AIR QUALITY ASSESSMENT

FOR

WELWYN MSCP

AT

WELWYN GARDEN CITY CAMPUS WEST

AQ109255

OCTOBER 2020

Prepared For
Welwyn Hatfield Borough Council
Council Offices
Campus East
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EXECUTIVE SUMMARY

Ensafe Group were commissioned by Welwyn Hatfield Borough Council to undertake an Air Quality Assessment in support of a proposed Multi Storey Car Park development at Welwyn Garden City Campus West.

The proposed development .comprises the redevelopment of an existing surface car park to form a new three floor car park providing circa 691 total car parking spaces.

Given the nature of the scheme there is potential for the proposals to cause impacts at nearby sensitive receptors during the construction and operational phases. An Air Quality Assessment is therefore required in order to determine baseline conditions and assess the potential impacts as a result of the proposed development.

Potential construction phase air quality impacts from fugitive dust emissions were assessed as a result of earthworks, construction and trackout activities. It is considered that the use of good practice control measures would provide suitable mitigation for a development of this size and nature and reduce potential impacts to an acceptable level.

Dispersion modelling was undertaken in order to predict air quality impacts as a result of road vehicle exhaust emissions associated with traffic generated by the proposed development. Results were subsequently verified using local monitoring results provided by Welwyn Hatfield Borough Council.

The assessment concluded that impacts on pollutant levels as a result of operational phase pollutant emissions were predicted to be **not significant** at all sensitive locations in the vicinity of the site, as a result of the **negligible impacts** at discrete sensitive receptor locations. The use of robust assumptions, where necessary, was considered to provide sufficient results confidence for an assessment of this nature.

Based on the assessment results, air quality issues are not considered a constraint to planning consent for the proposed development.

1.0 INTRODUCTION

1.1. Background

Ensafe Group has been commissioned by Welwyn Hatfield Borough Council (WHBC), hereafter referred to as “the Client” to undertake an Air Quality Assessment in support of a proposed development, comprising of the development of an Multi Storey Car Park (MSCP) providing circa 691 car parking spaces, herein after referred to as the “Proposed Development”.

1.2. Site Location and Content

The application site is located Welwyn Garden City Campus West at approximate National Grid Reference (NGR) 523330, 213380. Reference should be made to Figure 1 within Appendix I for a location plan.

Given the nature of the scheme there is potential for the proposals to cause impacts at nearby sensitive receptors during the construction and operational phases. Subsequently, the Proposed Development has the potential to cause impacts at sensitive receptor locations as a result of fugitive dust emissions during the construction phase and additional road vehicle exhaust emissions generated during the operational phase.

An Air Quality Assessment has therefore been requested to quantify annual mean NO_2 and PM concentrations at nearby sensitive receptors, to consider suitability for the proposed end-use, and to assess potential impacts as a result of the development. This is detailed in the following report.

1.3. Limitations

This report has been produced in accordance with Ensafe Group's standard terms of engagement. Ensafe Group has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Ensafe Group; a charge may be levied against such approval.

2.0 LEGISLATION, GUIDANCE AND POLICY

The following legislation, guidance and policy will be considered and adhered to during the preparation of the Air Quality Assessment:

- European Union (EU) Directive 2008/50/EC;
- The National Planning Policy Framework (NPPF), updated on 19th February 2019);
- The National Planning Practice Guidance (NPPG), relevant chapters produced on 1th November 2019;
- Section 82 of the Environment Act (1995) (Part IV);
- The Air Quality Standards (Amendment) Regulations (2016)[1];
- Local Air Quality Management Technical Guidance 2016 LAQM.TG (16), DEFRA, 2016[2];
- Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management (IAQM), v1.1, June 2016[3]; and
- Land-Use Planning and Development Control: Planning for Air Quality, Environmental Protection UK and IAQM, January 2017[4].

2.1. UK Legislation

The Air Quality Standards (Amendment) Regulations (2016) came into force on 31st December 2016. These Regulations amend the Air Quality Standards Regulations 2010 and transpose the EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for 7 pollutants, as well as Target Values for an additional 6 pollutants.

Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007. The AQS sets out AQOs that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

Table 1 presents the AQOs for pollutants considered within this assessment.

Table 1: Air Quality Objectives

Pollutant	Air Quality Objectives	
	Concentration ($\mu g/m^3$)	Averaging Periods
NO_2	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year
PM_{10}	40	Annual mean
	50	24-hour mean; not to be exceeded more than 35 times a year
$PM_{2.5}$	25	Annual Mean

Table 2 summarises the advice provided in DEFRA guidance LAQM (TG16)[2] on where the AQOs for pollutants considered within this report apply.

1 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007
2 Local Air Quality Management Technical Guidance 2016 LAQM (TG16), DEFRA, February 2018.
3 Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management, 2016.
4 Land-Use Planning and Development Control: Planning for Air Quality, EPUK and IAQM, January 2017.

Table 2: Examples of Where the Air Quality Objectives Apply

Averaging Periods	Objectives Should Apply At	Objectives Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
1-hour mean	All locations where the annual mean and 24-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

2.2. Local Planning Policy

2.2.1. Welwyn Hatfield Council District Plan

Welwyn Hatfield Borough Council (WHBC) adopted the District Plan[5] in 2005, which provides a series of key policies that guide the scale, location and type of development in the area until 2011. Upon request by the Secretary of State, a number of these policies have been saved until the Welwyn Hatfield District Plan is replaced by the new Welwyn Hatfield Local Plan. As such, the saved policies contained within the Welwyn Hatfield District Plan provide the current basis for the determination of planning applications within Welwyn Hatfield's area of administration.

A review of the Welwyn Hatfield District Plan indicated the following policy in relation to air quality that is relevant to this assessment:

- Policy R18 – Air Quality

Additionally, the Welwyn Hatfield Local Plan[6] was submitted to the Secretary of State for examination in public on 15 May 2017 and sets out detailed policies which will be used to determine planning applications for development within the borough until 2032.

A review of the Welwyn Hatfield District Local Plan indicated the following policy in relation to air quality that is relevant to this assessment:

[5] Welwyn Hatfield District Plan, Adopted 2005
[6] Welwyn Hatfield Draft Local Plan Proposed Submission Document 2016

- Policy SADM 18 – Environmental Pollution

  These policy has been considered throughout this report by assessing potential air quality impacts as a result of the proposed development

3.0 METHODOLOGY

There is the potential for air quality impacts as a result of the construction and operation of the proposed development at nearby sensitive receptors. These have been assessed in accordance with the following methodology.

3.1. Construction Phase Assessment

There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the IAQM document 'Guidance on the Assessment of Dust from Demolition and Construction'[3].

Activities on the proposed construction site have been divided into three types to reflect their different potential impacts. These are:

- Earthworks
- Construction
- Trackout

The potential for dust emissions was assessed for each activity that is likely to take place and considered three separate dust effects:

- Annoyance due to dust soiling
- Harm to ecological receptors
- The risk of health effects due to a significant increase in exposure to PM_{10} and $PM_{2.5}$

The assessment steps are detailed below.

3.1.1. Step 1

Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the site boundary or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should proceed to Step 2. Additionally, should ecological receptors be identified within 50m of the boundary site or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should also proceed to Step 2.

Should sensitive receptors not be present within the relevant distances then **negligible** impacts would be expected and further assessment is not necessary.

3.1.2. Step 2

Step 2 assesses the risk of potential dust impacts. A site is allocated to a risk category based on two factors:

- The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (Step 2A); and
- The sensitivity of the area to dust impacts, which can be defined as low, medium or high sensitivity (Step 2B).
- The two factors are combined in Step 2C to determine the risk of dust impacts without the application of best practice mitigation measures.

3.1.3. Step 3

Step 3 requires the identification of site-specific mitigation measures within the IAQM guidance[3] to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For sites with **negligible** risk, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

3.1.4. Step 4

Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be **'not significant'**.

The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts. The IAQM guidance[3] suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix IV.

3.2. Operational Phase Assessment

It should be noted that the Proposed Development site does not include any relevant exposure to long term pollutant concentrations, such as residential units, and as such on-site exposure to the annual mean NO_2 and PM concentrations does not apply. Subsequently, this has not been considered in further detail during the preparation of the assessment.

The development does however have potential to impact on existing air quality as a result of road traffic exhaust emissions, such as NO_2 and PM associated with vehicles travelling to and from the site. impacts have been defined by predicting pollutant concentrations at existing sensitive locations using dispersion modelling for the following scenarios:

- 2019 as baseline year for verification against latest ratified data;
- Opening year do-something (DM) (predicted traffic flows in 2021 should the proposals not proceed)
- Opening year do-something (DS) (predicted traffic flows in 2021 should the proposals be completed with the addition of traffic generated by the proposed development and emissions associated with the proposed MSCP)

It should be noted that air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors for 2019 were utilised within the dispersion model. The use of 2021 traffic data and 2021 emission factors is considered to provide a worst-case scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations.

Full details of data used for the modelling assessment are presented in Appendix II of this report.

Receptors potentially sensitive to changes in pollutant concentrations were identified within the assessment extents. LAQM (TG16)[2] provides the following examples of where annual mean AQOs should apply:

- Residential properties;
- Schools;
- Hospitals; and
- Care homes.

The sensitivity impact significance of each receptor was defined in accordance with the criteria shown in Table 3. These are based upon the guidance provided within the EPUK and IAQM guidance[4].

Table 3: Predicted Background Pollutant Concentrations

Long Term Average Concentration	% Change in Concentration Relative to AQO			
	1	2-5	6-10	>10
75% or less of AQO	Negligible	Negligible	Slight	Moderate
76 - 94% of AQO	Negligible	Slight	Moderate	Moderate
95 - 102% of AQO	Slight	Moderate	Moderate	Substantial
103 - 109% of AQO	Moderate	Moderate	Substantial	Substantial

The criteria shown in Table 3 is adapted from the EPUK and IAQM guidance[4] with sensitivity descriptors included to allow comparisons of various air quality impacts. It should be noted that changes of 0%, i.e. less than 0.5%, will be described as negligible in accordance with the EPUK and IAQM guidance.

Following the prediction of impacts at discrete receptor locations utilising the criteria in Table 3 the EPUK and IAQM guidance[4] states that this framework is to be used as a starting point to make a judgement on significance of effect but other influences might need to be accounted for. Whilst impacts might be determined as 'slight', 'moderate' or 'substantial' at individual receptors, overall effect might not necessarily be deemed as significant in some circumstances. The following factors may provide some assistance in determining the overall significance of a development:

- Number of properties affected by significant air quality impacts and a judgement on the overall balance;
- Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective will be relevant;
- The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors;
- Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease; and
- The extent to which an objective is exceeded e.g. an annual mean NO_2 concentration of 41µg/m^3 should attract less significance than an annual mean of 51µg/m^3.

These factors were considered and an overall significance determined for the impact of operational phase road traffic emissions. It should be noted that the determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

Reference should be made to Appendix II for full modelling assessment input details, including car park emission modelling parameters.

4.0 BASELINE

Existing air quality conditions in the vicinity of the application site were identified in order to provide a baseline for assessment. These are detailed in the following sections.

4.1. Local Air Quality Management

As required by the Environment Act (1995), WHBC has undertaken Review and Assessment of air quality within their area of administration. This process concluded that concentrations of pollutants considered within the AQS are currently below the relevant AQOs and as such no Air Quality Management Areas (AQMAs) have been designated within WHBC.

4.2. Air Quality Monitoring

Monitoring of pollutant concentrations is undertaken by WHBC using continuous and passive methods throughout their areas of administration. A review of WHBC most recent Air Quality Status Report (ASR)[7] indicated that the closest continuous monitor to the proposed development is the Great North Rd/A1000 analyser, sited at the NGR: 523292, 209172; approximately 4.2km north east of the proposed development. Due to the distance between the development and monitoring site, similar pollutant concentrations would not be anticipated, and this source of data has not been considered further within this report.

WHBC monitor NO_2 concentrations across the borough using passive diffusion tubes throughout their area of administration. A review of the 2019 ASR[7] indicated 4 diffusion tubes located within the vicinity of the application site. Monitoring results from recent years are summarised in, presented in Table 4.

Table 4: Diffusion Tube Monitoring Results

ID	Site Name	Type	NGR (m)		Distance to Site (m)	Annual Mean Concentration (μg/m³)	
			X	Y		2018	2019
WH11	Digswell Road, WGC	Roadside	523765	213540	292	28	29
WH2	Wigmores North, WGC	Urban Background	523804	213092	387	-	22
WH28	Taxi Rank, WGC	Roadside	523815	212960	495	25	-
WH18	B195/Broadwater Road, WGC	Roadside	524285	212988	844	35	31

As indicated in Table 4, there were no exceedances of annual mean AQO for NO_2 at these diffusion tube locations in recent years. Reference should be made to Figure 2 within Appendix I for a graphical representation of the passive monitoring locations.

4.3. Background Pollutant Concentrations

The total concentration of a pollutant is comprised of explicit local emission sources (such as roads and industrial sources) and the background component. The background component consists of indeterminate sources which are transported into an area from further away by meteorological conditions. Background pollutant concentrations are therefore the ambient level of pollution that is not affected by local sources of pollution.

In reality, it is not usually practical to obtain a true representation of background levels in urban areas due to corruption by local sources; background levels used in assessments may contain a mixture of both sources.

[7] 2019 Air Quality Annual Status Report (ASR) for Welwyn Hatfield Borough Council, 2020

Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The Proposed Development site is located across grid square:

- NGR: 523500, 213500

Data for this location was downloaded from the DEFRA website[8]. For the purpose of this assessment, background concentrations are summarised in Table 5 for the verification year (2019) and the predicted development opening year (2021).

Table 5: Predicted Background Pollutant Concentrations

Pollutant	Predicated Background Concentration (µg/m³)	
	2019	2021
NO	19.40	17.60
NO_2	14.27	13.07
PM_{10}	14.48	14.00
$PM_{2.5}$	9.83	9.45

As shown in Table 5 background pollutant concentrations do not exceed the relevant AQOs. Comparison with the monitoring results indicates the impact that vehicle exhaust emissions from the highway network have on pollutant concentrations at roadside locations, specifically adjacent to arterial traffic routes.

4.4. Sensitive Receptors

A sensitive receptor is defined as any location where AQOs may apply, as indicated in Table 2, as well as being susceptible to changes in local pollutant concentrations. Receptors have been defined for both construction and operational phase scenarios.

4.4.1. Construction Phase Sensitive Receptors

There are no nationally or European designated ecological receptors within 50m of the Site boundary, or within 50m from a route used by construction vehicles on the public highway (up to 500m from the Site entrance). Therefore, the risk of dust effects at a nationally or European designated ecological receptor site from construction impacts is not considered further in this assessment.

Human receptors sensitive to potential dust impacts during, earthworks and construction were identified from a desk-top study of the area up to 350m from the Proposed Development boundary. These are summarised in Table 6.

Table 6: Demoliton, Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors
Less than 20	10 - 100
20 – 50	More than 100
50 – 100	More than 100
100 – 350	More than 100

8 http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html.

Reference should be made to Figure 3 within Appendix I for a graphical representation of earthworks and construction dust buffer zones.

Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 500m of the site access route. These are summarised in Table 7. The exact construction vehicle access routes were not available for the purpose of this assessment as they will depend on sourcing of materials. This is likely to be decided by the contractor. However, it was assumed that construction traffic would access the Proposed Development via The Campus, to ensure a worst case trackout assessment is undertaken.

Table 7: Trackout Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors
Less than 20	More than 100
20 – 50	More than 100

Reference should be made to Figure 4 within Appendix I for a graphical representation of trackout dust buffer zones.

A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 8.

Table 8: Additional Area Sensitivity Factors

Guidance	Comment
Whether there is any history of dust generating activities in the area	The site is located in a predominantly commerical location. There is likely to have been a history of dust generating activities due to regeneration in the locality
The likelihood of concurrent dust generating activity on nearby sites.	A review of the WHBC Planning Portal indicated that there are several large-scale planning applications within 500m of the proposed development. There is therefore potential for concurrent dust generation
Pre-existing screening between the source and the receptors	There is some dense vegetation present along the northern and southern boundary of the site. As such natural protective screening is limited and is dependent on the amount of vegetation retained during construction.
Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place	The wind direction is predominantly from the south west of the development, as shown in Figure 5 within Appendix I. As such, properties to the north east of the site would be most affected by dust emissions
Conclusions drawn from local topography	The topography of the area appears to be predominantly flat. As such, there are no constraints to dust dispersion
Duration of the potential impact, as a receptor may become more sensitive over time	Currently the duration of the construction phase is unknown but considering the 2021 opening year it is likely to extend over at least a year.

Guidance	Comment
Any known specific receptor sensitivities which go beyond the classifications given in the document.	No specific receptor sensitivities identified during the baseline

4.4.2. Operational Phase Sensitive Receptors

A desk-top study was undertaken in order to identify any sensitive receptor locations in the vicinity of the site that require specific consideration during the assessment and are summarised Table 9.

Table 9: Existing Sensitive Human Receptors

Potential Impact		NGR (m)		Height (m)
		X	Y	
R1	Woodside House	523483.0	213372.0	1.5
R2	Woodside House	523483.0	213372.0	4.5
R3	Woodside House	523500.1	213327.2	1.5
R4	Woodside House	523500.1	213327.2	4.5
R5	Library	523567.0	213398.3	1.5
R6	Library	523567.0	213398.3	4.5
R7	Oaklands College	523737.6	213370.6	1.5
R8	27 Bridge Road	523531.7	213265.6	1.5

The sensitive receptors identified in Table 9 represent worst-case locations. However, this is not an exhaustive list and there may be other locations within the vicinity of the site that may experience air quality impacts as a result of the proposed development that have not been individually identified above. Reference should be made to Figure 6 within Appendix I for a graphical representation of operational phase emission sensitive human receptor locations.

5.0 ASSESSMENT

There is the potential for air quality impacts as a result of the construction and operation of the Proposed Development at nearby sensitive receptors. These are assessed in the following Sections.

5.1. Construction Phase Assessment

5.1.1. Step 1

The undertaking of activities such as excavation, ground works, cutting, construction, concrete batching and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements both on-site and on the local road network also have the potential to result in the re-suspension of dust from haul road and highway surfaces.

The desk-study detailed in Section 4.4.1 identified a number of highly sensitive receptors within 350m of the site boundary, and within 50m of the anticipated trackout routes. As such, a detailed assessment of potential dust impacts was required, and summarised in the below sections.

Reference should be made to Appendix III for details of the relevant IAQM construction phase assessment criteria, which were utilised in conjunction with site specific information.

5.1.2. Step 2A – Magnitude

The scale and nature of the works was determined to assess the magnitude of dust arising from each construction phase activity. The determination of magnitude was based upon the criteria detailed in Appendix III, with the outcome of Step 2A is summarised below in Table 10.

Earthworks

The Proposed Development site is estimated to cover an area of approximately 7,200m^2. The magnitude of potential dust emissions related to earthwork activities is therefore considered ***medium***.

Construction

Given the modular nature of the construction process, as well as the offsite preparation, it is not anticipated that significant impacts will arise during construction activities. The magnitude of potential dust emissions related to construction activities is therefore considered ***small.***

Trackout

Information on the number of HDV trips to be generated during the construction phase of the Proposed Development was not available at the time of assessment. Similarly, the surface material and unpaved road length was not known at this stage of the project. Based on the site area, it is anticipated that the unpaved road length is likely to be between 50m and 100m. The magnitude of potential dust emissions from trackout is therefore considered ***medium.***

Table 10: Dust Emission Magnitude

Magnitude of Activities		
Earthworks	**Construction**	**Trackout**
Medium	Small	Medium

5.1.3. Step 2B – Sensitivity

The next step (Step 2B) is to determine the sensitivity of the surrounding area, based on general principles such as amenity and aesthetics, as well as human exposure sensitivity.

Dust Soiling

As shown in Section 4.4.1 and Table 7, the desk top study indicated are approximately ***10 - 100*** sensitive receptors within 20m of the Proposed Development boundary and ***More than 100*** within 20m of the anticipated trackout routes.

Based on the assessment criteria detailed in Appendix III, the sensitivity of the receiving environment to potential dust soiling impacts was considered to be high for all construction phase activities. This is because the site is situated in a predominantly residential area and the people or property would reasonably be expected to be present here for extended periods of time.

Human Health

The annual mean concentration of PM_{10} is less than 24µg/m^3 as detailed in Section 4. Based on the receptor counts detailed above the area is considered to be of ***low*** sensitivity for earthworks and construction phase activities and ***medium*** for trackout activities.

The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria detailed in Appendix III is summarised in Table 11.

Table 11: Sensitivity of the Surrounding Area

Potential Impact	Sensitivity of the Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling	High	High	High
Human Health	Low	Low	Medium

5.1.4. Step 2C – Risk

Both the magnitude and sensitivity factors are combined in Step 2C to determine the risk of dust impacts without the application of best practice mitigation measures.

It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk was predicted based on a worst-case scenario of works being undertaken at the site boundary closest to each sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase. A summary of the risk from each dust generating activity is provided in Table 12.

Table 12: Summary of Potential Unmitigated Dust Risks

Potential Impact	Risk		
	Earthworks	Construction	Trackout
Dust Soiling	Medium	Low	Medium
Human Health	Low	Negligible	Low

5.1.5. Step 3 – Mitigation

The IAQM guidance[3] provides a number of potential mitigation measures to reduce impacts during the construction phase. These measures have been adapted for the Proposed Development site as summarised in Table 13. The mitigation measures outlined in Table 13 can be reviewed prior to the commencement of construction works incorporated into the existing strategies as applicable.

Table 13: Fugitive Dust Mitigation Measures

Issue	Control Measure
Communications	• Display the name and contact details of person(s) account- able for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager. • Develop and implement a stakeholder communications plan that includes community engagement before work commences on site. • Display the head or regional office contact information. • Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority.
Site Management	• Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken. • Make the complaints log available to the local authority when asked. • Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book.
Monitoring	• Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary. • Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority. • Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Issue	Control Measure
Preparing & Maintaining Site	• Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. • Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site. • Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive time period. • Avoid site runoff of water or mud. • Keep site fencing, barriers and scaffolding clean using wet methods. • Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below. • Cover, seed or fence stockpiles to prevent wind whipping.
Operating Vehicle/Machinery & Sustainable Travel	• Ensure all vehicles switch off engines when stationary - no idling vehicles. • Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable. • Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un- surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate) • Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials • Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)
Operations	• Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems. • Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate. • Use enclosed chutes and conveyors and covered skips. • Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. • Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste Management	• Avoid bonfires and burning of waste materials.
Earthworks & Construction	• Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. • Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable • Only remove the cover in small areas during work and not all at once • Avoid scabbling (roughening of concrete surfaces) if possible • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.

Issue	Control Measure
Trackout	• Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use. • Avoid dry sweeping of large areas. • Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. • Record all inspections of haul routes and any subsequent action in a site log book. • Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned. • Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable). • Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits. • Access gates to be located at least 10 m from receptors where possible.

5.1.6. Step 4 – Residual Impacts

Assuming the relevant mitigation measures outlined in Table 13 are implemented, the residual effect from all dust generating activities is predicted to be **not significant**, in accordance with the IAQM guidance[3].

5.2. Operational Phase Assessment

5.2.1. Future Exposure

As discussed previously in 3.2, it should be noted that the proposed development does not include any relevant exposure to long term pollutant concentrations, such as residential units. As a result, considerations of annual mean NO_2 and PM concentrations is not required across the Proposed Development as in accordance with LAQM (TG16)[2] and has not been assessed further in the context of pollutant exposure.

5.2.2. Road Vehicle Exhaust Impacts

Any additional vehicle movements associated with the Proposed Development will generate exhaust emissions, such as NO_2, PM_{10} and $PM_{2.5}$ on the local and regional road networks. An assessment was therefore undertaken using dispersion modelling in order to quantify potential changes in pollutant concentrations at sensitive locations in the vicinity of the site.

Based on data from the appointed traffic consultant, it is expected that there will be 685 trips associated with the proposed development. It should be noted the proposed development will not generate any new vehicle trips on the road network, instead the operation of the Proposed Development will lead to a redistribution of the existing trips associated with the existing Campus East Car Park.

The assessment was undertaken based on the above information and in accordance with the methodology detailed in Section 3.2. Reference should be made to Appendix II for full assessment input details.

5.2.3. Nitrogen Dioxide

Predicted Concentrations at Sensitive Receptors

Annual mean NO_2 concentrations were predicted for 2021 DM and DS scenarios and are summarised in Table 14. Reference should be made to Figure 6 for a graphical representation of these locations.

Table 14: Predicted Annual Mean NO_2 Concentrations

Potential Impact		Predicted Annual Mean NO_2 Concentration (µg/m^3)		
		DM	DS	Change
R1	Woodside House	15.40	15.75	0.35
R2	Woodside House	15.40	15.75	0.35
R3	Woodside House	16.46	16.77	0.31
R4	Woodside House	16.06	16.36	0.30
R5	Library	16.38	17.29	0.91
R6	Library	16.10	17.00	0.90
R7	Oaklands College	20.66	20.76	0.10
R8	27 Bridge Road	17.23	17.36	0.13
R9	Rosanne House	17.05	17.16	0.11

As indicated in Table 14, annual mean NO_2 concentrations were below the relevant AQO at all receptor locations considered.

Predicted impacts on annual mean NO_2 concentrations are summarised in Table 15.

Table 15: Predicted NO_2 Impacts

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	Woodside House	0.87	Negligible	Well Below AQO
R2	Woodside House	0.87	Negligible	Well Below AQO
R3	Woodside House	0.77	Negligible	Well Below AQO
R4	Woodside House	0.75	Negligible	Well Below AQO
R5	Library	2.28	Negligible	Well Below AQO
R6	Library	2.25	Negligible	Well Below AQO
R7	Oaklands College	0.25	Negligible	Well Below AQO
R8	27 Bridge Road	0.32	Negligible	Well Below AQO
R9	Rosanne House	0.27	Negligible	Well Below AQO

As indicated in Table 15 impacts on annual mean NO_2 concentrations as a result of road vehicle exhaust emissions associated with the development were predicted to be negligible at all receptor locations. It is therefore considered that the overall impacts as a result of the proposed development are **not significant.** Further justifications are discussed in Section 5.2.6.

5.2.4. Particulate Matter (PM_{10})

Predicted Concentrations at Sensitive Receptors

Annual mean PM_{10} concentrations were predicted for 2021 DM and DS scenarios and are summarised Table 16.Exceedances of the AQO are shown in bold.

Table 16: Predicted Annual Mean PM_{10} Concentrations

Potential Impact		Predicted Annual Mean PM_{10} Concentration (µg/m^3)		
		DM	DS	Change
R1	Woodside House	14.66	14.71	0.05
R2	Woodside House	14.66	14.71	0.05
R3	Woodside House	14.83	14.87	0.04
R4	Woodside House	14.76	14.81	0.05
R5	Library	14.79	14.93	0.14
R6	Library	14.75	14.88	0.13
R7	Oaklands College	15.48	15.50	0.02
R8	27 Bridge Road	14.93	14.96	0.03
R9	Rosanne House	14.94	14.95	0.01

As indicated in Table 16 annual mean PM_{10} concentrations were below the relevant AQO at all receptor locations considered.

Predicted impacts on annual mean PM_{10} concentrations are summarised in Table 17.

Table 17: Predicted PM_{10} Impacts

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	Woodside House	0.13	75% or Less of the AQO	Negligible
R2	Woodside House	0.13	75% or Less of the AQO	Negligible
R3	Woodside House	0.10	75% or Less of the AQO	Negligible
R4	Woodside House	0.13	75% or Less of the AQO	Negligible
R5	Library	0.35	75% or Less of the AQO	Negligible
R6	Library	0.33	75% or Less of the AQO	Negligible
R7	Oaklands College	0.05	75% or Less of the AQO	Negligible
R8	27 Bridge Road	0.08	75% or Less of the AQO	Negligible
R9	Rosanne House	0.02	75% or Less of the AQO	Negligible

As indicated in Table 17 impacts on annual mean PM_{10} concentrations as a result of road vehicle exhaust emissions associated with the development were predicted to be negligible at all receptor locations. It is therefore considered that the overall impacts as a result of the proposed development are **not significant.** Further justifications are discussed in Section 5.2.6.

5.2.5. Particulate Matter ($PM_{2.5}$)

Predicted Concentrations at Sensitive Receptors

Annual mean $PM_{2.5}$ concentrations were predicted for 2021 DM and DS scenarios and are summarised Table 16.Exceedances of the AQO are shown in bold.

Table 18: Predicted Annual Mean $PM_{2.5}$ Concentrations

Potential Impact		Predicted Annual Mean $PM_{2.5}$ Concentration ($\mu g/m^3$)		
		DM	DS	Change
R1	Woodside House	9.93	9.96	0.03
R2	Woodside House	9.93	9.96	0.03
R3	Woodside House	10.03	10.06	0.03
R4	Woodside House	9.99	10.02	0.03
R5	Library	10.01	10.10	0.09
R6	Library	9.99	10.07	0.08
R7	Oaklands College	10.42	10.43	0.01
R8	27 Bridge Road	10.10	10.11	0.01
R9	Rosanne House	10.10	10.11	0.01

As indicated in Table 16 annual mean $PM_{2.5}$ concentrations were below the relevant AQO at all receptor locations considered.

Predicted impacts on annual mean $PM_{2.5}$ concentrations are summarised in Table 17.

Table 19: Predicted PM_{10} Impacts

Potential Impact		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	Woodside House	0.12	75% or Less of the AQO	Negligible
R2	Woodside House	0.12	75% or Less of the AQO	Negligible
R3	Woodside House	0.12	75% or Less of the AQO	Negligible
R4	Woodside House	0.12	75% or Less of the AQO	Negligible
R5	Library	0.36	75% or Less of the AQO	Negligible
R6	Library	0.32	75% or Less of the AQO	Negligible
R7	Oaklands College	0.04	75% or Less of the AQO	Negligible
R8	27 Bridge Road	0.04	75% or Less of the AQO	Negligible
R9	Rosanne House	0.04	75% or Less of the AQO	Negligible

As indicated in Table 17 impacts on annual mean $PM_{2.5}$ concentrations as a result of road vehicle exhaust emissions associated with the development were predicted to be negligible at all receptor locations. It is therefore considered that the overall impacts as a result of the proposed development are **not significant.** Further justifications are discussed in Section 5.2.6.

5.2.6. Impact Significance

The overall significance of operational phase road traffic emission impacts for 2021 was determined as not significant. This was based on the predicted impacts at discrete receptor locations and the considerations outlined in Section 5.2. Further justifications are provided in Table 20.

Table 20: Overall Road Emissions Impact Significance

Guidance	Comment
Number of properties affected by slight, moderate or substantial air quality impacts and a judgement on the overall balance	Impacts on annual mean NO_2 and PM concentrations were predicted to be **negligible** at all 9 sensitive receptors locations considered The sensitive locations represent worst-case locations and therefore it is unlikely that any other receptors would be significantly affected by the proposed development
Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant	The proposed development will not result in any new exposure to pollutant concentrations on the development site and as such no new exposure has been introduced
The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors	The change in concentration relative to the AQO was predicted to range from: • 0.25% to 2.27% for NO_2, • 0.02% to 0.35% for PM_{10}; and • 0.04% to 0.36% for $PM_{2.5.}$ Resultant impacts were subsequently predicted to be **negligible** at all receptor locations considered
Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease	There were no exceedances of the annual mean AQOs for NO_2, PM_{10} and $PM_{2.5}$ at any location within the modelling extent
The extent to which an objective is exceeded e.g. an annual mean NO_2 concentration of 41µg/m^3 should attract less significance than an annual mean of 51µg/m^3	As stated above, there were no exceedances of the annual mean AQOs for NO_2, PM_{10} and $PM_{2.5}$ at any sensitive receptor location within the modelling extent

It should also be noted that the combined use of 2021 traffic data and 2019 emission factors is considered to provide a worst-case scenario, which may lead to overestimations of actual pollutant concentrations during the operation of the proposals. As such, the overall significance of operational phase road traffic emission impacts on annual mean NO_2 and PM_{10} concentration was determined **not significant** with a high level of confidence.

6.0 CONCLUSION

Ensafe Group were commissioned by the client to undertake an Air Quality Assessment in support of a proposed MSCP development at Welwyn Garden City Campus West.

During the construction phase of the Proposed Development there is the potential for air quality impacts as a result of fugitive dust emissions from the site. These were assessed in accordance with the IAQM methodology. Assuming good practice dust control measures are implemented, the residual potential air quality impacts from dust generated by construction, earthworks and trackout activities was predicted to be **not significant** .

Dispersion modelling was undertaken in order to predict air quality impacts as a result of road vehicle exhaust emissions associated with traffic generated by the development. Results were subsequently verified using monitoring results obtained WHBC local monitoring data.

Predicted impacts on annual mean NO_2 and PM concentrations as a result of operational phase exhaust emissions were predicted to be **negligible** at all 9 sensitive receptor locations within the vicinity of the site. The overall significance of potential impacts was determined to be **not significant** in accordance with the EPUK and IAQM guidance. The use of robust assumptions, in the form of worse-case road vehicle emission factors, was considered to provide sufficient results confidence for an assessment of this nature.

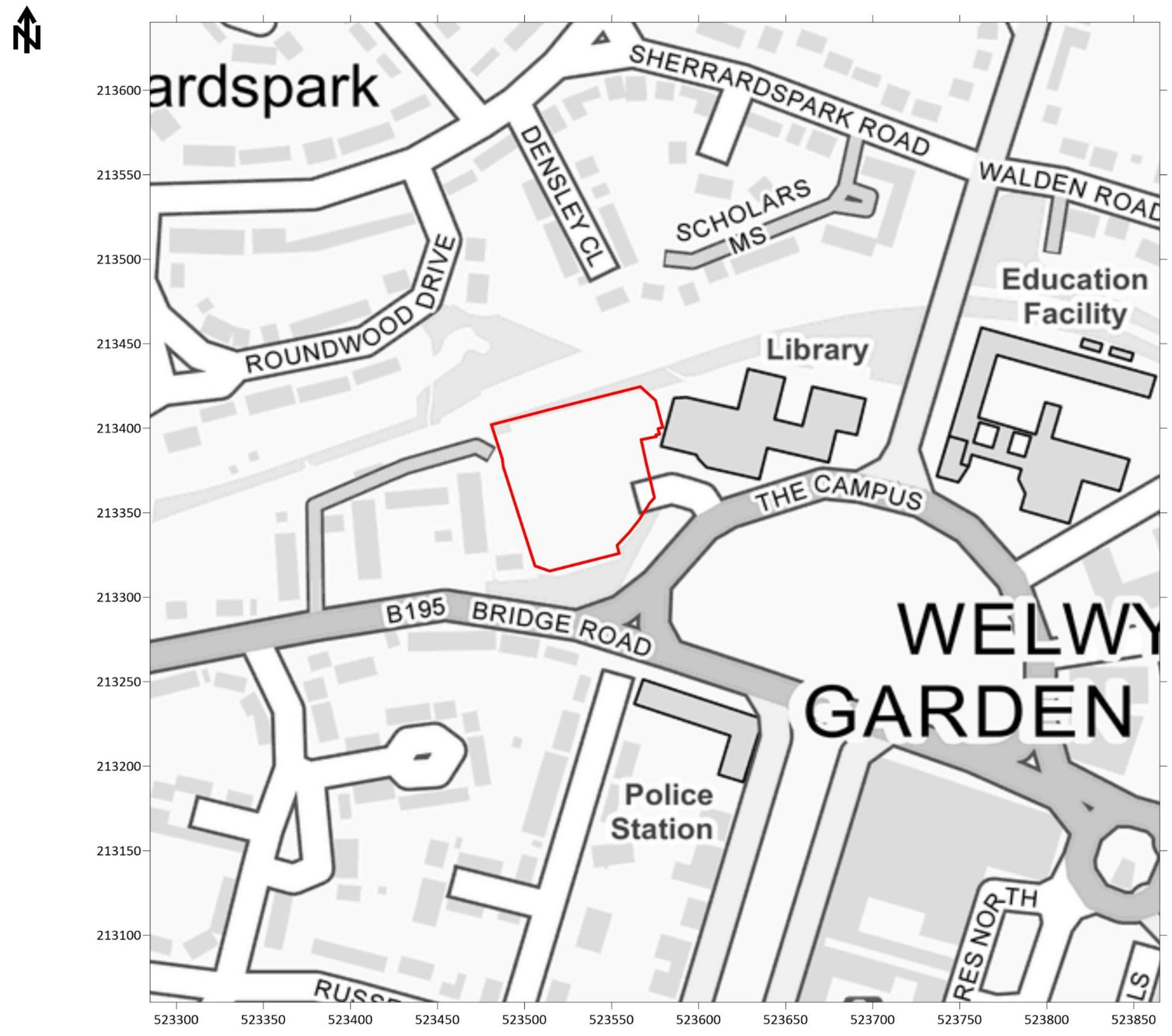
Based on the assessment results, air quality is not considered a constraint to planning consent and the Proposed Development is considered suitable for proposed end use.

7.0 ABBREVIATIONS

AADT	Annual Average Daily Traffic
ADM	Atmospheric Dispersion Modelling
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Strategy
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DS	Do Something
DMP	Dust Management Plan
EPUK	Environmental Protection UK
EU	European Union
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LA	Local Authority
LDV	Light Duty Vehicle
MSCP	Multi Storey Car Park
NGR	National Grid Reference
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5µm
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10µm
TEMPRO	Trip End Model Presentation Program
WHBC	Welwyn Hatfield Borough Council
z_0	Roughness Length

END OF REPORT

APPENDIX I - FIGURES



Legend

Site Boundary

Title

Figure 1

Site Location

Project

Welwyn MSCP

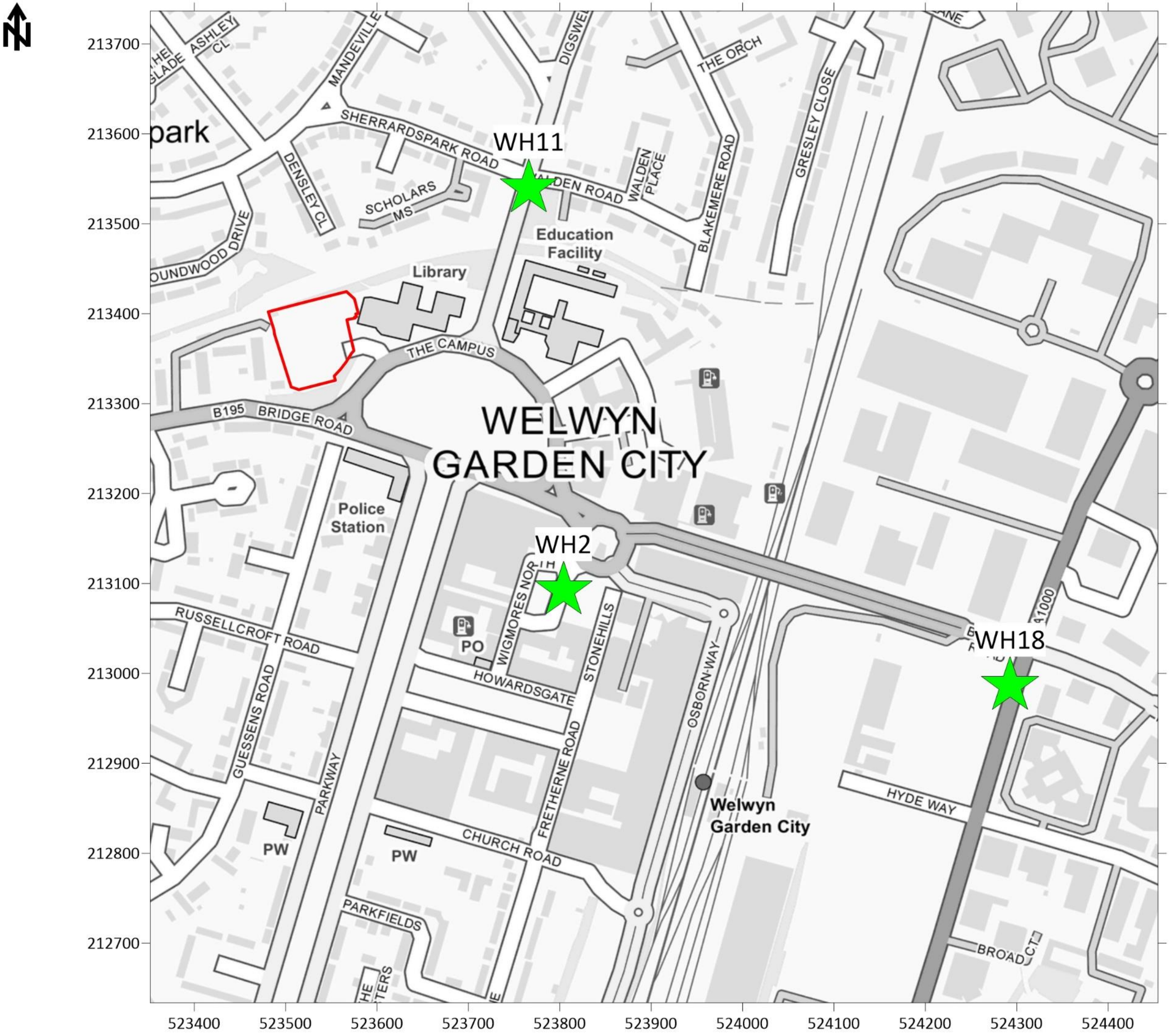
Project Number

AQ109255

Client

Welwyn Hatfield Borough Council

Ensafe Consultants
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300
www.ensafe.co.uk



Legend

Site Boundary

Diffusion Tube Monitoring Locations

Title

Figure 2

Diffusion Tube Monitoring Locations

Project

Welwyn MSCP

Project Number

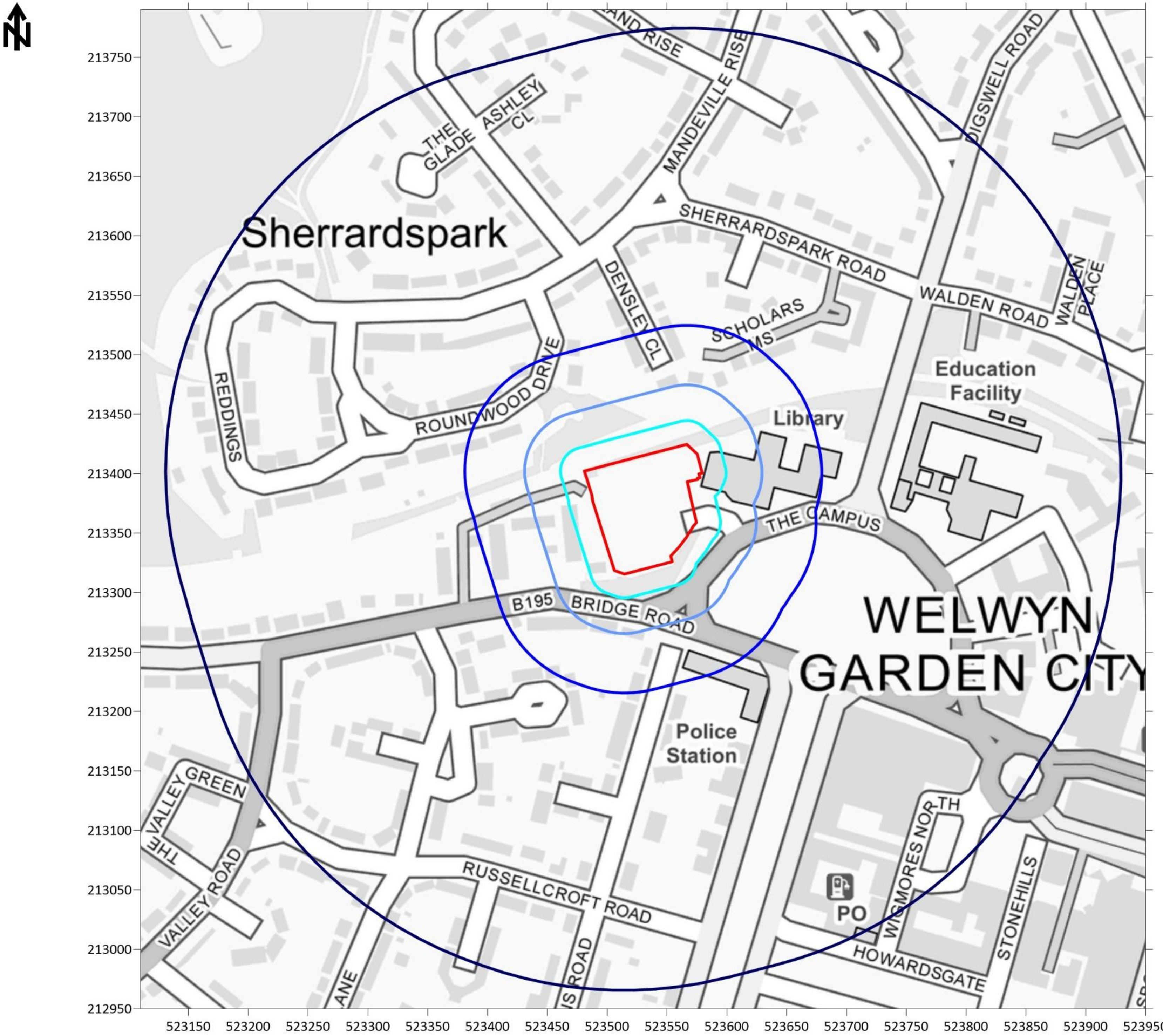
AQ109255

Client

Welwyn Hatfield Borough Council

Ensafe Consultants
Osprey House, Broadway, Manchester M50 2UE

Tel – 0161 868 1300
www.ensafe.co.uk



Legend

- Site Boundary
- 20m from Site Boundary
- 50m from Site Boundary
- 100m from Site Boundary
- 350m from Site Boundary

Title

Figure 3

Earthworks and Construction Dust Buffer Zones

Project

Welwyn MSCP

Project Number

AQ109255

Client

Welwyn Hatfield Borough Council

Ensafe Consultants
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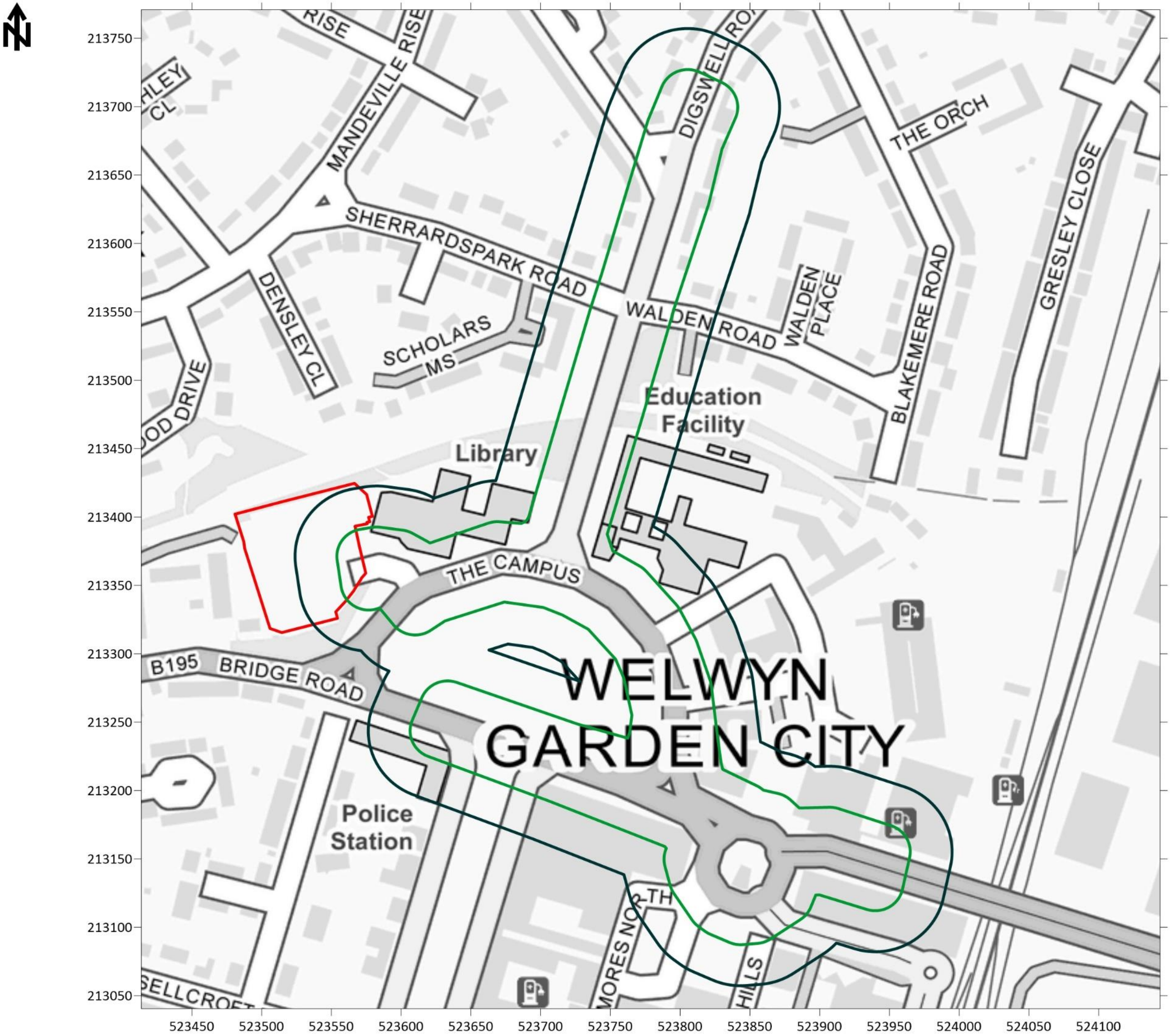

Legend

Site Boundary

20m from Site Access Route

50m from Site Access Route

Title

Figure 4

Trackout Dust Buffer Zones

Project

Welwyn MSCP

Project Number

AQ109255

Client

Welwyn Hatfield Borough Council

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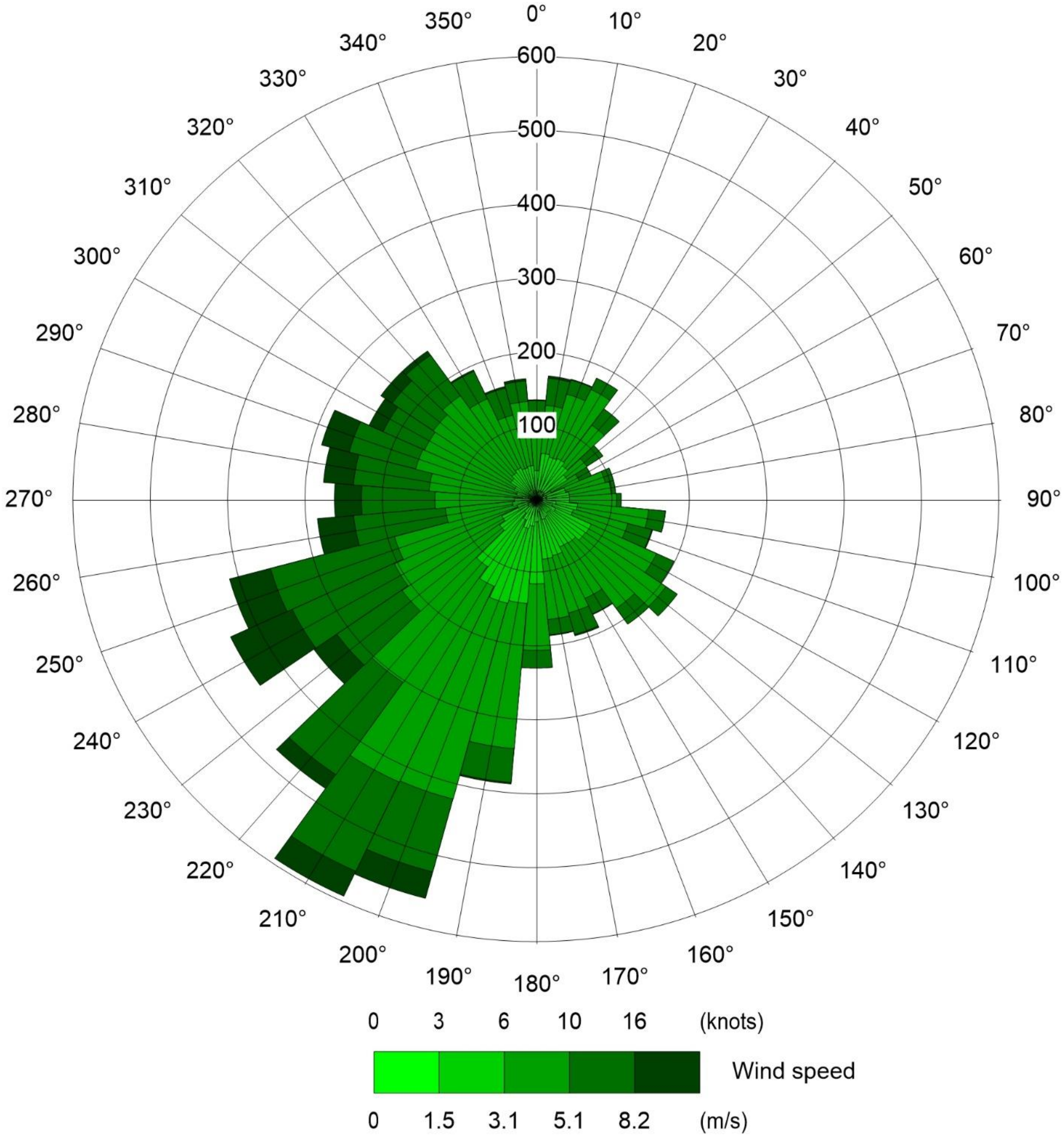

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Title

Figure 5

Wind Rose Luton Aiport 2019 Meteorological Station

Project

Welwyn MSCP

Project Number

AQ109255

Client

Welwyn Hatfield Borough Council

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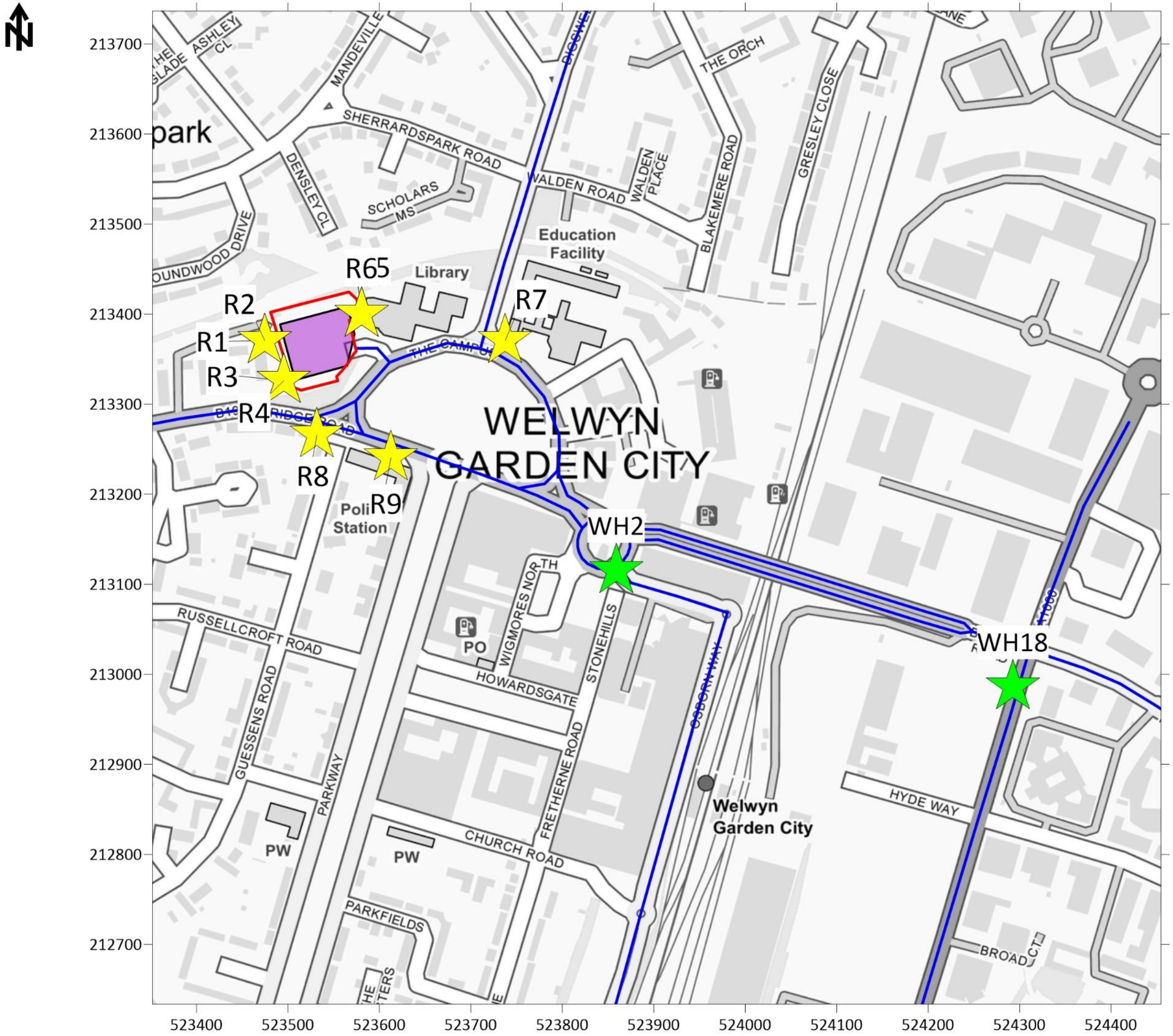

Legend

Site Boundary

Modelled Road Link

Diffusion Tube Monitoring

Sensitive Receptor Locations

Proposed MSCP

Title

Figure 6

ADMS-Roads Input

Project

Welwyn MSCP

Project Number

AQ109255

Client

Welwyn Hatfield Borough Council

Ensafe Consultants
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APPENDIX II – ASSESSMENT INPUTS

Assessment Inputs

The Proposed Development has the potential to introduce nearby sensitive receptors to poor air quality. Dispersion modelling using ADMS Roads was therefore undertaken to predict NO_2, PM_{10} and $PM_{2.5}$ concentrations at sensitive locations both with and without the development in place, to consider potential impacts and assess site suitability for the proposed end-use.

The assessment was undertaken in accordance with the guidance contained within the DEFRA document LAQM TG(16)[2] and the EPUK and IAQM guidance[4].

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 5.0). ADMS-Roads is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and DEFRA.

The model requires input data that details the following parameters:

- Assessment area;
- Traffic flow data;
- Vehicle emission factors;
- Spatial co-ordinates of emissions;
- Street width;
- Meteorological data;
- Roughness length; and
- Monin-Obukhov length.

Traffic Flow Data

Development flows traffic data was provided by the appointed Transport Consultants for the scheme, and indicated that a flow of 684 AADT is anticipated to be redistributed across the road network as a result of the Proposed Development. It should be noted that due to the closure of the existing Campus East car park the proposed development does not generate any new vehicle trips of the road network.

Traffic data for all Broadwater road and Bessemer Road used in the assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition, was obtained from the Department for Transport (DfT). The Dft Matrix web tool enables the user to view and download traffic flows on every link of the A-road and motorway network in Great Britain for the years 1999 to 2019.

All other traffic data was provided by the transport consultant, from ATC data undertaken in 2019. Growth factors provided by the Trip End Model Presentation Program (TEMPRO) software package were utilised to allow for conversion from the obtained 2019 traffic flow to 2021 respectively, to represent the operational year scenario.

It should be noted that the DfT matrix is referenced in DEFRA guidance LAQM TG(16)[2] as being a suitable source of data for air quality assessments and is therefore considered to provide a reasonable representation of traffic flows in the vicinity of the site.

Vehicle speeds were estimated based on the free flow potential of each link and local speed limits. Road widths were estimated from aerial photography and UK highway design standards.

A summary of the traffic data used in the verification scenario is provided in Table AII 1.

Table AII 1: 2019 Verification Traffic Data

Road Link		Road Width (m)	24 Hour AADT Flow	HDV %	Mean Vehicle Speed (km/hr)
L1	Broadwater Road	7.30	5,976	3.6	35
L2	Broadwater Road/Bridge Street Junction	11.00	5,976	3.6	10
L3	Bessemer Road Road/Bridge Street Junction	14.10	2,633	3.7	10
L4	Bessemer Road	7.90	2,633	2.3	35
L5	Bridge Road Slow Down	15.60	2,633	7.6	10
L6	Bridge road Westbound	7.60	8,543	8.2	35
L7	Bridge road Eastbound	6.40	4,272	7.0	35
L8	Bridge road Eastbound Speed up	4.40	8,543	7.0	20
L9	Bridge road Westbound Slow Down	6.80	8,543	8.2	10
L10	Bridge Road Roundabout	8.10	8,543	8.5	25
L11	Bridge road Westbound Speed up	7.00	3,865	4.7	10
L12	Bridge road Eastbound Slow Down	6.90	3,865	8.8	20
L13	Bridge Road	8.80	8,480	4.7	35
L14	Bridge Road to The Campus	4.50	8,480	4.7	35
L15	The Campus	8.05	8,480	8.8	35
L16	The Campus	7.00	2,120	8.8	35
L17	Bridge Road West of The Campus	5.00	2,120	3.4	35
L18	Bridge road onto The Campus	5.25	2,120	3.4	10
L19	Bridge Road	6.40	7,401	4.7	35
L20	Digswell road Slow Down	12.40	7,112	1.6	10
L21	Digswell Road	6.60	7,112	1.6	30
L22	Digswell Road	5.90	12,846	1.6	35
L23	Digswell Road	5.25	12,846	1.6	35
L24	Bridge Road East	9.50	12,846	2.4	40
L25	Bridge Road East - Junction	9.50	13,796	2.4	10
L26	Site Access	6.00	5,198	0.0	10
L27	Osbourne Way	9.70	5,198	7.2	20

Reference should be made to Figure 6 within Appendix I for a graphical representation of the road link locations used within the verification assessment. The road width, canyon height and mean vehicle speed shown in Table AII.1 remained the same for the 2021 scenarios.

In order to consider a robust assessment, the baseline traffic data was factored up to the development opening year, using TEMPRO and the traffic redistributed based on information provided by the transport consultant.

A summary of the 2021 traffic data is shown in Table AII 2.

Table AII 2: 2021 Traffic Data

Road Link		DM		DS	
		24 Hr AADT Flow	HDV Prop (%)	24 Hr AADT Flow	HDV Prop (%)
L1	Broadwater Road	19,059	3.6	19,059	3.6
L2	Broadwater Road/Bridge Street Junction	19,059	3.6	19,059	3.6
L3	Bessemer Road Road/Bridge Street Junction	14,641	3.7	14,641	3.7
L4	Bessemer Road	14,641	2.3	14,641	2.3
L5	Bridge Road Slow Down	14,344	7.6	14,344	7.6
L6	Bridge road Westbound	7,203	8.2	7,203	8.2
L7	Bridge road Eastbound	7,141	7.0	7,141	7.0
L8	Bridge road Eastbound Speed up	7,141	7.0	7,141	7.0
L9	Bridge road Westbound Slow Down	7,203	8.2	7,203	8.2
L10	Bridge Road Roundabout	7,056	8.5	7,056	8.5
L11	Bridge road Westbound Speed up	4,899	4.7	4,899	4.7
L12	Bridge road Eastbound Slow Down	6,910	8.8	6,910	8.8
L13	Bridge Road	9,798	4.7	10,023	4.7
L14	Bridge Road to The Campus	4,899	4.7	5,124	4.7
L15	The Campus	13,820	8.8	14,045	8.8
L16	The Campus	13,820	8.8	14,045	8.8
L17	Bridge Road West of The Campus	6,910	3.4	7,135	3.4
L18	Bridge road onto The Campus	6,910	3.4	6,910	3.4
L19	Bridge Road	9,798	4.7	9,798	4.7
L20	Digswell road Slow Down	9,051	1.6	9,051	1.6
L21	Digswell Road	9,051	1.6	9,051	1.6
L22	Digswell Road	9,051	1.6	9,051	1.6
L23	Digswell Road	9,051	1.6	9,051	1.6
L24	Bridge Road East	13,506	2.4	13,506	2.4
L25	Bridge Road East - Junction	13,506	2.4	13,506	2.4
L26	Site Access	1,577	0.0	2,262	0.0
L27	Osbourne Way	9,054	7.2	9,054	7.2

Reference should be made to Figure 6 within Appendix I for a graphical representation of the road link locations used within the operation phase assessment.

Emission Factors

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 10.0) released in August 2020, which incorporates updated COPERT 5 vehicle emissions factors for NO_x and PM and EURO 6 vehicle fleet sub-categories.

There is current uncertainty over NO_2 concentrations within the UK, with roadside levels not reducing as previously expected due to the implementation of new vehicle emission standards. Therefore, 2019 emission factors have been utilised for the prediction of pollution levels for all scenarios in preference to the development opening year in order to provide a robust assessment.

Car Park Emissions

Emissions associated with car movements within the current car park and the proposed multi-storey car park were represented within the model through the use of area and volume sources to represent the DM and DS scenarios respectively. This was in accordance with the methodology provided within CERC Helpdesk Note 'Modelling Car Parks'. NOx, PM_{10} emission rates were calculated using the following parameters:

- Number of car movements;
- 2019 emission factors (g/km);
- Average journey length (km); and
- Site area (m2)/volume (m3).

Cold-start emissions were also calculated using the Exempt spreadsheet tool provided by DEFRA[9] for inclusion in the model.

To ensure an accurate representation of both existing and proposed carparks a combination of area and volume sources was utilised within the ADMS-roads model, it should be noted that some of the existing car parking will be retained as part of the proposed development. The journey length (D) for the volume sources were measured using the drawings provided by form existing base maps. The site area, and volume (CP) was calculated from the relevant car-park dimensions. The sections of the carpark and their inputs are presented in Table AII.6

Table AII 3: Car Park Inputs

Area Source	Modelled in	Journey Length (km)	Site Depth (m)	Site Area (m^2)	Site Volume (m^3)
Baseline Surface Car Park	Verification and DM	0.27	n/a	4581	-
Proposed MSCP	DS	0.43	6.6	4581	30,235
Top Floor Surface Level Car Park	DS	0.25	n/a	3113.7	-

<u>Number of Car Movements</u>

Information provided by the Transport Consultant indicated that the car park is predicted to generate a total of approximately 2,226 daily vehicle trips (M).

<u>Emission Factors</u>

The 2019 NOx emission factor per vehicle for cars (EF) was obtained from the Emission Factor Toolkit (version 10.0), which was the most recent available from the DEFRA website at the time of assessment. This indicated the following emission factors:

- NOx - 0.502g/km;
- PM_{10} - 0.0355g/km; and
- $PM_{2.5}$ - 0.0317g/km.

As stated above, 2019 emission factors were utilised for the predicted opening year (2021) to provide a robust assessment.

9 http://laqm.defra.gov.uk/review-and-assessment/tools/emissions.html#exempt.

Cold Start Emissions

Cold start emissions (CS) were obtained from the Exempt v1.0 spreadsheet available from DEFRA and are summarised in Table AII.7.

Table AII 7: Car Park Inputs

Area Source	Pollutant	Cold Start Emissions (g)
Existing Car Park	NO_x	0.1265
	PM_{10}	0.002
	$PM_{2.5}$	0.002
Proposed MSCP	NO_x	0.1731
	PM_{10}	0.003
	$PM_{2.5}$	0.003
Proposed Top Floor Surface Level Car Park	NO_x	0.0939
	PM_{10}	0.002
	$PM_{2.5}$	0.002

Calculation of Emissions

The following equation for the calculation of the car park emission rates was obtained from the Helpdesk Note:

$$\text{Emission rate (g/m}^3\text{/s)} = \frac{(EF \times D \times M) + (CS \times M/2)}{60 \times 60 \times 24 \times CP}$$

Where:

- EF = Emission factor (g/km);
- D = Average distance travelled (km);
- M = Vehicle movements (per day);
- CS = Cold start emission factor (g/trip); and
- CP = Car park volume (m3) or area (m2).

The equation was used with the relevant inputs to calculate the emission factors for each car park as shown in Table AII.8.

Table AII 8: Car Park Pollutant Emissions

Scenario	Pollutant	Emission Rate (g/m3/s)
Existing Car Park	NO_x	7.75E-07
	PM_{10}	4.16E-08
	$PM_{2.5}$	2.70E-08
Proposed MSCP	NO_x	1.69E-07
	PM_{10}	1.33E-08
	$PM_{2.5}$	8.44E-09

Proposed Top Floor Surface Level Car Park	NOx	4.84E-07
	PM_{10}	1.86E-08
	$PM_{2.5}$	1.19E-08

Meteorological Data

Meteorological data used in this assessment was taken from Luton Airport meteorological station over the period 1st January 2019 to 31st December 2019 (inclusive). Luton Airport meteorological station is located at approximate NGR: 512380, 220910 which is approximately 14km North west of the Proposed Development. Although there is a large distance between the application site and Luton Airport the use of this data has prior approval from the Environmental Health Department at WHBC and is therefore considered to provide a reasonable representation of conditions at the development site.

All meteorological records used in the assessment were provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 5 within Appendix I for a wind rose of utilised meteorological data.

Roughness Length

The specific roughness length (z_0) values used to represent conditions during the verification process, DS scenario, as well as conditions at the Luton Airport meteorological station are summarised in Table AII 4.

Table AII 4: Utilised Roughness Lengths

Scenario	Roughness Length (m)	ADMS Description
Verification, Operational phase (DS and DM scenario) and Meteorological Station	0.5	Parkland, Open Suburbia

These values of z_0 are considered appropriate for the morphology of the assessment area.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere within certain urban or rural contexts. The specific length values used to represent conditions during the verification process, DS scenario, as well as conditions at the Leconfield meteorological station are summarised in Table AII 5

Table AII 5: Utilised Monin-Obukhov Lengths

Scenario	Monin-Obukhov Length (m)	ADMS Description
Verification and Operational phase (DS and DM scenario) and Meteorological Station	30	Mixed Urban/Industrial

This Monin-Obukhov value is considered appropriate for the morphology of the assessment area.

Background Concentrations

The annual mean NO_2 concentrations detailed in Table 5, was used in the dispersion modelling assessment to represent annual mean pollutant levels at the Proposed Development site and local monitoring sites.

Table AII 6 displays the specific background concentrations as predicted by DEFRA, utilised to represent the condition at the monitoring locations used within the verification process.

Table AII 6: Predicted Background Pollutant Concentrations for Diffusion Tubes

Monitoring Location	DEFRA Grid Square	Pollutant	2019 Predicted Background Concentration (µg/m³)
WH18	524500, 212500	NO_x	22.90
		NO_2	16.43
WH2	523500, 213500	NO_x	19.40
		NO_2	14.27

Similar to emission factors, background concentrations for 2019 were utilised in preference to predicted background concentrations for the development opening year (2021). This provided a robust assessment and is likely to overestimate actual pollutant concentrations during the operation of the proposals.

Table AII 7 displays the predicted background concentrations by DEFRA used in the operational phase assessment for the sensitive receptor locations.

Table AII 8: Predicted Background Pollutant Concentrations for Receptors

Monitoring Location	DEFRA Grid Square	Pollutant	2019 Predicted Background Concentration (µg/m³)
R1 to R9	523500, 213500	NO_x	19.40
		NO_2	14.27
		PM_{10}	14.48
		$PM_{2.5}$	9.83

NO_x to NO_2 Conversion

Predicted annual mean NO_x concentrations from the dispersion model were converted to NO_2 concentrations using the NO_x to NO_2 Calculator (v.8.1) provided by DEFRA, which is the method detailed within LAQM TG(16)[2].

Verification

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

- Estimates of background concentrations;
- Uncertainties in source activity data such as traffic flows and emission factors;
- Variations in meteorological conditions;
- Overall model limitations; and
- Uncertainties associated with monitoring data, including locations.

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

For the purpose of this assessment model verification was undertaken for 2019, using traffic data, meteorological data and monitoring results from this year.

WHBC undertakes periodic monitoring of NO_2 concentrations at 2 roadside monitoring location within the assessment extents. The road contribution to total NO_x concentration was calculated from the monitored NO_2 result for use in the verification process. This was undertaken following the methodology contained within DEFRA guidance LAQM TG(16)[2] The monitored annual mean NO_2 concentration and calculated road NO_x concentration are summarised in Table AII 9.

Table AII 9: Monitoring Results

Site ID	Monitored Road NO_x Concentration (µg/m³)	Modelled Road NO_x Concentration (µg/m³)	% Difference ((Monitored- Modelled)/ Monitored)) * 100
WH18	19.24	28.61	32.76
WH2	11.00	14.60	24.64

The monitored and modelled NO_x road contribution concentrations were graphed and the equation of the trend line based on the linear progression through zero was calculated, as shown in Graph 1. This indicated that a verification factor of **1.4477** was required to be applied to all NO_x modelling results, showing the model underestimated pollutant concentrations throughout the assessment extents.

Graph 1 - Verification Adjustment Factor

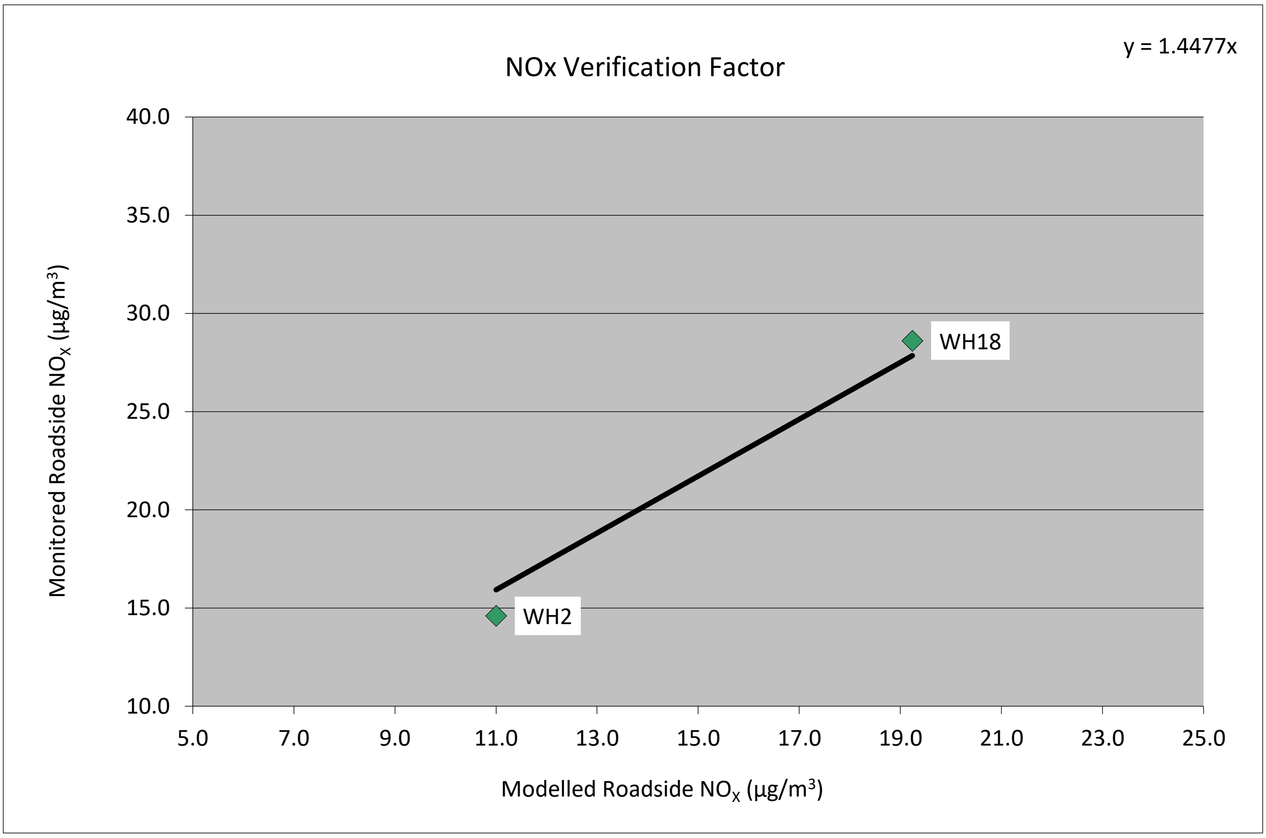

Table AII 10 presents the monitored annual mean NO_2 concentrations and the adjusted modelled total NO_2 concentration based on the above verification factor.

Table AII 10: Modelled Concentrations

Site ID	Monitored Road NO_2 Concentration (µg/m³)	Adjusted Modelled Road NO_2 Concentration (µg/m³)	% Difference ((Monitored- Modelled)/ Monitored)) * 100
WH18	31.00	30.64	1.16
WH2	22.00	22.68	-3.07

As demonstrated in Table AII 10, the percentage difference between modelled and monitored concentrations is deemed acceptable and is less than 10% in all cases. This reduces uncertainties in the model predictions and provide a robust representation of pollutant concentrations in accordance with the guidance suggested in LAQM (TG16)[2].

As PM monitoring is not undertaken within the assessment extents, the NO_x adjustment factor of **1.4477** was utilised to adjust model predictions of PM in accordance with the guidance provided within LAQM (TG16)[2].

APPENDIX III – CONSTRUCTION PHASE ASSESSMENT CRITERIA

CONSTRUCTION PHASE METHODOLOGY

There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the Institute of Air Quality Management (IAQM) document 'Guidance on the Assessment of Dust from Demolition and Construction'[10].

Activities on the proposed construction site have been divided into three types to reflect their different potential impacts. These are:

- Earthworks;
- Construction; and
- Trackout.

The potential for dust emissions was assessed for each activity that is likely to take place and considered three separate dust effects:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to a significant increase in exposure to PM_{10} and $PM_{2.5}$.

The assessment steps are detailed below.

Step 1

Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the site boundary or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should proceed to Step 2. Additionally, should ecological receptors be identified within 50m of the boundary site or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should also proceed to Step 2.

Should sensitive receptors not be present within the relevant distances then negligible impacts would be expected and further assessment is not necessary.

Step 2

Step 2 assesses the risk of potential dust impacts. A site is allocated to a risk category based on two factors:

- The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (Step 2A); and
- The sensitivity of the area to dust impacts, which can be defined as low, medium or high sensitivity (Step 2B).

The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied.
Step 2A defines the potential magnitude of dust emission through the construction phase. The relevant criteria are summarised in Table AIII.1.

10 Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management, 2016.

Table AIII.1: Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Earthworks	• Total site area greater than 10,000m^2 • Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • More than 10 heavy earth moving vehicles active at any one time • Formation of bunds greater than 8m in height • More than 100,000 tonnes of material moved
	Construction	• Total building volume greater than 100,000m^3 • On site concrete batching • Sandblasting
	Trackout	• More than 50 Heavy Duty Vehicle (HDV) trips per day • Potentially dusty surface material (e.g. high clay content) • Unpaved road length greater than 100m
Medium	Earthworks	• Total site area 2,500m^2 to 10,000m^2 • Moderately dusty soil type (e.g. silt) • 5 to 10 heavy earth moving vehicles active at any one time • Formation of bunds 4m to 8m in height • Total material moved 20,000 tonnes to 100,000 tonnes
	Construction	• Total building volume 25,000m^3 to 100,000m^3 • Potentially dusty construction material (e.g. concrete) • On site concrete batching
	Trackout	• 10 to 50 HDV trips per day • Moderately dusty surface material (e.g. high clay content) • Unpaved road length 50m to 100m
Small	Earthworks	• Total site area less than 2,500m^2 • Soil type with large grain size (e.g. sand) • Less than 5 heavy earth moving vehicles active at any one time • Formation of bunds less than 4m in height • Total material moved less than 20,000 tonnes • Earthworks during wetter months
	Construction	• Total building volume less than 25,000m^3 • Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	• Less than 10 HDV trips per day • Surface material with low potential for dust release • Unpaved road length less than 50m

Step 2B defines the sensitivity of the area around the development site for construction, earthworks and trackout. The factors influencing the sensitivity of the area are shown in Table AIII.2.

Table AIII.2: Examples of Factors Defining Sensitivity of an Area

Sensitivity	Examples	
	Human Receptors	**Ecological Receptors**
High	• Users expect of high levels of amenity • High aesthetic or value property • People expected to be present continuously for extended periods of time • Locations where members of the public are exposed over a time period relevant to the AQO for PM10 e.g. residential properties, hospitals, schools and residential care homes	• Internationally or nationally designated site e.g. Special Area of Conservation
Medium	• Users would expect to enjoy a reasonable level of amenity • Aesthetics or value of their property could be diminished by soiling • People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work	• Nationally designated site e.g. Sites of Special Scientific Interest
Low	• Enjoyment of amenity would not reasonably be expected • Property would not be expected to be diminished in appearance • Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, playing fields, farmland, footpaths, short term car park and roads	• Locally designated site e.g. Local Nature Reserve

The guidance also provides the following factors to consider when determining the sensitivity of an area to potential dust impacts during the construction phase:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and the receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which works will take place;
  - Any conclusions drawn from local topography;
  - Duration of the potential impact, as a receptor may become more sensitive over time; and
  - Any known specific receptor sensitivities which go beyond the classifications given in the document.

These factors were considered in the undertaking of this assessment.

The sensitivity of the area to dust soiling effects on people and property is shown in Table AIII.3.

Table AIII.3: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
High	More than 100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

Table AIII.4 outlines the sensitivity of the area to human health impacts.

Table AIII.4: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM10 Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
High	Greater than 32µg/m^3	More than 100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32µg/m^3	More than 100	High	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28µg/m^3	More than 100	High	Medium	Low	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	Less than 24µg/m^3	More than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
	Less than 24µg/m^3	More than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	Greater than 32µg/m^3	More than 10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	28 - 32µg/m^3	More than 10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24 - 28µg/m^3	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	Less than 24µg/m^3	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Low	-	More than 1	Low	Low	Low	Low	Low

Table AIII.5 outlines the sensitivity of the area to ecological impacts.

Table AIII.5: Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	Less than 20	Less than 50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Step 2C combines the dust emission magnitude with the sensitivity of the area to determine the risk of unmitigated impacts.

Table AIII.6 outlines the risk category from earthworks and construction activities.

Table AIII.6: Dust Risk Category from Earthworks and Construction

Receptor Sensitivity	Distance from the Source (m)		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Table AIII.7 outlines the risk category from trackout.

Table AIII.7: Dust Risk Category from Trackout

Receptor Sensitivity	Distance from the Source (m)		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Low	Negligible
Low	Low	Low	Negligible

Step 3

Step 3 requires the identification of site-specific mitigation measures within the IAQM guidance to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For sites with negligible risk, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

Step 4

Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'.

APPENDIX IV – ASSESSOR’ S CURRICULUM VITAE

LEWIS ELLISON

Air Quality Consultant

MOcean.Geo (Hons)

KEY EXPERIENCE:

Lewis is an Environmental Consultant with specialist experience in the air quality sector. His key capabilities include:

- Production of Air Quality Assessments to the Department for Environment, Food and Rural Affairs (DEFRA), Environment Agency and Environmental Protection UK (EPUK) methodologies for clients from the residential, retail and commercial sectors.
- Detailed dispersion modelling of road vehicle emissions using ADMS-Roads. Studies have included impact assessment of pollutant concentrations at various floor levels and assessment of suitability of development sites for proposed end-use.
- Assessment of road vehicle exhaust emissions using the Design Manual for Roads and Bridges (DMRB) calculation spreadsheet.
- Assessment of dust impacts from construction sites to the Institute of Air Quality Management (IAQM) methodology.
- Production of air quality mitigation strategies for developments throughout the UK.
- Defining baseline air quality conditions and identification of sensitive areas.

QUALIFICATIONS:

- Master of Science

SELECT PROJECTS SUMMARY:

Residential Development:

AGFA Works, Seagate – Air Quality Assessment using ADMS-Roads in support of an 83 residential unit development with the potential to cause air quality impacts at sensitive locations.

Andrew Avenue, Breahead – Air Quality Assessment using ADMS-Roads in support of a 77 residential unit development in close proximity to the M8.

Clothorn Road, Didsbury – Air Quality assessment for a residential development consisting of 12 units in close proximity to an AQMA declared by Manchester city council.

Downend Road, Portchester – Air Quality Assessment in support of a 350 residential unit development in close proximity to the M27.

Great Leighs, Chelmsford- Baseline scoping report in support of several proposed large scale residential developments totalling 1300 residential units, with the potential to impact on nearby sensitive locations.

Parkview, Lofthouse Gate – Air Quality Assessment in support of a proposed 160 residential unit development in close proximity to two AQMA declared by Wakefield Metropolitan District Council.

Shields Road, Walkergate - Air Quality Assessment using ADMS-Roads in support of a 40 residential unit development in close proximity to the Shields Road.

Environmental impact assessment:

Bower Farm, Bridgewater – Production of an Air Quality Assessment with relevant mitigation measures for inclusion in an EIA report for part of the east Sedgemoor development.

Commercial Development:

ALDI, Hertford – Air Quality Assessment for the Proposed Aldi Superstore at Hertfordshire using ADMS-Roads.

Hortonwood West, Telford – Construction Environmental Management Plan (CEMP) for the expansion of the current factory on site.

Inverness Airport Business Park – Air Quality Scoping Report for a proposed hotel and commercial office space.

Odour assessment:

Wren Park Care Home, Shefford – Qualitative Odour Assessment of industrial units in the vicinity of a proposed extension to the current care home.

Marsh Farm, Basildon – Qualitative Odour Assessment of an anaerobic digesting unit in support of a follow up assessment for the unit.

Mixed-Use Development:

Coldharbour Land, Lambeth – Air Quality Assessment for a proposed mixed use development with the implementation of mitigation measures.

Old Fire Station, Newham, London- Air Quality Assessment using ADMS-Roads for a proposed mixed use development with the implementation of mitigation measures, in support of a redevelopment of the previous fire station.

Ordsall Lane, Salford – Air Quality Assessment in support of a mixed use development using ADMS-Roads.