



April 2009

**TRANSFIELD SERVICES PTY. LTD.,
RINGWOOD, VICTORIA**

EastLink Ambient Air Quality Monitoring Report January-March 2009

Submitted to:
Transfield Services Pty. Ltd.

REPORT



This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

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APPENDICES

APPENDIX A

Limitations



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 Golder Associates Pty. Ltd. {trading as 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; and
- 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 1st January, 2009 to 31st March, 2009 inclusive are contained in the following report.

Your attention is drawn to the document - "Limitations", which is included in Attachment A of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by Golder, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.



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

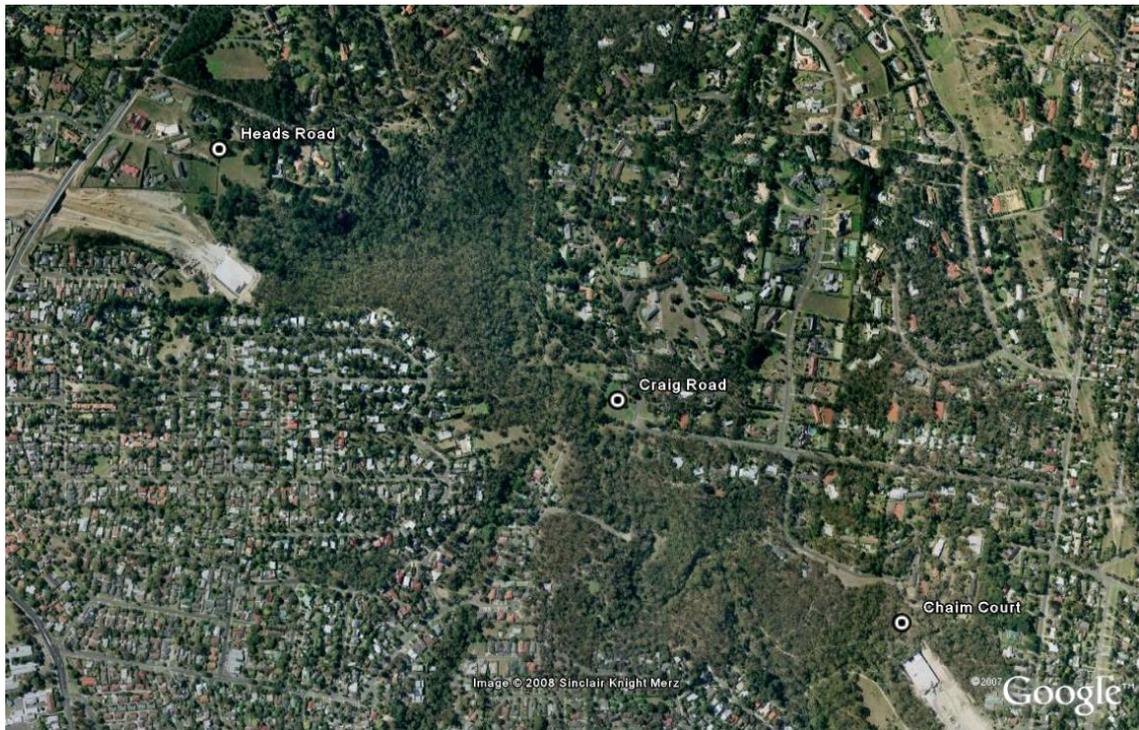


Figure 1: Ambient Air Monitoring Stations



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 the Flow Dynamics Measurement System (TEOM-FDMS).

Ambient air was 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 passed through the FDMS unit which compensates for loss of volatile material from the TEOM filter. Measurements were made in real-time (2 s intervals) with the 5-minute averages logged. 1-hour and 24-hour averages were then calculated from the logged data.

4.2 PM₁₀

PM₁₀ concentration in ambient air was determined in real time using a Tapered Element Oscillating Microbalance (TEOM) analyser. Ambient air was drawn through a PM₁₀ WINS size selective inlet at 1 m³/h. Measurements were made in real-time (2 s intervals) with the 5-minute averages logged. From the logged data 1-hour and 24-hour averages were 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 m 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.



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 uses 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: 01/01/2009 – 31/01/2009

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 1st January to 31st January, 2009 are shown in Tables 3-5. Averages were only collected for those periods where the 5-minute data constituted 75% data capture.

Section 6.3 provides further information on the reasons for invalid data periods.

Table 3: Data Capture Statistics - 1 Hour Averages

PARAMETER	STATION	COLLECTED PERIODS	AVAILABLE PERIODS	DATA CAPTURE
PM _{2.5}	Chaim Crt.	739	744	99.3%
PM ₁₀	Chaim Crt	741	744	99.6%
	Craig Rd.	741	744	99.6%
	Heads Rd.	742	744	99.7%
NO, NO ₂	Chaim Crt	711	744	95.6%
	Craig Rd.	711	744	95.6%
	Heads Rd.	711	744	95.6%
CO	Chaim Crt	711	744	95.6%
	Craig Rd.	711	744	95.6%
	Heads Rd.	711	744	95.6%

Table 4: Data Capture Statistics - 8 Hour Rolling Averages

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

Table 5: 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	31	31	100.0%
	Craig Rd.	31	31	100.0%
	Heads Rd.	31	31	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	41	26	21	19	16	13	10

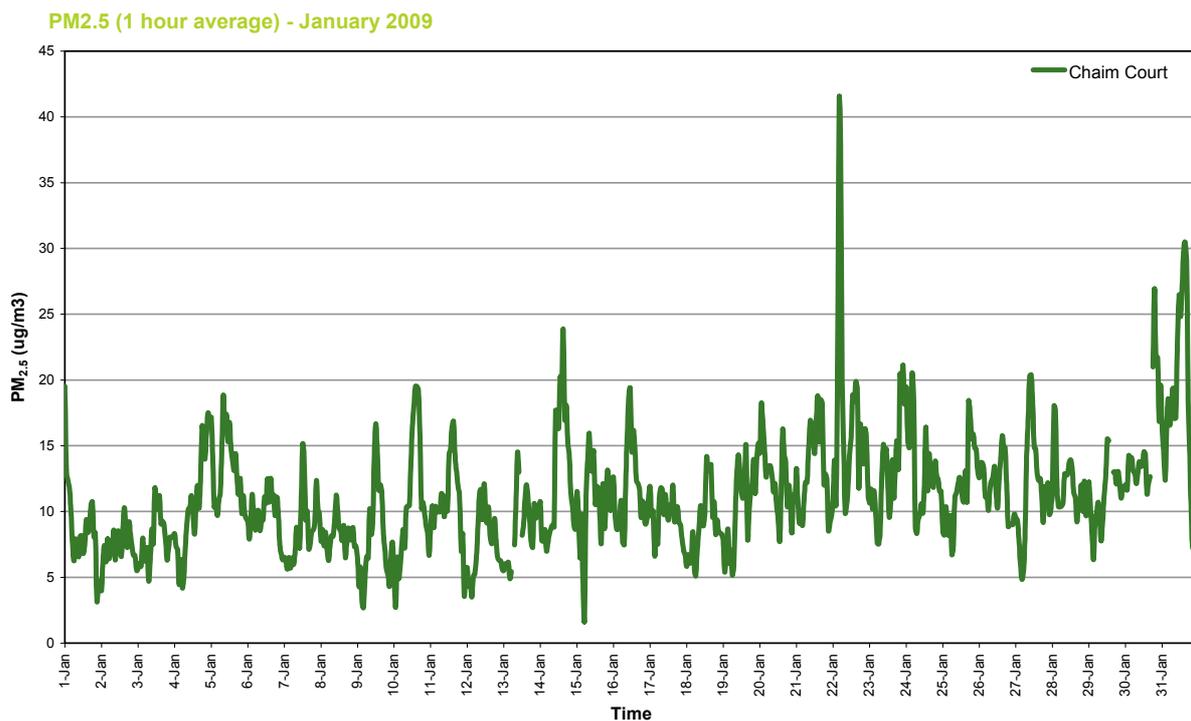


Figure 2: PM_{2.5} Concentration (1 Hour Average)



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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	18	18	17	16	13	13	11

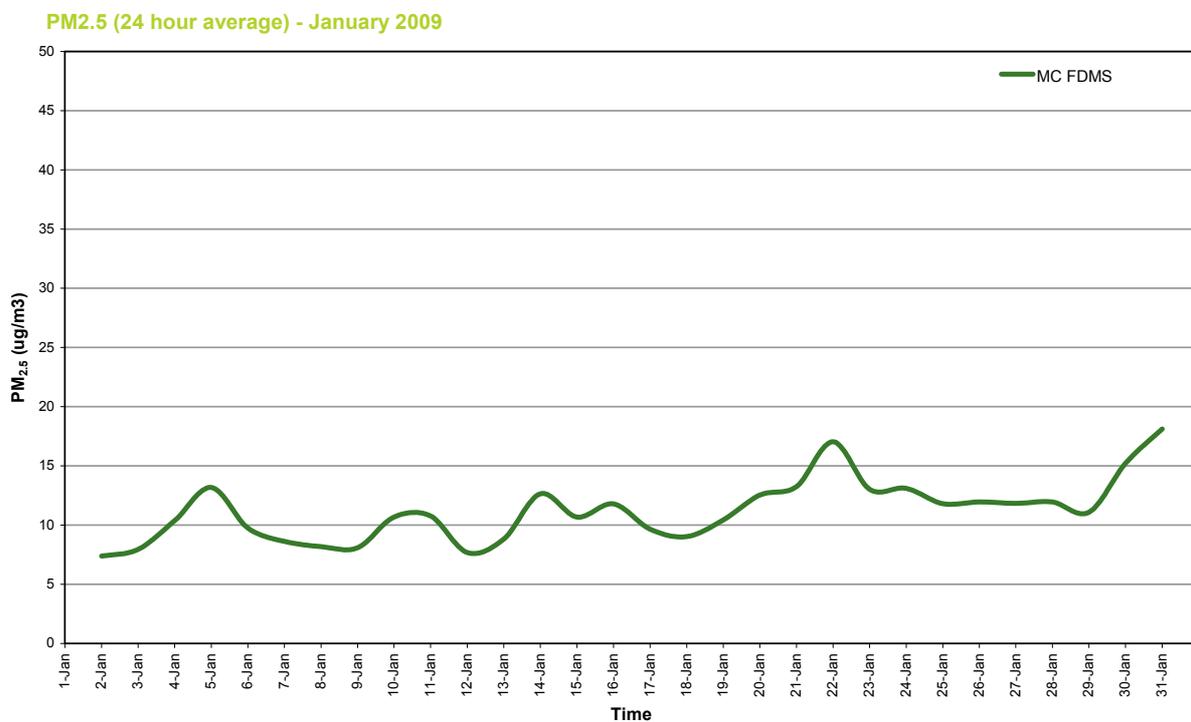


Figure 3: PM_{2.5} Concentration (24 Hour Average)

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.



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Table 8: PM₁₀ Concentration Percentiles (1 Hour Average)

STATION	PM ₁₀ CONCENTRATION (µg/m ³) (1-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	200	73	57	40	32	22	16
Craig Rd	290	97	65	46	39	26	19
Heads Rd	290	80	60	45	37	26	19

PM₁₀ (1 hour average) - January 2009

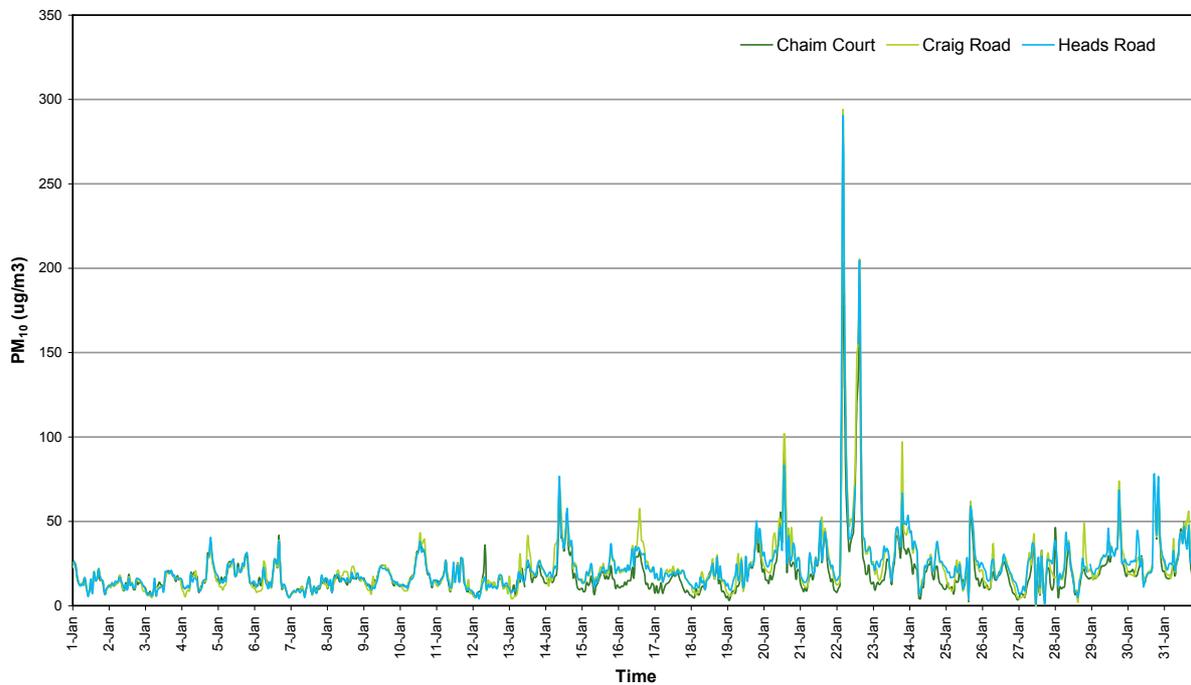


Figure 4: PM₁₀ Concentration (1 Hour Average)

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	60	51	42	28	26	20	17
Craig Rd.	80	67	54	35	31	27	20
Heads Rd	77	64	51	34	32	26	20

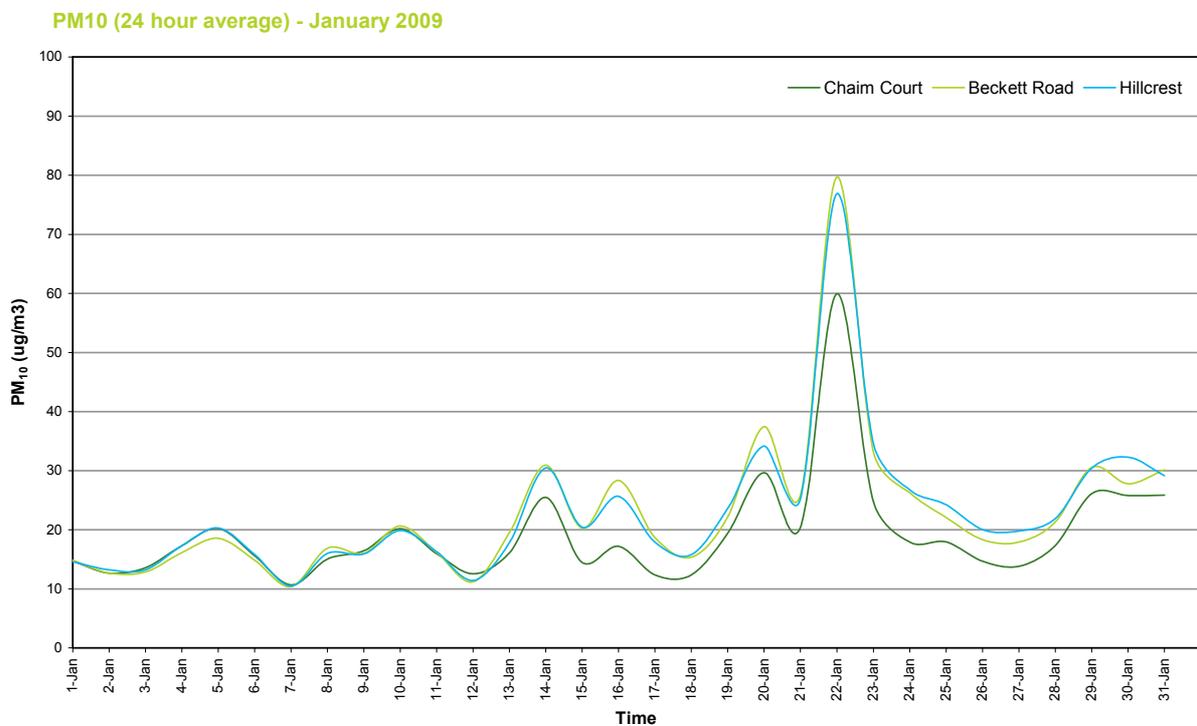


Figure 5: PM₁₀ Concentration (24 Hour Average)

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	0.67	0.55	0.48	0.41	0.37	0.30	0.22
Craig Rd	0.58	0.38	0.34	0.26	0.21	0.15	0.11
Heads Rd	0.68	0.36	0.32	0.26	0.20	0.16	0.11

Carbon Monoxide (1 hour average) - January 2009

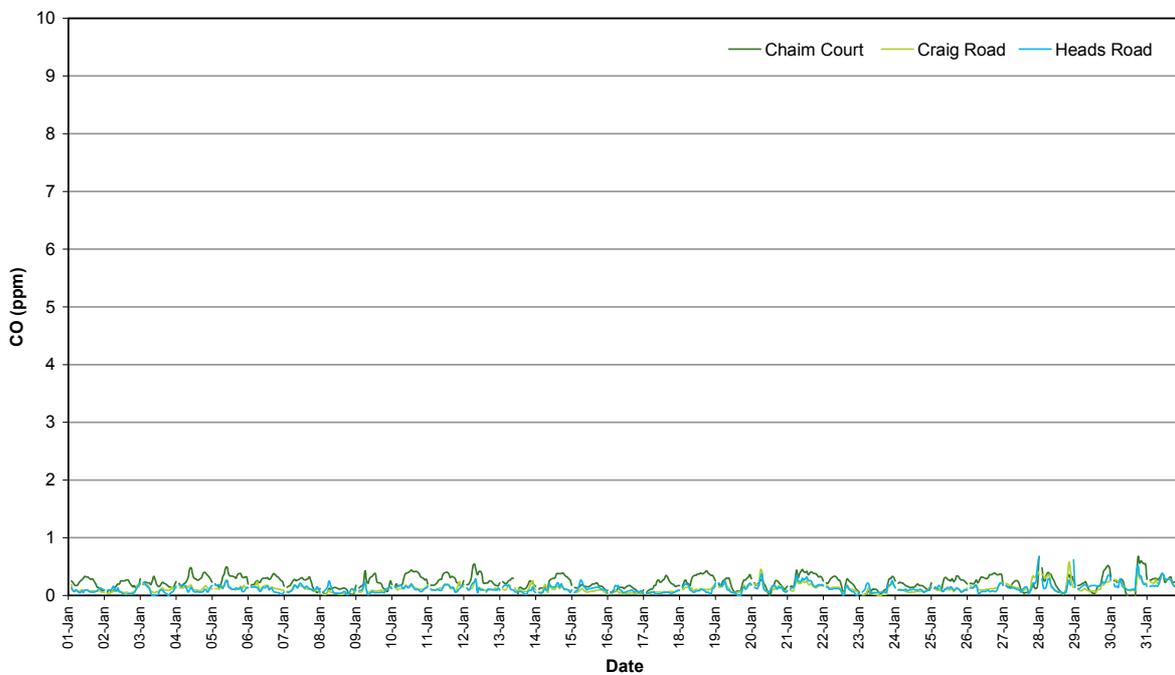


Figure 6: Carbon Monoxide Concentration (1 Hour Average)

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	0.54	0.42	0.40	0.38	0.35	0.29	0.22
Craig Rd	0.36	0.30	0.28	0.24	0.21	0.15	0.12
Heads Rd	0.33	0.30	0.28	0.24	0.19	0.15	0.11

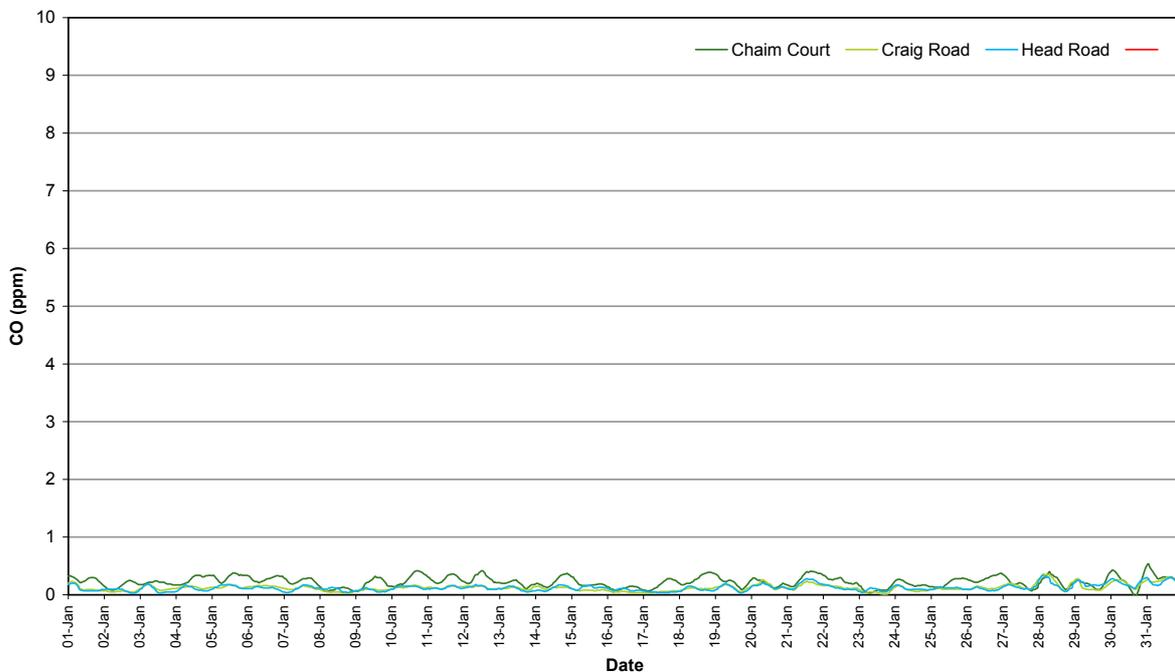


Figure 7: Carbon Monoxide Concentration (8 Hour Rolling Average)

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	47	11	9.4	7.1	5.0	3.1	1.9
Craig Rd	16	9.9	8.0	5.8	3.9	1.8	0.74
Heads Rd	33	12	9.2	6.3	4.4	2.1	0.50

Nitric Oxide (1 hour average) - January 2009

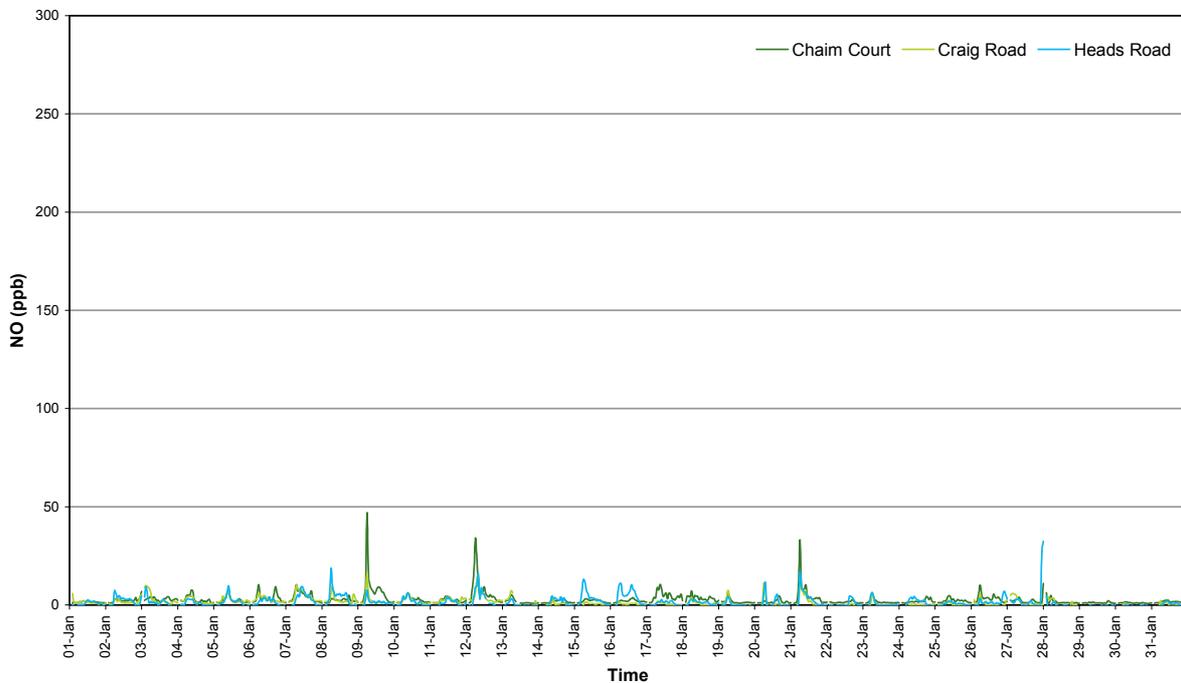


Figure 8: Nitric Oxide Concentration (1 Hour Average)

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	36	14	13	11	9.0	6.3	4.1
Craig Rd	22	18	15	11	8.8	6.1	3.9
Heads Rd	34	16	15	12	9.8	7.2	4.9

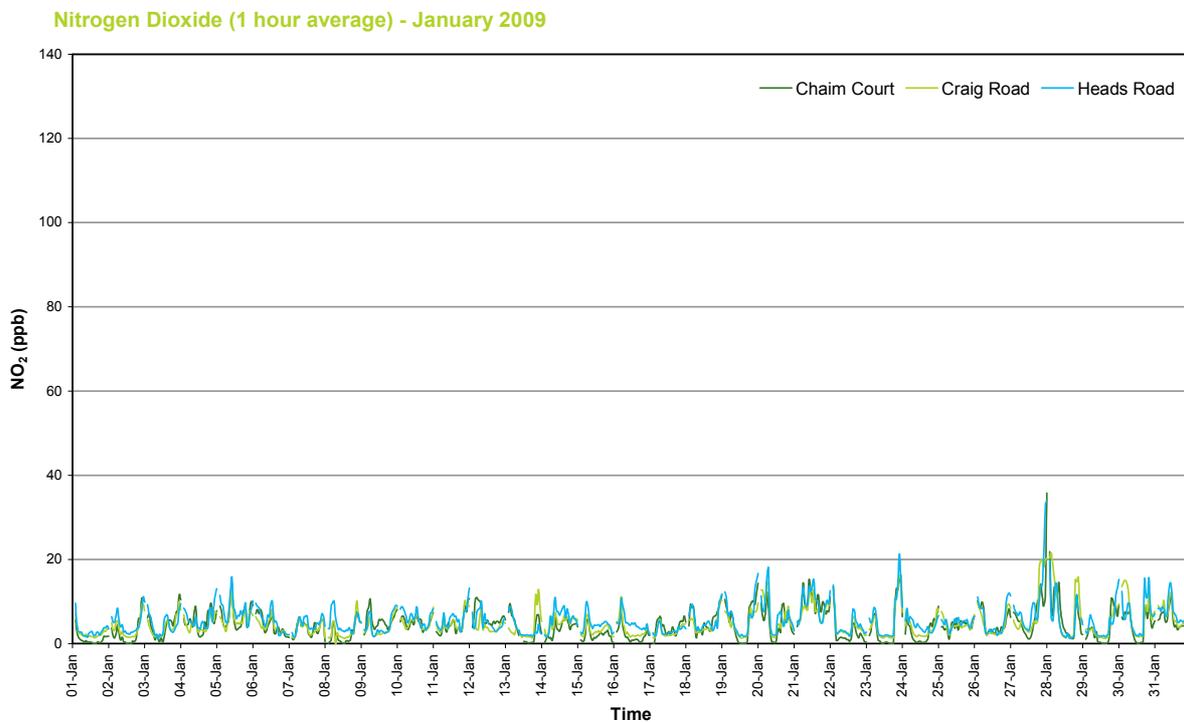


Figure 9: Nitrogen Dioxide Concentration (1 Hour Average)

6.2.5 Meteorological Data

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



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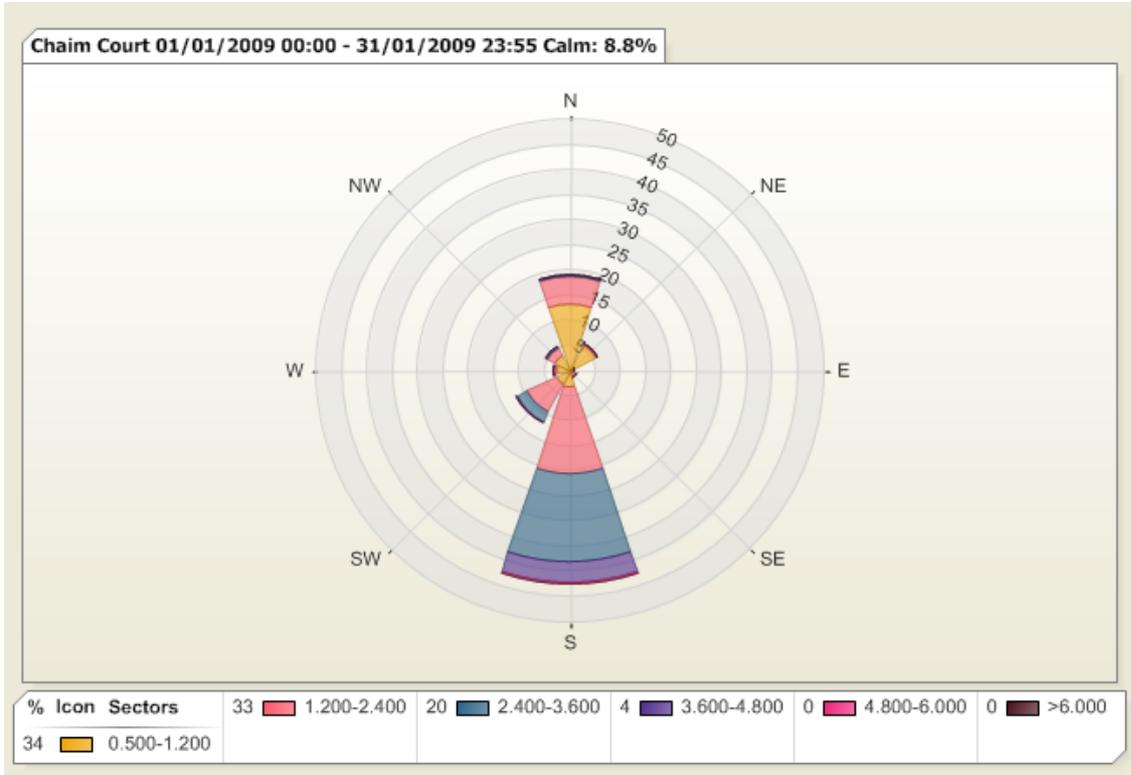


Figure 10: Chaim Court Wind Rose

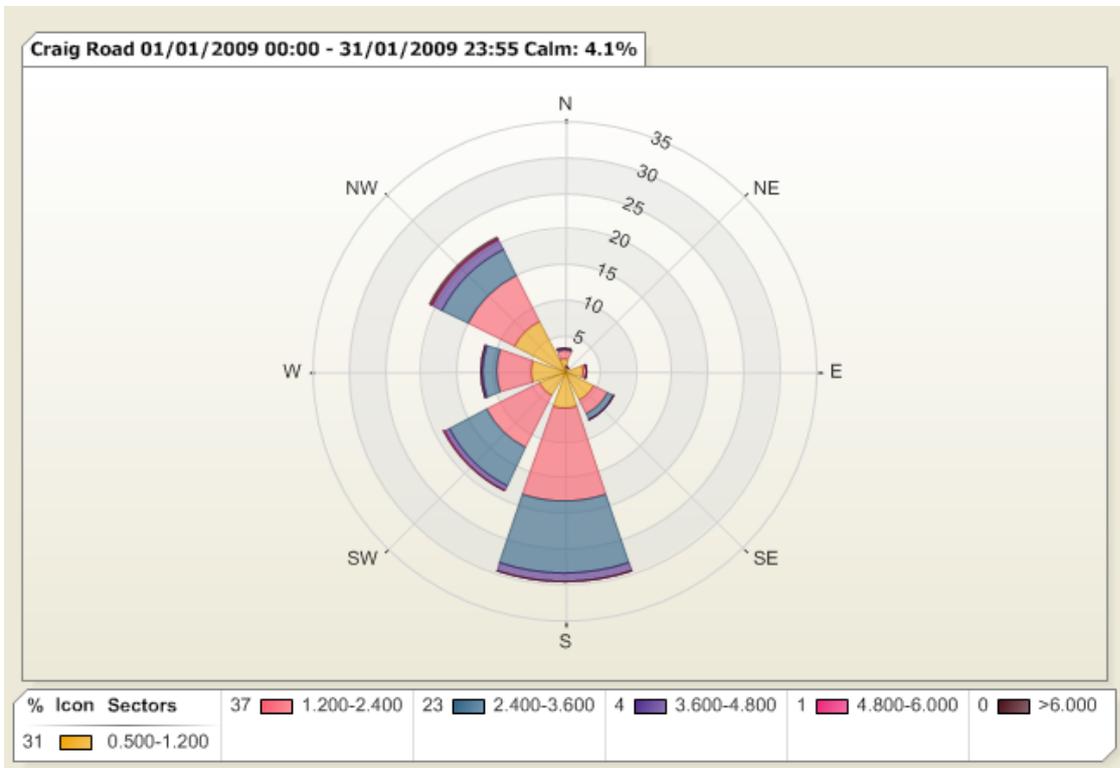


Figure 11: Craig Road Wind Rose



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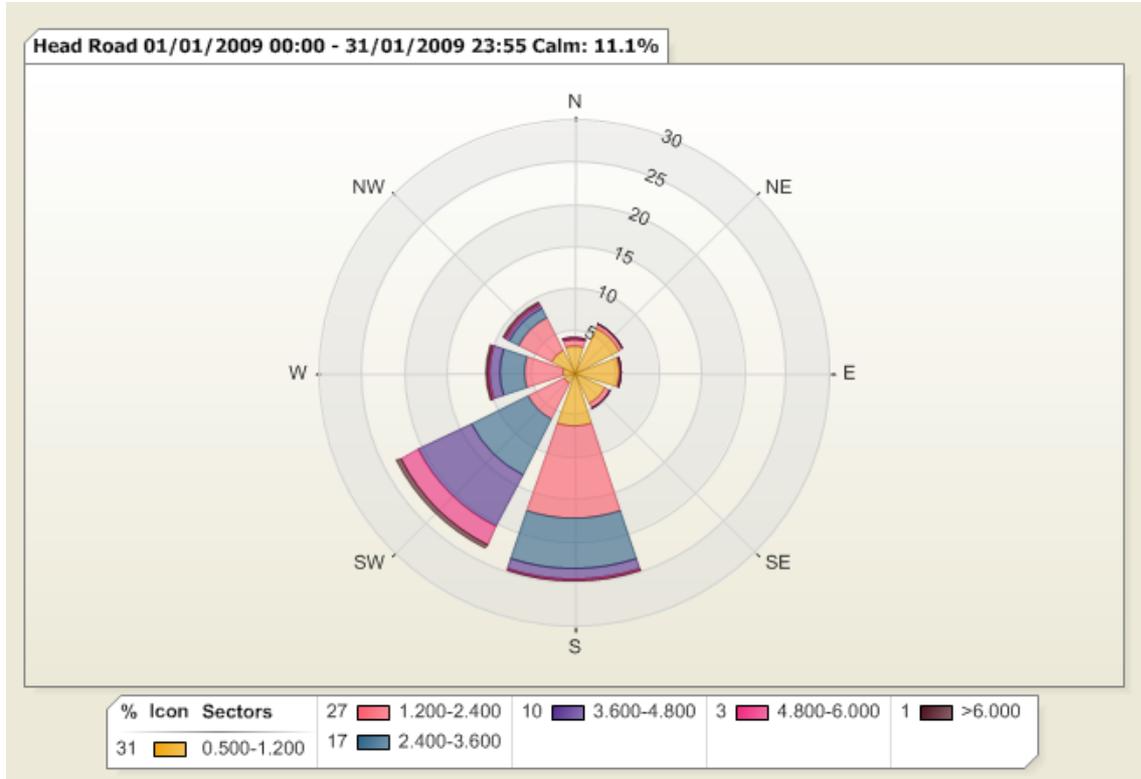


Figure 12: Heads Road Wind Rose



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
13/01/2009 10:10	13/01/2009 10:35	CO, NO, NO ₂ , NO _x	Maintenance/ calibration
13/01/2009 11:20	13/01/2009 11:50	NO, NO ₂ , NO _x	Maintenance/ calibration
29/01/2009 14:25	30/01/2009 14:25	All parameters	Power failure
29/01/2009 14:25	29/01/2009 15:10	PM ₁₀ , PM _{2.5}	Power failure
29/01/2009 16:50	30/01/2009 16:50	All parameters	Power failure
30/01/2009 16:50	30/01/2009 17:50	PM ₁₀ , PM _{2.5}	Power failure

Table 15: Data Exceptions - Craig Road

Start	End	Parameter	Reason
13/01/2009 7:45	13/01/2009 9:50	CO, NO, NO ₂ , NO _x	Maintenance/ calibration
13/01/2009 9:00	13/01/2009 9:20	PM ₁₀	Maintenance/ calibration
29/01/2009 14:25	29/01/2009 14:25	All parameters	Power failure
29/01/2009 14:25	29/01/2009 15:05	PM ₁₀	Power failure
30/01/2009 16:50	30/01/2009 16:50	All parameters	Power failure
30/01/2009 16:50	30/01/2009 17:30	PM ₁₀	Power failure

Table 16: Data Exceptions - Heads Road

Start	End	Parameter	Reason
12/01/2009 13:55	12/01/2009 13:55	CO	Maintenance/ calibration
12/01/2009 13:55	12/01/2009 14:45	NO, NO ₂ , NO _x	Maintenance/ calibration
12/01/2009 14:40	12/01/2009 14:50	PM ₁₀	Maintenance/ calibration
22/01/2009 13:05	22/01/2009 13:05	All parameters	Power failure
22/01/2009 13:05	22/01/2009 13:45	PM ₁₀	Power failure
28/01/2009 22:00	28/01/2009 22:20	All parameters	Power failure
28/01/2009 22:00	28/01/2009 23:00	PM ₁₀	Power failure



7.0 AMBIENT AIR QUALITY MONITORING PERIOD: 01/02/2009 – 28/02/2009

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 February to 28th February, 2009 are shown in Tables 17-19. Averages were only collected for those periods where the 5-minute data constituted 75% data capture.

Section 7.3 provides further information on the reasons for invalid data periods.

Table 17: Data Capture Statistics - 1 Hour Average

PARAMETER	STATION	COLLECTED PERIODS	AVAILABLE PERIODS	DATA CAPTURE
PM _{2.5}	Chaim Crt.	668	672	99.4%
PM ₁₀	Chaim Crt	667	672	99.3%
	Craig Rd.	667	672	99.3%
	Heads Rd.	667	672	99.3%
NO, NO ₂	Chaim Crt	642	672	95.5%
	Craig Rd.	637	672	94.8%
	Heads Rd.	642	672	95.5%
CO	Chaim Crt	641	672	95.4%
	Craig Rd.	638	672	94.9%
	Heads Rd.	643	672	95.7%

Table 18: Data Capture Statistics - 8 Hour Rolling Averages

PARAMETER	STATION	COLLECTED PERIODS	AVAILABLE PERIODS	DATA CAPTURE
CO	Chaim Crt	672	672	100.0%
	Craig Rd.	672	672	100.0%
	Heads Rd.	672	672	100.0%

Table 19: Data Capture Statistics - 24 Hour Averages

PARAMETER	STATION	COLLECTED PERIODS	AVAILABLE PERIODS	DATA CAPTURE
PM _{2.5}	Chaim Crt.	28	28	100.0%
PM ₁₀	Chaim Crt	28	28	100.0%
	Craig Rd.	28	28	100.0%
	Heads Rd.	28	28	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.	190	110	96	69	47	25	14

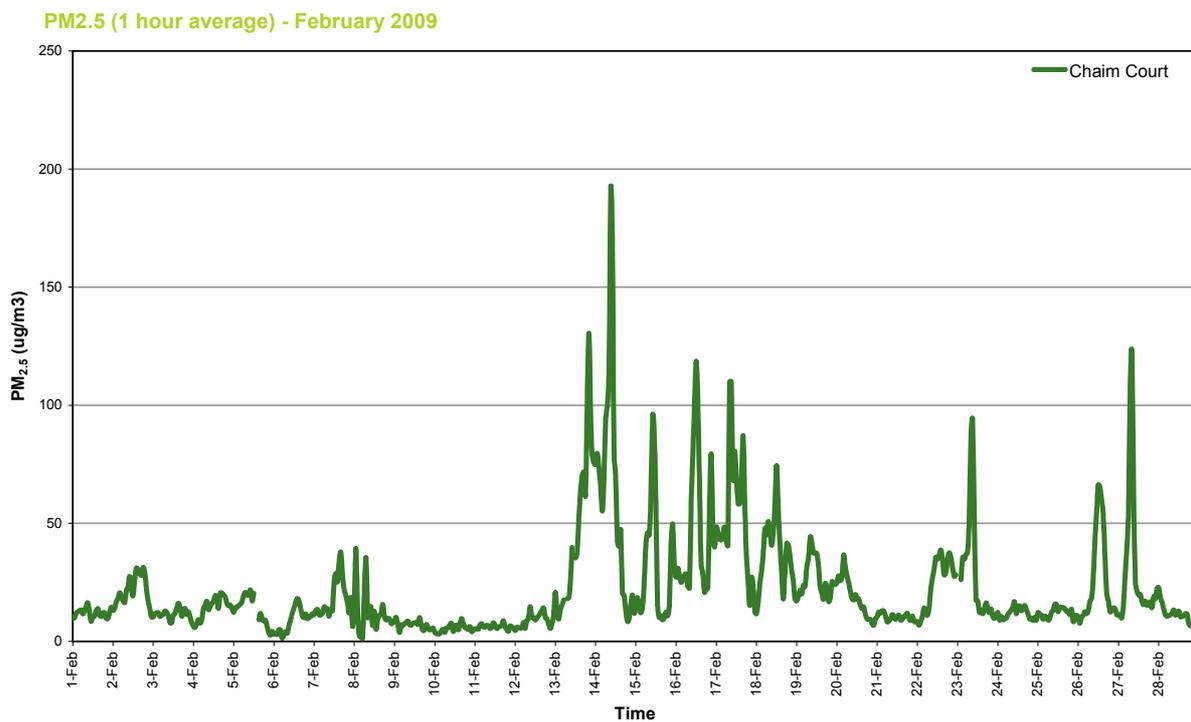


Figure 13: PM_{2.5} Concentration (1 Hour Average)



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.	62	59	57	51	46	29	16

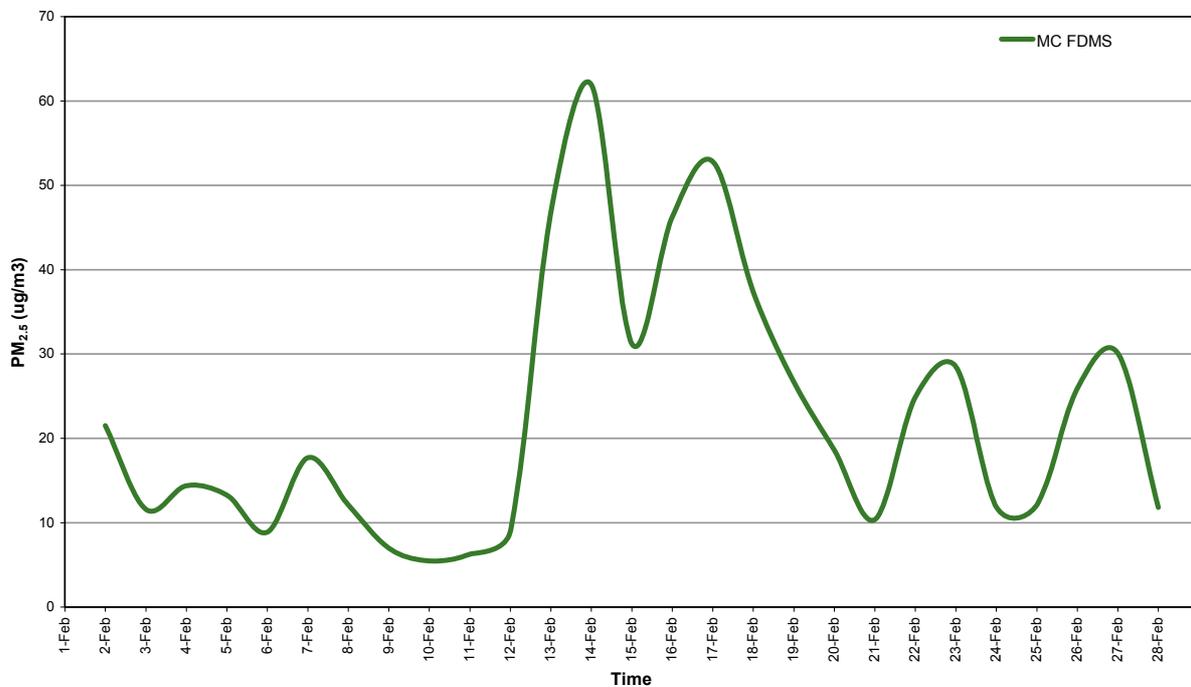


Figure 14: PM_{2.5} Concentration (24 Hour Average)

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) (1-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	270	120	91	66	48	27	13
Craig Rd	290	120	100	75	60	35	22
Heads Rd	320	140	110	84	62	39	23

PM10 (1 hour average) - February 2009

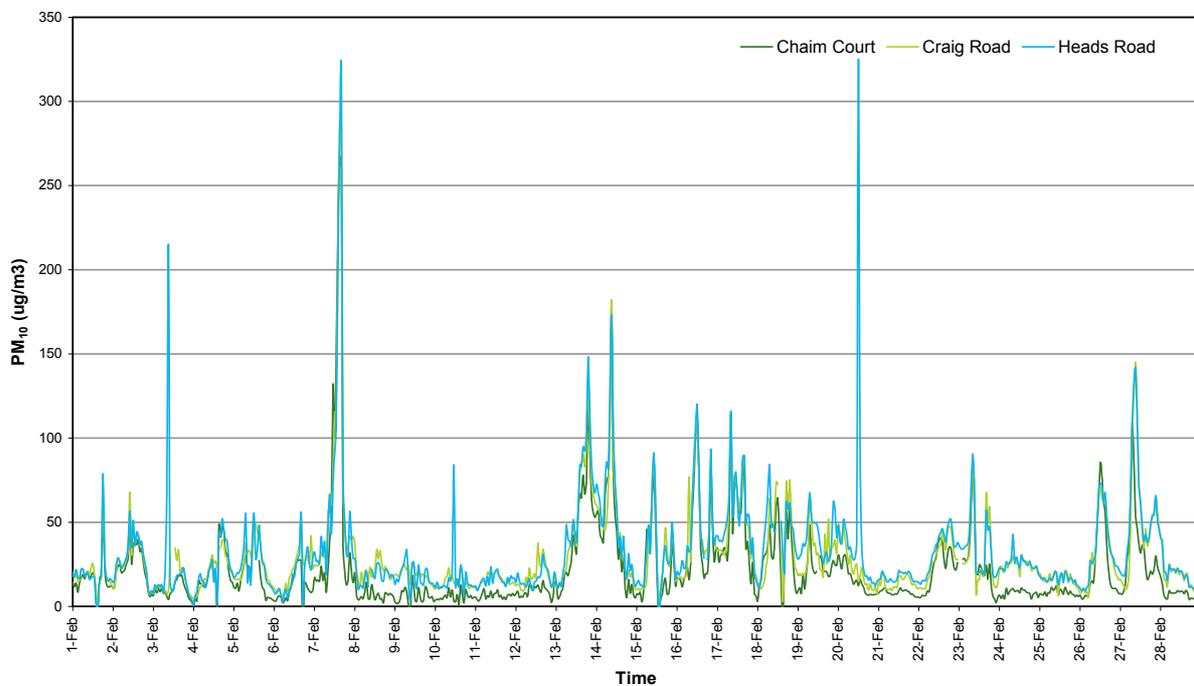


Figure 15: PM₁₀ Concentration (1 Hour Average)

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	64	59	54	45	44	27	19
Craig Rd.	75	70	64	54	52	34	26
Heads Rd	74	70	66	58	57	44	28

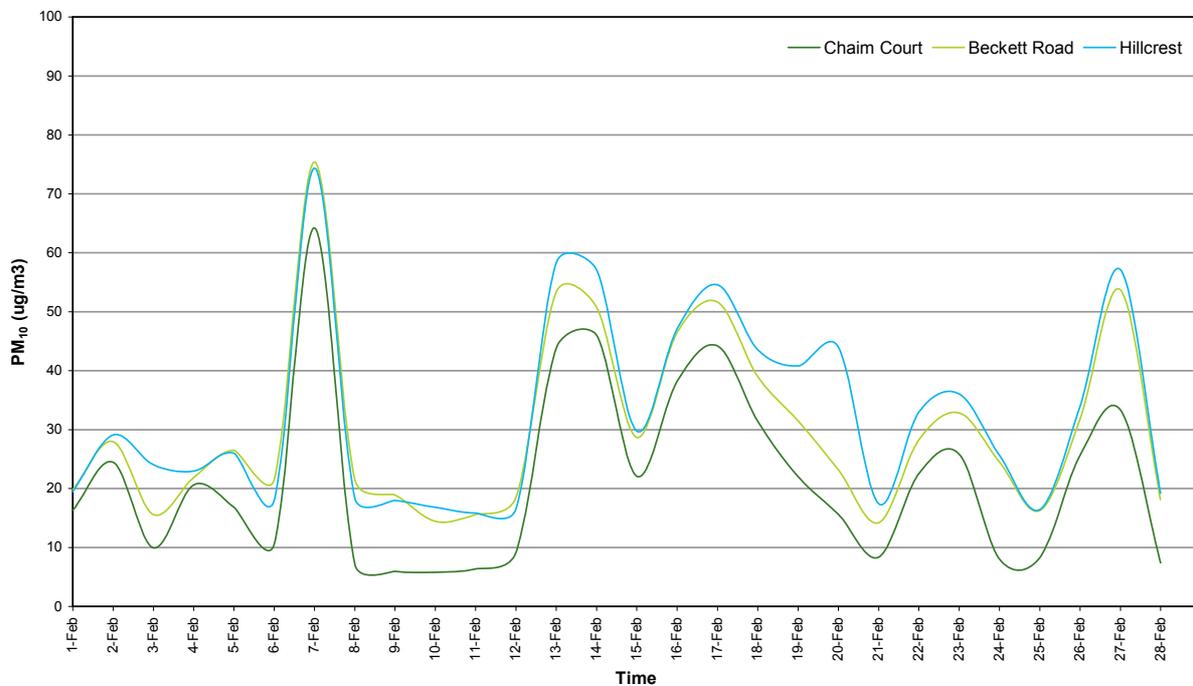


Figure 16: PM₁₀ Concentration (24 Hour Average)

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	2.0	1.4	1.1	0.86	0.68	0.42	0.27
Craig Rd	1.7	1.0	0.89	0.69	0.49	0.29	0.16
Heads Rd	1.6	1.2	0.96	0.71	0.51	0.32	0.17

Carbon Monoxide (1 hour average) - February 2009

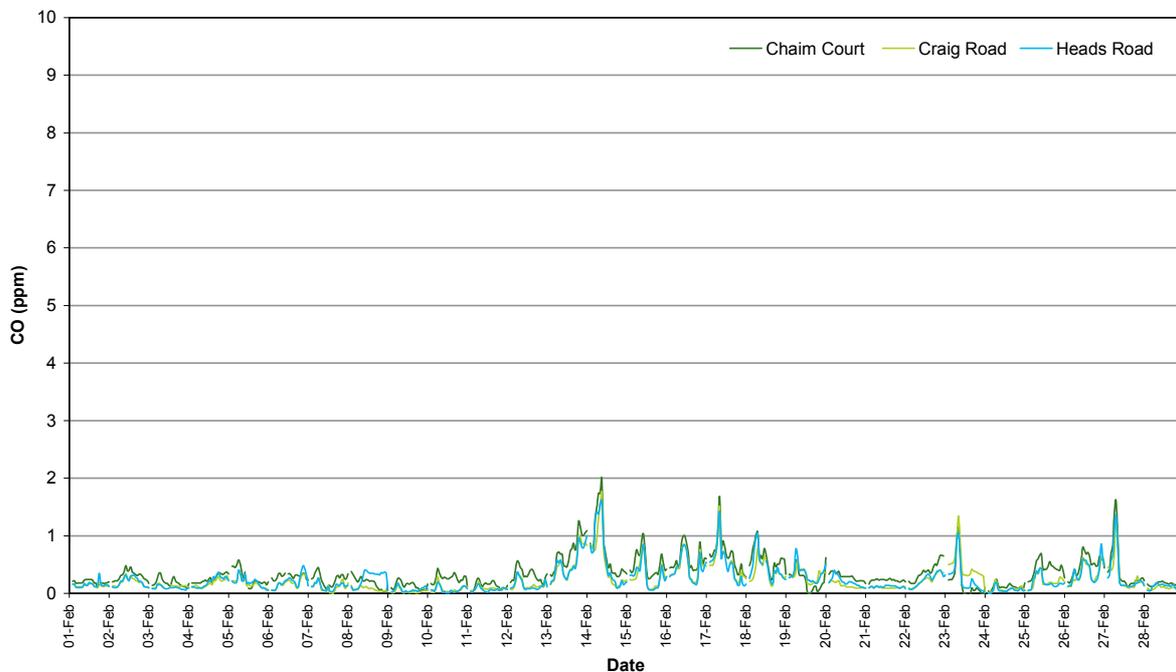


Figure 17: Carbon Monoxide Concentration (1 Hour Average)

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	1.4	1.1	1.0	0.79	0.64	0.45	0.28
Craig Rd	1.1	0.89	0.84	0.64	0.49	0.31	0.17
Heads Rd	1.2	0.99	0.82	0.65	0.48	0.32	0.18

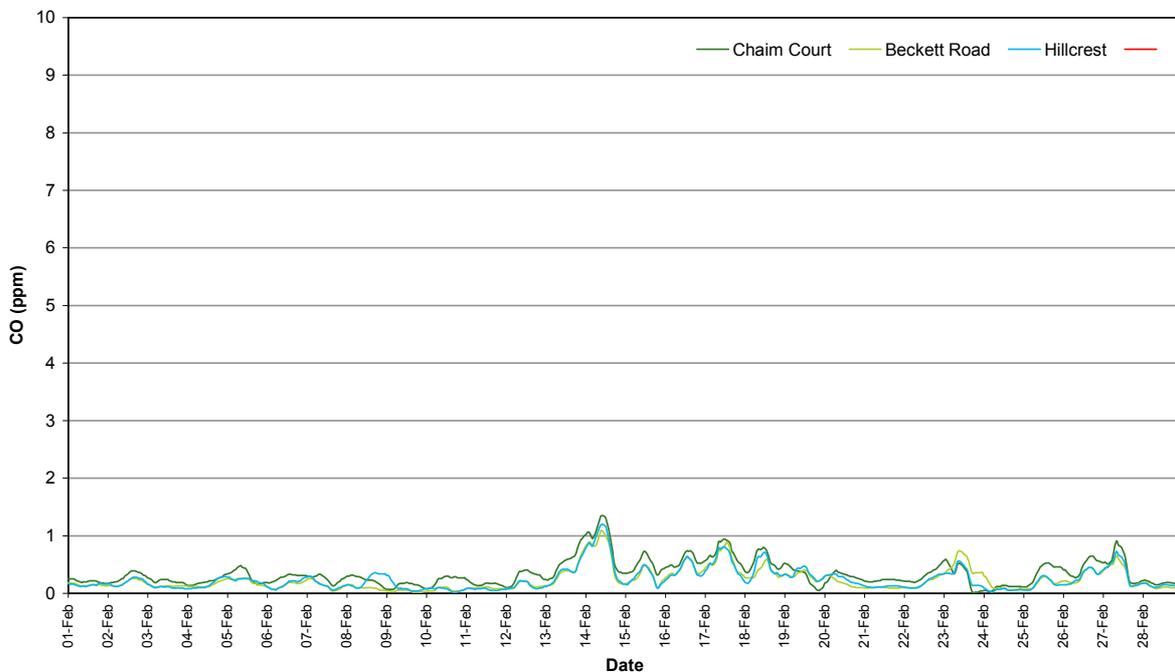


Figure 18: Carbon Monoxide Concentration (8 Hour Rolling Average)

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	48	27	21	16	9.9	4.7	2.3
Craig Rd	37	18	14	7.5	4.7	1.3	0.2
Heads Rd	47	19	15	8.9	5.2	2.3	0.4

Nitric Oxide (1 hour average) - February 2009

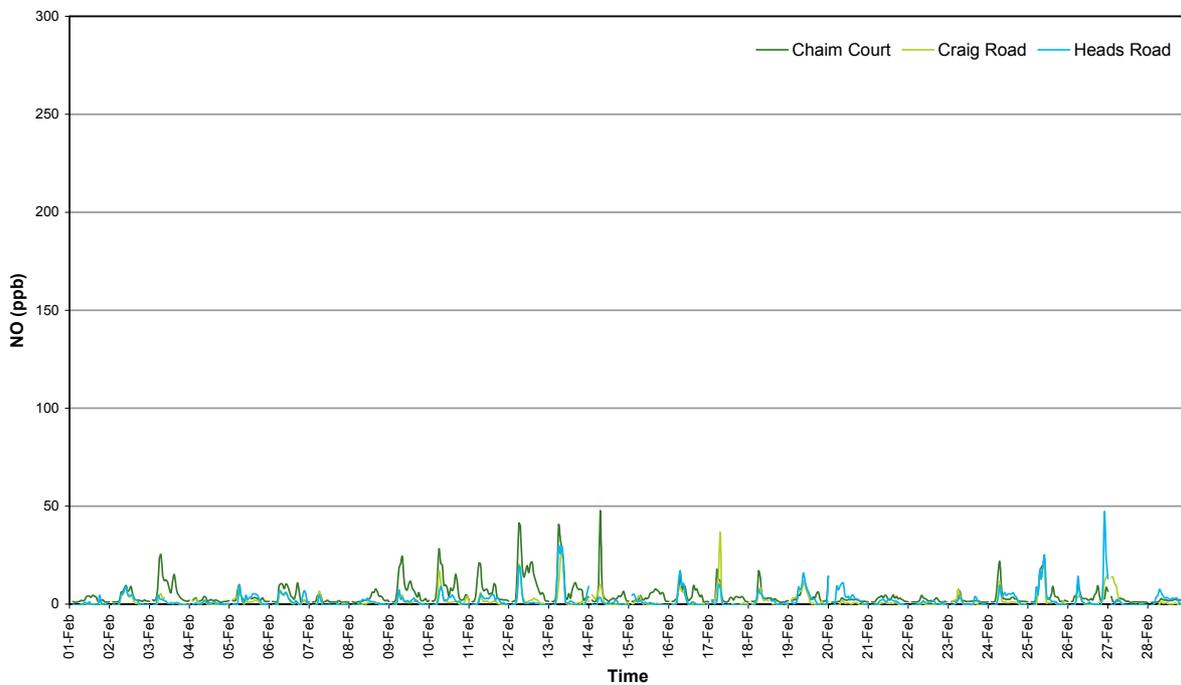


Figure 19: Nitric Oxide Concentration (1 Hour Average)

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	30	20	19	16	14	10	6.2
Craig Rd	24	20	19	15	13	8.6	5.5
Heads Rd	28	21	19	16	13	9.1	5.7

Nitrogen Dioxide (1 hour average) - February 2009

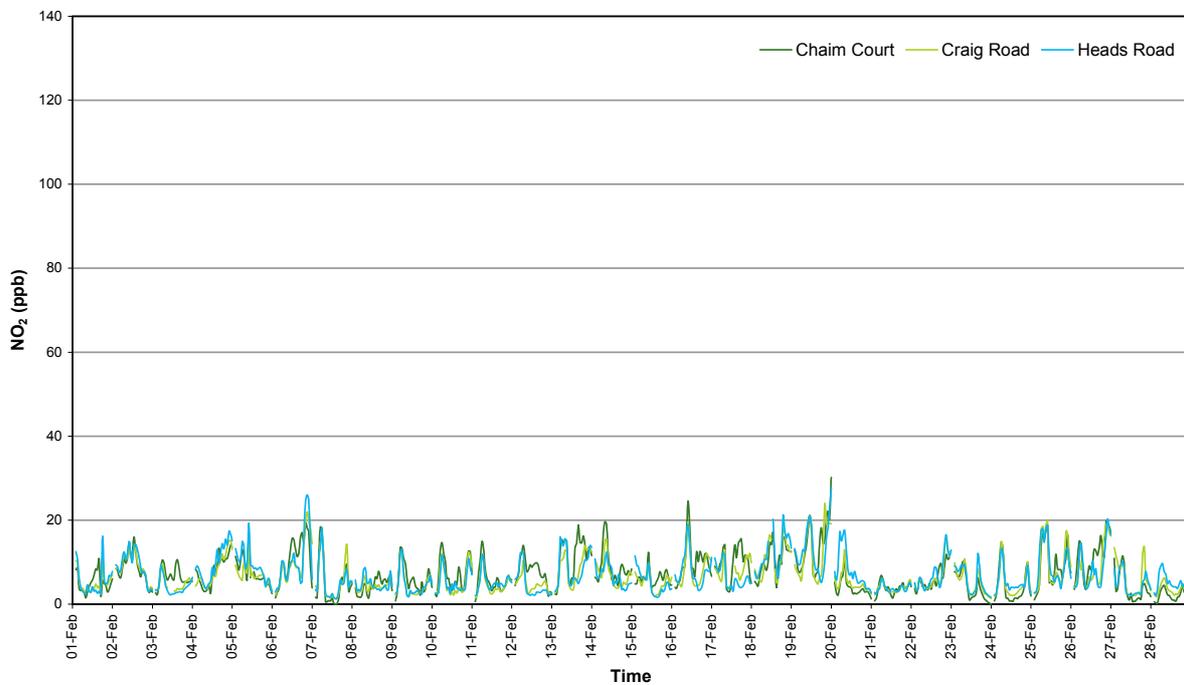


Figure 20: Nitrogen Dioxide Concentration (1 Hour Average)

7.3.3 Meteorological Data

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



EASTLINK AMBIENT AIR QUALITY MONITORING REPORT: JANUARY-MARCH 2009

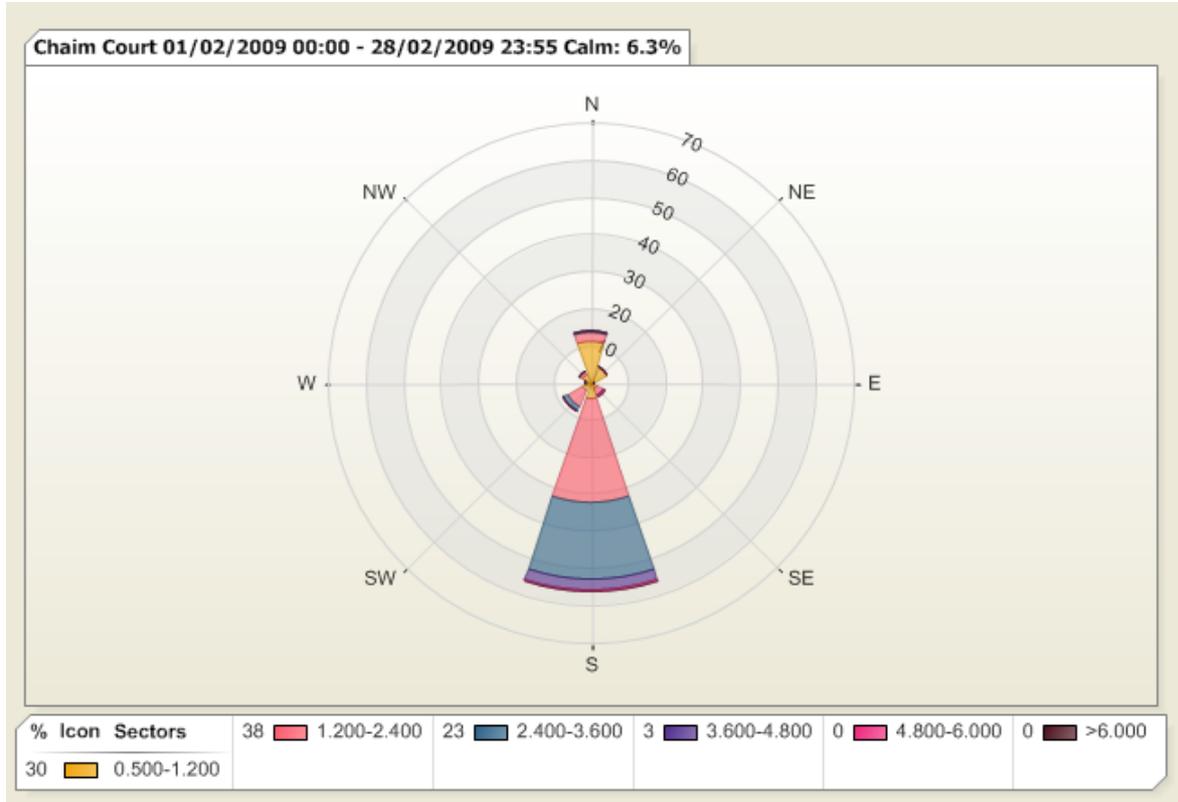


Figure 21: Chaim Court Wind Rose

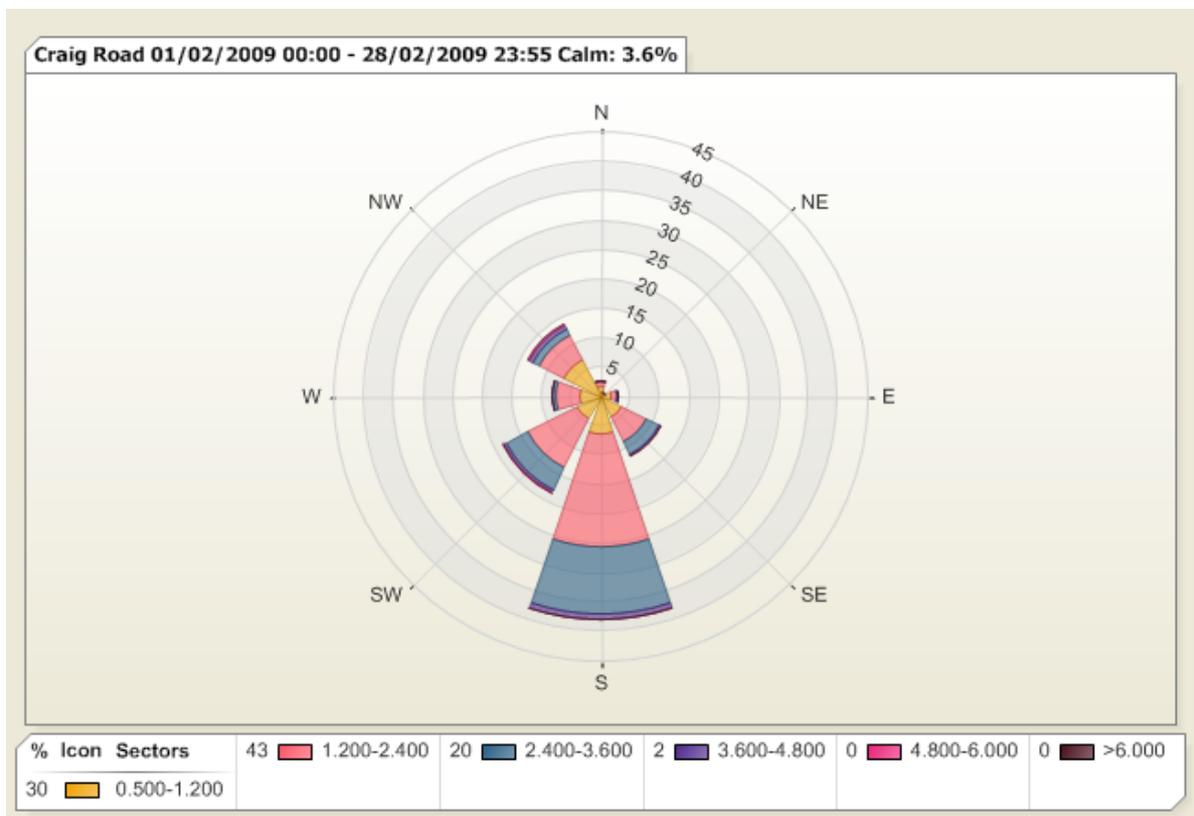


Figure 22: Craig Road Wind Rose



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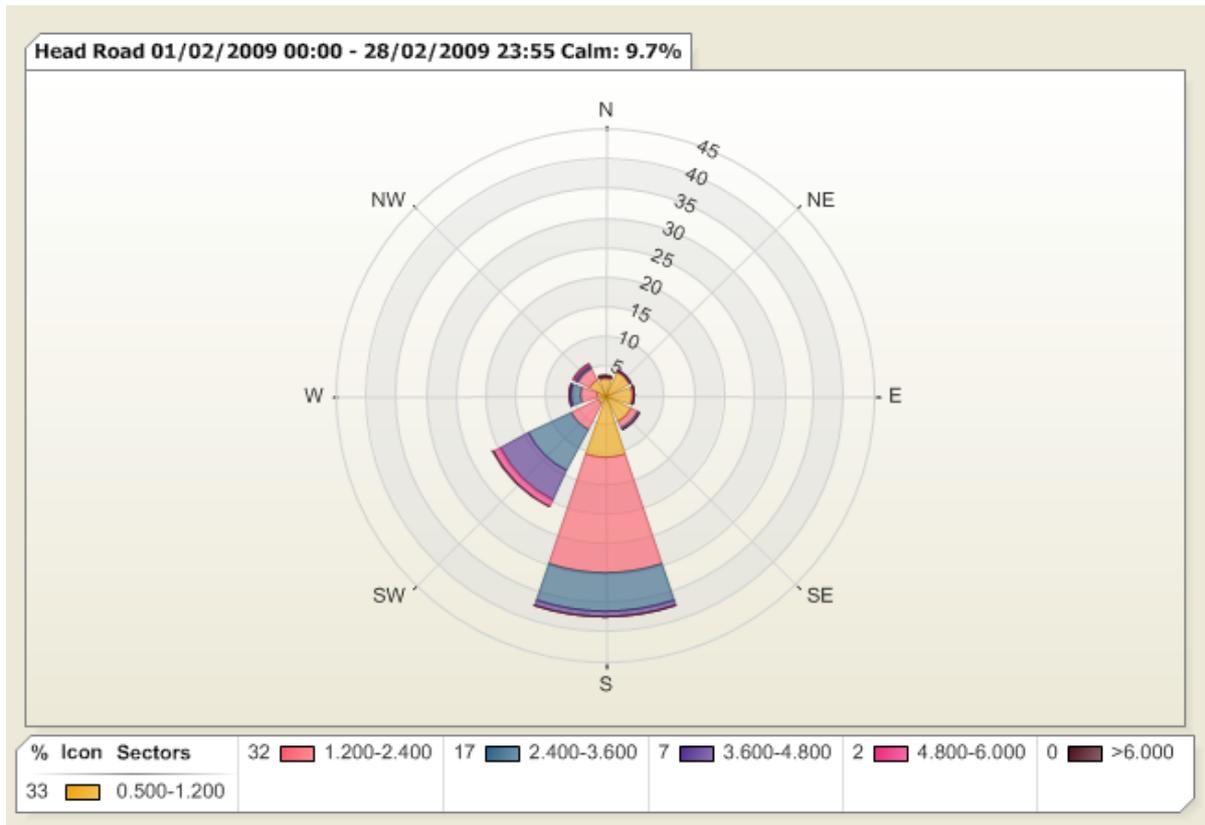


Figure 23: Heads Road Wind Rose



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
5/02/2009 10:45	5/02/2009 12:05	CO	Maintenance/ calibration
5/02/2009 12:10	5/02/2009 12:55	NO, NO ₂ , NO _x	Maintenance/ calibration
5/02/2009 12:50	5/02/2009 14:35	PM ₁₀ , PM _{2.5}	Maintenance/ calibration
6/02/2009 9:30	6/02/2009 9:35	All Parameters	Power failure
6/02/2009 9:40	6/02/2009 11:50	CO	Maintenance/ calibration
19/02/2009 12:20	19/02/2009 13:00	PM ₁₀ , PM _{2.5}	Maintenance/ calibration

Table 29: Data Exceptions - Craig Road

Start	End	Parameter	Reason
3/02/2009 10:35	3/02/2009 12:45	NO, NO ₂ , NO _x	Maintenance/ calibration
3/02/2009 10:40	3/02/2009 11:05	CO	Maintenance/ calibration
3/02/2009 11:15	3/02/2009 12:25	PM ₁₀	Maintenance/ calibration
3/02/2009 12:20	3/02/2009 12:35	CO	Maintenance/ calibration
17/02/2009 12:05	17/02/2009 14:05	CO	Maintenance/ calibration
17/02/2009 12:05	17/02/2009 14:10	NO, NO ₂ , NO _x	Maintenance/ calibration
18/02/2009 12:55	18/02/2009 13:50	CO	Maintenance/ calibration
18/02/2009 12:55	18/02/2009 13:50	NO, NO ₂ , NO _x	Maintenance/ calibration
18/02/2009 12:55	18/02/2009 13:25	PM ₁₀	Maintenance/ calibration

Table 30: Data Exceptions - Heads Road

Start	End	Parameter	Reason
8/02/2009 8:50	8/02/2009 8:55	All parameters	Power failure
8/02/2009 8:50	8/02/2009 9:30	PM ₁₀	Power failure
16/02/2009 17:10	16/02/2009 17:50	PM ₁₀	Maintenance/ calibration
18/02/2009 10:55	18/02/2009 13:00	NO, NO ₂ , NO _x	Maintenance/ calibration
18/02/2009 11:00	18/02/2009 11:50	CO	Maintenance/ calibration
18/02/2009 11:20	18/02/2009 13:35	PM ₁₀	Maintenance/ calibration



8.0 AMBIENT AIR QUALITY MONITORING PERIOD: 01/03/2009 – 31/03/2009

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 March to 31st March 2009 are shown in Tables 31-33. Averages were only collected for those periods where the 5-minute data constituted 75% data capture.

Section 8.3 provides further information on the reasons for invalid data periods.

Table 31: Data Capture Statistics - 1 Hour Averages

PARAMETER	STATION	COLLECTED PERIODS	AVAILABLE PERIODS	DATA CAPTURE
PM _{2.5}	Chaim Crt.	737	744	99.1%
PM ₁₀	Chaim Crt	739	744	99.3%
	Craig Rd.	737	744	99.1%
	Heads Rd.	742	744	99.7%
NO, NO ₂	Chaim Crt	710	744	95.4%
	Craig Rd.	703	744	94.5%
	Heads Rd.	709	744	95.3%
CO	Chaim Crt	711	744	95.6%
	Craig Rd.	706	744	94.9%
	Heads Rd.	711	744	95.6%

Table 32: Data Capture Statistics - 8 Hour Rolling Averages

PARAMETER	STATION	COLLECTED PERIODS	AVAILABLE PERIODS	DATA CAPTURE
CO	Chaim Crt	744	744	100.0%
	Craig Rd.	731	744	98.3%
	Heads Rd.	744	744	100.0%

Table 33: 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	31	31	100.0%
	Craig Rd.	31	31	100.0%
	Heads Rd.	31	31	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.	65	48	41	32	23	15	11

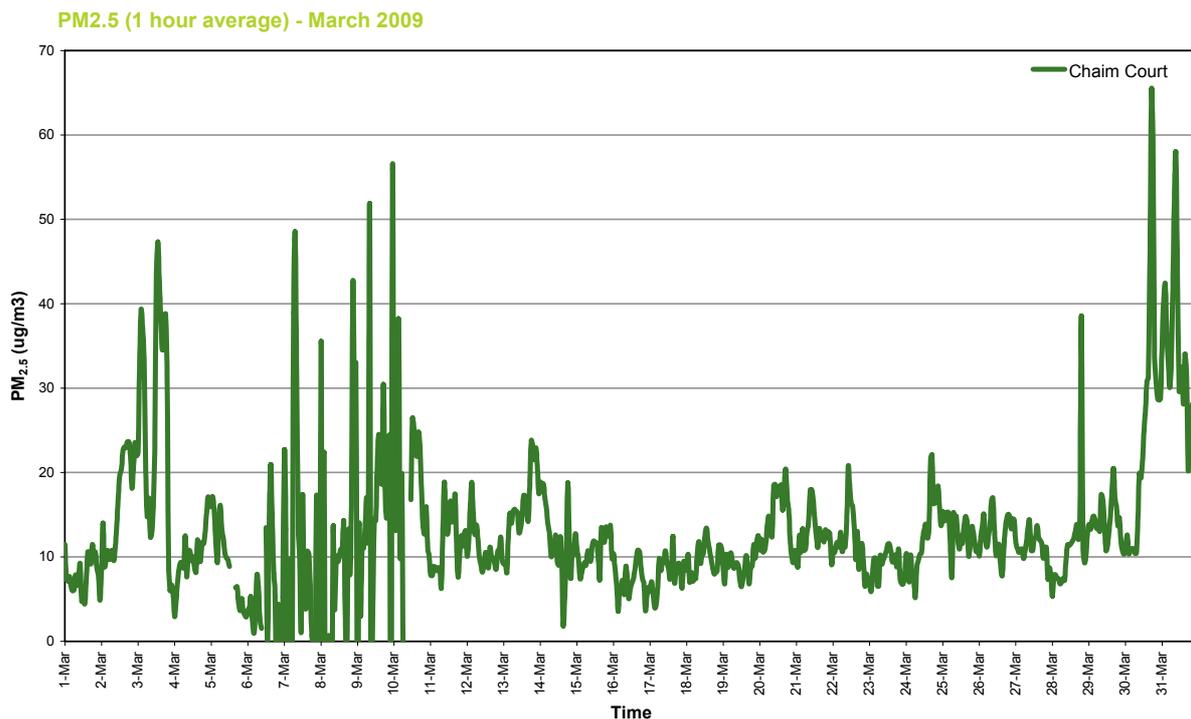


Figure 24: PM_{2.5} Concentration (1 Hour Average)

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.	34	31	29	26	16	14	12

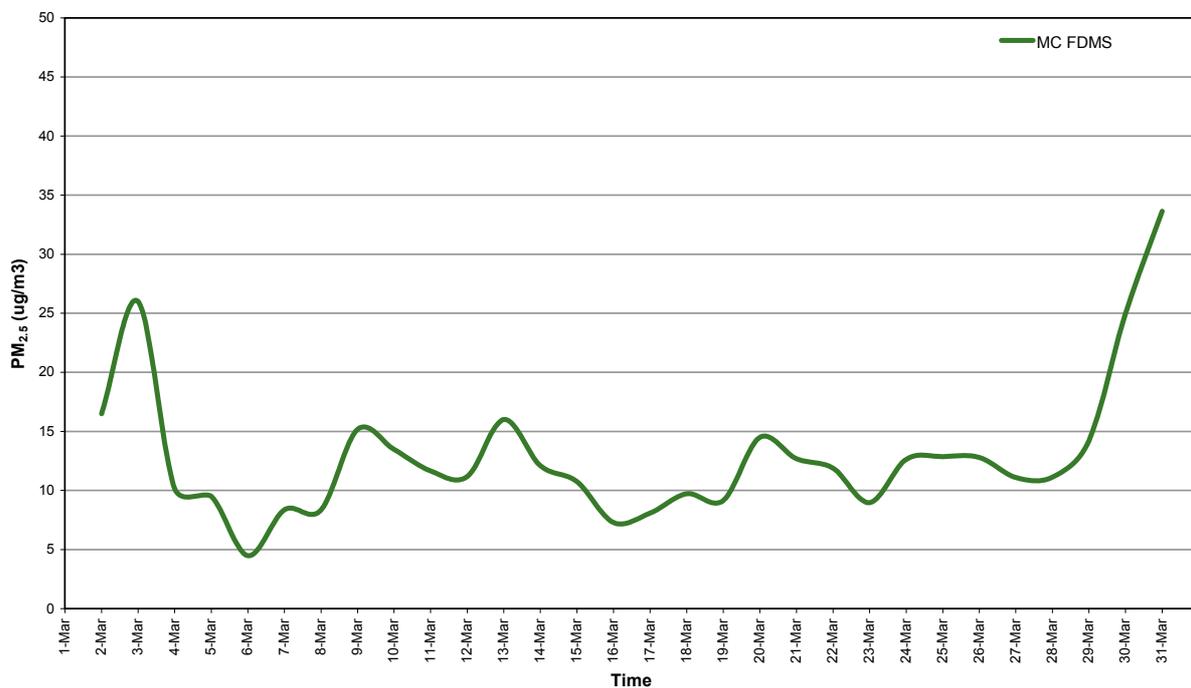


Figure 25: PM_{2.5} Concentration (24 Hour Average)

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.



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Table 36: PM₁₀ Concentration Percentiles (1 Hour Average)

STATION	PM ₁₀ CONCENTRATION (µg/m ³) (1-HOUR AVERAGE)						
	MAXIMUM	99 th	98 th	95 th	90 th	75 th	50 th
Chaim Crt	170	86	40	27	21	12	7.8
Craig Rd	550	230	58	41	33	23	15
Heads Rd	450	230	61	42	35	24	16

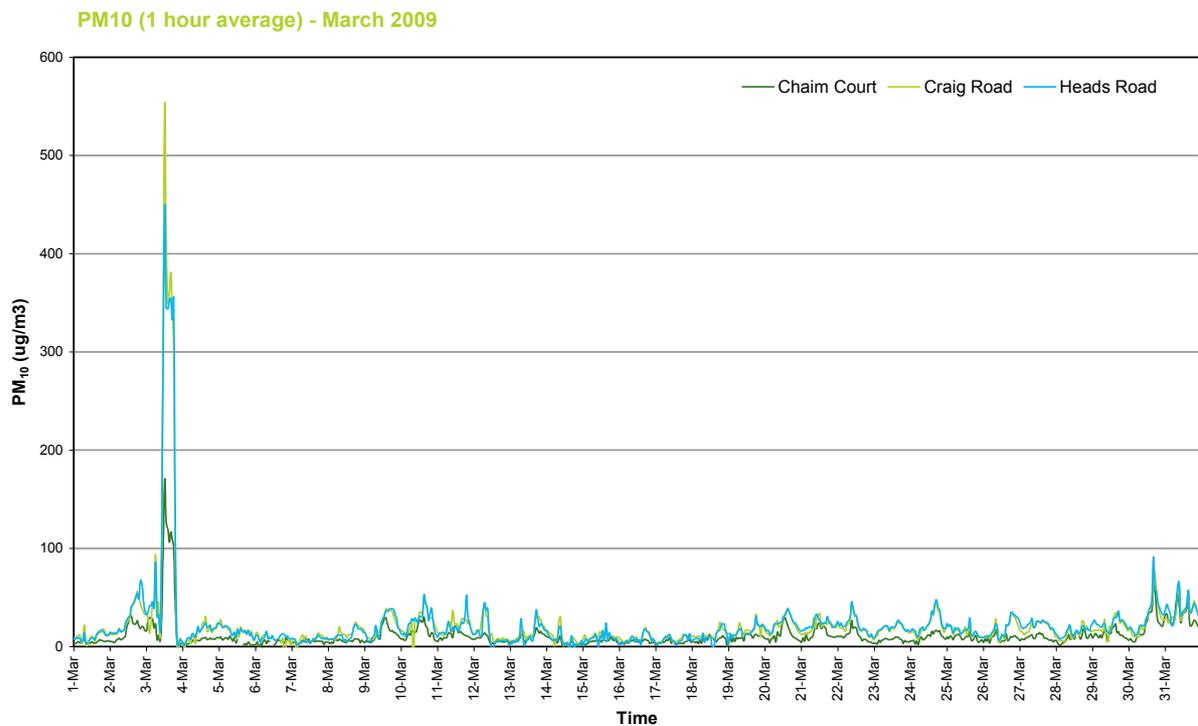


Figure 26: PM₁₀ Concentration (1 Hour Average)

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	51	45	39	26	16	13	9.2
Craig Rd.	150	120	83	33	29	21	17
Heads Rd	150	110	81	35	32	23	16

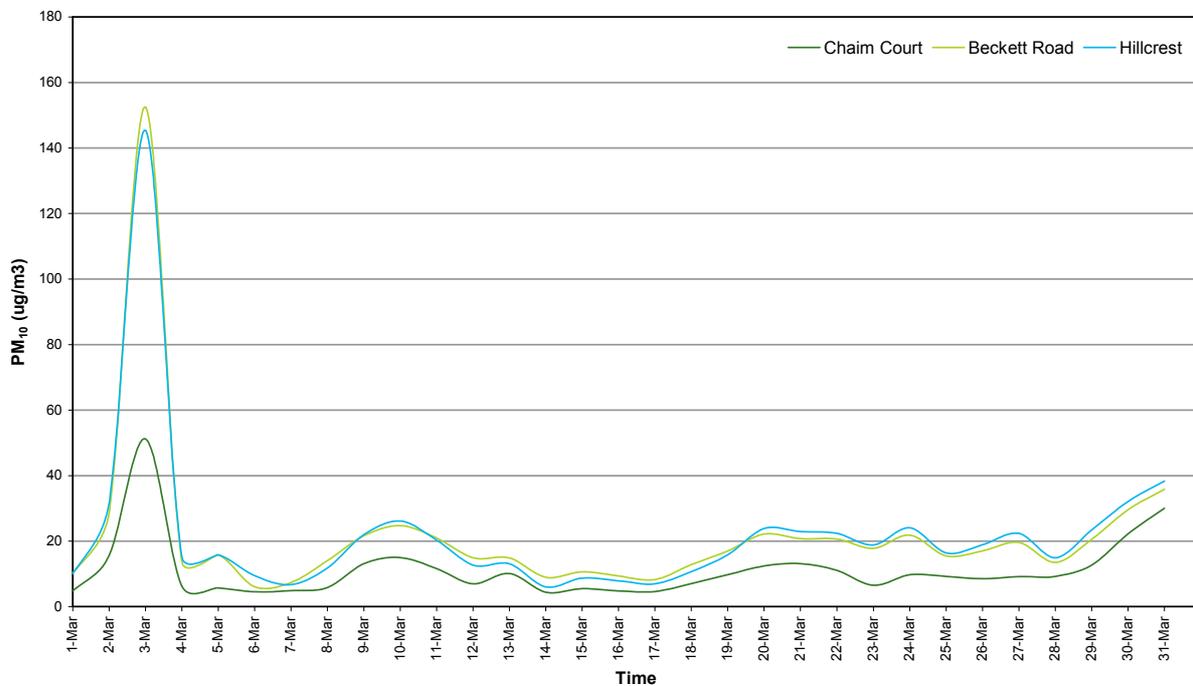


Figure 27: PM₁₀ Concentration (24 Hour Average)

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	0.9	0.7	0.7	0.6	0.5	0.3	0.2
Craig Rd	0.9	0.7	0.6	0.5	0.4	0.3	0.1
Heads Rd	0.8	0.6	0.5	0.4	0.4	0.2	0.1

Carbon Monoxide (1 hour average) - March 2009

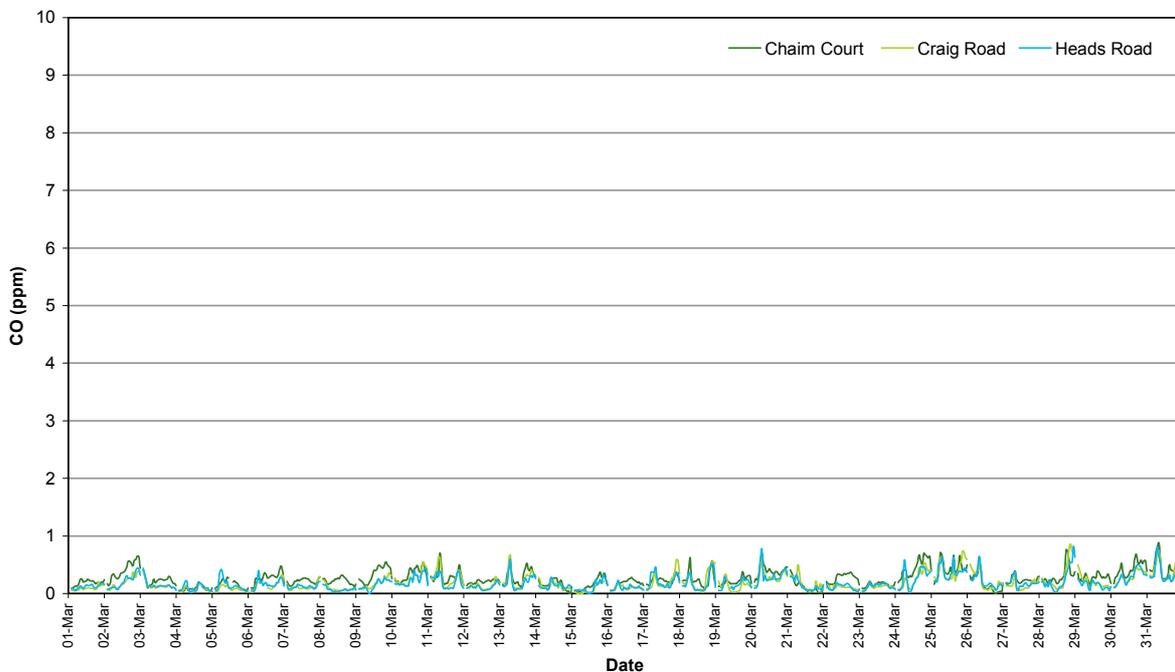


Figure 28: Carbon Monoxide Concentration (1 Hour Average)

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	0.6	0.6	0.6	0.5	0.4	0.3	0.2
Craig Rd	0.7	0.6	0.5	0.4	0.4	0.3	0.1
Heads Rd	0.5	0.5	0.4	0.4	0.3	0.2	0.2

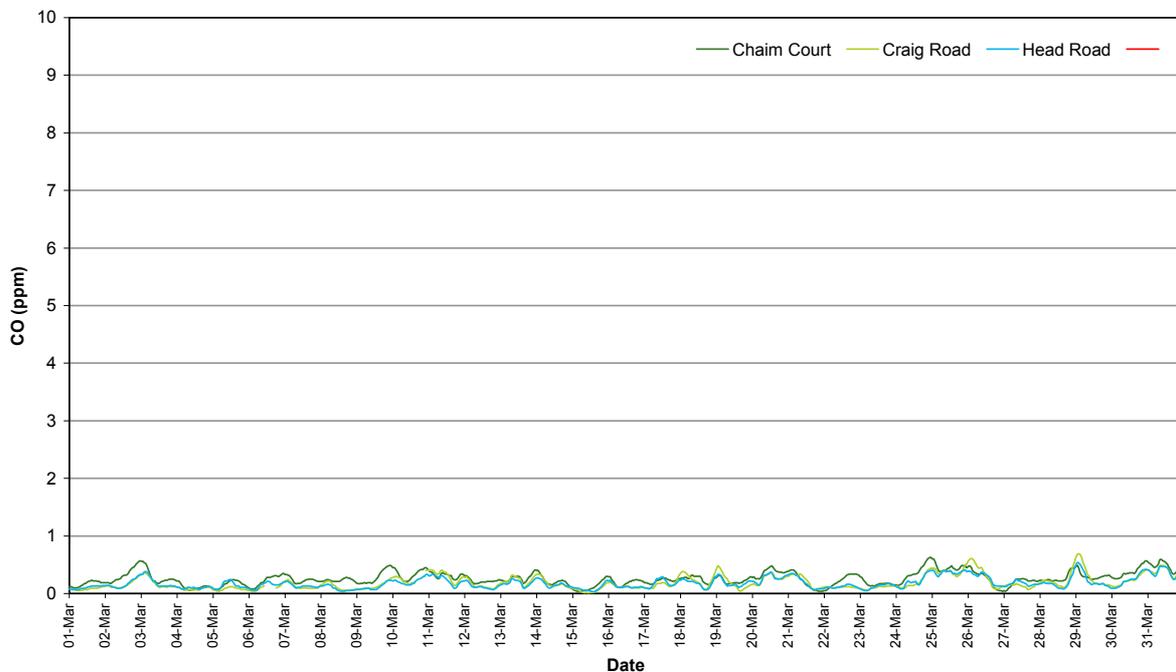


Figure 29: Carbon Monoxide Concentration (8 Hour Rolling Average)

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	67	33	27	16	11	4.9	2.7
Craig Rd	56	39	32	19	14	4.6	1.1
Heads Rd	65	39	30	20	12	5.2	1.5

Nitric Oxide (1 hour average) - March 2009

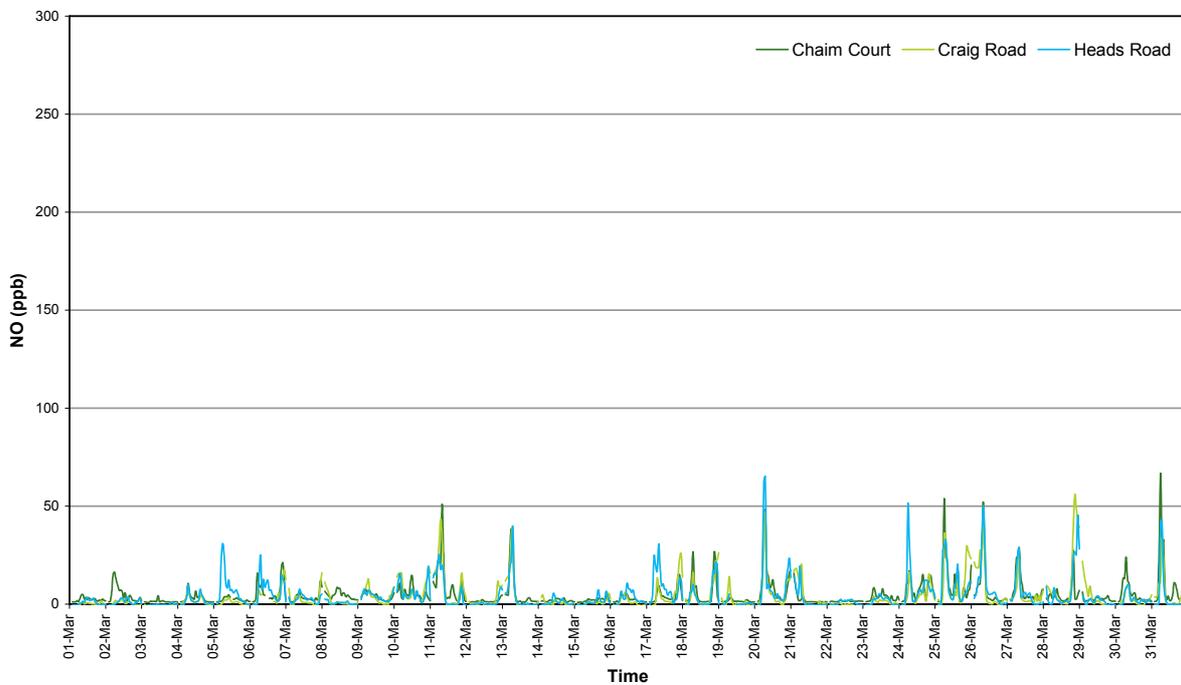


Figure 30: Nitric Oxide Concentration (1 Hour Average)

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	35	29	25	20	16	11	6.9
Craig Rd	31	26	23	20	16	11	7.1
Heads Rd	32	30	26	21	17	12	7.6

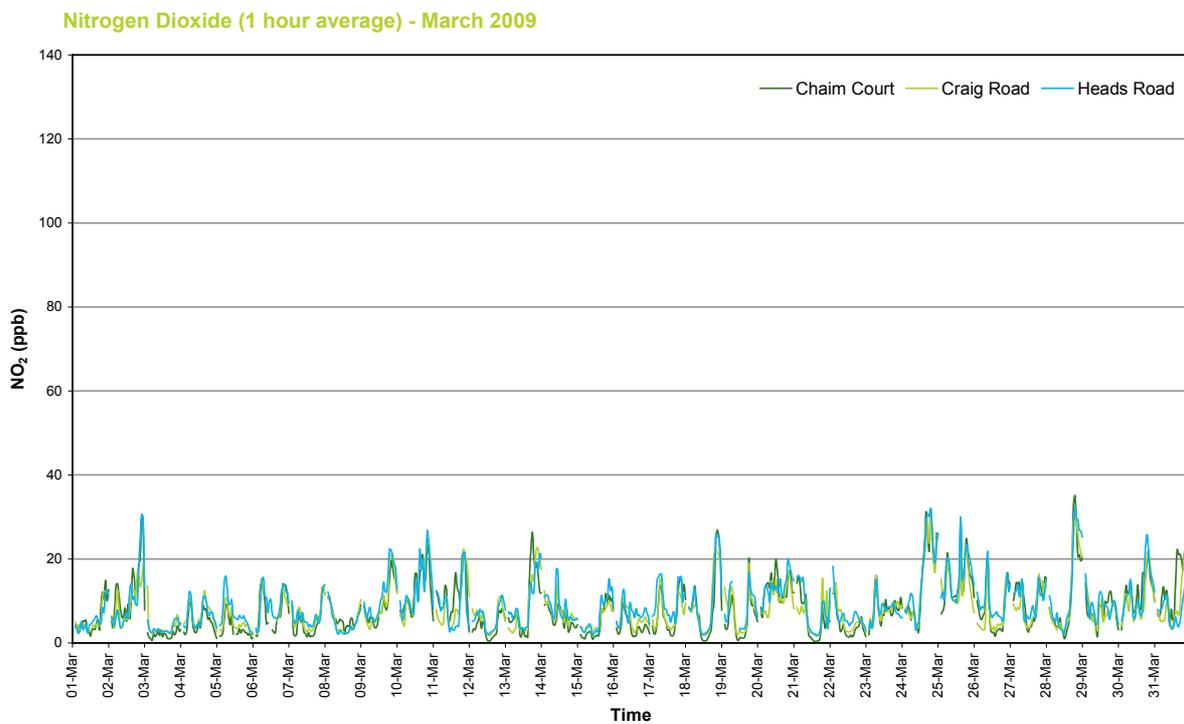


Figure 31: Nitrogen Dioxide Concentration (1 Hour Average)

8.4 Meteorological Data

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



EASTLINK AMBIENT AIR QUALITY MONITORING REPORT: JANUARY-MARCH 2009

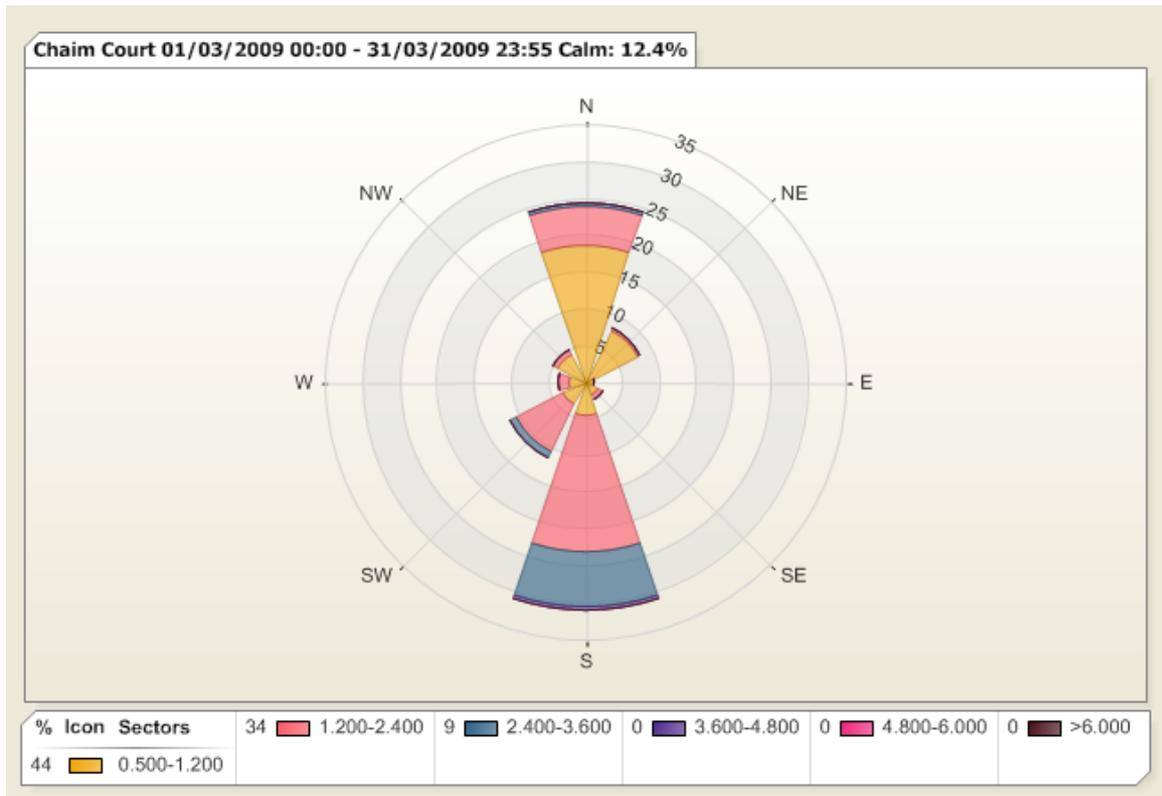


Figure 32: Chaim Court Wind Rose

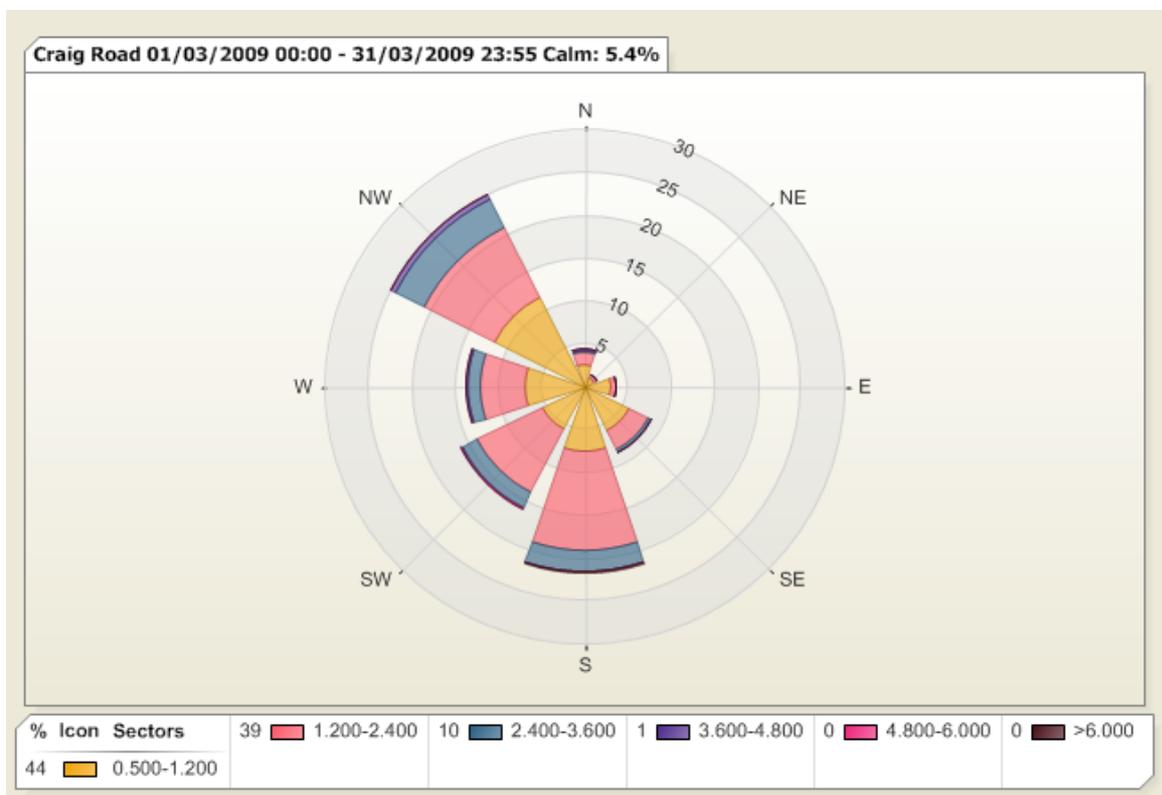


Figure 33: Craig Road Wind Rose



EASTLINK AMBIENT AIR QUALITY MONITORING REPORT: JANUARY-MARCH 2009

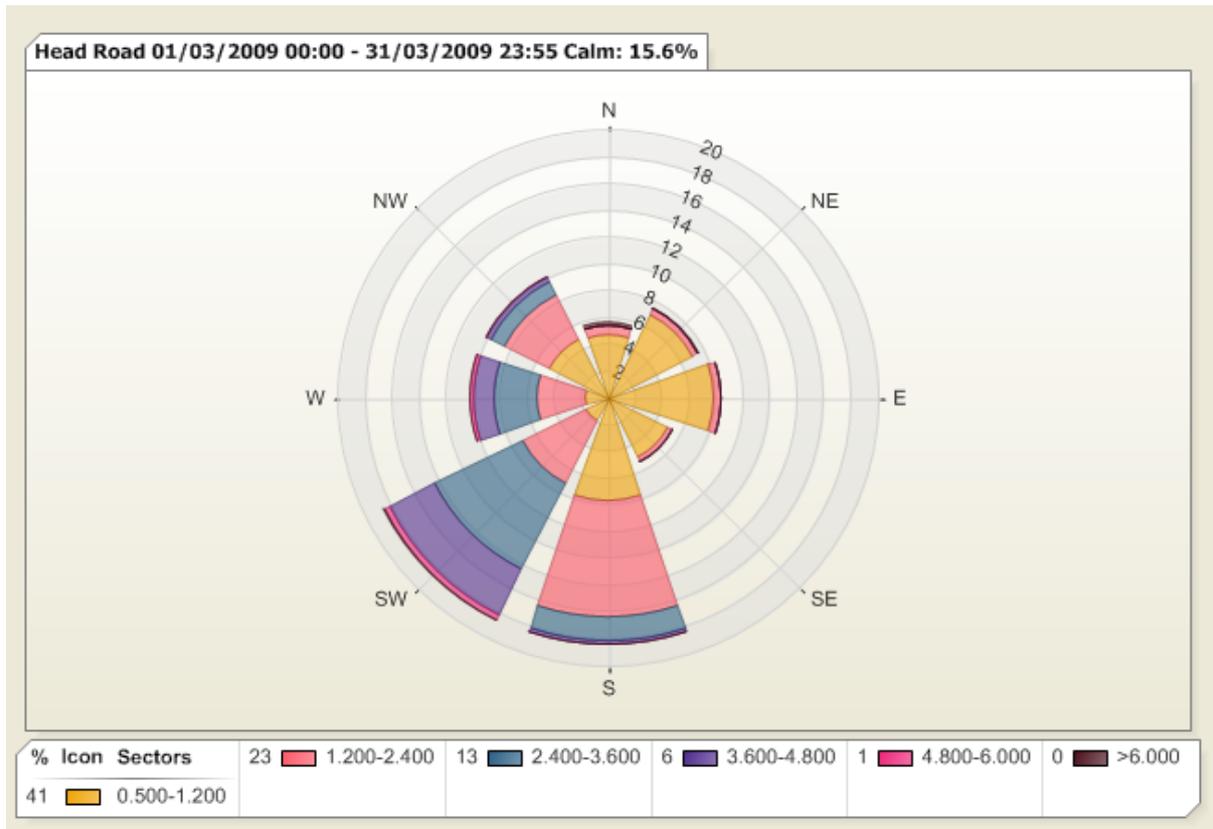


Figure 34: Heads Road Wind Rose



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
5/03/2009 11:50	5/03/2009 12:40	NO, NO ₂ , NO _x	Maintenance/ calibration
5/03/2009 12:40	5/03/2009 13:30	CO	Maintenance/ calibration
5/03/2009 13:25	5/03/2009 15:40	PM ₁₀ , PM _{2.5}	Maintenance/ calibration
6/03/2009 10:00	6/03/2009 12:00	PM ₁₀ , PM _{2.5}	Maintenance/ calibration
6/03/2009 11:25	6/03/2009 12:30	NO, NO ₂ , NO _x	Maintenance/ calibration

Table 43: Data Exceptions - Craig Road

Start	End	Parameter	Reason
6/03/2009 9:10	6/03/2009 12:35	CO	Maintenance/ calibration
6/03/2009 9:10	6/03/2009 16:00	NO, NO ₂ , NO _x	Maintenance/ calibration
6/03/2009 9:35	6/03/2009 16:10	PM ₁₀	Maintenance/ calibration
10/03/2009 14:35	10/03/2009 16:20	CO	Maintenance/ calibration
10/03/2009 14:35	10/03/2009 16:25	NO, NO ₂ , NO _x	Maintenance/ calibration

Table 44: Data Exceptions - Heads Road

Start	End	Parameter	Reason
19/03/2009 8:30	19/03/2009 9:40	CO	Maintenance/ calibration
19/03/2009 8:30	19/03/2009 11:15	NO, NO ₂ , NO _x	Maintenance/ calibration
19/03/2009 10:05	19/03/2009 11:30	PM ₁₀	Maintenance/ calibration



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 five exceedence days of the PM_{2.5} intervention level during the reported period. Exceedences occurred during the period 13/02/2009 to 18/02/2009 corresponding with increased atmospheric particulate matter from bushfires. The maximum 24-hour average PM_{2.5} concentration was 62 µg/m³ on 14/02/2009 at Chaim Court monitoring station.

There were three exceedence days of the PM₁₀ intervention level during the reported period. Exceedences occurred on 22/01/2009, 07/02/2009 and 03/03/2009 corresponding with increased atmospheric particulate matter from bushfires. The maximum 24-hour average PM₁₀ concentration was 150 µg/m³ on 03/03/2009 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 36 ppb on 28/01/2009 00:00 hours 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 on 14/02/2009 09:00 hours at Chaim Court monitoring station. The maximum 8-hour average CO concentration was 1.4 ppm on 14/02/2009 10:00 hours reported at the Chaim Court monitoring station.

9.2 Data Capture Year to Date

2009 data capture statistics for the period 01/01/2009 to 31/03/2009 are presented in Table 45.



Table 45: Data Capture - Year to Date

STATION	DATA CAPTURE STATISTICS % YEAR TO DATE (01/01/2009 – 31/03/2009)			
	PM _{2.5}	PM ₁₀	NO _x	CO
Chaim Crt	99.5	99.5	97.0	97.0
Craig Rd		99.5	96.0	96.3
Heads Rd		99.7	96.9	97.0



Report Signature Page

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APPENDIX A

Limitations



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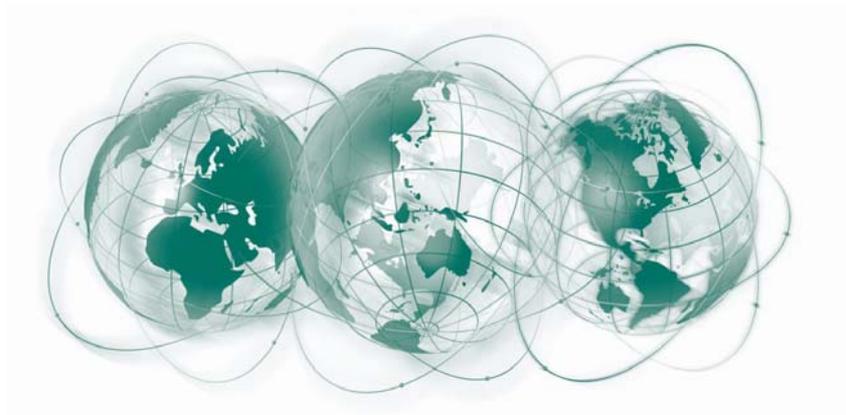
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