Dundee City Council

S-Paramics Air Quality Modelling Study – Forfar Road

March 2016

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Executive Summary

Bureau Veritas have been commissioned by Dundee City Council to undertake air quality dispersion modelling studies to predict annual mean concentrations of NO_2 and PM_{10} for three areas of Dundee (Forfar, Lochee and Stannergate) identified by the Council. This report and associated results file focus on the Forfar area of Dundee. Separate reports have been produced for the Lochee and Stannergate areas.

The Council commissioned SIAS to develop a S-Paramics traffic micro-simulation model for the study areas to simulate real-time behaviour of vehicles on the roads in the study areas. The output from the S-Paramics model was then processed using the Analysis of Instantaneous Road Emissions (AIRE) model to produce hourly emissions of NO_x and PM_{10}. The emissions from AIRE have then been inputted into an ADMS-Roads dispersion model to predict the pollutant concentrations at sensitive receptors.

In line with those detailed in SIAS report “Forfar Road S-Paramics Model”, the following scenarios have been assessed:

- 2012 Base (BC);
- Scenario 1 (SC1) – A90 Bypass; and
- Scenario 2 (SC2) – Forfar Road Signal Timing Optimisation.

The traffic data was provided by SIAS in the form of hourly exhaust emissions of NO_x and PM_{10} for each of the modelled links split between different vehicle types. PM_{10} contributions from brake, tyre wear and road abrasion were calculated by entering the number of vehicles on each road link (as output from S-Paramics) for each hour into the Emissions Factor Toolkit (EFT) v6.0.2.

Annual mean concentrations of NO_2 and PM_{10} were predicted at 1,065 specific receptors across the modelled area representing relevant public exposure, located at the façade of properties. Of the 1,065 receptors, 902 were at ground floor level (1.5m height), 82 were at 1st floor level (4.5m height), 41 were at 2nd floor level (7.5m height) and 40 were at 3rd floor level (10.5m).

Of the 902 receptors at ground floor level (1.5m), a maximum of 22 were predicted to exceed the 40µg/m^3 annual mean Air Quality Objective (AQO) for NO_2 in any of the three scenarios. At 1st floor level (4.5m) a maximum of 3 receptors were predicted to exceed the 40µg/m^3 AQO in any of the three scenarios. There were no exceedences predicted at 2nd (7.5m) or 3rd (10.5m) floor level in any of the three scenarios.

The NO_2 hourly mean AQO was expected to be met at all modelled receptors in all three scenarios.

According to EPUK guidance, in relation to the annual mean AQO for NO_2, implementation of SC1 would result in a negligible impact at 983 receptors, a slight beneficial impact at 52 receptors, a moderate beneficial impact at 16 receptors and a substantial beneficial impact at 14 receptors. An adverse impact was not predicted at any receptors as a result of SC1 in relation to the annual mean AQO for NO_2.

According to EPUK guidance, in relation to the annual mean AQO for NO_2, implementation of SC2 would result in a negligible impact at 1,041 receptors and a slight beneficial impact at 18 receptors. Slight adverse impacts were predicted at 6 receptors as a result of SC2 in relation to the annual mean AQO for NO_2.

Of the 902 receptors at ground floor level (1.5m), a maximum of 10 were predicted to exceed the 18µg/m^3 annual mean AQO for PM_{10} in any of the three scenarios. There were no exceedences predicted at 1st (4.5m), 2nd (7.5m) or 3rd (10.5m) floor level in any of the three scenarios.

The PM_{10} 24-hour mean AQO was expected to be met at all modelled receptors in all three scenarios.

According to EPUK guidance, in relation to the annual mean AQO for PM_{10}, implementation of SC1 would result in a negligible impact at 1,015 receptors, a slight beneficial impact at 40 receptors and a moderate beneficial impact at 10 receptors. An adverse impact was not predicted at any receptors as a result of SC1.

According to EPUK guidance, SC2 in relation to the annual mean AQO for PM_{10}, implementation of SC2 would result in a negligible impact at 1,060 receptors and a slight beneficial impact at 5 receptors. An adverse impact was not predicted at any receptors as a result of SC2.

A source apportionment study for the BC scenario found that HGVs were found to cause the highest proportion of road NO_x and road NO_2 concentrations when results were averaged across all modelled receptors, and when averaged across receptors with NO_2 concentration greater than 40µg/m^3.Cars were found to cause the greatest proportion of road NO_x at the receptor with the maximum road NO_x concentration.

Cars were found to cause the highest proportion of road PM_{10} concentrations when results were averaged across all modelled receptors, when averaged across receptors with PM_{10} concentration greater than 18µg/m^3 and at the receptor with the maximum road PM_{10} concentration.

The number of people predicted to be exposed to potential exceedences of the annual mean NO_2 and PM_{10} in the area covered by the Forfar model for the BC scenario, is estimated to be 138 and 92 respectively.

Full results for all modelled receptors can be found in the MS Excel file, which accompanies this report (Forfar Results_submitted_V3.xlsx).

1 Introduction

1.1 Scope of Study

The Review and Assessment of air quality undertaken by Dundee City Council (the Council) as part of the Local Air Quality Management (LAQM) regime has identified widespread exceedences of the Air Quality Strategy (AQS) Air Quality Objectives (AQO) for nitrogen dioxide (NO_2) and particulate matter (PM_{10}). In July 2006 the Council declared the entire of Dundee city centre as an Air Quality Management Area (AQMA) in relation to the annual mean Air Quality Objective (AQO) for NO_2. This AQMA declaration was subsequently modified in October 2010 to include PM_{10} and the hourly mean for NO_2 in March 2013.

The Council identified three areas of the city (Forfar Road, Lochee Road and Stannergate), in which elevated concentrations of NO_2 and PM_{10} had been recorded. In order to better understand the extents of the areas of exceedences, the Council wished for a detailed air quality dispersion modelling study to be undertaken.

It is hoped that in addition to providing baseline concentrations, the modelling would be able to predict impacts from major projects being undertaken in Dundee, including:

- Impacts of the Port of Dundee expansion, which will impact traffic on the local road network; and
- Impacts from schemes being considered by the Council's Transport department, considering various route and traffic management options.

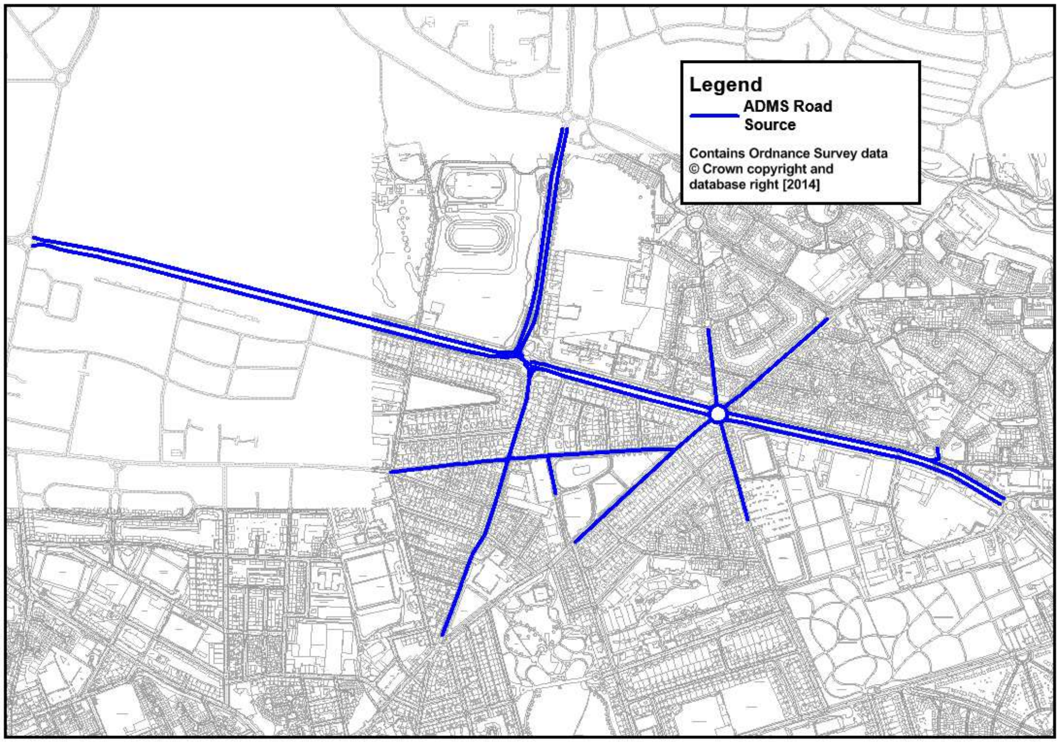
The Council intends this study to inform the air quality impacts of various traffic management options in order to assess the implications for compliance with the AQOs and the requirements for mitigation.

The Council commissioned SIAS to develop a S-Paramics traffic micro-simulation model for the study areas to simulate real-time behaviour of vehicles on the roads in the study areas. The output from the S-Paramics model was then processed using the Analysis of Instantaneous Road Emissions (AIRE) model to produce hourly emissions of NO_x and PM_{10}. The emissions from AIRE have then been used in ADMS-Roads to predict the pollutant concentrations at sensitive receptors.

Bureau Veritas has therefore been commissioned by Dundee City Council to undertake air quality dispersion modelling studies to predict annual mean concentrations of NO_2 and PM_{10} for the three areas of Dundee identified by the Council, under baseline conditions, and under a variety of development and intervention scenarios.

This report and the associated results file focus on the Forfar Road area of Dundee. Separate reports have been produced for the Lochee and Stannergate areas. The area considered in this report is illustrated in Figure 1.

Figure 1 - Modelled Area



2 Air Quality – Legislative Context

2.1 Air Quality Strategy

The importance of existing and future pollutant concentrations can be assessed in relation to the national air quality standards and objectives established by Government. The Air Quality Strategy[1] (AQS) provides the over-arching strategic framework for air quality management in the UK and contains national air quality standards and objectives established by the UK Government and Devolved Administrations to protect human health. The air quality objectives incorporated in the AQS and the UK Legislation are derived from Limit Values prescribed in the EU Directives transposed into national legislation by Member States.

The CAFE (Clean Air for Europe) programme was initiated in the late 1990s to draw together previous directives into a single EU Directive on air quality. The CAFE Directive[2] has been adopted and replaces all previous air quality Directives, except the 4th Daughter Directive[3]. The Directive introduces new obligatory standards for $PM_{2.5}$ for Government but places no statutory duty on local government although Scottish Government have brought in a new $PM_{2.5}$ standard for Scottish local authorities through the Air Quality (Scotland) Amendment Regulations 2016 which introduces (from 1 April 2016) a $PM_{2.5}$ annual mean standard of $10ug/m^3$ for Scottish local authorities to work towards achieving.

The Air Quality Standards (Scotland) Regulations[4] 2010 came into force on 11 June 2010 in order to align and bring together in one statutory instrument the Government's obligations to fulfil the requirements of the new CAFE Directive.

The objectives for ten pollutants – benzene (C_6H_6), 1,3-butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), particulate matter - PM_{10} and $PM_{2.5}$, ozone (O_3) and Polycyclic Aromatic Hydrocarbons (PAHs), have been prescribed within the AQS[2].

The EU Limit Values are considered to apply everywhere with the exception of the carriageway and central reservation of roads and any location where the public do not have access (e.g. industrial sites).

Guidance from the UK Government and Devolved Administrations makes clear that exceedences of the health based objectives should be assessed at outdoor locations where members of the general public are regularly present over the averaging time of the objective. Table 1 taken from LAQM TG(09)[5] provides an indication of those locations that may or may not be relevant for each averaging period.

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[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007), Published by Defra in partnership with the Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland

[2] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe.

[3] Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic hydrocarbons in ambient air.

[4] The Air Quality Standards Regulations (England) 2010, Statutory Instrument No 1001, The Stationary Office Limited.

[5] LAQM Technical Guidance LAQM.TG(09) - February 2009. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.

Table 1 – Examples of where the Air Quality Objectives should apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual mean	All locations where members of the public might be regularly exposed Building facades of residential properties, schools, hospitals, care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour mean and 8-hour mean	All locations where the annual mean objectives would apply, together with hotels Gardens or residential properties[1]	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives would apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where the public might reasonably be expected to spend one hour or more. Any outdoor locations at which the public may be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-minute mean	All locations where members of the public might reasonably be expected to spend a period of 15 minutes or longer.	

Note [1] For gardens and playgrounds, such locations should represent parts of the garden where relevant public exposure is likely, for example where there is seating or play areas. It is unlikely that relevant public exposure would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.

This assessment focuses on NO_2 and PM_{10} as these are the pollutants of most concern within the Council's administrative area, given monitored exceedences. Moreover, as a result of traffic pollution the UK has failed to meet the EU Limit Values for this pollutant by the 2010 target date. As a result, the Government has had to submit time extension applications for compliance with the EU Limit Values. Continued failure to achieve these limits may lead to EU fines. The AQOs for NO_2 and PM_{10} are presented in Table 2. Further details regarding the effects of NO_2 and PM_{10} can be found in Appendix 1.

Table 2 – Relevant AQOs for the Assessed Pollutants in Scotland

Pollutant	AQO	Concentration Measured as:	Date for Achievement
Nitrogen dioxide (NO_2)	200µg/m³ not to be exceeded more than 18 times per year	1-hour mean	31 December 2005
	40µg/m³	Annual mean	31 December 2005
Particulate Matter (PM_{10}) (gravimetric)	50µg/m³ not to be exceeded more than 7 times per year	24-hour mean	31 December 2005
	18µg/m³	Annual mean	31 December 2005

2.2 Local Air Quality Management (LAQM)

Part IV of the Environment Act 1995 places a statutory duty on local authorities to periodically Review and Assess the current and future air quality within their area, and determine whether they are likely to meet the AQOs set down by Government for a number of pollutants – a process known a Local Air Quality Management (LAQM). The AQOs that apply to LAQM are defined for seven pollutants: benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, sulphur dioxide and particulate matter.

Where the results of the Review and Assessment process highlight that problems in the attainment of health-based objectives for air quality will arise, the authority is required to declare an Air Quality Management Area (AQMA) – a geographic area defined by high concentrations of pollution and exceedences of health-based standards.

Where an authority has declared an AQMA, and development is proposed to take place either within or near the declared area, further deterioration to air quality resulting from a proposed development can be a potential barrier to gaining consent for the development proposal. Similarly, where a development would lead to an increase of the population within an AQMA, the protection of residents against the adverse long-term impacts of exposure to existing poor air quality can provide the barrier to consent. As such, following an increased number of declarations across the UK, it has become standard practice for planning authorities to require an air quality assessment to be carried out for a proposed development (even where the size and nature of the development indicates that a formal Environmental Impact Assessment (EIA) is not required).

One of the objectives of the LAQM regime is for local authorities to enhance integration of air quality into the planning process. Current LAQM Policy Guidance[6] clearly recognises land-use planning as having a significant role in terms of reducing population exposure to elevated pollutant concentrations. Generally, the decisions made on land-use allocation can play a major role in improving the health of the population, particularly at sensitive locations – such as schools, hospitals and dense residential areas.

[6] LAQM Policy Guidance LAQM.PG(09) - February 2009. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.

3 Review and Assessment of Air Quality Undertaken by the Council

3.1 First and Second Rounds of Review and Assessment

The First and Second Rounds of air quality Review and Assessment for the Council concluded that exceedences of the annual mean objective for NO_2 were likely as a result of traffic sources in Dundee City Centre, especially in the following areas:

- Seagate;
- Nethergate / Marketgait Junction;
- Dock Street;
- Commercial Street;
- Victoria Road / Hilltown / Meadowside Junction;
- Lochee Road / Rankine Street Junction;
- Lochee Road / Dudhope Junction; and
- Logie Street / Loons Road Junction.

Following the detailed modelling of NO_2 and PM_{10} concentrations in Dundee in 2005, the Council declared the whole of the City Centre as an AQMA for NO_2 in July 2006. The results of the 2005 Detailed Assessment were inconclusive for PM_{10} as there was insufficient confidence in verification of the modelled predictions for 2010. It was concluded that additional monitoring and modelling would be required to determine whether an AQMA for PM_{10} was required. The Scottish Environment Protection Agency (SEPA) and the Scottish Government accepted the conclusions of the Detailed Assessment and funded the expansion of the PM_{10} monitoring network. This included OSIRIS particulate monitoring in potential areas of exceedence, a new background site and a local gravimetric factor inter-comparison study.

3.2 Third Round of Review and Assessment

The Third Round of Review and Assessment started with the Updating and Screening Assessment (USA), completed in 2006. The USA showed that the monitored PM_{10} concentrations in Union Street exceeded the annual mean objective. However, this result was adversely influenced by major construction projects in the vicinity and may not have been truly representative of ambient concentrations present at this location.

The 2007 Annual Progress Report analysis of the 2006 monitoring data for NO_2 confirmed the need for continuance of the AQMA and development of an Action Plan. Two new areas of potential exceedence of the NO_2 annual mean were identified at the Kingsway/Forfar Road and Arbroath Road/Albert Street Junctions, which were considered in the 2009 Further Assessment.

The Council's 2006 monitoring results indicated exceedences of the PM_{10} annual mean objective at the following locations:

- Victoria Road / Hilltown Junction;
- Seagate;
- Logie Street; and

- Lochee Road.

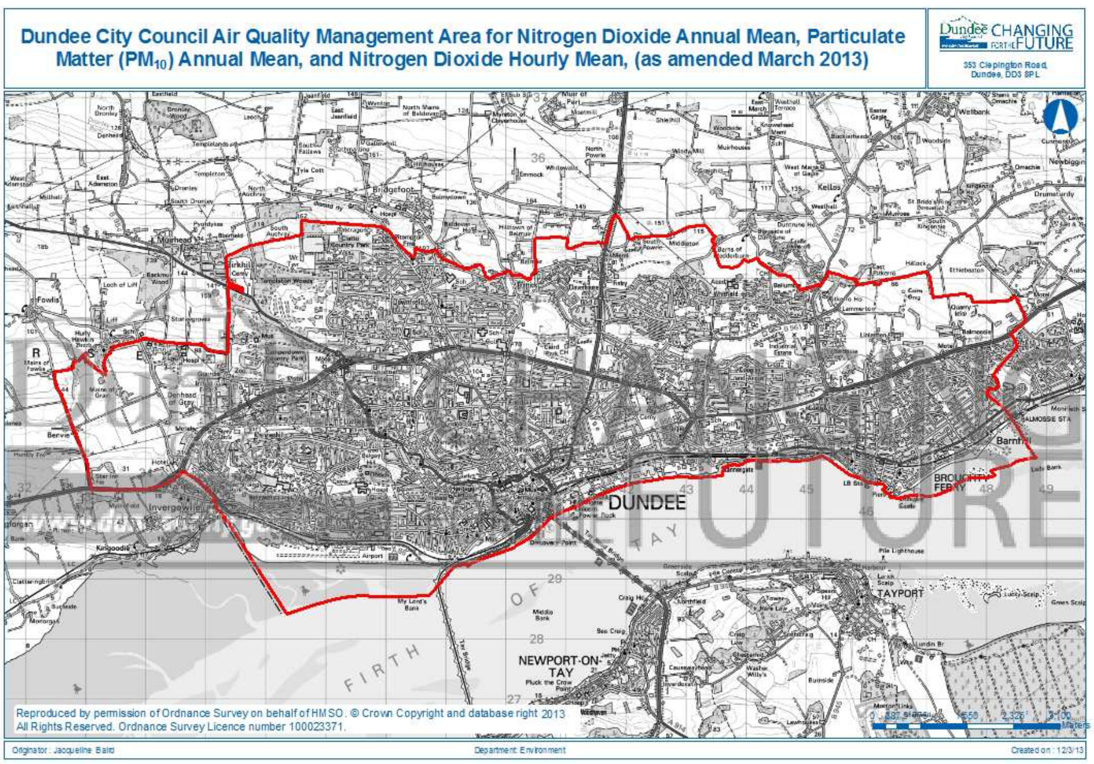
The 2006 PM_{10} monitoring results indicated that a Detailed Assessment of PM_{10} should be carried out. This Detailed Assessment, completed in 2009, modelled the areas identified as at risk, and confirmed the exceedences of the PM_{10} annual mean objective. Consequently, it was recommended that the Council declare an AQMA for PM_{10}.

The Further Assessment for the Dundee City AQMA for NO_2 was completed in November 2009[7]. The Further Assessment confirmed the need to maintain the AQMA for NO_2. It also confirmed significant exceedences of the PM_{10} annual mean objective. Based on the risk of exceedence the assessment confirmed that the Council should declare an AQMA for PM_{10}.

3.3 Fourth Round of Review and Assessment

The Fourth Round of Review and Assessment started with the USA 2009, which confirmed the risk of exceedence of the PM_{10} annual mean objective at a number of busy roadside sites. Accordingly, the existing AQMA, declared for NO_2 only, was varied on 25 October 2010 to include the PM_{10} annual mean objective. The AQMA is shown in Figure 2.

Figure 2 – Dundee City AQMA for NO_2 and PM_{10}



The Progress Reports 2010 and 2011 reviewed the 2009 and 2010 monitoring data and made the following conclusions:

- The PM_{10} annual mean objective was still being exceeded;

[7] Dundee City Council – LAQM Detailed and Further Assessment 2009 - BV/AQ/AGGX1347518 – November 2009

- The NO_2 annual mean objective was still exceeded in the AQMA. The monitoring data also identified a new area with potential exceedences in Strathmore Avenue;

- At some diffusion tubes, the NO_2 annual mean concentration was close to 60µg/m^3, which highlighted potential exceedence of the NO_2 1-hour mean objective. However, these tubes were not representative of public exposure. The Council decided to monitor at locations of relevant exposure to verify this; and

- At the Lochee Road automatic monitoring site, the number of NO_2 1-hour means above 200µg/m^3 was 23 and 67 in 2009 and 2010 respectively, whilst the objective only allows 18 exceedences. All these exceedences occurred during peak-hours on weekdays in winter. It was concluded that these were likely due to particularly cold weather, congestion and poor dispersion.

3.4 Fifth Round of Review and Assessment

The Fifth Round of Review and Assessment started with the USA 2012, which recommended the following actions:

- Take forward the amendment of the current AQMA order to include the NO_2 1-hour mean objective;

- Review the need to amend the AQMA order to include the PM_{10} 24-hour mean objective as more data becomes available;

- Review the results of additional monitoring installed at Kingsway–Myrekirk and Stannergate roundabouts as information becomes available;

- Review the NO_2 diffusion tube monitoring network in light of trends in monitoring results and new exposure; and

- Further investigate sources of biomass/solid fuel combustion in Dundee to enable appropriate screening, and report findings in subsequent LAQM reports as information becomes available.

3.5 Sixth Round of Review and Assessment

The Sixth Round of Review and Assessment started with the USA 2015. The 2015 USA concluded that no assessments of monitoring data or emission sources justify the need to proceed to a Detailed Assessment for any pollutant. Proposed actions arising from the 2015 USA are as follows:

- Review results of new diffusion tube sites installed on Coupar Angus Rd / Stirling St. , West Marketgait /Old Mill, High Street - Lochee (22-24), Broughty Ferry Rd (129);

- Compare diurnal profiles of pollutant concentrations and traffic (where available), in particular for Lochee Road;

- Undertake further analysis of pollutant concentrations in Meadowside following the one year trialling of an Action Plan measure that extends the distance between the facades of ground floor flats and vehicle exhausts by reallocating road space to cycles;

- Review the remaining Dundee City Council traffic radar count data for the presence of relevant exposure to identify where new classified traffic counts or NO_2 diffusion tube monitoring may be needed;

- Review and assess updated traffic data from Department of Transport for 2014 when this becomes available in June 2015;
- Review the results of the Council's on-going air dispersion modelling projects for Kingsway/Forfar Road, Dundee Eastern Arterial Routes (including Stannergate Roundabout), North West arterial route (Lochee Road) and bus emissions in the city centre;
- Review the results of third party air quality monitoring and modelling study of the Kingsway/Myrekirk Road roundabout and associated road network;
- Carry out classified traffic counts on Coupar Angus Road, Lochee District Centre and South Union Street once new traffic flows and patterns become established;
- Investigate sources of biomass/solid fuel combustion in the local authority area to enable appropriate screening and report findings in subsequent LAQM reports as information becomes available; and
- Take forward the planned actions highlighted in the Action Plan Progress Report.

3.6 Council Monitoring Data

The Council operates 13 automatic air quality monitoring stations throughout Dundee which monitor NO_2 and/or PM_{10}. Table 3 shows the details of the six automatic monitoring locations which monitor NO_2, along with the recorded annual mean NO_2 concentrations for years 2012 to 2014.

Table 3 – LAQM Automatic NO_2 Monitoring Undertaken in the Council area – Annual Mean

Site	Site Name	Site Type	OS Grid Ref	Annual Mean NO_2 Concentration ($\mu g/m^3$)		
				2012	2013	2014
CM12	Mains Loan	Urban Background	340972, 731893	9.8	11.5	12.4
CM5	Seagate Romon	Roadside	340487, 731446	**47.6**	**55.0**	**54.5**
CM2	Union Street Rollalong	Roadside	340235, 730091	31.7	30.5	28.4
CM6	Whitehall Street Romon	Roadside	340278, 730156	**44.4**	**41.2**	**42.5**
CM14	Meadowside Romom	Roadside	340243, 730653	**53.9**	**49.1**	39.6
CM4	Lochee Road	Roadside	338861, 730773	**52.9**	**51.6**	**45.8**
In **Bold**, exceedence of the annual mean NO_2 AQS objective of $40\mu g/m^3$						

Annual mean NO_2 concentrations have been observed to be above the $40\mu g/m^3$ AQOs at the roadside sites CM4, CM5, CM6 and CM14 for almost all years from 2012 to 2014. The annual mean NO_2 concentration at the urban background site CM12 has been observed to be well below the AQO for all years from 2012 to 2014, with a maximum annual mean concentration of $12.4\mu g/m^3$ occurring in 2014.

Table 4 shows the details of the twelve locations which monitor PM_{10}, along with the recorded annual mean PM_{10} concentrations for years 2012 to 2014.

Table 4 – LAQM Automatic PM_{10} Monitoring Undertaken in the Council area – Annual Mean

Site	Site Name	Site Type*	OS Grid Ref	Annual Mean PM_{10} Concentration (µg/m^3)		
				2012	2013	2014
CM3	Broughty Ferry Road Rollalong (TEOM)	UI	341970, 730977	14.2	15.9	14.7
CM13	Broughty Ferry Road (Partisol)	UI	341971, 730978	14.3	15.1	14.5
CM4	Lochee Road Romon (BAM)	RS	338861, 730773	16.5	17.9	**18.6**
CM9	Logie Street (Osiris)	KS	338176, 731298	**18.0**	16.5	16.1
CM12	Mains Loan (TEOM)	UB	340972, 731893	11.4	11.9	12.9
CM5	Seagate Romon (BAM)	RS	340487, 730446	14.1	16.0	17.7
CM2	Union Street Rollalong (BAM)	RS	340235, 730091	15.5	15.1	16.5
CM14	Meadowside Romon (BAM)	RS	340243, 730653	**18.6**	**18.6**	16.6
CM15	Albert Street (Osiris)	KS	341090, 731105	16.8	**18.3**	**21.4**
CM16	Broughty Ferry Road (Osiris)	UI	341970, 730977	13.4	15.0	14.6
CM17	Myrekirk (Osiris)	RS	335438, 731740	16.1	15.5	**18.3**
CM18	Stannergate (Osiris)	RS	343322, 731073	**19.9**	**24.5**	**26.7**
In **Bold**, exceedence of the annual mean NO_2 AQO of 18µg/m^3						
* UI = Urban Industrial, RS = Roadside, KS = Kerbside, UB = Urban Background						

Annual mean PM_{10} concentrations have been observed to be above the 18µg/m^3 AQO for at least one year between 2012 and 2014 at the roadside sites CM4, CM14, CM17 and CM18 and the kerbside sites CM9 and CM15. The annual mean PM_{10} concentration at the urban background site CM12 has been observed to be below the AQO for all years from 2012 to 2014, with a maximum annual mean concentration of 12.9µg/m^3 occurring in 2014.

In addition to the automatic monitoring stations, the Council operates an extensive network of passive monitoring for NO_2 within the city. Recent monitoring results for the sites in the vicinity of the modelled area are shown in Table 5.

Table 5 – LAQM Diffusion Tube Monitoring undertaken for NO_2 in modelled area

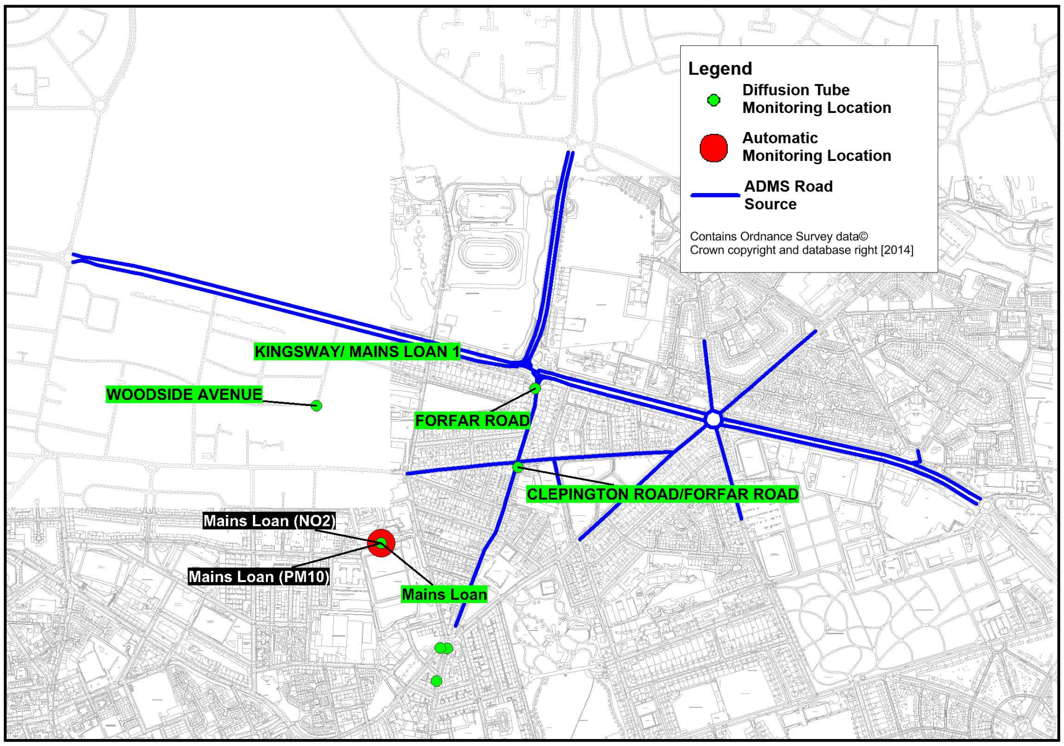
Site	Site Name	Site Type**	OS Grid Ref	Distance to Road (m)	Annual Mean NO_2 Concentration (µg/m^3)*		
					2012 (Bias 0.88)	2013 (Bias 0.87)	2014 (Bias 0.82)
2	Albert street (fish)	KS	341139 ,731476	2.7	31.7	-	-
3	Albert street (Shandon place)	RS	341171 ,731574	2.7	35.7	-	-
13	Clepington road/ Forfar road	KS	341385 ,732121	2.7	38.0	36.4	33.6
27	Kingsway/ Mains loan 1	RS	341124 ,732468	2.6	34.4	36.4	32.0
82	Woodside Avenue	UB	340776 ,732307	2.6	16.2	15.4	14.9
83	Forfar road	KS	341437 ,732360	2.6	**50.2**	**45.9**	**44.8**
146	Mains Loan	UB	340972 ,731893	-	15.0	-	-
In **bold**, exceedence of the annual mean NO_2 AQO of 40µg/m^3							
* Bias Adjustment Factors listed with relevant year							
** UI = Urban Industrial, RS = Roadside, KS = Kerbside, UB = Urban Background							

Annual mean NO_2 concentrations have been observed to be above the 40µg/m^3 AQO for all years between 2012 and 2014 at the kerbside site 83 (Forfar Road). The annual mean NO_2

concentration at the urban background sites 146 (Mains Loan) and 82 (Woodside Avenue) have been observed to be below the AQO for all years from 2012 to 2014, with a maximum annual mean concentration of 16.2µg/m^3 occurring in 2012 at site 82 (Woodside Avenue).

Figure 3 shows the monitoring locations in the vicinity of the modelled road network. Diffusion tube sites 2 (Albert Street (fish)) and 3 (Albert Street (Shandon Place)) are located just to the south of the modelled road network.

Figure 3 – Local Monitoring Locations



3.7 Background Mapped Concentration Estimates

The Scottish Government's Air Quality in Scotland website[8] includes a nationwide model of existing and future background air quality concentrations at a 1km grid square resolution. The data sets include annual mean concentration estimates for NO_x, NO_2, PM_{10} and $PM_{2.5}$, using a base year of 2011. The model used is semi-empirical in nature; it uses the national atmospheric emissions inventory (NAEI) emissions to model-predict the concentrations of pollutants at the centroid of each 1km grid square, but then calibrates these concentrations in relation to actual monitoring data.

Annual mean background concentrations have been obtained from the Air Quality in Scotland website background maps[9] for consideration in the assessment, based on the 1km grid squares which cover the modelled area and the affected road network. The Air Quality in Scotland mapped background concentrations for 2012 are presented in Table 6.

[8] Air Quality in Scotland - http://www.scottishairquality.co.uk/

[9] http://www.scottishairquality.co.uk/data/mapping?view=data

Table 6 – Background Pollutant Concentrations (Air Quality in Scotland Background Maps)

Grid Square (E,N)	2012 Annual Mean Concentration (μg/m^3)		
	NO_x	NO_2	PM_{10}
340500, 733500	16.2	11.3	11.5
341500, 733500	21.2	14.6	12.6
342500, 733500	19.7	13.6	12.1
340500, 732500	26.2	17.6	13.5
341500, 732500	25.6	17.3	13.2
342500, 732500	28.3	18.7	13.1
340500, 731500	26.2	17.6	13.0
341500, 731500	25.7	17.3	12.7
342500, 731500	25.0	16.9	12.7
AQS objective	**-**	***40.0***	***18.0***

These mapped background concentrations are all well below the respective annual mean AQOs.

3.8 Background Concentrations used in the Assessment

It is generally preferable to use background data from appropriate local monitoring where available and provided there is good data capture. Mapped concentrations are estimates of background pollution and include inherent errors associated with large scale modelling. LAQM TG(09)[5] states that if mapped background concentrations are to be used, these should be "*compared against local monitoring data to confirm there is good agreement*".

Annual mean background concentrations for the pollutants of relevance to this assessment have therefore been derived using local monitoring data. The background NO_2 concentration applied to modelled receptors has been taken from the urban background diffusion tube sites 82 (Woodside Avenue) and 146 (Mains Loan). Both the background sites are located within the vicinity of the modelled road network, but sufficient distance from the modelled roads to be considered a background site.

The background PM_{10} concentration applied to modelled receptors has been taken from the 2012 concentrations observed at the urban background TEOM site CM12 (Mains Loan). CM12 is located within the vicinity of the modelled road network but sufficient distance from the modelled roads to be considered a background site.

These concentrations are summarised in Table 7. This background concentration was applied to all receptor locations considered.

Table 7 - Background Concentrations Used in Assessment

	Background Concentration (μg/m^3)		
Pollutant	NO_x	NO_2	PM_{10}
Concentration	22.9	15.6	11.4
AQO	-	*40.0*	*18.0*

Whilst urban background sites are useful in providing an indication of background values, they are not useful for the purpose of model verification. Model verification has therefore been undertaken using only the kerbside and roadside sites listed in Table 5.

4 Assessment Methodology

To assess the impact of road traffic emissions on air quality and quantify the benefits of upgrading the bus fleet, the atmospheric dispersion model ADMS Roads version 3.4 was utilised, focusing on emissions of NO_x and PM_{10}.

In order to provide consistency with the Council's own work on air quality, the guiding principles for air quality assessments as set out in the latest guidance and tools provided by Defra for air quality assessment (LAQM.TG(09)[5]) have been used.

The approach used in this assessment has been based on the following:

- Prediction of ambient NO_2 concentrations, to which existing receptors may be exposed and comparison with the relevant AQOs; and
- Determination of the geographical extent of any potential exceedences.

4.1 Traffic Inputs

The traffic data for this assessment has been provided by the Council's traffic consultant SIAS.

SIAS were commissioned to develop an S-Paramics model in 2013 for the area around Forfar Road. The project include the use of Analysis of Instantaneous Emissions (AIRE) program to enable outputs to be used in an air quality dispersion modelling study to predict concentrations at local receptors. The AIRE outputs enabled Dundee City Council to consider various options for future year development and junction alterations. Further details of the work undertaken by SIAS can be found in Forfar Road S-Paramics/AIRE Assessment Model Development Report (SIAS Ref. 75326, September 2013)[10] and Forfar Road S-Paramics Model (SIAS Ref. TPDCCFAA/77000 March 2015)[11].

The traffic data was provided by SIAS in the form of hourly exhaust emissions of NO_x and PM_{10} for each of the modelled links split between different vehicle types. PM_{10} contributions from brake, tyre wear and road abrasion were calculated by entering the number of vehicles on each road link (as output from S-Paramics) for each hour into the Emissions Factor Toolkit (EFT) v6.0.2[12].

Tabulated Annual Average Daily Traffic (AADT) counts split between vehicles type are provided for modelled scenarios in Appendix 2. Complete details of the road geometry assumed during the modelling is provided in the MS Excel file, which accompanies this report (Forfar Results_submitted_V3.xlsx). An ESRI shape file (Road Sources.shp) showing the location of the modelled road sources also accompanies this submission.

4.2 Assessment Scenarios

In line with those detailed in Forfar Road S-Paramics Model[11], the following scenarios have been considered:

- 2012 Base (BC) – Base case traffic developed using a single modelled period covering a full 24-hours in early 2013;
- Scenario 1 (SC1) – A90 Bypass, conceptual test assessing the impact of a bypass between the A90 Invergowrie and the A90 south of Forfar. The bypass was not included

[10] Forfar Road S-Paramics/AIRE Assessment Model Development Report (SIAS Ref. 75326, September 2013)

[11] Forfar Road S-Paramics Model (SIAS Ref. TPDCCFAA/77000 March 2015)

[12] Emission Factor Toolkit, Version 6.0.2, November 2014 – Available athttp://laqm.defra.gov.uk/review-and-assessment/tools/emissions.html#eft

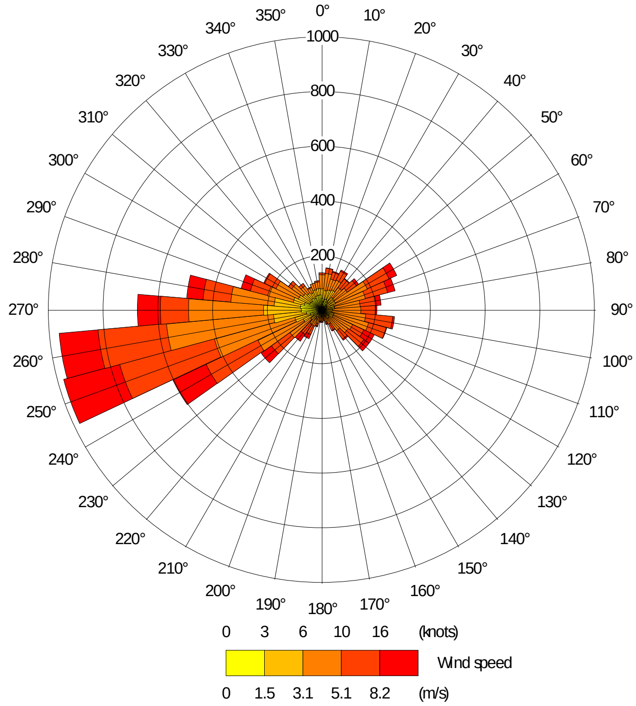
in the modelling work, however, this was accounted for by removing trips from the study that would otherwise use the bypass; and

- Scenario 2 (SC2) – Forfar Road Signal Timing Optimisation, modelled the optimisation of northbound trips on Forfar Road through two main junctions in the network: the A929 Forfar Road/Clepington Road junction and the A929 Forfar Road/A90 Kingsway East/A90 Forfar Road Junction.

4.3 Meteorological Data

2012 meteorological data from Leuchars weather station, located approximately 13km to the south, has been used in this assessment. A wind rose for this site for the year 2012 is shown in Figure 4.

Figure 4 – Leuchars 2012 Meteorological Data

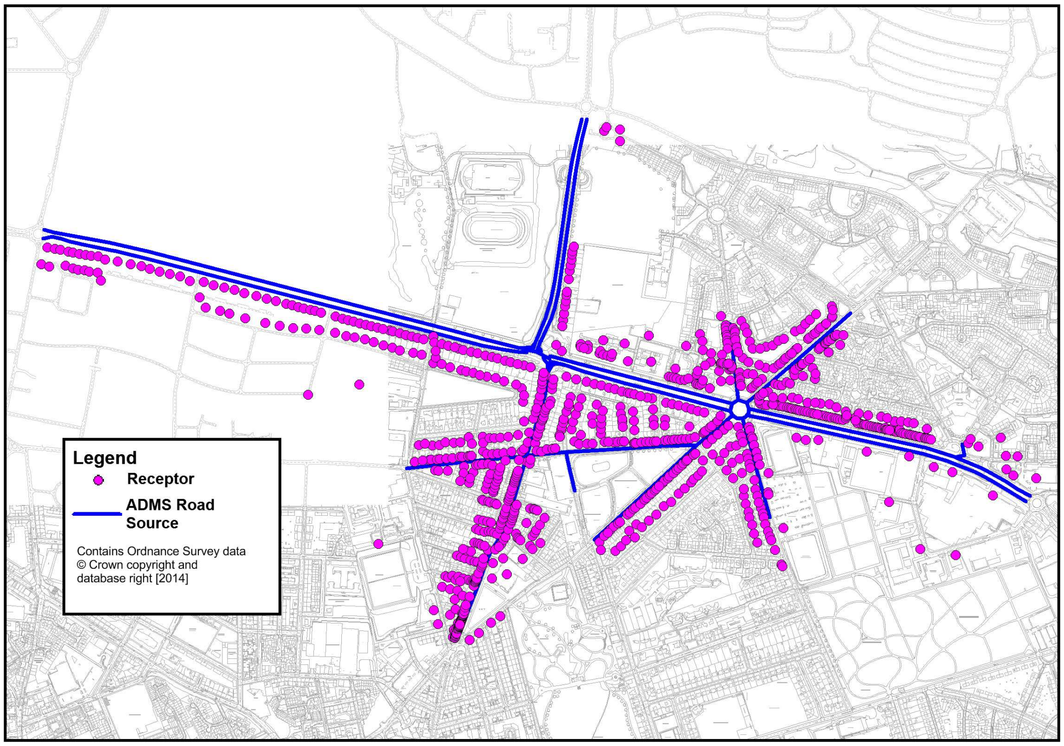


Most dispersion models do not use meteorological data if they relate to calm winds conditions, as dispersion of air pollutants is more difficult to calculate in these circumstances. ADMS-Roads treats calm wind conditions by setting the minimum wind speed to 0.75m/s. It is recommended in LAQM.TG(09)[5] that the meteorological data file be tested within a dispersion model and the relevant output log file checked, to confirm the number of missing hours and calm hours that cannot be used by the dispersion model. This is important when considering predictions of high percentiles and the number of exceedences. LAQM.TG(09)[5] recommends that meteorological data should only be used if the percentage of usable hours is greater than 75%, and preferably 90%. 2012 meteorological data from Leuchars includes 8,783 lines of usable hourly data out of the total 8,784 for the year, i.e. 99.9% usable data. This is therefore suitable for the dispersion modelling exercise.

4.4 Sensitive Receptors

A total of 902 ground level receptor locations are considered in the assessment of emissions from road traffic and their location is illustrated in Figure 5.

Figure 5 – Receptor Locations considered in the Assessment



Ground level receptors have been assumed to be a height of 1.5m, representative of the average inhalation height of an individual. In areas of elevated concentrations or areas of interest to the Council, receptors have additionally been considered at heights representative of 1st floor level (4.5m) and 2nd floor level (7.5m). Table 8 shows the number of receptors at each of the different heights, a complete list of receptor locations and associated heights can be found in Appendix 3

Table 8 – Number of Modelled Receptors

Scenario	Number of Receptors	Ground (1.5m)	1st Floor (4.5m)	2nd Floor (7.5m)
All Scenarios	All Receptors	902	42	1

4.5 Model Outputs

The monitored background NO_2 concentration has been used in conjunction with the contribution from road traffic calculated in the ADMS-Roads model to calculate predicted total annual mean concentrations of NO_x and NO_2.

For the prediction of annual mean NO_2 concentrations for the modelled scenarios, the output of the ADMS-Roads model for NO_x has been converted to NO_2 following the methodology in LAQM.TG(09)[5] and using the NO_x to NO_2 conversion tool developed on behalf of Defra. This tool also utilises the total background NO_x and NO_2 concentrations. This assessment has utilised version 4.1 (June 2014) of the NO_x to NO_2 conversion tool. The road contribution is then added to the appropriate NO_2 background concentration value to obtain an overall total NO_2 concentration.

Verification of the ADMS assessment has been undertaken using those local authority monitoring locations that are located adjacent to the affected road network.

All NO_2 results presented in the assessment are those calculated following the process of model verification, using a factor of 2.592.

All PM_{10} results presented in the assessment are those calculated following the process of model verification, using a factor of 9.731 applied to the PM_{10} exhaust emissions.

Full details of the model verification can be found in Significance Criteria

4.6 Significance Criteria

Although no formal procedure exists for classifying the magnitude and significance of air quality effects from SC1 and SC2, guidance issued by Environmental Protection UK (EPUK)[13] has been used to address the issue.

The EPUK guidance has been superseded by the Land-Use Planning & Development Control: Planning for Air Quality (May 2015)[14] produced jointly by EPUK and the Institute of Air Quality Management (IAQM). The 2015 EPUK/IAQM guidance is not, however, as prescriptive for assessing beneficial impacts and so cannot be applied as readily for assessing the impacts associated with the intervention scenarios, hence the previous EPUK[13] guidance has been applied in this assessment.

In the EPUK guidance, the magnitude of impact due to an increase/decrease in annual mean NO_2, PM_{10} and other pollutants is described using the criteria in Table 9. These criteria are based on the change in concentration brought about by the interventions as a percentage of the assessment level, or the equivalent mass basis.

Table 9 – Definition of Impact Magnitude for Changes in Pollutant Concentrations

Magnitude of Change	Annual Mean NO_2 and PM_{10} Concentrations	Change in Number of Days with PM_{10} Concentration greater than 50 µg/m^3	Other Pollutants[1]
Large	Increase/decrease > 4 µg/m^3	Increase/decrease > 4 days	Increase/decrease > 10%
Medium	Increase/decrease 2 - 4 µg/m^3	Increase/decrease 2-4 days	Increase/decrease 5-10%
Small	Increase/decrease 0.4 - 2 µg/m^3	Increase/decrease 1-2 days	Increase/decrease 1-5%
Imperceptible	Increase/decrease < 0.4 µg/m^3	Increase/decrease <1 days	Increase/decrease <1%
[1] For other pollutants, increase/decrease is a % relative to the relevant annual mean AQOs.			

When describing the impact at a specific receptor (either adverse or beneficial), the actual concentration at that receptor should be taken into account, in combination with the magnitude of change, using the approach detailed in Table 10. The shaded cells in Table 10 show those changes which may be considered as significant, whereas the changes in the non-shaded cells can be considered as not significant.

[13] Environmental Protection UK (EPUK) (2010). Development Control: Planning for Air Quality (2010 Update).

[14] Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) Land-Use Planning & Development Control: Planning For Air Quality (May 2015).

Table 10 – Air Quality Impact Descriptors

Annual Mean NO_2 and PM_{10}	Change in Number of Days with PM_{10} Concentration greater than 50 µg/m^3	Other Pollutants	Change in Concentration[1]		
			Small	Medium	Large
Increase with Scheme					
Above Objective/Limit Value *With* Scheme (>40 µg/m^3 for NO_2) (>18 µg/m^3 for PM_{10})	Above objective *With* Scheme (>7 days)	>100% objective/limit value *With* Scheme	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value *With* Scheme (36-40 µg/m^3 for NO_2) (16.2-18 µg/m^3 for PM_{10})	Just below objective *With* Scheme (6-7 days)	90-100% objective/limit value *With* Scheme	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value *With* Scheme (30-36 µg/m^3 for NO_2) (13.5-16.2 µg/m^3 for PM_{10})	Below objective *With* Scheme (5-6 days)	75-90% objective/limit value *With* Scheme	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value *With* Scheme (<30 µg/m^3 for NO_2) (<13.5 µg/m^3 for PM_{10})	Well below objective *With* Scheme <5 days)	<75% objective/limit value *With* Scheme	Negligible	Negligible	Slight Adverse
Decrease with Scheme					
Above Objective/Limit Value *Without* Scheme (>40 µg/m^3 for NO_2) (>18 µg/m^3 for PM_{10})	Above objective *Without* Scheme (> 7 days)	>100% objective/limit value *Without* Scheme	Slight Beneficial	Moderate Beneficial	Substantia l Beneficial
Just Below Objective/Limit Value *Without* Scheme (36-40 µg/m^3 for NO_2) (16.2-18 µg/m^3 for PM_{10})	Just below objective *Without* Scheme (6-7 days)	90-100% objective/limit value *Without* Scheme	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value *Without* Scheme (30-36 µg/m^3 for NO_2) (13.5-16.2 µg/m^3 for PM_{10})	Below objective *Without* Scheme (5-6 days)	75-90% objective/limit value *Without* Scheme	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value *Without* Scheme (<30 µg/m^3 for NO_2) (<13.5 µg/m^3 for PM_{10})	Well below objective *Without* Scheme <5 days)	<75% objective/limit value *Without* Scheme	Negligible	Negligible	Slight Beneficial

[1] An imperceptible change would be described as 'negligible'.

For short-term pollutant emissions, the magnitude of change is determined based upon the number of predicted exceedences of the short-term AQO limit. This makes the EPUK guidance less pragmatic to apply, since it requires data on the existing number of exceedences which is generally not known for most pollutants. The guidance has therefore been applied to annual mean NO_2 concentrations only.

The significance of the impact of SC1 and SC2 will be determined by applying the magnitude of change to the relevant impact descriptor for the receptors of concern.

4.7 Comparison with AQOs

Annual mean NO_2 and PM_{10} concentrations have been predicted based on dispersion modelling, and compared to their respective long-term AQOs. However, short-term concentrations (1-hour mean for NO_2 and 24-hour mean for PM_{10}) have also been considered in the assessment, as follows:

- For NO_2, the 1-hour mean AQO is 200µg/m^3 with 18 allowed exceedences per year. Analysis of UK continuous NO_2 monitoring data has shown that it is unlikely that the 1-

hour mean objective would be exceeded where the annual mean objective is below 60µg/m^3 [15]. Therefore, potential exceedences of the 1-hour mean objective have been identified based on this criterion.

- For PM_{10}, the 24-hour mean AQO is 50µg/m^3, not to be exceeded more than 7 times per year (Scotland only). The number of 24-hour mean exceeding 50µg/m^3 can be estimated using the relationship detailed in LAQM.TG(09)[5]. This relationship indicates that where the annual mean is above 22.5µg/m^3, more than 7 24-hour mean exceedences of 50µg/m^3 may be expected in a calendar year (i.e. the likelihood of an exceedence of the 24-hour mean objective for PM_{10} would be high).

[15]AEAT (May 2008) - Analysis of the relationship between annual mean nitrogen dioxide concentration and exceedences of the 1-hour mean AQS Objective. A report produced for Defra, the Scottish Government, the Welsh Assembly Government and the Department of the Environment in Northern Ireland.

5 Assessment Results

5.1 Nitrogen Dioxide (NO_2)

Annual mean NO_2 concentrations were predicted at 945 specific receptors across the modelled area representing relevant public exposure, located at the façade of properties. Concentrations have been predicted for the three scenarios as detailed in section 4.2. Table 11 shows the number of receptors predicted to exceed the 40µg/m^3 AQO for NO_2 at each of the assumed floor levels. Of the 902 receptors at ground floor level (1.5m) a maximum of 22 are predicted to exceed in any of the three scenarios. At 1st floor level (4.5m) a maximum of 3 receptors are predicted to exceed the 40µg/m^3 AQO in any of the three scenarios. There were no exceedences predicted at 2nd (7.5m) floor level in any of the three scenarios.

Table 11 – Predicted Number of Exceedences of NO_2 40µg/m^3 AQO at Different Floor Levels

Scenario	Number of Receptors	Ground (1.5m)	1st Floor (4.5m)	2nd Floor (7.5m)
BC	**Number of Exceeding Receptors**	22	3	0
SC1		12	1	0
SC2		17	3	0
All Scenarios	***All Receptors***	*902*	*42*	*1*

At ground floor level (1.5m) the exceedences of the annual mean NO_2 AQO were predicted at the junctions between Forfar Road and Kingsway, the roundabout between Kingsway and Pitkerro Road and between Forfar Road and Clepington Road. Thematic maps showing annual mean NO_2 concentrations at ground floor level for the BC, SC1 and SC2 scenarios are shown in Appendix 4 Figures A3, A4 and A5 respectively.

Figures A6 and A7 show thematic maps for SC1 and SC2 respectively, highlighting where exceedences of the annual mean NO_2 AQO previously identified at ground floor level for the BC scenario remain or have been removed, or indeed new exceedences have been introduced, by the intervention scenario.

At first floor level (4.5m) the exceedences of the annual mean NO_2 AQO were predicted at the junction between Forfar Road and Kingsway only. Thematic maps showing annual mean NO_2 concentrations at first floor level for the BC, SC1 and SC2 scenarios are shown in Appendix 4 Figures A8, A9 and A10 respectively.

Figures A11 and A12 show thematic maps for SC1 and SC2 respectively, highlighting where exceedences of the annual mean NO_2 AQO previously identified at first floor level for the BC scenario remain or have been removed, or indeed new exceedences have been introduced, by the intervention scenario.

Table 12 provides a summary of the predicted NO_2 concentrations for the three scenarios in comparison to the annual mean NO_2 AQO and the predicted impact according to the EPUK guidance.

Table 12 – NO_2 Results Summary

Descriptor		BC	SC1	SC2
Brief Statistics (µg/m^3)	Min	16.8	16.7	16.8
	Max	50.1	50.0	50.0
	Average	24.9	23.8	24.9
Number of Receptors with NO_2 concentration relative to 100%, 90% and 75% of the 40µg/m^3 AQO.	<30µg/m^3	786	823	786
	30-36µg/m^3	99	90	99
	36-40µg/m^3	35	19	40
	>=40µg/m^3	25	13	20
Percentage of Receptors with NO_2 concentration relative to 100%, 90% and 75% of the 40µg/m^3 AQO.	<30µg/m^3	83.2%	87.1%	83.2%
	30-36µg/m^3	10.5%	9.5%	10.5%
	36-40µg/m^3	3.7%	2.0%	4.2%
	>=40µg/m^3	2.6%	1.4%	2.1%
EPUK Impact Descriptor	Substantial Beneficial	Not Applicable	14	0
	Moderate Beneficial		16	0
	Slight Beneficial		52	18
	Negligible		863	921
	Slight Adverse		0	6
	Moderate Adverse		0	0
	Substantial Adverse		0	0

SC1 is predicted to result in a decreased number of exceedences of the NO_2 annual mean objective with 25 predicted exceedences in BC reducing to 13 predicted exceedences in SC1. According to EPUK guidance, implementation of SC1 would result in a negligible impact at 863 receptors, a slight beneficial impact at 52 receptors, a moderate beneficial impact at 16 receptors and a substantial beneficial impact at 14 receptors, in relation to the annual mean AQO for NO_2. Adverse impacts were not predicted at any receptors as a result of SC1 in relation to the annual mean AQO for NO_2.

SC2 is predicted to result in a decreased number of exceedences of the NO_2 annual mean objective with 25 predicted exceedences in BC reducing to 20 predicted exceedences in SC2. According to EPUK guidance, implementation of SC2 would result in a negligible impact at 921 receptors and a slight beneficial impact at 18 receptors, in relation to the annual mean AQO for NO_2. Slight adverse impacts were predicted at 6 receptors as a result of SC2 in relation to the annual mean AQO for NO_2.

Analysis of UK continuous NO_2 monitoring data has shown that it is unlikely that the hourly mean NO_2 AQO, of 18 hourly means over 200µg/m^3, would be exceeded where the annual mean objective is below 60µg/m^3 [16]. Across the whole modelled area, the maximum predicted annual mean for NO_2 at a receptor for any of the three scenarios is 50.1µg/m^3. Therefore, the NO_2 hourly mean AQO is expected to be met at all modelled receptors.

Full results for all modelled receptors can be found in the MS Excel file, which accompanies this report (Forfar Results_submitted_V3.xlsx).

[16] Analysis of the relationship between annual mean nitrogen dioxide concentration and exceedences of the 1-hour mean AQS Objective – AEA - 2008

5.2 Particulate Matter (PM_{10})

Annual mean PM_{10} concentrations were predicted at 945 specific receptors across the modelled area representing relevant public exposure, located at the façade of properties. Concentrations have been predicted for the three scenarios as detailed in section 4.2. Table 13 shows the number of receptors predicted to exceed the 18µg/m^3 AQO at each of the assumed floor levels. Of the 902 receptors at ground floor level (1.5m) a maximum of 10 are predicted to exceed in any of the three scenarios. There were no exceedences predicted at 1st (4.5m) and 2nd (7.5m) floor level in any of the three scenarios.

Table 13 – Predicted Number of Exceedences of PM_{10} 18µg/m^3 AQO at Different Floor Levels

Scenario	Number of Receptors	Ground (1.5m)	1st Floor (4.5m)	2nd Floor (7.5m)
BC	**Number of Exceeding Receptors**	10	0	0
SC1		8	0	0
SC2		10	0	0
All Scenarios	***All Receptors***	*902*	*42*	*1*

At ground floor level (1.5m), exceedences of the annual mean PM_{10} AQO were predicted at the junctions between Forfar Road and Kingsway, the roundabout between Kingsway and Pitkerro Road and between Forfar Road and Clepington Road. Thematic maps showing annual mean PM_{10} concentrations at ground floor level for the BC, SC1 and SC2 scenarios are shown in Appendix 4 Figures A13, A14 and A15 respectively.

Figures A16 and A17 show thematic maps for SC1 and SC2 respectively, highlighting where exceedences of the annual mean PM_{10} AQO previously identified at ground floor level for the BC scenario remain or have been removed, or indeed new exceedences have been introduced, by the intervention scenario.

Table 14 provides a summary of the predicted PM_{10} concentrations for the three scenarios in comparison to the annual mean PM_{10} AQO and the predicted impact according to the EPUK guidance.

Table 14 – PM_{10} Results Summary

Descriptor		BC	SC1	SC2
Brief Statistics (µg/m^3)	Min	11.7	11.6	11.7
	Max	20.2	20.2	20.2
	Average	13.5	13.3	13.5
Number of Receptors with PM_{10} concentration relative to 100%, 90% and 75% of the 18µg/m^3 AQO.	<13.5µg/m^3	575	610	570
	13.5-16.2µg/m^3	330	306	339
	16.2-18µg/m^3	30	21	26
	>=18µg/m^3	10	8	10
Percentage of Receptors with PM_{10} concentration relative to 100%, 90% and 75% of the 18µg/m^3 AQO.	<13.5µg/m^3	60.8%	64.6%	60.3%
	13.5-16.2µg/m^3	34.9%	32.4%	35.9%
	16.2-18µg/m^3	3.2%	2.2%	2.8%
	>=18µg/m^3	1.1%	0.8%	1.1%
EPUK Impact Descriptor	Substantial Beneficial	Not Applicable	0	0
	Moderate Beneficial		10	0
	Slight Beneficial		40	5
	Negligible		895	940
	Slight Adverse		0	0
	Moderate Adverse		0	0
	Substantial Adverse		0	0

Annual mean PM_{10} concentrations were predicted at 945 specific receptors across the modelled area representing relevant public exposure, located at the façade of properties. Concentrations have been predicted for three scenarios as detailed in section 4.2. The results have been summarised in Table 14.

SC1 is predicted to result in a decreased number of exceedences of the PM_{10} annual mean objective with 10 predicted exceedences in BC reducing to 8 predicted exceedences in SC1. According to EPUK guidance, implementation of SC1 would result in a negligible impact at 895 receptors, a slight beneficial impact at 40 receptors and a moderate beneficial impact at 10 receptors. Adverse PM_{10} impacts were not predicted at any receptors as a result of SC1.

SC2 is predicted to result in the same number of exceedences of the PM_{10} annual mean objective as BC, with 10 predicted exceedences in both scenarios. According to EPUK guidance, implementation of SC2 would result in negligible impacts at 940 receptors and slight beneficial impacts at 5 receptors. Adverse PM_{10} impacts were not predicted at any receptors as a result of SC2.

Analysis of UK continuous PM_{10} monitoring data has shown that it is unlikely that the 24-hour mean PM_{10} AQO of seven 24-hour means over 50µg/m^3, would be exceeded where the annual mean objective is below 22.5µg/m^3. Across the whole modelled area, the maximum predicted annual mean PM_{10} concentration at a receptor in any of the three scenarios is 20.2µg/m^3. Therefore, the 24-hour mean AQO is expected to be met at all modelled receptors.

Full results for all modelled receptors can be found in the MS Excel file, which accompanies this report (Forfar Results_submitted_V3.xlsx).

5.3 Source Apportionment

A source apportionment study was carried out for the BC scenario of the Forfar modelled area. The source apportionment was carried out for the following vehicle classes:

- Cars;
- Light-Goods Vehicles (LGVs);
- Heavy-Goods Vehicles (HGVs); and
- Buses.

NO_x

Table 15 and Figure 6 present source apportionment results for BC NOx concentrations for three different selections of the modelled receptors:

- **Average across all modelled receptors**. This provides useful information when considering possible AQAP measure to test and adopt. It will however understate road NOx concentrations in problem areas;
- **Average across all receptors with NO_2 Concentration greater than 40µg/m^3**. This provides an indication of source apportionment in areas known to be a problem (i.e. only where the AQS objective is exceeded). As such, this information should be considered with more scrutiny when testing and adopting AQAP measures; and
- **At the Receptor with maximum road NOx Concentration**. This is likely to be in the area of most concern and so a good place to test and adopt AQAP measures. Any gains predicted by AQAP measures are however likely to be greatest at this location and so would not represent gains across the whole modelled area.

When considering the average NOx concentration across all modelled receptors, road traffic accounts for 19.4µg/m^3 (41.4%) of total NO_x (42.3µg/m^3). Of this total average NO_x, HGVs account for the most (16.6%) of any of the vehicle types on average, followed by Cars (14.8%). LGVs and buses account on average for 6.2% and 3.9% respectively of the overall predicted average NO_x concentration.

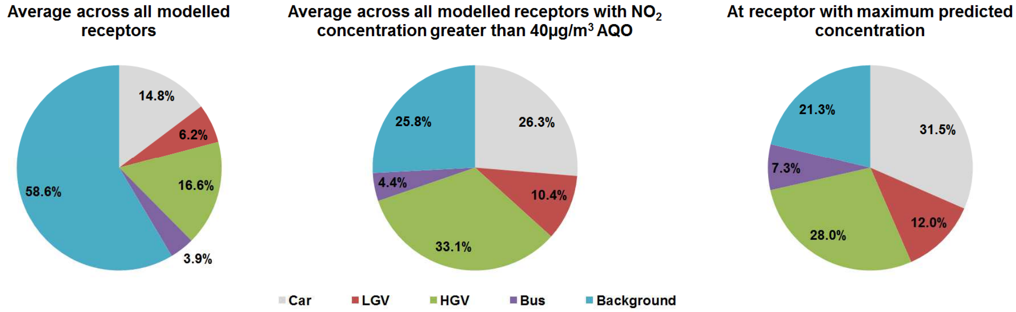
Table 15 – NO_x Source Apportionment for BC

Results	All Vehicles	Car	LGV	HGV	Bus	Background
Average across all modelled receptors						
NO_x Concentration (µg/m^3)	19.4	6.9	2.9	7.9	1.7	22.9
Percentage	41.4%	14.8%	6.2%	16.6%	3.9%	58.6%
Percentage Road Contribution	100%	35.6%	14.8%	40.2%	9.4%	-
Average across all receptors with NO_2 Concentration greater than 40µg/m^3						
NO_x Concentration (µg/m^3)	66.7	23.6	9.3	29.7	4.0	22.9
Percentage	74.2%	26.3%	10.4%	33.1%	4.4%	25.8%
Percentage Road Contribution	100%	35.5%	14.0%	44.6%	5.9%	-
At Receptor with maximum road NO_x Concentration (Receptor 692_1.5 – Pitkerro Road)						
NO_x Concentration (µg/m^3)	84.9	34.0	12.9	30.2	7.8	22.9
Percentage	78.7%	31.5%	12.0%	28.0%	7.3%	21.3%
Percentage Road Contribution	100%	40.0%	15.2%	35.6%	9.2%	-

When considering the average NO_x concentration at receptors with an NO_2 concentration greater than 40µg/m^3, road traffic contribution is much higher, accounting for 66.7µg/m^3 (74.2%) of total NO_x (89.6µg/m^3). Of this 89.6µg/m^3, HGVs account for the most (33.1%) of any of the vehicle types, followed by Cars (26.3%) then LGVs and buses (10.4% and 4.4% respectively).

At the receptor with the maximum road NOx concentration (107.8µg/m^3, predicted at receptor 692_1.5 on Pitkerro Road near the junction with Kingsway), road traffic accounts for 78.7% of the overall NO_x. Of this 107.8µg/m^3, Cars account for the most (31.5%) of any of the vehicle types, followed by HGVs (28.0%) then LGVs and buses (12.0% and 7.3% respectively).

Figure 6 – Pie Charts showing NO_x Source Apportionment for BC



NO_2

Table 16 and Figure 7 present source apportionment results for BC NO_2 concentrations for three different selections of the modelled receptors, using the same approach as was undertaken for $NO_{x,}$ as follows:

- **Average across all modelled receptors**.
- **Average across all receptors with NO_2 Concentration greater than 40µg/m^3**.
- **At the Receptor with maximum road NO_2 Concentration**.

When considering the average NO_2 concentration across all modelled receptors, road traffic accounts for 9.2µg/m^3 (34.2%) of total NO_2 (24.8µg/m^3). Of this total average NO_2, HGVs account for the most (13.8%) of any of the vehicle types on average, followed by Cars (12.2%). LGVs and buses account on average for 5.1% and 3.2% respectively of the overall predicted average NO_2 concentration.

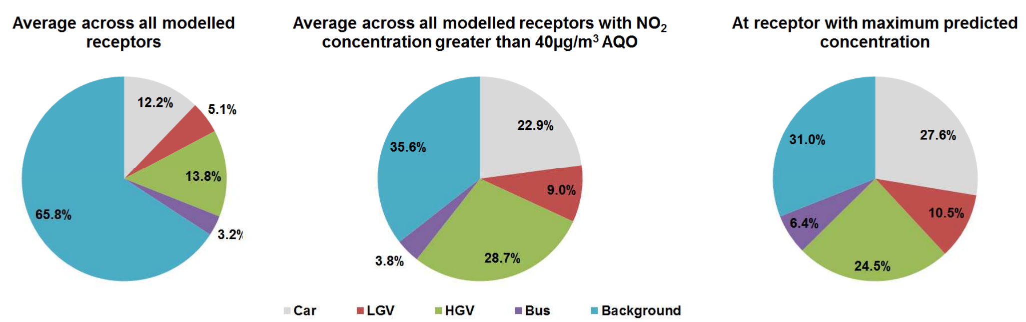
When considering the average NO_2 concentration at receptors with an NO_2 concentration greater than 40µg/m^3, road traffic contribution is much higher, accounting for 28.5µg/m^3 (64.4%) of total NO_2 (44.1µg/m^3). Of this 44.1µg/m^3, HGVs account for the most (28.7%) of any of the vehicle types, followed by Cars (22.9%) then LGVs and buses (9.0% and 3.8% respectively).

At the receptor with the maximum road NO_2 concentration (50.3µg/m^3, predicted at receptor 692_1.5 on Pitkerro Road near the junction with Kingsway), road traffic accounts for 69.0% of the overall NO_2. Of this 50.3µg/m^3, Cars account for the most (27.6%) of any of the vehicle types, followed by HGVs (24.5%) then LGVs and buses (10.5% and 6.4% respectively).

Table 16 – NO_2 Source Apportionment for BC

Results	All Vehicles	Car	LGV	HGV	Bus	Background
Average across all modelled receptors						
NO_2 Concentration ($\mu g/m^3$)	9.2	3.3	1.4	3.7	0.9	15.6
Percentage	34.2%	12.2%	5.1%	13.8%	3.2%	65.8%
Percentage Road Contribution	100%	35.6%	14.8%	40.2%	9.3%	-
Average across all receptors with NO_2 Concentration greater than 40µg/m^3						
NO_2 Concentration ($\mu g/m^3$)	28.5	10.1	4.0	12.7	1.7	15.6
Percentage	64.4%	22.9%	9.0%	28.7%	3.8%	35.6%
Percentage Road Contribution	100%	35.5%	14.0%	44.6%	6.0%	-
At Receptor with maximum road NO_2 Concentration (Receptor 692_1.5 – Pitkerro Road)						
NO_2 Concentration ($\mu g/m^3$)	34.7	13.9	5.3	12.3	3.2	15.6
Percentage	69.0%	27.6%	10.5%	24.5%	6.4%	31.0%
Percentage Road Contribution	100%	40.0%	15.2%	35.6%	9.2%	-

Figure 7 – Pie Charts showing NO_2 Source Apportionment for BC



PM_{10}

Table 17 and Figure 8 present source apportionment results for BC PM_{10} concentrations for three different selections of the modelled receptors, using the same approach as was undertaken for NO_x and NO_2, as follows:

- **Average across all modelled receptors**.
- **Average across all receptors with PM_{10} Concentration greater than 18µg/m^3**.
- **At the Receptor with maximum road PM_{10} Concentration**.

When considering the average PM_{10} concentration across all modelled receptors, road traffic accounts for 2.1µg/m^3 (15.4%) of total PM_{10} (13.5µg/m^3). Of this total average PM_{10}, Cars account for the most (8.6%) of any of the vehicle types on average, followed by HGVs and LGVs (both 3.1%). Buses account on average for 0.6% of the overall predicted average PM_{10} concentration.

When considering the average PM_{10} concentration at receptors with a PM_{10} concentration greater than 18µg/m^3, road traffic contribution is much higher, accounting for 7.4µg/m^3 (39.4%) of total

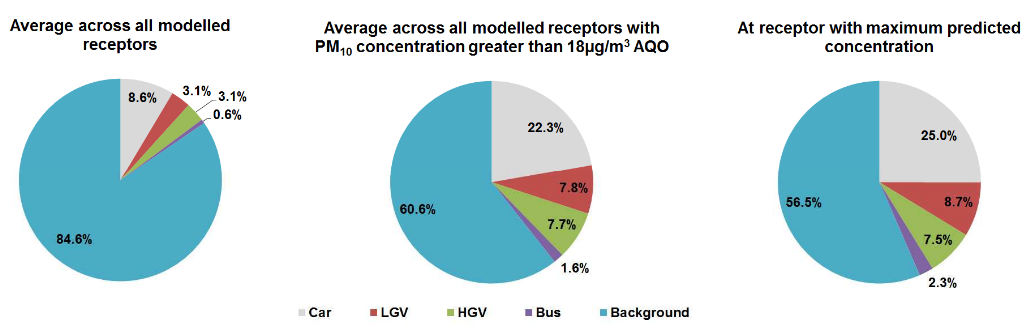
PM_{10} (18.8µg/m^3). Of this 18.8µg/m^3, Cars account for the most (22.3%) of any of the vehicle types, followed by LGVs (7.8%) then HGVs and buses (7.7% and 1.6% respectively).

Table 17 – PM_{10} Source Apportionment for BC

Results	All Vehicles	Car	LGV	HGV	Bus	Background
Average across all modelled receptors						
PM_{10} Concentration (µg/m^3)	2.1	1.2	0.4	0.4	0.1	11.4
Percentage	15.4%	8.6%	3.1%	3.1%	0.6%	84.6%
Percentage Road Contribution	100%	55.6%	20.3%	20.0%	4.1%	-
Average across all receptors with PM_{10} Concentration greater than 18µg/m^3						
PM_{10} Concentration (µg/m^3)	7.4	4.2	1.5	1.5	0.3	11.4
Percentage	39.4%	22.3%	7.8%	7.7%	1.6%	60.6%
Percentage Road Contribution	100%	56.5%	19.8%	19.6%	4.1%	-
At Receptor with maximum road PM_{10} Concentration (Receptor 692_1.5 – Pitkerro Road)						
PM_{10} Concentration (µg/m^3)	8.8	5.1	1.8	1.5	0.5	11.4
Percentage	43.5%	25.0%	8.7%	7.5%	2.3%	56.5%
Percentage Road Contribution	100%	57.6%	20.0%	17.2%	5.2%	-

At the receptor with the maximum road PM_{10} concentration (20.2µg/m^3, predicted at receptor 692_1.5 on Pitkerro Road near the junction with Kingsway), road traffic accounts for 43.5% of the overall PM_{10}. Of this 20.2µg/m^3, Cars account for the most (25.0%) of any of the vehicle types, followed by LGVs (8.7%) then HGVs and buses (7.5% and 2.3% respectively).

Figure 8 – Pie Charts showing PM_{10} Source Apportionment for BC



5.4 Population Exposure

The predicted pollutant concentrations at receptors were used to determine the population exposure to potential exceedence of the annual mean NO_2 and PM_{10} AQS objectives, as presented in Table 18. The Office for National Statistics[17] provides an average number of 2.3 people per UK household based on the 2011 census.

Based on the number of properties located in areas where annual mean NO_2 concentrations are predicted to be 36µg/m^3 and above, and the average number of people per UK household, the

[17] http://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/populationandhouseholdestimatesfortheunitedkingdom/2011-03-21

number of people exposed to potential exceedences of the annual mean NO_2 in the area covered by the Forfar model is estimated to be 138.

Based on the number of properties located in areas where annual mean PM_{10} concentrations are predicted to be 16.2µg/m^3 and above, and the average number of people per UK household, the number of people predicted to be exposed to potential exceedences of the annual mean PM_{10} in the area covered by the Forfar model is estimated to be 92.

Table 18 – Estimated Population exposure to NO_2 and PM_{10} Exceedences

Pollutant	Number of receptors where pollutant concentration is predicted to be greater than 90% of annual mean AQS Objective	Estimated population exposed in the Modelled area
NO_2	60	138
PM_{10}	40	92

6 Conclusions

Bureau Veritas has been commissioned by Dundee City Council to undertake air quality dispersion modelling studies to predict annual mean concentrations of NO_2 and PM_{10} for the three areas of Dundee (Forfar, Lochee and Stannergate) identified by the Council. This report and associated results files focus on the Forfar area of Dundee. Separate reports have been produced for the Lochee and Stannergate areas.

In line with those detailed in Forfar Road S-Paramics Model[11], the following scenarios have been assessed:

- 2012 Base (BC);
- Scenario 1 (SC1) – A90 Bypass; and
- Scenario 2 (SC2) – Forfar Road Signal Timing Optimisation.

Annual mean concentrations of NO_2 and PM_{10} were predicted at 1,065 specific receptors across the modelled area representing relevant public exposure, located at the façade of properties. Of these 1,065 receptors, 902 were at ground floor level (1.5m height), 82 were at 1st floor level (4.5m height), 41 were at 2nd floor level (7.5m height) and 40 were at 3rd floor level (10.5m).

6.1 Nitrogen Dioxide (NO_2)

Of the 902 receptors at ground floor level (1.5m), a maximum of 22 were predicted to exceed the 40µg/m^3 AQO for NO_2 in any of the three scenarios. At 1st floor level (4.5m) a maximum of 3 receptors were predicted to exceed the 40µg/m^3 AQO in any of the three scenarios. There were no exceedences predicted at 2nd (7.5m) or 3rd (10.5m) floor level in any of the three scenarios.

The NO_2 hourly mean AQO was expected to be met at all modelled receptors in all three scenarios.

According to EPUK guidance, in relation to the annual mean AQO for NO_2, implementation of SC1 would result in a negligible impact at 983 receptors, a slight beneficial impact at 52 receptors, a moderate beneficial impact at 16 receptors and a substantial beneficial impact at 14 receptors. An adverse impact was not predicted at any receptors as a result of SC1 in relation to the annual mean AQO for NO_2.

According to EPUK guidance, in relation to the annual mean AQO for NO_2, implementation of SC2 would result in a negligible impact at 1,041 receptors and a slight beneficial impact at 18 receptors. Slight adverse impacts were predicted at 6 receptors as a result of SC2 in relation to the annual mean AQO for NO_2.

6.2 Particulate Matter (PM_{10})

Of the 902 receptors at ground floor level (1.5m), a maximum of 10 were predicted to exceed the 18µg/m^3 annual mean AQO for PM_{10} in any of the three scenarios. There were no exceedences predicted at 1st (4.5m), 2nd (7.5m) or 3rd (10.5m) floor level in any of the three scenarios.

The PM_{10} 24-hour mean AQO was expected to be met at all modelled receptors in all three scenarios.

According to EPUK guidance, in relation to the annual mean AQO for PM_{10}, implementation of SC1 would result in a negligible impact at 1,015 receptors, a slight beneficial impact at 40 receptors and a moderate beneficial impact at 10 receptors. An adverse impact was not predicted at any receptors as a result of SC1 in relation to the annual mean AQO for PM_{10}.

According to EPUK guidance, in relation to the annual mean AQO for PM_{10}, implementation of SC2 would result in a negligible impact at 1,060 receptors and a slight beneficial impact at 5 receptors. An adverse impact was not predicted at any receptors as a result of SC2 in relation to the annual mean AQO for PM_{10}.

Full results for all modelled receptors can be found in the MS Excel file, which accompanies this report (Forfar Results_submitted_V3.xlsx).

6.3 Source Apportionment

A source apportionment study was carried out for the BC scenario of the Forfar modelled area for NO_x, NO_2 and PM_{10}.

Of the four modelled vehicle types (Cars, LGVs, HGVs and Buses), HGVs were found to cause portion of road NO_x when averaged across all modelled receptors (40.2% road NO_x), and when averaged across receptors with NO_2 concentration greater than 40µg/m^3 (44.6% road NO_x). At the receptor with the maximum road NO_x concentration the vehicle type with the highest proportion of road NO_x is Car, with 40.0% of the road NO_x contribution. Background NO_x accounted for 58.6% of the total NO_x concentration when averaged across all receptors.

Of the four modelled vehicle types (Cars, LGVs, HGVs and Buses), HGVs were found to cause the largest portion of road NO_2 when averaged across all modelled receptors (40.2% road NO_2), and when averaged across receptors with NO_2 concentration greater than 40µg/m^3 (44.6% road NO_2). At the receptor with the maximum road NO_2 concentration the vehicle type with the highest proportion of road NO_2 is Car, with 40.0% of the road NO_2 contribution. Background NO_2 accounted for 65.8% of the total NO_2 concentration when averaged across all receptors.

Of the four modelled vehicle types (Cars, LGVs, HGVs and Buses), Cars were found to cause the largest portion of road PM_{10} when averaged across all modelled receptors (55.6% road PM_{10}), and when averaged across receptors with PM_{10} concentration greater than 18µg/m^3 (56.5% road PM_{10}). At the receptor with the maximum road PM_{10} concentration the vehicle type with the highest proportion of road NO_2 is Car, with 57.6% of the road PM_{10} contribution. Background PM_{10} accounted for 84.6% of the total PM_{10} concentration when averaged across all receptors.

6.4 Population exposure

The number of people predicted to be exposed to potential exceedences of the annual mean NO_2 in the area covered by the Forfar model is estimated to be 138.

The number of people predicted to be exposed to potential exceedences of the annual mean PM_{10} in the area covered by the Forfar model is estimated to be 92.

Appendices

Appendix 1 – Background to Air Quality

Emissions from road traffic contribute significantly to ambient pollutant concentrations in urban areas. The main constituents of vehicle exhaust emissions, produced by fuel combustion are carbon dioxide (CO_2) and water vapour (H_2O). However, combustion engines are not 100% efficient and partial combustion of fuel results in emissions of a number of other pollutants, including carbon monoxide (CO), particulate matter (PM), Volatile Organic Compounds (VOCs) and hydrocarbons (HC). For HC, the pollutants of most concern are 1,3 - butadiene (C_4H_6) and benzene (C_6H_6). In addition, some of the nitrogen (N) in the air is oxidised under the high temperature and pressure during combustion; resulting in emissions of oxides of nitrogen (NO_x). NO_x emissions from vehicles predominately consist of nitrogen oxide (NO), but also contain nitrogen dioxide (NO_2). Once emitted, NO can be oxidised in the atmosphere to produce further NO_2.

The quantities of each pollutant emitted depend upon a number of parameters; including the type and quantity of fuel used, the engine size, the vehicle speed, and the type of emissions abatement equipment fitted. Once emitted, these pollutants disperse in the air. Where there is no additional source of emission, pollutant concentrations generally decrease with distance from roads, until concentrations reach those of the background.

This air quality assessment focuses on NO_2 and PM_{10} (PM of aerodynamic diameter less than 10µm) as these pollutants are least likely to meet their respective Air Quality Strategy (AQS) objectives near roads. This has been confirmed over recent years by the outcome of the Local Air Quality Management (LAQM) regime. Recent statistics[18] regarding Air Quality Management Areas (AQMAs) show that, 601 AQMAs were declared in the UK, of which 562 include NO_2 and 99 include PM_{10} (a number of AQMAs have been declared for both pollutants). The majority (92%) of existing AQMAs have been declared in relation to road traffic emissions.

In line with these results, the reports produced by the Council under the LAQM regime have confirmed that road traffic within their administrative area is the main issue in relation to air quality.

An overview of these two pollutants, describing briefly the sources and processes influencing the ambient concentrations, is presented below.

Particulate Matter (PM_{10})

Particulate matter is a mixture of solid and liquid particles suspended in the air. There are a number of ways in which airborne PM may be categorised. The most widely used categorisation is based on the size of particles such as $PM_{2.5}$, particles of aerodynamic diameter less than 2.5µm (micrometre = 10^{-6} metre), and PM_{10}, particles of aerodynamic diameter less than 10µm. Generically, particulate residing in low altitude air is referred to as Total Suspended Particulate (TSP) and comprises coarse and fine material including dust.

Particulate matter comprises a wide range of materials arising from a variety of sources. Examples of anthropogenic sources are carbon (C) particles from incomplete combustion, bonfire ash, recondensed metallic vapours and secondary particles (or aerosols) formed by chemical reactions in the atmosphere. As well as being emitted directly from combustion sources, man-made particles can arise from mining, quarrying, demolition and construction operations, from brake and tyre wear in motor vehicles and from road dust resuspension from moving traffic or strong winds. Natural sources of PM include wind-blown sand and dust, forest fires, sea salt and biological particles such as pollen and fungal spores.

The health impacts from PM depend upon size and chemical composition of the particles. For the purposes of AQOs, PM_{10} or $PM_{2.5}$ is solely defined on size rather than chemical composition. This enables a uniform method of measurement and comparison. The short and long-term exposure to PM has been associated with increased risk of lung and heart diseases([see 2]). PM may also carry

[18] Statistics from the UK AQMA website available at http://aqma.defra.gov.uk – Figures as of January 2013

surface-absorbed carcinogenic compounds. Smaller PM have a greater likelihood of penetrating the respiratory tract and reaching the lung to blood interface and causing the above adverse health effects.

In the UK, emissions of PM_{10} have declined significantly since 1980, and were estimated to be 114kt (kilotonne) in 2010[19]. Residential / public electricity and heat production and road transport are the largest sources of PM_{10} emissions. The road transport sector contributed 22% (25kt) of PM_{10} emissions in 2010. The main source within road transport is brake and tyre wear.

It is important to note that these estimates only refer to primary emissions, that is, the emissions directly resulting from sources and processes and do not include secondary particles. These secondary particles, which result from the interaction of various gaseous components in the air such as ammonia (NH_3), sulphur dioxide (SO_2) and NO_x, can come from further a field and impact on the air quality in the UK and vice versa.

Similarly to PM_{10}, emissions of $PM_{2.5}$ have declined since 1970, and were estimated to be 67kt in 2010, which makes over 58% of PM_{10} emissions. In 2010, the road transport sector emitted 28% (18kt) of the total $PM_{2.5}$ emissions in the UK.

Nitrogen Oxides (NOx)

NO and NO_2, collectively known as NO_x, are produced during the high temperature combustion processes involving the oxidation of N. Initially, NO_x are mainly emitted as NO, which then undergoes further oxidation in the atmosphere, particularly with ozone (O_3), to produce secondary NO_2. Production of secondary NO_2 could also be favoured due to a class of compounds, VOCs, typically present in urban environments, and under certain meteorological conditions, such as hot sunny days and stagnant anti-cyclonic winter conditions.

Of NO_x, it is NO_2 that is associated with health impacts. Exposure to NO_2 can bring about reversible effects on lung function and airway responsiveness. It may also increase reactivity to natural allergens, and exposure to NO_2 puts children at increased risk of respiratory infection and may lead to poorer lung function in later life.

In the UK, emissions of NO_x have decreased by 62% between 1990 and 2010. For 2010, NO_x (as NO_2) emissions were estimated to be 1,106kt. The transport sector remained the largest source of NO_x emissions with road transport contribution 34% to NO_x emissions in 2010.

[19] National Atmospheric Emissions Inventory (NAEI) Summary Emission Estimate Datasets 2010. March 2012

Appendix 2 – Traffic Data

Base Case

Link	Traffic Count AADT	% Car	% LGV	% HGV	% Bus	Speed kph
0a_194	5926	78.6	13.8	6.3	1.3	32.4
0a_0b	21751	77.2	13.7	9.0	0.1	43.3
2_45	13672	78.7	14.0	7.3	0.1	57.9
3_0g	12503	77.7	13.8	4.8	3.7	10.2
7_142	14802	78.5	13.5	5.0	3.0	9.6
8_152	14213	71.5	12.5	16.0	0.0	81.6
9_154z	4695	77.7	13.8	4.8	3.7	18.6
9_153z	4740	77.2	13.8	9.0	0.0	6.6
9_152z	5137	77.4	13.5	5.7	3.3	28.7
9_151x	5842	77.2	14.2	4.9	3.7	22.7
11_12	20704	74.8	13.2	11.8	0.1	56.3
12_167z	20704	78.4	14.3	6.3	1.0	15.2
13_16	4694	82.3	16.2	1.5	0.0	44.5
13_154z	5050	80.4	14.6	4.0	1.0	36.0
15_151y	13587	81.2	14.1	3.9	0.8	20.3
16_58	222	77.1	13.6	8.9	0.4	25.7
16_13	5050	81.1	15.6	3.3	0.0	48.1
16_64	4476	71.5	12.5	16.0	0.0	61.8
19_94	4358	71.5	12.5	16.0	0.0	84.2
19_96	5136	77.2	13.7	9.0	0.1	26.4
19z_3	12503	81.5	14.9	3.6	0.0	50.2
0b_145	14214	81.5	14.9	3.6	0.0	50.0
0b_0c	7537	81.5	14.9	3.6	0.0	50.9
0c_0d	22340	81.7	14.8	3.5	0.0	14.5
0d_140	1017	81.0	15.1	3.6	0.2	44.6
0d_0e	22802	81.0	15.1	3.6	0.2	36.3
0e_170	7848	76.5	13.7	7.1	2.7	21.1
0e_0f	22338	72.4	12.9	14.7	0.0	29.5
0f_0g	8665	77.7	13.5	5.7	3.1	19.2
0f_40	13673	69.4	12.5	17.1	1.1	28.8
0g_30	21168	70.2	12.4	16.3	1.1	54.9
30_0a	21281	75.5	13.3	10.3	0.9	13.3
30_31	696	72.4	12.9	14.7	0.0	63.6
31_30	811	72.4	12.9	14.7	0.0	79.3
37z_11	20704	75.4	14.0	7.8	2.8	10.1
38z_105	21037	70.2	12.4	16.3	1.1	57.2
39z_37z	20704	69.4	12.5	17.1	1.1	53.0
40_2	13672	70.2	12.4	16.3	1.1	46.7
45_15	13672	70.2	12.4	16.3	1.1	58.9
48_173	4740	77.3	14.1	5.0	3.6	16.7
48_49	5139	77.2	14.2	4.9	3.7	38.7
49_48	4740	71.5	12.5	16.0	0.0	61.9
49_50	5139	72.4	12.9	14.7	0.0	64.6
50_49	4740	72.4	12.9	14.7	0.0	75.7
50_51	5139	78.5	13.5	5.0	3.0	39.1
51_50	4740	77.2	14.2	4.9	3.7	35.0
51_153z	5244	83.9	11.7	1.8	2.5	42.3
51z_151x	5761	81.5	15.9	2.6	0.0	49.6
51z_52	5842	81.5	15.9	2.6	0.0	30.5
52_51z	5761	78.7	14.0	7.3	0.1	30.1
52_149z	5842	76.4	13.6	9.9	0.1	54.3
53_149z	5761	76.4	13.6	10.0	0.0	45.5
57_68	5987	78.6	14.0	7.3	0.1	62.5
57_64	11688	76.4	13.6	10.0	0.0	50.0
57_65	21038	78.0	14.4	6.4	1.2	26.1
58_155z	12503	78.6	13.8	6.3	1.3	36.1

Link	Traffic Count AADT	% Car	% LGV	% HGV	% Bus	Speed kph
58_16	4967	78.6	13.8	6.3	1.3	37.6
58_64	13587	78.6	13.8	6.3	1.3	38.5
59_60	14526	78.6	14.0	7.3	0.1	38.9
60_69	14526	75.4	13.1	11.5	0.0	8.9
62_63	15002	78.5	13.5	5.1	3.0	30.6
63_71	15002	78.5	13.5	5.1	3.0	38.9
64_58	17252	80.4	14.6	4.0	1.0	42.3
64_57	18063	80.4	14.6	4.0	1.0	7.7
65_66	21038	78.1	14.5	4.8	2.7	43.7
66_38z	21038	78.6	13.8	6.3	1.3	37.2
67_100z	21036	77.2	14.2	4.9	3.7	23.3
68_62	15002	80.0	14.8	4.9	0.3	52.3
69_64	5564	81.6	15.9	2.6	0.0	44.5
69_57	8962	79.9	14.9	4.9	0.3	18.8
71_85	15001	77.3	14.1	5.0	3.6	16.1
72_75	15001	79.3	15.1	5.6	0.0	54.0
73_76	14526	77.8	13.8	4.8	3.7	32.5
74_73	14526	74.8	13.2	11.8	0.1	51.2
75_90	15001	70.6	12.6	0.6	16.3	26.1
76_59	14526	78.5	13.9	6.3	1.3	32.2
85_72	15001	77.2	13.7	9.0	0.1	42.5
91_74	14526	78.6	14.0	7.3	0.1	57.4
94_152z	4358	77.7	13.8	4.9	3.7	10.2
94_19	5136	78.3	13.4	5.2	3.1	9.5
96_19	4358	71.5	12.5	16.0	0.0	81.0
96_111	5136	77.7	13.8	4.9	3.7	18.0
99z_39z	20704	77.2	13.7	9.1	0.0	6.3
100z_101z	21036	77.3	13.4	5.8	3.5	28.1
101z_104	21036	77.4	14.1	4.9	3.6	22.6
105_107	21037	74.9	13.2	11.8	0.1	55.7
107_67	21036	78.4	14.2	6.3	1.1	15.1
111_96	4358	81.9	16.6	1.5	0.0	44.5
111_113	5136	80.3	14.7	3.9	1.0	35.6
112_148y	4358	81.1	14.1	4.0	0.9	20.1
113_111	4358	77.1	13.6	8.9	0.4	25.3
113_169	5136	80.6	15.9	3.5	0.0	48.1
115_173	2749	71.5	12.5	16.0	0.0	61.6
138_151z	1017	71.5	12.5	16.0	0.0	84.0
138_140	1479	77.2	13.7	9.0	0.1	25.2
140_138	1017	81.4	15.1	3.5	0.0	50.1
140_0d	1479	81.4	15.1	3.5	0.0	50.0
142_143	14802	81.4	15.1	3.5	0.0	50.7
143_0c	14802	81.6	15.0	3.4	0.0	14.3
144_8	14213	80.9	15.3	3.5	0.3	44.4
145_144	14214	80.9	15.3	3.5	0.3	36.1
146_151	14803	76.4	13.7	7.3	2.7	21.2
147_181z	14200	72.4	12.9	14.7	0.0	29.4
150_147	14200	77.6	13.4	5.8	3.2	19.1
151_7	14803	69.4	12.5	16.9	1.1	27.9
152_161	14200	70.1	12.4	16.4	1.1	55.0
161_150	14200	75.5	13.3	10.3	0.9	13.0
163_148z	5925	72.4	12.9	14.7	0.0	63.4
163_200	6396	72.4	12.9	14.7	0.0	79.0
174_148z	6397	75.7	13.7	7.7	2.9	9.9
194_196	5926	70.1	12.4	16.4	1.1	57.3
194_0a	6396	69.4	12.5	16.9	1.1	52.4
196_200	5925	70.1	12.4	16.4	1.1	46.7
196_194	6396	70.1	12.4	16.4	1.1	59.0
200_163	5925	77.4	14.0	5.0	3.6	16.5
200_196	6396	77.4	14.1	4.9	3.6	38.8
180y_146	14803	71.4	12.5	16.0	0.0	61.8

Link	Traffic Count AADT	% Car	% LGV	% HGV	% Bus	Speed kph
167z_68	9015	72.4	12.9	14.7	0.0	64.5
167z_57	11688	72.3	12.9	14.7	0.0	75.6
168_169	4358	78.4	13.4	5.2	3.1	38.7
168_148y	5136	77.4	14.1	4.9	3.6	35.1
169_113	4358	84.0	11.7	1.7	2.6	41.8
169_168	5136	81.0	16.3	2.7	0.0	49.5
170_0e	7385	81.0	16.3	2.7	0.0	30.0
170_172	7848	78.6	14.0	7.3	0.1	29.4
172_170	7385	76.5	13.5	9.9	0.1	54.0
172_173	7848	76.5	13.5	10.0	0.0	45.6
173_172	7385	78.6	14.0	7.3	0.1	62.1
173_115	2813	76.5	13.5	10.0	0.0	50.0
173_48	5139	78.2	14.1	6.4	1.3	25.7
148z_174	5925	78.5	13.9	6.3	1.3	35.7
148z_163	6397	78.4	13.9	6.3	1.3	37.1
148y_168	4358	78.4	13.9	6.3	1.3	38.0
148y_112	5136	78.6	14.0	7.3	0.1	38.7
149z_52	5761	75.3	13.1	11.5	0.0	8.6
149z_53	5842	78.3	13.4	5.2	3.1	30.1
151z_138	1479	78.3	13.4	5.2	3.1	38.2
151y_58	13587	80.3	14.8	3.9	1.0	41.7
151x_9	5761	80.3	14.8	3.9	1.0	7.5
151x_51z	5842	77.9	14.5	4.8	2.8	43.2
152z_9	4358	78.4	13.9	6.3	1.3	36.6
152z_94	5136	77.4	14.1	4.9	3.6	23.3
153z_51	4740	79.8	14.8	5.1	0.3	51.9
153z_9	5244	81.0	16.3	2.7	0.0	44.5
154z_13	4694	79.8	14.9	5.0	0.3	18.7
154z_9	5050	77.4	14.0	5.0	3.6	16.0
155z_19z	12503	79.2	15.1	5.7	0.0	54.0
155y_51	106	77.7	13.7	4.9	3.7	32.2
15_16	87	74.9	13.2	11.8	0.1	50.9
152_153	0	0	0	0	0	0

SC1

Link	Traffic Count AADT	% Car	% LGV	% HGV	% Bus	Speed kph
0a_194	5927	78.2	14.4	6.2	1.3	32.3
0a_0b	21634	78.2	14.4	6.2	1.3	32.3
2_45	13684	77.9	14.4	6.5	1.2	34.9
3_0g	12492	85.1	14.5	0.4	0.0	29.7
7_142	14803	72.6	11.9	13.7	1.8	44.1
8_152	14213	78.1	13.3	4.9	3.7	10.0
9_154z	4695	72.8	12.7	14.5	0.0	62.0
9_153z	4750	72.8	12.7	14.5	0.0	62.0
9_152z	5137	72.8	12.7	14.5	0.0	62.0
9_151x	5840	72.8	12.7	14.5	0.0	62.0
11_12	15045	80.3	17.0	2.6	0.0	49.8
12_167z	15044	78.5	14.0	7.3	0.1	52.5
13_16	4695	78.0	13.4	5.0	3.6	22.9
13_154z	5071	78.0	13.4	5.0	3.6	22.9
15_151y	13587	78.1	13.3	4.9	3.7	31.8
16_58	222	76.6	15.5	5.3	2.6	43.6
16_13	5071	76.6	15.5	5.3	2.6	43.6
16_64	4477	77.9	14.4	6.5	1.2	36.1
19_94	4359	77.2	13.8	9.0	0.1	26.5
19_96	5137	81.9	14.5	3.5	0.0	50.2
19z_3	12492	80.0	14.5	5.5	0.0	51.6
0b_145	14141	77.6	13.2	5.9	3.3	18.2

Link	Traffic Count AADT	% Car	% LGV	% HGV	% Bus	Speed kph
0b_0c	7493	77.6	13.2	5.9	3.3	18.2
0c_0d	22227	83.8	13.4	2.9	0.0	49.2
0d_140	1012	78.5	14.0	7.3	0.1	52.1
0d_0e	22688	78.5	14.0	7.3	0.1	52.1
0e_170	7791	78.5	14.0	7.3	0.1	52.5
0e_0f	22244	78.5	14.0	7.3	0.1	52.5
0f_0g	8623	78.0	13.4	5.0	3.6	22.9
0f_40	13621	78.2	14.4	6.2	1.3	37.2
0g_30	21052	81.2	14.5	4.0	0.2	46.9
30_0a	21270	77.4	13.7	8.0	0.9	13.2
30_31	696	75.0	13.1	11.8	0.0	65.1
31_30	809	75.0	13.1	11.8	0.0	79.3
37z_11	15045	66.4	10.9	22.6	0.1	5.8
38z_105	15364	78.5	14.0	7.3	0.1	58.1
39z_37z	15045	71.7	12.5	14.0	1.8	68.1
40_2	13684	72.6	11.9	13.7	1.8	44.1
45_15	13684	72.6	11.9	13.7	1.8	52.9
48_173	4749	71.8	12.5	14.0	1.8	59.2
48_49	5126	79.1	13.0	4.9	3.0	9.6
49_48	4749	78.1	13.3	4.9	3.7	10.0
49_50	5126	78.1	13.4	5.0	3.6	16.7
50_49	4749	79.1	13.0	4.9	3.0	37.1
50_51	5126	72.8	12.7	14.5	0.0	62.0
51_50	4749	78.0	14.5	6.4	1.1	15.0
51_153z	5232	78.0	14.5	6.4	1.1	15.0
51z_151x	5760	78.1	14.4	7.0	0.4	25.6
51z_52	5840	78.3	14.3	6.9	0.4	20.3
52_51z	5760	77.1	13.9	9.0	0.1	50.9
52_149z	5840	77.1	13.9	9.0	0.1	50.9
53_149z	5760	75.0	13.2	11.8	0.0	65.0
57_68	5988	78.9	13.1	4.8	3.1	37.8
57_64	11687	72.6	12.8	14.6	0.0	84.6
57_65	15364	78.0	13.3	5.1	3.6	44.4
58_155z	12492	78.9	13.1	4.8	3.1	36.7
58_16	4977	72.6	12.8	14.6	0.0	30.3
58_64	13587	78.2	13.3	4.9	3.7	17.9
59_60	8852	83.6	13.4	3.0	0.0	49.2
60_69	8852	83.6	13.4	3.0	0.0	49.8
62_63	9343	78.5	14.0	7.3	0.1	29.9
63_71	9343	76.3	13.6	10.0	0.1	54.0
64_58	17251	79.0	13.1	4.8	3.1	30.9
64_57	18064	79.0	13.1	4.8	3.1	30.9
65_66	15364	78.5	14.1	6.1	1.3	36.5
66_38z	15364	81.0	14.7	4.1	0.3	46.6
67_100z	15364	70.2	8.9	4.3	16.5	21.8
68_62	9343	78.5	14.0	7.4	0.1	62.5
69_64	5564	77.1	13.9	9.0	0.0	31.6
69_57	3288	77.1	13.9	9.0	0.0	31.6
71_85	9342	78.0	13.3	5.1	3.6	16.0
72_75	9342	80.1	14.4	5.5	0.0	54.0
73_76	8852	78.2	13.2	4.9	3.7	31.4
74_73	8852	87.2	12.8	0.0	0.0	28.8
75_90	9342	77.5	13.3	5.8	3.4	27.7
76_59	8852	78.1	13.4	5.0	3.5	10.8
85_72	9342	77.6	14.7	6.4	1.3	25.1
91_74	8852	78.9	13.1	4.8	3.1	39.0
94_152z	4359	79.8	15.0	4.1	1.0	42.1
94_19	5137	79.8	15.0	4.1	1.0	7.4
96_19	4359	81.8	14.7	3.6	0.0	46.4
96_111	5137	81.8	14.7	3.6	0.0	46.4
99z_39z	15046	78.0	13.3	5.1	3.6	22.9

Link	Traffic Count AADT	% Car	% LGV	% HGV	% Bus	Speed kph
100z_101z	15298	72.8	12.7	14.5	0.0	65.2
101z_104	15298	72.8	12.7	14.5	0.0	84.6
105_107	15298	77.2	13.8	9.0	0.1	26.5
107_67	15298	81.9	14.5	3.5	0.0	50.2
111_96	4336	81.9	14.5	3.5	0.0	50.4
111_113	5118	81.9	14.5	3.5	0.0	50.4
112_148y	4336	80.7	14.1	4.9	0.3	14.7
113_111	4336	81.2	14.5	4.0	0.2	36.2
113_169	5118	80.7	14.1	4.9	0.3	41.8
115_173	2736	75.0	13.1	11.8	0.0	32.9
138_151z	1012	72.6	11.9	13.7	1.8	24.0
138_140	1473	72.6	11.9	13.7	1.8	24.0
140_138	1012	75.8	13.0	10.3	0.9	13.5
140_0d	1473	75.8	13.0	10.3	0.9	13.5
142_143	14735	75.0	13.1	11.8	0.0	79.3
143_0c	14735	66.4	10.9	22.6	0.1	5.8
144_8	14141	78.5	14.0	7.3	0.1	58.1
145_144	14141	71.7	12.5	14.0	1.8	68.1
146_151	14735	72.6	11.9	13.7	1.8	44.1
147_181z	14129	72.6	11.9	13.7	1.8	52.9
150_147	14129	79.1	13.0	4.9	3.0	37.1
151_7	14734	72.8	12.7	14.5	0.0	62.0
152_161	14128	83.7	13.3	3.0	0.0	44.5
161_150	14128	78.0	13.3	5.1	3.6	34.4
163_148z	5898	78.9	13.1	4.8	3.1	36.7
163_200	6369	72.6	12.8	14.6	0.0	30.3
174_148z	6368	77.6	14.7	6.4	1.3	39.6
194_196	5898	76.4	13.6	10.0	0.0	78.0
194_0a	6369	76.4	13.6	10.0	0.0	78.0
196_200	5898	77.1	13.9	9.0	0.0	31.6
196_194	6369	77.1	13.9	9.0	0.0	31.6
200_163	5898	78.9	13.1	4.8	3.1	38.1
200_196	6369	81.8	14.7	3.5	0.0	65.8
180y_146	14735	81.0	14.6	4.1	0.3	47.1
167z_68	3336	78.5	14.0	7.4	0.1	52.3
167z_57	11625	78.5	14.0	7.4	0.1	52.3
168_169	4336	77.6	14.7	6.4	1.3	39.6
168_148y	5118	77.6	14.7	6.4	1.3	39.6
169_113	4336	81.0	14.7	4.1	0.3	46.6
169_168	5118	70.2	8.9	4.3	16.5	21.8
170_0e	7347	78.5	14.0	7.4	0.1	62.5
170_172	7791	80.8	14.0	4.9	0.3	19.2
172_170	7347	80.3	16.9	2.7	0.0	44.6
172_173	7791	76.4	13.6	10.0	0.0	58.2
173_172	7347	80.1	14.4	5.5	0.0	54.0
173_115	2801	80.1	14.4	5.5	0.0	54.0
173_48	5104	77.5	13.3	5.8	3.4	12.0
148z_174	5898	78.0	13.3	5.1	3.6	34.4
148z_163	6368	78.0	13.3	5.1	3.6	34.4
148y_168	4336	78.0	13.3	5.1	3.6	34.4
148y_112	5118	78.0	13.3	5.1	3.6	34.4
149z_52	5731	77.5	13.3	5.8	3.4	17.7
149z_53	5815	80.3	16.9	2.7	0.0	49.6
151z_138	1473	76.4	13.6	10.0	0.0	45.6
151y_58	13524	76.4	13.6	10.0	0.0	45.6
151x_9	5731	76.4	13.6	10.0	0.0	45.6
151x_51z	5816	76.4	13.6	10.0	0.0	45.6
152z_9	4336	77.1	13.9	9.0	0.0	6.3
152z_94	5119	76.4	13.6	10.0	0.0	78.0
153z_51	4725	81.0	14.6	4.1	0.3	47.1
153z_9	5209	77.1	13.9	9.0	0.0	31.6

Link	Traffic Count AADT	% Car	% LGV	% HGV	% Bus	Speed kph
154z_13	4670	47.8	0.0	0.0	52.2	26.5
154z_9	5055	78.0	13.3	5.1	3.6	16.0
155z_19z	12429	81.8	14.7	3.5	0.0	65.8
155y_51	106	81.8	14.7	3.5	0.0	65.8
15_16	99	81.0	14.7	4.1	0.3	46.6
152_153	0	0	0	0	0	0

SC2

Link	Traffic Count AADT	% Car	% LGV	% HGV	% Bus	Speed kph
0a_194	5927	79.0	13.7	6.1	1.3	32.4
0a_0b	21630	79.0	13.7	6.1	1.3	32.4
2_45	13691	78.3	14.0	6.5	1.2	35.0
3_0g	12498	82.0	17.5	0.4	0.0	29.4
7_142	14804	69.7	12.2	17.0	1.1	43.1
8_152	14211	78.2	13.3	4.9	3.7	10.5
9_154z	4700	71.4	12.6	16.0	0.0	61.8
9_153z	4745	71.4	12.6	16.0	0.0	61.8
9_152z	5136	71.4	12.6	16.0	0.0	61.8
9_151x	5842	71.4	12.6	16.0	0.0	61.8
11_12	20705	85.4	12.4	2.2	0.0	49.4
12_167z	20705	79.0	13.7	7.2	0.1	51.9
13_16	4700	78.2	13.1	5.1	3.6	23.1
13_154z	5078	78.2	13.1	5.1	3.6	23.1
15_151y	13590	78.2	13.3	4.9	3.7	34.5
16_58	224	78.1	14.4	4.8	2.6	43.4
16_13	5078	78.1	14.4	4.8	2.6	43.4
16_64	4476	78.3	14.0	6.5	1.2	36.5
19_94	4358	77.6	13.3	9.0	0.1	27.2
19_96	5136	82.1	14.4	3.5	0.0	50.3
19z_3	12499	80.3	14.3	5.4	0.0	51.2
0b_145	14140	78.6	12.6	5.5	3.3	19.8
0b_0c	7490	78.6	12.6	5.5	3.3	19.8
0c_0d	22223	83.8	14.2	2.0	0.0	49.0
0d_140	1010	78.9	13.7	7.2	0.1	51.2
0d_0e	22686	78.9	13.7	7.2	0.1	51.2
0e_170	7785	79.0	13.7	7.2	0.1	51.9
0e_0f	22243	79.0	13.7	7.2	0.1	51.9
0f_0g	8617	78.2	13.1	5.1	3.6	23.1
0f_40	13626	79.0	13.7	6.1	1.3	37.7
0g_30	21050	81.8	14.1	3.8	0.2	46.7
30_0a	21268	77.7	13.4	8.0	0.9	13.5
30_31	697	72.4	12.9	14.7	0.0	63.6
31_30	810	72.4	12.9	14.7	0.0	79.3
37z_11	20705	65.7	12.1	22.1	0.0	5.0
38z_105	21041	78.9	13.7	7.2	0.1	57.1
39z_37z	20705	70.3	12.3	16.3	1.1	67.7
40_2	13691	69.7	12.2	17.0	1.1	43.1
45_15	13691	69.7	12.1	17.0	1.1	47.2
48_173	4744	70.3	12.3	16.3	1.1	58.9
48_49	5121	79.1	13.0	5.0	3.0	9.9
49_48	4744	78.2	13.3	4.9	3.7	10.5
49_50	5121	78.2	13.1	5.1	3.6	18.0
50_49	4744	79.1	13.0	5.0	3.0	37.4
50_51	5121	71.4	12.6	16.0	0.0	61.8
51_50	4745	79.3	13.2	6.3	1.1	15.2
51_153z	5227	79.3	13.2	6.3	1.1	15.2
51z_151x	5760	79.2	13.6	6.8	0.4	25.7
51z_52	5842	79.0	13.7	6.9	0.4	20.2

Link	Traffic Count AADT	% Car	% LGV	% HGV	% Bus	Speed kph
52_51z	5760	77.5	13.4	8.9	0.1	48.7
52_149z	5842	77.5	13.4	8.9	0.1	48.7
53_149z	5760	72.5	12.9	14.6	0.0	63.9
57_68	5988	78.7	13.1	5.1	3.1	38.3
57_64	11690	71.5	12.5	16.1	0.0	73.8
57_65	21041	78.0	13.2	5.2	3.6	44.2
58_155z	12499	78.7	13.1	5.1	3.1	36.7
58_16	4978	71.5	12.5	16.1	0.0	28.2
58_64	13590	78.1	13.2	5.0	3.7	19.8
59_60	14526	84.7	13.4	1.9	0.0	49.1
60_69	14526	84.7	13.4	1.9	0.0	49.9
62_63	15002	79.0	13.7	7.2	0.1	29.4
63_71	15002	76.6	13.2	10.2	0.1	54.0
64_58	17254	78.7	13.1	5.1	3.1	31.6
64_57	18067	78.7	13.1	5.1	3.1	31.6
65_66	21041	79.2	13.3	6.2	1.3	37.1
66_38z	21041	81.9	14.1	3.8	0.3	46.5
67_100z	21038	75.1	6.7	2.6	15.5	20.7
68_62	15002	79.0	13.7	7.2	0.1	61.8
69_64	5564	77.6	13.4	9.0	0.0	32.6
69_57	8962	77.6	13.4	9.0	0.0	32.6
71_85	15002	78.0	13.2	5.2	3.6	16.4
72_75	15002	80.2	14.3	5.5	0.0	53.7
73_76	14526	78.1	13.2	5.0	3.7	34.3
74_73	14526	85.8	14.2	0.0	0.0	28.5
75_90	15002	78.0	12.8	5.7	3.4	29.1
76_59	14526	78.1	13.3	5.0	3.5	10.6
85_72	15002	78.9	13.6	6.3	1.3	25.7
91_74	14526	78.7	13.1	5.1	3.1	38.7
94_152z	4358	81.1	14.1	3.8	1.0	42.1
94_19	5136	81.1	14.1	3.8	1.0	7.4
96_19	4358	82.5	14.2	3.4	0.0	46.0
96_111	5135	82.5	14.2	3.4	0.0	46.0
99z_39z	20706	78.0	13.2	5.2	3.6	22.6
100z_101z	20950	71.4	12.6	16.0	0.0	56.3
101z_104	20950	71.4	12.6	16.0	0.0	79.3
105_107	20951	77.6	13.3	9.0	0.1	27.2
107_67	20950	82.1	14.4	3.5	0.0	50.3
111_96	4334	82.1	14.4	3.5	0.0	48.8
111_113	5118	82.1	14.4	3.5	0.0	48.8
112_148y	4334	80.2	14.5	5.0	0.3	12.8
113_111	4334	81.8	14.1	3.8	0.2	36.2
113_169	5118	80.2	14.5	5.0	0.3	41.0
115_173	2736	72.4	12.9	14.7	0.0	29.3
138_151z	1010	69.7	12.1	17.1	1.1	20.2
138_140	1473	69.7	12.1	17.1	1.1	20.2
140_138	1010	76.0	12.8	10.3	0.9	14.1
140_0d	1473	76.0	12.8	10.3	0.9	14.1
142_143	14734	72.4	12.9	14.7	0.0	79.3
143_0c	14734	65.7	12.1	22.1	0.0	5.0
144_8	14140	78.9	13.7	7.2	0.1	57.1
145_144	14140	70.3	12.3	16.3	1.1	67.7
146_151	14735	69.7	12.2	17.0	1.1	43.1
147_181z	14127	69.7	12.1	17.0	1.1	47.2
150_147	14127	79.1	13.0	5.0	3.0	37.4
151_7	14735	71.4	12.6	16.0	0.0	61.8
152_161	14127	84.7	13.4	1.9	0.0	44.5
161_150	14127	78.0	13.2	5.2	3.6	34.3
163_148z	5900	78.7	13.1	5.1	3.1	36.7
163_200	6367	71.5	12.5	16.1	0.0	28.2
174_148z	6367	78.8	13.6	6.3	1.3	39.9

Link	Traffic Count AADT	% Car	% LGV	% HGV	% Bus	Speed kph
194_196	5900	76.7	13.2	10.2	0.0	78.7
194_0a	6367	76.7	13.2	10.2	0.0	78.7
196_200	5900	77.6	13.4	9.0	0.0	32.6
196_194	6367	77.6	13.4	9.0	0.0	32.6
200_163	5900	78.8	13.0	5.1	3.1	38.6
200_196	6367	82.5	14.2	3.3	0.0	64.8
180y_146	14735	81.9	14.1	3.8	0.3	46.7
167z_68	8965	79.0	13.7	7.2	0.1	51.6
167z_57	11628	79.0	13.7	7.2	0.1	51.6
168_169	4334	78.8	13.6	6.3	1.3	39.9
168_148y	5118	78.8	13.6	6.3	1.3	39.9
169_113	4334	81.9	14.1	3.8	0.3	46.5
169_168	5118	75.1	6.7	2.6	15.5	20.7
170_0e	7342	79.0	13.7	7.2	0.1	61.8
170_172	7784	80.2	14.4	5.1	0.3	19.0
172_170	7342	85.5	12.4	2.1	0.0	44.6
172_173	7784	76.7	13.2	10.2	0.0	58.3
173_172	7342	80.2	14.3	5.5	0.0	53.7
173_115	2799	80.2	14.3	5.5	0.0	53.7
173_48	5099	78.1	12.8	5.7	3.4	12.1
148z_174	5900	78.0	13.2	5.2	3.6	34.3
148z_163	6367	78.0	13.2	5.2	3.6	34.3
148y_168	4334	78.0	13.2	5.2	3.6	34.3
148y_112	5118	78.0	13.2	5.2	3.6	34.3
149z_52	5731	78.1	12.8	5.7	3.4	19.4
149z_53	5817	85.5	12.4	2.1	0.0	49.3
151z_138	1473	76.7	13.2	10.2	0.0	45.4
151y_58	13526	76.7	13.2	10.2	0.0	45.4
151x_9	5730	76.7	13.2	10.2	0.0	45.4
151x_51z	5817	76.7	13.2	10.2	0.0	45.4
152z_9	4334	77.6	13.4	9.0	0.0	6.6
152z_94	5118	76.7	13.2	10.2	0.0	78.7
153z_51	4721	81.9	14.1	3.8	0.3	46.7
153z_9	5204	77.6	13.4	9.0	0.0	32.6
154z_13	4674	47.8	0.0	0.0	52.2	26.5
154z_9	5063	78.0	13.2	5.2	3.6	16.4
155z_19z	12433	82.5	14.2	3.3	0.0	64.8
155y_51	106	82.5	14.2	3.3	0.0	64.8
15_16	102	81.9	14.1	3.8	0.3	46.5
152_153	0	0	0	0	0	0

Appendix 3 – Full list of Modelled Results

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration ($\mu g/m^3$)			Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
				BC	SC1	SC2	BC	SC1	SC2
Clepington_Forfar	341384.7	732121.1	2.6	43.9	43.6	43.8	18.1	18.1	18.1
Kingsway_Mains1	341123.6	732468.3	2.6	36.2	29.6	36.8	16.6	15.1	16.7
Woodside_Avenue_UB	340776	732307	2.6	17.4	16.9	17.5	11.8	11.7	11.8
Forfar_Road	341437	732360	2.6	43.8	40.6	42.2	17.3	16.8	17.0
MainsLoan_UB_1.8	340972	731893	1.8	16.7	16.5	16.7	11.6	11.6	11.6
MainsLoan_UB_2	340972	731893	2	16.7	16.5	16.7	11.6	11.6	11.6
1_1.5	340034.6	732669	1.5	18.8	17.8	18.8	12.0	11.8	12.0
2_1.5	340051.4	732715.3	1.5	22.2	20.2	22.2	12.6	12.3	12.6
3_1.5	340057.4	732662.6	1.5	19.2	18.1	19.2	12.1	11.9	12.1
4_1.5	340072.1	732711.6	1.5	24.0	21.4	24.0	13.0	12.5	13.0
5_1.5	340087.7	732709.1	1.5	25.5	22.4	25.5	13.3	12.8	13.3
6_1.5	340102.8	732664.5	1.5	20.7	19.1	20.7	12.4	12.1	12.4
7_1.5	340109.9	732704.2	1.5	27.1	23.6	27.1	13.7	13.1	13.7
8_1.5	340123.1	732701.4	1.5	27.8	24.1	27.9	13.9	13.2	13.9
9_1.5	340123.6	732656.7	1.5	20.8	19.2	20.8	12.4	12.1	12.4
10_1.5	340137.9	732652.8	1.5	20.9	19.3	21.0	12.4	12.2	12.4
11_1.5	340141.2	732698	1.5	28.6	24.7	28.7	14.1	13.3	14.1
12_1.5	340156.1	732651.5	1.5	21.3	19.5	21.3	12.5	12.2	12.5
13_1.5	340158	732695.3	1.5	29.3	25.1	29.3	14.3	13.5	14.3
14_1.5	340168.4	732648.3	1.5	21.4	19.6	21.4	12.5	12.2	12.5
15_1.5	340173.6	732692.3	1.5	29.6	25.3	29.6	14.4	13.5	14.4
16_1.5	340191.8	732646.3	1.5	21.8	19.8	21.8	12.6	12.3	12.6
17_1.5	340192.6	732690.3	1.5	30.5	26.0	30.5	14.6	13.7	14.6
18_1.5	340200.8	732624.3	1.5	20.3	18.8	20.4	12.4	12.1	12.4
19_1.5	340212.5	732681.6	1.5	28.9	24.8	28.9	14.2	13.5	14.2
20_1.5	340247.8	732676.1	1.5	29.6	25.3	29.6	14.5	13.6	14.5
21_1.5	340283.4	732669.1	1.5	29.6	25.3	29.6	14.6	13.7	14.6
22_1.5	340313.5	732663.9	1.5	29.4	25.2	29.5	14.7	13.7	14.7
23_1.5	340336.1	732656.1	1.5	27.7	24.0	27.9	14.3	13.5	14.3
24_1.5	340364.1	732648.5	1.5	26.8	23.3	26.9	14.2	13.4	14.2
25_1.5	340392.6	732641.9	1.5	26.4	23.0	26.6	14.2	13.4	14.2
26_1.5	340421.1	732635.1	1.5	26.4	23.0	26.6	14.2	13.4	14.2
27_1.5	340447.9	732621.9	1.5	25.0	22.1	25.2	13.8	13.1	13.8
28_1.5	340475.5	732577.5	1.5	21.0	19.2	21.1	12.6	12.3	12.7
29_1.5	340486.6	732619.8	1.5	27.8	24.0	28.0	14.4	13.6	14.4
30_1.5	340492.4	732548.3	1.5	19.7	18.4	19.8	12.3	12.1	12.3
31_1.5	340513.3	732610.4	1.5	27.3	23.6	27.5	14.2	13.4	14.2
32_1.5	340531.3	732539.2	1.5	19.8	18.5	19.9	12.4	12.1	12.4
33_1.5	340543.5	732604.3	1.5	28.1	24.1	28.3	14.4	13.5	14.4
34_1.5	340557.9	732532.1	1.5	19.8	18.5	19.9	12.4	12.1	12.4
35_1.5	340572	732597.8	1.5	28.5	24.4	28.7	14.5	13.6	14.5
36_1.5	340599.3	732589.2	1.5	28.0	24.1	28.2	14.4	13.5	14.4
37_1.5	340602.1	732519.1	1.5	19.8	18.5	19.9	12.4	12.1	12.4
38_1.5	340632.8	732580.9	1.5	28.2	24.2	28.4	14.4	13.6	14.4
39_1.5	340657.3	732506.1	1.5	19.9	18.5	20.0	12.4	12.1	12.4
40_1.5	340661.4	732573.1	1.5	28.1	24.1	28.3	14.4	13.5	14.4
41_1.5	340687.2	732567.2	1.5	28.4	24.4	28.6	14.4	13.6	14.5
42_1.5	340696.9	732497.6	1.5	20.0	18.6	20.1	12.4	12.1	12.4
43_1.5	340715.8	732559.6	1.5	28.3	24.3	28.6	14.4	13.6	14.5
44_1.5	340731.9	732554.8	1.5	28.1	24.2	28.3	14.4	13.5	14.4
45_1.5	340735.2	732491.8	1.5	20.2	18.7	20.3	12.4	12.2	12.5
46_1.5	340749.8	732550	1.5	28.1	24.1	28.3	14.4	13.5	14.4
47_1.5	340764.4	732546.2	1.5	28.1	24.1	28.3	14.4	13.5	14.4
48_1.5	340771.5	732490.5	1.5	20.6	19.0	20.8	12.6	12.2	12.6
49_1.5	340783.2	732542.1	1.5	28.3	24.3	28.6	14.4	13.6	14.5
50_1.5	340795.6	732539.1	1.5	28.4	24.4	28.6	14.5	13.6	14.5

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration (µg/m^3)			Annual Mean PM_{10} Concentration (µg/m^3)		
				BC	SC1	SC2	BC	SC1	SC2
51_1.5	340807.9	732486.6	1.5	21.0	19.3	21.1	12.6	12.3	12.6
52_1.5	340813	732534.4	1.5	28.3	24.3	28.5	14.4	13.6	14.5
53_1.5	340850.8	732479.4	1.5	21.2	19.4	21.4	12.7	12.3	12.7
54_1.5	340852.8	732524.5	1.5	28.1	24.1	28.3	14.5	13.6	14.5
55_1.5	340872.6	732518.2	1.5	27.6	23.8	27.8	14.4	13.5	14.4
56_1.5	340882.6	732470.4	1.5	21.2	19.4	21.3	12.7	12.3	12.7
57_1.5	340888.2	732513.4	1.5	27.3	23.6	27.5	14.3	13.5	14.3
58_1.5	340903.3	732509.4	1.5	27.3	23.6	27.5	14.3	13.5	14.3
59_1.5	340905.9	732465.8	1.5	21.3	19.5	21.5	12.7	12.4	12.7
60_1.5	340919.1	732334.8	1.5	18.2	17.4	18.2	12.0	11.8	12.0
61_1.5	340920	732505.3	1.5	27.4	23.6	27.6	14.3	13.5	14.3
62_1.5	340933.8	732460.6	1.5	21.5	19.6	21.7	12.8	12.4	12.8
63_1.5	340936.2	732501.2	1.5	27.4	23.7	27.6	14.3	13.5	14.3
64_1.5	340952.1	732497.2	1.5	27.4	23.7	27.7	14.3	13.5	14.4
65_1.5	340959.2	732452.9	1.5	21.5	19.6	21.6	12.8	12.4	12.8
66_1.5	340968.8	732493.2	1.5	27.6	23.8	27.8	14.4	13.5	14.4
67_1.5	340984.1	732489.8	1.5	27.8	23.9	28.1	14.4	13.6	14.4
68_1.5	340986.4	732443.8	1.5	21.4	19.6	21.6	12.7	12.4	12.8
69_1.5	341003.2	732485.3	1.5	28.0	24.1	28.3	14.5	13.6	14.5
70_1.5	341010.5	732437.9	1.5	21.6	19.7	21.7	12.8	12.4	12.8
71_1.5	341012.1	732482.5	1.5	27.9	24.0	28.2	14.4	13.6	14.5
72_1.5	341031.3	732430.1	1.5	21.5	19.6	21.7	12.7	12.4	12.8
73_1.5	341031.7	732477.1	1.5	27.9	24.0	28.2	14.4	13.6	14.5
74_1.5	341047.5	732472.9	1.5	28.0	24.0	28.3	14.4	13.6	14.5
75_1.5	341064.4	732468.3	1.5	28.0	24.0	28.3	14.4	13.6	14.5
76_1.5	341068.3	732423.6	1.5	22.0	19.9	22.2	12.8	12.4	12.8
77_1.5	341072.3	732120.6	1.5	20.6	20.2	20.5	12.4	12.3	12.4
78_1.5	341080.9	732464	1.5	28.2	24.1	28.5	14.4	13.6	14.5
79_1.5	341084.5	732167.2	1.5	18.3	17.8	18.3	12.0	11.9	12.0
80_1.5	341092.3	732417.8	1.5	22.2	20.1	22.4	12.9	12.5	12.9
81_1.5	341094.9	732124	1.5	21.2	20.7	21.1	12.5	12.4	12.5
82_1.5	341097.4	732460.1	1.5	28.5	24.3	28.9	14.5	13.6	14.6
83_1.5	341101.4	732170.4	1.5	18.4	17.9	18.4	12.0	11.9	12.0
84_1.5	341113	732125.4	1.5	21.6	21.2	21.6	12.7	12.6	12.6
85_1.5	341117.5	732126.7	1.5	21.5	21.1	21.5	12.6	12.6	12.6
86_1.5	341121.5	732165.9	1.5	18.7	18.2	18.7	12.1	12.0	12.1
87_1.5	341124.7	732394.4	1.5	21.7	19.7	21.8	12.7	12.3	12.7
88_1.5	341125.9	731708.8	1.5	17.0	16.9	17.0	11.7	11.7	11.7
89_1.5	341127.2	732451.8	1.5	28.9	24.5	29.3	14.5	13.6	14.6
90_1.5	341129.3	732096.9	1.5	22.4	22.0	22.3	12.9	12.8	12.8
91_1.5	341130.6	732410	1.5	22.7	20.4	23.0	12.9	12.5	13.0
92_1.5	341130.6	732428.8	1.5	24.5	21.6	24.8	13.4	12.8	13.4
93_1.5	341134.8	732127.3	1.5	22.0	21.5	22.0	12.8	12.7	12.8
94_1.5	341137.3	731670.2	1.5	17.1	17.0	17.1	11.7	11.7	11.7
95_1.5	341138.3	732095.8	1.5	21.8	21.4	21.7	12.8	12.7	12.8
96_1.5	341141.6	732167.2	1.5	18.9	18.4	18.9	12.1	12.0	12.1
97_1.5	341142	732127.9	1.5	22.1	21.6	22.0	12.9	12.8	12.9
98_1.5	341146.9	732448.4	1.5	29.8	25.0	30.3	14.7	13.7	14.8
99_1.5	341148.1	732391.8	1.5	22.1	20.0	22.3	12.8	12.4	12.8
100_1.5	341149	731774.1	1.5	17.3	17.1	17.3	11.7	11.7	11.7
101_1.5	341158.1	731803.3	1.5	17.3	17.1	17.3	11.7	11.7	11.7
102_1.5	341158.5	732174.9	1.5	19.0	18.4	19.0	12.1	12.0	12.1
103_1.5	341159.8	732130	1.5	22.0	21.6	22.1	13.0	12.9	13.0
104_1.5	341164.3	732095.6	1.5	21.2	20.8	21.2	12.8	12.7	12.8
105_1.5	341165.3	732442.8	1.5	29.7	24.9	30.2	14.6	13.7	14.7
106_1.5	341166.2	731800	1.5	17.4	17.2	17.4	11.8	11.7	11.8
107_1.5	341170.4	731767.9	1.5	17.6	17.4	17.6	11.8	11.8	11.8
108_1.5	341170.8	732382.8	1.5	22.3	20.1	22.4	12.8	12.4	12.8
109_1.5	341171.1	731696.5	1.5	18.1	17.9	18.1	11.8	11.8	11.8

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration (μg/m[3])			Annual Mean PM_{10} Concentration (μg/m[3])		
				BC	SC1	SC2	BC	SC1	SC2
110_1.5	341177.2	732130.9	1.5	22.3	21.9	22.4	13.2	13.1	13.2
111_1.5	341177.3	731804.9	1.5	17.5	17.3	17.5	11.8	11.8	11.8
112_1.5	341178.2	731633.7	1.5	17.9	17.8	17.9	11.8	11.8	11.8
113_1.5	341181.1	731655.1	1.5	19.3	19.2	19.3	12.0	12.0	12.0
114_1.5	341181.2	732173.7	1.5	19.2	18.7	19.3	12.2	12.1	12.2
115_1.5	341183.1	731646.7	1.5	19.5	19.4	19.5	12.0	12.0	12.0
116_1.5	341183.4	731631.6	1.5	18.0	17.9	18.0	11.8	11.8	11.8
117_1.5	341183.4	732438.1	1.5	30.1	25.2	30.6	14.7	13.7	14.8
118_1.5	341184.1	731739	1.5	18.3	18.1	18.2	11.9	11.9	11.9
119_1.5	341184.5	731634.6	1.5	18.4	18.3	18.4	11.9	11.8	11.9
120_1.5	341185.6	731637.6	1.5	18.9	18.8	18.9	11.9	11.9	11.9
121_1.5	341185.7	731793.6	1.5	17.7	17.6	17.7	11.8	11.8	11.8
122_1.5	341186.6	731640.1	1.5	19.5	19.4	19.5	12.0	12.0	12.0
123_1.5	341186.7	731712.1	1.5	18.8	18.6	18.8	12.0	11.9	12.0
124_1.5	341187.7	731642.8	1.5	20.4	20.2	20.3	12.2	12.1	12.2
125_1.5	341188.4	731644.8	1.5	21.0	20.9	21.0	12.3	12.2	12.3
126_1.5	341188.4	731659.4	1.5	20.9	20.7	20.8	12.3	12.2	12.2
127_1.5	341189.2	731647.1	1.5	21.7	21.5	21.6	12.4	12.3	12.4
128_1.5	341189.7	731860.1	1.5	17.5	17.3	17.5	11.8	11.8	11.8
129_1.5	341190.2	731649.9	1.5	22.3	22.1	22.2	12.5	12.4	12.4
130_1.5	341191.3	731652.8	1.5	22.7	22.6	22.7	12.5	12.5	12.5
131_1.5	341191.5	731763.3	1.5	18.2	18.1	18.2	11.9	11.9	11.9
132_1.5	341192	731654.3	1.5	22.9	22.8	22.9	12.6	12.5	12.6
133_1.5	341192.5	731656.1	1.5	23.0	22.9	22.9	12.6	12.6	12.6
134_1.5	341193.2	731657.7	1.5	23.2	23.0	23.1	12.6	12.6	12.6
135_1.5	341193.3	731673	1.5	21.3	21.2	21.3	12.3	12.3	12.3
136_1.5	341193.8	731802.3	1.5	17.8	17.6	17.8	11.9	11.8	11.9
137_1.5	341193.8	732435.4	1.5	30.4	25.3	30.9	14.7	13.7	14.8
138_1.5	341194.1	731660	1.5	23.4	23.2	23.3	12.6	12.6	12.6
139_1.5	341195.1	731662.9	1.5	23.4	23.3	23.4	12.7	12.6	12.6
140_1.5	341195.7	731664.4	1.5	23.5	23.3	23.4	12.7	12.6	12.6
141_1.5	341196.3	731665.8	1.5	23.6	23.4	23.5	12.7	12.6	12.7
142_1.5	341197.2	731668.3	1.5	23.7	23.5	23.6	12.7	12.7	12.7
143_1.5	341197.7	732134.3	1.5	22.2	21.7	22.3	13.1	13.0	13.1
144_1.5	341197.8	731669.8	1.5	23.7	23.6	23.7	12.7	12.7	12.7
145_1.5	341198.3	731671.2	1.5	23.8	23.6	23.7	12.7	12.7	12.7
146_1.5	341198.8	732067.2	1.5	19.0	18.6	19.0	12.2	12.1	12.2
147_1.5	341199	731789.6	1.5	18.1	17.9	18.1	11.9	11.9	11.9
148_1.5	341199.4	732174.9	1.5	19.4	18.8	19.5	12.2	12.1	12.2
149_1.5	341199.4	731674.4	1.5	23.8	23.6	23.7	12.7	12.7	12.7
150_1.5	341200.6	731677.3	1.5	23.9	23.7	23.8	12.7	12.7	12.7
151_1.5	341201.1	731678.8	1.5	23.9	23.7	23.8	12.7	12.7	12.7
152_1.5	341201.7	731680.4	1.5	23.9	23.7	23.8	12.7	12.7	12.7
153_1.5	341202	731856.8	1.5	17.6	17.4	17.6	11.8	11.8	11.8
154_1.5	341202	732375.6	1.5	22.9	20.6	23.0	12.9	12.5	12.9
155_1.5	341202.3	731681.7	1.5	24.0	23.8	23.9	12.8	12.7	12.7
156_1.5	341202.8	731683	1.5	24.0	23.8	23.9	12.8	12.7	12.7
157_1.5	341203.3	731684.4	1.5	24.0	23.8	23.9	12.8	12.7	12.7
158_1.5	341203.8	732134.8	1.5	22.2	21.8	22.3	13.1	13.1	13.2
159_1.5	341204	731700.8	1.5	21.9	21.7	21.8	12.5	12.4	12.4
160_1.5	341204.5	731687.8	1.5	24.0	23.9	23.9	12.8	12.7	12.8
161_1.5	341205.5	731750	1.5	19.4	19.3	19.4	12.1	12.1	12.1
162_1.5	341205.6	731690.6	1.5	24.1	23.9	24.0	12.8	12.8	12.8
163_1.5	341206.3	731692.5	1.5	24.1	23.9	24.0	12.8	12.8	12.8
164_1.5	341206.4	731699.9	1.5	22.8	22.7	22.7	12.6	12.6	12.6
165_1.5	341206.5	731797.8	1.5	18.2	18.1	18.2	11.9	11.9	11.9
166_1.5	341206.8	731693.8	1.5	24.1	23.9	24.0	12.8	12.8	12.8
167_1.5	341207.2	731878.3	1.5	17.6	17.4	17.6	11.8	11.8	11.8
168_1.5	341207.3	731695.3	1.5	24.1	23.9	24.0	12.8	12.8	12.8

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration ($\mu g/m^3$)			Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
				BC	SC1	SC2	BC	SC1	SC2
169_1.5	341207.6	732431.6	1.5	30.8	25.6	31.3	14.8	13.8	14.8
170_1.5	341208	732089.6	1.5	20.2	19.8	20.2	12.5	12.5	12.5
171_1.5	341208	731697.2	1.5	24.2	24.0	24.0	12.8	12.8	12.8
172_1.5	341208.7	731698.9	1.5	24.2	24.0	24.1	12.8	12.8	12.8
173_1.5	341209.4	732107.1	1.5	23.1	22.7	23.2	13.5	13.4	13.5
174_1.5	341211.4	731706.1	1.5	24.4	24.2	24.2	12.9	12.9	12.9
175_1.5	341211.7	731852.9	1.5	17.8	17.6	17.8	11.9	11.8	11.9
176_1.5	341212.4	731716.7	1.5	23.2	23.0	23.1	12.8	12.8	12.8
177_1.5	341214.8	731723.4	1.5	23.4	23.2	23.3	12.9	12.9	12.9
178_1.5	341215.6	731875	1.5	17.7	17.5	17.8	11.8	11.8	11.8
179_1.5	341216.3	732371.7	1.5	23.2	20.8	23.3	12.9	12.5	12.9
180_1.5	341221	732136.6	1.5	22.4	21.9	22.5	13.2	13.1	13.2
181_1.5	341221.5	731793.9	1.5	19.1	18.9	19.1	12.1	12.1	12.1
182_1.5	341222.8	732188.6	1.5	19.5	18.9	19.6	12.2	12.1	12.2
183_1.5	341224.1	732062	1.5	19.0	18.6	19.0	12.2	12.1	12.2
184_1.5	341225	731626	1.5	17.7	17.6	17.7	11.8	11.7	11.8
185_1.5	341225.5	731746.3	1.5	24.7	24.5	24.5	13.2	13.2	13.2
186_1.5	341226	732137	1.5	22.4	22.0	22.6	13.2	13.1	13.2
187_1.5	341226.7	732075.6	1.5	19.4	19.1	19.5	12.3	12.2	12.3
188_1.5	341227.3	731847.1	1.5	18.3	18.1	18.3	12.0	11.9	12.0
189_1.5	341228.6	732426.4	1.5	32.0	26.5	32.5	15.0	13.9	15.0
190_1.5	341228.6	731871.8	1.5	18.0	17.8	18.0	11.9	11.9	11.9
191_1.5	341230.4	731789.6	1.5	20.2	20.0	20.2	12.4	12.3	12.4
192_1.5	341230.7	732137.6	1.5	22.4	22.0	22.6	13.2	13.1	13.2
193_1.5	341231.8	732171.1	1.5	19.9	19.3	20.0	12.4	12.3	12.4
194_1.5	341235.1	732092.5	1.5	20.5	20.1	20.5	12.6	12.5	12.6
195_1.5	341235.4	731788.9	1.5	21.1	20.9	21.1	12.6	12.5	12.6
196_1.5	341235.8	732367.8	1.5	23.7	21.2	23.8	13.0	12.6	13.0
197_1.5	341237.2	731777.1	1.5	23.8	23.6	23.7	13.1	13.1	13.1
198_1.5	341237.7	731897.1	1.5	18.0	17.8	18.0	11.9	11.9	11.9
199_1.5	341238	731787.9	1.5	21.9	21.7	21.8	12.8	12.7	12.7
200_1.5	341239.6	731843.9	1.5	18.9	18.7	18.9	12.1	12.1	12.1
201_1.5	341241	731786.4	1.5	23.1	23.0	23.0	13.1	13.0	13.1
202_1.5	341241.1	731798.8	1.5	21.5	21.4	21.5	12.7	12.6	12.7
203_1.5	341242.1	731789.1	1.5	23.1	22.9	23.0	13.1	13.0	13.0
204_1.5	341243.2	731791.9	1.5	23.1	23.0	23.1	13.1	13.0	13.0
205_1.5	341243.3	732112.1	1.5	23.8	23.4	24.0	13.7	13.6	13.7
206_1.5	341243.5	731934.1	1.5	17.9	17.7	18.0	11.9	11.9	11.9
207_1.5	341244.1	731794.5	1.5	23.2	23.0	23.1	13.0	13.0	13.0
208_1.5	341245.1	731797.2	1.5	23.2	23.0	23.2	13.0	13.0	13.0
209_1.5	341246.8	731841.9	1.5	19.6	19.4	19.6	12.2	12.2	12.2
210_1.5	341246.8	732421.5	1.5	33.7	27.6	34.1	15.2	14.1	15.3
211_1.5	341248.1	731893.8	1.5	18.3	18.1	18.3	12.0	11.9	12.0
212_1.5	341249.2	731811.9	1.5	22.5	22.4	22.5	12.9	12.8	12.9
213_1.5	341249.4	732112.6	1.5	23.8	23.4	24.1	13.7	13.6	13.7
214_1.5	341249.4	731960.7	1.5	18.1	17.8	18.1	11.9	11.9	11.9
215_1.5	341251.6	731646.2	1.5	18.0	17.9	18.0	11.8	11.8	11.8
216_1.5	341252.6	731930.9	1.5	18.1	17.8	18.1	11.9	11.9	11.9
217_1.5	341253.3	731892.6	1.5	18.5	18.2	18.5	12.0	12.0	12.0
218_1.5	341253.9	732361.3	1.5	24.1	21.4	24.0	13.0	12.6	13.0
219_1.5	341257.8	731827.9	1.5	23.7	23.6	23.7	13.1	13.1	13.1
220_1.5	341259.1	731889.3	1.5	18.8	18.6	18.8	12.1	12.0	12.1
221_1.5	341259.5	731833.4	1.5	23.5	23.4	23.5	13.1	13.0	13.1
222_1.5	341259.8	732113.8	1.5	24.0	23.7	24.4	13.7	13.7	13.8
223_1.5	341259.8	732015.3	1.5	18.5	18.2	18.6	12.0	12.0	12.0
224_1.5	341261.1	732189.9	1.5	20.1	19.4	20.1	12.3	12.2	12.4
225_1.5	341261.2	731838.3	1.5	23.3	23.2	23.3	13.0	13.0	13.0
226_1.5	341262.4	731958.1	1.5	18.2	18.0	18.2	12.0	11.9	12.0
227_1.5	341263	732150	1.5	21.6	21.1	21.8	12.8	12.8	12.9

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration (µg/m^3)			Annual Mean PM_{10} Concentration (µg/m^3)		
				BC	SC1	SC2	BC	SC1	SC2
228_1.5	341263	732173	1.5	20.4	19.8	20.5	12.5	12.4	12.5
229_1.5	341264.1	731853.1	1.5	21.9	21.7	21.9	12.7	12.7	12.7
230_1.5	341264.3	732013.3	1.5	18.6	18.3	18.6	12.0	12.0	12.0
231_1.5	341265.8	732114.4	1.5	24.1	23.8	24.5	13.7	13.7	13.8
232_1.5	341266.3	731887.4	1.5	19.3	19.1	19.3	12.2	12.2	12.2
233_1.5	341266.3	731926.3	1.5	18.4	18.2	18.4	12.0	12.0	12.0
234_1.5	341269.6	732415.6	1.5	36.1	29.3	36.4	15.6	14.3	15.7
235_1.5	341270.2	732045.8	1.5	19.1	18.8	19.2	12.2	12.1	12.2
236_1.5	341272.8	732356.8	1.5	24.5	21.8	24.4	13.1	12.6	13.1
237_1.5	341273.5	732142.1	1.5	23.1	22.7	23.5	13.3	13.2	13.4
238_1.5	341274.1	731955.5	1.5	18.5	18.2	18.5	12.0	12.0	12.0
239_1.5	341274.1	732061.3	1.5	19.5	19.2	19.6	12.3	12.2	12.3
240_1.5	341275.1	731875.6	1.5	22.0	21.9	22.0	12.8	12.8	12.8
241_1.5	341276.4	732115.4	1.5	24.4	24.1	24.9	13.8	13.7	13.9
242_1.5	341277.3	732010.7	1.5	18.8	18.5	18.8	12.1	12.0	12.1
243_1.5	341277.9	732073.7	1.5	20.0	19.6	20.0	12.4	12.3	12.4
244_1.5	341278.6	731927.6	1.5	18.8	18.5	18.8	12.1	12.0	12.1
245_1.5	341280.6	732186.6	1.5	20.5	19.8	20.5	12.4	12.3	12.4
246_1.5	341281.8	732008.1	1.5	18.9	18.5	18.9	12.1	12.0	12.1
247_1.5	341283.1	732086.7	1.5	20.7	20.3	20.8	12.6	12.5	12.6
248_1.5	341284	731674.8	1.5	18.0	17.8	17.9	11.8	11.8	11.8
249_1.5	341284.4	731952.3	1.5	18.8	18.5	18.8	12.1	12.0	12.1
250_1.5	341286.4	731926.3	1.5	19.2	19.0	19.2	12.2	12.1	12.2
251_1.5	341287	731797.8	1.5	20.8	20.6	20.7	12.5	12.5	12.5
252_1.5	341287.2	732411	1.5	37.5	30.3	37.6	15.8	14.5	15.9
253_1.5	341288.3	732111.8	1.5	23.5	23.1	23.9	13.4	13.3	13.5
254_1.5	341288.9	732142.7	1.5	24.0	23.6	24.5	13.5	13.4	13.6
255_1.5	341289.7	731840.4	1.5	22.6	22.5	22.6	12.9	12.9	12.9
256_1.5	341290.9	732036	1.5	19.4	19.1	19.4	12.2	12.2	12.2
257_1.5	341290.9	732041.2	1.5	19.5	19.2	19.5	12.2	12.2	12.2
258_1.5	341293.5	731923.7	1.5	19.9	19.6	19.9	12.3	12.3	12.3
259_1.5	341293.5	732186.6	1.5	20.8	20.1	20.8	12.5	12.4	12.5
260_1.5	341294.8	732049	1.5	19.8	19.4	19.8	12.3	12.2	12.3
261_1.5	341295.5	732005.5	1.5	19.2	18.9	19.2	12.2	12.1	12.2
262_1.5	341295.6	731878	1.5	26.2	26.0	26.2	13.8	13.8	13.8
263_1.5	341296.8	732057.4	1.5	20.0	19.6	20.0	12.3	12.3	12.3
264_1.5	341298.1	732352.9	1.5	25.4	22.4	25.2	13.2	12.8	13.2
265_1.5	341300.7	732002.3	1.5	19.4	19.1	19.4	12.2	12.2	12.2
266_1.5	341300.7	732065.9	1.5	20.3	19.9	20.4	12.4	12.4	12.4
267_1.5	341301.7	731920.6	1.5	21.4	21.2	21.4	12.7	12.6	12.7
268_1.5	341302.2	732408.1	1.5	39.2	31.4	39.0	16.1	14.7	16.1
269_1.5	341302.3	732144	1.5	25.0	24.6	25.5	13.7	13.6	13.7
270_1.5	341303.9	732074.3	1.5	20.7	20.3	20.7	12.5	12.4	12.5
271_1.5	341303.9	732083.4	1.5	21.1	20.7	21.2	12.6	12.5	12.6
272_1.5	341306.9	731885.6	1.5	23.2	23.1	23.3	13.1	13.1	13.1
273_1.5	341307.8	732095.1	1.5	22.0	21.6	22.1	12.8	12.8	12.9
274_1.5	341309	731936.1	1.5	21.5	21.3	21.5	12.7	12.7	12.7
275_1.5	341310	731692.3	1.5	17.7	17.6	17.7	11.8	11.8	11.8
276_1.5	341311.1	732105.5	1.5	23.3	22.9	23.5	13.2	13.1	13.2
277_1.5	341311.1	732187.3	1.5	21.2	20.6	21.3	12.6	12.5	12.6
278_1.5	341312.2	731946	1.5	21.5	21.2	21.5	12.7	12.6	12.7
279_1.5	341312.4	731893.6	1.5	23.2	23.0	23.2	13.1	13.1	13.1
280_1.5	341313.6	731950.6	1.5	21.5	21.2	21.5	12.7	12.7	12.7
281_1.5	341316.9	731961	1.5	21.5	21.3	21.5	12.7	12.7	12.7
282_1.5	341318.3	731965.3	1.5	21.6	21.3	21.6	12.7	12.7	12.7
283_1.5	341318.4	731853.3	1.5	19.7	19.5	19.7	12.3	12.2	12.3
284_1.5	341318.9	732145.8	1.5	26.6	26.2	27.1	13.9	13.9	14.0
285_1.5	341319.6	731904.1	1.5	23.1	22.9	23.1	13.1	13.0	13.1
286_1.5	341320.8	732344.4	1.5	25.6	22.7	25.3	13.3	12.8	13.2

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration ($\mu g/m^3$)			Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
				BC	SC1	SC2	BC	SC1	SC2
287_1.5	341321.7	731976.2	1.5	21.7	21.4	21.6	12.7	12.7	12.7
288_1.5	341323.2	731980.6	1.5	21.7	21.4	21.7	12.8	12.7	12.8
289_1.5	341323.8	732401.4	1.5	40.0	31.9	39.2	16.2	14.7	16.0
290_1.5	341324.8	731912.5	1.5	23.2	23.0	23.2	13.1	13.1	13.1
291_1.5	341325	732124.8	1.5	33.8	33.5	34.8	15.8	15.8	16.0
292_1.5	341326.8	731992.2	1.5	21.9	21.6	21.9	12.8	12.8	12.8
293_1.5	341328	731809	1.5	18.6	18.5	18.6	12.0	12.0	12.0
294_1.5	341332.5	732189.9	1.5	21.9	21.2	21.9	12.7	12.6	12.7
295_1.5	341332.8	732012.9	1.5	22.6	22.3	22.5	13.0	12.9	13.0
296_1.5	341332.9	731932.6	1.5	24.0	23.8	24.0	13.3	13.3	13.3
297_1.5	341334.7	732019	1.5	23.2	22.8	23.1	13.1	13.0	13.0
298_1.5	341336.7	732025.2	1.5	23.7	23.4	23.6	13.1	13.1	13.1
299_1.5	341338.4	732030.9	1.5	24.1	23.7	24.0	13.2	13.1	13.2
300_1.5	341338.6	731949.9	1.5	24.1	23.9	24.1	13.3	13.3	13.3
301_1.5	341339.1	732397.6	1.5	41.1	32.6	39.6	16.4	14.8	16.1
302_1.5	341341.7	732149.1	1.5	28.5	28.1	29.0	14.3	14.2	14.3
303_1.5	341341.7	732041	1.5	24.6	24.3	24.5	13.3	13.2	13.3
304_1.5	341342.4	731959	1.5	23.9	23.6	23.9	13.3	13.2	13.3
305_1.5	341344.1	732048.5	1.5	24.9	24.6	24.8	13.4	13.3	13.3
306_1.5	341344.4	731965.5	1.5	24.0	23.7	24.0	13.3	13.2	13.3
307_1.5	341346.2	731971.8	1.5	24.1	23.9	24.1	13.3	13.3	13.3
308_1.5	341347.9	732059.1	1.5	25.6	25.2	25.5	13.5	13.4	13.5
309_1.5	341348	731977.9	1.5	24.3	24.0	24.3	13.4	13.3	13.4
310_1.5	341349.2	731984	1.5	24.7	24.4	24.7	13.5	13.4	13.5
311_1.5	341349.4	732063.9	1.5	25.8	25.4	25.7	13.5	13.5	13.5
312_1.5	341351	732069.1	1.5	26.1	25.7	26.0	13.6	13.5	13.6
313_1.5	341352.4	731995.6	1.5	25.1	24.8	25.1	13.7	13.6	13.6
314_1.5	341352.5	732074	1.5	26.3	25.9	26.2	13.7	13.6	13.6
315_1.5	341354	732078.9	1.5	26.6	26.2	26.5	13.7	13.7	13.7
316_1.5	341354.2	731921.4	1.5	19.9	19.6	19.9	12.3	12.3	12.3
317_1.5	341354.6	732335.3	1.5	26.1	23.4	25.8	13.3	12.9	13.3
318_1.5	341355.1	732001.4	1.5	24.9	24.6	24.9	13.7	13.6	13.6
319_1.5	341355.6	732084.1	1.5	27.0	26.6	26.9	13.8	13.8	13.8
320_1.5	341357.1	732089.1	1.5	27.4	27.0	27.4	13.9	13.9	13.9
321_1.5	341358.3	732392.8	1.5	41.7	33.5	39.9	16.5	15.0	16.1
322_1.5	341358.7	731910.4	1.5	19.3	19.1	19.3	12.2	12.2	12.2
323_1.5	341359.2	732095.9	1.5	28.2	27.8	28.2	14.1	14.0	14.1
324_1.5	341359.8	732195.1	1.5	23.0	22.3	23.0	12.9	12.8	12.9
325_1.5	341362.4	732126.3	1.5	38.6	38.3	39.2	16.8	16.8	16.9
326_1.5	341362.6	731907.1	1.5	19.1	18.9	19.1	12.1	12.1	12.1
327_1.5	341366.5	731903.3	1.5	18.9	18.7	18.9	12.1	12.1	12.1
328_1.5	341369.5	732324.3	1.5	25.7	23.4	25.4	13.3	12.9	13.2
329_1.5	341370.3	732150.8	1.5	36.1	35.7	36.3	16.0	15.9	16.0
330_1.5	341372.3	731851	1.5	18.1	18.0	18.2	11.9	11.9	11.9
331_1.5	341373.4	732287.3	1.5	23.6	22.1	23.4	12.9	12.7	12.9
332_1.5	341376	732232.8	1.5	23.1	22.2	22.9	12.9	12.8	12.9
333_1.5	341376	732305.4	1.5	24.6	22.8	24.4	13.1	12.8	13.1
334_1.5	341376.3	732156.3	1.5	34.6	34.2	34.7	15.6	15.5	15.6
335_1.5	341376.5	732387.8	1.5	41.2	34.1	39.6	16.4	15.1	16.1
336_1.5	341383.4	731951.3	1.5	19.3	19.1	19.3	12.2	12.2	12.2
337_1.5	341386.4	732174.9	1.5	31.3	30.9	31.1	14.8	14.7	14.7
338_1.5	341390.5	732201.6	1.5	27.4	26.8	27.2	13.9	13.8	13.8
339_1.5	341392.1	732115.8	1.5	36.5	36.2	36.5	16.1	16.0	16.1
340_1.5	341393.1	731887.7	1.5	18.2	18.0	18.2	12.0	11.9	12.0
341_1.5	341393.8	731990.9	1.5	19.9	19.6	19.9	12.3	12.3	12.3
342_1.5	341394.1	732383.5	1.5	40.8	35.1	39.8	16.2	15.3	16.1
343_1.5	341394.8	732126.8	1.5	47.4	47.2	47.4	19.1	19.1	19.1
344_1.5	341400.3	731879.3	1.5	18.1	17.9	18.1	11.9	11.9	11.9
345_1.5	341400.3	731915.6	1.5	18.4	18.2	18.4	12.0	12.0	12.0

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration (µg/m^3)			Annual Mean PM_{10} Concentration (µg/m^3)		
				BC	SC1	SC2	BC	SC1	SC2
346_1.5	341402.8	732241	1.5	27.5	26.6	27.2	13.9	13.7	13.8
347_1.5	341403.5	731989.6	1.5	19.6	19.3	19.6	12.3	12.2	12.3
348_1.5	341406.8	731923.4	1.5	18.4	18.2	18.5	12.0	12.0	12.0
349_1.5	341406.8	731988.3	1.5	19.5	19.2	19.5	12.2	12.2	12.2
350_1.5	341406.8	732172	1.5	33.8	33.4	33.6	15.4	15.4	15.3
351_1.5	341408.3	732259.4	1.5	27.9	26.9	27.5	13.9	13.8	13.8
352_1.5	341410	731931.8	1.5	18.5	18.3	18.5	12.0	12.0	12.0
353_1.5	341411.3	732269.5	1.5	28.2	27.1	27.9	14.0	13.8	13.9
354_1.5	341411.5	732151.8	1.5	37.5	37.2	37.8	16.5	16.5	16.5
355_1.5	341412.6	731986.4	1.5	19.3	19.0	19.3	12.2	12.2	12.2
356_1.5	341412.8	732191.6	1.5	31.7	31.2	31.4	14.9	14.8	14.8
357_1.5	341415.4	732199.8	1.5	31.2	30.7	30.9	14.8	14.7	14.7
358_1.5	341416.4	732286.8	1.5	29.1	27.8	28.6	14.1	13.9	14.0
359_1.5	341419.9	732214	1.5	30.9	30.3	30.5	14.7	14.6	14.6
360_1.5	341420.4	731945.4	1.5	18.5	18.3	18.5	12.0	12.0	12.0
361_1.5	341420.5	732302.4	1.5	30.4	28.9	29.9	14.4	14.1	14.3
362_1.5	341422.3	732221.6	1.5	30.8	30.1	30.4	14.6	14.6	14.5
363_1.5	341422.3	731895.5	1.5	18.0	17.8	18.0	11.9	11.9	11.9
364_1.5	341424.2	732321.9	1.5	33.3	31.4	32.4	14.9	14.7	14.8
365_1.5	341424.7	732149	1.5	35.8	35.5	36.4	16.3	16.3	16.4
366_1.5	341426.3	732337.1	1.5	35.2	32.9	34.3	15.3	15.0	15.1
367_1.5	341426.8	732235.9	1.5	30.7	30.0	30.4	14.6	14.5	14.5
368_1.5	341427.3	732344.1	1.5	36.4	33.8	35.4	15.6	15.2	15.4
369_1.5	341428.6	732239.9	1.5	30.5	29.8	30.1	14.6	14.5	14.5
370_1.5	341429.1	732357.6	1.5	39.1	35.9	37.9	16.1	15.6	15.9
371_1.5	341430.1	732244.9	1.5	30.6	29.8	30.2	14.6	14.5	14.5
372_1.5	341430.8	732367.9	1.5	42.2	38.2	40.7	16.7	16.0	16.5
373_1.5	341432.7	731965.6	1.5	18.7	18.4	18.7	12.1	12.0	12.1
374_1.5	341433.8	732258.1	1.5	31.1	30.2	30.7	14.7	14.6	14.6
375_1.5	341435.9	732265.1	1.5	31.3	30.4	30.9	14.7	14.6	14.6
376_1.5	341437.9	732271.6	1.5	31.5	30.5	31.1	14.7	14.6	14.6
377_1.5	341439.5	732155.4	1.5	30.2	29.8	30.6	14.8	14.8	14.9
378_1.5	341447.2	732280	1.5	29.4	28.3	29.0	14.2	14.1	14.1
379_1.5	341450.3	732289.7	1.5	30.0	28.8	29.6	14.3	14.2	14.2
380_1.5	341453.4	732322.6	1.5	36.0	34.3	35.2	15.6	15.4	15.4
381_1.5	341455.2	732156.9	1.5	28.7	28.3	29.1	14.5	14.4	14.6
382_1.5	341455.2	732335.4	1.5	37.8	35.8	36.8	16.0	15.7	15.8
383_1.5	341458.2	732349.5	1.5	39.8	37.3	38.8	16.4	16.0	16.2
384_1.5	341462.9	732157.6	1.5	28.1	27.7	28.6	14.4	14.3	14.4
385_1.5	341465.4	732445.8	1.5	49.9	42.1	49.6	18.5	16.9	18.5
386_1.5	341474.7	732194.4	1.5	23.3	22.7	23.3	13.1	13.0	13.0
387_1.5	341476	732189.9	1.5	23.3	22.7	23.4	13.1	13.0	13.1
388_1.5	341480.5	732209.4	1.5	22.9	22.2	22.9	12.9	12.8	12.9
389_1.5	341481.3	732428.2	1.5	48.7	44.6	49.0	18.3	17.6	18.5
390_1.5	341481.8	732217.2	1.5	22.9	22.2	22.9	12.9	12.8	12.9
391_1.5	341481.9	732497.1	1.5	43.2	32.8	43.0	16.8	14.8	16.8
392_1.5	341484.7	732514.2	1.5	42.0	31.8	42.2	16.6	14.6	16.7
393_1.5	341485.1	732228.9	1.5	23.0	22.2	22.9	12.9	12.8	12.9
394_1.5	341485.7	732239.3	1.5	23.1	22.3	23.1	12.9	12.8	12.9
395_1.5	341487.3	732532.4	1.5	40.1	30.6	40.6	16.3	14.4	16.4
396_1.5	341490.3	732552.9	1.5	37.0	28.6	37.7	15.6	14.0	15.8
397_1.5	341492.2	732566.9	1.5	35.2	27.4	36.1	15.3	13.8	15.5
398_1.5	341493.7	732357.7	1.5	36.8	34.3	36.4	15.6	15.2	15.5
399_1.5	341494.2	732260	1.5	23.5	22.5	23.5	13.0	12.8	13.0
400_1.5	341494.5	732583.3	1.5	34.0	26.6	34.9	15.1	13.7	15.3
401_1.5	341495.8	732592.1	1.5	33.6	26.4	34.7	15.1	13.7	15.2
402_1.5	341500	732276.3	1.5	24.1	23.0	24.0	13.1	12.9	13.1
403_1.5	341500.6	732282.1	1.5	24.4	23.2	24.3	13.1	13.0	13.1
404_1.5	341500.7	732627.9	1.5	33.2	26.3	34.4	15.1	13.7	15.3

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration (µg/m^3)			Annual Mean PM_{10} Concentration (µg/m^3)		
				BC	SC1	SC2	BC	SC1	SC2
405_1.5	341503.5	732650.3	1.5	32.9	26.1	34.2	15.1	13.7	15.3
406_1.5	341505.8	732300.9	1.5	25.6	24.2	25.5	13.4	13.2	13.3
407_1.5	341506.1	732666.9	1.5	32.6	25.9	33.9	15.0	13.6	15.2
408_1.5	341507.9	732681.6	1.5	32.5	25.8	33.8	15.0	13.6	15.3
409_1.5	341508.4	732211.3	1.5	22.2	21.5	22.2	12.8	12.7	12.8
410_1.5	341509.9	732695.9	1.5	32.4	25.7	33.7	15.0	13.6	15.2
411_1.5	341511.3	732704.8	1.5	32.3	25.7	33.6	15.0	13.6	15.2
412_1.5	341511.7	732232.1	1.5	22.3	21.5	22.3	12.8	12.7	12.8
413_1.5	341515.4	732718.5	1.5	31.3	25.1	32.6	14.8	13.5	15.0
414_1.5	341516.3	732177.3	1.5	22.5	22.0	22.7	13.1	13.0	13.1
415_1.5	341519.5	732252.3	1.5	22.6	21.7	22.7	12.8	12.7	12.8
416_1.5	341521.7	732349.3	1.5	32.8	30.8	33.0	14.9	14.5	14.9
417_1.5	341527.3	732273	1.5	23.3	22.2	23.3	12.9	12.8	12.9
418_1.5	341529.2	732169.1	1.5	22.5	22.0	22.7	13.2	13.1	13.2
419_1.5	341532.4	732442.9	1.5	34.4	30.6	34.3	15.0	14.4	15.0
420_1.5	341533.7	732447.8	1.5	33.7	29.8	33.6	14.9	14.2	14.9
421_1.5	341534.3	732439.1	1.5	34.5	30.9	34.5	15.1	14.5	15.1
422_1.5	341534.4	732195.1	1.5	21.8	21.2	21.8	12.8	12.7	12.8
423_1.5	341535.1	732297	1.5	24.5	23.2	24.5	13.2	13.0	13.2
424_1.5	341543	732436.4	1.5	33.6	30.3	33.6	14.9	14.3	14.9
425_1.5	341549.4	732342.9	1.5	30.4	28.7	30.9	14.5	14.2	14.6
426_1.5	341550.8	732170.5	1.5	22.0	21.5	22.1	13.1	13.0	13.1
427_1.5	341553	732444	1.5	31.6	28.4	31.6	14.5	13.9	14.5
428_1.5	341554	732433.6	1.5	32.4	29.4	32.4	14.7	14.2	14.7
429_1.5	341565.6	732247	1.5	21.9	21.1	22.0	12.7	12.6	12.7
430_1.5	341565.9	732171.3	1.5	21.8	21.3	21.9	13.1	13.0	13.1
431_1.5	341566.2	732226.3	1.5	21.5	20.8	21.6	12.7	12.6	12.7
432_1.5	341572	732336.6	1.5	28.7	27.2	29.5	14.3	14.0	14.4
433_1.5	341578.6	732280.1	1.5	22.9	21.9	23.0	12.9	12.8	12.9
434_1.5	341585.9	731898.7	1.5	19.3	19.1	19.3	12.1	12.1	12.1
435_1.5	341586.2	732422.4	1.5	29.7	27.4	29.9	14.3	13.9	14.3
436_1.5	341587.9	732428.6	1.5	29.1	26.7	29.2	14.1	13.7	14.1
437_1.5	341589.2	731876	1.5	17.7	17.5	17.7	11.8	11.8	11.8
438_1.5	341590.3	732197.7	1.5	21.1	20.5	21.2	12.7	12.6	12.7
439_1.5	341590.3	732212	1.5	21.2	20.5	21.2	12.6	12.5	12.7
440_1.5	341590.9	732226.9	1.5	21.3	20.6	21.4	12.6	12.5	12.7
441_1.5	341591.5	732242.5	1.5	21.6	20.8	21.7	12.7	12.6	12.7
442_1.5	341591.6	732332.7	1.5	28.0	26.6	28.9	14.2	14.0	14.3
443_1.5	341595.4	732263.3	1.5	22.1	21.3	22.3	12.8	12.6	12.8
444_1.5	341595.9	732458.4	1.5	27.1	24.5	27.1	13.6	13.2	13.6
445_1.5	341596.2	732418.3	1.5	29.1	26.9	29.3	14.2	13.8	14.2
446_1.5	341598.3	731914.9	1.5	21.5	21.4	21.5	12.6	12.6	12.6
447_1.5	341599.3	733038.4	1.5	25.9	21.7	25.9	13.1	12.4	13.1
448_1.5	341599.9	732176.5	1.5	21.4	20.9	21.5	13.0	12.9	13.0
449_1.5	341605.2	733049.2	1.5	24.4	20.8	24.4	12.8	12.3	12.8
450_1.5	341607.5	732415.1	1.5	28.3	26.3	28.6	14.1	13.7	14.1
451_1.5	341608.7	731923.4	1.5	21.5	21.5	21.6	12.6	12.6	12.6
452_1.5	341610.9	732175.7	1.5	21.5	21.0	21.6	13.0	12.9	13.0
453_1.5	341612.3	732326.2	1.5	27.0	25.8	28.0	14.0	13.8	14.2
454_1.5	341615.2	731931.8	1.5	22.4	22.4	22.5	12.8	12.8	12.8
455_1.5	341618.7	732412.1	1.5	27.7	25.8	27.9	14.0	13.7	14.0
456_1.5	341620.9	732420.1	1.5	27.0	25.1	27.3	13.8	13.5	13.8
457_1.5	341624.9	731940.3	1.5	22.4	22.3	22.4	12.8	12.8	12.8
458_1.5	341625.8	732175.5	1.5	21.5	21.0	21.6	13.1	13.0	13.1
459_1.5	341628.2	732322.9	1.5	26.8	25.6	27.8	14.0	13.8	14.2
460_1.5	341630.1	731873.4	1.5	17.5	17.4	17.6	11.8	11.8	11.8
461_1.5	341636.7	732176.2	1.5	21.5	21.1	21.7	13.1	13.0	13.1
462_1.5	341637.9	731949.8	1.5	21.8	21.7	21.8	12.7	12.7	12.7
463_1.5	341642.5	733010.9	1.5	21.9	19.4	21.9	12.5	12.1	12.5

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration ($\mu g/m^3$)			Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
				BC	SC1	SC2	BC	SC1	SC2
464_1.5	341642.7	731954.1	1.5	21.8	21.7	21.8	12.7	12.7	12.7
465_1.5	341642.8	733043.3	1.5	21.3	19.0	21.3	12.3	12.0	12.3
466_1.5	341644.8	732273.6	1.5	22.4	21.6	22.6	12.9	12.8	12.9
467_1.5	341645.4	732253.5	1.5	21.7	21.0	21.9	12.7	12.6	12.8
468_1.5	341645.7	731887	1.5	17.7	17.5	17.7	11.8	11.8	11.8
469_1.5	341647.8	732177.1	1.5	21.6	21.1	21.7	13.1	13.0	13.1
470_1.5	341648.6	732316.4	1.5	26.0	24.9	26.9	13.9	13.7	14.0
471_1.5	341648.7	732230.8	1.5	21.2	20.6	21.4	12.7	12.6	12.7
472_1.5	341648.7	732239.3	1.5	21.4	20.7	21.5	12.7	12.6	12.7
473_1.5	341650	732217.2	1.5	21.1	20.5	21.2	12.6	12.6	12.7
474_1.5	341654.4	732177.3	1.5	21.6	21.1	21.7	13.1	13.0	13.1
475_1.5	341656	732448.9	1.5	24.3	22.5	24.4	13.1	12.9	13.2
476_1.5	341659.3	731903.3	1.5	17.9	17.7	17.9	11.9	11.9	11.9
477_1.5	341663.8	731974.2	1.5	21.5	21.4	21.6	12.8	12.8	12.9
478_1.5	341664.5	732312.3	1.5	25.6	24.6	26.4	13.8	13.7	14.0
479_1.5	341665.1	732399.9	1.5	25.8	24.4	26.2	13.7	13.4	13.7
480_1.5	341669	731928.6	1.5	18.3	18.2	18.4	12.0	12.0	12.0
481_1.5	341669.7	731979.7	1.5	21.5	21.4	21.6	12.9	12.9	12.9
482_1.5	341671.6	732310.4	1.5	25.5	24.5	26.3	13.8	13.7	13.9
483_1.5	341678.5	732260	1.5	22.1	21.4	22.2	12.8	12.7	12.9
484_1.5	341680.3	731989.4	1.5	21.5	21.3	21.5	12.9	12.9	12.9
485_1.5	341681.6	732172.3	1.5	22.7	22.2	22.9	13.4	13.4	13.5
486_1.5	341681.8	732234.7	1.5	21.4	20.8	21.5	12.7	12.6	12.7
487_1.5	341683.1	732208.8	1.5	21.1	20.6	21.3	12.7	12.6	12.7
488_1.5	341683.3	732307.8	1.5	25.4	24.5	26.1	13.8	13.7	13.9
489_1.5	341684	731911.7	1.5	17.8	17.7	17.9	11.9	11.9	11.9
490_1.5	341684	732173.6	1.5	22.5	22.1	22.7	13.4	13.3	13.4
491_1.5	341685.1	731993.6	1.5	21.4	21.3	21.5	12.9	12.9	12.9
492_1.5	341686.9	732172.7	1.5	22.7	22.3	22.9	13.5	13.4	13.5
493_1.5	341688.5	731947.4	1.5	18.5	18.3	18.5	12.0	12.0	12.0
494_1.5	341699.1	732004.2	1.5	21.1	20.9	21.1	12.8	12.8	12.8
495_1.5	341700.3	732303.5	1.5	25.5	24.6	26.1	13.9	13.7	13.9
496_1.5	341702.4	732174.8	1.5	22.7	22.3	23.0	13.4	13.3	13.4
497_1.5	341704.1	731939.6	1.5	18.1	17.9	18.1	12.0	11.9	12.0
498_1.5	341711.1	732015.4	1.5	21.2	21.0	21.2	12.8	12.8	12.8
498_1.5	341711.1	732015.4	1.5	21.2	21.0	21.2	12.8	12.8	12.8
499_1.5	341715.2	732175.6	1.5	22.9	22.5	23.1	13.4	13.4	13.5
500_1.5	341717	732021.1	1.5	21.2	21.1	21.3	12.9	12.8	12.9
501_1.5	341718.3	732299.5	1.5	26.0	25.1	26.5	14.0	13.8	14.0
502_1.5	341722.8	732471.3	1.5	22.0	20.7	22.1	12.7	12.5	12.7
503_1.5	341723.6	731957.1	1.5	18.2	18.0	18.2	12.0	12.0	12.0
504_1.5	341725.1	732176.3	1.5	23.1	22.7	23.3	13.5	13.4	13.5
505_1.5	341726.3	732029.9	1.5	21.3	21.2	21.4	12.9	12.9	12.9
506_1.5	341729	732399	1.5	23.6	22.5	23.9	13.2	13.0	13.2
507_1.5	341731.3	732034.5	1.5	21.4	21.2	21.4	12.9	12.9	12.9
508_1.5	341731.9	732296.4	1.5	26.8	26.0	27.2	14.1	14.0	14.1
509_1.5	341735.3	732266.8	1.5	23.4	22.8	23.6	13.2	13.1	13.2
510_1.5	341736.6	732238.3	1.5	22.1	21.6	22.3	12.9	12.8	12.9
511_1.5	341737.1	732177.4	1.5	23.4	23.0	23.6	13.5	13.4	13.5
512_1.5	341737.2	732222.7	1.5	21.8	21.3	21.9	12.8	12.7	12.8
513_1.5	341739.3	732041.5	1.5	21.4	21.2	21.5	12.9	12.9	12.9
514_1.5	341743.3	732045.3	1.5	21.5	21.3	21.5	12.9	12.9	12.9
515_1.5	341743.7	731974	1.5	18.3	18.1	18.3	12.0	12.0	12.0
516_1.5	341744.2	732177.7	1.5	23.6	23.3	23.9	13.6	13.5	13.6
517_1.5	341751.8	732053.2	1.5	21.6	21.4	21.6	12.9	12.9	13.0
518_1.5	341761.5	732062.9	1.5	21.8	21.6	21.9	13.0	13.0	13.0
519_1.5	341764.5	731997.4	1.5	18.6	18.4	18.6	12.1	12.0	12.1
520_1.5	341766.2	732067.3	1.5	21.9	21.7	22.0	13.0	13.0	13.0
521_1.5	341767.1	732221.4	1.5	22.3	21.9	22.4	12.9	12.9	13.0

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration (µg/m^3)			Annual Mean PM_{10} Concentration (µg/m^3)		
				BC	SC1	SC2	BC	SC1	SC2
522_1.5	341767.4	732180.4	1.5	24.5	24.2	24.8	13.7	13.6	13.7
523_1.5	341767.7	732238.3	1.5	22.8	22.3	22.9	13.0	12.9	13.0
524_1.5	341771.3	732285	1.5	28.8	28.1	28.8	14.4	14.3	14.4
525_1.5	341775.4	732075.9	1.5	22.1	21.9	22.1	13.1	13.1	13.1
526_1.5	341776.3	732181.1	1.5	25.0	24.6	25.2	13.7	13.7	13.8
527_1.5	341778.2	732357.4	1.5	26.0	25.2	26.3	13.9	13.8	14.0
528_1.5	341780.3	732080.4	1.5	22.2	22.0	22.2	13.1	13.1	13.1
529_1.5	341784.6	732009.8	1.5	18.6	18.4	18.6	12.1	12.1	12.1
530_1.5	341785.9	732355.4	1.5	26.2	25.4	26.4	13.9	13.8	14.0
531_1.5	341788.1	732280.8	1.5	29.3	28.8	29.4	14.5	14.4	14.5
532_1.5	341788.2	732181.7	1.5	25.4	25.1	25.7	13.8	13.8	13.9
533_1.5	341791.1	732090.1	1.5	22.4	22.2	22.4	13.1	13.1	13.2
534_1.5	341793.3	732353.6	1.5	26.3	25.5	26.5	14.0	13.8	14.0
535_1.5	341794.3	732182.1	1.5	25.6	25.3	25.9	13.9	13.8	13.9
536_1.5	341796.2	732379.1	1.5	23.4	22.6	23.6	13.2	13.0	13.2
537_1.5	341800.6	732099.1	1.5	22.7	22.5	22.7	13.2	13.2	13.2
538_1.5	341800.9	732351.8	1.5	26.4	25.7	26.6	14.0	13.9	14.0
539_1.5	341805.4	732032.4	1.5	18.9	18.7	18.9	12.2	12.1	12.2
540_1.5	341805.9	732182.8	1.5	26.0	25.7	26.2	14.0	13.9	14.0
541_1.5	341806	732276.5	1.5	30.0	29.4	29.9	14.6	14.5	14.6
542_1.5	341806.2	732104.1	1.5	22.8	22.6	22.9	13.3	13.2	13.3
543_1.5	341811.1	732347.8	1.5	26.9	26.2	27.0	14.1	14.0	14.1
544_1.5	341814.3	732111.6	1.5	23.2	23.0	23.3	13.3	13.3	13.4
545_1.5	341814.7	732183.4	1.5	26.3	26.0	26.5	14.0	14.0	14.1
546_1.5	341819.2	732116.2	1.5	23.4	23.2	23.5	13.4	13.4	13.4
547_1.5	341822.1	732348.2	1.5	26.4	25.7	26.5	14.0	13.8	14.0
548_1.5	341822.3	732047.4	1.5	19.1	18.9	19.2	12.2	12.2	12.2
549_1.5	341825.5	732184.1	1.5	26.8	26.5	27.0	14.1	14.1	14.2
550_1.5	341826.2	732271.7	1.5	30.6	30.1	30.5	14.8	14.7	14.7
551_1.5	341826.7	732442.1	1.5	21.0	20.1	21.1	12.5	12.4	12.5
552_1.5	341827.1	732123.1	1.5	23.8	23.6	24.0	13.5	13.5	13.5
553_1.5	341829.6	732125.4	1.5	24.0	23.8	24.2	13.6	13.5	13.6
554_1.5	341832.3	732128	1.5	24.3	24.1	24.4	13.6	13.6	13.6
555_1.5	341832.6	732352.6	1.5	25.5	24.8	25.6	13.7	13.6	13.7
556_1.5	341835.9	732219.4	1.5	24.5	24.1	24.6	13.4	13.3	13.4
557_1.5	341837.9	732184.8	1.5	27.7	27.4	28.0	14.4	14.3	14.4
558_1.5	341840.4	732064.3	1.5	19.4	19.2	19.5	12.3	12.3	12.3
559_1.5	341841.5	732266.7	1.5	30.6	30.1	30.5	14.8	14.7	14.7
560_1.5	341846.8	732139.4	1.5	25.4	25.2	25.6	13.9	13.9	13.9
561_1.5	341846.9	732073.4	1.5	19.6	19.4	19.7	12.3	12.3	12.4
562_1.5	341851	732188.6	1.5	28.2	27.9	28.5	14.5	14.4	14.5
563_1.5	341852.3	732144.3	1.5	26.4	26.1	26.5	14.1	14.1	14.2
564_1.5	341853.3	732347.1	1.5	25.8	25.2	25.8	13.7	13.6	13.7
565_1.5	341853.6	732342.2	1.5	26.5	25.9	26.6	13.9	13.8	13.9
566_1.5	341855.3	732353.9	1.5	24.9	24.2	24.9	13.5	13.4	13.5
567_1.5	341855.4	732336.4	1.5	27.6	27.0	27.6	14.2	14.1	14.2
568_1.5	341856.8	732363.6	1.5	23.9	23.3	24.0	13.3	13.2	13.3
569_1.5	341858.3	732262.2	1.5	31.1	30.6	31.0	14.9	14.8	14.8
570_1.5	341859.4	732373.1	1.5	23.2	22.5	23.3	13.1	13.0	13.1
571_1.5	341860.4	732335.3	1.5	27.6	27.0	27.7	14.2	14.1	14.2
572_1.5	341860.6	732083.1	1.5	19.9	19.6	19.9	12.4	12.4	12.4
573_1.5	341865.3	732333.7	1.5	27.8	27.2	27.8	14.3	14.2	14.3
574_1.5	341865.3	732475.6	1.5	20.2	19.4	20.2	12.3	12.2	12.4
575_1.5	341870.1	732337.6	1.5	26.9	26.3	26.9	14.0	13.9	14.0
576_1.5	341870.3	732094.1	1.5	20.2	20.0	20.3	12.5	12.4	12.5
577_1.5	341871.2	732455.8	1.5	20.4	19.7	20.5	12.4	12.3	12.4
578_1.5	341872.8	732431.4	1.5	20.9	20.1	20.9	12.5	12.4	12.5
579_1.5	341872.8	732347.3	1.5	25.4	24.8	25.4	13.6	13.5	13.6
580_1.5	341872.9	732124	1.5	22.0	21.7	22.0	12.9	12.9	12.9

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration ($\mu g/m^3$)			Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
				BC	SC1	SC2	BC	SC1	SC2
581_1.5	341874.6	732201	1.5	29.6	29.2	29.8	14.8	14.8	14.8
582_1.5	341877	732257.1	1.5	31.8	31.4	31.7	15.0	15.0	15.0
583_1.5	341877.2	732203.1	1.5	29.7	29.3	29.9	14.8	14.8	14.9
584_1.5	341879.6	732388.9	1.5	22.2	21.5	22.3	12.8	12.7	12.8
585_1.5	341880.1	732205.6	1.5	29.8	29.4	30.0	14.8	14.8	14.9
586_1.5	341884.2	732170.8	1.5	31.0	30.7	31.2	15.4	15.3	15.4
587_1.5	341891.9	732324.7	1.5	28.8	28.3	28.9	14.5	14.4	14.5
588_1.5	341892.6	732215.9	1.5	30.8	30.5	31.1	15.1	15.0	15.1
589_1.5	341895.2	732398.3	1.5	21.7	21.1	21.8	12.7	12.6	12.7
590_1.5	341896.2	732421.4	1.5	21.0	20.3	21.1	12.6	12.4	12.6
591_1.5	341898.3	732220.7	1.5	31.7	31.3	31.9	15.2	15.2	15.3
592_1.5	341899.5	732184.4	1.5	31.3	31.0	31.5	15.4	15.4	15.5
593_1.5	341900.2	732141.5	1.5	23.0	22.7	23.1	13.1	13.1	13.1
594_1.5	341909	732229.8	1.5	34.2	33.8	34.3	15.8	15.7	15.8
595_1.5	341914	732234.1	1.5	35.7	35.4	35.8	16.1	16.0	16.1
596_1.5	341914.8	732196.8	1.5	32.3	32.0	32.5	15.6	15.6	15.6
597_1.5	341918.3	732373	1.5	22.9	22.3	22.9	13.0	12.9	13.0
598_1.5	341919	732123.4	1.5	21.2	21.0	21.3	12.7	12.6	12.7
599_1.5	341922.2	732393.6	1.5	21.9	21.3	21.9	12.8	12.7	12.8
600_1.5	341922.3	732248.7	1.5	39.0	38.7	39.0	16.9	16.8	16.9
601_1.5	341922.9	732396.4	1.5	21.8	21.2	21.8	12.7	12.6	12.7
602_1.5	341923.1	732525.9	1.5	19.3	18.6	19.4	12.2	12.0	12.2
603_1.5	341923.5	732343.8	1.5	25.4	24.9	25.4	13.6	13.5	13.6
604_1.5	341926.6	732395.6	1.5	21.8	21.2	21.9	12.7	12.6	12.7
605_1.5	341926.7	732417.8	1.5	21.1	20.5	21.2	12.6	12.5	12.6
606_1.5	341930.1	732394.6	1.5	21.9	21.3	21.9	12.8	12.7	12.8
607_1.5	341931.2	732209.8	1.5	35.1	34.8	35.3	16.2	16.1	16.2
608_1.5	341932	732144.8	1.5	22.4	22.2	22.5	13.0	12.9	13.0
609_1.5	341935.8	732499.4	1.5	19.8	19.1	19.8	12.3	12.1	12.3
610_1.5	341936.4	732493.6	1.5	19.9	19.2	20.0	12.3	12.2	12.3
611_1.5	341937.8	732478.7	1.5	20.2	19.5	20.2	12.3	12.2	12.4
612_1.5	341938.1	732483.9	1.5	20.1	19.4	20.2	12.3	12.2	12.3
613_1.5	341938.6	732472.1	1.5	20.3	19.6	20.3	12.4	12.3	12.4
614_1.5	341939.1	732096.8	1.5	20.0	19.7	20.0	12.4	12.4	12.4
615_1.5	341939.8	732392.1	1.5	22.1	21.5	22.1	12.8	12.7	12.8
616_1.5	341939.8	732466.6	1.5	20.4	19.7	20.4	12.4	12.3	12.4
617_1.5	341940.4	732456.6	1.5	20.5	19.9	20.6	12.4	12.3	12.4
618_1.5	341941.2	732450.6	1.5	20.6	20.0	20.7	12.5	12.3	12.5
619_1.5	341941.3	732435.4	1.5	20.9	20.3	20.9	12.5	12.4	12.5
620_1.5	341943.7	732393.1	1.5	22.1	21.5	22.1	12.8	12.7	12.8
621_1.5	341944.5	732221.3	1.5	40.1	39.8	40.2	17.4	17.3	17.4
622_1.5	341946.6	732377.3	1.5	22.9	22.4	22.9	13.0	12.9	13.0
623_1.5	341947.3	732379.9	1.5	22.8	22.3	22.8	13.0	12.9	13.0
624_1.5	341947.8	732392.1	1.5	22.3	21.7	22.3	12.8	12.8	12.9
625_1.5	341948.9	732163.6	1.5	23.7	23.5	23.8	13.3	13.2	13.3
626_1.5	341949.1	732347.3	1.5	25.3	24.8	25.3	13.5	13.5	13.5
627_1.5	341951.1	732391.1	1.5	22.5	21.9	22.5	12.9	12.8	12.9
628_1.5	341952	732378.6	1.5	23.1	22.5	23.1	13.0	13.0	13.0
629_1.5	341952.8	732381.7	1.5	23.0	22.5	23.0	13.0	12.9	13.0
630_1.5	341953.7	732384.9	1.5	22.9	22.4	23.0	13.0	12.9	13.0
631_1.5	341954.7	732118.1	1.5	20.7	20.5	20.8	12.6	12.5	12.6
632_1.5	341956.7	732075.9	1.5	19.4	19.1	19.4	12.2	12.2	12.3
633_1.5	341957.5	732492.1	1.5	20.5	19.8	20.5	12.4	12.3	12.4
634_1.5	341961.8	732485.6	1.5	20.3	19.7	20.4	12.4	12.3	12.4
635_1.5	341962.5	732479.8	1.5	20.4	19.8	20.5	12.4	12.3	12.4
636_1.5	341962.9	732465.7	1.5	20.7	20.1	20.8	12.5	12.4	12.5
637_1.5	341963.7	732458.9	1.5	20.8	20.2	20.9	12.5	12.4	12.5
638_1.5	341966.4	732165.6	1.5	23.7	23.5	23.8	13.2	13.2	13.3
639_1.5	341966.5	732444.8	1.5	21.0	20.4	21.1	12.5	12.4	12.5

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration ($\mu g/m^3$)			Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
				BC	SC1	SC2	BC	SC1	SC2
640_1.5	341967.1	732438.7	1.5	21.1	20.5	21.2	12.6	12.5	12.6
641_1.5	341971.3	732217.4	1.5	35.7	35.5	35.7	16.1	16.0	16.1
642_1.5	341971.9	732425.1	1.5	21.3	20.7	21.3	12.6	12.5	12.6
643_1.5	341974.8	732129.2	1.5	21.2	20.9	21.2	12.7	12.6	12.7
644_1.5	341974.9	732368.9	1.5	23.9	23.4	23.9	13.3	13.2	13.2
645_1.5	341976.2	732354.9	1.5	25.1	24.7	25.1	13.5	13.4	13.5
646_1.5	341976.9	732349	1.5	25.8	25.3	25.8	13.7	13.6	13.7
647_1.5	341978.3	732197.2	1.5	28.5	28.2	28.6	14.3	14.3	14.3
648_1.5	341978.4	732336.7	1.5	27.6	27.2	27.6	14.1	14.0	14.1
649_1.5	341978.9	732330.8	1.5	28.8	28.5	28.9	14.4	14.3	14.4
650_1.5	341980.2	732190.3	1.5	27.1	26.8	27.2	14.0	14.0	14.0
651_1.5	341980.9	732510.6	1.5	19.3	18.7	19.4	12.2	12.1	12.2
652_1.5	341981.3	732089.6	1.5	19.7	19.5	19.8	12.3	12.3	12.3
653_1.5	341983.8	732409.3	1.5	21.5	20.9	21.5	12.7	12.6	12.7
654_1.5	341984.7	732174.6	1.5	24.8	24.6	24.9	13.5	13.5	13.5
655_1.5	341987.2	732026.6	1.5	18.5	18.3	18.5	12.1	12.0	12.1
656_1.5	341987.2	732045.4	1.5	18.8	18.6	18.8	12.1	12.1	12.1
657_1.5	341990	732493.8	1.5	19.5	18.9	19.6	12.2	12.1	12.2
658_1.5	341992.4	732003.9	1.5	18.2	18.0	18.2	12.0	12.0	12.0
659_1.5	341996.3	732142.8	1.5	22.0	21.8	22.0	12.9	12.9	12.9
660_1.5	341996.5	732478.8	1.5	19.7	19.1	19.7	12.3	12.2	12.3
661_1.5	341997.8	732365.5	1.5	23.8	23.3	23.8	13.2	13.1	13.2
662_1.5	341997.9	732130.1	1.5	21.3	21.0	21.3	12.7	12.7	12.7
663_1.5	341999.5	731982.4	1.5	18.0	17.8	18.0	11.9	11.9	11.9
664_1.5	341999.8	732397.6	1.5	21.8	21.3	21.8	12.7	12.6	12.7
665_1.5	342001.7	732217.2	1.5	35.3	35.1	35.4	16.0	16.0	16.0
666_1.5	342001.9	732114.1	1.5	20.6	20.4	20.6	12.6	12.5	12.6
667_1.5	342002.8	731966.3	1.5	17.8	17.6	17.8	11.9	11.9	11.9
668_1.5	342004.3	732208.6	1.5	31.9	31.6	31.9	15.1	15.1	15.2
669_1.5	342004.3	732454.4	1.5	20.1	19.5	20.1	12.3	12.2	12.3
670_1.5	342005	732103.4	1.5	20.3	20.1	20.3	12.5	12.5	12.5
671_1.5	342007.1	732324.8	1.5	31.8	31.5	31.8	15.0	14.9	15.0
672_1.5	342009.2	732191	1.5	27.8	27.5	27.8	14.2	14.1	14.2
673_1.5	342009.9	731946.1	1.5	17.6	17.4	17.6	11.8	11.8	11.8
674_1.5	342010.9	732184.9	1.5	26.8	26.6	26.8	14.0	13.9	14.0
675_1.5	342011.1	732435.3	1.5	20.5	19.9	20.5	12.4	12.3	12.4
676_1.5	342011.7	732328.9	1.5	30.7	30.4	30.7	14.7	14.7	14.7
677_1.5	342012.1	732363.3	1.5	24.1	23.7	24.1	13.2	13.2	13.2
678_1.5	342015.5	732167.6	1.5	24.6	24.4	24.6	13.5	13.5	13.5
679_1.5	342015.8	731921.4	1.5	17.4	17.2	17.4	11.8	11.8	11.8
680_1.5	342017.1	732069.9	1.5	20.0	19.8	20.0	12.4	12.4	12.5
681_1.5	342019.8	732043.8	1.5	19.4	19.2	19.4	12.3	12.3	12.3
682_1.5	342021	732337.5	1.5	28.8	28.4	28.7	14.3	14.2	14.3
683_1.5	342021.2	732148.3	1.5	22.5	22.3	22.5	13.1	13.0	13.1
684_1.5	342024.8	732025.9	1.5	19.1	18.9	19.1	12.2	12.2	12.2
685_1.5	342024.8	731897.4	1.5	17.2	17.0	17.2	11.7	11.7	11.7
686_1.5	342025.7	732341.6	1.5	28.0	27.7	28.0	14.1	14.1	14.1
687_1.5	342025.9	732131.4	1.5	21.5	21.3	21.5	12.9	12.8	12.9
688_1.5	342027.7	732299	1.5	47.6	47.5	47.6	19.4	19.4	19.4
689_1.5	342027.9	732007.5	1.5	18.7	18.6	18.7	12.1	12.1	12.1
690_1.5	342029.5	732389.8	1.5	22.2	21.8	22.2	12.8	12.8	12.8
691_1.5	342029.9	732290.9	1.5	43.7	43.5	43.7	18.2	18.1	18.2
692_1.5	342030.9	732304.8	1.5	50.1	50.0	50.0	20.2	20.2	20.2
693_1.5	342031.4	732112.4	1.5	20.8	20.5	20.8	12.7	12.7	12.7
694_1.5	342032.2	732282.4	1.5	44.7	44.6	44.7	18.5	18.5	18.5
695_1.5	342032.2	732434.6	1.5	20.5	20.0	20.5	12.4	12.3	12.4
696_1.5	342034.5	731992.3	1.5	18.6	18.5	18.6	12.0	12.0	12.1
697_1.5	342036.1	732307.4	1.5	46.5	46.4	46.4	19.1	19.0	19.1
698_1.5	342036.9	732350.9	1.5	26.7	26.4	26.7	13.9	13.8	13.8

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration ($\mu g/m^3$)			Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
				BC	SC1	SC2	BC	SC1	SC2
699_1.5	342038.7	732280.1	1.5	43.8	43.7	43.9	18.2	18.2	18.2
700_1.5	342040.2	731976.9	1.5	18.4	18.3	18.4	12.0	12.0	12.0
701_1.5	342041.6	732312.3	1.5	44.9	44.7	44.8	18.6	18.6	18.6
702_1.5	342041.9	731966.2	1.5	18.1	18.0	18.1	11.9	11.9	11.9
703_1.5	342044.5	732278.9	1.5	42.9	42.7	42.9	17.9	17.9	18.0
704_1.5	342047	731947.8	1.5	17.7	17.5	17.7	11.8	11.8	11.9
705_1.5	342047.8	732382.1	1.5	23.1	22.7	23.1	13.0	13.0	13.0
706_1.5	342048.8	732440.5	1.5	20.4	19.9	20.4	12.4	12.3	12.4
707_1.5	342050.7	732277.9	1.5	41.7	41.6	41.8	17.6	17.6	17.7
708_1.5	342053.8	732036.1	1.5	20.1	20.0	20.1	12.5	12.5	12.5
709_1.5	342054.2	732314.8	1.5	36.3	36.0	36.2	16.3	16.2	16.2
710_1.5	342054.3	731927.4	1.5	17.4	17.3	17.4	11.8	11.8	11.8
711_1.5	342055.7	732029.4	1.5	20.0	19.8	20.0	12.4	12.4	12.4
712_1.5	342056	732089.6	1.5	19.9	19.7	19.9	12.4	12.4	12.4
713_1.5	342059	731913.3	1.5	17.3	17.1	17.3	11.8	11.7	11.8
714_1.5	342062.6	731902.8	1.5	17.2	17.1	17.2	11.7	11.7	11.8
715_1.5	342065.5	732280.9	1.5	36.9	36.7	37.0	16.4	16.3	16.4
716_1.5	342066.6	732444.4	1.5	20.4	19.9	20.4	12.4	12.3	12.4
717_1.5	342067.9	732300.9	1.5	32.5	32.3	32.5	15.2	15.2	15.2
718_1.5	342068.1	732280.3	1.5	36.6	36.4	36.7	16.3	16.3	16.3
719_1.5	342069.3	732381.2	1.5	24.2	23.8	24.1	13.3	13.2	13.3
720_1.5	342072.9	732279.3	1.5	36.0	35.8	36.1	16.1	16.1	16.2
721_1.5	342072.9	731875.6	1.5	17.0	16.9	17.0	11.7	11.7	11.7
722_1.5	342073.3	732336.6	1.5	33.8	33.5	33.5	15.8	15.8	15.8
723_1.5	342077.7	732278.1	1.5	35.5	35.3	35.6	16.0	16.0	16.0
724_1.5	342082.2	732334	1.5	30.3	30.0	30.1	14.8	14.8	14.8
725_1.5	342082.3	732277.1	1.5	35.1	34.9	35.1	15.9	15.9	15.9
726_1.5	342082.8	732456.4	1.5	20.2	19.7	20.2	12.4	12.3	12.4
727_1.5	342083.9	732390.9	1.5	24.0	23.5	23.9	13.3	13.2	13.2
728_1.5	342085.4	732276.4	1.5	34.7	34.5	34.8	15.8	15.8	15.8
729_1.5	342089.2	732395.4	1.5	23.8	23.4	23.7	13.2	13.1	13.2
730_1.5	342090.7	732275.3	1.5	34.3	34.1	34.3	15.7	15.7	15.7
731_1.5	342091.5	731836.6	1.5	16.8	16.7	16.9	11.7	11.7	11.7
732_1.5	342092.6	732332.8	1.5	28.3	28.0	28.2	14.3	14.3	14.3
733_1.5	342094	731830.5	1.5	16.8	16.7	16.8	11.7	11.6	11.7
734_1.5	342094.5	732298.3	1.5	29.2	29.0	29.3	14.5	14.4	14.5
735_1.5	342096.2	732273.9	1.5	33.8	33.6	33.9	15.6	15.6	15.6
736_1.5	342096.3	731937	1.5	17.4	17.3	17.4	11.8	11.8	11.8
737_1.5	342097.8	732462.6	1.5	20.2	19.7	20.2	12.4	12.3	12.4
738_1.5	342099.1	732405.1	1.5	23.4	23.0	23.3	13.1	13.0	13.1
739_1.5	342103.8	732409.1	1.5	23.3	22.9	23.3	13.1	13.0	13.1
740_1.5	342105.3	732341.2	1.5	27.0	26.7	26.9	14.0	14.0	14.0
741_1.5	342107	732271.6	1.5	32.9	32.7	33.0	15.4	15.4	15.4
742_1.5	342112.7	732270.3	1.5	32.5	32.3	32.6	15.3	15.3	15.3
743_1.5	342114.7	732338.1	1.5	26.0	25.6	25.9	13.7	13.7	13.7
744_1.5	342114.9	732417.5	1.5	23.3	22.9	23.2	13.1	13.0	13.1
745_1.5	342117.6	732269.2	1.5	32.1	31.9	32.2	15.2	15.2	15.3
746_1.5	342120.3	732422.1	1.5	23.2	22.8	23.2	13.1	13.0	13.1
747_1.5	342121.2	732298.6	1.5	26.9	26.6	26.9	13.9	13.9	13.9
748_1.5	342121.8	732268.3	1.5	31.8	31.6	31.9	15.2	15.1	15.2
749_1.5	342124.9	732372.3	1.5	27.5	27.1	27.3	14.2	14.1	14.2
750_1.5	342128.3	732361	1.5	25.6	25.2	25.5	13.7	13.6	13.7
751_1.5	342128.5	732266.7	1.5	31.2	31.0	31.3	15.1	15.0	15.1
752_1.5	342128.6	732482.7	1.5	20.0	19.6	20.0	12.3	12.2	12.3
753_1.5	342128.8	732376.4	1.5	27.5	27.1	27.3	14.2	14.1	14.2
754_1.5	342130.6	732432.1	1.5	23.1	22.7	23.1	13.0	12.9	13.0
755_1.5	342132.7	732188	1.5	25.4	25.1	25.5	13.7	13.7	13.7
756_1.5	342133.4	732265.6	1.5	30.8	30.6	30.9	15.0	14.9	15.0
757_1.5	342135	732435.9	1.5	23.2	22.8	23.1	13.0	12.9	13.0

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration ($\mu g/m^3$)			Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
				BC	SC1	SC2	BC	SC1	SC2
758_1.5	342137.6	732264.7	1.5	30.4	30.1	30.4	14.9	14.9	14.9
759_1.5	342138.4	732295.4	1.5	26.0	25.7	26.0	13.7	13.7	13.7
760_1.5	342141.7	732385.1	1.5	26.6	26.2	26.5	14.0	13.9	14.0
761_1.5	342142.8	732263.5	1.5	29.7	29.5	29.8	14.8	14.8	14.8
762_1.5	342143.4	732386.6	1.5	26.6	26.2	26.5	14.0	13.9	13.9
763_1.5	342146.2	732488.6	1.5	20.2	19.7	20.2	12.3	12.3	12.3
764_1.5	342148.9	732391.4	1.5	26.5	26.1	26.4	13.9	13.9	13.9
765_1.5	342150.3	732392.6	1.5	26.5	26.1	26.3	13.9	13.9	13.9
766_1.5	342150.7	732358.7	1.5	23.8	23.5	23.7	13.2	13.2	13.2
767_1.5	342152.9	732261.1	1.5	28.5	28.3	28.6	14.6	14.5	14.6
768_1.5	342157.6	732260	1.5	28.0	27.8	28.1	14.5	14.4	14.5
769_1.5	342157.8	732503.1	1.5	19.8	19.4	19.9	12.3	12.2	12.3
770_1.5	342159.3	732181.8	1.5	24.6	24.4	24.8	13.6	13.5	13.6
771_1.5	342164	732285	1.5	25.1	24.8	25.1	13.6	13.6	13.6
772_1.5	342164.3	732258.6	1.5	27.4	27.1	27.5	14.4	14.3	14.4
773_1.5	342164.9	732461.6	1.5	23.3	22.9	23.2	13.0	12.9	13.0
774_1.5	342165.1	732401.6	1.5	25.8	25.5	25.7	13.7	13.7	13.7
775_1.5	342169.4	732465.7	1.5	23.2	22.8	23.1	13.0	12.9	12.9
776_1.5	342170.5	732406.5	1.5	26.0	25.7	25.9	13.7	13.7	13.7
777_1.5	342171.1	732514.8	1.5	19.7	19.3	19.7	12.2	12.1	12.2
778_1.5	342172.9	732256.6	1.5	26.7	26.4	26.8	14.2	14.2	14.3
779_1.5	342177.6	732380.8	1.5	23.0	22.6	22.9	13.0	13.0	13.0
780_1.5	342178.9	732255.3	1.5	26.3	26.0	26.4	14.2	14.1	14.2
781_1.5	342180.5	732474.6	1.5	23.2	22.8	23.2	12.9	12.9	12.9
782_1.5	342183.8	732254.3	1.5	26.0	25.8	26.1	14.1	14.1	14.1
783_1.5	342184.4	732350.6	1.5	22.4	22.0	22.3	12.9	12.8	12.9
784_1.5	342184.8	732285.3	1.5	23.9	23.7	24.0	13.3	13.3	13.3
785_1.5	342185.6	732479	1.5	23.2	22.8	23.1	12.9	12.9	12.9
786_1.5	342186.4	732364.6	1.5	22.3	22.0	22.3	12.9	12.8	12.9
787_1.5	342186.7	732530.8	1.5	19.4	19.0	19.4	12.1	12.1	12.1
788_1.5	342191.7	732252.4	1.5	25.6	25.4	25.7	14.0	14.0	14.1
789_1.5	342193.7	732180.9	1.5	25.3	25.0	25.5	13.8	13.8	13.9
790_1.5	342194.7	732433.5	1.5	28.5	28.2	28.4	14.2	14.1	14.2
791_1.5	342195.8	732251.6	1.5	25.4	25.2	25.5	14.0	14.0	14.0
792_1.5	342196	732488.8	1.5	22.9	22.5	22.8	12.9	12.8	12.9
793_1.5	342198.3	732437.1	1.5	28.7	28.4	28.5	14.2	14.2	14.2
794_1.5	342200	732282.4	1.5	23.3	23.1	23.4	13.2	13.2	13.2
795_1.5	342200.6	732492.8	1.5	22.8	22.4	22.8	12.8	12.8	12.8
796_1.5	342202	732250.2	1.5	25.2	24.9	25.3	14.0	13.9	14.0
797_1.5	342208.6	732248.8	1.5	25.0	24.7	25.1	13.9	13.9	13.9
798_1.5	342212.2	732501.3	1.5	22.8	22.4	22.8	12.8	12.7	12.8
799_1.5	342213.4	732449.4	1.5	28.3	28.0	28.2	14.1	14.1	14.1
800_1.5	342213.8	732247.6	1.5	24.8	24.5	24.9	13.9	13.8	13.9
801_1.5	342214.9	732450.8	1.5	28.3	28.0	28.2	14.1	14.1	14.1
802_1.5	342216	732504.6	1.5	22.7	22.3	22.7	12.8	12.7	12.8
803_1.5	342218.5	732246.6	1.5	24.7	24.4	24.8	13.9	13.8	13.9
804_1.5	342220.2	732455.3	1.5	28.3	27.9	28.1	14.1	14.0	14.1
805_1.5	342221.7	732456.8	1.5	28.3	27.9	28.1	14.1	14.0	14.1
806_1.5	342222.4	732424.3	1.5	22.8	22.5	22.8	12.9	12.9	12.9
807_1.5	342224.2	732245.3	1.5	24.5	24.2	24.6	13.8	13.8	13.9
808_1.5	342225	732280.5	1.5	22.5	22.2	22.5	13.1	13.0	13.1
809_1.5	342229.8	732244	1.5	24.4	24.1	24.5	13.8	13.8	13.8
810_1.5	342230	732460.1	1.5	26.9	26.6	26.8	13.8	13.7	13.8
811_1.5	342231.2	732521	1.5	21.7	21.3	21.7	12.6	12.5	12.6
812_1.5	342231.5	732552.8	1.5	19.1	18.8	19.1	12.1	12.0	12.1
813_1.5	342233.2	732525.9	1.5	21.2	20.8	21.2	12.5	12.4	12.5
814_1.5	342233.5	732542.1	1.5	19.8	19.4	19.7	12.2	12.1	12.2
815_1.5	342238.5	732469.6	1.5	27.4	27.1	27.3	13.9	13.8	13.8
816_1.5	342239	732242.1	1.5	24.2	23.9	24.3	13.8	13.7	13.8

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration (µg/m^3)			Annual Mean PM_{10} Concentration (µg/m^3)		
				BC	SC1	SC2	BC	SC1	SC2
817_1.5	342239.9	732470.9	1.5	27.3	27.0	27.2	13.8	13.8	13.8
818_1.5	342243.1	732241.1	1.5	24.1	23.8	24.2	13.8	13.7	13.8
819_1.5	342243.9	732272	1.5	22.2	22.0	22.3	13.0	13.0	13.0
820_1.5	342245.8	732473.8	1.5	26.6	26.2	26.5	13.7	13.6	13.6
821_1.5	342248.2	732239.9	1.5	24.0	23.7	24.1	13.7	13.7	13.8
822_1.5	342254.2	732238.6	1.5	23.9	23.6	24.0	13.7	13.7	13.7
823_1.5	342255.2	732445.1	1.5	22.0	21.6	21.9	12.7	12.7	12.7
824_1.5	342262.9	732236.8	1.5	23.7	23.5	23.8	13.7	13.6	13.7
825_1.5	342264	732472.6	1.5	23.3	22.9	23.2	12.9	12.9	12.9
826_1.5	342269.8	732260.3	1.5	22.0	21.7	22.0	13.0	13.0	13.0
827_1.5	342270.4	732241.5	1.5	23.1	22.8	23.1	13.4	13.4	13.4
828_1.5	342271.5	732246.3	1.5	22.7	22.4	22.8	13.3	13.2	13.3
829_1.5	342272.4	732250.1	1.5	22.4	22.2	22.5	13.2	13.1	13.2
830_1.5	342297.3	732235.9	1.5	22.7	22.4	22.8	13.4	13.3	13.4
831_1.5	342299.1	732244.1	1.5	22.1	21.8	22.2	13.1	13.1	13.1
832_1.5	342301.8	732228.3	1.5	23.3	23.0	23.4	13.6	13.6	13.6
833_1.5	342306.2	732255.4	1.5	21.4	21.1	21.4	12.9	12.8	12.9
834_1.5	342310.6	732226.3	1.5	23.2	22.9	23.3	13.6	13.5	13.6
835_1.5	342313.7	732225.6	1.5	23.1	22.9	23.2	13.6	13.5	13.6
836_1.5	342320	732224.3	1.5	23.1	22.8	23.2	13.6	13.5	13.6
837_1.5	342323.5	732223.5	1.5	23.1	22.8	23.2	13.6	13.5	13.6
838_1.5	342326.9	732222.8	1.5	23.0	22.8	23.1	13.5	13.5	13.6
839_1.5	342328.2	732148.9	1.5	23.6	23.3	23.7	13.4	13.4	13.5
840_1.5	342331.8	732249.6	1.5	21.1	20.9	21.2	12.8	12.8	12.8
841_1.5	342336.8	732220.4	1.5	23.0	22.7	23.1	13.5	13.5	13.6
842_1.5	342342.4	732219.3	1.5	22.9	22.7	23.0	13.5	13.5	13.5
843_1.5	342348.9	732217.8	1.5	22.9	22.6	23.0	13.5	13.5	13.5
844_1.5	342354.6	732216.5	1.5	22.8	22.6	22.9	13.5	13.5	13.5
845_1.5	342357.5	732215.9	1.5	22.8	22.6	22.9	13.5	13.5	13.5
846_1.5	342362.8	732214.8	1.5	22.8	22.5	22.9	13.5	13.5	13.5
847_1.5	342367.5	732213.8	1.5	22.7	22.5	22.9	13.5	13.5	13.5
848_1.5	342368.5	732246.4	1.5	20.7	20.4	20.7	12.7	12.7	12.7
849_1.5	342374.9	732212.1	1.5	22.7	22.5	22.8	13.5	13.4	13.5
850_1.5	342379.6	732210.5	1.5	22.7	22.5	22.8	13.5	13.5	13.5
851_1.5	342380.4	732214.4	1.5	22.3	22.1	22.4	13.3	13.3	13.3
852_1.5	342381.7	732210	1.5	22.7	22.5	22.8	13.5	13.5	13.5
853_1.5	342384	732210.2	1.5	22.6	22.4	22.8	13.5	13.4	13.5
854_1.5	342385.1	732242.2	1.5	20.6	20.4	20.6	12.7	12.7	12.7
855_1.5	342387.1	732209.6	1.5	22.6	22.4	22.7	13.5	13.4	13.5
856_1.5	342390.8	732009.7	1.5	17.8	17.7	17.9	11.9	11.9	11.9
857_1.5	342391.2	732208.6	1.5	22.6	22.4	22.7	13.5	13.4	13.5
858_1.5	342396.8	732207.4	1.5	22.6	22.3	22.7	13.5	13.4	13.5
859_1.5	342402.1	732215.6	1.5	21.7	21.5	21.8	13.1	13.1	13.1
860_1.5	342402.8	732206	1.5	22.6	22.3	22.7	13.5	13.4	13.5
861_1.5	342406.5	732232.8	1.5	20.7	20.4	20.7	12.7	12.7	12.8
862_1.5	342407.8	732204.9	1.5	22.5	22.3	22.6	13.4	13.4	13.5
863_1.5	342412.8	732203.8	1.5	22.5	22.3	22.6	13.4	13.4	13.5
864_1.5	342418.3	732204.1	1.5	22.3	22.1	22.4	13.4	13.3	13.4
865_1.5	342419	732207.1	1.5	22.0	21.8	22.1	13.3	13.2	13.3
866_1.5	342419.8	732210.2	1.5	21.7	21.5	21.8	13.1	13.1	13.2
867_1.5	342424.3	732233.8	1.5	20.4	20.2	20.4	12.7	12.6	12.7
868_1.5	342425.3	732200.9	1.5	22.5	22.3	22.6	13.4	13.4	13.5
869_1.5	342430.4	732199.9	1.5	22.4	22.2	22.6	13.4	13.4	13.4
870_1.5	342436.4	732198.6	1.5	22.4	22.2	22.5	13.4	13.4	13.4
871_1.5	342443	732230.5	1.5	20.3	20.0	20.3	12.6	12.6	12.6
872_1.5	342445.7	732196.4	1.5	22.4	22.2	22.5	13.4	13.4	13.4
873_1.5	342446.3	732135.6	1.5	27.3	27.0	27.5	14.5	14.5	14.5
874_1.5	342450.4	732195.3	1.5	22.4	22.2	22.5	13.4	13.4	13.4
875_1.5	342455.6	732194.2	1.5	22.4	22.2	22.5	13.4	13.4	13.4

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration ($\mu g/m^3$)			Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
				BC	SC1	SC2	BC	SC1	SC2
876_1.5	342458.6	732227.9	1.5	20.2	19.9	20.2	12.6	12.6	12.6
877_1.5	342461.2	732192.9	1.5	22.4	22.2	22.5	13.4	13.4	13.4
878_1.5	342465.8	732191.9	1.5	22.4	22.2	22.5	13.4	13.4	13.4
879_1.5	342473.6	732190.1	1.5	22.4	22.1	22.5	13.4	13.4	13.4
880_1.5	342477.5	731878.4	1.5	16.9	16.8	16.9	11.7	11.7	11.7
881_1.5	342477.6	732189.1	1.5	22.4	22.1	22.5	13.4	13.4	13.4
882_1.5	342484.1	732187.7	1.5	22.3	22.1	22.4	13.4	13.4	13.4
883_1.5	342489.8	732186.5	1.5	22.3	22.1	22.4	13.4	13.3	13.4
884_1.5	342493	732185.7	1.5	22.3	22.1	22.4	13.4	13.3	13.4
885_1.5	342495.6	732212.3	1.5	20.3	20.1	20.4	12.7	12.6	12.7
886_1.5	342496.8	732184.9	1.5	22.3	22.1	22.4	13.4	13.3	13.4
887_1.5	342501.8	732183.8	1.5	22.3	22.1	22.4	13.4	13.3	13.4
888_1.5	342506.5	732182.9	1.5	22.2	22.0	22.3	13.4	13.3	13.4
889_1.5	342515.1	732106.7	1.5	23.9	23.7	24.0	13.5	13.4	13.5
890_1.5	342566.7	732091.8	1.5	24.4	24.3	24.6	13.5	13.5	13.6
891_1.5	342575.5	731862.4	1.5	16.9	16.8	16.9	11.7	11.7	11.7
892_1.5	342610.5	732171.8	1.5	20.6	20.5	20.7	12.7	12.7	12.7
893_1.5	342617	732183.4	1.5	19.9	19.7	20.0	12.5	12.5	12.5
894_1.5	342638.6	732163.8	1.5	20.4	20.3	20.5	12.6	12.6	12.6
895_1.5	342678.5	732027.7	1.5	25.5	25.4	25.4	13.5	13.5	13.5
896_1.5	342700.4	732188	1.5	18.8	18.6	18.8	12.2	12.1	12.2
897_1.5	342714.7	732137.6	1.5	20.3	20.2	20.4	12.5	12.5	12.5
898_1.5	342716.8	732100.4	1.5	24.2	24.1	24.2	13.5	13.5	13.5
899_1.5	342735.6	732083.3	1.5	27.1	27.0	27.0	14.1	14.1	14.1
900_1.5	342747.5	732135.7	1.5	19.9	19.8	19.9	12.4	12.4	12.4
901_1.5	342798.9	732075.4	1.5	21.8	21.7	21.8	12.8	12.7	12.7
234_4.5	341269.6	732415.6	4.5	33.2	27.4	33.4	15.0	13.9	15.1
252_4.5	341287.2	732411	4.5	34.5	28.2	34.5	15.2	14.1	15.2
268_4.5	341302.2	732408.1	4.5	35.9	29.2	35.7	15.5	14.2	15.4
289_4.5	341323.8	732401.4	4.5	36.9	29.8	36.1	15.6	14.3	15.4
301_4.5	341339.1	732397.6	4.5	37.8	30.5	36.6	15.7	14.4	15.5
321_4.5	341358.3	732392.8	4.5	38.3	31.4	37.0	15.8	14.5	15.6
325_4.5	341362.4	732126.3	4.5	31.1	30.7	31.4	14.9	14.8	14.9
329_4.5	341370.3	732150.8	4.5	30.0	29.6	30.2	14.6	14.5	14.6
335_4.5	341376.5	732387.8	4.5	38.0	32.0	36.9	15.8	14.6	15.5
339_4.5	341392.1	732115.8	4.5	30.6	30.2	30.7	14.7	14.6	14.7
342_4.5	341394.1	732383.5	4.5	38.0	32.8	37.1	15.7	14.8	15.5
343_4.5	341394.8	732126.8	4.5	35.9	35.6	36.0	16.0	16.0	16.0
354_4.5	341411.5	732151.8	4.5	32.2	31.8	32.3	15.1	15.1	15.2
368_4.5	341427.3	732344.1	4.5	32.3	29.8	31.6	14.6	14.3	14.5
370_4.5	341429.1	732357.6	4.5	34.7	31.6	33.9	15.1	14.6	15.0
372_4.5	341430.8	732367.9	4.5	37.3	33.7	36.4	15.6	15.0	15.5
380_4.5	341453.4	732322.6	4.5	31.8	30.0	31.2	14.7	14.4	14.5
382_4.5	341455.2	732335.4	4.5	33.4	31.3	32.7	15.0	14.7	14.8
383_4.5	341458.2	732349.5	4.5	35.4	33.0	34.7	15.4	15.0	15.2
385_4.5	341465.4	732445.8	4.5	46.3	39.1	45.9	17.7	16.2	17.6
389_4.5	341481.3	732428.2	4.5	44.6	40.5	44.8	17.4	16.6	17.5
391_4.5	341481.9	732497.1	4.5	40.3	31.1	40.1	16.2	14.4	16.2
392_4.5	341484.7	732514.2	4.5	39.0	30.0	39.1	16.0	14.2	16.0
395_4.5	341487.3	732532.4	4.5	37.1	28.8	37.4	15.6	14.0	15.7
396_4.5	341490.3	732552.9	4.5	34.2	27.0	34.8	15.1	13.7	15.2
397_4.5	341492.2	732566.9	4.5	32.6	25.9	33.2	14.8	13.5	14.9
398_4.5	341493.7	732357.7	4.5	34.3	32.0	34.0	15.1	14.7	15.0
600_4.5	341922.3	732248.7	4.5	34.6	34.3	34.6	15.8	15.7	15.8
621_4.5	341944.5	732221.3	4.5	34.7	34.4	34.7	15.9	15.9	15.9
688_4.5	342027.7	732299	4.5	38.9	38.7	38.9	16.9	16.9	16.9
691_4.5	342029.9	732290.9	4.5	38.5	38.3	38.5	16.8	16.8	16.8
692_4.5	342030.9	732304.8	4.5	38.3	38.1	38.3	16.8	16.7	16.8
694_4.5	342032.2	732282.4	4.5	39.5	39.3	39.5	17.1	17.1	17.1

Receptor name	X(m)	Y(m)	Z(m)	Annual Mean NO_2 Concentration (µg/m^3)			Annual Mean PM_{10} Concentration (µg/m^3)		
				BC	SC1	SC2	BC	SC1	SC2
697_4.5	342036.1	732307.4	4.5	37.1	36.9	38.1	16.4	16.4	16.4
699_4.5	342038.7	732280.1	4.5	38.9	38.7	38.9	16.9	16.9	17.0
701_4.5	342041.6	732312.3	4.5	35.9	35.6	35.8	16.1	16.1	16.1
703_4.5	342044.5	732278.9	4.5	38.2	38.0	38.2	16.8	16.7	16.8
707_4.5	342050.7	732277.9	4.5	37.4	37.2	37.5	16.5	16.5	16.6
709_4.5	342054.2	732314.8	4.5	32.6	32.4	32.6	15.3	15.3	15.3
715_4.5	342065.5	732280.9	4.5	34.2	34.0	34.2	15.7	15.7	15.7
718_4.5	342068.1	732280.3	4.5	33.9	33.7	34.0	15.6	15.6	15.7
720_4.5	342072.9	732279.3	4.5	33.5	33.3	33.5	15.5	15.5	15.5
354_7.5	341411.5	732151.8	7.5	26.2	25.8	26.3	13.7	13.7	13.7

Appendix 4 – ADMS Model Verification

The ADMS-Roads dispersion model has been widely validated for this type of assessment and is specifically listed in the Defra's LAQM.TG(09)[5] guidance as an accepted dispersion model.

Model validation undertaken by the software developer (CERC) will not have included validation in the vicinity of the proposed development site. It is therefore necessary to perform a comparison of modelled results with local monitoring data at relevant locations. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results.

The predicted results from a dispersion model may differ from measured concentrations for a large number of reasons, including uncertainties associated with:

- Background concentration estimates;
- Source activity data such as traffic flows and emissions factors;
- Monitoring data, including locations; and
- Overall model limitations.

Model verification is the process by which these and other uncertainties are investigated and where possible minimised. In reality, the differences between modelled and monitored results are likely to be a combination of all of these aspects.

Model setup parameters and input data were checked prior to running the models in order to reduce these uncertainties. The following were checked to the extent possible to ensure accuracy:

- Traffic data;
- Distance between sources and monitoring as represented in the model;
- Speed estimates on roads;
- Background monitoring and background estimates; and
- Monitoring data.

Traffic data was obtained from the Council as detailed in Section 4.1. Separation distances between road sources and receptors were checked using electronic OS mapping data.

NO_2 Verification

Dundee City Council, operates an extensive network of automatic and passive NO_2 monitoring as part of its LAQM commitment. Details of the six LAQM monitoring sites located within the vicinity of the modelled road network are presented in Table A1.

Whilst urban background sites are useful for giving an indication of background values they are not useful for the purpose of model verification. Model verification has therefore been undertaken using only the kerbside and roadside sites listed in Table A1.

Table A1 – Local Monitoring Data Available for Model Verification

Site I.D.	Site Name	Site Type*	OS Grid Ref	2012 Annual Mean NO_2 Concentration (µg/m^3)
13	Clepington road / Forfar road (DT)	KS	341385 ,732121	38.0
27	Kingsway/ Mains loan 1 (DT)	RS	341124 ,732468	34.4
82	Woodside Avenue (DT)	UB	340776 ,732307	16.2
83	Forfar road (DT)	KS	341437 ,732360	**50.2**
CM12	Mains Loan (Automatic)	UB	340972 ,731893	9.8
146	Mains Loan (DT)	UB	340972 ,731893	15.0
In **bold**, exceedence of the annual mean NO_2 AQO of 40µg/m^3 *KS = Kerbside, RS = Roadside, UB = Urban Background				

Verification calculations

The verification of the modelling output was performed in accordance with the methodology provided in Annex 3 of LAQM.TG(09)[5].

For the verification and adjustment of NOx/NO_2, the LAQM diffusion tube monitoring data was used as shown in Table A1. Data capture for 2012 at the kerbside and roadside sites was 92%, above the 75% threshold. Table A2 shows an initial comparison of the monitored and unverified modelled NO_2 results for the year 2012, in order to determine if verification and adjustment was required.

Table A2 - Comparison of Unverified Modelled and Monitored NO_2 Concentrations

Site ID	Site Type	Background NO_2	Monitored total NO_2 (µg/m^3)	Modelled total NO_2 (µg/m^3)	% Difference (modelled vs. monitored)
13	KS	15.6	38.0	27.9	-26.9
27	RS	15.6	34.4	24.4	-29.7
83	KS	15.6	50.2	27.9	-44.8

The model was observed to be under predicting by more than 25% at all three locations and no further improvement of the modelled results could be obtained on this occasion. Therefore adjustment of modelled results was necessary. The relevant data was gathered to allow the adjustment factor to be calculated.

Model adjustment needs to be undertaken based on NO_x and not NO_2. For the diffusion tube monitoring results used in the calculation of the model adjustment, NO_x was derived from NO_2; these calculations were undertaken using a spreadsheet tool available from the LAQM website[20].

Table A3 provides the relevant data required to calculate the model adjustment based on regression of the modelled and monitored road source contribution to NO_x.

Table A3 – Data Required for NO_2 Adjustment Factor Calculation

Site ID	Monitored total NO_2 (µg/m^3)	Monitored total NO_x (µg/m^3)	Background NO_2 (µg/m^3)	Background NO_x (µg/m^3)	Monitored road contribution NO_2 (total - background) (µg/m^3)	Monitored road contribution NO_x (total - background) (µg/m^3)	Modelled road contribution NO_x (excludes background) (µg/m^3)
13	38.0	73.0	15.6	22.9	22.4	50.0	25.4
27	34.4	63.9	15.6	22.9	18.8	41.0	17.6
83	50.2	107.6	15.6	22.9	34.6	84.7	25.3

[20] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc

Figure A1 provides a comparison of the Monitored Road NO_x Contribution versus the Unverified Modelled Road NO_x and the equation of the trend line based on linear regression through zero. The Total Monitored NO_x concentration has been derived by back-calculating NO_x from the NO_x/NO_2 empirical relationship using the spreadsheet tool available from Defra's website[9]. The equation of the trend lines presented in Figure A1 gives an adjustment factor for the modelled results of 2.592.

Figure A1 - Comparison of the Modelled Road Contribution NO_x versus Monitored Road Contribution NO_x

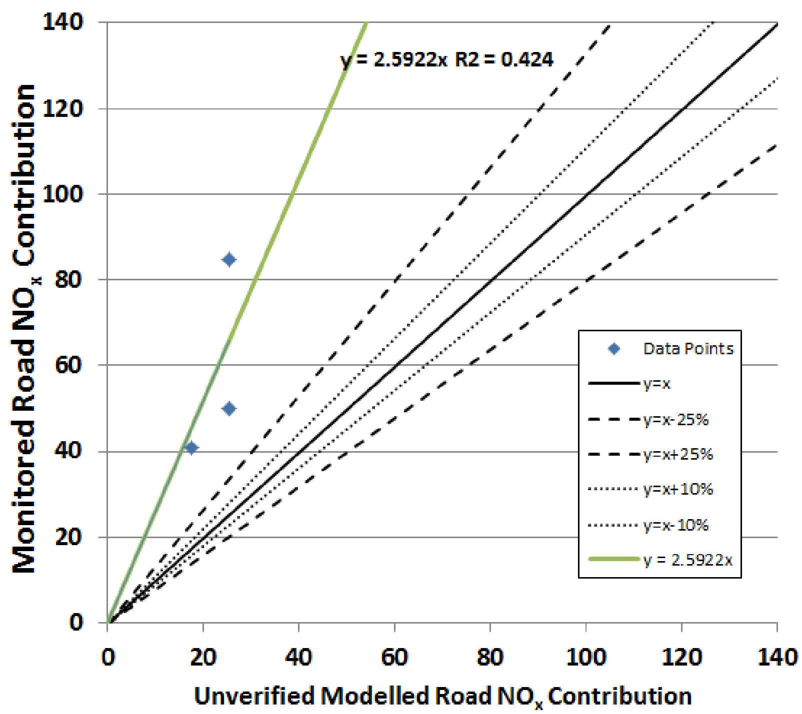
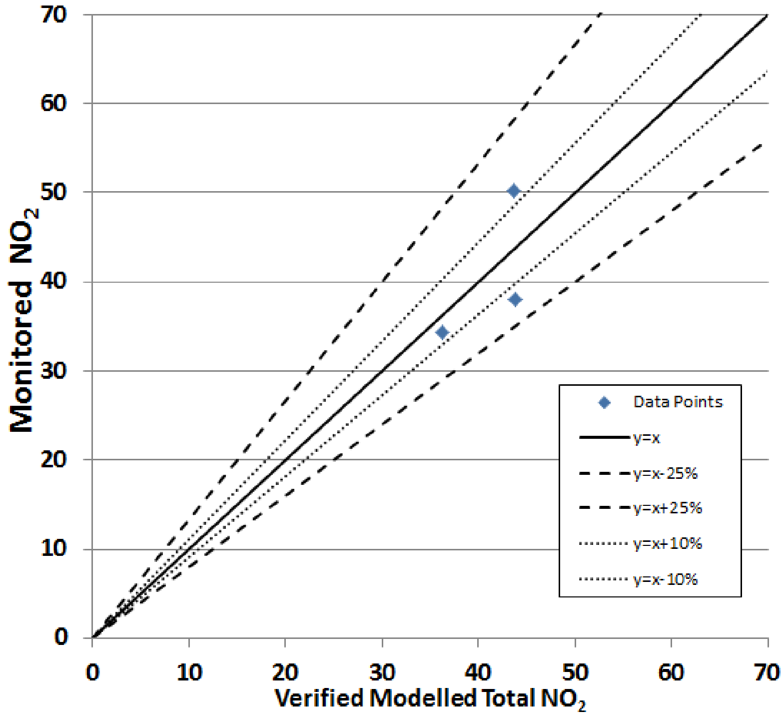


Figure A1 and Table A4 show the ratios between monitored and modelled NO_2 for each monitoring location. All sites considered show acceptable agreement between the ratios of monitored and modelled NO_2 all being ±25%. A verification factor of 2.592 was therefore used to adjust the modelled results. A factor of 2.592 reduces the Root Mean Square Error (RMSE) from a value of 15.42 to 5.14.

Table A4 – Model NO_2 Verification

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NO_x	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x (µg/m³)	Adjusted modelled total NO_x (including background NO_x) (µg/m³)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m³)	Monitored total NO_2 (µg/m³)	% Difference (adjusted modelled NO_2 vs. monitored NO_2)
13	1.97	2.592	65.9	88.8	43.9	38.0	15.4
27	2.33		45.5	68.4	36.2	34.4	5.3
83	3.35		65.6	88.5	43.8	50.2	-12.8

Figure A2 - Comparison of the Modelled NO_2 versus Monitored NO_2



The adjustment factor 2.592 was applied to the road-NO_x concentrations predicted by the model to arrive at the final NO_2 concentrations. NO_2 results presented and discussed herein are those calculated following the process of model verification using an adjustment factor 2.592.

PM_{10} Verification

Dundee City Council, undertakes PM_{10} monitoring as part of its LAQM commitments at 13 locations, of which the CM12 - Main Loan Ramon TEOM site is the only location in the vicinity of the modelled road network. As CM12 is an urban background site, whilst it is suitable for using as a background value it is not suitable for model verification.

Model verification has therefore been undertaken using the CM4 – Lochee Road Romon BAM site. Whilst CM4 is not located in the FORFAR modelled area, it is located in the LOCHEE modelled area which forms another part of this study. Full details of the Lochee air quality modelling study can be found in the Bureau Veritas report *Dundee Modelling Lochee_v1.doc*[21]. Details of monitoring sites CM4 and CM12 used for the purposes of model verification are presented in Table A5 below.

Table A5 – Local PM_{10} Monitoring Data Available for Model Verification

Site I.D.	Site Name	Site Type	OS Grid Ref	2012 Annual Mean NO_2 Concentration ($\mu g/m^3$)
CM4	Lochee Road Romon (BAM)	RS	338861, 730773	16.5
CM12	Mains Loan (TEOM)	UB	340972, 731893	11.4

PM_{10} annual mean background values have been assumed to be 11.4µg/m^3 as observed in 2012 at CM4. This has then been subtracted from the roadside contribution recorded at CM12 to give a

[21] Dundee Modelling Lochee_v1.doc (Bureau Veritas 2016).

PM_{10} concentration of 5.1µg/m^3 due to road emissions. The modelled road PM_{10} concentration is split between those PM_{10} emissions from vehicle exhausts and those PM_{10} emissions from Brake, Tyre Wear and Abrasion (BTWA) of vehicles.

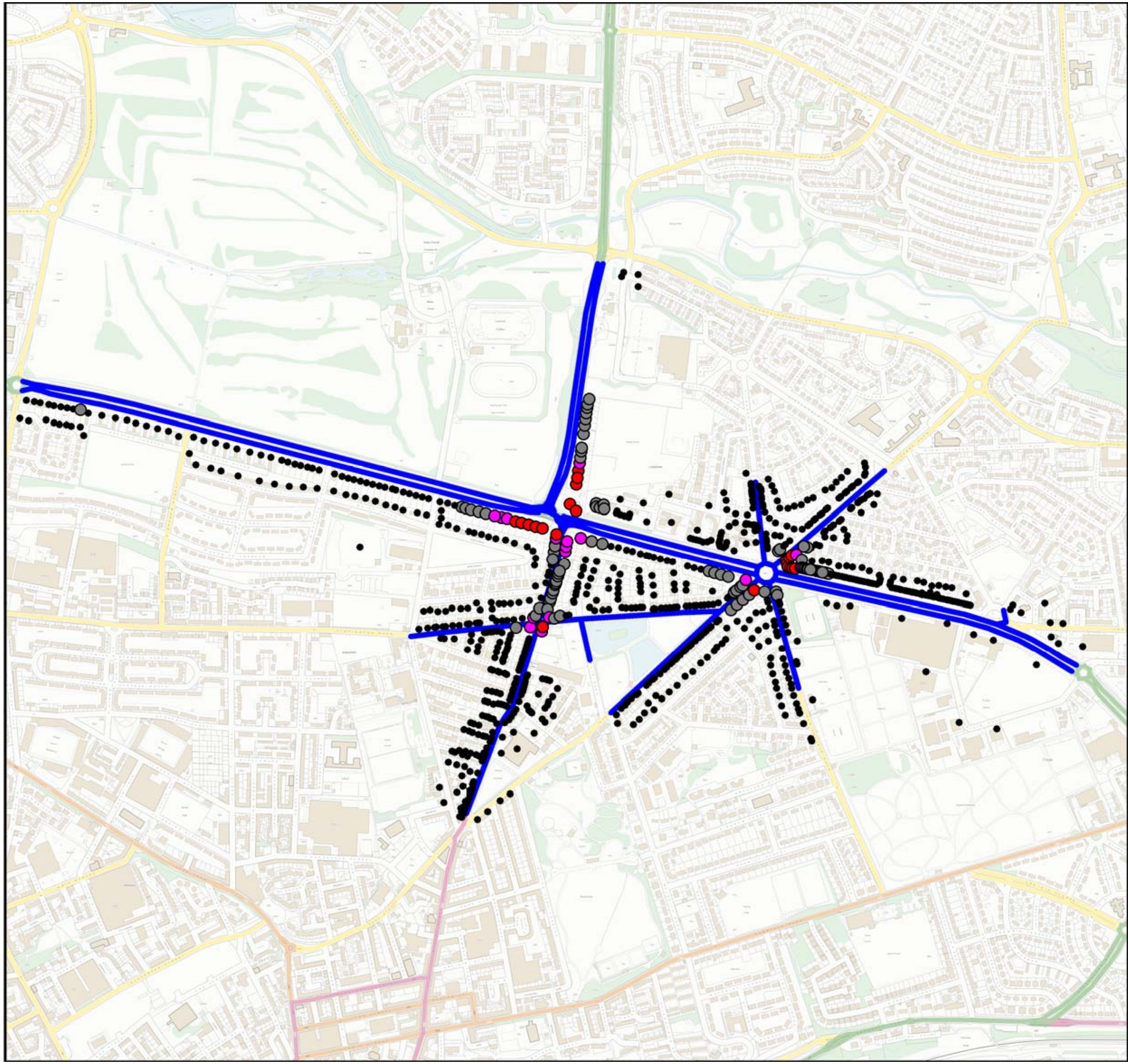
The BTWA portion of the PM_{10} emission should not require any verification as BTWA emissions should be consistent regardless of local conditions. Verification has therefore been undertaken using the exhaust portion of the PM_{10} emission only. As shown in Table A6 verification against the exhaust portion of the modelled PM_{10} concentration results in an emission factor of 9.731.

Table A6 – Data Required for PM_{10} Adjustment Factor Calculation

Site ID	PM_{10} Concentration(µg/m^3)						Verification Factor
	Monitored total	Monitored Road	Modelled Exhaust	Modelled BTWA	Modelled total	Monitored Road Exhaust (Monitored Roadside – Modelled BTWA)	Monitored Road Exhaust / Modelled Exhaust
CM4	16.5	5.1	0.46	0.64	1.09	4.46	9.731

PM_{10} results presented and discussed herein are those calculated following the process of model verification using an adjustment factor 9.731.

Appendix 5 – Figures



BC NO2 Concentration
Ground Floor Level (ug/m3)

- <30 (785)
- 30 to 36 (76)
- 36 to 40 (19)
- >40 (22)

Air Quality
Parklands
825a Wilmslow Road
Didsbury
Manchester M20 2RE
Telephone: 0845 600 1828

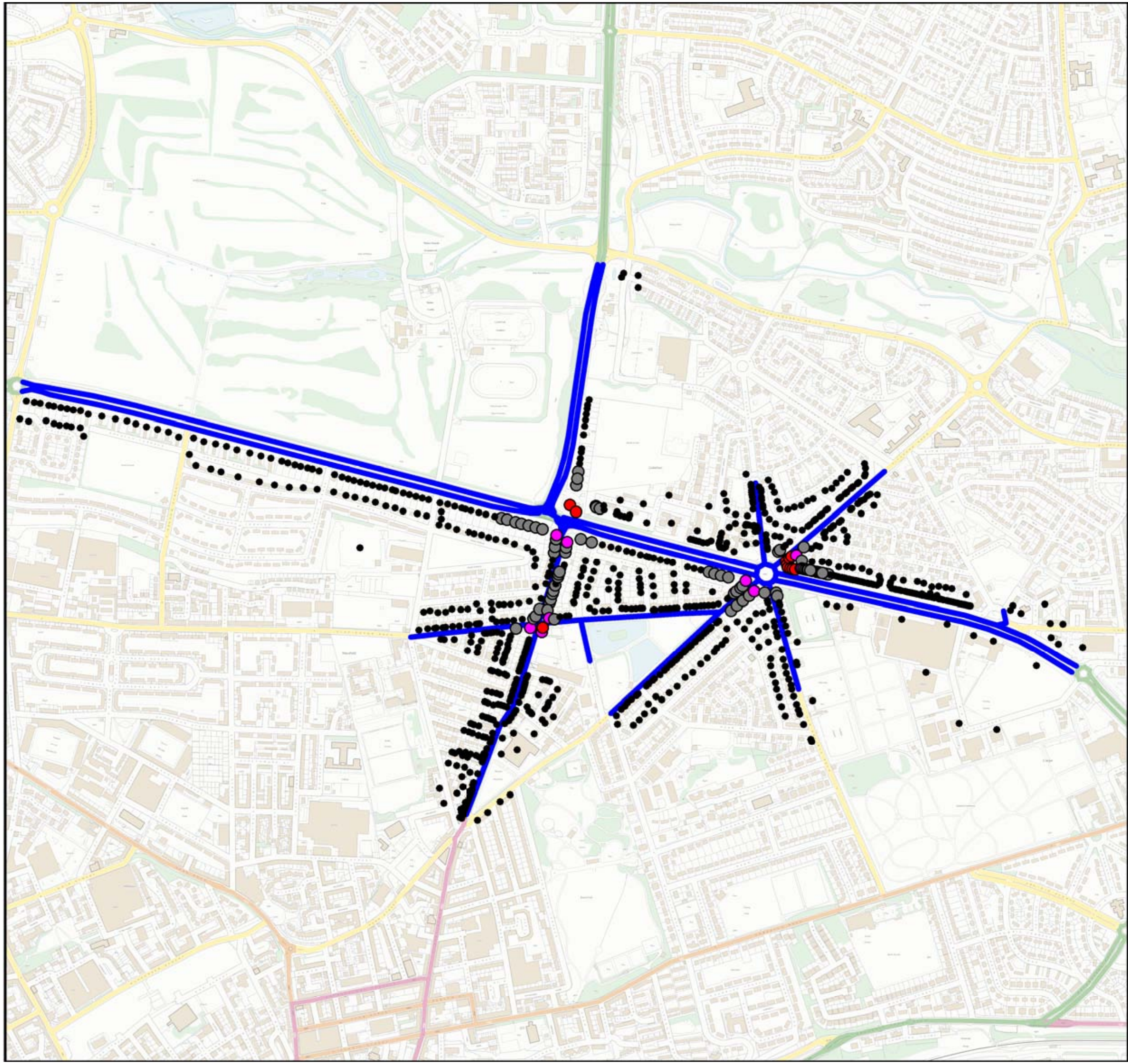
Location
Dundee - Forfar

Title
ADMS Model Inputs

By	Checked	Approved
FL	**JC**	**JC**

Scale	Date
N.T.S.	**March 2016**

Job No.	Fig. No.
AGGX7725624	**A3**



SC1 NO2 Concentration
Ground Floor Level (ug/m3)

- <30 (813)
- 30 to 36 (67)
- 36 to 40 (10)
- >40 (12)

Air Quality
Parklands
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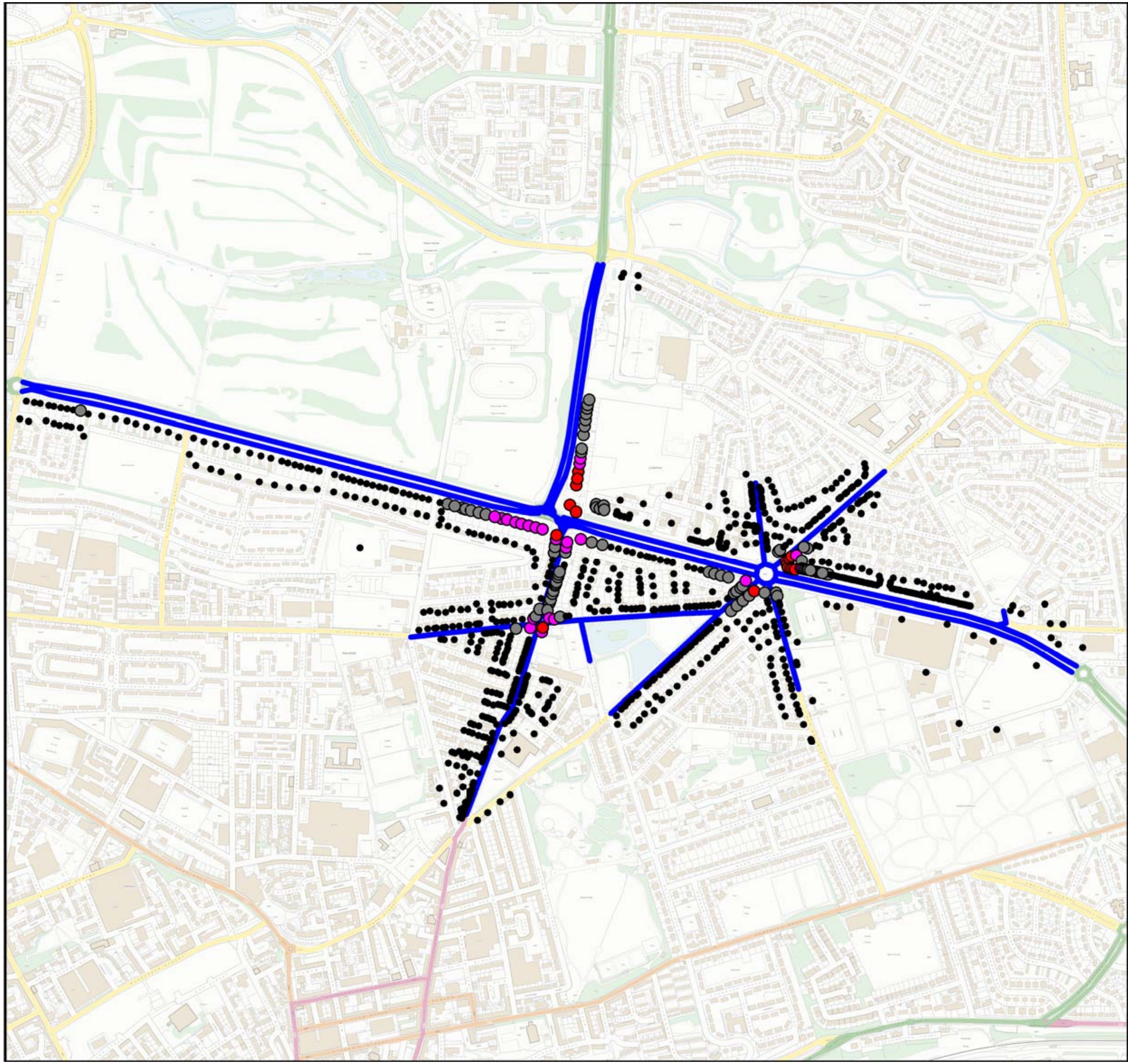
Didsbury
Manchester M20 2RE
Telephone: 0845 600 1828

Location	**Dundee - Forfar**
Title	**ADMS Model Inputs**

By	Checked	Approved
FL	**JC**	**JC**

Scale	Date
N.T.S.	**March 2016**

Job No.	Fig. No.
AGGX7725624	**A4**



SC2 NO2 Concentration Ground Floor Level (ug/m3)

- <30 (785)
- 30 to 36 (76)
- 36 to 40 (24)
- >40 (17)

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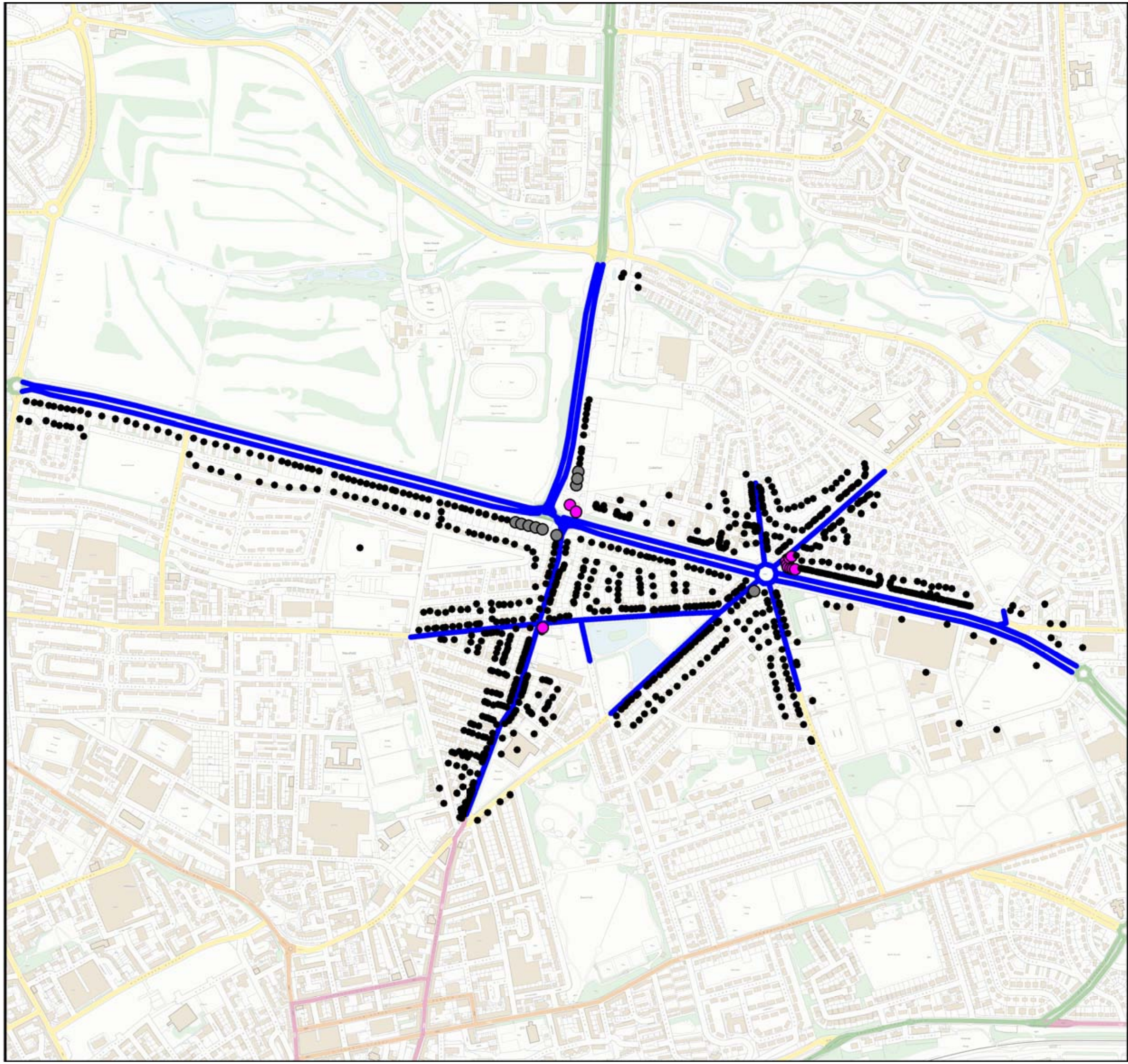
Telephone: 0845 600 1828

Location	**Dundee - Forfar**
Title	**ADMS Model Inputs**
By	**FL**
Checked	**JC**
Approved	**JC**
Scale	**N.T.S.**
Date	**March 2016**
Job No.	**AGGX7725624**
Fig. No.	**A5**



SC1 Impact NO2
Ground Floor Level

- Not Exceeding (880)
- Exceedence Remains (12)
- Removes Exceedence (10)
- New Exceedence (0)

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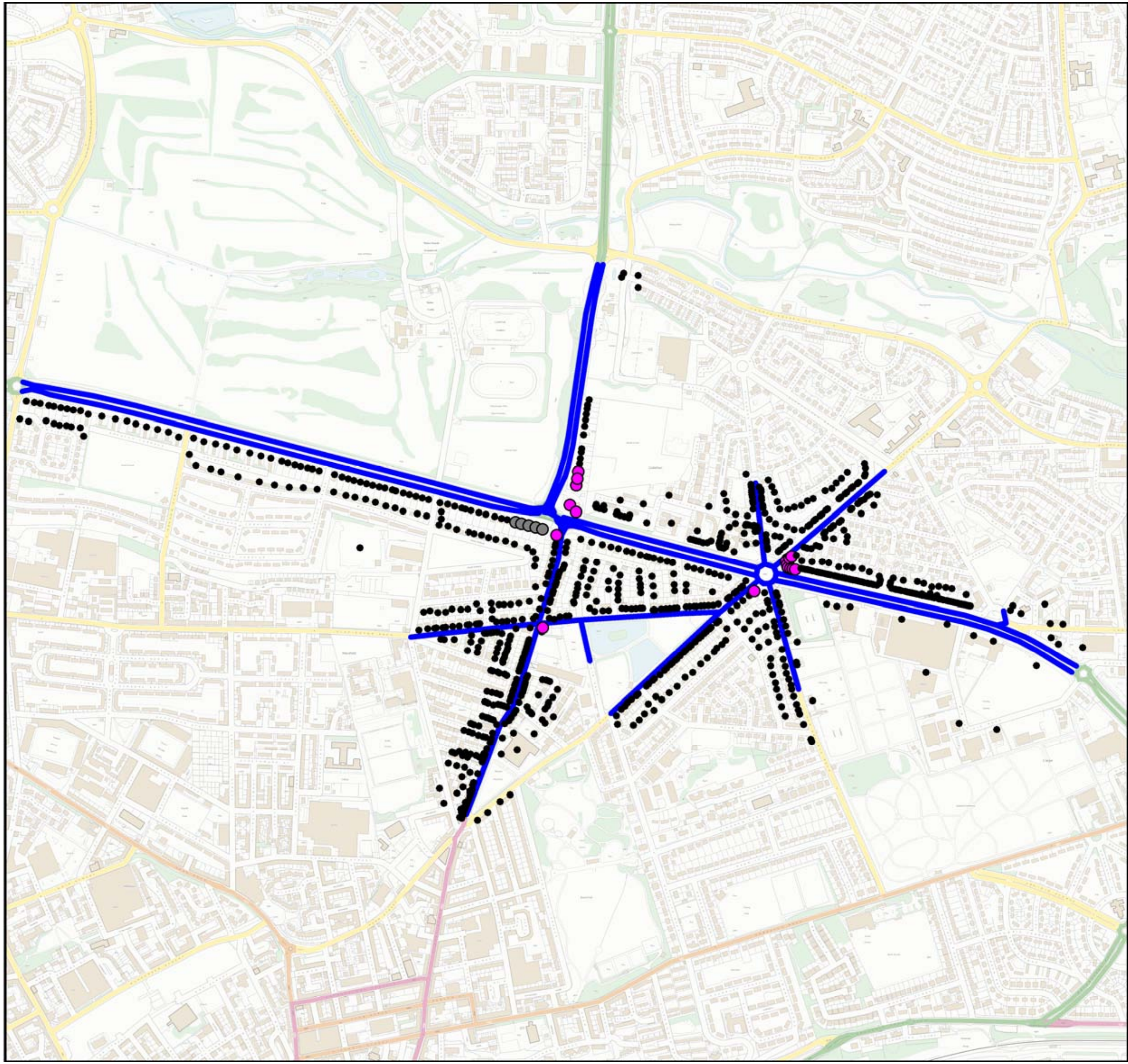
Location	**Dundee - Forfar**
Title	**ADMS Model Inputs**
By	**FL**
Checked	**JC**
Approved	**JC**
Scale	**N.T.S.**
Date	**March 2016**
Job No.	**AGGX7725624**
Fig. No.	**A6**



SC2 Impact NO2
Ground Floor Level

- Not Exceeding (880)
- Exceedence Remains (17)
- Removes Exceedence (5)
- New Exceedence (0)

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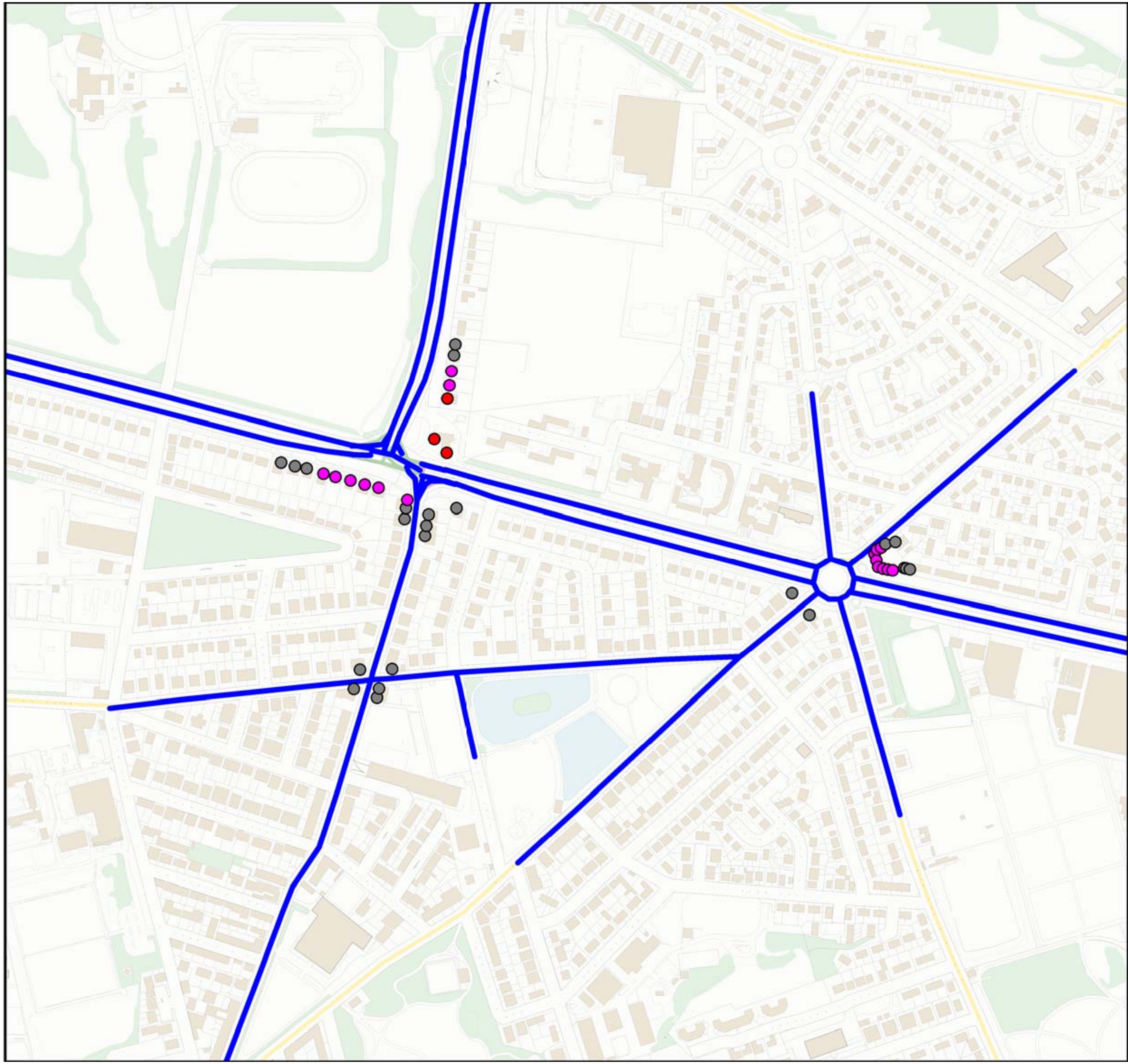
Location	**Dundee - Forfar**
Title	**ADMS Model Inputs**
By	**FL**
Checked	**JC**
Approved	**JC**
Scale	**N.T.S.**
Date	**March 2016**
Job No.	**AGGX7725624**
Fig. No.	**A7**



BC NO2 Concentration First Floor Level (ug/m3)

<30	(0)
30 to 36	(23)
36 to 40	(16)
>40	(3)

Air Quality
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BUREAU VERITAS

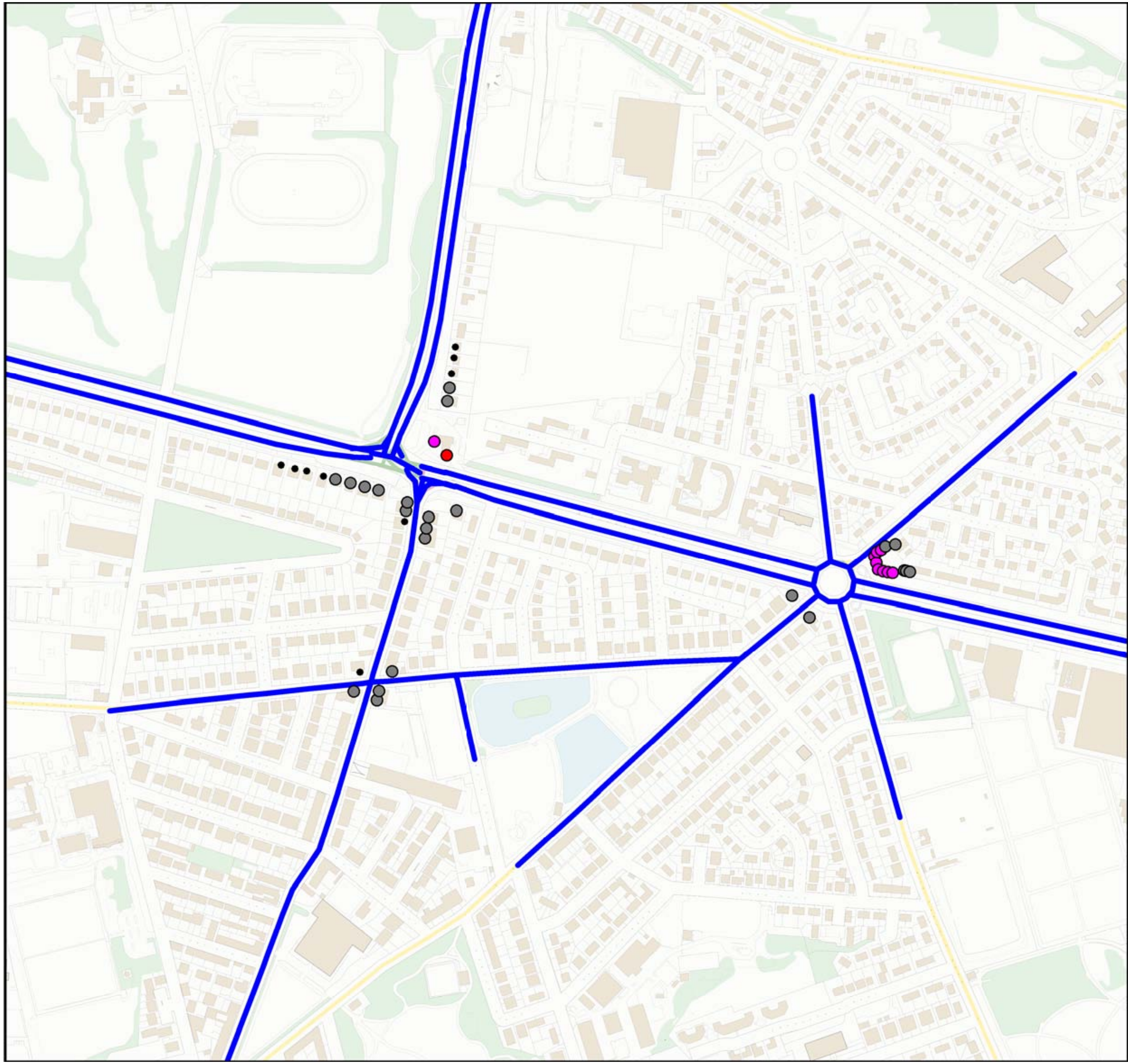
Location
Dundee - Forfar

Title
ADMS Model Inputs

By	Checked	Approved
FL	**JC**	**JC**

Scale	Date
N.T.S.	**March 2016**

Job No.	Fig. No.
AGGX7725624	**A8**



SC1 NO2 Concentration First Floor Level (ug/m3)

- <30 (9)
- 30 to 36 (23)
- 36 to 40 (9)
- >40 (1)

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Location	**Dundee - Forfar**
Title	**ADMS Model Inputs**

By	Checked	Approved
FL	**JC**	**JC**

Scale	Date
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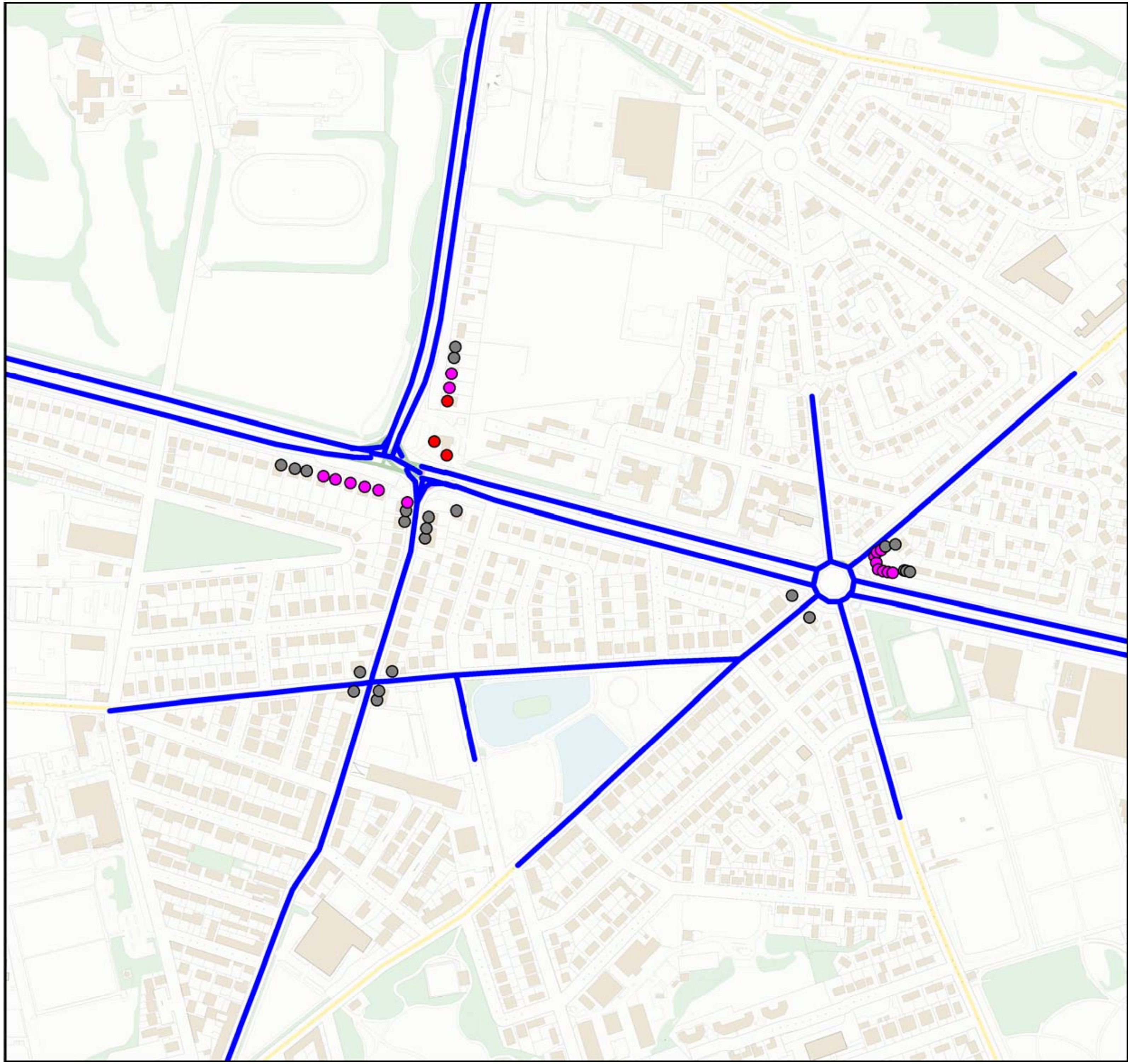
Job No.	Fig. No.
AGGX7725624	**A9**



SC2 NO2 Concentration First Floor Level (ug/m3)

- <30 (0)
- 30 to 36 (23)
- 36 to 40 (16)
- >40 (3)

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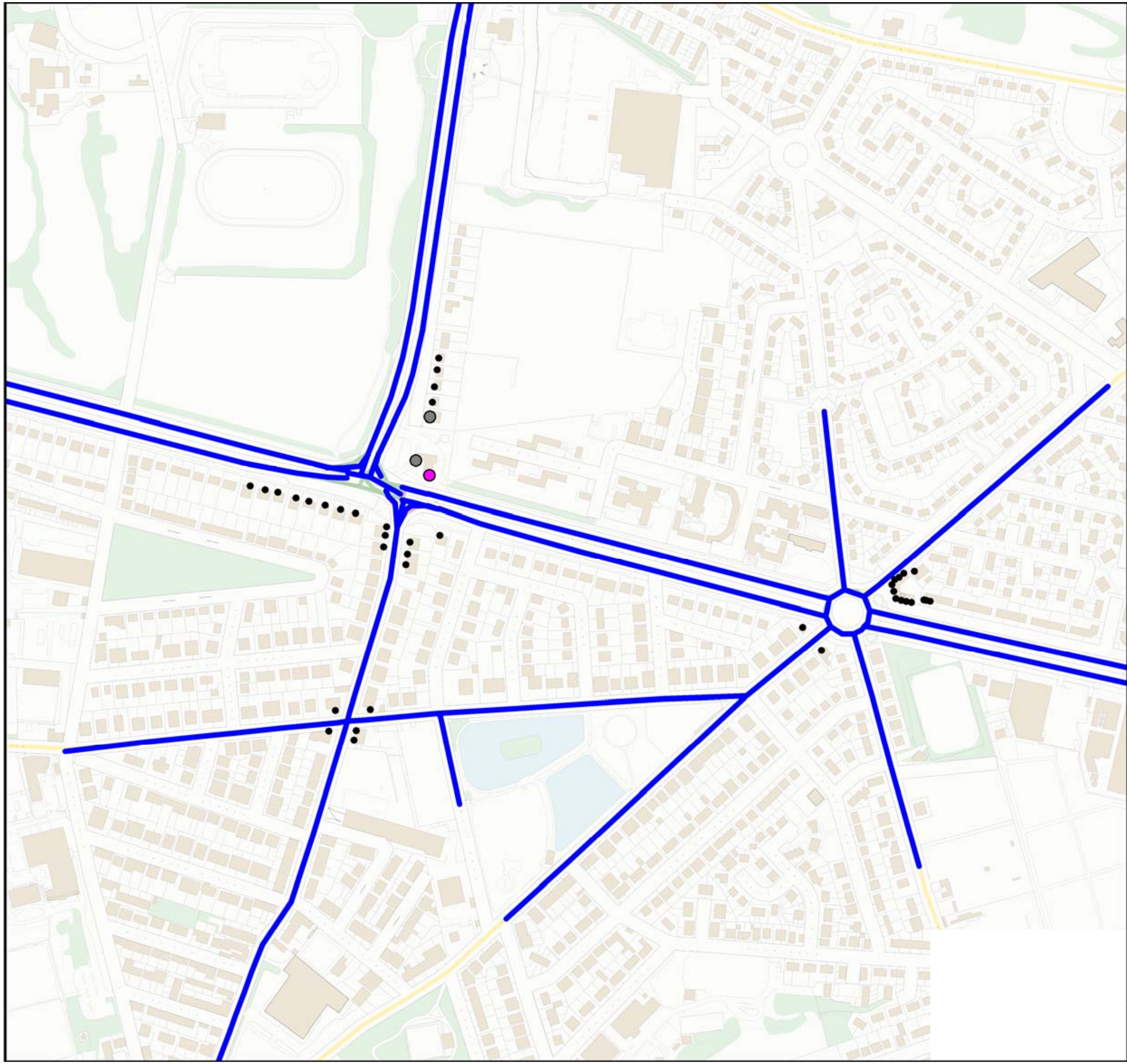
Didsbury
Manchester M20 2RE
Telephone: 0845 600 1828

Location	**Dundee - Forfar**
Title	**ADMS Model Inputs**
By	**FL**
Checked	**JC**
Approved	**JC**
Scale	**N.T.S.**
Date	**March 2016**
Job No.	**AGGX7725624**
Fig. No.	**A10**



SC1 Impact NO2
First Floor Level

Not Exceeding	(39)
Exceedence Remains	(1)
Removes Exceedence	(2)
New Exceedence	(0)

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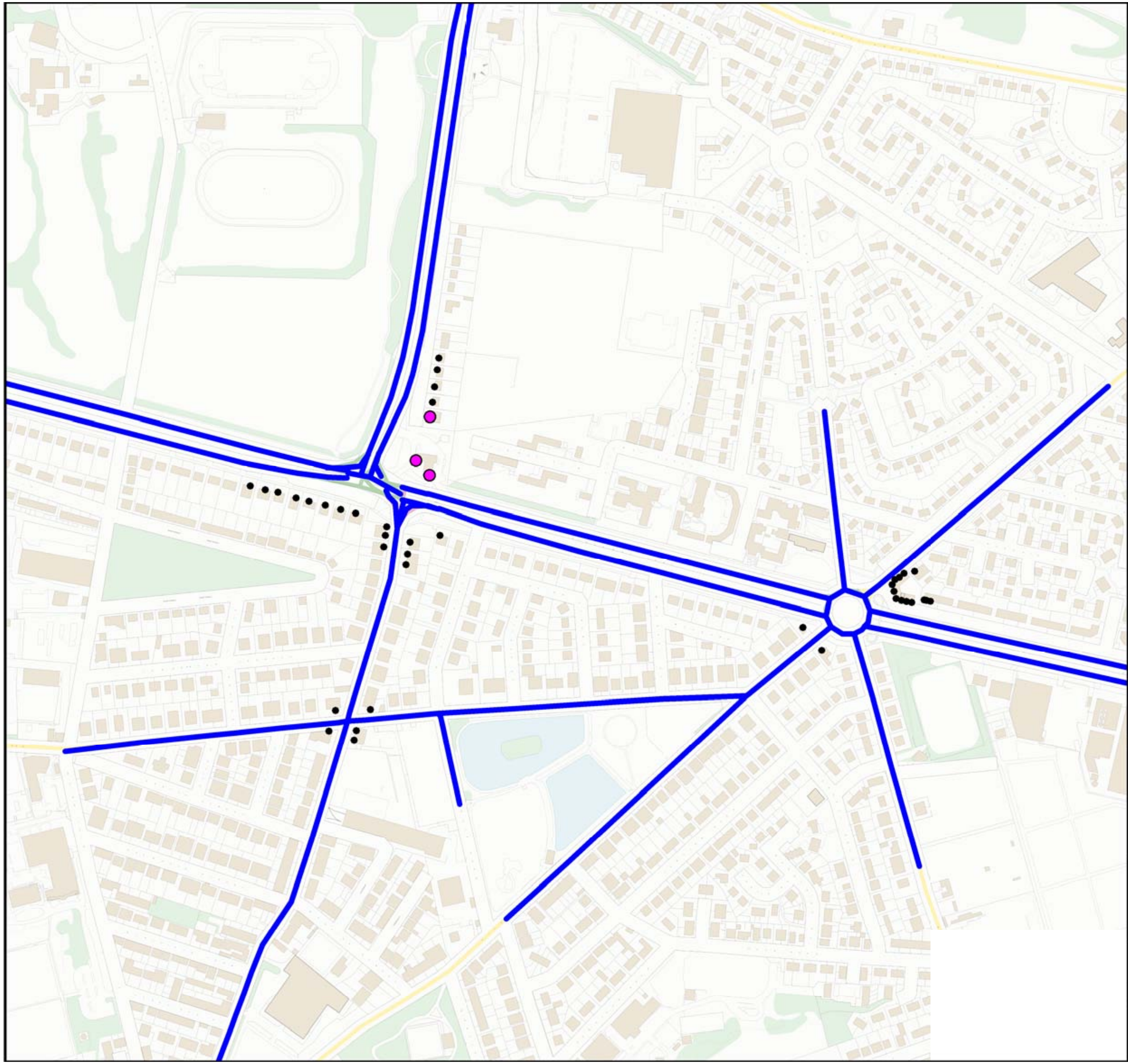
Location	**Dundee - Forfar**	
Title	**ADMS Model Inputs**	
By **FL**	Checked **JC**	Approved **JC**
Scale **N.T.S.**	Date **March 2016**	
Job No. **AGGX7725624**	Fig. No. **A11**	



SC2 Impact NO2
First Floor Level

- Not Exceeding (39)
- Exceedence Remains (3)
- Removes Exceedence (0)
- New Exceedences (0)

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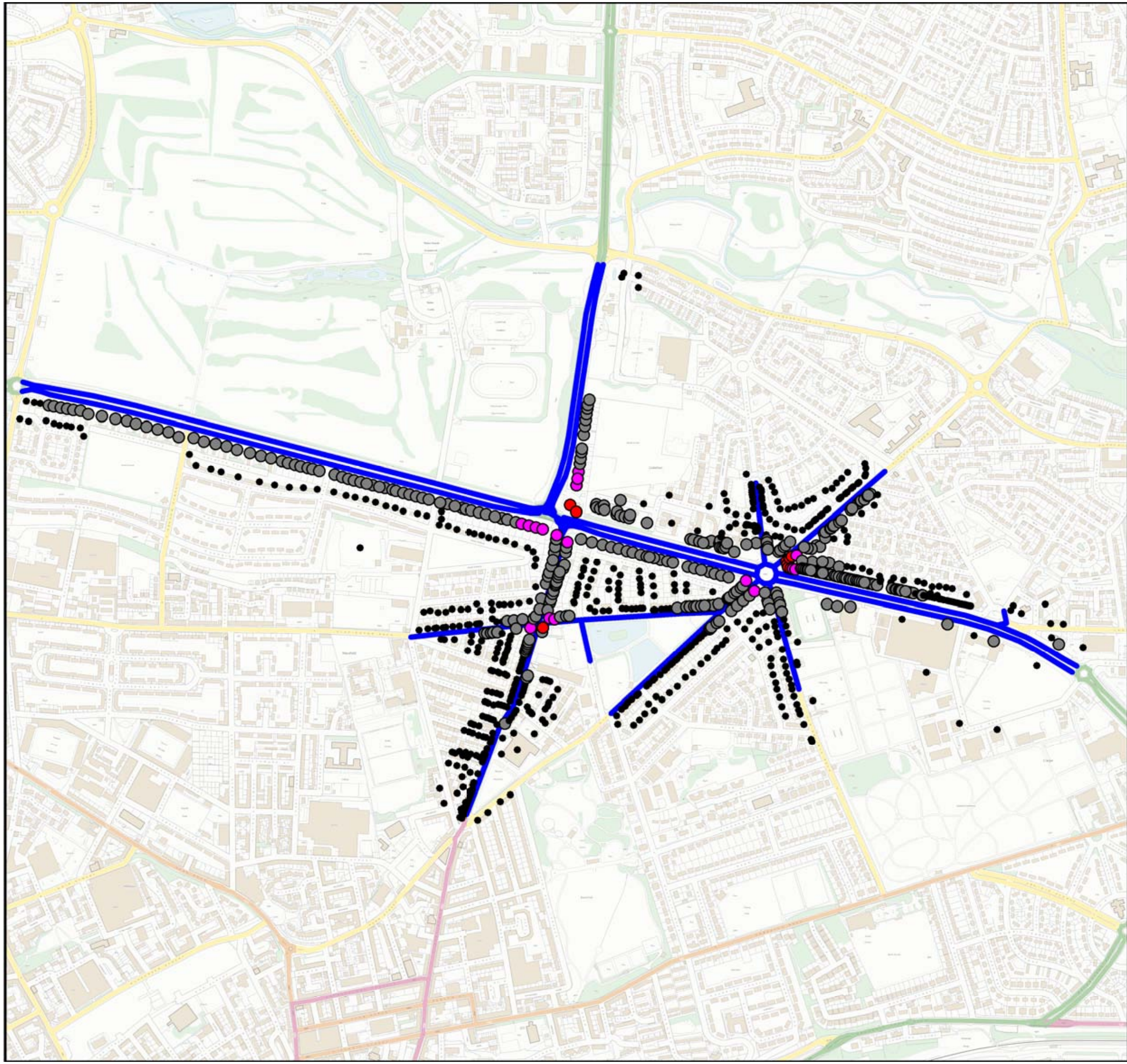
Location **Dundee - Forfar**

Title **ADMS Model Inputs**

By	Checked	Approved
FL	**JC**	**JC**

Scale	Date
N.T.S.	**March 2016**

Job No.	Fig. No.
AGGX7725624	**A12**



BC PM10 Concentration Ground Floor Level (ug/m3)

- <13.5 (575)
- 13.5 to 16.2 (298)
- 16.2 to 18 (19)
- >18 (10)

Air Quality
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Location	**Dundee - Forfar**
Title	**ADMS Model Inputs**

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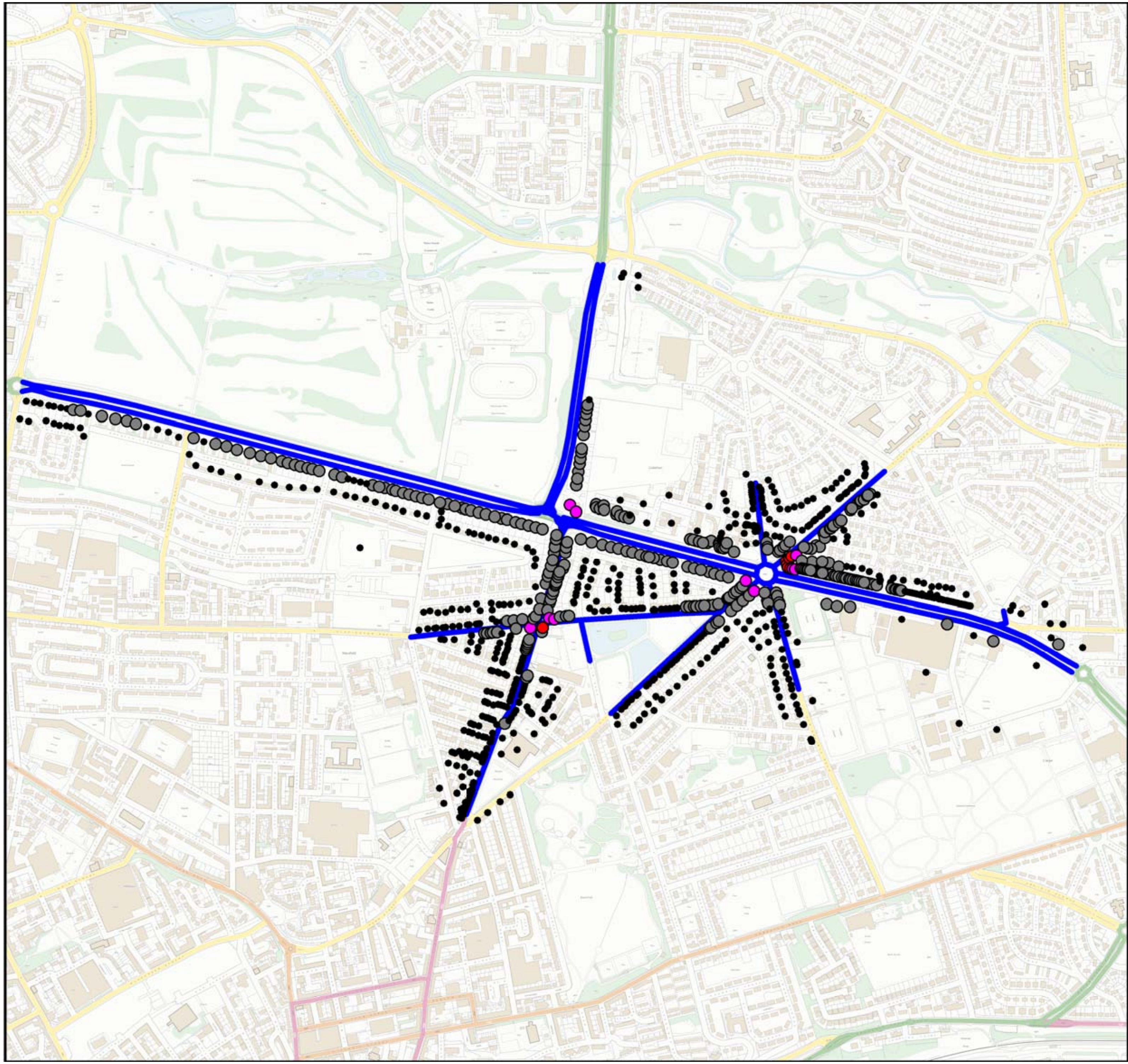
Scale	Date
N.T.S.	**March 2016**

Job No.	Fig. No.
AGGX7725624	**A13**



SC1 PM10 Concentration Ground Floor Level (ug/m3)

<13.5	(609)
13.5 to 16.2	(273)
16.2 to 18	(12)
>18	(8)

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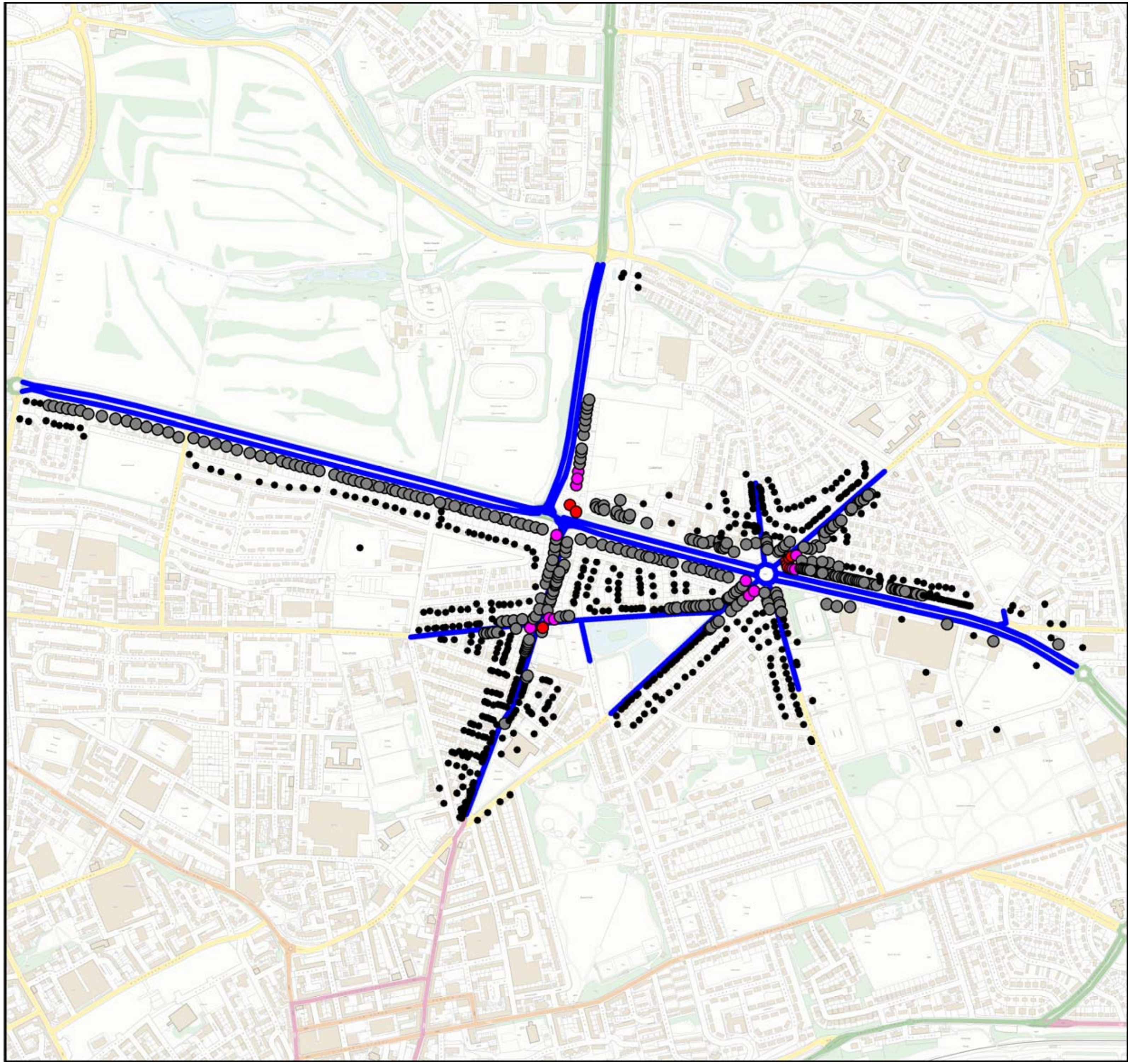
Location	**Dundee - Forfar**	
Title	**ADMS Model Inputs**	
By **FL**	Checked **JC**	Approved **JC**
Scale **N.T.S.**	Date **March 2016**	
Job No. **AGGX7725624**	Fig. No. **A14**	



SC2 PM10 Concentration Ground Floor Level (ug/m3)

- <13.5 (570)
- 13.5 to 16.2 (307)
- 16.2 to 18 (15)
- >18 (10)

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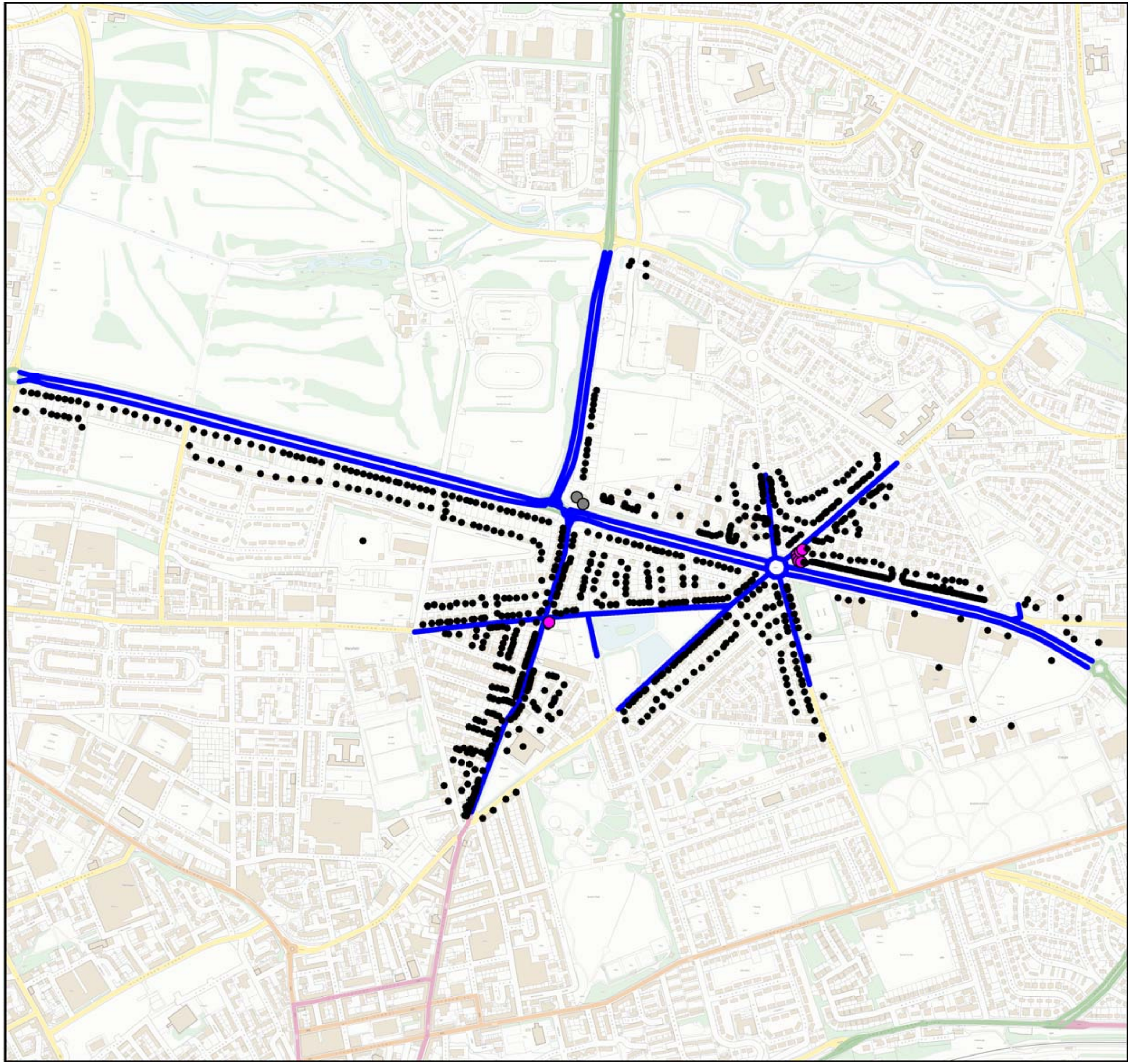
Location	**Dundee - Forfar**
Title	**ADMS Model Inputs**
By	**FL**
Checked	**JC**
Approved	**JC**
Scale	**N.T.S.**
Date	**March 2016**
Job No.	**AGGX7725624**
Fig. No.	**A15**



SC1 Impact PM10
Ground Floor Level

- Not Exceeding (892)
- Exceedence Remains (8)
- Removes Exceedence (2)
- New Exceedence (0)

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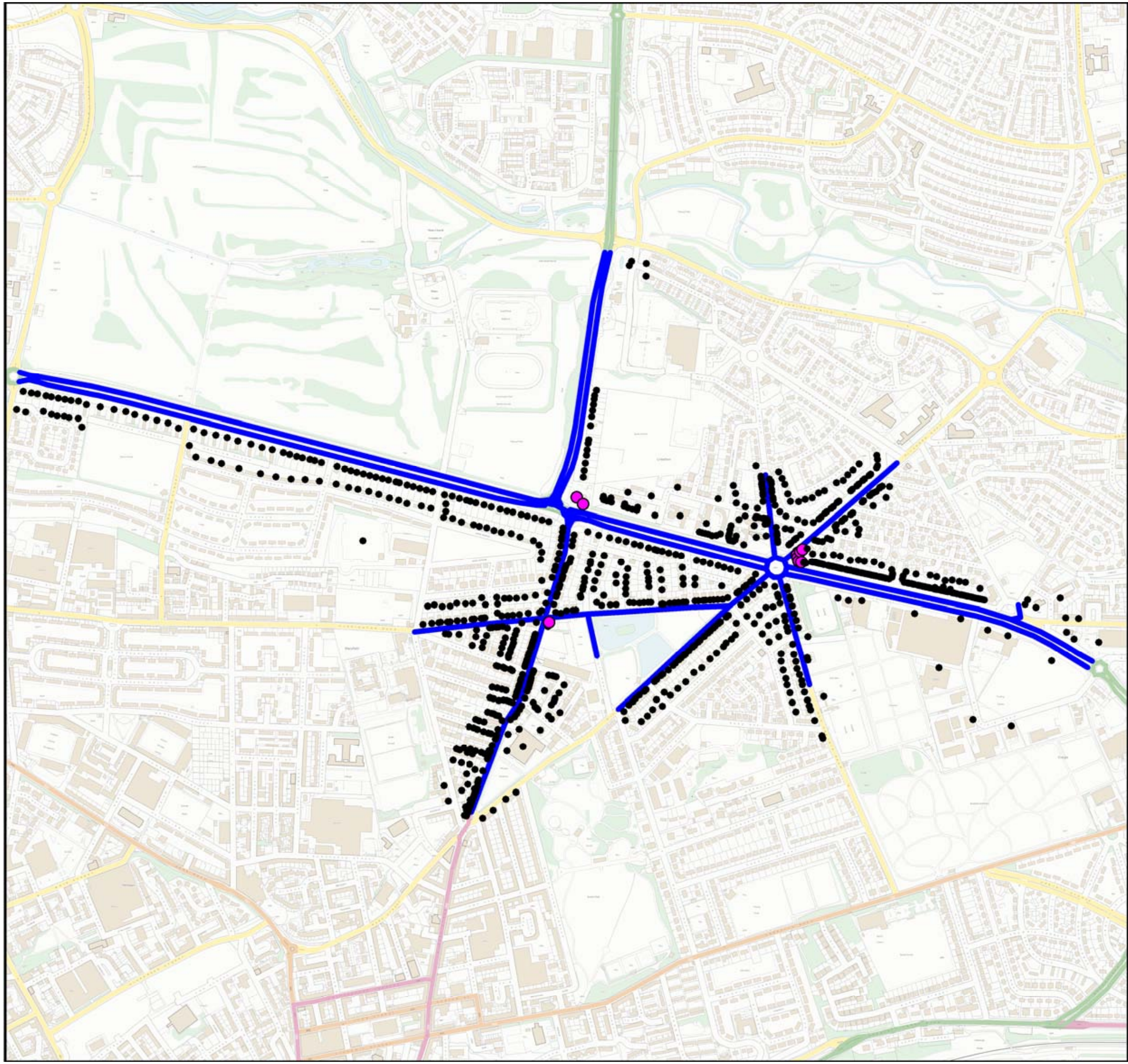
Location
Dundee - Forfar

Title
ADMS Model Inputs

By	Checked	Approved
FL	**JC**	**JC**

Scale	Date
N.T.S.	**March 2016**

Job No.	Fig. No.
AGGX7725624	**A16**



SC2 Impact PM10
Ground Floor Level

- Not Exceeding (892)
- Exceedence Remains (10)
- Removes Exceedence (0)
- New Excceedence (0)

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Didsbury
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Location **Dundee - Forfar**

Title **ADMS Model Inputs**

By	Checked	Approved
FL	JC	JC

Scale	Date
N.T.S.	March 2016

Job No.	Fig. No.
AGGX7725624	A17