Air Quality Monitoring Results

High Lane, Stockport

Client: Residents Against Mass Development

Reference: 2635-1r1

Date: 22nd May 2019

Report Issue

Report Title: Air Quality Monitoring Results - High Lane, Stockport

Report Reference: 2635-1

Field	Report Version			
	1	2	3	4
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Date of Issue	22nd May 2019			
Comments	-			

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1.0 INTRODUCTION

1.1.1 Redmore Environmental Ltd was commissioned by Residents Against Mass Development to undertake Air Quality Monitoring in order to determine baseline conditions and identify any potential issues along a stretch of the A6 road network through High Lane, Stockport.

1.1.2 Monitoring of pollutant concentrations was undertaken at ten separate locations in the immediate vicinity of the A6 road network through High Lane, Stockport.

1.1.3 Monitoring was instructed for a total period of 3-months and included assessment of the following species at ten separate sampling locations:

- Nitrogen dioxide (NO_2).

1.1.4 A summary of the monitoring schedule is provided in Table 1.

Table 1 Monitoring Schedule

Sampling Location	Period	Start Date	Finish Date	Monitoring Parameters
Location 1	1	01/02/2019	27/02/2019	NO_2
Location 2				
Location 3				
Location 4				
Location 5				
Location 6				
Location 7				
Location 8				
Location 9				
Location 10				
Location 1	2	27/02/2019	28/03/2019	NO_2
Location 2				
Location 3				

Sampling Location	Period	Start Date	Finish Date	Monitoring Parameters
Location 4				
Location 5				
Location 6				
Location 7				
Location 8				
Location 9				
Location 10				
Location 1	3	28/03/2019	29/04/2019	NO_2
Location 2				
Location 3				
Location 4				
Location 5				
Location 6				
Location 7				
Location 8				
Location 9				
Location 10				

1.1.5 Reference should be made to Figure 1 for a map showing the locations of the sampling positions.

2.0 LEGISLATION AND POLICY

2.1 European Directives

2.1.1 European Union (EU) air quality legislation is provided within Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new Air Quality Limit Values (AQLVs) for particulate matter with an aerodynamic diameter of less than 2.5µm. The consolidated Directives include:

- Directive 1999/30/EC - the First Air Quality "Daughter" Directive - sets ambient AQLVs for NO_2, oxides of nitrogen, sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm;
- Directive 2000/69/EC - the Second Air Quality "Daughter" Directive - sets ambient AQLVs for benzene and carbon monoxide; and,
- Directive 2002/3/EC - the Third Air Quality "Daughter" Directive - seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

2.1.2 The fourth daughter Directive was not included within the consolidation and is described as:

- Directive 2004/107/EC - sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

2.2 UK Legislation

2.2.1 The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and transpose EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for seven pollutants, as well as Target Values for an additional five pollutants. Critical levels for the protection of vegetation were also included for two species.

2.2.2 Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for

Environment, Food and Rural Affairs (DEFRA) and published in July 2007[1]. The AQS sets out Air Quality Objectives (AQOs) that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedences over a specified timescale. These are generally in line with the AQLVs, although the requirements for the determination of compliance vary.

2.2.3 Table 2 presents the AQOs for pollutants considered within this assessment.

Table 2 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration (µg/m^3)	Averaging Period
NO_2	40	Annual mean
	200	1-hour mean, not to be exceeded on more than 18 occasions per annum

[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

3.0 METHODOLOGY

3.1 Introduction

3.1.1 Monitoring was undertaken using passive diffusion tube samplers at ten separate locations for a total period of 3-months. Installation and maintenance of the diffusion tubes was undertaken in accordance with DEFRA guidance[2]. A summary of the sampling methodology is provided in the following Sections.

3.2 Monitoring Locations

3.2.1 The monitoring positions were selected following consultation with the client, a baseline review of the local road network and consideration of appropriate locations for fixing the samplers. A summary of the survey positions is provided in Table 3.

Table 3 Sampling Locations

Location Number	Approximate National Grid Reference (NGR) (m)		Description
	X	Y	
1	394005.8	385645.5	Roadside - 247 High Lane, Lamppost 79
2	394464.2	385568.1	Roadside - 275 High Lane, Lamppost 95
3	394801.5	385463.7	Roadside - 6 High Lane, Lamppost 105
4	394927.7	385458.6	Roadside - 4 Windlehurst Lane
5	394914.5	385404.4	Roadside - Opposite Horseshoe Inn
6	395203.8	385276.0	Roadside - 74 High Lane, Lamppost 122
7	395016.4	385355.5	Roadside - 26 High Lane, Opposite M.O.T Centre
8	395366.6	385251.6	Roadside - Opposite St Thomas's Church
9	395703.7	385228.2	Roadside - 157 High Lane, Lamppost 137
10	395501.9	385236.8	Roadside - Down to Earth Florist, Lamppost 131

[2] Local Air Quality Management Technical Guidance (TG16), DEFRA, 2018.

3.2.2 Reference should be made to Figure 1 for a map showing the locations of the sampling positions.

3.3 Diffusion Tubes

3.3.1 Monitoring was undertaken in triplicate at each location using passive diffusion tubes. The samplers contain a reagent which absorbs the pollutants of interest at a known rate and from the period of exposure and subsequent analysis an ambient pollutant concentration can be calculated. For the purpose of this monitoring survey a preparation of 20% triethanolamine (TEA) in water was utilised.

3.3.2 Diffusion tubes provide a time weighted average concentration over the exposure period. They are extensively used by Local Authorities and are recommended in Environment Agency (EA) Technical Guidance Note (TGN) M8[3]. Diffusion tubes are suitable for carrying out spatial or localised air quality assessments and can provide suitable data for baseline pollutant analysis.

3.3.3 The samplers were supplied and analysed by Gradko International, a UKAS accredited contract laboratory. Concentrations of NO_2 absorbed by the tubes were determined using ultra violet / visible spectrophotometry with reference to calibration curves derived from the analysis of standard solutions using UKAS accredited methods.

3.4 Sampling Details

3.4.1 The survey was carried out over a period of 3-months commencing 1st February 2019 and utilised an approximate 4-week exposure interval. A summary of the monitoring periods are provided in Table 4.

Table 4 Monitoring Period

Monitoring Period	Start Date	End Date
1	01/02/2019	27/02/2019
2	27/02/2019	28/03/2019
3	28/03/2019	29/04/2019

[3] TGN M8, Monitoring Ambient Air, EA, 2011.

3.5 Calculation of Results

3.5.1 An overall period mean was calculated for each monitoring location based on the average of the triplicate results. Annualisation was then undertaken in order to estimate annual mean NO_2 concentrations and facilitate direct comparison of the measurement data to the relevant AQO. This process was undertaken in accordance with DEFRA guidance[4].

3.5.2 Annual mean NO_2 concentrations for use in the annualisation process were obtained from background monitoring sites at three different locations within a 50-mile radius of the project. A summary of the monitoring sites selected for use in the assessment is provided in Table 5.

Table 5 Monitoring Sites

Site Name	NGR (m)		Station Type
	X	Y	
Manchester Piccadilly	384310	398337	Urban Background
Manchester Sharston	384179	386086	Suburban Background
Glazebury	368759	396028	Rural Background

3.5.3 The period mean for each monitoring site was calculated for the corresponding monitoring interval for the project (1st February 2019 to 29th April 2019). The ratio of the 2018 annual mean to the period mean was then calculated and an average derived as the adjustment factor. A summary of the data used to calculate the adjustment factor is provided in Table 6.

Table 6 Annualisation Data

Site Name	NO_2 Concentration (µg/m³)		Ratio (A_m/P_m)
	Annual Mean (A_m)	Period Mean (P_m)	
Manchester Piccadilly	34.64	39.88	0.87
Manchester Sharston	23.57	25.26	0.93

[4] Local Air Quality Management Technical Guidance (TG16), DEFRA, 2018.

Site Name	NO_2 Concentration (µg/m³)		Ratio (A_m/P_m)
	Annual Mean (A_m)	Period Mean (P_m)	
Glazebury	13.79	14.84	0.93
Average (R_a)			0.91

3.5.4 An estimate of the annual mean NO_2 concentrations at the project monitoring locations was then calculated by multiplying the measured period mean concentration by the adjustment factor.

3.5.5 Diffusion tubes are affected by several sources of interference which can cause under or overestimation of ambient pollutant concentrations. As such, a Bias Adjustment Factor (BAF) was applied to the annualised results in order to validate the data. The BAF was calculated using the DEFRA spreadsheet (version 09/18) using the relevant tube preparation method and laboratory analysis. The value obtained was 0.87. This was applied to the annualised monitoring results to correct the monitored values at each sample location.

4.0 MONITORING RESULTS

4.1 Introduction

4.1.1 The results of the monitoring are summarised in the following Sections. Reference should be made to Appendix 1 for full details of the sampling data.

4.2 Unadjusted Monitoring Results

4.2.1 A summary of the unadjusted monitoring results is provided in Table 7.

Table 7 Unadjusted Monitoring Results

Location Number	Tube ID	NO_2 Concentration (µg/m³)			
		01/02/19 - 27/02/19	27/03/19 - 28/03/19	28/03/19 - 29/04/19	Overall Period Mean
1	1A	41.06	38.37	33.23	**36.87**
	1B	35.49	40.84	30.56	
	1C	39.22	42.90	30.13	
	Mean	**38.59**	**40.71**	**31.30**	
2	2A	45.83	49.06	50.19	**47.56**
	2B	46.67	45.30	51.72	
	2C	45.46	49.55	44.23	
	Mean	**45.99**	**47.97**	**48.71**	
3	3A	35.08	32.38	38.95	**35.75**
	3B	35.10	31.63	41.38	
	3C	37.71	30.83	38.66	
	Mean	**35.96**	**31.61**	**39.66**	
4	4A	33.89	32.87	23.58	**31.21**
	4B	35.68	32.47	26.48	
	4C	39.03	35.66	21.27	
	Mean	**36.20**	**33.67**	**23.77**	

Location Number	Tube ID	NO_2 Concentration (µg/m³)			
		01/02/19 - 27/02/19	27/03/19 - 28/03/19	28/03/19 - 29/04/19	Overall Period Mean
5	5A	30.74	24.52	37.62	**32.37**
	5B	31.20	27.17	40.11	
	5C	30.32	27.43	42.23	
	Mean	**30.75**	**26.37**	**39.99**	
6	6A	40.47	37.39	40.42	**39.35**
	6B	45.58	34.64	36.35	
	6C	43.37	34.84	41.13	
	Mean	**43.14**	**35.62**	**39.30**	
7	7A	29.13	25.90	32.43	**30.15**
	7B	27.19	28.30	33.52	
	7C	31.49	27.35	36.01	
	Mean	**29.27**	**27.18**	**33.98**	
8	8A	26.63	29.55	31.66	**30.42**
	8B	26.43	35.69	33.95	
	8C	26.25	27.36	36.24	
	Mean	**26.43**	**30.87**	**33.95**	
9	9A	45.44	47.34	29.78	**41.85**
	9B	47.06	46.27	39.44	
	9C	45.71	44.89	30.75	
	Mean	**46.07**	**46.17**	**33.32**	
10	10A	26.99	25.33	30.61	**27.34**
	10B	24.52	27.33	30.30	
	10C	25.33	23.51	32.18	
	Mean	**25.61**	**25.39**	**31.03**	

4.3 Adjusted Monitoring Results

4.3.1 A summary of the adjusted monitoring results is provided in Table 8.

Table 8 Adjusted Monitoring Results

Location Number	Period Mean NO_2 Concentration (µg/m³)	Annualised NO_2 Concentration (µg/m³)	Bias Adjusted NO_2 Concentration (µg/m³)
1	36.87	33.56	29.19
2	47.56	43.28	37.66
3	35.75	32.54	28.31
4	31.21	28.41	24.72
5	32.37	29.46	25.63
6	39.35	35.82	31.16
7	30.15	27.44	23.87
8	30.42	27.68	24.09
9	41.85	38.09	33.14
10	27.34	24.89	21.65

4.3.2 As shown in Table 8, the adjusted results indicate that concentrations of NO_2 were below the annual mean AQO at all monitoring locations.

5.0 CONCLUSION

5.1.1 Redmore Environmental Ltd was commissioned by Residents Against Mass Development to undertake Air Quality Monitoring in order to determine baseline conditions and identify any potential issues along a stretch of the A6 road network through High Lane, Stockport.

5.1.2 Monitoring of pollutant concentrations was undertaken at ten separate locations in the vicinity of the A6 road network through High Lane, Stockport, over a 3-month period.

5.1.3 Monitoring results were annualised and bias adjusted in order to estimate annual mean NO_2 concentrations at the survey locations. This facilitated direct comparison of the measurement data to the relevant AQO.

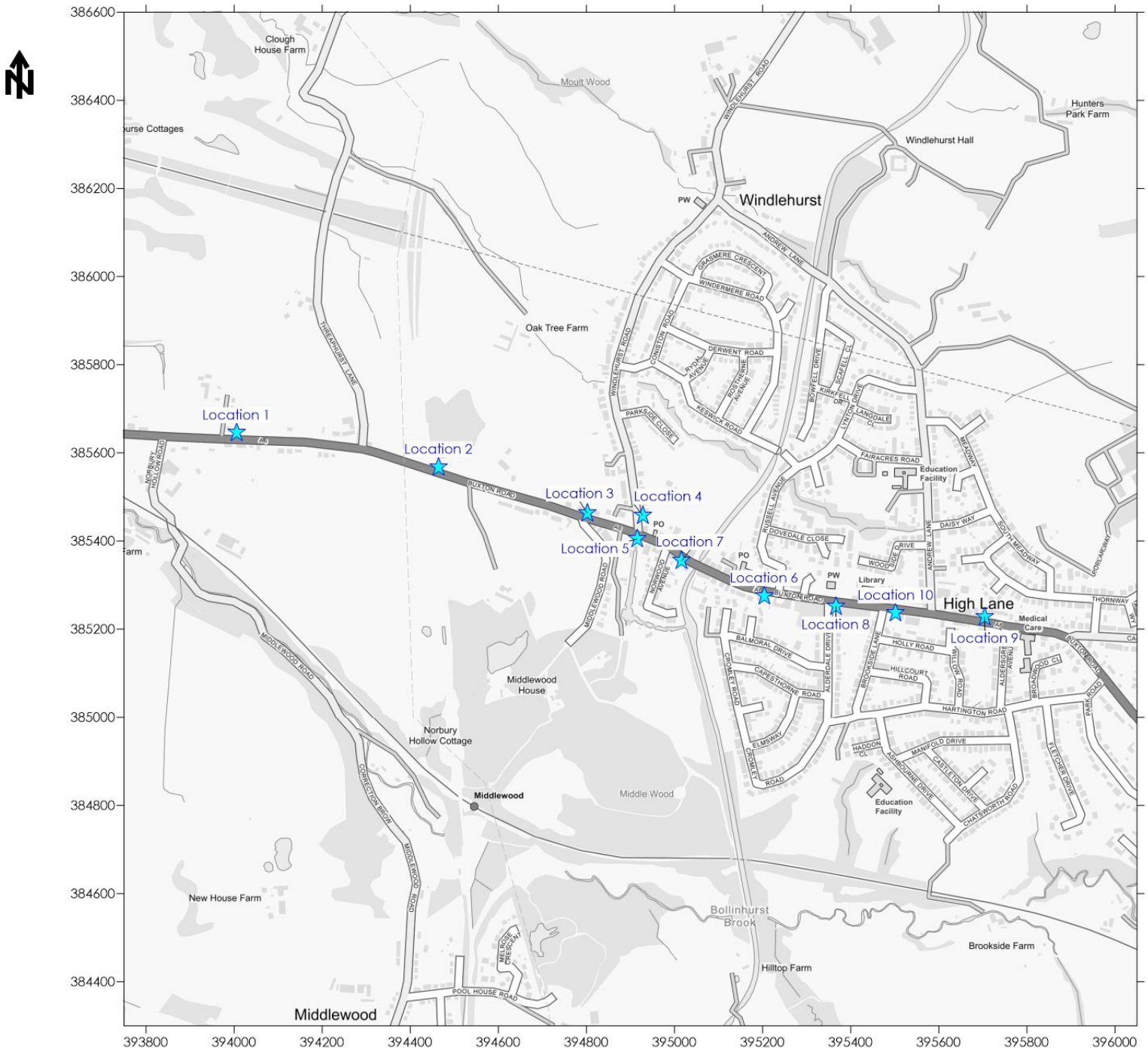
5.1.4 The results of the survey and subsequent data analysis indicated that predicted annual mean NO_2 concentrations were below the relevant AQO at all monitoring locations.

5.1.5 Based on the monitoring results, exceedences of the relevant AQO were not identified throughout the survey extents.

6.0 ABBREVIATIONS

AQLV	Air Quality Limit Value
AQO	Air Quality Objective
AQS	Air Quality Strategy
BAF	Bias Adjustment Factor
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EU	European Union
NGR	National Grid Reference
NO_2	Nitrogen dioxide
TEA	Triethanolamine
TGN	Technical Guidance Note

Figures



Legend

Monitoring Location

Title
Figure 1 - Monitoring Locations

Project
Air Quality Monitoring Results
High Lane, Stockport

Project Reference
2635

Client
Residents Against Mass Development

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Appendix 1 - Monitoring Data

Monitoring Period 1						
Location	**Sample Reference**	**Monitoring Parameter**	**Start Date**	**End Date**	**Exposure Time (hr)**	**Concentration (µg/m³)**
1	1A	NO_2	01/02/2019	27/02/2019	623.35	41.06
	1B	NO_2	01/02/2019	27/02/2019	623.35	35.49
	1C	NO_2	01/02/2019	27/02/2019	623.35	39.22
2	2A	NO_2	01/02/2019	27/02/2019	623.23	45.83
	2B	NO_2	01/02/2019	27/02/2019	623.23	46.67
	2C	NO_2	01/02/2019	27/02/2019	623.23	45.46
3	3A	NO_2	01/02/2019	27/02/2019	623.23	35.08
	3B	NO_2	01/02/2019	27/02/2019	623.23	35.10
	3C	NO_2	01/02/2019	27/02/2019	623.23	37.71
4	4A	NO_2	01/02/2019	27/02/2019	623.20	33.89
	4B	NO_2	01/02/2019	27/02/2019	623.20	35.68
	4C	NO_2	01/02/2019	27/02/2019	623.20	39.03
5	5A	NO_2	01/02/2019	27/02/2019	623.12	30.74
	5B	NO_2	01/02/2019	27/02/2019	623.12	31.20
	5C	NO_2	01/02/2019	27/02/2019	623.12	30.32
6	6A	NO_2	01/02/2019	27/02/2019	623.12	40.47
	6B	NO_2	01/02/2019	27/02/2019	623.12	45.58
	6C	NO_2	01/02/2019	27/02/2019	623.12	43.37
7	7A	NO_2	01/02/2019	27/02/2019	623.00	29.13
	7B	NO_2	01/02/2019	27/02/2019	623.00	27.19
	7C	NO_2	01/02/2019	27/02/2019	623.00	31.49
8	8A	NO_2	01/02/2019	27/02/2019	623.22	26.63
	8B	NO_2	01/02/2019	27/02/2019	623.22	26.43
	8C	NO_2	01/02/2019	27/02/2019	623.22	26.25
9	9A	NO_2	01/02/2019	27/02/2019	623.40	45.44
	9B	NO_2	01/02/2019	27/02/2019	623.40	47.06

Monitoring Period 1						
Location	**Sample Reference**	**Monitoring Parameter**	**Start Date**	**End Date**	**Exposure Time (hr)**	**Concentration (µg/m³)**
	9C	NO_2	01/02/2019	27/02/2019	623.40	45.71
10	10A	NO_2	01/02/2019	27/02/2019	622.95	26.99
	10B	NO_2	01/02/2019	27/02/2019	622.95	24.52
	10C	NO_2	01/02/2019	27/02/2019	622.95	25.33

Monitoring Period 2						
Location	**Sample Reference**	**Monitoring Parameter**	**Start Date**	**End Date**	**Exposure Time (hr)**	**Concentration (µg/m³)**
1	1A	NO_2	27/02/2019	28/03/2019	695.28	38.37
	1B	NO_2	27/02/2019	28/03/2019	695.28	40.84
	1C	NO_2	27/02/2019	28/03/2019	695.28	42.90
2	2A	NO_2	27/02/2019	28/03/2019	695.30	49.06
	2B	NO_2	27/02/2019	28/03/2019	695.30	45.30
	2C	NO_2	27/02/2019	28/03/2019	695.30	49.55
3	3A	NO_2	27/02/2019	28/03/2019	695.22	32.38
	3B	NO_2	27/02/2019	28/03/2019	695.22	31.63
	3C	NO_2	27/02/2019	28/03/2019	695.22	30.83
4	4A	NO_2	27/02/2019	28/03/2019	695.27	32.87
	4B	NO_2	27/02/2019	28/03/2019	695.27	32.47
	4C	NO_2	27/02/2019	28/03/2019	695.27	35.66
5	5A	NO_2	27/02/2019	28/03/2019	695.23	24.52
	5B	NO_2	27/02/2019	28/03/2019	695.23	27.17
	5C	NO_2	27/02/2019	28/03/2019	695.23	27.43
6	6A	NO_2	27/02/2019	28/03/2019	695.10	37.39
	6B	NO_2	27/02/2019	28/03/2019	695.10	34.64
	6C	NO_2	27/02/2019	28/03/2019	695.10	34.84

Monitoring Period 2						
Location	**Sample Reference**	**Monitoring Parameter**	**Start Date**	**End Date**	**Exposure Time (hr)**	**Concentration (µg/m³)**
7	7A	NO_2	27/02/2019	28/03/2019	695.28	25.90
	7B	NO_2	27/02/2019	28/03/2019	695.28	28.30
	7C	NO_2	27/02/2019	28/03/2019	695.28	27.35
8	8A	NO_2	27/02/2019	28/03/2019	695.12	29.55
	8B	NO_2	27/02/2019	28/03/2019	695.12	35.69
	8C	NO_2	27/02/2019	28/03/2019	695.12	27.36
9	9A	NO_2	27/02/2019	28/03/2019	694.90	47.34
	9B	NO_2	27/02/2019	28/03/2019	694.90	46.27
	9C	NO_2	27/02/2019	28/03/2019	694.90	44.89
10	10A	NO_2	27/02/2019	28/03/2019	695.33	25.33
	10B	NO_2	27/02/2019	28/03/2019	695.33	27.33
	10C	NO_2	27/02/2019	28/03/2019	695.33	23.51

Monitoring Period 3						
Location	**Sample Reference**	**Monitoring Parameter**	**Start Date**	**End Date**	**Exposure Time (hr)**	**Concentration (µg/m³)**
1	1A	NO_2	28/03/2019	29/04/2019	768.17	33.23
	1B	NO_2	28/03/2019	29/04/2019	768.17	30.56
	1C	NO_2	28/03/2019	29/04/2019	768.17	30.13
2	2A	NO_2	28/03/2019	29/04/2019	768.07	50.19
	2B	NO_2	28/03/2019	29/04/2019	768.07	51.72
	2C	NO_2	28/03/2019	29/04/2019	768.07	44.23
3	3A	NO_2	28/03/2019	29/04/2019	768.05	38.95
	3B	NO_2	28/03/2019	29/04/2019	768.05	41.38
	3C	NO_2	28/03/2019	29/04/2019	768.05	38.66
4	4A	NO_2	28/03/2019	29/04/2019	767.97	23.58

Monitoring Period 3						
Location	**Sample Reference**	**Monitoring Parameter**	**Start Date**	**End Date**	**Exposure Time (hr)**	**Concentration (µg/m³)**
	4B	NO_2	28/03/2019	29/04/2019	767.97	26.48
	4C	NO_2	28/03/2019	29/04/2019	767.97	21.27
5	5A	NO_2	28/03/2019	29/04/2019	767.98	37.62
	5B	NO_2	28/03/2019	29/04/2019	767.98	40.11
	5C	NO_2	28/03/2019	29/04/2019	767.98	42.23
6	6A	NO_2	28/03/2019	29/04/2019	768.00	40.42
	6B	NO_2	28/03/2019	29/04/2019	768.00	36.35
	6C	NO_2	28/03/2019	29/04/2019	768.00	41.13
7	7A	NO_2	28/03/2019	29/04/2019	768.03	32.43
	7B	NO_2	28/03/2019	29/04/2019	768.03	33.52
	7C	NO_2	28/03/2019	29/04/2019	768.03	36.01
8	8A	NO_2	28/03/2019	29/04/2019	767.97	31.66
	8B	NO_2	28/03/2019	29/04/2019	767.97	33.95
	8C	NO_2	28/03/2019	29/04/2019	767.97	36.24
9	9A	NO_2	28/03/2019	29/04/2019	767.92	29.78
	9B	NO_2	28/03/2019	29/04/2019	767.92	39.44
	9C	NO_2	28/03/2019	29/04/2019	767.92	30.75
10	10A	NO_2	28/03/2019	29/04/2019	767.83	30.61
	10B	NO_2	28/03/2019	29/04/2019	767.83	30.30
	10C	NO_2	28/03/2019	29/04/2019	767.83	32.18