6.0 LAND, SOILS AND GEOLOGY

6.1 Introduction

This chapter addresses the magnitude of potential impacts to, and the significance of effects on, land, soils and geology from the Carmanhall Road Strategic Housing Development (SHD) 2022 (the 'Proposed Development') on lands located at the former Avid Technology International site on Carmanhall Road, Sandyford Industrial Estate, Dublin 18, (the 'Site' / 'Application Site'). Potential impacts to human health from contaminated land are also addressed as part of the assessment, as are the potential impacts and effects from soils and geology to the Proposed Development. Associated impacts to the water environment and ecology are addressed in separate chapters (Chapters 7 and 5, respectively).

The chapter has been prepared by Anna Goodwin who has 18 years of consultancy experience and holds an MSc in Geology and an MSc in Hydrogeology. She is chartered through the Geological Society of London.

6.1.1 Project Description

The development will consist of 334 Build to Rent residential apartment units within 4 no. apartment blocks and as follows:

- *79 No. Studio*
- *175 No. 1 bed*
- *80 No. 2 bed*

- *All residential units provided with private balconies/terraces to the north/south/east and west elevations*
- *Crèche 272 sq.m.*
- *Residential amenity spaces 893 sq.m. (including a unit of 146.5 sqm open to the public, resident's gym, business centre, multipurpose room, staff facilities, multimedia/cinema room, shared working space, concierge, and games room)*
- *Height ranging from 5 to 16 storeys (over basement)*
- *Landscaped communal space in the central courtyard*
- *Provision of a new vehicular entrance from Carmanhall Road and egress to Blackthorn Road*
- *Provision of pedestrian and cycle connections*
- *125 No. Car Parking, 6 No. Motorcycle Parking and 447 cycle spaces at ground floor/under croft and basement car park levels*
- *Plant and telecoms mitigation structures at roof level*

The development also includes 2 no. ESB substations, lighting, plant, storage, site drainage works and all ancillary site development works above and below ground.

6.1.2 Technical Scope

The technical scope of this assessment is to consider the potential impacts and effects on soils, land and geology that can be reasonably foreseen as consequences of the normal construction and operation of the Proposed Development. The assessment considers the potential sources of change resulting from Proposed Development activities detailed in the project description (Chapter 3).

The potential for loss of agricultural soils will be considered, as will the potential to impact geologically important sites and land quality. Associated secondary potential impacts of changes to land quality on human health are also considered. It should be noted that this assessment does not, however, constitute a contaminated land risk assessment, a geotechnical/geohazard risk assessment, or detailed quantitative human health risk assessment.

The potential effects associated with hydrogeological and hydrological receptors are considered in Chapter 7 (Water). The effects of the Proposed Development on population and human health are addressed in Chapter 4 (Population and Human Health), although as noted above the potential effects of land quality on human health are considered in the current chapter. Any secondary effects on ecology or biodiversity due to changes in land quality or habitat removal are considered in Chapter 5 (Ecology and Biodiversity).

6.1.3 Geographical and Temporal Scope

The geographical study area for the assessment covers the Proposed Development area (as identified in Figure 6.1 and a buffer zone of 500 m from the development boundary, because most potential effects to geological, land and soil receptors are anticipated to occur within the development footprint or immediately adjacent to it.

The temporal scope of the assessment covers the construction and after-use project phases. A decommissioning phase for the development has not been considered due to the 'permanent' nature of the development. When it is demolished, it is assumed that the legislation, guidance and good practice at that time would require to be followed, and the effects would be likely to be similar to the construction effects, as broadly similar activities would be undertaken.

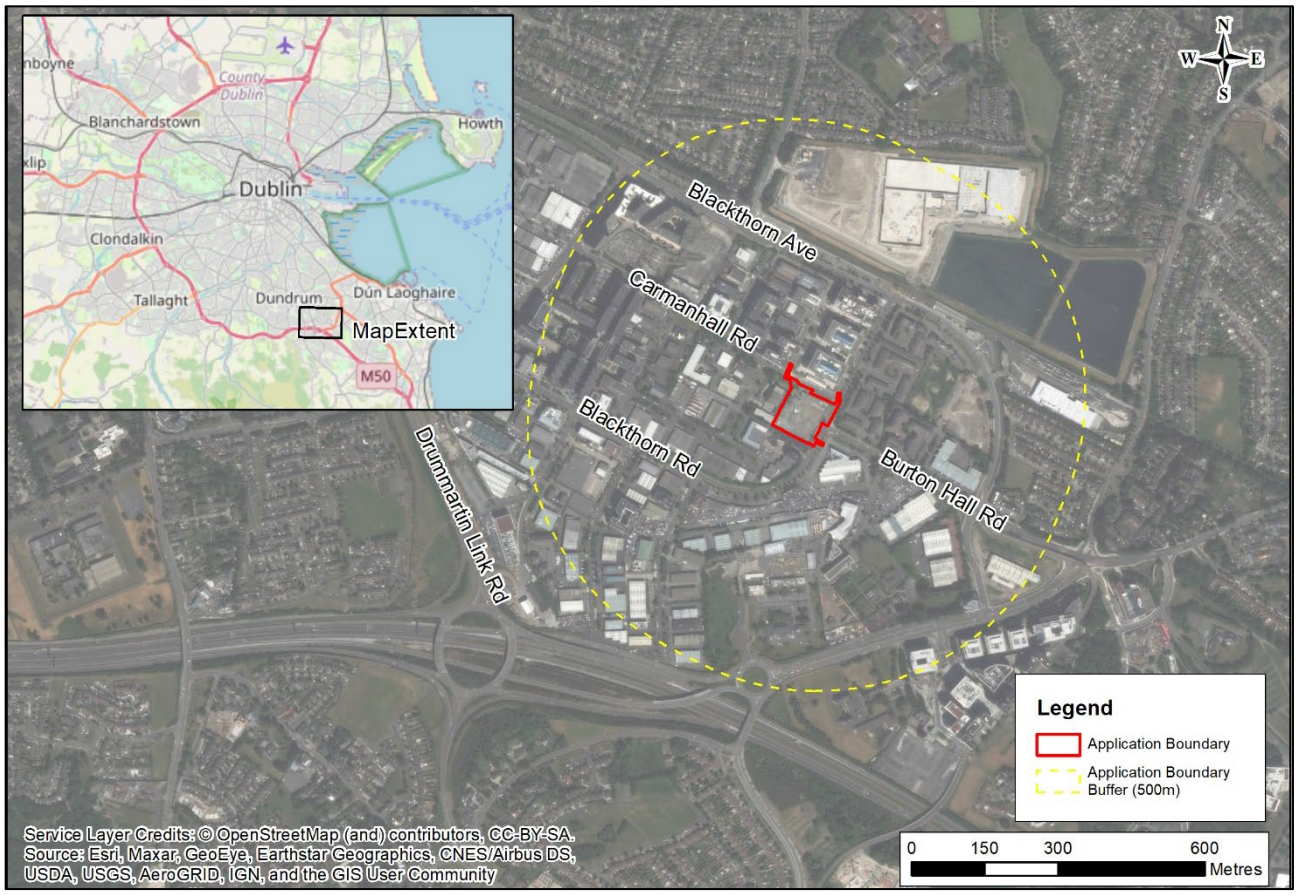


Figure 6.1: Location of the Proposed Development

6.2 Legislative and Policy Context

This section addresses the legislation and guidance that has been considered when preparing this chapter, and key policy context relevant to soils, land and geology that has guided the focus of the assessment. The overarching EIA legislation under which this assessment is required is addressed separately in Chapter 2 (Scope and Methodology).

6.2.1 Legislation and Guidance

In addition to the Regulations that underpin the EIA process (see Chapter 2), this assessment has been made with cognisance to relevant guidance, advice and legislation, including, but not limited to:

- The European Communities (Environmental Liability) Regulations 2008 (as amended) - These Regulations (SI 547/2008) transpose EU Directive 2004/35/CE on environmental liability with regard to the prevention and remedying of environmental damage. The purpose of these Regulations is to establish a framework of environmental liability based on the 'polluter-pays' principle, to prevent and remedy environmental damage. The Environmental Protection Agency (EPA) is designated as the competent authority for all aspects of these Regulations.
- The Environmental Protection Agency Act 1992 and the Protection of the Environment Act 2003 – which detail the requirements associated with general pollution control and activities that come under integrated pollution prevention and control.
- The EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (2022) – which presents key topics of interest, high-level information on the interactions that should be considered in relation to EIA legislation, and overviews on the recommended approach to describing the baseline environment, completing impact assessments, describing effects, and addressing mitigation and monitoring.
- Department of Housing, Planning and Local Government. Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018).
- Gov.uk online guidance, Guidance on Land Contamination Risk Management (LCRM). Available at https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks. Uses a tiered approach to risk assessment, including preliminary risk assessment, generic quantitative risk assessment and detailed quantitative risk assessment.
- The National Roads Authority Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (2009) in relation to aspects to be considered and assessment approach (including relative receptor importance and cross discipline interactions).
- Institute of Geologists of Ireland. Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (April 2013).
- The National Roads Authority Guidelines for the Creation, Implementation and Maintenance of an Environmental Monitoring Plan (undated) in relation to impact mitigation.
- CIRIA C741: Environmental Good Practice on Site (2015, Fourth Edition) in relation to source of impact and mitigation.
- Scottish and Northern Irish Pollution Prevention Guidelines (PPGs) and Guidance for Pollution Prevention (GPPs) – these, although not Irish guidance, provide environmental good practice guidance for activities such as oil and chemical storage, works in or near water, works on construction sites, and dealing with spills and pollution incidents.

6.2.2 Local Policy

The National Planning Framework (Project Ireland 2040) includes National Policy Objective 60 to "Conserve and enhance the rich qualities of natural and cultural heritage of Ireland in a manner appropriate to their significance".

The current local plan is the Dún Laoghaire-Rathdown Development Plan 2022 to 2028. The review of the earlier plan was initiated in January 2020 and the new plan came into effect on 21 April 2022.

Under the principles of development within the plan, the planning authority will require adequate and appropriate investigations to be carried out into the nature and extent of any soil contamination and the risks associated with site development work where brownfield development is proposed.

Within the Strategic Environmental Assessment Environmental Report that accompanies the 2022 to 2028 plan, the 'Soil (and Land)' Component includes the following Strategic Environmental Objectives (SEOs):

- Protect soils against pollution and prevent degradation of the soil resource.
- Promote the sustainable use of infill and brownfield sites over the use of greenfield within the County.
- Safeguard areas of prime agricultural land and designated geological sites.

6.3 Assessment Methodology and Significance Criteria

6.3.1 Introduction

This section presents the method used to assess the impacts and effects of the Proposed Development on soils, land and geology, and to secondary associated human health receptors. It establishes the stages of the assessment, and the qualitative criteria used to assess impact magnitude and determine the level of effect significance.

6.3.2 Qualitative Assessment Method

The assessment of potential effects has been undertaken using the qualitative assessment method outlined below, and is supported by the baseline condition information, the Proposed Development design and the preliminary Construction Management Plan (pCMP), the Preliminary Construction Demolition Waste Management Plan (pCDWMP), the Resource & Waste Management Plan (RWMP) for Construction & Demolition Waste, and the Construction Environmental Management Plan (CEMP). Accompanying this EIAR are initial versions of these documents, which will be further developed by the Main Contractor, who will be appointed by the Developer and contracted to undertake the relevant mitigation measures identified in this EIAR during the construction phase).

The assessment follows a staged approach. A summary of the stages involved is included below:

1) Confirm baseline conditions – determine baseline and develop conceptual site model by consideration of available records and data sets, site reports and published information.
2) Confirm the key receptors and their value/importance.
3) Qualitatively characterise the magnitude of impacts on the receptors – describe what potential changes could occur to each receptor as a result of the Proposed Development, identify source-pathway receptor linkages, and assign the magnitudes of impact. This stage takes into account embedded design mitigation, good practice in construction environment management and pollution prevention.
4) Determine the initial effect significance of each potential impact on each sensitive receptor.

5) Consider the need for additional mitigation if it is considered necessary to reduce the initial magnitude of the impact and associated effect significance further.

6) Assess the residual impact magnitude and residual effect significance after all mitigation is applied.

Stages 1 and 2 have been completed using published literature and guidance and available information specific to the Proposed Development, which is presented in Chapter 3. For the identification of receptor value/importance that completes Stage 2, and for the description of impact magnitude (Stage 3), a common framework of assessment criteria and terminology has been used based on the EPA's Guidelines on the Information to be Contained in EIARs (EPA, 2022)[1], with some modifications made to increase clarity. The descriptions for value (sensitivity) of receptors are provided in Table 6.1 and the descriptions for magnitude of impact are provided in Table 6.2.

The potential for an impact to occur at a receptor has been determined using the understanding of the baseline environment and its properties and consideration of whether there is a feasible linkage between a source of impact and each receptor (i.e. a conceptual site model). This follows the method of preliminary risk assessment that is widely presented in some of the guidance documents listed in Section 6.2.

Table 6.1: Environmental value (sensitivity) and descriptions

Value (sensitivity) of receptor / resource	Typical description
High	High importance and rarity, national scale, and limited potential for substitution. For example: Global/European/National designation Large volumes of nationally or locally important peat Well drained and highly fertile soils Proven economically extractable mineral resource Human health.
Medium	Medium or high importance and rarity, regional scale, limited potential for substitution. For example: Regionally important sites Moderately drained and/or moderate fertility soils.
Low	Low or medium importance and rarity, local scale. For example: Locally designated sites Poorly drained and/or low fertility soils.
Negligible	Very low importance and rarity, local scale.

Table 6.2: Magnitude of impact and typical descriptions

Magnitude of impact (change)		Typical description
High	Adverse	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. Significant harm to human health – death, disease, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. Significant harm to buildings/infrastructure/plant – Structural failure, substantial damage or substantial interference with any right of occupation.
	Beneficial	Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality.

[1] Environmental Protection Agency Guidelines on the information to be contained in Environmental Impact Assessment Reports, August 2022

Magnitude of impact (change)		Typical description
Medium	Adverse	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.
	Beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Low	Adverse	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
	Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse	Very minor loss or alteration to one or more characteristics, features or elements.
	Beneficial	Very minor benefit to or positive addition of one or more characteristics, features or elements.

The assessment of magnitude of impact considers whether the change that causes the impact is positive or negative, and whether the impact is direct or indirect, short- medium- or long-term, temporary or permanent, and if it is reversible.

For the purposes of this assessment, a direct impact is one that occurs as a direct result of the Proposed Development and is likely to occur at or near the development itself. Indirect impacts (or secondary/tertiary impacts) are those where a direct impact on one receptor has another knock-on impact on one or more other related receptor(s) (e.g. the Proposed Development results in a change in land quality, which then has an indirect impact on human health). Indirect impacts can occur within the study area or away from the Proposed Development.

For the purposes of this assessment, the following definitions of duration have been used:

- Temporary – effect likely to last less than 1 year without intervention (i.e. less than the construction phase);
- Short term – effect likely to last 1 to 7 years without intervention;
- Medium term – effect likely to last 7 to 15 years without intervention;
- Long term – effect likely to last 15 to 60 years without intervention; and
- Permanent – effect likely to last over 60 years without intervention.

An irreversible impact is defined as a change to the baseline that would not reverse itself naturally. Such impacts will usually be long-term and irreversible, such as the removal of best and most versatile agricultural soils. A reversible impact is defined as a change to the baseline conditions that would reverse naturally once the source of the impact is exhausted or has stopped.

6.3.3 Significance Criteria

The approach followed to derive effects significance from receptor value and magnitude of impacts (Stage 4) is shown in Table 6.3. Where Table 6.3 includes two significance categories, reasoning is provided in the text if the lower of the two significance categories is selected. A description of the significance categories used is provided in Table 6.4.

Table 6.3: Significance Matrix

	Magnitude of Impact (Degree of Change)				
		Negligible	Low	Medium	High
Environmental value (Sensitivity)	High	Slight	Slight or moderate	Moderate or large	Profound
	Medium	Imperceptible or slight	Slight or moderate	Moderate	Large or profound
	Low	Imperceptible	Slight	Slight	Slight or moderate
	Negligible	Imperceptible	Imperceptible or slight	Imperceptible or slight	Slight

Table 6.4: Significance categories and typical descriptions

Significance Category	Typical Description
Profound	An effect which obliterates sensitive characteristics.
Large	An effect which, by its character, magnitude, duration or intensity alters a significant proportion of a sensitive aspect of the environment.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Imperceptible	An effect capable of measurement but without significant consequences.

Residual adverse effects of ‘large’ or ‘profound’ significance are considered to be ‘significant’ for the purposes of this assessment.

If required following the assessment of the level of effect significance, additional mitigation measures are presented that will be used to avoid, prevent or reduce the magnitude of the potential impact (Stage 5). The significance of the effect taking into account the additional mitigation is then assessed (Stage 6) to give the residual effect significance. Any monitoring that will be required to measure the success of the mitigation is also presented in residual impacts and effects tables (Stage 7) (see Section 6.7).

The effects of the Proposed Development are also considered cumulatively with those that could foreseeably result from other known developments in the assessment study area that are going through the planning process (see Chapter 15).

6.4 Baseline Conditions

This Section presents baseline information on soils, land use, land quality and geology. Information about the water environment (including hydrogeology) is included in Chapter 7.

6.4.1 Soils and Land Use

There is no soil cover mapped on Site; only made ground / artificial surfaces (EPA, 2022).

The Application Site is in an urban area where land use is mixed (industrial, commercial and residential). There are no waste facilities, or dump sites mapped within the study area (EPA, 2022).

There are a number of historical maps available for the area (Ordnance Survey of Ireland, 2022). These include six inch first edition mapping surveyed between 1829 and 1842, 25 inch mapping surveyed and published at the start of the 20th century, and an updated set of six inch maps dating from the mid-20th century. All of the maps show the area as agricultural / pasture. Historical land use is likely to have been agricultural prior to development of the industrial estate (date unknown). Online mapping shows development on the Site since at least 1995 (Ordnance Survey of Ireland, 2022). The warehouse shown in those images was demolished some time between June 2018 and July 2019.

The most recent former occupier of the Site was Avid Technologies International, which is a technology and multimedia company. It is unknown what activities were undertaken on the Site, or what materials were used or stored there. Whilst building materials may have contained asbestos in the past, the Site has been demolished to ground level with no stockpiled waste material remaining on site. Fuels or other substances may have been stored in bulk on site.

6.4.2 Mapped Superficial (Subsoil) Geology and Bedrock Geology

The mapped Quaternary sediments comprise Till derived from limestones, and the mapped bedrock geology comprises granites of the Northern and Upper Liffey Valley Plutons Formation (GSI, 2022). The depth to bedrock is mapped as potentially being within the top 1 m, but local variations may occur. The subsoil mapping for the study area is presented in Figure 6.2. The Quaternary sediments mapping for the study area is presented in Figure 6.3. The bedrock geology mapping for the study area is presented in Figure 6.4.

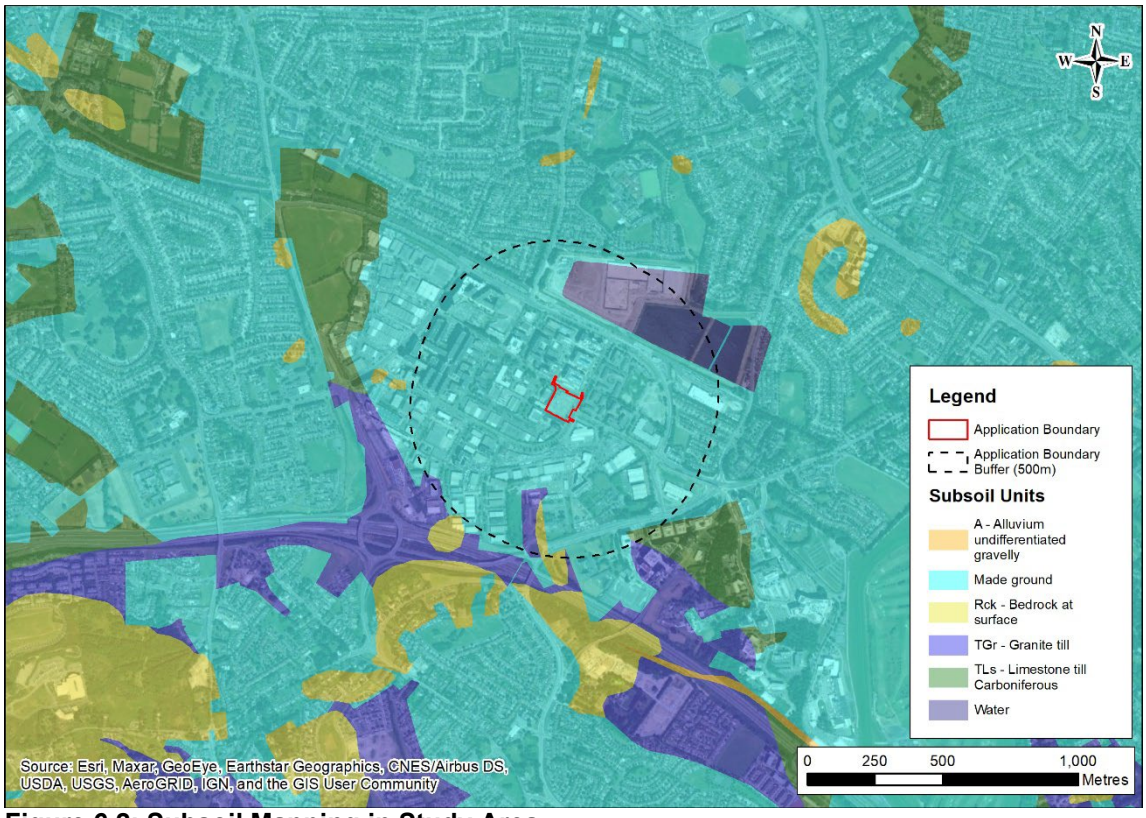


Figure 6.2: Subsoil Mapping in Study Area

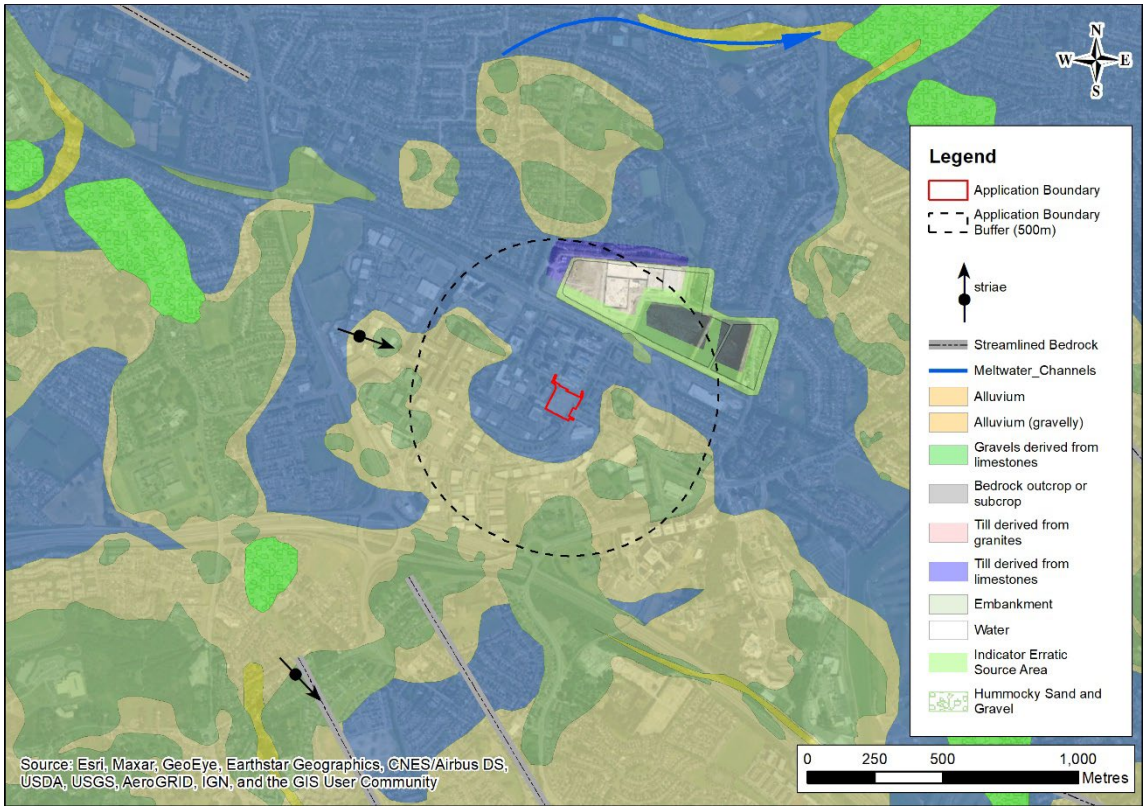


Figure 6.3: Quaternary Geology Mapping in Study Area

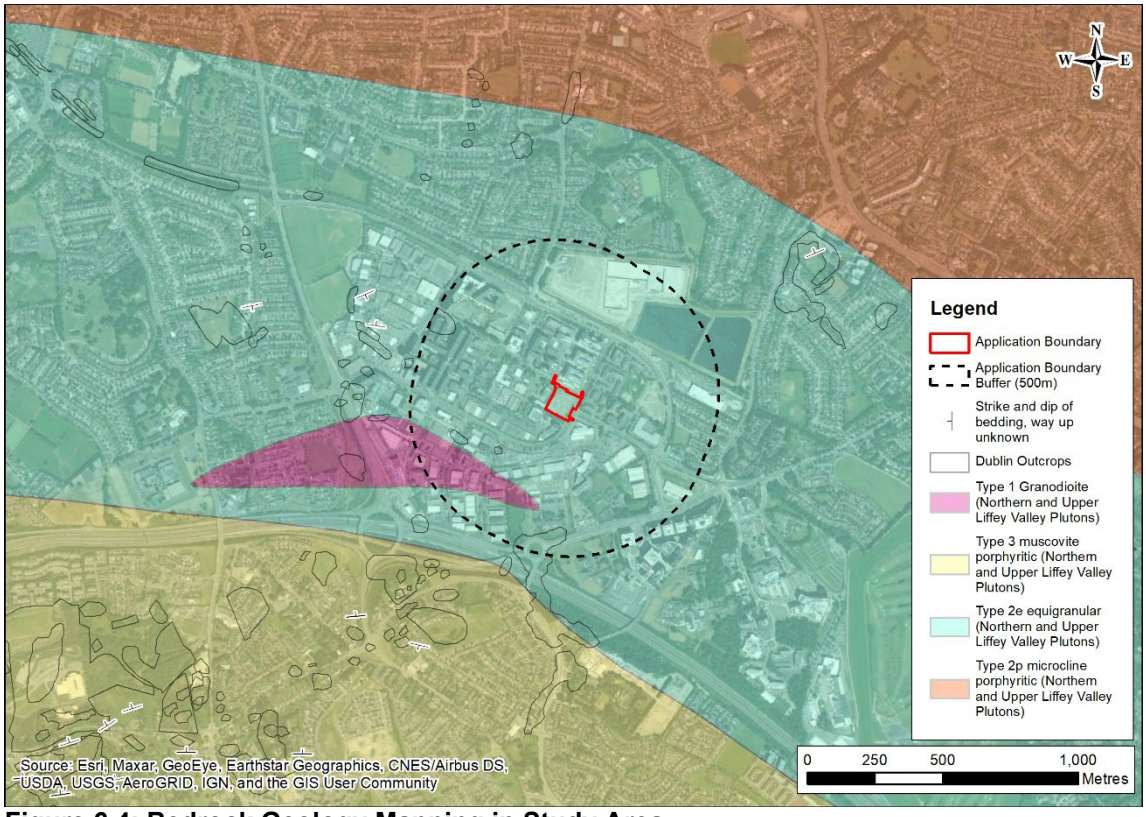


Figure 6.4: Bedrock Geology Mapping in Study Area

6.4.3 Site Geology

A site investigation was undertaken in 2020 (AECOM Consulting Engineers, 2020). Intrusive works comprised four cable percussion boreholes of 200 mm diameter (BH01 to BH04) that were located in the corners of the Site, two 78 mm diameter rotary core boreholes (RC02 and RC04), and 12 trial pits (TP01 to TP12). Ground gas monitoring was also undertaken, and soil samples were taken for geotechnical and environmental laboratory analysis.

At the cable percussion borehole locations, Tarmac up to 20 cm thick was logged at the surface in some places and there was fill material (Made Ground) to between 1.0 m below ground level (bgl) and 1.9 m bgl. This material was described as clay with gravel, clayey gravel or gravelly sand with some brick and concrete and occasional wood, plastic and metal. Below the fill, stiff to very stiff brown and grey sandy gravelly clay was logged to between 7.3 m bgl and 11.2 m bgl. This was interpreted as Glacial Till/Boulder Clay. These findings were also supported by the trial pit observations.

The rotary core boreholes were drilled through the Glacial Till and into granite bedrock below. The granite was described as weak to medium fractured, and was encountered at 8.7 m bgl in RC02. Very weathered granite was encountered in RC04 at 11.1 m bgl.

The geological succession encountered at the Site corresponds with the mapped geology.

The results of the ground gas monitoring (carbon dioxide, oxygen and methane) showed there was negligible gas and it was concluded in the AECOM report that no safety issues relating to ground gas were identified.

The results of the chemical tests for sulphate, chloride and pH indicated no special foundation precautions required to deal with sulphate or chloride aggression (AECOM, 2020). Made ground/fill samples were taken down to a depth of 1 m bgl and were tested for waste acceptance criteria. It was concluded in the AECOM report that the material would be likely to be acceptable as waste at inert sites (although it was considered that a Waste Characterisation Assessment might be required by landfill operators in the event of major excavation). No asbestos traces were identified.

6.4.4 Geological Assets and Geohazards

There are no active quarries or mineral sites at or near the Proposed Development (GSI, 2022).

Landslides/mass movements typically occur due to erosion of features such as cliffs, or due to factors such as slope, saturation/drainage, vegetation, soil structure and loading/disturbance on sites with unconsolidated deposits such as peat. The Proposed Development is in a low landslide susceptibility area and no landslide locations are recorded within the study area (GSI, 2022).

6.4.5 Radon

The Radon Map for Ireland (EPA, 2022) indicates that the Proposed Development is located in an area where between 5% and 10% of homes are estimated to be above the radon reference level. All new homes in High Radon Areas need to be installed with a radon barrier. A High Radon Area is classified by the EPA as any area where it is predicted that 10% or more of homes will exceed the Reference Level of 200 becquerel per cubic metre (Bq/m3). The Proposed Development is not located in a High Radon Area.

6.4.6 Designated Geological Sites

There are no geological heritage sites at, or within 0.5 km of, the Proposed Development (GSI, 2022).

6.4.7 Selection of Sensitive Receptors

No geological heritage sites or mineral sites have been identified as part of the baseline. The superficial tills are unlikely to represent a future resource and the bedrock geology beneath the Site that could be used as a

crushed rock resource is ubiquitous across Ireland. Therefore, the impacts to, and effects on, geological sites and mineral or aggregate reserves have not been considered further in this assessment.

There is no indication that the Proposed Development would sterilise any limited geological resources and there are no soils (agricultural or not) mapped at the Site, so the use or sterilisation of natural resources, loss of organic matter, soil erosion, or soil compaction is not considered further.

Land quality assessment work to date (AECOM, 2020) does not indicate any widespread contamination at the Site. The historical industrial/commercial use of the land could mean previously unidentified contamination might be present. The Proposed Development should not lead to new contamination. Therefore, land quality within, and immediately adjacent to, the Proposed Development will be the main receptor considered during the construction phase and the operational phases of the assessment. Associated potential impacts to human health will also be considered in both phases.

Taking account of the above and the receptor classification method described in Section 6.3, the receptors carried forward in this assessment and their assigned importance are presented in Table 6.5.

Table 6.5: Soil, Land and Geology Receptors

Receptor	Importance and Reasoning
Land (soil/sub-soils) at and immediately adjacent to the Proposed Development	Negligible (no designation, no rarity, local importance)
Human Health (workers during construction and after-use occupiers)	High (human health receptor)

6.5 Characteristics of the Proposed Development

6.5.1 Proposed Development Plans

Construction of the Proposed Development is expected to last for approximately 2 years. It is expected that a detailed Construction Programme will be prepared by the main contractor for the works. The operational phase of the Proposed Development will follow and will be of a 'permanent' duration (i.e. lasting greater than 60 years). A decommissioning phase for the Proposed Development has not been considered due to the 'permanent' nature of the development.

The Proposed Development will comprise of the construction of a 'build-to-rent' housing development, accommodating a total of 334 no. residential units, in four apartment blocks.

All apartments will have access to private amenity space (balconies/terraces). Green roofs (used to collect and temporarily store water to attenuate discharges from the roof area) and screened private landscaped roof terrace areas are to be provided. All of the apartments will have access to communal amenity space in the courtyard.

Shared residential amenities, facilities and associated spaces are to be provided within the Proposed Development. This will include a residents' childcare facility, gym, business centre, multipurpose room, staff facilities, multimedia/cinema room, shared working space, concierge and games room.

The Proposed Development will be served by a basement and lower ground floor level carpark, which will providing vehicular parking spaces and bicycle parking spaces. Plant and storage will also be accommodated at basement and lower ground floor levels. Plant includes switching equipment, air source heat pump, generator, water storage tanks, sprinkler systems, and heating plant. There will also be two ESB substations located off the new spine road, in blocks G and D respectively, that separates the development from the neighbouring former Tack Packing site.

The elevation of the basement will be at approximately 82 metres above Ordnance Datum (m AOD) and the lower ground floor car park will be at about 85.00 m AOD. As current ground elevations are typically around 84 m AOD to 86 m AOD, the development of a basement level will involve the excavation of material.

Water supply for the Proposed Development is intended to be from the mains. Irish Water has indicated that this is possible without an upgrade to the existing infrastructure (Irish Water, letter reference CDS21008079, dated 25 January 2022) and that it has no objection to the proposed connection (Irish Water, letter reference CDS21008079, dated 30 June 2022). Connections could be the north on Carmanhall Road, or to the east on Blackthorn Road.

Separate storm and foul water connections have been confirmed by Irish Water as being feasible (Irish Water, letter reference CDS21008079, dated 25 January 2022). The surface and storm water from the site will be discharged into the existing storm water network (i.e. not to IW combined/foul sewer) (Waterman Moylan, 2022b). Foul water will be discharged via a new connection to the existing 225 mm diameter clay wastewater sewer in Arkle Road (Waterman Moylan, 2022b), as recommended in the confirmation of feasibility from Irish Water (Irish Water, letter reference CDS21008079, dated 25 January 2022).

6.5.2 Embedded Mitigation

This initial assessment of the significance of potential effects resulting from the Proposed Development takes into consideration embedded design, proposed construction and waste management methods, and commonly undertaken good practice mitigation. The elements of the Proposed Development design and good working practices that reduce the potential for impacts to soils and geology include the following:

- To reduce the impact of the Proposed Development on land and soils, the proposed basement depth was optimised to keep the excavations required to a minimum, and hence this will reduce the amount of material to be exported off-site. It is proposed that where materials are to be exported off-site either toa local, appropriately permitted/licenced soil recovery/disposal facility or to another project in the area that requires such material to complete the development where feasible to reduce the carbon footprint associated with the transport and handling of the material. The more detailed mitigation with respect to earthworks/cut-and-fill presented in the CDWMP will be followed.
- No soil or backfill material is anticipated to need to be imported for construction purposes. Materials already on site will be reused where possible. Should any material need to be imported, it will be of a suitable quality that will not lead to ground contamination. Any imported material will come from a suitable source where the quality of the material will have been confirmed prior to acceptance. The more detailed mitigation with respect to topsoil presented in the CDWMP and RWMP for Construction and Demolition Waste will be followed.
- There will be no underground storage tanks, other than those for water attenuation.
- There will be no septic tanks during construction or after-use that could result in leaks to ground. Welfare facilities for construction workers will include portable toilets. Waste from these will be disposed of off-site.
- The completed development will be connected to mains water and foul sewer.
- There are no planned discharges to ground during construction, which will reduce the potential for impacts to land quality.
- There will be no on-site concrete batching.
- Construction materials will be stored in the designated site compound area before use.

- Wates will be managed as per the CDWMP and RWMP. Any waste removal will be managed and undertaken by a competent contractor appointed by the Main Contractor according to best practice and disposed of accordingly by a licensed waste disposal contractor.
- The removal of soils from the Site will be carried out in accordance with the CDWMP/RWMP. Soils for removal may be suitable for re-use, recovery or disposal subject to further analysis and assessment. Further in-situ testing of these soils will be required and will be conducted by a suitably qualified consultant and overseen by the Main Contractor.
- Excavations will be left open and exposed for as little time as possible, which will reduce the potential for instability, and reduce the potential for leaving pathways open for contamination between the surface and sub-surface.
- Stockpiles will be evaluated and monitored by the Main Contractor and kept stable for safety and to minimise erosion.
- Refuelling and the addition of hydraulic oils or lubricants to vehicles or generators will take place on-site using a mobile bowser fuelling plant (i.e. no bulk fuel storage tanks will be used). This will only take place in designated areas. The designated areas will have impermeable surfaces, any fuel/oils that enter the drains will be intercepted, and the refuelling areas will be equipped with easily accessible spills kits that staff have been trained to use. Any flexible pipe, pump, tap or valve will be fitted with a lock and will be secured when not in use. Portable generators or similar fuel containing equipment will be placed on suitable drip trays.
- No discharges to ground are planned during any of the project stages.
- The Contractor will prepare a Construction Management Plan (CMP) and maintain the live Construction Environmental Management Plan (CEMP). The CMP and CEMP will set out how the construction of the Proposed Development will be managed and are living documents and will go through iterations before works commence and during the works. Preliminary versions of these documents accompany this EIAR (Waterman Moylan 2022c, and Golder/WSP 2022). These will be further developed by the Contractor through subsequent iterations and will be 'live' documents that are referred to and updated as necessary throughout the construction phase. The CMP/CEMP will include widely used good practice measures to avoid or reduce the potential impact of construction works on workers, members of the public and the environment. These will include, but not be limited to, the following:
    - All construction works will be conducted in accordance with the appropriate site rules.
    - Appropriate Personal Protection Equipment (PPE) will be used by all construction workers. Selection of PPE will depend on the quality of the land being worked and the method by which any contamination present could impact workers (e.g. ingestion, dermal contact, inhalation).
    - Hazardous materials will be labelled clearly, transported with care by competent and trained persons, and stored in dedicated areas in appropriately bunded containers. Any liquid accumulating within the bunds, or secondary containment systems, will be disposed of at a suitably authorised facility.
    - Maintenance checks and procedures will be completed to reduce the potential for leaks and spills from plant and substance storage.
    - Method statements will be prepared and followed for the management, storage, testing and disposal of waste (including excavated materials).

- Water (from run-off, rainfall and groundwater seepage) will be managed during construction to enable the construction of the Proposed Development, maintain stability, and to protect construction workers from unstable excavations.
- Pollution management measures will be implemented to prevent contamination by machinery pollutants, such as fuels, oils and lubricants during construction and operation activities. These measures will be informed by guidance provided in relevant documents, such as the CIRIA guides to environmental good practice on site.
- Other information on good practice to reduce the potential for environmental pollution that will be consulted includes the following documents developed by the Environment Agency (England and Wales), the Scottish Environment Protection Agency and the Northern Ireland Environment Agency:
  - GPP 1 Understanding your environmental responsibilities - good environmental practices;
  - GPP 2 Above ground oil storage tanks;
  - PPG 6 Working at construction and demolition sites;
  - GPP 8 Safe storage and disposal of used oils;
  - GPP 13 Vehicle washing and cleaning;
  - GPP 21 Pollution incident response planning;
  - GPP 22 Dealing with spills; and
  - GPP 26 Safe storage - drums and intermediate bulk containers.

- A property management agent will manage the operational estate and common areas on behalf of the landlord, including maintenance, landscaping and waste storage/management. Plant will be maintained in accordance with manufacturer guidelines. Parking places will only be used for parking (i.e. no other purpose).

6.6 Potential Effects

The main potential impacts and associated effects that will be considered in the assessment relate to the following:

- Activities or events that might impact land quality during construction (e.g. leaks and spills from machinery or stored substances, or discharges);
- Mobilisation of existing contamination by construction works (e.g. earth movements, excavation and foundation construction) should there be historical contamination at the Proposed Development, which could impact workers and land quality;
- Dewatering during construction that could lead to destabilisation and/or subsidence of unconsolidated soils and sub-soils;
- Importation of material that could be unsuitable for the intended after-use;
- Activities that might impact land quality or development occupiers during operation (e.g. leaks and spills); and
- Fuel and chemical storage during operation – general maintenance activities.

These are considered and assessed in the following sections.

6.6.1 Construction Phase Impacts

General earthworks (e.g. excavation, soil movement, ground compaction, stockpiling, reprofiling) have the potential to affect human health of workers if they were to become unstable. The stability of excavations and stockpiles will be monitored and managed by the Main Contractor, who will be obliged to do so in line with relevant legislation, the CMP and the contract, so the potential impact is predicted to be **negligible (adverse).**

Dewatering may be required during construction. Based on the project description and the groundwater encountered during site investigation works, this would be limited in inflow rate and within the top metre or two from the ground surface rather than within deeper saturated aquifer systems. This would lead to drainage of pore water and changes in effective stress that can lead to destabilisation and/or subsidence of unconsolidated soils and sub-soils. This, in turn, could result in a source of impact to construction workers. The potential for this will be addressed at the design stage and water management will be addressed in the CMP/CEMP. Any effects that will be managed will be local. Therefore, the predicted potential impact on both soils and human health is **negligible (adverse).**

Excavation work could lead to the disturbance and mobilisation of existing ground contamination. This could impact existing land quality or construction workers. Land quality assessment work to date (AECOM, 2020) does not indicate widespread contamination at the Site. Where required, appropriate PPE will be used by construction workers and this will be specified in the CMP. The land quality at the Site is unlikely to be fully characterised by the previous investigation work, so previously unidentified contamination could be present given the historical industrial/commercial use of the land. Therefore, the predicted potential impact on adjacent land quality and human health is **low (adverse)**.

Although not currently intended, if material is imported as part of the construction process, leaching from the import and use of contaminated soil/infill materials has the potential to impact existing land quality or construction workers. The embedded mitigation associated with assessment of the suitability and quality of any imported materials means the predicted potential impact on adjacent land quality, development features and human health is **negligible (adverse)**.

Fuel and other substance leaks or spills from stored substances or from machinery/equipment used during development could affect the chemistry of the soil. There will be no underground tanks, no septic tanks, refuelling will take place using a mobile bowser fuelling plant and only in designated areas suitable for refuelling, the CMP/CEMP will include maintenance and management procedures, there are no planned discharges to ground, and hazardous materials will be managed and stored appropriately. The predicted potential impact on land quality is **negligible (adverse).**

Wheel washing may take place on site during construction to reduce the deposition of material on surrounding roads. It is assumed that the wheel wash would be supplied from the mains and would be reused as much as possible. The water and sludge that collects in the wheel wash has the potential to become contaminated with material washed off the vehicles. If this was to be discharged or leak to ground, this could affect the chemistry of the ground. Without management, localised land quality changes could occur. The predicted impact to land quality is **low (adverse)**.

Welfare facilities will include portable toilet facilities; the waste from which will be disposed of off-site. Leaks from these to ground could affect land quality. Good practice construction site pollution prevention guidance will be followed and there will be no discharges to ground. The predicted impact potential impact on land quality is **negligible (adverse).**

6.6.2 Operational/After-use Phase Impacts

The proposed after-use of the Proposed Development is as rented residential housing and associated amenities (e.g. recreational spaces, parking, café and communal facilities).

There is the potential that discharges to ground, or leaks, could lead to local land quality being affected. Such discharge or leaks could originate from sewerage; drainage from areas of hard-standing; and transport, storage and handling of waste and hazardous substances such as fuel for the Proposed Development's systems. The potential impact from sanitary waste will be mitigated by connection to mains sewer. Drainage from hard-standing will be attenuated via permeable paving and swales, and all surface water from the Site will discharge to the public network after flowing through the proposed petrol interceptor, where hydrocarbons are removed. An operational management strategy will be developed that covers operational property management. With these embedded measures the predicted potential impact on land quality is **negligible (adverse)**.

The evaluation of effects takes into account the predicted impact magnitude combined with receptor sensitivity. The evaluation of effect significance from each of the initial construction and after-use impacts (taking account of embedded mitigation) discussed above is presented in Table 6.6. As can be seen from Table 6.3, any negligible initial impact magnitude will result in a slight, not significant or imperceptible level of effect significance, which are all 'not significant'. Therefore, Table 6.6 only includes those sources of impact that may result in a low to high initial impact magnitude.

Table 6.6: Evaluation of Initial Impacts and their Effect Significance

Project Phase	Receptor	Sensitivity	Source of Impact/Description of Change*	Impact Magnitude*	Level of Effect *
Construction	Land	Negligible	Disturbance and mobilisation of existing ground contamination	Low (adverse)	Slight
			Discharge of wheel washing water/sludge	Low (adverse)	Slight
	Human Health	High	Disturbance and mobilisation of existing ground contamination	Low (adverse)	Moderate

* Taking account of embedded mitigation

6.6.3 'Do-Nothing' Scenario

In the event that the Proposed Development does not progress (i.e. the Site remains undeveloped with the previous building demolished), there are unlikely to be impacts on the geological, land or soil environment in the area of the Project Site.

Derelict and vacant land can encourage fly tipping, so there is some potential for pollution incidents to occur and land quality to be adversely impacted if the Proposed Development did not proceed.

6.7 Mitigation and Management

6.7.1 Mitigation

Additional mitigation and/or management is intended to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment. The initial assessment of potential effects (taking into account embedded mitigation) has not identified any significant adverse effects. However, to further mitigate the initial effects associated with land quality and human health, the following additional mitigation will take place:

- If evidence of previously unidentified potential contamination (either visual or olfactory) is identified during construction works, construction good practice and management procedures will be followed that may include investigation and assessment works. Any contaminated waste material identified during such works that needs to be removed from site will be disposed of at an appropriately licensed landfill.
- Any sludge collected from wheel wash used during construction will be tested and disposed of to an appropriate waste disposal facility. No used water or settled solids will be disposed of to land without prior consent of the EPA.

After-use phase occupiers of the Proposed Development will be responsible for managing their activities and applying for (and working within the constraints of) any environment authorisations or consents required for their operations. If the requirements of relevant regulations, licenses and permits (e.g. integrated pollution prevention and control under The Environmental Protection Agency Act 1992 and the Protection of the Environment Act 2003) are adhered to, the magnitude of impact and likelihood will be reduced to acceptable levels.

6.7.2 Monitoring

No monitoring requirement is foreseen to maintain and protect the conditions of the land, soil and geology. Any monitoring associated with licences or permits will be detailed within the licences or permit documentation.

6.7.3 Residual Effects

A summary of the sources of impact, predicted magnitudes of residual impact (accounting for embedded mitigation and additional mitigation) and subsequent residual effect significance is presented in Table 6.7. In all cases the residual effect is **Not Significant and not greater than Slight**.

Table 6.7: Evaluation of Predicted Residual Impacts and their Effect Significance

Project Phase	Receptor (importance)	Potential Source of Impact	Direct or Indirect	Duration*	Reversible or Irreversible	Summary of Combined Mitigation (embedded and additional)	Residual Magnitude of Impact (direction)	Residual Effect Significance
Construction	Land/soil quality (negligible)	Disturbance and mobilisation of existing ground contamination	Direct	Permanent	Reversible	Procedure for dealing with previously unidentified contamination during construction.	Negligible	Not significant/ Imperceptible
		Discharge of wheel washing water/sludge	Direct	Permanent	Reversible	No discharges to ground. Good practice pollution prevention measures. Waste management procedures.	Negligible	Not significant/ Imperceptible
	Human Health - construction workers (high)	Contact with existing ground contamination (e.g. ingestion, dermal contact, inhalation)	Indirect	Permanent	Reversible or irreversible	Procedure for dealing with previously unidentified contamination during construction. Use of appropriate PPE.	Negligible	Not significant/ Slight

* Maximum duration without intervention

6.8 Difficulties Encountered

No particular difficulties were encountered in undertaking the assessment of soils, land and geology.

6.9 Cumulative Effects

The effects of the Proposed Development are considered cumulatively with other reasonably foreseeable developments in the local area in Chapter 15 – Interactions, Cumulative and Combined Effects.

6.10 Summary and Conclusions

This assessment considers the potential impacts and effects on soils, land and geology that can be reasonably foreseen as consequences of the normal construction and operation of the Proposed Development during the construction and after-use phases.

The main receptors identified that required to be assessed were land (soil/sub-soils) at and immediately adjacent to the Proposed Development and human health (workers during construction and after-use occupiers), that could be secondarily affected by changes to soils/sub-soils.

No geological heritage sites or mineral sites have been identified as part of the baseline. The superficial tills are unlikely to represent a future resource and the bedrock geology beneath the Site that could be used as a crushed rock resource is ubiquitous across Ireland. Therefore, the impacts to, and effects on, geological sites and mineral or aggregate reserves were not considered further in this assessment.

There is no indication that the Proposed Development would sterilise any limited geological resources and there are no soils (agricultural or not) mapped at the Site, so the use or sterilisation of natural resources, loss of organic matter, soil erosion, or soil compaction were not considered further in this assessment.

Known design and construction management mitigation measures were accounted for in an assessment of initial impacts and effects. Where additional mitigation measures could be incorporated to reduce the initial impacts and effects, these were identified and included in an assessment of residual impacts and effects.

In summary, the significance of residual effects on soils and geology (and on human health from soils and geology) resulting from the different potential sources of change are predicted to be **no higher than slight adverse** and, therefore, **not significant** in terms of this assessment.

6.11 References

- AECOM Consulting Engineers, (2020), 'Report on a Site Investigation at Former Avid Site, Sandyford'. June 2020. Report 22455.
- Environmental Protection Agency (EPA), (2022), Online Mapping - https://gis.epa.ie/EPAMaps/ (Accessed: 9 February 2022).
- Geological Surveys of Ireland (GSI), (2022), Spatial Resources Online Mapping - https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 (Accessed: 9 February 2022).
- Golder Associates Ireland Limited - WSP Ireland Consulting Ltd, (2022), 'Construction Environment Management Plan'.
- Ordnance Survey of Ireland, (2022), Online mapping portal: https://webapps.geohive.ie/mapviewer/index.html, (Accessed: 9 February 2022).
- Waterman Moylan Consulting Engineers Limited, (2022a), 'Carmanhall Road SHD 2022 Engineering Assessment Report, issue no. 1', June 2022.
- Waterman Moylan Consulting Engineers Limited, (2022b), 'Carmanhall Road SHD Preliminary Construction Management Plan, issue draft 3', 13 July 2022.
- Waterman Moylan Consulting Engineers Limited, (2022c), 'Carmanhall Road SHD Preliminary Construction Demolition Waste Management Plan, issue draft 2', 13 July 2022.
- Waterman Moylan Consulting Engineers Limited, (2022d), 'Carmanhall Road SHD Resource & Waste Management Plan (RWMP) for Construction & Demolition Waste, issue draft 2', 13 July 2022.

7.0 WATER

7.1 Introduction

This chapter addresses the magnitude of potential impacts to, and the significance of effects on, surface water and/or the groundwater receptors from the Carmanhall Road Strategic Housing Development (SHD) 2022 (the 'Proposed Development') on lands located at the former Avid Technology International site on Carmanhall Road, Sandyford Industrial Estate, Dublin 18, (the 'Site' / 'Application Site'). It considers groundwater levels, flow regime, and quality; and surface water flows, quality and flood risk. The potential for changes in the water environment to impact any water dependent habitat receptors is considered in the ecology chapter (Chapter 5).

The chapter has been prepared by Anna Goodwin who has 18 years of experience and holds an MSc in Geology and an MSc in Hydrogeology. She is chartered through the Geological Society of London.

7.1.1 Project Description

The development will consist of 334 Build to Rent residential apartment units within 4 no. apartment blocks and as follows:

- *79 No. Studio*
- *175 No. 1 bed*
- *80 No. 2 bed*

- *All residential units provided with private balconies/terraces to the north/south/east and west elevations*
- *Crèche 272 sq.m.*
- *Residential amenity spaces 893 sq.m. (including a unit of 146.5 sqm open to the public, resident's gym, business centre, multipurpose room, staff facilities, multimedia/cinema room, shared working space, concierge, and games room)*
- *Height ranging from 5 to 16 storeys (over basement)*
- *Landscaped communal space in the central courtyard*
- *Provision of a new vehicular entrance from Carmanhall Road and egress to Blackthorn Road*
- *Provision of pedestrian and cycle connections*
- *125 No. Car Parking, 6 No. Motorcycle Parking and 447 cycle spaces at ground floor/under croft and basement car park levels*
- *Plant and telecoms mitigation structures at roof level*

The development also includes 2 no. ESB substations, lighting, plant, storage, site drainage works and all ancillary site development works above and below ground.

7.1.2 Technical Scope

The technical scope of this assessment is to consider the potential impacts and effects of the Proposed Development on the water environment (including water resources and flood risk). The assessment considers the potential sources of change resulting from the Proposed Development activities as detailed in the project description on hydrological (surface water) receptors and hydrogeological (groundwater) receptors.

The assessment also considers the potential effects on land, people (including health) and infrastructure as a result of any predicted changes in flood risk. It is supported by the Flood Risk Assessment (Waterman Moylan,

2022a), and drainage details presented in the Engineering Assessment Report (Waterman Moylan, 2022b). Key baseline information about flood risk is presented in this chapter and the FRA has been used to determine the predicted magnitude of effects for this EIA. The assessment does not address the design requirements associated with managing effective water supply to, and wastewater discharge from, the Proposed Development.

7.1.3 Geographical and Temporal Scope

The geographical study area for the assessment covers the Proposed Development area (as identified in Figure 7.1 and a buffer zone that extends to 1 km from the development boundary. The 1 km buffer zone is used to identify surface watercourses or waterbodies that are on site, intersect the site, or could feasibly be affected by discharges from the development. Where there is a connection through an identified watercourses within the study area to other downstream watercourses with environmental designations, these are also considered in the assessment. With respect to the groundwater environment, the 1 km buffer allows aquifers that could be hydraulically connected with the proposed development site to be identified. It also allows identification of on-site or nearby groundwater abstractions that could be used for supply.

The temporal scope of the assessment covers the construction and after-use project phases. A decommissioning phase for the Proposed Development has not been considered due to the 'permanent' nature of the development. When it is demolished, it is assumed that the legislation, guidance and good practice at that time would be followed and the effects are likely to be similar to the construction effects

7.1.4 Interactions

There are potential interactions between changes in the water environment and: (i) population and human health; (ii) land, soils and geology; (iii) ecology and biodiversity; and (iv) material assets.

Impacts to human health through water use are addressed within the chapter. This chapter also addresses the potential secondary effects of changes in land quality on water quality. As such, it draws on the assessment presented in Chapter 6 (Land, Soils and Geology).

Secondary effects on ecology or biodiversity as a result of changes in water quality are considered in Chapter 5 (Ecology and Biodiversity).

Material assets associated with the water environment (e.g. the foul and potable water networks, and the surface water drainage infrastructure) are considered separately in chapter 14.

Additional discussion regarding interactions is presented in Chapter 15.

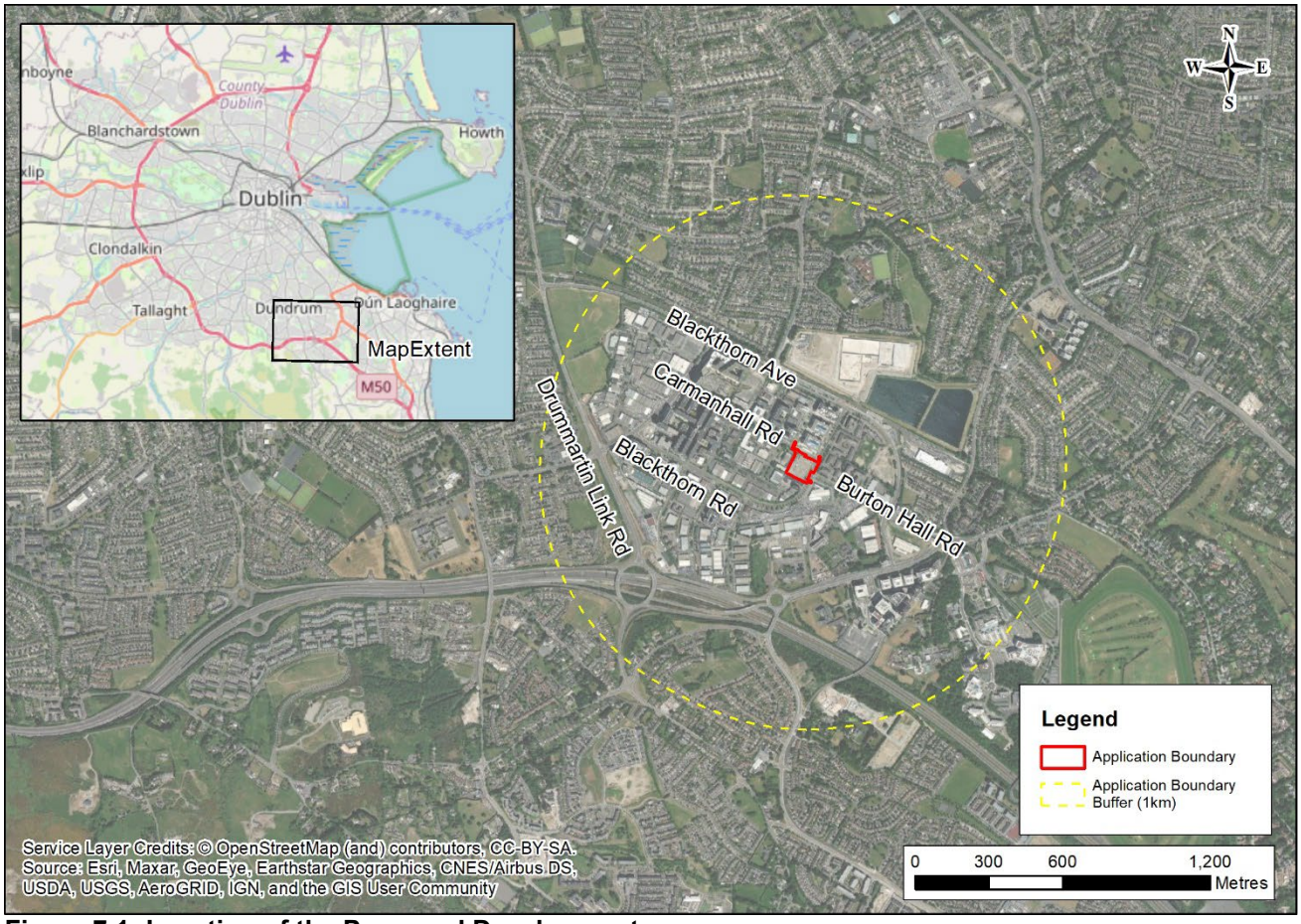


Figure 7.1: Location of the Proposed Development

7.2 Legislative and Policy Context

This section describes the legislation and guidance that has been considered when preparing this chapter, and key policy context relevant to water that has guided the focus of the assessment. The overarching EIA legislation under which this assessment is required is addressed separately in Chapter 2.

7.2.1 Legislation and Guidance

In addition to the Regulations that underpin the EIA process (see Chapter 2), this assessment has been made with cognisance to relevant guidance, advice and legislation relating to the water environment, which have been used to steer the focus of the baseline information collection, the categorisation of receptor sensitivities, and the mitigation measures that have been included.

- Local Government (Water Pollution) Act 1977 (as amended) and associated Statutory Instrument Regulations made under that Act outlines the general prohibition of entry of polluting matter to water, the requirement to licence both trade and sewage effluent discharges, licencing of water abstractions, controlling discharges to aquifers, and notification of accidental damages.
- The European Union (EU) Water Framework Directive (WFD) (2000/60/EC) is the European legislation that establishes a framework for the protection of groundwater and surface water, including the establishment of river basin district, the requirement to prevent further deterioration by preventing or limiting inputs of pollutants, reducing the pollution and promoting sustainable water use. The Groundwater Daughter Directive (GWDD) (2006/118/EC) sits beneath the WFD and relates to water protection and management. It establishes measures to prevent and control groundwater pollution, including criteria for assessing good chemical status and identifying trends.

- The WFD and GWDD have been transposed into Irish law through many Regulations. These Regulations cover governance, the shape of the WFD characterisation, monitoring and status assessment programmes in terms of assigning responsibilities for the monitoring of different water categories, determining the quality elements and undertaking the characterisation and classification assessments. They include, but are not limited to, the following:
  - European Communities (Water Policy) Regulations 2003 and its subsequent amendments;
  - European Communities Environmental Objectives (Surface Waters) Regulations, 2009 and its subsequent amendments;
  - European Communities Environmental Objectives (Groundwater) Regulations, 2010 and its subsequent amendments; and
  - European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations 2011.
- The EU Directive on the Assessment and Management of Flood Risks (2007/60/EC) is transposed into Irish law by the European Communities (Assessment and Management of Flood Risks) Regulations 2010 and its subsequent amendment. The aim of the legislation is to reduce the adverse consequences of flooding on human health and the environment and to outline the requirements for flood risk assessments to be completed as part of the planning process.

Other guidance relating to the EIA process that has been used to guide the assessment of potential impacts to the water environment and the identification of relevant mitigation include:

- Institute of Geologists of Ireland. Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (April 2013).
- The EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (2022) – which presents key topics of interest, high-level information on the interactions that should be considered in relation to EIA legislation, and overviews on the recommended approach to describing the baseline environment, completing impact assessments, describing effects, and addressing mitigation and monitoring.
- Department of Housing, Planning and Local Government. Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018).
- Gov.uk online guidance, Guidance on Land Contamination Risk Management (LCRM). Available at https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks. Uses a tiered approach to risk assessment, including preliminary risk assessment, generic quantitative risk assessment and detailed quantitative risk assessment.
- The National Roads Authority Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (2009) in relation to aspects to be considered and assessment approach (including relative receptor importance and cross discipline interactions).
- The National Roads Authority Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan (undated) in relation to impact mitigation.
- CIRIA C532: Control of water pollution from construction sites. Guidance for consultants and contractors (2001).

- CIRIA C741: Environmental Good Practice on Site (2015, Fourth Edition) in relation to source of impact and mitigation.
- CIRIA C750: Groundwater control – design and practice (2016, Second Edition).
- Scottish and Northern Irish Pollution Prevention Guidelines (PPGs) and Guidance for Pollution Prevention (GPPs) – these, although not Irish guidance, provide environmental good practice guidance for activities such as oil and chemical storage, works in or near water, works on construction sites, and dealing with spills and pollution incidents.

7.2.2 Policy

The National Planning Framework (Project Ireland 2040) includes National Policy Objective 60 to "Conserve and enhance the rich qualities of natural and cultural heritage of Ireland in a manner appropriate to their significance".

The current local plan is the Dún Laoghaire-Rathdown Development Plan 2022 to 2028. The review of the earlier plan was initiated in January 2020 and the new plan came into effect on 21 April 2022.

Under the principles of development within the plan, ongoing development of the County is undertaken in such a way as to not compromise the quality of surface water (and associated habitats and species) and groundwater. Developments shall not give rise to the pollution of ground or surface waters both during construction and subsequent operation.

Specific policies relating to the protection of the water environment and management of surface water in the 2022 to 2028 plan include, but are not limited to, the following:

- Policy EI1: Sustainable Management of Water - it is a policy objective to work with Irish Water to ensure the efficient and sustainable use and development of water resources and water services infrastructure in order to manage and conserve water in a manner that supports climate action, the circular economy, a healthy society and protection of the environment.
- Policy EI6: a Sustainable Drainage Systems – it is a policy objective to ensure that all development proposals incorporate Sustainable Drainage Systems (SuDS). Site specific solutions to surface water drainage systems shall meet the requirements of the Water Framework Directive and the River Basin Management Plan 2018 – 2021 any subsequent RBMP and 'Water Quality in Ireland 2013 - 2018' (2019), or any updated version of the document.
- Policy EI8: Groundwater Protection and Appropriate Assessment – The Council will ensure the protection of the groundwater resources in and around the County and associated habitats and species in accordance with the Groundwater Directive 2006/118/EC and the European Communities Environmental Objectives (Groundwater) Regulations, 2010. In this regard, the Council will support the implementation of Irish Water's Water Safety Plans to protect sources of public water supply and their contributing catchment.
- Policy EI16: Water Pollution – The Council will implement the provisions of water pollution abatement measures in accordance with National and EU Directives and other legislative requirements in conjunction with other agencies as appropriate. This includes 1) endeavouring to improve the water quality in rivers and other watercourses in the County, including ground waters and 2) minimising the impact on groundwater of discharges from septic tanks and other potentially polluting sources.
- Policy EI22: Flood Risk Management – The Council will support the implementation of the EU Flood Risk Directive (2007/60/EC) on the assessment and management of flood risks, the Flood Risk Regulations (SI No 122 of 2010) and the Department of the Environment, Heritage and Local Government and the Office of Public Works Guidelines on 'The Planning System and Flood Risk Management, (2009)' and relevant

outputs of the Eastern District Catchment and Flood Risk Assessment and Management Study (ECFRAMS Study).

In addition, under the principles of development, the planning authority will require adequate and appropriate investigations to be carried out into the nature and extent of any groundwater contamination and the risks associated with site development work where brownfield development is proposed.

Within the Strategic Environmental Assessment report that is part of the 2022 to 2028 County Development Plan, Strategic Environmental Objectives (SEOs) relate to maintaining and improving where possible, the quality and status of surface waters, and preventing groundwater pollution.

The Sandyford Urban Framework Plan was adopted as Appendix No. 16 to the County Development Plan. Under that, the key objectives relating to water are as follows:

- SWD1 - It is an objective of the Council to ensure that stormwater management and SuDS, including a requirement to undertake Stormwater Audits, shall form part of the pre-planning stage of any application.
- SWD2 - It is an objective of the Council to ensure that SuDS measures shall be fully implemented on all sites to Greenfield runoff rates. In this regard solutions other than tanking systems shall be required for all developments. For larger applications green roofs shall be used in accordance with the Dún Laoghaire-Rathdown County Council's Green Roofs Guidance Document.
- FD2 - It is an objective of the Council to support Irish Water to ensure that detailed hydraulic analyses of the foul sewer network, between housing and commercial developments within the Sandyford Business District and the nearest significant trunk sewers, be completed by future applicants. Where capacity issues are identified localised upgrade works will be required in order to facilitate the development.

7.3 Assessment Methodology and Significance Criteria

This section presents the method used to assess the impacts and effects of the Proposed Development on the water environment, and to human health from changes to the water environment. It establishes the stages of the assessment, and the qualitative criteria used to assess impact magnitude and determine the level of effect significance.

7.3.1 Qualitative Assessment Method

The assessment of potential effects has been undertaken using the qualitative assessment method outlined below. The assessment is supported by the baseline condition information, the Proposed Development design, the preliminary Construction Management Plan (pCMP), Construction Environmental Management Plan (CEMP), the Construction Demolition Waste Management Plan (CDWMP), the Resource & Waste Management Plan (RWMP) for Construction & Demolition Waste, the Flood Risk Assessment (FRA), and drainage design. It follows a staged approach. A summary of the stages involved is included below:

1) Confirm baseline conditions – determine baseline and develop conceptual site model by consideration of available records and data sets, site reports and published information.

2) Confirm the key receptors and their value/importance.

3) Qualitatively characterise the magnitude of impacts on the receptors – describe what potential changes could occur to each receptor as a result of the Proposed Development, identify source-pathway receptor linkages, and assign the magnitudes of impact. This stage takes into account embedded design mitigation, good practice in construction environment management and pollution prevention.

4) Determine the initial effect significance of each potential impact on each sensitive receptor.

5) Consider the need for additional mitigation if it is considered necessary to reduce the initial magnitude of the impact and associated effect significance further.

6) Assess the residual impact magnitude and residual effect significance after all mitigation is applied.

Stages 1 and 2 have been completed using published literature and guidance and available information specific to the Proposed Development, which is presented in Chapter 3. For the identification of receptor value/importance that completes Stage 2, and for the description of impact magnitude (Stage 3), a common framework of assessment criteria and terminology has been used based on the EPA's Guidelines on the Information to be Contained in EIARs (EPA, 2022)[1], are the environmental assessment method section of the Design Manual for Roads and Bridges (LA 104 Environmental Assessment and Monitoring). This is a widely adopted qualitatively approach for determining effect significance. Some modifications have been made to increase clarity for this assessment. The descriptions for value (sensitivity) of receptors are provided in Table 7.1 and the descriptions for magnitude of impact are provided in Table 7.2.

The potential for an impact to occur at a receptor has been determined using the understanding of the baseline environment and its properties and consideration of whether there is a feasible linkage between a source of impact and each receptor (i.e. a conceptual site model). This follows the method of preliminary risk assessment that is widely presented in some of the guidance documents listed in Section 7.2.

Table 7.1: Environmental value (sensitivity) and descriptions.

Value (sensitivity) of receptor / resource	Typical description
High	High importance and rarity, national scale, and limited potential for substitution. For example: Global/European/National designation - or supports an internationally important feature. Human health receptors. Regionally important aquifer with multiple wellfields. Inner source protection area for a regional resource. Regionally important potable water source supplying >2,500 homes (surface water or aquifer). Flood plain protecting more than 50 residential or commercial properties from flooding.
Medium	Medium or high importance and rarity, regional scale, limited potential for substitution. For example: Regionally important sites. Regionally important aquifer. Outer source protection area for a regional resource. Locally important potable water source supplying >1,000 homes (surface water or aquifer). Flood plain protecting between 5 and 50 residential or commercial properties from flooding.
Low	Low or medium importance and rarity, local scale. For example: Locally important aquifer. Outer source protection area for a local resource.

[1] Environmental Protection Agency Guidelines on the information to be contained in Environmental Impact Assessment Reports, 2022

Value (sensitivity) of receptor / resource	Typical description
	Local potable water source supplying >50 homes (surface water or aquifer). Flood plain protecting between 1 and 5 residential or commercial properties from flooding.
Negligible	Very low importance and rarity, local scale. Environmental equilibrium is stable and is resilient to impacts that are greater than natural fluctuations, without detriment to its present character. Poorly productive aquifer. Local potable water source supplying <50 homes (surface water or aquifer). Flood plain protecting 1 residential or commercial properties from flooding.

Table 7.2: Magnitude of impact and typical descriptions.

Magnitude of impact (change)		Typical description
High	Adverse	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. Significant harm to human health - death, disease, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. Significant harm to buildings/infrastructure/plant - Structural failure, substantial damage or substantial interference with any right of occupation. Significant pollution of the water environment, which is defined by: ■ A breach of, or failure to meet, any statutory quality standard for the water environment at an appropriate pollution assessment point. ■ A breach of, or a failure to meet, any operational standard adopted by EPA for the protection of the water environment. ■ Pollution results in an increase in treatment required for an existing drinking water supply. ■ Pollution results in an increase level of treatment required of water abstracted for industrial purposes. ■ Pollution results in deterioration in the status of a water body, failure to meet good status objectives defined by the Water Framework Directive, or failure of a protected drinking water area to meet its objectives as defined by the Water Framework Directive. ■ There is a significant and sustained upwards trend in concentration of pollutants in groundwater being affected by the land in question. There is a material and adverse impact on the economic, social and/or amenity use associated with a particular water environment.

Magnitude of impact (change)		Typical description
	Beneficial	Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality.
Medium	Adverse	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.
	Beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Low	Adverse	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
	Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse	Very minor loss or alteration to one or more characteristics, features or elements.
	Beneficial	Very minor benefit to or positive addition of one or more characteristics, features or elements.

The assessment of impact magnitude considers whether the change that causes the impact is positive or negative, and whether the impact is direct or indirect, short- medium- or long-term, temporary or permanent, and if it is reversible.

For the purposes of this assessment, a direct impact is one that occurs as a direct result of the Proposed Development and is likely to occur at or near the Proposed Development itself. Indirect impacts (or secondary/tertiary impacts) are those where a direct impact on one receptor has another knock-on impact on one or more other related receptor(s) (e.g. the Proposed Development results in a change in groundwater quality, which then has an indirect impact on surface water quality and/or users of the water, such as human health or ecology). Indirect impacts can occur within the study areas or away from the Proposed Development.

For the purposes of this assessment, the following definitions of duration have been used:

- Temporary – effect likely to last less than 1 year without intervention (i.e. less than the construction phase);
- Short term – effect likely to last 1 to 7 years without intervention;
- Medium term – effect likely to last 7 to 15 years without intervention;
- Long term – effect likely to last 15 to 60 years without intervention; and
- Permanent – effect likely to last over 60 years without intervention.

An irreversible impact is defined as a change to the baseline that would not reverse itself naturally. Such impacts will usually be long-term and irreversible, such as changes to the groundwater flow regimes caused by changes to the properties of the subsurface.

A reversible impact is defined as a change to the baseline conditions that would reverse naturally once the source of the impact is exhausted, removed or has stopped. For example, impacts to groundwater quality from

contamination only last as long as the source of the impacts is present. If it is removed, groundwater quality may naturally improve or could be remediated.

7.3.2 Significance Criteria

The approach followed to derive effects significance from receptor value and magnitude of impacts (Stage 4) is shown in Table 7.3. Where Table 7.3 includes two significance categories, reasoning is provided in the text if the lower of the two significance categories is selected. A description of the significance categories used is provided in Table 7.4.

Table 7.3: Significance Matrix

	Magnitude of Impact (Degree of Change)				
Environmental value (Sensitivity)		Negligible	Low	Medium	High
	High	Slight	Slight or moderate	Moderate or large	Profound
	Medium	Imperceptible or slight	Slight or moderate	Moderate	Large or profound
	Low	Imperceptible	Slight	Slight	Slight or moderate
	Negligible	Imperceptible	Imperceptible or slight	Imperceptible or slight	Slight

Table 7.4: Significance categories and typical descriptions

Significance Category	Typical Description
Profound	An effect which obliterates sensitive characteristics.
Large	An effect which, by its character, magnitude, duration or intensity alters a significant proportion of a sensitive aspect of the environment.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Imperceptible	An effect capable of measurement but without significant consequences.

Residual adverse effects of ‘large’ or ‘profound’ significance are considered to be ‘significant’ for the purposes of this assessment.

Following the assessment of the level of effect significance, mitigation measures are presented that will be used to avoid, prevent or reduce the magnitude of the potential impact (Stage 5). The significance of the effect taking into account the mitigation is then assessed (Stage 6) to give the residual effect significance. Any monitoring that will be required to measure the success of the mitigation is also presented in residual impacts and effects tables in Section 7.7 (Stage 7).

The effects of the Proposed Development are also considered cumulatively with those that could foreseeably result from other known developments in the assessment study area that are going through the planning process (see Chapter 15).

7.4 Baseline Conditions

This section presents baseline information on the water environment (hydrology, hydrogeology and flooding). Information about land use, soils and geology and ground conditions at the Site is included in Chapter 6.

7.4.1 Existing Contamination

Details of previous site investigation work are presented in Chapter 6. The land quality assessment work to date (AECOM, 2020) does not indicate any widespread contamination at the Site. The historical industrial/commercial use of the land might mean that previously unidentified contamination is present. The results of the ground gas monitoring (carbon dioxide, oxygen and methane) showed there was negligible gas and it was concluded in the AECOM report that no safety issues relating to ground gas were identified. No asbestos traces were identified in the soil samples taken.

7.4.2 Groundwater

Regional Hydrogeological Setting Overview

There are two main types of aquifer in Ireland; bedrock aquifers, and sand and gravel aquifers (GSI, 2022b). The majority of bedrock aquifers across the Republic of Ireland that are regionally important are Karstified Limestones. Groundwater flow in these rocks is predominantly through fissures and fractures. The majority of these aquifers are unconfined. Less than 5% of the country is underlain by sand and gravel aquifers (GSI, 2022b). These aquifers have intergranular permeability, are typically relatively thin, and are generally unconfined. Water is usually abstracted from these aquifers from pumping wells or boreholes, although water can naturally seep to the surface via springs.

The regional topography is varied; with mountains in the west and low lying land at the coast in the east. The topographic slope will influence the hydraulic gradient in the aquifer and the groundwater flow direction (GSI, undated).

The majority of groundwater flow will occur in the top couple of metres. This flow is mostly along a weathered zone and laterally towards rivers and springs. Flow at depth (i.e. greater than 10 m below ground level) is possible where the bedrock is fractured. Flow below a depth of 30 m is only in isolated fractures (GSI, undated).

Regional groundwater flow paths are not considered to develop. Typical groundwater flow paths will be in the order of a couple of hundred metres, with discharge occurring to the closest surface water feature (GSI, undated).

Regional groundwater contour mapping suggests elevations around 80 m above Ordnance Datum (m AOD) to 90 m AOD, which is likely to be near ground level (GSI, 2022a).

Regionally, recharge to bedrock aquifers is dominated by vertical flow through the overlying soils and Quaternary Glacial Till deposits (GSI, undated). Higher recharge occurs in areas with thin or no soil/Quaternary deposits; although the limited aquifer potential of many of the rocks means that storage potential is low and run-off to surface water is high.

Local Aquifers and their Properties

The Water Framework Directive Groundwater Body (GWB) over which the Proposed Development is located is the Kilcullen GWB (GSI, 2022a). The bedrock is classified as a ‘Poor Aquifer’ (i.e. the bedrock is generally unproductive except for local zones) (GSI, 2022a). The bedrock aquifer is classified as having ‘good’ Water Framework Directive groundwater body status (EPA, 2022a). There are no mapped gravel aquifers (sensitive groundwater bodies) (EPA, 2022a).

Groundwater Vulnerability defines how easily groundwater may be contaminated by human activities. The vulnerability of groundwater is moderate on the west side of the Site and high on the east (EPA, 2022a) (Figure 7.2). The change in vulnerability is likely due to a reduction in thickness of soil cover from west to east.

The Site is currently covered in hardstanding, which limits groundwater recharge. The underlying Glacial Till will also limit recharge to the bedrock at depth. Groundwater recharge to the Made Ground is estimated at 97 mm/yr and sub-soil permeability is mapped as low (GSI, 2022a).

Two infiltration tests were undertaken at the Site as part of the March 2020 site investigation (AECOM Consulting Engineers, 2020). During these tests there was no fall in the water level, which indicated a very low permeability clay. It was concluded in the AECOM report that the ground was unsuitable for dispersion of storm and surface water and that use of the local authority drainage systems for storm water and surface water disposal was recommended.

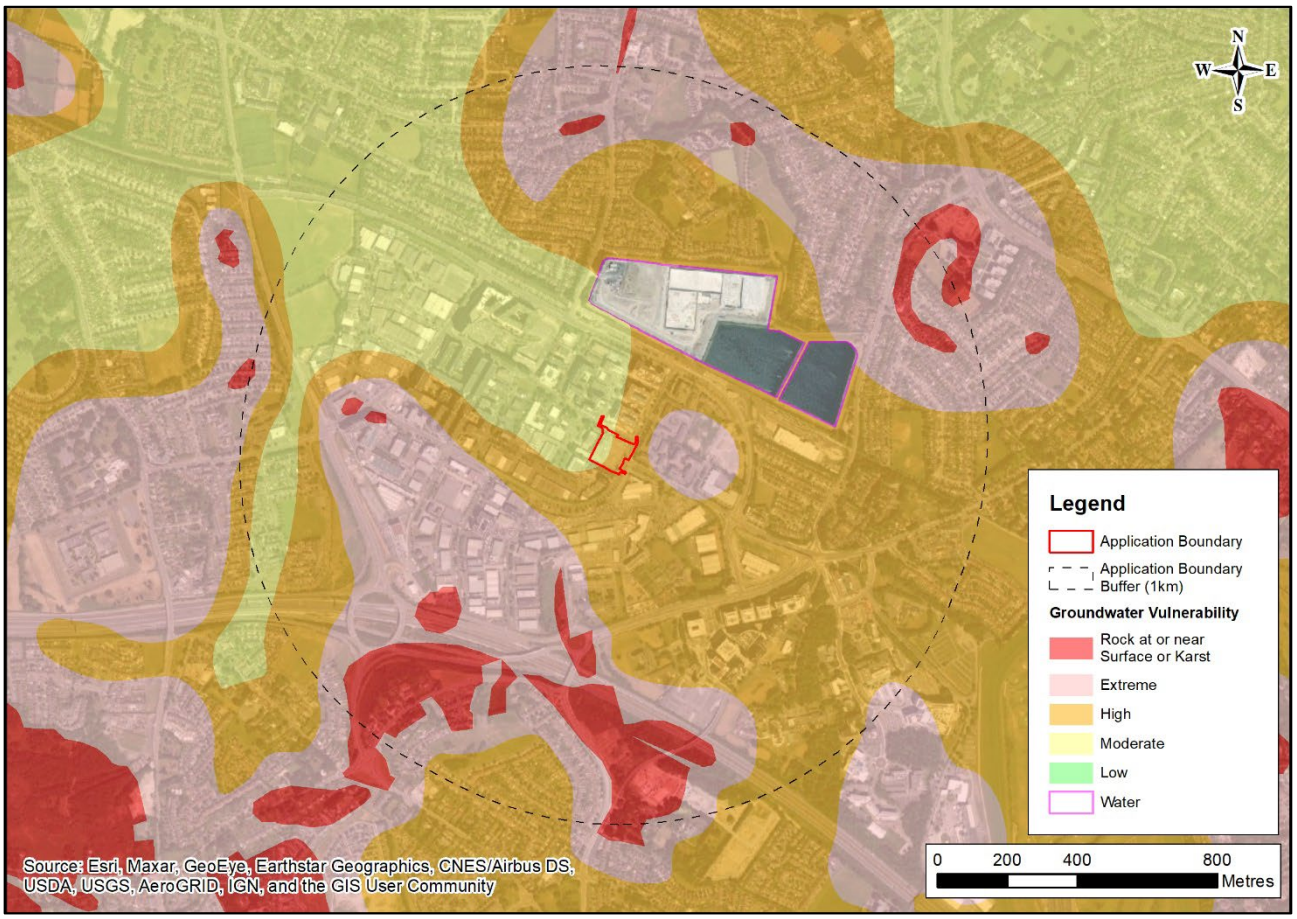


Figure 7.2: Groundwater Vulnerability

Local Groundwater Levels and Flows

A site investigation was undertaken in March 2020 (AECOM Consulting Engineers, 2020). Intrusive works comprised four cable percussion boreholes of 200 mm diameter (BH01 to BH04) that were located in the corners of the Site, two 78 mm diameter rotary core boreholes (RC02 and RC04), and 12 trial pits (TP01 to TP12). Two infiltration tests, and water level monitoring were also undertaken.

Cable percussion boreholes BH02 and BH04 (drilled to 8.5 m below ground level, bgl, and 11.2 m bgl) were dry. Slow to moderate water seepage was noted at 3.8 m bgl in borehole BH01 (drilled to 7.3 m bgl). Slow to

moderate water seepage was noted at 3.1 m bgl in borehole BH03 (drilled to 8.3 m bgl). Boreholes BH01 and BH03 were installed with slotted pipe for water monitoring within the Glacial Till. Rotary core boreholes RC02 and RC04 were also installed with slotted pipework in the granitic bedrock.

Dips of the depth to groundwater were collected once a month for three months (March, May and June 2020) and the results indicate the depth to groundwater in both the Glacial Till and the granitic bedrock is typically between 2 m bgl and 3 m bgl. Given that the current ground elevation in the area is around 85 m AOD to 86 m AOD, the groundwater elevation appears to be around 82 m AOD to 84 m AOD, which corresponds with the regional contour mapping.

Although there is some groundwater present at shallow depths, the likely low hydraulic conductivity and highly anisotropic nature of the Glacial Till suggests there will be limited potential for lateral groundwater flow in the superficial deposits. Given the geology (see Chapter 6, Section 6.4) and aquifer classification, groundwater may only be in the more weathered bedrock geology nearer the surface. Flow in the weathered zone would be in the top couple of meters and towards the nearest surface watercourses.

Groundwater Flooding

There are no areas of groundwater flooding probability shown on the Geological Surveys of Ireland's Groundwater flooding probability maps (Office of Public Works, 2022).

It is stated in the Flood Risk Assessment (Waterman Moylan, 2022a) that groundwater flooding at the Site is unlikely and the risk to the Proposed Development from groundwater flooding is low.

Local Groundwater Quality

The Site is on the Kilcullen Water Framework Directive (WFD) groundwater body (EPA, 2022a). It had good chemical and quantitative status (2013 to 2018; most recent publicly available data). This groundwater body intersects EU designated Special Areas of Conservation (SAC) and Special Protection Area (SPA) habitats.

The Kilcullen WFD groundwater body has been designated as 'at risk' under the third cycle WFD assessment. This means it is at risk of not meeting WFD objectives by 2027 due to pressures on that waterbody. Measures will be applied to meet those objectives. Agriculture and forestry giving rise to nutrient pollution (namely due to phosphorus loss) has been identified as a significant pressure on the Kilcullen WFD groundwater body. Other unidentified anthropogenic pressures are also cited (EPA, 2021).

There are no site-specific groundwater quality data.

7.4.3 Surface Water

Surface Water Features and Catchments

The Proposed Development is in the Liffey and Dublin Bay WFD catchment, the Dodder WFD sub-catchment and the Brewery Stream River sub-basin (EPA, 2022a).

There are no surface watercourses on site. The Stillorgan Reservoirs are located just over 200 m to the north (Figure 7.3). Carrickmines Stream/Racecourse Stream (Figure 7.3) is located approximately 600 m to the south and appears to be partially culverted under the industrial estate, but is mapped at the surface in an open, vegetated area to the south of the M50 motorway (EPA, 2022a). It flows towards the south-east to become Carrickmines River; eventually converging with the Loughlinstown River (North) to the east of the Site (near the N11 road and Loughlinstown) and discharging, as the Shanganah River, into the Irish Sea between Loughlinstown and Shankhill. Racecourse Stream is defined as having moderate waterbody status and is an 'at risk waterbody' under the WFD.

Brewery Stream/Carysfort Maretimo Stream (Figure 7.3) is mapped at the surface approximately 800 m northeast of the Site (EPA, 2022a). This stream, which is extensively culverted in the area of the Site, originates

in the Tree Rock Mountains and flows under the M50 and across the heavily urbanised areas of Sandyford, Leopardstown and Stillorgan before discharging into Dublin Bay/the Irish Sea at Blackrock. The Brewery Stream/Carysfort Maretimo Stream is defined as having moderate waterbody status. There is no WFD risk status currently assigned to this watercourse; it is under review . The Irish Sea in Dublin Bay has designations that are covered in Section 7.4.6.

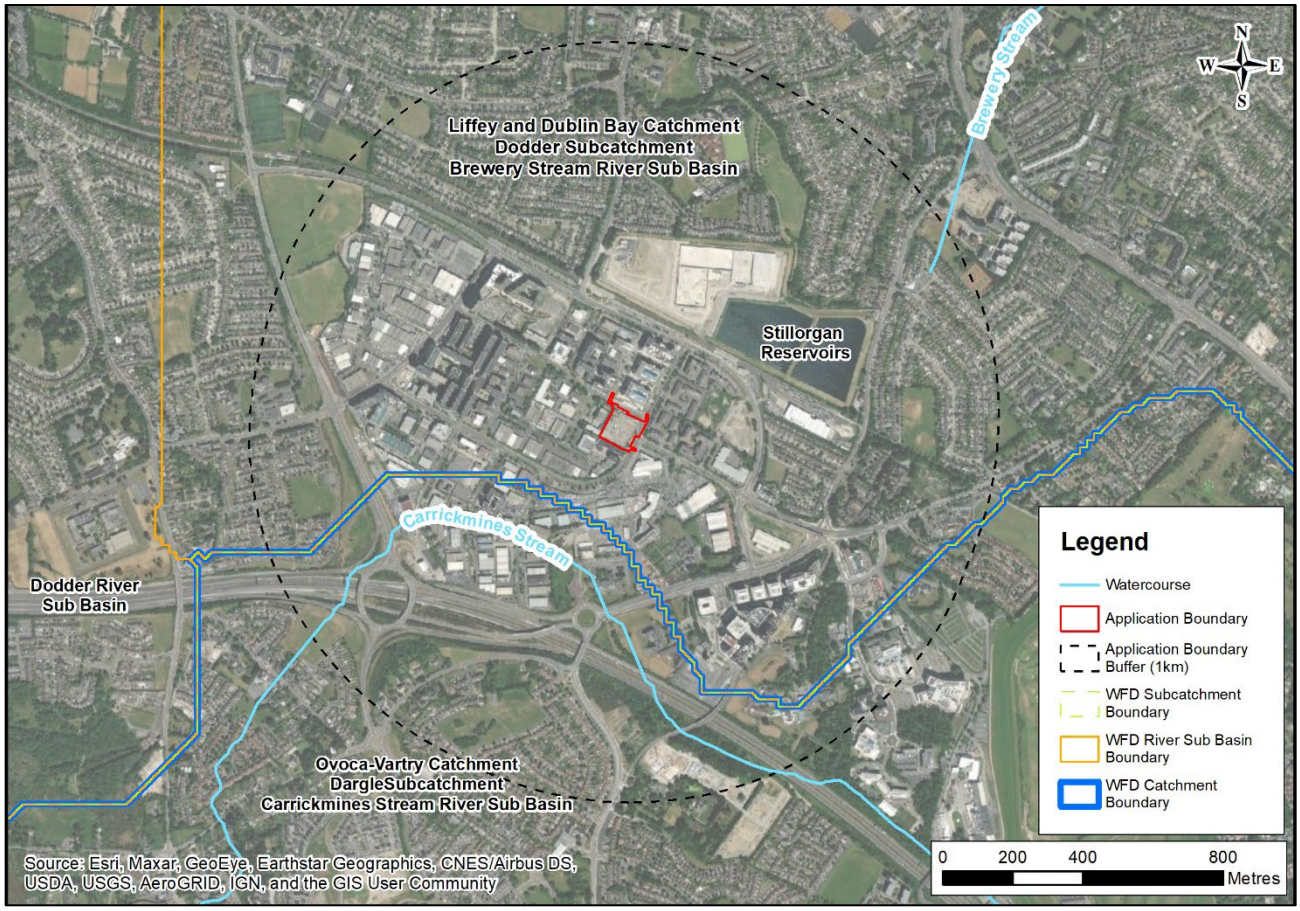


Figure 7.3: Surface Water Features

Existing Flows and Drainage

Details about the existing surface water drainage (AECOM, 2021) indicate that there is a 450 mm diameter public surface water sewer in Carmanhall Road and a separate 375 mm diameter public surface water sewer in Blackthorn Avenue. The previous development was connected to the junction manhole on Blackthorn Avenue. Both these sewers are expected to discharge to Brewery Stream/Carysfort Maretimo Stream.

There is an existing connection to the 225 mm diameter clay wastewater sewer in Carmanhall Road (AECOM, 2021). There is also another 225 mm foul sewer in Blackthorn Avenue (AECOM, 2021).

Foul discharge from the Proposed Development is ultimately expected to drain to Ringsend wastewater treatment plant (WWTP) prior to discharge to Dublin Bay at Poolbeg. In April 2019 Irish Water was granted planning permission for an upgrade to the Ringsend facility[2]. This will see improved treatment standards and

[2] https://www.water-technology.net/projects/ringsend-wastewater-treatment-plant-upgrade-project/

will increase network capacity by 50%, with a target completion date of 2023, which will be in time to address additional loading from the Proposed Development.

Flooding

The Site is not mapped as at risk of flooding from rivers or the coast (Office of Public Works, 2022). The future flood probability mapping covers two scenarios; a mid-range future scenario that takes into account the potential effects of climate change using an increase in rainfall of 20% and sea level rise of 500mm, and a high-end future scenario that takes account of the potential effects of climate change using an increase in rainfall of 30% and sea level rise of 1,000 mm.

There are localised areas of low to medium risk from river (fluvial) flooding to the east of the Site, including an area of low flood probability mapped along Blackthorn Road along the eastern boundary of the Site. Low flood probability covers areas that modelling has shown might be flooded by rivers in a very extreme flood event. Such events have a probability of 1 in 1,000 of occurring in a given year (an annual exceedance probability of 0.1%). This area of fluvial flood mapping is associated with the route of the Carysfort Maretimo Stream, which is culverted in the area of the Site.

There are no records of past flooding events in the immediate vicinity of the Site (Office of Public Works, 2022).

The Flood Risk Assessment (FRA) prepared by Waterman Moylan (2022a) notes the following:

- There is no pathway for tidal flooding from the Irish Sea to impact the Proposed Development, so the risk from tidal flooding is insignificant.
- The risk from various sources of pluvial flooding is determined as low or extremely low.
- The risk to the Proposed Development from fluvial flooding is insignificant.

7.4.4 Regulated Discharges and Emissions

There are no wastewater treatment plants or emission points on Site or in the study area. The Site is in the Ringsend WWTP catchment area. There are no Section 4 discharges to water located within the study area (EPA, 2022a).

7.4.5 Water Users

The Site is not in a Group Scheme and Public Supply Source protection area. There is only one well or spring mapped within 2 km (GSI, 2022a), but the available mapping does not provide an exhaustive dataset (Figure 7.4). That borehole is located over 1.7 km northeast of the Site. It was drilled in 1997 to 85.3 m depth. The purpose of the borehole is not specified, and there is no abstraction rate recorded, so it could be a monitoring well. Private water supplies could be present, but the poor aquifer potential limits the likelihood.

Figure 7.4: GSI Well / Spring Location

It is understood that properties in the area, and the previous development at the Site, have mains water supplies. There is a 355.6 mm asbestos cement watermain in Carmanhall Road and 152.4 mm asbestos cement watermains in both Carmanhall Road and Blackthorn Avenue.

7.4.6 Designated Sites

There are no international designated sites at, or within 2 km of, the Proposed Development. There is a proposed national designated Natural Heritage Area (Fitzsimon's Wood) located approximately 1.6 km to the south west (Figure 7.5). Parts of Dublin Bay (between approximately 3.5 km and 9 km north) are designated SACs for their habitats (North Dublin Bay SAC and South Dublin Bay SAC), SPAs for various bird species (South Dublin Bay and River Tolka Estuary SPA, and North Bull Island SPA), and as a Nature Reserve (North Bull Island Nature Reserve) (Figure 7.6).

Part of the near-shore water (about 1.5 km off the coast of where the Shanganah River discharges into the sea, and 8 km east of the Site) is designated as the Rockabill to Dalkey Island SAC (Figure 7.6). These coastal designated sites have the potential to be hydraulically linked to the Proposed Development by the surface watercourses, or by discharges of waste water via the Ringsend WWTP.

Where a designated site is outside the defined study area, but there could feasibly be a hydraulic connection between the proposed development and the designated site, the designated site would be included as a receptor in the assessment. The Wicklow Mountains SAC and SPA are located approximately 6.5 km to the south west (Figure 7.6). These internationally designated sites are located upstream with respect to the surface water environment. They are also located on different geology and are at a higher elevation than the proposed development site, so there is unlikely to be a hydrogeological connection. These designated sites have, therefore, been excluded from this assessment.

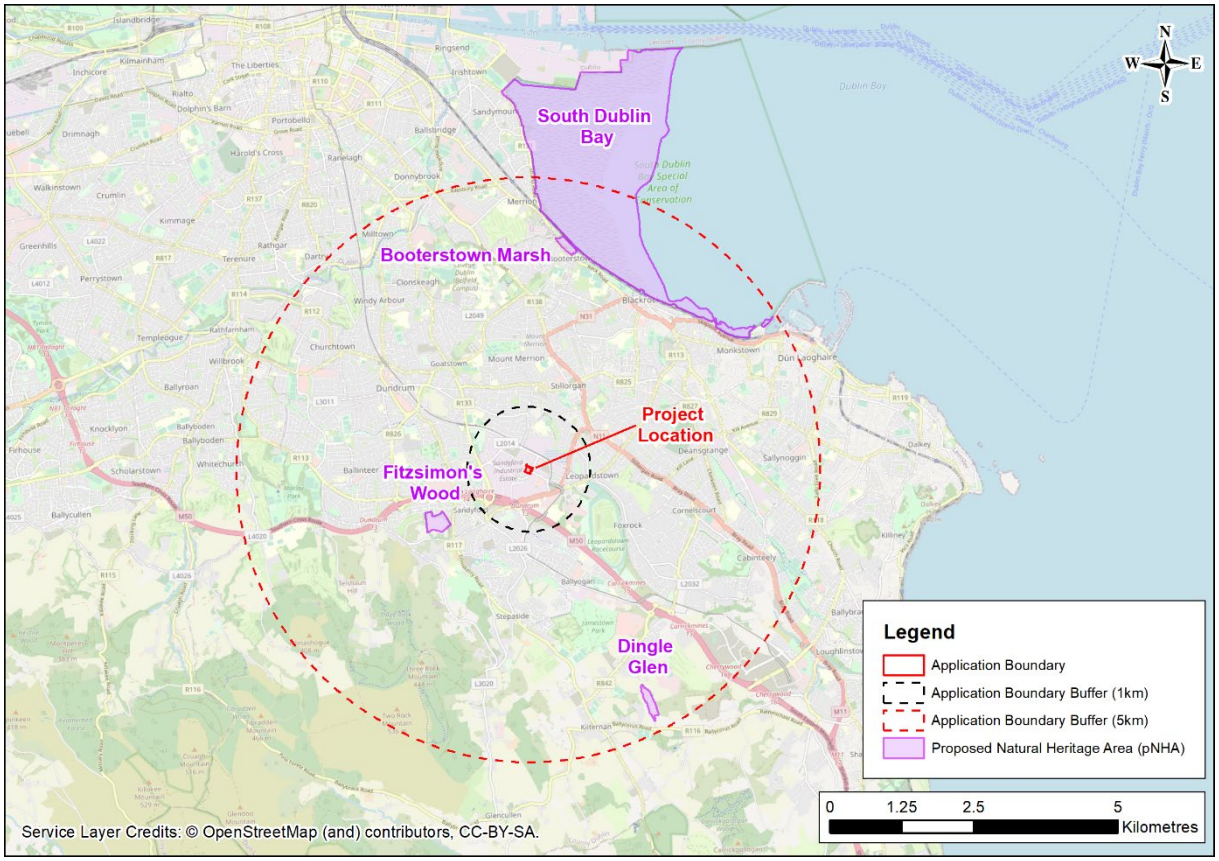


Figure 7.5: Location of Natural Heritage Areas and proposed National Heritage Areas

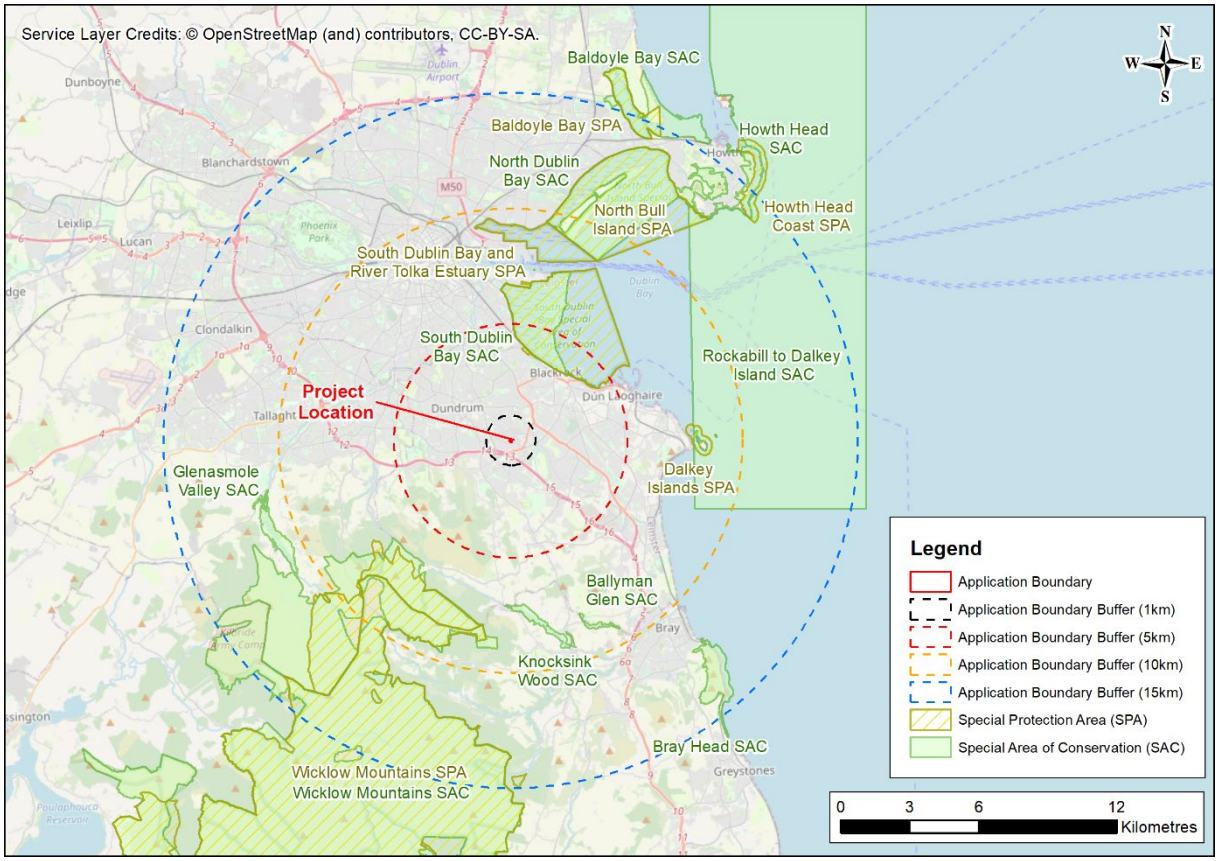


Figure 7.6: Location of Special Areas of Conservation and Special Protection Areas

7.4.7 Commentary on the Future Baseline and Climate Trends

Future climate change could alter the water environment at the Site by changing temperatures, recharge rates, changing flood risk and sea levels, and by affecting demand from public water supplies.

The climate in Ireland is changing in line with wider global changes. According to the EPA (2022b), temperatures have increased by 0.8°C compared to 1900, and there has been an increase in average annual national rainfall of approximately 60mm (or 5%) between 1981 and 2010.

Based on the most recent climate projections for Ireland (EPA, 2020), summary information presented by the EPA (2022b) and the Irish Meteorological Service (2022) indicate that in Ireland:

- the average annual temperatures are projected to increase by between 1 to 1.2 °C and 1.3 to1.6 °C by the middle of this century (2041 to 2060), depending on the emissions trajectory;
- the greatest temperature increase will be in the east of Ireland;
- the number of warm days is expected to increase;
- summer heat waves are expected to occur more frequently;
- precipitation is expected to become more variable;
  - significant reductions are expected in average levels of annual, spring and summer rainfall;
  - a substantial increase is predicted in the frequency of heavy precipitation events in winter and autumn (approx. 20%);
  - snowfall is predicated to decrease substantially; and
- sea levels are predicted to rise at the same, or a faster, rate than between 2006 and 2015 (3.6 mm/yr).

Overall, predictions associated with future climate change indicate that the future baseline might involve warmer average summer and winter temperatures, higher sea levels, and changes in rainfall patterns, volume and intensity.

Increases in rainfall intensity could lead to greater run-off, reduced aquifer recharge, increased suspended solids and pollution input to watercourses, and more river flooding. Sea level increases could have economic, social and environmental impacts; and lead to increased coastal erosion, flooding and damage to property and infrastructure. Longer drier periods combined with higher temperatures could lead to increased potential for drought that could also affect future water resource availability. Changes in population (specifically increases) could result in more demand on water resources and water shortages in summer months. Changes in future water resource availability and demand could increase the relative importance of groundwater and surface water that either currently, or could in the future, provide water supplies.

The Proposed Development is unlikely to be directly affected by sea level change. As noted in Section 7.4.3, there is no current or future risk from coastal flooding at the Site and modelled future scenarios of fluvial flooding that include climate change do not change the flood probability at the Site.

7.4.8 Information Gaps

At the time of assessment, the following information gaps have been identified with respect to this assessment:

- There is no site-specific information on current groundwater quality.
- There has been no water features survey to confirm the status of wells mapped in the study area, or to identify if there are any surface water users in the study area. For the purposes of this assessment, the

information presented in the section on water users (Section 7.4.5) has been used in the receptor selection process.

The identification of these information gaps has not affected the completion of this assessment of potential effects on the water environment. Where necessary, mitigation has been included to address these gaps.

7.4.9 Selection of Sensitive Receptors

Taking account of the above and the receptor classification method described in Section 7.3, the receptors carried forward in this assessment and their assigned importance are presented in Table 7.5.

Table 7.5: Water Receptors

Receptor	Importance and Reasoning
Groundwater – unlikely currently used for supply and limited future resource potential. Quality and availability due to regulatory requirement to maintain good quality status.	Negligible (local importance poorly productive aquifer)
Surface water – quality and availability due to regulatory requirement to maintain quality status. Surface water features that could feasibly be connected to the Proposed Development by sewers/waste water drainage and discharge (specifically the Dublin Bay SACs and SPAs).	High (no known supplies, connection to internationally designated sites)
Flooding – Changes in surface water flows on on-site plant and infrastructure (during construction and during after-use).	Negligible (local importance, not in flood risk area)
Flooding - Changes in surface water flows on infrastructure immediately adjacent and downstream of the Proposed Development.	Negligible (local importance, not in flood risk area)
Humans/Human Health (existing water users – water availability and quality).	High (human receptor)

With regard to existing water users, the likelihood of groundwater use for supply is very low due to the nature of the aquifers in the area, the predominance of mains water supply, and because only one borehole located over 1.5 km from the Site has been identified as part of the baseline work. However, there are data gaps around the use of the borehole, if there are other unidentified boreholes in the area, and if surface water is used as a source of supply. Therefore, it has been assumed that groundwater and/or surface water could be used as a local resource in the project area.

Where it is possible the impacts to the water environment study area could also impact ecological receptors (e.g. downstream designated sites that could have some water dependence – either on water quality or flows - for their qualifying species/habitats) this has been discussed in Chapter 5, (Ecology and Biodiversity).

7.5 Characteristics of the Proposed Development

7.5.1 Proposed Development Plans

The former Avid Technology International buildings have already been demolished. Construction of the Proposed Development is expected to last for approximately 2 years. It is expected that a detailed Construction Programme will be prepared by the main contractor for the works. The operational phase of the Proposed Development will follow and will be a ‘permanent’ duration (lasting greater than sixty years). A decommissioning

phase for the Proposed Development has not been considered due to the 'permanent' nature of the development.

The Proposed Development will comprise of the construction of a 'build-to-rent' housing development, accommodating a total of 334 no. residential units, in four apartment blocks.

All apartments will have access to private amenity space (balconies/terraces). Green roofs (used to collect and temporarily store water to attenuate discharges from the roof area) and screened private landscaped roof terrace areas are to be provided. All of the apartments will have access to communal amenity space in the courtyard. Where located over a basement podium slab, the courtyard will act as a green roof with hard and soft landscaping constructed over a surface water storage mat ('Blue Roof') providing interception, filtration and attenuation of surface water. Where located on grade, surface water will drain to ground through direct infiltration.

Shared residential amenities, facilities and associated spaces are to be provided within the Proposed Development. This will include a residents' childcare facility, gym, business centre, multipurpose room, staff facilities, multimedia/cinema room, shared working space, concierge and games room.

The Proposed Development will be served by a basement and lower ground floor level carpark, which will providing vehicular parking spaces and bicycle parking spaces. Plant and storage will also be accommodated at basement and lower ground floor levels. Plant includes switching equipment, air source heat pump, generator, water storage tanks, sprinkler systems, and heating plant. There will also be two substations located on the new spine road that separates the development from the neighbouring Tack site. The water tank(s) will be for attenuation and will hold roof drainage. Some rainfall will be managed by the Blue Roofs, whilst the rest will be managed through the attenuation and surface water drainage system.

The elevation of the basement will be at approximately 82 metres above Ordnance Datum (m AOD) and the lower ground floor car park will be at about 85.00 m AOD. As current ground elevations are typically around 84 m AOD to 86 m AOD and groundwater has been encountered around 2 m to 3 m bgl, the development of a basement level will involve the excavation of material and may intersect groundwater.

Water supply for the Proposed Development is intended to be from the mains. Irish Water has indicated that this is possible without an upgrade to the existing infrastructure (Irish Water, letter reference CDS21008079, dated 25 January 2022) and that it has no objection to the proposed connection (Irish Water, letter reference CDS21008079, dated 30 June 2022). Connections could be the north on Carmanhall Road, or to the east on Blackthorn Road.

Separate storm and foul water connections have been confirmed by Irish Water as being feasible (Irish Water, letter reference CDS21008079, dated 25 January 2022). The surface and storm water from the site will be discharged into the existing storm water network (i.e. not to IW combined/foul sewer) (Waterman Moylan, 2022b). Foul water will be discharged via a new connection to the existing 225 mm diameter clay wastewater sewer in Arkle Road (Waterman Moylan, 2022b), as recommended in the confirmation of feasibility from Irish Water (Irish Water, letter reference CDS21008079, dated 25 January 2022).

The proposed footpaths within the Development Site will drain to the surface water network via the site-wide drainage system ((Waterman Moylan, 2022b).

The draft Property Management Strategy Report (Aramark, 2022) states that a property management agent will manage the estate and common areas on behalf of the landlord, including maintenance, landscaping and waste storage/management.

7.5.2 Embedded Mitigation

The initial assessment of the significance of potential effects resulting from the Proposed Development takes into consideration embedded design, proposed construction and waste management methods, and commonly undertaken good practice mitigation. The elements of the Proposed Development design and good working practices that reduce the potential for impacts to the water environment include the following:

- No soil or backfill material is anticipated to be needed to be imported for construction purposes. Materials already on site will be reused where possible. Should any material need to be imported, it will be of a suitable quality that will not lead to ground contamination. Any imported material will come from a suitable source where the quality of the material will have been confirmed prior to acceptance.
- There will be no septic tanks during construction or after-use that could result in leaks to ground and the water environment. Welfare facilities for construction workers will include portable toilets. Waste from these will be disposed of off-site.
- There will be no other underground storage tanks included in the completed development that could result in leaks to groundwater.
- All water required during construction will be taken from the mains and the completed development will be connected to mains water (i.e. there will be no new groundwater or surface water abstractions) and foul sewer. A Pre-Connection Enquiry was submitted to Irish Water (Reference No: CDS21008079) for the Proposed Development and the Confirmation of Feasibility was issued by letter from Irish Water on 25 January 2022.
- There will be no on-site concrete batching.
- Construction materials will be stored in the designated site compound area before use.
- Wates will be managed as per the CDWMP and RWMP. Any waste removal will be managed and undertaken by a competent contractor appointed by the Main Contractor according to best practice and disposed of accordingly by a licensed waste disposal contractor.
- There will be a wheel washing system to reduce the deposition of material on the surrounding road network that could get into the water environment.
- There are no planned discharges to ground during construction, which will reduce the potential for impacts to water quality.
- If dewatering of excavations is required, this water will be captured and the quality of the water will be improved through the provision of settlement tanks and will be regularly monitored visually for hydrocarbon sheen and suspended solids. If the discharge of dewatering water is required, the appropriate licence(s) will be applied for and any discharge limits in relation to rates or quality will be adhered to.
- Excavations will be left open and exposed for as little time as possible, which will be used to control sediments in run-off, and reduce the potential for leaving pathways open for contamination between the surface and groundwater.
- Stockpiles will be evaluated and monitored by the main contractor to minimise erosion and input of suspended solids to the water environment.
- Refuelling and the addition of hydraulic oils or lubricants to vehicles or generators will take place on-site using a mobile bowser fuelling plant (i.e. no bulk fuel storage tanks will be used). This will only take place in designated areas. The designated areas will have impermeable surfaces, any fuel/oils that enter the drains will be intercepted, and the refuelling areas will be equipped with easily accessible spills kits that staff

have been trained to use. Any flexible pipe, pump, tap or valve will be fitted with a lock and will be secured when not in use. Portable generators or similar fuel containing equipment will be placed on suitable drip trays.

- The Contractor will prepare a Construction Management Plan (CMP) and maintain the live Construction Environmental Management Plan (CEMP). The CMP and CEMP will set out how the construction of the Proposed Development will be managed and are living documents and will go through iterations before works commence and during the works. Preliminary versions of these documents accompany this EIAR (Waterman Moylan 2022c, and Golder/WSP 2022). These will be further developed by the Contractor through subsequent iterations and will be 'live' documents that are referred to and updated as necessary throughout the construction phase. The CMP/CEMP will include widely used good practice measures to avoid or reduce the potential impact of construction works on workers, members of the public and the environment. For the protection of the water environment, these will include, but not be limited to, the following:
  - All construction works will be conducted in accordance with the appropriate site rules.
  - Hazardous materials will be labelled clearly, transported with care by competent and trained persons, and stored in dedicated areas in appropriately bunded containers. Any liquid accumulating within the bunds, or secondary containment systems, will be disposed of at a suitably authorised facility.
  - Maintenance checks and procedures will be completed to reduce the potential for leaks and spills from plant and substance storage. These will include plans for inspections, maintenance and actions should a spill occur.
  - Method statements will be prepared and followed for the management, storage, testing and disposal of waste (including excavated materials).
  - Water will be managed during construction to reduce suspended solid generation.
  - Pollution management measures will be implemented to prevent contamination of the water environment (either directly or via the ground) by silt or from machinery pollutants, such as fuels, oils and lubricants during construction and operation activities. These measures will be informed by guidance provided in relevant documents, such as the CIRIA guides to environmental good practice on site.
  - Other information on good practice to reduce the potential for environmental pollution that will be consulted includes the following documents developed by the Environment Agency (England and Wales), the Scottish Environment Protection Agency and the Northern Ireland Environment Agency
    - GPP 1 Understanding your environmental responsibilities - good environmental practices;
    - GPP 2 Above ground oil storage;
    - PPG 3 Use and design of oil separators in surface water drainage systems;
    - GPP 5 Works and maintenance in or near water;
    - PPG 6 Working at construction and demolition sites;
    - GPP 8 Safe storage and disposal of used oils;
    - GPP 13 Vehicle washing and cleaning;

  - GPP 21 Pollution incident response planning;
  - GPP 22 Dealing with spills; and
  - GPP 26 Safe storage - drums and intermediate bulk containers.

- Information about the proposed design of the Development includes specific design mitigation relating to the water environment (Waterman Moylan, 2022b). It addresses water management at the Proposed Development. These mitigation measures include:
  - Strict separation of surface water and wastewater will be implemented within the development.
  - Green roofs that will provide a first level of water treatment (removal/attenuation of pollutants or sediments) and storage (reduction and delay of surface water runoff volumes).
  - Rain gardens[3] will be incorporated in the east of the development to improve the quality of surface water run-off. The rain gardens will be connected to the wider site-wide surface water network and pass through the attenuation tank before discharge to public surface water sewer.
  - Permeable asphalt will be used for footpath surfaces. The permeable paving will be lined with a membrane to prevent groundwater ingress, and a perforated pipe system will convey collected surface water to the site-wide drainage system.
  - Filter drains will be used adjacent to the footpath to the north of the site to treat water run-off before conveying it to the site-wide surface water drainage network.
  - An attenuation tank (533 m^3 volume) located at the eastern side of the basement will be used to store surface water before it is discharged to public surface water sewer via a hydrobrake system. The tanks have been designed to manage the calculated peak outflow from the impermeable area of the Proposed Development during a 1 in 100 year storm event, plus 20% climate change. Discharge from the attenuation tanks will be limited to greenfield run-off rates of 2.4 l/s.
  - Petrol Interceptors will be installed upstream of the proposed attenuation tank as a final treatment level before discharging to the attenuation tank.
  - Tree pits will be incorporated to the south of the development to prove interception storage south of the access road.
  - Within the basement carpark area, any rainwater entering the system as a result of snow melt or raindrops from cars will pass through a petrol interceptor providing treatment and will be discharged into the foul water network.

The core elements of the SuDS system (attenuation tanks, permeable paving, filter strips, tree pits, rain gardens and green roofs will be inspected and maintained during the afteruse/occupation of the Proposed Development as per manufacturers instruction, the recommended schedules presented in the Engineering Assessment Report (Waterman Moylan, 2022b) or equivalent developed by the management company.

The draft Property Management Strategy Report (Aramark, 2022) and draft Building Lifecycle Report (Aramark 2022) state the following mitigation will be adopted during the operational phase:

[3] Rain gardens are typically small systems that serve part of a single property. Filter and drainage layers are generally replaced by a thin layer of compost/sand-amended native soils or specified soil mixes (engineered soils). They have a simple inflow where rainwater enters the garden, and they have maximum depth of standing water of 150 mm (Waterman Moylan Consulting Engineers Limited, 2022b).

- An experienced property management company agent will be appointed to manage the development on behalf of the landlord. The agent will ensure the development is well managed and maintained in line with the planning application.
- There will be a fire-fighting system in place that comprises dry and wet risers. The systems will be supplied by a water tank at basement level, so there will be no need for storage of chemicals for firefighting.

Mechanical plant, soils and waste pipework in landlord areas and electrical infrastructure will be included in the planned preventative maintenance programme. Tanks and pumps will be maintained in accordance with manufacturers guidelines.

7.6 Potential Effects

The main potential impacts and associated effects that will be considered in the assessment relate to the following:

- Mobilisation of existing contamination by construction works (e.g. earth movements, excavation, foundation construction and piling) that could impact water quality and use;
- Activities that might impact water quality and use (e.g. increased suspended solids, leaks and spills from machinery or stored substances, or discharges – including drainage and waste water discharges and their potential impacts, and effects on water quality at the SACs/SPAs);
- Dewatering during construction that could lead to changes in groundwater levels and flow regimes (and, therefore, water availability), and the discharge of dewatering water that could result in changes to watercourse quality and/or morphology;
- Changes to surface water flow regimes and discharges that could alter flood risk; and
- Construction of the basement and foundations that could lead to changes in groundwater levels and flow regimes (and, therefore, water availability).

These are discussed and assessed in the following sections.

Construction Phase Impacts

Changes in the quality and/or availability of surface water or groundwater as a result of the Proposed Development could affect existing users and future resource potential and would not support the WFD objectives. The Proposed Development could introduce a range of sources that on their own or in combination have the potential to impact water quality or availability. These are grouped together in the following section to describe the potential impact linkages to the selected receptors.

Impacts to surface water could occur directly or indirectly via surface flows or via groundwater. Impacts to groundwater are more likely to be indirect through the ground, but excavations into the sub-surface would reduce soil and sub-soil thickness and could result in an increased risk to aquifer water quality from contamination/pollution incidents on the surface.

There is also the potential for activities undertaken during construction to create a new pathway for an impact to affect a receptor, or increase the likelihood or magnitude of an impact. Piling activities, if used for ground improvements or foundations, and excavations into the subsurface could create pathways that increase the vulnerability of groundwater by either providing a source of pollution in the activity itself or creating more rapid/direct pathways for pollution transport to groundwater.

Changes in Water Quality (Groundwater and Surface Water)

Potential sources of impact that could result in a change in water quality depend on the activities that will be undertaken during construction. The following potential sources have been identified through the project description and experience of typical construction activities:

- Refuelling leaks or spills could introduce hydrocarbons to the water environment.
- Leaching of substances from imported infill materials if the materials are not of suitable quality.
- Discharges or leaks from welfare facilities could introduce washing and toilet facility waste to the environment.
- Wheel washing discharges that could be contaminated with hydrocarbons, brake dust, metals, road salt, cleaning agents and other traffic residue.
- Leaks and spills of substances during storage, transport, use and/or disposal.
- The introduction of drilling fluids through piling (foundation type to be confirmed).
- Dewatering and the discharge of dewatering water. Based on the project description, dewatering would be within the top metre or two from the ground surface rather than within deeper aquifer systems, but the discharge of groundwater to a different location, such as surface water, could impact surface water quality.
- Works that discharge water to the surface water sewer, which in turn discharges into Brewery Stream/Carysfort Maretimo Stream. Poor sediment erosion control could result in high suspended solids. Construction activities such as excavations, earth movement, stockpiling, reprofiling and building represent potential sources of suspended solids.

Embedded mitigation includes activities or processes to manage and limit the potential impact from refuelling, leaching from imported materials, leaks and spills from stored and used substances, and water discharges. With management in place, the predicted magnitude of impact is considered to be **negligible (adverse)**.

However, the impacts associated with potential for previously unidentified contamination and piling activities mean that pollution events could occur, baseline water quality could deteriorate, and water quality standards could be breached. The predicted magnitude of impact to water quality is **high (adverse).**

It is assumed that the wheel wash would be supplied from the mains and would be reused as much as possible. The water and sludge that collects in the wheel wash has the potential to become contaminated with material washed off the vehicles. There are no planned discharges to ground, but if this was to be discharged or leak to the water environment, this could affect water quality. The predicted impact to water quality is **high (adverse).**

Changes in Surface Water Flow Characteristics (Catchments and Run-off Rates)

Increased hardstanding (e.g. roads and paving) can change surface water flow regimes, which can in turn affect flood risk. Capturing excess water during construction to manage water levels (e.g. passive or active dewatering) or water quality (e.g. settlement ponds) could result in changes to discharge rates and locations from the catchment.

Taking into account the intended water management design (Waterman Moylan, 2022b) and the construction good practice measures, the predicted magnitude of impact is considered to be **negligible (adverse)**.

Changes in Groundwater Flow Regime (Levels and Flows)

Changes in recharge to groundwater could occur as a result of increased coverage of the ground with hardstanding and due to the compaction of soils during construction. This could, in turn, result in a change in groundwater resource availability. Given that the Site was previously developed, the underlying

subsoil/superficial deposits are clayey and the bedrock is classified as a poor aquifer, the predicted impact on groundwater recharge is considered to be **negligible (adverse).**

If any groundwater abstraction is required for dewatering, this will result in a localised change in groundwater flow directions and levels. This could, in turn, result in a temporary change in local groundwater resource availability. The near surface ground conditions at the Site are known to be clayey and, although water has been encountered, only minor seeps have been observed. Therefore, if dewatering of any kind (including passive drainage of excavations) is required, the predicted impact on groundwater flows and levels is considered to be **negligible (adverse).**

Piled foundations result in the installation of a barrier to groundwater flow in the sub-surface. This can locally change groundwater flow paths and change groundwater levels (back up of groundwater upgradient and groundwater shadowing downgradient), particularly if the piling is laterally extensive, or extends to the full thickness of an aquifer. It is uncertain at this stage if any of the Development foundations will be piled. If such activities are undertaken, there is the potential to impact groundwater resource availability. Given the size of the Proposed Development compared to the lateral extent of the mapped geological units, that underlying subsoil/superficial deposits are clayey with low hydraulic conductivity meaning that any changes in water levels will likely be over short distances, and the bedrock is classified as a poor aquifer, the predicted impact on groundwater flows and levels is considered to be **negligible (adverse).**

Secondary Receptors

Effects on the water can have secondary effects on human water users. The nearest known water borehole is located over 1.5 km from the Proposed Development and the area is known to have mains water supplies. However, there could be unknown private water supplies or abstractions from surface water in the study area, so the end user could also be affected by any changes in groundwater quality and/or availability. The magnitude of the predicted impact to water is discussed in the text above. The associated level of effect depends on the importance of the receptor. The predicted effects on human receptors are presented in Table 7.6.

Secondary receptors to changes in surface water flows and flood risk include Development plant and infrastructure, and infrastructure immediately adjacent and downstream of the Proposed Development itself. Taking into account the intended water management design (AECOM, 2021) and the construction good practice measures, the predicted magnitude of impact is considered to be **negligible (adverse)**.

Secondary impacts to ecology as a result of changes to the water environment are addressed in Chapter 5.

After-use Phase Impacts

The proposed after-use of the Development is a mixture of residential housing and associated amenities (e.g. shared utilities, recreational spaces, parking and childcare facilities). For the purposes of this assessment it is assumed that residential users will not grow vegetables in the ground in the shared areas at ground level. The Proposed Development will be connected to mains water and sewerage. It is, therefore, unlikely that additional water supplies will be required.

Depending on the activities that may take place during the occupied after-use phase, there is the potential that discharges to ground, or leaks, could lead to water quality being affected. Such discharge or leaks could originate from sewerage; drainage from areas of hard standing (e.g. car parks and roads); or transport, storage and handling of hazardous substances required for plant maintenance. The potential impact from sanitary waste will be mitigated by connection to mains sewer, parking places (with associated oil/water interceptor) will be for parking only, and the landscaping/surfacing will be designed to provide attenuation and filtering. With this mitigation the predicted potential impact on water quality is **negligible (adverse)**.

After completion and during occupation of the proposed development, surface water will be collected in the site-wide surface water collection system and be stored in attenuation tanks before being discharged at greenfield rates. Compared to the existing unrestricted surface water discharge from the land, this is considered to result in a **low (beneficial)** impact on surface water discharges.

Other potential changes to surface water flow, water quality or water availability that continue through the after-use phase, but that originated from permanent sources of impact initiated in the construction phase (e.g. changes to drainage, hardstanding, foundations) are not reconsidered in this assessment phase.

The Proposed Development will be equipped with a fire safety system using mains water, as referenced in Section 7.5.2. In the unlikely event of a major fire the predicted potential impact on water quality would be **negligible (adverse)**, as no significant quantities of hazardous materials will be stored on-site and the Site's SuDS system would be expected to treat some, if not all, of the run-off fire water that arose.

Evaluation of Initial Effect Significance

The evaluation of effects takes into account the predicted impact magnitude combined with receptor sensitivity. The evaluation of effect significance from each of the initial construction and after-use impacts (taking account of embedded mitigation) discussed above is presented in Table 7.6. As can be seen from Table 7.3, any negligible initial impact magnitude will result in a slight or imperceptible level of effect, both of which levels are 'not significant'. Therefore, Table 7.6 only includes those sources of impact that may result in a low to high negative initial impact magnitude.

Table 7.6: Evaluation of Initial Impacts and their Effect Significance

Project Phase	Receptor	Sensitivity	Source of Impact/Description of Change*	Impact Magnitude*	Level of Effect *
Construction	Groundwater	Negligible	Drilling and piling activities and/or disturbance of unidentified previously contaminated material introducing substances to groundwater resulting in poorer groundwater quality	High (adverse), indirect, short term, reversible	Slight
			Wheel wash water or sludge discharges resulting in poorer groundwater quality	High (adverse), indirect, short term, reversible	Slight
	Surface Water	High	Wheel wash water or sludge discharges resulting in poorer water quality	High (adverse), direct/indirect, temporary, reversible	Profound
	Human water users	High	Drilling and piling activities and/or disturbance of unidentified previously contaminated material introducing substances to groundwater resulting in poorer groundwater quality for groundwater users	High (adverse), indirect, short term, reversible	Profound
			Wheel wash water or sludge discharges resulting in poorer water quality for water users	High (adverse), indirect, short term, reversible	Profound

* Taking account of embedded mitigation

7.6.1 'Do-Nothing' Scenario

In the event that the Proposed Development does not progress (i.e. the Site remains undeveloped with the previous building demolished), there are unlikely to be impacts on the water environment in the area of the Site.

Derelict and vacant land can encourage fly tipping, so there is some potential for pollution incidents to occur and water quality to be adversely impacted if the Proposed Development did not proceed

7.7 Mitigation and Management

To further mitigate the initial effects associated with the potential impacts on the water environment and associated human users, the following additional mitigation will take place:

- A pre-construction water feature survey to obtain current information on any potential non recorded local water users and the source of their water (note that given the urban location it is considered highly unlikely that there are any non-recorded water users). If such users are identified, an assessment to be made of how/if the Proposed Development (including construction activities) could affect these water users. The CEMP will be updated to include any further mitigation that may be required if impacts are predicted.
- If evidence of previously unidentified potential contamination (either visual or olfactory) is identified during construction works, construction good practice and management procedures will be followed that may include investigation and assessment works. Any contaminated waste material identified during such works that needs to be removed from site will be disposed of at an appropriately licensed landfill.
- Any sludge collected from wheel wash used during construction will be tested and disposed of to an appropriate waste disposal facility. No used water or settled solids will be disposed of to land or water without prior consent.
- Should any discharges to ground or surface water be proposed during construction, the relevant responsible authority will be consulted to determine if the discharges require authorisation. Local authorities are responsible for the issuing of effluent discharge licences for effluents discharged to waters, and Irish Water are responsible for effluent discharges to sewers. If authorisation is required, the discharger will make the relevant application(s). Discharges will be monitored as per the licence/consent, and appropriate treatment will be undertaken so that discharges meet the relevant environmental standards.
- Any piling activities will be undertaken using good practice methods that reduce the potential for creating new pathways between the surface and sub-surface; particularly to groundwater within the bedrock aquifer.
- Precautions will be taken during connection of the Proposed Development to the existing sewage and surface water drainage systems to ensure materials do not enter the existing systems.
- The design of the drainage system will take into account the interim guidance presented in the Department of Housing, local Government and Heritage's document on Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas Water Sensitive Urban Design Best Practice.
- With specific reference to EPA guidance on private well protection, and if relevant, there will be a minimum of 30 m between wells and any septic tank or fuel storage, and a minimum of 5 m between a well and chemical storage.

7.7.1 Monitoring

No monitoring requirement is foreseen to maintain and protect the conditions of the water environment. Any monitoring associated with licences or permits will be detailed within the licences or permit documentation.

7.8 Residual Effects

Any impact linkages included in Table 7.6 have been carried forward to this section. A summary of the sources of impact, predicted magnitudes of residual impact (accounting for embedded mitigation and additional mitigation) and subsequent residual effect significance is presented in Table 7.7. In all cases the residual effect is **not greater than Slight and is therefore Not Significant**.

Table 7.7: Evaluation of Predicted Residual Impacts and their Effect Significance

Project Phase	Receptor (importance)	Potential Source of Impact	Direct or Indirect	Duration*	Reversible or Irreversible	Summary of Combined Mitigation (embedded and additional)	Residual Magnitude of Impact (direction)	Residual Effect Significance
Construction	Groundwater (Negligible)	Drilling and piling activities and/or disturbance of unidentified previously contaminated material introducing substances to groundwater resulting in poorer groundwater quality	Indirect	Short term	Reversible	Good practice piling techniques if piling is required. Construction good practice and management procedures, including investigation and assessment works if required.	Negligible	Not significant/ Imperceptible
		Wheel wash waste discharges to groundwater resulting in poorer groundwater quality	Indirect	Short term	Reversible	No planned discharges to ground. Appropriate management, collection and disposal of wheel wash water/sludge. Follow good practice detailed in CMP/CEMP. Consented discharges to the water environment or sewer where proposed.	Negligible	Not significant/ Imperceptible
	Surface Water (High)	Wheel wash waste discharges to surface water resulting in poorer water quality	Direct or indirect	Temporary	Reversible	No planned discharges to ground. Appropriate management, collection and disposal of wheel wash water/sludge. Follow good practice detailed in CMP/CEMP. Consented discharges to the	Negligible	Not significant/ Slight

Project Phase	Receptor (importance)	Potential Source of Impact	Direct or Indirect	Duration*	Reversible or Irreversible	Summary of Combined Mitigation (embedded and additional)	Residual Magnitude of Impact (direction)	Residual Effect Significance
						water environment or sewer where proposed.		
	Human water users (High)	Drilling and piling activities and/or disturbance of unidentified previously contaminated material introducing substances to groundwater resulting in poorer groundwater quality for groundwater users	Indirect	Short term	Reversible	Pre-construction water feature survey. Good practice piling techniques if piling is required. Construction good practice and management procedures, including investigation and assessment works if required.	Negligible	Not significant/ Slight
		Wheel wash waste discharges resulting in poorer water quality for water users	Indirect	Short term	Reversible	Pre-construction water feature survey. No planned discharges to ground. Appropriate management, collection and disposal of wheel wash water/sludge. Follow good practice detailed in CMP/CEMP. Consented discharges to the water environment or sewer where proposed.	Negligible	Not significant/ Slight

* Maximum duration without intervention

7.9 Difficulties Encountered

No particular difficulties were encountered in undertaking the assessment of the water environment. The identification of information gaps (see Section 7.4.8) has not caused any difficulties in completing this assessment of potential effects on the water environment. Where necessary, the proposed mitigation addresses the information gaps.

7.10 Cumulative Effects

The effects of the Proposed Development are considered cumulatively with other reasonably foreseeable developments in the local area in Chapter 15 – Interactions, Cumulative and Combined Effects.

7.11 Summary and Conclusions

This assessment considers the potential impacts and effects on the water environment that can be reasonably foreseen as consequences of the normal construction and operation of the Proposed Development during the construction and after-use phases.

The main receptors that required to be assessed were groundwater, surface water, on-site plant and infrastructure, infrastructure immediately adjacent and downstream of the Proposed Development and human health (specifically existing water users) that could be secondarily affected by changes to the water environment. The secondary effects on ecology and biodiversity are considered in Chapter 5.

There are no surface water features on the Site, the closest being Stillorgan Reservoirs just over 200m to the north. The Site is classified as being at low flood risk (Flood Zone C). There is only one well or spring mapped within 2km of the Site, a borehole located over 1.7km to the north-east. There are no internationally designated sites at, or within 2km, of the Site.

Known design and construction management mitigation measures were accounted for in an assessment of initial impacts and effects. Where additional mitigation measures could be incorporated to reduce the initial impacts and effects further, these were identified and included in an assessment of residual impacts and effects.

In summary, the significance of residual effects on water (and on human health from water) resulting from the different potential sources of impact are predicted to be no greater than **slight adverse** and, therefore, **not significant** in terms of this assessment.

7.12 References

- AECOM Consulting Engineers, (2020), 'Report on a Site Investigation at Former Avid Site, Sandyford'. June 2020. Report 22455.
- AECOM Consulting Engineers, (2021), 'Stage 3: Planning Application to An Bord Pleanala Infrastructure Report'. February 2021.
- Aramark, (2022), 'Proposed SHD. Carmanhall Road Development. Property Management Strategy Report'. 2022.
- Aramark, (2022), 'Building Lifecycle Report'. Draft dated 22 July 2022.
- Environmental Protection Agency (EPA), (2020), 'High-resolution Climate Projections for Ireland – A Multi-model Ensemble Approach', September 2020.
- Environmental Protection Agency (EPA), (2021), '3rd Cycle Draft Liffey and Dublin Bay Catchment Report (HA09), version 1', August 2021.
- Environmental Protection Agency (EPA), (2022a), Online Mapping - https://gis.epa.ie/EPAMaps/ accessed 9 February 2022.
- Environmental Protection Agency (EPA), (2022b) 'What impact will climate change have on Ireland?'. Available at: https://www.epa.ie/environment-and-you/climate-change/what-impact-will-climate-change-have-for-ireland/ accessed 10 February 2022.
- Geological Survey Ireland (GSI), (2022), Geological Survey Ireland Spatial Resources online data viewer. https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228, accessed 9 February 2022.
- Geological Survey Ireland (GSI), (2022b), Geological Survey Ireland https://www.gsi.ie/en-ie/data-and-maps/Pages/Groundwater.aspx, accessed 9 February 2022.
- Geological Survey Ireland (GSI), undated: Kilcullen GWB: Summary of Initial Characterisation.
- Golder Associates Ireland Limited - WSP Ireland Consulting Ltd, (2022), 'Construction Environment Management Plan'.
- Irish Meteorological Service, (2022), 'New Climate Projections'. Available at: https://www.met.ie/epa-climate-projections-2020, accessed 10 February 2022.
- Office of Public Works, (2022), Online Flood mapping. https://www.floodinfo.ie/map/floodmaps/. Accessed 9 February 2022.
- Waterman Moylan Consulting Engineers Limited, (2022a), 'Carmanhall Road SHD 2022 Flood Risk Assessment, draft 3', 1 July 2022.
- Waterman Moylan Consulting Engineers Limited, (2022b), 'Carmanhall Road SHD 2022 Engineering Assessment Report, issue no. 1', June 2022.
- Waterman Moylan Consulting Engineers Limited, (2022c), 'Carmanhall Road SHD Preliminary Construction Management Plan, issue draft 3', 13 July 2022.
- Waterman Moylan Consulting Engineers Limited, (2022d), 'Carmanhall Road SHD Preliminary Construction Demolition Waste Management Plan, issue draft 2', 13 July 2022.

- Waterman Moylan Consulting Engineers Limited, (2022e), 'Carmanhall Road SHD Resource & Waste Management Plan (RWMP) for Construction & Demolition Waste, issue draft 2', 13 July 2022.

8.0 AIR QUALITY AND CLIMATE

8.1 Introduction

8.1.1 Background

Golder, member of WSP in Ireland ("Golder") have been commissioned to prepare this Environmental Impact Assessment Report (EIAR) on behalf of Atlas GP Ltd, as Applicant for the Carmanhall Road Strategic Housing Development (SHD) 2022, (hereafter the 'Proposed Development'), on lands located at the former Avid Technology International site on Carmanhall Road, Sandyford Industrial Estate, Dublin 18, (the 'Site' / 'Application Site'). It represents the findings of an Environmental Impact Assessment (EIA) carried out for the Proposed Development and supports the overall planning application for it. 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 15 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 (Project Description).

8.1.2 Project Description

The development will consist of 334 Build to Rent residential apartment units within 4 no. apartment blocks and as follows:

- *79 No. Studio*
- *175 No. 1 bed*
- *80 No. 2 bed*

- *All residential units provided with private balconies/terraces to the north/south/east and west elevations*
- *Crèche 272 sq.m.*
- *Residential amenity spaces 893 sq.m. (including a unit of 146.5 sqm open to the public, resident's gym, business centre, multipurpose room, staff facilities, multimedia/cinema room, shared working space, concierge, and games room)*
- *Height ranging from 5 to 16 storeys (over basement)*
- *Landscaped communal space in the central courtyard*
- *Provision of a new vehicular entrance from Carmanhall Road and egress to Blackthorn Road*
- *Provision of pedestrian and cycle connections*
- *125 No. Car Parking, 6 No. Motorcycle Parking and 447 cycle spaces at ground floor/under croft and basement car park levels*
- *Plant and telecoms mitigation structures at roof level*

The development also includes 2 no. ESB substations, lighting, plant, storage, site drainage works and all ancillary site development works above and below ground.

8.1.3 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.

8.1.4 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-east corner of the Carmanhall Road and Blackthorn Road intersection, within the Sandyford Industrial Estate. The total Application Site is approximately ca. 0.99 ha with ca. 0.73 ha owned by the Applicant.

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

Figure 8.1: Application Site boundary

8.1.5 Site Description

A detailed description of the Proposed Development is provided in Chapter 3.0 Project Description, but in summary it will comprise the following:

The Application Site is currently clear as the former Avid Technology International buildings have been demolished on site 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 approval for a part-seven rising to nine storey student accommodation development under Reg. Ref. PL06D.303467, will be superseded by the Proposed Development. Carmanhall Road abuts the Site's northern boundary and Blackthorn Road abuts the Site's eastern boundary. Opposite the Application Site to the north are commercial premises including the Nova Atria building (six-storey) and a number of shops. There is a six- storey office development adjacent to the south of the Site. The Application Site is immediately adjacent to a vacant site, the former Tack Packaging site, to the west.

MDO Architects have developed a Masterplan for the Application Site and the adjacent Tack Packaging site. A separate SHD application has been submitted for the Tack Packaging site known as the Tack Sandyford SHD.

Vehicular access is currently provided into the Application Site via an entrance to the north-west off Carmanhall Road. The Site slopes from south to north, with a difference in elevation of approximately 4 m across the Site.

Landscaping proposals will include communal open space through secure central courtyard gardens set over a podium which will sit above the car park and further communal open space is to be provided through the provision of roof gardens.

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.

8.1.6 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

National and Regional Planning Policy

The National Development Plan 2021-2030 sets out the investment priorities that will underpin the successful implementation of the National Planning Framework, including the development of the necessary housing stock. The Plan states:

'*Supporting the growth projected in the NPF requires capital investment. Ireland needs to prepare to support an additional 1 million people living in the country by 2040 compared to 2016 and with that, there is a need to create 660,000 additional jobs and at least 550,000 more homes.*'

The Proposed Development is considered to reflect the type of sustainable development which is sought throughout National Policy regarding the appropriate development of under-utilized sites. Moreover, the National Development Plan demonstrates the Government's commitment to meeting Ireland's infrastructure and investment needs over the next ten years, through a total investment estimated at €165 billion over the period. This includes investment in high quality integrated public and sustainable transport systems. Sandyford is listed as an area of potential growth in the Dublin Metropolitan Area Strategic Plan (MASP) within the Greater Dublin Area Transport Strategy 2022-2042. As such, the area will form part of orbital core bus corridors, reconfigured Luas lines and an extension to the M50.

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 Dún 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 Dún 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.'

Dún 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.

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'.

Local Planning Policy

At the local level, the Dún Laoghaire Rathdown County Development Plan 2022 - 2028 guides planning policy in relation to air quality and climate. The following policies are relevant to the proposed Development:

Policy CA1*: National Climate Action Policy - It is a Policy Objective to support the implementation of International and National objectives on climate change including the 'Climate Action Plan 2021 Securing Our Future', the 'National Adaptation Framework' 2018, the 'National Energy and Climate Plan 2021- 2030', and take account of the 'Climate Action and Low Carbon Development (Amendment) Act 2021', and subsequent updates, other relevant policy, guidelines and legislation, that support the climate action policies included in the County Development Plan*

Policy CA16*: Low Emissions Vehicles* - It is a Policy Objective to support and facilitate the rollout of alternative low emission fuel infrastructure through the Development Management process, prioritising electric vehicle infrastructure.

Policy EL14*: Air & Noise Pollution* - It is a Policy Objective 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. (Consistent with RPO 10.10 of the Regional Spatial and Economic Strategy).

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'. The Site is zoned 'A2' in the Dún Laoghaire Rathdown Development Plan 2022-2028, 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 (SUFP) area only. The Application Site lies within the Sandyford Business District as identified in the SUFP.

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 on ambient air quality and cleaner air for Europe (CAFE) 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 (PM_{10} and $PM_{2.5}$) when measured as annual mean concentrations, are as follows:

- NO_2 - 40 µg/m^3;
- PM_{10} - 40 µg/m^3; and
- $PM_{2.5}$ - 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

European Context

In October 2014, the European Council agreed the 2030 Climate and Energy Framework, which included actions such as setting out targets for reducing GHG emissions and reforming the EU Emissions Trading Scheme (ETS). The Framework proposed a commitment to an overall EU reduction of at least 40% in GHG emissions by 2030 compared to 1990 levels. The EU ETS legislation was revised in 2018 to enable it to achieve the EU's 2030 emission reduction targets in line with the 2030 Climate and Energy Policy Framework and as part of the EU's contribution to the 2015 Paris Agreement. The EU ETS is implemented in Ireland under S.I. 490 of 20127 and amendments and S.I. No. 261 of 2010 and amendments. The Effort Sharing Regulation was adopted in 2018 as part of the EU's implementation of the Paris Agreement. It established binding annual GHG emission targets for Member States for the periods 2013–2020 and 2021–2030. These targets concern emissions from most sectors not included in the EU ETS, such as transport, buildings, agriculture and waste.

National Context

The Climate Action and Low Carbon Development National Policy Position for Ireland was published in 2014 with the Act of the same name being published in 2015. The Act sets out the national objective of transitioning to a low carbon, climate resilient and environmentally sustainable economy in the period up to 2050. The Act introduced a requirement for the preparation of a National Mitigation Plan and a National Adaptation Framework to specify tools and structures for transitioning to a low carbon economy. The first National Mitigation Plan was published in July 2017 by the Department of Communications, Climate Action and Environment. The Plan is designed to be a whole-of-Government approach to tackling greenhouse gas emission. The National

Adaptation Framework (NAF) was published in 2018 and sets out the national strategy to reduce the vulnerability of the country to the negative effects of climate change and to avail of positive impacts.

The Government of Ireland's Climate Action Plan was published in 2019 and updated in 2021. The plan sets out a detailed sectoral roadmap to deliver a cumulative reduction in emissions, including the introduction of Carbon Budgets. More recently, Climate Action and Low Carbon Development (Amendment) Bill, 2021 has been published, which amends the Climate Action and Low Carbon Development 2015 Act. If enacted, the Bill seeks to achieve a carbon neutral economy by no later than the end of 2050.

Under the EU's Effort Sharing Regulation, targets are set for Ireland's reductions of non-Emissions Trading Scheme sector emissions on 2005 levels with annual binding limits set for each year.

8.2.2.3 Guidance

This assessment has been made with reference to the 'Guidelines on the information to be contained in environmental impact assessment reports', published by the EPA in 2022 and 'Environmental Impact Assessment of Projects, Guidance on the Preparation of the Environmental Impact Assessment Report' published by the European Commission in 2017.

Other documents considered in this assessment include:

- Dún Laoghaire-Rathdown County Development Plan 2022 – 2028
- Department of Communication, Climate Action and Environment, Climate Action Plan 2021;
- EPA, Ireland's Greenhouse Gas Emissions Projections 2021 – 2040, 2022;
- EPA, The impact on 2020 greenhouse Gas Emissions of COVID-19 restrictions, 2021;
- European Commission; Climate Change and Major Projects, 2016;
- IEMA - Assessing Greenhouse Gas Emissions and Evaluating their Significance, 2017; and
- IEMA - EIA Guide to Climate Change Resilience and Adaptation, 2020

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.

Stage	Activity
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.

8.3.1.1 Air Quality

8.3.1.1.1 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.

8.3.1.1.2 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. 0.99 ha with an area of ca. 0.73 ha owned by the Applicant. The Proposed Development will comprise of 334 residential apartments and will be served by a lower ground floor and basement level carpark, providing a total of 125 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 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.	Typically, any combustion plant where the single or combined NO_x emission rate is less than 5 mg/s is unlikely to give rise to impacts, provided that the emissions are

The development will:	Criteria to proceed to an air quality assessment
NB. This includes combustion plant associated with standby emergency generators (typically associated with centralised energy centres) and shipping.	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. 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.

8.3.1.2 Climate

The approach to establishing the significance of impacts for climate has broadly followed the overall methodology of this EIAR in terms of ascertaining the magnitude of impacts (level of change predicted to occur) as well as the sensitivity of the receptor in order to provide a reasoned judgment of the significance of impacts. It is important to note that CO_2 emissions have a global effect when they are released into the atmosphere, and it is difficult to assess the scale of significance of CO_2 emissions at a local level. The Proposed Development is considered in a combined construction and operation phase for the climate assessment.

8.3.2 Air Quality 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 (2020) for NO_2, NO_x, PM_{10} and $PM_{2.5}$ from suburban monitoring locations in Dublin (Zone A) is presented in Table 8.7 below.

Table 8.7: Annual Mean Monitoring Data for Suburban Dublin Zone A Stations (2020)

	Monitoring Location	Concentration (µg/m^3)
NO_2	Swords	11
	Davitt Road	14
	Dun Laoghaire	14
	Blanchardstown	12
	Ballyfermot	12
	Average	**12.6**
NO_X	Swords	15.5
	Davitt Road	27.5
	Dun Laoghaire	21.7
	Blanchardstown	62.4
	Ballyfermot	17.1
	Average	**28.8**
PM_{10}	Dun Laoghaire	12
	Blanchardstown	15
	Ballyfermot	12
	Tallaght	10
	Phoenix Park	10
	Average	**11.0**

	Monitoring Location	Concentration (µg/m³)
$PM_{2.5}$	Ballyfermot	8
	Phoenix Park	7
	St Anne's Park	7
	Davitt Road	9
	Finglas	7
	Average	**8.0**

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 Coronavirus (COVID-19) crisis, it is likely that traffic flows are 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 (2017-2021).

Table 8.8: Dublin Airport recorded Temperature Information

Mean Air Temperature (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
2020	6.4	5.7	6.1	8.8	11.5	13.5	14.4	14.9	13.0	9.6	8.5	4.9
2021	3.9	6.1	7.3	6.2	9.3	14.0	16.3	14.8	14.8	11.8	7.8	7.0
Maximum 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
2020	13.7	12.8	14.5	19.1	20.7	24.0	21.8	23.2	22.2	15.1	15.8	14.1
2021	11.6	13.5	16.2	16.1	20.1	23.1	26.3	21.6	22.3	19.9	16.0	13.9
Minimum Air Temperature (°C)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**

Mean Air Temperature (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
2020	-2.1	-2.1	-3.4	-1.6	-2.1	4.6	5.4	4.0	1.3	0.3	-0.9	-4.1
2021	-5.6	-0.3	-3.3	-4.5	-1.8	3.0	7.3	7.6	5.2	3.8	-1.0	-1.2

Table 8.9: Dublin Airport recorded Climate Information

Total Precipitation (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
2020	36.0	130.4	31.8	12.8	9.3	69.6	98.9	87.1	60.9	80.6	48.1	83.1
2021	115.1	55.0	32.1	10.8	83.5	12.6	72.9	65.3	42.0	79.8	11.7	85.8
Mean Wind Speed (knot)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
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
2020	9.7	13.1	10.3	8.4	8.6	9.2	8.9	8.5	8.5	10.4	9.6	10.5
2021	9.4	11.9	9.7	7.8	8.6	7.8	6.6	7.5	7.0	8.4	9.5	9.6
Sunshine duration (hours)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
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
2020	65.0	103.2	140.6	188.2	295.0	130.0	104.2	97.1	143.0	120.6	70.7	65.5
2021	54.1	70.0	116.3	209.9	214.2	180.2	190.8	115.2	102.6	111.9	70.3	59.1
Mean Relative Humidity (%)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
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
2020	83.6	81.5	79.0	78.0	70.9	79.9	82.0	86.0	82.8	82.7	86.2	87.2
2021	88.9	79.1	80.9	77.2	77.4	76.2	81.8	84.1	84.5	83.7	86.8	88.4

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 August, 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 December to 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 April 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.

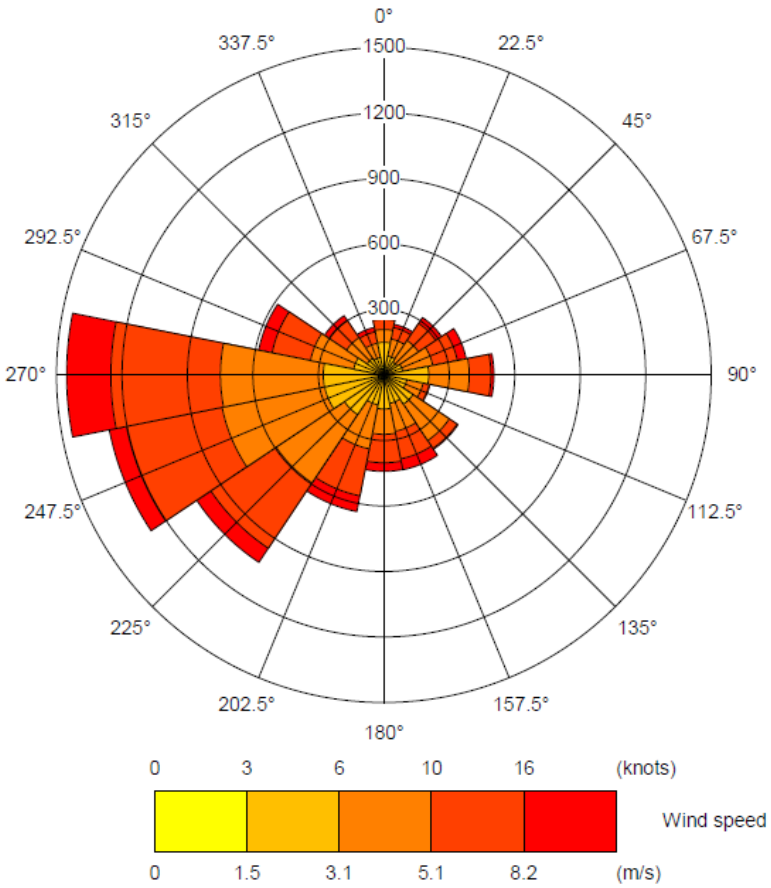


Figure 8.2: Annual dominant wind direction at Dublin Airport using Hourly Wind Data (Assessment Period 1 January 2020 to 31 December 2020)

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 north-west 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 50 m east of the Site boundary area. The nearest residential receptor to the Site is an apartment block (The Forum) located approximately 150 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.

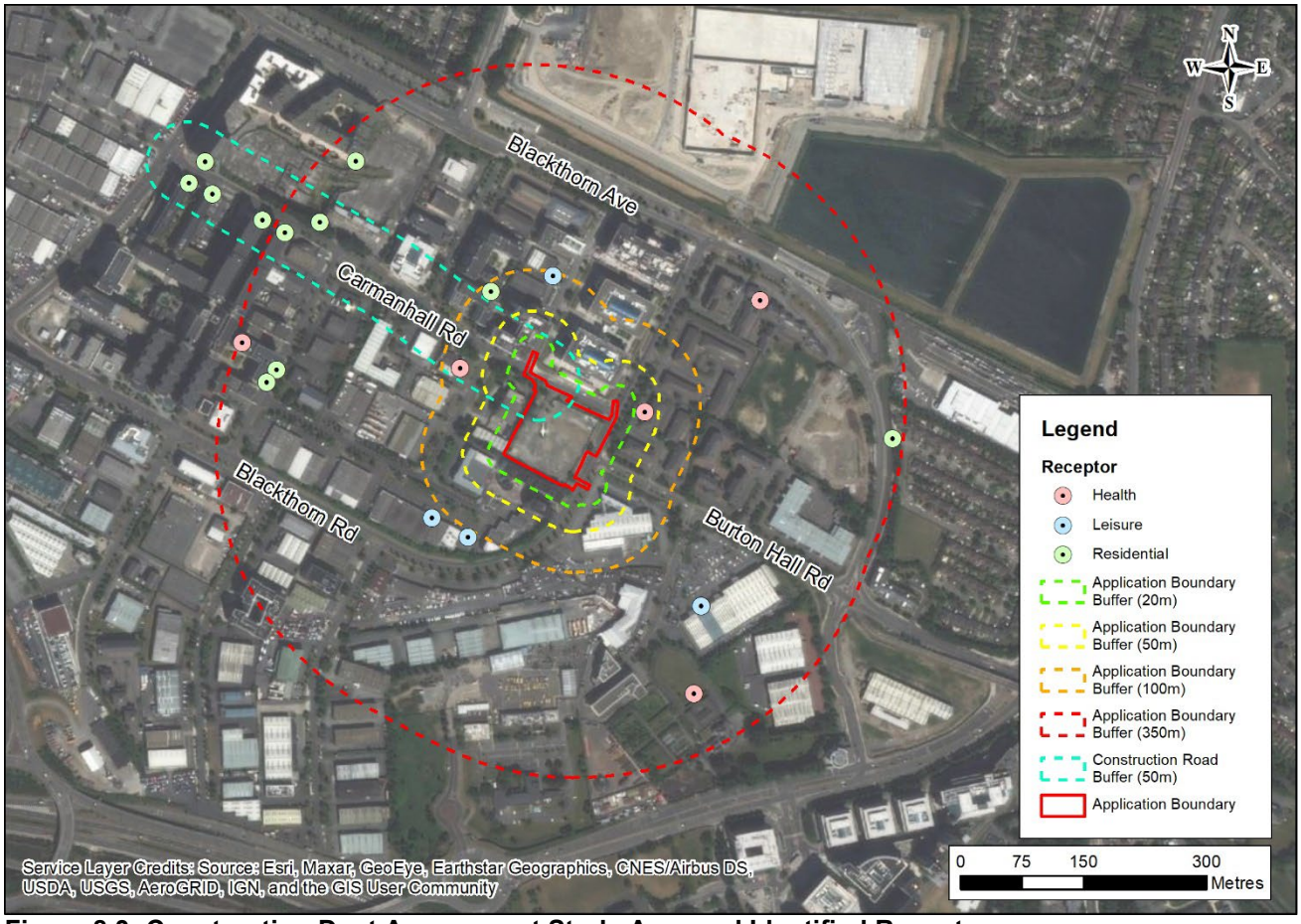


Figure 8.3: Construction Dust Assessment Study Area and Identified Receptors

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.

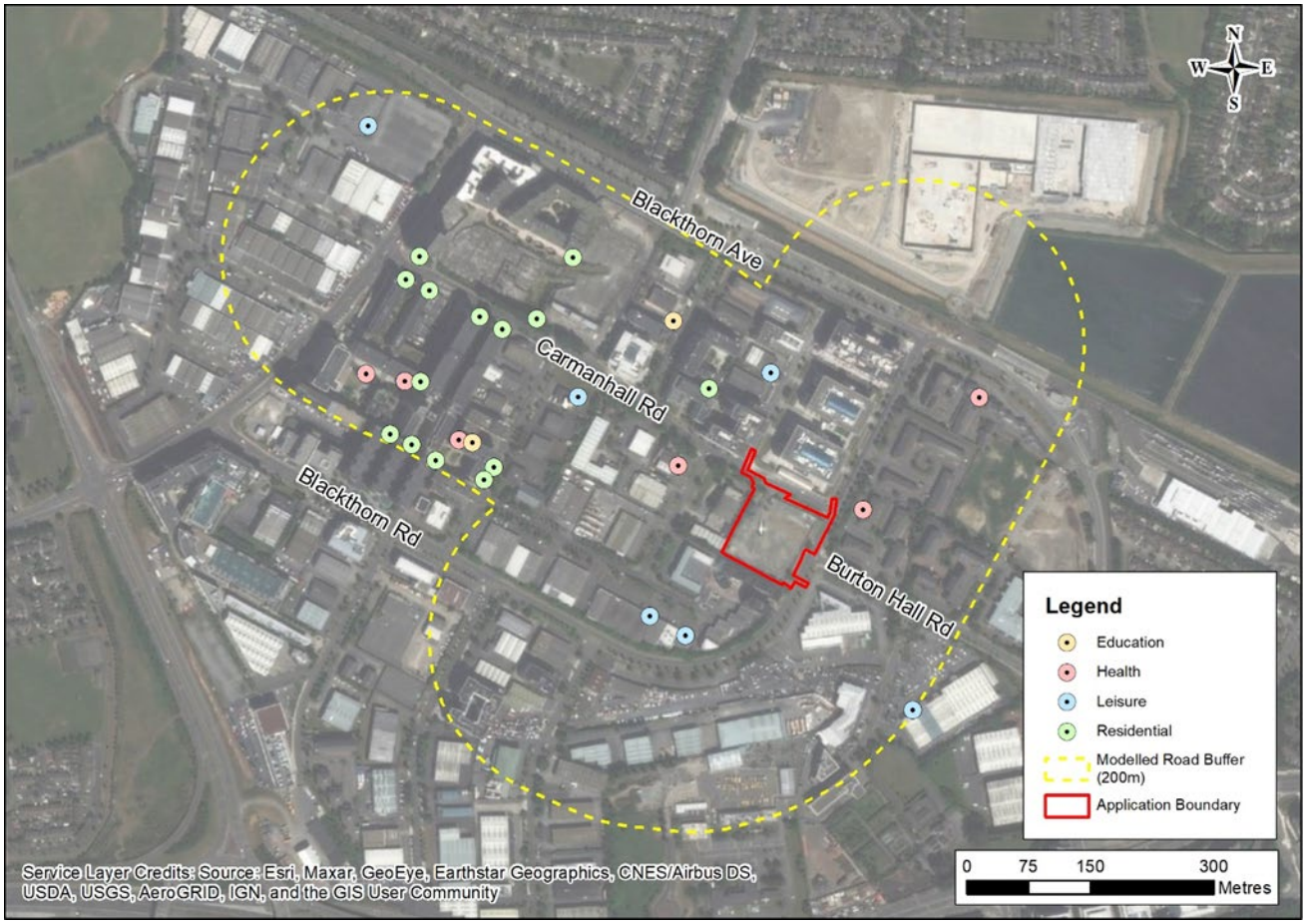


Figure 8.4: Operational Scenarios Air Quality Assessment Study Area and Identified Receptors

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 health facility (*high* receptor sensitivity) located within 50 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 6 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 µg/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 50 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. The sensitivity to trackout has been defined as medium due to the presence of >100 residential receptors (high receptor sensitivity) in 6 apartment buildings located within 20 m of the construction route

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
	Develop and implement a DMP appropriate to the level of anticipated dust risk and detailing mitigation measures during construction activities.	Mandatory

Activity	Mitigation Measure	Implementation Level
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
	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

Activity	Mitigation Measure	Implementation Level
	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
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	Recommended

Activity	Mitigation Measure	Implementation Level
	with suitable emission control systems to prevent escape of material and overfilling during delivery.	
	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

Climate change is an alteration in the distribution of weather patterns in a region in which such change lasts for an extended period of time (i.e. decades or longer). Climate change refers to a change in meteorological conditions, including temperature, rain and wind that characteristically prevail in a particular region over a period of time (typically 30 years).

Directive 2014/52/EU recognises that climate change will continue to cause damage and compromise economic development, therefore it must be incorporated into the decision-making process with the climate change impacts and vulnerabilities of projects assessed.

Ireland is a party to the Paris Agreement, which is a legally binding agreement with the central aim to strengthen the global response to the threat of climate change. Ireland is also bound by nationally determined contributions designated by the EU on behalf of all Member States and commits the EU to reduce GHG emissions by at least 40% (compared to 1990 levels) by the year 2030.

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.

It should be noted that a Climate Change Impact Assessment has been prepared for the Carmanhall Road SHD 2022 application pack by Enviroguide Consulting. That document was prepared in accordance with DLRCC planning requirements and, it assesses the impact of climate change on the Proposed Development and ensures that the policies and objectives produced and implemented by the local authority in relation to climate change and climate change protection measures, particularly in relation to drainage design, as set out within the Dún Laoghaire Rathdown County Development Plan 2022-2028 (DLR CDP), have been incorporated into the Proposed Development design. The report sets out adaptive design measures that have been incorporated into the design of the Proposed Development design.

8.8.3 Effect of Climate Change on the Proposed Development

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.

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, 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 7. Although the Proposed Development is currently not mapped as at risk of flooding, climate change could alter flood risk and flood damage due to changes in surface water flows and 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 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 Application Site given its relative lack of habitat, therefore impacts are deemed to be not significant.

8.8.4 Effect of the Proposed Development on Climate Change - 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, 2022) estimate that annual emissions for 2022 for the road transport sector will be 11,583.4 / 11,483.4 Kt CO_{2e} and the residential sector 6,405.9 / 6,384.4 Kt CO_{2e} with existing measures / with additional measures respectively. 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.

8.8.5 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.

8.8.6 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.

8.9 Difficulties Encountered

See Section 8.3.3., ‘Assumptions and Limitations’.

8.10 Cumulative Effects

The effects of the Proposed Development are considered cumulatively with other reasonably foreseeable developments in the local area in Chapter 15 – Interactions, Cumulative and Combined Effects.

8.11 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.

8.12 References

- Act of the Oireachtas No. 6 of 1987. 'Air Pollution Act 1987'
- Defra's NOx to NO2 converter v7.1 (2019), last accessed 17 February 2021, Available at <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html> Defra (2019). Emissions Factors Toolkit v9 - User Guide.
- Directive 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air.
- Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe
- Dún Laoghaire-Rathdown County Development Plan 2022 – 2028
- Environmental Protection UK / Institute of Air Quality Management (EPUK/IAQM, 2017) Land-Use Planning and Development Control: Planning for Air Quality, 2017.
- Environmental Protection Agency (EPA, 2020) Monitoring Data Archives, last accessed April 2022, available at: <http://www.epa.ie/media/Summary%20Data%20Tables%20-%202019.pdf>
- Highways England. (2007). Design Manual for Roads and Bridges (DMRB). Volume 11 Section 3 Part 1.
- Institute of Air Quality Management (IAQM) (2014), Guidance on the assessment of dust from demolition and construction v1.1, 2016.
- IN2, (2022), 'Energy Analysis Report. No. D2005'.
- S.I. No. 180/2011. 'The Air Quality Standards Regulations 2011'.
- The Regional Planning Guidelines Office (RPGO), (2010) Regional Planning Guidelines for the Greater Dublin Area 2010 – 2022, 2010.

APPENDIX 8.1

Construction Dust Assessment

REPORT

Carmanhall Road SHD EIAR

Chapter 8.0: Air and Climate - Appendix 8.1: Construction Dust Assessment

Submitted to:

An Bord Pleanála
64 Marlborough Street
Rotunda
Dublin 1
D01 V902

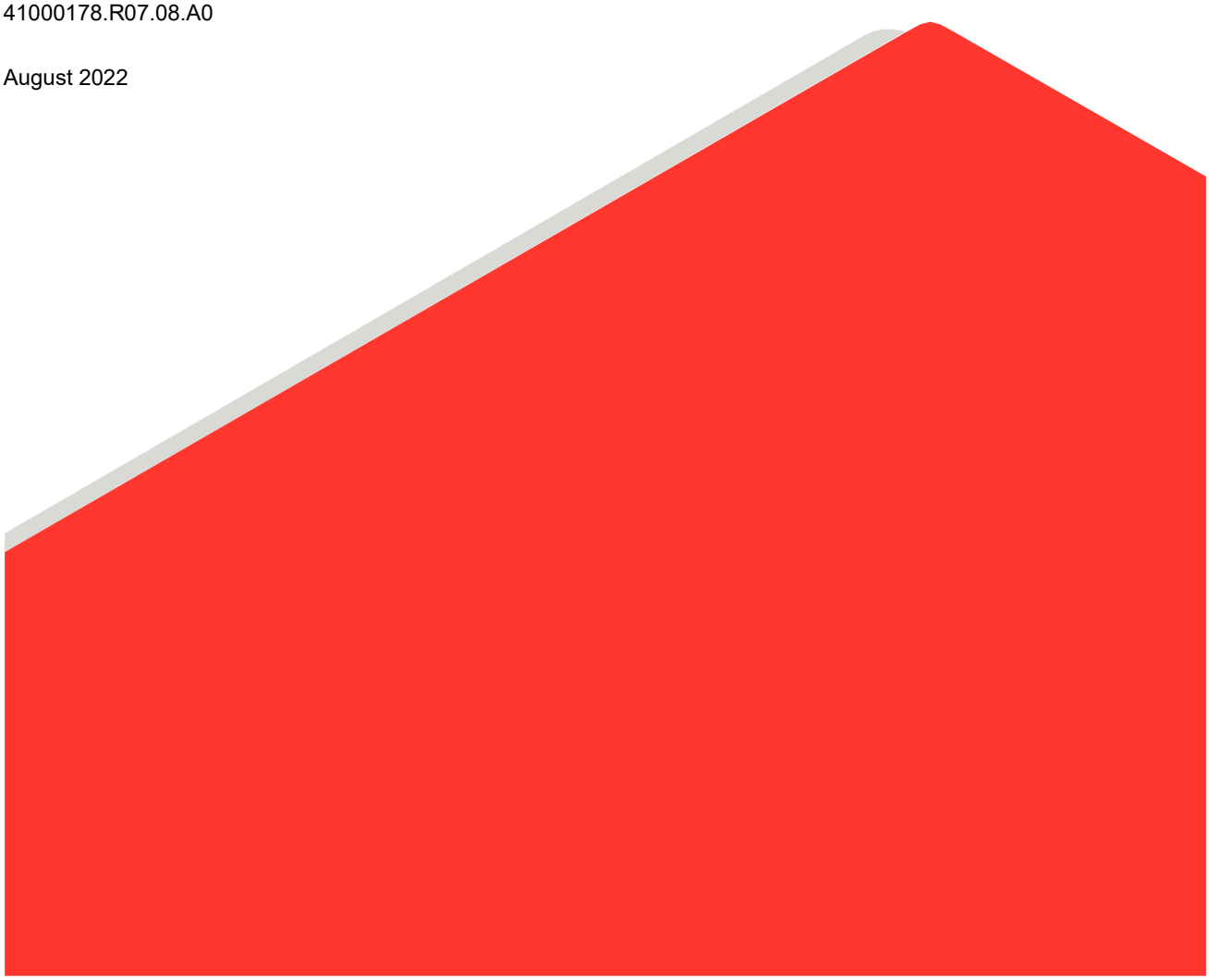
Submitted by:

Golder Associates Ireland Limited
Town Centre House, Dublin Road, Naas,
Co. Kildare, W91 TD0P Ireland

+353 45 810 200

41000178.R07.08.A0

August 2022



Distribution List

Atlas GP Ltd - 1 Copy

Golder Associates Ireland - 1 Copy

Table of Contents

TABLES

FIGURES

1.0 AIR QUALITY AND CLIMATE – APPENDIX 8.1

1.1 Introduction

This Construction Dust Assessment appendix has been prepared to support Chapter 8 Air Quality and Climate and should be read in conjunction with the chapter.

The report sets out a qualitative assessment of dust impacts (deposited dust and human health) from the Proposed Development during the construction phase has been undertaken in line with IAQM 'Guidance on the assessment of dust from demolition and construction' (IAQM 2014), making reference as appropriate to preceding EPUK guidance "Development Control: Planning for Air Quality" (EPUK 2017).

2.0 POLICY AND LEGISLATION CONTEXT

2.1 European Air Quality Directive

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 on ambient air quality and cleaner air for Europe (CAFE) 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.

2.2 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 recent Environmental Protection Agency (EPA) report on Air Quality in Ireland (2019) considers the sources of particulates (transport emissions and solid fuel burning) and the potential associated health impacts.

The 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 (PM_{10} and $PM_{2.5}$) when measured as annual mean concentrations, are as follows:

- NO_2 - 40 µg/m^3;
- PM_{10} - 40 µg/m^3; and
- $PM_{2.5}$ - 25 µg/m^3.

This assessment considers the potential impacts relating to deposited dust and fine particulates only, while Appendix 8.2 of this EIAR Chapter 8 considers all other relevant pollutants.

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.

2.3 Relevant Guidance

In the absence of any specific Irish guidance, The Planning Practice Guidance for Air Quality (Department for Communities & Local Government, 2014 (amended 2019)) states that when deciding whether air quality is relevant to a planning application, considerations could include whether the development would give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations.

The Institute of Air Quality Management "Guidance on the assessment of dust from demolition and construction" (IAQM 2014 (amended 2016)) sets out an approved method for undertaking construction impact assessment and has been used as the basis of this assessment.

3.0 POTENTIAL IMPACTS

For the purpose of this assessment, dust is defined as solid particles that are suspended in air or have settled out onto a surface after having been suspended in air. In line with the IAQM 2014 guidance, the main air quality impacts potentially arising during demolition and construction are considered to be:

- Dust deposition, resulting in the soiling of surfaces;
- Visible dust plumes, which are evidence of dust emissions;
- Elevated PM_{10} concentrations, as a result of dust generating activities on the Site; and
- An increase in concentrations of airborne particles (and NO_2) due to vehicles and equipment used on site and vehicles accessing the Site.

3.1 Dust Soiling Effects

3.1.1 People and Property – Loss of Amenity

Loss of amenity may be caused by dust deposition resulting in the soiling of surfaces, which in turn causes annoyance and may result in complaints. The level at which soiling becomes an annoyance is highly subjective. Consequently, there are no universally agreed standards for assessing for example the risk of dust soiling. Mean rates of dust deposition, based upon gravimetric analysis, are generally used to indicate any potential impact, with guideline values suggesting a mean average rate of 350 mg/m^2/day is often an adequate criterion to assess dust deposition.

3.1.2 Damage to Sensitive Habitats

Dust soiling can also affect sensitive habitats. Direct impacts may occur on vegetation or aquatic ecosystems. For example, dust coating plant foliage during long dry periods may adversely affect photosynthesis and other biological functions. Subsequent rainfall removing the deposited dust can rapidly leach chemicals into the soil. Indirect impacts may occur on fauna (e.g., deterioration of foraging habitats).

3.1.3 Visible Dust Plumes

Visible dust plumes are evidence of dust emissions and have been known to be cited as causing loss of amenity. Plumes are often related to people making complaints but are not necessarily sufficient to be a legal nuisance.

3.2 Human Health Effects – Elevated PM_{10} Concentrations

While dust deposition will arise from the deposition of dust in all size fractions, the ambient dust relevant to human health outcomes will be that measured as PM_{10}. PM_{10} concentration in the vicinity of the development site may become elevated as a result of dust generating activities, including exhaust emissions from non-road mobile machinery and vehicles accessing the Site.

3.2.1 Exhaust Emissions

The 2021 EPA report on Air Quality in Ireland considers the sources of particulates (transport emissions and solid fuel burning) and the potential associated health impacts.

The IAQM 2014 guidance notes that "experience of assessing the exhaust emissions from on-site plant and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases will not need to be quantitatively assessed." Reference is made to a threshold of >200 heavy goods vehicles (HGVs) per day over a period of a year or more as being indicative of the need for quantitative assessment of construction vehicle emissions.

4.0 ASSESSMENT METHODOLOGY

The dust assessment has been undertaken based on the IAQM 2014 guidance.

Activities on construction sites are classified into four types to reflect their different potential effects:

- Demolition;
- Earthworks;
- Construction; and
- Trackout.

The following steps, as defined in the IAQM 2014 guidance, were followed when assessing potential impacts:

- Step 1 – Screen the requirement for detailed assessment – Applicable human and ecological receptors were identified and the distance to the Proposed Development and relevant construction routes determined;
- Step 2 – Assess the risk of dust effects – The potential risk of dust impact occurring for each activity was determined, based on the magnitude of the potential dust emissions and the sensitivity of the receptors;
- Step 3 – Identify the need for site-specific mitigation. Based on the risk of impact occurring, site-specific mitigation measures were determined; and
- Step 4 – Define (residual) impacts and their significance. The significance of the potential residual dust effects (taking mitigation into account) for each activity was determined.
-

5.0 ASSESSMENT OF EFFECTS

5.1 Step 1 - Screening

The IAQM 2014 guidance screening criteria have been applied to determine whether detailed assessment is required. A detailed assessment is deemed necessary if there is:

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); or

An ecological receptor within 50 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 form the site entrance(s).

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

Human receptors are largely apartment blocks located to the west and north-west of the Site (e.g., Time Place Apartment Building to the west and South Central Apartments to the north-west). There is one health facility located within 50 m of the Site boundary and another within 100 m, 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 and 125 m to the south-east, which would be particularly sensitive to the effects of dust soiling.

The nearest education receptor to the Site is a school (Goatstown Stillorgan Educate Together) located approximately 225 m north-west of the Site Boundary. The nearest health facility (MedLab Pathology) is 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. Dust will be generated during construction of the Proposed Development, which may have adverse effects on local sensitive receptors (e.g., residents living nearby).

A review of publicly available information indicates that there are no statutory (international or national) ecological receptors within 50 m of the Site or applicable construction routes. It can therefore be concluded, as there are no statutory receptors within the distance defined by the above criteria, that the level of risk to ecological sites is negligible, and any impacts will be not significant. Therefore, assessment of potential impacts on ecological receptors has been scoped out and is not considered further in this assessment. As such, a detailed assessment of potential impacts on ecological receptors is not required. The construction dust assessment study area including identified receptors is included below as Figure 1.

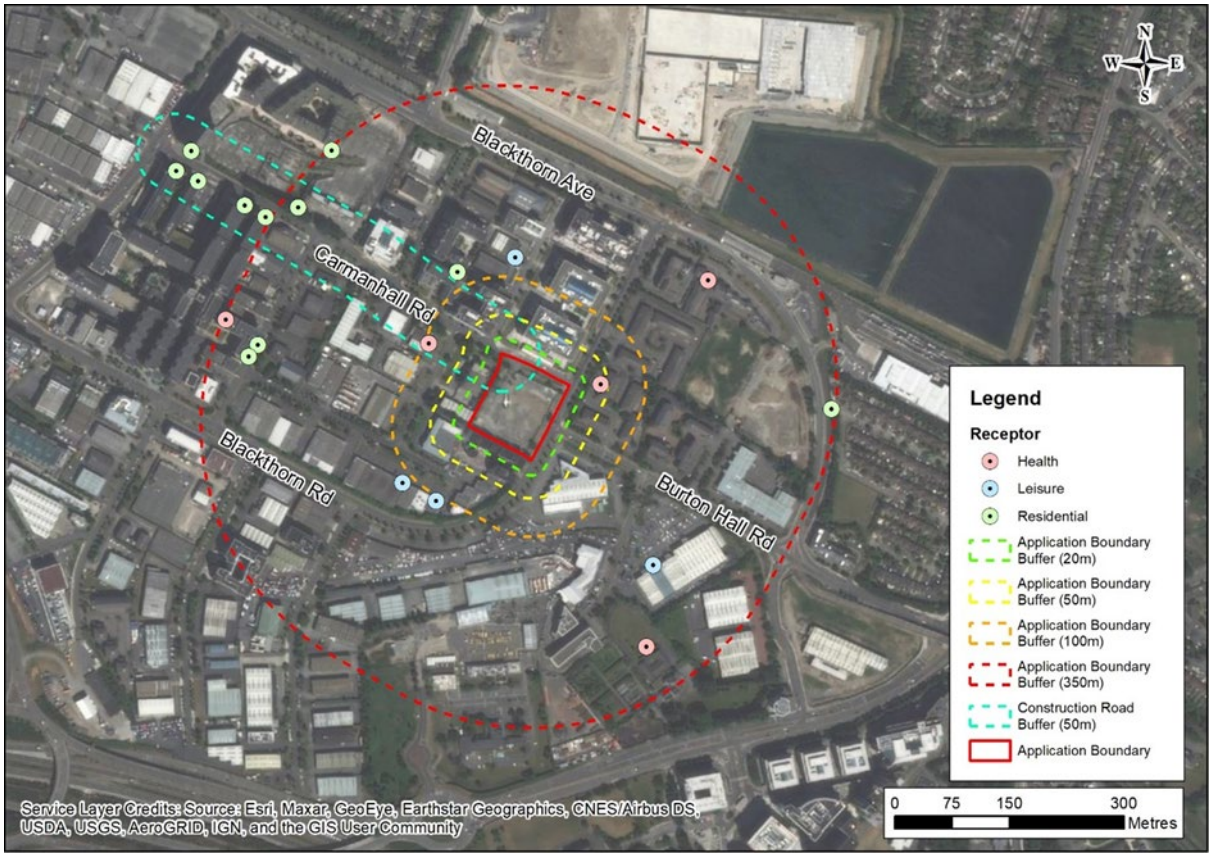


Figure 1: Construction Dust Assessment Study Area and Identified Receptors

The number of construction vehicles will be dependent on the appointed Main Contractors methodology and sequencing of works, however due to the size of the development and the planned single construction phase 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 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 emissions are considered not significant.

5.2 Step 2 – Assess the Risk of Dust Impacts

In accordance 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 types of dust releasing activities relevant to this Project: earthworks, construction and trackout. This assessment does not consider demolition, as the required demolition works have already been completed at the Application Site on foot of Reg. Ref. D16A/0158.

A site is 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 of 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 required.

5.2.1 2A – Defining Potential Dust Emission Magnitude

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.

5.2.1.1 Earthworks

The earthworks activities expected at the Proposed Development in conjunction with construction have been classified as *medium* 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.

5.2.1.2 Construction

The construction activities expected at the Proposed Development have been classified as *large* 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.

5.2.1.3 Trackout

The trackout activities expected at the Proposed Development have been classified as *medium* 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 it is anticipated to average 10-50 HDV movements per day, although the exit roads are paved, therefore minimising the potential for resuspension.

A summary of the anticipated dust emission magnitude for each activity is provided in Table 1.

Table 1: Dust Emission Magnitude

Activity	Dust Emission Magnitude
Earthworks	Medium
Construction	Large
Trackout	Medium

5.2.2 2B – Defining the Sensitivity of the Area

The following were taken into consideration when determining the sensitivity of the area to dust soiling and the human health impacts of PM_{10}.

- The Proposed Development is located close to residential receptors, which are considered to have a high sensitivity to dust soiling effects;
- There are approximately 20 residential, health and leisure receptors within 350 m of the Proposed Development and applicable construction routes. This includes buildings, e.g., apartment blocks and not the individual residences contained within these, which are anticipated to be in excess of 100.
- No monitoring of PM_{10} is undertaken in Sandyford or the surrounding area. EPA records (2019 data) give an estimated annual average background concentration of 13.6 µg/m^3 for other monitored locations in the Dublin Zone A air quality zones (Table 2); and
- There are some natural shelters (e.g., trees - which can trap particulates) found in the vicinity of the study area, the majority of which will be retained.

The sensitivity of the area has been assessed independently for potential dust soiling effects on people and property and the potential human health impacts from elevated PM_{10} concentrations.

Table 2: 2019 and 2020 Annual Mean Monitoring Data for Suburban Dublin Zone A Stations

	Monitoring Location	2019 Concentration (µg/m^3)	2020 Concentration (µg/m^3)
PM_{10}	Dun Laoghaire	12	12
	Blanchardstown	19	15
	Ballyfermot	14	12
	Tallaght	12	10
	Phoenix Park	11	10
	Average	13.6	**11.0**

5.2.2.1 Dust Soiling Effects on People and Property

The specific sensitivity of receptors in the area can be classified as high, medium and low. Examples for high sensitivity receptors with regard to dust soiling effects include residential dwellings, hospitals, museums and other culturally important collections, as well as medium and long-term car parks/ car show rooms. Medium sensitivity receptors include parks, places of work (commercial & industrial) and leisure facilities. Indicative examples for low sensitivity receptors include playing fields, farmland, footpaths, short-term car parks and roads. The sensitivity of the area to dust soiling effects has been derived based on receptor sensitivity, number of receptors and distance from the Proposed Development boundary, as shown in Table 3.

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

Receptor Sensitivity	Number of Receptors	Distance (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Based on the above assessment criteria, 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 health facility (high receptor sensitivity) located within 50 m which is conservatively assumed to contain between 10 and 100 people. 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 6 apartment buildings located within 20 m of the construction route.

5.2.2.2 Human Health Impacts

The specific sensitivity of receptors in the area to human health impacts can been classified as high, medium and low. Examples of high sensitivity receptors, with regard to human health impacts, include residential properties and health facilities. Medium sensitivity receptors include places of work. Indicative examples for low sensitivity receptors include public footpaths, playing fields, parks and shopping streets. The sensitivity of the area to human health impacts has been derived based on receptor sensitivity, number of receptors, annual mean PM_{10} concentration and distance from the Proposed Development boundary, as shown in Table 4.

Table 4: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance (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

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 µg/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 health facility (high receptor sensitivity) located within 50 m of the Proposed Development Boundary which is conservatively assumed to contain between 10 and 100 people. The sensitivity of the area has been determined as medium for trackout due to the presence of >100

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

residential receptors (high receptor sensitivity) in 6 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 to development boundary or the construction route.

5.2.3 2C - Defining the Risk of Impacts

To define the risk of impacts from dust soiling effects and human health impacts, the emission magnitude has been combined with the sensitivity of the area to determine the potential risk of impacts with no mitigation applied. Table 5, Table 6 and Table 7 depict the assessment matrix used for earthworks, construction and trackout.

Table 5: Risk of Dust Impacts Matrix - Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	***Medium***	***Small***
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 6: Risk of Dust Impacts Matrix - Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	***Medium***	***Small***
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 7: Risk of Dust Impacts Matrix - Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	***Medium***	***Small***
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Taking into consideration the conclusions from steps 2A and 2B, the risk of unmitigated dust impacts for each activity are provided in Table 8.

Table 8: Risk of Unmitigated Dust Impacts

	Risk		
	Earthworks	**Construction**	**Trackout**
Dust Soiling	Medium	Medium	Medium
Human Health	Low	Low	Low
Ecological	Not applicable – no ecological receptors within study area		

In summary, it is considered that prior to mitigation the risk of dust soiling and human health impact is medium to *low* for earthworks, construction and trackout activities associated with the Proposed Development.

5.3 Step 3 – Site-Specific Mitigation Measures

The dust risk categories prescribed to each of the three construction activities have been used to define an appropriate, site-specific mitigation scheme, as detailed in Table 9.

Table 9: Required Site-Specific Mitigation Measures to be included in the CEMP

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
	Develop and implement a Dust Management Plan (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 the 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 the Dún Laoghaire Rathdown County Council. As required, where	Mandatory

Activity	Mitigation Measure	Implementation Level
	possible commence baseline monitoring at least three months before work commences.	
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
	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	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.	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

These recommended measures will be included in the Construction Environmental Management Plan (CEMP) (incorporating a DMP, if required) and agreed with the Dún Laoghaire Rathdown County Council Environmental Health Officer prior to construction works commencing.

5.4 Determination of Residual Effect Significance

The IAQM 2014 guidance states that “in the case of construction it is assumed that mitigation (secured by planning conditions, legal requirements or required by regulations) will ensure that a potentially significant adverse effect will not occur, so the residual effect will normally be ‘not significant’”.

Following the application of the site-specific mitigation measures set out in Section 5.3, it is therefore considered that the residual effects of dust deposition and related human health impacts associated with the construction phase of the Proposed Development will be not significant.

6.0 CONCLUSIONS

With regard to potential impacts during the construction phase, it is concluded that:

- The nearest residential receptor is an apartment block (>100 residential receptors) located approximately 100 m north of the Proposed Development boundary;
- There are greater than 100 residential receptors within 50 m of the construction route;
- There are 5 – 10 places of work located within 20 m of the Proposed Development boundary;
- There is 1 health facility located within 50 m of the proposed Development Boundary;
- No monitoring of PM_{10} is undertaken in the vicinity of the Proposed Development. EPA records (2019 data) give an estimated annual average background concentration of 13.6 µg/m^3 for similar Zone A air quality zones;
- Taking the above into consideration, the sensitivity of the surrounding area to dust soiling effects is considered to be medium for earthworks and construction and high for trackout. The sensitivity of the surrounding area to human health impacts is considered to be low for earthworks and construction and medium for trackout;
- Prior to mitigation, the potential risk of dust soiling and human health effects are determined to be medium to low during earthworks, construction and trackout;
- Appropriate mitigation measures have been recommended and will be included in the CEMP to effectively control the effects during the construction phase; and
- Therefore, it is considered that the residual effects associated with the construction phase of the Proposed Development will be not significant.

7.0 REFERENCES

- Environmental Protection UK / Institute of Air Quality Management (EPUK/IAQM, 2017) Land-Use Planning and Development Control: Planning for Air Quality, v1.2, 2017.
- Institute of Air Quality Management (IAQM, 2014) Guidance on the assessment of dust from demolition and construction v1.1, 2016.
- Environmental Protection Agency (EPA, 2020) Monitoring Data Archives, last accessed 08 February 2022, available at: <Monitoring & Assessment: Air Publications | Environmental Protection Agency (epa.ie) >

.

APPENDIX 8.2

Air Dispersion Modelling

REPORT

Carmanhall Road SHD EIAR

Chapter 8.0: Air and Climate - Appendix 8.2: Air Dispersion Modelling

Submitted to:

An Bord Pleanála
64 Marlborough Street
Rotunda
Dublin 1
D01 V902

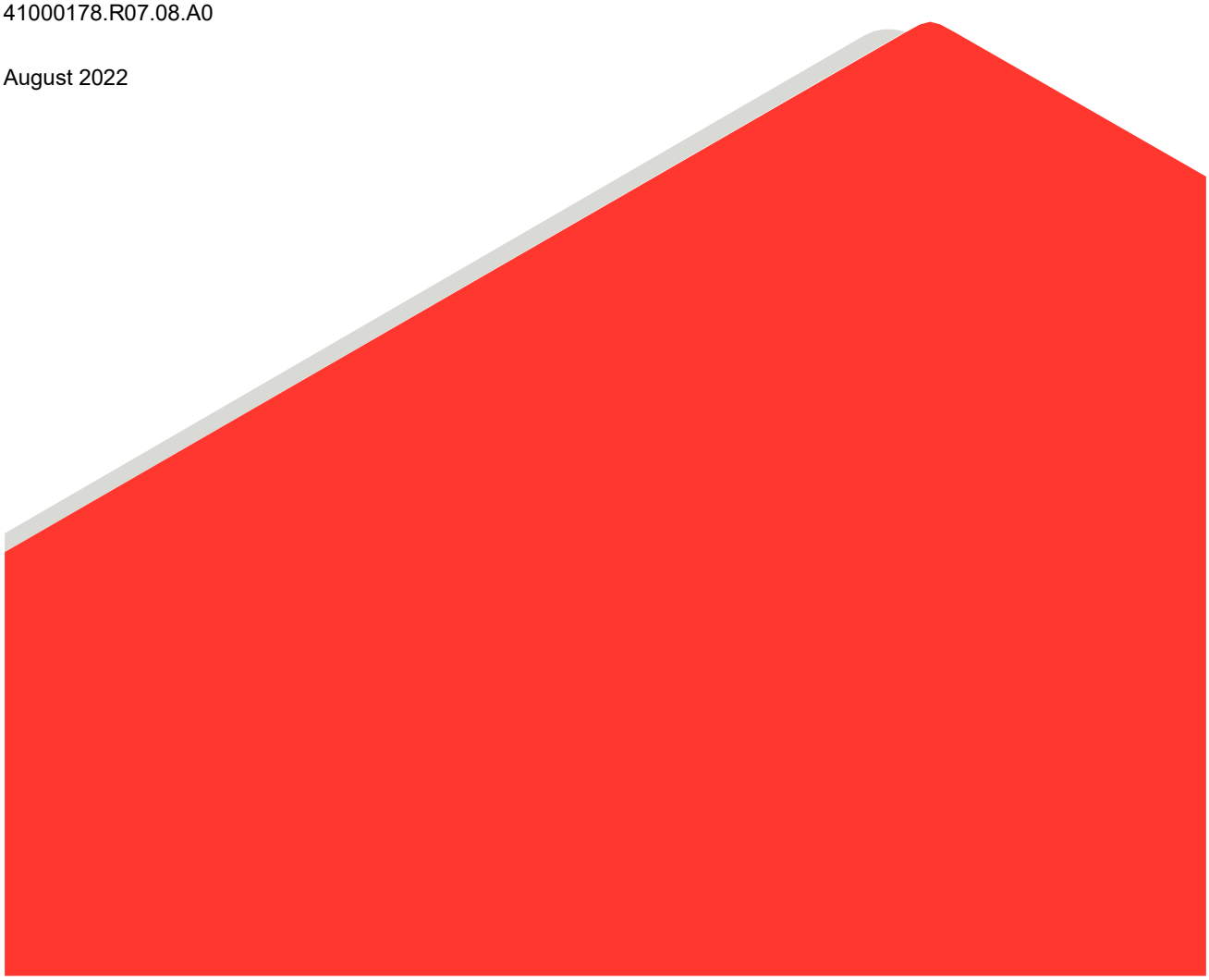
Submitted by:

Golder Associates Ireland Limited
Town Centre House, Dublin Road, Naas,
Co. Kildare, W91 TD0P Ireland

+353 45 810 200

41000178.R07.08.A0

August 2022



Distribution List

Atlas GP Ltd - 1 Copy

Golder Associates Ireland - 1 Copy

Table of Contents

TABLES

FIGURES

1.0 AIR QUALITY AND CLIMATE – APPENDIX 8.2

1.1 Background

This Air Dispersion Modelling Report appendix has been prepared to support Chapter 8 Air Quality and Climate and should be read in conjunction with the chapter.

In accordance with EPUK/IAQM guidance "Land-Use Planning and Development Control: Planning for Air Quality" (IAQM 2017 Guidance), a quantitative assessment of effects from road traffic emissions for the operational phase of the Proposed Development has been undertaken.

The number of construction vehicles will be dependent on the appointed Main Contractor's methodology and sequencing of works, however 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 construction emissions are considered not significant.

The assessment has been undertaken to predict concentrations of the road transport derived pollutants, principally nitrogen dioxide (NO_2), particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$) and to determine whether likely road traffic emissions occurring during the operation of the Proposed Development are predicted to generate significant effects on local air quality.

1.2 Study Area

The Study Area for this assessment extends to 200 m either side of all assessed roads. Two road links (Link 001 and 002) were identified as 'affected roads' – i.e. those meeting the criteria set out in the IAQM 2017 Guidance but due to the extent of the traffic model, all roads have been included in the assessment. The assessed roads for the operational phase are detailed below.

- Link 001 –Blackthorn Road
- Link 002 – Carmanhall Road
- Link 003 – Ravens Rock Road

For ecological receptors, DMRB states that a quantitative impact assessment of road source emissions may be required if Natura 2000 Sites (e.g. Special protection Areas and Special Areas of Conservation) are within 200 m of 'affected roads'. No such protected sites are located within 200 m of the assessed roads and therefore impacts of operational traffic on ecological receptors are deemed not significant and are not assessed further.

1.3 Legislation and Guidance

1.3.1 European Air Quality Directives

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 (1999/30/EC) sets limit values for NO_2 and PM_{10} (amongst other pollutants) in ambient air.

Following the Daughter Directives, EU Council Directive 2008/50/EC on ambient air quality and cleaner air for Europe (CAFE) 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 legislation in 2011 through The Air Quality Standards Regulations 2011. The directive merged the four daughter directives and EU Council decision into a single directive on air quality. The new Directive also introduced a new limit value for $PM_{2.5}$ but does not change the existing air quality standards.

1.3.2 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 (PM_{10} and $PM_{2.5}$) when measured as annual mean concentrations, are as follows:

- NO_2 - 40 µg/m^3;
- PM_{10} - 40 µg/m^3; and
- $PM_{2.5}$ - 25 µg/m^3.

1.4 Assessment Method

A detailed air quality assessment, including air dispersion modelling using ADMS-Roads (v.5.0.0.1), has been undertaken. In the absence of any relevant Irish guidance, the assessment follows the methodology set out in Defra's Local Air Quality Management Guidance Technical Guidance (TG16) (LAQM 2018).

ADMS-Roads has been used to predict NO_2, PM_{10} and $PM_{2.5}$ concentrations. The outputs of the modelled scenarios have been used to calculate a percentage change in concentrations. This value has then been compared to appropriate long-term and short-term standards set to protect human health, to assess compliance.

The findings of the modelling study and conclusions reached are presented in terms of predicted impact on local air quality sensitive receptors (i.e. residential receptors, locations where the general public may be present for sufficient periods of time e.g. health and leisure facilities) located within the area surrounding the Site (further discussed in Section 4.3).

1.5 Evaluation Criteria

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 in the IAQM 2017 Guidance document. These impact assessment criteria have been adopted for the purposes of the assessment undertaken and are presented in Table 1.

Table 1: 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

Long Term Average Concentration at Receptor	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	<1	2-5	6-10	>10
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

2.0 EXISTING AIR QUALITY

2.1 Baseline Sources

There are four 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.

A review of publicly available information identifies 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.

In the absence of local background data, the 2020 and 2019 (most recent data available) annual mean data for NO_2, NO_x, PM_{10} and $PM_{2.5}$ from suburban monitoring locations in Dublin (Zone A) is presented in Table 2. Due to reduced activity as a potential consequence of the COVID- 19 restrictions during 2020, the baseline data is lower than that recorded during 2019. The 2019 data may be a more accurate representation of the future baseline conditions following the easing of COVID-19 restrictions and is therefore used in this assessment.

Table 2: Annual mean monitoring data for Zone A stations with averages of all locations shown.

	Monitoring Location	Annual Mean Concentration ($\mu g/m^3$) 2019	Annual Mean Concentration ($\mu g/m^3$) 2020
NO_2	Swords	15	11
	Davitt Road	24	14
	Dun Laoghaire	15	14
	Blanchardstown	31	12
	Ballyfermot	20	12
	Average	**21**	**12.6**
NO_X	Swords	21	15.5
	Davitt Road	46	27.5
	Dun Laoghaire	27	21.7
	Blanchardstown	70	62.4

	Monitoring Location	Annual Mean Concentration (µg/m³) 2019	Annual Mean Concentration (µg/m³) 2020
	Ballyfermot	28	17.1
	Average	**38.4**	**28.8**
PM_{10}	Dun Laoghaire	12	12
	Blanchardstown	19	15
	Ballyfermot	14	12
	Tallaght	12	10
	Phoenix Park	11	10
	Average	**13.6**	**11.0**
$PM_{2.5}$	Ballyfermot	10	8
	Phoenix Park	8	7
	St Anne's Park	8	7
	Davitt Road	11	9
	Finglas	9	7
	Average	**9.2**	**8.0**

2.2 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 Coronavirus (COVID-19) crisis, it is likely that traffic flows are currently slightly reduced compared to the pre-COVID levels. As a result of the impacts of COVID-19, no Site visits were undertaken for Air Quality and Climate.

The assessment undertaken therefore considers an un-validated change to the base-case and considers the average Zone A background data when making a comparison with the AQS.

2.3 Background Data Used in this Assessment

Due to the absence of monitoring data for the Site or specific roadside location monitoring, the Zone A 2019 annual monitoring data have been used to represent the background air quality. The data used in the assessment is an average of the monitoring data, as presented in Table 2 and below:

- NO_2 average background – 21 µg/m³
- NO_x average background – 38.4 µg/m³
- PM_{10} average background – 13.6 µg/m³
- $PM_{2.5}$ average background – 9.2 µg/m³

The Zone A background concentrations, pollutant concentrations at the Site are below the relevant AQSs.

3.0 EMISSIONS SOURCES AND SCENARIOS

3.1 Background

The emissions sources considered in the assessment comprise the network of roads in the vicinity of the Site and background concentrations of pollutants, as calculated from the Zone A monitoring data.

Traffic data for the purposes of the air quality assessment was generated by the transport consultants, Waterman Moylan, in the form of 24-hour Annual Average Daily Traffic (AADT) and Heavy Goods Vehicle (HGV) flows for the links shown in Figure 1.

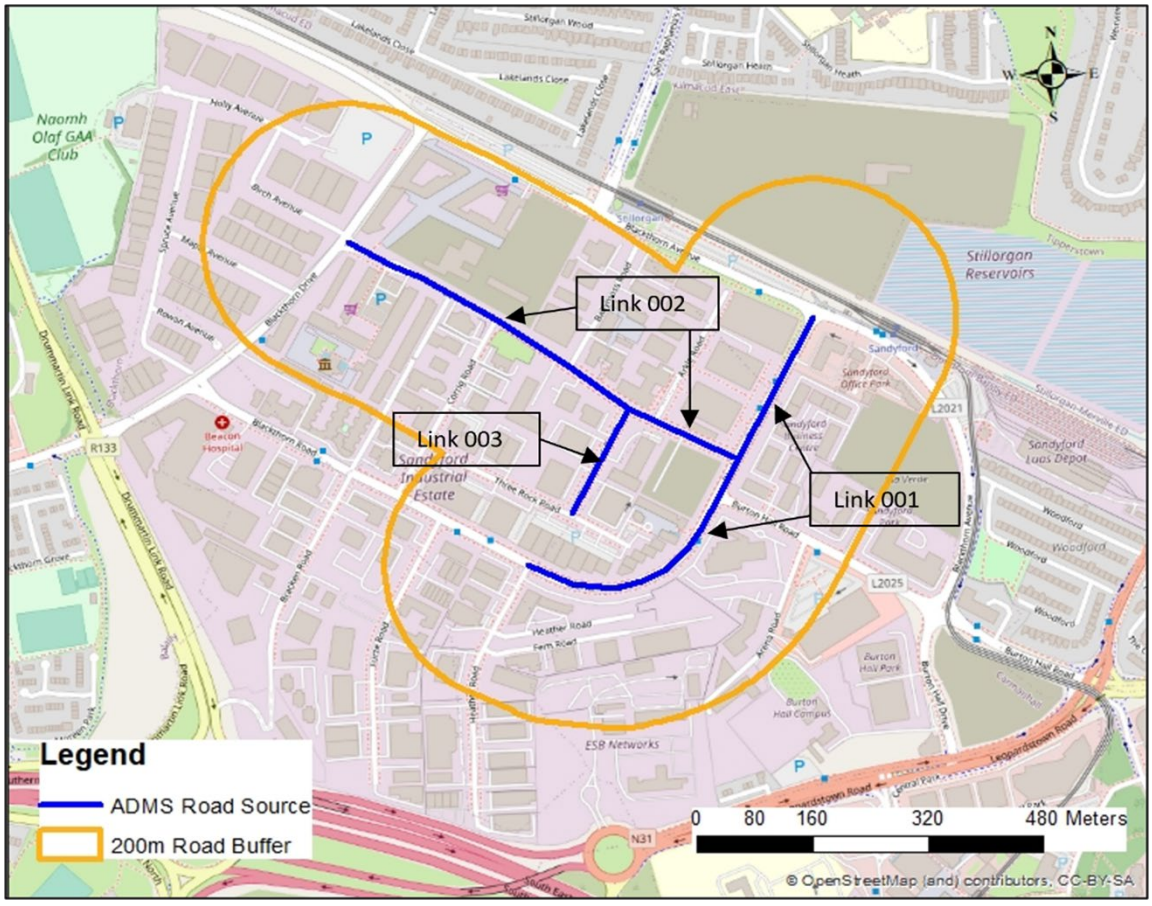


Figure 1: Modelled Traffic Links

3.2 Model Scenarios

A quantitative local air quality assessment has been undertaken using the latest version of CERC ADMS-Roads dispersion modelling software, to predict concentrations of NO_2, PM_{10} and $PM_{2.5}$ at identified sensitive receptors. The assessment follows the methodology set out in Defra's Local Air Quality Management Guidance (LAQM 2018) and quantifies total pollutant concentrations for the following scenarios:

- Baseline - Scenario 001: 2022 Baseline (assuming 2022 vehicle emissions data, 2019 background pollutant concentrations and modelled using 2020 meteorological data;
- Future Baseline 2026 Concentrations Without Proposed Development, Do Nothing Scenario - Scenario 002: 2026 Future Baseline: 2026 fully operational year, with no Proposed Development

traffic (assuming 2022 vehicle emissions data for conservatism, 2019 background pollutant concentrations and 2020 meteorological data); and

- Future 2026 With Proposed Development, Do Something Scenario - Scenario 003: 2026 Future with Development: 2026 fully operational year, with Proposed Development traffic (assuming 2022 vehicle emissions data for conservatism, 2019 background pollutant concentrations and 2020 meteorological data).

3.3 Operational Sources

The traffic flows for Scenario 001, Scenario 002 and Scenario 003 for each road link are provided in Table 3.

Table 3: Sources included in the modelled scenarios.

Affected Road Link ID	LDV 24-hour AADT			HDV 24-hour AADT		
	Scenario 001	Scenario 002	Scenario 003	Scenario 001	Scenario 002	Scenario 003
Link 001	17,256	18,170	19,356	264	290	296
Link 002	9,423	9,955	10,604	218	240	244
Link 003	1,738	1,840	1,994	122	134	136

4.0 . ATMOSPHERIC DISPERSION MODELLING

4.1 Justification of Atmospheric Dispersion Model

Pollutant emissions were modelled using the advanced atmospheric dispersion modelling software ADMS-Roads 5.0.0.1 (utilising emissions factor toolkit UK EFTv9.0). ADMS-Roads is an advanced dispersion model that allows multiple road and industrial sources (including point, line, area and volume sources) to be modelled simultaneously. The model uses a number of input parameters to simulate the dispersion of pollutant emissions, predicting ambient pollutant concentrations. The input parameters include information on pollutant emissions, local meteorological conditions and background pollutant concentrations. ADMS-Roads is regularly used in detailed assessment dispersion modelling studies for the purposes of Local Air Quality Management and environmental impact assessment.

4.2 General Model Assumptions

Details of the applied general model assumptions are provided in Table 4.

Table 4: General ADMS-Roads Model Assumptions

Variables	ADMS-Roads Model Input
Surface roughness at source	1 (cities, woodlands)
Minimum Monin-Obukhov length (urban)	10
Terrain types	Flat
Receptor locations	See Table 9 and Figure 5
Emissions	NO_x (converted to NO_2 for reporting), PM_{10} and $PM_{2.5}$
Emissions factors	Emission Factor Toolkit v9.0
Meteorological data	Dublin Airport, 2020
Model Outputs	Long-term annual mean NO_x concentrations (converted to NO_2 for reporting),

Variables	ADMS-Roads Model Input
	Long-term annual mean PM_{10} concentrations
	Long-term annual mean $PM_{2.5}$ concentrations

Modelled NO_x values were converted to NO_2 using the Defra 'NOx to NO_2' calculator version 7.1, released in April 2019 (Last accessed 23 February 2022, Available at https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html). This version has been used (rather than the more recent v8.0) as it corresponds with using EFTv9.0 which is built into the model.

4.3 Receptors

4.3.1 Modelled Domain

The extent of the modelled domain is provided in Table 5.

Table 5: Extent of the Modelled Domain

Point	X (ITM)	Y (ITM)
Southwest corner	318549	225987
Northeast corner	320050	227352

4.3.2 Discrete Receptors

The assessment required the modelling of pollutant concentrations at identified sensitive human receptors within 200 m of the roads. These were identified as discrete receptors in the model and represented areas of population and other locations where there is likely to be relevant public exposure to the emissions (e.g., schools, health facilities and leisure facilities). The discrete receptors included in the models for the Scenarios 001 to 003 are listed in Table 6 and shown in Figure 2.

Table 6: Discrete Receptors included in Models

Receptor ID	Description	X Coordinate (m)	Y Coordinate (m)
ADM01	Residential	319253	226860
ADM02	Residential	319210	226786
ADM03	Residential	319419	226701
ADM04	Residential	319157	226606
ADM05	Health	319049	226710
ADM06	Health	319115	226639
ADM07	Health	319381	226608
ADM08	Health	319003	226719
ADM09	Residential	319145	226591
ADM10	Residential	319087	226614
ADM11	Residential	319058	226633
ADM12	Residential	319032	226646
ADM13	Residential	319167	226773

Receptor ID	Description	X Coordinate (m)	Y Coordinate (m)
ADM14	Residential	319068	226710
ADM15	Residential	319140	226788
ADM16	Residential	319079	226820
ADM17	Residential	319051	226834
ADM18	Leisure	319390	226402
ADM19	Leisure	319347	226425
ADM20	Leisure	319494	226720
ADM21	Health	319606	226554
ADM22	Leisure	319178	226181
ADM23	Leisure	319005	227020
ADM24	Health	319746	226691
ADM25	Residential	319067	226861
ADM26	Education	319375	226783
ADM27	Leisure	319260	226691
ADM28	Education	319131	226636

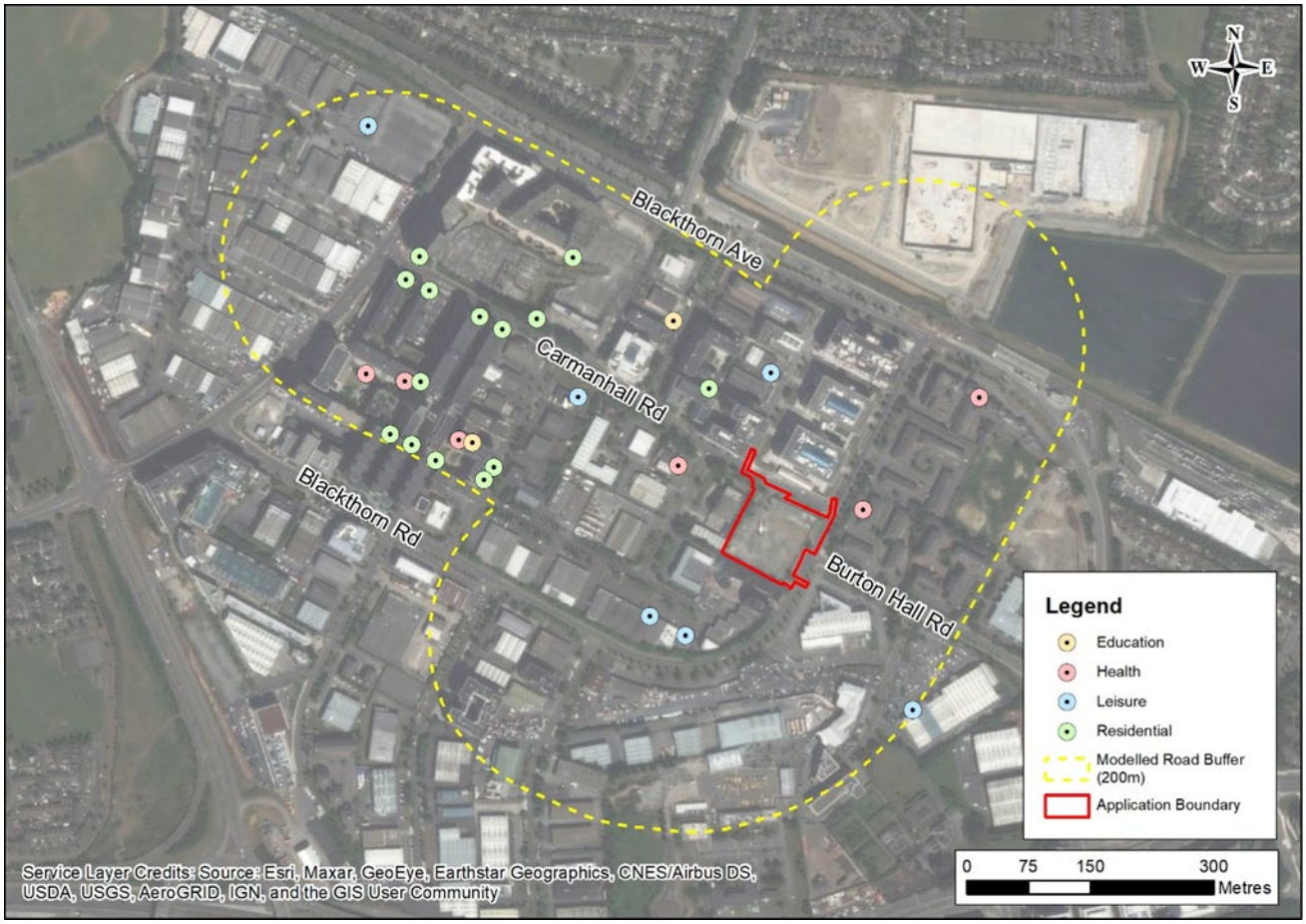


Figure 2: Discrete receptors included in Models

4.4 Meteorology

4.4.1 Meteorological Characteristics

Meteorological data from Dublin Airport was used in this assessment. The Dublin Airport meteorological station lies approximately 17 km to the north of the Site and is the closest representative operational meteorological station with a full year of recent data. The dataset used was for 2020, which is a recent representative meteorological year, and included the following hourly sequential data (Table 7).

The wind rose for the meteorological data used is presented in Figure 3.

Table 7: Hourly sequential readings used in the 2020 meteorological dataset.

Parameter	Units
Wind speed	m/s
Wind direction	Degrees measured clockwise from North
Cloud cover	oktas
Surface temperature	˚C
Relative humidity	%

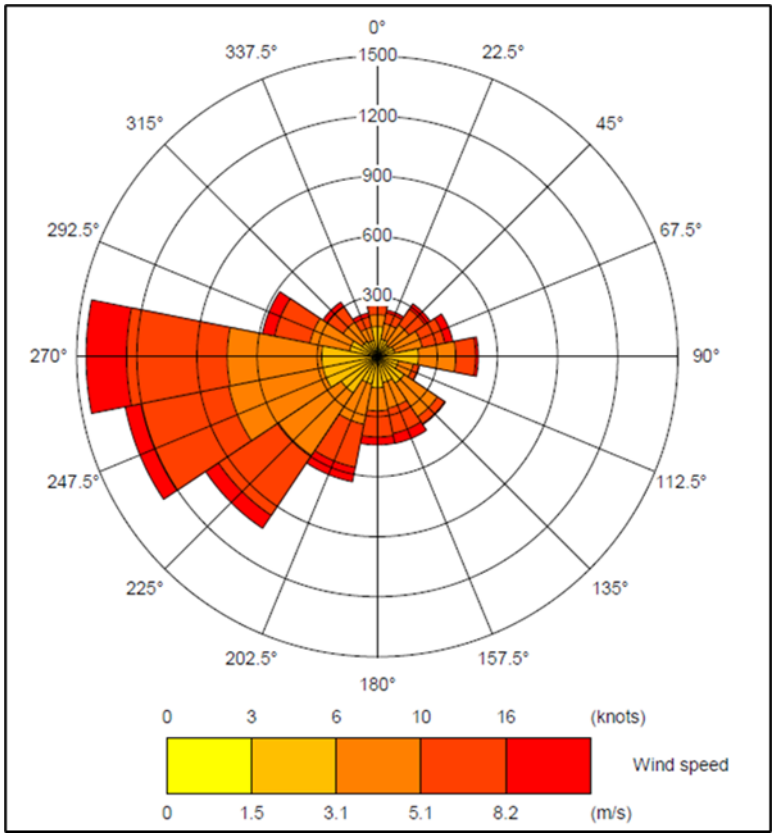


Figure 3: Dublin Airport Windrose for 2020

4.4.2 Surface Characteristics

The characteristics of the land use are based on default values for surface roughness contained within ADMS-Roads. A surface roughness value of 1 m (cities, woodland) is used at the dispersion site (the Site) and a value of 0.02 m (open grassland) is used at the meteorological measurement site (Dublin Airport) to account for the nature of the site as an airfield.

4.5 Road Traffic Emissions

Atmospheric emissions from road traffic were calculated by the model based on information of traffic flows and the latest in-built database of vehicle emission factors, UK Emission factor toolkit (EFT) v.9.0. The EFT does not have specific data for Ireland; therefore, the Northern Ireland data has been used in the assessment. Information on traffic flows on roads was obtained from Waterman Moylan, as described in Section 3.1 of this report. Traffic speeds were estimated from national speed limits as no speed data were available.

Traffic count data were converted into ADMS-Roads format, which requires the data to be input as vehicle counts per hour, vehicle speed, and road type. The data was further classified into the ADMS-Roads two-category vehicle classes, light vehicles and heavy vehicles. As data were supplied as 24-hour AADT, the data was converted to hourly vehicle data. It is known that the traffic profiles change depending on the hour of the day and the day of the week, therefore this is represented in the model. The Department for Transport (DfT) have published UK traffic distributions considering the time of day and the day of the week (Table TRA 0308- https://www.gov.uk/government/statistical-data-sets/road-traffic-statistics-tra accessed on: 20 February 2022) for both cars and heavy goods vehicles. Although the data is applicable to the UK, it has been applied in this assessment in the absence of an alternative dataset. In the absence of separate cars and light Dusty Vehicle (LDV) traffic data, all LDVs were assumed to be cars. This data was used to generate variable emissions files, as described below.

ADMS-Roads uses the variable emissions files and the information from the in-built emissions factors database (EFTv.9.0) to calculate an overall pollutant emission for each road in grams/km/second. The emission factors depend in part on assumptions made of vehicle types of different types of road.

The Emissions data in ADMS Roads, EFTv.9.0, has annual emissions factors up to 2030. Scenario 002 and 003 have assessment years of 2026, but emissions data for 2022 (baseline year) have been used for these scenarios for conservatism as EFTv.9.0 assumes that emissions will reduce in the future based on technology advances. This provides a conservative assessment as the higher emissions data values are applied.

4.5.1 Variable Emissions Data

Time varying emission files were generated for each road source based on the DfT traffic distribution data for both cars and HGVs. In the absence of separate cars and LDV traffic data, all LDVs were assumed to be cars.

ADMS Roads is limited to one emissions profile which has to be applied to both cars and HGVs on a road source. The DfT traffic distribution is different for both vehicle types, therefore an emissions profile was generated which combines the emissions of both vehicle types. The generation of the combined emissions profiles is detailed below:

1) The EFTv.9.0 was used to identify the emissions from a single car and a single HGV travelling at each relevant vehicle speed;

2) A factor was generated using the emissions data in step 1 to calculate the equivalent number of cars of each HGV, considering the speeds of both the car and HGV on each road source; and

3) For each day and hour, the average hours LDV data was multiplied by the DfT factor for cars. The average hours HDV was multiplied by the DfT factor for HDVs and then multiplied by the HDV to LDV factor calculated in step 2. These values were then added together and divided by the total cars equivalent (cars plus HDV multiplied by the HDV to LDV factor) to give the factor per hour per road source.

4.5.2 NO_X to NO_2 Conversion

DEFRA publish a NO_x to NO_2 converter v7.1 (DEFRA, 2019) which is made available as a tool to calculate the road source NO_2 contribution from modelled road source NO_x contributions, corresponding to the EFTv.9.0. The tool comes in the form of a Microsoft Excel spreadsheet and uses local authority area specific data to calculate annual mean concentrations of NO_2 from dispersion model output values of annual mean concentrations of NO_x. This tool was used to calculate the total NO_2 concentrations at receptors from the modelled road NO_x contribution and associated background concentration. Due to the location of the Site, the setting for all non-urban traffic was selected. The tool does not contain information for local authorities in Ireland and therefore data for Belfast was applied in the model. Although the population data for Belfast is lower than that of Dublin, the Proposed Development is located on the outskirts of Dublin.

4.6 Terrain

No terrain data was input into the model due to there being only small changes in elevation across the study area.

4.7 Special Treatments

No special treatments in excess of those previously outlined in the preceding sections were incorporated into the study.

4.8 Predicting the Number of Times per Year the NO_2 Hourly Mean Objective is Exceeded

Research projects completed on behalf of DEFRA and the Devolved Administrations (Laxen and Marner (2003) and AEAT (2008)) have concluded that the hourly mean NO_2 objective is unlikely to be exceeded if annual mean concentrations are predicted to be less than 60 µg/m^3.

In 2003, Laxen and Marner concluded: "local authorities could reliably base decisions on likely exceedances of the 1-hour objective for nitrogen dioxide alongside busy streets using an annual mean of 60 µg/m^3 and above."

The findings presented by Laxen and Marner (2003) are further supported by AEAT (2008), who revisited the investigation to complete an updated analysis including new monitoring results and additional monitoring sites. The recommendations of this report are: "Local authorities should continue to use the threshold of 60 µg/m^3 NO_2 as the trigger for considering a likely exceedance of the hourly mean nitrogen dioxide objective."

The assessment considers the likelihood of exceeding the hourly mean NO_2 objective by comparing predicted annual mean NO_2 concentrations at all receptors to an annual mean equivalent threshold of 60 µg/m^3 NO_2. Where predicted concentrations are below this value, it can be concluded with confidence that the hourly mean NO_2 objective (200 µg/m^3 NO_2, not to be exceeded more than 18 times per year) will be achieved at all relevant commercial properties. Although the assessment includes and refers to commercial property receptors, the findings would be applicable to all receptor types.

4.9 Model Verification

When using air dispersion modelling to predict pollutant concentration, it is necessary to make a comparison between the modelled predictions and measured concentrations at the same location, to ensure that the model is reproducing concentrations as actually observed. The accuracy of the future year of modelling results are relative to the accuracy of the base year results, therefore greater confidence can be placed in future year predicted concentrations if good agreement is found with the base year.

In this instance, it was not possible to verify the data with model outputs with the monitoring data available as no comparable diffusion tube monitoring was undertaken due to COVID-19, as outlined in Section 2.2. Therefore, the focus of the assessment is on the percentage change between the modelled scenarios and the Zone A average background data.

5.0 MODEL RESULTS

5.1 Model Coverage

The modelled results at each of the sensitive receptors, detailed in Section 4.3, identified for each of the scenarios considered for NO_2, PM_{10} and $PM_{2.5}$ are presented in this section.

5.2 Operational Scenarios

5.2.1 Future Baseline

5.2.1.1 NO_2

The change in predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ between Scenario 001 and Scenario 002 are presented in Table 8**,** Table 10 and Table 12, respectively.

Table 8: Predicted change in operational baseline conditions, 2022 - 2026, calculated from annual average NO_2 concentrations µg/m^3, 2022 emission factors

Receptor	Difference between Scenarios 001 and 002 (%)
ADM01	0.05

Receptor	Difference between Scenarios 001 and 002 (%)
ADM02	0.19
ADM03	0.09
ADM04	0.00
ADM05	0.05
ADM06	0.05
ADM07	0.19
ADM08	0.00
ADM09	0.00
ADM10	0.05
ADM11	0.05
ADM12	0.00
ADM13	0.40
ADM14	0.05
ADM15	0.40
ADM16	0.32
ADM17	0.27
ADM18	0.55
ADM19	0.23
ADM20	0.09
ADM21	0.05
ADM22	0.00
ADM23	0.05
ADM24	0.05
ADM25	0.18
ADM26	0.05
ADM27	0.14
ADM28	0.05

The results indicate that the 2026 future baseline (Scenario 002) annual average concentrations will increase by up to 0.55% when compared to Scenario 001 2022 baseline for all modelled receptors, as shown in Table 9.

As shown in Table 9 the greatest percentage increase for NO_2 (0.55%) has been applied to the average of the Zone A 2019 background data (21 µg/m^3), shown in Table 2. This gives a 2026 baseline predicted maximum concentration of 21.12 µg/m^3.

Table 9: Scenario 002 Predicted NO_2 concentration based on maximum background and maximum modelled percentage change.

Pollutant	Background ($\mu g/m^3$)	Background data source	Modelled Maximum % change	Predicted Maximum Concentration ($\mu g/m^3$)	% of AQS
NO_2	21	Zone A average	0.55	21.12	52.8

For the 2026 future baseline, annual average NO_2 concentrations are predicted to remain at less than 53% of the NO_2 AQS for all receptors.

This value is below the 60 $\mu g/m^3$ threshold mentioned in Section 4.8 regarding the trigger for considering a likely exceedance of the hourly mean NO_2 objective.

5.2.1.2 PM_{10}

Table 10: Predicted change in operational baseline conditions, 2022 - 2026, calculated from annual average PM_{10} concentrations $\mu g/m^3$, 2022 emission factors.

Receptor	Difference between Scenarios 001 and 002 (%)
ADM01	0.02
ADM02	0.07
ADM03	0.04
ADM04	0.01
ADM05	0.01
ADM06	0.01
ADM07	0.07
ADM08	0.01
ADM09	0.01
ADM10	0.01
ADM11	0.01
ADM12	0.01
ADM13	0.18
ADM14	0.01
ADM15	0.17
ADM16	0.13
ADM17	0.12
ADM18	0.24
ADM19	0.10
ADM20	0.04
ADM21	0.04
ADM22	0.01

Receptor	Difference between Scenarios 001 and 002 (%)
ADM23	0.01
ADM24	0.02
ADM25	0.08
ADM26	0.02
ADM27	0.06
ADM28	0.01

The model results indicate an overall negligible increase in PM_{10} concentrations between Scenario 001 and Scenario 002, as shown by Table 10.

As shown in Table 11 the greatest percentage increase for PM_{10} (0.24%) has been applied to the average of the Zone A 2019 background data (13.6 µg/m^3), shown in Table 2. This gives a 2026 baseline predicted maximum concentration of 13.63 µg/m^3.

Table 11: Scenario 002 Predicted PM_{10} concentration based on average background and maximum modelled percentage change.

Pollutant	Background (µg/m^3)	Background data source	Modelled Maximum % change	Predicted Maximum Concentration (µg/m^3)	% of AQS
PM_{10}	13.6	Zone A average	0.24	13.63	34.1

Predicted concentrations at all receptor locations in both scenarios are less than 35% of the PM_{10} AQS.

5.2.1.3 $PM_{2.5}$

Table 12: Predicted change in baseline conditions, 2022 - 2026, calculated from annual average $PM_{2.5}$ concentrations µg/m^3, 2022 emission factors.

Receptor	Difference between Scenarios 001 and 002 (%)
ADM01	0.02
ADM02	0.06
ADM03	0.04
ADM04	0.01
ADM05	0.01
ADM06	0.01
ADM07	0.06
ADM08	0.01
ADM09	0.01
ADM10	0.01
ADM11	0.01
ADM12	0.01

Receptor	Difference between Scenarios 001 and 002 (%)
ADM13	0.15
ADM14	0.01
ADM15	0.14
ADM16	0.11
ADM17	0.10
ADM18	0.21
ADM19	0.08
ADM20	0.04
ADM21	0.03
ADM22	<0.01
ADM23	0.01
ADM24	0.01
ADM25	0.06
ADM26	0.02
ADM27	0.05
ADM28	0.01

The model results indicate an overall negligible increase in $PM_{2.5}$ concentrations between Scenario 001 and Scenario 002, as shown in Table 12.

As shown in Table 13, the greatest percentage increase for $PM_{2.5}$ (0.21%) has been applied to Zone A 2019 background data (9.2 µg/m^3), shown in Table 2. This gives a 2026 baseline predicted maximum concentration of 9.22 µg/m^3.

Table 13: Scenario 002 Predicted $PM_{2.5}$ concentration based on average background and maximum modelled percentage change.

Pollutant	Background (µg/m^3)	Background data source	Modelled Maximum % change	Predicted Maximum Concentration (µg/m^3)	% of AQS
$PM_{2.5}$	9.2	Zone A Average	0.21	9.22	36.9

5.2.2 Predicted Change Attributable to the Operation of the Proposed Development

The change in ambient concentrations attributable to the existence of the Proposed Development is determined by comparing the change in concentrations between Scenario 002 (2026 Future Baseline) and Scenario 003 (2026 Future with Proposed Development).

5.2.2.1 NO_2

The model results indicate that operation of the Proposed Development (Scenario 003) produces up to 0.68% change in NO_2 concentrations at all receptors when compared with Scenario 002, as shown in Table 14.

Table 14: Predicted change between Scenario 002 and Scenario 003, calculated from annual average NO_2 concentrations µg/m^3, 2022 emission factors.

Receptor	Difference between Scenarios 002 and 003 (%)
ADM01	0.05
ADM02	0.18
ADM03	0.09
ADM04	0.05
ADM05	<0.01
ADM06	0.05
ADM07	0.18
ADM08	0.05
ADM09	0.05
ADM10	<0.01
ADM11	<0.01
ADM12	0.05
ADM13	0.44
ADM14	0.05
ADM15	0.44
ADM16	0.32
ADM17	0.32
ADM18	0.68
ADM19	0.32
ADM20	0.09
ADM21	0.14
ADM22	0.05
ADM23	<0.01
ADM24	0.05
ADM25	0.18
ADM26	0.09
ADM27	0.19
ADM28	0.05

As shown in Table 15 to predict the worst case NO_2 concentration, this percentage increase has been applied to the calculated predicted NO_2 concentration of 21.12 µg/m^3 for Scenario 002 (As shown in Table 9). This gives a worst case 2026 concentration of 21.26 µg/m^3 for Scenario 003.

Table 15: Scenario 002 Predicted NO_2 concentration based on maximum background and maximum modelled percentage change.

Pollutant	Background ($\mu g/m^3$)	Background data source	Modelled Maximum % change	Predicted Maximum Concentration ($\mu g/m^3$)	% of AQS
NO_2	21.12	0.68	21.26	53.2	NO_2

Notes:

1. Calculated in Table 9.
2. Change between Scenario 002 and Scenario 003.

For the 2026 Future scenario with the Proposed Development, annual average NO_2 concentrations are predicted to remain at less than 54% of the NO_2 AQS for all receptors.

5.2.2.2 PM_{10}

The model results indicate that operation of the Proposed Development (Scenario 003) produces a negligible change (no more than 0.29%) in PM_{10} concentrations at all receptors when compared with Scenario 002, as shown in Table 16.

Table 16: Predicted change between Scenario 002 and Scenario 003, calculated from annual average PM_{10} concentrations $\mu g/m^3$, 2022 emission factors.

Receptor	Difference between Scenarios 002 and 003 (%)
ADM01	0.02
ADM02	0.07
ADM03	0.05
ADM04	0.02
ADM05	0.01
ADM06	0.01
ADM07	0.07
ADM08	0.01
ADM09	0.01
ADM10	0.01
ADM11	0.01
ADM12	0.01
ADM13	0.19
ADM14	0.01
ADM15	0.18
ADM16	0.13
ADM17	0.12
ADM18	0.29
ADM19	0.11
ADM20	0.05

Receptor	Difference between Scenarios 002 and 003 (%)
ADM21	0.04
ADM22	0.01
ADM23	0.01
ADM24	0.02
ADM25	0.08
ADM26	0.03
ADM27	0.06
ADM28	0.02

As shown in Table 16 to predict the worst case NO_2 concentration, this percentage increase has been applied to the calculated predicted NO_2 concentration of 21.12µg/m^3 for Scenario 002 (As shown in Table 9). This gives a worst case 2026 concentration of 21.26 µg/m^3 for Scenario 003.

Table 17: Scenario 003 Predicted PM_{10} concentration based on maximum background and maximum modelled percentage change.

Pollutant	Background (µg/m^3)	Background data source	Modelled Maximum % change	Predicted Maximum Concentration (µg/m^3)	% of AQS
PM_{10}	13.63	0.29	13.67	34.2	PM_{10}

Notes:

1. Calculated in Table 11.
2. Change between Scenario 002 and Scenario 003.

As shown in Table 17, to predict the worst case PM_{10} concentration, this percentage increase has been applied to the calculated predicted PM_{10} concentration of 13.63 for Scenario 002 (as shown in Table 11). This gives a worst case 2026 concentration of 13.67 µg/m^3 for Scenario 003.

For the 2026 Future scenario with the Proposed Development, annual average PM_{10} concentrations are predicted to remain at less than 35% of the PM_{10} AQS for all receptors.

5.2.2.3 $PM_{2.5}$

The model results indicate that operation of the Proposed Development (Scenario 003) produces a negligible change (no more than 0.24%) in $PM_{2.5}$ concentrations at all receptors when compared with Scenario 002, as shown in Table 18.

As shown in Table 19 to predict the worst case $PM_{2.5}$ concentration, this percentage increase has been applied to the calculated predicted $PM_{2.5}$ concentration of 9.22 µg/m^3 for Scenario 002 (As shown in Table 13). This gives a worst case 2026 concentration of 9.24 µg/m^3 for Scenario 003.

For the 2026 Future scenario with the Proposed Development, annual average $PM_{2.5}$ concentrations are predicted to remain at 37% of the $PM_{2.5}$ AQS for all receptors.

Table 18: Predicted change between Scenario 002 and Scenario 003, calculated from annual average $PM_{2.5}$ concentrations µg/m^3, 2022 emission factors.

Receptor	Difference between Scenarios 002 and 003 (%)
ADM01	0.02
ADM02	0.06
ADM03	0.04
ADM04	0.01
ADM05	0.01
ADM06	0.01
ADM07	0.06
ADM08	0.01
ADM09	0.01
ADM10	0.01
ADM11	0.01
ADM12	0.01
ADM13	0.15
ADM14	0.01
ADM15	0.15
ADM16	0.11
ADM17	0.10
ADM18	0.24
ADM19	0.10
ADM20	0.04
ADM21	0.03
ADM22	<0.01
ADM23	0.01
ADM24	0.02
ADM25	0.07
ADM26	0.02
ADM27	0.05
ADM28	0.01

Table 19: Scenario 003 Predicted $PM_{2.5}$ concentration based on maximum background and maximum modelled percentage change.

Pollutant	Background ($\mu g/m^3$)	Background data source	Modelled Maximum % change	Predicted Maximum Concentration ($\mu g/m^3$)	% of AQS
$PM_{2.5}$	9.22	0.24	9.24	37.0	$PM_{2.5}$

Notes:

1. Calculated in Table 13.
2. Change between Scenario 002 and Scenario 003.

6.0 ASSESSMENT OF IMPACTS

6.1 Operational Phase

The modelling results presented show that for the 2026 future operational baseline year (Scenario 002) there is a predicted increase of no more than 0.55% in annual average NO_2 concentrations across the Study Area when compared to the 2022 baseline (Scenario 001). When the Proposed Development is included (Scenario 003), the model predicts a further small increase in NO_2 concentrations when compared with Scenario 002; however, the increase is no more than 0.68%.

For PM_{10}, the model results indicate an overall negligible increase of less than 0.24% in PM_{10} concentrations between Scenario 001 and Scenario 002. When the Proposed Development is included, the model predicts a further small increase of PM_{10} concentrations when compared with the future baseline; however, the increase is by no more than 0.29%.

For $PM_{2.5}$, the model results indicate an overall negligible increase of less than 0.21% in $PM_{2.5}$ concentrations between Scenario 001 and Scenario 002. When the Proposed Development is included (Scenario 003), the model predicts an increase in $PM_{2.5}$ concentrations when compared with the future baseline (Scenario 002); however, the increase is no more 0.24%.

An assessment of the impact of the change in air quality is assessed in accordance with the criteria set out in Section 1.5. In all cases the predicted change in air quality concentrations is considered 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 $\mu g/m^3$ for all receptors, with worst case concentrations below 54% of the AQS. Therefore, 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 $\mu g/m^3$ for all receptors, with concentrations below 35% 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 $\mu g/m^3$ for all receptors, with concentrations below 37% of the AQS. Accordingly, the predicted impact is classified as negligible.

7.0 REFERENCES

- AEAT. (2008). Analysis of the Relationship between Annual Mean Nitrogen Dioxide Concentration and exceedances of the 1-hour mean AQS Objective
- Department for Transport Road Traffic Statistics Table TRA 0308- Last accessed 20 February 2022, Available at <https://www.gov.uk/government/statistical-data-sets/road-traffic-statistics-tra#annual-daily-traffic-flow-and-distribution-tra03>
- Defra's Local Air Quality Management Guidance Technical Guidance (TG16) (LAQM 2018)
- Defra's Local Air Quality Management National Bias Adjustment Factor Spreadsheet v0919
- Defra's NOx to NO2 converter v7.1 (DEFRA, 2019), last accessed 23 February 2022, Available at <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>
- Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management
- Directive 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air
- Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe
- EPUK/IAQM. (2017). Land-Use Planning and Development Control: Planning for Air Quality
- Highways England's Design Manual for Roads and Bridges (DMRB). Volume 11 Section 3 Part 1, 2007
- Laxen and Marner. (2003). Analysis of the relationship between 1-hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Locations
- The Air Quality Standards Regulations 2010, SI 2010/1001
- Institute of Air Quality Management (IAQM, 2014) Guidance on the assessment of dust from demolition and construction v1.1, 2016.
- Environmental Protection Agency (EPA, 2020) Monitoring Data Archives, last accessed 08 February 2022, available at: <Monitoring & Assessment: Air Publications | Environmental Protection Agency (epa.ie) >

9.0 NOISE AND VIBRATION

9.1 Introduction

9.1.1 Purpose of the Assessment

This chapter considers the potential noise and vibration impacts associated with the proposed Carmanhall Road Strategic Housing Development (SHD) 2022 ('the Proposed Development'), both at sensitive receptors within the Application Site and at off-site sensitive receptors. This assessment of noise impacts associated with the Proposed Development has been undertaken as part of the wider Environmental Impact Assessment (EIA) process.

9.1.2 Project Description

The development will consist of 334 Build to Rent residential apartment units within 4 no. apartment blocks and as follows:

- *79 No. Studio*
- *175 No. 1 bed*
- *80 No. 2 bed*

- *All residential units provided with private balconies/terraces to the north/south/east and west elevations*
- *Crèche 272 sq.m.*
- *Residential amenity spaces 893 sq.m. (including a unit of 146.5 sqm open to the public, resident's gym, business centre, multipurpose room, staff facilities, multimedia/cinema room, shared working space, concierge, and games room)*
- *Height ranging from 5 to 16 storeys (over basement)*
- *Landscaped communal space in the central courtyard*
- *Provision of a new vehicular entrance from Carmanhall Road and egress to Blackthorn Road*
- *Provision of pedestrian and cycle connections*
- *125 No. Car Parking, 6 No. Motorcycle Parking and 447 cycle spaces at ground floor/under croft and basement car park levels*
- *Plant and telecoms mitigation structures at roof level*

The development also includes 2 no. ESB substations, lighting, plant, storage, site drainage works and all ancillary site development works above and below ground.

9.1.3 Scope of Assessment

The scope of this assessment has included the following:

- Baseline noise survey at and around the Site;
- Semi-qualitative evaluation of potential noise impacts associated with the construction phase;
- Prediction and evaluation of potential noise impacts at Noise Sensitive Receptors (NSRs); and
- Specification of appropriate outline mitigation, where required.

The Application Site lies within a predominantly commercial and light industrial area; given the absence of neighbouring high sensitivity Noise-Sensitive Receptors (NSRs) and the relatively short duration of construction works (i.e. approximately 24 months), this assessment considers a single worst-case scenario and determines appropriate threshold noise criteria for the construction phase. Appropriate controls will be put in place during construction such that these threshold criteria are met and these will be detailed in the Construction Management Plan (CMP) and Construction Environmental Management Plan (CEMP), which are live documents to be updated as the Proposed Development progresses.

Construction activities are not anticipated to generate significant vibration beyond the site boundary, and no receptors with high sensitivity have been identified within close proximity to the Proposed Development, therefore evaluation of construction phase vibration has been scoped out of this assessment. No significant sources of vibration have been identified, and the Proposed Development will not generate vibration during the occupation phase, therefore vibration impacts during the operational/occupation phase have been scoped out of this assessment.

9.1.4 Study Area and NSRs

The study area considered in this assessment comprises a buffer approximately 150 m beyond the Site redline boundary. This area includes the anticipated dominant noise sources identified during the baseline survey which will affect the Proposed Development in the operational/occupation phase, comprising Blackthorn Road, Ravens Rock Road and Carmanhall Road, and commercial/industrial properties to the north, east, south and west. The buffer also includes the closest NSRs to the Proposed Development for the evaluation of construction noise impacts.

NSRs considered in this assessment comprise proposed dwellings within the Proposed Development which will be sensitive to noise during the operational/occupation phase, and the closest noise-sensitive off-site receptors which will be sensitive to construction noise during the construction phase and increases in road traffic noise during the operational/occupation phase.

The closest identified non-commercial/industrial off-site NSR is Bloom Health clinic, approximately 100 m to the north-west of the site boundary. A pathology laboratory is noted approximately 50 m to the east of the site boundary; however, this is considered to be a commercial receptor with low sensitivity to noise, not a medical facility. The closest residential NSR to the Proposed Development is an apartment block approximately 150 m to the north of the site boundary. All other existing NSRs are more remote from the Site and are screened from site-generated noise by tall buildings therefore noise impacts from the Proposed Developments at these NSRs will be negligible[1].

Representative NSRs within the Proposed Development considered within this assessment are shown in Figure 9.1 and are listed in Table 9.1.

[1] Bloom Health is the closest NSR to the Proposed Development and will only be sensitive to noise during the daytime period. Construction activities will only occur during the daytime period, therefore Bloom Health is appropriate for the evaluation of construction noise; noise levels at more distant NSRs will be substantially lower due to distance attenuation and impacts will be lesser.

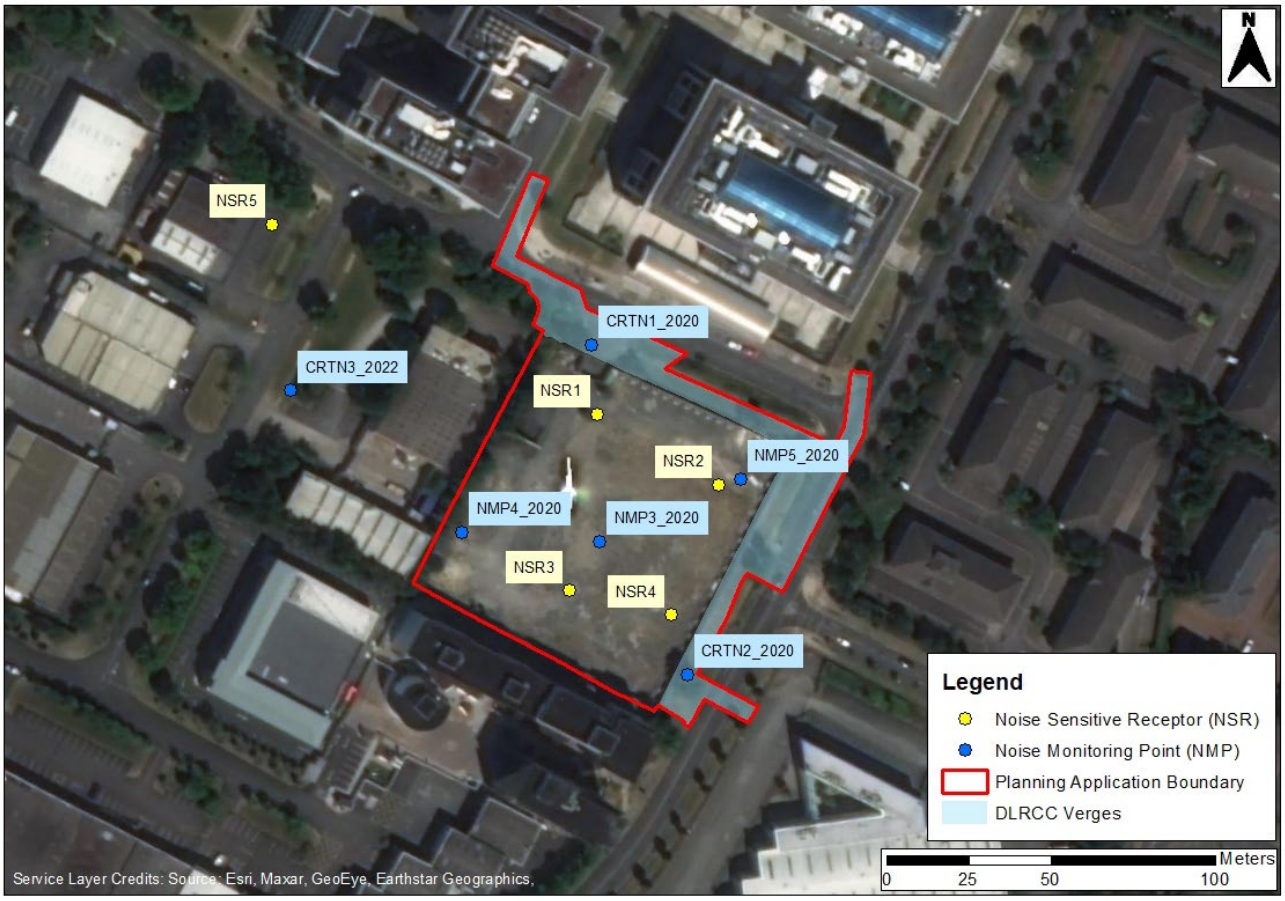


Figure 9.1: Proposed Development, Noise Sensitive Receptors and Noise Monitoring Points

Table 9.1: Representative NSRs considered in assessment

Receptor	Representative of
NSR1	First-floor residential properties at the western end of the northern façade of the Proposed Development, overlooking Carmanhall Road (Block D)
NSR2	First-floor residential properties in the eastern façade of the Proposed Development, overlooking Blackthorn Road (Block E)
NSR3	First-floor residential properties in the southern and eastern façades of the Proposed Development, overlooking the adjacent commercial units and the proposed site access (Block G)
NSR4	First-floor residential properties at the southern end of the eastern façade of the Proposed Development, overlooking Blackthorn Road (Block F)
NSR5	Bloom Health clinic – off-site medical facility 100 m from the site boundary.

Representative receptors within the Proposed Development have been selected at first-floor properties, as these will receive the highest levels of road traffic noise as they are less likely to benefit from screening (such as planting) present at ground level and therefore represent the worst-case. Ground-floor uses of the building comprise a mix of a creche (which extends to the lower ground floor, adjacent to a proposed resident's gym) fronting an internal street and residential uses fronting internal streets/courtyards, Blackthorn Road and Carmanhall Road. Noise levels received at upper floor receptors will be lower, given their greater separation distance from noise sources.

Noise effects during the construction phase arising at off-site NSRs (including the residential NSR 150 m to the north) have been evaluated using NSR5 Bloom Health as a proxy. This NSR has been assumed to be sensitive to noise arising due to the Proposed Development during the daytime period only (opening hours noted to be 10h00 – 18h00, Monday to Friday), however, this is appropriate for evaluation of construction noise, which will be confined to the daytime period.

Noise impacts arising due to the Proposed Development during the operational/occupation phase at more distant NSRs will be negligible and have been scoped out.

9.1.5 About the Author

This noise assessment has been prepared by Simon Waddell BSc (Hons). Simon is a corporate member of the UK Institute of Acoustics (IoA) and has more than 12 years' experience in environmental noise assessment. He has completed the IoA postgraduate diploma in Acoustics and Noise Control and also the Certificate of Competence in Environmental Noise Measurement. Simon has been responsible for the delivery of noise and vibration assessments in support of EIARs in Ireland and the UK for a wide range of projects including residential and mixed-use developments, large infrastructure developments, such as wind farms and large-scale manufacturing sites, as well as noise assessments for international ESIAs for mineral and oil and gas extraction.

9.2 Legislative and Policy Context

9.2.1 Legislation

Legislation informing this assessment is summarised below.

9.2.1.1 Environmental Noise Regulations 2006 / EU Directive 2002/49/EC

The Environmental Noise Regulations 2006 give effect to EU Directive 2002/49/EC on the assessment and management of environmental noise. The Directive applies to noise to which humans are exposed, particularly in built-up areas, public parks or other quiet areas within built-up areas, and in quiet areas in open country, near schools, hospitals and other noise-sensitive buildings and areas. 'Environmental noise' is defined within the Directive as "*unwanted or harmful outdoor sound created by human activities, including noise emitted by means of road traffic, and from site of industrial activity…"*

Under the Directive, local authorities are required to make action plans to reduce ambient noise. The EPA exercises general supervision over the functions and actions of the local authorities in this aspect of their work.

Noise indices specified by the Directive include L_{den} and L_{night}, however, supplementary noise indicators are permitted where these are used to express relevant limit values in EU Member State legislation.

When granting planning permission, the local authority has the power to provide those conditions in relation to noise prevention or reduction be included in the permission. These conditions may apply to the construction phase and/or to the subsequent use of the building.

9.2.2 Policy

Local policy documents which have been reviewed and inform the scope of this assessment are described below.

9.2.2.1 DLR County Development Plan 2022 - 2028

The Sandyford Urban Framework Plan represents Appendix 16 of the County Development Plan 2022 – 2028. It promotes residential development within the area of the Proposed Development, however it does not mention noise or vibration.

9.2.3 Guidance

Guidance documents which have informed this assessment are provided in the following sections.

9.2.3.1 Calculation of Road Traffic Noise (CRTN)

CRTN (UK Department of Transport, 1988) provides a method for the prediction of noise levels due to road traffic based on traffic flows, road type and geometry. CRTN may be used for determining the entitlement of existing properties to noise insulation where new roads are proposed and provides criteria for this purpose.

A 'shortened measurement procedure' is provided to enable the derivation of the $L_{A10,18hr}$ from the $L_{A10,3hr}$ value.

9.2.3.2 Design Manual for Roads and Bridges (DMRB)

DMRB provides standards and advice regarding the assessment, design and operation of roads in the UK and sets out screening criteria, by which percentage changes in traffic flow can be related to a predicted change in road traffic noise and vibration. The guidance also provides significance criteria, by which the percentage of people adversely affected by traffic noise can be related to the total noise due to road traffic, or the increase over an existing level.

9.2.3.3 Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping

The study by TRL Ltd. provides formulae for converting the tenth-percentile ($L_{A10,18hr}$) noise index used in CRTN into the EU noise indices L_{day}, $L_{evening}$, L_{night} and L_{den}. Various formulae are provided in the study, and these are applied according to the available traffic and measurement data.

9.2.3.4 ISO 9613: Attenuation of sound during propagation outdoors, Part 1 and Part 2

ISO 9613 describes a method for calculating the attenuation of sound during propagation outdoors to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level under meteorological conditions.

9.2.3.5 British Standard BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings

BS 8233 (BSI, 2014) provides guidance on the control of noise in and around buildings. The Standard sets out acceptable noise levels for new and refurbished buildings and amenity areas according to their use.

For external amenity areas BS8233 specifies a 'desired' level of 50 $dBL_{Aeq,T}$ and an 'upper guideline level' of 55 $dBL_{Aeq,T}$. It is acknowledged within the Standard that these guidelines may not be achievable in urban areas adjoining the transport network. It further notes that "*in such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited*".

The Standard provides noise limits for rooms within building by type of use; (bedroom, living room, office) and by time of day. Methods are provided for simplified calculation of internal noise levels from external levels, and for detailed calculations. The simplified method relies on a reduction to façade levels provided either by open or closed windows, which are assumed to provide attenuation of approximately 15 dB and 33 dB respectively. Where road traffic is the dominant noise source, a correction of -5 dB (C_{tr}) is applied to these attenuation factors, to allow for its low-frequency component.

The Standard notes that, "*in general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values…*". For bedrooms the guideline is 35 $dBL_{Aeq,16hr}$ during the daytime (07h00 – 23h00) and 30 $dBL_{Aeq,8hr}$ during the night-time (23h00 – 07h00). For living rooms, the guideline is 35 $dBL_{Aeq,16hr}$ (daytime-only guideline specified for living rooms).

BS8233 also provides a graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves (NR Curve). The curves account for the frequencies produced by a given noise source, and are typically used for rating noise from Heating, Ventilation and Air Conditioning (HVAC) plant.

9.2.3.6 British Standard BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites, Parts 1 and 2.

BS5228 (BSI, 2014) provides a procedure for the estimation of construction noise and vibration levels and for the assessment of the significance of the predicted effects at the nearest sensitive receptors. Annex D of the Standard includes measured typical noise levels for a range of construction plant and activities.

Part 1 of the Standard provides several methods for the evaluation of the significance of construction noise effects. The ABC method considers significance by comparison to the measured baseline $L_{Aeq,T}$ noise level, rounded to the nearest 5 dB. Three categories of threshold values are provided; A, B and C, in increasing 5 dB bands, for the periods “daytime and Saturdays”, “evenings and weekends” and “night-time”. Where the measured baseline exceeds the highest category (C), a 3 dB increase over baseline is considered significant. The evaluation periods are defined as follows:

- Daytime: 07h00 – 19h00 on weekdays and 07h00 – 13h00 on Saturdays.
- Evenings and weekends: 19h00 – 23h00 weekdays, 13h00 – 23h00 Saturdays and 07h00 – 23h00 Sundays.
- Night-time: 23h00 – 07h00 (all days).

Part 2 of the Standard provides threshold levels at which vibration may be perceptible to people, through to becoming intolerable and frequency-weighted thresholds at which vibration may cause cosmetic damage to structures.

9.2.3.7 BS7445-1:2003 Description and Measurement of Environmental Noise. Guide to Quantities and Procedures.

BS7445 provides guidance on appropriate environmental noise monitoring, including specification of equipment and appropriate calibration intervals, suitable weather conditions and observations to note regarding the nature of the noise environment.

9.2.3.8 DLR County Council – Guidance Notes for Environmental Design and Management of Construction Projects.

The Guidance Notes specify that noise planning should follow the methods set out in the ProPG: Planning and Noise guidance by the Institute of Acoustics which, in turn, recommends the use of BS8233, BS5228 and other appropriate guidance documents, as identified and summarised in this section.

The Guidance Notes further recommend that noise monitoring is undertaken during construction works and that if trigger levels are breached that appropriate measures be implemented to reduce construction noise.

9.3 Assessment Methodology and Significance Criteria

This assessment considers that human receptors, including residential dwellings, have a high sensitivity to noise. Commercial and industrial receptors, comprising buildings and businesses, are considered to have a low sensitivity to noise and have been scoped out of further assessment. The assumed sensitivity of identified representative existing and proposed NSRs are provided in Table 9.2.

Table 9.2: Assumed sensitivity of representative NSRs

NSR	Type of receptor	Sensitivity
NSR1– NSR4 proposed dwellings	Human / residential	High
NSR5 – Bloom Health	Healthcare	High (weekday daytime only)

9.3.1 Impact Magnitude Criteria

Appropriate criteria have been adopted for the derivation of impact magnitude and are provided in Table 9.3. The criteria have been adapted from DMRB and relate to road traffic noise, which will remain the dominant noise source during the operational/occupation phase of the Proposed Development.

Table 9.3: Impact magnitude criteria

Exceedance of threshold value OR change in noise level, dBLAeq,T	Subjective reaction	Impact Magnitude
≥5	Clearly perceptible	High adverse
≥3, <5	Perceptible	Medium adverse
>0, <3	Barely perceptible	Low adverse
≤0	Inaudible	No change / none

The Proposed Development will introduce additional anthropogenic noise sources to the study area during both the construction and occupation phases, therefore all potential impacts are assumed to be adverse.

The criteria in Table 9.3 have been used to determine the significance of noise effects for receptors of different sensitivities, as shown in Table 9.4.

Table 9.4: Derivation of effect significance.

Magnitude	Level of significance, relative to sensitivity of receptor		
	Low	Medium	High
High	Moderate	Moderate/Large	Large
Medium	Slight	Moderate	Moderate
Low	Neutral	Slight	Slight
No change / none	Neutral	Neutral	Neutral

This assessment considers that effects of moderate and large significance are significant, and that effects of neutral and slight significance are not significant.

9.3.2 Target Noise Levels

Target noise levels (noise criteria) have been adopted from appropriate guidance, as provided in Section 9.2.3. The adopted criteria are provided below.

Construction Phase

Threshold noise levels have been derived from measured baseline noise levels in accordance with BS5228, using the ABC method described in Annex E of the Standard. This assessment assumes that the Proposed Development will be constructed prior to occupation, therefore construction phase noise effects will only occur at existing NSRs. It is further noted that a preliminary Construction Management Plan (CMP) and a Construction Environmental Management Plan accompany this SHD application and will be developed alongside the

proposals. It will set out methods which will be adopted to minimise unnecessary noise from construction. The baseline derived (as set out in Section 9.4 below) threshold noise levels for off-site NSRs are as follows:

- Weekday daytimes (07h00 – 19h00) and Saturday mornings (07h00 – 13h00): 65 $dBL_{Aeq,1hr}$
- Evenings (19h00 – 23h00) and weekends (13h00-23h00 Saturday, 07h00 – 23h00 Sundays): 55 $dBL_{Aeq,1hr}$
- Night-time (23h00 – 07h00): 45 $dBL_{Aeq,1hr}$

Operational / Occupation Phase

Criteria for residential NSRs are adopted from guideline levels provided in BS8233. Measured and predicted noise levels across the Proposed Development have been evaluated against the criteria to determine the magnitude of noise impacts at proposed NSRs.

The criteria for ambient (dB L_{Aeq}) noise levels for new dwellings affected by noise from road traffic are provided below:

- Target level of 50 - 55 $dBL_{Aeq,16hr}$ (free field) external amenity areas;
- Internal target level of 35 $dBL_{Aeq,16hr}$ daytime (07h00 – 23h00), corresponding to external free-field level of 50 $dBL_{Aeq,16hr}$, assuming closed-window attenuation of 28 dB; 33 dB for standard thermal double glazing minus 5 dB C_{tr} correction; and
- Internal target level of 30 $dBL_{Aeq,\ 8hr}$ night-time (23h00 – 07h00), corresponding to external free-field level of 45 $dBL_{Aeq,8hr}$, assuming closed-window attenuation of 28 dB; 33 dB for standard thermal double glazing minus 5 dB C_{tr} correction.

9.3.3 Method of Baseline Characterisation

- This assessment relies on the results of two baseline monitoring campaigns: one undertaken in July 2020 and another undertaken in February 2022. The 2020 baseline information has been sourced from previous surveys that were undertaken in support of a previous SHD application at the Application Site (Ref: ABP-310104-21).
- During the 2020 survey, baseline noise measurements were undertaken over two days, from 22nd July – 23rd July. Noise Monitoring Points (NMPs) were selected to characterise noise from roads and existing commercial/industrial properties adjacent to the former Avid Technology site (previous use of the Application Site). The monitoring locations are listed below and shown in Figure 9.1.
  - CRTN1_2020 – shortened CRTN measurement representative of Carmanhall Road;
  - CRTN_2_2020 – shortened CRTN measurement representative of Blackthorn Road;
  - NMP3_2020 – centre of the Application Site;
  - NMP4_2020 – south-western area of the Application Site;
  - NMP5_2020 – north-eastern area of the Application Site; and
  - CRTN3_2022 - shortened CRTN measurement representative of Ravens Rock Road, plus daytime and night-time measurements.

This assessment considers that the noise environment within the neighbouring site to the north-west (the Tack Sandyford SHD site, which is being considered along with the Proposed Development for a combined masterplan as set out in Chapter 3) is representative of the noise environment at the Application Site.

During the 2022 survey, supplementary baseline measurements were undertaken a location representative of the adjacent Tack Sandyford SHD site, and Ravens Rock Road. Including noise monitoring undertaken at this point also enables a cumulative assessment to be made of the likely impacts should the Proposed Development plus the proposed Tack Sandyford SHD be permitted together[2].

This is the CRTN3_2022 location indicated on Figure 9.1.

In both surveys monitoring was undertaken in accordance with BS7445 or CRTN guidance, as appropriate, using a Norsonic Nor-140 Class I sound level meter (SLM). The SLM was mounted on a tripod at a height of 1.2 – 1.5m above ground level. The SLM was field calibration tested at the start and end of each measurement, with no significant drift noted. The SLM and calibrator were within their laboratory calibration period.

Weather conditions during the survey were in accordance with the requirements of BS7445, with no rain and wind speeds below 4 m/s throughout. Road surfaces were dry and free from standing water during the CRTN measurements. The temperature was generally within the range 16 – 21°C (July 2020 survey) and 5 – 10°C (February 2022 survey).

The following noise indices were recorded:

- $L_{Aeq,T}$ – the equivalent continuous level is the constant noise level that would result in the same sound energy over a given period and is used to represent varying noise levels over a time, T, as a single number. Typically referred to as the 'ambient' noise level.
- $L_{A90,T}$ – the 'background' or 90th percentile noise level, i.e. the noise level that is exceeded for 90 percent of a time, T. Representative of the quieter moments experienced at a location, this index is unaffected by short-duration noisy events.
- $L_{A10,T}$ – the 10th percentile noise level, i.e. the noise level that is exceeded for 10 percent of a time, T. Typically used to characterise road traffic noise.
- $L_{Amax,T}$ – the maximum noise level recorded over a time, T.

A 1-minute averaging period (T) was used for on-site measurements, such that the variability of noise across the Site could be investigated.

For CRTN measurements a 1-hour averaging period was used, in accordance with the guidance.

9.3.4 Method of Prediction

Construction Noise

Detailed information on construction methods, schedules and hours of work is not currently available, however, it is understood that no driven (percussive) piling will be undertaken. Secant piling will be required around the basement construction and will be installed by rotary methods or by continuous flight auger methods (CFA) of piling. While detailed noise predictions of multiple stages of construction is beyond the scope of this assessment, an assemblage of plant representative of the assumed noisiest stage of construction works, rotary piling, has been assumed within the Site boundary in the noise model to determine likely worst-case noise levels for the construction phase at the closest high-sensitivity NSR. We note that the closest neighbouring buildings are non-

[2] Chapter 3 of this EIAR sets out the overall masterplan proposals for the Application Site which is the subject of this EIAR in tandem with the proposed Tack Packaging Sandyford SHD immediately adjacent to the north-west

residential and of low sensitivity to noise. Noise levels from construction activity at more distant, noise-sensitive, properties will be lower.

Predictions of noise from construction assumes that the adjacent Tack Sandyford SHD site has not yet been constructed, and that construction work on both sites will occur simultaneously should both the Tack Sandyford SHD and the Carmanhall Road SHD 2022 are granted planning permission. There will therefore be no screening by buildings, and as such represent 'worst case' noise levels at NSR5. Proposed residential properties of the adjacent site will not be occupied and will not be noise-sensitive.

Operational / Occupation Phase Noise

During the baseline noise surveys, the dominant noise source across the Application Site was determined to be road traffic on Blackthorn Road and Carmanhall Road. Noise effects during occupation of the Proposed Development will therefore predominantly arise from road traffic. Road traffic noise has been predicted as $L_{A10,18hr}$ values for roads surrounding the Proposed Development in accordance with the CRTN method.

Projected traffic flows for the baseline year (2022), and the future baseline and future-with-development scenarios for 2026 and 2031 have been provided by the traffic consultant as 24-hour Annual Average Daily Traffic (AADT) flows, including HGV composition percentage. The 24-hour traffic flows have been converted to 18-hour flows using a factor agreed with the traffic consultants. Traffic has been assumed to be travelling at the speed limit of the road. The AADT flows are provided in Appendix 9.1.

A road traffic verification model has been undertaken to compare predicted baseline noise due to road traffic with measured baseline noise levels (including both 2020 and 2022 data). The predicted baseline levels using measured data were 0.7 dB and 4.8 dB above measured levels at CRTN monitoring locations, with the greatest difference (4.8 dB) noted at NMP2 (2020), representative of Carmanhall Road. The results are therefore considered to be conservative, and a correction has been applied to predicted levels from Carmanhall Road, at which the greatest over-prediction occurs. The results of the model verification exercise are provided in Appendix 9.2.

The proposed access road at the western side of the Application Site, which will lead to the underground car park, has been excluded from predictions. Approximately 125 parking spaces will be provided as part of the Proposed Development and resultant traffic flows on the proposed road will therefore be very low. Noise from traffic movements on the proposed access will be negligible, particularly in the context of the dominant noise arising from road traffic on Carmanhall Road and Blackthorn Road.

The predicted increases in noise from road traffic noise arising from development-generated flows have been evaluated against criteria provided in Table 9.3 to determine potential impacts at off-site NSRs.

Noise levels at proposed NSRs, comprising outdoor amenity spaces and proposed dwellings of the Proposed Development have been predicted in accordance with CRTN. Predicted $L_{A10,18hr}$ values have been converted to EU noise indices L_{day}, L_{night} and L_{den} using Method 3 of the TRL study. In accordance with BS8233, predicted external noise levels have been converted to internal levels assuming a reduction of 33 dB for thermal double glazing, minus a 5 dB correction for the low-frequency component of road traffic ($+C_{tr}$), giving an overall reduction to external noise levels of 28 dB(A).

Noise from commercial and industrial sources has been considered using measured baseline values; no predictive modelling of commercial / industrial noise sources has been undertaken.

Predicted noise levels provided in this report are for the most exposed proposed dwellings, i.e. those facing outwards and may therefore be considered 'worst-case'. Noise levels within proposed dwellings which face onto the central courtyard will be substantially lower, given the screening provided by the buildings of the Proposed Development, and impacts will be lesser.

Predicted noise levels presented within this assessment exclude any screening that may be delivered in association with the proposed Tack Sandyford SHD to the west (as described in Chapter 3 of this EIAR). It would be reasonable to assume that actual noise levels could be lower should that proposed site be built upon, as buildings there would be expected to provide partial screening to the Proposed Development from road traffic noise.

9.4 Baseline Conditions

9.4.1 Description of Baseline Noise Environment

The noise environment in the vicinity of the Application Site was dominated by road traffic on Carmanhall Road and Blackthorn Road, with a lesser contribution from Ravens Rock Road and the distant M50 (approximately 550 m away). Lesser contributors to measured noise levels included;

- intermittent vehicle movements in the business park;
- nearby construction works, comprising the construction of scaffolding on an adjacent site;
- low-level fan noise from HVAC plant on nearby buildings;
- wind-induced rustling from vegetation;
- bird calls; and
- infrequent aircraft and trams.

The measured noise levels within the Site were characterised by measurements at CRTN3_2022 (Tack Sandyford SHD Site, 2022) and NMP3_2020, NMP4_2020 and NMP5_2020 (Application Site, 2020), these are summarised in Table 9.5

Table 9.5: Summary of measured baseline noise levels

Noise monitoring position ID	Duration of measurement, T	Measured Noise Level			
		Ambient, $dBL_{Aeq,T}$	Maximum, dBL_{Amax}	10th Percentile, $dBL_{A10,T}$	Background, $dBL_{A90,T}$
February 2022					
CRTN3_2022 – Day	2 hours	58.7	88.4	59.9	56.0
CRTN3_2022 – Night	1 hour	48.4	70.0	49.5	45.6
2020					
NMP3_2020 – Day	2 hr	51.6	68.4	52.6	50.1
NMP3_2020 – Night	2 hr	38.9	58.4	40.3	36.0
NMP4_2020 – Day	20 min	50.8	68.2	51.9	48.8
NMP5_2020 - Day	20 min	52.9	64.6	53.9	51.7

Measurements at CRTN1_2020 and CRTN2_2020 were used for characterisation of road traffic noise only and are not reported in Table 9.5.

Data measured at the Application Site in 2020 showed similar trends to the recent 2022 monitoring and measured levels were comparable for the daytime and night-time periods.

Charts of measured noise levels at monitoring locations within the Application Site at NMP3_2020, NMP4_2020 and NMP5_2020 are provided in Appendix 9.3.

On the basis of the relative prominence of road traffic noise and the absence of audible commercial or industrial noise sources, other than 'slightly audible' HVAC plant, a BS4142 assessment of potential impacts of commercial / industrial noise on proposed NSRs has been scoped out of this assessment.

9.4.2 Characterisation of Road Traffic Noise

Measured noise levels at CRTN3_2022 and 2020 data from CRTN1_2020) and CRTN2_2020 are provided in Table 9.6.

Table 9.6: Characterisation of road traffic source levels

Noise monitoring position ID	Duration of measurement, T	Measured Noise Level			
		Ambient, $dBL_{Aeq,T}$	Maximum, dBL_{Amax}	10th Percentile, $dBL_{A10,T}$	Background, $dBL_{A90,T}$
CRTN3_2022 – Ravens Rock Road	3hr total	61.8	91.0	64.0	54.0
CRTN1_2020 – Carmanhall Road	3hr total	62.9	86.5	66.9	53.5
CRTN2_2020 – Blackthorn Road	3hr total	62.3	85.8	65.4	53.7

Noise emissions from Carmanhall Road, Blackthorn Road and Ravens Rock Road have been characterised using the relationship provided in CRTN whereby the $L_{A10,18hr}$ = $L_{A10,3hr}$ – 1dB, with appropriate corrections applied for the distance of the measurement location from the edge of the carriageway.

9.5 Characteristics of the Proposed Development

The Proposed Development comprises the construction 334 residential units in four apartment blocks ranging from four storeys to a maximum height of sixteen storeys to be provided at the south-eastern edge of the Site, at the corner of Carmanhall Road and Blackthorn Road.

The proposed apartment blocks will comprise the following:

- Block D: 10 storey facing Carmanhall Road;
- Block E: 8–16 storey facing Carmanhall Road/Blackthorn Road;
- Block F: 8 storey facing Blackthorn Road; and
- Block G: 4–5 storey facing the proposed Tack Sandyford SHD site.

All apartments are provided with private balconies and terrace spaces with the use of planting and balustrades to provide a privacy and a threshold between the communal courtyard and private amenity spaces of podium level units. BS8233 notes that target noise levels for external amenity areas do not apply to balconies, as they

are commonly within urban environments, where noise levels are higher. The layout of the building will screen the central courtyard/amenity space from road traffic and commercial / industrial noise.

9.6 Potential Effects

9.6.1 Construction Phase Effects

In accordance with the 'ABC' method provided in BS5228 and with reference to Table 9.5, measured ambient levels for the daytime and night-time periods in 2022, the daytime threshold criterion for construction noise is 65 $dBL_{Aeq,1hr}$ and the night-time criterion is 53 $dBL_{Aeq,1hr}$. No baseline measurements were undertaken during the evening/weekend periods, therefore the lower threshold criterion from the ABC method of 55 $dBL_{Aeq,1hr}$ has been adopted.

The construction phase is anticipated to take approximately 24 months, and a preliminary Construction Management Plan (pCMP) has been prepared to accompany this SHD application. The pCMP will be developed further by the Main Contractor as the project is developed. Proposed construction working hours will be 08h00 – 19h00 Monday to Friday, and 08h00 – 14h00 on Saturdays (it is noted that the final hour of Saturday working falls within the 'evenings and weekends' category of BS5228).

Potential worst-case noise effects during the construction phase are anticipated to arise during site preparation works and foundation construction by rotary piling in the early stages of construction. The worst-case predicted noise levels at the closest off-site NSR (NSR5) are provided and evaluated against derived BS5228 threshold values provided above and impact magnitude criteria (from Table 9.3) in Table 9.7. Predicted levels at NSR5 are external and actual noise levels within buildings will be lower. Assuming open-window transmission a reduction of 15 dB to construction noise levels may be assumed, or approximately 30 dB for closed window transmission.

Table 9.7: Evaluation of predicted worst-case construction phase noise levels against derived criteria

Threshold criterion using BS5228 'ABC method'	Predicted level, $dBL_{Aeq,1hr}$	Comparison of predicted with criterion (predicted minus threshold)	Magnitude of impact	Significance of effect (high sensitivity receptors)
Weekday daytimes & Saturday mornings 65 $dBL_{Aeq,1hr}$	64	-1	No change / none	Neutral
Evenings and weekends 55 $dBL_{Aeq,1hr}$		+10	High adverse	Large
Night-time 55 $dBL_{Aeq,1hr}$		+10	High adverse	Large

We note that no evening or night-time working is proposed, however, worst-case predicted noise levels are evaluated against the criteria for all BS5228 periods for completeness. We further note that NSR5 is a commercial receptor, albeit a medical facility, and may not operate at evenings and weekends. Should this be the case the sensitivity of the NSR may be reduced during these periods and impacts would be lesser.

Noise effects associated with the proposed construction activities during weekday daytimes and Saturday mornings have been evaluated as being of 'neutral' significance and are 'not significant'. Construction

management measures will be required to ensure compliance with noise criteria for construction activities. Additional mitigation measures within the CEMP will need to be incorporated to ensure that short-term residual effects from construction activities are kept within acceptable limits.

Noise effects associated with construction activities during evenings, weekends and the night-time period have been evaluated as being of 'large' significance, based on worst-case predicted noise levels. This assessment notes, however, that no evening or night-time working is proposed and assumes that if any out-of-hours work is required, a noise assessment of the proposed activities will be undertaken to demonstrate predicted compliance of the proposed activities with the evening, weekend or night-time noise limits and submitted to the local authority for review and approval prior to works being undertaken.

9.6.2 Operational / Occupation Phase

Proposed Development - Internal noise levels

The conversion from predicted $L_{10,18hr}$ values to L_{day} and L_{night} values is demonstrated in Appendix 9.4. Predicted noise levels within proposed residential dwellings via closed-window transmission are evaluated against BS8233 target internal noise levels (as set out in Section 9.3.2) in Table 9.8.

Table 9.8: Evaluation of predicted worst-case operational / occupation phase noise levels against derived criteria via closed window transmission

NSR ID	Internal ambient level via closed window transmission, $dBL_{Aeq,T}$	Comparison with criterion (predicted level minus target level), dB	Impact magnitude	Effect significance
Daytime period (07h00 – 23h00)				
NSR1	32.4	-2.6	No change / none	Neutral
NSR2	36.2	1.2	Low adverse	Slight
NSR3	27.7	-7.3	No change / none	Neutral
NSR4	37.2	2.2	Low adverse	Slight
Night-time period (23h00 – 07h00)				
NSR1	24.0	-6.0	No change / none	Neutral
NSR2	27.6	-2.4	No change / none	Neutral
NSR3	19.5	-10.5	No change / none	Neutral
NSR4	28.5	-1.5	No change / none	Neutral

Note - Where the comparison with criterion produces a negative value, this indicates compliance with the target noise level.

During the daytime and the night-time period, predicted noise levels within rooms in the most-exposed façades of proposed dwellings overlooking Blackthorn Road marginally exceed the target internal noise levels, via closed-window transmission. The resultant impact magnitude at these NSRs is 'low adverse' and the effect

significant is ‘slight’. At all other NSRs during the daytime period, and at all NSRs during the night-time period the impact magnitude is ‘no change / none’ and the effect significance at high sensitivity NSRs is ‘neutral’.

Noise effects during the occupation phase are therefore ‘not significant’.

Where predicted levels within proposed dwellings on the most-exposed façades are above the target levels during the daytime period, we note that actual levels on most floors will be lower, and that the lower floors will be most affected. Target levels may be met by the specification of glazing with increased sound attenuation on the lower floors on façades overlooking Blackthorn Road.

We note that noise level criteria may be met within proposed dwellings via open window attenuation in rooms facing into the central courtyard.

Proposed Development - External amenity areas

Figure 9.2 presents predicted daytime noise levels within the proposed courtyard area and in the outdoor amenity space on the southern side of the Proposed Development. Predicted L_{day} levels meet the 55 dB BS8233 ‘upper guideline’ level across all of the external amenity space. The impact magnitude is therefore no change / none and the resultant effect significance is ‘neutral’. Noise effects in external amenity areas of the Proposed Development are therefore ‘not significant’.

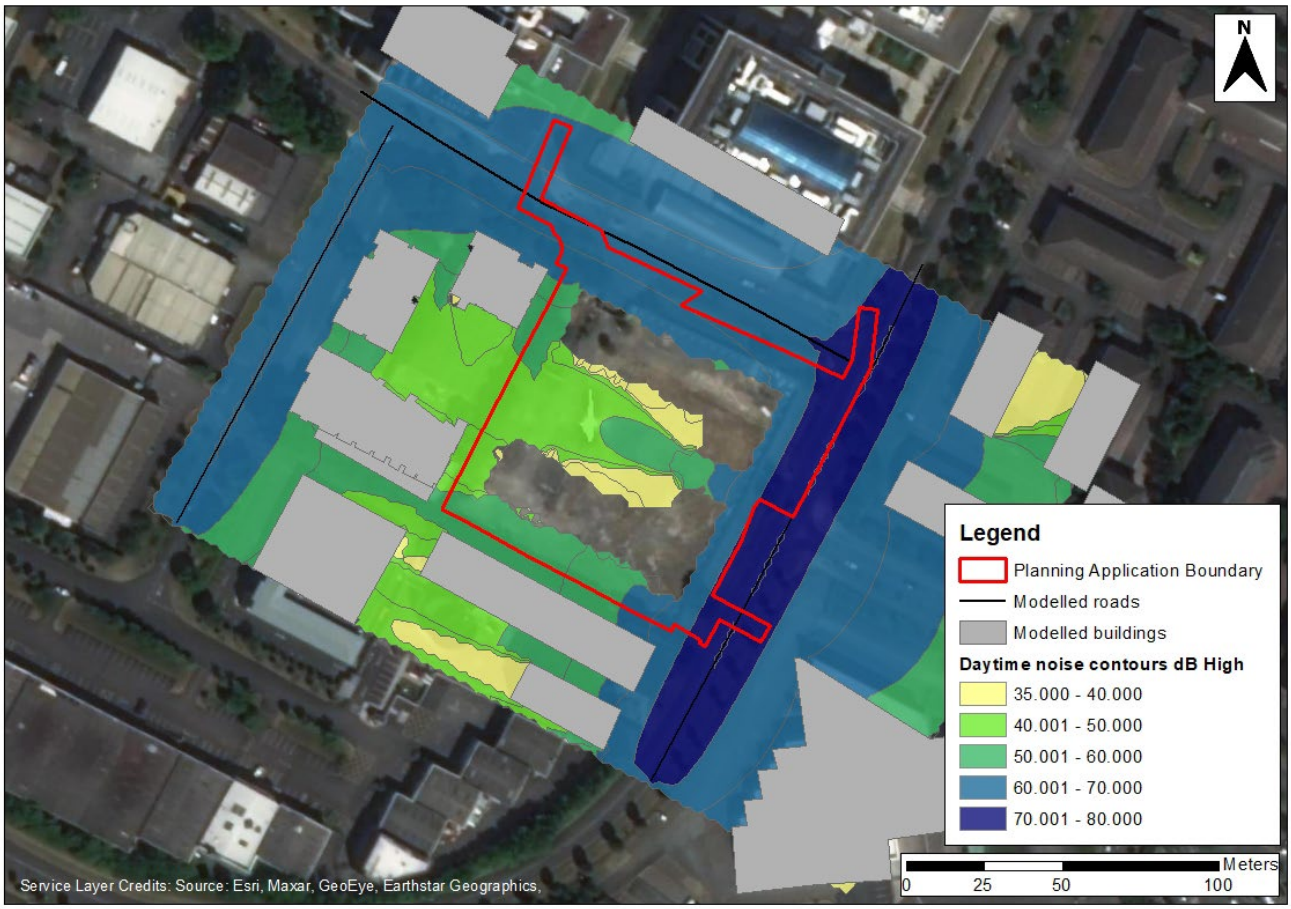


Figure 9.2: Predicted daytime noise levels surrounding the Proposed Development.

Off-site NSRs

With reference to Appendix 9.2 the change in the source level of Carmanhall Road, Blackthorn Road and Ravens Rock Road arising due to development-generated flows, as shown at prediction locations CRTN1_2020, CRTN2_2020 and CRTN3_2022 ranges from 0.0 dB to 0.3 dB, in the 2026 and 2031 scenarios.

Evaluating these projected increases against the criteria in Table 9.3 gives an impact magnitude of 'low adverse'. At high sensitivity NSRs, such as NSR5 and more distant residential properties, the significance of effect is 'slight', and is therefore 'not significant'.

9.6.3 'Do-Nothing' Scenario

Previous commercial development at the Site has been demolished and noise levels either directly from the Site or indirectly by generation of off-site traffic movements associated with it, are low. In the absence of the Proposed Development no construction noise effects would arise, however, given its urban location it is likely that the Site would be developed at some point and construction noise would be generated. Impacts from construction of alternative developments may be assumed to be similar in character to those associated with the Proposed Development, however the duration of construction may differ.

The Proposed Development will introduce new NSRs to the area; if the Site was not put to residential use, no new high-sensitivity residential receptors would be introduced to the study area, and noise impacts associated with existing noise sources would remain unchanged.

9.7 Mitigation and Management

Construction Phase Mitigation

Any out-of-hours work specific to the relevant phases of the Main Contractor's works will be addressed within the final CMP and updated in the Site's CEMP. These management measures will identify appropriate measures to ensure that construction noise meets the derived criteria at all sensitive receptors.

Noise control measures will be included in a Noise Management Plan to include the following:

- Specification and substitution:
  - Be cognisant of noise when choosing plant and activities to be employed on site; and
  - If noise problems arise during construction of the proposed development, where reasonably practicable, replace noisy plant or activities with quieter alternatives;
- Modification of plant and equipment:
  - Seek to modify existing plant and equipment or apply improved sound reduction methods, to reduce noise generated;
  - Consult the original equipment manufacturer and a specialist in noise reduction techniques when undertaking any modifications;
  - Fit all pneumatic tools with silencers or mufflers;
  - Use rubber linings in chutes and dumpers;
  - Noise from diesel engines can be reduced by fitting a more effective exhaust silencer system or by designing an acoustic canopy to replace the normal engine cover;
  - If necessary, reduce noise caused by resonance of body panels and cover plates by stiffening with additional ribs or by increasing the damping effect with a surface coating of special resonance damping material; and
  - Minimise direct metal-to-metal contact.
- Timing of operations:
  - Move plant onto and around the site within core construction working hours; and

- Ensure that any plant and equipment required for operation at night (23h00 – 07h00) is mains electric powered where practicable, or suitably silenced and shielded.

- Noise enclosures:
  - Where practicable and necessary, contain fixed plant and equipment (e.g. compressors and generators) within suitable acoustic enclosures or behind acoustic screens; and
  - Ensure that a reflecting surface, such as a parked lorry, is not located opposite the open side of noise enclosures. Any openings in complete enclosures (e.g. for ventilation) should be effectively sound-reduced. The effectiveness of partial noise enclosures and screens is reduced if they are used incorrectly.
- Location of plant and equipment:
  - Position noisy plant and equipment away from noise-sensitive areas; and
  - Wherever practicable, orientate plant so that the noise generated is directed away from noise-sensitive areas.
- Loading and unloading of materials:
  - Take care when loading and unloading vehicles to minimise noise;
  - Lower rather than drop materials whenever practicable. If it is necessary to drop materials, minimize the drop height; and
  - Cover surfaces on to which materials are being moved with resilient material.
- Engine noise reduction:
  - Prohibit unnecessary idling of construction traffic within the site boundary or at the site access points;
  - Switch plant off when not in use (including during breaks and down times of more than 30 minutes);
  - Avoid operating plant simultaneously or close together to avoid cumulative noise impacts;
  - Avoid unnecessary revving of engines;
  - Keep internal haul routes well maintained and avoid steep gradients; and
  - Close engine acoustic covers when engines are in use and idling.
  - Maintenance of plant and equipment:
  - Ensure that trained personnel regularly maintain equipment and plant, as increases in noise are often indicative of future mechanical failure;
  - Frictional noise from the cutting action of tools and saws can be reduced if the tools are kept sharp;
  - Noises caused by friction in conveyor rollers, trolleys and other machines can be reduced by proper lubrication; and
  - Noise caused by vibrating machinery having rotating parts can be reduced by attention to proper balancing.
- Monitoring:

- Arrangements for noise compliance monitoring during construction is to be agreed with DLRCC, with details to be updated in the Site's CEMP.

Operational/Occupation Phase Mitigation

Predicted internal noise levels marginally exceed the criterion within proposed dwellings on the most-exposed façades via closed window attenuation, during the daytime period (predicted levels meet the criterion during the night-time period). Alternative ventilation will be provided, either comprising acoustic trickle ventilation or mechanical ventilation, such that windows do not need to be opened. If trickle ventilation is adopted, then the vents must give an equivalent or greater sound reduction to external noise levels to that of thermal double glazing; 33 $Dbr_{w+}C_{Tr}$.

For predicted noise levels with dwellings on the most exposed façades to meet the daytime criterion, double glazing providing a sound reduction of at least 35 $Dbr_{w+}C_{Tr}$ should be installed.

At detailed design stage, plant will be specified such that noise from ventilation and air conditioning within proposed dwellings will meet NR20 Noise Rating Curves as specified in BS8233.

9.8 Residual Effects

Provided that appropriate construction management measures are implemented to ensure works meet appropriate noise limits at all sensitive receptors, no additional mitigation is required, therefore residual effects remain **Not Significant**, for the construction phase.

No specific mitigation is required for the operational / occupation phase beyond the use of closed windows to achieve internal noise criteria, and residual effects therefore remain **Not Significant**.

9.9 Difficulties Encountered

This assessment has been undertaken during the Covid-19 global pandemic, and as such it is possible that during the 2020 baseline survey road traffic and commercial activities may have been at lower levels than before Covid-19 restrictions came into force. As a result, baseline noise levels recorded in the 2020 survey may be lower than would have been expected in the pre-Covid situation. We note, however, that the predicted source noise levels of modelled road links have been verified using the CRTN measurements undertaken during the baseline survey and found to be within acceptable levels of accuracy, and 2022 measurements were broadly in agreement with levels measured in 2020.

9.10 Cumulative Effects

The effects of the Proposed Development are considered cumulatively with other reasonably foreseeable developments in the local area in Chapter 15 – Interactions, Cumulative and Combined Effects.

9.11 Summary and Conclusions

This assessment considers potential noise impacts associated with the construction and occupation of a proposed residential development and associated amenities for residents.

The assessment has comprised a desk study to determine an appropriate study area and identify potentially sensitive receptors, characterisation of the baseline noise environment, prediction of worst-case construction and operational / occupation phase noise levels and evaluation against appropriate criteria. The Proposed Development lies within a predominantly commercial and light industrial area, with no high-sensitivity NSRs nearby.

Potential construction phase noise impacts (and in particular those which shall occur on Saturdays) will be controlled by implementation of the Main Contractor's final CMP and associated CEMP and will meet threshold criteria derived from measured baseline noise levels.

Operational / occupation phase noise impacts at proposed NSRs will be mitigated through appropriate specification of alternative ventilation within residential units, such that internal target noise levels will be met using closed-window attenuation. Effects to proposed NSRs will arise from road traffic on Carmanhall Road and Blackhall Road, and noise from commercial / industrial sources, however this will not be significant.

9.12 References

- European Parliament and Council of the European Union, (2002), 'EU Directive 2002/49/EC'.
- UK Department of Transport, Welsh Office, (1988), 'Calculation of Road Traffic Noise'.
- Highways Agency, (1989), 'Design Manual for Roads and Bridges' (live version frequently updated online).
- International Organization for Standardization, (1996), 'ISO 9613: Attenuation of sound during propagation outdoors, Part 1 and Part 2'.
- British Standards Institute, (2014), 'British Standard BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings'.
- World Health Organization, (1999), 'Guidelines for Community Noise'.
- British Standards Institute, (2019), 'British Standard BS 4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound'.
- British Standards Institute, (2014), 'British Standard BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites, Parts 1 and 2'.
- British Standards Institute, (2003), 'BS7445-1:2003 Description and Measurement of Environmental Noise. Guide to Quantities and Procedures'.

APPENDIX 9.1

AADT Traffic Flows

Appendix 9.1 – AADT Traffic flows corrected from 24 hour to 18 hour

Base flow 2022			
Road ID	**24hr AADT**	**18hr AADT**	**% HGV**
BlackthornRd	17,520	16,819	HGV02
CarmanhallRd	9,641	9,255	HGV02
RavensRockRd	1,860	1,786	HGV07
Future baseline 2026			
Road ID	**24hr AADT**	**18hr AADT**	**% HGV**
BlackthornRd	18,460	17,722	HGV02
CarmanhallRd	10,195	9,787	HGV02
RavensRockRd	1,974	1,895	HGV07
Future with devt 2026			
Road ID	**24hr AADT**	**18hr AADT**	**% HGV**
BlackthornRd	19,652	18,866	HGV02
CarmanhallRd	10,848	10,414	HGV02
RavensRockRd	2,130	2,045	HGV06
Future baseline 2031			
Road ID	**24hr AADT**	**18hr AADT**	**% HGV**
BlackthornRd	19,425	18,648	HGV02
CarmanhallRd	10,749	10,319	HGV03
RavensRockRd	2,073	1,990	HGV07
Future with devt 2031			
Road ID	**24hr AADT**	**18hr AADT**	**% HGV**
BlackthornRd	20,617	19,792	HGV02
CarmanhallRd	11,402	10,946	HGV02
RavensRockRd	2,229	2,140	HGV07

APPENDIX 9.2

Road Traffic Noise Model Verification, Pre- and Post- Development Road Traffic Noise Comparison

Appendix 9.2 – Road traffic noise model verification, comparison of pre- and post-development road traffic noise

Table 1 – Verification of road traffic noise model

CRTN location	Predicted level, $dBL_{A10,18hr}$	Measured level, $dBL_{A10,18hr}$	Difference (measured minus predicted), dB	Notes
CRTN1_2020 - Carmanhall Road	67.0	65.9	-1.1	-
CRTN2_2020 - Blackthorn Road	69.2	64.4	-4.8	Conservative -4 dB correction applied to predicted level from Blackthorn Road
CRTN3_2022 - Ravens Rock Road	62.6	60.8	-1.8	-

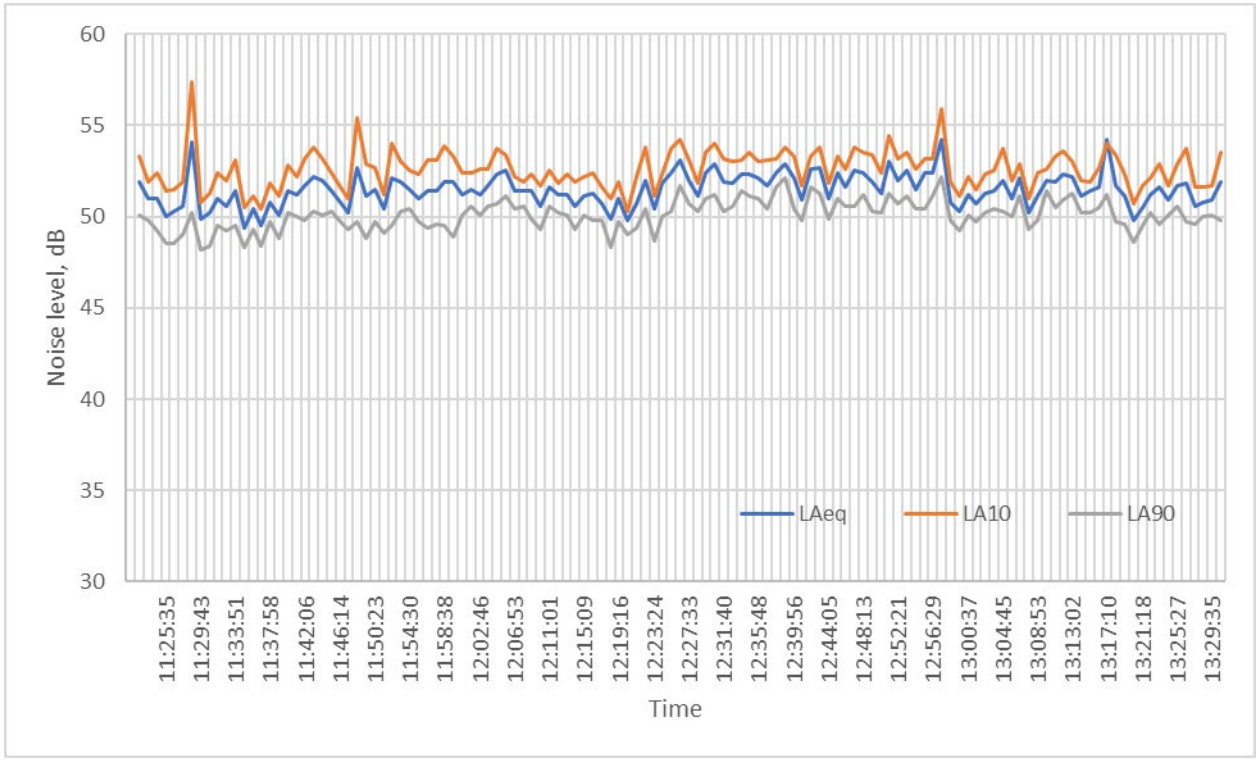
Table 2 – Comparison of pre- and post-development road traffic noise from modelled roads

CRTN location	2026 future baseline level, $dBL_{A10,18hr}$	2026 with development level, $dBL_{A10,18hr}$	Increase due to development, dB
CRTN1_2020 - Carmanhall Road	67.2	67.5	0.3
CRTN2_2020 - Blackthorn Road	69.4	69.7	0.3
CRTN3_2022 - Ravens Rock Road	62.9	63.1	0.2
CRTN location	**2031 future baseline level, $dBL_{A10,18hr}$**	**2031 with development level, $dBL_{A10,18hr}$**	**Increase due to development, dB**
CRTN1_2020 - Carmanhall Road	67.8	67.8	0
CRTN2_2020 - Blackthorn Road	69.6	69.6	0
CRTN3_2022 - Ravens Rock Road	63.3	63.6	0.3

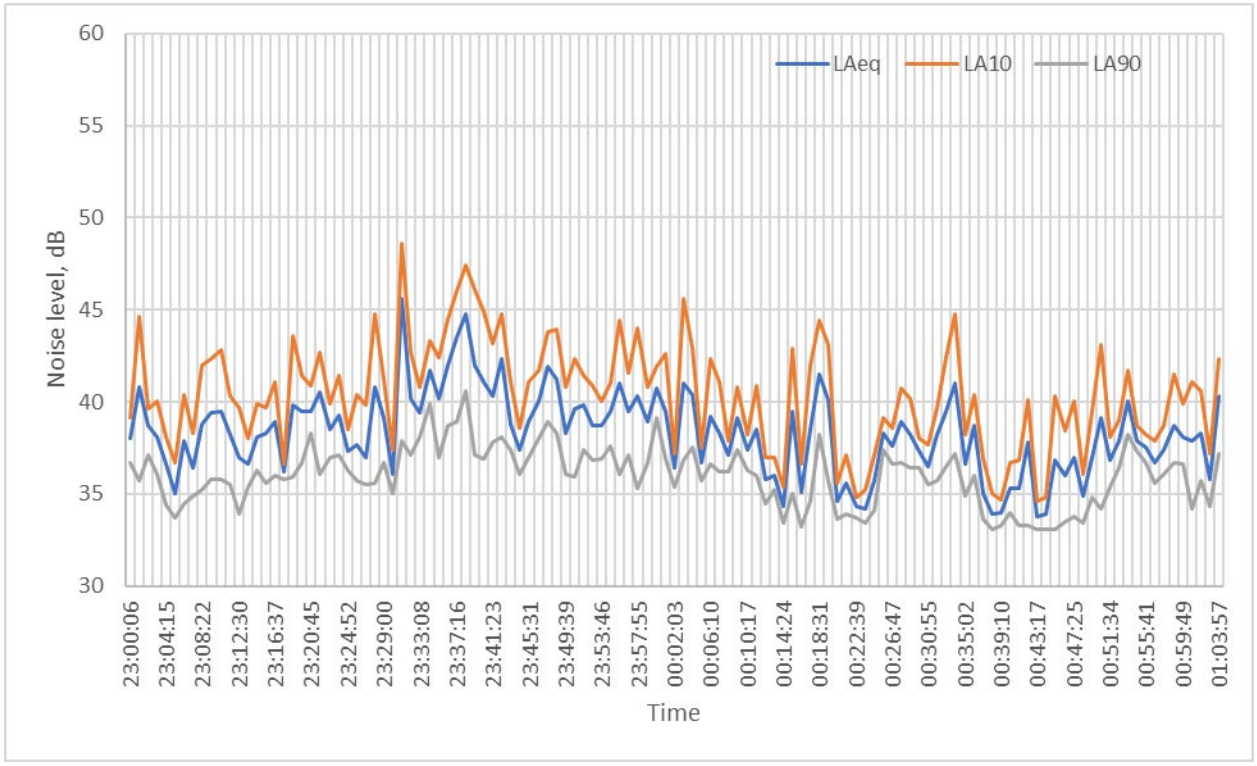
APPENDIX 9.3

2020 Baseline Data

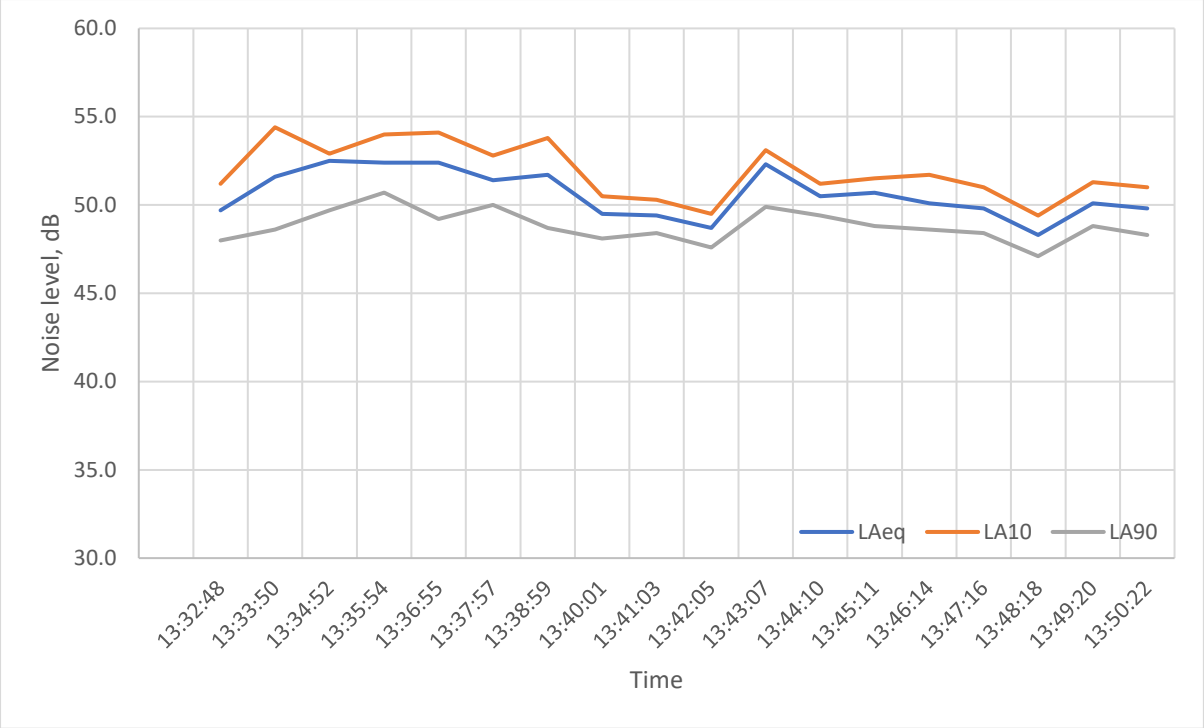
Appendix 9.3 – 2020 baseline data



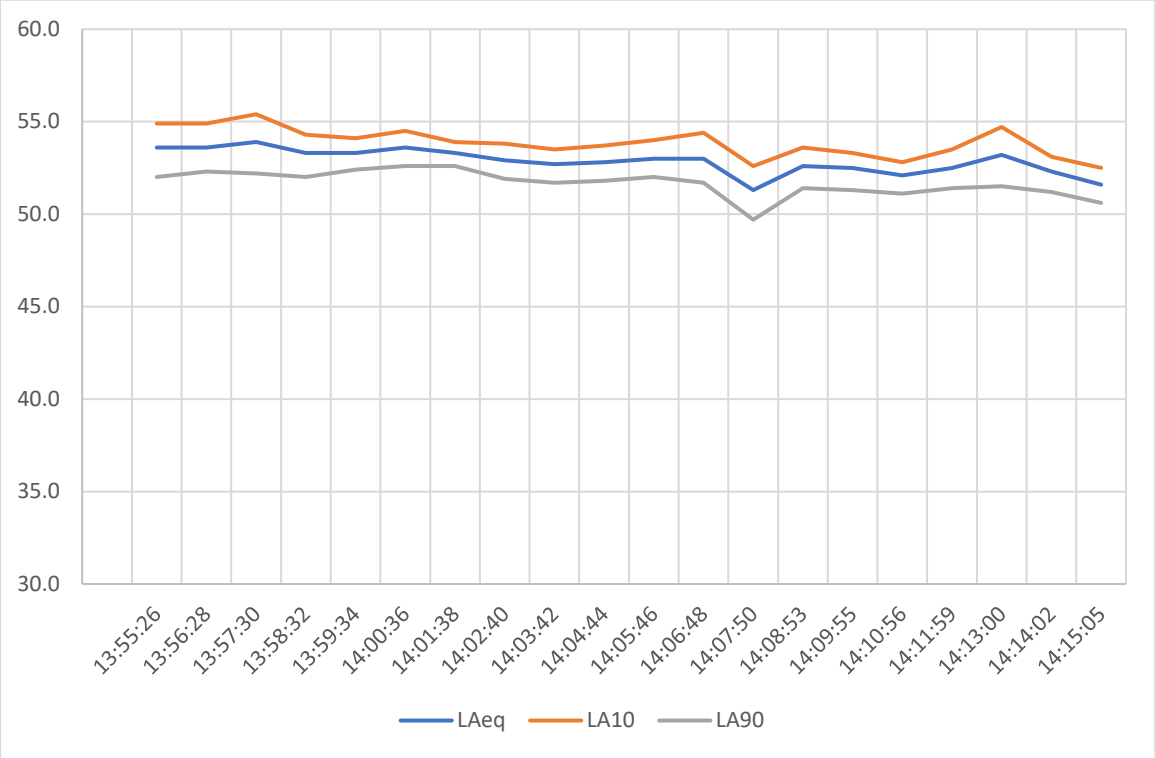
Measured noise levels – NMP3_2020 daytime period



Measured noise levels – NMP3_2020 night-time period



Measured noise levels – NMP4_2020 daytime period



Measured noise levels – NMP5_2020 daytime period

APPENDIX 9.4

Conversion from $L_{A10,18hour}$ to L_{day} and L_{night}

Appendix 9.4 – Conversion from $L_{A10,18hour}$ to L_{day} and L_{night}

NSR name	NSR ID	18 hour L10 (façade level)	Conversion to ambient (L_{Aeq})		Internal level (closed window transmission)		Comparison with target level	
		$dBL_{A10,18hr}$	dBL_{day}	dBL_{night}	dB L_{day}	dBL_{night}	dB	dB
NW building	NSR1	64.0	62.2	53.8	32.4	24.0	-2.6	-6.0
NE Building	NSR2	68.0	66.0	57.4	36.2	27.6	1.2	-2.4
SW building	NSR3	59.0	57.5	49.3	27.7	19.5	-7.3	-10.5
SE building	NSR4	69.0	67.0	58.3	37.2	28.5	2.2	-1.5

Conversion from L10 to Lday using Method 3 of TRL study
= 0.95 * L10,18hr + 1.44

Conversion from L10 to Lnight using Method 3 of TRL study
= 0.9 * L10,18hr - 3.77

10.0 CULTURAL HERITAGE

10.1 Introduction

Golder, member of WSP in Ireland, (Golder) has been commissioned to prepare this Environmental Impact Assessment Report (EIAR) on behalf of Atlas GP Ltd, as Developer and Applicant for the Carmanhall Road Strategic Housing Development (SHD) 2022, (the 'Proposed Development'), on lands located at the former Avid site on Carmanhall Road, Sandyford Industrial Estate, Dublin 18 ('the Site'). 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. This chapter of the EIAR considers the potential effects of the Proposed Development on cultural heritage.

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 cultural heritage assessment has been prepared by Franc Myles of Archaeology and Built Heritage Ltd. Franc is a Member of the Institute of Archaeologists of Ireland, a board member of the Dublin Civic Trust and has over 30 years' experience in the production of heritage reports for planning purposes.

A detailed description of the Site and the Proposed Development can be found in Chapter 3.0 of this EIAR (Project Description).

10.1.1 Project Description

The development will consist of 334 Build to Rent residential apartment units within 4 no. apartment blocks and as follows:

- 79 No. Studio
- 175 No. 1 bed
- 80 No. 2 bed

- All residential units provided with private balconies/terraces to the north/south/east and west elevations
- Crèche 272 sq.m.
- Residential amenity spaces 893 sq.m. (including a unit of 146.5 sqm open to the public, resident's gym, business centre, multipurpose room, staff facilities, multimedia/cinema room, shared working space, concierge, and games room)
- Height ranging from 5 to 16 storeys (over basement)
- Landscaped communal space in the central courtyard
- Provision of a new vehicular entrance from Carmanhall Road and egress to Blackthorn Road
- Provision of pedestrian and cycle connections
- 125 No. Car Parking, 6 No. Motorcycle Parking and 447 cycle spaces at ground floor/under croft and basement car park levels
- Plant and telecoms mitigation structures at roof level

The development also includes 2 no. ESB substations, lighting, plant, storage, site drainage works and all ancillary site development works above and below ground.

10.1.2 Scope

The scope of this cultural heritage assessment comprises a fully detailed baseline study, effects analysis and impact assessment for the Proposed Development. The baseline is informed by the results of desk-based and archival research and has been informed by the results of a separate archaeological impact assessment previously prepared by the writer for the Site.

The impact assessment considers both direct and indirect impacts from the construction and operation of the Proposed Development upon cultural heritage assets, and also considers cumulative and combined effects. Decommissioning has been scoped out of the assessment due to the nature of the Proposed Development (i.e. it is not expected that the apartments will be removed). Informed by the results of the impact assessment, an appropriate and proportionate mitigation strategy for the Proposed Development has been developed, with residual effects subsequently assessed.

In lieu of specific guidance from the Institute of Archaeologists of Ireland (IAI), this impact assessment conforms to the guidelines set out by the Chartered Institute for Archaeologists (CIfA, 2020a[1]; 2020b[2]).

For the purposes of this EIAR, the term ‘cultural heritage’ is used as a collective term to refer to all assets of archaeological, architectural and historical or cultural value. Archaeological heritage typically refers to objects, monuments, buildings, environmental remains or cultural landscapes older than AD 1700, although it can also be used to describe objects, monuments and other tangible remains that date from post-AD 1700. Architectural heritage (or built heritage) refers to structures or buildings (including their contents) of cultural value that are younger than AD 1700. Designed landscapes and gardens dating to post-AD 1700 are also considered to be architectural in this assessment. In both cases, the setting of an asset is considered an integral part of its value.

[1] CIfA (2020a). Standard and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment.

[2] CIfA (2020b). Standard and guidance for historic environment desk-based assessment.

10.1.3 Site Location and Description

The Proposed Development is located within the Sandyford Industrial Estate, Dublin 18. The Site measures approximately 0.99 ha and is located on the southwestern corner of the intersection of Carmanhall Road and Blackthorn Road, approximately 8.8 km south of Dublin City Centre (as shown in Figure 10.1). Until recently, approximately two thirds of the Proposed Development site was occupied by an industrial unit, with hardstanding occupying the remaining area. The Site slopes gently from south to north towards Carmanhall Road.

Figure 10.1: Proposed Development boundary

10.1.4 Study Area

In order to capture sufficient baseline data to robustly assess direct impacts to cultural heritage assets, the spatial scope of the assessment comprises all the land that may be required for the Proposed Development (i.e.land situated within the 'red line boundary' shown on Figure 10.1), together with a buffer of 1 km around the Proposed Development to allow the assessment of indirect impacts. In line with a precautionary approach, some cultural heritage assets have been considered that are located more than 1 km from the Proposed Development, where relevant (e.g. to account for visual effects). The Study Area is shown in Figure 10.2.

10.1.5 Chapter Structure

This chapter is divided into the following sections:

- 10.1 – Introduction, which includes details of the assessment scope, study area and structure;
- 10.2 – Policy and Legislation Context, which includes a description of legislation, policy, standards and guidance relevant to cultural heritage;
- 10.3 – Assessment Methodology and Significance Criteria, which presents a description of how the assessment has been undertaken, the consultations that have taken place and includes any assumptions that have been made or limitations that have been encountered;
- 10.4 – Baseline Conditions, which presents the sources of information used, a detailed breakdown of the assets recorded, a summarised historic map regression and a summarised appraisal of previous archaeological investigations in the study area;
- 10.5 – Characteristics of the Proposed Development, which briefly describes the Proposed Development and those characteristics pertinent to cultural heritage;
- 10.6 – Potential Effects, which summarises the cultural heritage assets considered in the assessment and identifies the sensitivity of those assets. It also presents the potential effects upon these assets as a result of the Proposed Development during construction and operation;
- 10.7 – Mitigation and Monitoring, which presents details of mitigation and monitoring that needs to be adopted to manage the potential effects identified in Section 10.6. It also presents any recommendations for further archaeological investigation that may be required;
- 10.8 – Residual Effects, which presents the residual effects of the Proposed Development, taking account of proposed mitigation;
- 10.9 – Difficulties Encountered, which presents any limitations to the assessment; and
- 10.10 – Summary and Conclusions, which presents a summary of the assessment and final conclusions.

10.2 Legislative and Policy Context

The Minister for Housing, Local Government and Heritage (representing the Department of Housing, Local Government and Heritage) is responsible for the conservation, preservation, protection and presentation of Ireland's cultural heritage. The protection of archaeological heritage is the responsibility of the National Monuments Service (NMS), whilst architectural heritage is the responsibility of the Built Heritage Policy Section (including the Architectural Heritage Advisory Service (AHAS) and National Inventory of Architectural Heritage (NIAH)).

At the national and international level, the key legislation pertinent to this assessment includes:

- Proposed Monuments and Archaeological Heritage Bill;
- The National Monuments Acts, 1930 to 2004;
- The Heritage Act, 1995;
- The Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999;
- The Planning and Development Acts, 2000 to 2020;
- The Convention concerning the Protection of the World Cultural and Natural Heritage (1972), ratified by the Irish Government in 1991; and

- The European Convention on the Protection of the Archaeological Heritage (Revised) (1992), ratified by the Irish Government in 1997.

Guidelines on the assessment of impacts on, and the protection of, cultural heritage assets in Ireland have been consulted and adhered to for this impact assessment, including:

- Guidelines on the information to be contained in Environmental Impact Assessment Reports (2022) – EPA;
- The Framework and Principles for the Protection of the Archaeological Heritage (1999) - Department of Arts, Heritage, Gaeltacht and the Islands (DAHGI); and
- Architectural Heritage Protection: Guidelines for Planning Authorities (2011) - Department of Arts, Heritage and the Gaeltacht (DAHG).

10.2.1 Legislative Mechanisms of Protection

There are a number of mechanisms for heritage protection in Ireland. Heritage assets can be protected under the National Monuments Acts 1930 to 2004 in four ways:

- The asset is recorded in the Record of Monuments and Places (RMP);
- The asset is registered in the Register of Historic Monuments (RHM);
- The asset is a national monument subject to a Preservation Order (or Temporary Preservation Order); or
- The asset is a National Monument in State Care.

Heritage assets can also be protected under the Planning and Development Act 2000, which requires all Local Authorities to curate and maintain a Record of Protected Structures (RPS). An asset is protected if it is inscribed on a county's RPS. Protected Structures may be archaeological in nature, and so an asset may appear on both the RMP and county RPS.

The 'Convention concerning the Protection of the World Cultural and Natural Heritage' (1972) provides The United Nations Educational, Scientific and Cultural Organization (UNESCO) with the power to inscribe assets of international importance on the World Heritage List as a World Heritage Site. Local authorities and stakeholders are encouraged to protect these sites through the production of Management Plans, which aim to manage the site in a suitable fashion.

Local authorities also have mechanisms by which to protect heritage assets, including the creation of Architectural Conservation Areas (ACAs) and Zones of Archaeological Potential (ZAPs) (or equivalents).

The mechanisms of heritage protection described here also afford protection to the setting of cultural heritage assets, as well as the physical assets.

10.2.2 Planning Policy

At the local level, the Dún Laoghaire-Rathdown County Development Plan 2022 - 2028 (DLRCDP) guides planning policy in relation to archaeological and architectural heritage. Policies pertinent to this assessment are summarised in Table 10.1.

Table 10.1: DLRCDP (2022-2028) Policies - Archaeological and Architectural Heritage

Policy Area	Policy
Archaeological Heritage	**HER1**: Protection of Archaeological Heritage *It is a Policy Objective to protect archaeological sites, National Monuments (and their settings), which have been identified in the Record of Monuments and Places and, where feasible, appropriate and applicable to promote access to and signposting of such sites and monuments.*
	AH2: Protection of Archaeological Material in Situ *It is a Policy Objective to seek the preservation in situ (or where this is not possible or appropriate, as a minimum, preservation by record) of all archaeological monuments included in the Record of Monuments and Places, and of previously unknown sites, features and objects of archaeological interest that become revealed through development activity. In respect of decision making on development proposals affecting sites listed in the Record of Monuments and Places, the Council will have regard to the advice and/or recommendations of the Department of Arts, Heritage and the Gaeltacht (DoAHG).*
	HER5: Historic Building Grounds *It is a Policy Objective to protect historical and/or closed burial grounds within the County and encourage their maintenance in accordance with good conservation practice and to promote access to such sites where possible.*
Architectural Heritage	**HER7:** Record of Protected Structures *It is a Policy Objective to include those structures that are considered in the opinion of the Planning Authority to be of special architectural, historical, archaeological, artistic, cultural, scientific, technical or social interest in the Record of Protected Structures.*
	HER8: *Work to Protected Structures* *It is a Policy Objective to:* *[…]* *i) Ensure that the form and structural integrity of the Protected Structure is retained in any redevelopment and that the relationship between the Protected Structure and any complex of adjoining buildings, designed landscape features, or views and vistas from within the grounds of the structure are respected.* *[…]* *viii) Protect the curtilage of protected structures and to refuse planning permission for inappropriate development within the curtilage and attendant grounds that would adversely impact on the special character of the Protected Structure.*
	HER9: Protected Structures Applications and Documentation *It is a Policy Objective policy to require all planning applications relating to Protected Structures to contain the appropriate level of documentation in accordance with Article 23 (2) Planning Regulations and Chapter 6 and Appendix B of the Architectural Heritage Protection Guidelines for Planning Authorities, or any variation thereof.*
	HER12: National Inventory of Architectural Heritage (NIAH)

Policy Area	Policy
	It is a Policy Objective to review and update the RPS on foot of any Ministerial recommendations. The 'Ministerial Recommendations', made under Section 53 of the Planning Acts, will be taken into account when the Planning Authority is considering proposals for development that would affect the historic or architectural interest of these structures.
	HER13: Architectural Conservation Areas *It is Policy Objective to:* *ii) Protect the character and special interest of an area which has been designated as an Architectural Conservation Area (ACA).* *iii) Ensure that all development proposals within an ACA be appropriate to the character of the area having regard to the Character Appraisals for each area.* *iv) Ensure that any new development or alteration of a building within an ACA or immediately adjoining an ACA is appropriate in terms of the proposed design, including scale, height, mass, density, building lines and materials.* v) *Seek a high quality, sensitive design for any new development(s) that are complimentary and/or sympathetic to their context and scale, whilst simultaneously encouraging contemporary design. Direction can also be taken from using traditional forms that are then expressed in a contemporary manner rather than a replica of a historic building style.* vi) *Ensure street furniture is kept to a minimum, is of good design and any redundant street furniture removed.* *vii) Seek the retention of all features that contribute to the character of an ACA including boundary walls, railings, soft landscaping, traditional paving and street furniture.*
	H**ER20:** Buildings of Vernacular and Heritage Interest *It is a Policy Objective to:* *i) Retain, where appropriate, and encourage the rehabilitation and suitable reuse of existing older buildings/structures/features which make a positive contribution to the character and appearance of the area and streetscape in preference to their demolition and redevelopment and to preserve surviving shop and pub fronts of special historical or architectural interest including signage and associated features.* *ii) Encourage the retention and/or reinstatement of original fabric of our historic building stock such as windows, doors, roof coverings, shopfronts, pub fronts and other significant features.* *iii) Ensure that appropriate materials be used to carry out any repairs to the historic fabric.*
	HER21: Nineteenth and Twentieth Century Buildings, Estates and Features *It is a Policy Objective to:* i) *Encourage the appropriate development of exemplar nineteenth and twentieth century buildings, and estates to ensure their character is not compromised.*

Policy Area	Policy
	ii) *Encourage the retention and reinstatement of features that contribute to the character of exemplar nineteenth and twentieth century buildings, and estates such as roofscapes, boundary treatments and other features considered worthy of retention.*
	HER22: Protection of Historic Street Furniture *It is a Policy Objective to:* *i) Preserve the retention of historic items of street furniture where these contribute to the character of the area including items of a vernacular or local significance.* *ii) Promote high standards for design, materials and workmanship in public realm improvements within areas of historic character.*
	HER23: Industrial Heritage *It is a Policy Objective to:* *i) Have regard to those items identified in the Industrial Heritage Survey (included in Appendix 4) when assessing any development proposals.* *ii) Identify further sites of industrial heritage significance with a view to assessing them for inclusion in the Record of Protected Structures.*
	HER 26: Historic Demesnes and Gardens *It is a Policy Objective that historic demesnes and gardens should be identified and protected to reflect and acknowledge their significance as part of our National Heritage. The following houses and gardens are listed: Cabinteely House, Marlay House, Fernhill and Old Conna.*

Dún Laoghaire-Rathdown County Council has a heritage management plan (Dún Laoghaire-Rathdown Heritage Plan 2013-2019), which has been consulted for reference, where applicable.

10.3 Assessment Methodology and Significance Criteria

This assessment has been produced in accordance with national and local legislation and policy, as well as best practice guidance. The impact assessment methodology aligns with EPA's Guidelines on the information to be contained in Environmental Impact Assessment Reports, (EPA, 2022) and has been adapted from the advice provided by the National Roads Authority (NRA), in their Guidelines for the Assessment of Architectural Heritage Impacts of National Roads Schemes and Guidelines for the Assessment of Archaeological Heritage Impacts of National Roads Schemes (no publication date). These guidelines can be equally applied to other development schemes.

The assessment has been completed using a phased qualitative assessment methodology, as outlined here:

- Cultural heritage assets with the potential to be affected by the Proposed Development are identified and ascribed a 'value', ranging from ''unknown' to 'very high';
- The 'magnitude' of any effects resulting from the Proposed Development upon the identified receptors are established, ranging from 'no change' to 'high' (assuming no mitigation is in place);

- A comparison of the magnitude of effect and receptor value is used to calculate the significance of effect;
- Where required, a mitigation strategy is proposed, with the significance of effect re-calculated (assuming any proposed mitigation is in place) to ascertain the residual effects.

Effects to cultural heritage assets can result from both direct and indirect effects. Direct effects are consideredhere to be those which result in an immediate, physical impact to an asset, such as ground disturbance. Indirecteffects are considered here to include those that occur through an environmental pathway (e.g. air, waterways,and groundwater) or that are secondary (e.g. mitigation measures for a different impact affecting cultural heritage). These indirect effects may be physical but may also affect the setting of an asset. Indirect effects can include, but are not limited to:

- Noise effects;
- Air pollution/dust effects; and
- Visual effects.

Consultation with other specialists, in particular air quality, noise, and landscape and visual, have been undertaken to capture combined effects and provide a holistic assessment of impacts upon cultural heritage assets. Assessment of Value of Cultural Heritage Assets

The value of a cultural heritage asset can be assessed using the criteria presented in Table 10.2.

Table 10.2: Criteria for Assessing the Value of Cultural Heritage Assets

Value of Asset	Criteria
Very High	■ World Heritage Sites (including nominated sites); ■ Assets of acknowledged international importance; and/or ■ Assets that can contribute significantly to acknowledged international research objectives.
High	■ Protected Assets (e.g. assets inscribed on the RMP, RHP or RPS); ■ Undesignated assets of recognised quality or importance (e.g. proposed for inclusion on the RMP, ACAs); and/or ■ Assets that can contribute significantly to acknowledged national research objectives.
Medium	■ Undesignated assets of regional importance or that might contribute to regional research objectives.
Low	■ Undesignated assets of local importance; ■ Assets compromised by poor preservation and/or poor survival of contextual associations; and/or ■ Assets of limited value, but with potential to contribute to local research objectives.
Negligible	■ Assets with very little or no surviving cultural interest.
Unknown	■ The importance of the asset cannot be ascertained.

10.3.1 Assessment of Magnitude of Effect

The scale and magnitude of effects on cultural heritage assets can be assessed using the tiered grading system presented in Table 10.3Table 10.3.

Table 10.3: Criteria for Assessing Magnitude of Effect on Cultural Heritage Assets

Magnitude of Effect	Criteria
High	■ Changes to most or all key archaeological/architectural elements, such that the asset is totally altered; and/or ■ Comprehensive changes to setting.
Medium	■ Changes to many key archaeological/architectural elements, such that the asset is clearly modified; and/or ■ Considerable changes to setting.
Low	■ Changes to key archaeological/architectural elements, such that the asset is slightly altered; and/or ■ Slight changes to setting.
Negligible	■ Very minor changes to elements or setting; and/or ■ Archaeological receptors are altered but no information is lost (through archaeological excavation and recording).
No change	■ No change.

10.3.2 Assessment of Significance of Effects

Using the value of an asset as indicated in Table 10.2, and the magnitude of effect as ascertained from Table 10.3, Table 10.4 indicates how the assessment of the significance of an effect has been concluded.

Table 10.4: Significance of Effect Matrix

		MAGNITUDE OF EFFECT				
		No change	**Negligible**	**Low**	**Medium**	**High**
VALUE OF ASSET	**Very High**	Imperceptible	Slight	Moderate/ Significant	Significant/ Profound	Profound
	High	Imperceptible	Slight	Slight/ Moderate	Moderate/ Significant	Significant/ Profound
	Medium	Imperceptible	Not Significant	Slight	Moderate	Moderate/ Significant
	Low	Imperceptible	Not Significant	Not Significant	Slight	Slight/ Moderate
	Negligible	Imperceptible	Imperceptible	Not Significant	Not Significant	Slight

The methodology outlined in this section is reliant on an element of subjectivity, and so inherently requires a level of professional judgement. It is considered, however, that the criteria described in Table 10.2 and Table 10.3 provide robust and transparent decision-making guidance that can be widely applied to a variety of potential cultural heritage assets.

10.4 Baseline Conditions

The results of the baseline study are presented here as a summarised appraisal of the various disparate data sources. They have been separated into archaeological and architectural assets. For ease of reference, each asset has been assigned a unique ID reference comprising a two-letter prefix ('AR' for archaeological assets and 'BU' for architectural assets), followed by a sequentially increasing number. This allows information from different datasets, each with their own reference systems, to be collated into a single receptor list.

10.4.1 Data Sources

The baseline study comprised a comprehensive desk-based review of existing, remotely available heritage datasets within the Study Area, which has allowed a good understanding of the baseline cultural heritage conditions at and around the Proposed Development to be established. Sources of information consulted include:

- The Sites and Monuments Record (SMR), compiled and maintained by the Archaeological Survey of Ireland (ASI) unit of the NMS, for details regarding all known monuments and sites[3].
- The NIAH Building[3] and Garden[4] Surveys, for details regarding buildings, structures, demesnes, designed landscapes and historic gardens of architectural importance;
- The RMP, compiled and maintained by the NMS, for details regarding protected sites;
- The NMS for details regarding national monuments in State care (ownership or guardianship of the Minister for Arts, Heritage and the Gaeltacht) and for monuments subject to Preservation Orders;
- The DLRCDP 2022-2028 for details regarding the county's RHM, RPS, National Monuments in State Care (ownership or guardianship of the Local Authority), monuments subject to Preservation Orders and ACAs;
- UNESCO for details regarding inscribed and tentative World Heritage Sites;
- The topographical files of the National Museum of Ireland (NMI) for details of any finds held in the national archive relevant to the Site;
- The SMR, Excavations Bulletin, and Transport Infrastructure Ireland Digital Heritage Collection for details of previous excavations;
- Ordnance Survey Ireland for historic cartographic and aerial image sources, in order to conduct a map regression; and
- Modern online aerial image sources (e.g. Google Earth, Bing Maps).

An archaeological impact assessment report was prepared for a previous SHD application at the Site (Archaeology and Built Heritage Ltd, 2021; presented in Appendix 10.1), the results and conclusion of which have been considered within this assessment.

[3] The SMR and NIAH Building Survey datasets are available in a downloadable Geographical Information System (GIS) format.

[4] The NIAH Garden survey is a work in progress. The desk-based survey (Phases 1 and 2) has been completed, but the field survey (Phase 3) remains incomplete. A policy framework and method of protection remains to be determined.

10.4.2 Archaeological Heritage

Sites and Monuments Record and the Record of Monuments and Places

Five archaeological monuments listed on the SMR are recorded within the Study Area, although none of these are located within the Site. The locations of these monuments relative to the Site are presented in Figure 10.2. A summary description of the monuments is provided in Table 10.5, with greater detail included in the Cultural Heritage Gazetteer in Appendix 10.2. A variety of monument types[5] is recorded, indicating long-term habitation and use of the area since at least the Bronze Age (2500 BCE to 500 BCE).

The nearest recorded asset to the Site is AR-01, an unclassified castle site located approximately 420 m to the northeast (DU023-045). Any remains of the castle were likely lost during construction of the Stillorgan reservoirs, but its location is indicated as 'Moltainstown' on the Down Survey (1655-56). As such, this site is not listed, or proposed for inclusion, on the RMP.

Located 775m to the southwest of the Site, AR-02 is recorded as a *fulacht fiadh* (a kidney-shaped cooking pit, typically interpreted as being Bronze Age in date). The SMR entry does not include any additional information,but the monument is located within the alignment of the M50 motorway, indicating that it was likely recorded prior to road construction.

Similarly, AR-03 and AR-04 are also located within the M50 alignment. Both of these assets have undergone archaeological evaluation through excavation under licence. Located approximately 650 m south of the Site, AR-03 is a potentially medieval field boundary (comprising a wall and ditch) with later fire pits and postholes. In close proximity, located 750 m south of the Site, AR-04 is recorded as a flat cemetery. This Bronze Age cemetery, dated to between 2000 and 1850 BCE, comprised three cremation burials, two of which contained vessels. The three burials were recorded within 7 m of each other.

Comprising the partial remains of a tower house, AR-05 is located 920 m south of the Site, within the landscaped gardens of Glencairn. The two sections of wall, built from granite masonry, are described as being within the entrance gate to the British Embassy at Glencairn (which is an architectural asset in its own right – BU-05). The SMR record indicates, however, that the tower house is associated with the western boundary of the demesne lands of Kill of the Grange (a church site located northeast of the Site), indicating a medieval date. The SMR record also indicates AR-05 as being located approximately 35 m east of BU-05.

There are no assets recorded in the Dún Laoghaire-Rathdown Industrial Heritage Survey located at the Site.

[5] A complete list of class definitions used in the SMR is available here: http://webgis.archaeology.ie/NationalMonuments/WebServiceQuery/Lookup.aspx

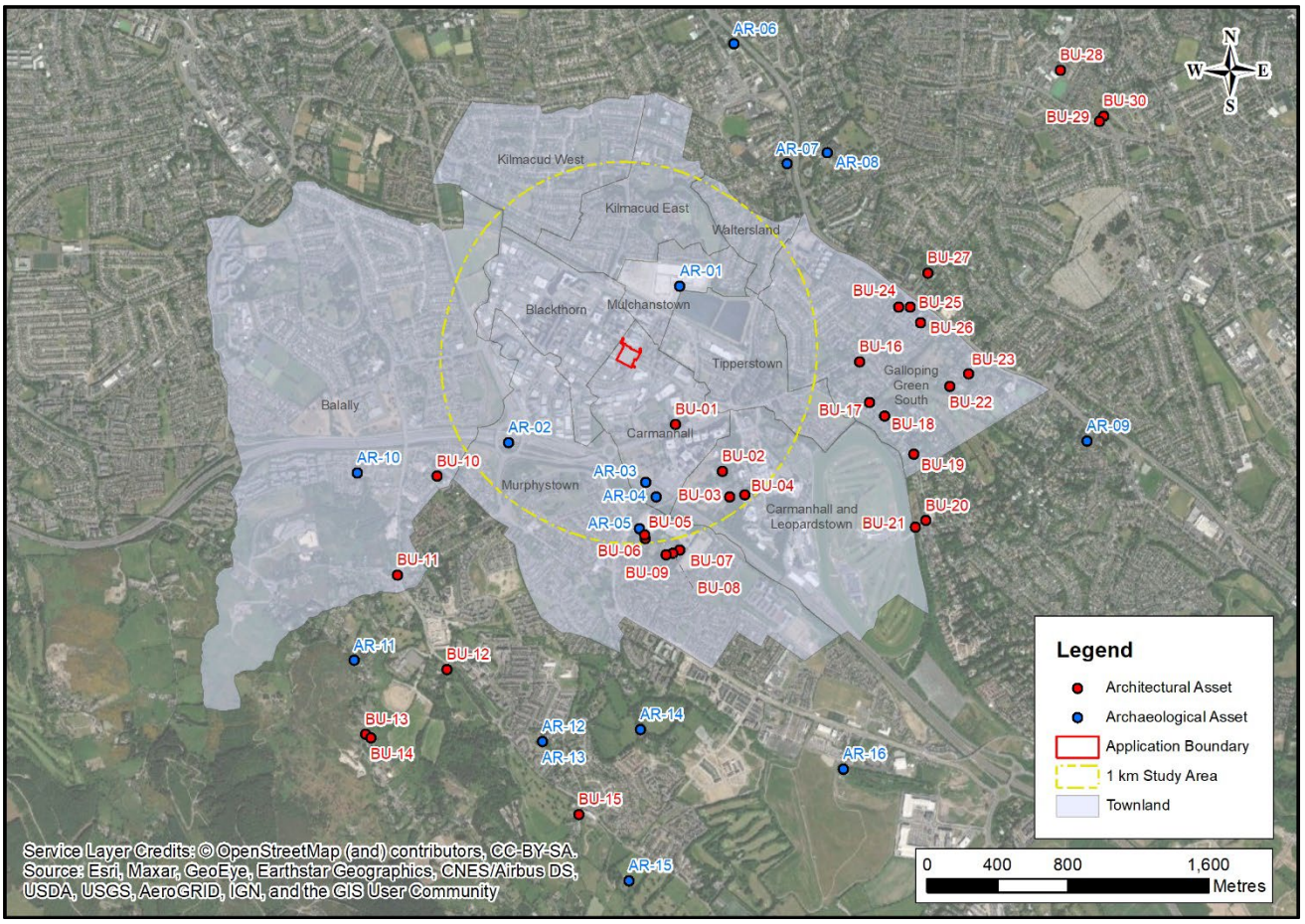


Figure 10.2: Study Area and Cultural Heritage Assets

(Sites and Monuments Record data created and maintained by the National Monument Service. National Inventory of Architectural Heritage Building and Garden Survey data created and maintained by the National Inventory of Architectural Heritage).

Table 10.5: Archaeological Assets within Study Area

Golder WSP ID	SMR Ref	Easting (ITM95)	Northing (ITM95)	Asset Description	Included (or Proposed for Inclusion) on RMP	Distance to Site	Value
AR-01	DU023-045----	719718	726951	Castle – unclassified	No	420 m (northeast)	Negligible
AR-02	DU022-109----	718744	726061	Fulacht fia	Yes	775 m (southwest)	High
AR-03	DU023-066----	719525	725836	Field boundary	Yes	650 m (south)	High
AR-04	DU023-063----	719583	725752	Flat cemetery	Yes	750 m (south)	High
AR-05	DU023-025----	719489	725570	Castle – tower house	Yes	920 m (south)	High

A further 11 archaeological assets are located within the wider vicinity of the Proposed Development, three to the north (AR-06 to AR-08), one to the east (AR-09) and seven to the south and south west (AR-10 to AR-16). Details of these assets are provided in the Cultural Heritage Gazetteer in Appendix 10.2.

Record of Protected Structures

None of the archaeological monuments recorded within the Study Area are listed on the Dún Laoghaire-Rathdown RPS.

Preservation Orders

None of the assets within the Study Area are subject to a Preservation Order. The nearest asset to the Site subject to a Preservation Order is the Kiltiernan Dolmen and associated stones (DU026-019----), located in Kiltiernan Domain, approximately 4.1 km south of the Site.

National Monuments in State Care

A national monument is defined by the National Monuments Act, 1930 as an asset 'the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto'. A National Monument in State Care is one in the ownership or guardianship of the Minster for Arts, Heritage and the Gaeltacht or a Local Authority.

None of the monuments recorded in the Study Area are designated as National Monuments in State Care. The nearest National Monument in State care is a cross in Kilgobbin (SMR number DU025-016), located some 2.2km south of the Site.

Register of Historic Monuments

None of the monuments recorded within the Study Area are inscribed on the RHM. The nearest monument that is inscribed on the RHM is a semi-circular enclosure (SMR number DU025-014), located in Woodside, approximately 2.2km southwest of the Site.

World Heritage Sites and Tentative List

There are no World Heritage Sites recorded within the Study Area. The nearest World Heritage Site to the Site is Brú na Bóinne (Archaeological Ensemble of the Bend of the Boyne), located 49 km to the north. The Historic City of Dublin is listed on the Tentative List for Ireland for consideration for inclusion on the World Heritage List, located approximately 6 km to the north of the Site.

Topographical Files

An online search was conducted of the topographical files archive at the NMI for all entries recorded in the 11 townlands that are within 1 km of the Site (as shown on Figure 10.2). The search returned four entries, two in Leopardstown, one in Murphystown and one in Galloping Green South. The two finds in Leopardstown comprise a silver shilling, dating to the Victorian era, and an early twentieth-century metal button from the Irish Volunteers, where a stone axehead was recorded beneath a granite boulder in Murphystown. An incised sandstone cobble, of potential Bronze Age origin, was found in Galloping Green South, although the record indicates that there is scepticism over the authenticity of the artefact.

From available online sources, including the National Museum of Ireland Finds Database (2010), a bronze flat axe is recorded to have been found approximately 565 m south of the Site, within the alignment of the M50 motorway.

Site specific analysis

There is little evidence in the immediate area of the Site for pre-historic activity despite there being a plethora of such sites slightly further afield. Some 900 m to the south of the site, to the north of a stream marking the boundary between Carmanhall and Murphystown townlands, a group of Bronze Age pit burials was excavated under licence 01E1229 prior to the construction of the M50. Burial 1 contained a single vessel, and Burial 2 two vessels. Burial 3 was not within a vessel and the cremated remains were placed in a stone-lined circular pit. The pits were found within 7m of each other and close to an area of weathered granite bedrock that may have been exposed at the time of interment. The vessels were identified as vase urns with one dating to between 2000BC and 1850BC. The Topographical Files of the National Museum record the finding of a bronze flat axe at a separate location some 700m to the south of the site, which with the number of *fulachta fiadh* recorded along the M50, emphasise the potential for recovering Bronze Age activity in the general area.

The most proximate archaeological investigation to the development site was undertaken as part of the monitoring works for the Luas extension under licence 07E0095 and is referred to here not for its archaeological significance, rather to illustrate the random nature of the deposits and structures which may underlie any site in the area. Here, some 430m to the southeast of the Site, the foundations of an undated drystone wall foundation were recorded, a structure which had not been recorded on historic mapping.

Perhaps more typical of what can be expected on the Site can be gleaned from a report generated under licence 99E0493, where material introduced for a recent development was recorded directly above the natural subsoil some 600m to the southeast. Similarly, the construction of the Beacon Hospital under licence 00E0835 involved the demolition of several modern buildings and the reduction of the ground level across the site. Monitoring of the removal of ground slabs and demolition revealed only modern deposits over bedrock, located at 300–600mm below the modern surface. Nothing of archaeological interest was noted.

The earliest evidence for historical settlement can be extrapolated backwards from the Down Survey undertaken in the mid-seventeenth century, which locates the Site in the lands of Leopardstown, a protrusion north-westwards of the medieval parish of Tully. The name Leopardstown traditionally relates to a leper colony associated with the Hospital of St. Stephen and where the primary reference has not been located, Ball refers to a surrender of the lands from Geoffrey Tyrrell and his wife Sarah in 1230. It is likely however that the lands were granted to St. Stephen's and the hospital continued to collect tithes from the farm in 1378, without necessarily having a physical presence either in the form of a grange (farm) or indeed a leper hospital.

Leopardstown was on the edge of the Pale and susceptible to occasional raids from the hills to the west. There were two castles or towerhouses in the vicinity which would have afforded some protection. The closest, some 500m to the north is marked on the Down Survey (1655-6) as 'Moltainstowne' (DU023-045), where the approximate site in the townland of Mulchanstown is now occupied by the Stillorgan reservoirs. One kilometre to the south a fragment of Murphystown castle survives inside the entrance gate of the United Kingdom's ambassador's residence Glencairn (DU023-025). The ruin comprises portions of two walls of granite masonry 1100m in thickness, with traces of a vault visible over the original ground floor.

The Site straddles the townlands of Carmanhall and Blackthorn, at the northern tip of the parish of Tully. There is no specific documentary evidence for settlement in the former. It is not referred to on the Down Survey terrier by name, where the lands of Leopardstown are described as arable pasture and meadow. It was presumably prime agricultural land as prior to the disturbances of the 1640s it was in ostensibly protestant hands as part of the estate of Theobold Welsh of Carrickmines. By 1670 the townland, and indeed all of Welsh's lands in the area, had been confiscated and divided between Sir Roger Jones and the Earl of Meath. The 1659 census does not return any inhabitants, however it is possible that the 31 English and 29 Irish returned for Blackthorn were all resident within the earlier denomination of Leopardstown.

The relative political stability brought about by the Restoration encouraged agricultural improvement and it is likely that by the turn of the eighteenth century the area had been subject to enclosure and the field systems which survived until the end of the twentieth century date to this period. Landholding systems were still defined by townlands, the boundaries of which remained stable. The Site is bisected by the boundary separating Carmanhall and Blackthorn, with the boundary just to the northeast to Mulchanstown, also separating the parishes of Tully and Kill.

Rocque's 1760 county map (Figure 10.3), demonstrates a degree of continuity from the Down Survey terrier of the preceding century, with areas of the landscape under tillage, with smaller enclosed fields where the ground is poorer. The enclosures are depicted as mature hedgerows which suggests they are of some antiquity.

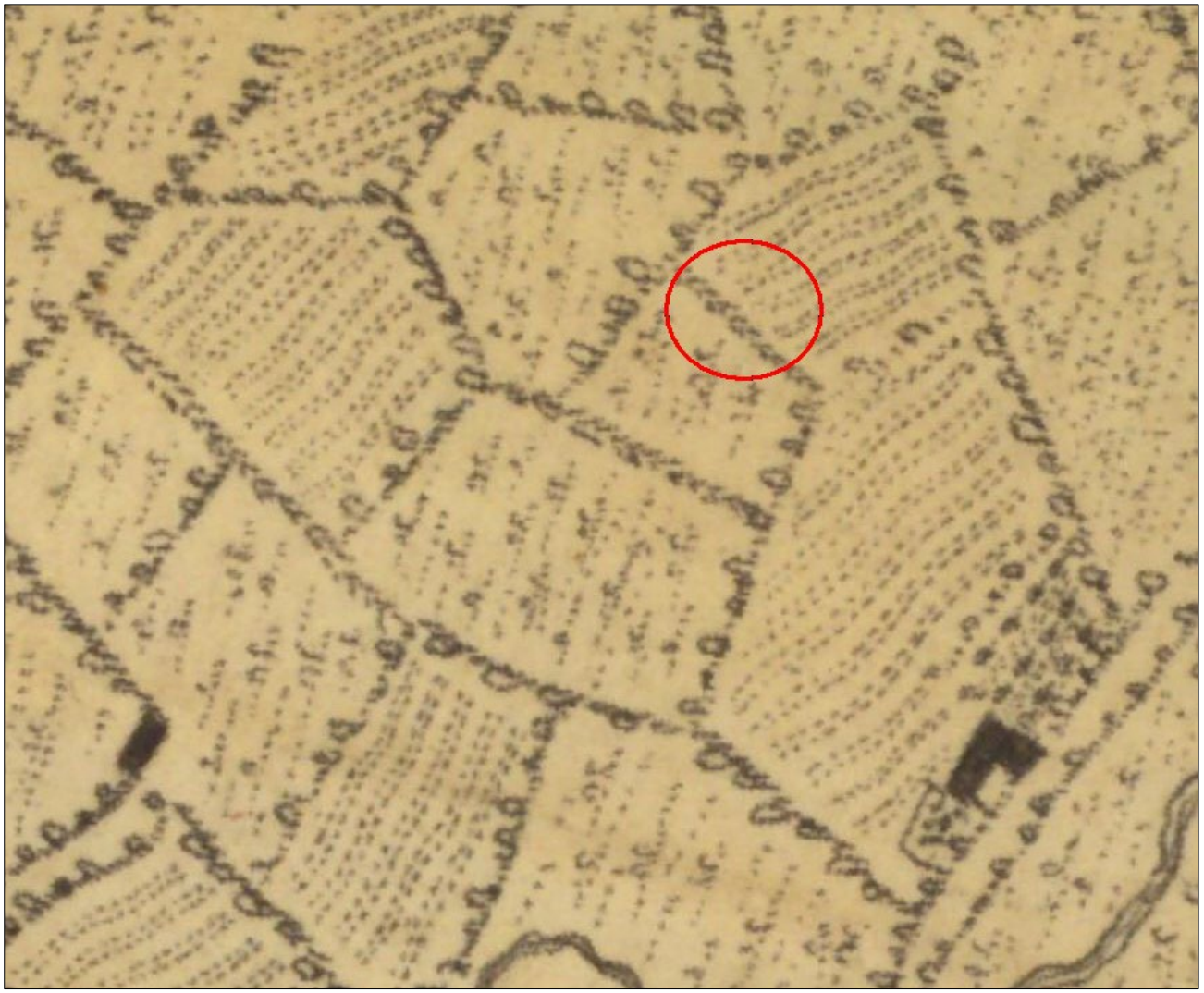


Figure 10.3: John Rocque, 'An actual survey of the county of Dublin', 1760. Approximate site location circled, with Burton Hall to the south

Carmanhall would appear to be an earlier name for Burton Hall, a house still in existence which can be discerned on Rocque's 1760 mapping, and from which the location of the development site can be identified by back-referencing field boundaries to the Ordnance Survey. *Burton Hall* was built in 1730 by Samuel Burton and during the nineteenth century was owned by Henry Guinness, founder of the Guinness Mahon Bank.

Where the demesne associated with the house is clearly annotated on the first edition Ordnance Survey mapping (Figure 10.4), the immediate area of the Site was clearly demarcated as farmland, with the townland field boundary traversing the area. This quite likely comprised a bank and ditch, with a stream running along the latter, flowing off to the northeast. Slightly further downstream the boundary is depicted as a path, with a line of trees planted at regular intervals. The ground in Blackthorn is a little higher and a little rougher, where subsequent mapping demonstrates further improvement into the century.

The Tenement Valuation indicates that in 1856 both fields in Carmanhall were held by Bernard Hanley Esq. from John F. Davis Esq. with the combined annual rateable value of the 36-acre holding assessed at £114. The entire townland of Blackhall was in the hands of the Ecclesiastical Commissioners of the Church of Ireland and leased to the Rev. B. McCausland and Josiah H. Dunne. The 115 acres were valued at £200 and a cottage at the centre

of the townland was occupied by John Stopford. This valuation appears high where much of the townland is depicted as scrubland, although it could easily have accommodated flocks of sheep.

By the turn of the twentieth century, an element of modernity had encroached into the polite agricultural landscape, one which had possibly remained unchanged for over 300 years (Figure 10.5). The Dublin and South Eastern Railway, which connected emerging suburban development in Dundrum, Foxrock and Leopardstown with the terminus at Harcourt Street began operations in 1854. The Stillorgan Reservoirs alongside the railway were developed by Dublin Corporation and built in two stages between 1862 and 1885. The development site however remained unaffected and indeed the boundaries depicted by Rocque in 1760 was still legible in 1943 (Figure 10.6). Subsequent imagery demonstrates the agricultural nature of the site until its development as a continuation of the larger Sandyford Industrial Estate, which began as early as 1967.

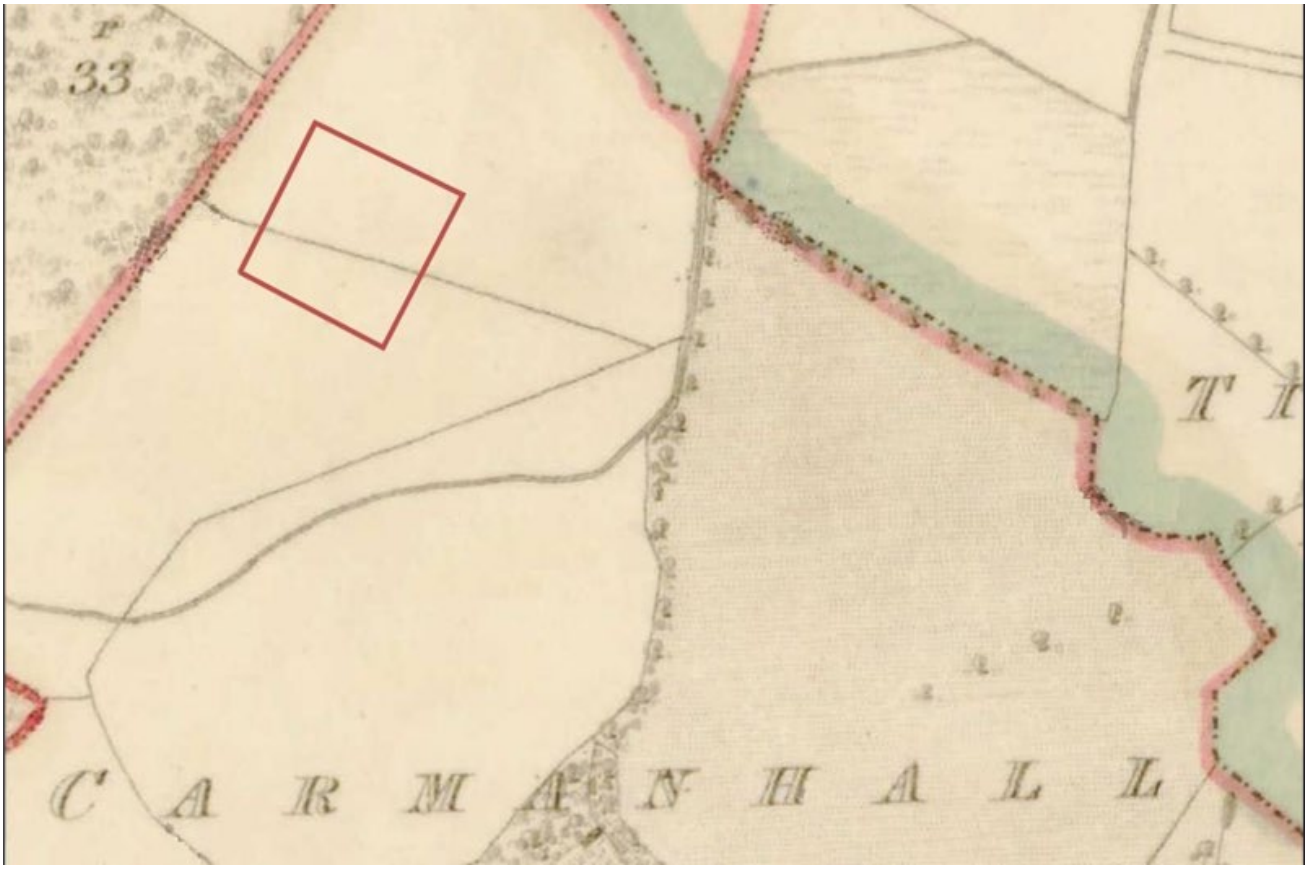


Figure 10.4: Ordnance Survey, Dublin, sheet 23, 6-inch mapping, c. 1838

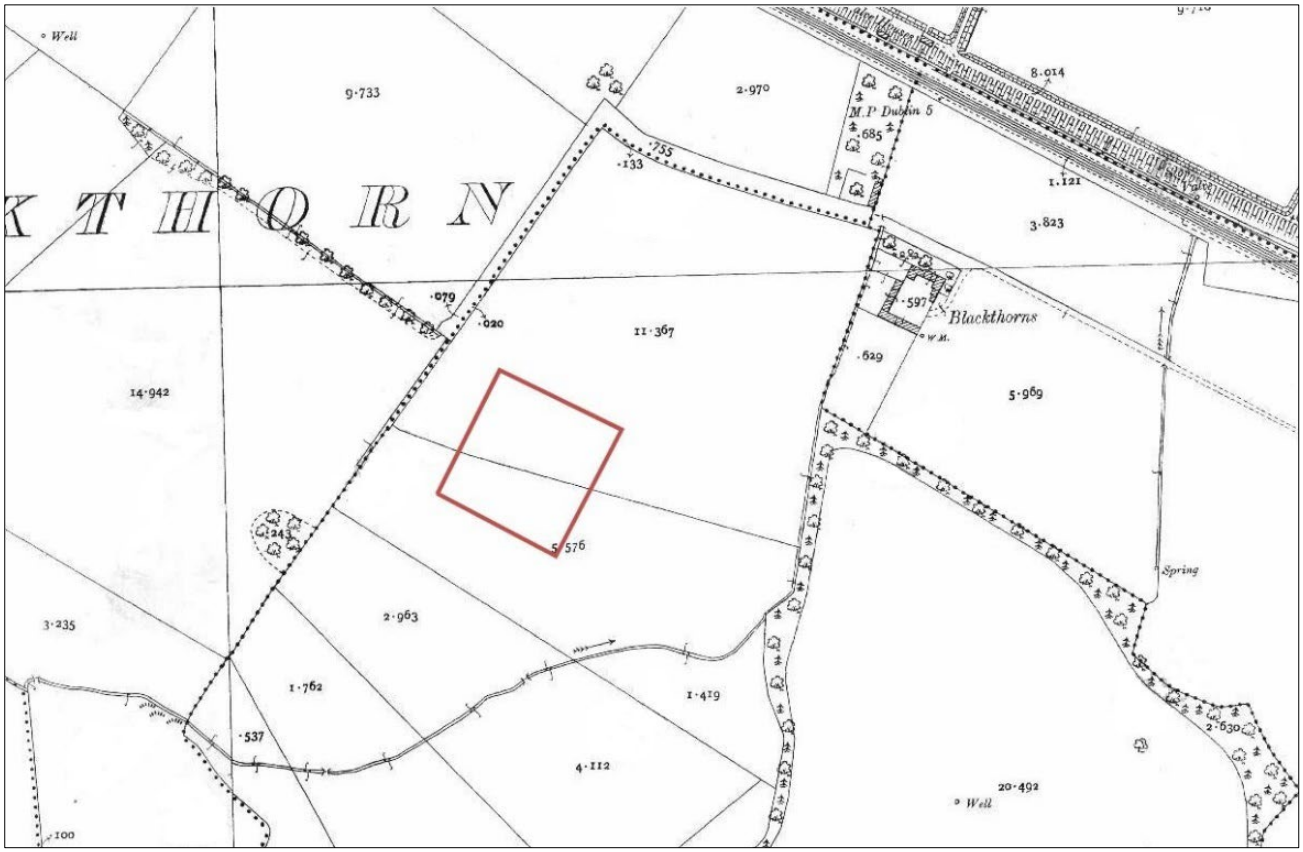


Figure 10.5: Ordnance Survey, DN023-13, 25-inch mapping, c. 1910

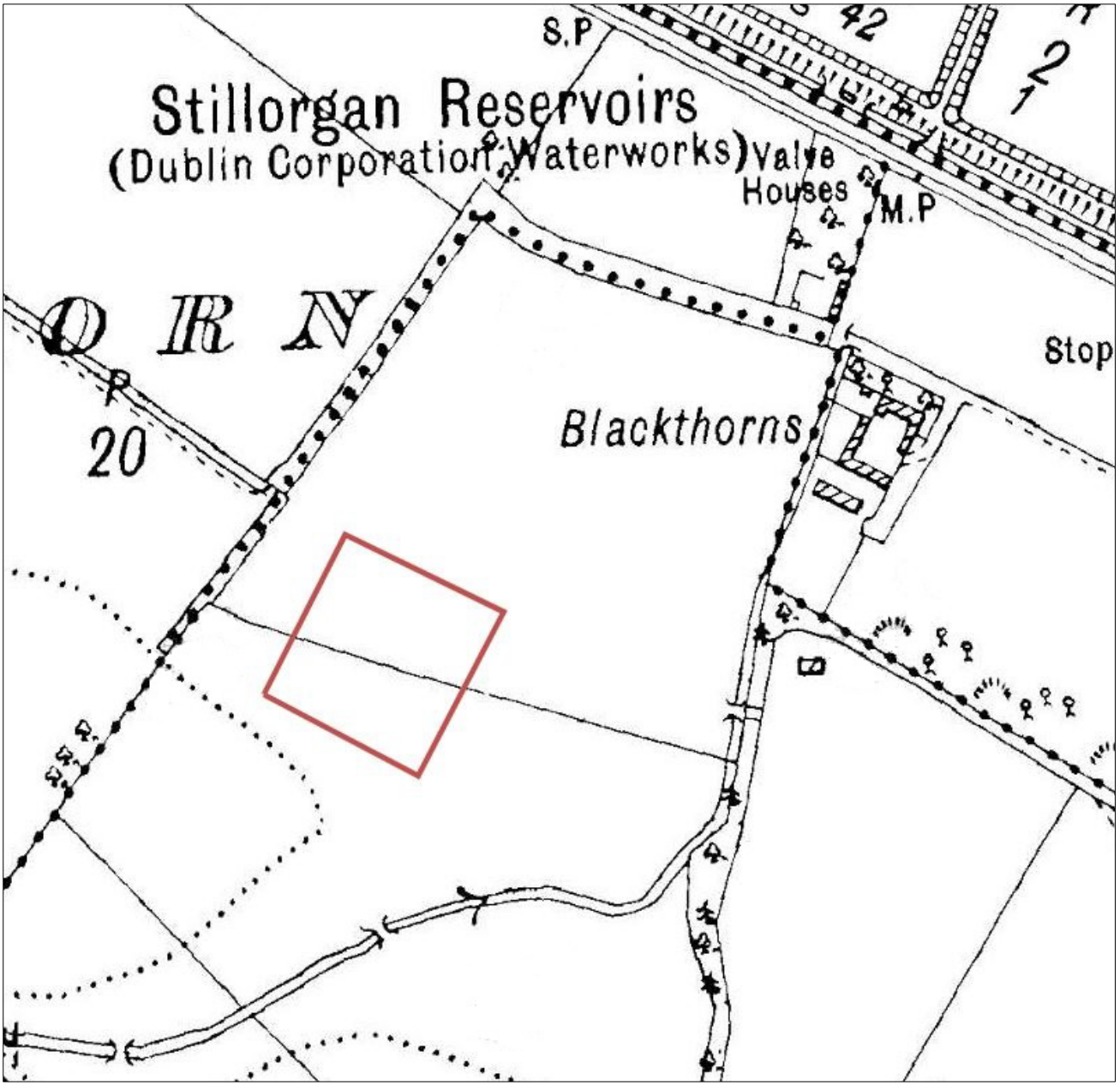


Figure 10.6: Ordnance Survey, DN-023, 6-inch mapping, c. 1943

10.4.3 Architectural Heritage

National Inventory of Architectural Heritage

Nine structures listed on the NIAH are recorded within the Study Area. The locations of these are shown in Figure 10.2, with details summarised in Table 10.6. Greater detail is provided in the Cultural Heritage Gazetteer in Appendix 10.2.

All nine structures are located south of the Site, with the nearest, BU-01, located 4100 m to the southeast. Of the nine structures, five are associated with the Glencairn estate and three are associated with Leopardstown Park. Eight of the structures are listed on the Dún Laoghaire-Rathdown RPS, BU-03 being the only one excluded.

Table 10.6: Architectural Assets within Study Area

Golder ID	NIAH Ref	Easting (ITM95)	Northing (ITM95)	Asset Description (Asset Date)	Asset listed on RPS?	Distance to Site	Value
BU-01	60230013	719627	726190	Burton Hall (1725 - 1735)	Yes (RPS ref. 1610)	410 m (southeast)	High
BU-02	60230012	719895	725924	Leopardstown Park – stable block (1877 - 1908)	Yes (RPS ref. 1630)	780 m (southeast)	High
BU-03	60230011	719935	725777	Leopardstown Park – hospital (1917 - 1937)	No	920 m (southeast)	Medium
BU-04	60230010	720021	725791	Leopardstown Park – country house (1795 - 1800)	Yes (RPS ref. 1634)	965 m (southeast)	High
BU-05	60230005	719452	725561	Glencairn – entrance gate (1900 - 1910)	Yes (RPS ref. 1643)	950 m (south)	High
BU-06	60230004	719455	725540	Glencairn – gate lodge (1855 - 1865)	Yes (RPS ref. 1643)	970 m (south)	High
BU-07	60230001	719651	725477	Glencairn – country house (1855 - 1865)	Yes (RPS ref. 1643)	1,070 m (south)	High
BU-08	60230002	719612	725457	Glencairn – conservatory (1855 - 1908)	Yes (RPS ref. 1643)	1,080 m (south)	High
BU-09	60230003	719573	725449	Glencairn – walled garden (1855 - 1908)	Yes (RPS ref. 1643)	1,080 m (south)	High

A further 21 structures are located within the wider vicinity of the Proposed Development, forming two distinct clusters. To the south and southwest there are six such structures (BU-10 to BU-15), whilst to the east and northeast there are 15 (BU-16 to BU-30). Details are provided in the Cultural Heritage Gazetteer in Appendix 10.2.

Architectural Preservation Areas

The Proposed Development is not located within an ACA. The nearest ACA to the Proposed Development is the Arkle Square ACA, located approximately 600m to the southeast.

10.4.4 Previous Studies and Archaeological Investigations

An archaeological impact assessment was prepared for the development site (Franc Myles; Archaeology and Built Heritage Ltd., 2021; Appendix 10.1). It concluded that the potential for the survival of significant archaeological remains was low, with an historic field boundary the only known feature potentially present, identified through historic map regression. This field boundary extends into the Site under discussion. Previous ground disturbance at the Site was considered to have likely truncated shallow archaeological deposits associated with its agricultural morphology but is not considered to have impacted on deeper substrates.

Twelve records of previous excavations are indicated within the Study Area, seven of which revealed no features of archaeological significance, although the foundations of an undated drystone wall at Carmanhall Site 1 is as an example of unidentified features and structures existing below the surface. The other five excavations were all undertaken upon known monuments AR-02, AR-03, AR-04 and AR-05. These excavations were generally development led, in response to construction of the M50 motorway, Luas B1 development or within the Sandyford Industrial Estate.

10.4.5 Historic Map Regression and Aerial Imagery

Historic mapping and aerial imagery for the Site is available from Ordnance Survey Ireland, including:

- 6 inch – 1829-1841;
- 25 inch – 1897-1913;
- 6 inch – 1943;
- Aerial photography (black and white - orthorectified) – 1995;
- Aerial photography (colour - orthorectified) – 2000;
- Aerial photography (colour - orthorectified) – 2005.

The map regression completed as part of the archaeological impact assessment (Franc Myles; Archaeology and Built Heritage, 2021; Appendix 10.1) has also been consulted.

The 6-inch map, dating to *c.* 1838, depicts the Site as largely undeveloped agricultural landwithin a wider rural landscape that is largely unrecognisable on modern aerial imagery. A field boundary, which also serves as the townland boundary, is shown as running east-west across the centre of the Site. Burton Hall (BU-01) is clearly depicted to the southeast.

The 25-inch mapping, dating from the first decade of the twentieth century, shows limited change throughout this period. A rural landscape is shown to prevail in the surrounding area, although there is also evidence of urban expansion in the wider area, including the establishment of the railway and Stillorgan Reservoirs to the north. The rougher land to the west and northwest had been reclaimed, with some areas of scrubland prevailing over ore marginal areas extending west into the townland of Balally. The 1943 Ordnance Survey map depicts a similar landscape, indicating little change up until the 1980s when the fields to the west of the reservoirs were prepared for development.

10.4.6 Field Visit Results and Observations

Nothing of archaeological interest was noted on a site visit undertaken on 15 January 2022.

10.4.7 Undiscovered Archaeological Remains

Given the agricultural history of the Site, with no indication of significant structures, and the scale of late twentieth-century development, the potential for undiscovered archaeological remains to exist within the Site is considered to be very low. It cannot be entirely discounted however, particularly deeper features, such as the townland boundary indicated on historic mapping, which may have survived the Site's most recent development.

10.5 Characteristics of the Proposed Development

The Proposed Development will comprise the construction of 4 apartment blocks, accommodating 334 no. build-to-rent residential units with a mix of studio, 1 bed and 2 bed apartment types. The height of the proposed building ranges between 4 and 16 no. storeys. Landscaping will include a green, communal open space courtyard and rooftop gardens The apartments will be served by a lower ground floor level carpark.

10.5.1 Characteristics of Significance for Cultural Heritage

The total area of the application boundary is approximately 0.99 ha, within which construction works have the potential to disturb ground. This the most pertinent characteristic of the development in terms of assessing impacts to cultural heritage.

The total height, which will determine how visible the Proposed Development is within the Study Area, is also akey characteristic. At its highest point, the Proposed Development will be sixteen storeys high.

10.6 Potential Effects

Using the assessment methodology described in Section 10.3, the effects of the Proposed Development upon cultural heritage assets have been assessed. Effects have been considered during construction and 'operation' (i.e. occupation of the residences). Decommissioning has been scoped out of the assessment due to the nature of the Proposed Development. However, it is considered that any decommissioning effects would be similar to, or less than, those predicted during construction.

10.6.1 Construction Phase

There are no known cultural heritage assets within the Site, and so no direct effects are predicted to known designated or non-designated assets. Although the potential for significant undiscovered archaeological material within the Site is considered to be very low, it cannot be discounted. A townland boundary bisects the Site, deeper sections of which may have survived more recent disturbance. As such, there is potential for these undiscovered archaeological remains to be directly impacted by ground disturbance during development works.

The Air Quality (Chapter 8.0) and Noise (Chapter 9.0) assessments indicate that there will be no significant effects during construction of the Proposed Development. As such, no indirect effects on the setting of cultural heritage assets within the Study Area are predicted as a result of emissions to air or noise emissions.

The landscape and visual impact assessment (LVIA; Chapter 13.0) indicates that there will be no significant effects either to the townscape or at representative viewpoints within the Study Area during construction. Whilst the Proposed Development will potentially be visible at a number of archaeological monuments, in the context of existing development in the Sandyford Industrial Estate and more widely across southern Dublin, it is not expected that visual changes as a result of the Proposed Development will result in material changes to the setting of these monuments, especially those with only distant potential views.

Table 10.7 presents the potential construction phase effects on cultural heritage assets.

Table 10.7: Potential Effects - Construction Phase

Golder ID	Description of Effect	Magnitude of Effect	Asset value	Significance of Effect (before mitigation)
Potential Undiscovered Archaeological Remains	Ground disturbance – potential for undiscovered archaeological remains beneath the surface to be disturbed by construction. Effect is permanent and irreversible.	High	Very High	Profound adverse*

*This is a conservative scenario, assuming very high value archaeological remains do exist within the Proposed Development.

10.6.2 Operational Phase

Ground disturbance will be limited to construction activities, and so no direct effects are predicted as a result of operation.

The Air Quality (Chapter 8.0) and Noise (Chapter 9.0) assessments indicate that there will be no significant effects during operation of the Proposed Development. As such, no indirect effects on the setting of cultural heritage assets within the Study Area are predicted as a result of emissions to air or noise emissions.

The landscape and visual impact assessment (LVIA; Chapter 13.0) indicates that there will be no significant effects either to the townscape or at representative viewpoints within the Study Area during operation. It is expected that visual changes during construction are permanent, but these are not expected to materially change the setting of cultural heritage assets.

10.6.3 'Do-Nothing' Scenario

If the Proposed Development weren't to be developed, i.e. the 'do-nothing' scenario, there would be no changeto the existing baseline as described in Section 10.4 and there would be no impact to cultural heritage assets as a result of the Proposed Development.

10.7 Mitigation and Management

10.7.1 Construction Phase

To mitigate for the potential presence of undiscovered archaeological remains within the Site, an agreed archaeological strategy will be implemented where the Main Contractor will appoint a suitably qualified and licensed specialist archaeological contractor to undertake the works outlined below and ensure these works are accommodated within the construction programme.

The appointed archaeologist will be required to prepare an archaeological method statement for the proposed works, which will be agreed and approved by the National Monuments Service of the Department of Housing, Local Government and Heritage. The appointed archaeologist will also be required to obtain the relevant licences to undertake the works.

A targeted archaeological trenching exercise will be undertaken during construction. Should the townland boundary be identified, the licensed archaeologist will amend the method statement to hand excavate and sample the fill at its base to recover potentially early environmental material, which may in addition provide dating evidence for the area's enclosure.

10.7.2 Operation Phase

No cultural heritage specific mitigation is required during operation.

10.7.3 Monitoring

Beyond the proposed archaeological strategy, no long-term or on-going monitoring for cultural heritage is required.

10.8 Residual Effects

10.8.1 Construction Phase

The residual effects of the Proposed Development during construction are presented in Table 10.8.

Table 10.8: Residual Effects - Construction Phase

Golder ID	Description of Effect	Magnitude of Effect	Asset value	Significance of Effect (after mitigation)
Potential Undiscovered Archaeological Remains	Ground disturbance – potential for undiscovered archaeological remains beneath the surface to be disturbed by construction. Effect is permanent and irreversible.	Negligible	Very High	Slight adverse*

*This is a conservative scenario, assuming very high value archaeological remains do exist within the Proposed Development.

10.8.2 Operational Phase

No residual effects from the Proposed Development are predicted on cultural heritage assets during operation.

10.9 Difficulties Encountered

A key limitation is that the assessment methodology cannot account for cultural heritage assets that are not recorded in the available data sources. Previously unrecorded assets, such as sub-surface archaeological remains, which do not present any diagnostic features, would not necessarily be identified by the desk-study.

Information has been used from a range of sources to determine baseline cultural heritage conditions. This assessment is therefore limited by the availability and reliability of these data sources.

10.10 Cumulative Effects

The effects of the Proposed Development are considered cumulatively with other reasonably foreseeable developments in the local area in Chapter 15 – Interactions, Cumulative and Combined Effects.

10.11 Summary and Conclusions

A multi-storey Strategic Housing Development is proposed to be constructed on a site within the Sandyford Industrial Park. A detailed study has been undertaken to determine the cultural heritage baseline conditions and a full impact assessment of the Proposed Development has been completed.

It is considered that the Proposed Development will have no direct or indirect impacts upon known archaeological monuments or other items of cultural interest that enjoy statutory protection within the Study Area. This report has demonstrated the agricultural nature of the site until its development in recent years, associated with the larger Sandyford Industrial Estate. Where historical mapping depicts a townland boundary across the Site, which dates at least to the 1750s (if not considerably earlier), there are no surface indications of historical settlement.

Although the construction of the existing structure would not have occasioned significant disturbance to substrates, it is likely that there was some ground reduction undertaken across the general area to create a level surface for construction. This, in all likelihood, truncated any evidence for historical agricultural development, where it is nonetheless possible that the historic townland boundary presents as a cut feature. There is little further potential for the survival of unrecorded monuments.

In mitigation, it is recommended that archaeological test trenching be undertaken under licence. This will specifically target the survival or otherwise of the townland boundary across the Site. Should there be significant survival, a representative extent of the alignment will be preserved by record.

10.12 References

- Archaeology and Built Heritage Ltd. (Franc Myles), (2021). Archaeological impact assessment. Avid Sandyford, Carmanhall Road, Sandyford Industrial Estate, Dublin 18.
- Department of Arts, Heritage, Gaeltacht and the Islands, (1999). The Framework and Principles for the Protection of the Archaeological Heritage. Government of Ireland: Dublin.
- Department of Arts, Heritage and the Gaeltacht, (2011). Architectural Heritage Protection: Guidelines for Planning Authorities. Government of Ireland: Dublin.
- Environmental Protection Agency, (2022). Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR). Environmental Protection Agency: Ireland.
- European Communities, (1999). Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions. European Communities: Luxembourg.
- National Roads Authority, (no publication date). Guidelines for the Assessment of Archaeological Heritage Impacts of National Roads Schemes. National Roads Authority: Ireland.
- National Roads Authority, (no publication date). Guidelines for the Assessment of Architectural Heritage Impacts of National Roads Schemes. National Roads Authority: Ireland.

APPENDIX 10.1

ABH Archaeology Impact Assessment

Archaeological impact assessment

Former Avid Technology International Site
Carmanhall Road
Sandyford Industrial Estate
Dublin 18

Strategic Housing Development
Planning and Development (Housing) and Residential Tenancies Act 2016

By

Franc Myles MUBC MIAI
Archaeology and Built Heritage Ltd.
Spade Enterprise Centre
St. Paul's Smithfield
Dublin 7

Atlas GP Ltd.
Heritage House
St. Stephen's Green
Dublin 2

04 March 2021

Archaeology and Built Heritage

Contents

List of figures

Figures

Executive summary

This document comprises an assessment of the archaeological risk associated with a proposed Strategic Housing Development (SHD) at the site of the former Avid Technology International *site in the townland of Carmanhall, Sandyford, Dublin 18. The assessment was undertaken on behalf of* Atlas GP Ltd. *in advance of a proposed application to* An Bord Pleanála*.*

The site's morphology is determined using historical mapping and information derived from previous archaeological investigations in the vicinity, where a walk-over survey did not reveal any features on the ground which may have a possible archaeological provenance. The development site is not located within the constraint zone of any sites or monuments noted in the statutory Record of Monuments and Places (RMP). Within the wider landscape there is evidence for diffuse yet sustained archaeological settlement and activity: within a 1km radius there are six sites noted on the Sites and Monuments Record (SMR).

Where a field boundary depicted by Rocque in 1760 has possible origins in the land enclosures undertaken in the late seventeenth century, it is recommended that licensed archaeological monitoring be undertaken over the initial ground reduction programme.

1 Introduction

1.1 This document constitutes an archaeological assessment of a 0.73ha brown-field development site on the corner of Carmanhall Road and Blackthorn Road within the Sandyford Industrial Estate, Dublin 18 (Figure 1). It is being submitted to *An Bord Pleanála* as part of a Strategic Housing Development application on behalf of Atlas GP Ltd.

Until recently approximately two thirds of the site was occupied by an industrial unit, with hardstanding occupying the remaining area. The site currently has planning permission for the construction of student accommodation with an overall gross floor area of 25,459m^2 arranged in a single 7 to 9 storey block providing a total of 817 bed spaces (PL06D.303467).

The immediate surroundings of the site reflect the ongoing changing nature of Sandyford and include a single storey commercial building and the 6-storey Microsoft building on Carmanhall Road to the north, low profile commercial buildings to the west fronting onto Ravensbrook Road, a 6 storey office complex to the south on Blackthorn Road and a 2 to 3-storey office and light industrial buildings on the opposite side of Blackthorn Road. The area is currently undergoing transformation from low rise industrial, employment and office usage, to higher density residential and mixed-use developments.

Figure 1 Site location (ASI Historic Environment Viewer)

1.2 The proposed development site is not located within the constraint zone of any site or monument noted in the Sites and Monuments Record (SMR), however within the wider landscape there is evidence for diffuse yet sustained archaeological settlement and activity. Inside of a radius of *c.*1km from the proposed development there are six sites afforded statutory protection under the National Monuments Acts (as amended) and the *Dún Laoghaire-Rathdown County Development Plan 2016-2022*.

Most of the archaeological investigations undertaken in the vicinity of the development site took place in 2001-2002 and were occasioned by the construction of the South Eastern Motorway (the M50). The construction of the Luas extension in 2007, some 400m to the south east, resulted in a small archaeological excavation, where the construction of the Leopardstown Hotel in 1999 also monitored under archaeological licence; there was nothing of significance recorded at either location. The only archaeological investigation undertaken in the Sandyford Industrial Estate, the development of the Beacon complex in 2000, did not result in the recording of archaeological deposits or features. A group of pit burials excavated in 2001 to the south of the site in the same townland can however be dated to the period 2000—1850BC.

1.3 Although there have been no archaeological test trenches opened, the historical mapping strongly suggests that the development site has been in agricultural use since at least the eighteenth century. There are unlikely to be surviving archaeological deposits impacted by the proposed development, where the existing remnant development has more than likely truncated any significant archaeological material, which in this area has been relatively ephemeral and recorded relatively close to the surface.

2 Proposed Strategic Housing Development

2.1 The proposed development will see the construction of an apartment block over a single basement level, arranged around a central courtyard. The development description is as follows:

> (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, eight 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.

3 Archaeological and historical contexts

3.1 There is little evidence in the immediate area of the proposed development site for pre-historic activity despite there being a plethora of such sites slightly further afield. Some 800m to the south of the site, to the north of a stream marking the boundary between Carmanhall and Murphystown townlands, a group of Bronze Age pit burials was excavated under licence 01E1229 prior to the construction of the M50. Burial 1 contained a single vessel, and Burial 2 two vessels. Burial 3 was not within a vessel and the cremated remains were placed in a stone-lined circular pit. The pits were found within 7m of each other and close to an area of weathered granite bedrock that may have been exposed at the time of interment. The vessels were identified as vase urns with one dating to between 2000BC and 1850BC.[1] The Topographical Files of the National Museum record the finding of a bronze flat axe at a separate location some 600m to the south of the site,[2] which with the number of *fulachta fiadh* recorded along the M50, emphasise the potential for recovering Bronze Age activity in the general area.

The most proximate archaeological investigation to the development site was undertaken as part of the monitoring works for the Luas extension under licence 07E0095 and is referred to here not for its archaeological significance, rather to illustrate the random nature of the deposits and structures which may underlie any site in the area. Here, some 430m to the southeast of the development site at Carmanhall Site 1 the foundations of an undated drystone wall foundation were recorded, a structure which had not been recorded on historic mapping.[3]

Perhaps more typical of what can be expected on the site under discussion can be gleaned from a report generated under licence 99E0493 where material introduced for a recent development was recorded directly above the natural subsoil some 600m to the southeast.[4] Similarly, the construction of the Beacon Hospital under licence 00E0835 involved the demolition of a number of modern buildings and the reduction of the ground level across the site. Monitoring of the removal of ground slabs and demolition revealed only modern deposits over bedrock, located at 300–600mm below the modern surface. Nothing of archaeological interest was noted.[5]

3.2 The earliest evidence for historical settlement can be extrapolated backwards from the Down Survey undertaken in the mid-seventeenth century (Figure 2), which locates the development site in the lands of Leopardstown, a protrusion north-westwards of the

[1] O'Reilly, F. 2004. Site 54 Carmanhall. In I. Bennett (ed.), *Excavations 2002: summary accounts of archaeological excavations in Ireland*, 129-30. Bray.
[2] NMI Topographical Files, IA/67/83.
[3] Johnston, A. 2007. Unpublished preliminary note issued to the National Monuments Section of the Department of Environment, Heritage and Local Government.
[4] Delany, D. 2003. '461 - Leopardstown Road, Rocklands, Dublin'. In I. Bennett (ed.), *Excavations 2001: summary accounts of archaeological excavations in Ireland*, 137. Bray.
[5] Ó Néill, J. 2003. '468 - Oriflame, Blackthorn Road, Sandyford, Dublin'. In I. Bennett (ed.), *Excavations 2001: summary accounts of archaeological excavations in Ireland,* 139. Bray.

medieval parish of Tully. The name Leopardstown traditionally relates to a leper colony associated with the Hospital of St. Stephen and where the primary reference has not been located, Ball refers to a surrender of the lands from Geoffrey Tyrrell and his wife Sarah in 1230.[6] It is likely however that the lands were granted to St. Stephen's and the hospital continued to collect tithes from the farm in 1378, without necessarily having a physical presence either in the form of a grange (farm) or indeed a leper hospital.

Leopardstown was on the edge of the Pale and susceptible to occasional raids from the hills to the west. There were two castles or towerhouses in the vicinity which would have afforded some protection. The closest, some 500m to the north is marked on the Down Survey (1655-6) as 'Moltainstowne' (DU023-045), where the approximate site in the townland of Mulchanstown is now occupied by the Stillorgan reservoirs. One kilometre to the south a fragment of Murphystown castle survives inside the entrance gate of the United Kingdom's ambassador's residence *Glencairn* (DU023-025). The ruin comprises portions of two walls of granite masonry 1100m in thickness, with traces of a vault visible over the original ground floor.

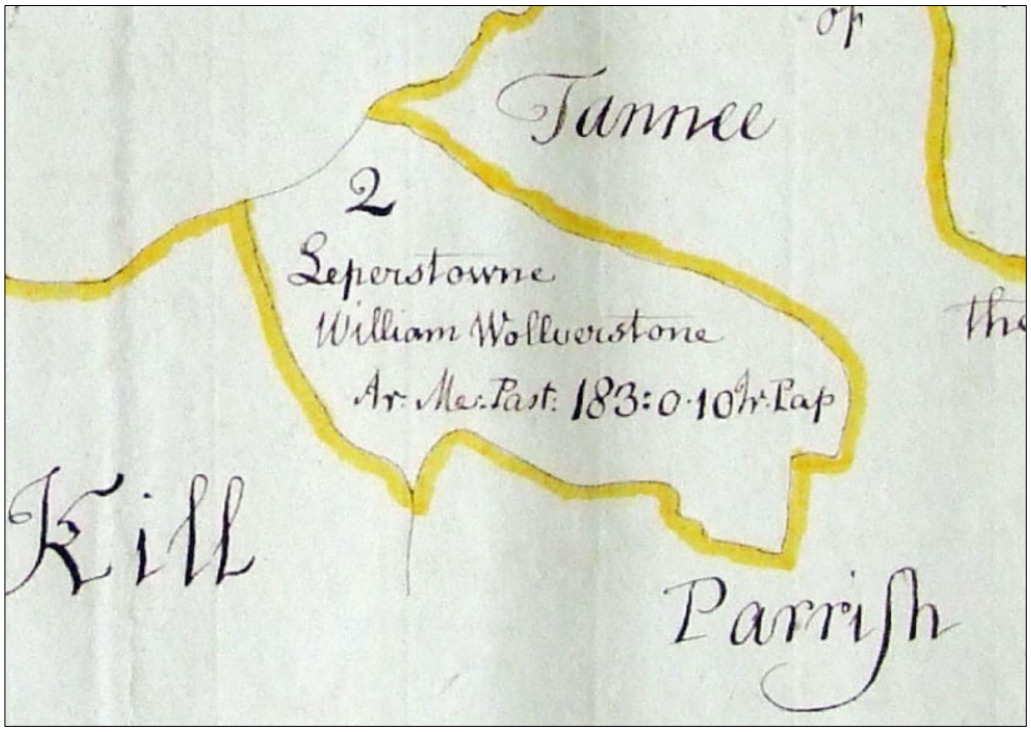


Figure 2 William Farrand, 'The Parish of Killeny, Tully and part of the parish of White Church in the half Barony of Rathdowne', *c.* 1655. (Extract, north to bottom)

3.3 There is no specific documentary evidence for settlement in the townland of Carmanhall itself. It is not referred to on the Down Survey *terrier* by name, where the lands of Leopardstown are described as arable pasture and meadow. It was presumably prime agricultural land as prior to the disturbances of the 1640s it was in ostensibly protestant hands as part of the estate of Theobold Welsh of Carrickmines. By 1670 the townland,

[6] Ball, F.E. 1902. *A History of County Dublin*, I, 109, Dublin.

and indeed all of Welsh's lands in the area, had been confiscated and divided between Sir Roger Jones and the Earl of Meath. The 1659 census does not return any inhabitants, however it is possible that the 31 English and 29 Irish returned for the adjacent townland of Blackthorn were all resident within the earlier denomination of Leopardstown.

The relative political stability brought about by the Restoration encouraged agricultural improvement and it is likely that by the turn of the eighteenth century the area had been subject to enclosure and the field systems which survived until the end of the twentieth century date to this period. Landholding systems were still defined by townlands, the boundaries of which remained stable. Two such boundaries were in close proximity to the site, the townland boundary just to the northwest of the site separating Carmanhall and Blackthorn, with the boundary to the northeast to Mulchanstown also being the boundary separating the parishes of Tully and Kill.

Rocque's 1760 county map (Figure 3), demonstrates a degree of continuity from the Down Survey *terrier* of the preceding century, with the northern half of the site ploughed under tillage and the southern half a smaller enclosed field. The enclosures are depicted as mature hedgerows which suggests they are of some antiquity.

Figure 3 John Rocque, 'An actual survey of the county of Dublin', 1760. Approximate site location circled, with *Burton Hall* to the south

3.4 Carmanhall would appear to be an earlier name for *Burton Hall*, a house still in existence which can be discerned on Rocque's 1760 mapping, and from which the location of the development site can be identified by back-referencing field boundaries to the Ordnance Survey. *Burton Hall* was built in 1730 by Samuel Burton and during the nineteenth century was owned by Henry Guinness, founder of the Guinness Mahon Bank.

Where the demesne associated with the house is clearly annotated on the first edition Ordnance Survey mapping (Figure 4), the development site itself was clearly demarcated as farmland, with a field boundary traversing the area. The *Tenement Valuation* indicates that in 1856 both fields were held by Bernard Hanley Esq. from John F. Davis Esq. with the combined annual rateable value of the 36-acre holding assessed at the not inconsiderable sum of £114.[7]

By the turn of the twentieth century an element of modernity had encroached into the polite agricultural landscape which had possibly remained unchanged for over 300 years (Figure 5). The Dublin and South Eastern Railway, which connected emerging suburban development in Dundrum, Foxrock and Leopardstown with the terminus at Harcourt Street began operations in 1854. The Stillorgan Reservoirs alongside the railway were developed by Dublin Corporation and built in two stages between 1862 and 1885. The development site however remained unaffected and indeed the field boundary depicted by Rocque in 1760 was still extant in 1943 (Figure 6).

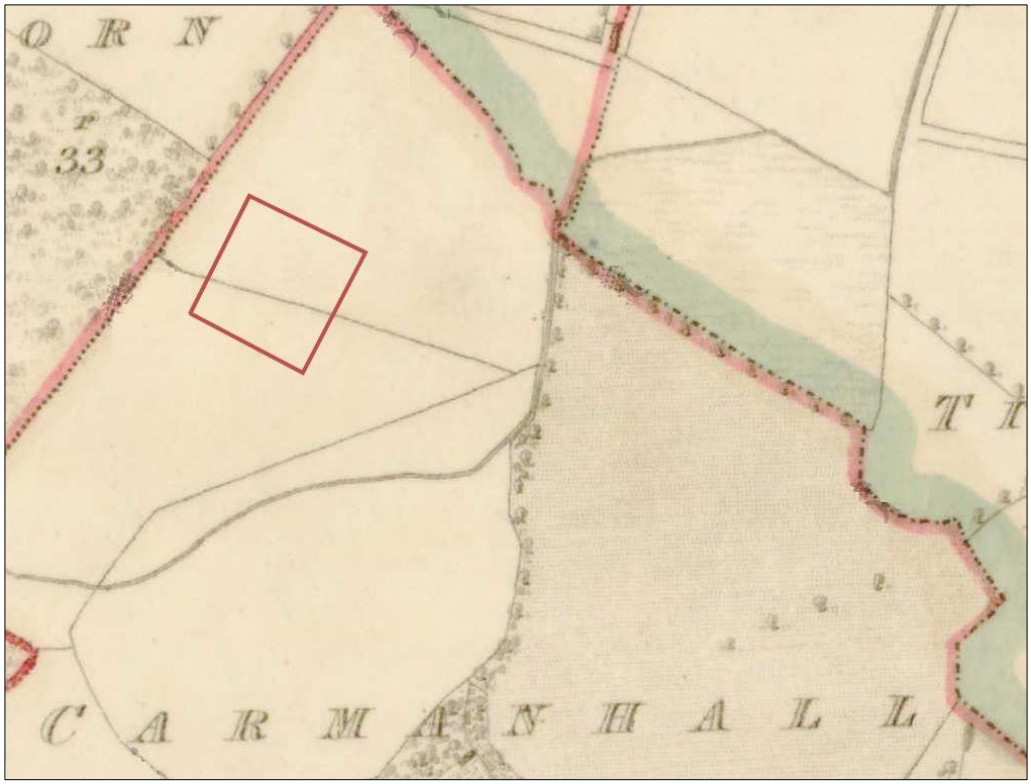


Figure 4 Ordnance Survey, Dublin, sheet 23, 6-inch mapping, *c.* 1838

[7] *Primary Valuation of Tenements*, Barony of Rathdown, Parish of Tully, Carmanhall, Plot 1.

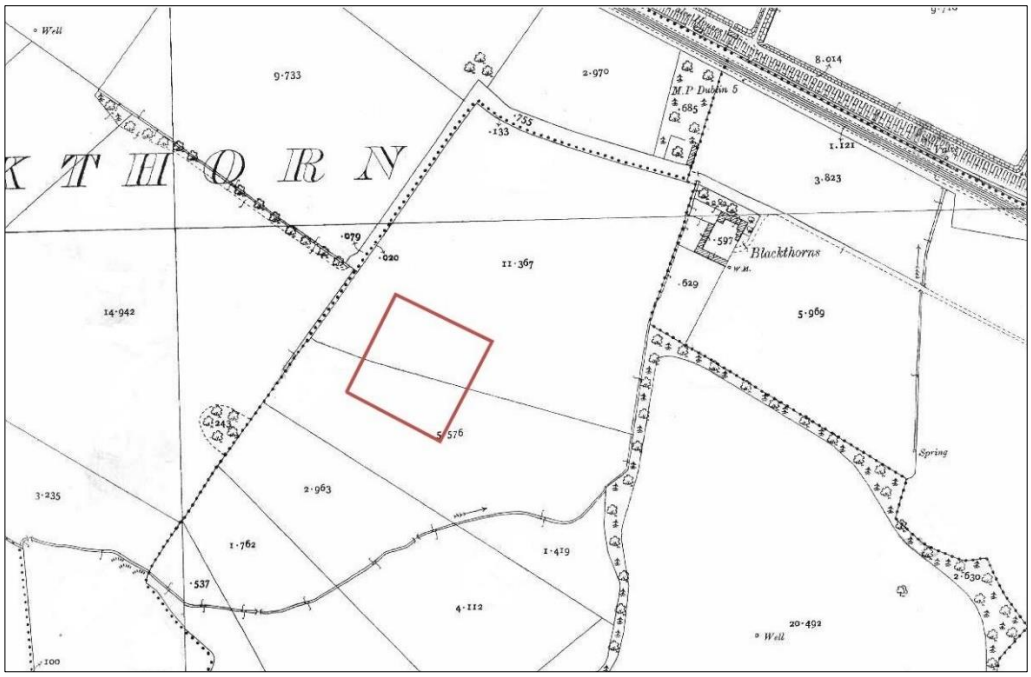


Figure 5 Ordnance Survey, Dublin, 25-inch mapping, *c.* 1910

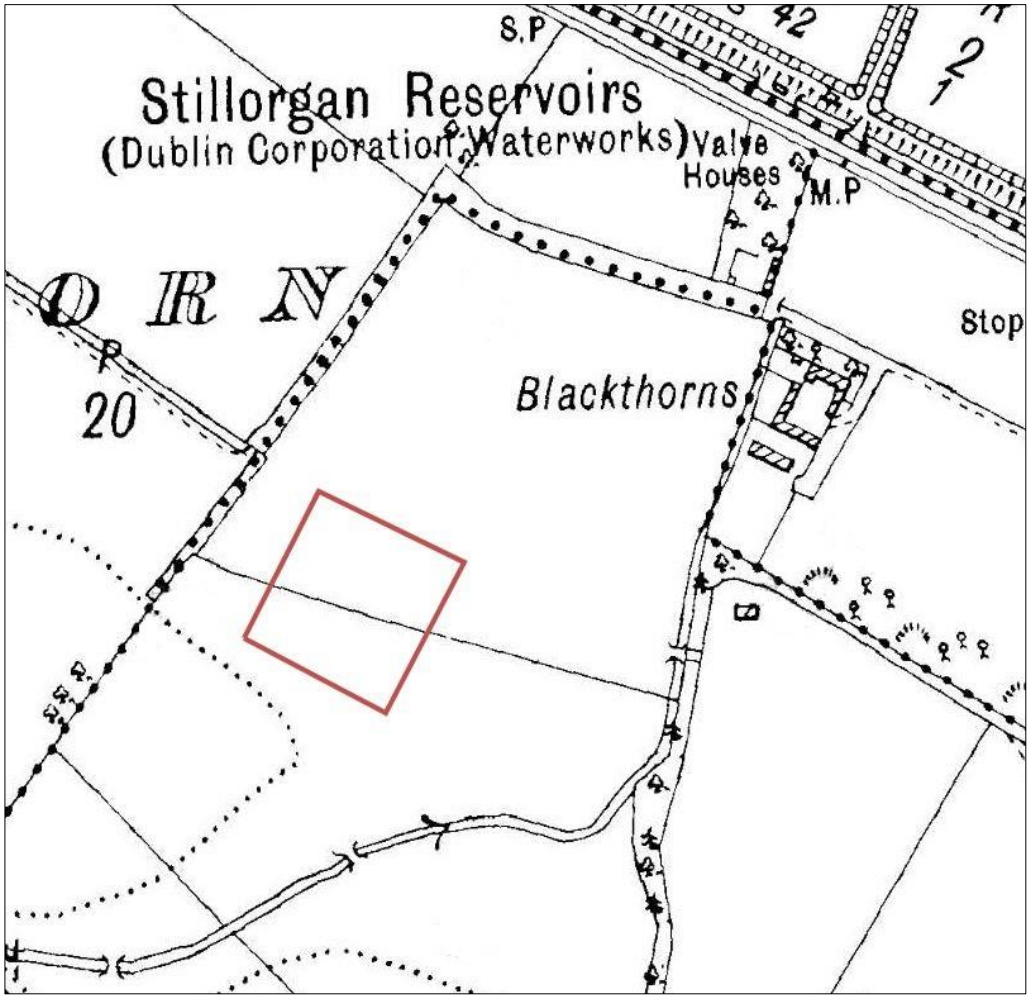


Figure 6 Ordnance Survey, Dublin, 6-inch mapping, *c.* 1943

4 Projected impact of the proposed development

4.1 The proposed development comprises a six to fifteen-storey apartment building over a single basement level (Figure 7). The proposed basement extends along the eastern and southern sides of the development, with no basement to the west and north. The slab will sit at 80.300mOD where under the central courtyard an attenuation area will impact to 81.500mOD. In both cases there can be an additional 1500mm added for slab depth, screed etc. The existing surface levels are between 84.400m to the north, rising to 86.500mOD to the southeast.

Where natural subsoil occurs at depths of between 600-1200mm sub-surface in the immediate area, the construction of the basement level will truncate through into the boulder clay and remove any surviving evidence for the field boundary across the site.

Figure 7 Extent of proposed single-level basement

4.2 The information compiled above strongly suggests that there is little of archaeological significance on the site, with the possible exception of an historic field boundary. Any surviving trace of this which may have remained undisturbed by previous development on the site will be removed.

5 Conclusion and recommendations

5.1 This report has demonstrated the agricultural nature of the site until its development in recent years, one associated with the larger Sandyford Industrial Estate, the development of which began as early as 1967 on an initial site of 120 acres. Where historical mapping depicts a field boundary across the development, which dates at least to the 1750s, there are no further indications of substantial historical settlement on the site.

5.2 Although the construction of the recently demolished *Avid Technology International* structure would not have occasioned significant disturbance to substrates, it is likely that there was some ground reduction undertaken across the site to create a level surface for construction. This in all likelihood truncated any evidence for historical agricultural development, where it is nonetheless possible that the historic field boundary presents as a cut feature across the site.

5.3 It is thus recommended that the initial stripping of the site is monitored under archaeological licence and that a section of the field boundary, should it survive, is excavated by hand to establish its nature and antiquity, should there be material suitable for scientific dating recovered.

Franc Myles MUBC MIAI

APPENDIX 10.2

Cultural Heritage Gazetteer

1.0 ARCHAEOLOGICAL ASSETS

Golder ID	SMR Reference	Description	Easting (ITM)	Northing (ITM)	Townland	RMP	Sensitivity/Value
AR-01	DU023-045----	Castle - unclassified	719718	726951	MULCHANSTOWN	No	Negligible
AR-02	DU022-109----	Fulacht fia	718744	726061	MURPHYSTOWN	Yes	High
AR-03	DU023-066----	Field boundary	719525	725836	CARMANHALL	Yes	High
AR-04	DU023-063----	Flat cemetery	719583	725752	CARMANHALL	Yes	High
AR-05	DU023-025----	Castle - tower house	719489	725570	MURPHYSTOWN	Yes	High
AR-06	DU023-007----	Ecclesiastical site	720025	728328	WOODLAND	Yes	High
AR-07	DU023-011001-	Church	720326	727646	STILLORGAN SOUTH	Yes	High
AR-08	DU023-071----	Castle - unclassified	720555	727710	STILLORGAN PARK	Yes	High
AR-09	DU023-026----	Mound	722031	726070	FOXROCK	Yes	High
AR-10	DU022-064----	Linear earthwork	717883	725888	BALALLY	Yes	High
AR-11	DU025-013----	Well	717867	724823	BARNACULLIA	Yes	High
AR-12	DU025-016008-	Architectural fragment	718937	724363	KILGOBBIN	Yes	High
AR-13	DU025-016012-	Bullaun stone	718937	724361	KILGOBBIN	Yes	High
AR-14	DU026-123----	Urn burial	719493	724431	KILGOBBIN	Yes	High
AR-15	DU026-003----	Ritual site - holy well	719428	723571	JAMESTOWN (Rathdown By.)	Yes	High
AR-16	DU026-115----	Linear earthwork	720647	724205	BALLYOGAN	Yes	High

2.0 ARCHITECTURAL ASSETS

Golder ID	NIAH Reference	Building Name	Original Use	Date	Easting (ITM)	Northing (ITM)	Townland	RPS (Ref)	Sensitivity
BU-01	60230013	Burton Hall	House	1725 - 1735	719627	726190	CARMANHALL	Yes (1610)	High
BU-02	60230012	Leopardstown Park	Stable	1877 - 1908	719896	725924	CARMANHALL AND LEOPARDSTOWN	Yes (1630)	High
BU-03	60230011	Leopardstown Park	Hospital	1917 - 1937	719936	725778	CARMANHALL AND LEOPARDSTOWN	-	Medium
BU-04	60230010	Leopardstown Park	House	1795 - 1800	720021	725791	CARMANHALL AND LEOPARDSTOWN	Yes (1634)	High
BU-05	60230005	Glencairn	Gate	1900 - 1910	719452	725561	MURPHYSTOWN	Yes (1643)	High
BU-06	60230004	Glencairn	Gate lodge	1855 - 1865	719455	725540	MURPHYSTOWN	Yes (1643)	High
BU-07	60230001	Glencairn	House	1855 - 1865	719651	725477	MURPHYSTOWN	Yes (1643)	High
BU-08	60230002	Glencairn	Glass house	1855 - 1908	719613	725457	MURPHYSTOWN	Yes (1643)	High
BU-09	60230003	Glencairn	Garden	1855 - 1908	719573	725449	MURPHYSTOWN	Yes (1643)	High
BU-10	60220043	Saint Mary's Catholic Church	Parochial house	1844 - 1901	718336	725870	BALALLY	Yes (1631)	High
BU-11	60220039	Sandyford Carnegie Free Library	Library	1905 - 1910	718113	725308	BALALLY	Yes (1660)	High
BU-12	60250009	Fern Hill	Gate lodge	1890 - 1909	718395	724771	NEWTOWN LITTLE (RA. BY.) GLENCULLEN ED	Yes (1704)	High
BU-13	60250005		House	1700 - 1837	717932	724402	BARNACULLIA	-	Medium
BU-14	60250006		House	1911 - 1937	717960	724383	BARNACULLIA	-	Medium
BU-15	60250014		Pound	1700 - 1837	719143	723946	KILGOBBIN	Yes (1756)	High
BU-16	60230016	Chadsley House	House	1895 - 1905	720740	726521	GALLOPING GREEN SOUTH	-	Medium
BU-17	60230019	Beech Trees	House	1893 - 1908	720796	726290	GALLOPING GREEN SOUTH	-	Medium
BU-18	60230022	The Laurels	House	1859 - 1862	720881	726212	GALLOPING GREEN SOUTH	Yes (1599)	High
BU-19	60230027		Post box	1901 - 1910	721047	725994	GALLOPING GREEN SOUTH	-	Medium
BU-20	60230033	The Gables	Shop	1900 - 1905	721117	725618	FOXROCK	-	Medium
BU-21	60230034	Leopardstown Race Course	House	1888 - 1908	721056	725580	CARMANHALL AND LEOPARDSTOWN	-	Medium
BU-22	60230069	Gareg Wen	House	1940 - 1950	721252	726382	GALLOPING GREEN SOUTH	Yes (1554)	High
BU-23	60230067	Cranleigh	House	1935 - 1940	721359	726452	GALLOPING GREEN SOUTH	Yes (1546)	High
BU-24	60230014	Mount Salem	House	1700 - 1837	720961	726833	GALLOPING GREEN SOUTH	Yes (1496)	High
BU-25	60230065	Sefton sometimes Sefton House	House	1860 - 1896	721026	726831	GALLOPING GREEN SOUTH	Yes (1498)	High
BU-26	60230064	Kelston	House	1844 - 1867	721088	726742	GALLOPING GREEN SOUTH	-	Medium
BU-27	60230078	Abilene	Gate	1800 - 1837	721128	727025	GALLOPING GREEN NORTH	Yes (1450)	High
BU-28	60230091	Mel Field sometimes Melfield	House	1700 - 1796	721881	728179	NEWTOWN, CASTLEBYRN	Yes (1012)	High
BU-29	60230116	Bellavista	House	1844 - 1879	722104	727889	NEWTOWN, CASTLEBYRN	-	Medium
BU-30	60230115		Milestone	1844 - 1908	722127	727917	NEWTOWN, CASTLEBYRN	-	Medium