York Central Partnership

York Central

Access Options Study

Appendix E Air Quality

Issue | June 2017

Job number 251869-00

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ARUP

E1 Introduction

Ove Arup & Partners Limited (Arup) has been commissioned by York Central Partnership to undertake an air quality appraisal to inform access option selection for a proposed development at York Central, York.

Air quality studies are concerned with the presence of airborne pollutants in the atmosphere. This appendix assesses the potential impact in relation to the difference between the shortlisted access options for the site. This appendix outlines relevant air quality management policy and legislation, describes the existing air quality conditions in the vicinity of the site, and outlines the nature of the development and the potential air quality impacts associated with its construction and operation. Mitigation measures are also proposed where necessary, which would be implemented to reduce the impact of the shortlisted option (not the full York Central development) on air quality, as far as practicable.

E1.1 Description of the Development

The York Central development site lies between the A59 Holgate Road to the south and Leeman Road to the north.

Two options for road access to York Central have been assessed. Option A provides access from the north-west of the site from Water End. Option E provides access from the south from Holgate Road (A59).

The location of the proposed development for York Central and the shortlisted access options are shown below in Figure E1E1.

Figure E1: The site boundary for the proposed development at York Central

E2 Policy, Legislation and Guidance

E2.1 European Air Quality Management

In 1996 the European Commission published the Air Quality Framework Directive on ambient air quality assessment and management (96/62/EC)[26]. This Directive defined the policy framework for 12 air pollutants, including NO_2, known to have harmful effects on human health and the environment. Limit values (pollutant concentrations not to be exceeded by a certain date) for each specified pollutant were set through a series of Daughter Directives, including Directive 1999/30/EC (the 1st Daughter Directive)[27] which sets limit values for nitrogen dioxide (NO_2) and particulate matter (amongst other pollutants) in ambient air.

In May 2008 the Directive 2008/50/EC[28] on ambient air quality and cleaner air for Europe came into force. This Directive consolidates the above (apart from the 4th Daughter Directive) and makes provision for extended compliance deadlines for NO_2 and PM_{10}. The Directive has been transposed into national legislation in England by the Air Quality Standards Regulations 2010[29]. The Secretary of State for the Environment has the duty of ensuring compliance with the air quality limit values.

E2.2 Environment Act 1995

Part IV of the Environment Act 1995[30] places a duty on the Secretary of State for the Environment to develop, implement and maintain an air quality strategy with the aim of reducing atmospheric emissions and improving air quality. The national air quality strategy (NAQS) for England, Scotland, Wales and Northern Ireland provides the framework for ensuring compliance with air quality limit values based on a combination of international, national and local measures to reduce emissions and improve air quality. This includes the statutory duty, also under Part IV of the Environment Act 1995, for local authorities to undergo a process of local air quality management and declare AQMAs where necessary.

E2.3 Air Quality Objectives and Limit Values

Air quality limit values and objectives are quality standards for clean air. Some pollutants have standards expressed as annual average concentrations due to the chronic way in which they affect health or the natural environment (i.e. effects occur (long-term) after a prolonged period of exposure to elevated concentrations) and others have standards expressed as 24-hour, 1-hour or 15-minute average

[26] Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management

[27] Directive 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air

[28] 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

[29] The Air Quality Standards Regulations (2010) SI 2010/1001

[30] Environment Act (1995) Chapter 25, Part IV Air Quality

concentrations (short-term) due to the acute way in which they affect health or the natural environment (i.e. after a relatively short period of exposure). Some pollutants have standards expressed in terms of both long-term and short-term concentrations. Table 1 sets out these EU air quality limit values and national air quality objectives for the pollutants relevant to this study (NO_2 and particulate matter (PM_{10} and $PM_{2.5}$)).

In the majority of cases the air quality limit values and air quality objectives have the same pollutant concentration threshold and date for compliance. The key difference is that the Secretary of State for the Environment is required under European Law to ensure compliance with the air quality limit values whereas local authorities are only obliged under national legislation to undertake best efforts to comply with the air quality objectives. To assist local authorities in demonstrating best efforts, the Environment Act 1995 requires that when carrying out their local air quality management functions, local authorities shall have regard to guidance issued by the Secretary of State.

Table E1: Air quality standards

Pollutant	Averaging period	Limit value/objective	Date for compliance	Basis
Nitrogen dioxide (NO_2)	1 hour mean	200 µg/m^3, not to be exceeded more than 18 times a year (99.8th percentile)	31 Dec 2005	UK
			1 Jan 2010	EU
	Annual mean	40 µg/m^3	31 Dec 2005	UK
			1 Jan 2010	EU
Fine particulates (PM_{10})	Daily mean	50 µg/m^3, not to be exceeded more than 35 times a year (90.4th percentile)	31 Dec 2004	UK
			None specified	EU
	Annual mean	40 µg/m^3	31 Dec 2004	UK
			None specified	EU
Very fine particulates ($PM_{2.5}$)	Annual mean	25 µg/m^3	2020	UK
			1 Jan 2015	EU

E3 Planning Policy and Guidance

E3.1 National Policy and Guidance

The land-use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality consideration that relates to land-use and its development can be a material planning consideration in the determination of planning applications, dependent on the details of the development site.

E3.2 National Planning Policy Framework (2012)

The National Planning Policy Framework[31] (NPPF) was published in March 2012 with the purpose of planning to achieve sustainable development. Paragraph 124 of the NPPF on air quality states that:

> *"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."*

In addition, paragraph 120 states that:

> *"To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area of proposed development to adverse effects from pollution, should be taken into account."*

E3.3 Planning Practice Guidance (2014)

As part of the NPPF, planning practice guidance on various topics was recently published[32]. In relation to air quality, the guidance refers to the significance of air quality assessments to determine the impacts of proposed developments in the area and describes the role of local and neighbourhood plans with regard to air quality. It also provides a flowchart method to assist local authorities to determine how considerations of air quality fit into the development management process.

[31] Department for Communities and Local Government (2012) National Planning Policy Framework
[32] Department for Communities and Local Government (2014) Planning Practice Guidance: Air Quality

E3.4 Local Policy

The CYC draft local plan[33] recognises the importance of the site and the site within a Special Policy Area where detail planning guidance will apply.

The CYC Draft Local Plan touches on air quality matters in a number of sections, which are outlined below.

Firstly, it is discussed that new development proposals must demonstrate that:

"b) i) within an Air Quality Management Area (AQMA), does not compromise the achievements of air quality improvement targets and;

ii) outside an AQMA it does not give rise to an unacceptable increase in vehicular traffic, air pollution or parking on the public highway; and

f) it does not give rise to an unacceptable deterioration in air quality."

In addition to the following more general statement regarding improving air quality:

"1.44 New developments should be designed and located to minimise the need to travel. Large increases in vehicular traffic as a result of a development will not be acceptable because existing road capacity is highly constrained and parts of the principle highway network in and around the city and the approaches into York City Centre have poor air quality which needs to be improved. The scope for new road construction is limited due to the environmental constraints of the City's built and natural environments, and the need to avoid attracting more traffic on to the City's highway network."

There is also a general policy relating to the Local Council's duty regarding air quality:

"2.15 The Council has a statutory duty to improve air quality in the City. By increasing the level of air quality monitoring and the continued promotion of sustainable traffic management measures, the Plan aims to minimise the environmental impact of new development in the City. As part of the process of producing this Plan for the City of York all policies have been considered against their contribution towards the City's environmental objectives, including the minimisation of air and water pollution."

CYC also introduced a new Air Quality policy in the local plan, which is as follows:

"GP4b: Air Quality

Proposals for development in an AQMA (Air Quality Management Area) are required to assess their impact on air quality. Proposals for development outside an AQMA will be required to assess their impact on air quality, where:

[33] Draft 'Local Plan' - incorporating the 4th set of changes (April 2005)

- *a) there is a cumulative significant impact of traffic generation (an increase of more than 5% traffic flow) or*
- *b) there is a significant number (300 or more spaces) of additional parking to be provided, or*
- *c) coach and lorry parking is to be provided, or*
- *d) there is already a recognised congestion or air quality problem in the area, or*
- *e) there will potentially be significant emissions to the air from sources other than traffic.*

When considering the air quality impacts from developments, it is important that full account is taken of impacts on recreational areas such as parks, gardens, play areas and open spaces. In addition, when considering future locations for such facilities, it is important that full account is taken of the existing air quality.

Where mitigation measures are required as a direct result of new development, applicants will be requested to enter a S106 agreement to implement measures to offset any increase in local pollutant emissions, and/or make an appropriate financial contribution towards improvement measures or air quality monitoring."

E3.5 Other Relevant Policy and Guidance

E3.5.1 Local Air Quality Management Policy Guidance and Technical Guidance

The 2016 policy guidance note from Defra, LAQM (PG16)[34], provides additional guidance on the links between transport and air quality. LAQM (PG16) describes how road transport contributes to local air pollution and how transport measures may bring improvements in air quality. Key transport-related Government initiatives are set out, including regulatory measures and standards to reduce vehicle emissions and improve fuels, tax-based measures and the development of an integrated transport strategy.

LAQM (PG16) also provides guidance on the links between air quality and the land-use planning system. The guidance advises that air quality considerations should be integrated within the planning process at the earliest stage and is intended to aid local authorities in developing action plans to deal with specific air quality problems and create strategies to improve air quality. It summarises the main ways in which the land-use planning system can help deliver compliance with the air quality objectives.

Technical Guidance (TG16)[35] is designed to support local authorities in carrying out their duties to review and assess air quality in their area.

[34] Defra (2016) Local Air Quality Management Policy Guidance. PG(16)
[35] Defra (2016) Local Air Quality Management Technical Guidance.TG(16)

E3.6 Environmental Protection UK/ IAQM Guidance (2017)

The 2017 Land-Use Planning & Development Control guidance document[36] produced by Environmental Protection UK (EPUK) and the IAQM provides a framework for professionals operating within the planning system to provide a means of reaching sound decisions, having regard to the air quality implications of development proposals.

The document provides guidance on when air quality assessments are required by providing screening criteria regarding the size of a development, changes to traffic flows/composition energy facilities or combustion processes associated with the development.

[36] Moorcroft and Barrowcliffe. et al. (2017). Land-use Planning & Development Control: Planning for Air Quality. v1.2. Institute of Air Quality Management, London.

E4 Methodology

The overall approach to the air quality assessment comprises:

- A review of the existing air quality conditions at, and in the vicinity of, the proposed development site; and
- An assessment of the potential changes in air quality arising from the operation of the proposed development, for the two road options (A and E).

E4.1 Method of Baseline Assessment

Existing or baseline ambient air quality refers to the concentration of relevant substances that are already present in the environment. These are present from various sources, such as industrial processes, commercial and domestic activities, traffic and natural sources.

A desk-based review of the following data sources has been undertaken to determine baseline conditions of air quality in this assessment:

- Local authority review and assessment reports and local air quality monitoring data;
- Air Quality England website[37]; and
- The Environment Agency (EA) website[38].

E4.2 Operational Assessment Method

The development has the potential to impact existing air quality as a result of road traffic exhaust emissions, such as NO_2 and PM_{10}, associated with vehicles travelling to and from the site during the operational phase.

As the shortlisted access options are close to an AQMA, the following criteria which apply to developments in an AQMA, have been used to help establish whether a detailed air quality assessment is necessary:

- A change of Light Duty Vehicle flows of more than 100 Annual Average Daily Traffic (AADT) movements; and
- A change of Heavy Duty Vehicle flows of more than 25 AADT movements.

The development meets both of the criteria listed above and therefore a detailed air quality assessment has been undertaken for all sources using dispersion modelling. The significance of predicted impacts has been determined in accordance with the methodology outlined in the EPUK/IAQM guidance.

[37] Air Quality England, http://www.airqualityengland.co.uk/local-authority/?la_id=76, Accessed May 2017
[38] Environment Agency, http://www.environment-agency.gov.uk, Accessed May 2017

E4.3 Road Traffic Emissions

Roads surrounding the proposed development have the potential to impact air quality at the site as a result of road traffic exhaust emissions of NOx and PM_{10} during operation. A modelling assessment has been carried out to determine the likely pollutant concentrations at receptors in the surrounding area, the proposed opening year of the development, 2031, for both the shortlisted access options proposed (options A and E) and the future scenario without the development.

The ADMS-Roads Extra (version 4.1.1.0) atmospheric dispersion model has been used for this assessment. The assessment follows the methodology set out in Defra's Local Air Quality Management Guidance (TG16). However, verification of the model has not been undertaken as results were used for a comparative study only.

ADMS-Roads Extra has been used to predict NOx and PM_{10} concentrations. Predicted NOx concentrations have been processed to determine annual mean NO_2 concentrations for comparison with the annual mean NO_2 objectives, using the latest NOx to NO_2 calculator from Defra[39], version 5.1.

Predicted PM_{10} concentrations have been compared against the relevant objectives.

E4.4 Traffic Data and Traffic Scenarios

Traffic data was provided for roads around the proposed development site by Arup as the transport consultants and was used in the modelling of the future scenarios:

- 2031 opening/future year scenario, without the development (do minimum);
- 2031 opening/future year scenario for Option A, with the development (do something); and
- 2031 opening/future year scenario for Option E, with the development (do something).

In an assessment for planning purposes, it would be normal practice to model a baseline scenario in order to verify the modelling, following LAQM.TG16 guidance[35]. The baseline year would be the latest year with complete monitoring data and meteorological data, which would be 2016 in this case. However, the baseline scenario was not modelled in this assessment. Model verification was not required to assess the two access options. The unverified results were considered to be sufficient to be used as a comparative measure for the appraisal of the two shortlisted access options.

Emission rates for all road sources were calculated using Defra's Emissions Factor Toolkit v7.0[40]. All the scenarios use the 2016 emissions, in order to

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[39] Defra (2017) NOx to NO_2 Calculator (version 5.1, June 2016).
[40] Defra Emissions Factors Toolkit. Accessed: http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

provide a worst case assessment of the future conditions, to account for the lack of improvement in road vehicle emissions.

The traffic data provided consisted of 24-hour Annual Average Daily Traffic (AADT) flows, split by vehicle type (light duty vehicles (LDVs) and heavy duty vehicles (HDVs)). Average daily speeds were not available, therefore the congested speeds were used. The congested speed includes junction delays and represents an average of weekday AM (08:00-09:00) and PM (17:00-18:00) peak hours. The congested speeds do not take into consideration the speeds during the inter-peak and the off-peak (night-time) times. The inter-peak and off-peak periods represent periods when traffic would flow more freely. The congestion speeds would represent the slowest speeds, which results in higher emissions of pollutants being calculated in Defra's Emissions Factor Toolkit v7.0[41]. Therefore congested speeds represent the worst case scenario.

Figure E2E2 presents the modelled road network and Table E2E2 presents the traffic data used in the assessment. The roads modelled were limited to those roads which exceeded the criteria outlined in the EPUK/IAQM guidance[36].

[41] Defra Emissions Factors Toolkit. Accessed: http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

Table E2: Traffic data for future year scenarios

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
1560-1001	6,568	0.6	7,546	0.8	8,487	0.7	31.0
1002-1001	5,277	1.6	4,735	1.6	5,425	1.6	27.9
1003-1001	2,265	0.3	4,209	0.6	3,806	0.5	19.7
1178-1002	7,783	1.7	8,025	1.4	8,476	1.6	10.5
1001-1002	6,568	0.6	7,546	0.8	8,486	0.7	7.7
1002-1003	6,834	1.2	8,756	1.1	8,783	1.0	28.2
1007-1003	6,943	1.0	9,068	0.9	8,646	0.9	27.6
1006-1005	1,677	0.6	2,413	0.7	2,340	0.8	27.0
1176-1006	4,643	1.0	5,667	1.1	5,687	1.1	28.8
1003-1007	6,834	1.2	8,756	1.1	8,783	1.0	29.8
1118-1007	6,118	1.2	8,460	1.0	7,892	1.1	27.7
1010-1008	4,795	0.7	5,123	0.7	5,072	0.7	29.3
1008-1010	5,168	0.7	5,373	0.6	5,415	0.6	5.0
1026-1010	6,680	2.7	7,560	2.3	7,271	2.4	7.9
1022-1011	6,355	1.0	7,128	0.9	6,855	1.0	21.1
1024-1013	10,710	1.0	10,694	1.2	10,637	1.1	5.0
1017-1013	7,552	1.6	8,518	1.4	8,136	1.5	8.9
1010-1016	8,839	1.9	9,690	1.7	9,358	1.7	26.6
1016-1017	7,788	1.6	8,723	1.3	8,362	1.4	24.1
1021-1020	5,481	1.1	6,267	1.0	5,978	1.1	25.0
1011-1021	6,246	1.0	7,019	0.9	6,742	1.0	22.5

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
1013-1022	6,169	1.0	6,955	0.9	6,659	1.0	28.8
1717-1024	9,131	1.2	9,170	1.4	9,094	1.3	27.4
1013-1024	5,841	1.5	6,021	1.3	5,946	1.3	25.0
1797-1026	6,714	2.7	7,601	2.3	7,309	2.4	5.0
1035-1033	5,651	1.1	5,044	0.9	5,258	0.8	8.9
1932-1033	6,237	1.1	6,403	1.0	6,373	1.0	5.0
1719-1034	7,129	1.2	8,218	1.1	7,796	1.2	5.0
1567-1034	4,718	1.4	6,495	1.2	6,452	1.1	5.0
1034-1035	5,623	1.1	5,015	0.9	5,227	0.8	29.3
1569-1046	7,335	1.7	8,158	1.5	7,693	1.6	5.2
1719-1046	4,610	1.8	5,563	1.6	5,476	1.6	5.9
1118-1062	5,849	1.4	7,773	1.2	7,769	1.1	26.9
1562-1062	5,849	1.2	8,175	0.9	7,608	1.0	23.9
1590-1064	5,027	1.3	3,730	1.1	3,742	1.1	21.8
1573-1065	4,456	1.4	3,183	1.3	3,200	1.3	18.6
1065-1066	15,237	1.2	14,205	1.1	14,410	1.1	30.0
1066-1067	15,391	1.1	14,621	1.0	14,804	1.0	27.1
1067-1068	16,959	1.3	16,374	1.2	16,267	1.1	26.9
1068-1074	18,420	1.0	17,856	1.0	18,131	1.0	28.8
1065-1084	10,673	1.0	11,331	0.9	11,672	1.0	28.6
1084-1085	11,702	1.0	12,182	1.0	12,455	0.9	27.8
1589-1086	7,555	1.2	7,892	1.0	8,061	1.0	8.7

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
1085-1086	13,620	1.0	13,970	1.0	14,204	1.0	25.5
1086-1089	11,284	1.0	11,708	0.9	11,886	1.0	20.9
1123-1095	13,316	1.5	10,997	1.4	10,506	1.5	5.0
1569-1095	5,674	1.8	6,473	1.6	6,387	1.6	12.1
1096-1095	7,645	1.1	7,147	1.3	6,846	1.2	8.1
1100-1096	6,399	1.0	5,903	1.1	5,634	1.1	17.0
1095-1096	6,168	1.1	4,305	1.1	4,294	1.0	16.8
1100-1097	6,676	1.4	5,186	1.3	5,143	1.3	16.4
1590-1097	7,466	1.0	7,044	1.1	6,740	1.1	15.4
1096-1100	5,879	1.2	4,231	1.1	4,194	0.9	9.7
1097-1100	6,843	1.0	6,392	1.1	6,097	1.1	11.0
1605-1104	6,251	2.2	6,925	2.1	6,514	2.3	5.0
1117-1105	4,769	1.9	4,624	1.8	4,960	1.8	5.0
9723-1105	7,320	1.7	8,857	1.6	8,664	1.8	7.9
1110-1106	572	0.6	1,240	0.5	1,420	0.6	25.4
1116-1106	1,854	0.5	1,479	0.5	1,606	0.4	21.0
1106-1107	2,511	0.5	2,691	0.5	3,022	0.5	29.9
1737-1110	1,707	1.4	2,423	1.3	2,858	1.7	27.4
1113-1111	5,490	1.8	5,270	2.0	5,993	1.7	27.8
1307-1111	6,470	1.9	6,610	1.8	7,854	1.6	29.1
1114-1112	3,288	1.4	3,112	1.9	4,893	1.5	29.6
1115-1112	4,115	1.0	4,577	1.0	5,788	0.8	25.8

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
1111-1113	6,155	2.0	6,239	1.9	7,562	1.7	24.8
1115-1113	5,490	1.8	5,270	2.0	5,993	1.7	31.0
1112-1114	4,262	0.9	4,738	1.0	5,954	0.8	17.3
1119-1114	8,439	1.2	8,754	1.6	10,326	1.5	15.8
1105-1114	3,680	0.8	5,087	1.0	5,201	1.2	29.9
1113-1115	6,805	1.8	6,889	1.8	8,213	1.6	5.0
1112-1115	3,331	1.3	3,200	1.8	4,960	1.5	5.0
1115-1116	5,850	1.7	5,284	1.8	5,658	1.8	14.2
1117-1116	3,696	2.3	3,684	2.2	3,647	2.3	9.5
1106-1116	2,820	0.9	3,326	0.8	3,115	0.9	12.9
1116-1117	4,198	2.2	4,055	2.1	4,390	2.1	13.2
1115-1117	651	-	651	-	651	-	19.6
1105-1117	3,696	2.3	3,684	2.2	3,647	2.3	31.0
1007-1118	5,615	1.4	7,540	1.2	7,538	1.1	26.9
1062-1118	6,417	1.2	8,759	0.9	8,195	1.0	27.9
1120-1119	7,970	1.3	8,449	1.6	10,047	1.5	20.5
1114-1119	7,813	0.9	9,965	1.0	11,450	1.0	21.7
1119-1120	7,396	0.9	9,709	1.0	11,217	1.0	18.4
1124-1120	7,970	1.3	8,449	1.6	10,047	1.5	22.2
1578-1122	12,530	1.8	11,589	1.9	11,175	1.9	11.5
9712-1122	6,623	1.4	5,913	1.4	5,444	1.5	6.4
1581-1122	5,262	1.1	1,364	1.1	1,542	1.0	5.0

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
1122-1123	13,237	1.5	10,918	1.4	10,427	1.5	31.0
1120-1124	7,396	0.9	9,709	1.0	11,216	1.0	23.1
1345-1124	3,070	-	1,881	-	2,268	-	7.6
1130-1124	5,129	2.0	6,799	2.0	9,298	1.6	28.4
1131-1125	5,896	1.2	8,276	1.2	6,895	1.8	9.9
1348-1125	3,350	1.8	3,963	1.5	3,314	1.3	5.2
1767-1125	1,908	3.8	3,000	3.5	1,562	4.2	13.5
1128-1126	4,522	1.6	6,073	1.7	4,954	1.9	27.0
1459-1126	4,318	1.9	6,030	1.9	3,340	2.2	28.2
1588-1127	6,191	1.2	7,760	1.3	6,561	1.4	5.1
9809-1127	-	-	10,356	1.3	-	-	5.0
1126-1128	3,163	2.6	4,294	2.6	2,986	2.4	5.8
1769-1128	3,731	1.8	5,255	1.8	4,069	2.2	12.6
1131-1130	5,188	2.0	6,828	2.0	-	-	26.8
1124-1130	5,851	1.2	8,250	1.2	9,051	1.2	27.4
1125-1131	5,188	2.0	6,828	2.0	4,707	1.6	23.2
1130-1131	5,896	1.2	8,275	1.2	-	-	20.4
1767-1132	4,005	1.7	5,506	1.7	4,298	2.0	28.0
1940-1132	1,395	5.1	2,665	4.0	1,125	5.7	27.5
1134-1133	6,630	0.9	3,717	0.9	4,916	0.9	8.7
1136-1133	7,074	0.8	6,406	0.7	6,699	0.5	6.8
1560-1133	7,543	1.2	8,944	1.1	9,231	1.2	23.6

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
1582-1134	7,054	0.9	3,752	0.9	5,447	0.8	22.5
9718-1135	5,260	0.9	1,105	0.8	3,904	0.7	34.7
9809-1136	-	-	6,406	0.7	-	-	5.0
1133-1136	9,034	1.2	5,388	1.3	6,339	0.8	25.7
9719-1138	5,346	1.0	699	1.2	706	1.2	33.4
9728-1138	5,246	0.8	144	-	144	-	32.4
1179-1159	6,223	1.1	7,176	0.8	6,864	1.1	46.9
1490-1160	2,210	0.7	3,031	0.7	2,730	0.8	25.7
1160-1161	2,287	0.7	3,108	0.7	2,808	0.8	27.8
1173-1161	1,747	0.4	1,955	0.4	2,399	0.3	24.8
1161-1173	1,744	0.4	2,590	0.5	2,494	0.6	28.7
1175-1173	2,008	0.2	2,092	0.2	2,629	0.2	26.4
1173-1175	2,177	0.2	2,931	0.4	2,920	0.4	28.6
1005-1175	1,526	0.1	1,595	0.1	2,135	0.1	24.8
1182-1176	4,115	0.5	4,764	0.4	4,669	0.4	24.3
1005-1178	2,063	0.5	2,725	0.6	2,774	0.7	6.2
1002-1178	7,113	0.8	7,417	0.6	8,041	0.7	17.9
1178-1179	7,184	0.9	7,987	0.6	7,988	0.8	27.5
1008-1180	3,691	0.5	4,265	0.5	4,106	0.5	26.1
1004-1180	937	0.9	1,229	0.8	1,445	0.8	27.3
1180-1182	3,768	0.4	4,483	0.4	4,423	0.4	28.5
1559-1229	10,444	1.7	10,862	1.8	10,778	1.7	19.4

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
1559-1230	9,764	1.6	10,320	1.6	10,056	1.6	28.8
1229-1235	4,698	2.2	5,319	2.5	5,116	2.3	24.6
1235-1236	4,458	2.3	4,999	2.7	4,827	2.5	28.3
1087-1297	6,944	0.9	6,950	0.9	7,454	0.8	31.0
1306-1298	2,305	0.8	3,153	0.6	3,169	0.6	21.9
1299-1298	7,056	0.8	7,138	0.8	7,686	0.7	28.0
1297-1299	7,109	0.9	7,118	0.9	7,625	0.8	29.0
1305-1304	386	0.1	477	0.0	1,061	0.0	39.2
1307-1304	4,462	0.6	5,175	0.5	4,951	0.3	40.1
1306-1305	2,292	0.9	2,589	0.9	3,118	0.7	29.7
1304-1305	1,215	0.1	1,813	0.1	1,741	0.1	39.4
1298-1306	2,292	0.9	2,589	0.9	3,118	0.7	31.0
1305-1306	2,305	0.8	3,153	0.6	3,169	0.6	31.0
1304-1307	2,423	0.9	2,400	1.0	2,946	0.8	31.5
1742-1307	10,347	1.2	11,196	1.1	12,394	1.0	28.9
1311-1310	10,629	1.1	11,508	1.1	12,666	1.0	39.8
1742-1310	7,818	1.2	7,586	1.3	8,981	1.2	38.7
1310-1311	7,597	1.2	7,577	1.4	9,133	1.2	40.5
1312-1311	12,119	1.0	13,041	0.9	14,153	0.9	39.8
1311-1312	8,775	1.0	8,607	1.2	9,903	1.1	24.6
1318-1312	4,457	-	5,473	-	5,991	-	18.8
1319-1318	4,385	-	5,419	-	5,962	-	29.3

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
1320-1319	3,829	-	4,889	-	5,368	-	30.4
1677-1320	5,268	-	6,732	-	6,920	-	31.2
1358-1342	2,790	-	3,711	-	3,768	-	29.6
1342-1343	3,788	-	5,143	-	4,910	-	30.2
1343-1344	4,428	-	5,882	-	5,689	-	23.1
1124-1345	1,775	-	1,669	-	3,685	-	29.7
1346-1345	2,648	-	1,610	-	2,022	-	24.7
1345-1346	1,419	-	1,319	-	3,263	-	24.5
1347-1346	3,141	-	2,114	-	2,455	-	27.3
1348-1347	114	-	140	-	1,531	-	28.8
1346-1347	1,905	-	1,970	-	3,937	-	28.6
1357-1347	3,039	-	2,007	-	2,436	-	30.4
1125-1348	1,961	1.5	2,889	1.0	2,766	2.4	36.1
1349-1348	3,445	1.7	4,011	1.5	3,238	1.3	36.6
1352-1349	2,706	-	3,396	-	2,082	-	20.8
1348-1349	1,976	1.5	2,906	1.0	1,277	5.2	34.6
1349-1350	3,498	0.9	4,771	0.6	2,747	2.4	33.8
1126-1352	2,280	-	2,911	-	1,553	-	23.9
1384-1353	2,997	-	2,513	-	2,093	-	28.1
1356-1353	1,269	-	1,307	-	3,041	-	30.1
1355-1354	2,255	-	2,332	-	3,612	-	28.9
1356-1355	3,713	-	4,224	-	5,213	-	23.0

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
1353-1356	2,342	-	1,913	-	1,435	-	24.9
1357-1356	3,895	-	4,313	-	7,123	-	19.1
1347-1357	1,882	-	1,894	-	5,332	-	30.6
1356-1357	5,919	-	5,114	-	5,452	-	23.6
1359-1358	5,523	-	6,062	-	6,866	-	30.6
1354-1358	2,216	-	2,368	-	3,612	-	21.5
1361-1359	2,668	-	3,371	-	3,328	-	31.0
1358-1359	2,928	-	3,062	-	4,333	-	16.3
1363-1361	3,010	-	3,728	-	3,672	-	36.5
1687-1362	2,867	-	4,478	-	2,392	-	24.4
1382-1363	1,944	-	3,528	-	1,469	-	25.4
1687-1363	3,890	-	4,580	-	4,510	-	9.7
1386-1372	2,732	-	3,283	-	2,901	-	19.6
1373-1372	3,592	0.8	4,476	0.7	4,678	1.4	27.4
1374-1373	3,466	0.9	4,336	0.7	4,535	1.5	18.4
1372-1373	6,200	0.9	6,968	0.9	6,297	0.7	35.7
1373-1374	6,110	1.0	6,860	0.9	6,192	0.7	14.1
1379-1374	3,291	0.9	4,166	0.7	4,367	1.5	36.0
1374-1375	2,369	-	3,089	-	3,058	-	29.4
1687-1375	988	-	1,782	-	932	-	25.1
1380-1379	3,448	0.9	4,323	0.7	4,525	1.5	35.2
1375-1379	971	-	1,770	-	923	-	24.7

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
1374-1379	3,794	1.5	3,824	1.6	3,187	1.4	35.9
1381-1380	3,893	0.8	6,263	0.5	2,683	2.5	27.6
1383-1380	2,052	-	2,110	-	3,874	-	14.9
1379-1380	4,765	1.2	5,594	1.1	4,109	1.0	27.0
1385-1381	2,786	-	4,331	-	2,087	-	12.6
1350-1381	1,964	1.5	2,888	1.0	1,488	4.5	26.0
1380-1381	3,551	1.7	4,784	1.3	3,846	1.1	12.1
1383-1382	2,095	-	3,672	-	1,598	-	28.5
1380-1383	3,711	-	4,860	-	2,296	-	14.0
1384-1383	1,707	-	1,698	-	3,488	-	14.8
1383-1384	2,958	-	2,474	-	2,054	-	31.0
1353-1384	1,707	-	1,698	-	3,488	-	31.0
1398-1385	2,800	-	4,214	-	2,061	-	30.3
1381-1385	1,963	-	3,050	-	1,937	-	29.8
1387-1386	2,626	-	3,187	-	2,773	-	30.4
1388-1387	2,615	-	3,111	-	2,684	-	27.9
1392-1388	2,824	-	3,240	-	2,977	-	29.3
1387-1388	2,488	0.0	2,619	-	2,526	0.0	27.6
1392-1390	3,133	-	3,641	-	3,099	-	29.8
1396-1391	4,175	1.7	4,228	1.7	3,608	1.9	36.5
1388-1392	3,133	-	3,434	-	3,099	-	29.9
1401-1393	7,985	1.4	7,713	1.9	7,531	1.4	22.9

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
1985-1393	4,409	1.6	4,325	1.7	3,930	1.7	5.0
1407-1396	4,175	1.7	4,228	1.7	3,608	1.9	38.0
1399-1398	3,012	-	4,354	-	2,254	-	27.9
1385-1398	2,157	-	3,107	-	2,142	-	30.2
1400-1399	3,164	-	4,618	-	2,298	-	29.3
1398-1399	2,856	-	3,745	-	2,831	-	28.2
1703-1400	10,497	1.1	11,717	1.3	9,298	1.2	18.7
1399-1400	3,550	0.0	4,139	-	3,547	0.0	10.2
1701-1400	5,055	1.4	4,624	1.5	4,505	1.6	6.0
1393-1401	4,330	1.6	4,248	1.7	3,852	1.7	28.1
1771-1402	5,065	1.4	4,770	1.5	4,519	1.5	5.0
1390-1407	3,023	-	3,586	-	2,941	-	15.1
1970-1407	7,914	1.0	8,114	1.0	7,446	1.0	18.3
1588-1459	5,196	1.6	6,886	1.6	4,222	1.7	29.7
1126-1459	5,473	1.3	7,042	1.4	5,832	1.6	30.0
1159-1490	2,339	0.7	3,034	0.7	2,873	0.8	28.8
1583-1548	1,345	0.3	305	-	459	-	26.3
9701-1548	168	0.7	1,636	0.2	1,636	0.2	5.0
9705-1548	670	0.0	1,690	0.2	1,930	0.2	5.0
1229-1559	8,554	1.6	8,540	1.6	8,435	1.6	22.0
1133-1560	6,568	0.6	7,546	0.8	8,487	0.7	29.1
1001-1560	7,543	1.2	8,944	1.1	9,231	1.2	27.1

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
1567-1562	5,932	1.3	8,295	1.0	7,700	1.1	26.5
1062-1562	5,209	1.4	7,129	1.2	7,117	1.1	16.5
1932-1563	8,684	1.4	8,599	1.6	8,648	1.5	5.0
1717-1563	6,534	1.1	6,756	0.9	6,636	1.0	27.3
1034-1567	5,955	1.3	8,341	1.0	7,752	1.1	27.9
1562-1567	4,888	1.4	6,561	1.2	6,620	1.1	5.0
1095-1569	7,336	1.7	8,158	1.5	7,693	1.6	31.0
1046-1569	4,129	1.4	4,901	1.3	4,781	1.3	28.1
1065-1573	6,508	1.2	6,106	1.2	5,810	1.3	29.3
1064-1573	4,166	1.5	2,879	1.4	2,889	1.4	23.8
1095-1578	13,042	1.4	12,053	1.5	11,650	1.5	28.8
9710-1580	7,089	1.3	6,378	1.3	5,873	1.4	27.5
9726-1580	6,064	2.2	6,635	2.2	6,222	2.4	13.2
1583-1581	5,185	1.2	516	-	693	-	21.4
1122-1581	5,303	1.0	1,627	1.7	1,784	1.6	28.8
1135-1582	6,896	0.9	3,594	0.9	5,290	0.8	23.2
1581-1583	4,731	0.9	305	-	459	-	35.2
1548-1583	1,670	0.2	516	-	693	-	22.1
9712-1586	5,806	2.0	6,324	2.0	5,856	2.2	12.8
1732-1586	6,768	1.3	6,009	1.4	5,447	1.5	18.4
1104-1587	7,311	1.7	8,799	1.7	8,597	1.8	21.9
1127-1588	5,196	1.6	6,886	1.6	4,222	1.7	23.7

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
1459-1588	6,191	1.2	7,760	1.3	6,561	1.4	26.6
1746-1589	7,555	1.2	7,892	1.0	8,061	1.0	15.8
1097-1590	5,776	1.7	4,563	1.6	4,553	1.7	20.7
1064-1590	7,466	1.0	7,044	1.1	6,740	1.1	15.2
1104-1605	7,244	1.4	6,593	1.4	6,087	1.5	26.6
9710-1605	6,185	2.2	6,866	2.1	6,449	2.3	27.4
1344-1677	5,268	-	6,732	-	6,920	-	35.8
1375-1687	2,369	-	3,089	-	3,058	-	25.2
1363-1687	2,867	-	4,478	-	2,392	-	31.0
1362-1687	2,509	-	3,274	-	2,384	-	29.5
1402-1701	4,865	1.4	4,500	1.5	4,294	1.6	28.5
1127-1703	10,497	1.1	11,718	1.3	9,298	1.2	31.0
1024-1717	7,618	1.2	7,865	1.0	7,724	1.0	26.4
1563-1717	9,130	1.4	9,129	1.5	9,079	1.4	27.1
1034-1719	5,127	1.8	6,080	1.6	5,977	1.6	23.2
1046-1719	6,900	1.4	7,940	1.3	7,551	1.4	28.8
9728-1728	5,333	1.1	181	-	183	-	30.2
9726-1731	6,242	1.4	5,430	1.5	4,942	1.7	19.6
1732-1731	6,871	2.0	7,510	2.0	7,112	2.1	8.9
1731-1732	4,371	2.0	3,847	2.1	3,514	2.3	20.3
1586-1732	5,802	2.0	6,324	2.0	5,856	2.2	24.5
1115-1737	2,076	1.8	2,709	1.6	3,178	1.9	30.0

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
1307-1742	7,649	1.2	7,405	1.4	8,789	1.2	35.1
1310-1742	10,499	1.2	11,358	1.1	12,568	1.0	38.6
1087-1746	7,601	1.1	7,964	1.0	8,118	1.0	22.5
1132-1767	1,761	4.1	2,935	3.6	1,338	4.8	8.1
1125-1767	4,005	1.7	5,506	1.7	4,298	2.0	31.0
1128-1769	1,472	4.9	2,665	4.0	1,125	5.7	5.0
1940-1769	3,731	1.8	5,255	1.8	4,070	2.2	31.0
1393-1771	78	-	78	-	78	-	5.0
1401-1771	4,987	1.4	4,692	1.6	4,440	1.5	5.0
1020-1790	5,601	1.3	6,388	1.2	6,091	1.2	29.8
1790-1800	6,461	1.1	7,280	1.1	6,970	1.1	5.0
1236-1931	4,662	2.2	5,203	2.6	5,033	2.4	5.0
1033-1932	8,684	1.4	8,599	1.6	8,648	1.5	5.0
1563-1932	5,617	1.3	5,784	1.1	5,754	1.1	5.0
1769-1940	1,395	5.1	2,665	4.0	1,125	5.7	27.8
1132-1940	3,731	1.8	5,255	1.8	4,070	2.2	25.0
1407-1970	12,266	1.0	12,578	1.3	11,834	1.0	38.4
3036-1970	7,914	1.0	8,114	1.0	7,446	1.0	43.6
1393-1985	7,980	1.4	7,713	1.9	7,531	1.4	5.0
1391-1985	3,744	1.8	3,777	1.9	3,168	2.0	5.0
1970-3036	12,266	1.0	12,578	1.3	11,834	1.0	48.0
1548-9701	130	0.9	1,175	0.3	1,237	0.3	31.0

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
9705-9704	89	0.1	13	-	7,958	1.6	31.0
1548-9705	660	0.0	1,941	0.2	2,095	0.2	26.3
9704-9705	88	0.1	14	-	5,516	0.7	5.4
9706-9705	27	-	4,196	0.6	6,521	1.3	5.0
9707-9705	-	-	2,613	2.3	2,613	2.3	5.0
9705-9706	-	-	4,549	1.4	4,171	0.9	31.0
9804-9706	-	-	4,196	0.6	-	-	5.0
9705-9707	-	-	2,511	0.9	2,686	0.9	31.0
1580-9710	6,129	2.2	6,751	2.2	6,335	2.3	26.5
1605-9710	7,207	1.4	6,553	1.4	6,047	1.5	24.9
1122-9712	5,758	2.1	6,322	2.0	5,949	2.2	26.3
1586-9712	6,768	1.3	6,009	1.4	5,447	1.5	22.2
1135-9718	5,370	1.0	4,646	0.7	5,978	1.2	29.4
9719-9718	5,260	0.9	629	2.2	629	2.2	26.2
9720-9718	142	-	891	0.4	4,041	0.8	20.4
9718-9719	5,346	1.0	699	1.2	706	1.2	26.0
1138-9719	5,259	0.9	629	2.2	629	2.2	28.0
9718-9720	167	-	4,361	0.8	6,037	1.3	31.0
9804-9720	-	-	831	0.7	-	-	5.0
9730-9720	-	-	3,294	0.6	3,294	0.6	5.0
1587-9723	7,311	1.7	8,799	1.7	8,597	1.8	27.5
1580-9726	6,909	1.3	6,159	1.4	5,657	1.5	13.7

Road ID	2031 Do Minimum		2031 Do Something A		2031 Do Something E		Congested Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
1731-9726	6,466	2.1	6,982	2.1	6,583	2.3	24.9
1138-9728	5,302	1.1	181	-	183	-	32.2
1728-9728	5,165	0.9	144	-	144	-	30.5
9720-9730	-	-	2,914	0.7	2,941	0.7	5.0
9807-9804	-	-	3,067	0.6	-	-	5.0
9720-9804	-	-	4,681	0.8	-	-	5.0
9706-9804	-	-	4,549	1.4	-	-	5.0
9804-9807	-	-	7,270	1.2	-	-	5.0
9809-9807	-	-	3,067	0.6	-	-	5.0
1136-9809	-	-	5,388	1.3	-	-	5.0
9807-9809	-	-	7,270	1.2	-	-	5.0
1127-9809	-	-	7,170	0.5	-	-	5.0
9704-1779	-	-	-	-	7,958	1.6	5.0
9720-9706	-	-	-	-	6,521	1.3	5.0
1728-1583	5,303	1.1	-	-	-	-	35.1
9705-9703	301	-	-	-	-	-	31.0
9703-9705	201	-	-	-	-	-	11.9
9725-9705	186	0.1	-	-	-	-	10.3
9705-9725	105	0.1	-	-	-	-	31.0
1779-9704	-	-	-	-	5,516	0.7	5.0
9706-9720	-	-	-	-	4,171	0.9	5.0
1583-1728	5,172	0.9	-	-	-	-	35.5

Figure E2: The modelled road network

E4.4.1 Sensitive Receptors

Sensitive human receptors have been selected at worst case locations on the road network, taking into consideration the AQMAs, and are shown in Figure E3. Their details are presented in table E3.

One ecologically designated site sensitive to NOx has been identified in the study area, the Clifton Ings and Rawcliffe Meadows site of special scientific interest (SSSI). Information provided by the Air Pollution Information System (APIS) website[42] states that this SSSI features habitats sensitive to NOx.

Table E3: Discrete receptors

Receptor number	OS Grid Ref.		Height (m)	Type
	X	Y		
1	458909	452215	1.5	Human
2	459058	452216	1.5	Human
3	459136	451899	1.5	Human
4	459164	452045	1.5	Human
5	459051	451889	1.5	Human
6	460255	451183	1.5	Human
7	460162	450996	1.5	Human
8	459646	451322	1.5	Human
9	458040	452230	1.5	Human
10	460349	453075	1.5	Human
11	458924	452013	1.5	Human
12	458923	452103	1.5	Human
13	460227	452514	1.5	Human
14	459003	451575	1.5	Human
15	460360	451610	1.5	Human
16	459724	452604	1.5	Human
17	459293	452962	1.5	Human
18	459318	451098	1.5	Human
19	458705	451392	1.5	Human
20	460785	451192	1.5	Human
21	458735	452224	1.5	Human
22	458672	452210	1.5	Human
23	458536	452191	1.5	Human
24	460157	452353	1.5	Human
25	460536	453004	1.5	Human

[42] Air Pollution Information System; http://www.apis.ac.uk, Accessed May 2017

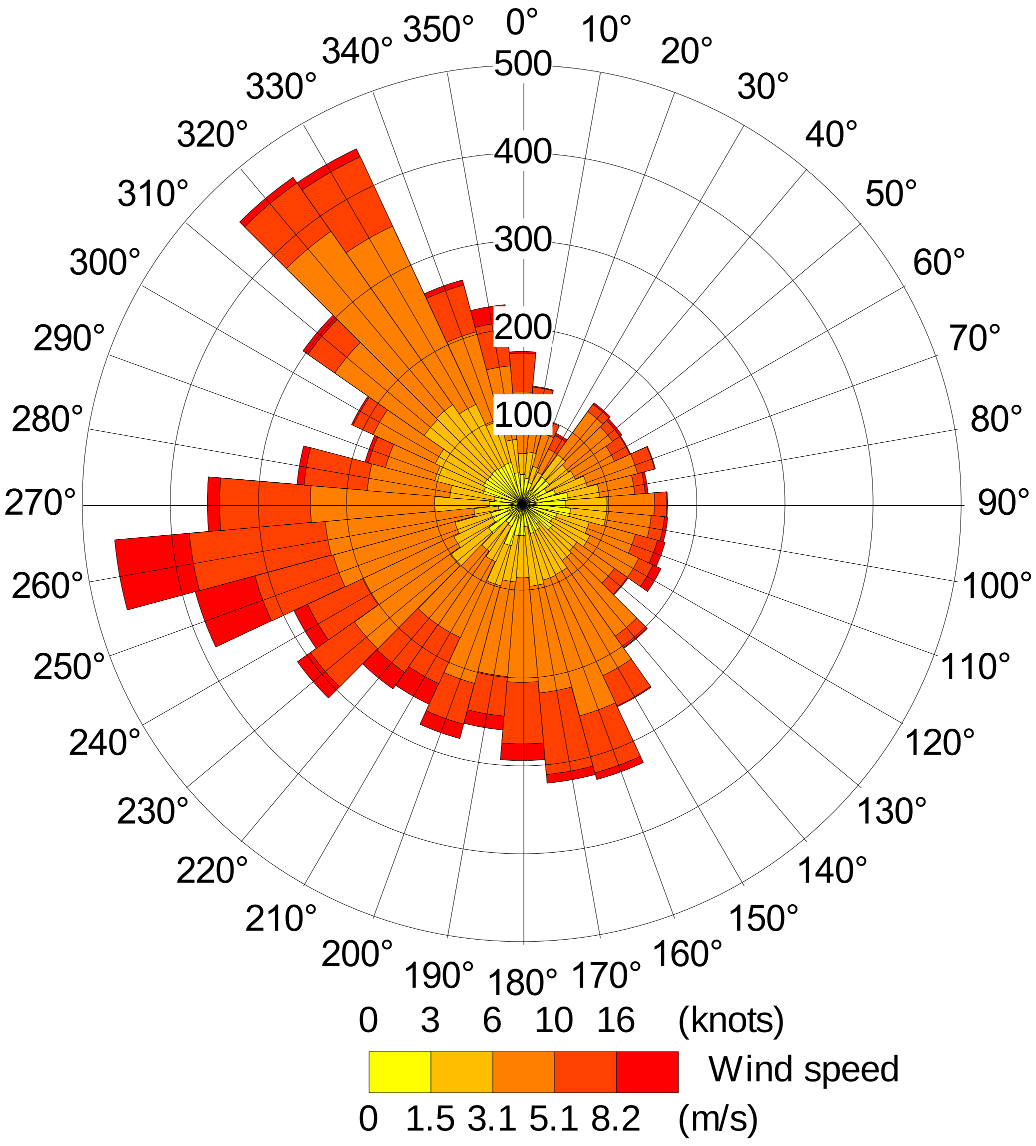
Receptor number	OS Grid Ref.		Height (m)	Type
	X	Y		
26	458843	451340	1.5	Human
27	459483	451246	1.5	Human
28	459097	451252	1.5	Human
29	458879	451284	1.5	Human
30	458991	451235	1.5	Human
31	458778	452205	1.5	Human
32	459050	452090	1.5	Human
33	458681	452323	1.5	Human
34	459227	450813	1.5	Human
35	460114	451149	1.5	Human
36	458301	452140	1.5	Human
37	458201	452074	1.5	Human
38	458642	451500	1.5	Human
39	459666	451484	1.5	Human
40	458615	452445	1.5	Human
41	458693	452422	1.5	Human
42	459565	451072	1.5	Human
43	459166	451558	1.5	Human
44	459995	451767	1.5	Human
45	459530	451188	1.5	Human
46	460630	451302	1.5	Human
47	459099	452893	1.5	Human
48	458520	452486	1.5	Human
49	458946	451446	1.5	Human
50	458522	452591	0	Ecological (SSSI)

Figure E3: Receptors modelled

E4.4.2 Meteorological Data

In order for the modelling exercise to be representative of local conditions and to predict long-term averages, the dispersion model requires representative meteorological data. Meteorological data used in this assessment was measured at Linton-on-Ouse over the period 1st January 2016 to 31st December 2016. Linton-on-Ouse is located approximately 17km north-west of the proposed development site. Figure E4E4 shows the wind rose for the full year of data. It can be seen that the predominant wind directions are westerly and north-westerly.

Figure E4: The wind rose for Linton-on-Ouse for 2016



Most dispersion models for roads 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. Defra's LAQM.TG16 guidance recommends that the meteorological data file is tested using 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. The guidance recommends that meteorological data should only be used if the percentage of usable hours is greater than 75% and preferably 90%.

Hourly sequential observation dataset for 2016 from Linton-on-Ouse includes 8,735 lines of usable hourly data, which corresponds to 99% of the year (a total of 8,784 lines of data). This is above the 90% threshold, therefore, the data meets the requirements of the Defra guidance and is adequate for the dispersion modelling.

E4.4.3 Other Model Parameters

The extent of mechanical turbulence (and hence, mixing) in the atmosphere is affected by the roughness of the surface/ground over which the air is passing. Typical surface roughness values range from 1.5m (for cities, forests and industrial areas) to 0.0001m (for water or sandy deserts).

In this assessment, the general land-use in the area around the site can be described as 'parkland, open suburbia' with a corresponding surface roughness of 0.5m. In addition, the minimum Monin-Obukhov length was set to 'cities and large towns' with a corresponding value of 30m.

E4.4.4 Model Verification

Model verification refers to the comparison of modelled and measured pollutant concentrations at the same location(s) to determine the performance of the model. Verification has not been carried out in this study. Results have been used as a comparative measure only.

E4.4.5 Background Concentrations

Background concentrations refer to the existing levels of pollution in the atmosphere, produced by a variety of sources, such as roads and industrial processes. The Defra website provides estimated background air pollution data for each 1x1km OS grid square for each local authority area. Background maps are available for the base year of 2013 and have been projected to estimate concentrations for each year from 2013 to 2030. Data for 2016 has been used in the assessment for both the baseline and future scenarios as a worst case assumption.

E4.4.6 Assessment of Significance

The 2017 EPUK/IAQM guidance note 'Land-Use Planning & Development Control' provides an approach to determining the air quality impacts resulting from a proposed development and the overall significance of local air quality effects arising from a proposed development.

Firstly, impact descriptors are determined based on the magnitude of incremental change as a proportion of the relevant assessment level, in this instance the annual mean NO_2 objective. The change is then examined in relation to the predicted total pollutant concentrations in the assessment year and its relationship with the annual mean NO_2 objective.

The assessment framework for determining impact descriptors at each of the assessed receptors is shown in Table E4.

Table E4: Impact descriptors

Annual average concentrations at receptor in the assessment year	**% Change in concentrations relative to annual mean NO_2 and hourly mean objectives**			
	1	2-5	6-10	>10
75% or less of objective	Negligible	Negligible	Slight	Moderate
76-94% of objective	Negligible	Slight	Moderate	Moderate
95-102% of objective	Slight	Moderate	Moderate	Substantial
103-109% of objective	Moderate	Moderate	Substantial	Substantial
110% of more of objective	Moderate	Substantial	Substantial	Substantial

Note: Changes in pollutant concentrations of 0% i.e. <0.5% would be described as negligible

The impact descriptors at each of the assessed receptors are then used as a starting point for making a judgement on the overall significance of effect of a proposed development, however, other influences would also need to be taken into account, such as:

- The existing and future air quality in the absence of the development;
- The extent of current and future population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

Professional judgement should be used to determine the overall significance of effect of the proposed development, however in circumstances where the proposed development can be judged in isolation, it is likely that a ‘moderate’ or ‘substantial’ impact will give rise to a significant effect and a ‘negligible’ or ‘slight’ impact will not result in a significant effect.

E5 Baseline Assessment

E5.1 Sources of Air Pollution

E5.2 Industrial Processes

Industrial air pollution sources are regulated through a system of operating permits or authorisations, requiring stringent emission limits to be met and ensuring that any releases to the environment are minimised or rendered harmless. Regulated (or prescribed) industrial processes are classified as Part A or Part B processes, and are regulated through the Pollution Prevention and Control (PPC) system[43],[44]. The larger more polluting processes are regulated by the Environment Agency (EA), and the smaller less polluting ones by the local authorities. Local authorities tend also to regulate only for emissions to air, whereas the EA regulates emissions to air, water and land.

There is a Part A process with releases to air within approximately 2km of York Station from 2012 as listed on the EA website.

Table E5: Part A processes within 1.5km of the site

Operator	Industry	Approx. distance and direction from site (km)
Nestle UK LTD	Other industry	2.2 north-east

E5.3 Local Air Quality

The Environment Act 1995 requires local authorities to review and assess air quality with respect to the objectives for seven pollutants specified in the National Air Quality Strategy. Local authorities have been required to carry out an assessment of their area to identify any areas likely to exceed air quality objectives. Where objectives are not predicted to be met, local authorities must declare the area as an Air Quality Management Area (AQMA). In addition, local authorities are required to produce an Air Quality Action Plan (AQAP), which includes measures to improve air quality within the AQMA.

As part of this review and assessment process, CYC declared three AQMAs for exceedences of the annual mean NO_2 objective. They are located in York City Centre, Fulford Village and Leeman Road area. The AQMAs are shown in Figure E5 and summarised in 6. The City Centre AQMA and the Salisbury Terrace AQMA lie partly within the site boundary.

[43] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control).
[44] The Environmental Permitting (England and Wales) (Amendment) Regulations 2013, SI 2013/390.

Table E6: A summary of the three AQMAs for York and the objective exceeded

AQMA name	AQMA location	Air quality objective exceeded
Fulford AQMA (No.2)	York (Fulford village): A19 corridor between Fishergate and the Outer Ring Road. Includes properties on Fulford Main Street only.	NO_2 annual mean
Salisbury Terrace AQMA (No.3)	York (Leeman Road area): Parts of Water End and the Leeman Road Area. Includes properties on Salisbury Terrace only.	NO_2 annual mean
City Centre AQMA (No.4)	York (City Centre): Inner ring road and properties included within 6 areas of technical breach.	NO_2 annual mean and NO_2 hourly mean (certain roads only)

Figure E5: The three AQMAs in place for York and in proximity to the York Central site

E5.4 Local Monitoring

E5.5 Automatic Monitoring

CYC operates nine automatic monitoring stations, five of which are within 1km of the site boundary. Four of these monitoring stations record NO_2, and three record PM_{10}. The locations of these monitoring stations are shown in Table E7 and Figure E6. The measured annual NO_2 concentrations are shown in Table E8 and the measured annual PM_{10} concentrations are shown in Table E9. This data is taken from the most recent LAQM report and the Air Quality England website. These results show that there are no recorded exceedances at any of the automatic monitoring sites between 2013 and 2016, for either NO_2 or PM_{10}.

Table E7: Automatic monitoring sites

Site name	OS Grid Ref.		Site type	Approx. distance from site
	X	Y		
Bootham	460022	452777	Background	850m
Nunnery Lane	460068	451199	Roadside	530m
Holgate	459512	451282	Roadside	70m
Gillygate	460147	452345	Roadside	500m
Plantation Drive	457428	452620	Roadside	900m

Notes: Plantation Drive records PM_{10} only, while Bootham and Holgate record both NO_2 and PM_{10}.

Table E8: Results of automatic NO_2 monitoring

Site name	Data capture 2016 (%)	Annual mean NO_2 ($\mu g/m^3$)			
		2013	2014	2015	2016
Bootham	84	19.0	18.8	15.8	17.8
Nunnery Lane	99	32.5	34.1	28.4	31.4
Holgate	98	38.0	32.5	30.7	29.4
Gillygate	97	32.8	34.7	27.8	27.3
Objective		40			

Table E9: Results of automatic PM_{10} monitoring

Site name	Data capture 2016 (%)	Annual mean PM_{10} ($\mu g/m^3$)			
		2013	2014	2015	2016
Bootham	-	11.7	11.7	15.3	n/a[c]
Holgate	90	23.8	18.3	20.9[a]	12.8
Plantation Drive	98	18.1	17.2	n/a[b]	15.5
Objective		40			

Notes: [a] data capture is less than 50%; [b] data is not available due to equipment malfunction; [c] data is not available.

E5.6 Diffusion Tube Monitoring

The City of York Council operated diffusion tube monitoring of NO_2 at 233 sites during 2015, and 178 of these diffusion tubes are within 2km of the proposed site. For this assessment 85 tubes have been chosen to represent the air quality in the vicinity of the site. These sites have been selected as they are on the roads closest to the proposed site and along routes where traffic might travel to access the development. The details of the diffusion tube monitoring sites are presented in Table E10, and their locations are shown in Figure E7E7.

Recent monitoring results are shown in Table E11E11. There are exceedences of the NO_2 annual mean air quality objectives recorded at 21 of the monitoring sites listed in Table E11 from 2013 to 2015. All of the exceedences are at roadside locations. From the diffusion tubes listed, the maximum annual NO_2 concentration is recorded at D51. The monitoring site D51 recorded an NO_2 concentration of 65.3µg/m^3 in 2014, and 57.1µg/m^3 in 2015. The local authority has noted that the reason for the high concentration is because the tube is situated inside the York Railway Station taxi rank.

Table E10: Selected diffusion tube site details.

Site ID	Site location	X	Y	Site type	Distance to kerb of nearest road (m)
3a	Bootham Monitoring Station	460024	452767	Background	49.6
3b	Bootham Monitoring Station	460024	452767	Background	49.6
3c	Bootham Monitoring Station	460024	452767	Background	49.6
6	Nunnery Lane Car Park	459777	451406	Roadside	2.8
7	Gillygate, opposite Portland Street	460217	452421	Roadside	0.3
8	Portland Street	460163	452468	Background	1.8
9	Portland Street	460163	452468	Background	1.8
9a	Portland Street	460163	452468	Background	1.8
11	Holly Bank	458846	450946	Background	0.7
13	Papillion Hotel, Gillygate	460176	452377	Roadside	1.5
14	Gillygate Surgery	460167	452347	Roadside	2.3
17	18 Queen Street	459646	451500	Roadside	1.3
35	Carr Lane	457603	451492	Roadside	2.9
37	Jarvis Abbey Park	459522	451187	Roadside	2.7
78	Gillygate Monitoring Station	460149	452342	Roadside	2.3
79	Gillygate Monitoring Station	460149	452342	Roadside	2.3
80	Gillygate Monitoring Station	460149	452342	Roadside	2.3
102	Inbetween 252 and 254 Salisbury Terrace	458703	452429	Roadside	1.0
103	Inbetween 252 and 254 Salisbury Terrace	458703	452429	Roadside	1.4
104	Inbetween 252 and 254 Salisbury Terrace	458703	452429	Roadside	1.4
107	Inbetween corner shop and betting office	458779	452387	Roadside	3.8
108	Opposite 200 Salisbury Terrace	458814	452373	Roadside	1.5
109	16 Rougier Street	459924	451833	Roadside	2.5
110	Inbetween Club Salvation and 31	459985	451727	Roadside	2.3

Site ID	Site location	X	Y	Site type	Distance to kerb of nearest road (m)
	George Hudson Street				
111	Cedar Court, opposite Multistorey Car Park on Tanner Row	459917	451728	Roadside	2.6
112	St Gregorys Mews, opposite Council HQT	459873	451684	Roadside	2.3
114	Inbetween Society bar and café and Rougier Street	459981	451778	Roadside	2.7
115	Inside Bus Stop, opposite 114	459962	451771	Roadside	1.5
116	111 Poppleton Road	458212	452037	Roadside	5.3
128	Inbetween 7 and 9 Livingstone Street	458687	452369	Roadside	1.6
A1	Bootham, outside dance shop	460088	452263	Roadside	2.3
A2	In front of registry office	459917	452405	Roadside	3.4
A3	WRVS building, Bootham	459822	452492	Roadside	2.6
A4	St Olaves Road	459699	452638	Background	0.7
A6	Clifton Bingo Hall	459536	452811	Roadside	3.0
A7	51 Clifton	459441	452892	Roadside	2.1
A13	Clifton Dale	459335	452931	Background	1.6
A14	Clifton Dale	459335	452931	Background	1.6
A14a	Clifton Dale	459335	452931	Background	1.6
A17	Sailsbury Road	458578	452472	Roadside	1.5
A19	17 Sailsbury Terrace	458713	452414	Roadside	1.3
A19a	17 Sailsbury Terrace	458713	452414	Roadside	1.3
A19b	17 Sailsbury Terrace	458713	452414	Roadside	1.3
A20	224 Sailsbury Terrace	458760	452404	Roadside	1.1
A20a	224 Sailsbury Terrace	458760	452404	Roadside	1.1
A20b	224 Sailsbury Terrace	458760	452404	Roadside	1.1
A21	Kingsland Terrace	458806	452326	Background	1.4
A22	Kingsland Terrace	458792	452242	Background	23.8
A25	Garfield Terrace	458706	452225	Roadside	1.5
A38	Boroughbridge Road	457857	452334	Background	10.3

Site ID	Site location	X	Y	Site type	Distance to kerb of nearest road (m)
A40	Poppleton Road School	458109	452196	Background	7.9
A41	140 Poppleton Road	458172	452108	Roadside	5.3
A45	Grantham Drive	458384	451817	Background	10.5
A48	9 Poppleton Road	458666	451468	Roadside	4.9
A50	Outside Foxpub, HolgateRd	458732	451393	Roadside	0.3
A51	Thrall entrance	458827	451348	Background	2.2
A52	Holgate Road on the corner of Hamilton Drive East)	458945	451254	Roadside	2.0
A53	Holgate Road	459066	451239	Roadside	2.7
A55	Holgate Road	459351	451221	Roadside	0.2
A56	Holgate Road	459470	451268	Background	10.2
A57	Hairdressers, Holgate Road	459533	451280	Roadside	2.8
A64	Outside Charlie Browns	460030	452327	Roadside	0.6
A94	5 Salisbury Road	458651	452426	Roadside	13.7
A96	Outside 31 Water End	459038	452850	Roadside	0.6
C19	Trentholme Drive	459271	450819	Background	0.4
C20	Elmbank Hotel	459280	450923	Background	0.5
C21	Dalton Terrace	459410	451040	Roadside	3.5
C22	Park Street	459570	451195	Background	1.1
C23	The Mount	459553	451252	Roadside	3.0
C26	Outside the Odean	459639	451334	Roadside	0.8
C27	Windmill Pub	459717	451433	Roadside	3.2
C56	On junction of Scarcroft Road and The Mount	459484	451141	Roadside	1.3
C62	East Mount Road	459579	451251	Roadside	1.0
D13	4 Skeldergate, opposite City Mills	460271	451358	Roadside	1.6
D19	On junction of Bridge Street and Micklegate	460038	451626	Roadside	0.2
D20	On junction of Low Ousegate and Clifford Street,outsideWaterst ones	460323	451685	Roadside	0.5

Site ID	Site location	X	Y	Site type	Distance to kerb of nearest road (m)
D22	Outside Museum Gardens	460035	452010	Roadside	2.1
D24	Priory Street sign, Micklegate	459805	451543	Roadside	0.5
D25	Bus Stop E outside of the Royal York Hotel	459693	451750	Roadside	0.4
D43	Signpost 1, Rougier Street	459920	451834	Roadside	0.3
D48	Outside De Grey House	460103	452180	Roadside	2.3
D51	Inside Taxi Rank at York Railway Station	459640	451722	Roadside	40.0
D55	Museum Street, opposite Thomas's Pub	460087	452065	Roadside	2.2
D59	Bus Stop outside 8/9 SLP	460087	452156	Roadside	2.7
D60	Outside Schuh	460294	451883	Roadside	1.7

Table E11: Measured annual mean concentrations of NO_2 for selected diffusion tubes.

Site ID	Site location	NO_2 annual mean concentration (µg/m^3)		
		2013	**2014**	**2015**
3a	Bootham Monitoring Station	20.3	17.4	14.4
3b	Bootham Monitoring Station	18.9	19.0	15.1
3c	Bootham Monitoring Station	19.5	16.2	16.0
6	Nunnery Lane Car Park	**40.6**	39.0	37.4
7	Gillygate, opposite Portland Street	**48.4**	**55.2**	**44.9**
8	Portland Street	20.9	20.1	16.3
9	Portland Street	21.6	19.2	15.3
9a	Portland Street	21.1	19.8	15.5
11	Holly Bank	21.8	18.6	15.8
13	Papillion Hotel, Gillygate	**46.5**	**48.3**	**45.5**
14	Gillygate Surgery	**50.7**	**52.2**	**47.1**
17	18 Queen Street	34.2	37.1	32.2
35	Carr Lane	25.6	27.5	24.9
37	Jarvis Abbey Park	34.5	37.5	33.2
78	Gillygate Monitoring Station	30.4	32.1	29.0
79	Gillygate Monitoring Station	31.2	35.2	29.4
80	Gillygate Monitoring Station	31.1	33.0	28.6
102	Inbetween 252 and 254 Salisbury Terrace	36.0	34.5	31.9
103	Inbetween 252 and 254 Salisbury Terrace	34.1	37.6	31.1
104	Inbetween 252 and 254 Salisbury Terrace	36.1	36.9	31.0
107	Inbetween corner shop and betting office	18.8	20.7	18.9
108	Opposite 200 Salisbury Terrace	22.9	26.3	23.5
109	16 Rougier Street	-	-	**46.4**
110	Inbetween Club Salvation and 31 George Hudson Street	**48.6**	**51.3**	**46.6**
111	Cedar Court, opposite Multistorey Car Park on Tanner Row	28.1	31.9	25.1
112	St Gregorys Mews, opposite Council HQT	24.5	27.2	23.3
114	Inbetween Society bar and café and Rougier Street	40.0	**41.5**	39.3
115	Inside Bus Stop, opposite 114	38.5	**48.4**	**42.6**
116	111 Poppleton Road	29.1	31.5	28.0
128	Inbetween 7 and 9 Livingstone Street	-	22.5	18.6
A1	Bootham, outside dance shop	**51.6**	**52.3**	**46.0**
A2	In front of registry office	35.4	-	31.1
A3	WRVS building, Bootham	30.5	34.4	29.2

Site ID	Site location	NO_2 annual mean concentration (µg/m^3)		
		2013	2014	2015
A4	St Olaves Road	24.6	21.0	18.2
A6	Clifton Bingo Hall	27.1	28.8	25.5
A7	51 Clifton	28.7	29.3	27.5
A13	Clifton Dale	20.8	19.7	16.4
A14	Clifton Dale	21.8	19.9	16.4
A14a	Clifton Dale	22.0	20.0	15.2
A17	Sailsbury Road	28.9	32.3	27.6
A19	17 Sailsbury Terrace	30.2	31.6	27.7
A19a	17 Sailsbury Terrace	28.3	30.9	28.8
A19b	17 Sailsbury Terrace	28.7	31.9	28.6
A20	224 Sailsbury Terrace	31.2	32.5	28.7
A20a	224 Sailsbury Terrace	32.4	35.6	28.8
A20b	224 Sailsbury Terrace	30.7	34.3	29.3
A21	Kingsland Terrace	22.7	22.8	18.5
A22	Kingsland Terrace	23.0	22.4	18.1
A25	Garfield Terrace	26.0	28.4	22.6
A38	Boroughbridge Road	20.6	19.1	15.3
A40	Poppleton Road School	25.6	22.9	17.8
A41	140 Poppleton Road	22.3	26.0	20.6
A45	Grantham Drive	19.8	18.8	14.3
A48	9 Poppleton Road	25.4	26.9	23.7
A50	Outside Foxpub, HolgateRd	30.6	-	26.2
A51	Thrall entrance	24.8	23.8	19.9
A52	Holgate Road on the corner of Hamilton Drive East)	34.6	37.1	31.0
A53	Holgate Road	32.4	32.2	30.8
A55	Holgate Road	35.3	36.3	31.8
A56	Holgate Road	32.9	30.2	26.3
A57	Hairdressers, Holgate Road	**51.6**	**49.2**	**46.9**
A64	Outside Charlie Browns	35.6	35.1	29.3
A94	5 Salisbury Road	26.7	26.2	22.0
A96	Outside 31 Water End	31.5	34.4	28.4
C19	Trentholme Drive	21.3	18.7	17.0*
C20	Elmbank Hotel	23.4	20.3	16.9
C21	Dalton Terrace	28.2	28.3	26.9
C22	Park Street	28.6	22.9	19.4
C23	The Mount	38.5	**42.9**	39.9

Site ID	Site location	NO_2 annual mean concentration (µg/m^3)		
		2013	2014	2015
C26	Outside the Odean	**40.9**	**42.1**	**40.4**
C27	Windmill Pub	**49.1**	**52.0**	**46.7**
C56	On junction of Scarcroft Road and The Mount	33.3	34.6	32.1
C62	East Mount Road	28.6	30.7	28.4
D13	4 Skeldergate, opposite City Mills	25.2	27.8	24.5
D19	On junction of Bridge Street and Micklegate	**50.8**	**54.7**	**48.0**
D20	On junction of Low Ousegate and Clifford Street,outsideWaterstones	**40.6**	**43.9**	**40.3**
D22	Outside Museum Gardens	33.4	39.9	33.0
D24	Priory Street sign, Micklegate	31.9	-	30.3
D25	Bus Stop E outside of the Royal York Hotel	-	**41.0**	35.1
D43	Signpost 1, Rougier Street	**45.0**	**47.9**	**40.4**
D48	Outside De Grey House	37.3	**41.2**	33.3
D51	Inside Taxi Rank at York Railway Station	-	**<u>65.3</u>**	**57.1**
D55	Museum Street, opposite Thomas's Pub	-	39.8	**42.6**
D59	Bus Stop outside 8/9 SLP	-	-	**50.7***
D60	Outside Schuh	-	-	22.2*

Notes: Exceedances of the annual mean NO_2 objective are shown in bold. Annual mean exceedances exceeding 60µg/m^3 may indicate the potential for exceedances of the NO_2 1-hour mean objective; these are shown in bold and underlined. * represents data with less than 75% data capture.

Figure E7: The locations of the automatic monitoring sites and the 85 selected diffusion tube sites within 1km of the site boundary

E5.7 Background Concentrations

The Defra website includes estimated background air pollution data for both NO_2 and PM_{10} for each 1km by 1km OS grid square.

The centre grid reference of the site boundary is 459133, 451824. The site boundary lies across four grid squares, each of which are listed in Table E12 with the corresponding Defra background NO_2 and PM_{10} concentrations for 2016.

Table 12 indicates that the Defra background concentrations for the relevant grid squares are below the Air Quality Objectives for annual mean NO_2 and PM_{10}. These Defra values for NO_2 are slightly higher than the measured concentrations from the Automatic Monitoring background station, and similar to the values measured by the diffusion tubes. As the Defra values are consistently higher than the measured values, background concentrations in the region of 17 $\mu g/m^3$ should be considered.

Table E12: 2016 baseline background pollutant concentrations.

OS Grid Square		**2016 Concentrations ($\mu g/m^3$)**	
X	Y	NO_2	PM_{10}
458500	452500	17.1	14.0
458500	451500	16.3	13.8
459500	452500	17.1	13.7
459500	451500	23.1	14.8
Air Quality Objective		40	

E6 Operational Assessment

E6.1 Road Traffic Emissions – Predicted Pollutant Concentration Results

Verification of the modelled pollutant concentrations was not carried out due to the lack of 24-hour traffic speed data and therefore the results should be used as a comparative measure of the impact of the two options rather than as a prediction of absolute values. The following impact descriptors, determined from the concentrations should, therefore, also be used as a comparative measure.

E6.1.1 NO_2

The NO_2 results are shown in Table E14E14, in Figure E8E8 and Figure EXXE9. The results show that shortlisted access Option E resulted in higher concentrations at 35 of the discrete receptors in comparison to the concentrations predicted for Option A. At 15 receptors predicted concentrations were higher for access Option A, in comparison to Option E. Therefore shortlisted access option E is predicted to cause higher concentrations at more of the receptors.

With regards to the impact descriptors, Table E13 shows that both Option A and E had one receptor predicted to have a slight adverse impact. All the other receptors were predicted to have a slight beneficial or negligible impact.

Option E results in two more receptors predicted to have a moderate adverse impact than for Option A. Option A results in five more receptors predicted to have a slight adverse impact than for Option E.

Table E13: The number of receptors with the following impact descriptors for each option.

Impact descriptor	Option A	Option E
Substantial beneficial	0	0
Moderate beneficial	0	0
Slight beneficial	3	1
Negligible	46	48
Slight adverse	1	1
Moderate adverse	0	0
Substantial adverse	0	0

Table E14: Comparative NO_2 results between shortlisted access options.

Receptor	Annual Mean NO_2 ($\mu g/m^3$)				Which Option resulted in highest concentration?	Impact Descriptors	
	Do Minimum	Do Something Access Option A	Do Something Access Option E	Difference (Option E minus Option A)		Option A	Option E
1	18.0	18.0	18.1	0.13	E	Negligible	Negligible
2	17.9	17.8	17.9	0.06	E	Negligible	Negligible
3	23.7	24.2	24.4	0.25	E	Negligible	Negligible
4	20.2	18.0	18.1	0.10	E	Negligible	Negligible
5	23.7	24.2	24.4	0.26	E	Negligible	Negligible
6	23.8	24.0	24.1	0.10	E	Negligible	Negligible
7	20.5	20.7	20.8	0.11	E	Negligible	Negligible
8	25.9	26.4	26.5	0.06	E	Negligible	Negligible
9	19.4	20.7	19.3	1.39	A	Negligible	Negligible
10	17.6	17.8	17.7	0.07	A	Negligible	Negligible
11	18.0	18.2	18.4	0.19	E	Negligible	Negligible
12	22.1	18.6	18.8	0.19	E	Slight beneficial	Slight beneficial
13	20.2	20.2	20.2	<0.01	E	Negligible	Negligible
14	23.6	24.0	27.3	3.36	E	Negligible	Slight adverse
15	22.3	21.7	21.7	<0.01	E	Negligible	Negligible
16	23.1	25.0	24.8	0.22	A	Negligible	Negligible
17	19.9	21.1	21.0	0.09	A	Negligible	Negligible
18	26.8	27.2	28.4	1.13	E	Negligible	Negligible
19	20.3	21.6	20.8	0.79	A	Negligible	Negligible

Receptor	Annual Mean NO_2 (µg/m^3)				Which Option resulted in highest concentration?	Impact Descriptors	
	Do Minimum	Do Something Access Option A	Do Something Access Option E	Difference (Option E minus Option A)		Option A	Option E
20	25.9	25.7	25.8	0.09	E	Negligible	Negligible
21	21.5	20.0	21.0	0.94	E	Negligible	Negligible
22	19.7	19.2	19.6	0.39	E	Negligible	Negligible
23	17.7	18.8	17.9	0.89	A	Negligible	Negligible
24	20.7	20.6	20.7	0.04	E	Negligible	Negligible
25	19.1	19.5	19.4	0.13	A	Negligible	Negligible
26	20.0	21.3	19.2	2.08	A	Negligible	Negligible
27	25.4	25.9	26.1	0.21	E	Negligible	Negligible
28	27.4	28.3	29.2	0.91	E	Negligible	Negligible
29	19.6	20.6	20.6	0.01	E	Negligible	Negligible
30	20.3	21.0	21.8	0.85	E	Negligible	Negligible
31	20.7	19.6	20.6	0.99	E	Negligible	Negligible
32	20.5	18.2	18.3	0.09	E	Slight beneficial	Negligible
33	23.6	21.2	22.4	1.28	E	Slight beneficial	Negligible
34	17.6	17.7	18.0	0.34	E	Negligible	Negligible
35	25.4	25.5	25.7	0.16	E	Negligible	Negligible
36	17.8	18.5	17.9	0.55	A	Negligible	Negligible
37	22.7	24.5	22.6	1.94	A	Negligible	Negligible
38	23.2	26.2	23.4	2.84	A	Slight adverse	Negligible
39	27.2	27.3	27.2	0.11	A	Negligible	Negligible
40	19.8	19.3	19.4	0.16	E	Negligible	Negligible

Receptor	Annual Mean NO_2 (µg/m^3)				Which Option resulted in highest concentration?	Impact Descriptors	
	Do Minimum	Do Something Access Option A	Do Something Access Option E	Difference (Option E minus Option A)		Option A	Option E
41	22.8	20.8	21.8	1.00	E	Negligible	Negligible
42	25.7	25.9	25.9	0.06	E	Negligible	Negligible
43	23.7	24.2	24.9	0.74	E	Negligible	Negligible
44	27.6	27.0	26.9	0.09	A	Negligible	Negligible
45	27.1	27.2	27.4	0.22	E	Negligible	Negligible
46	24.2	23.9	24.0	0.07	E	Negligible	Negligible
47	21.1	21.8	22.0	0.26	E	Negligible	Negligible
48	21.3	21.0	20.6	0.32	A	Negligible	Negligible
49	17.0	17.3	18.6	1.30	E	Negligible	Negligible
50	18.3	18.5	18.4	0.14	A	Negligible	Negligible

Figure E8: Access Option A, indicative NO_2 concentrations (future Do Something)

Figure E9: Access Option A NO_2 impact descriptors (future Do Something).

Figure EXX: Access Option E, NO_2 indicative concentrations (future Do Something)

Figure EXX: Access Option E NO_2 impact descriptors (future Do Something)

E6.1.2 PM_{10}

The PM_{10} results are shown in Table EXX EXX. The PM_{10} results show a similar trend to the NO_2 results. Shortlisted access Option E resulted in higher concentrations at 35 of the discrete receptors in comparison to the concentrations predicted in option A. At 15 receptors, higher concentrations were predicted with access Option A, in comparison to Option E. Therefore shortlisted access Option E is predicted to cause higher concentrations at more of the receptors.

With regards to the impact descriptors, a negligible impact is predicted at all receptors.

Table EXX: Comparative PM_{10} results between access options.

Receptor	Annual Mean PM_{10} ($\mu g/m^3$)				Which Option resulted in highest concentration	Impact Descriptors	
	Do Minimum	Do Something Access Option A	Do Something Access Option E	Difference (Option E minus Option A)		Option A	Option E
1	14.2	14.2	14.2	0.02	E	Negligible	Negligible
2	13.8	13.8	13.8	0.01	E	Negligible	Negligible
3	14.9	15.0	15.0	0.04	E	Negligible	Negligible
4	14.2	13.8	13.9	0.02	E	Negligible	Negligible
5	14.9	15.0	15.0	0.04	E	Negligible	Negligible
6	15.2	15.2	15.2	0.02	E	Negligible	Negligible
7	14.4	14.4	14.4	0.02	E	Negligible	Negligible
8	15.3	15.3	15.4	<0.01	E	Negligible	Negligible
9	14.4	14.6	14.4	0.21	A	Negligible	Negligible
10	13.8	13.8	13.8	0.01	A	Negligible	Negligible
11	14.2	14.2	14.3	0.03	E	Negligible	Negligible
12	14.9	14.3	14.3	0.03	E	Negligible	Negligible
13	14.6	14.6	14.6	<0.01	E	Negligible	Negligible
14	14.9	14.9	15.5	0.54	E	Negligible	Negligible
15	14.9	14.8	14.8	<0.01	E	Negligible	Negligible
16	14.7	15.0	15.0	0.04	A	Negligible	Negligible
17	14.1	14.3	14.3	0.01	A	Negligible	Negligible
18	15.4	15.5	15.7	0.20	E	Negligible	Negligible
19	14.4	14.6	14.5	0.11	A	Negligible	Negligible

Receptor	Annual Mean PM_{10} ($\mu g/m^3$)				Which Option resulted in highest concentration	Impact Descriptors	
	Do Minimum	Do Something Access Option A	Do Something Access Option E	Difference (Option E minus Option A)		Option A	Option E
20	15.6	15.5	15.5	0.02	E	Negligible	Negligible
21	14.8	14.5	14.7	0.16	E	Negligible	Negligible
22	14.5	14.4	14.5	0.07	E	Negligible	Negligible
23	14.1	14.3	14.2	0.14	A	Negligible	Negligible
24	14.7	14.7	14.7	<0.01	E	Negligible	Negligible
25	14.1	14.2	14.2	0.02	A	Negligible	Negligible
26	14.4	14.6	14.3	0.32	A	Negligible	Negligible
27	15.2	15.3	15.3	0.03	E	Negligible	Negligible
28	15.5	15.6	15.8	0.15	E	Negligible	Negligible
29	14.4	14.5	14.6	0.01	E	Negligible	Negligible
30	14.5	14.6	14.7	0.14	E	Negligible	Negligible
31	14.6	14.5	14.6	0.17	E	Negligible	Negligible
32	14.3	13.9	13.9	0.02	E	Negligible	Negligible
33	15.1	14.7	14.9	0.22	E	Negligible	Negligible
34	13.8	13.8	13.9	0.06	E	Negligible	Negligible
35	15.4	15.4	15.4	0.02	E	Negligible	Negligible
36	14.2	14.3	14.2	0.08	A	Negligible	Negligible
37	15.0	15.3	15.0	0.34	A	Negligible	Negligible
38	14.9	15.3	14.9	0.41	A	Negligible	Negligible
39	15.5	15.5	15.5	0.02	A	Negligible	Negligible
40	14.4	14.4	14.4	0.02	E	Negligible	Negligible

Receptor	Annual Mean PM_{10} (µg/m^3)				Which Option resulted in highest concentration	Impact Descriptors	
	Do Minimum	Do Something Access Option A	Do Something Access Option E	Difference (Option E minus Option A)		Option A	Option E
41	14.9	14.6	14.8	0.16	E	Negligible	Negligible
42	15.2	15.2	15.2	0.01	E	Negligible	Negligible
43	14.9	15.0	15.1	0.12	E	Negligible	Negligible
44	15.4	15.4	15.4	0.01	A	Negligible	Negligible
45	15.3	15.4	15.4	0.03	E	Negligible	Negligible
46	15.3	15.2	15.2	0.01	E	Negligible	Negligible
47	14.4	14.5	14.6	0.05	E	Negligible	Negligible
48	14.7	14.6	14.6	0.04	A	Negligible	Negligible
49	14.0	14.0	14.2	0.20	E	Negligible	Negligible
50	14.2	14.3	14.2	0.02	A	Negligible	Negligible

E6.1.3 Access Option Appraisal

The results should be used as a comparative measure of the impact of the two options rather than as a prediction of absolute values, because verification of the modelled pollutant concentrations was not carried out due to the lack of 24-hour traffic speed data. The following impact descriptors, determined from the concentrations should, therefore, also be used as a comparative measure.

The comparative study found that Option A is considered to be the better option with regards to air quality. Option A and E both resulted in one slight adverse impact for NO_2 at a receptor. However, Option A resulted in more slight beneficial impacts for NO_2 at the receptors. The impact descriptors are a less rigorous measure for comparison and therefore more weight should be given to the differences in the indicative concentrations of the pollutants.

The results for both NO_2 and PM_{10} found that predicted concentrations at the majority of the 50 receptors would be lower with Option A than with Option E.

E7 Conclusion

This appendix presents the air quality appraisal for the proposed development options at York Central in York. A review of current legislation and planning policy, a baseline assessment describing the current air quality conditions in the vicinity of the proposed development and an assessment of indicative air quality impacts associated with the operation of both of the scheme options have been undertaken.

The site of the proposed development includes part of two of the CYC AQMAs (Salisbury Terrace AQMA (No.3) and City Centre AQMA (No.4)), which were declared due to exceedences of the air quality standard for annual mean NO_2 concentrations, and, in the City Centre AQMA, exceedences of the hourly mean NO_2 objective.

A modelling assessment has been carried out to determine the likely pollutant concentrations at receptors in the surrounding area. Concentrations of annual mean NO_2 and PM_{10} have been predicted for the two options (options A and E) and compared at assessed receptors.

The indicative modelled concentrations suggest that the health-based air quality objectives for NO_2 and PM_{10} are not predicted to be exceeded at any of the selected receptors for either Option A or E. However, it should be noted that the model has not been verified as part of this study and the predicted concentrations are only indicative and used as a comparative measure for the appraisal of the two access options.

The comparative study found that Option A is considered to be the better option with regards to air quality, considering the differences of indicative concentrations at each discrete receptor.