DOWNEY

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR)

BROOMFIELD SHD

Proposed Strategic Housing Development

Lands at Back Road and Kinsealy Lane, Kinsaley, Broomfield, Malahide, Co. Dublin

Applicant: Birchwell Developments Ltd.

April 2022

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NON-TECHNICAL SUMMARY

1.0 INTRODUCTION

Birchwell Developments Ltd. (the applicant) is applying to An Bord Pleanála for planning permission for 415 no. residential dwellings, comprising 252 no. houses, 135 no. apartments, and 28 no. duplexes (the development) on 12.5ha of lands off the Back Road and Kinsealy Lane, Kinsaley, Broomfield, Malahide, Co. Dublin (the application site). The planning application is made to An Bord Pleanála as a Strategic Housing Development (SHD) application.

The application site of 12.5 hectares falls in what can be considered a built-up area. On this basis, the proposal is environmental impact assessment (EIA) development under Part 2 of Schedule 5 (Annex II) of the EIA Regulations 2018.

This Environmental Impact Assessment Report (EIAR) has been prepared under the following assessment chapters:

1. Introduction
2. Description of Project & Alternatives Considered
3. Planning and Development Context
4. Population and Human Health
5. Biodiversity
6. Land and Soils
7. Water
8. Air Quality
9. Noise and Vibration
10. Climate
11. Landscape and Visual Impact
12. Material Assets - Traffic and Transport
13. Cultural Heritage
14. Material Assets - Utilities and Waste
15. Interactions and Cumulative effects
16. Summary of Mitigation & Monitoring Measures

This EIAR has been prepared by an experienced and suitably qualified team of consultants, as described in the following table:

Name	Role
<u>Downey Planning</u> John Downey, Planning Consultant, BA (Hons), MRUP, MBA, MIPI, MRTPI – 25 years' experience & Eva Bridgeman, Planning Consultant BA (Hons), MRUP, MIPI – 10 years' experience	EIAR Project Managers & Planning Consultants Preparation of the following EIAR chapters: ▪ *Chapter 1: Introduction* ▪ *Chapter 2: Description of Project & Alternatives Considered* ▪ *Chapter 3: Planning and Development Context* ▪ *Chapter 4: Population & Human Health* ▪ *Chapter 15: Interactions* ▪ *Chapter 16: Summary of Mitigation & Monitoring Measures* ▪ *Compilation of EIAR and NTS*
<u>MCORM Architects</u> Stephen Manning, MRIAI	Preparation of the following EIAR chapters: ▪ *Chapter 2: Description of Project & Alternatives Considered* ▪ *Chapter 16: Summary of Mitigation & Monitoring Measures*

Waterman Moylan Consulting Engineers Mark Duignan, Associate Director, Engineer, MA BAI CEng MIEI	Preparation of the following EIAR chapters: ▪ *Chapter 6: Land and Soils* ▪ *Chapter 7: Water* ▪ *Chapter 12: Traffic & Transport* ▪ *Chapter 14: Utilities & Waste* ▪ *Chapter 16: Summary of Mitigation & Monitoring Measures*
KFLA Landscape Architects Kevin Fitzpatrick, MILI	Preparation of the following EIAR chapters: ▪ *Chapter 11: Landscape and Visual Impact Assessment* ▪ *Chapter 16: Summary of Mitigation & Monitoring Measures*
Dermot Nelis Archaeology **Dermot Nelis, BA ArchOxon AIFA MIAI**	Preparation of the following EIAR chapters: ▪ *Chapter 13: Cultural Heritage* ▪ *Chapter 16: Summary of Mitigation & Monitoring Measures*
Faith Wilson Ecological Consultant Ecological Consultant BSc CEnv MCIEEM	Preparation of the following EIAR chapters: ▪ *Chapter 5: Biodiversity* ▪ *Chapter 16: Summary of Mitigation & Monitoring Measures*
AWN Consulting Ciara Nolan, Environmental Consultant, BSc MSc AMIAQM AMIEnvSc Leo Williams BAI MAI PgDip AMIOA, Acoustic Consultant	Preparation of the following EIAR chapters: ▪ *Chapter 8: Air Quality* ▪ *Chapter 9: Noise & Vibration* ▪ *Chapter 10: Climate* ▪ *Chapter 16: Summary of Mitigation & Monitoring Measures*

Further information on the basis for the EIAR and project team is provided in Chapter 1 of this EIAR.

2.0 DESCRIPTION OF PROJECT & ALTERNATIVES CONSIDERED

2.1 The Site

The subject site is located off Back Road and off Kinsealy Lane, in the townlands of Kinsaley, Broomfield, Malahide, in the northern periphery of Dublin and within 12 km distance from its city centre. The site is located within the administrative boundaries of Fingal County Council.

With an approximate area of 12.5 ha, the subject site is situated within the development boundary of Malahide. The proposed development appears to be a natural extension to two adjoining, existing developments currently under construction by the same applicant (Birchwell Developments Ltd.), namely Ashwood Hall and Brookfield. These two schemes were planned and are being delivered as part of the development of the Broomfield lands which were subject to the objectives of the Broomfield Local Area Plan (LAP) 2010. The proposed development will represent the completion of the developable lands originally envisaged for residential development within the LAP. Access to the site is currently via an entrance off the Back Road, 0.55km east of the junction between Back Road and Kinsealy Lane. The overall proposed development is divided into 2 no. sites. The northern parcel is bound by Ashwood Hall to the west, the Dublin-Belfast rail line to the east, agricultural lands to the south, and by existing properties to the north. The southern parcel is bound by Hazelbrook to the west, Brookfield to the north and agricultural lands to the south and east.

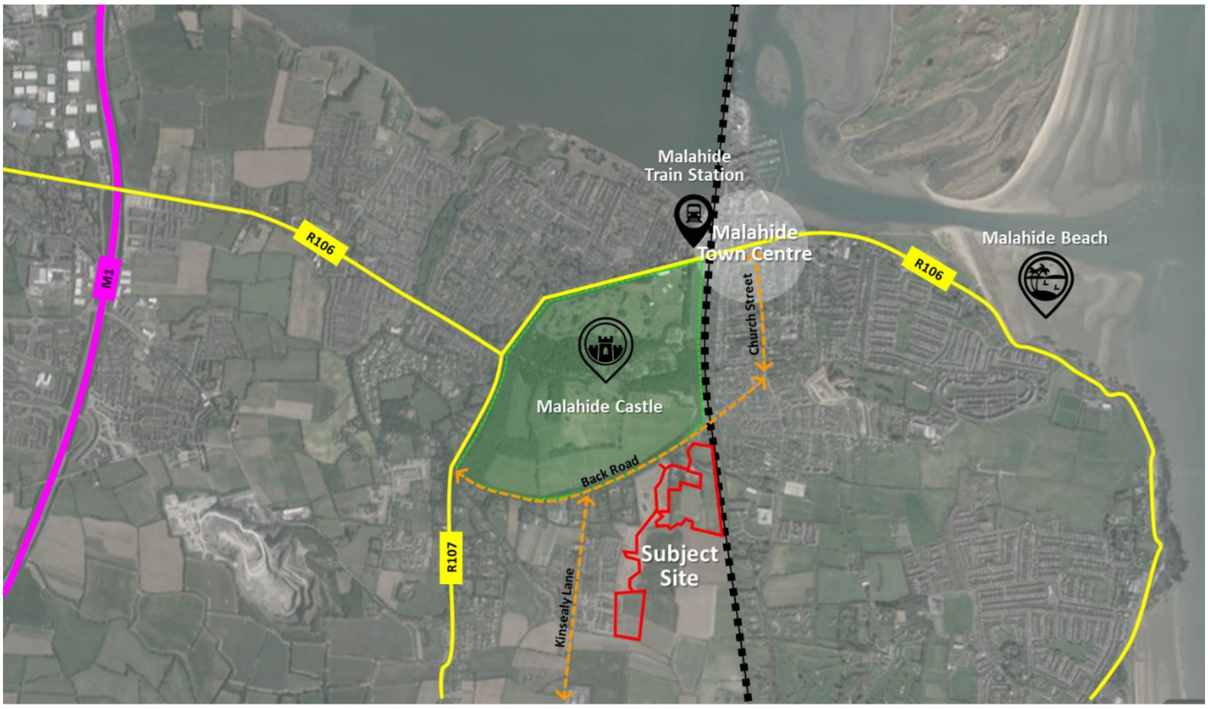

Figure 1. Site Context Diagrammatic

With an approximate area of 12.5 hectares, the site splits into two distinct sections; the northern land parcel which is generally bound by the railway track to the east, Ashwood Hall to the west and agricultural lands to the south, and the southern land parcel which lies to the east of Hazelbrook and to the south of Brookfield. The surrounding area is predominately characterised by residential development and agricultural land. The application site is spread across irregularly shaped fields, with the northern lands partly framed by existing field boundaries of trees and hedgerow. It is important to note that Malahide Demesne, the castle, and gardens, are located immediately to the north of the site on the opposite side of Back Road, which has created a sylvan character of the landscape forming part of the site. Furthermore, the agricultural lands to the south have provided a strong visual amenity for the residents in the area, with a significant number of the dwellings planned to have a pleasant aspect overlooking these lands.

Figure 2. Aerial View of the Application Site (approximate boundaries of the subject site outlined in red)

2.2 The Baseline Scenario

The baseline scenario including a description of the current receiving environment has been considered as part of this EIAR through the collection and collation of data, tests, site visits, desktop reviews, etc, including analytical data for traffic, noise levels, surface water quality, etc. A description of the existing environment is presented in each relevant section for the various environmental chapters.

The application lands are located at Back Road and Kinsealy Lane, Kinsaley, Broomfield, Malahide, in the northern periphery of Dublin and within the administrative boundaries of Fingal County Council. The surrounding land uses are generally residential with Malahide Castle and Demesne located 800m to the north of the land and accessed via Back Road. To the northeast of the site there is Malahide DART Station at 1.3km and Malahide Beach at 1.8km. Malahide village centre is located to the north-east of the subject lands and provides a wide array of shops and services. The application site is provided across irregular shaped fields, partly framed by existing field boundaries of trees and hedgerow, and residential developments.

The proposed development appears to be a natural extension to two existing developments currently under construction by the same applicant, namely Ashwood Hall and Brookfield. These two schemes are being developed as part of the Broomfield Lands which were subject to the objectives of the Broomfield LAP 2010.

2.3 The Development

Birchwell Developments Ltd. (the applicant) intend to apply to An Bord Pleanála for planning permission for the following development, as described in the public notices:

"We, Birchwell Developments Ltd., intend to apply to An Bord Pleanála for permission for a strategic housing development on lands at Back Road and Kinsealy Lane, Kinsaley, Broomfield, Malahide, Co. Dublin. The northern lands are generally bound by Ashwood Hall to the west, and the southern lands are generally bound by Hazelbrook to the west and Brookfield to the north.

The development will consist of the demolition of the former rugby clubhouse structure on site and the construction of a total of 415 no. residential units (252 no. houses, 135 no. apartments, and 28 no. duplex units); with 1 no. childcare facility and ancillary residential amenity facilities to be provided as follows:

- *252 no. residential houses (192 no. 3 bed units, 48 no. 4 bed units, 12 no. 5 bed units) in detached, semi-detached, mid-terraced and end-terraced houses ranging from two to three storey in height;*
- *Apartment Blocks A & B are connected at ground and first floor level sharing an undercroft car park at ground floor level and a landscaped podium garden at first floor level, and contain a total of 110 no. units in 2 no. buildings ranging from one to five storeys in height, with Apartment Block A containing a total of 54 no. units comprising of 14 no. 1 bed units, 39 no. 2 bed units, and 1 no. 3 bed unit, and Apartment Block B containing a total of 56 no. units comprising of 14 no. 1 bed units, 40 no. 2 bed units, and 2 no. 3 bed units, with*

all units provided with private balconies/terraces; internal bicycle stores, bin stores and plant rooms at ground floor level; and on-street car parking and bicycle parking. Ancillary residential amenity facilities are also proposed including concierge/reception, meeting room, gym, and multi-purpose room;

- *Apartment Block C containing a total of 25 no. units comprising of 9 no. 1 bed units, 14 no. 2 bed units and 2 no. 3 bed units, with all units provided with private balconies/terraces, in a building four storeys in height; with on-street car parking and bicycle parking; with access to a communal bin store and bike store;*
- *Duplex Block D containing a total of 12 no. units comprising of 6 no. 2 bed units and 6 no. 3 bed units, with all units provided with private balconies/terraces, with a communal bin store and bike store; and 1 no. childcare facility with outdoor play area, all in a building ranging from one to three storeys in height; with residential on-street car parking; and childcare on-street drop-off area, car parking and bicycle parking;*
- *Duplex Block E containing a total of 8 no. units comprising of 4 no. 1 bed units and 4 no. 2 bed units, with all units provided with private balconies/terraces; in a three storey building; with a communal bin store and bike store, and on-street car parking;*
- *Duplex Block F containing a total of 8 no. units comprising of 4 no. 1 bed units and 4 no. 2 bed units, with all units provided with private balconies/terraces; in a three storey building; with a communal bin store and bike store, and on-street car parking.*

The development will provide for a total of 721 no. car parking spaces within the scheme; a total of 227 no. bicycle spaces serving the apartments, duplexes and childcare facility; proposed use of the existing vehicular access off Back Road (proposed vehicular access via Ashwood Hall and Brookfield) and proposed use of the existing vehicular access off Kinsealy Lane (proposed vehicular access via Hazelbrook); proposed upgrades to public realm including footpaths, landscaping including play equipment, boundary treatments, and public lighting; and all associated engineering and site works necessary to facilitate the development including proposed upgrade of part of the existing foul drainage network in Hazelbrook, and proposed connection and associated works to the existing foul network along Kinsealy Lane which will be upgraded under planning permission Reg. Ref. F21A/0451.

The application contains a statement setting out how the proposal will be consistent with the objectives of the Fingal Development Plan 2017-2023. The application contains a statement indicating why permission should be granted for the proposed development, having regard to a consideration specified in section 37(2)(b) of the Planning and Development Act, 2000, as amended, notwithstanding that the proposed development materially contravenes a relevant development plan or local area plan other than in relation to the zoning of the land.

An Environmental Impact Assessment Report (EIAR) and a Natura Impact Statement (NIS) have been prepared in respect of the proposed development".

Further information on the proposed development is provided in Chapter 2 of this EIAR.

2.4 Alternatives Considered

This EIAR has considered the following alternatives to the development proposal:

1. **Do Nothing Scenario:** A "Do Nothing" scenario would not be consistent with the RA land-use zoning pertaining to the lands and the objectives of the Development Plan to facilitate a new residential development on the subject lands as part of a wider development of the Broomfield lands, and Malahide. Given the subject site's location within Malahide as well as access to public transport and mobility, failure to develop these lands would significantly impair the quality of the urban landscape and viability for a mix of sustainable uses and amenities for existing and future residents. The level of demand for housing within the development boundary of the Malahide area, based on the future population growth predictions, would not be met, resulting in downstream impacts including housing needs and affordability. As such, it is considered that the "Do Nothing" scenario is not a suitable alternative option for the subject lands. Furthermore, to not develop these zoned and serviced lands would be inconsistent with national planning policy as set out in the National Planning Framework, Regional Spatial Economic Strategy and Urban Development and Building Height Guidelines.
2. **Alternative Uses**: As previously stated, the subject site is located within the functional area of Fingal County Council. As such, the development of the site is informed by the policies and objectives of the Fingal County Council Development Plan 2017-2023. Under the current Development Plan, the subject lands are zoned as *"RA – Residential Area"* zoning objective. Thus, the proposed development is considered permitted in principle uses under the pertaining zoning objective.
3. **Alternative Designs and Layouts:** The alternatives to the proposed development considered during the course of the preparation of this EIAR were related to the overall layout and internal roads pertaining to the proposed scheme. The design of the proposed project has evolved throughout the pre-application consultation process, resulting in various alterations to the proposal. It is worth noting that the proposal may continue to develop following the application submission and continued consultation with relevant stakeholders. The main environmental issues that have most informed the chosen design relates to the impact on trees and hedgerows, as well as visual impact.

Further information on the alternatives considered as part of this EIAR is provided in Chapter 2 of this EIAR.

3.0 PLANNING POLICY

Chapter 3 of this EIAR considers in detail the planning policy and legislative context of the site, development proposal and this EIA at European, national, regional, and local levels. This chapter of the EIAR also considers the planning history of the scheme and the surrounding area. For the purposes of this Non-Technical Summary, this section will consider the site's zoning policy contained in the Fingal County Council Development Plan (2017 to 2023). Under this Plan, the site is zoned *"RA – Residential Area"* which seeks: *"Provide for new residential communities subject to the provision of the necessary social and physical infrastructure."*

The vision for the *"RA – Residential Area"* seeks to: *"Ensure the provision of high quality new residential environments with good layout and design, with adequate public transport and cycle links and within walking distance of community facilities. Provide an appropriate mix of house sizes, types and tenures in order to meet household needs and to promote balanced communities."*

The uses proposed as part of this development are permitted under the pertaining zoning objectives. The proposed development is in accordance with relevant national, regional, and local planning policy documents.

4.0 POPULATION AND HUMAN HEALTH

This section of the EIAR has been prepared by Downey. The subject site and proposed development were examined in terms of the impact on the human environment in the general area. The proposed development will have a positive impact on population, in that it caters for predicted future increase in population for the Malahide area.

4.1 Methodology

The assessment was carried out by way of site visits and desktop research of the demographic profile of the area, assessment of community and social infrastructure facilities, employment, educational and commercial facilities in the area.

4.2 Receiving Environment

The proposed development is located within the Kinsaley ED, appearing as an extension to the Malahide East and Malahide West ED's. The Table below shows the population change within these Electoral Divisions (ED's) defined as the receiving environment of this assessment. The latest Census results show that the population of the receiving environment stood at 22,199 in April 2016, an increase of 572 (2.6%) since April 2011

Table 1. Population Change in the Catchment Area over 2011-2016

Area	2011	2016	Actual Change	% Change
Kinsaley ED	8,475	9,621	+1,146	+13.5%
Malahide West ED	6,273	6,149	-124	-2.0%
Malahide East ED	6,879	6,429	+550	+8.0%
Total	21,627	22,199	572	+2.6

Source: CSO StatBank

4.3 Potential Impact of Proposal

5.3.1 Construction Phase

The construction of this project, like any project, has potential to give rise to an impact on health and safety of human beings if construction activities are not managed appropriately.

5.3.2 Operation Phase

The proposed development will see an increase in population from the operation phase of the development. This will support an increase in economic activity in the area and employment. This will take place close to people's homes and public transportation. This is seen as a positive impact. The development will generate an increase in traffic and noise, which will have a slight and permanent impact on human health, if not mitigated.

4.4 Remedial/Mitigation Measures

5.4.1 Construction Phase

Measures to address such health and safety considerations will be addressed in the Construction Management Plan, including Construction Traffic Management Plan for the development, which shall be agreed with the Planning Authority pending a grant of permission is obtained.

5.4.2 Operation Phase

No mitigation or remedial measures are required in relation to population or human health during the operational phase of the development.

4.5 Predicated Impact of Proposal

5.5.1 Construction Phase

The development will have a positive and temporary impact on employment during the construction phase, providing significant construction sector and related employment over the construction period of the development.

5.5.2 Operation Phase

The development will have a positive and long-term impact in terms of community and recreational facilities in that it will provide areas of green amenity space and will contribute to the critical mass needed to support community and recreational facilities in the wider area. There will be a change in the density of the land use pattern of the site although the use itself is currently residential. This is seen to be a neutral impact.

4.6 Monitoring

In terms of population and human health, measures to avoid negative impacts have been a key consideration in the design evolution of the buildings and the overall layout of the proposed project. Conditions will be attached to any grant of planning permission to ensure compliance in this regard. Building Regulations will also be adhered to during the construction phase to ensure a fully compliant development is constructed. Health & Safety requirements, which are site-specific to the proposed project, will be carried out by the Project Manager on site. Impacts from Air Quality, Noise and Vibration, Climate, and Traffic and Transport and monitoring measures in this regard are addressed in the relevant chapters of this EIAR.

5.0 BIODIVERSITY

An assessment of the potential effects of the construction and occupation of a housing development on lands at Broomfield has been carried out. To establish the current baseline terrestrial biodiversity within the planning boundary and adjacent areas, a series of site visits and specialist surveys were completed. The baseline was also informed by previous surveys of adjoining lands some of which are currently under construction. The surveys included terrestrial ecology and habitat surveys, invasive plant species surveys, bird surveys, bat surveys and badger surveys. Other sources of information used to inform the baseline included information held by the National Biodiversity Data Centre (NBDC), Bat Conservation Ireland, BirdWatch Ireland and the National Parks and Wildlife Service.

The habitats present within the lands are typical of the farmed landscape of North Dublin and include areas of tilled ground, arable crops, dry meadows and grassy verges, soil and disturbed ground, hedgerows, treelines, earthen banks, drainage ditches, scrub, the former rugby club building and a lowland depositing watercourse. No legally protected species plant species was recorded on the site. A stand of Japanese knotweed within the lands has been treated since 2018.

These support a diversity of common countryside birds and animal species including bats, badger, and rabbit. A bat derogation licence has been granted for the demolition of the former rugby club building, which had previously been used by bats.

Mitigation measures to avoid or ameliorate impacts on biodiversity within the site include protection measures for retained vegetation and habitats, protection measures for birds, bats, badgers, and a proposed naturalisation of the Hazelbrook Stream, as well as measures for invasive species, soil handling and the use of native species in landscaping proposals within the development.

The overall impact on flora and fauna within the site is deemed moderate negative as they are undeveloped and offer ecological structure and diversity. They provide habitat for wildlife in what is becoming an increasingly urbanised area along Back Road. This will be permanently altered through their development for residential purposes; however, the land is zoned for Residential Development and is identified as such within the Fingal County Council Development Plan. As such residential development will occur on this site and the environment on the site will change. The proposed development retains and enhances some of the natural features of the site where possible and includes positive planting proposals which will add some diversity to the site and will favour some species. A Natura Impact Statement has been prepared which accompanies the planning application. Comprehensive mitigation is proposed which is detailed in Chapter 5 and 16.

6.0 LAND AND SOILS

This section of the Environmental Impact Assessment Report (EIAR) has been prepared by Waterman Moylan Consulting Engineers and provides a Non-Technical Summary of the assessment of the impact that the proposed residential development of lands, over 2 parcels of land, at Broomfield, Malahide, Co. Dublin will have on the surrounding soil and geology within the vicinity of the site. It also sets out mitigation and remedial measures and methods of monitoring once the development is operational.

6.1 Assessment Methodology

A desktop study was carried out to assess existing data from the Geological Survey of Ireland (GSI). This information was supplemented by a review of geotechnical Site Investigations carried out within the Broomfield sites by Site investigations Ltd. in March 2021 for the northern and southern land parcels. A further Site investigation Report was also consulted, this report was undertaken in April 2020 by Ground Investigations Ireland Ltd. and was conducted in the location where there was known to be an area of historical in-fill. These comprehensive ground investigations assessed the soil, rock, and groundwater conditions across the site. The details of the review of these documents have formed the basis for the identification of potential issues and mitigation/remedial measures, which are discussed in the following sections in a non-technical manner.

6.2 Receiving Environment

The subject sites are located at Broomfield, Malahide, Co. Dublin. A topographic survey of the area indicated that the north site generally slopes uniformly from north-east to south, from a height of 20.5m to 11.5m, with an existing dry ditch system along the south-east boundary, and ditch to the south-west. The southern site also slopes from north to south from a height of 6m to 4.7m, with localised high points.

The site is primarily greenfield in nature (agricultural) however, a section of the northern site was formerly home to Malahide Rugby Club and thus there are on-site structures in the form of the former clubhouse and associated buildings. These structures have been heavily vandalised, including serious fire damage, and their demolition is included as part of the subject application. The groundwater vulnerability of the site is considered to be high to extreme.

A review of historic maps for the locality indicates that the lands have historically been used for agricultural purposes only.

As part of the ground investigation reporting, Various tests, including Waste Acceptance Criteria (WAC) testing, were carried out on soil samples obtained. The depth of topsoil on-site is generally 0.3m deep. The area and volume of historic infill was determined as this will need to be disposed of appropriately off-site. It has been calculated that the collective volume of historic in-fill material to be excavated and disposed of is 17,280m^3, based on an area of 11,520m^2 and average depth of 1.5m.

An invasive species (Japanese knotweed) has been found on-site. Once its presence was identified the area surround the knotweed was immediately fenced off to avoid accidental disturbance. The treatment and removal method are detailed in full in Chapter 6, Section 6.5.

6.3 Characteristics of Proposed Development

The Broomfield SHD development is divided into two land parcels, north and south. The northern parcel is bound the east by the Dublin-Belfast rail line, to the south by Agricultural fields, to the west by the Ashwood Hall residential development, and to the north by individual residential units. The southern parcel is bound to the east by agricultural land, the south by Hazelbrook Stream, the west by Hazelbrook residential development and to the north by the Brookfield residential development. The proposed development is primarily residential in nature, totalling 415 units comprising 252 houses, 28 duplexes, and 135 apartments, and also includes ancillary services such as creche and gym facilities etc., and all other services required for the development.

The proposed development of the north and south sites, with respect to soils and geology, includes excavation of road and building foundations, excavation for drainage sewers and utilities, minor regrading and landscaping and disposal of any surplus excavated soils including any contaminated material. The proposed road layout is as per drawing number 18-091-P100, with typical cross sections as per P130. The drainage and watermain layouts can be seen on drawing numbers P200 & P300, respectively.

6.4 Potential Impacts

The removal of topsoil during earthworks and the construction of roads, services, and buildings, in particular road and building foundations, will expose subsoil to weathering and may result in the erosion of soils during adverse weather conditions. Surface water runoff from the surface of the excavated areas may result in silt discharges to the Hazelbrook stream. Excavations for foundations, remaining roadworks and services will result in a surplus of subsoil. Surplus subsoil will be used in fill areas where applicable.

Dust from the site and from soil spillages on the existing road network around the site may be problematic, especially during dry conditions. Accidental oil or diesel spillages from construction plant and equipment, in particular at refuelling areas, may result in oil contamination of the soils and underlying geological structures. Construction traffic may also lead to the compaction of soil in a very limited area during the development of the structures and access roads.

During the operational stage of the development, it is not envisaged that there will be any ongoing impacts on the underlying soil as a result of the proposed development.

6.5 Potential Cumulative Impacts

It is not anticipated that potential cumulative impacts will be generated on land, soils, and geology during the construction or operation phases, or in the event of future developments adjacent to the site should they implement the appropriate mitigation measures.

6.6 Mitigation Measures (Remedial or Reductive Measures)

Building and road levels are designed to minimise the cut and fill balance. Nonetheless, given the proposed design levels, it is anticipated that there will be a surplus of soil to be removed from these locations, but is envisaged to be utilised elsewhere on-site. Surplus subsoil and rock that may be required to be removed from site will be deposited in approved fill areas on-site or to an approved waste disposal facility.

Where contaminated soils are encountered during the works, they will be excavated and disposed of off-site in accordance with the Waste Management Acts, 1998-2006, and associated regulations and guidance. Wheel wash facilities at the construction entrances and regular cleaning of the adjoining road network will prevent the build-up of soils from the development site on the existing public roads. Dampening down measures with water sprays will be implemented during periods of dry weather to reduce dust levels arising from the development works.

Measures will be implemented throughout the construction stage to prevent contamination of the soil and adjacent watercourses from oil and petrol leakages. During excavation works, temporary sumps will be used to collect any surface water run-off thereby avoiding of standing water within the building foundation trenches and other excavations. Silt traps, silt fences and tailing ponds will need to be provided by the contractor where necessary to prevent silts and soils being washed away by heavy rains during the course of the construction stage.

After implementation of the above measures, the proposed development will not give rise to any significant long term adverse impact. Moderate negative impacts during the construction stage will be short term only in duration.

Within the development, landscaped areas will be topsoiled and planted in accordance with the proposed landscaping plan. Following completion of these reinstatement works, no significant adverse impacts on the soils and geology of the subject lads are envisaged.

A comprehensive drainage network will be constructed to ensure that the lands drain effectively following their reshaping/re-profiling. The drainage system shall incorporate sustainable urban drainage methods to clean flows prior to discharge.

6.7 Predicted Impact

With the protective measures noted above in place during excavation works, any potential impacts on soils and geology in the area will be minimised. The proposed development will result in a surplus of excavated material, which may contain contaminants. Any contaminated material will be exported to an approved licensed waste facility. No significant adverse impacts on the soils and geology of the subject lands are envisaged.

6.8 Monitoring

Monitoring during the construction stage is recommended, including monitoring surface water discharging to the existing drainage network, monitoring cleanliness of the adjoining road network and to ensure prevention of oil and petrol spillages.

6.9 Do Nothing Scenario

The ground conditions will remain as they currently are.

6.10 Risks to Human Health

A potential risk to human health due to the associated works during the construction is the direct contact, ingestion, or inhalation of receptors (i.e., construction works), with any soils which may potentially contain low level hydrocarbon concentrations from site activities (potential minor leaks, oils, and paint).

No human health risks associated with long term exposure to contaminants (via direct contact, ingestion, or inhalation), resulting from the proposed development are anticipated.

6.11 Reinstatement

Trenches opened during construction will be backfilled with subsoil to reinstate existing ground levels. Upon completion no impact is foreseen.

6.12 Interactions

Any potential rock breaking will generate noise and excavations on site will give rise to dust. From review of the Site Investigation reports, it is not anticipated that rock breaking will be necessary.

6.13 Difficulties Encountered

There were no difficulties encountered when undertaking this assessment.

7.0 WATER

This section of the EIAR has been prepared by Waterman Moylan Consulting Engineers and provides a Non-Technical Summary of the assessment of the impact that the proposed residential development of lands, over 2 sites, at Broomfield, Malahide, Co. Dublin will have on the surface water, groundwater, foul water, water supply network, and flood risk in the vicinity of the site, during both the construction and operation phase of the proposed development.

It also sets out mitigation and remedial measures and methods of monitoring to reduce the impact of the proposed development.

7.1 Assessment Methodology

The following information sources were used in the assessment of the local hydrology and hydrogeological aspects of the proposed development site.

- Geological Survey of Ireland (GSI) Website
- Environmental Protection Agency
- Office of Public Works (OPW) National Flood Hazard Mapping
- OPW Catchment Flood Risk and Management Studies
- Fingal County Council Drainage Record Maps
- Ordinance Survey Mapping
- Topographical Survey
- Site investigation reports and soakaway testing
- Irish Water confirmation of feasibility letter

7.2 Receiving Environment

The subject lands are located at Broomfield, Malahide, Co. Dublin. The northern parcel is bound to the west by Ashwood Hall Residential development, to the east by the Dublin-Belfast Rail line, the north by existing residential units fronting onto the Back Road, and to the south by agricultural land. The southern parcel is bound to the west by Hazelbrook residential development, to the north by Brookfield residential development, to the east by agricultural land and to the south by Hazelbrook stream.

The northern parcel will primarily be accessed via the existing junction to Back Road serving the Ashwood Hall residential development. The southern site was to be accessed from its northern boundary via the Brookfield residential development. Fingal County Council have requested as part of their Opinion Report to ABP, and in specific their Internal Consultee Report from their Transport Planning Section, that an additional access will need to be provided for the southern parcel via the Hazelbrook residential development. This request has been incorporated to the revised layout.

A topographic survey of the area indicated that the northern parcel generally slopes uniformly from north-east to south, from a height of 20.5m to 11.5m, with an existing dry ditch system along the south-east boundary, and ditch to the south-west. The southern site also slopes from north to south from a height of 6m to 4.7m, with localised high points.

The existing dry ditch on the southern boundary of the north site serves the subject site only due to topography, water flowing to this ditch is percolated locally and there is no connection to any watercourse. The drainage ditch to the south-west eventually connects to the Hazelbrook stream. The ditch to the north of the south site flows from east to west and connects to Hazelbrook Stream. Hazelbrook stream forms the southern boundary flowing from west to east. Hazelbrook stream is a tributary of the Sluice River with an ultimate outfall to Baldoyle Bay.

The location of the subject sites is as indicated in Figure 1 below:

There are no foul sewers internal to the site to facilitate foul drainage. It is proposed to drain foul water in a westerly direction from both sites to the existing foul water infrastructure. These existing foul networks have been sized accordingly, with spurs already constructed, in anticipation of the proposed development. The north site is proposed to drain to the adjacent Ashwood Hall and Brookfield residential development, while the south site will drain to the adjacent Hazelbrook residential development. Letters of consent to connect to these adjacent developments have ben obtained. These existing developments currently flow to Connolly Avenue pumping station, however due to capacity constraints, a new pumping station named Castleway pumping station is to be constructed on Kinsealy Lane, Fingal County Council Planning Register Reference: F21A/0451, Final Permission Grant date: 21/01/2022. This pumping station will alleviate the capacity constraints in the existing network and has been sized in conjunction with Irish Water to accept the additional volumes from the proposed development and further facilitate continued development in the locality.

Similar to the foul network, there are no watermains on the subject site. It is proposed to connect to the watermains in the adjacent development, which again have been sized and have had spurs constructed in anticipation of the proposed development. Letters of consent have been obtained for the connections to these networks. The Irish Water Confirmation of Feasibility letter advised that minor upgrades are required to the local public network in order to facilitate the development.

A new surface water drainage network is proposed to serve the development and will outfall to the local ditches which form the site boundary. These ditches flow to the Hazelbrook Stream, which is a tributary of the Sluice River. The south site will outfall to its boundary ditch on the north and to the Hazelbrook Stream on the south.

The proposed and existing foul and surface water networks can be seen on drawing numbers 18-091P200 to P206, with the proposed and existing watermain networks on P300 to P306.

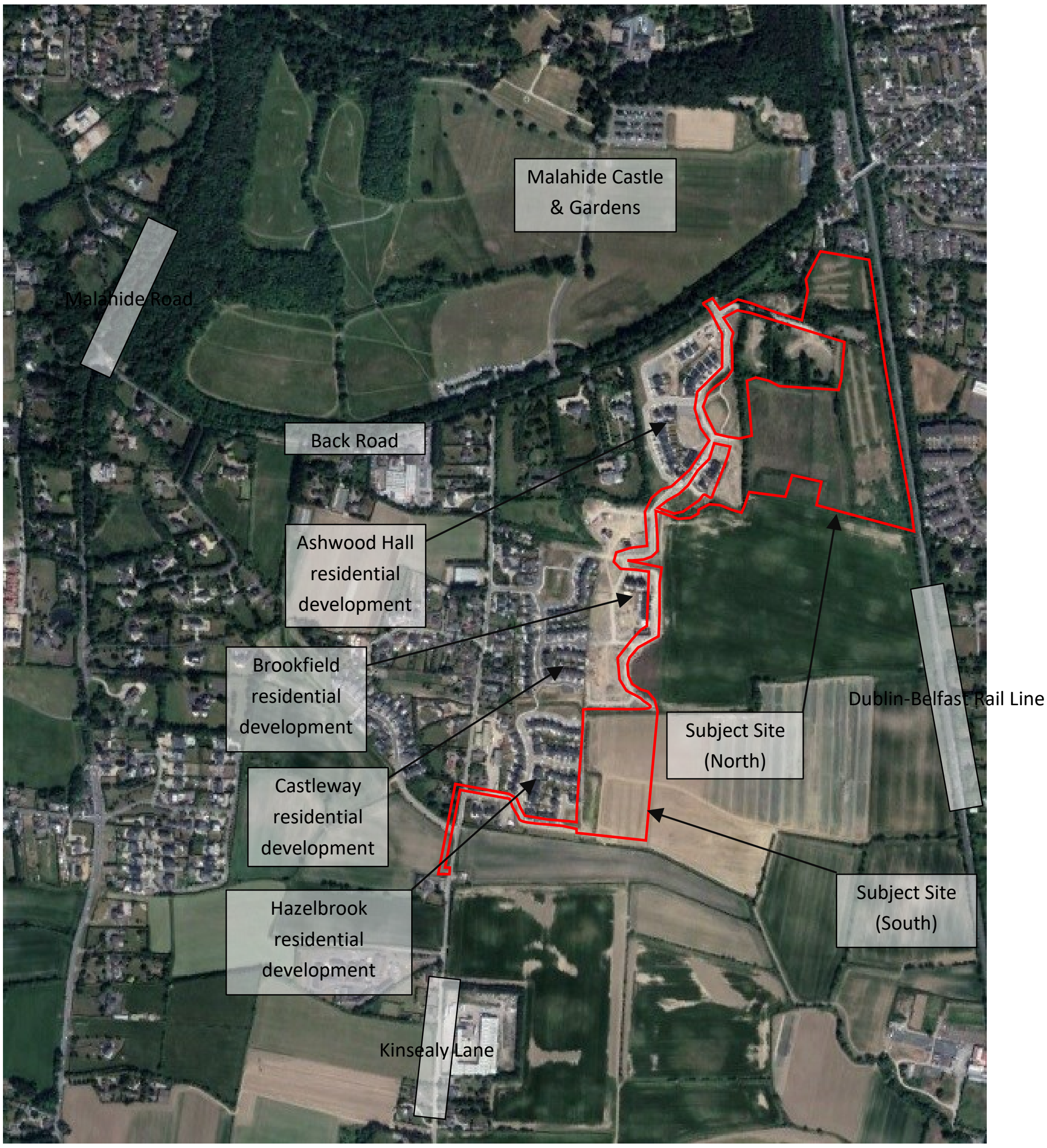

Figure 3. Site Location (Source: Google Earth)

7.3 Potential Impacts of the Proposed Development

The potential impacts of the proposed development from both a hydrology (surface water), and hydrogeology (groundwater) perspective at construction and operational stages are outlined as follows:

Significant amounts of site stripping and excavation will be required in order to construct the development. When the site has been stripped, layers of sub-soil will be exposed to weathering and there will be potential for erosion due to rainfall and subsequent runoff. The erosion of soil can lead to sediments being washed into the receiving watercourses /sewers at higher rates of runoff.

There is also potential during the development's construction stage that contaminants from cement/concrete be washed into the receiving watercourses/sewers.

There is a risk of pollution of groundwater/watercourses/soils by accidental spillage of oils/diesel from temporary storage areas or where maintaining construction equipment. Foul water could be connected to the surface water drainage network resulting in the contamination of the receiving watercourses. Furthermore, if there is damage to any foul pipes, there is potential for contaminants to seep into the groundwater. The construction of the proposed development has potential to cause a slight, adverse, temporary, residual impact on receiving watercourses/groundwater.

The proposed development will result in increased impermeable areas and there is potential for an increase in risk of higher rates of surface water runoff leading to increased downstream flooding. There is a potential impact for the discharge of contaminants from the proposed development and road surfaces to the surrounding drainage sewers. These would include particulates, oil, soluble extracts from the bitumen binder etc. The quality of runoff from the site would be dependent on the time of year, weather, particulate deposition from the atmosphere and any gritting or salting carried out by the Local Authority. The time of year has a major bearing on the quality of storm water run-off, in particular the first rains after a prolonged dry period where accumulated deposits of rubber, particulates, oils, etc. are, washed away. There is potential for leaks in the foul network to result in contamination of the groundwater. Accidental spills of fuels/hydrocarbons and washing down into the drainage pipe network has the potential to impact on the receiving hydrogeology.

The operation of the proposed development has the potential to cause a slight, adverse, temporary, residual impact on receiving watercourses/groundwater. There is a potential for Watermain leaks which would increase the volume of water permeating through the underground soil strata. Mitigation measures are discussed later in this chapter.

7.4 Potential Cumulative Impacts

There are no anticipated cumulative impacts arising from the proposed development in relation to water other than those noted in the section above.

7.5 Do Nothing Scenario

In this scenario, surface water runoff would continue to be discharges at existing unrestricted discharge rates. The receiving watercourses and groundwater aquifers would remain in their current state and there would be no change. There would be no increase in loading to the foul water network, nor any increase in demand to the water supply network.

7.6 Risks to Human Health

There is a risk to Human Health should the ground water or the existing water supply become contaminated during the construction or operational stages, and the water is consumed. In order to mitigate these risks, the measures outlined below will be adopted.

7.7 Mitigation Measures

Construction Stage

A Construction Management Plan has been prepared for this application and is included under a separate cover. It is considered that the Construction Management Plan (CMP) will be updated by the appointed contractor. In order to minimise the potential impact of the construction phase of the proposed development on the surrounding surface water and groundwater environs, the following construction stage mitigation measures are to be included in the plan and be implemented in full.

- The contractor will appoint a suitably qualified person to oversee the implementation of measures for the prevention of pollution to the receiving surface water environment.
- To minimise the adverse effects, the prevailing weather conditions and time of year is to be taken into account when the site development manager is planning the stripping back of the site.
- Site stripping will be minimised as far as practicable.
- Settlement ponds/silt traps will be provided to prevent silt runoff into the existing sewers/watercourses during the drainage works.
- Regular testing of surface water discharges will be undertaken at the outfall from the subject lands. The location for testing and trigger levels for halting works will be agreed between the project ecologist and the site foreman at the commencement of works.
- Where silt control measures are noted to be failing or not working adequately, works will cease in the relevant area. The project ecologist will review and agree alternative pollution control measures, such as deepening or redirecting trenches as appropriate, before works may recommence.
- All fuels and chemicals will be bunded, and where applicable, stored within double skinned tanks/containers with the capacity to hold 110% of the volume of chemicals and fuels contents. Bunds will be located on flat ground a suitable distance from any watercourse or other water conducting features, including the cut off trenches.
- Foul and surface water pipes will be carefully laid so as to minimise the potential for cross connections which results in contamination of receiving watercourses.
- Site personnel inductions are to be conducted such that all site personnel are made aware of the procedures and the best practices in relation to the management of surface water runoff and ground water protection.
- Where possible, precast concrete units are to be used to avoid on-site "wet" mix concrete usage. In situ concrete pours are to be managed in accordance with best practice to avoid overspills
- Concrete truck and wheel wash down facilities are to be provided in designated areas. Discharge from these areas is to be directed into the settlement ponds/silt traps.
- Topsoil for landscaping will be located in such a manner as to reduce the risk of washing away into local drainage or watercourses.
- All new foul sewers will be tested by means of an approved air test during the construction stage in accordance with Irish Water's Code of practice and Standard Details.
- All private drainage will be inspected and signed off by the Design Engineer in accordance with the Building Regulations Part H.
- Method statements setting out in detail the procedures to be used when working in the vicinity of existing watermains will be produced by the contractor for any construction works within the vicinity of watermains or for roads and services crossing watermains.
- The connection of new foul sewers to the public sewer will be carried out under the supervision of Irish Water and will be checked prior to commissioning.

Operational Stage

The implementation of the following operation stage mitigation measures will minimise the impact on the hydrology and hydrogeology aspects of the development lands.

- The surface water drainage network has been designed in accordance with the CIRIA SUDS Manual and the Greater Dublin Strategic Drainage Scheme. The appropriate interception mechanisms and treatment train process has been incorporated into the design.
- Surface water outflow will be restricted to the equivalent greenfield runoff rate from the proposed attenuation tanks.
- Sustainable urban drainage measures, including green roofs, permeable paving and filter strips/swales will be provided to improve water quality.
- A petrol interceptor will be installed at all outfalls to prevent hydrocarbons entering the natural surface drainage system.
- Regular inspection and maintenance of the drainage network, including petrol interceptors.
- Water metering via district meters will be installed to Irish Water requirements. Monitoring of the telemetry data will indicate any excessive water usage which may indicate the potential for a leak in the watermain network, Early identification of potential leaks will lead to a faster response in determining the exact location of leaks and completion of remedial works.

With the protective measures noted above in place during excavation works, any potential impacts on soils and geology in the area will be minimised.

The proposed development will result in a surplus of excavated material, which may contain contaminants. Any contaminated material will be exported to an approved licensed waste facility.

No significant adverse impacts on the soils and geology of the subject lands are envisaged.

7.8 Residual Impact

Due to the proposed mitigation measures outlined above, and the implementation of a Construction Management Plan, the impact during construction stage on the hydrology, hydrogeological, and flood risk aspects of the lands is not significant. Due to the proposed mitigation measures outlined above many of the potential impacts will not arise during the operational phase of the proposed development on surface water and groundwater quality. Surface water discharge from the site will be restricted by means of attenuation, therefore, no adverse impact in respect of flooding downstream will arise from the proposed development. The installation of a Sustainable Drainage System will ensure surface water runoff will be of high quality before discharge to the natural surface watercourse. The impact following the operational phase mitigation measures outlined above is imperceptible. There will be increased loading of the foul water network, and an increased demand to the water supply network.

7.9 Worst Case Scenario

The worst-case scenario in relation to hydrology and hydrogeology during construction phase would be the failure to implement the mitigation measures outlined above. This may result in the contamination of the receiving surface water network and/or groundwater.

In relation to the operation stage, the worst case would be the flooding of the surface water drainage network. In this regard, the network has been designed to accommodate a 20% increase in flows due to climate change. Finished floor levels have also been set with appropriate freeboard and an overland flood route through the site has been provided.

Implementation of the mitigation measures outlined in this document will reduce the risk of the worst-case scenario occurring, making this unlikely.

7.10 Monitoring

Implementation of the Construction Management Plan is required to protect the hydrology and groundwater elements of the subject lands during construction stage. Maintenance of the mitigation measures and monitoring of the management process is required to ensure best practice.

The monitoring measures to be implemented include:

- Monitoring of the management and storage of dangerous chemicals and fuel.
- Monitoring and maintenance of the wheel wash facilities.
- Regular maintenance and monitoring of the sediment control measures.
- Monitoring and maintenance of the watermain telemetry, SUDS features, road gullies, and attenuation tanks during the construction phase of the development.

Monitoring and maintenance of the SUDS features, road gullies, attenuation and flow control devices are imperative during the operation phase of the development.

7.12 Reinstatement

No reinstatement is anticipated on site with respect to the water environment.

7.13 Interactions

The main interactions relating to this EIAR Chapter are Land & Soils, Biodiversity, and Utilities.

During construction stage, the connection of wastewater services has the potential to impact groundwater if wastewater were to leak from the network during the construction process. There are potential implications for the local populations if there is a disruption to utility services during the connection of the new services to the proposed development. The construction of the various services will also interact with construction traffic as outlined in the Traffic and Transport Chapter.

During the operation stage, the water supply and foul drainage services have a potential interaction with the available water supply and with potential pollution to natural water bodies.

In respect of Land & Soils, interaction between surface and ground water and the bedrock geology is feasible. Any impact will be negligible as the aquifer is at low risk and is not considered to be regionally important. The implementation of the mitigation measures outlined in this chapter will reduce the potential of surface contaminants into the underlying geology.

In respect of Biodiversity, there is interaction between hydrology and the downstream habitats present along the Hazelbrook Stream and Sluice River. The mitigation measures ensure that surface water runoff is treated to the required standards so that downstream habitats are not negatively impacted.

7.14 Difficulties Encountered

There were no difficulties encountered when undertaking this assessment

8.0 AIR QUALITY

8.1 Introduction

AWN Consulting Limited has conducted an assessment of the likely impact on air quality associated with the proposed residential development Back Road, Broomfield, Malahide, Co. Dublin.

In terms of the existing air quality environment, baseline data and data available from similar environments indicates that levels of nitrogen dioxide, particulate matter less than 10 microns and less than 2.5 microns are generally well below the National and European Union (EU) ambient air quality standards.

8.2 Predicted Impacts

Impacts to air quality can occur during both the construction and operational phases of the proposed development. With regard to the construction stage the greatest potential for air quality impacts is from fugitive dust emissions impacting nearby sensitive receptors. In terms of the operational stage air quality impacts will predominantly occur as a result of the change in traffic flows on the road links near the proposed development.

There are a number of sensitive receptors in close proximity to the site. Provided the dust mitigation measures outlined in Appendix 8.3 of Chapter 8 are implemented, dust emissions are predicted to be short-term, negative and imperceptible and will not cause a nuisance at nearby sensitive receptors.

8.3 Mitigation Measures

The best practice dust mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the impact of construction of the proposed development is likely to be short-term, localised, negative and imperceptible with respect to human health.

Potential impacts to air quality during the operational phase of the proposed development are as a result of increased traffic volumes on the local road network. The changes in traffic flows were assessed against the UK Design Manual for Roads and Bridges (DMRB) screening criteria for an air quality assessment. The operational phase air quality modelling assessment determined that there is no potential for significant impacts as a result of traffic related to the proposed development. It can therefore be determined that the impact to air quality as a result of increased traffic volumes during the operational phase of the proposed development is localised, negative, imperceptible and long-term.

As the National and EU standards for air quality are based on the protection of human health, and concentrations of pollutants in the operational stage of the proposed development are predicted to be significantly below these standards, the impact to human health is predicted to be imperceptible, negative and long term.

No significant impacts to air quality are predicted during the construction or operational phases of the proposed development.

9.0 NOISE AND VIBRATION

9.1 Introduction

AWN Consulting Limited has been commissioned to conduct an assessment of the likely noise and vibration impacts associated with the proposed residential development at the Back Road, Malahide, Dublin. The existing noise climate in the vicinity of the proposed development has been surveyed. Prevailing noise levels are primarily due to local road and rail traffic with contributions from aircraft movements.

The noise impact assessment has focused on the potential outward impacts associated with the construction and operational phases of the proposed development on its surrounding environment.

9.2 Predicted Impacts

During the main construction phase involving site clearance, building construction works, and landscaping the assessment has determined that for the majority of works, the construction noise criteria can be complied with at the nearest sensitive properties. During the operational phase, the outward noise impact to the surrounding environment will be include any additional traffic on surrounding roads and plant noise from the residential and commercial buildings as part of the development. The impact assessment has concluded that additional traffic from the proposed development on local roads will have an insignificant impact on the surrounding noise environment.

9.3 Monitoring

Mechanical plant items will be designed to ensure any noise and vibration impacts during this phase will not exceed the recommended limit values. The resulting impact is of neutral, permanent, and imperceptible. The impact of noise on the development itself has been assessed. Traffic noise along the adjacent rail line is the primary noise source, with contribution from aircraft noise making up the noise environment across the development site. Mitigation measures have been recommended to facades overlooking the local rail network and to the roofs of the residential units so that appropriate internal noise levels are achieved.

10.0 CLIMATE

AWN Consulting Limited has conducted an assessment of the likely impact on climate associated with the proposed residential development at Back Road, Broomfield, Malahide, Co. Dublin.

10.1 Methodology

The existing climate baseline can be determined by reference to data from the EPA on Ireland's total greenhouse gas (GHG) emissions and compliance with European Union's Effort Sharing Decision "EU 2020 Strategy" (Decision 406/2009/EC). The EPA state that Ireland had total GHG emissions of 57.7 Mt CO_2eq in 2020. This is 6.73 Mt CO_2eq higher than Ireland's annual target for emissions in 2020. The EPA predict that Ireland can comply with the GHG targets for 2021 – 2030 provided full implementation of the measures outlined within the Climate Action Plan and the use of the flexibilities available.

10.2 Potential Impacts

Impacts to climate can occur during both the construction and operational phases of the proposed development. With regard to the construction stage impacts to climate can occur as a result of vehicle and machinery emissions. In terms of the operational stage climate impacts will predominantly occur as a result of the change in traffic flows on the road links near the proposed development.

Based on the scale and short-term nature of the construction works, the potential impact on climate change and CO2 emissions from the construction of the proposed development is deemed to be short-term, neutral and imperceptible in relation to Ireland's obligations under the EU 2030 target set out under Regulation (EU) No. 525/2013. Potential impacts to climate during the operational phase of the proposed development are as a result of increased traffic volumes on the local road network. The changes in traffic flows were assessed against the UK Design Manual for Roads and Bridges (DMRB) screening criteria for a climate assessment. The operational phase climate modelling assessment determined that there is no potential for significant impacts as a result of traffic related to the proposed development. It can therefore be determined that the impact to climate as a result of increased traffic volumes during the operational phase of the proposed development is negative, imperceptible and long-term. In addition, the proposed development has been designed to reduce the impact to climate where possible.

No significant impacts to climate are predicted during the construction or operational phases of the proposed development.

11.0 LANDSCAPE AND VISUAL IMPACT

The proposed development site is located on the outskirts of Malahide, along Back Road and to the immediate south of Malahide Castle and its associated grounds. The site is surrounded mostly by low-density residential development and farmland. The site boundaries are formed primarily by existing vegetation in the form of native hedgerow, hedging and trees, however in some parts of the site there are no physical boundaries or temporary boundaries associated with neighbouring construction sites.

The subject lands and surrounding area are relatively flat agricultural land with many mature trees along boundaries, along streets, roads and neighbouring open spaces and within Malahide Castle, directly to the North. Malahide Castle is an important feature in the surrounding lands and contributes towards the landscape character of the area with a number of protected trees and heritage features. There are also a number of low-density housing estates and many individual suburban and rural style houses in the local area.

The landscape character of the site itself is changing from various previous uses such as sports, residential garden, construction storage and agriculture to a landscape dominated by scrub and natural development of wild trees, noxious weeds and saplings.

There is a high amount of tree cover both on and around the site and the site is set back from any main road. As a result of this the existing views of the site are very limited to non-existent.

There are a number of potential visual impacts and impacts on landscape character which could arise as a result of the proposed development of houses, apartments, duplexes and associated infrastructure, boundaries and landscape proposals. During construction there are potential negative impacts on the existing trees, which would have an effect on the landscape character of the site. The construction process would also introduce new machinery, storage, access roads, structures and so on which could cause a visual intrusion into the landscape and change the current use of the site in relation to landscape character. Upon completion of the development, the potential impacts relate to the visual impacts of the new buildings and infrastructure and installation of a new landscape and impacts on landscape character due to changes in use.

Several mitigation measures are proposed as part of the development including design mitigation and mitigation through construction and operation. Design mitigation measures include tree retention, proposed boundary planting, proposed woodland and proposed street trees, parkland and ornamental trees. During construction the management of a well organised construction site and appropriate protection of existing trees will mitigate negative impacts while during operation appropriate landscape and tree management will do the same.

During construction, the predicted impacts in relation to tree removal are negative, however they are only slight and short-term, while impacts due to a change of use are also negative, moderate and again short-term. During operation the impacts are more positive due to the design mitigation, notably the installation of a new landscape. The landscape proposals will cause a change to landscape type and a resultant positive impact on landscape character, the impact is slight and long-term. The landscape and visual impacts of the new landscape itself are also positive, moderate and long-term. Visual impacts during operation are non-existent.

12.0 MATERIAL ASSETS – TRAFFIC & TRANSPORT

This chapter of the EIAR assesses the likely traffic and transportation impacts on the receiving environment during the construction and operational phases of the proposed development. The existing and proposed transport infrastructure in the area is described, and an assessment of the current and the future traffic environment is made. The impact of the development in terms of public transportation, pedestrians and cyclists are also assessed.

The chapter describes: the methodology; the receiving environment at the application site and surroundings; the characteristics of the proposal in terms of physical infrastructure; the potential impact that proposals of this kind would be likely to produce; the predicted impact of the proposal examining the effects of the proposed development on the local road network; the remedial or reductive measures required to prevent, reduce or offset any significant adverse effects; and the monitoring.

12.1 Assessment Methodology

The following methodology has been adopted for this assessment:

- Review of relevant available information including, current Development Plan, existing traffic information and other relevant studies;
- Site visit to gain an understanding of the site access and observe the existing traffic situation;
- Consultations with Fingal County Council Road Department to agree the site access arrangements and determine the scope of the traffic analysis required to accompany a planning application;

- Detailed estimation of the transport demand that will be generated by the development. The morning and evening peak times will be addressed as well as an estimation of under-construction and potential future developments in the surrounding area.
- Assessment of the impact of traffic on local junctions, car parking requirements and accessibility of the site by sustainable modes including walking, cycling and public transport.

12.3 Receiving Environment

The subject site is located in Broomfield, Malahide, Co. Dublin. The development entrance is from Back Road, 0.55km east of the junction between Back Road and Kinsealy Lane.

The north site is located between the existing Ashwood Hall residential development to the west and the Dublin-Belfast rail line to the east, with agricultural land to the south and residential properties and Back Road to the north. The southern site is bounded by the Hazelbrook development to the west, Brookfield Residential development to the north and agricultural lands to the south and east.

The northern site will primarily be accessed via the existing junction to Back Road serving the Ashwood Hall residential development. The southern site was to be accessed from its northern boundary via the Brookfield residential development. Fingal County Council have requested as part of their Opinion Report to ABP, and in specific their Internal Consultee Report from their Transport Planning Section, that an additional access will need to be provided for the southern site via the Hazelbrook residential development. This request has been incorporated to the revised layout.

The location of the subject sites is as indicated in Figure 12.1 below:

Local Road Network

The site is located 2.6km south-west of Malahide Town centre and is in close proximity to regional roads including the R107 Malahide Road, Back Road, Streamstown Lane, Careys Lane and Feltirim Road which serve the area with residential, commercial and agricultural lands. R107 Malahide Road is a regional road in north Dublin which runs for approximately 10.5km from Fairview to Malahide. The speed limit along the Back Road adjacent to the site is 60kph. This road is approximately 700m in length from the priority-controlled junction with Back Road through to a signalised junction with R106 Swords Road. Along this section, R107 Malahide Road comprises a carriageway of c. 7.5m wide with a narrow footpath provided on the western side. No cycle lanes are provided.

Back Road is a single carriageway road running west-east for approximately 1.8km from the priority junction with R107 Malahide Road through to a priority junction with R124 The Hill. This road, which crosses the railway line via an existing bridge, currently comprises a carriageway of approximately 7.30m with narrow footpaths running along both sides of the road for the majority of its length.

Kinsealy Lane is a local road running north-south for approximately 1.8km from a priority T-junction with Back Road through to a priority junction with Chaple Road. This road is currently comprising a carriageway of approximately 5.50m with no footpaths for the majority of the road. The Hill Road is a single carriageway road running north-south for approximately 3.2km from a priority junction with St. Margrets Park to a priority junction with the Chapel Road. This road currently comprises a carriageway of approximately 7.00m with narrow footpaths running along both sides of the road for the majority of its length.

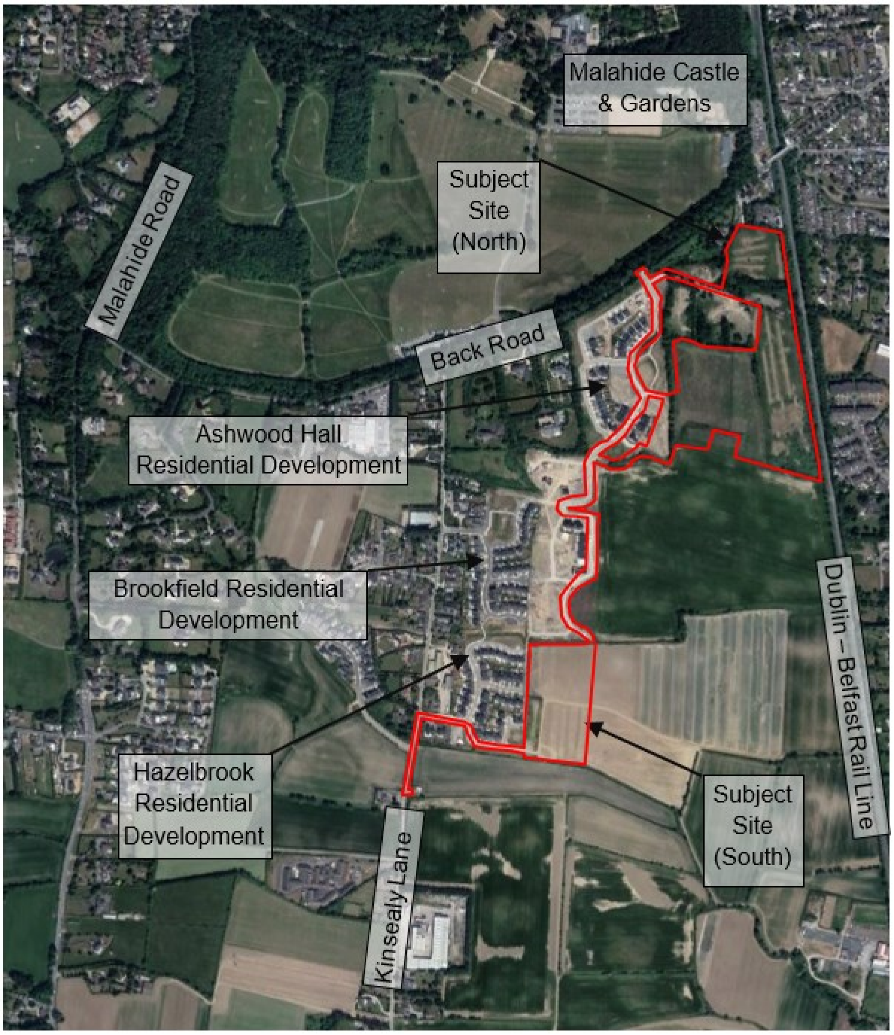

Figure 4. Site Location (Source: Google Earth)

Pedestrian and Cyclist facilities

The site is well located to provide non-car access for residents and visitors of the proposed development with good local walk-in access from the local catchment. Proposals for the Greater Dublin Area Cycle Network Plan were published by the National Transport Authority in December 2013. The plan sets out a vision and a strategy for the construction and/or designation of a comprehensive network of cycling routes throughout the Greater Dublin Area (Counties Dublin, Meath, Kildare and Wicklow).

Public Transport

The assessment of the public transport and the surrounding existing roads, junctions and pathways is shown below. The proposed development has adequate capacity of current public transport infrastructure with access to Malahide Dart Station and several Dublin Bus routes.

Train Services Accessibility

The nearest train station to the subject site is the Malahide station, located approximately 1.6km from the northern site (c. 20-minute walk or c.6-minute cycle) and 2.7km north-east of the southern site (c.34-minute walk or c.10-minute cycle). It is also possible to take the 42 Bus to Malahide Train Station, which reduces the travel time from the northern site from c.20 minutes to c.14 minutes.

The route though Malahide Castle Gardens closes at certain times. The alternative route using The Hill Road is shown in Figure 12.2 below. It is approximately 1.8km (22-miinute walk or 7-minute cycle) from the proposed site entrance to Malahide Dart Station using this route.

The Malahide Station is served by Commuter Rail and DART services. The Commuter Rail service through Malahide Station serves all main stations from Dundalk through Dublin City Centre to Gorey. The service operates at 3 to 4 services per hour in both direction on weekdays.

The DART service through Malahide Station serves all stations from Malahide through Dublin City Centre to Bray and Greystones. On weekdays, this service operates at a 20-minute frequency in both directions.

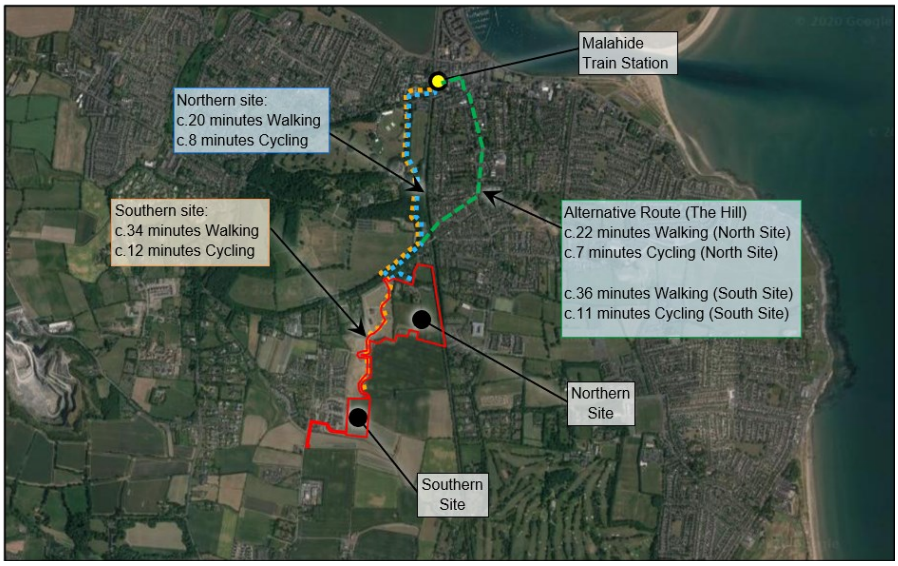

Figure 5. Walking Distance to Nearest Dart Station

Bus Services Accessibility

The subject site is served by Dublin Bus Routes 42 and 142. Route 42 connects Sand's Hotel in Portmarnock to Talbot Street in Dublin City Centre, and Route 142 connects Portmarnock to UCD Belfield via the Port Tunnel.

The nearest bus stops to the subject site are located on either side of The Hill Road (R124), immediately south of the junction with Back Road. These stops are approximately 900m north-east of the subject site entrance. This equates to a c.9-minute walk from the northern site.

The walking distance to these bus stops from the southern site is longer, approximately 1.7km, which equates to a c.22-minute walk. Residents at the southern site also have the option of walking to bus stops on the Malahide Road (R107), immediately north of the junction with Back Road, which are served by the 42 Bus Route. The walking route is via Hazelbrook and Kinsealy Lane, and is approximately 1.6km, which equates to a c.20-minute walk.

A summary of the Dublin Bus Route frequencies is presented in the Table below. Travel time on the 42 bus between Malahide and Talbot Street is approximately 42 minutes in either direction, while the travel time on the 142 between Malahide and UCD Belfield is approximately 60 minutes in either direction.

Table 2. Bus Frequency

Route No.	From	To	AM Weekday Frequency	PM Weekday Frequency
			(07:00 to 09:00)	*(17:00 to 19:00)*
42	Sand's Hotel (Portmarnock)	Talbot Street	Every 20 minutes	Every 20 to 25 minutes
42	Talbot Street	Sand's Hotel (Portmarnock)	Every 15 to 30 minutes	Every 20 to 25 minutes
142	Portmarnock	UCD Belfield	Bus leaves terminus at: 07:10, 07:35, 07:55	*No evening buses*
142	UCD Belfield	Portmarnock	*No morning buses*	Bus leaves terminus at: 16:35, 17:05

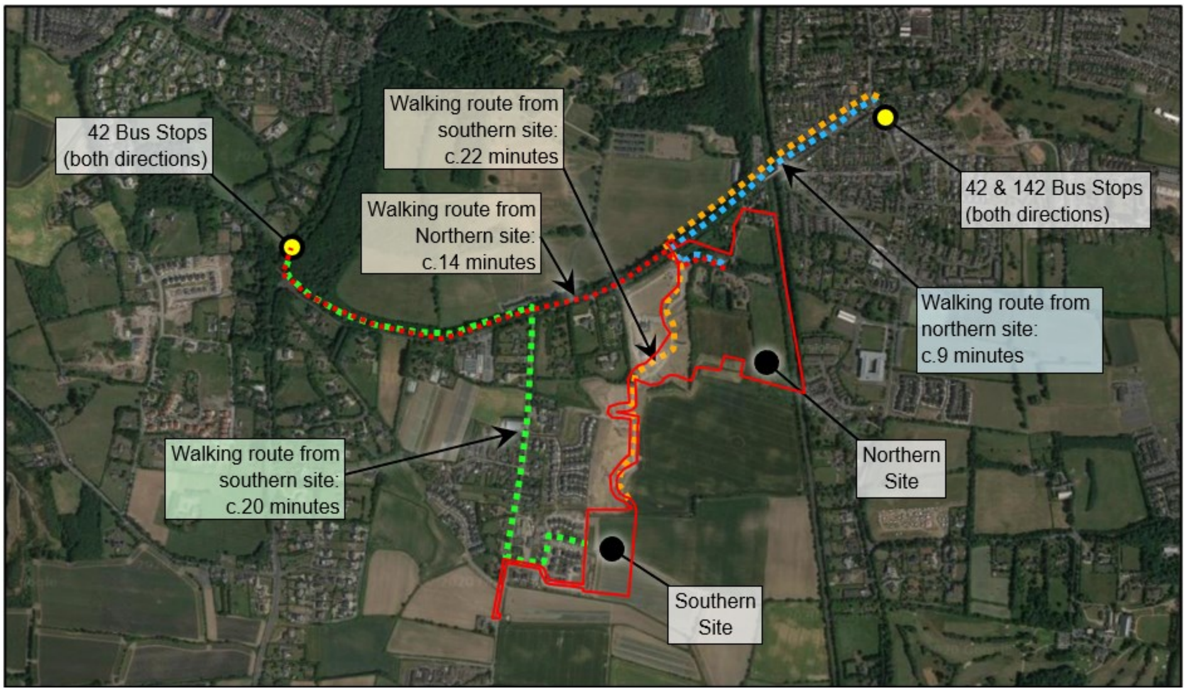

Figure 6. Walking Distance to Nearest Bus Stops

12.4 Potential Impacts of the Proposed Development

Construction Traffic

There is potential for construction traffic to impact from a noise and dust perspective in relation to the surrounding road network. Deliveries to and from the site by heavy good vehicles will impact on noise levels, whilst dust may result from vehicles travelling along gravel roads. There is also potential for traffic congestion, due to increased heavy good vehicles on the road network which may also perform turning movements, unloading, etc., in areas that impact on traffic. The potential for inappropriate parking whilst waiting for access to the site, may also impact local road users. There is potential for construction traffic to have a moderate effect on the surrounding environment. However, the duration of this impact will be short-term (i.e., one to three years).

Operation Traffic

The proposed development will generate a number of trips by various modes of travel including vehicular, pedestrian, cycle and public transport. These trips may have an impact on the surrounding road network and could contribute to increased congestion.

Traffic count data was obtained for the purposes of the planning application. The data surveyed is expected to reflect the peak traffic conditions on the local road network. An estimation of the traffic generation and distribution of the proposed development has been set out in the previous section. This will be compared to the background traffic counts in order to ascertain the impact the proposed development will have on the local road network.

12.5 Potential Cumulative Impacts

There are no anticipated cumulative impacts arising from the proposed development in relation to traffic other than those noted in the section above.

12.6 Do Nothing Scenario

Should the proposed development not take place, the access roads and infrastructure will remain in their current state and there will be no change. Background traffic would be expected to grow over time. Given the location and zoning of the subject site, it is reasonable to assume that a similar development, with a potentially more intensive requirement for vehicular trips would be established on this site at some stage in the future.

12.7 Mitigation Measures

Construction Stage

It is considered that a Construction Management Plan (CMP) will be prepared by the appointed contractor in order to minimise the potential impact of the construction phase of the proposed development on the safety and amenity of other users of the public road. The CMP will consider the following aspects:

- Dust and dirt control measures.
- Noise assessment and control measures
- Routes to be used by vehicles
- Working hours of the site
- Details of construction traffic forecasts
- Time when vehicle movements and deliveries will be made to the site
- Facilities for loading and unloading
- Facilities for parking cars and other vehicles

Further to the above, a detailed Traffic Management Plan (TMP) will be prepared by the main contractor. This document will outline proposals in relation to construction traffic and associated construction activities that impact the surrounding roads network. The document will be prepared in coordination and agreed with the local authority.

Care will be taken to ensure existing pedestrian and cycling routes are suitably maintained or appropriately diverted as necessary during the construction period, and temporary car parking is provided within the site for contractor's vehicles. It is likely that construction will have an imperceptible impact on pedestrian and cycle infrastructure.

Through the implementation of the CMP and TMP, it is anticipated that the effect of traffic during the construction phase will have a slight effect on the surrounding road network for short-term period.

Operational Stage

The proposed development is situated adjacent to suitable infrastructure and transport services for travel by sustainable modes. A key barrier to modal shift towards sustainable modes of travel is often a lack of information about potential alternatives to the car. As such, it is proposed that residents will be made aware of potential alternatives including information on walking, cycle routes and public transport. Residents will be encouraged to avail of these facilities for travel to and from work. Provision of this information would be made during the sales process and will be included in the new homeowner's pack upon the sale of each unit, as this represents the best opportunity to make residents aware and to secure travel behaviour change. It is anticipated that this measure may help to reduce the level of traffic at the proposed development, thus providing mitigation against any traffic and transport effects of the development. A Travel Plan has been included in this application under separate cover. This Plan sets out method to reduce the dependence on private car journeys and encourage residents within the development to avail of sustainable forms of transport such as walking, cycling and public transport.

12.8 Monitoring

Construction Stage

During the Construction Phase the following monitoring is advised. The specific compliance exercises to be undertaken in relation to the range of measures detailed in the final construction management plan will be agreed with the planning authority.

- Construction vehicles routes and parking
- Internal and external road conditions
- Construction activities hours of work

Operational Phase

The Travel Plan for the proposed development will be monitored and updated at regular intervals. This will enable tracking in terms of a reduction in the dependence on private car journeys and a shift towards sustainable transport options such as walking, cycling and the use of public transport such as buses and trains.

13.9 Reinstatement

No reinstatement is anticipated on site with respect to the transport

13.10 Interactions

There may be temporary negative impacts to human health during the Construction Phase caused by noise, dust, air quality and visual impacts which are covered in other chapters of this EIAR. There may also be interaction with the surrounding water bodies through surface water runoff during topsoil stripping and earthworks which will be required to construct the roads.

The effects of these will be mitigated through the implementation of the measures outlined in this Chapter and within the Construction Management Plan.

13.11 Difficulties Encountered

There were no difficulties encountered when undertaking this assessment.

13.0 CULTURAL HERITAGE

This chapter has been prepared to assess and define any likely significant impacts or effects which the proposed development may have on the archaeological, architectural and cultural heritage resource. The chapter provides an assessment of the archaeological, architectural and cultural heritage background of the proposed development area and outlines mitigation measures, based on current information, which may be used to avoid, reduce or offset any likely adverse impacts or effects.

As a result of carrying out this assessment the following potential archaeological, architectural and cultural heritage direct, indirect, construction, operational and residual impacts have been assessed.

Two phases of Licensed test trenching carried out within the proposed development area revealed the presence of four previously unrecorded below-ground archaeological features (a pit; a hearth/burnt pit; and two possible enclosure ditches). Construction works will have a significant, permanent, direct impact on these previously unrecorded archaeological remains. Construction works will have a significant, permanent, direct impact on any previously unrecorded archaeological remains that may exist within the development area and which may be discovered during the construction phase. There will be no indirect construction phase impact on the archaeological resource. There will be no operational phase impact on the archaeological resource.

There is one historic park and garden (Broomfield House) recorded on the National Inventory of Architectural Heritage (NIAH) within the proposed development area. With the exception of the western boundary, there are no features associated with Broomfield demesne extant within the proposed development area. As a result, it is assessed that there will be no construction or operational phase impacts on Broomfield demesne.

There are no Protected Structures within the proposed development area or the 500m study area. There are no Architectural Conservation Areas within the proposed development area. There are two Architectural Conservation Areas within the 500m study area. There are no structures recorded on the NIAH within the proposed development area. There are four structures recorded on the NIAH within the 500m study area. There are an additional two historic parks and gardens recorded on the NIAH within the 500m study area. It is assessed that there will be an imperceptible, permanent, visual impact on the above-mentioned architectural heritage features recorded within the 500m study area. There will be no construction phase impact on the architectural resource. There will be no indirect operational phase impact on the architectural resource.

Proposed access roads and footpaths will truncate a townland and parish boundary in six places. Construction works will have an imperceptible, permanent, direct impact on the townland and parish boundary. There will be no indirect construction phase impact on the cultural heritage resource. There will be no operational phase impact on the cultural heritage resource.

It is recommended that the four archaeological features (a pit; a hearth/burnt pit; and two possible enclosure ditches) revealed during the test trenching programmes be fully excavated and recorded well in advance of groundworks commencing on site. Excavation would be carried out under Licence to the Department of Housing, Local Government and Heritage and the National Museum of Ireland.

It is recommended that monitoring of all groundworks be undertaken in Fields 1, 2 and 5. Monitoring would be carried out under Licence to the Department of Housing, Local Government and Heritage and the National Museum of Ireland. Provision would be made for the full excavation and recording of any archaeological features or deposits that may be exposed during monitoring. It is considered monitoring is not required in Fields 3, 4, 6, 7, 8, 9 and 10 as fieldwork failed to reveal any archaeological features or artefacts in these areas.

It is recommended that written and photographic records be created, well in advance of groundworks commencing on site, where the proposed access roads and footpaths truncate the townland and parish boundary.

There are no mitigation measures available to offset the imperceptible, permanent, visual impact on the architectural heritage features recorded within the 500m study area.

There will be no residual impacts on the archaeological resource if the mitigation measures outlined above are implemented in full.

There will be no residual impacts on the cultural heritage resource if the mitigation measures outlined above are implemented in full.

It is assessed that there will be a residual imperceptible, permanent, visual impact on the architectural heritage features recorded within the 500m study area.

14.0 MATERIAL ASSETS - UTILITIES AND WASTE

This Chapter has been prepared by Waterman Moylan Consulting Engineers and describes in a non-technical manner, the material assets – Utilities & Waste, that are potentially impacted by the proposed Project at Broomfield. Material assets are resources that are valued and intrinsic to the site of the proposed Project and surrounding environs.

This Chapter considers and assesses the effects of the proposed Project on the material assets, including major utilities within and around the site during the construction and operational phases such as built services (i.e. gas, electricity, telecommunications, etc.) and waste management. Water, Roads and Traffic are also counted as material assets and are assessed under separate chapters of this EIAR.

A Preliminary Construction and Demolition Waste Management Plan (CDWMP) has been prepared by Waterman Moylan Consulting Engineers which may be used as a guide for the Main Contractor to prepare their Construction Waste Management Plan.

Operational waste management will be managed by the management companies on site and the appointed licenced waste contractor which will ensure the sustainable management of domestic and commercial waste arising from the development in accordance with legislative requirements and best practice standards.

14.1 Study Methodology

14.2.1 Desk Study

The methodology followed for this Chapter is in accordance with the EPA's "Environmental Impact Assessment Reports. Draft Guidelines 2017". Information on built assets in the vicinity of the development lands was assembled from the following sources:

- A Desktop review of ESB, GNI, Eir and Virgin utility network maps.
- Site inspection/walkover.
- Review of the topographical survey map.

14.2.2 Rating of Impacts

Material assets are generally considered to be location sensitive. The likely significance of all impacts is determined in consideration of the magnitude of the impact and the baseline rating upon which the impact has an effect. Having assessed the magnitude of impact with respect to the sensitivity/value of the asset, the overall significance of the impact is then classified as imperceptible, slight, moderate, significant, or profound.

14.2 Baseline Environment

14.3.1 Site Location and Context

The subject site is located at Broomfield, Malahide, Co. Dublin, as indicated in Figure 14.1, overleaf. The north site is bound to the west by Ashwood Hall residential development, to the east by the Dublin-Belfast rail line, the north by existing residential; units fronting Back Road, and to the south by agricultural land. The south site is bound to the west by Hazelbrook residential development, to the north by Brookfield residential development, to the east by agricultural land, and to the south by the Hazelbrook Stream.

The northern site will primarily be accessed via the existing junction to Back Road serving the Ashwood Hall residential development. The southern site was to be accessed from its northern boundary via the Brookfield residential development. Fingal County Council have requested as part of their Opinion Report to An Bord Pleanála, that an additional access will need to be provided for the southern site via the Hazelbrook residential development to connect to Kinsealy Lane. This instruction has been incorporated to the revised layout.

14.3 Electricity, Gas and Telecommunications

There is currently electricity, gas, and telecommunications utilities available to the site.

Based on the information received from ESB Networks (ESBN), the subject lands are traversed by existing ESB cables with overhead lines. Underground networks have been constructed to the existing residential developments adjacent to the subject site. There is an existing Gas network in the adjacent sites. The gas network to the adjacent site is served via a connection across Kinsealy Lane to the Sleepy Hollow residential development. In terms of telecommunications, it is known from Eir E-Maps that there are existing networks in the adjacent residential development, Back Road and Kinsealy Lane. Maps for the Virgin Media networks also inform of the same.

14.4 Waste Management

In terms of waste management, the receiving environment is defined by Fingal County Council as the Local Authority with responsibility for setting standards and targets and for monitoring/regulating waste management activities in the area, as set out by the management plan for the region. The Fingal County Development Plan 2017-2023 sets out these policies and objectives regarding waste management. In addition, waste operators already service the area as there are existing residential properties adjacent to the subject lands.

Figure 7. Existing ESB Network Layout

14.5 Potential Impact of the Proposed Project

This section provides a description of the potential impacts of the proposed Project may have during the Construction and Operational phases. The impact assessment addresses the *direct, indirect, cumulative, short, medium, and long term, permanent, temporary, positive, and negative effects.*

14.6 Construction Phase

Site Location and Context

The Construction phase will likely have a temporary impact on the existing settlement in the vicinity of the subject lands. There may also be some slight and temporary impacts to the existing population which may arise during the construction phase, refer to the following EIAR Chapters: population and human health, air quality, noise and vibration, and climate for further information.

Access

During the construction phase, access will be affected by hoarding and security fencing required onto the site boundary. A detailed traffic management plan will be prepared and implemented by the Main Contractor and agreed with the Local Authority prior to commencing works. As a result, there will be a temporary disturbance to traffic in the surrounding area during construction.

The number of construction vehicle movements anticipated is low compared to the number of trips expected to be generated by the proposed development during the operational phase. It should be noted that the majority of such vehicle movements would be undertaken outside of the traditional peak hours, and it is not considered that this level of traffic would result in any operational problems.

It is estimated that 75% of construction traffic will come from M50 / Swords and 25% from city centre / Baldoyle direction. Delivery trucks will be instructed to access the site via the main site access from Back Road. Flag men shall operate to ensure safe access and egress of HGV's. It is likely that construction will have a negligible impact on pedestrian and cycle infrastructure. It is proposed that a Construction Management Plan (CMP) would be prepared by the appointed contractor in order to minimise the potential impact of the construction phase of the proposed development on the safety and amenity of other users of the public road.

The proposal will also involve the provision of a new foul water line along Kinsealy Lane, under the road, which is in the charge of Fingal County Council. This will involve a temporary dig of the road and result in some traffic restrictions on a temporary basis. The impact of this would be temporary and slight.

Electricity, Gas and Telecommunications

Electricity will be required during the construction phase. In conjunction with the ESB, the provision of a temporary builders' power supply will be provided. There is potential for temporary impacts to the local electricity supply network, by way of disruption in supply to the local area during electricity connection works for the proposed Project. However, this is a potential impact which is likely to be neutral, slight, and temporary.

The supply of gas will not be operational during the construction phase of the proposed Project. There is potential for temporary impacts to the local gas supply network, by way of disruption in gas supply to the local area. However, this is a potential impact which is likely to be neutral.

Telecommunications will not be operational during the construction phase of the proposed Project. There is potential for temporary impacts to local supply, by way of disruption during connections works. However, this is a potential impact which is likely to be neutral, slight, and temporary.

Waste Management

The proposed Project will generate a range of waste materials during the excavation and construction phase as outlined in the Construction and Demolition Waste Management Plan that is prepared under separate cover as part of the planning application. Typical municipal waste will also be generated by construction works on sites such as food waste. Waste materials will be stored temporarily on site until such time as collection takes place by a licenced waste contractor. Dedicated, easily accessible locations for collection will be clearly identified across the construction sites.

If waste is not managed or stored appropriately, it is likely to give rise to litter and/or pollution issues on the construction sites and surrounding area. In addition, if unauthorised waste contractors were used, waste materials could be incorrectly managed and disposed of illegally and result in negative environmental impacts or pollution. Thus, all waste generated must be managed in accordance with regional and national waste legislation and taken to suitably registered and licenced waste facilities for processing, segregation, reuse, recycling, recovery, or disposal, as deemed appropriate. There are numerous licensed waste facilities in the region which can accept waste generated. The potential effect of construction waste generated from the proposed Project is considered to be short-term, not significant, and neutral. For further information, please refer to the Construction and Demolition Waste Management Plan (C&DWMP).

14.7 Operational Phase

Site Location and Context

The proposed development consists of a total of 415 residential units, comprising 252 houses, 28 duplex units and 135 apartments. The proposed development will also include the construction of a creche. The development includes all associated site works, boundary treatments, drainage, and additional service connections.

Access

The operational phase of the proposed Project will result in increased traffic volumes to the local road network, primarily the Back Road. A Traffic and Transport Assessment has been prepared and is submitted as part of the planning applications for the proposed Project. Please also refer to the Chapter on transport, included in this document for further information.

Electricity, Gas and Telecommunications

Electricity will be required during the operational phase. In conjunction with the ESB, the provision of supply will be facilitated. This will result in increased demand for electricity in the area. The potential impact from the operational phase is likely to be slight and long term.

The supply of gas will be required during the operational phase. In conjunction with Gas Networks Ireland, the provision of supply will be facilitated. The proposed Project will result in increased demand for gas in the area. The potential impact from the operational phase is likely to be moderate and long term.

Telecommunications will be required during the operational phase of the proposed Project. The proposed Project will result in increased demand for telecommunications in the area. The potential impact from the operational phase is likely to be neutral, imperceptible, and long term.

A utilities layout drawing has been prepared as part of the planning application with the appropriate services being designed as part of the proposed development.

Waste Management

Given the nature of the proposed Project i.e. a residential development comprising 415 no. new residential units and 1 no. childcare facility, waste materials during the operational phase will be generated. As Malahide is an established suburb of Dublin City, an existing network of waste collection, treatment and disposal contractors and facilities serve the area. If waste is not managed or stored appropriately, it is likely to give rise to litter and/or pollution issues. The implications of such are that vermin may be attracted to the immediate area as a result. In addition, if unauthorised waste contractors were used, waste materials could be incorrectly managed and disposed of illegally and result in negative environmental impacts or pollution. Thus, all waste generated must be managed in accordance with regional and national waste legislation and taken to suitably registered and licenced waste facilities for processing, segregation, reuse, recycling, recovery or disposal, as deemed appropriate. There are numerous licensed waste facilities in the region which can accept waste generated.

It is noted that appropriate waste storage areas have been incorporated into the design of the development with shared waste stores serving the apartments and duplex units while the houses will be provided with their own bin stores. The proposed development will also be managed by a Management Company ensuring that waste will be managed correctly. Waste materials generated will be segregated on site, where it is practical. Where the on-site segregation of certain waste types is not practical, off-site segregation will be carried out. There will be bins and receptacles provided to facilitate segregation at source. The appointed waste contractor will collect and transfer the wastes to the licensed waste facility. Waste contractors will be required to service the development on a regular basis each week. The potential effect of operational waste generated from the proposed Project is considered to be long-term, not significant and negative.

14.8 Avoidance, Remedial & Mitigation Measures

All possible precautions shall be taken to avoid unplanned disruptions to any services or utilities during the construction phase of the proposed Project. It should be noted that a number of mitigation measures proposed in other EIAR chapters are also of relevance to Material Assets and should be referred to when reading this EIAR.

The construction phase mitigation measures include, avoidance, reduction and remedy measures as set out within the Development Management Guidelines document. The design and construction of the necessary service infrastructure will be in accordance with relevant codes of practice and guidelines. As a result, this is likely to mitigate any potential impacts during the operational phase of the proposed Project. However, routine maintenance of the site services will be required from time to time, as such any mitigation measures will be advised by the relevant service provider.

A Preliminary Construction and Demolition Waste Management Plan (PC&DWMP) has been prepared to deal with waste generation during the construction phase of the proposed Project and is included as part of the application packs. This document was prepared in accordance with best practice guidelines. Operational waste management will be managed by a designated management company on site and the appointed licenced waste contractor which will ensure the sustainable management of domestic and commercial waste arising from the development in accordance with legislative requirements and best practice standards.

14.9 Predicted Impacts

If unregulated, predicted impacts associated with the construction phase of the proposed Project would be expected to include potential disruption to local natural and human material assets resulting in both short-term and long-term impacts. The implementation of the mitigation measures set out in this chapter and other chapters of this EIAR would ensure that there is unlikely to be significant residual impacts during the construction phase. Therefore, impacts are likely to be temporary and neutral. During the operational phase, the impact to services and utilities is considered to be positive and permanent positive to all end users.

14.10 Monitoring

Prior to the operational phase of the proposed Project, all services/utility connections will be tested by a suitably qualified professional under the supervision of the service provider.

Any monitoring of the built services required during the operational phase of the proposed Project will be as advised by the relevant service provider.

The management of waste during the construction and operational phases of the proposed Project should be monitored to ensure compliance with best practice and relevant legislative requirements.

14.11 Reinstatement

No reinstatement will be required regarding Material Assets. Residual impacts on services and utilities are considered to be imperceptible.

14.12 Interactions

The main interactions relating to Material Assets are water, air quality, and population and human health.

During the operational phase, the water supply and wastewater services will have a potential interaction with the available water supply and the potential emissions to the water cycle.

14.13 Difficulties Encountered in Compiling

The exact location of existing service infrastructure is reliant upon the records obtained, where relevant. Overall, no difficulties were encountered in compiling this chapter.

14.14 Cumulative Impacts

The assessment has considered cumulative impacts of construction and operational phases of the proposed Project, in conjunction with surrounding developments.

Considering the minimal use of material assets during the construction phase, there is no likely impact.

Multiple sites under construction at the one time may result in cumulative impacts in terms of noise and vibration during the construction period. However, such impacts are short term and neutral.

During the operational phase of the development there will be similar existing and residential developments in proximity to the proposed Project, such as at Ashwood Hall, Brookfield, and Hazelbrook, which will generate similar waste types. Authorised waste collectors will be required to collect segregated waste materials from multiple development which is likely to result in an improvement of efficiencies of waste collection and indeed is likely to result in an improvement in waste targets in line with national and local legislation. As such the long-term effect will be imperceptible and neutral.

14.15 'Do-Nothing' Impact

A 'do-nothing' scenario is not considered valid as the lands are currently zoned for development under the Fingal County Development Plan. However, if a do-nothing scenario were to occur, the lands would not be developed and therefore would be no adverse impacts to material assets. In the event that the proposed Project does not proceed, the lands would remain in its current condition in the short-term or until alternative development proposals are granted planning permission.

14.16 References

- Environmental Protection Agency (EPA), Guidelines on the information to be contained in Environmental Impact Statements (March 2002).
- Preliminary Construction and Demolition Waste Management Plan, Preliminary Construction Management Plan, and Traffic & transport Assessment Reports, prepared by Waterman Moylan Consulting Engineers.
- ESB Network Maps
- Virgin Media Network Maps
- GNI network Maps

- Eir online E-map Viewer

15.0 INTERACTIONS AND CUMULATIVE EFFECTS

The interaction of impacts, as considered in the EIAR, and their relationship to the information requirements outlined in the European Communities (Environmental Impacts Assessment) Regulations, are summarised as the following:

No.	Heading	Population and Human Health	Biodiversity	Land, Soils & Geology	Water	Air Quality	Noise & Vibration	Climate	Landscape & Visual Impact	Transportation	Cultural Heritage	Utilities & Waste
4	Population and Human Health				X	X	X			X		
5	Biodiversity				X				X	X		
6	Land and Soils											
7	Water		X	X								X
8	Air Quality	X					X			X		
9	Noise & Vibration	X				X				X		
10	Climate	X				X	X			X		
11	Landscape	X	X								X	
12	Traffic and Transport					X	X		X			
13	Cultural Heritage											
14	Utilities & Waste	X			X	X						

16.0 OVERALL IMPACT ON THE ENVIRONMENT

The Environmental Impact Assessment Report has assessed the characteristics of the proposal for significant environmental impacts. Each topic was examined and the resultant environmental impact, if any, noted and mitigation or reductive measures have been put in place. Whilst the development will give rise to some short-term environmental impacts which are adverse in nature (such as the impact on the landscape or noise activities during construction processes), it is considered that these are outweighed by positive impacts associated with the scheme. These include meeting housing needs, supporting the local economy, the delivery of community facilities as well as beneficial long-term impacts on the landscape. Equally, the development mitigates harm on traffic junctions through embedded and additional mitigation and the provision of linkages to public transport and adequate pedestrian and cyclist facilities as part of the proposed development, will result in a positive effect on sustainable transport modes. Accordingly, the proposed development will result in no significant negative long-term impacts on the environment as a result of the mitigation measures proposed as part of the design and at operation stage.

1.0 INTRODUCTION

1.1 Purpose of This Report

This Environmental Impact Assessment Report (EIAR) has been prepared in parallel with the preparation and formulation of a proposed Strategic Housing Development (SHD) on lands at Back Road and Kinsealy Lane, Kinsaley, Broomfield, Malahide, Co. Dublin (the application site).

The subject lands extend to approximately 12.5 hectares and are located off the Back Road and off Kinsealy Lane in the townlands of Kinsaley, Broomfield, Malahide, Co. Dublin, and within the administrative area of Fingal County Council. The subject site is situated 1.3 km to the south of the existing built-up area of Malahide. Access to the site is currently via an entrance off the Back Road, 0.55km east of the junction between Back Road and Kinsealy Lane. The overall proposed development is divided into 2 no. sites. The northern parcel is bound by Ashwood Hall to the west, the Dublin-Belfast rail line to the east, agricultural lands to the south, and by existing properties to the north. The southern parcel is bound by the Hazelbrook housing development to the west, Brookfield to the north and agricultural lands to the south and east.

The proposed development (the project) that is subject to this SHD application and EIAR provides for the construction of 415 no. residential dwellings, comprising 252 no. houses, 135 no. apartments, and 28 no. duplexes. The proposed development also provides for 1 no. childcare facility along with ancillary residential amenity facilities designed within the Apartment Block A&B of the proposed development.

1.2 Nature and Extent of Proposed Development

Birchwell Developments Ltd. (the applicant) intend to apply to An Bord Pleanála for planning permission for the following development, as described in the public notices:

> *"We, Birchwell Developments Ltd., intend to apply to An Bord Pleanála for permission for a strategic housing development on lands at Back Road and Kinsealy Lane, Kinsaley, Broomfield, Malahide, Co. Dublin. The northern lands are generally bound by Ashwood Hall to the west, and the southern lands are generally bound by Hazelbrook to the west and Brookfield to the north.*
>
> *The development will consist of the demolition of the former rugby clubhouse structure on site and the construction of a total of 415 no. residential units (252 no. houses, 135 no. apartments, and 28 no. duplex units); with 1 no. childcare facility and ancillary residential amenity facilities to be provided as follows:*
>
> - *252 no. residential houses (192 no. 3 bed units, 48 no. 4 bed units, 12 no. 5 bed units) in detached, semi-detached, mid-terraced and end-terraced houses ranging from two to three storey in height;*
> - *Apartment Blocks A & B are connected at ground and first floor level sharing an undercroft car park at ground floor level and a landscaped podium garden at first floor level, and contain a total of 110 no. units in 2 no. buildings ranging from one to five storeys in height, with Apartment Block A containing a total of 54 no. units*

comprising of 14 no. 1 bed units, 39 no. 2 bed units, and 1 no. 3 bed unit, and Apartment Block B containing a total of 56 no. units comprising of 14 no. 1 bed units, 40 no. 2 bed units, and 2 no. 3 bed units, with all units provided with private balconies/terraces; internal bicycle stores, bin stores and plant rooms at ground floor level; and on-street car parking and bicycle parking. Ancillary residential amenity facilities are also proposed including concierge/reception, meeting room, gym, and multi-purpose room;

- *Apartment Block C containing a total of 25 no. units comprising of 9 no. 1 bed units, 14 no. 2 bed units and 2 no. 3 bed units, with all units provided with private balconies/terraces, in a building four storeys in height; with on-street car parking and bicycle parking; with access to a communal bin store and bike store;*
- *Duplex Block D containing a total of 12 no. units comprising of 6 no. 2 bed units and 6 no. 3 bed units, with all units provided with private balconies/terraces, with a communal bin store and bike store; and 1 no. childcare facility with outdoor play area, all in a building ranging from one to three storeys in height; with residential on-street car parking; and childcare on-street drop-off area, car parking and bicycle parking;*
- *Duplex Block E containing a total of 8 no. units comprising of 4 no. 1 bed units and 4 no. 2 bed units, with all units provided with private balconies/terraces; in a three storey building; with a communal bin store and bike store, and on-street car parking;*
- *Duplex Block F containing a total of 8 no. units comprising of 4 no. 1 bed units and 4 no. 2 bed units, with all units provided with private balconies/terraces; in a three storey building; with a communal bin store and bike store, and on-street car parking.*

The development will provide for a total of 721 no. car parking spaces within the scheme; a total of 227 no. bicycle spaces serving the apartments, duplexes and childcare facility; proposed use of the existing vehicular access off Back Road (proposed vehicular access via Ashwood Hall and Brookfield) and proposed use of the existing vehicular access off Kinsealy Lane (proposed vehicular access via Hazelbrook); proposed upgrades to public realm including footpaths, landscaping including play equipment, boundary treatments, and public lighting; and all associated engineering and site works necessary to facilitate the development including proposed upgrade of part of the existing foul drainage network in Hazelbrook, and proposed connection and associated works to the existing foul network along Kinsealy Lane which will be upgraded under planning permission Reg. Ref. F21A/0451.

The application contains a statement setting out how the proposal will be consistent with the objectives of the Fingal Development Plan 2017-2023.

The application contains a statement indicating why permission should be granted for the proposed development, having regard to a consideration specified in section 37(2)(b) of the Planning and Development Act, 2000, as amended, notwithstanding that the proposed development materially contravenes a relevant development plan or local area plan other than in relation to the zoning of the land.

An Environmental Impact Assessment Report (EIAR) and a Natura Impact Statement (NIS) have been prepared in respect of the proposed development".

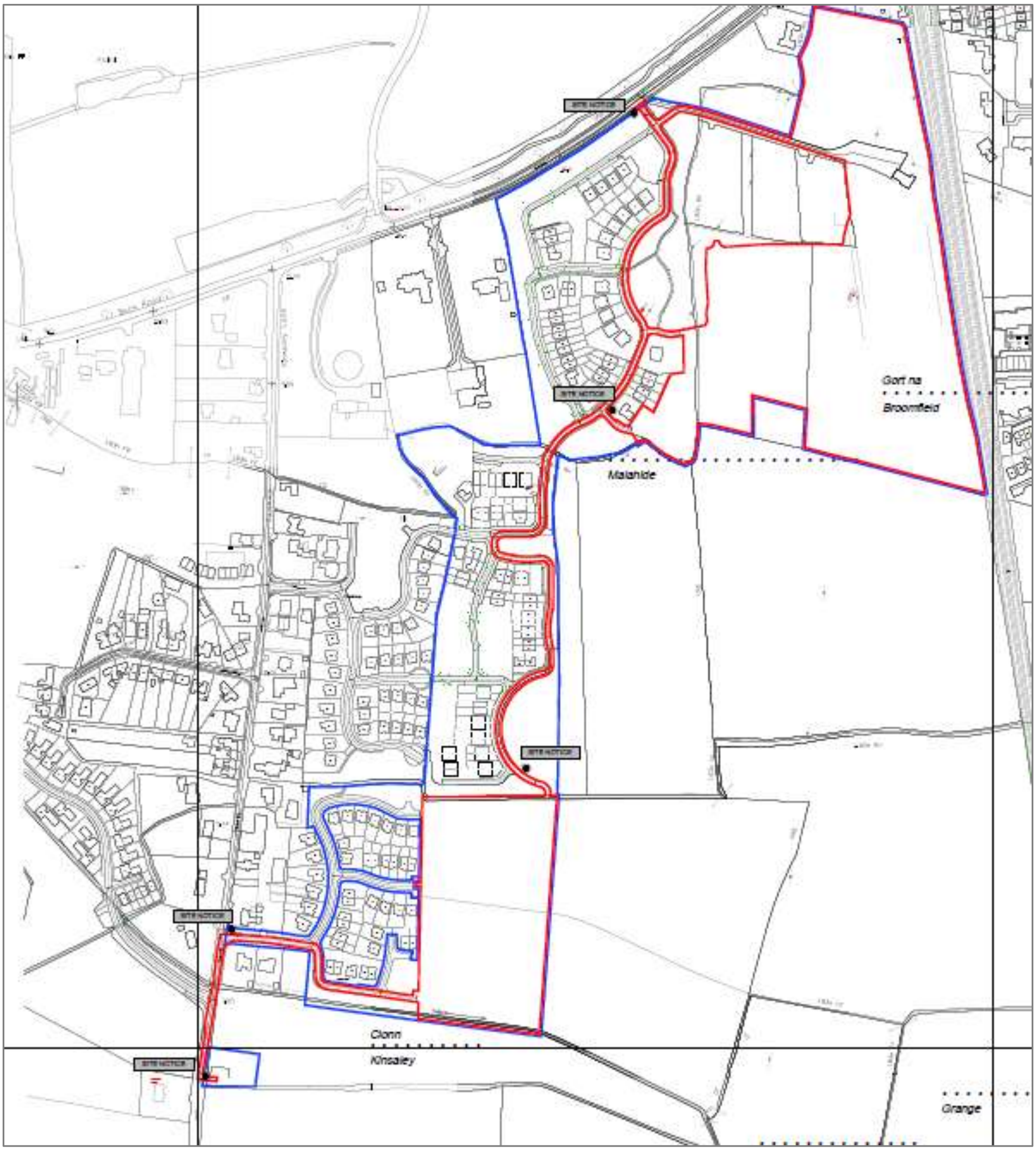

Figure 1.1. Site Location Map (full extent of application site outlined in red)

Figure 1.2. Approximate outline of Developable Site Boundary and Aerial View (source: Google Maps)

1.3 EIA Process

The requirements for an Environmental Impact Assessment (EIA) of development proposals (projects) are governed by Directive 2014/52/EU, which amends the previous EIA Directive (Directive 2011/92/EU). The primary purpose of an EIA is to ensure that certain projects that are likely to have significant effects on the environment are subjected to an assessment of their likely environmental impacts. The EIA process itself forms part of the planning consenting process and is carried out by the Competent Authority (An Bord Pleanála in this instance).

An EIAR is prepared by and on behalf of an applicant/developer in respect of development proposal / project that they are seeking planning consent/permission. Therefore, the EIAR becomes a central element that informs the Competent Authority's determination of the planning permission.

The 2014 Directive introduced strict requirements in respect of the competency of experts responsible for the preparation of the EIAR. It is possible to summarise the EIA process as follows:

1. Screening - Is EIA required?
2. Scoping - If EIA is required, what aspects of the Environment should be considered?
3. Preparation of EIAR.
4. EIAR informs EIA (as part of the consent process).

1.4 The Need for an Environmental Impact Assessment Report

The EIA Directive was transposed into Irish Planning Legislation on 1st September 2018. Section 172(1) of the Planning and Development Act 2000 (as amended) sets out the requirement for EIA. This current proposed project has been screened for EIA in accordance with the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018).

The EIA Directives list those projects for which an EIA is mandatory (Annex I) and those projects for which an EIA may be required (Annex II). Annex I projects are listed in Part 1 of Schedule 5 of the Planning and Development Regulations 2001 (as amended, 'the Regulations'). The Project is not listed within Part 1 of Schedule 5 of the Regulations and therefore mandatory EIA is not required under Annex 1. With respect to Part 2 of Schedule 5 (Annex II) Projects, the relevant thresholds relating to the subject proposal are outlined below:

- **Class 10(b)(i) "Construction of more than 500 dwelling units"**: This project (the proposed development) comprises a residential development including the provision of 415 no. new residential dwelling units and a childcare facility. Therefore, the Project falls below the stated threshold, and an EIA is not required on this basis.

- **Class 10(b)(ii): "Construction of a car-park providing more than 400 spaces, other than a car-park provided as part of, and incidental to the primary purpose of a development.":** The project (the proposed development) does not include a car park providing 400 no. spaces or more. Furthermore, all car parking being provided within the project is incidental to the primary purpose of the residential development. Therefore, the car parking element of the project does not fall within this Class of Regulations. An EIA is not required on this basis.

- **Class 10(b)(iv): "Urban development which would involve an area greater than 2 hectares in the case of a business district, 10 hectares in the case of other parts of a built-up area and 20 hectares elsewhere".** In this instance, the application site extends to c. 12.5 hectares within what can be considered a built-up area. An EIA is required on this basis and, as a consequence, an EIAR has been prepared to accompany the planning application.

This EIAR has been prepared in accordance with the requirements of the following statutory documents:

- *The European Community Directive on Environmental Impact Assessment (No 85/337/EEC);*
- *The European Community Directive (97/11/EC) amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment;*
- *The Planning and Development Act, 2000 (as amended);*
- *The Planning and Development Regulations 2000 (as amended);*
- *European Commission, Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (May 1999);*
- *European Commission, Guidance on EIA Screening (June 2001);*
- *European Commission, Guidance on EIA Scoping (June 2001);*
- *Environmental Protection Agency (EPA), Guidelines on the information to be contained in Environmental Impact Statements (March 2002);*
- *EPA, Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) (September 2003);*

- *EPA, Guidelines on the Information to be contained in Environmental Impact Assessment Reports (August 2017);*
- *EPA, Advice notes for preparing Environmental Impact Statements Draft (September 2015);*
- *European Commission, Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (April 2013)*
- *Circular Letter Pl 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive)*
- *The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018); and,*
- *The Guidelines for Planning Authorities and An Bord Pleanála on Carrying Out Environmental Impact Assessment (August 2018).*

The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) transposed the requirements of the 2014 EIA Directive into Irish Planning Law. On 1st September 2018, the provisions of the Regulations came into effect. This EIAR has been prepared in light of these EIAR Regulations and has also had specific regard to the *'Guidelines for Planning Authorities and An Bord Pleanála on Carrying Out Environmental Impact Assessment'* which were published in August 2018.

1.5 Scope of Environmental Impact Assessment Report

The scope of this EIAR has had regard to the following:

- Guidelines on the recommended information to be contained in EIAR, which have been published by the EPA (March 2022, September 2003, September 2015, and August 2017);
- The requirements of Part X of the Planning and Development Act, 2000 (as amended) and also Part 10 of the Planning and Development Regulations, 2001 (as amended);
- The requirements of the Fingal Development Plan 2017-2023;
- The location, scale, and nature of the proposed development;
- The receiving environment and any vulnerable or sensitive local features and current uses;
- Previous planning applications that have been submitted on lands adjoining the subject site;
- The likely and significant impacts (including interactive effects, indirect and cumulative effects) of the proposed development on the environment; and,
- Available mitigation measures (including mitigation embedded in the project design) for reducing or eliminating any potential undesirable impacts.

Other assessments made pursuant to EU legislation have been considered for this EIAR, however, these have been ruled out as irrelevant for this chapter, which include, the Environmental Noise Directive (2002/49/EC) and the Strategic Environmental Assessment Directive (2001/42/EC).

1.6 Structure of Environmental Impact Assessment Report

An EIAR is a process of examining and assessing the environment in tandem with a proposed development in a series of loops and flow systems to ensure that all potential environmental impacts are documented and taken into consideration in the overall formulation of the proposed development inter alia through the design process. This process allows for the creation of a series of steps in the assessment of potential impacts on various elements of the environment.

The overall structuring of this EIAR has regard to the information requirements of the Directives and Irish Statutory Law and Regulations. In accordance with the statutory regulations, a Non-Technical Summary has been prepared and is included as part of this EIAR. The structure used in this report is a grouped format structure in the form of chapters that examine the broadened scope of environmental considerations introduced by the 2014 Directive.

The structure of this EIAR is based on the requirement to provide a detailed and systematic analysis of the environment at the subject lands and the potential impacts of the development; proposed mitigation measures and future monitoring of environmental indicators.

1.7 The EIAR Study Team

This EIAR has been prepared by an experienced and suitably qualified team of consultants led by Downey Planning. The table below provides information on the members of the EIAR study team and their respective inputs within the report.

Table 1.1 The EIAR Study Team

Name	Role
Downey Planning John Downey, Planning Consultant, BA (Hons), MRUP, MBA, MIPI, MRTPI – 25 years' experience & Eva Bridgeman, Planning Consultant BA (Hons), MRUP, MIPI – 10 years' experience	EIAR Project Managers & Planning Consultants Preparation of the following EIAR chapters: ▪ *Chapter 1: Introduction* ▪ *Chapter 2: Description of Project & Alternatives Considered* ▪ *Chapter 3: Planning and Development Context* ▪ *Chapter 4: Population & Human Health* ▪ *Chapter 15: Interactions* ▪ *Chapter 16: Summary of Mitigation & Monitoring Measures* ▪ *Compilation of EIAR and NTS*
MCORM Architects Stephen Manning, MRIAI	Preparation of the following EIAR chapters: ▪ *Chapter 2: Description of Project & Alternatives Considered* ▪ *Chapter 16: Summary of Mitigation & Monitoring Measures*
Waterman Moylan Consulting Engineers Mark Duignan, Associate Director, Engineer, MA BAI CEng MIEI	Preparation of the following EIAR chapters: ▪ *Chapter 6: Land and Soils* ▪ *Chapter 7: Water* ▪ *Chapter 12: Traffic & Transport* ▪ *Chapter 14: Utilities & Waste* ▪ *Chapter 16: Summary of Mitigation & Monitoring Measures*

KFLA Landscape Architects Kevin Fitzpatrick, MILI	Preparation of the following EIAR chapters: ▪ *Chapter 11: Landscape and Visual Impact Assessment* ▪ *Chapter 16: Summary of Mitigation & Monitoring Measures*
Dermot Nelis Archaeology Dermot Nelis, BA ArchOxon AIFA MIAI	Preparation of the following EIAR chapters: ▪ *Chapter 13: Cultural Heritage* ▪ *Chapter 16: Summary of Mitigation & Monitoring Measures*
Faith Wilson Ecological Consultant Ecological Consultant BSc CEnv MCIEEM	Preparation of the following EIAR chapters: ▪ *Chapter 5: Biodiversity* ▪ *Chapter 16: Summary of Mitigation & Monitoring Measures*
AWN Consulting Ciara Nolan, Environmental Consultant, BSc MSc AMIAQM AMIEnvSc Leo Williams BAI MAI PgDip AMIOA, Acoustic Consultant	Preparation of the following EIAR chapters: ▪ *Chapter 8: Air Quality* ▪ *Chapter 9: Noise & Vibration* ▪ *Chapter 10: Climate* ▪ *Chapter 16: Summary of Mitigation & Monitoring Measures*

The development is being proposed by Birchwell Developments Ltd., Kinsealy Hall, Kinsealy, Co. Dublin (the applicant).

1.8 Impartiality

This EIAR has been prepared in reference to a standardised methodology that is accepted and acknowledged universally. Competently qualified and experienced specialists have been used throughout the EIA process in order to ensure that this document is robust, subjective, and impartial.

1.9 Statement of Difficulties Encountered

No exceptional difficulties were experienced in compiling this EIAR. However, where difficulties and limitations have been encountered by the study team, this shall be stated within the relevant section(s) of the EIAR.

1.10 Errors

Every effort has been made to ensure that the EIAR is error-free and accurate. However, there may be instances within the document where typographical errors or minor errors may occur. Where minor in nature, any such cases are unlikely to have any material impact on the overall and final findings contained in the EIAR.

1.11 References

A reference list detailing the sources used for the descriptions and assessment has been included with each chapter, where necessary.

2.0 DESCRIPTION OF PROJECT & ALTERNATIVES CONSIDERED

2.1 Site Location

The subject site is located off Back Road and off Kinsealy Lane, in the townlands of Kinsaley, Broomfield, Malahide, in the northern periphery of Dublin and within 12 km distance from its city centre. The site is located within the administrative boundaries of Fingal County Council.

With an approximate area of 12.5 ha, the subject site is situated within the development boundary of Malahide. The proposed development appears to be a natural extension to two adjoining, existing developments currently under construction by the same applicant (Birchwell Developments Ltd.), namely Ashwood Hall and Brookfield. These two schemes were planned and are being delivered as part of the development of the Broomfield lands which were subject to the objectives of the Broomfield Local Area Plan (LAP) 2010. The proposed development will represent the completion of the developable lands originally envisaged for residential development within the LAP. Access to the site is currently via an entrance off the Back Road, 0.55km east of the junction between Back Road and Kinsealy Lane. The overall proposed development is divided into 2 no. sites. The northern parcel is bound by Ashwood Hall to the west, the Dublin-Belfast rail line to the east, agricultural lands to the south, and by existing properties to the north. The southern parcel is bound by Hazelbrook to the west, Brookfield to the north and agricultural lands to the south and east.

Figure 2-1. Site Context Diagrammatic

The land uses surrounding the site are generally residential. Malahide Castle and Demesne is located 800m to the north of the subject site and can be accessed via Back Road. To the northeast of the site is Malahide DART Station (1.3km) and Malahide Beach (1.8km). Malahide Golf Club is also located c.1.5 km to the south of the site. Malahide village centre is located to the north-east of the subject lands (1.3km) and provides a wide array of shops and services. The site enjoys excellent connectivity to Dublin City Centre via Dublin Bus services that run along Malahide Road, as well as commuter services from Malahide DART Station. The site in its context is depicted on Figure 2-1.

2.2 Site Description

With an approximate area of 12.5 hectares, the site splits into two distinct sections; the northern land parcel which is generally bound by the railway track to the east, Ashwood Hall to the west and agricultural lands to the south, and the southern land parcel which lies to the east of Hazelbrook and to the south of Brookfield. The surrounding area is predominately characterised by residential development and agricultural land. The application site is spread across irregularly shaped fields, with the northern lands partly framed by existing field boundaries of trees and hedgerow.

It is important to note that Malahide Demesne, the castle, and gardens, are located immediately to the north of the site on the opposite side of Back Road, which has created a sylvan character of the landscape forming part of the site. Furthermore, the agricultural lands to the south have provided a strong visual amenity for the residents in the area, with a significant number of the dwellings planned to have a pleasant aspect overlooking these lands.

Figure 2-2. Aerial View of the Application Site (approximate boundaries of the subject site outlined in red)

2.3 Description of the Design

It was determined that in addition to the Fingal County Council zoning objectives pertaining to the subject site, the design was also guided by the relevant national, regional, and local policy documents and guidelines. Full details in this regard can be found in Chapter 3.0 (Planning and Development Context) of this EIAR. Furthermore, the design brief for the development proposal was set to create an exemplar of sustainable design to ensure all new development can be delivered in a manner that protects and enhances the biodiversity of the local environment, mitigates climate change, and delivers high energy efficiency in accordance with NZEB strategies in all typologies.

2.4 Description of Proposed Development

The proposed development subject to this Strategic Housing Development (SHD) application provides for the demolition of the former rugby clubhouse structure on site and the construction of 415 no. residential dwellings, comprising of 252 no. houses, 135 no. apartments, and 28 no. duplexes. The proposed development also provides for 1 no. childcare facility along with ancillary residential amenity facilities and numerous pocket parks and communal open spaces across the subject lands, with car parking and bicycle parking spaces also proposed, and all associated ancillary site development infrastructure works necessary to facilitate the development. Furthermore, the proposed development provides for proposed use of the existing vehicular access off Back Road (proposed vehicular access via Ashwood Hall and Brookfield) and proposed use of the existing vehicular access off Kinsealy Lane (proposed vehicular access via Hazelbrook.

Figure 2-3. Proposed Site Layout (source: MCORM Architects)

The form and buildings envelope of the proposed residential scheme will range from conventional own door housing on own curtilage to three-storey duplex blocks and four to five-storey apartment buildings, which have been designed for to provide an appropriate variation from the surrounding residential areas, to create a legible development with various character areas, respectful of the site setting. Design and materials will be of high quality and there will be a mixture of unit configurations across the site to avoid a homogenous block appearance and to facilitate the various types of people and families that will ultimately occupy the units. It is proposed to provide a mix of one, two, and three-bed apartments, one, two, and three-bed duplexes, and three, four, and five-bed houses providing for a mix of units.

2.5 Characteristics of the Proposed Development

The following provides a detailed overview of the characteristics of the proposed SHD.

2.5.1 Site Location

The proposed development is located on lands at Back Road and Kinsealy Lane, Kinsaley, Broomfield, Malahide, Co. Dublin, and within the administrative area of the Fingal County Council.

2.5.2 Site Area

The site subject to this SHD application extends to an area of approximately 12.5 hectares which also includes the access road and proposed engineering upgrade works, however, the quantum of developable land for the provision of housing and directly associated uses stands at 11.1 hectares (the developable site area).

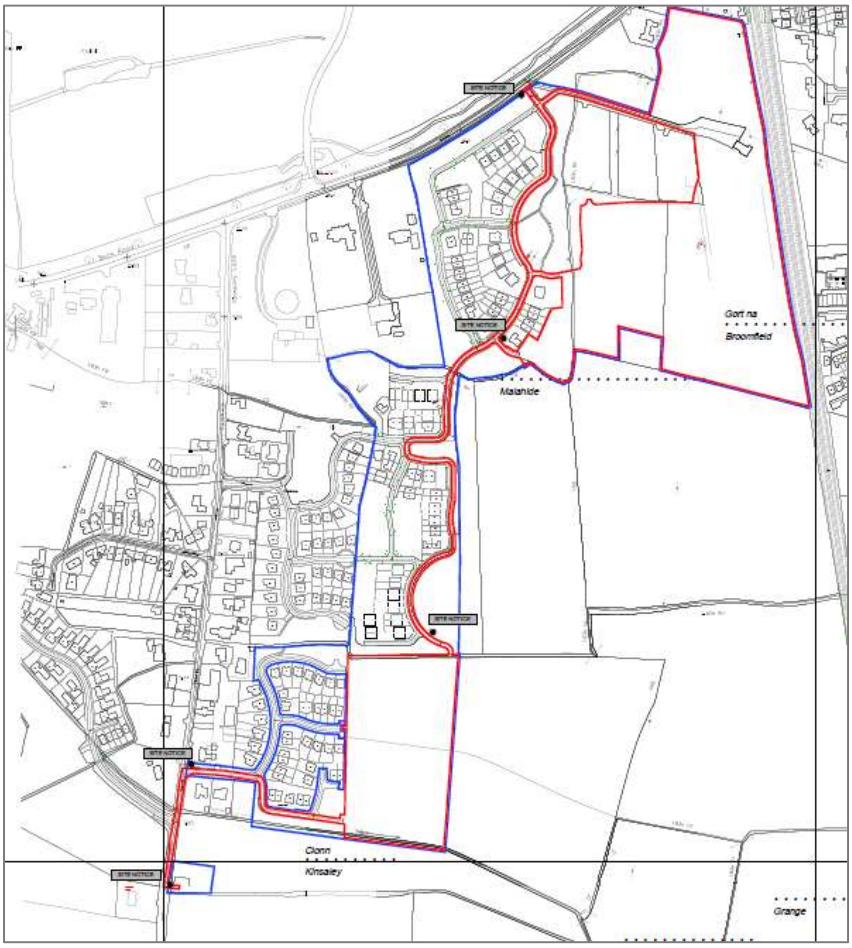

Figure 2-4. Site Boundaries (source: MCORM Architects)

2.5.3 Density of Development

As outlined earlier, the application site extends to approximately 12.5 hectares, however, the quantum of developable land for the provision of housing and directly associated uses stands at 11.1 hectares. The Development Plan provides that the number of dwellings to be provided on a site should be determined with reference to the '*Sustainable Residential Development in Urban Areas – Guidelines for Planning Authorities*' (2009). As a general principle and to promote sustainable forms of development, higher residential densities will be promoted within walking distance of town and district centres and high-capacity public transport facilities.

With respect to the overall proposed number of units at 415 dwellings, the proposed development provides for a sustainable development with an overall net density of c. 37 dwellings per hectare, on appropriately zoned lands within the development boundary of Malahide and therefore accords with the density requirements of both the Development Plan and national guidelines. This has been calculated according to the provided guidance on Appendix A of the "*Sustainable Residential Development in Urban Areas and Best Practice Urban Design Guidelines (2009)".*

Overall Site Area Subject to this SHD Application: 12.5 ha
Net Site Area: 11.1 ha
Net Density: 415 units ÷ 11.1 ha = 37.4 uph

The residential density of the proposed development is therefore in keeping with the DEHLG Guidelines on "*Sustainable Residential Development in Urban Areas and Best Practice Urban Design Guidelines (2009)"* and accompanying Design Manual (Best Practice Urban Design Manual, May 2009).

In light of the objectives and constraints associated with the development site, it is considered that the density proposed represents a sustainable and efficient use of the subject lands.

2.5.4 Detailed Description of Proposed Development

The proposed development, as per the description contained within the statutory planning notices, provides for:

> *"The development will consist of the demolition of the former rugby clubhouse structure on site and the construction of a total of 415 no. residential units (252 no. houses, 135 no. apartments, and 28 no. duplex units); with 1 no. childcare facility and ancillary residential amenity facilities to be provided as follows:*
>
> - *252 no. residential houses (192 no. 3 bed units, 48 no. 4 bed units, 12 no. 5 bed units) in detached, semi-detached, mid-terraced and end-terraced houses ranging from two to three storey in height;*
> - *Apartment Blocks A & B are connected at ground and first floor level sharing an undercroft car park at ground floor level and a landscaped podium garden at first floor level, and contain a total of 110 no. units in 2 no. buildings ranging from one to five storeys in height, with Apartment Block A containing a total of 54 no. units comprising of 14 no. 1 bed units, 39 no. 2 bed units, and 1 no. 3 bed unit, and Apartment Block B containing a total of 56 no. units comprising of 14 no. 1 bed units, 40 no. 2 bed units, and 2 no. 3 bed units, with all units provided with private balconies/terraces; internal*

bicycle stores, bin stores and plant rooms at ground floor level; and on-street car parking and bicycle parking. Ancillary residential amenity facilities are also proposed including concierge/reception, meeting room, gym, and multi-purpose room;

- *Apartment Block C containing a total of 25 no. units comprising of 9 no. 1 bed units, 14 no. 2 bed units and 2 no. 3 bed units, with all units provided with private balconies/terraces, in a building four storeys in height; with on-street car parking and bicycle parking; with access to a communal bin store and bike store;*
- *Duplex Block D containing a total of 12 no. units comprising of 6 no. 2 bed units and 6 no. 3 bed units, with all units provided with private balconies/terraces, with a communal bin store and bike store; and 1 no. childcare facility with outdoor play area, all in a building ranging from one to three storeys in height; with residential on-street car parking; and childcare on-street drop-off area, car parking and bicycle parking;*
- *Duplex Block E containing a total of 8 no. units comprising of 4 no. 1 bed units and 4 no. 2 bed units, with all units provided with private balconies/terraces; in a three storey building; with a communal bin store and bike store, and on-street car parking;*
- *Duplex Block F containing a total of 8 no. units comprising of 4 no. 1 bed units and 4 no. 2 bed units, with all units provided with private balconies/terraces; in a three storey building; with a communal bin store and bike store, and on-street car parking.*

The development will provide for a total of 721 no. car parking spaces within the scheme; a total of 227 no. bicycle spaces serving the apartments, duplexes and childcare facility; proposed use of the existing vehicular access off Back Road (proposed vehicular access via Ashwood Hall and Brookfield) and proposed use of the existing vehicular access off Kinsealy Lane (proposed vehicular access via Hazelbrook); proposed upgrades to public realm including footpaths, landscaping including play equipment, boundary treatments, and public lighting; and all associated engineering and site works necessary to facilitate the development including proposed upgrade of part of the existing foul drainage network in Hazelbrook, and proposed connection and associated works to the existing foul network along Kinsealy Lane which will be upgraded under planning permission Reg. Ref. F21A/0451."

2.5.5 Demolition Works

In order to facilitate the new residential development, the proposed development would also involve a certain amount of demolition works, i.e., demolition of the former clubhouse building on the site. This is outlined in more detail in the Preliminary Construction Demolition Waste Management Plan, prepared by Waterman Moylan Consulting Engineers, which accompanies this planning application.

2.5.6 General Layout

The site layout has been developed in the context of the surrounding built environment and particularly within the context of the wider Broomfield lands. The proposed scheme essentially represents the completion of the developable lands within Broomfield and appears to be a natural extension to the Ashwood Hall and Brookfield developments which are currently under construction and partly occupied. The proposed layout connects well with the existing and/or under construction developments and links into the street and open space networks already established in the area. The proposed layout also relies on established urban design principles, in order to create people-friendly spaces to socialise and move throughout in an easy and logical way, conceiving the public realm as the extension of the home.

Furthermore, the development is laid out in residential clusters and urban blocks to establish distinct character areas across the lands. The layout of the scheme has been designed to promote permeability and openness through the site and across to the Malahide Demesne and Malahide town centre. Moreover, many well-landscaped pocket parks, smaller open spaces and pedestrian/cycling links are provided throughout to support visual amenity. Existing trees and/or hedgerows have been retained where viable and have been fully integrated into the overall landscape strategy.

The location of the childcare facility is centrally placed in the northern parcel of the development, adjacent to the main park, allowing for an easy drop off for both residents of the scheme and clients from neighbouring schemes that may wish to use the facility, as well as it contributes to increasing the activity in this key point of the scheme.

2.5.7 Building Height and Form

The height of the proposed development will range from conventional two-storey housing to three-storey duplex blocks and four to five-storey apartments which offer a harmonic landscape based on a clear pattern of housing cells arranged around a legible street and open space hierarchy, in which interest areas stand out due to prominent build forms.

This variation in height supported by the mix of housing types would also assist in establishing different character areas. It is important to note that the variety and diversity of unit mix would also provide for the variety of housing that is required by the housing market, on an inclusive basis, and achieve robustness, in terms of adaptability and variation over time.

The proposed compact urban form allows for apartments and duplex units to be stitched into streetscapes that are legible and characterised by traditional terraces of housing to ensure the delivery of a total number of dwellings significant enough to sustain the existing and future road and drainage infrastructure and neighbourhood facilities of Malahide.

It is noted that the heights being proposed are suggested to be consistent with national planning guidelines, particularly the '*Urban Development and Building Heights Guidelines for Planning Authorities (December 2018)'.*

2.5.8 Open Space

The landscape strategy aims to integrate the proposed residential development with the existing landscape and create a network of attractive and useable open spaces while contributing to local biodiversity. The public green areas are designed as landscape spaces that offer the opportunity for meeting, walking and formal and informal play. The protection and enhancement of existing landscape features, notably existing trees and hedgerows is an important aspect of the overall strategy. The landscape strategy was also informed by the adjoining developments under construction, namely Ashwood Hall and Brookfield, to form an interlinked well-integrated network of green infrastructure across the Broomfield LAP lands.

In the lands adjoining Ashwood Hall, western open spaces relate with a compacter-built fabric. The envisaged central park is defined by the apartment blocks and the duplex linear block located south side, whilst the landscaped area north side contributes to generating a transition between the principal area of the scheme and its northern edge, with a 4-storey apartment block as a key visual feature that contributes to way-finding throughout the local dynamic and fluid public realm thereby projected. Eastern open spaces relate to the previously designed park of Ashwood Hall development, thus connecting with the neighbouring green infrastructure and, particularly, with Malahide Castle and Gardens. The scheme provides for continuity of the central green spine between Ashwood Hall and this new neighbourhood as it proposes landscaped areas south side that open to the existing agricultural lands, thus generating a positive tension between the Malahide Demesne and the southern built fabric throughout the Back Road adjacent developments.

Along with the aforementioned, the proximity of the Dublin-Belfast railway infrastructure has been taken as an opportunity to propose a linear park adjacent to this infrastructure in the form of a continuous pedestrian and cycle link along its length, as per Fingal County Council objectives at this location. This provides a strong amenity feature, enhances permeability, and creates an attractive landscaped buffer between the buildings proposed and the railway line, which acts as an acoustic barrier and improves the urban image on this edge of the scheme.

As per the following Table, the proposed development provides for an overall of c. 1.35 ha public open space, comprising of both Class 1 and 2 public open spaces, as specified within the Fingal Development Plan. With respect to the developable site area of 11.1 ha, this would provide for 12% public open space provision which exceeds the threshold envisaged in the Development Plan.

Table 2-1. Public Open Space Provision within the Proposed Development

Public Space Provision	Area 1: 2,940 sqm Area 2: 2,250 sqm Area 3: 919 sqm Area 4: 2,830 sqm Area 5: 1,357 sqm Area 6: 470 sqm Area 7: 414 sqm Area 8: 1,350 sqm Area 9: 510 sqm Area 10: 460 sqm
Total	**13,500 sqm (1.35 ha)**

A detailed landscape plan has been prepared by KFLA Landscape Architecture which accompanies the application for the proposed development. The design of the development has been carefully considered with the public open space integrated as part of the development proposal that will cater for the residents of the subject site and the immediate local area.

The proposed amenity spaces also benefit from passive surveillance from the proposed residential units and are carefully screened to permit visual transparency between the buildings while maintaining security for residents. Where deemed appropriate corner residential units with gable windows have been located at prominent points to address public areas and further enhance passive surveillance. Landscape design will play an important role in marrying the external amenity spaces and creating a visual continuity between the scheme and its wider context.

In addition to the above, each residential unit benefits from the provision of adequately sized private open space in the form of gardens, balconies, or patios/terraces (designed in accordance with quantitative and qualitative standards), with the units at ground floor level provided with appropriate boundary treatments to ensure privacy and security whilst also providing visual interest and distinction between spaces. Appropriate separation distances have been provided between buildings to ensure privacy without compromising the internal residential amenity of the apartments.

Private open space has been provided for all houses by way of private gardens to the rear or side of a house, or balconies/terraces for the apartments. This meets and/or exceeds the requirements of the Fingal County Development Plan as shown on the compliance schedule/residential quality audit provided with this planning application. Note that the provision for private open spaces for the apartments is also in full compliance with the requirements of both the Fingal County Development Plan and Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities 2020.

2.5.9 Drainage Infrastructure

Proposed Foul Water

It is proposed to drain wastewater from the proposed development in a south-westerly direction by gravity through a series of 150mm, 225mm, & 300mm diameter sewer networks to the existing sewer network in the Ashwood and Hazelbrook developments. It is further proposed to upgrade part of the existing foul drainage network in the Hazelbrook development from a 225mm to a 300mm diameter pipe network. This will continue to drain by gravity to the existing public sewer in Kinsealy Lane, which in turn currently discharges to Connolly Avenue Pumping Station. As part of the construction of the Castleway pumping station, this foul water sewer is proposed to be diverted from Connolly Avenue pumping station to the Castleway pumping station.

The existing foul networks in the adjacent residential developments, have been appropriately designed and constructed, including spurs for connection points, to accommodate the future connection of the proposed development. Letters of consent from the adjacent development owners have been obtained permitting connections to these privately owned networks. Please refer to the accompanying submission from Downey Planning for copies of the Letters of Consent.

The proposed internal foul drainage network has been designed and sized in accordance with the Irish Water code of Practice for Wastewater Infrastructure and Standard Details. Please refer to Drawing numbers: 18-091-P201 to P206, which show the proposed foul drainage layout, and existing foul water networks in adjacent estates, and subsequent route to the Castleway pumping station.

A Statement of Design Acceptance has also been issued by Irish Water and is provided in Appendix B of the Engineering Assessment Report which accompanies the application.

Proposed Surface Water

It is proposed to drain surface water from the north site via a series of sewers ranging from 150mm to 600mm diameter to outfall to the existing drainage ditches to the south-west. The northern site has been subdivided to 6 sub-catchments, each with its own attenuation tank.

The south site will have surface water drainage pipes with diameters ranging from 150mm to 450mm, and has 2 outfalls, 1 to the ditch on the northern boundary and the other to Hazelbrook Stream on the southern boundary. It has 2 sub-catchments each with its own attenuation tank.

A new headwall will be constructed at each of the outfalls, and a Class A petrol interceptor will be installed immediately prior to this.

The proposed development incorporates a Storm Water Management Plan through the use of various SuDS techniques. Treatment and storage of surface water at source will intercept and slow down the rate of runoff from the site to the existing surface water sewer system.

Based on three key elements, Water Quantity, Water Quality and Amenity, the targets of the SuDS train concept have been implemented in the design. The SuDS devices proposed around the site include permeable paving, filter drains, green/sedum roofing, bio-retention systems/raingardens, roadside trees, swales, attenuation tanks, flow control devices and petrol interceptors.

Attenuation storage is provided to limit the discharge rate from the site into the public network. As per the GDSDS, the required attenuation volume is calculated assuming 100% runoff from paved areas, and has been calculated for the 1-year, 30-year and 100-year return periods, identifying the critical storm for each. To achieve the required attenuation volume, the sites (north and south) have been divided into eight separate sub-catchments.

All catchments will be attenuated in underground storage tanks. This was discussed and agreed with Fingal County Council water and drainage departments in an online meeting on the condition that more surface SuDS were to be incorporated to benefit biodiversity. These additional surface SuDS, most notably swales, have been introduced to the revised surface drainage design.

The tanks proposed to serve the apartment blocks will remain under private management.

Surface water runoff will be restricted via a hydro-brake or similar approved flow control device, limited to the greenfield equivalent runoff rate for each catchment.

The proposed new surface water drainage network is shown on the drainage layout drawings, 18-091-P200, P201, P202, P203, & P205.

Potable Water

It is proposed to supply water to the north site via 3 no. connections to the 3 no. spurs constructed as part of the Ashwood Hall Development in anticipation of the proposed development. Similarly, it is proposed to serve the south site utilising 3 of the 5 no. existing spurs (1 no. spur from Brookfield Residential Development, and 2 no. of the 4 no. spurs from the Hazelbrook Residential Development). Etters of consent have been obtained from the network owners permitting these proposed connections.

The proposed network, for both the north and south sites, comprises of a 150mm trunk watermain running along the main access roads, with a series of 100mm diameter branches serving lower density residential streets. The proposed new connections and watermain network, and the existing networks in the adjacent sites are shown on the watermain layout drawings, 18-091-P300 to P306.

For further details and information in this regard, please refer to the enclosed Engineering Assessment Report prepared by Waterman Moylan Consulting Engineers and provided with this planning application.

2.6 Construction and Sequencing

The proposed development will be constructed as follows:

2.6.1 Area 1

This area corresponds to the southern portion of the subject site and would include delivery of an overall total of 87 no. units comprising of 16 no. duplexes and 71 no. houses. The development of this portion of the lands will suppose the consolidation of the residential pattern in the area, as an extension of Hazelbrook and Brookfield developments.

2.6.2 Area 2

This area comprises the southern portion of the northern lands, including the block of duplexes and crèche plus the housing cells most adjacent to the agricultural lands at that location. This includes delivery of an overall total of 110 units comprising of 12 no. duplex units and 98 no. houses.

2.6.3 Area 3

This final area of development comprises of northern portion of the lands and would include delivery of an overall total of 218 units comprising of 131 no. apartments, 4 no. duplexes, and 83 no. houses.

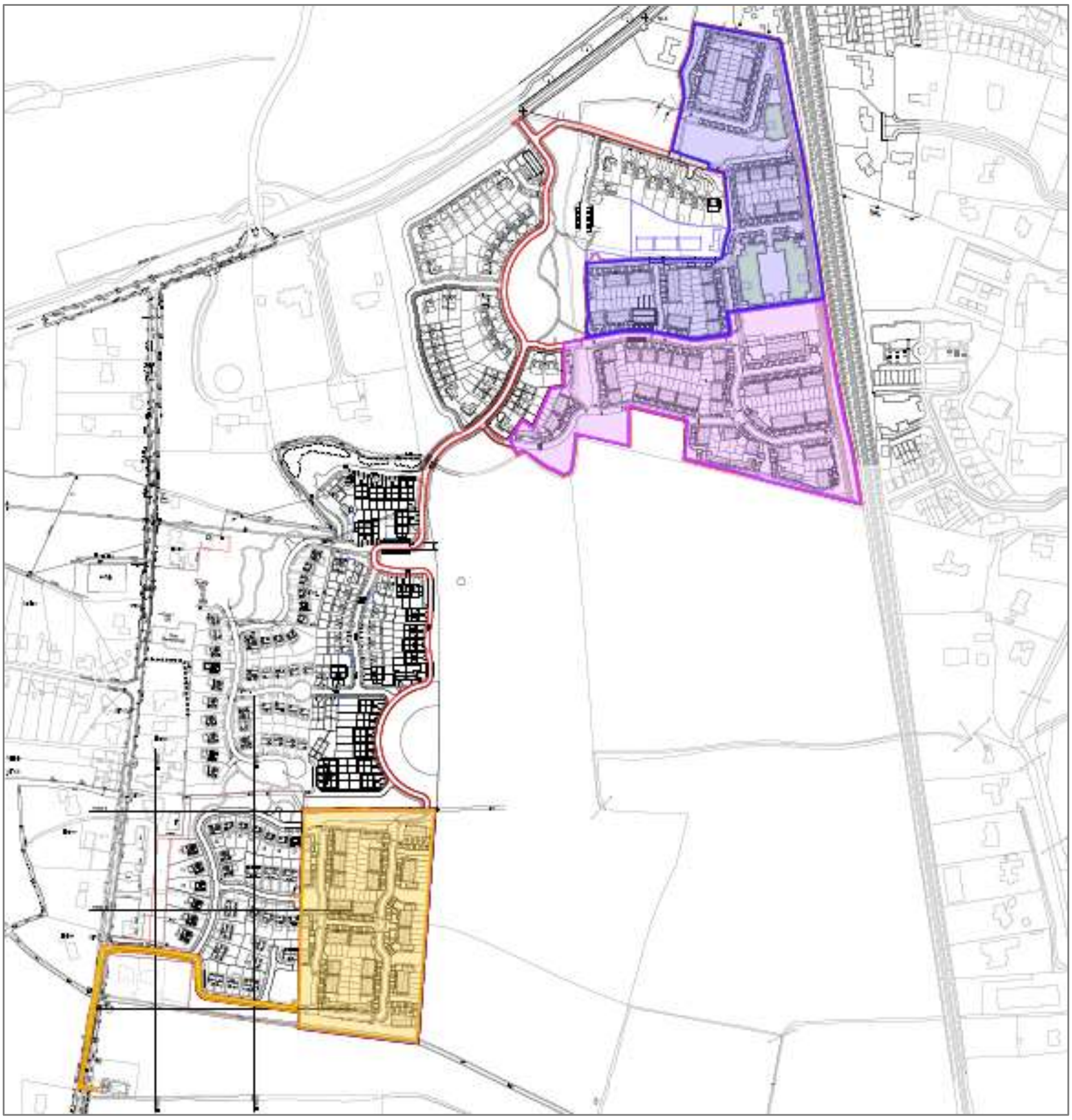

Figure 2-5. Phasing Strategy of the Proposed Development (source: MCORM Architects)

2.7 Description of Reasonable Alternatives

This section of the EIAR focuses on alternatives that were considered during the preparation of this EIAR and planning application. It has been carried out in accordance with Part 1(d) of Schedule 6 of the Regulations which requires: "*An outline of the main alternatives studied by the developer and an indication of the main reasons for his or her choice, taking into account the effects on the environment.*" It also has close regard to the Guidelines for Planning Authorities and An Bord Pleanála on Carrying out Environmental Impact Assessment (2018) which state in this regard that:

> *"The Directive requires that information provided by the developer in an EIAR shall include a description of the reasonable alternatives studied by the developer. These are reasonable alternatives, which are relevant to the project and its specific characteristics.*

The developer must also indicate the main reasons for the option chosen taking into account the effects of the project on the environment.
Reasonable alternatives may relate to matters such as project design, technology, location, size, and scale."

This section of the EIAR sets out an outline of the main alternatives that have been examined through the design and consultation stages of the planning process with the following headings:

- Alternative Locations
- Do-Nothing Scenario
- Alternative Uses
- Alternative Processes
- Alternative Designs/Layouts

2.7.1 Alternative Locations

The consideration of alternative locations for the development has, in a significant number of cases, already been addressed and decided at strategic planning level during the preparation and adoption of the Fingal Development Plan 2017-2023. This plan establishes a housing need for the district which is required to be accommodated during the plan period and assesses all available land in the district to meet the identified housing need, including the subject site and all available alternatives. This plan will have been subject to Strategic Environmental Assessment which takes into account the environmental considerations associated with, for example, the cumulative impact of an area zoned for industry on a sensitive landscape. The EIA Guidelines also state that the statutory development plans can establish project-level objectives or other mitigation that a subsequent site project and its EIAR should be cognisant of.

Having regard to the above, Downey notes that the lands subject to this application and EIAR are located within the Fingal County Council administrative area and the subject site is zoned *"RA – Residential Area."* Outlined in the Development Plan, this zoning objective seeks the following:

- ***"RA - Residential Area Zoning Objective:*** *To provide for new residential communities subject to the provision of the necessary social and physical infrastructure."*

As this site is mainly zoned for residential development within an established urban area, it was not considered necessary to consider other sites outside of those already considered as part of the plan-making process. Furthermore, the site forms a natural extension to the two existing developments currently under construction by the same applicant, namely Ashwood Hall and Brookfield.

2.7.2 Do Nothing Scenario

A "Do Nothing" scenario would not be consistent with the RA land-use zoning pertaining to the lands and the objectives of the Development Plan to facilitate a new residential development on the subject lands as part of a wider development of the Broomfield lands, and Malahide. Given the subject site's location within Malahide as well as access to public transport and mobility, failure to develop these lands would significantly impair the quality of the urban landscape and viability for a mix of sustainable uses and amenities for existing and future residents. The level of demand for housing within the development boundary of the Malahide area, based on the future population growth predictions, would not be met, resulting in downstream impacts including housing needs and affordability. As such, it is considered that the "Do Nothing" scenario is not a suitable alternative option for the subject lands.

Furthermore, to not develop these zoned and serviced lands would be inconsistent with national planning policy as set out in the National Planning Framework, Regional Spatial Economic Strategy and Urban Development and Building Height Guidelines.

2.7.3 Alternative Uses

As previously stated, the subject site is located within the functional area of Fingal County Council. As such, the development of the site is informed by the policies and objectives of the Fingal County Council Development Plan 2017-2023. Under the current Development Plan, the subject lands are zoned as *"RA – Residential Area"* zoning objective. Thus, the proposed development is considered permitted in principle uses under the pertaining zoning objective.

2.7.4 Alternative Designs and Layouts

It must be noted that given the applicant's control of the landholding subject to this project, the existing, under construction, and planned infrastructure/development in place, and the zoning of the lands, there were no major alternative uses or processes that were considered reasonable. The alternatives to the proposed development considered during the course of the preparation of this EIAR were related to the overall layout and internal roads pertaining to the proposed scheme.

The design of the proposed project has evolved throughout the pre-application consultation process, resulting in various alterations to the proposal. It is worth noting that the proposal may continue to develop following the application submission and continued consultation with relevant stakeholders. The main environmental issues that have most informed the chosen design relates to the impact on trees and hedgerows, existing residential amenity, as well as visual impact. This shall be set out below:

Alternative 1: Layout for Section 247 Pre-Planning Meeting with Planning Authority

At the first Section 247 pre-planning meeting with Fingal County Council (August 2020), a proposal of 477 no. dwellings (comprising 252 no. houses, 48 no. duplex units and 177 no. apartments). It is noted that in this proposal, the creche was proposed to be located within Block B along the eastern side of the site.

It was suggested for the proposal be revisited to provide for an optimum design solution with respect to the following issues of particular concern:

- Development hindrance in the southern portion of the lands which is located within the Outer Public Safety Zone;
- Compliance with the Core Strategy of the current Fingal Development Plan;
- Creating interest and diversity across the site by utilising various house types spreading evenly across the lands;
- Location of the creche and gym to be repositioned to avoid potential noise impact;
- Positioning of balconies in Block A&B to enhance the privacy of all units; and,

- Meeting the standards in the on-site provision of public open space with respect to the pertaining planning policy of the Development Plan.

Alternative 2: Layout for Pre-Application Consultation with An Bord Pleanála

Following on from the Section 247 pre-planning meeting with the Planning Authority, the design team made a number of amendments to the layout and proposed development. These included changes to the density and arrangement of the dwellings in order to achieve a balanced use of the lands with respect to locational attributes of the site, its surrounding, and existing development standards of the Development Plan. This provided for a proposal of 458 no. dwellings (comprising 242 no. houses, 60 no. duplex units and 156 no. apartments) in addition to 1 no. childcare facility along with ancillary amenity including concierge and gym.

However, the Board's Notice of Opinion from the tripartite consultation meeting as well as further feedback from the Planning Authority meant that Alternative 2 was subject to further amendments, which forms this current proposed development. Some of the key changes include:

- Decreasing the density by provision for 415 no. residential units on the lands with respect to the southern portion of the lands which is located within the Outer Public Safety Zone;
- Compliance with Core Strategy of the current Fingal Development Plan;
- Enhancing the permeability of the site with particular regard to the vehicular permeability through the site and connectivity with Kinsealy Lane;
- Further consideration to the design and layout of internal streets, specifically the design of the proposed home zones, car and bicycle parking, and positioning of footpaths relative to parking spaces; and,
- Further consideration to landscaping and treatment of existing trees on the site and existing treeline within Ashwood Hall to the west.

Justification for Selecting Chosen Layout and Design

This EIAR has set out the evolution of the design of the scheme and alternatives, which has informed the chosen planning application.

- The chosen application layout represents an efficient use of appropriately zoned and serviced land that is located within proximity to the Malahide Town Centre.
- An optimum density is achieved by factoring in elements such as the context, adjoining developments which all form the overall Broomfield LAP lands, and development hindrance of the site in the southern portion which is located in the Outer Public Safety Zone.
- A high-quality residential development that meets the necessary provision of open spaces and residential amenities has been achieved.
- The layout provides for a variety of housing types and demographic needs that will create a sustainable community.
- Provision of a mix of uses and residential amenity facilities that would further reinforce a sustainable community, i.e., childcare facility and ancillary residential amenities.
- Appropriate building heights to provide for an optimum density, but also integrates well with the surrounding context.

- An appropriate quantum of green spaces provisioned in a hierarchy of public open spaces, pocket parks, and communal spaces which help blend the scheme into its context.
- The layout provides for good permeability and legibility.
- The chosen layout will provide for a high-quality development that will help to complete the housing supply within the Broomfield lands, and in a broader scope in Malahide, and the Fingal area.

Figure 2-6. Alternative scheme arrangements considered as part of the design process (source: MCORM Architects)

- Fingal County Council recommended an additional vehicular access to the site which is now proposed from Kinsealy Lane, via Hazelbrook during the SHD pre-application process. This will benefit the southern site for vehicular, pedestrian and cycle access. Fingal County Council requested that a road connects between the north and south sites for Broomfield to increase the permeability of the area including Brookfield and the existing Hazelbrook residential area.
- It is considered that the route between the site entrance from the Hazelbrook residential development to the site exit on the north on the Back Road, and vice versa, will not create a “rat-run” if there is any potential build-up of traffic at the Kinsealy Lane-Back Road junction. This is owing to the fact that the layout of the proposed route is meandering, and has frequent interruptions such; as raised tables, pedestrian crossings and low radii corners which will effectively enforce a slower vehicular speed as per DMURS guidelines discussed further in the reports accompanying this planning application. It is noted that local residents may raise concerns about ‘short-cuts/rat running’ and increased traffic flows due to the addition of the

access to Kinsealy Lane. In this regard, it is proposed that Fingal County Council, along with the developer, will monitor the road in order to assess if this becomes an issue. Should it become an issue, Fingal County Council can introduce bollards to prevent through traffic in order to stop this occurring.

2.8 Consideration of Cumulative Effects with Other Projects

The assessment in each EIAR Chapter (nos. 4 to 14) has considered the cumulative impacts of construction and operational stages of the proposed development, in conjunction with surrounding developments completed, under construction, and those to be commenced.

As it stands, the proposed development represents the completion of the last developable zoned Broomfield lands, located in a context with ongoing developments immediately abutting the site and in the adjoining areas. Additional planning applications in the wider vicinity of the lands include the earlier developments of Ashwood Hall and Brookfield which are under construction and completed developments such as Castleway and Hazelbrook. Other planning applications in the wider area include revisions and alterations to existing or permitted buildings, or small proposals, or permissions which have since expired. The aforementioned applications and developments have all been taken into consideration as part of this EIAR. As per this EIAR, it is submitted that such applications are expected to have no in combination environmental effects to the proposed development.

2.9 Risk of Major Accidents and/or Disasters

The surrounding environment of the proposed project consists of a mix of low-rise residential, commercial, recreational and educational facilities. There are no SEVESO II Directive sites (96/82/EC & 2003/105/EC) within 1km of the proposed project and therefore there is no risk of a major accident or disaster in relation to a major chemical accident. In terms of the risk of a major accident and disaster, the vulnerability of the scheme is considered to be low given the location of the proposed scheme and the existing built environment surrounding the site. Therefore, the potential risk posed by a major accident and or disaster have been considered based on a low vulnerability of same. The overall risk is considered to be low.

3.0 PLANNING & DEVELOPMENT CONTEXT

3.1 Introduction

The subject site is located within the administrative area of Fingal County Council, for which the statutory Development Plan is the Fingal Development Plan 2017-2023.

The subject lands are subject to national, regional, and local objectives and planning policies. The foregoing represents the relevant plans, guidelines, frameworks, and legislation for the Assessment in line with recital 32 and Article 4(4) of the EIA Directive and Article 299(1)(b)(ii)(II)(C) of the Planning and Development Regulations 2001 (as amended).

National Planning Policy

- Project Ireland 2040: National Planning Framework
- Project Ireland 2040: National Development Plan 2018-2027
- Rebuilding Ireland, An Action Plan for Housing and Homelessness (2016)
- Housing for All: A New Housing Plan for Ireland
- Affordable Housing Act 2021 & Housing Circular 28/2021
- Residential Densities in Towns and Villages (Circular Letter NRUP 02/2021)
- Sustainable Residential Development in Urban Areas and Best Practice Urban Design Manual Guidelines (2009)
- Delivering Homes, Sustaining Communities: Statement on Housing Policy (2007)
- Quality Housing for Sustainable Communities (2007)
- Sustainable Urban Housing: Design Standards for New Apartments (March 2018)
- Urban Development and Building Heights: Guidelines for Planning Authorities (Dec 2018)
- Childcare Facilities: Guidelines for Planning Authorities (2001)
- Childcare Facilities Operating under the ECCE Scheme (Circular PL 3/2016)
- Smarter Travel: A Sustainable Transport Future
- Design Manual for Urban Roads and Streets (DMURS)
- EIA Directive
- Birds and Habitats Directive - Appropriate Assessment
- The Planning System and Flood Risk Guidelines (2009)
- All-Ireland Pollinator Plan 2021-2025
- National Adaptation Framework: Planning for a Climate Resilient Ireland
- Climate Action Plan 2019

Regional Planning Policy

- Regional Planning Guidelines for the Eastern & Midland Region 2019-2031;
- Transport Spatial and Economic Strategy for the Greater Dublin Area 2016-2035

Local Planning Policy

- Fingal County Council Development Plan 2017-2023

This chapter outlines the planning and development context for the proposed development with reference to the aforementioned principal planning policy documents. This chapter also sets out the development context and the planning history within which the proposed development should be considered and provides the policies, principles, and objectives within which the proposed development should be assessed. It is important to note that a full Statement of Consistency with Planning Policy has been prepared by Downey Planning and is submitted under separate cover as part of the planning application. That report sets out a detailed analysis of the project's consistency with the relevant planning objectives as they pertain to the area and project.

3.2 Proposed Development

The applicant is seeking planning permission for the following development:

"We, Birchwell Developments Ltd., intend to apply to An Bord Pleanála for permission for a strategic housing development on lands at Back Road and Kinsealy Lane, Kinsaley, Broomfield, Malahide, Co. Dublin. The northern lands are generally bound by Ashwood Hall to the west, and the southern lands are generally bound by Hazelbrook to the west and Brookfield to the north.

The development will consist of the demolition of the former rugby clubhouse structure on site and the construction of a total of 415 no. residential units (252 no. houses, 135 no. apartments, and 28 no. duplex units); with 1 no. childcare facility and ancillary residential amenity facilities to be provided as follows:

- *252 no. residential houses (192 no. 3 bed units, 48 no. 4 bed units, 12 no. 5 bed units) in detached, semi-detached, mid-terraced and end-terraced houses ranging from two to three storey in height;*
- *Apartment Blocks A & B are connected at ground and first floor level sharing an undercroft car park at ground floor level and a landscaped podium garden at first floor level, and contain a total of 110 no. units in 2 no. buildings ranging from one to five storeys in height, with Apartment Block A containing a total of 54 no. units comprising of 14 no. 1 bed units, 39 no. 2 bed units, and 1 no. 3 bed unit, and Apartment Block B containing a total of 56 no. units comprising of 14 no. 1 bed units, 40 no. 2 bed units, and 2 no. 3 bed units, with all units provided with private balconies/terraces; internal bicycle stores, bin stores and plant rooms at ground floor level; and on-street car parking and bicycle parking. Ancillary residential amenity facilities are also proposed including concierge/reception, meeting room, gym, and multi-purpose room;*
- *Apartment Block C containing a total of 25 no. units comprising of 9 no. 1 bed units, 14 no. 2 bed units and 2 no. 3 bed units, with all units provided with private balconies/terraces, in a building four storeys in height; with on-street car parking and bicycle parking; with access to a communal bin store and bike store;*
- *Duplex Block D containing a total of 12 no. units comprising of 6 no. 2 bed units and 6 no. 3 bed units, with all units provided with private balconies/terraces, with a communal bin store and bike store; and 1 no. childcare facility with outdoor play area, all in a building ranging from one to three storeys in height; with residential on-street car parking; and childcare on-street drop-off area, car parking and bicycle parking;*

- *Duplex Block E containing a total of 8 no. units comprising of 4 no. 1 bed units and 4 no. 2 bed units, with all units provided with private balconies/terraces; in a three storey building; with a communal bin store and bike store, and on-street car parking;*
- *Duplex Block F containing a total of 8 no. units comprising of 4 no. 1 bed units and 4 no. 2 bed units, with all units provided with private balconies/terraces; in a three storey building; with a communal bin store and bike store, and on-street car parking.*

The development will provide for a total of 721 no. car parking spaces within the scheme; a total of 227 no. bicycle spaces serving the apartments, duplexes and childcare facility; proposed use of the existing vehicular access off Back Road (proposed vehicular access via Ashwood Hall and Brookfield) and proposed use of the existing vehicular access off Kinsealy Lane (proposed vehicular access via Hazelbrook); proposed upgrades to public realm including footpaths, landscaping including play equipment, boundary treatments, and public lighting; and all associated engineering and site works necessary to facilitate the development including proposed upgrade of part of the existing foul drainage network in Hazelbrook, and proposed connection and associated works to the existing foul network along Kinsealy Lane which will be upgraded under planning permission Reg. Ref. F21A/0451.

The application contains a statement setting out how the proposal will be consistent with the objectives of the Fingal Development Plan 2017-2023.

The application contains a statement indicating why permission should be granted for the proposed development, having regard to a consideration specified in section 37(2)(b) of the Planning and Development Act, 2000, as amended, notwithstanding that the proposed development materially contravenes a relevant development plan or local area plan other than in relation to the zoning of the land.

An Environmental Impact Assessment Report (EIAR) and a Natura Impact Statement (NIS) have been prepared in respect of the proposed development."

The proposed development is discussed in full detail in Chapter 2.0 of this Environmental Impact Assessment Report.

3.3 National Planning Context

3.3.1 Project Ireland 2040: National Planning Framework

The National Planning Framework is "*the Governments high-level strategic plan for shaping the future growth and development of our country out to the year 2040*". It is a Framework to guide public and private investment, to create and promote opportunities for our people, and to protect and enhance our environment- from our villages to our cities and everything in between. It is stated within the National Planning Framework that, "*a major new policy emphasis on renewing and developing existing settlements will be required, rather than continual expansion and sprawl of cities and towns out into the countryside, at the expense of town centres and smaller villages*".

It is also stated that there will be an ongoing shift in population and jobs to the east and to the counties around Dublin in particular. The NPF will support the future growth and success of Dublin as Ireland's leading global city of scale, by better managing Dublin's growth to ensure that more of it can be accommodated within and close to the city. According to the National Planning Framework, Dublin needs to accommodate a greater proportion of the growth it generates within its metropolitan boundaries and to offer improved housing choice, transport mobility and quality of life. Dublin's continued performance is critical to Ireland's competitiveness.

The NPF states that, "*the long-term vision for Ireland's housing future aims to balance the provision of good quality housing that meets the needs of a diverse population, in a way that makes our cities, towns, villages and rural areas good places to live now and in the future."* It is outlined within the Plan that future homes are required to be located where people have the best opportunities to access a high standard quality of life. In Ireland, the location of housing has taken on a dispersed and fragmented character which has led to people living further away from their jobs and often being at a sizeable remove from important services such as education and healthcare. It is stated that it is important to "*prioritise the location of new housing provision in existing settlements as a means to maximising a better quality of life for people through accessing services, ensuring a more efficient use of land and allowing for greater integration with existing infrastructure.*"

The NPF has several national policy objectives which are relevant to this application, which include**:** National Policy Objective 3a, 4, 11, 13, 33 and 35 which seek to deliver the majority of housing within the built-up area of existing settlements, particularly towns that can support sustainable growth and achieve an increase in residential density set within the context of a high-quality development. Furthermore, the NPF adds that *"apartments made up 12% of all occupied households in Ireland and 35% of occupied households in the Dublin City Council area in 2016 (census data)".*

The National Planning Framework 2040 envisages increased apartment provision to be provided as part of residential proposals, particularly in urban areas. It is stated that, *"to more effectively address the challenge of meeting the housing needs of a growing population in our key urban areas, it is clear that we need to build inwards and upwards, rather than outwards. This means that apartments will need to become a more prevalent form of housing, particularly in Ireland's cities".* It is evident that apartment developments are required in urban areas to meet the current demand for housing, particularly in Dublin. It is therefore considered that the provision of 415 no. residential units proposed i.e., 252 no. houses, 135 no. apartments and 28 no. duplex units with ancillary amenity facilities (gym and concierge) and 1 no. childcare facility on the subject site will assist in achieving the objectives of the National Planning Framework.

3.3.2 Project Ireland 2040: National Development Plan 2021-2030

Project Ireland 2040 National Planning Framework (NPF), which sets the overarching spatial strategy for the next twenty years, includes the National Development Plan, which sets out the ten-year investment strategy. The NPF housing supply target has been refined to reflect recent (2020) ESRI research based on NPF population growth, considering both existing demand and a legacy of undersupply to date. There is now a need to accommodate around 600,000 new households by 2040, with the Department of Housing planning to deliver an average of 33,000 homes per annum to 2030 including an average of 10,000 new social homes each year and an average of 6,000 affordable homes each year.

Set out in the NDP, public capital investment must, as a top priority, support the delivery and location of the homes that society will need over the next decade and beyond, while also ensuring that in the future the pattern of housing development underpins the development of more compact higher-density cities, towns, and other areas. It is also a priority to enable infill development, with up to 50% of future housing in our cities and major urban centres and 30% elsewhere to be provided within existing built-up areas serviced by existing facilities and along high-capacity public transport corridors.

The proposed development will provide for a sustainable residential development on appropriately zoned lands, in a highly accessible location within the development boundary of Malahide which promotes compact urban growth and a good quality of life. It is therefore considered that the provision 415 no. residential units (252 no. houses, 135 no. apartments and 28 no. duplex units) with ancillary amenity facilities (gym and concierge) and 1 no. childcare facility on the subject site will assist in achieving the objectives of the National Development Plan 2021-2030. Malahide is an attractive, vibrant urban centre for people to live and work in, supported by high-quality physical and social infrastructure as well as vast recreational amenities such as Malahide Castle and the various sports clubs and centres within the area.

3.3.3 Rebuilding Ireland, An Action Plan for Housing and Homelessness (2016)

'*Rebuilding Ireland, an Action Plan for Housing and Homelessness*', provides a multi-stranded, action-oriented approach to achieving many of the Government's key housing objectives. The overarching aim of the Plan is to ramp up delivery of housing from its current undersupply across all tenures to help individuals and families meet their housing needs, and to help those who are currently housed to remain in their homes or be provided with appropriate options of alternative accommodation especially those families in emergency accommodation. The provision of 415 no. residential units (252 no. houses, 135 no. apartments and 28 no. duplex units) with 1 no. childcare facility on the application site will help the Government to achieve the objectives of the Housing Action Plan. Thus, it is submitted that the proposed development is consistent with the policy in this regard.

3.3.4 Housing for All: A New Housing Plan for Ireland

The Housing for All: A New Housing Plan for Ireland states that Ireland's housing system is not meeting the needs of enough of our people, and therefore, it needs to increase new housing supply to an average of at least 33,000 new units per year over the next decade. This will include over 10,000 social homes each year over the next five years, with 9,500 of these being new-builds, and an average of 6,000 affordable homes for purchase or rent. As per, Housing for All provides four pathways to achieving four overarching objectives: (1) Supporting Homeownership and Increasing Affordability; (2) Eradicating Homelessness, Increasing Social Housing Delivery and Supporting Social Inclusion; (3) Increasing New Housing Supply; and (4) Addressing Vacancy and Efficient Use of Existing Stock. Outlined in the Plan, the State must act decisively to increase supply of both private and public housing. An average of 33,000 homes must be provided every year between now and 2030. Increased housing output is needed in all sectors - private, affordable, and social - to meet the needs of people in a wide variety of circumstances.

It is submitted that provision of 415 no. residential units on the subject site will help the Government to achieve the objectives of the Housing for All Plan in increasing the housing output. Therefore, it is considered that the proposed development is consistent with the development framework in this regard.

3.3.5 Affordable Housing Act 2021 & Housing Circular 28/2021

In July 2021, the Affordable Housing Act 2021 was published, aiming to address problems associated with the high cost of housing for the portion of the population that do not qualify for social housing. Effective of 3rd September 2021, the Housing Circular 28/2021, amended Part V of the Planning and Development Act 2000. The Programme for Government contained commitments in relation to expanding Part V to encompass affordable purchase and cost rental units and introducing affordable homes requirements to Part V. Part 6 of the Affordable Housing Act 2021, which was enacted on 21 July 2021, gives effect to this commitment. The principal change to Part V made by these amendments is to increase the Part V contribution for new housing developments from 10% social housing to a mandatory 20% requirement, at least half of which must be applied to social housing provision and up to half of which may be applied to affordable and cost rental housing.

It is noted that these changes to Part V primarily apply to land purchased on or after 1 August 2021. Any new planning permissions for housing development on that land will have a 20% Part V requirement. However, a 10% Part V requirement will apply where land already has planning permission or was purchased between 1 September 2015 and 31 July 2021 and planning permission is granted before 31 July 2026. It is considered that the proposed development is consistent with the Affordable Housing Act 2021, Housing Circular 28/2021, and the requirements under Part V of the Act as it is proposed to provide 10% of the housing units for social and affordable housing. For further details, please refer to the enclosed Part V Validation Letter from Fingal County Council with associated indicative costings and layout.

3.3.6 Residential Densities in Towns and Villages (Circular Letter: NRUP 02/2021)

The purpose of this Circular, issued on 21st April 2021, is to provide clarity in relation to the interpretation and application of current statutory guidelines, in advance of issuing updated Section 28 guidelines that will address sustainable residential development in urban areas. It is considered important to address this matter in the context of both the need for significantly increased and more sustainable housing supply throughout Ireland, and national recovery from the Covid-19 pandemic.

Considering that the Census 2016 recorded a population of 16,550 people for Malahide, the town stands within the larger towns category, contributing to consolidation of Dublin Metropolitan Area. Accordingly, the proposed development of the subject lands is submitted to strengthen the urban role of Malahide and reinforcing the vital role of Malahide in the settlement's hierarchy of the County, and therefore, is considered to be consistent with the foregoing Circular.

3.3.7 Sustainable Residential Development in Urban Areas and Best Practice Urban Design Guidelines (2009)

The main objective of the '*Sustainable Residential Development in Urban Areas Guidelines*' is to produce high-quality sustainable developments through providing*:* (A) Quality homes and neighbourhoods; (B) Places where people actually want to live, to work and to raise families; (C) Places that work - and will continue to work – not just for us, but for our children and for our children's children. These are set out in several principles as follows:

1. The Guidelines set out the key planning principles which should be reflected in development plans and local area plans including Section 2.3 which promote a sequential approach to the zoning of residential lands. The subject site is zoned for new residential development under the "RA- Residential Area" zoning designation of the Fingal Development Plan 2017-2023 where both residential and childcare facilities are permitted in principle land use. The site is located on appropriately zoned lands to the south of Malahide. The site is contiguous to existing residential developments at Castleway and Hazelbrook to the south and south-west, and Ashwood Hall and Brookfield. In light of this, the zoning and future development of the subject site is in accordance with these Guidelines.
2. The Guidelines also support increased residential densities particularly for sites located in *"Outer Suburban/Greenfield"* sites, particularly for such sites on the periphery of cities or larger towns, as it states: "35-50 dwellings per hectare" and that "development at net densities less than 30 dwellings per hectare should generally be discouraged." The application site will achieve an overall net density of c. 37.4 dwellings per hectare (net developable area is 11.1 hectares when the access road is omitted). It is considered that the site is classified as an outer suburban/greenfield site noting its location within the development boundary of Malahide Town and its setting along the periphery of the existing urban area which will form a natural extension to the suburbs of the town within a highly accessible location on appropriately zoned lands.
3. In terms of planning for sustainable neighbourhoods, the document outlines the importance of the provision of schools, community centres, healthcare facilities and district/neighbourhood centres use to the sustainability of communities. The subject site is located within Malahide, immediately adjoining the Malahide Demesne and in proximity to the range of services provided within Malahide Village as set out in the Community Social Infrastructure Audit submitted under separate cover.
4. In relation to amenity/quality of life issues, the guidance states that: *Well-designed open space is even more important in higher density residential developments".* The proposed development provides for a high level of amenity space throughout the site with c. 1.35 ha of open space provided. This is in addition to Malahide Demesne, a regional park which provides an additional of high quality public open space to serve the residents of the wider Malahide area.
5. The design of the proposed development has placed considerable emphasis on the context of the site and location as well as the surrounding built environment. The proposed development successfully incorporates the criteria of the '*Urban Design Manual - A Best Practice Guide'* and its 12 criteria, including: *Context, Connections, Inclusivity, Variety, Efficiency, Distinctiveness, Layout, Public Realm, Adaptability, Privacy/Amenity, Parking*, and *Detailed Design*, of which Planning Authorities are recommended to assess planning applications. It is evident that the form, layout, and architectural and landscaping design of the proposed development have been informed by the development's place and time. Well-designed homes in the right locations are fundamental to building strong, sustainable communities. Such communities will ensure Ireland's continued success in attracting and generating investment and improving the quality of life for residents. Downey are of the considered opinion that the proposed development represents a development that has been carefully and appropriately designed, giving full consideration to its historic setting and neighbouring lands and would integrate successfully with its environs. The proposed development has had regard to the surrounding environment and carefully assesses the proposal

in light of same. The development positively contributes to the character and identity of the surrounding vicinity. The proposed scheme is also considered to be of an appropriate density which will help to support the efficient use of serviceable lands within the existing settlement boundary.

Downey are of the considered opinion that the provision of 415 no. residential units (252 no. houses, 135 no. apartments and 28 no. duplex units) with 1 no. childcare facility would be a positive addition to the surrounding built environment of Malahide and to the identity of the locality. Furthermore, it is considered that the proposed new homes will meet the aspirations of a range of people and the design and layout of such allows easy access by all. For further detailed information on the proposed development's consistency with the Urban Design Manual, please refer to the Architectural Design Statement prepared by MCORM Architects.

3.3.8 Delivering Homes, Sustaining Communities: Statement on Housing Policy (2007)

The "Delivering Homes, Sustaining Communities" policy statement is accompanied by Best Practice Guidelines entitled "Quality Housing for Sustainable Communities". The purpose of these Guidelines is to promote high standards in the design and construction and the provision of residential units and services in new housing developments. Best use of land is encouraged and optimal utilisation of services and infrastructure in the provision of new housing; point the way to cost effective options for housing design that go beyond minimum codes and standards; promote higher standards of environmental performance and durability in housing construction; seek to ensure that residents of a new housing scheme enjoy the benefits of first-rate living conditions in a healthy, accessible and visually attractive environment; and provide homes and communities that may be easily managed and maintained.

This pre-application consultation request is accompanied by an Architectural Design Statement and a Housing Quality Assessment (HQA) prepared by MCORM Architects, which demonstrates the proposed development is compliant with the relevant standards in the '*Quality Housing for Sustainable Communities*' document and the Fingal County Development Plan 2017-2023.

3.3.9 Delivering Homes, Sustaining Communities Best Practice Guidelines – Quality Homes for Sustainable Communities (2007)

The aim of these Guidelines is to identify principles and criteria that are important in the design of housing and to highlight specific design features, requirements and standards that have been found, from experience to be particularly relevant. The guidelines set out some recommended standards in terms of space provision and room sizes etc.

The proposed scheme has been cognisant of the need to facilitate a high standard of living for future occupants, while representing a proposal that is conducive to complimenting and augmenting the established residential character of the surrounding area. In this regard it is noted that all of the residential units have been designed to comply with the room standards as set out in these Guidelines, as well as in the County Development Plan. MCORM Architects have also prepared an Architectural Design Statement for this scheme and is submitted under a separate cover. This outlines the rationale behind the design of the scheme and how it will contribute to a positive and attractive residential development.

This current SHD pre-application consultation request is accompanied by a Housing Quality Assessment (HQA) document, which has been prepared by MCORM Architects and illustrates how the proposed development will comply with the required standards that have been set out in this assessment.

3.3.10 Sustainable Urban Housing: Design Standards for New Apartments (Dec 2020)

The '*Sustainable Urban Housing: Design Standards for New Apartments'* build on the content of the 2015 apartment guidance, much of which remains valid, particularly with regard to design quality safeguards such as internal space standards for apartments, internal storage, and amenity space.

The Guidelines state that, "*in the longer term to 2040, the Housing Agency has identified a need for at least 45,000 new homes in Ireland's five cities (Dublin, Cork, Limerick, Galway, and Waterford), more than 30,000 of which are required in Dublin City and suburbs, which does not include additional pent-up demand arising from under-supply of new housing in recent years*". It is also stated that it is "*critical to ensure that apartment living is an increasingly attractive and desirable housing option for a range of household types and tenures*."

The Guidelines also state that, *"aspects of previous apartment guidance have been amended and new areas addressed in order to:*

- *enable a mix of apartment types that better reflects contemporary household formation and housing demand patterns and trends, particularly in urban areas;*
- *make better provision for building refurbishment and small-scale urban infill schemes;*
- *address the emerging 'build to rent' and 'shared accommodation' sectors; and*
- *remove requirements for car-parking in certain circumstances where there are better mobility solutions and to reduces costs."*

The Guidelines state that Ireland is a long way behind European averages in terms of the numbers of households living in apartments, especially in our cities and larger towns. Given the gap between Irish and European averages in numbers of households living in apartments and the importance of addressing the challenges of meeting the housing needs of a growing population in our key cities and towns and by building inwards and upwards rather than outwards, apartments need to become the norm for urban housing solutions.

The Guidelines state that, *"ongoing demographic and societal changes mean that in addition to families with children, the expanding categories of household that may wish to be accommodated in apartments include:*

- *Young professionals and workers generally;*
- *Those families with no children;*
- *'Downsizers'; and,*
- *Older people, in both independent and assisted living settings."*

The Guidelines identify types of locations that may be suitable for apartment developments. In this regard, it is considered that the proposed development falls within '*(2) Intermediate Urban Locations'* as it meets the criteria for this location in that the site is located approximately within 1km (closest point) to 2km (furthest point) of Malahide Town Centre, is located within the town's development boundary, and within walking distance of high capacity urban public transport stops (i.e. Malahide DART station) and frequent bus services, and as such is suitable for a net density of c. 37 units per hectare (net developable area is 11.1 hectares when the access road is omitted).

The Guidelines also have specific planning policy requirements (SPPRS), which include:

1) ***Specific Planning Policy Requirement 1** – Apartment developments may include up to 50% one-bedroom or studio type units (with no more than 20-25% of the total proposed development as studios) and there shall be no minimum requirement for apartments with three or more bedrooms. Statutory development plans may specify a mix for apartment and other housing developments, but only further to an evidence-based Housing Need and Demand Assessment (HNDA)"*. In this regard, the proposed development at Malahide (subject to this application) provides for 415 no. residential units (252 no. houses, 135 no. apartments and 28 no. duplex units) with ancillary amenity facilities (gym and concierge), 1 no. childcare facility and a total of 721 no. car parking spaces, open space, and communal open space.
2) **Specific Planning Policy Requirement 3:** "Minimum Apartment Floor Areas: Studio apartment (1 person) 37 sqm; 1-bedroom apartment (2 persons) 45 sqm; 2-bedroom apartment (4 persons) 73 sqm; 3-bedroom apartment (5 persons) 90 sqm". This pre-application consultation request also includes a Housing Quality Assessment and a detailed daylight, sunlight, and internal light analysis report, in accordance with Chapter 6 of the Guidelines. The proposed development will help to meet the current demand for apartment type developments. For further information in this regard, please refer to the enclosed architectural drawings and detailed Architectural Design Statement and Housing Quality Assessment prepared MCORM Architects, which provide confirmation that the proposed development is consistent with the design standards of these Guidelines.
3) **Specific Planning Policy Requirement 4:** *"In relation to the minimum number of dual aspect apartments that may be provided in any single apartment scheme, the following shall apply… In suburban or intermediate locations, it is an objective that there shall generally be a minimum of 50% dual aspect apartments in a single scheme.* The development in this instance is located in a suburban location on appropriately zoned lands in a highly accessible location within the development boundary of Malahide. In this regard, the minimum requirement for dual aspect units is 50%. The proposed development provides for 60% dual aspect units across the proposed apartment blocks and therefore accords with the guidelines.
4) In terms of Children's Play areas, the Guidelines state: *"Children's play needs around the apartment building should be catered for: within the private open space associated with individual apartments; within small play spaces (about 85-100 sqm) for the specific needs of toddlers and children up to the age of six, with suitable play equipment, seating for parents/guardians, and within sight of the apartment building, in a scheme that includes 25 or more units with two or more bedrooms; and, within play areas (200-400 sqm) for older children and young teenagers, in a scheme that includes 100 or more apartments with two or more bedrooms."* The landscape strategy aims to integrate the proposed residential development with the existing landscape and create a network of attractive and useable open spaces while contributing to local biodiversity. The public green areas are designed as landscape spaces that offer the opportunity for meeting,

walking and formal and informal play. The protection and enhancement of existing landscape features, notably existing trees and native hedgerows is an important aspect of the overall strategy. The landscape strategy was also informed by the adjoining developments under construction, namely Ashwood Hall and Brookfield, to form an interlinked well-integrated network of green infrastructure across the Broomfield lands. The proposed development provides for an overall of c. 1.35 ha open space, comprising of both Class 1 and 2 public open spaces, as specified within the Fingal Development Plan. With respect to the developable site area of 11.1 ha, this would provide for 12% public open space provision.

5) In relation to bicycle and car parking requirements, the Guidelines state that it must be ensured that, *"new development proposals in central urban and public transport accessible locations and which otherwise feature appropriate reductions in car parking provision are at the same time comprehensively equipped with high quality cycle parking and storage facilities for residents and visitors".* The proposed development subject to this SHD has provided a total of 227 no. bicycle spaces in high-quality, safe, and accessible locations.

6) As stated within the Guidelines, *"the quantum of car parking or the requirement for any such provision for apartment developments will vary, having regard to the types of location in cities and towns that may be suitable for apartment development, broadly based on proximity and accessibility criteria".* In this regard, the proposed development provides for a total of 721 no. car parking spaces and a total of 227 no. bicycle spaces in high quality, safe and accessible locations throughout the scheme. This is considered to be acceptable and in accordance with the requirements of the Guidelines and the pertaining Development Plan standards.

As such, it is submitted that the proposed development is consistent with the Guidelines in this instance. Please refer to the enclosed landscape drawings and accompanying report prepared by KFLA Landscape Architects for further information in this regard.

Specific Planning Policy Requirement	Compliance
SPPR1 ***(Housing Mix)***	**In compliance**
SPPR2 ***(Building Refurbishment and Urban Infill Development on sites up to 0.25ha)***	**Not Applicable; SPPR1 applies to the entire development**
SPPR3 ***(Minimum Apartment Floor Areas)***	**In compliance with the standards**
SPPR4 ***(Dual Aspect Ratios)***	**In compliance with the requirements**
SPPR5 ***(Floor to Ceiling Height)***	**In compliance with the requirements**
SPPR6 ***(Lift and Stair Cores)***	**In compliance with the required quantum**
SPPR7 ***(Specific BTR Developments)***	**Not Applicable**
SPPR8 ***(Qualified as BTR Developments)***	**Not Applicable**

Table 3-1. Compliance with Specific Planning Policy Requirements

3.3.11 Urban Development and Building Heights Guidelines for Planning Authorities (Dec 2018)

The *"Urban Development and Building Heights, Guidelines for Planning Authorities"* are intended to set out national planning policy guidelines on building heights in relation to urban areas, to provide greater build heights and more compact forms of development. The guidelines states that *"newer housing developments outside city and town centres and inner suburbs, i.e., the suburban edges of towns and cities, typically now include townhouses (2-3 storeys), duplexes (3-4 storeys) and apartments (4 storeys upwards). Such developments deliver medium densities, in the range of 35-50 dwellings per hectare net"*.

As part of these guidelines, it is proposed to introduce a number of Strategic Planning Policy Requirements including:

*"**SPPR 3:** It is a specific planning policy requirement that where; 1. an applicant for planning permission sets out how a development proposal complies with the criteria above; and 2. the assessment of the planning authority concurs, taking account of the wider strategic and national policy parameters set out in the National Planning Framework and these guidelines; then the planning authority may approve such development, even where specific objectives of the relevant development plan, local area plan or planning scheme may indicate otherwise".*

This planning application has taken into consideration and outlined through appropriate documentation and plans, how the proposed development accords with the assessment criteria outlined in SPPR3, including daylight/shadow studies, ecological assessments, Housing Quality Assessments, DMURS and also with national planning policy including that of the NPF.

*"**SPPR 4:** It is a specific planning policy requirement that in planning the future development of greenfield or edge of city/town locations for housing purposes, planning authorities must secure: 1. the minimum densities for such locations set out in the Guidelines issued by the Minister under Section 28 of the Planning and Development Act 2000 (as amended), titled "Sustainable Residential Development in Urban Areas (2007)" or any amending or replacement Guidelines; 2. a greater mix of building heights and typologies in planning for the future development of suburban locations; and 3. avoid mono-type building typologies (e.g. two storey or own-door houses only), particularly, but not exclusively so in any one development of 100 units or more."*

The proposed development in this instance provides for an overall net density of c. 37 dwellings per hectare (net developable area is 11.1 hectares when the access road is omitted), which is in accordance with relevant local and national policy guidelines. Furthermore, there is an appropriate mix of housing typologies and heights ranging from 2 storey houses, 3 storey duplexes to 5 storey apartment units. The development is therefore in accordance with SPPR 4 of these Guidelines, keep consistent with the aforementioned Guidelines.

3.3.12 Childcare Facilities: Guidelines for Planning Authorities (2001)

Government policy on childcare is to increase the number of childcare places and facilities available and to improve the quality of childcare services for the community. These Guidelines for Planning Authorities on Childcare Facilities provide a framework to guide both local authorities in preparing development plans and assessing applications for planning permission, and developers and childcare providers in formulating development proposals.

For housing schemes, the Guidelines provide a benchmark provision of 1 no. 20 space childcare facility per 75 dwellings. The threshold for provision should be established having regard to existing location of facilities and the emerging demography of the area where new housing is proposed. The recommendations provided within the Guidelines must be considered in the context of the '*Sustainable Urban Housing: Design Standards for New Apartments'* (2018), which state that: *"Notwithstanding the Department's Planning Guidelines for Childcare Facilities, which are currently subject to review and recommend the provision of one childcare facility (equivalent to a minimum of 20 child places) for every 75 dwelling units, the threshold for provision in apartment scheme should be established having regard to the scale and unit mix of the proposed development and the existing geographical distribution of childcare facilities and the emerging demographic profile for the area."*

As recommended in the Guidelines, 1 no. childcare facility may be required as part of the proposal to cater for the influx of population arising from the proposed scheme. It is worth noting that as stated within the apartment guidelines, "*one-bedroom or studio type units should not generally be considered to contribute to a requirement for any childcare provision and subject to location, this may also apply in part or whole, to units with two or more bedrooms*".

With respect to the average household size in the area, which stood at 2.8 in Census 2016, and regarding the household size mix, it is suggested that not all the 2-bedroom dwellings are to be family-occupied. To provide for a more accurate estimation, therefore, the 1-bed units and half of the 2-bed units were excluded from the calculations on the basis that these will not be occupied by families, instead these are foreseen to be occupied by young professionals or singles. As such, the proposed development comprises a total of 317 no. residential units which could be potentially family occupied. 1-beds and 50% of 2-beds may be excluded from the calculations (45 no. 1-beds + 53 no. 2-beds (107/2 = 53.5units), and provision is therefore required for c. 85 children. This is calculated as follows:

$$((415 - 98) \div 75) \times 20 = 84.53$$

The proposed development provides for a 476 sqm childcare facility intended to cater for c. 86 no. children which exceeds by 1 no. space regarding the Guidelines requirement. A Childcare Provision Assessment Report is being prepared by Downey and will accompany the planning application in due course, thus providing a detailed assessment of the existing childcare facilities within the subject area and assessing the current capacity of the surrounding environs as well as whether the proposed childcare facility would be sufficient to cater for the proposed development.

The Childcare Provision Assessment Report provides a detailed assessment of the existing childcare facilities within the subject area, thus assessing the current capacity of the surrounding environs as well as whether the proposed childcare facility would be sufficient to cater for the proposed development. The report confirms that the proposed development generates a requirement of 74 no. childcare spaces. The proposed childcare facility would provide c. 86 no. childcare spaces to cater for the proposed residential scheme, which is 4 no. spaces over the required level of the proposed scheme. It is considered that given the demographics of the area within which the subject site is located, as well as the current characteristics and trends as per data from the CSO results and the childcare facilities survey as set out within the report, the construction of 1 no. childcare facility on site is justified in this instance. Please refer to the enclosed report for further details.

In light of the above and noting the provision of a childcare facility within the scheme, it is submitted that the proposed development is consistent with the Childcare Facilities Guidelines.

3.3.13 Childcare facilities operating under the Early Childhood Care and Education (ECCE) Scheme (Circular Letter: PL 3/2016)

The purpose of this Circular, issued on 31st March 2016, is to revise the Childcare Facilities Guidelines for Planning Authorities 2001. Planning authorities are requested to: (a) Expedite all pre-planning application consultation requests from Childcare facility providers in relation to proposals to extend opening hours, to increase capacity or to provide new facilities; (b) Expedite, insofar as is possible, consideration of all planning applications or Section 5 declaration submissions in respect of childcare facilities in order to facilitate the expansion of required capacity as appropriate.

It is submitted that the scheme would bring the proposed childcare facility at a central location within the northern portion of the subject site, providing for full accessibility. The childcare would also benefit from the adjacent main public open space to the north, which will be activated by the activity of the childcare facility and can be used as a complementary outdoor space, in addition to its own playground. The neighbouring apartments and duplex blocks will also enhance activity within the surrounding public realm, which would also contribute positively to achieve a safe and dynamic bounding public realm for the creche. It is submitted that the proposed childcare facility provides for adequate capacity to cater for the influx of population arising from the proposed development. Therefore, it is suggested that the proposed development is consistent with Circular PL 3/2016.

3.3.14 Space for Play; A Play Policy for Fingal

"Space for Play; A Play Policy for Fingal", the best practice policy guidelines developed by the Council's Parks & Green Infrastructure Division aims to provide a framework for the provision of safe, accessible, inclusive, natural, and engaging play spaces for all children and adolescents up to the age of 17. Fingal County Council currently manages a network of play spaces on Council managed land ranging from playgrounds of various scales in local and regional parks, to Multi Use Games Areas (MUGA), and skate parks. The Play Policy will provide the basis on which the current and future play provision throughout the County will be developed to the highest quality in line with international best practice.

Outlined in the policy guidelines, it is Fingal County Council's policy that Play facilities shall be provided at a rate of 4 sqm per residential unit. All residential schemes in excess of 50 units shall incorporate play facilities clearly delineated on the planning application drawings and demarcated and built, where feasible and appropriate, in advance of the sale of any units.

The proposed development provides for an overall total of 3,010 sqm play area, comprising of 210 sqm of play areas with formal equipment, 800 sqm of informal play areas, along with a minimum of 2,000 sqm useable kickabout space. This is submitted to be consistent with the relevant policy and guidelines. However, out of an abundance of caution, this item is fully discussed in a Material Contravention Statement should it be considered to potentially materially contravene the Fingal

Development Plan 2017-2023 by the competent authority in their assessment of the application, which we invite the Board to refer to.

3.3.15 Smarter Travel: A Sustainable Transport Future

In summary, '*Smarter Travel: A Sustainable Transport Future*' states that, "*to achieve the vision of a sustainable transport system, individual lifestyles will have to change and collectively we will have to work progressively on a range of solutions which deal with apparently conflicting goals: economic growth, reduced emissions, less use of motorised transport and better accessibility.*" The 5 key goals of this transport policy include improving quality of life; economic competitiveness; minimising the negative impacts of transport; reducing travel demand and improving energy supply security.

It is considered that the proposed development complies with '*Smarter Travel: A Sustainable Transport Future*'. The subject site is strategically located within cycling walking distance of the Malahide DART Station and is serviced by a frequent bus service serving the R107 Malahide Road to the west and the R124/Church Road to the east of the subject site. The proposed development is to provide considerable secure, covered bicycle parking for future residents and visitors, particularly to residents of the apartment blocks, where it will encourage use of sustainable modes of transportation. There are also proposals to include improved pedestrian and cycle connections to the town centre. Therefore, it is considered that the proposed development is consistent with this national transport policy and will assist in its implementation.

3.3.16 Design Manual for Urban Roads and Streets (DMURS)

The '*Design Manual for Urban Roads and Streets*' (DMURS) 2013 and as updated in 2019, sets out design guidance and standards for constructing new and reconfigured existing urban roads and streets. It also sets out practical design measures to encourage more sustainable travel patterns in urban areas. The transport documentation prepared by Waterman Moylan Engineering Consultants provide further details in respect of the compliance of the proposed development with the provision of DMURS. Please refer to the pertaining documents prepared by Waterman Moylan Engineering Consultants for further information in this regard.

3.3.17 National Cycle Manual (June 2011)

The *'National Cycle Manual'* 2011 embraces the Principles of Sustainable Safety as this will offer a safe traffic environment for all road users including cyclists. The Manual also gives guidance on the minimum number of spaces which should be provided initially at new private and public facilities in urban areas. For housing developments, this is stated to be: 1 no. private secure bicycle space per bed space, minimum 2 spaces; and 1 visitor bicycle space per two housing units. Cycle parking should also be designed for convivence with shared facilities suitable for multiple dwellings

It is submitted that connections in the proposed development have been addressed by developing an integrated site strategy having full regard to cycle and pedestrian movement, in addition to efficient vehicular access points.

Furthermore, Permeability through the site has been reinforced by the proposed pedestrian/cycle routes across the scheme and at its northern and southern borders, which ensures that the site remains well connected to its surroundings. Future permeability and connections to adjacent lands have also been provided for which would allow shorter pedestrian and cycle journey times to the village centre. Please refer to the enclosed Traffic and Transport drawings and documentation prepared by Waterman Moylan Engineering Consultants for further details in this regard.

3.3.18 EIA Directive

The requirements for an Environmental Impact Assessment (EIA) of development proposals (projects) are governed by Directive 2014/52/EU, which amends the previous EIA Directive (Directive 2011/92/EU). The primary purpose of an EIA is to ensure that certain projects that are likely to have significant effects on the environment are subjected to an assessment of their likely environmental impacts. The EIA process itself forms part of the planning consenting process and is carried out by the Competent Authority (An Bord Pleanála in this instance).

An EIAR is prepared by and on behalf of an applicant/developer in respect of development proposal / project that they are seeking planning consent/permission. Therefore, the EIAR becomes a central element that informs the Competent Authority's determination of the planning permission. The EIA Directives list those projects for which an EIA is mandatory (Annex I) and those projects for which an EIA may be required (Annex II). Annex I projects are listed in Part 1 of Schedule 5 of the Planning and Development Regulations 2001 (as amended, 'the Regulations'). The Project is not listed within Part 1 of Schedule 5 of the Regulations and therefore mandatory EIA is not required under Annex 1. With respect to Part 2 of Schedule 5 (Annex II) Projects, the relevant thresholds relating to the subject proposal are outlined below:

- **Class 10(b)(i) "Construction of more than 500 dwelling units"**: This project (the proposed development) comprises a residential development including the provision of 415 no. new residential dwelling units and a childcare facility. Therefore, the Project falls below the stated threshold, and an EIA is not required on this basis.
- **Class 10(b)(ii): "Construction of a car-park providing more than 400 spaces, other than a car-park provided as part of, and incidental to the primary purpose of a development.":** The project (the proposed development) does not include a car park providing 400 no. spaces or more. Furthermore, all car parking being provided within the project is incidental to the primary purpose of the residential development. Therefore, the car parking element of the project does not fall within this Class of Regulations. An EIA is not required on this basis.
- **Class 10(b)(iv): "Urban development which would involve an area greater than 2 hectares in the case of a business district, 10 hectares in the case of other parts of a built-up area and 20 hectares elsewhere".** In this instance, the application site extends to c. 12.5 hectares within what can be considered a built-up area. An EIA is required on this basis and, as a consequence, an EIAR has been prepared to accompany the planning application.

3.3.19 Bird and Habitats Directive - Appropriate Assessment

The proposed development has been screened for Appropriate Assessment in accordance with the requirements of Article 6(3) of the EU Habitats Directive (92/32/EEC). Faith Wilson Ecological Consultants has prepared a report for Screening for Appropriate Assessment for the proposed development. A Natura Impact Statement (NIS) has also been prepared by Faith Wilson Ecological Consultants for the proposed development. For further information in this regard, please refer to the

Appropriate Assessment Screening Report and Natura Impact Statement prepared by Faith Wilson Ecological Consultants.

3.3.20 The Planning System and Flood Risk Guidelines (2009)

These Guidelines require the planning system at all levels to avoid developments in areas at risk of flooding, particularly floodplains, except where there are no suitable alternative sites available in areas at lower risk that are consistent with the objectives of proper planning and sustainable development. Where such development has to take place, in the case of urban regeneration for example, the type of development has to be carefully considered and the risks should be mitigated and managed through location, layout and design of the development to reduce flood risk to an acceptable level.

Applicants are advised to carefully examine their development proposals to ensure consistency with the requirements of these Guidelines including carefully researching whether there have been instances of flooding or there is the potential for flooding on specific sites and to carry out a site-specific flood risk assessment.

In accordance with these Guidelines, Waterman Moylan Consulting Engineers have carried out a flood risk assessment of the subject site. The site has been assessed in accordance with the Flood Risk Management Guidelines, with appropriate mitigation measures proposed such as SuDS and attenuation design, setting of floor levels, overland flood routing, damp proof membranes, and regular inspections.

Therefore, it is considered that the proposed development is consistent with the requirements of this national flood risk management policy. For further information in this regard, please refer to the enclosed Flood Risk Assessment report prepared by Waterman Moylan Consulting Engineers.

3.3.21 All-Ireland Pollinator Plan 2021-2025

The All-Ireland Pollinator Plan is a shared plan of action which is to bring about a landscape where pollinators can flourish over 2021-2025. To achieve this, the Plan sets out six objectives: (1) Making farmland pollinator friendly, (2) Making public land pollinator friendly, (3) Making private land pollinator friendly, (4) All-Ireland Honeybee Strategy, (5) Conserving rare pollinators, and (6) Strategic coordination of the Plan.

With respect to the aforementioned, the proposed development has taken into consideration the All-Ireland Pollinator Plan, reflecting the relevant guidelines and proposed measures by providing for an internal network of landscaped open spaces. Moreover, these high-quality landscaped areas retain the existing trees and hedgerows where possible, which will enhance the scheme by providing mature sylvan areas as a foil to the new streetscapes and buildings now proposed. Please refer to the Landscape drawings and report prepared by KFLA landscape Architects for further details on inclusion of the Plan guidelines within the proposed landscape of the scheme.

3.3.22 National Adaptation Framework: Planning for a Climate Resilient Ireland

In accordance with the ‘*Climate Action and Low Carbon Development Act 2015*’, this National Adaptation Framework (NAF) specifies the national strategy for the application of adaptation measures in different sectors and by local authorities in their administrative areas in order to reduce the vulnerability of the State to the negative effects of climate change and to avail of any positive effects that may occur.

The 'Built Environment and Spatial Planning' section within this Framework recognises that, "*climate change considerations need to be taken into account as a matter of course in planning-related decision-making processes and that the deepening of adaptation considerations in the planning and building standards processes is considered the most appropriate way of increasing the resilience of the built environment*".

Furthermore, "*effective planning reduces vulnerability to the negative effects of climate change by integrating climate considerations into decision making in order to avoid inappropriate forms of development in vulnerable areas and promoting compact development in less vulnerable areas*". It is important to mention that this Framework envisions 'flood resilience' and 'access to wildlife and green space' as no-regret benefits of effective adaptation which would continue to be worthwhile regardless of future climate scenarios.

As such, the proposed development has taken into consideration the context of the site and it can be noted that an assessment of Flood Risk has been prepared by Waterman Moylan Consulting Engineers, with appropriate mitigation measures proposed such as SuDS design attenuation ponds, overland flood routing, etc. Thus, the proposed development with access to high-quality green communal space and introduction of best practice energy efficiency measures as required to meet the Energy Strategy and Building Regulations and promoting a compact urban form for 'less vulnerable areas' is consistent with this national framework.

3.3.23 Climate Action Plan 2019

Climate disruption is already having diverse and wide-ranging impacts on Ireland's environment, society, economic and natural resources. The Climate Action Plan 2019 sets out an ambitious course of action over the coming years to address this issue.

The Plan notes that the built environment accounted for 12.7% of Ireland's greenhouse gases in 2017. Our buildings are 70% reliant on fossil fuels, including oil fired boilers; over 80% of our homes and other buildings assessed for their BER have a rating of C or worse; and the current annual retrofit activity for existing stock is far too limited (approximately 23,000, mainly shallow, retrofits). A hierarchy of the most cost-effective investments underpin this, including, improving the fabric of buildings, district heating, heat pumps and new building standards.

As such, the proposed development has taken into consideration the Climate Action Plan and measures have been included within the design of the development to reduce carbon emissions in line with the requirements of the Action Plan.

3.4 Regional Planning Context

3.4.1 Regional Spatial & Economic Strategy for the Eastern & Midland Region

The '*Regional Spatial and Economic Strategy*' (RSES) was published by the Eastern and Midland Regional Assembly. The RSES outlines the long-term regional level strategic planning and economic framework in support of the National Planning Framework for the period 2019-2031. The RSES identifies regional assets, opportunities, pressures, and constraints and provides a framework for investment to better manage spatial planning and economic development throughout the Eastern & Midland Region.

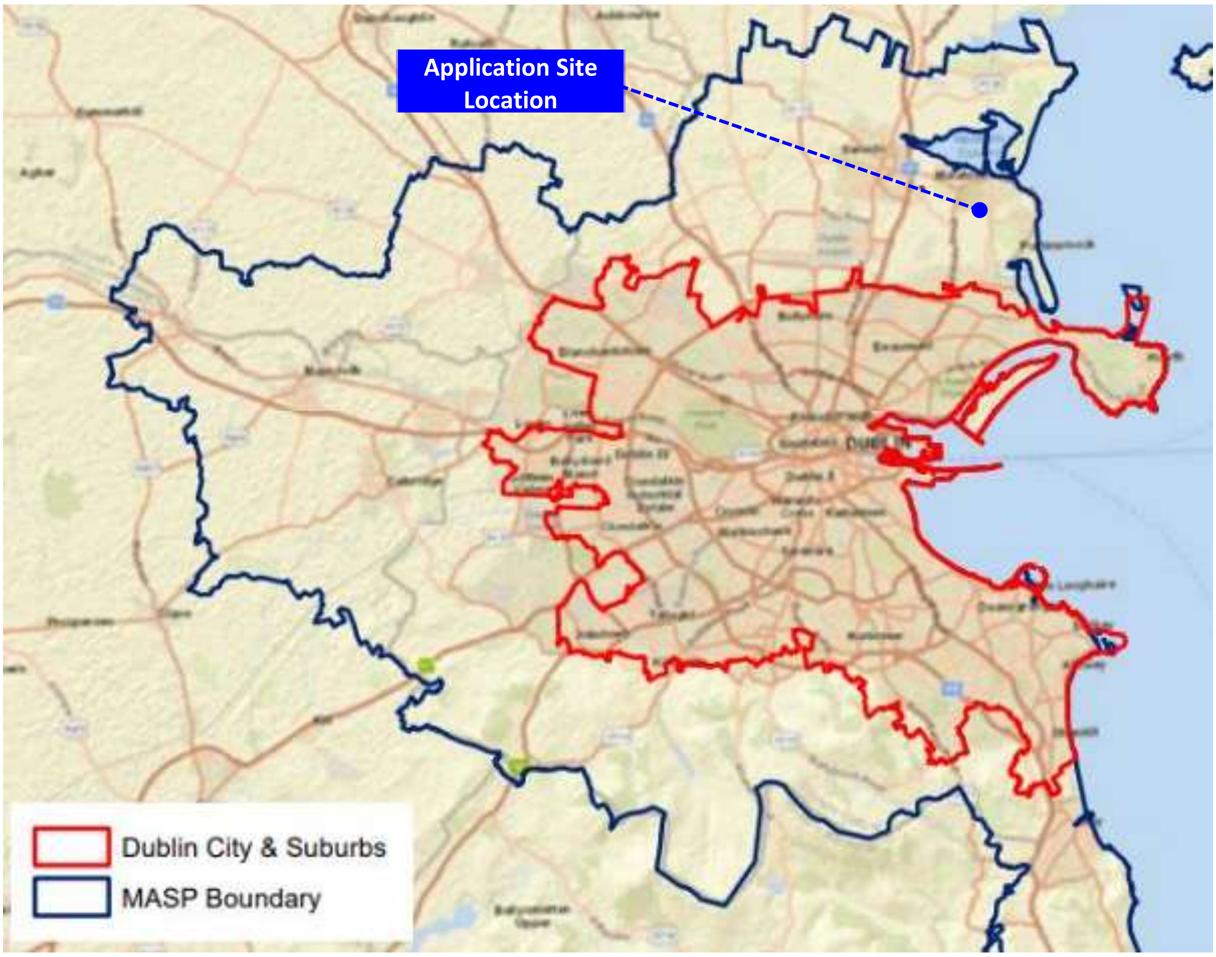

Figure 3-1. Application Site Location within the Dublin Metropolitan Area Strategic Plan' (MASP) Area under the Regional Spatial and Economic Strategy (Eastern & Midland Regional Assembly)

In conjunction with the NPF, the RSES predicts the Dublin Metropolitan Area under '*Dublin Metropolitan Area Strategic Plan' (MASP)* to experience continued population growth over the period 2019-2031 with a predicted increase of 250,000. The NPF targets 50% of all housing to be provided within or contiguous to the built-up area of Dublin city and suburbs. In order to combat and provide for compact residential development, the RSES outlines a number of key Regional Policy Objectives that pertain to the NPF targets. The key Regional Policy Objectives applicable to the development proposal are the following:

Regional Policy Objective (RPO) 4.3 – *"Support the consolidation and re-intensification of infill/brownfield sites to provide high density and people intensive uses within the existing built-up area of Dublin city and suburbs and ensure that the development of future development areas is co-ordinated with the delivery of key water infrastructure and public transport projects."*

Regional Policy Objective (RPO) 5.4 – *"Future development of strategic residential development areas within the Dublin Metropolitan area shall provide for higher densities and qualitative* *standards as set out in the 'Sustainable Residential Development in Urban Areas', 'Sustainable Urban Housing; Design Standards for New Apartments' Guidelines, and 'Urban Development and Building Heights Guidelines for Planning Authorities'."*

Regional Policy Objective (RPO) 5.5 – *"Future residential development supporting the right housing and tenure mix within the Dublin Metropolitan Area shall follow a clear sequential approach, with a primary focus on the consolidation of Dublin and suburbs, and the development of Key Metropolitan Towns, as set out in the Metropolitan Area Strategic Plan (MASP) and in line with the overall Settlement Strategy for the RSES. Identification of suitable residential development sites shall be supported by a quality site selection process that addresses environmental concerns."*

The RSES seek to deliver strategic development areas identified in the MASP, located within existing settlement development boundaries including locations where there an excellent provision of public transport services. The proposed development at Broomfield will provide for a sustainable residential development on appropriately zoned lands, in a highly accessible location within the development boundary of Malahide which promotes compact urban growth and a good quality of life. It is submitted that the provision of a high quality and medium density residential development consisting of 415 no. residential units (252 no. houses, 135 no. apartments and 28 no. duplex units) with 1 no. childcare facility will assist in achieving the aforementioned objectives and it also complies with the pertaining policies and standards. For further details on how the proposed development is in accordance with these policies, please refer to the Housing Quality Assessment and Architectural Design Statement prepared by MCORM Architects which is included as part of the architectural planning packs.

In relation to Settlement Strategies, Regional Policy Objectives (RPO) 4.1 and 4.2 of the RSES set out the rationale and basis for preparing these strategies. RPO 4.1 states: *"In preparing Core Strategies for development Plans, Local Authorities shall determine the hierarchy of settlements in accordance with the hierarchy, guiding principles and typology of settlements in the RSES, within the population projections set out in the National Planning Framework to ensure that towns grow at a sustainable and appropriate level, by setting out a rationale for land proposed to be zoned for residential, employment and mixed-use development across the Region. Core strategies shall also be developed having regard to the infill/brownfield targets set out in the National Planning Framework, National Policy Objectives 3a-3c."*

RPO 4.2 states: *"Infrastructure investment and priorities shall be aligned with the spatial planning strategy of the RSES. All residential and employment developments should be planned on a phased basis in collaboration with infrastructure providers so as to ensure adequate capacity for services (e.g., water supply, wastewater, transport, broadband) is available to match projected demand for services and that the assimilative capacity of the receiving environment is not exceeded."*

It is submitted that the proposed development on appropriately zoned lands will adhere with the policies and objectives of the Regional Spatial and Economic Strategy for the Eastern & Midland Regional Assembly area and will contribute to providing additional housing units within the Dublin Metropolitan Area.

3.4.2 Transport Strategy for the Greater Dublin Area 2016-2035

This transport strategy provides a framework for the planning and delivery of transport infrastructure and services in the Greater Dublin Area (GDA). The purpose of the Strategy is: *"To contribute to the economic, social and cultural progress of the Greater Dublin Area by providing for the efficient, effective and sustainable movement of people and goods."* The core of the strategy seeks the better integration of land use planning and transport planning. This can be achieved through the consolidation of development into higher order centres. In terms of the provision of housing, the strategy seeks to directly enable the sustainable development of strategically important residential sites, particularly in Metropolitan Dublin, where demand is highest.

The proposed development at Broomfield seeks to develop on appropriately zoned lands, in a highly accessible location within the development boundary of Malahide. The application site is also located within walking distance of a Dublin Bus stop located along R107 Malahide Road to the west of the application site and the R124/Church Road to the east of the application site and is located within 1km (closest point) to 2km (furthest point) of Malahide DART station. It is considered that the proposed application will represent an appropriate form of development in the context of supporting the vision and objectives of the Transport Strategy for the Greater Dublin Area 2016-2035.

3.5 Local Planning Context

3.5.1 Fingal Development Plan 2017-2023

3.5.1.1 Overarching Considerations

The subject site is located within the functional area of Fingal County Council. The development of the site is therefore informed by the policies and objectives of the Fingal County Council Development Plan. The policies and objectives of the Development Plan are underpinned by the following vision:

> *"Within the next 25 to 30 years, Dublin will have an established international reputation as one of Europe's most sustainable, dynamic, and resourceful city regions. Dublin, through the shared vision of its citizens and civic leaders, will be a beautiful, compact city, with a distinct character, a vibrant culture, and a diverse, smart, green, innovation-based economy. It will be a socially inclusive city of urban neighbourhoods, all connected by an exemplary public transport, cycling and walking system and interwoven with a quality bio-diverse green space network. In short, the vision is for a capital city where people will seek to live, work, experience, invest and socialise, as a matter of choice."*

3.5.1.2 Core Strategy

<u>Fingal Development Plan 2017-2023</u>

The purpose of the Core Strategy is to articulate a medium-to-longer term quantitatively based strategy for the spatial development of the area of the Planning Authority and in doing so, to demonstrate that a Development Plan and its policies and objectives are entirely consistent with national and regional policies and strategies.

Malahide has been identified as a Moderate Sustainable Growth Town in the Development Plan. The County Plan notes that Malahide has experienced population growth in recent years and is served by high-capacity public transport links to Dublin City.

The vision of the Fingal Development Plan is to grow the county in a long-term sustainable way as it enters a period of economic and population growth. The plan states, "*the emphasis of this Plan is to continue to consolidate the existing zoned lands and to maximise the efficient use of existing and proposed infrastructure. In this way the Council can ensure an integrated land use and transport strategy in line with national and regional policy. […]. The development of larger areas of residential or mixed-use lands will only take place subject to the necessary infrastructure being available and to this end will be subject to a Local Area Plan. It is through the LAP process that, within the towns and villages, the detailed phasing and distribution of housing will be determined in line with the population and housing targets established at a strategic level."*

In this instance, the subject site is located on appropriately zoned lands within the development boundary of Malahide ensuring the development of these lands is consistent with development plan policy. The Development Plan estimates that 1,114 residential units can be produced within Malahide. The proposed development provides for an overall net density of c. 37.5 dwellings per hectare (net developable area is 11.1 hectares when the access road is omitted), in accordance with the objectives of the Development Plan and national policy guidance.

With regards to the housing strategy as set out within the Development Plan, there are three core principles which inform and guide the core strategy which are as follows:

- *"To ensure Fingal County Council provides for the development of sufficient housing to meet its obligations as set out in the Regional Planning Guidelines.*
- *To identify the existing and likely future need for housing in the area of the Development Plan.*
- *To ensure that sufficient zoned lands are provided to meet the needs of the different categories of households."*

It is submitted that the proposed development at Malahide is consistent with the housing strategy as it will assist in the delivery of housing, of a sustainable density on appropriately zoned lands, in a highly accessible location within the development boundary of Malahide. The application site is also located within walking distance of a Dublin Bus stop located along R107 Malahide Road to the west of the application site and the R124 Church Road to the east of the application site and is located within 1km (closest point) to 2km (furthest point) of Malahide DART station whilst providing a variety of unit types and mixed tenures for all, in a high-quality, vibrant community setting.

Fingal Development Plan 2017-2023 Variation no. 2

This Variation No. 2 (adopted) to the Fingal Development Plan 2017-23 seeks to respond to the changes in National and Regional planning policy, namely the publication of the National Planning Framework (NPF) in 2018 and the Eastern and Midland Regional Assembly (EMRA) Regional Spatial and Economic Strategy (RSES) in 2019. The NPF includes a National Strategic Outcome (NSO) to achieve compact growth and consolidation of Ireland's cities as a top priority. Under the adopted variation, Malahide is listed as a 'Self-Sustaining Town' with the remaining capacity for residential units of 956 units (Table 2.4) of the potential 43,104 units for the county. The key tenet of the overall Settlement Strategy is the continued promotion of sustainable development through positively encouraging consolidation and densification of the existing urban built form - and thereby maximising efficiencies from already established physical and social infrastructure.

Town/Village	Remaining Capacity (hectares)	Remaining Residential Units	Metropolitan Core % Land	Metropolitan-Core % Units
Metropolitan Area				
Key Town				
Swords	481	14,799		
Dublin City and Suburbs				
Blanchardstown	260	9,306		
Howth	14	436		
Baldoyle/Sutton	29	1498		
Other Settlements*	66.5	2,320		
Other Metropolitan Areas				
Portmarnock	43	1,116		
Self Sustaining Growth Towns				
Donabate	101	3,532		
Self Sustaining Town				
Malahide	75.5	956		
Towns/Villages	92	844		
Total Metropolitan	1,162	34,806	76%	81%

Figure 3-2. Residential Capacity under Fingal Development Plan 2017-2023, updated as of September 2019

Set out under **Objective SS02** of the Fingal Development Plan, Fingal County Council seeks to:

> *"Ensure that all proposals for residential development accord with the County's Settlement Strategy and are consistent with Fingal's identified hierarchy of settlement centres."*

With respect to the timing and sequencing of planning applications in the area, there may be a possible material contravention of the proposed scheme with the Core Strategy of the Development Plan. An overview of the applications on housing provision in the area, mainly lodged through the SHD process, expects that an overall total of 646 no. units to be potentially delivered in Malahide up to 2023. This includes Seamount Road SHD providing for 142 no. dwellings (TA06F.305991 - granted permission on 20/03/2020), Auburn House SHD providing for 368 no. dwellings (TA06F.309907 - in the pre-application stage), Lamorlaye, Back Road SHD providing for 102 no. dwellings (TC06F.310125 - in the pre-application stage), and Streamstown Lane development providing for 34 no. dwellings (PL06F.301848 - granted permission on 03/12/2018). Thus, there is still a remaining capacity of 310 no. residential units to be delivered in the area. This is further discussed in the Statement of Material Contravention prepared by Downey and enclosed under a separate cover with the application, which we invite the Board to refer to.

The variation notes that, *"Self-Sustaining Towns are towns that require contained growth, focusing on driving investment in services, employment growth and infrastructure whilst balancing housing delivery."* As a Self-Sustaining Town, Malahide has an important role within the Metropolitan Area and should continue to develop as a self-sustaining centre through the provision of a range of facilities to support the existing and new populations. Development in these towns should focus on consolidation and inclusion of policies in relation to improvements in services and employment provision. Objective ED85 of the variation to the Development Plan seeks to:

> *"Ensure that settlements and locations within the Metropolitan Area pursue development policies of consolidation and maximise their economic strengths and competitive advantages such as tourism and marine sectoral activities in Malahide and Howth, while the lands within the southern part of the County maximise their economic potential through the strong functional linkages to the M50."*

As stated in the adopted variation, *"Malahide is considered a Self-Sustaining Town within the RSES definitions. It is a coastal town with a high quality built and natural environment. Integral to its character and its exceptional amenity offer is Malahide Castle and Demesne and its coastal environment, the tourism offer being enhanced by excellent public transport accessibility. It is envisaged that Malahide will develop as a self- sustaining centre through the provision of a range of facilities to support the existing and new populations. In order for this to be achieved, it is vital that the urban role of Malahide be strengthened, and development consolidated within the town. There is a strong built heritage with four Architectural Conservation Areas (ACAs) in the town. The natural heritage of Malahide Estuary, a European Site, is designated through a Special Area of Conservation (SAC) and a Special Protection Area (SPA) and future development must respect the natural heritage sensitivities."*

The Development Strategy for Malahide seeks to promote the planned and sustainable consolidation of the existing urban form and the sensitive promotion of amenities. The need to upgrade and support the development of the core as a town centre will be balanced with the need to conserve its appearance as an attractive, historic village settlement and to retain the existing amenities of the area, being cognisant of its proximity to an ecologically sensitive coastline including European Sites.

It is submitted that the proposed development of 415 units complies with the objectives of the proposed variation to promote sustainable development through densification of the existing urban form. In this regard the lands are served by existing bus stops and indeed are within 1km (closest point) to 2km (furthest point) from Malahide DART Station. The provision of 415 no. units will seek to ensure the objectives for Malahide as a self-sustaining town are achieved but may exceed the remaining capacity of 956 units as set out in the Adopted Variation No. 2 to Fingal County Development Plan 2017-2023.

3.5.1.3 Movement and Transport

In relation to movement and transport, the Development Plan states that it will:

- Promote and facilitate movement to, from, and within the County of Fingal, by integrating land use with a high quality, sustainable transport system that prioritises walking, cycling and public transport.
- Provide an appropriate level of safe road infrastructure and traffic management, in particular to support commercial and industrial activity and new development.
- Work with all relevant stakeholders to seek a reduction in greenhouse gas emissions from transport.

Some of the policies and objectives in this regard include:

> ***Objective MT01 –*** *"Support National and Regional transport policies as they apply to Fingal. In particular, the Council supports the Government's commitment to the proposed new Metro North and DART expansion included in Building on Recovery: Infrastructure and Capital Investment 2016-2021. The Council also supports the implementation of sustainable transport solutions."*
>
> ***Objective MT02 –*** *"Support the recommendations of the National Transport Authority's Transport Strategy for the Greater Dublin Area 2016-2035 to facilitate the future sustainable growth of Fingal."*
>
> ***Objective MT03 –*** *"Implement Smarter Travel – A Sustainable Travel Future policy and work to achieve the Key Goals set out in this policy."*
>
> ***Objective MT04 –*** *"At locations where higher density development is being provided, encourage the development of car-free neighbourhoods, where non-motorised transport is allowed and motorised vehicles have access only for deliveries but must park outside the neighbourhood, creating a much better-quality public realm with green infrastructure, public health, economic and community benefits."*

It is submitted that the proposed development at Malahide is consistent with these policies and objectives. This additional development in Malahide will ensure walking and cycling are viable options for the community, with the area also very well served by existing public transport infrastructure (Dublin Bus Stop & DART station located within 1km (closest point) to 2km (furthest point) of application site), all of which will ensure that the future population utilise sustainable public transport and active travel options rather than car transport.

3.5.1.4 Land Use Zoning

Under the current Fingal County Council Development Plan, the subject site is zoned *"RA – Residential Area"* which seeks: *"Provide for new residential communities subject to the provision of the necessary social and physical infrastructure."*

The vision for the *"RA – Residential Area"* seeks to:

"Ensure the provision of high quality new residential environments with good layout and design, with adequate public transport and cycle links and within walking distance of community facilities. Provide an appropriate mix of house sizes, types, and tenures in order to meet household needs and to promote balanced communities."

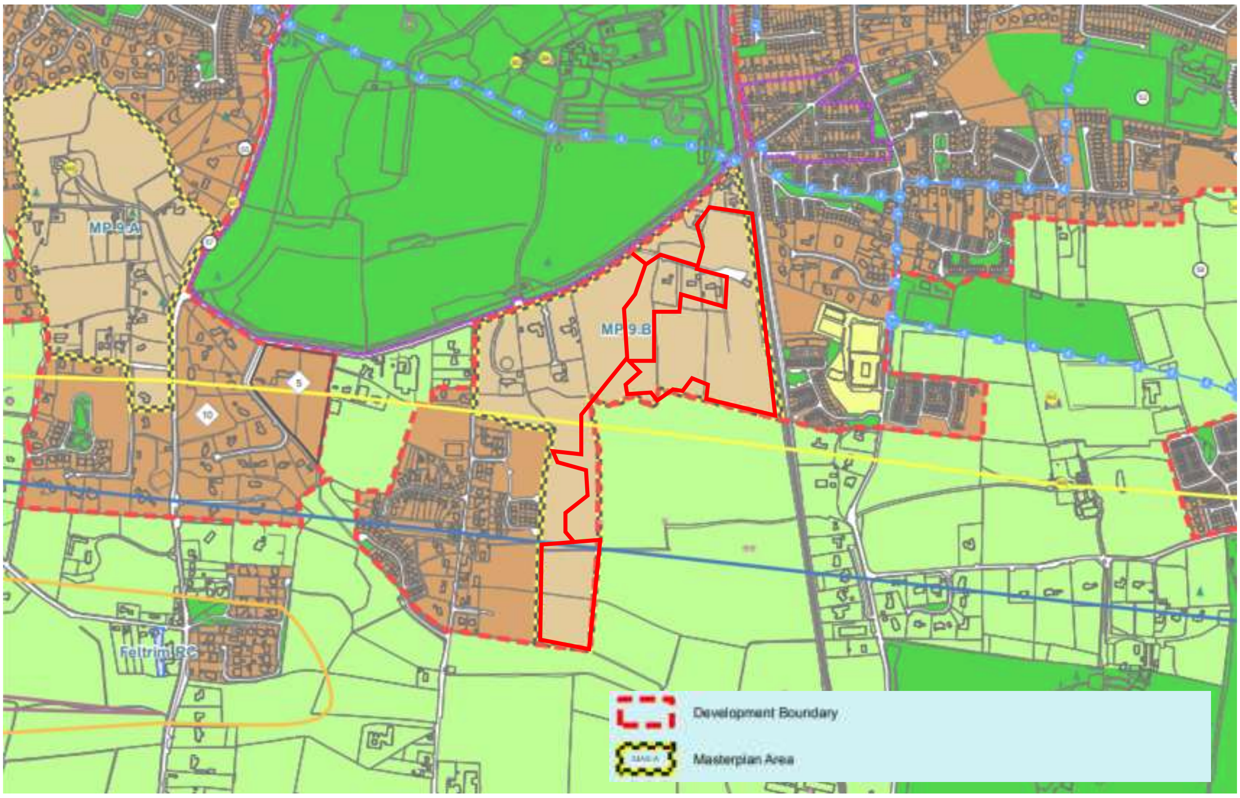

Figure 3-3. Fingal County Council Land Use Zoning Map, 2017-2023 (Lands outlined in red)

Under the RA zoning, the following uses are permitted in principle.

Uses Permitted in Principle under the RA Land Use Zoning
Amusement Arcade[9]; Bed and Breakfast; Betting Office[9]; **Childcare Facilities**; Community Facility; Education; Funeral Home/Mortuary[9]; Guest House; Health Centre; Health Practitioner; Hospital; Office Ancillary to Permitted Use; Office ≤ 100sqm[9]; Office>100sq.m. and, 1,000sqm[11]; Open Space; Place of Worship; Public House[9]; Public Transport Station; Recreational Facility/Sports Club; **Residential**; Residential Care Home/Retirement Home; Restaurant/Cafe[9]; Retail-Local < 150 sqm nfa; Retail – Convenience ≤ 500 sqm nfa[9]; Retail – Comparison ≤ 500 sqm nfa[9]; Retail – Supermarket ≤ 2,500 sqm nfa[9]; Retirement Village; Sheltered Accommodation; Sustainable Energy Installation; Taxi Office; Traveller Community Accommodation; Utility Installations; Veterinary Clinic.

[9] *In a local centre only*
[11] *Only located in a local centre and of a scale appropriate to that centre*

Table 3-2. Permitted Uses under the RA Land Use Zoning

Therefore, the proposed development of residential units and 1 no. childcare facility are permitted in principle under the zoning objectives pertaining to the subject lands.

3.5.1.5 Site Specific Objectives and Designations

Masterplan

The subject lands at Broomfield, whilst zoned for residential development, are also located in an area marked M.P 9B (Broomfield Masterplan) and therefore are subject to the preparation of a Masterplan.

The Fingal County Development Plan 2017-2023 notes that the policies of the Plan will be further developed at a local level through the preparation of Masterplans with further elaboration in relation to the roles of masterplans noting that:

> *"Masterplans are assigned to particular areas to ensure the best policy response is in place to facilitate development in a planned, coordinated and sustainable manner."*

Section 11.3 of the Development Plan sets out that:

> *"The preparation of Masterplans will assist in achieving quality developments in terms of, inter alia, urban design, structure, delivery of community/amenity facilities and permeability. The Fingal Development Plan will identify large or key sites that will require the preparation of approved Masterplans and subsequent planning applications will be required to adhere to the approved Masterplans. Masterplans will be subject to a public consultation process and presentation to the Elected Members of the Planning Authority for agreement. The use of Masterplans has not been confined to residentially zoned lands; Masterplans have also been sought for lands intended for other land uses. The Planning Authority considers Masterplans as an effective means of guiding new development and providing essential social and physical infrastructure in a phased and sustainable manner."*

Objective PM14 of the Fingal County Development Plan 2017 -2023 seeks to:

> *"Prepare Masterplans for areas designated on Development Plan maps in co-operation with relevant stakeholders, and actively secure the implementation of these plans and the achievement of the specific objectives indicated."*

Chapter 3, Section 3.2 of the Development Plan sets out the following guidance on the form that Masterplans should take:

> *"Each Masterplan shall consist of a written statement and a plan or series of plans indicating the objectives in such detail, as may be determined by the Planning Authority for the proper planning and sustainable development of the area to which it applies to include, inter alia, the following details:*
>
> - *Proposals in relation to the overall design of the proposed development including house types and mix of housing units, maximum heights, external finishes of structures and the general appearance and design, including that of the public realm.*
> - *The types and extent of any proposed development indicating how these uses integrate with surrounding development and land uses.*

- *Proposals in relation to transportation including public transportation and non-motorised modes, vehicular roads layout and access arrangements, loading / unloading provision, the provision of parking spaces and traffic management.*
- *Proposals in relation to the provision of services in the area including the provision of waste and sewerage facilities and water, electricity, and telecommunications services, oil, and gas pipelines, including storage facilities for oil and gas.*
- *The element of residential development shall include proposals relating to the provision of amenities, facilities and services for the community including crèches and other childcare services, community, and resource centres.*
- *The facilitation of public access to the proposed amenity areas located within the Plan boundaries and beyond.*
- *To make provision for sport and recreational infrastructure commensurate with the needs of the development as an integral element of their proposals."*

Objective Malahide 11 in Chapter 4 of the Development Plan states that it is an objective to:

"Prepare and/or implement the following Masterplans during the lifetime of this Plan:

- *Broomfield Masterplan (see Map Sheet 9, MP 9.B)"*

To date a Masterplan has not been prepared or adopted for the Broomfield lands by Fingal County Council. This provides that the proposed development may be considered to potentially materially contravene Objective PM14 and Objective Malahide 11 of the Fingal County Development Plan in that a Masterplan has not yet been prepared and/or adopted for the Broomfield lands by Fingal County Council. However, the masterplan area is already largely built out and/or approved at this stage with the exception of subject site. The making of this application effectively constitutes the masterplan lands as the lands comprise the remaining lands available for development under the Broomfield Masterplan designation.

Therefore, with respect to the current circumstances of the lands and by matters of planning permission precedent, Downey are of the professional opinion that the foregoing objectives appear superfluous. To better demonstrate this, the Fingal Development Plan was adopted back in 2017, with Fingal County Council recently commencing the review process of this Development Plan on 12th March 2021. These specific objectives have also been superseded by virtue of planning permission decisions and development that have occurred in the area since 2017. The Statement of Material Contravention enclosed under a separate cover with this application provides the justification for the granting of permission for the development of the lands at Back Road, Broomfield in the absence of the preparation and adoption of the Broomfield Masterplan, which we invite the Board to refer to.

It is also important to note that the masterplan layout and supporting documentation enclosed with this application sets out the proposed development's compliance with the specific objectives for the masterplan which are set out under Objective Malahide 11 including connections to adjoining lands, provision of public open space, etc. The Architectural Design Statement which is enclosed under separate cover sets out the site analysis for the entire masterplan lands. The Masterplan lands include recent development at Ashwood Hall and Brookfield. Since the masterplan was identified in the Fingal Development Plan many of the sites within the identified masterplan area have already been developed, are subject to live planning applications, or are currently under construction. Please refer to the enclosed supporting documentation which sets out the design principles for the development of the Masterplan lands in the context of the specific policies and objectives for the lands as set out in the Fingal County Development Plan 2017-2023.

Dublin Airport Noise Zones & Public Safety Zone

The Fingal Development Plan 2017-2023 seeks to minimise the adverse impact of noise without placing unreasonable restrictions on development and to avoid future conflicts between the community and the operation of the airport. Variation no. 1 of the Development Plan introduces three noise buffer zones for Dublin Airport, replacing the previous Inner Noise Zone and Outer Noise Zone, with Noise Zones A, B, and C.

Objective DA07 of the Fingal Development Variation no. 1 seeks:

> *"Strictly control inappropriate development and require noise insulation where appropriate in accordance with table 7.2 above within Noise Zone B and Noise Zone C and where necessary in Assessment Zone D, and actively resist new provision for residential development and other noise sensitive uses within Noise Zone A, as shown on the Development Plan maps, while recognising the housing needs of established families farming in the zone. To accept that time based operational restrictions on usage of a second runway are not unreasonable to minimize the adverse impact of noise on existing housing within the inner and outer noise zone."*

With respect to the Dublin Airport Noise Zones and as illustrated in the Figure below, the majority of the subject site is located within the Noise Zone C, and a small portion of the site in the southern ends is located in the Noise Zone B.

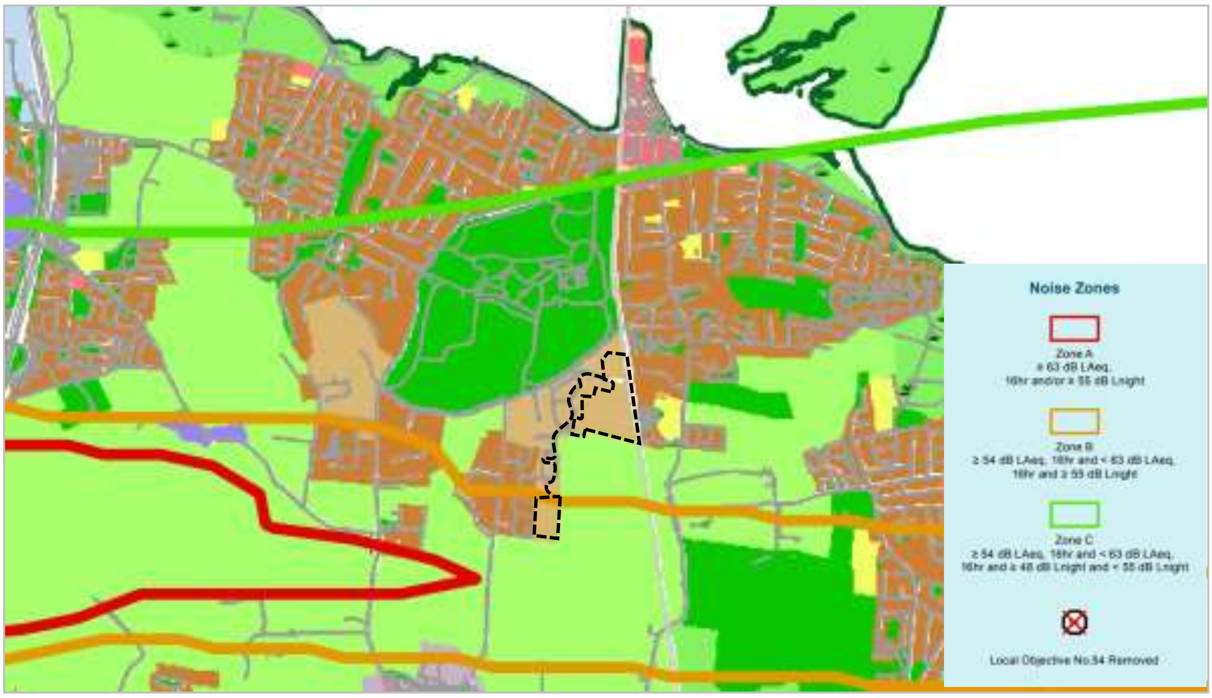

Figure 3-4. Dublin Airport Noise Zones extracted from the Development Plan (approximate boundaries of the subject site outlined in dashed black line)

It is the Objective of the Fingal Development Plan Variation no. 1 for **Noise Zone C**:

*"**To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure, where appropriate, noise insulation is incorporated within the development.***

Noise sensitive development in this zone is less suitable from a noise perspective than in Zone D. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed.

The noise assessment must demonstrate that relevant internal noise guidelines will be met. This may require noise insulation measures.

An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels.

Applicants are strongly advised to seek expert advice."

Also, it is the Objective of the Fingal Development Plan Variation no. 1 for **Noise Zone B**:

*"**To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure noise insulation is incorporated within the development.***

Noise sensitive development in this zone is less suitable from a noise perspective than in Zone C. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed.

Appropriate well-designed noise insulation measures must be incorporated into the development in order to meet relevant internal noise guidelines.

An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the developments design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels.

Applicants must seek expert advice."

On the other hand, the Fingal Development Plan Variation no. 1 outlines Broomfield amongst townlands which **Assessment Zone D** applies to.

"To identify noise sensitive developments which could potentially be affected by aircraft noise and to identify any larger residential developments in the vicinity of the flight paths serving the Airport in order to promote appropriate land use and to identify encroachment.

All noise sensitive development within this zone is likely to be acceptable from a noise perspective. An associated application would not normally be refused on noise grounds, however where the development is residential-led and comprises non-residential noise sensitive uses, or *comprises 50 residential units or more, it may be necessary for the applicant to demonstrate that a good acoustic design has been followed.*

Applicants are advised to seek expert advice."

This Strategic Housing Development application is accompanied by a Noise Assessment Report prepared by AWN Consulting Ltd., which demonstrates the proposed development is compliant with the relevant standards in the Fingal Development Plan Variation no. 1, and good acoustic design has been followed in the design process.

Moreover, it has been recognized that the incidence of aircraft accidents is the highest in the immediate vicinity of busy runways. To address the risk of an aircraft accident to people on the ground, Public Safety Zones (PSZ) are established around the runways. PSZs are areas of land at the end of the runways at the busiest airports, within which development is restricted in order to control the number of people on the ground at risk of death or injury in the event of an aircraft accident on take-off or landing. It is a specific objective to adhere with the following: -

Objective DA14 – "*Review Public Safety Zones associated with Dublin Airport and implement the policies to be determined by the Government in relation to these Public Safety Zones."*

Objective DA15 – "*Take into account relevant publications issued by the Irish Aviation Authority in respect of the operations of and development in and around Dublin Airport."*

Objective DA16 – *"Continue to take account of the advice of the Irish Aviation Authority with regard to the effects of any development proposals on the safety of aircraft or the safe and efficient navigation thereof."*

The blue lines in the Figure below depict the outer PSZ, whereas the yellow lines represent the inner PSZ. The southern portion of the Broomfield development lies within the outer PSZ.

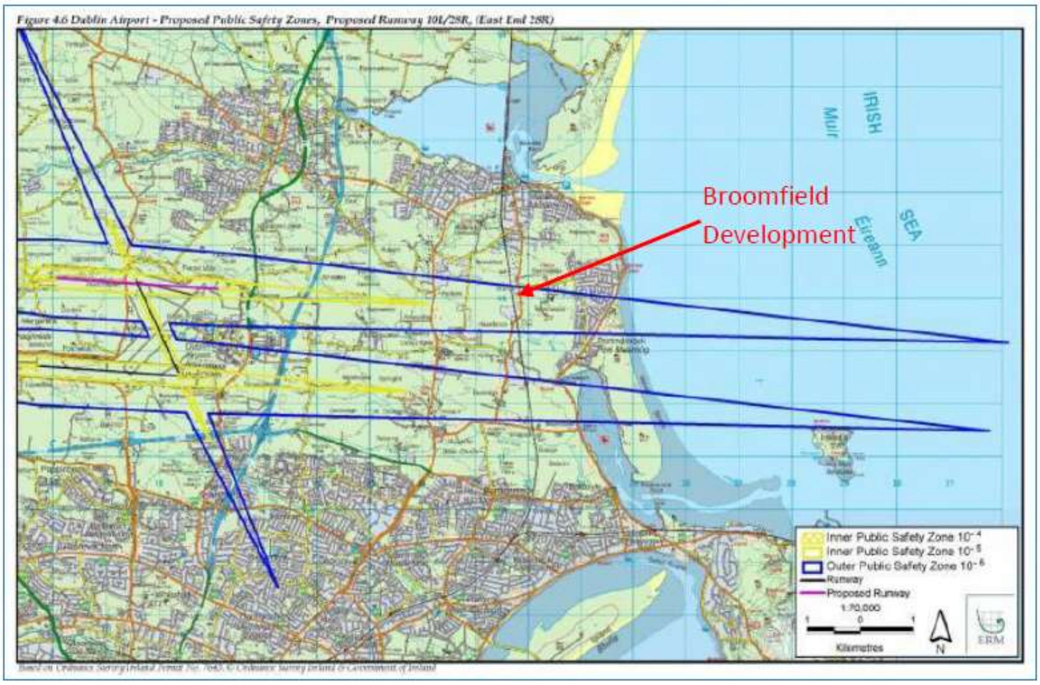

Figure 3-5. PSZ at Dublin Airport extracted from the Aviation Safety Assessment accompanied by the Application for the Proposed Development

As per the Environmental Resources Management (ERM) Ireland, 2003 *"In some cases, permitted developments are restricted to a maximum density of persons. This density is expressed as the number of persons per half hectare. A half hectare was chosen as this approximates the average maximum aircraft crash area. The maximum density should be applied to any single half hectare within which the proposed development is located."* And therefore, the southern portion of the Broomfield SHD application site is restricted to a maximum occupancy of 60 persons in any ½ hectare.

This Strategic Housing Development application is accompanied by an Aviation Safety Assessment prepared by Cyrrus Ltd., which demonstrates:

- The latest layout revision assessed within this report fully complies with the published Aviation Public Safety Zone requirements;
- Of the identified ½ hectare grid squares, none exceed the stated maximum population density of >60 persons per ½ hectare;
- This development does not compromise the population density of pre-existing dwellings;
- Provided that the Fingal Development Plan and Regional Spatial and Economic Strategy (RSES) are implemented as published, the housing occupancy rate in Fingal should decrease over the coming years as more housing stock comes online, thereby ensuring ongoing compliance.

The proposed Strategic Housing Development on lands at Back Road, Broomfield, Malahide, Co. Dublin seeks permission for a total of 415 no. residential units with ancillary amenity facilities (gym and concierge), 1 no. childcare facility and associated car and bicycle parking.

Therefore, Downey are of the professional opinion that the proposed development complies with the requirements of the Aviation Public Safety Zone, and the provisions for the density stipulated in the ERM report, and therefore, is considered to be consistent with the relevant policy and planning framework. For further details in this regard, please refer to the Noise Chapter prepared by AWN Consulting Ltd. and enclosed with the application.

3.5.1.6 Development Management Standards

Chapter 12 of the Fingal County Development Plan sets out development standards and criteria that form the policies and objectives of the Development Plan to ensure that development occurs in an orderly and efficient manner and that it is in accordance with proper planning and sustainable development. The following section assesses the main set of standards and criteria required for high-quality sustainable development.

Table 3-3. Compliance with Chapter 12 – Development Management Standards

Criteria	Compliance
12.1 Background	
Pre-Planning	On 25/08/2020, Downey and the applicant engaged in a pre-application consultation meeting with representatives of Fingal County Council regarding the proposed Strategic Housing Development on lands at Back Road, Broomfield, Malahide, County Fingal.

	On 27/04/2021, Downey and the applicant engaged in a pre-application consultation meeting with representatives of An Bord Pleanála and Fingal County Council regarding the proposed development as part of a Stage 2 consultation meeting. On 04/05/2021, An Bord Pleanála issued the notice of pre-application consultation opinion for the proposed development, under case reference ABP-308804-20. For the detailed response to this opinion and to source the requested information within the application documentation, please refer to the "Statement of Response to An Bord Pleanála's Pre-Application Consultation Opinion" prepared by Downey.
12.2 Common Principles for all Planning Applications	
Access for All	It is noted that the design of the proposed development has taken cognisance of people with reduced mobility through the provision of universally accessible dwelling units as well as readily adaptable dwellings. It is submitted that inclusivity and access have fully influenced the design of the scheme, as follows: - The development will be fully Part M compliant with easy access. Physical and visual barriers have been avoided and full passive surveillance has been designed into overlook all public realm areas. Street layouts, footpath arrangements, street and verge planting combine to allow pedestrians and cyclists easily navigate the scheme through the different character areas proposed and connecting into the adjacent Ashwood and Brookfield schemes currently under construction. - The provision of 1 to 5-bed units in a proportioned mix will include a wide diversity of households, bringing a new inclusive community at Malahide. - An adequate compliance with Part V, delivering over 10%. Please refer to architectural drawings for further detail on the Part V plan. The proposed development is also submitted to be designed in accordance with the recommendations of 'Buildings for Everyone' 2002 published by the National Disability Authority and Technical Guidance Document M Access and Use of the Building Regulations 2010. For further details in this regard, please refer to Universal Access Statement prepared by MCORM Architects and submitted as part of this application.
Green Infrastructure	The proposed development provides for an overall of c. 1.35 ha public open space, comprising of both Class 1 and 2 public open spaces, as specified within the Fingal Development Plan. With respect to the developable site area of 11.1 ha, this would provide for 12% public open space provision which exceeds the threshold envisaged in the Development Plan. It is noted that this calculation does not include the additional 0.55 ha Green Route/Cycle Link. The proposed scheme would also benefit from green infrastructure conceived for Ashwood Hall, with intuitive and clear connections to the park located east side, which will be a reference as a central open space when the northern lands are developed, and thus generating a strong relationship between the surrounding green systems and the future internal open space network envisaged. Regarding the southern lands, potential clear linkages with Hazelbrook (West) and Brookfield (North) are observed. A completion of

	neighbouring urban patterns within this southern subject site, with a reliance on linked landscaped open spaces and pocket parks, is envisioned. Finally, the natural hedgerow and tree boundary along the Dublin-Belfast railway is a promising opportunity to design a linear park which, in addition, would work as an acoustic barrier against train traffic for the adjacent housing cells. For further information in this regard, please refer to the detailed landscaping proposals prepared by KFLA Landscape Architecture.
Sustainable Design	Efficiency through design has been achieved in the macro scale in terms of layout and site configuration with good attention to detailing of the individual dwelling plan forms providing energy efficiency and reduced lifetime running costs of the overall scheme. Efficient planning and design have also been brought into the layouts of the individual dwelling units planned, along with apartments and duplex units. The design brief was set to create an exemplar of sustainable design to ensure all new development can be delivered in a manner that protects and enhances the biodiversity of the local environment, mitigates climate change, and delivers high energy efficiency in accordance with NZEB strategies.
Environmental Impact Assessment	Given that 415 no. units are proposed and indeed noting that the application site extends to an overall of c. 12.5 hectares within what can be considered a built-up area, an Environmental Impact Assessment Report has been prepared as part of the proposed application. Please refer to the enclosed EIAR which assesses the overall development and is enclosed with this SHD application for the consideration of the Board.
Screening for Appropriate Assessment	An Appropriate Assessment Screening report has been carried out by Faith Wilson Ecological Consultants as part of this SHD application. A Natura Impact Statement has also been prepared. Please refer to the enclosed Screening Report for Appropriate Assessment and Natura Impact Statement prepared by Faith Wilson Ecological Consultants for further details.
12.3 Design Criteria for Urban Development	
High Quality Urban Design	The Development Plan defines several objectives to support high-quality urban design. It will allow the creation of accessible places where people want to live, work, and spend time. It is the policy of the Council to ensure all development is of a high-quality design and promotes the achievement of accessible, safe, and sustainable built and natural environments, which reflect the special character and heritage of the County and its varied townscapes and landscapes. Design principles are based on the '*Sustainable Residential Development in Urban Areas – Guidelines for Planning Authorities*' and '*Best Practice Urban Design Manual.'* Which contains twelve design principles to be applied to all developments with **Objective DMS03** requiring: *"Submit a detailed design statement for developments in excess of 5 residential units or 300 sqm of retail/commercial/office development in urban areas. The design statement is required to:* ▪ *Explain the design principles and design concept.* ▪ *Demonstrate how the twelve urban design criteria (as per the 'Urban Design Manual - A Best Practice Guide') have been taken into account when designing schemes in urban areas. Each of*

	the twelve criteria is of equal importance and has to be considered in an integrated manner. ▪ *Outline how the development meets the Development Plan Objectives, and the objectives of any Local Area Plan, Masterplan, Urban Centre Strategy, Framework Plan, or other similar Plan affecting the site.* ▪ *Include photographs of the site and its surroundings.* ▪ *Include other illustrations such as photomontages, perspectives, sketches.* ▪ *Outline detailed proposals for open space and ensure the provision of open space is designed in from the beginning when designing a new scheme.* ▪ *Outline a detailed high-quality open space and landscape design plan including specifications, prepared by suitably qualified professionals.* ▪ *Outline how Green Infrastructure integrates into the scheme."* In accordance with the aforementioned objective, an Architectural Design Statement has been prepared by MCORM Architects which sets out the proposed development's compliance with the 12 Urban Design criteria and how the proposed development accords with the requirements of Objective DMS03. Please refer to the enclosed Architectural Design Statement and associated drawings prepared by MCORM Architects for further information in this regard. Please also refer to the detailed landscaping proposals prepared by KFLA Landscape Architecture.
12.4 Design Criteria for Residential Development	
Residential Zoning	Under the current Fingal County Council Development Plan, the subject site is zoned "RA – Residential Area" which seeks: *"Provide for new residential communities subject to the provision of the necessary social and physical infrastructure."* It is also submitted that the proposed development of residential units and 1 no. childcare facility are permitted in principle under the zoning objectives pertaining to the subject lands. The Fingal Development Plan 2017-2023 states that some RA zoning areas, as the case in this instance, will be subject to either a Local Area Plan or a Masterplan. Thus, it is an objective of the Development Plan to prepare/ implement a Masterplan for Broomfield during the lifetime of the Development Plan under ***'Objective Malahide 11'***. A layout and supporting documentation have been prepared and accompanies this SHD application. The Architectural Design Statement sets out the design principles for the overall lands at Broomfield. It is important to note that the lands at Broomfield subject to this SHD, represent the final developable lands subject to the designation. Also, please refer to the Statement of Material Contravention for further details on the Masterplan.
Mix of Dwelling Types	The Development Plan states that the dwelling mix in any residential scheme should provide a balanced range of dwelling types and sizes to support a variety of household types. In this regard, the proposed development provides for provision 415 no. residential units (252 no. houses, 135 no. apartments and 28 no. duplex units) with ancillary amenity facilities (gym and concierge) and 1 no.

	childcare facility provides for a variety of unit types encompassing a mix of one, two and three bed apartments, two, three, four and five bed houses, one, two and three bed duplex units, all of which provide for a mix and variety of units types in accordance with the Development Plan and indeed the mix requirements as set out within the '*Design Standards for New Apartments Guidelines for Planning Authorities*' and the *'Delivering Homes, Sustaining Communities: Statement on Housing Policy'*. Whilst there are different apartment unit types and different house unit types provided, in terms of bedroom provision, it is also important to note that within these units, there is a significant amount of diversity in terms of size, layout, storage, aspect, room dimensions, etc. This ensures that the proposed development provides for the various needs of potential future residents and that it is a sustainable form of residential development which can cater for all age demographics and is adaptable and flexible for their future needs, be it, single professionals, young couples, small young families, older families, the elderly, those looking to downsize, etc.
Residential Density & Height	The Development Plan provides that the number of dwellings to be provided on a site should be determined with reference to the '*Sustainable Residential Development in Urban Areas – Guidelines for Planning Authorities*' (2009). As a general principle and to promote sustainable forms of development, higher residential densities will be promoted within walking distance of town and district centres and high-capacity public transport facilities. In this regard, the proposed development provides for a sustainable development with an overall net density of c. 37.4 dwellings per hectare (net developable area is 11.1 ha when the access road is omitted), on appropriately zoned lands, in a highly accessible location within the development boundary of Malahide and therefore accords with the density requirements of both the Development Plan and national guidelines. It is also noted that the Development Plan requires that Masterplans be prepared by Fingal County Council for the designated lands. The subject lands are designated for the preparation of the Broomfield Masterplan. However, such a masterplan has yet to be prepared for the lands under Objective PM14 and PM15. For further details in this regard, please refer to the enclosed Statement of Material Contravention prepared by Downey.
Apartment Development	The '*Design Standards for New Apartments Guidelines for Planning Authorities*' have superseded the design standards for apartments as set out in the Development Plan. With regards to Dual Aspect the proposed development provides for 60% dual aspect units within the proposed apartment units in accordance with Objective DMS20 of the Development Plan. The apartment floor areas are also in accordance with the '*Design Standards for New Apartments Guidelines for Planning Authorities'* as set out in the enclosed Architectural Design Statement and Housing Quality Assessment (HQA) prepared by MCORM Architects. Please refer to the enclosed report for full details on the proposed development's compliance with standards for apartment developments.
Quantitative Standards	The development proposal adheres with the Quality Housing for Sustainable Communities; Best Practice Guidelines for Delivering Homes and Sustaining Communities (DEHLG, 2007) and Sustainable Urban Housing: Design Standards

	for New Apartments Guidelines for Planning Authorities (DEHLG, 2018) when assessing proposals for apartment development. Please refer to the Accommodation Schedule and Architectural Design Statement prepared by MCORM Architects for compliance in this regard.
Separation Distances	Appropriate separation distances between dwellings have been provided. Furthermore, sufficient separation between side gables has also been provided for in accordance with Objective DMS28 & DMS29 of the Development Plan.
Daylight, Sunlight and Overshadowing	Objective DMS30 of the Development Plan requires that all new residential units comply with the recommendations of '*Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice*' (B.R.209, 2011) and B.S. 8206 '*Lighting for Buildings, Part 2 2008: Code of Practice for Daylighting*' or other updated relevant documents. For further details in this regard, please refer to the Daylight & Sunlight Assessment as provided for by Digital Dimensions accompanying this SHD application.
Acoustic Privacy	Objective DMS31 of the Fingal County Development Plan requires that sound transmission levels in semi-detached, terraced, apartments and duplex units comply as a minimum with the 2014 Building Regulations Technical Guidance Document Part E or any updated standards. It is submitted that the proposed development will comply with Objective DMS31 of the Development Plan in this regard.
Open Plan Estates	The removal of the exempted development rights is subject to agreement with the Planning Authority and An Bord Pleanála as part of a condition to the granting planning permission.
Gated Communities	Objective DMS32 of the Fingal County Development Plan prohibits proposals that would create a gated community for any new residential developments. It is viewed that the proposed development is not a 'gated community' and will adhere with Objective DMS32 of the Development Plan in this instance.
Management Companies and Facilities for Apartment Developments	Outlined in the Development Plan, higher-density apartment type development will require a management company to maintain communal areas. It is a specific objective to adhere with the following: - ***Objective DMS33*** *- Require properly constituted management companies in apartment type schemes are set up and necessary management structures are put in place for the benefit of the residents.* ***Objective DMS34*** *- Provide in high density apartment type schemes in excess of 100 units facilities for the communal use of residents as deemed appropriate by the Council.* ***Objective DMS35*** *- Require the provision of communal laundry rooms and storage facilities in high density apartment type developments where deemed appropriate.* The proposed apartments within the scheme will be privately managed by the establishment of a management company. This management company will be responsible for maintaining the external appearance of the apartments, maintaining the internal and external communal spaces, bins management, etc.

	It is also important to note that the public parks and main roads are proposed to be taken in charge by Fingal County Council. For information in this regard, please see the enclosed pertaining drawing prepared by MCORM Architects.
Refuse Storage and Bins	The proposed development provides for convenient and well-designed proposals for the storage of refuse. The proposed development provides for several apartments at ground floor level which have own door access in addition to the two storey houses. For further details, please refer to the Housing Quality Assessment (HQA), Bin Storage Plan, and Architectural Design Statement prepared by MCORM Architects.
12.7 Open Space	
Public Open Space	The proposed development provides for an overall of c. 1.35 ha public open space, comprising of both Class 1 and 2 public open spaces. This includes outdoor play opportunities for children which are accessible to all within the scheme and the wider community. With respect to the developable site area of 11.1 ha, this would provide for 12% public open space provision. It is noted that this calculation does not include the additional 0.55 ha Green Route/Cycle Link. The proposed scheme would also benefit from green infrastructure conceived for Ashwood Hall, with intuitive and clear connections to the park located east side. Malahide Castle and Demesne (Class 1 Open Space Area) is located immediately north of the application site, and this extends to over 260 acres of parkland, woodland, playground, walking trails and botanical gardens. It is submitted that given the proximity of the application site to Malahide Castle and Demesne, the provision of public open space is appropriate in this instance given the excellent provision of public open space facilities in the locality.
Private Open Space	In accordance with national policy and particularly the Urban Design Manual and new Apartment Guidelines, the proposed development has achieved appropriate separation distances to maintain privacy and protect residential amenity, with design solutions and appropriate landscaping also proposed to protect privacy for residents. It is noted that each residential unit benefits from the provision of adequately sized private open space in the form of gardens, balconies, or patios/terraces (designed in accordance with quantitative and qualitative standards), with the units at ground floor level provided with appropriate boundary treatments to ensure privacy and security whilst also providing visual interest and distinction between spaces. For further information on the private open space proposed as part of this SHD application, please refer to the Architectural Design Statement prepared by MCORM Architects and the landscaping pack for further details.
Playground Facilities	Outlined in the Development Plan, all residential schemes in excess of 50 units should incorporate playground facilities which should be provided at a rate of 4 sqm per residential unit. It is noted that the proposed development provides for 210 sqm of play areas with formal equipment, 800 sqm of informal play areas, along with a minimum of 2,000 sqm useable kickabout space, which are

	demarcated on the Landscape drawings prepared by KFLA Landscape Architects. With respect to the broad definition of play area, as specified in the Space for Play; A Play Policy for Fingal, the overall play area provision is submitted to be consistent with the Management Standards of the Development Plan. However, out of an abundance of caution, it has been included in a Material Contravention Statement should it be considered to potentially materially contravene the Fingal Development Plan 2017-2023 by the competent authority in their assessment of the application, which we invite the Board to refer to.
12.8 Community Infrastructure, Facilities and Services	
Childcare Facilities	All childcare facilities shall be provided in accordance with the *'Childcare Facilities: Guidelines for Planning Authorities' (DEHLG)*. The proposed SHD development will provide for a purpose-built childcare facility to accommodate approximately 86 children within the site with appropriate outdoor play space, drop off facilities, etc.
12.10 Movement and Infrastructure	
Car Parking Standards	The proposed development will be consistent with the standards for car parking with a total of 721 spaces proposed. This includes accessible parking bays, across undercroft and surface level, to serve the overall development (i.e., residents, visitors, and drop-off). The Development Plan requires that each dwelling is to be provided with 2 no. car parking spaces, which is being provided for in this scheme. The car parking for apartments and duplex units is provided at a ratio of 1.25 car parking spaces per unit. This allows for 1 space for each resident and 1 visitor space per 4 dwellings. This is a benchmark given in the Design Standards for New Apartments 2020. In the case of the standalone apartment and duplex buildings, this car parking is accommodated on street broken up by street trees which avoids over dominance of the car in the streetscape. This approach is used at the northern end of the development site and also the southern lands where there is also a combination of standalone duplex and apartments blocks. Please refer to the Traffic and Transport report prepared by Waterman Moylan Consulting Engineers and the Architectural Design Statement prepared by MCORM Architects for further details.
Bicycle Parking Standards	The proposed development provides considerable secure, covered bicycle parking for the apartment and duplex units as part of the development proposal (227 no. spaces in total). This ensures that future residents and visitors are encouraged to use sustainable modes of transportation. It is considered that the bicycle parking provision as part of the proposed development is consistent with Table 12.9 – Bicycle Parking Standards of the Development Plan. For further information on the bicycle parking, please refer to the Traffic and Transport report prepared by Waterman Moylan Consulting Engineers and Housing Quality Assessment, Architectural Design Statement and associated drawings prepared by MCORM Architects.

3.6 Planning History Context

Downey have carried out an examination of the planning history of the subject site which determined that there has been one number planning application made on the northern portion of the subject lands, as follows:

- **Reg. Ref. F94A/0887 -** By order dated 20th February 1995, Fingal County Council granted permission to E. M. Hogan for reinstatement of lands incorporating new pitch.

However, as the application site adjoins two neighbouring developments, namely Ashwood Hall and Brookfield, which were subject to the Broomfield LAP 2010 designation area, the following provides an overview of the foregoing applications:

- **Reg. Ref. F13A/0459/PL06F.243863 (Ashwood Hall) -** By order dated 26th August 2014, Fingal County Council granted permission to Birchwell Developments Ltd. for 56 no. two storey dwellings with associated on-curtilage parking, neighbourhood centre containing three retail units, with associated parking and a reserved site for a disability care facility unit and a house unit adapted for special needs (subject to a future planning application). The development will be served via a new vehicular and pedestrian access (replacing existing road junction) from Back Road. The main spine road through this development will link to and serve the Southern Development Area Broomfield LAP lands. The development also includes for pedestrian and cyclists' linkages, landscaping, boundary treatments, ESB sub-station, foul sewer works connecting to Kinsealy Lane, SUDS surface water drainage works together with all other associated site development works necessary to facilitate the development. The works also propose the demolition of three dwellings (one of which is a derelict dwelling). Subsequently, an appeal was lodged on 16th September 2014 and a decision to Grant Permission was made by An Bord Pleanála on 10th March 2015.

- **Reg. Ref. F13A/0459/E1** - Grant Extension of Duration up to and including 10th March 2025.

- **Reg. Ref. F13A/0460/ PL06F.243821 (Brookfield) -** By order dated 20th August 2014, Fingal County Council granted permission to Birchwell Developments Ltd. for 80 no. dwellings and associated car parking of which 1 no. dwelling will be utilised as a creche. The development also includes landscaping, boundary treatments, ESB sub-station, foul sewer works connecting to Kinsealy Lane, SUDS surface water drainage works, and all other associated site works necessary to facilitate the development. The proposed development provides for pedestrian and cyclist linkages, emergency, and agricultural access to the adjoining 'RS' zoned lands to the west (residential scheme granted under Reg. Ref. F11A/0386). The development will be accessed via 1 no. vehicular and pedestrian access onto Back Road. Subsequently, an appeal was lodged on 5th September 2014 and a decision to Grant Permission was made by An Bord Pleanála on 10th March 2015.

- **Reg. Ref. F13A/0460/E1** - Grant an extension of duration up to and including 10th March 2025.

It is important to note that the foregoing applications are currently under construction, which gives an indication of the existing context to the proposed residential scheme. It is important to note that there have been minor revision applications on these lands for mainly change of house types, extensions, etc. which are suggested to be beyond the scope of this planning history.

To provide for further context to the application site and the wider Broomfield lands, the following represents the planning history to the immediate surroundings of the lands. Noted that these applications are all located to the immediate north of the subject lands.

- **Reg. Ref. F19A/0579** - By order dated 3rd February 2020, Fingal County Council granted permission for: (a) Construction of 2 no. 288sqm part two storey/part single storey detached four bedroom dwellings, (each dwelling consists of 141sqm at ground floor level and 147sqm at first floor level); (b) New vehicular entrance to existing road and off-street parking; (c) New soft landscaping to boundaries and freestanding walls surrounding building to define external spaces; and (d) All associated siteworks.

- **Reg. Ref. F19A/0580** - By order dated 5th February 2020, Fingal County Council granted permission for: (a) Construction of a 288sqm part two storey, part single storey detached four-bedroom dwelling, (141sqm at ground floor level and 147sqm at first floor level); (b) New vehicular entrance to existing road and off-street parking; (c) New soft landscaping to boundaries and freestanding walls surrounding building to define external spaces; and (d) All associated siteworks.

- **Reg. Ref. F19A/0581** - By order dated 12th March 2020, Fingal County Council granted permission for: (a) Construction of a 398sqm part three storey/part single storey detached five bedroom dwelling, (161sqm at ground floor level, 147sqm at first floor level and 90sqm at attic floor level); (b) New vehicular entrance to existing road and off-street parking; (c) New soft landscaping to boundaries and freestanding walls surrounding building to define external spaces; and (d) All associated siteworks.

Furthermore, it is submitted that there is one application regarding infrastructure provision in the area relevant to this application, as follows:

- **Reg. Ref. F21A/0451** - By order dated 12th February 2021, Fingal County Council granted permission for proposed upgrades of the existing foul water storage tank to provide for a pumping station with increased storage capacity, new sewer and rising main along Kinsealy Lane with associated interceptions and manholes, boundary treatments, and all associated engineering and site works necessary to facilitate the development.

4.0 POPULATION AND HUMAN HEALTH

4.1 Introduction

This section of the Environmental Impact Assessment Report assesses the impact of the proposed development on the population, human health, and human environment in the general area of the proposed project on lands at Back Road and Kinsealy Lane, Kinsaley, Broomfield, Malahide, Co. Dublin. Specific aspects that will be examined include population levels, human health, residential amenity, impact on employment, commercial activity, land-use, community infrastructure and social facilities. Insofar as possible, this assessment has also considered impacts on the future residents, workers, and visitors to the subject lands.

4.2 Research Methodology

The following assessment of the predicted impacts on population and human health was undertaken based on local population information from the Central Statistics Office's Census of Population reports and databank, the Regional Spatial and Economic Strategy 2019-2031, and the Fingal County Council Development Plan 2017-2023. It is important to note that given the location of the subject site situated within the Kinsaley electoral division (ED) and appearing as an extension to the Malahide East and Malahide West ED's, the catchment area for demographic investigation of this study was defined as follows:

1. Kinsaley ED (04026)
2. Malahide East ED (04029)
3. Malahide West ED (04030)

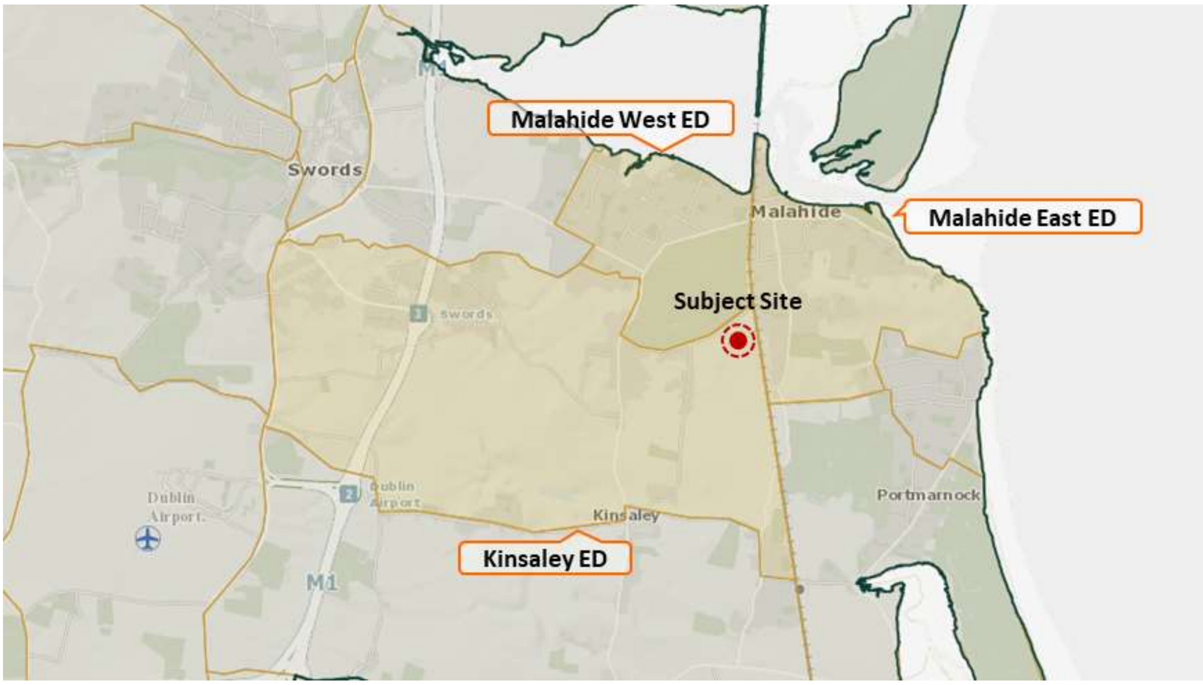

Figure 4-1. Spatial Scope of Demographic Studies (subject site location marked in red)

However, given the nature and scale of the proposed development, it was reasonably considered that in terms of assessing the amenities capable of catering the proposed development, that the area within approximately 2km radius of the subject site to be assessed. This approach was also taken with the Community and Social Infrastructure Audit, School Demand Assessment, and Childcare Provisions Assessment, and as such provides for greater consistency between these reports and the following EIAR.

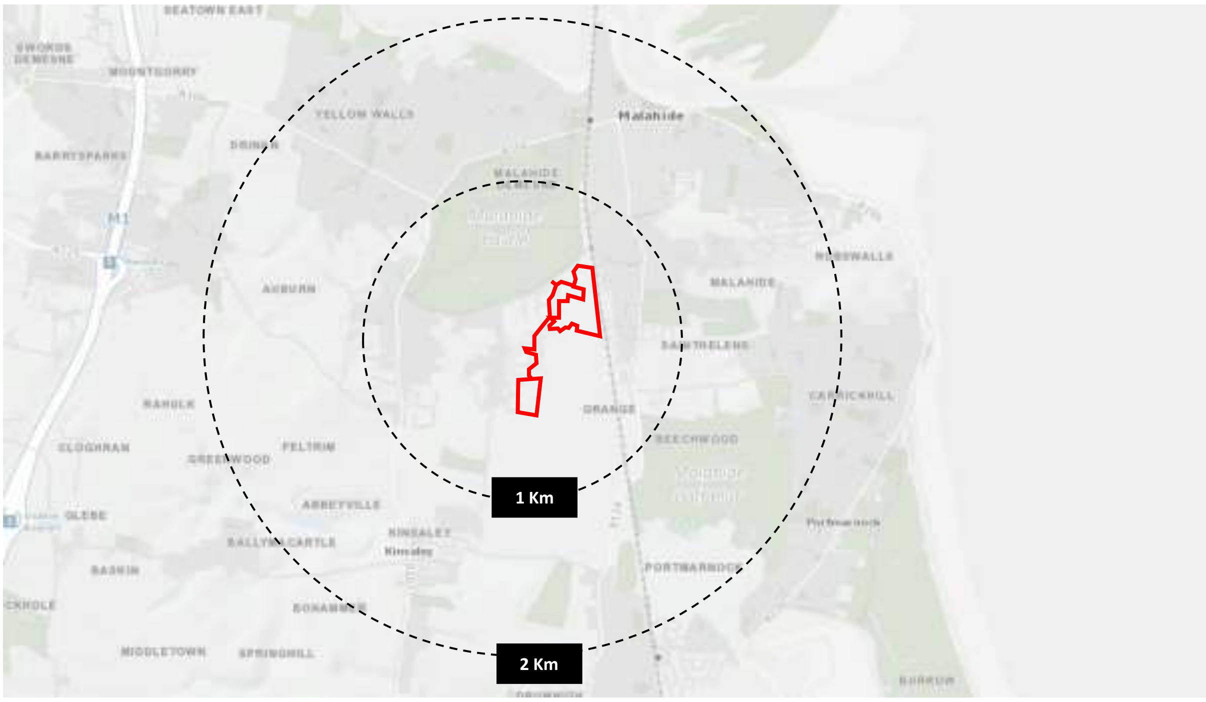

Figure 4-2. Spatial Scope of Community and Social Infrastructure Audit (approximate boundaries of the subject site outlined in red)

A site visit and a Community and Social Infrastructure Audit was also undertaken to appraise the location, the existing infrastructure and services in the area and any likely and significant potential impact upon human receptors. This also accompanies a School Provisions Assessment and a Childcare Provision Assessment to further investigate the future demand for these facilities with respect to the flux of population arising from the proposed scheme. The employment context was set out drawing principally on the most recently available statistics for the total number of persons at work, unemployment levels and employment categorised according to social group. Therefore, information on the economic performance of the area and the wider Dublin region is derived primarily from the 2016 Census results and statistics obtained from the ESRI. The following assessment of land-use was undertaken based on a site visit appraisal and a review of the zoning objectives from the Fingal County Council Development Plan 2017-2023. The assessment was also carried out in accordance with the following guidance documents and aligned accordingly based on Downey's professional experience and judgement.

- EPA (2017), Guidelines on the Information to be Contained in Environmental Impact Statements.
- EPA (2015), Advice Notes on Current Practice in the Preparation of Environmental Impact Statements.

4.3 Baseline Environment

The subject lands are located off the Back Road and Kinsealy Lane, Kinsaley, Broomfield, Malahide, in the northern periphery of Dublin and within 12 km distance from its city centre, and within the administrative boundaries of Fingal County Council. The surrounding land uses are generally residential with Malahide Castle and Demesne located 800m to the north of the land and accessed via Back Road. To the northeast of the site, there is Malahide DART Station at 1.3km and Malahide Beach at 1.8km. Malahide village centre is located to the north-east of the subject lands and provides a wide array of shops and services. The application site is spread across irregularly shaped fields, with the northern lands partly framed by existing field boundaries of trees and hedgerow. With an approximate area of 12.5 hectares, the site splits into two distinct sections; the northern land parcel which is generally bound by the railway track to the east, Ashwood Hall to the west and agricultural lands to the south, and the southern land parcel which lies to the east of Hazelbrook and to the south of Brookfield.

4.4 Characteristics of the Proposed Development

The proposed development subject to this Strategic Housing Development application provides for demolition of a dilapidated structure on the lands and the construction of 415 no. residential dwellings, comprising of 252 no. houses, 135 no. apartments, and 28 no. duplexes. The proposed development also provides for 1 no. childcare facility and ancillary amenity including concierge and gym, with numerous pocket parks and communal parks across the subject lands, car and cycle parking spaces, and all associated ancillary site development infrastructure, works necessary to facilitate the development, including proposed use of the existing vehicular access off Back Road (accessed via Ashwood Hall and Brookfield) and proposed use of the existing vehicular access off Kinsealy Lane (proposed access via Hazelbrook); and proposed upgrade of part of the existing foul drainage network in Hazelbrook, and proposed connection and associated works to the existing foul network along Kinsealy Lane.

4.5 Demographic Trends

4.5.1 Population

The latest Census results show that Ireland's population stood at 4,761,865 in April 2016, an increase of 173,613 (3.8%) since April 2011. This trend has been represented in the Dublin region with a greater growth rate, increasing by 5.9% to 1,347,359 over the intercensal period. As illustrated in Table 4-1 below, the population growth of County Fingal followed the same pattern as the Region but with an even greater growth rate, increasing by 8% to 296,020 in 2016. This recorded the County Fingal as the most dynamic county in the Region in terms of population change over 2011-2016.

Table 4-1. Population Change Across the Dublin Region over 2011-2016

Area	2011	2016	Actual Change	% Change
Dublin City	527,312	554,554	+27,242	5.2
Dun Laoghaire - Rathdown	206,261	218,018	+11,757	5.7
South Dublin	265,205	278,767	+13,562	5.1
Fingal	273,991	296,020	+22,029	8.0

Source: CSO StatBank

The proposed development is located within the Kinsaley ED, appearing as an extension to the Malahide East and Malahide West ED's. The Table 4-2 below shows the population change within these Electoral Divisions (ED's) defined as the catchment area of this assessment. In this regard, the "catchment area" refers to the area surrounding the subject lands which bound the lands and may be affected by the proposed development. Coincidentally, the catchment area also refers to the population which will be served by the proposed scheme.

Table 4-2. Population Change in the Catchment Area over 2011-2016

Area	2011	2016	Actual Change	% Change
Kinsaley ED	8,475	9,621	+1,146	+13.5%
Malahide West ED	6,273	6,149	-124	-2.0%
Malahide East ED	6,879	6,429	+550	+8.0%
Total	21,627	22,199	572	+2.6

Source: CSO StatBank

4.5.2 Average Household Size

With an average household size of 2.8, there were 8,043 private households in the Malahide Area in 2016. As shown in the Table 4-3 below, nearly 67% of the households residing in this area in 2016 were small-sized households ranging from 1- to 3-person households (5,370 households). It is noted that the average household size in the area slightly increased from 2.7 in 2011 to 2.8 in 2016. While average household size in Malahide West stood at 2.9 during the intercensal period and slightly increased from 2.6 to 2.7 in Malahide East, it increased from 2.6 to 2.9 persons per household in Kinsaley.

Table 4-3. Private Households in Malahide Area by Household Size, 2016

Size of household	Kinsaley ED	Malahide West ED	Malahide East ED	Total	%
1-person Households	538	349	546	1,433	17.8
2-person Households	911	683	904	2,498	31.1
3-person Households	632	351	456	1,439	17.9
4-persons Households	676	459	470	1,605	20.0
5-person and over Households	436	306	326	1,068	13.3
Total	3,193	2,148	2,702	8,043	-

Source: CSO StatBank

4.5.3 Average Age

CSO 2016 statistics indicate that the average age for the study area has increased by almost a year since the last census period in 2011. However, while the average age has increased within the study area and it stands above the State average (37.4) for both Malahide East and Malahide West ED's, the age profile of Kinsaley ED is characterised by a young population.

Table 4-4. Average Age within the Assessment Area

Area	Avg. Age (years)		Avg. Change
	2011	2016	2011-2016
Kinsaley ED	31.3	32.2	0.9
Malahide West ED	38.5	40.5	2
Malahide East ED	38.5	39	0.5

Source: CSO StatBank

Investigating the age profile of the area as per Census 2016 indicates that younger age cohorts still form the greatest share of the population residing in Malahide Area, however, as shown on the Figure 4-3, this is more notable in the Kinsaley ED.

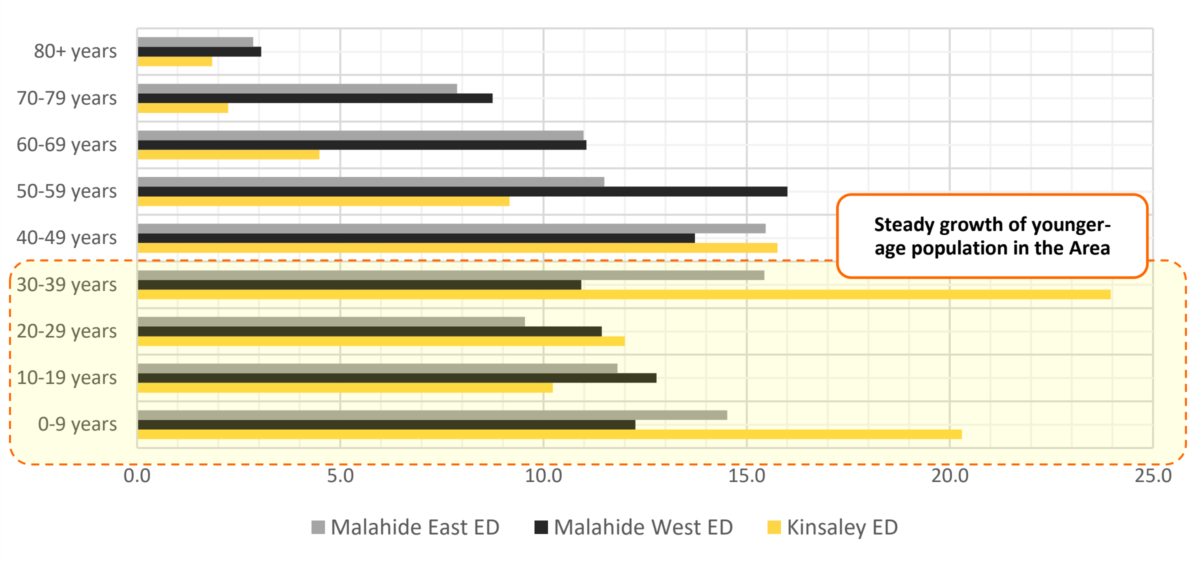

Figure 4-3. Population Age Cohorts in Malahide Area across the ED's, 2016

The population pyramid below (Figure 4-4) shows the age distribution in the area with more detail. A peak of births in 1980s shows up in the 30-39 age category, and another peak in the number of births occurred in 2000s and shows up in the 0-9 age category. Overall, the age pyramid indicates a young population residing in the town, which is expected to grow in the coming years.

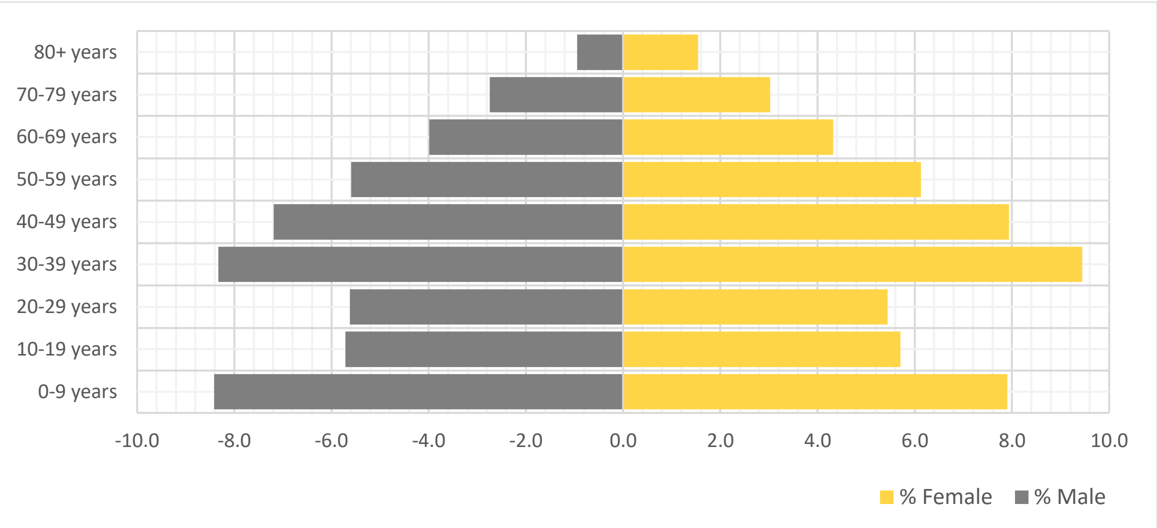

Figure 4-4. Population Age Pyramid of Assessment Area ED's, 2016

The factors outlined above have a knock-on implication on the provision of housing and its associated required facilities to cater for this increase in population within the local area. The factors above would indicate that with a relatively small household size and an average age in the house-buying age, that there would be a need for the proposed development within this area.

4.5.4 Potential Impact of the Proposed Development

4.5.4.1 Construction Phase

The construction phase of the proposed development should not have any direct impact on the population of the area or the subject lands. It is expected that the workforce will generally travel to the development site rather than take up residence in the immediate vicinity. However, the construction of any project has the potential to give rise to an impact on the health and safety of human beings if construction activities are not managed appropriately. Measures to address such health and safety considerations will be addressed in a Construction Management Plan for the development for implementation during the construction phase, in accordance with best practice.

4.5.4.2 Operational Phase

The operational phase of the proposed development will result in the provision of 415 no. new residential units, which is a significant beneficial effect. The average household size in Fingal is currently 3.02 persons, which is based on the 2016 census of population and for the development's catchment area it is also 2.8 persons. Based on this figure, it is anticipated that the proposed development to accommodate a maximum of 1,162 persons. It is noted that within the proposed mix of unit types, there is also one-bedroom apartment/duplex units. Excluding the 1-bedroom apartment/duplex units, this leaves a total of 372 no. units that can be deemed to accommodate families. Applying the average household size to 370 apartment/duplex units capable of accommodating families would generate 1,036 total residents in total within these units. Applying a maximum household size of 2 to the one-bedroom apartments would generate 90 total residents in these units. This would provide for an overall of 1,126 persons. Therefore, the proposed scheme is expected to accommodate a maximum of 1,126 to 1,162 persons, resulting in significant beneficial impacts on affordability in the housing market.

4.5.5 Remedial and Reductive Measures

No remedial or reductive measures are proposed with reference to population.

4.5.6 Predicted Impact of the Proposed Development

4.5.6.1 Construction Phase

The construction phase of the development will have a negligible or neutral impact on population with effects arising mitigated through other environmental disciplines.

4.5.6.2 Operational Phase

The population analysis above suggests that the population of the area will continue to rise in the medium term. The population increase predicted as a result of the operational stage of the proposed development ties in with broader trends in the area and the development will provide for this increase, therefore resulting in a positive impact on population.

4.5.6.3 Monitoring

There is no requirement for population monitoring.

4.6 Employment

CSO 2016 Statistics noted an employment level of 2,006,641 and an unemployment level of 297,396 for the State. The employment level is up 199,281 since 2011 and the unemployment level is down significantly from the previous figure of 424,843 people, this was mainly due to the impact of the recession on employment levels during the census period. County Fingal as a whole experienced an increase in employment between the period of 2011-2016, and the same trend was followed within the study area with Kinsaley ED recording a notable increase in the rate of employment amongst all (Table 4-5).

Table 4-5. Total Number of Persons aged +15 years at Work in the County and Study Area, 2011-2016

	Persons at Work		% Change
Area	**2011**	**2016**	**2011-2016**
County Fingal	119,276	133,971	12.3
Kinsaley ED	4,314	4,919	14.0
Malahide West ED	2,571	2,679	4.2
Malahide East ED	3,040	3,334	9.7

Source: CSO StatBank

The Labour Force Survey Q3 2021, which was published by the CSO in November 2021, contains the labour market statistics for Ireland. Due to the impact of COVID-19 in the global economy the CSO has compiled standard methodology and separate COVID-19 adjusted estimates (as stated in their Information Note on Implications of COVID-19 on the Labour Force Survey), which stated:

"As the Central Statistics Office (CSO) is obliged to follow standard definitions and methodology when calculating official estimates from the Labour Force Survey (LFS), it has been decided to compile the Quarter 1 2020 LFS Estimates in the usual way and provide separate COVID-19 Adjusted Estimates. This approach preserves the methodology of the LFS while at the same time providing transparency around the current impact of COVID-19 on the Labour Market within Ireland.

The CSO has produced a supplementary measure of Monthly Unemployment in parallel with the routine Monthly Unemployment Estimate methodology, which incorporates those in receipt of the Pandemic Unemployment Payment into the calculation to produce a COVID-19 Adjusted Measure of Monthly Unemployment. This new measure was published as part of the Monthly Unemployment Estimates (MUE) release for March 2020 and April 2020 and will continue to be made available for as long as deemed necessary by the CSO."

Accordingly, there were 2,471,200 people aged 15-89 years in employment in Q3 2021, giving an employment rate of 72.2% for those aged 15-64, based on the International Labour Organisation (ILO) criteria. The number of persons in employment was up 9.8% (221,200) from 2,250,000 over the year while the employment rate was up from 66.4% in Q3 2020.

The COVID-19 Adjusted Measure of Employment, or the lower bound for the number of employed persons aged 15-89 years, rose from 2,369,731 to 2,393,394 between the end of September 2021 and the end of October 2021. This was accompanied by an increase from 69.1% in September 2021 to 69.8% in October 2021 in the associated COVID-19 Adjusted Employment Rate for those aged 15-64.

Table 4-6. Summary of Labour Force Survey (Q3 2021)

	Standard LFS Methodology (ILO)	COVID-19 Adjusted Estimates September 2021
Indicator	**Q3 2021**	**end of Q3 2021**
Employed persons aged 15-89 years	2,471,200	2,369,731
Employment rate for those aged 15-64 years	72.2%	69.1%
Unemployed persons aged 15-74 years	149,100	232,866
Unemployment rate for those aged 15-74 years	5.7%	8.9%
In labour force	2,620,300	-
Not in labour force	1,407,700	-

Source: CSO StatBank

There were 149,100 unemployed persons aged 15-74 years in Q3 2021 based on ILO methodology. In Q3 2021, the unemployment rate was 5.7% for those aged 15-74 years with a rate of 12.1% for those aged 15-24 years, these rates are down from 7.4% and 20.9% respectively in Q3 2020. The COVID-19 Adjusted Measure of Monthly Unemployment published as part of the Monthly Unemployment release for October 2021, was 232,866 for September 2021 (end of Q3 2021), this estimate is an upper bound and adds all those on the Pandemic Unemployment Payment (PUP) to the standard Monthly Unemployment Estimate.

Furthermore, the COVID-19 Adjusted Measure of Unemployment fell to 205,246 in October 2021. The associated COVID-19 Adjusted Unemployment Rate fell from 8.9% in September 2021 to 7.9% in October 2021.

4.6.1 Potential Impact of the Proposed Development

4.6.1.1 Construction Phase

The proposed development will provide significant beneficial construction sector employment over the construction period of the development. It can be difficult to determine the exact numbers that may be employed directly on-site during the construction phase as workers may only be employed on a temporary basis as sub-contractors and may also work on other sites during the period. Should An Bord Pleanála grant planning permission for this proposed development, then it will be constructed over a phased basis, in accordance with the indicative proposed construction sequencing plan for the proposed project and in agreement with the Planning Authority. Aside from the benefits of direct employment, it is anticipated that builder suppliers and other related services will indirectly benefit from the construction phase of the proposed development. The construction phase will be beneficial to the local economy due to the additional income and expenditure that will arise. This is considered to be a positive impact arising from the development.

4.6.1.2 Operational Phase

The proposed development will attract visitors to the area on a temporary basis, possibly sustaining and increasing the demand for local services, including shops, public houses, restaurants, etc.

In addition to the residential component of the development, the application also proposes 1 no. childcare facility and ancillary residential amenities, which will deliver new local employment opportunities, both full time and part time positions which will become available, for the resident population, with an overall positive impact on employment.

Both of these long-term operational effects are significant and beneficial in nature.

4.6.2 Remedial and Reductive Measures

No adverse impacts on employment are predicted during the construction or operational phase of the development. No remedial or mitigation measures are considered necessary.

4.6.3 Predicted Impact of the Proposed Development

The predicted impact of the proposed development will be the same as that set out for potential impacts.

4.6.4 Monitoring

There is no requirement for economic monitoring.

4.7 Land-Use

Under the current Fingal County Council Development Plan, the subject site is zoned *"RA – Residential Area"* which seeks:

> *"Provide for new residential communities subject to the provision of the necessary social and physical infrastructure."*

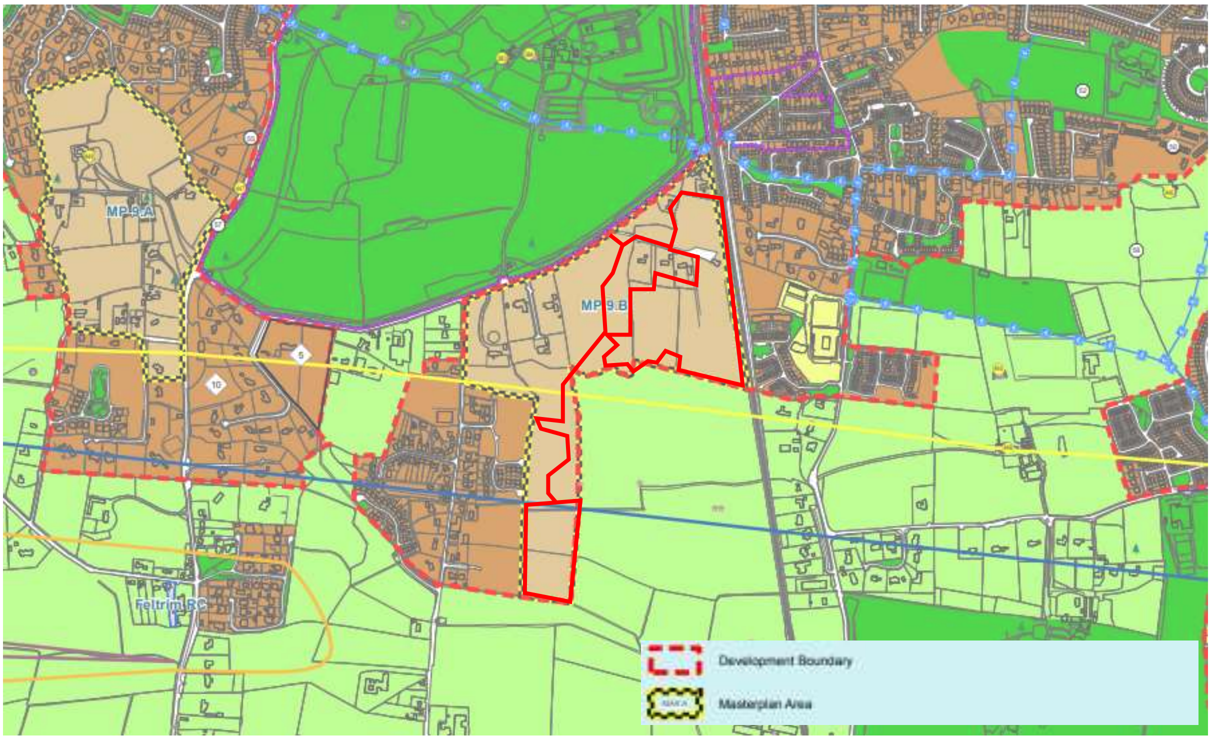

Figure 4-5. Fingal County Council Land Use Zoning Map, 2017-2023 (Lands outlined in red)

The vision for the *"RA – Residential Area"* seeks to:

> *"Ensure the provision of high quality new residential environments with good layout and design, with adequate public transport and cycle links and within walking distance of community facilities. Provide an appropriate mix of house sizes, types, and tenures in order to meet household needs and to promote balanced communities."*

Under the RA zoning, the following uses are permitted in principle.

Uses Permitted in Principle under the RA Land Use Zoning
Amusement Arcade[9]; Bed and Breakfast; Betting Office[9]; Childcare Facilities; Community Facility; Education; Funeral Home/Mortuary[9]; Guest House; Health Centre; Health Practitioner; Hospital; Office Ancillary to Permitted Use; Office ≤ 100sqm[9]; Office>100sq.m. and, 1,000sqm[11]; Open Space; Place of Worship; Public House[9]; Public Transport Station; Recreational Facility/Sports Club; Residential; Residential Care Home/Retirement Home; Restaurant/Cafe[9]; Retail-Local < 150 sqm nfa; Retail – Convenience ≤ 500 sqm nfa[9]; Retail – Comparison ≤ 500 sqm nfa[9]; Retail – Supermarket ≤ 2,500 sqm nfa[9]; Retirement Village; Sheltered Accommodation; Sustainable Energy Installation; Taxi Office; Traveller Community Accommodation; Utility Installations; Veterinary Clinic.

[9] In a local centre only
[11] Only located in a local centre and of a scale appropriate to that centre

Table 4-7. Permitted Uses under the RA Land Use Zoning

Therefore, the proposed development of residential units and 1 no. childcare facility are permitted in principle under the zoning objectives pertaining to the subject lands.

4.7.1 Potential Impact of the Proposed Development

4.7.1.1 Construction Phase

The construction phase of the development involves a change in land-use of the majority of the site from a current greenfield site, which is in agricultural use in part or has no active use. The site is considered suitable for construction activities to provide a development that will cater for a portion of Malahide's planned population growth through the provision of new homes.

With recommended construction mitigation measures in place as set out within this EIAR, the subject lands and surrounding area have the capacity to accommodate the construction of the proposed development without any significant risk of impact upon existing land-uses. This would mitigate any significant adverse impact.

4.7.1.2 Operational Phase

The proposed development will result in a permanent change in land-use of the site from a current greenfield site, which has no current activity to a residential development and supporting community uses (comprising childcare facility, and the ancillary amenity including concierge and gym, etc.). The total proposed net development area comprises c. 11.1 hectares. This is considered to be a permanent positive impact on an area of land that has no current active use. The surrounding land-uses (primarily residential, recreation and commercial uses) will continue during the operational phase of the proposed development. The impact of the proposed site is negligible as the site will have a positive impact on the surrounding area through the provision of a new resident community.

Therefore, while the proposed development will result in a permanent change in land-use from an undeveloped land to a mix of residential and residential amenity use, this change is consistent with the zoning objectives for the lands as per the Fingal Development Plan 2017-2023.

4.7.2 Remedial and Reductive Measures

No remedial or reductive measures are proposed with reference to land-use.

4.7.3 Predicted Impact of the Proposed Development

4.7.3.1 Construction Phase

The predicted impacts of the construction phase of the development are the same as that set out under the potential impacts of the construction phase of the development and are not anticipated to be significant. Furthermore, all impacts will be temporary in nature.

4.7.3.2 Operational Phase

The predicted impact is the same as that set out under the potential impacts of the operational phase of the development.

4.7.4 Monitoring

There is no requirement for land-use monitoring.

4.8 Community Infrastructure and Social Facilities

Community infrastructure can generally be defined as services and facilities that are available to the residents of any given area. These include early childcare and educational facilities, open spaces, recreational, and sporting facilities, community centres and halls, retail provision, healthcare facilities, and religious buildings. The current situation in relation to these facilities in the subject area is set out in the following sections and is also subject to a separate report prepared by Downey, which forms part of the planning application documentation.

4.8.1 Early Childcare & Educational Facilities

4.8.1.1 Childcare Facilities

As seen on the TUSLA map below, there are a number of registered childcare providers in the area and Downey have contacted them to determine their current capacity. The details of these childcare facilities are outlined in the Figure 4-6 on the next page. It is important to note that not all the childcare facilities decided to participate in the assessment, however the information obtained from our efforts indicates that there is spare capacity within the existing operators in the area which could cater for the proposed development.

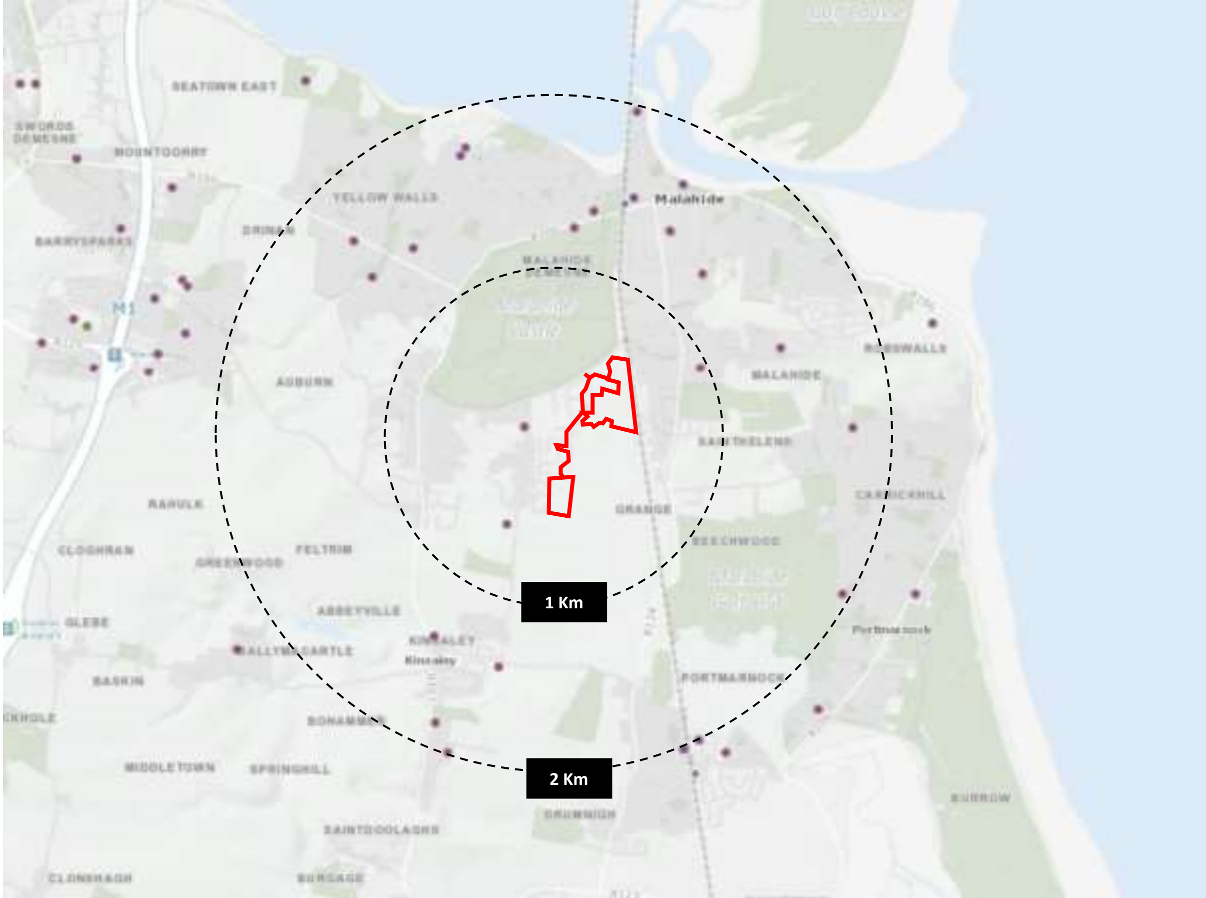

Figure 4-6. Location of Childcare Facilities within 1-2km of the Subject Lands (approximate boundaries of the lands outlined in red) (Source: pobal.ie)

This is further supported by the proposed childcare facility provisioned as part of developing the subject lands, which provides for 1 no. childcare facility of 476 sqm capable of accommodating circa 86 no. children. This is submitted to be 1 no. spaces over what was initially projected to suffice the proposed scheme. For further information in this regard, refer to the *Childcare Provision Assessment Report* prepared by Downey. Therefore, Downey are of the considered opinion that while there is a significant number of childcare facilities within the area, the quantum of units being proposed as part of this development would justify the provision of a new childcare facility which forms part of this proposed development. And this new childcare would cater both the residents of the application site and its wider community.

Table 4-8. Childcare Facilities within 1-2km Radius of the Subject Lands (source: Tulsa.ie updated by Downey)

	Name	Address	Max Capacity	Type of Service Age Profile
Within 1 Km Radius of the Subject Lands	**The Cottage Montessori**	The Cottage, Kinsealy Lane, Co. Dublin	22 children	Sessional (2-6 years)
	Bright Sparks Montessori	Bright Sparks Montessori, Kinsealy Lane, Malahide, Co. Dublin	64 children	Sessional (2-6 years)
	Purple Turtle	13 Mountfield Lawns, Malahide, Co. Dublin	10 children	Sessional (2-6 years)
Within 2 Km Radius of the Subject Lands	**Links Creche & Montessori Ltd. (Links Childcare)**	St Olaves, Kinsealy, Co. Dublin	89 children	Full Day/Part Time/Sessional (0-6 years)
	Cheeky Monkeys Playschool	Churchview' Chapel Rd., Kinsealy, Co. Dublin	20 children	Sessional (2-6 years)
	Sherpa Kids Kinsealy	St. Nicholas of Myra Ns., Malahide Road, Kinsealy, Co. Dublin	Temporarily Closed	Afterschool (4-12 years)
	Nzone	Posie Row, Kinsealy, Malahide Road, Co. Dublin, Co. Dublin	80 children	Full Day/Part Time/Sessional (1-6 years)
	Room to Bloom Montessori	7 Limetree Avenue, Portmarnock, Co. Dublin	11 children	Part Time (3-6 years)
	Green Gables Preschool	160 Ardilaun, Co. Dublin	22 children	Sessional (2-6 years)
	Charlie's Childcare (Seamount)	2/3 Jameson Orchard, Seamount Road, Malahide, Co. Dublin	57 children	Full Day (1-6 years)
	Absolute Angels	12 Grove Ave, Malahide, Co. Dublin	18 children	Part Time/Sessional (3-6 years)
	Kandoo After School Club Limited	St Andrews Malahide Parish Centre, Church Road, Malahide, Co. Dublin	18 children	Afterschool
	Little Milestones Montessori School Ltd	St. Marnock's Room, Saint Andrew's Malahide Parish Centre, Church Road, Co. Dublin	18 children	Sessional (8 month-6 Years)
	The Village Montessori	Malahide Yacht Club, St James's Terrace, Malahide, Co Dublin	16 children	Sessional (2-6 years)
	St. Sylvesters Montessori	Malahide Pastoral Parish Centre, Malahide, Co. Dublin	22 children	Sessional (2-6 years)
	Charlie's Childcare	Presbyterian Church Hall, Dublin Road Malahide, Co. Dublin	22 children	Part Time (2-6 years)
	Little Crickets Preschool	Malahide Cricket Club, Dublin Road, Malahide, Co. Dublin	22 children	Sessional (2-6 years)

Name	Address	Max Capacity	Type of Service Age Profile
Malahide Marina Creche & Montessori	Fragrance House, Malahide Marina Village, Malahide, Co. Dublin	64 children	Full Day/Part Time (0-6 years)
The Band Room Montessori	Sea Road, Yellow Walls, Malahide, Co. Dublin	22 children	Sessional (2-6 years)
OSH Club	7 The Cove, Co. Dublin	24 children	Afterschool
Hi5 Childcare	86 Millview Lawns, Co. Dublin	36 children	Afterschool
Links Creche & Montessori Ltd Abington Malahide	Abington Wood, Swords Road, Malahide, Co. Dublin	110 children	Full Day/Part Time/Sessional (0-6 years)
Grow Montessori	4 Talbot Road, Swords Road, Co. Dublin	20 children	Sessional (2-6 years)

4.8.1.2 Primary Schools

There is one primary school within one kilometre radius, and seven primary schools within two kilometres radius of the subject site. Downey attempted to contact the schools with regard to their available capacity, however, the level of feedback was low. The feedback received did not indicate exact numbers, but it was suggested that there is sufficient capacity within the primary-school level in the vicinity of the site to cater for the proposed development.

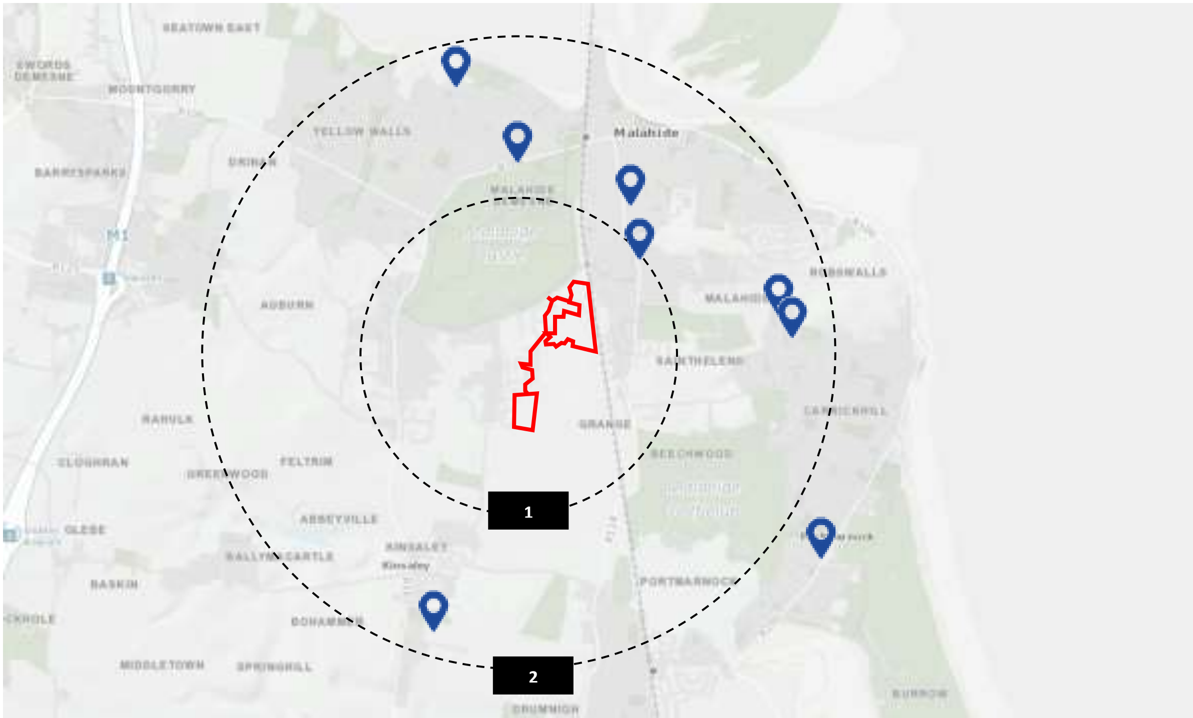

Figure 4-7. Location of Primary Schools (approximate boundaries of the subject site outlined in red)

Table 4-9. Primary Schools within 1-2km Radius of the Subject Lands (source: DoES & Schooldays.ie updated by Downey)

	Name	Address	Enrolment
Within 1 Km Radius of the Subject Lands	**St. Oliver Plunkett**	Grove Road, Malahide, Co. Dublin	Boys: 474 Girls: 442
Within 2 Km Radius of the Subject Lands	**John Paul II National School**	Sonesta Malahide Co. Dublin	Boys: 373 Girls: 363
	St. Sylvesters Infant School	Malahide, Co. Dublin	Boys: 212 Girls: 198
	St. Andrews National School	Malahide, Co. Dublin	Boys: 129 Girls: 94
	St. Helens Senior National School	Martello, Portmarnock, Co. Dublin	Boys: 174 Girls: 157
	St. Helens Junior National School	Lime Tree Avenue, Portmarnock, Co. Dublin	Boys: 191 Girls: 166
	San Nioclas Myra	Kinsealy, Co. Dublin	Boys: 110 Girls: 101
	St. Marnock's	Strand Road, Portmarnock, Co. Dublin	Boys: 342 Girls: 228

Therefore, Downey are of the considered opinion that there is suitable capacity within and close proximity to the area at a National School level to accommodate the proposed development. For further details, please refer to the enclosed *School Provision Assessment* prepared under a separate cover by Downey accompanying the proposed SHD application.

4.8.1.3 Post-primary Schools

There is one primary school within one kilometre radius, and one within two kilometres radius of the subject site. Downey attempted to contact these schools with regard to their available capacities, however, the level of feedback was low. The feedback received did not indicate exact numbers, but it was suggested there is some spare capacity within the secondary schools in the vicinity of the site.

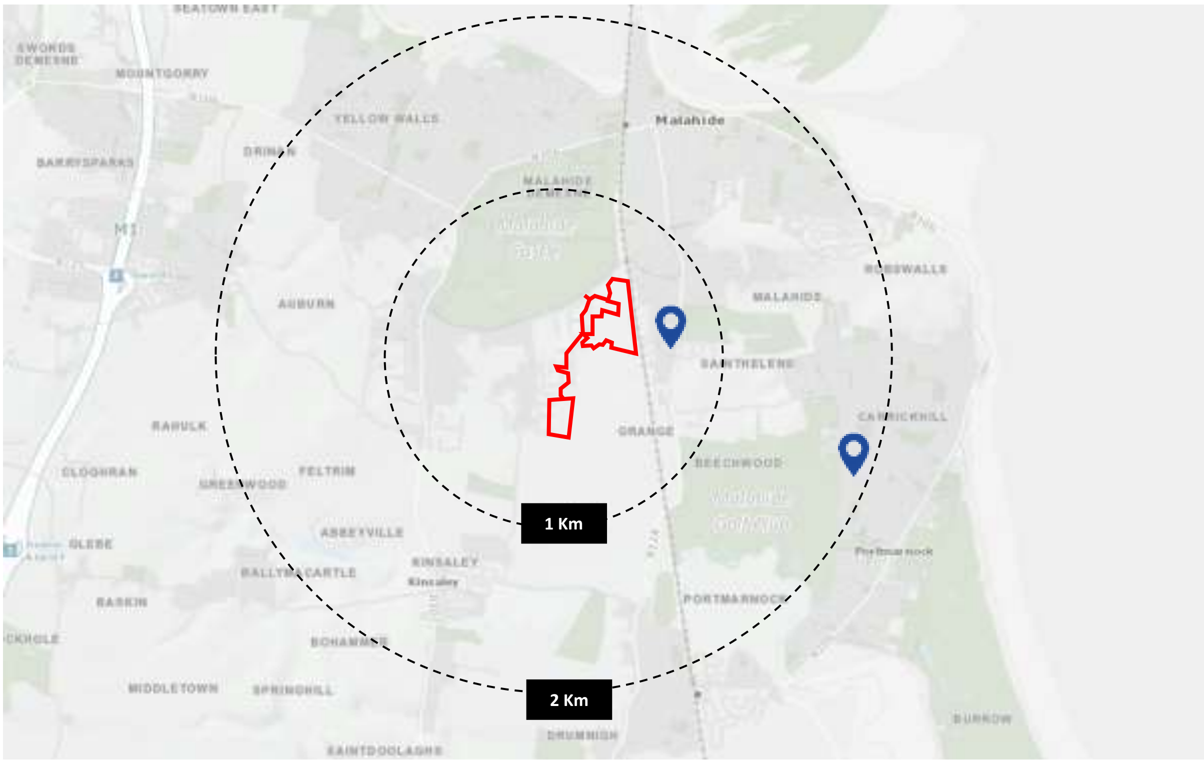

Figure 4-8. Location of Post-primary Schools (approximate boundaries of the subject site outlined in red)

With regard to the existing secondary schools in the area, Downey are of the considered opinion that there is suitable capacity within the area at a Secondary School level to accommodate the proposed development. For further details, please refer to the enclosed *School Provision Assessment* prepared under a separate cover by Downey accompanying the proposed SHD application.

Table 4-10. Post-primary Schools within 1-2km Radius of the Subject Lands (source: Schooldays.ie)

	Name	Address	Enrolment
Within 2 Km Radius of the Subject Lands	**Malahide Community School**	Broomfield, Malahide, Co. Dublin	Boys: 605 Girls: 614
	Portmarnock Community School	Carrickhill Road, Portmarnock, Co. Dublin	Boys: 520 Girls: 408

4.8.2 Recreational Facilities

This part of the Audit assesses the number and location of existing recreational facilities that are within 1-2km radius of the subject lands. It will include parks, playing fields, community centres and gyms, etc. categorised as indoor and outdoor recreational facilities.

4.8.2.1 Indoor Leisure & Recreational Facilities

It can be seen in the Figure 4-9 below, there are a number of sport centres and fitness facilities, a library, and several community-related facilities within 1-2km radius of the proposed development.

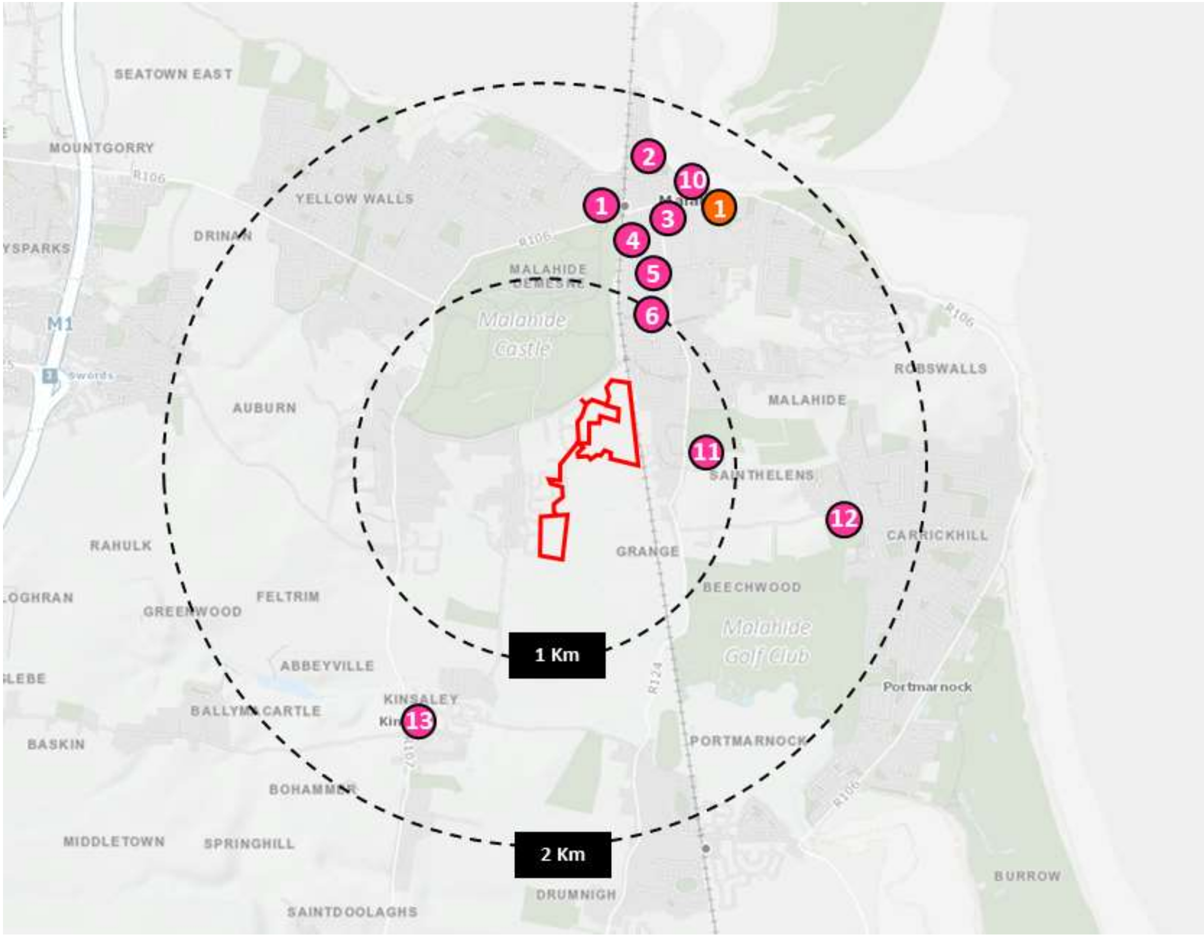

Figure 4-9. Location of Indoor Recreational Facilities (approximate boundaries of the subject site outlined in red)

Accordingly, there is a notable range of indoor sporting activities within 1-2km radius of the subject lands including, gyms and clubs, yoga studios, personal trainers, swimming pools, etc. Furthermore, the Portmarnock Sports and Leisure Club, which is located in close proximity of the subject lands, hosts a vast range of sports and activities by providing for a 25m swimming pool, padel court and squash court, a bar, and several function rooms catering for up to 300 guests. It is noted that Portmarnock Sports and Leisure Club also supports outdoor sports and activities by offering all-weather pitches.

Furthermore, the Malahide Library is located within 2km radius of the subject lands, supporting a wide range of services and activities including free WiFi and internet access, photocopying and printing facilities, study space and lecture room, exhibition space, and local history collection. The relevant details on these facilities are outlined in the Table 4-11 below.

It is important to note that the proposed development also provides for ancillary amenity facilities, including a gym and concierge which can facilitate personal services, administrative/reception duties, and other purposes for the prospective residents of the scheme.

Table 4-11. Indoor Leisure & Recreational Facilities within 1-2km Radius of the Subject Lands

	No.	Name	Location	Type
Gyms and Leisure Facilities	1	**Garage Gym**	The Casino, Malahide, Co. Dublin	Gym
	2	**Yoga Sanctuary**	3, Bissett's Loft, Strand St, Malahide, Co. Dublin	Yoga Studio
	3	**NU Fitness**	Unit, 3A Old St, Malahide, Co. Dublin	Gym
	4	**Enlightened Pilates**	Castle Terrace, 2 Main St, Malahide, Co. Dublin	Pilates Studio
	5	**Evolution Fitness Studio**	St. Sylvester GAA Club, No. Malahide, 2 Church Road, Co. Dublin	Gym
	6	**Reform Physiotherapy and Pilates**	Suite 6, Manor House, 3 Church Rd, Malahide, Co. Dublin	Physical therapist and Pilates
	7	**Tree of Life, Malahide Holistic Centre**	Kilronan House, Church Rd, Malahide, Co. Dublin	Yoga Studio
	8	**The Arena Health & Fitness Club**	1 Grove Rd, Malahide, Co. Dublin, K36 NC44	Swimming Pool, Aerobics Room, Gymnasium
	9	**Fit Mum**	Malahide Rd, Malahide, Co. Dublin	Pilates Studio
	10	**BE Martial Arts & Fitness**	St Sylvester's Parish Hall, Malahide, Co. Dublin	Martial Arts Fitness Club
	11	**Malahide Regional Bridge Club**	Broomfield, Malahide, Co. Dublin	Bridge Club
	12	**Portmarnock Sports and Leisure Club**	Blackwood Ln, Portmarnock, Co. Dublin	32 clubs incl. tennis, squash, badminton, basketball, 5 aside soccer, squash, swimming, sub-aqua, fitness and martial arts
	13	**Evolution Fitness**	8 St Olave's, Kinsealy, Co. Dublin	Gym
Community Facilities	1	**Malahide Library**	Main St, Malahide, Co. Dublin	Library

4.8.2.2 Outdoor Leisure & Recreational Facilities

There is a huge range of outdoor recreational facilities within the 1-2km radius of the subject site and its wider area. This includes sports clubs, a rugby club, a boxing club, playing pitches, and a variety of open green spaces (Figure 4-10). The location of subject lands is within walking distance of the

Malahide Castle and Parkland, indicating a good level of site accessibility to quality green open space, which provides a wide range of recreational facilities. The relevant details of these amenities are outlined in Table 4-12.

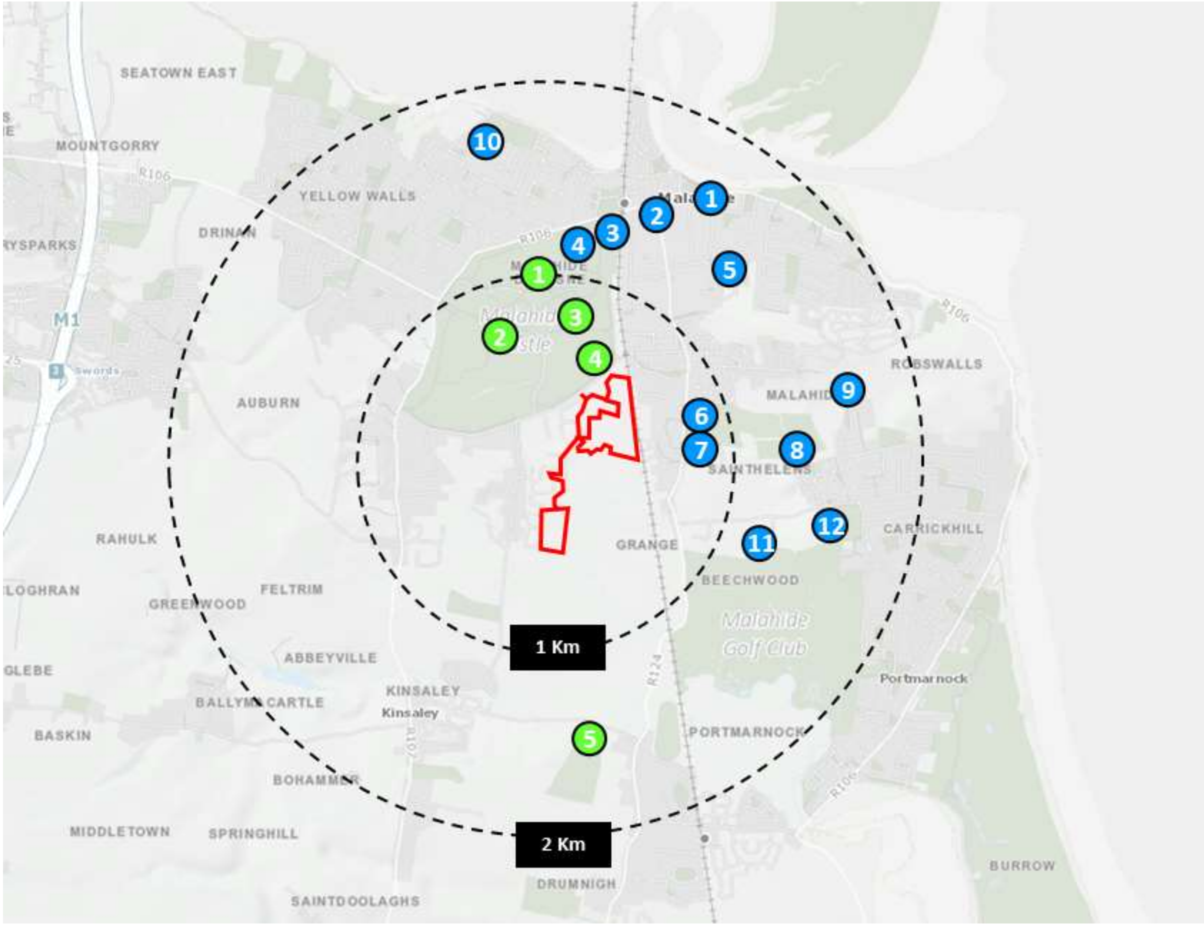

Figure 4-10. Location of Outdoor Recreational Facilities (approximate boundaries of the subject site outlined in red)

The Malahide Castle Demesne and parkland comprises of a circa 109 ha regional park supporting a notable range of activities for different age groups by providing for play areas, sporting facilities, a large children’s playground, mature 9-hole par 3 golf course, 18-hole pitch and putt course, sports pitches, tennis courts, cricket pitch and exercise trail.

The Talbot Botanic Gardens, situated behind the castle, comprising several hectares of plants and lawns, a walled garden of 1.6 ha and seven glasshouses, including a Victorian conservatory. In addition to woodland walks, and a marked exercise trail, the park features sports grounds, including a cricket pitch and several football pitches, golf course, tennis courts and a boules area.

Adjacent to the golfing facilities, and containing the access to them, is a pavilion which also contains a café and other facilities. There is an extensive children's playground near the castle. A seasonal road train operates in a loop from the vicinity of the castle to the railway station and back.


Figure 4-11. Malahide Castle and Talbot Botanic Garden

Furthermore, as part of the overall scheme for the subject lands, the proposed development also includes areas designated for public open space, which are intended to integrate with the existing outdoor spaces benefiting the lands. As such, the proposed open spaces will serve not only to the future residents of the development, but also to the wider community.

Table 4-12. Outdoor Leisure & Recreational Facilities within 1-2km Radius of the Subject Lands

	No.	Name	Location	Type
Sport Clubs & Outdoor Exercise	1	**Malahide Lawn Tennis and Croquet Club**	The Square, Malahide, Co. Dublin	Tennis Club
	2	**St Sylvester's GAA Club (Club House)**	2 Church Rd, Malahide, Co. Dublin	GAA Club
	3	**St. Sylvester's GAA Club (Bridgefield GAA Pitch)**	Dublin Rd, Malahide, Co. Dublin	GAA Club
	4	**Malahide Cricket Club**	Dublin Rd, Malahide, Co. Dublin	Cricket Club
	5	**Grove Lawn Tennis Club**	Grove Rd, Malahide, Co. Dublin	Tennis Club
	6	**Malahide Hockey Club**	Saint Helens, Malahide, Co. Dublin	Hockey Club
	7	**St Sylvester's GAA (Broomfield Pitch)**	Broomfield, Malahide, Co. Dublin	GAA Club
	8	**Naomh Mearnog GAA Club**	Blackwood Ln, Sainthelens, Portmarnock, Co. Dublin	GAA Club
	9	**Portmarnock AFC**	Robswalls, Portmarnock, Co. Dublin	Football Club
	10	**Malahide Yacht Club**	Sea Rd, Yellow Walls, Malahide, Co. Dublin	Sailing & Boat Club

	11	**Malahide Golf Club**	The Grange, Beechwood Lane, Beechwood, Malahide, Co. Dublin	Golf Club
	12	**Portmarnock Sports and Leisure Club**	Blackwood Ln, Portmarnock, Co. Dublin	32 Sports Clubs1
Outdoor Recreational & Park Facilities	1	**Public Park of Malahide Castle**	Malahide Demesne, Malahide, Co. Dublin	Park
	2	**Malahide Castle**	Malahide Demesne, Malahide, Co. Dublin	Castle
	3	**The Talbot Botanic Gardens**	Malahide Demesne, Malahide, Co. Dublin	Botanical Gardens
	4	**Malahide Playground**	Malahide Demesne, Malahide, Co. Dublin	Playground
	5	**Kinsealy Grange Golf Centre & Driving Range**	Chapel Rd, Kinsealy, Portmarnock, Co. Dublin	Golf Driving Range
	6	**Robswall Park Hillside Hike**	Robswalls, Co. Dublin	Park

The proposed development provides for two large open spaces in the northern section of the site connected by the proposed circulation routes. Both are quite centrally located within the scheme and are within easy walking distance from all parts of the site. The landscape for the southern section includes more informal open spaces and outdoor rooms, including the provision of a wildflower meadow, with a small simple seating area for relaxation. Mown grass tracks create secondary circulation routes directed towards small secondary seating spaces cut out of the meadow.

Figure 4-12. Proposed Landscaping (Left Photo: Southern Section, and Right Photo: Northern Section)

Therefore, Downey are of the considered opinion that there is suitable capacity within the area for the recreational and leisure facilities to accommodate the proposed development. This would be complemented by the proposed range of open green spaces within the development.

4.8.3 Retail Provision

The Audit will now look further into the subject site within the retail hierarchy in its wider area and Malahide, providing details on the number and location of retail provision within proximity of the subject site. These provide an important factor in the overall quality of life for the future residents of the proposed development.

In this regard and as illustrated in the Figure below, it is noted that the retail provision ranges from convenience food supermarkets to comparable good facilities within 1-2km of the subject site and its wider area. Further details are outlined in the Table 6.

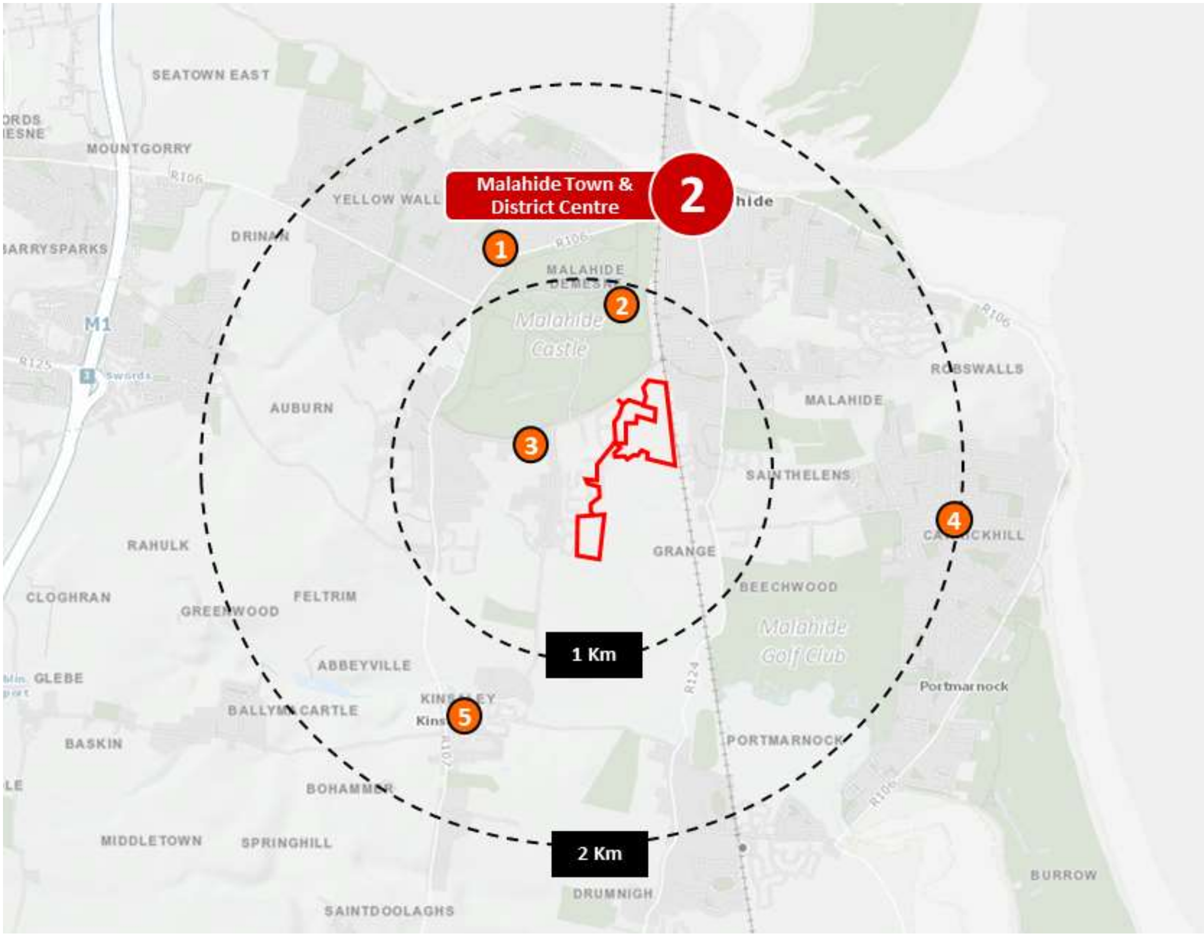

Figure 4-13. Subject Site within Retail Hierarchy of Malahide Town Centre and its Retail Provision (approximate boundaries of the subject site outlined in red)

With respect to Fingal Retail Hierarchy, the Malahide Town Centre, as a level 3 retail provision is located within 2km radius of the subject lands. Outlined in the adopted County Development Plan, "*while the town centres identified as level 3 retail provision are unique with distinctive characters and historic development, they perform and have further potential to perform over the Plan period to a higher retailing level due to the strength of their resident-population and catchment- population. These Town Centre locations have at least one convenience store, a range of middle order comparison retailers and a range of supporting retail services.*"

Figure 4-14. Range of Retail Offerings in Malahide Town Centre

The Malahide Town Centre provides a range of national supermarket retailers and general comparison goods shopping. The existing primary retail provision in Malahide is centred along New Street extended along Main Street, Marina Village, and the Green. The retail representation consists mainly of independent retailers providing a range of goods and services, all complemented by some national and international retailers established within the town, such as the brand name supermarket chains of Tesco, SuperValu, Insomnia, Boots, etc. all within or adjacent to the town centre.

Table 4-13. List of Retail Facilities in Proximity of the Subject Site

No.	Name	Location	Type
1	**Londis**	Yellow Walls Rd, Malahide Demesne, Malahide, Co. Dublin	Supermarket
2	**Avoca Malahide**	Malahide Castle & Gardens, Dublin Road, Co. Dublin	Store
3	**The Garden House**	The Garden House, Back Road, Mabestown, Malahide, Co. Dublin	Garden Centre
4	**The Hilltop Stores**	1, 4 The Hill, Malahide, Co. Dublin	Store
5	**Dunnes Stores Shopping Centre**	Wendell Ave, Carrickhill, Portmarnock, Co. Dublin	Grocery Store

Therefore, Downey are of the considered opinion that there is adequate retail provision catering for the influx of new population into the area.

4.8.4 Healthcare Facilities

As shown on Figure 4-15, there is a wide range of healthcare facilities within 2km radius of the subject site and its wider area. This includes health centre, GP clinics, pharmacies, dental practice, and nursing home. The relevant details on the healthcare provision in the area is listed in Table 4-14.

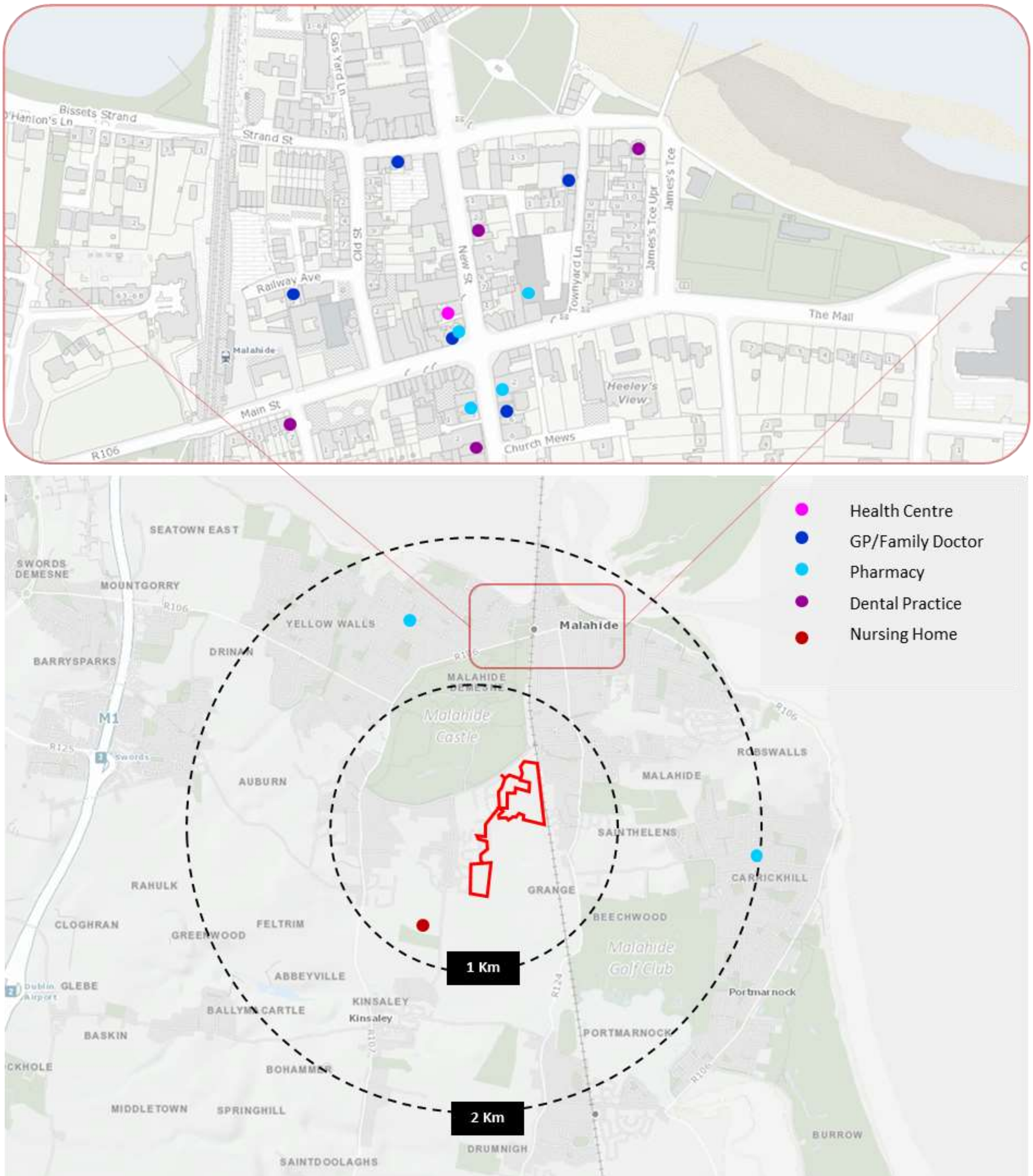

Figure 4-15. Location of Healthcare Facilities within 1-2km Radius of the Subject Site and its Wider Area (approximate boundaries of the subject site outlined in red)

With respect to concentration of healthcare services in Malahide Town Centre and proximity of the subject lands to this area, it is suggested that there is an appropriate level of access to these facilities and services. Furthermore, the St. Francis Hospice hospital is located within approximately 8.9 km to the south of the subject lands, and this is c. 17-minute driving distance via R124.

Table 4-14. List of Healthcare Facilities in Proximity of the Subject Site

Name	Location	Type
Malahide Health Centre	New Street, Malahide, Co. Dublin	Health centre
Seabury Medical Centre	1 Seabury Parade, Malahide, Co. Dublin	Family Practice
Malahide Medical Centre 1) Samuel Van Eeden (GMS)	Kilronan House, Church Road, Malahide, Co. Dublin	Family Practice
The Village Medical Centre 1) Gerard Molloy (GMS)	The Diamond, Main Street, Malahide, Co. Dublin	Family Practice
Railway Avenue Medical Practice 1) Kelly Marie Dunlop 2) Carol Mooney (GMS) 3) Blathnaid Raftery 4) Brian Prendiville 5) Aogan Rooney	1 Railway Avenue, Malahide, Co. Dublin	Family Practice
Malahide Family Practice 1) Fiona Fox 2) Claire Fitzsimmons 3) Muireann Banim 4) Seamus Duffy 5) Joanne Daly 6) Elizabeth Noelle Hewetson (GMS) 7) Kathleen Mary McClory	15 Strand Street, Malahide, Co. Dublin	Family Practice
Temenos Medical Centre 1) John Veale (GMS) 2) Samantha Burrows 3) Gavin Treanor 4) Deirdre Nevin	Townyard House, Townyard Lane, Malahide, Co. Dublin	Family Practice
McCabe's Pharmacy	Unit 2, Yellow Walls Road, Malahide, Co. Dublin	Pharmacy
The Medical Hall	1a Church Road, Malahide, Co. Dublin	Pharmacy
Boots	2 Church Road, Malahide, Co. Dublin	Pharmacy
McCabe's Pharmacy	The Diamond, Main Street, Malahide, Co. Dublin	Pharmacy
McCabe's Pharmacy	Unit 4 Malahide Shopping Centre, Main Street, Malahide, Co. Dublin	Pharmacy
McCartan's Pharmacy	Unit 4 Dunnes Stores Shopping Centre, Wendell Avenue, Portmarnock, Co. Dublin	Pharmacy
Malahide Dental Practice	7 Castle Terrace, Main Street, Malahide, Co. Dublin	Dental Practice
Dublin Orthodontics	Manor House, Church Road, Malahide, Co. Dublin	Dental Practice
Malahide Dental Care	3 Ross Terrace, New Street, Malahide, Co. Dublin	Dental Practice
The Gallery Dental Practice	Marine Court Centre, The Green, Malahide, Co. Dublin	Dental Practice
Talbot Lodge Nursing Home	Talbot Lodge Nursing Home, Talbot Lodge, Kinsealy Lane, Malahide, Co. Dublin	Nursing Home

4.8.4 Religious and Community Provision

There are 6 no. religious centres in the area including Christian and Catholic churches and 2 no. religious organisations which would provide religious and community support. As mentioned earlier, there is also 1 no. library within 2km radius of the subject lands. The details on these facilities are summarised in Table 4-15.

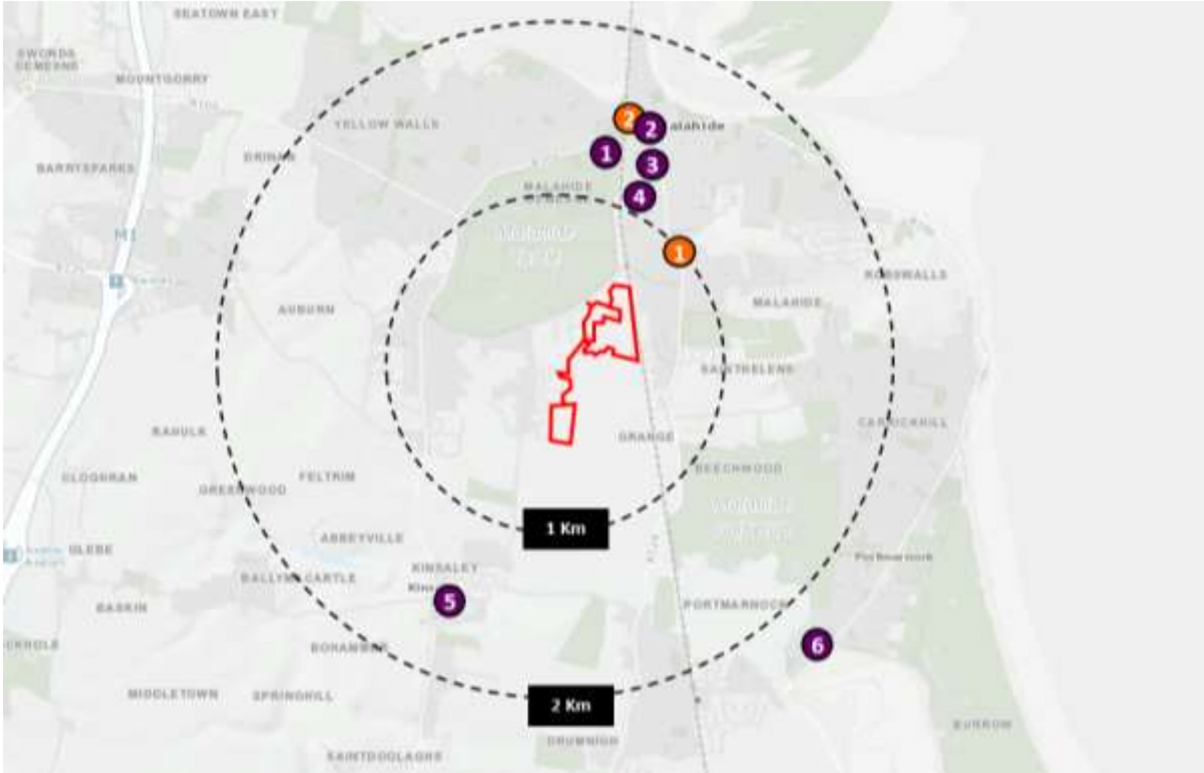

Figure 4-16. Location of Religious & Community Facilities within 1-2km Radius of the Subject Site and its Wider Area (approximate boundaries of the subject site outlined in red)

Taking into consideration the scale of the proposal, and the influx of new population into the area, the existing facilities prove to be sufficient and meet the needs of the proposed development.

Table 4-15. List of Religious & Community Facilities in Proximity of the Subject Site

No.	Name	Location	Type
1	**Malahide Presbyterian Church**	Dublin Road, Malahide, Co. Dublin	Presbyterian Church
2	**St. Sylvester's Catholic Church**	1 Main St, Malahide, Co. Dublin	Catholic Church
3	**St. Andrews Malahide Parish Centre**	Church Rd, Malahide, Co. Dublin	Anglican Church
4	**St. Andrew's Church**	Church Rd, Malahide, Co. Dublin	Anglican Church
5	**St. Nicholas of Myra Catholic Church**	Kinsealy, Co. Dublin	Catholic Church
6	**Saint Anne's Catholic Church**	Strand Rd, Burrow, Portmarnock, Co. Dublin	Catholic Church
1	**St. Andrews Malahide Parish Centre**	Church Rd, Malahide, Co. Dublin	Community centre
2	**Malahide Parish Pastoral Centre**	Main St, Malahide, Co. Dublin	Community centre

Malahide Parish Pastoral Centre supports a wide range of activities for various age groups, such as formation gatherings and meetings, dance, yoga and fitness classes, retreats, and seminars. The Parish also has a café, serving the community on a daily basis.

Figure 4-17. Malahide Parish Pastoral Centre Hosting a Notable Range of Activities

4.9 Potential Impact of the Proposed Development

4.9.1 Construction Phase

Construction impacts are expected to be short term, but some potential adverse local impacts can be expected due to the actual construction of the development. This is likely to be associated with construction traffic and any possible nuisance with such movements, for example an increase in daytime noise levels. The resident community in adjoining housing developments are most likely to be affected by these short-term temporary impacts. Corresponding mitigation measures are set out in Chapter 9 which will reduce these impacts to an insignificant level. Noting the inclusion of this mitigation plan, any further assessment in relation to noise impact was not considered relevant. The development may also have some positive impacts on passive recreational facilities within the area with additional revenue being derived from the use of these facilities by the construction workers.

Impacts to the local population are considered to be neutral, imperceptible, temporary in nature and therefore not considered significant.

4.9.2 Operational Phase

The proposed development could have the following potential operational impacts:

1) An increase in traffic levels.
2) Additional demand on local community services.
3) An impact on the landscape and appearance in the area.
4) Increased demands on services infrastructure.

The predicted population increase arising from the proposed development will generate additional traffic loads in the area, although according to the Transportation Chapter of this EIAR, will be within the capacity of the road network. The impacts in this regard are set out in detail in Chapter 12.0 Transportation. The resident community will benefit from the additional passive amenity areas, to be provided as part of the proposed development. There is a public park and several open spaces being put forward as part of the proposed development, in particular areas of public open space containing play equipment for children that will be available for future residents and the wider community, which will add to recreational amenity of the area and will have a positive impact on health for the overall area.

4.9.3 Remedial and Reductive Measures

4.9.3.1 Construction Phase

Measures to mitigate potential impacts arising from the construction phase of the proposed development such as noise are set out in relevant chapters of this EIAR.

4.9.3.2 Operational Phase

The proposed development will have a positive impact on the local community and will positively contribute to the vitality and viability of the local area, as well as passive amenity and open space provision.

4.9.4 Predicted Impact of the Proposed Development

4.9.4.1 Construction Phase

Through the implementation of remedial and reductive measures that have been set out above, the impacts of the construction phase of the development are not anticipated to be significant. Furthermore, all impacts will be temporary in nature.

4.9.4.2 Operational Phase

The predicted impact is the same as that set out under the potential impacts of the operation phase of the development.

4.9.5 Monitoring

There is no requirement for community monitoring.

4.10 Human Health

The subject lands are located at Back Road and Kinsealy Lane, Kinsaley, Broomfield, Malahide, County Dublin. With an irregular shape and approximate area of 12.5 ha, the subject site's northern field is partly framed by existing field boundaries of trees and hedgerow. The site splits into two distinct sections. The surrounding land uses are generally residential, with neighbouring developments of Ashwood Hall, Brookfield, and Hazelbrook. These developments are characterised by 2-storey dwellings with associated on-curtilage parking in a variety of unit types. The proposed scheme will make a positive contribution to the existing community by creating new places/spaces that are accessible not only to the residents of the scheme, but also to members of the public. It is submitted that the completion of the proposed scheme will not have an adverse impact on human health including mental health or wellbeing. Furthermore, there will be no adverse impacts on social, economic, or environmental living conditions as a result of the development.

4.10.1 Potential Impact of the Proposed Development

4.10.1.1 Construction Phase

Construction impacts are expected to be short term, but some potential adverse local impacts can be expected due to the actual construction of the development. These impacts are likely to be associated with construction traffic movements and any possible nuisance with such movements, for example an increase in daytime noise levels, migration of surface contaminants and dust. The resident community in adjoining housing estates are most likely to be affected by these short-term temporary impacts. Corresponding mitigation measures are set out in Chapter 8.0 which will reduce these impacts to an insignificant level. Noting the minor nature of these impacts, any further assessment in this regard was not considered relevant. The development may also have some positive impacts on passive recreational facilities within the area with additional revenue being derived from the use of these facilities by the construction workers.

4.10.1.2 Operational Phase

The proposed development could have the following potential operational impacts as a result of an increase in population levels:

1) An increase in traffic levels.
2) Additional demand on local community services.
3) An impact on the landscape and appearance in the area.
4) Increased demands on services infrastructure.

The impacts in regard to additional traffic loads in the Back Road area generated by the predicted population increase are set out in detail in Transportation Chapter of this EIAR.

In relation to potential impacts on human health and safety during the operational phase are unlikely to result in any significant adverse impacts once the development is completed and operational. Environmental impacts of the proposed development and their relationship to human health is dealt with under the relevant noise and vibration, air and climate and traffic sections of the EIAR. There will not be significant impacts on human health as a result of the operation of the proposed development.

4.10.2 Remedial and Reductive Measures

4.10.2.1 Construction Phase

Measures to mitigate potential impacts arising from the construction phase of the proposed development such as noise, traffic and air quality are set out in relevant chapters of this EIAR.

4.10.2.2 Operational Phase

No mitigation measures are required in respect of human health during the operational phase of the development.

4.10.3 Predicted Impact of the Proposed Development

4.10.3.1 Construction Phase

Through the implementation of remedial and reductive measures that have been set out above, the impacts of the construction phase of the development are not anticipated to be significant. Furthermore, all impacts will be temporary in nature.

4.10.3.2 Operational Phase

The proposed development will provide a development that will be integrated with the surrounding area and existing and future transport infrastructure, including green infrastructure. The proposed development will make a positive contribution to the existing community by creating new places and spaces as well as improved permeability that are accessible not only to the residents of the scheme, but also to members of the public.

It is submitted that the proposed development at Back Road, Broomfield will not have an adverse impact on human health including mental health or wellbeing. Furthermore, there will be no adverse impacts on social, economic, or environmental living conditions as a result of the proposed scheme.

4.11 Monitoring

In terms of population and human health, measures to avoid negative impacts have been a key consideration in the design evolution of the buildings and overall layout of the proposed project. Conditions will be attached to any grant of planning permission to ensure compliance in this regard. Building Regulations will also be adhered to during the construction phase to ensure a fully compliant development is constructed.

Health & Safety requirements, which are site specific to the proposed project, will be carried out by the Project Manager on site.

Impacts from Air Quality, Noise and Vibration, Climate, and Traffic and Transport and monitoring measures in this regard are addressed in the relevant chapters of this EIAR.

4.12 Reinstatement

No reinstatement will be required specifically for population and human health.

4.13 Interactions

The main interactions relating to population and human health are water, air quality, noise, and traffic during the construction phase.

Construction activities will have a temporary impact the landscape of the area by way of visual disturbance. These impacts are not considered to be significant.

During the operational phase, the main interactions relating to population and human health are water, air quality, noise, and traffic. These impacts are not considered to be significant. Please refer to the associated chapters for further information on these interactions.

4.14 Difficulties Encountered in Compiling

Overall, no difficulties were encountered in compiling this chapter.

4.15 Cumulative Impacts

The assessment has considered cumulative impacts of construction and operational phases of the proposed project, in conjunction with surrounding developments.

Multiple sites under construction at the one time may result in cumulative impacts in terms of noise and vibration during the construction period for human beings. However, such impacts are short-term, and the implementation of appropriate mitigation measures will ensure that noise and vibration impact is kept to a minimum. Please refer to Chapter 9.0 for further details in this regard.

During the operational phase of the development, there will be residential, recreational, and commercial developments in proximity to the proposed project which will generate a synergy of uses. This will increase population, increase employment opportunities, and increase community facilities such as childcare facilities, and as such the long-term effect will be a positive and permanent impact for Broomfield and the overall town.

4.16 "Do Nothing" Impact

A "Do Nothing" scenario is not considered appropriate as the lands are currently zoned for residential under the Fingal Development Plan 2017-2023. However, if a do-nothing scenario were to occur, the lands would not be developed and therefore would be no adverse impacts to population and human health. In the event that the proposed project does not proceed, the lands would remain in its current condition in the short-term or until alternative development proposals are granted planning permission.

4.17 References

- Central Statistics Office [CSO] (Census data results and analysis from 2011 and 2016)
- CSO (2021). Quarterly Labour Force Survey Q1 2021
- Economic and Social Research Institute [ESRI] (data results and analysis)
- Eastern and Midland Regional Assembly (2019), Regional Spatial and Economic Strategy 2019-2031
- Fingal County Council, Fingal County Council Development Plan 2017-2023

5.0 BIODIVERSITY

5.1 Introduction

5.1.1 Background

Faith Wilson Ecological Consultant was commissioned by Birchwell Developments Ltd. to prepare an Ecological Impact Assessment Report as part of a Strategic Housing Development Application for lands proposed for development at Broomfield, Back Road, Malahide, Co. Dublin as shown on **Figure 5.1** below.

The proposed development within the Broomfield SHD consists of 415 residential units, comprising of 252 houses, 28 duplex units and 135 apartments, and a childcare facility on lands at Broomfield, Malahide, Co. Dublin as shown on **Figures 5.1** and **5.2** below.

Figure 5.1 Proposed development site for the Broomfield SHD, outlined in red at Broomfield, Malahide, Co. Dublin

Figure 5.2 Proposed development site for the Broomfield SHD, outlined in red at Broomfield, Malahide, Co. Dublin.

5.1.2 Project Description

Planning permission is sought for a strategic housing development on lands at Broomfield, Back Road, Malahide, Co. Dublin as shown on **Figure 5.1** and **5.2** above.

The proposed development within the Broomfield SHD consists of 415 residential units, comprising of 252 houses, 28 duplex units and 135 apartments, and a childcare facility.

5.2 Methodology

5.2.1 Desk study

A desk study was carried out to collate the available information on the ecological environment potentially impacted by the proposed development at Broomfield and to determine the proximity of the proposed development to designated areas for conservation.

A review of existing information on European sites, their Qualifying Interests and Conservation Objectives, and other available information on the terrestrial and marine ecology in the vicinity of the proposed development was conducted.

Data sources relevant to each European site include the Site Synopsis, Conservation Objectives, the Conservation Objectives backing documents, and the Natura 2000 Standard Data Form, all of which are publicly available online at www.npws.ie were also reviewed.

The National Parks and Wildlife Service (NPWS) of the Department of Housing, Local Government and Heritage database of designated conservation areas and NPWS records of rare and protected plant species as listed under the Irish Red List - Vascular Plants (Wyse Jackson, et al. 2016) were checked with regard to the location of the lands at Broomfield.

Information on protected species of fauna and flora listed for protection under Annex II of the EU Habitats Directive (92/43/EEC), Annex I of the Birds Directive (79/409/EEC) and the Wildlife (Amendment) Act (2000) was also sought from NPWS, the National Biodiversity Data Centre and published sources.

Further ecological information was gathered in relation to the study area by examining GIS datasets, maps and aerial photographs, and by drawing on other existing information.

A review was also completed of the ecological and faunal interest from the general environs of Back Road. Much of this information was gathered by the author of this report during field surveys of previous surveys completed for Ashdown Hall and Broomfield, lands to the west of here at Lamorlaye, and of studies conducted in Malahide Demesne for Fingal County Council Parks Department.

5.2.2 Field Surveys - Habitat & Botanical Survey

The wider 'Broomfield' lands have been the subject of many years of field surveys by Faith Wilson the first being on the 3rd September 2013 with further surveys conducted on 28th May 2014, 16th May 2017, 11th June 2018, 20th June 2018, and 26th June 2018.

Additional habitat surveys focusing on the lands which form part of this application were conducted on 16th June 2020, 31st August 2020, 16th October 2020, 1st December 2020, 8th January 2021 and 24th February 2022.

The lands have been surveyed to describe and map the habitats present using the habitat survey and mapping techniques described by Smith *et al.* (2011). The habitats within the site were described to level three using the Heritage Council Guide to Habitats of Ireland (Fossitt (2000)). Plant species within the site were identified using Parnell and Curtis (2012).

A particular focus of the surveys was to determine if any protected species of plant under the Flora Protection Order (2015) or listed in the Irish Vascular Plants Red Data Book are present on the site or if any of the habitats present correspond to any of the habitats listed under Annex I of the EU Habitats Directive.

Invasive species present in the site were also identified and mapped if present. A particular focus of the surveys was for those invasive species listed in the Birds and Habitats Regulations 2011.

5.2.3 Field Surveys - Fauna

Bat Survey

The bat survey consists of several elements – a desktop review and consultation with Bat Conservation Ireland, an inspection of trees within the site for their potential to support roosting bats, an inspection of the buildings on site due for demolition and several bat detector activity surveys of the property.

The aims of the surveys were to:

a) To determine what species of bats are known from the site and the immediate environs.
b) To identify roosting sites in buildings within the site.
c) To determine the use of any mature trees and other habitats in the site as feeding and commuting areas for bats.
d) To ensure that bats are considered and protected in the development.

Bat activity is usually detected by the following signs (though direct observations are also occasionally made):

- bat droppings (these will accumulate under an established roost or under access points);
- insect remains (under feeding perches);
- oil (from fur) and urine stains;
- scratch marks; and
- bat corpses.

The nature and type of habitats present are also indicative of the species likely to be present.

Trees within the Broomfield lands were assessed for their potential to support roosting bats on 1st December 2020 and 8th January 2021 by completing a preliminary ground level roost assessment. Potential tree roosts were identified using the following standard criteria, which were created by bat specialists from Bat Conservation Ireland for use in the assessments of tree roosts on large infrastructural projects and are summarised in NRA (2006):

- Presence or absence of bat droppings (these can be hard to find amongst leaf litter or may be washed away following periods of wet weather),
- Bat droppings may also be seen as a black streak beneath holes, cracks, branches, etc.,
- Presence or absence of smooth edges with dark marks at potential entrances to roosts,
- Presence or absence of urine stains at potential entrances to roosts,
- Presence of natural cracks and rot holes in the trunk or boughs of the tree,
- Hollow trees,
- Presence or absence of creepers such as ivy or honeysuckle on trees (ivy clad trees are often used by bat species such as pipistrelles as roosts),
- Presence or absence of loose bark such as that of sycamore, or flaky bark on coniferous species such as cedars, cypress and Scot's pine,
- Presence or absence of bracket fungi which may indicate a rotten or potentially hollow centre to the tree,
- Known bat roosts previously identified,
- Trees with storm or machinery damage or broken boughs,
- Clutter level - where the branches and trunk are easily accessible, this is considered a better tree for bat roosts,
- Adjoining habitat - if there are a variety of feeding opportunities for bats, this increases the potential of a tree as a bat roost,
- Adjoining potential roosts / known roosts. This raises the likelihood of a tree being of benefit as bats may move roosts if the roost becomes too hot or cold during roosting and a nearby alternative roost is highly desirable.

The arboricultural features described in the Bat Tree Habitat Key (Andrews, 2013) also informed the survey.

In accordance with best practice as described in the 'Guidelines for the Treatment of Bats During the Construction of National Road Schemes' (NRA 2006) and 'Bat Mitigation Guidelines for Ireland' (Kelleher 2006), a bat activity survey of the property was conducted during the active bat season. The bat surveys of the wider Broomfield lands were first conducted on 28th May 2014, 16th May 2017, 20th June 2018, 26th /27th June 2018 by Faith Wilson. The rugby club building and the wider lands were resurveyed for bats on the 16th October 2019 and again on the 29th March 2022.

These surveys assisted in determining if any bat roosts are present in the buildings on site, what bat species occur within the site and how bats are using the property for foraging or commuting purposes.

Bat activity is predominantly bi-modal, with bats taking advantage of increased insect numbers on the wing during the periods after dusk and before dawn, (there is usually a lull in activity in the middle of the night). While this holds true for 'hawking' species (bats that capture prey in the open air), 'gleaning' species such as brown long-eared (*Plecotus auritus*), Natterer's (*Myotis nattereri*) and

Whiskered/Brandt's bats (*Myotis mystacinus/brandtii*) remain active throughout the night, as prey is available on foliage for longer periods.

Badger Survey

A speedy and productive means of determining the mammal fauna within a site is to walk the entire site concerned, paying particular attention to all hedgerow, woodland, watercourses, fence lines, paths etc. to locate mammal signs. These include setts, old bedding material, feeding signs, latrines, badger tracks or paw prints, badger paths and badger hair caught on vegetation or fences.

Badger surveys of the lands adjoining the northern Broomfield lands were conducted on 28th May 2014, 16th May 2017, 11th June 2018, 20th June 2018, and 26th June 2018 as part of surveys and monitoring work completed for the Ashwood Hall/Broomfield developments. These surveys focused on badger activity along the eastern boundary of the Ashwood Hall development (which lies to the west of, and shares a common boundary with the proposed Broomfield SHD application lands).

Further surveys of badger activity along this shared boundary continued during 2019/2020/2021 and 2022, and at a potential sett which was identified to the north of the Rugby Club Building during the initial walkover survey of the property conducted on 16th October 2019 and were followed up with further surveys on 16th June 2020, 1st December 2020, 8th January 2021, 5th October 2021 and 24th February 2022. A camera trap was deployed between the 1st December 2020 and 8th January 2021 at this potential sett.

The survey was carried out by an experienced mammal specialist (Faith Wilson) in accordance with best practice as described in the 'Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes' (NRA 2009) and 'Guidelines for the treatment of badgers prior to the construction of National Road Schemes' (NRA 2005).

Otter Survey

An otter survey was conducted along drainage ditches and the Hazelbrook Stream during the site visits conducted on 16th June 2020, 1st December 2020, 8th January 2021, 5th October 2021 and 24th February 2022 in accordance with best practice as described in the 'Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes' (NRA 2009), 'Otter Breeding Sites. Conservation and Management. Conserving Natura 2000 Rivers Conservation Techniques Series No. 5, (Liles, 2003)' and 'Guidelines for the treatment of otters prior to the construction of National Road Schemes' (NRA 2006).

Other Mammals

A dedicated survey for other mammals was carried out during the site visits on 31st August 2020, 16th September 2020, 10th June 2021 and 5th October 2021 using the techniques as prescribed in Ecological Survey Techniques for Protected Flora and Fauna (NRA, 2008). This entailed searching for and identification of signs, tracks and droppings of various mammals (including pine marten, Irish stoat, Irish hare, red squirrel, hedgehog and pygmy shrew along with non-native species such as fallow deer, American mink, grey squirrel and rabbit) within the site.

Bird Survey

All birds seen and heard during the walkover surveys of the site on the 16th October 2019, 16th June 2020, 31st August 2020, 16th October 2020, 1st December 2020, 8th January 2021, 24th February 2022 and 29th March 2022 were recorded.

5.3 Results

5.3.1 Description of the site, its environs, habitats and fauna

The lands proposed for development under the Broomfield SHD application adjoin Phase 1 of the development of these lands (Broomfield and Ashwood Hall).

The northern lands are located to the south of Back Road and Malahide Castle demesne, and are bounded to the north by private residences, to the east by the Dublin Belfast railway line, to the west by set aside arable fields and the residential developments of Ashwood Hall and Broomfield, which are currently under construction.

The southern lands are bounded to the west by the residential development of Hazelbrook and Castleway, to the south by Hazelbrook Stream, to the east by agricultural lands and to the north by a drainage ditch and the residential development of Broomfield.

5.3.2 Habitats

A habitat map of the receiving habitats mapped to Fossitt Level 3 is presented on Figure 5.1 below. The location of the Hazelbrook Stream is shown on Figure 5.4 below.

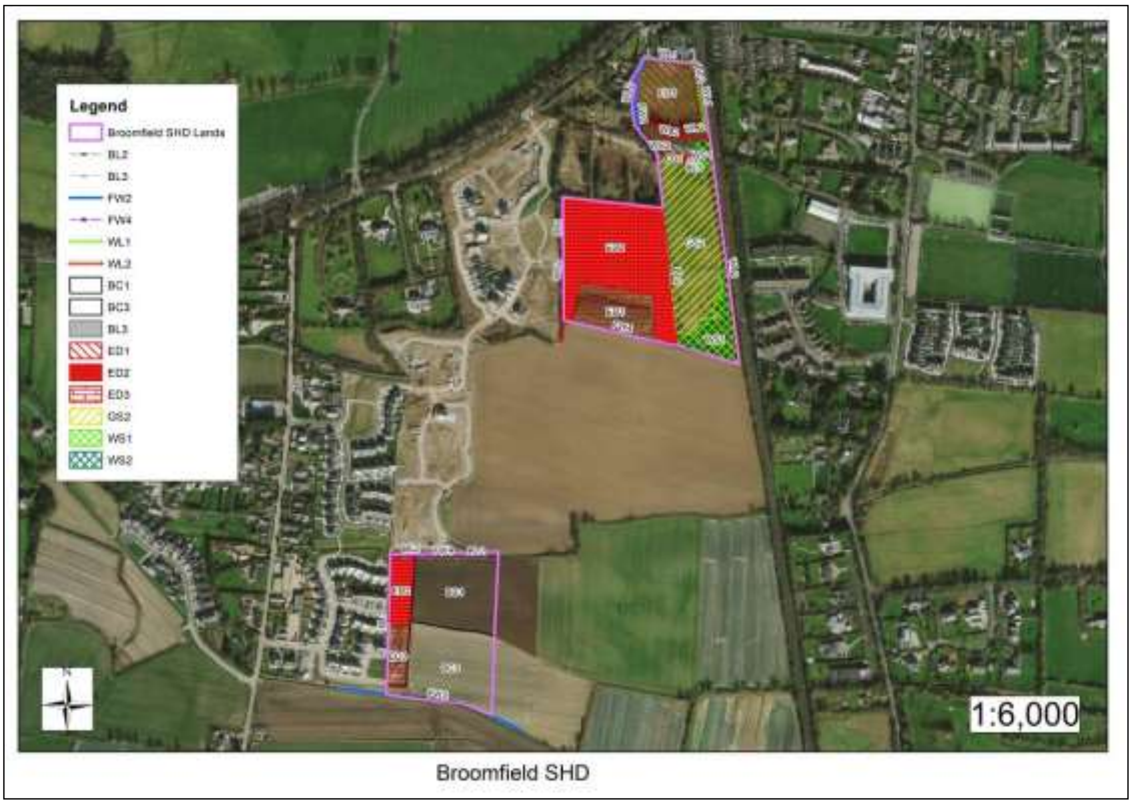

Figure 5.3. Habitat Map of the Broomfield SHD lands.

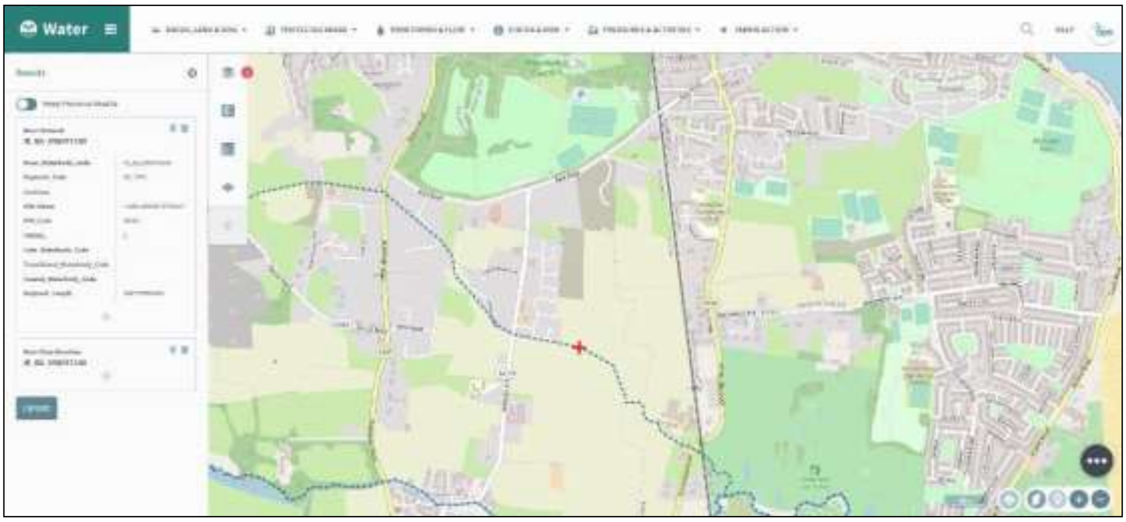

Figure 5.4. The Hazelbrook Stream adjoins the site to the south.

The 10km square in which the site is located (O24) contains a number of historical and more recent records of rare and scare botanical species – namely Hairy Violet (*Viola hirta*), Meadow Saxifrage (*Saxifraga granulata*), Red Hemp Nettle (*Galeopsis angustifolia*), Round Prickly Headed Poppy (*Papaver hybridum*), Annual knawel (*Scleranthus annuus*), Lesser Centaury (*Centaurium pulchellum*), Basil Thyme (*Acinos arvensis*), Meadow Barley (*Hordeum secalinum*) and Oyster Plant (*Mertensia maritima*).

None of these species were recorded from the lands at Broomfield, Back Road or are likely to occur within the proposed development given the nature of the habitats present.

Southern Lands

The southern lands proposed for development within the Broomfield SHD lands consist of an area of stored topsoil (ED3), an area of recently ploughed ground (BC3), an area of recolonising set aside (ED2) and an area of agricultural land planted with arable crops (BC1) principally barley (but also oats in the past)). A block wall and a post and timber panel separates these lands from the Hazelbrook and Castleway developments to the west and a drainage ditch (FW4) is found along the northern boundary of these lands. The Hazelbrook Stream (FW2) is found along the southern boundary of these lands.

Plate 1. Hazelbrook Stream along the southern boundary of the southern lands.

A variety of common ruderal and arable weeds were recorded on these lands including; common orache (Atriplex patula), knotgrass (Polygonun aviculare), common fumitory (Fumaria officinalis), redshank (Persicaria maculosa), mouse ear chickweed (Cerastium arvense), good king henry (Chenopodium bonus-henricus), perennial sow thistle (Sonchus arvensis), groundsel (Senecio vulgaris), red dead nettle (Lamium purpureum), field speedwell (Veronica persicaria), common poppy (Papaver rhoeas), wild turnip (Brassica rapa), etc. Bristly oxtongue (Picris echioides) was found in some abundance here following recent disturbance of soil.

Plate 2. Stored topsoil and recently ploughed land east of Hazelbrook.

The Hazelbrook Stream (FW2) is found along the southern boundary of these lands and is vegetated with fool's watercress (Apium nodiflorum), bur reed (Sparganium sp.), reed canary grass (Phalaris arundinacea) and duckweed (Lemna sp.), while hoary willowherb (Epilobium hirsutum), figwort (Scrophularia nodosa) and wild angelica (Angelica sylvestris) is found on the banks. The stream here has been canalised and deepened. The drier banks of soil beside the watercourse are dominated by false oat-grass, creeping thistle, oats, nettle, bindweed (Calystegia sepium), dove's-foot cranesbill (Geranium molle) with flailed elder, ash and Wych elm. The Hazelbrook Stream drains to the Sluice River and discharges into Baldoyle Bay which is designated as the Baldoyle Bay SAC/SPA.

The area of stored topsoil (ED3) adjoining Hazelbrook has revegetated with wild turnip, hoary willowherb, buddleia, creeping thistle, docks, creeping bent and nettles.

Plate 3. Set aside land and arable crop on the southern lands.

A deep drainage ditch (FW4) which was infilled between the Castlebrook and Hazelwood developments, forms the northern boundary of the southern lands. This was wet at the time of survey and supports fool's watercress, hoary willowherb, angelica and duckweed, with bindweed, hogweed, nettle, docks, false oat grass and meadow vetchling (Lathyrus pratensis) on the earthen banks (BL2).

Plate 4. Looking north east towards the former rugby club lands from the southern lands.

Plate 5. Drainage ditch at the northern boundary of the southern lands.

Northern Lands

The northeastern portion of the northern Broomfield SHD lands includes the former Rugby Club lands and clubhouse (BL3). These lands were developed on infilled land adjacent to the railway line and would originally have been managed as amenity grassland but are now dominated by rank grassland (GS2) and scrub (WS1). The land is bounded to the east by the Dublin – Belfast railway line alongside which is a treeline (WL2) of ash (*Fraxinus excelsior*) and sycamore (*Acer pseudoplatanus*).

Plate 6. Eastern boundary of the rugby club lands adjoining the railway line.

The southern portion of the former Rugby Club lands are dominated by scrub (WS1) consisting of dense tangles of bramble (*Rubus fruticosus* agg.), buddleia bush (*Buddleia davidii*), and scattered immature ash (*Fraxinus excelsior*). The grassland (GS2) on the former playing area is dominated by Yorkshire fog (*Holcus lanatus*), false oat-grass (*Arrhenatherum elatius*), cock's-foot grass (*Dactyls glomerata*), red fescue (*Festuca rubra*), with occasional dandelion (*Taraxacum* agg.), ribwort plantain (*Plantago lanceolata*), creeping buttercup (*Ranunculus repens*), meadow buttercup (*Ranunculus acris*) and germander speedwell (*Veronica chamaedrys*).

The treeline (WL2) near the rugby club building has Wych elm (*Ulmus glabra*) and ash, and dense bramble tangles and several ornamental shrubs are found around the building forming an area of scrub (WS1). A double treeline (WL2) of Leyland Cypress (*Cupressus* sp.) separates the rugby club building from a small field located at the rear of the residences on Back Road. A deep drainage ditch (FW4) which was dry at the time of survey is found at the base of this treeline and an old disused badger (*Meles meles*) sett, which is currently used by fox (*Vulpes vulpes*) is located here. Three rows of apple (*Malus* sp.), sycamore, beech (*Fagus sylvatica*), hawthorn (*Crataegus monogyna*), and poplar (*Populus alba*) are found on the north side of this treeline forming an area of immature woodland (WS2)

Plate 7. Scrub at the southern end of the rugby club lands.

The northern field had been recently disturbed by test trenching in June 2020 for archaeological purposes and is abandoned pasture which has become invaded by large patches of hogweed (Heracleum sphondylium), nettle (Urtica dioica), bramble, creeping thistle (Cirsium arvense), and docks (Rumex sp.). This area is heavily grazed by rabbits. A deep ditch adjoins an earthen bank (BL2) on the eastern boundary and a double hedgerow (WL1) of hawthorn, ash, sycamore and bramble is found here. Numerous rabbit burrows are found on the earthen banks (BL2). An old laneway (possibly a way leave for the railway) is located between it and the fence of the railway line beyond which is a treeline (WL2). This is vegetated with hogweed, ivy (Hedera helix), bramble, bush vetch (Vicia sepium), nettle, false-brome (Brachypodium sylvaticum), sycamore seedlings, greater plantain (Plantago major), ragwort (Senecio jacobaea), docks, Yorkshire fog and lesser burdock (Arctium minus).

Some areas of very dense bramble could not be adequately surveyed for fauna in this area and these will need to be supervised during site clearance.

The northern boundary of the northern field is demarcated by a hedgerow (WL1) of ash, elder (Sambuccus nigra), bramble and sycamore with occasional mature ash and sycamore. An ESB substation is located here.

Plate 8. Treeline to the north of the rugby club.

The western boundary of the northern field consists of a treeline (WL2) of mature and semi-mature ash and sycamore located on an earthen bank with cherry laurel (*Prunus laurocerasus*), dog rose (*Rosa canina*), Wych elm (*Ulmus glabra*), beech and hawthorn. A drainage ditch (FW4) which was dry at the time of survey is located at the base of this treeline.

Between the former Rugby Club lands and the Ashwood Hall development is a field which has been either recently ploughed ground (BC3), an area of agricultural land planted with arable crops (BC1) or more recently an area of recolonising set aside (ED2). A similar suite of species to those recorded on the southern lands were recorded here. This field is bounded to the west by the shared treeline (WL2) of Ashwood Hall which is dominated by mature and semi-mature ash (*Fraxinus excelsior*), oak (*Quercus robur*), wild cherry (*Prunus avium*), sweet chestnut (*Castanea sativa*), sycamore (*Acer pseudoplatanus*), and beech (*Fagus sylvatica*) with an understorey of hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), Wych elm (*Ulmus glabra*), bramble (*Rubus fruticosus* agg.), elder (*Sambuccus nigra*) and dog rose (*Rosa canina*). This treeline is located on a shallow earthen bank (BL2) with an associated deep drainage ditch (FW4) which was dry at the time of survey. East of this is a treeline (WL2) of Leyland and Lawson cypress which runs north to south near the rugby clubhouse.

Plate 9. Broomfield under development.

Plate 10. Northeastern field – showing test trenching activity for archaeology in June 2020.

Plate 11. Old laneway adjoining the railway line.

The three private residences, which were located near the former rugby club in Pocket Park, have been demolished. These works were completed under a bat derogation licence issued by National Parks and Wildlife Service and supervised by Faith Wilson (see below). Surrounding the residences are remnant hedgerows (WL1), which have been retained. These are dominated mostly by non-native species such as leylandii, beech and other ornamental shrubs. A younger treeline (WL2) of horse chestnut (*Aesculus hippocastanum*) and field maple (*Acer campestre*) is found along the northern boundary of these properties adjoining the road.

Plate 12. Looking south west over the northern field.

5.3.3 Invasive Species

The main invasive species noted in the general vicinity include stands of Japanese knotweed (*Fallopia japonica*) and buddleia (*Buddleia davidii*) which were found within the rugby club lands. The location of these stands is shown on **Figure 5.5** below.

A detailed Japanese knotweed management plan was developed to ensure that this species is not and has not inadvertently been spread during development of the site.

The client Carroll Estates Ltd./Birchwell Developments engaged a trained horticulturalist (Graeme Cahill) to treat the Japanese knotweed in 2017. The first treatment of the knotweed at Broomfield was on May 19th 2018. An application rate of 100ml Glyphosate:5 litres water was used. A total of 3 litres of spray was applied via a knapsack sprayer. Follow up treatment has since been conducted. The Japanese knotweed record of treatment, maintained by Graeme Cahill is presented in **Appendix 5.5**.

The Japanese knotweed stands have been the subject of ongoing treatment in situ and have not spread or become established elsewhere within the site in the intervening period.

Figure 5.5 Location of Japanese knotweed within the site.

Plate 13. Japanese knotweed on the former rugby club lands following treatment in 2018.

Plate 14. Japanese knotweed areas clearly demarcated and treated in January 2021.

5.3.4 Faunal Interest

As part of a request for further information from Fingal County Council Planning (Reg Ref: F13A/0459 (Item 4)) and An Bord Pleanála Reference Number: PL 06F.243863 Planning Condition 6 for the development of Ashwood Hall and Broomfield Phase 1 a Badger and Biodiversity Management Plan was prepared and has been implemented during the construction of the neighbouring developments of Ashwood Hall and Broomfield Phase 1.

5.3.4.1 Badger

A badger (Meles meles) sett, as documented in 2014, is located at the southern end of the shared treeline with Ashwood Hall, which forms the western boundary of the northern lands of the Broomfield SHD.

This badger sett consists of a single entrance sett, which was not active at the time of the initial or subsequent surveys. This and a number of other holes and burrows in the area are well used by rabbits but there was no evidence of current use by badger during recent surveys.

There were feeding signs of badger noted along the southern boundary of the Broomfield Phase 1 lands in 2014 and a dead badger was noted on the Back Road to the west of the entrance to Malahide Castle.

The current surveys conducted in 2019/2020 recorded a possible second disused sett within the treeline north of the rugby club building. This was in use by fox at that time. The locations of these inactive setts are shown on Figure 5.6 below.

Plate 15. Trails leading to badger sett (disused) north of the rugby club building.

It is considered likely that the setts within the Broomfield SHD lands are used by badgers as outlier setts to a main territory, which is located within Malahide Castle Demesne.

Figure 5.6. Badger setts within the Broomfield SHD lands.

The setts within the Broomfield SHD lands have been the subject of ongoing monitoring over the winter months during 2020/2021 and 2021/2022. A camera trap was deployed here between 1st December 2020 and 8th January 2021. No evidence of badger was recorded on the trap. The results of these surveys are presented below.

1st December 2020

No badger activity at northern or southern setts – numerous tracks through undergrowth – attributed to rabbit and fox.

8th January 2021

No badger activity at northern or southern setts – numerous tracks through undergrowth – attributed to rabbit and fox.

5th October 2021

No badger activity at northern or southern setts – numerous tracks through undergrowth – attributed to rabbit and fox.

24th February 2022

No badger activity at northern or southern setts – numerous tracks through undergrowth – attributed to rabbit and fox. Large fox scat at northern sett.

The setts present within the Broomfield lands would appear to not be in recent use by badger.

5.3.4.2 Bats

Bats on the Broomfield lands have been the subject of a number of bat surveys to date (conducted in 2014, 2017, 2018, 2019 and 2022). The results of these are outlined below.

2014 Survey

The detector survey conducted in 2014 confirmed the presence of three species of bats using the environs of the lands at Broomfield. These included the following species:

- Leisler's bat (*Nyctalus leisleri*)
- Common Pipistrelle (*Pipistrellus pipistrellus*)
- Soprano Pipistrelle (*Pipistrellus pygmaeus*)

Leisler's bat was recorded immediately after dusk flying high over the site. Common and Soprano Pipistrelle bats were recorded foraging along the boundary and internal treelines and hedgerows and hunting over the open fields. No confirmed tree roosts were recorded on the site but several of the mature trees in the central treeline have some potential to support roosting bats. The buildings were not surveyed as part of that survey.

2017 & 2018 Surveys

A detector survey conducted at dusk on the 16th May 2017 recorded 3-5 common pipistrelles foraging along the lane which provides access to the three houses and the rugby club building from Back Lane. Only the grounds of the first house (westernmost property) could be walked and examined and access was not possible to the other two properties.

The surveys conducted on the 20th and 26th/27th June 2018 confirmed the presence of four species of bats at Broomfield. These were as follows:

- Leisler's bat (*Nyctalus leisleri)*
- Common Pipistrelle (*Pipistrellus pipistrellus)*
- Soprano Pipistrelle (*Pipistrellus pygmaeus)*
- Brown long-eared bat (*Plecotus auritus)*

In the intervening period between 2017 and 2018 the buildings had been the subject of various damaging activities including the theft of copper piping and materials associated with heating systems, stripping of lead flashings from the roofs and in the case of the middle house a fire which had completely destroyed the roof structure of the house.

House 1

This was the westernmost property and is a dormer bungalow with a detached garage. The roof was composed of tiles on felt. There was no evidence of bats roosting in this property but swallows were recorded nesting in the garage.

Plate 16. House 1 and detached garage – front view in 2018.

Plate 17. House 1 and detached garage – rear view in 2018.

House 2

This was the central property, which had been burnt out since it was first examined externally in 2017. The roof was almost completely gone and only a small area of tiles on battens remains. A detached garage associated with this property remained extant.

Plate 18. House 2 – front view in 2018.

Plate 19. House 2 and detached garage – rear view in 2018.

Common and Soprano pipistrelle were recorded in the garden of this property and 2 common pipistrelle were seen returning to the garage at dawn on the 27th June 2018.

Plate 20. House 2 – detached garage in 2018.

House 3

This was the easternmost of the three houses. The main house was connected to a long extension building (which contains a boiler room) by a conservatory. A small annex/granny flat building was located in the garden. The roof was stripped of lead flashing but generally remained intact. The roof spaces of the house and adjoining building had been converted and velux windows were present (albeit smashed in some instances).

The granny flat in the garden had both soprano pipistrelle and common pipistrelle bats emerging at dusk (c. 2- 3 bats) and foraging extensively along the treeline which extends south at the back of this property. They were joined by approximately 8-9 bats which appeared to emerge from the fascia boards on the rear of the main house, indicating a possible roost on the main gable of the house. In total 10-12 bats were recorded. A single brown long-eared bat was recorded roosting in the boiler house of the long extension.

Plate 21. House 3 – rear view in 2018. Bats emerged from the fascia of the main gable as indicated by the red arrow).

Plate 22. House 3 in 2018 – long extension building which contained the boiler house (indicated by the red arrow).

Plate 23. Granny flat in the garden of House 3 in 2018. Up to 5 common pipistrelle and soprano pipistrelle emerged from this building.

Plate 24. Brown long eared bat roosting in the boiler house in 2018.

Rugby Clubhouse Building

The rugby clubhouse also had a tiled roof and has been subject to some vandalism and theft. A single common pipistrelle bat was seen flying in the attic. Approximately 2-3 common pipistrelle and soprano pipistrelle bats were recorded emerging from this building and foraging in the general vicinity.

Plate 25. Former rugby clubhouse building in 2018.

Leisler's bat was recorded foraging above the site and appeared to approach the lands from the railway bridge area to the north - east. No roosts were confirmed for this species in the site.

In summary no confirmed maternity roosts were recorded in the surveys in 2017 and 2018 in any of the four properties scheduled for demolition. Three species recorded were roosting in small numbers and in various locations as detailed above. A bat derogation licence was granted by NPWS for the demolition of these buildings in 2018 (see **Appendix 5.1**).

The three residential properties were demolished under licence between the 8th and 15th October 2018 under the supervision of Faith Wilson. As per the mitigation measures in the bat report and the conditions of the licence the roof tiles were removed manually and half the roof of each structure exposed and left overnight. A photographic record of this process is presented below.

Plate 26. Roof stripping of the easternmost house in October 2018.

Plate 27. Roof stripping of the easternmost house in October 2018.

Plate 28. Roof stripping of the easternmost house in October 2018.

Plate 29. Roof stripping of the easternmost house in October 2018.

Plate 30. Demolition of the easternmost house in October 2018.

Plate 31. Roof stripping of the granny flat in the grounds of the easternmost house in October 2018.

No bats were injured during this process. Two pipistrelle bats (species unidentified) were recorded emerging from the fascia boards of the easternmost house during the works. There were no significant build up of droppings in any of the roofs which would indicate that a maternity roost had been present.

2019 Survey

The final extant building (the former rugby club) and the lands proposed for development under the Broomfield SHD application were resurveyed on the 16th October 2019 during clear, calm conditions.

Leisler's bat was recorded foraging over the southern lands and over the area of scrub south of the rugby club building. The rugby club building had been the subject of arson and no longer has an intact roof/attic space. No bats were recorded emerging from this property.

Plate 32. Rugby club building destroyed by arson - 2018.

Soprano pipistrelle bat and common pipistrelle bat were recorded foraging along the laneway leading from the rugby club east towards Ashwood Hall, over the northern field and in the shelter of the laneway adjoining the railway line and along the central treeline between Ashwood Hall and the eastern Broomfield SHD lands.

2022 Survey

The final extant building (the former rugby club) and the lands proposed for development under the Broomfield SHD application were resurveyed on the 29th March 2022 during clear, calm conditions. Initial temperatures were 9.5°C dropping to 8°C at the end of the survey.

The first bat species recorded was observed at 20:20 when a Leisler's bat was recorded foraging along the edge of the railway line and over the area of scrub south of the rugby club building.

Plate 33. Rugby club building in 2022.

The rugby club building had deteriorated further in condition with fascia removed and the soffits exposed. No bats were recorded emerging from this property.

Common pipistrelle and soprano pipistrelle bats were recorded foraging in the shelter of the treelines/vegetation adjoining the railway line, along the treeline at the northern side of the access road to the site and along the treeline which forms the western boundary of the northern lands with Ashwood Hall. No bat activity was recorded in the southern lands.

5.3.4.3 Other Mammals

The terrestrial fauna consists of species typical of the open countryside of North Dublin. There are many rabbits (*Oryctolagus cuniculus*) present and a fox (*Vulpes vulpes*) has been both seen and heard during the site visits. A foxes den was noted on grounds within the railway cutting along the eastern boundary of the northern lands.

Other common fauna that would be expected include brown rat (*Rattus norvegicus*), long tailed field mouse (*Apodemus sylvaticus*), house mouse (*Mus musculus*), hedgehog (*Erinaceus europaeus*), and pygmy shrew (*Sorex minutus*). Irish stoat (*Mustela erminea hibernica*) may also occur but have not been observed – they have been recorded from Malahide Demesne to the north of the lands, where grey squirrels (*Sciurus carolinensis*) are also frequent.

5.3.4.4 Birds

The bird fauna recorded was rich and a good variety of breeding species were recorded. Species recorded from hedgerows and treelines within the site over the years include blackbird, yellowhammer, robin, willow warbler, goldfinch, wren, blue tit, song thrush, bullfinch, chaffinch, starling, woodpigeon, starling, dunnock, jackdaw, and greenfinch.

Corvid species recorded on site include; rook, magpie, hooded crow and jackdaw.

Pied wagtails were recorded in the vicinity of the new housing at Ashwood Hall.

Birds of prey such as buzzard and sparrowhawk were confirmed using the area and summer visitors, such as swallow were regularly observed.

Species such as redwing and fieldfare may visit during the winter months.

Mallard ducks have been observed rising from the Hazelbrook Stream along the southern boundary of the southern lands. Grey heron was seen flying over the lands in darkness on the 29th March 2022 travelling north.

5.3.4.5 Amphibians

There are no ponds or other water features within the red line boundary of the site that could support breeding frogs and newts – however these species may utilise the areas of standing water in drainage ditches and slow flowing sections of the Hazelbrook Stream.

5.4 Description of Natura 2000 Sites

In line with the European Commission Methodological Guidance (EC (2001) and EC (2021)) and the DoEHLG Guidance (DoEHLG (2010)) a review of all European sites that could be potentially affected by the proposed project was made using the NPWS online map viewer. These included any European sites within or adjacent to the land at Broomfield and any European sites within the likely zone of impact of the proposed development (using the source – pathway – receptor criteria) including any downstream. These are summarised in **Table 5.2.1** below and shown on **Figure 5.7**.

In addition to the identified European sites consideration is also given to relevant species listed under Annexes I and II and IV of the Birds and Habitats Directives respectively.

The lands at Broomfield are not currently designated for any nature conservation purposes.

Eighteen Natura 2000 designated sites occur within a 15km radius of the site. These include nine Special Areas of Conservation (SACs) and nine Special Protection Areas (SPAs) as follows

- Malahide Estuary SAC (Site Code: 000205)
- Malahide Estuary SPA (Site Code: 004025)
- Baldoyle Bay SAC (Site Code: 000199)
- Baldoyle Bay SPA (Site Code: 004016)
- North Dublin Bay SAC (Site Code: 000206)
- North Bull Island SPA (Site Code: 004006)
- Rockabill to Dalkey Islands SAC (Site Code: 003000)
- Rogerstown Estuary SAC (Site Code: 000208)
- Rogerstown Estuary SPA (Site Code: 004015)
- Ireland's Eye SAC (Site Code: 002193)
- Ireland's Eye SPA (Site Code: 004117)
- South Dublin Bay/Tolka Estuary SPA (Site Code: 004024)

- South Dublin Bay SAC (Site Code: 000210)
- Howth Head SAC (Site Code: 000202)
- Howth Head Coast SPA (Site Code: 004113)
- Lambay Island SAC (Site Code: 000204)
- Lambay Island SPA (Site Code: 004069)
- Skerries Islands SPA (Site Code: 004122)

Some of these and a number of other sites in the area are also designated as proposed Natural Heritage Areas:

- Lambay Island pNHA (Site Code: 000204),
- Rogerstown Estuary pNHA (Site Code: 000208)
- Portraine Shore pNHA (Site Code: 001215),
- Malahide Estuary pNHA (Site Code: 000205),
- Feltrim Hill pNHA (Site Code: 001218),
- Sluice River Marsh pNHA (Site Code: 001763),
- Santry Demesne pNHA (Site Code: 000178),
- Ireland's Eye pNHA (Site Code: 000203),
- Howth Head pNHA (Site Code: 000202),
- Baldoyle Bay pNHA (Site Code: 000199).

Hydrological Links to Natura 2000 sites:

There are no Natura 2000 sites located either within or directly adjacent to the proposed development lands at Broomfield.

The most relevant of the protected sites is Baldoyle Bay SAC/SPA/pNHA, which is hydrologically connected to the lands at Broomfield via the Hazelbrook Stream, which is found along the southern boundary of the southern lands.

This watercourse and the surface waters from the site drain to the Sluice River and discharge into Baldoyle Bay, which is designated as the Baldoyle Bay SAC/SPA.

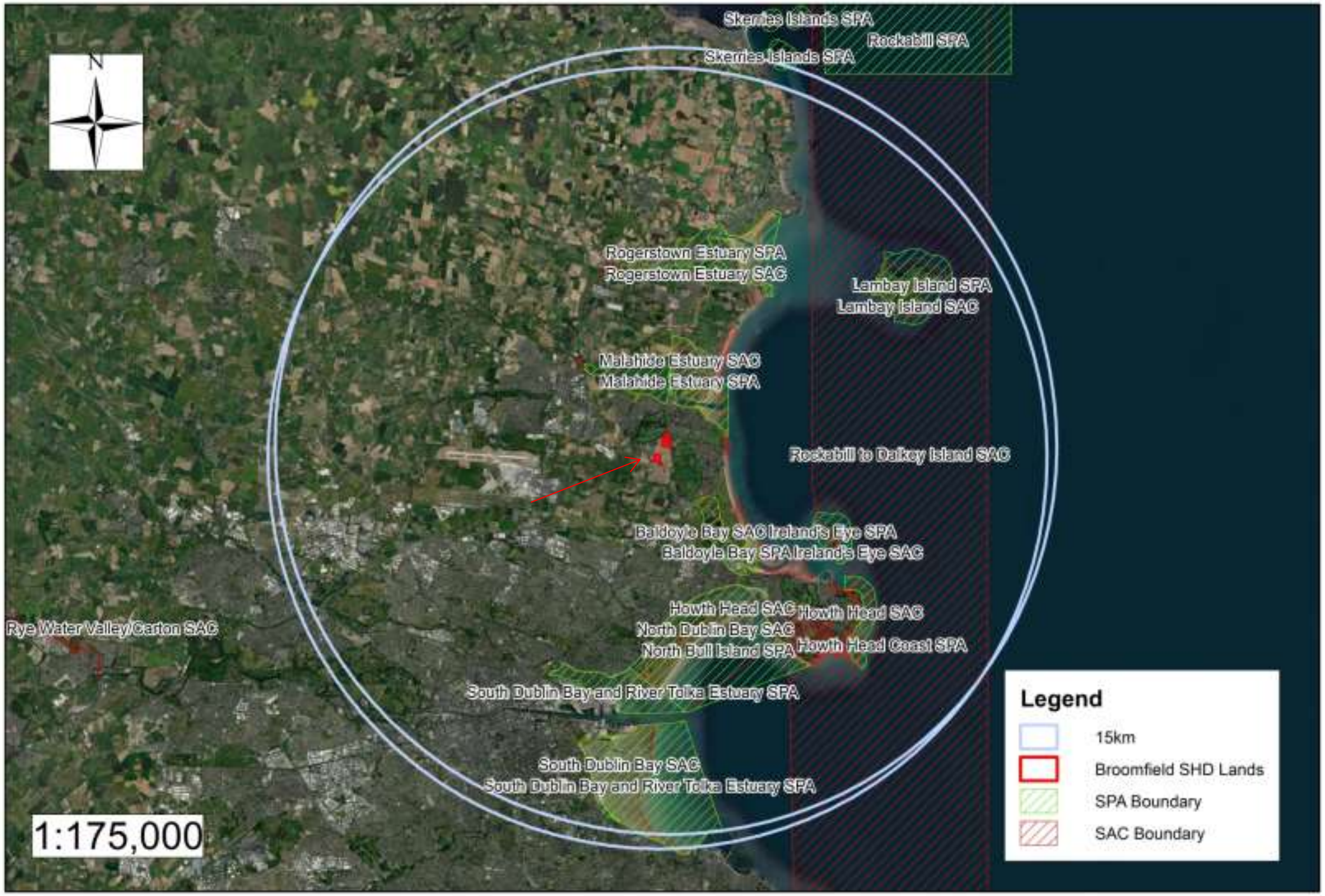

Figure 5.7. Designated sites within a 15km radius of the lands at Broomfield – indicated by the red arrow.

Table 5.2.1. Designated Natura 2000 sites of relevance to the lands at Broomfield.

Site Code	Site Name and Designation	Approximate distance from the proposed development	Qualifying Interest	General Conservation Objectives
000205	Malahide Estuary SAC	1.2km N	• (1140) Mudflats and sandflats not covered by seawater at low tide • (1310) *Salicornia* and other annuals colonizing mud and sand • (1320) Spartina swards (*Spartinion maritimae*) • (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • (1410) Mediterranean salt meadows (*Juncetalia maritimi*) • (2130) Fixed coastal dunes with herbaceous vegetation (grey dunes)* • (2120) Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)	Source: NPWS (2013) Conservation Objectives: Malahide Estuary SAC 000205. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed 23rd March 2022. To maintain the favourable conservation condition of the Annex I habitats for which the SAC has been selected: • (1140) Mudflats and sandflats not covered by seawater at low tide • (1310) *Salicornia* and other annuals colonizing mud and sand • (1320) Spartina swards (*Spartinion maritimae*) • (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • (1410) Mediterranean salt meadows (*Juncetalia maritimi*) • (2130) Fixed coastal dunes with herbaceous vegetation (grey dunes)* • (2120) Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)

Site Code	Site Name and Designation	Approximate distance from the proposed development	Qualifying Interest	General Conservation Objectives
004025	Broadmeadow / Swords Estuary SPA (also known as Malahide Estuary SPA)	1.2km N	• Great Crested Grebe (*Podiceps cristatus*) [A005] • Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] • Shelduck (*Tadorna tadorna*) [A048] • Pintail (*Anas acuta*) [A054] • Goldeneye (*Bucephala clangula*) [A067] • Red-breasted Merganser (*Mergus serrator*) [A069] • Oystercatcher (*Haematopus ostralegus*) [A130] • Golden Plover (*Pluvialis apricaria*) [A140] • Grey Plover (*Pluvialis squatarola*) [A141] • Knot (*Calidris canutus*) [A143] • Dunlin (*Calidris alpina*) [A149] • Black-tailed Godwit (*Limosa limosa*) [A156] • Bar-tailed Godwit (*Limosa lapponica*) [A157] • Redshank (*Tringa totanus*) [A162] • Wetlands & Waterbirds [A999]	Source: NPWS (2013) Conservation Objectives: Malahide Estuary SPA 004025. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed 23rd March 2022. To maintain the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA: • [wintering] *Podiceps cristatus* • [wintering] *Branta bernicla hrota* • [wintering] *Tadorna tadorna* • [wintering] *Anas acuta* • [wintering] *Bucephala clangula* • [wintering] *Mergus serrator* • [wintering] *Haematopus ostralegus* • [wintering] *Pluvialis squatarola* • [wintering] *Calidris canutus* • [wintering] *Limosa limosa* • [wintering] *Limosa lapponica* • [wintering] *Tringa tetanus* To maintain the favourable conservation condition of the wetland habitat in Malahide Estuary SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.

Site Code	Site Name and Designation	Approximate distance from the proposed development	Qualifying Interest	General Conservation Objectives
000199	Baldoyle Bay SAC	2km SE	• (1140) Mudflats and sandflats not covered by seawater at low tide • (1310) *Salicornia* and other annuals colonizing mud and sand • (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • (1410) Mediterranean salt meadows (*Juncetalia maritimi*)	Source: NPWS (2012) Conservation Objectives: Baldoyle Bay SAC 000199. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed 23rd March 2022. To maintain the favourable conservation condition of the Annex I habitats for which the SAC has been selected: • (1140) Mudflats and sandflats not covered by seawater at low tide • (1310) *Salicornia* and other annuals colonizing mud and sand • (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • (1410) Mediterranean salt meadows (*Juncetalia maritimi*)

Site Code	Site Name and Designation	Approximate distance from the proposed development	Qualifying Interest	General Conservation Objectives
004016	Baldoyle Bay SPA	2km SE	• Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] • Shelduck (*Tadorna tadorna*) [A048] • Ringed Plover (*Charadrius hiaticula*) [A137] • Golden Plover (*Pluvialis apricaria*) [A140] • Grey Plover (*Pluvialis squatarola*) [A141] • Bar-tailed Godwit (*Limosa lapponica*) [A157] • Wetlands & Waterbirds [A999]	Source: NPWS (2013) Conservation Objectives: Baldoyle Bay SPA 004016. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed 23rd March 2022. To maintain the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA: • [wintering] *Branta bernicla hrota* • [wintering] *Tadorna tadorna* • [wintering] *Charadrius hiaticula* • [wintering] *Pluvialis squatarola* • [wintering] *Limosa lapponica* To maintain the favourable conservation condition of the wetland habitat in Baldoyle Bay SPA
000206	North Dublin Bay SAC	5.4km SE	• (1140) Mudflats and sandflats not covered by seawater at low tide • (1210) Annual vegetation of drift lines • (1310) *Salicornia* and other annuals colonizing mud and sand • (1320) *Spartina* swards (Spartinion maritimae) • (1330) Atlantic salt meadows (Glauco-Puccinellietalia maritimae) • (1395) Petalwort (*Petalophyllum ralfsii*) • (1410) Mediterranean salt meadows (Juncetalia maritimi)	Source: NPWS (2013) Conservation Objectives: North Dublin Bay SAC 000206. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed 23rd March 2022. To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II

Site Code	**Site Name and Designation**	**Approximate distance from the proposed development**	**Qualifying Interest**	**General Conservation Objectives**
			• (2110) Embryonic shifting dunes • (2120) Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) • (2130) Fixed coastal dunes with herbaceous vegetation (grey dunes) • (2190) Humid dune slacks	species for which the SAC has been selected: • (1140) Mudflats and sandflats not covered by seawater at low tide • (1210) Annual vegetation of drift lines • (1310) *Salicornia* and other annuals colonizing mud and sand • (1320) *Spartina* swards (Spartinion maritimae) • (1330) Atlantic salt meadows (Glauco-Puccinellietalia maritimae) • (1395) Petalwort (*Petalophyllum ralfsii)* • (1410) Mediterranean salt meadows (Juncetalia maritimi) • (2110) Embryonic shifting dunes • (2120) Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) • (2130) Fixed coastal dunes with herbaceous vegetation (grey dunes) • (2190) Humid dune slacks

Site Code	Site Name and Designation	Approximate distance from the proposed development	Qualifying Interest	General Conservation Objectives
004006	North Bull Island SPA	5.4km SE	• Light-bellied Brent Goose (*Branta bernicla hrota*) • Shelduck (*Tadorna tadorna*) • Teal (*Anas crecca*) • Pintail (*Anas acuta*) • Shoveler (*Anas clypeata*) • Oystercatcher (*Haematopus ostralegus*) • Golden Plover (*Pluvialis apricaria*) • Grey Plover (*Pluvialis squatarola*) • Knot (*Calidris canutus*) • Sanderling (*Calidris alba*) • Dunlin (*Calidris alpina*) • Black-tailed Godwit (*Limosa limosa*) • Bar-tailed Godwit (*Limosa lapponica*) • Curlew (*Numenius arquata*) • Redshank (*Tringa totanus*) • Turnstone (*Arenaria interpres*) • Black-headed Gull (*Larus ridibundus*) • Wetlands & Waterbirds	Source: NPWS (2015) Conservation Objectives: North Bull Island SPA 004006. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed 23rd March 2022. To maintain the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA: • *Branta bernicla hrota* [wintering] • *Tadorna tadorna* [wintering] • *Anas crecca* [wintering] • *Anas acuta* [wintering] • *Anas clypeata* [wintering] • *Haematopus ostralegus* [wintering] • *Pluvialis apricaria* [wintering] • *Pluvialis squatarola* [wintering] • *Calidris canutus* [wintering] • *Calidris alba* [wintering] • *Calidris alpina* [wintering] • *Limosa limosa* [wintering] • *Limosa lapponica* [wintering] • *Numenius arquata* [wintering] • *Tringa totanus* [wintering] • *Arenaria interpres* [wintering] • *Chroicocephalus ridibundus* [wintering] • Wetlands

Site Code	Site Name and Designation	Approximate distance from the proposed development	Qualifying Interest	General Conservation Objectives
003000	Rockabill to Dalkey Islands SAC	5.4km E	• (1170) Reefs • (1351) Harbour Porpoise (*Phocoena phocoena*)	Source: NPWS (2013) Conservation Objectives: Rockabill to Dalkey Island SAC 003000. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed 23rd March 2022. To maintain the favourable conservation condition of the Annex I habitat and the Annex II species for which the SAC has been selected: • (1170) Reefs • (1351) Harbour Porpoise (*Phocoena phocoena*)

Site Code	Site Name and Designation	Approximate distance from the proposed development	Qualifying Interest	General Conservation Objectives
000208	Rogerstown Estuary SAC	6.2km N	• (1130) Estuaries • (1140) Mudflats and sandflats not covered by seawater at low tide • (1310) *Salicornia* and other annuals colonizing mud and sand • (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • (1410) Mediterranean salt meadows (*Juncetalia maritimi*) • (2120) Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) • (2130) Fixed coastal dunes with herbaceous vegetation (grey dunes)*	Source: NPWS (2013) Conservation Objectives: Rogerstown Estuary SAC 000208. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed 23rd March 2022. To maintain the favourable conservation condition of the Annex I habitats for which the SAC has been selected: • (1130) Estuaries • (1140) Mudflats and sandflats not covered by seawater at low tide • (1310) *Salicornia* and other annuals colonizing mud and sand • (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • (1410) Mediterranean salt meadows (*Juncetalia maritimi*) • (2120) Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) • (2130) Fixed coastal dunes with herbaceous vegetation (grey dunes)*

Site Code	Site Name and Designation	Approximate distance from the proposed development	Qualifying Interest	General Conservation Objectives
004015	Rogerstown Estuary SPA	6.2km N	• Greylag Goose (*Anser anser*) [A043] • Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] • Shelduck (*Tadorna tadorna*) [A048] • Shoveler (*Anas clypeata*) [A056] • Oystercatcher (*Haematopus ostralegus*) [A130] • Ringed Plover (*Charadrius hiaticula*) [A137] • Grey Plover (*Pluvialis squatarola*) [A141] • Knot (*Calidris canutus*) [A143] • Dunlin (*Calidris alpina*) [A149] • Black-tailed Godwit (*Limosa limosa*) [A156] • Redshank (*Tringa totanus*) [A162] • Wetlands & Waterbirds [A999]	Source: NPWS (2013) Conservation Objectives: Rogerstown Estuary SPA 004015. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed 23rd March 2022. To maintain the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA: • [wintering] *Anser anser* • [wintering] *Branta bernicla hrota* • [wintering] *Tadorna tadorna* • [wintering] *Anas clypeata* • [wintering] *Haematopus ostralegus* • [wintering] *Charadrius hiaticula* • [wintering] *Pluvialis squatarola* • [wintering] *Calidris canutus* • [wintering] *Limosa limosa* • [wintering] *Tringa totanus* To maintain the favourable conservation condition of wetland habitat in Rogerstown Estuary SPA as a resource for the regularly occurring migratory waterbirds that utilise it.

Site Code	Site Name and Designation	Approximate distance from the proposed development	Qualifying Interest	General Conservation Objectives
004117	Ireland's Eye SPA	6.4km SE	• Cormorant (*Phalacrocorax carbo*) [A017] • Herring Gull (*Larus argentatus*) [A184] • Kittiwake (*Rissa tridactyla*) [A188] • Guillemot (*Uria aalge*) [A199] • Razorbill (*Alca torda*) [A200]	Source: NPWS (2022) Conservation objectives for Ireland's Eye SPA [004117]. Generic Version 9.0. Department of Housing, Local Government and Heritage. Accessed 23rd March 2022. To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA: • [breeding]*Phalacrocorax carbo* • [breeding] *Larus argentatus* • [breeding] *Rissa tridactyla* • [breeding] *Uria aalge* • [breeding]*Alca torda*
002193	Ireland's Eye SAC	6.4km SE	• Perennial vegetation of stony banks [1220] • Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	Source: NPWS (2017) Conservation Objectives: Ireland's Eye SAC 002193. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. Accessed 23rd March 2022. To maintain the favourable conservation condition of the Annex I habitats for which the SAC has been selected: • Perennial vegetation of stony banks [1220] • Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]

Site Code	Site Name and Designation	Approximate distance from the proposed development	Qualifying Interest	General Conservation Objectives
004024	South Dublin Bay and River Tolka Estuary SPA	8.1km S	• Brent goose (*Branta bernicla hrota*), • Sandwich Tern (*Sterna sandvicensis*), • Roseate Tern (*Sterna dougallii*), • Common Tern (*Sterna hirundo*), • Arctic Tern (*Sterna paradisaea*), • Oystercatcher (*Haematopus ostralegus*), • Ringed Plover (*Charadrius hiaticula*), • Knot (*Calidris canuta*), • Sanderling (*Calidris alba*), • Dunlin (*Calidris alpina*), • Bar-tailed Godwit (*Limosa lapponica*)	Source: NPWS (2015) Conservation Objectives: South Dublin Bay and River Tolka Estuary SPA 004024. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed 23rd March 2022. To maintain the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA: • Brent goose (*Branta bernicla hrota*), • Sandwich Tern (*Sterna sandvicensis*), • Roseate Tern (*Sterna dougallii*), • Common Tern (*Sterna hirundo*), • Arctic Tern (*Sterna paradisaea*), • Oystercatcher (*Haematopus ostralegus*), • Ringed Plover (*Charadrius hiaticula*), • Knot (*Calidris canuta*), • Sanderling (*Calidris alba*), • Dunlin (*Calidris alpina*), • Bar-tailed Godwit (*Limosa lapponica*) To maintain the favourable conservation condition of wetland habitat in South Dublin and the River Tolka Estuary SPA as a resource for the regularly occurring migratory waterbirds that utilise it.

Site Code	Site Name and Designation	Approximate distance from the proposed development	Qualifying Interest	General Conservation Objectives
000202	Howth Head SAC	8.4km SE	• Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] • European dry heaths [4030]	Source: NPWS (2016) Conservation Objectives: Howth Head SAC 000202. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. Accessed 23rd March 2022. To maintain or restore the favourable conservation condition of the Annex I habitats for which the SAC has been selected: • Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] • European dry heaths [4030]
004113	Howth Head Coast SPA	8.4km SE	• Kittiwake (*Rissa tridactyla*) [A188]	Source: NPWS (2022) Conservation objectives for Howth Head Coast SPA [004113]. Generic Version 9.0. Department of Housing, Local Government and Heritage. Accessed 23rd March 2022. To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA: • [breeding] *Rissa tridactyla*

Site Code	Site Name and Designation	Approximate distance from the proposed development	Qualifying Interest	General Conservation Objectives
000210	South Dublin Bay SAC	10.7km S	• Mudflats and sandflats not covered by seawater at low tide [1140] • Annual vegetation of drift lines [1210] • Salicornia and other annuals colonising mud and sand [1310] • Embryonic shifting dunes [2110]	Source: NPWS (2013) Conservation Objectives: South Dublin Bay SAC 000210. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed 23rd March 2022. To maintain or restore the favourable conservation condition of the Annex I habitats for which the SAC has been selected: • Mudflats and sandflats not covered by seawater at low tide [1140] • Annual vegetation of drift lines [1210] • Salicornia and other annuals colonising mud and sand [1310] • Embryonic shifting dunes [2110]

Site Code	Site Name and Designation	Approximate distance from the proposed development	Qualifying Interest	General Conservation Objectives
000204	Lambay Island SAC	9.8km NE	• (1230) Vegetated sea cliffs of the Atlantic and Baltic coasts • (1170) Reefs • (1364) *Halichoerus grypus* • (1265) *Phoca vitulina*	Source: NPWS (2013) Conservation Objectives: Lambay Island SAC 000204. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Accessed 23rd March 2022. To maintain the favourable conservation condition of the Annex I habitat and the Annex II species for which the SAC has been selected: • (1230) Vegetated sea cliffs of the Atlantic and Baltic coasts • (1170) Reefs • (1364) *Halichoerus grypus* • (1265) *Phoca vitulina*

Site Code	Site Name and Designation	Approximate distance from the proposed development	Qualifying Interest	General Conservation Objectives
004069	Lambay Island SPA	9.8km NE	• Fulmar (*Fulmarus glacialis*) [A009] • Cormorant (*Phalacrocorax carbo*) [A017] • Shag (*Phalacrocorax aristotelis*) [A018] • Greylag Goose (*Anser anser*) [A043] • Lesser Black-backed Gull (*Larus fuscus*) [A183] ^ • Herring Gull (*Larus argentatus*) [A184] ^ • Kittiwake (*Rissa tridactyla*) [A188] • Guillemot (*Uria aalge*) [A199] • Razorbill (*Alca torda*) [A200] • Puffin (*Fratercula arctica*) [A204]	Source: NPWS (2022) Conservation objectives for Lambay Island SPA [004069]. Generic Version 9.0. Department of Housing, Local Government and Heritage. Accessed 23rd March 2022. To maintain the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA: • Fulmar (*Fulmarus glacialis*) [A009] • Cormorant (*Phalacrocorax carbo*) [A017] • Shag (*Phalacrocorax aristotelis*) [A018] • Greylag Goose (*Anser anser*) [A043] • Lesser Black-backed Gull (*Larus fuscus*) [A183] ^ • Herring Gull (*Larus argentatus*) [A184] ^ • Kittiwake (*Rissa tridactyla*) [A188] • Guillemot (*Uria aalge*) [A199] • Razorbill (*Alca torda*) [A200] • Puffin (*Fratercula arctica*) [A204]

Site Code	Site Name and Designation	Approximate distance from the proposed development	Qualifying Interest	General Conservation Objectives
004122	Skerries Islands SPA	14.99km north	• Cormorant (*Phalacrocorax carbo*) [A017] • Shag (*Phalacrocorax aristotelis*) [A018] • Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] • Purple Sandpiper (*Calidris maritima*) [A148] • Turnstone (*Arenaria interpres*) [A169] • Herring Gull (*Larus argentatus*) [A184]	Source: NPWS (2022) Conservation objectives for Skerries Islands SPA [004122]. Generic Version 9.0. Department of Housing, Local Government and Heritage. Accessed 23rd March 2022. To maintain the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA: • Cormorant (*Phalacrocorax carbo*) [A017] • Shag (*Phalacrocorax aristotelis*) [A018] • Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] • Purple Sandpiper (*Calidris maritima*) [A148] • Turnstone (*Arenaria interpres*) [A169] • Herring Gull (*Larus argentatus*) [A184]

5.5 POTENTIAL IMPACTS

Planning permission is sought for:

The development of 415 residential units, comprising of 252 houses, 135 duplex units and 28 apartments, and a childcare facility.

The development of the lands at Broomfield will result in:

- permanent landtake;
- construction activities (e.g. runoff and other pollution, increase of suspended solids, alteration of hydraulic conditions, noise and dust emissions, lighting, movement of vehicles, presence of construction personnel);
- occupation once completed

All areas of grassland, arable crops and some sections of treelines/hedgerows, shrubs, scrub and trees will be removed during the construction phase. The rugby club building within the site will be completely demolished.

As detailed in the arboricultural impact assessment the proposed development will require the removal of 46 individually recorded trees, 12 groups of trees/hedgerows, and the partial removal of five groups of trees/hedgerows. Of the 63 survey entries proposed to be removed or partially removed, six trees are of moderate quality and value (B Category), 42 trees and groups of trees/hedgerows are of low quality and value (C Category), and 15 trees are of poor quality (U Category).

The other potential impacts during the construction phase arise from the risk of damage to areas of retained vegetation and habitats within the environs of the site. These include the site boundary treelines and hedgerows and the Hazelbrook Stream (which ultimately flows to the Baldoyle SAC/SPA).

A confirmed bat roost dating from 2018 was recorded within the old rugby club building which will be lost. There will be loss of foraging areas, resting sites and breeding habitat for birds and other fauna arising from the removal of grassland, arable crops and sections of treelines/hedgerows, shrubs, scrub and trees scheduled for site clearance.

The physical disturbance of the soil within the site will result in the potential for run-off from soil disturbance on the site to the adjoining drainage ditches and the Hazelbrook Stream and ultimately the Baldoyle Bay SAC/SPA unless some remedial measures are put in place. There is also some potential for leaks of oil and petrol from machinery and equipment used on site to enter the Natura 2000 site via this pathway.

During the operational phase of the development there is potential for contamination of Hazelbrook Stream and ultimately the Baldoyle Bay SAC/SPA from surface water run off from the site.

The lighting design for the scheme could also interfere with the movement of bats and other fauna through the site.

5.6 REMEDIAL OR REDUCTIVE MEASURES

5.6.1 Mitigation by Avoidance

The principal mitigation that should be considered in any development is avoidance of impact. The site layout has been designed to avoid impacts on the adjoining Hazelbrook Stream and the boundary treelines and hedgerows surrounding the site.

5.6.2 Planting of Native Species

Native species appropriate to the area (such as hawthorn, elder, ash, alder, holly, hazel, willows, oak, dog rose, gorse and bramble) have been used within the landscaping plans for the development.

These will, as they mature, provide a food source, shelter and habitat for foraging bats, nesting habitat for birds and a food source for pollinators. All species used will be of certified native origin and sourced locally to ensure genetic provenance to the area – certified material is available from the forestry nurseries who supply the native woodland scheme.

All planting within gardens and public spaces within the scheme will be pollinator friendly as per the All Ireland Pollinator Plan – see https://pollinators.ie/wordpress/wp-content/uploads/2018/04/Gardens_actions-to-help-pollinators-2018-WEB.pdf

5.6.3 Protective Measures for Retained Treelines, Hedgerows & the Hazelbrook Stream

The Hazelbrook Stream, hedgerows and treelines, which form the existing site boundaries, are to be retained.

A 10 - 15 metre wide riparian buffer strip has been retained along the Hazelbrook Stream in line with objective WQ5 in the Fingal County Development Plan 201 – 2023.

These retained treelines, hedgerows, drainage ditches & the Hazelbrook Stream will be given protection from accidental damage by machinery during site works prior to any works commencing in the development and as set out in the arboricultural impact statement. **These areas will be clearly delineated by fencing or other measures. Fences will be erected outside the drip-line or canopy of each tree in accordance with BS 5837 (2012) – Trees in Relation to Construction.** Please refer to the arboricultural tree protection drawings (**Figures 5.8** and **5.9** below).

Figure 5.8. Tree Protection Drawing (Northern lands).

Figure 5.9. Tree protection Drawing (Northern lands).

5.6.4 Invasive Species

An invasive species management plan for Phase I of the project was prepared to deal with the Japanese knotweed stands as shown on Chapter 5, **Figure 5.3**. Further information on the results of same is presented in Chapter 5, **Appendix 5.3**. The most recent surveys indicate that the plants would appear to have gone into dormancy with very small stems & leaves, no spread.

A detailed programme for the excavation and screening of soil into a container/large skips as the next step of eradication will be prepared with follow up monitoring by the specialist contractor Graeme Cahill who has been treating the population since 2018.

There is also potential for Japanese knotweed and other invasive species to spread/become established within the development site through poor site management or the import of contaminated topsoil so any material brought to site must be certified that it is free of invasive species.

5.6.5 Mitigation Measures for Badgers

An inactive badger sett is located at the southern end of the eastern boundary treeline (adjoining Ashwood Hall) within the site in the vicinity of O 22265 44683 and a disused sett is located in the treeline north of the rugby club building as shown on **Figure 5.6** above.

Both of these setts have been the subject of regular examination to determine their use by badgers and suitable protective measures (southern sett)/appropriate methodology for their destruction (northern sett) for these setts will need to be implemented during the construction phase of the Broomfield SHD lands. Although not in use at present they were previously used by badgers and could be again.

Badgers and their setts are protected under the provisions of the Wildlife Act, 1976, and the Wildlife Amendment Act, 2000. It is an offence to intentionally kill or injure a protected species or to wilfully interfere with or destroy the breeding site or resting place of a protected wild animal. Exclusion of badgers should only be considered where a development would unavoidably destroy a badger sett (or any part of its underground tunnel and chamber system), or its immediate surroundings, making it unsuitable for continued occupancy.

Construction works such as those proposed within the Broomfield SHD lands, which occur within the vicinity of a sett (albeit inactive/disused) may require a licence should the setts become active. It should be noted that all activity related to badger surveys, evacuation procedures and sett destruction should only be undertaken by personnel with recognised expertise in badger ecology.

In keeping with best practice measures to address potential effects on protected species such as badgers should firstly aim to avoid those impacts. If there are unavoidable impacts then mitigation should be designed to reduce those impacts.

Badger sett tunnels can extend 20m or more from the entrance holes and are typically located between 0.2m and several metres deep, depending on the soil and topography. Potential impacts include:

- damage and destruction of setts;
- disturbance from noise, lighting, vibration and other human disturbances such as fires and use of chemicals;
- loss of feeding areas;
- entrapment in works compounds, excavations, etc.

Monitoring

Given that some time may have lapsed between approval of planning permission and commencement of construction the activity at these setts will be the subject of ongoing monitoring in order to determine if a licence could become a requirement.

Southern Sett

The badger sett (at the southern end of the eastern boundary treeline (adjoining Ashwood Hall)) will not be directly impacted by the proposed Broomfield SHD and both it and the treeline in which it is located will be retained as part of the scheme. The proposed housing layout and internal access roads were redesigned during Phase 1 to ensure that these parts of the lands were retained as part of a wildlife corridor through the property and the sett was not directly impacted.

Both this treeline and inactive badger sett will be afforded protection as set out in the arborist's report and accompanying drawing (see **Figure 5.10** below) to ensure that the retained trees, vegetation and sett are not damaged by the construction works. Any fencing measures deployed must incorporate access for mammals at the base – this should be a gap no smaller than 300mm high by 225mm wide. This will be inspected and signed off by the ecological clerk of works.

Figure 5.10. Badger protection zone – southern sett.

Badgers and other wildlife will continue to use established paths across a site even when construction work has started. Therefore during construction, any open trenches/excavations will incorporate facilities for badgers (and other wildlife, such as rabbits, foxes, hedgehogs etc.) to escape, by means of the following:

1. Gently sloping earth incline to be left at the end of each day's operation – at each end of open excavations/trenches.
2. Timber escape planks should be provided at c. 50m intervals along any deep excavations/trenches and these should be left in place at the end of each day's operations; these should usually be placed at right-angles to the excavation/trench.
3. Any temporarily exposed open pipe system should be capped in such a way as to prevent badgers gaining access as may happen when contractors are off site.

Continued access to lands to the west, east and south must be provided for badgers to ensure that any animals associated with this sett will have access to foraging areas.

The following provisions apply to all construction works within the Broomfield SHD lands:

- badger sett tunnel systems can extend up to c. 20m from sett entrances. Therefore, no heavy machinery should be used within 30m of badger setts (unless carried out under licence); lighter machinery (generally wheeled vehicles) should not be used within 20m of a sett entrance; light work, such as hand digging or scrub clearance should not take place within 10m of sett entrances.
- during the breeding season (December to June inclusive) none of the above works should be undertaken within 50m of active setts nor blasting or pile driving within 150m of active setts.
- following consultation with NPWS and badger experts, works near setts may take place during the breeding season provided appropriate mitigation measures are in place, e.g. sett screening, restricted working hours, etc.

During the construction phase of the development activities may pose a temporary threat to badgers or disturb them if they reuse that sett. This should be mitigated by adopting the following practices.

- The use of noisy plant and machinery in the vicinity of the protection zone of the sett should cease at least two hours before sunset.
- Security lighting should be directed away from the sett and treeline to avoid impacts on badgers and foraging bats.
- Chemicals should be stored as far away from the sett and areas adjoining the retained treeline as possible.
- Trenches must be covered at the end of each working day, or include a means of escape for any animal falling in.

In order to comply with the above constraints:

- all affected setts should be clearly marked and the extent of bounds prohibited for vehicles clearly marked by fencing or adequate physical boundary. Hazard tape is often insufficient and prone to deterioration and damage by wind or cattle etc.
- all contractors/operators on site should be made fully aware of the procedures pertaining to the sett on site.

- construction activities within the vicinity of affected setts may commence once the current status of this sett has been determined, and the if active the sett has been evacuated and destroyed under licence from NPWS. .
- in almost all circumstances, works close to badger setts may only be conducted under the supervision of a qualified expert under licence from NPWS.

Additional mitigation measures include:

- Topsoil from areas likely to have constituted good badger foraging habitat (rich in earthworms) will be retained on site and used in the creation of worm-rich amenity or other grassland habitats.
- The use of noisy plant and machinery in the vicinity of the protection zone will cease at least two hours before sunset.
- Security lighting should be directed away from the sett.
- Chemicals will be stored as far away from the sett as possible.
- Trenches must be covered at the end of each working day, or include a means of escape for any animal falling in. (Badgers will continue to use established paths across a site even when construction work has started).
- Any temporarily exposed open pipe system should be capped in such a way as to prevent badgers gaining access as may happen when contractors are off site.
- Badger gates may need to be installed in perimeter fencing. If so, specialist advice should be sought.
- Water sources (for badgers) should always be safeguarded.

Northern Sett

The sett located to the north of the rugby club building has been the subject of ongoing monitoring to determine activity and to see if an exclusion license is required. The results of the current surveys would indicate that a license is not required but this will be informed by ongoing monitoring in order to determine if a licence could become a requirement.

Scrub Clearance

The area of scrub south of the rugby club building could not be fully surveyed for mammal activity and site clearance in this area will be supervised by an ecologist to ensure protection of same.

5.6.6 Mitigation Measures for Bats

Rugby Club Building Demolition

The rugby club building was confirmed as a roost for 2-3 common pipistrelle and soprano pipistrelle bats during surveys in 2018.

A bat derogation licence was previously provided in 2018 for the proposed demolition work of the rugby club building - see **Appendix 5.1**.

A new bat derogation licence was therefore sought from National Parks and Wildlife Service and granted – see **Appendix 5.2.**

The grounds on which the bat derogation licence was sought for the demolition of this bat roost are:

'In the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment'.

The lands are zoned for development and the project design and density of housing required under the SHD process does not allow for the retention of the rugby clubhouse building.

A number of mitigation measures are proposed to accommodate any bats that previously roosted in the rugby club building within the development. These include the erection of bat boxes on trees and integrated bat boxes within the building fabric. The retention and enhancement of the riparian corridor along the Hazelbrook Stream and the retention of the site boundary hedgerows coupled with sensitive lighting design also ensures that suitable habitat for bats remains within the site.

These have been demonstrated to work on a number of previous projects including the M11 Rathnew to Arklow motorway (bat boxes), Rockingham House, Glenamuck Road, Co. Dublin.

The loss of a minor roost for common and soprano pipistrelle bats in the rugby club building will not have a detrimental effect on the local bat population given the rich habitat and roosting potential in Malahide Castle and Demesne adjoining the site and the provision of roosting alternatives for the bats. The loss of this roost is highly unlikely to affect the conservation status of either of these species which is currently 'Favourable' at a national level.

Building Resurvey

Given that some time may have lapsed between approval of planning permission and commencement of construction it is recommended that the rugby club building scheduled for demolition is resurveyed for bats prior to any proposed demolition works. Although the building has been the subject of an arson attack bats have been observed returning to a burnt structure to roost in should suitable locations prevail demonstrating the site fidelity of bats to a roost site (F. Wilson, pers. obs.).

A precautionary approach to the demolition of the building can then be prepared whereby any remaining potential roosting location for bats are manually removed. This work will be supervised by a licensed bat specialist who can deal with any bats present and will be done during the winter months.

Provision of Bat Boxes

Fifteen bat boxes shall be erected on suitable buildings or trees (i.e. not illuminated and above 3 metres height and close to green areas) within the development. The most successful box types are "woodcrete" boxes made by Schwegler and available from www.alanaecology.com. Several designs are available including some of which can be incorporated into the walls and the surface fabric of new buildings.

Vegetation Retention and Protection

The other main protective measure for bats is in the retention of boundary hedgerows, treelines, watercourses and drainage ditches within the site and protective measures will be put in place for these features. The use of native species in the landscaping proposals for the site will also assist in ensuring that bats continue to forage and remain in the area.

Lighting Design

Sensitivity in the provision of lighting is also important to ensure that bats continue to use the site. The retained hedgerows, treelines, watercourse and drainage ditches and newly created areas of planted vegetation will be retained as dark zones and the amount of lighting shining on such areas limited.

Design recommendations from the BCT (2010) for wildlife-friendly lighting include:

1. Do not "over" light. This is a major cause of obtrusive light and is a waste of energy. Use only the minimum amount of light needed for safety. There are published standards for most lighting tasks, adherence to which will help minimise upward reflected light.
2. Eliminate any bare bulbs and any light pointing upwards. The spread of light should be kept near to or below the horizontal.
3. Use narrow spectrum bulbs to lower the range of species affected by lighting.
4. Use light sources that emit minimal ultra-violet light. Insects are attracted to light sources that emit ultra-violet radiation.
5. Reduce light-spill so that light reaches only areas needing illumination. Shielding or cutting light can be achieved through the design of the luminaire or with accessories, such as hoods, cowls, louvers and shields to direct the light.
6. Reduce the height of lighting columns. Light at a low level reduces ecological impact. However, higher mounting heights allow lower main beam angles, which can assist in reducing glare.
7. For pedestrian lighting, use low level lighting that is directional as possible and below 3 lux at ground level.
8. Limit the times that lights are on to provide some dark periods for wildlife.
9. Use lighting design computer programs and professional lighting designers to predict where light spill will occur.
10. In general, any lighting used in the development should not overspill onto adjoining trees, hedgerows, and watercourses thereby ensuring that a dark corridor for foraging and commuting bats and movement for other wildlife is maintained.

In addition:

11. Luminaires will be dimmable LED (light emitting diode) fittings with High performance optics to provide high visual comfort.
12. Luminaires will be selected to ensure that when installed there shall be zero direct upward light emitted to the sky (all output shall be at or below 90º to the horizontal to help prevent sky glow from light pollution of the night sky).
13. Luminaires will be selected to ensure that there is no light spill from the proposed development onto the retained areas of linear vegetation and boundary features.
14. The light emitted from these fittings shall have no photo biological risk and shall be categorised as “Exempt Group” in relation to emissions of Blue light, Infrared and Ultra Violet Radiation in accordance with EN 62741:2008.

15. All luminaires shall have a Luminous intensity Classification of between G4 and G6 to IS EN 13201-2:2003(E) / BS 5489-1:2013.
16. The recommendations of the Institution of Lighting Professionals and Bat Conservation Trust “Bats and Lighting in the UK” documentation and Bat Conversation Ireland Guidance Notes for planners, engineers, architects and developers December 2010 will be met.

Further detailed information on lighting design for bats and other wildlife is presented in the document prepared by the Bat Conservation Trust and the Institute of Lighting Professionals ‘BCT (2018). Guidance Note 08/18 - Bats and artificial lighting in the UK. Bats and the Built Environment series’ and the EUROBATS Guidance available from:

https://cdn.bats.org.uk/pdf/Resources/ilp-guidance-note-8-bats-and-artificial-lighting-compressed.pdf?mtime=20181113114229&focal=none and

https://cdn.bats.org.uk/pdf/Resources/EUROBATSguidelines8_lightpollution.pdf?mtime=20181113114256&focal=none

These guidelines have been implemented in the previous phases of the developments at Broomfield and in the project lighting design as set out in Figure 5.11 below.

Figure 5.11. Project lighting design.

Plate 34. Dark corridor for foraging bats and other wildlife maintained along the shared boundary treeline with Ashwood Hall.

Felling of Potential Bat Roosts in trees

All trees proposed for removal will be subject to appropriate felling measures as detailed in NRA Guidelines for the Treatment of Bats during the Construction of National Road Schemes (National Roads Authority 2006). The felling/clearance of trees will be scheduled for the autumn months of September/October when bats are less likely to be using trees. This also avoids the bird breeding season.

Prior to tree felling works the trees will be inspected by a licensed bat specialist in the presence of the tree surgeons and an appropriate felling methodology agreed.

The felling of those trees, which have been identified as potential bat roosts, must be supervised by a bat specialist holding a bat handling licence issued by the National Parks and Wildlife Service, (Department of Environment, Heritage and Local Government). If bats are encountered they should be removed by the licence holder to a bat box, to be sited on a nearby tree and the NPWS notified.

Identified trees must be felled carefully. Specific advice in relation to individual trees will be given on site by a bat specialist. Gradual dismantling of some mature trees may be necessary to ensure the safety of any bats which may be roosting within significant sized boughs or in the trunk. The tree will be inspected by a bat specialist, and depending on the structure of the tree they may need to be left intact on the ground for 24 hours to allow any bats within them to escape prior to processing.

5.6.7 Mitigation Measures for Birds

As detailed in the arboricultural impact assessment the proposed development will require the removal of 46 individually recorded trees, 12 groups of trees/hedgerows, and the partial removal of five groups of trees/hedgerows. Of the 63 survey entries proposed to be removed or partially removed, six trees are of moderate quality and value (B Category), 42 trees and groups of trees/hedgerows are of low quality and value (C Category), and 15 trees are of poor quality (U Category).

No clearance of vegetation shall be carried out from March 1st to August 31st (except in circumstances of immediate danger to the public). This will protect nesting birds, eggs and nestlings from injury or death. No clearance of vegetation suitable for nesting birds within the site (shrubs, bramble tangles, etc.) will take place during this period. Should such clearance be required than the area proposed for clearance should be inspected by an ecologist to ascertain if any nesting birds are present.

Provision of Bird Boxes

Forty bird boxes of varying designs will be erected on suitable buildings or trees within the development. Several designs are available including some which can be incorporated into the walls and the surface fabric of the new buildings. These include integrated designs for swift, house sparrow, swallows, starling, etc. Suitable locations for these will be agreed by the project ecologist with the architect and set out for the contractor on detailed drawings.

5.6.8 Watercourse Restoration

It is proposed to naturalise the Hazelbrook Stream along the southern boundary of the site and to enhance it for wildlife through suitable planting.

A buffer of 10-15m has been retained along this watercourse in line with the Fingal County Development Plan 2017 – 2023, p.330), which states:

“Establish riparian corridors free from new development along all significant watercourses in the County. Ensure a 10 to 15 metre wide riparian buffer strip measured from top of bank either side of all watercourses, except in respect of the Liffey, Tolka, Pinkeen, Mayne, Sluice, Ward, Broadmeadow, Corduff, Matt and Delvin where a 30m wide riparian buffer strip from top of bank to either side of all watercourses outside urban centres is required.”

Excellent guidance on watercourse rehabilitation is provided in the Inland Fisheries Ireland document ‘Planning For Watercourses In The Urban Environment A Guide to the protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning *Including one-off developments’.

Suitable species for planting along this watercourse have been specified by the project ecologist to the landscape designer.

Care should be taken when purchasing aquatic plants from nurseries as many species have the potential to become invasive. Attention is drawn to the invasive species listed under the Birds and Natural Habitats Regulations 2011.

5.6.9 Sediment Control

Sediment control practices are used on building sites to prevent sand, soil, cement and other building materials from reaching watercourses such as the Hazelbrook Stream and water dependent habitats such as the reedbeds and saltmarshes downstream. Even a small amount of pollution from a site can cause significant environmental damage by killing aquatic life, silting up streams and blocking storm water pipes. Storm water can contain many pollutants which can enter our local drainage ditches, streams, rivers and marine systems, causing harm to native animals, plants, fish breeding habitats and recreational areas.

Soil erosion, sediment and litter from building sites can be major sources of storm water pollution, and can cause:

- significant harm to the environment e.g. loss of valuable foraging areas in adjoining mudflats for wintering birds
- weed infestation of waterways caused by sediment settling on the creek beds and transporting nutrients
- loss of valuable topsoil
- significant public safety problems when washed onto roads and intersections
- blocked drains creating flooding and increased maintenance costs
- damage to recreational and commercial fishing.

Sediment control usually requires little effort and results in:

- Cleaner waterways and healthier aquatic life.
- Improved site conditions.
- Improved wet weather working conditions.
- Reduced wet weather construction delays.
- Reduced losses from material stockpiles.
- Fewer mud and dust problems.

Good site management in relation to sediment control during the construction phase should prevent this from occurring and possible mitigation measures for consideration are outlined below. Other measures to be implemented on site include briefing of all site contractors regarding the sensitivity of the adjoining watercourse and the need for strict site management in relation to potential run off.

Minimising site disturbance:

Prevention is better than cure. Careful design and an efficient construction sequence will minimise disturbance to the site. This will save money and reduce environmental impact.

Design to avoid excessive cut and fill, unnecessary clearing of vegetation and to preserve existing site drainage patterns. Clear only those areas necessary for building work to occur. Preserve grassed areas and vegetation where possible. This helps filter sediment from storm water run off before it reaches the watercourse and stops rain turning exposed soil into mud. Delay removing vegetation or commencing earthworks until just before building activities start. Avoid building activities that involve soil disturbance during periods of expected heavy or lengthy rainfall.

Implement sediment control:

Install sediment control measures before commencing any excavation or earth moving. Regularly maintain them until construction is complete and the site is stabilised.

Prevent sediment-contaminated water leaving the site

Use barriers to trap coarse sediment at all points where storm water leaves the site, before it can wash into the watercourse and down to the Natura 2000 site downstream. Relocate sediment on site or dispose of it suitably. Remove accidental spills of soil or other material immediately. Maintain vegetation on the site in the vicinity of watercourses as in a healthy state as it can function as an additional filter for sediment. Cut brick, tile or masonry on a pervious surface such as grass or loosened soil within the property boundary. The same applies when cleaning equipment. Waste concrete, paint and other solutions used on site should be properly disposed of so they do not contaminate storm water.

5.6.10 Protection Measures for Fisheries

Various measures will be required to ensure that there is no deterioration in water quality in the Hazelbrook Stream along the southern boundary of the site arising from the development.

These relate mainly to the control of silt and sediment runoff during construction and the installation of hydrocarbon/petrol interceptors on surface water drainage systems leaving the development.

For any instream works the guidelines presented in the Eastern Regional Fisheries Board 'Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites' should be reviewed and followed where applicable and the contractor informed of the sensitivity of the catchment. This and other guidance is available from:

http://www.fisheriesireland.ie/fisheries-management-1/86-planning-for-watercourses-in-the-urban-environment-1/file

http://www.fisheriesireland.ie/fisheries-management-1/90-requirements-for-the-protection-of-fisheries-habitat-during-construction-and-development-works-at-ri-1/file

5.6.11 Contractor Briefing

All site contractors should be briefed regarding the biodiversity value of the retained watercourse, trees and vegetation to ensure that there are no accidental or unintentional actions conducted during the project construction that could lead to a reduction in water quality/damage to same.

Such matters often arise through ignorance or by accident rather than as a result of an intentional action.

5.6.12 Soil Handling

Soil should be handled with care as it is a living entity. The topsoil and subsoil layers will be stripped, stored and maintained separately. Topsoil will be temporarily stored upon geotextile such as Terram 1000 (www.terram.com). The contractor should submit proposals for supplier and product, which should be a nonwoven geotextile manufactured from UV stabilised, high tenacity, virgin polypropylene fibres that have been both mechanically and thermally bonded with a minimum of 5 years lifespan in all soil conditions. Note that soil levels within the root spread of those trees that are to be retained should not be raised. From this temporary storage heap the topsoil should be distributed as required for landscaping purposes. In general the topsoil should not be firmed, consolidated or compacted when laying. Tipping and grading to approximate levels should be done in one operation with minimum of trafficking by plant.

The topsoil, which is to be retained and reused should not be mixed with: subsoil, stone, hardcore, rubbish or material from demolition work, or the other grades of topsoil, including those contaminated with non-native invasive species. The topsoil should be handled in the driest condition possible. Topsoil should not be handled during or after heavy rainfall or when it is wetter than the plastic limit less 3%, to BS 1377-2.

Depending on how long the construction period is expected to last it might be necessary to seed the stored topsoil to prevent weed establishment. A recommended mixture is: 35% Chewings fescue, 35% Slender red fescue, 20% Smooth stalked meadow grass and 10% Brown top bent. This should be applied to the manufacturer's recommendations (min. 15g/m2) and the following wildflower mix @ 5g/m2 added:

- Native Origin Irish Wildflower Seed Mixture - Product Code/Name: MM12 Wild Flora for Raw Impoverished Sub Soil
- Supplier: Design by Nature www.wildflowers.ie
- Species List: Bird's-foot Trefoil, Black Medick, Corn Marigold, Corn Pansy, Corn Poppy, Corncockle, Cornflower, Cowslip, Devil's Bit Scabious, Eyebright, Meadow Buttercup, Fleabane, Greater Trefoil, Lesser Knapweed, Scented Mayweed, Meadowsweet, Ox-eye Daisy, Purple Loosestrife, Ragged Robin, Red Rattle, Red Bartsia, Red Clover, Ribwort Plantain, Rough Hawksbit, Sorrel, St. John's-wort, White Campion, Wild Angelica, Wild Carrot, Yarrow, Yellow Rattle, Lady's Smock, Yellow Clover.

5.6.13 SUDS Measures

The drainage system has been designed with the aim of providing a sustainable drainage solution ensuring, in so far as feasible, that the development has a minimal impact on the existing public surface water sewer system. The proposed development has been designed to incorporate best drainage practice.

It is proposed to incorporate a Storm Water Management Plan through the use of various SuDS techniques to treat and minimise surface water runoff from the site. This has been designed by Waterman Moylan Consulting engineers (see the Engineering Assessment Report).

It is proposed to construct a SW drainage network that will service and attenuate the development internally before discharging at the current greenfield (or allowable) rates to the local natural ditch systems. Surface drainage layout and attenuation strategy can be reviewed on drawing numbers 18-091-P201, P202 & P203. The location and extent of SuDS devices proposed for the development can be viewed on drawing 18-091-P233.

Storm water from each catchment will be attenuated and discharge at a controlled rate, limited to the greenfield equivalent runoff or 2 l/s (whichever is greater), to ultimately outfall to the existing ditch system on the site, south catchment 2 however, will outfall directly to the Hazelbrook Stream. The proposed development will be designed to incorporate best drainage practice.

Potential negative impacts could arise should untreated surface water enter the Hazelbrook Stream from the proposed development. These impacts have been addressed through careful consideration of the ground conditions within the site and the installation of silt traps and hydro-carbon traps as outlined in the Engineering Assessment Report and accompanying drawings prepared by Waterman Moylan Consulting Engineers, which will ensure that all surface water leaving the site is treated before it ultimately enters the Baldoyle Bay SAC/SPA.

5.6.14 Ecological Clerk of Works

An ecological clerk of works will be appointed to oversee the project and sign off on the above mitigation measures.

5.7 'DO NOTHING' SCENARIO

Under a 'do-nothing' scenario the northern lands would continue to be unmanaged and ungrazed rank grassland would continue to develop and over time would become dominated by brambles. This would develop into and be replaced by scrub and ultimately woodland over time. The southern lands would continue to be used for agricultural purposes for the production of crops or other foodstuffs. Given the agricultural quality of the northern lands, there is also a risk that the northern lands would also be used for agricultural purposes under the Do Nothing Scenario.

5.8 WORST CASE SCENARIO

Under a worst-case scenario none of the mitigation measures recommended will be implemented during the construction phase when the main damage and losses to local biodiversity can occur.

It is for this reason that an ecological clerk of works is to be appointed to brief the contractor and oversee same.

5.9 PREDICTED IMPACT OF THE PROPOSED DEVELOPMENT

The overall impact on flora and fauna within this site is deemed moderate negative as they are undeveloped and offer ecological structure and diversity. This is through the permanent alteration of unmanaged, ungrazed and agricultural land to residential development on a site that is of local interest as it is not designated for any nature conservation purposes. That said, the site provides habitat for wildlife in what is becoming an increasingly urbanised area along Back Road. This will be permanently altered through their development for residential purposes.

This land is zoned for Residential Development and is identified as such within the Fingal County Council Development Plan. As such residential development will occur on this site and the environment on the site will change.

The proposed development retains and enhances some of the natural features of the site are retained where possible and includes positive planting proposals which will add some diversity to the site which will favour some species. Comprehensive additional mitigation is proposed as part of this chapter which should be implemented by a planning condition.

5.10 INTERACTIVE AND CUMULATIVE EFFECTS

Interactive effects

The key environmental interactions with Biodiversity are Water, Landscaping and Transport. In respect of Water, there is interaction between hydrology and accidental spills of fuels/hydrocarbons and washing down into the drainage pipe network has the potential to impact on the receiving hydrogeology and ecology. A series of mitigation measures are proposed in the Water Chapter of this EIAR document to ensure the quality (pollution and sedimentation) and quantity (surface run-off and flooding) is of an appropriate standard. In respect of the Landscape, some of the nature features of the site are retained where possible and includes some positive planting proposals which will add some diversity to the site and favour some species. Finally, interactions exist between Traffic and Transport in relation to mortality from direct impact, the effects of which cannot be completely removed but will be reduced through mitigation.

Cumulative effects

A number of the identified environmental impacts can also act cumulatively with other impacts from similar developments in this area of Fingal. These arise through the urbanisation of habitat for wildlife and the increasing urbanisation of the local hinterland, on land of varying ecological sensitivity, as provided for by land-use zoning and include loss of habitats and species, particularly hedgerows, habitats and disturbance of species.

This proposed development can be viewed alongside the permitted construction of a series of residential developments in Broomfield. This project represents the completion of the zoned lands in the Broomfield area so the ability to influence any future development beyond this application is limited. The development of the site is consistent with emerging baseline trends albeit with comprehensive ecological mitigation applied to the development which should be implemented.

5.11 CONCLUSION

The proposed construction of a residential development on the Broomfield lands at Back Road has been assessed from the perspective of ecology and detailed mitigation measures have been presented to reduce impacts on same in the vicinity of the proposed development and surrounding lands.

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6.0 LAND AND SOILS

6.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) has been prepared by Waterman Moylan Consulting Engineers and provides an assessment of the impact that the proposed residential development of lands, over 2 sites, at Broomfield, Malahide, Co. Dublin will have on the surrounding soil and geology within the vicinity of the site. It also sets out mitigation and remedial measures and methods of monitoring once the development is operational.

6.2 Research Methodology

A Desktop study to classify the geological features related to the site was undertaken. The Geological Survey of Ireland (GSI) was consulted, and the following maps reviewed:

- Bedrock Geology Map
- Bedrock Aquifer Map
- Groundwater Vulnerability Map

This information was further supplemented by geotechnical site investigations carried out by Site Investigations Ltd. in March 2021 for the north and south sites, and by Ground Investigations Ireland Ltd. in April 2020 for a portion of the northern site. These reports are included as Appendix 6.1 to this document.

6.3 Receiving Environment

6.3.1 Site Location and Topography

The subject lands are located at Broomfield, Malahide, Co. Dublin. The northern site is bound to the west by Ashwood Hall residential development, to the east by the Dublin-Belfast Rail line, the north by existing residential units fronting onto the Back Road, and to the south by agricultural land. The southern site is bound to the west by Hazelbrook residential development, to the north by Brookfield residential development, to the east by agricultural land and to the south by the Hazelbrook stream.

The northern site will primarily be accessed via the existing junction to Back Road serving the Ashwood Hall residential development. The southern site was to be accessed from its northern boundary via the Brookfield residential development. Fingal County Council have requested as part of their Opinion Report to An Bord Pleanála, and specifically within their Internal Consultee Report from their Transport Planning Section, that an additional access will need to be provided for the southern site via the Hazelbrook residential development. This request has been incorporated into the revised layout.

A topographic survey of the area indicated that the northern site generally slopes uniformly from north-east to south, from a height of 20.5m to 11.5m, with an existing dry ditch system along the south-east boundary, and ditch to the south-west. The southern site also slopes from north to south from a height of 6m to 4.7m, with localised high points.

The existing dry ditch on the southern boundary of the north site serves the subject site only due to topography, water flowing to this ditch is percolated locally and there is no connection to any watercourse. The drainage ditch to the south-west eventually connects to the Hazelbrook stream. The ditch to the north of the south site flows from east to west and connects to Hazelbrook Stream. Hazelbrook stream forms the southern boundary flowing from west to east. Hazelbrook stream is a tributary of the Sluice River with an ultimate outfall to Baldoyle Bay.

The location of the subject sites is as indicated in *Figure 6.1* below:

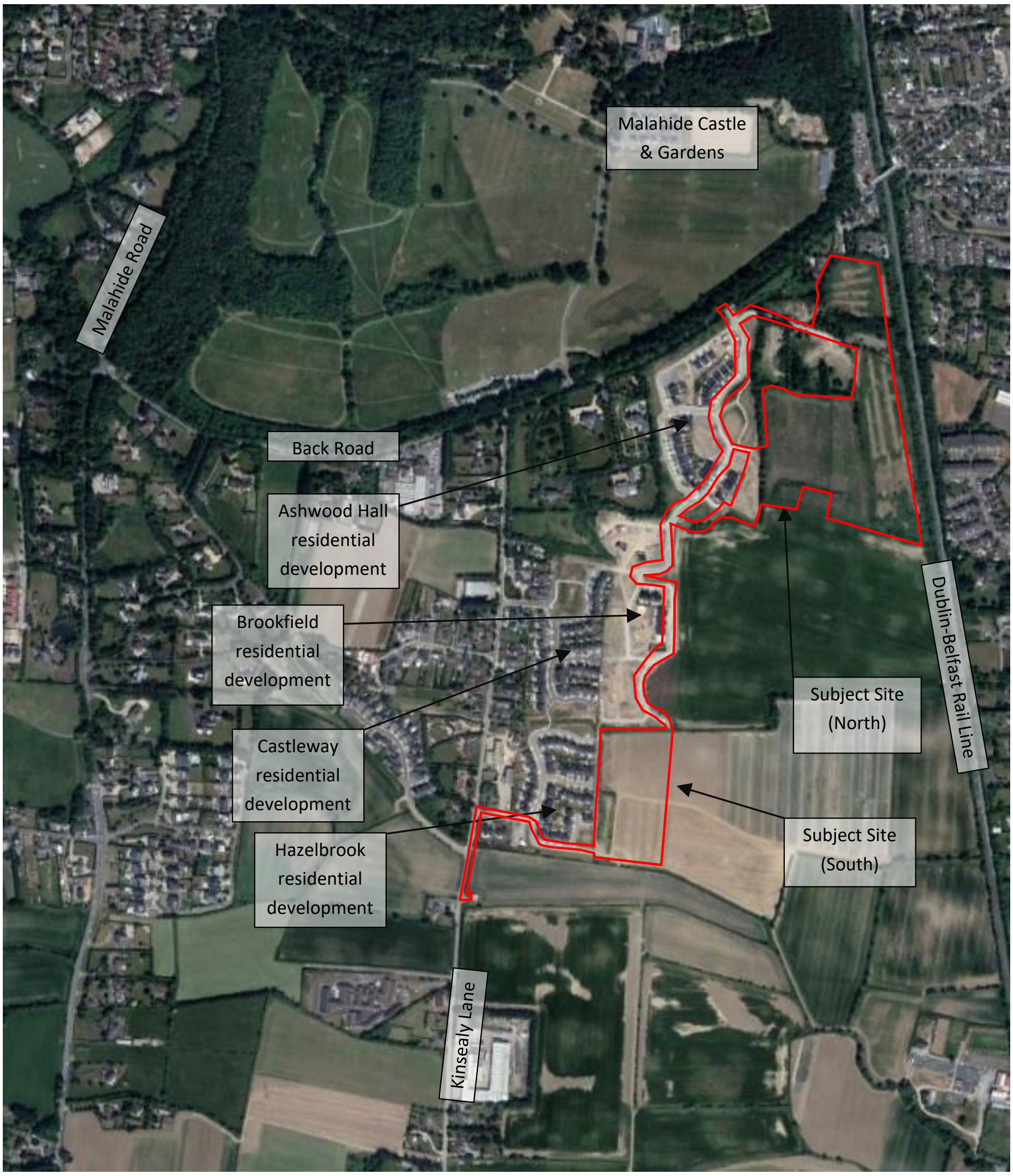

Figure 6.1 | Site Location (Source: Google Earth)

6.3.2 Desktop Study

Historic maps for the locality have been reviewed. The site is primarily greenfield in nature (agricultural); however, a section of the northern site was formerly home to a Rugby Club and thus there are on-site structures in the form of the former clubhouse and associated buildings. These structures have been heavily vandalised, including serious fire damage, and their demolition is included as part of the subject application.

Geological Survey Ireland (GSI) produces a wide range of datasets, including bedrock geology mapping, extracted below in *Figure 6.2.*

The map indicates that the sites lie withing the Tober Colleen Formation.

The Tober Colleen Formation is described as a calcareous shale and limestone conglomerate. The formation is comprised of dark-grey, calcareous, commonly bioturbated mudstones and subordinate thin micritic limestones, with a thickness of 50m to 250m.

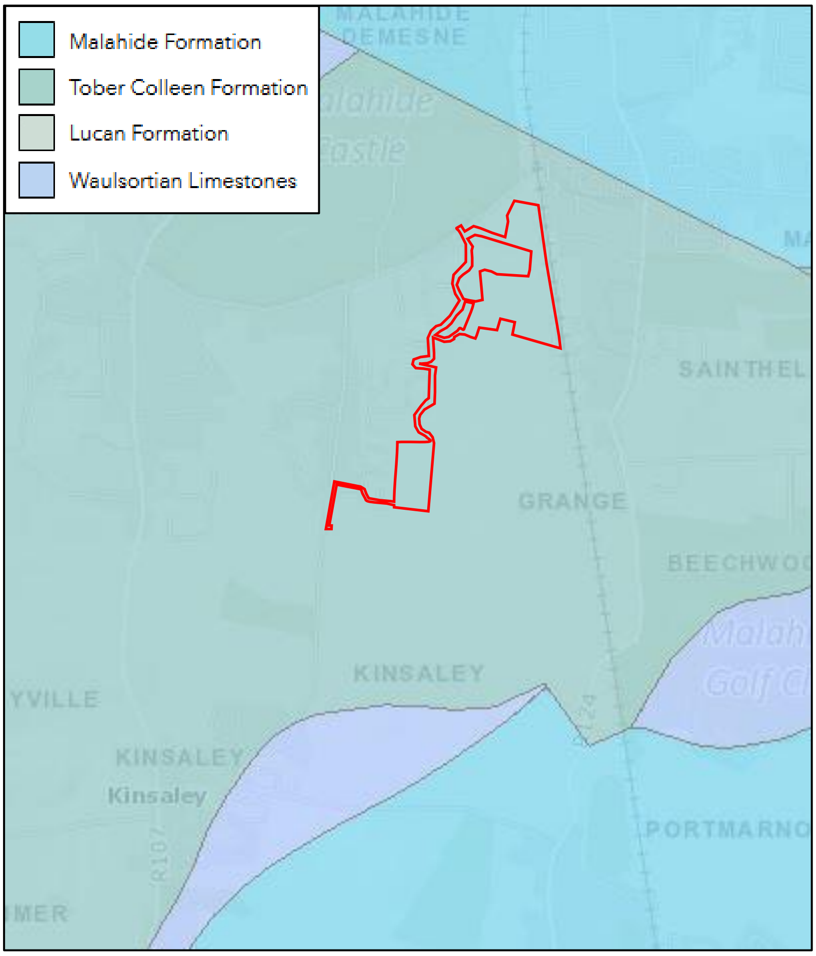

Figure 6.2 | Extract from GSI Bedrock Geology Map

The national Aquifer Bedrock Map prepared by the Geological Survey of Ireland was consulted and is extracted in *Figure 6.3*, overleaf.

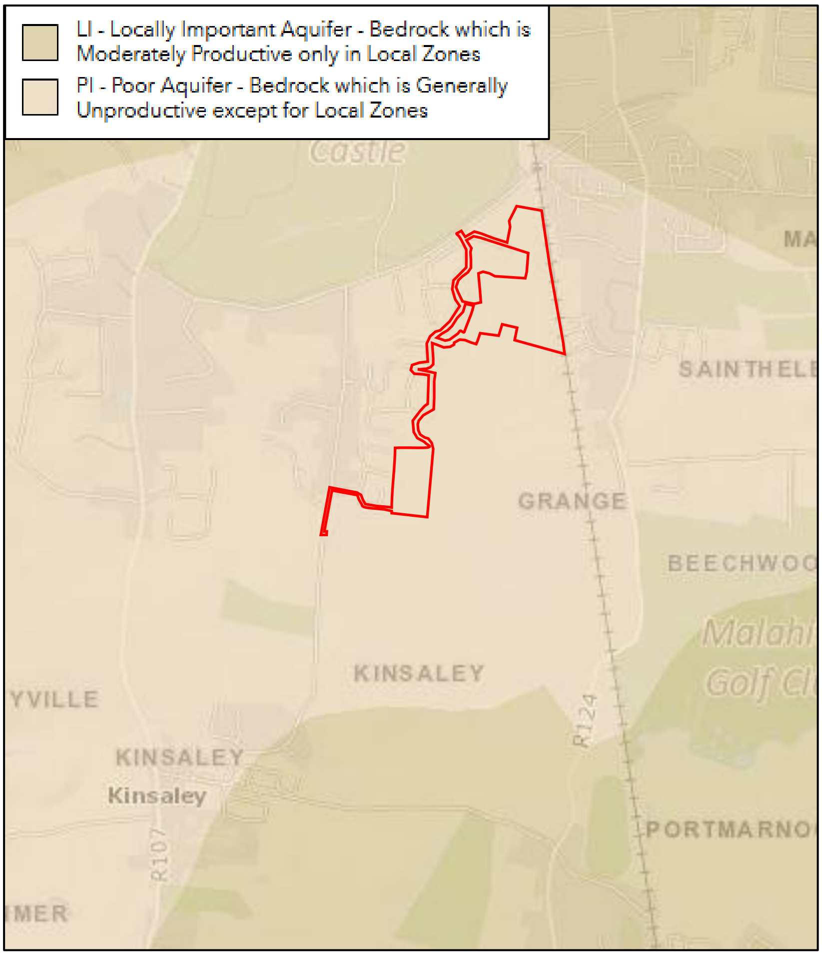

Figure 6.3 | Extract from GSI Bedrock Aquifer Map

From the above map extracts the sites lie in the Tober Colleen Formation which has a designation of PI, which represents Poor Aquifer qualities, where the bedrock is generally unproductive except for local zones.

The groundwater vulnerability in the vicinity of the proposed sites was also examined by referencing the Geological Survey of Ireland. From the GSI groundwater vulnerability map, extracted overleaf, the site lies within an area of high to extreme groundwater vulnerability.

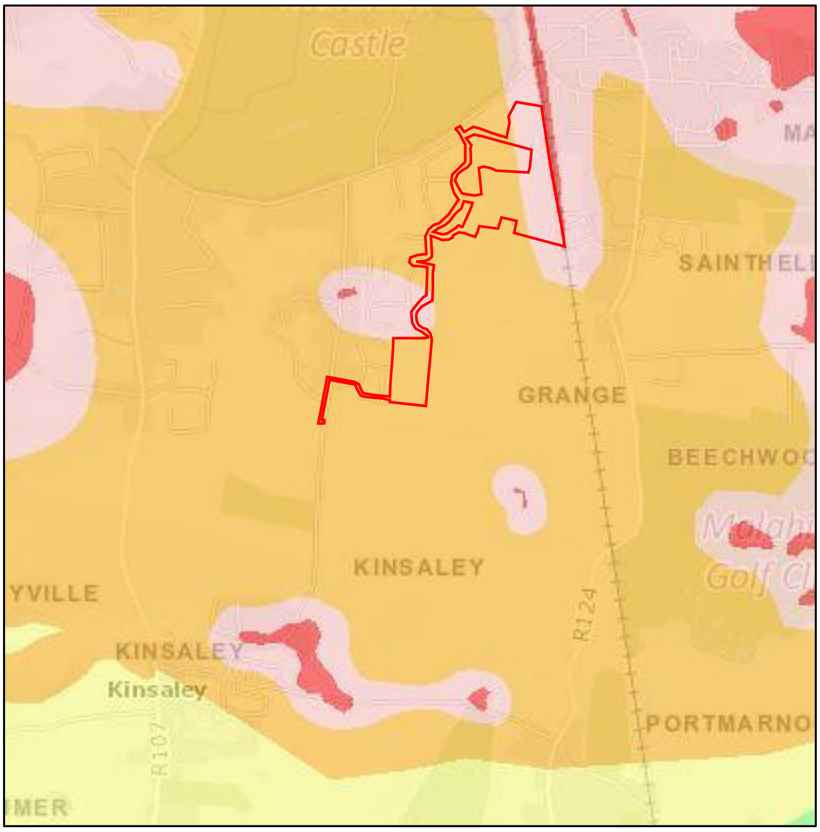

Figure 6.4 | Extract from GSI Groundwater Vulnerability Map

6.3.3 Site Investigations

Site investigations for the north and south site were carried out by Site Investigations Ltd. in March 2021. The fieldworks comprised a programme of 12 no. trial pits with dynamic probes and soakaway tests. The locations are indicated on the figure overleaf.

Trial pits were excavated using a tracked excavator, and representative disturbed bulk samples were returned to the laboratory for geotechnical testing. Geotechnical laboratory testing was completed in accordance with BS 1377 (1990). The suite of testing included moisture contents, Atterberg limits, and particle size gradings tests.

Soakaway tests were also undertaken on 50% of the trial pits. The pit was filled with water and the level of groundwater recorded over time. As stipulated by BRE Special Digest 365, the pit should be filled 3 times and that the final cycle is used to provide the infiltration ratio. The time taken for the water level to fall from 75% volume to 25% volume is required to calculate the rate of infiltration. However, if the water level does not fall at a steady rate, then the test is deemed to have failed, and the area is unsuitable for stormwater percolation.

Figure 6.5 | Trial Pit (TP) & Soakaway (SA) Locations for the North & South Site Reports

The results of the site investigations are summarised as follows:

North Site

The natural ground conditions are consistent across the site with cohesive firm brown slightly gravelly silty clay with medium cobble overlying stiff black slightly sandy slightly gravelly silty clay with medium cobble and low bounder content.

Groundwater was not encountered during the excavations.

Soakaway tests 01 & 03 were considered failed. The unsuitability of the soils for soakaways is further suggested by the soil description of the material in this area of the site i.e., clay.

South Site

The natural ground conditions are consistent across the site with cohesive firm brown slightly sandy slightly gravelly silty clay with medium cobble overlying stiff brown to grey or black slightly sandy slightly gravelly silty clay with medium cobble and low boulder content.

Groundwater was encountered in TP 01 & 03 during the excavations.

SA 02 recorded no infiltration and owing to groundwater ingress at TP01 & 03 all soakaway tests are considered failed. The unsuitability of the soils for soakaways is further suggested by the soil description of the material in this area of the site i.e., clay.

6.3.4 Detailed Site Investigation Report

A more detailed localised Site Investigation Report was undertaken by Ground Investigations Ireland (GII) in April 2020 for a specific area of the northern site, located in the south-east corner, which was known to be an area of historic in-fill. This report identified the area and depth of infill and conducted extensive chemical analysis to ascertain the requirements for its safe excavation and disposal prior to construction.

This area specific Site Investigation comprised 14 no. trial pits, 3 no. slit trenches, collection of surface water and waste/subsoil samples for chemical analysis, Environmental laboratory testing, waste classification and assessment of subsoil quality against Human Health Generic Assessment Criteria (GAC).

The trial pits and slit trenches were both excavated using a 12T tracked excavator. Trial pits (TP) 01-09 were excavated in the area known to be the historic infill area. The slit trenches were undertaken at select locations to confirm the northern lateral extent of the in-fill area. Trial pits 10-14 were utilised to assess the typical undisturbed (by historic in-fill) ground conditions of the subject area.

The image in *Figure 6.6* overleaf, is extracted directly from the GII report and shows the location of the trial pits (TP), and slit trenches (ST), as well as indicating the area of the historic landfill with a purple hatch. Also noted with the yellow hatch is an area with Japanese Knotweed which when identified was immediately fenced off to prevent further accidental spread by inadvertent local excavations.

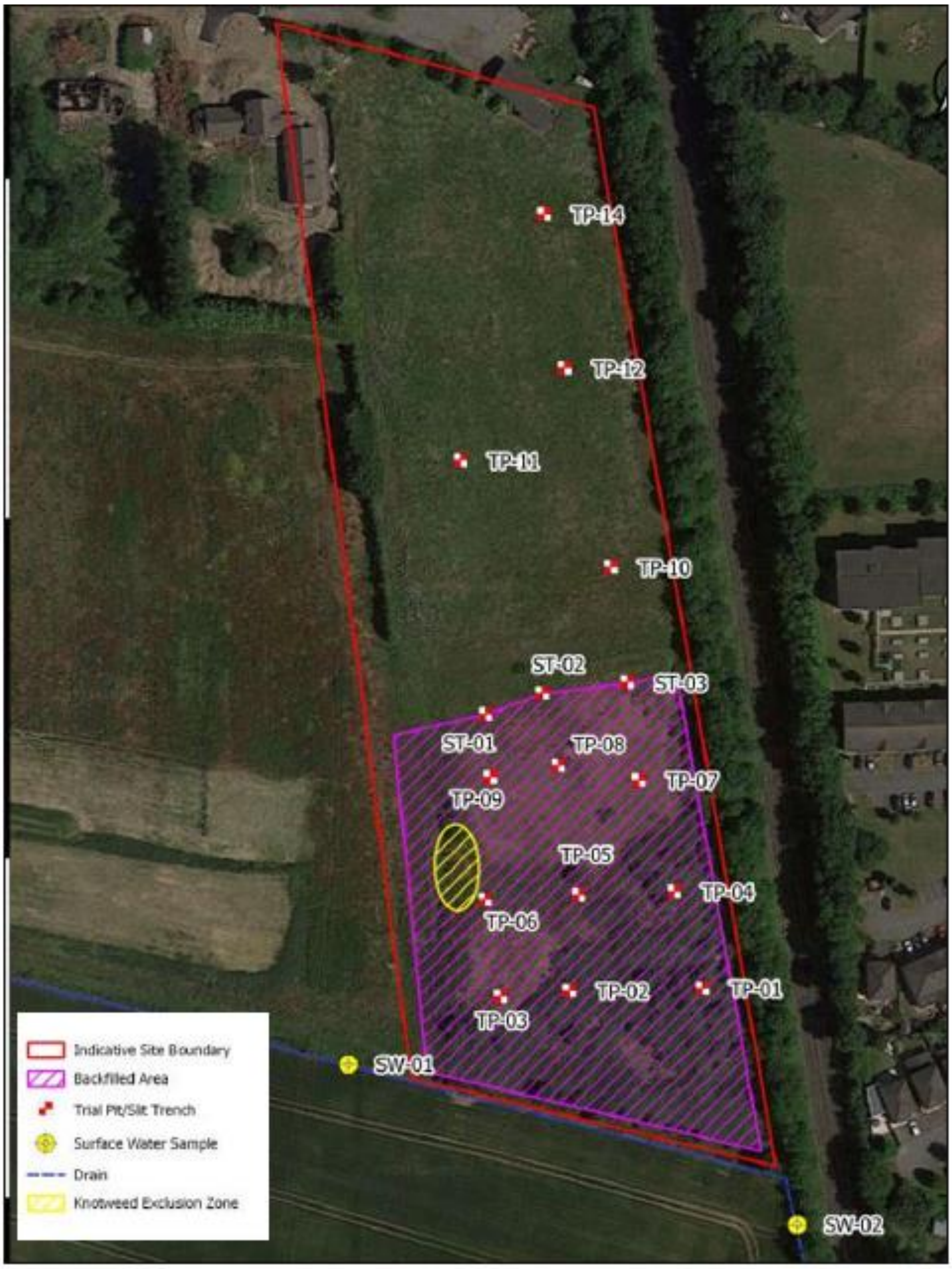

Figure 6.6 | Extract of Mapped Location from the GII Report

The results of the Detailed Site Investigation Report are as follows:

<u>Topsoil</u>
Topsoil was encountered at all the Trial Pits outside the backfilled area and at 4 locations within. Topsoil was present to a maximum depth of 0.3m BGL (Below Ground Level).

<u>Made Ground</u>
Made ground deposits were encountered beneath the topsoil or from the surface in the backfilled area of the site. The made ground was comprised of brown silty sandy clayey fine to coarse subangular to subround gravel with occasional subangular to subrounded cobbles and boulders and occasional fragments of plastic, timber, red and yellow brick, slate, foam, metal, cloth, Wavin pipe and concrete. There was no evidence of potentially hazardous waste such as hydrocarbon-based material, asbestos containing waste, clinical waste, or household waste

Cohesive deposits

Cohesive deposits were encountered beneath the made ground or topsoil and were described typically as brown silty slightly very gravelly clay with occasional subangular to subrounded cobbles and boulders. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till mix.

Surface water assessment

There was no evidence of contamination noted during the collection of the surface water sample. i.e., hydrocarbon, odour, or iridescence etc. at the 2 locations as shown in *Figure 6.6.*

Laboratory analysis was completed by Element Material Technology based in the UK and is a UKAS accredited lab. Analytical methodologies are all to ISO/CEN approved standard or equivalents. Samples were tested for dissolved arsenic, boron, cadmium, copper, chromium, cyanide, lead, mercury, nickel, manganese and zinc, aliphatic and aromatic petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAH), methyl tert-butyl ether (MTBE), benzene toluene ethylbenzene and toluene (BTEX), total phenols, pH, electrical conductivity, nitrate, nitrite, chloride, sulphate, ammonia, BOD, COD, total suspended solids, and potassium. The parameter range was based on the site history and the need to establish a comprehensive environmental baseline for the surface water quality for the site.

The results of the lab analysis do not show any significant impact from the waste body on the surface water however the following points are noted:

- The levels of Ammonia detected in both surface water samples is above the EQS (Environmental Quality Standards).
- The level of Chromium increased between SW-01 and SW-02. The downstream level exceeded the AA-EQS (Annual Average – EQS) but was within the MAC-EQS (Maximum Acceptable Concentration – EQS).
- PAHs, petroleum hydrocarbons and the BTEX compounds were not detected in the surface water samples.

Made ground assessment

In order to assess materials, to be excavated and removed from site, in terms of waste classification, a selection of samples collected were analysed for a suite of parameters which allows for the assessment of the soils in terms of total pollutant content for classification of materials as hazardous or non-hazardous (RILTA suite). The suite also allows for assessment of solids for placement at various categories of landfill. The RILTA suite also includes those parameters as specified in the EU Council Decision establishing criteria for the acceptance of waste at landfills (Council Decision 2003/33/EC), for which the soil samples are tested for pH, Total Organic Carbon (TOC), speciated aliphatic and aromatic petroleum hydrocarbons, BTEX, Phenol, polychlorinated biphenyl (PCB) and PAH.

Asbestos fibres were detected in the samples of waste material encountered in TP-01, 02, 03 & 06. The asbestos type encountered in all instances was chrysotile, the levels detected were below the laboratory detection limit of <0.001%. The laboratory did not identify asbestos containing material (ACMs) in the sample. The level detected in all cases was below the hazardous level of 0.1% (as specified by Environment Agency (2018) Technical Guidance WM3).

As part of their assessment GII utilised HazWasteOnline™, a web-based commercial waste classification tool which assists the classification of potentially hazardous materials. This tool was used to determine whether the materials sampled are classified as hazardous or non-hazardous. The use of the online tool is accepted by the EPA (EPA 2014). In total, 15 no. samples were assessed using the HazWasteOnline™ tool. All samples were classified as being non-hazardous.

It should be noted that the environmental regulator (in this case the EPA) and the waste acceptor (in this case the landfill operator) shall decide whether a waste is hazardous or non-hazardous and suitable for disposal at their facility.

Landfill Waste Acceptance Criteria (WAC)
WAC have been agreed by the EU (Council Decision 2003/33/EC) and are only applicable to material if it is to be disposed of as a waste to a landfill facility. Each individual member state and landfill operator may apply more stringent WAC. The data obtained from laboratory testing has been compared to the WAC limits set out in the Council Decision as well as the specific WAC which the EPA had applied to Integrated Materials Solutions (IMS) landfill in north Co. Dublin. The IMS landfill has higher limits for a range of parameters while still operating under an inert landfill licence.

The waste category sections are divided in 4, lettered A-D, with numbered subcategories, A being suitable for disposal at an unlined soil recovery facility, B an inert landfill, C a non-hazardous landfill, and D a hazardous waste treatment facility.

The samples obtained from Trial Pits 01, 09, 10 & 13 fall into category A, Trial Pits 04, 05, 07, & 08 to Category B1 & Trial Pits 01, 02, 03, and 06 to Category C1. Note that some trial pits may fall into 2 categories depending on the level of the material being excavated and whether it is composed of in-fill material or the natural soil underneath.

Category A waste is briefly described as: Soil and stone only which are free from anthropogenic materials such as concrete, brick, timber etc. Soil must be free from contamination e.g., PAHs & hydrocarbons.

Category B1 waste: Reported concentrations within inert waste limits, which are set out by the adopted EU Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/ EC (2002). Results also found to be non-hazardous using the HWOL application.

Category C waste: Reported concentrations greater than Category B2 criteria but within non-hazardous landfill waste acceptance limits set out by the adopted EU Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1993/31/EC (2002). Note: Category C1 is as above but with asbestos fibres <0.001%.

It is estimated that the collective volume of historic in-fill material to be excavated and disposed of is 17,280m³, based on an area of 11,520m² and average depth of 1.5m.

6.4 Characteristics of the Proposed Development

The proposed development consists of a total of 415 residential units, comprising 252 houses, 28 duplex units, and 135 apartments. The proposed development will also include the construction of a creche. The development includes all associated site works, boundary treatments, drainage, and service connections. The development will utilise the existing entrance from the Back Road that serves the Ashwood Hall development. Although not originally proposed, an additional access, to the south site from Kinsealy Lane via the Hazelbrook residential development is now included, as requested by Fingal County Council.

The proposed development, with respect to soils and geology, includes the following characteristics:

- Preparation of in-fill area for excavation (Japanese knotweed removal)
- Excavation and disposal of historic infill area to a suitably licenced landfill
- Stripping of topsoil
- Excavation for roads and building foundations
- Excavation for drainage sewers and utilities
- Minor regrading and landscaping
- Disposal of any surplus excavated soils including any contaminated materials

The proposed roads layout can be seen on drawing numbers 18-091-P100 to PP103, P130, & P131.

The proposed surface and foul drainage layouts can be seen on drawing numbers 18-091-P200 to P206, and the watermain layout on drawings P300 to P306.

6.5 Potential Impacts

6.5.1 Construction Phase

The area of historic in-fill will need to be prepared for excavation. This will entail the removal of the Japanese Knotweed. The Japanese Knotweed if not treated and removed correctly may spread to other parts of the site or adjacent sites.

The removal of topsoil during earthworks and the construction of roads, services, and buildings, in particular roads and building foundations, will expose subsoil to weathering and may result in the erosion of soils during adverse weather conditions.

Construction traffic movements involved in the construction of the proposed development and access roads, may result in local compaction of the subsoil along haulage routes, but this will be a very limited area,

Surface water runoff from the surface of the excavated areas may result in silt discharges to the local ditch systems and the Hazelbrook Stream, which is a tributary of the Sluice River. Excavations for foundations, roadworks, and services will result in a surplus of subsoil. Surplus subsoil will be used in areas requiring fill where appropriate,

Dust from the site and from soil spillages on the existing road network around the site may be problematic, especially during dry conditions.

Accidental oil or diesel spillages from the construction plant and equipment, in particular at refuelling areas, may result in oil contamination of the soils and underlying geological structures.

6.5.2 Operational Phase

During the operational phase of the development, it is not envisaged that there will be any ongoing impacts on the underlying soil as a result of the proposed development. Any hydro-geological impacts are temporary and associated with the construction of the proposed development.

6.5.3 Potential Cumulative Impacts

On completion of the construction phase and following replacement of topsoil and a planting programme, no further impacts on the soil environment are envisaged except for the possibility of contamination of soil from foul water effluent or oil/chemical spills

6.6 Remedial/Reductive or Mitigative Measures

6.6.1 Construction Phase

A competent person/company will be assigned to pre-treat (kill-off) the Japanese Knotweed prior to excavation. It is generally recommended that a 3m depth of soil and an area encompassing a 7m offset distance are treated and excavated for disposal for this invasive species. The competent professional should also be present during excavation to ensure there are no living rhizomes (root structures) present when being excavated. The dead Japanese knotweed plant, root system and surrounding soil will need to be disposed of, by prior arrangement, to an authorised deep-fill landfill. These works are to be undertaken in accordance with the "Environmental Agency guidelines on Japanese Knotweed", Landfill operator permitting, and industry best practices & guidelines as appropriate.

Environmental Laboratory chemical analysis has indicated that the historic in-fill constituents are non-hazardous. Excavated material from this location should be continuously monitored/inspected for signs of hazardous material contamination during excavation. Should there be any indication of hazardous material contamination, it may be required to be further sampled and analysed to confirm its chemical properties and waste category classification.

To reduce the quantity of soil to be removed from or imported to the site, the finished floor levels of the proposed buildings and the road levels are designed to match existing levels and minimise the cut and fill volumetric balance. The number of vehicle movements will be minimised by this optimisation. For the area of historic in-fill, levels here have been designed based on the calculated ground levels post excavation and disposal of the historic in-fill material. Surplus subsoil and rock may be relocated to approved areas of the site that may require in-fill, or if required to be removed from site, will be deposited in approved fill areas off-site (Article 27 notification to the EPA required) or to an approved waste disposal facility.

In the case of topsoil careful planning and on-site storage can ensure that this resource is reused on-site as much as possible. Any surplus soil not used can be transferred elsewhere subject to submission of an Article 27 notification to the EPA. However, topsoil is quite sensitive and can be rendered useless if not stored and cared for properly. It is therefore important that topsoil is kept completely separate from all other construction waste and stored material and heaped (stored) appropriately.

It is important to ensure that topsoil is protected from all kinds of vehicle damage and kept away from site-tracks, delivery vehicle turning areas and site plant and vehicle storage areas. If topsoil is stored in piles of greater than 2m in height the soil matrix (internal structure) can be damaged beyond repair. It should also be kept as dry as possible and used as soon as possible to reduce any deterioration through lengthy storage and excess movements around the site.

Records of topsoil storage, movements and transfers will be kept by the C&D Waste Manager.

Silt traps, silt fences and tailing ponds will also need to be provided by the contractor where necessary to prevent silts and soils being washed away by heavy rains during the course of the construction phase.

The provision of wheel wash areas at the exit to the development as necessary will minimise the amount of soil deposited on the surrounding road network. The adjoining road network will be cleaned on a regular basis. All trucks on the public road will carry a maximum of 10 cubic metres of material to prevent spillage and damage to the surrounding road network.

Dampening down measures with water sprays will be implemented during periods of dry weather to reduce dust levels arising from the development works.

Appropriate storage and bunding measures will be implemented throughout the construction stage to prevent contamination of the soil and groundwater from oil and petrol leakage from site plant. Refuelling will be restricted to allocated re-fuelling areas. This is to be an impermeable bunded area, designed to contain 110% of the volume of fuel stored. Emergency fuel spill kits are to be stored on-site with designated staff familiar with their usage.

If groundwater is encountered during excavations, mechanical pumps will be required to remove that groundwater from sumps. Sumps should be carefully located and constructed to ensure that groundwater is efficiently removed from excavations and trenches.

Waterman Moylan's accompanying Preliminary Construction Demolition and Waste Management Plan and Preliminary Construction Management Plan will be implemented by the contractor during the construction phase to mitigate and control the above remedial measures.

6.6.2 Operational Phase

On completion of the construction phase and following replacement of topsoil, a planting programme will commence to prevent soil erosion.

SuDS and filtration devices are proposed to be provided as part of the development. These will help to remove pollutants from rainwater runoff. They will require periodic inspection and maintenance as per their installation manuals.

6.7 Predicted Impacts of the Proposal

6.7.1 Construction Phase

With the protective measures noted above in place during the excavation works, any potential impacts on soils and geology in the area will not have significant adverse impacts, and no significant adverse impacts on the soils and geology of the subject lands are envisaged.

6.7.2 Operational Phase

On completion of the construction phase and following replacement of topsoil and implementation of a planting programme, no further impacts on the soil are envisaged.

SuDS measures, including permeable paving and infiltration drains, will assist with cleaning surface water runoff while replenishing the natural ground water table.

6.8 Monitoring

Monitoring during the construction phase is recommended, in particular to the following items:

- Excavation of area of Japanese Knotweed.
- Excavation of the historic in-fill material.
- Adequate protection of topsoil stockpiled for reuse.
- Adequate protection from contamination of soils for removal.
- Monitoring of surface water discharging to existing watercourses, ditches, and the existing surface water drainage system.
- Monitoring cleanliness of the adjoining road network.
- Monitoring measures for prevention of oil and petrol spillages.
- Dust control by dampening down measures, when required due to dry weather conditions.

During the operation phase, the surface water network (drains, gullies, manholes. AJs, SuDS Devices, attenuation systems etc.) will need to be regularly maintained and where required cleaned out. A suitable maintenance regime of inspecting and cleaning should be incorporated into the safety file/maintenance manual for the development.

6.9 Do Nothing Scenario

The ground conditions will remain as they currently are.

6.10 Risks to Human Health

A potential risk to human health due to the associated works during construction is the direct contact, ingestion, or inhalation of receptors (i.e., construction workers) with any soils which may potentially contain low level hydrocarbon concentrations from site activities (potential minor leaks, oils, and paint).

No human health risks associated with long term exposure to contaminants (via direct contact, ingestion, or inhalation) resulting from the proposed development are anticipated.

6.11 Reinstatement

Reinstatement measures in relation to soils consist primarily of the re-soiling of open areas / landscaping and the replanting of these areas. No post development reinstatement works will be required.

6.12 Interactions

No significant interactions are anticipated.

6.13 Difficulties Encountered

There were no difficulties encountered.

6.14 References

- Geological Survey of Ireland, Bedrock Maps
- Google Maps
- Site Investigation Reports
- Ordinance Survey of Ireland Historical Maps

7.0 WATER

7.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) has been prepared by Waterman Moylan and provides an assessment of the impact that the proposed residential development of lands, over 2 sites, at Broomfield, Malahide, Co. Dublin, will have on the surrounding hydrological (surface water), hydrogeological (ground water), foul water, water supply and flood risk both during the construction and operation phases. The interaction between the surface water drainage proposal as part of the development will also be assessed in this chapter.

7.2 Study Methodology

The methodology followed for this section is in accordance with the EPA's "Environmental Impact Assessments Reports, Draft Guidelines 2017".

The following information sources were used in the assessment of the local hydrology and hydrogeological aspects of the proposed development site.

- Geological Survey of Ireland (GSI) Website
- Environmental Protection Agency
- Office of Public Works (OPW) National Flood Hazard Mapping
- OPW Catchment Flood Risk and Management Studies
- Fingal County Council Drainage Records Maps
- Ordinance Survey Mapping
- Topographical Survey
- Site Investigation Reports and Soakaway Testing

The following methodology has been adopted for this assessment:

- Review of relevant information including where available, Development Plans, existing drainage, watermain and flooding information, and other relevant studies as outlines above; and
- Consultations with Fingal County Council to agree the foul drainage strategy.
- Irish Water confirmation of feasibility letter.
- Irish Water Statement of Design Acceptance.

7.3 Receiving Environment

7.3.1 Site Location and Topography

The subject lands are located at Broomfield, Malahide, Co. Dublin. The north site is bound to the west by Ashwood Hall Residential development, to the east by the Dublin-Belfast Rail line, the north by existing residential units fronting onto the Back Road, and to the south by agricultural land. The south site is bound to the west by Hazelbrook residential development, to the north by Brookfield residential development, to the east by agricultural land and to the south by Hazelbrook stream.

The northern site will primarily be accessed via the existing junction to Back Road serving the Ashwood Hall residential development. The southern site was to be accessed from its northern boundary via the Brookfield residential development. Fingal County Council have requested as part of their Opinion Report to ABP, and in specific their Internal Consultee Report from their Transport Planning Section, that an additional access will need to be provided for the southern site via the Hazelbrook residential development to connect to Kinsealy Lane. This request has been incorporated to the revised layout.

A topographic survey of the area indicated that the north site generally slopes uniformly from north-east to south, from a height of 20.5m to 11.5m, with an existing dry ditch system along the south-east boundary, and ditch to the south-west. The southern site also slopes from north to south from a height of 6m to 4.7m, with localised high points.

The existing dry ditch on the southern boundary of the north site serves the subject site only due to topography, water flowing to this ditch is percolated locally and there is no connection to any watercourse. The drainage ditch to the south-west eventually connects to the Hazelbrook stream. The ditch to the north of the south site flows from east to west and connects to Hazelbrook Stream. Hazelbrook stream forms the southern boundary flowing from west to east. Hazelbrook stream is a tributary of the Sluice River with an ultimate outfall to Baldoyle Bay.

The location of the subject sites is as indicated in Figure 7.1 below.

7.3.2 Desktop Study

Historic maps for the locality have been reviewed, with the subject site generally showing no sign of development and have been historically used for agriculture. A section of the north site has been used previously as a rugby club and comprises and area of hardstanding and structures. These structures have been heavily vandalised in the form of fire damage and their demolition comprises part of the subject application.

7.3.3 Hydrology (Surface Water)

The subject sites both generally slope from north to south. They are not served by any surface water drainage sewers, and instead drain, in their greenfield state, to local ditches which eventually flow to the Hazelbrook stream. An exception to this is the southern boundary of the north site which is a static (dry ditch), which due to topography serves the subject lands to the north only and percolates any surface water locally.

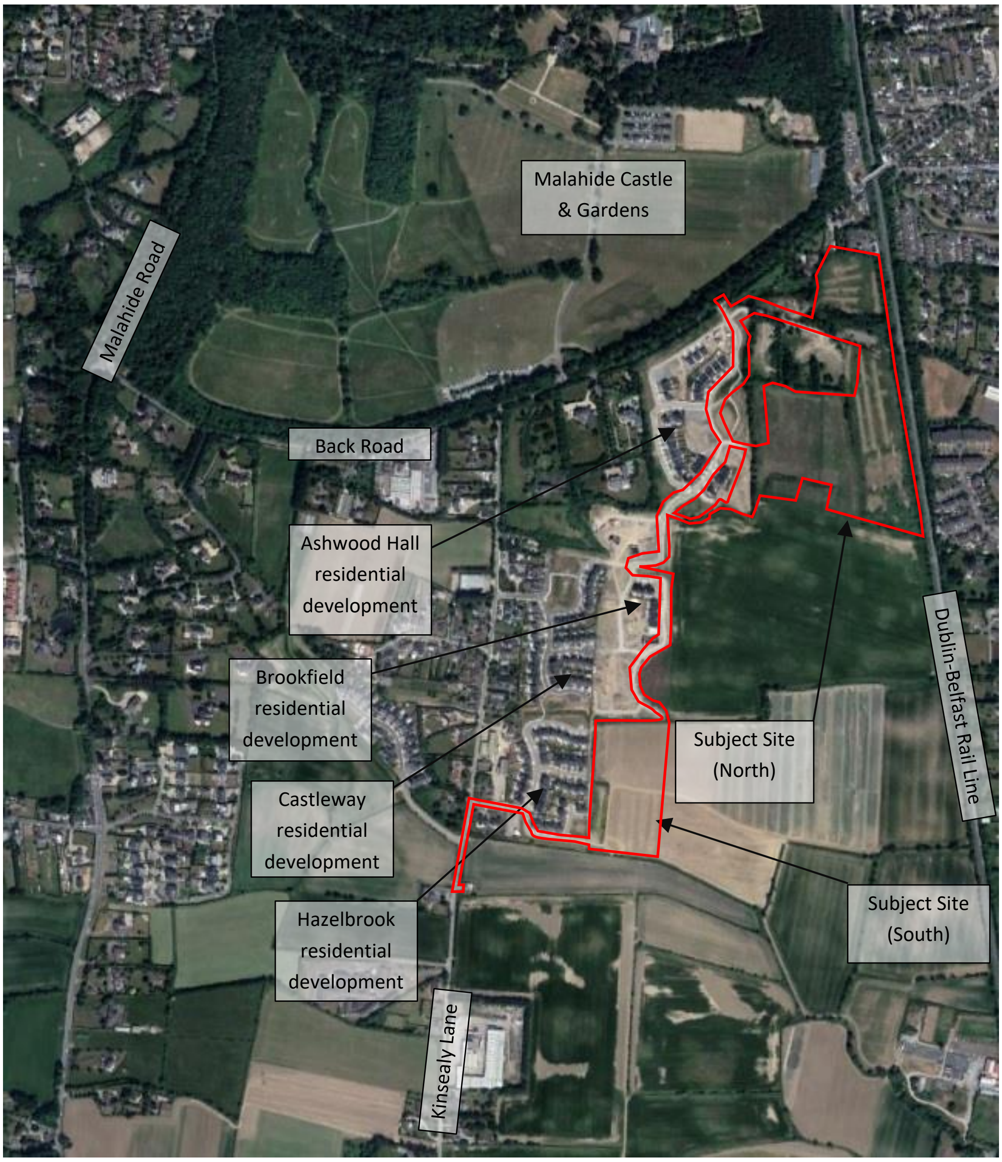

Figure 7.1 | Site Location (Source: Google Earth)

7.3.4 Hydrogeology (Groundwater)

A review of the EPA's (Environmental Protection Agency) website database classifies the ground waterbody (2013-2018) status as good, as per the extract shown in Figure 7.2 below.

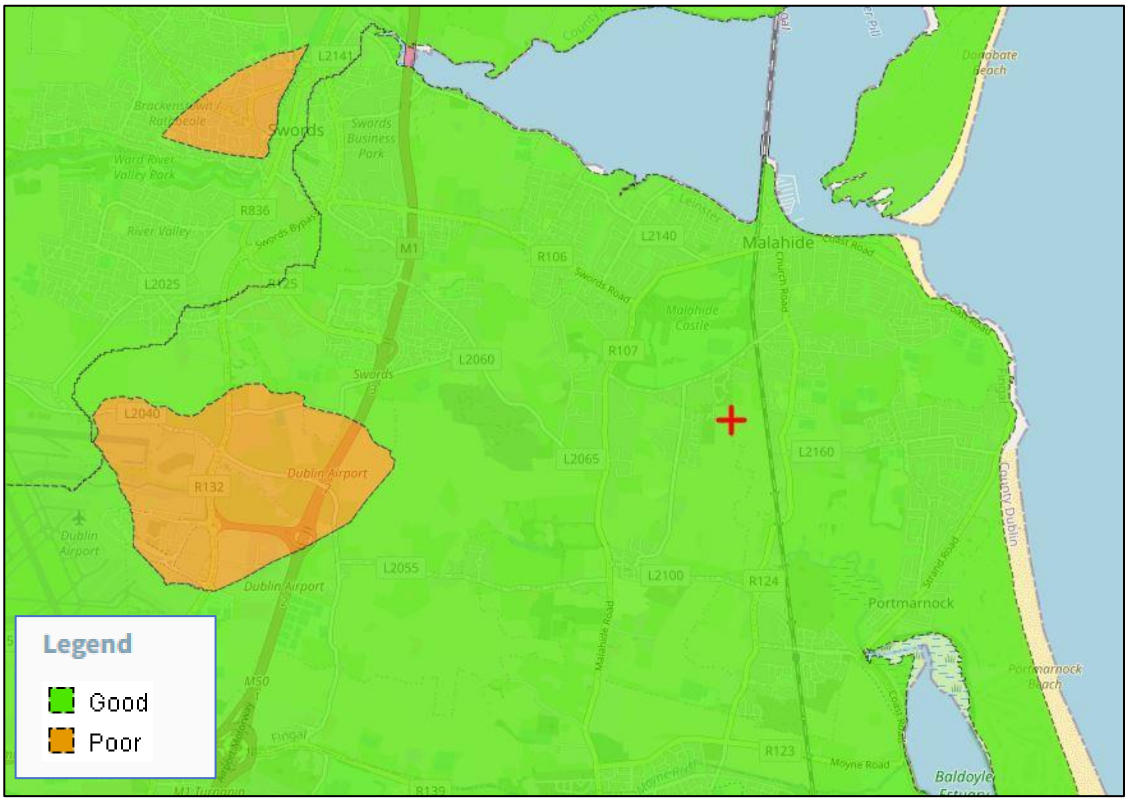

Figure 7.2 | EPA's Ground Waterbody Status

GSI's aquifer classes are divided into three main groups based on their resource potential, and further sub-divided based on the type of openings through which groundwater flows. A review of the GSI databased revealed that the aquifer below the subject lands is classified as PI, Poor Aquifer – Bedrock which is generally unproductive except for Local Zones.

Figure 7.3 | GSI Aquifer

7.3.5 Flood Risk Assessment

A Flood Risk Assessment has been prepared by Waterman Moylan Engineers and has been submitted under a separate cover. This Flood Risk Assessments has been carried out in accordance with the DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management published in November 2009. The assessment identifies and sets out possible mitigation measures against potential risks of flooding from various sources. Sources of possible flooding include costal, fluvial (river), pluvial (direct heavy rain) and groundwater.

The subject site is located within the Sluice River catchment. The site is hydrologically connected to the Sluice River via local ditches adjacent and internal to the subject area, which outfall to the Hazelbrook Stream, which forms the southern boundary of the south site, which in turn outfalls to the Sluice River.

Figure 7.4 overleaf, is an extract from the Flood Studies carried out by Fingal County Council as part of their strategic flood risk assessment for the Fingal development plan 2017-2023. The maps shows that the subject site is outside of the 0.1% annual Exceedance Probability (AEP) flood plain.

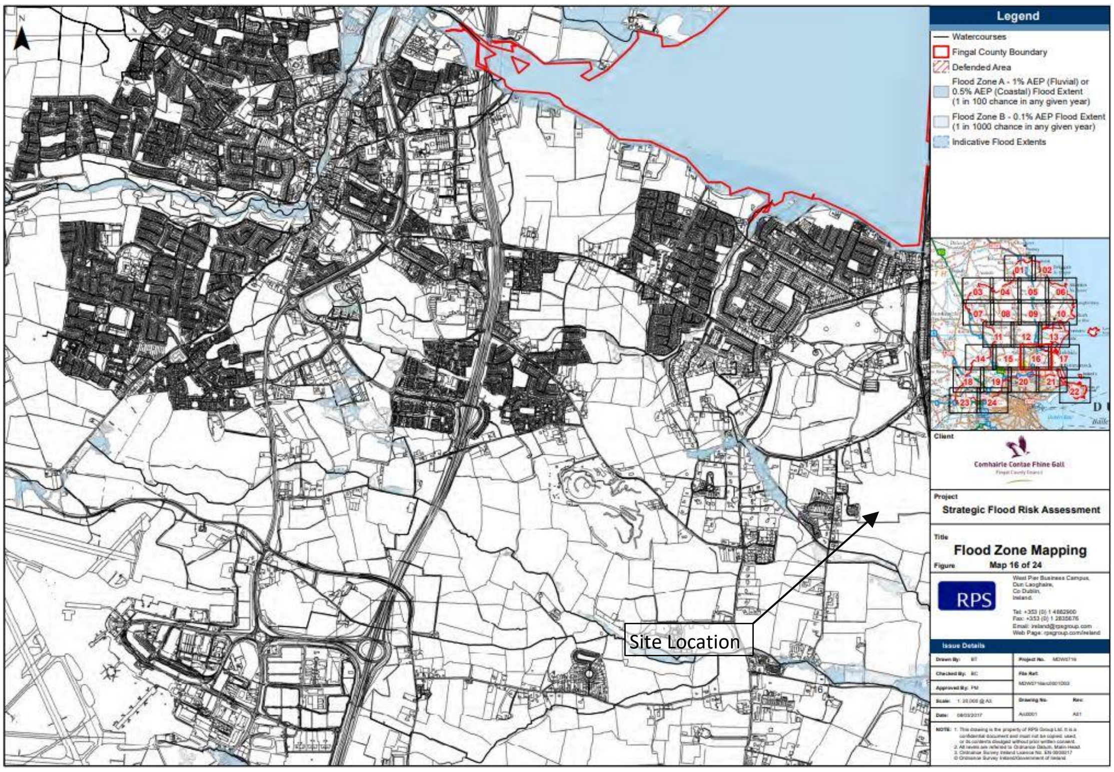

Figure 7.4 | Flood Extent Map

A summary of flood risks can be seen in Table 7.1, below.

Source	**Pathway**	**Receptor**	**Likelihood**	**Consequence**	**Risk**	**Mitigation Measure**	**Residual Risk**
Tidal	*Irish Sea (Malahide Estuary)*	*Proposed development*	*Extremely low*	*None*	*Negligible*	*None*	Negligible
Fluvial	*Hazelbrook Stream (tributary of the Sluice River)*	*Proposed development*	*Low*	*Low*	*Extremely Low*	*Setting of floor levels, overland flood routing*	Extremely Low
Pluvial	*Private & Public Drainage Network*	*Proposed development, downstream properties, and roads*	*Ranges from high to low*	*Moderate*	*Ranges from high to low*	*Appropriate drainage, SuDS, and attenuation design, setting of floor levels, overland flood routing*	Low
Ground Water	*Ground*	*Underground services,*	*Moderate*	*Moderate*	*Moderate*	*Appropriate setting of*	Low

		ground level of buildings, roads				*floor levels, flood routing, damp proof membranes*	
Human/ Mechanical Error	*Drainage network*	*Proposed development*	*High*	*Moderate*	*High*	*Setting of floor levels, overland flood routing, regular inspection of SW network*	Low

Table 7.1 | Summary of the Flood Risks from the Various Components

7.3.6 AA Screening

Indirect impacts from the foul and surface flows are discussed in the AA screening commentary and are addressed in the Biodiversity Chapter of this EIAR.

7.3.7 Water Supply

A pre-connection enquiry was submitted to Irish Water, the subsequent confirmation of feasibility letter from Irish Water, advises that local upgrades to the public network is required.

There are a number of existing interconnected water supply mains in the vicinity of the subject site, including:

- A 150mm diameter water supply network serving Ashwood Hall residential development, to the west of the north subject site, is connected to the 300mm diameter public networks on both Kinsealy Lane & Back Road. 3 no. 100mm diameter spurs have been constructed on Ashwood Hall in anticipation of connections required by the proposed development (of the north site).
- Brookfield Residential Development, to the north of the subject south site, is served by a 150mm diameter network. This network is connected to the 300mm diameter public mains in Kinsealy Lane via the network in the Castleway Residential Development, and to the 300mm Diameter public main in the Back Road Via the Ashwood Hall residential Development. A 150mm spur has been constructed as part of the Brookfield Residential development in anticipation of a future connection from the proposed development (of the south site).
- Hazelbrook Residential Development, to the west of the subject south site, is served by a 150mm diameter network connected to the 300mm diameter public mains in Kinsealy Lane. 5 no. 150mm diameter spurs have been constructed as part of the Hazelbrook Residential Development in anticipation of future connections from the proposed development (of the south site).

7.3.8 Foul Water Network

The sites are generally greenfield with no existing foul sewer networks.

Similar to the existing watermain network, there are a number of interconnected networks adjacent to the subject sites, that have been designed in anticipation of future connections from the proposed development.

- Ashwood Hall Residential Development has 2 no. 225mm diameter spurs constructed to provide future connections for the north site. The Ashwood Hall foul network is comprised of a 225mm diameter network, which flows south, to connect to the Brookfield Residential Development 225mm diameter network. The Brookfield network flows south and then westerly to connect to the Castleway Residential Development 225mm diameter network. The Castleway network flows south to connect to the Hazelwood Residential Development 225mm diameter network.
- The Hazelbrook Residential Development has constructed 2 no. 225mm diameter spurs in anticipation of future connection of the south site of the proposed development.

The foul flows from the above-mentioned Residential developments currently flow to the public mains in Kinsealy Lane, which outfalls to Connolly Avenue pumping station. Connolly Avenue pumping station pumps flows from these developments, and other areas, to Malahide Wastewater Treatment Plant.

Irish Water have recently commissioned a new pumping station on Chapel Road discharging via a new rising main to the existing North Fringe Interceptor Sewer, at Marrsfield Avenue, Clongriffin. The Floraville pumping station, at the southern end of Kinsealy Lane has been decommissioned and will instead drain by gravity to the new Chapel Road pumping station. This has alleviated some of the constraints in the Connolly Avenue pumping station catchment.

During the pre-planning process in respect of this subject application, Irish Water further discussed the possibility of a new ‘Castleway’ pumping station on Kinsealy Lane, which would pump wastewater from the subject site and the surrounding area southwards to the newly commissioned gravity sewer at Chapel Road Pumping Station. This network has capacity available to serve the subject development and diverted flows from Connolly Avenue pumping station.

This long-term solution will relieve capacity constraints at Connolly Avenue Pumping Station, the Malahide foul water gravity network and within the Malahide WWTP catchment area, and this has been designed and sized to accommodate this subject development.

This Castleway pumping station has received a full Grant of Permission from Fingal County Council on 21st January 2022 under Planning Register Reference No. F21A/0451.

A letter from the Applicant of the Castleway pumping station (Carley Properties Ltd.) has been obtained, and states that Carley Properties Ltd. intend to develop this pumping station. The letter also confers the legal entitlement to Birchwell Developments Ltd. to develop the pumping station if so required, to ensure this development is not reliant on a third party to construct the pumping station.

Construction of the pumping station will be completed prior to the connection of units from this subject application.

A Confirmation of Feasibility Letter was issued by Irish Water on 13 January 2021, and is included as Part of the Engineering Assessment Report. The confirmation of feasibility letter states that connection to the Irish Water network is feasible subject to delivery of the new Castleway pumping station and commissioning of the Chapel Road pumping station. Once again, Chapel Road pumping Station has since been commissioned.

7.4 Characteristics of the Proposed Development

The proposed development consists of a total of 415 residential units, comprising 252 houses, 28 duplex units, and 135 apartments. The proposed development will also include the construction of a creche. The development includes all associated site works, boundary treatments, drainage, and additional service connections. The development will utilise the existing entrance from the Back Road that serves the Ashwood Hall development. Although not originally proposed, an additional access, to the south site from Kinsealy Lane via the Hazelbrook residential development, as requested by Fingal County Council.

7.4.1 Proposed Water Supply

It is proposed to supply water to the north site via 3 no. connections to the 3 no. spurs constructed as part of the Ashwood Hall Development in anticipation of the proposed development. Similarly, it is proposed to serve the south site utilising 3 of the 5 no. existing spurs (1 no. spur from Brookfield Residential Development, and 2 no. of the 4 no. spurs from the Hazelbrook Residential Development). Etters of consent have been obtained from the network owners permitting these proposed connections.

The proposed network, for both the north and south sites, comprises of a 150mm trunk watermain running along the main access roads, with a series of 100mm diameter branches serving lower density residential streets. The proposed new connections and watermain network, and the existing networks in the adjacent sites are shown on the watermain layout drawings, 18-091-P300 to P306.

An estimate of the water demand from the public water supply system for the subject development is shown in Table 7.2 below. The average domestic demand has been established based on an average occupancy ratio of 2.7 persons per dwelling with a daily domestic per capita consumption of 150 litres and with a 10% allowance factor. The average day/peak week demand has been taken as 1.25 times the average daily domestic demand, while the peak demand has been taken as 5 times the average day/peak week demand, as per Section 3.7.2 of the Irish Water Code of Practice for Water Infrastructure.

The Creche facility has been calculated to have a population of 100 persons (15 staff and 85 children). The creche population has been attributed a water demand of 90 litres per head per day, based upon the outflow volume as per section Appendix C of the Irish Water Code of Practice for Wastewater Infrastructure.

Description	Total Population	Water Demand	Average Demand	Average Peak Demand	Peak Demand
	No. People	*l/day*	*l/s*	*l/s*	*l/s*
252 Houses	680.4	112,266	1.299	1.624	8.120
28 Duplexes	75.6	12,474	0.144	0.180	0.900

135 Apartments	364.5	60,142.5	0.696	0.870	4.350
Crèche	100	9,900	0.115	0.144	0.720
Total	**1,220.5**	**194,782.5**	**2.254**	**2.818**	**14.090**

Table 7.2 | Calculation of Total Water Demand for the Development

Based on these figures, the average water demand that will be generated by the development is approximately 2.254 l/s, or 194.75m^3 per day.

A Confirmation of Feasibility Letter was issued by Irish Water on January 13th, 2021, for the proposal, confirming that connection to the existing water supply network is feasible with local upgrades to the network required.

In addition, a Statement of Design Acceptance was issued by Irish Water on February 3rd, 2022, confirming that Irish Water has no objection to the subject proposal. Both the Confirmation of Feasibility Letter and the Statement of Design Acceptance are included as Appendices to the Engineering Assessment Report, which accompanies this submission under separate cover.

7.4.2 Proposed Foul network

It is proposed to drain wastewater from the proposed development in a south-westerly direction by gravity through a series of 150mm, 225mm, & 300mm diameter sewer networks to the existing sewer network in the Ashwood and Hazelbrook developments. It is further proposed to upgrade part of the existing foul drainage network in the Hazelbrook development from a 225mm to a 300mm diameter pipe network. This will continue to drain by gravity to the existing public sewer in Kinsealy Lane, which in turn currently discharges to Connolly Avenue Pumping Station. As part of the construction of the Castleway pumping station, this foul water sewer is proposed to be diverted from Connolly Avenue pumping station to the Castleway pumping station.

The existing foul networks in the adjacent residential developments, have been appropriately designed and constructed, including spurs for connection points, to accommodate the future connection of the proposed development. Letters of consent from the adjacent development owners have been obtained permitting connections to these privately owned networks. Please refer to the accompanying submission from Downey Planning for copies of the Letters of Consent.

The proposed internal foul drainage network has been designed and sized in accordance with the Irish Water code of Practice for Wastewater Infrastructure and Standard Details. Please refer to Drawing numbers: 18-091-P201 to P206, which show the proposed foul drainage layout, and existing foul water networks in adjacent estates, and subsequent route to the Castleway pumping station.

A Statement of Design Acceptance has also been issued by Irish Water and is provided in Appendix B of the Engineering Assessment Report.

An estimate of the foul water discharge rate from the subject development to the public drainage network is shown in Table 7.3 overleaf. Domestic wastewater loads have been calculated based on 2.7 persons per unit with a per capita wastewater flow of 150 litres per head per day along with a 10% unit consumption allowance, in line with Section 3.6 of the Irish Water Code of Practice for Wastewater Infrastructure. A peak flow multiplier of 3 has been used, as per Section 2.2.5 of Appendix B of the Code of Practice.

The foul water discharge rate for the crèche is based on per capita daily discharge rates of 90 litres, which Is based on the Irish Water specified load for a unit with a similar usage: Non-residential School with a canteen facility on site, as per Appendix C of the same Code of Practice.

Description	Total Population	Load per Capita	Daily Load	Total DWF	Peak Flow
	No. People	*l/day*	*l/day*	*l/s*	*l/s*
252 Houses	680.4	150	112,266	1.299	3.897
28 Duplexes	75.6	150	12,474	0.144	0.432
135 Apartments	364.5	150	60,142.5	0.696	2.088
Crèche	100	90	9,900	0.115	0.345
Total	**1,220.5**	**Varies**	**194,782.5**	**2.254**	**6.762**

Table 7.3 | Calculation of Total Foul Water Flow from the Development

The total dry weather flow from the development is 2.254 l/s, with a peak flow of 6.762l/s.

7.4.3 Proposed Surface Water Network

It is proposed to drain surface water from the north site via a series of sewers ranging from 150mm to 600mm diameter to outfall to the existing drainage ditches to the south-west. The northern site has been subdivided to 6 sub-catchments, each with its own attenuation tank.

The south site will have surface water drainage pipes with diameters ranging from 150mm to 450mm, and has 2 outfalls, 1 to the ditch on the northern boundary and the other to Hazelbrook Stream on the southern boundary. It has 2 sub-catchments each with its own attenuation tank.

A new headwall will be constructed at each of the outfalls, and a Class A petrol interceptor will be installed immediately prior to this.

The proposed development incorporates a Storm Water Management Plan through the use of various SuDS techniques. Treatment and storage of surface water at source will intercept and slow down the rate of runoff from the site to the existing surface water sewer system.

Based on three key elements, Water Quantity, Water Quality and Amenity, the targets of the SuDS train concept have been implemented in the design. The SuDS devices proposed around the site include permeable paving, filter drains, green/sedum roofing, bio-retention systems/raingardens, roadside trees, swales, attenuation tanks, flow control devices and petrol interceptors.

Attenuation storage is provided to limit the discharge rate from the site into the public network. As per the GDSDS, the required attenuation volume is calculated assuming 100% runoff from paved areas, and has been calculated for the 1-year, 30-year and 100-year return periods, identifying the critical storm for each. To achieve the required attenuation volume, the sites (north and south) have been divided into eight separate sub-catchments.

All catchments will be attenuated in underground storage tanks. This was discussed and agreed with Fingal County Council water and drainage departments in an online meeting on the condition that more surface SuDS were to be incorporated to benefit biodiversity. These additional surface SuDS, most notably swales, have been introduced to the revised surface drainage design.

The tanks proposed to serve the apartment blocks will remain under private management.

Surface water runoff will be restricted via a hydro-brake or similar approved flow control device, limited to the greenfield equivalent runoff rate for each catchment.

The proposed new surface water drainage network is shown on the drainage layout drawings, 18-091-P200, P201, P202, P203, & P205.

7.4.4 Potential Impact of the Proposed Development

<u>Construction Phase:</u>

Significant amounts of site stripping and excavation will be required in order to construct the development. When the site has been stripped layers of sub-soil will be exposed to weathering and there will be potential for erosion due to rainfall and subsequent runoff. The erosion of soil can lead to sediments being washed into the receiving watercourses/sewers at higher rates of runoff.

There is also potential during the development's construction stage that contaminants from cement/concrete be washed into the receiving watercourses / sewers.

There is a risk of pollution of groundwater/watercourses/soils by accidental spillage of oils/diesel from temporary storage areas or where maintaining construction equipment.

Foul water could be connected to the surface water drainage network resulting in the contamination of the receiving watercourses. Furthermore, if there is damage to any foul pipes, there is potential for contaminants to seep into the groundwater.

The construction of the proposed development has potential to cause a slight, adverse, temporary, residual impact on receiving watercourses/groundwater.

There may be temporary interruptions to the local water supply during the upgrading works to the public network. Local residents that may be affected will be notified in advance of the works taking place.

There will be some minor water demand for site offices. There is a risk of contamination to the existing water supply during connection of the development's watermains to the public water supply.

<u>Operational Phase:</u>

The proposed development will result in increased impermeable areas and there is potential for an increase in risk of higher rates of surface water runoff leading to increased downstream flooding.

There is a potential impact for the discharge of contaminants from the proposed development and road surfaces to the surrounding drainage sewers. These would include particulates, oil, soluble extracts from the bitumen binder etc. The quality of runoff from the site would be dependent on the time of year, weather, particulate deposition from the atmosphere and any gritting or salting carried out by the Local Authority. The time of year has a major bearing on the quality of storm water run-off - in particular the first rains after a prolonged dry period where accumulated deposits of rubber, particulates, oils, etc. are, washed away.

There is potential for leaks in the foul network to result in contamination of the groundwater.

Accidental spills of fuels/hydrocarbons and washing down into the drainage pipe network has the potential to impact on the receiving hydrogeology.

The operation of the proposed development has the potential to cause a slight, adverse, temporary, residual impact on receiving watercourses/groundwater.

There is a potential for Watermain leaks which would increase the volume of water permeating through the underground soil strata.

During the operational phase of the development, there will be an increase in demand for water from the public water supply.

7.5 Potential Cumulative Impacts

There are no anticipated cumulative impacts arising from the proposed development, or any further development in the locality in relation to water, other than those noted above.

7.6 Do Nothing Scenario

In this scenario, surface water runoff would continue to be discharged at existing un-restricted discharge rates. The receiving watercourses and groundwater aquifers would remain in their current state and there would be no change

7.7 Risks to Human Health

There is a risk to Human Health should the ground water or the existing water supply become contaminated during the construction or operational stages, and the water is consumed. In order to mitigate these risks, the measures outlined below will be adopted.

7.8 Mitigation Measures

This section of the report will discuss mitigation measures to reduce the impact of the proposed development on the surrounding water environments during the construction and operation phase.

Construction Phase:

A Preliminary Construction Management Plan (PCMP) has been prepared for this application and is included under a separate cover. It is considered that the PCMP will be updated by the appointed contractor. In order to minimise the potential impact of the construction phase of the proposed development on the surrounding surface water and groundwater environs, the following construction stage mitigation measures are to be included in the plan and be implemented in full.

- The contractor will appoint a suitably qualified person to oversee the implementation of measures for the prevention of pollution to the receiving surface water environment.
- To minimise the adverse effects, the prevailing weather conditions and time of year is to be taken into account when the site development manager is planning the stripping back of the site.
- Site stripping will be minimised as far as practicable.
- Settlement ponds/silt traps will be provided to prevent silt runoff into the existing sewers/watercourses during the drainage works.

- Regular testing of surface water discharges will be undertaken at the outfall from the subject lands. The location for testing and trigger levels for halting works will be agreed between the project ecologist and the site foreman at the commencement of works.
- Where silt control measures are noted to be failing or not working adequately, works will cease in the relevant area. The project ecologist will review and agree alternative pollution control measures, such as deepening or redirecting trenches as appropriate, before works may recommence.
- All fuels and chemicals will be bunded, and where applicable, stored within double skinned tanks/containers with the capacity to hold 110% of the volume of chemicals and fuels contents. Bunds will be located on flat ground a suitable distance from any watercourse or other water conducting features, including the cut off trenches.
- Foul and surface water pipes will be carefully laid so as to minimise the potential for cross connections which may result in contamination of receiving watercourses.
- Site personnel inductions are to be conducted such that all site personnel are made aware of the procedures the best practice in relation to the management of surface water runoff and ground water protection.
- Where possible, precast concrete units are to be used to avoid on-site “wet” mix concrete usage. In-situ concrete pours are to be managed in accordance with best practice to avoid overspills
- Concrete truck and wheel wash down facilities are to be provided in designated areas. Discharge from these areas is to be directed into the settlement ponds/silt traps.
- Topsoil for landscaping will be located in such a manner as to reduce the risk of washing away into local drainage or watercourses.
- A method statement setting out in detail the procedure to be used when working in the vicinity of existing watermains will be produced by the contractor for any construction works within the vicinity of watermains and for roads and or services crossing watermains.
- All watermains will be cleaned and tested in accordance with Irish Water guidelines prior to connection to the public watermain.
- All connections to the public watermain will be carried out and tested by or under the supervision of Irish Water or the design engineer.
- Details for the construction methods of the outfall head walls to mitigate against pollution of the natural surface water networks are set out in the Preliminary Construction Demolition & Waste Management Plan.
- In order to reduce the risk of defective or leaking foul sewers, the following measures will be implemented:
- All new foul sewers will be tested by means of an approved air test during the construction phase in accordance with Irish Waters Code of Practice and Standard Details.
- All private drainage will be inspected and signed off by the design Engineer in accordance with the Building Regulations Part H and BCAR requirements.
- Foul sewers will be surveyed by CCTV to identify possible physical defects.
- The connection of the new foul sewers to the public sewer will be carried out under the supervision of Irish Water and will be checked prior to commissioning.

- Prior to commencement of excavations in public areas, all utilities and public services will be identified and checked, to ensure that adequate protection measures are implemented during the construction phase.

Potential negative impacts during construction phase will be short term only.

Operational Phase:

The implementation of the following operation stage mitigation measures will minimise the impact on the hydrology and hydrogeology aspects of the development lands.

- The surface water drainage network has been designed in accordance with the CIRIA SUDS Manual and the Greater Dublin Strategic Drainage Scheme. The appropriate interception mechanisms and treatment train process has been incorporated into the design.
- Surface water outflow will be restricted to the equivalent greenfield runoff rate from the proposed attenuation tanks.
- Flow restrictors with attenuation storage will be used to slowdown and store surface water runoff from discharging above green field rates to the local ditches/Hazelbrook Stream.
- Sustainable urban drainage measures, including green roofs, permeable paving, and filter strips/swales will be provided to improve water quality.
- A petrol interceptor will be installed to prevent hydrocarbons entering the local drainage system at all outfalls.
- Regular inspection and maintenance of the drainage network, including petrol interceptors.
- Water metering via district meters will be installed to Irish Water requirements. Monitoring of the telemetry data will indicate any excessive water usage which may indicate the potential for a leak in the watermain network. Early identification of potential leaks will lead a faster response in determining the exact location of leaks and completion of remedial works.

It is not envisaged that any further remedial or reductive measures will be necessary upon completion.

7.9 Predicted Impacts of the Proposed Development

Construction Phase:

Due to the proposed remedial measures outlined above no significant adverse impacts are expected to arise during the construction phase of the proposed development on the water supply network. There will be a minor increase in water demand and foul water outflow during the period of construction.

Operational Phase:

Due to the proposed mitigation measures outlined above many of the potential impacts will not arise during the operational phase of the proposed development on surface water and groundwater quality.

Surface water discharge from the site will be restricted by means of attenuation, therefore, no adverse impact in respect of flooding downstream will arise from the proposed development.

The installation of a Sustainable Urban Drainage System will ensure surface water runoff will be of high quality before discharge to the local ditch network/stream and will not have an impact on the receiving waters downstream of the development.

There will be a water demand for the proposed development of approximately 195m^3 per day. Irish Water have confirmed in their Confirmation of Feasibility Letter that the existing network has sufficient capacity to cater for the development with a requirement for minor local upgrade to facilitate the proposed development.

There is not anticipated to be any issues associated with the foul network during the operation phase based on the full incorporation of the mitigation measures during the construction phase. The impact following the operational phase mitigation measures outlined above is imperceptible. The increase in outflow volume to the public network has been calculated to be approximately 195m^3 when the development is fully occupied.

7.10 Worst-Case Scenario

The worst-case scenario in relation to hydrology and hydrogeology during construction phase would be the failure to implement the mitigation measures outlined above. This may result in the contamination of the receiving surface water network and/or groundwater.

In relation to the operation stage, the worst case would be the flooding of the surface water drainage network. In this regard, the network has been designed to accommodate a 20% increase in flows due to climate change. Finished floor levels have also been set with appropriate freeboard and an overland flood route through the site has been provided.

Implementation of the mitigation measures outlined in this document will reduce the risk of the worst-case scenario occurring, making this unlikely.

7.11 Monitoring

<u>Construction Stage</u>

Implementation of the Construction Management Plan is required to protect the hydrology and groundwater elements of the subject lands during construction stage. Maintenance of the mitigation measures and monitoring of the management processed is required to ensure best practice.

The monitoring measures to be implemented include:

- Monitoring of the management and storage of dangerous chemicals and fuel.
- Monitoring and maintenance of the wheel wash facilities.
- Regular maintenance and monitoring of the sediment control measures.
- Monitoring and maintenance of the SUDS features, road gullies and, attenuation ponds during the construction phase of the development.

<u>Operational Stage</u>

Monitoring and maintenance of the water metering telemetry, SUDS features, road gullies, attenuation and flow control devices are imperative during the operation phase of the development

7.12 Reinstatement

No reinstatement is anticipated on site with respect to the Water environment.

7.13 Interactions

The main interactions relating to this EIAR Chapter are Land & Soils, Biodiversity and Utilities.

During construction stage, the connection of wastewater services has the potential to impact groundwater and soils if wastewater were to leak from the network during the construction process. There are potential implications for the local populations if there is a disruption to utility services during the connection of the new services to the proposed development. The construction of the various services will also interact with construction traffic as outlined in the Traffic and Transport Chapter.

During the operation stage, the water supply and foul drainage services have a potential interaction with the available water supply and with potential pollution to natural water bodies.

In respect of Land & Soils, interaction between surface and ground water and the bedrock geology is feasible. The implementation of the mitigation measures outlined in this chapter will reduce the potential of surface contaminants into the underlying geology.

In respect of Biodiversity, there is interaction between hydrology and the downstream habitats present along the Hazelbrook Stream & Sluice River. The mitigation measures ensure that surface water runoff is treated to the required standards so that downstream habitats are not negatively impacted.

7.14 Difficulties Encountered

There were no particular difficulties encountered compiling the Water chapter of the EIAR.

7.15 References

- Environmental Impact Assessment Reports – Draft Guidelines, (2017), Environmental Protection Agency
- Environmental Protection Agency available at http://gis.epa.ie/EPAMaps/
- Geological datasets available at www.gsi.ie
- Greater Dublin Strategic Drainage Study (GDSDS), (2015), Dublin Drainage
- OPW Eastern CFRAM study
- OPW Flood Hazard Mapping

8.0 AIR QUALITY

8.1 Introduction

This chapter assesses the likely air quality impacts associated with the proposed development at Back Road, Broomfield, Malahide, Co. Dublin. A full description of the development is available in Chapter 2.

This chapter was completed by Ciara Nolan, Senior Environmental Consultant in the air quality section of AWN Consulting Ltd. She holds an MSc. (First Class) in Environmental Science from University College Dublin and has also completed a BSc. in Energy Systems Engineering. She is an Associate Member of both the Institute of Air Quality Management (AMIAQM) and the Institution of Environmental Science (AMIEnvSc). She has been active in the field of air quality for over 5 years, with a primary focus on consultancy.

8.2 Methodology

8.2.1 Criteria for Rating of Impacts

8.2.1.1 Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, National and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set (see Table 8.1 and Appendix 8.1).

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011, which incorporate European Commission Directive 2008/50/EC which has set limit values for a number of pollutants with the limit values for NO_2, PM_{10} and $PM_{2.5}$ being relevant to this assessment (see Table 8.1). Council Directive 2008/50/EC combines the previous Air Quality Framework Directive (96/62/EC) and its subsequent daughter directives (including 1999/30/EC and 2000/69/EC).

Table 8-1. Ambient Air Quality Standards

Pollutant	Regulation Note 1	Limit Type	Value
Dust Deposition	TA Luft (German VDI 2002)	Annual average limit for nuisance dust	350 mg/(m^2*day)
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m^3
		Annual limit for protection of human health	40 µg/m^3
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m^3 PM_{10}
		Annual limit for protection of human health	40 µg/m^3 PM_{10}
Particulate Matter (as $PM_{2.5}$)	2008/50/EC	Annual limit for protection of human health	25 µg/m^3 $PM_{2.5}$

Note 1 EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

8.2.1.2 Dust Deposition Guidelines

The concern from a health perspective is focused on particles of dust that are less than 10 microns and the EU ambient air quality standards outlined in section 8.2.1.1 have set ambient air quality limit values for PM_{10} and $PM_{2.5}$.

With regard to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development (construction) in Ireland.

However, guidelines for dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/(m^2*day) averaged over a one-year period at any receptors outside the site boundary. The TA-Luft standard has been applied for the purpose of this assessment based on recommendations from the EPA in Ireland in the document titled 'Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals) (EPA, 2006). The document recommends that the Bergerhoff limit of 350 mg/(m^2*day) be applied to the site boundary of quarries. This limit value can be implemented with regard to dust impacts from the construction of the proposed development.

8.2.2 Construction Phase

The current assessment focuses on identifying the existing baseline levels of PM_{10} and $PM_{2.5}$ in the region of the proposed development by an assessment of EPA monitoring data. Thereafter, the impact of the construction phase of the development on air quality was determined by a qualitative assessment of the nature and scale of dust-generating construction activities associated with the proposed development.

Construction phase traffic also has the potential to impact air quality and climate. The UK Highways Agency Design Manual for Roads and Bridges (DMRB) guidance (UK Highways Agency, 2019a), states that road links meeting one or more of the following criteria can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment. The use of the UK guidance is recommended by the TII (2011) in the absence of specific Irish guidance, this approach is considered best practice and can be applied to any development that causes a change in traffic.

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- A change in speed band; and
- A change in carriageway alignment by 5m or greater.

The construction stage traffic does not meet the above scoping criteria. Therefore, a detailed air quality modelling assessment has been scoped out as there is no potential for significant impacts to air quality during construction as a result of traffic emissions

8.2.3 Operational Phase

Operational phase traffic has the potential to impact air quality. The air quality assessment has been carried out following procedures described in the publications by the EPA (2015; 2017) and using the methodology outlined in the guidance documents published by the UK Highways Agency (2019a) and UK Department of Environment Food and Rural Affairs (DEFRA) (2016; 2018). TII reference the use of the UK Highways Agency and DEFRA guidance and methodology in their document *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* (2011). This approach is considered best practice as is has been applied in Irish guidelines transposing European Guidelines in the Air Quality Standards Regulations 2011 and can be applied to any development that causes a change in traffic.

In 2019 the UK Highways Agency DMRB air quality guidance was revised with *LA 105 Air Quality* replacing a number of key pieces of guidance (HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15). This revised document outlines a number of changes for air quality assessments in relation to road schemes but can be applied to any development that causes a change in traffic. Previously the DMRB air quality spreadsheet was used for the majority of assessments in Ireland with detailed modelling only required if this screening tool indicated compliance issues with the EU air quality standards. Guidance from TII (TII, 2011) recommends the use of the UK Highways Agency DMRB spreadsheet tool for assessing the air quality impacts from road schemes. However, the DMRB spreadsheet tool was last revised in 2007 and accounts for modelled years up to 2025. Vehicle emission standards up to Euro V are included but since 2017, Euro 6d standards are applicable for the new fleet. In addition, the model does not account for electric or hybrid vehicle use. Therefore, this is a somewhat outdated assessment tool. The LA 105 guidance document states that the DMRB spreadsheet tool may still be used for simple air quality assessments where there is unlikely to be a breach of the air quality standards. Due to its use of a "dirtier" fleet, vehicle emissions would be considered to be higher than more modern models and therefore any results will be conservative in nature and will provide a worst-case assessment.

The 2019 UK Highways Agency DMRB air quality revised guidance *LA 105 Air Quality* states that modelling should be conducted for NO_2 for the base, opening and design years for both the do minimum (do nothing) and do something scenarios. Modelling of PM_{10} is only required for the base year to demonstrate that the air quality limit values in relation to PM_{10} are not breached. Where the air quality modelling indicates exceedances of the PM_{10} air quality limits in the base year then PM_{10} should be included in the air quality model in the do minimum and do something scenarios. Modelling of $PM_{2.5}$ is not required as there are currently no issues with compliance with regard to this pollutant. The modelling of PM_{10} can be used to show that the project does not impact on the $PM_{2.5}$ limit value as if compliance with the PM_{10} limit is achieved then compliance with the $PM_{2.5}$ limit will also be achieved. Historically modelling of carbon monoxide (CO) and benzene was required however, this is no longer needed as concentrations of these pollutants have been monitored to be significantly below their air quality limit values in recent years, even in urban centres (EPA, 2021). The key pollutant reviewed in this assessment is NO_2. Concentrations of PM_{10} have been modelled for the base year to indicate that there are no potential compliance issues. Modelling of operational NO_2 concentrations has been conducted for the do nothing and do something scenarios for the opening year (2026) and design year (2041).

The TII guidance (2011) states that the assessment must progress to detailed modelling if:

- Concentrations exceed 90% of the air quality limit values when assessed by the screening method; or
- Sensitive receptors exist within 50m of a complex road layout (e.g. grade separated junctions, hills etc).

The UK Highways Agency guidance *LA 150* (2019) scoping criteria outlined in Section 8.2.2 was used to determine the road links required for inclusion in the modelling assessment. Sensitive receptors within 200m of impacted road links are included within the modelling assessment. Pollutant concentrations are calculated at these sensitive receptor locations to determine the impact of the proposed development in terms of air quality. The guidance states a proportionate number of representative receptors which are located in areas that will experience the highest concentrations or greatest improvements as a result of the proposed development are to be included in the modelling (UK Highways Agency, 2019a). The TII guidance (2011) defines sensitive receptor locations as residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present. A single high sensitivity receptor (R1) was included in the modelling assessment and is detailed in Figure 8.1.

The following model inputs are required to complete the assessment using the DMRB spreadsheet tool: road layouts, receptor locations, annual average daily traffic movements (AADT), percentage of heavy goods vehicles (%HGV), annual average traffic speeds and background concentrations. Using this input data the model predicts the road traffic contribution to ambient ground-level concentrations at the worst-case sensitive receptors using generic meteorological data. The DMRB model uses conservative emission factors, the formulae for which are outlined in the DMRB Volume

11 Section 3 Part 1 – HA 207/07 Annexes B3 and B4. These worst-case road contributions are then added to the existing background concentrations to give the worst-case predicted ambient concentrations. The worst-case ambient concentrations are then compared with the relevant ambient air quality standards to assess the compliance of the proposed development with these ambient air quality standards.

The TII document *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* (2011) details a methodology for determining air quality impact significance criteria for road schemes which can be applied to any project that causes a change in traffic. The degree of impact is determined based on both the absolute and relative impact of the proposed development. The TII significance criteria have been adopted for the proposed development and are detailed in Appendix 8.2 Table A8.2.1 and Table A8.2.2. The significance criteria are based on NO_2 and PM_{10} as these pollutants are most likely to exceed the annual mean limit values (40 µg/m^3).

8.2.3.1 Conversion of NOx to NO_2

NO_X (NO + NO_2) is emitted by vehicles exhausts. The majority of emissions are in the form of NO, however, with greater diesel vehicles and some regenerative particle traps on HGV’s the proportion of NO_X emitted as NO_2, rather than NO is increasing. With the correct conditions (presence of sunlight and O_3) emissions in the form of NO, have the potential to be converted to NO_2.

Transport Infrastructure Ireland states the recommended method for the conversion of NOx to NO_2 in “*Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes*” (2011). The TII guidelines recommend the use of DEFRAs NOx to NO_2 calculator (2020) which was originally published in 2009 and is currently on version 8.1. This calculator (which can be downloaded in the form of an excel spreadsheet) accounts for the predicted availability of O_3 and proportion of NOx emitted as NO for each local authority across the UK. O_3 is a regional pollutant and therefore concentrations do not vary in the same way as concentrations of NO_2 or PM_{10}.

The calculator includes Local Authorities in Northern Ireland and the TII guidance recommends the use of ‘Armagh, Banbridge and Craigavon’ as the choice for local authority when using the calculator. The choice of Craigavon provides the most suitable relationship between NO_2 and NOx for Ireland. The “All Non-Urban UK Traffic” traffic mix option was used.

8.2.3.2 Update to NO_2 Projections using DMRB

In 2011 the UK DEFRA published research (Highways England, 2013) on the long-term trends in NO_2 and NO_X for roadside monitoring sites in the UK. This study marked a decrease in NO_2 concentrations between 1996 and 2002, after which the concentrations stabilised with little reduction between 2004 and 2010. The result of this is that there now exists a gap between projected NO_2 concentrations which UK DEFRA previously published and monitored concentrations. The impact of this ‘gap’ is that the DMRB screening model can under-predict NO_2 concentrations for predicted future years. Subsequently, the UK Highways Agency published an Interim advice note (IAN 170/12) in order to correct the DMRB results for future years. This methodology has been used in the current assessment to predict future concentrations of NO_2 as a result of the proposed development.

8.2.3.3 Traffic Data Used in Modelling Assessment

Traffic flow information was obtained from Waterman Moylan Consulting Engineers for the purposes of the operational phase assessment. Data for the Do Nothing and Do Something scenarios for the base year 2021, opening year 2026 and design year 2041 were provided. The traffic data is detailed in Table 8.2. Only road links that met the DMRB scoping criteria outlined in Section 8.2.2 and that were within 200m of receptors were included in the modelling assessment. Background concentrations have been included as per Section 8.3.2. of this chapter based on available EPA background monitoring data (EPA, 2021).

The data used for the do something scenario was based on a worst-case sensitivity analysis scenario which includes traffic associated with the proposed development in addition to a potential residential development at Streamstown. This allows for a worst-case cumulative assessment of potential traffic related air quality impacts.

Table 8.2 Traffic Data used in Air Quality Modelling Assessment

Road Name	Speed (kph)	% HGV	Base	Do Nothing		Do Something	
			2021	2026	2041	2026	2041
R107 Malahide Road (N)	60	2.15%	9,903	10,773	12,139	10,908	13,432

Figure 8-1. Location of Sensitive Receptors used in Air Quality Assessment

8.3 Receiving Environment

8.3.1 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e., traffic levels) (WHO, 2006). The wind is of key importance in dispersing air pollutants and for ground-level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM_{10}, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than $PM_{2.5}$) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles ($PM_{2.5}$ - PM_{10}) will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Dublin Airport meteorological station, which is located approximately 6 km south-west of the site. Dublin Airport met data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 8.2). For data collated during five representative years (2016 - 2020), the predominant wind direction is westerly to south-westerly with a mean wind speed of 5.5 m/s over the period 1981 - 2010 (Met Eireann, 2022).

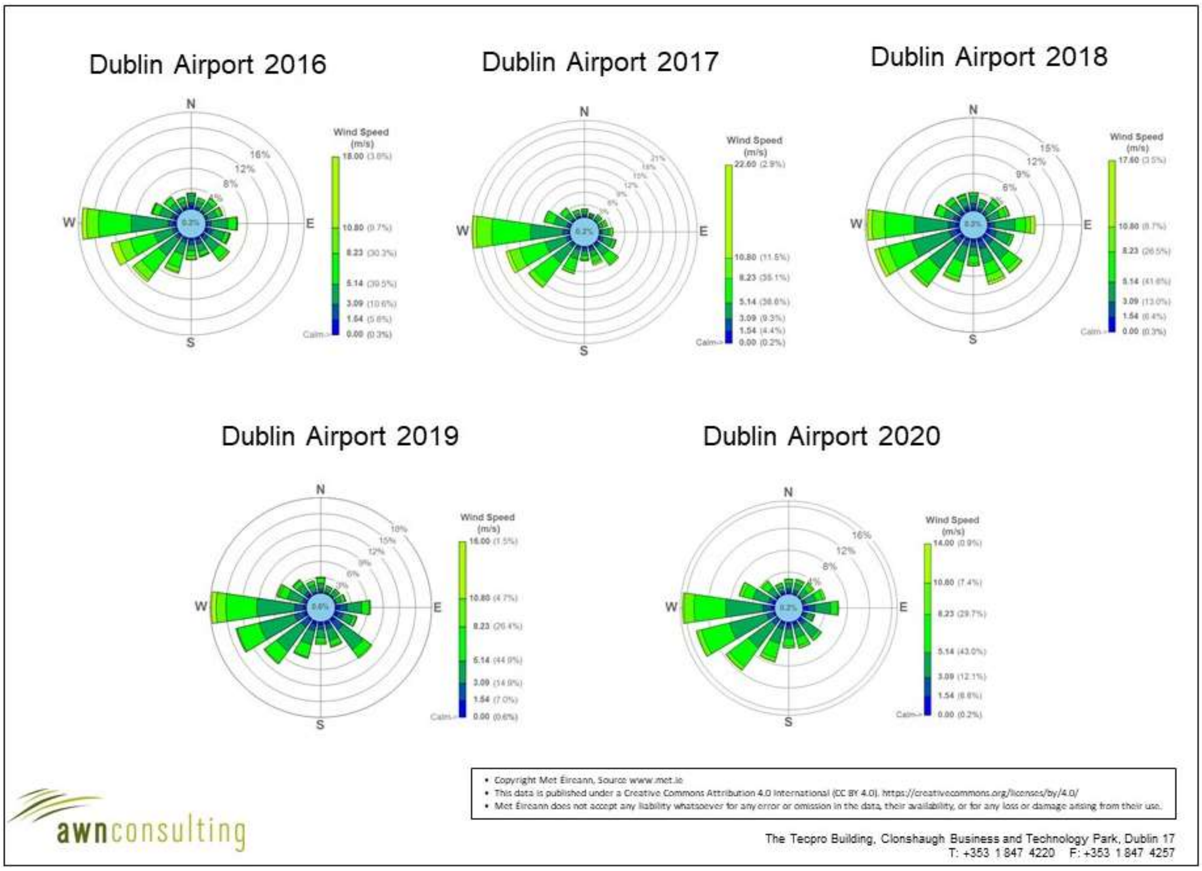

Figure 8-2. Dublin Airport Windroses 2016 - 2020

8.3.2 Baseline Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality in Ireland is "*Air Quality In Ireland 2012*" (EPA ,2021a). The EPA website details the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments (EPA, 2022).

As part of the implementation of the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), four air quality zones have been defined in Ireland for air quality management and assessment purposes[(8)]. Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D.

In terms of air monitoring and assessment, the proposed development is within Zone A (EPA, 2022). Long-term monitoring data has been used to determine background concentrations for the key pollutants in the region of the proposed development. The background concentration accounts for all non-traffic derived emissions (e.g., natural sources, industry, home heating etc.).

In 2020 the EPA reported (EPA, 2021) that Ireland was compliant with EU legal air quality limits at all locations, however this was largely due to the reduction in traffic due to Covid-19 restrictions. The EPA *Air Quality in Ireland 2020* report details the effect that the Covid-19 restrictions had on air monitoring stations, which included reductions of up to 50% at some monitoring stations which have traffic as a dominant source. The report also notes that CSO figures show that while traffic volumes are still slightly below 2019 levels, they have significantly increased since 2020 levels. 2020 concentrations are therefore predicted to be an exceptional year and not consistent with long-term trends. For this reason, they have not been included in the baseline section and previous long-term data has been used to determine baseline levels of pollutants in the vicinity of the proposed development.

Long-term NO_2 monitoring was carried out at the Zone A suburban locations of Rathmines, Ballyfermot, Dun Laoghaire and Swords for the period 2015 – 2019 (EPA, 2021). Long term average concentrations are significantly below the annual average limit of 40 $\mu g/m^3$ for these suburban locations. Average results range from 13 – 22 $\mu g/m^3$ (Table 8.3). Background concentrations monitored at Swords are likely representative of the proposed development's location due to its location further from the city centre. Annual mean concentrations in Swords ranged from 13 – 16 $\mu g/m^3$ over the period 2015 – 2019. Based on the above information and having regard to the proposed development's location further from the city centre, a conservative estimate of the current background NO_2 concentration for the region of the proposed development is 16 $\mu g/m^3$.

Table 8-3. Trends In Zone A Air Quality – Nitrogen Dioxide (NO2)

Station	**Station Classification**	**Averaging Period** Note 1,2	**Year**				
			2015	**2016**	**2017**	**2018**	**2019**
Rathmines		Annual Mean NO_2 ($\mu g/m^3$)	18	20	17	20	22

	Suburban Background	99.8th%ile 1-hr NO_2 ($\mu g/m^3$)	105	88	86	87	102
Ballyfermot	Suburban Background	Annual Mean NO_2 ($\mu g/m^3$)	16	17	17	17	20
		99.8th%ile 1-hr NO_2 ($\mu g/m^3$)	127	90	112	101	101
Dun Laoghaire	Suburban Background	Annual Mean NO_2 ($\mu g/m^3$)	16	19	17	19	15
		99.8th%ile 1-hr NO_2 ($\mu g/m^3$)	91	105	101	91	91
Swords	Suburban Background	Annual Mean NO_2 ($\mu g/m^3$)	13	16	14	16	15
		99.8th%ile 1-hr NO_2 ($\mu g/m^3$)	93	96	79	85	80

Note 1 Annual average limit value - 40 $\mu g/m^3$ (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Note 2 1-hour limit value - 200 $\mu g/m^3$ as a 99.8th%ile, i.e. not to be exceeded >18 times per year (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Continuous PM_{10} monitoring was carried out at the Zone A locations of Rathmines, Dun Laoghaire, Ballyfermot and Phoenix Park from 2015 – 2019. Levels range from 9 – 16 $\mu g/m^3$ over the five-year period with at most 9 exceedances of the 24-hour limit value of 50 $\mu g/m^3$ in Rathmines and in 2019 (35 exceedances are permitted per year) (Table 8.4). Based on the EPA data, a conservative estimate of the current background PM_{10} concentration in the region of the proposed development is 15 $\mu g/m^3$.

Table 8-4. Trends In Trends In Zone A Air Quality - PM10

Station	Station Classification	Averaging Period Note 1, 2	Year				
			2015	2016	2017	2018	2019
Ballyfermot	Suburban Background	Annual Mean PM_{10} (µg/m³)	12	11	12	16	14
		24-hr Mean > 50 µg/m³ (days)	3	0	1	0	7
Dún Laoghaire	Suburban Background	Annual Mean PM_{10} (µg/m³)	13	13	12	13	12
		24-hr Mean > 50 µg/m³ (days)	3	0	2	0	2
Rathmines	Suburban Background	Annual Mean PM_{10} (µg/m³)	15	15	13	15	15
		24-hr Mean > 50 µg/m³ (days)	5	3	5	2	9
Phoenix Park	Urban Background	Annual Mean PM_{10} (µg/m³)	12	11	9	11	11
		24-hr Mean > 50 µg/m³ (days)	2	0	1	0	2

Note1 Annual average limit value - 40 µg/m³ (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Note 2 24-hour limit value - 50 µg/m³ as a 90.4th%ile, i.e. not to be exceeded >35 times per year (EU Council Directive 1999/30/EC & S.I. No. 180 of 2011).

Monitoring of both PM_{10} and $PM_{2.5}$ takes place at the station in Rathmines which allows for the $PM_{2.5}/PM_{10}$ ratio to be calculated. Average $PM_{2.5}$ levels in Rathmines over the period 2015 – 2019 ranged from 9 – 10 µg/m³, with a $PM_{2.5}/PM_{10}$ ratio ranging from 0.60 – 0.68 (EPA, 2021). Based on this information, a conservative ratio of 0.7 was used to generate an existing $PM_{2.5}$ concentration in the region of the proposed development of 10.5 µg/m³.

8.4 Characteristics of the Proposed Development

The proposed development is located on lands at Back Road, Broomfield, Malahide, Co. Dublin. The proposed development will consist of the demolition of the former clubhouse building on site and the proposed construction of 415 no. residential units comprising 252 no. houses and associated car parking, 28 no. duplex units and 135 no. apartments Blocks A & B providing ancillary amenity facilities, all provided with private balconies/terraces and associated car parking and bicycle parking; 1 no. childcare facility; landscaping including play equipment; boundary treatments; public lighting; and all associated site infrastructure and engineering works necessary to facilitate the development including proposed connection to permitted upgrades to existing foul network along Kinsealy Lane. A full description of the development is available in Chapter 2.

Impacts to air quality can occur during both the construction and operational stages of the development. During the construction stage the main source of air quality impacts will be as a result of fugitive dust emissions from site activities. The primary sources of air emissions in the operational context are deemed long term and will involve the change in traffic flows or congestion in the local areas which are associated with the development. The following describes the primary sources of potential air quality impacts which have been assessed as part of this EIAR.

8.5 Potential Impacts

8.5.1 Construction Phase

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust. While construction dust tends to be deposited within 350 m of a construction site, the majority of the deposition occurs within the first 50 m. The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction. A review of Dublin Airport meteorological data (see Section 8.3.1) indicates that the prevailing wind direction is westerly to south-westerly and wind speeds are generally moderate in nature. In addition, dust generation is considered negligible on days where rainfall is greater than 0.2 mm. A review of historical 30-year average data for Dublin Airport indicates that on average 191 days per year have rainfall over 0.2 mm (Met Eireann, 2022) and therefore it can be determined that over 50% of the time dust generation will be reduced.

The proposed development can be considered large in scale and therefore there is the potential for significant dust soiling 100 m from the source (TII, 2011) (Table 8.5). There are a number of high sensitivity residential receptors bordering the site. In the absence of mitigation, there is the potential for significant, negative, short-term impacts to nearby sensitive receptors as a result of dust emissions from the proposed development.

Table 8.5 Assessment Criteria for the Impact of Dust Emissions from Construction Activities with Standard Mitigation in Place

Source		Potential Distance for Significant Effects (Distance from source)		
Scale	Description	Soiling	PM_{10}	Vegetation Effects
Major	Large construction sites with high use of haul routes	100m	25m	25m
Moderate	Moderate sized construction sites with moderate use of haul routes	50m	15m	15m
Minor	Minor construction sites with limited use of haul routes	25m	10m	10m

Source: Appendix 8: Assessment of Construction Impacts taken from "Guidelines for the treatment of Air Quality During the Planning & Construction of National Road Schemes" (TII, 2011)

There is also the potential for traffic emissions to impact air quality in the short-term over the construction phase. Particularly due to the increase in HGVs accessing the site. The construction stage traffic has been reviewed and a detailed air quality assessment has been scoped out as none of the road links impacted by the proposed development satisfy the DMRB assessment criteria in Section 8.2.2. It can therefore be determined that the construction stage traffic will have an imperceptible, neutral and short-term impact on air quality.

8.5.2 Operational Phase

The potential impact of the proposed development has been assessed by modelling emissions from the traffic generated as a result of the development. The impact of NO_2 emissions for the opening and design years was predicted at the nearest sensitive receptors to the development. This assessment allows the significance of the development, with respect to both relative and absolute impacts, to be determined.

TII's document *Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes* (2011) details a methodology for determining air quality impact significance criteria for road schemes and this can be applied to any development that causes a change in traffic which includes guidance from the UK. The degree of impact is determined based on both the absolute and relative impact of the proposed development. Results are compared against the 'Do-Nothing' scenario, which assumes that the proposed development is not in place in future years, in order to determine the degree of impact.

The results of the assessment of the impact of the proposed development on NO_2 in the opening year 2026 are shown in Table 8.6 and for design year 2041 are shown in Table 8.7. The annual average concentration is in compliance with the limit value at all worst-case receptors in 2026 and 2041. Concentrations of NO_2 are at most 40% of the annual limit value in 2026 and 39% of the annual limit value in 2041. In addition, the hourly limit value for NO_2 is 200 $\mu g/m^3$ and is expressed as a 99.8^{th} percentile (i.e. it must not be exceeded more than 18 times per year). The maximum 1-hour NO_2 concentration is not predicted to be exceeded in any modelled year (Table 8.8).

The impact of the proposed development on annual mean NO_2 concentrations can be assessed relative to "Do Nothing (DN)" levels. Relative to baseline levels, there are predicted to be some imperceptible increases in NO_2 concentrations at receptor R1. Concentrations at R1 will increase by at most 0.01 $\mu g/m^3$ in 2026 and by 0.1 $\mu g/m^3$ in 2041. Using the assessment criteria outlined in Appendix 8.2, Table A8.2.1 and Table A8.2.2 the impact of the proposed development in terms of NO_2 is considered negligible. Therefore, the overall impact of NO_2 concentrations as a result of the proposed development is long-term, negative and imperceptible.

Concentrations of PM_{10} were modelled for the baseline year of 2021. The modelling showed that concentrations were in compliance with the annual limit value of 40 $\mu g/m^3$ at all receptors assessed, therefore, further modelling for the opening and design years was not required. Concentrations reached at most 0.34 $\mu g/m^3$. When a background concentration of 15 $\mu g/m^3$ is included, the overall impact is 38% of the annual limit value at the worst-case receptor.

The potential impact of the proposed development on ambient air quality in the operational stage is considered long-term, localised, negative and imperceptible and therefore, no mitigation is required.

Table 8.6 Predicted Annual Mean NO_2 Concentrations – Opening Year 2026 (µg/m^3)

Receptor	Opening Year 2026				
	DN	**DS**	**DS-DN**	**Magnitude**	**Description**
R1	16.0	16.0	0.01	Imperceptible Increase	Negligible

Table 8.7 Predicted Annual Mean NO_2 Concentrations – Design Year 2041 (µg/m^3)

Receptor	Design Year 2041				
	DN	**DS**	**DS-DN**	**Magnitude**	**Description**
R1	15.7	15.8	0.10	Imperceptible Increase	Negligible

Table8.8 Predicted 99.8th percentile of Daily Maximum 1-hour NO_2 Concentrations (µg/m^3)

Receptor	Opening Year 2026		Design Year 2041	
	DN	**DS**	**DN**	**DS**
R1	56	56	55	55

8.5.3 Do Nothing Scenario

Under the Do-Nothing Scenario no construction works will take place and the previously identified impacts of fugitive dust and particulate matter emissions will not occur. Impacts from increased traffic volumes and associated air emissions will also not occur. The ambient air quality at the site will remain as per the baseline and will change in accordance with trends within the wider area (including influences from new developments in the surrounding area, changes in road traffic, etc.). Therefore, this scenario can be considered neutral in terms of air quality.

8.6 Mitigation Measures

8.6.1 Construction Phase

A detailed dust minimisation plan associated with a high level of dust control is outlined in Appendix 8.3. This plan draws on best practice mitigation measures from Ireland, the UK and the USA in order to ensure the highest level of mitigation possible.

In summary the measures which will be implemented will include: -

- Drop heights from conveyors, loading shovels, hoppers and other loading equipment should be minimised, if necessary fine water sprays should be employed.
- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- Any road that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads.

- Vehicles using site roads will have their speed restricted, and this speed restriction will be enforced rigidly. On any un-surfaced site road, this will be 20 kph, and on hard surfaced roads as site management dictates.
- Public roads and footpaths outside the site will be regularly inspected for cleanliness and cleaned as necessary. If sweeping using a road sweeper is not possible due to the nature of the surrounding area then a suitable smaller scale street cleaning vacuum will be used.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.
- Hoarding or screens shall be erected around works areas to reduce visual impact. This will also have an added benefit of preventing larger particles of dust from travelling off-site and impacting receptors.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

8.6.2 Operational Phase

No mitigation is proposed for the operation phase of the proposed development as it is predicted to have an imperceptible impact on air quality.

8.7 Residual Impacts

8.7.1 Construction Phase

In order to minimise dust emissions during construction, a series of mitigation measures have been prepared in the form of a dust minimisation plan which will be incorporated into the construction environmental management plan (CEMP) for the site. Provided the dust minimisation measures outlined in the plan (see Appendix 8.3 and Section 8.6.1) are adhered to, the air quality impacts during the construction phase will be short-term, negative, localised and imperceptible.

8.7.2 Operational Phase

Air dispersion modelling of operational traffic emissions associated with the proposed development was carried out using the UK DMRB model. The modelling assessment determined that the change in emissions of NO_2 at nearby sensitive receptors as a result of the proposed development will be imperceptible. Therefore, the operational phase impact to air quality is long-term, localised, negative and imperceptible.

8.7.3 Impacts to Human Health

Dust emissions from the construction phase of the proposed development have the potential to impact human health through the release of PM_{10} and $PM_{2.5}$ emissions. As per Table 8.5 PM_{10}

emissions can occur within 25 m of the site for a development of this scale. There are a number of high sensitivity receptors to the bordering the site to the west, a number of which are within 25m of the site boundary. Therefore, in the absence of mitigation there is the potential for slight, negative, short-term impacts to human health as a result of the proposed development.

Best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the impact of construction of the proposed development is likely to be negative, short term and imperceptible with respect to human health.

Traffic related air emissions have the potential to impact human health if they do not comply with the ambient Air Quality Standards detailed in Table 8.1. However, air dispersion modelling of traffic emissions has shown that levels of all pollutants are below the ambient air quality standards set for the protection of human health. It can be determined that the impact to human health during the operational stage is long-term, negative and imperceptible and therefore, no mitigation is required.

8.7.4 Cumulative Impacts

8.7.4.1 Construction Phase

According to the IAQM guidance (2014) should the construction phase of the proposed development coincide with the construction phase of any other development within 350m then there is the potential for cumulative construction dust impacts. However, a high level of dust control will be implemented across the site which will avoid significant dust emissions. Provided these mitigation measures are in place for the duration of the construction phase cumulative dust related impacts to nearby sensitive receptors are not predicted to be significant. Cumulative impacts to air quality will be short-term, localised, negative and imperceptible.

8.7.4.2 Operational Phase

The traffic data reviewed for the operational stage impacts to air quality included the cumulative traffic associated with other existing and permitted developments in the local area including a potential masterplan residential development at Streamstown. Therefore, the cumulative impact is included within the operational stage impact for the proposed development. The impact is predicted to be long-term, negative and imperceptible with regards to air quality.

8.8 Monitoring

8.8.1 Construction Phase

Monitoring of construction dust deposition along the site boundary to nearby sensitive receptors during the construction phase of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/(m^2*day) during the monitoring period between 28 - 32 days.

8.8.2 Operational Phase

There is no monitoring recommended for the operational phase of the development as impacts to air quality are predicted to be imperceptible.

8.9 References

- BRE (2003) Controlling Particles, Vapours & Noise Pollution From Construction Sites
- Department of the Environment Heritage and Local Government (DEHLG) (2004) Quarries and Ancillary Activities, Guidelines for Planning Authorities
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- German VDI (2002) Technical Guidelines on Air Quality Control – TA Luft
- Institute of Air Quality Management (IAQM) (2016) Guidance on the Assessment of Dust from Demolition and Construction Version 1.1
- Met Éireann (2022) Met Eireann website: https://www.met.ie/
- The Scottish Office (1996) Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects Of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings
- Transport Infrastructure Ireland (2011) Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes
- UK Highways Agency (2007) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 - HA207/07 (Document & Calculation Spreadsheet)
- UK Highways Agency (2019a) UK Design Manual for Roads and Bridges (DMRB), Volume 11, Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 LA 105 Air quality
- UK Office of Deputy Prime Minister (2002) Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance
- USEPA (1997) Fugitive Dust Technical Information Document for the Best Available Control Measures
- World Health Organisation (2006) Air Quality Guidelines - Global Update 2005 (and previous Air Quality Guideline Reports 1999 & 2000)

9.0 NOISE AND VIBRATION

9.1 Introduction

This section of the EIAR has been prepared by AWN to assess the noise and vibration impact of the proposed development in the context of current relevant standards and guidance. This assessment has been prepared by Leo Williams BAI MAI PgDip AMIOA, Acoustic Consultant at AWN Consulting who has over 5 years' experience as an environmental consultant specialising in Acoustics and Environmental Impact Assessment.

This chapter includes a description of the receiving ambient noise climate in the vicinity of the subject site and an assessment of the potential noise and vibration impact associated with the proposed development during both the short-term construction phase and the long-term operational phase on its surrounding environment. The assessment of direct, indirect, and cumulative noise and vibration impacts on the surrounding environment have been considered as part of the assessment.

Mitigation measures are included, where relevant, to ensure the proposed development is constructed and operated in an environmentally sustainable manner in order to ensure minimal impact on the receiving environment.

9.2 Assessment Methodology

The assessment has been undertaken with reference to the most appropriate guidance documents relating to environmental noise and vibration which are set out in the following sections. In addition to specific noise and vibration guidance documents, the following Environmental Protection Agency (EPA) guidelines were considered and consulted in the preparation of this Chapter:

1. Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017);
2. Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – Draft (EPA, 2017); and
3. Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning & Local Government, 2018).

The study has been undertaken using the following methodology:

1. Baseline noise monitoring has been undertaken across the development site to determine the range of noise levels at varying locations across the site;
2. A review of the most applicable standards and guidelines has been conducted in order to set a range of acceptable noise and vibration criteria for the construction and operational phases of the proposed development, this is summarised in the following sections;
3. Predictive calculations have been performed to estimate the likely noise emissions during the construction phase of the project at the nearest sensitive locations (NSLs) to the site;
4. Predictive calculations have been performed to assess the potential impacts associated with the operation of the development at the most sensitive locations surrounding the development site;
5. An assessment of inward noise impact from the existing road noise sources on the proposed development; and,

6. A schedule of mitigation measures has been proposed, where relevant, to control the noise and vibration emissions associated with both the construction and operational phases of the proposed development.

9.2.1 CONSTRUCTION PHASE – NOISE

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local Authorities typically control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

9.2.1.1 British Standard BS 5228 – 1: 2009+A1:2014

As we do not have any published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project however local authorities normally control construction activities by imposing limits on the hours of operation with certain noise limits at their discretion. Reference is made to British Standard *BS 5228 – 1: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Noise* (hereinafter referred to as BS 5228-1:2009+A1:2014) as appropriate criteria relating to permissible construction noise threshold levels for a development of this scale may be found in BS 5228-1:2009+A1:2014.

Potential noise impacts during the construction stage of a project are often assessed in accordance with BS 5228-1:2009+A1:2014. Various mechanisms are presented as examples of determining if an impact is occurring, these are discussed in the following paragraphs.

ABC Method

The approach adopted here calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a significant noise impact is associated with the construction activities, depending on context.

BS 5228-1:2009+A1:2014 sets out guidance on permissible noise levels relative to the existing noise environment. Table 9.1 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors.

Table 0-1. Example Threshold of Significant Effect at Dwellings

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A [A]	Category B [B]	Category C [C]
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
Evenings and weekends D	55	60	65
Night-time (23:00 to 07:00hrs)	45	50	55

A. Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
B. Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
C. Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.
D. 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

For the appropriate assessment period (i.e., daytime in this instance) the ambient noise level is determined and rounded to the nearest 5 dB. If the construction noise exceeds the appropriate category value, then a significant effect is deemed to occur. It should be noted that this assessment method is only valid for residential properties and if applied to commercial premises without consideration of other factors may result in an excessively onerous threshold being set.

The closest neighbouring noise-sensitive properties to the proposed development are existing dwellings within the masterplan site, to the west of both the northern and southern sectors of the proposed development.

Fixed Limits

Review of the proposed development surroundings identified Malahide Community School located 180m to the east of the subject site.

When considering non-residential receptors, reference is made to BS 5228-1:2009+A1:2014, which gives several examples of acceptable limits for construction noise, the most simplistic being based upon the exceedance of fixed noise limits. For example, paragraph E.2 states: -

> *"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut."*

Paragraph E.2 goes on to state: -

> *"Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary, should not exceed: -*
>
> *70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise;*
>
> *75 decibels (dBA) in urban areas near main roads in heavy industrial areas".*

Proposed Threshold Noise Levels

Taking into account the proposed documents outlined above and making reference to the baseline noise environment monitored around the development site (see Section 9.3), BS 5228-1:2009+A1:2014 has been used to inform the assessment approach for construction noise.

The following Construction Noise Threshold (CNT) levels are proposed for the construction stage of this development: -

1. For residential NSLs it is considered appropriate to adopt 65 dB(A) CNT depending on the existing noise level. Given the baseline monitoring carried out, it would indicate that Category A and C values are appropriate using the ABC method.
2. For non-residential NSLs it is considered appropriate to adopt the 70 dB(A) CNT, given the urban environment in which the community centre resides, in line with BS 5228-1:2009+A1:2014.

Interpretation of the CNT

In order to assist with the interpretation of CNTs, Table 9.2 includes guidance as to the likely magnitude of the impact associated with construction activities, relative to the CNT. This guidance is derived from Table 3.16 of *DMRB: Noise and Vibration* and adapted to include the relevant significant effects from the *EPA Guidelines* (EPA 2017).

Table 0-2. Construction Noise Significance Ratings

Guidelines for Noise Impact Assessment Significance (DMRB)	CNT per Period	EPA EIAR Significance Effects	Determination
Negligible	Below or equal to baseline noise level	Not Significant	Depending on CNT, duration & baseline noise level
Minor	Above baseline noise level and below or equal to CNT	Slight to Moderate	
Moderate	Above CNT and below or equal to CNT +5 dB	Moderate to Significant	
Major	Above CNT +5 to +15 dB	Significant, to Very Significant	
	Above CNT +15 dB	Very Significant to Profound	

The adapted DMRB guidance outlined will be used to assess the predicted construction noise levels at NSLs and comment on the likely impacts during the construction stages.

9.2.1.3 Construction Traffic

In order to assist with the interpretation of construction traffic noise, Table 9.3 includes guidance as to the likely magnitude of the impact associated with changes in traffic noise levels along an existing road. This is taken from Table 3.17 of the *DMRB Noise and Vibration* (UKHA 2020).

Table 0-3. Likely Effect Associated with Change in Traffic Noise Level – Construction Phase

Magnitude of Impact	Increase in Traffic Noise Level (dB)
No impact	Less than 1.0
Minor	Greater than or equal to 1.0 and less than 3.0
Moderate	Greater than or equal to 3.0 and less than 5.0
Major	Greater than or equal to 5.0

In accordance with the *DMRB Noise and Vibration*, construction noise and construction traffic noise impacts shall constitute a significant effect where it is determined that a major or moderate magnitude of the impact will occur for a duration exceeding:

1. Ten or more days or nights in any 15 consecutive days or nights;
2. A total number of days exceeding 40 in any six consecutive months.

9.2.2 CONSTRUCTION PHASE – VIBRATION

Vibration standards address two aspects: those dealing with cosmetic or structural damage to buildings and those with human comfort. For the purpose of this scheme, the range of relevant criteria used for surface construction works for both building protection and human comfort are expressed in terms of Peak Particle Velocity (PPV) in mm/s.

9.2.2.1 Building Damage

With respect to vibration, British Standard BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Vibration recommends that for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in the frequency range of predominant pulse) of 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. The standard also notes that below 12.5 mm/s PPV the risk of damage tends to zero. It is therefore common, on a cautious basis to use this lower value. Taking the above into consideration the vibration criteria in Table 9.4 are recommended.

Table 0-4. Recommended Vibration Criteria During Construction Phase

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of:		
Less than 15Hz	15 to 40Hz	40Hz and above
12 mm/s	20 mm/s	50 mm/s

Expected vibration levels from the construction works will be discussed further in Section 9.5.

9.2.2.2 Human Perception

People are sensitive to vibration stimuli at levels orders of magnitude below those which have the potential to cause any cosmetic damage to buildings. There are no current standards that provide guidance on typical ranges of human response to vibration in terms of PPV for continuous or intermittent vibration sources.

BS5228-2:2009+A1:2014, provides a useful guide relating to the assessment of human response to vibration in terms of the PPV. Whilst the guide values are used to compare the typical human response to construction works, they tend to relate closely to general levels of vibration perception from other general sources.

Table 9.5 below summarises the range of vibration values and the associated potential effects on humans.

Table 0-5. Guidance on Effects of Human Response to PPV Magnitudes

Vibration Level, PPV	Effect
0.14mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies. At lower frequencies people are less sensitive to vibration.
0.3mm/s	Vibration might be just perceptible in residential environments.
1mm/s	It is likely that a vibration level of this magnitude in residential environments will cause complaint.

Vibration typically becomes perceptible at around 0.15 to 0.3 mm/s and may become disturbing or annoying at higher magnitudes. However, higher levels of vibration are typically tolerated for single events or events of short-term duration, particularly during construction projects and when the origin and or the duration of vibration is known. For example, ground breaking can typically be tolerated at vibration levels up to 2.5 mm/s if adequate public relations are in place and timeframes are known. These values refer to the day-time periods only.

During surface construction works (demolition and groundbreaking etc.) the vibration limits set within Table 9.5 would be perceptible to building occupants and have the potential to cause subjective effects. The level of effect is, however, greatly reduced when the origin and time frame of the works are known and limit values relating to structural integrity are adequately communicated. In this regard, the use of clear communication and information circulars relating to planned works, their duration and vibration monitoring can significantly reduce vibration effects to the neighbouring properties.

Interpretation of the Human Response to Vibration

In order to assist with interpretation of vibration thresholds, Table 9.6 presents the significance table relating to potential impacts to building occupants during construction based on guidance from BS5228-2:2009+A1:2014.

Table 0-6. Human Response Vibration Significance Ratings

Criteria	Impact Magnitude	Significance Rating
≥10 mm/s PPV	Very High	Very Significant
≥1 mm/s PPV	High	Moderate to Significant
≥0.3 mm/s PPV	Medium	Slight to Moderate
≥0.14 mm/s PPV	Low	Not significant to Slight
Less than 0.14 mm/s PPV	Very Low	Imperceptible to Not significant

9.2.3 OPERATIONAL PHASE – NOISE

9.2.3.1 Mechanical Plant

The most appropriate standard used to assess the impact of a new continuous source (i.e. plant items) to a residential environment is BS 4142 *Methods for rating and assessing industrial and commercial sound* (2014). This standard describes a method for assessing the impact of a specific noise source at a specific location with respect to the increase in "background" noise level that the specific noise source generates. The standard provides the following definitions that are pertinent to this application:

1. "Specific sound level, LAeq, Tr" is equivalent to continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T. This level has been determined with reference manufacturers'ers information for specific plant items.
2. "Rating level" LAr,Tr is the specific noise level plus adjustments for the character features of the sound (if any), and;
3. "Background noise level" is the A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T. This level is expressed using the LA90 parameter. These levels were measured as part of the baseline survey.

The assessment procedure in BS4142: 2014 is outlined as follows:

1. determine the specific noise level;
2. determine the rating level as appropriate;
3. determine the background noise level, and;
4. subtract the background noise level from the specific noise level in order to calculate the assessment level.

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific source will have an adverse impact or a significant adverse impact. A difference of +10 dB or more is likely to be an indication of a significant adverse impact. A difference of around +5 dB is likely to be an indication of an adverse impact, dependent on the context. Where the rated plant noise level is equivalent to the background noise level, noise impacts are typically considered to be neutral.

9.2.3.2 Traffic Noise

There are no specific guidelines or limits relating to traffic-related sources along the local or surrounding roads. Given that traffic from the development will make use of existing roads already carrying traffic volumes, it is appropriate to assess the calculated increase in traffic noise levels that will arise because of vehicular movements associated with the development. In order to assist with the interpretation of the noise associated with additional vehicular traffic on public roads, Table 9.7 is taken from DMRB Design Manual for Roads and Bridges (DMRB), Highways England Company Limited, Transport Scotland, The Welsh Government and The Department for Regional Development Northern Ireland, (2020).

Table 0-7. Significance in Change of Noise Level

Change in Sound Level (dB)	Subjective Reaction	Magnitude of Impact	EPA Glossary of Effects[1]
10+	Over a doubling of loudness	Major	Significant
5 – 9.9	Up to a doubling of loudness	Moderate	Moderate
3 – 4.9	Perceptible	Minor	Slight
0.1 – 2.9	Imperceptible	Negligible	Imperceptible
0	None	No Change	Neutral

The guidance outlined in Table 9.7 will be used to assess the predicted increases in traffic levels on public roads associated with the proposed development and comment on the likely long-term impacts during the operational phase.

9.2.3.3 Vibration

The development is residential in nature; therefore it is not anticipated that there will be any impact associated with vibration during the operational phase.

9.2.3.4 Fingal Development Plan Policy on Aircraft Noise

The Site of the proposed Project is located in Zone C with part of the southern sector located in Zone B, as illustrated in Figure 9.1 below.

[1] EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports, (Draft August 2017)

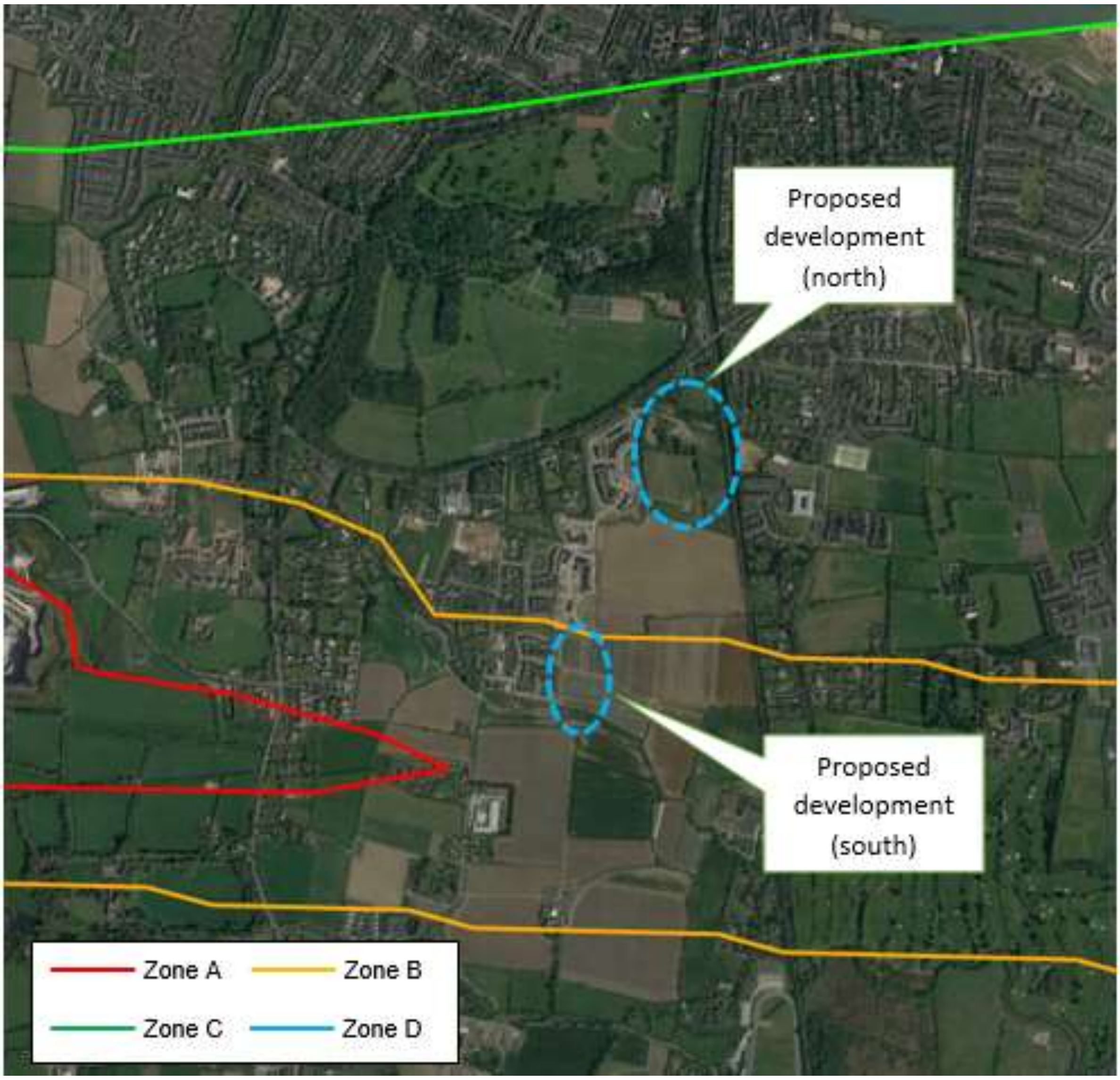

Figure 0-1. Proposed Airport Noise Zones – Site Location

The members of Fingal County Council (FCC) resolved to adopt Variation No. 1 of the Fingal Development Plan 2017-2023 (the 'Development Plan') at a Council meeting on 9 December 2019. Variation No. 1 outlines revised Noise Zones and policy objectives in relation to aircraft noise from Dublin Airport.

Four noise zones (Zone A to D) are now indicated representing potential site exposure to aircraft exposure. The council will actively resist residential development within Zone A, and resist in Zone B and C pending independent acoustic advice and mitigation measures. Certain specific residential developments located in Zone D may be required to demonstrate that aircraft noise intrusion has been considered in the design.

Table 9.8 below outlines the objectives to be adhered to by applicants for developments in the zones relevant in this instance.

Table 0-8. Aircraft Noise Zones

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
D	≥ 50dB and < 54dB $L_{Aeq, 16hr}$ and ≥ 40dB and < 48dB L_{night}	To identify noise sensitive developments which could potentially be affected by aircraft noise and to identify any larger residential developments in the vicinity of the flight paths serving the Airport in order to promote appropriate land use and to identify encroachment. All noise sensitive development within this zone is likely to be acceptable from a noise perspective. An associated application would not normally be refused on noise grounds, however where the development is residential-led and comprises non-residential noise sensitive uses, or comprises 50 residential units or more, it may be necessary for the applicant to demonstrate that a good acoustic design has been followed. Applicants are advised to seek expert advice.
C	≥ 54dB and < 63dB $L_{Aeq, 16hr}$ and ≥ 48dB and < 55dB L_{night}	To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure, where appropriate, noise insulation is incorporated within the development Noise sensitive development in this zone is less suitable from a noise perspective than in Zone D. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed. The noise assessment must demonstrate that relevant internal noise guidelines will be met. This may require noise insulation measures. An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels. Applicants are strongly advised to seek expert advice.
B	≥ 54 dB and < 63 dB $L_{Aeq, 16hr}$ And ≥ 55 dB L_{night}	**To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure noise insulation is incorporated within the development.** *Noise sensitive development in this zone is less suitable from a noise perspective than in Zone C. A noise assessment **must** be undertaken in order to demonstrate good acoustic design has been followed.* *Appropriate well-designed noise insulation measures **must** be incorporated into the development in order to meet relevant internal noise guidelines.* *An external amenity area noise assessment **must** be undertaken where external amenity space is intrinsic to the development's design. This assessment should make*

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
		specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels. *Applicants **must** seek expert advice.*
A	≥ 63 dB $L_{Aeq, 16hr}$ and/or ≥ 55 dB L_{night}	**To resist new provision for residential development and other noise sensitive uses.** *All noise sensitive developments within this zone may potentially be exposed to high levels of aircraft noise, which may be harmful to health or otherwise unacceptable. The provision of new noise sensitive developments will be resisted.*
Notes: '*Good Acoustic Design'* means following the principles of assessment and design as described in ProPG: *Planning & Noise – New Residential Development, May 2017*; Internal and External Amenity and the design of noise insulation measures should follow the guidance provided in British Standard BS 8233:2014 *'Guidance on sound insulation and noise reduction for buildings'*.		

9.2.3.5 Noise Action Plan for Dublin Airport 2019-2023

The *Noise Action Plan* for Dublin Airport (2019-2023) was published by FCC on 19 December 2019. The *Noise Action Plan* outlines the following objective in relation to aircraft noise:

> *"to avoid, prevent and reduce, where necessary, on a prioritised basis the effects due to long term exposure to aircraft noise, including health and quality of life through implementation of the International Civil Aviation Organisation's 'Balanced Approach' to the management of aircraft noise as set out under EU Regulation 598/2014"*

Whilst the *Noise Action Plan* outlines a range of measures to achieve this objective, the document is focussed primarily on the outward impact of the airport and aircraft noise and consider planning only in the context of outward impact such as the encroachment of airport activities on existing uses.

Discussion on the consideration of the inward noise impacts on residential amenity is considered in more detail in the *Dublin Agglomeration Noise Action Plan 2019-2023*.

9.2.3.6 Dublin Agglomeration Noise Action Plan 2019 - 2023

The Dublin Agglomeration NAP states the following with respect to assessing the noise impact on new residential development:

> *"In the scenario where new residential development or other noise sensitive development is proposed in an area with an existing climate of environmental noise, there is currently no clear national guidance on appropriate noise exposure levels. The EPA has suggested in the interim, that Action Planning Authorities should examine planning policy guidance notes, such as ProPG*

(2017). Such guidance notes have been produced with a view to providing practitioners with guidance on a recommended approach to the management of noise within the planning system."

In addition, the following is provided:

"In advance of any national guidance relating to noise in the planning process, the following actions relating to planning and development will be considered for implementation:

1. *To integrate Noise Action Plans into the County Development Plans.*
2. *To develop guidelines relating to Noise and Planning for FCC. These guidelines should outline the considerations to be taken into account when determining planning applications for both noise-sensitive developments and for those activities which will generate noise. They should introduce the concept of a risk based approach to assessment of noise exposure, and for Good Acoustic Design to be encouraged as part of all new residential developments in FCC.*
3. *To require developers to produce a noise impact assessment and mitigation plans, where necessary, for any new development where the Planning Authority considers that any new development will impact negatively on pre-existing environmental noise levels within their Council area.*
4. *To ensure that future developments are designed and constructed in such a way as to minimise noise disturbances in accordance with Department of the Environment, Community and Local Government planning guidelines such as the Urban Design Manual. e.g. the position, direction and height of new buildings, along with their function, their distance from roads, and the position of noise barriers and buffer zones with low sensitivity to noise,*
5. *To ensure that new housing areas and in particular brown field developments will be planned from the outset in a way that ensures that at least the central area is quiet. This could mean designating the centre of new areas as pedestrian and cycling zones with future developments to provide road design layouts to achieve low speed areas where appropriate.*
6. *To incorporate street design in new developments, which recognise that residential streets have multi-function uses (e.g. movement, recreation) for pedestrians, cyclists and vehicles, in that priority order. The noise maps will be used to identify and classify the priority areas and streets. In the design of streets, cognisance should be given to the Irish Manual for Roads and Streets 2013.*
7. *To require sound proofing for all windows, in all new residential developments, where noise maps have indicated undesirable high noise levels. This may also lead to a requirement to install ducted ventilation.*
8. *To advise during pre-planning meetings regarding site specific design, the orientation of sensitive rooms and balconies away from noise, designing the layout and internal arrangement in apartments to ensure that similar rooms in individual units are located above each other or adjoin each other and that halls are used as buffer zones between sensitive rooms and staircases."*

In accordance with the Dublin Agglomeration NAP policy, an Acoustic Design Statement (ADS) has been incorporated into this EIAR chapter to comply with the requirements of this policy.

9.2.3.7 Inward Noise - ProPG Planning & Noise

The *Professional Guidance on Planning & Noise*: New Residential Development (ProPG) and associated supplementary documents[2] were published in May 2017. The document was prepared by a working group comprising members of the Association of Noise Consultants (ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH). Although not a government document, since its adoption it has been generally considered as a best practice guidance and has been widely adopted in the absence of equivalent Irish guidance.

The ProPG outlines a systematic risk based 2 stage approach for evaluating noise exposure on prospective sites for residential development. The two primary stages of the approach can be summarised as follows:

- Stage 1 - Comprises a high-level initial noise risk assessment of the proposed site considering either measured and or predicted noise levels; and,
- Stage 2 – Involves a full detailed appraisal of the proposed development covering four "key elements" that include:
    - Element 1 - Good Acoustic Design Process;
    - Element 2 - Noise Level Guidelines;
    - Element 3 - External Amenity Area Noise Assessment
    - Element 4 - Other Relevant Issues

A key component of the evaluation process is the preparation and delivery of an Acoustic Design Statement (ADS) which is intended for submission to the planning authority. This document is intended to clearly outline the methodology and findings of the Stage 1 and Stage 2 assessments, so as the planning authority can make an informed decision on the permission. ProPG outlines the following possible recommendations in relation to the findings of the ADS:

A. *Planning consent may be granted without any need for noise conditions;*

B. *Planning consent may be granted subject to the inclusion of suitable noise conditions;*

C. *Planning consent should be refused on noise grounds in order to avoid significant adverse effects ("avoid"); or,*

D. *Planning consent should be refused on noise grounds in order to prevent unacceptable adverse effects ("prevent").*

Section 3.0 of the ProPG provides a more detailed guide on decision making to aid local authority planners on how to interpret the findings of an accompanying Acoustic Design Statement (ADS).

A summary of the ProPG approach is illustrated in Figure 9.2.

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2 PropG Supplementary Document 1 (May 2017) on Planning and Noise Policy and Guidance and PropG Supplementary Document 2 (May 2017) on Good Acoustic Design for Residential Development

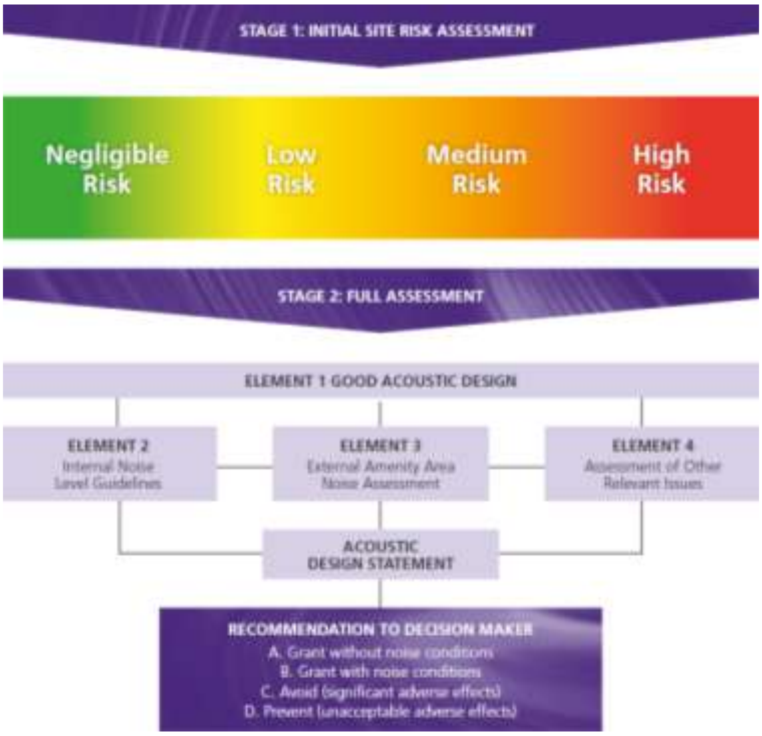

Figure 0-2. ProPG Approach (Source: ProPG)

9.2.3.8 British Standard BS 8233:2014

Internal Noise

There are no statutory guidelines or specific local guidelines relating to appropriate internal noise levels in dwellings. In this instance, reference is made to BS 8233: 2014: *Guidance on sound insulation and noise reduction for buildings.*

BS 8233 sets out recommended internal noise levels for several different building types from external noise sources such as traffic. The guidance is primarily for use by designers and hence BS 8233 may be used as the basis for an appropriate schedule of noise control measures. The recommended indoor ambient noise levels for residential dwellings and other spaces are set out in Table 9.9.

Table 0-9. Indoor Ambient Noise Levels for Dwellings from BS8233: 2014

Activity	Location	Day (07:00 to 23:00hrs) dB $L_{Aeq,16hr}$	Night (23:00 to 07:00hrs) dB $L_{Aeq,8hr}$
Resting	Living room	35	-
Dining	Dining room/area	40	-
Sleeping (Daytime resting)	Bedroom	35	30
Commercial	Open plan office	40	-

BS 8233 also provides some guidance on individual noise events, it states:

> *"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or L_{AFmax}, depending on the character and number of events per night. Sporadic noise events could require separate values."*

Typically, a 45 dB L_{AFmax} criterion is applied to individual noise events within bedrooms at night. This criterion is generally considered a noise level that should not typically be exceeded.

External Noise

BS 8233 also provides desirable noise levels for external amenity areas such as gardens, patios and balconies. It states:

> *"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."*

9.2.4 OPERATIONAL PHASE - VIBRATION

Taking into account the expected activities associated with the operational phase of the proposed development, it is not anticipated that there will be any impact associated with vibration.

Inward vibration impact from rail traffic has been considered. The relevant vibration criteria are set out below.

Vibration Dose Value (VDV)

Guidance relating to human response to vibration is contained within BS 6472 Guide to evaluation of human exposure to vibration in buildings (2008): Part 1 - Vibration sources other than blasting.

BS 6472 uses the Vibration Dose Value (VDV) which is measured or forecast over the day or night-time periods in terms of m·s-1.75. The VDV parameter takes into account how people respond to vibration in terms of frequency content, vibration magnitude and the number of vibration events during an assessment period.

The following table, as set out in the standard, details the values of VDV where various comments from occupiers are possible. The standard notes that the values are applicable for both vertical and horizontal vibration with the appropriate weighting applied. The values in Table 2 have been adopted for this assessment.

Table 0-10. VDV (m·s-1.75) above which various degree of adverse comment may be expected in residential buildings.

Building Type	Low probability of adverse comment	Adverse comment possible	Adverse comment probable
Residential Building Day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential Building Night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

9.3 Receiving Environment

The proposed development is located at Back Road, Broomfield, Malahide, Co. Dublin. The site is bounded to the east by the Dublin-Belfast Railway line and to the north by the Back Road. The site is also located within the proposed Dublin Airport Noise Zones. The northern sector of the site is located in Zone C, while the southern sector of the site is located in Zone B.

The two parts of the proposed development are located adjacent to other phases of the Masterplan site and also near residential properties located off Kinsealy Lane to the west.

9.3.1 BASELINE NOISE ENVIRONMENT

Baseline noise monitoring has been undertaken across the development site to determine the range of noise levels at varying locations across the site.

9.3.1.1 Environmental Noise Survey

An environmental noise survey has been conducted at the site in order to quantify the existing noise environment. The survey was conducted in general accordance with ISO 1996: 2017: *Acoustics – Description, measurement and assessment of environmental noise.* Specific details are set out below.

Choice of Measurement Locations

An environmental noise survey has been conducted at the site in order to quantify the existing noise environment. The survey was conducted in general accordance with ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise. Specific details are set out below.

Choice of Measurement Locations

The measurement locations are described below and shown in Figure 9.3.

NM1 located adjacent to the southern sector of the proposed development at Castleway.

NM2 located adjacent to existing houses in the northern sector of the site.

NM3 located adjacent to the rail line to the east of the site.

NM4 unattended noise monitor located inside the north eastern site boundary.

Figure 0-3. Noise Monitoring Locations (Image Source: Google Maps)

Survey Periods

The noise survey was carried out over the following periods:

Table 0-11. Survey Periods

Aspect	Survey Position	Survey Period
Noise	NM1	13:55hrs to 18:15hrs on 22 September 2021
	NM2	
	NM3	
	NM4 (unattended)	17:45hrs on 12th to 15:45hrs on 15th October 2021
Vibration	VM1	13:55hrs to 18:15hrs on 22 September 2021

Instrumentation

The noise and vibration measurements were carried out using the equipment listed below. The instrument was calibrated before and after the survey with no significant drift noted.

Table 0-12. Monitoring Equipment Details

Measurement	Manufacturer	Equipment Model	Serial Number	Calibration date
Noise	RION	NL-52	164427	5/5/2020
Vibration	Instantel	Minimate	BE20173	23/3/2021

Measurement Parameters

The noise survey results are presented in terms of the following parameters.

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

L_{AFmax} is the instantaneous maximum sound level measured during the sample period using the 'F' time weighting.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

Survey Results and Discussion

The results of the noise survey at the four monitoring locations are summarised below.

Location NM1

Table 0-13. Measured Noise Levels at NM1

Period	Time	Measured Noise Levels (dB re. $2x10^{-5}$Pa)		
		L_{Aeq}	L_{Amax}	L_{A90}
Daytime	13:55	46	54	42
	15:37	47	62	42
	17:06	44	61	41

During the daytime at this location the primary noise sources were observed to be distant road traffic, distant construction works, foliage noise and activity at nearby houses. Birdsong and distant aircraft noise also contributed to measured noise levels. Ambient noise levels were in the range of 44 to 47 dB L_{Aeq}. Maximum levels ranged from 54 to 62 dB L_{Amax}. Background noise levels were in the range of 41 to 42 dB L_{A90}.

Location NM2

Table 0-14. Measured Noise Levels at NM2

Period	Time	Measured Noise Levels (dB re. $2x10^{-5}$Pa)		
		L_{Aeq}	L_{Amax}	L_{A90}
Daytime	14:43	56	67	50
	16:07	52	68	45

	17:33	49	61	44

During the daytime at this location the primary noise sources were observed to be construction noise from adjacent sites, distant aircraft noise and agricultural activity. Birdsong and foliage noise were also observed. Ambient noise levels were in the range of 49 to 56 dB L_{Aeq}. Maximum levels ranged from 61 to 67 dB L_{Amax}. Background noise levels were in the range of 44 to 50 dB L_{A90}.

Location NM3

Table 0-15. Measured Noise Levels at NM3

Period	Time	Measured Noise Levels (dB re. 2x10^{-5}Pa)		
		L_{Aeq}	L_{Amax}	L_{A90}
Daytime	15:06	50	61	48
	16:38	52	64	48
	17:58	52	70	43

During the daytime at this location the primary noise source was noted to be from rail movements on the adjacent line. Birdsong, foliage noise and distant road traffic noise were also noted to be contributing to measured noise levels. Ambient noise levels were in the range of 50 to 52 dB L_{Aeq}. Maximum levels ranged from 61 to 70 dB L_{Amax}. Background noise levels were in the range of 43 to 48 dB L_{A90}.

Location NM4

The unattended measurements collected over the survey period are summarised below.

Table 0-16. Measured Noise Levels at NM4

Date	Period	Average Measured Noise Levels (dB re. 2x10^{-5} Pa)		
		L_{Aeq}	L_{Amax}	L_{A90}
12/10/21	Day	46	71	40
	Night	39	63	31
13/10/21	Day	48	71	42
	Night	41	64	34
14/10/21	Day	49	69	44
	Night	39	62	30
15/10/21	Day	46	68	39
	Night	-	-	-
Average	Day	47	71	41
	Night	40	64	32

On installation and collection at this location the primary noise sources were observed to be in keeping with those at Location NM3 to the south. Average daytime ambient noise levels ranged from 46 to 49 dB $L_{Aeq,16hr}$ with an average of 47 dB $L_{Aeq,16hr}$. Average daytime background noise levels ranged from 39 to 44 dB $L_{A90,16hr}$ with an average of 41 dB $L_{A90,16hr}$.

Average night-time ambient noise levels ranged from 39 to 41 dB $L_{Aeq,8hr}$ with an average of 40 dB $L_{Aeq,8hr}$. Average night-time background noise levels ranged from 30 to 34 dB $L_{A90,8hr}$ with an average of 32 dB $L_{A90,8hr}$.

In addition, the L_{AFmax} values were measured over 15-minute intervals over the duration of the unattended monitoring survey. Figure 9.4 presents the number of measured L_{AFmax} events for each decibel level during the night period measured at Location NM4. On review of the maximum noise levels the value of 65 dB L_{AFmax} is not regularly exceeded on a given night (less than 10 events).

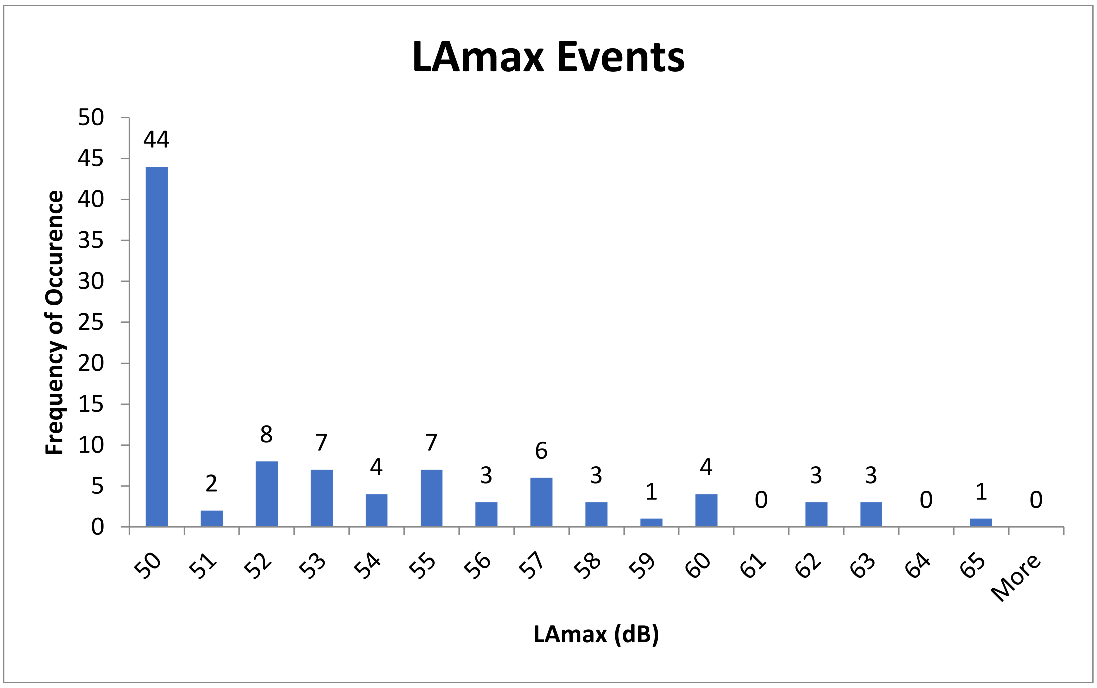

Figure 0-4. Distribution of LAmax events – Night-time

Location VM1

Attended vibration measurements were made during the survey period in order to capture baseline vibration levels along the eastern site boundary adjacent to the rail line. The measurement position was chosen so as to be representative of the location of future development buildings. The measured PPV and VDV levels are summarised below.

Review of the measured noise levels indicated that at the measurement position rail movements on the rail line were not contributing to measured vibration levels. PPV levels exceeded the value 0.30 mm/s several times, i.e the vibration level that may be just perceptible in a residential setting. The average vibration levels were 0.06 – 0.08 mm/s and would not be perceptible.

Table 0-17. Measured PPV Levels at NM4

Parameter	X-axis PPV	Y-axis PPV	Z-axis PPV
Maximum	0.44	0.47	0.41
Minimum	0.03	0.03	0.03
Average	0.08	0.07	0.06

To account for the regularity of rail movements the VDV levels are reviewed.

Table 0-18. Measured VDV Levels at NM4

Parameter	X-axis VDV	Y-axis VDV	Z-axis VDV
Maximum	0.00289	0.00381	0.01992
Minimum	0.00024	0.00023	0.00028
Average	0.00049	0.00047	0.00205

Based on measured levels the maximum VDV value was of the order of 0.08 $m{\cdot}s^{-1.75}$. Based on 70 train movements per 16-hour daytime period, this results in a value for $VDV_{b,\ day}$ of 0.008 $m{\cdot}s^{-1.75}$. Based on 6 train movements during the night-time period the predicted value for $VDV_{b,\ night}$ is 0.005 $m{\cdot}s^{-1.75}$.

Therefore, with reference to Table 9.10 the predicted daytime and night-time VDV period values are orders of magnitude below a level that would correspond to even a low probability of adverse comment.

9.3.1.2 Do Nothing Scenario

In the absence of the proposed development being constructed, the noise environment at the nearest noise sensitive locations and within the development site will remain largely unchanged.

9.4 Characteristics of the Proposed Development

The proposed development is located on lands at Back Road, Broomfield, Malahide, Co. Dublin. The proposed development will consist of the demolition of the former clubhouse building on site and the proposed construction of 415 no. residential units comprising 252 no. houses and associated car parking, 28 no. duplex units and 135 no. apartments Blocks A & B providing ancillary amenity facilities, all provided with private balconies/terraces and associated car parking and bicycle parking; 1 no. childcare facility; landscaping including play equipment; boundary treatments; public lighting; and all associated site infrastructure and engineering works necessary to facilitate the development including proposed connection to permitted upgrades to existing foul network along Kinsealy Lane. A full description of the development is available in Chapter 2.

When considering a development of this nature, the potential noise and vibration impact on the surroundings is considered for each of two distinct stages:

1. Construction and demolition phase; and,
2. Operational phase.

The construction phase will involve demolition, excavation over the development site, construction of foundations and buildings, landscaping, and vehicle movements to site using the local road network. This phase will generate the highest potential noise impact due to the works involved, however the time frame is short term in duration.

The primary sources of outward noise in the operational context are deemed to be long term in duration and will comprise traffic movements to the development site using the existing road network and plant noise emissions from the completed buildings. These issues are discussed in detailed in the following sections.

Inward noise incident on the development from existing noise sources, specifically rail traffic and aircraft noise, is also assessed.

9.5 Potential Impacts

The potential noise and vibration impacts associated with the construction and operational phases of the proposed development are discussed in the following sections.

9.5.1 CONSTRUCTION PHASE

9.5.1.1 Noise

During the construction phase of the proposed development, a variety of items of plant will be in use, such as excavators, piling equipment, dumper trucks, compressors and generators. Due to the nature of daytime activities undertaken on a construction site such as this, there is potential for generation of significant levels of noise. The flow of vehicular traffic to and from a construction site is also a potential source of relatively high noise levels.

Taking into account the outline construction methodology, it is possible to predict typical noise levels using guidance set out in BS 5228-1:2009+A1:2014. Table 9.19 outlines typical plant items and associated noise levels that are anticipated for various phases of the construction programme.

Table 0-19. Reference Plant Noise Emissions

Activity	Item of Plant *(BS5228 Ref)*	L_{Aeq} at 10m
Site Clearance	Tracked excavator (C2.21)	71
	Dump Truck (C2.30)	79
	Dozer (C2.13)	78
	Diesel Generator (C4.76)	61
Demolition*	Breaker Mounted on Backhoe (C1.2)	92
	Pulveriser on Tracked Excavator (C1.5)	72
	Tracked Crusher (C1.14)	82
	Dump Truck (C4.2)	78
Foundations	Tracked Excavator (C3.24)	72
	Concrete Pump (C3.25)	78
	Compressor (D7.6)	77
	Poker Vibrator (C4 33)	78
	Dump Truck (C4.2)	78
General Construction	Compressor (D7.8)	70
	Telescopic Handler (C4.54)	79
	Hand Held Circular Saw (C4.72)	79
	Diesel Generator (C4.76)	61
	Internal Fit out	70
Road Works/Landscaping	Asphalt Paver & Tipping Lorry (C5.30)	75
	Electric Water Pump (C5.40)	68
	Vibratory Roller (C5.20)	75

Note It is assumed that demolition will be localised at the existing building located in the east of the site.

The calculations also assume that the equipment will operate for 66% of the 12-hour working day (i.e. 8 hours) and that a standard site hoarding, typically 2.4m height will be erected around the perimeter of the construction site for the duration of works. It is assumed that construction works will take place during normal working hours only.

The closest noise sensitive locations have been identified as shown in Figure 9.3 and described below.

NSL 1 Hazelbrook housing estate on Kinsealy Lane, located to the east of the proposed site some 20m from the nearest significant site works;

NSL 2 Ashwood Hall housing estate on the Back Road some 30m west of the proposed site.

NSL 3 The Fairview apartments and houses at Galtrim Grange located to the east of the site some 50m from the nearest significant site works;

NSL 4 Malahide Community School some 180m to the east of the proposed site.

Review of the baseline noise survey and the threshold values detailed in Table 9.1 indicates that the appropriate daytime noise criteria for construction noise are as follows:

1. NSL 1: 65 dB LAeq,1hr
2. NSL 2: 65 dB LAeq,1hr
3. NSL 3: 65 dB LAeq,1hr

The following noise threshold has been applied to NSL4:

NSL 4: 70 dB LAeq,1hr

Review of the baseline noise survey and the threshold values detailed in Table 9.1 indicates that the appropriate daytime noise criteria for construction noise are as follows:

- NSL 1: 65 dB $L_{Aeq,1hr}$
- NSL 2: 65 dB $L_{Aeq,1hr}$
- NSL 3: 65 dB $L_{Aeq,1hr}$

The following noise threshold has been applied to NSL4:

- NSL 4: 70 dB LAeq,1hr

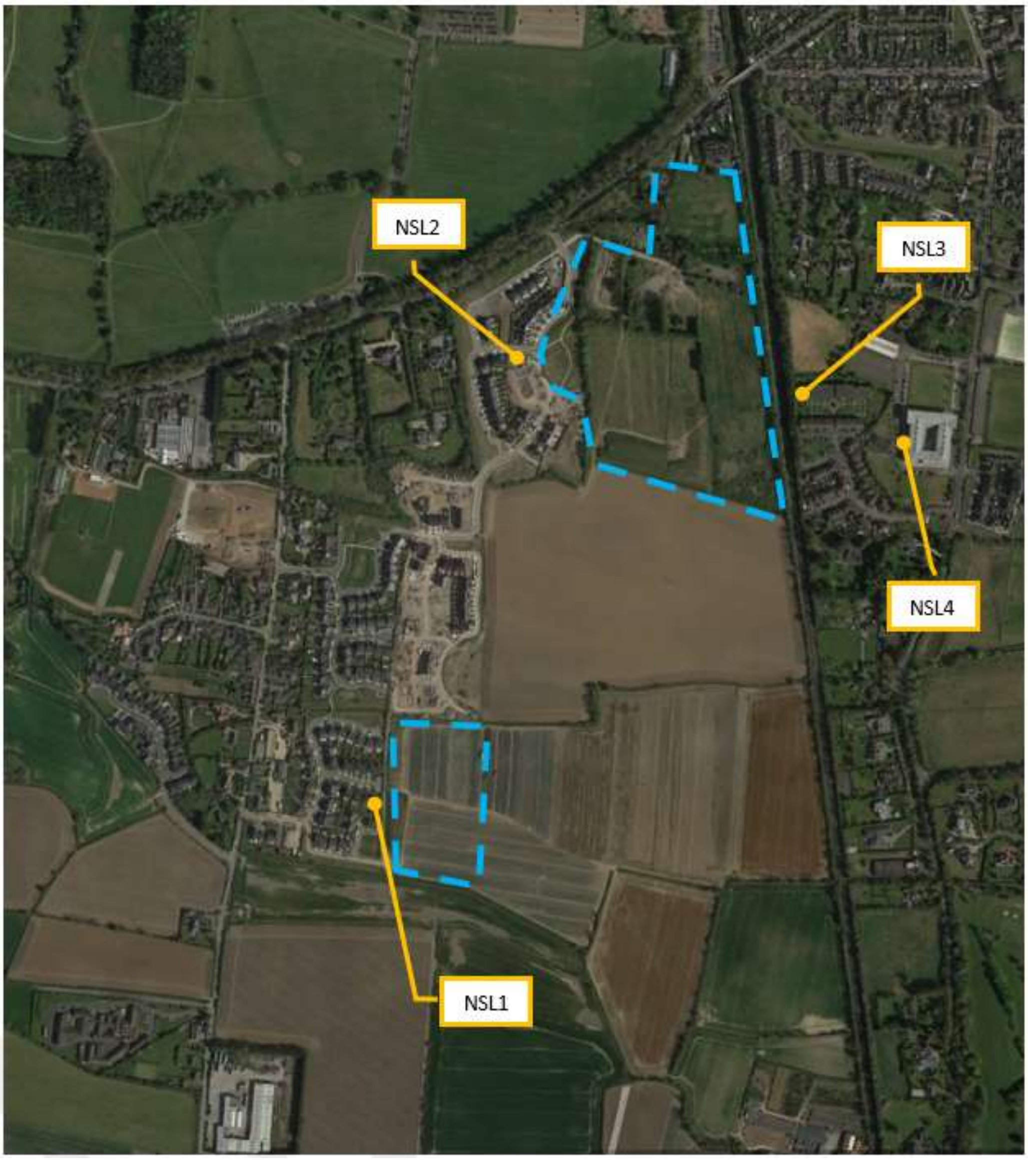

Figure 0-5. Site Context & Noise Assessment Locations (Image Source: Google Maps)

Table 9.20 below presents the predicted daytime noise levels from an indicative construction period at these noise sensitive locations (NSLs).

Table 0-20. Indicative Construction Noise Levels at Nearest Noise Sensitive Locations

Construction Phase	Item of Plant (*BS 5228-1* Ref)	L_{Aeq} at distance (m)			
		NSL1 (20m)	NSL2 (30m)	NSL3 (50m)	NSL4 (180m)
Site Clearance	Tracked excavator (C2.21)	59	56	51	40
	Dump Truck (C2.30)	65	62	57	46
	Dozer (C2.13)	65	62	57	46
	Diesel Generator (C4.76)	48	45	40	29
Demolition	Breaker Mounted on Backhoe (C1.2)	73	73	66	56

Construction Phase	Item of Plant (*BS 5228-1* Ref)	L_{Aeq} at distance (m)			
		NSL1 (20m)	NSL2 (30m)	NSL3 (50m)	NSL4 (180m)
	Pulveriser on Tracked Excavator (C1.5)	53	53	46	36
	Tracked Crusher (C1.14)	63	63	56	46
	Dump Truck (C4.2)	59	59	52	42
Foundations	Tracked Excavator (C3.24)	59	56	51	40
	Concrete Pump (C3.25)	65	62	57	46
	Compressor (D7.6)	64	61	56	45
	Poker Vibrator (C4 33)	65	62	57	46
	Dump Truck (C4.2)	65	62	57	46
General Construction	Compressor (D7.8)	64	61	56	45
	Telescopic Handler (C4.54)	66	63	58	47
	Hand Held Circular Saw (C4.72)	66	63	58	47
	Diesel Generator (C4.76)	48	45	40	29
	Internal Fit out	57	54	49	38
Road Works/ Landscaping	Asphalt Paver & Tipping Lorry (C5.30)	62	59	54	43
	Electric Water Pump (C5.40)	55	52	47	36
	Vibratory Roller (C5.20)	62	59	54	43

Note – demolition is anticipated at the existing buildings in the southern sector of the site. Distances to the nearest NSLs have been adjusted to take this into account.

At a distance of 20-30m from areas of major construction, representative of NSL1 and NSL2, the predicted construction noise levels associated with demolition activities are above the 65 dB(A) CNT. The impact of this is negative, significant to very significant and temporary. Other activities are predicted to be under the CNT and therefore with reference to Table 9.2, it is expected that there will be a negative, slight to moderate and short-term impact associated with general construction, and a negative, slight to moderate and temporary impact associated with landscaping. These predicted effects are presented in the absence of mitigation measures.

At a distance of 50m from areas of major construction, representative of NSL3, the predicted construction noise levels are in-line and below the CNT, i.e. 65 dB(A) and therefore it is expected that there will be a negative, moderate and short-term impact at this location in the absence of mitigation.

At a distance of 180m from works at locations representative of NSL4, the predicted noise levels associated with the works are comfortably below the CNT, i.e. 70 dB(A) and therefore it is expected that there will be a negative, not significant and short-term impact at this location in the absence of mitigation.

Construction Traffic

During the construction phase of the proposed development there will be additional construction traffic on local roads. Considering that in order to increase traffic noise levels by 1 dB, traffic volumes would need to increase by the order of 25% it is considered that additional traffic introduced onto the local road network due to the construction phase will not result in a significant noise impact.

9.5.1.2 Vibration

During demolition and ground-breaking in the excavation phase, there is potential for vibration to propagate through the ground. Empirical data for this activity is not provided in the BS 5228-2:2009+A1:2014 standard, however the likely levels of vibration from this activity is expected to be below the vibration threshold for building damage on experience from other sites.

AWN have previously conducted vibration measurements under controlled conditions, during trial construction works, on a sample site where concrete slab breaking was carried out. The trial construction works consisted of the use of the following plant and equipment when measured at various distances:

1. 3 tonne hydraulic breaker on small CAT tracked excavator
2. 6 tonne hydraulic breaker on large Liebherr tracked excavator

Vibration measurements were conducted during various staged activities and at various distances. Peak vibration levels during staged activities using the 3 Tonne Breaker ranged from 0.48 to 0.25 PPV (mm/s) at distances of 10 to 50m respectively from the breaking activities. Using a 6 Tonne Breaker, measured vibration levels ranged between 1.49 to 0.24 PPV (mm/s) at distances of 10 to 50m respectively.

The range of values recorded provides some context in relation typical ranges of vibration generated by construction breaking activity likely required on the proposed site. This range of vibration magnitudes indicate vibration levels at the closest neighbouring buildings are likely to be below the limits set out in Table 9.4 to avoid any cosmetic damage to buildings.

In terms of disturbance to building occupants, works undertaken within close proximity to the residential receptors on the site perimeter have the potential to emit perceptible vibration levels.

Notwithstanding the above, any construction activities undertaken on the site will be required to operate below the recommended vibration threshold set out in Table 9.4 during all activities. Further discussion on mitigation measures during this phase are discussed in Section 9.6.2.

It is anticipated that excavations will be made using standard excavation machinery, which typically do not generate appreciable levels of vibration close to the source. Taking this into account and considering the distance that these properties are from the works and the attenuation of vibration levels over distance, the resultant vibration levels are expected to be well below a level that would cause disturbance to building occupants or even be perceptible.

The associated impact with these activities is considered to be negative, not significant and temporary.

9.5.2 OPERATIONAL PHASE

9.5.2.1 Mechanical Plant

It is expected that the principal items of building and mechanical services plant will be associated with ventilation and heating of the apartment blocks. These items will be selected at a later stage, however, they will be designed and located so that there is no negative impact on sensitive receivers in proximity to the proposed development. The services plant will be designed/attenuated to meet the relevant plant noise criteria for day and night-time periods at nearby sensitive receivers as set out in Section 9.2.3.1.

The effect associated with building services plant, once designed to achieve the relevant noise criteria, is categorised as negative, imperceptible and permanent.

9.5.2.2 Additional Traffic on Adjacent Roads

During the operational phase of the proposed development, there will be an increase in vehicular traffic associated with the site on some surrounding roads.

A traffic impact assessment relating to the proposed development has been prepared by Waterman Moylan consulting engineers, as part of this EIAR. Using this information, the related noise impacts along the relevant road links has been assessed.

Table 9.21 below displays the predicted change in noise level at different road links around the site for the year of opening and the design year using the Annual Average Daily Traffic (AADT) flows along the road links under consideration.

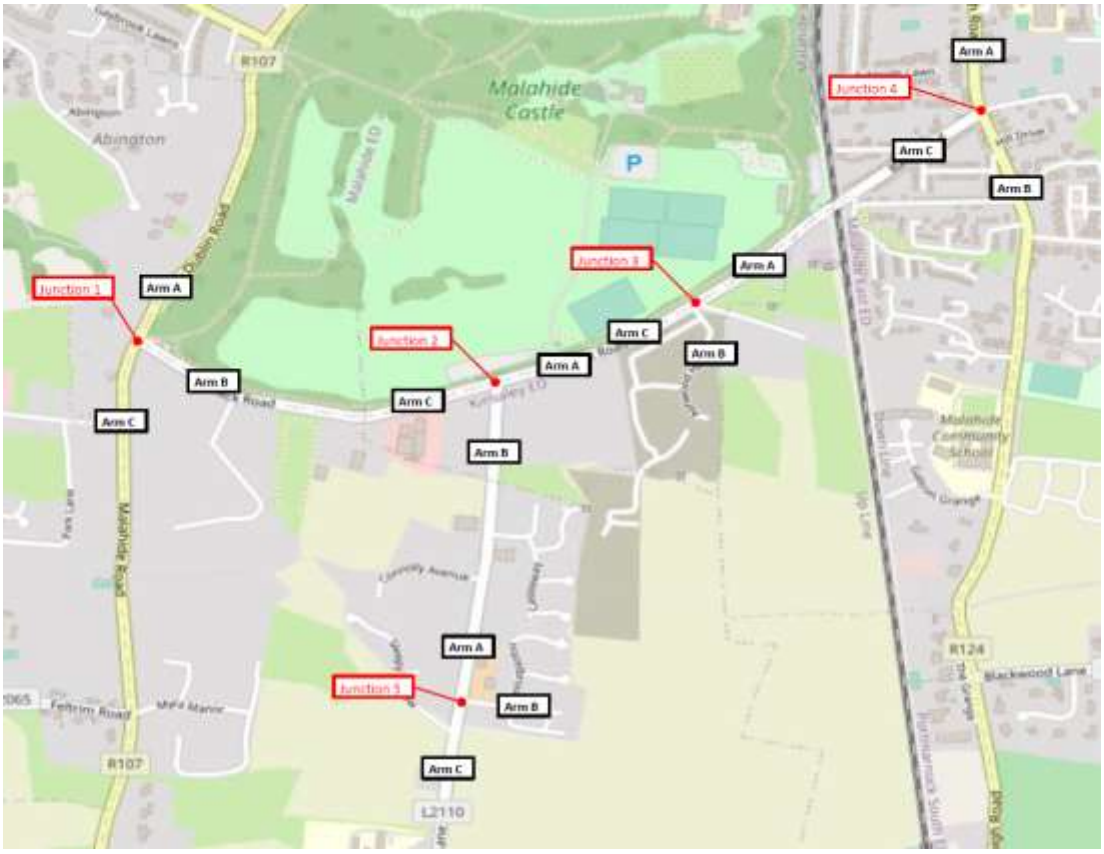

Figure 0-6. Road Links – Diagram 1

Table 0-21. Junction Road Link Road Name Opening Year (2025)

Junction	Road Link	Road Name	Opening Year (2026)		
			Do Nothing - AADT Without Development	Do Something - AADT With Development	Change in Noise Level (dB)
Junction 1	Arm A	R107 Malahide Road (N)	10,773	10,908	+0.1
	Arm B	Back Road	7,752	8,211	+0.2
	Arm C	R107 Malahide Road (S)	9,950	10,374	+0.2
Junction 2	Arm A	Back Road (E)	7,840	8,438	+0.3
	Arm B	L2110 Kinsealy Lane	2,598	2,926	+0.5
	Arm C	Back Road (W)	7,438	8,048	+0.3
Junction 3	Arm A	Back Road (E)	6,426	6,781	+0.2
	Arm B	Broomfield LAP Access Road	1,099	1,918	+2.4
	Arm C	Back Road (W)	6,784	7,421	+0.4
Junction 4	Arm A	R124 The Hill (N)	8,372	8,483	+0.1
	Arm B	R124 The Hill (S)	9,795	10,015	+0.1
	Arm C	Back Road	6,157	6,464	+0.2
Junction 5	Arm A	L2110 Kinsealy Lane (N)	2,270	2,603	+0.6
	Arm B	Hazelbrook Access Road	466	745	+2.0
	Arm C	L2110 Kinsealy Lane (S)	2,258	2,476	+0.4
Junction	**Road Link**	**Road Name**	**Design Year (2040)**		
			Do Nothing - AADT Without Development	**Do Something - AADT With Development**	**Change in Noise Level (dB)**
Junction 1	Arm A	R107 Malahide Road (N)	12,139	12,274	+0.0
	Arm B	Back Road	8,710	9,169	+0.2
	Arm C	R107 Malahide Road (S)	11,191	11,616	+0.2
Junction 2	Arm A	Back Road (E)	8,799	9,397	+0.3
	Arm B	L2110 Kinsealy Lane	2,920	3,248	+0.5
	Arm C	Back Road (W)	8,354	8,964	+0.3
Junction 3	Arm A	Back Road (E)	7,225	7,580	+0.2
	Arm B	Broomfield LAP Access Road	1,182	2,000	+2.3
	Arm C	Back Road (W)	7,604	8,240	+0.3
Junction 4	Arm A	R124 The Hill (N)	9,429	9,541	+0.1
	Arm B	R124 The Hill (S)	11,033	11,254	+0.1
	Arm C	Back Road	6,924	7,231	+0.2
Junction 5	Arm A	L2110 Kinsealy Lane (N)	2,550	2,883	+0.5
	Arm B	Hazelbrook Access Road	522	801	+1.9
	Arm C	L2110 Kinsealy Lane (S)	2,533	2,751	+0.4

With reference to Table 9.7, for the Opening Year 2026 the predicted change in noise level associated with additional traffic on the surrounding existing road network has a negligible effect. The impact is therefore neutral, imperceptible and long term.

With reference to Table 9.7, for the Design Year 2041 the predicted change in noise level associated with additional traffic on the surrounding existing road network has a negligible effect. The impact is therefore neutral, imperceptible and long term.

9.5.2.3 Inward Noise Assessment

In the context of noise impacts inwards on the proposed development, the site is bound to the east by the Dublin-Belfast rail line and is located within the proposed new airport noise Zone C, with the southern sector located in Zone B. These external noise sources are assessed here in order to ensure that internal noise levels within houses and apartments meet the appropriate criteria so that residential amenity of future occupants is not negatively impacted.

Rail Noise

Noise from rail traffic was measured during the baseline noise survey on Site and the SEL derived. Using this SEL and knowledge of the number of rail movements in a given period, it is possible to predict the expected noise levels arising at the façade of the nearest noise sensitive receptor using the following equation:

$$L_{Aeq} = L_{AX} - 10*\log_{10}(r_1/r_2) + 10*\log_{10}(N) - 10*\log_{10}(T)$$

Where:

L_{AX} = measured SEL
N = number of vehicle movements
T = time (seconds)
r_1 = distance from the source to the receiver
r_2 = distance from the source to the measurement

Predicted noise levels are presented in the table below.

Table 0-22. Predicted Rail Noise at Development Site

Location	Distance	Period	No. Rail Movements	Predicted Façade Noise Level ($L_{Aeq,T}$) (dB)
Houses Road 1	48m	Daytime	80	63
		Night-time	8	56
Block C Eastern Facade	30m	Daytime	80	64
		Night-time	8	56
Houses Road 3.1/3.2	22 - 27m	Daytime	80	64
		Night-time	8	56
Block B Eastern Facade	32m	Daytime	80	64
		Night-time	8	56
Houses Road 3.3	33m	Daytime	80	64
		Night-time	8	56

At façades located further from the rail line, rail noise levels are predicted to be of a level that is similar to the prevailing background noise levels.

Aircraft Noise

A future change to the local infrastructure that is likely to alter the noise environment is the development of the North Runway at Dublin Airport. To address this, FCC have produced noise zone maps for the area surrounding the airport. These maps present noise contours as follows:

- Zone A – ≥ 63 dB $L_{Aeq,16hr}$ and/or ≥ 55 dB L_{night};
- Zone B – ≥ 54 dB $L_{Aeq,16hr}$ and < 63 dB $L_{Aeq,16hr}$ and ≥ 55 dB L_{night};
- Zone C – ≥ 54 dB $L_{Aeq,16hr}$ and < 63 dB $L_{Aeq,16hr}$ and ≥ 48dB L_{night} and < 55 dB L_{night}; and,
- Zone D – ≥ 50 dB $L_{Aeq,16hr}$ and < 54dB $L_{Aeq,16hr}$ and ≥ 40dB L_{night} and < 48dB L_{night}.

As illustrated in Figure 9.1, the Site is located in Zone C with the southern portion of the site located in Zone B. Therefore, the noise levels incident to dwellings and external amenity areas falling within these zones can be summarised as:

Zone B:

- Daytime: 63 dB $L_{Aeq,16hr}$.
- Night-time: 55 dB L_{night}.

Summary

With reference to the Noise Risk Assessment outlined in ProPG, the noise levels for relevant periods have been derived in order to classify the proposed Project Site. Table 9.23, below, summarises the predicted cumulative noise levels at various proposed building facades as per the site layout provided.

Table 9.23: Predicted and Measured Noise Levels at Development Site

Location	Period	Predicted Noise Level (dB, $L_{Aeq,T}$)	Noise Risk Category
Houses Road 1	Daytime	63	Medium
	Night-time	56	Medium
Block C Eastern Facade	Daytime	64	Medium
	Night-time	56	Medium
Houses Road 3.1/3.2	Daytime	64	Medium
	Night-time	56	Medium
Block B Eastern Facade	Daytime	64	Medium
	Night-time	56	Medium
Houses Road 3.3	Daytime	64	Medium
	Night-time	56	Medium

Giving consideration to the noise levels presented, the initial site noise risk assessment has concluded that the level of risk across the site lies within the medium risk range, in line with Figure 9.7 categories.

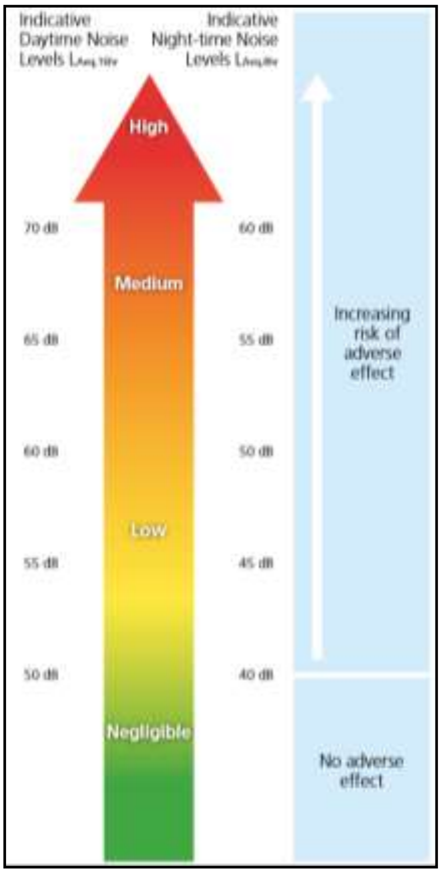

Figure 0-7. Noise Risk Assessment

ProPG states the following with respect to medium and high risks areas:

> *Medium Risk As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.*

Given the above it can be concluded that the development site may be categorised as *Medium Risk* and as such the Acoustic Design Statement (following here and also in Section 9.6.3.4) is required to demonstrate that suitable care and attention has been applied in mitigating and minimising noise impact to such an extent that an adverse noise impact will be avoided in the final development.

It should be noted that ProPG states the following with regard to how the initial site noise risk is to be used,

> *"2.12 It is important that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker. The recommended approach is intended to give the developer, the noise practitioner, and the decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced. Thus, a site considered to be high risk will be recognised as presenting more acoustic challenges than a site considered as low risk. A site considered as negligible risk is likely to be acceptable from a noise perspective and need not normally be delayed on noise grounds. A potentially problematical site will be flagged*

at the earliest possible stage, with an increasing risk indicating the increasing importance of good acoustic design."

Following the guidance contained in ProPG, therefore, it does not preclude residential development on sites that are identified as having medium or high noise levels. It merely identifies the fact that a more considered approach will be required to ensure the developments on the higher risk sites are suitably designed to mitigate the noise levels. The primary goal of the approach outlined in ProPG is to ensure that the best possible acoustic outcome is achieved for a particular site.

Façade Noise Levels

Noise levels have been predicted across the proposed development site during day and night-time periods using the survey data and EPA noise maps.

Facades along the eastern site boundary are exposed to additional noise associated with the rail line and therefore a minimum sound insulation performance specification is required for windows and ventilators to ensure that when windows are closed and vents are open, the internal noise criteria are achieved.

Predicted noise levels on facades along the eastern boundary are above a level whereby internal noise levels are achieved with standard double glazing and therefore mitigation in the form of enhanced glazing will be required. These facades are identified in the figure below.

The specification of this enhanced façade is discussed in Section 9.6.3.

Figure 0-8. Facades with Higher Noise Levels

External Noise Levels

ProPG provides the following advice with regards to external noise levels for amenity areas in the development:

> *"The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$."*

With respect to rail noise, external noise levels within the vast majority of communal open spaces across the development site are predicted to be within the recommended range of noise levels from ProPG of between 50 – 55 dB $L_{Aeq,16hr}$. No further mitigation is required to control external noise levels across amenity areas in this regard.

With reference to the FCC revised airport noise zones, the northern and southern sectors of the proposed development fall within Zone C and Zone B respectively. External noise levels across the site during the daytime, with the North Runway in operation, are expected fall in the region of 63 dB $L_{Aeq,16hr}$.

It is noted that whilst external amenity areas located in Zone B and Zone C would be above the desirable level of 55 dB $L_{Aeq,16hr}$ it is not possible to reduce the noise level across external spaces due to aircraft noise being the dominant noise source. Notwithstanding this, efforts have been made to provide private external space to each dwelling to the rear of the houses and a large external amenity area is located serving the apartments.

9.5.2.4 Inward Vibration Assessment

Human Perception

Review of the measured noise levels indicated that at the measurement position rail movements on the rail line were not contributing to measured vibration levels. PPV levels exceeded the value 0.30 mm/s several times, i.e the vibration level that may be just perceptible in a residential setting. The average vibration levels were 0.06 – 0.08 mm/s and would not be perceptible.

Measured vibration levels from site have been used to predict the vibration dose for day and night-time periods. With reference to Table 9.10, the predicted daytime and night-time VDV period values are orders of magnitude below a level that would correspond to even a low probability of adverse comment.

9.6 Mitigation Measures

9.6.1 CONSTRUCTION PHASE - NOISE

With regard to construction activities, best practice control measures for noise and vibration from construction sites are found within BS 5228 (2009 +A1 2014) *Code of Practice for Noise and Vibration Control on Construction and Open Sites* Parts 1 and 2. Whist construction noise and vibration impacts are expected to vary during the construction phase depending on the distance between the activities and noise sensitive buildings, the contractor will ensure that all best practice noise and vibration control methods will be used, as necessary in order to ensure impacts at off-site noise sensitive locations are minimised.

The best practice measures set out in BS 5228 (2009) Parts 1 and 2 includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

- selection of quiet plant;
- noise control at source;
- screening;
- liaison with the public, and;
- monitoring.

Detailed comment is offered on these items in the following paragraphs. Noise control measures that will be considered include the selection of quiet plant, enclosures and screens around noise sources, limiting the hours of work and noise and vibration monitoring, where required.

9.6.1.1 Selection of Quiet Plant

This practice is recommended in relation to static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

9.6.1.2 Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

Referring to the potential noise generating sources for the works under consideration, the following best practice migration measures should be considered:

- Site compounds will be located in excess of 30m from noise sensitive receptors within the site constraints. The use lifting bulky items, dropping and loading of materials within these areas should be restricted to normal working hours.
- For mobile plant items such as dump trucks, excavators and loaders, the installation of an acoustic exhaust and or maintaining enclosure panels closed during operation can reduce noise levels by up to 10 dB. Mobile plant should be switched off when not in use and not left idling.
- For concrete mixers, control measures should be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.

- For compressors, generators and pumps, these can be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
- Demountable enclosures can also be used to screen operatives using hand tools and will be moved around site as necessary.
- All items of plant should be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

9.6.1.3 Screening

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. Construction site hoarding will be constructed around the site boundaries as standard. The hoarding will be constructed of a material with a mass per unit of surface area greater than 7 kg/m2 to provide adequate sound attenuation.

In addition, careful planning of the site layout will also be considered. The placement of site buildings such as offices and stores will be used, where feasible, to provide noise screening when placed between the source and the receiver.

9.6.1.4 Liaison with the Public

A designated environmental liaison officer will be appointed to site during construction works. Any noise complaints should be logged and followed up in a prompt fashion by the liaison officer. In addition, where a particularly noisy construction activity is planned or other works with the potential to generate high levels of noise, or where noisy works are expected to operate outside of normal working hours etc., the liaison officer will inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

9.6.1.5 Monitoring

Where required, construction noise monitoring will be undertaken at periodic sample periods at the nearest noise sensitive locations to the development works to check compliance with the construction noise criterion.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise.

9.6.1.6 Project Programme

The phasing programme will be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. During excavation/ piling or other high noise generating works are in progress on a site at the same time as other works of construction that themselves may generate significant noise and vibration, the working programme will be phased so as to prevent unacceptable disturbance at any time.

9.6.2 CONSTRUCTION PHASE – VIBRATION

The vibration from construction activities will be limited to the values set out in Section 9.2. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Limit values have been provided for soundly constructed residential and commercial properties.

9.6.3 OPERATIONAL PHASE

9.6.3.1 Additional Traffic on Adjacent Roads

During the operational phase of the development, noise mitigation measures with respect to the outward impact of traffic from the development are not deemed necessary.

9.6.3.2 Mechanical Services Plant

Taking into account that sensitive receivers within the development are much closer than off-site sensitive receivers, once the relevant noise criteria are achieved within the development it is expected that there will be no negative impact at sensitive receivers off site, and therefore no further mitigation required.

9.6.3.4 Inward Noise

As is the case in most buildings, the glazed elements and ventilation paths of the building envelope are typically the weakest element from a sound insulation perspective. In general, all wall constructions (i.e. block work or concrete and spandrel elements) offer a high degree of sound insulation, much greater than that offered by the glazing systems. Therefore, noise intrusion via the wall construction will be minimal.

Table 0-23. Sound Insulation Performance Requirements for Glazing, SRI (dB)

Mark-up	Octave Band Centre Frequency (Hz)						R_w
	125	250	500	1000	2000	4000	
BLUE	26	27	34	40	38	46	37

The overall R_w and $D_{ne,w}$ outlined in this section are provided for information purposes only. The over-riding requirement is the Octave Band sound insulation performance values which may also be achieved using alternative glazing and ventilation configurations. Any selected system will be required to provide the same level of sound insulation performance set out in Table 9.24 and Table 9.25 or greater.

The following performance requirements apply to all ventilation paths from outside the building. This can be achieved by passive acoustic wall or window vents or via mechanical ventilation systems. Ventilators in the facades of dual aspect living/dining spaces in areas designated ‘BLUE’ should provide increased performance as outlined below.

Table 9.25: Sound Insulation Performance Requirements for Ventilation, Dn,e,w (dB)

Mark-up	Octave Band Centre Frequency (Hz)						$D_{n,e,w}$
	125	250	500	1000	2000	4000	
BLUE	35	34	33	38	49	45	39

Figure 0-9. Façade Sound Insulation Specification

9.7 Residual Impacts

9.7.1 Construction Phase

During the construction phase of the project there is the potential for significant and moderate impacts on nearby noise sensitive properties due to noise emissions from site activities. The application of binding noise limits, hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration impacts are reduced.

It is predicted that construction activity will have a ***negative***, ***moderate to very significant*** and ***short-term*** impact at distances up to 30m from the works.

At distances greater than 30m it is predicted that construction activity will have a ***negative***, ***slight to moderate*** and ***short-term*** impact.

Noise levels associated with construction vehicles moving to and from the site are predicted to have an impact that is ***negative***, ***not significant*** and ***short-term***.

9.7.2 Operational Phase

9.7.2.1 Mechanical Plant

Noise levels associated with operational plant are expected to be well within the adopted day and night-time noise limits at the nearest noise sensitive properties taking into account the site layout, the nature and type of units proposed and distances to nearest residences. Assuming the operational noise levels do not exceed the adopted design goals, the resultant residual noise impact from this source will be of **negative, imperceptible, long-term impact.**

9.7.2.2 Additional Vehicular Traffic

The predicted change noise levels associated with additional traffic is predicted to be of imperceptible impact along the existing road network. In the context of the existing noise environment, in most cases the overall contribution of induced traffic is considered to be of **neutral, imperceptible and long-term impact** to nearby residential locations.

9.8 Cumulative Impacts

During the construction phase of the proposed development, construction noise on site will be localised and will therefore likely the primary noise source at the nearest noise sensitive receivers. There are lands reserved for future development within the Masterplan site. Should construction of both sites occur simultaneously there is potential for cumulative noise impacts at noise sensitive receivers equidistant from the sites.

In this scenario, it is recommended that liaison between construction sites is on-going throughout the duration of the construction phase. Contractors should schedule work in a co-operative effort to limit the duration and magnitude of potential cumulative impacts on nearby sensitive receptors. Cumulative construction noise impacts have the potential to be negative, moderate to significant and short-term at times of high activity on both sites.

The contractor will be required to control noise impacts associated with the construction of this future development in line with the guidance levels included in Table 9.1 and follow the best practice control measures within BS 5228 -1.

In the context of the operational phase, permitted developments are included in the traffic impact and therefore the potential for a cumulative impact has been assessed (and found to be negative, imperceptible to moderate, and long-term).

Any large-scale future projects that are not yet proposed or permitted would also need to be a formal planning application / EIA process in order to ascertain whether any impacts on the environment exist that should be mitigated by planning condition and, in turn, to ensure that **no significant impacts** resulting from noise and vibration will occur as a result of those developments.

9.9 Difficulties Encountered

No difficulties were encountered during the preparation of the EIAR chapter.

9.10 References

- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017);
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – Draft (EPA, 2017);
- BSI (1993). BS 7385: 1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration;

- BS 4142: 2014: Methods for Rating and Assessing Industrial and Commercial Sound;
- BSI (2014). BS 5228-1:2009 +A1:2014 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise;
- BSI (2014). BS 5228-2:2009+A:2014 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration;
- DCC; FCC; SDCC; DLRCC (2018). Dublin Agglomeration Third Environmental Noise Action Plan December 2018 – July 2023;
- Fingal County Council (FCC) (2017). Fingal Development Plan Policy on Aircraft Noise.
- Fingal County Council (FCC) (2019). Noise Action Plan for Dublin Airport 2019-2023.
- EPA (2015). Advice Notes for Preparing Environmental Impact Statements. Draft. September 2015;
- EPA (2017). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. Draft. August 2017;
- EPA (2020). EPA Maps [Online] Available from gis.epa.ie/EPAMaps;
- ISO (2016). ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures;
- UK Department of Transport (1998). Calculation of Road Traffic Noise;
- UKHA (2020). Design Manual for Roads and Bridges Sustainability & Environment Appraisal LA 111 Noise and Vibration Revision 2; and
- (IoA, 2017). Professional Practice Guidance on Planning & Noise (ProPG).

10.0 CLIMATE

10.1 Introduction

This chapter assesses the likely climate impacts associated with the proposed development at Back Road, Broomfield, Malahide, Co. Dublin. A full description of the development is available in Chapter 2.

This chapter was completed by Ciara Nolan, Senior Environmental Consultant in the air quality section of AWN Consulting Ltd. She holds an MSc. (First Class) in Environmental Science from University College Dublin and has also completed a BSc. in Energy Systems Engineering. She is an Associate Member of both the Institute of Air Quality Management (AMIAQM) and the Institution of Environmental Science (AMIEnvSc). She has been active in the field of air quality for over 5 years, with a primary focus on consultancy.

10.2 Methodology

10.2.1 Criteria for Rating of impacts

10.2.1.1 Climate Agreements

Ireland is party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The Paris Agreement, which entered into force in 2016, is an important milestone in terms of international climate change agreements and includes an aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to GHG emissions will be based on Intended Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress was also made in the Paris Agreement on elevating adaption onto the same level as action to cut and curb emissions.

In order to meet the commitments under the Paris Agreement, the EU enacted *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013* (the Regulation). The Regulation aims to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30%, respectively, by 2030 compared to 2005. Ireland's obligation under the Regulation is a 30% reduction in non-ETS greenhouse gas emissions by 2030 relative to its 2005 levels.

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) (Government of Ireland, 2015) was enacted (the Act). The purpose of the Act was to enable Ireland '*to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050*' (3.(1) of No. 46 of 2015). This is referred to in the Act as the '*national transition objective*'. The Act made provision for a national mitigation plan, and a national adaptation framework. In addition, the Act provided for the establishment of the Climate Change Advisory

Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

The first Climate Action Plan (CAP) was published by the Irish Government in June 2019 (Government of Ireland, 2019a). The Climate Action Plan 2019 outlined the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlined the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The 2019 CAP also detailed the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The Government published the second Climate Action Plan in November 2021 (Government of Ireland, 2021a). The plan contains similar elements as the 2019 CAP and aims to set out how Ireland can reduce our greenhouse gas emissions by 51% by 2030 (compared to 2018 levels) which is in line with the EU ambitions, and a longer-term goal of to achieving net-zero emissions no later than 2050. The 2021 CAP outlines that emissions from the Built Environment sector must be reduced to 4 - 5 $MtCO_2e$ by 2030 in order to meet our climate targets. This will require further measures in addition to those committed to in the 2019 CAP. This will include phasing out the use of fossil fuels for the space and water heating of buildings, improving the fabric and energy of our buildings, and promoting the use of lower carbon alternatives in construction.

Following on from Ireland declaring a climate and biodiversity emergency in May 2019 and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme in December 2019 followed by the publication of the Climate Action and Low Carbon Development (Amendment) Act 2021 in July 2021 (Government of Ireland, 2021b). The 2021 Climate Act was prepared for the purposes of giving statutory effect to the core objectives stated within the CAP.

The purpose of the 2021 Climate Act is to provide for the approval of plans '*for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050*'. The 2021 Climate Act will also '*provide for carbon budgets and a decarbonisation target range for certain sectors of the economy'.* The 2021 Climate Act defines the carbon budget as '*the total amount of greenhouse gas emissions that are permitted during the budget period'.*

The 2021 Climate Act removes any reference to a national mitigation plan and instead refers to both the Climate Action Plan, as published in 2019, and a series of National Long Term Climate Action Strategies. In addition, the Environment Minister shall request each local authority to make a 'local authority climate action plan' lasting five years and to specify the mitigation measures and the adaptation measures to be adopted by the local authority.

The impact of the proposed development on climate has been assessed in relation to Ireland's commitments and obligations under the above policies and legislation.

10.2.2 Construction Stage

The impact of the construction phase of the development on climate was determined by a qualitative assessment of the nature and scale of greenhouse gas generating construction activities associated with the proposed development.

The UK Highways Agency has published an updated DMRB guidance document in relation to climate impact assessments *LA 114 Climate* (UK Highways Agency 2019). The following scoping criteria are used to determine whether a detailed climate assessment is required for a proposed project. If any of the road links impacted by the proposed development meet or exceed the below criteria, then further assessment is required.

- A change of more than 10% in AADT;
- A change of more than 10% to the number of heavy duty vehicles; and
- A change in daily average speed of more than 20 km/hr.

The construction phase traffic was reviewed against the above criteria and it was found that none of the road links will experience a change greater than the criteria above. Therefore, modelling of construction phase traffic emissions was not required as there is no potential for significant impacts to climate as a result of traffic emissions.

10.2.3 Operational Stage

Ireland has annual GHG targets which are set at an EU level and need to be complied with in order to reduce the impact of climate change. Impacts to climate as a result of GHG emissions are assessed against the targets set out by the EU under *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013*. Which has set a target of a 30% reduction in non-ETS sector emissions by 2030 relative to 2005 levels.

As per the EU guidance document *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment* (European Commission, 2013) the climate baseline is first established by reference to EPA data on annual GHG emissions (see Section 10.3.1). Thereafter the impact of the proposed development on climate is determined. Emissions from road traffic associated with the proposed development have the potential to emit carbon dioxide (CO_2) which will impact climate.

The operational phase traffic was reviewed in line with the DMRB screening criteria detailed in Section 10.2.2. There are a number of road links that will experience a change in AADT of over 10% and therefore a detailed climate assessment is required. The impact of the proposed development at a national / international level has been determined using the procedures given by Transport Infrastructure Ireland (2011) and the methodology provided in Annex D in the UK Design Manual for Roads and Bridges (UK Highways Agency, 2007). The assessment focused on determining the resulting change in emissions of carbon dioxide (CO_2). The Annex provides a method for the prediction of the regional impact of emissions of these pollutants from road schemes and can be applied to any development that causes a change in traffic. The inputs to the dispersion model consist of information on road link lengths, AADT movements and annual average traffic speeds (see Table 10.1).

The EU guidance (2013) also states indirect GHG emissions as a result of a development must be considered, this includes emissions associated with energy usage. The Building Lifecycle Report prepared by MCORM Architects in relation to the proposed development has been reviewed and used to inform the operational phase climate assessment. This report outlines a number of measures in relation to building materials and energy usage from the proposed development primarily in relation to heat and electricity. A number of measures have been incorporated into the overall design of the development to reduce the impact to climate where possible.

Table 10-1. Traffic Data used in Climate Assessment

Road Name	Speed (kph)	% HGV	Base	Do Nothing		Do Something (Sensitivity)	
			2021	2026	2041	2026	2041
R107 Malahide Road (N)	60	2.15%	9,903	10,773	12,139	10,908	13,432
L2110 Kinsealy Lane	50	2.54%	2,333	2,598	2,920	2,926	3,288
Back Road (W)	60	2.90%	6,637	7,438	8,354	8,048	9,311
Broomfield LAP Access Road	30	8.55%	599	1,099	1,182	1,918	2,000
Back Road (W)	60	2.65%	5,940	6,784	7,604	7,421	8,528
L2110 Kinsealy Lane (N)	50	2.44%	2,029	2,270	2,550	2,603	2,943
Hazelbrook Access Road	30	6.52%	406	466	522	745	801
L2110 Kinsealy Lane (S)	50	1.86%	1,996	2,258	2,533	2,476	2,792

10.3 Receiving Environment

10.3.1 Climate Baseline

Anthropogenic emissions of greenhouse gases in Ireland included in the EU 2020 strategy are outlined in the most recent review by the EPA which details provisional emissions up to 2020 (EPA, 2021a). The data published in 2021 states that Ireland will exceed its 2020 annual limit set under the EU's Effort Sharing Decision (ESD), 406/2009/EC1 by an estimated 6.73 Mt. For 2021, total national greenhouse gas emissions are estimated to be 57.70 million tonnes carbon dioxide equivalent (Mt CO_2eq) with 44.38 MtCO_2eq of emissions associated with the ESD sectors for which compliance with the EU targets must be met. Agriculture is the largest contributor in 2021 at 37.1% of the total, with the transport sector accounting for 17.9% of emissions of CO_2.

GHG emissions for 2020 are estimated to be 3.6% lower than those recorded in 2019. Emission reductions have been recorded in 6 of the last 10 years. However, compliance with the annual EU targets has not been met for five years in a row. Emissions from 2016 – 2020 exceeded the annual EU targets by 0.29 MtCO_2eq, 2.94 MtCO_2eq, 5.57 MtCO_2eq,6.85 MtCO_2eq and 6.73 MtCO_2eq respectively. Agriculture is consistently the largest contributor to emissions with emissions from the transport and energy sectors being the second and third largest contributors respectively in recent years.

The EPA 2020 GHG Emissions Projections Report for 2020 – 2040 (EPA, 2021b) notes that there is a long-term projected decrease in greenhouse gas emissions as a result of inclusion of new climate mitigation policies and measures that formed part of the National Development Plan (NDP) which was published in 2018 and the Climate Action Plan published in 2019. Implementation of these are classed as a "*With Additional Measures scenario*" for future scenarios. A change from generating electricity using coal and peat to wind power and diesel vehicle engines to electric vehicle engines are envisaged under this scenario. While emissions are projected to decrease in these areas, emissions from agriculture are projected to grow steadily due to an increase in animal numbers. However, over the period 2013 to 2020 Ireland is projected to cumulatively exceed its compliance obligations with the EU's Effort Sharing Decision (Decision No. 406/2009/EC) 2020 targets by approximately 12.2MtCO_2eq under the "With Existing Measures" scenario and under the "With Additional Measures" scenario. The projections indicate that Ireland can meet its non-ETS EU targets over the period 2021 – 2030 assuming full implementation of the 2019 Climate Action Plan and the use of the flexibilities available (EPA, 2021b).

10.4 Characteristics of the Proposed Development

The proposed development is located on lands at Back Road, Broomfield, Malahide, Co. Dublin. The proposed development will consist of the demolition of the former clubhouse building on site and the proposed construction of 415 no. residential units comprising 252 no. houses and associated car parking, 28 no. duplex units and 135 no. apartments Blocks A & B providing ancillary amenity facilities, all provided with private balconies/terraces and associated car parking and bicycle parking; 1 no. childcare facility; landscaping including play equipment; boundary treatments; public lighting; and all associated site infrastructure and engineering works necessary to facilitate the development including proposed connection to permitted upgrades to existing foul network along Kinsealy Lane. A full description of the development is available in Chapter 2.

Impacts to climate can occur during both the construction and operational stages of the development. During the construction stage emissions from construction vehicles and machinery have the potential to impact climate. The primary sources of climatic emissions in the operational context are deemed long term and will involve the change in traffic flows or congestion in the local areas which are associated with the development. The following describes the primary sources of potential climate impacts which have been assessed as part of this EIAR.

10.5 Potential Impacts

10.5.1 Construction Phase

There is the potential for a number of greenhouse gas emissions to atmosphere during the construction of the development. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions. The Institute of Air Quality Management document *Guidance on the Assessment of Dust from Demolition and Construction* (IAQM, 2014) states that site traffic and plant is unlikely to make a significant impact on climate. In addition, the construction stage traffic has been screened out of a detailed climate assessment as it does not meet the DMRB screening criteria detailed in Section 10.2.2 of this guidance. Therefore, the impact on climate is considered to be neutral, imperceptible, and short term.

10.5.2 Operational Phase

Climate change has the potential to alter weather patterns and increase the frequency of rainfall in future years. As a result of this there is the potential for flooding related impacts on site in future years. However, adequate attenuation and drainage have been provided for to account for increased rainfall in future years as part of the design of this development. Therefore, the impact will be long-term, localised, neutral and imperceptible.

There is also the potential for increased traffic volumes to impact climate. The predicted concentrations of CO_2 for the future years of 2026 and 2041 are detailed in Table 10.2. These are significantly less than the 2026 and 2030 targets set out under EU legislation (targets beyond 2030 are not available). It is predicted that in 2026 the proposed development will increase CO_2 emissions by 0.00011% of the EU 2026 target. Similarly low increases in CO_2 emissions are predicted to occur in 2041 with emissions increasing by 0.00023% of the EU 2030 target. Therefore, the potential climate impact of the proposed development is considered negative, long-term and imperceptible.

The proposed development has been designed to reduce the impact to climate where possible. A number of measures have been incorporated into the design to ensure the operational phase emissions are minimised. These are outlined within the Building Lifecycle Report prepared by MCORM Architects and are summarised below.

The development will be a Nearly Zero Energy Building (NZEB) in accordance with the 2019 Part L requirements. Each building will have a Building Energy Rating (BER) of A2/A3. The construction materials chosen for the development will have a long-term durability and low maintenance requirement where possible which will lower the overall operational phase embodied carbon of the development as materials will not require replacement as frequently. LED lighting will be utilised where possible which is more energy efficient than traditional light bulbs. Condensing boilers are being investigated as they are more energy efficient than standard boilers and have a lower fuel consumption. Natural ventilation is being considered where possible, if mechanical ventilation is required a low energy system will be utilised. Renewable technologies are being considered where practicable in the form of PV solar panels. Electric vehicle charging points will be incorporated into the development to promote more sustainable modes of transport, bicycle parking will also be provided. In addition, the development is located within close proximity to a number of public transport routes including bus and rail which will also reduce the requirement for private vehicle use. Overall, these measures will aid in reducing the impact to climate during the operational phase of the proposed development.

Table 10-2. Climate Impact Assessment

Year	**Scenario**	**CO_2 (tonnes/annum)**
2026	Do Nothing	547
	Do Something	590
2041	Do Nothing	615
	Do Something	691
Increment in 2026		42.4 Tonnes
Increment in 2041		75.4 Tonnes
Emission Ceiling (kilo Tonnes) 2026		37,869 Note 1
Emission Ceiling (kilo Tonnes) 2030		33,381 Note 1

Impact in 2026 (%)	0.00011 %
Impact in 2041 (%)	0.00023 %

Note 1 Target under Commission Implementing Decision (EU) 2020/2126 of 16 December 2020 on setting out the annual emission allocations of the Member States for the period from 2021 to 2030 pursuant to Regulation (EU) 2018/842 of the European Parliament and of the Council

10.5.3 Do Nothing Scenario

Under the Do Nothing Scenario no construction works will take place and the previously identified impacts of emissions from equipment and machinery will not occur. Impacts from increased traffic volumes and associated air emissions will also not occur. GHG emissions will follow the predicted trends as outlined in Section 10.3.1. Therefore, this scenario can be considered neutral in terms of climate.

10.6 Mitigation Measures

10.6.1 Construction Phase

Construction stage impacts to climate are considered neutral, however, the following best practice measures are recommended to ensure no significant impacts occur.

- Prevent on-site or delivery vehicles from leaving engines idling, even over short periods.
- Ensure all plant and equipment are serviced regularly and well maintained.
- Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site.

10.6.2 Operational Phase

No mitigation is proposed for the operation phase of the proposed development as it is predicted to have an imperceptible impact on climate. A number of measures have been incorporated into the overall design of the development to reduce impacts to climate during operation.

10.7 Residual Impacts

10.7.1 Construction Phase

According to the IAQM guidance (2014) site traffic and plant are unlikely to make a significant impact on climate during the construction phase. In addition, the construction stage traffic has been screened out of a detailed climate assessment as it does not meet the DMRB screening criteria detailed in Section 10.2.2. Therefore, the potential impact on climate is considered neutral, imperceptible and short-term.

10.7.2 Operational Phase

Modelling of operational phase CO_2 emissions as a result of the traffic associated with the proposed development was carried out to determine the impact to climate. It was found that emissions of CO_2 will increase by an imperceptible amount as a result of the proposed development and are significantly below the EU 2026 and 2030 GHG targets. The operational phase impact to climate is long-term, negative and imperceptible.

In addition, the proposed development has been designed to reduce the impact to climate where possible through incorporated design measures. Full details of all measures included are outlined within the Building Lifecycle Report submitted as part of this planning application.

10.7.3 Cumulative Impacts

10.7.3.1 Construction Phase

Due to the short-term duration of the construction phase and the low potential for significant CO_2 and N_2O emissions cumulative impacts to climate are considered neutral.

10.7.3.2 Operational Phase

The traffic data reviewed for the operational stage impacts to climate included the cumulative traffic associated with other existing and permitted developments in the local area including a potential masterplan residential development at Streamstown. Therefore, the cumulative impact is included within the operational stage impact for the proposed development. The impact is predicted to be long-term, negative and imperceptible with regards to climate.

10.8 Monitoring

No monitoring is recommended.

10.9 References

- Environmental Protection Agency (2021a) Ireland's Provisional Greenhouse Gas Emissions 1990 – 2020
- Environmental Protection Agency (2021b) GHG Emissions Projections Report - Ireland's Greenhouse Gas Emissions Projections 2020 - 2040
- European Commission (2013) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment
- Government of Ireland (2015) Climate Action and Low Carbon Development Act
- Government of Ireland (2019) Climate Action Plan 2019
- Government of Ireland (2020) Draft General Scheme of the Climate Action (Amendment) Bill 2019
- Government of Ireland (2021a) Climate Action Plan 2020
- Government of Ireland (2021b) Climate Action and Low Carbon Development (Amendment) Act 2021
- UK Highways Agency (2019) UK Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 14 LA 114 Climate

11.0 LANDSCAPE AND VISUAL IMPACT

11.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) has been prepared by Kevin Fitzpatrick Landscape Architects and provides an assessment of the impact that the proposed residential development of lands, over 2 sites, at Broomfield, Malahide, Co. Dublin, will have regarding landscape and visual impacts both during the construction and operation phases.

11.2 Study Methodology

This chapter has been prepared having regard to the following guidelines;

- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning & Local Government, 2018)
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017);
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – Draft (EPA, 2017);
- Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (Landscape Inst. + IEMA 2013)

The assessment was carried out by visiting the site and its surroundings in October 2021, by analysis of the proposals through photomontages, plans, aerial photographs, the tree survey by Charles McCorkell Arboricultural Associate Ltd., historic maps and by reference to the Fingal Development Plan 2017 – 2023.

11.2.1 Relevant Legislation and Guidance

The criteria as set out in the current EPA Guidelines on Information to be contained in Environmental Impact Assessment Reports (2017, Draft), Table 3.3 are used in the assessment of the likely impacts.

The subject lands are designated as having a 'Low Lying Character Type' in the Fingal Landscape Character Assessment. The character type is dominated by agricultural land with few protected views or prospects. This Landscape Character type would be considered to have low to medium sensitivity and in general to have a modest value. Principles for development in these LCAs can be summarised as the following:

- The skyline should be protected
- Retention and management of older stocks and belts of trees, retention and management of roadside hedging. Strong planting schemes using native species to integrate new development into the open landscape.

Within the Fingal Development Plan 2017 – 2023 there are no specific landscape objectives that apply to the subject lands. There are several objectives that apply to the general environs of the site and new development which may occur on subject lands listed below.

GIO20:

Require all new development to contribute to the protection and enhancement of existing green infrastructure and the delivery of new green infrastructure, as appropriate.

GIO27:

Provide a range of accessible new parks, open spaces and recreational facilities accommodating a wide variety of uses (both passive and active), use intensities and interests.

GIO36:

Ensure green infrastructure provision responds to and reflects landscape character including historic landscape character, conserving, enhancing and augmenting the existing landscapes and townscapes of Fingal which contribute to a distinctive sense of place.

NHO27:

Protect existing woodlands, trees and hedgerows which are of amenity or biodiversity value and/or contribute to landscape character and ensure that proper provision is made for their protection and management.

NHO34:

Ensure development reflects and, where possible, reinforces the distinctiveness and sense place of the landscape character types, including the retention of important features or characteristics, taking into account the various elements which contribute to their distinctiveness such as geology and landform, habitats, scenic quality, settlement pattern, historic heritage, local vernacular heritage, and-use and tranquillity.

11.3 Receiving Environment

11.3.1 Overview

The site is in the townland of Broomfield, on the outskirts of Malahide, North Dublin approximately 15 kilometres from the city centre and 3km from the Marina at Malahide. The site is located to the immediate South of the Malahide Castle grounds, separated only by Back Road, which connects the town of Malahide to the R107/Malahide Road. The shape of the site is large and irregular, being framed for the most part by low-density residential development to the East and West and existing agricultural land to the South.

The development site is divided into two distinct sections to the North and South, connected by existing roads associated with neighbouring residential developments. The site boundary traces the edges of these roads through 'Ashwood Hall' and 'Brookfield', both of which are permitted developments currently under construction. Due to the shape and location of the development site along with the complex site boundary, the existing boundary types vary significantly. They range from solid structural boundaries to having no physical demarcation at all in some cases.

Northern Section

The northern boundary is formed predominantly by existing vegetation in the form of native hedgerow, thick boundary hedging and existing trees, structural boundaries such as fences and walls associated with the neighbouring residences may also be present here, hidden and overgrown by the vegetation. There is no apparent structural boundary to the south, however there is a drop in level between the subject lands and the neighbouring agricultural field. The south-eastern portion of this earth bank contains emerging trees and scrub vegetation. A circa 2-3m high, green palisade fence defines the eastern site boundary, much of which is partially hidden by emerging native hedgerow and scrub vegetation. This is associated with the DART railway line to the east of the development. The western boundary is dominated by varying forms of existing vegetation such as native hedgerow, mature Leyland and Lawson Cypresses, mature trees such as Ash, Birch, Elm, Oak and Sweet Chestnut and groups of hybrid Poplars. The south-western site boundary is formed by existing vegetation and a partially constructed blockwork boundary wall associated with neighbouring 'Ashwood Hall' development.

Southern Section

There is no permanent structural boundary to the North, however the adjoining development is currently a construction site, therefore there is temporary construction fencing along this boundary. The development site at present is part of an existing agricultural field, as a result of this, there is no structural or vegetative boundary to the South or East. The western site boundary is formed by the boundary walls of the houses in neighbouring residential development 'Hazelbrook'.

11.3.2 Characteristics of the site and its environs

The character of the site and its environs has largely been determined by the following:

- the flat topography of the subject site and its surrounding environs
- a number of large trees along external roads and footpaths, in neighbouring developments and in local green space areas
- a number of large, mature moderate quality trees, native mixed hedgerows and naturally emerging growth on subject lands
- a number of low-density residential developments and individual suburban dwellings located in the immediate area
- close proximity to 'Malahide Castle' and effects of the associated landscape history in the local area
- flat, agricultural land in the immediate and wider area

In the wider environment, the landscape can be divided into residential, agricultural, and recreational green space areas. The area to the North of the subject lands is dominated by 'Malahide Castle' and its associated grounds which now make up a public park. The land-use would be considered recreational green space and is zoned as such in the County Development Plan. Also of importance here are the national heritage features, with the grounds containing a number of heritage monuments and protected trees. The area to the South of the subject lands consists of a large green belt which extends from the coast, north of Portmarnock across the city to Dublin Airport. The green belt as it relates to the subject lands consists predominantly of agricultural land with native hedgerow boundaries, typical of those found in the Irish rural landscape. The coastal suburbs of Malahide and

Portmarnock are located to the East of the subject lands, like any towns they have a mixed-use. The residential settlement here typifies that of suburban Dublin.

Figure 11.1 - Context Map

The site could be considered as consisting of a variety landscape types. Much of the overall site could be considered a transitional landscape, changing from the previous use, which in many cases is still observable, to a state of natural revegetation, where emerging saplings, scrub and noxious weeds are beginning to establish. The northern section of the site has a greater variety of landscape typologies, while the southern section would have only one.

Southern Section

This area is considered to have the typology of an agricultural field, typical of those to be found in many urban fringe and semi-rural parts of North County Dublin.

Northern Section

Here, there are a range of landscape typologies to be found, all of which are in a current state of transition. The remnants of a former GAA pitch are present in the eastern field beside the railway line. Goals, floodlights and a former clubhouse/changing room are all still present, but in a state of disrepair. This points to a former recreational/sports use on the subject lands and may also explain the presence of Leylandiis which have often been used in Irish landscapes to provide windbreaks.

Figure 11.2 – Subject Lands - Landscape Typologies

Figure 11.3 - Former Sports Field

Along the northern site boundary, evidence of residential settlement can be found. The houses are not on subject lands, however the gardens extend back to form a boundary with the proposed development site. Ornamental hedging species such as Beech and Laurel are present and, according to the arborists survey, have a maintained quality. Native hedgerow and emergent native trees such as Ash and Hawthorn are also present. This part of the site would be considered to have the character of a traditional rural residential landscape.

The area to the south can be characterised as a transitional landscape. There is evidence that the site has been used for construction waste and storage, with a large spoil heap located in the south-west corner and vehicular tracks traversing the site. This part of the site appears to have a particularly high number of noxious weeds and emergent vegetation. There are also remnants of temporary construction fencing/hoarding and other waste dispersed around this region of the subject lands.

Figure 11.4 - Construction Waste and Storage

The western site boundary abuts the open space in the neighbouring development 'Ashwood Hall'. Although this area is not technically within the site boundary, it has an effect on the landscape typology for this part of the site. The existing hedgerow along the western boundary contains many mature trees with species such as Elm, Oak and Sweet Chestnut dominating, these trees would be considered typical parkland species. New trees have been planted as part of the 'Ashwood Hall' development, many of which would also be typically associated with parkland, such as Beech, Field

Maple, Oak and Pine. This part of the subject lands would be considered an emerging parkland landscape.

Figure 11.5 - Emerging Parkland

The site is relatively flat in nature, with the levels falling by circa. 9m across the site from a highest point of +20.00 in the north-east beside the railway line to the lowest point of +11.00 in the south-west beside 'Ashwood Hall'.

11.3.3 Trees and Vegetation

The trees and hedgerows on the subject lands have been surveyed by a qualified arborist (Charles McCorkell Arboricultural Consultancy Ltd) and the arborist's report forms part of this submission. In general, the trees and vegetation are of a mixed quality in terms of their amenity value, health and vigour. There are a total of 23 no. Category B trees with 2 no. Category B Tree Groups, the remainder of the trees, tree groups and hedgerows on site are predominantly Category C. The Category B trees consist of Beech, Birch, Oak, Sweet Chestnut and Sycamore.

Many of the Category B trees can be found along the northern and western site boundaries, while the remainder can be found in clusters within the site.

Each tree is assessed as to their quality and assigned a grading. The grading categories as defined in the Arborists report are listed as follows:

- Category U – Those trees in such a condition that any existing value would be lost within 10 years.
- Category A - Trees of high quality/value with a minimum of 40 years life expectancy.
- Category B – Trees of moderate quality/value with a minimum of 20 years life expectancy.
- Category C – Trees of low quality/value with a minimum of 10 years life expectancy.

11.3.4 Landscape Development and History

From an analysis of historic maps, the name 'Broomfield' dates back to the 6-inch maps from the 1830/40s and appears to have been a townland in the Malahide area. Malahide at this time was a much smaller town concentrated on the coast, while the surrounding land was dominated by farmland. The subject lands formed part of 'Broomfield' townland, which consisted of an estate house and cottage, this is now the site of Malahide Community School. The subject lands do not appear drastically different to what we see today. Some sections of the internal hedgerows have been removed; however, the majority still remain. Some of the existing vegetation found on site at present cannot be traced back to the historic maps. The railway line is present in both the 6-inch maps and 25-inch maps; however, it is noted as being 'In Progress', therefore it is unclear to what extent it was built. Malahide Castle is a dominant feature through the series of historic maps. In later 25-inch maps, the castle appears slightly more wooded, with existing woodland along 'Back Road' that we see today being prominent. Expansion of built structures around the castle is also evident.

From studying aerial photography from the last 20-30 years, some changes to the landscape are apparent. The southern field which currently holds spoil and construction detritus was formerly an agricultural field used for a form of crop production. The sports pitch referenced in Section 1.3.2 is visible. In images from the early 2000's the grass seems to be lusher and line markings can be made out, which would suggest more frequent use and maintenance. The residential dwellings formerly to the East of 'Ashwood Hall' and North-West of the subject lands, were present until recent years, most likely being demolished between 2017 to 2021, this area is currently utilised for construction storage. Another prominent change apparent from studying the aerial photography is the maturing of the boundary and internal hedgerows, tree lines and other vegetation on site.

11.3.5 Views and Visibility

In the assessment of the visibility of the subject lands within the site it is noted that that views of the lands from the surrounding lands are extremely limited to non-existent. The lack of vertical features and flat topography of the site contribute to the above, along with the lack of road frontage. The mature tree lines and hedgerows in addition to the extent of the surrounding built development prevents any long-distance views of the subject lands.

11.4 Characteristics of the Proposed Development

The proposed development consists of a total of 415 residential units, comprising 252 houses, 28 duplex units, and 135 apartments. The proposed development will also include the construction of a creche. The development includes all associated site works, boundary treatments, drainage, and additional service connections. The development will utilise the existing entrance from the Back Road that serves the Ashwood Hall development. Although not originally proposed, a secondary access, to the south site from Kinsealy Lane via The Hazelbrook residential development, as instructed by Fingal County Council.

11.4.1 Potential Impact of the Proposed Development

Construction Phase:

- Visual impacts due to the introduction of new structures, access roads, machinery, materials storage, associated earthworks, car parking, lighting and hoarding.
- Change of character due to the change in use.
- Visual impacts due to removal of trees and vegetation.
- Visual impacts as a result of change in ground level and earthworks.

Operational Phase:

- Visual impacts due to the introduction of new buildings and built structures.
- Visual impacts due to the introduction of new roads, infrastructure, parking and lighting.
- Change of character due to the change in use.
- Visual impact of landscape proposals – installation of new trees and vegetation, play spaces, boundaries, hard surfaces, paths, etc.

11.5 Potential Cumulative Impacts

There are no anticipated cumulative impacts arising from the proposed development, or any further development in the locality in relation to landscape and visual impact, other than those noted above.

11.6 Do Nothing Scenario

In the event of this scenario the lands would continue to lie idle and the areas discussed in Section 11.3.2 would continue to fall further into disrepair as scrubland becomes more dominant. As the area has a specific zoning for development it is likely that the site would be developed in the future in a similar scale and type as is currently proposed.

11.7 Mitigation Measures

This section of the report will discuss mitigation measures to reduce the impact of the proposed development on the surrounding water environments during the construction and operation phase.

11.7.1 Incorporated Design Mitigation

- Retention and enhancement of a number of moderate-quality existing trees and incorporation into the landscape design
- Significant level of proposed perimeter planting including native woodland, hedgerow, copses of native trees and formal hedging
- Significant level of proposed street, parkland and ornamental trees within the subject lands
- Significant level of proposed woodland planting

11.7.2 Construction Phase Mitigation

- The protection of existing trees and other vegetation to be retained to BS 5837:2012 standards with the Root Protection Area (RPA) securely protected by fencing for the duration of the construction process.

- Implementation and monitoring of a well-managed and organised construction site, with control of construction activity, traffic, materials storage and lighting with due consideration for neighbouring residences

11.7.3 Operational Phase Mitigation

- Implementation and monitoring of a landscape management plan for the full duration of the defects liability period to ensure successful establishment of all proposed trees and vegetation.
- Periodic tree surveys and implementation of a tree management plan for the mature trees on site to ensure their continuing sustainability.

11.8 Predicted Impacts of the Proposed Development

Landscape assessments measure the sensitivity of specific landscape types and features and describe the nature and significance of changes to that landscape occurring because of a proposed development. In general, it can be assumed that landscape and visual impacts are intrinsically linked however both types of impacts are assessed separately in this study where a development characteristic may result in a starkly different type, quality or magnitude of impact in landscape or visual terms. The assessment of likely significant impacts has been made on the basis that all incorporated design mitigation measures are included.

Character, for the purposes of this assessment refers to the interaction of elements in the landscape that combine to give the area its identity. In this context, impacts on character include the effect on existing land uses and responses that are felt towards the combined effects of the new development.

11.8.1 Construction Phase:

The change of use of the site from its current state to that of a construction site has the potential to result in the following impacts:

<u>Removal of vegetation</u>

As detailed in the Arborists package a number of the existing trees are to be removed due to both tree health and to accommodate the built development. The loss of any trees will normally result in a negative impact on the landscape character. The impact in this instance has been mitigated by design measures including the retention of the highest quality trees and their incorporation into the landscape design along with the planting of a significant amount of newly proposed trees and woodland. The impact would be considered **negative, short-term in duration and slight.**

<u>Change in use to a construction site</u>

The change of use of the site from its existing use to that of a construction site will result in an impact on the landscape character. The level of this impact will be somewhat mitigated by the retention of some of the larger trees and the sites' location away from major roads in the area. Similar construction activities in close proximity to the site and the current state of the subject lands in relation to the construction storage, waste and access would also lessen the impact. The impact would be a **negative and moderate** local impact; however, the impact would only be **short-term** in duration.

11.8.2 Operational Phase:

Impacts on landscape character due to change of landscape type

The character of the subject lands will be significantly changed from its current character to that of a residential scheme with all the associated facilities. As a result of land zoning, development trends in the local area are of both a similar scale and nature. In addition to this, the site is currently unused, overgrown and in disrepair. As described in section 1.3.2 of this report the current landscape has the character of a transitional landscape and therefore its current state is temporary. The proposed scheme includes a comprehensive landscape scheme which includes the retention of many of the highest quality trees on site along with a variety of soft and hard landscaping proposals. These design measures will mitigate the level of impact. The resulting impact would be considered **positive and slight in magnitude in the long-term.**

Landscape and visual impacts due to the introduction of a new landscape

The proposed scheme includes a comprehensive landscape scheme (refer to KFLA drawings 100 – 107 and accompanying reports) which includes the retention and enhancement of the highest quality tees on the subject lands along with a large amount of newly proposed landscape softworks. Included in the proposed landscape scheme are native and ornamental trees, street trees, amenity lawn, native shrubs and perennials, formal boundary hedging, native hedgerow, wildflower meadow, woodland planting and a range of pollinating plants with a complex planting palette. This scheme will significantly enhance local biodiversity, provide a range of high-quality amenity options to the new residents and integrate the proposed structures into the surrounding landscape and suburban context. The impact of the proposed landscape scheme would be considered **positive, long-term, and moderate** in magnitude.

Visual impacts due to the introduction of new buildings and built structures

The subject lands are surrounded by existing development and vegetation, due to its lack of public road frontage, visibility of the application site from the public realm is restricted by intervening development and trees.

The extent of potential visual impact of the proposed development on the built environment from 6 representative view locations around the proposed development and is discussed below. The view locations assessed are representative of locations from which it was suggested by mapping analysis that development might be visible. Photomontages, prepared by Digital Dimensions Ltd. and included in Appendix 11.1, from these locations are included with this submission as a separate A3 document.

<u>Assessment of visual impacts from specific locations</u>

Figure 11.6 - Proposed Viewpoints (Verified Views labelled 1-6)

The proposed development will not be visible from any of the view locations shown in Figure 11.6 above. Intervening development and existing trees and woodland between the viewpoints and the subject lands deter any views of the proposed development, hence there is no visual impact associated with these views. Refer to Appendix 11.1 for details.

11.9 Worst Case Scenario

The worst-case scenario in relation to landscape and visual impacts during both the construction and operation phases would be the failure to implement the mitigation measures outlined above. This may result in impacts on existing trees to be retained as part of the design scheme, which would have an adverse effect on the existing landscape character. Failure to implement a well-managed construction site would also likely increase negative visual impacts associated with the construction process.

11.10 Monitoring

Contracts will ensure good working practices to reduce any negative impacts arising from construction to the lowest possible level and to ensure that all machinery operates within clearly defined construction area. Storage areas will be so located to avoid impacting on sensitive views, trees, hedgerows, drainage patterns etc. and such areas will be fully re-instated prior to at the end of the construction contract. The works will also have continuous monitoring to ensure adequate protection of areas outside of the construction works.

11.11 Reinstatement

On completion of sections of the proposed scheme, any area of landscape will be restored to previous state or enhanced as part of the new landscape scheme.

11.12 Interactions

The main interactions relating to this EIAR Chapter are Population and Human Health, Biodiversity and Cultural Heritage.

Interactions between landscape and Population and Human Health have been considered. Landscape has the potential to impact greatly on human health by providing external spaces which provide for communities in various ways such as recreational use, visual enhancement of streets and external spaces, sports and play facilities and so on. The landscape mitigation measures include a significant amount of designed usable spaces for both future and existing residents which will have a long-term and moderate positive impact on Population and Human Health.

Interactions between landscape and biodiversity have been considered. An adverse impact to the biodiversity of the lands during either the construction or operational phases has the potential to negatively impact the landscape character. The landscape mitigation measures will ensure that where possible the existing trees on site are retained, and a new planting scheme is proposed that will improve and extend the area native planting area on the subject lands. Therefore, the measures proposed to mitigate impact on the landscape character will result in a positive impact on the biodiversity value of the lands. This impact would be considered moderate in magnitude and long-term in duration.

Interactions between landscape and cultural heritage have been considered. The proposed development has the potential to impact on cultural heritage in the local area. Landscape character, history and visual characteristics can be considered a part of cultural heritage. The proximity of the subject lands to historic landscape spaces, namely Malahide Castle and its associated parkland could all be considered to have a potential impact on cultural heritage. Furthermore, the landscape mitigation measures include their retention and incorporation into the landscape scheme which will have a positive impact on cultural heritage.

11.13 Difficulties Encountered

There were no particular difficulties encountered compiling the Water chapter of the EIAR.

11.14 References

- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning & Local Government, 2018)
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017);
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – Draft (EPA, 2017);
- Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (Landscape Inst. + IEMA 2013)

12.0 TRAFFIC AND TRANSPORT

12.1 Introduction

This chapter of the EIAR assesses the likely traffic and transportation impacts on the receiving environment during the construction and operational phases of the proposed development. The existing and proposed transport infrastructure in the area is described, and an assessment of the current and the future traffic environment is made. The impact of the development in terms of public transportation, pedestrian and cycle is also assessed.

The chapter describes: the methodology; the receiving environment at the application site and surroundings; the characteristics of the proposal in terms of physical infrastructure; the potential impact that proposals of this kind would be likely to produce; the predicted impact of the proposal examining the effects of the proposed development on the local road network; the remedial or reductive measures required to prevent, reduce or offset any significant adverse effects; and the monitoring.

12.2 Assessment Methodology

The following methodology has been adopted for this assessment:

- Review of relevant available information including, current Development Plan, existing traffic information and other relevant studies;
- Site visit to gain an understanding of the site access and observe the existing traffic situation;
- Consultations with Fingal County Council Road Department to agree the site access arrangements and determine the scope of the traffic analysis required to accompany a planning application;
- Detailed estimation of the transport demand that will be generated by the development. The morning and evening peak times will be addressed as well as an estimation of under-construction and potential future developments in the surrounding area.
- Assessment of the impact of traffic on local junctions, car parking requirements and accessibility of the site by sustainable modes including walking, cycling and public transport.

12.3 Receiving Environment

This section reviews the baseline conditions, providing backing information for the site in order to determine the significance of any traffic implications. It also considers the existing accessibility of the site by sustainable modes of transport.

12.3.1 Site Location

The subject site is located in Broomfield, Malahide, Co. Dublin. The development entrance is from Back Road, 0.55km east of the junction between Back Road and Kinsealy Lane.

The overall proposed development is divided into 2 sites, as shown in the Figure below.

The north site is located between the existing Ashwood Hall residential development to the west and the Dublin-Belfast rail line to the east, with agricultural land to the south and residential properties and Back Road to the north.

The southern site is bounded by the Hazelbrook development to the west, Brookfield Residential development to the north and agricultural lands to the south and east.

Figure 12.1 | Proposed Development Location

12.3.2 Local Road Network

The site is located 2.6km south-west of Malahide Town centre and is in close proximity to regional roads including the R107 Malahide Road, Back Road, Streamstown Lane, Careys Lane and Feltirim Road which serve the area with residential, commercial, and agricultural lands.

R107 (Malahide Road)

R107 Malahide Road is a regional road in north Dublin which runs for approximately 10.5km from Fairview to Malahide. The speed limit along the R107 adjacent to the site is 60kph. This road is approximately 700m in length from the priority-controlled junction with Back Road through to a signalised junction with R106 Swords Road. Along this section, R107 Malahide Road comprises a carriageway of c. 7.5m wide with a narrow footpath provided on the western side. No cycle lanes are provided.

Back Road

Back Road is a single carriageway road running west-east for approximately 1.8km from the priority junction with R107 Malahide Road through to a priority junction with R124 The Hill. This road, which crosses the railway line via an existing bridge, currently comprises a carriageway of approximately 7.30m with narrow footpaths running along both sides of the road for the majority of its length.

Kinsealy Lane

Kinsealy Lane is a local road running north-south for approximately 1.8km from a priority junction with Back Road through to a priority junction with Chaple Road. This road is currently comprising a carriageway of approximately 5.50m with no footpaths for the majority of the road.

The Hill Road

The Hill Road is a single carriageway road running north-south for approximately 3.2km from a priority junction with St. Margarets Park to a priority junction with the Chapel Road. This road currently comprises a carriageway of approximately 7.00m with narrow footpaths running along both sides of the road for the majority of its length.

12.3.2 Baseline Traffic data

In order to determine the volume of traffic movements at key points on the road network surrounding the subject site, traffic count data has been assessed for the following three junctions:

- **Junction 1**: R107 Malahide Road / Back Road
- **Junction 2**: Back Road / Kinsealy Lane
- **Junction 3**: Back Road / Broomfield Access Road
- **Junction 4**: Back Road / The Hill
- **Junction 5**: Kinsealy Lane / Hazelbrook

Figure 12.2 | Junctions Assessed

A summary of the baseline two-way flows and the two-way flow expected to be generated by the proposed + committed and potential future developments in the local area are presented below in Table 12.1 for Junction 1, Table 12.2 for Junction 2, Table 12.3 for Junction 3, Table 12.4 for Junction 4 and Table 12.5 for Junction 5.

Description	Total Junction Two Way Flow (Veh)	Proposed + Committed + Future Developments Two Way Flow (Veh)	% Traffic increase
AM Peak Hour (08:00 - 09:00)	1,098	108	10%
PM Peak Hour (18:00 - 19:00)	1,066	118	11%

Table 12.1 | Summary Results for Junction 1

Description	Total Junction Two Way Flow (Veh)	Proposed + Committed + Future Developments Two Way Flow (Veh)	% Traffic increase
AM Peak Hour (08:00 - 09:00)	738	113	15%
PM Peak Hour (18:00 - 19:00)	732	145	20%

Table 12.2 | Summary Results for Junction 2

Description	Total Junction Two Way Flow (Veh)	Proposed + Committed + Future Developments Two Way Flow (Veh)	% Traffic increase
AM Peak Hour (08:00 - 09:00)	534	156	29%
PM Peak Hour (18:00 - 19:00)	570	169	30%

Table 12.3 | Summary Results for Junction 3

Description	Total Junction Two Way Flow (Veh)	Proposed + Committed + Future Developments Two Way Flow (Veh)	% Traffic increase
AM Peak Hour (08:00 - 09:00)	1,109	59	5%
PM Peak Hour (18:00 - 19:00)	1,199	65	5%

Table 12.4 | Summary Results for Junction 4

Description	Total Junction Two Way Flow (Veh)	Proposed + Committed + Future Developments Two Way Flow (Veh)	% Traffic increase
AM Peak Hour (08:00 - 09:00)	259	66	25%
PM Peak Hour (18:00 - 19:00)	204	73	36%

Table 12.5 | Summary Results for Junction 5

Trip generation calculations for the proposed, committed, and potential future developments are presented later in this Chapter.

As recommended in the Transport Infrastructure Ireland (TII) Publication, 'Project Appraisal Guidelines Unit 16.1: Expansion Factors for Short Period Traffic Counts (October 2016)', the traffic count data has been converted to Annual Average Daily Traffic (AADT) data in order to provide a dataset representative of the annual traffic flow profile for the road network surrounding the proposed development.

The General Expansion Factor Method, as outlined in the TII Publication, was used to convert the surveyed flows for the 4 No. junctions into the Annual Average Daily Traffic (ADDT). The corresponding Factors for the Greater Dublin Region were used.

The traffic growth rate of 1.016 used to factor up the 2020 surveyed flows into 2021 is in accordance with the 'Table 6.1: Link-Based Growth Rates: Metropolitan Area Annual Growth Rates' within the TII Publications – Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections (May 2019). The ADDT flows are shown below in Tables 12.6, 12.7, 12.8, 12.9 and 12.10.

Hour Ending	Proportion of Daily Traffic	Existing Two-way Flows through Junction 1 (Vehicles)
07:00	0.037	681
08:00	0.077	1,098
09:00	0.081	949
16:00	0.069	1,108
17:00	0.083	1,139
18:00	0.088	1,068
Total	0.435	6,043

Table 12.6 | Junction 1 - R107 Malahide Rd/Back Rd

24 Hour Estimate = 6,043/0.435 = 13,891 vehicles

Weekly Average Daily Traffic (WADT) = 13,891 x 0.99 = 13,753 vehicles

Annual Average Daily Traffic (AADT) = 13,753 x 0.97 = 13,340 vehicles

Hour Ending	Proportion of Daily Traffic	Existing Two-way Flows through Junction 2 (Vehicles)
07:00	0.037	345
08:00	0.077	738
09:00	0.081	626
16:00	0.069	732
17:00	0.083	648
18:00	0.088	686
Total	0.435	3,775

Table 12.7 | Junction 2 – Back Road/Kinsealy Lane

24 Hour Estimate = 3,775/0.435 = 8,678 vehicles

Weekly Average Daily Traffic (WADT) = 8,678 x 0.99 = 8,591 vehicles

Annual Average Daily Traffic (AADT) = 8,591 x 0.97 = 8,334 vehicles

Hour Ending	Proportion of Daily Traffic	Existing Two-way Flows through Junction 3 (Vehicles)
07:00	0.037	283
08:00	0.077	574
09:00	0.081	438
16:00	0.069	508
17:00	0.083	570
18:00	0.088	495
Total	0.435	2,868

Table 12.8 | Junction 3 – Back Road / Broomfield Site Access Road

24 Hour Estimate = 2,868/0.435 = 6,593 vehicles

Weekly Average Daily Traffic (WADT) = 6,593 x 0.99 = 6,527 vehicles

Annual Average Daily Traffic (AADT) = 6,527 x 0.97 = 6,331 vehicles

Hour Ending	Proportion of Daily Traffic	Existing Two-way Flows through Junction 4 (Vehicles)
07:00	0.037	422
08:00	0.077	1,111
09:00	0.081	764
16:00	0.069	993
17:00	0.083	988
18:00	0.088	1,205
Total	0.435	5,483

Table 12.9 | Junction 4 – Back Road/The Hill

24 Hour Estimate = 5,483/0.435 = 12,605 vehicles

Weekly Average Daily Traffic (WADT) = 12,605 x 0.99 = 12,479 vehicles

Annual Average Daily Traffic (AADT) = 12,479 x 0.97 = 12,104 vehicles

Hour Ending	Proportion of Daily Traffic	Existing Two-way Flows through Junction 2 (Vehicles)
07:00	0.037	137
08:00	0.077	259
09:00	0.081	199
16:00	0.069	193
17:00	0.083	204
18:00	0.088	183
Total	0.435	1,175

Table 12.10 | Junction 5 – Kinsealy Lane/Hazelbrook

24 Hour Estimate = 1,175/0.435 = 2,701 vehicles

Weekly Average Daily Traffic (WADT) = 2,701 x 0.99 = 2,674 vehicles

Annual Average Daily Traffic (AADT) = 2,674 x 0.97 = 2,594 vehicles

Pedestrian and Cycling Facilities

The site is well located to provide non-car access for residents and visitors of the proposed development with good local walk-in access from the local catchment.

Proposals for the Greater Dublin Area Cycle Network Plan were published by the National Transport Authority in December 2013. The plan sets out a vision and a strategy for the construction and/or designation of a comprehensive network of cycling routes throughout the Greater Dublin Area (Counties Dublin, Meath, Kildare, and Wicklow). There are cycle routes available along the roads and through Malahide Castle ground connecting to Malahide Town Centre.

12.3.3 Public Transport Facilities

The assessment of the public transport and the surrounding existing roads, junctions and pathways is shown below. The proposed development has adequate capacity of current public transport infrastructure with access to Malahide Dart Station and several Dublin Bus routes.

Train Services Accessibility

The nearest train station to the subject site is the Malahide station, located approximately 1.6km from the northern site (c. 20-minute walk or c.6-minute cycle) and 2.7km north-east of the southern site (c.34-minute walk or c.10-minute cycle). It is also possible to take the 42 Bus to Malahide Train Station, which reduces the travel time from the northern site from c.20 minutes to c.14 minutes.

The route though Malahide Castle Gardens closes at certain times. The alternative route using The Hill Road is shown in Figure 3 below. It is approximately 1.8km (22-miinute walk or 7-minute cycle) from the proposed site entrance to Malahide Dart Station using this route.

The Malahide Station is served by Commuter Rail and DART services. The Commuter Rail service through Malahide Station serves all main stations from Dundalk through Dublin City Centre to Gorey. The service operates at 3 to 4 services per hour in both direction on weekdays.

The DART service through Malahide Station serves all stations from Malahide through Dublin City Centre to Bray and Greystones. On weekdays, this service operates at a 20-minute frequency in both directions.

Figure 12.3 | Walking Distance to Malahide Train Station

Bus Services Accessibility

The subject site is served by Dublin Bus Routes 42 and 142. Route 42 connects Sand's Hotel in Portmarnock to Talbot Street in Dublin City Centre, and Route 142 connects Portmarnock to UCD Belfield via the Port Tunnel.

The nearest bus stops to the subject site are located on either side of The Hill Road (R124), immediately south of the junction with Back Road. These stops are approximately 900m north-east of the subject site entrance. This equates to a c.9-minute walk from the northern site.

The walking distance to these bus stops from the southern site is longer, approximately 1.7km, which equates to a c.22-minute walk. Residents at the southern site also have the option of walking to bus stops on the Malahide Road (R107), immediately north of the junction with Back Road, which are served by the 42 Bus Route. The walking route is via Hazelbrook and Kinsealy Lane, and is approximately 1.6km, which equates to a c.20-minute walk.

A summary of the Dublin Bus Route frequencies is presented in the Table below. Travel time on the 42 bus between Malahide and Talbot Street is approximately 42 minutes in either direction, while the travel time on the 142 between Malahide and UCD Belfield is approximately 60 minutes in either direction.

Route No.	From	To	AM Weekday Frequency	PM Weekday Frequency
			(07:00 to 09:00)	*(17:00 to 19:00)*
42	Sand's Hotel (Portmarnock)	Talbot Street	Every 20 minutes	Every 20 to 25 minutes
42	Talbot Street	Sand's Hotel (Portmarnock)	Every 15 to 30 minutes	Every 20 to 25 minutes
142	Portmarnock	UCD Belfield	Bus leaves terminus at: 07:10, 07:35, 07:55	*No evening buses*
142	UCD Belfield	Portmarnock	*No morning buses*	Bus leaves terminus at: 16:35, 17:05

Table 12.11 | Frequency of Dublin Bus Route 42

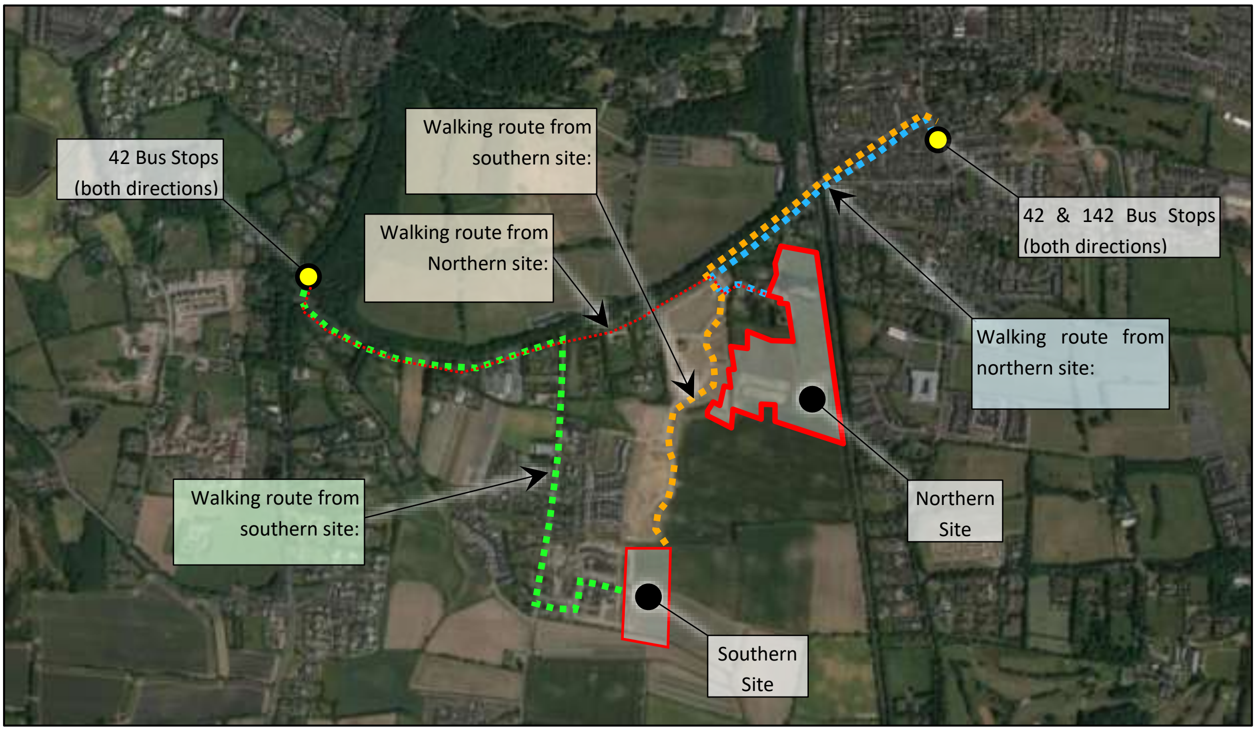

Figure 12.4 | Walking Distance to Nearest Bus Stops

12.4 Characteristics of the Proposal

12.4.1 Introduction

The proposed development consists of two sites. The northern site consists of 328 residential units and a creche approximately 476 sqm. The southern site will consist of 87 residential units. The combined total of proposed development is 415 residential units, comprising of 252 houses, 28 duplex units and 135 apartments, as set out in the Schedule of Accommodation below:

Description	1-bed	2-bed	3-bed	4-bed	5-bed	GFA (Sqm)	Total
Northern Site							
House	-	-	133	36	12	-	181
Duplex	-	6	6	-	-	-	12
Apartment	37	93	5	-	-	-	135
Creche	-	-	-	-	-	476 sqm	-
Northern Total	**37**	**99**	**144**	**36**	**12**	**476sqm**	**328 units 476 sqm**
Southern Site							
House	**-**	**-**	**59**	**12**	**-**	**-**	**71**
Duplex	**-**	**8**	**8**	**-**	**-**	**-**	**16**
Southern Total	**-**	**8**	**67**	**12**	**-**	**-**	**87**
Total Site	37	107	211	48	12	476sqm	415 units 476 sqm

Table 12.12 | Schedule of Accommodation

12.4.2 Broomfield Development Lands

Description

In the Fingal Development Plan 2017 – 2023, the Broomfield Development Lands falls within the zoning objective type of:

> *"RA – Residential Area: provide for new residential communities subject to the provision of the necessary social and physical infrastructure.*
>
> *Ensure the provision of high quality new residential environments with good layout and design, with adequate public transport and cycle links within walking distance of community facilities. Provide an appropriate mix of house sizes, types and tenures in order to meet household needs and to promote balanced communities."*

The location of the subject site within the Broomfield Development Lands is shown in the Figure below:

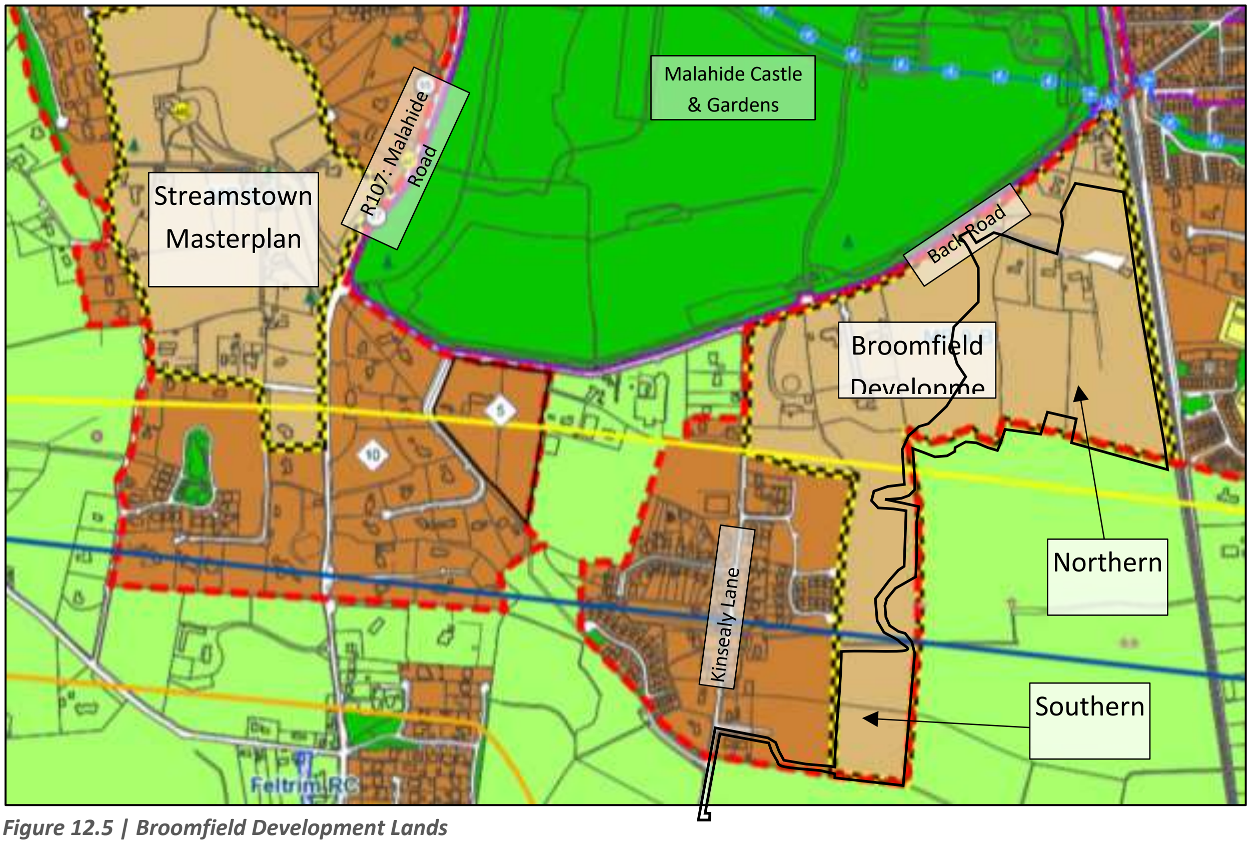

Figure 12.5 | Broomfield Development Lands

12.4.3 Ashwood Hall and Brookfield (Planning. Ref's. F13A/0459 and F13A/0460)

The under-construction Ashwood Hall and Brookfield development of Broomfield Development Lands will comprise a total of 149 residential units (61 dwelling under Planning Reference F13A/0459 and 88 dwellings under Planning Reference F13A/0460). It is expected that Ashwood Hall and Brookfield will be fully developed and occupied by 2023. Ashwood Hall and Brookfield of Broomfield has also been assessed with regards to trip generation/distribution and additional population.

The overall proposal of the approved development of Ashwood Hall and Brookfield (Planning Reference F13A/0459) also includes the upgrade of the existing priority-controlled T-junction between Back Road and Broomfield Access Road to accommodate a right turning lane to facilitate access for traffic travelling from the west on Back Road onto Broomfield lands.

12.4.4 Physical Infrastructure

Internal Road Layout

The proposed road layout incorporates a road hierarchy including link roads, side streets and homezones. Generally, the internal link and side streets are 6.0 m wide, and footpaths are 2.0 m wide. Various traffic calming measures such as the avoidance of long straight sections, raised tables, pedestrian friendly crossings and homezone areas, have been introduced to ensure a design speed of 30 km/h. Pedestrian crossing points are located at various points within the development such that unimpeded pedestrian movement is facilitated.

Site Access Points

Ashwood Hall and Brookfield of the Broomfield Development Plan includes a site access point to the north of the overall site connecting to Back Road and creating a priority T-Junction. The proposed development will connect to this site access point also.

Fingal County Council recommended additional vehicular access to the site is now proposed from Kinsealy Lane, via Hazelbrook during the SHD pre-planning process. This will benefit the southern site for vehicular, pedestrian and cycle access. Fingal County Council requested that a road connects between the north and south sites for Broomfield to increase the permeability of the area including Broomfield and the existing Hazelbrook residential area.

It is considered that the route between the site entrance from the Hazelbrook residential development to the site exit on the north on the Back Road, and vice versa, will not create a “rat-run” if there is any potential build-up of traffic at the Kinsealy Lane-Back Road junction. This is owning to the fact the layout of the proposed route is meandering, and has frequent interruptions such as raised tables, pedestrian crossings and low radii corners which will effectively enforce a slower vehicular speed as per DMURS guidelines discussed further in the reports accompanying this planning application.

Internal Pedestrian and Cyclist Facilities

Footpaths within the proposed development will be provided in accordance with Section 4.3.1 of the Design Manual for Urban Roads and Streets (DMURS) which suggests that a minimum 1.8m footpath should be provided. Crossing points are located at various points within the development such that unimpeded pedestrian movement is facilitated. Accordingly, the proposed development is consistent with the principles outlined in DMURS. A statement in respect of DMURS compliance has been prepared within the DMURS Report which accompanies this application under separate cover.

According to the Fingal County Council Development Plan 2017-2023, the proposed development is required to provide, 163 bicycle parking spaces for residents, 33 bicycle parking spaces for visitors and 2 bicycle parking spaces for the Creche.

When considering the Design Standard for New Apartments standard, the bicycle parking requirement for the proposed development is also 163 spaces for residents but increases to 82 for visitors (1 cycle parking space per bedroom plus 1 cycle space per every two residential units).

The proposed development will provide 227spaces on site. This is provision exceeds both the Fingal Development Plan 2017 – 2023 and the Design Standards for New Apartments requirements and is considered ideal to serve the proposed development. Cycle parking for the dwellings will be provided privately within each house.

Pedestrian Linkages to Surrounding Lands

Using the proposed development access point on Back Road, it is a 1.4km walk (17-minute walk) to the Malahide Town Centre. Along the route to Malahide, a narrow footpath, directly adjacent to the carriageway, is provided on both sides of Back Road. On The Hill Road, a wider footpath is provided along the western side of the carriageway and on both sides of the road until the Malahide. No cycle lanes are provided along the route.

Car Parking Provision

The number of car parking spaces projected to serve the proposed development is presented in Table 12.13 below

Description	No. of Units	Spaces per Unit	Total Spaces
Apartment Blocks A & B	110	1.25	138 (Includes 28 visitor spaces)
Apartment Block C	25	1.25	31 (Includes 6 visitor spaces)
Duplex Block D + creche	24	1.25	28 (Includes 10 visitor/staff parking spaces)
Duplex Block E	16	1.25	20 (Includes 4 visitor spaces)
Houses	252	2	504
Total	415	-	721

Table 12.13 | Proposed Car Parking

As seen from the above table, the proposed will be served with 725 car parking spaces, with 217 being provided for the apartment and Duplex units (1.25 car parking spaces per unit). In-curtilage parking is proposed for each of the houses. The creche includes 6 no. pickup and drop off spaces and 10 staff parking which also serve as visitor parking for Duplex Block D.

There are 8 disabled car parking spaces included in the Apartment/Duplex Blocks. This consists of 1 disabled car parking space per block except 4 disabled car parking spaces for Blocks A and B.

The reduced provision of car parking spaces per apartment reflects the location of the proposed development in relation to public transport services.

As per the Fingal Development 2017 – 2023, One space or more per 100 spaces should be reserved for electric vehicles with charging facilities. Therefore, as part of the proposed development, there will be 7 electric vehicle charging point within the Proposed Development.

12.4.5 Potential Future Developments

In order to provide a robust assessment of the transportation network in the local area, the following potential future developments have also been assessed with regards to trip generation and additional population. The location of these potential future development sites is illustrated in Figure 12.6 below.

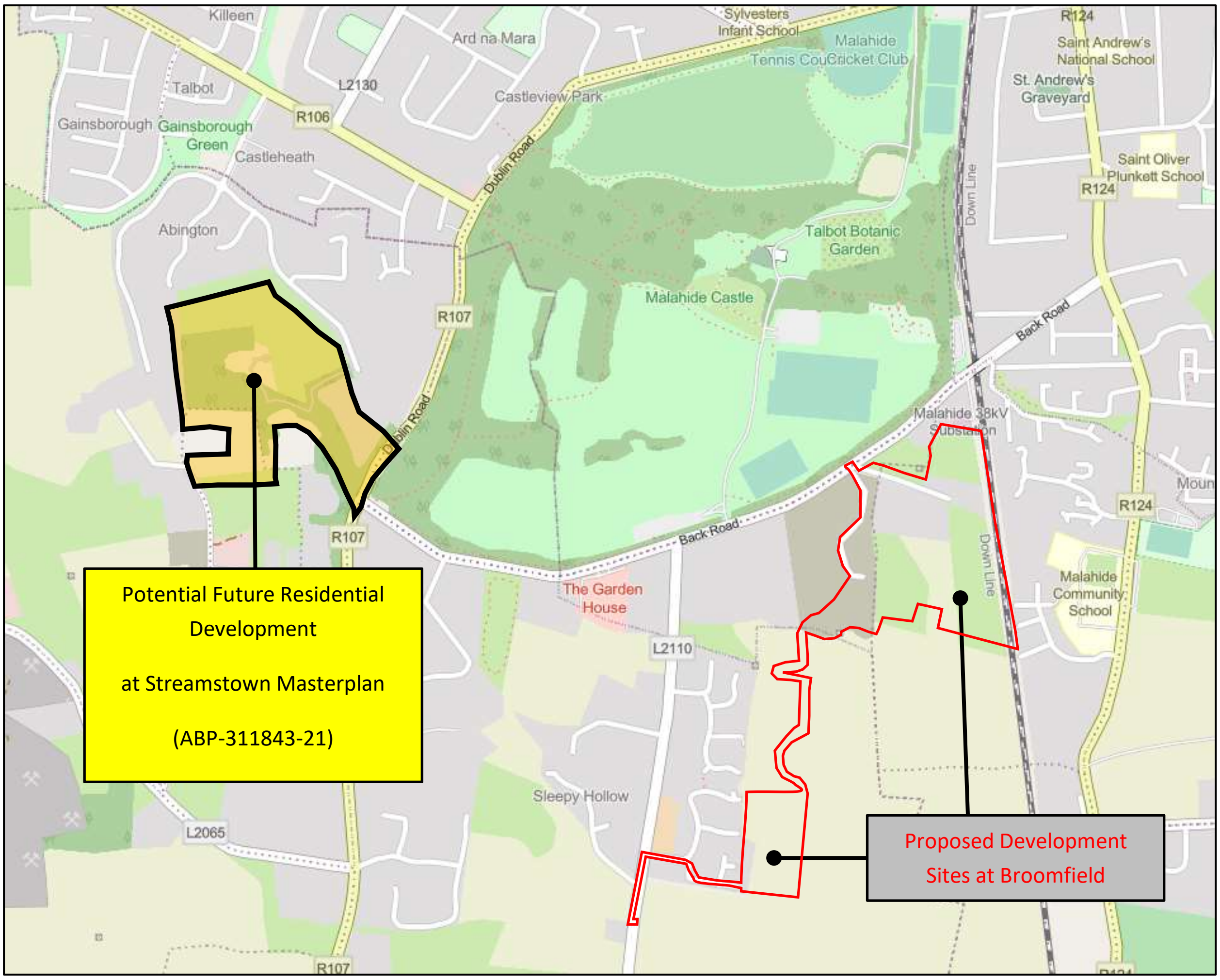

Figure 12.6 *| Location Map for Proposed Development and Potential Future Development Sites.*

Development at Streamstown Masterplan

The first main element of the Streamstown Masterplan as set out in the Fingal Development Plan 2017 - 2023 requires the provision of low-density residential developments reflective of the character of the area. At the time of writing in 2022, some low-density residential units are complete in the Streamstown Masterplan area.

Planning application for a further c. 369 residential units (88 no. houses, 239 no apartments and 42no. duplexes) within Streamstown Masterplan is currently pending, which would result in a population increase of c. 1,218 people when fully completed and occupied.

The planning application for Streamstown was rejected, however, the Streamstown Masterplan has been added to the Strategic Housing Development Plan and there is a potential future development at this location.

Sensitivity Analysis

Due to the additional potential developments in the area and the sensitivity of the road network a sensitivity analysis is include in the traffic and transport assessment. The sensitivity analysis will include the overall Broomfield site including the proposed development and the potential development at Streamstown.

The Sensitivity Analysis will be for the following years:

- Opening Year + 5 Years Forecast: 2031
- Opening Year + 15 Years Forecast: 2041

12.4.6 Trip Generation

In order to assess the likely impact of the traffic generation arising from the proposed development at Broomfield Development Lands Trip Rates were taken from TRICS Database.

TRICS is the national standard of trip generation and analysis in Ireland. It is a database system which allows users to identify representative trip rates and to establish potential levels of trip generation for a wide variety of developments.

TRICS trip rates have been used to estimated apartment trips and for house/duplex trips. These trip rates are shown in Table 12.14 below.

Full TRICS trip rates for apartments, which were sourced from the TRICS version 7.3.2, have been provided in Appendix B.

Use	CAR TRIP RATES				
	08:00 – 09:00		17:00 – 18:00		Source
	IN	OUT	IN	OUT	
Houses	0.147	0.380	0.380	0.194	(F13A/0459 Approved TIA)
Apartments	0.029	0.221	0.221	0.064	TRICS Consultation
Duplexes	0.147	0.380	0.380	0.194	(F13A/0459 Approved TIA)

Table 12.14 | TRICS Car Trip Rates.

Proposed Development

<u>Northern Site</u>

The proposed northern site will comprise a total of 328 no. residential units (181 no. houses, 135 no. apartments, 12 no. duplexes and a creche). The AM and PM peak hour trip generation to/from the proposed development, estimated after the trip rates presented in Table 12.15, is shown in Table 12.16 below.

The creche located in the Northern site is assumed to be used for internal use and therefore no trips will be generated except for staff for the creche.

Use	Units / No. of classrooms	PROPOSED Northern Site			
		08:00 – 09:00		**17:00 – 18:00**	
		IN	**OUT**	**IN**	**OUT**
Houses	181	27	72	69	41
Apartments	135	4	30	30	9
Duplexes	12	2	6	4	0
Creche	8 Classrooms	8	-	-	8
Total	**328 Units 8 No. Classrooms**	**41**	**108**	**103**	**58**

Table 12.15 | Trip Generation – Northern Site

As can be seen from the above, the northern site under the subject application is estimated to generate a total of 159 vehicle movements in the AM peak hour (41 arrivals and 108 departures) and a total of 161 vehicle movements in the PM peak hour (103 arrivals and 58 departures).

Southern Site

The proposed southern site will comprise a total of 89 no. residential units (73 no. houses and 16 no. duplexes). The AM and PM peak hour trip generation to/from the proposed development, estimated after the trip rates presented in Table 9.

Use	Units	PROPOSED Southern Site			
		08:00 – 09:00		**17:00 – 18:00**	
		IN	**OUT**	**IN**	**OUT**
Houses	73	11	29	28	16
Duplexes	16	2	6	6	4
Total	**89**	**13**	**35**	**34**	**20**

Table 12.16 | Trip Generation – Southern Site

As can be seen from the above, the southern site under the subject application is estimated to generate a total of 48 vehicle movements in the AM peak hour (13 arrivals and 35 departures) and a total of 54 vehicle movements in the PM peak hour (34 arrivals and 20 departures).

12.4.7 Trip Distribution

In order to determine the amount of new car trips expected to travel through each surveyed junction in the vicinity of the proposed development site, the calculated car trips for each assessed development have been distributed. These are presented below.

Proposed Development (Current Application)

The trip distribution for the proposed development was assumed based on a number of factors including the existing traffic survey and the location of existing schools, town centres and areas of employment. Based on the traffic survey the majority of traffic will travel south towards Dublin City Centre and this has been taken into account for creating the trip distribution.

Northern Site

The trip distribution for the peak hour generated traffic for the northern site is detailed in Figure 15 below. The northern site is assumed to have 90% of the trips using the northern access point on Back Road and 10% using the southern access point to travel south on Kinsealy Lane. Of the 95% of trips, 30% will travel to/from west on Back Road towards the Hill with 10% travelling to/from the north and 20% travelling to/from south. The other 65% will travel to/from west on Malahide Road with 15% travelling south to/from Kinselay Lane and the 50% continuing onto R107 Malahide Road with 35% travelling to/from south on Malahide Road and the remaining 15% travelling to/from north on Malahide Road.

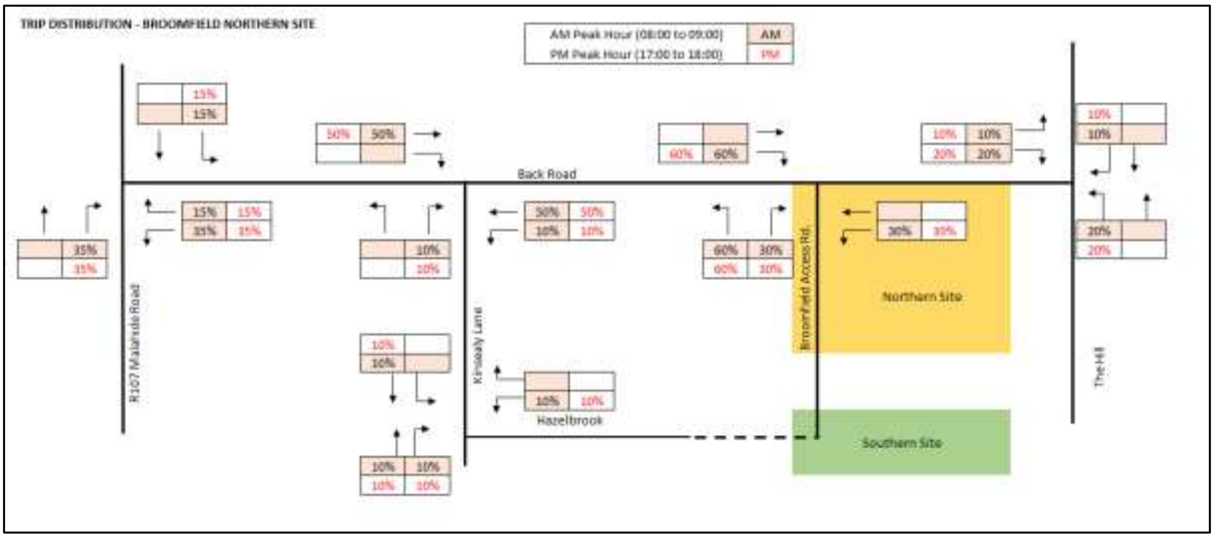

Figure 12.7 | Proposed development – Northern Site trip distribution

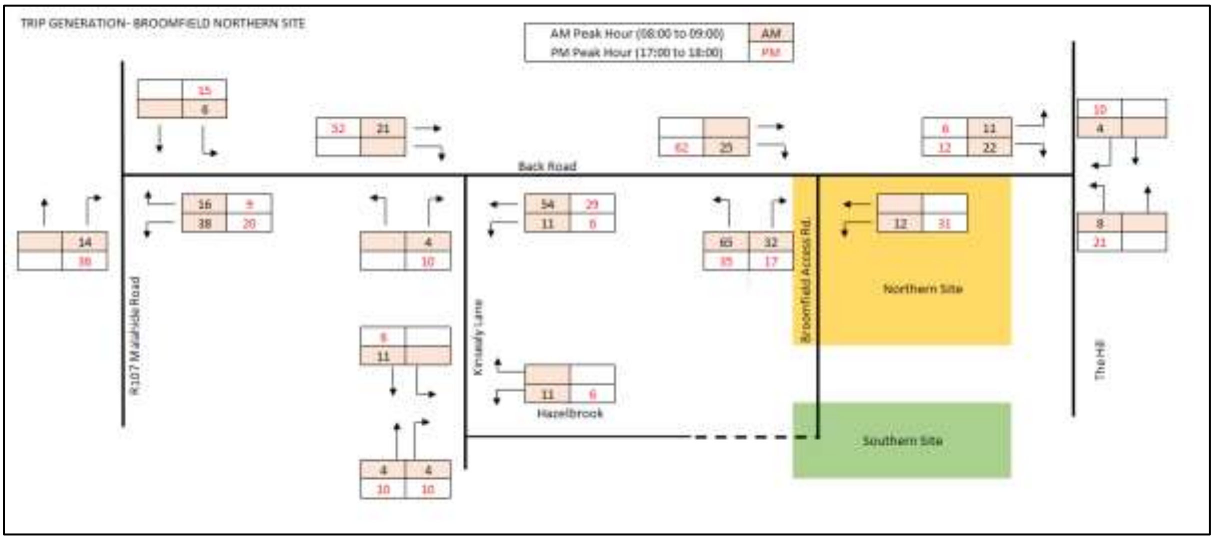

Figure 12.8 | Trip Generation – Proposed Development: Northern Site (Current Application).

Southern Site

The trip distribution for the peak hour generated traffic for the southern site is detailed in Figure 12.9 below. The southern site is assumed to have 90% of the trips using the site access road on Kinsealy Lane and 10% using the site access road on Back Road. Of the 90% of trips, 15% will travel to/from south on Kinsealy Lane and 75% to/from Back Road. On Back Road, 55% will travel west to/from Malahide Road with 40% travelling to/from south on Malahide Road and 15% travelling to/from north on Malahide Road. Of the trips travelling from the Kinsealy Road access point, 20% will travel east on Back Road, joining with the 10% of trips from the site access on Back Road to/from The Hill Road. On The Hill Road, 10% will travel to/from the north and 20% to/from the south.

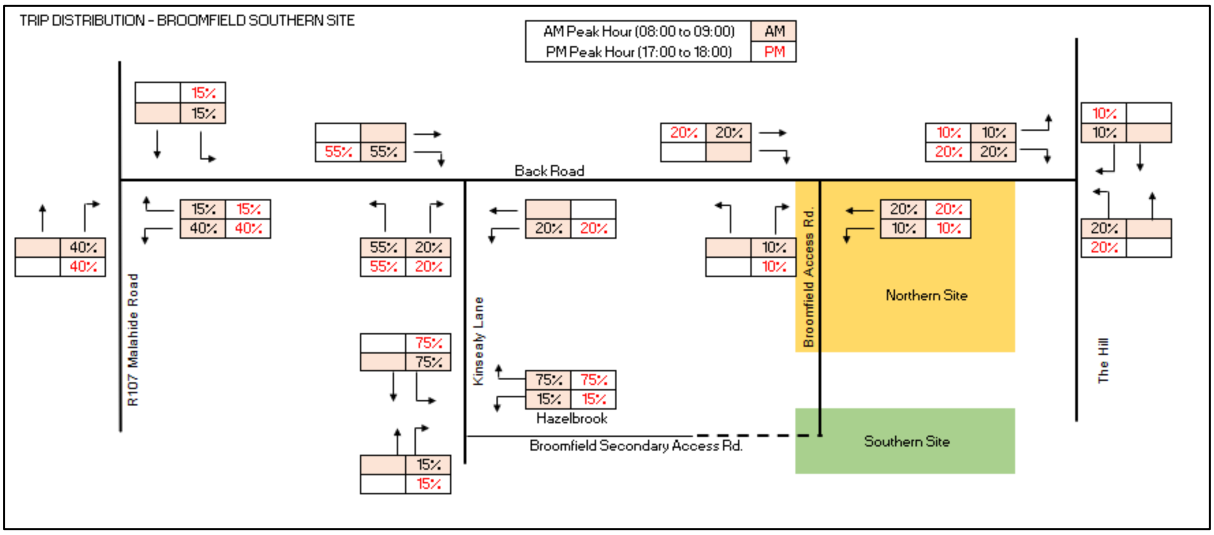

Figure 12.9 | Trip Distribution – Proposed Development: Southern Site (Current Application).

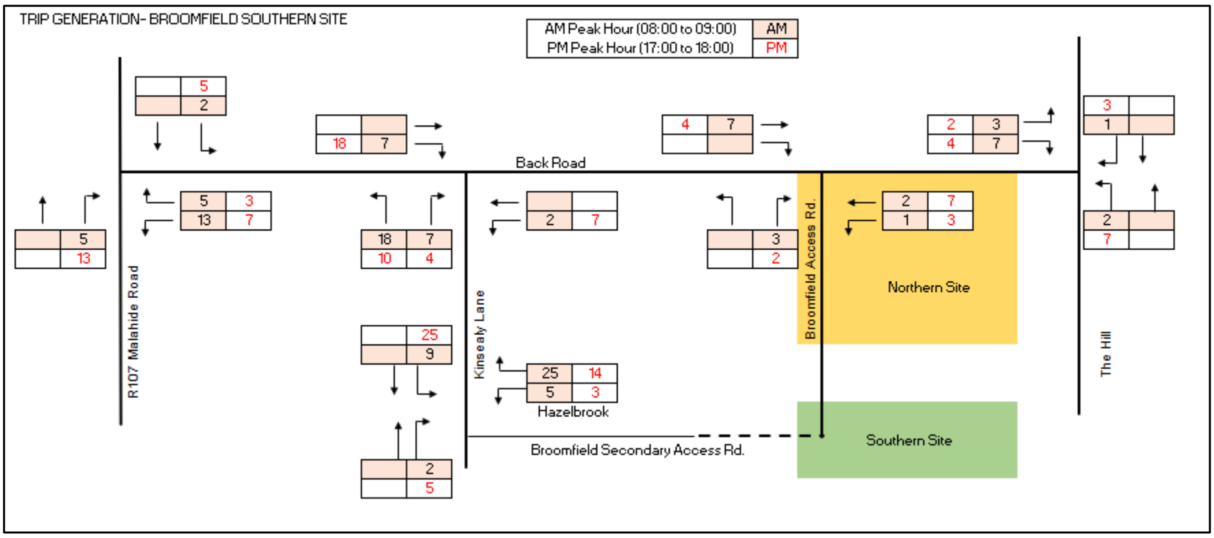

Figure 12.10 | Trip Generation – Proposed Development: Southern Site (Current Application).

12.5 Potential Impact of the Proposal

12.5.1 Introduction

The potential impacts of the proposed development from a traffic and transport perspective at both construction and operational stage are outlined in the following sections.

12.5.2 Traffic Impact

Construction Traffic

There is potential for construction traffic to impact from a noise and dust perspective in relation to the surrounding road network. Deliveries to and from the site by heavy good vehicles will impact on noise levels, whilst dust may result from vehicles travelling along gravel roads. There is also potential for traffic congestion, due to increased heavy good vehicles on the road network which may also perform turning movements, unloading, etc., in areas that impact on traffic. The potential for inappropriate parking whilst waiting for access to the site, may also impact local road users.

There is potential for construction traffic to have a moderate effect on the surrounding environment. However, the duration of this impact will be short-term (i.e., one to three years).

Operation Traffic

The proposed development will generate a number of trips by various modes of travel including vehicular, pedestrian, cycle, and public transport. These trips may have an impact on the surrounding road network and could contribute to increased congestion.

Traffic count data was obtained for the purposes of the planning application. The data surveyed is expected to reflect the peak traffic conditions on the local road network. An estimation of the traffic generation and distribution of the proposed development has been set out in the previous section. This will be compared to the background traffic counts in order to ascertain the impact the proposed development will have on the local road network.

12.5.3 Walking and Cycling Infrastructure

There is a potential of conflict between construction traffic and pedestrian/cyclists using the existing facilities on Back Road. There is also potential for conflicts and disruption to vehicular access, pedestrian and cyclists during the construction works of the proposed site access junction.

12.5.4 Do-Nothing Scenario

Should the proposed development not take place, the access roads and infrastructure will remain in their current state and there will be no change. Background traffic would be expected to grow over time. Given the location and zoning of the subject site, it is reasonable to assume that a similar development, with a potentially more intensive requirement for vehicular trips would be established on this site at some stage in the future.

12.6 Mitigating measures

12.6.1 Introduction

This section of the report discusses mitigation measures to reduce the impact of the proposed development on the surrounding area during the construction and operational phases.

12.6.2 Construction Phase

It is considered that a Construction Management Plan (CMP) will be prepared by the appointed contractor in order to minimise the potential impact of the construction phase of the proposed development on the safety and amenity of other users of the public road. The CMP will consider the following aspects:

- Dust and dirt control measures.
- Noise assessment and control measures
- Routes to be used by vehicles
- Working hours of the site
- Details of construction traffic forecasts
- Time when vehicle movements and deliveries will be made to the site
- Facilities for loading and unloading
- Facilities for parking cars and other vehicles

Further to the above, a detailed Traffic Management Plan (TMP) will be prepared by the main contractor. This document will outline proposals in relation to construction traffic and associated construction activities that impact the surrounding roads network. The document will be prepared in coordination and agreed with the local authority.

Care will be taken to ensure existing pedestrian and cycling routes are suitably maintained or appropriately diverted as necessary during the construction period, and temporary car parking is provided within the site for contractor’s vehicles. It is likely that construction will have an imperceptible impact on pedestrian and cycle infrastructure.

Through the implementation of the CMP and TMP, it is anticipated that the effect of traffic during the construction phase will have a slight effect on the surrounding road network for short-term period.

12.6.3 Operational Phase

The proposed development is situated adjacent to suitable infrastructure and transport services for travel by sustainable modes. A key barrier to modal shift towards sustainable modes of travel is often a lack of information about potential alternatives to the car. As such, it is proposed that residents will be made aware of potential alternatives including information on walking, cycle routes and public transport.

Residents will be encouraged to avail of these facilities for travel to and from work. Provision of this information would be made during the sales process and will be included in the new homeowner’s pack upon the sale of each unit, as this represents the best opportunity to make residents aware and to secure travel behaviour change. It is anticipated that this measure may help to reduce the level of traffic at the proposed development, thus providing mitigation against any traffic and transport effects of the development.

A Travel Plan has been included in this application under separate cover. This Plan sets out a method to reduce the dependence on private car journeys and encourage residents within the development to avail of sustainable forms of transport such as walking, cycling and public transport.

12.7 Predicted Impact of the Proposal

12.7.1 Traffic

The predicted impacts of the proposed development from a traffic and transport perspective at both construction and operational phases are outlined in the following sections.

12.7.2 Construction Phase

Provided the above mitigation measures and management procedures outlined in the Construction Management Plan are incorporated during the Construction Phase, the residual impact upon the local receiving environment is predicted to be temporary in nature and slight in terms of effect.

12.7.3 Operational Phase

In order to assess the potential impact arising from the proposed development during the operational phase, a Traffic and Transport Assessment has been prepared and is included in the SHD application under a separate cover. The traffic modelling carried out as part of the Traffic and Transport Assessment includes the analysis of 5 no. Junctions of the surrounding network as set out below.

- **Junction 1**: R107 Malahide Road / Back Road
- **Junction 2**: Back Road / Kinsealy Lane
- **Junction 3**: Back Road / Broomfield Access Road
- **Junction 4**: The Hill / Back Road.
- **Junction 5**: Kinsealy Lane / Hazelbrook

Traffic Growth Factors

These junctions were assessed for the estimated the opening year of 2026 and future design years of 2031 (Opening Year +5 Years) and 2041 (Opening Year +15 Years). The background traffic growth factors used to factor up the baseline traffic movements are in accordance with the 'Table 6.1: Link-Based Growth Rates: Metropolitan Area Annual Growth Rates' within the TII Publications – Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections (May 2019). These are:

- 1.066 (Central Growth) growth factor from 2022 to 2026
- 1.143 (Central Growth) growth factor from 2022 to 2031.
- 1.202 (Central Growth) growth factor from 2022 to 2041

Committed and Potential Future Developments

The traffic modelling carried out as part of the Traffic and Transport Assessment also accounts for a committed (Under-construction Ashwood Hall and Brookfield), and a potential future development located at Streamstown. In order to determine the cumulative impact of the subject development in conjunction with other developments in the vicinity of the site is assessed.

Ashwood Hall and Brookfield – Reg. Ref. F13A/0459 and Reg. Ref. F13A/0460

The Ashwood Hall and Brookfield developments in Broomfield Development Lands comprise a total of 149 residential units (61 dwelling under Ashwood Hall (Planning Reference F13A/0459) and 88 dwellings under Brookfield (Planning Reference F13A/0460)). It is expected that both developments will be fully developed and occupied by 2023. Ashwood hall and Brookfield has also been assessed with regards to trip generation/distribution and additional population.

The overall proposal of the approved development of Ashwood Hall (Planning Reference F13A/0459) also includes the upgrade of the existing priority-controlled T-junction between Back Road and Broomfield Access Road to accommodate a right turning lane to facilitate access for traffic traveling from west on Back Road onto Broomfield lands.

Under-construction Ashwood Hall and Brookfield

The permission for the under-construction Ashwood Hall and Brookfield of Broomfield Development Lands provided for the construction of a total of 149 no. houses (61 no. houses under Planning Reference F13A/0459 and 88 no. houses under Planning Reference F13A/0460).

The AM and PM peak hour trip generation to/from the under-construction Ashwood Hall and Brookfield development - extracted from the Traffic Impact Assessment approved under Planning Reference F13A/0459 is presented in Table 12.17 below.

Use	Units	ASHWOOD HALL AND BROOKFIELD			
		08:00 – 09:00		17:00 – 18:00	
		IN	OUT	IN	OUT
Houses (F13A/0459)	61	9	23	23	12
Houses (F13A/0460)	88	13	37	34	22
Total	**149**	**22**	**60**	**57**	**34**

Table 12.17 | Summary of Broomfield Peak Hour Car Trip Generation

As can be seen from the above, based on the TIA approved under Planning Ref. F13A/0459, the under-construction Ashwood Hall and Brookfield development (including both planning applications) is estimated to generate a total of 82 vehicle movements in the AM peak hour (22 arrivals and 60 departures) and a total of 91 vehicles movements in the PM peak hour (57 arrivals and 34 departures).

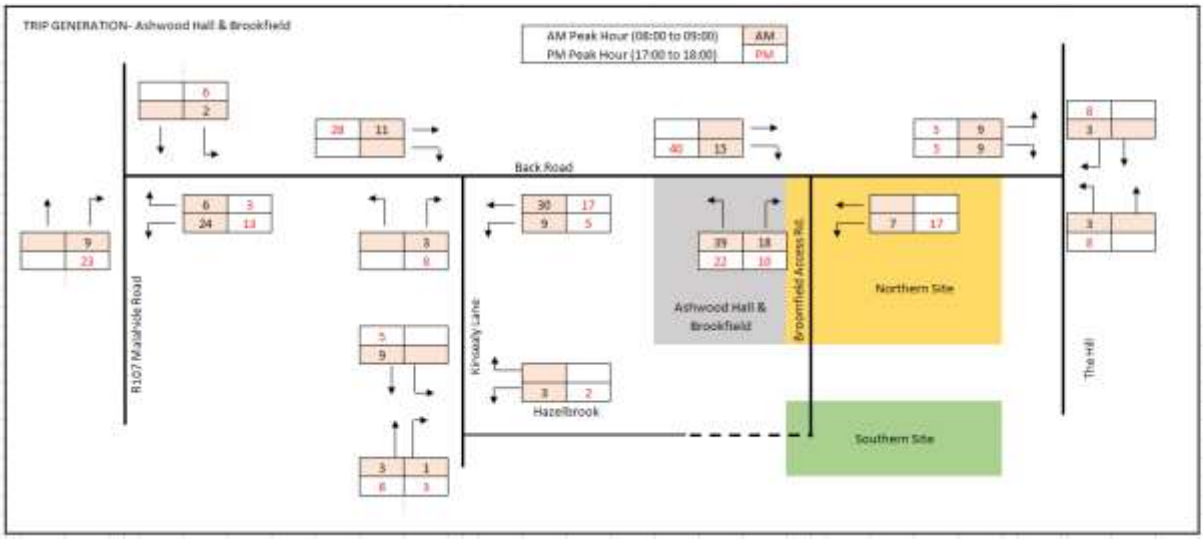

Figure 12.11 | Traffic to/from the Under-construction Ashwood Hall and Brookfield of Broomfield– 2026.

Potential Future Development at Streamstown

Trip generation for the potential future residential development at Streamstown Masterplan is presented in Table 12.18 below. It has been based on:

- 369 no. residential units (88 no. houses, 239 no. apartments and 42 no. duplexes).
- Car Trips for Table 7.

Use	Units	Potential Future Development at Streamstown			
		08:00 – 09:00		17:00 – 18:00	
		IN	OUT	IN	OUT
Houses	88	13	33	33	17
Apartments	239	7	53	53	15
Duplexes	42	6	16	16	8
Total	**369**	**26**	**102**	**102**	**40**

Table 12.18 | Car Trip Generation – Potential Future Residential Development at Streamstown Masterplan

As can be seen from the above, based on 369 no. residential units and the trip rates, the potential future development at Streamstown Masterplan is estimated to generate a total of 128 trips in the 08:00 – 09:00 peak hour (26 arrivals and 102 departures) and a total of 142 trips in the 17:00 – 18:00 peak hour (102 arrivals and 40 departures)

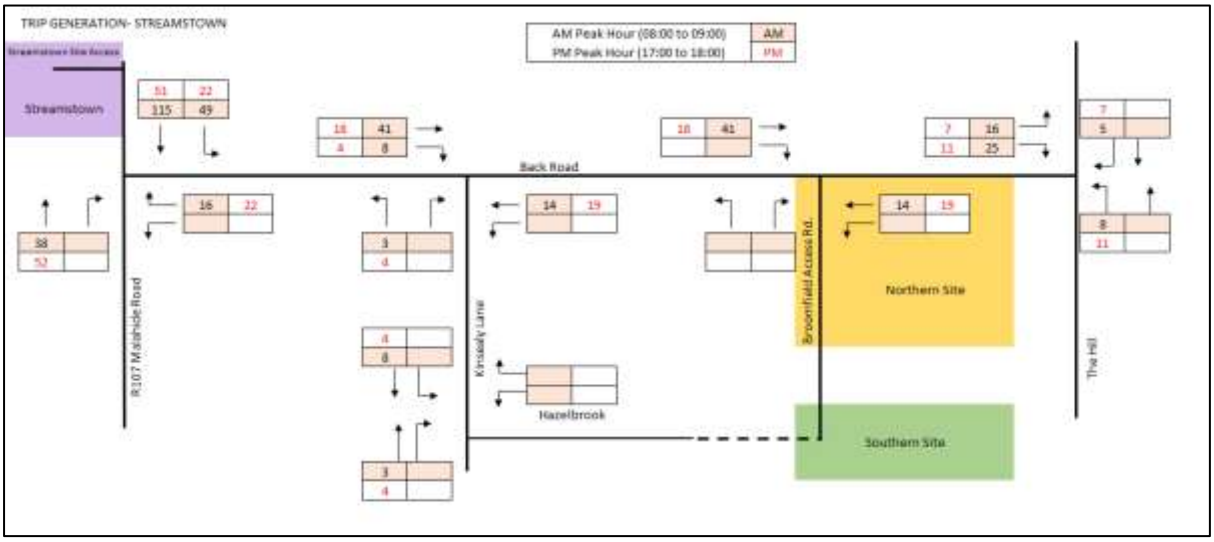

Figure 12.12 | Trip Generation – Potential Future Residential Development at Streamstown Masterplan.

Forecast Traffic 2041

The future traffic on the surrounding road network in 2041 is illustrated in Figure 12.13 below. It has been assumed within this TTA that the proposed development will be constructed over a period of approximately 3 years. Therefore, the assumed year of opening is 2026. As per methodology adopted in the 'Transport Assessment Guidelines (May 2014)', which the subject TTA is based on, the future design year (worst-case scenario) for junction assessment is 2041 (Opening year +15 years). It was assumed that, by the future year of 2041, Ashwood Hall and Brookfield, and the associated Junction 3 improvements will be fully constructed and occupied.

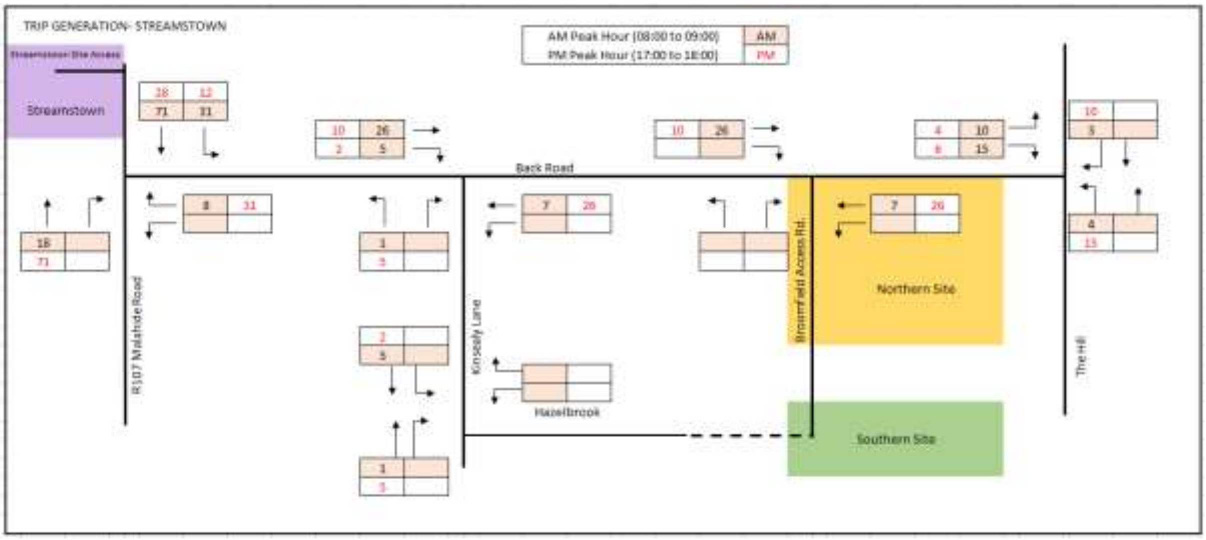

Figure 12.13 | Forecast Traffic 2041.

Assessment Scenarios

For the purposes of this TTA, several assessment scenarios were analysed for the proposed development, committed developments and the surrounding traffic network. A sensitivity analysis was also complete for the potential future developments in the area.

- **BASELINE SCENARIO 2022:** Baseline 2022 Traffic Survey Road Network
- **DO NOTHING 2026:** Baseline 2022 Road Network with traffic flows factored up + traffic to/from Ashwood Hall and Brookfield
- **DO NOTHING 2031:** Baseline 2022 Road Network with traffic flows factored up + traffic to/from Ashwood Hall and Brookfield
- **DO NOTHING 2041:** Baseline 2022 Road Network with traffic flows factored up + traffic to/from Ashwood Hall and Brookfield
- **DO SOMETHING 2026:** Baseline 2022 Road Network with traffic flows factored up + traffic to/from Ashwood Hall and Brookfield + traffic to/from the proposed development
- **DO SOMETHING 2031:** Baseline 2022 Road Network with traffic flows factored up + traffic to/from Ashwood Hall and Brookfield + traffic to/from the proposed development
- **DO SOMETHING 2041:** Baseline 2022 Road Network with traffic flows factored up + traffic to/from Ashwood Hall and Brookfield + traffic to/from the proposed development
- **SENSITIVETY ANALYSIS 2031:** Baseline 2022 Road Network with traffic flows factored up + traffic to/from Ashwood Hall and Brookfield + traffic to/from the proposed development + traffic to/from Potential Development at Streamstown
- **SENSITIVETY ANALYSIS 2041:** Baseline 2022 Road Network with traffic flows factored up + traffic to/from Ashwood Hall and Brookfield + traffic to/from the proposed development + traffic to/from Potential Development at Streamstown

Modelling Results

A summary of the results of the modelling carried out as part of the Traffic and Transport Assessment is provided below.

Junction 1 – R107 Malahide Road/Back Road (Existing Priority)

Junction 1 is currently a priority T-junction between primary road R107 Malahide Road and secondary road Back Road.

Figure 12.14 | Junction 1 - Malahide Road / Back Road

This junction has been modelled based on its current configuration and the PICADY analysis results are summarised in the table below. The arms of the junction were labelled as follows within the PICADY model:

- Arm A: R107 Malahide Road (N)
- Arm B: Back Road (E)
- Arm C: R107 Malahide Road (S)

2022 Baseline				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-C	0.4	0.30	0.2	0.19
Stream B-A	0.7	0.40	0.5	0.34
Stream C-AB	0.7	0.33	0.7	0.32
DO NOTHING 2026				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-C	0.6	0.39	0.3	0.23
Stream B-A	0.9	0.47	0.7	0.40
Stream C-AB	0.9	0.39	1.0	0.40
DO SOMETHING 2026				

Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-C	1.1	0.52	0.4	0.29
Stream B-A	1.3	0.56	0.8	0.45
Stream C-AB	1.0	0.43	1.6	0.52
DO NOTHING 2041				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-C	0.9	0.48	0.4	0.28
Stream B-A	1.3	0.57	0.9	0.48
Stream C-AB	1.1	0.45	1.3	0.47
DO SOMETHING 2041				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-C	1.9	0.66	0.5	0.35
Stream B-A	2.3	0.70	1.2	0.54
Stream C-AB	1.4	0.50	2.2	0.60
SENSITIVITY ANALYSIS 2041				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-C	9.8	0.95	0.7	0.42
Stream B-A	9.1	0.94	1.9	0.65
tream C-AB	1.7	0.55	2.7	0.64

Table 12.19 Junction 1 – DO NOTHING / DO SOMETHING PICADY Results

As shown in Table 12.19 above, the junction will remain under capacity for the scenario DO SOMETHING 2041 with the highest RFC of 0.70 and a corresponding queue of 2.3 vehicles in the AM peak hour and the highest RFC of 0.60 and a corresponding queue of 2.2 vehicles in the PM Peak hour.

For the Sensitivity Analysis 2041 the AM peak hour is over capacity with an RFC of 0.95 and a corresponding queue of 9.8 vehicles and under capacity in the PM peak hour with an RFC of 0.65 and a corresponding queue of 1.9 vehicles.

Junction 2 – Back Road / Kinsealy Lane (Priority Junction)

Junction 2 is an existing priority-controlled T-junction located west of the proposed development site.

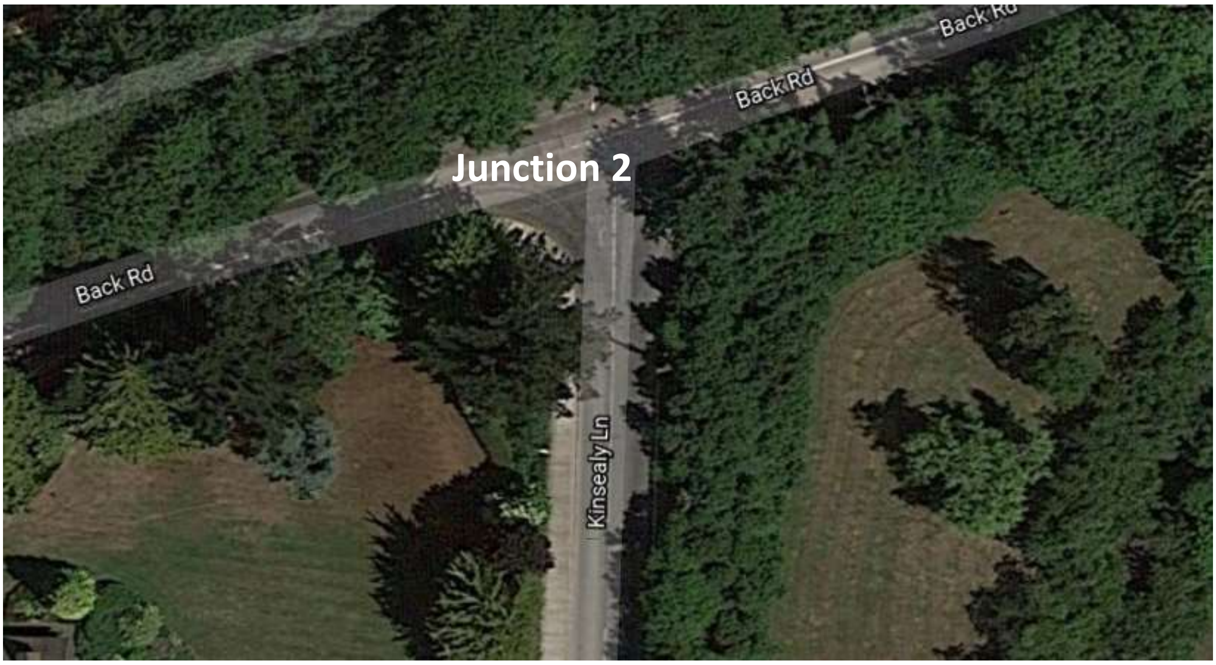

Figure 12.15 | Junction 2 – Back Road / Kinsealy Lane

This junction has been modelled based on its current configuration and the PICADY analysis results are summarised below. The arms of the junction were labelled as follows within the PICADY model:

- Arm A: Back Road (E).
- Arm B: Kinsealy Lane (S).
- Arm C: Back Road (W).

2022 Baseline				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	0.5	0.34	0.4	0.29
Stream C-AB	0.2	0.14	0.2	0.09
DO NOTHING 2026				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	0.6	0.39	0.5	0.35
Stream C-AB	0.3	0.16	0.2	0.10
DO SOMETHING 2026				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	0.9	0.47	0.7	0.42

Stream C-AB	0.4	0.18	0.3	0.15
DO NOTHING 2041				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	0.8	0.45	0.7	0.40
Stream C-AB	0.4	0.19	0.2	0.12
DO SOMETHING 2041				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	1.2	0.54	0.9	0.48
Stream C-AB	0.4	0.21	0.4	0.17
SENSITIVITY ANALYSIS 2041				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	1.2	0.56	1.0	0.50
Stream C-AB	0.5	0.24	0.4	0.18

Table 12.20 | Junction 2 - DO NOTHING / DO SOMETHING PICADY Results

As shown in Table 12.20 above, the junction will remain under capacity for the scenario DO SOMETHING 2041 with the highest RFC of 0.54 and a corresponding queue of 1.2 vehicles in the AM peak hour and the highest RFC of 0.48 and a corresponding queue of 0.9 vehicles in the PM Peak hour.

For the Sensitivity Analysis 2041 the AM peak hour is under capacity with an RFC of 0.56 and a corresponding queue of 1.2 vehicles and in the PM peak hour with an RFC of 0.50 and a corresponding queue of 1.0 vehicles.

Junction 3 – Back Road / Broomfield Access Road

Junction 3 is an existing priority-controlled T-junction located north of the proposed development site. As described earlier in Section 5.2, the overall proposal of the approved development of Ashwood Hall (Planning Reference F13A/0459) includes the upgrade of this junction to accommodate a right turning lane to facilitate access for traffic traveling from west on Back Road onto Broomfield lands. It is expected for the junction to be upgraded by 2023. Therefore, Junction 3 has been modelled based on its future configuration with a dedicated right turning lane for the DO NOTHING and DO SOMETHING scenarios and the PICADY analysis results are summarised in Table 13.21 below. The arms of the junction were labelled as follows within the PICADY model:

- Arm A: Back Road (E).
- Arm B: Broomfield Access Road (S).

- Arm C: Back Road (W).

Figure 12.16 | Junction 3 – Back Road / Broomfield Site Access Road

Baseline 2022				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	0.1	0.06	0.1	0.06
Stream C-AB	0.0	0.02	0.0	0.02
DO NOTHING 2026				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	0.2	0.19	0.2	0.13
Stream C-B	0.1	0.05	0.1	0.09
DO SOMETHING 2026				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	0.7	0.42	0.4	0.27
Stream C-B	0.1	0.09	0.3	0.20
DO NOTHING 2041				

Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	0.2	0.20	0.2	0.15
Stream C-B	0.1	0.05	0.1	0.09
DO SOMETHING 2041				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	0.8	0.44	0.4	0.29
Stream C-B	0.1	0.10	0.3	0.21
SENSITIVITY ANALYSIS 2041				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	0.8	0.45	0.4	0.29
Stream C-B	0.1	0.10	0.3	0.21

Table 12.21 | Junction 3 - DO NOTHING / DO SOMETHING PICADY Results

As shown in Table 12.21 above, the junction will remain under capacity for the scenario DO SOMETHING 2041 with the highest RFC of 0.44 and a corresponding queue of 0.8 vehicles in the AM peak hour and the highest RFC of 0.29 and a corresponding queue of 0.4 vehicles in the PM Peak hour.

For the Sensitivity Analysis 2041 the AM peak hour is under capacity with an RFC of 0.45 and a corresponding queue of 0.8 vehicles and in the PM peak hour with an RFC of 0.29 and a corresponding queue of 0.4 vehicles.

Junction 4 – Back Road / The Hill (Existing Priority)

Junction 4 is an existing priority-controlled T-junction located west of the proposed development site. This junction has been modelled based on its current configuration and the PICADY analysis results are summarised in Table 12.22 below. The arms of the junction were labelled as follows within the PICADY model:

- Arm A: The Hill (S)
- Arm B: Back Road
- Arm C: The Hill (N)

Figure 12.17 | Junction 4 – Back Road / The Hill

Baseline 2022				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	2.0	0.68	7.3	0.92
Stream C-AB	0.5	0.21	0.8	0.32
DO NOTHING 2026				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	3.8	0.81	19.7	1.07
Stream C-AB	0.6	0.24	1.0	0.38
DO SOMETHING 2026				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	8.4	0.94	32.0	1.16
Stream C-AB	0.6	0.25	1.2	0.42
DO NOTHING 2041				
Stream	08:00 – 09:00		17:00 – 18:00	

	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	11.6	0.99	54.9	1.33
Stream C-AB	0.8	0.29	1.5	0.46
DO SOMETHING 2041				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	27.4	1.13	68.9	1.41
Stream C-AB	0.8	0.30	1.7	0.50
SENSITIVITY ANALYSIS 2041				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	56.0	1.32	96.2	1.56
Stream C-AB	0.9	0.33	2.1	0.55

Table 12.22 | Junction 4 - DO NOTHING / DO SOMETHING PICADY Results

As can been in Table 12.22 above the junction is over capacity for the DO NOTHING 2026 scenario in the PM Peak hour with an RFC of 1.07 and a corresponding queue of 19.7 vehicles. For the DO SOMETHING 2041 scenario, the junction has an RFC of 1.13 and a corresponding queue of 27.4 vehicles in the AM peak hour and an RFC of 1.41 and a corresponding queue of 68.9 vehicles. When compared with DO NOTHING 2041 the RFC increase in very small and while the junction is over capacity the proposed development has minimal impact on the junction.

Junction 5 – Kinsealy Lane / Hazelbrook (Existing Priority)

Junction 5 is an existing priority-controlled T-junction located west of the proposed development site. This junction has been modelled based on its current configuration and the PICADY analysis results are summarised in Table 12.23 below. The arms of the junction were labelled as follows within the PICADY model:

- Arm A: Kinsealy Lane (N)
- Arm B: Hazelbrook
- Arm C: Kinsealy Lane (S)

Figure 12.18 | Junction 5 – Kinsealy Lane / Hazelbrook

Baseline 2022				
Stream	08:00 – 09:00		17:00 – 18:00	
	ueue (Veh.)	RFC	ueue (Veh.)	RFC
tream B-AC	0.1	0.06	0.0	0.03
tream C-AB	0.0	0.01	0.0	0.02
DO NOTHING 2026				
Stream	08:00 – 09:00		17:00 – 18:00	
	ueue (Veh.)	RFC	ueue (Veh.)	RFC
tream B-AC	0.1	0.07	0.0	0.04
tream C-AB	0.0	0.02	0.0	0.03
DO SOMETHING 2026				
Stream	08:00 – 09:00		17:00 – 18:00	
	ueue (Veh.)	RFC	ueue (Veh.)	RFC
tream B-AC	0.2	0.14	0.1	0.07
tream C-AB	0.0	0.03	0.1	0.06

DO NOTHING 2041				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	0.1	0.08	0.0	0.04
Stream C-AB	0.0	0.02	0.0	0.03
DO SOMETHING 2041				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	0.2	0.15	0.1	0.08
Stream C-AB	0.0	0.03	0.1	0.06
SENSITIVITY ANALYSIS 2041				
Stream	08:00 – 09:00		17:00 – 18:00	
	Queue (Veh.)	RFC	Queue (Veh.)	RFC
Stream B-AC	0.2	0.15	0.1	0.08
Stream C-AB	0.0	0.03	0.1	0.06

Table 12.23 | Junction 5 - DO NOTHING / DO SOMETHING PICADY Results

As shown in Table 12.23 above, the junction will remain under capacity for the scenario DO SOMETHING 2041 with the highest RFC of 0.15 and a corresponding queue of 0.2 vehicles in the AM peak hour and the highest RFC of 0.08 and a corresponding queue of 0.1 vehicles in the PM Peak hour.

For the Sensitivity Analysis 2041 the AM peak hour is under capacity with an RFC of 0.15 and a corresponding queue of 0.2 vehicles and in the PM peak hour with an RFC of 0.08 and a corresponding queue of 0.1 vehicles.

Summary

All junction assessment above shows minimal impact from the proposed development. Junctions 1, 2, 3 and 5 will remain under capacity for the worst-case scenario DO SOMETHING 2041 and SENSITIVTY ANALYSIS 2041. Junction 4 is over capacity for DO NOTHING 2026, when comparing the junction with and without the development, the proposed development will have minimal impact on the overall junction with an increase of 5.67%.

The provision of linkages to public transport and adequate pedestrian and cyclist facilities as part of the proposed development will result in a positive effect on sustainable transport modes.

12.8 Monitoring and Reinstatement

12.8.1 Construction Phase

During the Construction Phase the following monitoring is advised. The specific compliance exercises to be undertaken in relation to the range of measures detailed in the final construction management plan will be agreed with the planning authority.

- Construction vehicles routes and parking
- Internal and external road conditions
- Construction activities hours of work

12.8.2 Operational Phase

The Travel Plan for the proposed development will be monitored and updated at regular intervals. This will enable tracking in terms of a reduction in the dependence on private car journeys and a shift towards sustainable transport options such as walking, cycling and the use of public transport such as buses and trains.

12.9 Interactions

There may be temporary negative impacts to human health during the Construction Phase caused by noise, dust, air quality and visual impacts which are covered in other chapters of this EIAR. There may also be interaction with the surrounding water bodies through surface water runoff during topsoil stripping and earthworks which will be required to construct the roads.

The effects of these will be mitigated through the implementation of the measures outlined in this Chapter and within the Construction Management Plan.

12.10 Difficulties in compiling Information

There were no difficulties encountered in compiling this Chapter.

12.11 References

- Dublin BusConnects Website: New Dublin Area Bus Network - BusConnects
- Design Manual for Urban Roads and Streets (DMURS), Department of Transport, Tourism and Sport
- Irish Rail Website: www.irishrail.ie
- Fingal County Council Development Plan 2017 – 2023
- NRA Guidelines, Traffic and Transportation Assessment Guidelines (2014), National Roads Authority
- Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections, (May 2019), Transport Infrastructure Ireland Publications
- Project Appraisal Guidelines for National Roads Unit 16.1 – Expansion Factors for Short Period Traffic Counts, (2016), Transport Infrastructure Ireland Publications
- Sustainable Urban Housing: Design Standards for New Apartments, (2020), Department of Housing, Planning and Local Government
- Transport for Ireland (TFI): www.transportforireland.ie

13.0 CULTURAL HERITAGE

13.1 Introduction

This chapter of the Environmental Impact Assessment Report has been prepared by Dermot Nelis Archaeology on behalf of Birchwell Developments Ltd. The chapter provides an assessment of the archaeological, architectural and cultural heritage background for a proposed development at Broomfield, Kinsaley and Malahide townlands, Malahide, County Dublin (figure 1; Ordnance Survey Sheets 012 and 015). The chapter includes an identification of potential significant impacts or effects which may arise and outlines mitigation measures, based on current information, which may be used to avoid, reduce or offset any potential adverse effects.

The key objectives of this chapter are to assess, as far as is reasonably possible from existing records, any effects the proposed development may have on the archaeological, architectural and cultural heritage resource. The following key issues are addressed:

- Direct and indirect construction phase effects on archaeological, architectural and cultural heritage features;
- Direct and indirect operational phase effects on archaeological, architectural and cultural heritage features; and
- Residual effects on archaeological, architectural and cultural heritage features.

13.1.1 Statement of Authority

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Dermot Nelis graduated from Queen's University Belfast, and after gaining extensive fieldwork experience undertook postgraduate studies at the University of Oxford in archaeological consultancy and project management.

Dermot has acted as Senior Archaeologist on several road schemes for various County Councils, and Directed large-scale multi-period excavations associated with those developments. He has completed over 180 licensed fieldwork programmes and over 250 archaeological, architectural, and cultural heritage desk-based reports and Environmental Impact Assessments.

13.2 Study Methodology

13.2.1 Desk Study

There is no professional standard for defining the extent of a study area when assessing potential impacts or effects on archaeological, architectural, or cultural heritage remains. A 1km study area has been imposed around the development site to assess the presence of Recorded Monuments, World Heritage Sites, sites included in the Tentative List as consideration for nomination to the World Heritage List, National Monuments, sites with Preservation Orders or Temporary Orders.

A 500m study area has been imposed around the development site to assess the presence of Protected Structures, Architectural Conservation Areas, structures, and historic gardens recorded on the National Inventory of Architectural Heritage, or any additional archaeological, architectural, or cultural heritage features recorded in the *Fingal Development Plan* (2017).

The following sources were examined, and a list of sites and areas of archaeological, architectural, or cultural heritage potential was compiled:

- Record of Monuments and Places of County Dublin;
- Topographical Files of the National Museum of Ireland;
- Cartographic and documentary sources relating to the study area;
- Aerial photographs of Ordnance Survey Ireland and Bing aerial photography;
- Fingal Development Plan 2017 – 2023;
- National Inventory of Architectural Heritage; and
- Environmental Protection Agency.

Record of Monuments and Places (RMP) is a list of archaeological sites known to the National Monuments Service. Back-up files of the Sites and Monuments Record (SMR) provide details of documentary sources and field inspections where these have taken place.

Topographical Files of the National Museum of Ireland is the archive of all known finds recorded by the National Museum. This archive relates primarily to artefacts, but also includes references to monuments and unique records of previous excavations. The findspots of artefacts are important sources of information in the discovery of sites of archaeological significance.

Cartographic sources are important in tracing land use development within an area of land take, as well as providing important topographical information on sites and areas of archaeological potential. Cartographic analysis of relevant maps has been made to identify any topographical anomalies that may no longer remain within the landscape. **Documentary sources** were consulted to gain background information on the historical and archaeological landscape of the proposed development area.

Aerial photographic coverage is an important source of information regarding the precise location of sites and their extent. It also provides initial information on the terrain and its potential to contain previously unidentified archaeological remains.

Fingal Development Plan 2017 - 2023 contains Objectives on the preservation and management of archaeological, architectural and cultural heritage sites and features. It was consulted to obtain information on sites within the proposed development area and the 1km study area.

National Inventory of Architectural Heritage (NIAH) is a section within the Department of Housing, Local Government and Heritage. The work of NIAH involves identifying, recording and evaluating on a non-statutory basis the architectural heritage of Ireland from 1700 to the present day. The NIAH website also contains a non-statutory register of historic gardens and designed landscapes in County Dublin.

Environmental Protection Agency's *Guidelines on the Information to be Contained in Environmental Impact Statements* (2002) and *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (2017).

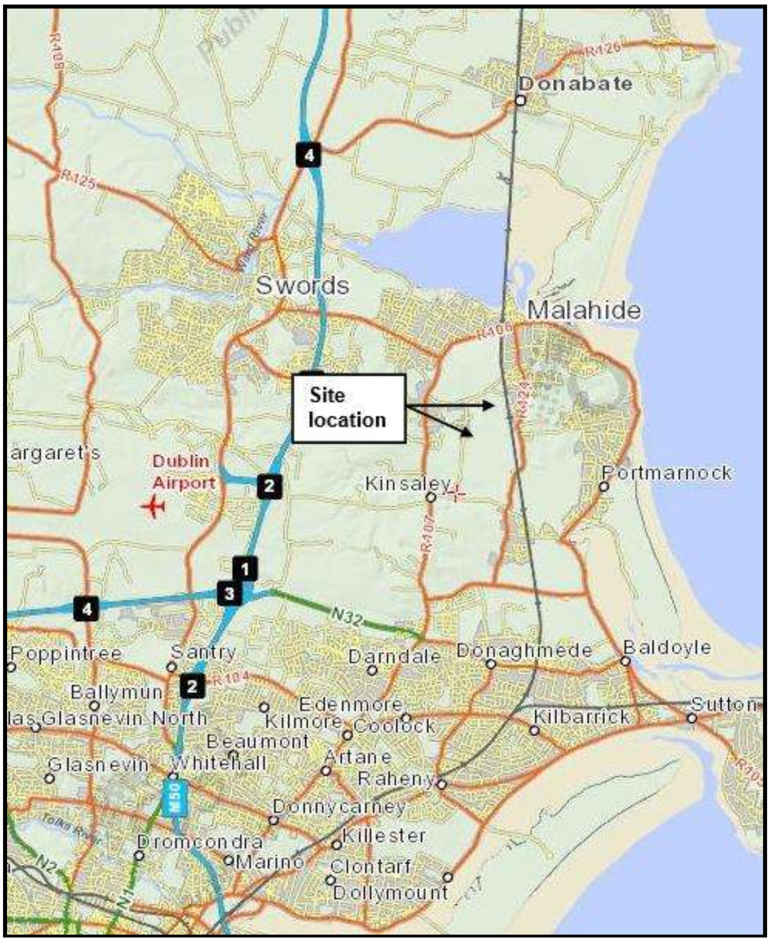

Figure 13-1. Site location

13.2.2 Legislation and Guidelines

Archaeological Resource

The National Monuments Acts, 1930 - 2014 and relevant provisions of the National Cultural Institutions Act, 1997 are the primary means of ensuring the satisfactory protection of archaeological remains, which includes all man-made structures of whatever form or date, except buildings habitually used for ecclesiastical purposes.

A number of mechanisms under the National Monuments Acts are applied to secure the protection of archaeological monuments. These include the Record of Monuments and Places, the Register of Historic Monuments, and placing Preservation Orders and Temporary Preservation Orders on endangered sites and National Monuments in the Ownership or Guardianship of the Minister for Housing, Local Government and Heritage or a Local Authority.

The Minister may acquire National Monuments by agreement or by compulsory order. The State or the Local Authority may assume guardianship of any National Monument (other than dwellings). The owners of National Monuments (other than dwellings) may also appoint the Minister or the Local Authority as Guardian of that monument if the State or Local Authority agrees. Once the site is in ownership or Guardianship of the State, it may not be interfered with without the written consent of the Minister.

Section 5 of the 1987 Act requires the Minister to establish and maintain a Register of Historic Monuments. Historic Monuments and archaeological areas present on the Register are afforded statutory protection under the 1987 Act. Any interference with sites recorded on the Register is illegal without the permission of the Minister. Two months' notice in writing is required prior to any work being undertaken on or in the vicinity of a Registered Monument. The Register also includes sites under Preservation Orders and Temporary Preservation Orders. All Registered Monuments are included in the Record of Monuments and Places.

Sites deemed to be in danger of injury or destruction can be allocated Preservation Orders under the 1930 Act. Preservation Orders make any interference with the site illegal. Temporary Preservation Orders can be attached under the 1954 Act. These perform the same function as a Preservation Order but have a time limit of six months, after which the situation must be reviewed. Work may only be undertaken on or in the vicinity of sites under Preservation Orders with the written consent, and at the discretion, of the Minister.

Section 12(1) of the 1994 Act requires the Minister to establish and maintain a Record of Monuments and Places where the Minister believes that such monuments exist. The Record comprises a list of monuments and relevant places and a map/s showing each monument and relevant place in respect of each county in the State. All sites recorded on the Record of Monuments and Places receive statutory protection under the National Monuments Act 1994.

Section 12(3) of the 1994 Act provides that:

> *"where the owner or occupier (other than the Minister for Arts, Heritage and the Gaeltacht) of a monument or place included in the Record, or any other person, proposes to carry out, or to cause or permit the carrying out of, any work at or in relation to such a monument or place, he or she shall give notice in writing to the Minister of Arts, Heritage and the Gaeltacht to carry out work and shall not, except in the case of urgent necessity and with the consent of the Minister, commence the work until two months after the giving of notice."* (www.archaeeology.ie).

Architectural and Built Heritage Resource

The main laws protecting the built heritage are the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999 and the Planning and Development Act 2000 (as amended). The Architectural Heritage Act requires the Minister to establish a survey to identify, record and assess the architectural heritage of the country. The National Inventory of Architectural Heritage records built heritage structures within all the counties of the State. As inclusion in the Inventory does not provide statutory protection, the document is used to advise Local Authorities on compilation of a Record of Protected Structures (RPS) as required by the Planning and Development Act 2000.

The Planning and Development Act 2000 requires Local Authorities to establish a Record of Protected Structures to be included in their County Development Plan. This Plan includes objectives designed to protect the archaeological, architectural and cultural heritage resource during the planning process. Buildings recorded in the RPS can include Recorded Monuments, structures listed in the NIAH, or buildings deemed to be of architectural, archaeological or artistic importance by the Minister. Sites, areas or structures of archaeological, architectural or artistic interest listed in the RPS receive statutory protection from injury or demolition under the 2000 Act. Damage to or demolition of a site registered on the RPS is an offence. The RPS list is not always comprehensive in every county.

A Local Authority has the power to order conservation and restoration works to be undertaken by the owner of a Protected Structure if it considers the building in need of repair. An owner or developer must make a written request to a Local Authority to carry out any works on a Protected Structure and its environs, and this will be reviewed within 12 weeks of application. Failure to do so may result in prosecution.

Figure 13-2. Northern Area proposed site layout

Figure 13-3. Southern Area proposed site layout

13.2.3 Rating of Impacts

Impacts can be identified from detailed information about a project, the nature of the area affected and the range of archaeological resources potentially affected. The construction and use of housing developments can affect the archaeological, architectural and cultural heritage resource of a given landscape in a number of ways.

- Permanent and temporary land-take, associated structures, landscape mounding, and their construction may result in damage to or loss of archaeological remains and deposits, or physical loss to the setting of historic monuments and to the physical coherence of the landscape;

- Archaeological sites can be affected adversely in a number of ways: disturbance by excavation, topsoil stripping and the passage of heavy machinery; disturbance by vehicles working in unsuitable conditions; or burial of sites, limiting accessibility for future archaeological investigation;
- Hydrological changes in groundwater or surface water levels can result from construction activities such as de-watering and spoil disposal, or longer-term changes in drainage patterns. These may desiccate archaeological remains and associated deposits;
- Visual impacts on the historic landscape sometimes arise from construction traffic and facilities, built earthworks and structures, landscape mounding and planting, noise, fences and associated works. These features can impinge directly on historic monuments and historic landscape elements as well as their visual amenity value;
- Landscape measures, such as tree planting, can damage sub-surface archaeological features due to topsoil stripping and through the root action of trees and shrubs as they grow;
- Ground consolidation by construction activities or the weight of permanent embankments can cause damage to buried archaeological remains, especially in colluvium or peat deposits;
- Disruption due to construction also offers in general the potential for adversely affecting archaeological remains. This can include machinery, site offices, service trenches, etc; and
- Although not widely appreciated, positive effects can accrue from permitted developments. These can include positive resource management policies, improved maintenance and access to archaeological monuments, and the increased level of knowledge of a site or historic landscape as a result of archaeological assessment and fieldwork.

There is no standard scale against which the significance of effects on the archaeological and historic landscape may be judged. The severity of a given level of land take or visual intrusion varies with the type of monument, site or landscape features and its environment. Significance of effect can be judged taking the following into account:

- The proportion of the feature affected and how far physical characteristics fundamental to the understanding of the feature would be lost;
- Consideration of the type, date, survival/condition, fragility/vulnerability, rarity, potential and amenity value of the feature affected; and
- Assessment of the levels of noise, visual and hydrological impacts, either in general or site specific terms, as may be provided by other specialists.

For this assessment the significant effects criteria outlined in **Table 13.1** are used:

Table 13-1. Significance of Effects

Level of Impact	Significance Criteria
Imperceptible	An effect capable of measurement but without significant consequences
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences

Level of Impact	Significance Criteria
Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends
Significant Effects	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment
Profound Effects	An effect which obliterates sensitive characteristics

Figure 13-4. Aerial photograph showing the Northern Area

Figure 13-5. Aerial photograph showing the Southern Area

13.3 Archaeological Heritage

13.3.1 Site-Specific Archaeological Background

During the Mesolithic period (*c*. 7000-4000 BC) people existed as hunters/gatherers, living on the coastline, along rivers and lakesides. They used flint and other stones to manufacture sharp tools, and locating scatters of discarded stone tools and debris from their manufacture can sometimes identify settlements. The native landscape consisted of woodland with hazel, oak, ash and Scot's pine as the primary species and Mesolithic hunting groups made no significant impact on the landscape.

Late Mesolithic and Neolithic fish traps were discovered during archaeological monitoring of development works on reclaimed land on the north bank of the River Liffey in 2004 (at depths of approximately -6m OD and -4m OD, respectively) (McQuade and O'Donnell 2007, 569-584). A Mesolithic shoreline was revealed and the remains of up to five wooden fish traps were excavated. The fish traps were constructed almost exclusively of hazel (*Corylus avellana*), and while fragmentary, were in a relatively good state of preservation, with tool marks in evidence. Radiocarbon determinations from five wood samples returned a date range of between 6,100 – 5,720 cal BC, suggesting that these are the earliest fish traps recorded in Ireland or Britain.

The population became more settled during the Neolithic period (*c*. 4000-2400 BC) with a subsistence economy based on crop growing and stock-raising. This period also saw changes in burial practices, and a tradition of burying the dead collectively and carrying out of cremations emerged. Neolithic monuments from County Dublin include portal, passage and wedge tombs.

By the 4th millennium BC a farming economy was developing that involved forest clearance. Archaeological and pollen records show an increasingly settled landscape with some fixed field boundaries for livestock and cereal production. While farming did spread throughout the country, the preference was for light soils and upland margins with free draining soils and light woodland cover. Extensive use of the productive though heavy soils of the poorly drained central lowlands was restricted by virtue of the limitations of available tools and technology.

The Bronze Age (*c*. 2400-600 BC) is characterised by the introduction of metalworking technology to Ireland and coincides with many changes in the archaeological record, both in terms of material culture as well as the nature of the sites and monuments themselves. Though this activity has markedly different characteristics to that of the preceding Neolithic period, including new structural forms and new artefacts, it also reflects a degree of continuity. During this period knowledge of metalworking was acquired resulting in changes in material culture such as the introduction of metal tools and artefacts, as well as the introduction of a highly decorated pottery called Beaker pottery. In addition to changes in material culture, there were changes in burial rite from communal megalithic tombs to single burial in cists.

Bronze Age monuments from County Dublin include standing stones, stone pairs, cairns, barrows and *fulachta fiadh,* which are one of the most numerous monument type in Ireland with over 4,500 examples recorded (Waddell 2005, 174).

RMP DU015-131 and DU015-132 are recorded as ring-ditches, and both are located approximately 920m south east of the Southern Area in Hazelbrook townland (figure 13.6). Both sites are recorded (www.archaeology.ie) as cropmarks on aerial photographs. (Cropmarks are earthworks that have been removed above-ground and due to subsoil conditions are revealed through aerial photography).

Ring-ditches are interpreted as being the likely remains of ploughed-out ring-barrows, especially when they occur in groups of two or more as ring-barrows sometimes do, forming small cemeteries. Ring-barrows are circular mounds of earth surrounded by a ditch with an external bank. The mounds were usually quite low and were often no higher than the surrounding bank (Waddell 2005, 365). Ring-barrows are widely distributed, and while they vary in size most seem to range in overall diameter from approximately 15m to 25m. The limited evidence of circular ring-barrows and ring-ditches indicates cremation-type burials from the later centuries BC and early centuries AD, with the occasional deposition of small token deposits of bone (*ibid*., 368). There are 154 ring-ditches recorded in County Dublin (www.archaeology.ie).

During the Iron Age (*c*. 600 BC-400 AD) new influences came into Ireland which gradually introduced the knowledge and use of iron, although for several centuries bronze continued to be widely used. The Iron Age in Ireland however is problematic for archaeologists as few artefacts dating exclusively to this period have been found, and without extensive excavation it cannot be determined whether several monument types, such as ring-barrows or standing stones, date to the Bronze Age or Iron Age.

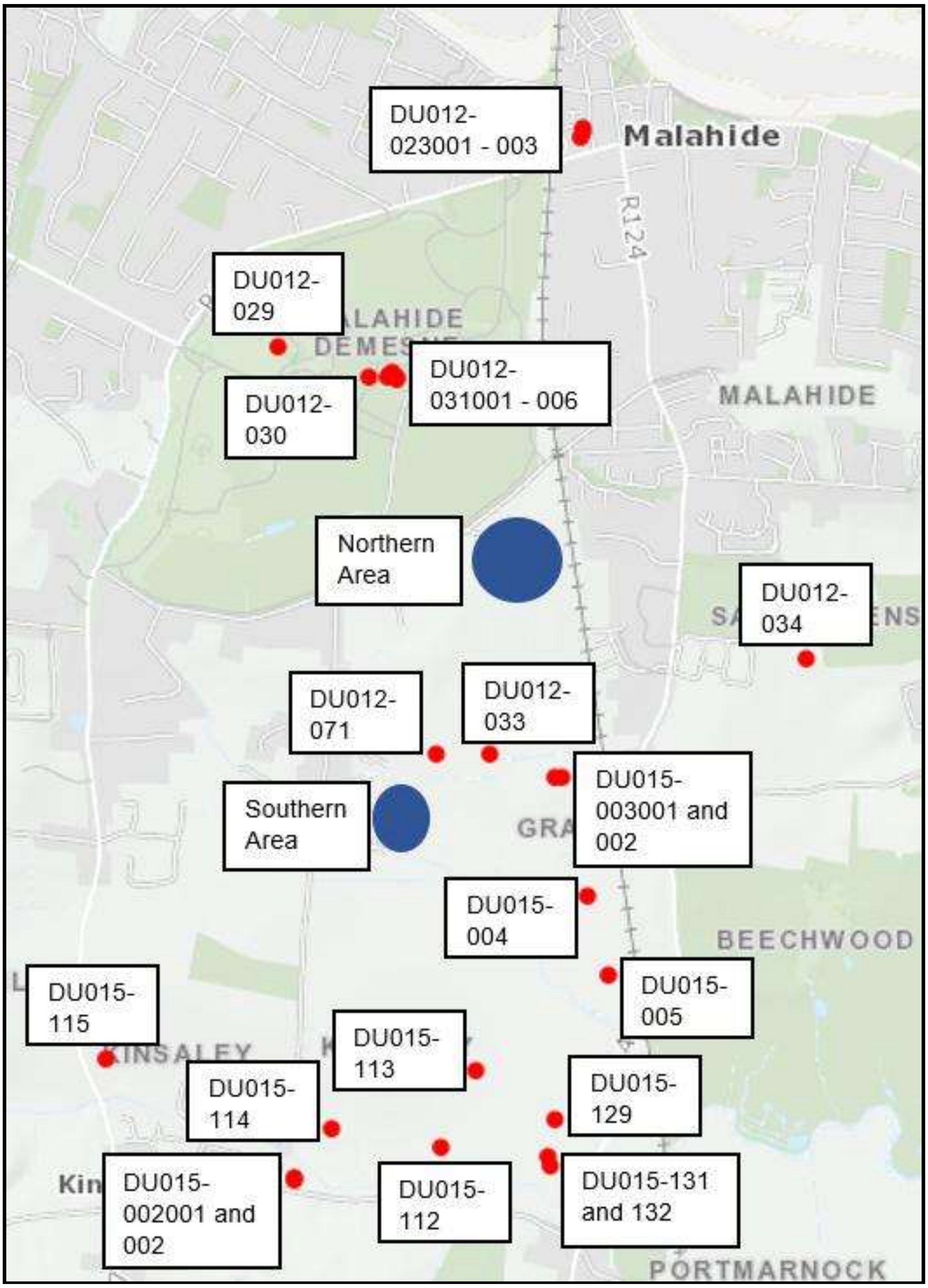

Figure 13-6. RMP sites within the 1km study area

The Early Medieval period (*c*. 400-1169 AD) is depicted in the surviving sources as entirely rural, characterised by the basic territorial unit known as *túath.* Walsh (2000, 30) estimates that there were at least 100, and perhaps as many as 150, kings in Ireland at any given time during this period, each ruling over his own *túath*.

Archer (1975, 7) equates the area of North Dublin with the ancient plain of Magh-Mhuireadha, within the sub-kingdom of Brega. Brega was under the control of the Saithne, a branch of the Cianachta tribe, whose seat was at Balrothery in north Dublin (Ryan 1949, 67). The Cianachta were said to have received these lands from the 3rd century High King Cormac MacArt, in return for services against Ulster (*ibid*.), suggesting their domination of the area was long-standing and undisputed. By the 8th century, both the Cianachta and the Gailenga were subject to the powerful sept of the Southern Uí Néill who had gained control of the kingdom of Brega (Ryan 1949, 67; Byrne 2001, 68-69).

One of the principal thoroughfares of Early Medieval Ireland – the *Slighe Cualann* – ran northwards from Dublin to the west of the general development area near Feltrim Hill, and a branch of this is said to have extended eastwards from Feltrim through the area of Malahide Demesne to Seamount Heights and southwards to Howth (Kennedy 1984, 49). The presence of a principal routeway, the proximity of the coast and the general fertile nature of the land would have made the area very attractive for settlement in the Early Medieval period.

During this turbulent period roughly circular defensive enclosures known as ringforts were constructed to protect farmsteads. They were enclosed by an earthen bank and exterior ditch, and ranged from approximately 25m to 50m in diameter. The smaller sized and single banked type (univallate) was more than likely home to the lower ranks of society, while larger examples with more than one bank (bivallate/trivallate) housed the more powerful kings and lords. They are regarded as defended family homesteads and the extant dating evidence suggests they were primarily built between the 7th and 9th centuries AD (Stout 1997, 22-31). Cashels are stone built and are generally situated in coastal or mountainous areas.

The ringfort is considered to be the most common indicator of settlement during the Early Medieval period. Detailed study (*ibid*., 53) has suggested that there is an approximate total of 45,119 potential ringforts or enclosure sites throughout Ireland.

There are four ringforts recorded within the 1km study area. RMP DU015-003001 and RMP DU015-003002 are located in Grange townland, approximately 300m east of the Southern Area (figure 13.6). RMP DU015-003001 is recorded (www.archaeology.ie) as the cropmark of a single-ditched enclosure, roughly circular in plan and measuring *c*. 45m in diameter. RMP DU015-003002 is also recorded as cropmark evidence for a sub-circular enclosure measuring approximately 55m east/west x 45m north/south. This feature is recorded on the First Edition (1844) Ordnance Survey map. Neither of these monuments are visible at ground level, and both are interpreted as the below-ground remains of ploughed-out ringforts. Local folklore identifies these ringforts as the stronghold of Hamund MacTorcaill, brother of the last Norse Earl or king of Dublin (Kennedy 1984, 55).

RMP DU015-004 is located in Grange townland, approximately 450m south east of the Southern Area (figure 13.6). It is recorded on the First Edition Ordnance Survey map (1844) as a univallate enclosure with a centrally located internal feature which may have been a house site. It is interpreted as the remains of a ploughed-out ringfort and is not visible at ground level.

RMP DU015-005 is recorded approximately 600 south east of the Southern Area in Grange townland (figure 13.6). It is recorded (www.archaeology.ie) as a platform ringfort comprising a circular raised area with slight traces of a bank around the perimeter and an external ditch at the base. There is an entrance ramp in the south east corner.

Enclosure sites belong to a classification of monument whose precise nature is unclear. Often they may represent ringforts, which have either been damaged to a point where they cannot be positively recognised, or are smaller or more irregular in plan than the accepted range for a ringfort. An Early Medieval date is in general likely for this site type, though not a certainty.

There are six enclosures recorded within the 1km study area (figure 4). RMP DU012-071 is located in Kinsaley townland, approximately 60m north of the Southern Area (figure 13.6), and is recorded (www.archaeology.ie) as a circular enclosure visible as a cropmark which does not survive above-ground. A 1995 black and white aerial photograph (www.map.geohive.ie) shows it as measuring approximately 60m-70m in diameter east/west and with a minimum north/south measurement of approximately 50m. An east/west oriented band of differential growth is noted extending across the northern end of the enclosure on the 1995 aerial photograph, and this may be the remains of an associated field boundary. This feature is also clearly visible on more recent aerial photography (www.bing.com/maps).

RMP DU012-033 (figure 13.6) is located in Broomfield townland, approximately 160m north east of the Southern Area. A 1997 aerial photograph records the cropmark of a sub-circular enclosure measuring approximately 20m in diameter and with internal features. This feature does not survive above-ground (www.archaeology.ie).

RMP DU015-112 is located approximately 800m south of the Southern Area in Kinsaley townland (figure 13.6). It is recorded as a circular enclosure on an aerial photograph, and does not survive above-ground (www.archaeology.ie). It is located on a low east/west rise at a relatively low point compared to the surrounding landscape. It is noted (www.archaeology.ie) that other below-ground features are also visible on the aerial photograph, and that these might represent a field system (RMP DU015-113). (Field systems are a group or complex of fields which appear to form a coherent whole, and which may date to any period from the Neolithic (*c*. 4000-2400 BC) onwards. The enclosed land could have been used for stock-raising, plant husbandry and crop protection. The fields vary in size and it is possible that many of them are more extensive than currently thought. A wide range of monuments, such as barrows, ringforts, enclosures, souterrains, hut sites, ecclesiastical remains *etc*., can be found inside field systems).

RMP DU015-114 is located approximately 800m south of the Southern Area in Kinsaley townland (figure 13.6). Like RMP DU015-112 which is located 300m to the east, it is recorded (www.archaeology.ie) as a roughly circular enclosure visible as a cropmark on an aerial photograph. Again, it is located on a low east/west rise at a relatively low point compared to the surrounding landscape.

RMP DU015-115 is the fourth enclosure recorded within the study area on aerial photography in Kinsaley townland. It is located approximately 980m southwest of the Southern Area (figure 13.6), and no above-ground evidence for the site survives (www.archaeology.ie).

RMP DU015-129 is located approximately 810m southeast of the Southern Area in Hazelbrook townland (figure 13.6). It takes the form of a sub-circular enclosure visible as a crop mark on an aerial photograph, and is in the same field as RMP DU015-131 and RMP DU015-132 (ring-ditches) (www.archaeology.ie). It is located on a low east/west rise at a relatively low point compared to the surrounding landscape.

The classification of archaeological monuments is often made difficult by their condition, whether it be the result of deliberate destruction, trampling by livestock or natural weathering and erosion. The term "*earthwork*" is used to denote any monument or feature of artificial origin which cannot be further categorised without excavation. The term "*earthwork site*" indicates sites which were levelled before detailed archaeological inspection took place. The majority of such sites may be levelled or destroyed ringforts.

An earthwork (RMP DU012-029) is recorded approximately 820m northwest of the Northern Area in Malahide Demesne townland (figure 13.6). Formerly located within the ornamental grounds of Malahide Demesne, the site originally consisted of an earthen platform approximately 17m in diameter, enclosed by a 3m-4m wide ditch, a *c*. 2m wide bank and an outer ditch measuring 3m-4m in width and 1m deep (www.archaeology.ie).

The Early Medieval period is also characterised by the foundation of a large number of ecclesiastical sites throughout Ireland in the centuries following the introduction of Christianity in the 5th century AD. The early churches tended to be constructed of wood or post-and-wattle. Between the late 8th and 10th centuries mortared stone churches gradually replaced the earlier structures. Many of the sites, some of which were monastic foundations, were possibly originally defined by an enclosing wall or bank similar to that found at coeval secular sites. This enclosing feature was probably built more to define the sacred character of the area of the church than as a defence against aggression. An inner and outer enclosure can be seen at some of the more important sites; the inner enclosure surrounding the sacred area of church and burial ground and the outer enclosure providing a boundary around living quarters and craft areas. Where remains of an enclosure survive it is often the only evidence that the site was an early Christian foundation.

A church (RMP DU012-031001) is located in the grounds of Malahide Castle, approximately 500m northwest of the Northern Area in Malahide Demesne townland (figure 13.6). It contains a nave and chancel with a sacristy attached to the southeast corner. There are stepped battlements on the side walls of the nave. Built of coursed, well-mortared limestone masonry, there are buttresses against the west gable either side of the window and a batter or buttress in the southwest corner. The church is entered towards the west end of the nave through opposed doorways with pointed arches, chamfered jambs and a hood moulding. The interior is lit by a triple light, ogee-headed west window of 15th century date and two double-light tracery windows in the east end. Above the west gable is a triple bellcote with steps leading up to it. The chancel is entered through a pointed, segmental chancel arch. There are wide, flat-arched windows in the south wall. The east window is a large, limestone, triple-light, tracery window. The sacristy is entered off the chancel into a vaulted ground floor with wall presses. There is an external stairs to first floor which contains a fireplace and wall presses in the east wall. A possible sheela-na-gig (RMP DU012-031003) is located at the exterior east gable wall of the Medieval church. Another sheela-na-gig (RMP DU012-031002) is built into a quoin at the north east angle of the chancel of the church. Both features are of sandstone and show evidence of having been worked to fit their present location (www.archaeology.ie).

A graveyard (RMP DU012-031006) is located in the grounds of Malahide Castle and surrounded by farm buildings. It is a relatively small sub-circular graveyard measuring approximately 45m north/south x 40m east/west and is enclosed by a battlemented wall. It is raised in the centre and dominated by the Medieval church (RMP DU012-031001). There are low headstones of 19th/20th century date (www.archaeology.ie).

The apex on the exterior of the south door of the Medieval church contains a carving of a "*mitred head*" (RMP DU012-031004). Located inside the church is an altar tomb (RMP DU012-031005) dedicated to Maud Plunkett (died 1494) with a recumbent effigy of a female figure in a horned cap (www.archaeology.ie).

A Medieval church (RMP DU015-002001) is located approximately 970m south of the Southern Area in Kinsaley townland (figure 13.6). It is recorded (www.archaeology.ie) as a plain, rectangular building, aligned east/west and built of random rubble masonry. Only the nave survives, and internal dimensions are 10.25m in length x 5.10m in width and the walls are 0.95m thick. There are opposed pointed segmental arched doorways in the west end of the nave. The interior is lit by narrow slit opes on the south wall and a tall round arched window at loft level in the west gable which contains a double bellcote. The chancel arch is all that survives of the chancel, and it is of pointed segmented type.

A rectangular walled graveyard (RMP DU015-002002) encloses the remains of the Medieval church. There is a kink in the wall along the southeast boundary which possibly indicates the former existence of an earlier enclosure. There are 19th and 20th century memorials within the graveyard (www.archaeology.ie).

A Medieval church (RMP DU012-023002) is reputed to have existed on the present site of St. Sylvester's Catholic church (www.archaeology.ie). The site is located approximately 1km north of the Northern Area (figure 13.6). Test trenching (Licence No. 10E0426), undertaken in advance of an extension to the modern church, revealed two Post-Medieval masonry walls which were interpreted as the remains of the early 19th century church building that previously occupied the site. A small undated pit/drainage gully and a silty deposit that may date from the Medieval period were also identified. No burial remains were uncovered. A second phase of test trenching on the site (Licence No. 11E0326) uncovered Medieval structural remains, a ditch, pits and 18th/19th century masonry walls.

RMP DU012-023001 is a holy well, traditionally called "*Sunday Well*" or "(*St*.) *Sylvester's Well*", located in a square at the rear of St. Sylvester's Church. The well is covered by a conical stone-built superstructure, and access is from a flight of steps. Pattern day is on August 15th. A modern stone plaque at the foot of the well is inscribed: "*St Sylvester's well ca. AD 430, restored 2001*" (www.archaeology.ie).

Tradition also notes that an earthwork or mound (RMP DU012-023003) existed on the present site of St. Sylvester's Catholic church (www.archaeology.ie). The recovery of Medieval pottery form the site during the above-mentioned test trenching exercises is interpreted as some level of activity taking place on the site or in the vicinity during the 13th or 14th centuries. It is possible the pottery sherds could relate to activity associated with the mound that once stood on the site, perhaps suggesting it may have been a motte or ringfort that was occupied for a considerable period of time.

The commencement of Viking raids at the end of the 8th century and their subsequent settlement during the following two centuries marked the first ever foreign invasion of Ireland. Viking settlement evidence is scarce and has been found in Cork, Dublin and Waterford, however excavations there have revealed extensive remains of the Viking towns. Outside these towns, understanding of Viking settlement is largely drawn from documentary and place-name evidence. In addition to Cork, Dublin and Waterford, documentary sources provide evidence for the Viking foundation of the coastal towns of Limerick and Wexford (Edwards 2006, 179). Other indirect evidence which suggests Viking settlement, or at least a Norse influence in Ireland, is represented by upwards of 120 Viking-age coin hoards, possible votive offerings of Viking style objects and the assimilation of Scandinavian art styles into Irish designs. While the initial Viking raids would have been traumatic, the wealth and urban expansion brought into the country as a result of Viking trading would have benefited the Gaelic Irish and cultural assimilation in some parts would have been significant.

The late 8th and early 9th centuries saw the arrival of Viking raiders to the east coast of Ireland, with the islands and coastline of north Dublin among the earliest casualties. Annalistic sources record Viking raids on Howth and the coast of Brega in 821 and Lusk in 824, 825 and 854 (Ryan 1949, 68; Kennedy 1984, 46). Within a short time the raiders had occupied the lands of Malahide and Howth and had assumed possession of Dublin to the south (*ibid.*).

The arrival of Anglo-Normans in Ireland towards the end of the 12th century caused great changes during the following century. Large numbers of colonists arrived from England and Wales and established towns and villages. They brought with them new methods of agriculture which facilitated an intensification of production. Surplus foods were exported to markets all along Atlantic Europe which created great wealth and economic growth. Results of this wealth can be seen in the landscape in the form of stone castles, churches and monasteries.

The political structure of the Anglo-Normans centered itself around the establishment of shires, manors, castles, villages and churches. In the initial decades after the Anglo-Norman invasion a distinctive type of earth and timber fortification was constructed- the motte and bailey. Mottes were raised mounds of earth topped with a wooden or stone tower while the bailey was an enclosure, surrounded by an earthen ditch with a timber palisade, used to house ancillary structures, horses and livestock. There are six motte and baileys recorded in County Dublin (www.archaeology.ie).

A motte and bailey (RMP DU012-034) is located approximately 630m east of the Northern Area in Sainthelens townland (figure 13.6). Located in level pasture, it is a flat-topped elongated mound with a flat-bottomed ditch enclosing the north side. There are indications of an intervening berm 2m in width. The ditch stops abruptly in the south where the ground is uneven, indicating the possible presence of a bailey (www.archaeology.ie).

In certain areas of Ireland Anglo-Norman settlers constructed square or rectangular enclosures, now termed moated sites. Their main defensive feature was a wide, often water-filled, fosse with an internal bank. As in the case of ringforts, these enclosures protected a house and outbuildings usually made of wood. They appear to have been constructed in the latter part of the 13th century though little precise information is available. There are six moated sites recorded in County Dublin (www.archaeology.ie).

More substantial stone castles followed the motte and bailey and moated sites in the 13th and 14th centuries. Tower houses are regarded as late types of castle and were erected from the 14th to early 17th centuries. Their primary function was defensive, with narrow windows and a tower often surrounded by a high stone wall (bawn). An Act of Parliament of 1429 gave a subsidy of £10 to "*liege*" men to build castles of a minimum size of 20ft in length, 16ft in breadth and 40ft in height (6m x 5m x 12m). By 1449 so many of these £10 castles had been built that a limit had to be placed on the number of grants being made available. The later tower houses were often smaller, with less bulky walls and no vaulting. There are 61 tower houses recorded in County Dublin (www.archaeology.ie).

Malahide Castle (RMP DU012-030) is located approximately 560m north west of the Northern Area in Malahide Demesne townland (figure 13.6). It is associated with the Talbot family who were granted these lands by Henry II in 1174 (www.archaeology.ie). The Late Medieval core of the castle is largely masked by a re-build dating to *c*. 1760, which involved the construction of a long symmetrical wing with corner towers that enclosed the earlier castle. The castle was re-roofed and renovated in the 19th century.

The 14th century throughout northwest Europe is generally regarded as having been a time of crisis, and Ireland was no exception. Although the Irish economy had been growing in the late 13th century, it was not growing quickly enough to support the rapidly expanding population, especially when Edward I was using the trade of Irish goods to finance his campaigns in Scotland and Wales. When the Great European Famine of 1315-1317 arrived in Ireland, brought about by lengthy periods of severe weather and climate change, its effects were exacerbated by the Bruce Invasion of 1315-1318. Manorial records which date to the early 14th century show that there was a noticeable decline in agricultural production. This economic instability and decline were further worsened with the onset of the Bubonic Plague in 1348.

Before the Tudors came to the throne the kings of England were also the kings of western France and so, during the 14th and 15th centuries, the various lords who ruled in Ireland were largely left to themselves. The Tudor conquest however brought a much greater interest in the affairs of Ireland. They wanted to put a stop to the raids of the Gaelic Irish on areas under English rule. To do this, they ruthlessly put down any rebellions and even quashed inter-tribal feuds. English settlers were then brought in to settle their lands. The first of these plantations occurred in the mid-16th century in what is now Laois and Offaly. After the Desmond rising in Munster in 1585 came another plantation, and parts of south-western Tipperary were planted at that time.

From 1593 until 1603 there was a countrywide war between the Gaelic Irish, who were supported by the French, and the Elizabethan English. The Irish were finally defeated and with the "*Flight of the Earls*" from Rathmullan, County Donegal in 1607 Ulster, which had previously been independent of English rule, was planted.

Austin Cooper writing in 1780 described Malahide as a "*very small Vile*" with a few cabins and a large strand at low tide (cited in Little 1948, 1-2). The Demesne was noted as having been recently "*modernised and improved*" (*ibid*.), suggesting expansion to its present limits, and the construction of Back Road may have already been completed. The incumbent Talbot at that time, Col. Richard Talbot, appears to have been an improving landlord, and is credited with the advance of industry in Malahide in the later 18th century (*ibid*., 13). This was primarily based on the manufacture of cotton, although it was short-lived as by the end of the century the market for cotton had collapsed, resulting in the abandonment of plans to expand the industry and to link Malahide and Swords via canal (*ibid*.; Lewis 1837, Vol. II, 234).

By the early 19th century silk manufacture was still carried on in the town, while the harbour continued to export meal and flour and import coal (*ibid*.). Malahide was also a fishing town and particularly noted for its oysters, with which it supplied the city of Dublin (*ibid*.). Lewis described the town as pleasing, with "*many handsome cottages*", although he noted a large number of these were only occupied seasonally as holiday homes (*ibid*.). Notwithstanding the arrival of the railway to Malahide in 1844 (Little 1948, 3), the town appears to have gone into decline in the later 19th century, and an account from 1912 describes it as "*a decayed watering-place which had attained an ephemeral popularity about sixty years ago*" (Joyce 1912, 280).

13.3.2 Toponyms

Townland names are important in understanding the archaeology, geology, land-use, ownership and cultural heritage of an area.

Broomfield means "*field of the broom*".

Kinsaley translates from the Irish *Cionn Sáile* as "*head of the salt water or brine*".

Malahide translates from *Mullach Íde* as "*Íde's summit or hilltop*".

13.3.3 Topographical Files of the National Museum of Ireland

The discovery of a stone axe-head is recorded in the Topographical Files from a field beside a house at Kinsaley Lane, which is to the west of the proposed development area. No additional information is available, as the axe was retained by the finder and does not form part of the Museum's collections.

No other artefacts from Kinsaley townland are recorded in the Topographical Files.

A large quantity of flint artefacts was recovered from freshly ploughed fields in Broomfield townland in the 1960s. These appear as four separate collections from the years 1964, 1966 and 1968. NMI Ref. 1964:29-30 consists of 16 waste flakes, one blade and three cores, along with flint nodules, pebbles and a probable gunflint. These were recovered from an orchard in the northern part of the townland, most likely in the area of Ivy Grange, to the east of the railway line.

NMI Ref. 1966:42 is a fragment of a flint side-scraper, noted as a surface find. It was further noted that in the same area the sawn tooth of a sperm whale and a fragment of tortoiseshell were also recovered, although these were considered to be of relatively modern origin and were therefore not retained by the Museum.

There are two collections recorded from 1968. NMI Ref. 1968:151-171 includes two stone axeheads, along with 72 flint and chert artefacts and a small number of miscellaneous finds of uncertain date. The flint and chert artefacts included scrapers, blades, flakes and cores, while some 58 were later noted as "*waste flakes, cores and chips of flint*" (Lucas 1971), suggesting flint-working had occurred in the vicinity. These artefacts, along with those presented to the National Museum in 1964 and 1966, are part of a more extensive collection of flint artefacts from the Malahide area recovered by the antiquarian Noel Flanagan. It is likely the Broomfield finds were recovered from lands close to his home, in the north of the townland. Indeed, the provenance for most of these finds is recorded at the northern end of the townland, while two flint flakes (NMI Ref. 1968: 159-160) were found in the north west of the townland, to the west of the railway line.

The second collection acquired by the National Museum in 1968 (NMI Ref. 1968:174-184) consists of 91 flint artefacts recovered as surface finds within Broomfield townland. As with the first collection, a large number of these artefacts are considered to be waste material from flint-working, along with flint cores, flakes and scrapers. No find-spots within Broomfield townland were recorded for the second collection.

A number of finds have also been recovered from test trenches excavated within Malahide Demesne, including a polished stone axehead (NMI Ref. 2012:17), Medieval pottery (NMI Ref. 2012:19), a clay pipe stem (NMI Ref. 2012:20) and associated animal bone (NMI Refs. 2012:18 and 2012:21).

13.3.4 Cartographic Analysis

Ordnance Survey Map First Edition 1:10,560 1844 (figure 13.7)

Northern Area

The First Edition 1:10,560 Ordnance Survey map records the Northern Area as part of six fields, with part of the western and southern ends being shown as townland and parish boundaries. Research suggests that:

> *"hoards and single finds of Bronze Age weapons, shields, horns, cauldrons and gold personal objects can all be shown to occur on boundaries" (Kelly 2006, 28).*

The "*Dublin and Drogheda Railway in Progress*" is recorded as forming the eastern boundary of the proposed area of land take. The eastern-most area of land take is recorded as part of Broomfield House demesne on the First Edition 1:10,560 Ordnance Survey map.

Southern Area

The Southern Area is recorded as part of three fields, with a generally east/west oriented path extending across the proposed development area towards Kinsaley Lane.

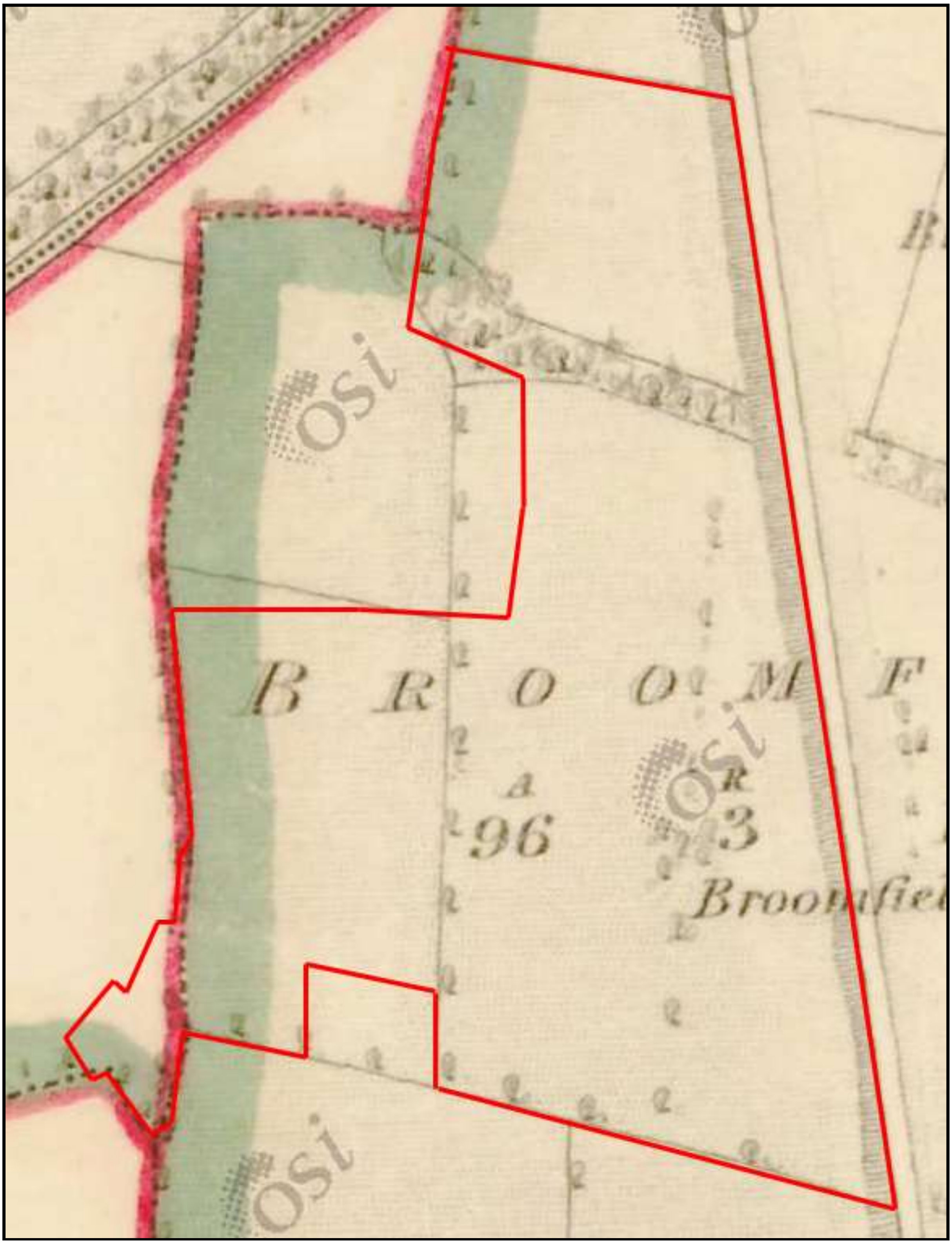

Figure 13-7. First Edition Ordnance Survey map 1:10,560 (1844), showing the Northern Area of the proposed development

There are no archaeological or architectural features recorded on the First Edition 1:10,560 Ordnance Survey map within the area of proposed land take.

Ordnance Survey Map First Edition 1:2,500 1863 (figure 13.8)

Northern Area

Broomfield House demesne is not recorded within the proposed development area on the First Edition 1:2,500 map. There are no other differences within the Northern Area between First Edition 1:10,560 map and the First Edition 1:2,500 map.

Southern Area

The generally east/west oriented path extending across the Southern Area shown on the First Edition 1:10,560 map is not recorded on the First Edition 1:2,500 map. Neither is a previously extant north/south field boundary recorded. The southern field boundary is recorded as a drain on the First Edition 1:2,500 map.

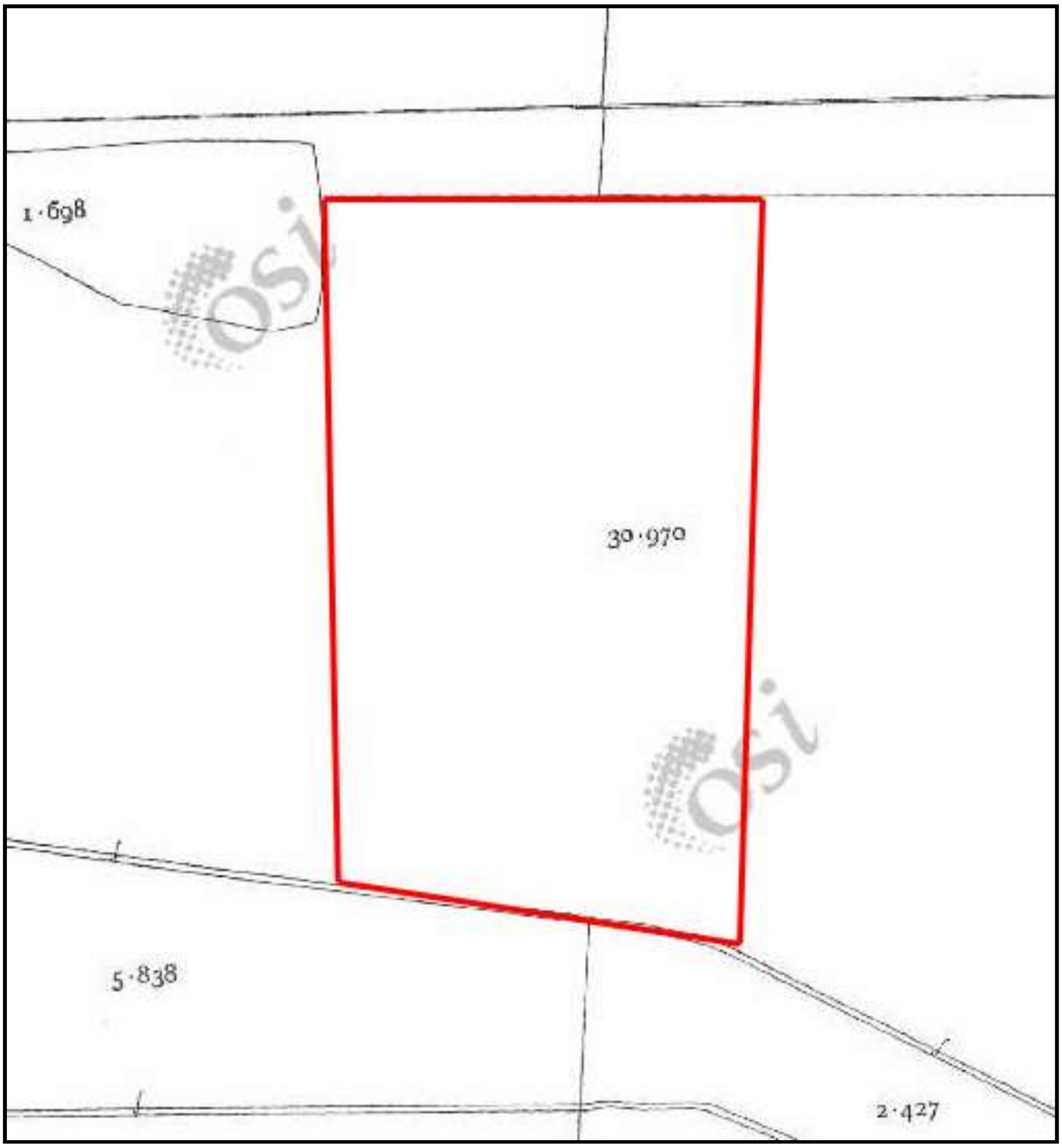

Figure 13-8. First Edition Ordnance Survey map 1:2,500 (1863), showing the Southern Area of the proposed development

There are no archaeological or architectural features recorded on the First Edition 1:2,500 Ordnance Survey map within the area of proposed land take.

Ordnance Survey Map Third Edition 1:10,560 1906 (figure 13.9)

There are no differences recorded within either the Northern Area or Southern Area between the First Edition 1:2,500 map and the Third Edition 1:10,560 map.

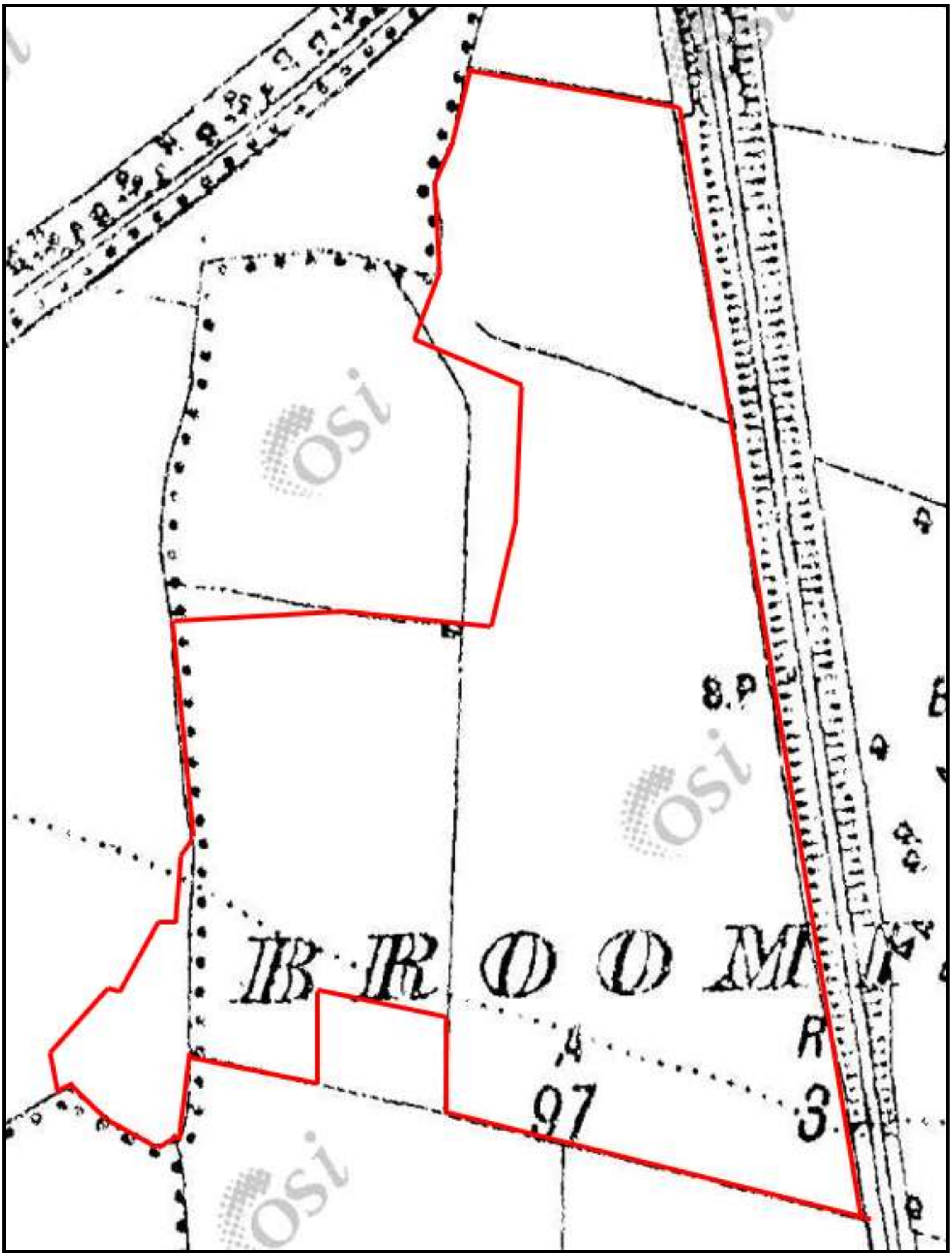

Figure 13-9. Third Edition Ordnance Survey map 1:10,560 (1906), showing the Northern Area of the proposed development

There are no archaeological or architectural features recorded on the Third Edition 1:10,560 Ordnance Survey map within the area of proposed land take.

13.3.5 Aerial Photographs

Aerial photographs held by Ordnance Survey Ireland (www.map.geohive.ie) were consulted to look for the presence of archaeological or architectural remains within the proposed development area.

The 1995, 2000 and 2005 photographs, along with more recent aerial photography (www.bing.com/maps), record a similar landscape to that which was noted during the test trenching programmes with generally large, enclosed fields being noted.

There was no evidence of any archaeological, architectural or cultural heritage features recorded on aerial photography within any areas of proposed land take.

13.3.6 Summary of Previous Fieldwork in the General Development Area

Reference to Summary Accounts of Archaeological Excavations in Ireland (www.excavations.ie) revealed that nine fieldwork programmes have been carried out in Broomfield, Kinsaley and Malahide townlands.

Test trenching (Licence Number 08E0529) was carried out in 2008 along the line of the Malahide Distributor Road. At Kinsaley, a 90m long trench and five offsets measuring 10m–13m were excavated on the summit of a hill and on its north-facing slope. A shallow pit, 1.33m x 0.8m, with a charcoal-rich fill was uncovered at the top of the hill. Another similarly sized pit was uncovered 27m further south where three field drains, at least two of which were Post-Medieval in date, were also uncovered. An *ex situ* sherd of prehistoric pottery was recovered towards the base of the hill.

Test trenching and monitoring were carried out by the writer (Licence Number 14E0009) towards the southern end of Kinsaley townland, as part of a Grant of Planning for a housing development. Testing revealed a possible small pit containing a sherd of Medieval pottery. No additional archaeological features or artefacts were revealed.

Test trenching was carried out by the writer (Licence Number 14E0165) in a field located immediately south west of the Northern Area and immediately north of the Southern Area. The excavation of 17 test trenches throughout the development area revealed 13 features of archaeological significance. An enclosure ditch (RMP DU012-071) was revealed to vary from 3.1m to 3.65m in width and from 1.1m to 1.3m in depth. In addition to the ditch, nine archaeological features in the form of spreads, linear features, a pit and a post-hole were revealed within the enclosure. No artefacts or environmental evidence were revealed by the hand-testing of these features. Subsequent monitoring of this area (Licence Number 18E0090) revealed the remains of a possible hearth.

Test trenching was carried out by the writer in 2014 (Licence Number 14E0162; Nelis 2014) in a field located immediately west of the Northern Area (**Section 13.5.2 Phase 1 Test Trenching**). Subsequent monitoring (Licence Number 17E0227; Nelis 2019) revealed four archaeological features in the middle/northern half of the development area. A radiocarbon determination for one of the features placed activity in the Late Neolithic/Early Bronze Age.

Test trenching was carried out in 2019 (Licence Number 19E0464) in an area straddling the townland boundary between Kinsaley and Broomfield, *i.e.* centered on a point approximately 70m south of the Northern Area. The excavation of nine trenches with a cumulative length of 810m failed to reveal any archaeological features or artefacts.

A ditched circular enclosure was excavated in Broomfield townland in 1985 (Licence Number 1985:23), and was noted as being one of three barely visible enclosures situated just below the south-facing brow of a low east/west ridge. Excavation revealed a flat circular area 14m in diameter, enclosed by a ditch 0.90m - 1.0m deep, with a slight internal bank (0.10m – 0.15m high x 1m - 1.5m wide) and 16 pits. Fifteen of the pits were contemporary with the enclosure, while one was earlier and sealed beneath the internal bank. This contained three sherds of Beaker pottery, charcoal and burnt earth. Around the entire circumference of the base of the ditch a line of 2" tile drains (*c*. 1800 - 1850) had been inserted, and a sod drain had been dug across the interior of the enclosure. The evidence points to the enclosure being the remains of a ploughed-out tree ring which had been erected in the $18^{th}/19^{th}$ century in an area of Early Bronze Age activity.

Reference to Summary Accounts of Archaeological Excavations in Ireland (www.excavations.ie) revealed that a number of fieldwork programmes have been carried out in townlands surrounding the proposed development area.

A landscape feature was excavated in 1980 in Auburn townland (Licence Number 1980-84:0093), but no further information is provided in the Summary Accounts of Archaeological Excavations in Ireland.

Monitoring of engineering pits in Malahide Demesne in 2004 (Licence Number 04E1528) in the grounds of Malahide Castle in the area of the Barbican Tower failed to reveal any archaeological features or artefacts.

Monitoring of topsoil stripping in 2006 (Licence Number 06E0661) associated with construction of a pavilion and car park within the demesne of Malahide Castle failed to reveal any features of archaeological significance.

Limited hand excavation at Malahide Castle in 2011 (Licence Numbers C451 and E4381) following a geophysical survey (Licence Number 10R070) revealed a series of linear ditches, curvilinear slot-trenches and pits producing evidence of possible structural remains, domestic occupation and agricultural/landscaping activity. The majority of the linear features were identified as drainage gullies and field boundaries of Post-Medieval date. Other features consisted of two curvilinear slots or gullies, a metalled surface and 10 widely dispersed pits, of varying form, containing charcoal-stained soils, Medieval pottery and possible prehistoric lithic material.

Various fieldwork exercises in Malahide dating from 1999 onwards have revealed worked flint from two fieldwalking programmes, Medieval pottery and Post-Medieval structural remains.

13.3.7 Fingal Development Plan 2017 - 2023

It is an Objective (CHO2) of Fingal County Council (Fingal Development Plan 2017, 346) to:

> *"Favour the preservation in situ or at a minimum preservation by record, of archaeological sites, monuments, features or objects in their settings. In securing such preservation the*

Council will have regard to the advice and recommendations of the National Monuments Service of the Department of the Arts, Heritage, Regional, Rural and Gaeltacht Affairs."

It is also an Objective (CHO3) of Fingal County Council (*ibid*.) to:

"Protect all archaeological sites and monuments, underwater archaeology, and archaeological objects, which are listed in the Record of Monuments and Places and all sites and features of archaeological and historic interest discovered subsequent to the publication of the Record of Monuments and Places, and to seek their preservation in situ (or at a minimum, preservation by record) through the planning process."

13.3.8 National Monuments

The Department of Housing, Local Government and Heritage maintains a database on a county basis of National Monuments in State Care: Ownership and Guardianship. The term National Monument is defined in Section 2 of the National Monuments Act (1930) as:

"a monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto." (www.archaeology.ie).

There are no National Monuments in State Care within the proposed development area or the 1km study area.

There are no sites with Preservation Orders or Temporary Preservation Orders within the proposed development area or the 1km study area.

There are no World Heritage Sites or sites included in the Tentative List as consideration for nomination to the World Heritage List within the proposed development area or the 1km study area.

13.4 Architectural and Cultural Heritage

13.4.1 Fingal Development Plan 2017 - 2023

It is an Objective (CH20) of Fingal County Council (Fingal Development Plan 2017, 350) to:

"Ensure that any development, modification, alteration, or extension affecting a Protected Structure and/or its setting is sensitively sited and designed, is compatible with the special character, and is appropriate in terms of the proposed scale, mass, height, density, layout, materials, impact on architectural or historic features, and junction with the existing Protected Structure."

It is also an Objective (CH25) of Fingal County Council (*ibid*., 351) to:

"Ensure that proposals for large scale developments and infrastructure projects consider the impacts on the architectural heritage and seek to avoid them. The extent, route, services and signage for such projects should be sited at a distance from Protected Structures, outside the boundaries of historic designed landscapes, and not interrupt specifically designed vistas. Where this is not possible the visual impact must be minimised through appropriate mitigation measures such as high quality design and/or use of screen planting."

Appendix 2 of the Fingal Development Plan (*ibid*.) contains the Record of Protected Structures for Fingal.

There are no Protected Structures recorded in the Fingal Development Plan within the proposed development area or the 500m study area.

A number of Protected Structures are located within the wider landscape of the proposed development area. Given the intervening distance between the proposed development area and the Protected Structures, along with natural screening and the built-up urbanised environment of Malahide village, it is considered no significant visual impacts on any Protected Structures will occur.

An Architectural Conservation Area (ACA) is:

> "*a place, area, group of structures or townscape that is of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest or value, or contributes to the appreciation of Protected Structures*." (*ibid*.).

Table 10.1 of the Fingal Development Plan (*ibid*., 352) contains a list of Architectural Conservation Areas in Fingal.

There are no Architectural Conservation Areas recorded in the Fingal Development Plan within the proposed development area.

There are two Architectural Conservation Areas recorded in the Fingal Development Plan within the 500m study area.

Table 13-2. Architectural Conservation Areas within the 500m Study Area

Architectural Conservation Area	Distance from Proposed Development Area
Malahide Castle Demesne	*c*. 40m (at its nearest point)
Malahide – The Bawn, Parnell Cottages and St. Sylvester's Villas	*c*. 145m (at its nearest point)

13.4.2 National Inventory of Architectural Heritage

Building Survey

The National Inventory of Archaeological Heritage (NIAH) maintains a non-statutory register of buildings, structures *etc*. recorded on a county basis (www.buildingsofireland.ie).

There are no structures recorded on the NIAH within the proposed development area.

There are four structures recorded on the NIAH within the 500m study area.

Table 13-3. NIAH structures within the 500m Study Area

Reg. No.	Structure Name	Description	Distance
11344020	Graveyard/cemetery	Graveyard with various cut stone grave markers. Ruined church with nave, chancel and sacristy to south. Late 15th	*c*. 490m

Reg. No.	Structure Name	Description	Distance
		century nave, 16th century chancel, possibly post-Reformation.	
11344021	Farmyard complex	Two-storey stable yard complex on a U-shaped plan, *c*. 1840, comprising gabled central block. Pairs of carriageway arches to north and south gables attached to flanking perpendicular blocks. Remodelled *c*. 1990 to accommodate workshops and retail outlets.	*c*. 475m
11344022	House	Detached three-bay two-storey house, *c*. 1860, retaining original features with single-bay two-storey return to rear.	*c*. 455m
11344026	Gate lodge	Detached three-bay single-storey former gate lodge, *c*. 1890, retaining original fenestration. Single-bay single-storey return to rear extended to east and to south, *c*. 1930. Now in use as detached house.	*c*. 300m

Garden Survey

The National Inventory of Archaeological Heritage maintains a non-statutory register of historic parks and gardens recorded on a county basis.

There is one historic park and garden recorded on the NIAH within the proposed development area.

Table 13-4. NIAH historic park and garden within the Proposed Development Area

Site ID	Name	Description	Distance
2522	Broomfield House	Eastern area of parkland covered by residential and industrial development. Western side arable farmed.	Within the proposed development area

The NIAH Survey Data for Broomfield House notes:

> *"Eastern area of parkland covered by residential and industrial development. Western side arable farmed." (www.buildingsofireland.ie).*

The NIAH Survey Data for Broomfield House notes that the site footprint is not visible, that "*Significant Development*" has taken place within the parkland, and that no architectural or landscape features, such as buildings, garden structures, avenues, woodland, parkland, formal garden, vistas or other features, survive.

Reference to the First Edition Ordnance Survey map (figure 13.7) shows that the area of proposed land take located within Broomfield demesne did not contain any architectural or landscape features associated with the parkland, other than regular field boundaries. Broomfield House and its associated landscaped grounds and gate lodge are all recorded east of the Dublin to Drogheda railway line on the First Edition Ordnance Survey map, and have therefore been historically severed from the area of proposed land take. Later edition cartographic sources (figure 13.9) confirm that the Broomfield parkland area had been substantially reduced in the 19th and early 20th century, and that no associated features survive within the area of proposed land take.

The western side of the Northern Area is recorded as a townland and parish boundary, and forms the western extent of Broomfield demesne (**Section 13.4.4 Townland Boundary**).

There are an additional two historic parks and gardens recorded on the NIAH within the 500m study area.

Table 13-5. NIAH historic parks and gardens within the 500m Study Area

Site ID	Name	Description	Distance
2514	Malahide Demesne	Buildings and woodland indicated. Area labelled Malahide Demesne.	*c.* 40m (at its nearest point)
2529	Sainthelens	Buildings indicated. Area labelled Sainthelens.	*c.* 235m (at its nearest point)

There are no features recorded on the *Fingal Industrial Heritage Survey* (2011) within the proposed development area.

13.4.3 Cultural Heritage

The Fingal Development Plan (2017 - 2023) does not contain any designated lists or sites of cultural heritage importance or significance.

13.4.4 Townland Boundary

The western side and part of the southern side of the Northern Area is recorded as a townland and parish boundary on historic cartographic sources. Proposed access roads and footpaths will truncate the townland and parish boundary in six places.

13.5 Site-Specific Archaeological Fieldwork

13.5.1 Geophysical Survey

A geophysical survey (Licence 18R0101) was carried out by Joanna Leigh within the proposed development area in June 2018 (Leigh 2018). The survey was undertaken to locate and identify any potential archaeological responses within the area of land take.

Due to ground conditions it was not possible to carry out the geophysical survey in Fields 1, 2, 4, 7, 8 and 10 (figures 13.12 and 13.13).

In summary, the geophysical survey in the Northern Area revealed the presence of a possible plough-damaged enclosure measuring approximately 40m north east/south west x 35m in the north west corner of Field 5 (figure 13.10). Isolated responses within and in the vicinity of the possible enclosure may represent small pit-type features, although the geophysical survey report noted that this interpretation is speculative (*ibid*., 4).

A possible small plectrum-shaped enclosure measuring approximately 35m north/south x 25m east/west was noted in the eastern end of Field 5 (figure 13.10). Elsewhere in Field 5, four small separate faint curvilinear trends were noted towards the southern and eastern ends of the field (each referred to as “4” on figure 13.10). Although it is possible these isolated anomalies represent plough-damaged short ditch-type features, the geophysical survey report (*ibid*.) noted that such an interpretation is cautious as no clear archaeological pattern is discernible.

Linear responses were noted towards the middle of Field 3 (referred to as “6” on figure 13.10). The geophysical survey report (*ibid*.) noted that while they may be the remains of modern field divisions, it is possible that archaeological ditch-type features are represented in these areas.

A circular trend with a 5m diameter (referred to as “8” on figure 13.10) was detected towards the southern end of Field 3. This feature is interpreted in the geophysical survey report (*ibid*.) as being of possible archaeological potential.

In the Southern Area linear trends suggest probable former field divisions in Field 9, however isolated responses with a magnetic signature similar to archaeological features were also detected in this area (figure 13.11). No clear archaeological pattern was discernible however, and the geophysical survey report (*ibid*., 5) noted the responses may equally represent more deeply buried ferrous debris.

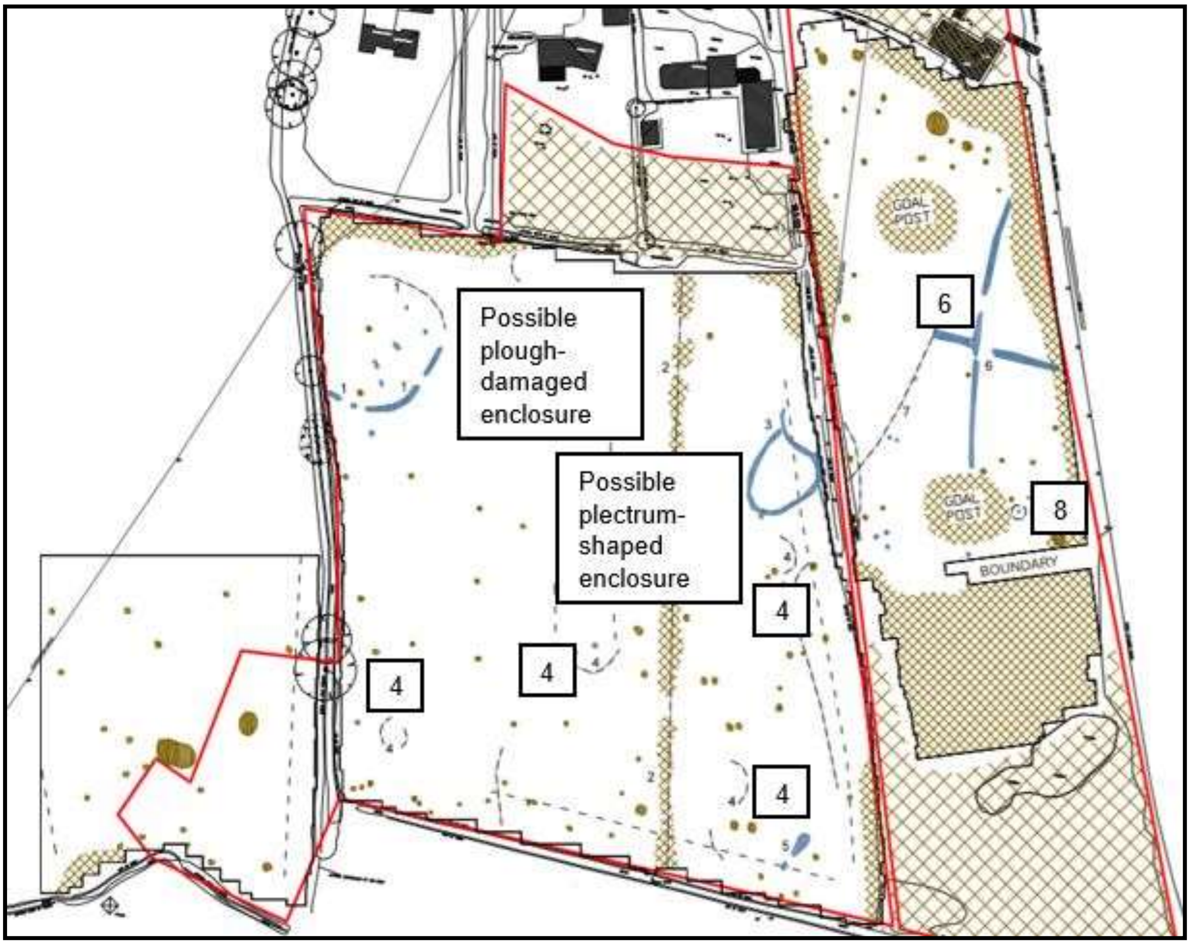

Figure 13-10. Results of the geophysical survey in the Northern Area

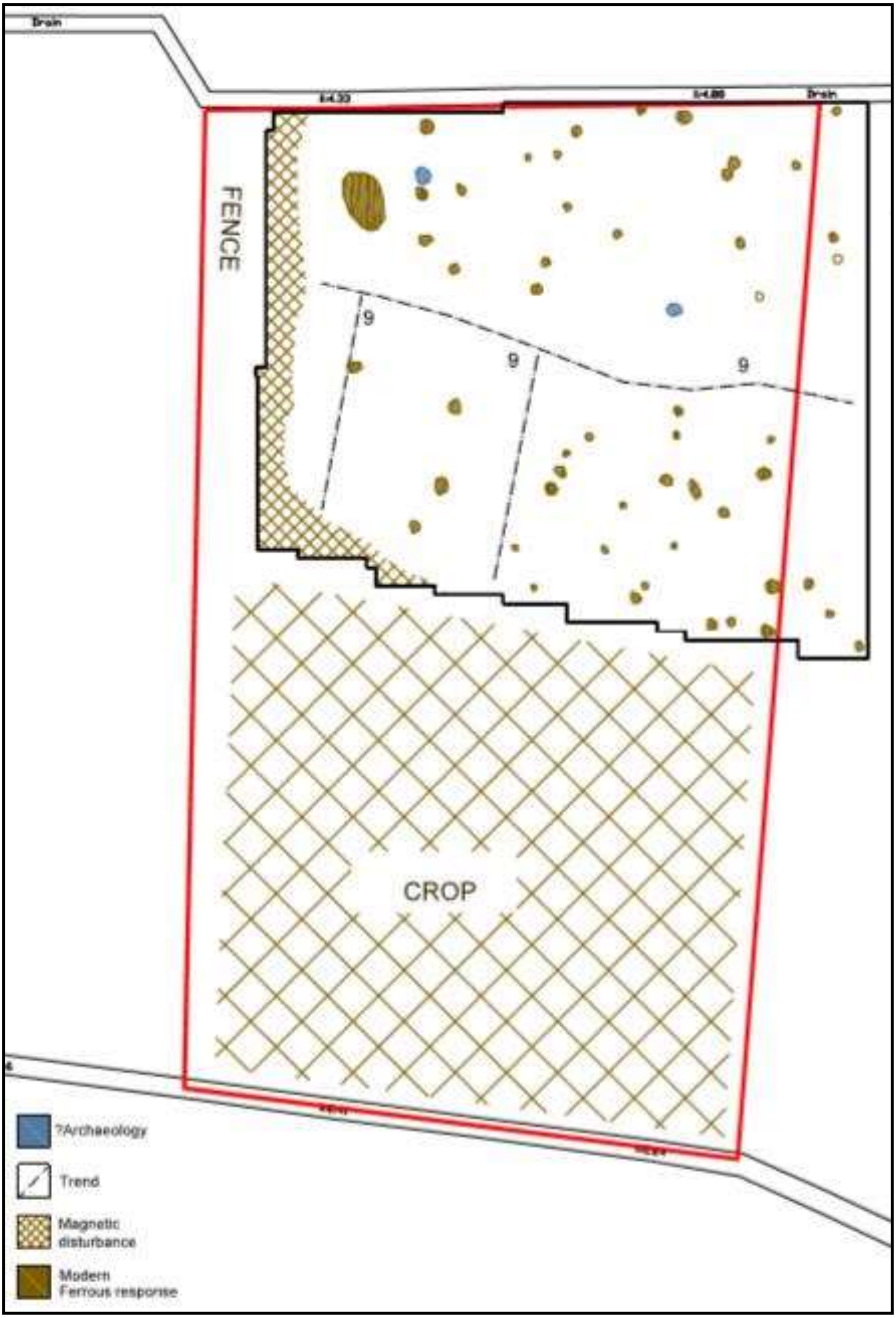

Figure 13-11. Results of the geophysical survey in the Southern Area

13.5.2 Phase 1 Test Trenching

Test trenching (Licence No: 14E0162) was carried out by Dermot Nelis Archaeology between 3rd and 6th June 2014 in a field located immediately west of the Northern Area (Nelis 2014). The excavation of 13 test trenches revealed four features of archaeological significance. Two of these features relate to the possible plough-damaged enclosure revealed in the geophysical survey in the northwest corner of Field 5 and which is located within the current development area (figure 13.10).

Testing in 2014 revealed the possible plough-damaged enclosure ditch located within the current development area to measure 1.75m wide. It extended beyond the test trench to both the east and west. A 0.40m wide hand-dug section revealed it to have a maximum depth of 0.60m. No artefacts or environmental evidence were revealed in the hand-dug section.

A sub-circular pit was revealed 0.17m north of the above-mentioned enclosure ditch, *i.e.* within the possible plough-damaged enclosure and within the current development area. It measured 0.98m east/west x 0.85m north/south x 0.25m deep, and extended beyond the trench to the west. It was revealed in the test trench as an obvious feature with burning, along with small amounts of animal bone on the surface. It was preserved *in situ*, and no artefacts or environmental evidence were revealed in the hand-dug section.

Phase 1 (2014) test trenching revealed an east/west oriented archaeological feature approximately 50m northwest of the proposed development area, *i.e.* outside the current development area. It measured 1.5m north/south x 0.30m deep maximum, and extended beyond the trench to the east and west. This feature has been preserved *in situ*.

Phase 1 (2014) test trenching also revealed an archaeological feature approximately 25m north of the proposed development area, *i.e.* outside the current development area. It took the form of a 0.38m north/south x 0.35m east/west x 8cm deep feature, revealed as a charcoal surface directly under topsoil. This feature was fully excavated at the time of Phase 1 test trenching.

13.5.3 Phase 2 Test Trenching

Phase 2 test trenching (Licence No: 20E0058) was carried out by Dermot Nelis Archaeology between 18th March and 1st July 2020, and in total took 18 days to complete (Nelis 2021). Test trenching revealed four possible archaeological features (a pit; a hearth/burnt pit; and two possible enclosure ditches) in two fields (Field 1 and Field 5; figure 13.12).

No archaeological features or artefacts were revealed in Fields 3, 4, 7, 8, 9 or 10.

The Phase 2 test trenching site visit carried out to facilitate submission of the Licence Application to National Monuments Service showed Field 2 (figure 13.12) to be overgrown and with large amounts of rubble, along with a large concrete hardstand. In addition, an overhead powerline was shown to extend across the middle of Field 2. As such, it was agreed in the Method Statement submitted to National Monuments Service that trenches would not be excavated in Field 2.

Field 6 (figure 13.12) was shown to have been previously topsoil stripped, and monitoring in this area (Nelis 2019) failed to reveal any archaeological features or artefacts. As such, Phase 2 test trenches were not excavated in Field 6.

Test trenching in Field 7 and Field 8 (figure 13.12) failed to reveal any archaeological features or artefacts. The location of Field 7 and Field 8 does not form part of the current development, but will instead be part of a future planning application. This area was assessed however as part of Phase 2 test trenching programme to provide information on the archaeological potential of the wider development area.

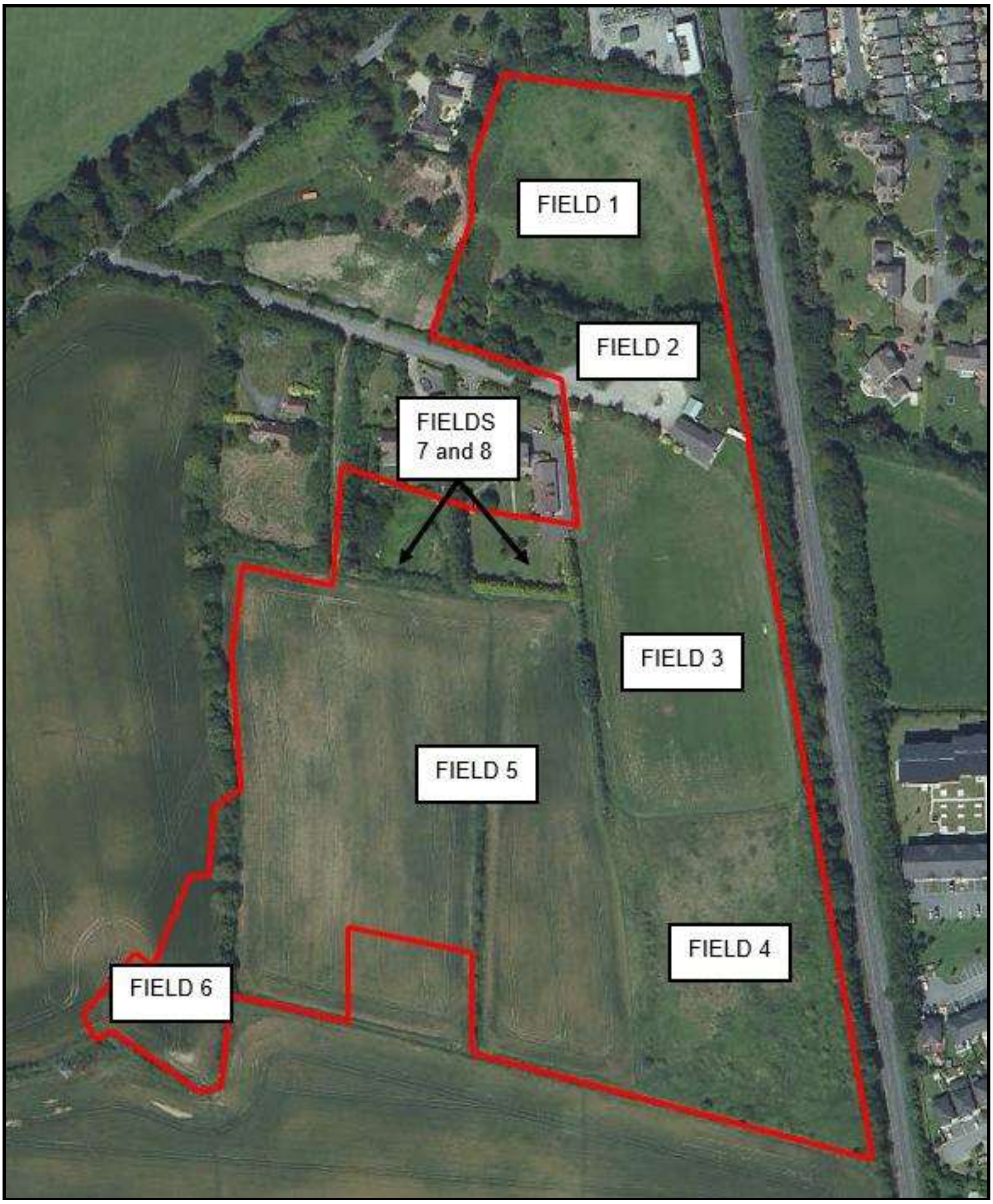

Figure 13-12. Location of Fields 1 – 8 in the Northern Area of the Phase 2 Test Trenching

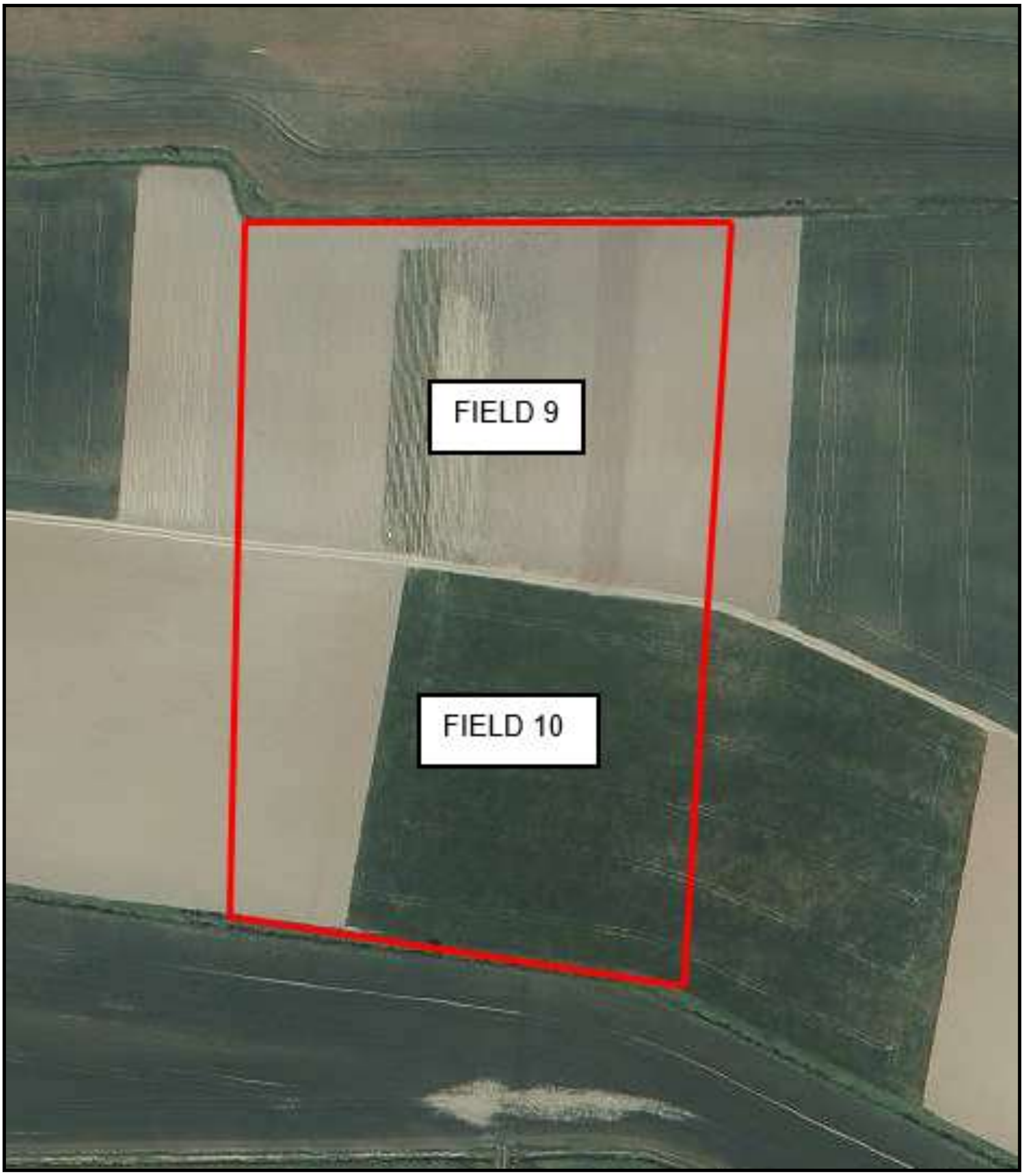

Figure 13-13. Location of Fields 9 and 10 in the Southern Area of the Phase 2 Test Trenching

A pit was identified towards the northern end of Field 1 (figure 13.14; plate 13.1). It was orientated roughly northwest/south east and measured 1.5m long x 1.1m wide. The fill was a friable charcoal-stained dark brown fine silt. The pit was fully preserved *in situ*, and no artefacts were revealed in association with the feature.

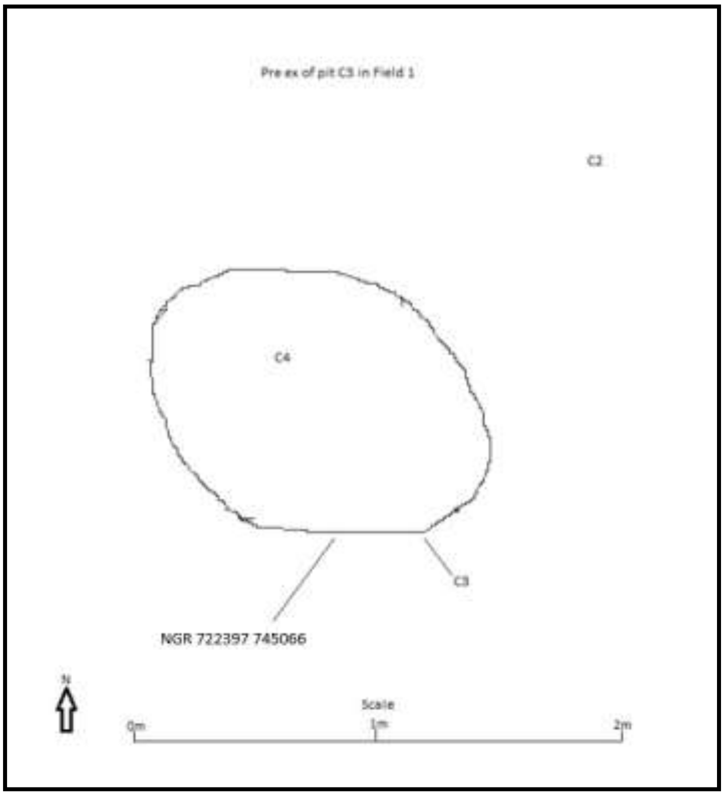

Figure 13-14. Plan of pit identified towards the northern end of Field 1

Figure 13-15. Pit identified towards the northern end of Field 1

A hearth/burnt pit was identified at the northern end of Field 5 (figure 13.15; plate 13.2). It was irregular in plan and measured 1.25m east/west x 0.6m north/south, although this feature appears to have been disturbed by ploughing activity. It was revealed as a spread of oxidized reddened silt with charcoal. No diagnostic artefacts were recovered from the fill, and the feature has been fully preserved *in situ*.

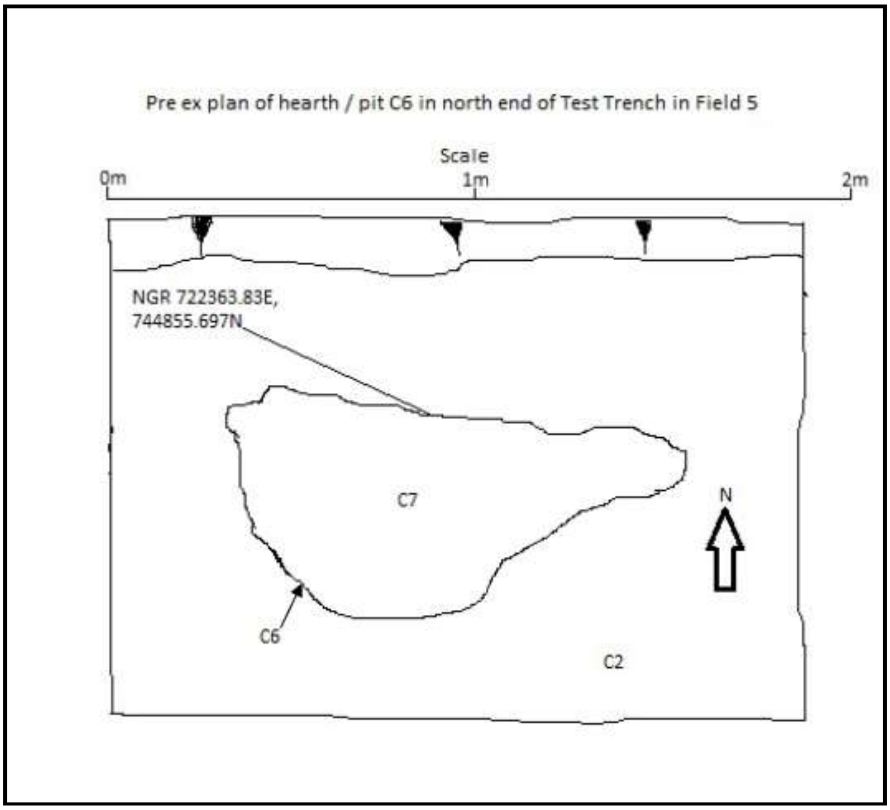

Figure 13-16. Plan of hearth/burnt pit identified at the northern end of Field 5

Figure 13-17. Hearth/burnt pit identified towards the northern end of Field 5

The geophysical survey indicated the presence of two previously unrecorded possible plough-damaged enclosures in Field 5 (figure 13.10). Four trenches (Trenches 1 – 4 on figure 13.16) were excavated as part of the Phase 2 test trenching programme to assess these geophysical anomalies.

Test Trenches 1 and 2 were excavated to assess the extent, character and condition of a possible plough-damaged enclosure located in the northwest corner of Field 5. Both trenches extended from within the probable enclosure and across the possible ditch, while also assessing internal isolated geophysical responses. Trench 1 measured 10m in length and assessed the ditch in the northern end of the possible enclosure. Trench 2 measured 20m in length and assessed the ditch in the southeast corner of the possible enclosure.

Pre-test trenching, the anomaly in Test Trench 1 was interpreted as possibly representing a badly plough-damaged enclosure ditch. Test trenching did not reveal any archaeological features associated with the geophysical anomaly in Test Trench 1, and it is suggested the ditch may have been removed through repeated ploughing in this location.

An archaeological feature was identified 3.5m from the south-eastern end of Test Trench 2, in the location of the geophysical anomaly (figure 13.17; plate 13.3). It took the form of a possible ditch with gently regular curving sides and a slightly rounded base. It measured approximately 1.1m wide north/south x approximately 0.3m deep, and continued beyond the trench to the northeast and southwest. The single fill was a loose mid brown silty clay with occasional small stone inclusions evenly distributed. No artefacts were recovered, and no additional archaeological features were identified in Geophysical Test Trench 2.

The possible enclosure ditch identified in Test Trench 2 is the same feature as that recorded in the Phase 1 (2014) test trenching programme (**Section 13.5.2 Phase 1 Test Trenching**).

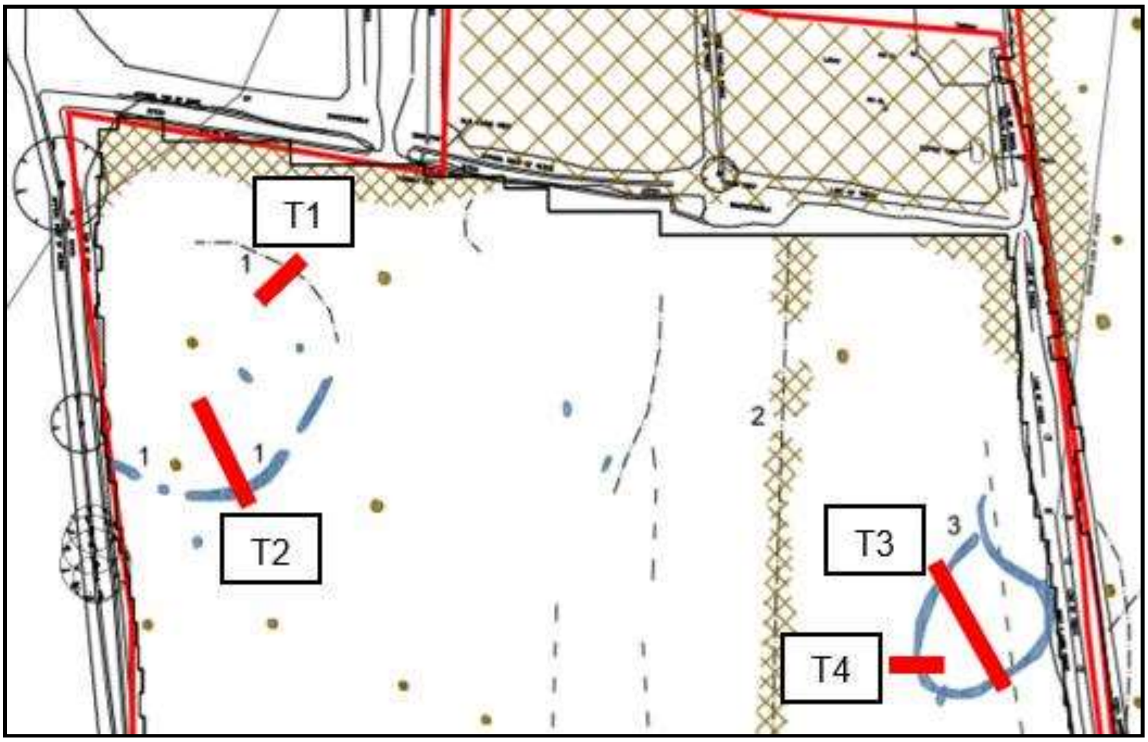

Figure 13-18. Location of Test Trenches 1 – 4 assessing geophysical anomalies in Field 5

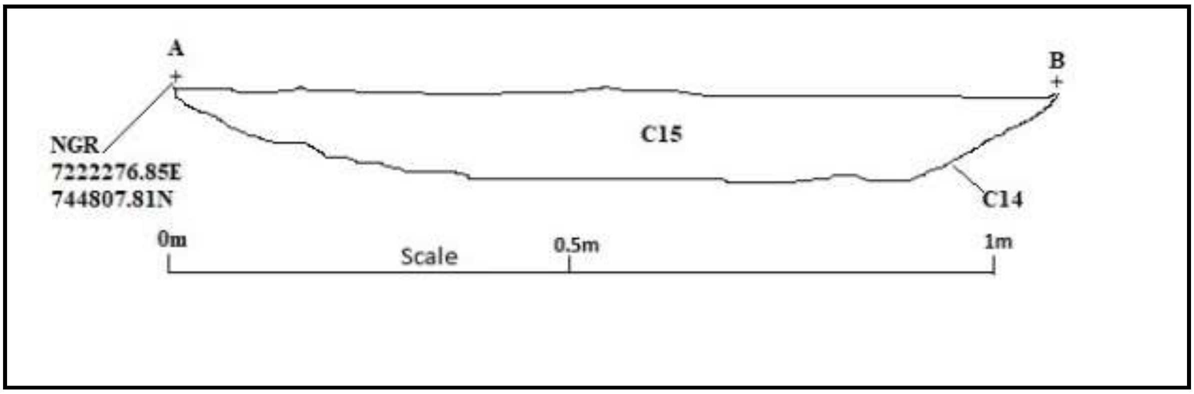

Figure 13-19. Section of possible enclosure ditch in Test Trench 2 Field 5

Figure 13-20. Possible enclosure ditch in Test Trench 2 Field 5

Test Trenches 3 and 4 (figure 13.16) were excavated to assess the extent, character and condition of a possible small enclosure located in the eastern end of Field 5 as revealed through the geophysical survey. Trench 3 extended across the possible enclosure in a northwest/southeast direction, thus assessing the potential ditch in two locations as well as any potential internal features. Trench 4 was excavated in an east/west direction and assessed the possible ditch in the southwest corner of the possible enclosure. Trench 3 measured 25m in length and Trench 4 measured 10m in length.

An archaeological feature was identified at the north-western end of Test Trench 3, in the location of the geophysical anomaly (figures 13.18 and 13.19; plate 13.4). It continued beyond the trench in a northeast/southwest direction and consisted of a narrow linear cut measuring 0.25m wide x 0.2m deep. It was V-shaped in profile, and the single fill was a greyish brown stony silt. Angular stones and cobbles were present in the fill, and these resembled packing material. This tentatively suggests the feature may have functioned as a slot-trench which supported upright wooden posts. A small amount of animal bone was recovered from a hand-excavated section.

Pre-test trenching, the geophysical anomaly in the southeast corner of Test Trench 3 was interpreted as part of a possibly plough-damaged enclosure ditch. Test trenching did not reveal any archaeological features associated with the geophysical anomaly in this location, and it is suggested the ditch may have been removed through repeated ploughing in this area. No additional archaeological features or artefacts were identified in Test Trench 3.

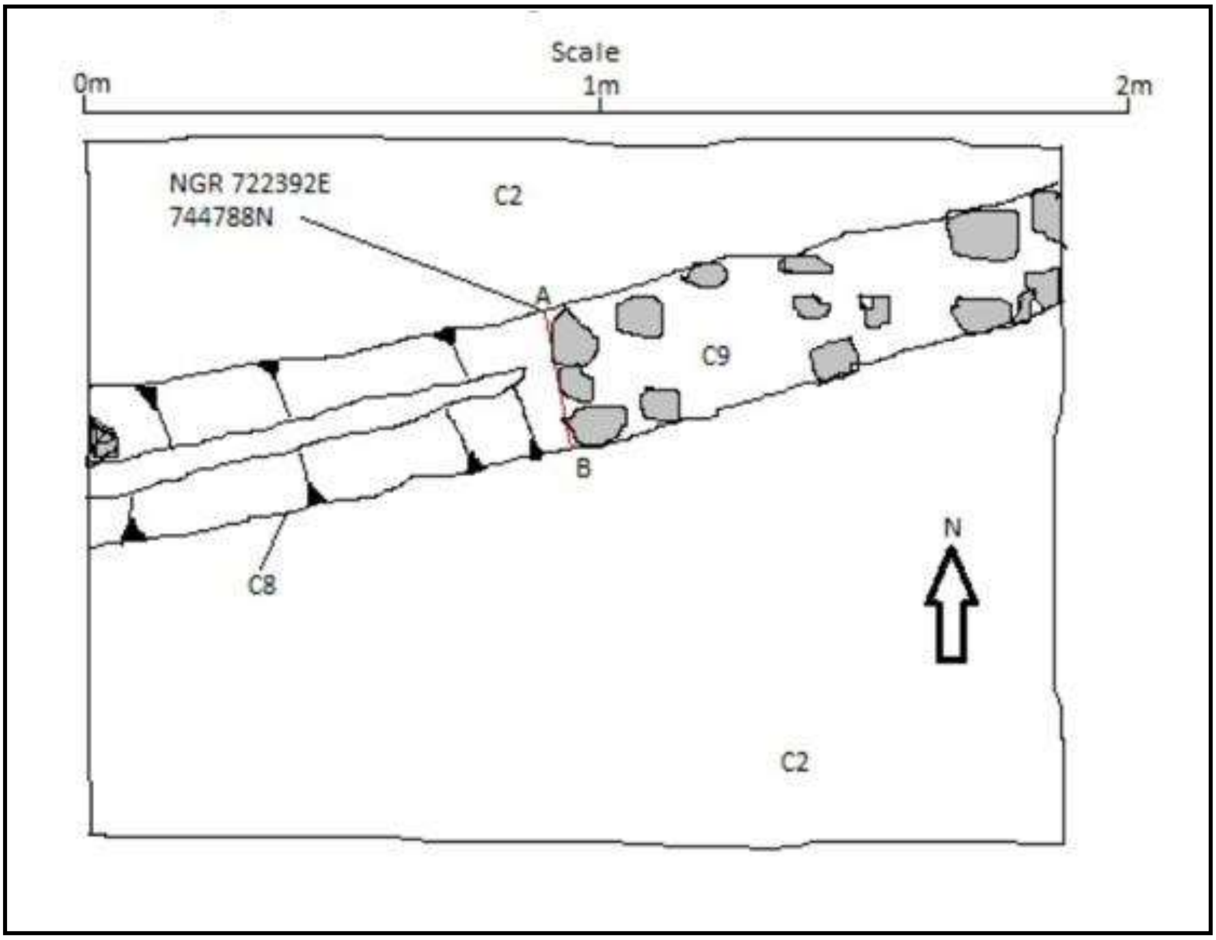

Figure 13-21. Plan of possible slot-trench in Test Trench 3 Field 5

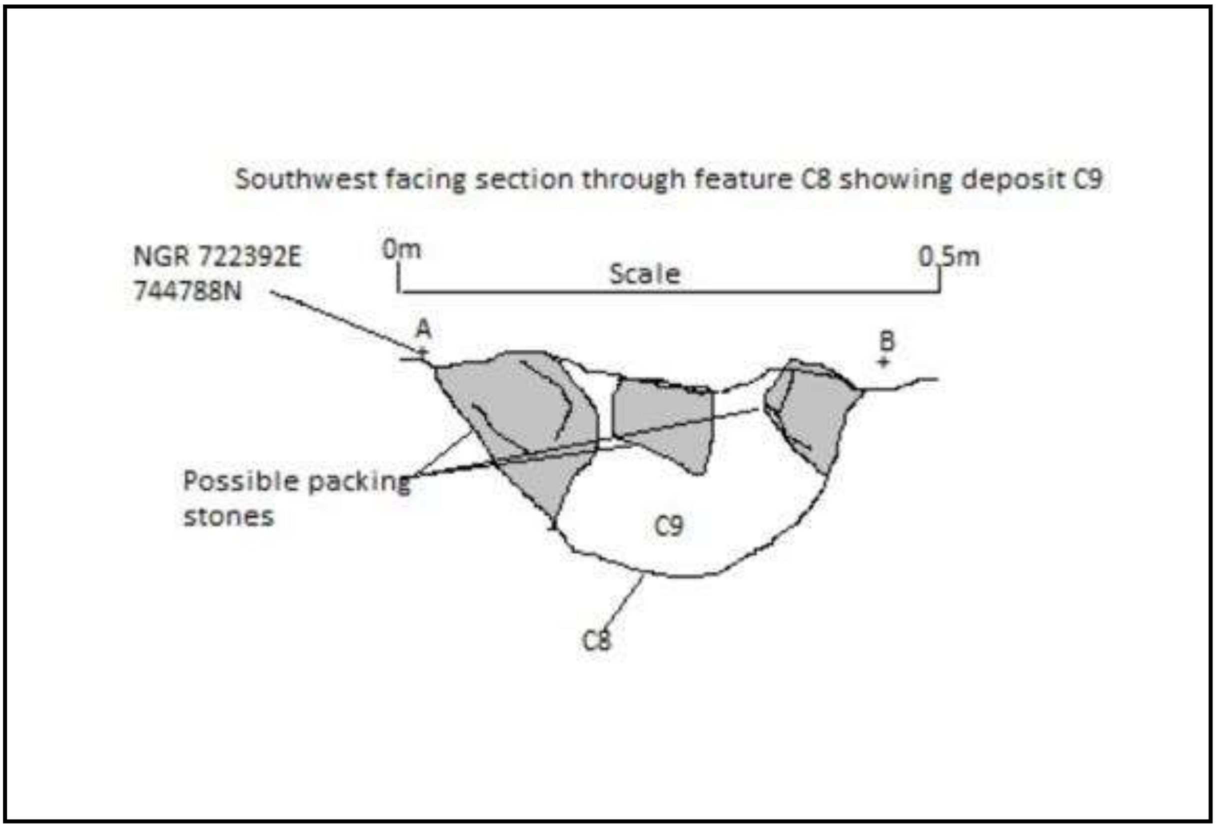

Figure 13-22. Section of possible slot-trench in Test Trench 3 Field 5

Figure 13-23. Possible slot-trench in Test Trench 3 Field 5

Test Trench 4 was oriented east/west, and was located a short distance west of Test Trench 3. A roughly north/south oriented linear feature was noted in the middle of the trench in the location of the geophysical anomaly, which took the form of a possible shallow ditch measuring 1.3m wide x 0.2m deep (plate 13.5). The single fill contained occasional small animal bone fragments and two sherds of 18th/19th century glazed red earthenware. The recovery of 18th/19th century pottery suggests the interpretation of this feature as an enclosure ditch is tentative. No additional archaeological features or artefacts were identified in Test Trench 4.

No environmental evidence was revealed during the Phase 2 test trenching exercise, and no additional archaeological features or artefacts were revealed as a result of carrying out the test trenching. With the exception of the hand-excavated sections discussed above, all archaeological features have been preserved *in situ*.

Figure 13-24. Linear feature in Test Trench 4 Field 5

13.6 Characteristics of the Proposed Development

The proposed development will be divided into two separate areas, the Northern Area and the Southern Area, and a Strategic Housing Development (SHD) consisting of 417 units is proposed for these lands. The overall site area measures 12.5 ha.

13.7 Potential Impact of the Proposed Development

13.7.1 Archaeological Heritage

Test trenching revealed the presence of four previously unrecorded below-ground archaeological features (a pit; a hearth/burnt pit; and two possible enclosure ditches) within the proposed development area.

Construction works will have a significant, permanent, direct impact on these previously unrecorded archaeological remains.

Construction works will have a significant, permanent, direct impact on any previously unrecorded archaeological remains that may exist within the development area, and which may be discovered during the construction phase.

There will be no indirect construction phase impact on the archaeological resource.

There will be no operational phase impact on the archaeological resource.

13.7.2 Architectural Heritage

There are no Protected Structures within the proposed development area or the 500m study area.

There are no Architectural Conservation Areas within the proposed development area. There are two Architectural Conservation Areas within the 500m study area.

There are no structures recorded on the NIAH within the proposed development area. There are four structures recorded on the NIAH within the 500m study area.

There are two historic parks and gardens recorded on the NIAH within the 500m study area.

It is assessed that there will be an imperceptible, permanent, visual impact on the above-mentioned architectural heritage features recorded within the 500m study area.

There is one historic park and garden (Broomfield House) recorded on the NIAH within the proposed development area (**Section 13.4.2 National Inventory of Architectural Heritage**). With the exception of the western boundary of the Northern Area, which formed the western extent of the parkland, there are no features associated with Broomfield demesne extant within the proposed development area. As a result, it is assessed that there will be no construction or operational phase impacts on Broomfield demesne.

The western side of the proposed development area is recorded as a townland and parish boundary, and is discussed below (**Section 13.7.3 Cultural Heritage**).

There will be no construction phase impact on the architectural resource.

There will be no indirect operational phase impact on the architectural resource.

13.7.3 Cultural Heritage

The western side and part of the southern side of the Northern Area is recorded as a townland and parish boundary. Proposed access roads and footpaths will truncate the townland and parish boundary in six places.

Construction works will have an imperceptible, permanent, direct impact on the townland and parish boundary.

There will be no indirect construction phase impact on the cultural heritage resource.

There will be no operational phase impact on the cultural heritage resource.

13.8 'Do Nothing' Impact

No 'Do Nothing' impact is predicted.

13.9 Avoidance, Remedial & Mitigation Measures

It is recommended that the four archaeological features (a pit; a hearth/burnt pit; and two possible enclosure ditches) revealed during the test trenching programmes be fully excavated and recorded well in advance of groundworks commencing on site. Excavation would be carried out under Licence to the Department of Housing, Local Government and Heritage and the National Museum of Ireland.

It is recommended that monitoring of all groundworks be undertaken in Fields 1, 2 and 5 (figure 13.12). Monitoring would be carried out under Licence to the Department of Housing, Local Government and Heritage and the National Museum of Ireland. Provision would be made for the full excavation and recording of any archaeological features or deposits that may be exposed during monitoring.

It is considered monitoring is not required in Fields 3, 4, 6, 7, 8, 9 and 10 (figures 13.12 and 13.13) as fieldwork failed to reveal any archaeological features or artefacts in these areas.

There are no mitigation measures available to offset the imperceptible, permanent, visual impact on the architectural heritage features recorded within the 500m study area.

It is recommended that written and photographic records be created, well in advance of groundworks commencing on site, where the proposed access roads and footpaths will truncate the townland and parish boundary.

13.10 Residual Impacts

There will be no residual impacts on the archaeological resource if the mitigation measures outlined in **Section 13.9 Avoidance, Remedial & Mitigation Measures** are implemented in full.

There will be no residual impacts on the cultural heritage resource if the mitigation measures outlined in **Section 13.9 Avoidance, Remedial & Mitigation Measures** are implemented in full.

It is assessed that there will be a residual imperceptible, permanent, visual impact on the architectural heritage features recorded within the 500m study area.

13.11 Monitoring

With the exception of the mitigation measures outlined in **Section 13.9 Avoidance, Remedial & Mitigation Measures**, there are no future monitoring requirements.

13.12 Reinstatement

No reinstatement will be required in relation to the proposed development.

13.13 Interactions

No interactions are predicted in relation to the proposed development.

13.14 Difficulties Encountered in Compiling

No difficulties were encountered in compiling this report.

13.15 References

13.15.1 References

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13.15.2 Cartographic Sources

Ordnance Survey	*1844, 1863 and 1906*

13.15.3 Internet Sources

www.archaeology.ie	*National Monuments Service*
www.bing.com/maps	*Bing Aerial Photography*
www.buildingsofireland.ie	*National Inventory of Architectural Heritage*
www.excavations.ie	*Database of Irish Excavation Reports*
www.fingal.ie	*Fingal County Council*
www.map.geohive.ie	*Ordnance Survey Ireland aerial*

14.0 MATERIAL ASSETS - UTILITIES & WASTE

14.1 Introduction

This Chapter has been prepared by Waterman Moylan Consulting Engineers and describes the material assets – Utilities & Waste, that are potentially impacted by the proposed Project at Broomfield. Material assets are resources that are valued and intrinsic to the site of the proposed Project and surrounding environs. Material assets may be of either natural or human origin and the value may arise for economic or cultural reasons.

This Chapter considers and assesses the effects of the proposed Project on the material assets, including major utilities within and around the site during the construction and operational phases such as built services (i.e. gas, electricity, telecommunications, etc.) and waste management. Water, Roads and Traffic are also counted as material assets and are assessed under separate chapters of this EIAR.

The EPA Guidelines (Draft 2017) state that:

> 'The meaning of this factor is less clear than others. In Directive 2011/92/EU it included architectural and archaeological heritage. Directive 2014/52/EU includes those heritage aspects as components of cultural heritage. Material assets can now be taken to mean built services and infrastructure. Traffic is included because in effect traffic consumes roads infrastructure. Sealing of agricultural land and effects on mining or quarrying potential come under the factors of land and soils.'

Given the importance of Archaeological and Cultural Heritage and noting established EIA best practice within Ireland, the Archaeological and Cultural Heritage has been comprehensively considered and assessed as a standalone chapter within this EIAR. Water, road infrastructure, and land/soil/geology have also been assessed by Waterman Moylan Consulting Engineers in Chapters 7, 13, and 6 of this report, respectively.

A preliminary Construction and Demolition Waste Management Plan (CDWMP) has been prepared by Waterman Moylan Consulting Engineers which may be used as a guide for the Main Contractor to prepare their Construction Waste Management Plan upon appointment, which will detail as to how the Contractor will address the issue of waste generation during the construction phase of the proposed Project and is included as part of the application packs. This document was prepared in accordance with best practice guidelines. Operational waste management will be managed by the management companies on site and the appointed licenced waste contractor which will ensure the sustainable management of domestic and commercial waste arising from the development in accordance with legislative requirements and best practice standards.

14.2 Study Methodology

14.2.1 Desk Study

The methodology followed for this Chapter is in accordance with the EPA's "Environmental Impact Assessment Reports. Draft Guidelines 2017". Information on built assets in the vicinity of the development lands was assembled from the following sources:

- A Desktop review of ESB, GNI, Eir and Virgin utility network maps.
- Site inspection/walkover.
- Review of the topographical survey map.

14.2.2 Rating of Impacts

Material assets are generally considered to be location sensitive. The likely significance of all impacts is determined in consideration of the magnitude of the impact and the baseline rating upon which the impact has an effect (i.e., the sensitivity or value of the material asset). Having assessed the magnitude of impact with respect to the sensitivity/value of the asset, the overall significance of the impact is then classified as imperceptible, slight, moderate, significant, or profound. The criteria for the assessment of impact significance are as per that set out in the relevant EPA Guidelines and in accordance with the EIA Directive.

14.3 Baseline Environment

14.3.1 Site Location and Context

The subject site is located at Broomfield, Malahide, Co. Dublin, as indicated in Figure 14.1, overleaf. The north site is bound to the west by Ashwood Hall residential development, to the east by the Dublin-Belfast rail line, the north by existing residential; units fronting Back Road, and to the south by agricultural land. The south site is bound to the west by Hazelbrook residential development, to the north by Brookfield residential development, to the east by agricultural land, and to the south by the Hazelbrook Stream.

The northern site will primarily be accessed via the existing junction to Back Road serving the Ashwood Hall residential development. The southern site was to be accessed from its northern boundary via the Brookfield residential development. Fingal County Council have requested as part of their Opinion Report to An Bord Pleanála, that an additional access will need to be provided for the southern site via the Hazelbrook residential development to connect to Kinsealy Lane. This instruction has been incorporated to the revised layout.

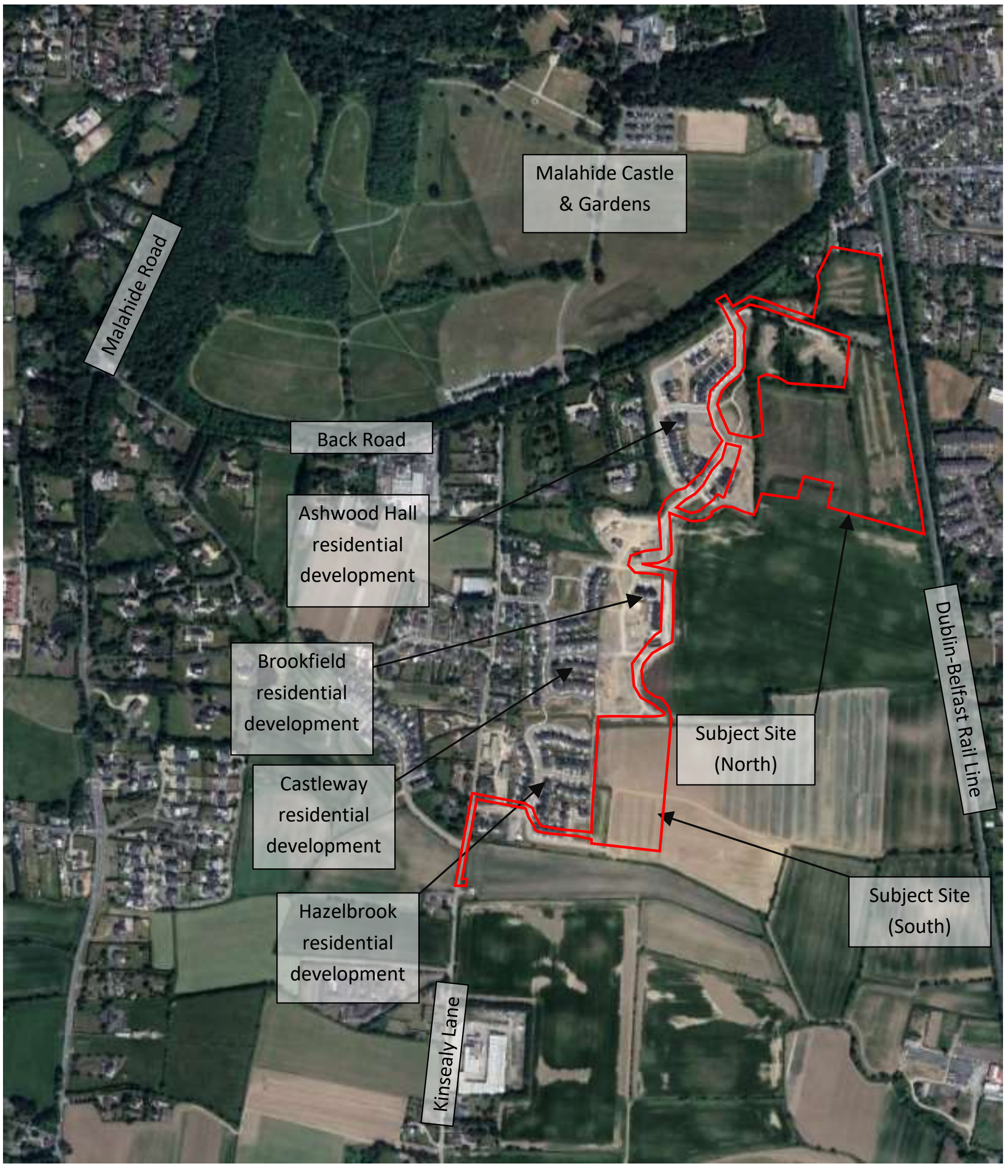


Fig. 14.1 – Site Location

14.3.2 Electricity, Gas and Telecommunications

There is currently electricity, gas, and telecommunications utilities available to the site.

Based on the information received from ESB Networks (ESBN), the subject lands are traversed by existing ESB cables with overhead lines. Underground networks have been constructed to the existing residential developments adjacent to the subject site. The undergrounding of the overhead networks will need to be agreed with ESB at the detailed design stage. There are no supply issues envisaged.

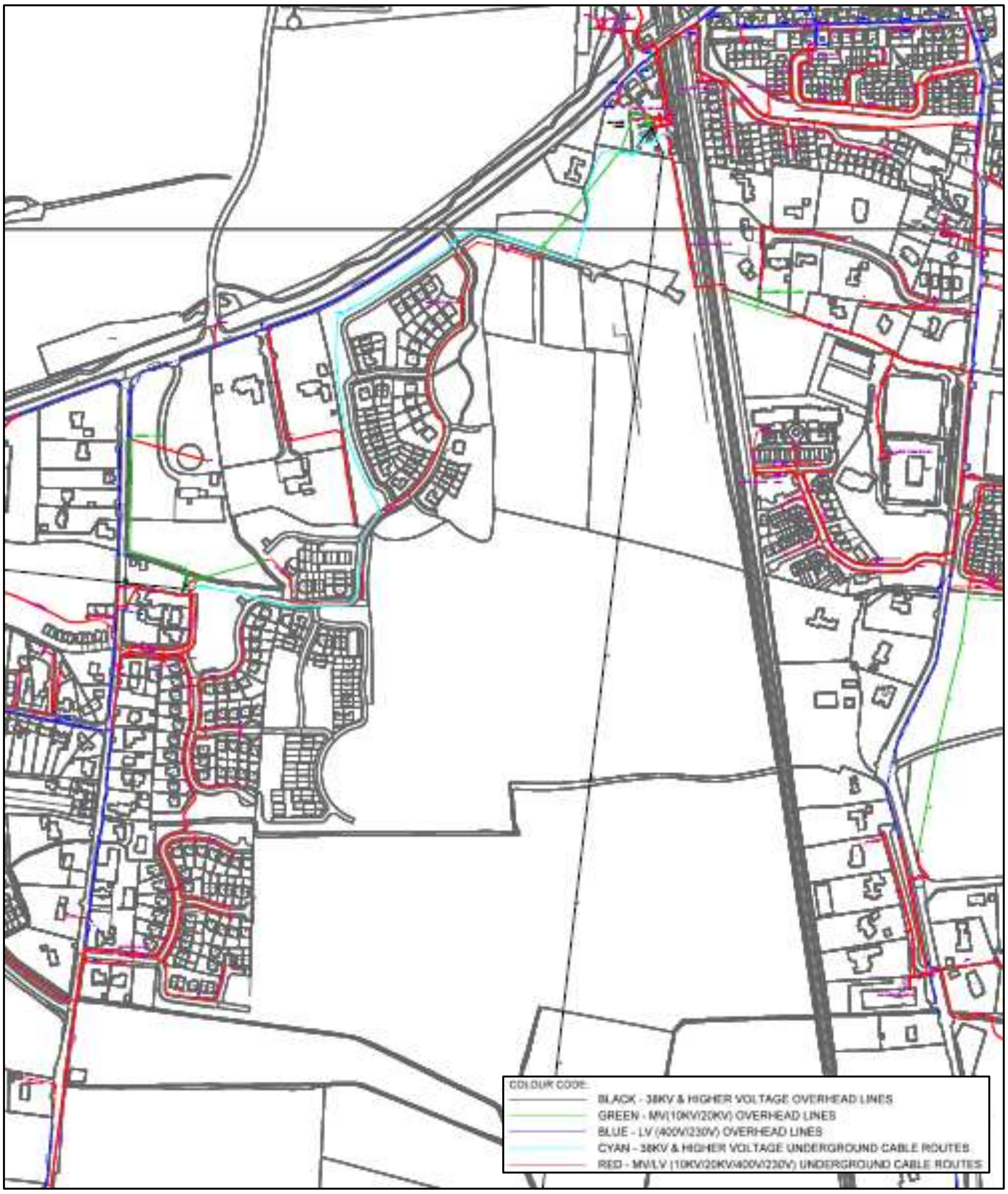


Fig. 14.2 – Existing ESB Network Layout

There is an existing Gas network in the adjacent sites. The gas network to the adjacent site is served via a connection across Kinsealy Lane to the Sleepy Hollow residential development.

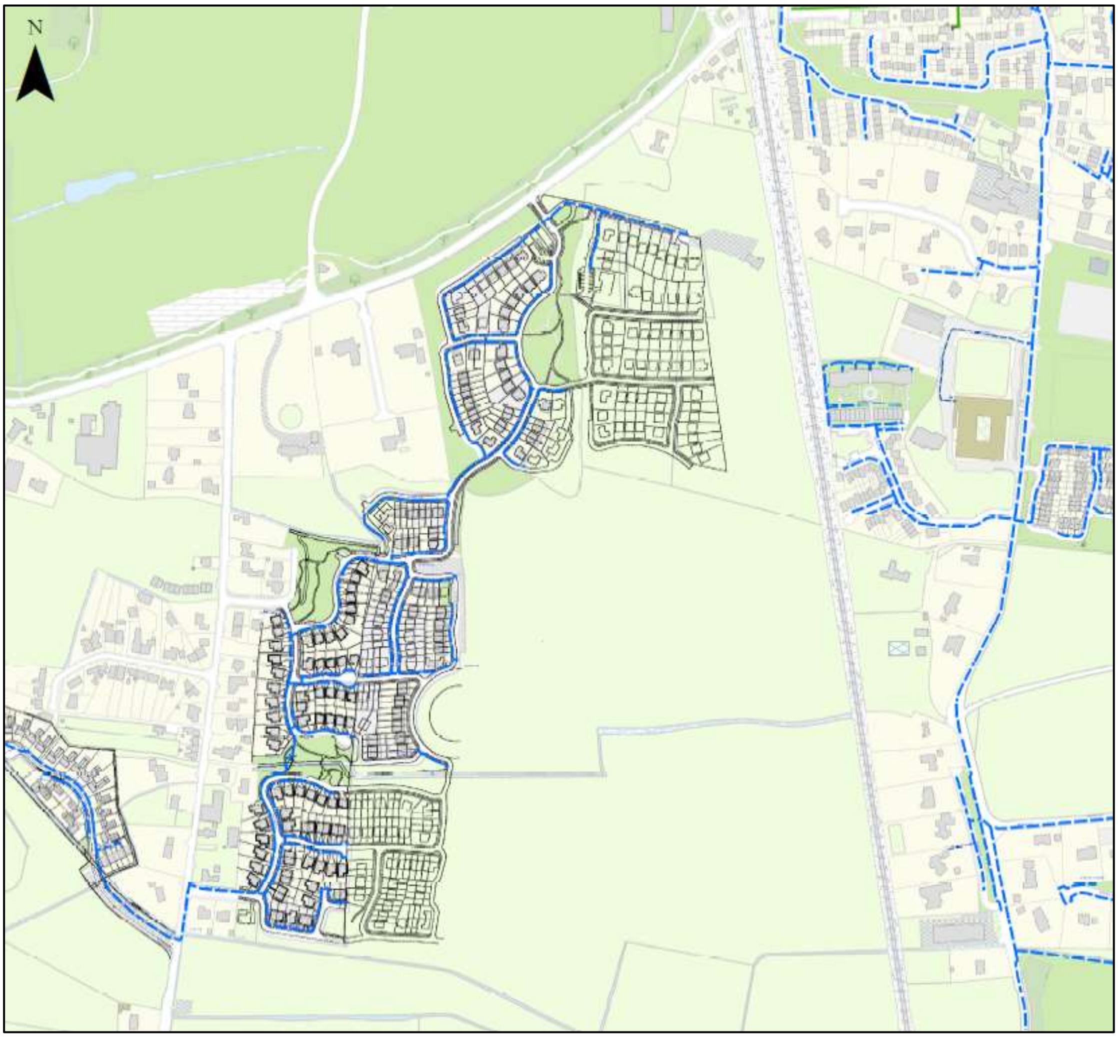


Fig. 14.3 – Existing Gas Network Layout

In terms of telecommunications, it is known from Eir E-Maps that there are existing networks in the adjacent residential development, Back Road and Kinsealy Lane.

Maps for the Virgin Media networks also inform of the same.

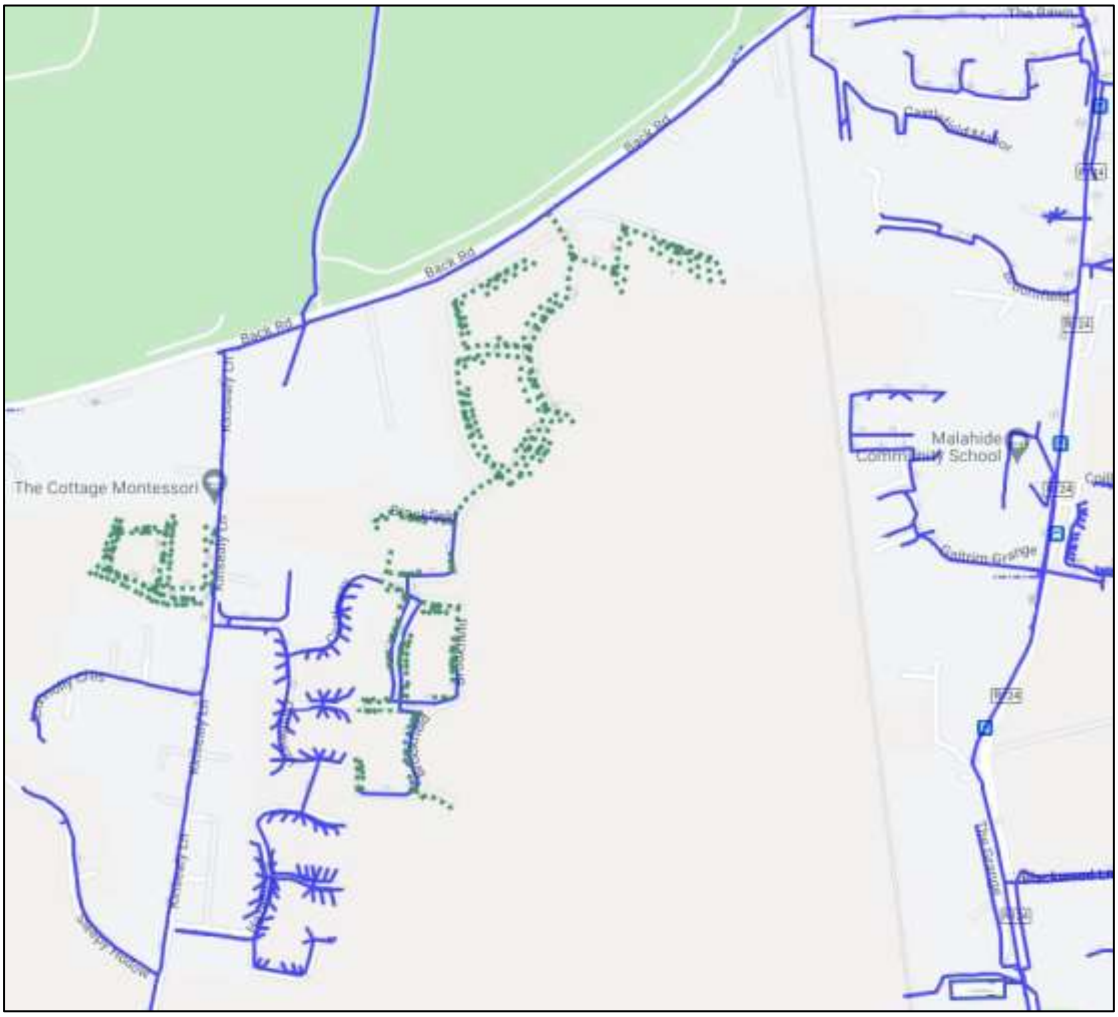


Fig. 14.4 – Existing Eir Telecommunications Network Layout

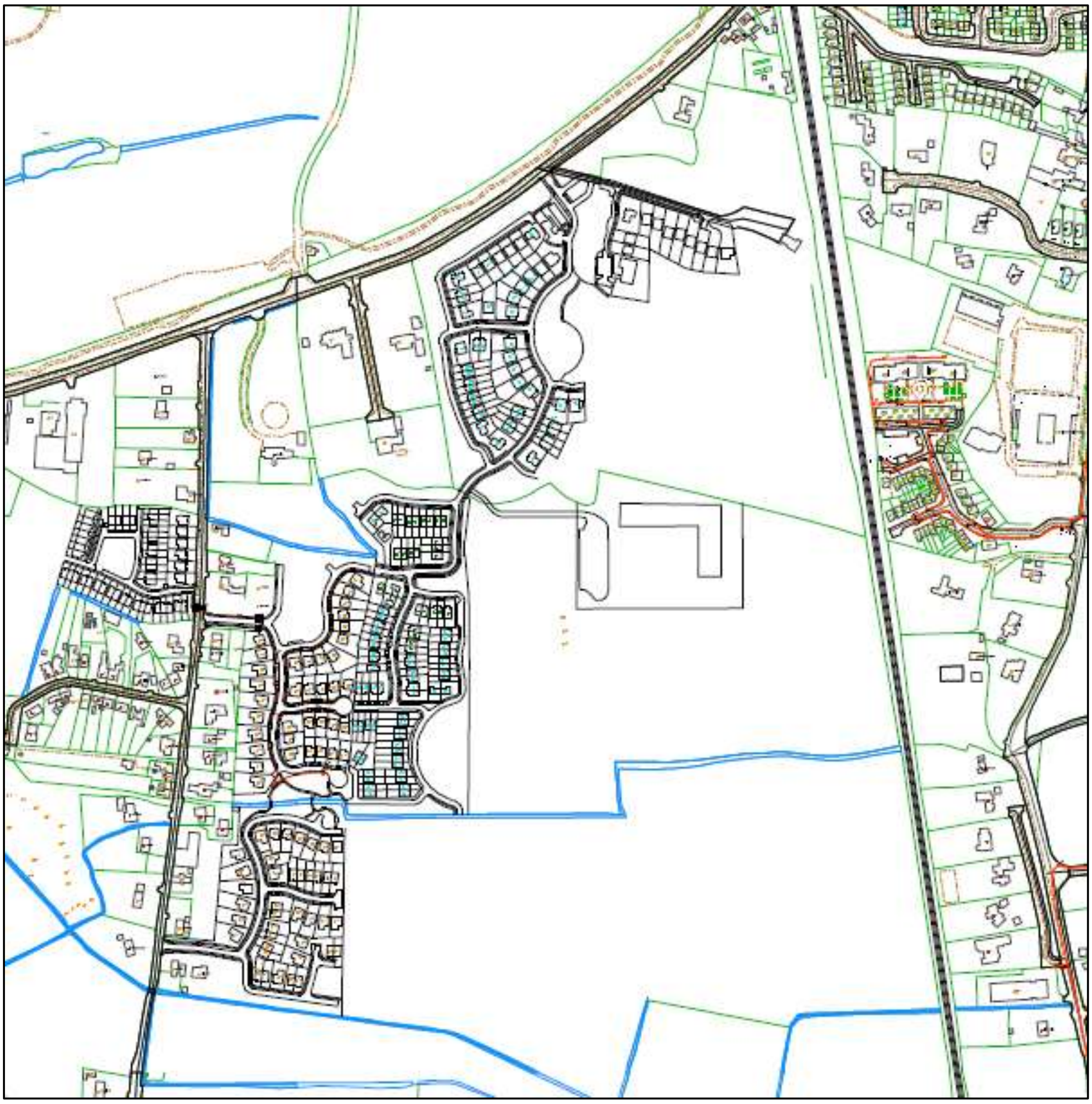


Fig. 14.5 – Existing Virgin Media Telecommunications Network Layout

14.3.3 Waste Management

In terms of waste management, the receiving environment is defined by Fingal County Council as the Local Authority with responsibility for setting standards and targets and for monitoring/regulating waste management activities in the area, as set out by the management plan for the region i.e., the EMRWMP 2015-2021. The Fingal County Development Plan 2017-2023 sets out these policies and objectives regarding waste management. In addition, waste operators already service the area as there are existing residential properties adjacent to the subject lands.

14.4 Potential Impact of the Proposed Project

This section provides a description of the potential impacts of the proposed Project may have during the Construction and Operational phases. The impact assessment addresses the *direct, indirect, cumulative, short, medium, and long term, permanent, temporary, positive and negative effects.*

14.4.1 Construction Phase

Site Location and Context

The Construction phase will likely have a temporary impact on the existing settlement in the vicinity of the subject lands. There may also be some slight and temporary impacts to the existing population which may arise during the construction phase, refer to the following EIAR Chapters: population and human health, air quality, noise and vibration, and climate for further information.

Access

During the construction phase, access will be affected by hoarding and security fencing required onto the site boundary. A detailed traffic management plan will be prepared and implemented by the Main Contractor and agreed with the Local Authority prior to commencing works. As a result, there will be a temporary disturbance to traffic in the surrounding area during construction.

The number of construction vehicle movements anticipated is low compared to the number of trips expected to be generated by the proposed development during the operational phase. It should be noted that the majority of such vehicle movements would be undertaken outside of the traditional peak hours, and it is not considered that this level of traffic would result in any operational problems.

It is estimated that 75% of construction traffic will come from M50 / Swords and 25% from city centre / Baldoyle direction. Delivery trucks will be instructed to access the site via the main site access from Back Road. Flag men shall operate to ensure safe access and egress of HGV's. It is likely that construction will have a negligible impact on pedestrian and cycle infrastructure. It is proposed that a Construction Management Plan (CMP) would be prepared by the appointed contractor in order to minimise the potential impact of the construction phase of the proposed development on the safety and amenity of other users of the public road.

The proposal will also involve the provision of a new foul water line along Kinsealy Lane, under the road, which is in the charge of Fingal County Council. This will involve a temporary dig of the road and result in some traffic restrictions on a temporary basis. The impact of this would be temporary and slight.

Electricity, Gas and Telecommunications

Electricity will be required during the construction phase. In conjunction with the ESB, the provision of a temporary builders' power supply will be provided. There is potential for temporary impacts to the local electricity supply network, by way of disruption in supply to the local area during electricity connection works for the proposed Project. However, this is a potential impact which is likely to be neutral, slight, and temporary.

The supply of gas will not be operational during the construction phase of the proposed Project. There is potential for temporary impacts to the local gas supply network, by way of disruption in gas supply to the local area. However, this is a potential impact which is likely to be neutral.

Telecommunications will not be operational during the construction phase of the proposed Project. There is potential for temporary impacts to local supply, by way of disruption during connections works. However, this is a potential impact which is likely to be neutral, slight, and temporary.

Waste Management

The proposed Project will generate a range of waste materials during the excavation and construction phase as outlined in the Construction and Demolition Waste Management Plan that is prepared under separate cover as part of the planning application. Typical municipal waste will also be generated by construction works on sites such as food waste. Waste materials will be stored temporarily on site until such time as collection takes place by a licenced waste contractor. Dedicated, easily accessible locations for collection will be clearly identified across the construction sites.

If waste is not managed or stored appropriately, it is likely to give rise to litter and/or pollution issues on the construction sites and surrounding area. In addition, if unauthorised waste contractors were used, waste materials could be incorrectly managed and disposed of illegally and result in negative environmental impacts or pollution. Thus, all waste generated must be managed in accordance with regional and national waste legislation and taken to suitably registered and licenced waste facilities for processing, segregation, reuse, recycling, recovery, or disposal, as deemed appropriate. There are numerous licensed waste facilities in the region which can accept waste generated. The potential effect of construction waste generated from the proposed Project is considered to be short-term, not significant, and neutral. For further information, please refer to the Construction and Demolition Waste Management Plan (C&DWMP).

14.4.2 Operational Phase

Site Location and Context

The proposed development consists of a total of 415 residential units, comprising 252 houses, 28 duplex units and 135 apartments. The proposed development will also include the construction of a creche. The development includes all associated site works, boundary treatments, drainage, and additional service connections.

Access

The operational phase of the proposed Project will result in increased traffic volumes to the local road network, primarily the Back Road. A Traffic and Transport Assessment has been prepared and is submitted as part of the planning applications for the proposed Project. Please also refer to the Chapter on transport, included in this document for further information.

Electricity, Gas and Telecommunications

Electricity will be required during the operational phase. In conjunction with the ESB, the provision of supply will be facilitated. This will result in increased demand for electricity in the area. The potential impact from the operational phase is likely to be slight and long term.

The supply of gas will be required during the operational phase. In conjunction with Gas Networks Ireland, the provision of supply will be facilitated. The proposed Project will result in increased demand for gas in the area. The potential impact from the operational phase is likely to be moderate and long term.

Telecommunications will be required during the operational phase of the proposed Project. The proposed Project will result in increased demand for telecommunications in the area. The potential impact from the operational phase is likely to be neutral, imperceptible, and long term.

A utilities layout drawing has been prepared as part of the planning application with the appropriate services being designed as part of the proposed development.

Waste Management

Given the nature of the proposed Project i.e. a residential development comprising 415 no. new residential units and 1 no. childcare facility, waste materials during the operational phase will be generated. As Malahide is an established suburb of Dublin City, an existing network of waste collection, treatment and disposal contractors and facilities serve the area.

If waste is not managed or stored appropriately, it is likely to give rise to litter and/or pollution issues. The implications of such are that vermin may be attracted to the immediate area as a result. In addition, if unauthorised waste contractors were used, waste materials could be incorrectly managed and disposed of illegally and result in negative environmental impacts or pollution. Thus, all waste generated must be managed in accordance with regional and national waste legislation and taken to suitably registered and licenced waste facilities for processing, segregation, reuse, recycling, recovery or disposal, as deemed appropriate. There are numerous licensed waste facilities in the region which can accept waste generated.

It is noted that appropriate waste storage areas have been incorporated into the design of the development with shared waste stores serving the apartments and duplex units while the houses will be provided with their own bin stores. The proposed development will also be managed by a Management Company ensuring that waste will be managed correctly.

Waste materials generated will be segregated on site, where it is practical. Where the on-site segregation of certain waste types is not practical, off-site segregation will be carried out. There will be bins and receptacles provided to facilitate segregation at source. The appointed waste contractor will collect and transfer the wastes to the licensed waste facility. Waste contractors will be required to service the development on a regular basis each week.

The potential effect of operational waste generated from the proposed Project is considered to be long-term, not significant and negative.

14.5 Avoidance, Remedial & Mitigation Measures

All possible precautions shall be taken to avoid unplanned disruptions to any services or utilities during the construction phase of the proposed Project. It should be noted that a number of mitigation measures proposed in other EIAR chapters are also of relevance to Material Assets and should be referred to when reading this EIAR.

The construction phase mitigation measures include, avoidance, reduction and remedy measures as set out within the Development Management Guidelines document. The design and construction of the necessary service infrastructure will be in accordance with relevant codes of practice and guidelines. As a result, this is likely to mitigate any potential impacts during the operational phase of the proposed Project. However, routine maintenance of the site services will be required from time to time, as such any mitigation measures will be advised by the relevant service provider.

A site-specific Construction and Demolition Waste Management Plan (C&DWMP) has been prepared to deal with waste generation during the construction phase of the proposed Project and is included as part of the application packs. This document was prepared in accordance with best practice guidelines. Operational waste management will be managed by a designated management company on site and the appointed licenced waste contractor which will ensure the sustainable management of domestic and commercial waste arising from the development in accordance with legislative requirements and best practice standards.

14.6 Predicted Impacts

If unregulated, predicted impacts associated with the construction phase of the proposed Project would be expected to include potential disruption to local natural and human material assets resulting in both short-term and long-term impacts. The implementation of the mitigation measures set out in this chapter and other chapters of this EIAR would ensure that there is unlikely to be significant residual impacts during the construction phase. Therefore, impacts are likely to be temporary and neutral. During the operational phase, the impact to services and utilities is considered to be positive and permanent positive to all end users.

14.7 Monitoring

Prior to the operational phase of the proposed Project, all services/utility connections will be tested by a suitably qualified professional under the supervision of the service provider.

Any monitoring of the built services required during the operational phase of the proposed Project will be as advised by the relevant service provider.

The management of waste during the construction and operational phases of the proposed Project should be monitored to ensure compliance with best practice and relevant legislative requirements.

14.8 Reinstatement

No reinstatement will be required regarding Material Assets. Residual impacts on services and utilities are considered to be imperceptible.

14.9 Interactions

The main interactions relating to Material Assets are water, air quality, and population and human health.

During the operational phase, the water supply and wastewater services will have a potential interaction with the available water supply and the potential emissions to the water cycle.

14.10 Difficulties Encountered in Compiling

The exact location of existing service infrastructure is reliant upon the records obtained, where relevant. Overall, no difficulties were encountered in compiling this chapter.

14.11 Cumulative Impacts

The assessment has considered cumulative impacts of construction and operational phases of the proposed Project, in conjunction with surrounding developments.

Considering the minimal use of material assets during the construction phase, there is no likely impact.

Multiple sites under construction at the one time may result in cumulative impacts in terms of noise and vibration during the construction period. However, such impacts are short term and neutral.

During the operational phase of the development there will be similar existing and residential developments in proximity to the proposed Project, such as at Ashwood Hall, Brookfield and Hazelbrook, which will generate similar waste types. Authorised waste collectors will be required to collect segregated waste materials from multiple development which is likely to result in an improvement of efficiencies of waste collection and indeed is likely to result in an improvement in waste targets in line with national and local legislation. As such the long-term effect will be imperceptible and neutral.

14.12 'Do-Nothing' Impact

A 'do-nothing' scenario is not considered valid as the lands are currently zoned for development under the Fingal County Development Plan. However, if a do-nothing scenario were to occur, the lands would not be developed and therefore would be no adverse impacts to material assets. In the event that the proposed Project does not proceed, the lands would remain in its current condition in the short-term or until alternative development proposals are granted planning permission.

14.13 References

- Environmental Protection Agency (EPA), Guidelines on the information to be contained in Environmental Impact Statements (March 2002).
- Preliminary Construction and Demolition Waste Management Plan, Preliminary Construction Management Plan, and Traffic & transport Assessment Reports, prepared by Waterman Moylan Consulting Engineers.
- ESB Network Maps
- Virgin Media Network Maps
- GNI network Maps
- Eir online E-map Viewer

15.0 INTERACTIONS AND CUMULATIVE EFFECTS

15.1 Introduction

The matrix incorporated in Table 15.1 below, inter-relates Chapters 4.0 to 14.0 of the Environmental Impact Assessment Report to the various impacts referred to in the relevant Environmental Impact Assessment Regulations.

The EIAR has identified potential for interactions between a range of factors identified in Table 15.1. These interactions require the implementation of suitable mitigation measures to ameliorate the impact of the development on the environment. This EIAR has found that subject to the full implementation of the various mitigation measures specified by the EIAR team and summarised in Chapter 16, the development will have no significant negative impact on the environment.

15.2 Summary of Interactions

The following sub-sections seek provide an overview of the interactions identified within the EIAR chapters. Such interactions include the following:

No.	Heading	Population and Human Health	Biodiversity	Land, Soils & Geology	Water	Air Quality	Noise & Vibration	Climate	Landscape & Visual Impact	Transportation	Cultural Heritage	Utilities & Waste
4	Population and Human Health				X	X	X			X		
5	Biodiversity				X				X	X		
6	Land and Soils											
7	Water		X	X								X
8	Air Quality	X					X			X		
9	Noise & Vibration	X				X				X		
10	Climate	X				X	X			X		
11	Landscape	X	X								X	
12	Traffic and Transport					X	X		X			
13	Cultural Heritage											
14	Utilities & Waste	X			X	X						

Table 15.1 Interactions Identified in the EIAR

15.3 Population and Human Health (Chapter 4.0)

Interactions

The main interactions relating to population and human health are water, air quality, noise, and traffic during the construction phase.

Construction activities will have a temporary impact the landscape of the area by way of visual disturbance. These impacts are not considered to be significant.

During the operational phase, the main interactions relating to population and human health are water, air quality, noise, and traffic. These impacts are not considered to be significant. Please refer to the associated chapters for further information on these interactions.

Cumulative effects

The assessment has considered cumulative impacts of construction and operational phases of the proposed project, in conjunction with surrounding developments.

Multiple sites under construction at the one time may result in cumulative impacts in terms of noise and vibration during the construction period for human beings. However, such impacts are short-term, and the implementation of appropriate mitigation measures will ensure that noise and vibration impact is kept to a minimum. Please refer to Chapter 9.0 for further details in this regard.

During the operational phase of the development, there will be residential, recreational, and commercial developments in proximity to the proposed project which will generate a synergy of uses. This will increase population, increase employment opportunities, and increase community facilities such as childcare facilities, and as such the long-term effect will be a positive and permanent impact for Broomfield and the overall town.

15.4 Biodiversity (Chapter 5.0)

Interactive effects

The key environmental interactions with Biodiversity are Water, Landscaping and Transport. In respect of Water, there is interaction between hydrology and accidental spills of fuels/hydrocarbons and washing down into the drainage pipe network has the potential to impact on the receiving hydrogeology and ecology. A series of mitigation measures are proposed in the Water Chapter of this EIAR document to ensure the quality (pollution and sedimentation) and quantity (surface run-off and flooding) is of an appropriate standard. In respect of the Landscape, some of the nature features of the site are retained where possible and includes some positive planting proposals which will add some diversity to the site and favour some species. Finally, interactions exist between Traffic and Transport in relation to mortality from direct impact, the effects of which cannot be completely removed but will be reduced through mitigation.

Cumulative effects

A number of the identified environmental impacts can also act cumulatively with other impacts from similar developments in this area of Fingal. These arise through the urbanisation of habitat for wildlife and the increasing urbanisation of the local hinterland, on land of varying ecological sensitivity, as provided for by land-use zoning and include loss of habitats and species, particularly hedgerows, habitats and disturbance of species.

This proposed development can be viewed alongside the permitted construction of a series of residential developments in Broomfield. This project represents the completion of the zoned lands in the Broomfield area so the ability to influence any future development beyond this application is limited. The development of the site is consistent with emerging baseline trends albeit with comprehensive ecological mitigation applied to the development which should be implemented.

15.5 Land and Soils (Chapter 6.0)

Interactions

No significant interactions are anticipated.

Cumulative effects

On completion of the construction phase and following replacement of topsoil and a planting programme, no further impacts on the soil environment are envisaged except for the possibility of contamination of soil from foul water effluent or oil/chemical spills

15.6 Water (Chapter 7.0)

Interactions

The main interactions relating to this EIAR Chapter are Land & Soils, Biodiversity and Utilities.

During the construction stage, the connection of wastewater services has the potential to impact groundwater and soils if wastewater were to leak from the network during the construction process. There are potential implications for the local populations if there is a disruption to utility services during the connection of the new services to the proposed development. The construction of the various services will also interact with construction traffic as outlined in the Traffic and Transport Chapter.

During the operation stage, the water supply and foul drainage services have a potential interaction with the available water supply and with potential pollution to natural water bodies.

In respect of Land & Soils, interaction between surface and groundwater and the bedrock geology is feasible. The implementation of the mitigation measures outlined in this chapter will reduce the potential of surface contaminants into the underlying geology.

In respect of Biodiversity, there is interaction between hydrology and the downstream habitats present along the Hazelbrook Stream & Sluice River. The mitigation measures ensure that surface water runoff is treated to the required standards so that downstream habitats are not negatively impacted.

Cumulative effects

There are no anticipated cumulative impacts arising from the proposed development, or any further development in the locality in relation to water, other than those noted above.

15.7 Air Quality (Chapter 8.0)

Interactive effects

Interactive effects may be felt with the disciplines of noise, climate, population and transport but none are anticipated in this case.

Cumulative effects

Construction Phase

According to the IAQM guidance (2014) should the construction phase of the proposed development coincide with the construction phase of any other development within 350m then there is the potential for cumulative construction dust impacts. However, a high level of dust control will be implemented across the site which will avoid significant dust emissions. Provided these mitigation measures are in place for the duration of the construction phase cumulative dust related impacts to nearby sensitive receptors are not predicted to be significant. Cumulative impacts to air quality will be short-term, localised, negative, and imperceptible.

Operational Phase

The traffic data reviewed for the operational stage impacts relating to air quality included the cumulative traffic associated with other existing and permitted developments in the local area including a potential masterplan residential development at Streamstown. Therefore, the cumulative impact is included within the operational stage impact for the proposed development. The impact is predicted to be long-term, negative, and imperceptible with regards to air quality.

15.8 Noise and Vibration (Chapter 9.0)

Interactive effects

Interactive effects may be felt with the disciplines of air quality, climate, population, and transport but none are anticipated in this case.

Cumulative effects

During the construction phase of the proposed development, construction noise on site will be localised and will therefore likely be the primary noise source at the nearest noise sensitive receivers. There are lands reserved for future development within the Masterplan site. Should construction of both sites occur simultaneously there is potential for cumulative noise impacts at noise-sensitive receivers equidistant from the sites.

In this scenario, it is recommended that liaison between construction sites is ongoing throughout the duration of the construction phase. Contractors should schedule work in a cooperative effort to limit the duration and magnitude of potential cumulative impacts on nearby sensitive receptors. Cumulative construction noise impacts have the potential to be negative, moderate to significant and short-term at times of high activity on both sites.

The contractor will be required to control noise impacts associated with the construction of this future development in line with the guidance levels included in Chapter 9, Table 9.1 and follow the best practice control measures within BS 5228 -1.

In the context of the operational phase, permitted developments are included in the traffic impact and therefore the potential for a cumulative impact has been assessed (and found to be negative, imperceptible to moderate, and long-term).

Any large-scale future projects that are not yet proposed or permitted would also need to be the subject of EIA in turn, to ensure that no significant impacts resulting from noise and vibration will occur as a result of those developments.

15.9 Climate (Chapter 10)

Interactive effects

Interactive effects may be felt with the disciplines of noise, air quality, population and transport but none are anticipated in this case.

Cumulative effects

Construction Phase

Due to the short-term duration of the construction phase and the low potential for significant CO_2 and N_2O emissions cumulative impacts to climate are considered neutral.

Operational Phase

The traffic data reviewed for the operational stage impacts to climate included the cumulative traffic associated with other existing and permitted developments in the local area including a potential masterplan residential development at Streamstown. Therefore, the cumulative impact is included within the operational stage impact for the proposed development. The impact is predicted to be long-term, neutral, and imperceptible with regards to climate.

15.10 Landscape and Visual Impact (Chapter 11)

Interactions

The main interactions relating to this EIAR Chapter are Population and Human Health, Biodiversity and Cultural Heritage.

Interactions between Landscape and Population and Human Health have been considered. The landscape has the potential to impact greatly on human health by providing external spaces which provide for communities in various ways such as recreational use, visual enhancement of streets and external spaces, sports and play facilities and so on. The landscape mitigation measures include a significant amount of designed usable spaces for both future and existing residents which will have a long-term and moderate positive impact on Population and Human Health.

Interactions between landscape and biodiversity have been considered. An adverse impact on the biodiversity of the lands during either the construction or operational phases has the potential to negatively impact the landscape character. The landscape mitigation measures will ensure that where possible the existing trees on site are retained, and a new planting scheme is proposed that will improve and extend the area native planting area on the subject lands. Therefore, the measures proposed to mitigate the impact on the landscape character will result in a positive impact on the biodiversity value of the lands. This impact would be considered moderate in magnitude and long-term in duration.

Interactions between landscape and cultural heritage have been considered. The proposed development has the potential to impact on the cultural heritage in the local area. Landscape character, history and visual characteristics can be considered a part of cultural heritage. The proximity of the subject lands to historic landscape spaces, namely Malahide Castle and its associated parkland could all be considered to have a potential impact on cultural heritage. Furthermore, the landscape mitigation measures include their retention and incorporation into the landscape scheme which will have a positive impact on cultural heritage.

Cumulative effects

There are no anticipated cumulative impacts arising from the proposed development, or any further development in the locality in relation to landscape and visual impact, other than those noted above.

15.11 Traffic and Transport (Chapter 12)

Interactions

There may be temporary negative impacts to human health during the Construction Phase caused by noise, dust, air quality and visual impacts which are covered in other chapters of this EIAR. There may also be interaction with the surrounding water bodies through surface water runoff during topsoil stripping and earthworks which will be required to construct the roads.

The effects of these will be mitigated through the implementation of the measures outlined in this Chapter and within the Construction Management Plan.

Cumulative effects

The traffic modelling carried out as part of the Traffic and Transport Assessment also accounts for a committed (Under-construction Ashwood Hall and Brookfield), and a potential future development located at Streamstown. In order to determine the cumulative impact of the subject development in conjunction with other developments in the vicinity of the site is assessed. Further details are provided in Chapter 12.

15.12 Cultural Heritage (Chapter 13)

Interactions

No interactions are predicted in relation to the proposed development.

15.13 Utilities and Waste (Chapter 14)

Interactions

The main interactions relating to Material Assets are water, air quality, and population and human health.

During the operational phase, the water supply and wastewater services will have a potential interaction with the available water supply and the potential emissions to the water cycle.

Cumulative effects

The assessment has considered the cumulative impacts of construction and operational phases of the proposed development, in conjunction with surrounding developments.

Considering the minimal use of material assets during the construction phase, there is no likely impact.

Multiple sites under construction at one time may result in cumulative impacts in terms of noise and vibration during the construction period. However, such impacts are short term and neutral.

During the operational phase of the development there will be similar existing and residential developments in proximity to the proposed Project, such as at Ashwood Hall, Brookfield and Hazelbrook, which will generate similar waste types. Authorised waste collectors will be required to collect segregated waste materials from multiple development which is likely to result in an improvement of efficiencies of waste collection and indeed is likely to result in an improvement in waste targets in line with national and local legislation. As such the long-term effect will be imperceptible and neutral.

16.0 SUMMARY OF MITIGATION & MONITORING MEASURES

16.1 Mitigation and Monitoring Measures

The sections provided 1 below, contains the mitigation and monitoring measures proposed to ensure no significant residual, significant effects arise from the proposed development, which have been set out in Chapters 4.0 to 14.0 of the Environmental Impact Assessment Report to the various impacts referred to in the relevant Environmental Impact Assessment Regulations.

Listed below are the mitigation and monitoring measures proposed for the proposed development:

16.2 Population and Human Health

16.2.1 Mitigation Measures

Construction Phase

Measures to mitigate potential impacts arising from the construction phase of the proposed development such as noise, traffic and air quality are set out in relevant chapters of this EIAR.

Operational Phase

No mitigation measures are required in respect of human health during the operational phase of the development.

16.2.2 Monitoring Measures

In terms of population and human health, measures to avoid negative impacts have been a key consideration in the design evolution of the buildings and overall layout of the proposed project. Conditions will be attached to any grant of planning permission to ensure compliance in this regard. Building Regulations will also be adhered to during the construction phase to ensure a fully compliant development is constructed.

Health & Safety requirements, which are site specific to the proposed project, will be carried out by the Project Manager on site.

Impacts from Air Quality, Noise and Vibration, Climate, and Traffic and Transport and monitoring measures in this regard are addressed in the relevant chapters of this EIAR.

16.3 Biodiversity

16.3.1 Mitigation Measures

Mitigation by Avoidance

The principal mitigation that should be considered in any development is avoidance of impact. The site layout has been designed to avoid impacts on the adjoining Hazelbrook Stream and the boundary treelines and hedgerows surrounding the site.

Planting of Native Species

Native species appropriate to the area (such as hawthorn, elder, ash, alder, holly, hazel, willows, oak, dog rose, gorse and bramble) have been used within the landscaping plans for the development.

These will, as they mature, provide a food source, shelter and habitat for foraging bats, nesting habitat for birds and a food source for pollinators. All species used will be of certified native origin and sourced locally to ensure genetic provenance to the area – certified material is available from the forestry nurseries who supply the native woodland scheme.

All planting within gardens and public spaces within the scheme will be pollinator friendly as per the All Ireland Pollinator Plan – see https://pollinators.ie/wordpress/wp-content/uploads/2018/04/Gardens_actions-to-help-pollinators-2018-WEB.pdf

Protective Measures for Retained Treelines, Hedgerows & the Hazelbrook Stream

The Hazelbrook Stream, hedgerows and treelines, which form the existing site boundaries, are to be retained.

A 10 - 15-metre-wide riparian buffer strip has been retained along the Hazelbrook Stream in line with objective WQ5 in the Fingal County Development Plan 201 – 2023.

These retained treelines, hedgerows, drainage ditches & the Hazelbrook Stream will be given protection from accidental damage by machinery during site works prior to any works commencing in the development and as set out in the arboricultural impact statement. **These areas will be clearly delineated by fencing or other measures. Fences will be erected outside the drip-line or canopy of each tree in accordance with BS 5837 (2012) – Trees in Relation to Construction.** Please refer to the arboricultural tree protection drawings (**Chapter 5, Figures 5.8** and **5.9** below).

Chapter - Figure 5.8. Tree Protection Drawing (Northern lands).

Chapter 5 -Figure 5.9. Tree protection Drawing (Northern lands).

<u>Invasive Species</u>

An invasive species management plan for Phase I of the project was prepared to deal with the Japanese knotweed stands as shown on **Chapter 5**, **Figure 5.3**. Further information on the results of same is presented in **Chapter 5, Appendix 5.3**. The most recent surveys indicate that the plants would appear to have gone into dormancy with very small stems & leaves, no spread.

A detailed programme for the excavation and screening of soil into a container/large skips as the next step of eradication will be prepared with follow up monitoring by the specialist contractor Graeme Cahill who has been treating the population since 2018.

There is also potential for Japanese knotweed and other invasive species to spread/become established within the development site through poor site management or the import of contaminated topsoil so any material brought to site must be certified that it is free of invasive species.

Mitigation Measures for Badgers

An inactive badger sett is located at the southern end of the eastern boundary treeline (adjoining Ashwood Hall) within the site in the vicinity of O 22265 44683 and a disused sett is located in the treeline north of the rugby club building as shown on **Chapter 5, Figure 5.6** above.

Both of these setts have been the subject of regular examination to determine their use by badgers and suitable protective measures (southern sett)/appropriate methodology for their destruction (northern sett) for these setts will need to be implemented during the construction phase of the

Broomfield SHD lands. Although not in use at present they were previously used by badgers and could be again.

Badgers and their setts are protected under the provisions of the Wildlife Act, 1976, and the Wildlife Amendment Act, 2000. It is an offence to intentionally kill or injure a protected species or to wilfully interfere with or destroy the breeding site or resting place of a protected wild animal. Exclusion of badgers should only be considered where a development would unavoidably destroy a badger sett (or any part of its underground tunnel and chamber system), or its immediate surroundings, making it unsuitable for continued occupancy.

Construction works such as those proposed within the Broomfield SHD lands, which occur within the vicinity of a sett (albeit inactive/disused) may require a licence should the setts become active. It should be noted that all activity related to badger surveys, evacuation procedures and sett destruction should only be undertaken by personnel with recognised expertise in badger ecology.

In keeping with best practice measures to address potential effects on protected species such as badgers should firstly aim to avoid those impacts. If there are unavoidable impacts then mitigation should be designed to reduce those impacts.

Badger sett tunnels can extend 20m or more from the entrance holes and are typically located between 0.2m and several metres deep, depending on the soil and topography. Potential impacts include:

- damage and destruction of setts;
- disturbance from noise, lighting, vibration and other human disturbances such as fires and use of chemicals;
- loss of feeding areas;
- entrapment in works compounds, excavations, etc.

Southern Sett

The badger sett (at the southern end of the eastern boundary treeline (adjoining Ashwood Hall)) will not be directly impacted by the proposed Broomfield SHD and both it and the treeline in which it is located will be retained as part of the scheme. The proposed housing layout and internal access roads were redesigned during Phase 1 to ensure that these parts of the lands were retained as part of a wildlife corridor through the property and the sett was not directly impacted.

Both this treeline and inactive badger sett will be afforded protection as set out in the arborist's report and accompanying drawing (see **Chapter 5, Figure 5.10** below) to ensure that the retained trees, vegetation and sett are not damaged by the construction works. Any fencing measures deployed must incorporate access for mammals at the base – this should be a gap no smaller than 300mm high by 225mm wide. This will be inspected and signed off by the ecological clerk of works.

Chapter 5 - Figure 5.10. Badger protection zone – southern sett.

Badgers and other wildlife will continue to use established paths across a site even when construction work has started. Therefore during construction, any open trenches/excavations will incorporate facilities for badgers (and other wildlife, such as rabbits, foxes, hedgehogs etc.) to escape, by means of the following:

1. Gently sloping earth incline to be left at the end of each day's operation – at each end of open excavations/trenches.
2. Timber escape planks should be provided at c. 50m intervals along any deep excavations/trenches and these should be left in place at the end of each day's operations; these should usually be placed at right-angles to the excavation/trench.
3. Any temporarily exposed open pipe system should be capped in such a way as to prevent badgers gaining access as may happen when contractors are off site.

Continued access to lands to the west, east and south must be provided for badgers to ensure that any animals associated with this sett will have access to foraging areas.

The following provisions apply to all construction works within the Broomfield SHD lands:

- badger sett tunnel systems can extend up to c. 20m from sett entrances. Therefore, no heavy machinery should be used within 30m of badger setts (unless carried out under licence); lighter machinery (generally wheeled vehicles) should not be used within 20m of a sett entrance; light work, such as hand digging or scrub clearance should not take place within 10m of sett entrances.
- during the breeding season (December to June inclusive) none of the above works should be undertaken within 50m of active setts nor blasting or pile driving within 150m of active setts.

- following consultation with NPWS and badger experts, works near setts may take place during the breeding season provided appropriate mitigation measures are in place, e.g. sett screening, restricted working hours, etc.

During the construction phase of the development activities may pose a temporary threat to badgers or disturb them if they reuse that sett. This should be mitigated by adopting the following practices.

- The use of noisy plant and machinery in the vicinity of the protection zone of the sett should cease at least two hours before sunset.
- Security lighting should be directed away from the sett and treeline to avoid impacts on badgers and foraging bats.
- Chemicals should be stored as far away from the sett and areas adjoining the retained treeline as possible.
- Trenches must be covered at the end of each working day, or include a means of escape for any animal falling in.

In order to comply with the above constraints:

- all affected setts should be clearly marked and the extent of bounds prohibited for vehicles clearly marked by fencing or adequate physical boundary. Hazard tape is often insufficient and prone to deterioration and damage by wind or cattle etc.
- all contractors/operators on site should be made fully aware of the procedures pertaining to the sett on site.
- construction activities within the vicinity of affected setts may commence once the current status of this sett has been determined, and the if active the sett has been evacuated and destroyed under licence from NPWS. .
- in almost all circumstances, works close to badger setts may only be conducted under the supervision of a qualified expert under licence from NPWS.

Additional mitigation measures include:

- Topsoil from areas likely to have constituted good badger foraging habitat (rich in earthworms) will be retained on site and used in the creation of worm-rich amenity or other grassland habitats.
- The use of noisy plant and machinery in the vicinity of the protection zone will cease at least two hours before sunset.
- Security lighting should be directed away from the sett.
- Chemicals will be stored as far away from the sett as possible.
- Trenches must be covered at the end of each working day, or include a means of escape for any animal falling in. (Badgers will continue to use established paths across a site even when construction work has started).
- Any temporarily exposed open pipe system should be capped in such a way as to prevent badgers gaining access as may happen when contractors are off site.
- Badger gates may need to be installed in perimeter fencing. If so, specialist advice should be sought.
- Water sources (for badgers) should always be safeguarded.

Northern Sett

The sett located to the north of the rugby club building has been the subject of ongoing monitoring to determine activity and to see if an exclusion license is required. The results of the current surveys would indicate that a license is not required but this will be informed by ongoing monitoring in order to determine if a licence could become a requirement.

Scrub Clearance

The area of scrub south of the rugby club building could not be fully surveyed for mammal activity and site clearance in this area will be supervised by an ecologist to ensure protection of same.

Mitigation Measures for Bats

The rugby club building was confirmed as a roost for 2-3 common pipistrelle and soprano pipistrelle bats during surveys in 2018.

A bat derogation licence was previously provided in 2018 for the proposed demolition work of the rugby club building - see **Chapter 5, Appendix 5.1**.

A new bat derogation licence was therefore sought from National Parks and Wildlife Service and granted – see **Chapter 5, Appendix 5.2.**

The grounds on which the bat derogation licence was sought for the demolition of this bat roost are:

'In the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment'.

The lands are zoned for development and the project design and density of housing required under the SHD process does not allow for the retention of the rugby clubhouse building.

A number of mitigation measures are proposed to accommodate any bats that previously roosted in the rugby club building within the development. These include the erection of bat boxes on trees and integrated bat boxes within the building fabric. The retention and enhancement of the riparian corridor along the Hazelbrook Stream and the retention of the site boundary hedgerows coupled with sensitive lighting design also ensures that suitable habitat for bats remains within the site.

These have been demonstrated to work on a number of previous projects including the M11 Rathnew to Arklow motorway (bat boxes), Rockingham House, Glenamuck Road, Co. Dublin.

The loss of a minor roost for common and soprano pipistrelle bats in the rugby club building will not have a detrimental effect on the local bat population given the rich habitat and roosting potential in Malahide Castle and Demesne adjoining the site and the provision of roosting alternatives for the bats. The loss of this roost is highly unlikely to affect the conservation status of either of these species which is currently 'Favourable' at a national level.

Building Resurvey

Given that some time may have lapsed between approval of planning permission and commencement of construction it is recommended that the rugby club building scheduled for demolition is resurveyed for bats prior to any proposed demolition works. Although the building has been the subject of an arson attack bats have been observed returning to a burnt structure to roost in should suitable locations prevail demonstrating the site fidelity of bats to a roost site (F. Wilson, pers. obs.).

A precautionary approach to the demolition of the building can then be prepared whereby any remaining potential roosting location for bats are manually removed. This work will be supervised by a licensed bat specialist who can deal with any bats present and will be done during the winter months.

Provision of Bat Boxes

Fifteen bat boxes shall be erected on suitable buildings or trees (i.e. not illuminated and above 3 metres height and close to green areas) within the development. The most successful box types are “woodcrete” boxes made by Schwegler and available from www.alanaecology.com. Several designs are available including some of which can be incorporated into the walls and the surface fabric of new buildings.

Vegetation Retention and Protection

The other main protective measure for bats is in the retention of boundary hedgerows, treelines, watercourses and drainage ditches within the site and protective measures will be put in place for these features. The use of native species in the landscaping proposals for the site will also assist in ensuring that bats continue to forage and remain in the area.

Lighting Design

Sensitivity in the provision of lighting is also important to ensure that bats continue to use the site. The retained hedgerows, treelines, watercourse and drainage ditches and newly created areas of planted vegetation will be retained as dark zones and the amount of lighting shining on such areas limited.

Design recommendations from the BCT (2010) for wildlife-friendly lighting include:

1. Do not "over" light. This is a major cause of obtrusive light and is a waste of energy. Use only the minimum amount of light needed for safety. There are published standards for most lighting tasks, adherence to which will help minimise upward reflected light.
2. Eliminate any bare bulbs and any light pointing upwards. The spread of light should be kept near to or below the horizontal.
3. Use narrow spectrum bulbs to lower the range of species affected by lighting.
4. Use light sources that emit minimal ultra-violet light. Insects are attracted to light sources that emit ultra-violet radiation.
5. Reduce light-spill so that light reaches only areas needing illumination. Shielding or cutting light can be achieved through the design of the luminaire or with accessories, such as hoods, cowls, louvers and shields to direct the light.

6. Reduce the height of lighting columns. Light at a low level reduces ecological impact. However, higher mounting heights allow lower main beam angles, which can assist in reducing glare.
7. For pedestrian lighting, use low level lighting that is directional as possible and below 3 lux at ground level.
8. Limit the times that lights are on to provide some dark periods for wildlife.
9. Use lighting design computer programs and professional lighting designers to predict where light spill will occur.
10. In general, any lighting used in the development should not overspill onto adjoining trees, hedgerows, and watercourses thereby ensuring that a dark corridor for foraging and commuting bats and movement for other wildlife is maintained.

In addition:

11. Luminaires will be dimmable LED (light emitting diode) fittings with High performance optics to provide high visual comfort.
12. Luminaires will be selected to ensure that when installed there shall be zero direct upward light emitted to the sky (all output shall be at or below 90º to the horizontal to help prevent sky glow from light pollution of the night sky).
13. Luminaires will be selected to ensure that there is no light spill from the proposed development onto the retained areas of linear vegetation and boundary features.
14. The light emitted from these fittings shall have no photo biological risk and shall be categorised as “Exempt Group” in relation to emissions of Blue light, Infrared and Ultra Violet Radiation in accordance with EN 62741:2008.
15. All luminaires shall have a Luminous intensity Classification of between G4 and G6 to IS EN 13201-2:2003(E) / BS 5489-1:2013.
16. The recommendations of the Institution of Lighting Professionals and Bat Conservation Trust “Bats and Lighting in the UK” documentation and Bat Conversation Ireland Guidance Notes for planners, engineers, architects and developers December 2010 will be met.

Further detailed information on lighting design for bats and other wildlife is presented in the document prepared by the Bat Conservation Trust and the Institute of Lighting Professionals ‘BCT (2018). Guidance Note 08/18 - Bats and artificial lighting in the UK. Bats and the Built Environment series’ and the EUROBATS Guidance available from:

https://cdn.bats.org.uk/pdf/Resources/ilp-guidance-note-8-bats-and-artificial-lighting-compressed.pdf?mtime=20181113114229&focal=none and

https://cdn.bats.org.uk/pdf/Resources/EUROBATSguidelines8_lightpollution.pdf?mtime=20181113114256&focal=none

These guidelines have been implemented in the previous phases of the developments at Broomfield and in the project lighting design as set out in Chapter 5, Figure 5.11 below.

Chapter 5 Figure 5.11. Project lighting design.

Chapter 5, Plate 34. Dark corridor for foraging bats and other wildlife maintained along the shared boundary treeline with Ashwood Hall.

Felling of Potential Bat Roosts in trees

All trees proposed for removal will be subject to appropriate felling measures as detailed in NRA Guidelines for the Treatment of Bats during the Construction of National Road Schemes (National Roads Authority 2006). The felling/clearance of trees will be scheduled for the autumn months of September/October when bats are less likely to be using trees. This also avoids the bird breeding season.

Prior to tree felling works the trees will be inspected by a licensed bat specialist in the presence of the tree surgeons and an appropriate felling methodology agreed.

The felling of those trees, which have been identified as potential bat roosts, must be supervised by a bat specialist holding a bat handling licence issued by the National Parks and Wildlife Service, (Department of Environment, Heritage and Local Government). If bats are encountered they should be removed by the licence holder to a bat box, to be sited on a nearby tree and the NPWS notified.

Identified trees must be felled carefully. Specific advice in relation to individual trees will be given on site by a bat specialist. Gradual dismantling of some mature trees may be necessary to ensure the safety of any bats which may be roosting within significant sized boughs or in the trunk. The tree will be inspected by a bat specialist, and depending on the structure of the tree they may need to be left intact on the ground for 24 hours to allow any bats within them to escape prior to processing.

16.1.1 Mitigation Measures for Birds

As detailed in the arboricultural impact assessment the proposed development will require the removal of 46 individually recorded trees, 12 groups of trees/hedgerows, and the partial removal of five groups of trees/hedgerows. Of the 63 survey entries proposed to be removed or partially removed, six trees are of moderate quality and value (B Category), 42 trees and groups of trees/hedgerows are of low quality and value (C Category), and 15 trees are of poor quality (U Category).

No clearance of vegetation shall be carried out from March 1st to August 31st (except in circumstances of immediate danger to the public). This will protect nesting birds, eggs and nestlings from injury or death. No clearance of vegetation suitable for nesting birds within the site (shrubs, bramble tangles, etc.) will take place during this period. Should such clearance be required than the area proposed for clearance should be inspected by an ecologist to ascertain if any nesting birds are present.

Provision of Bird Boxes

Forty bird boxes of varying designs will be erected on suitable buildings or trees within the development. Several designs are available including some which can be incorporated into the walls and the surface fabric of the new buildings. These include integrated designs for swift, house sparrow, swallows, starling, etc. Suitable locations for these will be agreed by the project ecologist with the architect and set out for the contractor on detailed drawings.

16.1.2 Watercourse Restoration

It is proposed to naturalise the Hazelbrook Stream along the southern boundary of the site and to enhance it for wildlife through suitable planting.

A buffer of 10-15m has been retained along this watercourse in line with the Fingal County Development Plan 2017 – 2023, p.330), which states:

"Establish riparian corridors free from new development along all significant watercourses in the County. Ensure a 10 to 15 metre wide riparian buffer strip measured from top of bank either side of all watercourses, except in respect of the Liffey, Tolka, Pinkeen, Mayne, Sluice, Ward, Broadmeadow, Corduff, Matt and Delvin where a 30m wide riparian buffer strip from top of bank to either side of all watercourses outside urban centres is required."

Excellent guidance on watercourse rehabilitation is provided in the Inland Fisheries Ireland document 'Planning For Watercourses In The Urban Environment A Guide to the protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning *Including one-off developments'.

Suitable species for planting along this watercourse have been specified by the project ecologist to the landscape designer.

Care should be taken when purchasing aquatic plants from nurseries as many species have the potential to become invasive. Attention is drawn to the invasive species listed under the Birds and Natural Habitats Regulations 2011.

16.1.3 Sediment Control

Sediment control practices are used on building sites to prevent sand, soil, cement and other building materials from reaching watercourses such as the Hazelbrook Stream and water dependent habitats such as the reedbeds and saltmarshes downstream. Even a small amount of pollution from a site can cause significant environmental damage by killing aquatic life, silting up streams and blocking storm water pipes. Storm water can contain many pollutants which can enter our local drainage ditches, streams, rivers and marine systems, causing harm to native animals, plants, fish breeding habitats and recreational areas.

Soil erosion, sediment and litter from building sites can be major sources of storm water pollution, and can cause:

- significant harm to the environment e.g. loss of valuable foraging areas in adjoining mudflats for wintering birds
- weed infestation of waterways caused by sediment settling on the creek beds and transporting nutrients
- loss of valuable topsoil
- significant public safety problems when washed onto roads and intersections
- blocked drains creating flooding and increased maintenance costs
- damage to recreational and commercial fishing.

Sediment control usually requires little effort and results in:

- Cleaner waterways and healthier aquatic life.
- Improved site conditions.
- Improved wet weather working conditions.

- Reduced wet weather construction delays.
- Reduced losses from material stockpiles.
- Fewer mud and dust problems.

Good site management in relation to sediment control during the construction phase should prevent this from occurring and possible mitigation measures for consideration are outlined below. Other measures to be implemented on site include briefing of all site contractors regarding the sensitivity of the adjoining watercourse and the need for strict site management in relation to potential run off.

Minimising site disturbance:

Prevention is better than cure. Careful design and an efficient construction sequence will minimise disturbance to the site. This will save money and reduce environmental impact.

Design to avoid excessive cut and fill, unnecessary clearing of vegetation and to preserve existing site drainage patterns. Clear only those areas necessary for building work to occur. Preserve grassed areas and vegetation where possible. This helps filter sediment from storm water runoff before it reaches the watercourse and stops rain turning exposed soil into mud. Delay removing vegetation or commencing earthworks until just before building activities start. Avoid building activities that involve soil disturbance during periods of expected heavy or lengthy rainfall.

Implement sediment control:

Install sediment control measures before commencing any excavation or earth moving. Regularly maintain them until construction is complete and the site is stabilised.

Prevent sediment-contaminated water leaving the site

Use barriers to trap coarse sediment at all points where storm water leaves the site, before it can wash into the watercourse and down to the Natura 2000 site downstream. Relocate sediment on site or dispose of it suitably. Remove accidental spills of soil or other material immediately. Maintain vegetation on the site in the vicinity of watercourses as in a healthy state as it can function as an additional filter for sediment. Cut brick, tile or masonry on a pervious surface such as grass or loosened soil within the property boundary. The same applies when cleaning equipment. Waste concrete, paint and other solutions used on site should be properly disposed of so they do not contaminate storm water.

Protection Measures for Fisheries

Various measures will be required to ensure that there is no deterioration in water quality in the Hazelbrook Stream along the southern boundary of the site arising from the development.

These relate mainly to the control of silt and sediment runoff during construction and the installation of hydrocarbon/petrol interceptors on surface water drainage systems leaving the development.

For any instream works the guidelines presented in the Eastern Regional Fisheries Board ‘Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites’ should be reviewed and followed where applicable and the contractor informed of the sensitivity of the catchment. This and other guidance is available from:

http://www.fisheriesireland.ie/fisheries-management-1/86-planning-for-watercourses-in-the-urban-environment-1/file

http://www.fisheriesireland.ie/fisheries-management-1/90-requirements-for-the-protection-of-fisheries-habitat-during-construction-and-development-works-at-ri-1/file

Contractor Briefing

All site contractors should be briefed regarding the biodiversity value of the retained watercourse, trees and vegetation to ensure that there are no accidental or unintentional actions conducted during the project construction that could lead to a reduction in water quality/damage to same. Such matters often arise through ignorance or by accident rather than as a result of an intentional action.

Soil Handling

Soil should be handled with care as it is a living entity. The topsoil and subsoil layers will be stripped, stored and maintained separately. Topsoil will be temporarily stored upon geotextile such as Terram 1000 (www.terram.com). The contractor should submit proposals for supplier and product, which should be a nonwoven geotextile manufactured from UV stabilised, high tenacity, virgin polypropylene fibres that have been both mechanically and thermally bonded with a minimum of 5 years lifespan in all soil conditions. Note that soil levels within the root spread of those trees that are to be retained should not be raised. From this temporary storage heap the topsoil should be distributed as required for landscaping purposes. In general, the topsoil should not be firmed, consolidated or compacted when laying. Tipping and grading to approximate levels should be done in one operation with minimum of trafficking by plant.

The topsoil, which is to be retained and reused should not be mixed with: subsoil, stone, hardcore, rubbish or material from demolition work, or the other grades of topsoil, including those contaminated with non-native invasive species. The topsoil should be handled in the driest condition possible. Topsoil should not be handled during or after heavy rainfall or when it is wetter than the plastic limit less 3%, to BS 1377-2.

Depending on how long the construction period is expected to last it might be necessary to seed the stored topsoil to prevent weed establishment. A recommended mixture is: 35% Chewings fescue, 35% Slender red fescue, 20% Smooth stalked meadow grass and 10% Brown top bent. This should be applied to the manufacturer's recommendations (min. 15g/m2) and the following wildflower mix @ 5g/m2 added:

- Native Origin Irish Wildflower Seed Mixture - Product Code/Name: MM12 Wild Flora for Raw Impoverished Sub Soil
- Supplier: Design by Nature www.wildflowers.ie
- Species List: Bird's-foot Trefoil, Black Medick, Corn Marigold, Corn Pansy, Corn Poppy, Corncockle, Cornflower, Cowslip, Devil's Bit Scabious, Eyebright, Meadow Buttercup, Fleabane, Greater Trefoil, Lesser Knapweed, Scented Mayweed, Meadowsweet, Ox-eye Daisy, Purple Loosestrife, Ragged Robin, Red Rattle, Red Bartsia, Red Clover, Ribwort Plantain, Rough Hawksbit, Sorrel, St. John's-wort, White Campion, Wild Angelica, Wild Carrot, Yarrow, Yellow Rattle, Lady's Smock, Yellow Clover.

SUDS Measures

The drainage system has been designed with the aim of providing a sustainable drainage solution ensuring, in so far as feasible, that the development has a minimal impact on the existing public surface water sewer system. The proposed development has been designed to incorporate best drainage practice.

It is proposed to incorporate a Storm Water Management Plan through the use of various SuDS techniques to treat and minimise surface water runoff from the site. This has been designed by Waterman Moylan Consulting engineers (see the Engineering Assessment Report).

It is proposed to construct a SW drainage network that will service and attenuate the development internally before discharging at the current greenfield (or allowable) rates to the local natural ditch systems. Surface drainage layout and attenuation strategy can be reviewed on drawing numbers 18-091-P201, P202 & P203. The location and extent of SuDS devices proposed for the development can be viewed on drawing 18-091-P233.

Storm water from each catchment will be attenuated and discharge at a controlled rate, limited to the greenfield equivalent runoff or 2 l/s (whichever is greater), to ultimately outfall to the existing ditch system on the site, south catchment 2 however, will outfall directly to the Hazelbrook Stream. The proposed development will be designed to incorporate best drainage practice.

Potential negative impacts could arise should untreated surface water enter the Hazelbrook Stream from the proposed development. These impacts have been addressed through careful consideration of the ground conditions within the site and the installation of silt traps and hydro-carbon traps as outlined in the Engineering Assessment Report and accompanying drawings prepared by Waterman Moylan Consulting Engineers, which will ensure that all surface water leaving the site is treated before it ultimately enters the Baldoyle Bay SAC/SPA.

Ecological Clerk of Works

An ecological clerk of works will be appointed to oversee the project and sign off on the above mitigation measures.

Monitoring Measures

<u>Monitoring Measures for Badgers</u>

Given that some time may have lapsed between approval of planning permission and commencement of construction the activity at these setts will be the subject of ongoing monitoring in order to determine if a licence could become a requirement.

16.4 Land and Soils

16.4.1 Mitigation

<u>Construction</u>

A competent person/company will be assigned to pre-treat (kill-off) the Japanese Knotweed prior to excavation. It is generally recommended that a 3m depth of soil and an area encompassing a 7m offset distance are treated and excavated for disposal for this invasive species. The competent professional should also be present during excavation to ensure there are no living rhizomes (root structures) present when being excavated. The dead Japanese knotweed plant, root system and surrounding soil will need to be disposed of, by prior arrangement, to an authorised deep-fill landfill. These works are to be undertaken in accordance with the "Environmental Agency guidelines on Japanese Knotweed", Landfill operator permitting, and industry best practices & guidelines as appropriate.

Environmental Laboratory chemical analysis has indicated that the historic in-fill constituents are non-hazardous. Excavated material from this location should be continuously monitored/inspected for signs of hazardous material contamination during excavation. Should there be any indication of hazardous material contamination, it may be required to be further sampled and analysed to confirm its chemical properties and waste category classification.

To reduce the quantity of soil to be removed from or imported to the site, the finished floor levels of the proposed buildings and the road levels are designed to match existing levels and minimise the cut and fill volumetric balance. The number of vehicle movements will be minimised by this optimisation. For the area of historic in-fill, levels here have been designed based on the calculated ground levels post excavation and disposal of the historic in-fill material. Surplus subsoil and rock may be relocated to approved areas of the site that may require in-fill, or if required to be removed from site, will be deposited in approved fill areas off-site (Article 27 notification to the EPA required) or to an approved waste disposal facility.

In the case of topsoil careful planning and on-site storage can ensure that this resource is reused on-site as much as possible. Any surplus soil not used can be transferred elsewhere subject to submission of an Article 27 notification to the EPA. However, topsoil is quite sensitive and can be rendered useless if not stored and cared for properly. It is therefore important that topsoil is kept completely separate from all other construction waste and stored material and heaped (stored) appropriately.

It is important to ensure that topsoil is protected from all kinds of vehicle damage and kept away from site-tracks, delivery vehicle turning areas and site plant and vehicle storage areas. If topsoil is stored in piles of greater than 2m in height the soil matrix (internal structure) can be damaged beyond repair. It should also be kept as dry as possible and used as soon as possible to reduce any deterioration through lengthy storage and excess movements around the site.

Records of topsoil storage, movements and transfers will be kept by the C&D Waste Manager.

Silt traps, silt fences and tailing ponds will also need to be provided by the contractor where necessary to prevent silts and soils being washed away by heavy rains during the course of the construction phase.

The provision of wheel wash areas at the exit to the development as necessary will minimise the amount of soil deposited on the surrounding road network. The adjoining road network will be cleaned on a regular basis. All trucks on the public road will carry a maximum of 10 cubic metres of material to prevent spillage and damage to the surrounding road network.

Dampening down measures with water sprays will be implemented during periods of dry weather to reduce dust levels arising from the development works.

Appropriate storage and bunding measures will be implemented throughout the construction stage to prevent contamination of the soil and groundwater from oil and petrol leakage from site plant. Refuelling will be restricted to allocated re-fuelling areas. This is to be an impermeable bunded area, designed to contain 110% of the volume of fuel stored. Emergency fuel spill kits are to be stored on-site with designated staff familiar with their usage.

If groundwater is encountered during excavations, mechanical pumps will be required to remove that groundwater from sumps. Sumps should be carefully located and constructed to ensure that groundwater is efficiently removed from excavations and trenches.

Waterman Moylan's accompanying Preliminary Construction Demolition and Waste Management Plan and Preliminary Construction Management Plan will be implemented by the contractor during the construction phase to mitigate and control the above remedial measures.

Operational

On completion of the construction phase and following replacement of topsoil, a planting programme will commence to prevent soil erosion.

SuDS and filtration devices are proposed to be provided as part of the development. These will help to remove pollutants from rainwater runoff. They will require periodic inspection and maintenance as per their installation manuals.

16.4.2 Monitoring Measures

Monitoring during the construction phase is recommended, in particular to the following items:

- Excavation of area of Japanese Knotweed.
- Excavation of the historic in-fill material.
- Adequate protection of topsoil stockpiled for reuse.
- Adequate protection from contamination of soils for removal.
- Monitoring of surface water discharging to existing watercourses, ditches, and the existing surface water drainage system.
- Monitoring cleanliness of the adjoining road network.
- Monitoring measures for prevention of oil and petrol spillages.
- Dust control by dampening down measures, when required due to dry weather conditions.

During the operation phase, the surface water network (drains, gullies, manholes. AJs, SuDS Devices, attenuation systems etc.) will need to be regularly maintained and where required cleaned out. A suitable maintenance regime of inspecting and cleaning should be incorporated into the safety file/maintenance manual for the development.

16.5 Water

16.5.1 Mitigation Measures

Construction stage

A Preliminary Construction Management Plan (PCMP) has been prepared for this application and is included under a separate cover. It is considered that the PCMP will be updated by the appointed contractor. In order to minimise the potential impact of the construction phase of the proposed development on the surrounding surface water and groundwater environs, the following construction stage mitigation measures are to be included in the plan and be implemented in full.

- The contractor will appoint a suitably qualified person to oversee the implementation of measures for the prevention of pollution to the receiving surface water environment.
- To minimise the adverse effects, the prevailing weather conditions and time of year is to be taken into account when the site development manager is planning the stripping back of the site.
- Site stripping will be minimised as far as practicable.
- Settlement ponds/silt traps will be provided to prevent silt runoff into the existing sewers/watercourses during the drainage works.
- Regular testing of surface water discharges will be undertaken at the outfall from the subject lands. The location for testing and trigger levels for halting works will be agreed between the project ecologist and the site foreman at the commencement of works.
- Where silt control measures are noted to be failing or not working adequately, works will cease in the relevant area. The project ecologist will review and agree alternative pollution control measures, such as deepening or redirecting trenches as appropriate, before works may recommence.
- All fuels and chemicals will be bunded, and where applicable, stored within double skinned tanks/containers with the capacity to hold 110% of the volume of chemicals and fuels contents. Bunds will be located on flat ground a suitable distance from any watercourse or other water conducting features, including the cut off trenches.
- Foul and surface water pipes will be carefully laid so as to minimise the potential for cross connections which may result in contamination of receiving watercourses.
- Site personnel inductions are to be conducted such that all site personnel are made aware of the procedures the best practice in relation to the management of surface water runoff and ground water protection.
- Where possible, precast concrete units are to be used to avoid on-site “wet” mix concrete usage. In-situ concrete pours are to be managed in accordance with best practice to avoid overspills
- Concrete truck and wheel wash down facilities are to be provided in designated areas. Discharge from these areas is to be directed into the settlement ponds/silt traps.
- Topsoil for landscaping will be located in such a manner as to reduce the risk of washing away into local drainage or watercourses.
- A method statement setting out in detail the procedure to be used when working in the vicinity of existing watermains will be produced by the contractor for any construction works within the vicinity of watermains and for roads and or services crossing watermains.

- All watermains will be cleaned and tested in accordance with Irish Water guidelines prior to connection to the public watermain.
- All connections to the public watermain will be carried out and tested by or under the supervision of Irish Water or the design engineer.
- Details for the construction methods of the outfall head walls to mitigate against pollution of the natural surface water networks are set out in the Preliminary Construction Demolition & Waste Management Plan.
- In order to reduce the risk of defective or leaking foul sewers, the following measures will be implemented:
- All new foul sewers will be tested by means of an approved air test during the construction phase in accordance with Irish Waters Code of Practice and Standard Details.
- All private drainage will be inspected and signed off by the design Engineer in accordance with the Building Regulations Part H and BCAR requirements.
- Foul sewers will be surveyed by CCTV to identify possible physical defects.
- The connection of the new foul sewers to the public sewer will be carried out under the supervision of Irish Water and will be checked prior to commissioning.
- Prior to commencement of excavations in public areas, all utilities and public services will be identified and checked, to ensure that adequate protection measures are implemented during the construction phase.

Potential negative impacts during construction phase will be short term only.

<u>Operational Phase:</u>

The implementation of the following operation stage mitigation measures will minimise the impact on the hydrology and hydrogeology aspects of the development lands.

- The surface water drainage network has been designed in accordance with the CIRIA SUDS Manual and the Greater Dublin Strategic Drainage Scheme. The appropriate interception mechanisms and treatment train process has been incorporated into the design.
- Surface water outflow will be restricted to the equivalent greenfield runoff rate from the proposed attenuation tanks.
- Flow restrictors with attenuation storage will be used to slowdown and store surface water runoff from discharging above green field rates to the local ditches/Hazelbrook Stream.
- Sustainable urban drainage measures, including green roofs, permeable paving, and filter strips/swales will be provided to improve water quality.
- A petrol interceptor will be installed to prevent hydrocarbons entering the local drainage system at all outfalls.
- Regular inspection and maintenance of the drainage network, including petrol interceptors.
- Water metering via district meters will be installed to Irish Water requirements. Monitoring of the telemetry data will indicate any excessive water usage which may indicate the potential for a leak in the watermain network. Early identification of potential leaks will lead a faster response in determining the exact location of leaks and completion of remedial works.

It is not envisaged that any further remedial or reductive measures will be necessary upon completion.

16.5.2 Monitoring Measures

Construction Stage

Implementation of the Construction Management Plan is required to protect the hydrology and groundwater elements of the subject lands during construction stage. Maintenance of the mitigation measures and monitoring of the management processed is required to ensure best practice.

The monitoring measures to be implemented include:

- Monitoring of the management and storage of dangerous chemicals and fuel.
- Monitoring and maintenance of the wheel wash facilities.
- Regular maintenance and monitoring of the sediment control measures.
- Monitoring and maintenance of the SUDS features, road gullies and, attenuation ponds during the construction phase of the development.

Operational Stage

Monitoring and maintenance of the water metering telemetry, SUDS features, road gullies, attenuation and flow control devices are imperative during the operation phase of the development

16.6 Air Quality

16.6.1 Mitigation Measures

Construction Phase

A detailed dust minimisation plan associated with a high level of dust control is outlined in Appendix 8.3. This plan draws on best practice mitigation measures from Ireland, the UK and the USA in order to ensure the highest level of mitigation possible.

In summary the measures which will be implemented will include: -

- Drop heights from conveyors, loading shovels, hoppers and other loading equipment should be minimised, if necessary fine water sprays should be employed.
- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- Any road that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads.
- Vehicles using site roads will have their speed restricted, and this speed restriction will be enforced rigidly. On any un-surfaced site road, this will be 20 kph, and on hard surfaced roads as site management dictates.
- Public roads and footpaths outside the site will be regularly inspected for cleanliness and cleaned as necessary. If sweeping using a road sweeper is not possible due to the nature of the surrounding area then a suitable smaller scale street cleaning vacuum will be used.

- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.
- Hoarding or screens shall be erected around works areas to reduce visual impact. This will also have an added benefit of preventing larger particles of dust from travelling off-site and impacting receptors.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Operational Phase

No mitigation is proposed for the operation phase of the proposed development as it is predicted to have an imperceptible impact on air quality.

16.6.2 Monitoring Measures

Construction Phase

Monitoring of construction dust deposition along the site boundary to nearby sensitive receptors during the construction phase of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/(m^2*day) during the monitoring period between 28 - 32 days.

Operational Phase

There is no monitoring recommended for the operational phase of the development as impacts to air quality are predicted to be imperceptible.

16.7 Noise and Vibration

16.7.1 Mitigation Measures

Construction Stage - Noise

With regard to construction activities, best practice control measures for noise and vibration from construction sites are found within BS 5228 (2009 +A1 2014) *Code of Practice for Noise and Vibration Control on Construction and Open Sites* Parts 1 and 2. Whist construction noise and vibration impacts are expected to vary during the construction phase depending on the distance between the activities and noise sensitive buildings, the contractor will ensure that all best practice noise and vibration control methods will be used, as necessary in order to ensure impacts at off-site noise sensitive locations are minimised.

The best practice measures set out in BS 5228 (2009) Parts 1 and 2 includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

- selection of quiet plant;
- noise control at source;
- screening;
- liaison with the public, and;
- monitoring.

Detailed comment is offered on these items in the following paragraphs. Noise control measures that will be considered include the selection of quiet plant, enclosures and screens around noise sources, limiting the hours of work and noise and vibration monitoring, where required.

Selection of Quiet Plant

This practice is recommended in relation to static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

Referring to the potential noise generating sources for the works under consideration, the following best practice migration measures should be considered:

- Site compounds will be located in excess of 30m from noise sensitive receptors within the site constraints. The use lifting bulky items, dropping and loading of materials within these areas should be restricted to normal working hours.
- For mobile plant items such as dump trucks, excavators and loaders, the installation of an acoustic exhaust and or maintaining enclosure panels closed during operation can reduce noise levels by up to 10 dB. Mobile plant should be switched off when not in use and not left idling.
- For concrete mixers, control measures should be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.

- For compressors, generators and pumps, these can be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
- Demountable enclosures can also be used to screen operatives using hand tools and will be moved around site as necessary.
- All items of plant should be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

Screening

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. Construction site hoarding will be constructed around the site boundaries as standard. The hoarding will be constructed of a material with a mass per unit of surface area greater than 7 kg/m2 to provide adequate sound attenuation.

In addition, careful planning of the site layout will also be considered. The placement of site buildings such as offices and stores will be used, where feasible, to provide noise screening when placed between the source and the receiver.

Liaison with the Public

A designated environmental liaison officer will be appointed to site during construction works. Any noise complaints should be logged and followed up in a prompt fashion by the liaison officer. In addition, where a particularly noisy construction activity is planned or other works with the potential to generate high levels of noise, or where noisy works are expected to operate outside of normal working hours etc., the liaison officer will inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

Project Programme

The phasing programme will be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. During excavation/ piling or other high noise generating works are in progress on a site at the same time as other works of construction that themselves may generate significant noise and vibration, the working programme will be phased so as to prevent unacceptable disturbance at any time.

Construction Stage - Vibration

The vibration from construction activities will be limited to the values set out in Section 9.2. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Limit values have been provided for soundly constructed residential and commercial properties.

Operation Stage

Additional Traffic on Adjacent Roads

During the operational phase of the development, noise mitigation measures with respect to the outward impact of traffic from the development are not deemed necessary.

Mechanical Services Plant

Taking into account that sensitive receivers within the development are much closer than off-site sensitive receivers, once the relevant noise criteria are achieved within the development it is expected that there will be no negative impact at sensitive receivers off site, and therefore no further mitigation required.

Inward Noise

As is the case in most buildings, the glazed elements and ventilation paths of the building envelope are typically the weakest element from a sound insulation perspective. In general, all wall constructions (i.e. block work or concrete and spandrel elements) offer a high degree of sound insulation, much greater than that offered by the glazing systems. Therefore, noise intrusion via the wall construction will be minimal.

Table 16-1. Sound Insulation Performance Requirements for Glazing, SRI (dB)

Mark-up	Octave Band Centre Frequency (Hz)						R_w
	125	250	500	1000	2000	4000	
BLUE	26	27	34	40	38	46	37

The overall R_w and $D_{ne,w}$ outlined in this section are provided for information purposes only. The over-riding requirement is the Octave Band sound insulation performance values which may also be achieved using alternative glazing and ventilation configurations. Any selected system will be required to provide the same level of sound insulation performance set out in Table 9.24 and Table 9.25 or greater.

The following performance requirements apply to all ventilation paths from outside the building. This can be achieved by passive acoustic wall or window vents or via mechanical ventilation systems. Ventilators in the facades of dual aspect living/dining spaces in areas designated 'BLUE' should provide increased performance as outlined below.

Table 9.25: Sound Insulation Performance Requirements for Ventilation, Dn,e,w (dB)

Mark-up	Octave Band Centre Frequency (Hz)						$D_{n,e,w}$
	125	250	500	1000	2000	4000	
BLUE	35	34	33	38	49	45	39

Figure 16-9. Façade Sound Insulation Specification

16.7.2 Monitoring Measures

Where required, construction noise monitoring will be undertaken at periodic sample periods at the nearest noise sensitive locations to the development works to check compliance with the construction noise criterion.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise.

16.8 Climate

16.8.1 Mitigation Measures

<u>Construction Stage</u>

Construction stage impacts to climate are considered neutral, however, the following best practice measures are recommended to ensure no significant impacts occur.

- Prevent on-site or delivery vehicles from leaving engines idling, even over short periods.
- Ensure all plant and equipment are serviced regularly and well maintained.
- Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site

Operation Stage

No mitigation is proposed for the operation phase of the proposed development as it is predicted to have an imperceptible impact on climate. A number of measures have been incorporated into the overall design of the development to reduce impacts to climate during operation.

16.8.2 Monitoring Measures

No monitoring is recommended.

16.9 Landscape and Visual Impact

16.9.1 Mitigation Measures

This section of the report will discuss mitigation measures to reduce the impact of the proposed development on the surrounding water environments during the construction and operation phase.

Incorporated Design

- Retention and enhancement of a number of moderate-quality existing trees and incorporation into the landscape design
- Significant level of proposed perimeter planting including native woodland, hedgerow, copses of native trees and formal hedging
- Significant level of proposed street, parkland and ornamental trees within the subject lands
- Significant level of proposed woodland planting

Construction Phase

- The protection of existing trees and other vegetation to be retained to BS 5837:2012 standards with the Root Protection Area (RPA) securely protected by fencing for the duration of the construction process.
- Implementation and monitoring of a well-managed and organised construction site, with control of construction activity, traffic, materials storage and lighting with due consideration for neighbouring residences

Operational Phase

- Implementation and monitoring of a landscape management plan for the full duration of the defects liability period to ensure successful establishment of all proposed trees and vegetation.
- Periodic tree surveys and implementation of a tree management plan for the mature trees on site to ensure their continuing sustainability.

16.9.2 Monitoring Measures

Contracts will ensure good working practices to reduce any negative impacts arising from construction to the lowest possible level and to ensure that all machinery operates within clearly defined construction area. Storage areas will be so located to avoid impacting on sensitive views, trees, hedgerows, drainage patterns etc. and such areas will be fully re-instated prior to at the end of the construction contract. The works will also have continuous monitoring to ensure adequate protection of areas outside of the construction works.

16.10 Traffic and Transport

16.10.1 Mitigation Measures

This section of the report discusses mitigation measures to reduce the impact the proposed development on the surrounding area during the construction and operational phases.

Construction Phase

It is considered that a Construction Management Plan (CMP) will be prepared by the appointed contractor in order to minimise the potential impact of the construction phase of the proposed development on the safety and amenity of other users of the public road. The CMP will consider the following aspects:

- Dust and dirt control measures.
- Noise assessment and control measures
- Routes to be used by vehicles
- Working hours of the site
- Details of construction traffic forecasts
- Time when vehicle movements and deliveries will be made to the site
- Facilities for loading and unloading
- Facilities for parking cars and other vehicles

Further to the above, a detailed Traffic Management Plan (TMP) will be prepared by the main contractor. This document will outline proposals in relation to construction traffic and associated construction activities that impact the surrounding roads network. The document will be prepared in coordination and agreed with the local authority.

Care will be taken to ensure existing pedestrian and cycling routes are suitably maintained or appropriately diverted as necessary during the construction period, and temporary car parking is provided within the site for contractor's vehicles. It is likely that construction will have an imperceptible impact on pedestrian and cycle infrastructure.

Through the implementation of the CMP and TMP, it is anticipated that the effect of traffic during the construction phase will have a slight effect on the surrounding road network for short-term period.

Operational Phase

The proposed development is situated adjacent to suitable infrastructure and transport services for travel by sustainable modes. A key barrier to modal shift towards sustainable modes of travel is often a lack of information about potential alternatives to the car. As such, it is proposed that residents will be made aware of potential alternatives including information on walking, cycle routes and public transport.

Residents will be encouraged to avail of these facilities for travel to and from work. Provision of this information would be made during the sales process and will be included in the new homeowner's pack upon the sale of each unit, as this represents the best opportunity to make residents aware and to secure travel behaviour change. It is anticipated that this measure may help to reduce the level of traffic at the proposed development, thus providing mitigation against any traffic and transport effects of the development.

A Travel Plan has been included in this application under separate cover. This Plan sets out a method to reduce the dependence on private car journeys and encourage residents within the development to avail of sustainable forms of transport such as walking, cycling and public transport.

16.10.2 Monitoring Measures

Construction Phase

During the Construction Phase the following monitoring is advised. The specific compliance exercises to be undertaken in relation to the range of measures detailed in the final construction management plan will be agreed with the planning authority.

- Construction vehicles routes and parking
- Internal and external road conditions
- Construction activities hours of work

Operational Phase

The Travel Plan for the proposed development will be monitored and updated at regular intervals. This will enable tracking in terms of a reduction in the dependence on private car journeys and a shift towards sustainable transport options such as walking, cycling and the use of public transport such as buses and trains.

16.11 Cultural Heritage

16.11.1 Mitigation Measures

It is recommended that the four archaeological features (a pit; a hearth/burnt pit; and two possible enclosure ditches) revealed during the test trenching programmes be fully excavated and recorded well in advance of groundworks commencing on site. Excavation would be carried out under Licence to the Department of Housing, Local Government and Heritage and the National Museum of Ireland.

It is recommended that monitoring of all groundworks be undertaken in Fields 1, 2 and 5 (figure 13.12). Monitoring would be carried out under Licence to the Department of Housing, Local Government and Heritage and the National Museum of Ireland. Provision would be made for the full excavation and recording of any archaeological features or deposits that may be exposed during monitoring.

It is considered monitoring is not required in Fields 3, 4, 6, 7, 8, 9 and 10 (figures 13.12 and 13.13) as fieldwork failed to reveal any archaeological features or artefacts in these areas.

There are no mitigation measures available to offset the imperceptible, permanent, visual impact on the architectural heritage features recorded within the 500m study area.

It is recommended that written and photographic records be created, well in advance of groundworks commencing on site, where the proposed access roads and footpaths will truncate the townland and parish boundary.

16.11.2 Monitoring Measures

With the exception of the mitigation measures outlined in Section 13.9 Avoidance, Remedial & Mitigation Measures, there are no future monitoring requirements.

16.12 Utilities and Waste

16.12.1 Mitigation Measures

All possible precautions shall be taken to avoid unplanned disruptions to any services or utilities during the construction phase of the proposed Project. It should be noted that a number of mitigation measures proposed in other EIAR chapters are also of relevance to Material Assets and should be referred to when reading this EIAR.

The construction phase mitigation measures include, avoidance, reduction and remedy measures as set out within the Development Management Guidelines document. The design and construction of the necessary service infrastructure will be in accordance with relevant codes of practice and guidelines. As a result, this is likely to mitigate any potential impacts during the operational phase of the proposed Project. However, routine maintenance of the site services will be required from time to time, as such any mitigation measures will be advised by the relevant service provider.

A site-specific Construction and Demolition Waste Management Plan (C&DWMP) has been prepared to deal with waste generation during the construction phase of the proposed Project and is included as part of the application packs. This document was prepared in accordance with best practice guidelines. Operational waste management will be managed by a designated management company on site and the appointed licenced waste contractor which will ensure the sustainable management of domestic and commercial waste arising from the development in accordance with legislative requirements and best practice standards.

16.12.2 Monitoring Measures

Prior to the operational phase of the proposed Project, all services/utility connections will be tested by a suitably qualified professional under the supervision of the service provider.

Any monitoring of the built services required during the operational phase of the proposed Project will be as advised by the relevant service provider.

The management of waste during the construction and operational phases of the proposed Project should be monitored to ensure compliance with best practice and relevant legislative requirements.

APPENDICES

APPENDIX 5.1 BAT DEROGATION LICENCE 2018

An Roinn Cultúir,
Oidhreachta agus Gaeltachta
Department of Culture,
Heritage and the Gaeltacht

Licence No.: DER/BAT 2018 – 77 (amended)

EUROPEAN COMMUNITIES (BIRDS AND NATURAL HABITATS) REGULATIONS, 2011 (S.I. No 477 of 2011)

DEROGATION LICENCE

Granted under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011, hereinafter referred to as "the Habitats Regulations".

Licence

The Minister for Arts, Heritage and the Gaeltacht, in exercise of the powers conferred on her by Regulation 54 of the Habitats Regulations hereby grants to **Carroll Estates** supervised by **Faith Wilson BSc (Hons), MCIEEM, CEnv** a licence in respect of the following **bat species**:

- **common pipistrelle** — ***Pipistrellus pipistrellus***
- ***soprano pipistrelle*** — ***Pipistrellus pygmaeus***
- **Leisler's bat** — ***Nycatalus leisler***
- **brown long-eared bat** — ***Plecotus auritus***

. This licence authorises the following:

(a) roost disturbance;

(b) damage or destruction of breeding sites or resting places;

("the authorised action(s)").

This licence is subject to the terms and conditions set out overleaf.

National Parks & Wildlife Services
LICENCE

Terms and Conditions

1. This licence is granted solely to allow the activities specified in connection with a confirmed bat roost in **various buildings due for demolition,** located in **Back Road, Malahide, Co. Dublin**, for **Carroll Estates**.

2. All activities authorised by this licence, and all equipment used in connection herewith, shall be carried out, constructed and maintained (as the case may be) so as to avoid unnecessary injury or distress to any species of **BAT**.

3. This licence may be modified or revoked, for stated reasons, at any time.

4. The mitigation measures outlined in the application report (**5.6, Protective Measures for bats, pp. 29-30**), together with any changes or clarification agreed in correspondence between NPWS and the agent or applicant, are to be carried out. Strict adherence must be paid to all the proposed measures in the application.

5. No work can begin before **6th September 2018** and must be completed by **31st March 2019**.

6. The works will be supervised by a licensed bat specialist **Faith Wilson.**

7. This licence shall be produced for inspection on a request being made on that behalf by a member of An Garda Síochána or an authorised NPWS officer appointed under Regulation 4 of the Habitats Regulations.

8. The local National Parks and Wildlife Service field officer **Niall Harmey, niall.harmey@chg.gov.ie, 087-6620373** should be contacted prior to the commencement of any activity, and if bats are detected on site during the course of the work, under the terms of this licence.

9. A report shall be submitted to Wildlife Licensing Unit, Department of Culture, Heritage and the Gaeltacht, Wildlife Licensing Unit, R. 2.03, 90 North King Street, Smithfield, Dublin 7, D07 N7CV on completion of the actions which this licence authorises, describing the activities carried out in pursuance of this licence.

2

National Parks & Wildlife Services
LICENCE

NOTES (1 to 2).

- This licence is granted for the period specified and subject to compliance with the conditions specified. Anything done other than in accordance with the terms of this licence may constitute an offence.

- This licence applies to **bats** and to no other species.

4

National Parks & Wildlife Services
LICENCE

Gerry Leckey
(a person authorised by the Minister to sign on her behalf)

6th September 2018

Wildlife Licensing Unit
Department of Culture, Heritage and the Gaeltacht
Wildlife Licensing Unit
R. 2.03
90 North King Street
Smithfield
Dublin 7
D07 N7CV

3

National Parks & Wildlife Services
LICENCE

APPENDIX 5.2 BAT DEROGATION LICENCE 2022

An Roinn Tithíochta,
Rialtas Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

Licence No.: DER/BAT 2022 – 42

EUROPEAN COMMUNITIES (BIRDS AND NATURAL HABITATS) REGULATIONS, 2011 (S.I. No 477 of 2011)

DEROGATION LICENCE

Granted under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011, hereinafter referred to as "the Habitats Regulations".

The Minister for Housing, Local Government and Heritage, in exercise of the powers conferred on him by Regulation 54 of the Habitats Regulations hereby grants to **Birchwell Developments** supervised by **Faith Wilson BSc(Hons) CEnv MCIEEM**, a licence. It is stated that:

(A) In the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment.

(B) There is no satisfactory alternative, and the action authorised by this licence will not be detrimental to the maintenance of the population of bats referred to below at a favourable conservation status in their natural range.

The licence is issued in respect of the following **bat species**:

- **common pipistrelle** *Pipistrellus pipistrellus*
- ***soprano pipistrelle*** *Pipistrellus pygmaeus*

. This licence authorises the following:

(a) Roost disturbance;

(b) Damage or destruction of breeding sites or resting places;

(c) Actions authorised within the licence

This licence is subject to the terms and conditions set out overleaf.

Terms and Conditions

1. This licence is granted solely to allow the activities specified in connection with the **demolition works** located at **Broomfield Lands, Malahide, Co. Dublin** for **Birchwell Developments.**

2. All activities authorised by this licence, and all equipment used in connection herewith, shall be carried out, constructed and maintained (as the case may be) so as to avoid unnecessary injury or distress to any species of **BAT**.

3. This licence may be modified or revoked, for stated reasons, at any time.

4. The mitigation measures outlined in the application report (**Broomfield SHD Ecological Impact Assessment Report, pgs.63-68**), together with any changes or clarification agreed in correspondence between NPWS and the agent or applicant, are to be carried out. Strict adherence must be paid to all the proposed measures in the application.

5. No work can begin before **September 1st 2022** and must be completed by **March 31st 2023.**

6. The works will be supervised by a licensed bat specialist **Faith Wilson.**

7. This licence shall be produced for inspection on a request being made on that behalf by a member of An Garda Síochána or an authorised NPWS officer appointed under Regulation 4 of the Habitats Regulations.

8. The local National Parks and Wildlife Service field officer **Roy Thompson,** **Roy.Thompson@housing.gov.ie** , **+353 15393237** should be contacted prior to the commencement of any activity, and if bats are detected on site during the course of the work, under the terms of this licence.

9. A report shall be submitted to Wildlife Licensing Unit, National Parks and Wildlife Service Department of Housing, Local Government and Heritage, R. 2.03, 90 North King Street, Smithfield, Dublin 7, D07 N7CV on completion of the actions which this licence authorises, describing the activities carried out in pursuance of this licence.

Claire Crowley
(a person authorised by the Minister to sign on his behalf)

01/04/2022

Wildlife Licensing Unit
National Parks and Wildlife Service
Housing, Local Government and Heritage
R. 2.03
90 North King Street
Smithfield
Dublin 7
D07 N7CV

NOTES (1 to 2).

- This licence is granted for the period specified and subject to compliance with the conditions specified. Anything done other than in accordance with the terms of this licence may constitute an offence.
- This licence applies to **bats** and to no other species.

3

APPENDIX 5.3 JAPANESE KNOTWEED TREATMENT

2018

Broomfield, Malahide, Co. Dublin Arbeco Ltd. Jan 2021

Pesticide Application Record – Amenity Areas

Site / Location:	Broomfield, Malahide, Co. Dublin
Name & Qualifications of Person applying	Graeme Cahill: Certified JKW Surveyor PA1, PA2f, PA6, PA6w PAINJ
PU Number of person applying	PU034173
Product Name and PCS No.	Round-up Biactive 04660
Situation / area treated:	Rough grass
Application rate	150ml Round-up per 5litre Water
Date applied / Volume	Sept 14th 2018 150ml product/5l water
Area Treated (Ha or M2)	30m2
Method of Application	knapsack sprayer/spot spray
Buffer Zone Applied (metres)	N/A
Nozzle type	Flat fan deflector
Rationale / Reason for Use:	Used for the treatment of Japanese Knotweed
Location	Isolated spot at developments lands at Broomfield west

2019

Broomfield, Malahide, Co. Dublin Arbeco Ltd. Jan 2021

Pesticide Application Record – Amenity Areas

Site / Location:	Broomfield, Malahide, Co. Dublin
Name & Qualifications of Person applying	Graeme Cahill: Certified JKW Surveyor PA1, PA2f, PA6, PA6w PAINJ
PU Number of person applying	PU034173
Product Name and PCS No.	Round-up Biactive 04660
Situation / area treated:	Rough grass
Application rate	N/A
Date applied / Volume	Sept 22nd 2019
Area Treated (Ha or M2)	N/A
Method of Application	knapsack sprayer/spot spray
Buffer Zone Applied (metres)	N/A
Nozzle type	Flat fan deflector
Rationale / Reason for Use:	Used for the treatment of Japanese Knotweed
Location	Isolated spot at developments lands at Broomfield west

Notes: On arrival it was evident that the target species had been burnt with therefore there was no leaf on which to apply herbicide. A follow up visit was scheduled for the following year to commence treatment

2020

Broomfield, Malahide, Co. Dublin Arbeco Ltd. Jan 2021

Pesticide Application Record – Amenity Areas

Site / Location:	Broomfield, Malahide, Co. Dublin
Name & Qualifications of Person applying	Graeme Cahill: Certified JKW Surveyor PA1, PA2f, PA6, PA6w PAINJ
PU Number of person applying	PU034173
Product Name and PCS No.	Round-up Biactive 04660
Situation / area treated:	Rough grass
Application rate	150ml Round-up per 5litre Water
Date applied / Volume	Sept 18th 2020 50ml product/2l water
Area Treated (Ha or M2)	5m2
Method of Application	knapsack sprayer/spot spray
Buffer Zone Applied (metres)	N/A
Nozzle type	Flat fan deflector
Rationale / Reason for Use:	Used for the treatment of Japanese Knotweed
Location	Isolated spot at developments lands at Broomfield west

Notes: Limited regrowth with stems too small to inject, therefore, target species was spot sprayed

An Roinn Cultúir,
Oidhreachta agus Gaeltachta
Department of Culture,
Heritage and the Gaeltacht

Licence No.: DER/BAT 2018 – 77 (amended)

EUROPEAN COMMUNITIES (BIRDS AND NATURAL HABITATS) REGULATIONS, 2011 (S.I. No 477 of 2011)

DEROGATION LICENCE

Granted under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011, hereinafter referred to as "the Habitats Regulations".

Licence

The Minister for Arts, Heritage and the Gaeltacht, in exercise of the powers conferred on her by Regulation 54 of the Habitats Regulations hereby grants to **Carroll Estates** supervised by **Faith Wilson BSc (Hons), MCIEEM, CEnv** a licence in respect of the following **bat species**:

- **common pipistrelle** — ***Pipistrellus pipistrellus***
- ***soprano pipistrelle*** — ***Pipistrellus pygmaeus***
- **Leisler's bat** — ***Nycatalus leisler***
- **brown long-eared bat** — ***Plecotus auritus***

. This licence authorises the following:

(a) roost disturbance;

(b) damage or destruction of breeding sites or resting places;

("the authorised action(s)").

This licence is subject to the terms and conditions set out overleaf.

National Parks & Wildlife Services
LICENCE

Terms and Conditions

1. This licence is granted solely to allow the activities specified in connection with a confirmed bat roost in **various buildings due for demolition,** located in **Back Road, Malahide, Co. Dublin**, for **Carroll Estates**.

2. All activities authorised by this licence, and all equipment used in connection herewith, shall be carried out, constructed and maintained (as the case may be) so as to avoid unnecessary injury or distress to any species of **BAT**.

3. This licence may be modified or revoked, for stated reasons, at any time.

4. The mitigation measures outlined in the application report (**5.6, Protective Measures for bats, pp. 29-30**), together with any changes or clarification agreed in correspondence between NPWS and the agent or applicant, are to be carried out. Strict adherence must be paid to all the proposed measures in the application.

5. No work can begin before **6th September 2018** and must be completed by **31st March 2019**.

6. The works will be supervised by a licensed bat specialist **Faith Wilson.**

7. This licence shall be produced for inspection on a request being made on that behalf by a member of An Garda Síochána or an authorised NPWS officer appointed under Regulation 4 of the Habitats Regulations.

8. The local National Parks and Wildlife Service field officer **Niall Harmey, niall.harmey@chg.gov.ie, 087-6620373** should be contacted prior to the commencement of any activity, and if bats are detected on site during the course of the work, under the terms of this licence.

9. A report shall be submitted to Wildlife Licensing Unit, Department of Culture, Heritage and the Gaeltacht, Wildlife Licensing Unit, R. 2.03, 90 North King Street, Smithfield, Dublin 7, D07 N7CV on completion of the actions which this licence authorises, describing the activities carried out in pursuance of this licence.

2

National Parks & Wildlife Services
LICENCE

NOTES (1 to 2).

- This licence is granted for the period specified and subject to compliance with the conditions specified. Anything done other than in accordance with the terms of this licence may constitute an offence.

- This licence applies to **bats** and to no other species.

National Parks & Wildlife Services
LICENCE

Gerry Leckey
(a person authorised by the Minister to sign on her behalf)

6th September 2018

Wildlife Licensing Unit
Department of Culture, Heritage and the Gaeltacht
Wildlife Licensing Unit
R. 2.03
90 North King Street
Smithfield
Dublin 7
D07 N7CV

National Parks & Wildlife Services
LICENCE

APPENDIX 6.1 SITE INVESTIGATION

S.I. Ltd Contract No: 5798A

Client:	EP Lynam Properties / Carroll Estates
Engineer:	Waterman Moylan
Contractor:	Site Investigations Ltd

Broomfield – North Site,
Back Road, Malahide, Co. Dublin
Site Investigation

Prepared by:

....

Stephen Letch

Issue Date:	29/03/2021
Status	Final
Revision	1

Contents: Page No.

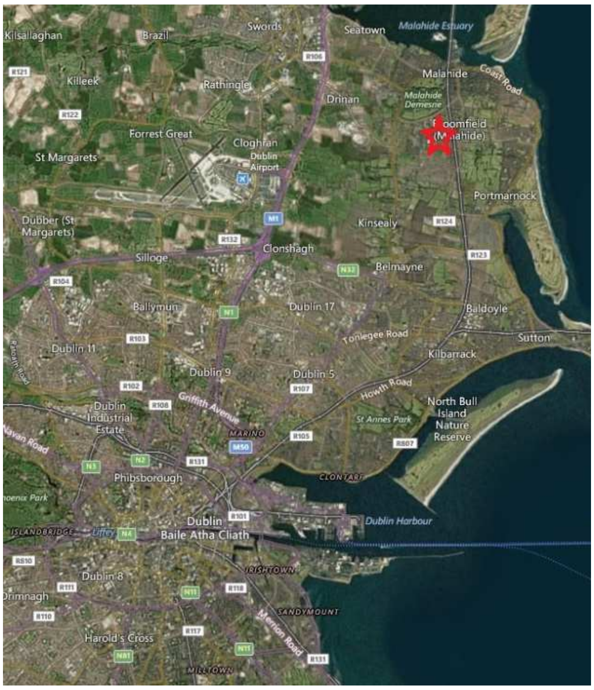
Appendices:

1. Introduction

On the instructions of Waterman Moylan, Site Investigations Ltd (SIL) were appointed to complete a site investigation at Broomfield, Malahide, Co. Dublin. The investigation was completed over two areas of the residential development, one on Back Road and one on Kinsealy Lane. The sites have been separated and this report covers the Back Road site. The investigation was completed in March 2021 on behalf of the client, EP Lynam Properties and Carroll Estates.

2. Site Location

The site is located on the Back Road, Malahide, Co. Dublin to the north of Dublin city. The map on the left shows the location of Malahide to the north of Dublin city and the second map shows the two site locations, with Back Road in red and Kinsealy Lane in green.



3. Fieldwork

The fieldworks comprised a programme of trial pits and soakaway tests. All fieldwork was carried out in accordance with Eurocode 7: Geotechnical Design and IEI Specification & Related Documents for Ground Investigation in Ireland (2006).

The fieldworks comprised the following:

- 6 No. trial pits with 3 No. soakaway tests

3.1. Trial Pits

6 No. trial pits were excavated using a tracked excavator. The pits were logged and photographed by SIL geotechnical engineer and representative disturbed bulk samples were recovered as the pits were excavated. TP01 and TP02 were terminated at the scheduled depth of 3.00mbgl whilst TP03 to TP06 terminated at depths ranging from 2.00mbgl to 2.70mbgl when boulder obstructions were encountered. The trial pits were backfilled with the arisings immediately upon completion.

The trial pit logs and photographs are presented in Appendix 1.

3.2. Soakaway Tests

At TP01 to TP03, soakaway tests were completed when the pits were 2.10mbgl. The soakaway test is used to identify possible areas for storm water drainage. The pit is filled with water and the level of the groundwater recorded over time. As stipulated by BRE Special Digest 365, the pit should be filled three times and that the final cycle is used to provide the infiltration rate. The time taken for the water level to fall from 75% volume to 25% volume is required to calculate the rate of infiltration. However, if the water level does not fall at a steady rate then the test is deemed to have failed and the area is unsuitable for storm water drainage.

The test results are provided in Appendix 2.

3.3. Surveying

Following completion of all the fieldworks, a survey of the exploratory hole locations was completed using a GeoMax GPS Rover. The data is supplied on each individual log and along with a site plan in Appendix 4.

4. Laboratory Testing

Geotechnical laboratory testing was completed on representative soil samples in accordance with BS 1377 (1990). Testing included:

- 6 No. Moisture contents
- 6 No. Atterberg limits
- 6 No. Particle size gradings

The geotechnical laboratory test results are presented in Appendix 3.

5. Ground Conditions

5.1. Overburden

The natural ground conditions are consistent across the site with cohesive firm brown slightly sandy slightly gravelly silty CLAY with medium cobble overlying stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

These natural soils are over-consolidated lodgement till which is encountered across the North Dublin region with several papers discussing the engineering characteristics of the soil. The brown grey soils are the weathered surface of the underlying black clays and the gravel and cobbles are generally subrounded to subangular and predominantly limestone in origin.

The laboratory tests of the shallow cohesive soils confirm that CLAY soils dominate the site with low to intermediate plasticity indices of 14 to 16% recorded. The particle size distribution curve showed poorly sorted straight-line curves with 32% to 56% fines content.

5.2. Groundwater

Groundwater details in the trial pits during the fieldworks are noted on the logs in Appendix 1. Groundwater was not encountered during excavations.

6. Recommendations and Conclusions

Please note the following caveats:

The recommendations given, and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between the exploratory hole locations or below the final level of excavation, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for adjacent unexpected conditions that have not been revealed by the exploratory holes. It is further recommended that all bearing surfaces when excavated should be inspected by a suitably qualified Engineer to verify the information given in this report.

Excavated surfaces in clay strata should be kept dry to avoid softening prior to foundation placement. Foundations should always be taken to a minimum depth of 0.50mBGL to avoid the effects of frost action and possible seasonal shrinkage/swelling.

If it is intended that on-site materials are to be used as fill, then the necessary laboratory testing should be specified by the Client to confirm the suitability. Also, relevant lab testing should be specified where stability of side slopes to excavations is a concern, or where contamination may be an issue.

6.1. Foundations

Due to the unknown depth of foundation and no longer-term groundwater information, this analysis assumes the groundwater will not influence the construction or performance of these foundations.

No numerical test data was completed as part of this investigation but the historical data from the numerous papers completed on these Dublin CLAYs would indicate an allowable bearing capacity range of 125kN/m^2 to 150kN/m^2 in the firm brown CLAY. This increases to between 250kN/m^2 to 300kN/m^2 when the stiff black CLAY is encountered.

If large bearing capacities are required for the proposed structures then further investigation with SPT N-values or dynamic probe N_{100} values would be recommended.

The following assumptions were made as part of these analyses. If any of these assumptions are not in accordance with detailed design or observations made during construction these recommendations should be re-evaluated.

- The foundation is to be 1m wide.
- Foundations are to be constructed on a level formation of uniform material type (described above).
- All man-made or filled material is to be removed prior to construction.
- The bulk unit weight of the material in this stratum has a minimum density of 19kN/m^3.

The trial pits recorded good pit wall stability but regular inspection of temporary excavations should be completed during construction to ensure that all slopes are stable. Temporary support should be used on any excavation that will be left open for an extended period.

6.2. Groundwater

The caveats below relating to interpretation of groundwater levels should be noted:
There is always considerable uncertainty as to the likely rates of water ingress into excavations in clayey soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water.

Furthermore, water levels noted on the borehole and trial pit logs do not generally give an accurate indication of the actual groundwater conditions as the borehole or trial pit is rarely left open for sufficient time for the water level to reach equilibrium.

Also, during boring procedures, a permeable stratum may have been sealed off by the borehole casing, or water may have been added to aid drilling. Therefore, an extended period of groundwater monitoring using any constructed standpipes is required to provide more accurate *information regarding groundwater conditions. Finally, groundwater levels vary with time of year, rainfall, nearby construction and tides.*

Pumping tests would be required to determine likely seepage rates and persistence into excavations taken below the groundwater level. Deep trial pits also aid estimation of seepage rates.

No groundwater ingresses were recorded during the fieldworks period. There is always considerable uncertainty as to the likely rates of water ingress into excavations in cohesive soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water. However, based on this information at the exploratory hole locations to date, it is considered likely that any shallow ingress into excavations of the CLAY will be slow.

If localised granular soils are encountered in shallow excavations, then the possibility of water ingressing into an excavation increase with higher ingress rates.

Finally, if groundwater is encountered during excavations then mechanical pumps will be required to remove the groundwater from sumps. Sumps should be carefully located and constructed to ensure that groundwater is efficiently removed from excavations and trenches.

6.3. Soakaway Design

The soakaway tests recorded no infiltration and therefore, failed the specification. The BRE Digest stipulates that the pit should half empty within 24hrs, and extrapolation indicates this condition would not be satisfied. The test was terminated at the end of the first (of a possible three) fill/empty cycle since further testing would give even slower fall rates due to increased soil saturation. The unsuitability of the soils for soakaways is further suggested by the soil descriptions of the materials in this area of the site where the soakaway was completed, i.e., well compacted clay/silt soils.

Appendix 1

Trial Pit Logs and Photographs

Trial Pit Log

Contract No: 5798A	Trial Pit Log				Trial Pit No: TP01
Contract:	Broomfield - North Site	Easting:	722388.040	Date:	18/03/2021
Location:	Back Road, Malahide, Co. Dublin	Northing:	745003.074	Excavator:	5T Tracked Excavator
Client:	EP Lynam Properties / Carroll Estates	Elevation:	17.33	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	2.80 x 0.90 x 3.00	Status:	FINAL

Level (mbgl) Depth	Stratum Description	Level (mOD) Depth	Samples / Field Tests Depth	Type	Result	Water Strike
0.10	TOPSOIL.	17.23				
1.60	Firm brown slightly sandy gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded of limestone. Cobbles are subrounded to rounded of limestone.	15.73	1.00	B	PM01	
3.00	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).	14.33	2.00	B	PM02	

Pit terminated at 3.00m

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	Dry	Soakaway test completed when pit 2.10mbgl.	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Contract No: 5798A	Trial Pit Log				Trial Pit No: TP02
Contract:	Broomfield - North Site	Easting:	722272.729	Date:	18/03/2021
Location:	Back Road, Malahide, Co. Dublin	Northing:	744716.671	Excavator:	5T Tracked Excavator
Client:	EP Lynam Properties / Carroll Estates	Elevation:	12.34	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.30 x 0.90 x 3.00	Status:	FINAL

Level (mbgl) Depth	Stratum Description	Legend	Level (mOD) Depth	Samples / Field Tests Depth	Type	Result	Water Strike
	Firm brown slightly sandy slightly gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded of limestone. Cobbles are subrounded to rounded of limestone.			0.50	B	PM10	
0.90	Firm grey slightly sandy gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).		11.44	1.00	B	PM11	
				2.00	B	PM12	
2.70	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).		9.64				
3.00	**Pit terminated at 3.00m**		9.34	3.00	B	PM13	

Scale (mbgl): 0.5, 1.0, 1.5, 2.0, 2.5

Scale (mOD): 12.0, 11.5, 11.0, 10.5, 10.0, 9.5

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	Dry	Soakaway test completed when pit 2.10mbgl.	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Trial Pit Log

Contract No: 5798A				Trial Pit No:	TP03
Contract:	Broomfield - North Site	Easting:	722386.766	Date:	18/03/2021
Location:	Back Road, Malahide, Co. Dublin	Northing:	744709.925	Excavator:	5T Tracked Excavator
Client:	EP Lynam Properties / Carroll Estates	Elevation:	13.42	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	2.90 x 0.90 x 2.70	Status:	FINAL

Level (mbgl) Depth	Stratum Description	Level (mOD) Depth	Samples Depth	Type	Result	Water Strike
	TOPSOIL.					
0.20	Firm brown slightly sandy slightly gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded of limestone. Cobbles are subrounded to rounded of limestone.	13.22	1.00	B	PM14	
			2.00	B	PM15	
2.30	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).	11.12	2.50	B	PM16	
2.70	Obstruction - boulders.	10.72				

Pit terminated at 2.70m

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Obstructions - possible boulders.	Pit walls stable.	Dry	Soakaway test completed when pit 2.10mbgl.	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Trial Pit Log

Contract No: 5798A				Trial Pit No:	TP04
Contract:	Broomfield - North Site	Easting:	722298.495	Date:	18/03/2021
Location:	Back Road, Malahide, Co. Dublin	Northing:	744833.799	Excavator:	5T Tracked Excavator
Client:	EP Lynam Properties / Carroll Estates	Elevation:	16.34	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	2.50 x 0.90 x 2.20	Status:	FINAL

Level (mbgl) Depth	Stratum Description	Legend	Level (mOD) Depth	Samples / Field Tests Depth	Type	Result	Water Strike
	Firm grey slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).			1.00	B	PM03	
2.10	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).		14.24				
2.20	Obstruction - boulders.		14.14	2.20	B	PM04	

Pit terminated at 2.20m

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Obstructions - possible boulders.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Trial Pit Log

Contract No: 5798A	Trial Pit Log				Trial Pit No: TP05
Contract:	Broomfield - North Site	Easting:	722277.722	Date:	18/03/2021
Location:	Back Road, Malahide, Co. Dublin	Northing:	744793.371	Excavator:	5T Tracked Excavator
Client:	EP Lynam Properties / Carroll Estates	Elevation:	15.06	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	2.30 x 0.90 x 2.00	Status:	FINAL

Depth (mbgl)	Stratum Description	Level (mOD)	Sample Depth	Type	Result	Water Strike
	TOPSOIL.					
0.20	Firm grey slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).	14.86				
			1.00	B	PM08	
1.80	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).	13.26				
2.00	Obstruction - boulders.	13.06	2.00	B	PM09	

Pit terminated at 2.00m

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Obstructions - possible boulders.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Trial Pit Log

Contract No: 5798A				Trial Pit No:	TP06
Contract:	Broomfield - North Site	Easting:	722315.322	Date:	18/03/2021
Location:	Back Road, Malahide, Co. Dublin	Northing:	744744.236	Excavator:	5T Tracked Excavator
Client:	EP Lynam Properties / Carroll Estates	Elevation:	13.39	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	2.70 x 0.90 x 2.40	Status:	FINAL

Level (mbgl) Depth	Stratum Description	Level (mOD) Depth	Samples Depth	Type	Result	Water Strike
	TOPSOIL.					
0.30	Firm brown slightly sandy slightly gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded of limestone. Cobbles are subrounded to rounded of limestone.	13.09	0.50	B	PM05	
0.90	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).	12.49	1.00	B	PM06	
			2.00	B	PM07	
2.40	Obstruction - boulders.	10.99				

Pit terminated at 2.40m

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Obstructions - possible boulders.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

TP01 Sidewall

TP01 Spoil

TP02 Sidewall

TP02 Spoil

TP03 Sidewall

TP03 Spoil

TP04 Sidewall

TP04 Spoil

TP05 Sidewall

TP05 Spoil

TP06 Sidewall

TP06 Spoil

Appendix 2

Soakaway Test Results

SOAKAWAY TEST

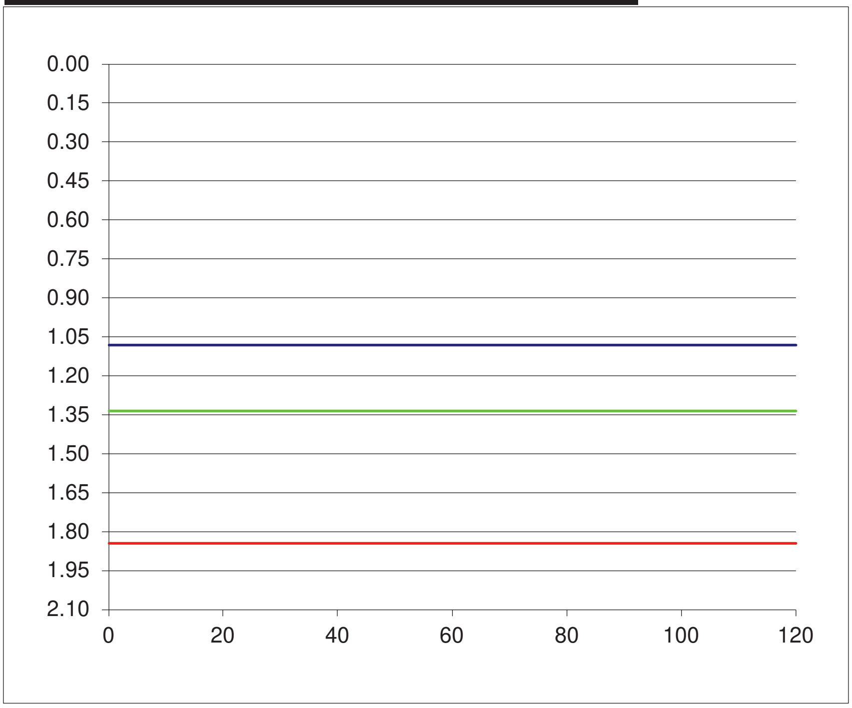
Project Reference:	5798A
Contract name:	Broomfield - North Site
Location:	Back Road, Malahide, Co. Dublin
Test No:	SA01
Date:	18/03/2021

Ground Conditions

From	To	
0.00	0.10	TOPSOIL.
0.10	1.60	Firm brown slightly sandy slightly gravelly silty CLAY with low cobble content.
1.60	2.10	Stiff grey slightly sandy slightly gravelly silty CLAY with low cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.08
0.5	1.08
1	1.08
1.5	1.08
2	1.08
2.5	1.08
3	1.08
3.5	1.08
4	1.08
4.5	1.08
5	1.08
6	1.08
7	1.08
8	1.08
9	1.08
10	1.08
12	1.08
14	1.08
16	1.08
18	1.08
20	1.08
25	1.08
30	1.08
40	1.08
50	1.08
60	1.08
75	1.08
90	1.08
120	1.08

Pit Dimensions (m)		
Length (m)	2.80	m
Width (m)	0.90	m
Depth	2.10	m
Water		
Start Depth of Water	1.08	m
Depth of Water	1.02	m
75% Full	1.34	m
25% Full	1.85	m
75%-25%	0.51	m
Volume of water (75%-25%)	**1.29**	m3
Area of Drainage	**15.54**	m2
Area of Drainage (75%-25%)	**6.29**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** or **Fail**

m/min **m/s**

SOAKAWAY TEST

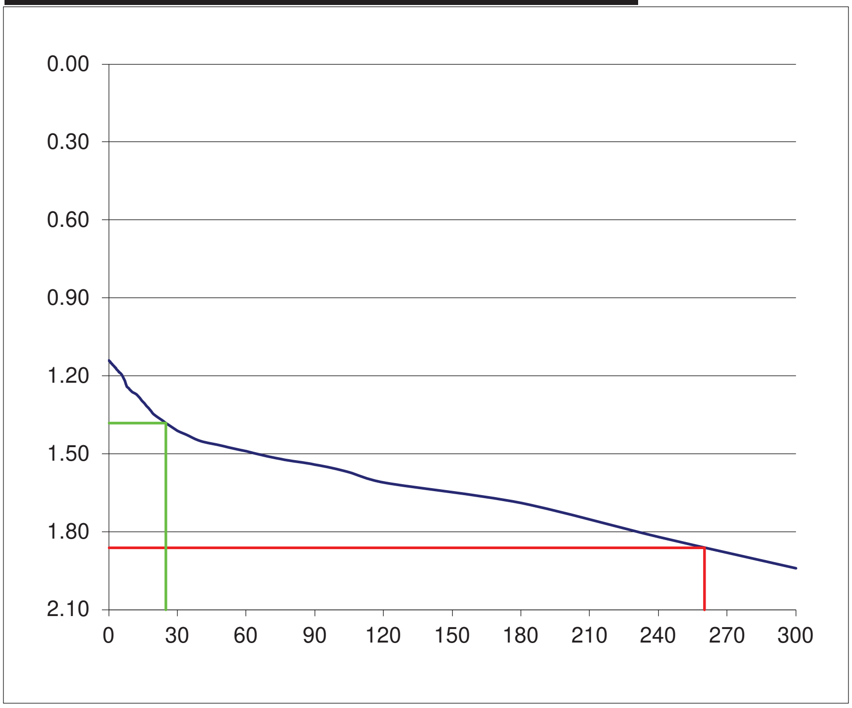
Project Reference:	5798A
Contract name:	Broomfield - North Site
Location:	Back Road, Malahide, Co. Dublin
Test No:	SA02
Date:	18/03/2021

Ground Conditions

From	To	
0.00	0.90	Firm brown slightly sandy slightly gravelly silty CLAY with low cobble content.
0.90	2.10	Stiff grey slightly sandy slightly gravelly silty CLAY with low cobble and boulder content.

Elapsed Time (mins)	Fall of Water (m)
0	1.14
0.5	1.15
1	1.15
1.5	1.16
2	1.16
2.5	1.17
3	1.17
3.5	1.18
4	1.18
4.5	1.19
5	1.19
6	1.20
7	1.22
8	1.24
9	1.25
10	1.26
12	1.27
14	1.29
16	1.31
18	1.33
20	1.35
25	1.38
30	1.41
35	1.43
40	1.45
50	1.47
60	1.49
75	1.52
90	1.54
105	1.57
120	1.61
180	1.69
240	1.82
300	1.94

Pit Dimensions (m)		
Length (m)	2.30	m
Width (m)	0.90	m
Depth	2.10	m
Water		
Start Depth of Water	1.14	m
Depth of Water	0.96	m
75% Full	1.38	m
25% Full	1.86	m
75%-25%	0.48	m
Volume of water (75%-25%)	**0.99**	m3
Area of Drainage	**13.44**	m2
Area of Drainage (75%-25%)	**5.14**	m2
Time		
75% Full	25	min
25% Full	260	min
Time 75% to 25%	**235**	min
Time 75% to 25% (sec)	**14100**	sec



f = 0.00082 or **1.37E-05**

m/min **m/s**

SOAKAWAY TEST

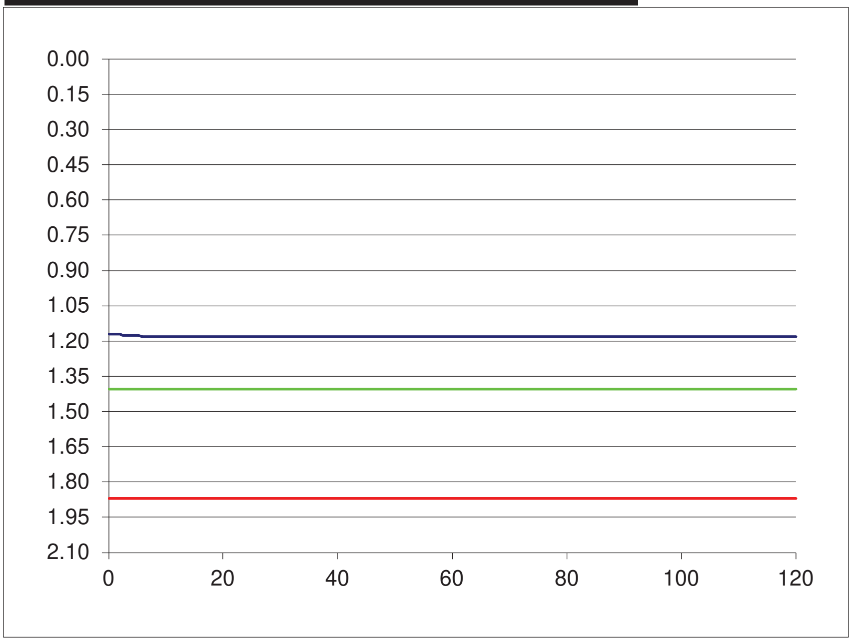
Project Reference:	5798A
Contract name:	Broomfield - North Site
Location:	Back Road, Malahide, Co. Dublin
Test No:	SA03
Date:	18/03/2021

Ground Conditions

From	To	
0.00	0.20	TOPSOIL.
0.20	1.70	Firm brown slightly sandy slightly gravelly silty CLAY with low cobble and boulder content.
1.70	2.10	Stiff black slightly sandy slightly gravelly silty CLAY with low cobble and boulder content.

Elapsed Time (mins)	Fall of Water (m)
0	1.17
0.5	1.17
1	1.17
1.5	1.17
2	1.17
2.5	1.18
3	1.18
3.5	1.18
4	1.18
4.5	1.18
5	1.18
6	1.18
7	1.18
8	1.18
9	1.18
10	1.18
12	1.18
14	1.18
16	1.18
18	1.18
20	1.18
25	1.18
30	1.18
40	1.18
50	1.18
60	1.18
75	1.18
90	1.18
120	1.18

Pit Dimensions (m)		
Length (m)	2.40	m
Width (m)	0.90	m
Depth	2.10	m
Water		
Start Depth of Water	1.17	m
Depth of Water	0.93	m
75% Full	1.40	m
25% Full	1.87	m
75%-25%	0.47	m
Volume of water (75%-25%)	**1.00**	m3
Area of Drainage	**13.86**	m2
Area of Drainage (75%-25%)	**5.23**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** m/min or **Fail** m/s

Appendix 3

Geotechnical Laboratory Test Results

Classification Tests in accordance with BS1377: Part 4

Client	EP Lynam Properties / Carroll Estates
Site	Broomfield, Malahide - North Site
S.I. File No	5798A / 21
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email info@siteinvestigations.ie
Report Date	24th March 2021

Hole ID	Depth	Sample No	Lab Ref No.	Sample Type	Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Plastic Index %	Min. Dry Density Mg/m^3	Particle Density Mg/m^3	% passing 425um	Comments	**Remarks** **C**=Clay; **M**=Silt **Plasticity**: **L**=Low; **I**=Intermediate; **H**=High; **V**=Very High; **E**=Extremely High
TP01	1.00	PM01	21/222	B	20.9	35	19	16			52.4		CL/CI
TP02	1.00	PM11	21/223	B	11.9	33	18	15			51.2		CL
TP03	1.00	PM14	21/224	B	12.6	34	19	15			54.3		CL
TP04	1.00	PM03	21/225	B	12.1	36	21	15			67.0		CI
TP05	1.00	PM08	21/226	B	12.2	34	20	14			52.7		CL
TP06	1.00	PM06	21/227	B	13.6	34	19	15			66.1		CL

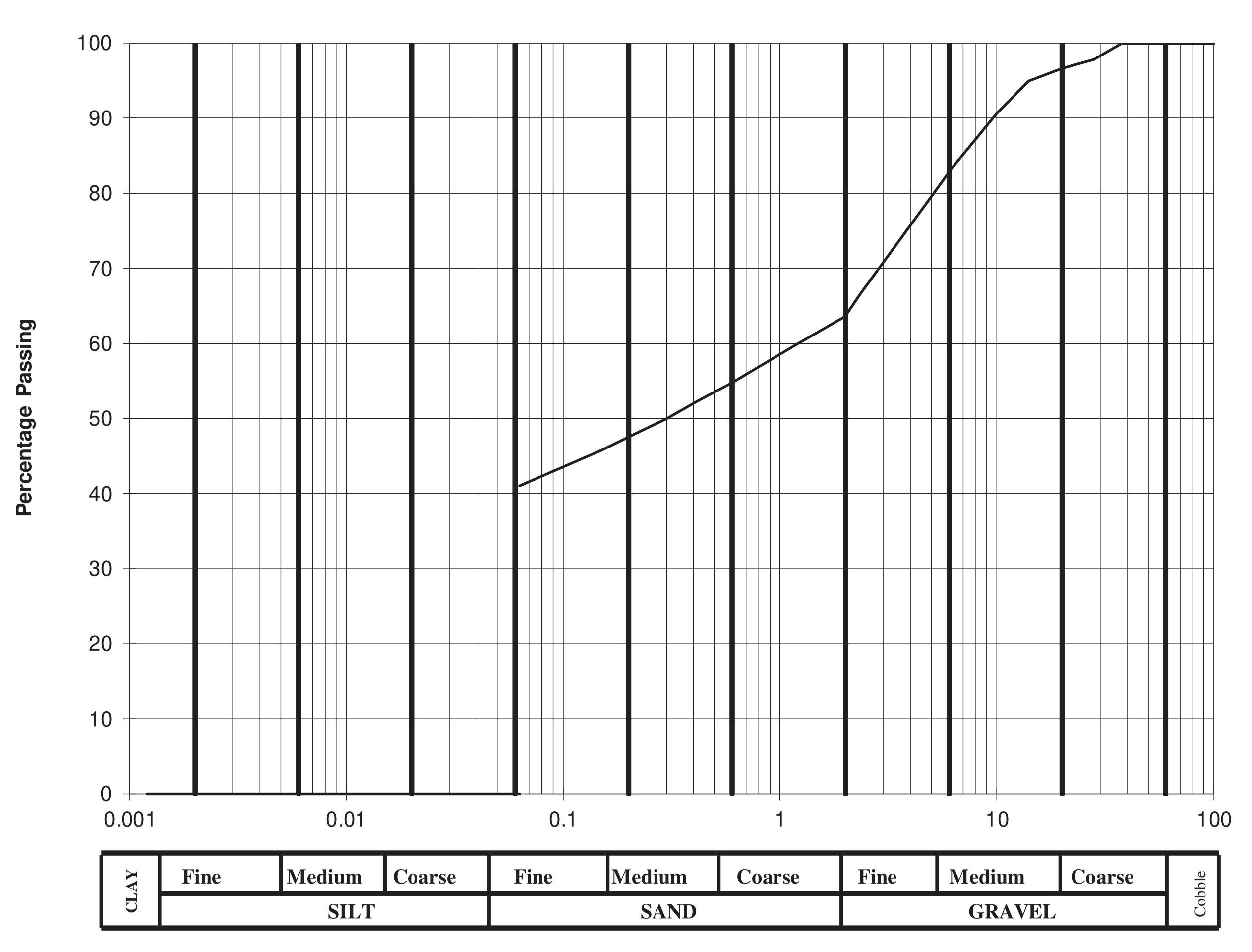
_______________________Paddy McGonagle
Site Investigations Ltd

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis Diameter, mm	Hydrometer analysis % passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	97.8		
20	96.6		
14	94.9		
10	90.6		
6.3	83.5		
5.0	79.6		
2.36	66.7		
2.00	63.6		
1.18	59.8		
0.600	54.7		
0.425	52.4		
0.300	50		
0.212	47.9		
0.150	45.8		
0.063	41		

Cobbles, %	0
Gravel, %	36
Sand, %	23
Clay / Silt, %	41



Client :	EP Lynam Properties / Carroll Estates	Lab. No :	21/222	Hole ID :	TP 01
Project :	Broomfield, Malahide - North Site	Sample No :	PM01	Depth, m :	1.00

Material description :	slighty sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

Printed 24/03/2021

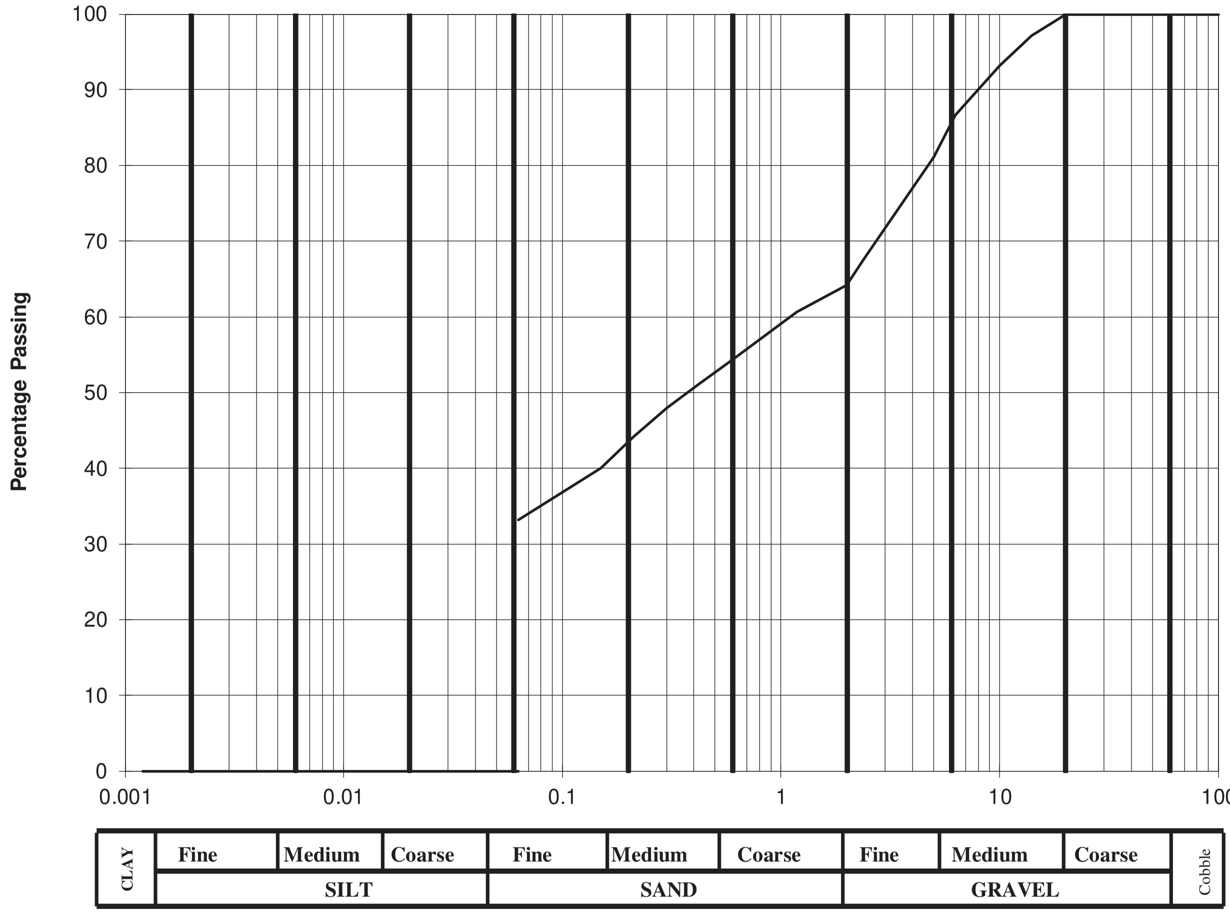
Paddy McGonagle
Site Investigations Ltd

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis Diameter, mm	Hydrometer analysis % passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	100		
14	97.1		
10	93.2		
6.3	86.7		
5.0	81.1		
2.36	67.4		
2.00	64.2		
1.18	60.6		
0.600	54.3		
0.425	51.2		
0.300	48		
0.212	44.2		
0.150	40		
0.063	33		

Cobbles, %	0
Gravel, %	36
Sand, %	31
Clay / Silt, %	33



Client :	EP Lynam Properties / Carroll Estates
Project :	Broomfield, Malahide - North Site

Lab. No :	21/223
Sample No :	PM11

Hole ID :	TP 02
Depth, m :	1.00

Material description :	slighty sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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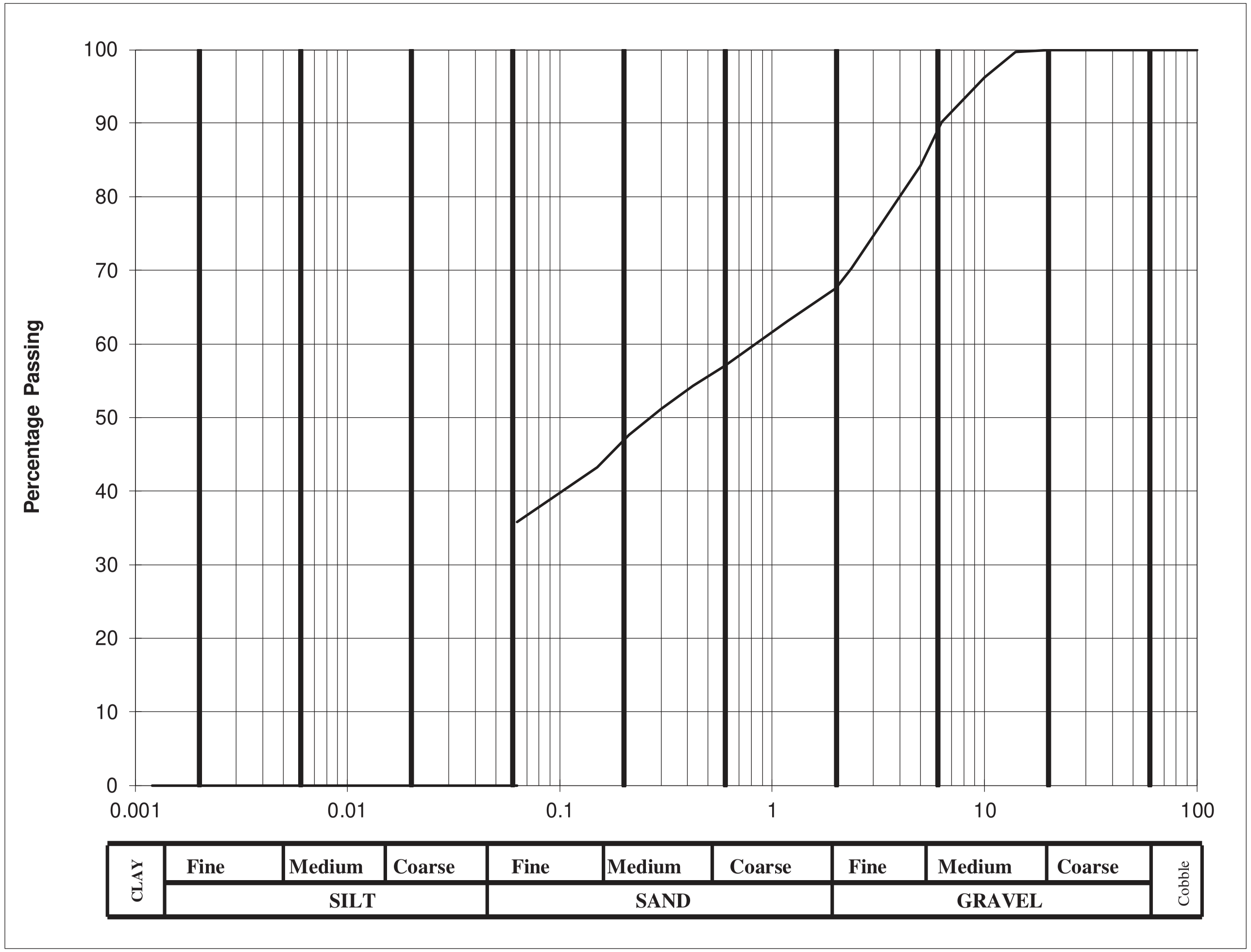
Paddy McGonagle
Site Investigations Ltd

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis Diameter, mm	Hydrometer analysis % passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	100		
14	99.7		
10	96.2		
6.3	90.1		
5.0	84.2		
2.36	70.3		
2.00	67.6		
1.18	63.1		
0.600	57		
0.425	54.3		
0.300	51.2		
0.212	47.6		
0.150	43.2		
0.063	36		

Cobbles, %	0
Gravel, %	32
Sand, %	32
Clay / Silt, %	36



Client :	EP Lynam Properties / Carroll Estates		Lab. No :	21/224		Hole ID :	TP 03
Project :	Broomfield, Malahide - North Site		Sample No :	PM14		Depth, m :	1.00

Material description :	slighty sandy slighty gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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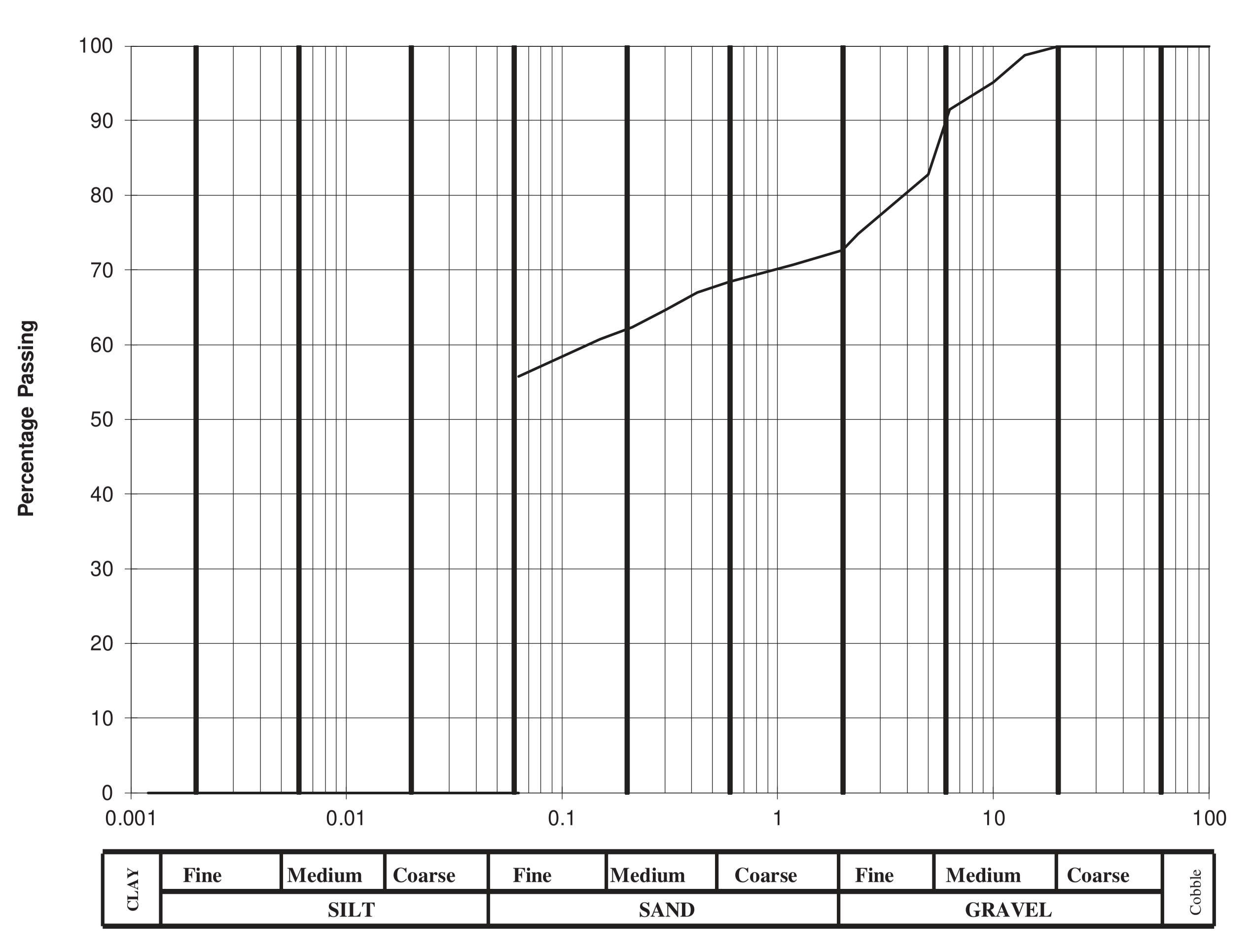
Site Investigations Ltd

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	100		
14	98.7		
10	95.1		
6.3	91.5		
5.0	82.8		
2.36	74.8		
2.00	72.6		
1.18	70.7		
0.600	68.4		
0.425	67		
0.300	64.6		
0.212	62.3		
0.150	60.7		
0.063	56		

Cobbles, %	0
Gravel, %	27
Sand, %	17
Clay / Silt, %	56



Client :	EP Lynam Properties / Carroll Estates	Lab. No :	21/225	Hole ID :	TP 04
Project :	Broomfield, Malahide - North Site	Sample No :	PM03	Depth, m :	1.00

Material description :	slighty sandy slighty gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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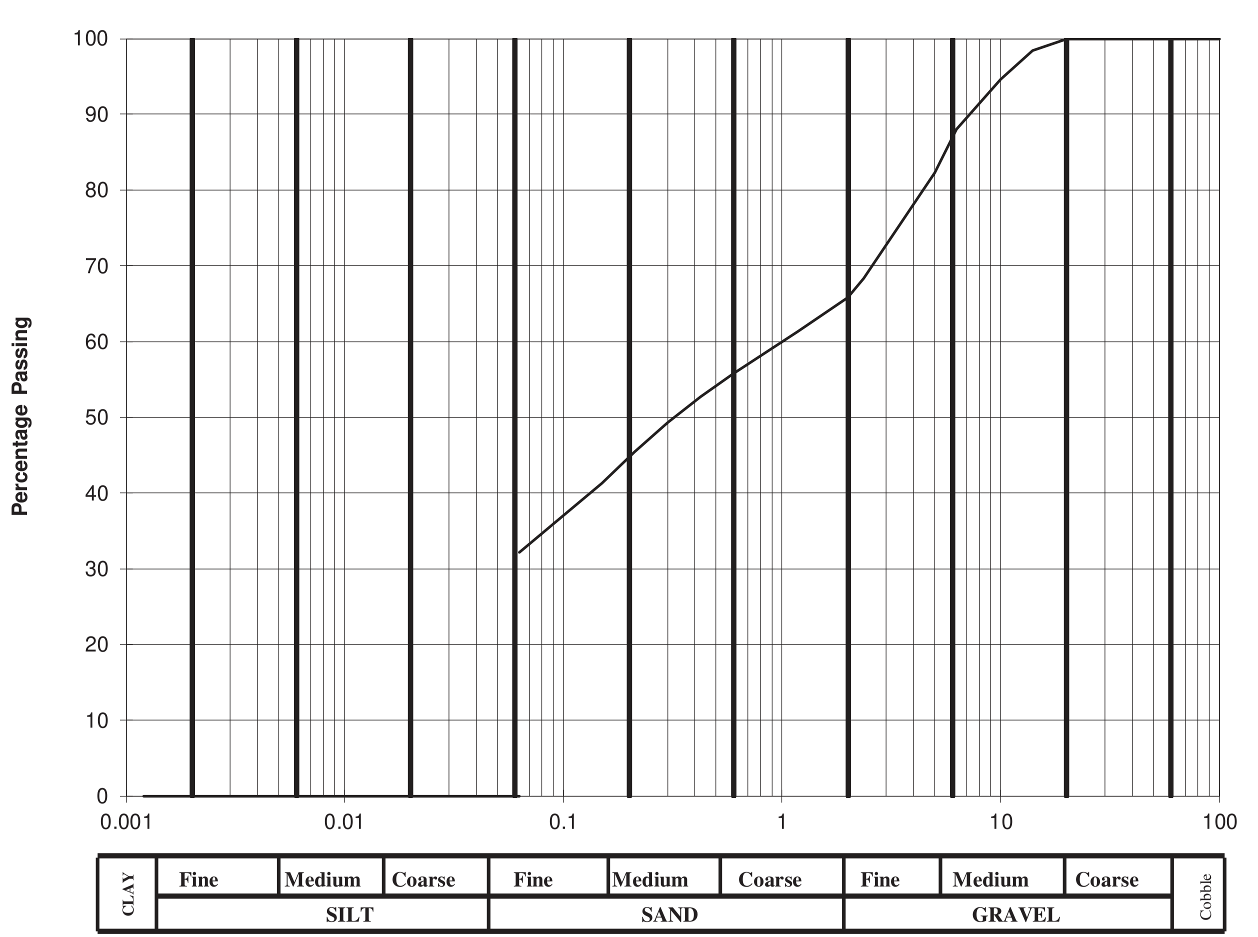
BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	100		
14	98.4		
10	94.6		
6.3	88		
5.0	82.3		
2.36	68.3		
2.00	65.8		
1.18	61.3		
0.600	55.7		
0.425	52.7		
0.300	49.3		
0.212	45.4		
0.150	41.3		
0.063	32		

Cobbles, %	0
Gravel, %	34
Sand, %	34
Clay / Silt, %	32



Client :	EP Lynam Properties / Carroll Estates
Project :	Broomfield, Malahide - North Site

Lab. No :	21/226
Sample No :	PM08

Hole ID :	TP 05
Depth, m :	1.00

Material description :	slighty sandy slighty gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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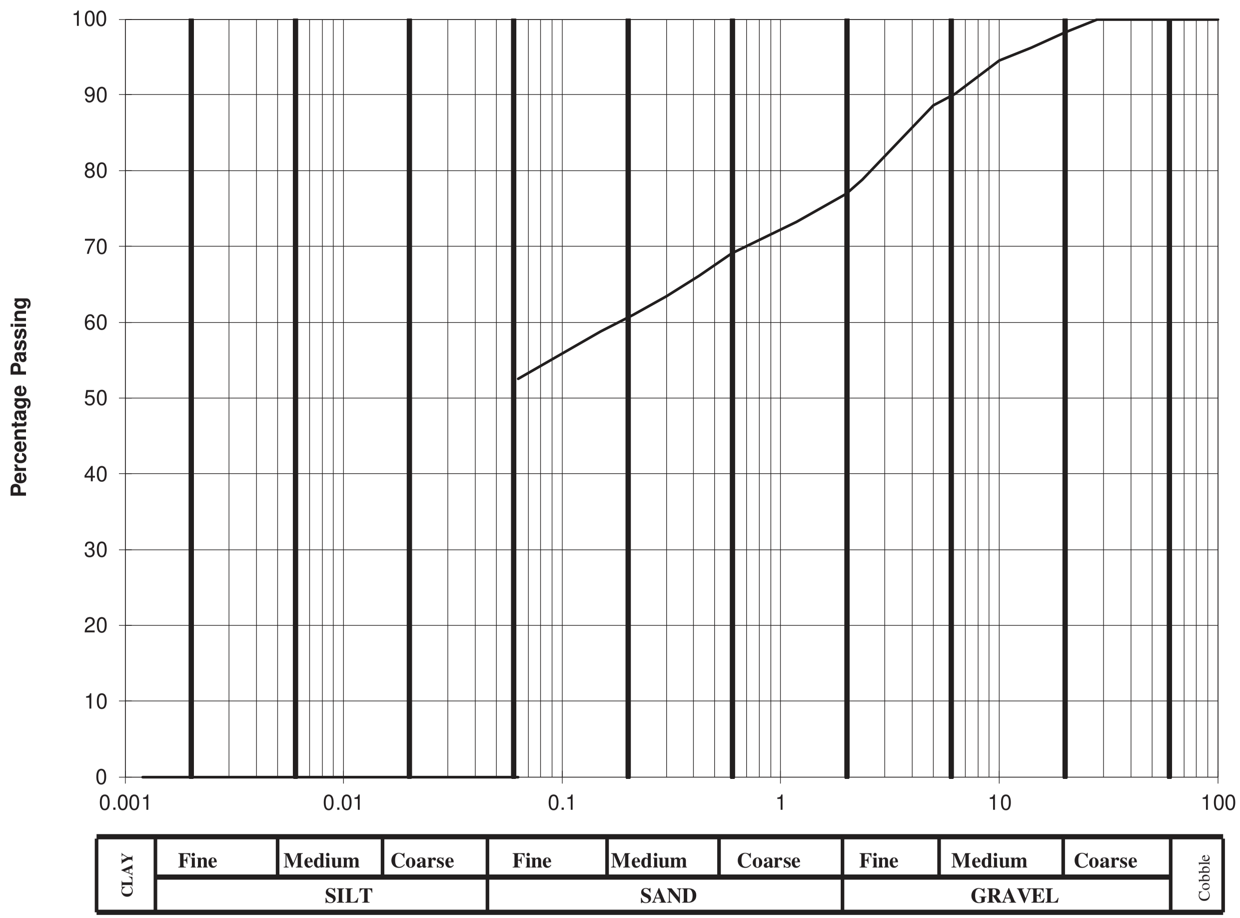
BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	98.2		
14	96.2		
10	94.5		
6.3	90.1		
5.0	88.6		
2.36	78.8		
2.00	76.9		
1.18	73.2		
0.600	69.1		
0.425	66.1		
0.300	63.4		
0.212	61		
0.150	58.8		
0.063	53		

Cobbles, %	0
Gravel, %	23
Sand, %	24
Clay / Silt, %	53



Client :	EP Lynam Properties / Carroll Estates
Project :	Broomfield, Malahide - North Site

Lab. No :	21/227
Sample No :	PM06

Hole ID :	TP 06
Depth, m :	1.00

Material description :	slighty sandy slighty gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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Site Investigations Ltd

Appendix 4

Survey Data

Survey Data

Location	Irish Transverse Mercator		Elevation	Irish National Grid	
	Easting	Northing		Easting	Northing
Trial Pits					
TP01	722388.040	745003.074	17.33	322463.709	244979.195
TP02	722272.729	744716.671	12.34	322348.376	244692.730
TP03	722386.766	744709.925	13.42	322462.438	244685.983
TP04	722298.495	744833.799	16.34	322374.146	244809.883
TP05	722277.722	744793.371	15.06	322353.369	244769.446
TP06	722315.322	744744.236	13.39	322390.978	244720.301

Contract No:	5798A	Client:	EP Lynam Properties / Carroll Estates
Contract:	Broomfield - North Site	Engineer:	Waterman Moylan
Location:	Back Road, Malahide, Co. Dublin	Scale:	1:2000
Title:	Site Plan	Drawn By:	SL

Legend Key

Locations By Type - TP

S.I. Ltd Contract No: 5798B

Client:	EP Lynam Properties / Carroll Estates
Engineer:	Waterman Moylan
Contractor:	Site Investigations Ltd

Broomfield – South Site,
Kinsealy Lane, Malahide, Co. Dublin
Site Investigation

Prepared by:

....

Stephen Letch

Issue Date:	29/03/2021
Status	Final
Revision	1

Contents: Page No.

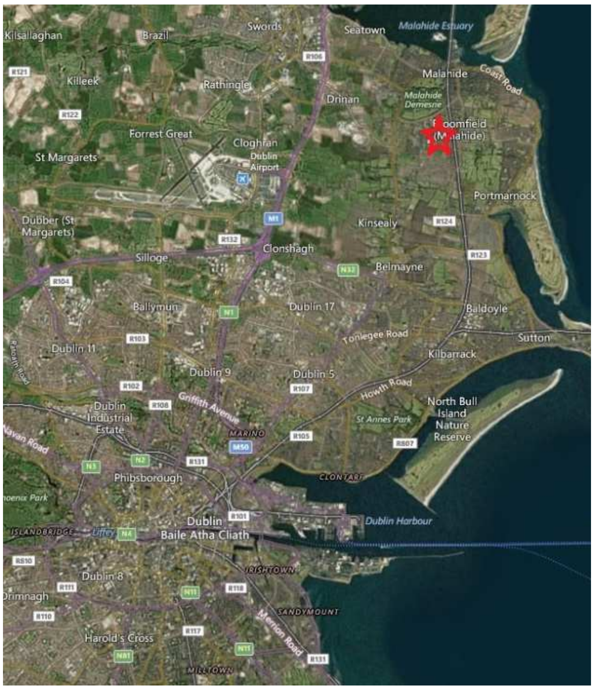
Appendices:

1. Introduction

On the instructions of Waterman Moylan, Site Investigations Ltd (SIL) were appointed to complete a site investigation at Broomfield, Malahide, Co. Dublin. The investigation was completed over two areas of the residential development, one on Back Road and one on Kinsealy Lane. The sites have been separated and this report covers the Kinsealy Lane site. The investigation was completed in March 2021 on behalf of the client, EP Lynam Properties and Carroll Estates.

2. Site Location

The site is located on the Kinsealy Lane, Malahide, Co. Dublin to the north of Dublin city. The map on the left shows the location of Malahide to the north of Dublin city and the second map shows the two site locations, with Back Road in red and Kinsealy Lane in green.



3. Fieldwork

The fieldworks comprised a programme of trial pits and soakaway tests. All fieldwork was carried out in accordance with Eurocode 7: Geotechnical Design and IEI Specification & Related Documents for Ground Investigation in Ireland (2006).

The fieldworks comprised the following:

- 6 No. trial pits with 3 No. soakaway tests

3.1. Trial Pits

6 No. trial pits were excavated using a tracked excavator. The pits were logged and photographed by SIL geotechnical engineer and representative disturbed bulk samples were recovered as the pits were excavated. TP04 was terminated at the scheduled depth of 3.00mbgl whilst the remaining five pits terminated at depths ranging from 1.30mbgl to 2.60mbgl when boulder obstructions were encountered. The trial pits were backfilled with the arisings immediately upon completion.

The trial pit logs and photographs are presented in Appendix 1.

3.2. Soakaway Tests

At TP01 to TP03, soakaway tests were completed, at 2.10mbgl in TP01 and at the base of the pits in TP02 (1.60mbgl) and TP03 (1.30mbgl). The soakaway test is used to identify possible areas for storm water drainage. The pit is filled with water and the level of the groundwater recorded over time. As stipulated by BRE Special Digest 365, the pit should be filled three times and that the final cycle is used to provide the infiltration rate. The time taken for the water level to fall from 75% volume to 25% volume is required to calculate the rate of infiltration. However, if the water level does not fall at a steady rate then the test is deemed to have failed and the area is unsuitable for storm water drainage.

The test results are provided in Appendix 2.

3.3. Surveying

Following completion of all the fieldworks, a survey of the exploratory hole locations was completed using a GeoMax GPS Rover. The data is supplied on each individual log and along with a site plan in Appendix 4.

4. Laboratory Testing

Geotechnical laboratory testing was completed on representative soil samples in accordance with BS 1377 (1990). Testing included:

- 6 No. Moisture contents
- 6 No. Atterberg limits
- 6 No. Particle size gradings

The geotechnical laboratory test results are presented in Appendix 3.

5. Ground Conditions

5.1. Overburden

The natural ground conditions are consistent across the site with cohesive firm brown slightly sandy slightly gravelly silty CLAY with medium cobble overlying stiff brown grey or black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

These natural soils are over-consolidated lodgement till which is encountered across the North Dublin region with several papers discussing the engineering characteristics of the soil. The brown grey soils are the weathered surface of the underlying black clays and the gravel and cobbles are generally subrounded to subangular and predominantly limestone in origin.

The laboratory tests of the shallow cohesive soils confirm that CLAY soils dominate the site with low to intermediate plasticity indices of 14 to 16% recorded. The particle size distribution curve showed poorly sorted straight-line curves with 32% to 56% fines content.

5.2. Groundwater

Groundwater details in the trial pits during the fieldworks are noted on the logs in Appendix 1. Groundwater was ingressed into TP01 at 2.00mbgl and TP03 at 1.20mbgl and were recorded as medium ingresses. The remaining trial pits remained dry during excavation.

6. Recommendations and Conclusions

Please note the following caveats:

The recommendations given, and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between the exploratory hole locations or below the final level of excavation, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for adjacent unexpected conditions that have not been revealed by the exploratory holes. It is further recommended that all bearing surfaces when excavated should be inspected by a suitably qualified Engineer to verify the information given in this report.

Excavated surfaces in clay strata should be kept dry to avoid softening prior to foundation placement. Foundations should always be taken to a minimum depth of 0.50mBGL to avoid the effects of frost action and possible seasonal shrinkage/swelling.

If it is intended that on-site materials are to be used as fill, then the necessary laboratory testing should be specified by the Client to confirm the suitability. Also, relevant lab testing should be specified where stability of side slopes to excavations is a concern, or where contamination may be an issue.

6.1. Foundations

Due to the unknown depth of foundation and no longer-term groundwater information, this analysis assumes the groundwater will not influence the construction or performance of these foundations.

No numerical test data was completed as part of this investigation but the historical data from the numerous papers completed on these Dublin CLAYs would indicate an allowable bearing capacity range of 125kN/m^2 to 150kN/m^2 in the firm brown CLAY. This increases to between 250kN/m^2 to 300kN/m^2 when the stiff brown grey or black CLAY is encountered.

If large bearing capacities are required for the proposed structures then further investigation with SPT N-values or dynamic probe N_{100} values would be recommended.

The following assumptions were made as part of these analyses. If any of these assumptions are not in accordance with detailed design or observations made during construction these recommendations should be re-evaluated.

- The foundation is to be 1m wide.
- Foundations are to be constructed on a level formation of uniform material type (described above).
- All man-made or filled material is to be removed prior to construction.
- The bulk unit weight of the material in this stratum has a minimum density of 19kN/m^3.

The trial pits recorded good pit wall stability but regular inspection of temporary excavations should be completed during construction to ensure that all slopes are stable. Temporary support should be used on any excavation that will be left open for an extended period.

6.2. Groundwater

The caveats below relating to interpretation of groundwater levels should be noted:
There is always considerable uncertainty as to the likely rates of water ingress into excavations in clayey soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water.

Furthermore, water levels noted on the borehole and trial pit logs do not generally give an accurate indication of the actual groundwater conditions as the borehole or trial pit is rarely left open for sufficient time for the water level to reach equilibrium.

Also, during boring procedures, a permeable stratum may have been sealed off by the borehole casing, or water may have been added to aid drilling. Therefore, an extended period of groundwater monitoring using any constructed standpipes is required to provide more accurate *information regarding groundwater conditions. Finally, groundwater levels vary with time of year, rainfall, nearby construction and tides.*

Pumping tests would be required to determine likely seepage rates and persistence into excavations taken below the groundwater level. Deep trial pits also aid estimation of seepage rates.

Medium groundwater ingresses were recorded in TP01 and TP03 during the fieldworks period. There is always considerable uncertainty as to the likely rates of water ingress into excavations in cohesive soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water. However, based on this information at the exploratory hole locations to date, it is considered likely that any shallow ingress into excavations of the CLAY will be slow to medium.

If localised granular soils are encountered in shallow excavations, then the possibility of water ingressing into an excavation increase with higher ingress rates.

Finally, if groundwater is encountered during excavations then mechanical pumps will be required to remove the groundwater from sumps. Sumps should be carefully located and constructed to ensure that groundwater is efficiently removed from excavations and trenches.

6.3. Soakaway Design

The soakaway test at TP02 recorded no infiltration and therefore, failed the specification. The pits at TP01 and TP03 encountered ingresses during excavation and the water level rose during testing.

The BRE Digest stipulates that the pit should half empty within 24hrs, and extrapolation indicates this condition would not be satisfied. The test was terminated at the end of the first (of a possible three) fill/empty cycle since further testing would give even slower fall rates due to increased soil saturation. The unsuitability of the soils for soakaways is further suggested by the soil descriptions of the materials in this area of the site where the soakaway was completed, i.e., well compacted clay/silt soils.

Appendix 1

Trial Pit Logs and Photographs

Trial Pit Log

Contract No: 5798B				Trial Pit No:	**TP01**
Contract:	Broomfield - South Site	Easting:	721999.052	Date:	18/03/2021
Location:	Kinsealy Lane, Malahide, Co. Dublin	Northing:	744287.661	Excavator:	5T Tracked Excavator
Client:	EP Lynam Properties / Carroll Estates	Elevation:	6.10	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	3.00 x 0.50 x 2.60	Status:	FINAL

Level (mbgl) Depth	Stratum Description	Level (mOD) Depth	Samples / Field Tests Depth	Type	Result	Water Strike
	TOPSOIL.					
0.30	Firm brown grey slightly sandy slightly gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded of limestone. Cobbles are subrounded to rounded of limestone.	5.80	1.00	B	PM01	
1.90	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).	4.20	2.00	B	PM02	▼
2.60	Obstruction - possible boulders.	3.50				

Pit terminated at 2.60m

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Obstructions - possible boulders.	Pit walls stable.	2.00 Medium	Soakaway test completed when pit 2.10mbgl.	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Trial Pit Log

Contract No:	Trial Pit Log	Trial Pit No:
5798B		TP02

Contract:	Broomfield - South Site	Easting:	722071.255	Date:	18/03/2021
Location:	Kinsealy Lane, Malahide, Co. Dublin	Northing:	744213.682	Excavator:	5T Tracked Excavator
Client:	EP Lynam Properties / Carroll Estates	Elevation:	6.33	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	2.20 x 0.50 x 1.60	Status:	FINAL

Level (mbgl) Depth	Stratum Description	Legend	Level (mOD) Depth	Samples / Field Tests Depth	Type	Result	Water Strike
	TOPSOIL.						
0.30	Firm brown grey slightly sandy gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded of limestone. Cobbles are subrounded to rounded of limestone.		6.03	1.00	B	PM05	
1.20	Stiff brown grey slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).		5.13	1.50	B	PM06	
1.60	Obstruction - possible boulders.		4.73				

Pit terminated at 1.60m

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Obstructions - possible boulders.	Pit walls stable.	Dry	Soakaway test completed at base of pit.	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Trial Pit Log

Contract No: 5798B				Trial Pit No:	TP03
Contract:	Broomfield - South Site	Easting:	722069.502	Date:	18/03/2021
Location:	Kinsealy Lane, Malahide, Co. Dublin	Northing:	744075.275	Excavator:	5T Tracked Excavator
Client:	EP Lynam Properties / Carroll Estates	Elevation:	4.61	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	2.40 x 0.50 x 1.30	Status:	FINAL

Level (mbgl) Depth	Stratum Description	Level (mOD) Depth	Samples Depth	Type	Result	Water Strike
0.20	TOPSOIL.	4.41				
1.10	Firm brown grey slightly sandy gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded of limestone. Cobbles are subrounded to rounded of limestone.	3.51	1.00	B	PM09	
1.30	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).	3.31	1.20	B	PM10	▼
	Obstruction - possible boulders.					

Pit terminated at 1.30m

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Obstructions - possible boulders.	Pit walls stable.	1.20 Medium	Soakaway test completed at base of pit.	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Trial Pit Log

Contract No: 5798B				Trial Pit No: TP04
Contract:	Broomfield - South Site	Easting: 722051.924	Date:	18/03/2021
Location:	Kinsealy Lane, Malahide, Co. Dublin	Northing: 744291.016	Excavator:	5T Tracked Excavator
Client:	EP Lynam Properties / Carroll Estates	Elevation: 5.89	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m): 3.10 x 0.50 x 3.00	Status:	FINAL

Level (mbgl) Depth	Stratum Description	Legend	Level (mOD) Depth	Samples / Field Tests Depth	Type	Result	Water Strike
	TOPSOIL.						
0.30	Firm brown grey slightly sandy slightly gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded of limestone. Cobbles are subrounded to rounded of limestone.		5.59	1.00	B	PM03	
2.10	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).		3.79	2.50	B	PM04	
3.00	**Pit terminated at 3.00m**		2.89				

Scale (mbgl): 0.5, 1.0, 1.5, 2.0, 2.5
Scale (mOD): 5.5, 5.0, 4.5, 4.0, 3.5, 3.0

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Scheduled depth.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Trial Pit Log

Contract No: 5798B					Trial Pit No: TP05
Contract:	Broomfield - South Site	Easting:	721992.441	Date:	18/03/2021
Location:	Kinsealy Lane, Malahide, Co. Dublin	Northing:	744237.166	Excavator:	5T Tracked Excavator
Client:	EP Lynam Properties / Carroll Estates	Elevation:	6.89	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	2.50 x 0.50 x 1.70	Status:	FINAL

Level (mbgl) Depth	Stratum Description	Level (mOD) Depth	Samples / Field Tests Depth	Type	Result	Water Strike
	TOPSOIL.					
0.30	Firm brown grey slightly sandy slightly gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded of limestone. Cobbles are subrounded to rounded of limestone.	6.59	0.50	B	PM11	
0.90	Stiff grey slightly sandy gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).	5.99	1.00	B	PM12	
1.10	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).	5.79	1.50	B	PM13	
1.70	Obstruction - possible boulders.	5.19				

Pit terminated at 1.70m

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Obstructions - possible boulders.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Trial Pit Log

Contract No: 5798B	Trial Pit Log				Trial Pit No: TP06
Contract:	Broomfield - South Site	Easting:	722023.265	Date:	18/03/2021
Location:	Kinsealy Lane, Malahide, Co. Dublin	Northing:	744153.987	Excavator:	5T Tracked Excavator
Client:	EP Lynam Properties / Carroll Estates	Elevation:	5.99	Logged By:	P. McGonagle
Engineer:	Waterman Moylan	Dimensions (LxWxD) (m):	2.20 x 0.50 x 1.40	Status:	FINAL

Level (mbgl) Depth	Stratum Description	Legend	Level (mOD) Depth	Samples / Field Tests Depth	Type	Result	Water Strike
	TOPSOIL.						
0.30	Firm brown grey slightly sandy gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, subrounded to rounded of limestone. Cobbles are subrounded to rounded of limestone.		5.69	1.00	B	PM07	
1.10	Stiff brown grey slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Cobbles and boulders are angular to subangular of limestone (up to 250mm diameter).		4.89	1.30	B	PM08	
1.40	Obstruction - possible boulders.		4.59				

Pit terminated at 1.40m

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Obstructions - possible boulders.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

TP01 Sidewall

TP01 Spoil

TP02 Sidewall

TP02 Spoil

TP03 Sidewall

TP03 Spoil

TP04 Sidewall

TP04 Spoil

TP05 Sidewall

TP05 Spoil

TP06 Sidewall

TP06 Spoil

Appendix 2

Soakaway Test Results

SOAKAWAY TEST

Project Reference:	5798B
Contract name:	Broomfield - South Site
Location:	Kinsealy Lane, Malahide, Co. Dublin
Test No:	SA01
Date:	19/03/2021

Ground Conditions

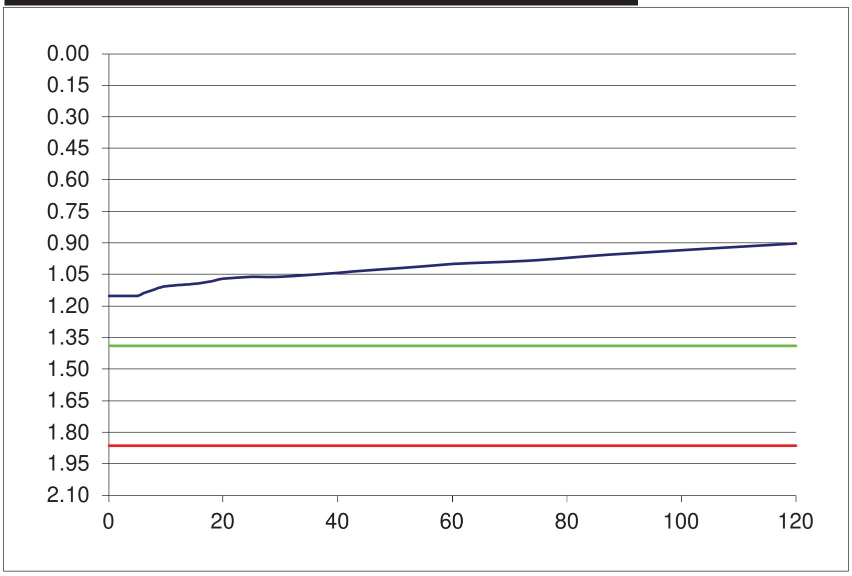
From	To	
0.00	0.30	TOPSOIL.
0.30	1.90	Firm brown grey slightly sandy slightly gravelly silty CLAY with low cobble content.
1.90	2.10	Stiff black slightly sandy slightly gravelly silty CLAY with low cobble and boulder content.

Remarks:

Medium water ingress at 2.00mbgl - water added to pit and water level rises after 6 minutes - unsuitable.

Elapsed Time (mins)	Fall of Water (m)
0	1.15
0.5	1.15
1	1.15
1.5	1.15
2	1.15
2.5	1.15
3	1.15
3.5	1.15
4	1.15
4.5	1.15
5	1.15
6	1.14
7	1.13
8	1.12
9	1.11
10	1.11
12	1.10
14	1.10
16	1.09
18	1.08
20	1.07
25	1.06
30	1.06
40	1.04
50	1.02
60	1.00
75	0.98
90	0.95
120	0.90

Pit Dimensions (m)		
Length (m)	2.80	m
Width (m)	0.90	m
Depth	2.10	m
Water		
Start Depth of Water	1.15	m
Depth of Water	0.95	m
75% Full	1.39	m
25% Full	1.86	m
75%-25%	0.48	m
Volume of water (75%-25%)	**1.20**	m3
Area of Drainage	**15.54**	m2
Area of Drainage (75%-25%)	**6.04**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** or **Fail**

m/min **m/s**

SOAKAWAY TEST

Project Reference:	5798B
Contract name:	Broomfield - South Site
Location:	Kinsealy Lane, Malahide, Co. Dublin
Test No:	SA02
Date:	19/03/2021

Ground Conditions

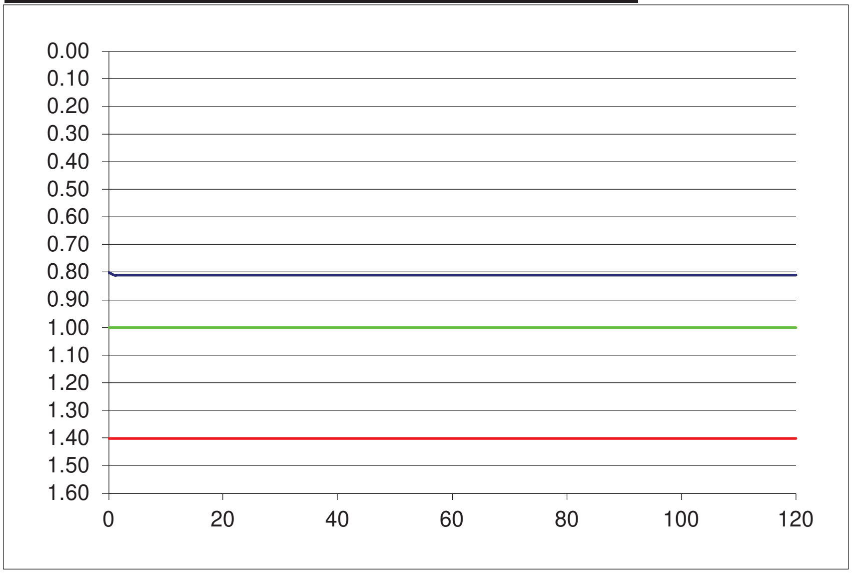
From	To	
0.00	0.30	TOPSOIL.
0.30	1.20	Firm brown grey slightly sandy slightly gravelly silty CLAY with low cobble content.
1.20	1.60	Stiff black slightly sandy slightly gravelly silty CLAY with low cobble and boulder content.

Remarks:

Pit terminated due to boulder obstructions - test completed at base of pit.

Elapsed Time (mins)	Fall of Water (m)
0	0.80
0.5	0.81
1	0.81
1.5	0.81
2	0.81
2.5	0.81
3	0.81
3.5	0.81
4	0.81
4.5	0.81
5	0.81
6	0.81
7	0.81
8	0.81
9	0.81
10	0.81
12	0.81
14	0.81
16	0.81
18	0.81
20	0.81
25	0.81
30	0.81
40	0.81
50	0.81
60	0.81
75	0.81
90	0.81
120	0.81

Pit Dimensions (m)		
Length (m)	2.20	m
Width (m)	0.90	m
Depth	1.60	m
Water		
Start Depth of Water	0.80	m
Depth of Water	0.80	m
75% Full	1.00	m
25% Full	1.40	m
75%-25%	0.40	m
Volume of water (75%-25%)	**0.79**	m3
Area of Drainage	**9.92**	m2
Area of Drainage (75%-25%)	**4.46**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** or **Fail**

m/min **m/s**

SOAKAWAY TEST

Project Reference:	5798B
Contract name:	Broomfield - South Site
Location:	Kinsealy Lane, Malahide, Co. Dublin
Test No:	SA03
Date:	19/03/2021

Ground Conditions

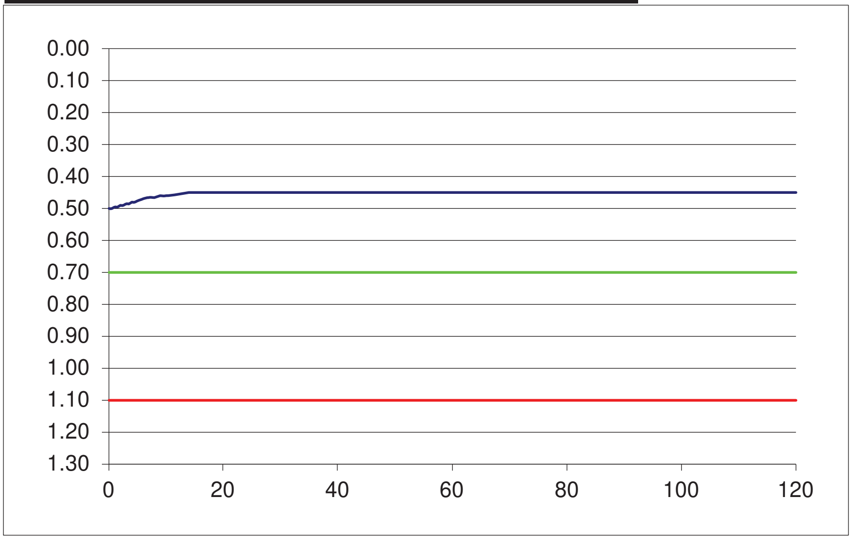
From	To	
0.00	0.20	TOPSOIL.
0.20	1.10	Firm brown grey slightly sandy slightly gravelly silty CLAY with low cobble content.
1.10	1.30	Stiff black slightly sandy slightly gravelly silty CLAY with low cobble and boulder content.

Remarks:

Pit terminated due to boulder obstructions - test completed at base of pit.
Medium water ingress at 1.20mbgl - water added to pit and water level rises after 1.5 minutes - unsuitable.

Elapsed Time (mins)	Fall of Water (m)
0	0.50
0.5	0.50
1	0.50
1.5	0.50
2	0.49
2.5	0.49
3	0.49
3.5	0.49
4	0.48
4.5	0.48
5	0.48
6	0.47
7	0.47
8	0.47
9	0.46
10	0.46
12	0.46
14	0.45
16	0.45
18	0.45
20	0.45
25	0.45
30	0.45
40	0.45
50	0.45
60	0.45
75	0.45
90	0.45
120	0.45

Pit Dimensions (m)		
Length (m)	2.40	m
Width (m)	0.90	m
Depth	1.30	m
Water		
Start Depth of Water	0.50	m
Depth of Water	0.80	m
75% Full	0.70	m
25% Full	1.10	m
75%-25%	0.40	m
Volume of water (75%-25%)	**0.86**	m3
Area of Drainage	**8.58**	m2
Area of Drainage (75%-25%)	**4.80**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** m/min or **Fail** m/s

Appendix 3

Geotechnical Laboratory Test Results

Classification Tests in accordance with BS1377: Part 4

Client	EP Lynam Properties / Carroll Estates
Site	Broomfield, Malahide - South Site
S.I. File No	5798B / 21
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email info@siteinvestigations.ie
Report Date	24th March 2021

Hole ID	Depth	Sample No	Lab Ref No.	Sample Type	Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Plastic Index %	Min. Dry Density Mg/m^3	Particle Density Mg/m^3	% passing 425um	Comments	**Remarks** **C**=Clay; **M**=Silt **Plasticity**: **L**=Low; **I**=Intermediate; **H**=High; **V**=Very High; **E**=Extremely High
TP01	1.00	PM01	21/228	B	18.2	38	20	18			81.9		CI
TP02	1.00	PM05	21/229	B	12.8	32	19	13			39.5		CL
TP03	1.00	PM09	21/230	B	17.2	32	20	12			52.9		CL
TP04	1.00	PM03	21/231	B	19.3	37	21	16			83.0		CI
TP05	1.00	PM12	21/232	B	12.3	32	18	14			36.2		CL
TP06	1.00	PM07	21/233	B	11.1	33	19	14			41.7		CL

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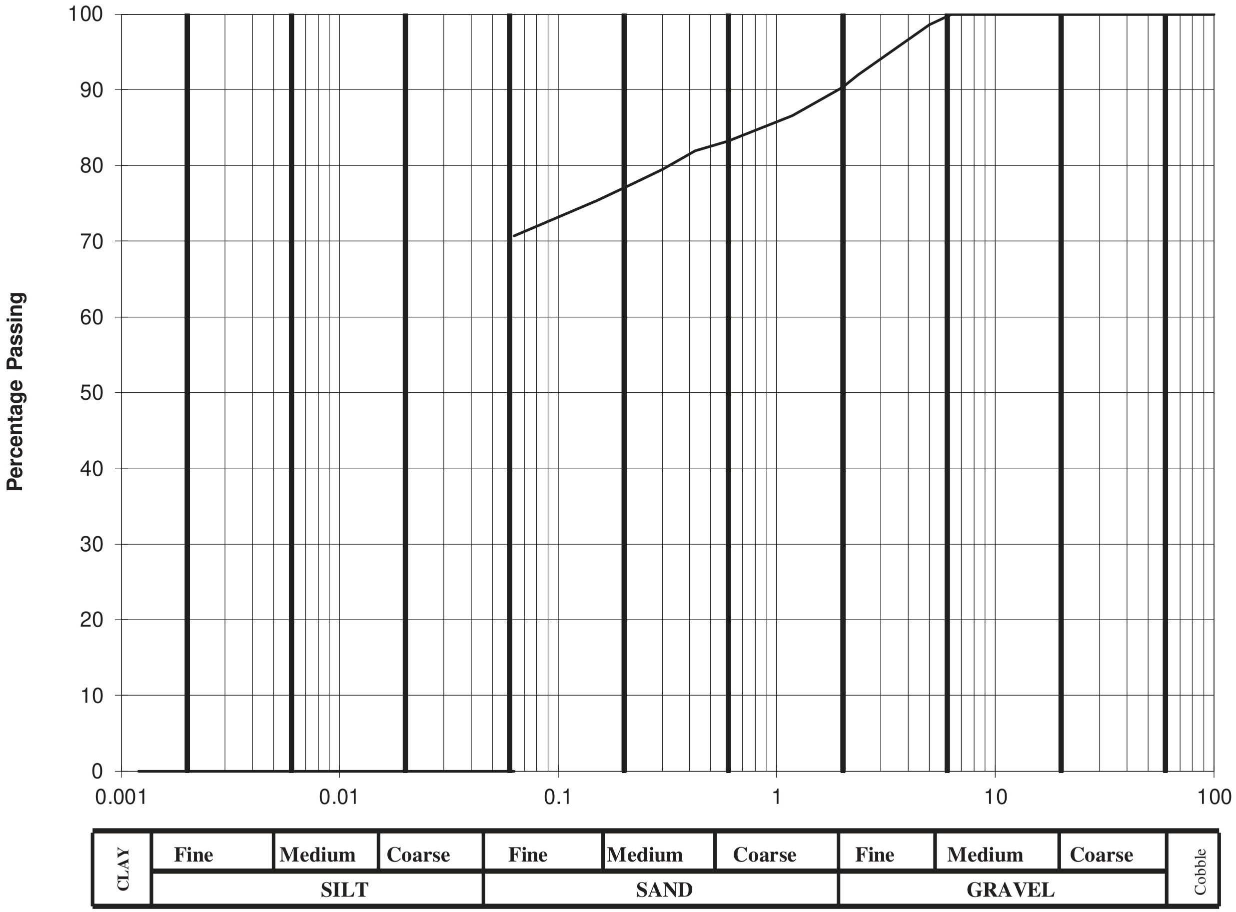
BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis Diameter, mm	Hydrometer analysis % passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	98.6		
2.36	92		
2.00	90.3		
1.18	86.6		
0.600	83.2		
0.425	81.9		
0.300	79.5		
0.212	77.4		
0.150	75.3		
0.063	71		

Cobbles, %	0
Gravel, %	10
Sand, %	19
Clay / Silt, %	71



Client :	EP Lynam Properties / Carroll Estates
Project :	Broomfield, Malahide - South Site

Lab. No :	21/228
Sample No :	PM01

Hole ID :	TP 01
Depth, m :	1.00

Material description :	slighty sandy slighty gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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BS 1377 Particle Size Analysis

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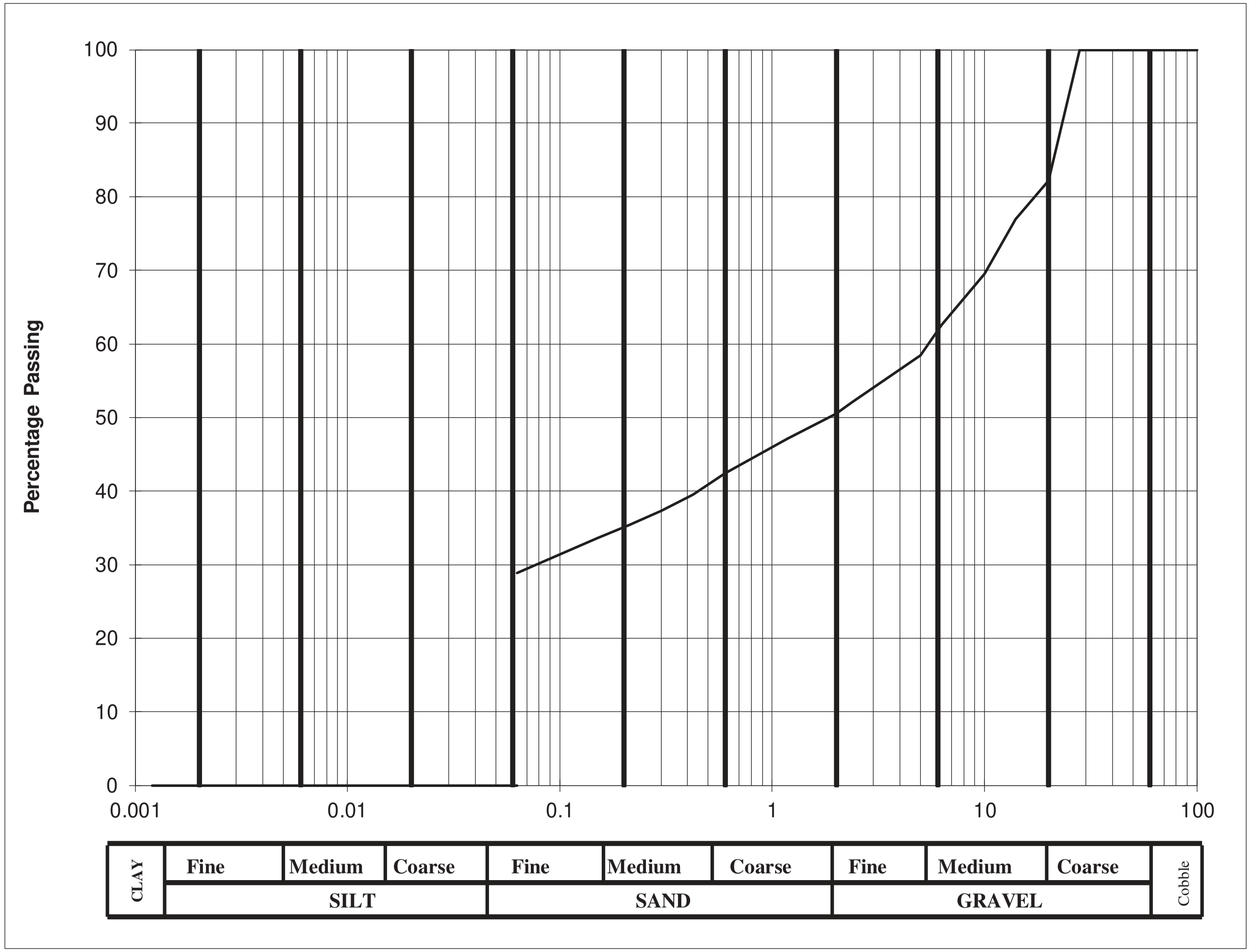
BS Sieve size, mm	Percent passing	Hydrometer analysis Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	82.2		
14	76.9		
10	69.5		
6.3	62.6		
5.0	58.4		
2.36	52		
2.00	50.5		
1.18	47.1		
0.600	42.4		
0.425	39.5		
0.300	37.3		
0.212	35.4		
0.150	33.6		
0.063	29		

Cobbles, %	0
Gravel, %	50
Sand, %	22
Clay / Silt, %	29



Client :	EP Lynam Properties / Carroll Estates
Project :	Broomfield, Malahide - South Site

Lab. No :	21/229
Sample No :	PM05

Hole ID :	TP 02
Depth, m :	1.00

Material description :	slighty sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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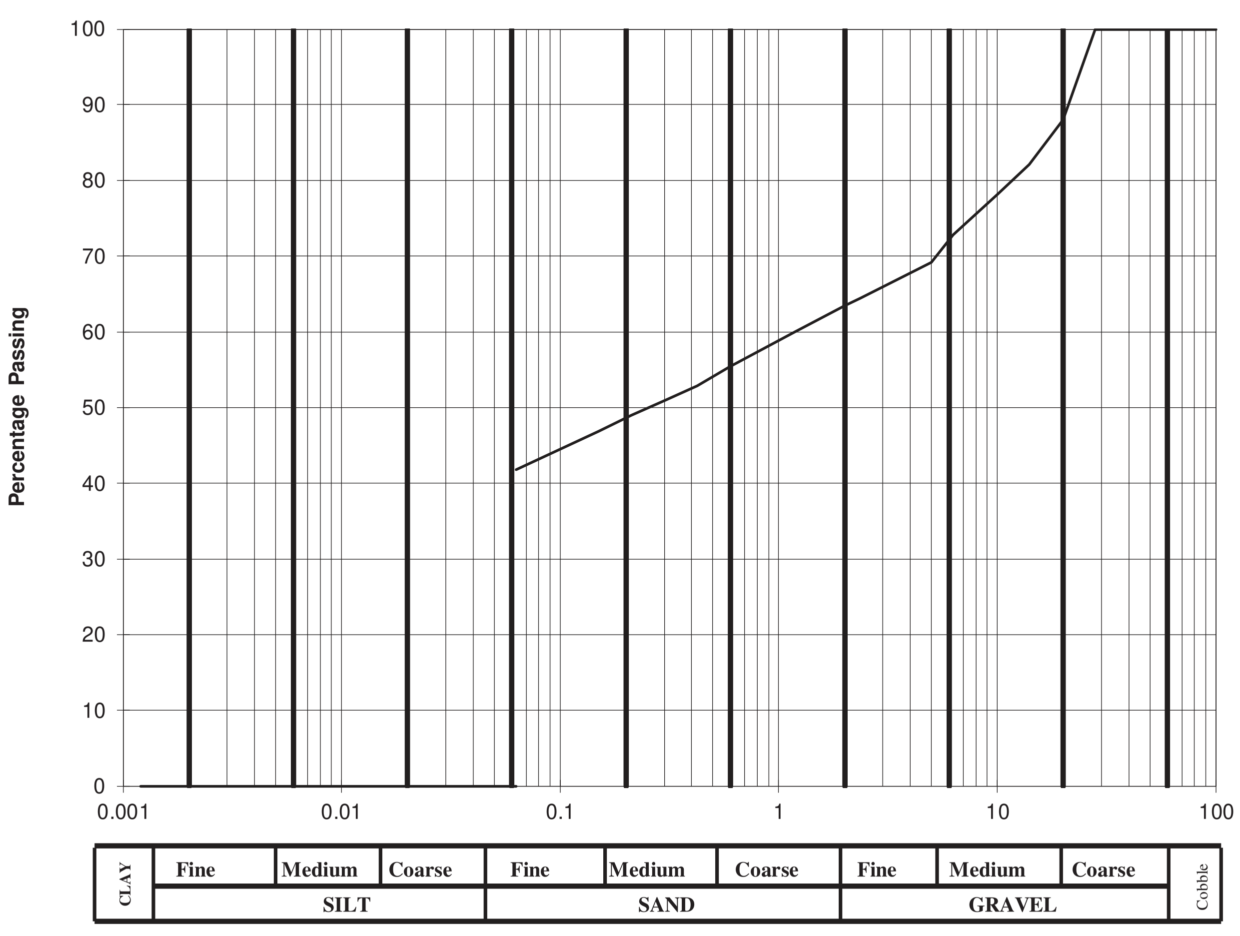
BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis: Diameter, mm	Hydrometer analysis: % passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	88		
14	82.1		
10	78.1		
6.3	72.8		
5.0	69.2		
2.36	64.4		
2.00	63.4		
1.18	60		
0.600	55.4		
0.425	52.9		
0.300	50.9		
0.212	49		
0.150	46.9		
0.063	42		

Cobbles, %	0
Gravel, %	37
Sand, %	21
Clay / Silt, %	42



Client :	EP Lynam Properties / Carroll Estates
Project :	Broomfield, Malahide - South Site

Lab. No :	21/230
Sample No :	PM09

Hole ID :	TP 03
Depth, m :	1.00

Material description :	slighty sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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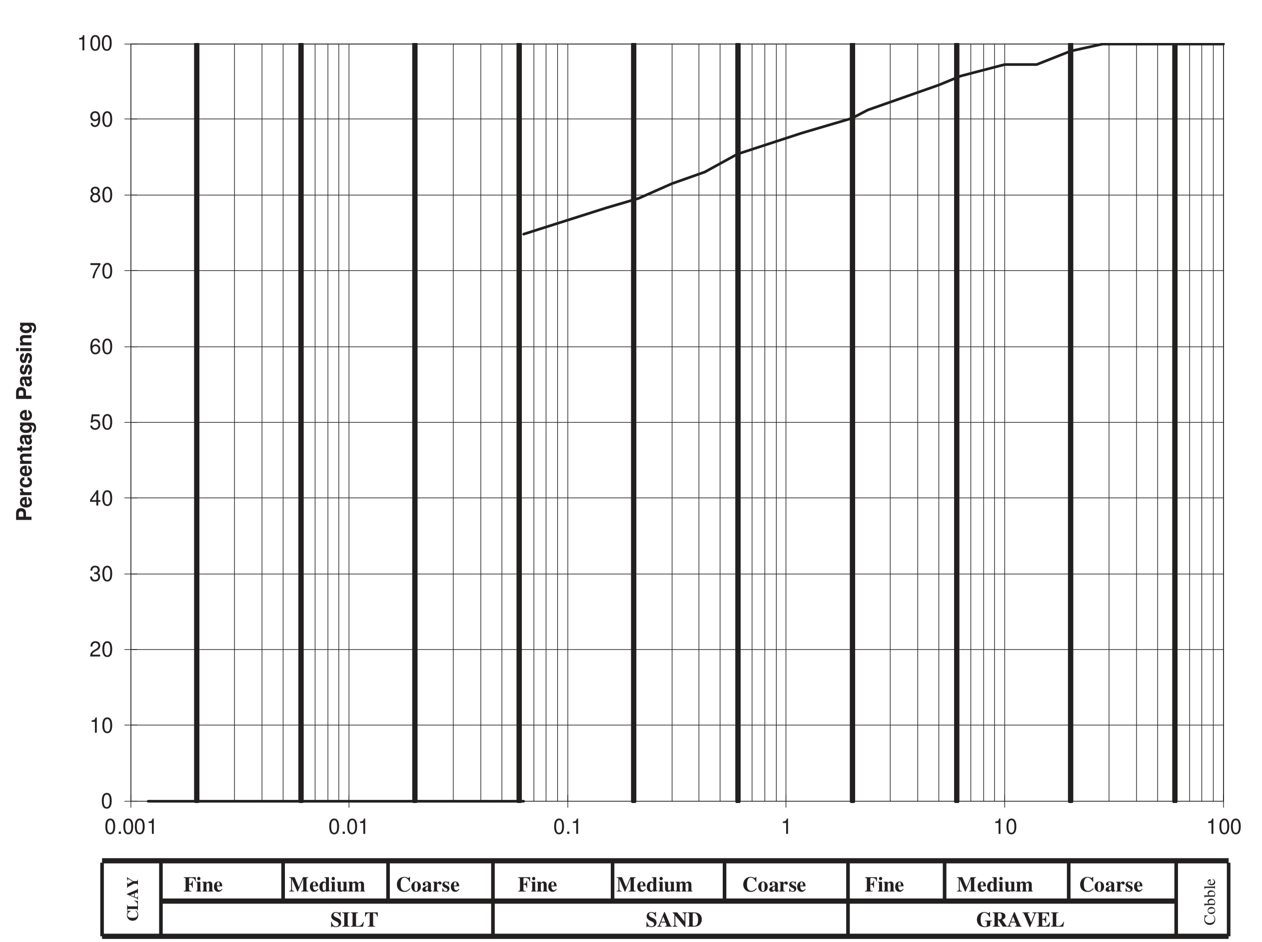
BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	99		
14	97.2		
10	97.2		
6.3	95.7		
5.0	94.5		
2.36	91.2		
2.00	90.1		
1.18	88.2		
0.600	85.4		
0.425	83		
0.300	81.5		
0.212	79.6		
0.150	78.3		
0.063	75		

Cobbles, %	0
Gravel, %	10
Sand, %	15
Clay / Silt, %	75



Client :	EP Lynam Properties / Carroll Estates	Lab. No :	21/231	Hole ID :	TP 04
Project :	Broomfield, Malahide - South Site	Sample No :	PM03	Depth, m :	1.00

Material description :	slighty sandy slighty gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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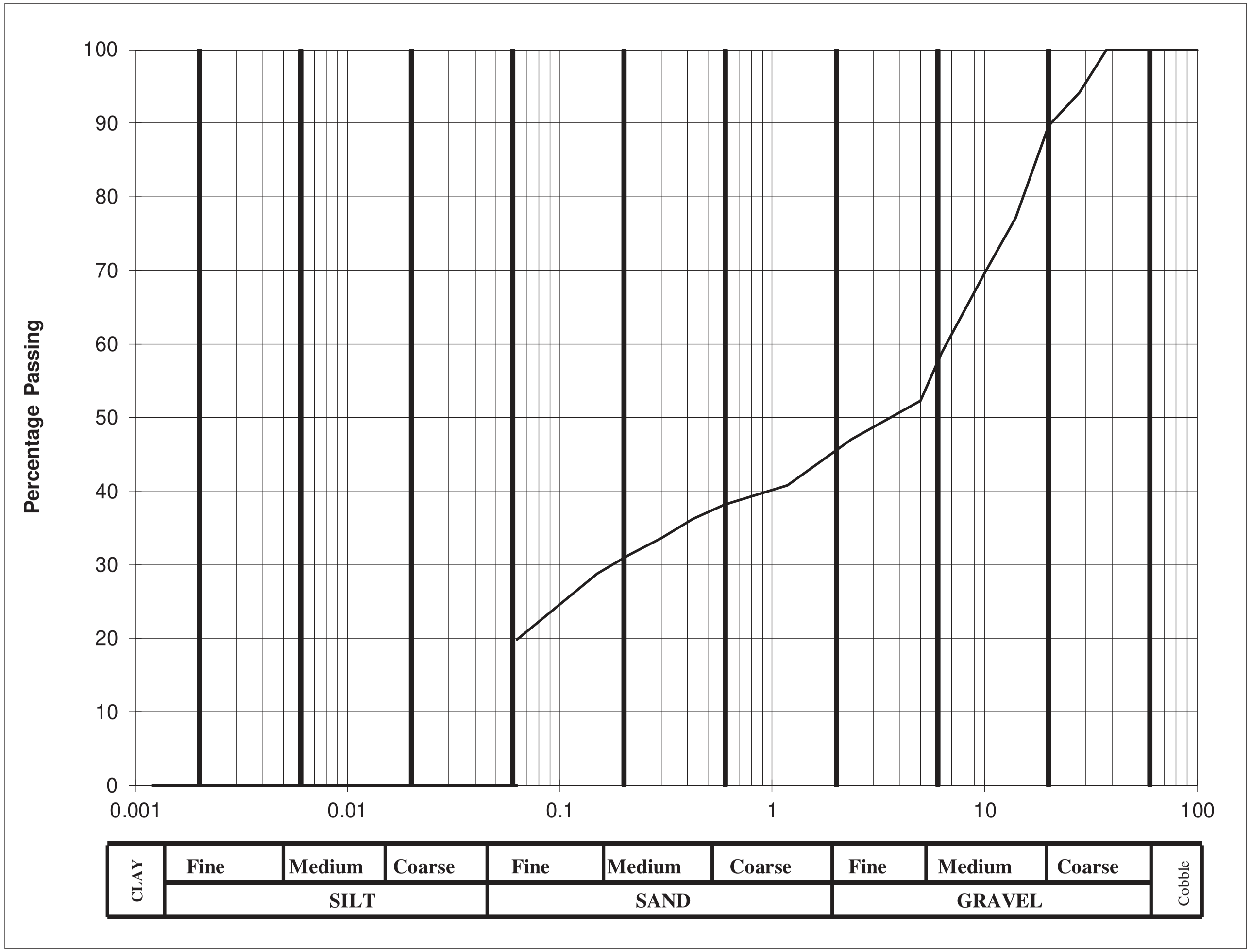
BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis Diameter, mm	Hydrometer analysis % passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	94.2		
20	89.6		
14	77.1		
10	69.6		
6.3	58.8		
5.0	52.3		
2.36	47		
2.00	45.5		
1.18	40.8		
0.600	38.2		
0.425	36.2		
0.300	33.6		
0.212	31.3		
0.150	28.8		
0.063	20		

Cobbles, %	0
Gravel, %	55
Sand, %	26
Clay / Silt, %	20



Client :	EP Lynam Properties / Carroll Estates	Lab. No :	21/232	Hole ID :	TP 05
Project :	Broomfield, Malahide - South Site	Sample No :	PM12	Depth, m :	1.00

Material description :	slighty sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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BS 1377 Particle Size Analysis

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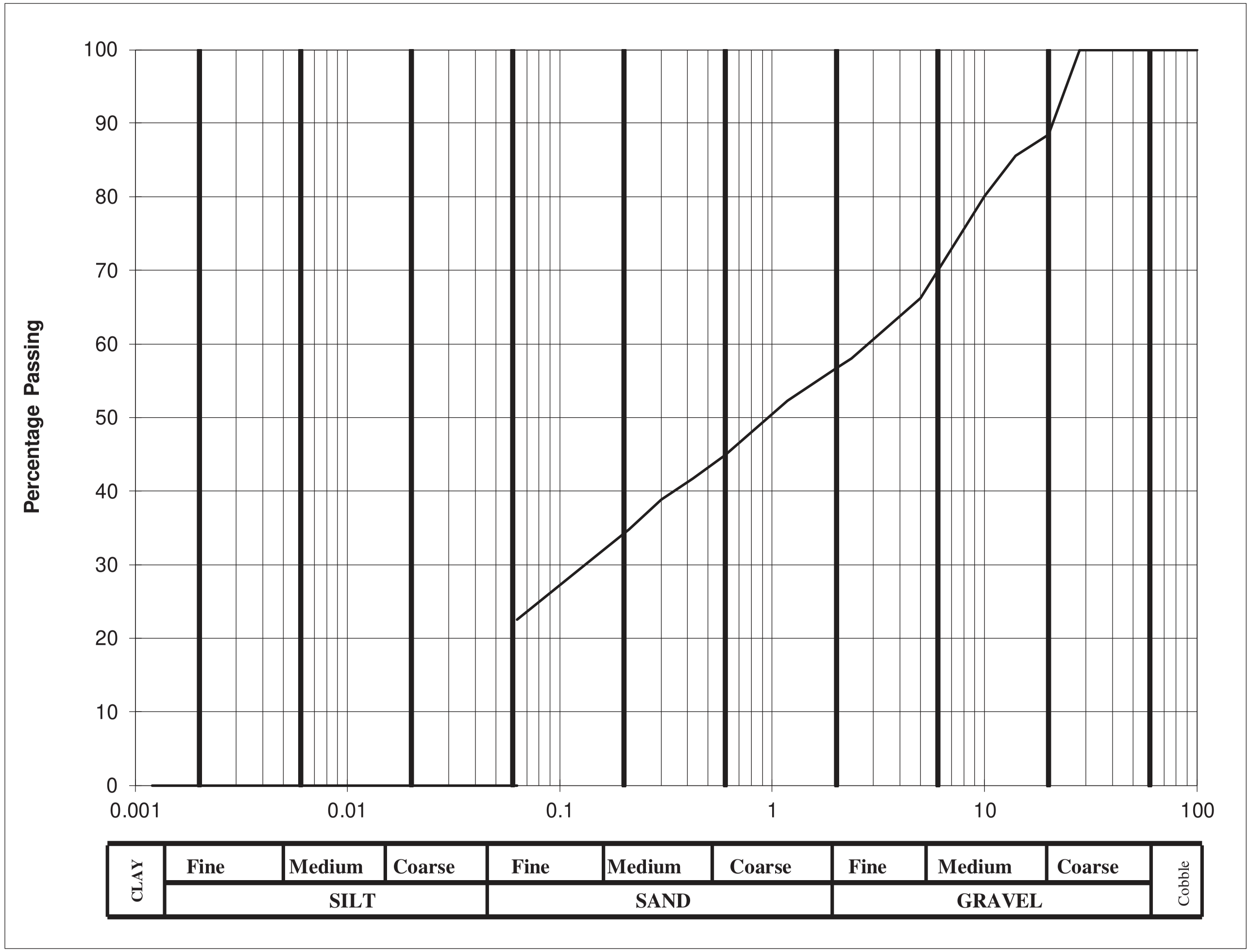
BS Sieve size, mm	Percent passing	Hydrometer analysis Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	88.4		
14	85.6		
10	80.1		
6.3	70.8		
5.0	66.2		
2.36	58		
2.00	56.7		
1.18	52.3		
0.600	44.8		
0.425	41.7		
0.300	38.8		
0.212	34.8		
0.150	31.3		
0.063	23		

Cobbles, %	0
Gravel, %	43
Sand, %	34
Clay / Silt, %	23



Client :	EP Lynam Properties / Carroll Estates
Project :	Broomfield, Malahide - South Site

Lab. No :	21/233
Sample No :	PM07

Hole ID :	TP 06
Depth, m :	1.00

Material description :	slighty sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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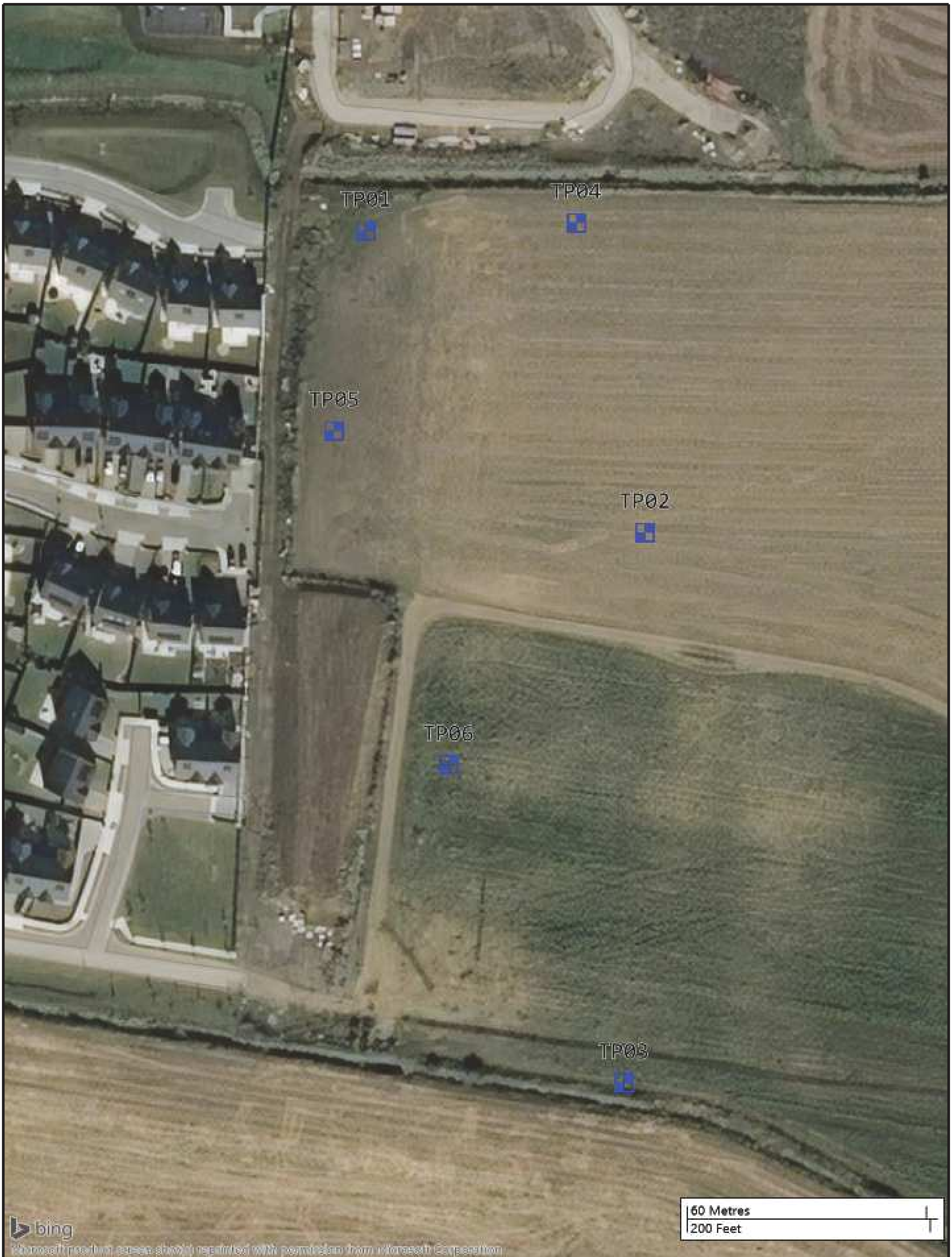
Appendix 4

Survey Data

Survey Data

Location	Irish Transverse Mercator		Elevation	Irish National Grid	
	Easting	Northing		Easting	Northing
Trial Pits					
TP01	721999.052	744287.661	6.10	322074.645	244263.625
TP02	722071.255	744213.682	6.33	322146.865	244189.630
TP03	722069.502	744075.275	4.61	322145.113	244051.193
TP04	722051.924	744291.016	5.89	322127.529	244266.981
TP05	721992.441	744237.166	6.89	322068.034	244213.119
TP06	722023.265	744153.987	5.99	322098.865	244129.922



	Contract No:	5798B	Client:	EP Lynam Properties / Carroll Estates	Legend Key
	Contract:	Broomfield - South Site	Engineer:	Waterman Moylan	Locations By Type - TP
	Location:	Kinsealy Lane, Malahide, Co. Dublin	Scale:	1:1250	
	Title:	Site Plan	Drawn By:	SL	

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Ground Investigations Ireland

Back Road Malahide

Cladwell Estates

Waste Classification Report

April 2020

Directors: Fergal McNamara (MD), James Lombard, Conor Finnerty, Aisling McDonnell & Barry Sexton
Ground Investigations Ireland Limited | Registered in Ireland Company Regsitration No.: 405726

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DOCUMENT CONTROL SHEET

Project Title	Back Road Malahide
Client	Cladwell Estates
Project No	9527-03-20
Document Title	Waste Classification Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Final	P Moloney	B Sexton	B Sexton	Dublin	09 April 2020

Ground Investigations Ireland Ltd. present the results of the fieldworks and laboratory testing in accordance with the specification and related documents provided by or on behalf of the client. The possibility of variation in the ground and/or groundwater conditions between or below exploratory locations or due to the investigation techniques employed must be taken into account when this report and the appendices inform designs or decisions where such variation may be considered relevant. Ground and/or groundwater conditions may vary due to seasonal, man-made or other activities not apparent during the fieldworks and no responsibility can be taken for such variation. The data presented and the recommendations included in this report and associated appendices are intended for the use of the client and the client's geotechnical representative only and any duty of care to others is excluded unless approved in writing.

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CONTENTS

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LIST OF TABLES

APPENDICES

1.0 Preamble

Ground Investigations Ireland (GII) was appointed by Cladwell Estates to carry out a Waste Classification assessment for a proposed residential development in Malahide, Co. Dublin. All site investigation works were carried out under the supervision of a GII Geo-Environmental Engineer. The site investigation works were completed in March 2020.

2.0 Purpose & Scope

The site in question has been the subject of backfilling with waste material of unknown origin and composition. The extent of the waste deposition and waste type is not known. It is understood that as part of the proposed development there may be an excavation to accommodate services, foundations for structures as well as roadways and pavements and as such the material which may be excavated and removed from site needs to be assessed in terms of waste disposal outlets. The waste material which may be retained on site following development requires assessment in terms of human health exposure.

The purpose of the waste classification exercise was as follows.

- Classification, in terms of waste management and final disposal outlets, of material that may require disposal following excavation during the construction phase;
- Assess impact of waste body on local surface water; and
- Suitability for any material left on site for the proposed use following development.

The scope of the work undertaken to facilitate the waste classification exercise included the following:

- Excavation of fourteen (14 No.) trial pits;
- Excavation of three (3 No.) slit trenches;
- Collection of surface water samples for chemical analysis;
- Collection of waste/subsoil samples for chemical analysis;
- Environmental laboratory testing;
- Waste classification; and
- Assessment of subsoil quality against human health Generic Assessment Criteria (GAC).

3.0 Limitations

GII has prepared this report for the sole use of Cladwell Estates. No other warranty, express or implied, is made as to the professional advice included in this report or other services provided by GII.
The conclusions and recommendations contained in this report are based upon information provided by others and the assumption that all relevant information has been provided by those bodies from whom it

has been requested. Information obtained from third parties has not been independently verified by GII, unless otherwise stated in this report.

This report has been prepared in line with best industry standards and within the project's budgetary and time constraints. The methodology adopted and the sources of information used by GII in providing its services are outlined in this report.

The work described was undertaken in March 2020, this report is based on the conditions encountered and the information available during that period. The scope of this Report and the services are accordingly factually limited by these circumstances.

GII disclaim any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to GII's attention after the date of the Report.

The conclusions presented in this report represent GII's best professional judgement based on review of site conditions observed during any site visit and the relevant information available at the time of writing. The opinions and conclusions presented are valid only to the extent that the information provided was accurate and complete.

The investigation was focused on a broad assessment of the subsoil quality across the site. The assessment did not extend to the identification of asbestos containing materials associated with any on-site structures, ground gases or groundwater.

The waste classification exercise is reflective of and applicable to the ground conditions on site at the time of the site investigation and sampling. Alterations to the ground conditions or any further excavations carried out on site following the investigation are not reflected in this report.

4.0 Site Location and Layout

The site is located off Back Road, Malahide, County Dublin (Figure 1 Appendix 1). At the time of the assessment the site was comprised of an area of rough overgrown ground in the southern section and the former Malahide Rugby club playing pitch in the northern section. The site was bounded to the north by former Rugby Clubhouse. The site was bounded to the east by the Malahide Dublin railway line. The site was bounded to the south by a field drain with agricultural lands beyond. The site was bounded to the south west by agricultural lands and the north west by open rough ground which had formerly been occupied by a house.

There was an area on the western site boundary where Japanese Knotweed was present and an exclusion zone fenced off. The southern section of the site was more raised than the lands to the south and west.

5.0 Site History

GII reviewed the aerial photographs and historical maps maintained by the Ordnance Survey of Ireland (OSI) and the google imagery records. These included the 6-inch maps that were produced between 1829 and 1842, the 25-inch maps that were produced between 1888 and 1913 and the 6-inch Cassini Maps that were produced between the 1830's and 1930's. The site is undeveloped on all historical maps reviewed.

The southern section of the site appears to have been backfilled or in the process of backfilling on the 1995 OSI aerial image. The backfilling of the site appears to have ceased by the time of the 2000 and 2005 OSI aerial images.

6.0 Subsurface Exploration

6.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.
The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

6.2. Trial Pits

The trial pits were excavated using a 12T tracked excavator at the locations shown in Figure 8. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of this Report.
The trial pits TP-01 to TP-09 were excavated within the southern section of the site where the waste material was expected to be encountered. The trial pits TP-10 to TP-14 were located within the northern section of the site (rugby pitch) where the waste material was not expected to be encountered.

6.3. Slit Trenches

The slit trenches were excavated using a 12T tracked excavator at the locations shown in Figure 8. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The slit trenches were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. The slit trenches were excavated in order to identify the northern lateral extant of the waste materials encountered on site. The interphase between the waste materials and natural deposits in each slit trench are identified on Figure 8.

6.4. Surveying

The exploratory hole locations have been recorded using a Trimble R10 GNSS System which records the coordinates and elevation of the locations to ITM or Irish National Grid as required by the project specification. The coordinates are provided on the exploratory hole logs in the appendices of this Report.

7.0 Ground Conditions

7.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and are generally comprised;

- Topsoil
- Made Ground
- Cohesive Deposits

TOPSOIL: Topsoil was encountered in all the exploratory holes outside the backfilled area and at four of the locations within the backfilled area was present to a maximum depth of 0.3m BGL.

MADE GROUND: Made Ground deposits were encountered beneath the Topsoil or from the surface in the backfilled area of the site. The made ground was comprised of *brown silty sandy clayey fine to coarse subangular to subrounded GRAVEL with occasional subangular to subrounded cobbles and boulders and occasional fragments of plastic timber red and yellow brick slate foam concrete metal cloth wavin pipe and ceramics*. **There was no evidence of potentially hazardous waste such as hydrocarbon based materials, asbestos containing waste or clinical waste encountered during the trial pitting. There was no evidence of organic or household waste noted.**
Made ground deposits were not encountered beneath the former rugby pitch area.
The made ground deposits ranged in thickness from 0.7m in TP-09 to 2.1m in TP-06. The thickest sequence was in the central section of the backfilled area. Based on the survey completed following the excavation of the trial pits the footprint of the backfilled area is 11,520m^2, the average thickness of the waste material is 1.5m giving an estimated volume of waste material of 17,280m^3.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Made Ground or Topsoil and were described typically as *brown silty slightly sandy very gravelly CLAY with occasional subangular to subrounded cobbles and boulders*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. These deposits had some, occasional or frequent cobble and boulder content where noted on the exploratory hole logs.

8.0 Surface Water Assessment

A surface water sample was collected from the drainage ditch located immediately to the south and downgradient of the site (Figure 8). The sample was collected on the 13th March 2020 by a GII Geo-Environmental Scientist.

8.1. Field Observations

There was no evidence of contamination noted during the collection of the surface water sample i.e. hydrocarbon odour or iridescence etc.

Table 1 Field Measurements

Sample ID	Date	pH (pH Units)	Electrical Conductivity (mS/cm)	ORP (mV)	Temperature (Celsius)
SW-01	13/03/2020	7.37	0.87	131	6.5
SW-02	13/03/2020	7.73	1.03	122	6.3

8.2. Laboratory Analysis

The laboratory analysis undertaken on the surface water sample included for dissolved arsenic, boron, cadmium, copper, chromium, cyanide, lead, mercury, nickel, manganese and zinc, aliphatic and aromatic petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAH), methyl tert butyl ether (MTBE), benzene toluene ethylbenzene and toluene (BTEX), total phenols, pH, electrical conductivity, nitrate, nitrite, chloride, sulphate, ammonia, BOD, COD, total suspended solids and potassium. The parameter range was based on the site history and the need to establish a comprehensive environmental baseline for the surface water quality for the site.

The laboratory testing was competed by Element Materials Technology in the UK; EMT is a UKAS accredited laboratory. The full laboratory reports are included in Appendix 3. The analytical methodologies are all ISO/CEN approved or equivalent.

8.3. Laboratory Results

The full laboratory test report is presented in Appendix 3 and the results are summarised in Tables 2 to 4. The tables include Environmental Quality Standards (EQS) specified in the Surface Water Environmental Objectives (Surface Water) Regulations 2009 (SI 272 of 2009).

The level of ammonia detected in both surface water samples is above the EQS.

The level of chromium increased between SW-01 and SW-02. The downstream level exceeded the AA-EQS but was within the MAC-EQS.

PAHs, petroleum hydrocarbons and the BTEX compounds were not detected in the surface water samples.

The results do not show any significant impact from the waste body on the surface water.

Table 2 Surface Water Metals and Inorganics

Parameter	SW-01	SW-02	LOD	Unit	AA-EQS[1]	MAC_EQS[2]
Dissolved Arsenic	4.0	3.6	<2.5	µg/l	25	20
Dissolved Boron	45	70	<12	µg/l	ne	ne
Dissolved Cadmium	<0.5	<0.5	<0.5	µg/l	0.08	0.45
Total Dissolved Chromium	<1.5	7.2	<1.5	µg/l	4.7	32
Dissolved Copper	<7	<7	<7	µg/l	5/30[3]	ne
Dissolved Lead	<5	<5	<5	µg/l	7.2	ne
Dissolved Manganese	103	63	<2	µg/l	ne	ne
Dissolved Mercury	<1	<1	<1	µg/l	0.05	0.07
Dissolved Nickel	<2	<2	<2	µg/l	20	ne
Dissolved Potassium	20	44	<0.1	mg/l	ne	ne
Dissolved Zinc	0.6	1.4	<3	µg/l	8/50/100[4]	ne
Hexavalent Chromium	<0.006	<0.006	<0.006	mg/l	3.7	ne
Sulphate	106.5	106.7	<0.5	mg/l	ne	ne
Chloride	37.1	37.4	<0.3	mg/l	ne	ne
Nitrate as NO_3	0.99	1.05	<0.2	mg/l	ne	ne
Nitrite	0.032	0.031	<0.02	mg/l	ne	ne
Total Cyanide	<0.01	<0.01	<0.01	mg/l	10	ne
Ammoniacal Nitrogen as NH_3	0.06	0.10	<0.03	mg/l	≤0.04[5]	≤0.09[6]
BOD (Settled)	<1	<1	<1	mg/l	ne	ne
COD (Settled)	18	20	<7	mg/l	ne	ne
Total Suspended Solids	<10	<10	<10	mg/l	ne	ne
Electrical Conductivity @25C	933	922	<2	µS/cm	ne	ne
pH	7.99	7.98	<0.01	pH units	6.0-9.0	ne

Table 3 Surface Water PAHs

Parameter	SW-01	SW-02	LOD	Unit	AA-EQS	MAC_EQ
PAH						
Naphthalene	<0.1	<0.1	<0.013	µg/l	2.4	ne
Acenaphthylene	<0.013	<0.013	<0.013	µg/l	ne	ne
Acenaphthene	<0.013	<0.013	<0.014	µg/l	ne	ne

[1] Annual Average.
[2] Maximum Allowable Concentration.
[3] For Copper, the value 5 applies where the water hardness measured in mg/l CaCO3 is less than or equal to 100; the value 30 applies where the water hardness exceeds 100 mg/l CaCO3.
[4] For Zinc, the standard shall be 8 µg/l for water hardness with annual average values less than or equal to 10 mg/l CaCO3, 50 µg/l for water hardness greater than 10 mg/l CaCO3 and less than or equal to 100 mg/l CaCO3 and 100 µg/l elsewhere.
[5] High status ≤0.040 (mean), Good status ≤0.065 (mean).
[6] High status ≤0.090 (95%ile), Good status or ≤0.140 (95%ile).

Parameter	SW-01	SW-02	LOD	Unit	AA-EQS	MAC_EQ
Fluorene	<0.014	<0.014	<0.011	µg/l	ne	ne
Phenanthrene	<0.011	<0.011	<0.013	µg/l	ne	ne
Anthracene	<0.013	<0.013	<0.012	µg/l	0.1	0.4
Fluoranthene	<0.012	<0.012	<0.013	µg/l	0.1	1
Pyrene	<0.013	<0.013	<0.015	µg/l	ne	ne
Benzo(a)anthracene	<0.015	<0.015	<0.011	µg/l	ne	ne
Chrysene	<0.011	<0.011	<0.018	µg/l	ne	ne
Benzo(bk)fluoranthene	<0.018	<0.018	<0.016	µg/l	0.03	ne
Benzo(a)pyrene	<0.016	<0.016	<0.011	µg/l	0.05	0.1
Indeno(123cd)pyrene	<0.011	<0.011	<0.01	µg/l	0.002	ne
Dibenzo(ah)anthracene	<0.01	<0.01	<0.011	µg/l	ne	ne
Benzo(ghi)perylene	<0.011	<0.011	<0.195	µg/l	0.002	ne
PAH 16 Total	<0.195	<0.195	<0.01	µg/l	ne	ne
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	µg/l	ne	ne
Benzo(k)fluoranthene	<0.01	<0.01	<0.1	µg/l	ne	ne

Table 4 Surface Water Hydrocarbons

Parameter	SW-01	SW-02	LOD	Unit	EPA IGV	GTV
TPH CWG						
Aliphatics						
>C5-C6	<10	<10	<10	µg/l	ne	ne
>C6-C8	<10	<10	<10	µg/l	ne	ne
>C8-C10	<10	<10	<10	µg/l	ne	ne
>C10-C12	<5	<5	<5	µg/l	ne	ne
>C12-C16	<10	<10	<10	µg/l	ne	ne
>C16-C21	<10	<10	<10	µg/l	ne	ne
>C21-C35	<10	<10	<10	µg/l	ne	ne
Total aliphatics C5-35	<10	<10	<10	µg/l	ne	ne
Aromatics						
>C5-EC7	<10	<10	<10	µg/l	ne	ne
>EC7-EC8	<10	<10	<10	µg/l	ne	ne
>EC8-EC10	<10	<10	<10	µg/l	ne	ne
>EC10-EC12	<5	<5	<10	µg/l	ne	ne
>EC12-EC16	<10	<10	<10	µg/l	ne	ne
>EC16-EC21	<10	<10	<10	µg/l	ne	ne
>EC21-EC35	<10	<10	<10	µg/l	ne	ne
Total aromatics C5-35	<10	<10	<10	µg/l	ne	ne
Total aliphatics and aromatics(C5-35)	<10	<10	<10	µg/l	ne	ne

Parameter	SW-01	SW-02	LOD	Unit	EPA IGV	GTV
Total Phenols HPLC	<10	<10	<0.01	µg/l	8	46
MTBE	<0.1	<0.1	<5	µg/l	ne	ne
Benzene	<0.5	<0.5	<5	µg/l	10	50
Toluene	<5	<5	<5	µg/l	10	ne
Ethylbenzene	<1	<1	<5	µg/l	ne	ne
m/p-Xylene	<2	<2	<5	µg/l	10	ne
o-Xylene	<1	<1	<5	µg/l	10	ne

9.0 Subsoil Laboratory Analysis

9.1. Analysis Suite

In order to assess materials, which may be excavated and removed from site, in terms of waste classification, a selection of samples collected were analysed for a suite of parameters which allows for the assessment of the soils in terms of total pollutant content for classification of materials as *hazardous* or *non-hazardous* (RILTA Suite). The suite also allows for the assessment of the soils in terms of suitability for placement at various categories of landfill. The parameter list for the RILTA suite includes analysis of the solid samples for arsenic, barium, cadmium, chromium, copper, cyanide, lead, nickel, mercury, zinc, speciated aliphatic and aromatic petroleum hydrocarbons, pH, sulphate, sulphide, moisture content, soil organic matter and an asbestos screen.

The total pollutant content analysis also provides analytical data which can be used to assess the quality of the subsoils underlying the site and allow an assessment of their suitability for a range of proposed uses against generic assessment criteria.

The RILTA suite also includes those parameters specified in the EU Council Decision establishing criteria for the acceptance of waste at Landfills (Council Decision 2003/33/EC), which for the solid samples are pH, total organic carbon (TOC), speciated aliphatic and aromatic petroleum hydrocarbons, BTEX, phenol, polychlorinated biphenyls (PCB) and PAH.

In line with the requirement of Council Decision 2003/33/EC a leachate was generated from the solid samples which was in turn analysed for antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, chloride, fluoride, soluble sulphate, sulphide, phenols, dissolved organic carbon (DOC) and total dissolved solids (TDS). The suite was selected due to the unknown origin of the material underlying the site and no evidence of specific contaminants of concern highlighted in the site history. The laboratory testing was competed by Element Materials Technology (EMT) in the UK; EMT is a UKAS accredited laboratory. The full laboratory reports are included in Appendix 3.

9.2. Asbestos

Asbestos fibres were detected in the samples of waste material encountered in TP-01, 02, 03 and 06. The asbestos type encountered in all instances was Chrysotile, the levels detected were below the laboratory detection limit of <0.001%. The laboratory did **not** identify asbestos containing materials (ACMs) in the sample. The level detected in all cases was below the hazardous level of 0.1%[7].

10.0 Waste Classification

GII understands that any materials which may be excavated from site would meet the definition of waste under the Waste Framework Directive. This may not be the case at the time of excavation when all or some of the materials may have been declared a by-product in line with Article 27 of the European Communities (Waste Directive) Regulations 2011[8].

Excess soil and stone resulting from excavation works (the primary purpose of which is not the production of soil and stone) may be declared a by-product if all four by-product conditions are met.[9]

a) further use of the soil and stone is certain;

b) the soil and stone can be used directly without any further processing other than normal industrial practice;

c) the soil and stone is produced as an integral part of a production process; and

d) further use is lawful in that the soil and stone fulfils all relevant requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

Due to the varying levels of anthropogenic materials encountered in the made ground there are potentially two sets of List of Waste (LoW)[10] codes with "mirror" entries which may be applied to excavated materials to be removed from site.

1. 17-05-03* (soil and stone containing dangerous substances, classified as hazardous) or 17-05-04 (soil and stone other than those mentioned in 17-05-03, not hazardous); or
2. 17-09-03* (other construction and demolition wastes (including mixed wastes) containing hazardous substances) or 17-09-04 (mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03).

Where waste is a mirror entry in the LoW, it can be classified via a process of analysis against standard criteria set out in the Waste Framework Directive. The assessment process is described in detail in guidance published by the Irish (EPA Waste Classification, List of Waste & Determining if Waste is Hazardous or Non-Hazardous, June 2015) and UK regulatory authorities (Guidance on the Classification and Assessment of Waste: Technical Guidance WM3, 2015). The assessment involves comparison of the concentration of various parameters against defined threshold values.

[7] Environment Agency (2018). Technical Guidance WM3 - Guidance on the classification and assessment of waste (1st Edition V1.1 May 2018) Technical Guidance WM3 – page 19.
[8] S.I. No. 126/2011 - European Communities (Waste Directive) Regulations 2011 (Article 27).
[9] Irish EPA (June 2019), Guidance on Soil and Stone By-Products.
[10] Formerly European Waste Catalogue Codes (EWC Codes)

The specific LoW code which should be applied to the material at each sample location is summarised in Table 4 below. These codes are only applicable where the material is being removed for site as a waste.

GII use HazWasteOnline™, a web-based commercial waste classification software tool which assists in the classification of potentially hazardous materials. This tool was used to determine whether the materials sampled are classified as hazardous or non-hazardous. The use of the online tool is accepted by the EPA (EPA 2014).

The conclusions presented in the report are based on GII's professional opinion. **It should be noted that the environmental regulator (in this case the EPA) and the waste acceptor (in this case a landfill operator) shall decide whether a waste is hazardous or non-hazardous and suitable for disposal at their facility.**

10.1. HazWasteOnLineTM Results

In total, fifteen (15 No.) samples were assessed using the HazWasteOnLine™ Tool. All samples were classified as being non-hazardous. The complete HazWasteOnLine™ report for all samples is included in Appendix 4.

The specific LoW code which should be applied to the material at each SI location is summarised in Table 5 below. The assigning of the LoW code is based on observations recorded in the trial pits, an estimation of the % of anthropogenic material present and the results of the HazWasteOnline™ output. The final LoW codes applied at the time of disposal may vary due to variations in % of anthropogenic material observed in the excavation phase. Where there is in excess of 2%[11] anthropogenic material observed the LoW code 17 09 04 may be applied.

Table 5 LoW Codes

SI Location	Depth (m)	Hazardous/Non-Hazardous	Asbestos Type if Present	LoW Code
TP-01	0.00-1.10	Non-Hazardous	Chrysotile <0.001%	17 09 04
TP-01	1.10-1.50	Non-Hazardous	NAD[12]	17 05 04
TP-02	0.00-1.10	Non-Hazardous	Chrysotile <0.001%	17 09 04
TP-03	0.00-1.50	Non-Hazardous	Chrysotile <0.001%	17 09 04
TP-04	0.00-1.70	Non-Hazardous	NAD	17 09 04
TP-05	0.00-1.00	Non-Hazardous	NAD	17 09 04
TP-05	1.00-1.90	Non-Hazardous	NAD	17 09 04
TP-05	1.90-2.30	Non-Hazardous	NAD	17 05 04
TP-06	0.00-2.10	Non-Hazardous	Chrysotile <0.001%	17 09 04
TP-07	0.00-1.20	Non-Hazardous	NAD	17 09 04
TP-08	0.00-0.80	Non-Hazardous	NAD	17 09 04
TP-09	0.00-0.70	Non-Hazardous	NAD	17 09 04

[11] EPA (2020) - Guidance on Waste Acceptance Criteria at Authorised Soil Recovery Facilities.
[12] NAD – no asbestos detected.

SI Location	Depth (m)	Hazardous/Non-Hazardous	Asbestos Type if Present	LoW Code
TP-09	0.70-1.10	Non-Hazardous	NAD	17 05 04
TP-10	0.50	Non-Hazardous	NAD	17 05 04
TP-13	0.50	Non-Hazardous	NAD	17 05 04

10.2. Landfill Waste Acceptance Criteria

Waste Acceptance Criteria (WAC) have been agreed by the EU (Council Decision 2003/33/EC) and are only applicable to material if it is to be disposed of as a waste at a landfill facility. Each individual member state and licensed operators of landfills may apply more stringent WAC. WAC limits and the associated laboratory analysis are not suitable for use in the determination of whether a waste is hazardous or non-hazardous. The data have been compared to the WAC limits set out in Council Decision 2003/33/EC as well as the specific WAC which the EPA have applied to the Integrated Materials Solutions (IMS) Landfill in north County Dublin. The IMS landfill has higher limits for a range of parameters while still operating under an inert landfill licence. The WAC data considered in combination with the waste classification outlined in Section 12.0 allows the most suitable waste category to be applied to the material tested. The applicable waste categories are summarised in Table 6. A summary of the WAC data is presented in Appendix 5. The waste category assigned to each sample is summarised in Table 7.

Table 6 Waste Category for Disposal/Recovery

Waste Category	Classification Criteria
Category A Unlined Soil Recovery Facilities	Soil and Stone only which are free from[13] anthropogenic materials such as concrete, brock timber. Soil must be free from "contamination" e.g. PAHs, Hydrocarbons[14].
Category B1 Inert Landfill	Reported concentrations within inert waste limits, which are set out by the adopted EU Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC (2002). Results also found to be non-hazardous using the HWOL[15] application.
Category B2 Inert Landfill	Reported concentrations greater than Category B1 criteria but less than IMS Hollywood Landfill acceptance criteria, as set out in their Waste Licence W0129-02. Results also found to be non-hazardous using the HWOL application.
Category C Non-Haz Landfill	Reported concentrations greater than Category B2 criteria but within non-haz landfill waste acceptance limits set out by the adopted EU Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC (2002).

[13] Free from equates to less than 2%.
[14] Total BTEX 0.05mg/kg, Mineral Oil 50mg/kg, Total PAHs 1mg/kg, Total PCBs 0.05mg/kg and Asbestos No Asbestos Detected – EPA Guidance on Waste Acceptance Criteria at Authorised Soil Recovery Facilities, 2020.
[15] HazWasteOnLine™ Tool.

	Results also found to be non-hazardous using the HWOL application.
Category C 1 Non-Haz Landfill	As Category C but containing < 0.001% w/w asbestos fibres.
Category C 2 Non-Haz Landfill	As Category C but containing >0.001% and <0.01% w/w asbestos fibres
Category C 3 Non-Haz Landfill	As Category C but containing >0.01% and <0.1% w/w asbestos fibres.
Category D Hazardous Treatment	Results found to be hazardous using HWOL Application.
Category D 1 Hazardous Disposal	Results found to be hazardous due to the presence of asbestos (>0.1%).

10.3. Final Waste Categorisation

All samples were assessed in terms of waste classification using the HazWasteOnLine™ tool and also the WAC set out in Council Decision 2003/33/EC and the IMS specific WAC to give a final waste categorisation to determine the most appropriate disposal route for any waste generated. The final and most applicable waste category for each sample is summarised in Table 7 and Figure 9.

Table 7 Individual Sample Waste Category

Sample ID	Sample Depth (m)	Material Type	Waste Category	LoW Code
TP-01	0.00-1.10	Made Ground	Category C1	17 09 04
TP-01	1.10-1.50	Clay	Category A	17 05 04
TP-02	0.00-1.10	Made Ground	Category C1	17 09 04
TP-03	0.00-1.50	Made Ground	Category C1	17 09 04
TP-04	0.00-1.70	Made Ground	Category B1	17 09 04
TP-05	0.00-1.00	Made Ground	Category B1	17 09 04
TP-05	1.00-1.90	Made Ground	Category B2	17 09 04
TP-05	1.90-2.30	Clay	Category B1	17 05 04
TP-06	0.00-2.10	Made Ground	Category C1	17 09 04
TP-07	0.00-1.20	Made Ground	Category B1	17 09 04
TP-08	0.00-0.80	Made Ground	Category B1	17 09 04
TP-09	0.00-0.70	Made Ground	Category B2	17 09 04
TP-09	0.70-1.10	Clay	Category A	17 05 04
TP-10	0.50	Clay	Category A	17 05 04
TP-13	0.50	Clay	Category A	17 05 04

11.0 Suitable for Use Assessment

GII assessed the soil data collected from the trial pits against the LQM/CIEH S4ULs for Human Health Risk Assessment (S4ULs)[16]. The S4ULs present soil assessment criteria for an extended range of 89

[16] LQM/CIEH 'Suitable 4 Use Levels' (S4ULs). Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3746. All rights reserved.

substances. For each substance, S4ULs have been derived for a range of generic land uses and Soil Organic Matter (%SOM) contents. All toxicological and physical-chemical inputs used in the derivation of the S4ULs are clearly identified and discussed. For each substance, S4ULs have been derived for six generic land uses (including the two Public Open Space land uses defined in C4SL guidance) and a range of Soil Organic Matter contents (organic contaminants only). All toxicological and physical-chemical data inputs used in the derivation of the S4ULs are presented and discussed in the publication. The proposed future use of the site is residential. In order to be conservative in terms of assessing any potential risk to future site users, the residential with homegrown produce S4UL criteria have been applied to the data.

The levels of Dibenzo(ah)anthracene in the sample TP-02 between ground level and 1.1m exceeded the residential with homegrown produce S4UL.

All remaining samples were all within the residential without homegrown produce S4ULs. A full summary of the S4UL data is presented in Appendix 6.

12.0 Conclusions & Recommendations

The conclusions and recommendations given and opinions expressed in this report are based on the findings of the site investigation works and laboratory testing undertaken. Where any opinion is expressed on the classification of material between site investigations locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the findings at the site investigation locations.

12.1. Conclusions

12.1.1. Waste Type

The waste material encountered on site is comprised of construction and demolition waste. There was no evidence of potentially hazardous waste such as hydrocarbon based materials, asbestos containing waste or clinical waste encountered during the trial pitting. There was no evidence of organic or household waste noted.

12.1.2. Waste Classification

Based on the results of the HazWasteOnLine™ tool the material sampled across the site can be classified as non-hazardous.

12.1.3. Waste Categories

The most applicable waste category for each of the samples has been presented in Table 7 and Figure 9.

12.1.4. Asbestos

Asbestos was detected in several locations at a level lower than the detection limit of the laboratory.

12.2. S4UL Assessment

The levels of Dibenzo(ah)anthracene in the sample TP-02 exceeded the residential with homegrown produce S4UL.

12.2.1. Surface Water

The waste body is not having a significant impact on the local surface water.

12.3. Recommendations

12.4. S4UL Assessment

The levels of Dibenzo(ah)anthracene in the sample TP-02 exceeded the residential with homegrown produce S4UL. In the case that the material is not to be excavated and removed from site it is not suitable for retention on site at surface level. There is no special action required for the material which exceed the S4UL where it will underly the footprint of the proposed building or any hard-standing areas such as roadways or footpaths. The material at TP-02 is suitable for use on site in soft landscaped areas if covered with at least 1m of clean suitable inert soil which would short circuit potential human contact routes i.e. dermal contact, ingestion or inhalation.

12.5. Trace Asbestos

There is no special action required for materials which contains trace levels of asbestos subsoils which will underly the footprint of the proposed building or any hard-standing areas such as roadways or footpaths. The materials which contains trace levels of asbestos are suitable for use on site if covered with at least 1m of clean suitable inert soil which would short circuit potential human contact routes i.e. dermal contact, ingestion or inhalation.

12.5.1. Waste Transfer

In the event that material is excavated for removal from site, any firm engaged to transport waste material from site and the operator of any waste facility that will accept subsoils excavated from this site should be furnished with, at a minimum, copies of the **full unabridged** laboratory reports and HazWasteOnLine™ report for all samples presented in this report.

The material on site if excavated should be removed to the most appropriate facility under the waste categories and LoW codes identified in Table 7 and Figure 9. Potential outlets for the various waste categories are presented in Appendix 7, this list is not exhaustive and applicable at the time of the writing this report.

The non-hazardous material across the site if excavated as a waste should be removed from site to an appropriate facility under either the LoW codes 17 05 04 or 17 09 04. Where during excavation there is noted to be in excess of 2% anthropogenic material the appropriate LoW code which should be applied is 17 09 04.

The material which has trace levels of asbestos if excavated as a waste should be removed from site to an appropriate facility licensed to accept waste which contains trace levels of asbestos under either the LoW codes 17 05 04 or 17 09 04. Where during excavation there is noted to be in excess of 2% anthropogenic material the appropriate LoW code which should be applied is 17 09 04.

12.6. Ground Gases

In the even that development is to take place on or adjacent to the waste body it is recommended that ground gas monitoring is undertaken to assess the risk of ground gas generation associated with the waste material.

13.0 References

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Nathanial, C.P.; McCaffrey, C.; Gillett, A.G.; Ogden, R.C. & Nathanial, J.F., *The LQM/CIEH S4ULs for Human Health Risk Assessment*, Land Quality Press, Nottingham (2015).

APPENDIX 1 - Figures

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

Client:

Cladwell Estates

0 40 80 120 m

Project Title:
Back Road Malahide

Drawing Title:
Figure 1 Site Location

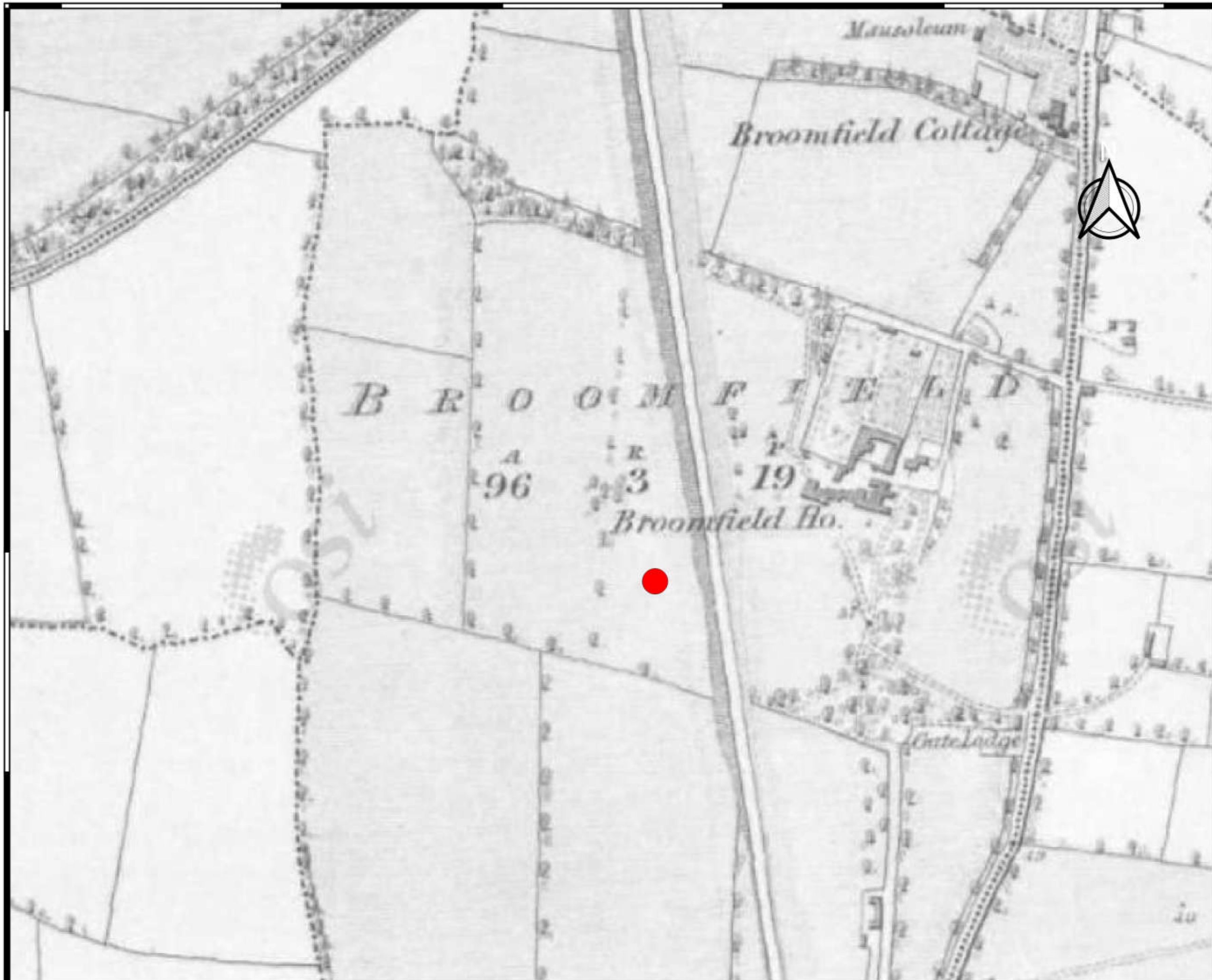
GII Project Reference:
E10226-03-20

Drawn By:
BS

Date:
04/03/2020

Site Location

Indicative Site Boundary



Indicative Site Location

Client:

A LYNAM COMPANY

CE CLADEWELL ESTATES LTD

Project Code:
9527-03-20

Project Title:
Back Road Malahide

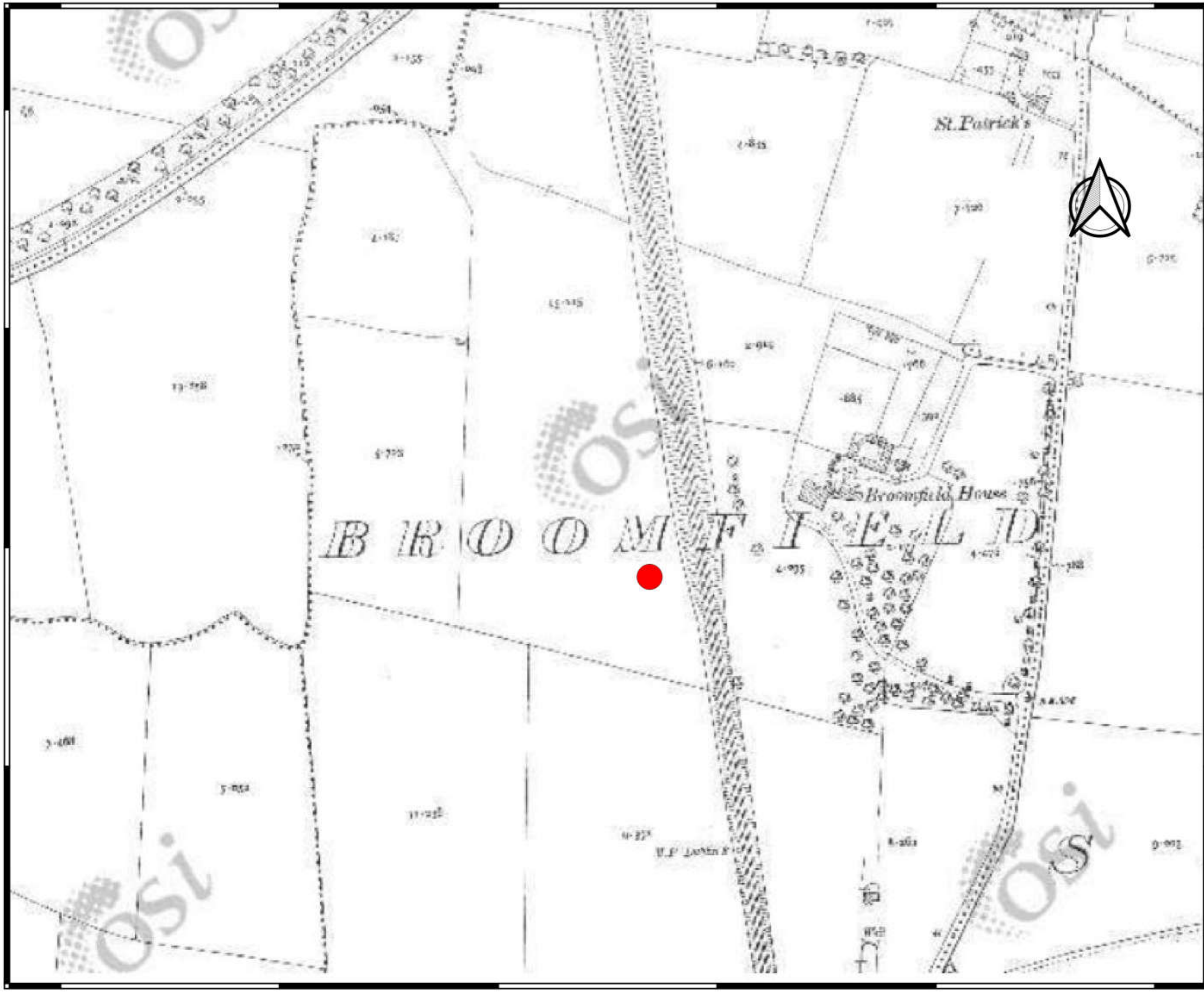
Drawing Title:
Figure 2 OSI 6-Inch Map

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

Drawn By: BS

Date: 09/04/2020



Indicative Site Location

Client: A LYNAM COMPANY

CE CLADEWELL ESTATES LTD

Project Code:
9527-03-20

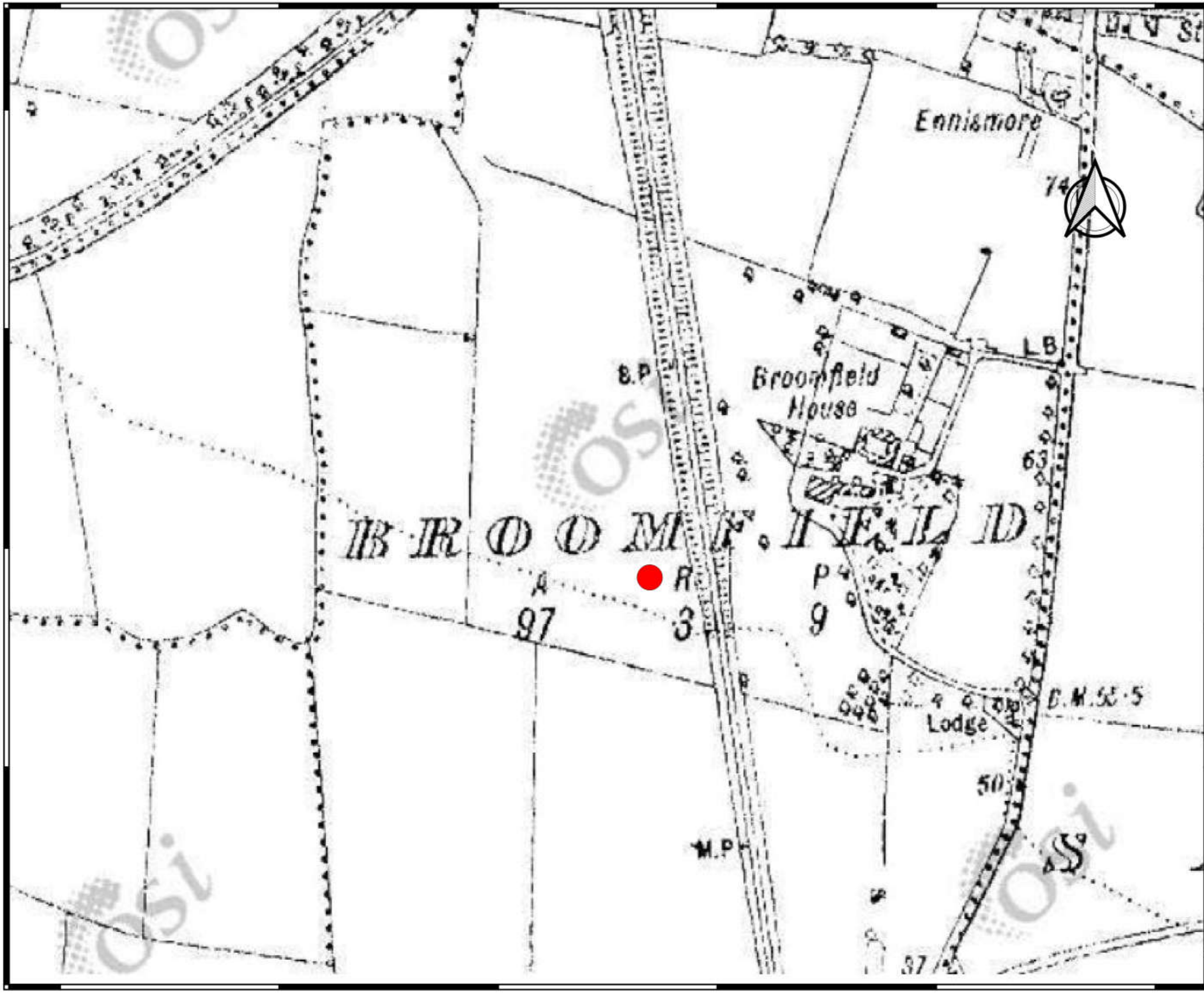
Project Title:
Back Road Malahide

Drawing Title:
Figure 3 OSI 25-Inch Map

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

Drawn By: BS

Date: 09/04/2020



Indicative Site Location

Client:

A LYNAM COMPANY

CE CLADEWELL ESTATES LTD

Project Code:
9527-03-20

Project Title:
Back Road Malahide

Drawing Title:
Figure 4 OSI Cassini Map

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

Drawn By: BS

Date: 09/04/2020

Indicative Site Location

Client:

A LYNAM COMPANY

CE CLADEWELL ESTATES LTD

Project Code:
9527-03-20

Project Title:
Back Road Malahide

Drawing Title:
Figure 5 OSI 1995 Aerial Image

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

Drawn By:	Date:
BS	09/04/2020

Indicative Site Location

Client:

A LYNAM COMPANY

CE CLADEWELL ESTATES LTD

Project Code:
9527-03-20

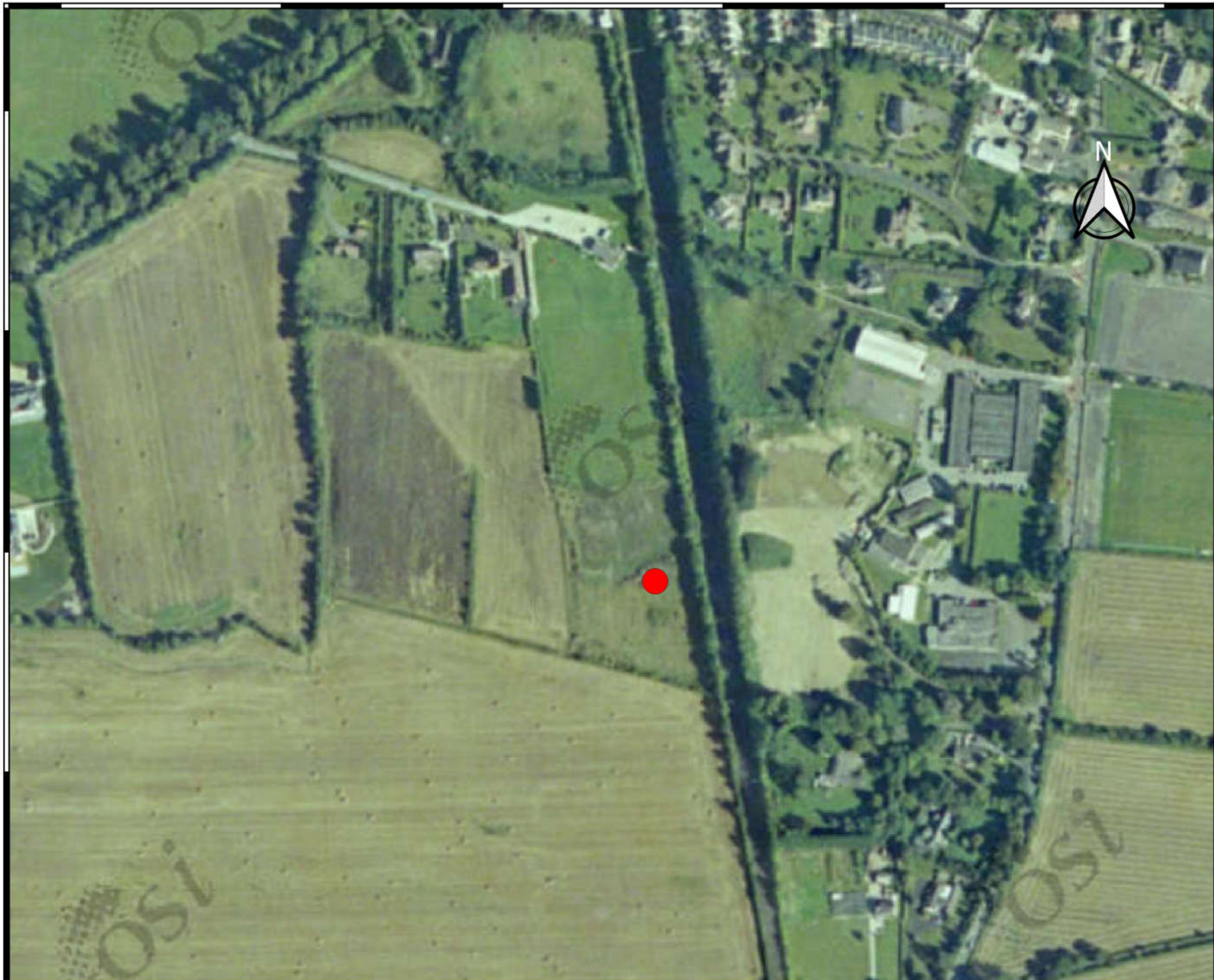
Project Title:
Back Road Malahide

Drawing Title:
Figure 6 OSI 2000 Aerial Image

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

Drawn By: BS

Date: 09/04/2020



Indicative Site Location

Client:

A LYNAM COMPANY

CE CLADEWELL ESTATES LTD

Project Code:
9527-03-20

Project Title:
Back Road Malahide

Drawing Title:
Figure 7 OSI 2005 Aerial Image

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
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Drawn By: BS	Date: 09/04/2020

GROUND INVESTIGATIONS IRELAND
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Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

Client: A LYNAM COMPANY

CE CLADEWELL ESTATES LTD

0 20 40 60 m

Project Title:
Back Road Malahide

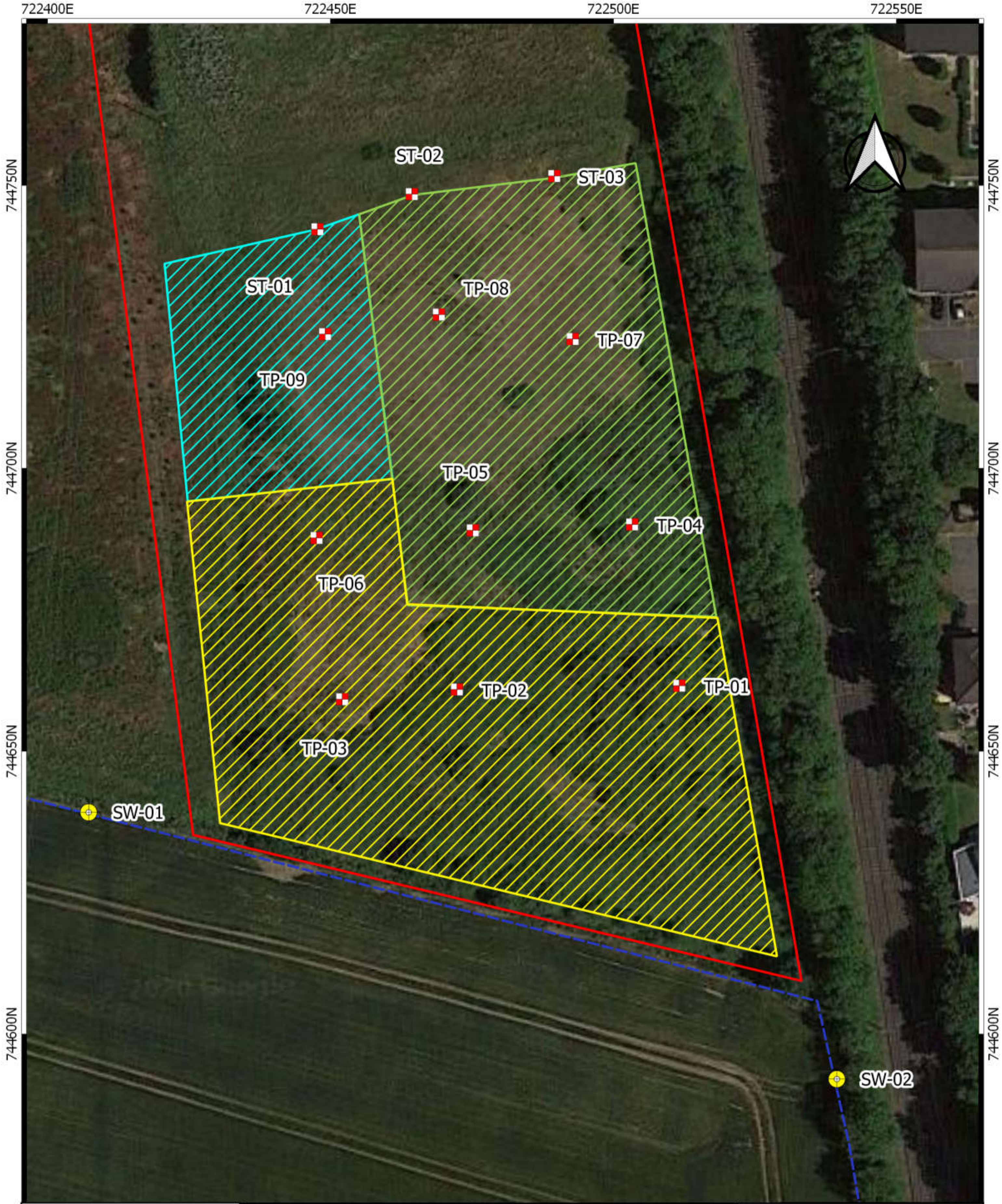
Drawing Title:
Figure 8 SI Locations

GII Project Reference:
9527-03-20

Drawn By:
BS

Date:
09/04/2020

Indicative Site Boundary
Backfilled Area
Trial Pit/Slit Trench
Surface Water Sample
Drain
Knotweed Exclusion Zone



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

Client: A LYNAM COMPANY
CE CLADEWELL ESTATES LTD

0 10 20 30 m

Project Title:
Back Road Malahide

Drawing Title:
Figure 9 Waste Categories

GII Project Reference:
9527-03-20

Drawn By:
BS

Date:
09/04/2020

- Indicative Site Boundary
- Trial Pit/Slit Trench
- Surface Water Sample
- Category B1 Waste
- Category B2 Waste
- Category C1 Waste

APPENDIX 2 – Trial Pit Records

Ground Investigations Ireland Ltd www.gii.ie		Site: Waste Assessment Back Road Malahide	Trial Pit Number: TP-01
Machine: 12 Tonne Tracked Excavator Method: Trial Pit	Dimensions: 1.30mW x 2.20mL x 1.50mD Ground Level (mOD):	Client: Cladwell Estates	Job Number: 9527-03-20
	Location: 722511.6 E 744661.4 N Dates: 12/03/2020	Project Contractor: Ground Investigations Ireland	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30) 0.30	Dark brown sandy clayey slightly gravelly TOPSOIL with occasional rootlets.		
0.50	EN				(0.80) 1.10	MADE GROUND: Light brown silty sandy clayey fine to coarse subangular to subrounded GRAVEL with occasional subangular to subrounded cobbles and boulders and occasional fragments of plastic timber red brick concrete metal wavin pipe and ceramics.		
					(0.40) 1.50	Firm light brown silty sandy very gravelly CLAY with occasional subangular to subrounded cobbles and boulders.		
1.50	EN					Complete at 1.50m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	PM	9527-03-20.TP-01

Ground Investigations Ireland Ltd www.gii.ie		Site: Waste Assessment Back Road Malahide	Trial Pit Number: **TP-02**
Machine: 12 Tonne Tracked Excavator Method: Trial Pit	Dimensions: 1.30mW x 2.80mL x 1.70mD Ground Level (mOD):	Client: Cladwell Estates	Job Number: 9527-03-20
	Location: 722472.4 E 744660.8 N Dates: 12/03/2020	Project Contractor: Ground Investigations Ireland	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-1.10	EN				(1.10)	MADE GROUND: Light brown silty sandy clayey fine to coarse subangular to subrounded GRAVEL with occasional subangular to subrounded cobbles and boulders and occasional fragments of plastic timber red brick yellow brick concrete metal wavin pipe and ceramics.		
1.10-1.60	EN				1.10 (0.60)	Firm light brown silty sandy very gravelly CLAY with occasional subangular to subrounded cobbles and boulders.		
					1.70	Complete at 1.70m		

Plan

Remarks

Sidewalls spalling at 0.50m

Scale (approx)	Logged By	Figure No.
1:25	PM	9527-03-20.TP-02

Ground Investigations Ireland Ltd www.gii.ie	Site: Waste Assessment Back Road Malahide	Trial Pit Number: TP-03

Machine : 12 Tonne Tracked Excavator	Dimensions: 1.30mW x 3.10mL x 2.00mD	Ground Level (mOD)	Client: Cladwell Estates	Job Number: 9527-03-20
Method : Trial Pit	Location: 722452.1 E 744659 N	Dates: 12/03/2020	Project Contractor: Ground Investigations Ireland	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-1.50	EN				(0.30) 0.30	Light brown sandy clayey slightly gravelly TOPSOIL with occasional rootlets.		
					(1.20) 1.50	MADE GROUND: Dark brown silty sandy clayey fine to coarse subangular to subrounded GRAVEL with occasional subangular to subrounded cobbles and boulders and occasional fragments of red and yellow brick metal plastic concrete ceramics and cloth with occasional concrete blocks.		
1.50-2.00	EN				(0.50) 2.00	Firm light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders.		
						Complete at 2.00m		

Plan

Remarks

Sidewalls spalling at 0.40m

Scale (approx)	Logged By	Figure No.
1:25	PM	9527-03-20.TP-03

Ground Investigations Ireland Ltd www.gii.ie			Site: Waste Assessment Back Road Malahide	Trial Pit Number: TP-04
Machine : 12 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.30mW x 3.00mL x 2.30mD	**Ground Level (mOD)**	**Client** Cladwell Estates	**Job Number** 9527-03-20
	Location 722503.3 E 744689.9 N	**Dates** 12/03/2020	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-1.70	EN				(1.70)	MADE GROUND: Greyish brown silty sandy very clayey fine to coarse subangular to subrounded GRAVEL with occasional subangular to subrounded cobbles and boulders and occasional fragments of red and yellow brick metal plastic glass concrete and ceramics with occasional concrete blocks.		
1.70-2.30	EN				1.70 (0.60)	Firm light brown silty slightly sandy very gravelly CLAY with occasional subangular to subrounded cobbles and boulders.		
					2.30	Complete at 2.30m		

Plan

Remarks

Sidewalls spalling at 0.50m
Sidewalls spalling at 1.60m

Scale (approx)	Logged By	Figure No.
1:25	PM	9527-03-20.TP-04

Ground Investigations Ireland Ltd www.gii.ie	Site: Waste Assessment Back Road Malahide	Trial Pit Number: TP-05
Machine: 12 Tonne Tracked Excavator; Method: Trial Pit	Dimensions: 1.30mW x 2.80mL x 2.30mD	Ground Level (mOD):	Client: Cladwell Estates	Job Number: 9527-03-20
	Location: 722475.1 E 744688.9 N	Dates: 12/03/2020	Project Contractor: Ground Investigations Ireland	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-1.00	EN				(1.20) 1.20	MADE GROUND: Light brown silty sandy very clayey fine to coarse subangular to subrounded GRAVEL with occasional subangular to subrounded cobbles and boulders and occasional fragments of red brick plastic and electric cables.		
1.00-1.90	EN				(0.70) 1.90	MADE GROUND: Dark grey silty sandy clayey fine to coarse subangular to subrounded GRAVEL with occasional subangular to subrounded cobbles and boulders and occasional fragments of red brick rebar concrete and plastic.		
1.90-2.30	EN				(0.40) 2.30	Light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.		
						Complete at 2.30m		

Plan

Remarks

Sidewalls spalling at 0.70m

Scale (approx)	Logged By	Figure No.
1:25	PM	9527-03-20.TP-05

Ground Investigations Ireland Ltd www.gii.ie		Site: Waste Assessment Back Road Malahide	Trial Pit Number: TP-06
Machine : 12 Tonne Tracked Excavator Method : Trial Pit	Dimensions: 1.30mW x 3.00mL x 2.50mD Ground Level (mOD):	Client: Cladwell Estates	Job Number: 9527-03-20
	Location: 722447.6 E 744687.5 N Dates: 12/03/2020	Project Contractor: Ground Investigations Ireland	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-2.10	EN				(0.30) 0.30	Dark brown sandy slightly gravelly TOPSOIL with occasional rootlets.		
					(1.80) 2.10	MADE GROUND: Light brown silty sandy very clayey fine to coarse subangular to subrounded GRAVEL with occasional subangular to subrounded cobbles and boulders and occasional fragments of red brick concrete plastic metal slate and white insulation foam with occasional concrete blocks.		
2.10-2.50	EN				(0.40) 2.50	Firm grey slightly sandy slightly gravelly silty CLAY with occasional subangular to subrounded cobbles.		
						Complete at 2.50m		

Plan

Remarks

Sidewalls spalling at 0.70m
Sidewalls spalling at 2.00m

Scale (approx)	Logged By	Figure No.
1:25	PM	9527-03-20.TP-06

Ground Investigations Ireland Ltd
www.gii.ie

Machine : 12 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.30mW x 3.20mL x 1.80mD	**Ground Level (mOD)**	**Site** Waste Assessment Back Road Malahide **Client** Cladwell Estates	**Trial Pit Number** TP-07 **Job Number** 9527-03-20
	Location 722492.8 E 744722.7 N	**Dates** 11/03/2020	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-1.20	EN				(0.20) 0.20	Dark brown sandy clayey slightly gravelly TOPSOIL with occasional rootlets.		
					(1.00) 1.20	MADE GROUND: Light brown silty sandy very clayey fine to coarse subangular to subrounded GRAVEL with occasional subangular to subrounded cobbles and boulders and occasional fragments of red brick plastic metal and white insulation foam with occasional concrete blocks.		
1.20-1.80	EN				(0.60) 1.80	Firm light brown silty slightly sandy very gravelly CLAY with occasional subangular to subrounded cobbles and boulders.		
						Complete at 1.80m		

Plan

Remarks

Sidewalls spalling at 0.50m

Scale (approx)	Logged By	Figure No.
1:25	PM	9527-03-20.TP-07

Ground Investigations Ireland Ltd www.gii.ie			Site Waste Assessment Back Road Malahide	Trial Pit Number TP-08
Machine : 12 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.30mW x 3.10mL x 1.80mD	**Ground Level (mOD)**	**Client** Cladwell Estates	**Job Number** 9527-03-20
	Location 722469.1 E 744727 N	**Dates** 11/03/2020	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.80	EN				(0.80)	MADE GROUND: Light brown silty sandy very clayey fine to coarse subangular to subrounded GRAVEL with occasional subangular to subrounded cobbles and boulders and occasional fragments of red brick plastic metal and white insulation foam with occasional concrete blocks.		
0.80-1.30	EN				0.80 (1.00)	Firm light brown silty slightly sandy very gravelly CLAY with occasional subangular to subrounded cobbles and boulders.		
					1.80	Complete at 1.80m		

Plan

Remarks

Sidewalls spalling at 0.50m

Scale (approx)	Logged By	Figure No.
1:25	PM	9527-03-20.TP-08

Ground Investigations Ireland Ltd www.gii.ie		Site Waste Assessment Back Road Malahide	Trial Pit Number TP-09
Machine : 12 Tonne Tracked Excavator Method : Trial Pit	Dimensions 1.30mW x 3.20mL x 1.10mD	Ground Level (mOD)	Client Cladwell Estates	Job Number 9527-03-20
	Location 722449.1 E 744723.6 N	Dates 11/03/2020	Project Contractor Ground Investigations Ireland	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.70	EN				(0.70)	MADE GROUND: Dark brown silty sandy very clayey fine to coarse subangular to subrounded GRAVEL with occasional subangular to subrounded cobbles and boulders and occasional fragments of red and yellow brick and ceramics with occasional concrete blocks.		
0.70-1.10	EN				0.70 (0.40)	Firm light brown silty slightly sandy very gravelly CLAY with occasional subangular to subrounded cobbles and boulders.		
					1.10	Complete at 1.10m		

Plan

Remarks

Sidewalls spalling at 0.50m

Scale (approx)	Logged By	Figure No.
1:25	PM	9527-03-20.TP-09

Ground Investigations Ireland Ltd www.gii.ie		Site: Waste Assessment Back Road Malahide	Trial Pit Number: TP-10
Machine : 12 Tonne Tracked Excavator; Method : Trial Pit	Dimensions: 1.20mW x 3.60mL x 1.70mD; Ground Level (mOD):	Client: Cladwell Estates	Job Number: 9527-03-20
	Location: 722484.6 E 744785.4 N; Dates: 11/03/2020	Project Contractor: Ground Investigations Ireland	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Light brown sandy slightly gravelly very clayey TOPSOIL with occasional rootlets.		
					0.30			
0.50	EN					Firm light brown silty slightly sandy very gravelly CLAY with occasional subangular to subrounded cobbles and boulders.		
					(1.40)			
1.50	EN							
					1.70	Complete at 1.70m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	PM	9527-03-20.TP-10

Ground Investigations Ireland Ltd www.gii.ie		Site: Waste Assessment Back Road Malahide	Trial Pit Number: TP-11
Machine : 12 Tonne Tracked Excavator Method : Trial Pit	Dimensions: 1.30mW x 3.80mL x 1.80mD Ground Level (mOD):	Client: Cladwell Estates	Job Number: 9527-03-20
	Location: 722440.3 E 744816.8 N Dates: 11/03/2020	Project Contractor: Ground Investigations Ireland	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Light brown sandy slightly gravelly very clayey TOPSOIL with occasional rootlets.		
					0.30	Firm light brown silty slightly sandy very gravelly CLAY with occasional subangular to subrounded cobbles and boulders.		
0.50	EN							
					(1.50)			
1.50	EN							
					1.80	Complete at 1.80m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	PM	9527-03-20.TP-11

Ground Investigations Ireland Ltd www.gii.ie			Site Waste Assessment Back Road Malahide	Trial Pit Number **TP-12**
Machine : 12 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.20mW x 3.70mL x 1.80mD	**Ground Level (mOD)**	**Client** Cladwell Estates	**Job Number** 9527-03-20
	Location 722471 E 744843.9 N	**Dates** 11/03/2020	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Light brown sandy slightly gravelly very clayey TOPSOIL with occasional rootlets.		
0.50	EN				0.30 (0.60)	Light brown silty sandy very clayey subangular to subrounded fine to coarse GRAVEL with occasional subangular to subrounded cobbles and boulders.		
					0.90 (0.40)	Light brown clayey gravelly fine to coarse SAND.		
1.50	EN				1.30 (0.50)	Firm light brownish grey silty slightly sandy very gravelly CLAY with occasional subangular to subrounded cobbles and boulders.		
					1.80	Complete at 1.80m		

Plan

Remarks

Sidewalls spalling at 0.50m
Sidewalls spalling at 1.30m

Scale (approx)	Logged By	Figure No.
1:25	PM	9527-03-20.TP-12

Ground Investigations Ireland Ltd www.gii.ie	Site Waste Assessment Back Road Malahide	Trial Pit Number **TP-13**

Machine : 12 Tonne Tracked Excavator Method : Trial Pit	Dimensions 1.20mW x 3.90mL x 1.70mD	Ground Level (mOD)	Client Cladwell Estates	Job Number 9527-03-20
	Location 72242.49 E 744866 N	Dates 11/03/2020	Project Contractor Ground Investigations Ireland	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Dark brown sandy slightly gravelly very clayey TOPSOIL with occasional rootlets.		
					0.30			
0.50	EN					Firm light brownish grey silty slightly sandy very gravelly CLAY with occasional subangular to subrounded cobbles and boulders.		
					(1.40)			
1.50	EN							
					1.70			
						Complete at 1.70m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	PM	9527-03-20.TP-13

Ground Investigations Ireland Ltd www.gii.ie			Site Waste Assessment Back Road Malahide	Trial Pit Number **TP-14**
Machine : 12 Tonne Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.30mW x 4.00mL x 1.70mD	**Ground Level (mOD)**	**Client** Cladwell Estates	**Job Number** 9527-03-20
	Location 722464.9 E 744889.3 N	**Dates** 11/03/2020	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Dark brown sandy slightly gravelly very clayey TOPSOIL with occasional rootlets.		
					0.30	Firm light brownish grey silty slightly sandy very gravelly CLAY with occasional subangular to subrounded cobbles and boulders.		
0.50	EN							
					(1.40)			
1.50	EN							
					1.70	Complete at 1.70m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	PM	9527-03-20.TP-14

APPENDIX 3 – Laboratory Testing

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

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Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

Attention :	Barry Sexton
Date :	27th March, 2020
Your reference :	9527-03-20
Our reference :	Test Report 20/3992 Batch 1
Location :	Waste Assesment Back Road Malahide
Date samples received :	13th March, 2020
Status :	Final report
Issue :	1

Two samples were received for analysis on 13th March, 2020 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Client Name: Ground Investigations Ireland
Reference: 9527-03-20
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton
EMT Job No: 20/3992

Report : **Liquid**

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-9	10-18	LOD/LOR	Units	Method No.
Sample ID	SW-01	SW-02			
Depth					
COC No / misc					
Containers	V H HN HCL Z P BOD G	V H HN HCL Z P BOD G			
Sample Date	13/03/2020	13/03/2020			
Sample Type	Surface Water	Surface Water			
Batch Number	1	1			
Date of Receipt	13/03/2020	13/03/2020			
Dissolved Arsenic #	4.0	3.6	<2.5	ug/l	TM30/PM14
Dissolved Boron	45	70	<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Total Dissolved Chromium #	<1.5	7.2	<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	ug/l	TM30/PM14
Dissolved Manganese #	103	63	<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	<2	<2	ug/l	TM30/PM14
Dissolved Phosphorus #	20	44	<5	ug/l	TM30/PM14
Dissolved Potassium #	0.6	1.4	<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<3	<3	<3	ug/l	TM30/PM14
Dissolved Zinc #	<3	<3	<3	ug/l	TM30/PM14
PAH MS					
Naphthalene #	<0.1	<0.1	<0.1	ug/l	TM4/PM30
Acenaphthylene #	<0.013	<0.013	<0.013	ug/l	TM4/PM30
Acenaphthene #	<0.013	<0.013	<0.013	ug/l	TM4/PM30
Fluorene #	<0.014	<0.014	<0.014	ug/l	TM4/PM30
Phenanthrene #	<0.011	<0.011	<0.011	ug/l	TM4/PM30
Anthracene #	<0.013	<0.013	<0.013	ug/l	TM4/PM30
Fluoranthene #	<0.012	<0.012	<0.012	ug/l	TM4/PM30
Pyrene #	<0.013	<0.013	<0.013	ug/l	TM4/PM30
Benzo(a)anthracene #	<0.015	<0.015	<0.015	ug/l	TM4/PM30
Chrysene #	<0.011	<0.011	<0.011	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.018	<0.018	<0.018	ug/l	TM4/PM30
Benzo(a)pyrene #	<0.016	<0.016	<0.016	ug/l	TM4/PM30
Indeno(123cd)pyrene #	<0.011	<0.011	<0.011	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene #	<0.011	<0.011	<0.011	ug/l	TM4/PM30
PAH 16 Total #	<0.195	<0.195	<0.195	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	85	89	<0	%	TM4/PM30
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	ug/l	TM15/PM10
Toluene #	<5	<5	<5	ug/l	TM15/PM10
Ethylbenzene #	<1	<1	<1	ug/l	TM15/PM10
m/p-Xylene #	<2	<2	<2	ug/l	TM15/PM10
o-Xylene #	<1	<1	<1	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	103	109	<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	109	112	<0	%	TM15/PM10

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 9527-03-20
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton
EMT Job No: 20/3992

Report : **Liquid**

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-9	10-18									LOD/LOR	Units	Method No.
Sample ID	SW-01	SW-02											
Depth													
COC No / misc													
Containers	V H HN HCL Z P BOD G	V H HN HCL Z P BOD G											
Sample Date	13/03/2020	13/03/2020											
Sample Type	Surface Water	Surface Water											
Batch Number	1	1											
Date of Receipt	13/03/2020	13/03/2020											
TPH CWG													
Aliphatics													
>C5-C6 #	<10	<10									<10	ug/l	TM36/PM12
>C6-C8 #	<10	<10									<10	ug/l	TM36/PM12
>C8-C10 #	<10	<10									<10	ug/l	TM36/PM12
>C10-C12 #	<5	<5									<5	ug/l	TM5/PM16/PM30
>C12-C16 #	<10	<10									<10	ug/l	TM5/PM16/PM30
>C16-C21 #	<10	<10									<10	ug/l	TM5/PM16/PM30
>C21-C35 #	<10	<10									<10	ug/l	TM5/PM16/PM30
Total aliphatics C5-35 #	<10	<10									<10	ug/l	TM5/TM36/PM12/PM16/PM30
Aromatics													
>C5-EC7 #	<10	<10									<10	ug/l	TM36/PM12
>EC7-EC8 #	<10	<10									<10	ug/l	TM36/PM12
>EC8-EC10 #	<10	<10									<10	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5									<5	ug/l	TM5/PM16/PM30
>EC12-EC16 #	<10	<10									<10	ug/l	TM5/PM16/PM30
>EC16-EC21 #	<10	<10									<10	ug/l	TM5/PM16/PM30
>EC21-EC35 #	<10	<10									<10	ug/l	TM5/PM16/PM30
Total aromatics C5-35 #	<10	<10									<10	ug/l	TM5/TM36/PM12/PM16/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10									<10	ug/l	TM5/TM36/PM12/PM16/PM30
Phenol #	<0.01	<0.01									<0.01	mg/l	TM26/PM0
Sulphate as SO4 #	106.5	106.7									<0.5	mg/l	TM38/PM0
Chloride #	37.1	37.4									<0.3	mg/l	TM38/PM0
Nitrate as N #	0.99	1.05									<0.05	mg/l	TM38/PM0
Nitrite as N #	0.032	0.031									<0.006	mg/l	TM38/PM0
Total Cyanide #	<0.01	<0.01									<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as NH3 #	0.06	0.10									<0.03	mg/l	TM38/PM0
Hexavalent Chromium	<0.006	<0.006									<0.006	mg/l	TM38/PM0
BOD (Settled) #	<1	<1									<1	mg/l	TM58/PM0
COD (Settled) #	18	20									<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	933	922									<2	uS/cm	TM76/PM0
pH #	7.99	7.98									<0.01	pH units	TM73/PM0
Total Suspended Solids #	<10	<10									<10	mg/l	TM37/PM0

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All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Client Name:	Ground Investigations Ireland	**VOC Report :**	**Liquid**
Reference:	9527-03-20		
Location:	Waste Assesment Back Road Malahide		
Contact:	Barry Sexton		
EMT Job No:	20/3992		

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-9	10-18	LOD/LOR	Units	Method No.
Sample ID	SW-01	SW-02			
Depth					
COC No / misc					
Containers	V H HN HCL Z P BOD G	V H HN HCL Z P BOD G			
Sample Date	13/03/2020	13/03/2020			
Sample Type	Surface Water	Surface Water			
Batch Number	1	1			
Date of Receipt	13/03/2020	13/03/2020			
VOC MS					
Dichlorodifluoromethane	<2	<2	<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1	<1	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<5	<5	<5	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2	ug/l	TM15/PM10
Toluene #	<5	<5	<5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2	<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2	<2	ug/l	TM15/PM10
Ethylbenzene #	<1	<1	<1	ug/l	TM15/PM10
m/p-Xylene #	<2	<2	<2	ug/l	TM15/PM10
o-Xylene #	<1	<1	<1	ug/l	TM15/PM10
Styrene	<2	<2	<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2	<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3	<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3	<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3	<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3	ug/l	TM15/PM10
Naphthalene	<2	<2	<2	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	103	109	<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	109	112	<0	%	TM15/PM10

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 9527-03-20
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/3992						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/3992

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/3992

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	please refer to TM5 and TM36 for method details	PM12/PM16/PM30	please refer to PM16/PM30 and PM12 for method details	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			

EMT Job No: 20/3992

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM37	Modified methods USEPA 160.2, EN872:2005 and SMWW 2540D. Gravimetric determination of Total Suspended Solids. Sample is filtered through a 1.5um pore size glass fibre filter and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM0	No preparation is required.				
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Comparable with ISO 15705:2002. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM58	APHA Standard Methods for the extraction of water and waste water (SMEWW) 5210B. Comparible with ISO 5815:1989. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand. Determination of Dissolved Oxygen using the Hach HQ30D Oxygen Meter.	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes			

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Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

Attention :	Barry Sexton
Date :	27th March, 2020
Your reference :	9527-03-20
Our reference :	Test Report 20/3992 Batch 2
Location :	Waste Assesment Back Road Malahide
Date samples received :	13th March, 2020
Status :	Final report
Issue :	1

Thirty seven samples were received for analysis on 13th March, 2020 of which fifteen were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

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Element Materials Technology Environmental UK Limited
Registered in England and Wales
Registered Office: 10 Lower Grosvenor Place, London, SW1W 0EN
Company Registration No: 11371415

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 9527-03-20
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton
EMT Job No: 20/3992

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	43-45	46-48	49-51	55-57	61-63	67-69	70-72	73-75	76-78	82-84			
Sample ID	TP-01	TP-01	TP-02	TP-03	TP-04	TP-05	TP-05	TP-05	TP-06	TP-07			
Depth	0.00-1.10	1.10-1.50	0.00-1.10	0.00-1.50	0.00-1.70	0.00-1.00	1.00-1.90	1.90-2.30	0.00-2.10	0.00-1.20			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	11/03/2020	12/03/2020	12/03/2020	12/03/2020	11/03/2020	12/03/2020	12/03/2020	12/03/2020	12/03/2020	11/03/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	2	2	2	2	2	2	2	2	2	2	LOD/LOR	Units	Method No.
Date of Receipt	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020			
Antimony	-	3	-	-	3	3	3	3	-	3	<1	mg/kg	TM30/PM15
Arsenic #	-	22.4	-	-	10.9	12.7	12.1	16.3	-	12.1	<0.5	mg/kg	TM30/PM15
Barium #	-	150	-	-	90	132	99	116	-	121	<1	mg/kg	TM30/PM15
Cadmium #	-	1.9	-	-	1.3	1.3	1.8	1.6	-	1.1	<0.1	mg/kg	TM30/PM15
Chromium #	-	92.4	-	-	50.6	78.0	48.1	103.7	-	82.1	<0.5	mg/kg	TM30/PM15
Copper #	-	70	-	-	31	39	38	40	-	27	<1	mg/kg	TM30/PM15
Lead #	-	39	-	-	57	51	35	57	-	41	<5	mg/kg	TM30/PM15
Mercury #	-	<0.1	-	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	mg/kg	TM30/PM15
Molybdenum #	-	7.3	-	-	4.8	6.8	5.2	8.3	-	6.2	<0.1	mg/kg	TM30/PM15
Nickel #	-	35.7	-	-	35.5	39.9	41.4	47.8	-	40.4	<0.7	mg/kg	TM30/PM15
Selenium #	-	1	-	-	1	1	6	2	-	2	<1	mg/kg	TM30/PM15
Zinc #	-	204	-	-	107	120	102	123	-	123	<5	mg/kg	TM30/PM15
Antimony	3	-	2	4	-	-	-	-	2	-	<1	mg/kg	TM30/PM62
Arsenic	14.5	-	11.4	15.5	-	-	-	-	13.8	-	<0.5	mg/kg	TM30/PM62
Barium	150	-	94	94	-	-	-	-	88	-	<1	mg/kg	TM30/PM62
Cadmium	3.1	-	1.5	1.8	-	-	-	-	1.3	-	<0.1	mg/kg	TM30/PM62
Chromium	19.2	-	20.1	21.2	-	-	-	-	25.7	-	<0.5	mg/kg	TM30/PM62
Copper	61	-	50	42	-	-	-	-	40	-	<1	mg/kg	TM30/PM62
Lead	110	-	76	56	-	-	-	-	57	-	<5	mg/kg	TM30/PM62
Mercury	<0.1	-	<0.1	<0.1	-	-	-	-	<0.1	-	<0.1	mg/kg	TM30/PM62
Molybdenum	7.1	-	3.7	2.7	-	-	-	-	2.7	-	<0.1	mg/kg	TM30/PM62
Nickel	55.3	-	44.3	39.4	-	-	-	-	43.7	-	<0.7	mg/kg	TM30/PM62
Selenium	3	-	2	2	-	-	-	-	1	-	<1	mg/kg	TM30/PM62
Zinc	134	-	94	117	-	-	-	-	112	-	<5	mg/kg	TM30/PM62

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All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 9527-03-20
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton
EMT Job No: 20/3992

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	43-45	46-48	49-51	55-57	61-63	67-69	70-72	73-75	76-78	82-84			
Sample ID	TP-01	TP-01	TP-02	TP-03	TP-04	TP-05	TP-05	TP-05	TP-06	TP-07			
Depth	0.00-1.10	1.10-1.50	0.00-1.10	0.00-1.50	0.00-1.70	0.00-1.00	1.00-1.90	1.90-2.30	0.00-2.10	0.00-1.20			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	11/03/2020	12/03/2020	12/03/2020	12/03/2020	11/03/2020	12/03/2020	12/03/2020	12/03/2020	12/03/2020	11/03/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	2	2	2	2	2	2	2	2	2	2	LOD/LOR	Units	Method No.
Date of Receipt	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020			
PAH MS													
Naphthalene #	0.10	<0.04	0.08	<0.04	<0.04	<0.04	0.05	<0.04	0.07	<0.04	<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	0.39	<0.03	<0.03	<0.03	0.06	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	<0.05	<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	0.32	<0.04	<0.04	<0.04	<0.04	<0.04	0.05	<0.04	<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.20	<0.03	2.72	0.28	0.23	0.07	0.44	<0.03	0.63	0.06	<0.03	mg/kg	TM4/PM8
Anthracene #	0.07	<0.04	1.75	0.08	<0.04	<0.04	0.14	<0.04	0.13	<0.04	<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.30	<0.03	4.42	0.53	0.30	0.13	0.79	<0.03	0.80	0.21	<0.03	mg/kg	TM4/PM8
Pyrene #	0.28	<0.03	3.60	0.50	0.27	0.12	0.69	<0.03	0.72	0.25	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.24	<0.06	2.06	0.46	0.21	0.09	0.59	<0.06	0.51	0.37	<0.06	mg/kg	TM4/PM8
Chrysene #	0.18	<0.02	2.21	0.37	0.19	0.08	0.52	<0.02	0.41	0.33	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.34	<0.07	3.33	0.81	0.35	0.13	0.95	<0.07	0.76	0.65	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.18	<0.04	2.03	0.53	0.17	0.07	0.49	<0.04	0.42	0.44	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	0.13	<0.04	1.24	0.25	0.13	<0.04	0.33	<0.04	0.24	0.25	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	0.32	0.08	<0.04	<0.04	0.08	<0.04	0.08	0.05	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.14	<0.04	1.12	0.28	0.13	<0.04	0.33	<0.04	0.24	0.25	<0.04	mg/kg	TM4/PM8
Coronene	<0.04	<0.04	0.23	<0.04	<0.04	<0.04	0.06	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
PAH 6 Total #	1.09	<0.22	12.14	2.40	1.08	0.33	2.89	<0.22	2.46	1.80	<0.22	mg/kg	TM4/PM8
PAH 17 Total	2.16	<0.64	25.89	4.17	1.98	0.69	5.52	<0.64	5.13	2.86	<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.24	<0.05	2.40	0.58	0.25	0.09	0.68	<0.05	0.55	0.47	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.10	<0.02	0.93	0.23	0.10	0.04	0.27	<0.02	0.21	0.18	<0.02	mg/kg	TM4/PM8
Benzo(j)fluoranthene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	TM4/PM8
PAH Surrogate % Recovery	96	105	97	100	74	105	103	104	103	103	<0	%	TM4/PM8
Mineral Oil (C10-C40)	<30	<30	<30	<30	33	<30	<30	140	<30	<30	<30	mg/kg	TM5/PM8/PM16
TPH CWG													
Aliphatics													
>C5-C6 #	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 #	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>C8-C10	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 #	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	<7	<7	<7	<7	<7	<7	<7	15	<7	<7	<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	<7	<7	<7	23	33	<7	26	115	<7	<7	<7	mg/kg	TM5/PM8/PM16
>C35-C40	<7	<7	<7	<7	<7	<7	<7	10	<7	<7	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-40	<26	<26	<26	<26	33	<26	26	140	<26	<26	<26	mg/kg	TM5/TM36/PM8/PM12/PM16
>C6-C10	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C25	<10	<10	<10	<10	<10	<10	<10	45	<10	<10	<10	mg/kg	TM5/PM8/PM16
>C25-C35	<10	<10	<10	18	24	<10	23	86	<10	<10	<10	mg/kg	TM5/PM8/PM16

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Element Materials Technology

Client Name:	Ground Investigations Ireland	**Report :**	**Solid**
Reference:	9527-03-20		
Location:	Waste Assesment Back Road Malahide	**Solids:**	V=60g VOC jar, J=250g glass jar, T=plastic tub
Contact:	Barry Sexton		
EMT Job No:	20/3992		

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	43-45	46-48	49-51	55-57	61-63	67-69	70-72	73-75	76-78	82-84			
Sample ID	TP-01	TP-01	TP-02	TP-03	TP-04	TP-05	TP-05	TP-05	TP-06	TP-07			
Depth	0.00-1.10	1.10-1.50	0.00-1.10	0.00-1.50	0.00-1.70	0.00-1.00	1.00-1.90	1.90-2.30	0.00-2.10	0.00-1.20			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	11/03/2020	12/03/2020	12/03/2020	12/03/2020	11/03/2020	12/03/2020	12/03/2020	12/03/2020	12/03/2020	11/03/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	2	2	2	2	2	2	2	2	2	2	LOD/LOR	Units	Method No.
Date of Receipt	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020			
TPH CWG													
Aromatics													
>C5-EC7 #	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	<7	<7	15	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	<7	<7	56	56	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
>EC35-EC40	<7	<7	12	13	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-40	<26	<26	83	69	<26	<26	<26	<26	<26	<26	<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-40)	<52	<52	83	69	<52	<52	<52	140	<52	<52	<52	mg/kg	TM5/TM36/PM8/PM12/PM16
>EC6-EC10 #	<0.1	<0.1	<0.1	<0.1 SV	<0.1	<0.1	<0.1 SV	<0.1	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC25	<10	<10	30	<10	<10	<10	<10	<10	<10	<10	<10	mg/kg	TM5/PM8/PM16
>EC25-EC35	<10	<10	42	50	<10	<10	<10	<10	<10	<10	<10	mg/kg	TM5/PM8/PM16
MTBE #	<5	<5	<5	<5 SV	<5	<5	<5 SV	<5	<5 SV	<5	<5	ug/kg	TM36/PM12
Benzene #	<5	<5	<5	<5 SV	<5	<5	<5 SV	<5	<5 SV	<5	<5	ug/kg	TM36/PM12
Toluene #	<5	<5	<5	<5 SV	<5	<5	<5 SV	<5	<5 SV	<5	<5	ug/kg	TM36/PM12
Ethylbenzene #	<5	<5	<5	<5 SV	<5	<5	<5 SV	<5	<5 SV	<5	<5	ug/kg	TM36/PM12
m/p-Xylene #	<5	<5	<5	<5 SV	<5	<5	<5 SV	<5	<5 SV	<5	<5	ug/kg	TM36/PM12
o-Xylene #	<5	<5	<5	<5 SV	<5	<5	<5 SV	<5	<5 SV	<5	<5	ug/kg	TM36/PM12
PCB 28 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 52 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 101 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 118 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 138 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 153 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 180 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
Total 7 PCBs #	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	ug/kg	TM17/PM8
Natural Moisture Content	14.8	19.3	18.9	16.9	14.5	16.9	13.4	24.0	14.4	22.5	<0.1	%	PM4/PM0
Moisture Content (% Wet Weight)	12.9	16.2	15.9	14.4	12.6	14.4	11.9	19.4	12.6	18.3	<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Chromium III	-	92.4	-	-	50.6	78.0	48.1	103.7	-	82.1	<0.5	mg/kg	NONE/NONE
Chromium III	19.2	-	20.1	21.2	-	-	-	-	25.7	-	<0.5	mg/kg	NONE/NONE
Total Organic Carbon #	NDP	0.38	NDP	NDP	0.96	1.29	0.85	1.78	NDP	0.99	<0.02	%	TM21/PM24
pH #	8.53	8.41	8.53	8.54	8.54	8.23	8.17	7.77	8.63	8.33	<0.01	pH units	TM73/PM11
Mass of raw test portion	0.1035	0.1079	0.0995	0.1068	0.1036	0.102	0.1034	0.1124	0.1063	0.1112		kg	NONE/PM17

Element Materials Technology

Client Name:	Ground Investigations Ireland	**Report :**	**Solid**
Reference:	9527-03-20		
Location:	Waste Assesment Back Road Malahide	**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub	
Contact:	Barry Sexton		
EMT Job No:	20/3992		

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	43-45	46-48	49-51	55-57	61-63	67-69	70-72	73-75	76-78	82-84			
Sample ID	TP-01	TP-01	TP-02	TP-03	TP-04	TP-05	TP-05	TP-05	TP-06	TP-07			
Depth	0.00-1.10	1.10-1.50	0.00-1.10	0.00-1.50	0.00-1.70	0.00-1.00	1.00-1.90	1.90-2.30	0.00-2.10	0.00-1.20			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	11/03/2020	12/03/2020	12/03/2020	12/03/2020	11/03/2020	12/03/2020	12/03/2020	12/03/2020	12/03/2020	11/03/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	2	2	2	2	2	2	2	2	2	2	LOD/LOR	Units	Method No.
Date of Receipt	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020			
Mass of dried test portion	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09		kg	NONE/PM17

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All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 9527-03-20
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton
EMT Job No: 20/3992

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	88-90	94-96	97-99	100-102	118-120								
Sample ID	TP-08	TP-09	TP-09	TP-10	TP-13								
Depth	0.00-0.80	0.00-0.70	0.70-1.10	0.50	0.50								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	12/03/2020	12/03/2020	12/03/2020	11/03/2020	11/03/2020								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	2	2	2	2	2						LOD/LOR	Units	Method No.
Date of Receipt	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020								
Antimony	2	2	3	3	2						<1	mg/kg	TM30/PM15
Arsenic #	12.5	11.6	14.4	11.7	10.5						<0.5	mg/kg	TM30/PM15
Barium #	108	83	100	96	81						<1	mg/kg	TM30/PM15
Cadmium #	1.8	1.7	1.1	1.4	1.1						<0.1	mg/kg	TM30/PM15
Chromium #	47.4	47.7	90.0	74.2	61.8						<0.5	mg/kg	TM30/PM15
Copper #	38	35	36	28	25						<1	mg/kg	TM30/PM15
Lead #	47	36	27	19	17						<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	mg/kg	TM30/PM15
Molybdenum #	5.5	5.6	8.2	7.2	5.0						<0.1	mg/kg	TM30/PM15
Nickel #	40.7	39.1	51.4	36.5	36.5						<0.7	mg/kg	TM30/PM15
Selenium #	3	2	2	2	<1						<1	mg/kg	TM30/PM15
Zinc #	100	89	111	93	77						<5	mg/kg	TM30/PM15
Antimony	-	-	-	-	-						<1	mg/kg	TM30/PM62
Arsenic	-	-	-	-	-						<0.5	mg/kg	TM30/PM62
Barium	-	-	-	-	-						<1	mg/kg	TM30/PM62
Cadmium	-	-	-	-	-						<0.1	mg/kg	TM30/PM62
Chromium	-	-	-	-	-						<0.5	mg/kg	TM30/PM62
Copper	-	-	-	-	-						<1	mg/kg	TM30/PM62
Lead	-	-	-	-	-						<5	mg/kg	TM30/PM62
Mercury	-	-	-	-	-						<0.1	mg/kg	TM30/PM62
Molybdenum	-	-	-	-	-						<0.1	mg/kg	TM30/PM62
Nickel	-	-	-	-	-						<0.7	mg/kg	TM30/PM62
Selenium	-	-	-	-	-						<1	mg/kg	TM30/PM62
Zinc	-	-	-	-	-						<5	mg/kg	TM30/PM62

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Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 9527-03-20
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton
EMT Job No: 20/3992

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	88-90	94-96	97-99	100-102	118-120	LOD/LOR	Units	Method No.
Sample ID	TP-08	TP-09	TP-09	TP-10	TP-13			
Depth	0.00-0.80	0.00-0.70	0.70-1.10	0.50	0.50			
COC No / misc								
Containers	V J T	V J T	V J T	V J T	V J T			
Sample Date	12/03/2020	12/03/2020	12/03/2020	11/03/2020	11/03/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil			
Batch Number	2	2	2	2	2			
Date of Receipt	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020			
PAH MS								
Naphthalene #	<0.04	0.05	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.12	0.14	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.12	0.07	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Pyrene #	0.11	0.06	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.11	0.08	<0.06	<0.06	<0.06	<0.06	mg/kg	TM4/PM8
Chrysene #	0.07	0.07	<0.02	<0.02	<0.02	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.10	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.06	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Coronene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
PAH 6 Total #	0.28	<0.22	<0.22	<0.22	<0.22	<0.22	mg/kg	TM4/PM8
PAH 17 Total	0.69	<0.64	<0.64	<0.64	<0.64	<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM4/PM8
Benzo(j)fluoranthene	<1	<1	<1	<1	<1	<1	mg/kg	TM4/PM8
PAH Surrogate % Recovery	100	106	107	100	99	<0	%	TM4/PM8
Mineral Oil (C10-C40)	<30	<30	<30	<30	<30	<30	mg/kg	TM5/PM8/PM16
TPH CWG								
Aliphatics								
>C5-C6 #	<0.1 SV	<0.1 SV	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 #	<0.1 SV	<0.1 SV	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C8-C10	<0.1 SV	<0.1 SV	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 #	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
>C35-C40	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-40	<26	<26	<26	<26	<26	<26	mg/kg	TM5/TM36/PM8/PM12/PM16
>C6-C10	<0.1 SV	<0.1 SV	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C25	<10	<10	<10	<10	<10	<10	mg/kg	TM5/PM8/PM16
>C25-C35	<10	<10	<10	<10	<10	<10	mg/kg	TM5/PM8/PM16

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Element Materials Technology

Client Name:	Ground Investigations Ireland	**Report :**	**Solid**
Reference:	9527-03-20		
Location:	Waste Assesment Back Road Malahide	**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub	
Contact:	Barry Sexton		
EMT Job No:	20/3992		

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	88-90	94-96	97-99	100-102	118-120								
Sample ID	TP-08	TP-09	TP-09	TP-10	TP-13								
Depth	0.00-0.80	0.00-0.70	0.70-1.10	0.50	0.50								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	12/03/2020	12/03/2020	12/03/2020	11/03/2020	11/03/2020								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	2	2	2	2	2						LOD/LOR	Units	Method No.
Date of Receipt	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020								
TPH CWG													
Aromatics													
>C5-EC7 #	<0.1 [SV]	<0.1 [SV]	<0.1	<0.1	<0.1						<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	<0.1 [SV]	<0.1 [SV]	<0.1	<0.1	<0.1						<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	<0.1 [SV]	<0.1 [SV]	<0.1	<0.1	<0.1						<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	<0.2	<0.2	<0.2	<0.2	<0.2						<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	<4	<4	<4	<4	<4						<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	<7	<7	<7	<7	<7						<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	<7	<7	<7	<7	<7						<7	mg/kg	TM5/PM8/PM16
>EC35-EC40	<7	<7	<7	<7	<7						<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-40	<26	<26	<26	<26	<26						<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-40)	<52	<52	<52	<52	<52						<52	mg/kg	TM5/TM36/PM8/PM12/PM16
>EC6-EC10 #	<0.1 [SV]	<0.1 [SV]	<0.1	<0.1	<0.1						<0.1	mg/kg	TM36/PM12
>EC10-EC25	<10	<10	<10	<10	<10						<10	mg/kg	TM5/PM8/PM16
>EC25-EC35	<10	<10	<10	<10	<10						<10	mg/kg	TM5/PM8/PM16
MTBE #	<5 [SV]	<5 [SV]	<5	<5	<5						<5	ug/kg	TM36/PM12
Benzene #	<5 [SV]	<5 [SV]	<5	<5	<5						<5	ug/kg	TM36/PM12
Toluene #	<5 [SV]	<5 [SV]	<5	<5	<5						<5	ug/kg	TM36/PM12
Ethylbenzene #	<5 [SV]	<5 [SV]	<5	<5	<5						<5	ug/kg	TM36/PM12
m/p-Xylene #	<5 [SV]	<5 [SV]	<5	<5	<5						<5	ug/kg	TM36/PM12
o-Xylene #	<5 [SV]	<5 [SV]	<5	<5	<5						<5	ug/kg	TM36/PM12
PCB 28 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 52 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 101 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 118 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 138 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 153 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 180 #	<5	<5	<5	<5	<5						<5	ug/kg	TM17/PM8
Total 7 PCBs #	<35	<35	<35	<35	<35						<35	ug/kg	TM17/PM8
Natural Moisture Content	12.5	13.3	20.8	13.8	13.2						<0.1	%	PM4/PM0
Moisture Content (% Wet Weight)	11.1	11.7	17.3	12.1	11.7						<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3						<0.3	mg/kg	TM38/PM20
Chromium III	47.4	47.7	90.0	74.2	61.8						<0.5	mg/kg	NONE/NONE
Chromium III	-	-	-	-	-						<0.5	mg/kg	NONE/NONE
Total Organic Carbon #	0.93	0.99	0.49	0.28	0.25						<0.02	%	TM21/PM24
pH #	8.37	8.10	8.38	8.70	8.73						<0.01	pH units	TM73/PM11
Mass of raw test portion	0.1016	0.1021	0.1075	0.1025	0.1033							kg	NONE/PM17

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 9527-03-20
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton
EMT Job No: 20/3992

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	88-90	94-96	97-99	100-102	118-120								
Sample ID	TP-08	TP-09	TP-09	TP-10	TP-13								
Depth	0.00-0.80	0.00-0.70	0.70-1.10	0.50	0.50								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	12/03/2020	12/03/2020	12/03/2020	11/03/2020	11/03/2020								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	2	2	2	2	2						LOD/LOR	Units	Method No.
Date of Receipt	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020								
Mass of dried test portion	0.09	0.09	0.09	0.09	0.09							kg	NONE/PM17

Client Name: Ground Investigations Ireland
Reference: 9527-03-20
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton
EMT Job No: 20/3992

Report : **CEN 10:1 1 Batch**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	43-45	46-48	49-51	55-57	61-63	67-69	70-72	73-75	76-78	82-84			
Sample ID	TP-01	TP-01	TP-02	TP-03	TP-04	TP-05	TP-05	TP-05	TP-06	TP-07			
Depth	0.00-1.10	1.10-1.50	0.00-1.10	0.00-1.50	0.00-1.70	0.00-1.00	1.00-1.90	1.90-2.30	0.00-2.10	0.00-1.20			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	11/03/2020	12/03/2020	12/03/2020	12/03/2020	11/03/2020	12/03/2020	12/03/2020	12/03/2020	12/03/2020	11/03/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	2	2	2	2	2	2	2	2	2	2	LOD/LOR	Units	Method No.
Date of Receipt	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020			
Dissolved Antimony #	<0.002	<0.002	0.004	<0.002	<0.002	<0.002	<0.002	0.003	0.002	<0.002	<0.002	mg/l	TM30/PM17
Dissolved Antimony (A10) #	<0.02	<0.02	0.04	<0.02	<0.02	<0.02	<0.02	0.03	0.02	<0.02	<0.02	mg/kg	TM30/PM17
Dissolved Arsenic #	<0.0025	<0.0025	0.0041	0.0040	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	mg/l	TM30/PM17
Dissolved Arsenic (A10) #	<0.025	<0.025	0.041	0.040	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	mg/kg	TM30/PM17
Dissolved Barium #	0.006	0.012	0.011	0.011	0.009	0.010	0.016	0.021	0.011	0.009	<0.003	mg/l	TM30/PM17
Dissolved Barium (A10) #	0.06	0.12	0.11	0.11	0.09	0.10	0.16	0.21	0.11	0.09	<0.03	mg/kg	TM30/PM17
Dissolved Cadmium #	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	mg/l	TM30/PM17
Dissolved Cadmium (A10) #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/kg	TM30/PM17
Dissolved Chromium #	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	mg/l	TM30/PM17
Dissolved Chromium (A10) #	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	mg/kg	TM30/PM17
Dissolved Copper #	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	mg/l	TM30/PM17
Dissolved Copper (A10) #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	TM30/PM17
Dissolved Lead #	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/l	TM30/PM17
Dissolved Lead (A10) #	<0.05	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM30/PM17
Dissolved Molybdenum #	0.019	0.004	0.014	0.015	0.010	0.010	0.014	0.008	0.011	0.009	<0.002	mg/l	TM30/PM17
Dissolved Molybdenum (A10) #	0.19	0.04	0.14	0.15	0.10	0.10	0.14	0.08	0.11	0.09	<0.02	mg/kg	TM30/PM17
Dissolved Nickel #	0.003	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	mg/l	TM30/PM17
Dissolved Nickel (A10) #	0.03	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM30/PM17
Dissolved Selenium #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/l	TM30/PM17
Dissolved Selenium (A10) #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM30/PM17
Dissolved Zinc #	0.003	<0.003	0.004	<0.003	<0.003	<0.003	<0.003	0.003	<0.003	<0.003	<0.003	mg/l	TM30/PM17
Dissolved Zinc (A10) #	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM30/PM17
Mercury Dissolved by CVAF #	0.00006	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	mg/l	TM61/PM0
Mercury Dissolved by CVAF #	0.0006	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	mg/kg	TM61/PM0
Phenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	TM26/PM0
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM26/PM0
Fluoride	0.5	0.8	0.6	0.5	0.6	0.7	0.5	0.6	0.6	0.4	<0.3	mg/l	TM173/PM0
Fluoride	5	8	6	5	6	7	5	6	6	4	<3	mg/kg	TM173/PM0
Sulphate as SO4 #	2.4	6.5	4.1	3.5	4.5	3.2	213.4	44.1	2.9	0.5	<0.5	mg/l	TM38/PM0
Sulphate as SO4 #	24	65	41	35	45	32	2133	441	29	<5	<5	mg/kg	TM38/PM0
Chloride #	0.5	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	1.2	0.4	0.4	<0.3	mg/l	TM38/PM0
Chloride #	5	3	<3	<3	<3	<3	<3	12	4	4	<3	mg/kg	TM38/PM0
Dissolved Organic Carbon	4	4	4	4	4	5	2	4	3	7	<2	mg/l	TM60/PM0
Dissolved Organic Carbon	40	40	40	40	40	50	<20	40	30	70	<20	mg/kg	TM60/PM0
pH	8.30	8.21	8.44	8.39	8.28	8.19	8.04	7.94	8.41	8.32	<0.01	pH units	TM73/PM0
Total Dissolved Solids #	132	93	87	187	107	102	385	180	146	133	<35	mg/l	TM20/PM0
Total Dissolved Solids #	1320	930	870	1870	1070	1020	3849	1800	1461	1329	<350	mg/kg	TM20/PM0

Element Materials Technology

Client Name:	Ground Investigations Ireland	**Report :**	**CEN 10:1 1 Batch**
Reference:	9527-03-20		
Location:	Waste Assesment Back Road Malahide	**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub	
Contact:	Barry Sexton		
EMT Job No:	20/3992		

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	88-90	94-96	97-99	100-102	118-120								
Sample ID	TP-08	TP-09	TP-09	TP-10	TP-13								
Depth	0.00-0.80	0.00-0.70	0.70-1.10	0.50	0.50								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	12/03/2020	12/03/2020	12/03/2020	11/03/2020	11/03/2020								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	2	2	2	2	2						LOD/LOR	Units	Method No.
Date of Receipt	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020								
Dissolved Antimony #	0.002	<0.002	<0.002	0.002	<0.002						<0.002	mg/l	TM30/PM17
Dissolved Antimony (A10) #	<0.02	<0.02	<0.02	<0.02	<0.02						<0.02	mg/kg	TM30/PM17
Dissolved Arsenic #	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025						<0.0025	mg/l	TM30/PM17
Dissolved Arsenic (A10) #	<0.025	<0.025	<0.025	<0.025	<0.025						<0.025	mg/kg	TM30/PM17
Dissolved Barium #	0.004	0.014	<0.003	0.004	0.004						<0.003	mg/l	TM30/PM17
Dissolved Barium (A10) #	0.04	0.14	<0.03	0.04	0.04						<0.03	mg/kg	TM30/PM17
Dissolved Cadmium #	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005						<0.0005	mg/l	TM30/PM17
Dissolved Cadmium (A10) #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	mg/kg	TM30/PM17
Dissolved Chromium #	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015						<0.0015	mg/l	TM30/PM17
Dissolved Chromium (A10) #	<0.015	<0.015	<0.015	<0.015	<0.015						<0.015	mg/kg	TM30/PM17
Dissolved Copper #	<0.007	<0.007	<0.007	<0.007	<0.007						<0.007	mg/l	TM30/PM17
Dissolved Copper (A10) #	<0.07	<0.07	<0.07	<0.07	<0.07						<0.07	mg/kg	TM30/PM17
Dissolved Lead #	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	mg/l	TM30/PM17
Dissolved Lead (A10) #	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	mg/kg	TM30/PM17
Dissolved Molybdenum #	0.035	0.019	<0.002	0.005	0.007						<0.002	mg/l	TM30/PM17
Dissolved Molybdenum (A10) #	0.35	0.19	<0.02	0.05	0.07						<0.02	mg/kg	TM30/PM17
Dissolved Nickel #	<0.002	<0.002	<0.002	<0.002	<0.002						<0.002	mg/l	TM30/PM17
Dissolved Nickel (A10) #	<0.02	<0.02	<0.02	<0.02	<0.02						<0.02	mg/kg	TM30/PM17
Dissolved Selenium #	<0.003	<0.003	<0.003	<0.003	<0.003						<0.003	mg/l	TM30/PM17
Dissolved Selenium (A10) #	<0.03	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM30/PM17
Dissolved Zinc #	<0.003	<0.003	<0.003	<0.003	<0.003						<0.003	mg/l	TM30/PM17
Dissolved Zinc (A10) #	<0.03	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM30/PM17
Mercury Dissolved by CVAF #	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001						<0.00001	mg/l	TM61/PM0
Mercury Dissolved by CVAF #	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001						<0.0001	mg/kg	TM61/PM0
Phenol	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	mg/l	TM26/PM0
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	mg/kg	TM26/PM0
Fluoride	0.6	0.5	0.6	0.6	0.4						<0.3	mg/l	TM173/PM0
Fluoride	6	5	6	6	4						<3	mg/kg	TM173/PM0
Sulphate as SO4 #	5.3	114.8	4.7	<0.5	<0.5						<0.5	mg/l	TM38/PM0
Sulphate as SO4 #	53	1149	47	<5	<5						<5	mg/kg	TM38/PM0
Chloride #	0.4	<0.3	<0.3	<0.3	<0.3						<0.3	mg/l	TM38/PM0
Chloride #	4	<3	<3	<3	<3						<3	mg/kg	TM38/PM0
Dissolved Organic Carbon	2	<2	2	<2	<2						<2	mg/l	TM60/PM0
Dissolved Organic Carbon	<20	<20	20	<20	<20						<20	mg/kg	TM60/PM0
pH	8.58	8.08	8.24	8.49	8.32						<0.01	pH units	TM73/PM0
Total Dissolved Solids #	60	269	83	45	40						<35	mg/l	TM20/PM0
Total Dissolved Solids #	600	2691	830	450	400						<350	mg/kg	TM20/PM0

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 9527-03-20
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton
EMT Job No: 20/3992

Report : EN12457_2

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	43-45	46-48	49-51	55-57	61-63	67-69	70-72	73-75	76-78	82-84						
Sample ID	TP-01	TP-01	TP-02	TP-03	TP-04	TP-05	TP-05	TP-05	TP-06	TP-07						
Depth	0.00-1.10	1.10-1.50	0.00-1.10	0.00-1.50	0.00-1.70	0.00-1.00	1.00-1.90	1.90-2.30	0.00-2.10	0.00-1.20						
COC No / misc																
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T						
Sample Date	11/03/2020	12/03/2020	12/03/2020	12/03/2020	11/03/2020	12/03/2020	12/03/2020	12/03/2020	12/03/2020	11/03/2020						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil						
Batch Number	2	2	2	2	2	2	2	2	2	2	Inert	Stable Non-reactive	Hazardous	LOD LOR	Units	Method No.
Date of Receipt	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020						
Solid Waste Analysis																
Total Organic Carbon #	NDP	0.38	NDP	NDP	0.96	1.29	0.85	1.78	NDP	0.99	3	5	6	<0.02	%	TM21/PM24
Sum of BTEX	<0.025	<0.025	<0.025	<0.025[SV]	<0.025	<0.025	<0.025[SV]	<0.025	<0.025[SV]	<0.025	6	-	-	<0.025	mg/kg	TM36/PM12
Sum of 7 PCBs #	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	1	-	-	<0.035	mg/kg	TM17/PM8
Mineral Oil	<30	<30	<30	<30	33	<30	<30	140	<30	<30	500	-	-	<30	mg/kg	TM5/PM8/PM16
PAH Sum of 6 #	1.09	<0.22	12.14	2.40	1.08	0.33	2.89	<0.22	2.46	1.80	-	-	-	<0.22	mg/kg	TM4/PM8
PAH Sum of 17	2.16	<0.64	25.89	4.17	1.98	0.69	5.52	<0.64	5.13	2.86	100	-	-	<0.64	mg/kg	TM4/PM8
CEN 10:1 Leachate																
Arsenic #	<0.025	<0.025	0.041	0.040	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.5	2	25	<0.025	mg/kg	TM30/PM17
Barium #	0.06	0.12	0.11	0.11	0.09	0.10	0.16	0.21	0.11	0.09	20	100	300	<0.03	mg/kg	TM30/PM17
Cadmium #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.04	1	5	<0.005	mg/kg	TM30/PM17
Chromium #	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.5	10	70	<0.015	mg/kg	TM30/PM17
Copper #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	2	50	100	<0.07	mg/kg	TM30/PM17
Mercury #	0.0006	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.01	0.2	2	<0.0001	mg/kg	TM61/PM0
Molybdenum #	0.19	0.04	0.14	0.15	0.10	0.10	0.14	0.08	0.11	0.09	0.5	10	30	<0.02	mg/kg	TM30/PM17
Nickel #	0.03	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.4	10	40	<0.02	mg/kg	TM30/PM17
Lead #	<0.05	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.5	10	50	<0.05	mg/kg	TM30/PM17
Antimony #	<0.02	<0.02	0.04	<0.02	<0.02	<0.02	<0.02	0.03	0.02	<0.02	0.06	0.7	5	<0.02	mg/kg	TM30/PM17
Selenium #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.1	0.5	7	<0.03	mg/kg	TM30/PM17
Zinc #	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	4	50	200	<0.03	mg/kg	TM30/PM17
Total Dissolved Solids #	1320	930	870	1870	1070	1020	3849	1800	1461	1329	4000	60000	100000	<350	mg/kg	TM20/PM0
Dissolved Organic Carbon	40	40	40	40	40	50	<20	40	30	70	500	800	1000	<20	mg/kg	TM60/PM0
Mass of raw test portion	0.1035	0.1079	0.0995	0.1068	0.1036	0.102	0.1034	0.1124	0.1063	0.1112	-	-	-		kg	NONE/PM17
Dry Matter Content Ratio	86.7	83.1	90.2	84.1	87.2	88.0	86.8	79.7	84.5	80.7	-	-	-	<0.1	%	NONE/PM4
Leachant Volume	0.886	0.882	0.89	0.883	0.887	0.888	0.886	0.877	0.884	0.878	-	-	-		l	NONE/PM17
Eluate Volume	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8	-	-	-		l	NONE/PM17
pH #	8.53	8.41	8.53	8.54	8.54	8.23	8.17	7.77	8.63	8.33	-	-	-	<0.01	pH units	TM73/PM11
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1	-	-	<0.1	mg/kg	TM26/PM0
Fluoride	5	8	6	5	6	7	5	6	6	4	-	-	-	<3	mg/kg	TM173/PM0
Sulphate as SO4 #	24	65	41	35	45	32	2133	441	29	<5	1000	20000	50000	<5	mg/kg	TM38/PM0
Chloride #	5	3	<3	<3	<3	<3	<3	12	4	4	800	15000	25000	<3	mg/kg	TM38/PM0

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Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 9527-03-20
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton
EMT Job No: 20/3992

Report : EN12457_2

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	88-90	94-96	97-99	100-102	118-120	Inert	Stable Non-reactive	Hazardous	LOD LOR	Units	Method No.
Sample ID	TP-08	TP-09	TP-09	TP-10	TP-13						
Depth	0.00-0.80	0.00-0.70	0.70-1.10	0.50	0.50						
COC No / misc											
Containers	V J T	V J T	V J T	V J T	V J T						
Sample Date	12/03/2020	12/03/2020	12/03/2020	11/03/2020	11/03/2020						
Sample Type	Soil	Soil	Soil	Soil	Soil						
Batch Number	2	2	2	2	2						
Date of Receipt	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020						
Solid Waste Analysis											
Total Organic Carbon #	0.93	0.99	0.49	0.28	0.25	3	5	6	<0.02	%	TM21/PM24
Sum of BTEX	<0.025 SV	<0.025 SV	<0.025	<0.025	<0.025	6	-	-	<0.025	mg/kg	TM36/PM12
Sum of 7 PCBs #	<0.035	<0.035	<0.035	<0.035	<0.035	1	-	-	<0.035	mg/kg	TM17/PM8
Mineral Oil	<30	<30	<30	<30	<30	500	-	-	<30	mg/kg	TM5/PM8/PM16
PAH Sum of 6 #	0.28	<0.22	<0.22	<0.22	<0.22	-	-	-	<0.22	mg/kg	TM4/PM8
PAH Sum of 17	0.69	<0.64	<0.64	<0.64	<0.64	100	-	-	<0.64	mg/kg	TM4/PM8
CEN 10:1 Leachate											
Arsenic #	<0.025	<0.025	<0.025	<0.025	<0.025	0.5	2	25	<0.025	mg/kg	TM30/PM17
Barium #	0.04	0.14	<0.03	0.04	0.04	20	100	300	<0.03	mg/kg	TM30/PM17
Cadmium #	<0.005	<0.005	<0.005	<0.005	<0.005	0.04	1	5	<0.005	mg/kg	TM30/PM17
Chromium #	<0.015	<0.015	<0.015	<0.015	<0.015	0.5	10	70	<0.015	mg/kg	TM30/PM17
Copper #	<0.07	<0.07	<0.07	<0.07	<0.07	2	50	100	<0.07	mg/kg	TM30/PM17
Mercury #	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.01	0.2	2	<0.0001	mg/kg	TM61/PM0
Molybdenum #	0.35	0.19	<0.02	0.05	0.07	0.5	10	30	<0.02	mg/kg	TM30/PM17
Nickel #	<0.02	<0.02	<0.02	<0.02	<0.02	0.4	10	40	<0.02	mg/kg	TM30/PM17
Lead #	<0.05	<0.05	<0.05	<0.05	<0.05	0.5	10	50	<0.05	mg/kg	TM30/PM17
Antimony #	<0.02	<0.02	<0.02	<0.02	<0.02	0.06	0.7	5	<0.02	mg/kg	TM30/PM17
Selenium #	<0.03	<0.03	<0.03	<0.03	<0.03	0.1	0.5	7	<0.03	mg/kg	TM30/PM17
Zinc #	<0.03	<0.03	<0.03	<0.03	<0.03	4	50	200	<0.03	mg/kg	TM30/PM17
Total Dissolved Solids #	600	2691	830	450	400	4000	60000	100000	<350	mg/kg	TM20/PM0
Dissolved Organic Carbon	<20	<20	20	<20	<20	500	800	1000	<20	mg/kg	TM60/PM0
Mass of raw test portion	0.1016	0.1021	0.1075	0.1025	0.1033	-	-	-		kg	NONE/PM17
Dry Matter Content Ratio	88.3	87.9	83.9	87.5	87.0	-	-	-	<0.1	%	NONE/PM4
Leachant Volume	0.888	0.888	0.883	0.887	0.887	-	-	-		l	NONE/PM17
Eluate Volume	0.8	0.8	0.8	0.8	0.8	-	-	-		l	NONE/PM17
pH #	8.37	8.10	8.38	8.70	8.73	-	-	-	<0.01	pH units	TM73/PM11
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	1	-	-	<0.1	mg/kg	TM26/PM0
Fluoride	6	5	6	6	4	-	-	-	<3	mg/kg	TM173/PM0
Sulphate as SO4 #	53	1149	47	<5	<5	1000	20000	50000	<5	mg/kg	TM38/PM0
Chloride #	4	<3	<3	<3	<3	800	15000	25000	<3	mg/kg	TM38/PM0

Client Name: Ground Investigations Ireland
Reference: 9527-03-20
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	EPH Interpretation
20/3992	2	TP-01	0.00-1.10	43-45	No interpretation possible
20/3992	2	TP-01	1.10-1.50	46-48	No interpretation possible
20/3992	2	TP-02	0.00-1.10	49-51	PAH's
20/3992	2	TP-03	0.00-1.50	55-57	PAH's & Possible lubricating oil
20/3992	2	TP-04	0.00-1.70	61-63	Possible lubricating oil
20/3992	2	TP-05	0.00-1.00	67-69	No interpretation possible
20/3992	2	TP-05	1.00-1.90	70-72	Possible lubricating oil & Possible PAH's
20/3992	2	TP-05	1.90-2.30	73-75	Unknown hydrocarbons
20/3992	2	TP-06	0.00-2.10	76-78	No interpretation possible
20/3992	2	TP-07	0.00-1.20	82-84	No interpretation possible
20/3992	2	TP-08	0.00-0.80	88-90	No interpretation possible
20/3992	2	TP-09	0.00-0.70	94-96	No interpretation possible
20/3992	2	TP-09	0.70-1.10	97-99	No interpretation possible
20/3992	2	TP-10	0.50	100-102	No interpretation possible
20/3992	2	TP-13	0.50	118-120	No interpretation possible

Client Name: Ground Investigations Ireland
Reference: 20/03/9527
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/3992	2	TP-01	0.00-1.10	44	18/03/2020	**General Description (Bulk Analysis)**	soil-stones
					18/03/2020	**Asbestos Fibres**	Fibre Bundles
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	Chrysotile
					18/03/2020	**Asbestos Level Screen**	less than 0.1%
					19/03/2020	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					19/03/2020	**Total Detailed Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					19/03/2020	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	<0.001 (mass %)
20/3992	2	TP-01	1.10-1.50	47	18/03/2020	**General Description (Bulk Analysis)**	soil-stones
					18/03/2020	**Asbestos Fibres**	NAD
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD
20/3992	2	TP-02	0.00-1.10	50	18/03/2020	**General Description (Bulk Analysis)**	soil.stones
					18/03/2020	**Asbestos Fibres**	Fibre Bundles
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	Chrysotile
					18/03/2020	**Asbestos Level Screen**	less than 0.1%
					19/03/2020	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					19/03/2020	**Total Detailed Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					19/03/2020	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	<0.001 (mass %)
20/3992	2	TP-03	0.00-1.50	56	18/03/2020	**General Description (Bulk Analysis)**	Soil/Stones
					18/03/2020	**Asbestos Fibres**	Fibre Bundles
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	Chrysotile
					18/03/2020	**Asbestos Level Screen**	less than 0.1%
					19/03/2020	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					19/03/2020	**Total Detailed Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					19/03/2020	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	<0.001 (mass %)
20/3992	2	TP-04	0.00-1.70	62	18/03/2020	**General Description (Bulk Analysis)**	soil.stones
					18/03/2020	**Asbestos Fibres**	NAD
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD

Client Name: Ground Investigations Ireland
Reference: 20/03/9527
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/3992	2	TP-05	0.00-1.00	68	18/03/2020	**General Description (Bulk Analysis)**	soil.stones
					18/03/2020	**Asbestos Fibres**	NAD
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD
20/3992	2	TP-05	1.00-1.90	71	18/03/2020	**General Description (Bulk Analysis)**	soil-stones
					18/03/2020	**Asbestos Fibres**	NAD
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD
20/3992	2	TP-05	1.90-2.30	74	18/03/2020	**General Description (Bulk Analysis)**	soil.stones
					18/03/2020	**Asbestos Fibres**	NAD
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD
20/3992	2	TP-06	0.00-2.10	77	18/03/2020	**General Description (Bulk Analysis)**	soil.stones
					18/03/2020	**Asbestos Fibres**	Fibre Bundles
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	Chrysotile
					18/03/2020	**Asbestos Level Screen**	less than 0.1%
					19/03/2020	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					19/03/2020	**Total Detailed Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					19/03/2020	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	<0.001 (mass %)
20/3992	2	TP-07	0.00-1.20	83	18/03/2020	**General Description (Bulk Analysis)**	Soil/Stones
					18/03/2020	**Asbestos Fibres**	NAD
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD
20/3992	2	TP-08	0.00-0.80	89	18/03/2020	**General Description (Bulk Analysis)**	Soil/Stones
					18/03/2020	**Asbestos Fibres**	NAD
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD
20/3992	2	TP-09	0.00-0.70	95	18/03/2020	**General Description (Bulk Analysis)**	soil-stones
					18/03/2020	**Asbestos Fibres**	NAD
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD
20/3992	2	TP-09	0.70-1.10	98	18/03/2020	**General Description (Bulk Analysis)**	soil.stones
					18/03/2020	**Asbestos Fibres**	NAD
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD
20/3992	2	TP-10	0.50	101	18/03/2020	**General Description (Bulk Analysis)**	Soil/Stones
					18/03/2020	**Asbestos Fibres**	NAD

Client Name: Ground Investigations Ireland
Reference: 20/03/9527
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/3992	2	TP-10	0.50	101	18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD
20/3992	2	TP-13	0.50	119	18/03/2020	**General Description (Bulk Analysis)**	Soil/Stones
					18/03/2020	**Asbestos Fibres**	NAD
					18/03/2020	**Asbestos ACM**	NAD
					18/03/2020	**Asbestos Type**	NAD
					18/03/2020	**Asbestos Level Screen**	NAD

Element Materials Technology

NDP Reason Report

Client Name: Ground Investigations Ireland

Reference: 9527-03-20

Location: Waste Assesment Back Road Malahide

Contact: Barry Sexton

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Method No.	NDP Reason
20/3992	2	TP-01	0.00-1.10	43-45	TM21/PM24	Asbestos detected in sample
20/3992	2	TP-02	0.00-1.10	49-51	TM21/PM24	Asbestos detected in sample
20/3992	2	TP-03	0.00-1.50	55-57	TM21/PM24	Asbestos detected in sample
20/3992	2	TP-06	0.00-2.10	76-78	TM21/PM24	Asbestos detected in sample

Client Name: Ground Investigations Ireland
Reference: 9527-03-20
Location: Waste Assesment Back Road Malahide
Contact: Barry Sexton

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/3992						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

EMT Job No.: 20/3992

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/3992

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes

EMT Job No: 20/3992

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM17	Modified method BS EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH_4^+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH_4^+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060, APHA Standard Methods for Examination of Water and Wastewater 5310B, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.			AR	Yes

EMT Job No: 20/3992

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM0	No preparation is required.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM131	Quantification of Asbestos Fibres and ACM, based on HSG248 and SCA method.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	Yes
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes
NONE	No Method Code	NONE	No Method Code			AR	Yes
NONE	No Method Code	PM17	Modified method BS EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM17	Modified method BS EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.			AR	

EMT Job No: 20/3992

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.			AR	

APPENDIX 4 – HazWasteOnLine^{TM} Report

HazWasteOnline™

Waste Classification Report

6U6UQ-P3PME-KNZP7

Job name

Back Road Malahide 17 05 04

Description/Comments

Project

9527-03-20

Site

Back Road Malahide

Related Documents

#	Name	Description
1	Back Road Malahide.hwol	.hwol file used to create the Job
2	Classification Report-Back Road Malahide.pdf	Classification for Job: Back Road Malahide

Waste Stream Template

Example waste stream template for contaminated soils

Classified by

Name:
Barry Sexton
Date:
09 Apr 2020 11:03 GMT
Telephone:
00353876119640

Company:
Ground Investigations Ireland
Catherinestown House,
Hazelhatch Road, Newcastle
Co. Dublin

HazWasteOnline™ Training Record:

Course	Date
Hazardous Waste Classification	09 Apr 2019
Advanced Hazardous Waste Classification	10 Apr 2019

Report

Created by: Barry Sexton
Created date: 09 Apr 2020 11:03 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	TP-01-12/03/2020-1.10-1.50m		Non Hazardous		2
2	TP-05-12/03/2020-1.90-2.30m		Non Hazardous		5
3	TP-09-12/03/2020-0.70-1.10m		Non Hazardous		8
4	TP-10-11/03/2020-0.50m		Non Hazardous		11
5	TP-13-11/03/2020-0.50m		Non Hazardous		14

Classification of sample: TP-01-12/03/2020-1.10-1.50m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP-01-12/03/2020-1.10-1.50m		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
16.2% (wet weight correction)			

Hazard properties

None identified

Determinands

Moisture content: 16.2% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		3	mg/kg	1.197	3.01	mg/kg	0.000301 %	✓	
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		22.4	mg/kg	1.32	24.784	mg/kg	0.00248 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.9	mg/kg	1.142	1.819	mg/kg	0.000182 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		92.4	mg/kg	1.462	113.17	mg/kg	0.0113 %	✓	
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3	mg/kg	1.923	<0.577	mg/kg	<0.0000577 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		70	mg/kg	1.126	66.045	mg/kg	0.0066 %	✓	
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	39	mg/kg	1.56	50.978	mg/kg	0.00327 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1	mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
9	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		7.3	mg/kg	1.5	9.177	mg/kg	0.000918 %	✓	
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		35.7	mg/kg	2.976	89.04	mg/kg	0.0089 %	✓	
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1	mg/kg	2.554	2.14	mg/kg	0.000214 %	✓	
12	zinc { zinc chromate }	024-007-00-3				204	mg/kg	2.774	474.246	mg/kg	0.0474 %	✓	
13	TPH (C6 to C40) petroleum group			TPH		<52	mg/kg		<52	mg/kg	<0.0052 %		<LOD
14	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
15	benzene	601-020-00-8	200-753-7	71-43-2		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
16	toluene	601-021-00-3	203-625-9	108-88-3		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
17	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
18	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
19	pH			PH		8.41	pH		8.41	pH	8.41 pH		
20	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
21	acenaphthylene		205-917-1	208-96-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
22	acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
23	fluorene		201-695-5	86-73-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
24	phenanthrene		201-581-5	85-01-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
25	anthracene		204-371-1	120-12-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
26	fluoranthene		205-912-4	206-44-0		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
27	pyrene		204-927-3	129-00-0		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
28	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<LOD
29	chrysene	601-048-00-0	205-923-4	218-01-9		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
30	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
31	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
32	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
33	indeno[123-cd]pyrene		205-893-2	193-39-5		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
34	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
35	benzo[ghi]perylene		205-883-8	191-24-2		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
36	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.035	mg/kg		<0.035	mg/kg	<0.0000035 %		<LOD
37	barium { barium oxide }		215-127-9	1304-28-5		150	mg/kg	1.117	140.345	mg/kg	0.014 %	✓	
38	coronene		205-881-7	191-07-1		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
39	benzo[j]fluoranthene	601-035-00-X	205-910-3	205-82-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
										Total:	0.101 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP-05-12/03/2020-1.90-2.30m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP-05-12/03/2020-1.90-2.30m		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:			
19.4% (wet weight correction)		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 19.4% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		3	mg/kg	1.197	2.895	mg/kg	0.000289 %	✓	
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		16.3	mg/kg	1.32	17.346	mg/kg	0.00173 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.6	mg/kg	1.142	1.473	mg/kg	0.000147 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		103.7	mg/kg	1.462	122.16	mg/kg	0.0122 %	✓	
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3	mg/kg	1.923	<0.577	mg/kg	<0.0000577 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		40	mg/kg	1.126	36.299	mg/kg	0.00363 %	✓	
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	57	mg/kg	1.56	71.661	mg/kg	0.00459 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1	mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
9	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		8.3	mg/kg	1.5	10.036	mg/kg	0.001 %	✓	
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		47.8	mg/kg	2.976	114.666	mg/kg	0.0115 %	✓	
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				2	mg/kg	2.554	4.116	mg/kg	0.000412 %	✓	
12	zinc { zinc chromate }	024-007-00-3				123	mg/kg	2.774	275.023	mg/kg	0.0275 %	✓	
13	TPH (C6 to C40) petroleum group			TPH		140	mg/kg		112.84	mg/kg	0.0113 %	✓	
14	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
15	benzene	601-020-00-8	200-753-7	71-43-2		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
16	toluene	601-021-00-3	203-625-9	108-88-3		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
17	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
18	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
19	pH			PH		7.77 pH		7.77 pH	7.77 pH		
20	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
21	acenaphthylene		205-917-1	208-96-8		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
22	acenaphthene		201-469-6	83-32-9		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
23	fluorene		201-695-5	86-73-7		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
24	phenanthrene		201-581-5	85-01-8		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
25	anthracene		204-371-1	120-12-7		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
26	fluoranthene		205-912-4	206-44-0		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
27	pyrene		204-927-3	129-00-0		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
28	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		<0.06 mg/kg		<0.06 mg/kg	<0.000006 %		<LOD
29	chrysene	601-048-00-0	205-923-4	218-01-9		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
30	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
31	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
32	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
33	indeno[123-cd]pyrene		205-893-2	193-39-5		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
34	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
35	benzo[ghi]perylene		205-883-8	191-24-2		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
36	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.035 mg/kg		<0.035 mg/kg	<0.0000035 %		<LOD
37	barium { barium oxide }		215-127-9	1304-28-5		116 mg/kg	1.117	104.389 mg/kg	0.0104 %	✓	
38	coronene		205-881-7	191-07-1		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
39	benzo[j]fluoranthene	601-035-00-X	205-910-3	205-82-3		<1 mg/kg		<1 mg/kg	<0.0001 %		<LOD
								Total:	0.085 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0113%)

Classification of sample: TP-09-12/03/2020-0.70-1.10m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP-09-12/03/2020-0.70-1.10m		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
17.3% (wet weight correction)			

Hazard properties

None identified

Determinands

Moisture content: 17.3% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		3	mg/kg	1.197	2.97	mg/kg	0.000297 %	✓	
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		14.4	mg/kg	1.32	15.723	mg/kg	0.00157 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.1	mg/kg	1.142	1.039	mg/kg	0.000104 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		90	mg/kg	1.462	108.784	mg/kg	0.0109 %	✓	
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3	mg/kg	1.923	<0.577	mg/kg	<0.0000577 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		36	mg/kg	1.126	33.52	mg/kg	0.00335 %	✓	
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	27	mg/kg	1.56	34.829	mg/kg	0.00223 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1	mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
9	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		8.2	mg/kg	1.5	10.173	mg/kg	0.00102 %	✓	
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		51.4	mg/kg	2.976	126.514	mg/kg	0.0127 %	✓	
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				2	mg/kg	2.554	4.224	mg/kg	0.000422 %	✓	
12	zinc { zinc chromate }	024-007-00-3				111	mg/kg	2.774	254.658	mg/kg	0.0255 %	✓	
13	TPH (C6 to C40) petroleum group			TPH		<52	mg/kg		<52	mg/kg	<0.0052 %		<LOD
14	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
15		benzene	601-020-00-8	200-753-7	71-43-2		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
16		toluene	601-021-00-3	203-625-9	108-88-3		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
17	●	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
18		xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
19	●	pH			PH		8.38	pH		8.38	pH	8.38 pH		
20		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
21	●	acenaphthylene		205-917-1	208-96-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
22	●	acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
23	●	fluorene		201-695-5	86-73-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
24	●	phenanthrene		201-581-5	85-01-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
25	●	anthracene		204-371-1	120-12-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
26	●	fluoranthene		205-912-4	206-44-0		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
27	●	pyrene		204-927-3	129-00-0		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
28		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<LOD
29		chrysene	601-048-00-0	205-923-4	218-01-9		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
30		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
31		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
32		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
33	●	indeno[123-cd]pyrene		205-893-2	193-39-5		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
34		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
35	●	benzo[ghi]perylene		205-883-8	191-24-2		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
36	●	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.035	mg/kg		<0.035	mg/kg	<0.0000035 %		<LOD
37		barium { ● barium oxide }		215-127-9	1304-28-5		100	mg/kg	1.117	92.335	mg/kg	0.00923 %	✓	
38	●	coronene		205-881-7	191-07-1		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
39		benzo[j]fluoranthene	601-035-00-X	205-910-3	205-82-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
											Total:	0.0727 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP-10-11/03/2020-0.50m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP-10-11/03/2020-0.50m
Moisture content:
12.1%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 12.1% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		3	mg/kg	1.197	3.157	mg/kg	0.000316 %	✓	
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		11.7	mg/kg	1.32	13.579	mg/kg	0.00136 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.4	mg/kg	1.142	1.406	mg/kg	0.000141 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		74.2	mg/kg	1.462	95.325	mg/kg	0.00953 %	✓	
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3	mg/kg	1.923	<0.577	mg/kg	<0.0000577 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		28	mg/kg	1.126	27.71	mg/kg	0.00277 %	✓	
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	19	mg/kg	1.56	26.05	mg/kg	0.00167 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1	mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
9	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		7.2	mg/kg	1.5	9.494	mg/kg	0.000949 %	✓	
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		36.5	mg/kg	2.976	95.489	mg/kg	0.00955 %	✓	
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				2	mg/kg	2.554	4.489	mg/kg	0.000449 %	✓	
12	zinc { zinc chromate }	024-007-00-3				93	mg/kg	2.774	226.778	mg/kg	0.0227 %	✓	
13	TPH (C6 to C40) petroleum group			TPH		<52	mg/kg		<52	mg/kg	<0.0052 %		<LOD
14	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
15		benzene	601-020-00-8	200-753-7	71-43-2		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
16		toluene	601-021-00-3	203-625-9	108-88-3		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
17		ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
18		xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
19		pH			PH		8.7	pH		8.7	pH	8.7 pH		
20		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
21		acenaphthylene		205-917-1	208-96-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
22		acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
23		fluorene		201-695-5	86-73-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
24		phenanthrene		201-581-5	85-01-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
25		anthracene		204-371-1	120-12-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
26		fluoranthene		205-912-4	206-44-0		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
27		pyrene		204-927-3	129-00-0		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
28		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<LOD
29		chrysene	601-048-00-0	205-923-4	218-01-9		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
30		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
31		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
32		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
33		indeno[123-cd]pyrene		205-893-2	193-39-5		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
34		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
35		benzo[ghi]perylene		205-883-8	191-24-2		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
36		polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.035	mg/kg		<0.035	mg/kg	<0.0000035 %		<LOD
37		barium { barium oxide }		215-127-9	1304-28-5		96	mg/kg	1.117	94.215	mg/kg	0.00942 %	✓	
38		coronene		205-881-7	191-07-1		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
39		benzo[j]fluoranthene	601-035-00-X	205-910-3	205-82-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
											Total:	0.0643 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP-13-11/03/2020-0.50m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP-13-11/03/2020-0.50m		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:		Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
11.7% (wet weight correction)			

Hazard properties

None identified

Determinands

Moisture content: 11.7% Wet Weight Moisture Correction applied (MC)

#	Determinand / CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide } 051-005-00-X	215-175-0	1309-64-4		2	mg/kg	1.197	2.114	mg/kg	0.000211 %	✓	
2	arsenic { arsenic trioxide } 033-003-00-0	215-481-4	1327-53-3		10.5	mg/kg	1.32	12.241	mg/kg	0.00122 %	✓	
3	cadmium { cadmium oxide } 048-002-00-0	215-146-2	1306-19-0		1.1	mg/kg	1.142	1.11	mg/kg	0.000111 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		61.8	mg/kg	1.462	79.756	mg/kg	0.00798 %	✓	
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0	215-607-8	1333-82-0		<0.3	mg/kg	1.923	<0.577	mg/kg	<0.0000577 %		<LOD
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X	215-270-7	1317-39-1		25	mg/kg	1.126	24.854	mg/kg	0.00249 %	✓	
7	lead { lead chromate } 082-004-00-2	231-846-0	7758-97-6	1	17	mg/kg	1.56	23.414	mg/kg	0.0015 %	✓	
8	mercury { mercury dichloride } 080-010-00-X	231-299-8	7487-94-7		<0.1	mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
9	molybdenum { molybdenum(VI) oxide } 042-001-00-9	215-204-7	1313-27-5		5	mg/kg	1.5	6.623	mg/kg	0.000662 %	✓	
10	nickel { nickel chromate } 028-035-00-7	238-766-5	14721-18-7		36.5	mg/kg	2.976	95.924	mg/kg	0.00959 %	✓	
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<LOD
12	zinc { zinc chromate } 024-007-00-3				77	mg/kg	2.774	188.617	mg/kg	0.0189 %	✓	
13	TPH (C6 to C40) petroleum group		TPH		<52	mg/kg		<52	mg/kg	<0.0052 %		<LOD
14	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane 603-181-00-X	216-653-1	1634-04-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
15	benzene	601-020-00-8	200-753-7	71-43-2		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
16	toluene	601-021-00-3	203-625-9	108-88-3		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
17	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
18	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
19	pH			PH		8.73	pH		8.73	pH	8.73 pH		
20	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
21	acenaphthylene		205-917-1	208-96-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
22	acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
23	fluorene		201-695-5	86-73-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
24	phenanthrene		201-581-5	85-01-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
25	anthracene		204-371-1	120-12-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
26	fluoranthene		205-912-4	206-44-0		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
27	pyrene		204-927-3	129-00-0		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
28	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<LOD
29	chrysene	601-048-00-0	205-923-4	218-01-9		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
30	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
31	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
32	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
33	indeno[123-cd]pyrene		205-893-2	193-39-5		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
34	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
35	benzo[ghi]perylene		205-883-8	191-24-2		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
36	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.035	mg/kg		<0.035	mg/kg	<0.0000035 %		<LOD
37	barium { barium oxide }		215-127-9	1304-28-5		81	mg/kg	1.117	79.856	mg/kg	0.00799 %	✓	
38	coronene		205-881-7	191-07-1		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
39	benzo[j]fluoranthene	601-035-00-X	205-910-3	205-82-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
										Total:	0.0563 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non CLP determinands

chromium(III) oxide (EC Number: 215-160-9, CAS Number: 1308-38-9)

Conversion factor: 1.462
Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4 H332 , Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Resp. Sens. 1 H334 , Skin Sens. 1 H317 , Repr. 1B H360FD , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

TPH (C6 to C40) petroleum group (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3 H226 , Asp. Tox. 1 H304 , STOT RE 2 H373 , Muta. 1B H340 , Carc. 1B H350 , Repr. 2 H361d , Aquatic Chronic 2 H411

ethylbenzene (EC Number: 202-849-4, CAS Number: 100-41-4)

CLP index number: 601-023-00-4
Description/Comments:
Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2B (77) 2000

pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4 H302 , Acute Tox. 1 H330 , Acute Tox. 1 H310 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315

acenaphthene (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Aquatic Chronic 2 H411

fluorene (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

phenanthrene (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Carc. 2 H351 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Skin Irrit. 2 H315

anthracene (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

fluoranthene (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4 H302 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

pyrene (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2 H315 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

indeno[123-cd]pyrene (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2 H351

benzo[ghi]perylene (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

polychlorobiphenyls; PCB (EC Number: 215-648-1, CAS Number: 1336-36-3)

CLP index number: 602-039-00-4
Description/Comments: Worst Case: IARC considers PCB Group 1; Carcinogenic to humans; POP specific threshold from ATP1 (Regulation 756/2010/EU) to POPs Regulation (Regulation 850/2004/EC). Where applicable, the calculation method laid down in European standards EN 12766-1 and EN 12766-2 shall be applied.
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): Carc. 1A H350
Reason for additional Hazards Statement(s):
29 Sep 2015 - Carc. 1A H350 hazard statement sourced from: IARC Group 1 (23, Sup 7, 100C) 2012

barium oxide (EC Number: 215-127-9, CAS Number: 1304-28-5)

Conversion factor: 1.117
Description/Comments: Data from ECHA's C&L Inventory Database, Sigma Aldrich SDS dated 6/2/20
Data source: https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/88825
Data source date: 02 Apr 2020
Hazard Statements: Acute Tox. 1 H332 , Eye Dam. 1 H318 , Skin Corr. 1B H314 , Acute Tox. 3 H301

coronene (EC Number: 205-881-7, CAS Number: 191-07-1)

Description/Comments: Data from C&L Inventory Database; no entries in Registered Substances or Pesticides Properties databases; SDS: Sigma Aldrich, 1907/2006 compliant, dated 2012 - no entries; IARC – Group 3, not carcinogenic.
Data source:
http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=17010&HarmOnly=no?fc=true&lang=en
Data source date: 16 Jun 2014
Hazard Statements: STOT SE 2 H371

Appendix B: Rationale for selection of metal species

antimony {antimony trioxide}

Worst case CLP species based on hazard statements/molecular weight and low solubility. Industrial sources include: flame retardants in electrical apparatus, textiles and coatings (edit as required)

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(III) compounds {chromium(III) oxide}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass (edit as required)

chromium in chromium(VI) compounds {chromium(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight. Industrial sources include: production stainless steel, electroplating, wood preservation, anti-corrosion agents or coatings, pigments (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

molybdenum {molybdenum(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case. Pigment cadmium sulphoselenide not likely to be present in this soil. No evidence for the other CLP entries: sodium selenite, nickel II selenite and nickel selenide, to be present in this soil. (edit as required)

zinc {zinc chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

barium {barium oxide}

Cr VI not detected

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.1, May 2018
HazWasteOnline Classification Engine Version: 2020.88.4220.8373 (28 Mar 2020)
HazWasteOnline Database: 2020.88.4220.8373 (28 Mar 2020)

This classification utilises the following guidance and legislation:
WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Wastes 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004
1st ATP to POPs Regulation - Regulation 756/2010/EU of 24 August 2010
2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010

HazWasteOnline™

Waste Classification Report

75LYA-QFPWZ-W299S

Job name

Back Road Malahide 17 09 04

Description/Comments

Project

9527-03-20

Site

Back Road Malahide

Related Documents

#	Name	Description
1	Back Road Malahide.hwol	.hwol file used to create the Job
2	Classification Report-Back Road Malahide.pdf	Classification for Job: Back Road Malahide

Waste Stream Template

Example waste stream template for contaminated soils

Classified by

Name:
Barry Sexton
Date:
09 Apr 2020 11:05 GMT
Telephone:
00353876119640

Company:
Ground Investigations Ireland
Catherinestown House,
Hazelhatch Road, Newcastle
Co. Dublin

HazWasteOnline™ Training Record:

Course	Date
Hazardous Waste Classification	09 Apr 2019
Advanced Hazardous Waste Classification	10 Apr 2019

Report

Created by: Barry Sexton
Created date: 09 Apr 2020 11:05 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	TP-01-11/03/2020-0.00-1.10m		Non Hazardous		3
2	TP-02-12/03/2020-0.00-1.10m		Non Hazardous		6
3	TP-03-12/03/2020-0.00-1.50m		Non Hazardous		9
4	TP-04-11/03/2020-0.00-1.70m		Non Hazardous		12
5	TP-05-12/03/2020-0.00-1.00m		Non Hazardous		15
6	TP-05-12/03/2020-1.00-1.90m		Non Hazardous		18
7	TP-06-12/03/2020-0.00-2.10m		Non Hazardous		21
8	TP-07-11/03/2020-0.00-1.20m		Non Hazardous		24
9	TP-08-12/03/2020-0.00-0.80m		Non Hazardous		27
10	TP-09-12/03/2020-0.00-0.70m		Non Hazardous		30

Classification of sample: TP-01-11/03/2020-0.00-1.10m

Non Hazardous Waste
Classified as **17 09 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP-01-11/03/2020-0.00-1.10m		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:			
12.9% (wet weight correction)		Entry:	17 09 04 (mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03)

Hazard properties

None identified

Determinands

Moisture content: 12.9% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		3 mg/kg	1.197	3.128 mg/kg	0.000313 %	✓	
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		14.5 mg/kg	1.32	16.675 mg/kg	0.00167 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		3.1 mg/kg	1.142	3.084 mg/kg	0.000308 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		19.2 mg/kg	1.462	24.442 mg/kg	0.00244 %	✓	
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3 mg/kg	1.923	<0.577 mg/kg	<0.0000577 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		61 mg/kg	1.126	59.82 mg/kg	0.00598 %	✓	
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	110 mg/kg	1.56	149.446 mg/kg	0.00958 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
9	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		7.1 mg/kg	1.5	9.277 mg/kg	0.000928 %	✓	
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		55.3 mg/kg	2.976	143.356 mg/kg	0.0143 %	✓	
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				3 mg/kg	2.554	6.673 mg/kg	0.000667 %	✓	
12	zinc { zinc chromate }	024-007-00-3				134 mg/kg	2.774	323.782 mg/kg	0.0324 %	✓	
13	TPH (C6 to C40) petroleum group			TPH		<52 mg/kg		<52 mg/kg	<0.0052 %		<LOD
14	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
15		benzene	601-020-00-8	200-753-7	71-43-2		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
16		toluene	601-021-00-3	203-625-9	108-88-3		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
17		ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
18		xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
19		pH			PH		8.53 pH		8.53 pH	8.53 pH		
20		naphthalene	601-052-00-2	202-049-5	91-20-3		0.1 mg/kg		0.0871 mg/kg	0.00000871 %	✓	
21		acenaphthylene		205-917-1	208-96-8		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
22		acenaphthene		201-469-6	83-32-9		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %		<LOD
23		fluorene		201-695-5	86-73-7		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
24		phenanthrene		201-581-5	85-01-8		0.2 mg/kg		0.174 mg/kg	0.0000174 %	✓	
25		anthracene		204-371-1	120-12-7		0.07 mg/kg		0.061 mg/kg	0.0000061 %	✓	
26		fluoranthene		205-912-4	206-44-0		0.3 mg/kg		0.261 mg/kg	0.0000261 %	✓	
27		pyrene		204-927-3	129-00-0		0.28 mg/kg		0.244 mg/kg	0.0000244 %	✓	
28		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.24 mg/kg		0.209 mg/kg	0.0000209 %	✓	
29		chrysene	601-048-00-0	205-923-4	218-01-9		0.18 mg/kg		0.157 mg/kg	0.0000157 %	✓	
30		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.24 mg/kg		0.209 mg/kg	0.0000209 %	✓	
31		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.1 mg/kg		0.0871 mg/kg	0.00000871 %	✓	
32		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.18 mg/kg		0.157 mg/kg	0.0000157 %	✓	
33		indeno[123-cd]pyrene		205-893-2	193-39-5		0.13 mg/kg		0.113 mg/kg	0.0000113 %	✓	
34		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
35		benzo[ghi]perylene		205-883-8	191-24-2		0.14 mg/kg		0.122 mg/kg	0.0000122 %	✓	
36		polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.035 mg/kg		<0.035 mg/kg	<0.0000035 %		<LOD
37		asbestos	650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5		<10 mg/kg		<10 mg/kg	<0.001 %		<LOD
38		barium { barium oxide }		215-127-9	1304-28-5		150 mg/kg	1.117	145.871 mg/kg	0.0146 %	✓	
39		coronene		205-881-7	191-07-1		<0.04 mg/kg		<0.04 mg/kg	<0.000004 %		<LOD
40		benzo[j]fluoranthene	601-035-00-X	205-910-3	205-82-3		<1 mg/kg		<1 mg/kg	<0.0001 %		<LOD

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
								Total:	0.0898 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP-02-12/03/2020-0.00-1.10m

Non Hazardous Waste
Classified as **17 09 04**
in the List of Waste

Sample details

Sample Name:
TP-02-12/03/2020-0.00-1.10m
Moisture content:
15.9%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 09 04 (mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03)

Hazard properties

None identified

Determinands

Moisture content: 15.9% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		2 mg/kg	1.197	2.014 mg/kg	0.000201 %	✓	
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		11.4 mg/kg	1.32	12.658 mg/kg	0.00127 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.5 mg/kg	1.142	1.441 mg/kg	0.000144 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		20.1 mg/kg	1.462	24.706 mg/kg	0.00247 %	✓	
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3 mg/kg	1.923	<0.577 mg/kg	<0.0000577 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		50 mg/kg	1.126	47.344 mg/kg	0.00473 %	✓	
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	76 mg/kg	1.56	99.697 mg/kg	0.00639 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
9	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		3.7 mg/kg	1.5	4.668 mg/kg	0.000467 %	✓	
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		44.3 mg/kg	2.976	110.885 mg/kg	0.0111 %	✓	
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				2 mg/kg	2.554	4.295 mg/kg	0.00043 %	✓	
12	zinc { zinc chromate }	024-007-00-3				94 mg/kg	2.774	219.307 mg/kg	0.0219 %	✓	
13	TPH (C6 to C40) petroleum group			TPH		83 mg/kg		69.803 mg/kg	0.00698 %	✓	
14	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
15	benzene	601-020-00-8	200-753-7	71-43-2		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
16	toluene	601-021-00-3	203-625-9	108-88-3		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
17	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
18	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
19	pH			PH		8.53	pH		8.53	pH	8.53 pH		
20	naphthalene	601-052-00-2	202-049-5	91-20-3		0.08	mg/kg		0.0673	mg/kg	0.00000673 %	✓	
21	acenaphthylene		205-917-1	208-96-8		0.39	mg/kg		0.328	mg/kg	0.0000328 %	✓	
22	acenaphthene		201-469-6	83-32-9		0.07	mg/kg		0.0589	mg/kg	0.00000589 %	✓	
23	fluorene		201-695-5	86-73-7		0.32	mg/kg		0.269	mg/kg	0.0000269 %	✓	
24	phenanthrene		201-581-5	85-01-8		2.72	mg/kg		2.288	mg/kg	0.000229 %	✓	
25	anthracene		204-371-1	120-12-7		1.75	mg/kg		1.472	mg/kg	0.000147 %	✓	
26	fluoranthene		205-912-4	206-44-0		4.42	mg/kg		3.717	mg/kg	0.000372 %	✓	
27	pyrene		204-927-3	129-00-0		3.6	mg/kg		3.028	mg/kg	0.000303 %	✓	
28	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		2.06	mg/kg		1.732	mg/kg	0.000173 %	✓	
29	chrysene	601-048-00-0	205-923-4	218-01-9		2.21	mg/kg		1.859	mg/kg	0.000186 %	✓	
30	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		2.4	mg/kg		2.018	mg/kg	0.000202 %	✓	
31	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.93	mg/kg		0.782	mg/kg	0.0000782 %	✓	
32	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		2.03	mg/kg		1.707	mg/kg	0.000171 %	✓	
33	indeno[123-cd]pyrene		205-893-2	193-39-5		1.24	mg/kg		1.043	mg/kg	0.000104 %	✓	
34	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.32	mg/kg		0.269	mg/kg	0.0000269 %	✓	
35	benzo[ghi]perylene		205-883-8	191-24-2		1.12	mg/kg		0.942	mg/kg	0.0000942 %	✓	
36	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.035	mg/kg		<0.035	mg/kg	<0.0000035 %		<LOD
37	asbestos	650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5		<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
38	barium { barium oxide }		215-127-9	1304-28-5		94	mg/kg	1.117	88.264	mg/kg	0.00883 %	✓	
39	coronene		205-881-7	191-07-1		0.23	mg/kg		0.193	mg/kg	0.0000193 %	✓	
40	benzo[j]fluoranthene	601-035-00-X	205-910-3	205-82-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
								Total:	0.0683 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00698%)

Classification of sample: TP-03-12/03/2020-0.00-1.50m

Non Hazardous Waste
Classified as **17 09 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP-03-12/03/2020-0.00-1.50m		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:			
14.4% (wet weight correction)		Entry:	17 09 04 (mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03)

Hazard properties

None identified

Determinands

Moisture content: 14.4% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		4	mg/kg	1.197	4.099	mg/kg	0.00041 %	✓	
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		15.5	mg/kg	1.32	17.518	mg/kg	0.00175 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.8	mg/kg	1.142	1.76	mg/kg	0.000176 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		21.2	mg/kg	1.462	26.523	mg/kg	0.00265 %	✓	
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3	mg/kg	1.923	<0.577	mg/kg	<0.0000577 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		42	mg/kg	1.126	40.478	mg/kg	0.00405 %	✓	
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	56	mg/kg	1.56	74.771	mg/kg	0.00479 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1	mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
9	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		2.7	mg/kg	1.5	3.467	mg/kg	0.000347 %	✓	
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		39.4	mg/kg	2.976	100.379	mg/kg	0.01 %	✓	
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				2	mg/kg	2.554	4.372	mg/kg	0.000437 %	✓	
12	zinc { zinc chromate }	024-007-00-3				117	mg/kg	2.774	277.836	mg/kg	0.0278 %	✓	
13	TPH (C6 to C40) petroleum group			TPH		69	mg/kg		59.064	mg/kg	0.00591 %	✓	
14	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
15	benzene	601-020-00-8	200-753-7	71-43-2		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
16	toluene	601-021-00-3	203-625-9	108-88-3		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
17	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
18	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
19	pH			PH		8.54	pH		8.54	pH	8.54 pH		
20	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
21	acenaphthylene		205-917-1	208-96-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
22	acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
23	fluorene		201-695-5	86-73-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
24	phenanthrene		201-581-5	85-01-8		0.28	mg/kg		0.24	mg/kg	0.000024 %	✓	
25	anthracene		204-371-1	120-12-7		0.08	mg/kg		0.0685	mg/kg	0.00000685 %	✓	
26	fluoranthene		205-912-4	206-44-0		0.53	mg/kg		0.454	mg/kg	0.0000454 %	✓	
27	pyrene		204-927-3	129-00-0		0.5	mg/kg		0.428	mg/kg	0.0000428 %	✓	
28	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.46	mg/kg		0.394	mg/kg	0.0000394 %	✓	
29	chrysene	601-048-00-0	205-923-4	218-01-9		0.37	mg/kg		0.317	mg/kg	0.0000317 %	✓	
30	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.58	mg/kg		0.496	mg/kg	0.0000496 %	✓	
31	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.23	mg/kg		0.197	mg/kg	0.0000197 %	✓	
32	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.53	mg/kg		0.454	mg/kg	0.0000454 %	✓	
33	indeno[123-cd]pyrene		205-893-2	193-39-5		0.25	mg/kg		0.214	mg/kg	0.0000214 %	✓	
34	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.08	mg/kg		0.0685	mg/kg	0.00000685 %	✓	
35	benzo[ghi]perylene		205-883-8	191-24-2		0.28	mg/kg		0.24	mg/kg	0.000024 %	✓	
36	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.035	mg/kg		<0.035	mg/kg	<0.0000035 %		<LOD
37	asbestos	650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5		<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
38	barium { barium oxide }		215-127-9	1304-28-5		94	mg/kg	1.117	89.839	mg/kg	0.00898 %	✓	
39	coronene		205-881-7	191-07-1		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
40	benzo[j]fluoranthene	601-035-00-X	205-910-3	205-82-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
								Total:	0.0689 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00591%)

Classification of sample: TP-04-11/03/2020-0.00-1.70m

Non Hazardous Waste
Classified as **17 09 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP-04-11/03/2020-0.00-1.70m		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:			
12.6% (wet weight correction)		Entry:	17 09 04 (mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03)

Hazard properties

None identified

Determinands

Moisture content: 12.6% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		3 mg/kg	1.197	3.139 mg/kg	0.000314 %	✓	
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		10.9 mg/kg	1.32	12.578 mg/kg	0.00126 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.3 mg/kg	1.142	1.298 mg/kg	0.00013 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		50.6 mg/kg	1.462	64.636 mg/kg	0.00646 %	✓	
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3 mg/kg	1.923	<0.577 mg/kg	<0.0000577 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		31 mg/kg	1.126	30.505 mg/kg	0.00305 %	✓	
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	57 mg/kg	1.56	77.707 mg/kg	0.00498 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
9	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		4.8 mg/kg	1.5	6.294 mg/kg	0.000629 %	✓	
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		35.5 mg/kg	2.976	92.345 mg/kg	0.00923 %	✓	
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1 mg/kg	2.554	2.232 mg/kg	0.000223 %	✓	
12	zinc { zinc chromate }	024-007-00-3				107 mg/kg	2.774	259.433 mg/kg	0.0259 %	✓	
13	TPH (C6 to C40) petroleum group			TPH		<52 mg/kg		<52 mg/kg	<0.0052 %		<LOD
14	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
15		benzene	601-020-00-8	200-753-7	71-43-2		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
16		toluene	601-021-00-3	203-625-9	108-88-3		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
17		ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
18		xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
19		pH			PH		8.54	pH		8.54	pH	8.54 pH		
20		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
21		acenaphthylene		205-917-1	208-96-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
22		acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
23		fluorene		201-695-5	86-73-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
24		phenanthrene		201-581-5	85-01-8		0.23	mg/kg		0.201	mg/kg	0.0000201 %	✓	
25		anthracene		204-371-1	120-12-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
26		fluoranthene		205-912-4	206-44-0		0.3	mg/kg		0.262	mg/kg	0.0000262 %	✓	
27		pyrene		204-927-3	129-00-0		0.27	mg/kg		0.236	mg/kg	0.0000236 %	✓	
28		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.21	mg/kg		0.184	mg/kg	0.0000184 %	✓	
29		chrysene	601-048-00-0	205-923-4	218-01-9		0.19	mg/kg		0.166	mg/kg	0.0000166 %	✓	
30		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.25	mg/kg		0.219	mg/kg	0.0000219 %	✓	
31		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.1	mg/kg		0.0874	mg/kg	0.00000874 %	✓	
32		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.17	mg/kg		0.149	mg/kg	0.0000149 %	✓	
33		indeno[123-cd]pyrene		205-893-2	193-39-5		0.13	mg/kg		0.114	mg/kg	0.0000114 %	✓	
34		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
35		benzo[ghi]perylene		205-883-8	191-24-2		0.13	mg/kg		0.114	mg/kg	0.0000114 %	✓	
36		polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.035	mg/kg		<0.035	mg/kg	<0.0000035 %		<LOD
37		barium { barium oxide }		215-127-9	1304-28-5		90	mg/kg	1.117	87.824	mg/kg	0.00878 %	✓	
38		coronene		205-881-7	191-07-1		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
39		benzo[j]fluoranthene	601-035-00-X	205-910-3	205-82-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
											Total:	0.0666 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP-05-12/03/2020-0.00-1.00m

Non Hazardous Waste
Classified as **17 09 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP-05-12/03/2020-0.00-1.00m		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:			
14.4% (wet weight correction)		Entry:	17 09 04 (mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03)

Hazard properties

None identified

Determinands

Moisture content: 14.4% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		3	mg/kg	1.197	3.074	mg/kg	0.000307 %	✓	
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		12.7	mg/kg	1.32	14.354	mg/kg	0.00144 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.3	mg/kg	1.142	1.271	mg/kg	0.000127 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		78	mg/kg	1.462	97.585	mg/kg	0.00976 %	✓	
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3	mg/kg	1.923	<0.577	mg/kg	<0.0000577 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		39	mg/kg	1.126	37.587	mg/kg	0.00376 %	✓	
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	51	mg/kg	1.56	68.095	mg/kg	0.00437 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1	mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
9	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		6.8	mg/kg	1.5	8.732	mg/kg	0.000873 %	✓	
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		39.9	mg/kg	2.976	101.653	mg/kg	0.0102 %	✓	
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1	mg/kg	2.554	2.186	mg/kg	0.000219 %	✓	
12	zinc { zinc chromate }	024-007-00-3				120	mg/kg	2.774	284.96	mg/kg	0.0285 %	✓	
13	TPH (C6 to C40) petroleum group			TPH		<52	mg/kg		<52	mg/kg	<0.0052 %		<LOD
14	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
15	benzene	601-020-00-8	200-753-7	71-43-2		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
16	toluene	601-021-00-3	203-625-9	108-88-3		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
17	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
18	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
19	pH			PH		8.23	pH		8.23	pH	8.23 pH		
20	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
21	acenaphthylene		205-917-1	208-96-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
22	acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
23	fluorene		201-695-5	86-73-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
24	phenanthrene		201-581-5	85-01-8		0.07	mg/kg		0.0599	mg/kg	0.00000599 %	✓	
25	anthracene		204-371-1	120-12-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
26	fluoranthene		205-912-4	206-44-0		0.13	mg/kg		0.111	mg/kg	0.0000111 %	✓	
27	pyrene		204-927-3	129-00-0		0.12	mg/kg		0.103	mg/kg	0.0000103 %	✓	
28	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.09	mg/kg		0.077	mg/kg	0.0000077 %	✓	
29	chrysene	601-048-00-0	205-923-4	218-01-9		0.08	mg/kg		0.0685	mg/kg	0.00000685 %	✓	
30	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.09	mg/kg		0.077	mg/kg	0.0000077 %	✓	
31	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.04	mg/kg		0.0342	mg/kg	0.00000342 %	✓	
32	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.07	mg/kg		0.0599	mg/kg	0.00000599 %	✓	
33	indeno[123-cd]pyrene		205-893-2	193-39-5		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
34	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
35	benzo[ghi]perylene		205-883-8	191-24-2		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
36	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.035	mg/kg		<0.035	mg/kg	<0.0000035 %		<LOD
37	barium { barium oxide }		215-127-9	1304-28-5		132	mg/kg	1.117	126.156	mg/kg	0.0126 %	✓	
38	coronene		205-881-7	191-07-1		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
39	benzo[j]fluoranthene	601-035-00-X	205-910-3	205-82-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
										Total:	0.0776 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP-05-12/03/2020-1.00-1.90m

Non Hazardous Waste
Classified as **17 09 04**
in the List of Waste

Sample details

Sample Name:
TP-05-12/03/2020-1.00-1.90m
Moisture content:
11.9%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 09 04 (mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03)

Hazard properties

None identified

Determinands

Moisture content: 11.9% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		3 mg/kg	1.197	3.164 mg/kg	0.000316 %	✓	
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		12.1 mg/kg	1.32	14.075 mg/kg	0.00141 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.8 mg/kg	1.142	1.812 mg/kg	0.000181 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		48.1 mg/kg	1.462	61.935 mg/kg	0.00619 %	✓	
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3 mg/kg	1.923	<0.577 mg/kg	<0.0000577 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		38 mg/kg	1.126	37.692 mg/kg	0.00377 %	✓	
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	35 mg/kg	1.56	48.097 mg/kg	0.00308 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
9	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		5.2 mg/kg	1.5	6.873 mg/kg	0.000687 %	✓	
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		41.4 mg/kg	2.976	108.554 mg/kg	0.0109 %	✓	
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				6 mg/kg	2.554	13.498 mg/kg	0.00135 %	✓	
12	zinc { zinc chromate }	024-007-00-3				102 mg/kg	2.774	249.29 mg/kg	0.0249 %	✓	
13	TPH (C6 to C40) petroleum group			TPH		<52 mg/kg		<52 mg/kg	<0.0052 %		<LOD
14	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
15	benzene	601-020-00-8	200-753-7	71-43-2		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
16	toluene	601-021-00-3	203-625-9	108-88-3		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
17	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
18	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
19	pH			PH		8.17	pH		8.17	pH	8.17 pH		
20	naphthalene	601-052-00-2	202-049-5	91-20-3		0.05	mg/kg		0.0441	mg/kg	0.00000441 %	✓	
21	acenaphthylene		205-917-1	208-96-8		0.06	mg/kg		0.0529	mg/kg	0.00000529 %	✓	
22	acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
23	fluorene		201-695-5	86-73-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
24	phenanthrene		201-581-5	85-01-8		0.44	mg/kg		0.388	mg/kg	0.0000388 %	✓	
25	anthracene		204-371-1	120-12-7		0.14	mg/kg		0.123	mg/kg	0.0000123 %	✓	
26	fluoranthene		205-912-4	206-44-0		0.79	mg/kg		0.696	mg/kg	0.0000696 %	✓	
27	pyrene		204-927-3	129-00-0		0.69	mg/kg		0.608	mg/kg	0.0000608 %	✓	
28	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.59	mg/kg		0.52	mg/kg	0.000052 %	✓	
29	chrysene	601-048-00-0	205-923-4	218-01-9		0.52	mg/kg		0.458	mg/kg	0.0000458 %	✓	
30	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.68	mg/kg		0.599	mg/kg	0.0000599 %	✓	
31	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.27	mg/kg		0.238	mg/kg	0.0000238 %	✓	
32	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.49	mg/kg		0.432	mg/kg	0.0000432 %	✓	
33	indeno[123-cd]pyrene		205-893-2	193-39-5		0.33	mg/kg		0.291	mg/kg	0.0000291 %	✓	
34	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.08	mg/kg		0.0705	mg/kg	0.00000705 %	✓	
35	benzo[ghi]perylene		205-883-8	191-24-2		0.33	mg/kg		0.291	mg/kg	0.0000291 %	✓	
36	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.035	mg/kg		<0.035	mg/kg	<0.0000035 %		<LOD
37	barium { barium oxide }		215-127-9	1304-28-5		99	mg/kg	1.117	97.381	mg/kg	0.00974 %	✓	
38	coronene		205-881-7	191-07-1		0.06	mg/kg		0.0529	mg/kg	0.00000529 %	✓	
39	benzo[j]fluoranthene	601-035-00-X	205-910-3	205-82-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
										Total:	0.0684 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP-06-12/03/2020-0.00-2.10m

Non Hazardous Waste
Classified as **17 09 04**
in the List of Waste

Sample details

Sample Name:		LoW Code:	
TP-06-12/03/2020-0.00-2.10m		Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Moisture content:			
12.6% (wet weight correction)		Entry:	17 09 04 (mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03)

Hazard properties

None identified

Determinands

Moisture content: 12.6% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		2	mg/kg	1.197	2.093	mg/kg	0.000209 %	✓	
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		13.8	mg/kg	1.32	15.925	mg/kg	0.00159 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.3	mg/kg	1.142	1.298	mg/kg	0.00013 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		25.7	mg/kg	1.462	32.829	mg/kg	0.00328 %	✓	
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3	mg/kg	1.923	<0.577	mg/kg	<0.0000577 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		40	mg/kg	1.126	39.361	mg/kg	0.00394 %	✓	
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	57	mg/kg	1.56	77.707	mg/kg	0.00498 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1	mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
9	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		2.7	mg/kg	1.5	3.54	mg/kg	0.000354 %	✓	
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		43.7	mg/kg	2.976	113.675	mg/kg	0.0114 %	✓	
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1	mg/kg	2.554	2.232	mg/kg	0.000223 %	✓	
12	zinc { zinc chromate }	024-007-00-3				112	mg/kg	2.774	271.556	mg/kg	0.0272 %	✓	
13	TPH (C6 to C40) petroleum group			TPH		<52	mg/kg		<52	mg/kg	<0.0052 %		<LOD
14	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
15	benzene	601-020-00-8	200-753-7	71-43-2		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
16	toluene	601-021-00-3	203-625-9	108-88-3		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
17	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
18	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
19	pH			PH		8.63	pH		8.63	pH	8.63 pH		
20	naphthalene	601-052-00-2	202-049-5	91-20-3		0.07	mg/kg		0.0612	mg/kg	0.00000612 %	✓	
21	acenaphthylene		205-917-1	208-96-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
22	acenaphthene		201-469-6	83-32-9		0.07	mg/kg		0.0612	mg/kg	0.00000612 %	✓	
23	fluorene		201-695-5	86-73-7		0.05	mg/kg		0.0437	mg/kg	0.00000437 %	✓	
24	phenanthrene		201-581-5	85-01-8		0.63	mg/kg		0.551	mg/kg	0.0000551 %	✓	
25	anthracene		204-371-1	120-12-7		0.13	mg/kg		0.114	mg/kg	0.0000114 %	✓	
26	fluoranthene		205-912-4	206-44-0		0.8	mg/kg		0.699	mg/kg	0.0000699 %	✓	
27	pyrene		204-927-3	129-00-0		0.72	mg/kg		0.629	mg/kg	0.0000629 %	✓	
28	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.51	mg/kg		0.446	mg/kg	0.0000446 %	✓	
29	chrysene	601-048-00-0	205-923-4	218-01-9		0.41	mg/kg		0.358	mg/kg	0.0000358 %	✓	
30	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.55	mg/kg		0.481	mg/kg	0.0000481 %	✓	
31	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.21	mg/kg		0.184	mg/kg	0.0000184 %	✓	
32	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.42	mg/kg		0.367	mg/kg	0.0000367 %	✓	
33	indeno[123-cd]pyrene		205-893-2	193-39-5		0.24	mg/kg		0.21	mg/kg	0.000021 %	✓	
34	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.08	mg/kg		0.0699	mg/kg	0.00000699 %	✓	
35	benzo[ghi]perylene		205-883-8	191-24-2		0.24	mg/kg		0.21	mg/kg	0.000021 %	✓	
36	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.035	mg/kg		<0.035	mg/kg	<0.0000035 %		<LOD
37	asbestos	650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5		<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
38	barium { barium oxide }		215-127-9	1304-28-5		88	mg/kg	1.117	85.873	mg/kg	0.00859 %	✓	
39	coronene		205-881-7	191-07-1		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
40	benzo[j]fluoranthene	601-035-00-X	205-910-3	205-82-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
								Total:	0.0687 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP-07-11/03/2020-0.00-1.20m

Non Hazardous Waste
Classified as **17 09 04**
in the List of Waste

Sample details

Sample Name:
TP-07-11/03/2020-0.00-1.20m
Moisture content:
18.3%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 09 04 (mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03)

Hazard properties

None identified

Determinands

Moisture content: 18.3% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		3 mg/kg	1.197	2.934 mg/kg	0.000293 %	✓	
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		12.1 mg/kg	1.32	13.052 mg/kg	0.00131 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.1 mg/kg	1.142	1.027 mg/kg	0.000103 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		82.1 mg/kg	1.462	98.035 mg/kg	0.0098 %	✓	
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3 mg/kg	1.923	<0.577 mg/kg	<0.0000577 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		27 mg/kg	1.126	24.836 mg/kg	0.00248 %	✓	
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	41 mg/kg	1.56	52.249 mg/kg	0.00335 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
9	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		6.2 mg/kg	1.5	7.599 mg/kg	0.00076 %	✓	
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		40.4 mg/kg	2.976	98.237 mg/kg	0.00982 %	✓	
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				2 mg/kg	2.554	4.173 mg/kg	0.000417 %	✓	
12	zinc { zinc chromate }	024-007-00-3				123 mg/kg	2.774	278.777 mg/kg	0.0279 %	✓	
13	TPH (C6 to C40) petroleum group			TPH		<52 mg/kg		<52 mg/kg	<0.0052 %		<LOD
14	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
15	benzene	601-020-00-8	200-753-7	71-43-2		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
16	toluene	601-021-00-3	203-625-9	108-88-3		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
17	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
18	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
19	pH			PH		8.33	pH		8.33	pH	8.33 pH		
20	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
21	acenaphthylene		205-917-1	208-96-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
22	acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
23	fluorene		201-695-5	86-73-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
24	phenanthrene		201-581-5	85-01-8		0.06	mg/kg		0.049	mg/kg	0.0000049 %	✓	
25	anthracene		204-371-1	120-12-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
26	fluoranthene		205-912-4	206-44-0		0.21	mg/kg		0.172	mg/kg	0.0000172 %	✓	
27	pyrene		204-927-3	129-00-0		0.25	mg/kg		0.204	mg/kg	0.0000204 %	✓	
28	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.37	mg/kg		0.302	mg/kg	0.0000302 %	✓	
29	chrysene	601-048-00-0	205-923-4	218-01-9		0.33	mg/kg		0.27	mg/kg	0.000027 %	✓	
30	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.47	mg/kg		0.384	mg/kg	0.0000384 %	✓	
31	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.18	mg/kg		0.147	mg/kg	0.0000147 %	✓	
32	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.44	mg/kg		0.359	mg/kg	0.0000359 %	✓	
33	indeno[123-cd]pyrene		205-893-2	193-39-5		0.25	mg/kg		0.204	mg/kg	0.0000204 %	✓	
34	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		0.05	mg/kg		0.0409	mg/kg	0.00000409 %	✓	
35	benzo[ghi]perylene		205-883-8	191-24-2		0.25	mg/kg		0.204	mg/kg	0.0000204 %	✓	
36	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.035	mg/kg		<0.035	mg/kg	<0.0000035 %		<LOD
37	barium { barium oxide }		215-127-9	1304-28-5		121	mg/kg	1.117	110.374	mg/kg	0.011 %	✓	
38	coronene		205-881-7	191-07-1		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
39	benzo[j]fluoranthene	601-035-00-X	205-910-3	205-82-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
										Total:	0.0729 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP-08-12/03/2020-0.00-0.80m

Non Hazardous Waste
Classified as **17 09 04**
in the List of Waste

Sample details

Sample Name:	**TP-08-12/03/2020-0.00-0.80m**	LoW Code:	
Moisture content:	**11.1%** (wet weight correction)	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
		Entry:	17 09 04 (mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03)

Hazard properties

None identified

Determinands

Moisture content: 11.1% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4		2	mg/kg	1.197	2.128	mg/kg	0.000213 %	✓	
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		12.5	mg/kg	1.32	14.672	mg/kg	0.00147 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.8	mg/kg	1.142	1.828	mg/kg	0.000183 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		47.4	mg/kg	1.462	61.588	mg/kg	0.00616 %	✓	
5	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3	mg/kg	1.923	<0.577	mg/kg	<0.0000577 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		38	mg/kg	1.126	38.035	mg/kg	0.0038 %	✓	
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	47	mg/kg	1.56	65.174	mg/kg	0.00418 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1	mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
9	molybdenum { molybdenum(VI) oxide }	042-001-00-9	215-204-7	1313-27-5		5.5	mg/kg	1.5	7.335	mg/kg	0.000734 %	✓	
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		40.7	mg/kg	2.976	107.688	mg/kg	0.0108 %	✓	
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				3	mg/kg	2.554	6.81	mg/kg	0.000681 %	✓	
12	zinc { zinc chromate }	024-007-00-3				100	mg/kg	2.774	246.622	mg/kg	0.0247 %	✓	
13	TPH (C6 to C40) petroleum group			TPH		<52	mg/kg		<52	mg/kg	<0.0052 %		<LOD
14	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
15	benzene	601-020-00-8	200-753-7	71-43-2		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
16	toluene	601-021-00-3	203-625-9	108-88-3		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
17	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
18	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
19	pH			PH		8.37	pH		8.37	pH	8.37 pH		
20	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
21	acenaphthylene		205-917-1	208-96-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
22	acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
23	fluorene		201-695-5	86-73-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
24	phenanthrene		201-581-5	85-01-8		0.12	mg/kg		0.107	mg/kg	0.0000107 %	✓	
25	anthracene		204-371-1	120-12-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
26	fluoranthene		205-912-4	206-44-0		0.12	mg/kg		0.107	mg/kg	0.0000107 %	✓	
27	pyrene		204-927-3	129-00-0		0.11	mg/kg		0.0978	mg/kg	0.00000978 %	✓	
28	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.11	mg/kg		0.0978	mg/kg	0.00000978 %	✓	
29	chrysene	601-048-00-0	205-923-4	218-01-9		0.07	mg/kg		0.0622	mg/kg	0.00000622 %	✓	
30	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		0.07	mg/kg		0.0622	mg/kg	0.00000622 %	✓	
31	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		0.03	mg/kg		0.0267	mg/kg	0.00000267 %	✓	
32	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		0.06	mg/kg		0.0533	mg/kg	0.00000533 %	✓	
33	indeno[123-cd]pyrene		205-893-2	193-39-5		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
34	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
35	benzo[ghi]perylene		205-883-8	191-24-2		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
36	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.035	mg/kg		<0.035	mg/kg	<0.0000035 %		<LOD
37	barium { barium oxide }		215-127-9	1304-28-5		108	mg/kg	1.117	107.198	mg/kg	0.0107 %	✓	
38	coronene		205-881-7	191-07-1		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
39	benzo[j]fluoranthene	601-035-00-X	205-910-3	205-82-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
										Total:	0.069 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP-09-12/03/2020-0.00-0.70m

Non Hazardous Waste
Classified as **17 09 04**
in the List of Waste

Sample details

Sample Name: **TP-09-12/03/2020-0.00-0.70m**	LoW Code:	
Moisture content: **11.7%** (wet weight correction)	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
	Entry:	17 09 04 (mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03)

Hazard properties

None identified

Determinands

Moisture content: 11.7% Wet Weight Moisture Correction applied (MC)

#	Determinand / CLP index number / EC Number / CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	antimony { antimony trioxide } 051-005-00-X / 215-175-0 / 1309-64-4		2	mg/kg	1.197	2.114	mg/kg	0.000211 %	✓	
2	arsenic { arsenic trioxide } 033-003-00-0 / 215-481-4 / 1327-53-3		11.6	mg/kg	1.32	13.524	mg/kg	0.00135 %	✓	
3	cadmium { cadmium oxide } 048-002-00-0 / 215-146-2 / 1306-19-0		1.7	mg/kg	1.142	1.715	mg/kg	0.000171 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide } 215-160-9 / 1308-38-9		47.7	mg/kg	1.462	61.559	mg/kg	0.00616 %	✓	
5	chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.3	mg/kg	1.923	<0.577	mg/kg	<0.0000577 %		<LOD
6	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		35	mg/kg	1.126	34.796	mg/kg	0.00348 %	✓	
7	lead { lead chromate } 082-004-00-2 / 231-846-0 / 7758-97-6	1	36	mg/kg	1.56	49.583	mg/kg	0.00318 %	✓	
8	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		<0.1	mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
9	molybdenum { molybdenum(VI) oxide } 042-001-00-9 / 215-204-7 / 1313-27-5		5.6	mg/kg	1.5	7.418	mg/kg	0.000742 %	✓	
10	nickel { nickel chromate } 028-035-00-7 / 238-766-5 / 14721-18-7		39.1	mg/kg	2.976	102.756	mg/kg	0.0103 %	✓	
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		2	mg/kg	2.554	4.51	mg/kg	0.000451 %	✓	
12	zinc { zinc chromate } 024-007-00-3		89	mg/kg	2.774	218.012	mg/kg	0.0218 %	✓	
13	TPH (C6 to C40) petroleum group TPH		<52	mg/kg		<52	mg/kg	<0.0052 %		<LOD
14	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane 603-181-00-X / 216-653-1 / 1634-04-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
15		benzene	601-020-00-8	200-753-7	71-43-2		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
16		toluene	601-021-00-3	203-625-9	108-88-3		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
17	●	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
18		xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
19	●	pH			PH		8.1	pH		8.1	pH	8.1 pH		
20		naphthalene	601-052-00-2	202-049-5	91-20-3		0.05	mg/kg		0.0442	mg/kg	0.00000441 %	✓	
21	●	acenaphthylene		205-917-1	208-96-8		<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
22	●	acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
23	●	fluorene		201-695-5	86-73-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
24	●	phenanthrene		201-581-5	85-01-8		0.14	mg/kg		0.124	mg/kg	0.0000124 %	✓	
25	●	anthracene		204-371-1	120-12-7		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
26	●	fluoranthene		205-912-4	206-44-0		0.07	mg/kg		0.0618	mg/kg	0.00000618 %	✓	
27	●	pyrene		204-927-3	129-00-0		0.06	mg/kg		0.053	mg/kg	0.0000053 %	✓	
28		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		0.08	mg/kg		0.0706	mg/kg	0.00000706 %	✓	
29		chrysene	601-048-00-0	205-923-4	218-01-9		0.07	mg/kg		0.0618	mg/kg	0.00000618 %	✓	
30		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
31		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
32		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
33	●	indeno[123-cd]pyrene		205-893-2	193-39-5		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
34		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
35	●	benzo[ghi]perylene		205-883-8	191-24-2		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
36	●	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.035	mg/kg		<0.035	mg/kg	<0.0000035 %		<LOD
37		barium { ● barium oxide }		215-127-9	1304-28-5		83	mg/kg	1.117	81.828	mg/kg	0.00818 %	✓	
38	●	coronene		205-881-7	191-07-1		<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
39		benzo[j]fluoranthene	601-035-00-X	205-910-3	205-82-3		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
											Total:	0.0615 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non CLP determinands

chromium(III) oxide (EC Number: 215-160-9, CAS Number: 1308-38-9)

Conversion factor: 1.462
Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4 H332 , Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Resp. Sens. 1 H334 , Skin Sens. 1 H317 , Repr. 1B H360FD , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

TPH (C6 to C40) petroleum group (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3 H226 , Asp. Tox. 1 H304 , STOT RE 2 H373 , Muta. 1B H340 , Carc. 1B H350 , Repr. 2 H361d , Aquatic Chronic 2 H411

ethylbenzene (EC Number: 202-849-4, CAS Number: 100-41-4)

CLP index number: 601-023-00-4
Description/Comments:
Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2B (77) 2000

pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4 H302 , Acute Tox. 1 H330 , Acute Tox. 1 H310 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315

acenaphthene (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Aquatic Chronic 2 H411

fluorene (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

phenanthrene (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Carc. 2 H351 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Skin Irrit. 2 H315

anthracene (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

fluoranthene (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4 H302 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

pyrene (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2 H315 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

indeno[123-cd]pyrene (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2 H351

benzo[ghi]perylene (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

polychlorobiphenyls; PCB (EC Number: 215-648-1, CAS Number: 1336-36-3)

CLP index number: 602-039-00-4
Description/Comments: Worst Case: IARC considers PCB Group 1; Carcinogenic to humans; POP specific threshold from ATP1 (Regulation 756/2010/EU) to POPs Regulation (Regulation 850/2004/EC). Where applicable, the calculation method laid down in European standards EN 12766-1 and EN 12766-2 shall be applied.
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): Carc. 1A H350
Reason for additional Hazards Statement(s):
29 Sep 2015 - Carc. 1A H350 hazard statement sourced from: IARC Group 1 (23, Sup 7, 100C) 2012

barium oxide (EC Number: 215-127-9, CAS Number: 1304-28-5)

Conversion factor: 1.117
Description/Comments: Data from ECHA's C&L Inventory Database, Sigma Aldrich SDS dated 6/2/20
Data source: https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/88825
Data source date: 02 Apr 2020
Hazard Statements: Acute Tox. 1 H332 , Eye Dam. 1 H318 , Skin Corr. 1B H314 , Acute Tox. 3 H301

coronene (EC Number: 205-881-7, CAS Number: 191-07-1)

Description/Comments: Data from C&L Inventory Database; no entries in Registered Substances or Pesticides Properties databases; SDS: Sigma Aldrich, 1907/2006 compliant, dated 2012 - no entries; IARC – Group 3, not carcinogenic.
Data source:
http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=17010&HarmOnly=no?fc=true&lang=en
Data source date: 16 Jun 2014
Hazard Statements: STOT SE 2 H371

Appendix B: Rationale for selection of metal species

antimony {antimony trioxide}

Worst case CLP species based on hazard statements/molecular weight and low solubility. Industrial sources include: flame retardants in electrical apparatus, textiles and coatings (edit as required)

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(III) compounds {chromium(III) oxide}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass (edit as required)

chromium in chromium(VI) compounds {chromium(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight. Industrial sources include: production stainless steel, electroplating, wood preservation, anti-corrosion agents or coatings, pigments (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

molybdenum {molybdenum(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case. Pigment cadmium sulphoselenide not likely to be present in this soil. No evidence for the other CLP entries: sodium selenite, nickel II selenite and nickel selenide, to be present in this soil. (edit as required)

zinc {zinc chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

barium {barium oxide}

Cr VI not detected

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.1, May 2018
HazWasteOnline Classification Engine Version: 2020.88.4220.8373 (28 Mar 2020)
HazWasteOnline Database: 2020.88.4220.8373 (28 Mar 2020)

This classification utilises the following guidance and legislation:
WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Wastes 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004
1st ATP to POPs Regulation - Regulation 756/2010/EU of 24 August 2010
2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010

APPENDIX 5 – WAC Summary Data

Waste Categorisation Summary Table
Back Road Malahide, March 2020

Sample ID	TP-01	TP-01	TP-02	TP-03	TP-04	TP-05	TP-05	TP-05					
Sample Depth (m)	0.00-1.10	1.10-1.50	0.00-1.10	0.00-1.50	0.00-1.70	0.00-1.00	1.00-1.90	1.90-2.30					
Material Description	Made Ground	Clay	Made Ground	Made Ground	Made Ground	Made Ground	Made Ground	Clay					
Sample Date	11/03/2020	12/03/2020	12/03/2020	12/03/2020	11/03/2020	12/03/2020	12/03/2020	12/03/2020					
LoW Code	17 09 04	17 05 04	17 09 04	17 09 04	17 09 04	17 09 04	17 09 04	17 05 04	**Inert Criteria**	**IMS* Criteria**	**Hazardous Criteria**	**LOD LOR**	**Units**
Waste Category	Category C1	Category A	Category C1	Category C1	Category B1	Category B1	Category B2	Category B1					
Metals													
Antimony	3	3	2	4	3	3	3	3	-	-	HazWaste	<1	mg/kg
Arsenic	14.5	22.4	11.4	15.5	10.9	12.7	12.1	16.3	-	-	HazWaste	<0.5	mg/kg
Barium	150	150	94	94	90	132	99	116	-	-	HazWaste	<1	mg/kg
Cadmium	3.1	1.9	1.5	1.8	1.3	1.3	1.8	1.6	-	-	HazWaste	<0.1	mg/kg
Chromium	19.2	92.4	20.1	21.2	50.6	78	48.1	103.7	-	-	HazWaste	<0.5	mg/kg
Copper	61	70	50	42	31	39	38	40	-	-	HazWaste	<1	mg/kg
Lead	110	39	76	56	57	51	35	57	-	-	HazWaste	<5	mg/kg
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	HazWaste	<0.1	mg/kg
Molybdenum	7.1	7.3	3.7	2.7	4.8	6.8	5.2	8.3	-	-	HazWaste	<0.1	mg/kg
Nickel	55.3	35.7	44.3	39.4	35.5	39.9	41.4	47.8	-	-	HazWaste	<0.7	mg/kg
Selenium	3	1	2	2	1	1	6	2	-	-	HazWaste	<1	mg/kg
Zinc	134	204	94	117	107	120	102	123	-	-	HazWaste	<5	mg/kg
Hexavalent Chromium	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	-	HazWaste	<0.3	mg/kg
pH (solid sample)	8.53	8.41	8.53	8.54	8.54	8.23	8.17	7.77	-	-	HazWaste	<0.01	pH units
alkali reserve	-	-	-	-	-	-	-	-	-	-	-	<0.000	gNaOH/100g
Asbestos													
Asbestos (Dry Weight)	<0.001	NAD	<0.001	<0.001	NAD	NAD	NAD	NAD	-	-	-	-	%
Asbestos (Moisture Corrected Weight)	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	-	-	0.1	<0.001	%
ACM Detected	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	-	-	-	Presence	Presence
PAHs													
Naphthalene	0.1	<0.04	0.08	<0.04	<0.04	<0.04	0.05	<0.04	-	-	HazWaste	<0.04	mg/kg
Acenaphthylene	<0.03	<0.03	0.39	<0.03	<0.03	<0.03	0.06	<0.03	-	-	HazWaste	<0.03	mg/kg
Acenaphthene	<0.05	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	HazWaste	<0.05	mg/kg
Fluorene	<0.04	<0.04	0.32	<0.04	<0.04	<0.04	<0.04	<0.04	-	-	HazWaste	<0.04	mg/kg
Phenanthrene	0.2	<0.03	2.72	0.28	0.23	0.07	0.44	<0.03	-	-	HazWaste	<0.03	mg/kg
Anthracene	0.07	<0.04	1.75	0.08	<0.04	<0.04	0.14	<0.04	-	-	HazWaste	<0.04	mg/kg
Fluoranthene	0.3	<0.03	4.42	0.53	0.3	0.13	0.79	<0.03	-	-	HazWaste	<0.03	mg/kg
Pyrene	0.28	<0.03	3.6	0.5	0.27	0.12	0.69	<0.03	-	-	HazWaste	<0.03	mg/kg
Benzo(a)anthracene	0.24	<0.06	2.06	0.46	0.21	0.09	0.59	<0.06	-	-	HazWaste	<0.06	mg/kg
Chrysene	0.18	<0.02	2.21	0.37	0.19	0.08	0.52	<0.02	-	-	HazWaste	<0.02	mg/kg
Benzo(bk)fluoranthene	0.34	<0.07	3.33	0.81	0.35	0.13	0.95	<0.07	-	-	HazWaste	<0.07	mg/kg
Benzo(a)pyrene	0.18	<0.04	2.03	0.53	0.17	0.07	0.49	<0.04	-	-	HazWaste	<0.04	mg/kg
Indeno(123cd)pyrene	0.13	<0.04	1.24	0.25	0.13	<0.04	0.33	<0.04	-	-	HazWaste	<0.04	mg/kg
Dibenzo(ah)anthracene	<0.04	<0.04	0.32	0.08	<0.04	<0.04	0.08	<0.04	-	-	HazWaste	<0.04	mg/kg
Benzo(ghi)perylene	0.14	<0.04	1.12	0.28	0.13	<0.04	0.33	<0.04	-	-	HazWaste	<0.04	mg/kg
Coronene	<0.04	<0.04	0.23	<0.04	<0.04	<0.04	0.06	<0.04	-	-	HazWaste	<0.04	mg/kg
PAH 6 Total	1.09	<0.22	12.14	2.4	1.08	0.33	2.89	<0.22	-	-	-	<0.22	mg/kg
PAH 17 Total	2.16	<0.64	25.89	4.17	1.98	0.69	5.52	<0.64	100	100	-	<0.64	mg/kg
Benzo(b)fluoranthene	0.24	<0.05	2.4	0.58	0.25	0.09	0.68	<0.05	-	-	HazWaste	<0.05	mg/kg
Benzo(k)fluoranthene	0.1	<0.02	0.93	0.23	0.1	0.04	0.27	<0.02	-	-	HazWaste	<0.02	mg/kg
Benzo(j)fluoranthene	<1	<1	<1	<1	<1	<1	<1	<1	-	-	HazWaste	<1	mg/kg
Hydrocarbons													
TPH (C5-40)	<52	<52	83	69	<52	<52	<52	140	-	-	HazWaste	<52	mg/kg
MTBE	<5	<5	<5	<5	<5	<5	<5	<5	-	-	HazWaste	<5	ug/kg
Benzene	<5	<5	<5	<5	<5	<5	<5	<5	-	-	HazWaste	<5	ug/kg
Toluene	<5	<5	<5	<5	<5	<5	<5	<5	-	-	HazWaste	<5	ug/kg
Ethylbenzene	<5	<5	<5	<5	<5	<5	<5	<5	-	-	HazWaste	<5	ug/kg
m/p-Xylene	<5	<5	<5	<5	<5	<5	<5	<5	-	-	HazWaste	<5	ug/kg
o-Xylene	<5	<5	<5	<5	<5	<5	<5	<5	-	-	HazWaste	<5	ug/kg
Total 7 PCBs	<35	<35	<35	<35	<35	<35	<35	<35	1,000	1,000	HazWaste	<35	ug/kg
WAC Solid Sample Summary**													
Total Organic Carbon *	NDP	0.38	NDP	NDP	0.96	1.29	0.85	1.78	3	6	-	<0.02	%
Sum of BTEX	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	6	6	-	<0.025	mg/kg
Sum of 7 PCBs	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	1	1	-	<0.035	mg/kg
Mineral Oil	<30	<30	<30	<30	33	<30	<30	140	500	500	-	<30	mg/kg
PAH Sum of 6	1.09	<0.22	12.14	2.40	1.08	0.33	2.89	<0.22	-	-	-	<0.22	mg/kg
PAH Sum of 17	2.16	<0.64	25.89	4.17	1.98	0.69	5.52	<0.64	100	100	-	<0.64	mg/kg
WAC Leachate Data**													
Arsenic	<0.025	<0.025	0.041	0.040	<0.025	<0.025	<0.025	<0.025	0.5	1.5	-	<0.025	mg/kg
Barium	0.06	0.12	0.11	0.11	0.09	0.10	0.16	0.21	20	20	-	<0.03	mg/kg
Cadmium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.04	0.04	-	<0.005	mg/kg
Chromium	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.5	0.5	-	<0.015	mg/kg
Copper	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	2	2	-	<0.07	mg/kg
Mercury	0.0006	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.01	0.01	-	<0.0001	mg/kg
Molybdenum	0.19	0.04	0.14	0.15	0.10	0.10	0.14	0.08	0.5	1.5	-	<0.02	mg/kg
Nickel	0.03	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	0.4	0.4	-	<0.02	mg/kg
Lead	<0.05	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	0.5	0.5	-	<0.05	mg/kg
Antimony	<0.02	<0.02	0.04	<0.02	<0.02	<0.02	<0.02	0.03	0.06	0.18	-	<0.02	mg/kg
Selenium	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.1	0.3	-	<0.03	mg/kg
Zinc	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	4	4	-	<0.03	mg/kg
Total Dissolved Solids	1320	930	870	1870	1070	1020	3849	1800	4000	12,000	-	<350	mg/kg
Dissolved Organic Carbon	40	40	40	40	40	50	<20	40	500	500	-	<20	mg/kg
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1	1	-	<0.1	mg/kg
Sulphate as SO4	24	65	41	35	45	32	2,133	441	1000	3,000	-	<0.5	mg/kg
Chloride	5	3	<3	<3	<3	<3	<3	12	800	2,400	-	<3	mg/kg

NAD- no asbestos detected

* - Integrated Materials Solutions Landfill, Hollywood Great, Nag's Head, The Naul, Co. Dublin

** - limits as specified in Council Decision 2003/33/EC

Waste Categorisation Summary Table
Back Road Malahide, March 2020

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Sample ID	TP-06	TP-07	TP-08	TP-09	TP-09	TP-10	TP-13	Inert Criteria	IMS* Criteria	Hazardous Criteria	LOD LOR	Units
Sample Depth (m)	0.00-2.10	0.00-1.20	0.00-0.80	0.00-0.70	0.70-1.10	0.50	0.50					
Material Description	Made Ground	Made Ground	Made Ground	Made Ground	Clay	Clay	Clay					
Sample Date	12/03/2020	11/03/2020	12/03/2020	12/03/2020	12/03/2020	11/03/2020	11/03/2020					
LoW Code	17 09 04	17 09 04	17 09 04	17 09 04	17 05 04	17 05 04	17 05 04					
Waste Category	Category C1	Category B1	Category B1	Category B2	Category A	Category A	Category A					
Metals												
Antimony	2	3	2	2	3	3	2	-	-	HazWaste	<1	mg/kg
Arsenic	13.8	12.1	12.5	11.6	14.4	11.7	10.5	-	-	HazWaste	<0.5	mg/kg
Barium	88	121	108	83	100	96	81	-	-	HazWaste	<1	mg/kg
Cadmium	1.3	1.1	1.8	1.7	1.1	1.4	1.1	-	-	HazWaste	<0.1	mg/kg
Chromium	25.7	82.1	47.4	47.7	90	74.2	61.8	-	-	HazWaste	<0.5	mg/kg
Copper	40	27	38	35	36	28	25	-	-	HazWaste	<1	mg/kg
Lead	57	41	47	36	27	19	17	-	-	HazWaste	<5	mg/kg
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	HazWaste	<0.1	mg/kg
Molybdenum	2.7	6.2	5.5	5.6	8.2	7.2	5	-	-	HazWaste	<0.1	mg/kg
Nickel	43.7	40.4	40.7	39.1	51.4	36.5	36.5	-	-	HazWaste	<0.7	mg/kg
Selenium	1	2	3	2	2	2	<1	-	-	HazWaste	<1	mg/kg
Zinc	112	123	100	89	111	93	77	-	-	HazWaste	<5	mg/kg
Hexavalent Chromium	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	-	HazWaste	<0.3	mg/kg
pH (solid sample)	8.63	8.33	8.37	8.1	8.38	8.7	8.73	-	-	HazWaste	<0.01	pH units
alkali reserve	-							-	-	-	<0.000	gNaOH/100g
Asbestos												
Asbestos (Dry Weight)	<0.001	NAD	NAD	NAD	NAD	NAD	NAD	-	-	-	-	%
Asbestos (Moisture Corrected Weight)	NAD	NAD	NAD	NAD	NAD	NAD	NAD	-	-	0.1	<0.001	%
ACM Detected	NAD	NAD	NAD	NAD	NAD	NAD	NAD	-	-	-	Presence	Presence
PAHs												
Naphthalene	0.07	<0.04	<0.04	0.05	<0.04	<0.04	<0.04	-	-	HazWaste	<0.04	mg/kg
Acenaphthylene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-	-	HazWaste	<0.03	mg/kg
Acenaphthene	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	HazWaste	<0.05	mg/kg
Fluorene	0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	-	-	HazWaste	<0.04	mg/kg
Phenanthrene	0.63	0.06	0.12	0.14	<0.03	<0.03	<0.03	-	-	HazWaste	<0.03	mg/kg
Anthracene	0.13	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	-	-	HazWaste	<0.04	mg/kg
Fluoranthene	0.8	0.21	0.12	0.07	<0.03	<0.03	<0.03	-	-	HazWaste	<0.03	mg/kg
Pyrene	0.72	0.25	0.11	0.06	<0.03	<0.03	<0.03	-	-	HazWaste	<0.03	mg/kg
Benzo(a)anthracene	0.51	0.37	0.11	0.08	<0.06	<0.06	<0.06	-	-	HazWaste	<0.06	mg/kg
Chrysene	0.41	0.33	0.07	0.07	<0.02	<0.02	<0.02	-	-	HazWaste	<0.02	mg/kg
Benzo(bk)fluoranthene	0.76	0.65	0.1	<0.07	<0.07	<0.07	<0.07	-	-	HazWaste	<0.07	mg/kg
Benzo(a)pyrene	0.42	0.44	0.06	<0.04	<0.04	<0.04	<0.04	-	-	HazWaste	<0.04	mg/kg
Indeno(123cd)pyrene	0.24	0.25	<0.04	<0.04	<0.04	<0.04	<0.04	-	-	HazWaste	<0.04	mg/kg
Dibenzo(ah)anthracene	0.08	0.05	<0.04	<0.04	<0.04	<0.04	<0.04	-	-	HazWaste	<0.04	mg/kg
Benzo(ghi)perylene	0.24	0.25	<0.04	<0.04	<0.04	<0.04	<0.04	-	-	HazWaste	<0.04	mg/kg
Coronene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	-	-	HazWaste	<0.04	mg/kg
PAH 6 Total	2.46	1.8	0.28	<0.22	<0.22	<0.22	<0.22	-	-	-	<0.22	mg/kg
PAH 17 Total	5.13	2.86	0.69	<0.64	<0.64	<0.64	<0.64	100	100	-	<0.64	mg/kg
Benzo(b)fluoranthene	0.55	0.47	0.07	<0.05	<0.05	<0.05	<0.05	-	-	HazWaste	<0.05	mg/kg
Benzo(k)fluoranthene	0.21	0.18	0.03	<0.02	<0.02	<0.02	<0.02	-	-	HazWaste	<0.02	mg/kg
Benzo(j)fluoranthene	<1	<1	<1	<1	<1	<1	<1	-	-	HazWaste	<1	mg/kg
Hydrocarbons												
TPH (C5-40)	<52	<52	<52	<52	<52	<52	<52	-	-	HazWaste	<52	mg/kg
MTBE	<5	<5	<5	<5	<5	<5	<5	-	-	HazWaste	<5	ug/kg
Benzene	<5	<5	<5	<5	<5	<5	<5	-	-	HazWaste	<5	ug/kg
Toluene	<5	<5	<5	<5	<5	<5	<5	-	-	HazWaste	<5	ug/kg
Ethylbenzene	<5	<5	<5	<5	<5	<5	<5	-	-	HazWaste	<5	ug/kg
m/p-Xylene	<5	<5	<5	<5	<5	<5	<5	-	-	HazWaste	<5	ug/kg
o-Xylene	<5	<5	<5	<5	<5	<5	<5	-	-	HazWaste	<5	ug/kg
Total 7 PCBs	<35	<35	<35	<35	<35	<35	<35	1,000	1,000	HazWaste	<35	ug/kg
WAC Solid Sample Summary**												
Total Organic Carbon *	NDP	0.99	0.93	0.99	0.49	0.28	0.25	3	6	-	<0.02	%
Sum of BTEX	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	6	6	-	<0.025	mg/kg
Sum of 7 PCBs	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	1	1	-	<0.035	mg/kg
Mineral Oil	<30	<30	<30	<30	<30	<30	<30	500	500	-	<30	mg/kg
PAH Sum of 6	2.46	1.80	0.28	<0.22	<0.22	<0.22	<0.22	-	-	-	<0.22	mg/kg
PAH Sum of 17	5.13	2.86	0.69	<0.64	<0.64	<0.64	<0.64	100	100	-	<0.64	mg/kg
WAC Leachate Data**												
Arsenic	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.5	1.5	-	<0.025	mg/kg
Barium	0.11	0.09	0.04	0.14	<0.03	0.04	0.04	20	20	-	<0.03	mg/kg
Cadmium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.04	0.04	-	<0.005	mg/kg
Chromium	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.5	0.5	-	<0.015	mg/kg
Copper	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	2	2	-	<0.07	mg/kg
Mercury	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.01	0.01	-	<0.0001	mg/kg
Molybdenum	0.11	0.09	0.35	0.19	<0.02	0.05	0.07	0.5	1.5	-	<0.02	mg/kg
Nickel	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.4	0.4	-	<0.02	mg/kg
Lead	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.5	0.5	-	<0.05	mg/kg
Antimony	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.06	0.18	-	<0.02	mg/kg
Selenium	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.1	0.3	-	<0.03	mg/kg
Zinc	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	4	4	-	<0.03	mg/kg
Total Dissolved Solids	1461	1329	600	2691	830	450	400	4000	12,000	-	<350	mg/kg
Dissolved Organic Carbon	30	70	<20	<20	20	<20	<20	500	500	-	<20	mg/kg
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1	1	-	<0.1	mg/kg
Sulphate as SO4	29	<5	53	1,149	47	<5	<5	1000	3,000	-	<0.5	mg/kg
Chloride	4	4	4	<3	<3	<3	<3	800	2,400	-	<3	mg/kg

NAD- no asbestos detected

* - Integrated Materials Solutions Landfill, Hollywood Great, Nag's Head, The Naul, Co. Dublin

** - limits as specified in Council Decision 2003/33/EC

APPENDIX 6 – Suitable 4 Use Data

S4UL - Metals (Residential with homegrown produce), Back Road, Malahide, March 2020

Sample ID	TP-01	TP-01	TP-02	TP-03	TP-04	TP-05	TP-05	TP-05	TP-06	TP-07	Max Level Detected	Units	Residential with homegrown produce
Sample Depth (m)	**0.00-1.10**	**1.10-1.50**	**0.00-1.10**	**0.00-1.50**	**0.00-1.70**	**0.00-1.00**	**1.00-1.90**	**1.90-2.30**	**0.00-2.10**	**0.00-1.20**			
Antimony	3	3	2	4	3	3	3	3	2	3	4	mg/kg	ne
Arsenic	14.5	22.4	11.4	15.5	10.9	12.7	12.1	16.3	13.8	12.1	22.4	mg/kg	37
Barium	150	150	94	94	90	132	99	116	88	121	150	mg/kg	ne
Cadmium	3.1	1.9	1.5	1.8	1.3	1.3	1.8	1.6	1.3	1.1	3.1	mg/kg	11
Chromium	19.2	92.4	20.1	21.2	50.6	78	48.1	103.7	25.7	82.1	103.7	mg/kg	910
Copper	61	70	50	42	31	39	38	40	40	27	70	mg/kg	2,400
Lead	110	39	76	56	57	51	35	57	57	41	110	mg/kg	ne
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	mg/kg	1.2
Molybdenum	7.1	7.3	3.7	2.7	4.8	6.8	5.2	8.3	2.7	6.2	8.3	mg/kg	ne
Nickel	55.3	35.7	44.3	39.4	35.5	39.9	41.4	47.8	43.7	40.4	55.3	mg/kg	130
Selenium	3	1	2	2	1	1	6	2	1	2	6	mg/kg	250
Zinc	134	204	94	117	107	120	102	123	112	123	204	mg/kg	3,700
Hexavalent Chromium	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0	mg/kg	6*

S4UL - Metals (Residential with homegrown produce), Back Road, Malahide, March 2020

Sample ID	TP-08	TP-09	TP-09	TP-10	TP-13	Max Level Detected	Units	Residential with homegrown produce
Sample Depth (m)	**0.00-0.80**	**0.00-0.70**	**0.70-1.10**	**0.5**	**0.5**			
Antimony	2	2	3	3	2	3	mg/kg	ne
Arsenic	12.5	11.6	14.4	11.7	10.5	14.4	mg/kg	37
Barium	108	83	100	96	81	108	mg/kg	ne
Cadmium	1.8	1.7	1.1	1.4	1.1	1.8	mg/kg	11
Chromium	47.4	47.7	90	74.2	61.8	90	mg/kg	910
Copper	38	35	36	28	25	38	mg/kg	2,400
Lead	47	36	27	19	17	47	mg/kg	ne
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1	0	mg/kg	1.2
Molybdenum	5.5	5.6	8.2	7.2	5	8.2	mg/kg	ne
Nickel	40.7	39.1	51.4	36.5	36.5	51.4	mg/kg	130
Selenium	3	2	2	2	<1	3	mg/kg	250
Zinc	100	89	111	93	77	111	mg/kg	3,700
Hexavalent Chromium	<0.3	<0.3	<0.3	<0.3	<0.3	0	mg/kg	6*

S4UL - Organic Compounds (Residential with Homegrown Produce), Back Road, Malahide, March 2020

Residential	TP-01	TP-01	TP-02	TP-03	TP-04	TP-05	TP-05	TP-05	TP-06	TP-07	Max Level	Units	Residential with homegrown produce LQM/CIEH Suitable 4 Use Levels (S4ULs) [mg/kg DW]		
	0.00-1.10	1.10-1.50	0.00-1.10	0.00-1.50	0.00-1.70	0.00-1.00	1.00-1.90	1.90-2.30	0.00-2.10	0.00-1.20	Detected		1 % SOM	2.5 % SOM	6 % SOM
Aliphatics															
>C5-C6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	42	78	160
>C6-C8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	100	230	530
>C8-C10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	27	65	150
>C10-C12	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.00	mg/kg	130	330	760
>C12-C16	<4	<4	<4	<4	<4	<4	<4		<4	<4	0.00	mg/kg	1,100	2,400	4,300
>C16-C21	<7	<7	<7	<7	<7	<7	<7	15	<7	<7	15.00	mg/kg	ne	ne	ne
>C21-C35	<7	<7	<7	23	33	<7	26	115	<7	<7	115.00	mg/kg	ne	ne	ne
>C16-C35	<14	<14	<14	23	33	<14	26	130	<14	<14	130.00	mg/kg	65000	92000	110000
>C35-C40	<7	<7	<7	<7	<7	<7	<7	10	<7	<7	10.00	mg/kg	ne	ne	ne
Total aliphatics C5-40	<26	<26	<26	<26	33	<26	26	140	<26	<26	140.00	mg/kg	ne	ne	ne
>C6-C10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	ne	ne	ne
>C10-C25	<10	<10	<10	<10	<10	<10	<10	45.00	<10	<10	45.00	mg/kg	ne	ne	ne
>C25-C35	<10	<10	<10	18	24	<10	23	86	<10	<10	86.00	mg/kg	ne	ne	ne
Aromatics															
>C5-EC7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	70	140	300
>EC7-EC8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	130	290	660
>EC8-EC10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	34	83	190
>EC10-EC12	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.00	mg/kg	74	180	380
>EC12-EC16	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	0.00	mg/kg	140	330	660
>EC16-EC21	<7	<7	15	<7	<7	<7	<7	<7	<7	<7	15.00	mg/kg	260	540	930
>EC21-EC35	<7	<7	56	56	<7	<7	<7	<7	<7	<7	56.00	mg/kg	1,100	1,500	1,700
>EC35-EC40	<7	<7	12	13	<7	<7	<7	<7	<7	<7	13.00	mg/kg	ne	ne	ne
Total aromatics C5-40	<26	<26	83	69	<26	<26	<26	<26	<26	<26	83.00	mg/kg	ne	ne	ne
Total aliphatics and aromatics(C5-40)	<52	<52	83	69	<52	<52	<52	140	<52	<52	140.00	mg/kg	ne	ne	ne
>EC6-EC10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	ne	ne	ne
>EC10-EC25	<10	<10	30	<10	<10	<10	<10	<10	<10	<10	30.00	mg/kg	ne	ne	ne
>EC25-EC35	<10	<10	42	50	<10	<10	<10	<10	<10	<10	50.00	mg/kg	ne	ne	ne
BTEX															
MTBE	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.00	mg/kg	ne	ne	ne
Benzene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.00	mg/kg	0.087	0.17	0.37
Toluene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.00	mg/kg	130	290	660
Ethylbenzene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.00	mg/kg	47	110	260
m/p-Xylene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.00	mg/kg	56	130	310
o-Xylene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.000	mg/kg	60	140	330
TOC	NDP	0.38	NDP	NDP	0.96	1.29	0.85	1.78	NDP	0.99		%			
SOM (Note 1)	NDP	0.65512	NDP	NDP	1.65504	2.22396	1.4654	3.06872	NDP	1.70676					

Note 1 - TOC * 1.724

S4UL - Organic Compounds (Residential with Homegrown Produce), Back Road, Malahide, March 2020

Residential	TP-08	TP-09	TP-09	TP-10	TP-13	Max Level Detected	Units	Residential with homegrown produce LQM/CIEH Suitable 4 Use Levels (S4ULs) [mg/kg DW] 1 % SOM	2.5 % SOM	6 % SOM
	0.00-0.80	0.00-0.70	0.70-1.10	0.50	0.50					
Aliphatics										
>C5-C6	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	42	78	160
>C6-C8	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	100	230	530
>C8-C10	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	27	65	150
>C10-C12	<0.2	<0.2	<0.2	<0.2	<0.2	0.00	mg/kg	130	330	760
>C12-C16	<4	<4	<4	<4	<4	0.00	mg/kg	1,100	2,400	4,300
>C16-C21	<7	<7	<7	<7	<7	0.00	mg/kg	ne	ne	ne
>C21-C35	<7	<7	<7	<7	<7	0.00	mg/kg	ne	ne	ne
>C16-C35	<14	<14	<14	<14	<14	0.00	mg/kg	65000	92000	110000
>C35-C40	<7	<7	<7	<7	<7	0.00	mg/kg	ne	ne	ne
Total aliphatics C5-40	<26	<26	<26	<26	<26	0.00	mg/kg	ne	ne	ne
>C6-C10	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	ne	ne	ne
>C10-C25	<10	<10	<10	<10	<10	0.00	mg/kg	ne	ne	ne
>C25-C35	<10	<10	<10	<10	<10	0.00	mg/kg	ne	ne	ne
Aromatics										
>C5-EC7	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	70	140	300
>EC7-EC8	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	130	290	660
>EC8-EC10	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	34	83	190
>EC10-EC12	<0.2	<0.2	<0.2	<0.2	<0.2	0.00	mg/kg	74	180	380
>EC12-EC16	<4	<4	<4	<4	<4	0.00	mg/kg	140	330	660
>EC16-EC21	<7	<7	<7	<7	<7	0.00	mg/kg	260	540	930
>EC21-EC35	<7	<7	<7	<7	<7	0.00	mg/kg	1,100	1,500	1,700
>EC35-EC40	<7	<7	<7	<7	<7	0.00	mg/kg	ne	ne	ne
Total aromatics C5-40	<26	<26	<26	<26	<26	0.00	mg/kg	ne	ne	ne
Total aliphatics and aromatics(C5-40)	<52	<52	<52	<52	<52	0.00	mg/kg	ne	ne	ne
>EC6-EC10	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	mg/kg	ne	ne	ne
>EC10-EC25	<10	<10	<10	<10	<10	0.00	mg/kg	ne	ne	ne
>EC25-EC35	<10	<10	<10	<10	<10	0.00	mg/kg	ne	ne	ne
BTEX										
MTBE	<0.005	<0.005	<0.005	<0.005	<0.005	0.00	mg/kg	ne	ne	ne
Benzene	<0.005	<0.005	<0.005	<0.005	<0.005	0.00	mg/kg	0.087	0.17	0.37
Toluene	<0.005	<0.005	<0.005	<0.005	<0.005	0.00	mg/kg	130	290	660
Ethylbenzene	<0.005	<0.005	<0.005	<0.005	<0.005	0.00	mg/kg	47	110	260
m/p-Xylene	<0.005	<0.005	<0.005	<0.005	<0.005	0.00	mg/kg	56	130	310
o-Xylene	<0.005	<0.005	<0.005	<0.005	<0.005	0.000	mg/kg	60	140	330
TOC	0.93	0.99	0.49	0.28	0.25		%			
SOM (Note 1)	1.60	1.71	0.84	0.48	0.43					

Note 1 - TOC * 1.724

S4UL - PAHs (Residential with Homegrown Produce), Back Road, Malahide, March 2020

	TP-01	TP-01	TP-02	TP-03	TP-04	TP-05	TP-05	TP-05	TP-06	TP-07	Max Level	Units	Residential with homegrown produce LQM/CIEH Suitable 4 Use Levels (S4ULs) [mg/kg DW]		
	0.00-1.10	1.10-1.50	0.00-1.10	0.00-1.50	0.00-1.70	0.00-1.00	1.00-1.90	1.90-2.30	0.00-2.10	0.00-1.20	Detected		1 % SOM	2.5 % SOM	6 % SOM
Naphthalene	0.1	<0.04	0.08	<0.04	<0.04	<0.04	0.05	<0.04	0.07	<0.04	0.10	mg/kg	2.3	5.6	13
Acenaphthylene	<0.03	<0.03	0.39	<0.03	<0.03	<0.03	0.06	<0.03	<0.03	<0.03	0.39	mg/kg	170	420	920
Acenaphthene	<0.05	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	<0.05	0.07	mg/kg	210	510	1,100
Fluorene	<0.04	<0.04	0.32	<0.04	<0.04	<0.04	<0.04	<0.04	0.05	<0.04	0.32	mg/kg	170	400	860
Phenanthrene	0.2	<0.03	2.72	0.28	0.23	0.07	0.44	<0.03	0.63	0.06	2.72	mg/kg	95	220	440
Anthracene	0.07	<0.04	1.75	0.08	<0.04	<0.04	0.14	<0.04	0.13	<0.04	1.75	mg/kg	2,400	5,400	11,000
Fluoranthene	0.3	<0.03	4.42	0.53	0.3	0.13	0.79	<0.03	0.8	0.21	4.42	mg/kg	280	560	890
Pyrene	0.28	<0.03	3.6	0.5	0.27	0.12	0.69	<0.03	0.72	0.25	3.60	mg/kg	620	1,200	2,000
Benzo(a)anthracene	0.24	<0.06	2.06	0.46	0.21	0.09	0.59	<0.06	0.51	0.37	2.06	mg/kg	7.2	11	13
Chrysene	0.18	<0.02	2.21	0.37	0.19	0.08	0.52	<0.02	0.41	0.33	2.21	mg/kg	15	22	27
Benzo(bk)fluoranthene	0.34	<0.07	3.33	0.81	0.35	0.13	0.95	<0.07	0.76	0.65	3.33	mg/kg	ne	ne	ne
Benzo(a)pyrene	0.18	<0.04	2.03	0.53	0.17	0.07	0.49	<0.04	0.42	0.44	2.03	mg/kg	2.2	2.7	3
Indeno(123cd)pyrene	0.13	<0.04	1.24	0.25	0.13	<0.04	0.33	<0.04	0.24	0.25	1.24	mg/kg	27	36	41
Dibenzo(ah)anthracene	<0.04	<0.04	0.32	0.08	<0.04	<0.04	0.08	<0.04	0.08	0.05	0.32	mg/kg	0.24	0.28	0.3
Benzo(ghi)perylene	0.14	<0.04	1.12	0.28	0.13	<0.04	0.33	<0.04	0.24	0.25	1.12	mg/kg	320	340	350
Coronene	<0.04	<0.04	0.23	<0.04	<0.04	<0.04	0.06	<0.04	<0.04	<0.04	0.23	mg/kg	ne	ne	ne
PAH 6 Total	1.09	<0.22	12.14	2.4	1.08	0.33	2.89	<0.22	2.46	1.8	12.14	mg/kg	ne	ne	ne
PAH 17 Total	2.16	<0.64	25.89	4.17	1.98	0.69	5.52	<0.64	5.13	2.86	25.89	mg/kg	ne	ne	ne
Benzo(b)fluoranthene	0.24	<0.05	2.4	0.58	0.25	0.09	0.68	<0.05	0.55	0.47	2.40	mg/kg	2.6	3.3	3.7
Benzo(k)fluoranthene	0.1	<0.02	0.93	0.23	0.1	0.04	0.27	<0.02	0.21	0.18	0.93	mg/kg	77	93	100
Benzo(j)fluoranthene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0.00	mg/kg	ne	ne	ne
TOC	NDP	0.38	NDP	NDP	0.96	1.29	0.85	1.78	NDP	0.99		%			
SOM (Note 1)	NDP	0.66	NDP	NDP	1.66	2.22	1.47	3.07	NDP	1.71					

Note 1 - TOC * 1.724

S4UL - PAHs (Residential with Homegrown Produce), Back Road, Malahide, March 2020

	TP-08	TP-09	TP-09	TP-10	TP-13	Max Level Detected	Units	Residential with homegrown produce LQM/CIEH Suitable 4 Use Levels (S4ULs) [mg/kg DW]		
	0.00-0.80	0.00-0.70	0.70-1.10	0.50	0.50			1 % SOM	2.5 % SOM	6 % SOM
Naphthalene	<0.04	0.05	<0.04	<0.04	<0.04	0.05	mg/kg	2.3	5.6	13
Acenaphthylene	<0.03	<0.03	<0.03	<0.03	<0.03	0.00	mg/kg	170	420	920
Acenaphthene	<0.05	<0.05	<0.05	<0.05	<0.05	0.00	mg/kg	210	510	1,100
Fluorene	<0.04	<0.04	<0.04	<0.04	<0.04	0.00	mg/kg	170	400	860
Phenanthrene	0.12	0.14	<0.03	<0.03	<0.03	0.14	mg/kg	95	220	440
Anthracene	<0.04	<0.04	<0.04	<0.04	<0.04	0.00	mg/kg	2,400	5,400	11,000
Fluoranthene	0.12	0.07	<0.03	<0.03	<0.03	0.12	mg/kg	280	560	890
Pyrene	0.11	0.06	<0.03	<0.03	<0.03	0.11	mg/kg	620	1,200	2,000
Benzo(a)anthracene	0.11	0.08	<0.06	<0.06	<0.06	0.11	mg/kg	7.2	11	13
Chrysene	0.07	0.07	<0.02	<0.02	<0.02	0.07	mg/kg	15	22	27
Benzo(bk)fluoranthene	0.1	<0.07	<0.07	<0.07	<0.07	0.10	mg/kg	ne	ne	ne
Benzo(a)pyrene	0.06	<0.04	<0.04	<0.04	<0.04	0.06	mg/kg	2.2	2.7	3
Indeno(123cd)pyrene	<0.04	<0.04	<0.04	<0.04	<0.04	0.00	mg/kg	27	36	41
Dibenzo(ah)anthracene	<0.04	<0.04	<0.04	<0.04	<0.04	0.00	mg/kg	0.24	0.28	0.3
Benzo(ghi)perylene	<0.04	<0.04	<0.04	<0.04	<0.04	0.00	mg/kg	320	340	350
Coronene	<0.04	<0.04	<0.04	<0.04	<0.04	0.00	mg/kg	ne	ne	ne
PAH 6 Total	0.28	<0.22	<0.22	<0.22	<0.22	0.28	mg/kg	ne	ne	ne
PAH 17 Total	0.69	<0.64	<0.64	<0.64	<0.64	0.69	mg/kg	ne	ne	ne
Benzo(b)fluoranthene	0.07	<0.05	<0.05	<0.05	<0.05	0.07	mg/kg	2.6	3.3	3.7
Benzo(k)fluoranthene	0.03	<0.02	<0.02	<0.02	<0.02	0.03	mg/kg	77	93	100
Benzo(j)fluoranthene	<1	<1	<1	<1	<1	0.00	mg/kg	ne	ne	ne
TOC	0.93	0.99	0.49	0.28	0.25		%			
SOM (Note 1)	1.60	1.71	0.84	0.48	0.43					

Note 1 - TOC * 1.724

APPENDIX 7 – Potential Material Outlets

Waste Category	Classification Criteria	Potential Outlets
Category A Unlined Soil Recovery Facilities	Soil and Stone only which are free from[17] anthropogenic materials such as concrete, brock timber. Soil must be free from "contamination" e.g. PAHs, Hydrocarbons.	Soil Recovery Facilities, Waste Facility Permitted Sites, COR Sites or potential by-product if deemed not to be a waste and complying with requirements under Article 27 of European Waste Directive Regulations (2011).[18]
Category B1 Inert Landfill	Reported concentrations within inert waste limits, which are set out by the adopted EU Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC (2002). Results also found to be non-hazardous using the HWOL application.	Integrated Materials Solutions Limited Partnership (IMS), Naul, County Dublin W0129-02 Walshestown Landfill Walshestown, Blackhall, Tipperkevin & Bawnoge, Naas, County Kildare W0254-01
Category B2 Inert Landfill	Reported concentrations greater than Category B1 criteria but less than IMS Hollywood Landfill acceptance criteria, as set out in their Waste Licence W0129-02. Results also found to be non-hazardous using the HWOL application*	Integrated Materials Solutions Limited Partnership (IMS), Naul, County Dublin W0129-02 Walshestown Landfill Walshestown, Blackhall, Tipperkevin & Bawnoge, Naas, County Kildare W0254-01[19]
Category C Non-Haz Landfill	Reported concentrations greater than Category B2 criteria but within non-haz landfill waste acceptance limits set out by the adopted EU Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC (2002). Results also found to be non-hazardous using the HWOL application.	Walshestown Landfill Walshestown, Blackhall, Tipperkevin & Bawnoge, Naas, County Kildare W0254-01[20] Ballynagran Landfill, Co. Wicklow. W165-02 Drehid Landfill, Co. Kildare. W0201-01 East Galway Landfill, Co. Galway. W0178-02 Knockharley Landfill, Co. Meath. W0146-02
Category C 1 Non-Haz Landfill	As Category C but containing < 0.001% w/w asbestos fibres.	RILTA Environmental LTD. W0192-03 Enva Portlaoise.

[17] Free from equates to less than 2%.
[18] S.I. No. 126/2011 - European Communities (Waste Directive) Regulations 2011 (Article 27).
[19] Licenced to accept Category B2 material for recovery.
[20] Licenced to accept Category C material for recovery.

		W0184-02
Category C 2 Non-Haz Landfill	As Category C but containing >0.001% and <0.01% w/w asbestos fibres	RILTA Environmental LTD. W0192-03 Enva Portlaoise. W0184-02
Category C Non-Haz Landfill	As Category C but containing >0.01% and <0.1% w/w asbestos fibres.	RILTA Environmental LTD. W0192-03 Enva Portlaoise. W0184-02
Category D Hazardous Treatment	Results found to be hazardous using HWOL Application.	RILTA Environmental LTD. W0192-03 Enva Portlaoise. W0184-02
Category D 1 Hazardous Treatment	Results found to be hazardous due to the presence of asbestos (>0.1%).	RILTA Environmental LTD. W0192-03

APPENDIX 8.1 AMBIENT AIR QUALITY STANDARDS

National standards for ambient air pollutants in Ireland have generally ensued from Council Directives enacted in the EU (& previously the EC & EEC). The initial interest in ambient air pollution legislation in the EU dates from the early 1980s and was in response to the most serious pollutant problems at that time which was the issue of acid rain. As a result of this sulphur dioxide, and later nitrogen dioxide, were both the focus of EU legislation. Linked to the acid rain problem was urban smog associated with fuel burning for space heating purposes. Also apparent at this time were the problems caused by leaded petrol and EU legislation was introduced to deal with this problem in the early 1980s.

In recent years the EU has focused on defining a basis strategy across the EU in relation to ambient air quality. In 1996, a Framework Directive, Council Directive 96/62/EC, on ambient air quality assessment and management was enacted. The aims of the Directive are fourfold. Firstly, the Directive's aim is to establish objectives for ambient air quality designed to avoid harmful effects to health. Secondly, the Directive aims to assess ambient air quality on the basis of common methods and criteria throughout the EU. Additionally, it is aimed to make information on air quality available to the public via alert thresholds and fourthly, it aims to maintain air quality where it is good and improve it in other cases.

As part of these measures to improve air quality, the European Commission has adopted proposals for daughter legislation under Directive 96/62/EC. The first of these directives to be enacted, Council Directive 1999/30/EC, has been passed into Irish Law as S.I. No 271 of 2002 (Air Quality Standards Regulations 2002) and has set limit values which came into operation on 17th June 2002. The Air Quality Standards Regulations 2002 detail margins of tolerance, which are trigger levels for certain types of action in the period leading to the attainment date. The margin of tolerance varies from 60% for lead, to 30% for 24-hour limit value for PM_{10}, 40% for the hourly and annual limit value for NO_2 and 26% for hourly SO_2 limit values. The margin of tolerance commenced from June 2002 and started to reduce from 1 January 2003 and every 12 months thereafter by equal annual percentages to reach 0% by the attainment date. A second daughter directive, EU Council Directive 2000/69/EC, has published limit values for both carbon monoxide and benzene in ambient air. This has also been passed into Irish Law under the Air Quality Standards Regulations 2002.

The most recent EU Council Directive on ambient air quality was published on the 11/06/08 which has been transposed into Irish Law as S.I. 180 of 2011. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive and its subsequent daughter directives. Provisions were also made for the inclusion of new ambient limit values relating to $PM_{2.5}$. The margins of tolerance specific to each pollutant were also slightly adjusted from previous directives. In regard to existing ambient air quality standards, it is not proposed to modify the standards but to strengthen existing provisions to ensure that non-compliances are removed. In addition, new ambient standards for $PM_{2.5}$ are included in Directive 2008/50/EC. The approach for $PM_{2.5}$ was to establish a target value of 25 $\mu g/m^3$, as an annual average (to be attained everywhere by 2010) and a limit value of 25 $\mu g/m^3$, as an annual average (to be attained everywhere by 2015), coupled with a target to reduce human exposure generally to $PM_{2.5}$ between 2010 and 2020. This exposure reduction target will range from 0% (for $PM_{2.5}$ concentrations of less than 8.5 $\mu g/m^3$ to 20% of the average exposure indicator (AEI) for concentrations of between 18 - 22 $\mu g/m^3$). Where the AEI is currently greater than 22 $\mu g/m^3$ all appropriate measures should be employed to reduce this level to 18 $\mu g/m^3$ by 2020. The AEI is based on measurements taken in urban background locations averaged over a three-year period from 2008 - 2010 and again from 2018-2020. Additionally, an exposure concentration obligation of 20 µg/m^3 was set to be complied with by 2015 again based on the AEI.

Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions. The Alert Threshold is defined in Council Directive 96/62/EC as "a level beyond which there is a risk to human health from brief exposure and at which immediate steps shall be taken as laid down in Directive 96/62/EC". These steps include undertaking to ensure that the necessary steps are taken to inform the public (e.g. by means of radio, television and the press).

The Margin of Tolerance is defined in Council Directive 96/62/EC as a concentration which is higher than the limit value when legislation comes into force. It decreases to meet the limit value by the attainment date. The Upper Assessment Threshold is defined in Council Directive 96/62/EC as a concentration above which high quality measurement is mandatory. Data from measurement may be supplemented by information from other sources, including air quality modelling.

An annual average limit for both NO_X (NO and NO_2) is applicable for the protection of vegetation in highly rural areas away from major sources of NO_X such as large conurbations, factories and high road vehicle activity such as a dual carriageway or motorway. Annex VI of EU Directive 1999/30/EC identifies that monitoring to demonstrate compliance with the NO_X limit for the protection of vegetation should be carried out distances greater than:

- 5 km from the nearest motorway or dual carriageway
- 5 km from the nearest major industrial installation
- 20 km from a major urban conurbation

As a guideline, a monitoring station should be indicative of approximately 1000 km^2 of surrounding area.

Under the terms of EU Framework Directive on Ambient Air Quality (96/62/EC), geographical areas within member states have been classified in terms of zones. The zones have been defined in order to meet the criteria for air quality monitoring, assessment and management as described in the Framework Directive and Daughter Directives. Zone A is defined as Dublin and its environs, Zone B is defined as Cork City, Zone C is defined as 23 urban areas with a population greater than 15,000 and Zone D is defined as the remainder of the country. The Zones were defined based on among other things, population and existing ambient air quality.

EU Council Directive 96/62/EC on ambient air quality and assessment has been adopted into Irish Legislation (S.I. No. 33 of 1999). The act has designated the Environmental Protection Agency (EPA) as the competent authority responsible for the implementation of the Directive and for assessing ambient air quality in the State. Other commonly referenced ambient air quality standards include the World Health Organisation. The WHO guidelines differ from air quality standards in that they are primarily set to protect public health from the effects of air pollution. Air quality standards, however, are air quality guidelines recommended by governments, for which additional factors, such as socio-economic factors, may be considered.

APPENDIX 8.2: TRANSPORT INFRASTRUCTURE IRELAND SIGNIFICANCE CRITERIA

Magnitude of Change	Annual Mean NO_2 / PM_{10}	No. days with PM_{10} concentration > 50 µg/m³	Annual Mean $PM_{2.5}$
Large	Increase / decrease ≥4 µg/m³	Increase / decrease >4 days	Increase / decrease ≥2.5 µg/m³
Medium	Increase / decrease 2 - <4 µg/m³	Increase / decrease 3 or 4 days	Increase / decrease 1.25 - <2.5 µg/m³
Small	Increase / decrease 0.4 - <2 µg/m³	Increase / decrease 1 or 2 days	Increase / decrease 0.25 - <1.25 µg/m³
Imperceptible	Increase / decrease <0.4 µg/m³	Increase / decrease <1 day	Increase / decrease <0.25 µg/m³

Table A8.2.1 Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration Note 1		
	Small	**Medium**	**Large**
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m³ of NO_2 or PM_{10}) (≥25 µg/m³ of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m³ of NO_2 or PM_{10}) (22.5 - <25 µg/m³ of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (30 - <36 µg/m³ of NO_2 or PM_{10}) (18.75 - <22.5 µg/m³ of $PM_{2.5}$)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<30 µg/m³ of NO_2 or PM_{10}) (<18.75 µg/m³ of $PM_{2.5}$)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m³ of NO_2 or PM_{10}) (≥25 µg/m³ of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m³ of NO_2 or PM_{10}) (22.5 - <25 µg/m³ of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (30 - <36 µg/m³ of NO_2 or PM_{10}) (18.75 - <22.5 µg/m³ of $PM_{2.5}$)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<30 µg/m³ of NO_2 or PM_{10}) (<18.75 µg/m³ of $PM_{2.5}$)	Negligible	Negligible	Slight Beneficial

Note 1 Well Below Standard = <75% of limit value.

Table A8.2.2 Air Quality Impact Significance Criteria For Annual Mean NO_2 and PM_{10} and $PM_{2.5}$ Concentrations at a Receptor

APPENDIX 8.3 DUST MANAGEMENT PLAN

APPENDIX 8.3 DUST MANAGEMENT PLAN

The objective of dust control at the site is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to develop a workable and transparent dust control strategy, the following management plan has been formulated by drawing on best practice guidance from Ireland, the UK (IAQM (2014), BRE (2003), The Scottish Office (1996), UK ODPM (2002)) and the USA (USEPA, 1997). The following measures will be incorporated into the Construction Management Plan (CMP) prepared for the site.

Site Management

The aim is to ensure good site management by avoiding dust becoming airborne at source. This will be done through good design and effective control strategies. At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance (see Figure 8.1 for the windrose for Dublin Airport Meteorological Station). As the prevailing wind is predominantly westerly to south-westerly, locating construction compounds and storage piles downwind of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors.

Good site management will include the ability to respond to adverse weather conditions by either restricting operations on-site or quickly implementing effective control measures before the potential for nuisance occurs. When rainfall is greater than 0.2mm/day, dust generation is generally suppressed (IAQM, 2014; UK ODPM, 2002). The potential for significant dust generation is also reliant on threshold wind speeds of greater than 10 m/s (19.4 knots) (at 7m above ground) to release loose material from storage piles and other exposed materials (USEPA, 1986). Particular care should be taken during periods of high winds (gales) as these are periods where the potential for significant dust emissions are highest. The prevailing meteorological conditions in the vicinity of the site are favourable in general for the suppression of dust for a significant period of the year. Nevertheless, there will be infrequent periods where care will be needed to ensure that dust nuisance does not occur. The following measures shall be taken in order to avoid dust nuisance occurring under unfavourable meteorological conditions:

- The Principal Contractor or equivalent must monitor the contractors’ performance to ensure that the proposed mitigation measures are implemented and that dust impacts and nuisance are minimised;
- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions;
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details;
- It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses;
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out;
- It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein;

- At all times, the procedures put in place will be strictly monitored and assessed.

The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed and satisfactory procedures implemented to rectify the problem. Specific dust control measures to be employed are described below.

Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Fully enclose specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating Vehicles / Machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum-speed-limit of 20 kph haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials.

Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Only remove the cover in small areas during work and not all at once.
- During dry and windy periods, and when there is a likelihood of dust nuisance, a bowser will operate to ensure moisture content is high enough to increase the stability of the soil and thus suppress dust.

Measures Specific to Construction

- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- 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.
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

Measures Specific to Trackout

Site roads (particularly unpaved) can be a significant source of fugitive dust from construction sites if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25 to 80% (UK ODPM, 2002).

- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles.
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use. If sweeping using a road sweeper is not possible due to the nature of the surrounding area then a suitable smaller scale street cleaning vacuum will be used.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.

- Record all inspections of haul routes and any subsequent action in a site logbook.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10 m from receptors where possible.

Summary of Dust Mitigation Measures

The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the contractor. The key features with respect to control of dust will be:

- The specification of a site policy on dust and the identification of the site management responsibilities for dust issues;
- The development of a documented system for managing site practices with regard to dust control;
- The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed; and
- The specification of effective measures to deal with any complaints received.

APPENDIX 11.1 PHOTOMONTAGES

Broomfield SHD

Proposed Strategic Housing Devlopment on lands at Back Road and Kinsealy Lane, Kinsaley, Broomfield, Malahide, Co Dublin

Method Statement - Photo-montage production.

1. Photographs are taken from locations as advised by client with a full frame SLR digital camera and prime lens. The photographs are taken horizontally with a survey level attached to the camera. The photographic positions are marked (for later surveying), the height of the camera and the focal length of the image recorded.

2. In each photograph, a minimum of 3no. visible fixed points are marked for surveying. These are control points for model alignment within the photograph. All surveying is carried out by a qualified topographical surveyor using Total Station / GPS devices.

3. The photographic positions and the control points are geographically surveyed and this survey is tied in to the site topographical survey supplied by the Architect / client.

4. The buildings are accurately modelled in 3D cad software from cad drawings supplied by the Architect. Material finishes are applied to the 3D model and scene element are place like trees and planting to represent the proposed landscaping.

5. Virtual 3D cameras are positioned according to the survey co-ordinates and the focal length is set to match the photograph. Pitch and rotation are adjusted using the survey control points to align the virtual camera to the photograph. Lighting is set to match the time of day the photograph is taken.

6. The proposed development is output from the 3D software using this camera and the image is then blended with the original photograph to give an accurate image of what the proposed development will look like in its proposed setting.

7. In the event of the development not being visible, the roof line of the development will be outlined in red if re-quested.

8. The document contains:

   a) Site location map with view locations plotted.
   b) Photo-montage sheet with existing or proposed conditions.
   c) Reference information including field of view/focal length, range to site / development, date of photograph.

Location Map

Location Map is for view location purposes only. Please refer to architects drawing for site layout & red line

Project: Broomfield SHD, Backroad Malahide

digital dimensions
architectural visualisation

Location	Date	Field of view	35mm equivalent	Distance to site	Camera model
View 1 Existing	25-09-2020	73°	24mm	146.5m	Canon EOS 5DS

Project: Broomfield SHD, Backroad Malahide

digital dimensions
architectural visualisation

Location	Date	Field of view	35mm equivalent	Distance to site	Camera model
View 1 Proposed	25-09-2020	73°	24mm	146.5m	Canon EOS 5DS

Project: Broomfield SHD, Backroad Malahide

digital dimensions
architectural visualisation

Location	Date	Field of view	35mm equivalent	Distance to site	Camera model
View 2 Existing	25-09-2020	73°	24mm	382.4m	Canon EOS 5DS

Location	Date	Field of view	35mm equivalent	Distance to site	Camera model
View 2 Proposed	25-09-2020	73°	24mm	382.4m	Canon EOS 5DS

Location	Date	Field of view	35mm equivalent	Distance to site	Camera model
View 3 Existing	25-09-2020	71.5°	25mm	618.5m	Canon EOS 5DS

Location	Date	Field of view	35mm equivalent	Distance to site	Camera model
View 3 Proposed	25-09-2020	71.5°	25mm	618.5m	Canon EOS 5DS

Project: Broomfield SHD, Backroad Malahide

digital dimensions
architectural visualisation

Location	Date	Field of view	35mm equivalent	Distance to site	Camera model
View 4 Existing	25-09-2020	73°	24mm	261m	Canon EOS 5DS

Project: Broomfield SHD, Backroad Malahide

digital dimensions
architectural visualisation

Location	Date	Field of view	35mm equivalent	Distance to site	Camera model
View 4 Proposed	25-09-2020	73°	24mm	261m	Canon EOS 5DS

Project: Broomfield SHD, Backroad Malahide

digital dimensions
architectural visualisation

Location	Date	Field of view	35mm equivalent	Distance to site	Camera model
View 5 Existing	25-09-2020	76°	23mm	301m	Canon EOS 5DS

Project: Broomfield SHD, Backroad Malahide

digital dimensions
architectural visualisation

Location	Date	Field of view	35mm equivalent	Distance to site	Camera model
View 5 Proposed	25-09-2020	76°	23mm	301m	Canon EOS 5DS

Project: Broomfield SHD, Backroad Malahide

digital dimensions
architectural visualisation

Location	Date	Field of view	35mm equivalent	Distance to site	Camera model
View 6 Existing	25-09-2020	73°	24mm	303m	Canon EOS 5DS

Location	Date	Field of view	35mm equivalent	Distance to site	Camera model
View 6 Proposed	25-09-2020	73°	24mm	303m	Canon EOS 5DS

Project: Broomfield SHD, Backroad Malahide

digital dimensions
architectural visualisation

APPENDIX 12.1 TRICS DATA

Calculation Reference: AUDIT-561501-201027-1030

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 03 - RESIDENTIAL
Category : C - FLATS PRIVATELY OWNED
TOTAL VEHICLES

Selected regions and areas:
15 GREATER DUBLIN
DL DUBLIN 1 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Primary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter: No of Dwellings
Actual Range: 140 to 140 (units:)
Range Selected by User: 80 to 220 (units:)

Parking Spaces Range: All Surveys Included

Parking Spaces per Dwelling Range: All Surveys Included

Bedrooms per Dwelling Range: All Surveys Included

Percentage of dwellings privately owned: All Surveys Included

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/12 to 10/09/13

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:
Tuesday 1 days

This data displays the number of selected surveys by day of the week.

Selected survey types:
Manual count 1 days
Directional ATC Count 0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:
Suburban Area (PPS6 Out of Centre) 1

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:
Residential Zone 1

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:
C3 1 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Population within 500m Range:
All Surveys Included

Secondary Filtering selection (Cont.):

Population within 1 mile:

25,001 to 50,000	1 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

500,001 or More	1 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

1.1 to 1.5	1 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

No	1 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:

No PTAL Present	1 days

This data displays the number of selected surveys with PTAL Ratings.

LIST OF SITES relevant to selection parameters

1 DL-03-C-14 BLOCKS OF FLATS DUBLIN
BALLINTEER ROAD
DUBLIN
DUNDRUM
Suburban Area (PPS6 Out of Centre)
Residential Zone
Total No of Dwellings: 140
Survey date: TUESDAY 10/09/13 Survey Type: MANUAL

This section provides a list of all survey sites and days in the selected set. For each individual survey site, it displays a unique site reference code and site address, the selected trip rate calculation parameter and its value, the day of the week and date of each survey, and whether the survey was a manual classified count or an ATC count.

TRIP RATE for Land Use 03 - RESIDENTIAL/C - FLATS PRIVATELY OWNED
TOTAL VEHICLES
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	1	140	0.021	1	140	0.236	1	140	0.257
08:00 - 09:00	1	140	0.029	1	**140**	**0.364**	1	140	0.393
09:00 - 10:00	1	140	0.071	1	140	0.136	1	140	0.207
10:00 - 11:00	1	140	0.014	1	140	0.021	1	140	0.035
11:00 - 12:00	1	140	0.043	1	140	0.064	1	140	0.107
12:00 - 13:00	1	140	0.057	1	140	0.079	1	140	0.136
13:00 - 14:00	1	140	0.043	1	140	0.071	1	140	0.114
14:00 - 15:00	1	140	0.100	1	140	0.021	1	140	0.121
15:00 - 16:00	1	140	0.086	1	140	0.021	1	140	0.107
16:00 - 17:00	1	140	0.150	1	140	0.021	1	140	0.171
17:00 - 18:00	1	140	0.221	1	140	0.014	1	140	0.235
18:00 - 19:00	1	**140**	**0.314**	1	140	0.107	1	**140**	**0.421**
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			1.149			1.155			2.304

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	140 - 140 (units:)
Survey date date range:	01/01/12 - 10/09/13
Number of weekdays (Monday-Friday):	1
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	0
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.