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PROPOSED IMPROVEMENTS WORKS AT JUNCTION 8, M62

AIR QUALITY ASSESSMENT REPORT

MAY 2016

WSP | PARSONS BRINCKERHOFF

PROPOSED IMPROVEMENTS WORKS AT JUNCTION 8, M62

AIR QUALITY ASSESSMENT REPORT

Final for issue

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WSP | Parsons Brinckerhoff
The Victoria, 150-182 The Quays
Salford, M50 3SP

Tel: +44 (0) 161 886 2400
Fax: +44 (0) 161 886 2401
www.wspgroup.com
www.pbworld.com

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Signature	alison.banks@wspgroup.com pp APPROVER 2016.06.07 09:02:28 +01'00'			
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1 EXECUTIVE SUMMARY

1.1.1 WSP | Parsons Brinckerhoff (WSP | PB) has undertaken an air quality assessment to support the Section 73 application for the Proposed Scheme of highways improvement works at the M62 Junction 8 (including realignment of Charon Way northwards).

1.1.2 This report presents the findings of the assessment, which addresses the potential air quality impacts during both the construction and operational phases of the Proposed Scheme. For both phases the type, source and significance of potential impacts were identified, and the measures that should be employed to minimise these proposed, where appropriate. The methodology followed in this study was discussed and agreed with the Environmental Health Officer (EHO) at Warrington Borough Council (WBC).

1.1.3 The assessment of construction phase impacts associated with fugitive dust and particulate matter emissions has been undertaken in line with the relevant Design Manual for Roads and Bridges (DMRB) guidance. Through good site practice and the implementation of suitable mitigation measures (detailed within the Environmental Management Plan), dust and particulate matter generation and suspension can be minimised; the residual effects are therefore negligible. The residual effects to air from construction vehicles and plant on local air quality are also negligible.

1.1.4 An assessment of the potential local and regional air quality impacts associated with traffic generated by the operational phase of the Proposed Scheme has been completed in line with published methodologies and technical guidance.

1.1.5 The quantitative assessment of the potential impacts on local air quality (nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$)) resulting from changes in traffic flow, traffic speeds, traffic composition and road alignment due to the Proposed Scheme has been carried out for a number of sensitive receptors using dispersion modelling.

1.1.6 Annual mean NO_2 concentrations are predicted to exceed the Air Quality Strategy (AQS) objective at a small number of receptors in the opening year (2017) in both the Do Minimum (DM) and Do-Something (DS) scenarios; the Proposed Scheme does not cause any new exceedances of the objective and there are no exceedances predicted in the design year (2032). Predicted concentrations of PM_{10} and $PM_{2.5}$ meet the AQS objectives in the DM and DS scenarios in both 2017 and 2032. Based on the Environmental Protection UK (EPUK)/Institute of Air Quality Management (IAQM) guidance the residual effects of the Proposed Scheme once operational are judged to range from moderate beneficial to negligible in 2017, and to be negligible in 2032.

1.1.7 The change in total air pollutant emissions is very small compared to national road transport emissions and therefore the residual effect on regional air quality is judged to be negligible.

2 INTRODUCTION

2.1.1 WSP | Parsons Brinckerhoff (PB) has prepared this air quality assessment.

2.1.2 Omega Warrington Limited submitted an outline application in 2003 for *'phased redevelopment for primarily employment uses (offices, industrial, storage and distribution) with associated development for subsidiary uses (retail, food & drink, non-residential institutions & hotel) and associated car parking, landscaping and infrastructure, including demolition of existing structures on site'* (Reference 2003/01449). The application was accompanied by an Environmental Statement (ES). A Supplementary ES was submitted in 2005. Application 2003/01449 was granted planning consent in 2007. This consent has been subsequently been updated via applications made under Section 73 (s73) of the Town and Country Planning Act (1990).

2.1.3 This Air Quality Report relates to an application for an amendment to the updated consent 2015/26475 which will be made to Warrington Borough Council (WBC), as the consenting authority.

2.1.4 A description of the s73 is as follows:

> *'Variation of Conditions (Major Application)- Proposed variation of conditions 3, 4, 6, and 8 attached to outline planning permission 2013/22086 to refer to a new development parcels plan & schedule and to revised maximum floor space levels (including the introduction of B2 and B8 (general industrial/logistics & distributive) floorspace, and a reduction in the previously permitted B1 office floorspace; variation of condition 25 to reflect current parkingstandards; deletion of original conditions 26 (automated system to monitor vehicle trips); 35 and 36 (B1 floorspace triggers); addition of new condition (34) to require a legal mechanism to link to original S106 agreement.'*

2.1.5 The *'highways improvement works'* comprise the expansion of the existing M62 Junction 8, including the widening of circulatory carriageways, off slip, Burtonwood Road and Skyline Drive and diversion of the westbound carriageway of Charon Way (hereafter referred to as the 'Proposed Scheme' or 'the Site').

2.1.6 M62 Junction 8 is an eight-arm grade separated signalised roundabout over the M62 with east and west facing on-slip / off-slip roads. Burtonwood Road crosses the roundabout north-south and Charon Way connects to the south-east. Skyline Drive has recently opened to the south-west. A temporary construction compound will also be erected within the Omega South site, to the south-west of the existing junction. Altogether these areas are referred to as the 'works area'. The works area covers an area of approximately 10.75 hectares (ha) and is located on the north-western periphery of Warrington. The location of the works area is shown by the blue line in **Figure 1.1 – Location of Works** and **Figure 1.2 – Works Area Boundary**.

2.1.7 This report presents the findings of the assessment of the potential air quality impacts during both the construction and operational phases of the Proposed Scheme. For both phases, the type, source and significance of potential impacts are identified, and the measures that should be employed to minimise these provided, where appropriate.

2.1.8 It is considered that the Proposed Scheme may have a temporary impact on local air quality during the construction phase, with earth-moving works, general construction activities and trackout by construction vehicles having the greatest potential to cause nuisance through the generation of dust and particulate matter.

2.1.9 For the operational phase, the impacts of changes to traffic flows (including traffic volume, composition, speeds and road alignment) on local and regional air quality have been considered.

2.1.10 This air quality assessment has been undertaken in line with the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1 (HA 207/07) Air Quality[1] and associated Interim Advice Notes (IANs) and Environmental Protection UK (EPUK) / Institute of Air Quality Management (IAQM) guidance, where appropriate.

2.1.11 A glossary of terms used in this report is provided in **Appendix A**.

[1] Highways Agency (2007). Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 – Air Quality.

3 LEGISLATION, POLICY & GUIDANCE

3.1 LEGISLATION

3.1.1 The applicable legislative framework is summarised as follows:

THE ENVIRONMENTAL PROTECTION ACT 1990

3.1.2 Section 79 of Part III of the Environmental Protection Act 1990[2] gives the following definitions of statutory nuisance relevant to dust and particles:

"Any dust, steam, smell or other effluvia arising from industrial, trade or business premises or smoke, fumes or gases emitted from premises so as to be prejudicial to health or a nuisance", and

"Any accumulation or deposit which is prejudicial to health or a nuisance."

3.1.3 Following this, Section 80 says that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

THE ENVIRONMENT ACT 1995

3.1.4 Part IV of the Environment Act 1995[3] introduced the Local Air Quality Management regime, within which local authorities must regularly review and document local air quality within their area against the air quality objectives defined in the Regulations. Where the objectives are not likely to be achieved, an authority is required to designate an Air Quality Management Area (AQMA). For each AQMA the local authority is required to draw up an Air Quality Action Plan (AQAP) to secure improvements in air quality and show how it intends to work towards achieving air quality standards in the future.

AIR QUALITY DIRECTIVE 2008/50/EC

3.1.5 The Air Quality Directive 2008/50/EC[4] came into force on the 11 June 2008. This directive merged three existing Directives and one Council Decision into a single Directive on air quality. It mandates air quality limit values, target values, and critical levels for a number of air pollutants established by the European Parliament and Council for the protection of human health, vegetation and ecosystems. These are sulphur dioxide (SO_2), nitrogen dioxide (NO_2), oxides of nitrogen (NO_X) particulate matter (PM_{10} and $PM_{2.5}$), lead (Pb), benzene (C_6H_6), carbon monoxide (CO) and ozone (O_3).

[2] The Environmental Protection Act 1990. [Online] Available at: http://www.legislation.gov.uk/ukpga/1990/43/contents
[3] The Environment Act 1995. [Online] http://www.legislation.gov.uk/ukpga/1995/25/contents
[4] 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.

THE AIR QUALITY (ENGLAND) REGULATIONS 2000 AND THE AIR QUALITY (ENGLAND) (AMENDMENT) REGULATIONS 2002 - STATUTORY INSTRUMENT 2000 NO. 921 AND 2002 NO. 3034

3.1.6 The Air Quality (England) Regulations 2000[5] and the Air Quality (England) (Amendment) Regulations 2002[6] require that likely exceedances of the Air Quality Objectives are assessed in relation to:

> *"…the quality of the air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present…"*

3.1.7 The Air Quality Objectives apply only where members of the public are likely to be regularly present for the averaging time of the objectives (i.e. where people will be exposed to pollutants). These periods reflect the varying effects on health of differing exposures to pollutants, for example temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road.

THE AIR QUALITY STANDARDS REGULATIONS 2010 - STATUTORY INSTRUMENT 2010 NO. 1001

3.1.8 The Air Quality Standards Regulations 2010[7] transposes 2008/50/EC in to the UK legislation.

THE AIR QUALITY STRATEGY (AQS) FOR ENGLAND, SCOTLAND, WALES AND NORTHERN IRELAND (VOLUMES 1 AND 2) JULY 2007

3.1.9 The Government's policy on air quality within the UK is set out in the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland published in July 2007[8]. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK.

3.1.10 The AQS also sets standards and objectives for nine key air pollutants to protect health, vegetation and ecosystems. For construction activities and road traffic emissions, which are the focus of this assessment, the main pollutants of concern are NO_2, PM_{10} and $PM_{2.5}$. The standards and objectives for these pollutants are given in **Appendix B**.

[5] The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928.
[6] The Air Quality (England) (Amendment) Regulations 2002- Statutory Instrument 2002 No.3043.
[7] The Air Quality Standards Regulations 2010 - Statutory Instrument 2010 No. 1001.
[8] Department for Environment, Food and Rural Affairs (DEFRA) and the Devolved Administrations (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2).

3.2 POLICY

NATIONAL PLANNING POLICY FRAMEWORK

3.2.1 The Government's overall planning policies for England are described in the National Planning Policy Framework[9]. This document also outlines the means by which Government intends to apply these policies at various levels to achieve its aim of contributing to sustainable development. The Framework acknowledges the importance of appropriate and robust planning at a local level and thus promotes opportunities for communities to engage in plan making at a neighbourhood level. The core underpinning principle of the Framework is the presumption in favour of sustainable development, defined as:

> *"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."*

ROAD INVESTMENT STRATEGY POLICY PAPER

3.2.2 The Department for Transport has published its Road Investment Strategy: for the 2015/16 – 2019/20 Road Period[10] which sets out policies relating to the strategic planning and funding of the road network. A £100 million Air Quality Fund is to be established to deliver air quality improvements for both new and existing schemes. A number of Performance Indicators are recommended within the document, including a number relating to the environment. In relation to Air Quality, the effect of vehicle emissions on concentrations of oxides of nitrogen and particulate matter is recognised, and it is identified that there is a need to demonstrate that the negative impacts of schemes are reduced.

WARRINGTON BOROUGH COUNCIL LOCAL PLAN CORE STRATEGY

3.2.3 WBC's Local Plan Core Strategy[11] contains Policy CS 4: Overall Spatial Strategy – Transport which states that:

> *"…The Council will support improvements to Warrington's Transport Network that: …*
>
> *… reduce the impact of traffic on air quality and reduce carbon emissions to help tackle climate change"*

3.2.4 Policy QE 6: Environment and Amenity Protection is also relevant and states:

> *"The Council in consultation with other Agencies, will only support development which would not lead to an adverse impact on the environment or amenity of future occupiers or those currently occupying adjoining or nearby properties, or does not have an unacceptable impact on the surrounding area. The Council will take into consideration the following: …*
>
> *… Air quality…*
>
> *… Levels of odours, fumes, dust…"*

[9] Department for Communities and Local Government (2012). National Planning Policy Framework.
[10] Department for Transport (2015). Road Investment Strategy for the 2015/16-2019/20 Road Period.
[11] Warrington Borough Council (2014). WBC Local Plan Core Strategy – Adopted July 2014.

3.3 GUIDANCE

3.3.1 A summary of the publications referred to in the undertaking of this assessment is provided below.

DESIGN MANUAL FOR ROADS AND BRIDGES AND INTERIM ADVICE NOTES

3.3.2 The Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1 (HA 207/07) Air Quality[12] provides guidance on the assessment of the impact that road projects may have on local and regional air quality. The assessment has followed the principles of this guidance where appropriate. In addition, the methodology set out in Interim Advice Note (IAN) 170/12 v3[13] has been followed to determine future year NO_2 concentrations, and IAN 175/13[14] for completing a compliance risk assessment.

LOCAL AIR QUALITY MANAGEMENT TECHNICAL GUIDANCE (LAQM.TG(16))

3.3.3 The Department for Environment, Food and Rural Affairs (DEFRA) has published technical guidance for use by local authorities in their review and assessment work[15]. This guidance, referred to in this document as LAQM.TG(16), has been used where appropriate in the assessment presented herein.

LAND-USE PLANNING & DEVELOPMENT CONTROL: PLANNING FOR AIR QUALITY

3.3.4 In May 2015 Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) published updated guidance[16] which offers comprehensive advice on: when an air quality assessment may be required; what should be included in an assessment; how to determine the significance of any air quality impacts associated with a development; and, the possible mitigation measures which may be implemented to minimise these impacts.

NATIONAL PLANNING PRACTICE GUIDANCE – AIR QUALITY

3.3.5 This guidance[17] provides a number of guiding principles on how the planning process can take into account the impact of new development on air quality, and explains how much detail air quality assessments need to include for proposed developments, and how impacts on air quality can be mitigated. It also provides information on how air quality is taken into account by Local Authorities in both the wider planning context of Local Plans and neighbourhood planning, and in individual cases where air quality is a consideration in a planning decision.

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[12] Highway England (2007). Design Manual for Roads and Bridges, Volume 11. Section 3. Part 1 – Air Quality.
[13] Highways England (2013). Interim Advice Note 170/12 v3: Updated air quality advice on the assessment of future NO_x and NO_2 projections for users of DMRB Volume 11, Scteion 3, Part 1 'Air Quailty'
[14] Highways England (2013). Interim Advice Note 175/13: Updated air quality advice on risk assessment related to compliance risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Plans for user of DMRB Volume 11, Section 3, Part 1 'Air Quality'
[15] DEFRA (2016) Part IV The Environment Act 1995 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Technical Guidance LAQM.TG16)
[16] Environmental Protection UK and Institute of Air Quality Management (2015). Land Use Planning & Development Control: Planning for Air Quality
[17] Department of Communities and Local Government (DCLG). National Planning Practice Guidance. Available online: http://planningguidance.communities.gov.uk/

4 SCOPE AND METHODOLOGY

4.1 SCOPE

4.1.1 The scope of the assessment has been determined in the following way:

- Consultation with the Environmental Health Officer (EHO) of WBC to obtain recent monitoring data, and agree the scope of the assessment and the methodology to be applied;
- Review of WBC's latest air quality monitoring data, as well as data available from DEFRA[18] and the Environment Agency[19];
- Desk study to confirm the locations of nearby existing receptors that may be sensitive to changes in local air quality; and
- Review of traffic data provided by Atkins.

EFFECTS SCOPED IN

4.1.2 The scope of the assessment includes consideration of the following potential impacts:

- Local Air Quality
  - Dust and particulate matter generated during the construction phase activities;
  - Changes in pollutant concentrations (NO_2,PM_{10} and $PM_{2.5}$) as a result of exhaust emissions arising from construction traffic and plant at sensitive receptors; and
  - Changes in pollutant concentrations (NO_2, PM_{10} and $PM_{2.5}$) as a result of exhaust emissions arising from road traffic movements generated once the Proposed Scheme is operational at sensitive receptors.
- Regional Air Quality
  - The impact of the Proposed Scheme once operational on total emissions of NOx and PM_{10}.

EFFECTS SCOPED OUT

ECOLOGICAL RECEPTORS

4.1.3 A review of the Multi-Agency Geographical Information for the Countryside (MAGIC) online database operated by DEFRA[20] indicates there are no designated sites within 200m of the Study Area (defined in **Section 4.2**) and consequently ecological receptors have been scoped out of any further assessment and are not mentioned further within this report.

[18] DEFRA Local Air Quality Management (LAQM) Support Pages. Available at: http://laqm.defra.gov.uk/ Accessed on 17.05.16
[19] Environment Agency Website. Available at: http://apps.environment-agency.gov.uk/wiyby/default.aspx. Accessed on 17.05.16
[20] MAGIC online mapping. Available at http://www.magic.defra.gov.uk Accessed on 17.05.16

COMPLIANCE RISK ASSESSMENT

4.1.4 As detailed later in Section 5.1, in 2032 (design year) one affected road link (based on DMRB local criteria) coincides with a link within the DEFRA's national Pollution Climate Mapping (PCM) model[21] (A49 (Winwick Road) south of the M62) and therefore requires consideration as part of the Compliance Risk Road Network (CRRN). A Compliance Risk Assessment in relation to the European Commission Directive on Ambient Air Quality (2008/50/EC) was therefore commenced for the design year 2032, in accordance with the Highways England IAN 175/13. The change in annual mean NO_2 concentrations between the 2032 DM and DS scenarios was found to be less than 0.4µg/m^3 at all receptors considered (see **Appendix E** for results); based on IAN 175/13, these changes are imperceptible, and this road was thus scoped out of the Compliance Risk Assessment. There were no other links within the CRRN and a Compliance Risk Assessment is not presented within this report.

4.2 METHODOLOGY

STUDY AREA

4.2.1 The study area for the assessment of air quality is defined in line with guidance contained in DMRB HA 207/07.

4.2.2 For the construction dust assessment, the study area will comprise of areas within 200m of the works area boundary, as shown in **Figure 1.3**.

4.2.3 The study area for the local air quality assessment includes sensitive receptors within 200m of 'affected' roads (shown in **Figures 1.4** and **1.5** for the opening and design years, respectively), which are defined in DMRB HA 207/07 as roads where:

- Road alignment would move by more than 5m; or
- Daily traffic flows would change by 1000 Annual Average Daily Traffic (AADT) or more; or
- Heavy Duty Vehicle (HDV) flows would change by 200 AADT or more; or
- Daily average speed would change by 10 km/hour or more; or
- Peak hour speed would change by 20 km/hour or more.

4.2.4 To ensure that the pollutant concentrations predicted at the receptors within 200m of an affected road were representative of the total pollutant concentrations, all road links within 200m of a receptor were also included in the model.

4.2.5 For the regional air quality assessment, the entire traffic data network was considered.

CONSTRUCTION PHASE

DUST AND PARTICULATE MATTER GENERATED BY CONSTRUCTION ACTIVITIES

4.2.6 An assessment of the likely significant impacts on local air quality due to the generation and dispersion of dust and particulate matter during the construction phase has been undertaken qualitatively taking into account sensitive receptors within 200m of the works area (such as housing, schools or hospitals), the nature of the construction activities to be undertaken, and local wind speed and direction.

[21] Defra Pollution Climate Mapping. Available at: http://uk-air.defra.gov.uk/data/gis-mapping

EMISSIONS TO AIR FROM CONSTRUCTION TRAFFIC AND PLANT

4.2.7 Exhaust emissions from construction vehicles and plant may have an impact on local air quality adjacent to the routes used by these vehicles to access the works area and in the vicinity of the works area itself. As detailed information on the number of vehicles and plant associated with the each phase of the construction is not available at this stage, a qualitative assessment of their impact on local air quality has been undertaken using professional judgement and by considering the following:

- The potential number and type of construction traffic and plant that are likely to be required;
- The number and proximity of sensitive receptors to the works area and along the likely routes to be used by construction vehicles; and
- The likely duration of the construction phase.

OPERATIONAL PHASE

LOCAL AIR QUALITY - EMISSIONS TO AIR FROM TRAFFIC GENERATED BY THE OPERATION OF THE PROPOSED SCHEME

4.2.8 Of the pollutants included in the AQS, concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been considered in this assessment as road traffic is a major source of these pollutants and their concentrations tend to be close to, or in exceedance of, the objectives in urban locations.

4.2.9 In order to predict impacts due to exhaust emissions arising from road traffic generated by the operation of the Proposed Scheme once operational, the dispersion model ADMS Roads (version 4.0.1.0) has been used. This model uses detailed information regarding traffic flows on the local road network, surface roughness, and local meteorological conditions to predict pollutant concentrations at specific receptor locations. The model also takes account of road geometry (alignment and width).

4.2.10 Meteorological data, including wind speed and direction, are used by the model to determine pollutant transportation and levels of dilution by the wind. Meteorological data used in the model was obtained from the Met Office observing station at Rostherne. This station is located approximately 17km southeast and is considered to provide data representative of the meteorological conditions at the Site. The meteorological data used for this assessment was from 2014. The use of this data was agreed during consultation with the EHO at WBC.

TRAFFIC DATA

4.2.11 Traffic data has been provided by Atkins for the following scenarios:

- 2014 Baseline;
- 2017 (Opening Year) DM;
- 2017 (Opening Year) DS;
- 2032 (Design Year) DM; and
- 2032 (Design Year) DS.

4.2.12 2014 has been used for verification of the model results and to provide data for the existing baseline scenario. 2017 represents the anticipated opening year of the Proposed Scheme, whilst 2032 represents the design year (15 years after the Proposed Scheme is expected to be operational). The 2017 and 2032 DM traffic flows assume the road network remains unchanged from the existing layout but includes changes to road network as a result of committed developments. The 2017 and 2032 DS traffic flows assume the Proposed Scheme is fully operational.

4.2.13 A summary of the traffic data used as inputs to the model can be found in **Appendix C**. It includes details of AADT, vehicle speeds (kph) and the percentage of Heavy Good Vehicles (HGVs)[22] for the local road network in all assessment years considered. Traffic speeds were reduced at junctions in line with guidance provided in LAQM.TG(16) and using professional judgement.

4.2.14 The extent of the area of traffic data available has been determined by Atkins. The traffic data was then screened against DMRB criteria from HA 207/07 to identify the affected road network based on the criteria detailed in paragraph 4.2.3.

4.2.15 The Proposed Scheme aims to facilitate the progress of future developments surrounding the M62 Junction 8. Without the Proposed Scheme the amount of development allowed by WBC will be lower. Therefore the amount of future development generated trips is greater in the DS scenarios compared to the DM scenarios and the impact of the Proposed Scheme cannot be assessed in isolation.

VEHICLE EMISSION FACTORS

4.2.16 The vehicle emission factors adopted for use in the assessment have been obtained using the Emission Factor Toolkit (EFT) version 6.0.2 available on the DEFRA website[23]. Emission factors are available for all years between 2008 and 2030 and take into account the most recent evidence relating to factors such as advances in vehicle and exhaust technology and changes in composition of the vehicle fleet; the emission factors consequently reduce over time. As the emission factors are only provided to 2030, it has been assumed that there is no reduction in emission factors from 2030 to 2032.

4.2.17 However, there is currently some uncertainty over how representative the future emission factors are for NO_2. To address this uncertainty, Highways England has produced IAN 170/12 v3 on the assessment of future NO_2 projections. The methodology is detailed below within the 'Projection of Future NO_2 – Gap Analysis' section (paragraph 4.2.24). This represents a conservative approach to the assessment and was agreed with the EHO at WBC prior to commencement of the assessment.

[22] Heavy Duty Vehicle (HDV) data are required for the model, and were requested, however the transport model only outputs HGV; Atkins have advised that use of the HGV data should not lead to an under-estimation of impact, therefore HGV numbers have been used as a proxy for HDV numbers.

[23] Emission Factor Toolkit. Available at http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html [Date accessed: 17.05.16].

PROCESSING OF BACKGROUND CONCENTRATIONS

4.2.18 DEFRA background concentration maps[24] provide estimated background concentrations at a grid resolution of 1x1km for the whole of the UK for 2011 to 2030. Background concentrations of NO_2, PM_{10} and $PM_{2.5}$ for the study area have therefore been taken from the DEFRA background maps. The maps assume that background concentrations will improve (i.e. reduce) over time, however as background concentrations include a significant proportion attributable to vehicle emissions, there is also uncertainty in the future reductions of background concentrations. As recommended by Highways England, this uncertainty is addressed as part of the Gap Analysis approach.

4.2.19 The background concentrations used in the assessment are presented later in **Table 3**.

MODEL VERIFICATION AND PROCESSING OF RESULTS

4.2.20 The ADMS Roads dispersion model has been widely validated for this type of assessment and is considered to be fit for purpose. Model validation undertaken by the software developer is unlikely to have included validation in the vicinity of the Proposed Scheme. To determine the performance of the model at a local level, a comparison of modelled results with the results of local monitoring carried out within the study area (on behalf of Highways England) was undertaken. This process of verification aims to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results, and was carried out following the methodology specified in Chapter 7 of LAQM.TG(16).

4.2.21 Further details of the verification calculations are presented in **Appendix D**. A factor of 2.01 was obtained during the verification process, which indicated that the model was under-predicting prior to adjustment. The factor was therefore applied to the road-NO_x component predicted at the relevant receptors; prior to conversion to annual mean NO_2 concentrations utilising the NO_x to NO_2 calculator (version 4.1) provided by DEFRA[25].

4.2.22 As local roadside monitoring data are not available for PM_{10} or $PM_{2.5}$, the modelled road-PM_{10} and road-$PM_{2.5}$ components have been adjusted using the factor calculated for road-NO_x, before adding to the appropriate background concentration. The number of days with PM_{10} concentrations greater than 50µg/m^3 was then estimated using the relationship with the annual mean concentration described in LAQM.TG(16).

4.2.23 Once processed, the predicted concentrations were compared against the current statutory limit values and objectives for NO_2, PM_{10} and $PM_{2.5}$ set out in **Appendix B**. LAQM.TG(16) advises that an exceedance of the 1 hour mean NO_2 objective is unlikely to occur where the annual mean concentration is below 60µg/m^3, where road transport is the main source of pollution. This concentration has been used to screen whether the hourly mean objective is likely to be achieved.

[24] DEFRA LAQM Background Maps. [Online] Available at: http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2011 [Accessed: 17.05.16].
[25] DEFRA. Available at: http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOXNO2calc Accessed: 17.05.16

PROJECTION OF FUTURE NO_2 – GAP ANALYSIS

4.2.24 To account for the uncertainty in future projections of NO_2 Highways England have produced IAN 170/12 v3. The guidance provides a method whereby an additional scenario (referred to as the Projected Base Year) is calculated to determine a 'Gap Factor' which is then applied to the verified modelled NO_2 opening year DM and DS concentrations. The application of the Gap Factor (using the Highway England 'Long Term Gap Analysis Calculator'[26]) is undertaken to ensure the modelled concentrations are better aligned with long term NO_2 trends. Both the adjusted results using the Gap Factor and the unadjusted results are presented in **Appendix E**.

REGIONAL AIR QUALITY - EMISSIONS TO AIR FROM TRAFFIC GENERATED BY THE OPERATION OF THE PROPOSED SCHEME

4.2.25 An assessment of the change in total NO_x and PM_{10} emissions as a result of the Proposed Scheme in the DS scenario relative to the DM scenario has also been undertaken for the entire traffic network available. The EFT version 6.0.2 has been used to calculate the total emissions.

SELECTION OF SENSITIVE RECEPTORS

4.2.26 Sensitive locations are places where the public may be exposed to pollutants from activities associated with the Proposed Scheme. These will include locations sensitive to dust deposition and particulate matter exposure as a result of on-site construction activities and vehicle emissions during construction and operation of the Proposed Scheme.

4.2.27 Receptors sensitive to dust generated by construction activities include housing, schools and hospitals within 200m of the works area. There are a number of residential dwellings within this distance, where the effects have therefore been considered in the following assessment (**Section 6.1**). The sensitivity of the area to dust and particulate matter has been determined qualitatively using professional judgement and DMRB HA 207/20.

4.2.28 Relevant sensitive locations for the assessment of exhaust emissions from plant or vehicles are places where the public may be expected to be regularly present for the averaging period of the objectives (**Appendix B**). For the annual, daily and hourly mean objectives, sensitive receptors would be the residential properties in the vicinity of the works area and within 200m of the affected road network (based on guidance provided in Box 1.1 of LAQM.TG(16) and DMRB HA 207/20).

4.2.29 The locations of the operational phase assessment receptors are shown in **Figure 1.6** and summarised in **Table 1.** Concentrations have been predicted at a height of 1.5m (relative to the adjacent road) representing exposure at ground floor level, with the exception of those properties with a first floor closer to the height of the adjacent road, where a height of 4.5m has been used. Concentrations have also been predicted at three receptors which represent exposure to the hourly mean NO_2 objective only (short term receptors; ST); long-term objectives do not apply at these locations.

Table 1: Receptor Locations Used in Operational Phase Assessment – Local Air Quality

Receptor Number	Receptor Name	OS Grid Reference	
		X	Y
R1	75 Butts Green	357361.1	391082.1
R2	28 Bodkin Green (first floor)	357301.0	391052.8

[26] Highways England. Interim Highways Agency Alternative Long Term Gap Analysis Calculator v1.1.

Receptor Number	Receptor Name	OS Grid Reference	
		X	Y
R3	36 Bodkin Green (first floor)	357274.4	391033.5
R4	Partisan Green_1 (first floor)	357222.6	390965.5
R5	Partisan Green_2	357237.9	390903.1
R6	17 Heralds Green	357260.6	390623.7
R7	30 Dovecote Green	357298.7	390431.4
R8	60 Coppice Green	357306.8	390307.5
R9	62 Coppice Green	357349.5	390305.2
R10	18 Tenbury Close	357133.4	390102.9
R11	6 Tenbury Close	357048.2	389993.8
R12	17 Leamington Close	357009.5	389811.3
R13	15 Leamington Close	357067.9	389792.4
R14	96 Bishopdale Close	357004.2	389536.4
R15	36 Rockford Gardens	357075.4	389595.5
R16	61 Wensleydale Close	356845.4	389662.3
R17	34 Lonsdale Close	356559.4	389660.8
R18	173 Butts Green	357518.7	391124.8
R19	2 Old Winwick Quay	359532.9	391788.3
R20	Wharfinger House	359582.5	391763.7
R21	The Gregory Building (Nursing Home)	360534.3	392072.6
R22	The MacArthur Building (Nursing Home)	360640.2	392070.3
R23	27 Elm Road	360486.8	391875.0
R24	24 Elm Road	360451.2	391852.4
R25	254 Newton Road	360414.4	391811.3
R26	240 Newton Road	360410.8	391747.6
R27	719 Winwick Road	360343.3	391513.6
R28	705 Winwick Road	360339.2	391482.3
R29	215 Winwick Road	360294.0	391413.3
R30	697 Winwick Road	360322.6	391342.5
ST1	Travelodge Apollo Park_1	357566.1	391205.4
ST2	Travelodge Apollo Park_2	357606.1	391216.5
ST3	Premier Inn, Newton Road	360314.3	391683.2
F1	Omega South Zone 6_Residential_1	357063.9	390331.1
F2	Omega South Zone 6_Residential_2	357179.0	390265.6
F3	Omega South Zone 6_Residential_3	357184.3	390217.3
F4	Omega South Zone 6_Residential_4	356844.9	389722.7
F5	Omega South Zone 6_Residential_5	356925.6	389801.6
F6	Omega South Zone 6_Residential_6	356608.3	389720.6
F7	Omega South Zone 6_Residential_7	356575.5	389721.1
F8	Omega South Zone 6_Residential_8	356822.8	389920.9

4.3 SIGNIFICANCE CRITERIA

CONSTRUCTION PHASE

DUST AND PARTICULATE MATTER GENERATED BY CONSTRUCTION ACTIVITIES

4.3.1 The significance of effects associated with dust generated from construction activities during this phase of the Proposed Scheme has been determined using professional judgement and guidance within paragraph 3.45 of DMRB HA 207/07.

EMISSIONS TO AIR FROM CONSTRUCTION TRAFFIC AND PLANT

4.3.2 The significance of effects of exhaust emissions arising from construction vehicles and on-site plant during the construction phase of the Proposed Scheme have been evaluated qualitatively using professional judgement and the principles of the EPUK/IAQM significance criteria described below for operational phase impacts.

OPERATIONAL PHASE

LOCAL AIR QUALITY - EMISSIONS TO AIR FROM TRAFFIC GENERATED BY THE OPERATION OF THE PROPOSED SCHEME

4.3.3 The approach provided in the EPUK/IAQM guidance (published in May 2015) has been used within this assessment to assist in describing the air quality effects of additional emissions from traffic generated by the Proposed Scheme once operational on the surrounding area. The guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion.

4.3.4 **Table 2** presents the suggested framework, provided within the EPUK/IAQM guidance, for describing the impacts.

Table 2: Impact Descriptors for Individual Receptors

Long term average concentration at receptors in assessment year	% Change in Concentration Relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial

Notes
AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy objectives.

% change based on rounded values. Where the % change in concentrations is 0, i.e. <0.5%, the change is described as 'Negligible' regardless of the concentration.

When defining the concentration as a percentage of the AQAL, the 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme' concentration where there is an increase.

Where a concentration increases, the impact is described as adverse, and where it decreases as beneficial.

4.3.5 The EPUK/IAQM guidance notes that the criteria in **Table 2** should be used to describe impacts at individual receptors and should only be considered as a starting point to make a judgement on significance of effects, as other influences may need to be accounted for. The EPUK/IAQM guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:

- 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.

4.3.6 The EPUK/IAQM guidance states that for most road transport related emissions, long-term average concentrations are the most useful for evaluating the severity of impacts. The guidance does not include criteria for determining the significance of the effect on hourly mean NO_2 concentrations or daily mean PM_{10} concentrations. The significance of effects of hourly mean NO_2 and daily mean PM_{10} concentrations arising from the operational phase have therefore been determined qualitatively using professional judgement and the principles described above.

REGIONAL AIR QUALITY - EMISSIONS TO AIR FROM TRAFFIC GENERATED BY THE OPERATION OF THE PROPOSED SCHEME

4.3.7 There is no guidance available on determining the significance of the results of the regional air quality assessment. Therefore, a comparison of the change in total emissions associated with Proposed Scheme against the total emissions produced by road traffic in the UK in 2013 (the most recent year available)[27] has been carried out to put the effect of the Proposed Scheme into national context.

4.4 LIMITATIONS & ASSUMPTIONS

CONSTRUCTION PHASE

4.4.1 Details regarding the construction phasing and activities (such as number of plant within the works area at any one time, volume and type of construction material) were limited at the time of writing. The available information on the Proposed Scheme, assumptions based on the size of the Proposed Scheme, and professional judgement have therefore been applied in order to define the magnitude of change and overall significance of effects.

OPERATIONAL PHASE

4.4.2 The Proposed Scheme aims to facilitate the progress of future developments surrounding the M62 Junction 8. Without the Proposed Scheme the amount of development allowed by WBC will be lower. Therefore the DS traffic data also include flows associated with the proposed developments facilitated by the Proposed Scheme; consequently the impact of the Proposed Scheme has not (and cannot) be assessed in isolation.

4.4.3 There are uncertainties associated with both measured and predicted concentrations. The model (ADMS Roads) used in this assessment relies on input data (including predicted traffic flows), which also have uncertainties associated with them. The model itself simplifies complex physical systems into a range of algorithms. In addition, local micro-climatic conditions may affect the concentrations of pollutants that the ADMS Roads model will not take into account.

4.4.4 In order to reduce the uncertainty associated with predicted concentrations, model verification has been carried out following guidance set out in LAQM.TG(16). As the model has been verified against measured concentrations at sites within the Study Area, there can be reasonable confidence that, overall, the predictions are robust.

4.4.5 Due to the uncertainty surrounding the future year vehicle emissions and background concentrations, a ‘gap analysis’ has been undertaken in line with IAN 170/12 v3, which is considered to provide more realistic results.

[27] Data available at: http://naei.defra.gov.uk/data/

4.4.6 The DEFRA EFT spreadsheet, DEFRA background concentrations and NO_x to NO_2 calculator make provision for assessment years up to 2030; therefore for the design year (2032) for both the local and regional operational phase assessment, it has been assumed that no change in vehicle emissions will occur between 2030 and 2032.

5 BASELINE CONDITIONS

5.1 LOCAL AIR QUALITY MANAGEMENT

5.1.1 WBC has declared three AQMAs within their administrative area as part of their Review and Assessment work. The Site is partially situated within the WBC AQMA No.1, which includes a 50m strip either side of the M62 carriageway in the vicinity of Junction 8. This AQMA has been declared due to exceedances of the UK Air Quality Strategy (AQS) objective for annual mean NO_2. There are three sensitive receptors, where long and short term objectives would apply, within the study area (all south of the M62; one to the west of Craven Court and two on Elm Road adjacent to Junction 9) that are located within the AQMA. There is also a hotel to the south of the M62 in the Study Area within the AQMA, where the hourly mean NO_2 objective would apply.

5.2 LOCAL EMISSION SOURCES

5.2.1 The Site is located in an area where air quality is mainly influenced by vehicular emissions associated with the M62 and local roads.

5.2.2 There are no known industrial pollution sources within the immediate vicinity of the Site which are likely to significantly affect air quality.

5.3 BACKGROUND AIR QUALITY DATA

5.3.1 **Table 3** presents the background concentrations of NO_2, PM_{10} and $PM_{2.5}$ that were used in the assessment. In 2014, the annual mean background concentrations are well below the relevant objectives.

Table 3: 2014 Background Concentrations use in the Assessment (µg/m^3)

	2014	2017	2030*
NO_2	16.2 – 27.9	14.5 – 18.1	9.9 – 12.0
PM_{10}	14.7 – 24.8	14.1 – 17.5	9.5 – 11.5
$PM_{2.5}$	12.1 – 18.9	13.7 – 17.1	9.1 – 11.0
*2030 data have been used for 2032 (design year)			

5.4 LOCAL AIR QUALITY MONITORING DATA

5.4.1 WBC undertakes air quality monitoring in its area, however there are no WBC monitoring locations within the Study Area. The WBC 2015 Updating and Screening Report[28] shows that between 2007 and 2014 annual mean NO_2 concentrations recorded in the borough have fluctuated with an overall slight downwards trend.

5.4.2 Monitoring undertaken by Highways England is presented in the 2015 Atkins Air Quality Scoping Report[29]. The period means (August 2013 to July 2014) at the two diffusion sites (HA022_0813 and HA023_0813 shown on **Figure 1.6**) close to junction 8, measured average NO_2

[28] Warrington Borough Council (2015). 2015 Updating and Screening Report.
[29] Atkins (2015). M62 Junction 8 Improvements: Air Quality Scoping Report

concentrations of 29.2 and 31.9µg/m^3, respectively, which are well below the annual mean NO_2 objective of 40µg/m^3.

5.5 POLLUTION CLIMATE MAPPING

5.5.1 Estimates of 2014 roadside concentrations are now publically available from DEFRA's national PCM model. There is one link affected by the Proposed Scheme in the 2032 design year which coincides with a PCM link; the A49 (Winwick Road) south of the M62. The 2014 PCM predicted roadside annual mean concentrations for NO_2, PM_{10} and $PM_{2.5}$ on this link are presented in **Table 4**.

Table 4: PCM Roadside 2014 Annual Mean Concentrations – A49 South of M62 (Census ID 8321)

POLLUTANT	PCM 2014 ANNUAL MEAN CONCENTRATIONS (µG/M^3)
NO_2	48.0
PM_{10}	20.3
$PM_{2.5}$	13.5

6 ASSESSMENT OF IMPACTS

6.1 CONSTRUCTION PHASE

DUST AND PARTICULATE MATTER GENERATED BY CONSTRUCTION ACTIVITIES

6.1.1 Construction activities associated with the Proposed Scheme that have the potential to generate and/or re-suspend dust and particulate matter are likely to include:

- Site preparation and earthworks;
- Preparation of temporary access/egress to the works area;
- Installation of utilities and drainage;
- Materials handling, storage, stockpiling, spillage and disposal;
- Movement of vehicles and construction traffic ;
- Exhaust emissions from site plant, especially when used at the extremes of their capacity and during mechanical breakdown;
- Foundation construction (no piling anticipated);
- Construction of proposed additional areas of hardstanding;
- Construction of proposed structures, signage and lighting installations, implementation of vehicle restraint systems and boundary fencing; and
- Landscaping.

6.1.2 The construction phase of the Proposed Scheme is anticipated to start in November 2016 with works completed in January 2017, therefore with a duration of just 3 months; any impacts related to the construction activities will therefore be temporary and short-term.

6.1.3 There are approximately 415 existing residential dwellings and a hotel within 200m of the works area (which as noted previously, during the construction phase includes a temporary construction compound, approximately 600m to the south of Junction 8 gyratory).

6.1.4 Following the implementation of the mitigation measures provided within the Environmental Management Plan (EMP)[30] it is considered that there is unlikely to be a significant effect on the identified residential properties.

EMISSIONS TO AIR FROM CONSTRUCTION TRAFFIC AND PLANT

6.1.5 Exhaust emissions from construction vehicles and plant will have an effect on local air quality both on the area immediately surrounding the works area and adjacent to the routes used by vehicles to access the works area. The greatest potential for effects on air quality from traffic associated with the construction phase will be in areas immediately adjacent to the principal site access for construction traffic.

[30] WSP | PB (2016). Proposed Improvement Works at M62 Junction 8: Environmental Management Plan.

6.1.6 The number of HDV movements associated with the construction phase of the Proposed Scheme and their routing is not known. It is, however known that construction vehicles will travel between the construction compound and Junction 8 along Burtonwood Road, where residential properties are located within 200m of the road edge. It is very unlikely that HDV movements associated with the construction phase would exceed the DMRB criteria set out in HA 207/20 of 200 movements per day; therefore no significant local air quality effects are expected as a result of construction phase traffic and plant emissions.

6.1.7 Final details of the exact plant and equipment likely to be used on the works area will be determined by the appointed contractor, it is likely to comprise dump trucks, diesel generators, compressors and trucks. The number of plant and their location within the works area are likely to be variable over the construction period.

6.1.8 Based on the proximity of sensitive receptors to the roads likely to be used by construction vehicles, and the likely numbers of construction vehicles and plant that will be used, the impacts are therefore negligible significance.

6.2 OPERATIONAL PHASE

LOCAL AIR QUALITY - EMISSIONS TO AIR FROM TRAFFIC GENERATED BY THE OPERATION OF THE PROPOSED SCHEME

6.2.1 Full results of the local air quality assessment are presented in **Appendix E** and a summary is provided below. The results discussed below for NO_2 are based on the concentrations predicted using the 'gap analysis', which takes into account long term trends in NO_2 and which are considered to provide a more realistic prediction of concentrations in future years. Both the 'gap analysis' adjusted and unadjusted results are presented in **Appendix E**.

ANNUAL MEAN NO_2 CONCENTRATIONS

6.2.2 The results of the assessment show that concentrations are predicted to exceed the annual mean NO_2 objective, of 40µg/m^3, at ten of the assessment receptors in the 2014 baseline; the highest predicted annual mean NO_2 concentration is 47.3µg/m^3 at Receptor 30 (697 Winwick Road).

6.2.3 In the 2017 (opening year) DM and DS scenarios, concentrations are predicted to exceed the annual mean NO_2 objective at three of the assessment receptors. The highest predicted annual mean NO_2 concentration is 41.5µg/m^3, again at Receptor 30, but there is no perceptible change in concentrations at this location between the DM and DS scenarios. The Proposed Scheme is not predicted to cause any new exceedances of the objective.

6.2.4 The maximum predicted increase in annual mean NO_2 concentrations as a result of the operational phase of the Proposed Scheme in the opening year of 2017 is 0.6µg/m^3 at Receptor 12 (17 Leamington Close), where concentrations are well below the objective. The maximum decrease in annual mean NO_2 concentrations as a result of the Proposed Scheme is a reduction of 3.5µg/m^3 at Receptor F1 (a future residential property in Omega South). The change in annual mean NO_2 concentrations as a result of the Proposed Scheme range between a reduction of 9% (i.e. improvement) to an increase of 2% (i.e. deterioration).

6.2.5 Based on the criteria presented in **Table 2**, the impact on annual mean NO_2 concentrations in the opening year (2017) range from negligible to moderate beneficial.

6.2.6 In the 2032 (design year) DM and DS scenarios, concentrations are not predicted to exceed the annual mean NO_2 objective at any of the assessment receptors. The highest predicted annual mean NO_2 concentrations are 32.2µg/m^3 and 31.7µg/m^3 (in the DM and DS scenarios, respectively) at Receptor 30.

6.2.7 In the design year, the maximum increase in annual mean NO_2 concentrations as a result of the operational phase of the Proposed Scheme is 1.1µg/m^3 predicted at Receptor F1 (a future residential property in Omega South), where concentrations are well below the objective. The maximum decrease in annual mean NO_2 concentrations as a result of the Proposed Scheme is a reduction of 0.8µg/m^3 at Receptor 18 (173 Butts Green). The change in annual mean NO_2 concentrations as a result of the Proposed Scheme range between a reduction of 2% (i.e. improvement) to an increase of 3% (i.e. deterioration).

6.2.8 Based on the criteria presented in **Table 2**, the impact on annual mean NO_2 concentrations in the design year (2032) are all negligible.

HOURLY MEAN NO_2 CONCENTRATIONS

6.2.9 All predicted annual mean NO_2 concentrations are below 60µg/m^3, and therefore exceedances of the hourly mean NO_2 objective are unlikely to occur. The impact of the Proposed Scheme on hourly mean NO_2 concentrations at assessment receptors is judged to be negligible.

ANNUAL MEAN PM_{10} AND $PM_{2.5}$ CONCENTRATIONS

6.2.10 Predicted annual mean concentrations of PM_{10} and $PM_{2.5}$ are all below the objectives of 40µg/m^3 and 25µg/m^3 respectively in all scenarios. The highest predicted annual mean PM_{10} and $PM_{2.5}$ concentrations predicted are 21.7µg/m^3 and 14.2µg/m^3, respectively, in the 2014 baseline scenario.

6.2.11 In 2017, the changes range from -1 to 0% for annual mean PM_{10} and $PM_{2.5}$ concentrations as a result of the Proposed Scheme.

6.2.12 In 2032, the changes range from 0 to 1% for annual mean PM_{10} and $PM_{2.5}$ concentrations as a result of the Proposed Scheme.

6.2.13 Based on the criteria presented in **Table 2**, the impacts on annual mean PM_{10} and $PM_{2.5}$ concentrations are therefore all negligible.

DAILY MEAN PM_{10} CONCENTRATIONS

6.2.14 The objective for daily mean PM_{10} objective is 50µg/m^3 to be exceeded no more than 35 times a year. The number of days exceeding 50µg/m^3 predicted is a maximum of 6 days in the 2014 baseline scenario, which is well below the objective.

6.2.15 The Proposed Scheme is predicted to cause no perceptible change in the number of days exceeding 50µg/m^3 at any of the assessment receptors. Consequently, the impact of the Proposed Scheme on daily mean PM_{10} concentration is negligible.

REGIONAL AIR QUALITY - EMISSIONS TO AIR FROM TRAFFIC GENERATED BY THE OPERATION OF THE PROPOSED SCHEME

6.2.16 A summary of the regional air quality assessment is presented in **Table 5**.

Table 5: Regional Air Quality Results

	2017 DM	2017 DS	2017 CHANGE	% CHANGE
NO_x Emissions (kg/year)	183,542	181,301	-2,241	-1%
PM_{10} Emissions (kg/year)	10,613	10,539	-74	-1%
	2032 DM	**2032 DS**	**2017 CHANGE**	**% CHANGE**
NO_x Emissions (kg/year)	82,994	86,227	3,233	4%
PM_{10} Emissions (kg/year)	9,633	9,834	201	2%

6.2.17 The significance of these changes on regional air quality has been judged by comparing with the total emissions from UK road transport sources in 2013 as shown in **Table 6**. At a national scale, the change in total air pollutant emissions is very small and therefore considered to be **negligible**.

Table 6: Total Regional Emissions in Comparison with 2013 Total UK Roads Emissions

	NO_x	PM_{10}
2013 Total UK Road Traffic Emissions (kg/year)	322,951,252	21,593,588
Change between 2017 DM and DS as % of UK total for 2013	-0.001%	-0.0003%
Change between 2032 DM and DS as % of UK total for 2013	0.001%	0.001%

7 MITIGATION & RESIDUAL EFFECTS

7.1 CONSTRUCTION PHASE

MITIGATION

7.1.1 The following mitigation measures are detailed within the EMP, to help minimise dust and particulate matter generation and re-suspension, and exhaust emissions from construction plant and traffic:

- Where practicable, erect solid screens or barriers around dusty activities or between works and sensitive receptor locations;
- Keep fencing, barriers and scaffolding clean using wet methods;
- Remove materials that have the potential to produce dust from the works area as soon as possible, unless being re-used on-site. If they are being re-used on-site, cover appropriately;
- Ensure vehicles entering and leaving the work areas are covered to prevent escape of materials during transport;
- All plant and equipment to be maintained in good working order. If possible, plant should be located well within the works area, away from the works area boundary and sensitive receptors;
- Ensure vehicle operators switch off engines when stationary (i.e. no idling vehicles);
- Avoid the use of diesel or petrol powered generators, and use mains electricity or battery powered equipment where practicable;
- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or suitable local exhaust ventilation systems;
- Ensure adequate water supply on the works area for effective dust and particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- Any on-site crushing, screening and concrete batching plant should be designed and operated in line with the appropriate Process Guidance notes and current best practice;
- Regular inspection of local highways and works area boundaries to check for dust deposits (evident by soiling and marking) on vegetation, cars and other objects, taking remedial measures where necessary. Inspections will be carried out on a daily basis, during the working week, or more frequently depending on the nature of the activity being undertaken or during prolonged dry or windy periods;
- Access roads should be watered as necessary using a water bowser and/or water spray and road surfaces to be maintained;
- Use of wheel-washing facilities and/or vehicle cleaning techniques to minimise transport of mud and dust outside of the Site boundary (i.e. to minimise trackout);
- Where possible, consideration should be given to undertaking on-site aggregate handling in enclosed areas;
- When loading materials into vehicles or using transfer chutes and skips, drop heights should be kept to a minimum and enclosed wherever possible/appropriate.
- Observation of wind speed and direction prior to conducting dust-generating activities to determine the potential for dust nuisance to occur, avoiding potentially dust- generating

activities during periods when wind direction may carry dust into sensitive areas and avoiding dust-generating operations during periods of high or gusty winds;

- Where possible, stockpiles of soils and materials should be located as far as possible from surrounding sensitive uses, taking into account the prevailing wind direction;
- Surface areas of stockpiles should be minimised where possible (subject to health and safety, and visual constraints regarding slope gradients and visual intrusion) to reduce the area of surfaces exposed to wind pick-up;
- Stockpiles of materials should also be covered (e.g. using sheeting) or screened, as appropriate, during the day when wind speeds are moderate (>20kph) and when the works area is closed to reduce the potential for wind pick-up and dispersion of dust;
- Dampening of exposed soils and stockpile materials to be carried out as and when appropriate (i.e. during dry or windy weather), using hoses and/or sprinklers. If longer term exposure is anticipated then consideration should be given to grassing of these areas;
- Windbreak netting should be positioned around materials stockpiles and vehicle loading / unloading areas, as well as exposed excavation and material handling operations, where appropriate; and
- Any dust and air quality complaints will be recorded and causes identified. Appropriate remedial action should be taken in a timely manner with a record kept of actions taken including any additional measures put in place to avoid reoccurrence.

7.1.2 Daily inspections shall be undertaken by the construction supervisors, both on and off-site for visible signs of dust generation and deposition originating from the works area to ensure the adequacy of the mitigation measures being employed. Records will be kept of these inspections and mitigation measures amended accordingly where issues are identified.

RESIDUAL EFFECTS

7.1.3 The residual effects of dust and particulate matter generated by construction activities following the application of the mitigation measures described above and good site practice are judged to be **negligible**.

7.1.4 The residual effects of emissions to air from construction vehicles and plant on local air quality are found to be **negligible**.

7.2 OPERATIONAL PHASE

MITIGATION

7.2.1 The changes in pollutant concentrations are predicted to be negligible to moderate beneficial, and the Proposed Scheme is not predicted to cause any new exceedances of the relevant air quality objectives. Therefore, no mitigation is proposed for the operational phase.

RESIDUAL EFFECTS

7.2.2 The residual effects of emissions from vehicles associated with the Proposed Scheme on local air quality range from **moderate beneficial** to **negligible** in the opening year (2017), and **negligible** in the design year (2032).

7.2.3 The change in total air pollutant emissions is very small compared to national road transport emissions and therefore the residual effect on regional air quality is judged to be **negligible**.

8 CONCLUSIONS

8.1.1 The air quality impacts associated with the construction and operation of the Proposed Scheme of the highway improvement works at the M62 Junction 8 (including the realignment of Charon Way northwards).

8.1.2 A qualitative assessment of the potential impacts on local air quality from construction activities has been carried out for the Proposed Scheme in line with DMRB guidance. Through good site practice and the implementation of suitable mitigation measures (detailed within the EMP), dust and particulate matter generation and suspension can be minimised; the residual effects are therefore negligible for dust and particulate matter generation. The residual effects to air from construction vehicles and plant on local air quality are also judged to be negligible.

8.1.3 In addition, a quantitative assessment of the potential impacts on local air quality (NO_2, PM_{10} and $PM_{2.5}$) from changes in traffic flow, traffic speeds, traffic composition and road alignment due to the Proposed Scheme has been carried out for a number of sensitive receptors using dispersion modelling.

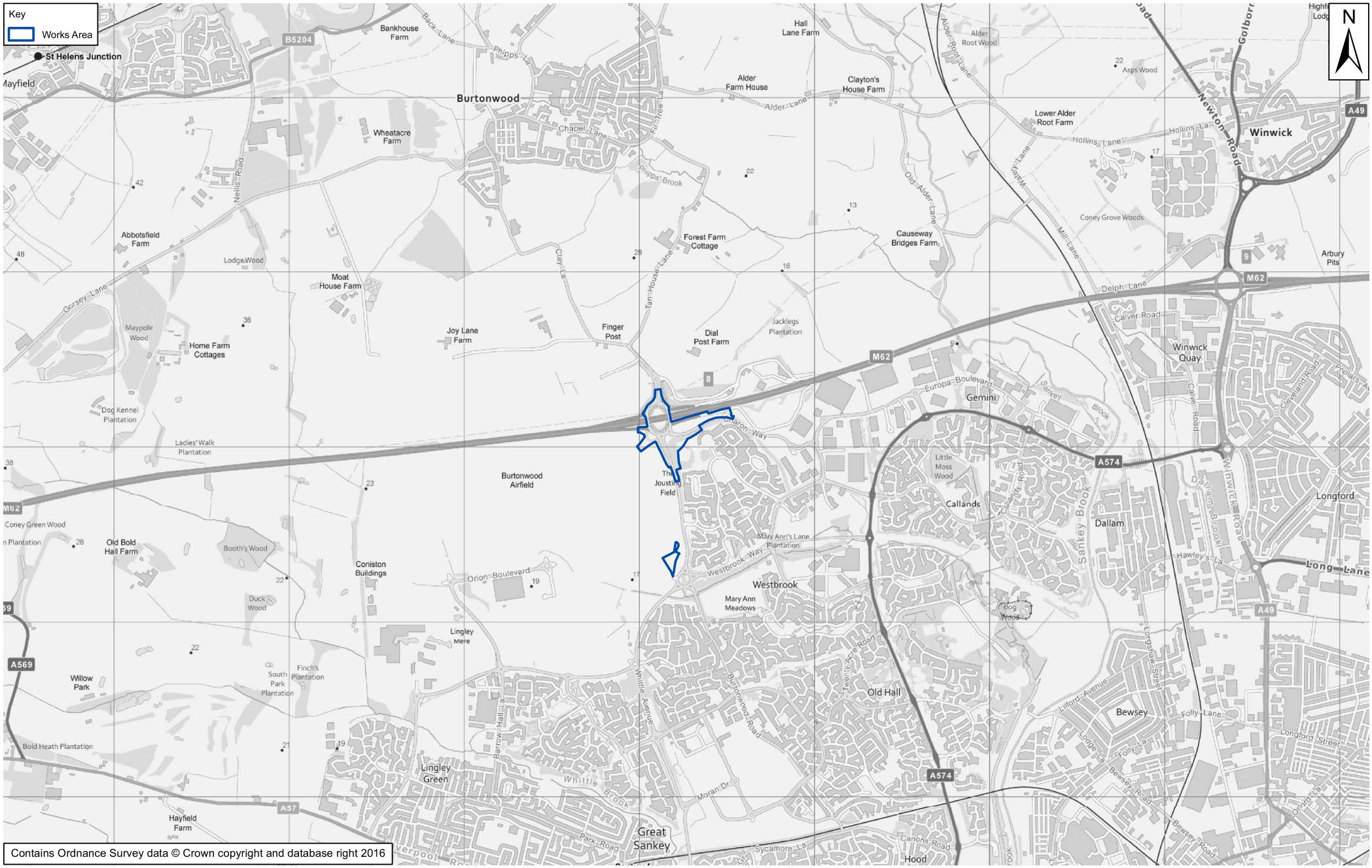
8.1.4 Annual mean NO_2 concentrations are predicted to exceed the AQS objective at a small number of receptors in the opening year (2017) in both the DM and DS scenarios, however, the Proposed Scheme does not cause any new exceedances of the objective. There are no exceedances predicted in the design year (2032) in either the DM or DS scenario. Predicted concentrations of PM_{10} and $PM_{2.5}$ meet the AQS objectives in the DM and DS scenarios in both 2017 and 2032. Based on the EPUK/IAQM guidance the residual effects of the Proposed Scheme once operational range from moderate beneficial to negligible in 2017, and negligible in 2032.

8.1.5 The change in total air pollutant emissions is very small compared to national road transport emissions and therefore the residual effect on regional air quality is judged to be negligible.

Location of the Works

Scale @ A3 : 20,000

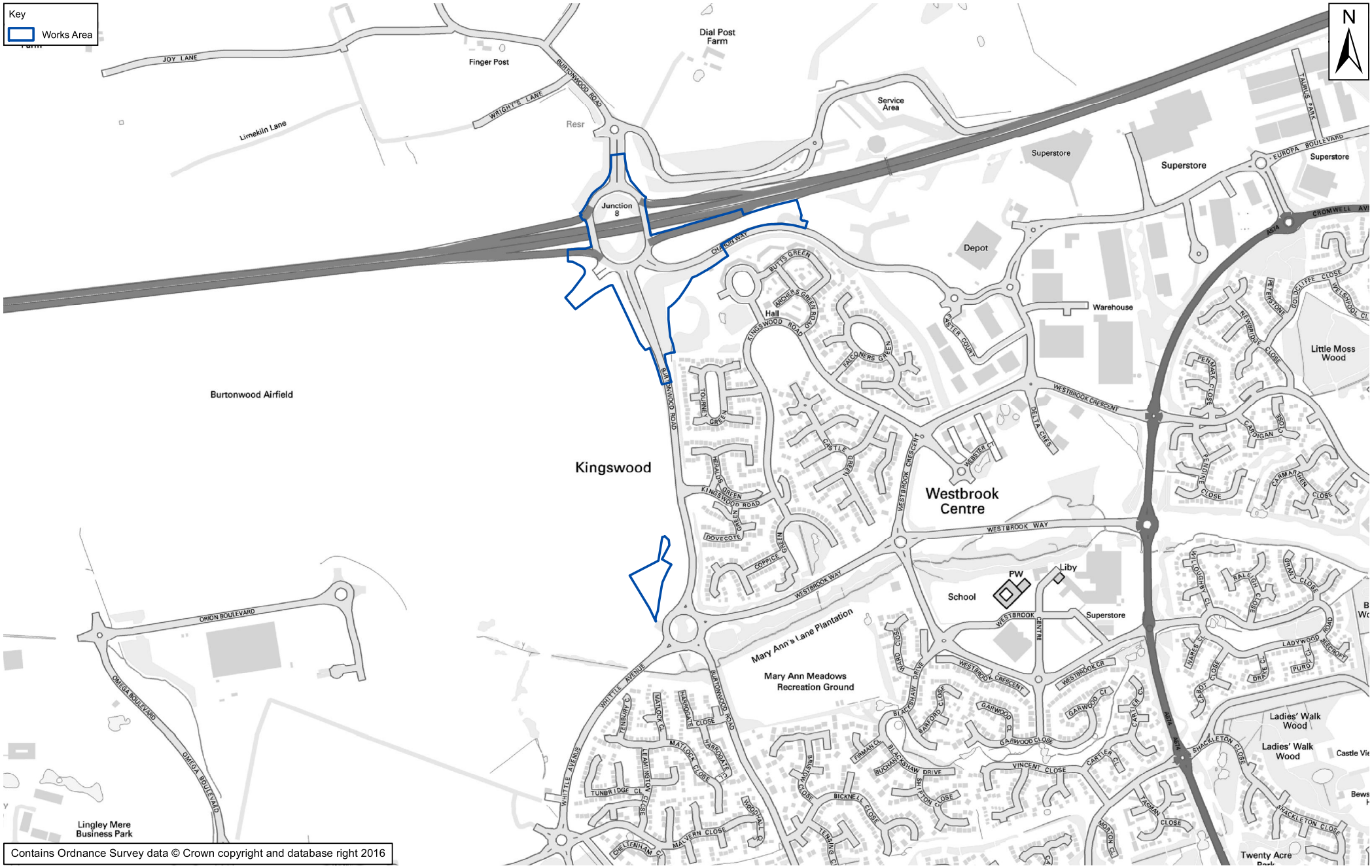
Figure 1.1



PROJECT: M62 Junction 8

PROJECT No: 70015234

Drawn: KW
Checked: KW
Approved: KS
Revision: B
Date: April 2016



PROJECT: M62 Junction 8

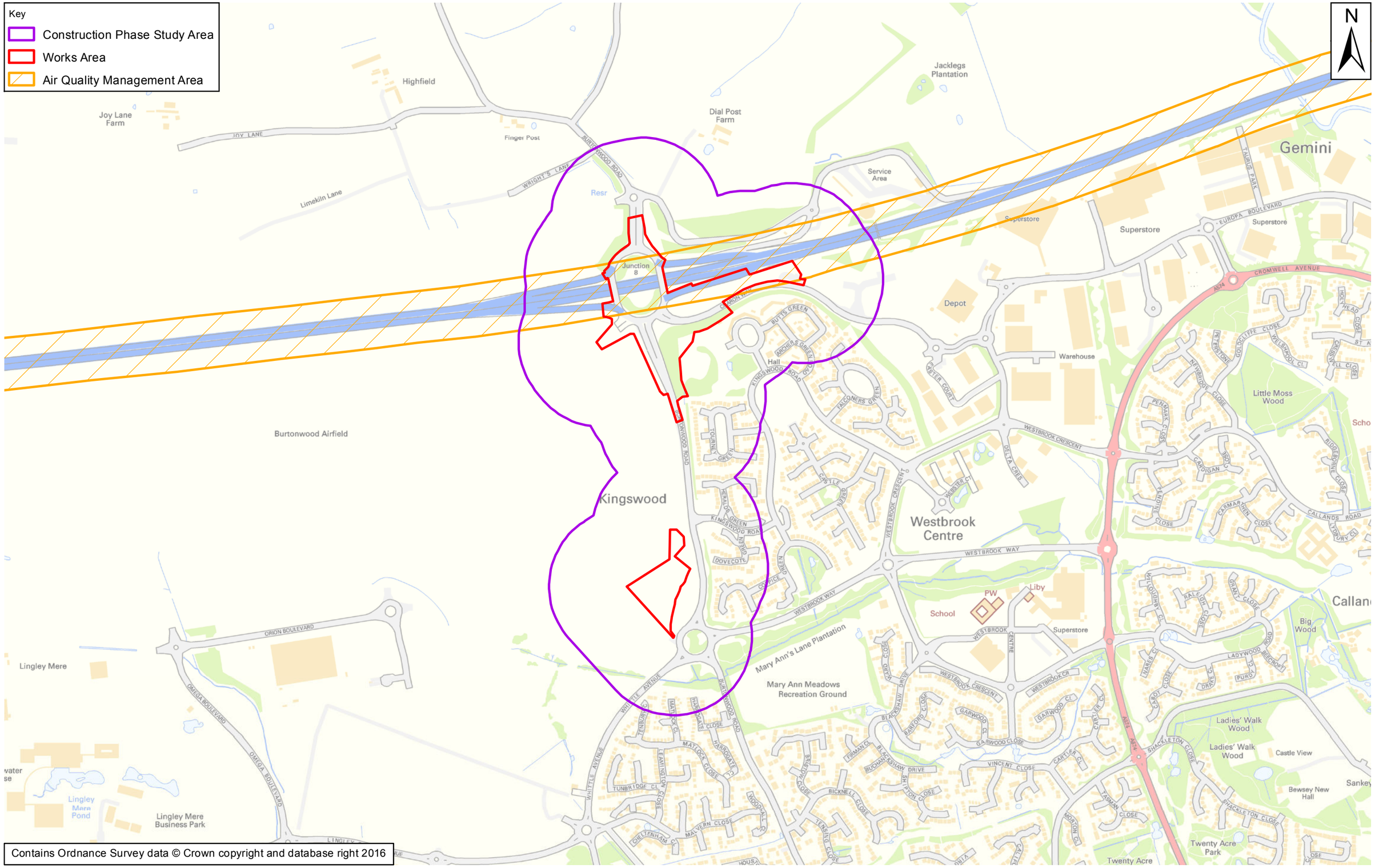
PROJECT No: 70015234

Drawn: KW
Checked: KW
Approved: KS
Revision: B
Date: April 2016

Air Quality - Construction Phase Study Area

Scale @ A3 1 : 9,000

Figure 1.3



PROJECT: M62 Junction 8

PROJECT No: 70015234

Drawn: AM
Checked: DE
Approved: DE
Revision: A
Date: May 2016

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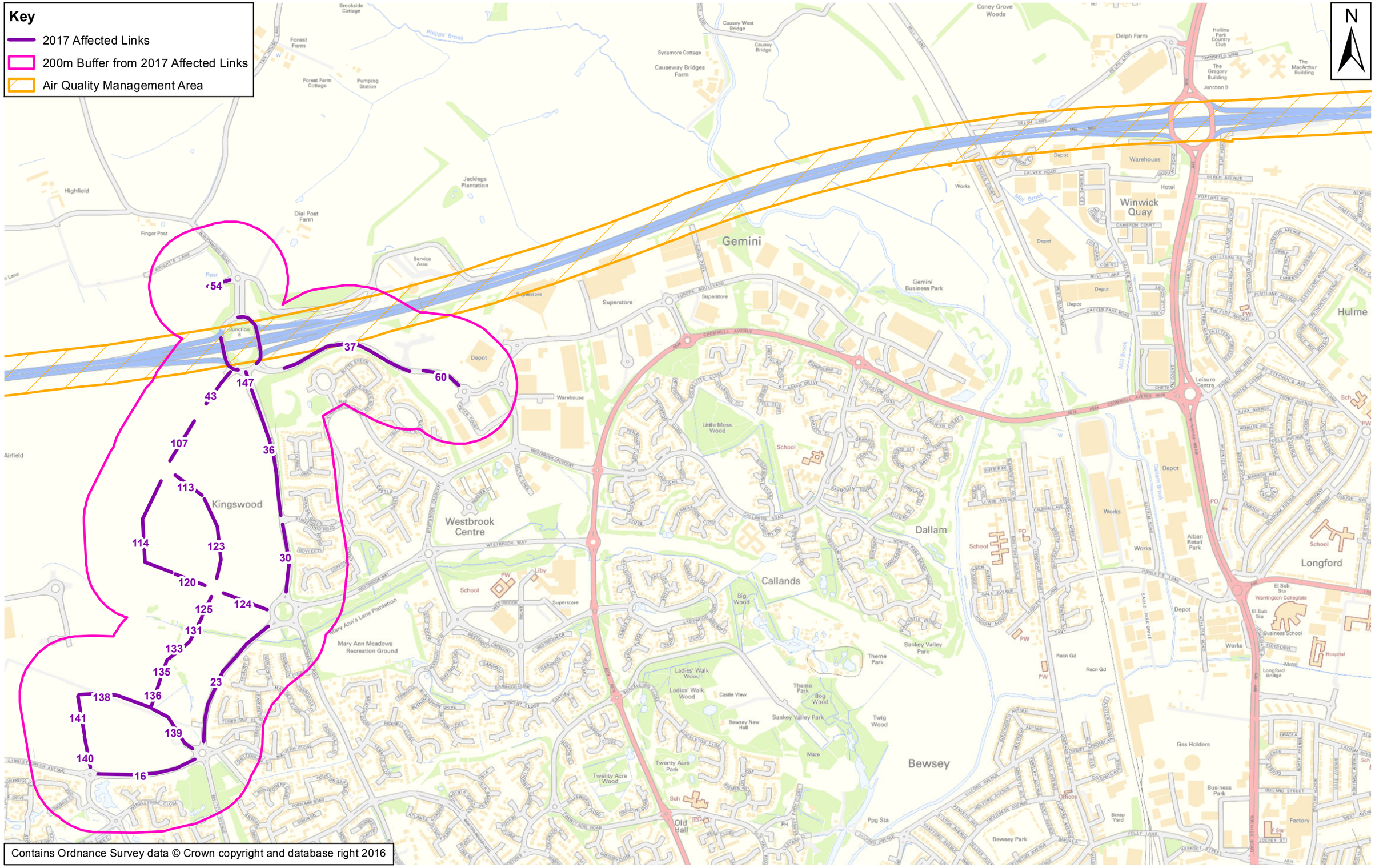

PROJECT: M62 Junction 8

PROJECT No: 70015234

Drawn: AM
Checked: DE
Approved: DE
Revision: A
Date: May 2016

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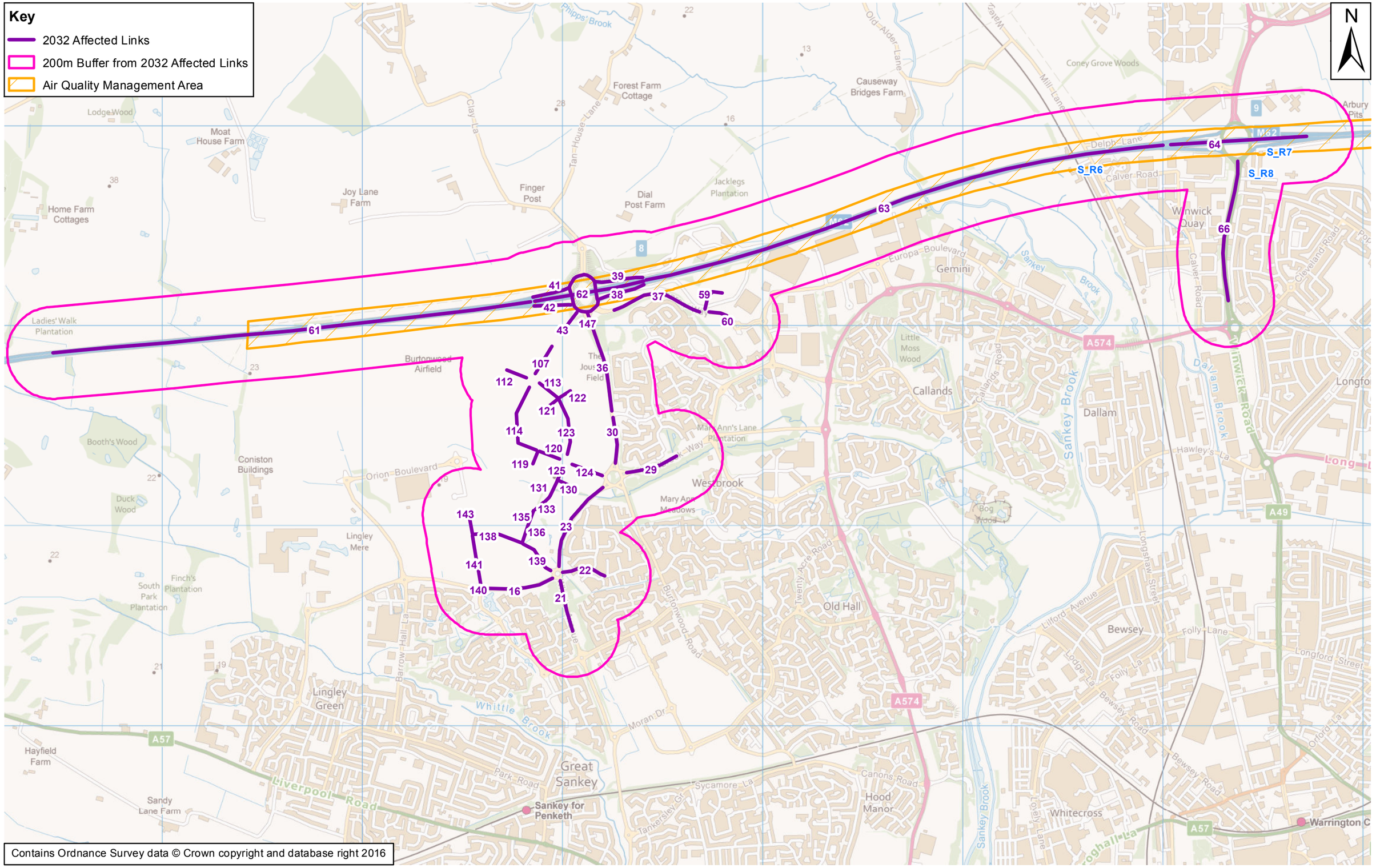

PROJECT: M62 Junction 8

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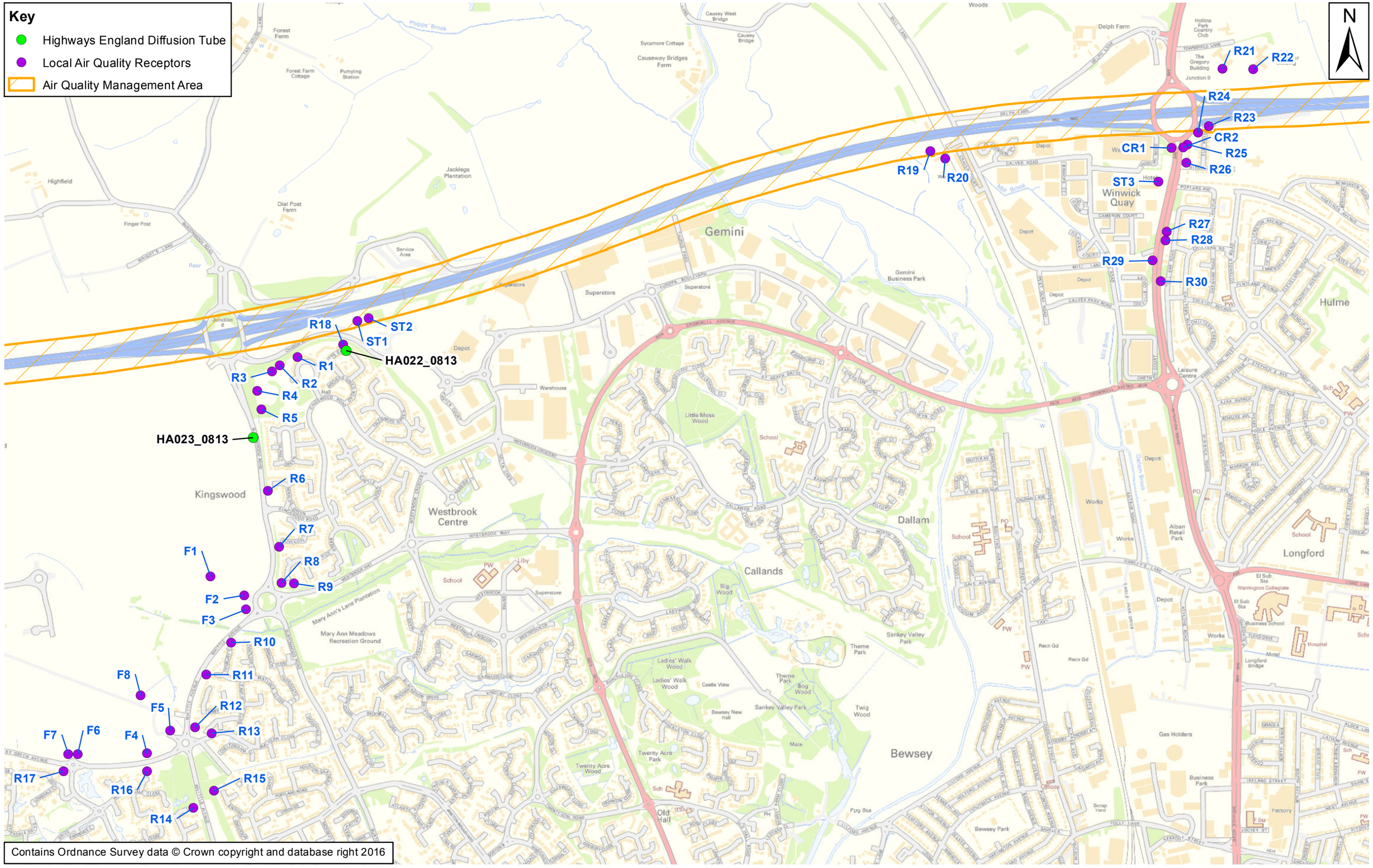

PROJECT: M62 Junction 8

PROJECT No: 70015234

Drawn: AM
Checked: DE
Approved: DE
Revision: A
Date: May 2016

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Appendix A

GLOSSARY

TERM	DEFINITION
AADT	Annual Average Daily Traffic . A daily total traffic flow (24 hrs), expressed as a mean daily flow across all 365 days of the year.
Adjustment	Application of a correction factor to modelled results to account for uncertainties in the model
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year.
AQMA	Air Quality Management Area.
DEFRA	Department for Environment, Food and Rural Affairs.
DMRB	Design Manual for Roads and Bridges
Exceedance	A period of time where the concentrations of a pollutant is greater than the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
HDV/HGV	Heavy Duty Vehicle/Heavy Goods Vehicle.
IAN	Interim Advice Note
LAQM	Local Air Quality Management.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 micrometres.
Trackout	Trackout is defined as the transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network
Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers.
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.
WBC	Warrington Borough Council

Appendix B

AIR QUALITY OBJECTIVES

National Air Quality Objectives and European Directive Limit Values for the protection of human health						
Pollutant	Applies to	Objective	Measured as	Date to be achieved by and maintained thereafter	European Obligations	Date to be achieved by and maintained thereafter
Nitrogen dioxide (NO_2)	UK	200µg/m^3 not to be exceeded more than 18 times a year	1 hour mean	31.12.2005	200µg/m^3 not to be exceeded more than 18 times a year	01.01.2010
	UK	40µg/m^3	annual mean	31.12.2005	40µg/m^3	01.01.2010
Particulate Matter (PM_{10}) (gravimetric)[A]	UK	40µg/m^3	annual mean	31.12.2004	40µg/m^3	01.01.2005
	UK (except Scotland)	50µg/m^3 not to be exceeded more than 35 times a year	24 hour mean	31.12.2004	50µg/m^3 not to be exceeded more than 35 times a year	01.01.2005
$PM_{2.5}$	UK (except Scotland)	25µg/m^3	Annual mean	2020	25µg/m^3	2010

[A] Measured using the European gravimetric transfer sampler or equivalent
µg/m^3 = microgram per cubic metre

Appendix C

TRAFFIC DATA

2014 BASELINE

GIS ID	ROAD DESCRIPTION	2014 BASELINE			
		Peak Average Speed (Kph)	Daily Average Speed (kph)	24 hr AADT	% HGV
1	Lingley Green Ave (s)	47.2	57.5	15028	2.0%
5	Lingley Mere Roundabout-Lingley Mere Business Park	44.3	53.9	7382	0.6%
6	Lingley Green Ave	45.1	54.9	13055	2.5%
7	Barrow Hall Lane	8.6	10.5	6114	0.0%
8	Omega Boulevard	37.5	45.6	5885	9.9%
9	Omega Boulevard	51.2	62.3	5879	9.8%
14	Lingley Green Ave	43.6	53.1	20373	2.9%
15	Kingsdale Road	9.8	11.9	6397	1.9%
16	Lingley Green Ave	38.7	47.1	17358	2.8%
21	Whittle Ave (s)	14.8	18.1	11507	2.1%
22	Malvern Close	24.2	29.4	2213	0.0%
23	Whittle Ave	54.7	66.6	26682	2.7%
28	Burtonwood Road (s)	47.1	57.4	2058	0.0%
29	Westbrook Way	53.3	64.8	12964	1.9%
30	Burtonwood Road	39.0	47.5	19848	2.4%
31	Burtonwood Road/Whittle Roundabout	50.1	61.0	14555	1.7%
32	Burtonwood Road/Whittle Roundabout	46.9	57.1	9762	3.4%
33	Burtonwood Road/Whittle Roundabout	40.3	49.1	6840	3.1%
34	Burtonwood Road/Whittle Roundabout	60.9	74.1	1498	0.0%
35	Kingswood Road	16.6	20.2	1876	1.0%
36	Burtonwood Road	40.7	49.5	20184	2.2%
37	Charon Way	35.5	43.2	13948	3.9%
38	M62 J8 WB off slip	14.0	16.1	13546	6.3%
39	M62 J8 EB on slip	79.3	79.0	9125	4.1%
40	Burtonwood Road	21.4	26.1	12721	5.2%
41	M62 J8 EB off slip	15.3	17.7	8108	8.9%
42	M62 J8 WB on slip	73.3	73.0	5832	6.1%
44	M62 J8 Roundabout	49.5	60.3	19552	5.7%
45	M62 J8 Roundabout	25.0	30.4	9550	3.7%
46	M62 J8 Roundabout	16.9	20.6	4133	5.9%
47	M62 J8 Roundabout	19.0	23.1	3088	14.5%
48	M62 J8 Roundabout	42.8	52.0	8455	8.5%
49	M62 J8 Roundabout	42.3	51.5	18015	4.8%
50	M62 J8 Roundabout	34.9	42.5	12646	4.6%
51	M62 J8 Roundabout	34.1	41.5	13469	6.0%
52	Service Road	36.1	43.9	238	15.7%
53	Burtonwood Road (n)	54.6	66.5	11824	5.2%
54	Omega North	44.7	54.5	792	0.0%
59	Apollo Park	30.0	36.6	1245	0.0%
60	Charon Way	43.4	52.8	13380	4.0%
61	M62 (west of J8)	107.2	109.6	99484	11.5%
62	M62 (through J8)	110.3	112.8	85502	12.1%
63	M62 between J8 + J9	108.1	110.6	108294	10.8%
64	M62 through J9	108.4	110.8	88145	12.4%
65	M62 (east of J9)	106.5	108.9	103254	12.3%
66	Winwick Road	50.7	61.7	34888	8.2%
67	M62 J9 WB off slip	33.3	38.5	8476	11.5%
68	M62 J9 EB on slip	81.7	81.3	6685	11.8%
69	Newton Road	17.0	20.7	31531	5.6%
70	M62 J9 EB off slip	27.0	31.2	10353	4.3%
71	M62 J9 WB on slip	70.7	70.4	11113	7.2%
72	M62 J9 Roundabout	30.5	37.1	23824	7.0%
73	M62 J9 Roundabout	15.2	18.5	17777	5.9%
74	M62 J9 Roundabout	21.2	25.8	8180	4.9%
75	M62 J9 Roundabout	45.2	55.1	8169	4.9%
76	M62 J9 Roundabout	21.1	25.7	15516	7.7%

77	M62 J9 Roundabout	18.1	22.0	7920	9.0%
78	Delph Lane	11.3	13.8	3192	3.1%
79	Newton Road	33.7	41.1	29891	5.6%
81	Omega Boulevard	49.3	60.1	5879	9.8%
84	Orion Boulevard	49.7	60.5	5874	9.8%
89	Post Office Car	51.3	62.5	5290	0.0%
90	Orion Boulevard	47.9	58.3	578	100.0%
92	Kingsdale Road	42.7	52.0	584	100.0%

OPENING YEAR - 2017

GIS ID	Road Description	2017 Do-Minimum (DM)				2017 Do-Something (DS)			
		Peak Average Speed (kph)	Daily Average Speed (kph)	24 hr AADT	% HGV	Peak Average Speed (kph)	Daily Average Speed (kph)	24 hr AADT	% HGV
1	Lingley Green Ave (s)	47.5	57.8	16508	2.0%	47.7	58.1	16504	2.0%
5	Lingley Mere Roundabout-Lingley Mere Business Park	35.1	42.7	6246	0.4%	35.0	42.6	6288	0.4%
6	Lingley Green Ave (W of Community Hub)	46.0	56.0	12791	2.5%	45.2	55.0	12729	2.5%
7	Barrow Hall Lane	31.4	38.2	6165	0.0%	29.9	36.4	6160	0.0%
8	Omega Boulevard	48.3	58.8	6335	7.6%	46.1	56.1	6714	7.4%
9	Omega Boulevard	65.4	79.6	6339	7.5%	63.9	77.8	6719	7.4%
14	Lingley Green Ave	39.1	47.6	15873	2.5%	39.3	47.9	15609	2.5%
15	Kingsdale Road	28.8	35.0	6668	1.7%	28.1	34.2	6673	1.7%
16	Lingley Green Ave	45.1	54.9	10306	1.9%	43.4	52.8	12131	2.3%
21	Whittle Ave (s)	46.3	56.4	12612	2.1%	44.0	53.5	12600	2.0%
22	Malvern Close	43.0	52.4	2377	0.0%	42.0	51.2	2377	0.0%
23	Whittle Ave	54.0	65.8	18047	2.0%	55.2	67.2	21738	2.5%
28	Burtonwood Road (s)	49.0	59.7	2017	0.0%	48.2	58.6	2017	0.0%
29	Westbrook Way	62.2	75.7	13662	1.7%	57.2	69.6	13652	1.7%
30	Burtonwood Road	40.2	49.0	13352	2.4%	39.8	48.4	14707	2.0%
31	Burtonwood Road/Whittle Roundabout	50.2	61.1	9619	1.3%	50.8	61.9	12469	1.7%
32	Burtonwood Road/Whittle Roundabout	50.1	61.0	6772	2.7%	46.8	56.9	6821	2.8%
33	Burtonwood Road/Whittle Roundabout	27.0	32.9	9015	2.6%	29.0	35.3	8325	2.4%
34	Burtonwood Road/Whittle Roundabout	60.9	74.1	8125	2.9%	60.9	74.1	7434	2.7%
35	Kingswood Road	14.4	17.5	1875	0.7%	14.4	17.5	1875	0.7%
36	Burtonwood Road (S of Charon Way)	30.5	37.1	13603	2.3%	41.5	50.5	15146	2.0%
37	Charon Way	16.2	19.7	13371	3.6%	48.6	59.1	13773	3.6%
38	M62 J8 WB off slip	40.0	46.3	15078	6.3%	38.2	44.2	15067	6.3%
39	M62 J8 EB on slip	78.2	77.8	11068	6.4%	75.8	75.5	11185	6.2%
40	Burtonwood Road	21.0	25.6	14609	4.9%	17.7	21.5	14674	4.8%
41	M62 J8 EB off slip	41.9	48.5	9237	11.3%	34.0	39.3	9234	11.3%
42	M62 J8 WB on slip	79.7	79.4	6805	11.2%	75.8	75.5	6996	10.8%
43	Skyline Drive	12.9	15.7	13853	9.0%	39.9	48.5	10095	10.5%
44	M62 J8 Roundabout	47.4	57.7	22641	7.1%	47.5	57.9	22712	7.0%
45	M62 J8 Roundabout	27.6	33.6	10928	5.6%	37.1	45.2	10907	5.6%
46	M62 J8 Roundabout	52.4	63.8	8373	2.9%	20.8	25.3	8694	10.8%
47	M62 J8 Roundabout	23.4	28.4	9354	10.4%	20.8	25.3	8694	10.8%
48	M62 J8 Roundabout	6.0	7.3	8192	8.0%	10.6	13.0	3754	12.3%
49	M62 J8 Roundabout	23.4	28.4	9049	5.4%	39.6	48.2	10723	4.9%
50	M62 J8 Roundabout	9.3	11.3	14791	5.5%	18.7	22.8	14886	5.3%
51	M62 J8 Roundabout	27.8	33.8	15647	8.1%	25.8	31.5	15705	8.0%
52	Service Road	2.2	2.7	226	11.0%	2.2	2.7	226	11.0%
53	Burtonwood Road (n)	56.3	68.6	11824	4.9%	50.3	61.2	11900	4.9%
54	Omega North	50.4	61.4	2847	3.5%	59.9	72.9	2806	3.5%
59	Apollo Park	28.6	34.8	1209	0.0%	29.6	36.0	1220	0.0%

60	Charon Way	20.1	24.5	12954	3.7%	42.9	52.3	13269	3.7%
61	M62 (west of J8)	109.0	111.4	100546	11.8%	108.5	110.9	100739	11.8%
62	M62 (through J8)	113.6	116.2	84400	11.9%	113.6	116.2	84406	11.9%
63	M62 between J8 + J9	110.0	112.5	110730	10.6%	110.1	112.5	110865	10.6%
64	M62 through J9	110.5	113.0	90372	12.2%	110.5	112.9	90455	12.2%
65	M62 (east of J9)	108.8	111.2	105477	12.1%	108.7	111.1	105569	12.1%
66	Winwick Road	50.6	61.6	34591	7.8%	50.6	61.6	34586	7.8%
67	M62 J9 WB off slip	32.2	37.2	8354	11.0%	32.2	37.2	8354	11.0%
68	M62 J9 EB on slip	82.0	81.7	6637	11.4%	81.9	81.5	6637	11.4%
69	Newton Road	17.0	20.7	31487	5.4%	16.9	20.6	31560	5.4%
70	M62 J9 EB off slip	26.9	31.1	10395	4.2%	27.0	31.2	10494	4.1%
71	M62 J9 WB on slip	70.5	70.2	11219	6.9%	70.5	70.2	11214	6.9%
72	M62 J9 Roundabout	30.3	36.9	23772	6.7%	30.1	36.7	23783	6.7%
73	M62 J9 Roundabout	15.2	18.5	17769	5.7%	15.2	18.5	17774	5.7%
74	M62 J9 Roundabout	21.2	25.9	8259	4.7%	21.2	25.8	8264	4.7%
75	M62 J9 Roundabout	45.6	55.5	8259	4.7%	45.5	55.4	8254	4.7%
76	M62 J9 Roundabout	21.0	25.6	15430	7.4%	21.1	25.7	15430	7.4%
77	M62 J9 Roundabout	18.0	21.9	7914	8.6%	17.7	21.5	7924	8.6%
78	Delph Lane	12.5	15.2	3140	3.0%	12.4	15.1	3145	3.0%
79	Newton Road	34.1	41.5	29879	5.4%	33.4	40.7	29957	5.4%
81	Omega Boulevard	54.0	65.7	6350	7.5%	52.8	64.3	6719	7.4%
82	North of Lingley Mere Business Park	34.6	42.1	2549	0.5%	35.0	42.6	2494	0.7%
83	Skyline Drive	48.9	59.6	7886	4.3%	47.8	58.2	8117	3.8%
84	Orion Boulevard	47.0	57.3	6600	10.2%	46.9	57.1	6573	10.1%
89	Post Office Car	50.9	62.0	5300	0.0%	51.0	62.1	5290	0.0%
90	Orion Boulevard	49.4	60.1	1289	52.1%	49.5	60.2	1278	52.1%
91	Plot 7c	46.3	56.4	739	14.3%	45.7	55.6	722	13.8%
92	Kingsdale Road	42.6	51.8	560	100.0%	42.6	51.8	560	100.0%
96	Plot 7D	59.5	72.4	731	16.2%	58.9	71.7	731	16.2%
97	Skyline Drive	59.6	72.6	8178	5.6%	58.3	71.0	8412	5.2%
98	Plot 7E,7F,7G	51.8	63.1	2186	16.2%	51.6	62.8	2175	16.0%
99	Skyline Drive	54.5	66.4	9109	8.5%	53.7	65.3	9325	8.3%
100	Plot 7A	56.0	68.1	720	16.4%	55.6	67.7	725	16.3%
101	Skyline Drive	54.3	66.1	9407	9.5%	53.4	65.1	9622	9.2%
102	Asda Distribution Centre	54.3	66.1	203	64.4%	53.4	65.0	232	53.5%
103	Skyline Drive	58.8	71.6	9437	10.4%	57.4	69.9	9672	10.0%
104	Asda Distribution Centre	48.4	59.0	169	51.4%	46.3	56.4	139	62.8%
105	Skyline Drive	48.5	59.1	9615	11.0%	48.0	58.4	9821	10.8%
107	Between Skyline Drive RA and Office Zone 1 RA	13.6	16.6	6433	7.0%	25.6	31.1	283	0.0%
112	Office Zone 1	29.0	35.3	72	0.0%	35.6	43.4	67	0.0%
113	Between Office Zone 1 RA and Westbrook/Whittle Parallel RA (e)	22.8	27.7	2644	5.4%	33.9	41.2	196	0.0%
114	Between Office Zone 1 RA and Westbrook/Whittle Parallel RA (w)	30.1	36.6	3731	8.0%	34.7	42.3	57	0.0%
119	Mixed Use Zone 3 & 4	34.1	41.5	87	0.0%	35.7	43.5	93	0.0%
120	Between Office Zone 1 RA and Westbrook/Whittle Parallel RA (w)	21.0	25.6	3742	8.1%	35.9	43.7	67	0.0%
121	SW Road	32.6	39.7	82	0.0%	34.1	41.6	87	0.0%
122	NE Road	33.4	40.6	77	0.0%	35.0	42.7	77	0.0%
123	Between Office Zone 1 RA and Westbrook/Whittle Parallel RA (e)	32.7	39.8	2526	5.7%	34.0	41.4	190	0.0%
124	Westbrook Way	29.1	35.4	4424	5.9%	31.1	37.9	154	0.0%
125	Road Parallel to Whittle Ave	27.9	33.9	4182	4.8%	35.6	43.4	87	0.0%
130	Mixed Use Zone 5	31.5	38.3	98	0.0%	34.1	41.5	98	0.0%
131	Road Parallel to Whittle Ave	31.8	38.7	4079	4.9%	34.4	41.9	72	0.0%
133	Road Parallel to Whittle Ave	31.9	38.9	4069	4.9%	33.8	41.2	72	0.0%
135	Road Parallel to Whittle Ave	32.1	39.1	4069	4.9%	34.9	42.5	72	0.0%
136	Road Parallel to Whittle Ave	31.4	38.3	4069	4.9%	34.2	41.6	72	0.0%

138	Between Whittle/Malvern Close RA and junc with Kingsdale Road	32.5	39.6	2212	3.9%	35.7	43.5	15	0.0%
139	Between Whittle/Malvern Close RA and junc with Kingsdale Road	19.4	23.6	3202	4.9%	19.8	24.2	57	0.0%
140	Kingsdale Road	31.3	38.1	2233	3.9%	26.6	32.4	15	0.0%
141	Kingsdale Road	32.5	39.5	2218	3.9%	35.8	43.6	15	0.0%
146	Lingley Green Ave (E of Community Hub)	38.4	46.8	12812	2.5%	38.6	47.0	12735	2.5%
147	Burtonwood Road (N of Charon Way)	-	-	-	-	15.5	18.9	20485	2.7%

DESIGN YEAR - 2032

GIS ID	Road Description	2032 Do-Minimum (DM)				2032 Do-Something (DS)			
		Peak Average Speed (kph)	Daily Average Speed (kph)	24 hr AADT	% HGV	Peak Average Speed (kph)	Daily Average Speed (kph)	24 hr AADT	% HGV
1	Lingley Green Ave (s)	38.2	46.5	19644	1.9%	36.9	44.9	20016	1.9%
5	Lingley Mere Roundabout-Lingley Mere Business Park	32.5	39.6	8692	0.4%	32.7	39.9	8431	0.4%
6	Lingley Green Ave (W of Community Hub)	40.3	49.1	15535	2.3%	37.8	46.0	16109	2.3%
7	Barrow Hall Lane	17.8	21.7	6551	0.0%	18.7	22.7	6345	0.0%
8	Omega Boulevard	32.5	39.6	8989	6.2%	31.7	38.6	9514	5.6%
9	Omega Boulevard	62.6	76.2	8953	6.3%	62.1	75.6	9299	5.8%
14	Lingley Green Ave	34.4	41.9	19187	2.4%	36.0	43.8	19605	2.1%
15	Kingsdale Road	11.1	13.5	7216	2.2%	11.2	13.6	7196	2.2%
16	Lingley Green Ave	28.9	35.2	14142	1.9%	30.8	37.5	15661	1.6%
21	Whittle Ave (s)	23.6	28.7	14643	1.9%	21.1	25.7	15723	1.8%
22	Malvern Close	33.3	40.5	2558	0.0%	22.0	26.8	2506	0.0%
23	Whittle Ave	39.4	48.0	23947	2.3%	42.0	51.1	25167	2.1%
28	Burtonwood Road (s)	46.7	56.9	2136	0.0%	43.9	53.5	2084	0.0%
29	Westbrook Way	55.3	67.3	15723	1.6%	26.7	32.6	17385	1.4%
30	Burtonwood Road	24.9	30.3	15252	1.9%	38.2	46.5	18202	2.0%
31	Burtonwood Road/Whittle Roundabout	25.0	30.4	13327	1.7%	47.6	58.0	13929	1.4%
32	Burtonwood Road/Whittle Roundabout	45.4	55.3	7415	2.3%	40.0	48.7	9189	2.2%
33	Burtonwood Road/Whittle Roundabout	41.7	50.8	6496	2.0%	36.4	44.3	8323	1.9%
34	Burtonwood Road/Whittle Roundabout	60.9	74.1	5549	2.4%	60.9	74.1	7387	2.2%
35	Kingswood Road	13.6	16.5	2020	0.9%	14.1	17.1	1984	0.9%
36	Burtonwood Road (S of Charon Way)	16.4	19.9	15644	1.9%	38.4	46.8	18594	2.0%
37	Charon Way	15.5	18.8	14383	3.5%	46.1	56.1	16652	3.4%
38	M62 J8 WB off slip	25.7	29.7	18168	6.7%	82.5	95.4	20256	5.9%
39	M62 J8 EB on slip	78.5	78.1	13079	6.4%	75.8	75.5	16333	5.3%
40	Burtonwood Road	13.8	16.8	13850	5.3%	13.4	16.3	14494	5.1%
41	M62 J8 EB off slip	11.6	13.4	10704	10.6%	16.4	18.9	12722	9.4%
42	M62 J8 WB on slip	80.0	79.7	7774	11.4%	72.3	72.0	10199	8.9%
43	Skyline Drive	23.7	28.9	16895	8.7%	28.3	34.4	24966	6.0%
44	M62 J8 Roundabout	44.6	54.3	26747	6.8%	44.3	54.0	32462	5.9%
45	M62 J8 Roundabout	20.1	24.5	13131	5.2%	26.9	32.8	15813	4.7%
46	M62 J8 Roundabout	52.2	63.6	9826	2.8%	17.3	21.0	15610	7.7%
47	M62 J8 Roundabout	26.4	32.2	11924	10.1%	17.3	21.0	15610	7.7%
48	M62 J8 Roundabout	13.9	16.9	8021	9.1%	10.4	12.6	3812	13.1%
49	M62 J8 Roundabout	28.5	34.6	9935	5.6%	33.7	41.0	12015	4.9%
50	M62 J8 Roundabout	12.8	15.6	16755	5.5%	16.9	20.6	21315	4.6%
51	M62 J8 Roundabout	25.4	30.9	19058	7.4%	24.1	29.3	24805	6.2%

52	Service Road	1.8	2.2	259	14.4%	1.9	2.3	238	15.7%
53	Burtonwood Road (n)	34.5	42.1	12383	5.1%	33.3	40.6	13017	4.9%
54	Omega North	10.9	13.3	2792	3.8%	11.2	13.6	2757	4.1%
59	Apollo Park	12.4	15.1	3180	0.0%	22.0	26.8	3242	0.0%
60	Charon Way	14.2	17.3	12629	4.0%	42.6	51.9	15391	3.6%
61	M62 (west of J8)	94.7	96.8	108182	12.1%	105.2	107.6	107523	12.3%
62	M62 (through J8)	110.7	113.2	89553	12.3%	113.0	115.5	84776	13.1%
63	M62 between J8 + J9	108.2	110.6	120819	10.9%	107.9	110.3	121887	10.8%
64	M62 through J9	108.8	111.2	98755	12.5%	108.2	110.6	99786	12.4%
65	M62 (east of J9)	107.1	109.5	114711	12.4%	106.9	109.3	114900	12.4%
66	Winwick Road	48.0	58.4	36813	8.2%	50.9	61.9	35228	8.6%
67	M62 J9 WB off slip	31.9	37.0	8988	11.8%	31.9	37.0	8523	12.7%
68	M62 J9 EB on slip	81.7	81.4	6951	11.1%	81.8	81.5	6584	11.9%
69	Newton Road	14.9	18.1	33176	5.5%	15.9	19.4	32291	5.7%
70	M62 J9 EB off slip	26.3	30.5	11154	4.3%	26.6	30.8	11196	4.2%
71	M62 J9 WB on slip	69.4	69.1	12230	6.8%	69.9	69.6	12089	6.9%
72	M62 J9 Roundabout	28.5	34.7	25276	6.8%	29.2	35.6	24445	7.1%
73	M62 J9 Roundabout	15.4	18.7	18950	5.9%	15.5	18.8	18510	6.1%
74	M62 J9 Roundabout	21.2	25.8	8934	4.7%	22.0	26.8	8755	4.9%
75	M62 J9 Roundabout	44.5	54.2	8929	4.7%	44.8	54.6	8751	5.0%
76	M62 J9 Roundabout	20.6	25.1	16313	7.7%	20.8	25.3	15367	8.2%
77	M62 J9 Roundabout	16.7	20.3	8575	8.8%	17.0	20.7	8190	9.3%
78	Delph Lane	10.8	13.1	3347	3.0%	11.7	14.3	3146	3.2%
79	Newton Road	21.9	26.6	31603	5.5%	22.6	27.5	30785	5.7%
81	Omega Boulevard	43.8	53.3	8937	6.3%	43.3	52.7	9299	5.8%
82	North of Lingley Mere Business Park	28.0	34.1	5285	0.6%	28.8	35.0	5165	0.4%
83	Skyline Drive	41.0	49.9	10750	3.9%	40.4	49.2	11212	4.2%
84	Orion Boulevard	42.8	52.1	7227	10.9%	42.2	51.4	6924	11.4%
89	Post Office Car	50.6	61.7	5568	0.0%	50.6	61.6	5192	0.0%
90	Orion Boulevard	49.6	60.3	1666	47.8%	49.6	60.4	1721	45.9%
91	Plot 7c	45.7	55.6	1045	17.3%	45.8	55.7	1112	16.2%
92	Kingsdale Road	42.4	51.6	609	100.0%	42.3	51.5	609	100.0%
96	Plot 7D	56.3	68.5	1013	17.2%	55.2	67.2	1002	16.8%
97	Skyline Drive	58.1	70.8	11150	5.3%	57.7	70.3	11694	5.5%
98	Plot 7E,7F,7G	49.6	60.4	3087	16.3%	49.6	60.4	3043	17.0%
99	Skyline Drive	53.0	64.5	12483	8.8%	52.9	64.5	12930	8.9%
100	Plot 7A	53.5	65.1	1006	16.1%	53.9	65.6	1055	17.1%
101	Skyline Drive	52.5	63.9	12912	9.7%	52.0	63.3	13367	10.0%
102	Asda Distribution Centre	47.1	57.4	232	53.5%	49.2	59.9	211	56.1%
103	Skyline Drive	56.9	69.3	12967	10.3%	57.0	69.4	13441	10.4%
104	Asda Distribution Centre	44.3	53.9	145	64.4%	42.5	51.7	157	67.3%
105	Skyline Drive	40.7	49.6	13180	10.9%	43.0	52.3	13618	11.0%
107	Between Skyline Drive RA and Office Zone 1 RA	20.7	25.2	3825	1.0%	18.5	22.5	11491	0.0%
112	Office Zone 1	33.2	40.4	664	0.0%	32.3	39.3	2835	0.0%
113	Between Office Zone 1 RA and Westbrook/Whittle Parallel RA (e)	33.2	40.4	2868	1.3%	29.3	35.6	7343	0.0%
114	Between Office Zone 1 RA and Westbrook/Whittle Parallel RA (w)	33.7	41.1	602	0.0%	32.8	39.9	2630	0.0%
119	Mixed Use Zone 3 & 4	34.1	41.5	674	0.0%	32.4	39.4	2753	0.0%
120	Between Office Zone 1 RA and Westbrook/Whittle Parallel RA (w)	35.1	42.7	463	0.0%	33.9	41.2	2156	0.0%
121	SW Road	33.3	40.6	664	0.0%	30.8	37.5	2748	0.0%
122	NE Road	33.1	40.3	659	0.0%	28.6	34.8	2769	0.0%
123	Between Office Zone 1 RA and Westbrook/Whittle Parallel RA (e)	33.5	40.8	2152	1.7%	32.4	39.5	4369	0.0%
124	Westbrook Way	21.3	25.9	1343	0.0%	21.2	25.8	6038	0.2%
125	Road Parallel to Whittle Ave	34.8	42.3	2368	1.6%	32.8	39.9	7191	0.2%
130	Mixed Use Zone 5	32.8	39.9	715	0.0%	25.9	31.6	2702	0.0%

131	Road Parallel to Whittle Ave	33.3	40.5	1813	2.1%	32.7	39.8	5045	0.2%
132	Residential Zone 6 Phases 4,6,7	34.9	42.5	93	0.0%	32.9	40.0	545	0.0%
133	Road Parallel to Whittle Ave	33.0	40.2	1782	2.1%	32.8	40.0	4870	0.3%
134	Residential Zone 6 Phase 4	34.8	42.4	82	0.0%	32.0	39.0	561	0.0%
135	Road Parallel to Whittle Ave	33.5	40.8	1772	2.1%	32.7	39.8	4886	0.3%
136	Road Parallel to Whittle Ave	32.7	39.8	1669	2.2%	31.0	37.8	4083	0.3%
138	Between Whittle/Malvern Close RA and junc with Kingsdale Road	33.5	40.8	1761	2.1%	33.1	40.3	3522	0.4%
139	Between Whittle/Malvern Close RA and junc with Kingsdale Road	15.9	19.3	931	0.0%	19.9	24.2	2326	0.0%
140	Kingsdale Road	19.2	23.4	1452	2.6%	19.8	24.2	2941	0.4%
141	Kingsdale Road	33.3	40.6	1432	2.6%	33.2	40.4	2683	0.5%
142	Residential Zone 6 Phase 1	34.0	41.4	124	0.0%	33.2	40.4	607	0.0%
143	Kingsdale Road	34.3	41.8	283	0.0%	34.0	41.4	1400	0.0%
146	Lingley Green Ave (E of Community Hub)	29.1	35.4	15542	2.3%	25.7	31.2	16129	2.3%
147	Burtonwood Road (N of Charon Way)	-	-	-	-	13.9	17.0	24616	2.6%

Appendix D

VERIFICATION

NITROGEN DIOXIDE

Most nitrogen dioxide (NO_2) is produced in the atmosphere by the reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of the primary pollutant emissions of nitrogen oxides (NO_x = NO + NO_2), in line with the guidance provided within LAQM.TG(16)[31].

The model has been run to predict 2014 annual mean road-NO_x contribution at two diffusion tube locations within the modelled road network.

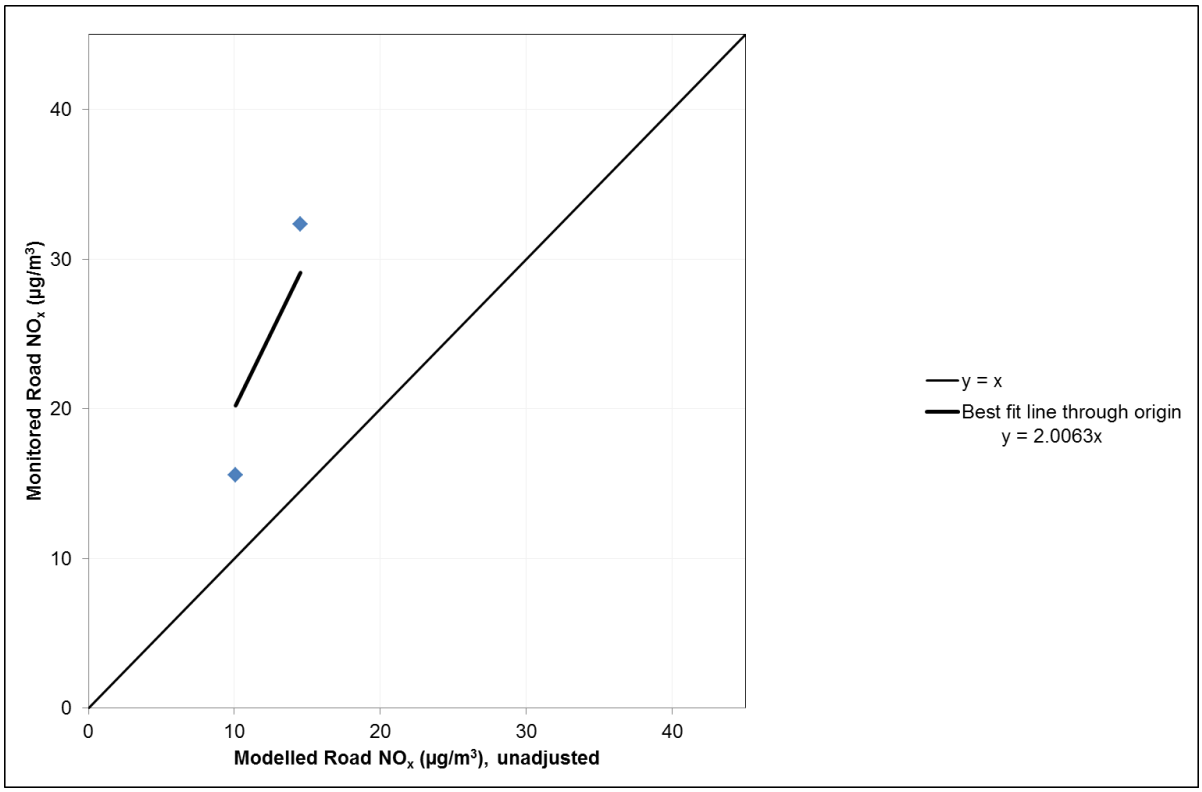
The model outputs of road-NO_x have been compared with the 2014 'measured' road-NO_x, which was determined from the measured NO_2 concentrations , utilising the NO_x from NO_2 calculator provided by DEFRA and the NO_2 background concentration (from the DEFRA background map).

A road-NO_x adjustment factor of 2.0 was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution, forced through zero. This factor was applied to the modelled road-NO_x concentration for each receptor to provide adjusted modelled road-NO_x concentrations. The total NO_2 concentrations were then determined by inputting the adjusted modelled road-NO_x concentrations and the background NO_2 concentration into the NO_x to NO_2 calculator.

The table and figure below present the verification process.

MONITORING SITE	2014[A] MONITORED ANNUAL MEAN NO_2 CONC. (µG/M^3)	2014 NO_2 BACKGROUND (µG/M^3)	2014 MONITORED ROAD-NO_X (µG/M^3) (FROM NO_X:NO_2 CALCULATOR)	2014 MODELLED ROAD NO_X (µG/M^3)	RATIO
HA022_0813	29.2	21.6	15.6	10.1	1.54
HA023_0813	31.9	16.3	32.3	14.5	2.23
[A] Monitoring period of August 2013 to July 2014, assumed to be representative of 2014 annual mean concentrations.					

[31] Defra (2016) Part IV The Environment Act 1995 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(16)



PARTICULATE MATTER

There are no local PM_{10} or $PM_{2.5}$ monitoring data against which the model could be verified. Consequently, the road-NO_x factor has been applied to the modelled road-PM_{10} and road-$PM_{2.5}$ contribution for each receptor in line with guidance given in LAQM.TG(16).

Appendix E

LOCAL AIR QUALITY RESULTS

RESULTS FOR LOCAL AIR QUALITY ASSESSMENT – ANNUAL MEAN NO_2 CONCENTRATIONS (μGM^3)

Receptor ID	2014 Baseline	Unadjusted 2017 DM	Unadjusted 2017 DS	Unadjusted 2017 Change[B]	Adjusted[A] 2017 DM	Adjusted[A] 2017 DS	Adjusted* 2017 Change[B]
R1	32.4	27.6	26.7	-0.9	29.1	28.1	-1.0
R2	31.2	26.7	26.0	-0.8	28.1	27.3	-0.8
R3	30.3	26.0	25.6	-0.4	27.2	26.7	-0.4
R4	23.8	20.4	20.3	-0.1	21.1	21.0	-0.1
R5	23.4	20.0	19.7	-0.2	20.5	20.3	-0.2
R6	27.0	21.6	21.4	-0.2	22.2	22.0	-0.2
R7	24.3	19.6	19.7	0.1	20.0	20.1	0.1
R8	23.9	20.0	20.0	0.0	20.4	20.4	0.0
R9	22.2	19.2	19.1	-0.1	19.4	19.4	-0.1
R10	24.1	19.2	19.7	0.5	19.7	20.2	0.5
R11	25.1	20.0	20.5	0.6	20.4	21.0	0.6
R12	27.7	21.7	22.3	0.6	22.2	22.8	0.6
R13	22.1	18.6	18.7	0.1	18.6	18.7	0.1
R14	20.7	17.3	17.3	0.0	17.2	17.2	0.0
R15	20.5	17.3	17.3	0.0	17.2	17.2	0.0
R16	20.3	16.7	16.9	0.2	16.7	16.9	0.2
R17	24.2	19.5	19.5	0.0	19.8	19.7	0.0
R18	33.7	29.0	27.6	-1.4	30.7	29.2	-1.5
R19	36.7	31.3	31.3	0.0	32.8	32.8	0.0
R20	33.6	28.8	28.8	0.0	29.9	29.9	0.0
R21	32.0	27.1	27.1	0.0	28.5	28.5	0.0
R22	31.7	26.9	26.9	0.0	28.2	28.2	0.0
R23	42.9	36.1	36.1	0.0	38.1	38.1	0.0
R24	41.6	35.2	35.2	0.0	36.9	36.9	0.0
R25	40.3	34.1	34.1	0.0	35.6	35.6	0.0
R26	40.0	33.7	33.7	0.0	35.3	35.3	0.0
R27	45.7	37.8	37.8	0.0	40.2	40.1	0.0
R28	44.1	36.6	36.5	0.0	38.7	38.7	0.0
R29	45.9	37.9	37.9	0.0	40.3	40.3	0.0
R30	47.3	39.0	39.0	0.0	41.5	41.5	0.0
ST1	42.9	35.7	34.8	-0.9	38.5	37.5	-0.9
ST2	42.5	35.5	34.9	-0.6	38.3	37.6	-0.6

ST3	37.7	32.0	32.0	0.0	33.3	33.3	0.0
F1	18.5	19.8	16.3	-3.5	19.7	16.2	-3.5
F2	21.5	19.7	18.3	-1.4	19.8	18.5	-1.4
F3	25.1	20.2	20.6	0.4	20.7	21.1	0.4
F4	23.0	18.0	18.4	0.4	18.2	18.6	0.4
F5	22.6	20.1	18.7	-1.4	20.3	18.8	-1.4
F6	24.8	20.5	19.8	-0.7	20.8	20.1	-0.7
F7	25.4	20.8	20.3	-0.6	21.2	20.6	-0.6
F8	18.2	19.2	16.0	-3.2	19.0	15.8	-3.2

[A] Adjusted refers to the 'gap analysis' assessment.
[B] Change calculation based on unrounded values and presented to one decimal place.

Receptor ID	Unadjusted 2032 DM	Unadjusted 2032 DS	Unadjusted 2032 Change[C]	Adjusted[A] 2032 DM	Adjusted[A] 2032 DS	Adjusted* 2032 Change[C]
R1	18.1	17.7	-0.4	22.4	21.9	-0.5
R2	17.6	17.4	-0.3	21.5	21.2	-0.3
R3	17.3	17.2	-0.1	20.8	20.7	-0.1
R4	14.9	14.9	0.0	16.4	16.3	0.0
R5	14.9	14.7	-0.2	16.1	15.9	-0.2
R6	16.1	15.7	-0.4	18.4	18.0	-0.5
R7	14.8	14.9	0.0	16.2	16.3	0.0
R8	14.7	15.1	0.4	16.0	16.4	0.4
R9	14.3	14.8	0.5	15.0	15.5	0.5
R10	14.8	14.9	0.2	16.2	16.4	0.2
R11	15.6	15.7	0.1	16.8	17.0	0.2
R12	16.3	16.5	0.2	18.3	18.6	0.3
R13	14.6	14.8	0.2	14.8	15.0	0.2
R14	14.1	14.2	0.1	13.8	14.0	0.1
R15	14.0	14.2	0.1	13.7	13.9	0.1
R16	13.6	13.7	0.1	13.5	13.6	0.1
R17	14.9	15.0	0.1	16.1	16.2	0.1
R18	18.7	18.1	-0.6	23.5	22.8	-0.8
R19	21.5	21.5	0.0	25.0	25.1	0.0
R20	20.3	20.3	0.0	22.8	22.8	0.0
R21	18.7	18.6	0.0	21.8	21.8	0.0
R22	18.5	18.5	0.0	21.6	21.5	0.0
R23	24.1	24.1	0.0	29.2	29.2	0.0
R24	23.7	23.6	-0.1	28.3	28.2	-0.1
R25	23.0	23.0	-0.1	27.3	27.2	-0.1
R26	22.8	22.7	-0.1	27.1	26.9	-0.1

R27	24.4	24.1	-0.3	31.0	30.7	-0.4
R28	23.9	23.6	-0.3	29.9	29.5	-0.3
R29	24.4	24.1	-0.3	31.2	30.8	-0.4
R30	24.9	24.6	-0.3	32.2	31.7	-0.4
ST1	22.0	21.6	-0.5	29.9	29.3	-0.6
ST2	21.9	21.6	-0.3	29.6	29.3	-0.4
ST3	22.0	21.9	-0.1	25.5	25.4	-0.1
F1	13.4	14.6	1.2	12.9	14.1	1.2
F2	14.1	14.9	0.8	14.6	15.4	0.8
F3	15.1	15.4	0.3	16.8	17.1	0.3
F4	14.5	14.6	0.2	15.2	15.4	0.2
F5	14.5	14.9	0.4	15.1	15.6	0.4
F6	15.2	15.6	0.3	16.6	17.0	0.4
F7	15.4	15.7	0.2	17.0	17.3	0.3
F8	13.5	14.3	0.7	12.7	13.4	0.7
CR1[B]	23.7	23.6	-0.1	28.9	28.7	-0.1
CR2[B]	24.0	23.9	-0.1	29.5	29.4	-0.1

[A] Adjusted refers to the ‘gap analysis’ assessment.
[B] CR1 and CR2 included for consideration of Compliance Risk Assessment only.
[C] Change calculation based on unrounded values and presented to one decimal place.

RESULTS FOR LOCAL AIR QUALITY ASSESSMENT – ANNUAL MEAN PM_{10} CONCENTRATIONS (μGM^3)

RECEPTOR ID	2014 BASELINE	2017 DM	2017 DS	2017 CHANGE[A]	2032 DM	2032 DS	2032 CHANGE[A]
R1	18.9	18.2	18.2	0.0	17.7	17.7	0.1
R2	18.7	18.1	18.1	0.0	17.6	17.7	0.1
R3	18.6	18.0	18.0	0.0	17.5	17.6	0.1
R4	15.4	14.8	14.9	0.1	14.4	14.5	0.1
R5	15.5	14.8	14.8	0.0	14.4	14.5	0.1
R6	16.2	15.2	15.3	0.1	14.8	15.0	0.2
R7	15.8	15.0	15.0	0.0	14.6	14.7	0.2
R8	15.6	15.0	15.0	0.0	14.6	14.7	0.1
R9	15.4	14.9	14.9	0.0	14.5	14.6	0.1
R10	15.9	15.0	15.2	0.1	14.8	14.9	0.1
R11	16.6	15.7	15.8	0.1	15.5	15.6	0.1
R12	16.7	15.8	15.9	0.1	15.5	15.6	0.1
R13	15.9	15.3	15.3	0.0	15.0	15.0	0.0
R14	15.6	15.1	15.1	0.0	14.8	14.8	0.0
R15	15.6	15.1	15.1	0.0	14.8	14.8	0.0
R16	15.1	14.4	14.5	0.0	14.1	14.2	0.0
R17	15.5	14.8	14.8	0.0	14.5	14.5	0.0
R18	19.1	18.3	18.3	0.0	17.8	17.9	0.1
R19	19.0	18.2	18.2	0.0	17.7	17.7	0.0
R20	18.7	17.9	17.9	0.0	17.4	17.4	0.0
R21	17.3	16.7	16.7	0.0	16.2	16.2	0.0
R22	17.3	16.6	16.6	0.0	16.1	16.1	0.0
R23	19.8	18.9	18.9	0.0	18.4	18.4	0.0
R24	19.7	18.9	18.9	0.0	18.3	18.3	0.0
R25	19.6	18.8	18.8	0.0	18.3	18.3	0.0
R26	19.8	19.0	19.0	0.0	18.5	18.5	0.0
R27	21.3	20.4	20.4	0.0	19.9	19.8	-0.1
R28	20.9	20.1	20.1	0.0	19.6	19.5	-0.1
R29	21.3	20.4	20.4	0.0	20.0	19.9	-0.1
R30	21.7	20.7	20.7	0.0	20.3	20.1	-0.1
ST1	20.0	19.1	19.1	0.0	18.5	18.6	0.1
ST2	20.0	19.1	19.1	0.0	18.5	18.5	0.0
ST3	19.6	18.8	18.8	0.0	18.3	18.3	0.0

F1	14.8	14.8	14.3	-0.5	14.1	14.5	0.4
F2	15.3	14.9	14.7	-0.2	14.4	14.6	0.2
F3	15.8	15.0	15.1	0.1	14.8	14.9	0.1
F4	15.5	14.7	14.8	0.1	14.4	14.5	0.1
F5	15.3	14.9	14.7	-0.2	14.4	14.5	0.1
F6	15.6	14.9	14.8	-0.1	14.6	14.7	0.1
F7	15.7	15.0	14.9	-0.1	14.6	14.7	0.1
F8	14.8	14.7	14.3	-0.4	14.1	14.3	0.2
[A] Change calculation based on unrounded values and presented to one decimal place.							

RESULTS FOR LOCAL AIR QUALITY ASSESSMENT – DAILY MEAN PM_{10} (DAYS WITH PM_{10} OVER 50 μGM^3)

Receptor ID	2014 Baseline	2017 DM	2017 DS	2017 Change[A]	2032 DM	2032 DS	2032 Change[A]
R1	2	2	2	0	1	1	0
R2	2	1	1	0	1	1	0
R3	2	1	1	0	1	1	0
R4	0	0	0	0	0	0	0
R5	0	0	0	0	0	0	0
R6	0	0	0	0	0	0	0
R7	0	0	0	0	0	0	0
R8	0	0	0	0	0	0	0
R9	0	0	0	0	0	0	0
R10	0	0	0	0	0	0	0
R11	1	0	0	0	0	0	0
R12	1	0	0	0	0	0	0
R13	0	0	0	0	0	0	0
R14	0	0	0	0	0	0	0
R15	0	0	0	0	0	0	0
R16	0	0	0	0	0	0	0

R17	0	0	0	0	0	0	0
R18	2	2	2	0	1	1	0
R19	2	2	2	0	1	1	0
R20	2	1	1	0	1	1	0
R21	1	1	1	0	0	0	0
R22	1	1	1	0	0	0	0
R23	3	2	2	0	2	2	0
R24	3	2	2	0	2	2	0
R25	3	2	2	0	2	2	0
R26	3	2	2	0	2	2	0
R27	5	4	4	0	3	3	0
R28	5	3	3	0	3	3	0
R29	5	4	4	0	3	3	0
R30	6	4	4	0	4	4	0
ST1	3	2	2	0	2	2	0
ST2	3	2	2	0	2	2	0
ST3	3	2	2	0	2	2	0
F1	0	0	0	0	0	0	0
F2	0	0	0	0	0	0	0
F3	0	0	0	0	0	0	0
F4	0	0	0	0	0	0	0
F5	0	0	0	0	0	0	0
F6	0	0	0	0	0	0	0
F7	0	0	0	0	0	0	0
F8	0	0	0	0	0	0	0

[A] Change based on unrounded values

RESULTS FOR LOCAL AIR QUALITY ASSESSMENT – ANNUAL MEAN $PM_{2.5}$ CONCENTRATIONS (μGM^3)

Receptor ID	2014 Baseline	2017 DM	2017 DS	2017 Change[A]	2032 DM	2032 DS	2032 Change[A]
R1	12.1	11.5	11.5	0.0	10.9	11.0	0.0
R2	12.1	11.4	11.4	0.0	10.9	10.9	0.0
R3	12.0	11.4	11.4	0.0	10.8	10.9	0.1
R4	10.5	10.0	10.0	0.0	9.5	9.6	0.1
R5	10.5	10.0	10.0	0.0	9.5	9.6	0.1
R6	11.0	10.2	10.2	0.0	9.8	9.9	0.1
R7	10.7	10.1	10.1	0.0	9.6	9.7	0.1

R8	10.6	10.1	10.1	0.0	9.6	9.7	0.1
R9	10.5	10.0	10.0	0.0	9.6	9.6	0.1
R10	10.8	10.1	10.2	0.1	9.7	9.8	0.0
R11	11.1	10.4	10.5	0.1	10.1	10.1	0.0
R12	11.2	10.5	10.5	0.1	10.1	10.1	0.0
R13	10.7	10.2	10.2	0.0	9.8	9.8	0.0
R14	10.5	10.1	10.1	0.0	9.7	9.7	0.0
R15	10.5	10.1	10.1	0.0	9.7	9.7	0.0
R16	10.3	9.7	9.8	0.0	9.4	9.4	0.0
R17	10.5	10.0	10.0	0.0	9.5	9.6	0.0
R18	12.3	11.6	11.6	0.0	11.0	11.0	0.0
R19	12.6	11.9	11.9	0.0	11.3	11.3	0.0
R20	12.4	11.7	11.7	0.0	11.1	11.1	0.0
R21	11.6	11.0	11.0	0.0	10.4	10.4	0.0
R22	11.6	11.0	11.0	0.0	10.4	10.4	0.0
R23	13.2	12.4	12.4	0.0	11.7	11.7	0.0
R24	13.1	12.3	12.3	0.0	11.7	11.7	0.0
R25	13.0	12.3	12.3	0.0	11.7	11.6	0.0
R26	13.1	12.4	12.4	0.0	11.7	11.7	0.0
R27	14.0	13.1	13.1	0.0	12.5	12.4	0.0
R28	13.8	12.9	12.9	0.0	12.3	12.3	0.0
R29	14.0	13.2	13.2	0.0	12.5	12.4	0.0
R30	14.2	13.3	13.3	0.0	12.6	12.6	-0.1
ST1	13.0	12.1	12.1	0.0	11.4	11.5	0.0
ST2	13.0	12.1	12.1	0.0	11.4	11.4	0.0
ST3	12.9	12.2	12.2	0.0	11.6	11.6	0.0
F1	10.1	10.0	9.7	-0.3	9.4	9.6	0.2
F2	10.4	10.0	9.9	-0.1	9.5	9.7	0.1
F3	10.8	10.1	10.2	0.1	9.7	9.8	0.1
F4	10.5	9.9	9.9	0.0	9.5	9.6	0.0
F5	10.4	10.0	9.9	-0.1	9.5	9.6	0.1
F6	10.6	10.0	10.0	-0.1	9.6	9.7	0.1
F7	10.7	10.1	10.0	0.0	9.6	9.7	0.0
F8	10.1	9.9	9.6	-0.3	9.3	9.5	0.1

[A] Change calculation based on unrounded values and presented to one decimal place.