8.0 AIR QUALITY AND CLIMATE

8.1 Introduction

8.1.1 Background

Golder Associates Ireland Ltd (Golder) have been commissioned to prepare this Environmental Impact Assessment Report (EIAR) on behalf of Atlas GP Ltd, as developer of the proposed Carmanhall Road Strategic Housing Development (SHD; hereafter the 'Proposed Development'). It represents the findings of an Environmental Impact Assessment (EIA) carried out for the Proposed Development and supports the overall planning application for the Proposed Development located at the former Avid Technology International site on Carmanhall Road, Sandyford Industrial Estate, Dublin 18, (the 'Site' / 'Application Site'). This chapter of the EIAR considers the potential effects of the Proposed Development on air quality and climate.

The choice of team members for each study has been informed by the experience of the relevant lead specialist in their area of technical interest. The air quality and climate assessment has been prepared by Rachel Lansley (BSc, MSc). Rachel is a Chartered Scientist (CSci), a Member of the Institution of Environmental Sciences (IES), and a Member of the Institute of Air Quality Management (IAQM) and has more than 14 years' experience in air quality and climate assessment.

A detailed description of the Proposed Development, its location, and site description can be found in Chapter 3 of this EIAR (Site and Scheme Description).

8.1.2 Scope

This chapter presents an assessment of the potential air quality and climate effects associated with the Proposed Development. The effects have been assessed in the context of relevant national, regional and local air quality policies. The assessment considers the construction and operational phases of the Proposed Development. The decommissioning phase is outside of the scope of the assessment as it is a permanent development.

A qualitative assessment of dust impact from the construction phase has been undertaken in line with Institute of Air Quality Management (IAQM) 'Guidance on the assessment of dust from demolition and construction' (IAQM, 2014). The detailed assessment is included in Appendix 8.1.

A quantitative operational phase assessment of effects from road traffic emissions has been undertaken in accordance with the Environmental Protection UK/Institute of Air Quality Management guidance document 'Land –Use Planning & Development Control: Planning for Air Quality' (EPUK/IAQM 2017). Detailed dispersion modelling using ADMS-Roads has been undertaken to determine the effect of the Proposed Development on traffic derived pollutants, nitrogen dioxide (NO_2) and particulate matter, at nearby sensitive receptors. The detailed assessment is included in Appendix 8.2.

8.1.3 Site Location

The Site is located in south county Dublin, within the administrative area of Dún Laoghaire Rathdown County Council (DLRCC). The Proposed Development is located on the south-west corner of the Carmanhall Road and Blackthorn Road intersection, within the Sandyford Industrial Estate. The Proposed Development is approximately 1.03 ha in area.

The location of the Proposed Development is shown in Figure 8.1.

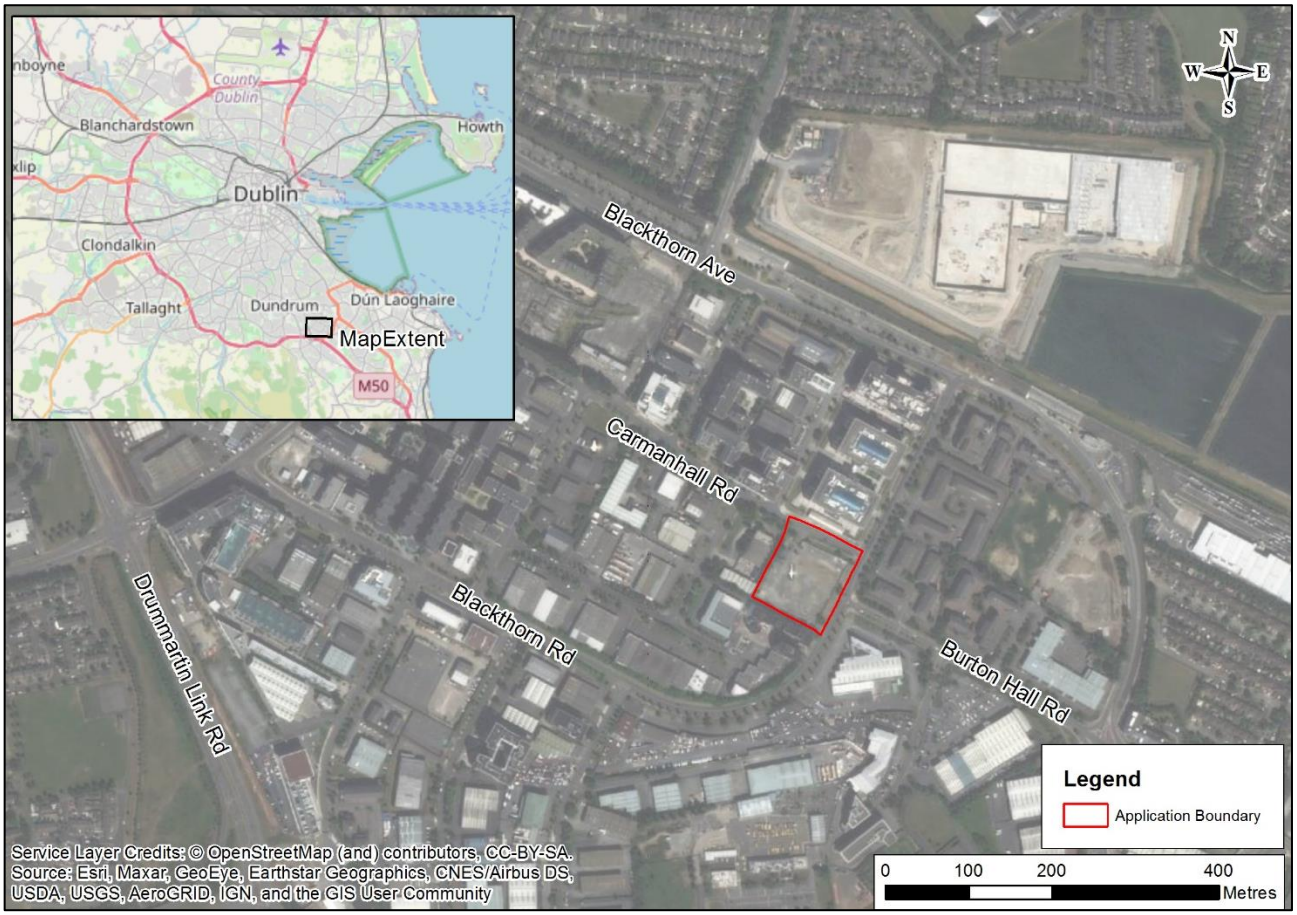

Figure 8.1: Proposed Development boundary

8.1.4 Site Description

The Proposed Development will comprise of:

(i) construction of a Build-To-Rent residential development within a new part six, part eight, part nine, part eleven storey rising to a landmark seventeen storey over basement level apartment building (40,814sq.m) comprising 428 no. apartments (41 no. studio, 285 no. one-bedroom, 94 no. two-bedroom & 8 no. three-bedroom units) of which 413 no. apartments have access to private amenity space, in the form of a balcony or lawn/terrace, and 15 no. apartments have access to a shared private roof terrace (142sq.m) at ninth floor level;

(ii) all apartments have access to 2,600sq.m of communal amenity space, spread over a courtyard at first floor level and roof terraces at sixth, eighth and ninth floor levels, a 142sq.m resident's childcare facility at ground floor level, 392sq.m of resident's amenities, including concierge/meeting rooms, office/co-working space at ground floor level and a meeting/games room at first floor level, and 696sq.m of resident's amenities/community infrastructure inclusive of cinema, gym, yoga studio, laundry and café/lounge at ground floor level. The café/lounge will primarily serve the residents of the development and will be open for community use on a weekly/sessional basis;

(iii) provision of 145 no. vehicular parking spaces (including 8 no. mobility parking spaces, 2 no. club-car spaces and 44 no. electric charging spaces), 5 no. motorcycle parking spaces, bin stores, plant rooms, switch room and 2 no. ESB sub-stations all at ground floor level; provision of bicycle parking (752 no. spaces), plant and storage at basement level; permission is also sought for the removal of the existing vehicular entrance and construction of a replacement vehicular entrance in the north-western corner of the site off Carmanhall Road;

(iv) provision of improvements to street frontages to adjoining public realm of Carmanhall Road & Blackthorn Road comprising an upgraded pedestrian footpath, new cycling infrastructure, an increased quantum of landscaping and street-planting, new street furniture inclusive of bins, benches and cycle parking facilities and the upgrading of the existing Carmanhall Road & Blackthorn Road junction through provision of a new uncontrolled pedestrian crossing; and,

(v) All ancillary works including provision of play equipment, boundary treatments, drainage works - including SuDS drainage, landscaping, lighting, rooftop telecommunications structure and all other associated site services, site infrastructure and site development works. The former Avid Technology International buildings were demolished on foot of Reg. Ref. D16A/0158 which also permitted a part-five rising to eight storey apartment building. The development approved under Reg. Ref. D16A/0158, and a subsequent part-seven rising to nine storey student accommodation development permitted under Reg. Ref. PL06D.303467, will be superseded by the Proposed Development.

Given the scale of the Site and the Proposed Development, it is currently proposed to construct the development over a construction period of approximately 24 months.

As noted in the description demolition works have already taken place at the Site and there are no further demolition works proposed in this scheme.

8.1.5 Study Area

The study area for air quality varies across the construction phase and operational phase assessments.

In line with the IAQM 2014 guidance, the study area for the construction phase assessment, which considers the effect of construction dust emissions, has been included as extending “up to 350 m from the boundary of the site and/ or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).”

During the operational phase, the study area for human receptors extends to 200 m either side of all ‘affected roads’ – i.e. those meeting the criteria set out in the EPUK/IAQM 2017 guidance.

For ecological receptors, Highways England’s Design Manual for Roads and Bridges (DMRB) states that a quantitative impact assessment [of road source emissions] may be required if Natura 2000 Sites (e.g. SPAs and SACs) are within 200 m of affected roads. No such protected sites are located within 200 m of the 'affected roads' and therefore impacts of operational traffic on ecological receptors are deemed not significant.

8.2 Policy and Legislation Context

8.2.1 Policy

Regional Planning Policy

The Regional Planning Guidelines for the Greater Dublin Area 2010 – 2022 (RPGs) identify two planning policy zones in the Greater Dublin Area (GDA) and under the Settlement Hierarchy of the RPGs, Sandyford is identified within Dun Laoghaire Rathdown as a metropolitan consolidation town.

Sandyford is identified as a growth centre and a driver within the core of the Greater Dublin Area, for sustained international and regional economic development, in Section 3.7.1 of the regional planning guidelines. Sandyford is included in Box 8: Gateway Core Economic Area, and is identified as a strong employment hub where diversification options should be explored.

Section 4.6 of the regional planning guidelines includes the following recommendations for Development Plans & Core Strategies associated with Dun Laoghaire Rathdown: *‘As mostly a metropolitan county, housing delivery should focus on strengthening the urban form of the county through building up town and district centres at*

public transport nodes; continuing sensitive infill to counteract falling population and declining services, and supporting new housing growth along the key new public transport services of the Luas extension from Sandyford to Bray/Fassaroe (in two phases) and upgrades to the DART route through the County.'

Dun Laoghaire Rathdown also falls within the Eastern and Midland Regional Assembly of the Regional Spatial & Economic Strategy which aims to enhance the regional planning function by including an economic strategy to be combined with the spatial strategy to foster growth within the region and sub-regions.

Local Planning Policy

At the local level, the Dún Laoghaire-Rathdown County Development Plan 2016 - 2022 guides planning policy in relation to air quality and climate. Policy EI20: Air and Noise Pollution states that '*It is Council policy to implement the provisions of National and EU Directives on air and noise pollution and other relevant legislative requirements in conjunction with other agencies as appropriate'. Policy CC1: National Climate Change Adaption Framework states that 'It is Council policy to implement the 'National Climate Change Adaptation Framework - Building Resilience to Climate Change' by supporting the preparation of a Climate Change Adaptation Plan'. Policy CC2: Development of National Climate Change Policy and Legislation states that 'It is Council policy to support on an ongoing basis the Government programme for the development of a National Climate Change Policy and Legislation through the inclusion and implementation of supporting and complementary County Development Plan policies'.*

The central focus of the Core Strategy is on 'residential development and in ensuring that there is an acceptable equilibrium between the supply of zoned, serviced land for residential development and the projected demand for new housing, over the lifetime of the Plan'.

A key strand of the overall Settlement Strategy focuses on the 'continued promotion of sustainable development through positively encouraging consolidation and densification of the existing urban/suburban built form – and thereby maximizing efficiencies from already established physical and social infrastructure'.

The Site is zoned 'A2' in the Dun Laoghaire-Rathdown Development Plan 2016-2022, the objective of which is to: 'provide for the creation of sustainable residential neighbourhoods and preserve and protect residential amenity.' This zoning objective applies to the Sandyford Urban Framework Plan area only.

The Sandyford Urban Framework Plan 2016-2022 specifies a policy to develop and support a culture of sustainable travel in the Sandyford Business District.

8.2.2 Legislation and Guidance

8.2.2.1 Air Quality

European Air Quality Legislation

The European Union (EU) Directive on Ambient Air Quality Assessment and Management came into force in September 1996 (96/62/EC) and defines the policy framework for 12 air pollutants known to have harmful effects on human health and the environment. Air quality limit values (ambient pollutant concentrations not to be exceeded after a given date) for the pollutants are set through a series of Daughter Directives. The first Daughter Directive (1990/30/EC) sets limit values for NO_2 (amongst other pollutants) in ambient air.

Following the Daughter Directives, EU Council Directive 2008/50/EC came into force in June 2008, consolidating the existing air quality legislation, making provision for Member States to postpone attainment deadlines and allowing exemption from the obligation to limit values for certain pollutants, subject to strict conditions and assessment by the European Commission. Directive 2008/50/EC was transposed into Irish national legislation in 2011 through the Air Quality Standards Regulations 2011. The directive merged the four daughter directives and one Council decision into a single directive on air quality. The new Directive also

introduced a new limit value for fine particulate matter ($PM_{2.5}$) but does not change the existing air quality standards.

National Air Quality Legislation

The Air Pollution Act (1987) is the primary legislation relating to air quality in Ireland and provides the means for local authorities to take the measures that they deem necessary to control air pollution.

The Air Quality Standards Regulations (2011) transpose the Directive on ambient air quality (2008/50/EC) into Irish law. These regulations establish limit values and thresholds for various pollutants in ambient air.

The Environmental Protection Agency (EPA) monitor the levels of various pollutants against the standards set out in EU and Irish legislation. The EPA are the competent authority for annual reporting to the Minister for the Environment, Heritage and Local Government and the European Commission.

The Air Quality Standards (AQSs) – the background pollutant levels considered acceptable for human health and the environment – for nitrogen dioxide (NO_2) and particulate matter (PM10 and PM2.5) when measured as annual mean concentrations, are as follows:

- NO_2 - 40 µg/m^3;
- PM10 - 40 µg/m^3; and
- PM2.5 - 25 µg/m^3.

There are 4 air quality Zones in Ireland, defined for air quality management and assessment purposes. Highly populated areas are classified as Zone A, with sparsely populated areas as Zone D. Sandyford is designated as a Zone A for air quality, as it is located in the Dublin Conurbation.

8.2.2.2 Climate

This assessment has been made with reference to the 'Guidelines on the information to be contained in environmental impact assessment reports', published in 'draft' by the EPA in August 2017; 'Environmental Impact Assessment of Projects, Guidance on the Preparation of the Environmental Impact Assessment Report' published by the European Commission in 2017 and, 'Advice Notes for Preparing Environmental Impact Statements', also published in 'draft' by the EPA in September 2015.

Other documents considered in this assessment include:

- Dún Laoghaire-Rathdown County Development Plan 2016 – 2022, Section 5: Strategic Environmental Objectives and Section 8: Principles of Development;
- Department of Communication, Climate Action and Environment, Climate Action Plan 2019;
- EPA, Ireland's Greenhouse Gas Emissions Projections 2019 – 2040, 2020;
- EPA, The impact on 2020 greenhouse Gas Emissions of COVID-19 restrictions, 2021;
- European Commission; Climate Change and Major Projects, 2016.

8.3 Assessment Methodology and Significance Criteria

8.3.1 Assessment Methodology

The general EIA method takes a staged approach as set out in Table 8.1. First steps include identifying the baseline condition, key receptors and their sensitivity to potential effects. Following on from this, the potential magnitude of change and significance of effect on the identified receptors that could result from the Proposed Development in the absence of any mitigation is determined. If, as a result of the assessment, mitigation and

monitoring are considered necessary to reduce the significant environmental effects, mitigation is proposed and then a final further assessment is undertaken that incorporates those measures, with conclusions then presented on the likely residual effects.

Table 8.1: General Approach to Environmental Assessment

Stage	Activity
1	Establish baseline conditions – determine site history through review of historic records; assess existing published information and available site investigation results.
2	Establish the key receptors and sensitivity – determined through baseline studies.
3	Characterise the change to the receptor – determine the potential changes to receptors brought about by the proposals.
4	Assess the significance of effect – determined by the nature and scale of change, combined with the importance/sensitivity of receptor.
5	Consider the need for mitigation measures – determine the need for mitigation measures should the effect be considered to be unacceptable.
6	Assess the residual significance of effect (after mitigation).
7	Assess the need for monitoring and management – used where there is a need to monitor the success of any mitigation measures.

In line with recognised guidance for the assessment of air quality impacts, additional specific methods have been followed to assess impacts from the construction and operational phases of the Proposed Development. Further detail on the specific methodologies used is given below and in the associated appendix, as referenced.

Construction Phase

For the construction phase, a qualitative assessment of dust impact has been undertaken in line with IAQM 'Guidance on the assessment of dust from demolition and construction' (IAQM 2014). The assessment takes the sensitivity of the area and local receptors (human and ecological) into account and considers the recommended management and mitigation measures to avoid significant effects. The assessment steps for each considered dust impact are summarised below:

- Screen the requirement for a more detailed assessment;
- Assess the risk of dust impacts (deposition and human health) based on the potential dust emission magnitude and the sensitivity of the area; and
- Determine site-specific mitigation based on the risk of dust impacts identified.

The IAQM 2014 guidance assesses the need for detailed assessment based on the proximity of human and ecological receptors to the site and construction vehicle routes. As no relevant ecological receptors are located within the study area as defined by the IAQM 2014 guidance, assessment of potential effect on ecological receptors has been scoped out and is considered not significant.

The number of construction vehicles has not yet been defined but due to the size of the development it is not anticipated that the maximum number of Heavy Duty Vehicle (HDV) (>3.5 tonnes) Annual Average Daily traffic (AADT) movements during the construction period, will be above the threshold (100 AADT) for a quantitative assessment of construction traffic referred to in the IAQM 2017 planning guidance (table 6.2) or the 200 HDV AADT screening criteria defined in the Design Manual for Roads and Bridges (DMRB) (LA105 Air Quality, 2019).

Therefore, a quantitative assessment of construction vehicle emissions has not been undertaken and the effect of such emissions is considered not significant.

In line with IAQM 2014 guidance, the study area for the construction phase, when considering the effects of dust emissions on human receptors, is “up to 350 m from the boundary of the site or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).”

The full qualitative construction phase dust assessment methodology is provided in Appendix 8.1.

Operational Phase

The EPUK/IAQM 2017 guidance states that if any of the criteria listed in Table 8.2 under category A, coupled with any of those listed under category B, apply then an air quality assessment is required. If none of the criteria are met, the effects of the development site can be considered not significant.

Table 8.2: Criteria for Assessment of Air Quality to be Applicable

If any of the following apply: 10 or more residential units or a site area of more than 0.5 ha More than 1,000 m^2 of floor space for all other uses or a site area greater than 1 ha
Coupled with any of the following: The development has more than 10 parking spaces The development will have a centralised energy facility or other centralised combustion process

The total Site area is ca. 1.03 ha with an area of ca. 0.73 ha owned by the Applicant. The Proposed Development will comprise of 428 residential apartments and will be served by a ground floor level carpark, providing a total of 145 vehicular parking spaces.Therefore, the criteria in Table 3 are exceeded and an air quality assessment is required.

The guidance states that assessment should be in the form of a detailed air quality assessment covering areas where the criteria set out in Table 8.3 are met or exceeded.

Table 8.3: EPUK/IAQM Indicative Criteria for Requiring an Air Quality Assessment

The development will:	Criteria to proceed to an air quality assessment
1. Cause a significant change in Light Duty Vehicles (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans <3.5t gross vehicle weight).	A change of LDV flows of: More than 100 Annual Average Daily Traffic (AADT) within or adjacent to an AQMA; and/or More than 500 AADT elsewhere.
2. Cause a significant change in Heavy Duty Vehicles (HDV) traffic flows on local roads with relevant receptors. (HDV = goods vehicles and buses >3.5t gross vehicle weight).	A change of HDV flows of: More than 25 AADT within or adjacent to an AQMA; and/or More than 100 AADT elsewhere.
3. Realign roads, i.e., changing the proximity of receptors to traffic lanes.	Where the change is 5 m or more and the road is within an AQMA.
4. Introduce a new junction or remove an existing junction near to relevant receptors.	Applies to junctions that cause traffic to significantly change or vehicles to accelerate/decelerate, e.g., traffic lights, or roundabouts.
5. Introduce or change a bus station.	Where bus flow changes will change by: More than 25 AADT within or adjacent to an AQMA; and/or

The development will:	Criteria to proceed to an air quality assessment
	More than 100 AADT elsewhere.
6. Have an underground car park with extraction system.	The ventilation extract for the car park will be within 20 m of a relevant receptor. Coupled with the car park having more than 100 movements per day (total in and out).
7. Have one or more substantial combustion processes where there is a risk of impacts at relevant receptors. NB. This includes combustion plant associated with standby emergency generators (typically associated with centralised energy centres) and shipping.	Typically, any combustion plant where the single or combined NOx emission rate is less than 5 mg/s is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and or height of adjacent buildings, consideration will need to be given to potential impacts at much lower emission rates. Conversely, where existing NO_2 concentrations are low, and where dispersion conditions are favourable, a much higher emission rate may be acceptable.

In the case of the Proposed Development, a detailed air quality assessment is required due to the development meeting/exceeding criteria 1 in Table 8.3 above. It is understood that there will be no significant point source or fugitive emissions from the Proposed Development, and that the energy strategy, (IN2, Energy Analysis Report, 2021), for the Proposed Development will not have substantial emission to air. As such, consideration of air quality effects associated with operational activities on-site has been scoped out of the assessment.

A quantitative operational phase assessment of effects from road traffic emissions has been undertaken using the latest version (version 5.0.0.1) of CERC ADMS-Roads dispersion modelling software, in accordance with IAQM 2017 Guidance, to determine the potential effects of NO_2, PM_{10} and $PM_{2.5}$ at nearby sensitive receptors within the Study Area.

For human receptors, the Study Area for the operational phase assessment extends to 200 m either side of all 'affected roads' (as defined in the IAQM 2017 Guidance) – i.e., those meeting the criteria set out in Table 8.3 above. There are three basic steps in an air quality assessment:

- Assess the existing air quality in the study area (existing baseline);
- Predict the future air quality without the development in place (future baseline); and
- Predict the future air quality with the development in place (future with development).

The assessment quantifies total pollutant concentrations for the following scenarios:

Scenario 1: Current 2020 Baseline;

Scenario 2: Future 2038 Baseline - including natural growth; and

Scenario 3: Future 2038 with Development - including natural growth and the Proposed Development.

The full quantitative air dispersion modelling assessment methodology is provided in Appendix 8.2.

8.3.2 Evaluation Criteria

Construction Phase

In line with the IAQM 2014 guidance, the risk of dust arising in sufficient quantities to cause annoyance or health impacts has been determined using four risk categories: negligible, low, medium and high risk. The risk category allocation is undertaken independently for the three relevant types of dust releasing activities: earthworks, construction and trackout.

Sites are allocated a risk category based on two factors:

The scale and nature of the works, which determines the potential dust emission magnitude as small, medium or large (Step 2A); and

The sensitivity of the area to dust impacts, which is defined as low, medium or high (Step 2B).

These two factors are then combined in Step 2C to determine the risk of dust impact with no mitigation applied. A summary of the anticipated dust emission magnitude for each activity and the sensitivity of the surrounding area is provided in Table 8.4 and Table 8.5.

Table 8.4: Dust Emission Magnitude

Activity	Dust Emission Magnitude
Earthworks	Medium
Construction	Large
Trackout	Medium

Table 8.5: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	<24 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

To define the risk of impacts from dust soiling effects and human health impacts, the dust emission magnitude is combined with the sensitivity of the area using significance assessment matrices to determine the potential risk of dust impacts with no mitigation applied.

Full detail of the risk assessment and evaluation criteria used is included in the Construction Dust Assessment (Appendix 8.1).

Operational Phase

The Institute of Air Quality Management (IAQM) provides advice on descriptors of the impact of the change in air quality as a consequence of development (IAQM/EPUK 2017). The impact assessment criteria have been adopted in this study and are presented in Table 8.6.

Table 8.6: IAQM Impact Significance Descriptors

Long Term Average Concentration at Receptor	% 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% of AQAL	Negligible	Slight	Moderate	Moderate
95 – 102% of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109% of AQAL	Moderate	Moderate	Substantial	Substantial
110 or more of AQAL	Moderate	Substantial	Substantial	Substantial

The EPUK/IAQM guidance includes seven explanatory notes to accompany the assessment of effects. In particular, it is noted that descriptors are for individual receptors only and that the overall significance should be determined using professional judgement. Additionally, it is noted that it is *"unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainly which is why there is a category that has a range around the [AQS], rather than being exactly equal to it".*

The guidance sets out that a change in the predicted annual mean concentration of less than 0.5% (equating to 0.2 µg/m^3 for NO_2 and PM_{10}, and 0.12 µg/m^3 for $PM_{2.5}$) is considered negligible, regardless of the long-term average concentration. A negligible change would not be capable of having a direct effect on local air quality that could be considered to be significant.

The AQS values have been set at concentrations that provide protection to all members of society, including more vulnerable groups such as the very young, the elderly or the unwell. Therefore, the sensitivity of all identified receptors is considered equal and no further subdivision in terms of sensitivity is necessary.

8.3.3 Overall Classification of Effects

The classification of all reported effects is then considered in overall terms. The potential for the development site to contribute to, or interfere with, the successful implementation of policies and strategies for the management of local air quality is considered, as relevant, but the principal focus is any change in the likelihood of maintaining future compliance with the AQS.

In terms of the consequences of any adverse effects, an effect is reported as being either 'not significant' or as being 'significant'. If the overall effect of the development site on local air quality is found to be 'moderate' or

'substantial' this will be deemed to be 'significant'. Effects found to be 'slight' are considered to be 'not significant', although they may be a matter of local concern. Effects classed are 'negligible' are considered to be 'not significant'.

Assumptions and Limitations

- Traffic data for the purposes of the air quality assessment was generated by the transport consultant, AECOM. Golder has not independently verified the traffic data supplied to support this modelling assessment.
- The traffic assessment for the Proposed Development uses a future assessment year of 2038.

8.4 Baseline Conditions

8.4.1 Air Quality

Information relating to baseline air quality within the study area has been gathered from a review of available published sources and databases, including EPA monitored background data.

8.4.1.1 EPA Monitoring

A review of publicly available information identified that the Irish EPA do not operate background air quality monitoring within Sandyford or the immediate surrounds. However, the EPA do operate several continuous monitoring stations within Dublin (Zone A) at both urban and suburban locations.

Sandyford is a suburb of Dublin, so in the absence of local background data, the most recent annual mean data (2019) for NO_2, NO_x, PM_{10} and $PM_{2.5}$ from suburban monitoring locations in Dublin (Zone A) is presented in Table 7 below.

Table 7: Annual Mean Monitoring Data for Suburban Dublin Zone A Stations (2019)

	Monitoring Location	Concentration (µg/m^3)
NO_2	Swords	15
	Davitt Road	24
	Dun Laoghaire	15
	Blanchardstown	31
	Ballyfermot	20
	Average	**21**
NO_X	Swords	21
	Davitt Road	46
	Dun Laoghaire	27
	Blanchardstown	70
	Ballyfermot	28
	Average	**38.4**
PM_{10}	Dun Laoghaire	12
	Blanchardstown	19

	Monitoring Location	Concentration (µg/m³)
	Ballyfermot	14
	Tallaght	12
	Phoenix Park	11
	Average	**13.6**
$PM_{2.5}$	Ballyfermot	10
	Phoenix Park	8
	St Anne's Park	8
	Davitt Road	11
	Finglas	9
	Average	**9.2**

8.4.1.2 Project Specific Monitoring

A baseline NO_2 diffusion tube monitoring study would usually be undertaken at a number of roadside locations surrounding the site, to use for the validation of the air quality traffic modelling (should it be required). Due to the current Coronavirus (COVID-19) crisis, it is likely that traffic flows are currently reduced compared to the pre-COVID levels. The traffic count data collection was undertaken in February 2020 prior to the implementation of COVID travel restrictions and therefore more recent monitoring data will not be suitable for the validation of the traffic model. As a result, no Site visits were undertaken for Air Quality and Climate.

8.4.2 Climate

The Irish climate is subject to strong maritime influences, the effects decreasing with increasing distance from the Atlantic coast. The climate in the area of the Site is typical of the Irish climate, which is temperate maritime. The closest representative Met station is Dublin Airport weather station, which is located 17 km north of the site.

Monthly parameters recorded include minimum, maximum and mean air temperature, precipitation, wind speed, sunshine duration and relative humidity (Table 8.8 and Table 8.9). Hourly wind speed and direction have been summarised from daily data over 5 years (2015-2019).

Table 8.8: Dublin Airport recorded Temperature Information

Mean Air Temperature (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	4.6	4.1	5.8	7.8	9.8	13.3	14.1	14.1	12.0	10.5	8.9	8.7
2016	5.1	3.6	4.4	4.9	9.3	12.2	13.3	13.3	12.4	9.4	4.7	6.1
2017	5.0	5.3	6.7	6.7	10.0	12.2	12.9	12.6	10.9	10.4	5.7	4.7
2018	4.4	2.3	3.4	6.9	9.9	12.3	13.9	13.4	10.5	8.1	7.3	6.9
2019	4.5	6.0	5.8	6.8	8.6	10.7	13.8	13.5	11.6	8.0	5.6	5.2
Maximum Air Temperature (°C)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2015	14.3	11.8	14.0	17.3	17.7	24.2	22.6	22.6	16.7	17.1	16.6	15.2
2016	15.1	11.6	13.4	13.3	20.4	21.6	26.0	22.5	24.8	16.4	15.6	15.2

Mean Air Temperature (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	11.6	12.7	15.9	16.2	22.8	26.1	24.0	21.0	18.7	19.1	13.9	13.5
2018	12.8	11.4	11.7	18.1	22.1	26.2	26.3	24.6	22.7	19.2	15.1	13.0
2019	11.1	15.0	16.8	21.1	20.7	22.5	23.9	21.9	20.0	15.9	13.2	13.4
Minimum Air Temperature (°C)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2015	-5.6	-7.7	-3.7	-2.4	1.1	1.1	4.5	4.2	4.3	-0.2	-0.8	-1.5
2016	-0.7	-4.8	-3.6	-2.0	2.2	3.3	7.4	6.5	5.4	2.1	-2.5	-2.2
2017	-4.0	-3.4	-1.0	-1.0	-0.9	3.8	6.2	5.9	4.7	1.2	-0.3	-4.4
2018	-2.7	-4.5	-4.8	-1.3	0.6	3.9	5.7	4.0	1.0	-3.9	1.3	0.9
2019	-5.6	-3.3	-1.8	-1.3	-0.6	2.0	4.7	8.1	4.3	-0.9	-2.2	-2.8

Table 8.9: Dublin Airport recorded Climate Information

Precipitation (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	47.7	34.6	57.5	43.9	90.5	14.1	69.2	100.1	56.6	49.1	121.6	193.5
2016	118.3	59.8	36.3	88.2	46.8	58.2	44	61.9	56.6	60	36.9	45.7
2017	22.8	41.6	67.2	10	43.5	86.4	42.2	73.2	82.3	47.8	81.5	63.1
2018	93.1	27	96.3	68.9	19.1	4.8	40	48	43.8	42.6	131.2	81
2019	26.8	30.5	92.5	74.6	33.4	82.9	41	91.9	104.4	76.4	173.9	57.7
Mean Wind Speed (knot)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2015	15.1	10.7	12.9	9.4	12.6	10.6	10.5	9.2	9.0	8.6	13.6	14.9
2016	13.2	13.2	10.6	10.6	9.5	7.7	10.3	10.8	10.3	9.4	10.6	9.8
2017	10.4	13.4	11.8	9.5	9.5	11.0	9.8	10.0	10.9	12.2	10.8	12.4
2018	14.8	11.9	12.3	10.8	8.8	8.7	6.9	8.1	9.0	9.2	10.1	9.5
2019	9.3	10.3	11.3	9.3	7.8	8.2	8.0	8.8	8.8	8.8	9.4	9.2
Sunshine duration (hours)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2015	92.4	79.2	155.9	229.9	165.9	204.3	134.5	158.1	136.4	88.4	54.5	48.4
2016	66.4	79.7	121.8	148.1	209.1	142.8	128.4	137.3	112.4	107.7	97.5	60.6
2017	57.4	51.1	127.7	99.1	224.3	161.5	166.0	120.5	128.7	73.9	87.0	59.1
2018	73.3	108.9	81.7	144.0	224.0	268.6	182.5	121.5	136.2	120.6	50.2	30.5
2019	46.8	112.4	132.6	123.7	139.0	159.8	166.9	173.4	144.0	113.2	41.3	60.0
Mean Relative Humidity (%)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2015	85.6	87.3	80.3	79.7	79.4	73.4	78.8	79.5	83.4	85.5	87.8	85.1
2016	87.1	83.3	77.5	77.1	75.7	80.2	76.9	78.9	78.5	83.4	84.8	85.6
2017	85.5	84.1	82.7	77.4	77.2	77.8	78.9	80.2	83.6	85.5	86.8	88.8
2018	85.3	81.0	84.5	82.5	76.7	73.2	75.3	79.2	78.6	81.2	83.0	87.1
2019	85.6	80.3	80.0	80.3	77.5	79.6	78.4	81.1	83.4	84.0	89.1	85.8

The information presented in Table 8.8 and Table 8.9 above provides an overview of the climatic conditions at the Site. Over the time period for which data is provided, the wettest months in terms of total rainfall for the period are November and December. High rainfall in these months provides natural dampening for potential dust emissions. The opposite impact occurs in windy months, with the potential for dust to be carried further. The months with the highest mean wind speed above are January, February and March. Similarly, dry weather can lead to greater potential for dust emissions. The data shown indicates that the driest months in the Site area are February and May.

An important meteorological parameter with regard to the dilution and dispersal of air pollutants is wind speed and direction. A wind-rose for the Dublin Airport station is presented in Figure 8.2 for the period 01 January 2020 to 31 December 2020. It is evident that the prevailing winds are from the west and south-westerly direction. A more detailed insight into the wind data is provided in Chapter 12.

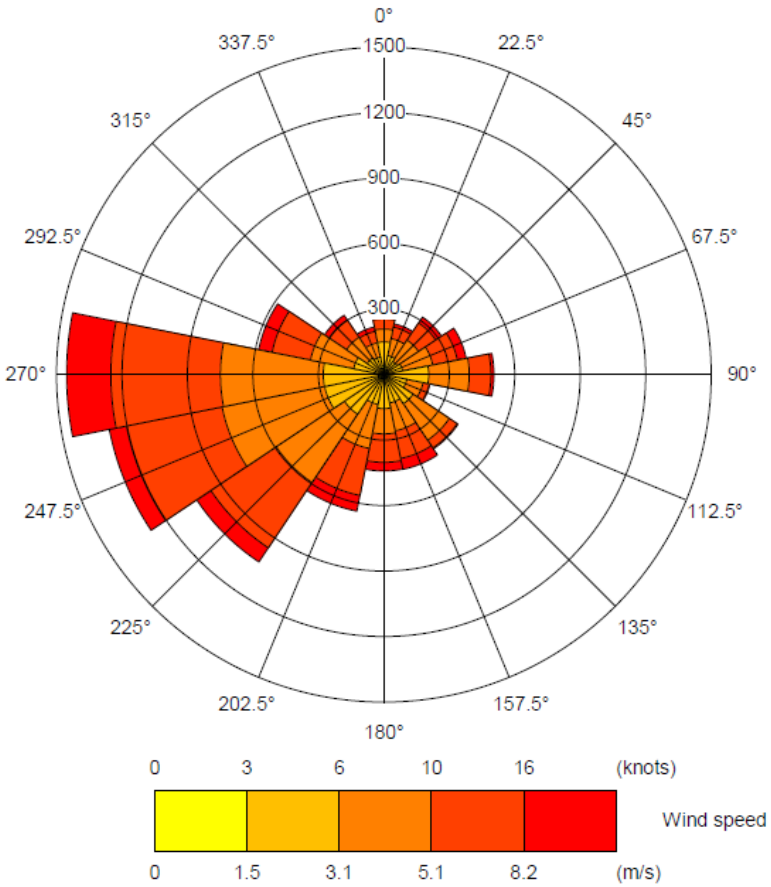

Figure 8.2: Annual dominant wind direction at Dublin Airport using Hourly Wind Data (Assessment Period 1 January 2020 to 31 December 2020)

8.4.3 Receptors

The IAQM guidance document, Land-Use Planning and Development Control: Planning for Air Quality (2017) contains a method for evaluating impact magnitude and determining significance of impacts and standard descriptors. The significance of impacts is assessed based on sensitive receptors which represent locations where people are likely to be present for a period of time. These locations are consistent with the air quality standards, and are based on effects on human health or loss of amenity and have varying sensitivity based on the receptor type.

The receptor locations used in this assessment are presented in Figure 8.3 and Figure 8.4.

Construction Phase

The construction phase assessment required assessment of risk at receptors falling within the following category:

- A human receptor within 350 m of the boundary of the site or 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

There are approximately 20 residential, health, and leisure receptors within 350 m of the Site boundary and within 50 m of applicable construction routes. This number includes buildings, e.g., apartment blocks and not the individual residences contained within these.

Human receptors are largely apartment blocks located to the east, west and northwest of the Site (e.g., Time Place Apartment Building to the west and South-Central Apartments to the north west) and the edge of Tipperstown located to the east of the Site at the edge of the study area. There are a small number of health facilities located within 100 m of the Site boundary and there are many commercial receptors located at various distances and directions from the Site boundary. There is an auto sales centre located approximately 100 m to the north, which would be particularly sensitive to the effects of dust soiling.

The nearest human receptor to the Site is a health facility (MedLab Pathology) located approximately 40 m east of the Site boundary area. The nearest residential receptor to the Site is an apartment block (The Forum) located approximately 120 m north of the Site boundary area. There are places of work (commercial and industrial) which are located close (less than 20 m) to the Site boundary. Dust will be generated during construction of the Proposed Development, which may have adverse effects on local sensitive receptors (e.g., residents living nearby).

The construction dust assessment study area including identified receptors is included below as Figure 8.3.

A qualitative assessment of construction dust has been undertaken in line with the IAQM 2014 guidance. The study area for this assessment was 350 m from the Proposed Development boundary and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrance.

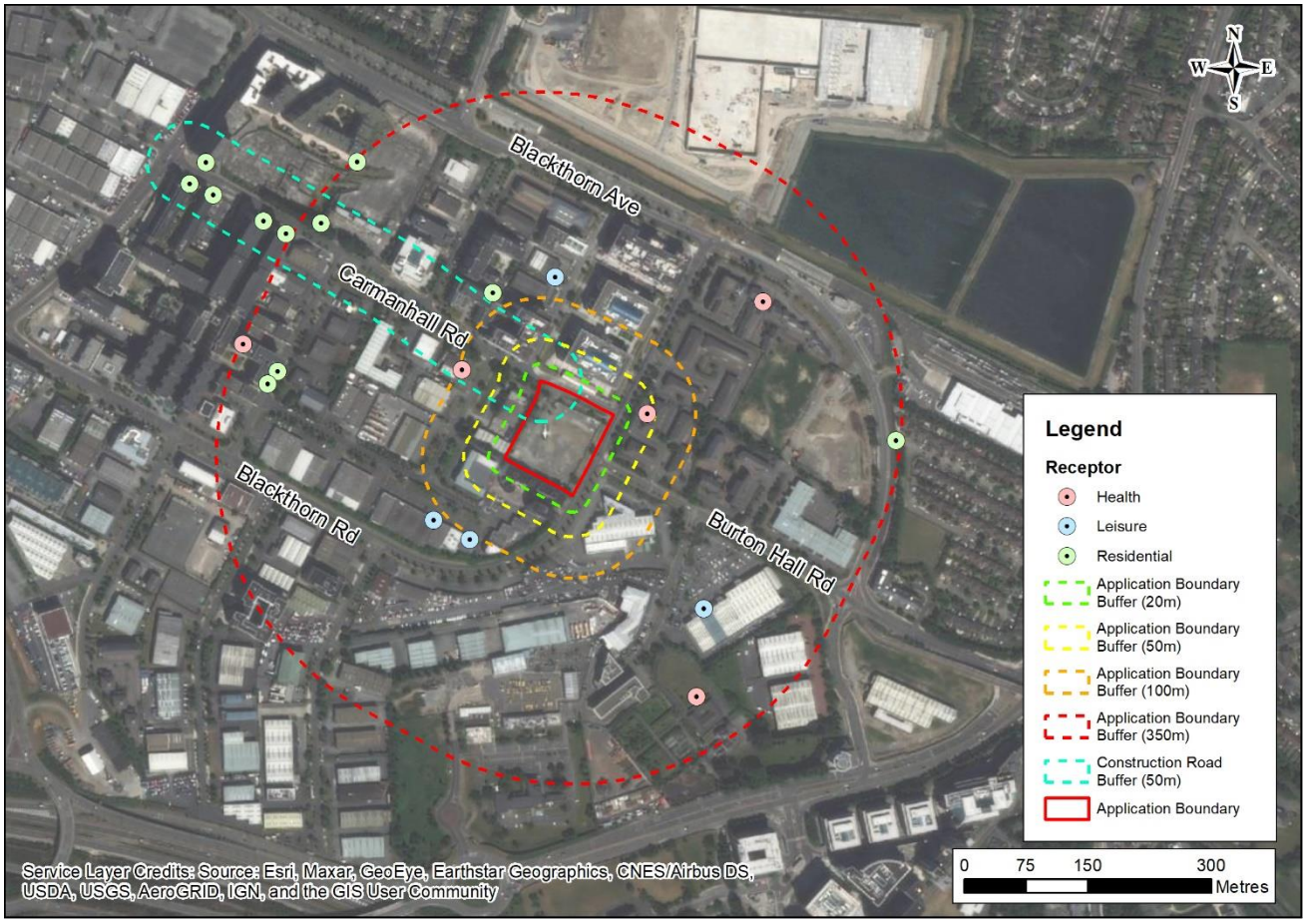

Figure 8.3: Construction Dust Assessment Study Area and Identified Receptors

Operational Phase

The operational phase assessment required the modelling of ground level pollutant concentrations at identified sensitive human receptors within 200 m of modelled roads.

All sensitive receptors were selected to represent locations where people are likely to be present for a period of time consistent with the air quality standards, and are based on effects on human health. The AQSs have been set at concentrations that provide protection to all members of the public, including more vulnerable groups such as the very young, elderly or unwell. As such, the sensitivity of receptors was considered in the definition of the values and therefore no additional subdivision of human health receptors on the basis of building or location type is necessary.

The air quality sensitive receptors used in this assessment are those that correspond to existing residential receptors where the short-term (hourly and daily means) and annual mean standards are relevant. Health and leisure facilities are also included as the short-term standards may be relevant at these locations. The receptors used in this assessment are detailed in Appendix 8.2 and illustrated on Figure 8.4 .

Each of the receptors chosen represents the maximum level of exposure that could be experienced at other similar receptors in their vicinity.

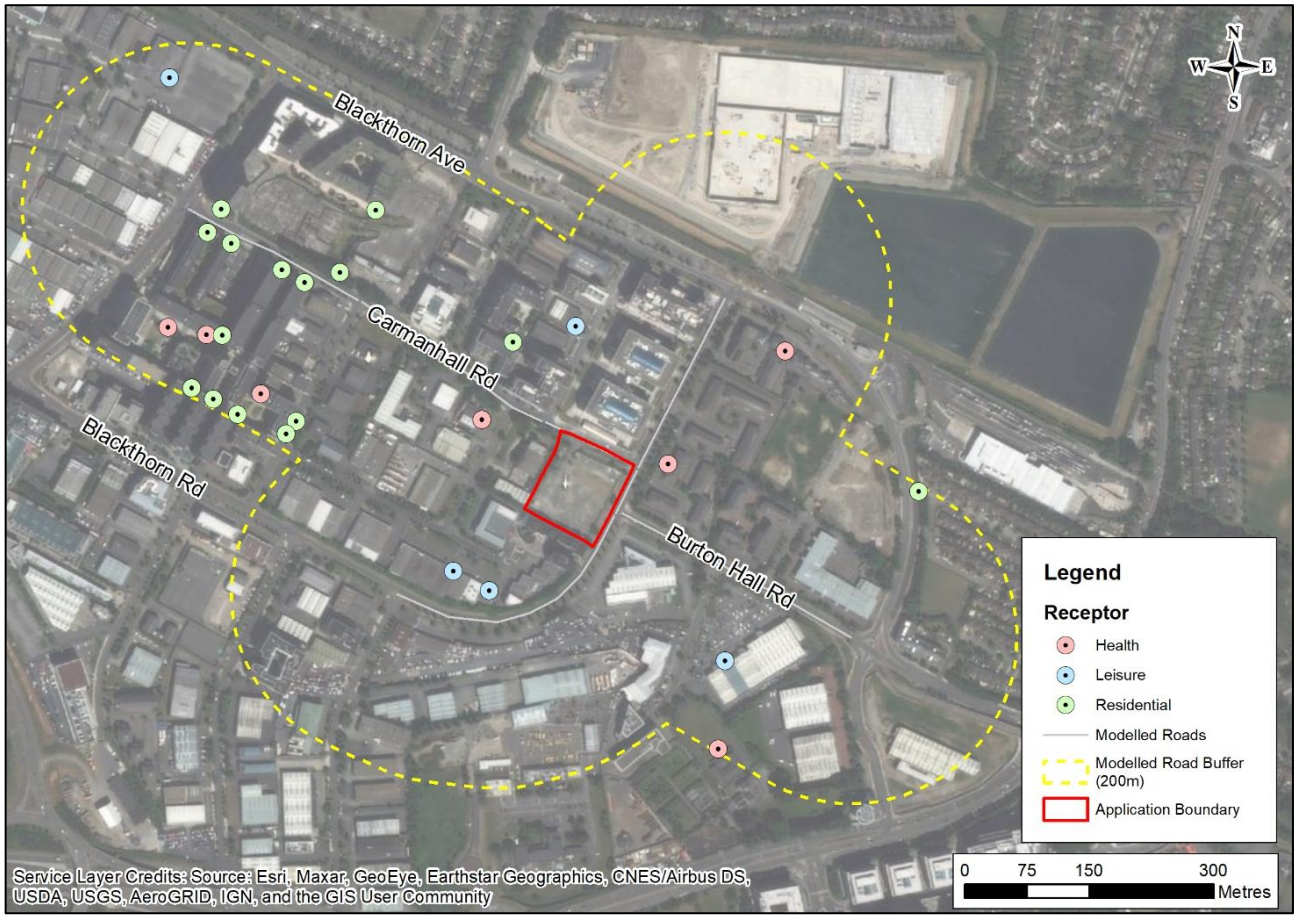

Figure 8.4: Operational Scenarios Air Quality Assessment Study Area and Identified Receptors

8.5 Potential Effects

8.5.1 Construction Phase

8.5.1.1 Emissions magnitude

This section presents an assessment of the potential sources of change to the air quality receptors and the assigned magnitude of change of each. The detailed construction dust risk assessment is included in Appendix 8.1. The potential dust emission magnitude is based on the scale of the anticipated works and associated activities and classified as small, medium or large, as defined in the IAQM 2014 guidance, as follows:

Earthworks

The earthworks activities expected at the Proposed Development in conjunction with construction have been classified as medium magnitude based on the following:

- The total development gross external area is anticipated to be between 2,500 to 10,000 m^2;
- There are likely to be 5 to 10 heavy earth moving vehicles active at any one time; and
- There is no soil cover mapped for the Proposed Development; only made ground and below this Glacial Till/Boulder Clay has been found to be present, which are unlikely to be prone to suspension when dry.

Construction

The construction activities expected at the Proposed Development have been classified as large magnitude based on the following:

- The total building volume being constructed is likely to be more than 100,000 m^3; and

- Construction materials will include some potentially dusty construction materials including stone and brick in addition to steel, metal cladding and glazing, which have a low dust generating potential.

Trackout

The trackout activities expected at the Proposed Development have been classified as medium magnitude based on the following:

- Worked surface materials will have a low potential for dust release (made ground and glacial till/ boulder clay); and
- The number of outward movements associated with the construction phase are not yet known but as no demolition works are being undertaken as part of the Proposed Development, it would be anticipated to average 10-50 HDV movements per day, although the exit roads are paved, therefore minimising the potential for resuspension.

8.5.1.2 Sensitivity of the Area

Based on the type, number and location of receptors (detailed in Section 8.4.3) the sensitivity of the area to dust soiling effects on people and property has been determined as medium for earthworks and construction due to the presence of 1 to 10 commercial and industrial receptors (medium receptor sensitivity) located within 20 m of the Proposed Development boundary. There are residential properties (high receptor sensitivity) located within 350 m of the Proposed Development boundary, but due to the distance from the boundary these generate a low sensitivity classification.

The sensitivity of the area to dust soiling effects on people and property has been determined as high for trackout due to the presence of >100 residential receptors (high receptor sensitivity) in 5 apartment buildings located within 20 m of the construction route. This classification takes a worst-case approach and assesses effects based on the closest receptors within 20 m of the development boundary or the construction route.

Publicly available EPA background data[1] has been reviewed for similar Zone A air quality areas in the absence of up-to-date background data for Sandyford. The data gives an average annual PM_{10} concentration of 13.6 $\mu g/m^3$. The sensitivity of the study area to human health impacts has therefore been determined as low for earthworks and construction due to the presence of 1 to 10 commercial and industrial receptors (medium receptor sensitivity) located within 20 m of the Proposed Development boundary. There are residential properties (high receptor sensitivity) located within 350 m of the development boundary, but due to the distance from the boundary these generate a low sensitivity classification.

8.5.1.3 Risk of impacts

To define the risk of impacts from either dust soiling effects and human health impacts, the dust emission magnitude (Section 8.5.1.1) has been combined with the sensitivity of the area (Section 8.5.1.2) to determine that prior to mitigation the risk of impacts of dust soiling and human health is **medium to low** for earthworks, construction, and trackout activities associated with the Site.

8.5.2 Operational Phase

A detailed air quality assessment has been undertaken using the latest version of CERC ADMS-Roads dispersion modelling software (version 5.0.0.1), to predict concentrations of NO_2, PM_{10} and $PM_{2.5}$ at identified sensitive receptors. The following modelled scenarios were assessed:

[1] https://www.epa.ie/media/Summary%20Data%20Tables%20-%202019.pdf

- Current Baseline - Operational Scenario 001: 2020 Baseline (assuming 2020 vehicle emissions data, 2019 background pollutant concentrations and modelled using 2020 meteorological data as the most recent full calendar year available);
- Future Baseline 2038 Concentrations Without Proposed Development, Do Nothing Scenario - Operational Scenario 002: 2038 Future Baseline: 2038 fully operational year, with no Proposed Development traffic (assuming 2020 vehicle emissions data for conservatism, 2019 background pollutant concentrations and 2020 meteorological data); and
- Future 2038 With Proposed Development, Do Something Scenario - Operational Scenario 003: 2038 Future with Development: 2038 fully operational year, with Proposed Development traffic (assuming 2020 vehicle emissions data for conservatism, 2019 background pollutant concentrations and 2020 meteorological data).

The description of the effect at each receptor takes into account the predicted change in concentration, in the context of the total concentration at that receptor and its relationship to the AQS value.

Future Baseline 2038 Concentrations Without Proposed Development

The future baseline without-development scenario included future traffic flows on the modelled roads based on projected natural growth (see Appendix 8.2 for further details).

The change in predicted concentrations between the Current (2020) Baseline and Future (2038) Baseline concentrations are determined through the change in predicted concentrations for Operational Scenarios 001 and 002.

For NO_2, the results indicate that the 2038 Future Baseline will result in a very slight increase (maximum 1.42%) in annual average NO_2 concentrations when compared to the 2020 Current Baseline for all modelled receptors. For the Future 2038 Baseline, annual average NO_2 concentrations are predicted to remain at less than 54% of the AQS of 40 µg/m^3 for all receptors.

For PM_{10}, the model results indicate an overall negligible increase (maximum 0.52%) in PM_{10} concentrations between the Current 2020 Baseline and the Future 2038 Baseline. Predicted concentrations at all receptor locations in both scenarios are less than 35% of the AQS of 40 µg/m^3.

For $PM_{2.5}$, the model results indicate an overall negligible increase (maximum 0.45%) in $PM_{2.5}$ concentrations between the Current 2020 Baseline and the Future 2038 Baseline. Predicted concentrations at all receptor locations are 37% of the AQS of 25 µg/m^3.

Future 2038 With Proposed Development

The future with-development scenario (Operational Scenario 003) included the Future 2038 baseline traffic flows combined with the additional traffic generated by the Proposed Development.

The change in predicted concentrations between the Future 2038 Baseline and the Future 2038 With Development concentrations are determined through the change in predicted concentrations for operational Scenarios 002 and 003.

For NO_2, the model results indicate that operation of the Proposed Development produces a negligible change (maximum 0.35%) in NO_2 concentrations at all receptors when compared with the Future 2038 Baseline. Predicted concentrations at all receptor locations are less than 58% of the AQS of 40 µg/m^3.

For PM_{10}, the model results indicate that operation of the Proposed Development produces a negligible change (maximum 0.14%) in PM_{10} concentrations at all receptors when compared with the Future 2038 Baseline. Predicted concentrations at all receptor locations are less than 36% of AQS of 40 µg/m^3.

For $PM_{2.5}$, the model results indicate that operation of the Proposed Development produces a negligible change (maximum 0.12%) in $PM_{2.5}$ concentrations at all receptors when compared with the Future 2038 Baseline. Predicted concentrations at all receptors are less than 37% of AQS of 25 µg/m^3.

The impact of the change in air quality is assessed in accordance with the criteria set out in Table 8.6 In all cases the predicted change in air quality concentrations is **negligible**. The change in traffic linked to the Proposed Development will thus have an impact on air quality but will not significantly change the pollutant concentrations in the area:

- For NO_2, the model indicates that ambient concentrations will be below the annual mean objective of 40 µg/m^3 for all receptors, with all concentrations below 58% of the AQS. Accordingly, the predicted impact is classified as **negligible**.
- For PM_{10}, the model indicates that ambient concentrations will be below the annual mean objective of 40 µg/m^3 for all receptors, with concentrations below 36% of the AQS. Accordingly, the predicted impact is classified as **negligible**.
- For $PM_{2.5}$, the model indicates that ambient concentrations will be below the annual mean objective of 25 µg/m^3 for all receptors, with concentrations below 38% of the AQS. Accordingly, the predicted impact is classified as **negligible**.

As the predicted impact from operational traffic emissions is negligible, based on the criteria defined in section 1.3.2, Table 8.6, the impact is classified as not significant and therefore no mitigation measures are required.

8.6 Air Quality Mitigation and Management

8.6.1 Construction Phase

Site-specific mitigation measures appropriate to the level of dust risk are defined below in Table 8.10 and in Section 5.3 of the construction dust risk assessment. The mandatory and recommended measures will be included in the Construction Environmental Management Plan (CEMP) and agreed with the Dún Laoghaire Rathdown County Council Environmental Health Officer prior to construction works commencing.

Construction works will be dependent on detailed information such as construction methods and schedules which will be devised by the Main Contractor upon appointment. Following the completion of a detailed construction programme the appointed Main Contractor will incorporate a Dust Management Plan (DMP) into their updated CEMP. Once the construction methods are identified the DMP identify measures appropriate to the level of anticipated dust risk from the construction activities.

Table 8.10: Required Site-Specific Mitigation Measures

Activity	Mitigation Measure	Implementation Level
Communication	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	Mandatory
	Display the name and contact details of person(s) accountable for air quality and dust issues on the Site boundary.	Mandatory
	Display the head or regional office contact information.	Mandatory

Activity	Mitigation Measure	Implementation Level
	Develop and implement a DMP appropriate to the level of anticipated dust risk and detailing mitigation measures during construction activities.	Mandatory
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.	Mandatory
	Make the complaints log available to the Dún Laoghaire Rathdown County Council when asked.	Mandatory
	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.	Mandatory
Monitoring	Undertake daily on and offsite inspection, where receptors are nearby, to monitor dust, record inspection results and make the log available to the Dún Laoghaire Rathdown County Council when asked. This could include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of the boundary, with cleaning to be provided if necessary.	Recommended
	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to Dún Laoghaire Rathdown County Council if requested.	Mandatory
	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.	Mandatory
	If required by the DMP, agree any dust deposition monitoring locations with Dún Laoghaire Rathdown County Council. As required, where possible commence baseline monitoring at least three months before work commences.	Mandatory
Preparing and maintaining the Site	Plan site layout so that machinery and dust causing activities including stockpiling are located away from receptors, as far as is possible.	Mandatory
	Erect solid screens or barriers around dusty activities or the site boundary which are at least as high as any stockpiles on site.	Mandatory

Activity	Mitigation Measure	Implementation Level
	Fully enclose site or specific operations, where possible, when there is a high potential for dust production.	Mandatory
	Avoid site runoff of water or mud.	Mandatory
	Keep site fencing, barriers and scaffolding clean using wet methods.	Mandatory
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on-site.	Mandatory
	Cover seed or fence stockpiles to prevent wind shipping.	Mandatory
Operating vehicle/ machinery and sustainable travel	Ensure all vehicles switch off engines when stationary – no idling vehicles.	Mandatory
	Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.	Mandatory
	Impose and signpost a maximum speed limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas.	Recommended
Construction Activities	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.	Mandatory
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	Mandatory
	Use enclosed chutes and conveyors and covered skips.	Mandatory
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	Mandatory
	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.	Mandatory
Waste Management	Avoid bonfires and burning of waste materials.	Mandatory

Activity	Mitigation Measure	Implementation Level
Earthworks	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	Recommended
	Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.	Recommended
	Only remove the cover in small areas during work and not all at once.	Recommended
General Construction	Avoid Scabbling (roughening of concrete surfaces)	Recommended
	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.	Mandatory
	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	Recommended
	For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.	Recommended
Trackout	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site.	Recommended
	Avoid dry sweeping of large areas.	Recommended
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	Recommended
	Record all inspections of haul routes and any subsequent action in a site log book.	Recommended
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	Recommended

8.6.2 Operational Phase

It is considered that the use of 2019 background concentrations and 2019 emission factors in this assessment is conservative and that no further mitigation of emissions from operational road traffic associated with the Proposed Development is necessary.

8.7 Air Quality Residual Effects

8.7.1 Construction Phase

Following the application of the site-specific mitigation measures set out in Appendix 8.1, it is considered that the residual effects associated with the construction phase of the Proposed Development will be not significant.

8.7.2 Operational Phase

As no site-specific mitigation measures are required, it is considered that the residual effects associated with the operational phase of the Proposed Development will be not significant.

8.8 Climate Factors

This section considers climate change resilience and adaptation, i.e., how the Proposed Development may interact with a changing climate and whether this interaction could result in significant environmental effects.

The contribution of the Proposed Development to climate change is also a requirement of the assessment of climate change resilience and adaptation of a development. The assessment will consider the potential climate impacts during construction and the operational phases.

8.8.1 Climate at the Site

The Irish climate is subject to strong maritime influences, the effects decreasing with increasing distance from the Atlantic coast. The climate in the area of the Application Site is typical of the Irish climate, which is temperate maritime.

8.8.2 Climate Change Impacts for Ireland

The EPA has identified a number of potential impacts for Ireland from climate change. Such changes are expected to include:

- Storm surges and waves. Storm surge events are expected to increase in frequency, with significant increases to be observed on the western coast of the country during the winter months. Average wave heights are expected to increase on the north-west coast of the country by approximately 10%.
- Weather extremes. The prediction of such weather extremes is difficult to predict however, additional energy trapped in the atmosphere by greenhouse gases is likely to continue to stimulate greater atmospheric volatility in Ireland.
- Fluvial flooding. Although it is difficult to predict it is expected that increases in the seasonality extremes will occur with increasing run-off to catchments in winter and decreasing flows in summer. This will result in significant consequences for the management of flood defences, water supplies, waste treatment and biodiversity conservation.
- Sea level rise. The EPA has noted that satellite altimetry has identified a rise of around 3.5 cm per decade in the seas around Ireland, which is in line with the IPCC's global projections. Further increases in sea levels would present as a substantial increase in sea levels globally. This would have significant implications for low lying coastal regions throughout the world and in Ireland.
- Precipitation. Similar to other climate variables precipitation is expected to become heavier during autumn and winter months by the end of the century, while summers are likely to become substantially drier over the same period. The EPA has noted that the accuracy of model projection can be difficult to verify however rainfall in winter/autumn is projected to increase by up to 25% and decline by up to 18% in the summer period.

- Sea temperatures. Sea temperatures around Ireland have been shown to increase by 0.3 to 0.4ºC per decade. Changes of this magnitude will have a significant effect on maritime ecosystems and economies through effects on commercial fish species.

The most applicable climate variable and hazards for the site, as identified by the EPA, include weather extremes, fluvial flooding and precipitation. Climate change factors such as ocean acidification, sea-level rise and storm surges and waves have been scoped out of this climate assessment, due to the location of the Proposed Development.

Factors in relation to the EIAR study areas have also been incorporated into the evaluation below, these include, air quality, noise, landscape and visual, water and flood risk, geology and ecology and biodiversity.

The assessment considers aspects of the Proposed Development that are potentially vulnerable to the effects of climate change. Where relevant aspects have been identified, these can be mitigated through embedded mitigation, monitoring or other measures; and also the impact on environmental receptors sensitive to climate change.

8.8.3 Effect of Climate Change on the Proposed Development

8.8.3.1 Construction

Based on the temporal nature of the construction phase of the Proposed Development (approximately 24 months), impacts of climate are deemed to be short- term and not significant

8.8.3.2 Operation

Air Quality

An increase in summer and winter rainfall volume and periods of higher intensity rainfall (storms) could lead to increased dust dampening and suppression. This would result in less dispersion of dust as the increased rainfall would result in particles being less available to be entrained by the air.

In the summer, higher air temperatures could result in changes to chemical reactions which occur in the atmosphere. If temperatures increase, there could be an increase in photochemical reactions in the atmosphere. This could lead to an increase in ozone concentrations in the atmosphere.

Increases in temperature may also trigger an increase in the demand for cooling of buildings, including air conditioning, which may result in increased carbon and greenhouse gas emissions through increased energy demand.

Increases in wind speed could change the dispersion patterns of pollutants.

Due to the scale of the Proposed Development, the temporal nature of the construction period (approximately 24 months) and the limited relevant predicted climatic changes over the anticipated life of the project, impacts of climate on air quality are deemed to be not- significant.

Noise

The projected windier, wetter and warmer environment is not anticipated to result in any significant change to future noise or vibration levels arising from the Proposed Development.

Landscape and Visual

The predicted seasonal variations in rainfall i.e., wetter winters and drier summers could create unfavourable conditions for the establishment of trees and shrubs, particularly during prolonged periods of drought, or where waterlogging of the ground persists. This could increase plant mortality and the effectiveness of screening

around the periphery of the development area, along with potential increased on-going maintenance costs. The impacts are deemed to be minor to insignificant.

Water and Flood Risk

In the future, increases in winter rainfall volume and periods of higher intensity rainfall (storms) could lead to increased runoff, greater surface water flows and more incidents of flooding. In summary, current predictions suggest that flashier floods in summer and bigger floods in winter could be expected.

In the summer, higher air temperatures could lead to higher surface water temperatures leading to greater evaporation and reduced flows. Rainfall could be less and more intense leading to potential increases in erosion and suspended solid concentrations during sudden high intensity rainfall events on dry ground. Less overall summer rainfall could also lead to lower flows in watercourses and possibly poorer quality (i.e., caused by changes in land use and the quality of runoff). Changes in surface water flow regime through the year caused by changes in rainfall distribution could alter the mobility and dilution of nutrients and contaminants (i.e., lower dilution in summer due to lower flow rates would result in higher concentrations, and lower flow rates could lead to algal blooms and lower oxygen). Lower summer flows and water levels also have the potential to result in reduced surface water resource available.

The susceptibility of the Proposed Development to fluvial flooding has been considered in Chapter 8 Water. Although the Proposed Development is currently not mapped as at risk of flooding and categorised as low risk Flood Zone C, climate change could alter flood risk and flood damage due to changes in surface water flows and flood plain storage and also flood risk from groundwater flooding. The potential for future change in flood risk is already incorporated into the embedded design mitigation, so no further consideration is required in this climate change assessment. Impacts are deemed to be not significant.

Geology, Ground Conditions and Groundwater

There are no geological heritage sites or mineral sites within the geology study area, and changes in rainfall, temperature and wind are not anticipated to result in any change to geological conditions that could affect the Proposed Development.

In terms of ground conditions and groundwater, higher air temperatures and windier conditions could result in higher evaporation and reduced soil saturation. Reduced soil saturation in drier and warmer summers could lead to reduced groundwater recharge in the summer, and the winter groundwater recharge period could be shortened due to autumn and winter rainfall balancing the soil moisture deficit before recharging groundwater. This may be compensated to some extent by increased winter rainfall. However, aquifers are recharged more effectively by prolonged steady rain, so changes in rainfall regimes could lead to more runoff to surface water rather than recharge to ground during higher intensity summer and winter rainfall events.

If recharge and groundwater levels were to decrease, there could be increased frequency and severity of groundwater droughts. Conversely, if groundwater recharge increases at certain times of the year there could be an increase in the frequency and severity of groundwater-related floods. If groundwater levels in contaminated ground rise due to climate change, this could lead to the mobilisation of historical contamination that was previously above groundwater level highs, which could impact baseline groundwater quality and ground quality.

Higher future temperatures and the potential reduction in the availability of surface water resources could also lead to a greater demand on groundwater resources for urban/industrial supplies and agricultural irrigation. However, improvements in water use efficiency may also take place in parallel with climate change.

Due to the scale of the Proposed Development and the predicted climatic changes over the anticipated life of the project, impacts of climate on air quality are deemed to be not- significant.

Ecology and Biodiversity

Climate change presents a risk to native wildlife and to the ecosystem services provided by natural capital, for example clean water.

At a local level (i.e., the spatial extent of the assessment defined for the Proposed Development), the projected windier, wetter and warmer environment is not expected to result in any measurable positive or negative change to the baseline biodiversity features of the Proposed Development, therefore impacts are deemed to be not significant.

8.8.4 Climate Mitigation and Monitoring

Air Quality

No additional air quality mitigation or monitoring is required as a result of potential climate change effects.

Noise

No additional noise mitigation or monitoring is required as a result of potential climate change effects.

Landscape and Visual

Consideration should be given to the inclusion of drought and water tolerant species in the perimeter planting mixes. This would minimise plant losses and maintain landscape and visual amenity.

Any dead or defective plants should be replaced annually as part of the ongoing site maintenance. No additional mitigation or monitoring is required as a result of climate change effects.

Water and Flood Risk

No additional water resources or flood risk mitigation or monitoring is required as a result of potential climate change effects.

Geology, Ground Conditions and Groundwater

No additional ground conditions or groundwater mitigation or monitoring is required as a result of potential climate change effects.

Ecology and Biodiversity

No additional ecology or biodiversity mitigation or monitoring is required as a result of potential climate change effects.

8.8.5 Residual Climate Effects

Air Quality

There will be no change to the identified residual air quality effects as a result of potential climate change effects.

Noise

There will be no change to the identified residual noise effects as a result of potential climate change effects.

Landscape and Visual

The potential changes to the landscape or to views experienced by nearby receptors, as a result of climate change, would be fully mitigated by the mitigation measures proposed. There would be no change to the residual landscape or visual effects identified.

Water and Flood Risk

There will be no change to the identified residual water resources and flood risk effects as a result of potential climate change effects.

Geology, Ground Conditions and Groundwater

There will be no change to the identified geology, ground conditions or groundwater effects as a result of potential climate change effects.

Ecology and Biodiversity

There will be no change to the identified residual ecology and biodiversity effects as a result of potential climate change effects.

8.8.6 Greenhouse Gas

There is the potential for greenhouse gases to be generated during both the construction and operational phases of the Proposed Development.

Primary sources of direct GHGs in the construction phase (approximately 24 months duration) will likely include vehicle movements, plant operation, waste disposal, and water and energy use. There will also be indirect sources of GHG emissions through the manufacture of the construction materials. Estimated vehicle movements associated with construction vehicles are estimated to generate approximately 1.45 Kilo tonnes carbon dioxide equivalent (Kt CO_{2e}) per annum based on the estimated construction HDV and LDV AADT data. This assumes diesel HDVs with an average one- way trip length of 50 km one way laden and one unladen. For LDVs the average trip length is assumed to be 30 km. The generation of GHGs during the construction phase will be short duration and therefore the impacts are considered to be not significant.

Operational direct sources of GHG will include vehicle movements, waste disposal, and energy and water use associated with the Proposed Development. Energy efficiency and reduction measures are inherent in the Proposed Development design, which will aid the reduction of operational GHG emissions throughout the life of the development. Operational phase annual GHG emissions associated with the estimated vehicle movements are estimated to be approximately 3.24 Kt CO_{2e} assuming an average one- way trip distance of 50 km. The figures are expressed as annual amounts as the expected lifespan of the Proposed Development is unknown.

The assessment of GHG emissions has required assumptions to be made as some values are currently projected as they cannot be known with complete certainty at this stage. The emission factors used have been sourced from the DEFRA (2018) Greenhouse Gas Reporting Conversion Factors which are designed for emissions reporting. The most appropriate conversion factor has been selected for each activity to represent the resulting emissions as best as possible. However, there will be some discrepancies in the results – such as for car traffic data, as 'average' car conversion factors have been used. Where available, data has been sourced directly such as the projected AADT data for the operational phase. Where data was not available assumptions have been made regarding traffic travel distances.

Ireland's Greenhouse Gas Emissions Projections (EPA, 2020) estimate that annual emissions for 2021 for the road transport sector will be 12246.5 Kt CO_{2e} and the residential sector 6232.2 Kt CO_{2e}. The estimated emissions relating to the Proposed Development traffic are less than 0.03% and 0.05% respectively of the EPA projections for road transport and residential. It should be noted that this data relates to Irish emissions pre COVID-19 and does not include the findings of the 2021 EPA report on the Impact on 2020 greenhouse gas emissions of COVID-19 restrictions, which has seen a decrease in transport emissions and an increase in residential emissions during restrictions. These findings have not been incorporated due to the length of the construction and operational period of the Proposed Development. Based on the quantum of Greenhouse Gas emissions estimated to be generated by the Proposed Development, the impacts are deemed to be negligible and therefore not significant.

8.9 Cumulative Effects

Cumulative effects of air quality and climate are assessed in Section 15.9 in Chapter 15. This includes two developments ca. 300 m to the north-west, (by Sandyford GP Ltd, ABP 305940-19; and by IRES Residential Properties Ltd, ABP 304405-19); and also two developments ca. 750 m to the south-east, (by Castdale Ltd, ABP 302580-18; and by Murphystown Land Developments DAC, ABP 308227-20).

There is the potential for cumulative impacts to occur when there are other proposed developments within the AQ and climate study area. The two committed developments ca. 300 m to the north-west are located within the study areas for both the construction and operational phase assessments. The other two committed developments ca. 750 m to the south-east are outside of the study area and therefore could only be potentially impacted by cumulative operational impacts.

During the construction phase, the predicted changes to air quality were defined to be not significant when the defined mitigation was employed. It is assumed that other committed developments in the study area will incorporate similar design and widely adopted good practice mitigation during their construction phase. Therefore, any cumulative construction phase impacts should be imperceptible and therefore not significant. No cumulative impacts are anticipated to occur for climate impacts during the construction phase, therefore this is deemed **imperceptible** and therefore **not significant**.

During the operational phase, the predicted changes to air quality were defined to be not significant. Cumulative impacts of the Proposed Development and surrounding area during the operational phase are calculated using central growth rates from the Traffic Infrastructure Ireland (TII) Travel Demand Projections (Unit 5.3) to take into account the level of committed developments in the immediate vicinity of the Site. Therefore, the cumulative impacts of the committed development are accounted for in the modelling assessment the results of which indicate that effects will are imperceptible and therefore not significant. No cumulative impacts are anticipated to occur for climate impacts during the operational phase, therefore this is deemed **imperceptible** and therefore **not significant**.

8.10 Summary and Conclusions

This assessment focuses on the potential effects of the Proposed Development on the environment with respect to air quality and climate. The potential effects during the construction and operational phases have been considered.

The study area for the construction phase assessment extends up to 350 m from the boundary of the Site and within 50 m of the routes used by construction vehicles on the public highway, up to 500 m from the Site entrances. Human receptors have been identified within the study area and assessed accordingly. No relevant ecological receptors are located within the study area; therefore, assessment of potential effect on ecological receptors was scoped out of the assessment.

The potential effects on air quality from construction dust have been considered using a qualitative risk assessment. The potential changes that could occur from the Proposed Development have been identified and the magnitude of that change assigned. Taking into consideration the mitigation associated with the Proposed Development design, good practice construction methods and pollution prevention measures that will be followed as part of the CEMP, the magnitudes of all predicted changes to air quality during construction are not significant. Therefore, it is concluded that there are no significant effects on air quality from dust arising during the construction phase of the Proposed Development.

The study area for the operational phase assessment extends up to 200 m either side of all roads. Human receptors were identified within the study area and therefore assessed. However, as no Natura 2000 Sites (e.g., SPAs and SACs) were identified within the study area the assessment of impacts on ecological receptors was scoped out of the assessment as not significant.

The potential effects on air quality from the operation of the Site have been considered using the quantitative Air Dispersion Model ADMS-Roads. The potential changes that could occur from the Proposed Development have been identified and the magnitude of that change assigned. The magnitudes of all predicted changes to air quality during the operational phase are negligible. Therefore, it is concluded that the effects on air quality from traffic arising from the operation of the Proposed Development are not significant.

There will be no significant contribution from the Proposed Development to climate change or greenhouse gas emissions during construction and the operational phase.

8.11 References

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