _x	Maintenance/ calibration
4/09/2008 13:05	4/09/2008 18:40	All parameters	Maintenance/ calibration
5/09/2008 10:55	5/09/2008 14:25	CO, NO, NO ₂ , NO _x , PM ₁₀	Maintenance/ calibration
6/09/2008 8:55	6/09/2008 8:55	All parameters	Data error
7/09/2008 11:45	7/09/2008 11:45	All parameters	Data error
10/09/2008 5:25	10/09/2008 12:20	All parameters	Power failure
30/09/2008 11:50	30/09/2008 12:55	CO, NO, NO ₂ , NO _x	Maintenance/ calibration

Table 44 Data Exceptions – Heads Road

START	END	PARAMETER	REASON
24/09/2008 13:20	24/09/2008 15:20	NO, NO ₂ , NO _x	Maintenance/ calibration
25/09/2008 4:20	25/09/2008 4:45	All parameters	Power failure
24/09/2008 13:45	24/09/2008 13:45	All parameters	Data error
24/09/2008 14:10	24/09/2008 14:10	All parameters	Data error
24/09/2008 15:00	24/09/2008 15:05	All parameters	Data error

9.0 Discussion

9.1 Comparison with Air Quality Objectives

9.1.1 PM_{2.5} and PM₁₀

Assessment criteria for PM_{2.5} and PM₁₀ are taken from the State Environment Protection Policy (Air Quality Management) (SEPP {AQM}) Schedule B intervention levels. The intervention levels for PM₁₀ and PM_{2.5} are as follows:

- PM₁₀ (24-hour) 60 µg/m³;
- PM_{2.5} (24 hour) 36 µg/m³.

There were no exceedences of the PM₁₀ or PM_{2.5} intervention levels during the reported period at any of the monitoring stations. The maximum 24-hour average PM_{2.5} concentration was 17 µg/m³ at Chaim Court monitoring station. The maximum 24-hour average PM₁₀ concentration was 29 µg/m³ at Craig Road monitoring station.

9.1.2 Nitrogen Dioxide

The assessment criterion for NO₂ is taken from the SEPP (AQM) Schedule B intervention level. The intervention level for NO₂ is as follows:

- NO₂ (1 hour) 140 ppb.

There were no exceedences of the NO₂ intervention level during the reported period at any of the monitoring stations. The maximum 1-hour average NO₂ concentration was 31 ppb at Chaim Court monitoring station.

9.1.3 Carbon Monoxide

Assessment criteria for CO are taken from the (SEPP AQM) Schedule B intervention level and the State Environment Protection Policy (Ambient Air Quality) {SEPP (AAQ)} air quality objective. The intervention and SEPP (AAQ) levels for CO are as follows:

- CO (1 hour) 29 ppm {SEPP (AQM)};
- CO (8-hour) 9 ppm {SEPP (AAQ)}.

There were no exceedences of the CO intervention level or SEPP (AAQ) objective during the reported period at any of the monitoring stations. The maximum 1-hour average CO concentration was 2.0 ppm at Craig Road monitoring station and the maximum 8-hour average CO concentration was 1.3 ppm reported at the Craig Road monitoring station.