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ENVIRONMENTAL IMPACT ASSESSMENT REPORT

CIRCULAR ECONOMY HUB

HUNTSTOWN

FINGAL

Prepared For: -

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GLOSSARY OF ACRONYMS

AA: Appropriate Assessment

ACA: Architectural Conservation Area

CDP: County Development Plan

CFRAM: Catchment Flood Risk Assessment and Management

CGS: County Geological Sites

CEMP: Construction Environmental Management Plan

CH4: Methane

CO2: Carbon Dioxide

CSO: Central Statistics Office

C&D: Construction & Demolition

DAA: Dublin Aviation Authority

DMURS: Design Manual for Urban Roads and Streets

DAFM: Department of Agriculture, Food and Marine

DCHG: Department of Culture, Heritage and the Gaeltacht

DECC: Department of the Environment, Climate and Communications

DHLGH: Department of Housing, Local Government and Heritage

DTCAGSM: Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media

DoT: Department of Transport

EIA: Environmental Impact Assessment

EIAR: Environmental Impact Assessment Report

EPA: Environmental Protection Agency

ESB: Electricity Supply Board

EU: European Union

FRA: Flood Risk Assessment

GDSDS: Greater Dublin Strategic Drainage Study

GHG: Greenhouse Gases

HSE: Health Service Executive

IAA: Irish Aviation Authority

LAP: Local Area Plan

LCA: Landscape Character Assessment

LECP: Local Economic and Community Plan

MSW: Municipal Solid Waste

NCCAF: National Climate Change Adaptation Framework

NDP: National Development Plan

NEEAP: National Energy Efficiency Action Plan

NHA: Natural Heritage Area

(p)NHA: (proposed) Natural Heritage Area

NIAH: National Inventory of Architectural Heritage

NPF: National Planning Framework

NIS: Natura Impact Statement

NPWS: National Parks and Wildlife Service

NRA: National Roads Authority

NSAI: National Standards Authority of Ireland

NSOOR: Newbridge Southern Outer Orbital Route

NTA: National Transport Authority

NZEB: Nearly Zero Energy Building

OPW: Office of Public Works

PFRA: Preliminary Flood Risk Assessment

RBMP: River Basin Management Plan

RMP: Record of Monuments and Places

RPS: Record of Protected Structures

RSA: Road Safety Audit

RWMP: Resource and Waste Management Plan

SAC: Special Area of Conservation

SDGs: Sustainable Development Goals

SEA: Strategic Environmental Assessment

SEAI: Sustainable Energy Authority of Ireland

SEAP: Sustainable Energy Action Plan

SFRA: Strategic Flood Risk Assessment

SHD: Strategic Housing Development

SI: Statutory Instrument

SID: Strategic Infrastructure Development

SPA: Special Protection Area

SuDS: Sustainable Drainage Solutions

TII: Transport Infrastructure Ireland

TTA: Traffic and Transport Assessment

UNFCCC: United Nations Framework Convention on Climate Change

WHO: World Health Organisation

1. INTRODUCTION

This revised Environmental Impact Assessment Report (EIAR) examines the potential impacts and significant effects on the environment of a proposal by Rathdrinagh Land Unlimited Company, trading as Irish Recycling Ltd (IRL) to develop Phase 1 of a Circular Economy Hub at Huntstown, Fingal. It takes into consideration the responses to the Further Information Request issued by Fingal County Council in relation to FW/23A/0111.

1.1 The Applicant

IRL is part of the SRETAW Group, which owns the nearby Huntstown Bioenergy Anaerobic Digestion Plant and has recently been granted planning permission for the development of a plastic waste recycling plant in Portlaoise.

1.2 Development Overview

The proposed development is Phase 1 of the proposed 9.863 ha Huntstown Circular Economy Hub (Hub). It comprises a Materials Recovery Facility (MRF), that will process household, commercial, industrial and construction and demolition wastes and a Food Container Cleaning Plant (FCCP) that will clean plastic food containers.

A MRF is the first step in the recovery and recycling chain and its purpose is to sort a wide range of wastes into recoverable and recyclable streams, with the objective of achieving a 98% recovery rate. The proposed FCCP will provide a centralised washing/sterilisation facility for plastic food trays and crates to allow the multiple re-use of these items.

1.3 Need for Environmental Impact Assessment (EIA)

The need for EIA derives from European Union (EU) Directive 85/337/EEC, as amended by Directives 97/11/EC 2003/35/EC, 2009/31/EC, 2011/92/EU and 2014/52/EU) on the assessment of the effects of certain public and private projects on the environment (EIA Directive).

The EIA Directive was initially transposed into Irish law by the European Communities (Environmental Impact Assessment) Regulations, 1989 (S.I. No. 349 of 1989), with subsequent amendments under the Planning and Development Regulations 2001 (SI No. 600 of 2001), as amended. The most recent amendment of the Directive was transposed by the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. 296 of 2018).

The primary objective of the EIA Directive is to ensure that projects that are likely to have 'significant effects' on the environment are subject to an assessment of their likely impacts.

The Environmental Protections Agency (EPA)'s *Guidelines on the Information to be contained in Environmental Impact Assessment Report (*May 2022*)* define a staged process to determine if a proposed project requires EIA.

An initial determination is required to establish if the project type falls into any of the activities listed in Annexes I and II of the EIA Directive, as transposed by Parts 1 and 2 of Schedule 5 of the Planning and Development Regulations (PDR) 2001, as amended. If a project is listed in Part 1 then EIA is required. If it is listed in Part 2, but is of a type where the need for EIA is based on a threshold, then it must be assessed against the thresholds specified in Part 2 of Schedule 5. If the project exceeds the threshold EIA is mandatory.

If the project is not listed in Part 1, but is listed in Part 2 and is below the relevant threshold there is there is no statutory requirement for EIA; however regard must be had to the EIA Directive's 'wide scope and broad purpose' and it may be necessary to go beyond the general project description and consider the component parts and/or any processes in accordance with Schedule 7 of the PDR. If any such parts or processes are significant the proposed project as a whole may fall within the requirements of the Directive.

The proposed development is not listed in Part I of the Schedule 5, but the proposed MRF is listed in Part 2 of the Schedule 'Facilities for the disposal of waste with an annual intake of more than 25,000 tonnes'. For the purposes of the EIA Directive the term 'disposal' included recycling. As the annual waste intake in the MRF will exceed 25,000 tonnes an EIA is required.

1.4 Purpose of an EIAR

An EIAR is defined in the EIA Regulations[1] as '*a report of the effects, if any, which proposed development, if carried out, would have on the environment and shall include the information specified in Annex IV of the Environmental Impact Assessment Directiv*e.'

An EIAR is prepared by the developer and is submitted to a Competent Authority as part of a consent process. The Competent Authority uses the information provided in the EIAR to assess the environmental effects of the project and, in the context of other considerations, to help determine if consent should be granted. The information in the EIAR can also be used by other parties to evaluate the acceptability of the proposed project and its effects and to inform their submissions to the Competent Authority.

Article 5 of the EIA Directive requires the information to be provided in the EIAR to at least include:

(a) a description of the project comprising information on the site, design, size and other relevant features of the project;

(b) a description of the likely significant effects of the project on the environment;

(c) a description of the features of the project and/or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;

(d) a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment;

[1] http://www.irishstatutebook.ie/eli/2018/si/296/made/en/print

(e) a non-technical summary of the information referred to in points (a) to (d); and (f) any additional information specified in Annex IV relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected.

To ensure the completeness and quality of an EIAR it must be prepared by competent experts.

1.5 EIA Scoping

The objective of scoping is to identify the key areas of concern related to a project and identify those 'effects' that may reasonably be seen as 'likely'. 'Likely' effects are those that are planned to take place (e.g. earth works, land take, building construction) and those that are the inevitable consequences of the normal operation of the project (e.g. emission, traffic, resource consumption).

The scoping should also determine the need for evaluating reasonably foreseeable 'worst-case' scenarios. This can be achieved by ensuring the description of the project is sufficiently detailed to avoid uncertainty over the direct, indirect and cumulative 'likely significant effects'. Where uncertainty arises, for example where difficulties are encountered in compiling the required information needed to determine the appropriate methodologies, then the 'worst case' effects of the alternative methodologies should be assessed.

An EIA must assess the likely significant effects on the following:

(a) population and human health;

(b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;

(c) land, soil, water, air and climate;

(d) material assets, cultural heritage and the landscape;

(e) the interaction between the factors referred to in points (a) to (d).

The effects must include the expected impacts associated with the vulnerability of the project to risks of major accidents and/or relevant disasters.

O'Callaghan Moran & Associates (OCM) completed a scoping exercise based on the nature of the proposed development, the available baseline information on the subject site and the feedback from the pre-application meeting held with Fingal County Council.

Although the proposed FCCP is not a type of project that requires an EIA, as it will be constructed and operated in conjunction with the MRF its cumulative impacts were assessed. As the proposed development has no defined lifetime, a detailed assessment of the decommissioning stage was scoped out.

1.6 EIAR Methodology

This EIAR presents an evaluation of the likely significant environmental impacts and applicable mitigation and monitoring measures associated with the construction and operation of the proposed development.

The EIAR addresses all of the aspects listed in Schedule 6 of the Planning and Development Regulations 2001 (SI No. 600 of 2001) (as amended), having regard to the requirements of Article 5(1) and Annex IV of Directive 2011/92/EU as amended by Directive 2014/52/EU (the EIA Directive).

The information contained in the EIAR complies with the requirements of Article 5 (1) (a) to (e), Article 3(1) (a) to (e) and Annex IV of Directive 2014/52/EU on the effects of certain public and private projects on the environment. The overall approach took into consideration the guidance and recommendations in the following:

- EPA *Advice Notes for Preparing Environmental Impact Statements (2003).*
- European Commission's *Environmental Impact Assessment of Projects - Guidance on Screening (2017).*
- European Commission's *Environmental Impact Assessment of Projects - Guidance on Scoping Report (2017).*
- European Commission's *Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report (2017).*
- Government of Ireland *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (2018).*
- EPA *Guidelines on the Information to be contained in Environmental Impact Assessment Reports (May 2022).*

Additional legislation and guidance pertinent to the particular environmental factor under consideration is referenced in the relevant Chapters of this EIAR.

The assessment of the effects on climate and water included the implications for climate change. The assessment of impacts on biodiversity included an evaluation of the significance of effects on Natura 2000 Sites. The effects on population and human health took into consideration the likely effects of traffic, noise, air quality impacts, major accidents and/or natural disasters and the existing local amenities.

The cumulative impacts of existing and permitted projects within one kilometre zone of influence (ZoI) of the subject site were included in the assessment of the effects on Land & Soil, Air, and Population and Health. This ZoI was determined by the fact that such impacts are effectively mitigated by distance.

The ZoI for climate was defined by the national boundary given Ireland's binding commitments to meet national greenhouse gas emission targets. The ZoI of the Materials Assets: Traffic & Transport was defined by the consultation with Fingal County Council. The ZoI for Cultural Heritage was determined by the Archaeologist.

The ZoI for Biodiversity and Water was determined by the viable pathways between the subject site and Natura 2000 Sites in Dublin Bay. The ZoI for the Landscape & Visual Impact Assessment was determined by the public view points, including existing residences, permitted developments and the public roads.

The EIA Directive and transposing regulations do not generally require assessment of the need for a proposed development, land-use planning, demographic issues and detailed socio-economic analysis and the EPA Guidance (2022) states that this should be avoided in an EIAR, unless issues such as economic or settlement patterns give rise directly to specific new developments and associated effects[2]. Given the nature of the proposed development detailed assessments of these aspects have not been considered.

The EIAR follows a grouped format structure, where each relevant topic is dealt with in a separate chapter that describes the baseline conditions (receiving environment), the direct and indirect significant impacts associated with the proposed activity, and the measures to avoid, prevent, reduce or, if possible, offset any identified significant adverse impacts and assesses the effects and the residual impacts.

The interactions between impacts on different environmental factors are addressed, as is the potential for the cumulation of many minor or significant effects, including effects of other projects to create larger and more significant effects.

To avoid repetition Chapter 3 is a detailed description of the Project Characteristics and in the subsequent Chapters only those aspects of the development that are relevant to the environmental factor being assessed are described. Similarly, where as a result of interaction(s) between two or more factors there is a need for mitigation measures already described in detail in other Chapters these are cross referenced and not repeated.

1.7 Anticipating, Avoiding &, Mitigating Significant Effects

The anticipation of impacts is the most effective means of avoiding adverse effects when applied at the design stage of a project. This involves forming preliminary opinions, usually in the absence of complete data, on the approximate significance, magnitude, character, duration and type of the likely effects.

The anticipation of effects allows the exploration of potential ways to avoid them by sharing the preliminary opinions with the members of the project design team to facilitate changes to the proposed design and method of operation. Where significant adverse effects are likely to occur alternative options must be evaluated to determine the combination that presents the best balance between the avoidance of significant adverse environmental effects and achieving the project objectives.

Avoidance measures are identified through the consideration of alternatives e.g. site location, site layouts, technologies or operational plans and mitigation and any monitoring measures. Consideration of alternatives in the early design stages usually affords the greatest potential for avoidance of significant adverse effects.

[2] Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA 2022).

1.8 Cumulation of Effects

Cumulative assessment provides the baseline for full environmental assessment of the potential effects arising from the proposed development in combination with other relevant plans and projects. The assessment of the cumulative impacts took into consideration the existing land use settlement patterns, local infrastructure, environmental setting and the existing operational and permitted activities in the vicinity of the subject site.

1.9 Assessment of Effects

Effects were assessed in terms of the likely natural or physical changes to the environment resulting either directly, or indirectly from the proposed development taking into consideration a 'baseline' scenario, cumulative effects, worst case and accidents. Effects are, where possible, described in terms of, quality, significance, extent & context, probability, duration and type listed in the EPA 2022 Guidelines. Effects are also described in accordance with guidance relevant to the particular topic being assessed and, where this occurs, they are referenced in the Chapters.

Quality.

- Positive: A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).

- Neutral: No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.

- Negative: A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

Significance.

- Imperceptible: An effect capable of measurement but without significant consequences.

- Not Significant: An effect that causes noticeable changes in the character of the environment, but without significant consequences.

- Slight: An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.

- Moderate: An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends

- Significant: 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: An effect which obliterates sensitive characteristics.

Extent & Context.

- Extent: Describe the size of the area, the number of sites, and the proportion of a population affected by an effect.

- Context: Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?).

Probability:

- Likely Effects: The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.

- Unlikely Effects: The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.

Duration:

- Momentary seconds-minutes.

- Brief <1 day.

- Temporary <1 year.

- Short-term 1-7 years.

- Medium Term 7-15 years.

- Long Term 15-60 year.

- Permanent >60 years.

- Reversible effects that can be undone, for example through remediation or restoration.

- Frequency: how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly).

Type.

- Indirect: Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.

- Cumulative: The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.

- Do Nothing: The environment as it would be in the future should the subject project not be carried out.

- Worst Case: The effects arising from a project in the case where mitigation measures substantially fail.

- Indeterminable: When the full consequences of a change in the environment cannot be described.

- Irreversible: When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.

- Residual: The degree of environmental change that will occur after the proposed mitigation measures have taken effect.

- Synergistic: Where the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of air pollutants to produce smog).

The significance of an effect was determined by a combination of objective (scientific) and subjective (social) concerns and the potential for the development to either have significant effect on an aspect of the environment that has been formally or systematically designated as being of importance, or to significantly alter the existing character of some aspects of the environment.

Prevention and mitigation measures and monitoring were only considered for those effects that were deemed likely to be significant.

1.10 Residual Impacts

Residual impacts are the final or intended effects that occur after the proposed mitigation measures have been implemented. It is not always either possible, or practical to mitigate all adverse effects. The effects that remain after all assessment and mitigation are the remaining environmental 'costs' of a proposed development that could not be reasonably avoided and are a key consideration in deciding whether a development should be permitted or not.

1.11 Consultation

1.11.1 Planning Authority

A pre planning application meeting was held with Fingal County Council.

1.11.2 Uisce Eireann

A meeting was also held with Uisce Eireann to obtain an understanding of the development constraints imposed by the way leaves for the Greater Dublin Orbital Sewer Route running through the development site.

1.12 Project Team: Competent Experts

The EIAR was completed by a project team co-ordinated by O'Callaghan Moran & Associates (OCM) who also prepared a number of Chapters. The field surveys and site specific assessments completed by the Project Team were;

- Archaeological Testing comprising information review and trench excavations by Kilkenny Archaeological & Historical Heritage Consultants and a geophysical survey and trench excavations by Archaeology Consultancy Services.

- Ecological Assessments by Dixon Brosnan Ecological Consultants, which included habitats, mammal, bat and bird, surveys and an Appropriate Assessment Screening.

- Tree Survey prepared by Andrew Boe Independent Arboriculture Consultant.

- Noise & Vibration Assessment by Damian Brosnan Acoustics.

- Traffic and Transport Assessment by Trafficwise.

- Air Quality and Climate Assessments by Katestone.

- Landscape Design Plan and Green Infrastructure Plan prepared by Park Hood.

- Photomontages of the proposed development prepared by Park Hood

- Intrusive geotechnical site investigations completed by Hamnar Site Investigation Services Ltd and a non-intrusive geophysical assessment completed by Apex Geophysics Ltd.

- Engineering Services Design Report prepared by Coyle Consulting Engineers.

- Aeronautical Assessment completed by O'Dwyer Jones Partnership.

- Glint & Glare Assessment prepared by Macroworks.

- Construction Environmental Management Plan and Resource and Waste Management Plan prepared by OCM.

The field surveys, assessments and plans were completed and prepared in accordance with best practice and, in the expert opinion of the authors, are considered sufficient to assess the potential significant effects associated with the proposed development.

1.13 Difficulties in Compiling the Required Information

Where difficulties were encountered in compiling the required information these are described in the relevant Chapters.

2. EXISTING SITE DESCRIPTION

This Chapter provides an overview of the proposed development area (site) and is not intended to provide the full baseline information on the receiving environment on which the assessment of impacts is based. This level of detail is provided in Chapters 5 to 14.

2.1 Site Location

The site location is shown on Figure 2.1. It is close to the M50 to the south and the N2 to the east and is 2.4 km south of Dublin Airport, in an area zoned for heavy industry in the Fingal Development Plan 2023 to 2029.

2.2 Surrounding Land Use

The surrounding land use (Figure 2.2) is a mix of quarrying, utilities and agricultural. Huntstown Quarry, which includes an inert soil recovery site, is to the west; Huntstown Bioenergy, which is an anaerobic digestion plant owned by the applicant, is 150m to the west; Huntstown Power Station, which is a Tier 2 Seveso Site, is approximately 280m to the north-west and there is an Eirgrid 220 kv Substation to the south-east.

The adjoining lands to the east, south and west are currently used for agriculture. The southern runway of Dublin Airport is approximately 2.4 km from the north-eastern boundary. The nearest private residences are on the North Road, approximately 50m from the eastern site boundary. There is a farmhouse approximately 270m south-west of the southern boundary.

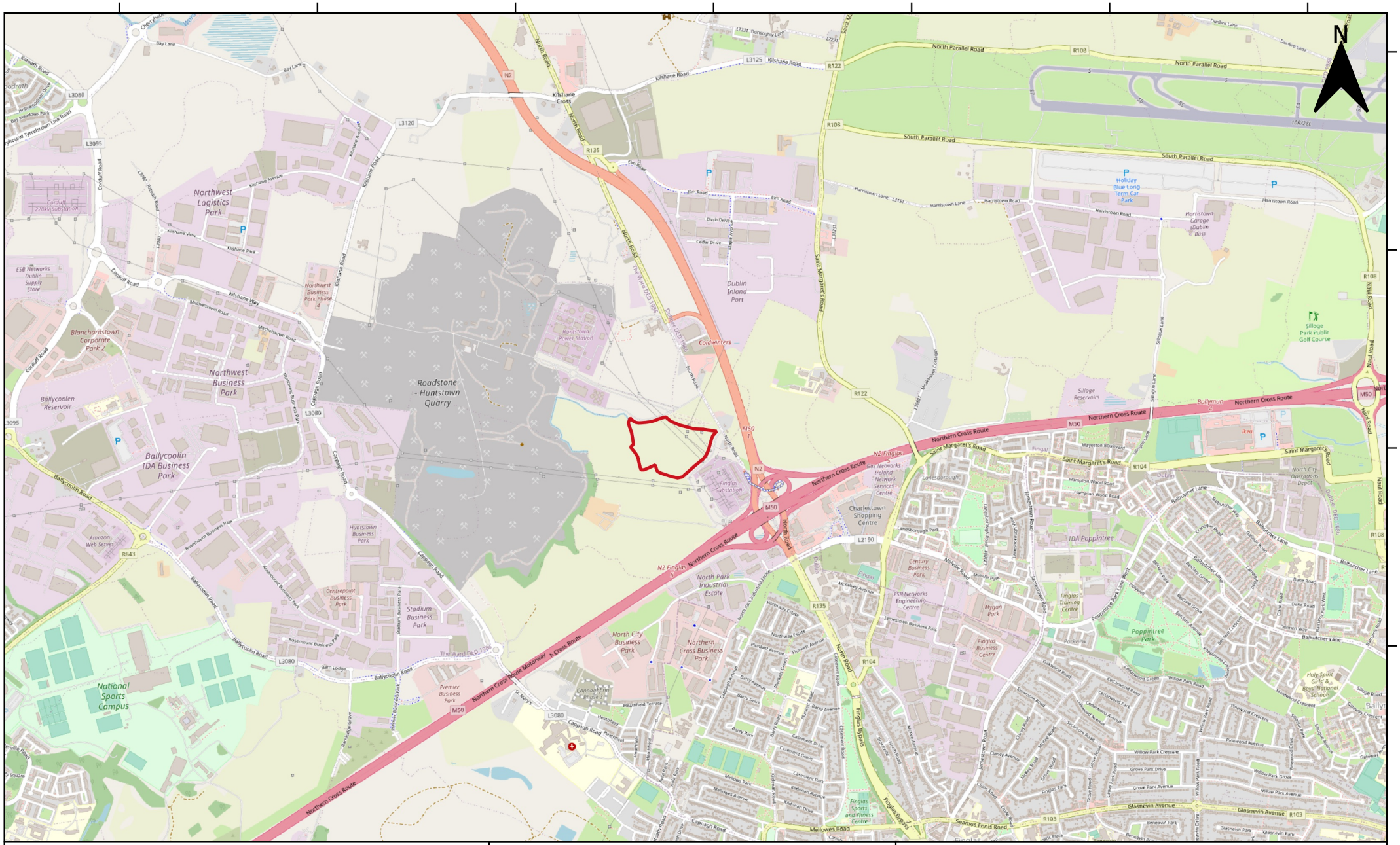
2.3 Site Layout

The existing layout is shown on Drawing No. 220620. The site encompasses 9.863 hectares and comprises two fields, both of which has been for agricultural purposes and a section of the Substation service road. A hedgerow running north south divides the fields. The western field had been used for animal grazing, but is no longer used for this purpose. The eastern field had been used for tillage but is currently uncultivated.

The ground levels rises from ca 78m Ordnance Datum (OD) at the site boundaries to a localised high point of 88m OD in the centre of the site. Historically this high point had been quarried for sand and gravel, but is now covered in scrub.

There were two 38 kv and one 110 kv overhead powerlines running from south-east to north-west across the north-eastern part of the site, and a 10 kv line running from south-west to north-east through the centre of the site, of which is a south-east to north-west spur. The overhead lines have been removed and laid underground inside the eastern and northern site boundaries in accordance with planning permission FW21A/0144.

Uisce Eireann permanent and temporary wayleaves for the Greater Dublin Orbital Sewer route run from north to south through the site.



Environmental Management for Business

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CLIENT

Irish Recycling Ltd

TITLE

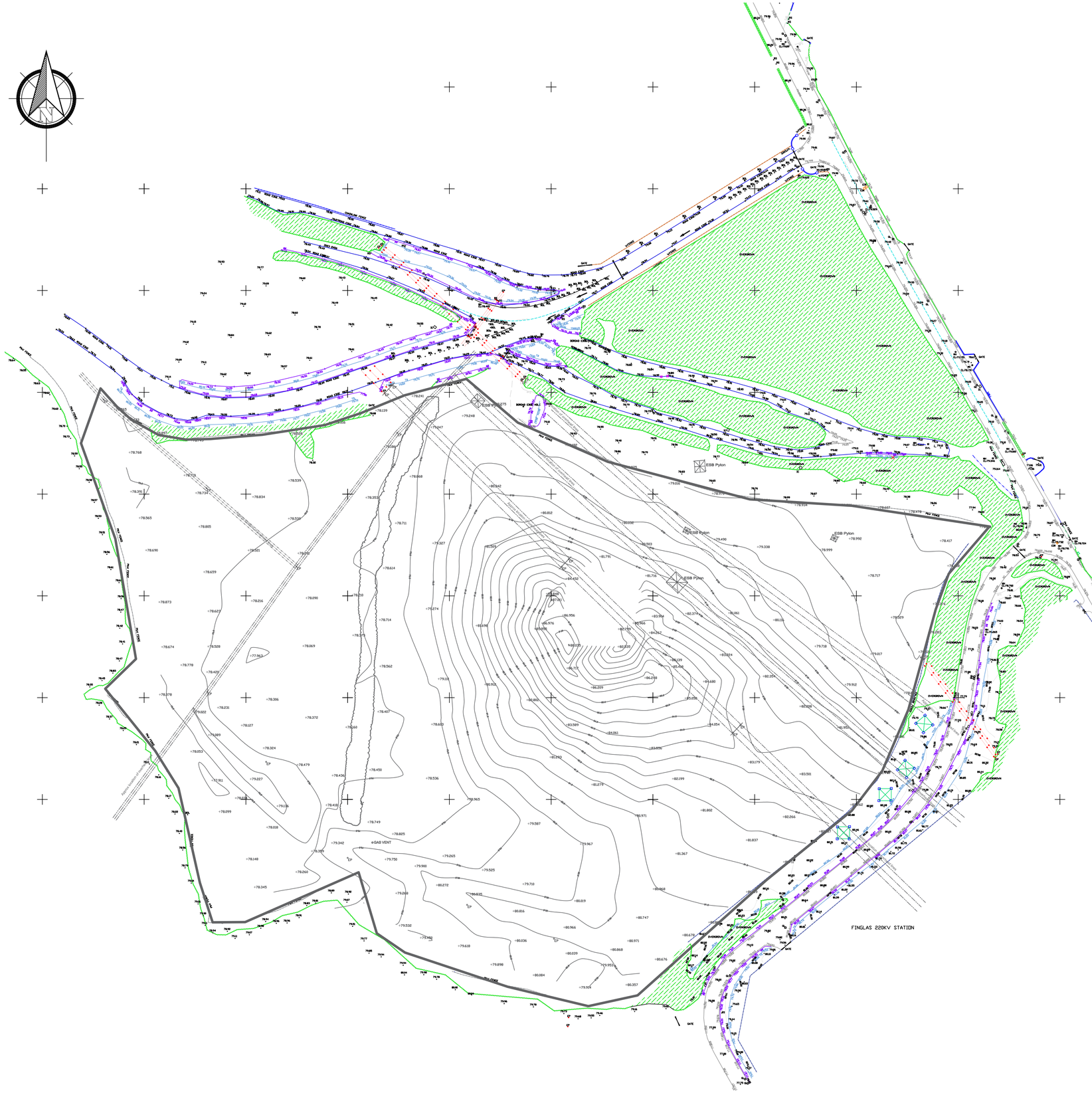
Site Location

DETAILS

Site Boundary

FIGURE 2.1

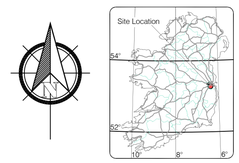
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The Client must promptly notify the Company of any errors in mapping of which it becomes aware. If misleading, inaccurate or otherwise inappropriate information is brought to the Company's attention or the Company itself identifies any such imprecision or error in a survey, it shall use its reasonable endeavours to fix or remove it and if necessary in certain instances, the Company being on notice of any such misleading, inaccurate or otherwise inappropriate information, it will re-conduct the survey and reproduce the data to within the specified scale or accuracy.



LEGEND TOPOGRAPHICAL

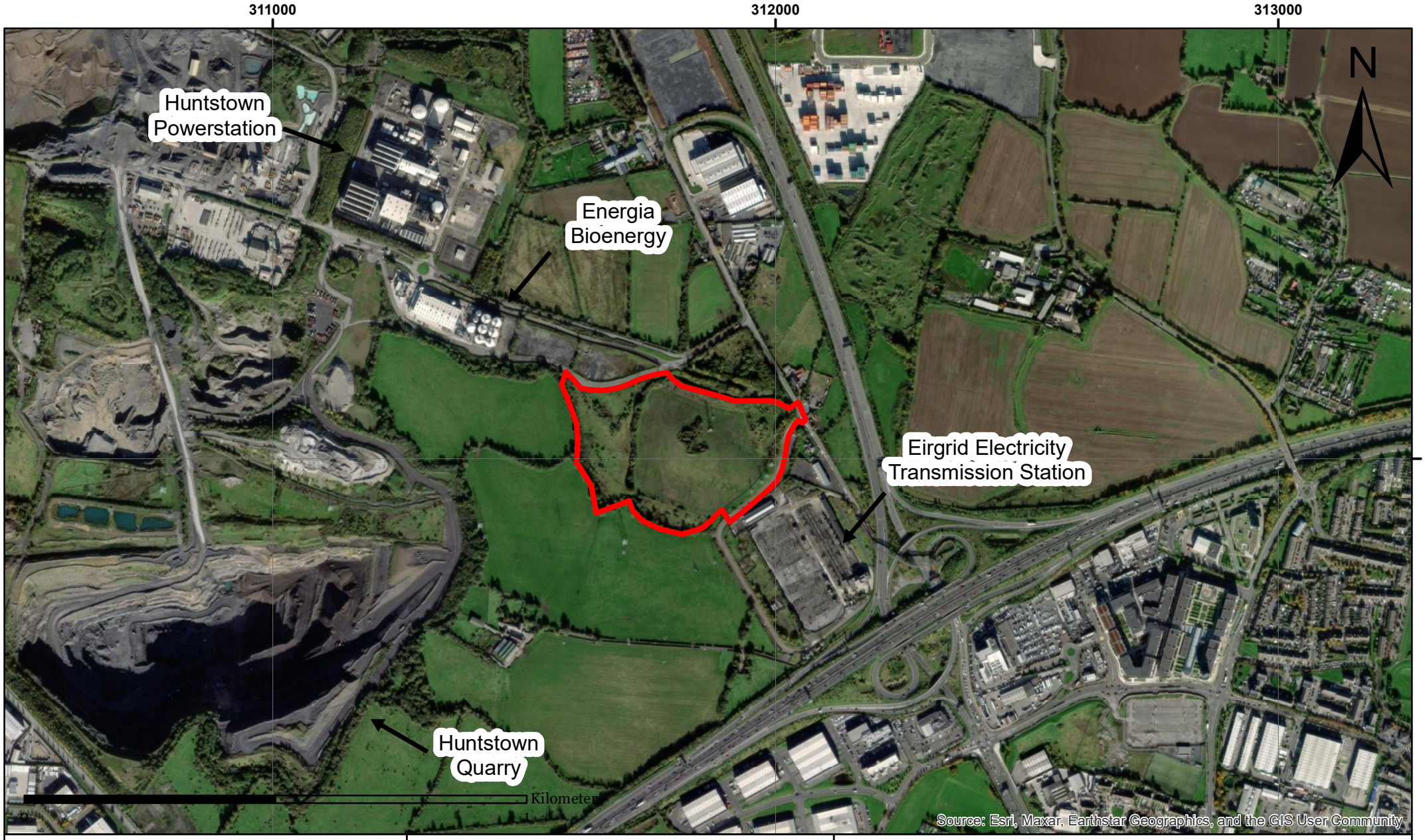
SYMBOLS (CONVENTION)	LINES (CONVENTION)
STN SURVEY STATION	BUILDING
SV SLUICE VALVE	TOP OF BANK
WV WATER VALVE COVER	BOTTOM OF BANK
MH MANHOLE CIRCULAR	FENCE/WALL
MH MANHOLE SQUARE	VOIDED FENCE
GATE GATE	HEDGE
HYDRANT HYDRANT	HEDGE / CHANNEL
BOLLARD CIRC.	KERB / TOP
ROAD GULLY	KERB / TOP
ESB ESB BOX	BUILDING
CIRCLE BOX	OUTLINE
CIRCLE COVER	SURFACE CHANGE
ESB COVER	TOP OF BANK
INSPECTION COVER	SINGLE YELLOW LINE
ESB POLE	FOOTPATH
TELEGRAPH POLE	OVERHEAD
ROAD SIGN	CONTOUR
LAMP POST	
TREE	

Rev.	Date	By	Description

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Website:
www.geosurvey.ie

TITLE	TOPOGRAPHICAL SURVEY		
PROJECT	Huntstown Coldwinters Co.Dublin	GRID	ITM
		DATUM	MALIN HEAD
CLIENT	Rathdrinagh Land Unlimited	SCALE	1:1000
DRAWN: A.D./M.S.	DATE: 30.06.2022	SHEET: A1	DRG.NO. 220620

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Environmental Management for Business

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CLIENT
Irish Recycling Ltd

TITLE
Surrounding Landuse

Details:
Site Boundary

Figure 2.2

2.4 Road Network

The road network in the vicinity of the site is shown in Figure 2.3. At present a farm gate on the northern boundary is the only access point and is only suitable for farm vehicles. The service road that provides access to the 220kV Substation from North Road runs along the eastern site boundary and also provides access to agricultural lands and a farm house with a large farm yard and sheds to the south west of the site.

The service road intersects North Road at a simple priority junction approximately 600m south of the Coldwinters N2 off-slip near the Dogs Trust property. North Road was formerly the N2 and had been directly connected to the M50 north of Finglas. The upgraded N2 and M2 road scheme bypasses the former N2 at its southern end and that section is now a cul-de-sac.



Figure 2.3 Road Network

2.5 Services

There are no existing connections to the Uisce Eireann mains supply, storm sewer and foul water network. There is an Uisce Eireann 150mm water main on North Road. The nearest connection point to the municipal foul sewer is also on North Road (Figure 2.4).



Figure 2.4 Uisce Eireann Services Drawing (Extract from Engineering Report)

2.6 Aviation Safety

The site is 2.4km from a main runway at Dublin Airport. It is well within the 13km radius of the airport identified as the area of potential bird hazard risk and is visible from the new Control Tower. It is also directly below the approach flight path to Casement Aerodrome.

3. PROJECT CHARACTERISTICS

This Chapter presents an overview of the European Union (EU) and national waste polices to provide a context for the proposed development. It describes the characteristics of the project, including the nature and scale of the development; building design considerations; services including water supply, sanitary wastewater, process wastewater and storm water management; landscape strategy; the operational stage processes and associated emissions and the construction stage works. It also identifies the permitted and proposed developments that have been taken into consideration for the assessment of cumulative effects.

3.1 Context

3.1.1 *European Commission Action Plan on the Circular Economy*

The purpose of the European Commission's (Commission) Action Plan on the Circular Economy[3] is to transition the EU to an economy where the value of products, materials and resources is maintained for as long as possible and the generation of waste minimised. This transition is essential to the EU's efforts to develop a sustainable, low carbon, resource efficient and competitive economy.

The Commission recognises that recycling is a pre-condition for a circular economy, where resources and materials can be recycled, returned back to the economy and used again, meaning that what was once considered a waste becomes a valuable resource. To achieve this, materials at the end of their life cycle should be recovered through recycling and ideally reintroduced to the product lifecycle. These "secondary raw materials" can then be traded like primary raw materials.

3.1.2 *National Waste Action Plan for a Circular Economy*

In 2020, the government published its 'Waste Action Plan for a Circular Economy' to take cognisance of the Commission' Action Plan on the Circular Economy. The objective is to inform and direct waste planning and management in Ireland over the coming years. While the thrust of the Plan is to prevent waste arising through reuse, its objectives include ensuring measures are introduced to support sustainable economic models (for example by supporting the use of recycled over virgin materials).

The Plan promotes the development – for environmental and economic reasons – of adequate and appropriate treatment capacity to ensure that the full circularity and resource potential of materials is captured in Ireland.

In 2022, The Circular Economy and Miscellaneous Provisions Act 2022 was enacted to underpin Ireland's shift from a "take-make-waste" linear model to a more sustainable pattern of production and consumption, that retains the value of resources in the economy for as long as possible and significantly reduce greenhouse gas emissions.

[3] https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en

3.1.3 *Fingal County Development Plan 2023-2029*

It is a strategic aim of the Fingal County Development Plan 2023-2029 to continue to support and promote Government policy on eliminating landfill; reducing the amount of waste produced, maximising waste as a source of products and renewable energy and prioritising waste prevention, re-use, recycling and recovery over the disposal of waste.

The Development Plan waste management policies and objectives support a move towards achieving a 'circular economy' which is essential if Fingal and the wider Eastern Region is to make better use of resources and become more resource efficient. The waste policies and relevant to the proposed development are:

- **Policy IUP 20 - Implementation of Existing Waste Management Policy**: Fingal County Council will continue to promote and support the objectives of the Eastern Midlands Region Waste Management Plan 2015-2021, or such plans as may be updated.

- **Policy IUP 21 – Transition from a Waste Economy Towards a Green Circular Econo**my: Support the principles of transition from a waste management economy to a green circular economy and implement good waste management and best practices to enable Fingal to become self- sufficient in terms of resource and waste management to enhance employment and increase the value recovery and recirculation of resources.

- **Objective IUO28 – Eastern Midlands Region Waste Management Plan**: Implement the provisions of the Eastern Midlands Waste Management Plan 2015-2021, or any subsequent Waste Management Plan applicable within the lifetime of the Development Plan. All prospective developments in the County will be expected to take account of the provisions of the Regional Waste Management Plan and adhere to the requirements of the Plan

- **Objective IUO29 – Sustainable Waste Recovery & Disposal**: Provide for, promote and facilitate high quality sustainable waste recovery and disposal infrastructure/technology in keeping with the EU waste hierarchy, national legislation and regional waste management policy to adequately cater for Fingal's growing population.

- **Policy IUP 21 – Recycling/Re-Use**: Promote and encourage the establishment of re-use, recycling and repair activities to prevent and minimise waste generation and disposal in accordance with the Eastern Midlands Waste Management Plan 2015-2021 (or any subsequent plan).

3.1.4 *Waste Management Plan for the Eastern-Midlands Region*

The Waste Management Plan for the Eastern-Midlands Waste Region (EMWR) Plan is the framework for the prevention and management of wastes in a safe and sustainable manner. The scope of the EMWR Plan is broad and provides policy direction, sets out waste management objectives and is a roadmap of actions to achieve those objectives. The EMWR Plan is a statutory document prepared by the local authorities of the region and covers the period from 2015 to 2021. It remains in force until a new National Waste Management Plan is adopted.

Efforts to decouple waste generation from economic growth have not yet been successful and the economic recovery that started in 2014, in conjunction with population growth, has resulted in a continuing increase in the quantities of waste arising, both nationally and in the Greater Dublin Area.

The EMWR Plan estimates that the increase in municipal wastes (combined household and commercial) between 2012 and 2021 will be in the region of 2-3% annually. It concludes that growth at the higher rates presents a challenge to the region to ensure adequate collection and treatment capacity is required. Furthermore, the need to treat more of these wastes in the country in support of Circular Economy initiatives means that treatment capacity needs to increase above the projected rates, making the provision of capacity even more challenging.

To ensure that national and regional recovery and recycling targets are met, to minimise the amount of waste disposed to landfill and to roll out circular economy initiatives there is a need to increase indigenous waste recycling and recovery capacity.

3.1.5 *Fingal Local Environmental Community Plan*

It is a strategic policy of the Fingal Local Environmental Community Plan to ensure, from environmental, business and public health needs, that waste management remains a priority for local authorities, that the waste management regions continue to invest in promoting and facilitating reuse and recycling by residential and commercial sources, and that high standard options for treatment and final disposal of waste are available within the Greater Dublin Area.

3.2 Development Overview

The proposed development is Phase 1 of the Huntstown Circular Economy Hub (Hub). It comprises a Materials Recovery Facility (MRF), a Food Container Cleaning Plant (FCCP) and ancillaries.

The MRF is the first step in the recovery and recycling chain and its purpose is to sort a wide range of wastes into recoverable and recyclable streams, with the objective of achieving a 98% recovery rate. The annual waste intake will be 90,000 tonnes and the wastes, which will arise in the Greater Dublin Area, will include:

- Source segregated household and commercial wastes comprising residual municipal solid waste (MSW);
- Source segregated household, commercial and industrial wastes comprising mixed and single stream dry recyclables (e.g. paper, cardboard, plastic, glass, metal);
- Source segregated household and commercial food waste (‘brown bin’)
- Source segregated and mixed construction and demolition (C&D) wastes

The recoverable materials will be sent off-site to authorised recovery facilities, for example waste to energy plants, cement kilns and soil recovery sites.

Initially the majority of the potential recyclables (metals, paper, plastic, cardboard, timber) will also be sent off site for further treatment at authorised waste management facilities to produce recyclates that can be reintroduced into the economy.

The EPA recently published a protocol for the production of recycled aggregates from C&D waste that will meet End of Waste Status, meaning they can be used as an alternative to quarry won materials[4]. It is the intention to manufacture these aggregates in Phase 1. Subsequent Phases of the Hub will include recycling facilities that will process other recyclables, for example plastics and timber into products that can be reintroduced into the economic cycle and replace virgin materials.

In response to growing sustainability pressures, in particular the need to eliminate/ minimise 'single use plastics', the food retail industry is moving towards the use of reusable food containers. The proposed FCCP will provide a centralised washing/sterilisation facility for large food retailers in the Greater Dublin Area to facilitate the multiple re-use of these items. The estimated annual throughput will be 5,000 tonnes.

The washing system will include a pre-wash to remove visible dirt and debris, a main wash with detergents followed by a rinse. The water will be sourced from the mains supply. The process water will be treated in an on-site wastewater treatment plant with the majority of treated water recycled to the washing plant and a small amount discharged to the foul sewer.

3.3 Site Layout

The layout of the proposed Hub is shown on HYP-A-007 and the proposed layout of Phase 1 is shown on Drawing No. HYP-A-001. Phase 1 comprises the MRF (5,302m^2), FCCP (5,302m^2), electrical substation (40.5m^2),paved open yards, weighbridge, car and bicycling parking areas, surface and foul water drainage systems and landscaping.

The building positioning, heights, roof plans and stormwater drainage design took into consideration the constraints imposed by the proximity to Dublin Airport and the flight path to Casement Aerodrome. The landscape design approach was to retain and supplement the existing trees and hedgerows on the boundary

Phase 1 involves extensive 'cut and fill' across the footprint of the Hub to achieve formation levels and will result in the loss of ca 220m of the existing hedgerow boundary between the two fields and the scrub in the centre of the site. Pending the development of future Phases, the lands outside of Phase 1 will be returned to agricultural use. The overhead power lines that traverse the site are currently being relocated underground inside the eastern and northern site boundaries.

3.3.1 *Landscape Strategy*

The design approach was to retain the existing boundary trees and hedgerows and supplement them with native trees and shrubs that will benefit pollinators and reinforce biodiversity.

3.4 Access

The design of the entrance off the existing service road, the internal access road and manoeuvring areas took into consideration the recommendations of a Road Safety Audit.

[4] https://www.epa.ie/publications/corporate/consultations/-consultations/DRAFT-End-of-Waste-Criteria-for-Recycled-Aggregates-EoW-N001-2023.pdf

N

0 10m 20m 50m

Notes

LEGEND

- ESB/Energia cables denote diversion route subject to seperate planning permission
- Proposed Pedestrian Door
- Proposed Lorry Access Door
- Proposed Public Lighting
- Proposed attenuation area
- Future access connectivity route
- Irish Water Permanent works area wayleave
- Irish Water Temporary works area wayleave
- Dropped Crossing
- Dropped Kerb
- Mark pedestrian route
- Outside the scope of this application

Rev	Description	By	Check	Date
1	Issued for Information	SL	MM	06.12.2023

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33-37 Stranmillis Road
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belfast@hyphen.archi

Client

Rathdrinagh Land Limited Company, t/a Irish Recycling Limited

Project

Rathdrinagh - Warehouse

Drawing

Masterplan Layout

Scale	Date	Author	Checked
1:1000 @ A2	06.12.2023	SL	MM

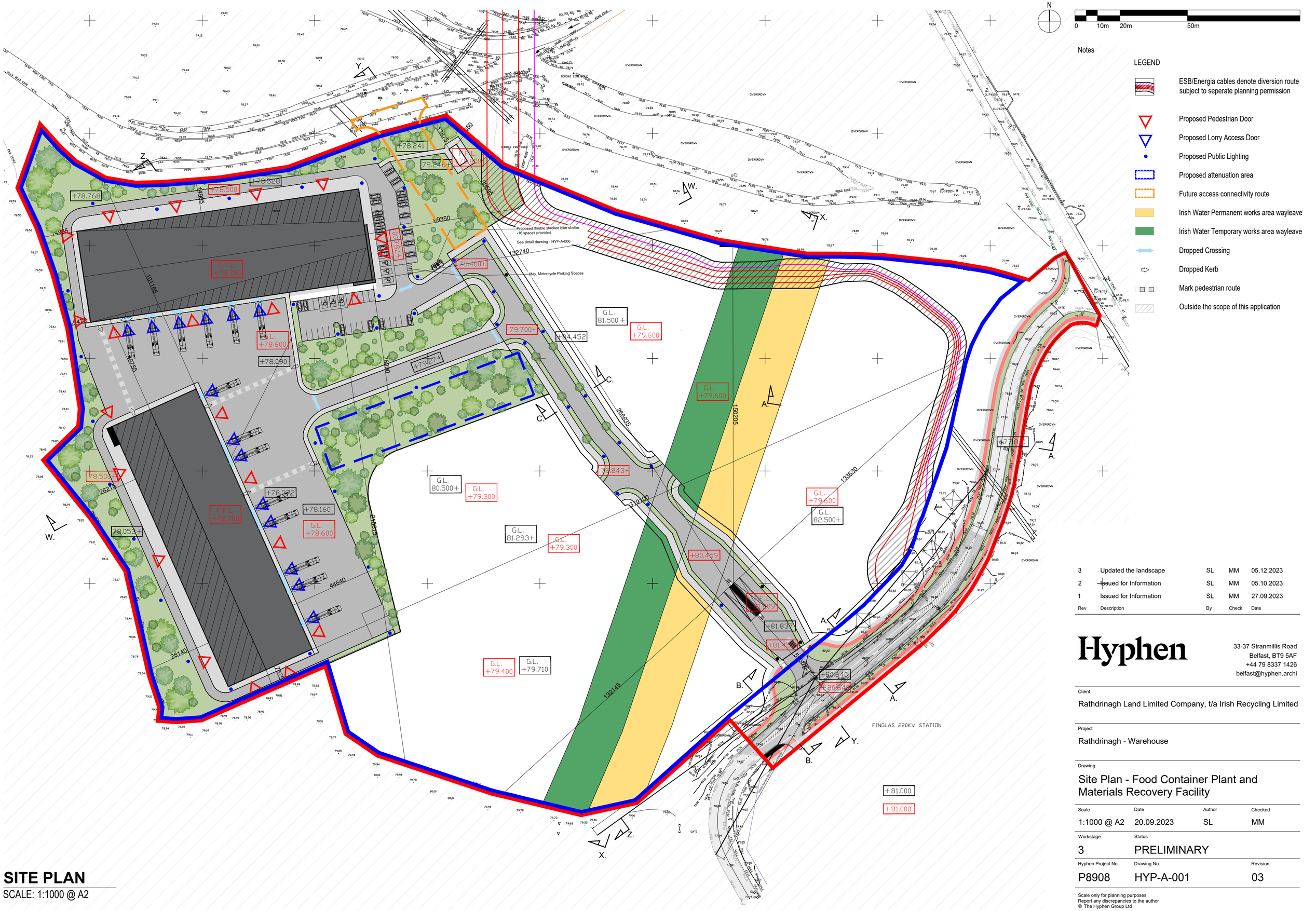
Workstage	Status
3	PRELIMINARY

Hyphen Project No.	Drawing No.	Revision
P8908	HYP-A-007	01

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Masterplan Layout

SCALE: 1:1000 @ A2



SITE PLAN

SCALE: 1:1000 @ A2

Rev	Description	By	Check	Date
3	Updated the landscape	SL	MM	05.12.2023
2	Issued for Information	SL	MM	05.10.2023
1	Issued for Information	SL	MM	27.09.2023

Hyphen

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Client

Rathdrinagh Land Limited Company, t/a Irish Recycling Limited

Project

Rathdrinagh - Warehouse

Drawing

Site Plan - Food Container Plant and Materials Recovery Facility

Scale	Date	Author	Checked
1:1000 @ A2	20.09.2023	SL	MM

Workstage	Status
3	PRELIMINARY

Hyphen Project No.	Drawing No.	Revision
P8908	HYP-A-001	03

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3.5 Building Design & Layout

3.5.1 *MRF*

The building elevations and sections are shown on Drawing No HYP-A-005. The building will be a steel portal frame structure, with external preformed and profile sheeting on the walls and low pitch roof cladding. It will be 13.4m to the eves, with an upper ridge level of 15.14m above ground level (93.84m OD). The roof will be surrounded by a parapet designed to effectively mitigate glint and glare from roof mounted solar panels.

The building floor and roof plan is shown on Drawing No HYP-A-004. An office and staff welfare facilities will be located in the southern end and there will designated areas for the reception and processing of the materials. The residual MSW and the 'brown bin' waste will be handled in an area separated from the rest of the building by a partition wall and fitted with the odour control system.

Commercial, industrial and domestic source segregated and mixed dry recyclables (MDR) and construction and demolition (C&D) waste will be handled in different bays. There will be designated materials storage areas, and quarantine areas will be provided for the temporary storage of materials not suitable for recovery/recycling.

3.5.2 *FCCP*

The building elevations and sections are shown on Drawing No HYP-A-003. The building will be a steel portal frame structure with external preformed and profile sheeting on the walls and low pitch roof cladding. It will be 12m to the eves, with an upper ridge level of 14m above ground level (92.70m OD) and the roof will be surrounded by an anti-glint and glare parapet.

The building floor and roof plan is shown on Drawing No HYP-A-002. An office and staff welfare facilities will be located in the eastern end and there will be designated materials reception, washing, sterilisation and storage areas.

3.6 Facility Management

All facility personnel will be provided with appropriate training and have the requisite qualifications and experience to complete their assigned tasks. An Integrated Management System (IMS) will be implemented that meets the requirements of International Standard Organisation (ISO) 14001 Environmental Management System and Occupational Health and Safety Assessment Series (OHSAS) 18001:2007.

3.7 Operational Hours & Staffing

The MRF and FCCP will operate 24 hours a day, 7 days a week and there will be approximately 30 full time staff comprising management, administration and general operatives.

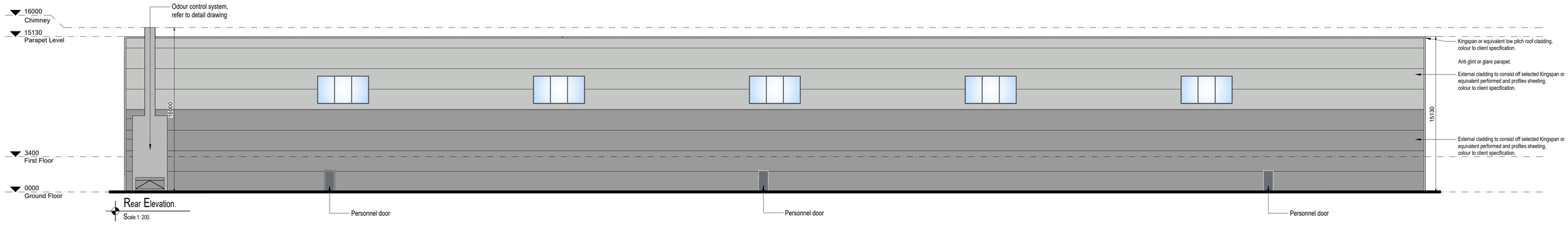
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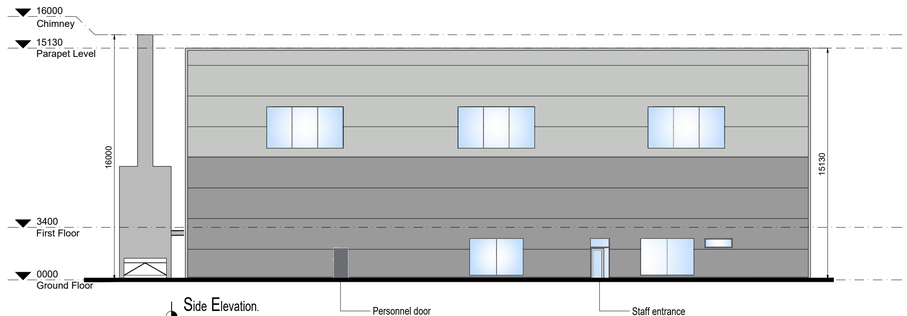
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RAL 7004

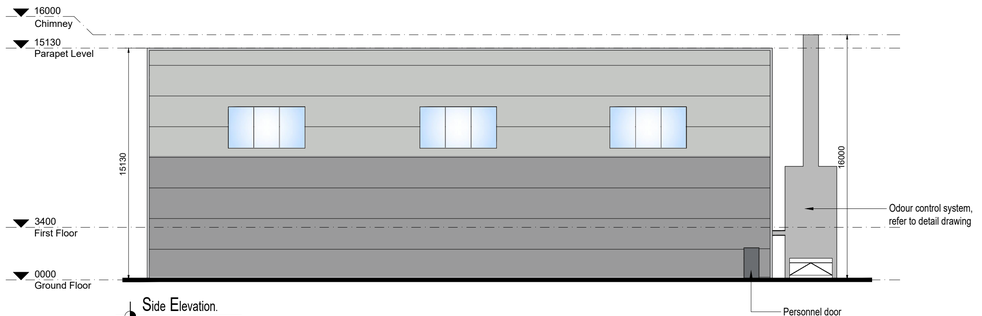
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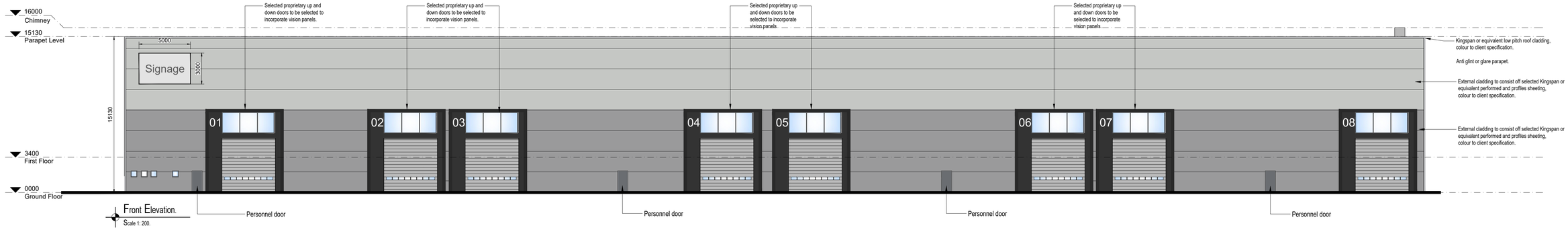
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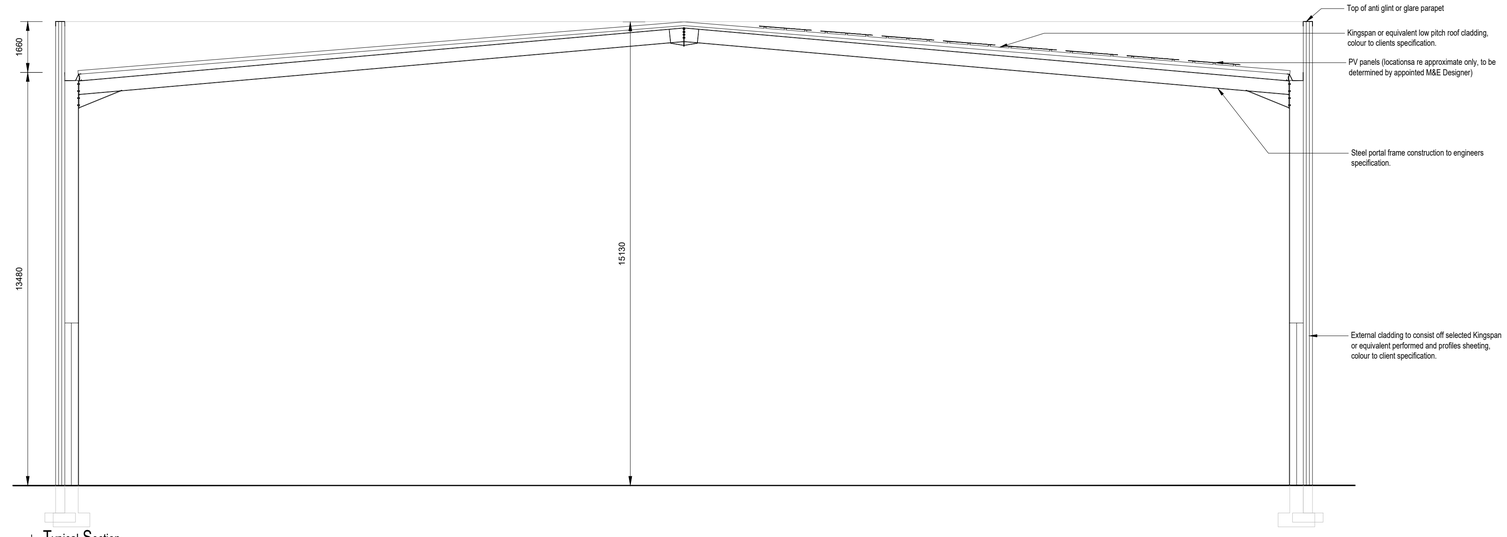
Side Elevation.
Scale 1: 200.



Side Elevation.
Scale 1: 200.



Front Elevation.
Scale 1: 200.



Typical Section.
Scale 1: 100.

Rev	Description	By	Check	Date
2	Updated titleblock and elevations	SL	MM	24.11.2023
1	Issued for Information	SL	MM	27.09.2023

Hyphen

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Client

Rathdrinagh Land Limited Company, t/a Irish Recycling Limited

Project

Drawing

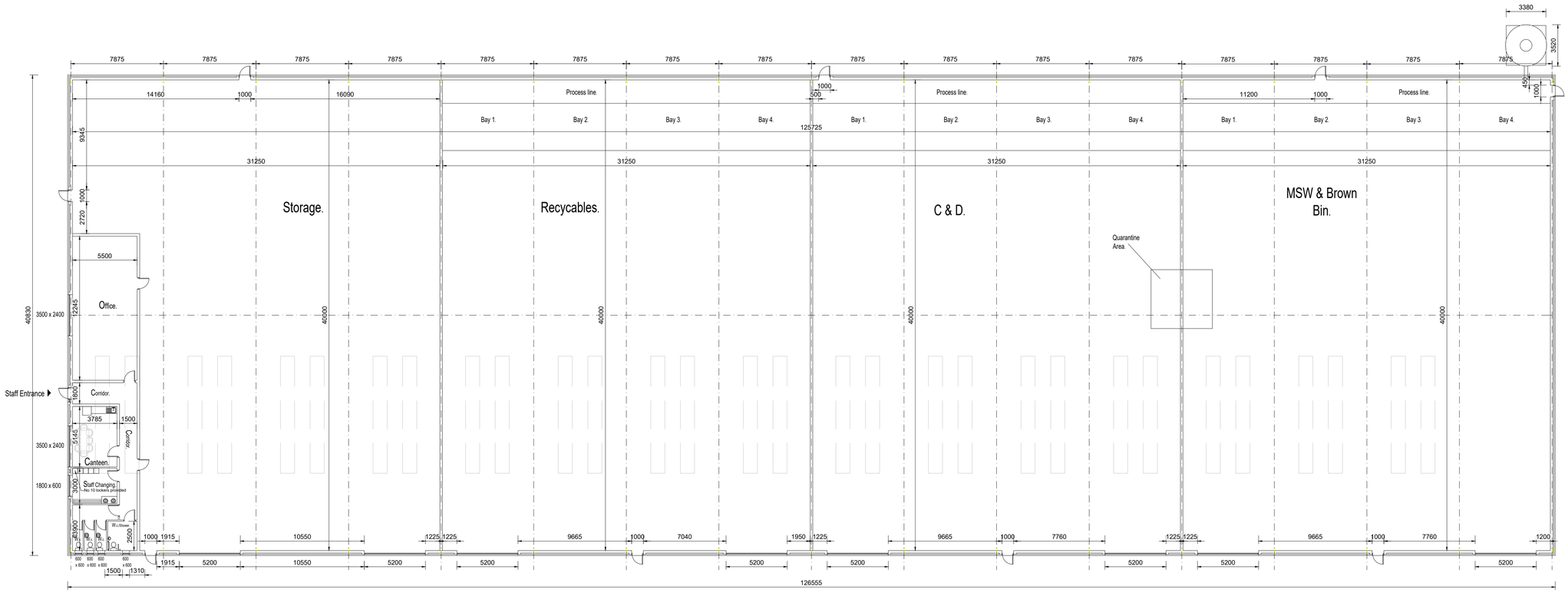
Material Recovery Facility -Proposed Elevations and Section

Scale	Date	Author	Checked
1:200 @ A1	15.09.2023	SL	MM

Workstage	Status
3	PRELIMINARY

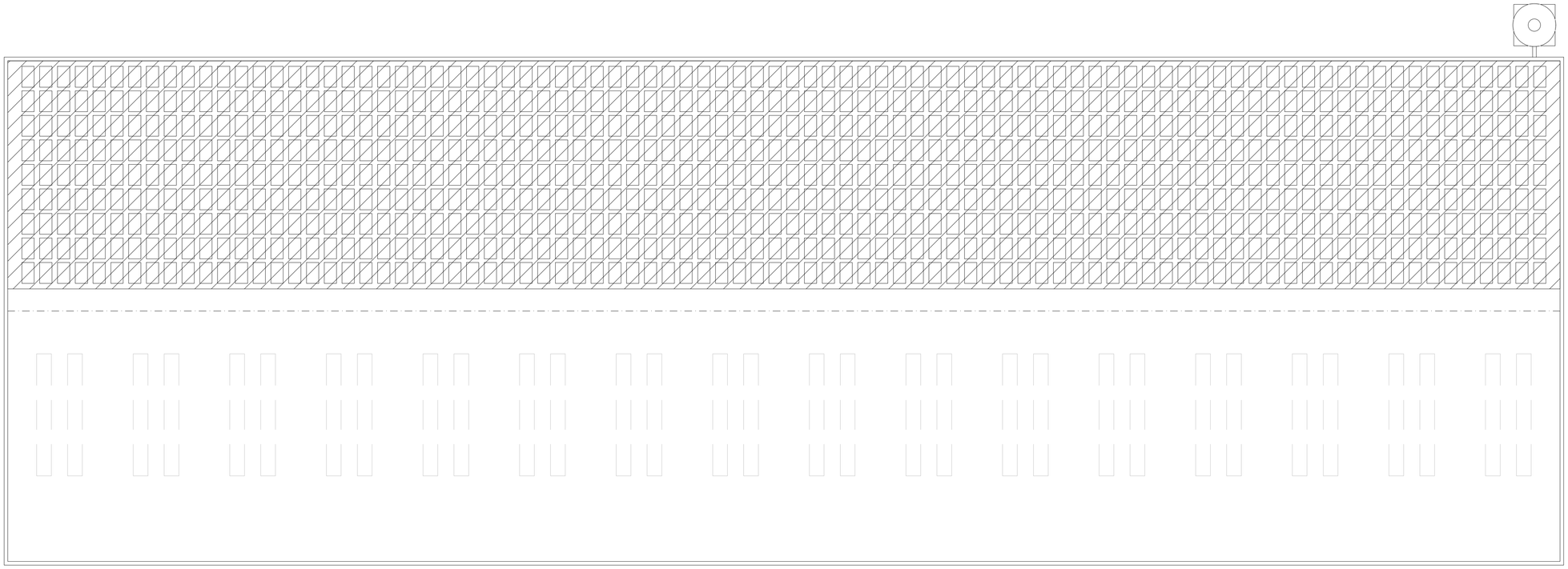
Hyphen Project No.	Drawing No.	Revision
P8908	HYP-A-005	02

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Report any discrepancies to the author
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Floor Plan. Floor Area:- 5032m2.

Scale 1: 200.



Roof Plan.

Scale 1: 200.

0 1m 2m 5m

Notes

Rev	Description	By	Check	Date
3	Lockers added to the staff changing room	SL	MM	11.12.2023
2	Updated titleblock	SL	MM	24.11.2023
1	Issued for Information	SL	MM	27.09.2023

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Client

Rathdrinagh Land Limited Company, t/a Irish Recycling Limited

Project

Rathdrinagh - Warehouse

Drawing

Materials Recovery Facility
-Proposed Floor Plan and Roof Plan

Scale	Date	Author	Checked
1:200 @A1	15.09.2023	SL	MM

Workstage	Status
3	PRELIMINARY

Hyphen Project No.	Drawing No.	Revision
P8908	HYP-A-004	03

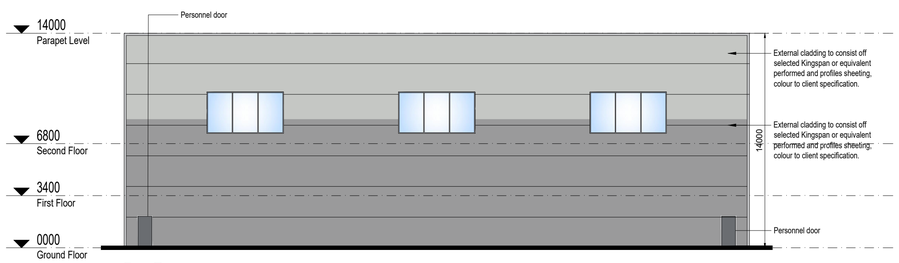
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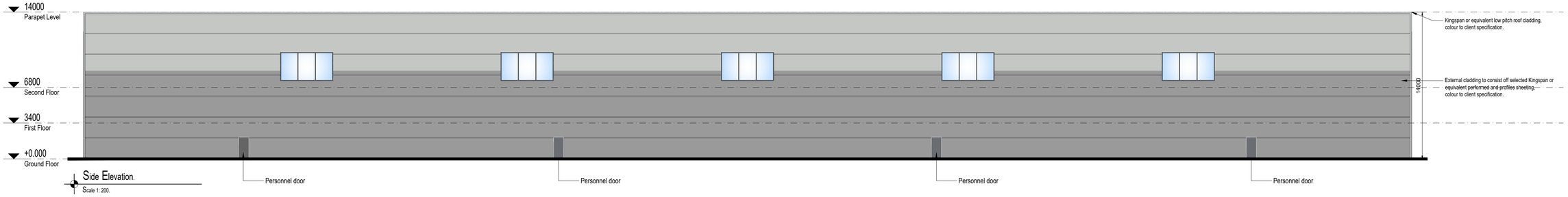
Side Elevation.
Scale 1: 200.



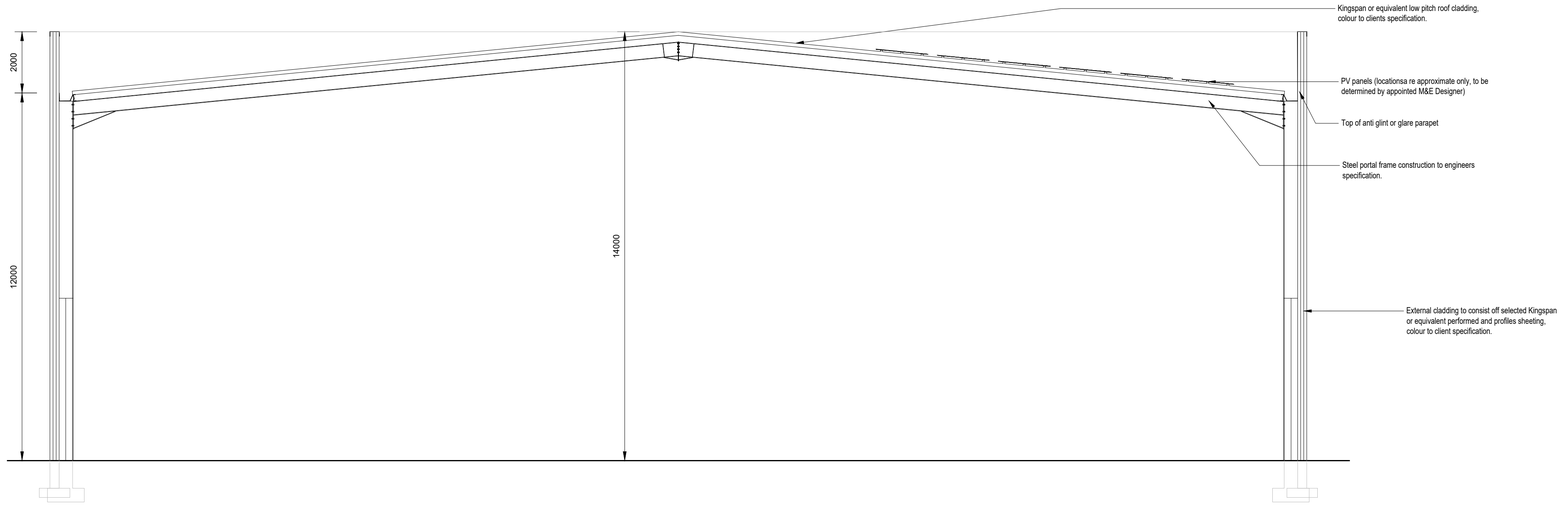
Front Elevation
Scale 1: 200.



Rear Elevation.
Scale 1: 200.



Side Elevation.
Scale 1: 200.



Typical Section.
Scale 1: 100.

KEY

RAL 7035

RAL 7004

0 1m 2m 5m

Notes

Rev	Description	By	Check	Date
2	Updated titleblock and elevations	SL	MM	24.11.2023
1	Issued for Information	SL	MM	27.09.2023

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Rathdrinagh Land Limited Company, t/a Irish Recycling Limited

Project
Rathdrinagh - Warehouse

Drawing
Food Container Plant
-Proposed Elevations and Section

Scale	Date	Author	Checked
1:200 @ A1	15.09.2023		

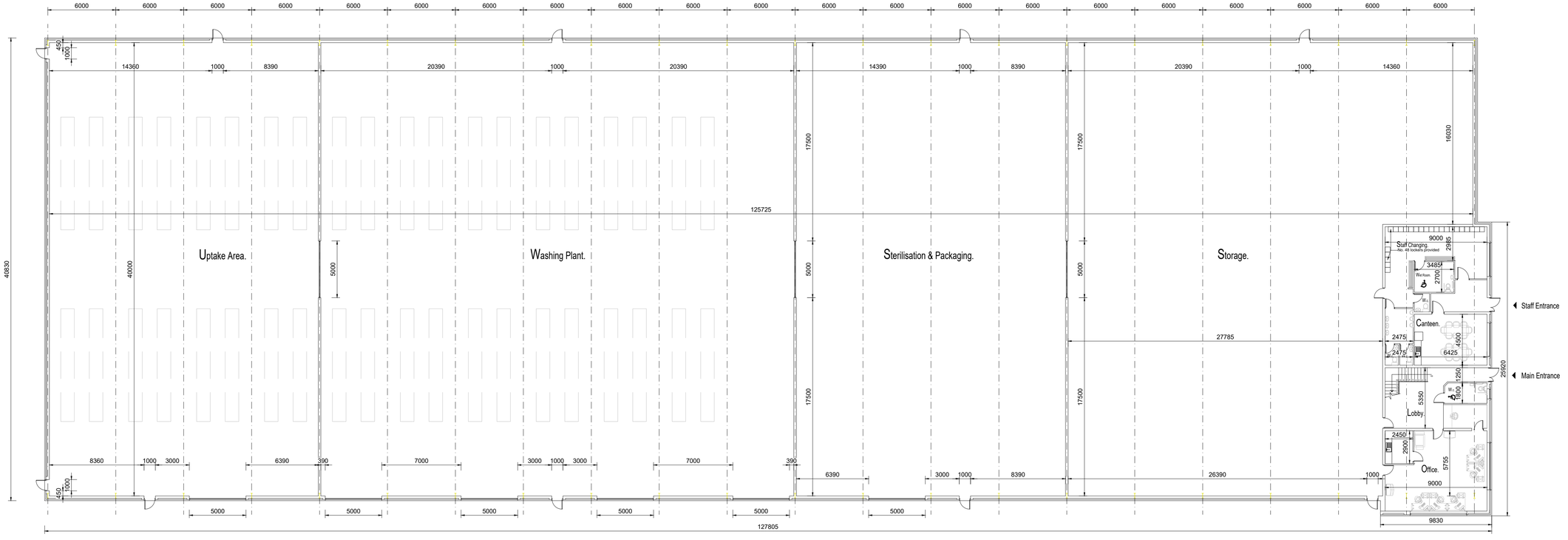
Workstage	Status
3	PRELIMINARY

Hyphen Project No.	Drawing No.	Revision
P8908	HYP-A-003	02

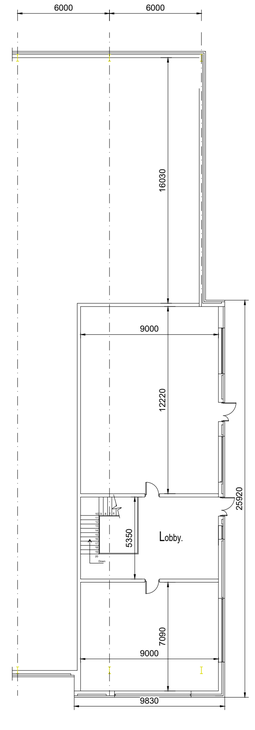
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0 1m 2m 5m

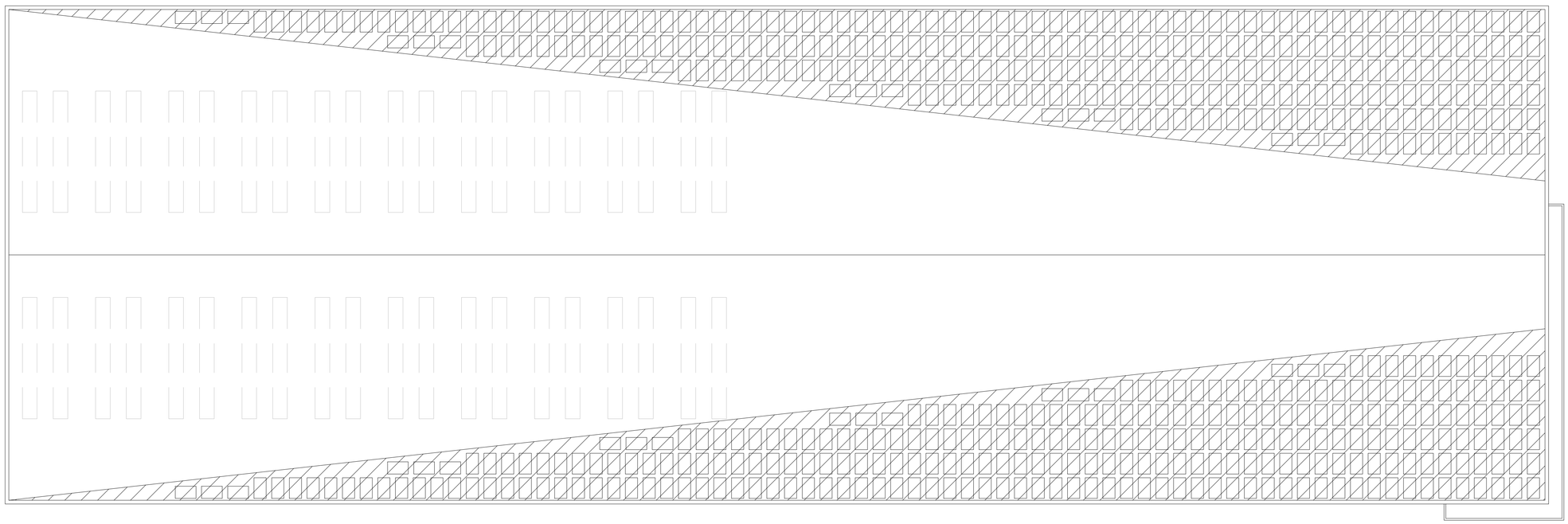
Notes



Ground Floor Plan. Floor Area:- 5086m2.
Scale 1: 200.



First Floor Plan. Floor Area:- 248m2.
Scale 1: 200.



Roof Plan.
Scale 1: 200.

Rev	Description	By	Check	Date
2	Updated titleblock	SL	MM	24.11.2023
1	Issued for Information	SL	MM	27.09.2023

Hyphen
North Road
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Client
Rathdrinagh Land Limited Company, t/a Irish Recycling Limited

Project
Rathdrinagh - Warehouse

Drawing
Food Container Plant
-Floor Plan and Roof Plan

Scale	Date	Author	Checked
1:200 @ A1	15.09.203	SL	MM

Workstage	Status
3	PRELIMINARY

Hyphen Project No.	Drawing No.	Revision
P8908	HYP-A-002	02

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3.8 MRF

3.8.1 *Materials Intake*

The incoming materials will be subject to a documented waste acceptance procedure that will require recording details of the source, type and quantity and the delivery vehicle registration number.

The wastes will be delivered by waste collectors that have up to date Waste Collection Permits and wastes will not accepted from members of the public. All deliveries will be in fully enclosed vehicles and all vehicles will be weighed in at the weighbridge, where accompanying documentation will be checked. The driver will then be directed to the appropriate off-loading area inside the MRF

Any delivery, which upon inspection at the weighbridge is deemed not to be suitable, will not be accepted. In such event facility personnel will record the name of the haulier, the registration number of the vehicle and the nature and origin of the waste and the vehicle driver will be instructed to return the materials to the producer. Records of all such incidents will be maintained.

Any materials identified as not being suitable following off-loading will, where practical, be loaded back onto the delivery vehicle for immediate removal from the MRF. If this is not possible, the material will be removed to a designated quarantine area inside the MRF, where it will be stored in suitable containers (e.g. skips) pending its removal. Records will be kept of the waste type, quantity, and ultimate disposal/treatment facility.

3.8.2 *Processes*

3.8.2.1 MSW

The residual MSW will be off loaded in the MSW/Brown Bin Bay which will be fitted with an odour control system. It will be inspected by trained personnel and unsuitable materials, which will include household hazardous waste and potential ignition sources, will removed and brought to a quarantine area. The materials will then be processed to separate the recoverables/recyclable from the non-recoverable/recyclable. The processing line will include a bag shredder, trommel, overband magnet, eddy current separator and wind sifters to remove organic fines, ferrous and non-ferrous metals and plastics/paper (lights).

The metals will be sent to authorised metal recycling facilities. The organic fines will be sent to authorised biological treatment facilities (composting and anaerobic digestion plants). The 'lights' will be too contaminated to be recycled but are suitable for the production of solid recovered fuel (SRF) which is used in cement kilns as a replacement for fossil fuels. The residual materials, which contain some putrescible matter, are suitable for use as a refuse derived fuel (RDF) in waste to energy plants.

The operators of the Irish cement kilns and waste to energy plants require the SRF and RDF to be delivered loose and therefore the SRF and RDF will be transported off site daily in enclosed articulated trailers.

The kilns and waste to energy plants regularly close down for maintenance and when this occurs the SRF/RDF will be baled in an on-site baler to facilitate temporary term storage inside the building. Depending on the planned down time of the kilns/waste to energy plants and in the event of a major breakdown it may be necessary, as a contingency measure, to store the bales externally until the kilns/waste to energy plants come back into service.

3.8.2.2 Brown Bin

The 'brown bin' waste will also be off loaded in the MSW/Brown Bin Bay. The materials will not be processed, but bulked up and sent off-site to authorised biological treatment plants.

3.8.2.3 Dry Recyclables

The household mixed dry recyclables (MDR) will be off-loaded in the Recyclable Bay where they will be inspected by trained personnel and any non-recyclables, potential ignition sources and hazardous wastes will be removed. The remaining materials will then undergo manual and mechanical separation into separate recyclable streams (paper, cardboard, plastic, metals). This will include a picking station, optical and ballistic separators, magnets and eddy current separators. The segregated materials will be baled and stored inside the building pending transfer to authorised recycling facilities.

The commercial recyclables will be source separated and will arrive either already baled or loose. The bales will be stored inside the building, pending consignment. The loose materials will be off loaded in the Recyclable Bay and then baled, with the bales stored inside the building.

The recovered plastics include high density polyethylene (HDPE), low density polyethylene (LDPE), polyethylene terephthalate (PET) polypropylene (PPE) and polyvinyl chloride (PVC). Initially it is intended to send these to the plastic recycling plant in Portlaoise which has received planning permission and is at detailed design stage. This plant is designed to process the plastics to a point where they can replace virgin polymers in the manufacture of plastic products. Depending on market conditions a plastics recycling plant will be developed in future phases of the Hub.

3.8.2.4 C&D Materials

The C&D materials will be off loaded in the C&D Bay. They will comprise mixed and source separated materials (rubble, bricks, tiles, timber metals plastics and soil and stone, and timber). The mixed waste will be off-loaded and inspected by trained personnel, with non-conforming materials (e.g. paint tins, black bags etc) manually removed and sent either to a quarantine Area, or the MSW Bay. Bulky items and timber will be mechanically removed.

The remaining materials will be separated using a mechanical screener, magnets and a picking line and wind sifters. The outputs will include 'lights', metals, timber, soil and stone and rubble. The 'lights' will be moved to the MSW Bay for use in the manufacture of SRF.

End of Waste Recycled Aggregates

Source segregated concrete rubble and other selected materials will be processed (crushed and screened) to produce aggregates that meet the End of Waste criteria specified in the EPA's national protocol.

Waste Timber

Timber waste is particularly problematic for the waste management industry. It is primarily generated during construction, building maintenance and demolition activities. As wood is biodegradable it is not suitable for landfill. While clean timber is valuable as a carbon neutral fuel source, a significant amount of waste timber contains trace contaminants, such as paint, glue and preservatives, which make it unsuitable to use as a fuel.

IRL intends to trial a plant for the automated segregation of clean and contaminated wood waste and to evaluate processing capabilities to produce a wood fibre suitable for the manufacture of new products. This will involve mechanical segregation, shredding, metal and 'lights' (plastic) contaminant removal. If the trial is successful a full scale processing plant will be developed in future phases of the Hub.

3.8.3 *Materials Consigned*

All materials consigned from the MRF, with the exception of those that meet End of Waste criteria, will be sent to authorised waste facilities. All shipments will be weighed on the weighbridge and records of the waste haulier, waste types and quantities and the details of the end destinations will be recorded.

3.8.4 *Wastewater*

A power washer will be located in the MSW /Brown Bin Bay and used as required to clean the wheels of the waste transport vehicles. The washwater will be collected in the floor drains and discharged to the foul sewer.

As described in Section 3.8.2.1 bales of SRF/RDF will only be stored externally as a contingency in the event that the cement kilns/ waste to energy plants are off-line for longer than normal during the planned annual maintenance shut-down, or if there is a major outage. As these are contingency events it is not possible to predict the frequency of occurrence.

The quantity of run-off-diverted to the foul sewer that will connect to the Ringsend Wastewater Treatment Plant (WWTP) is a function of the duration of the external storage, the size of the storage area and the amount of rainfall during the temporary storage period.

Assuming, worst case that the bales are stored externally for two weeks, the storage area is 1,000m2, and an average weekly rainfall of 75mm, the total volume of run-off diverted to the foul sewer would be 150m^3, equivalent to a daily average of 10.7m^3.

The wrapping on the bales is intended to prevent liquid seeps from the materials during storage and transport and it also prevents the infiltration of rainfall into the bales. Therefore the risk of surface water contamination is low.

As a worst case it has been assumed that in the run-off from the temporary storage area the Biochemical Oxygen Demand (BOD) will be 80 mg/l, the Chemical Oxygen Demand (COD) will be 200mg/l and the Total Suspended Solids (TSS) will be 100mg/l. These are all significantly below the average levels in the influent to the Ringsend WWTP, which are BOD 259mg/l, COD 533mg/l and TSS 240mg/l.

The total volume (150m^3) represents 0.034% of the average annual hydraulic loading on the Ringsend WWTP. The Uisce Eireann 2022 Annual Environmental Report for the Ringsend WWTP confirms that maximum and average annual hydraulic loading on the WWTP is less than the peak treatment plant capacity. The total loadings during the two week storage event will be BOD 12kg, COD 30kg/day and TSS 15kg/day. These are orders of magnitude below the annual loadings on the WWTP, which are BOD 112,791kg, COD 232,115kg and TSS 104,517kg.

While the Ringsend WWTP has the capacity to accept and treat the run-off, as described in Section 3.19.1 the operation of the MRF will be regulated by an Industrial Emissions Licence from the EPA. The

EPA is obliged to engage with Uisce Eireann to determine the emission limits to the foul sewer that will protect the integrity of the sewer network and the effective operation of the Ringsend WWTP.

3.8.5 *Plant & Equipment*

Operations will require the use of a range of fixed and mobile plant and an indicative list is shown in Table 3.1.

Table3.1 Plant and Equipment

Type of Plant	Units
Front Loading Shovel	2
Trommel or similar mechanical process	1/2
Baler	1
Air Compressor	1
Shredder	1
Conveyor	2
Bag Opener	1
Crusher & Screener	1
Forklift	2
Mechanical Grab	1
Teleporter	
Yardsweeper	1
Odour abatement system	1

The final layout of the fixed plant has not yet been determined. All key plant items will have 100% duty and 50% standby capacity. Additional supporting plant items may be hired in for use for short periods, if required to ensure continued site operations. Critical spares will be maintained on-site and a preventative maintenance programme will be implemented.

3.9 **FCCP**

3.9.1 *Materials Intake*

The reusable food containers will not be classed as waste and typically will arrive in boxes or on pallets covered in plastic wrapping. There will be a dedicated reception area inside the building where the trays/crates will be removed from the boxes/unwrapped. The containers will then be sent to the cleaning plant.

3.9.2 *Processes*

There will be a five-step process to clean and sanitise the containers:

- Pre-washing—remove visible dirt and debris;
- Washing—hot wash with detergents and water;

- Rinsing—rinse all remaining detergents and residue;
- Sanitising—treat and disinfect;
- Drying – air drying, and
- Packaging & Storage.

The sanitisation process involves passing the containers through a tunnel where sanitising agent, for example isopropyl alcohol (IPA) will be misted on the top, sides and bottom of each item. After drying, quality assurance testing will be carried out to confirm the trays are suitable for use. This will include using industry standard Adenosine Triphosphate (ATP) testing. The containers will then be packaged and stored in a dedicated area pending return to the customers.

3.9.2.1 Wastewater Treatment

The pre wash, hot wash and rinse water will be directed to a wastewater treatment plant located inside the building. This will comprise physico-chemical treatment and will not involve biological stages e.g. activated sludge. The water will flow by gravity to an underground chamber from where it will be pumped through a high level automatic fine screen to remove gross solids. It will then pass into an above ground balance tank fitted with a submersible agitator to keep the contents mixed.

From the balance tank the water will be pumped to a diffused air floatation (DAF) unit (80m^3/hour capacity). Flocculants and coagulants will be added to enhance the removal of solids. The treated effluent will discharge to an above ground buffer tank from where it will be pumped back to the washing plant. Sludge accumulating in the DAF unit will be pumped to a fully enclosed sludge holding tank, where it will be stored before being sent off-site for treatment.

To maximise the efficiency of the DAF unit it is necessary to continually bleed a small volume (ca 1m^3/hour) of the treated wastewater to the foul sewer and replace this with water from the mains supply.

3.10 Services

A detailed description of the water supply, surface water and foul water drainage systems is in the Engineering Planning Report prepared by Coyle Civil & Structural Engineers. The Report is in Appendix 3.1 and should be consulted in relation to the detailed design calculations.

3.10.1 *Water Supply*

Water will be obtained from the Uisce Eireann 150mm water main on North Road as shown on Drawing No C100. The mains supply will be augmented by rainwater harvesting, with the water used as grey water in the welfare facilities. A ring main fitted with six fire hydrants will be installed.

- (AV) On-line Air Valve as per STD-W-22
- (SV) Sluice Valve as per STD-W-15
- (WH) Washout Hydrant as per STD-W-30A with Scour Chamber as per STD-W-30B
- (H) Off-line Hydrant as per STD-W-19
- WM Electromagnetic Meter chamber as per STD-W-26

GREYWATER INLET PIPE TO BUILDING

10,000 LITRE KINGSPAN KLARGESTER BELOW GROUND RAINWATER HARVESTING SYSTEM (ENV0350TKSW)

PROPOSED SUDS BASED PERMEABLE PAVING TO CARPARK AREA

STORM TO FOUL CONNECTION TO ALLOW FOR STORAGE AREA OUTFALL TO FOUL LINE

10,000 LITRE KINGSPAN KLARGESTER BELOW GROUND RAINWATER HARVESTING SYSTEM (ENV0350TKSW)

GREYWATER INLET PIPE TO BUILDING

Drainage storage with infiltration - Geocellular storage 20m x 96m. Stormblock Optimum 0.8m x 0.8m x 0.66m, two layers of 3000 pcs, 2407m³ volume. 2335m³ required storage, 72m³ spare capacity.

STORM TO FOUL CONNECTION TO ALLOW FOR STORAGE AREA OUTFALL TO FOUL LINE

By-pass Petrol Interceptor Klargester NSBE040 or similar approved

Approx location of overhead lines

Drainage Layout.

Scale:- 1: 500.

NOTES:-

This is a planning drawing only and is therefore limited in its capacity to convey the total information, details & specification necessary to complete the works. Any work carried out that is not covered here will be the responsibility of the persons carrying them out. If any situation arises which would cause a contravention of the building regulations, then the Engineer should be consulted, otherwise the Engineer cannot be held responsible. As these drawings are prepared as planning drawings only, it is strongly recommended that the Engineer be consulted for the preparation of full working drawings. It is solely the clients responsibility to appoint a Qualified Engineer to supervise the project during the construction stage and to prepare structural working drawings for the builder.

ALL WORK AND MATERIALS ARE TO BE IN ACCORDANCE WITH THE CURRENT BUILDING REGULATIONS WHETHER DETAILED ON THIS DRAWING OR NOT.

All dimensions to be taken on site. Do not scale any dimensions from this drawing. This drawing is to be read in conjunction with all other relevant drawings and specifications etc that are issued.

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Project: Phase 1 of the proposed 9.863 ha Huntstown Circular Economy Hub comprising Materials Recovery Facility, Food Container Cleaning Plant & Ancillaries at Huntstown Td / Coldwinters Td, Fingal, Co. Dublin.

Client: Rathdrinagh Land Unlimited Company, t/a Irish Recycling Limited.

Sheet Title: Drainage & Watermain Layout - Sheet 1

Project No.:		Date:	
22-039		05-04-23	
Drawing No.:	Scale:	Rev:	Checked:
C-100.	As shown.	A	PC

3.10.2 *Foul Water*

The foul water drainage system is shown on Drawing No C100. Given the gradient from the site to the Uisce Eireann foul sewer on North Road 300mm diameter pipes are required to achieve the optimum self- cleansing velocity.

3.10.3 *Surface Water Drainage*

The drainage system is shown on Drawing No C 100. As there are no water courses or storm sewers in or adjacent to the development site the drainage system comprises:

- Permeable paving in car parking areas;
- Rainwater harvesting on building roofs, and
- Attenuation storage cell with a soakaway.

There will be separate drainage systems for the building roofs and the open paved areas. The run-off from the roofs will be collected in 10m^3 underground harvesting tanks for use as 'grey water'. Surplus run-off will discharge to the attenuation cell.

The car parking areas will be provided with permeable paving; however as the remaining open paved areas will be trafficked by heavy goods vehicles permeable paving cannot be used there.

Run-off from the areas trafficked by the HGVs will be directed to an oil interceptor and then into an underground attenuation storage cell, from where it will infiltrate to ground. The storage cell will have a capacity of 2,407m^3.

In the event there is a need for the external contingency storage of baled SRF/RDF, as a precautionary measure rainwater run-off from the storage areas will temporarily be diverted to the foul sewer by activating valves located in two inspection chambers.

3.10.4 *Power Supply*

Electricity will be obtained from a renewable energy utility provider and an electrical substation will be installed in the north east of the site. Solar panels will be installed on the building roofs, as shown on Drawings No.HYP-A-002 and HYP-A-004. The buildings will not be over shadowed so the maximum daylight usage will be achieved.

3.10.5 *Lighting*

The proposed lighting scheme is shown on Drawing No E600 in Appendix 3.4. The system is designed to minimise the impact external lighting upon faunal populations by retaining dark areas around the external boundaries. The scheme optimises the lighting configuration to achieve recommended illuminance levels, while minimising light spill through a combination of column location and height, luminaire wattage and optical setting.

3.11 Materials Storage

At the MRF the unprocessed and processed materials will be stored in accordance with a Materials and Waste Storage Plan agreed with the EPA. The Plan will specify the types and maximum quantities of wastes that will be on site at any one time, identify the storage locations and will take into consideration the EPA Guidance Note: Fire Safety at Non-Hazardous Waste Transfer Stations, (2013) and the EPA Guidance on Fire Risk Assessment for Non-Hazardous Waste Facilities, 2016.

At the FCCP the materials storage area will comply with Hazard Analysis & Critical Control Point (HACCP) procedures to ensure the cleaned and sterilised containers are not cross contaminated by either incoming containers, or the cleaning process itself.

3.12 Oil & Chemical Storage

Transport vehicles will not be refuelled at the site. The forklifts used in the FCCP will be electrically powered. Diesel for the mobile plant used in the MRF will be stored in a bunded tank (2,000 litres) in a designated area inside the building.

The bund design will have regard to the EPA guidelines 'Storage and Transfer of Materials for Scheduled Activities' (2004) and will provide 110% of the capacity of the storage tank. The fuel dispensing unit will also be inside the bund.

Hydraulic and lubricating oil used in plant maintenance will be stored on a spill pallet in a designated area inside the MRF. Detergents used in the FCCP washing system will be stored on a bunded pallet in a designated area adjacent to the system.

3.13 Fire Safety Management

3.13.1 General Prevention Measures

To prevent/reduce risk of arson there will be a security fence around Phase 1 and the entrance gate will be locked in the event of a temporary closure.

Members of the public will not have access to the MRF and the FCCP and only authorised personnel will be permitted inside the buildings. Visitors will be informed of the safety and fire prevention procedures that must be followed while they are on site and there will be a policy of only smoking in designated areas.

Safe systems of work will be provided and service contractors will be obliged to undergo safety inductions before getting access to operational areas. The inductions will address fire procedures, behaviour on site, housekeeping and specific high risk jobs i.e. hot works procedure & permits.

The use of portable electrical heaters will be prohibited and the electrical systems in the buildings will be subject to regular inspections.

Emergency exit doors will be provided in all of the buildings and fitted with emergency exit signs with back-up lighting.

3.13.2 *Fire Spread*

The separation distances between the buildings means that a fire outbreak in one will not spread to the other. In the MRF the internal separation distances between materials storage areas/bays will comply with the requirements of the EPA Guidance Note: Fire Safety at Non-Hazardous Waste Transfer Stations, (2013) and the EPA Guidance on Fire Risk Assessment for Non-Hazardous Waste Facilities, 2016.

3.13.3 *Fire Detection Systems*

An automatic fire detection (for example ceiling mounted heat and smoke detectors) and alarm systems certified to IS 3218 will be installed in both buildings that cover all internal areas, supplemented by a manual break glass system. The detection systems will be subject to annual checks by a fire safety contractor.

3.13.4 *Fire Suppression*

The ring main will be fitted with six hydrants that comply with the Uisce Eireann Water Infrastructure Standard Details (STD-W-19). Fire extinguishers will be positioned at strategic locations throughout the site and the positions recorded in Fire Register. The extinguishers will be subject to annual inspection and replenishment/replacement as required by a fire safety contractor. Site staff will be trained to extinguish small fires with appropriate hand held fire. If staff members cannot tackle a fire safely and effectively, the evacuation of all personnel will be the primary priority.

3.14 **Resource Consumption and Energy Efficiency.**

3.14.1 *Electricity*

The operation of the MRF and the FCCP washing plant will be significant consumers of electricity. Prior to equipment fit out IRL will engage with equipment suppliers to ensure the optimum energy efficiency of the electrical motors. In the operational stage IRL will conduct regular energy efficiency audits and implement the recommendations.

The proposed development includes a solar panel installation on the roofs of both the MRF and the FCCP. The electricity generated will be used directly in site operations

3.14.2 *Fuel/Oil*

Fuel oil will not be used in the materials processing and container washing and diesel powered HGVs will not be refuelled on site. It is estimated that the annual diesel consumption by the mobile plant operating in the MRF will be approximately 5,000 litres. It is the intention to use compressed natural gas (CNG) fuelled and electrically powered vehicles to transport materials from the facility. Hydraulic and lubricating oil and grease will be used in plant maintenance and it is estimated that approximately 500 litres will be used annually.

3.15 Safety and Hazard Control

All facility personnel and visitors will be obliged to comply with IRL's safety guidelines regarding access and on-site traffic movement. All site personnel will be provided with and obliged to wear, personal protective equipment (PPE) appropriate for their particular functions. PPE includes facemasks, gloves, safety glasses, steel-toed footwear, overalls, reflective jackets and helmets.

3.16 Accidents & Emergencies

An emergency is an accident/incident that has the potential to result in environmental pollution and/or harm to human health. An Accident Prevention Policy and Emergency Response Procedure (ERP) will be prepared prior to the start of operations.

3.17 Emissions

Potential and actual emissions associated with the proposed development include, rainwater run-off, sanitary wastewater, process wastewater, noise, odours, dust and vehicle exhausts. Sanitary wastewater and treated process wastewater will discharge to the Uisce Eireann foul sewer. Surplus rainwater run-off will infiltrate to ground.

The noise sources include the conveyors, extrusion plant, washing plant and vehicle loading and movement. Vehicle movements on the yard are potential sources of dust during dry periods. The residual MSW and 'brown bin' wastes will be sources of odours. Petrol, diesel and compressed natural gas fuelled vehicles will be sources of exhaust gas emissions.

3.18 Emission Controls

The site design and method of operation facilitates the implementation of the following proposed emission controls, which in the case of the MRF are based on the requirements of the EU Best Available Techniques (BAT) Reference Document for Waste Treatment (2018.).

3.18.1 Noise

All materials reception and processing will be carried out inside the buildings. If considered necessary from a Health & Safety perspective acoustic screens will be installed on individual plant items.

3.18.2 Surface Water & Groundwater

The open yards and building floors will be paved and subject to regular inspection, with damaged areas repaired. All tank and drum storage areas will be impervious to the stored materials. An adequate supply of containment booms and/or suitable absorbent material will be kept on-site to contain and absorb any spillage and staff will be trained in the appropriate response actions. There will be an oil interceptor on the surface water drainage system serving the open yards and the permeable paving in the car parking areas will be designed to filter out oil.

3.18.3 Air

3.18.3.1 Dust

Waste processing will located inside the MRF. The paved yards and building floors will be cleaned regularly using a road sweeper and the open yards will be damped down in dry periods.

3.18.3.2 Vehicle Exhausts

The diesel fuelled heavy goods vehicles transporting materials to the facility will be fitted with Selective Catalytic Reduction (SCR) systems. A diesel fuel additive (AdBlue) is used in the SCR to reduce the nitrous oxide levels in the exhaust gases.

3.18.3.3 Odours

The only materials accepted at the facility that will be significant source of malodours are the residual MSW and the 'brown bin' wastes that will be processed in the MRF. An odour management system comprising the extraction of odorous air and its treatment in an odour control unit (OCU) consisting of a dust filter to remove dusts and a carbon filter to reduce odour levels will be installed in the MSW/Brown Bin Bay.

Prior to the installation of the system the walls and ceiling will be inspected and a thick foam spray will be applied to all cladding joints and other parts of the building fabric that could be susceptible to air leaks. The objective is to achieve an air leakage rate of < $2m^3/m^2$/hour. Rapid action doors will be fitted to the vehicle access points.

Air will be drawn from the building using an extraction fan and a system of internal ceiling mounted ducts provided with grills. The fan will have the capacity to achieve 2 air changes per hour. The air will pass through the dust filter before entering the carbon filter. A damper will be fitted to the inlet of the unit to allow the air flow to be balanced. The treated air will vent to atmosphere via a single stack.

The detailed design of the odour management system will be submitted to the EPA for its prior approval before it is installed. The installation will be the subject of a Quality Assurance Plan to ensure it is installed and commissioned in accordance with the approved design parameters.

3.19 Regulatory Approval

3.19.1 MRF

The materials that will be accepted and processed in the MRF are wastes and, as the annual waste intake will exceed 50,000 tonnes, an Industrial Emissions Licence issued by the EPA is required to allow it to operate. The EPA Licence will specify the operational and infrastructural controls that must be implemented and the emission limit values that must be achieved to ensure that operations do not give rise to environmental pollution or impairment of amenity outside the facility boundary.

The EPA Licence will also specify the monitoring that must be carried out to demonstrate compliance with the Licence requirements. In addition, the EPA will conduct regulatory compliance inspections and its own independent monitoring.

3.19.2 FCCP

The reusable containers cleaned in the FCCP will not be classed as wastes and therefore an authorisation under the Waste Management Act 1996, as amended is not required. The treated washwater will be a trade effluent and its discharge to the foul sewer requires a trade effluent discharge licence from Uisce Eireann.

3.20 Decommissioning

Although the MRF does not have a defined lifetime, the EPA licence will require the preparation of a Decommissioning Management Plan (DMP). The scope will include the removal of all wastes and hazardous substances, clean out of all tanks and buildings, removal of plant and equipment, including processing lines and the disconnection of service. The DMP will identify the actions that will be taken to ensure that the decommissioning works will not cause environmental pollution and, when complete, ensures the former MRF will not present any significant risk of environmental pollution.

3.21 Construction Stage

3.21.1 Works Programme

It is estimated that construction will begin within 6 months of the grant of planning permission and will last for approximately 14 months.

3.21.2 Construction Compound

An indicative location of the Construction Compound is shown on Drawing No in the Preliminary Construction Environmental Management Plan (CEMP) a copy of which is in Appendix 3.3. The exact location of the Compound will be confirmed in advance of the start of the works and agreed with Fingal County Council. The Compound will include a site office and welfare facilities, hardstanding for plant and machinery and designated waste storage areas. It will be serviced with electrical power from an on-site generator and will include portable toilet facilities.

3.21.3 Site Preparatory Works

Site preparatory works will be carried out by the Main Contractor and will include:

- Setting of access control to the development areas;
- Provision of secure compound for the storage of all on-site machinery and materials;
- Confirming the buffer distances from sensitive locations including tree root zones;
- Provision of temporary fencing; and
- Erection of signage.

Prior to the commencement of the works the Main Contractor will check records and drawings to establish the location of existing buried services/utilities. Where it is necessary to disconnect services/utilities during the works for an extended period, temporary alternative provisions will be made.

3.21.4 *Working Hours*

The normal working hours will be 07:00 to 19:00 Monday to Friday (excluding bank holidays) and 08:00 to 14:00 Saturdays. Works will not be carried out on Sundays and Public Holidays. Subject to the agreement of Fingal County Council out of hours activities may be required for certain elements e.g. connections to water mains and foul sewer.

3.21.5 *Plant & Equipment*

Construction materials will be delivered in heavy goods vehicles and concrete mixing trucks. The construction plant items will include tracked excavators, dozers, dump trucks, telescopic handlers, backhoe loaders, lifting platforms, mobile cranes, mobile generators and asphalt paving machines

3.21.6 *Excavation Works*

Top soils and subsoils will be excavated to establish formation levels for the buildings and roads and for underground services, including the surface water attenuation system.

3.21.7 *Concrete Works*

Concrete batching will take place off site. Excess concrete will be removed from the site and concrete washout will not be permitted. Concrete pouring will be monitored to minimise the risk of significant accidental discharges. Accidental spills will not be hosed down and will be immediately cleaned up.

3.21.8 *Materials – Source and Transportation*

The selection and specification of construction materials will be informed by the local availability of these materials. Subject to the necessary constraints of performance, durability and cost, construction materials will be sourced from local suppliers and manufacturers, where possible.

3.21.9 *Oils and Chemical Storage*

All oils, fuels, paints and other chemicals will be stored in a secure, bunded, hardstand area in the Construction Compound. The retention capacity of any bulk oil storage tanks will at a minimum be 110% of the tank. For drum storage, a bund capacity of 25% of the maximum volume of material stored is required. Generators will have an integral double contained fuel storage tank. The refuelling and servicing of mobile plant and equipment will only be carried out in the Construction Compound. Spill clean-up equipment and materials will be provided and staff trained in their proper use.

3.21.10 *Surface Water Management*

As there are no surface water courses within or adjacent to the site, specific surface water management measures are not required.

3.21.11 *Groundwater Management*

The construction does not require dewatering. The oil and chemical storage and handling procedures (Section 3.21.9) are designed to minimise the risk to soil and groundwater from accidental spills.

3.21.12 *Traffic Management*

A Traffic Management Plan (TMP) will be prepared prior to the start of the construction stage and submitted to Fingal County Council for its approval. Traffic will include:

- Private vehicles use by construction site staff;
- Construction vehicles (excavators and dump trucks);
- Materials delivery vehicles, typically heavy goods vehicles (HGV).

3.21.13 *Resource and Waste Management Plan*

A Preliminary Resource and Waste Management Plan (RWP) has been prepared that describes the measures that will be implemented in the Design Stage and the Construction Stage to' design out' waste, minimise the volumes of waste generated, ensure that the wastes that do arise are managed appropriately and maximise the recycling/recovery of those materials. A copy of the Preliminary RWMP is in Appendix 3.2.

3.21.14 *Construction Environmental Management Plan*

As referred to in Section 3.21.1 a Preliminary CEMP has been prepared that describes the prevention and mitigation measures that will be implemented in the Construction Stage to minimise the risk of adverse environmental impacts, nuisance and impairment of amenity value. A copy of the Preliminary CEMP is in Appendix 3.3.

3.21.15 *Health and Safety*

As required by the Safety, Health and Welfare at Work (Construction) Regulations 2013, the Main Contractor will prepare a Health and Safety Plan that addresses site specific health and safety issues from the start to the completion of the construction stages.

The Main Contractor will ensure that 'Site Induction' training is provided to all construction staff and ensure all site staff have current 'Safe Pass' cards. All construction staff will receive a full safety briefing and will be provided with all of the safety equipment required for their assigned tasks.

3.21.16 *Site Security*

The Main Contractor will be responsible for site security in the construction stage, including erecting and maintaining adequate fencing.

3.22 **Cumulation**

3.22.1 *Cumulative Projects*

The identification and detailed assessment of the potential impact of the proposed development in cumulation with other planned and permitted developments in the surrounding area was in in accordance with the advice in sections 3.5.7 and 3.7.3 of the EPA Guidelines EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports (May 2022) and the requirements of Annex IV(5)(e) of Directive 2014/52/EU.

Section 3.5.7 of the EPA Guidelines on EIAR relates to the description of:

- other related projects that occur as a direct result of the main project, such as a power line, a substation or a road junction upgrade which may result in significant effects;

- off-site projects which include projects specifically required for the project which take place at a distance from the site, often on lands owned by others (such as public roads) and which are sometimes permitted and developed by others; and

- secondary projects that may arise largely because of the existence of the principal project, though they are usually not carried out by the developer of the principal project.

The proposed development will not directly result in any other related project. The materials that will be accepted and processed at the MRF are currently generated at existing off-site residential, commercial and industrial activities. The food containers that will be cleaned in the Food Container Cleaning Plan (FCCP) arise at existing retail outlets. The only potentially significant cumulative effect linked to these off-site projects are traffic movements, including the delivery of wastes and food containers and the consignment of the processed waste and clean food containers.

Any secondary projects that may arise due to the existence of the development will occur in the future, for example plastic recycling plants. All such projects will be the subject of separate planning applications and, depending on the scale, EIA.

Section 3.7.3 of the EPA Guidelines relates to the 'addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects. While a single activity may itself result in a minor impact, it may, when combined with other impacts (minor or insignificant), result in a cumulative impact that is collectively significant. For example, effects on traffic due to an individual industrial project may be acceptable; however, it may be necessary to assess the cumulative effects taking account of traffic generated by other permitted or planned projects. It can also be prudent to have regard to the likely future environmental loadings arising from the development of zoned lands in the immediate environs of the proposed project.'

Directive Annex 5 e) requires 'information of the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected, or the use of natural resources'

Based on the above, the existing and permitted developments that were included in the cumulative assessment are Huntstown Quarry, which includes an inert soil recovery site; Huntstown Bioenergy anaerobic digestion plant; Huntstown Power Station, which is a Tier 2 Seveso Site; a proposed data centre to the north of the development area (FW21A/0151) and a proposed electrical substation (FW22A/0213) to the west.

4. ALTERNATIVES

4.1 Introduction

This Chapter describes the reasonable alternatives to the proposed development that were considered, including location, layout, design, technologies and mitigation measures. It also describes the 'Do Nothing Scenario'

4.2 Location

Waste management is deemed to be an industrial activity. The Waste Management Plan for Eastern-Midlands Region (2016 -2021) does not identify specific locations for future waste activities, but does state that the proper siting of these activities, including expansion of existing facilities, is the most appropriate method of the planning hierarchy to address the potential for impact on the environment.

In the absence of national guidelines on the siting of waste management facilities IRL conducted a scoping study of potentially suitable locations in the Greater Dublin Area. The key site selection criteria were:-

- Appropriate land zoning (industrial/general employment);
- Environmental sensitivity;
- A single landholding large enough (8 to 10 ha) to allow the progressive development of recycling and recovery capacity on one campus, and
- Proximity and accessibility to sources of the wastes arising, existing recycling and recovery facilities and to food retail outlets.

IRL conducted a review of all industrial and general employment zoned lands, taking into consideration the other key site selection criteria. The review identified the proposed development site as the most suitable location for the Circular Economy Hub.

The Fingal County Development Plan permits the development of waste disposal and recovery facilities in areas zoned for General Employment (GE) and Heavy Industry (HI). In the GE zoning waste disposal and recovery (excluding high impact) is a permitted use, whereas in the HI zoning waste disposal and recovery (high impact) is permitted.

The Development Plan defines 'high impact' as the use of land or buildings for facilities with high potential for odour, noise, dust and other nuisances including putrescible waste. Examples of high impact facilities are transfer stations and treatment plants for organic waste and residual waste which have a potential for odour, crushing and processing of construction and demolition waste, and facilities where waste is stored outside of buildings and which is visually intrusive or otherwise likely to be a nuisance, including scrapyards. Excludes landfills'.

The land use objective for HI zoning is to facilitate opportunities for industrial uses, activities and processes, which may give rise to land use conflict if located within other zones. Such uses, activities and processes would be likely to produce adverse impacts, for example by way of noise, dust or visual impacts. In this context, areas zoned for HI are deemed to have a low environmental sensitivity.

The site is accessed by the North Road and is adjacent to the N2 and M50. The national road connections to the M50 provide ready access to the sources of waste generation in the Greater Dublin Area and to the retail outlets that will be the sources of the food containers.

The M50 provides access to Dublin Port for the export of recyclables/ recoverables pending the expansion of national capacity and the M50 / M7 connection provides access to the permitted plastics recycling plant in Portlaoise.

The North Road provides access to the Huntstown Bioenergy Plant which operates under an EPA licence that authorises the anaerobic digestion of up to 90,000 tonnes of 'brown bin' waste and organic fines.

While the amount of non recoverables/recyclables generated at the MRF will be small (ca 2% of the annual waste intake) the only management option for these materials is landfill. The N2 provides access to the Knockharley Landfill in County Meath and the M 11/N11 provide access to the Ballynagran Landfill in County Wicklow.

4.3 Alternative Site Layouts

The evaluation of alternative site layouts was determined by a combination of the site's physical constraints and relevant policy and guidance documents. The constraints were evaluated by the Design Team and the appropriate avoidance, prevention and mitigation measures were incorporated into the design.

The physical constraints are defined by:

- The site topography, ground conditions, biodiversity and access;
- Existing Uisce Eireann permanent and temporary wayleaves through the site for the Greater Dublin Orbital Sewer route;
- Future Eirgrid wayleaves though the site for underground lines, and
- Proximity to the residences along North Road.

The design had regard to the following policy and guidance documents:

- Fingal County Development Plan 2023 -2029;
- Department of the Environment, Community and Local Government's Urban Design Manual (May 2009) (DMURS).

4.3.1 Iteration 1

This was a 'first pass' of Phase 1, including site access and the implications of the constraints that could be imposed by the rerouting of the overhead power lines. The proposed redline boundary was confined to Phase 1.

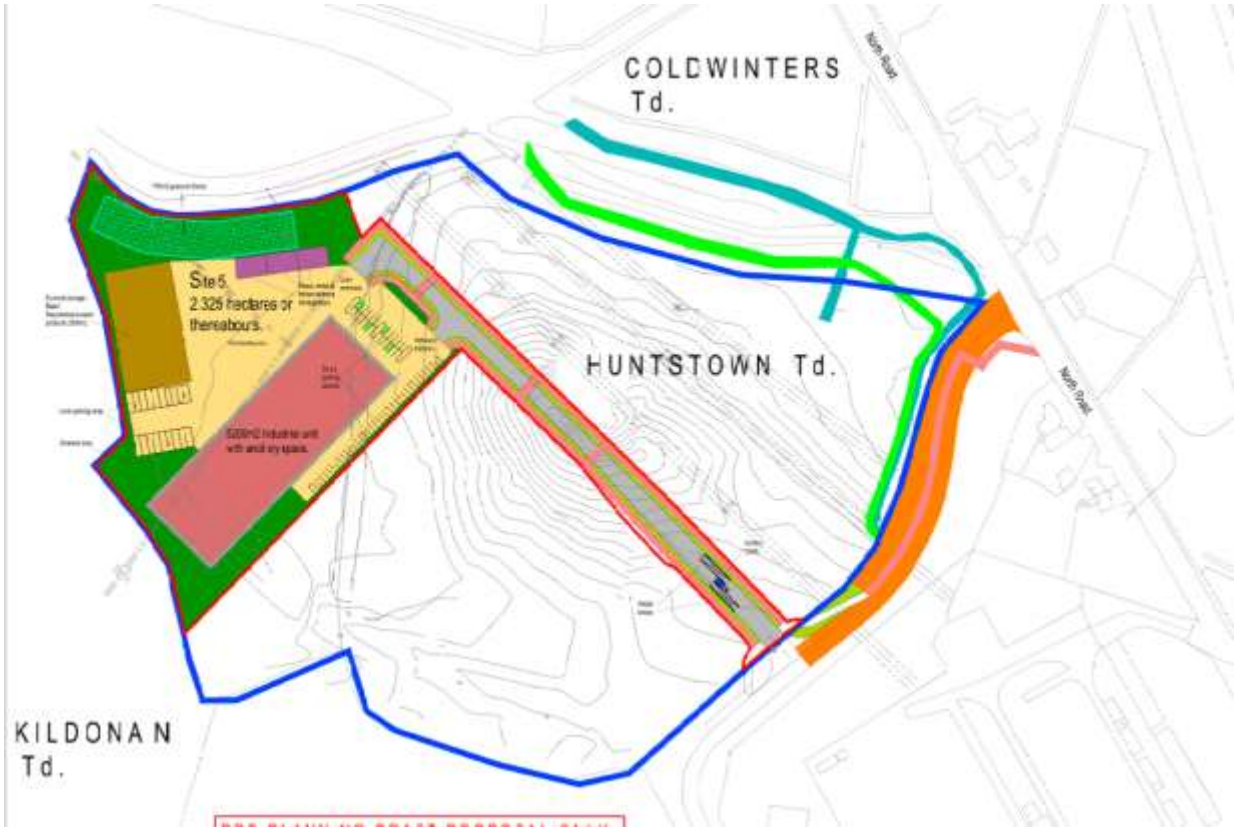


Figure 4.1 Iteration 1

4.3.2 Iteration 2

Iteration No. 2 was an initial pass at possible future phases and encompassed the entire landholding and assessed car parking, cycle paths and internal access and the potential routes of the underground power lines.

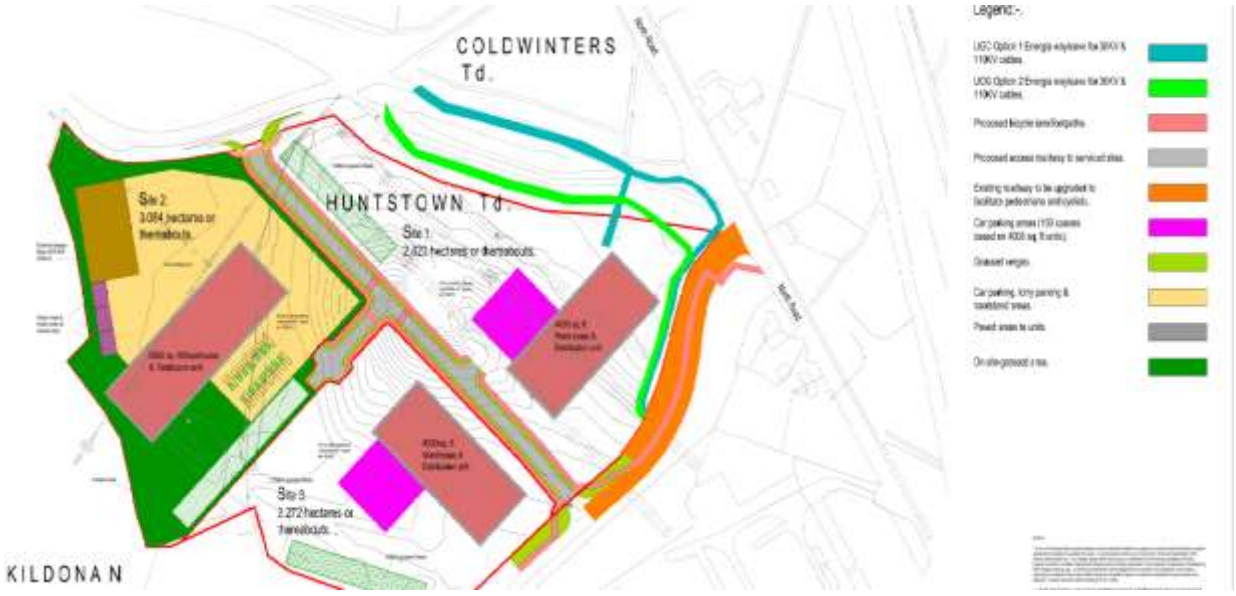


Figure 4.2 Iteration 2

4.3.3 Iteration 3

Iteration 3 assessed the intensification of land use across the entire site.

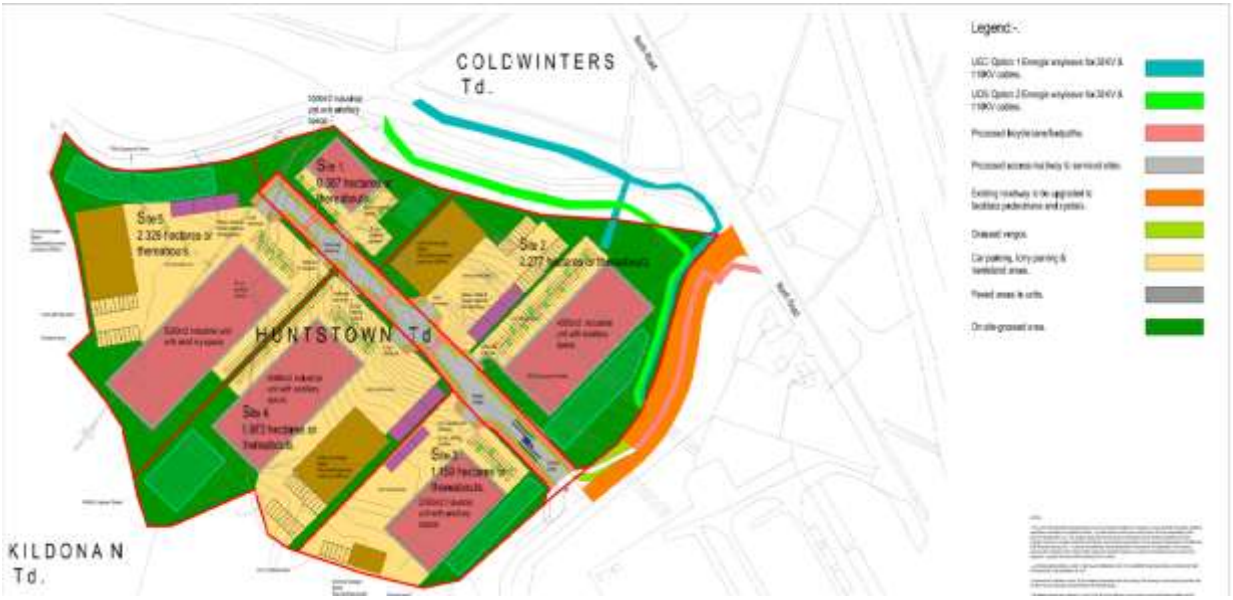
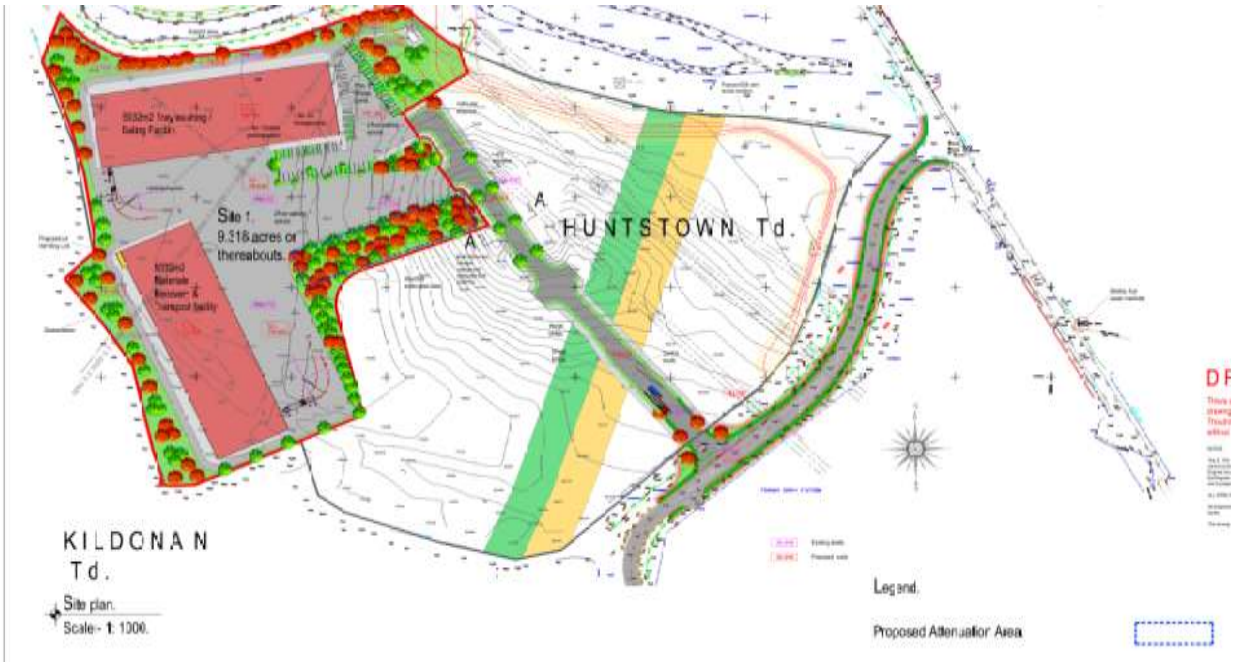


Figure 4.3 Iteration 3

4.3.4 Iteration 4

Previous layouts were based on the storm water design objective of avoiding the use of underground attenuation systems in favour of above ground systems (swales); however the proximity to Dublin Airport and the flight path to Casement Aerodrome required consideration of aviation safety and the assessment of the bird strike hazard and the glint and glare potential in the landscaping and drainage provisions. On the advice of aviation consultants O'Dwyer Jones Partnership the drainage system design was changed to remove the swales and, as an alternative, use an underground attenuation system.



The area of Phase 1 was increased to accommodate changes to the design of the Food Container Building to facilitate safe access to the buildings and incorporate landscaping measures.

4.3.5 Iteration 5

Iteration 5 assessed how the revised Phase 1 fitted into the overall master plan

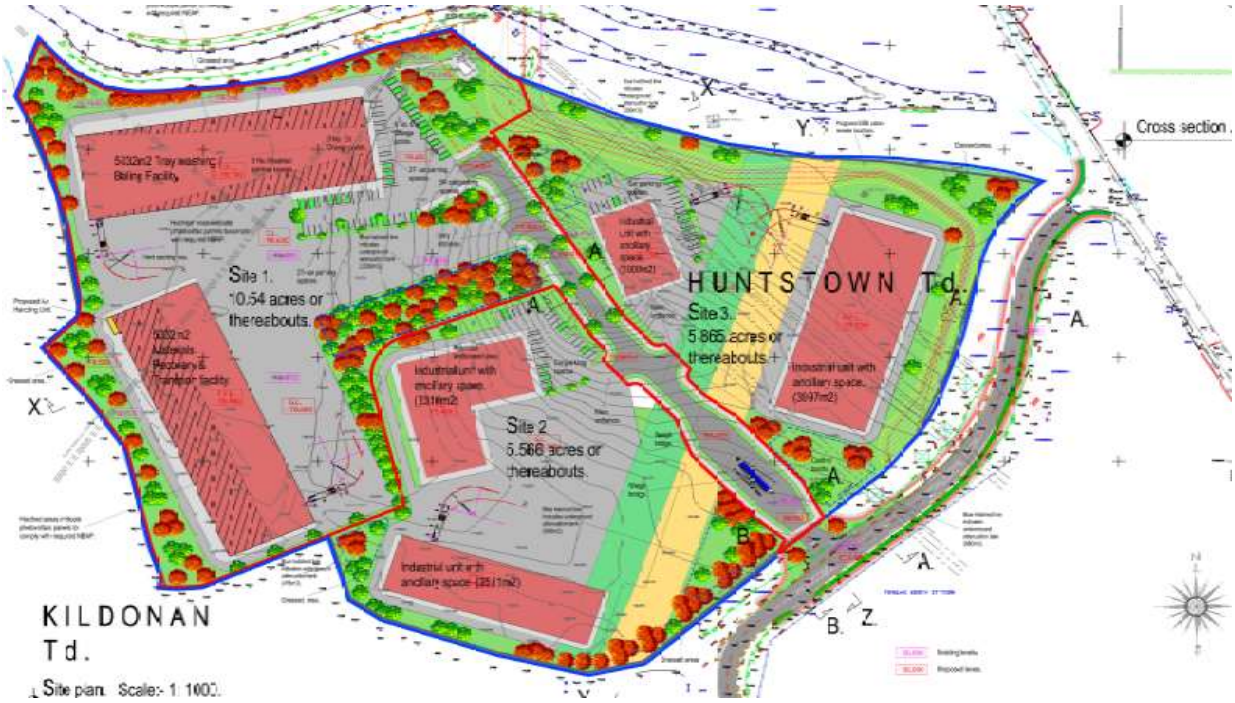


Figure 4.5 Iteration 5

4.3.6 Iteration 6 Final Layout

Iteration 6 is the Final Layout of Phase 1 and includes an extension of the redline boundary to include a section of the service road where alterations are required to facilitate the new vehicle entrance.



Figure 4.6 Iteration 6

4.4 Alternative Technologies

The assessment of technologies that will be applied in the MRF was based on the Best Available Techniques (BAT) Reference Document for Waste Management (European Commission 2018), current proven waste management processing equipment and the need to ensure consistent high quality outputs. An assessment of the proposed operations in the context of the BAT requirements is in Appendix 4.1. As the proposed technologies comply with BAT, consideration of alternatives was not considered necessary.

The assessment of the technologies that will be applied in the FCCP was based on proven treatment systems that provide the highest level of food safety protection and therefore the consideration of alternatives was not required.

4.5 Alternative Services Design

4.5.1 *Surface Water Drainage*

As referred to in Section 4.3.4, the initial storm water design objective was to avoid the use of underground attenuation systems. The initial design included a combination of rain water harvesting, green roofs, permeable paving and swales; however aviation safety issues require an assessment of potential bird strike hazards of any development either in the vicinity of an airport or aerodrome, or under any flight path.

Given the proximity to Dublin Airport Aviation Safety Consultants O'Dwyer Jones Design Partnership were commissioned to prepare an Aeronautical Assessment to address aviation safety issues including the risk of bird strikes and the risk of glint and glare that could adversely affect pilots on flight paths and/ or air traffic controllers at an airport/aerodrome.

A copy of the O'Dwyer Jones Partnership Report is in Appendix 4.2. The relevant guidance on aviation safety is:

- Bird and Wildlife Strike Management at Aerodromes (Irish Aviation Authority 2021);
- The Airport Services Manual Part 3 – "Wildlife Control & Reduction"(International Civil Aviation Organization's) and
- Wildlife Hazard Management at Airports. (Federal Aviation Administration).

The recommended control measures to minimise bird strike aviation hazard at developments in the vicinity of airports and on flight paths include:

- Control of any bird attractants during construction;
- Avoidance of landscape elements that might provide avian food;
- Avoidance of unnecessary standing water features that might attract birds;
- Management of any necessary standing water elements (e.g. flood-control swales) in locations where they will be less attractive to birds, and
- Implementation of ongoing bird control and deterrence measures.

Landscape measures to minimise glint or glare hazards to aviation include:

- Avoidance of unnecessary standing water in vicinity of flight paths & aerodromes, and
- Avoidance of all standing water in direct line of sight from an airport's Control Tower cab.

At aviation-sensitive development sites the general guidance in regard to SuDS provision may not apply. In particular the general preference for ponds and swales rather than underground solutions (such as attenuation tanks) would be reversed, although permeable ground surfaces are acceptable at all sites (whether near or far from aviation facilities).

O'Dwyer Jones Partnership concluded that, due to the aviation safety risks, the design of the landscape and drainage features requires all potential bird strike hazards to be either eliminated, or minimised. In addition, the nature of the intended operations, which involve minimal pedestrian activity and the transport of potential bird attractant, means that some commonly adopted bird hazard reduction features are inappropriate, for example locating of swales or ponds close to well-trafficked pathway that discouraged birds from roosting.

O'Dwyer Jones Partnership concluded that ponds or swales would give rise to a bird strike hazard and also had a glint and glare potential affecting visibility from Dublin Airport's Control Tower cab. Consequently there should be no permanent ponds and minimal swale provision (if any).

O'Dwyer Jones Partnership recommended that the appropriate SuDS provisions on this particular site for aviation safety reasons are, where possible, underground attenuation systems and permeable paving. Therefore there is no alternative to the proposed combination of rainwater harvesting, permeable paving and an underground attenuation system.

4.6 Prevention and Mitigation Measures

The proposed prevention and mitigation measures in relation to emissions to the environment are based on best industry practice, aviation safety concerns and, in the case of the MRF, the typical structural and operational controls conditioned by the EPA to ensure that licensable activities do not result in environmental pollution, impairment of amenity and adverse human health impacts. Therefore alternative measures were not considered.

4.7 Do Nothing

If the proposed development does not proceed there will be no expansion of waste treatment capacity to meet the projected demands in the Dublin region and no contribution to meeting national recovery and recycling targets and circular economy initiatives, including the avoidance of single use plastics. Given the land zoning and the strategic location it is likely the site will be developed for industrial use in the short term.

5. CLIMATE

5.1 Introduction

This Chapter examines the potential effects of the proposed development on climate and the vulnerability of the development to the potential effects of climate change. It identifies the prevention, mitigation and monitoring measures that will be implemented to reduce the significance of the effects and assesses the residual potential impacts.

The Chapter was prepared by Dr. Michéal Fogarty and Mr Simon Welchman of Katestone. Mr Fogarty is a Senior Air Quality Consultant with 12 years of experience in Ireland and Australia. He holds a B.Eng, M.Eng and PhD from the UCD College of Engineering and Architecture. He specialises in the areas of air quality and odour impact assessment. Mr Welchman B.Eng has been a director of Katestone since 2004, with more than twenty-three years' experience working as an air quality expert in the private sector and for an environmental regulator.

5.2 Relevant Legislation and Guidance

In addition to the guidance documents listed in Section 1.5 the assessment took into consideration the following:

- European Commission (2019) 2030 Climate & Energy Framework;
- European Commission (2013) The EU Strategy on Adaptation to Climate Change;
- European Commission (2021) Communication from the commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change;
- European Commission (2018) Revised Energy Performance of Buildings Directive (EPBD) (2018/844/EU);
- United Nations (1992) United Nations Framework Convention on Climate Change;
- United Nations (1997) Kyoto Protocol to the United Nations Framework Convention on Climate Change;
- United Nations (2016) The Paris Agreement 'Accord de Paris'. The United Nations Framework Convention on Climate Change (UNFCCC);
- United Nation (1992) United Nations Framework Convention on Climate Change. First steps to a Safer Future;
- DECC, (2013) National Policy Position on Climate Action and Low Carbon Development (National Policy Position) 2013;

- Department of the Environment, Climate and Communications (2017) National Mitigation Plan;
- Department of the Environment, Climate and Communications (2021) Climate Action Plan 2021 (DECC, 2021);
- Department of the Environment, Climate and Communications (2018) National Adaptation Framework (NAF);
- Department of the Environment, Climate and Communications (2015) Ireland's Transition to a Low Carbon Energy Future 2015-2030;
- Department of Environment, Heritage and Local Government (2016) Climate Action and Low Carbon Development Act 2015, as amended;
- Department of the Environment, Climate and Communications (2021), Climate Action and Low Carbon Development (Amendment) Act 2021 (Act 32 of 2021);
- European Commission (2009a) Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020;
- EPA (2019) Integrating climatic factors into the strategic environmental assessment process in Ireland - A Guidance Note, and
- Fingal County Council (2019) Climate Change Action Plan 2019 – 2024.

5.3 Methodology

The methodologies used to calculate greenhouse gas (GHG) emissions associated with the proposed development are presented in this section and cover

- The construction of the facility;
- The calculation of

    GHG emissions generated in the operational stage

    GHG emissions offset in the operational phase of the proposed development;

- The determination of suitable evaluation criteria.

5.3.1 *Construction Stage*

The predominant sources of GHG emissions will be the manufacturing and transportation of construction materials, construction activities and end of life phase. These are commonly referred to as embodied greenhouse gas emissions and were calculated using:

- Data on the quantities of construction materials that will be used;

- Emission factors derived for construction materials, and
- Data from Walsh and McAuliffe (2020)

The embodied GHG emission for each type of construction material were calculated as the product of:

- The weight or volume of construction material used, and
- The GHG emission factor for that type of material.

The total embodied GHG emissions from the construction stage were calculated as the sum of the embodied GHG emissions for each type of construction material.

Studies have shown that the embodied GHG emissions of construction materials constitute the largest proportion of GHG emissions from the construction stage of development (Walsh and McAuliffe, 2020). The overall GHG emissions from the construction stage were calculated based on:

- The total embodied emissions for the construction stage, and
- The proportion of total greenhouse gas emissions accounted for by embodied emissions

5.3.2 *Data on Quantities of Construction Materials Used*

The construction materials to be used in the following buildings and infrastructure were considered:

- Paved roads
- Carparks
- Yards
- Footpaths
- MRF
- FCCP

Table 5.1 is an overview of the construction materials that will be used.

Table 5.1 Construction Materials: Overview

Construction Material	Value	Unit
Concrete	5,280	m^3
Stone	12,600	m^3
Steel	165	tonne
Drainage Pipe	2178	m
Cladding& Roofing	19,700	m^2

5.3.2.1 Emission Factors for Construction Materials

The emissions factors are presented in the following Tables.

Table 5.2 Emission Factor for Concrete (including Concrete Blocks)

Parameter	Value	Unit
GWP Portland cement[1]	763	kg CO_2-e/tonne
GHG cement production as a proportion of concrete greenhouse gas emissions[2]	77	%
Concrete emission factor	991	kg CO_2-e/tonne
Density of concrete[3]	2.4	t/m³
Concrete emission factor	413.0	kg CO_2-e/m³
[1] Cement Manufacturers Ireland (2022) [2] Busch (2022) [3] https://civiltoday.com/civil-engineering-materials/concrete/361-density-of-concrete		

Table 5.3 Emission Factor for Stone (Quarry Material)

Parameter	Value	Unit
GHG emission factor for stone (quarry material)	2.18	kg CO2-e/tonne
[1] The maximum from the range of GHG emissions reported for quarried stone in Goudouva, 2018		

Table 5.4 Emission Factor for Steel

Parameter	Value	Unit
GHG emission factor for steel[1]	1.85	tCO_2-e/t_{steel}
[1] World Steel Association (https://www.mckinsey.com/industries/metals-and-mining/our-insights/decarbonization-challenge-for-steel)		

Table 5.5 Emission Factor for Drainage Pipe

Parameter	Value	Unit
Wavin pipes - GHG emission factor[1]	170	kg CO_2-e/tonne
[1] Orbia (2021) Orbia sustainability report		

Table 5. 6 Emission Factor for Galvanised Steel Cladding

Parameter	Value	Unit
GHG emission factor for galvanised steel[1]	1.796	tCO_2-e/$t_{galvanised\ steel}$
[1] Arguillarena and Margallo (2021)		

5.3.3 Walsh & McAuliffe

Walsh and McAuliffe (2020) completed a life cycle assessment (LCA) of residential buildings in accordance with EN15978 - Sustainability of Construction Works - Assessment of Environmental Performance of Buildings - Calculation Method.

An LCA calculates the total impact a product, service or system has on the environment throughout its whole lifespan. The GHG emissions from the product stage and construction stage include:

- The Product Stage:
  - A1 - Raw material supply
  - A2 - Transport
  - A3 – Manufacturing

- Construction Process Stage
  - A4 - Transport
  - A5 - Construction installation process

Walsh and McAuliffe calculated that embodied GHG emissions (Stage A1 – A3) in construction materials make up 86% of the GHG emissions associated with residential masonry construction; however they did not determine an equivalent calculation for embodied GHG emissions associated with the construction of industrial buildings.

For the purpose of this assessment of the proposed development it was assumed that embodied GHG emissions will comprise 75% of emissions associated with the construction of industrial buildings. This is a conservative estimate compared to the value determined for residential buildings.

5.3.4 Operation of the MRF

The methodology adopted involved:

- Assessing the MSW processing in 'Do-Nothing' and 'Do-Something' scenarios

- Assigning a GHG emission factor to MSW for the 'Do-Nothing' and 'Do-Something' scenarios

- Determining the difference in GHG emissions generated from MSW as part of the 'Do-Nothing' and 'Do-Something' scenarios

In the 'Do-Nothing' scenario all the additional MSW arising would be sent to waste-to-energy facilities in Ireland as:

- There would be no capacity to either handle or process the additional wastes in Dublin and to segregate materials and recover valuable waste streams from the MSW, and

- It is not possible to send MSW directly to landfill, as all landfills require organic waste to be biostabilised before it can be accepted.

In the 'Do-Something' scenario the proposed development will facilitate the handling and processing of additional MSW to produce the following outputs:

- Waste Derived Fuel including
  - SRF
  - RDF

- Separated Organic Fines;

- Separated Metals;

- Separated Glass, and

- Separated Wood.

The SRF will go to cement kilns as a source of fuel. The RDF will be sent to waste-to-energy facilities. The separated organic fines will go to biological treatment facilities for biostabilisation. Separated metals and glass will be sent to dedicated recycling facilities.

A literature review was undertaken to determine suitable emission factors for the waste streams under the 'Do-Nothing' and 'Do-Something' scenarios. GHG emission factors for various types of household waste generated in Ireland were sourced from The Carbon Footprint of Waste (Ireland) (ACRplus, 2021). These factors include emissions associated with the material being:

- Generated
- Recycled
- Incinerated
- Landfilled

The emission factors for incineration were applied to the quantity of each waste category:

- In MSW for the 'Do-Nothing' scenario
- In RDF in the 'Do-Something' scenario
- Recycling factors were applied to the quantity of each category for which recycling is achieved in the 'Do-Something' scenario including:
  - Separated Metals
  - Separated Glass
  - Separated Wood
- Landfilling factors were applied to the quantity of bio-stabilised organic materials produced in the 'Do-Something scenario'.

The emission factors applied to each waste category management techniques, including incineration and recycling, are presented in Table 5.7. These factors were developed by the Zero Waste Scotland's analysis team used insights provided by partners in Ireland alongside default datasets based on the Scottish Carbon Metric and represent life-cycle carbon impact of each waste category (ACRplus, 2021)). A negative value indicates that over the lifecycle of the waste stream the management technique results in reduced carbon emissions.

Table 5.7 Emission Factors

Waste Category	GHG Emission factor (tCO_2-e/t)		
	Incineration	Recycling	Landfilling
Plastics	1.78		
Organic Waste (Food and Garden)	-0.07		0.64
Paper, Card and Beverage Container	-0.32		
Fines	0.22		
Textiles	0.32		
Nappies	0.22		
Metal	-0.74	-4.04	
Glass	0.03	-0.83	
Wood	-0.34	-0.64	
Hazardous waste	0.39	-0.92	

There is no LCA GHG emission factor for bio-stabilised organic wastes in ACRplus (2021). The majority of LCA GHG emissions from landfilled organic wastes is due to the biodegradation of the organic material in landfills resulting in the generation of methane (a potent greenhouse gas).

The proposed development will facilitate the segregation of a large fraction of the organic material from MSW, which will be sent for bio-stabilisation after segregation. The bio-stabilisation of organic waste to the meet the EPA approved biodegradability stability standard means that the organic material landfilled as a result of the proposed development will have virtually no GHG emissions, as the EPA considers it to have a biodegradable factor of zero. The use of the LCA GHG emission factor presented in ACRplus (2021) for landfilled organic waste is therefore highly conservative.

In the 'Do-Nothing 'scenario it was assumed that all waste categories would be sent for incineration. Recycling emissions factors were identified for the waste categories that would be segregated and recycled as part of the proposed development including:

- Organic waste;
- Metal;
- Glass;
- Wood, and
- Hazardous waste

5.3.5 *Operation of FFCP*

GHG emissions from the FCCP are associated with wastewater from the washing process and electricity used to power the wastewater treatment plant. Due to the level of uncertainty the following potential reductions in GHG emissions that would occur due to operation of the plant were not quantified as part of this assessment:

- The elimination of GHG emissions from the manufacture of single use plastics:

- The reuse of organic sludge generated as part of the wastewater treatment process in composting or anaerobic digestion plants instead of incineration or bio stabilising and landfilling.

The methodology adopted involves determining the GHG emissions from:

- The wastewater generated, and

- The energy used to operate the wastewater treatment plant.

The wastewater treatment plant will facilitate the re-use of water for the washing process by removing the solid particles. To maintain efficiency some of the wastewater will be discharged to the foul sewer at a rate of 1.0 m^3/hour. This water will be replaced from the mains supply. The wastewater generation rate is therefore 8,760 m^3/annum, as there are 8,760 hours per year.

The GHG emissions associated with the wastewater were calculated by determining the amount of methane and nitrous oxide emissions from wastewater as described in IPPC, 2006. The quantity of methane produced is based on the quantity of Biological Oxygen Demand (BOD) in the wastewater and the quantity of nitrous oxide produced is based on nitrogen content of the wastewater. Conservatively it was assumed that the BOD of the wastewater was 10,000 mg/l, with a total nitrogen content of 400 mg/l. Upper limit values were used to determine the emission factors for methane and nitrous oxide emissions.

The amount of electricity required to operate the wastewater treatment plant was estimated based on the BOD production rate. The electricity usage rate for the treatment of wastewater was reported as ranging from 1.76 kWh/kg_{BOD} to 8.09 kWh/kg_{BOD} (Doran, 2006). The upper level was assumed to determine GHG emissions associated with the operation of the wastewater treatment plant. The GHG emissions from the electricity generation were calculated based on the carbon intensity of electricity in Ireland for 2021 reported by EPA of 0.331 $kgCO_2e$/GJ (EPA, 2022).

5.3.6 *Traffic*

The assessment was based on Design Manual for Roads and Bridges (DMRB) (Highways England, 2021), which provides a framework for assessing, mitigating and reporting the effects of motorway and all-purpose trunk road projects on climate.

The impact of a project is initially determined by a scoping assessment that identifies if there is a need to undertake a detailed assessment of the potential effects on climate. The scoping is based on whether, in the operational stage, will roads meet or exceed any of the following criteria:

a) a change of more than 10% in the annual average daily traffic (AADT);

b) a change of more than 10% to the number of heavy goods vehicles; and

c) a change in daily average speed of more than 20 km/hr.

Where the answer to one or more of the scoping questions is 'yes', further assessment must be undertaken and the study area must be consistent with the affected road network (ARN) defined by the proposed development's traffic model.

The Air Quality Spreadsheet issued by the Highways Agency in England provides a tool for the calculation of emissions of carbon dioxide from road transport (Highways Agency, 2021). The latest iteration of the Spreadsheet is Version 8 (Highways Agency, 2021), which incorporates emissions derived from the Emissions Factor Toolkit Version 10.1 (DEFRA, 2020).

5.3.7 *Evaluation Criteria – Climate Change & Policy*

5.3.7.1 Global Climate Change Response

Ireland is a party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, which together provide an international legal framework for addressing climate change. The Doha Amendment to the Kyoto Protocol was adopted at COP 18 in December 2012 and came into force in December 2020. Parties, to the Doha Amendment, including the European Union, committed to reduce GHG emissions by at least 18% below 1990 levels in the eight-year period from 2013 to 2020.

Each EU Member State committed to differing emission reduction targets in the EU's so-called effort-sharing decision of 2009. Ireland's GHG emissions reduction commitments under the EU's effort sharing decision is to reach 20% below 2005 levels over the 2013 to 2020 period, with annual targets within the period of the Doha Amendment.

The Paris Agreement is the most recent legally binding, global agreement addressing climate change under the UNFCCC. It has a stated aim of limiting global temperature increases to no more than 2°C above pre-industrial levels, with a commitment to pursue efforts to limit this rise to 1.5°C. The

Agreement was adopted by 195 Parties to the UNFCCC, representing 95% of global emissions, at the twenty-first session of the Conference of the Parties (COP 21) to the UNFCCC in December 2015.

The ratification of the Agreement by the EU triggered its entry into force on 4 November 2016, the same date the Agreement was ratified by Ireland. This legally binding agreement represents a global milestone in international efforts to achieve a peaking of greenhouse gas emissions as soon as possible and to achieve net zero emissions by the second half of the century.

Each Member State must commit to a Nationally Determined Contribution (NDC) that shall increase in ambition over time, with progress being tracked by a series of global stocktakes, to be held every five years, starting in 2023. Ireland's contribution to the Paris Agreement will be via the NDC tabled by the EU on behalf of its Member States. The EU has committed to reducing its GHG emissions by at least 40% by 2030, compared to 1990 levels.

5.3.7.2 EU Response

The European Green Deal Communication launched a new growth strategy for the EU that aims to transform the EU into a fair and prosperous society, improving the quality of life of current and future generations, with a modern, resource-efficient and competitive economy where there are no net GHG emissions in 2050 and where economic growth is decoupled from resource use. The European Green Deal reaffirms the Commission's ambition to make Europe the first climate-neutral continent by 2050.

The European Climate Law enshrines the goal set out in the European Green Deal for Europe's economy and society to become climate-neutral by 2050. The Law also sets the intermediate target of reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels. The Law entered into force in July 2021.

The Commission has a range of strategies and targets to reduce emissions of GHG including:

- 2020 climate & energy package;
- 2030 climate & energy framework, and
- 2050 long-term strategy

The 2030 climate and energy framework includes EU-wide targets and policy objectives for the period from 2021 to 2030.

The *Effort Sharing Regulation*[5] establishes binding greenhouse gas emission targets for Member States, stipulating emissions targets for the periods 2013-2020 and 2021-2030 that are required to fulfil the EU's commitments under the Paris Agreement. It also details the rules on determining annual emission allocations and for the evaluation of national progress towards meeting minimum contributions.

The Effort Sharing Regulation aims for emissions reduction targets include:

- 43% in the EU emissions trading system ('EU ETS') laid down in Directive 2003/87/EC of the European Parliament and of the Council by 2030 compared to 1990 levels;

- 30 % in the non-ETS sectors by 2030 compared to 1990 levels, and

[5] Regulation (EU) 2018/842 - 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

- 80-95 % by 2050 compared to 1990 levels

Overall, the EU has adopted an interim objective for a reduction in GHG emissions of 40% by 2030. This objective will be achieved through a combination of the EU Emissions Trading Scheme (ETS) and individual targets for each EU Member State for non-ETS sectors. Complementary to this, the Commission's Climate and Energy Framework includes targets of 32% renewable energy and an energy efficiency improvement of at least 32.5% across the EU by 2030.

In July 2020, a draft law[6] to amend *the Effort Sharing Regulation* was tabled by the Commission. Its aim was to assign strengthened emission reduction targets to each Member State for buildings, road and domestic maritime transport, agriculture, waste and small industries. These targets recognise the different starting points and capacities of each country. The update reflects the increased ambition enshrined in the European Climate Law.

5.3.7.3 National Policy & Long Term Vision

In 2014, the Government adopted the National Policy Position on Climate Action and Low Carbon Development (National Policy Position). The National Policy Position establishes the fundamental objective of achieving the transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out the context for the objective, clarifies the level of GHG mitigation ambition envisaged and establishes the process to pursue and achieve the overall objective. Specifically, the National Policy Position envisages that policy development will be guided by a long-term vision based on:

- An aggregate reduction in carbon dioxide (CO_2) emissions of at least 80% (compared to 1990 levels) by 2050 across the electricity generation, built environment and transport sectors, and

- In parallel, an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise capacity for sustainable food production.

With 2015 GHG emissions as a starting point this equates to average annual reductions of 0.75MtCO_2, compared to the projected position in 2035, which would require average annual reductions of almost 2 MtCO_2 and highlights the need for earlier action.

The White Paper on Energy Policy, *Ireland's Transition to a Low Carbon Energy Future 2015-2030* recognises that a radical transformation of Ireland's energy system is required to meet national, EU and international climate objectives and sets a course for an energy sector where the State will provide the supports that enable consumers to become active energy citizens.

The aim is to reduce GHG emissions from the energy sector by between 80% and 95% compared to 1990 levels by 2050, while ensuring secure supplies of competitive and affordable energy remain available to citizens and businesses. The White Paper sets out how the energy transition will depend on accelerated and diversified renewable energy generation and a renewed focus on energy efficiency.

[6] Proposal for a Regulation amending 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. https://opac.oireachtas.ie/Data/Library3/Documents%20Laid/2021/pdf/DECCdocslaid270821a_270821_162547.pdf

The *Climate Action and Low Carbon Development Act 2015* provides the statutory basis for the national transition objective – the goal of progressively pursuing a low carbon, climate resilient and environmentally sustainable economy by 2050. It also provides the legislative framework for the development and submission to Government for approval of national mitigation plans and national adaptation frameworks. This includes the institutional and governance framework for the development of these plans, together with independent advisory and Oireachtas accountability arrangements.

The Climate Action and Low Carbon Development (Amendment) Act 2021 provides the legally binding path to net-Zero emissions no later than 2050 and to a 51% reduction in emissions (compared to 2018 levels) by 2030. Ireland's statutory national climate objective and 2030 targets are aligned with Ireland's obligations under the Paris Agreement and with the EU's objective to reduce GHG emissions by at least 55% by 2030, compared to 1990 levels and to achieve climate neutrality in the EU by 2050 (DECC, 2021).

At a national level, Ireland has also adopted the Climate Action Plan 2021, which was published in November 2021 (DECC, 2021). It sets out the measures to be taken to reach Ireland's targets in each sector of the economy. The Climate Action Plan compliments the National Policy Position and contains measures relevant to the management of GHG emissions at a national level, including a detailed plan of action to achieve a 51% reduction in overall greenhouse gas emissions by 2030 and setting Ireland on a path to reach net-zero emissions by no later than 2050.

In July 2022 Ireland adopted sectoral emission ceilings to achieve the targets of the Climate Action and Low Carbon Development (Amendment) Act 2021. The ceilings include:

- A 50% reduction in GHG emissions from transport by 2030.
- A 45% reduction in GHG emissions from buildings (commercial and public) by 2030

5.4 Development Description

Chapter 3 includes a detailed description of the existing site and the proposed developments. The aspects relevant to Climate are:

- Impacts in the construction stage due to:

  The generation of GHG emissions from construction activities;

  The GHG emissions generated as part of the manufacture of construction materials (embodied emissions), and

  Additional traffic associated with the construction works.

- Impacts in the operational stage due to:

  The generation of GHG emissions associated with

  Traffic;

  The energy required for on-site operational activities;

The bio-stabilisation and landfilling of segregated organic material (Irish landfills are not authorised to accept MSW residue unless bio-stabilised)

The combustion of other waste streams in:
- Municipal waste incinerators, and
- Cement kilns;

- The offset of GHG emissions from the recycling of metal, glass and batteries instead of combustion in a waste-to-energy facility, and

- Impacts by the potential effects of climate change.

GHG emissions that are directly associated with the operational stage are linked to the traffic and energy requirements. The generation and offset of indirect GHG emissions may not occur at the site; however without the proposed development to facilitate the processing of certain waste streams, GHG emission offsets would not be realised at downstream waste management facilities.

The 'brown bin' waste will be unloaded from collection trucks and transferred to bulk transport vehicles for off-site removal. The transfer of material from collection trucks to bulk transport vehicles will result in a more efficient long distance haulage, which offsets GHG emissions compared to the 'Do-Nothing' scenario that would require long distance haulage in collection trucks.

The processing and segregation of MSW will facilitate indirect GHG emission generation and offsets that would not occur if the proposed development did not proceed. GHG emission offsets will occur due to:

- The segregation and bio stabilisation of the organic component of MSW, and

- The removal of recyclable components from MSW that would otherwise be included in materials sent for incineration in waste to energy facilities

The FCCP will result in in the GHG emission generation and offsets.

- Generation of GHG emissions from:

  Wastewater generated as part of the washing process, and

  Electricity required to operate the wastewater treatment plant

- Reduction of GHG emissions by facilitating:

  The reuse of plastic trays which eliminates the use of single plastic packaging in the food industry, which would reduce GHG generation from the manufacture of plastic packaging significantly;

  The removal of residual food products from trays that would otherwise end up in the waste management system which will:

  - Eliminate the need for either;
    Biostabilisation of this organic material before landfill, or

    Incineration of this organic material;

- Facilitate the generation of fresh waste water treatment sludge that can be composted or used for feedstock at an anaerobic digestion plant.

GHG emissions associated with the construction and operational stages will contribute to climate change. GHG emissions offsets in the operational stage will negate the potential effects that would occur from the GHG emissions generated if the proposed development does not proceed.

5.5 Receiving Environment

5.5.1 *GHG Emissions*

Ireland's Final Greenhouse Gas Emissions 1990-2020 (EPA, 2022) presents a detailed summary of national emissions for 2020, together with an overview of national emissions from 1990 until 2020. Ireland's national GHG emissions for 2020 were estimated to be 57,716 ktCO2-e (excluding Land Use, Land-use Change and Forestry or LULUCF), with 9,703 $ktCO_2$-e (16.8%) attributable to road transport emissions as a sector.

The EPA published a report entitled *Ireland's Greenhouse Gas Emissions Projections 2021-2040 in 2022* (EPA, 2022a). This report provides an assessment of Ireland's total projected greenhouse gas emissions from 2021 to 2040. The report also assesses Ireland's progress towards achieving its emission reduction targets for 2020 and 2030 as set out under the EU Effort Sharing Decision (ESD)[7] and *Effort Sharing Regulation*. Ireland's Greenhouse Gas Emissions Projections 2021-2040 is presented in spreadsheet form in EPA (2022b).

Ireland's existing long term National Policy Position on Climate Action and Low Carbon Development (DECC, 2013) sets out a low-carbon road map process that will be guided by a long-term low-carbon transition. Key findings include:

- Implementation of "Additional Measures" (including those in the 2019 Climate Action Plan) is projected to save 58 Mt CO_2eq over the period 2021-2030 compared to the "With Existing Measures". This represents a reduction of 1.8% per annum in emissions over the period;

- The projections made in the report indicate that Ireland can meet its non-ETS EU targets over the period 2021 to 2030, assuming the full implementation of the 2019 Climate Action Plan and the use of the flexibilities available. Future, more ambitious targets as presented in the European Climate Law and Ireland's Climate Bill will require many (as yet unidentified) additional measures;

- Increased renewable electricity generation, including a projected 5 GW of offshore wind generation, is expected to make a 70% contribution to renewable electricity generation by 2030. Energy industries emissions are projected to decrease by one third by 2030 compared to the most recent figures in 2019, and

- The Covid-19 pandemic highlighted the need for homes to become far more energy efficient, particularly in the context recent regulations to encourage working from home. Implementing the 2019 Climate Action Plan measure for the installation of over 600,000 heat-pumps by 2030, as well as retrofitting 500,000 homes to a B2 equivalent BER will help achieve this.

[7] Decision No 406/2009/EC of 23 April 2009 (EC, 2009)

In addition to defining legally binding emission reduction commitments, the Climate Action and Low Carbon Development (Amendment) Act (DECC, 2021) will support Ireland's transition to net-zero and the achievement of a climate neutral economy no later than 2050. It also establishes a legally binding framework with clear targets and commitments, to ensure the necessary structures and processes are in place to deliver our national, EU and international climate goals and obligations in the near and long term.

In light of the increase in ambition under the Climate Action Plan, significant additional measures must be undertaken across the whole of Irish society and across the economy to achieve the level of change required to meet the 2030 target. The Climate Action Plan also assumes full implementation of the 2019 plan. In the medium term, Ireland is still projected to meet its 2030 target under the Climate Action and Low Carbon Development (Amendment) Act.

The binding annual greenhouse gas emission target for Ireland under the EU Effort Sharing Regulation (ESR) EU/2018/842 for non-ETS sectors is a reduction of 30% in emissions by 2030 compared to 2005 levels. This target will be amended following the European Council's decision to increase ambition from its existing EU-wide 2030 target of a 40% reduction to at least 55%, compared to 1990 levels. Annual greenhouse gas emissions for non-ETS sectors were 47,869 Mt CO_2 eq in 2005 (SEAI, 2021). Ireland's obligation under the ESR Ireland's greenhouse gas emission target for non-ETS sections is 33,508 kt CO_2 eq in 2030.

The binding annual GHG emission target for Ireland under the Climate Action and Low Carbon Development (Amendment) Act is a reduction of 51% in emissions by 2030 compared to 2018 levels. Annual GHG emissions for Ireland were 60,242 kt CO_2 eq in 2018 (comprising 13,441 kt CO_2 eq of ETS emissions and 46,801 kt CO_2 eq of non-ETS emissions). According to Ireland's obligation under the Climate Action and Low Carbon Development (Amendment) Act, Ireland's GHG emission target is 29,886 kt CO_2 eq in 2030.

The baseline GHG emissions for the assessment were taken from EPA (2022a) and are presented in Table 5.8. The data reported in 2022, with additional measures, *"includes all policies and measures included in the WEM scenario, plus those included in government plans but not yet implemented. For example, the WAM scenario includes the target of 944,600 Electric Vehicles on the road by 2030 in the Climate Action Plan 2021. The full amount of this ambition is not currently in the existing measures scenario as actions still remain to be taken that would deliver it."* (EPA, 2022a)

Table 5-8 Baseline GHG Emissions

Projected GHG emissions	Year	non-ETS emissions (kt CO_2 eq.)	Total emissions (kt CO_2 eq.)
Projected GHG emissions (with existing measures)	2024	43,304	59,612
Projected GHG emissions (with additional measures)	2024	40,495	56,804
Projected GHG emissions (with existing measures)	2039	37,864	49,890
Projected GHG emissions (with additional measures)	2039	25,389	36,407

5.5.2 *Climate Vulnerability*

In addition to the potential impact of the proposed development on climate change as a result of GHG emissions, the potential vulnerability of the proposed development to the impacts of climate change is considered in this chapter.

The baseline climate of the receiving environment is described in Section 9.4 of Chapter 9 – Air Quality. The assessment of climatic hazards in Fingal County Council Climate Adaptation Strategy 2019-2024 identifies five main climatic categories:

- Wind storms;
- Extreme heat;
- Drought events;
- Extreme rainfall events, and
- Freezing conditions/snow events.

It also identifies other risks associated with climate change including sea level rise and flooding. Combination events, described as two extreme climatic events occurring simultaneously, are referenced and it is noted that such combinations would give rise to more severe and destructive impacts.

The greatest risk of climate change to the proposed development is from extreme weather events that could adversely impact on operations. The site is not in a flood risk zone so additional risk of flooding associated with climate change in the region is not likely to affect the proposed development

5.6 Impacts

5.6.1 *Construction Stage*

GHG emissions from the construction stage include embodied emissions and construction activities. The embodied emissions are presented in Table 5-9. The emissions during the construction stage are listed in Table 5-10. The GHG emissions from the construction phase as a proportion of projected non-ETS GHG emissions in Ireland in 2024 are presented in Table 5.11.

Table 5-9 Embodied GHG Emissions

Construction Material	Value	Unit
Concrete	2,180.8	tCO_2-e
Stone	741.6	tCO_2-e
Steel	305.3	tCO_2-e
Drainage Pipes	4.3	tCO_2-e
Cladding& Roofing	240.6	tCO_2-e
Total	3,472.6	tCO_2-e
Total embodied GHG emissions	3.5	$ktCO_2$-e

Table 5-10 Construction Stage Emissions

Parameter	Value	Unit
Embodied GHG emissions as a percentage of total construction GHG emissions	75%	
Calculated GHG emissions from the construction phase of the proposed development	4,630.1	tCO_2-e
Calculated GHG emissions from the construction phase of the proposed development	4.6	tCO_2-e

The GHG emissions associated with the construction stage are conservatively estimated to be 0.011% of non-ETS GHG emissions (if existing measures are applied to GHG reduction) in 2024 and 0.012% of non-ETS GHG emissions (if additional measures are applied to GHG reduction) in 2024. The emissions from the construction stage, in the context of non-ETS GHG emissions, are considered negative, slight and long-term.

Table 5-11 GHG Emissions as a Proportion of Projected non-ETS GHG Emissions in Ireland in 2024

Parameter	Value	Units
Total GHG emissions from the construction phase of the proposed development	4.6	kt CO_2e
Projected non-ETS GHG emissions (with existing measures) - 2024	42,991	kt CO_2e
Projected non-ETS GHG emissions (with additional measures) - 2024	40,044	kt CO_2e
Construction phase contribution to projected non-ETS GHG emissions (with existing measures) - 2024	0.011%	%
Construction phase contribution to projected non-ETS GHG emission (with additional measures) - 2024	0.012%	%

5.6.2 Operational Stage

The operational stage will result in GHG emissions predominantly due to the additional traffic, along with emissions resulting from the operation of the MRF and the FCCP.

5.6.2.1 Traffic

Traffic data was obtained from the Trafficwise TTA to determine the potential for air quality impacts in the operational stage under the 'Do-Something 'scenario. Traffic data was provided for the following road links:

- Link 1 – North Road (South of Development Access Junction)
- Link 2 – North Road (South of Huntstown Quarry)
- Link 3 – North Road (North of Huntstown Quarry)
- Link 4 – N2 Coldwinters Off-slip
- Link 5 – R135 North Road (Between N2 Off/On-slips)
- Link 6 – N2 Southbound On-slip Link Road
- Link 7 – N2 Southbound On-slip
- Link 8 – R135 North Road (South of Kilshane Cross)
- Link 9 – L3120
- Link 10 – L3125
- Link 11 - R135 North Road (North of Kilshane Cross)
- Link 12 – Blanchardstown Link Road
- Link 13 – R135 Wards Cross.

The scoping assessment methodology described in Highways England (2021) was used to determine if further assessment was required. There will be no changes in speed band on the roads in the ARN due to the proposed development. The total volume of traffic generated as a result of the proposed development on any road link is less than the scoping criteria for:

- AADT of >=1,000, and

- HDV AADT of >=200

Considering that there will be no changes in speed band or carriageway alignment by >=5m, the scoping assessment indicates that no further assessment is required to demonstrate that traffic in the operational stage will result in GHG emissions at significant levels. Therefore the potential impact of GHG emissions on climate associated with the traffic was not considered further.

5.6.2.2 MRF

GHG emissions were calculated for the 'Do-Something' and the 'Do-Nothing' scenarios for the handling and processing of MSW in the MRF and the results are presented in Table 5-11.

Table 5-11 GHG Emissions 'Do-Nothing' and 'Do-Something Scenarios

Waste Category	GHG Emission emissions (tCO_2-e/t)	
	Do-nothing	Do-something
Plastics	12,934	12,934
Organic Waste (Food and Garden)	-428	3,916
Paper, Card and Beverage Container	-1,836	-1,836
Fines	926	926
Textiles	1,224	1,224
Nappies	841	841
Metal	-1,330	-7,262
Glass	37	-1,016
Wood	-143	-269
Hazardous waste	298	-704
Total	1,2523	8,755

The 'Do Something' operation of the MRF will result in a GHG emissions reduction of 3,768 tCO_2e/annum compared to the 'Do-Nothing' scenario.

5.6.2.3 FCCP

GHG emissions were calculated for the 'Do-Something' and the 'Do-Nothing' scenarios. The GHG emissions from the wastewater generated at the site were calculated as:

- 2,190 kg/annum for methane
- 87.6 kg/annum for nitrous oxide

These values were converted to carbon dioxide equivalents using conversion factors of 21 $kgCO_2e/kgCH_4$ and 310 $kgCO_2e/kgCH_4$.respectively. The total GHG emissions resulting from the wastewater treatment was calculated as 73 tCO_2e/annum.

The amount of electricity used to operate the wastewater treatment plant was estimated based on an annual BOD production rate of 87,600 kg_{BOD}/annum and an electricity usage rate of 8.09 kWh/ kg_{BOD}. Electricity usage was therefore estimated at 708.6 MWh/annum.

GHG emissions due to electricity used in the wastewater treatment was estimated at 235 tCO_2e/annum using a GHG emissions intensity of 0.331 $kgCO_2e/GJ$ for electricity in Ireland (EPA, 2022).

Total GHG emissions resulting from the operation of the FCCP were estimated to be 308 tCO_2e/annum.

The FCCP will facilitate activities that will have significant GHG emission reductions from:

- The replacement of single use plastics with multi-use rigid plastic trays in the food industry, and

- The diversion of contaminants that adhere to single use plastics from landfill or incineration to recycling facilities with significantly lower GHG emission footprints for the treatment of organic materials including composting and Anaerobic digestions facilities.

As referred to in Section 5.3.5 these benefits have not been quantified as part of this assessment.

5.6.2.4 Summary

A summary of the GHG emissions for the operational stage is presented in Table 5-12**13.**

Table 5-12 Operational Stage GHG Emissions

Activity	tCO_2-e/annum
Increase in GHG emissions resulting from the operation of the Tray Washing and Baling Facility	308
Reduction in emissions facilitated by the processing of MSW as part of the proposed development	-3,768
Net GHG emissions resulting from the proposed development	-3,460

The GHG emissions from the proposed development as a percentage of projected non-ETS emissions in Ireland are presented in Table 5-13. The proposed development will result in a net positive impact on GHG emissions in Ireland in the opening and design years.

The quantity of operational GHG emissions will be insignificant and positive in the opening year and the design year in the context of Ireland's projected non-ETS emissions. The potential impact of the operational stage on climate will be positive, not significant, national, likely and long-term

Table 5-13 GHG Emissions as a % of Projected Non-ETS Emissions in Ireland

Parameter	Opening Year	Design Year
	kt/Year - CO_2e	
Operational Emissions (NET)	-3.46	-3.46
Projected non-ETS GHG emissions (with additional measures)[8]	40,044	33,226
GHG emissions from the proposed development as a percentage of projected non-ETS emissions (with additional measures)	-0.009%	-0.010%

[8] 1 From EPA (2021) Ireland's Greenhouse Gas Emissions Projections. 2020 - 2040

5.6.3 *Climate Vulnerability*

The greatest risk of climate change to the project is from extreme weather events. The increased risk and intensity of extreme weather events could lead to damage to buildings and onsite infrastructure in the operational stage.

5.7 Baseline Scenario

If the proposed development does not proceed there will be no GHG emissions from the processes and emissions offset benefits from the operation of the MRF will not accrue. Given the land zoning it is likely that the site will be developed for industrial use in the short term.

5.8 Prevention & Mitigation Measures

5.8.1 *Design Stage*

The requirements for the conservation of fuel and energy for buildings other than dwellings are laid out in Part L of the Second Schedule to the Building Regulations 1997 (S.I. No. 497 of 1997), as amended by the Building Regulations (Part L Amendment) Regulations 2011 (S.I. 259 of 2011), the Building Regulations (Amendment) Regulations 2017 (S.I. 4 of 2017).

The above guidance on energy performance was considered at the design stage and the Design Team decided that the appropriate energy options for the development are:

- Installation of roof mounted Photovoltaic (PV) Solar Panels to supplement the electricity supply;
- Insulation of pipes conveying heated water in the FCCP;
- Provision of energy efficient artificial lighting systems and
- Provision of electric vehicle charging points.

5.8.2 *Construction Stage*

The impact of emissions resulting from the construction stage was determined to be insignificant and therefore mitigation is not required, however best practice measures to minimise emissions will still be implemented, including:

- Planning to optimise schedules and haul routes for the delivery and removal of construction materials;
- Efficient use of construction equipment and resources, and
- Minimisation of waste generated from construction activities.

5.8.3 *Operational Stage*

The impact of the emissions from the operational stage was determined to be positive and insignificant and therefore, no additional mitigation is required. The risks associated with the impacts of climate

change on the proposed development are insignificant and additional mitigation measures are not required.

5.9 Monitoring

Monitoring of the effects on climate is not required during the construction and operational stages.

5.10 Cumulative Effects

The assessment of cumulative effects took into consideration Ireland's legaly binding obligations on GHG emission reduction, the impacts of the existing traffic and those assoicated with the proposed development.

5.11 Residual Impacts

5.11.1 Construction Stage

The impact will be negative, slight, national, likely and long-term.

5.11.2 Operational Stage

The impact on climate change will be positive, imperceptible, national, likely and long-term. The impact of climate change on the proposed development will be negative, imperceptible, local, likely and long-term.

5.11.3 Summary of Impacts

Table 5.11 Residual Impacts

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration
Construction Stage					
Greenhouse Gas Emissions	Negative	Slight	National	Likely	Long Term
Operational Stage					
Greenhouse Gas Emissions	Positive	Imperceptible	National	Likely	Long Term
Climate Change					
	Negative	Imperceptible	Local	Likely	Long Term

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6. LAND AND SOIL

6.1 Introduction

This Chapter describes the land and geology at the proposed development site and the impacts of the proposed development, including a 'baseline' scenario. It identifies the prevention, mitigation and monitoring measures that will be implemented to reduce the significance of the impacts and assesses the residual impacts. This Chapter should be read in conjunction with Chapter 7 Water, Chapter 8 Biodiversity, and Chapter 12 Landscape and Visual Impact.

The Chapter was prepared by Mr Austin Hynes of OCM. Mr Hynes has BSc in Geology and an MSc in Geology with over 6 years' experience of the supervision of environmental and geotechnical site investigations, soil sample collection, the completion of interpretative geological and land use assessment reports and environmental impact assessment.

6.2 Relevant Legislation & Guidance

In addition to the legislation and guidance listed in Section 1.5, the assessment took into consideration the following:

- Institute of Geologists of Ireland (IGI) 'Guidelines for the Preparation of Soils Geology and Hydrogeology Chapters of Environmental Impact Statements' (2013);
- Guidance on Waste Acceptance Criteria at Soil Recovery Sites (EPA 2020), and
- Article 27 Guidance on Soil & Stone By-Products (EPA 2019).

6.3 Methodology

The assessment was based on a walkover survey of the site to establish the current land use and morphology; a desk study of databases maintained by the Geological Survey of Ireland (GSI), EPA, Teagasc and the Central Statistics Office (CSO) and the findings of a geophysical survey completed by Apex Geophysics Ltd in 2019 and a geotechnical investigation carried out by Hanmar Site Investigations Ltd (Hanmar) in 2022.

The Apex Geophysics Ltd Geophysical Survey Report is in Appendix 6.1. The objectives were to determine the nature of the material in the raised part of the site and to confirm the depth to bedrock. The survey covered ca. 5.3 ha in the eastern part of the site and involved the collection of 4 Electrical Resistivity Tomography (ERT) profiles and 4 seismic refraction profiles.

The Hanmar Site Investigation Report is in Appendix 6.2. The investigation covered the entire development area and comprised the excavation of 3 trial pits; drilling of 2 rotary percussive and 1 rotary cored boreholes; 1 permeability test to BRE Digest 365; the collection and laboratory analysis of 3 soil samples and groundwater level monitoring in 2 standpipes installed in the boreholes.

6.4 Development Description

Chapter 3 provides a full description of the proposed development. Those aspects of the development of relevance to Land & Geology are;

- Site clearance including stripping and stockpiling some of the topsoils and removal from the site of surplus soils;
- Excavation and stockpiling of subsoils across Phase 1 to achieve formation levels and the removal of surplus soils from the site:
- Construction of the buildings, paved yards and installation of drainage systems
- Landscaping measures and
- Operational stage impacts.

6.5 Receiving Environment

6.5.1 Land Use

The site encompasses two fields and a section of the service road. The western field had been used for animal grazing, but is no longer used for this purpose. The eastern field had been used for tillage but is currently uncultivated. The Central Statistics Office agriculture databases indicates that in Fingal there are 15,437 hectares of grassland and 11,021 hectares of tillage land. The service road allows access to the 220kv Substation and a farm holding to the south-west.

6.5.2 Geology

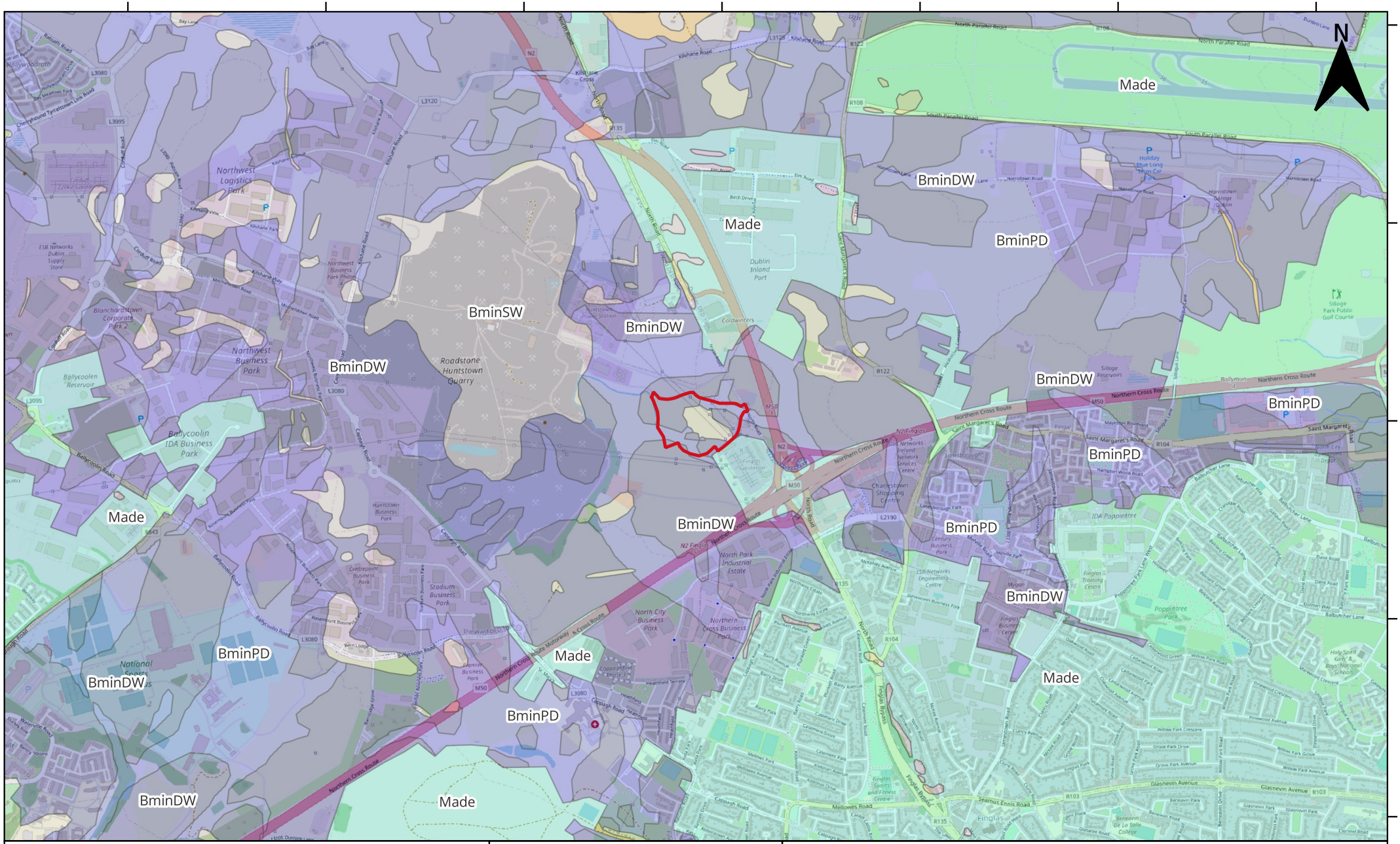
6.5.2.1 Topsoils

The Teagasc National Soil Map (Figure 6.1) indicates that the topsoils are mineral soils of varying thickness. Across most of the site the soils are deep and well drained, locally in the southern part of the site they are poorly drained, and in the central part - shallow and well drained. The elevated area in the centre of the site is covered by mineral alluvium. (Figure 6.1)

6.5.2.2 Subsoils

The Teagasc National Subsoil Maps (Figure 6.2) indicate the subsoils in the west, south and north of the site are glacial tills derived from Carboniferous limestone. In the centre and east of the site are glaciofluvial sand and gravels (Figure 6.2).

The 2019 geophysical survey indicates that the subsoil thickness across the site ranges in depth from 1m in the west to up to 25m in the east. The 2022 site investigation confirmed the subsoils are glacial tills, comprising stiff greyish brown gravelly sandy silty CLAY containing frequent cobbles and boulders, ranging from 0.75m below ground level in the west of the site to 7.50m near the southern boundary.



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CLIENT

Irish Recycling Ltd

TITLE

Soils Distribution

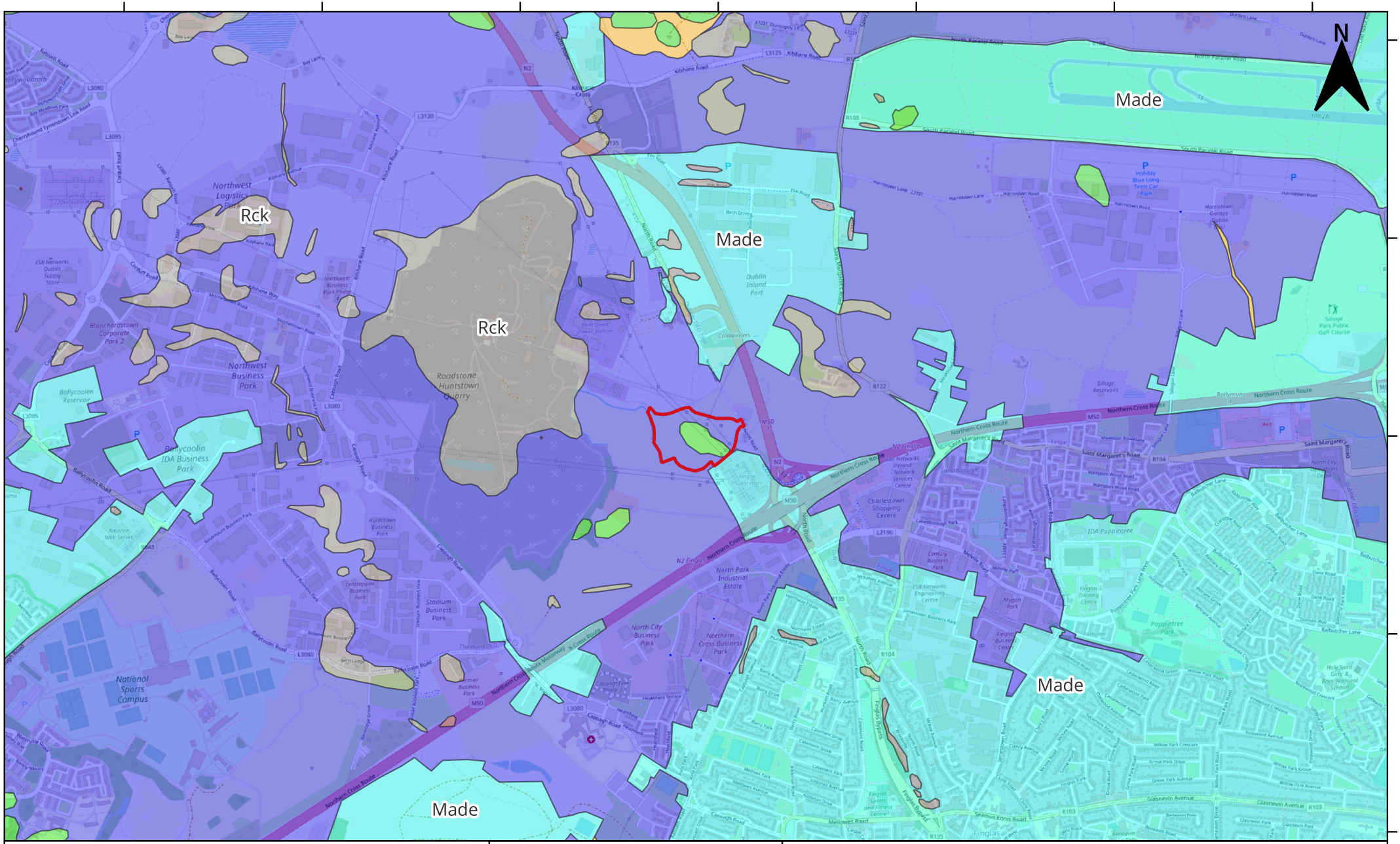
DETAILS

- Site Boundary
- AlluvMIN - Mineral alluvium
- BminDW - Deep well drained mineral (mainly basic)
- BminPD - Mineral poorly drained (mainly basic)
- BminSW - Shallow well drained mineral (mainly basic)
- Made - Made ground

0 500 m

FIGURE 6.1

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CLIENT
Irish Recycling Ltd

TITLE
Subsoils

DETAILS

0 500 m

Site Boundary

Subsoils

GLs - Limestone sands and gravels (Carboniferous)

Rck - Bedrock at surface

TLs - Limestone till (Carboniferous)

A - Alluvium undifferentiated

Made - Made ground

FIGURE 6.2

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6.5.2.3 Bedrock

The GSI Bedrock Geology map (1:100000) indicates that the west and south of the development area is underlain by nodular and muddy limestones and shales of the Boston Hill Formation. The rest of the site is underlain by limestones of the Tober Collen Formation and Waulsortian Limestones

The GSI Bedrock Dublin GeoUrban Geology map (1:50000) provides more detailed information based on mineral exploration reports and old geology maps. It indicates that most of the site is underlain by calcareous shale and limestone conglomerate of the Tober Coleen Formation, with only a small area in the west of the underlain by nodular and muddy limestone and shale of the Boston Hill Formation (Figure 6.3). An anticlinal fold is mapped running through the centre of the site. The geophysical survey indicates that the bedrock has a weathered upper layer (1.0 – 5.0 thick).

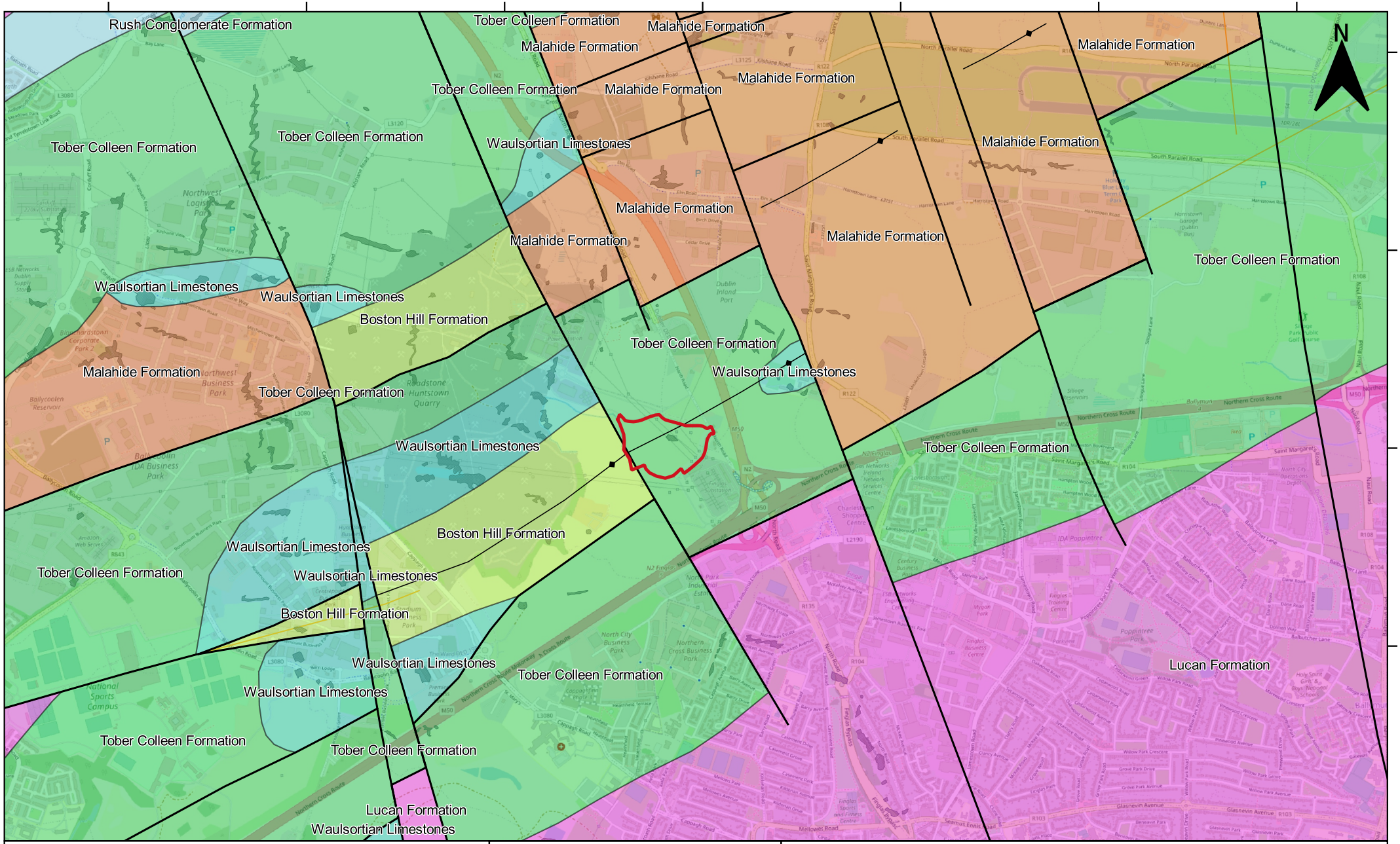
6.5.3 Soil Quality

A subsoil quality assessment was completed as part of the 2022 site investigation which comprised the collection and analysis of soil samples from 1 borehole (BH02) and 2 trial pits (TP01, TP02), as shown on Figure 6.4, which also indicates the locations of the ERT and seismic refraction profiles.

The samples were analysed for metals, BTEX (benzene, toluene, ethylbenzene and xylene), total petroleum hydrocarbons (TPH) aliphatic and aromatic hydrocarbons, polychlorinated biphenyls (PCB), and polyaromatic hydrocarbons (PAH). These parameters were selected to establish baseline quality and are derived from EPA Guidance on Waste Acceptance Criteria At Soil Recovery Sites (2020). The results are in Table 6.1.

Table 6.1 Soil Quality

Location		**BH02**	**TP01**	**TP02**
	Depth (mbgl)	**1.5**	**1.0**	**1.0**
Parameter	**Units**			
Asbestos		Not Detected	Not Detected	Not Detected
Moisture	**%**	8.9	11.0	12.0
Boron	**mg/kg**	1.0	0.79	0.90
Sulphur	**mg/kg**	0.088	0.045	0.036
Cyanide	**mg/kg**	<0.50	<0.50	<0.50
Sulphide	**mg/kg**	2.3	3.7	7.8
Arsenic	**mg/kg**	4.1	5.3	2.7
Cadmium	**mg/kg**	0.7	1.0	0.45
Chromium	**mg/kg**	7.5	9.5	4.2
Mercury	**mg/kg**	<0.05	<0.05	<0.05
Nickel	**mg/kg**	15	23	11
Lead	**mg/kg**	17	9.8	5.1
Hexavalent Chromium	**mg/kg**	<0.50	<0.50	<0.50
Total Aliphatic >C10-C35	**mg/kg**	<5.0	<5.0	<5.0
Total Aromatic >C10-C35	**mg/kg**	<5.0	<5.0	<5.0
BTEX	**ug/kg**	<0.010	<0.010	<0.010
Phenol	**mg/kg**	<0.30	<0.30	<0.30
Total 17 PAH	**mg/kg**	<2.0	<2.0	<2.0
Total PCB	**mg/kg**	<10	<10	<10



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CLIENT

Irish Recycling Ltd

TITLE

Bedrock Geology

DETAILS

Site Boundary

Dublin_Stratigraphy

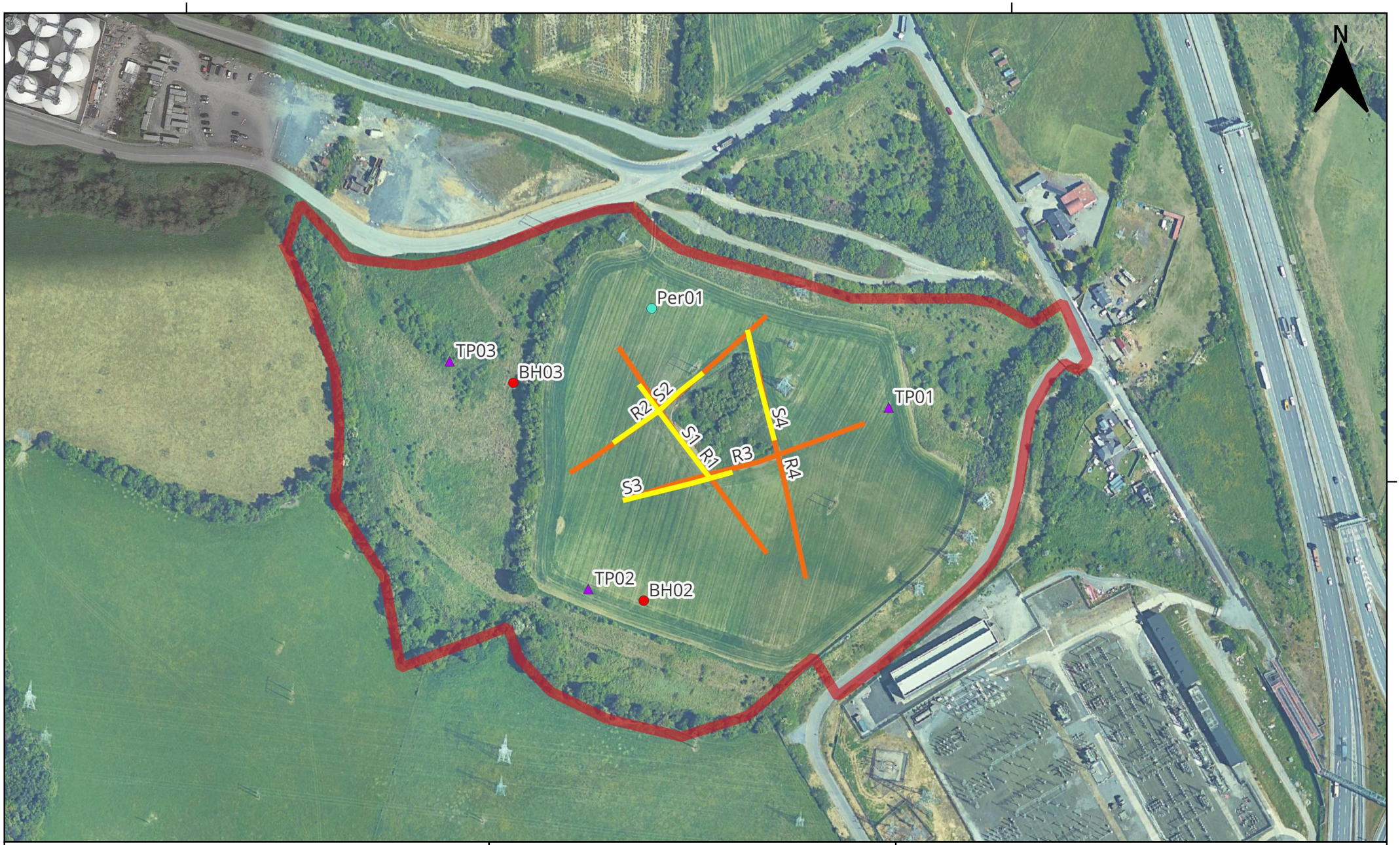
- Boston Hill Formation
- Lucan Formation
- Malahide Formation
- Tober Colleen Formation
- Waulsortian Limestones

Dublin_Geological_Linework

- Anticlinal Axis
- Antiformal axis
- Fault

0 500 m

FIGURE 6.3



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Environmental Management for Business

CLIENT
Irish Recycling Ltd

TITLE
Site Investigation Locations

DETAILS

Site Boundary

Site Investigation in 2022
- Borehole
- Trial Pit
- Percolation Test

Site Investigation in 2019
- 2D Resistivity Profile
- Seismic Refraction Profile

0 20 m

FIGURE 6.4

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BTEX, TPH, PCB and PAH were not detected and the metal levels are were within the range of naturally occurring levels in unpolluted Irish Soils. The soils are clean, with no evidence of contamination.

6.6 Impacts

6.6.1 Land Take

Land take is defined as the transformation of natural and semi-natural land to urban and other artificialized land[9]. It affects habitats and ecosystems, both directly by reducing their area, and indirectly through fragmentation and degradation.

The majority of the site (ca 9 ha) had been used for agricultural purposes (tillage and pasture), but is no longer in such use and therefore not contributing to agricultural sector in Fingal. The site is zoned for Heavy Industrial use in the Fingal Development Plan 2023-2029, which means it is unlikely to be used for agricultural purposes in the long term. In this context the development will have no impact on crop production.

Following the development of Phase 1 and pending the development of future Phases the area outside of Phase 1 (ha) will be returned to beneficial agricultural use (pasture).

6.6.1 *Construction Stage*

The development will involve the stripping of the topsoils and the excavation of the subsoils to meet the formation levels for the site entrance, access road, buildings and underground services and car parking.

A 'cut and fill' assessment established that 11,067m^3 of topsoils will be stripped. The proposed landscaping measures require approximately 9,161m^3 of top soil. This amount will be retained on-site in temporary stockpiles, with the remaining top soil (1,906m^3) sent off-site. To achieve formation levels will require the excavation of approximately 34,155m^3 of subsoils. Of this, 4,925m^3 will be retained on site in temporary stockpiles for use in the development, with the remainder sent off site.

Based on the initial laboratory analysis the soils that must be removed from the site are suitable for recovery at authorised Soil Recovery Sites. They also meet the quality criteria specified in the EPA's Article 27 Guidance on Soil & Stone By-Products and are suitable for use at other development sites that are permitted to accept soil and stone that meet the Article 27 By-Product criteria.

Approximately 2,700m^3 of imported aggregate is required for the sub base beneath the buildings, car parking areas, hardstanding and site entrance and access road.

There is the potential for spills/leaks to occur in areas where polluting substances (e.g. oils) are handled and when refuelling mobile plant that could impact the exposed subsoils.

6.6.2 *Operational Stage*

In the operational stage, rainwater run-off that is not harvested will infiltrate to ground via the soakaway and permeable paving. There is the potential for accidental spills to occur when the diesel storage tank is being filled and during the refuelling of the mobile plant which could infiltrate to ground either through damaged paving. There is also the potential that minor oil leaks from vehicles in the permeable paved areas and leaks from the foul sewers could infiltrate to ground

[9] https://www.eea.europa.eu/data-and-maps/indicators/land-take-3/assessment

In the event of a fire, which is the' worst case' scenario there is the potential for contaminated firewater run-off to infiltrate to the soil via damaged paving and leaking sewers.

6.7 Baseline Scenario

If the proposed development does not proceed there will be no land take, soils and subsoils will not be excavated and there will be no short term change to the potential for impact on land and geology; however given the land zoning and the location it is likely that the site will be developed for industrial use in the short term.

6.8 Prevention and Mitigation Measures

6.8.1 *Design*

Given the nature of the development there are no design stage prevention and mitigation measures to reduce the effects of land take.

The topography of the site, with a hill in the centre, means that significant earthworks are required to achieve optimum development levels. It was a design objective to retain the maximum possible amount of the soils within the site. When the final layout was agreed, a 'cut and fill' exercise was completed to identify the volumes of soils that will be retained for use in the landscaping and for achieving formation levels. A soil quality assessment was completed to identify appropriate management options for the soils that will have to be removed from the site.

The storm water drainage system design includes SuDS as detailed in their Engineering Services Report in Appendix 3.1. The measures comprise rainwater harvesting, permeable paving in car parking areas and an underground attenuation and infiltration cell. An oil interceptor will be installed on the surface water drainage system connected to the attenuation cell and the permeable paving in the car parking areas is designed to filter the small amounts of oil that may leak from parked vehicles.

The fire safety measures included in the design to mitigate the risk of fire outbreak are described in Section 10.8.1.6

The EPA has recently issued a draft National End of Waste Protocol for the production of recycled aggregates from construction and demolition waste. Assuming the final Protocol has been introduced at the detailed design stage of the development, the feasibility of using the recycled aggregated as a replacement for quarry won materials in the construction stage will be completed.

6.8.2 *Construction Stage*

A preliminary Construction Environmental Management Plan (CEMP) describing the proposed construction mitigation measures has been prepared and a copy is in Appendix 3.3. A preliminary Resource and Waste Management Plan (RWMP) has also been prepared and a copy is in Attachment 3.2. Both documents will be updated in advance of the construction stage to take into consideration any additional measures that may be required by conditions attached to planning permission.

The mitigation measures include:

- A construction compound will be established at a selected location agreed in advance with Fingal County Council. All construction materials with the potential to impact on soils, for example oils will be stored in secure bunded areas within the compound;

- Drip trays will be provided for drum storage and will be capable of holding at least 25% of the drum capacity. Where more than one drum is stored, the drip tray capacity will be 25% of the aggregate volume of the drums stored;

- Provision and maintenance of appropriate spill clean-up equipment and training of staff in its proper use. Any spillages will be immediately contained and contaminated soil removed from the site and disposed of in a licensed waste facility;

- Refuelling of the mobile plant will be undertaken by trained personnel in a designated area where appropriate spill control materials are to hand;

- All construction and demolition plant items will be regularly checked to ensure there are no leaks or drips of oils to ground;

- Provision of appropriate waste receptacles (bins and skips) in the construction compound and at strategic locations in the works area, and

- The stripping and stockpiling of topsoil will only be undertaken when absolutely necessary as long term exposure of bare ground can lead to sediment run off and leaching of nutrients from soils.

6.8.3 *Operational Stage*

The impermeable paved yards and the building floors will be subject to regular inspection and repair as required. The above ground oil storage bund in the MRF and the underground drains will be subject to regular inspection, with integrity testing completed every three years. Staff will be trained in accident response actions and appropriate spill clean-up equipment will be maintained on site.

The fire safety and emergency response measures that will be implemented in the operational stage to mitigate the risk of fire outbreak and, if one does occur, to ensure the appropriate response actions are taken to ensure the fire is extinguished as quickly as possible so as to minimise the adverse environmental impacts are detailed in Section 10.8.3.1.

6.9 **Monitoring**

6.9.1 *Construction Stage*

In the construction stage the works will be regularly inspected to ensure that materials and waste handling and storage practices are in accordance with the CEMP and RWMP. Where non-conformances are identified appropriate corrective actions will be implemented.

6.9.2 *Operational Stage*

In addition to the inspections referred to in Section 6.8.3 the oil interceptor will be inspected weekly to ensure it is functioning properly and will be cleaned out as required. The discharge from the interceptor will be monitored at frequency specified in the EPA licence and the parameters will, at a minimum, include hydrocarbons. The monitoring results will be submitted to the EPA and will be publically accessible.

6.10 Cumulative Impacts

The only potentially significant aspect of particular importance is land take, which is defined in Section 6.6.1 as the 'transformation of natural and semi-natural land to urban and other artificialized land. It affects habitats and ecosystems, both directly by reducing their area, and indirectly through fragmentation and degradation'.

The 'proposed development will contribute to the cumulative land take in the area zoned for Heavy Industry`. This is in accordance with the 'prudent' approach recommended in Section 3.7.3 of the EIA Guidelines in relation to the development of zoned lands in the immediate environs of the proposed development. Section 8.10 assesses in detail the cumulative impacts on Biodiversity, which includes habitats and ecosystems.

6.11 Residual Impacts

6.11.1 Land Take

The proposed development involves land take and ground disturbance including the stripping of topsoils and the excavation of subsoils in the construction stage. Once the construction works have been completed, the land take area will be permanently occupied by the buildings, roads and open landscaped area. The proposed loss of ca 9 ha of former agricultural lands will have a negative, imperceptible, local, likely and permanent impact on land.

6.11.2 Soils

Some of the topsoil and the majority of the excavated subsoils will be removed from the site. They will be suitable either for recovery at authorised soil recovery sites, or for use in other permitted developments where clean fill/ topsoil is required.

The proposed development includes SuDS measures that involve the infiltration of rainwater to ground. The oil interceptor upstream of the underground attenuation system and the permeable paving are designed to protect soil quality.

The proposed development will have a negative, not significant, local, likely and permanent impact on soils.

6.11.3 Summary of Residual Impacts

Table 6.2 Residual Impacts

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration
Land Take	Negative	Imperceptible	Local	Likely	Permanent
Soil	Negative	Not significant	Local	Likely	Permanent

6.12 References

European Environment Agency, 2019b. Land take in Europe. Indicator Assessment. Available at: https://www.eea.europa.eu/data-and-maps/indicators/land-take-3/assessment

7. WATER

7.1 Introduction

This Chapter describes the surface water and the groundwater conditions at the proposed development site and the impacts the development will have on surface water and groundwater within and outside the site boundary, including a 'baseline' scenario. It identifies the prevention, mitigation and monitoring measures that will be implemented to reduce the significance of the impacts and assesses the residual impacts. This Chapter should be read in conjunction with Chapter 6 Land & Soils, Chapter 8 Biodiversity and Chapter 10 Population and Health.

The Chapter was prepared by Ms Marzena Nowakowska MSc and Mr Sean Moran of OCM. Ms Nowakowska has an MSc in Geology, majoring in mineral and water resource management and has over 15 years' experience in water resource and hydrogeological assessments including water quality monitoring, hydrogeological mapping and water resource management at regional level.

Mr. Moran holds an MSc in Hydrogeology and is a member of the Institute of Geologists of Ireland (P.Geol.), the European Federation of Geologists (Eur. Geol.) and the Chartered Institute of Water and Environmental Management. He has over 30 years of experience in the field hydrological and hydrogeological assessment and EIA.

7.2 Relevant Legislation & Guidance

The general EIA legislation and guidance documents are listed in Section 1.5. The legislation and guidelines relevant to Water considered in the preparation of this Chapter include:

- Local Government Water Pollution Acts 1977 & 1992, as amended.
- European Union Water Framework Directive (2000/60/EC).
- European Communities Environmental Objectives (Groundwater) Regulations (SI No 9 of 2010), as amended.
- European Communities Environmental Objectives (Surface Water) Regulations (S.I. No 272 of 2009), as amended.
- Institute of Geologists of Ireland (IGI) 'Guidelines for the Preparation of Soils Geology and Hydrogeology Chapters of Environmental Impact Statements' (2013).

7.3 Methodology

The assessment was based on a walkover survey of the site to establish the local drainage patterns and a desk study, whose sources included:

- River Basin Management Plan (RBMP) 2018-2021;
- Hydrogeological databases maintained by the GSI;
- EPA water quality databases;
- Hanmar Site Investigation Report (Appendix 6.1)
- Engineering Report prepared by Coyle Civil and Structural Engineers (Appendix 3.1).

7.4 Development Description

Chapter 3 provides a full description of the proposed development. Those aspects of the development relevant to Water are;

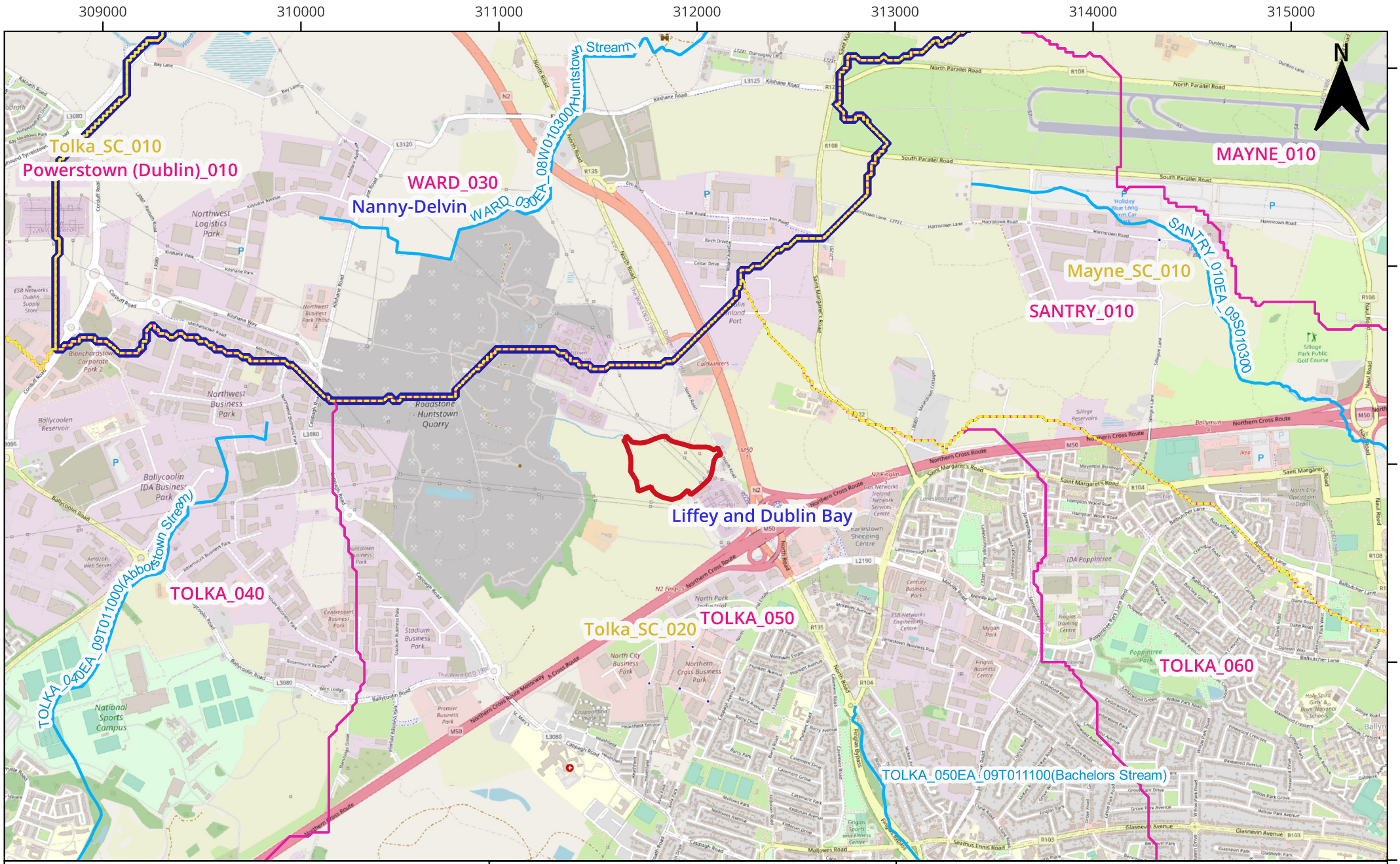
- Excavation works for building foundations, roads sub-base and underground services measures;
- Construction of the buildings, paved yards and installation of drainage systems, and
- Operational stage impacts.

7.5 Receiving Environment

7.5.1 *Hydrology*

The local and regional hydrological conditions are shown on Figure 7.1. There are no watercourses inside the site boundary and the closest water feature is Huntstown Stream, which is approximately 970m north of the site. Other streams in the vicinity include the Abbotstown Stream, 1.5km west and Bachelor's Stream, 1.6km southeast. The Huntstown Stream is a tributary of the Ward River, which is to the north while the Abbotstown and Bachelor's Streams are tributaries of the River Tolka and are to the west and south east of the development area respectively.

The development site is in the catchment of the River Tolka, which is ca. 3km south of the site. The Tolka is one of Dublin's three main rivers, rising in Dunshaughlin in County Meath flowing through Clonee, Blanchardstown and Ashtown and entering Dublin Bay between East Wall and Clontarf.



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CLIENT: Irish Recycling Ltd

TITLE: Local and Regional Hydrology

DETAILS

0 500 m

- Site Boundary
- Rivers
- WFD_RiverSubBasins
- WFD_Subcatchments
- WFD_Catchments

FIGURE 7.1

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The Tolka is part of the IE_EA_Tolka Water Management Unit (WMU) originally designated in the first cycle of the Eastern River Basin District (EBRD) Management Plan prepared under the EU Water Framework Directive (WFD). The WMU comprises various Water Bodies and the site is in the Tolka_050 River Water Body.

Status Reports have been prepared for each Water Body. Status means the condition of the water in a watercourse and is defined by its ecological and chemical conditions, whichever is worse. Water Bodies are ranked in one of five classes,' High', 'Good', 'Moderate', 'Poor' and 'Bad'.

The WFD requires measures to ensure waters achieve at least 'Good Status' by 2015 and that their current status does not deteriorate. Where necessary, for example in heavily impacted or modified watercourses, extended deadlines (2021 and 2027) were set for achieving the following objectives:

- Prevent Deterioration
- Restore Good Status
- Reduce Chemical Pollution
- Achieve Protected Areas Objectives

The objectives for particular watercourses are based on 'Pressure and Impact Assessments' of human activity, including point and diffuse emissions, land use and morphological conditions on surface waters to identify those water bodies that are 'At Risk' of failing to meet the WFD objectives. The latest ecological status/potential of the Tolka_050 is classified as 'Poor' due to significant pressure of urban run-off and urban waste water and the river is 'At Risk' of meeting its RBMP objectives.

7.5.2 *Hydrogeology*

7.5.2.1 Subsoils

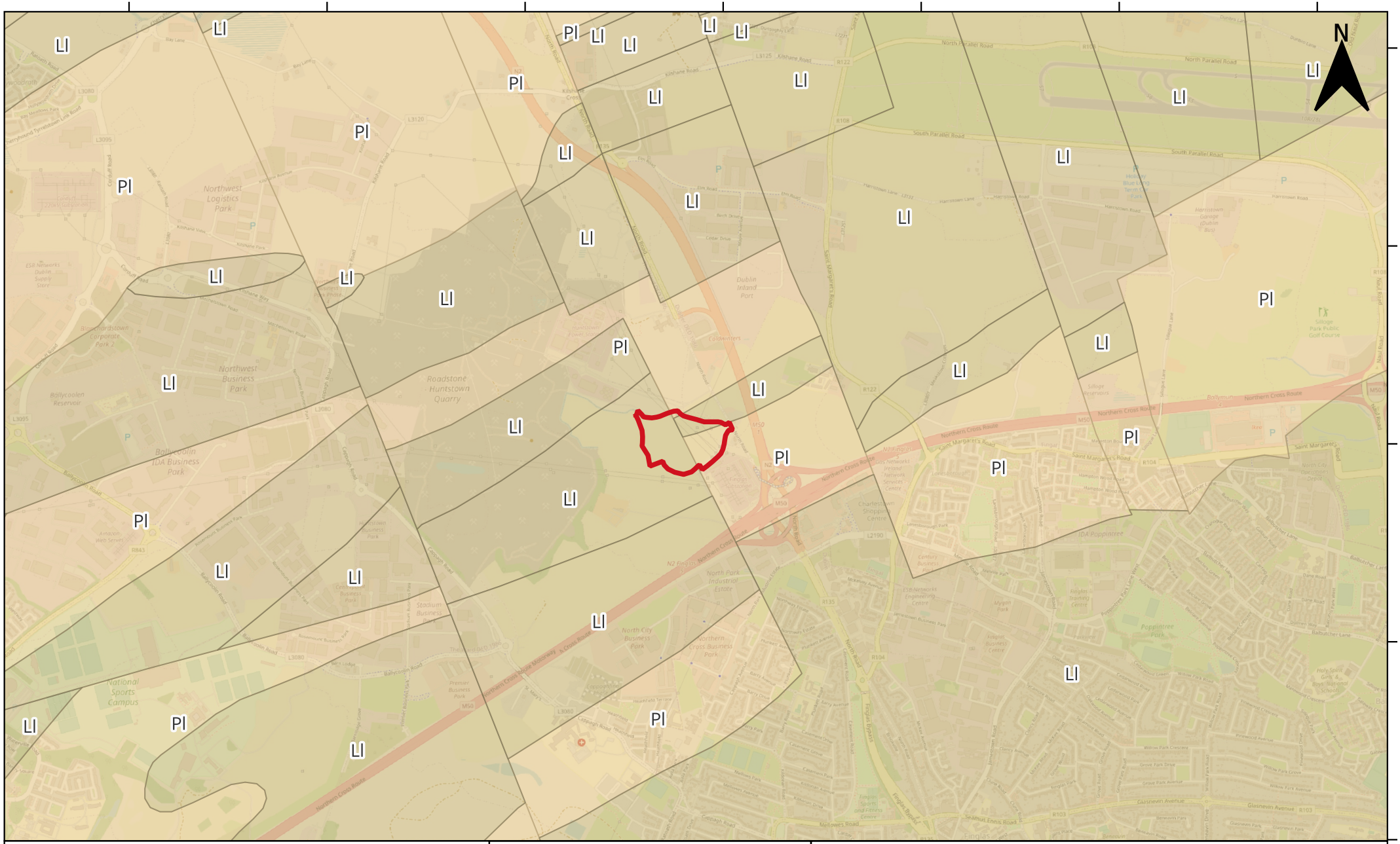
The subsoils, while water bearing are not classified as an aquifer. Groundwater was not encountered during the drilling of the boreholes and the excavation of the trial pits completed by Hanmar in September 2022. Groundwater standpipes were installed in the two boreholes (BH02 and BH-03) as shown on Figure 6.4. In BH 02 the standpipe extended to 4m below ground level and was entirely within the subsoils. In BH-03 the standpipe extended to 3.7m below ground level and straddled both the subsoils and the bedrock. Water levels were subsequently checked in October and November and the depths ranged from 2.1 to 3.7m below ground level.

7.5.2.2 Aquifer Classification

The GSI aquifer map indicates that the Boston Hill Formation underlies the west and north of the site and is classified as a locally important bedrock aquifer, moderately productive only in local zones (Figure 7.2). The Tober Colleen Formation, which the GSI Map shows underlying the south east of the site, is regarded as poor and moderately productive only in local zones.

The GSI aquifer classification is based on GSI Bedrock Map scale 1:100000 and is not consistent with detailed bedrock stratigraphy for Dublin Area scale 1:50000 described in 6.5.2.3, which indicates the majority of the development is underlain by the Tober Colleen Formation

A review of the GSI groundwater well database identified that the closest recorded abstraction well is ca 0.85 km to the north-east. This has a reported yields of 83.8 m^3/day, but its use is unknown.



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CLIENT Irish Recycling Ltd

TITLE Aquifer Classification

DETAILS

0 500 m

Site Boundary

Aquifer Classification

LI - Locally Important Bedrock Aquifer, Moderately Productive only in Local Zones

PI - Poor Bedrock Aquifer, Moderately Productive only in Local Zones

FIGURE 7.2

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7.5.2.3 Aquifer Vulnerability

The GSI defines vulnerability as the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. The GSI uses four groundwater vulnerability categories - Extreme, High, Moderate and Low based on the permeability and thickness of the subsoils overlying the aquifer.

The GSI groundwater vulnerability map indicates the aquifer vulnerability of the site is generally 'High' to 'Moderate' (Figure 7.3), however the site investigation indicates the vulnerability in the west of the site is Extreme (Section 6.5.2.2).

7.5.2.4 Recharge

The GSI Groundwater Recharge map indicates the average annual recharge to the groundwater aquifer is 151-200 mm/year in the northern and western part of the site and 51-100 mm/year in the southern and eastern part of the site (Figure 7.4).

7.5.2.5 Groundwater Flow Direction

The direction of groundwater flow is related to the morphology. Within the site boundary the direction is influenced by the hill in the centre and the shallow groundwater flow is to the west and south. Outside the boundary the flow is to the south towards the River Tolka.

7.5.3 Groundwater Quality

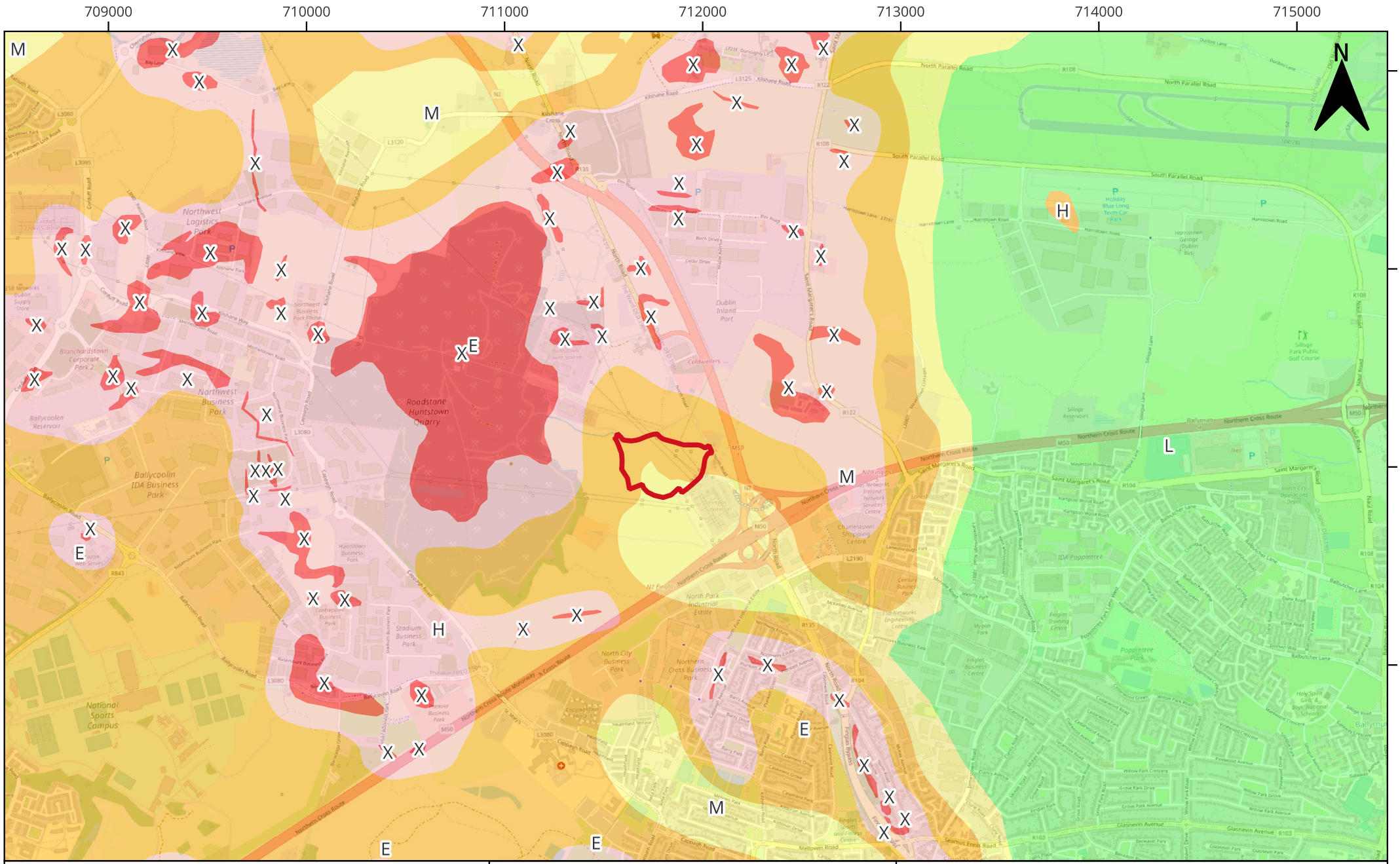
OCM visited the site to collect groundwater samples for laboratory analysis to establish baseline conditions; however there was insufficient water in either standpipe to collect representative samples.

The bedrock aquifer belongs to the Dublin Groundwater Body (IE_EA_G_009) designated in the RBMP. The condition of a Groundwater Body is defined by its chemical and quantitative status, whichever is worse, and groundwater quality is ranked in one of two status classes: Good or Poor. The condition of the Dublin Groundwater Body is under review and therefore the current status has not been determined.

7.5.4 Flood Risk

The mapping on the OPW www.floodinfo.ie website confirms the site is neither in, nor adjacent to a location that is at risk of fluvial, pluvial or groundwater flooding and there are no records of any flood events either at, or in proximity to the site (Figure 7.5). The nearest recorded flood events occurred in 2002 in Dubber Cross ca 900m to the east and at Kilshane Cross ca 2km to the north.

Coyle Civil and Structural Engineers prepared a Site Specific Flood Risk Assessment (FRA) for the proposed development site, a copy of which is in Appendix 7.1. The FRA concluded that there is no indication of flooding from coastal, pluvial, fluvial and groundwater sources at the proposed development site.



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CLIENT

Irish Recycling Ltd

TITLE

Aquifer Vulnerability

DETAILS

0 500 m

Site Boundary

Vulnerability

X - Bedrock near Surface

E - Extreme

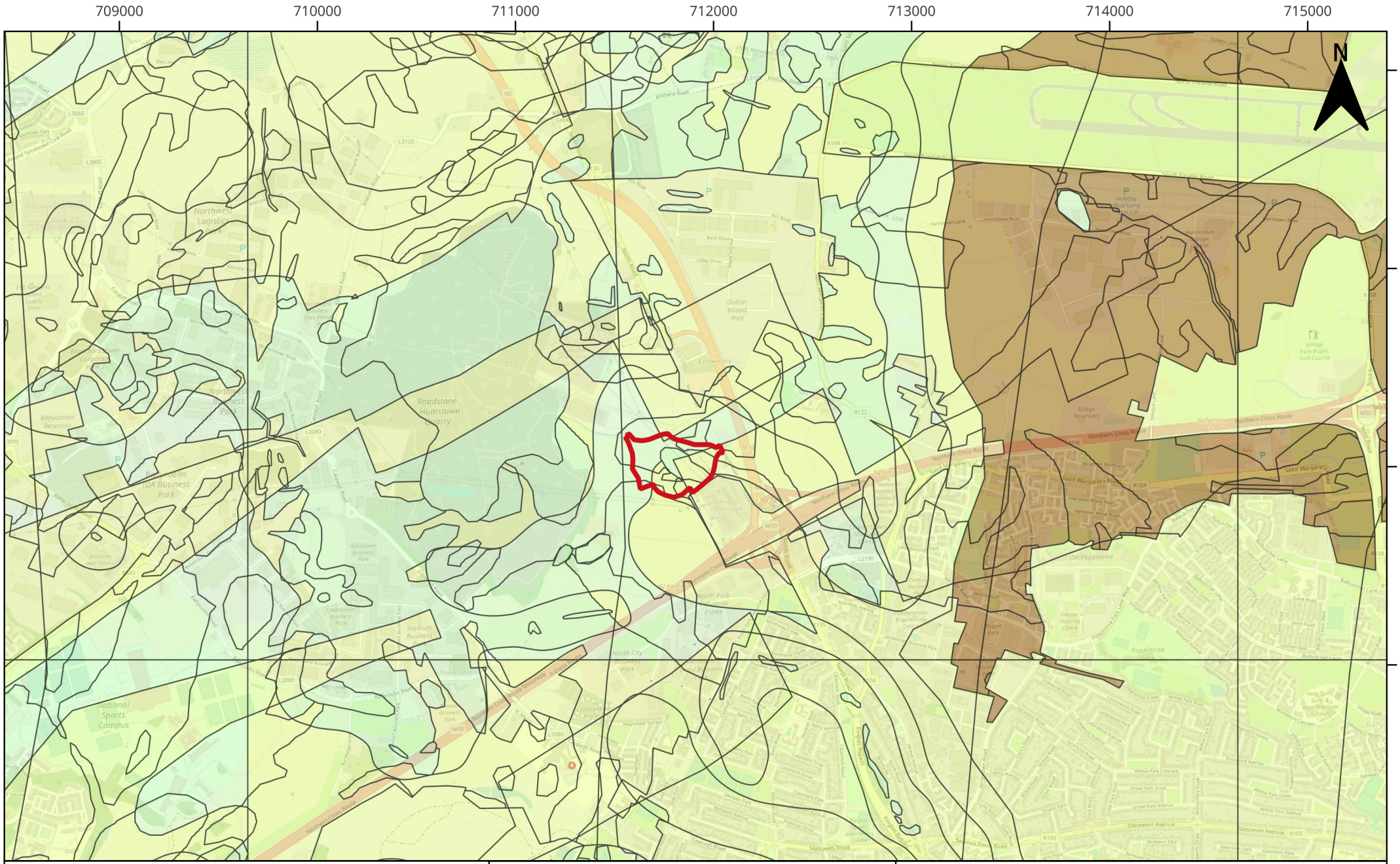
H - High

L - Low

M - Moderate

Water

FIGURE 7.3



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CLIENT Irish Recycling Ltd

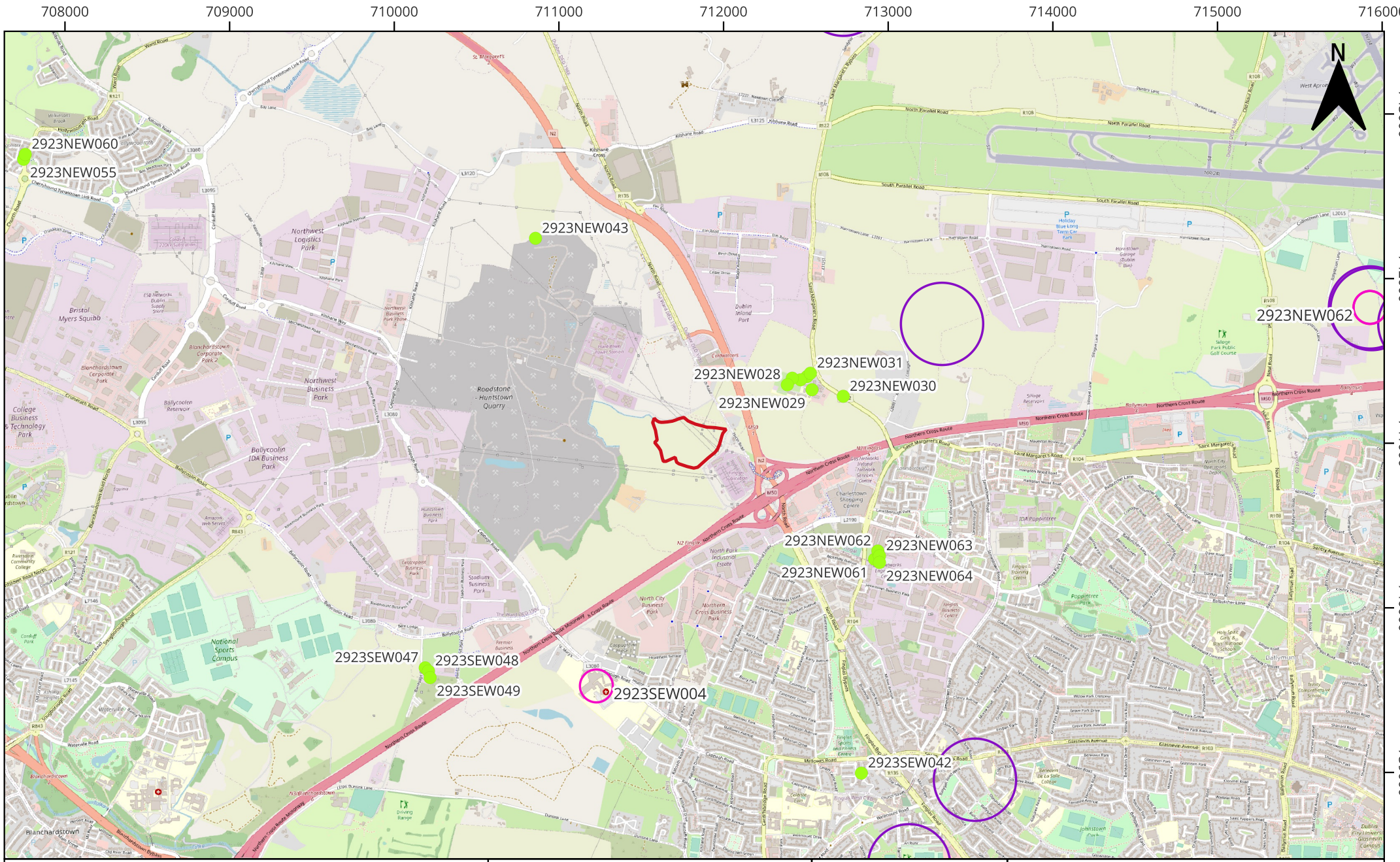
TITLE Groundwater Recharge

DETAILS
- Site Boundary

Groundwater Recharge [mm/year]
- 151-200
- 101-150
- 51-100
- 1-50

FIGURE 7.4

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2923NEW063
2923NEW061
2923NEW064
2923SEW047
2923SEW048
2923SEW049
2923SEW004
2923SEW042
Northwest Logistics Park
Bristol Myers Squibb
Blanchardstown Corporate Park 2
Blanchardstown Corporate Park
Northwest Business Park
Roodstone - Huntstown Quarry
College Business & Technology Park
Ballycoolin Reservoir
Ballycoolin IDA Business Park
Dublin Inland Port
Sluice Park Public Golf Course
Charlestown Shopping Centre
IDA Poppintree
North Park Industrial Estate
North City Business Park
Northern Cross Business Park
National Sports Campus
Stadium Business Park
Premier Business Park
Finglas Business Centre
Poppintree Park
Blanchardstown
Northern Cross Route
North Parallel Road
South Parallel Road
Ballymun
Finglas
Glasnevin
Dunsink Lane
Ballycoolin Road
Mellowes Road
Finglas Bypass
Northern Cross Route Motorway
N2 Finglas - Northern Cross Route
M50
N2
N3
R108
R104
R135
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R843
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7.6 Impacts

7.6.1 *Construction Stage*

The development will involve the stripping of the topsoils and excavation of the subsoils to meet the formation levels for the site entrance, access road, buildings and underground services and car parking.

The development will require the excavation of approximately 45,200m^3 of soils and subsoils. Of this, approximately 14,080m^3 will be retained on site in temporary stockpiles for use in the development, with the remainder sent off site. The subsoil depth ranges from 1m to 25m across the site and the removal of the subsoils may have a localised affect the aquifer vulnerability rating.

Approximately 2,700m^3 of imported aggregate is required for the sub base beneath the buildings, car parking areas, hardstanding, site entrance and access road.

There is the potential for spills/leaks to occur in areas where polluting substances (e.g. oils) are handled and when refuelling mobile plant that could infiltrate the soils and migrate to the water table.

7.6.2 *Operational Stage*

In the operational stage there will be no emission to surface waters. Rainwater run-off that is not harvested will infiltrate to ground via the soakaway and permeable paving, which will reduce the aquifer recharge rate and affect its quantitative status.

There is the potential for accidental spills to occur during filling of the diesel storage tank and the refuelling of the mobile plant which could infiltrate to ground through damaged paving. There is also the potential for minor oil leaks in the permeable paved areas and leaks from the foul sewers to infiltrate to ground and groundwater.

In the event of a fire there is the potential for contaminated firewater run-off to infiltrate to the soil via damage paving and leaking sewers and then migrate to the water table. The latter would be the 'worst case' scenario.

7.7 Baseline Scenario

If the proposed development does not proceed the current land use will continue in the short term and there will be no change to the potential impacts on, surface water and groundwater; however given the land zoning and location it is likely that the site will be developed for industrial use in the short term.

7.8 Prevention & Mitigation Measures

7.8.1 *Design Stage*

7.8.1.1 Sustainable Urban Drainage Systems (SuDs)

SuDS measures were incorporated into the design of the surface water management system completed by Coyle Civil and Structural Engineers, as detailed in their Engineering Services Report in Appendix 3.1 and shown on Drawing C-100. The measures include:

- Permeable paving in car parking areas;
- Rainwater harvesting on building roofs, and
- Attenuation storage cell with a soakaway.
-

7.8.1.2 Oil Interceptor

All surface water run-off from HGV trafficked areas will pass through a Class 1 Bypass Separator upstream of the soakaway. Bypass separators fully treat all flows generated by rainfall rated of up 6.5mm/hour, which covers over 99% of all rainfall events. Flows from events above this rate are allowed to bypass the separator.

Bypass separators are used at sites where it is considered the risk of a large spillage and heavy rainfall occurring at the same time is small. A Class 1 interceptor is designed to achieve an oil concentration in the outflow of less than 5mg/l.

7.8.1.3 Permeable Paving

The permeable paving, while allowing rain fall to infiltrate to ground, is also designed to filter out silt and adsorb and subsequently biodegrade low level oil contamination.

7.8.1.4 Fire Safety

The fire safety measures included in the design to mitigate the risk of fire outbreak are described in Section 10.8.1.6.

7.8.2 Construction Stage

The preliminary CEMP and RWMP describe the proposed construction mitigation measures, including the management of wastes that will be implemented. As referred to in Section 6.8.2 both document will be updated in advance of the construction stage to take into consideration any additional measures that may be required by conditions attached to planning permission. The measures that will be implemented to mitigate the effects of soils (Section 6.8.2) apply equally to surface water and groundwater. In addition the following control measures will be applied when concrete is poured:

- Pouring of cementitious materials will be carried out where possible in the dry;
- The pouring will be monitored to minimise the risk accidental discharge;
- Excess concrete will not be discharged to ground;
- There will be no hosing od accidental spills of concrete, cement, grout or similar materials, and
- Washout from mixing plant or concrete trucks will not be permitted on the site.

7.8.3 *Operational Stage*

The surface water drainage system will maximise the groundwater recharge within the site. The provision and maintenance of the Class 1 oil interceptor on the inflow to the soakaway will ensure that any minor oil leaks that occur from vehicles do not adversely affect the groundwater. In the areas where the permeable paving is provided the biodegradation of hydrocarbons will occur within the subbase.

The impermeable paved yards and the building floors will be subject to regular inspection and repair as required. The above ground oil storage bund in the MRF and the underground drains will be subject to regular inspection, with integrity testing completed every three years. Staff will be trained in accident response actions and appropriate spill clean-up equipment will be maintained on site.

The fire safety and emergency response measures that will be implemented in the operational stage to minimise the risk of fire outbreak and, if one does occur, to ensure the appropriate response actions are taken to ensure the fire is extinguished as quickly as possible are detailed in Section 10.8.3.1.

7.9 **Monitoring**

7.9.1 *Construction Stage*

The works will be regularly inspected to ensure that materials and waste handling and storage practices are in accordance with the CEMP and RWMP. Where non-conformances are identified appropriate corrective actions will be implemented.

7.9.2 *Operational Stage*

In addition to the inspections referred to in Section 7.8.3, the oil interceptor will be inspected weekly to ensure it is functioning properly and will be cleaned out as required. The discharge from the interceptor will be monitored at frequency specified in the EPA licence and the parameters will, at a minimum, include hydrocarbons. The monitoring results will be submitted to the EPA and will be publically accessible

7.10 **Cumulative Impacts**

As there will be no discharge to surface water in either the construction, or operational stages an assessment of the cumulative effects of other existing and approved developments is not required.

The harvesting of rainwater will reduce the groundwater recharge rate and will contribute to the cumulative impact on the quantitative status of the bedrock aquifer locally. The bedrock aquifer is classed as poor and moderately productive only in local zones. The nearest recorded abstraction well is ca 0.85 km to the north-east. This has a reported yields of 83.8 m^3/day, but its use is unknown (Ref Section 7.5.2.2).

As the aquifer is not a significant groundwater resource, there will be no discharge of polluting substances to ground/groundwater in either the construction or operational stages and it is not proposed to abstract groundwater as part of the development it is considered that the an assessment

of the cumulative effect of the proposed development along with individual existing and approved projects is not of particular environmental importance.

7.11 Residual Impacts

7.11.1 *Construction Stage*

There will be no emissions to on or off-site water features and therefore no impacts on surface waters. There is the potential for accidental spills of polluting materials to occur; however the mitigation measures specified in the CEMP will minimise the associated impacts. The removal of the soils and subsoils will affect the aquifer vulnerability rating; however this will be offset by the provision of impermeable surfaces. The construction stage impacts on groundwater will be negative, not significant, local, likely and permanent.

7.11.2 *Operational Stage*

There will be no emissions to on or off-site water features water and therefore no impacts on surface water. The rainwater harvesting will reduce the recharge rate and affect the bedrock aquifer's quantitative status. The storm water drainage system is designed to maximise the groundwater recharge within the site boundary, but the discharge to ground has the potential to indirectly impact on groundwater quality. The oil interceptor upstream of the underground attenuation system and the permeable paving are designed to protect groundwater quality.

The operational stage will have a negative, not significant, local, likely and long term impact on groundwater quality, and a negative, imperceptible, local, likely and long term impact on the quantitative status of the bedrock aquifer.

7.11.3 *Summary of Residual Effects*

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration
Construction Stage					
Aquifer Vulnerability	Negative	Not Significant	Local	Likely	Permanent
Groundwater Quality	Negative	Imperceptible	Local	Likely	Short Term
Operational Stage					
Groundwater Qualitative Status	Negative	Not significant	Bedrock Aquifer	Not Likely	Long Term
Groundwater Quantitative Quantitative Status	Negative	Not Significant	Bedrock Aquifer	Likely	Long Term

8. BIODIVERSITY

8.1 Introduction

This Chapter describes the biodiversity of the site and the impacts the proposed development will have on flora (plants), fauna (animals), and habitats including a 'baseline' scenario. It identifies the prevention, mitigation and monitoring measures that will be implemented to reduce the significance of the impacts and assesses the residual impacts. This Chapter should be read in conjunction with Chapter 6 Land & Soil, Chapter 7 Water, Chapter 9 Air, Chapter 10 Population & Human Health and Chapter 12 Land & Visual Impact and the Appropriate Assessment Screening Report submitted separately with the planning application.

The Chapter was prepared by Carl Dixon MSc (Ecological Monitoring) and Dr. Sorcha Sheehy PhD (Ecology/ornithology). Fieldwork was completed by Cian Gill MSc (Ecological Monitoring) and Mark Donnelly BSc (Forestry).

Mr Dixon holds an Honours Degree (BSc) in Ecology and a Masters (MSc) in Ecological Monitoring from UCC. He is a senior ecologist who has over 25 years' experience of ecological assessment. He has particular expertise in freshwater ecology, including electrofishing fish stock assessments and water quality assessments. He also has considerable experience in habitat mapping and mammal ecology, including survey work and reporting in relation to badgers and bats. Other competencies include surveys for invasive species and bird surveys.

Mr Dixon has extensive experience with regards to EIAR and Natura Impact Statement mitigation and impact assessment. He has experience large-scale industrial developments (gas pipelines, incinerators, electrical cable routes, oil refineries and quarries) involving complex assessments as part of multi-disciplinary teams. Such projects include.

Dr Sheehy holds an Honours Degree (BSc) in Ecology and a PhD in ornithology/behavioural ornithology from UCC. She has 15 years' experience in ecological assessment and has prepared Screening/NIS for a range of small and large-scale projects with expertise in assessing impacts on birds. Dr Sheehy's PhD research focused on bird behaviour at airports, where she studied bird avoidance behaviour and collision risk to aircraft. Her research involved field observations, post-mortem analysis and radar surveys. She has worked on bird collision risk assessments at airports throughout Ireland including Dublin airport, Cork airport, Shannon airport and Kerry airport.

Dr Sheehy has prepared out field-based surveys and environmental reports including NIS, AA screening and EIARs. Notable projects include the Arklow Bank Wind Park, Indaver Ireland Waste Management Facility at Ringaskiddy, Irving Oil Whitegate Refinery, Shannon Liquefied Natural Gas Terminal and the Greenlink Interconnector.

Mr Gill holds an Honours Degree (BSc) in Zoology/Animal Ecology and a Masters (MSc) in Ecological Monitoring from UCC. He has over ten years' experience working with wildlife and ecology-based NGOs and public bodies in Ireland, the UK and the US. Past projects include invasive species planning for the city of Rosemount, Minnesota, and the Under the Sea project for Essex Wildlife Trust. Recent projects include ecological reports for Cork-based housing and private developments. During his

consultancy work Mr Gill has conducted field-based surveys and prepared environmental reports for a range of large and small scale projects throughout Ireland.

Mr Donnelly holds a BSc. Hons in Forestry from Bangor University, Wales, and is a member of the Institute of Chartered Foresters. He worked as an arboricultural consultant for the National Trust in Wales for 22 years and was a lecturer in Forest Ecology at Bangor University. In Ireland, he has completed landscape assessments for a range of projects including wind farms, quarries, local authorities, housing developments, roads and pipelines. During his consultancy work Mr Donnelly has conducted field-based surveys and environmental reports for a range of large and small scale projects throughout Ireland.

8.2 Relevant Legislation & Guidelines

The general EIA legislation and guidance documents are listed in Section 1.5. The legislation and guidelines relevant to Water considered in the preparation of this Chapter include:

8.2.1 *Legislation*

8.2.1.1 European Legislation

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (The Habitats Directive);
- Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (The Birds Directive);
- Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (The Water Framework Directive);
- Directive 2006/44/EC of the European Parliament and of the Council of 6 September 2006 on the quality of fresh waters needing protection or improvement in order to support fish life (The Fish Directive (consolidated)).

8.2.1.2 Irish Legislation

- The Wildlife Act 1976, as amended by the Wildlife Act 1976 (Protection of Wild Animals) Regulations, 1980, the Wildlife (Amendment) Act 2000, the Wildlife (Amendment) Act 2010, Wildlife (Amendment) Act 2012, European Communities (Wildlife Act, 1976) (Amendment) Regulations 2017. (The Wildlife Act);
- European Communities (Conservation of Wild Birds) Regulations 1985 (S.I. 291/1985) as amended by S.I. 31/1995;
- European Communities (Natural Habitats) Regulations, S.I. 94/1997 as amended by S.I. 233/1998 & S.I. 378/2005 (The Habitats Regulations);
- Fisheries (Consolidation) Act, 1959 (as amended), hereafter referred to as the Fisheries Act;
- European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011);
- Flora (Protection) Order, 2022 (S.I. No. 235/2022).

8.2.2 *Guidelines*

- Guidelines on Ecological Impact Assessment in the UK and Ireland, 2nd edition (Chartered Institute of Ecology and Environmental Management CIEEM 2016);
- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, Version 1.1 (CIEEM, 2018);
- Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU) (European Union (EU), 2017);
- Managing Natura 2000 Sites: The Provision of Article 6 of the Habitats Directive 92/43/EEC (EC Environment Directorate-General, 2018);
- Guidance on integrating climate changes and biodiversity into environmental impact assessment (EU Commission 2013);
- Assessment of plans & projects in relation to N2K sites – Methodological Guidance (EC 2021);
- Biodiversity Net Gain Good practice principles for development (CIEEM 2019)
- Biodiversity Net Gain. A practical guide. (CIEEM 2016);
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters Inland Fisheries Ireland (2016);
- Guidance document on the strict protection of animal species of Community interest under the Habitats Directive (EC 2021);
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (National Roads Authority (NRA) 2009);
- Best Practice Guidance for Habitat Survey and Mapping (Heritage Council, 2011);
- A Guide to Habitats in Ireland (Fossitt, 2000);
- Guidelines for the treatment of Badgers prior to the construction of National Road Schemes. National Roads Authority, Dublin (National Roads Authority (NRA) 2005a);
- Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes (National Roads Authority (NRA) 2005b).
- Guidelines for the treatment of bats during the construction of national road schemes (National Roads Authority (NRA) 2005c);
- Guidelines for the protection and preservation of trees, hedgerows and scrub prior to, during and post construction of national road schemes. (National Roads Authority (NRA) 2006).
- Guidelines for the treatment of Otters prior to the construction of National Road Schemes (National Roads Authority (NRA) 2008);
- Bird Census Techniques (Bibby, C.J., Burgess, N.D., Hill, D.A. & Mustoe, S.H. 2000)

- Bird Monitoring Methods - a Manual of Techniques for Key UK Species. (Gilbert, G., Gibbons, D.W. & Evans, J. (1998))
- Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd ed)' (Collins, 2016) and
- Bat Mitigation Guidelines for Ireland Volume 2. (F. Marnell, C. Kelleher and E. Mullen NPWS (2022))

8.3 Limitations

Standard survey methods were followed; however any biases or limitations associated with these methods could potentially affect the findings. Although every effort was made to provide a full assessment and comprehensive description of the study area, natural fluctuations in populations may not be fully reflected due to the instantaneous nature of the field surveys. However, the field surveys together with the background knowledge provided by a desk study, provides a robust representation of the baseline for the habitats and species within the zone of influence (ZoI) of a proposed development site.

8.4 Methodology

The assessment was carried out in three stages:

1. Desktop study to determine existing information and records in relation to:
   - Sites, species, and habitats protected under the Habitats Directive and sites and species protected under the Birds Directive, within the ZoI of the proposed development and more distant hydrologically linked sites. The ZoI comprises the area within which the proposed development may potentially affect the conservation objectives (or qualifying interests) of a protected site, and
   - Biodiversity, habitats, and species present near the proposed development.
2. Site visits and field surveys by the specialist ecologists to establish the existing ecological conditions within the footprint of the proposed development and within the vicinity of all the proposed development elements.
3. Evaluation of the proposed development and determination of the scale and extent of potential likely direct and indirect significant effects on biodiversity (i.e., flora, fauna, and habitats) and the identification of appropriate mitigation and monitoring measures.

8.4.1 *Desk Top Study*

A desktop study was carried out to collate the available information on the local ecological environment. The purpose was to identify features of ecological value occurring within the proposed development site and those occurring near to it that have the potential to be affected by the proposed development. The desktop review allowed the key ecological issues to be identified early in the assessment process and facilitated the planning of surveys. The information sources included:

- National Parks and Wildlife Service (NPWS) - www.npws.ie

- Environmental Protection Agency (EPA) – www.epa.ie
- National Biodiversity Data Centre (NBDC) – www.biodiversityireland.ie
- Bat Conservation Ireland - www.batconservationireland.org
- Birdwatch Ireland - www.birdwatchireland.ie
- National Biodiversity Action Plan 2017-2021 (NPWS 2017)
- Fingal Development Plan 2023 to 2029 and
- Draft Fingal Biodiversity Action Plan 2022-2030.

8.4.2 Site Surveys

Surveys were carried out on the 4th of December 2020, 1st March, 2021 and the 27th of August 2022 to identify the habitats, flora and fauna present at the site. The survey area included all lands within the proposed development site boundary.

- Habitats were mapped according to the classification scheme outlined in the Heritage Council Publication A Guide to Habitats in Ireland (Fossitt, 2000) and following the guidelines contained in Best Practice Guidance for Habitat Survey and Mapping (Heritage Council, 2011). Habitats were cross referenced with Habitats Directive Annex I habitats.
- The botanical survey, including a survey for invasive species, was conducted in-parallel with the habitats survey (Wyse et al. 2016; Stace 2019);
- A general breeding bird survey was carried out (Gilbert et al. 1998 and Bibby et al. 2000) which aimed to capture a snapshot of breeding bird activity within the survey area. The survey focused on terrestrial habitats within the planning boundary. The site was walked so that all habitats within 50m of all potential nesting features were surveyed. The ornithological surveyor slowly walked through the site, stopping at regular intervals to scan with binoculars and to listen for bird calls or song. Birds were identified by sight and song. All species seen or heard in the survey area and immediate environs were recorded including those in flight. The surveys were made during favourable weather conditions.
- General mammal surveys were conducted in conjunction with habitat surveys. These surveys focused on protected mammal species (Wildlife Act 1976, as amended) in particular on Badger and Otter and identifying potential habitat for Bats (NRA 2005a, NRA 2005b, NRA 2005c, NRA 2008). The Otter survey methodology included searches for breeding or resting sites within 150m of the proposed development site boundary.
- Bat activity surveys (dusk) were conducted within the proposed development site under suitable weather conditions on the 27th August 2022. The surveys were carried out a minimum of 15 minutes before sunset (Collins 2016) using Batbox Duet. The objective was to assess bat usage of trees and habitats located within or in close proximity to the site boundary. The surveys also identified foraging and/or commuting routes within the proposed development site boundary (i.e., hedgerows/treelines, etc.).

- A preliminary roost assessment was carried at ground level on all trees earmarked for removal within the proposed development site as per Collins (2016). These assessments followed the guidelines set out in 'Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd ed)' (Collins, 2016).

- A Tree Survey was conducted in July 2023. The trees were described and recorded as either individual trees or groups. A Tree Constraint Plan was plotted directly onto a topographical site survey. It contains the positions and dimensions of all trees. The assessment followed the standards in BS 5837 (2012). The Tree Survey Report is in Appendix 8.1.

The surveys were carried out in accordance with best practice and in the expert opinion of the authors, are considered sufficient to assess potential significant ecological effects associated with the project. Prior to the survey a literature review was completed for reference to the site and locality, as were the listings of sites of conservation importance in the locality held by the NPWS of the Department of the Environment, Heritage and Local Government (www.npws.ie).

8.4.3 *Evaluation of Ecological Receptors*

The potential effects of the construction, operation and decommissioning (where relevant) stages of a proposed development on biodiversity include:

- Potential Effects on Habitats;
- Potential Effects on Mammals;
- Potential Effects on Birds;
- Potential Effects on Amphibians and Reptiles;
- Potential Effects on Other Species;
- Potential Effects from Non-native Invasive Species;
- Potential Effects on Water Quality and Aquatic Ecology, and
- Potential Effects from Air Emissions

8.4.4 *Magnitude of Impacts*

When describing changes/activities and impacts on ecosystem structure and function, the important elements to consider are positive/negative, extent, magnitude, duration, frequency and timing, and reversibility.

8.4.5 *Significance of Impacts*

The EPA Guidelines (2022) states that the significance of effects is usually understood to mean the importance of the outcome of the effects and is determined by a combination of objective (scientific) and subjective (social) concerns. The Guidelines note w*hile guidelines and standards help ensure consistency, the professional judgement of competent experts plays a role in the determination of significance. These experts may place different emphases on the factors involved. As this can lead to*

differences of opinion, the EIAR sets out the basis of these judgements so that the varying degrees of significance attributed to different factors can be understood".

With this in mind, the geographic frame of reference applied to determining impact significance by the NRA (2009) in Ireland and CIEEM (2019) in Ireland and the UK was used in this assessment in tandem with the EPA's qualitative significance criteria. Table 8.1 compares the qualitative versus geographic approaches to determining the significance of effects.

Table 8.1. Equating the Definitions of Significance of Effects Using a Geographic vs. Qualitative Scale of Reference

Geographic Scale of Significance **(NRA, 2009; CIEEM, 2019)**	**Qualitative Scale of Significance of Effects** **(EPA 2022)**
Negligible or Local Importance (Lower Value). No significant effects predicted to significant ecological features.	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.
Local Importance (Higher Value), County, National, Regional, or International.	Slight / Moderate / Significant / Very Significant / Profound i.e., effects can be slight, moderate, significant, very significant, or profound at Local scale, subject to the proportion of the local population/habitat area affected.

The geographic frame of reference is a 'good fit' for the assessments of biodiversity impacts because it allows clear judgements to be made about the scale of significance, with reference to published data for the population size of a given species at county, national and / or international scales or areas of habitats at such scales.

The proportion of a known feature impacted at county scale (i.e., 1% of the known or estimated population in a given county) is measurably different from that impacted at national scale (i.e., 1 % of the known or estimated national population).

A non-geographic qualitative approach can be a 'poor fit' to the assessment of biodiversity, since the definitions provided for the different qualitative terms do not relate to measurable units of space, such as a county or national boundary. For instance, a significant effect is defined by the EPA as "an effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment without affecting its sensitivities", while a very significant effect is that which "by its character, magnitude, duration or intensity significantly.

8.5 Proposed Development

Chapter 3 provides a detailed description of the proposed development. The elements relevant to Biodiversity include:

- Terrestrial habitat loss;
- Construction and operational stage disturbance (lighting, noise) to protected species inside and outside the site boundary;
- Construction and operational stage risks of contamination of surface water and potential impacts on designated sites of ecological importance.

8.6 Receiving Environment

8.6.1 European (Natura 2000) Sites

Special Areas of Conservation (SACs) and candidate SACs are protected under the Habitats Directive and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. Special Protection Areas (SPAs) are protected under the Birds Directive and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. Collectively, these sites are referred to as Natura 2000 or European sites.

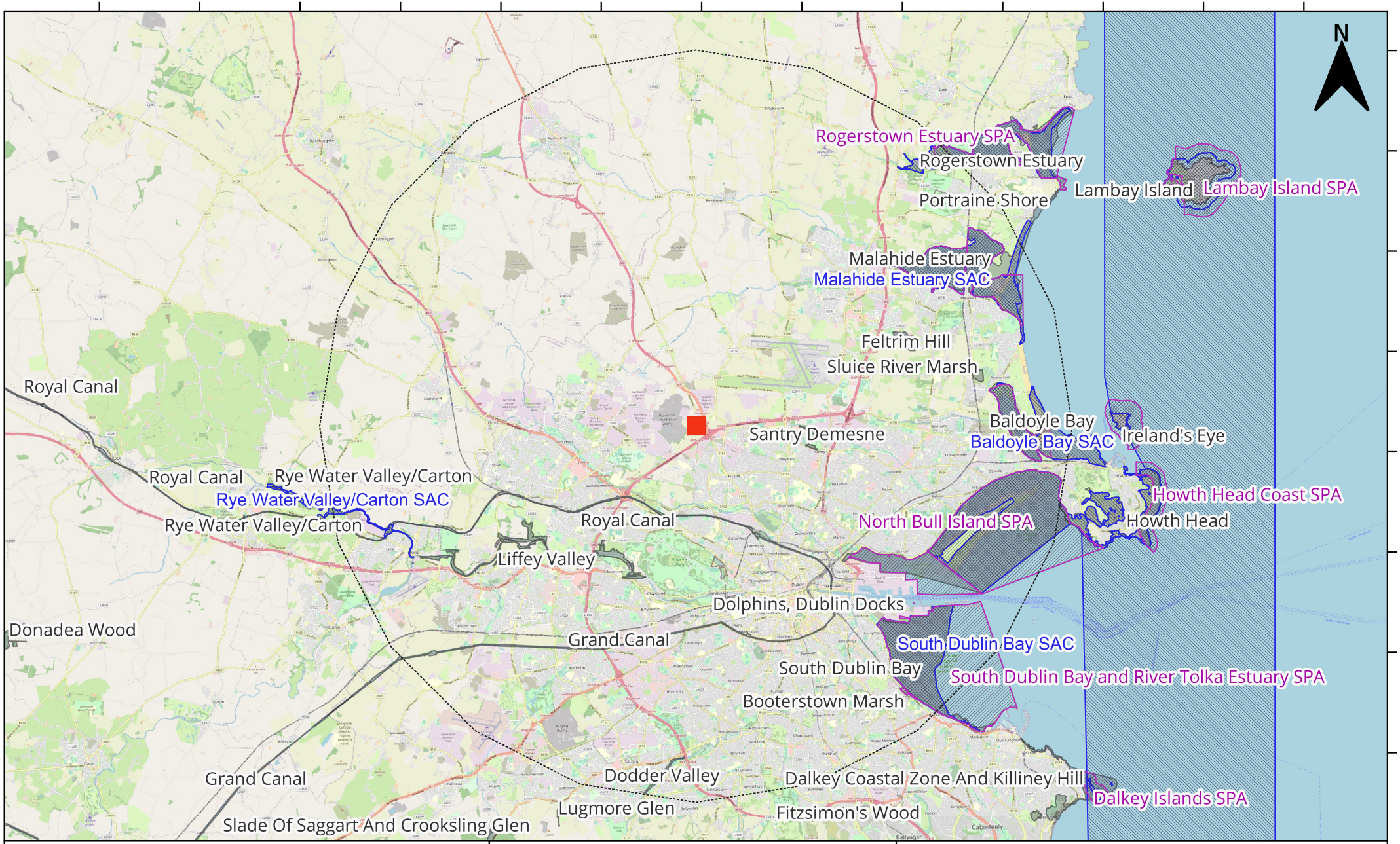
In accordance with the European Commission Methodological Guidance (EC 2018), a list of Natura 2000 Sites that can be potentially affected by the proposed project was complied. These are listed in Table 8.1 and their locations shown in Figure 8.1. Further information on these Natura 2000 is sites also provided below.

<u>South Dublin Bay and River Tolka Estuary SPA</u>

The South Dublin Bay and River Tolka Estuary SPA comprises a substantial part of Dublin Bay. It includes the intertidal area between the River Liffey and Dun Laoghaire, and the estuary of the River Tolka to the north of the River Liffey, as well as Booterstown Marsh. A portion of the shallow marine waters of the Bay is also included.

The site is a SPA under the EU Birds Directive, of special conservation interest for the following species: Light-bellied Brent Goose, Oystercatcher, Ringed Plover, Grey Plover, Knot, Sanderling, Dunlin, Bar-tailed Godwit, Redshank, Black-headed Gull, Roseate Tern, Common Tern and Arctic Tern.

The EU Birds Directive pays particular attention to wetlands and, as these form part of the SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds. South Dublin Bay is a significant site for wintering gulls, with a nationally important population of Black-headed Gull, but also Common Gull and Herring Gull. Mediterranean Gull is also recorded from here, occurring through much of the year, but especially in late winter/spring and again in late summer into winter.



Environmental Management for Business

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CLIENT: IRISH RECYCLING LTD

TITLE: DESIGNATED SITES

DETAILS

0 2,000 m

SPA | NHA | Site Location

SAC | pNHA | 15km buffer

FIGURE 8.1

This drawing is the property of O'Callaghan Moran & Associates and shall not be used, produced or disclosed to anyone without the prior written permission at O'Callaghan Moran & Associates and shall be returned upon request.

Table 8.1 **European Sites**

Site	Code	Qualifying Interests/Special Conservation Interests	Location & Distance
Special Protection Areas (SPA)			
South Dublin Bay and River Tolka Estuary SPA	004024	Birds A162 Redshank (*Tringa totanus*) A193 Common Tern (*Sterna hirundo*) A157 Bar-tailed Godwit (*Limosa lapponica*) A130 Oystercatcher (*Haematopus ostralegus*) A141 Grey Plover (Pluvialis squatarola) A149 Dunlin (Calidris alpina) A137 Ringed Plover (*Charadrius hiaticula*) A194 Arctic Tern (*Sterna paradisaea*) A192 Roseate Tern (*Sterna dougallii*) A143 Knot (Calidris canutus) A179 Black-headed Gull (Chroicocephalus ridibundus) A144 Sanderling (*Calidris alba*) A046 Light-bellied Brent Goose (*Branta bernicla* hrota) Habitats Wetlands	8.0 km southeast.

Site	Code	Qualifying Interests/Special Conservation Interests	Location & Distance
Malahide Estuary (Broadmeadown/Swords) SPA	004025	Birds A130 Oystercatcher (*Haematopus ostralegus*) A005 Great Crested Grebe (*Podiceps cristatus*) A162 Redshank (*Tringa totanus*) A067 Goldeneye (Bucephala clangula) A141 Grey Plover (Pluvialis squatarola) A149 Dunlin (Calidris alpina) A046 Light-bellied Brent Goose (*Branta bernicla hrota*) A054 Pintail (*Anas acuta*) A048 Shelduck (*Tadorna tadorna*) A069 Red-breasted Merganser (*Mergus serrator*) A143 Knot (Calidris canutus) A156 Black-tailed Godwit (*Limosa limosa*) A140 Golden Plover (*Pluvialis apricaria*) A157 Bar-tailed Godwit (*Limosa lapponica*) Habitats Wetlands	9.8 km northeast.

Site	Code	Qualifying Interests/Special Conservation Interests	Location & Distance
North Bull Island SPA	004006	Birds A179 Black-headed Gull (Chroicocephalus ridibundus) A048 Shelduck (*Tadorna tadorna*) A054 Pintail (*Anas acuta*) A160 Curlew (Numenius arquata) A157 Bar-tailed Godwit (*Limosa lapponica*) A046 Light-bellied Brent Goose (*Branta bernicla hrota*) A056 Shoveler (*Anas clypeata*) A169 Turnstone (Arenaria interpres) A141 Grey Plover (Pluvialis squatarola) A052 Teal (Anas crecca) A144 Sanderling (*Calidris alba*) A130 Oystercatcher (*Haematopus ostralegus*) A140 Golden Plover (*Pluvialis apricaria*) A149 Dunlin (Calidris alpina) A156 Black-tailed Godwit (*Limosa limo*sa) A162 Redshank (*Tringa totanus*) A143 Knot (Calidris canutus) Habitats Wetlands	10.5 km east. .

Site	Code	Qualifying Interests/Special Conservation Interests	Location & Distance
Baldoyle Bay SPA	004016	Birds A140 Golden Plover (*Pluvialis apricaria*) A137 Ringed Plover (*Charadrius hiaticula*) A048 Shelduck (*Tadorna tadorna*) A046 Light-bellied Brent Goose (*Branta bernicla* hrota) A157 Bar-tailed Godwit (*Limosa lapponica*) A141 Grey Plover (Pluvialis squatarola) Habitats Wetlands	11.7 km east.
Rogerstown Estuary SPA	004015	Birds A149 Dunlin (Calidris alpina) A046 Light-bellied Brent Goose (*Branta bernicla hrota*) A048 Shelduck (*Tadorna tadorna*) A137 Ringed Plover (*Charadrius hiaticula*) A141 Grey Plover (Pluvialis squatarola) A156 Black-tailed Godwit (*Limosa limosa*) A056 Shoveler (*Anas clypeata*)	14.2 km northeast.

Site	Code	Qualifying Interests/Special Conservation Interests	Location & Distance
		A043 Greylag Goose (*Anser anser*) A130 Oystercatcher (*Haematopus ostrale*gus) A162 Redshank (*Tringa totanus*) A143 Knot (Calidris canutus) Habitats Wetlands	
Malahide Estuary SAC	000205	Habitats 1140 Mudflats and sandflats not covered by seawater at low tide 1310 Salicornia and other annuals colonising 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)*	9.8 km northeast.

Site	Code	Qualifying Interests/Special Conservation Interests	Location & Distance
North Dublin Bay SAC	000210	Habitats 1140 Mudflats and sandflats not covered by seawater at low tide 1210 Annual vegetation of drift lines 1310 Salicornia and other annuals colonising mud and sand 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) 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 Species 1395 Petalwort (Petalophyllum ralfsii)	10.4 km southeast.
South Dublin Bay SAC	000206	Habitats 1140 Mudflats and sandflats not covered by seawater at low tide 1210 Annual vegetation of drift lines 1310 Salicornia and other annuals colonising mud and sand 2110 Embryonic shifting dunes	10.7 km east.

Site	Code	Qualifying Interests/Special Conservation Interests	Location & Distance
Baldoyle Bay SAC	000199	Habitats 1140 Mudflats and sandflats not covered by seawater at low tide 1310 Salicornia and other annuals colonising mud and sand 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) 1410 Mediterranean salt meadows (Juncetalia maritimi)	11.8 km east.
Rye Water Valley/Carton SAC	001398	Habitats 7220 Petrifying springs with tufa formation (Cratoneurion)* Species 1014 Narrow-mouthed Whorl Snail (Vertigo angustior) 1016 Desmoulins's Whorl Snail (Vertigo moulinsiana)	12.1 km southwest.
Rogerstown Estuary SAC	000208	Habitats 1130 Estuaries 1140 Mudflats and sandflats not covered by seawater at low tide 1310 Salicornia and other annuals colonising 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)*	13.1 km northeast.

North Bull Island SPA

North Bull Island SPA covers all of the inner part of north Dublin Bay, with the seaward boundary extending from the Bull Wall lighthouse across to Drumleck Point at Howth Head. The North Bull Island sand spit is a relatively recent depositional feature, formed as a result of improvements to Dublin Port during the 18th and 19th centuries. It is almost 5 km long and 1 km wide and runs parallel to the coast between Clontarf and Sutton. Part of the interior of the island has been converted to golf courses.

The site is of special conservation interest for the following species: Light-bellied Brent Goose, Shelduck, Teal, Pintail, Shoveler, Oystercatcher, Golden Plover, Grey Plover, Knot, Sanderling, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Turnstone and Black-headed Gull. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds.

The EU Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Baldoyle Bay SPA

Baldoyle Bay SPA, located to the north and east of Baldoyle and to the south of Portmarnock. The site is a relatively small, narrow estuary separated from the open sea by a large sand dune system. Two small rivers, the Mayne River and the Sluice River, flow into the inner part of the estuary.

The site is a special conservation interest for the following species: Light-bellied Brent Goose, Shelduck, Ringed Plover, Golden Plover, Grey Plover and Bar-tailed Godwit. The site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds. Regular breeding birds include Shelduck, Mallard and Ringed Plover. In Autumn, passage migrants such as Curlew Sandpiper, Spotted Redshank and Green Sandpiper are regular in small numbers. Little Egret, a species which has recently colonised Ireland, also occurs at this site.

Rogerstown Estuary SPA

Rogerstown Estuary SPA is situated about 2 km north of Donabate. It is a relatively small, funnel shaped estuary separated from the sea by a sand and shingle peninsula; the site extends eastwards to include an area of shallow marine water. The estuary receives the waters of the Ballyboghil and Ballough rivers and has a wide salinity range, from near full seawater to near full freshwater.

The site is of special conservation interest for the following species: Greylag Goose, Light-bellied Brent Goose, Shelduck, Shoveler, Oystercatcher, Ringed Plover, Grey Plover, Knot, Dunlin, Black-tailed Godwit and Redshank.

The site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds. Rogerstown Estuary SPA is an important link in the chain of estuaries on the east coast. It supports an internationally important population of Light-bellied Brent Goose and nationally important populations of a further 10 species. The presence of Little Egret and Golden Plover is of note, as these species are listed on Annex I of the EU Birds Directive. Rogerstown Estuary is also a Ramsar Convention site, and part of Rogerstown Estuary SPA is designated as a Statutory Nature Reserve and a Wildfowl Sanctuary.

North Dublin Bay SAC

North Dublin Bay SAC covers the inner part of north Dublin Bay, the seaward boundary extending from the Bull Wall lighthouse across to the Martello Tower at Howth Head. The North Bull Island is the focal point of this site. This site is an excellent example of a coastal site with all the main habitats represented. The site holds good examples of nine habitats that are listed on Annex I of the EU Habitats Directive; one of these is listed with priority status. Several of the wintering bird species have populations of international importance, while some of the invertebrates are of national importance. The site contains a numbers of rare and scarce plants including some which are legally protected. Its proximity to the capital city makes North Dublin Bay an excellent site for educational studies and research.

8.6.2 National Sites

Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) are national designations under the Wildlife Act 1976, as amended. A Natural Heritage Area (NHA) is designated for its wildlife value and receives statutory protection. These areas are considered nationally important for the habitats present or which holds species of plants and animals whose habitats needs protection. Under the Wildlife Amendment Act (2000), NHAs are legally protected from damage from the date they are formally proposed for designation.

Proposed Natural Heritage Areas (pNHA) were published on a non-statutory basis in 1995 and have not since been statutorily designated. These sites are also of significance for wildlife and habitats. Prior to statutory designation, pNHAs are still subject to limited protection, in the form of:

- Agri-environmental farm planning schemes support the objective of maintaining and enhancing the conservation status of pNHAs;
- There is a requirement for the Forest Service to gain NPWS approval before they will pay afforestation grants on pNHA lands; and,
- A recognition of the ecological value of pNHAs by Planning and Licencing Authorities.

The NHAs (pNHAs) located in the vicinity of the proposed development site are listed in Table 8.2 and are shown in Figure 8.1. The proposed development site is not located within any NHA or pNHA. There are a number of pNHAs in its vicinity. The closest pNHA is Santry Demesne pNHA, located 3.9km to the east. The Santry Demesne pNHA is a public park with associated house and gardens.

8.6.3 Important Bird Areas Dublin Bay and Baldoyle Bay

Important Bird and Biodiversity Areas (IBAs) are sites selected as important for bird conservation because they regularly hold significant populations of one or more globally or regionally threatened, endemic or congregator bird species or highly representative bird assemblages.

The European IBA Programme identifies, monitors and protects key sites for birds all over the continent. It aims to ensure that the conservation value of IBAs in Europe (now numbering more than 5,000 sites or about 40% of all IBAs identified globally to date) is maintained, and where possible enhanced. The Programme aims to guide the implementation of national conservation strategies, through the promotion and development of national protected areas to form a network of sites ensuring that migratory species find suitable breeding, stop-over and wintering places along their respective flyways.

Table 8.2 Natural Heritage Sites

Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs)	Site Code	Overlapping with European site	Location & Description
Santry Demesne pNHA	000178	No	3.9km east. Former demesne woodland which contains a protected plant species: Hairy St-John's Wort. .
Royal Canal pNHA	002103	No	3.4km south. Extensive freshwater feature of value to a range of biodiversity, and with value as an ecological corridor.
Sluice River Marsh pNHA	001763	No	4.0km east-northeast. Freshwater marsh
Liffey Valley pNHA	000128	No	5.8km southwest. Presence of legally protected plant species, hairy St. John's-wort *Hypericum hirsutum*, rare Red List plant species green figwort *Scrophularia umbrosa* and yellow archangel *Lamiastrum galeobdolon* and the diversity of habitat present.
Grand Canal pNHA	002104	No	8.7km south. Diversity of species canal supports and presence of legally protected plant species, opposite-leaved pondweed *Groenlandia densa*
Feltrim Hill pNHA	001208	No	8.9km northeast. Good example of knoll-reef phenomenon. Previously known to contain two rare plant species, namely spring squill Scilla verna and long-stalked crane's-bill *Geranium columbinum*

Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs)	Site Code	Overlapping with European site	Location & Description
South Dublin Bay pNHA	000210	South Dublin Bay SAC and South Dublin Bay and River Tolka Estuary SPA	10.7km southeast. See South Dublin Bay SAC above for description.
North Dublin Bay pNHA	000206	North Dublin Bay SAC and North Bull Island SPA	11.1km southeast. See North Dublin Bay SAC and North Bull Island SPA above for description. Potential source-pathway-receptor link has been identified (surface water run-off during construction and/or operational phases, and the spread of invasive species).
Malahide Estuary pNHA	000205	Malahide Estuary SPA/ Malahide Estuary (Broadmeadown/Swords) SPA	11.5km northeast. See Malahide Estuary SPA/ Malahide Estuary (Broadmeadown/Swords) SPA above for description. .
Baldoyle Bay pNHA	000199	Baldoyle Bay SAC/Baldoyle Bay SPA	11.9km east. See Baldoyle Bay SAC/Baldoyle Bay SPA above for description. .
Dodder Valley pNHA	000991	No	13.0km south .
Rogerstown Estuary pNHA	000208	Rogerstown Estuary SAC/Rogerstown Estuary SPA	13.8km northeast. See Rogerstown Estuary SAC/Rogerstown Estuary SPA for description. .

8.6.4 *Important Bird Areas Dublin Bay and Baldoyle Bay*

Important Bird and Biodiversity Areas (IBAs) are sites selected as important for bird conservation because they regularly hold significant populations of one or more globally or regionally threatened, endemic or congregator bird species or highly representative bird assemblages. The proposed development lies 10.7km from Dublin Bay (IE109) and 11.9km from Baldoyle Bay (IE112). These sites qualify for designation under the following IBA Criteria (2000):

- A4iii - The site is known or thought to hold, on a regular basis, ≥ 20,000 waterbirds or ≥ 10,000 pairs of seabird of one or more species.
- B1i - The site is known or thought to hold ≥ 1% of a flyway or other distinct population of a waterbird species.
- B2 - The site is one of the most important in the country for a species with an unfavourable conservation status in Europe and for which the site-protection approach is thought to be appropriate.
- C2. Concentrations of a species threatened at the European Union level. The site is known to regularly hold at least 1% of a flyway population or of the EU population of a species threatened at the EU level (listed on Annex I and referred to in Article 4.1 of the EC Birds Directive).
- C3 - The site is known to regularly hold at least 1% of a flyway population or of the EU population of a species threatened at the EU level (not listed on Annex 1 of The Birds Directive).
- C4 - The site is known to regularly hold at least 20,000 migratory waterbirds and/or 10,000 pairs of migratory species of one or more species.
- C6 - The site is one of the five most important in the European region in question for a species or subspecies considered threatened in the European Union.

Details of triggers species for Dublin Bay IBA and Baldoyle Bay IBA are listed in Table 8.3 and Table 8.4.

Table 8.3 Summary of the Dublin Bay IBA Trigger Species

Species	Current IUCN Red List Category	Season	Year(s) of estimate	Population estimate	IBA Criteria Triggered
Brent Goose *Branta bernicla*	NT	winter	2002-2006	2,730-5,290 individuals	B1i, B2, C3
Bar-tailed Godwit *Limosa lapponica*	NT	Winter	2002-2006	771-2,511 individuals	B1i, C2, C6
Black-tailed Godwit *Limosa*	NT	Winter	2002-2006	679-1,448 individuals	B1i, C3
Red Knot *Calidris canutus*	NT	Winter	2002-2006	2,506-5,375 individuals	B2
Common Tern *Sterna hirundo*	LC	Breeding	2008-2009	404-477 breeding pairs	C6
A4iii Species group – waterbirds	n/a	Winter	2002-2006	27,472-34,996 individuals	A4iii, C4

Table 8.4 Summary of the Baldoyle Bay IBA Trigger Species

Species	Current IUCN Red List Category	Season	Year(s) of estimate	Population estimate	IBA Criteria Triggered
Brent Goose *Branta bernicla*	NT	winter	2002-2006	668-908 individuals	B1i, B2, C3

8.6.5 RAMSAR Sites

The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides a framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. A key commitment of Ramsar Contracting Parties is to identify and place suitable wetlands onto the List of Wetlands of International Importance. There are a number of Ramsar sites around Dublin Bay i.e. North Bull Island, Sandymount Strand/Tolka Estuary, Baldoyle Bay and Rogerstown Estuary, which is a non-statutory designation.

8.6.6 Flora

The development site lies within Ordnance Survey National Grid 10km square O14. The National Biodiversity Data Centre (NBDC) online database provides data on the distribution of mammals, birds, and invertebrates within the 10km grid squares. The NBDC database lists one protected plant species within O14 i.e., Meadow Barley (*Hordeum secalinum*). This species is protected by the Flora (Protection) Order, 2022 (S.I. No. 235/2022). Blue Fleabane (*Erigeron acer*), Smooth Brome (*Bromus racemosus*) and Glebionis segetum, are endangered plant species that have also been recorded within O14.

The Flora (Protection) Order, 2022 (S.I. No. 235/2022) also gives legal protection to 65 species of bryophytes in the Republic of Ireland (25 liverworts and 40 mosses). No rare or threatened bryophyte species have been recorded in the vicinity of the proposed development site (NPWS map viewer).

Table 8.5 lists threatened species and their designations recorded within O14. No rare, threatened or legally protected plant species, as listed in the Irish Red Data Book (Wyse Jackson *et al* 2016; Curtis & McGough, 1988), were found within the site nor have they been recorded in the general area in the past.

Table 8.5. NBDC Listed Flowering and Endangered Flowering plants Grid Square O14

Flowering plant Species	Latin Name	Designations/Threatened Status
Blue Fleabane	*Erigeron acer*	Threatened Species: Least concern
Smooth Brome	*Bromus racemosus*	Threatened Species: Vulnerable
Meadow Barley	*Hordeum secalinum*	Flora Protection Order & Threatened Species: Endangered
	Glebionis segetum	Threatened Species: Near threatened

Source NBDC database 28/03/23

8.6.7 *Habitats*

Walk-over surveys were completed on the 4th of December 2020, 1st March, 2021 and the 27th of August 2022. The aim of the surveys was to provide information on habitats and species within the area of the proposed project and within the receiving environment.

An overview of habitats recorded within the proposed development site is provided in Figure 8.2 and these habitats are described in Table 8.6. Photographs of the site are also included below. The ecological value of habitats was defined using the classification scheme outlined in the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (National Roads Authority, 2009) (Appendix 8.2).

It should be noted that the value of a habitat is site specific and partially related to the amount of that habitat in the surrounding landscape. Habitats that are considered to be good examples of Annex I and Priority habitats are classed as being of International or National Importance. Semi-natural habitats with high biodiversity in a county context and that are vulnerable, are considered to be of County Importance. Habitats that are semi-natural, or locally important for wildlife, are considered to be of Local Importance (higher value) and sites containing small areas of semi-natural habitat or maintain connectivity between habitats are considered to be of Local Importance (lower value).

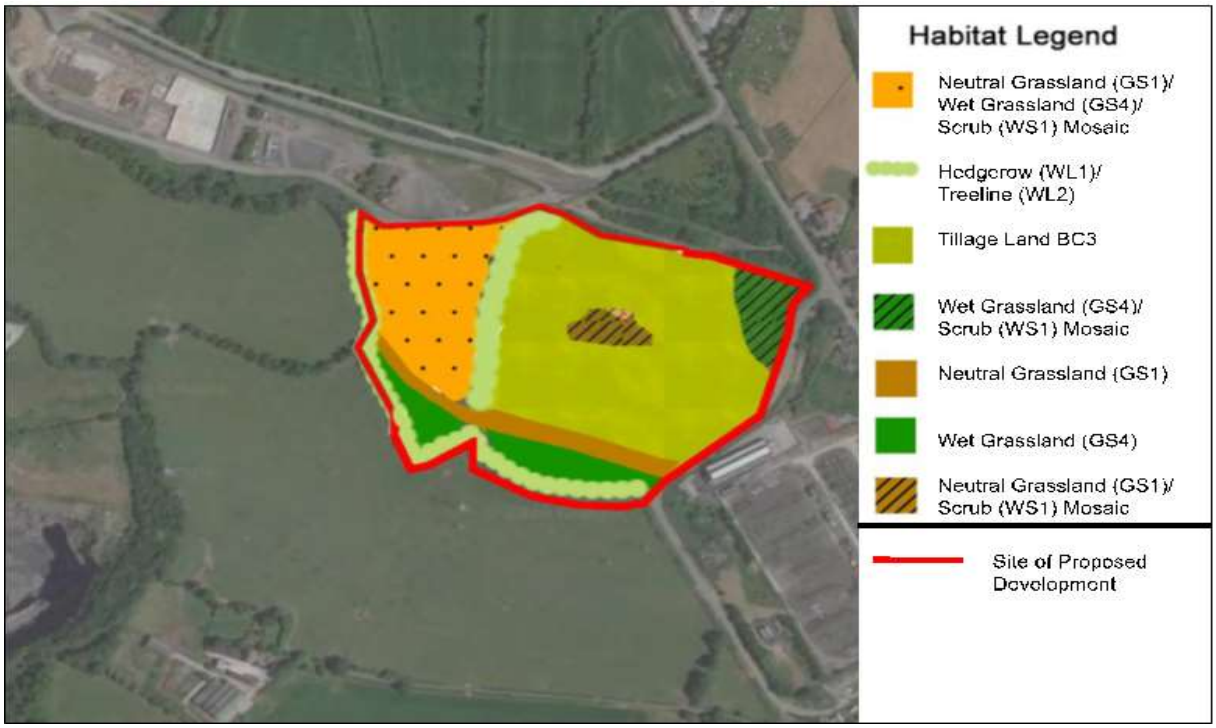


Figure 8.2 Habitats

The proposed development site contains two agricultural fields separated by an overgrown treeline. The site covers a mixture of flat to undulating land with a high point of c. 90m at an old sand pit/quarry (at the centre of the eastern field) to a low point of c. 80m along the southern site boundary. Soils are a mixture of dry minerals with sand from the old quarry site.

The larger eastern field was formerly used for tillage farming, but this area is no longer cultivated. The centre of this field was historically used as a sandpit and the dry mineral and sandy soils from this activity persist in the field. The smaller western field was formerly grazed, most likely by horses, but has been un-grazed for several years.

A mix of Hedgerow (WL1)/Treeline (WL2) occurs along the southern and western site boundaries of the site. The dominant species within this boundary habitat is Hawthorn (*Crataegus monogyna*), however Blackthorn (*Prunus spinosa*), Elm (*Ulmus sp*), Ash (*Fraxinus excelsior*), Great Willow (*Epilobium hirsutum*) and Downy Birch (*Betula pubescens*) are also present.

The internal Boundary has more species diversity than the external boundaries, including elm (Ulmus spp.), Ash (*Fraxinus excelsior*) and one Oak (*Quercus robur*). All hedges are in excess of 150 years old and are a higher value habitat at a local level. Both Elm disease (*Ophiostoma ulmi*) and ash dieback disease (*Hymenoscyphus fraxinus*) are present.

The larger eastern field is classified as Tilled land (BC3). This area was previously cropped for cereals but has not been actively farmed for tillage for several years. Ground at the centre of this field is slightly raised due to its previous use as a sand pit/quarry and supports a mosaic of Neutral Grassland (GS1)/Scrub (WS1). In the absence of active management, common ruderal species have become established i.e., Dandelion (Taraxacum *spp*.), Willowherb (*Epilobium spp*.), Creeping Thistle (*Circium arvense*) and ragworts (*Senecio* spp.). These species are of value for seed eating bird species such as Linnet (*Linaria cannabina*) which was recorded here.

Table 8.6. Habitats within the Proposed Development Site

Habitat Type	Habitat Description	Habitat value (NRA Guidelines)
Hedgerow (WL1)/Treeline (WL2)	A mix of Hedgerow (WL1)/Treeline (WL2) are located on the southern, western boundaries and on the internal boundary between the two fields. The dominant species is Hawthorn *Crataegus monogyna*, but Blackthorn *Prunus spinosa*, Elm *Ulmus spp*., Ash *Fraxinus excelsior,* and Downy Birch *Betula pubescens* were also noted. The boundary between the two fields is dominated by Ash and Elm.	Local importance (Higher Value).
Tilled Land (BC3)	The larger eastern field is classified as Tilled land (BC3). This area was previously cropped for cereals but has not been actively farmed for tillage for a few years. In the absence of active management, common ruderal species have become established i.e., Dandelion (*Taraxacum spp*.), Willow-herbs (*Epilobium* spp.) and ragworts (*Senecio* spp.). These species are of value for seed eating bird species such as Linnet (*Linaria cannabina*) which was recorded here.	Local importance (Lower value).
Wet Grassland (GS4)/Scrub (WS1)	A Wet Grassland (GS4)/Scrub (WS1) mosaic has become established on the boundary of the proposed development site. The best example of this habitat is located in the north-eastern corner of the site. This area has gleyed soil conditions and the waterlogging. Wet grassland (GS4) has links with Annex I: Wet grassland may contain examples of the annexed habitat, 'Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (6410)'. This is a poor example of wet grassland habitat and does not correspond to this Annex I habitat.	Local importance (Higher value)
Neutral Grassland (GS1)	On the western field where grazing has not taken place for 2-3 years, Wet Grassland (GS4) has formed a mosaic with Neutral Grassland (GS1). The area has reverted to rank grassland with encroachment from Scrub (WS1), in particular Hawthorn. A small manmade berm spans both fields near the southern boundary of the site and Neutral grassland (GS1) has established along its ridge. Neutral grassland (GS1) has Links with Annex I: Calcareous grasslands with either high numbers or diversity of orchids correspond to the priority habitat, 'semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (*important orchid sites) (6210)'. Grassland with scattered Juniper (*Juniperus communis*) could also be included in the Annex I category, 'Juniperus communis formations on heaths or calcareous grasslands (5130)'. The habitats recorded on site do not correspond to these Annex I habitats.	Local importance (Higher value)

Habitat Type	Habitat Description	Habitat value (NRA Guidelines)
Neutral Grassland (GS1)/Scrub (WS1) Mosaic	Ground at the centre of this field is slightly raised due to its previous use as a sand pit/quarry and supports a Neutral Grassland (GS1)/Scrub (WS1) habitat mosaic. Neutral Grassland (GS1) has links with Annex I: Calcareous grasslands with either high numbers or diversity of orchids correspond to the priority habitat, 'semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (*important orchid sites) (6210)'. Grassland with scattered Juniper (*Juniperus communis*) could also be included in the Annex I category, 'Juniperus communis formations on heaths or calcareous grasslands (5130)'. The habitats recorded on site do not correspond to these Annex I habitats.	Local importance (Higher value)

A Wet Grassland (GS4)/Scrub (WS1) mosaic has become established on the boundary of the proposed development site. Scrub species such as Great Willow, Blackthorn and Hawthorn are spreading inwards from the boundary hedgerows. The best example of this habitat is located in the north-eastern corner of the site, where gleyed soil conditions and the waterlogging has allowed species such as Hard Rush (*Juncus inflexus*) and Canary Grass (*Phalaris arundinacea*) to grow. Other wet grassland species recorded within the proposed development site include Meadowsweet (*Filipendula ulmaria*), Marsh Thistle (*Cirsium palustre*) and Silverweed (*Potentilla anserina*).

In the western field where grazing has not taken place for 2-3 years, Wet Grassland (GS4) has formed a mosaic with Neutral Grassland (GS1). The area has reverted to rank grassland with encroachment from Scrub (WS1) in particular hawthorn. Buddleia (*Buddleia davidii*) was also recorded within this area.

A small manmade berm spans both fields near the southern boundary of the site and Neutral grassland (GS1) has established along its ridge. Species recorded within neutral grassland habitat include Meadow Vetchling (*Lathyrus pratensis*), Cow Parsley (*Anthriscus sylvestris*) and coarse grasses such as False Oat Grass (*Arrhenatherum elatius*) and Cocksfoot (*Dactylis glomerata*). Rosebay Willowherb (*Chamaenerion angustifolium*) was growing in thick patches during the August survey, and Creeping Cinquefoil (*Potentilla reptans*), Common Fleabane (*Pulicaria dysenterica*) and Tufted Vetch (*Vicia cracca*) were locally common. There are no watercourses within the proposed development site.



Photograph 8.1. Treeline between eastern and western field



Photograph 8.2. Eastern Field: Entrance at north showing tillage land, neutral grassland and scrub in background.



Photograph 8.3. Western field: Rank grassland-wet and dry, with scrub



Photograph 8.4. Treeline between eastern and western field



Photograph 8.5. Eastern Field: Neutral grassland and scrub at the south of tillage land



Photograph 8.6. Western field: Rank grassland-wet and dry, with scrub

8.6.8 Invasive Species

Non-native plants are defined as those plants which have been introduced outside of their native range by humans and their activities, either purposefully or accidentally. Invasive non-native species are so-called as they typically display one or more of the following characteristics or features:

- Prolific reproduction through seed dispersal and/or re-growth from plant fragments;
- Rapid growth patterns; and
- Resistance to standard weed control methods.

Where a non-native species displays invasive qualities and is not managed it can potentially:

- Out compete native vegetation, affecting plant community structure and habitat for wildlife;
- Cause damage to infrastructure including road carriageways, footpaths, walls and foundations; and,
- Have an adverse effect on landscape quality.

The NBDC lists a number of high impact invasive species that have been recorded within O14 (Table 8.7).

Table 8.7. NBDC List of High Impact Invasive Species in O14

Species name	Species group
Ruddy Duck (*Oxyura jamaicensis*)	bird
Arthurdendyus triangulatus	flatworm (Turbellaria)
Cherry Laurel (*Prunus laurocerasus*)	flowering plant
Common Cord-grass (*Spartina anglica*)	flowering plant
Giant Hogweed (*Heracleum mantegazzianum*)	flowering plant
Japanese Knotweed (*Fallopia japonica*)	flowering plant
Eastern Grey Squirrel (*Sciurus carolinensis*)	terrestrial mammal
American Mink (*Mustela vison*)	terrestrial mammal
Brown Rat (*Rattus norvegicus*)	terrestrial mammal

Source NBDC 28/03/23

Section 49(2)The Birds and Natural Habitats Regulations 2011 (SI 477 of 2011 prohibits the introduction and dispersal of species listed in the Third Schedule, which includes Japanese Knotweed *Fallopia japonica*, as follows: "*any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow [….] shall be guilty of an offence*."

No Third Schedule invasive species or species which are at risk of having damaging effects (Kelly *et al* 2013), were recorded within the proposed development site.

The medium impact invasive species, as classified by the NDBC, Buddleia (*Buddleia davidii*) was recorded within the western field. This species is listed on the Invasive Species Ireland *"Amber List: Recorded Species"* (which under the right conditions could represent a significant impact on native species or habitats).

Buddleia is also included in the *NRA Guidelines on the Management of Noxious Weeds and Non-native Species on National Roads* (NRA, 2010) as these species have been shown to have an adverse impact on landscape quality, native biodiversity or infrastructure. This species is not in the Third Schedule of the Birds and Natural Habitats Regulations 2011 (SI 477 of 2011). Therefore, its presence at the site does not have the potential to lead to an offence under the Birds and Natural Habitats Regulations 2011 (SI 477 of 2011).

8.6.9 Fauna

8.6.9.1 Bats

In Ireland, nine species of bat are currently known to be resident with the residency of the tenth recorded species yet to be proven. These are classified into two Families: the Rhinolophidae (Horseshoe bats) and the Vespertilionidae (Common bats). The lesser horseshoe bat *Rhinolophus hipposideros* is the only representative of the former Family in Ireland. All the other Irish bat species are of the latter Family and these include three pipistrelle species: common *Pipistrellus pipistrellus*,

soprano *P. pygmaeus* and Nathusius' *P. nathusii*, four *Myotids*: Natterer's *Myotis nattereri*, Daubenton's *M. daubentonii*, whiskered *M. mystacinus*, Brandt's *M. brandtii*, the brown long-eared *Plecotus auritus* and Leisler's *Nyctalus leisleri* bats.

Whiskered and Natterer's bats are listed as '*Threatened in Ireland*', while the other species are listed as '*Internationally Important'* in the Irish Red Data Book 2: Vertebrates (Whilde, 1993). The population status of both Whiskered and Natterer's bats was considered '*indeterminate*' because of the small numbers known of each, a few hundred and approximately a thousand respectively. Ireland is considered to be an international stronghold for Leisler's bat, whose global status is described as being at '*low risk, near threatened*' (LR; nt) by the IUCN (Hutson, *et al*., 2001).

Near threatened status is applied to those taxa that are close to being listed as vulnerable (facing a high risk of extinction in the wild in the medium-term future on the basis of a range of criteria defined by the IUCN). The Irish population of the Lesser Horseshoe Bat is estimated at 14,000 individuals and is considered of International Importance because it has declined dramatically and become extinct in many other parts of Europe. Data collected shows that the species increased significantly between from the early 1990's to present.

A review of existing bat records within O14 identified that six Irish bat species have been recorded (Table 8.8). It is noted that other species which have not been included within this database are also likely to occur. Lesser horseshoe bat is the only species of bat listed on Annex II of the Habitats Directive (Directive 92/43/EEC) and this species does not occur in this area. While the remaining Irish bat species; Nathusius' pipistrelle and Brandt's bats have not been recorded in the local area to date, Whiskered Bats could occur as this species is widespread in the Irish countryside. Nathusius' pipistrelle and Brandt's bat, are rarer Irish species, which are less likely to occur.

Table 8.8. Presence of Irish Bat Species within Grid Square O14

Common name	Scientific name	Presence
Lesser Noctule	*Nyctalus leisleri*	Present
Pipistrelle	*Pipistrellus pipistrellus sensu lato*	Present
Soprano Pipistrelle	*Pipistrellus pygmaeus*	Present
Daubenton's Bat	*Myotis daubentonii*	Present
Natterer's Bat	*Myotis nattereri*	Present
Brown Long-eared Bat	*Plecotus auritus*	Present
Whiskered Bat	*Myotis mystacinus*	Absent
Lesser Horseshoe	*Rhinolophus hipposideros*	Absent
Nathusius's Pipistrelle	*Pipistrellus nathusii*	Absent

Source NBDC 28/03/23

All bat species are protected under the Wildlife Acts (1976 & 2000) which make it an offence to wilfully interfere with or destroy the breeding or resting place of all species; however, the Acts permit limited exemptions for certain kinds of development. All species of bats in Ireland are listed in Schedule 5 of the 1976 Act and are therefore subject to the provisions of Section 23 which make it an offence to:

- Intentionally kill, injure or take a bat;
- Possess or control any live or dead specimen or anything derived from a bat;
- Wilfully interfere with any structure or place used for breeding or resting by a bat; or
- Wilfully interfere with a bat while it is occupying a structure or place which it uses for that purpose.

All bats are listed in Annex IV of the EU Habitats Directive. The domestic legislation that implements this Directive gives strict protection to individual bats and their breeding and resting places. It should also be noted that any works interfering with bats and especially their roosts, including for instance, the installation of lighting in the vicinity of the latter, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997, (which transposed the EU Habitats Directive into Irish law) issued by NPWS.

Furthermore, the European Communities (Birds and Natural Habitats) Regulations 2011 require the protection of the Irish bat fauna and specify derogation licensing requirements. Table 8.9 summarises the protection given to bats by national and international legislation and conventions.

Table 8.9. Legislative Protection for Bats in Ireland

Legislation/Convention	Relevance to Irish bats
Irish Wildlife Act (1976) & Irish Wildlife (Amendment) Act 2000.	It is an offence to wilfully interfere with or destroy the breeding or resting place of bats, (with some exemptions for certain kinds of construction development). Provides for the creation of NHAs.
EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (Directive 92/43/EEC), commonly known as the 'Habitats Directive	Lists all the vesper bats in Annex IV as in need of strict protection and also encourages Member States to conserve landscape features such as river corridors, field boundaries, ponds and woodlands. It also requests that Member States establish a system to monitor the incidental capture and killing of the animals listed in Annex IV. The lesser horseshoe bat is further listed in Annex II of the EU Habitats Directive The level of protection offered to lesser horseshoe bats effectively means that areas important for this species are designated as Special Areas of Conservation.
The Convention on the Conservation of European Wildlife and Natural Habitats, commonly known as the 'Berne Convention'.	It obliges states to protect and conserve animals and their habitats, especially those listed as endangered or vulnerable. Also obliges parties to promote national policies for the conservation of wild fauna and natural habitats
The Convention on the Conservation of Migratory Species of Wild Animals, commonly known as the 'Bonn Convention'.	This led to the European Bats Agreement (EUROBATS), which lists a wide range of objectives, including promoting research programmes relating to the conservation and management of bats, promoting bat conservation and public awareness of bats, and identifying and protecting important feeding areas of bats from damage and disturbance.

A study by Lundy *et al.* (2011) examined the relative importance of landscape and habitat associations across Ireland. Maximum Entropy Models (MEM) were constructed for each bat species using records from the National Bat Database from 2000-2009. This method allows species' records that have not been collected in a systematic survey to be analysed. The results help explain patterns of species' occurrence and predict where species might occur. Landcover (CORINE), topography, climate, soil pH, riparian habitat and human bias factors were incorporated into the models.

The analyses provide a picture of the broad scale geographic patterns of occurrence and local roosting habitat requirements for Irish bat species and also provides a 'Habitat Suitability' Index. The Index ranges from 0 to 100, with 0 being least favourable and 100 most favourable for bats. The habitat indices for all Irish bats for the landscape within the vicinity of the proposed development site are in Table 8.10. The indices indicate that the proposed development site is of low to moderate value for bat species.

Table 8.10. Predicted Habitat Suitability Indices at the Proposed Development Site

Bat species	Common Name	Habitat indices
All Bats		24.67
Pipistrellus pygmaeus	Soprano pipistrelle	35
Plecotus auratus	Brown long-eared bat	34
Pipistrellus pipistrellus	Common pipistrelle	39
Rhinolophus hipposideros	Lesser horseshoe	0
Nyctalus leisleri	Leisler's bat	38
Myotis mystacinus	Whiskered bat	27
Myotis daubentoniid	Daubenton's bat	19
Pipistrellus nathusii	Nathusius' pipistrelle	5
Myotis nattereri	Natterer's bat	25

Source: NBDC 28/03/23

Evidence of bat activity associated with potential roost sites includes bat droppings, urine staining, feeding remains and dead/alive bats. Indicators that potential roost locations and access points are likely to be inactive include the presence of cobwebs and general detritus within the apertures. Potential roost features associated with trees include cracks, crevices, loose bark, woodpecker holes and splits. Evidence indicating bat presence includes dark stains running below holes or cracks, bat droppings, odours, or scratch marks.

Bats generally make use of large mature trees that contain natural holes, cracks/splits in major limbs, loose bark, hollows/cavities, dense epicormic growth (bats may roost within it) and bird and bat boxes. The importance of trees to bats varies with species, season and foraging behaviour. For Leisler's bats, trees are essential for both summer and winter roosts while Daubenton's and Natterer's bats utilise trees more often during the summer months. Other species such as brown long-eared bats and pipistrelle bats avail of trees in the winter months.

In general, individual males throughout the season use tree roosts, more often, while females will use trees for temporary night roosts or night perches for consuming prey. Hollow trees are widely used by bats for both summer and winter roosts (weather dependent) and bats will roost in 'sound' trees in crevices, holes and under split bark. Bats rest, give birth, raise young and hibernate in tree holes, crevices and beneath loose bark.

Tree species use by bats include Oak, Ash, Beech and Scot's pine. Trees, especially native ones also play host to numerous insect species which are prey items for bat species and also provide shelter for swarming insects which bats will avail of. In addition, trees are important commuting routes for bats. A gap in a hedge/treeline of greater than 10m may force some species of bats to seek an alternative commuting route.

Lighting deters some bat species from foraging. Studies have shown that illumination levels as low as 0.06 lux can effect on the behaviour of bats. Even a full moon night (0.02 lux) can reduce bat activity to more sheltered, darker wildlife corridors and foraging areas (e.g., woodlands). The slower flying broad-winged species (Natterer's bats, Daubenton's bats, whiskered bats, Brandt's bats, lesser horseshoe bats and brown long-eared bats) are known to avoid street lights.

In a study of a roost in Suffolk, UK, the numbers of Natterer's Bats also often use features such as hedgerows, treelines, woodland edges and waterways as commuting pathways between roosts and foraging areas. Sheltering vegetation, such as treelines and woodland, not only acts as cover from potential predators and the weather, but also provides structure for acoustic orientation and navigation. Sheltered areas also allow insects to gather and therefore support bat foraging.

Linear features within the proposed development site including treelines and hedgerows, have the potential to link roost sites to foraging areas and facilitate the dispersal of bats into the wider landscape. Areas of grassland with hedgerows and treelines, within and outside the proposed development site, have the potential to provide feeding habitat.

A bat survey was carried out on 27th August 2022 to determine if bats were roosting in the trees within the site boundaries, and whether the trees and hedgerows within the site boundary were used by foraging/commuting bats. A visual assessment was carried out to identify, from ground level in daylight, any potential roost features (PRF) that had suitability to support roosting bats.

The ash trees within the internal boundary which will be remove are considered of low potential value for bats with no obvious cavities. The Elm are not sufficient size to be of value for bats. Overall, the trees within the internal boundary were considered to be of low potential value for bats, with no obvious cavities and no obvious PRFs. Therefore the trees are considered of low to suitability as bat roosts under the guidelines set out in '*Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn*)' (Collins 2016).

A bat activity survey was also carried out on 27th August 2022 to assess potential bat usage more accurately. The survey was carried out using a Batbox Duet bat detector. This survey followed the guidelines set out in '*Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn*)' (Collins 2016). The survey commenced at 19.48 and sunset was at 20.28.

Weather conditions were suitable with bright, dry conditions and suitable temperatures (>11°C). Transects were walked several times during the survey, including the western treeline (A), the central treeline (B) and the southern treeline (C) (Figure 8.3). No signals or sightings were obtained at transect A or transect C. Signals were occasional during the survey period (Table 8.11).

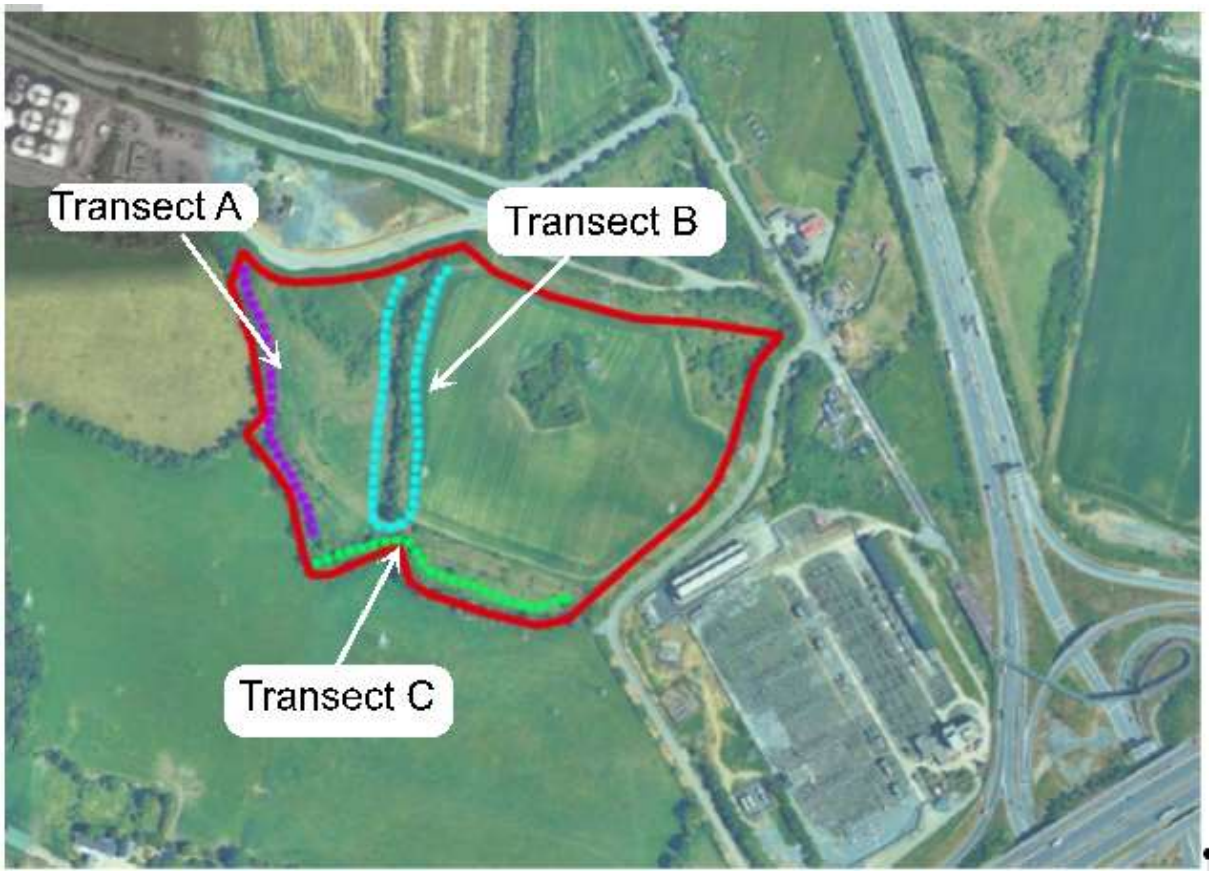


Figure 8.3 Transects Walked During Bat Survey

Table 8.11. Bat Survey Data For 27/08/22

Transect	Time	Bat species	Count/Behaviour/Height/Pattern	LAND TYPE
B	21.00	Common Pipistrelle	1/flying/5m/following treeline	Treeline
B	21.18	Leisler's	2/flying/15m/following treeline	Treeline
B	21.45	Common Pipistrelle	1/flying/6m/following treeline	Treeline
B	22.04	Common Pipistrelle	2/flying/6m/following treeline	Treeline

The results are indicative of some limited foraging in the general area. Common Pipistrelle was detected on three occasions, at the same location on Transect B, likely the same individual. One Leisler's Bat was detected on Transect B also at its north end. No bats were seen emerging from trees and as noted above, no suitable roosting habitat was recorded in the visual survey.

The survey indicates that low numbers of individual bats were using the hedgerows for foraging, perhaps 1-2 common pipistrelles and 1 Leisler's Bat for commuting. However, the trees on site, as part of a connecting corridor with the wider landscape, could provide a foraging and commuting corridor of local importance for bats. It is noted that a lack of lighting from the surrounding sites may make the area suitable for bat activity.

Overall, the habitats within the planning boundary are of low to moderate value for foraging bats and the linear features, i.e., treelines and hedgerows, provide moderate bat foraging habitat. Agricultural grassland and tillage areas provide low value habitat.

8.6.9.2 Otter

Otters, along with their breeding and resting places are protected under the provisions of the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act, 2000. Otters have additional protection because of their inclusion in Annex II and Annex IV of the Habitats Direct which is transposed into Irish law in the European Communities (Natural Habitats) Regulations (S.I 94 of 1997), as amended. Otters are also listed as requiring strict protection in Appendix II of the Berne Convention on the Conservation of European Wildlife and Natural Habitats and are included in the Convention on International Trade of Endangered species (CITES).

Although rare in parts of Europe they are widely distributed in the Irish countryside in both marine and freshwater habitats. Otters are solitary and nocturnal and as such are rarely seen. Thus, surveys for Otters rely on detecting signs of their presence. These include spraints (faeces), anal gland secretions, paths, slides, footprints and remains of prey items. Spraints are of value as they are used as territorial markers and are often found on prominent locations such as grass tussocks, stream junctions and under bridges. In addition, they are relatively straightforward to identify.

Otters occasionally dig out their own burrows but generally they make use of existing cavities as resting placing or for breeding sites. Suitable locations include eroded riverbanks, under trees along rivers,

under fallen trees, within rock piles or in dry drainage pipes or culverts etc. If ground conditions are suitable the holt may consist of a complex tunnel and chamber system. Otters often lie out above ground especially within reed beds where depressions in the vegetation called “couches” are formed.

Generally, holts or resting areas can be located by detecting signs such as spraints or tracks. Each Otter holds a territory with as many as 30-40 resting places and each Otter can have a large home range, the actual size of which can vary depending on the quality of habitat, availability of food, and competition from neighbouring Otters. Not all resting places will be actively used.

Natal holts which are used by breeding females can be extremely difficult to locate. They are often located a considerable distance from any aquatic habitats and Otters may also use habitats adjoining small streams with minimal or no fish populations. In addition, natal holts are usually carefully hidden and without obvious sprainting sites. Otters do not have a well-defined breeding season.

It is noted that Otters are largely nocturnal, particularly in areas subject to high levels of disturbance as evidenced by the presence of Otters in the centre of Cork and Limerick City. Thus, Otters can adapt to increased noise and activity levels; however, breeding holts are generally located in areas where disturbance is lower.

A review of existing records within a 10km radius of the proposed development site (grid square O14) showed that Otter or signs of Otter have been recorded on 14 occasions, the most recent being in May 2015 (Source NBDC 28/03/23).

While Otters are known to occur within the vicinity, no signs of Otter (i.e. spraints, track, holts couches, feeding signs etc.) were recorded during the site surveys. There are no watercourses located within the proposed development site and the closest watercourse is Huntstown Stream which is located approximately 970m north of the site. Other streams in the vicinity include the Abbotstown Stream 1.5km west and Bachelor’s Stream 1.6km southeast.

Wet grassland habitat at the site could potentially provide habitat for Common Frog, although given the small areas of habitat present and the absence of waterbodies, this is not unlikely to be a valuable foraging area for Otter. Given the lack of watercourses onsite and the level of road traffic in the vicinity, the proposed development site does not provide critical resources for this species and is of negligible value for Otter.

8.6.9.3 Other terrestrial mammals

Fourteen other species of terrestrial mammal have been recorded within grid square O14. Seven of which are protected under the Irish Wildlife Act; namely Badger (*Meles mele*s), Pygmy Shrew (*Sorex minutus*), Red Squirrel (Sciurus vulgaris), Hedgehog (*Erinaceus europaeus*), Irish Hare (*Lepus timidus hibernicus*), Irish Stoat (*Mustela erminea hibernica*) and Pine Marten (*Martes martes*).

Badger

Badger setts are protected under the provisions of the Wildlife Act 1976, as amended, and it is an offence to intentionally, knowingly or unknowingly kill or injure a protected species, or to wilfully interfere with or destroy the breeding site or resting place of a protected wild animal. Badger setts are formed by a complex group of interlinked tunnels, and therefore works in proximity to setts can potentially cause damage to a protected species. Badgers are also protected under Appendix III of the Berne. No signs of Badger, were recorded during site surveys.

Hedgehog

Hedgehog is listed in Appendix III of the Berne Convention and can be found throughout Ireland, with male hedgehogs having an annual range of around 56 hectares. Due to the habitats recorded within the proposed development site and surrounding landscape, Hedgehog are likely to occur.

Irish Stoat

Irish stoats occur in most habitats with sufficient cover, including urban areas. Stoat could potentially occur within the proposed development site given there is suitable habitat for prey species.

Red Squirrel

Red Squirrel is listed in Appendix III of the Berne Convention and can be found throughout Ireland. Red Squirrel is known to occur in the wider area (NBDC records), however there is no suitable habitat for Red Squirrel within the proposed development site.

Irish Hare

Irish Hare is listed in Appendix III of the Berne Convention, Annex V(a) of the EC Habitats Directive (92/43/EEC) and as an internationally important species in the Irish Red Data Book. The Irish hare is adaptable and lives in a wide variety of habitats. It typically reaches its highest densities on farmland, particularly where there is a mix of grassland and arable fields along with hedgerows and other cover. Hare could potentially occur within the proposed development site.

Pygmy Shrew

Pygmy Shrew is common throughout mainland Ireland and has a preference for habitats such as hedgerows and grasslands; they have also been found utilizing stone walls. Pygmy Shrew could potentially occur within the proposed development site.

Pine Marten

Pine Marten are habitat specialists, requiring forest or scrub habitat to exist in an area. They are adept at climbing trees as they have powerful non-retractable claws. The species is primarily active at night and individuals live in territories that can vary in size from 50 hectares to 400 hectares. Males typically have bigger territories than females and there can be partial overlap between adjacent territories. There are no records of pine marten in the vicinity of the proposed development site and given the lack of suitable habitat onsite they are unlikely to occur.

8.6.9.4 Amphibians and Reptiles

According to records held by the NBDC the amphibian species Common Frog (*Rana temporaria*) and Smooth Newt (*Lissotriton vulgaris*) have been recorded in Grid Square O14. Common Frog is listed in Annex V of the EU Habitats Directive and is protected under the Wildlife Acts. The species was not recorded during the site visit. The wet grassland and waterlogged areas of the proposed development site could potentially provide habitat for adult frogs, but there is no breeding habitat within the site.

The Smooth Newt is the only member of the Urodela (the tailed amphibians) found in Ireland. While commonly encountered near water bodies, adult newts are actually terrestrial, only returning to water bodies to breed. There are no suitable habitats for Smooth Newt within the proposed development site.

Two species of reptile have been recorded within O14 Red-eared Terrapin (*Trachemys scripta*) and Yellow-bellied Slider (*Trachemys scripta scripta*). Both are non-native species which will not occur within the proposed development site. No valuable habitats for reptiles were recorded within the proposed development site.

8.6.9.5 Birds

The NBDC online lists 15 Annex I Bird species which have been recorded within O14, namely Little Egret (*Egretta garzetta*), Little Gull (*Larus minutus*), Peregrine Falcon (*Falco peregrinus*), Golden Plover (*Pluvialis apricaria*), Bar-tailed Godwit *(Limosa lapponica*), Common Kingfisher (*Alcedo atthis*), Common Tern *(Sterna hirundo*), Corn Crake (*Crex crex*), Dunlin (*Calidris alpina*), Hen Harrier (*Circus cyaneus*), Mediterranean Gull (*Larus melanocephalus*), Ruff (*Philomachus pugnax*), Short-eared Owl (*Asio flammeus*), Snowy Owl (*Bubo scandiaca*) and Whooper Swan (*Cygnus cygnus*). The habitats within the proposed development site do not represent critical foraging or breeding habitat for these Annex I birds.

Bird surveys were carried out in conjunction with the habitat survey during 4th of December 2020, 1st March, 2021 and the 27th of August 2022. During the surveys, all birds seen or heard within the proposed development site or utilising habitats in proximity to it, were recorded.

Birds species listed in Annex I of the Birds Directive are considered a conservation priority. Certain bird species are listed by BirdWatch Ireland as Birds of Conservation Concern in Ireland (BOCCI). These are bird species suffering declines in population size.

BirdWatch Ireland and the Royal Society for the Protection of Birds have identified and classified these species by the rate of decline into Red and Amber lists (Gilbert et al. 2021). Red List bird species are of high conservation concern and the Amber List species are of medium conservation. Green listed species are regularly occurring bird species whose conservation status is currently considered favourable. Birds species listed in Annex I of the Birds Directive (2009/147/EC) are considered a conservation priority. Species recorded within the site are shown in Table 8.12.

Terrestrial habitats within the proposed development site are of local value for terrestrial bird species that are relatively common in the Irish countryside. Vegetation within the fallow lands, particularly the early successional, seed producing species, provides some feeding/nesting resources for birds. Two RedList bird species i.e. Meadow Pipit and Snipe, were recorded within grassland habitats.

The rank grassland within the site is generally not suitable for wading birds, as they find it difficult to move around and feed in such habitats (Chapman 2017). The overgrown grassland at the site do not provide suitable habitat for foraging or roosting wading birds or waterfowl. However Snipe will use rank grasslands and were recorded within the proposed development site. Meadow Pipit were also recorded within these habitats.

Both species are probable breeders at the site. Snipe and Meadow Pipit are a ground nesting species which makes them particularly vulnerable to disturbance and egg damage during the breeding season. Intensification of agriculture and the loss of suitable grassland habitats is a significant threat to grassland nesting species such as Snipe and Meadow Pipit.

Two Amber Listed species were also recorded within the proposed development site i.e., Linnet and Swallow. Linnet are probable breeders at the site, foraging on early successional plant species within semi-natural grassland and scrub habitats. Swallows were recorded foraging at the site.

Table 8.12. Bird Species Recorded in the Site Surveys

Species		Birds Directive Annex I	BOCCI	
			Red List	Amber List
Turdus merula	Blackbird			
Corvus cornix	Hooded Crow			
Erithacus rubecula	Robin			
Carduelis cannabina	Linnet			X
Gallinago	Snipe		X	
Turdus philomelos	Song thrush			
Cyanistes caeruleus	Blue tit			
Troglodytes troglodytes	Wren			
Corvus frugilegus	Rook			
Columba palumbus	Woodpigeon			
Parus major	Great Tit			
Prunella modularis	Dunnock			
Anthus pratensis	Meadow Pipit		x	
Buteo buteo	Buzzard			
Hirundo rustica	Swallow			X
Sylvia atricapilla	Blackcap			
Carduelis carduelis	Goldfinch			

Mature trees and areas of scrub at the site are likely to provide valuable nesting habitat for birds. A well-managed, mature, hedgerow provides a range of habitats for invertebrates, birds and mammals. Old hedgerow trees are often the most valuable because their many branches, fissured bark and holes provide nesting and roosting spaces for birds such as tits and tree creepers.

Hedgerows are chosen by a sizeable number of common bird species for nesting and roosting: 55 of the 110-bird species recorded regularly in Birdwatch Ireland's Countryside Bird Survey use them during the breeding season. These include the Linnet and Yellowhammer, two species which have declined in Ireland.

Scattered around the boundary of the proposed development site are patches of scrub habitat. Scrub can provide high quality breeding habitat for many birds and like woodland habitats the bird species present will depend on the location, size, plant species and structure of the scrub habitat.

The surrounding landscape is dominated by a mix of urban development to the south, east and west and agricultural land to the north. Passerine species are some of the most commonly seen farmland

birds. Swallow, Starling, House Sparrow, Tree Sparrow, Linnet and Yellowhammer are all associated with agricultural areas and farmyards. These species could potentially utilise the habitats within the proposed development site for foraging and breeding.

The intensity of grazing has been variable within the proposed development over the last few years. This has allowed scrub and a greater range of perennial herbaceous species to become established. However, the range of bird species recorded is not significantly different to that which occurs on the farmed grassland habitats in the surrounding countryside.

Overall, the proposed development site is of a local value for bird species that are common in the Irish countryside. However, given the small size of the site, this is of limited value and the area to be affected is not likely to be a critical feeding resource for bird species in the context of the wider landscape.

8.6.9.6 Other Species

The NBDC does not have records of any protected, rare or notable species of invertebrates within 2km of the proposed development site. While no site is without invertebrate interest, it is considered unlikely that the proposed development site would support protected invertebrate species given the common and intensively managed habitats which dominate the site.

8.7 Impacts Construction Stage

8.7.1 Designated Sites

DixonBrosnan prepared a screening for Appropriate Assessment (AA) report, which accompanies the planning application. The screening investigated the potential for the proposed development to have significant effects on European sites (SAC/cSAC/SPA). DixonBrosnan concluded that the proposed development either alone, or in-combination with other plans and/or projects does not have the potential to significantly affect any European Site, in light of their conservation objectives. Therefore, a Stage 2 Appropriate Assessment was not required.

8.7.2 Habitats

Direct impacts on habitats as a result of construction works are described in Table 8.14. It should be noted that the value of a habitat is site specific and will be partially related to the amount of that habitat in the surrounding landscape.

Table 8.14. Potential Impacts on Habitats

Habitat Type	Habitat value (NRA Guidelines)	Predicted impacts in the absence of mitigation
Hedgerow (WL1)/Treeline (WL2)	Local importance (Higher Value).	The internal hedgerow/treeline will be removed. Hedgerow/treeline along the southern and western will be retained. Negative, moderate, long-term
Tilled Land (BC3)	Local importance (Lower value).	This habitat will be removed. Negative, imperceptible, long-term
Wet Grassland (GS4)/Scrub (WS1)	Local importance (Higher value)	This habitat will be removed. Negative, slight, long-term

Habitat Type	Habitat value (NRA Guidelines)	Predicted impacts in the absence of mitigation
Neutral Grassland (GS1)	Local importance (Higher value)	This habitat will be removed. Negative, slight, long-term
Neutral Grassland (GS1)/Scrub (WS1) Mosaic	Local importance (Higher value)	This habitat will be removed. Negative, slight, long-term

8.7.3 Invasive Species

No third schedule invasive species or species at risk of having damaging effects were recorded within the proposed development site. The medium impact invasive species Buddleia is present. The NBDC lists this as a medium impact species due to its potential to have an adverse impact on landscape quality, native biodiversity or infrastructure.

No precise studies have been done on the level of impact of Buddleia due to its long history of naturalisation, but it is likely to displace native plants where it is present. While there is potential in the absence of mitigation for construction works to spread this species, given the relatively low risk posed by these species to the surrounding habitats the impact is predicted to be negative, not significant and long-term.

8.7.4 Mammals

8.7.4.1 Bats

There are no buildings within the proposed development site. No trees with the potential to support bat roosts were recorded within the site boundary. While no bat roosts were detected, the presence of occasional bats in semi-mature trees earmarked for removal cannot altogether be excluded and therefore, in the absence of mitigation, direct impacts on bats during tree removal cannot be ruled out.

Linear features within the proposed development site boundary, including treelines and hedgerows have low to moderate local value as bat foraging/commuting areas, linking roost sites outside the site to foraging areas and facilitating the dispersal of bats into the wider landscape. Treelines and hedgerows are an important linear landscape features for commuting bats, as bats prefer to travel in the shelter of such features to reduce predation. Loss of such habitats affects the ability of bats to travel safely from roosting sites to foraging areas. A gap of as little as 10m may force some species to seek an alternative commuting route and even change roosting sites.

During construction, the internal hedgerow/treeline, as well as areas of semi-natural grassland and scrub habitat will be removed. This internal hedgerow/treeline is more diverse than the boundary habitats and small numbers of bats were recorded foraging/commuting. No bats were recorded foraging on the less diverse hedgerow/treelines on the southern and western site boundaries which will be retained. However, it is noted that a range of supplementary planting using native trees proposed along these boundary habitats could increase their foraging potential for local bat populations (See Park Hood Drawing 7670-L-001 for details).

In the absence of mitigation, the construction stage will result in the long-term loss of low to moderate value local bat foraging habitat. Habitat fragmentation due to the loss of commuting habitat also has the potential to impact local bat populations. The most significant impact will be the removal of the internal hedgerow/treeline, where small numbers of two species of bat i.e. Common and Soprano

Pipistrelle were recorded foraging and Leisler's Bat was recorded commuting. In the absence of mitigation, this could potentially impact on local populations of bats commuting/foraging in this area.

Construction works will be largely carried out during daylight hours and therefore no significant disturbance impacts from lighting. During the winter months, where lighting may be required during daytime hours, bats will be in hibernation and no significant impact will occur.

Overall, the loss of semi-natural habitat, in particular treelines/hedgerows, will reduce the foraging/commuting habitats available for bats. The impact on foraging bats will be negative, moderate and medium term at a local geographic level.

8.7.4.2 Otter

No signs of Otter were recorded within 150m of the proposed development and there are no watercourses or waterbodies within the site. Wet grassland habitat at the site could potentially provide habitat for Common Frog, which is an important prey species for Otter. Although given the small areas of habitat present and the absence of waterbodies, the proposed development site is unlikely to be a valuable foraging area for Otter.

In theory, construction works could indirectly affect fish stocks and aquatic invertebrates via impacts on water quality downstream. However it is noted that there are no watercourses within or in the vicinity of the proposed development site. The closest watercourse, the Huntstown Stream, is located approximately 970m north of the proposed development site and given the absence of drainage ditches within the site, there is no direct hydrological connection to this stream.

During the works noise and disturbance levels will increase; however works will primarily take place during daytime hours, which will avoid the largely nocturnal foraging habits of Otter. In the event of Otters passing through or occasionally forage within this area, there may be some short-term displacement of Otter. However, the increased noise and disturbance will not significantly impact on Otter due to their ability to move away from short-term disturbance.

Overall, given the low value of the site for Otter, the impact of construction works will be negative, not significant and short-term at a local geographic level in the absence of mitigation.

8.7.4.3 Other Mammals

No other protected mammal species were recorded at the proposed development site. However, Irish Stoat, Pygmy Shrew, Irish Hare and Hedgehog could potentially use this site. As part of the landscape plan, areas of shrubs will be formed that could provide ecological value/foraging opportunities. Treelines/hedgerows on the southern and western boundary will also be retained and supplementary planting using native tree species will be added to these linear features.

Common mammal species are likely to continue to use retained/newly landscaped habitats at the site, albeit is much lower numbers. However, these species are likely to be displaced from the site in the short-term during construction works due to increased noise and disturbance.

The habitats that will be affected are common and there is no evidence to indicate they are of particular value for these species in the context of the surrounding countryside. Effects on these species during construction due to loss of habitat, increased noise and disturbance and lighting are predicted to be negative, slight and short-term at a local geographic level in the absence of mitigation.

8.7.5 *Amphibians & Reptiles*

Construction works will lead to the removal of an area of wet grassland habitat, which could potentially lead to a loss of low value habitat for Common Frog. However, no signs of Common Frog were recorded during site surveys and therefore significant impacts are unlikely. The impact on this species will be negative, imperceptible and long-term at a local geographic level. No signs of Smooth Newt were recorded and no impact on this species will occur. Impacts of reptiles will be neutral, imperceptible and short-term.

8.7.6 *Birds*

The most significant impacts on breeding birds will through habitat loss, fragmentation and modification. In the absence of mitigation, potential impacts include disturbance and injury to eggs, young and nests, and long-term loss of potential nesting sites and foraging habitat.

As noted above, semi-natural grassland habitats, an internal hedgerow/treeline and scrub will be removed. While displaced common bird species, such as Blackbird, Wren and Robin, are likely to use alternative grasslands and hedgerow/treeline habitats in the vicinity, intensification of agriculture and the loss of suitable grassland habitats is a significant threat to grassland nesting species such as Snipe and Meadow Pipit. The removal of semi-natural grassland habitats means that these species will no longer breed or forage within the site boundary.

The loss of semi-natural grassland is also likely to reduce foraging/nesting habitat for species such as Linnet and Goldfinch. However, the retention of the boundary hedgerow/treeline as well as supplementary native planting e.g. Holly and Hawthorn, in these areas will create year round foraging opportunities for local bird species.

During the works increased noise and disturbance is likely to disturb and/or displace breeding birds from the site; however noise levels will fall off quickly outside the site boundary.

The majority of birds recorded at the proposed development site are common birds and are typical of an urban fringe landscape. Many of these species may be habituated to human activity and disturbance. Given the mobile nature of birds, the common nature of habitats within the site and the availability of alternative foraging habitat in the immediate vicinity, the impact from disturbance will be slight during the works at a local level. However, as noted above grassland nesting species such as Meadow Pipit and Snipe will be more vulnerable to disturbance.

In the absence of mitigation, potential impacts include disturbance and injury to eggs, young and nests, and long-term loss of potential nesting sites and foraging habitat. Overall the impact on breeding birds is likely to be negative, moderate and short-term at a local level in the absence of mitigation.

8.7.7 *Other Species*

The habitats to be affected support common species of invertebrates and there is no evidence to indicate that the proposed development site is of particular value for other species in the context of the surrounding countryside. No significant effects on invertebrate species have been identified.

8.7.8 *Water Quality & Aquatic Ecology*

In the absence of appropriate design and mitigation, high levels of silt in surface water run-off from construction works area could theoretically impact on fish and invertebrate species in nearby watercourses. It is noted that additional information on potential impacts on water quality is provided in Chapter 7 Water.

There are no surface watercourses /drains within the proposed development site and closest water feature is the Huntstown Stream, which is approximately 970m north of the site. While spillage and leaks could potentially impact on exposed subsoils, there is no direct pathway for surface water runoff to local watercourses during the construction phase.

Given the distance from local watercourses and the lack of hydrological/hydrogeological connections, the impact on fish and aquatic invertebrates during construction will be neutral, imperceptible, local, unlikely and short-term.

8.7.9 Air Emissions

No significant emissions to air will occur during construction.

8.8 Impacts Operational Stage

8.8.1 Designated Sites

There will be no impacts on Designated Sites

8.8.2 Habitats

The mapping on the OPW www.floodinfo.ie website confirms the development area is neither in nor adjacent to a location that is at risk of fluvial, pluvial or groundwater flooding and there are no records of any flood events either at, or in proximity to the site.

Sustainable Urban Drainage (SUDS) features will be provided to ensure that flood risk/runoff is managed. Therefore, no significant impacts on aquatic habitats during operation of the proposed development have been identified.

Maintenance works may be required on occasion along boundary habitats. However, no significant operational impacts on terrestrial habitats have been identified.

8.8.3 Invasive Species

No impacts will occur.

8.8.4 Mammals

8.8.4.1 Bats

Habitat fragmentation due to the loss of the foraging and commuting habitat has the potential to continue to impact local bat populations. The retention of boundary habitats, although currently or lower foraging value, will retain some foraging or commuting habitat for bats at the proposed development site. The tree planting strategy, which includes native species and will enhance retained habitats within the site and potentially create connectivity with the wider landscape.

Increased activity and human presence, noise and artificial lighting may impact and disturb or displace bats. Lighting around the proposed buildings and outdoor areas including new paths, parking areas and access roads means that bat foraging in these areas is likely to be reduced. Light spillage from the development onto the retained boundary habitats could prevent/reduce bat foraging.

Lighting deters some bat species in particular Myotis species such as Daubenton's Bat, from foraging (Azam et al. 2018). Studies have shown that illumination levels as low as 0.06 lux can influence the behaviour of bats. Even a full moon night (0.02 lux) can reduce bat activity within more sheltered, darker wildlife corridors and foraging areas (e.g., woodlands). It is noted that Pipistrelle species appear to be more tolerant of light and disturbance (Speakman 1991; Stones et al. 2009; Haffner 1986). Leisler's Bats will also opportunistically feed on such insect gatherings in lit areas (Bat Conservation Ireland 2010). However, more recent research suggests that even in light opportunistic foraging species, foraging activity may be impacted by increased lighting (Hooker et al. 2022).

The impact on bats during the operational stage will be negative, slight, likely and long-term at a local level.

8.8.4.2 Otter

Increased activity and human presence, noise and artificial lighting may disturb or displace Otter, including light spillage onto previously unlit boundary habitats. Badly designed lighting could displace Otter from nearby habitats and create a barrier to connectively in the wider area. The lighting will be designed to minimise light spillage outside the site boundary. However, there will be some light spillage on the retained boundary habitats on the western and southern boundaries. Noise and activity at the site will increase.

No signs of Otter were recorded and there are historical records of Otter in the vicinity. The impacts on Otter will be neutral, imperceptible long-term at a local geographic level.

8.8.4.3 Other Mammals

Increased activity and human presence, noise, fencing and additional lighting may disturb or displace other mammal species such Pygmy Shrew and Hedgehog from favoured foraging habitats. However, given the retention of treelines/hedgerows at the site and the availability of similar habitat in the vicinity and the mobile nature of these species, potential impacts on other mammals during operation are predicted to be negative, slight and long-term at a local level.

8.8.4.4 Amphibians & Reptiles

There will be no impact on amphibians and reptiles.

8.8.5 Birds

Following the habitat removal in the construction stage, the Red List species Meadow Pipit and Snipe will be displaced from the site. Overall there will be a nett reduction in the habitat available for these threated bird species.

Common bird species are likely to continue to forage and breed within retained hedgerow/treeline at the site. However, increased human presence and increased noise and lighting reduce the numbers of birds using these habitats. In areas where nesting habitat is retained within the site e.g. hedgerow/treeline, increased disturbance may impact on breeding birds.

The impact on birds will be negative, slight, likely and long-term at a local level due to disturbance and/or displacement of bird species.

8.8.6 *Other Species*

The habitats that will be affected support common species of invertebrates and there is no evidence to indicate that the development site is of particular value for other species in the context of the surrounding countryside. No significant effects on invertebrate species have been identified.

8.8.7 *Water Quality & Aquatic Ecology*

In the operational stage there will be no emission to surface waters. Rainwater run-off that is not harvested will infiltrate to ground via the soakaway and the permeable paving. There is the potential for accidental spills to occur during filling of the diesel storage tank and the refuelling of the mobile plant which could infiltrate to ground through damaged paving. There is also the potential for minor oil leaks in the permeable paved areas and leaks from the foul sewers to infiltrate to ground and groundwater. However, even in the absence of mitigation, given the distance of the site from local waterbodies, there is no potential for direct discharges of these watercourses.

Given the distance from local watercourses and the lack of hydrological/hydrogeological connections to local watercourses, the impact on fish and aquatic invertebrates will be neutral, imperceptible, not likely, local and short-term.

8.8.8 *Air Quality*

The assessment of the impacts of the proposed development on air quality has concluded that in relation to ecological sites the impact will be negative, imperceptible, local, likely and long-term.

8.8.9 *Fire*

In the event of a fire, which is the 'worst case' there may be damage to the landscape areas and trees inside the site boundary; however these are low ecological value habitats and readily replaced.

8.9 **Baseline**

Most of the habitats that will be affected have been significantly modified from their natural state by human activity. In pockets of semi-natural habitats within the site boundary, the general pattern of succession from grassland to scrub to woodland would be expected to continue. In the absence of development, it is expected that the lands within the development boundary would largely remain under the same management regimes.

No significant changes to the habitats within the boundary are likely to occur, in the "baseline" scenario. However given the site location and land zoning it is likely that it will be developed for industrial use in the short term.

8.10 **Prevention and Mitigation**

8.10.1 *Design Stage*

The landscape design approach was to retain the existing trees and hedgerows on the boundary wherever possible. A detailed landscape plan has been prepared and it includes the planting of native shrub species in an area east of the MRF, to compensate for the loss of the internal boundary hedgerow/tree line. Planting of native shrubs and trees will also be carried out to supplement the boundary hedgerows.

8.10.1.1 Lighting

The lighting scheme will be designed to minimise the impact of external lighting upon bat populations by retaining dark areas around the external boundaries. The scheme will optimise the lighting configuration to achieve recommended illuminance levels, while minimising light spill through a combination of column location and height, luminaire wattage and optical setting.

8.10.1.2

The fire safety measures included in the design to mitigate the risk of fire outbreak are described in Section 10.8.1.6.

8.10.2 Construction Stage

It is essential that all construction staff, including all sub-contracted workers, are informed of valuable habitats and made aware that no construction waste of any kind (rubble, soil, etc.) is to be deposited in these areas and that care must be taken with liquids or other materials to avoid spillage.

All staff and subcontractors will be responsible for:

- Understanding the importance of avoiding pollution onsite, including noise and dust, and how to respond in the event of an incident to avoid or limit environmental impact;
- Responding in the event of an incident to avoid or limit environmental impact, and
- Monitoring the workplace for potential environmental risks and alert the site manager if any are observed.

An Outline CEMP has been prepared for proposed development and a copy is in Appendix 3.3. It contains all of the mitigation measures to prevent and mitigate impacts on Land, Water, Air and Human Health, all of which are also directly relevant to Biodiversity. Additional biodiversity mitigation measures are set out below.

8.10.2.1 Habitats and Floral Species

The Wildlife Act 1976, as amended, makes it is an offence to cut, grub, burn or destroy any vegetation on uncultivated land or such growing in any hedge or ditch from the 1st March to the 31st August. Exemptions include the clearance of vegetation in the course of road or other construction works or in the development or preparation of sites on which any building or other structure will be constructed. Therefore, where possible, vegetation will be removed outside of the breeding season and in particular, removal during the peak-breeding season (April-June inclusive) will be avoided.

To prevent incidental damage woodland, hedgerow, tree and scrub vegetation that are located in close proximity to working areas will be clearly marked and fenced off to avoid accidental damage during excavations and site preparation. The existing hedgerows on the southern and western property boundaries that are to be retained will be protected (in accordance with the recommendations included in BS 5837: 2012) by:-

- The provision of adequate fencing around trees to prevent harmful encroachment / damage by vehicles or storage of materials during construction;
- The avoidance of any reduction in levels in the root protection area of individual trees; and

- Inspection for disease, dead wood or storm damage and, if necessary, treating or carrying out tree surgery, following the advice of qualified tree surgeon if necessary.

Further details on tree protection measures are in the Park Hood Landscape Management and Maintenance Plan in Appendix 11.1.

Habitats that are damaged and disturbed will be reinstated and landscaped once construction is complete.

8.10.2.2 Bats

During the site works, general mitigation measures for bats will follow Marnell *et al.* (2022), Kelleher and Marnell (2006) and NRA (2005c). These documents outline the measures required pre-construction (site clearance) stage to minimise negative effects on roosting bats and to prevent avoidable effects resulting from significant alterations to the immediate landscape. All mitigation measures, including detailed method statements will be agreed with the NPWS prior to commencement of works that could affect any bat populations on site.

Although mature trees with the potential to be of significant value as bat roosts are absent from the site, the following precautionary measures will be implemented during the removal of semi-mature and mature trees.

- The Environmental Clerk of Works will work with the Contractor to ensure that trees earmarked for retention are adequately protected.
- If bats are recorded by the bat specialist within any trees no works will proceed without a relevant derogation licence from the NPWS.
- Tree-felling will ideally be undertaken in the period September to late October/early November. During this period bats are capable of flight and may avoid the risks of tree-felling if proper measures are undertaken.
- Felled trees will not be mulched immediately. Such trees will be left lying several hours and preferably overnight before any further sawing or mulching. This will allow any bats within the tree to emerge and avoid accidental death. The bat specialist will be on-hand during felling operations to inspect felled trees for bats. If bats are seen or heard in a tree that has been felled, work will cease and the local NPWS Conservation Ranger will be contacted.
- Tree will be retained where possible and no 'tidying up' of dead wood and spilt limbs on tree specimens will be undertaken unless necessary for health and safety.
- Treelines outside the proposed development area but adjacent to it and thus at risk, will be clearly marked by a bat specialist to avoid any inadvertent damage.
- During construction directional lighting will be employed to minimise light spill onto adjacent areas. Where practicable during night-time works, there will be no directional lighting focused towards boundary habitats and focusing lights downwards will minimise light spillage.

The lighting mitigation measures will follow recommendations outlined in Bat Conservation Ireland (2010) and Bat Conservation Trust (2018).

8.10.2.3 Birds

Where possible, vegetation will be removed outside of the breeding season and in particular, removal during the peak-breeding season (April-June inclusive) will be avoided. This will also minimise the

potential disturbance of breeding birds outside the site boundary. If works are carried out during the breeding season, a pre-construction survey will be carried out and if birds are detected appropriate mitigation measures will be implemented.

8.10.2.4 Invasive Species

Prior to the commencement of construction works an invasive species survey will be undertaken within the proposed development boundary by a competent expert to determine if invasive species listed under Part 1 of the Third Schedule of S.I No. 477 of 2011 have become established. If invasive species are identified a site-specific Invasive Species Management Plan will be developed and implemented by a competent specialist on behalf of the Contractor.

Buddleia favours disturbed sites and physical grubbing of plants can provide ideal conditions for the germination of seeds. Therefore, care needs to be taken to ensure re-vegetation of controlled areas is undertaken swiftly. The branches of Buddleia are capable of rooting as cuttings, so care should also be taken to ensure material is disposed of in a manner to avoid this risk.

As mature plants occur within the proposed works area, the preferred method of treatment is cutting back to a basal stump or grubbing out followed by chemical treatment. Herbicide applications will consider sensitive receptors such as locally important habitats and must only be applied in line with manufacturer's recommendations.

Recommended practice for the application of herbicides requires cutting back of plants to a basal stump during active growth (late spring to early summer) which is then treated (brushed on) immediately with a systemic weed killer mix (Starr et al. 2003). Foliar application of triclopyr or glyphosate may be adequate for limited infestations of younger plants but should be followed up at 6 monthly interval until the plant is no longer extant within the works area.

8.10.2.5 Lighting

Lighting associated with the site works could cause disturbance/displacement of fauna. If of sufficient intensity and duration, there could be impacts on reproductive success. Site lighting will typically be provided by tower mounted temporary portable construction floodlights.

The floodlights will be cowled and angled downwards to minimise spillage to surrounding properties. Lighting mitigation measures will follow Bats & Lighting Guidance Notes for: Planners, engineers, architects and developers (Bat Conservation Ireland, 2010). The following measures will be applied in relation to construction works lighting:

- Site lighting will be provided with the minimum luminosity necessary for safety and security purposes. Where possible, lighting will be restricted to the working area and using the cowl and angling noted above will minimise overspill and shadows on sensitive habitats outside the construction area and

- Site lighting will be positioned and directed so that it does not unnecessarily intrude on adjacent ecological receptors. The primary area of concern is the potential impact at the woodland and treelines. There will be no directional lighting focused towards these areas and cowling and focusing lights downwards will minimise light spillage.

8.11 Monitoring

8.11.1 Construction Stage

A Bat Specialist will attend on site during the removal of the mature and semi-mature trees.

8.11.2 Operational Stage

The inspection regimen referenced in the Landscape Management Plan will be implemented.

8.12 Cumulative Effects

A search of the Fingal County Council and An Bord Pleanála planning databases was carried out to identify any potential cumulative effects on biodiversity. The proposed development site is located in an area surrounded by existing industrial and road infrastructure, with considerable levels of disturbance.

The cumulative impacts of the proposed development and nearby consented projects are described in Table 8.15. No significant cumulative impacts with the proposed development have been identified.

Table 8.15 Potential Cumulative Effects

Development	Project Details	Potential Cumulative Impacts
FW22A/0258 Planning granted 14th March 2023 Located approximate 150m north and 200m west of proposed development site.	The development comprises the construction and operation of 3 no weighbridges (each with a dedicated weighbridge office), a new 2,160m2 soil waste inspection and quarantine shed, new site offices and associated parking facilities. The development will facilitate internal re-routing of soil intake for future backfilling and restoration of Huntstown South Quarry (previously approved under planning permission Ref. FW12A/0022).	In the event that the construction phase of the proposed development was to overlap with this scheme, potential cumulative impacts could arise. Cumulative noise/ visual disturbance impacts to local fauna. Should this situation arise, construction activities will be planned and phased, in consultation with the relevant construction management team. Construction mitigation measures have been outlined in this EIAR chapter and the CEMP which accompanies this application. These measures will ensure that no significant cumulative noise/disturbance effects or habitat loss for Badgers will occur during construction works. No potential cumulative operational impacts from noise and disturbance have been identified. No significant adverse impacts from changes in water or air quality were identified during the operational phase of the proposed development. Therefore, no cumulative impacts for water or air have been identified. Following the implementation of mitigation measures, no significant cumulative effects have been identified.

Development	Project details	Potential cumulative impacts
FW22A/0213 Planning granted 14th March 2023 Located approximately 100m east of proposed development site	The development is within a total site area of up to c. 1 ha. to include 1 no. DSO (Distribution System Operator) electrical substation building. 1 no. customer switchgear, electrical inverter / transformer station modules. 40 no. containerised battery storage units on concrete support structures, heating, ventilation and air conditioning units (HVAC units), access tracks and upgraded site entrance, underground cabling route c. 1.45 km to existing ESB 220kV Finglas Electricity Substation, associated electrical cabling and ducting, security gates, palisade perimeter security fencing, CCTV security monitoring system and landscaping works and all associated ancillary site infrastructure.	In the event that the construction phase of the proposed development was to overlap with this scheme, potential cumulative impacts could arise. Cumulative noise/ visual disturbance impacts to local fauna. Should this situation arise, construction activities will be planned and phased, in consultation with the relevant construction management team. Construction mitigation measures have been outlined in this EIAR chapter and the CEMP which accompanies this application. These measures will ensure that no significant cumulative noise/disturbance effects or habitat loss for Badgers will occur during construction works. No potential cumulative operational impacts from noise and disturbance have been identified. No significant adverse impacts from changes in water or air quality were identified during the operational phase of the proposed development. Therefore, no cumulative impacts for water or air have been identified. Following the implementation of mitigation measures, no significant cumulative effects have been identified.
FW21A/0151 Application under appeal Located approximately 120m north of proposed development site	• Demolition of 2 no. existing residential dwellings and ancillary structures to the east of the site (c.344qm total floor area); • Construction of 2 no. data hall buildings (Buildings A and B) comprising data hall rooms, mechanical and electrical galleries, ancillary offices including meeting rooms, workshop spaces, staff areas including break rooms, toilets, shower/changing facilities, storage areas, lobbies, outdoor staff areas, loading bays and docks, associated plant throughout, photovoltaic panels and screened plant areas at roof levels, circulation areas and stair and lift cores throughout; • External plant and 58 no. emergency generators located within a generator yard to the east and west of Buildings A and B at ground level. The area is enclosed by a c.6.5m high louvered screen wall; • The proposed data halls (Buildings A and B) are arranged over 3 storeys with a gross floor area of C.37,647sqm each; • The overall height of the data hall buildings is c28m to roof parapet level and c32m including roof plant, roof vents and flues. The total height of Buildings A and B does not exceed 112m OD (above sea level);	In the event that the construction phase of the proposed development was to overlap with this scheme, potential cumulative impacts could arise. Cumulative noise/ visual disturbance impacts to local fauna. Should this situation arise, construction activities will be planned and phased, in consultation with the relevant construction management team. Construction mitigation measures have been outlined in this EIAR chapter and the CEMP which accompanies this application. These measures will ensure that no significant cumulative noise/disturbance effects or habitat loss for Badgers will occur during construction works. No potential cumulative operational impacts from noise and disturbance have been identified. No significant adverse impacts from changes in water or air quality were identified during the operational phase of the proposed development. Therefore, no cumulative impacts for water or air have been identified. Following the implementation of mitigation measures, no significant cumulative effects have been identified.

	• The proposed development includes the provision of a temporary substation (c.32sqm), water treatment building (c. 369sqm and c.7.7m high), 7 no. water storage tanks (2,800m3 in total and c.6.4m high each), 2 no. sprinkler tanks (c.670m3 each and c.7.9m high each) with 2 no. pump houses each (c.40sqm and c. 6m high each); • The total gross floor area of the data halls and ancillary structures is c.75,775sqm; • All associated site development works, services provision, drainage upgrade works, 2 no. attenuation basins, landscaping and berming (c.6m high), boundary treatment works and security fencing up to c.2.4m high, new vehicular entrance from the North Road, secondary access to the south west of the site from the existing private road, all internal access roads, security gates, pedestrian/cyclist routes, lighting, 2 no. bin stores, 2 no. bicycle stores serving 48 no. bicycle spaces, 208 no. parking spaces including 10 no. accessible spaces, 20 no. electric vehicle charging spaces and 8 no. motorcycle spaces; • Existing electricity overhead lines traversing the site will be undergrounded under concurrent application Ref. FW21A/0144; • A proposed 220kv substation located to the south west of this site will be subject of a separate Strategic Infrastructure Development application to An Bord Pleanála under section 182A of the Planning and Development Act 2000 (as amended);.	

8.13 Residual Impacts

8.13.1 Habitats

Retention of hedgerow/treelines on the western and southern boundary will maintain some foraging and commuting habitat for birds, bats and other fauna. However, the loss of semi-natural grassland, the internal hedgerow/treeline and scrub habitat means there will be a nett loss of habitats at the site. This will have a negative, slight, local, likely and long-term local impact.

8.13.2 Invasive Species

Following the implementation of mitigation measures, there will be no residual impact from the spread of invasive species.

8.13.3 Water Quality

Given the absence of direct discharges to surface water and the distance of the site from local watercourses, there will be no residual impact on local water quality and aquatic ecology.

8.13.4 *Air Quality*

The implementation of the CEMP will ensure that the impact construction activities on air quality be negative, imperceptible, localised and temporary. In the operational stage the impacts will be negative, not significant, localised, likely and long term. There will be no significant residual impacts on sensitive ecological receptors.

8.13.5 *Bats*

Specific mitigation measures will be put in place to ensure that direct impacts on bats from tree removal are avoided. Given the low value roosting potential of trees earmarked for removal and the mitigation measures outlined above, no significant impact from tree removal will occur.

The hedgerow/treelines on the western and southern site boundaries will be retained. However the internal hedgerow/treeline as well as an areas of semi-natural grassland and scrub within the site will be removed. The removal of these habitats has the potential to lead to the loss bat foraging habitat and reduce connectivity to the wider area. No bat activity was recorded along the hedgerow/treelines that will be retained, however supplementary native planting could improve their foraging/commuting value for bats.

Lit areas of the site may be avoided by bats, although they are likely to continue to forage in dark areas. Construction and operational lighting design will ensure that dark areas are maintained at the site. However, increased lighting along retained hedgerow/treeline is likely to reduce the value of foraging habitat in some areas. The residual impact will be negative, moderate, likely and long-term at a local level.

8.13.6 *Otter*

Increased activity and human presence, noise and artificial lighting may impact and disturb/displace Otter during construction and operational stages. No signs of Otter were recorded and there are historical records of Otter in the vicinity. The residual impacts will be neutral, imperceptible, not likely and long-term at a local geographic level.

8.13.7 *Other Mammals*

Other protected mammal species such as Hedgehog, Pygmy Shrew, Irish Stoat and Irish Hare could potentially use the proposed development site. These are mobile species that can move away from the site of disturbance. There will be a net loss of feeding habitat. However the retained boundary habitats will maintain some areas of cover for small mammals.

Small mammals such as Hedgehog and Pygmy Shrew are likely to recolonise newly planted hedgerows/treelines at the site following construction and continue to use retained habitats. Larger species such as Irish Hare are likely to use other areas of grassland habitat in the vicinity. The residual impact will be negative, not significant, likely and long-term at a local level.

8.13.8 *Amphibians and reptiles*

There will be no residual impact on amphibian and/or reptile species.

8.13.9 *Birds*

Breeding birds will be displaced from grassland and boundary habitats within the site boundary during construction works. Noise levels during construction are likely to be significant and birds will be

displaced during peak construction works. During operation and following the implementation of the landscape plan, common woodland edge bird species are likely to recolonise retained and landscaped hedgerow and grassland habitats at the site, albeit in lower numbers. The removal of semi-natural grassland areas will prevent ground nesting birds such as Snipe and Meadow Pipit from breeding or foraging at the site. The residual impact on birds will be negative, moderate and long-term at a local level.

8.13.10 Other Species

Following mitigation measures, residual impacts on other species, including fish, terrestrial and aquatic invertebrates, will be neutral, imperceptible and long-term.

8.13.11 Summary of Residual Impacts

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration
Habitats	Negative	Slight	Local	Likely	Long Term
Bats	Negative	Moderate.	Local	Likely	Long Term
Otter	Neutral	Imperceptible	Local	Unlikely	Long Term
Other Mammals	Negative	Not Significant	Local	Likely	Long Term
Amphibians & Reptiles	Negative	Not Significant	Local	Likely	Long Term
Birds	Negative	Slight	Local	Likely	Long Term
Other Species	Negative	Not Significant	Local	Likely	Long Term

8.14 References

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9. AIR

9.1 Introduction

This Chapter describes the ambient air quality and the impacts of the proposed development on air quality in the receiving environment including a 'baseline' scenario. It focuses on the local environment in the vicinity of the proposed development, referred to in this chapter as the' study area'. It identifies the prevention, mitigation and monitoring measures that will be implemented to reduce the significance of the potential impacts and assesses the residual potential impacts.

The Chapter was prepared by Dr. Micheal Fogarty and Mr. Simon Welchman of Katestone. Dr Fogarty is a Senior Air Quality Consultant with 13 years of experience in Ireland and Australia. He holds a B.Eng, M.Eng and PhD from the UCD College of Engineering and Architecture. He specialises in the areas of air quality and odour impact assessment. Mr. Welchman has been a director of Katestone since 2004 with more than twenty-seven years of experience working as an air quality expert in the private sector and for the environmental regulator.

9.2 Relevant Legislation & Guidance

The general EIA guidelines and legislation are listed in Sections 1.2 and the specific legislation and guidelines relevant to air quality that set out the general principles and suitable methods to complete the air quality assessment taken into account in the preparation of this Chapter are:

- Air Pollution Act 1987, as amended.
- Environmental Protection Agency Acts 1992, as amended
- Air Quality Standards Regulations 2011 (S.I. No. 180 / 2011), as amended.
- The Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive (2008/50/EC).
- The fourth Daughter Directive (2004/107/EC).
- EPA (2020) Air Dispersion Modelling from Industrial Installations Guidance Note (AG4).
- NRA (2011) Treatment of Air Quality During the Planning and Construction of National Road Schemes.
- UK Highways Agency (2019) Design Manual for Roads and Bridges - Sustainability & Environment Appraisal- Air quality - LA 105.
- NRA (2008) Environmental Impact Assessment of National Road Schemes – A Practical Guide.
- Institute of Air Quality Management (IAQM) (2014) Guidance on the assessment of dust from demolition and construction.
- DEHLG (2004) Quarries and Ancillary Activities Guidelines for Planning Authorities.

- Environmental Management Guidelines – Environmental Management in the Extractive Industry (EPA 2006).

9.3 Methodology

The assessment was based on data derived from ambient air quality databases maintained by the EPA collected at the nearest ambient monitoring station an odour impact and air quality modelling assessment completed by Katestone.

9.3.1 *Air Quality Information Sources*

The following sources were used in the preparation of this air quality assessment:

- EPA (2018) Air Quality in Ireland 2017 – Indicators of Air Quality;
- EPA (2019) Air Quality in Ireland 2018 – Indicators of Air Quality;
- EPA (2020) Air Quality in Ireland 2019 – Indicators of Air Quality;
- Met Éireann (2021) meteorological monitoring data.

9.3.2 *Assessment of Construction Impact*

The National Road Authority (NRA) guidance document titled Treatment of Air Quality During the Planning and Construction of National Road Schemes (NRA, 2011) addresses the potential impacts of construction activities on local air quality. It states *"The potential impact of both dust and vehicle emissions during the construction phase should be considered within the EIS. Dust emissions can lead to elevated PM_{10} and $PM_{2.5}$ concentrations and may also cause dust soiling."* The predominant emission of concern in the construction stage will be dust.

The DEHLG guidance document Quarries and Ancillary Activities Guidelines for Planning Authorities, states that *Residents living in proximity to quarries can potentially be affected by dust up to 0.5km from the source, although continual or severe concerns about dust are most likely to be experienced within about 100m of the dust source.*

The Institute of Air Quality Management (IAQM) 2014 Guidance provide guidance on how to undertake a construction impact assessment (including demolition and earthworks as appropriate). It describes a stepped assessment procedure to consider potential impacts. Katestone considers the methodology described in IAQM Guidance to be the most comprehensive and robust guidance for the assessment of impacts during the construction stage of proposed developments and adopted this approach.

Step 1 is to determine the likelihood of significant impacts based on the distance between the works and sensitive receptors, both human and ecological. If there are no receptors within the specified distance of the works then no further assessment is required. If there are receptors within the specified distances then a more detailed assessment of the dust impacts (Step 2) is required.

This Step applies to four activities (demolition; earthworks; construction; and track out) and takes account of the scale and nature of the works, which determines the potential dust emission magnitude (Step 2A); and the sensitivity of the area (Step 2B). These factors are combined in Step 2C to establish the risk of dust impacts.

Step 3 is to determine the site-specific mitigation for each of the four activities listed in Step 2. Step 4 is to examine the residual effects and to determine whether or not these are significant and Step 5 is the preparation of the dust assessment report.

The Step 1 screening criteria that trigger the Step 2 assessment are:

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

- an 'ecological receptor' within: - 50 m of the boundary of the site; or
    - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

The risk of dust arising in sufficient quantities to cause annoyance and/or health and/or ecological impacts are determined using four risk categories: negligible, low, medium and high risk. A site specific risk category is based on two factors:

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

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

The two factors are combined in Step 2C to determine the risk of dust impacts with no mitigation applied. The parameters used to characterise each construction activity and the limits used to define the extent of the activity in Step 2 are in Table 9.1. The sensitivity of an area to dust impacts (Step 2B) is dependent on:

- The type of receptors (human health and dust soiling impacts);
- The number of receptors in a potentially affected area (human health and dust soiling impacts);
- The distance of the receptors from the source of emissions or if known, from the dust generating activities (human health and dust soiling impacts), and
- Background levels of PM_{10} (human health impacts only).

The classification of areas with high sensitivity, medium sensitivity and low sensitivity based on the type of receptors is presented in the following tables:

- Table 9.2 for Dust Soiling Effects
- Table 9.3 for the Health Effects of PM_{10}.

Once the type of receptors has been determined, the sensitivity of an area to dust impacts (Step 2B) is determined by combining this information with the number of receptors in a potentially affected area, the distance of the receptors from the source of emissions or if known, from the dust generating activities and background levels of PM_{10} (human health impacts only) using the frameworks described in the following tables:

- Table 9.4 for Dust Soiling Effects on People and Property
- Table 9.5 Human Health impacts from Emissions of PM_{10}.

Table 9-1 Parameters Used to Characterise Each Construction Activity

Activity	Parameter	Parameter unit	Categories - Scale of activity		
			Small	Medium	Large
Demolition	Total building volume	m^3	<20000	20,000 - 50,000	>50000
Earthworks	Total site area	m^2		2,500 – 10,000	>10,000
Construction	Total building volume	m^3	<25,000	25,000 – 100,000	>100,000
Track out	HDV (>3.5t) outward movements	movements/day	<10	10 - 50	>50

Table 9-2 Indicative Examples used to characterise location sensitivity to dust soiling effects

Receptor sensitivity	Indicative examples listed in IAQM (2014)
High sensitivity receptor	Dwellings, museum and other culturally important collections, medium and long term car parks and car showrooms
Medium sensitivity receptor	Parks and places of work
Low sensitivity receptor	Playing fields, farmland (unless commercially sensitive horticultural), footpaths, short term car parks and roads.

Table 9-3 Indicative examples used to characterise location sensitivity to the health effects of PM_{10}

Receptor sensitivity	Indicative examples listed in IAQM (2014)
High sensitivity receptor	Residential properties. Hospitals, schools and residential care homes
Medium sensitivity receptor	Office and shop workers
Low sensitivity receptor	Public footpaths, playing fields, parks and shopping streets

Table 9-4 Framework used to determine the sensitivity of an area to dust soiling effects.

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

Table 9-5 Framework used to determine the sensitivity of a location to human health impacts from emissions of PM_{10}

Receptor Sensitivity	Annual Mean PM_{10} concentration	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m³	>100	High	High	High	Medium	Low
		10 -100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28-32 µg/m³	>100	High	High	Low	Low	Low
		10 -100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24-28 µg/m³	>100	High	Medium	Low	Low	Low
		10 -100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	<24 µg/m³	>100	Medium	Low	Low	Low	Low
		10 -100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1 - 10	Medium	Low	Low	Low	Low
Low	-	>10	Low	Low	Low	Low	Low

Step 2C combines the sensitivity of an area and the magnitude of dust emissions to determine the risk of dust impacts which is established separately for demolition, earthworks, construction and track out. The frameworks used to determine the risk of dust impacts is presented in:

- Table 9.6 for Demolition Activities
- Table 9.7 for Earthwork and Construction Activities
- Table 9.8 for Track out Activities.

Step 3 determines the site-specific mitigation measures based on the risk categories for each of the four activities. The final step (Step 4) is to determine whether there are significant effects arising from the construction stage. Significance is only assigned to the effect after consideration of the mitigation measures.

Table 9-6 Framework used to determine the risk of dust impacts - demolition

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

Table 9-7 Framework used to determine the risk of dust impacts – earthworks/construction

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

Table 9-8 Framework used to determine the risk of dust impacts - track out

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

9.3.3 *Assessment of Operational Impacts*

The sources of emissions in the operational will include emissions of odour from the exhaust stack of the OCU and exhaust gas emissions from road transport associated with hauling material to and from the proposed development.

9.3.3.1 Odour

The methodology is based on a dispersion modelling study incorporating source characteristics and operational activity data with meteorological data that is representative of the site and surrounding region. The assessment was in accordance with industry standards, regulatory requirements and best practice approaches and included:

- Selection of relevant odour assessment criteria.

- Derivation of an odour emissions rate for the OCU stack based on its air flow capacity and manufacturer's design odour emission limit.

- Derivation of an odour emissions rate for the Huntstown Bioenergy Facility based on emission characteristics identifies in licence documentation for this facility.

- Characterisation of meteorological conditions in the region and generation of a representative meteorological dataset using observations from Dublin Airport.

- Dispersion modelling using the regulatory dispersion model, AERMOD, to predict ground-level concentrations of odour across a Cartesian grid that covers the study area and at the closest sensitive receptor locations to the site boundary.

- Comparison of the predicted ground-level concentrations of odour against the relevant odour assessment criterion.

Meteorological Data

The EPA's Air Dispersion Modelling Guidance Note (AG4) (EPA, 2020) states:

> "*The dispersion process is dependent on the underlying meteorological conditions and ensuring that the air dispersion model includes representative meteorological data is critical....The USEPA (24) has defined meteorological representativeness as: "the extent to which a set of {meteorological} measurements taken in a space-time domain reflects the actual conditions in the same or different space-time domain taken on a scale appropriate for a specific application"...and has expanded on this definition by outlining the factors to consider in the selection of appropriate meteorological data:*
>
> - *Proximity of the meteorological station to the modelling domain;*
> - *The complexity of the terrain;*
> - *The exposure of the meteorological monitoring site;*
> - *The period of time during which data is collected."*

Data gathered at Met Eireann's meteorological observation station at Dublin Airport is likely to be representative of meteorological conditions at the Site as defined in EPA's Air Dispersion Modelling Guidance Note (AG4).

AERMET is a general-purpose meteorological pre-processor for organizing meteorological data into a format suitable for use by the AERMOD air quality dispersion model. The AERMET meteorological pre-processor was configured with surface data from Dublin Airport and upper air data from Castor Bay, Co. Down and used to generate a meteorological file suitable for use in the AERMOD dispersion model.

AERMET requires inputs of roughness length (Z_o), Bowen ratio and Albedo. The AERMET User's Guide stipulates that Z_o should be determined based on land cover within a 1.0 km radius of the meteorological site. If the value of Z_o varies significantly by direction, then sector dependency should be used. Sector width should be >= 30°. The Bowen ratio and Albedo should be determined based on land cover within a 10 km x 10 km domain. A simple unweighted mean has been used for the Albedo and a weighted geometric mean for the Bowen ratio as required by the AERMET User's Guide. The approach to determining these parameters is described in Appendix 9.1.

Dispersion Modelling

The dispersion modelling was conducted in accordance with recognised techniques specified in EPA's AG4 document (EPA, 2020). AERMOD was used to predict ground-level concentrations of odour across the model domain due to emission sources at the site for five years of meteorological data. The modelling assumed that emissions occur 24 hours each day, for all hours of each modelled year.

Building Downwash

When modelling emissions from an industrial installation it should be borne in mind that stacks that are relatively short can be subjected to additional turbulence due to the presence of nearby buildings. Buildings are considered nearby if they are within five times the lesser of the building height or maximum projected building width (but not greater than 800m) (EPA, 2020).

The plume from a short stack is likely to be down washed if its height is less than two and a half times the height of nearby buildings within a distance of 10 x L from each source, where L is the lesser of the height or width of the building. A Building Profile Input Program (BPIP) was used to determine the effects of buildings at the site on the point sources of emissions. The Plume Rise Model Enhancements (PRIME) algorithm is recommended in EPA Guidance for use with AERMOD. PRIME was used in the dispersion modelling assessment to determine the effect of building induced turbulence on plumes from point sources at the proposed development.

The PRIME algorithm takes into account the position of each stack relative to each relevant building and the projected shape of each building for 36 wind directions (at 10º intervals). The model determines the change in plume centre-line location with downwind distance based on the slope of the mean streamlines and coupled to a numerical plume rise model.

Proposed Development

Three buildings/structures were included in the BPIP program to represent buildings and structures at the MRF. The coordinates used in the configuration of the onsite buildings and structures in the BPIP program are presented in Table 9-9.

Table 9-9 The Buildings and Structures and Configuration of the proposed development in BPIP

Building	Easting	Northing	Height (m)
	UTM (m)	UTM (m)	
Food Cleaning Plant Building	678,040.3	5920,991	14
	678,033.5	5921,031	
	678,156.8	5921,053	
	678,164.1	5921,012	
Odour Control Unit	678,050.9	5920,944	15.14
	678,048.5	5920,943	
	678,052.2	5920,935	
	678,054.4	5920,937	
	678,039.3	5920,972	
	678,048.6	5920,976	
	678,053.1	5920,965	
MRF Building	678,104.9	5920,830	15.14
	678,050.9	5920,944	
	678,087.5	5920,962	
	678,141.4	5920,847	

The Huntstown Bioenergy Facility

Three buildings/structures were included in the BPIP program to represent buildings and structures at the Huntstown Bioenergy Facility. The coordinates used in the configuration of the onsite buildings and structures in the BPIP program are presented in Table 9.10.

Table 9-10 The Buildings and Structures and Configuration of the Huntstown Bioenergy Facility in BPIP

Building	Easting	Northing	Height (m)
	UTM (m)	UTM (m)	
AD Building	677,667	5921,268	25.4
	677,676	5921,289	
	677,703	5921,277	
	677,679	5921,224	
OCU	678,051	5920,944	25.4
	678,049	5920,943	
	678,052	5920,935	
	678,054	5920,937	
Gas Processing Equipment	678,165	5920,859	25.4
	678,160	5920,870	
	678,169	5920,874	
	678,174	5920,863	
Tank Farm	678,044	5920,961	25.4
	678,039	5920,972	
	678,049	5920,976	
	678,053	5920,965	

Sensitive Receptors

The sensitive receptors that are of interest in relation to odour emissions from the proposed development include:

- Residential locations located south and northeast of the site boundary, and
- Commercial units and industrial facilities located northeast, northwest and southeast of the site boundary.

The closest sensitive residential receptors are:

- 160 m east of the site boundary and 435 m east of the OCU Stack.
- 265 m southwest of the site boundary and 360 m southwest of the OCU Stack

The closest sensitive commercial or industrial receptors are located 40 m south of the site boundary (adjacent to the site entrance) and approximately 338 m southeast of the OCU Stack

The sensitive residential and commercial and industrial receptors were included in the dispersion modelling assessment.

Source Configuration

The parameters used to characterise the OCU stack in the dispersion modelling assessment are presented in Table 9-11.

Table 9-11 Source parameters for the OCU stack at the MRF as modelled

Source Name	Location		Diameter	Height	Temperature	Velocity
	Easting	Northing				
	m	m	m	m	°C	m/s
OCU Stack	678,052	5,920,939	1.2	16	15	7.9

The parameters used to characterise the OCU stack at the Huntstown Bioenergy Facility in the dispersion modelling assessment are presented in **Table 9-12**.

Table 9-12 Source parameters for the OCU stack at the MRF as modelled

Source Name	Location		Diameter	Height	Temperature	Velocity
	Easting	Northing				
	m	m	m	m	°C	m/s
Huntstown Bioenergy OCU Stack[1]	677,697	5921,211	1.5	25	20	17.3

[1] Data taken from EPA Licence for Huntstown Bioenergy Limited (EPA, 2020b) and the EIS Submitted as part of the licence application for the facility (SLR, 2013)

Emissions

The odorous waste streams will be handled and processed in the MSW / Brown Bin Bay in the MRF. The Bay will be maintained under negative air pressure with air being treated in an odour control unit (OCU) and vented through an elevated odour exhaust stack located on the western side of the building.

Negative pressure will be maintained in the Bay by:

- Having a well-sealed building, and
- Exhausting air to the OCU at a rate that results in two (2) air changes per hour inside the MSW/Brown Bin Bay.

The OCU will be designed to have a maximum exhaust concentration of odour of 1,000 ou_E/m^3.

The odour emission rate adopted in the assessment was calculated as the product of the maximum exhaust concentration of odour of the OCU and the design air flowrate of the extraction system. The values used to determine the odour emission rate adopted in the modelling assessment are presented in Table 9-13.

Table 9-13 Odour Emission Rate Modelling Assessment for the OCU Stack

Parameter	Value	Unit	Comment/Reference
Building Volume	16,120	m^3	Confirmed by O'Callaghan Moran
Air Changes Per Hour	2		Confirmed by O'Callaghan Moran
Air Flowrate	32,240	m^3/h	Calculated
Air Flowrate	9.0	m^3/s	Calculated
Stack Diameter	1.2	m	Confirmed by O'Callaghan Moran
Stack Air flowrate	7.9	m/s	Calculated based on assumed diameter

Parameter	Value	Unit	Comment/Reference
Modelled Odour Concentration	1,000.0	ou_E/m^3	Odour concentration limit for the OCU
Stack Odour Emission rate	8,955.6	ou_E/s	Calculated

The odour emission rate adopted in the assessment for the odour control unit at the Huntstown Bioenergy Facility was calculated as the product of the maximum exhaust concentration of odour of its OCU (Licence limit as per EPA, 2020b) and the design air flowrate of the exhaust system. The values used to determine the odour emission rate adopted in the modelling assessment are presented in Table 9-14.

Table 9-14 Odour Emission Rate Modelling Assessment for the OCU Stack

Parameter	Value	Unit	Comment/Reference
Air Flowrate	30.6	m^3/s	Licence Limit at 20°C as per EPA, 2020b
Stack Diameter	1.5	0	SLR, 2013
Stack Air Velocity	17.3	0	Calculated
Modelled Odour Concentration	1,000	ou_E/m^3	Licence Limit as per EPA, 2020b
Stack Odour Emission rate	30,556	ou_E/s	Calculated
Stack Height	25	m	As per EPA, 2020b

9.3.3.2 Traffic

Road transport associated with a development can be the source of emissions of several air pollutants, which are also produced by a wide range of industrial, commercial and domestic processes. The pollutants of most concern near roads are nitrogen dioxide (NO_2) and particles (PM_{10}) in relation to human health and oxides of nitrogen (NO_x) in relation to vegetation and ecosystems.

The assessment of potential transport related air quality impacts from the proposed development was conducted using the screening method set out in the Design Manual for Roads and Bridges (DMRB) (Highways England, 2019).

The DMRB provides a framework for assessing, mitigating and reporting the effects of motorway and all-purpose trunk road projects on air quality by determining whether the impacts of a project on human health or designated habitats can trigger a significant air quality effect. Part LA105 sets out the requirements for assessing and reporting the effects of highway projects on air quality (Highways England, 2019). It includes assessment methodologies to consider the impact of traffic emissions on human health and ecological sites, including the health of protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity.

The methodology includes a scoping approach to determine whether the air quality impacts of a project can either be scoped out, or require an assessment based on the changes between the' do something' traffic (with the project) compared to the do minimum traffic (without the project). If a project triggers the traffic scoping criteria, either a simple or detailed assessment shall be required.

The scoping criteria used were:

1) annual average daily traffic (AADT) >=1,000; or
2) heavy duty vehicle (HDV) AADT >=200; or
3) a change in speed band; or
4) a change in carriageway alignment by >=5m

The network of all roads that trigger the traffic screening criteria and adjoining roads within 200m is defined as the affected road network (ARN)

The proposed development will increase volumes of traffic associated with:

- The transportation of waste streams that will be delivered to and processed at the site and ultimately hauled from the site for further processing
- Staff and service vehicles attending the site.

In relation to selecting sensitive receptors to consider potential human health impacts, DMRB states:

> *Sensitive receptors shall be chosen within 200m of the ARN and include residential properties, schools and hospitals for the assessment of annual mean air quality thresholds. Where there is a risk of the short-term air quality thresholds being exceeded.*

In relation to selecting sensitive receptors to consider potential ecological impacts, DMRB states:

> *Internationally, nationally and locally designated sites of ecological conservation importance on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity (known as designated habitats) within 200m of the ARN shall be included in the air quality assessment.*

If the scoping assessment indicates that an assessment is required, DMRB provides a risk-based mechanism to determine whether a simple or detailed air quality assessment is required. The level of assessment is determined by the level of risk and the stage of assessment for a project. A simple assessment provides sufficient information to confirm that the project does not result in any exceedances of the air quality thresholds. A detailed level of assessment is more likely where there is a risk of exceeding air quality thresholds and for the detailed design stage of the project lifecycle.

9.3.4 *Evaluation Criteria*

9.3.4.1 Air Quality

The significance of air quality impacts in the operational stage were determined based on compliance with the limit values of the *Air Quality Standards Regulations 2011, (S.I. No. 180 / 2011)* as amended (Air Quality Standards), which are presented in Table 9-15. The annual average limit values for SO_2 and NO_x are for the protection of vegetation and ecosystems, respectively. All other limit values specified in the Table are for the protection of human health.

Table 9-15 Air Quality Standards Regulations 2011 (S.I. No. 180/2011)

Air contaminant	Averaging period	Limit value (µg/m³)	Basis of application of limit value
CO	8-hour	10000	Maximum
NO_2	1-hour	200	Not to be exceeded more than 18 times in a calendar year
	annual	40	Average
PM_{10}	24-hour	50	35th Highest
	annual	40	Average
$PM_{2.5}$	annual	25	Average
SO_2	1-hour	350	Not to be exceeded more than 24 times in a calendar year
	24-hour	125	Not to be exceeded more than 3 times in a calendar year
	annual	20	Average
NO_x	annual	30	Average

The criteria described in NRA (2011) were used to determine the significance of air quality impacts from traffic in the operational stage. The NRA methodology to determine the significance of air quality impacts involves categorising the magnitude of change in concentrations of air contaminants according to the criteria identified in Table 9-16.

The NRA methodology includes definitions of impact magnitude for changes in the number of days with PM_{10} concentration greater than 50 µg/m³ and for changes in annual mean $PM_{2.5}$. Table 9-16 excludes these as the Highway Agency's latest spreadsheet calculates annual average concentrations of NO_x and PM_{10} and not shorter-term average concentrations.

The relationship between the annual average and 1-hour average concentration is discussed in NRA (2011) which states:

> *The standards for nitrogen dioxide are expressed in terms of both the annual mean and the number of hours above 200 µg/m³. It is not straightforward to predict exceedances of the 1-hour standard and all models are inevitably poorer at predicting short-term peaks than they are at predicting annual mean concentrations. However, empirical data suggest that the hourly mean standard is unlikely to be exceeded at roadside locations unless the annual mean is above 60 µg/m³.*

The relationship between the annual average and the number of exceedances of the 24-hour average concentration standard for PM_{10} is also discussed in NRA (2011) which states:

> *The standards for PM_{10} are expressed as the annual mean and the number of days above 50 µg/m³. Dispersion models are inherently less accurate at predicting exceedances of the 24-hour mean PM_{10} standard than for the annual mean standard. An empirical relationship between the annual mean concentration and the number of days >50 µg/m³ PM_{10} has been derived in LAQM.TG(09) and takes the form:*
>
> *No. 24-hour mean exceedances = -18.5 + 0.00145 x annual mean³ + (206/annual mean)*

This relationship has been adopted to determine if the impact of traffic emissions on air quality is likely to result in exceedances of the 24-hour average concentration standard for PM_{10}.

Table 9-16 Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Magnitude of Change	Annual Mean NO_2/PM_{10}
Large	Increase/decrease ≥4 µg/m³
Medium	Increase/decrease 2 - <4 µg/m³
Small	Increase/decrease 0.4 - <2 µg/m³
Imperceptible	Increase/decrease <0.4 µg/m³

9.3.4.2 Nuisance Dust

Dust particles in the ambient environment can cause nuisance. Localised increases in dust particles are often associated with exposure of soil surfaces, or activities that involve the disturbance of soil or rock-based materials, such as agricultural and construction activities.

Whether dust deposition becomes an issue for the general public depends on a variety of factors including the sensitivity of nearby locations, the repetition of any dust deposition occurring and the characteristics of the deposited materials. The focus for dust control and emissions is on minimising the potential for a nuisance occurring in the first instance and implementing good site practices where practicable.

There are currently no Irish or European Union air quality standards for deposited dust. In 2004, the DEHLG issued Quarries and Ancillary Activities Guidelines for Planning Authorities, which states "There are currently no Irish statutory standards or EPA guidelines relating specifically to dust deposition thresholds for inert mineral/aggregate dust"

A subsequent report issued by the EPA and titled: Environmental Management Guidelines - Environmental Management in the Extractive Industry (EPA, 2006) states:

> *The impact of dust is usually monitored by measuring rates of dust deposition (DoE, 1995). There are currently no Irish statutory standards or EPA guidelines relating specifically to dust deposition thresholds for inert mineral dust. There are a number of methods to measure dust deposition but only the German TA Luft Air Quality Standards (TA Luft, 1986) specify a method of measuring dust deposition – The Bergerhoff Method (German Standard VDI 2119, 1972) – with dust nuisance. It is the only enforceable method available.*

The TA Luft air quality standard has become the most commonly used method for the assessment of dust deposition. This involves determining a mass dust deposition rate per unit area over a given time period, using a direct collection pot with standard dimensions of either glass or plastic. The system benefits from being a direct collection method i.e. less transferring of material and consequent reduction in sampling errors. This method is defined as an internationally recognised standard and has been adopted by the EPA as the method of choice for measuring deposited dust associated with licensed facilities.

The TA Luft has recommended a threshold guideline value of 350 mg/m²/day for dust deposition. Below this threshold guideline value dust deposition problems are considered less likely. The EPA and local authorities generally apply the TA Luft guideline to development consents and Industrial Emissions Licences

9.3.4.3 Odour

In 2020, the EPA issued its updated guidance document air quality impact assessment (known as AG4). Appendix H of this document provides guidance that is specific to the assessment of odour impacts using dispersion modelling techniques. In relation to the odour assessment criteria, AG4 states:

> *Currently there is no general statutory odour standard in Ireland relating to industrial installations.*
> *.....*
> *Guidance from the UK (EA, 2011, and adapted for Irish EPA use) recommends that odour standards should vary from 1.5 – 6.0 OUE/m3 as a 98th%ile of one hour averaging periods at the worst-case sensitive receptor based on the offensiveness of the odour and with adjustments for local factors such as population density...*

Table A4 of AG4 contains indicative odour standards based on offensiveness of odour that have been adopted for use in Ireland. Relevant aspects are:

- The most offensive odours should be assessed against an Indicative Criterion of 1.5 OU_E/m^3 as a 98th%ile of hourly averages at the worst-case sensitive receptor
- Moderately offensive odours should be assessed against an Indicative Criterion of 3.0 OU_E/m^3 as a 98th%ile of hourly averages at the worst-case sensitive receptor

- Less offensive odours should be assessed against an Indicative Criterion of 6.0 OU_E/m^3 as a 98th%ile of hourly averages at the worst-case sensitive receptor.

The industrial sectors that fit into each category are described as follows:

- Most offensive:
  - Processes involving decaying animal or fish remains.
  - Processes involving septic effluent or sludge waste sites including landfills, waste transfer stations and non-green waste composting facilities.
- Moderately offensive
  - Intensive Livestock Rearing
  - Fat Frying / Meat Cooking (Food Processing)
  - Animal Feed
  - Sugar Beet Processing
  - Well aerated green waste composting.
- Less offensive
  - Brewery / Grain / Oats Production
  - Coffee Roasting
  - Bakery
  - Confectionery.

The sources of odour at the proposed development fall into the most offensive category based on EPA guidance and the odour exposure criterion relevant to operations at the site is C_{98}, 1-hour ≤ 1.5 ou_E/m^3.

9.4 Receiving Environment

9.4.1 *Regional & Local Meteorological Conditions*

The dominant influence on Ireland's climate is the Atlantic Ocean. Consequently, Ireland does not suffer from the extremes of temperature experienced by many other countries at similar latitude. The warm North Atlantic Drift has a marked influence on sea temperatures. This maritime influence is strongest near the Atlantic coasts and decreases with distance inland. The hills and mountains, many of which are near the coasts, provide shelter from strong winds and from the direct oceanic influence. Winters tend to be cool and windy, while summers, when the depression track is further north and depressions less deep, are mostly mild and less windy (Met Eireann https://www.met.ie/climate/climate-of-ireland).

The site is located 13 km from the east coast. Meteorological conditions at the site are therefore not significantly affected by coastal influences, which generally occur within 10 km of the coast (EPA, 2020). Land features (terrain and land use) in the vicinity of the site can be described as agricultural and industrial land, which is flat.

At its closest point, the site is approximately 3.0 km from the Tolka River Valley, which runs from northwest to southeast through Dublin and is the lowest point in the terrain in the vicinity of the site. The proximity of a site to rivers can affect local meteorological parameters such as wind speed and wind direction. The wind direction observed at a site can be heavily affected by the orientation of the river with winds aligning with the orientation of the river. Rivers are generally at the lowest point in the local terrain, often in valleys that induce drainage air flows. The site is in the flatlands of the River Tolka and River Liffey Valley that is generally oriented west to east.

The nearest meteorological station operated by Met Eireann is at Dublin Airport, which is approximately 4 km northeast of the site. Dublin Airport is approximately 9 km from the eastern coastline. It is in a relatively flat topography with terrain that gently slopes from the higher ground to the west down to the Irish Sea. The general climate (in terms of temperature, relative humidity and rainfall) and local meteorological conditions that affect dispersion (predominantly wind speed and direction) at Dublin Airport would provide a highly indicative representation of climate at the site.

The data from the observation station at Dublin is considered highly representative of the development area due to:

- The close proximity of the observation station to the Site
- The similar nature of the terrain at both locations
- The similar nature of land use at both locations
- The absence of major terrain features in the vicinity of the observation station and the Site
- The absence of coastal affects at the observation station and the Site
- Both locations being located in a flat valley that runs from west to east.

The climate and local meteorological conditions of the site was therefore characterised using the parameters observed at Dublin Airport. The observation station at Dublin Airport has recorded long term data that represents regional climate characteristics. Long term meteorological data reported between 1981 and 2020 at Dublin Airport is summarised in Table 9-17**.**

Table 9-17 Long-Term Average Meteorological Parameters Dublin Airport

Parameter	30-year average
Mean Temperature (°C)	9.8
Mean Relative Humidity (9 AM UTC) (%)	83.0
Mean Daily Sunshine Duration (Hours)[1]	3.9
Annual Rainfall (mm)	758.0
Averaged total rainfall (mm) (Summer)	196.2
Averaged total rainfall (mm) (Winter)	184.1
Average Windspeed (m/s)	5.3
Monthly average windspeed (m/s) (Summer)	4.45
Monthly average windspeed (m/s) (Winter)	6.1

Wind speed and wind direction are important parameters for the transport and dispersion of air pollutants from a source. A wind rose representing the annual distribution of 1-hour average winds at Dublin Airport is presented in Figure 9-1.

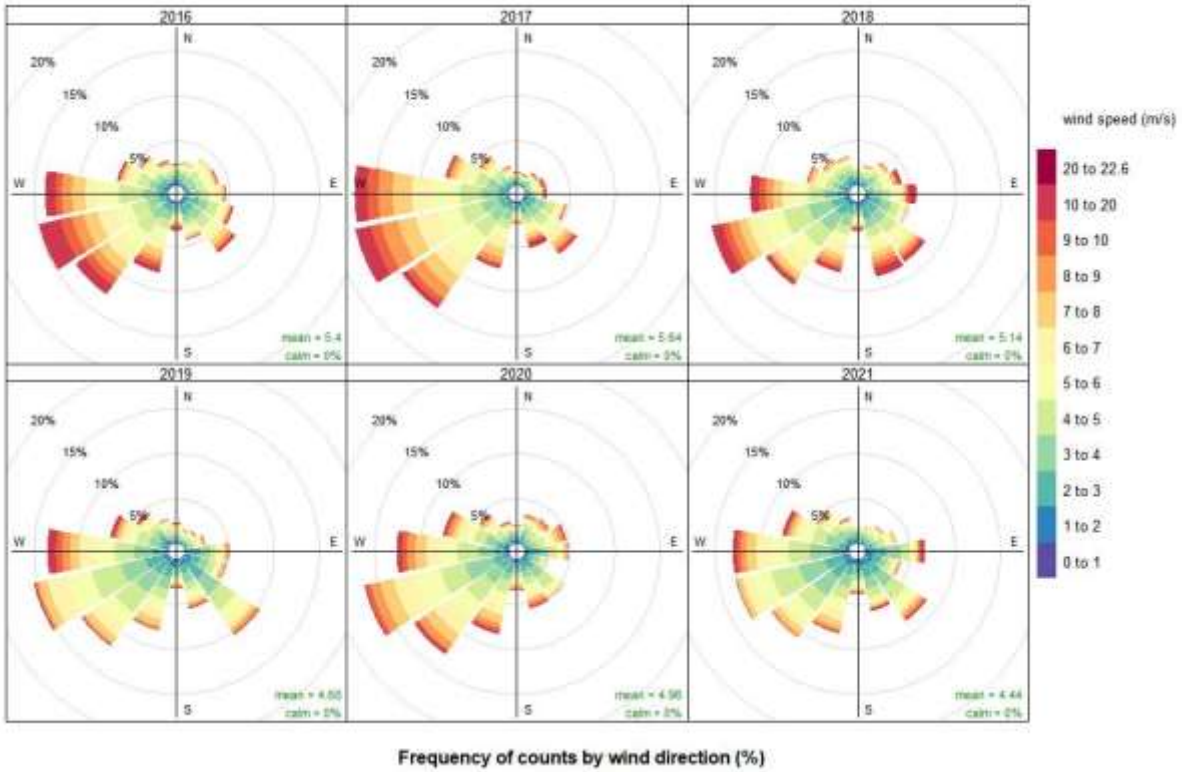


Figure 9-1 Annual windrose for Dublin Airport (Source of data: Met Eireann)

Diurnal and seasonal windroses for Dublin Airport are presented in Figure 9-2 and Figure 9-3. The prevailing wind at Dublin Airport is from the west and southwest. Winds are aligned to the valley in which the observation station is situated. Winds from the north and northeast are infrequent. The winter months are and windier than the summer months, however summer months are wetter.

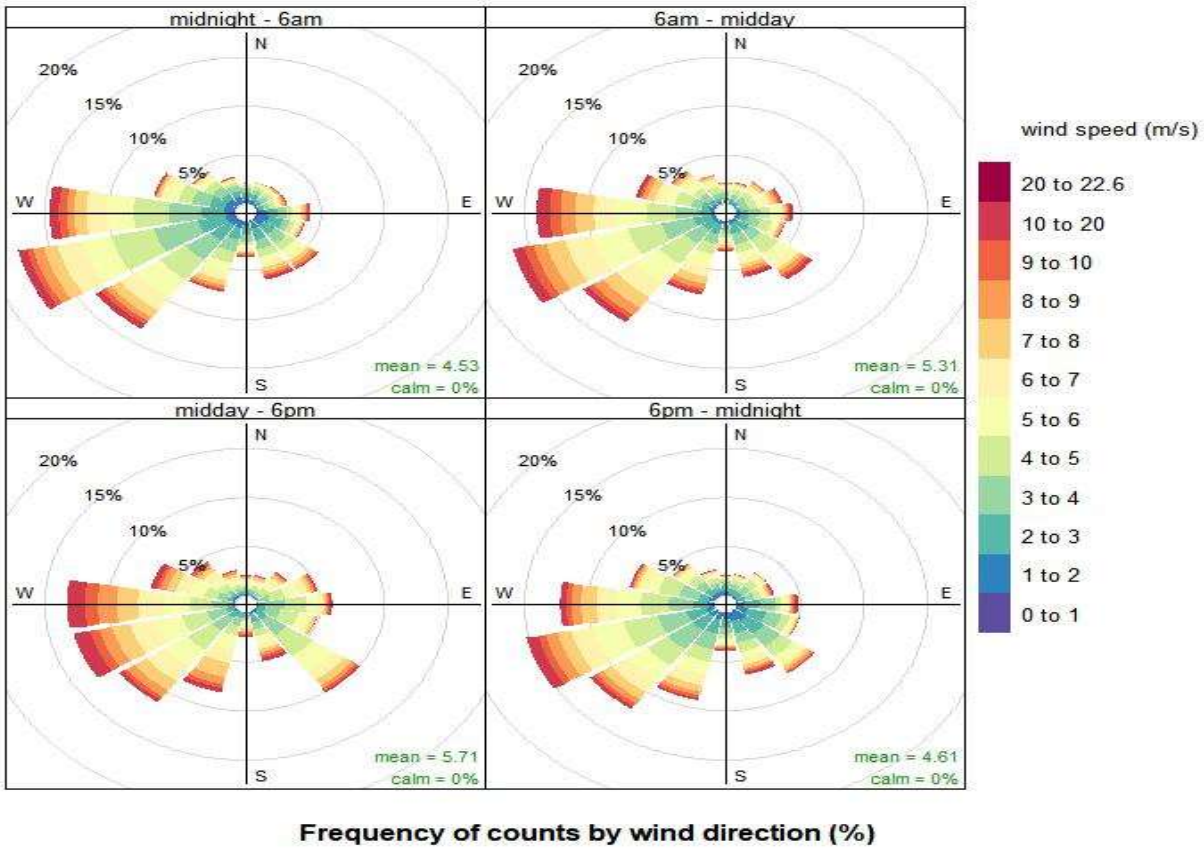


Figure 9-2 Diurnal windroses for Dublin Airport (Source of data: Met Eireann)

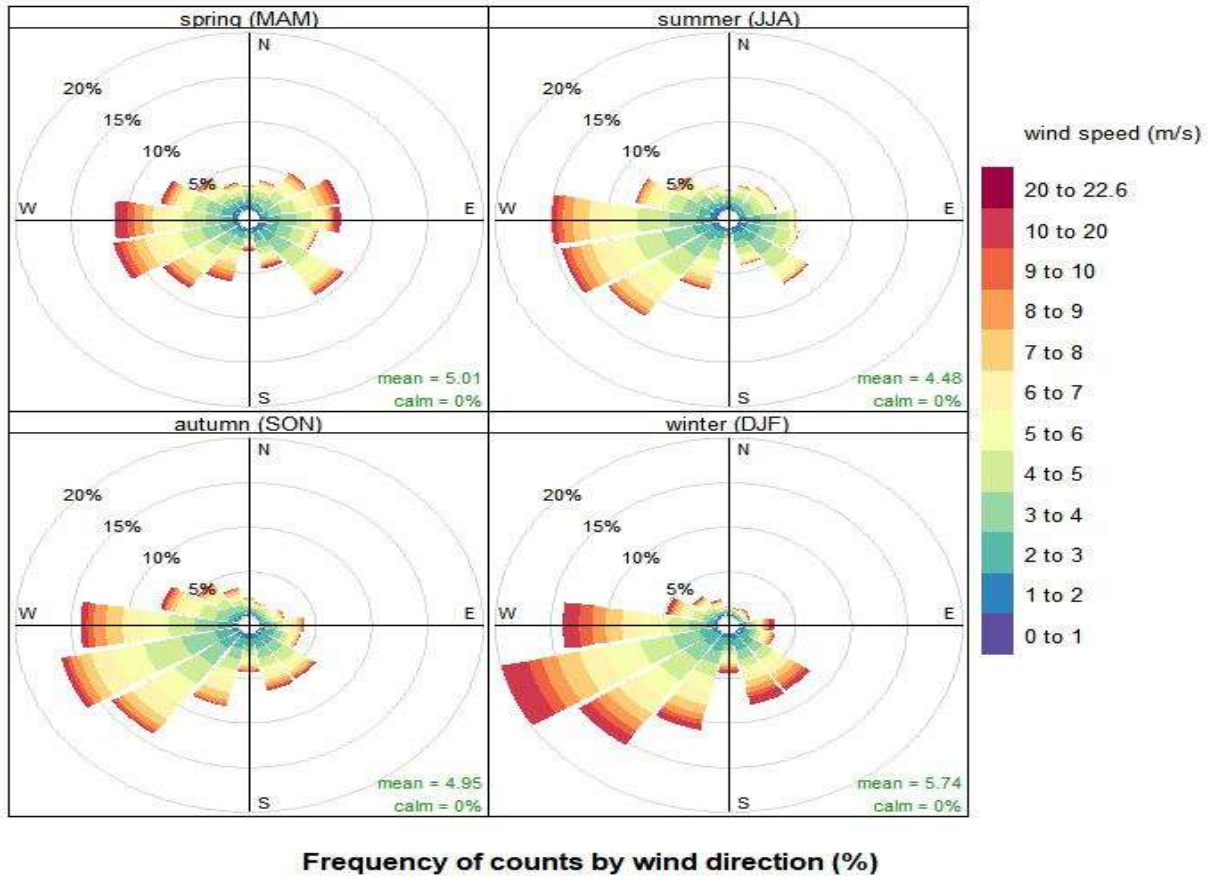


Figure 9-3 Seasonal Windroses for Dublin Airport (Source of data: Met Eireann)

9.4.2 Baseline Air Quality

9.4.2.1 Air Quality

Under the Clean Air for Europe Directive, EU member states must designate "Zones" for the purpose of managing air quality. In Ireland, four zones are defined in the *Air Quality Standards Regulations 2011* (DEHLG, 2011). The Proposed Facility is in Zone A, which is Dublin.

The site and its surroundings are presented in Figure 9-4 that shows it is surrounded by industrial and commercial installations and farmland. It is approximately 800m north of the residential areas of Finglas. There are a number of isolated dwellings in closer proximity to the site.

Baseline air quality in the study area is affected by:

- Typical baseline levels of air contaminants that are prevalent at Zone A locations that are representative of the site, and
- Emissions from industrial installations located in close proximity to the site.

The industrial installations located in close proximity to the site that will affect local air quality include:

- The Roadstone Huntstown Quarry
- The Huntstown Power Station

- The Huntstown Bioenergy Plant

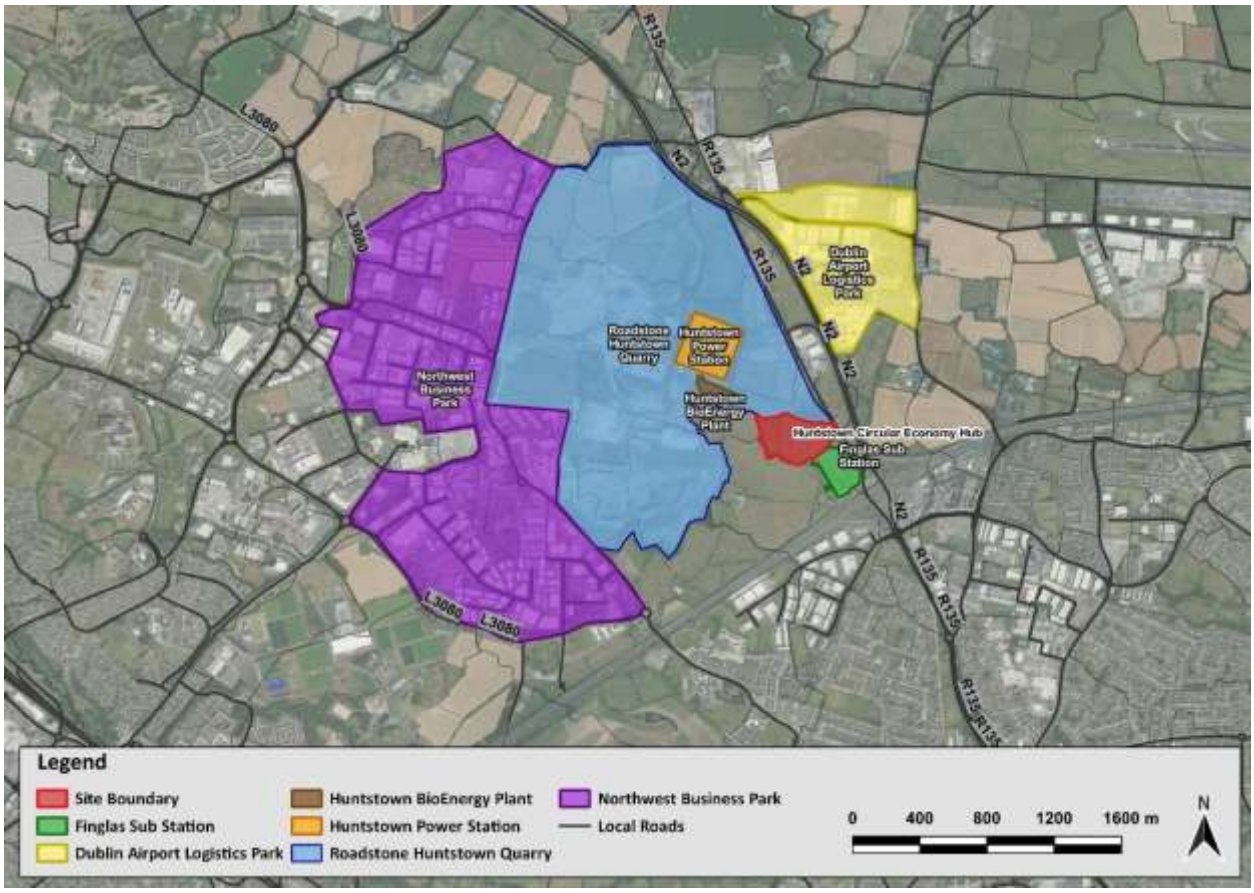


Figure 9-4 Site Setting

Installations such as the Finglas sub-station and the Dublin Airport Logistics Park are not associated with emissions to air that would affect baseline levels that are typical of Zone A baseline levels.

Emissions from installations such as the Roadstone Huntstown Quarry, the Huntstown Power Station and the Huntstown Bioenergy Plant were considered as part of the baseline for the study area as they are likely to elevate air contaminants above levels that are typical of Zone A baseline levels in close proximity to these installations and the proposed development site.

The baseline levels that are typical of Zone A were determined from three reports:

- Air Quality in Ireland 2019 – Indicators of Air Quality (EPA, 2020a)
- Air Quality in Ireland 2020 – Indicators of Air Quality (EPA, 2021)
- Air Quality in Ireland 2021 – Indicators of Air Quality (EPA, 2022)

Background air quality data observed at Zone A ambient air monitoring sites was used including data from:

- Swords, Dublin Airport and Dublin Port to represent ambient levels of NO_2 at the site
- Blanchardstown, Dublin Airport, Dublin Port and Finglas to represent ambient levels of PM_{10} and $PM_{2.5}$ at the site
- Winetavern St, Rathmines, Tallaght or Ringsend to represent ambient levels of SO_2 at the site

- Winetavern St, Rathmines, Tallaght or Ringsend to represent ambient levels of CO at the site.

The closest NO_2 monitoring station to the site is at Blanchardstown; however, it is located adjacent to the busy roadway intersection that connects the M50 to the N3. The observed levels of NO_2 at Blanchardstown are likely to overestimate baseline levels of NO_2 at the proposed development site due to its proximity to this intersection. Baseline levels of NO_2 from Zone A locations that are representative of the site were taken from Dublin Airport (monitoring location approximately 6 km northeast of the site), Swords (monitoring location approximately 8 km northeast of the site) and Dublin Port (monitoring location is in a heavily industrialised port location that is considered representative of the industrial nature of the site.)

In relation to PM_{10} and $PM_{2.5}$, the monitoring location at Finglas is 1.9 km from the site and is surrounded by residential areas and roads typical of a suburban town centre. The air quality at this location is influenced by emissions from road traffic and residential heating and is considered to be a conservative representation of background air quality at the proposed development site.

The monitoring location at Blanchardstown is 4.1 km from the site. It is surrounded by residential areas of Blanchardstown to the southwest and it is within 10 m of a major road that forms part of the M50-M3 Motorway Interchange.

The monitoring location at Dublin Port provides a representative indication of $PM_{2.5}$ levels in an industrial location of Zone A. Considering the proximity of the Blanchardstown and Finglas monitoring locations to residential areas and a motorway interchange and the proximity of the Dublin Port monitoring location to industrial sources of emissions the use of worst case data collected at these locations is considered to provide a conservative characterisation of baseline PM_{10} and $PM_{2.5}$ in the study area.

In relation to SO_2 and CO, the highest observed concentrations of these air contaminants at Winetavern St, Rathmines, Tallaght or Ringsend over a three-year period provide a conservative indication of baseline levels of these air contaminants in the study area as local emissions will not result in ground level concentrations that exceed these observed worst-case levels.

Air quality in the study would also be influenced by the nearby emission sources at the Huntstown BioEnergy Plant and the Huntstown Power station. Katestone conducted a review of the Environmental Impact Statement (Huntstown Bioenergy EIS) submitted as part of the EPA licence application for the Huntstown Bioenergy Plant (SLR, 2013) and the air quality assessment submitted to EPA in support of environmental permit application for the Huntstown Temporary Emergency Power Plant (Mott McDonald, 2022), referred to here as the Huntstown Power Plant Report.

The Huntstown Power Plant Report indicates that the fuel is natural gas. Consequently, the Huntstown Power Plant will:

- Likely to have significant effect on baseline levels of NO_2 in the study area.

- Be unlikely to have significant effects on baseline levels of:
    - SO_2 which is likely to result from the low sulphur content of natural gas
    - PM_{10} or $PM_{2.5}$ as emissions of these air contaminants is low from the combustion of natural gas
    - CO above ambient levels due to the low levels of impact of CO in relation to the guidance level for impacts

The Huntstown Power Plant Report includes a number of modelling scenarios. Scenario 3 assessed the impacts of the Proposed Huntstown Temporary Emergency Power Plant in combination with the Huntstown Power Station and the Huntstown BioEnergy Plant. The Scenario 3 modelling assessment

shows that emissions of NO_x from these facilities results in a combined worst case impact of NO_2 in the modelling domain of:

- 64.3 µg/m³ as a 1-hour average 99.79th percentile concentration on the modelling domain
- 7.1 µg/m³ as an annual average concentration on the modelling domain

These predicted concentrations were added to the typical worst case Zone A concentrations of NO_2 and provide a highly conservative estimate of baseline levels of NO_2 in the study area.

The long-term data presented in Table 9-18 indicates that the level of air contaminants reported are below the limit values specified in the *Air Quality Standards Regulations 2011* (S.I. No. 180 / 2011), as amended. The data is representative of the baseline air quality at the site and indicates that the baseline air quality in the vicinity of the site is good.

In relation to PM_{10}, the *Air Quality Standards Regulations 2011* states that the 50 µg/m³ daily limit value may not be breached more than 35 times in a calendar year. The EPA does not apply a daily limit that can be adopted as a baseline for modelled ground-level concentrations of PM_{10}. UK DEFRA and EPA advise that the 36th high 24-hour mean process contribution can be added to the annual mean background PM_{10} to determine the cumulative daily impacts of PM_{10} from localised sources with background.

Table 9-18

Pollutant	Averaging period	Baseline Ambient Value (µg/m³)	Source
Nitrogen dioxide	1-hour	185.8[a]	Maximum1-hour average concentration measured at Swords, Dublin Airport or Dublin Port between 2019 and 2021 in combination with localised ground level concentrations resulting from emissions from localised industrial installations
	Annual	34[b]	Maximum1-hour average concentration measured at Swords, Dublin Airport or Dublin Port between 2019 and 2021 in combination with localised ground level concentrations resulting from emissions from localised industrial installations
PM_{10}	24-hour	20.2	Maximum from Blanchardstown, Finglas, Dublin Port or Dublin Airport between 2019 and 2021
	Annual	20.1	Maximum from Blanchardstown, Finglas, Dublin Port or Dublin Airport between 2019 and 2021
$PM_{2.5}$	Annual	9.1	Maximum from Blanchardstown, Finglas, Dublin Port or Dublin Airport between 2019 and 2021
Sulphur Dioxide	1-hour	65	Maximum from Winetavern St, Rathmines, Tallaght or Ringsend between 2019 and 2021
	24-hour	45	Maximum from Winetavern St, Rathmines, Tallaght or Ringsend between 2019 and 2021
	Annual	5.4	Maximum from Winetavern St, Rathmines, Tallaght or Ringsend between 2019 and 2021
Carbon Monoxide	8-hour Rolling	3,699	Maximum from Winetavern St between 2019 and 2021

[a] worst case ambient background based on observations from the EPA Air Monitoring Network of 121.5 µg/m³ in combination with the worst-case impact of Scenario 3 of the Huntstown Power Plant Report (Mott MacDonald, 2022) of 64.3 µg/m³

[b] A worst case ambient background based on observations from the EPA Air Monitoring Network of 26.9 µg/m³ in combination with the worst-case impact of Scenario 3 of the Huntstown Power Plant Report (Mott MacDonald, 2022) of 7.1 µg/m³

9.4.2.2 Odour

A review of nearby existing and approved facilities was undertaken to determine baseline odour levels in the study area. The review identified:

- A number of industrial facilities in close proximity to the proposed development with operation that are typically not associated with odorous emissions including:
  - The Roadstone Huntstown Quarry
  - The Huntstown Power station
  - The Dublin Airport Logistics Park
  - The Finglas Sub-station

- A single industrial facility, the Huntstown Bioenergy Facility, that accepts and processes waste streams and the odorous emissions from which could result in cumulative odour impacts in combination with the proposed development

The Huntstown Bioenergy Facility is an EPA licensed facility (Registration P0993-02). Katestone reviewed the EPA licence and documents submitted as part of the licence application to determine how to quantify baseline levels of odour in the study area due to the operation of this facility.

Baseline odour levels in the study area was quantified using dispersion modelling techniques as described in section 9.3.3.1. The results of this assessment are presented in Figure 9-5 as predicted ground level concentrations of odour due to the operation of the Huntstown Bioenergy Facility in the study area. The results show that baseline levels of odour are well within applicable odour criterion recommended by EPA for waste facilities at all locations in the study area beyond the licence boundary of the Huntstown Bioenergy Facility.

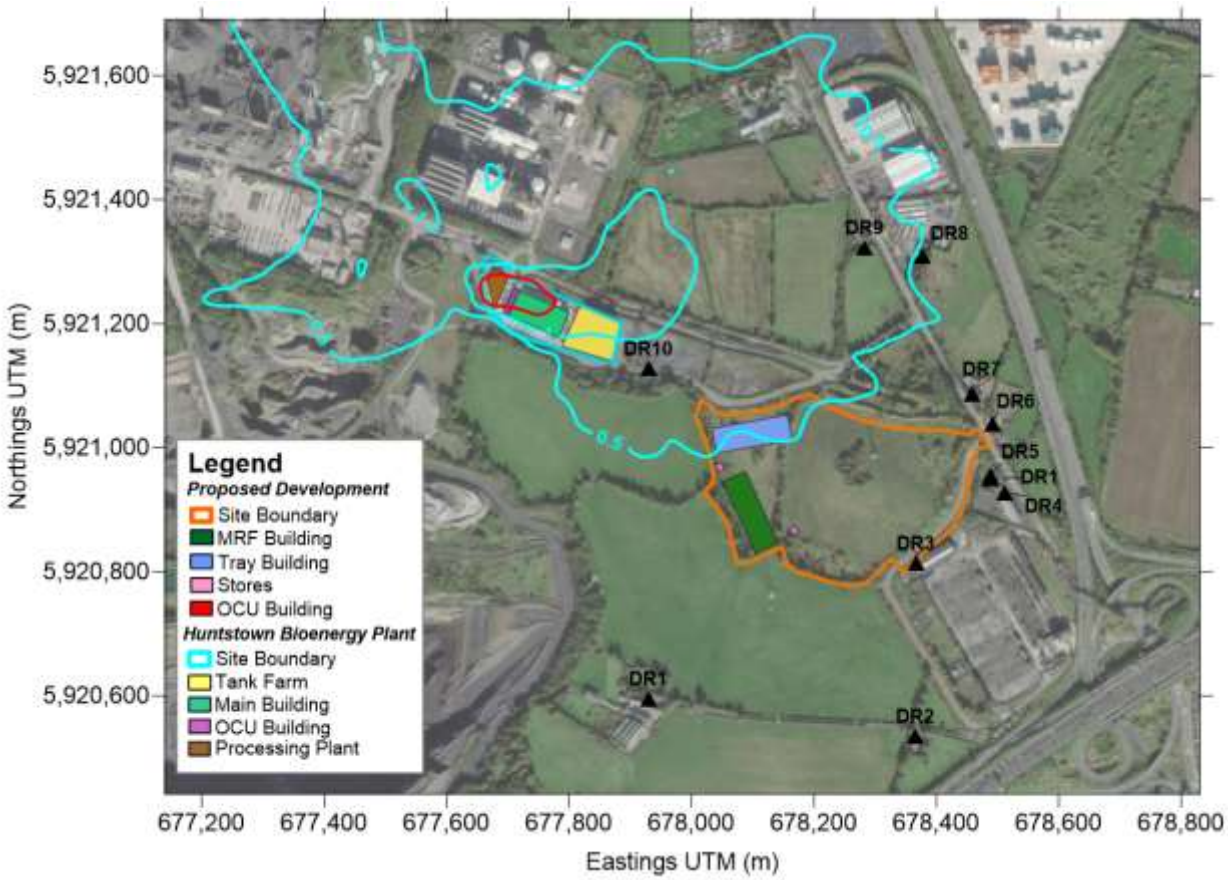


Figure 9-5 Highest Predicted Ground-Level concentrations of odour (1-hour 98th percentile) from the Huntstown Bioenergy Plant

9.4.3 *Sensitive Receptors*

The sensitive human receptors that are of greatest interest are residential and commercial locations in close proximity to construction and operational activities at the site. Construction activities including earthworks, construction and trackout will occur in close proximity to residential and commercial areas. The sensitive receptors included in the assessment of construction phase impacts are presented in Table 9-19 and Figure 9-6.

Table 9-19 Sensitive Receptors Included in the Assessment

Receptor ID	Receptor Type	x-coordinate	y-coordinate
		UTM (m)	
DR1	Residential	677,930	5920,595
DR2	Residential	678,366	5920,534
DR3	Commercial	678,367	5920,813
DR4	Residential	678,512	5920,927
DR5	Residential	678,488	5920,955
DR6	Residential	678,491	5921,038
DR7	Residential	678,458	5921,086
DR8	Residential	678,377	5921,309
DR9	Residential	678,283	5921,322
DR10	Commercial	677,930	5921,127

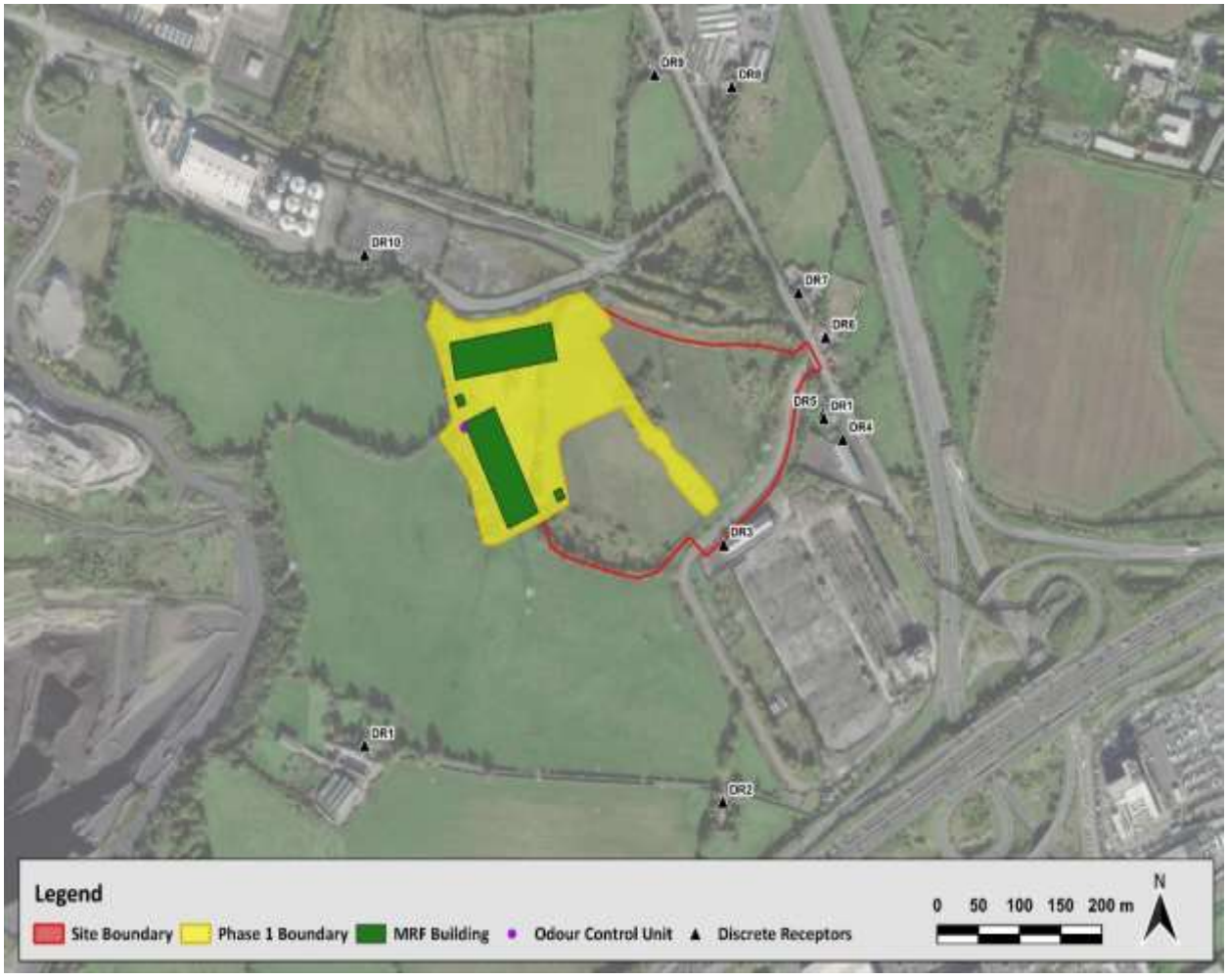


Figure 9-6 Sensitive Human Receptors Construction and Operational Stages

There are two ecological sensitive Natura 2000 Sites within 10 km of the proposed development including:

- The South Dublin Bay and River Tolka Estuary SPA
- The Malahide Estuary SAC

The location of these and other Natura 2000 Sites in relation to the proposed development are shown on Figure 9.7. The shortest distance between the proposed development Natura 2000 sites is:

- 7.8 km from the South Dublin Bay and River Tolka Estuary SPA
- 9.5 km from the Malahide Estuary SAC
- 10.1 km from the North Bull Island SPA
- 11.3 km from the Baldoyle Bay SAC
- 10.1 km from the North Dublin Bay SAC
- 10.3 km from the South Dublin Bay SAC

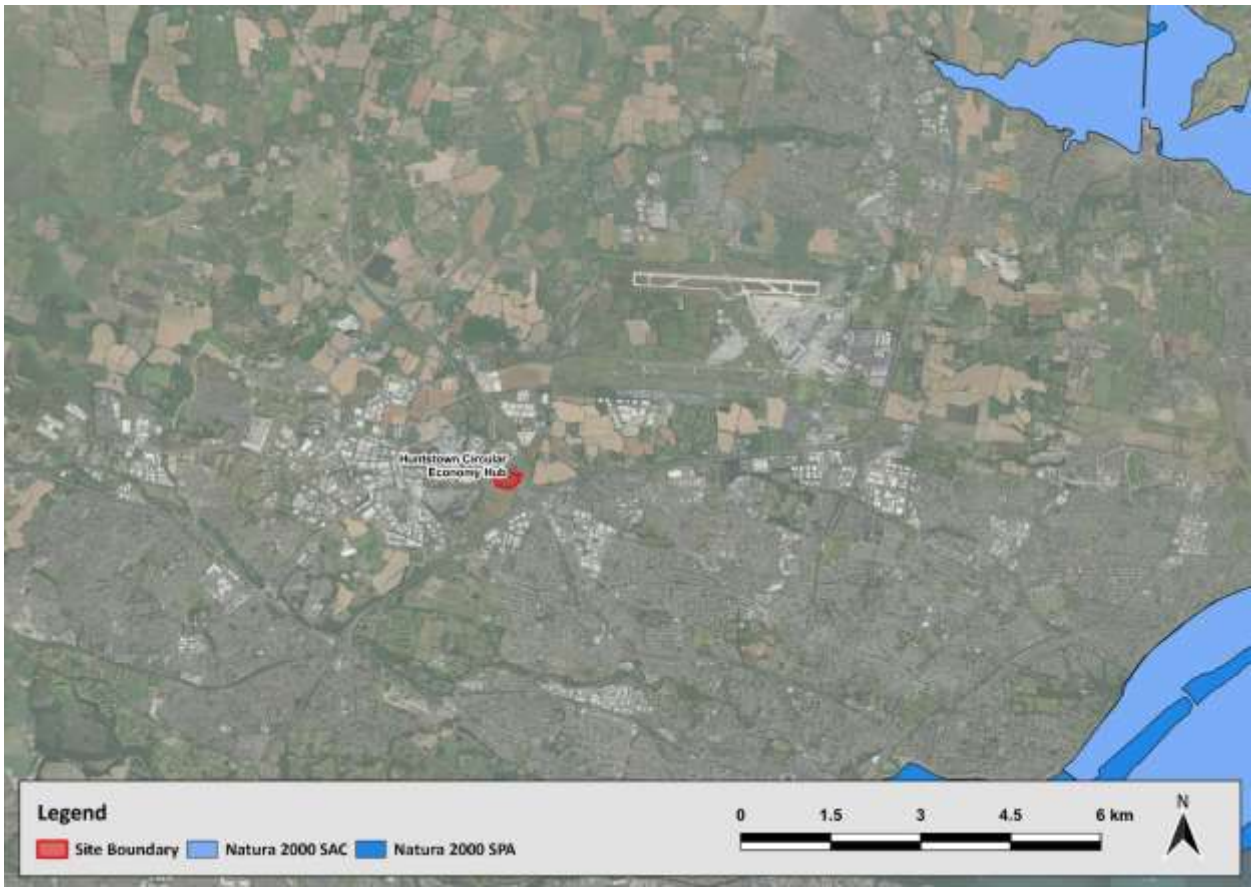


Figure 9.7 Ecological Receptors

9.5 Impacts

9.5.1 Construction Stage

Potential temporary impacts on air quality associated with the construction stage are dusts and vehicle exhaust emissions. Dusts are likely to arise from the following activities (IAQN, 2014):

- Earthworks
- Wind blow from temporary stockpiles
- Handling of construction materials
- Landscaping
- Construction traffic movements (Trackout)

The screening assessment, conducted in accordance with in IAQM (2014), indicated that a more detailed assessment is required as there are human receptors within 350 m of the boundary of the site and within 50 m of the routes used by construction traffic.

There are no ecological receptors within 50 m of the boundary of the site or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance. The effect of the construction stage on ecological receptors can be screened out, meaning that the effects are negative and temporary.

The air quality assessment of the construction phase of the proposed development on senstive human locations was conducted for the following construction elements:

- Demolition
- Earthworks
- Construction
- Trackout.

There will be no demolition activities associated with the construction phase of the proposed development.

Earthworks are required to facilitate the levelling of the site, the installation of a drainage network and installation of foundations and piles. As a precautionary measure it was assumed that the maximum land area on which earthworks will take place is greater than 10,000 m². According to IAQM (2014) size categories, earthwork activities are therefore classified as large.

Construction will involve the construction of the MRF building, the Tray Washing Building, the OCU, onsite roads and car park. The volume of buildings that will be constructed is over 150,000 m³. According to IAQM (2014) size categories, the construction phase of the proposed development is class classified as large (volume of buildings is greater than 100,000 m³).

Earthworks and construction will involve the removal of topsoil and excavated inert material and delivery of construction materials using heavy duty vehicles (HDVs). The maximum number of HDVs on any one day will be between 10 and 50. According to IAQM (2014) size categories, trackout is therefore classified as medium. A summary of the size of each construction activity for the purpose of adopting IAQM (2014) guidance is presented in Table 9-18.

Table 9-18 Summary of the Scale of Each Construction Activity

Activity	Size	Magnitude Of Activity	Unit of Activity
Demolition	Not applicable		m³ of structures demolished
Earthworks	Large	>10,000	m² of earthworks area
Construction	Medium	25,000 to 100,000	m³ of construction buildings
Trackout	Medium	10 to 50	maximum number of vehicles per day

Earthworks, construction and trackout will not take place in close proximity to sensitive locations. The closest residential receptors are over 170 m from where construction works will take place. There are no sensitive residential locations within 100 m of the site boundary.

According to IAQM (2014) residential locations are classified as “highly sensitive receptor” in terms of potential dust soiling effects and to health effects on people. There is a single industrial operation within 20 m of site boundary, the Finglas Sub Station. Places of work are classified as “medium sensitive receptor” in terms of potential dust soiling effects and to health effects on people.

Considering the baseline level of PM_{10} and the number of receptors affected, the sensitivity of the area to adverse impacts of PM_{10} at the construction phase of the proposed development is low. In terms of dust soiling, the area would also be considered to be of low sensitivity as there is a single industrial facility with operations within 20 m of the site boundary. In this instance the point of the site boundary is the access road to the proposed development. The main body of construction activities will take place over 200 m from this location.

Earthworks and construction activities will be conducted across the extents of the proposed development site. Earthworks and construction activities may occur within 170 m of the nearest residential properties and within 200 m of the closest industrial premises. According to IAQM (2014) the sensitivity of an area to dust soiling and human health impacts is low due to earthworks and construction activities due to:

- The significant distance between earthworks and construction activities and sensitive locations;
- The low number of sensitive locations in proximity to the site, and
- Baseline PM_{10} levels are below 24 µg/m³.

Considering the magnitude of dust emissions and sensitivity of the area to dust impacts from earthwork activities, the unmitigated risk of dust impacts is classified as:

- A low risk for dust soiling impacts, and
- A low risk for health effects of PM_{10}

Considering the dust emissions magnitude and sensitivity of the area to dust impacts from construction activities, the unmitigated risk of dust impacts is classified as:

- A low risk for dust soiling impacts, and
- A low risk for health effects of PM_{10}

Trackout activities will take place in along the service road link between the site entrance and North Road (R135) before traffic continues on to North Road. As the magnitude of the activity is medium, trackout activities are considered within 200 m of the site entrance. As the distance along the access road link between the site entrance and North Road is more than 200 m this is the road link considered for trackout activities. According to IAQM (2014) the sensitivity of the area in the vicinity of road link within 200 m of the site entrance to dust soiling and human health impacts are as follows:

- Dust soiling: sensitivity is medium because there is a single medium sensitive receptor (industrial installation) located at distances less than 200 m from the site entrance and less than 20 m trackout activities
- Human health impacts: sensitivity is low because baseline PM_{10} levels are below 24 µg/m³ and fewer than 10 highly sensitive receptors are located at distances less than 50 m from trackout activities.

Considering the magnitude of dust emissions from trackout and sensitivity of the area to dust impacts, the unmitigated risk of dust impacts is classified as a low risk for both dust soiling and for health effects of PM_{10}.

A summary of the unmitigated risk of dust impacts from various construction activities is presented in Table 9-19.

Table 9-19 Summary of Unmitigated Risk of Dust Impacts s

Construction Activity	Dust Soiling	Health Effect PM_{10}
Demolition	n/a	
Earthworks	Low Risk	Low Risk
Construction	Low Risk	Low Risk
Trackout	Low Risk	Low Risk

The unmitigated impact of construction on air quality can be described in terms of dust soiling as negative, imperceptible and temporary effects. The unmitigated impact of construction on air quality can be described in terms of health impacts as negative, imperceptible and temporary effects.

Mitigation will not be required to reduce potential impacts of construction activities to levels that can be described as not significant.

9.5.2 *Operational Stage*

9.5.2.1 Traffic

The potential for air quality impacts in the operational stage under the 'do-something' scenario result from traffic associated with the proposed development. The air contaminants of concern from traffic are NO_x, NO_2 and PM_{10}.

Traffic data was obtained from Trafficwise to determine the potential for air quality impacts at the operational stage of the proposed development under the do-something scenario. Traffic data was provided for the following road links:

- Link 1 – North Road (South of Development Access Junction)
- Link 2 – North Road (South of Huntstown Quarry)
- Link 3 – North Road (North of Huntstown Quarry)
- Link 4 – N2 Coldwinters Off-slip
- Link 5 – R135 North Road (Between N2 Off/On-slips)
- Link 6 – N2 Southbound On-slip Link Road
- Link 7 – N2 Southbound On-slip
- Link 8 – R135 North Road (South of Kilshane Cross)
- Link 9 – L3120
- Link 10 – L3125
- Link 11 - R135 North Road (North of Kilshane Cross)
- Link 12 – Blanchardstown Link Road
- Link 13 – R135 Wards Cross.

The assessment of impacts of the operational phase of the proposed development is based on the air quality impacts due to predicted AADT and HDV AADT on the road links.

A summary of the traffic flows generated on each of the road links due to the operational phase of the proposed development is presented in Table 9-20**.**

Table 9-20 Traffic Flows on Road Links: Operational Stage

Road Link	AADT	HDV AADT
Link 1 – North Road (South of Development Access Junction)	0	0
Link 2 – North Road (South of Huntstown Quarry)	236	162
Link 3 – North Road (North of Huntstown Quarry)	236	162
Link 4 – N2 Coldwinters Off-slip	75	50
Link 5 – R135 North Road (Between N2 Off/On-slips)	162	105
Link 6 – N2 Southbound On-slip Link Road	233	146
Link 7 – N2 Southbound On-slip	71	49
Link 8 – R135 North Road (South of Kilshane Cross)	90	63
Link 9 – L3120	40	22
Link 10 – L3125	24	15
Link 11 - R135 North Road (North of Kilshane Cross)	26	18
Link 12 – Blanchardstown Link Road	16	16
Link 13 – R135 Wards Cross.	11	8

The total volume of traffic generated as a result of the proposed development on any road link is less than the scoping criteria for:

- AADT of >=1,000
- HDV AADT of >=200

Considering that there will be no changes in speed band or carriageway alignment by >=5m due to the proposed development, no further assessment is required to demonstrate that traffic generated as part of the operational phase of the proposed development would cause adverse air quality impacts.

The potential impact of the operational stge on air quality is therefore found to be imperceptible, negative and long-term.

9.5.2.2 Odour

The potential for air quality impacts in the operational stage under the' do-something' scenario result from in-coming MSW and brown bin waste streams that will be handled and processed in the MRF.

The operational phase of the proposed development has the potential to result in odorous emissions that could cause adverse impacts that could in the absence of mtigation be described as significant, negative and long-term. Mitigation, in the form of an onsite odour abatement unit will be required to reduce potential impacts of operational activities to levels that can be described as not significant.

9.5.2.3 Fire

In the event of a fire, which is the worst case scenario, smoke emissions would be generated by the combustion of materials and wastes; however the localised impacts on air quality will be brief.

9.6 Baseline Scenario

In the do-nothing scenario, no development of the site will take place. Air quality at the site will remain at baseline levels. Baseline air quality levels at the site will change with time in line with general trends in air quality for the site and the wider surrounding area.

9.7 Prevention & Mitigation

9.7.1 Design Stage

9.7.1.1 Odour

An odour management system comprising the extraction of odorous air and its treatment in an odour control unit consisting of a dust filter to remove dusts and a carbon filter to reduce odour levels, will be installed in the section of the MRF where the MSW and 'brown bin' wastes are handled.

Prior to the installation of the system a thick foam spray will be applied to all cladding joints and other parts of the building fabric that could be susceptible to air leaks. The objective is to achieve an air leakage rate of < $2m^3/m^2$/hour. Rapid action doors will be fitted to the vehicle access points.

Air will be drawn from the building using an extraction fan and a system of internal ceiling mounted ducts provided with grills. The fan will have the capacity to achieve 2 air changes per hour. The air will pass through the dust filter before entering the carbon filter. A damper will be fitted to the inlet of the unit to allow the air flow to be balanced. The treated air will vent to atmosphere via a single stack. The stack height was determined by the air dispersion modelling to ensure that the ground level concentrations of the odours emitted in the operational stage would not be a cause of odour nuisance.

9.7.1.2 Fire Safety

The fire safety measures included in the design to mitigate the risk of fire outbreak are described in Section 10.8.1.6.

9.7.2 Construction Stage

When rainfall is greater than 0.20 mm/day, dust generation is generally suppressed. The potential for significant dust generation is also dependent on threshold wind speeds greater. 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.

A Preliminary CEMP describing the proposed construction mitigation measures has been prepared and a copy is in Appendix 3.3. This document will be updated in advance of the construction stage to take into consideration any additional measures that may be required by conditions attached to planning permission. The following measures shall be taken in order to avoid dust nuisance occurring under unfavourable meteorological conditions:

- Water spraying of exposed earthworks and site haul road during dry weather using mobile bowser units.
- Provision of a wheel cleaning unit at the site access road to remove dirt from vehicles prior to exiting the site
- Control of vehicle speeds on site roads
- Material drop heights from plant to plant or from plant to stockpile will be minimised.

9.7.3 *Operational Stage*

9.7.3.1 Air Quality

The impact of the proposed development was considered in accordance with regulatory guidance and determined to be imperceptible. Therefore, no additional mitigation is required to further reduce operational impacts on air quality.

9.7.3.2 Odour

The odour abatement unit installed in the MRF will effectively mitigate potential effects of odorous emissions. The emissions will be regulated by and Industrial Emissions Licence issued by the EPA and the emission limit values applied in the odour impact assessment are typical of levels set in EPA Licences.

9.7.3.3 Fire Safety

The fire safety and emergency response measures that will be implemented in the operational stage to mitigate the risk of fire outbreak and, if one does occur, to ensure the appropriate response actions are taken to ensure the fire is extinguished as quickly as possible so as to minimise the adverse environmental impacts are detailed in Section 10.8.3.1.

9.8 **Monitoring**

9.8.1 *Construction Stage*

A minimum of three monitoring gauges will be located at the site boundary at points closest to the nearest sensitive receptors (residential and farm dwellings).

The monitoring will be carried out using Bergerhoff gauges specified in the German Engineering Institute VDI 2119 document entitled 'Measurement of Dustfall Using the Bergerhoff Instrument' (Standard Method). The gauges will be set up such that the containers are approximately 2m above the ground surface. To inhibit the growth of algae, 10ml of copper sulphate will be added to each jar. Monitoring will be carried out monthly through the construction stage. The deposition limit will be 350 mg/m^2/day.

9.8.2 *Operational Stage*

At the MRF, the emissions from the odour control unit will be monitored at the frequencies set in the EPA licence to demonstrate compliance with the emission limits. The odour control unit will be inspected regularly to ensure it is operating effectively. Dust deposition monitoring will be carried out at locations and frequencies specified by the EPA. At a minimum, this will include three locations inside the EPA licence boundary at quarterly intervals.

9.9 **Cumulative Impacts**

9.9.1 *Construction Stage*

Construction activities will take place in proximity to operational activities at the Huntstown Quarry. The closest point between construction activities and the quarry opeational will be 300 m. The implementation of the CEMP for the proposed development will ensure that levels of impact identified in the assessment of the construction stage in combination with the quarry operations will be imperceptible, negative and temporary.

9.9.2 *Operational Stage*

9.9.2.1 Air Quality

The nature of the proposed development, involving haulage activities has the potential to impact on air quality in the operational stage due to traffic. Considering that baseline levels of air quality in the study area are well below regulatory limits, the potential impact of the operational stage on air quality in combination with baseline levels of air quality was therefore also found to be imperceptible, negative and long-term.

9.9.2.2 Odour

A cumulative odour impact assessment was undertaken to determine the impact of the proposed development in combination with the baseline levels of odour resulting from the Huntstown Bioenergy Facility. The assessment was undertaken using dispersion modelling techniques as described in Section 9.3.3.1. Predicted ground-level concentrations of odour (1-hour average, 98th percentile) are presented here as:

- Concentrations of odour at modelled receptors in Table 9-21
- A contour plot illustrating the concentrations of odour on a cartesian grid around the site in Figure 9-

The results show that predicted concentrations comply with the odour criterion recommended by EPA for waste facilities of 1.5 ou_E/m^3 at all sensitive receptors included in the modelling assessment. The operation of the OCU will ensure that levels of odour impact identified in combination with baseline levels of odour will be minimised to levels that are imperceptible, negative and long-term.

Table 9-203 Highest Predicted Odour Ground-Level Concentrations (1-hour 98th percentile) for each Sensitive Receptors

Receptor ID	1-hour 98th Odour Concentrations (ou_E/m^3)
	Maximum 5-year
DR1	0.2
DR2	0.2
DR3	0.6
DR4	0.4
DR5	0.4
DR6	0.4
DR7	0.5
DR8	0.5
DR9	0.6
DR10	0.9

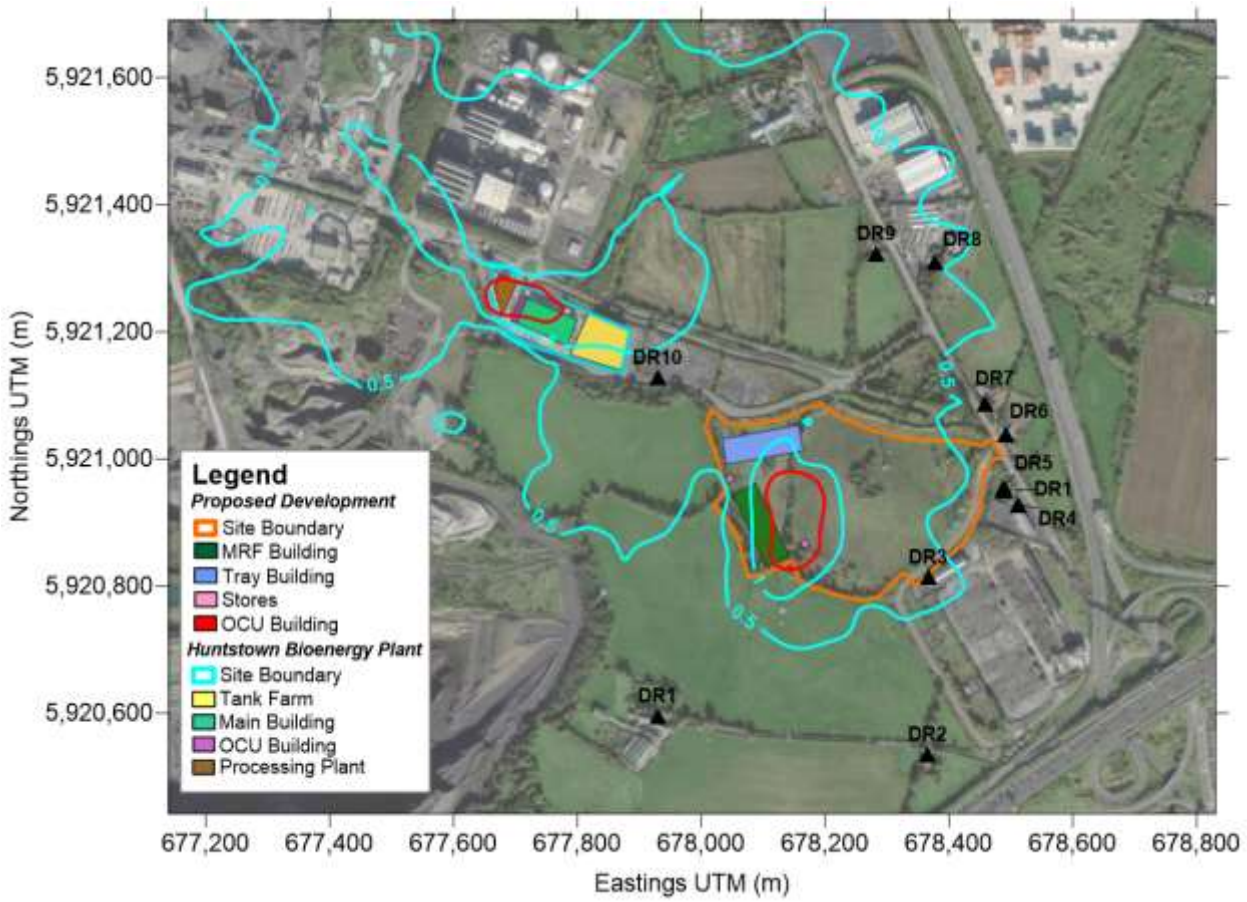


Figure 9-8 Highest predicted ground-level concentrations of odour (1-hour 98th percentile) in any of the five modelled years included in the dispersion modelling assessment due to the MRF

9.10 Residual Impacts

9.10.1 Construction Stage

The implementation of the CEMP will ensure that levels of impact identified in the assessment of construction impacts will be minimised to levels that are negative, imperceptible, local, not likely and temporary.

9.10.2 Operational Stage

9.10.2.1 Air Quality

The results of the traffic modelling assessment indicate that the impact of the operational stage on human health will be negative, imperceptible, local, likely and long-term. In relation to ecological sites the impact will be negative, imperceptible, not likely and long-term.

9.10.2.2 Odour

The predicted ground-level concentrations of odour (1-hour average, 98th percentile) are presented here as:

- Concentrations of odour at modelled receptors in Table 9-212
- A contour plot illustrating the concentrations of odour on a cartesian grid around the site in Figure 9-

The results show that predicted concentrations comply with the odour criterion recommended by EPA for waste facilities of 1.5 ou_E/m^3 at all sensitive receptors included in the modelling assessment. The operation of the OCU will ensure that levels of impact identified in the assessment in terms of odour will be minimised to levels that are negative, imperceptible, local, likely and long-term.

Table 9-21 Highest Predicted Odour Ground-Level Concentrations (1-hour 98th percentile) for each Sensitive Receptor

Receptor ID	1-hour 98th Odour Concentrations (ou_E/m^3)
	Maximum 5-year
DR1	0.1
DR2	0.1
DR3	0.4
DR4	0.3
DR5	0.3
DR6	0.3
DR7	0.3
DR8	0.3
DR9	0.2
DR10	0.4

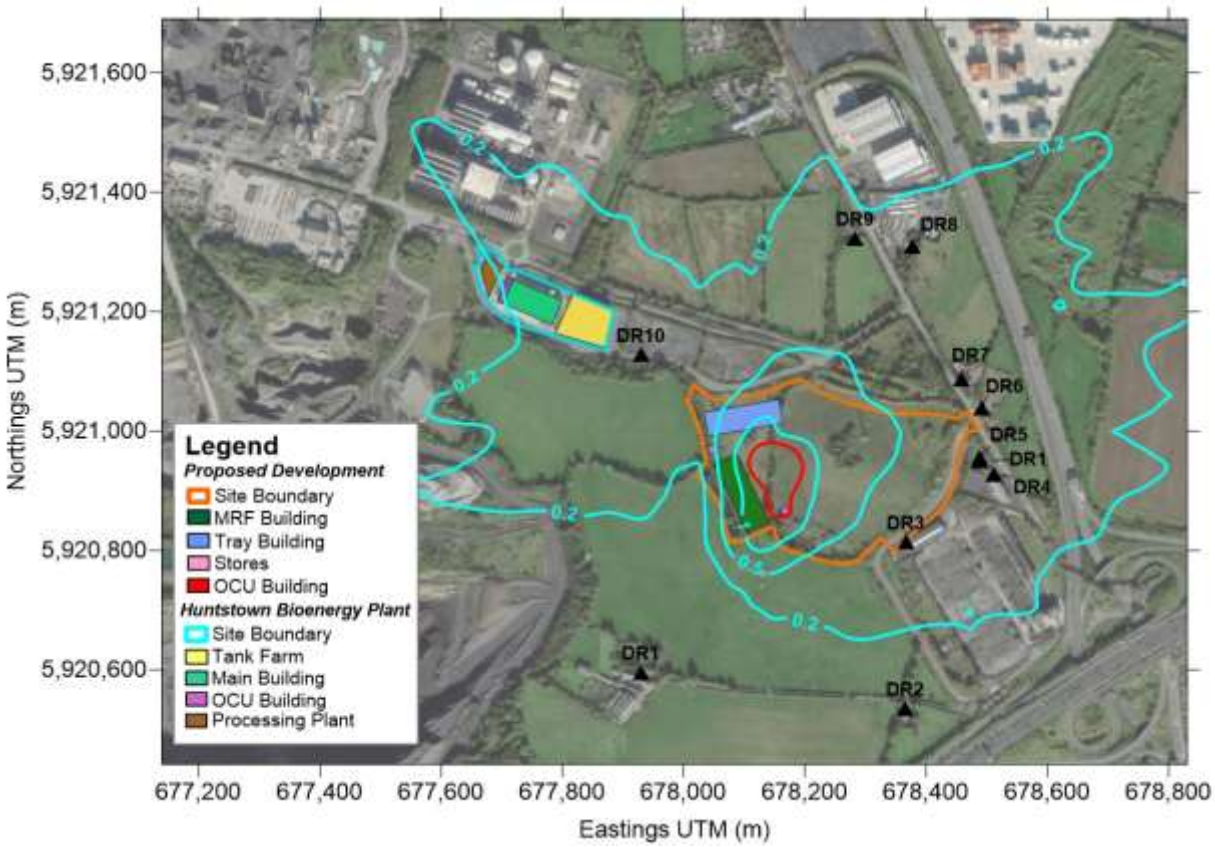


Figure 9-9 Highest Predicted Ground-Level Odour Concentrations (1-hour 98th percentile)

9.10.3 *Summary of Impacts*

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration
Construction Stage					
Air Quality	Negative	Imperceptible	Local	Likely	Long Term
Operational Stage					
Air Quality Human Receptors	Negative	Imperceptible	Local	Likely	Long Term
Air Quality Ecological Receptors	Negative	Imperceptible		Not Likely	Long Term

9.11 References

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10. POPULATION & HUMAN HEALTH

10.1 Introduction

This Chapter assesses the impacts of the proposed development on the population and human health. The assessment considered a 'baseline' scenario and identifies the prevention, mitigation and monitoring measures that will be implemented to reduce the significance of the impacts and assesses the residual impacts. This Chapter should be read in conjunction with Chapter 9 Air and Chapter 14 Materials Assets Traffic & Transport.

"Human health" is not defined in the EIA Directive; however the term "human health" is contained in both the Strategic Environmental Assessment Directive (2001/42/EC) and EIA Directive and a common interpretation can be assumed. Therefore the consideration of human health effects resulting from the construction and operation of a project should focus on health issues arising in the context of the other relevant environmental factors listed in Article 3 of the Directive[10], namely:

- Population
- Biodiversity, with particular attention to protected species and habitats
- Land, soil, water, air and climate
- Material assets, cultural heritage and the landscape
- Interactions between the above factors

The EIA Directive and transposing regulations do not generally require assessments of land-use planning, demographic issues or detailed socio-economic analysis and these should be avoided in an EIAR, unless issues such as economic or settlement patterns give rise directly to specific new developments and associated effects[11]. Given the nature of the proposed development these aspects have not been considered.

This Chapter was prepared by Dr Martina Gleason PhD of OCM, with assistance from Mr Damian Brosnan MSc of Damian Brosnan Acoustics (dBA) who prepared a Noise and Vibration Impact Assessment for the proposed development, a copy of which is in Appendix 10.1. Dr Gleeson has a BSc in Environmental Geochemistry and a PhD in Geochemistry. She has over 15 years' experience of environmental impact assessment and, managing environmental monitoring contracts at EPA licensed sites including the preparation of interpretive reports on air quality and noise impact assessments.

[10] • Government of Ireland Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (2018).

[11] Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA 2017).

Mr Brosnan holds a BSc, Diploma in Acoustics and Noise Control, MSc in Applied Acoustics and is a Member of the Instituted of Acoustics (MIOA) and a founding member of the Association of Acoustic Consultants of Ireland (AACI) who has over 20 years' experience in scoping and carrying out noise and vibration impact assessments.

10.2 Relevant Regulations and Guidance

The general EIA legislation and guidance documents are listed in Section 1.5. The guidelines relevant to Population and Human Health considered in the preparation of this Chapter include:

- Dublin Airport Local Area Plan(LAP) 2020);
- Fingal Noise Action Plan 2019-2023, and
- Noise Action Plan Dublin Airport 2019 – 2023.

10.3 Methodology

The assessment was based on the land use and settlement patterns in the vicinity of the proposed development. Information was derived from databases maintained by the Central Statistics Office (CSO), the Fingal County Development Plan; Chapter 9 Air, and Chapter 14 Traffic & Transport; a Noise & Vibration Assessment completed by dBA (Appendix 10.1); an Aeronautical Assessment prepared by O' Dwyer Jones Design Partnership (Appendix 10.2), and a Glint and Glare Assessment completed by MacroWorks (Appendix 10.3).

10.4 Proposed Development

Chapter 3 provides a detailed description of the proposed development. Those aspects of the relevant to Population & Human Health include the land use in the vicinity of the development site; local amenities; proximity to Dublin Airport and the flight path to Casement Aerodrome; emissions during the construction and operational stages with the potential to directly and indirectly impact on human health, for example air emissions and noise, and potential sources of nuisance (e.g. odours and traffic congestion).

10.5 Receiving Environment

10.5.1 Surrounding Land Use

The surrounding land use is a mix of quarrying, utilities and agricultural. Huntstown Quarry, which includes an inert soil recovery facility, is to the west; Huntstown Bioenergy, which is an anaerobic digestion plant is 150m to the west Huntstown Power Station, which is a Tier 2 Seveso Site, is approximately 280m to the north-west; an Eirgrid 220 kv Substation is to the south-east. The adjoining lands to the east, south and west are currently used for agriculture. The southern runway of Dublin Airport is approximately 2.4km from the north-eastern boundary.

Despite the commercial character of the area, there are a number of residential dwellings in proximity to the development site (Figure 10.1) that are potential sensitive receptors to human health impacts:

- A cluster of three dwellings 220 m east of Phase 1 on North Road are the nearest receptors. One of these houses a veterinary clinic.
- Individual dwellings further north, including the Ravenswood Estate Community Housing Project at 830 m.
- An isolated farmhouse 280 m southwest of the site (Kildonan House), which is accessed from the Substation service road.



Figure 10.1: Phase 1 Nearest Residences (White). Ravenswood Estate Community Housing Project (Yellow), and the Baleskin Reception Centre (Orange).

Other receptors are scattered in several directions, all of which are over 700 m from the site. A number of residential estates lie to the south and south-east, in addition to apartment complexes at Charlestown.

In terms of noise impacts, all of receptors in proximity to the site are residential. There are no particularly vulnerable receptors such as hospitals or nursing homes within 500 m. Commercial and energy-related facilities, including their offices, are not considered noise sensitive. Similarly The Dog's Trust Facility to the north is also not considered to be a noise sensitive location.

10.5.2 Amenities

There are no recreational areas, schools, nursing homes or medical centres within 1km of the site.

10.5.3 Major Accidents and Natural Disasters

10.5.3.1 Major Accidents

The Seveso II Directive 96/82/EC is concerned with the prevention of major accidents that involve dangerous substances and the limitation of their consequences for humans and the environment. It applies to establishments where dangerous substances are produced, used, handled or stored. The Directive was transposed into Irish law by the "European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations" SI No 476 of 2000 and the Health and Safety Authority (HSA) is the designated competent authority.

Facilities that are subject to the Regulations are ranked as Upper and Lower Tier Establishments based on their scale. The proposed development will not be subject to the Regulations and the nearest designated facility is the Lower Tier Huntstown Power Station, approximately 270m to the north-west.

10.5.3.2 Natural Disasters

The subject site is not in an area at risk of land instability or identified as being at risk of, pluvial, fluvial or groundwater flooding.

10.5.4 Dublin Airport & Casement Aerodrome

The development site is outside all Airport Public Safety Zones, and just outside the new Airport Noise Zone C. However it is 2.4km from one of Dublin Airport's main runway thresholds (Threshold 10R) and is on elevated ground directly under the Airport's "Inner Horizontal Surface".

The site's ground surfaces are directly in view of Dublin Airport's new 90m-tall Control Tower and in line with the control tower's view towards aircraft landing on Dublin's Runway 10R. It is well within the 13km distance from Dublin Airport, identified as the area of bird hazard risk. The development area is also directly under the end of the "Approach Surface" to Casement Aerodrome's Runway 22 and directly under the Aerodrome's "Outer Horizontal Surface".

Aviation safety at and around Dublin Airport and in Fingal in general is provided for under Objectives of the Dublin Airport Local Area Plan (LAP) 2020. Objective OS01 requires the control of the type and height of any structures developed in the environs of the Airport in accordance with the Obstacle Limitation Requirements of Regulation (EU) No 139/2014 (EASA Certification Specifications).

10.5.5 Noise & Vibration

The Noise Action plan for Fingal County 2019-2023 includes maps relating to the road network in the vicinity of the proposed development. The Day-Evening-Night noise levels (Lden) levels at the proposed development reach 65 dB, and exceed 65 dB at the nearest dwelling cluster on North Road,

as well as at Kildonan House to the southwest. Night (Lnight) levels are also elevated, exceeding 55 dB across the local area. These high levels reflect the 24 hour dominance of road traffic, and approach the 'undesirable high' noise level thresholds set out in the Noise Action Plan.

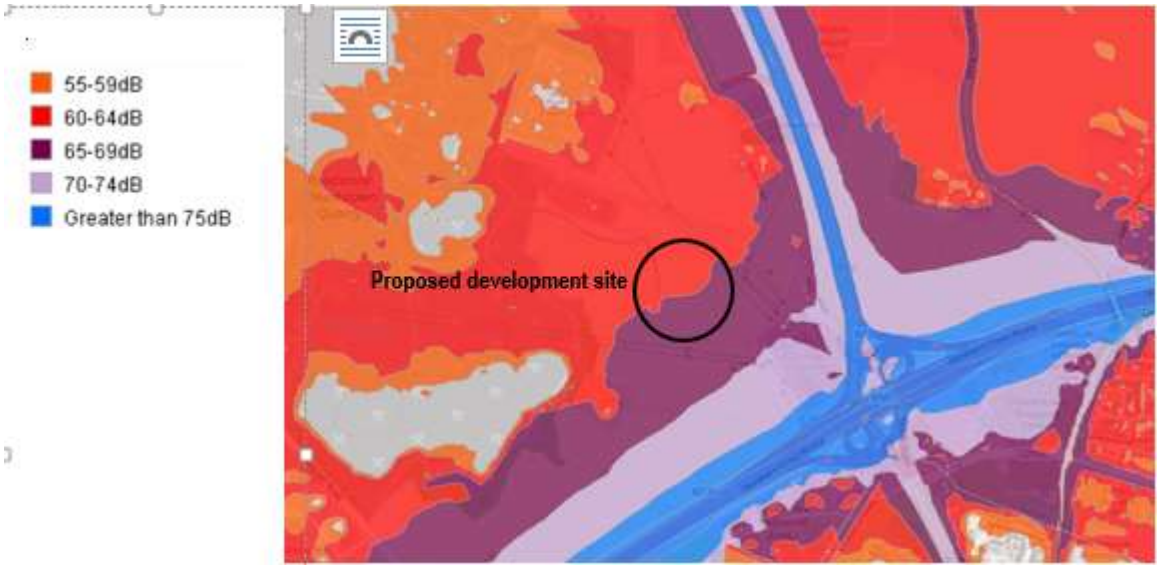


Figure 10.2 Day-Evening-Night Time Noise Contours

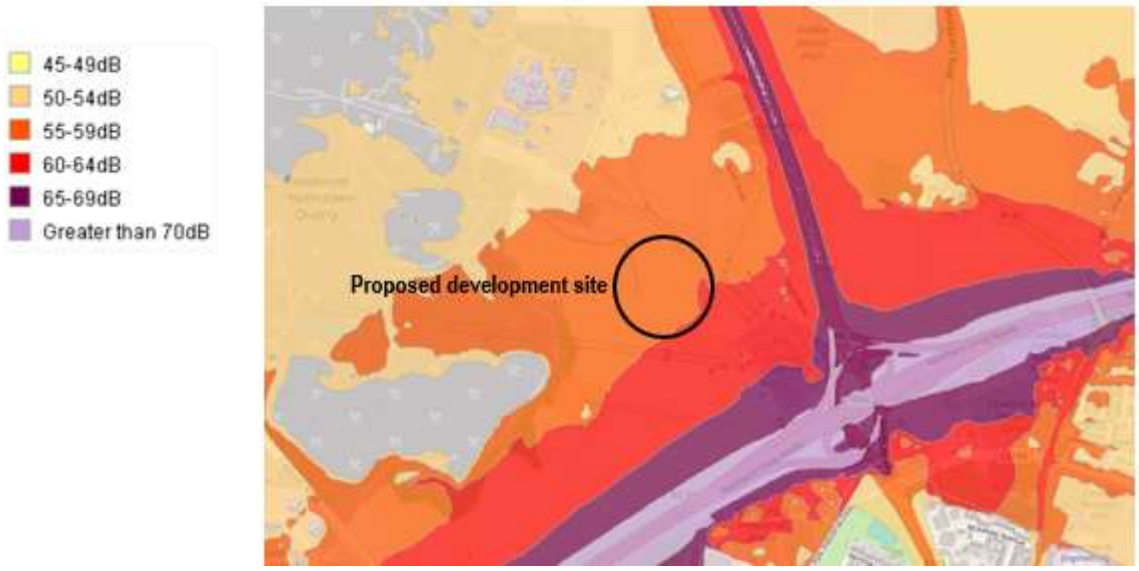


Figure 10.3 Night Time Noise Contours

The development site is outside the noise zones specified in the Draft Dublin Airport Noise Action Plan. dBA completed a baseline noise survey on 23.02.23—24.02.23 at three locations (N1, N2 and N3) shown on Figure 10.4. The survey methodology, equipment specifications and weather conditions are described in Section 3.4 of the dBA report in Appendix 10.1, with the noise date presented in Tables 9 and 10.

The soundscape at all three stations was entirely dominated by distant road traffic, with traffic on N2 being more intrusive than M50 traffic. Intermittent North Road traffic was also significant at station N3, chiefly associated with truck movements related to the nearby Huntstown Quarry. All three

stations were influenced by local bird song/calls and aircraft movements, while noise emissions from the quarry were slightly audible at N1.

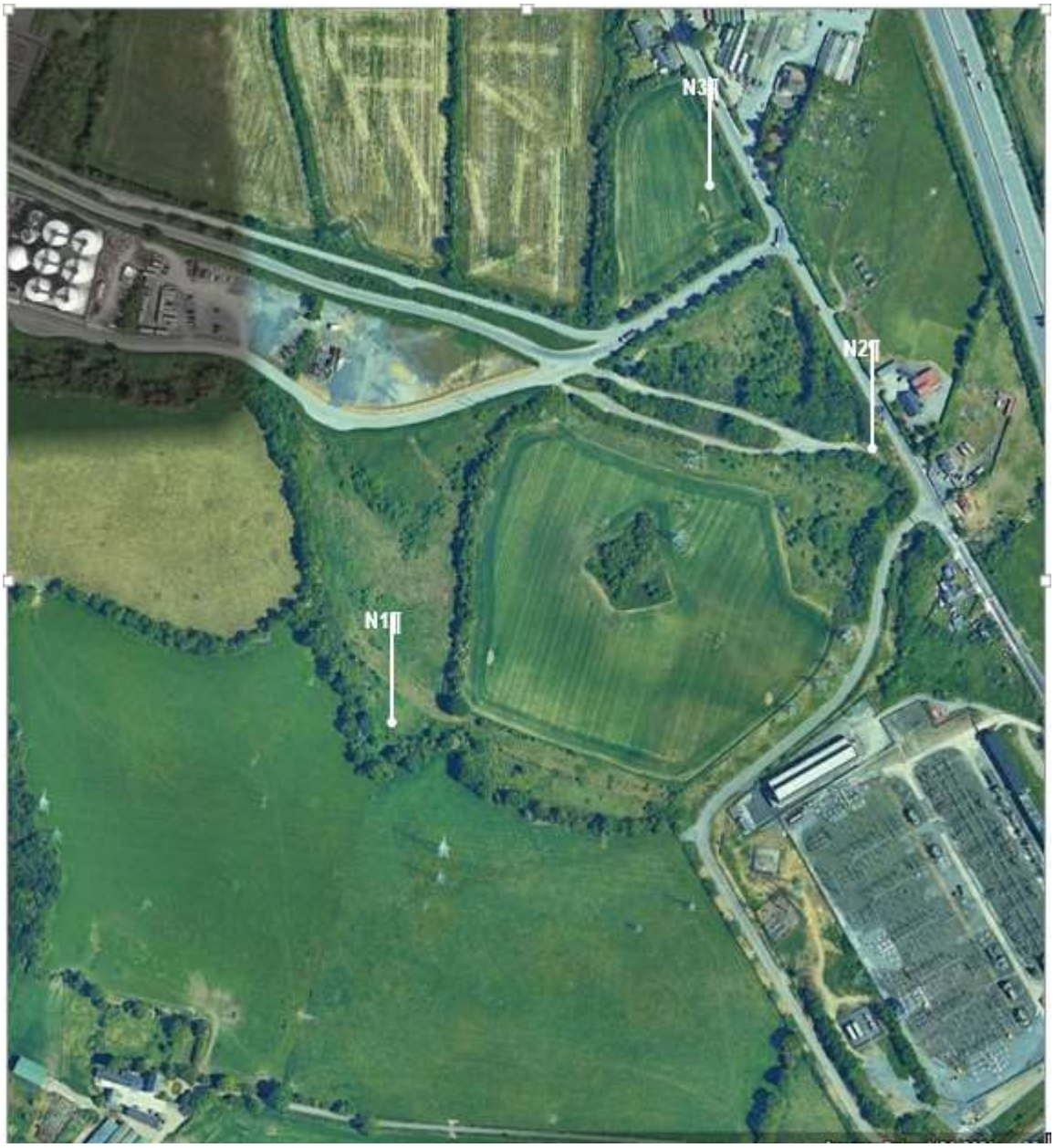


Figure 10. 4 Baseline Noise Monitoring Locations

The dominance of distant traffic is reflected in the relatively high noise levels measured, in particular the elevated LAF90 30 min levels. Daytime and evening LAF90 30 min levels exhibit a narrow range, suggesting little or no break in distant traffic. Night-time levels show a wider range, attributable to occasional lulls in traffic. Lden and Lnight levels measured across all three stations are relatively high.

The noise levels at all three stations, measured levels are lower than mapped levels in the Fingal Noise Action Plan (Figures 10. 4 and 10.5). The most likely explanation is that the northeast and northwest breezes prevailing during the survey significantly minimised M50 traffic noise levels, and it was noted during the survey that N2 traffic noise masked M50 traffic noise. In contrast, the Noise Action Plan mapping indicates that M50 noise contours ordinarily exhibit a considerably wider corridor than N2 contours.

10.5.6 *Air Quality*

The development site is in an area that that has been extensively developed for industrial and commercial use and mineral extraction. The assessment of the impact of the development on air quality (Chapter 9) has established that the baseline air quality in the vicinity of the site is good.

10.5.7 *Traffic*

At present there is no direct access to the development lands from s public road. The proposed access is off the existing service road that provides access to the ESB Finglas 220kV Station from North Road. The service road also provides access to agricultural lands and a farm house with a large farm yard and sheds located between M50 to the south. The service road intersects North Road at a simple priority junction approximately 600m south of the Coldwinters N2 off-slip near the Dogs Trust property.

There is a footpath along the eastern side of the North Road between the ESB service road junction and the Dogs Trust. A short section of footpath continues on the western side of the road past the Dogs Trust. To the south of the ESB service road the footpath continues along the eastern side of the road ending approximately 40m short of the end of the overbridge of the M50.

The closest bus stop is on North Road, immediately north of the Dogs Trust. The bus stop serves northbound travellers and the closest southbound bus stop is between Kilshane Cross and the M50 overbridge of the N2. Both bus stops are serviced by Bus Eireann Routes 103 and 105X.

10.6 **Impacts**

10.6.1 *Construction Stage*

In the construction stage (approximately 14 months) in the absence of mitigation noise, air emissions and construction related traffic have the potential to result in localised, if temporary, nuisance. Construction stage impacts on air are described in Section 9.5.1 and construction related traffic is described in Section 14.6 of this EIAR.

10.6.1.1 Noise & Vibration

Noise

The chief source of noise emissions will be the plant and equipment used onsite. The emissions will vary considerably due to:

- Relocation of plant around the site as required;
- Different plant items will be required at different times, and construction operations will vary on a daily basis;
- Each plant item may operate under different loading conditions or be in varying states of repair;
- Construction works may be concentrated for certain periods, followed by periods of inactivity;

- Localised works may require several hours of intense activity, and

- During the later stages of the construction phase, emissions from some operations will be screened by previously completed structures.

With respect to noise sensitive receptors, the 'worst case' scenario emissions will arise when works are undertaken close to their respective boundaries. An 'extreme worst case' scenario consists of construction activity simultaneously occurring at the nearest points to offsite receptors, involving plant with the greatest noise output. In this scenario, operations may occur simultaneously in two zones:

- Zone 1: Construction works near the northeast corner.

- Zone 2: Construction works near the southwest corner.

dBA modelled the extreme worst case scenario (Sections 4.1.5 and 4.1.6 of dBA Report in Appendix 10.1). The modelling established that the noise levels will be considerably lower than the relevant noise criterion (65 dB) applicable to construction sites.

Vibration

Delivery truck movements may give rise to vibration at positions adjacent to the road. However, such emissions are typically imperceptible beyond 10 m, and are highly unlikely to be perceptible at dwellings alongside site access routes. North Road is currently subject to a large number of daily truck movements.

The on-site movement of plant is not considered to constitute a source of groundborne vibration and is not listed in typical vibration documents such as BS 5228-2:2009. In addition, plant machinery used onsite is likely to be small to mid-sized, and similar to those used on other urban construction projects.

Excavation of trenches and pits for foundation and services will be required. These activities are not typically associated with off-site groundborne vibration impacts. Piling is not proposed and in addition, rock breaking is unlikely to be required.

While vibro-rolling will generate high levels of vibration at the point of operation, experience at other sites indicates that such vibration is typically immeasurable beyond 50 m.

On the basis of the foregoing peak particle velocity levels at all receptors are expected to be considerably lower than relevant human threshold and building and structural integrity criteria, and indeed are expected to be below measurement threshold. It follows that construction operations are unlikely to be either perceptible offsite, or to cause cosmetic or structural damage to buildings.

10.6.2 Operational Stage

10.6.2.1 Odour

The residual MSW and the 'brown bin' wastes, which will be processed in the MRF, are odorous and in the absence of mitigation could be a source of odour nuisance outside the development boundary. The wastewater treatment plant in the FCCP plant will be a physico-chemical system and will not involve potentially odorous biological stages e.g. activated sludge. The mechanical screenings and sludge from the DAF unit are potentially odorous.

10.6.2.2 Noise

The MRF and the FCCP plant will operate 24/7. In the MRF the noise emission sources will include trommels, shredders, optical separators, magnets, eddy current separators, wind sifters, picking lines, compactor units and bale wrapping units. The C&D processing line will have crushing and screening equipment. A mobile grab front end loader and a telescopic loader will be used to move the materials. Negative air pressure will be maintained in the MSW/Brown Bin Bay using an air management system that includes an air extraction fan.

In the FCCP Plant the noise sources will include the washing and waste water treatment plants. Electric forklift trucks will be used to move tray and crate stacks within the building, including loading/unloading of vans and trucks.

dBA completed a predictive noise modelling assessment of the operational phase for three different methodologies (Ref Section 5.3 of the dBA Report in Appendix 10.1). The first was based on criteria recommended by the EPA and established that the proposed development will comply with EPA criteria at the nearest dwellings and will also comply at more distant dwellings.

The second method was based on British Standard 4142:2014, which provides for the comparison of specific LAeq T levels (i.e. noise levels attributable to the source in question) with background levels. This established that in all cases, operational noise levels will be lower than background levels, which at all receptors are dominated by road traffic.

The third method was an assessment of the increase in LAeq 30 min levels arising from the proposed development in line with Institute of Environmental Management and Assessment (IEMA) guidance. This concluded that in all cases, impacts will be imperceptible, again due to high existing baseline noise levels resulting from road traffic.

10.6.2.3 Nuisance

In addition to odour and noise and in the absence of mitigation the waste processing activities have the potential be a source of off-site nuisance and impairment of amenity linked to litter, traffic, vermin and birds.

10.6.2.4 Fire

A major incident such as a fire presents a risk to site staff and there is the potential, depending on the weather conditions, for smoke to affect the occupants of the residential, industrial and commercial properties in the vicinity of the site.

10.6.2.5 Aircraft Safety

Given the proximity of the development area to Dublin Airport and its location beneath the flight path to Casement Aerodrome birds attracted to the development present a risk of bird strike to aircraft.

10.7 Baseline Scenario

If the proposed development does not proceed there will be no new point emission sources to air, no additional traffic in the vicinity of the site with their associated emissions, no new noise sources, no potential sources of nuisances and no potential risk to aviation safety.

10.8 Prevention & Mitigation Measures

10.8.1 Design Stage

10.8.1.1 Building Design Height

The Dublin Airport Aerodrome Operator's Map is the 'Safeguarding Chart' for the airport. This Chart shows 0.5 × 0.5km grids with guidelines as to building heights in each grid-square – 0m, 10m, 15m, 45m, 90m – above which it is advised that a proposed development be referred for consultation with the Dublin Airport Authority (DAA). It also shows the principal "Obstacle Limitation Surfaces" that apply around the airport.

The proposed development is in an area for which assessment is advised for any building higher than 15m. The "Obstacle Limitation Surfaces" constitute the principal height restrictions that now apply in the vicinity of the various airports/aerodromes. In the south-west part of Fingal, the "Surfaces" of Dublin Airport, Casement Aerodrome and Weston Aerodrome all overlap, with the lowest "Surface" being the limiting one.

The Dublin Airport "Inner Horizontal Surface" extends to 4km from the centrelines of all runways at Dublin Airport, and is 45m above the airport's datum (67m OD), i.e. it is a flat Surface at 112m OD. This "Surface" extends above the proposed development area; however, the highest element of the proposed development – which is the odour control unit exhaust stack at the west corner of the Materials Recovery Facility – rises to just 94.7m OD. The proposed development is therefore very comfortably below Dublin Airport's "Inner Horizontal Surface".

The Casement Aerodrome's "Outer Horizontal Surface" is 145m above the Aerodrome's datum (86.6mOD) i.e. it is a level surface at 231.6m OD, and extends for 15km from the Aerodrome's reference point. The "Approach Surface" to the Aerodrome's Runway 22 extends for 15.06km from the 22 Threshold and the section of this "Approach Surface" above the development area is 243.3m OD. The two Casement "Surfaces" , at 231.6m OD and 243.3m OD, are therefore very substantially higher (by 136.9m and 148.6m) than the highest element of the proposed development (94.7m OD).

10.8.1.2 Roof Top Solar Panels Glint & Glare

Solar/PV panels will be provided on roofs of the two buildings. Because the new control tower at Dublin Airport is particularly tall (extending 160m OD) the height of the roof parapet (1.66m above roof gutter level) is designed to obscure all panels from any view from the new Control Tower cab.

10.8.1.3 Lighting

The proposed development area is not in a location, or of a height, where aviation obstruction lighting is required. Given the proximity to the flight path to/from Dublin Airport's Runway 10R/28L the external lighting will be of the cut-off type (i.e. not showing light above horizontal).

10.8.1.4 Odour

An odour control system designed to ensure that odour emissions from the processing of odorous waste in the MRF will not be a source of off-site nuisance will be installed.

10.8.1.5 Noise

Design stage measures are not required.

10.8.1.6 Fire Safety

To prevent/reduce risk of arson there will be a security fence around Phase and the entrance gate will be locked during non-operational hours. Emergency exit doors will be provided in all of the buildings and fitted with emergency exit signs with back-up lighting.

An automatic fire detection (for example ceiling mounted heat and smoke detectors) and alarm system certified to IS 3218 will be installed in both buildings that covers all internal areas, supplemented by a manual break glass system.

The ring main will be fitted with six hydrants that comply with the Uisce Eireann Water Infrastructure Standard Details (STD-W-19).

The separation distances between the buildings means that a fire outbreak in one will not spread to any of the others. Internal separation distances between materials storage areas/bays will comply with the requirements of the EPA Guidance Note: Fire Safety at Non-Hazardous Waste Transfer Stations, (2013) and the EPA Guidance on Fire Risk Assessment for Non-Hazardous Waste Facilities, 2016.

10.8.2 Construction Stage

10.8.2.1 Air

Dust emissions are likely to arise from earthworks, wind blow from temporary soil stockpiles; construction traffic movements; handling of construction materials and landscaping. Given the distance between the site and the nearest sensitive receptor there is no risk of dust soiling causing a nuisance; however the following control measures will be implemented at a minimum:

- Spraying of exposed earthworks, soil stockpiles and site haul roads during dry weather using mobile bowser units;
- Provision of a wheel cleaner at the site entrance road to remove soil from vehicles before they leave the site;
- Paved roads will be regularly swept to remove mud and debris and traffic movements on non-paved areas will be restricted to essential site traffic;
- Control of vehicle speeds;
- Material drop heights from plant to plant or from plant to stockpile will be minimised and

- The access junction on the service road will be inspected daily for cleanliness and cleaned as required using a mechanical road sweeper.

The following mitigation measures will be implemented to minimise the impacts of vehicle exhaust emissions:

- Construction materials will where possible be sourced locally so as to minimise transport distances;
- Engines will be turned off when machinery is not in use, and
- Regular maintenance of vehicles, plant and equipment.

10.8.2.2 Noise

The will be no vibration impacts and although noise emissions will be short term, and will not exceed the applicable noise criterion, the following mitigation measures will be implemented:

- Construction operations will in general be confined to the periods Monday-Friday 0700-1900 and Saturday 0800-1400, unless otherwise agreed with Fingal County Council.
- Drivers of plant and vehicles will be instructed to avoiding hooting at all times.
- Plant items will be maintained in a satisfactory condition and in accordance with manufacturer recommendations. In particular, exhaust silencers will be fitted and operating correctly at all times. Defective silencers will be immediately replaced.
- Queuing of trucks on North Road will be prohibited.
- Machinery not in active use will be shut down.
- The Environmental Clerk of Works will acct a liaison officer with the local community and all noise complaints will be logged in a register, and investigated immediately. Details of follow-up action will be included in the register.
- Where it is proposed to import potentially noisy plant to the site, the potential impact of noise emissions will be assessed in advance.
- Guidance set out in British Standard BS 5228:2009 with respect to noise control will be applied throughout the construction phase.

For aviation safety reasons the operating height of any cranes on site will be limited to no more that 33m above finished ground level, and 17m above the highest element of the development (i.e. to no higher than 112m OD).

As required by S.I. 215 of 2005 – 'Irish Aviation Authority (Obstacles to Aircraft in Flight) Order' the IAA and DAA will be informed 30 days in advance of the use of any cranes and all notifications and safety measures required by either authority, for example the provision of aviation warning lights will be implemented.

10.8.3 Operational Stage

10.8.3.1 Fire Safety

Members of the public will not have access to the facility and only authorised personnel will be permitted inside the waste processing buildings. Site visitors will be informed of the safety and fire prevention procedures that must be followed while they are on site. There will be a policy of only smoking in designated areas.

Safe systems of work will be provided and outside contractors will be obliged to undergo safety inductions before being allowed access operational areas. The inductions will address behaviour on site, housekeeping and specific high risk jobs i.e. hot works procedures & permits.

The use of portable electrical heaters will be prohibited and the electrical systems in the buildings will be subject to regular inspections.

In the MRF the internal separation distances between materials storage areas/bays will comply with the requirements of the EPA Guidance Note: Fire Safety at Non-Hazardous Waste Transfer Stations, (2013) and the EPA Guidance on Fire Risk Assessment for Non-Hazardous Waste Facilities, 2016.

Fire extinguishers will be positioned at strategic locations throughout the site and the locations recorded in Fire Register. The extinguishers will be subject to annual inspection and replenishment/replacement as required by a fire safety contractor. Site staff will be trained to extinguish small fires with appropriate hand held fire. If staff members cannot tackle a fire safely and effectively, the evacuation of all personnel will be the primary priority.

An Emergency Response Procedure will be prepared that describes the actions that will be taken in the event of a fire outbreak to ensure it is contained and extinguished as soon as is practical.

10.8.3.2 Noise

As the impacts at offsite receptors will be imperceptible, site specific mitigation measures are required; however the following general measures will be implemented:

- Both the MRF and the FCCP will be constructed so as to avoid any gaps at cladding joints;
- Prior to selection of the air management system and odour control unit, noise emissions data shall be assessed to ensure that emissions are entirely broadband in character;
- All mobile plant shall be fitted with flat spectrum reversing alarms;
- Hooting will be prohibited onsite. Drivers of plant and vehicles will be instructed to avoiding hooting at all times;
- Plant and equipment will be maintained in a satisfactory condition and in accordance with manufacturer recommendations, and
    - All noise complaints received will be logged in a register, and investigated immediately. Details of follow-up action will be included in the register.

10.8.3.3 Odour

An Odour Management Plan (OMP) will be prepared for the MRF that identifies all the potential sources of odours and specifies the control measures that will be implemented to effectively mitigate odour nuisance, which will include:

- All materials acceptance and processing will be carried out inside the buildings;
- The doors on the MSW/Brown Bin Bay in the MRF will be kept closed and only opened to allow vehicles to enter and leave the building;
- Odorous materials will typically be sent off-site within 24 hour of arrival and in any event within 72 hours, and
- Regular cleaning of the floor of the MSW/Brown Bin Bay.

The odour management system in the MRF will be the subject to a regular preventative maintenance programme to ensure it operates effectively. Stocks of the carbon filter media will be kept on site to minimise downtime of the system when it has to be replaced.

10.8.3.4 Nuisance

In addition to the measures to mitigate odour nuisance the following will be implemented:

- Daily litter patrols;
- Retaining a pest controller to implement appropriate pest and vermin control measures as required, and
- During periods of dry weather the paved yards will be damped down with water to prevent windblown dusts.

10.8.3.5 Aviation Safety

All wastes containing foodstuff that are attractive to birds will be delivered to the MRF in fully enclosed bin trucks and the vehicles will only be off off-loaded inside the building The entrances will be fitted with rapid opening and closing doors, typical opening and closing time <10 seconds. As these doors also form part of the odour control system they will only opened to allow the vehicles to enter and leave and will be closed at all other times. All processing and storage of wastes containing foodstuff will be carried out inside the building and all waste containing food stuff will be dispatched in fully enclosed vehicles. Additional measures that can be deployed if required include bird wires, netting, acoustic distress calls and kites.

10.9 Monitoring

10.9.1 Construction Stage

If required by Fingal County Council noise surveys and dust deposition monitoring will be carried out at agreed locations and frequencies, and the results submitted to the Council.

10.9.2 Operational Stage

At the MRF, the emissions from the odour control unit will be monitored at the frequencies set in the EPA licence to demonstrate compliance with the emission limits. The odour control unit will be inspected regularly to ensure it is operating effectively.

Dust deposition monitoring will be carried out at locations and frequencies specified by the EPA. At a minimum this will include three locations inside the EPA licence boundary at quarterly intervals.

At both the MRF and the FCCP the discharges to the foul sewer will be monitored in accordance with the conditions of the EPA licence and the Uisce Eireann Trade Effluent Discharge Licence.

10.9.2.1 Fire Safety

The fire detection system will be subject to annual checks by a fire safety contractor. The alarm will be remotely monitored by a security company and if activated outside of operational hours the security company will notify the emergency services and nominated site personnel.

The fire extinguishers will be subject to annual inspection and replenishment/replacement as required by a fire safety contractor.

10.10 Cumulative Impacts

10.10.1 Air Quality

The cumulative impacts of the proposed development on Air in conjunction with the existing activities in the vicinity of the development area (Huntstown Quarry, Huntstown Energy Plan and Huntstown Bioenergy Anaerobic Digestion Plant) and permitted projects whose construction have the potential to overlap with the proposed development are assessed in Section 9.9 of this EIAR.

10.10.2 Noise

The local soundscape is entirely dominated by road traffic noise. Although a number of commercial and industrial noise sources are located in the surrounding area, emissions from these do not contribute to the soundscape at receptors. The only exception is Kildonan House to the southwest of the site, where quarry operations are audible during the daytime.

The predictive noise modelling indicates that noise emissions from the proposed development will be lower than baseline noise levels at receptors, and thus cumulative impacts will not arise. While cumulative impacts will arise in relation to an increase in North Road traffic, the increase will be negligible north of the Huntstown Quarry entrance. South of the entrance, the proposed development will generate an increase in traffic noise levels of 4 dB, resulting in a not significant to slight impact. Therefore, the proposed development will not give rise to any cumulative noise impacts of significance.

10.10.3 Traffic

The cumulative impacts of the proposed development on traffic in conjunction with the existing activities in the vicinity of the development area and permitted projects whose construction have the potential to overlap with the proposed development are assessed in Section 14.9 of this EIAR.

10.11 Residual Impacts

10.11.1 Construction Stage

The construction stage will have a negative, not significant, local, likely and temporary impact on Population and Human Health.

10.11.2 Operational Stage

The operational stage will have a negative, not significant/slight, local, likely and long term impact on Population and Human Health.

10.11.3 Summary of Residual Impacts

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration
Construction Stage					
Human Health Noise	Negative	Imperceptible	Local	Likely	Short Term
Human Health Vibration	Neutral	Imperceptible	Local	Unlikely	Short Term
Operational Stage					
Human Health Air Quality	Negative	Imperceptible	Local	Likely	Medium Term
Human Health Noise	Neutral	Imperceptible to Not Significant	Local	Likely	Medium Term
Amenity	Positive	Slight	Local	Likely	Long Term

10.12 References

Report RI 8507: Structural response and damage produced by ground vibration from surface mines blasting (US Bureau of Mines, 1980).

British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration (1993).

International Standard ISO 9613-2:1996 Acoustics: Attenuation of sound during propagation outdoors – Part 2 General method of calculation (1996)

Guidelines on community noise (World Health Organisation, 1999).

Directive 2002/49/EC of the European Parliament and of the Council relating to the assessment and management of environmental noise (2002), transposed into Irish law by the European Communities (environmental noise) Regulations 2018 (SI no. 549/2018).

Night noise guidelines for Europe (World Health Organisation, 2009).

Design manual for roads and bridges (UK Highways Agency, 2011).

British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (2014).

British Standard BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (2014).

Good practice guidance for the treatment of noise during the planning of national road schemes (National Roads Authority (now Transport Infrastructure Ireland), 2014).
Guidelines for environmental noise impact assessment (Institute of Environmental Management & Assessment, 2014).

NG4 Guidance note for noise: Licence applications, surveys and assessments in relation to scheduled activities (EPA, 2016).

International Standard ISO 1996-2:2017 Acoustics – Description, measurement and assessment of environmental noise, Part 2: Determination of environmental noise levels (2017).

Noise action plan for Fingal County 2019-2023 (Fingal County Council, 2018).

Noise action plan for Dublin Airport 2019-2023 (Fingal County Council, 2018).

British Standard BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (2019).

11. LANDSCAPE & VISUAL IMPACT

11.1 Introduction

This Chapter provides an assessment of the visual impacts of the proposed development on the landscape and visual amenity, which includes a 'baseline' scenario. It identifies the prevention, mitigation and monitoring measures that will be implemented to reduce the significance of the impacts and assesses the residual impacts. The Chapter should be read in conjunction with Chapter 8 Biodiversity and Chapter 10 Population & Human Health.

This Chapter was prepared by Mr Jim O'Callaghan of OCM. Mr O'Callaghan holds a BA Moderatorship in Geography and an MSc in Environmental Science. He is a Chartered Member of the Institution of Waste Management, a Chartered Environmentalist and an Associate of the Institute of Environmental Management and Assessment. He has over 35 years' experience in the field of environmental consultancy services including land use and landscape and visual impact assessment of large scale industrial waste management developments.

11.2 Relevant Legislation & Guidelines

The general EIA guidelines and legislation are listed in Section 1.5 and the specific guidelines relevant to the Landscape and Visual Impact Assessment taken into account in the preparation of this Chapter are:

- Guidelines for Landscape and Visual Impact Assessment (Landscape Institute & IEMA, UK 2013);
- Landscape and Landscape Assessment, Consultation Draft of Guidelines for Planning Authorities' published by the Department of the Environment and Local Government (June 2002), and
    - Landscape Institute Technical Guidance Note 06/19: Visual Representation of Development Proposals
- Landscape Character Assessment (Fingal Development Plan 2017-2023).
    - BS 5837:2012 Trees in relation to design, demolition and construction

11.3 Methodology

The objective of the assessment was to determine the magnitude and significance of the proposed development to the landscape character and visual setting. Significance depends on the sensitivity of the affected landscape and visual receptor and the magnitude of change judged to have resulted from the proposed development. In considering the magnitude and significance, the following were considered:

- The sensitivity of views taking into account both the public accessibility of the land where views are possible and the likely sensitivity of that view given the distance, travelling speed (if relevant), intervening vegetation and land usage;

- The quality and value of the existing landscape;

- The degree to which the development will be visible within the surrounding area, and

- Any other changes in the existing landscape e.g. new road junctions.

While the significance or scale of impact may range from 'Imperceptible' to 'Profound' in relation to distance and proximity, the nature of the change and the sensitivities of the viewers must be considered. An individual's sensitivity can cause emotive responses that often have little or no regard to the appropriateness and/or design of the proposal and, as such, it must be borne in mind that the impact of a proposed development must be assessed based on its context.

The assessment of quality must consider the nature of the proposed change, its context, appropriateness, quality of design and the sensitivities of the viewers. The quality of impact can be determined as 'positive' or 'negative' depending on whether the change is considered to improve or reduce the quality of the landscape character or visual environment. It may also be assessed as 'neutral' if the landscape is unaffected.

11.3.1 Trees & Hedgerows

Mr Andrew Boe, Arboricultural Consultant prepared a Tree Constraints Plan, copies of which are in Appendix 11.1. The Tree Survey assessed all of trees and hedgerows in accordance with BS5837:2012 (2005).

11.3.2 Photomontages

In the Further Information Request the Council looked for photomontages of the proposed development showing the 'As Existing View', the 'As Proposed View' and the 'As Proposed Cumulative View' from the following locations:

- The vicinity of residential properties located west of North Road (north of the Roadstone entrance and opposite entrance to Woodkraft).

- The vicinity of residential properties located west of North Road (south of the Roadstone entrance -at entrance to commercial unit).

- The existing entrance to 'Roadstone Huntstown' on North Road, and

- The pedestrian bridge over the M50 to N2 slip lane.

The photomontages and analysis of views were prepared by Parkhood Chartered Landscape Architects. The four locations identified by the Council were visited, surveyed and photographed on 21st July 2023 and this and the subsequent photomontages were undertaken in accordance with the "Landscape Institute Technical Guidance Note 06/19: Visual Representation of Development Proposals". These include guidance on photographic technology, including camera selection, choice of lens and printing.

11.3.3 Green Infrastructure Plan

Park Hood prepared a Green Infrastructure Plan that references or identifies all existing natural features (hedgerows, significant trees, waterbodies) and the proposed green infrastructure network within the development. The Plan includes details of all landscape areas, ecological corridors, drainage measures (where feasible due to Dublin Airport advice), walls / boundary specifications, locations of bird, bat and invertebrate boxes, any permeable paving, tree planting, biodiversity enhancement and hedgerow management proposals. Given the commercial nature and intended land-use, public access and connectivity were not applicable. A copy of the Plan is in Appendix 11.2.

11.4 Proposed Development

A detailed description of the proposed development is in Chapter 3. Those aspects that are relevant to the landscape and visual impact assessment are the topography; form, height and massing of the buildings; the construction materials texture and colour, the removal of the existing hedgerows/trees and the proposed landscape measures.

11.4.1 Topography

The site encompasses approximately 9.8 ha and comprises two fields and a section of an adjoining service road. The western field had been used for animal grazing, but is no longer used for this purpose. The eastern field had been used for tillage but is currently uncultivated. The ground levels rises from ca 78 to 79m Ordnance Datum (OD) at the site boundaries to a localised high point of 88m OD in the centre of the site.

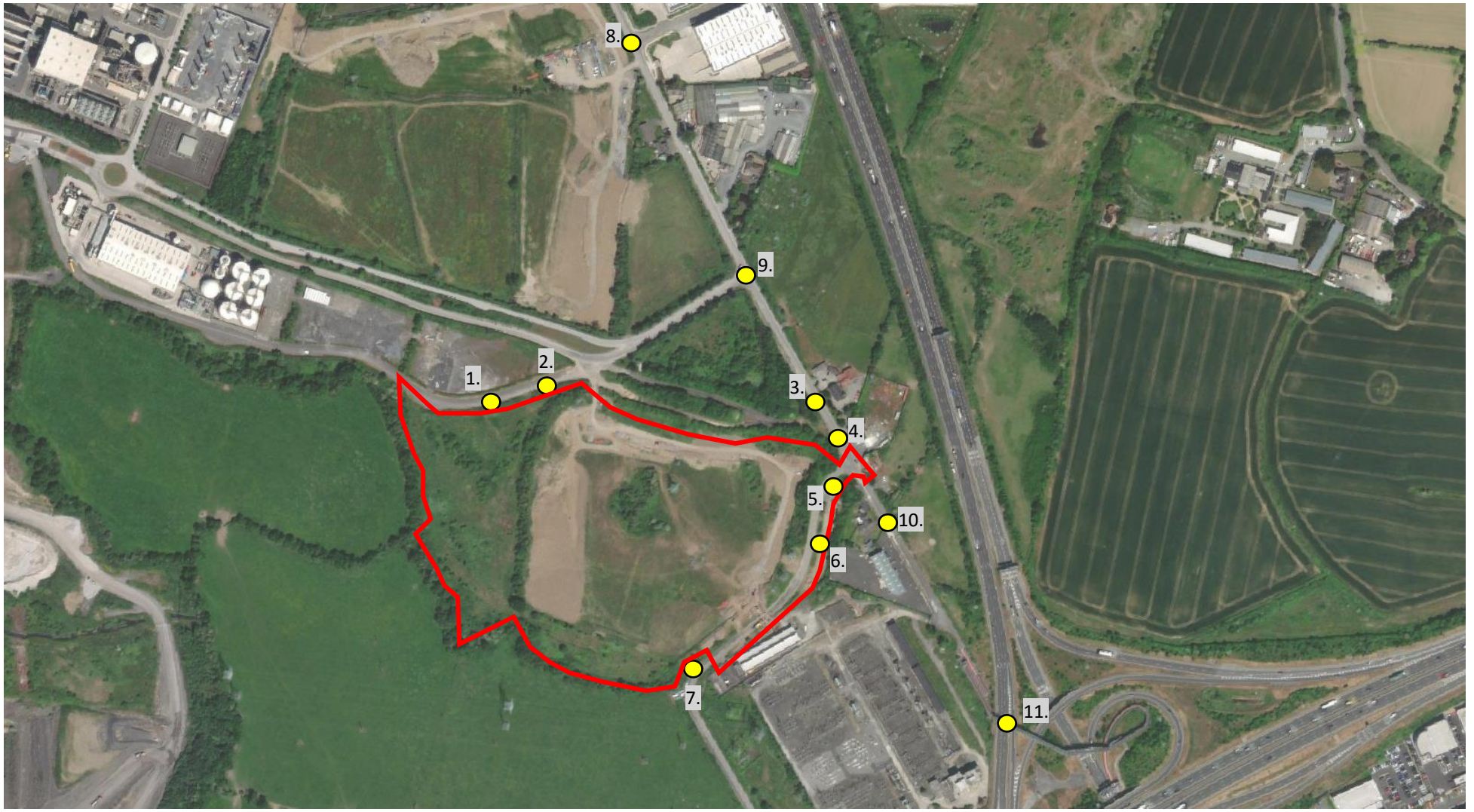
11.4.2 Building Form & Materials

Elevations and Sections of the MRF and the FCCP are shown on Drawing No.HYP-A-003 and HYP-A-005. The eaves of the Materials Recovery Building will be 15.13m above ground level, while the eaves of the FCCP will be 14m above ground level. The highest structural element will be the stack on the odour control unit at the MRF, which will extend to 16m above ground levels. The buildings will a neutral monochromatic (e.g. goose grey) external cladding and anti-glint and glare parapets.

11.4.3 Landscape Plan

The proposed landscaping measures are shown on Drawing No. 7670-L2101 Landscape Proposal. The western hedgerow (307m) will be retained and augmented where weak with additional native hedgerow species to gap up these sections. The hedgerows will be managed to remove ivy and dead material and cut back the hedge faces to return them to a more compact form in line with their original intent. Within the site native woodland belts will be planted that will further augment the boundary vegetation in this area as it matures. The minimum depth of any boundary vegetation will be 7m and, in sections, the existing hedge and proposed woodland belt will be of up to 16m wide. The proposed woodland planted area will be 1,300m².

The quality of the southern hedgerow is generally very poor but the objective is to, where possible, retain, augment and improve this boundary vegetation. Immediately to the south of the proposed MRF is a 75m section of hedgerow that includes 4 no. Ash (*Fraxinus excelsior*), which the Tree Survey (Appendix 8.1) recommends to be removed due to disease. In and around the trees is a collective of "single and multi-stemmed trees" whose felling is also recommended due to disease.



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Title:

Figure 11.1 Viewpoints

Legend

-Viewpoint

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Client:

Irish Recycling Ltd

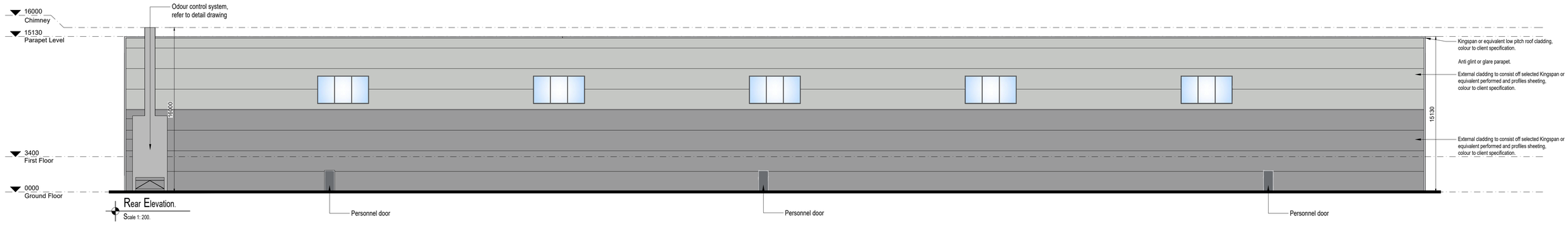
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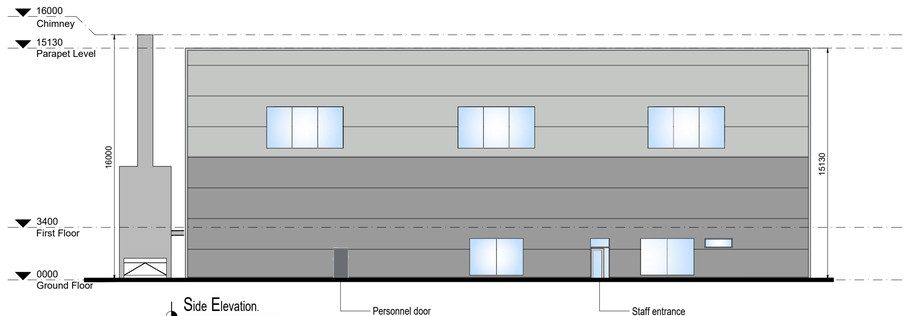
RAL 7035

RAL 7004

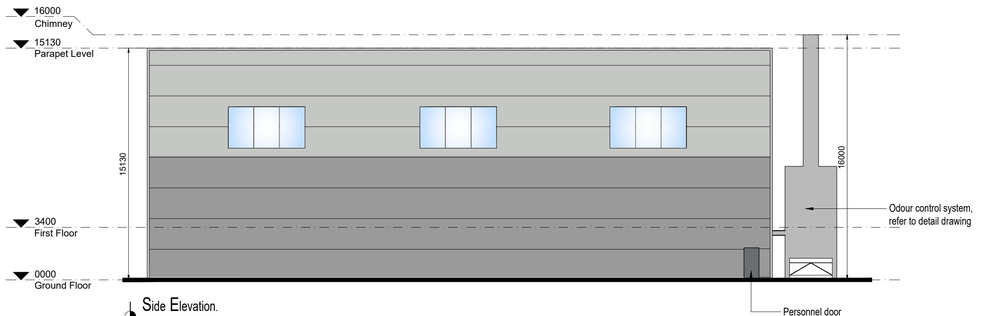
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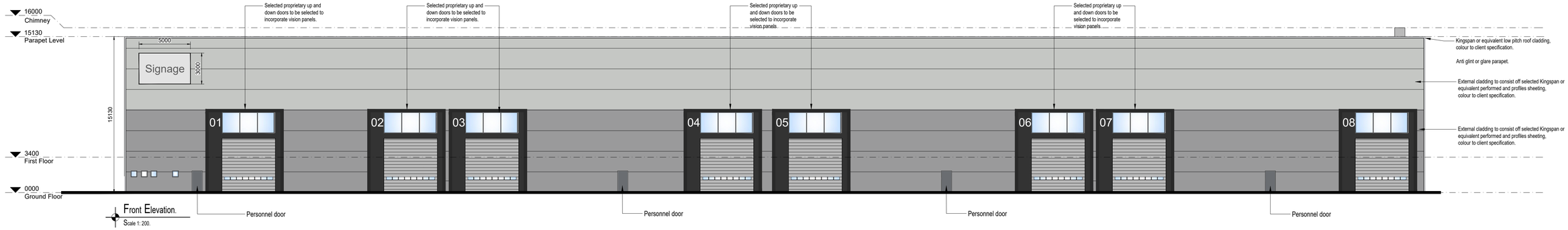
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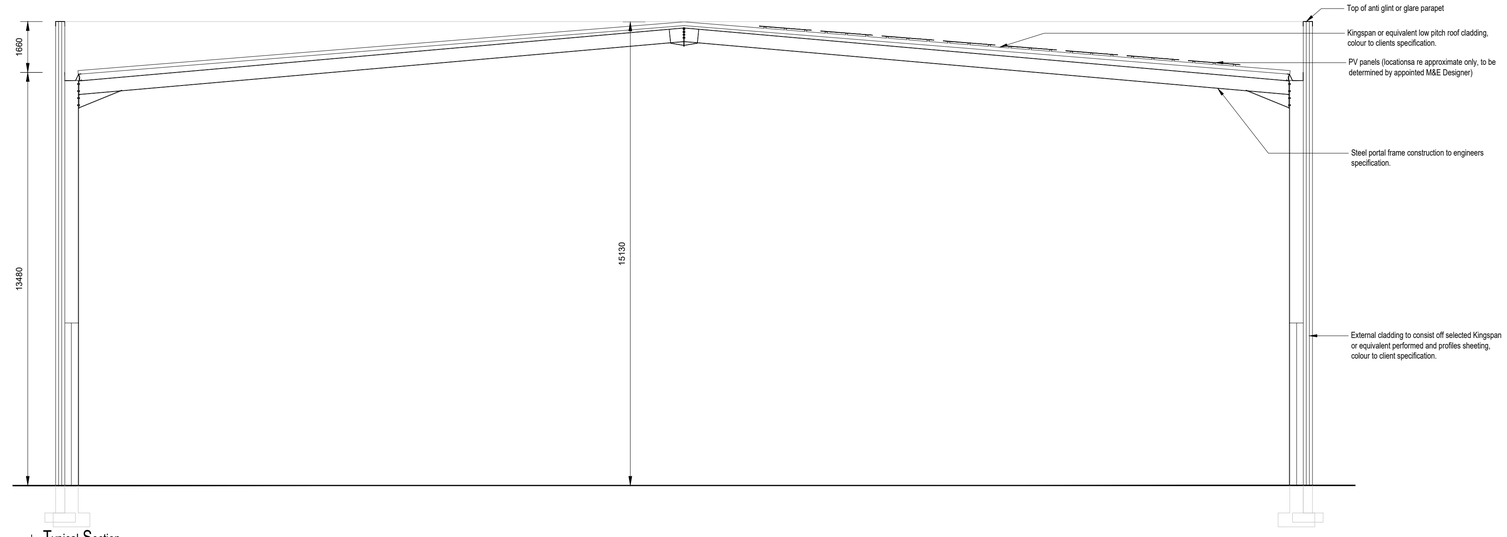
Side Elevation.
Scale 1: 200.



Side Elevation.
Scale 1: 200.



Front Elevation.
Scale 1: 200.



Typical Section.
Scale 1: 100.

Rev	Description	By	Check	Date
2	Updated titleblock and elevations	SL	MM	24.11.2023
1	Issued for Information	SL	MM	27.09.2023

Hyphen

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Client

Rathdrinagh Land Limited Company, t/a Irish Recycling Limited

Project

Drawing

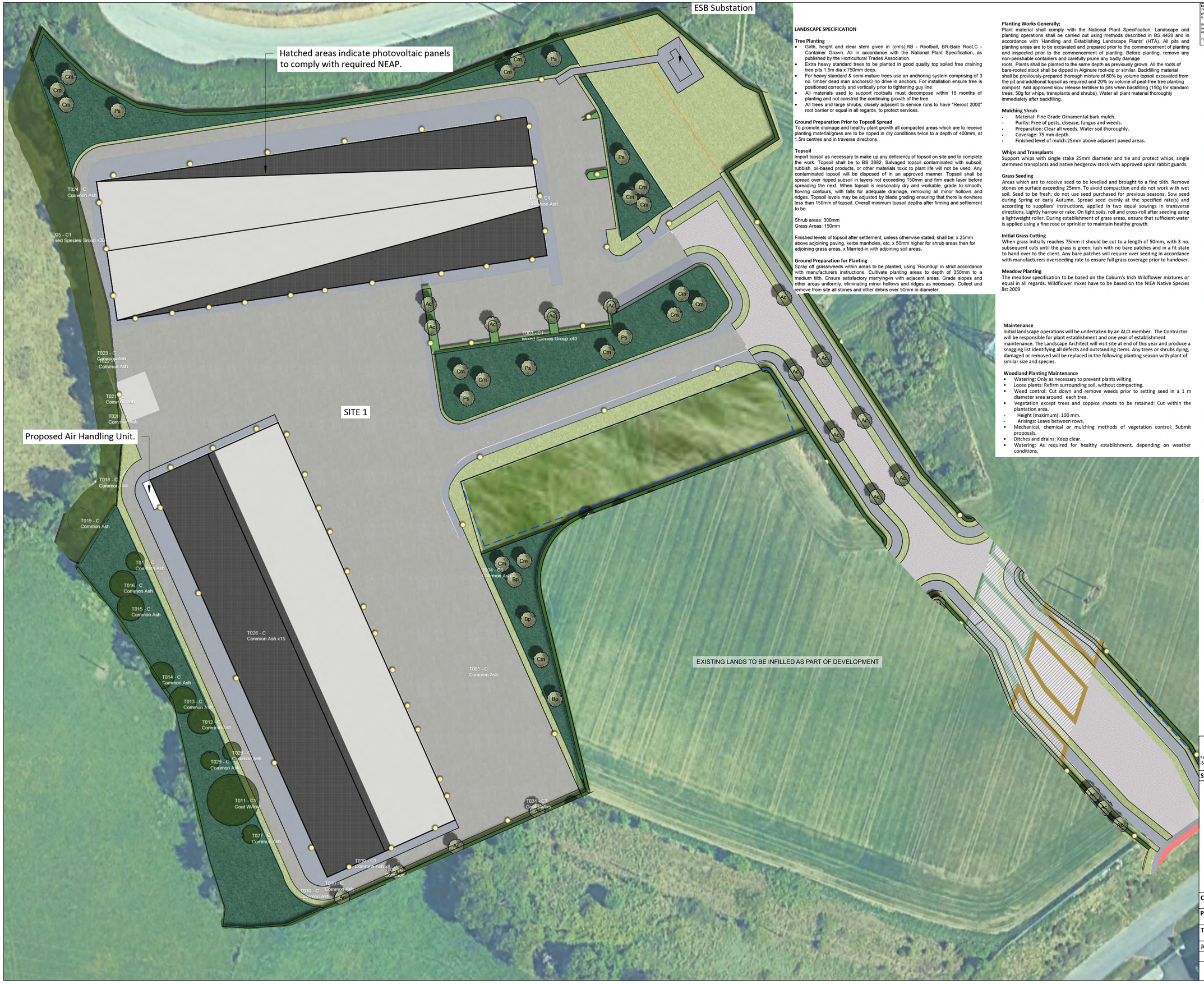
Material Recovery Facility -Proposed Elevations and Section

Scale	Date	Author	Checked
1:200 @ A1	15.09.2023	SL	MM

Workstage	Status
3	PRELIMINARY

Hyphen Project No.	Drawing No.	Revision
P8908	HYP-A-005	02

Scale only for planning purposes
Report any discrepancies to the author
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LANDSCAPE SPECIFICATION

Tree Planting

- Girth, height and clear stem given in (cm's),RB - Rootball, BR-Bare Root,C - Container Grown. All in accordance with the National Plant Specification, as published by the Horticultural Trades Association.
- Extra heavy standard trees to be planted in good quality top soiled free draining tree pits 1.5m dia x 750mm deep.
- For heavy standard & semi-mature trees use an anchoring system comprising of 3 no. timber dead man anchors/3 no drive in anchors. For installation ensure tree is positioned correctly and vertically prior to tightening guy line.
- All materials used to support rootballs must decompose within 18 months of planting and not constrict the continuing growth of the tree.
- All trees and large shrubs, closely adjacent to service runs to have "Reroot 2000" root barrier or equal in all regards, to protect services.

Ground Preparation Prior to Topsoil Spread

To promote drainage and healthy plant growth all compacted areas which are to receive planting material/grass are to be ripped in dry conditions twice to a depth of 400mm, at 1.5m centres and in traverse directions.

Topsoil

Import topsoil as necessary to make up any deficiency of topsoil on site and to complete the work. Topsoil shall be to BS 3882. Salvaged topsoil contaminated with subsoil, rubbish, oil-based products, or other materials toxic to plant life will not be used. Any contaminated topsoil will be disposed of in an approved manner. Topsoil shall be spread over ripped subsoil in layers not exceeding 150mm and firm each layer before spreading the next. When topsoil is reasonably dry and workable, grade to smooth, flowing contours, with falls for adequate drainage, removing all minor hollows and ridges. Topsoil levels may be adjusted by blade grading ensuring that there is nowhere less than 150mm of topsoil. Overall minimum topsoil depths after firming and settlement to be:

Shrub areas: 300mm
Grass Areas: 150mm

Finished levels of topsoil after settlement, unless otherwise stated, shall be: x 25mm above adjoining paving, kerbs manholes, etc, x 50mm higher for shrub areas than for adjoining grass areas, x Married-in with adjoining soil areas.

Ground Preparation for Planting

Spray off grass/weeds within areas to be planted, using 'Roundup' in strict accordance with manufacturers instructions. Cultivate planting areas to depth of 350mm to a medium tilth. Ensure satisfactory marrying-in with adjacent areas. Grade slopes and other areas uniformly, eliminating minor hollows and ridges as necessary. Collect and remove from site all stones and other debris over 50mm in diameter.

Planting Works Generally;

Plant material shall comply with the National Plant Specification. Landscape and planting operations shall be carried out using methods described in BS 4428 and in accordance with 'Handling and Establishing Landscape Plants' (HTA). All pits and planting areas are to be excavated and prepared prior to the commencement of planting and inspected prior to the commencement of planting. Before planting, remove any non-perishable containers and carefully prune any badly damage
roots. Plants shall be planted to the same depth as previously grown. All the roots of bare-rooted stock shall be dipped in Alginure root-dip or similar. Backfilling material shall be previously-prepared thorough mixture of 80% by volume topsoil excavated from the pit and additional topsoil as required and 20% by volume of peat-free tree planting compost. Add approved slow release fertiliser to pits when backfilling (150g for standard trees, 50g for whips, transplants and shrubs). Water all plant material thoroughly immediately after backfilling.

Mulching Shrub

- Material: Fine Grade Ornamental bark mulch.
- Purity: Free of pests, disease, fungus and weeds.
- Preparation: Clear all weeds. Water soil thoroughly.
- Coverage: 75 mm depth.
- Finished level of mulch:25mm above adjacent paved areas.

Whips and Transplants

Support whips with single stake 25mm diameter and tie and protect whips, single stemmed transplants and native hedgerow stock with approved spiral rabbit guards.

Grass Seeding

Areas which are to receive seed to be levelled and brought to a fine tilth. Remove stones on surface exceeding 25mm. To avoid compaction and do not work with wet soil. Seed to be fresh; do not use seed purchased for previous seasons. Sow seed during Spring or early Autumn. Spread seed evenly at the specified rate(s) and according to suppliers' instructions, applied in two equal sowings in transverse directions. Lightly harrow or rake. On light soils, roll and cross-roll after seeding using a lightweight roller. During establishment of grass areas, ensure that sufficient water is applied using a fine rose or sprinkler to maintain healthy growth.

Initial Grass Cutting

When grass initially reaches 75mm it should be cut to a length of 50mm, with 3 no. subsequent cuts until the grass is green, lush with no bare patches and in a fit state to hand over to the client. Any bare patches will require over seeding in accordance with manufacturers overseeding rate to ensure full grass coverage prior to handover.

Meadow Planting

The meadow specification to be based on the Coburn's Irish Wildflower mixtures or equal in all regards. Wildflower mixes have to be based on the NIEA Native Species list 2009

Maintenance

Initial landscape operations will be undertaken by an ALCI member. The Contractor will be responsible for plant establishment and one year of establishment maintenance. The Landscape Architect will visit site at end of this year and produce a snagging list identifying all defects and outstanding items. Any trees or shrubs dying, damaged or removed will be replaced in the following planting season with plant of similar size and species.

Woodland Planting Maintenance

- Watering: Only as necessary to prevent plants wilting.
- Loose plants: Refirm surrounding soil, without compacting.
- Weed control: Cut down and remove weeds prior to setting seed in a 1 m diameter area around each tree.
- Vegetation except trees and coppice shoots to be retained: Cut within the plantation area.
  - Height (maximum): 100 mm.
  - Arisings: Leave between rows.
- Mechanical, chemical or mulching methods of vegetation control: Submit proposals.
- Ditches and drains: Keep clear.
- Watering: As required for healthy establishment, depending on weather conditions.

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Unless otherwise stated all dimensions are in millimeters. Where dimensions are not given, drawings must not be scaled and the matter must be referred to the Landscape Architect. If the drawing includes conflicting details/dimensions the matter must be referred to the Landscape Architect. All dimensions must be checked on site. The Landscape Architect must be informed, by the Contractor, of any discrepancies before work proceeds.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH RELEVANT CONSULTANT'S DRAWINGS.

LEGEND:

Existing Trees to be retained - Refer to Development Impact Plan

Trees

Tree Tags	Species	Girth	Height	Spec
Pa	Prunus avium 'Plena'	12-14cm	2.0-3.0m	3xtr. (R/B)
Sa	Sorbus aucuparia 'Rowan'	12-14cm	2.0-3.0m	3xtr. (R/B)
Bp	Betula pendula 'Silver Birch'	10-12cm	1.5-2.0m	3xtr. (R/B)
Ac	Acer campestre 'Field maple'	12-14cm	2.0-3.0m	3xtr. (R/B)
Ps	Pinus sylvestris - Scots pine'	12-14cm	2.0-3.0m	3xtr. (R/B)

Native Boundary Planting

Species	Height	Stock	Spec	Density
Corylus avellana	80-100cm	BR	1+2 Bushy	0.5/m2
Pinus sylvestris	80-100cm	C, 5L	leader/laterals	0.5/m2
Viburnum opulus	80-100cm	BR	1+2 Bushy	0.5/m2
Eunoymus europaea	80-100cm	BR	1+2 Bushy	0.5/m2
Betula pendula	80-100cm	BR	1+2 Bushy	0.5/m2
Crataegus monogyna	80-100cm	BR	1+2 Bushy	0.5/m2
Prunus avium	80-100cm	BR	1+2 Bushy	0.5/m2
Ilex aquifolium	125-150cm	RB	leader/laterals	0.5/m2
Sambucus nigra	80-100cm	BR	1+2 Bushy	0.5/m2

Grass Areas

Grass seed with general seed mix e.g. Mix: 30% (Perennial Ryegrass) + 30% (Perennial Ryegrass) + 40% (Strong creeping red fescue) + Sowing rate: 35g/m2 (12.5Kg 20 bags/Ha @ 25/gm2) Cutting height: Between 20-50mm

Shrub Planting

Species	Stock	Height	Spec	Density	%
Hebe albicans Red Edge	C2	20-30cm	Bushy	4/m2	30
Pyracantha 'Orange Glow'	C3	40-60cm	Bushy	4/m2	30
Cornus alba 'Sibirica'	C2	40-60cm	Bushy	3/m2	20
Viburnum tinus 'Lucidum'	C5	40-60cm	Bushy	3/m2	20

HARDWORKS

- Proposed Footway
- Underground attenuation tank
- Road access & Car Parking
- Lighting - refer to lighting consultant
- Proposed Yard
- Irish Water Permanent works area wayleave
- Irish Water Temporary works area wayleave

NOTE: For all boundary treatment details please refer to architects drawing

Revision Notes	By / Chk	Date	Rev
FURTHER INFORMATION REQUESTED	OC / AB	03/11/23	P01
ISSUED FOR PLANNING	KH / AB	19/04/23	P00

Status: PLANNING

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Client: Rathdrinagh Land Unlimited Company, t/a Irish Recycling Limited

Project: Huntstown MRF
Dublin

Title: Phase One Landscape Proposals 1-500
Sheet 1 of 1

Job No: 7670 | **Scale@**A1 1-500 | **Date:** November 2023

Drawing Number

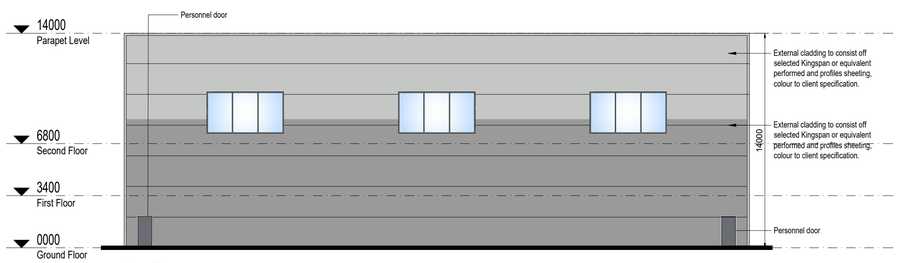
7670-L-2101 | Revision P01



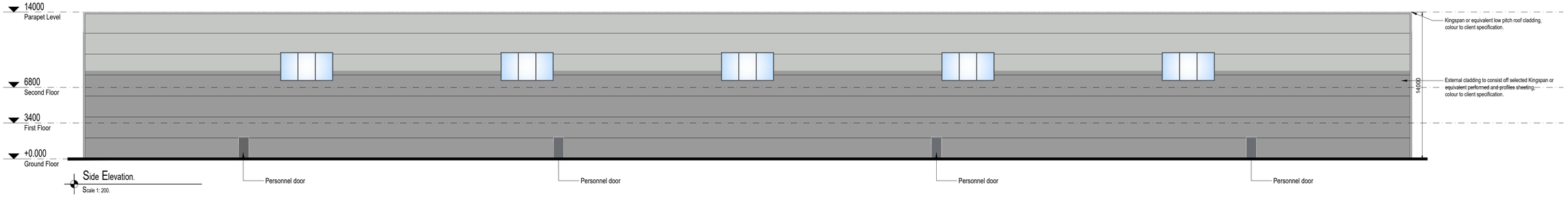
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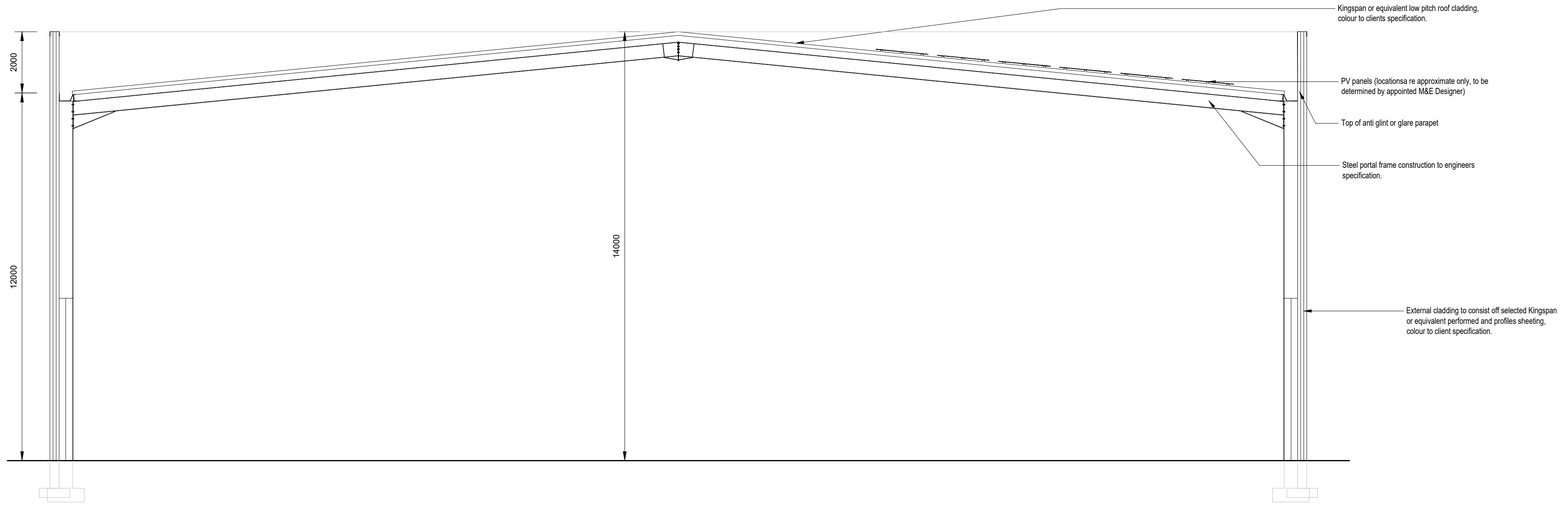
Front Elevation
Scale 1: 200.



Rear Elevation.
Scale 1: 200.



Side Elevation.
Scale 1: 200.



Typical Section.
Scale 1: 100.

KEY

RAL 7035

RAL 7004

0 1m 2m 5m

Notes

Rev	Description	By	Check	Date
2	Updated titleblock and elevations	SL	MM	24.11.2023
1	Issued for Information	SL	MM	27.09.2023

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Client
Rathdrinagh Land Limited Company, t/a Irish Recycling Limited

Project
Rathdrinagh - Warehouse

Drawing
Food Container Plant
-Proposed Elevations and Section

Scale	Date	Author	Checked
1:200 @ A1	15.09.2023		

Workstage	Status
3	PRELIMINARY

Hyphen Project No.	Drawing No.	Revision
P8908	HYP-A-003	02

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Report any discrepancies to the author
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This LCT can absorb a certain amount of development once the scale and forms are kept simple and surrounded by adequate screen boundaries and appropriate landscaping to reduce impact on the rural character of the surrounding roads.

11.6.1.1 Local Landscape

At a site specific level, the facility is an area zoned for heavy industry, with industrial type developments to the west and south and extensive quarrying to the north and west. It is not in an area designated as Highly Sensitive, Special Amenity Area or of High Amenity Value and is not overlooked by any designated views or prospect areas.

The section of North Road near the N2/M50 junction is essentially a cul-de-sac on account of its former route towards the city centre having been severed by the new road junction constructed around 2007. A link from the N2 connects to the R135 North Road to the north near Coldwinters but the c. 900m section to its south is closed off by bollards once at the lands Finglas ESB 220kv Substation. A pedestrian and cycle link continues to the south but vehicular access is not possible.

The road is lined with incidental commercial properties and small groups of detached residential dwellings amongst which there are vacant lands and farmlands. It has a very mixed character with some properties having a refined boundary and well managed landscape in amongst which are areas that have a more degraded and dishevelled appearance. The sense of place is affected by the proximity of the Roadstone Huntstown quarry, the sub-stations / power stations, commercial premises and the nearby road infrastructure that all combine to limit the quality and sensitivity of this landscape.

The quality and nature of roadside vegetation is very mixed and includes wooded belts and remnant field hedgerows that merge into newer hedgerows aside the entrance to the Roadstone quarry, commercial properties and around residential properties.

To the immediate north of the site is a wooded area (extending to nearly 1.8 hectares) located between it and North Road that is a key factor in limiting views. The site to the north of the Roadstone Quarry entrance is set back by over 200m from the North Road so the influence of the site is currently very limited due to distance and intervening vegetation. There is nothing on this section of road that is noted in terms of landscape, scenic or amenity provision that would be a factor in ensuring that any views would be rated as being of significance.

A pedestrian walkway and cycle bridge that crosses the N2 slip road at the M50 junction provides a link between the North Road and the Charlestown area to the south of the M50. While the bridge is an important amenity in terms of functional connection for residents and premises on North Road with the city, it is not part of any promoted tourism link or suggested amenity walk.

11.6.2 Trees & Hedgerows

The Tree Survey identified a total of 265 no. trees, wooded groups or hedgerows comprising:

- 1 no. tree of moderate quality (Grade B). Trees assigned to this category include healthy attractive trees with remediable defects that are in a condition as to be able to make a significant contribution for a minimum of 20 years.

- 246 no. trees of low quality (Grade C). Trees in this category include unremarkable trees of limited merit, small-growing, young species which have a relatively low potential amenity value, and low landscape benefits.

- 18 no. trees (Grade U). Trees assigned to this category are in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years and/or are unsuitable for retention in the proximity of new dwellings or areas of public open space.

11.6.3 Visibility

Given the local land use, topography and existing vegetation the views of the site are limited to the North Road, the access roads to Huntstown Quarry to the west, the Substation service road to the south and the pedestrian footbridge over the M50 N2 slip lane.

The low-lying landscape ensures that views are often restricted to the road corridor itself. If views are afforded over weak sections of hedge across adjacent fields, they are ultimately closed off by an accumulation of further hedgerows or wooded areas though quarry plant, power stations, powerlines and large scale warehouses.

The pedestrian bridge offers relativity broad views over the Huntstown area including towards the proposed development site, although the intervening landscape includes the Huntstown 220kV Substation that extends over 5 hectares. Powerlines and major road infrastructure are also a feature of the view which give this part of Fingal a very utilitarian landscape character.

There are no views towards the site from the lower N2 road and junction areas due to intervening topography, roadside banks, built infrastructure and vegetation.

11.7 **Impacts**

The proposed development will impact on the landscape character to varying degrees based on its perceived nature and scale. These effects are tempered and conditioned by sensitivities associated with the receptor. The duration of such impacts is however determined by the design life of the proposed development. In this case the development has a design life of up to 60 years and in this instance the impacts on landscape character are therefore deemed to be of long-term duration.

In assessing the landscape character impacts, there are three main inter-related aspects to be addressed in considering the development proposals, namely:

- The perceived character of the area – how it is affected by the proposal;
- Effects of the proposed development on social and cultural amenity, and
- The proposed views of the development, relative to the existing site and the associated impact on visual amenity.

11.7.1 Trees, Woodland and Hedgerows

To facilitate the construction and operation of the development a ca 170m section of hedgerow along the existing internal field boundary will have to be removed. The hedgerows/treelines along the southern and western boundaries will be retained, with the exception of the trees identified in the Tree Survey as being diseased. Where the trees are removed they will be replaced by native planting.

11.7.2 Landscape Character

The development will result in a change to the landscape character and the conversion of former agricultural land to industrial use. However the subject site is zoned for heavy industrial use and the proposed development is consistent with this zoning.

11.7.3 Views

11.7.3.1 Construction Stage:

In the construction stage the following have the potential to cause temporary impacts:

- Construction of the new entrance;
- Temporary site works – hoarding, lighting, cranes, car parking, storage areas;
- Hedgerow clearance;
- Groundworks – cut and fill excavations;
- Installation of foundations and site services;
- Construction of buildings, and
- Construction traffic;

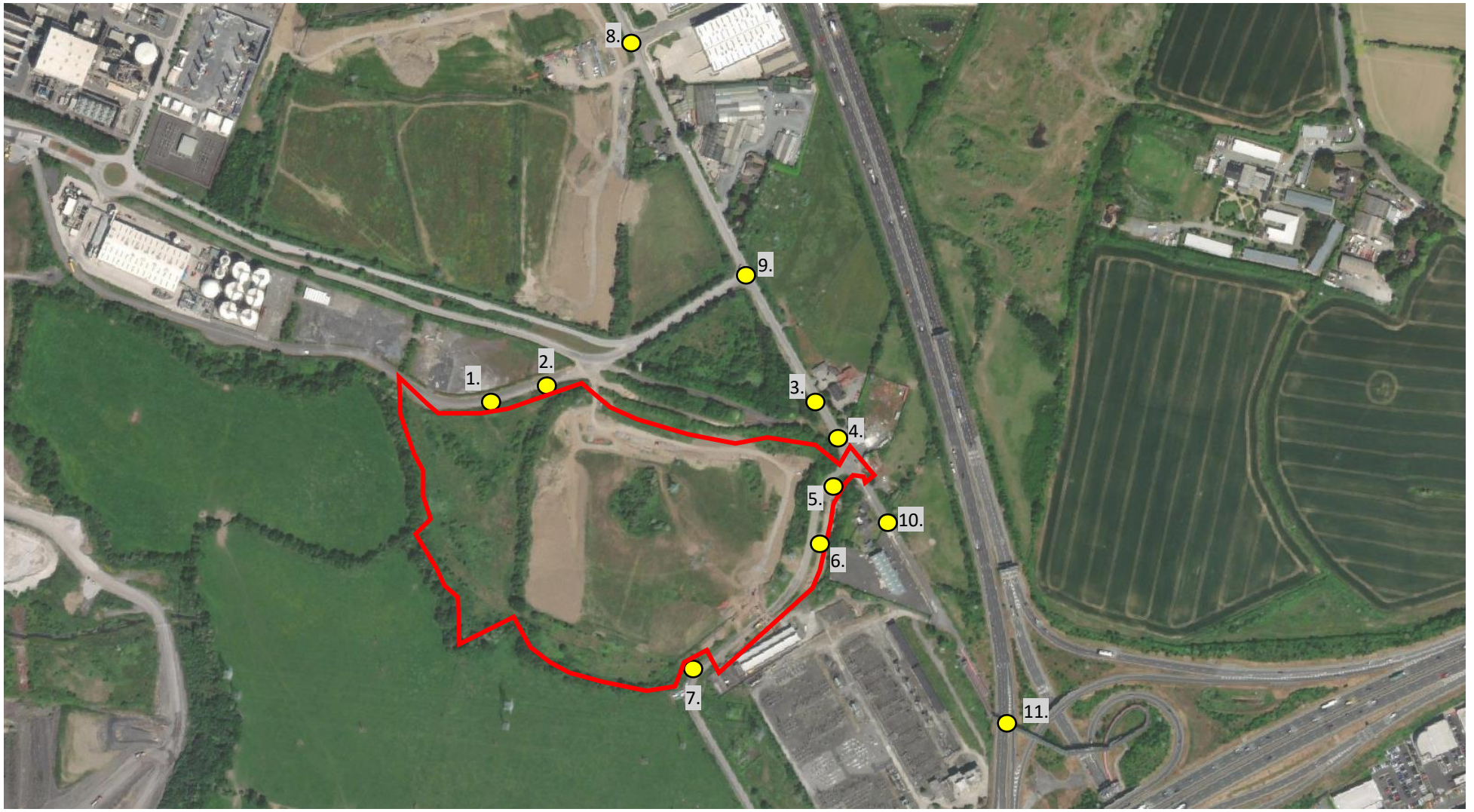
11.7.3.2 Operational Stage

The principal elements likely to give rise to landscape and visual impact in the long term are:

- Permanent entrance off the service road;
- Alterations to ground levels;
- Building massing and heights;
- New structures, road, lighting, boundaries and pathways, and
- Landscape works.

11.7.4 Visibility into the Site

For the visual impact assessment the view points, viewpoints were selected present the likely visual impact from a variety of direction around the site. The viewpoints are shown on Figure 11.1. The photographs from View Points 1 to 7 were taken in early Spring before the foliage on the deciduous trees had established.



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Title:

Figure 11.1 Viewpoints

Legend

-Viewpoint

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Client:

Irish Recycling Ltd

Visual 1: View Point 1 Huntstown Quarry Access Road North of Phase 1 Looking South West



Existing View:

From this location Phase 1 is screened by the embankment along the access road. The 110 kv overhead power lines were visible, as are the storage tanks in the Huntstown Bioenergy plant

Proposed Changes and Visual Impact:

The embankment is outside the proposed development area and will not be interfered with. Boundary treatment comprising native tree species will be planted along the northern boundary of Phase 1. Pending the achievement of the final height of the trees, the upper part of the northern elevation of the MRF will be visible all year round. When the trees are fully grown the building may be partially visible in the winter/spring.

Visual 2: View Point 2 East of View Point 1 on Huntstown Quarry Access Road Looking South-West



Existing View:

An existing farm access gate allows view into the site, with existing field boundary hedgerow and overhead power line visible.

Proposed Changes and Visual Impact:

The access gate will be removed and the gap planted with native tree species as part of the proposed boundary treatment. The existing roadside hedgerow will be retained. Pending the achievement of the final height of the trees, the upper parts of the northern and eastern elevations of the MRF will be visible all year round. When the trees are fully grown the building may be partially visible in the winter/spring.

Visual 3: View Point 3 Close to Residence on North Road Looking South West



Existing View:

Roadside hedgerow/treeline screen the development site

Proposed Changes and Visual Impact:

The road side hedges are outside the development area and will be retained. The upper parts of the eastern elevations of the MRF and FCCP may be partially visible in the winter/early spring.

Visual 4: View Point 4 South of Viewpoint 3 on North Road Looking South West



Existing View:

A combination of the topography and existing treeline/woodland screen Phase 1 from view. The overhead power lines were partially visible

Proposed Changes and Visual Impact:

The treelines and woodland will be retained and Phase 1 is unlikely to be visible from this view point.

Visual 5: View Point 5 Entrance to Access Road to Eirgrid Station Looking west



Existing View:

The roadside embankment and existing hedgerow screen Phase 1 from view.

Proposed Changes and Visual Impact:

The embankment and hedgerow are outside the development boundary and will be retained. Phase 1 will not be visible from this view point.

Visual 6: View Point 6 South of View Point 5 on Access Road to Eirgrid Station Looking west



Existing View:

A combination of the topography, fence line and hedgerow screen Phase 1 from view.

Proposed Changes and Visual Impact:

The fence line hedgerow will be retained. Phase 1 will not be visible from this view point.

Visual 7: View Point 7 South of View Point 6 on Access Road to Eirgrid Station Looking North-West



Existing View:

A combination of the topography, fence line and hedgerow screen Phase 1 from view.

Proposed Changes and Visual Impact:

The fence line hedgerow will be retained. Phase 1 will not be visible from this view point.

11.7.5 *Photomontages*

The existing and proposed views from the four locations requested by the Council and are in the LVIA Photomontages prepared by Parkhood submitted under separate cover, which should be consulted to for details of the methodology applied and to assess the full images. Extracts of the existing and proposed views are included below

Visual 8 View Point 8 - North Road (North of the Roadstone Entrance and Opposite Entrance to Woodkraft).



Existing



Proposed Changes and Visual Impact

Visual 9 Existing Entrance to 'Roadstone Huntstown' on North Road



Existing



Proposed Changes and Visual Impact: (Wireline Subject Site Obscured)

Visual 10 View Point 9 Residential Properties Located West of North Road (South of the Roadstone Entrance)



Existing

Proposed Changes and Visual Impact: (Wireline Subject Site Obscured)



Proposed Changes and Visual Impact: (Wireline Subject Site Obscured)

The MRF and FCCP will be set back at such a distance to ensure that it is either visually obscured by intervening vegetation or, where visible, its introduction will not have an unacceptable or adverse effect on the view. The effects are therefore rated as negligible to the vast majority of North Road. Where there are glimpse views as in Viewpoint 8, there will be a slight effect though given the intervening landscape view and visual context, the magnitude of change is low.

Visual 11 View Point 11 Pedestrian Bridge over the M50 to N2 Slip Lane.



Existing



Proposed Changes and Visual Impact

Viewpoint 11 is from a locally elevated vantage point on the pedestrian walkway and bridge that crosses the N2 slip road at the M50 junction providing part of a link between the North Road and the Charlestown area to the south of the M50. The bridge rises to such a height that it offers relativity broad views over the Huntstown area including towards the Application Site though the intervening landscape includes the Huntstown 220kV Substation that extends over 5 hectares.

The eastern and southern façades of the MRF and the southern and eastern façade of the FCCP will be discernible above and set to either side of the 110kV GIS building in the Substation.

There are already built elements on the skyline in this direction associated with the Huntstown Power Plant and the Energia AD Plant. The proposed development, while visible, will not intrude into the local skyline to any significant degree comparable to the current situation. The nature of the buildings are also reflective of the character and type in the area so it would not be out of character or visually out of place in this view.

11.8 Baseline Scenario

If development does not proceed the land use at the site will not change, with no alteration to the landscape character and no additional visual intrusion.

11.9 Prevention & Mitigation Measures

11.9.1 Design Stage

The Fingal Development Plan 2017 to 2023 sets out the principles for development in the 'Low Lying Agricultural' LCT

- The wider LCT, being intensively farmed, will depend on the retention and proper maintenance of deciduous hedgerow systems in order to preserve some of its original character.

- Sensitive siting and design of individual buildings and groups of buildings as well as site treatment appropriate to the area will be of importance in this landscape.

These principles were taken into consideration in the design stage; however, as with any development, some degree of impact is inevitable and wherever possible measures have been proposed to mitigate the adverse nature of these impacts. In the case of the proposed development the visual impact will be intrusion and not obstruction.

The building heights were the lowest that allow the safe internal operations while complying with aviation safety requirements. The height of the stack on the odour control unit was determined by the air dispersion modelling. The colours of the external building materials were selected to minimise visual intrusion.

Although the Tree Survey rated the general condition as being of low quality and the amenity value also as low, the hedgerows to the west and south of the site form part of the landscape character and it was a design objective is to retain and augment their presence. A detailed landscape management plan has been prepared and a copy is in Appendix 11.3. It is proposed to plant native trees species along the western and southern boundaries to supplement the existing hedgerows. Additional planting will be carried out to the east and south of the MRF and south and east of the FCCP to enhance the visual appearance of the site and compensate for the loss of the existing hedgerow along the internal field boundary.

11.9.2 Construction Stage

Careful attention will be paid to avoiding any potentially adverse construction-related effects on the adjacent residences. Operating a well-managed, organised and planned construction site, with adequate control of construction traffic and working activity, is key to avoiding/minimising such impacts. In addition, any lighting required during the construction phase should be located sensitively to avoid unnecessary light spill into the surrounding residential areas.

11.9.3 Operational Stage

Prevention and mitigation measures are not required.

11.10 Monitoring

11.10.1 Construction Stage

In the construction stage the following will be implemented:

- Set Up– clearly identify trees and hedgerows that are to be retained and protected – ensuring tree protection measures are then place. Clearly identify trees and vegetation that are to be removed.

- Excavation stage – ensure existing vegetation is adequately protected and that topsoil is correctly stripped and stored for landscape reinstatement

- Landscape Works - ensure that landscape proposals are being implemented correctly

11.10.2 Operational Stage

In the operational stage long term maintenance plan will be put in place as specified in Sections 4 and 5 of the Landscape Management Plan in Appendix 11.?.

11.11 Cumulative Effects

The proposed development will have a not significant, negative, local and long term cumulative impact on the landscape.

11.12 Residual Impacts

11.12.1 Landscape

The development will alter the existing landscape character as a result of changing from agricultural to industrial use, but will have no impact on the existing boundary hedgerows, amenities or cultural heritage. The impact will be negative, not significant, local, likely and long term.

11.12.2 Visibility

The combination of the topography and existing vegetation effectively screens the proposed development from the majority of public view points. The site will be partially visible all year round from a view point on the access road to Huntstown Quarry to the north west and from the new entrance off the service road to the Substation, however at the other viewpoints the site will either be fully screened or only partially visible over the winter period. In the context of the surrounding landscape, which is dominated by quarrying and industrial type units, the visual impact will be negative, not significant, local, likely and long term.

11.12.3 Summary of Residual Impacts

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration
Landscape Character	Negative	Not Significant	Local	Likely	Long Term
Visual Intrusion	Negative	Not Significant	Local	Likely	Long Term

12. CULTURAL HERITAGE

12.1 Introduction

This Chapter describes the archaeological, architectural and cultural heritage significance of the development site and its environs and assesses the impact of the proposed development including a 'baseline' scenario. It identifies the prevention, mitigation and monitoring measures that will be implemented to reduce the significance of the impacts and assesses the residual impacts.

This Chapter was prepared by Mr Jim O'Callaghan of OCM and is based on the Archaeology Assessment completed by the Archaeology Consultancy Services Unit (ACSU) in 2023, a copy of which is in Appendix 12.1. The ACSU report addresses the entire development site and describes previous archaeological testing carried out both for the purpose of the proposed development and the undergrounding of the overhead power lines. These include the Archaeological Impact Assessment completed by Kilkenny Archaeology (KA) in 2020 that involved test trenching in the western part of the proposed development site. A copy of the KA report is in Appendix 12.2.

12.2 Relevant Legislation & Guidance

The general EIA legislation and guidance documents are referenced in Sections 1.5 of this EIAR. In addition the Heritage Act (1995) identifies the various aspects of heritage, including archaeological monuments and objects, architectural heritage, fauna, flora, geology, heritage gardens and parks, heritage objects, inland waterways, landscapes, monuments, seascapes, wildlife habitats, and wrecks.

12.3 Methodology

The ACSU assessment conformed to the methodologies recommended in 'Framework and Principles for the Protection of the Archaeological Heritage' issued by the Department of Arts, Heritage, Gaeltacht and the Islands (1999) and were in accordance with the legislative frameworks of the National Monuments Acts 1930-2004, the Heritage Act 2000 and the European Convention on the Protection of the Archaeological Heritage (ratified by Ireland 1997).

The assessment included a desk study, field inspection, geophysical survey and test excavations. The study area comprised a ca 2 km radius of the proposed development site. The desk study involved a review of primary and secondary documentary sources to determine the archaeological and historical background of the proposed development area and a review of reports on previous archaeological investigations undertaken inside and within the vicinity of the site.

The field inspection was undertaken to identify any potential impacts the proposed development might have upon recorded archaeological monuments on and in the environs of the development site and to identify any previously unrecorded archaeological monuments or areas of archaeological potential. The geophysical survey was completed under licence 23R0419.

The test trenching was carried out under Archaeological Excavation Licence 23E0872 in accordance with the IAI Code of Conduct for Archaeological Assessment Excavation (IAI 2006) and a Method Statement submitted to the National Monuments Service and the National Museum of Ireland.

The test trenches were excavated to the natural subsoil or where applicable, to the surface of potential archaeological deposits/features. The latter were cleaned by hand to determine their horizontal extent and the spoil from excavated test trenches was examined for finds.

All excavated trenches and archaeological deposits/features were recorded using ArcGIS Survey123 and digital photography. Digital photography images were taken using a high-resolution digital camera with a minimum resolution of 10 Megapixels.

12.4 Proposed Development

Chapter 3 provides a full description of the proposed development. Those aspects of the development of relevance to Cultural Heritage are:

Site clearance including stripping and stockpiling of soils;

- Excavation and fill to achieve formation levels;
- Excavation works for building foundations, roads sub-base and underground services, and
- Construction of the buildings, paved yards and installation of drainage systems.

12.5 Receiving Environment

12.5.1 Development Site

The proposed development site-covers 9.863 ha and encompasses former agricultural land and a section of the service road to the Eirgrid Substation. The western part of the site is a scrub field and is defined on the west by a field boundary. A second field boundary traverses the site and marks the division with a tillage field to the east. This field contains a steep hill that has been partially quarried for gravel. The gravel pit is marked on the first edition Ordnance Survey Ireland map and subsequent editions.

12.5.2 Cultural Landscape

A review of available historic mapping for the area was carried out to include the Ordnance Survey of Ireland, including the 6-inch (surveyed 1836 – published 1843; Figure 12.1) and 25-inch (surveyed 1906 – published 1909; Figure 12.2). Potential archaeological or cultural heritage features are marked on such maps and provide a useful resource in identifying sites, particularly if they no longer have any above-ground remains.

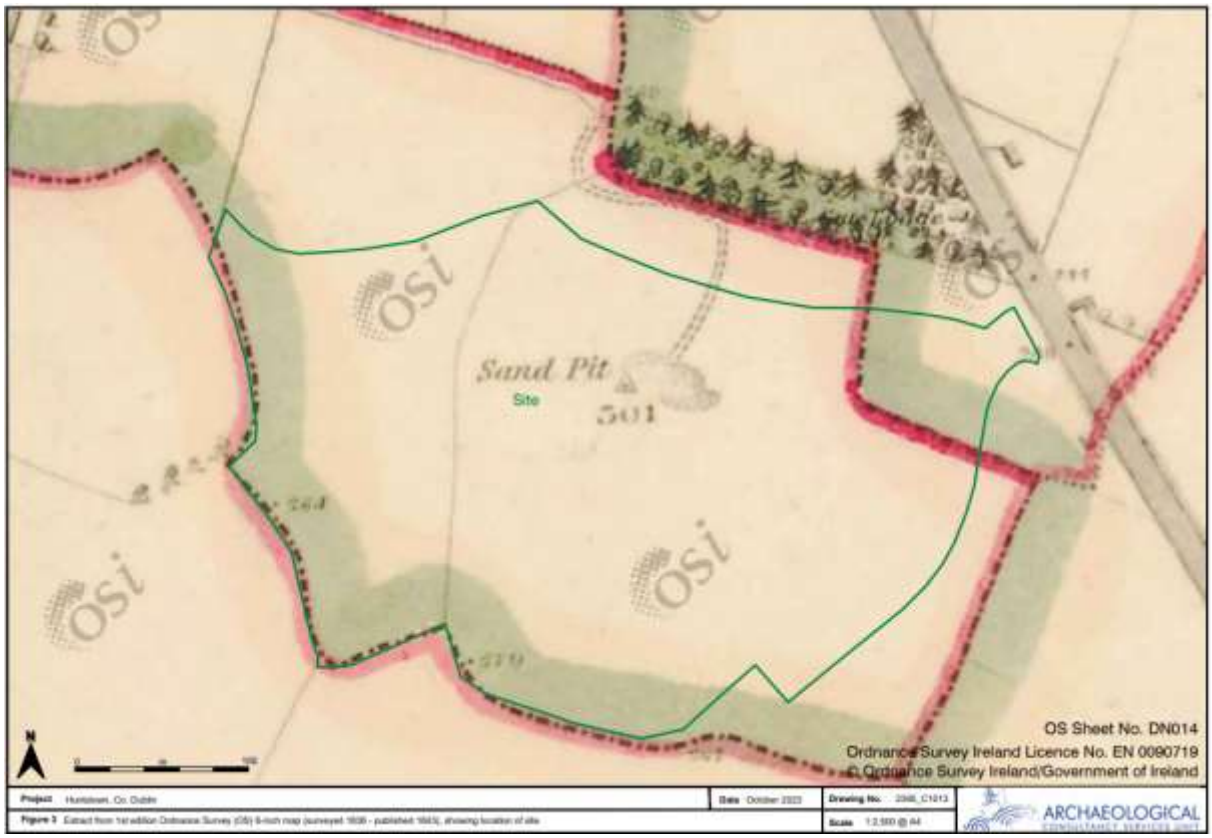


Figure 12.1 OSI 1836 Map (Extract from ACSU Report)

The development site is located within two large fields on the 1836 map with a strip of trees north of the eastern field. An east to west aligned road runs from the west up as far as the strip of trees to the east. A small laneway runs from the end of the road into the eastern field and stops at a sand pit, roughly one third of the length of the field. There are no structures within the two fields.

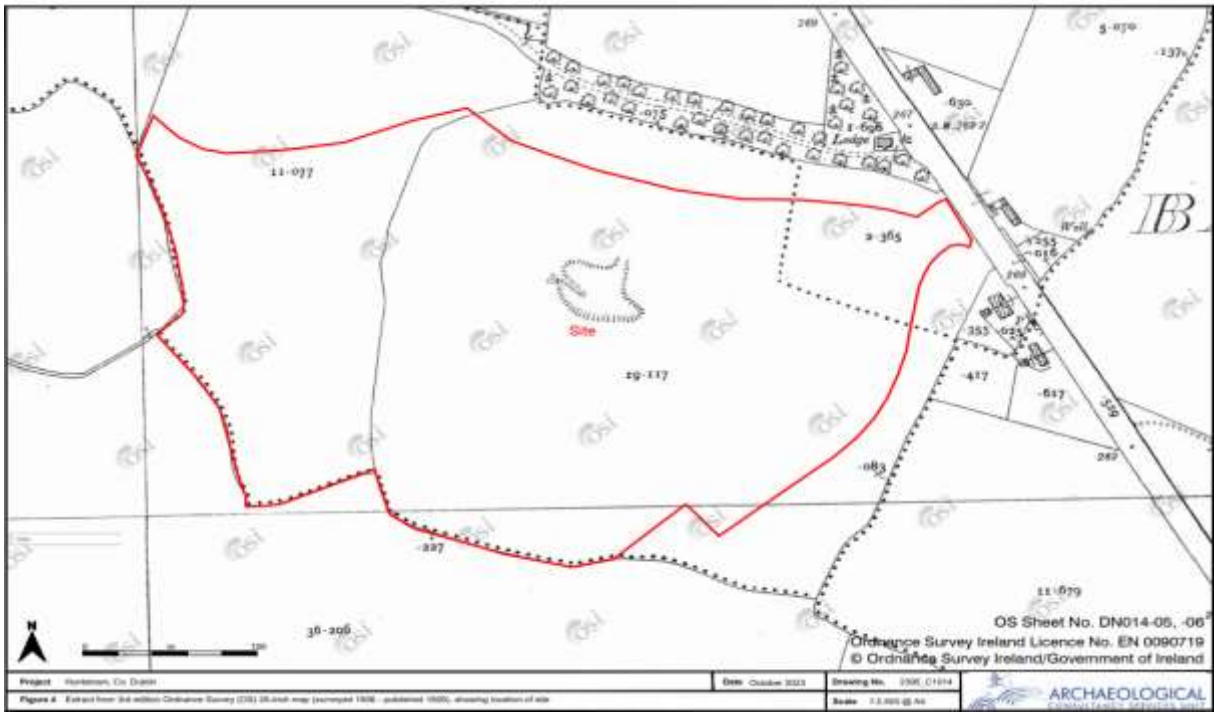


Figure 12.2 OSI 1836 Map Third Edition (Extract from ACSU Report)

On the third edition map (Figure 12.2) the laneway down to the sand quarry has gone, suggesting the quarry was abandoned. The rest of the fields remain the same

12.5.3 Archaeological Background

12.5.3.1 Prehistoric Period

There are five known prehistoric sites (pre c. 500 AD) within the study area. The low number may be attributed to the flat terrain and heavy soils of north county Dublin. The most significant site is a Neolithic causewayed enclosure in Kilshane Townland [DU014-093], which is 1.5 km north of the development site on a gently undulating gravel ridge associated with tributaries of the Ward River.

The other features include a Ring-ditch [DU014-015], 500m to the north of the development site in the townland of Coldwinters; a second ring-ditch [DU014-100] approximately 1.2km to the north-east in the townland of Newtown and two burnt mound sites, one (DU014-050) in the townland of Grange 1.3km to the west and the other (Site 1 of 031450) in the townland of Newtown, 1km north of the development site.

12.5.3.2 Early Medieval Period

The study area is within the plain of Brega and the earliest historical records note that the Síl nÁedo Sláine, a dynasty of the southern Uí Néill, were the dominant rulers in the area during the early medieval period. The dominant monument from this era (500 – 1169 AD) is the ringfort. These monuments were primarily settlements and may also have been for people to retreat into at times of conflict, or enclosures to protect cattle. Sometimes souterrains, which are stone or wooden lined tunnels leading to chambers or hidden exits, are present.

There are four possible ringforts, five enclosures and one souterrain within the study area. Only one of the ringforts is extant. The nearest ringfort (DU0140-006002) is c. 1.3km to the north in the townland of Newtown. This now levelled monument was recorded prior to its destruction in 1953.

Elsewhere in Newtown, a probable levelled ringfort (DU014-097) was identified from cropmarks on aerial photography c. 250m east of (DU014-006.001). Also in Newtown is an oval enclosure [DU014-007]. An enclosure [DU014-016] recorded from aerial photography in neighbouring Coldwinters townland, approximately 800m east of the development area may also have been a ringfort. Another possible enclosure (DU014-017) is recorded to the east

Two enclosures in Baleskin (DU014-124 & and DU014-102), identified by cropmarks, are located 650m and 750m to the east of the development site. Three enclosures (possible ringforts) and a possible souterrain are located in Cloghran, between 1.7 – 1.8km west of the development site. The one considered most likely to have been a ringfort (DU014:014.001) was on a north facing slope under tillage. A possible souterrain (DU014:001.003) was identified within the one of other possible ringforts (DU014:014.002). The extant ringfort (DU014-029) is in the townland of Cappoge, 1.5km south of the development site. It is still visible, albeit damaged from farm machinery.

It is possible that some of the churches and graveyards discussed in the next section may have early medieval origins, although this is not certain. A possible candidate is a series of 123 Christian burials excavated n 1988, (Site 99E0220), which is 1.8 km northwest of the development site.

12.5.3.3 Medieval Period

The arrival of the Anglo-Normans gave rise to profound changes in the cultural and political landscape. In 1172 King Henry II made Hugh de Lacy palatinate of the lands of Meath, which probably included the Barony of Castleknock. De Lacy then granted Hugh Tyrell the lands of Castleknock on behalf of the king.

There are references to Huntstown townland during the medieval period and medieval monuments occupy it and its environs. The name itself is thought to translate as the land of the Hunt family, an Anglo-Norman family who briefly feature in documentary sources until the 14th century, when the last member of the lineage was executed for treason.

Anglo-Norman settlement in the part of Ireland where the development site is located was characterised initially by motte and bailey castles, which were often set up along strategic locations overlooking rivers or important route ways. They comprised a large earthen mound on top of which was a timber castle within a palisade. A fosse or moat encircled the mound to provide added defensive security, and sometimes an outer area known as a bailey was constructed. This too was delineated by a defensive ditch or palisade.

There are two motte and bailey castles within the study area – Newtown (DU014-013) and Dunsoghly (DU014-005.003). Both are north-west of the development site, with Newtown being the closest at 900m. The Newtown motte was destroyed in 1952 but the site is visible as a soil mark on aerial photographs and is also shown on the six inch map. Unlike Newtown, the Dunsoghly motte still partially survives on a natural rise in the landscape, not least because a modern farm is built on the top of it.

As the Middle Ages progressed castle forms changed from mottes to tower houses. Tower houses are substantial stone structures that are often square or rectangular shaped with few windows. There are two tower houses in the study area. One is at Dunsoghly (DU014-005001), approximately 250m NW of Dunsoghly motte and c. 2km from the development site, and the second at Cappoge (DU014-027), 1.6km south of the development site.

Dunsoghly castle [DU014-005001] is a well preserved tower house dating to the late 15th-century. It is associated with the Plunkett family (Tutty, 1979, 155-7). It is four storeys high and has four corner towers and is built of limestone. Adjoining the castle is a medieval church (DU014-005002). Cappoge castle was a three storey structure that was knocked down before 1860.

A possible church, burying ground and a domestic well (DU014-01200103) are shown on a first edition map as being in the townland of Killshane, 1km north of the development site. However, no burials or an associated church have been found and this area has been subjected to extensive quarrying.

12.5.3.4 Post Medieval Period

There are twenty cultural heritage sites within the study area associated with the post-medieval period (c. 17th to c. 19th century). None are recorded in the National Inventory of Architectural Heritage for Fingal, but five are in the Sites and Monuments Record. These include a 16th / 17th century probable fortified house at Dubber (DU014-018), which is 1.8km from the development site; a house in the same area built out of the ruins of Dubber castle) DU084-017); an Inn in Dubber (DU014-017), and two houses / a chapel and a crucifixion plaque at Dunsoghly (DU005-002, -004, -005, -006), 1.9km north east of the development site.

There are fourteen quarries and six gravel pits, including the one in the east of the development site, which probably date from the post-medieval period. The quarries pre-date Huntstown Quarry, which was opened in the 1970s and not developed from an earlier quarry. There are also two limekilns in the study area

There are references to Huntstown in historical sources, although there are three townlands with the name of Huntstown in Dublin, two of which are in the Barony of Castleknock and one in the Barony of Coolock.

The earliest mentioned person linked to Huntstown of Castleknock Parish is a merchant Hoxes Cotes 'of Huntstown and Johnston in Castleknock Parish, Co. Dublin, 1766' who is mentioned in association with an estate map in the National Archives. The estate almost certainly includes Huntstown House, which is labelled 'Newtown' on the Rocque map of 1760 (Figure 12.3). The map shows no buildings or features of archaeological significance in the approximate area of the development site; however it is difficult to precisely place the location of the development site on this map (Arrow).



Figure 12.3 Rocque Map 1760 (Extract from Kilkenny Archaeology AIA

Huntstown House was 1.4 km north-west of the development site. The house was entirely removed during the development of Huntstown quarry, which now covers an extensive area of Huntstown and neighbouring townlands. The Griffiths Valuation, which was the primary valuation of property in Ireland between 1847 and 1864, indicates in 1853 Huntstown House was leased by a Mr. Christopher Kelly. Mr Kelly also leased the three fields east of his house which formed the eastern end of Huntstown townland. These totalled 91 acres. The 1843 Map (Figure 12.1) shows the sandpit within the development area.

Aerial photographs show the larger (west) field in the application area has been disturbed by construction works, probably associated with the adjoining road network and Huntstown Power Station.

12.5.4 *Geophysical Survey*

The ACSU geophysical survey identified the partial remains of an oval enclosure slightly offset to the south and surrounding the pre-existing quarry. The enclosure consists of a curving negative anomaly commencing at the south-western edge of the quarry and continuing southeast, east and then curving back to the north along the east side into an area of magnetic interference.

A portion of the north-eastern edge of the enclosure appears to return westwards immediately east of the quarry. Overall, the enclosure measures 80m by 65m. The existing 19th-century quarry has impacted the north-west portion of the enclosure and a significant part of the interior. The southern extent of the enclosure appears to have a gap where it opens into a possible field or annex at the southwest corner.

There were a series of linear and curvilinear anomalies that extend southwards from the enclosure and east-west across the gentle south-facing slope of the ridge. These have associated small and larger negative features that could represent pits or kilns.

The north-south and east-west aligned linear anomalies probably represent field systems or other rectangular enclosures associated with the main enclosure on the summit of the ridge. The anomalies appear to extend eastwards towards the site where human remains consisting of two individuals were identified during the undergrounding of the powerline. There is therefore a possibility that further human burials might be present within the site. The complex to the south of the enclosure measures 125m east-west by 65m north-south approximately

12.5.5 *Field Testing*

KA completed archaeological testing in the west of the site in December 2020. For safety reasons the overhead power lines prevented test trenching across much of the site. Seven archaeological test-trenches were excavated across Phase 1 using a mechanical excavator with a toothless grading bucket.

The trenches were excavated to the level of the underlying glacial subsoil, which averaged 0.4 m below ground level. At all seven locations there was evidence of previous disturbance of the topsoil and in Tr 4 modern field trains were observed in the natural subsoils. Nothing of archaeological interest was noted in any of the trenches.

ACSU completed archaeological testing in the central and eastern part of the site, where the geophysical survey had identified the presence of potential archaeological features. This involved the excavation of 24 test trenches, each measuring 1.8m in width. In total, 979m of linear trenches were excavated.

A total of 36 features were identified consisting of linear and pit features. Due to the quantity and extent of these features, interpretation is based on a combination of the results of the trench testing listed in Tables 3 and 4 of the ACSU Report as well as the results of the geophysical survey

The locations of the test trenches excavated in 2020 and 2023 and the archaeological features identified by the geophysical survey are shown on Figure 12.4.

The ACSU test trenching revealed feature C1201, which was orientated east to west and was previously identified during the geophysical survey. ACSU interprets this as a ditch that enclosed a possible habitation site located at the summit of the hill. The linear and pit features found on the southern

slope of the hill are considered to be part of potential field systems associated with the enclosed settlement.

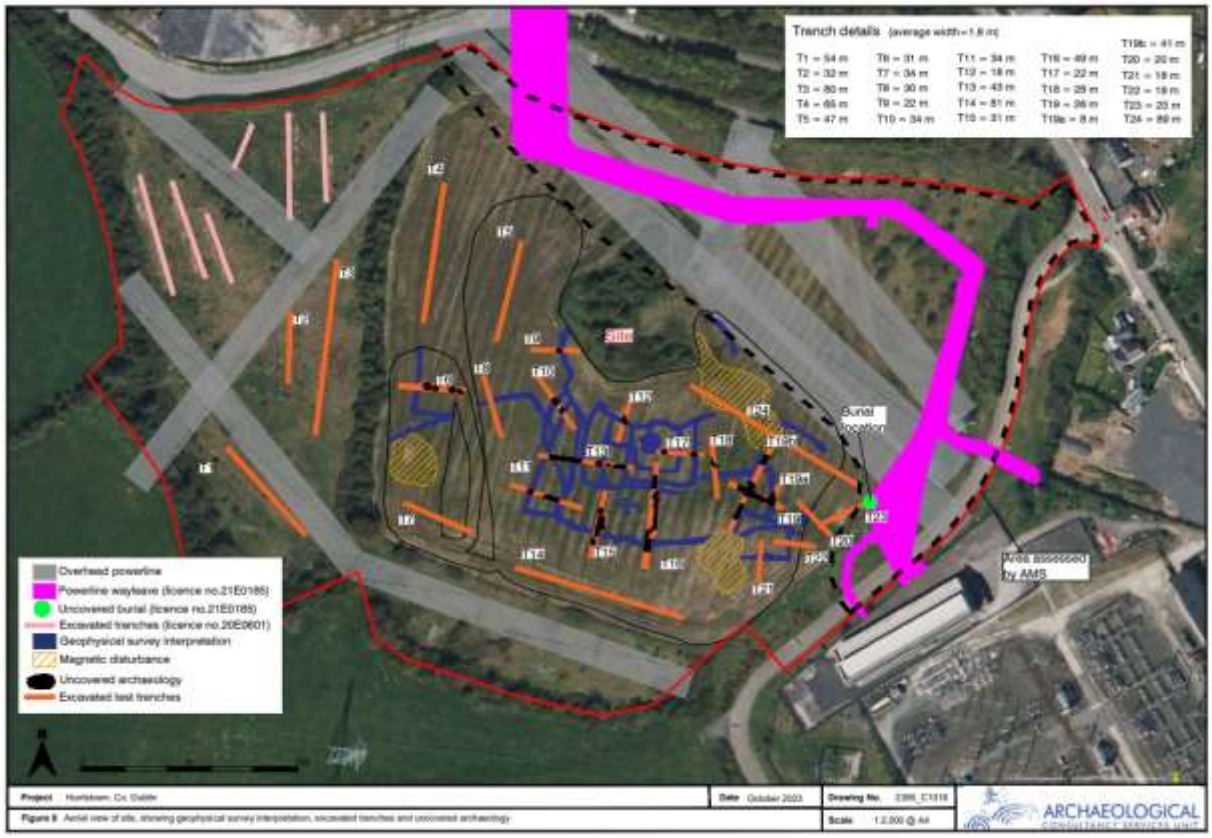


Figure 12.4 Combined Test Trench Locations & Geophysical Survey Finding

A section of C1903 (Photograph 12.2) revealed a ditch measuring 4m in width and with a depth of 1.2m. The ditch features a step or shelf measuring 2m in width before dropping off to the base. This feature also appears to be the same as C1902 (Photograph 12.3). The size and location of this feature suggest a substantially large ditch was used to demarcate the outer boundary of the fields used by the settlement.

ACSU did not no find any materials of archaeological significance during testing; however, animal bone was present in many of the features across the site. No dating evidence was observed in the form of diagnostic artefacts during the test trenching. Similarly, no soil samples were taken from the site for radiocarbon dating. However, ACSU consider that the lack of pottery sherds combined with the observed archaeological features suggests a late iron age/early medieval date to the site.



Photograph 12.1 : C1201 linear facing east



Photograph 12.2 C1903 linear facing southwest



Photograph 12.3 C1902 linear facing north

12.5.6 *Cultural Heritage Value*

The results of the geophysical survey and test trenching suggest a possible enclosure at the summit of the hill, with the linear features running down the slope of the hill to the south representing associated field systems. This type of archaeology is characteristic of early medieval settlement.

Settlement in early medieval Ireland (AD 400-1100) is characterised by enclosed habitation sites such as raths, cashels and crannógs (O'Sullivan et al, 2013). Raths are more commonly known as ringforts and refer to enclosures with earthen banks and ditches enclosing a habitation site (ibid).

The term fort implies a militaristic nature to these settlements as a defendable fortress, however, the archaeological evidence suggests that while being defendable, their primary use was to protect cattle which was the basis of wealth during the period (McCormick and Murray, 2007).

Early medieval society was agricultural and while some sites incorporating multiple banks and ditches have been interpreted as royal sites, the majority are better interpreted as enclosed farmsteads (O'Sullivan et al 2012).

The northern slope of the hill has been previously quarried, and habitation evidence may have been disturbed or removed as a result. However, while speculative until the features are excavated archaeologically, the curvilinear feature identified during the geophysical survey suggests this was the enclosure ditch of a settlement based at the summit of the hill, with linear features running to the south related to the associated field systems.

12.6 **Impacts**

The proposed development which involves extensive excavation of the subsoils will have a direct impact on the identified archaeology and preservation in situ is not an option.

12.7 **Baseline Scenario**

If the development does not proceed the site will remain in its current condition, with no changes to the potential impacts on the overall cultural heritage.

12.8 **Prevention and Mitigation Measures**

12.8.1 *Design Stage*

Given the extent of the buried archaeological features it is not possible to 'design out' impacts.

12.8.2 *Construction Stage*

The proposed mitigation measure are preservation by record. Prior to the start of the site set up works a structured programme of archaeological investigations will be carried out in the areas identified in the ACSU report as containing archaeological features. The investigations will be carried out by a licence-eligible archaeologist in compliance with a method statement approved by the Department of Housing, Local Government and Heritage in consultation with the National Museum of Ireland.

Following completion of the investigations, the archaeologist will prepare a full and final report for submission to Fingal County Council, the Department of Housing, Local Government and Housing and National Museum of Ireland.

12.8.3 *Operational Stage*

As there will be no impacts on cultural heritage features in the operational stage mitigation measures are not required.

12.9 Monitoring

12.9.1 *Construction Stage*

As the cultural heritage value of the entire development site has been comprehensively assessed that the archaeology will be resolved through preservation by record prior to the start of the construction stage, monitoring measures are not required.

12.9.2 *Operational Stage'*

Operational stage monitoring is not required.

12.10 Cumulative Impacts

The proposed development will have a slight positive cumulative effect on cultural heritage as the preservation by record will add to the cultural heritage database on medieval activities in County Dublin.

12.11 Residual Impacts

The proposed development will have a negative, not significant, local, likely and permanent impact on the archaeological features within the development site boundary but will have a positive, slight make a positive contribution to the archaeological heritage record of the area.

12.11.1 *Summary of Residual Impacts*

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration
Construction Stage					
Loss of Archaeological Features	Negative	Not Significant	Local	Likely	Permanent
Cultural Heritage Record	Positive	Slight	Local	Likely	Permanent

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13. MATERIAL ASSETS: BUILT SERVICES

13.1 Introduction

This Chapter describes the material assets on and in the environs of the site. It identifies the potential impacts, describes the proposed prevention mitigation and monitoring measures and assesses the impacts, including residual impacts. It also addresses a 'baseline' scenario.

Material Assets as defined in the 'Advice Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022) are 'built services and infrastructure'. This includes roads and traffic, electricity, telecommunications, gas, water supply infrastructure, sewerage systems and waste management. Roads and traffic are addressed separately in Chapter 14. This Chapter was prepared by Dr Martina Gleeson and Mr Jim O'Callaghan of OCM and should be read in conjunction with Chapter 5 Climate and Chapter 14 Traffic and Transport.

13.2 Relevant Legislation & Guidance

In addition to the guidance documents referenced in Section 1.5 the following legislation and guidance were taken into consideration:

- The Waste Management Act 1996, as amended;
- Waste Management Plan for the Eastern Midlands Region (2015 to 2021)
- Fingal Local Economic and Community Plan (2016-2020)
- Waste Action Plan for a Circular Economy (Department of Environment, Climate & Communications 2021.
- Building Regulations Part G (S.I. No. 335/2008), Part H (S.I. No. 561/2010) and Part L (S.I. No 292/2019 –
- European Commission (2018) Revised Energy Performance of Buildings Directive (EPBD) (2018/844/EU)
- European Union (Energy Performance of Building) (No.2) Regulations 2019),
- Part L and European Union (Energy Performance of Buildings) (No. 2) Regulations 2019 Technical Guidance Document (Department of Housing, Planning and Local Government).
- European Union (Energy Performance of Buildings) Regulations 2021 (S.I. No. 393 of 2021).

13.3 Methodology

The assessment was based on the Coyle Civil & Structural Engineering Services Report and information derived from the current County Development Plan, Eastern Midlands Region Waste Management Plan, Uisce Eireann database. The Engineering Report is in Appendix 14.1 and should be consulted for the detailed information on the existing and proposed water supply, wastewater and surface water services.

13.4 Proposed Development

Chapter 3 describes the existing site and the proposed development. Those aspects that are relevant to the Materials Assets are water, electricity and energy supplies, surface water drainage, waste management, and natural resource consumption.

13.5 Receiving Environment

13.5.1 Services

There is no water supply and foul water drainage system serving the development site. There is no existing surface water drainage system and incident rain fall infiltrates to ground.

There are two 38 kv and one 110 kv overhead powerlines running from south-east to north-west across the north-eastern part of the site, and a 10kv line running from south-west to north-east through the centre of the site, off of which is a south-east to north-west spur. Currently works are on-going to remove the overhead lines and lay them underground inside the eastern and northern development site boundaries.

Uisce Eireann permanent and temporary wayleaves run from north to south through the site for the Greater Dublin Orbital Sewer route.

13.5.2 Waste Management

In 2020, the government published its 'Waste Action Plan for a Circular Economy' to take cognisance of the European Commission's (Commission) Action Plan on the Circular Economy. The purpose of Commission's Action Plan the is to transition the European Union (EU) to an economy where the value of products, materials and resources is maintained for as long as possible and the generation of waste minimised. This transition is essential to the EU's efforts to develop a sustainable, low carbon, resource efficient and competitive economy.

The Commission recognises that recycling is a pre-condition for a circular economy, where resources and materials can be recycled, returned back to the economy and used again, meaning that what was once considered a waste can become a valuable resource. To achieve this, materials at the end of their life cycle should be recovered through recycling and ideally reintroduced to the product lifecycle. These "secondary raw materials" can then be traded like primary raw materials.

The objective of the government's Waste Action Plan for a Circular Economy is to inform and direct waste planning and management in Ireland over the coming years. While the thrust of the Plan is to prevent waste arising through reuse its objectives include ensuring that measures support sustainable economic models (for example by supporting the use of recycled over virgin materials).

The Plan promotes the development – for environmental and economic reasons – of adequate and appropriate treatment capacity at indigenous facilities to ensure that the full circularity and resource potential of materials is captured in Ireland.

Efforts to decouple waste generation from economic growth have not yet been successful and the economic recovery that started in 2014, in conjunction with population growth, has resulted in a continuing increase in the quantities of waste arising, both nationally and in the Greater Dublin Area.

The Eastern Midlands Regional Waste Management Plan estimates that the increase in municipal wastes (combined household and commercial) between 2012 and 2021 will be in the region of 2-3% annually. Growth at the higher rates presents a challenge to the region to ensure adequate collection and treatment capacity is required. Furthermore, the need to treat more of these wastes in the country in support of Circular Economy initiatives means that treatment capacity needs to increase above the projected rates, making the provision of capacity even more challenging.

To ensure that national and regional recovery and recycling targets are met, to minimise the amount of waste disposed to landfill and to roll out circular economy initiatives there is a need to increase indigenous waste recycling and recovery capacity.

It is strategic policy of the Fingal Local Environmental Community Plan to ensure, from environmental, business and public health needs, that waste management remains a priority for local authorities and waste management regions in continuing to invest in promoting and facilitating reuse and recycling by residential and commercial sources and that high standard options for treatment and final disposal of waste are available within the Greater Dublin Area.

13.6 **Impacts**

13.6.1 Water Supply

In the operational stage water for potable use and for use in the dust control measures will be obtained from the mains supply. Rainwater will be harvested for use as 'grey water' in the staff well fare facilities.

13.6.2 Surface Drainage Systems

A surface water drainage system will be provided that incorporates SuDs measures to harvest rainwater for use in the processes, with surplus water collected and percolated to ground via soakaways. There will be no discharge to off-site water courses.

13.6.3 Foul Water Drainage

Sanitary wastewater and process wastewater will discharge to the Uisce Eireann foul sewer.

13.6.4 Resource Consumption

A connection will be made to the existing overhead electrical power line running along North Road. This may require a temporary disruption of supply locally. An electricity substation will be provided in the north-east of the site.

In the construction stage, electricity will be required for lighting and power in the construction compound. In the operational stage electricity will be needed in the buildings for lighting, ventilation, waste processes, washing the food containers, wastewater treatment plant, electrically powered fork lifts and external lighting. The electricity from the roof mounted solar panels will be directly used on-site.

The development will result in an increase in the consumption of natural resources in the construction and operational stage associated with the use of construction materials, vehicle fuels, water, diesel and oil used in the mobile plant items.

13.6.5 Waste Management /Circular Economy

The proposed development will increase the waste treatment capacity in the Greater Dublin Area to significantly assist in the achievement and maintenance of national and regional recycling and recovery targets and circular economy initiatives, including the avoidance of single use plastics.

13.7 Baseline Scenario

If the proposed development does not proceed there will be no new connections to the electricity networks, mains water supply and foul water network and no generation of electricity from renewable sources. There will be no expansion of the waste treatment capacity in the Greater Dublin area and no contribution to the achieving circular economy initiatives

13.8 Prevention & Mitigation Measures

13.8.1 Design Stage

13.8.1.1 Energy Efficiency

The requirements for the conservation of fuel and energy for buildings other than dwellings are laid out in Part L of the Second Schedule to the Building Regulations 1997 (S.I. No. 497 of 1997), as amended by the Building Regulations (Part L Amendment) Regulations 2011 (S.I. 259 of 2011), the Building Regulations (Amendment) Regulations 2017 (S.I. 4 of 2017). The Second Schedule, insofar as it relates to works related to buildings other than dwellings is:

L1 A building shall be designed and constructed so as to ensure that the energy performance of the building is such as to limit the amount of energy required for the operation of the building and the amount of carbon dioxide (CO_2) emissions associated with this energy use insofar as is reasonably practicable.

For new buildings other than dwellings, the requirements of L1 shall be met by: –

(a) providing that the energy performance of the building is such as to limit the calculated primary energy consumption and related Carbon Dioxide (CO_2) emissions to a Nearly Zero Energy Building level insofar as is reasonably practicable, when both energy consumption and Carbon Dioxide emissions are calculated using the Non-domestic Energy Assessment Procedure (NEAP) published by Sustainable Energy Authority of Ireland;

(b) providing that the nearly zero or very low amount of energy required is covered to a very significant extent by energy from renewable sources produced on-site or nearby;

(c) limiting the heat loss and, where appropriate, availing of the heat gains through the fabric of the building;

(d) providing and commissioning energy efficient space heating and cooling systems, heating and cooling equipment, water heating systems, and ventilation systems, with effective controls;

(e) ensuring that the building is appropriately designed to limit need for cooling and, where air-conditioning or mechanical ventilation is installed, that installed systems are energy efficient, appropriately sized and adequately controlled;

(f) limiting the heat loss from pipes, ducts and vessels used for the transport or storage of heated water or air;

(g) limiting the heat gains by chilled water and refrigerant vessels, and by pipes and ducts that serve air conditioning systems;

(h) providing energy efficient artificial lighting systems and adequate control of these systems; and

(i) providing to the building owner or occupants sufficient information about the building, the fixed building services, controls and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and energy than is reasonable.

In accordance with the EU Energy Performance of Buildings Directive Recast (EPBD Recast) 2010/31/EU of 19th May 2010 definition for Nearly Zero Energy Buildings (NZEB) Part L provides for buildings with a very high energy performance. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby.

The above guidance on energy performance was considered at the design stage and the Design Team decided that the appropriate energy options for the development included:

- Installation of roof mounted Photovoltaic (PV) Solar Panels to supplement the electricity supply.
- Insulation of pipes conveying heated water
- Provision of energy efficient artificial lighting systems
- Provision of electric vehicle charging points.

13.8.1.2 Surface Water Drainage

The capacity of the proposed storm network was modelled and analysed to cater for a 1-in-2 year and a 1-in-30 year rainfall event using the Rational Method. A roughness coefficient (ks) of 0.6mm was used in design to achieve a minimum self-cleansing velocity of 0.75m/s when flowing half full.

The soakaway design complies with guidance published by the Building Research Establishment (BRE), Digest 365 Soakaway Design. The subsoil infiltration characteristics were established by the on-site testing by Site Investigation Ltd. to BRE digest 365.

13.8.1.3 Natural Resource Consumption

The design mitigation measures implemented to minimise energy usage will also reduce indirect natural resource consumption.

13.8.2 Construction Stage

13.8.2.1 Natural Resource Consumption

The Resource & Waste Management Plan will identify all of the measures to maximise the reuse/recovery of construction and demolition waste generated by the development and also the opportunities to use recycled aggregates in the construction as alternative to natural materials.

The use of fuels by the construction traffic and the plant and equipment will be minimised by:

- Optimising schedules for the delivery and removal of construction related materials;
- Prohibition of vehicle idling, and
- The proper maintenance and efficient use of construction plant and equipment.

13.8.3 Operational Stage

13.8.3.1 Water

There is no scope for mitigation measures in addition to those already 'designed in'.

13.8.3.2 Foul Water

There is no need for mitigation measures.

13.8.3.3 Waste Management

Food waste from the canteen will be collected and sent to the Brown Bin Bay in the MRF. Waste oils, batteries and electrical items will be stored in appropriate containers e.g. battery and light bulb boxes, before being sent off-site. All wastes sent off-site will be transported by authorised waste collectors and go to appropriately authorised waste management facilities.

13.8.3.4 Natural Resource Consumption

The on-site use of the electricity generated by the solar panels in conjunction with the mitigation measures for the reduction of the impact on energy demands will contribute to the mitigation of the impacts on natural resource consumption.

13.9 Monitoring

13.9.1 Construction Stage

The Resource Waste Manager will monitor construction activities to ensure that the waste segregation and storage specified in the RWEMP are implemented.

13.9.2 Operational Stage

Energy, fuel and water usage will be monitored.

13.10 Cumulative Effects

In the operational stage the proposed development will contribute to the cumulative natural resource consumption in the Greater Dublin Area. The installation of the roof mounted solar panels on the processing buildings will reduce reliance on non-renewable energy sources. The development will contribute to a cumulative increase in the waste recycling and recovery capacity in the Greater Dublin Area.

13.11 Residual Impacts

There will be a demand on the national electricity grid, but this will be somewhat off-set by the electricity generated in by the solar panels. In relation to the regional waste management capacity and circular economy initiatives the development will have a positive, moderate, likely, national and long term impact.

13.11.1 Summary of Residual Impacts

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration
Construction Stage					
Waste Management	Negative	Not Significant	Subject site	Likely	Temporary
Operational Stage					
Resource Consumption:	Negative	Not Significant	National	Likely	Long Term
Waste Management	Positive	Moderate	Greater Dublin Area	Likely	Long Term

14. MATERIAL ASSETS: TRAFFIC AND TRANSPORT

14.1 Introduction

This Chapter describes the existing road network and traffic conditions and the impacts of the proposed development, including a 'baseline' scenario. It identifies the prevention, mitigation and monitoring measures that will be implemented to reduce the significance of the impacts and assesses the residual impacts.

This Chapter was prepared by Mr Julian Keenan BEng (Hons) of Trafficwise Ltd and is based on the Traffic and Transport Assessment completed by Trafficwise Ltd, which has been submitted separately with the planning application and should be referred to for the supporting data.

Mr Keenan is a director of Trafficwise Limited and is a member of the Institution of Engineers of Ireland and a member of the Chartered Institution of Highways and Transportation. He has over 30 years engineering experience and has specialised in roads design and traffic and transportation planning for approximately 25 years.

Mr Keenan is familiar with the receiving road network generally comprising the 'Dublin Enterprise Zone' and has previously carried out various traffic studies in the vicinity of the application site in the past including:

- Planning Reg. Ref. FW13A/0089: Applicant Stream Bio Energy. Planning permission for the construction of a Renewable Bioenergy Plant to generate up to 3.8MW of electricity from 90,000 tonnes of non-hazardous biodegradable waste per annum utilising Anaerobic Digestion technology on a 2.38 hectares site within Roadstone Wood's Huntstown Quarry, Huntstown, North Road, Finglas, Dublin 11.

- Planning Reg. Ref. FW18A/0159: Applicant Veridian Renewables. Planning Permission is sought for an increase in the annual volume of waste to be imported to the permitted bioenergy plant at Huntstown, North Road, Finglas, Dublin 11. The proposed increase is 9,900 tonnes, which would take the permitted volume from 90,000 tonnes to 99,900 tonnes.

- Planning Reg. Ref. FW18A/0087: Applicant Kilsaran Concrete. Development consists of the expansion of the existing Concrete Batching Plant Facility within the northern portion of the site and construction of a 2 storey Building for Office / Logistics / Training / Staff Welfare uses and associated facilities within the south-western portion of the site.

- Planning Reg. Ref. F02A/1474: Applicant Greenstar Holdings. Phased development of a proposed Waste Materials Recovery Facility and Biowaste Treatment facility at Millennium Business Park, Cappagh Road, Ballycoolin.

- Planning Reg. Ref. FW20A/0122: Applicant Padraig Thornton Waste Disposal Limited. Permission for development an existing C&D waste facility.

14.2 Relevant Legislation & Guidance

In addition to the guidance documents referenced in Section 1.5 of the EIAR the following legislation and guidance were taken into consideration.

- The requirements of EU Directives and national legislation (primary and secondary) concerning Environmental Impact Assessment (especially having due regard to the revised provisions of Directive 2014/52/EU);
- EPA (2002) Guidelines on the Information to be Contained in Environmental Impact Statements;
- EPA (2003) Advice Notes on Current Practice in the Preparation of Environmental Impact Statements;
- EPA (September 2015) Advice Notes for Preparing Strategic Environmental Assessments;
- EPA (August 2017) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- DHPCLG (15/05/17) 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): Advice on Administrative Provisions in Advance of Transposition;
- DHPCLG (May 2017) Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licencing Systems: Key Issues Consultation Paper;
- Fingal County Development Plan 2023-2029;
- Department of Transport, Tourism and Sport (2019) 'Traffic Signs Manual';
- Transport Infrastructure Ireland (TII) (2014) PE-PDV-02045 'Traffic and Transport Assessment Guidelines', referred to hereafter as the TTA Guidelines;
- TII (2016) PE-PAG-02039 Project Appraisal Guidelines for National Roads 'Unit 16.1 – Expansion Factors for Short Period Traffic Counts';
- TII (2021) PE_PE-PAG-02017 Project Appraisal Guidelines for National Roads 'Unit 5.3 – Travel Demand Projections';
- TII (2016) PE_PE-PAG-02016 Project Appraisal Guidelines for National Roads 'Unit 5.2 – Data Collection';
- TII (2017) 'Rural Road Link Design' DN-GEO-03031 and
- TII (2017) 'Geometric Design of Junctions' (priority junctions, direct accesses, roundabouts, grade separated and compact grade separated junctions) DN-GEO-03060-02; and

14.3 Methodology

The general methodology was discussed and agreed as appropriate at a pre-planning scoping meeting with the Local Authority Roads Department. This Chapter is structured generally in accordance with the Chartered Institution of Highways & Transportation (CIHT) document *'Guidelines for Traffic Impact Assessment'* (September 1994) and the TII Publication PE-PDVp02045 *'Traffic and Transport Assessment Guidelines'* (2014).

This Chapter describes the receiving roads environment and reports upon past, present and forecast future traffic conditions arising at the site and on the receiving road network. The quantum of traffic generated by the development has been reviewed together with traffic survey data which provides a frame of reference with respect to present, baseline and future forecast traffic flows on the receiving road network.

Under the current proposal vehicles transporting materials to and from the site will principally use North Road (Former N2 National Primary Road) connecting with N2/M2 and to Ballycoolin, St. Margaret's and north via R135 North Road.

The comprehensive appraisal of the existing receiving road network in this EIAR is intended as a desktop aid to the Planning Authority in assessing the receiving roads environment. It is important to note that the current proposal relies on the existing haul routes serving the South-eastern portion of the Dublin Enterprise Zone and benefits from the new road infrastructure intersecting R135 North Road. In general, practically all roads in the receiving area can be observed to carry HGV traffic during traffic surveys in 2022.

The assessment was completed in accordance with Transport Infrastructure Irelands' Traffic and Transport Assessment Guidelines PE-PDV-02045 (May 2014). Information from the Fingal County Council Development Plan 2023-2029 was used to describe the development location and its local context in relation to transportation objectives. The general methodology adopted for the assessment was as follows:

- Traffic data – 12-hour classified vehicular traffic count surveys were undertaken on Thurs 08-Sept-2022 by Traffinomics Transportation Surveys. The surveys cover 07:00 and 19:00hrs at 6 locations on North Road.

- Trip Generation – A development trip generation assessment was carried out using the comparison method, which is underpinned by surveys and weighbridge analysis for similar land-uses to determine the potential vehicular and person trips to and from the proposed development.

- Trip Distribution – Based upon existing traffic characteristics on the surrounding road network an appropriate distribution was assigned to the proposed development vehicular trips across the road network.

- Future Road Network Assessments – Future year traffic forecasts were derived from the application of TII PAG growth factors to baseline survey data. Traffic generation arising from permitted development was included in the future year road network assessments. The assessment included forecast development trip generation and separately considered the potential traffic generation arising from the development of zone masterplan lands. Traffic flows and thus impact upon the performance of the receiving road network were modelled for the proposed year of opening, 5 years after opening and 15 years after opening. Assessments

were undertaken both with and without the proposed development to assess the incremental impact arising directly form the construction and operation of the proposed development.

- Parking – Car parking and bicycle parking provision within the proposed development were assessed with reference to demand.

- Mobility Management – The availability of sustainable transport options in the vicinity of the development site assessed and mobility measures, by which the proposed development may reduce the rate of private car use by employees and visitors, were identified.

14.3.1 Consultation

Based on consultation with Fingal County Council the scope of the key transportation aspects addressed included the requirement for pedestrian and cycle accessibility, service arrangements, emergency vehicle access, public transport accessibility and internal car park design parameters. The key matters were:

- Design of car parks and service roads in accordance with relevant standards;

- Access to North Road to accommodate pedestrian/cycles;

- No parking provision along internal service roads;

- Overall car and cycle parking provision to be commensurate with use;

- Consider Pedestrian/Cycle connectivity to public transport facilities;

- The methodology adopted in preparing the TTA should accord with Transport Infrastructure Ireland (TII) Publication TII-PE-PDV-02045 'Traffic and Transport Assessment Guidelines' and to have regard to the Chartered Institution of Highways & Transportation (IHT) 'Traffic Impact Assessment Guidelines';

- Traffic surveys and junction assessments include;

  - Site 1: North Road - Huntstown Quarry Access,

  - Site 2: Coldwinters N2 Northbound Off-Slip,

  - Site 3: Dublin Airport Logistics Park Roundabout (N2 On-Slip),

  - Site 4: N2 Southbound On-Slip North Road Traffic Signals,

  - Site 5: North Road – Kilshane Cross Traffic Signals,

  - Site 6: Ward Cross Roundabout, and

  - Site 7: ESB Service Road (future North Rd./Cappagh Rd. Link)

- Future year roads network capacity assessment scenarios to include;
  - Opening Year
  -
  - Opening Year +5 years
  -
  - Opening Year +15 years

14.4 Development Description

Chapter 3 presents a detailed description of the proposed development and those aspects that are relevant to the Traffic Impact Assessment are discussed in this section. The development is Phase 1 of the 'Huntstown Circular Economy Hub'. The Hub will be developed in phases or stages, with Phase 1 comprising a MRF and FCCP on a plot in the west of the overall landholding.

The MRF will be used to sort municipal solid waste (MSW), source segregated and mixed dry recyclables and construction and demolition wastes into recoverable and recyclable streams. In addition brown bin waste will be accepted, bulked up and transferred to biological treatment plants. Subsequent stages of the Hub will include recycling facilities that will process the recyclables separated in Phase 1 into materials that meet end of waste criteria. The proposed FCCP Plant will provide a centralised tray washing/sterilisation facility for large food retailers in the Greater Dublin Area to facilitate the multiple use of these trays. The combined annual materials intake to Phase 1 will be 95,000 tonnes.

The development will be accessed via the existing direct vehicle access junction from North Road that currently serves the Finglas 220kV Substation. It is an objective of the Fingal Development Plan 2023-2029 to connect this service road to the Cappagh Road at Cappogue. The future connecting road will function as a local distributor road and will serve to provide access to zoned lands including the development site.

It is proposed that the direct access to the ESB service road will make provision for a right turning lane. The turning lane is not required in the short term, but was provided in anticipation of the realisation of the connecting local access and distributor road between North Road and Cappagh Road. A right turn lane is proposed at the direct development access to preserve the future carrying capacity of the link road. No modifications are proposed at the T-junction on North Road to the east of the site.

The proposed development access junction was designed in accordance with Transport Infrastructure Ireland's Design Geometry publications formerly the National Roads Authority's Design Manual for Roads and Bridges. The proposed road design and road improvement works to provide the right turn lane on the North Road Cappagh Road future link road were the subject of an independent Road Safety Audit (Stage 1) prepared by Traffico Road Safety Engineering Consultants in March 2023. A copy of the Road Safety Audit (RSA) including Designer Feedback Form is included in the TTA at Appendix C.

In accordance with Table 1.2 of TII-DN-GEO-03031 the Design Speed for the proposed North Road Cappagh Road link and thus the design of the development access is 60km/h, which is the Design Speed consistent with a speed limit of 50km/h which applies on both North Road and Cappagh Road and is reasonably expected to apply to the new link road when constructed.

The proposed horizontal alignment of the link road is unchanged from existing. The access junction serving the proposed development from the North Road Cappagh Road Link Road must accommodate all turning movements. The layout of the turning radii appropriately accords with TII-DN-GEO-03060

Section 5.6.5 and incorporates a compound radius curve as per DN-GEO-03060 Appendix C, Figure C.1, 'Design of Compound Curve'.

TII-DN-GEO-03060 Section 4.3. sets out that the use of computer software to predict the swept path of large vehicles is mandatory in the design of all junction types accordingly the junction has been assessed using AutoDesk Tracking for the vehicle type used in the haulage of materials. The same checking of swept paths was completed for the internal junctions, weighbridge bypass lanes and service yards within the development.

The drawings accompanying the planning submission include vehicle track assessments using a design vehicle with the specification, dimensions and steering characteristics of articulated tipper vehicles that will be used to service the proposed development. The assessments confirm that the junction and internal geometry can accommodate articulated heavy goods vehicles (HGV).

14.4.1 DMURS Guidance

The Design Manual for Urban Roads and Streets (DMURS) provides a set of principles, approaches and standards necessary to achieve best practice in urban areas which includes cities, towns and villages. Local Authorities are required to facilitate implementation of the principles set out in the manual in carrying out their development and planning functions under the Planning Code.

The principles, approaches and standards set out in the DMURS apply to the design of all urban roads and streets which are defined as those roads and streets in cities, in towns and in villages subject to a speed limit of 60km/h or less. The subject site connects to existing roads infrastructure subject to 50km/h locally accordingly from the perspective of roads design and the provision of visibility sightlines at and within the proposed development, the receiving road locally comes under that category of road where the principles of the DMURS apply.

In relation to 'Place' and 'Context ' DMURS acknowledges that the place status varies from high in urban centres, lowering in proportion to distance decreasing to Neighbourhood, Suburb and Business Park/Industrial Areas. Business Park/Industrial Areas are the lowest order of place next to the rural fringe. DMURS advises that designers must consider the context of a street or street network noting the greater need for connectivity, and integration and ease of movement for vulnerable road users where the 'place' value is high, such as in urban centres.

DMURS acknowledges the challenges presented by industrial estates and business parks stating the following:

"Business Parks / Industrial Estates are areas that are primarily focused on (and often purpose built for) providing areas of commercial and industrial activity outside of Centres. Streets within these areas generally have a low place status as buildings have little street presence and they are largely devoid of pedestrian activity. Many of these areas are in a state of transition toward more intensive commercial and residential uses replacing older industrial ones. As this transition occurs, the status of these places will rise. Place status in existing campus style Business Parks also tends to be higher and pedestrians can be highly active in these areas during business hours.

Managing transitions within Business Parks/Industrial Estates presents a series of challenges to designers. As development within these areas intensifies, designers are encouraged to move toward standards that are better suited to densely populated urban areas (i.e. Centres and/or Neighbourhoods). However, the implementation of standards which seek to slow vehicular movement and increase pedestrian mobility (such as narrower carriageways or tighter corner radii), may be more difficult to implement due to the manoeuvrability requirements of larger vehicles. Under such

circumstances designers may consider additional mitigation measures (as further detailed in Chapters 4 and 5)."

The Fingal County Development Plan sets out future plans for the ESB service road to become a local distributor road or spine road generally running parallel to the M50 through zoned lands connecting between North Road in the east and Cappagh Road in the west. The existing service road is single carriageway and has a cross-section in the order of approximately 7.5m carriageway with generous adjoining verges on both sides but with no adjoining footways or cycleways.

No cycleways are provided on the existing service road or on the greater local road network serving the area. In the interest of a consistent layout it is proposed that in developing the access to the site the existing service road will be improved with the addition of cycleways and footways on both sides reflecting the same configuration as that of the Cappagh Road to which it will connect and that of the greater road infrastructure serving the Dublin Enterprise Zone.

DMURS advises that in circumstances where there are regular turning movements by articulated vehicles corner radii may be increased to 9.0m and examples Industrial Estates. The primary internal junctions with the development spine road will be required to accommodate frequent access by articulated vehicles and have corner radii of 9.0m.

The spine road within the proposed development is provided with 2.0m verge and a minimum of 3.0m shared footway/cycleway accordingly internal junction visibility splays are generous. All visibility splays will be maintained clear of obstructions, however, objects that would not be large enough to wholly obscure a vehicle, pedestrian or cyclist are acceptable providing their impact on the overall visibility envelope is not significant. Landscaping along the internal roads is mindful of the cumulative effect of street trees within the verge area.

The internal road network of the proposed development will generally be subject to 30 km/h speed limit. The minor roads connecting to the individual units and service yards are intended to support a lower speed environment in accordance with the general principles of DMURS. Dedicated cycle lanes are not proposed within the site since demand is likely to be low, pedestrian and cyclist volumes will be low and traffic volumes will similarly be low which should contribute toward a safe environment in which to share footway space.

The proposed development area will provide for an appropriate speed environment. In accordance with DMURS Table 4.1 all internal roads are designed to a maximum Design Speed of 50kph, while the minor roads serving the local needs of the industrial units will be subject to a 30kph speed limit designed to be self-enforcing through the principles of DMURS and the inclusion of signage and road markings.

The road network for the proposed development will provide safe and appropriate conditions for pedestrians and cyclists. This should encourage, insofar as practicable, a modal shift in favour of cycling and walking over use of private motor vehicles especially for those living and employed locally. Given the frequency of commercial vehicle access it is not intended that raised thresholds/crossings will be provided. Pedestrian crossings in the form of dropped kerbs incorporating tactile paving are designed and located so as to accommodate the expected pedestrian desire lines. Dropped crossings will be provided to accommodate pedestrians crossing at all internal junctions with the internal spine road.

14.4.2 Forecast Traffic Generation – Proposed Phase 1

In the context of estimating the trip attraction the 'Comparison' method involves comparing the proposed development with a similar existing development and applying survey information from that

site to the proposed development. This method can often be cross referred to a trip attraction database such as TRICS which often provides a larger number of sample sites.

In the case of the proposed development there are no relevant survey sites in the TRICS database so the trip attraction model is based upon detailed examination of a large sample of traffic data for a similar facility located in Greenogue Business Park situated in Rathcoole, County. Dublin. Greenogue Business Parks comprises a mix of industrial, warehousing and manufacturing facilities, with primary access to the business park from Regional Road R120 which runs from Rathcoole and N7 Junction 4 south of Greenogue northwest to Newcastle.

At the time of examination the rate of acceptance of waste materials permitted at the Comparison Site under Planning Reg. Ref. SD03A/0607 was 95,000 tonnes per annum. The generation of HGV and the volume of product transported by each vehicle entering and leaving the site is not only product dependent but is commercially driven. Waste is delivered in a variety of vehicles in correspondingly varied quantities.

Vehicle types chiefly include roll-on-roll-off containers ranging in capacity from 15 to 35m^3 together with small and standard skip lorries. Waste is delivered in the quantity prescribed by the various sources. There are sources which by their nature may require many loads and logistical efficiency is typically the objective in those cases. Such efficiency is achieved by ensuring that in the case of multiple loads as many as practicable are full loads. Equally there are smaller deliveries arising from specific demands relating to finite activities on larger sites or simply arising from smaller jobs or one-off loads such as house extensions and the like.

To assess the traffic generation characteristics of the Comparison Site, weighbridge records for the site were analysed, chiefly recording the mass of waste entering the site and mass of processed wastes leaving the site. The weighbridge data analysis period extends for the 12-month period from 01-Jun-2017 to 31-May-2018. Based upon an assessment of weighbridge data the haulage of waste to and from the site does not typically occur all in full loads. Over the course of the 12-month period of analysis the average payload of vehicles entering the site with waste was recorded as 2.39 tonnes while the average payload of outbound vehicles carrying processed waste was 20.14 tonnes.

The Comparison Site was used to derive various statistics such as seasonal, weekly, daily and hourly profiles for vehicles arriving and departing the site and these are set out in detail in Section 5 of the TTA.

The Comparison Site is considered likely to be a suitable model in terms of traffic generation to the MRF element of the proposed development. The FCCP will provide a centralised washing/sterilisation facility for large food retailers in the Greater Dublin Area and will operate on similar principles. There are no traffic generation data bases for such a facility however based on the processes involved it is considered likely that the FCCP will generate less HGV traffic than a traditional MRF.

The proposed development is for a combined import to Phase 1 of 95,000 tonnes per annum as per the Comparison Site. In this assessment the HGV traffic generation associated with Phase 1 is modelled on the Comparison Site and is assumed to have similar traffic generation characteristics.

Given that the FCCP is likely to be a lesser generator of traffic than a traditional MRF, modelling the whole as an MRF is considered robust. On this basis the proposed development site assessment HGV daily traffic generation rate adopted in this study comprises 72 no. HGV importing materials and 8 no. HGV exporting. Table 14.1 summaries the forecast daily traffic generation of the development.

Table 14.1 Forecast Daily Traffic Generation

Time Period	**Proposed Units Operating at 95,000t/a Combined** (2 x 5,032m^2)				
	Light Vehicles		Goods Vehicles		
	Arrive No.	Depart No.	Import Rigid (No.)	Export Artic (No.)	Combined Two-way Flow
07:00-08:00	5	0	2	1	6
08:00-09:00	6	1	4	1	8
09:00-10:00	2	2	8	1	17
10:00-11:00	4	2	8	1	17
11:00-12:00	4	4	9	1	20
12:00-13:00	3	5	6	1	13
13:00-14:00	7	3	5	1	11
14:00-15:00	2	4	8	1	19
15:00-16:00	3	4	9	1	20
16:00-17:00	2	9	7	1	14
17:00-18:00	1	6	10	1	20
Daily	**37**	**37**	**72**	**9**	**162**

The distribution of development traffic to the receiving road network both in the short-term, when access is exclusively via North Road, and in the long term via the link road joining North Road and Cappagh Road, is set out in the Appendix C of the TTA, which provides detailed network traffic flow diagrams.

14.4.3 Forecast Traffic Generation – Masterplan

In considering the overall development of the site this assessment includes for the forecast traffic generation of the masterplan development. Since the masterplan envisages related circular economy type development it is assumed for the purposes of the assessment that typical MRF operation would likely be the most intensive traffic generator of that genre of operation.

In the interest of simplicity and based upon approximate floor areas the forecast traffic generation of the masterplan lands, in concert with the Phase 1 lands, is estimated to be twice that of Phase 1 taken in isolation. On the basis of 144 no. HGV importing waste and 18 no. HGV exporting waste daily, the peak hour assessment value is 17 no. HGV trips arising from waste receipts and 2 no. HGV trips from waste exportation giving a total peak hour traffic generation rate of 19 no. HGV trips per hour.

14.4.4 Committed Development Traffic

The assessments of traffic impact includes for development and traffic increases associated with economic development and this is done by the application of published network traffic growth rates. This assessment also makes allowance for the traffic generated by local third party committed developments (under construction but not occupied) that have the potential to generate additional vehicle movements in the study area over and above those movements recorded in the September 2022 traffic surveys.

There are a number of developments that can be considered committed development at the time of the base traffic surveys. There have also been developments that have received planning permission but have yet to be commenced. Traffic generated by the following developments has been included in the assessment of network traffic impact arising. The traffic generation characteristics of the following developments were considered where the traffic details of traffic generation have been determined from review of the respective traffic assessments accompanying those applications:

- Planning Reg. Ref. F16A/0128: Rohan Holdings Ltd. Dublin Airport Logistics Park, St. Margaret's Road, St. Margaret's, Co. Dublin. Four single storey units for industrial and/or warehouse use with ancillary two storey office with a gross floor area of 15,692 square metres. This development was completed at the time of the traffic surveys.

- Planning Reg. Ref. F17A/0769: Coldwinters Devco Ltd. Coldwinters, St. Margaret's, Co. Dublin. Development will consist of the construction of two single story units for industrial and/or warehousing use with ancillary two storey offices with a gross floor area of 9,422sq.m.

- Planning Reg. Ref. SID/02/18: Irish Water. Newtown, North Road (R135), Dublin 1. Provision of 2no. biosolids storage buildings, each approximately 50m wide, 105m long and 15m in height, including solar panels on the roof of one building.

- Planning Reg. Ref. FW20A/0211: Coldwinters Devco Ltd. Lands between the N2 and R135 (north of the N2-R135 link road), at Coldwinters, St. Margaret's, Co. Dublin. The development will consist of 3 no. buildings for industrial/warehouse/logistics use (Units 3, 4 and 5) with gross floor area of 24,356q.m.

- Planning Reg. Ref. FW22A/0068: Abbey Issuer DAC Lands between the N2 and R135 (north of the N2-R135 link road), at Coldwinters, St. Margaret's, Co. Dublin. The development will consist of 1 no. building for warehouse/logistics use, to be known as Unit 6, with a gross floor area of 9,821 sq.m. This development is part of a phased development which includes Planning Reg. Ref. FW20A/0211.

- Planning Reg. Ref. FW20A/0126: IPUT Newtown, Kilshane Cross, Co Dublin. The development will comprise the provision of 4 No. warehouses with marshalling offices, ancillary office space, staff facilities and associated development.

- Planning Reg. Ref. FW21A/0144: TLI Group. Permission has been sought for the installation of two underground cable circuits of approximately 1.2km length (110kV) and one circuit 1.2km length (38kV) and associated underground ducting, joint bays and associated infrastructure between the existing ESB Finglas substation and Huntstown Power Station.

- Planning Reg. Ref. FW21A/0151: Huntstown Power Company Limited, permission for the development of 2 no. data hall buildings and ancillary structures on a site located east of the existing Huntstown Power Station.

Figure 14.1 shows the location of the various developments for which forecast peak hour traffic generations have been derived from their respective planning application submissions. The forecast peak hour traffic arising from these developments is distributed to the existing road network in accordance with the regime set out in their respective traffic assessment reports.

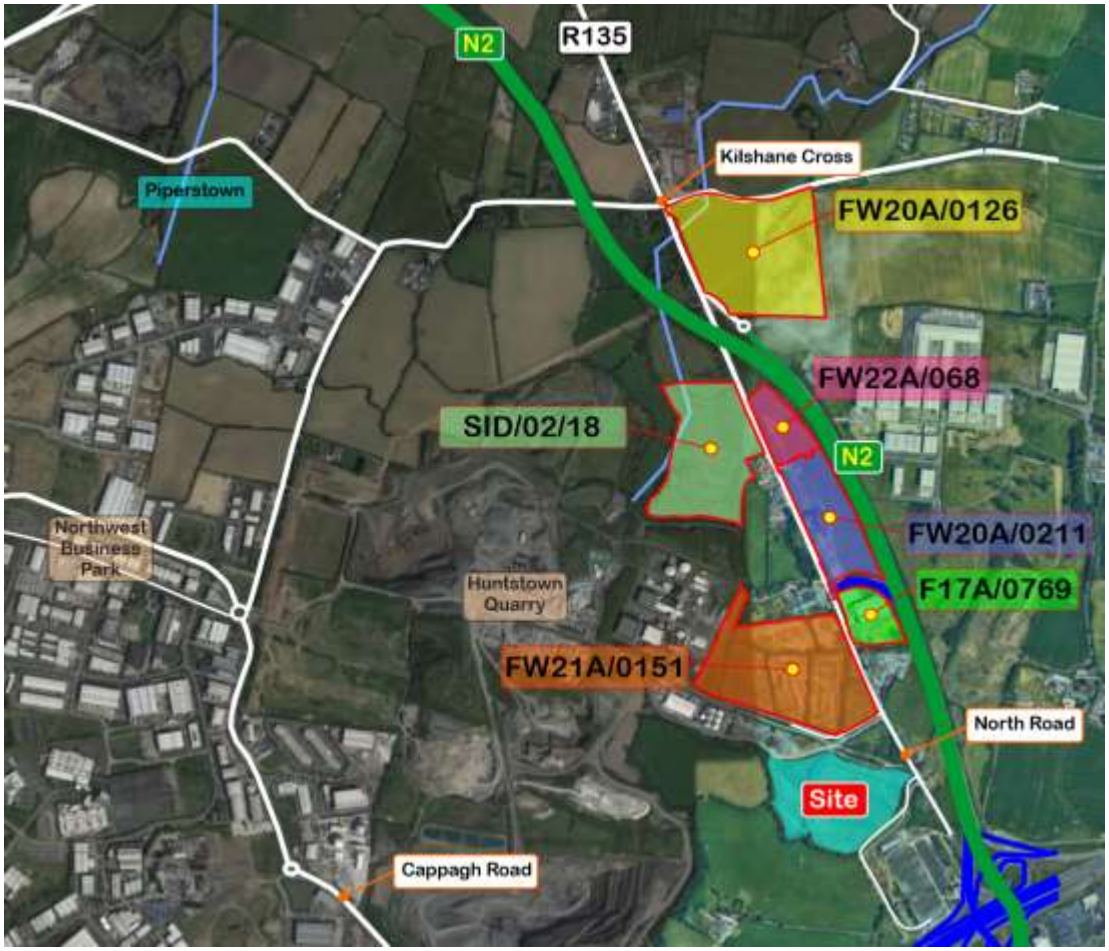


Figure 14-1: Committed Development

14.5 Receiving Environment

14.5.1 Existing Receiving Roads Environment

The site is currently a greenfield site with no direct vehicle access to the public road network. The landownership within which the site is located is identified in Figure 14-2. Located to the east of North Road the site is bounded to the north by Huntstown Quarry, to the west by open fields and to the south by an existing service road to Finglas 220kv Substation (ESB).

The Huntstown Quarry lands to the north of the development site currently accommodate Huntstown Power Station, the Huntstown Bioenergy Plant and a quarry together with ancillary manufacturing. On site quarry operations include the extraction and processing of aggregates together with the manufacturing of concrete blocks, readymade concrete and asphalt products.

The primary access to greater Huntstown Quarry site is provided from North Road (permitted under planning register reference F06A/0164). The internal access road from North Road into the quarry is shared by quarry traffic and traffic arising from the power station and the bioenergy plant.

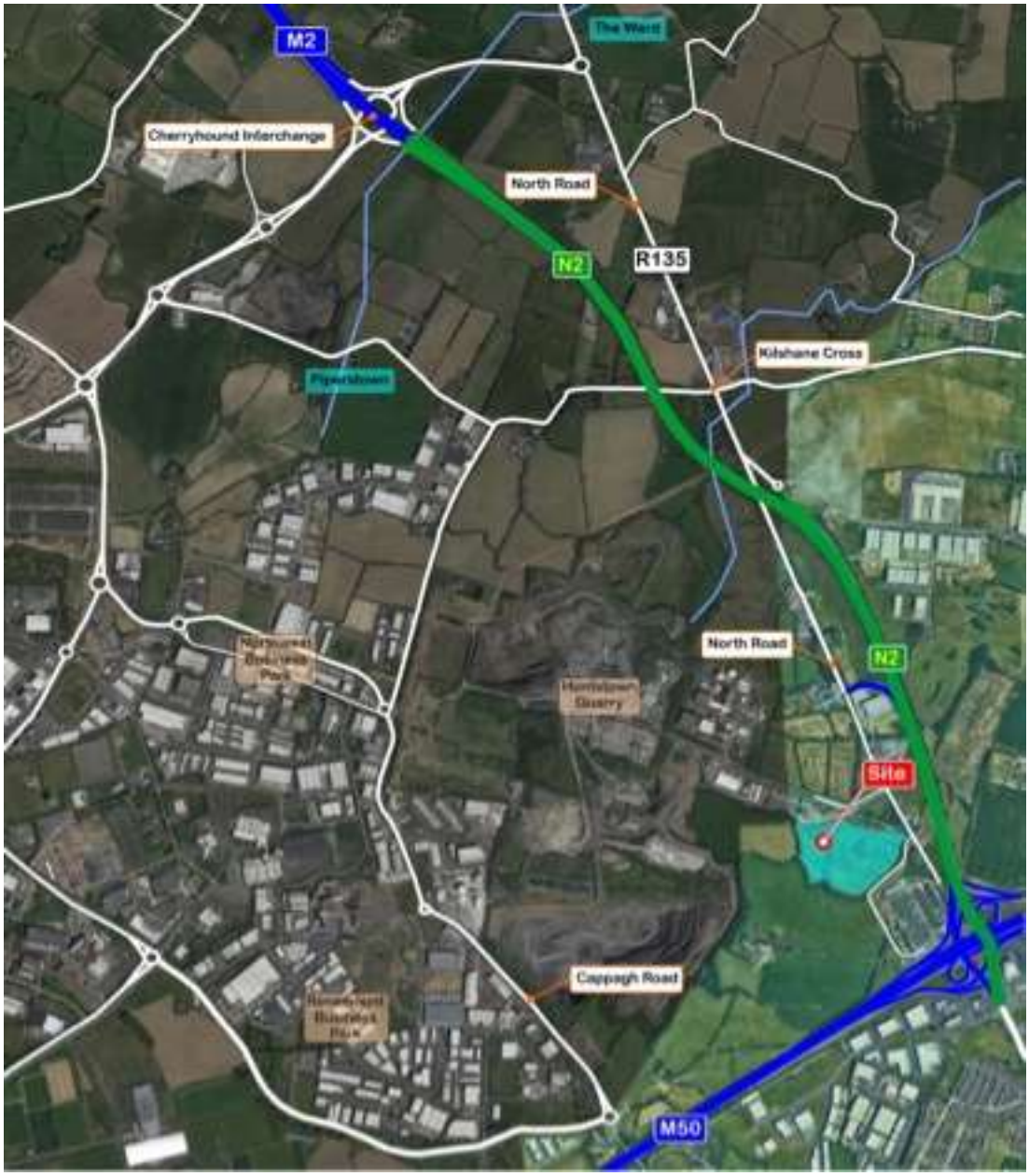


Figure 14-2: Site Location and Receiving Road Network

14.5.2 Receiving Road

North Road was formerly the N2 and had been directly connected to the M50 north of Finglas. The upgraded N2 and M2 road scheme bypasses the former N2 at its southern end and thus that section has become a cul-de-sac for vehicular traffic.

There is a cycle and footbridge crossing at the southern end of North Road which partially overflies the northern connecting arms of M50 Junction 5. A footway and adjoining cycleway continue through the interchange and south into Finglas along the N2.

In the vicinity of the Coldwinters cul-de-sac North Road is subject to a 50kph speed limit which is in effect to a point approximately 100m north of the Coldwinters off-slip junction. Thereafter North Road is subject to a 60km/h speed limit northward as far as the 'Brock Inn Roundabout' near 'The Ward'.

The visibility envelope at the existing ESB service road junction is measured to be in excess of 120m ('y' distance along carriageway) from a set-back or 'x' distance of 3.0m. This is the level of visibility provision required in Transport Infrastructure Ireland (TII) publication DN-GEO-0360 and corresponds to a Design Speed of 70kph (two design steps above speed limit of 50km/h). A Design Speed of 50km/h requires a sightline in the order of 70m and for 60km/h the distance is 90m.

The existing road infrastructure in the vicinity of the site is of a reasonably high quality. North Road is a single mainline carriageway of 7.0m width adjoined by a 2.0m wide footway on the eastern side. North Road has a relatively straight and flat alignment between the Coldwinters cul-de-sac and as far as the Brock Inn Roundabout approximately 3km to the north.

The road pavement in the vicinity of the ESB service road junction is in good condition. Until the opening of the N2/M2 scheme North Road accommodated an Annual Average Daily Traffic (AADT) Flow of approximately 20,000 vehicles of which 15% or 3,000 were HGV so it is expected that the underlying structure of North Road is satisfactory to accommodate development generated HGV traffic.

14.5.3 Accessibility

The centre of the site is located approximately 500m northwest of the M50/N2 interchange and is provided with excellent accessibility to both of these strategic roads. Traffic coming to the site from the M50 must travel a short distance (900m) northbound along the N2 before taking the Coldwinters off-slip exit. This slip road from the N2 forms a priority T-junction with the North Road approximately 400m to the north of the existing entrance to the Huntstown Quarry lands. The junction of the existing service road with North Road is approximately 230m further south of the Huntstown Quarry access.

Traffic coming to the site from the N2 north (travelling southbound) must exit the N2 at the Cherryhound Interchange (St. Margaret's/Blanchardstown Exit) and travel via the R135 link road to the roundabout at the Brock Inn. They must take the 3rd exit at the Brock Inn Roundabout and travel southwards along the R135 North Road for approximately 3km to access the ESB service road.

Southbound traffic leaving the site and travelling towards the M50 are provided with direct access onto the N2 via a slip road which is accessible at the North Road traffic signal junction located approximately 1.5km north of the existing North Road junction with the ESB service road.

Northbound traffic leaving the site along the N2 must travel along the North Road for approximately 3km and take the first exit at the Brock Inn Roundabout to access the N2 via the N2/N3 link road.

The development lands are proposed to be accessed from the existing service road that principally provides access to the ESB Finglas 220kV Station from North Road. The service road also provides access to agricultural lands and a farm house with a large farm yard and sheds located between M50 to the south, Huntstown Quarry to the north, Cappagh Road to the west and Finglas 220kV Station to the east. The service road intersects North Road at a simple priority junction located approximately 600m south of the Coldwinters N2 off-slip near the Dogs Trust property.

A footway generally measuring 1.5m in width is provided along the eastern side of the R135 North Road between the ESB service road junction and the Dogs Trust. A short section of footway continues on the western side of the road past the Dogs Trust. To the south of the ESB service road the footway continues along the eastern side of the road terminating approximately 40m short of the end of the pedestrian/cycle overbridge of the M50.

The closest bus stop to the application site is situated on North Road, immediately north of the Dogs Trust. The bus stop is Bus Eireann Stop 134451 (St. Margaret's, Kildonan) and serves northbound travellers. The closest southbound serviced bus stop is Stop 101121 (Suncourt) located between Kilshane Cross and the M50 overbridge of the N2. Both bus stops are serviced by Bus Eireann Routes 103 and 105X.

Route 103 (Dublin – Ashbourne – Ratoath – Tayto Park). The service from Ratoath to Dublin operates every day of the week, with drop-off-only approximately every 20 mins between 06:38hrs and 01:06hrs on weekdays. Service on Saturday is reduced to approximately half-hourly and on Sundays it is hourly. The service from Dublin is pick-up only. Route 105X (Fairyhouse Road – Ratoath – Dublin) runs three city-bound services in the morning stopping at Suncourt at 07:38, 07:53 and 08:08hrs. Three services to Fairyhouse Cross run in the evening stopping at Kildonan at 17:41, 17:57 and 18:27hrs.

There are no proposals in the Bus Connects Network to provide services along R135, with the existing and programmed services concentrated in the locality north of the M50 generally in the Ballycoolin area in the west, or the Airport in the east.

14.5.4 Future Roads Infrastructure Objectives

The Fingal Development Plan 2023-2029 Blanchardstown North Sheet No. 12 shows an indicative routing of the proposed Metro West rail line adjacent to the M50 northern boundary. A proposed metro stop will be located at Kildonan, which is proximate to the application site.

The proposed light rail scheme will link the principal towns/suburbs along the western fringes of Dublin (beyond the M50 Motorway) including Tallaght, Lucan and Blanchardstown to the proposed Metro North scheme, which will serve Dublin Airport and Swords.

The objectives of the Fingal Development Plan 2011-2017 that have been realised and that benefit the Huntstown area include the N2-N3 Link Road, which comprises high quality road sections from Tyrrelstown to Cherryhound and from Castaheany to Damastown. The link between Tyrrelstown and the Cherryhound Interchange began construction in September 2011 and was opened in May 2013 by the Minister for Transport who stated that "This road is more than just a link between two motorways and an alternative route to and from the airport. It's about providing vital infrastructure to encourage businesses to settle in the area, and take traffic and heavy vehicles away from other roads. The project also includes off-road bike lanes to encourage more people to cycle."

The objective of the Dublin Enterprise Zone is to encourage employment, with zones for science & technology developments, warehousing, light industrial and office accommodation. The N2-N3 Link Road and associated infrastructure has been designed to be future-proof, with essential infrastructure pre-installed under and alongside the road. The road commences at Church Road close to Tyrrelstown and joins the N2 at the Cherryhound interchange. Six roundabouts have been constructed along the route to link with existing local roads and provide access points to future development lands. The road ultimately links to the N3 at Damastown and connects with the N2 at Cherryhound Interchange.

Fingal County Council has future proposals to provide a western link from the Broghan Roundabout on the R135 (old N2) to Dublin Airport. This East West Link Road scheme is set as development Objective EA04 in the Dublin Airport Local Area Plan 2020. It is envisaged that existing traffic flows at the signal controlled Kilshane Cross on the R132 (North Road) will significantly reduce pending the construction of the airport link road scheme (principally due to re-distribution of traffic flow).

Recent improvements and upgrade of the Kilshane Crossroad junction were implemented as part of development carried out under Planning Reg. Ref. F18A/0146 (Killeen Properties). Improvements

include the provision of an additional lane on the eastern arm of the signal-controlled junction together with a left filter lane to North Road (south) and improvement in the provision for pedestrians and cyclists on the approaches to the junction and in the traffic signal operation.

It is understood that the junction of the N2 off-slip at Coldwinters with North Road is required to be upgraded to signal operation. In the grant of permission determined under Planning Reg. Ref. FW21A/0151 (Huntstown Power) Condition No.22 of the grant of permission for the development requires a special contribution in respect of upgrading the junction of R135 North Road with the northbound slip road from the N2 at Coldwinters.

From a review of that planning file it is understood that Fingal County Council has assessed the operation of the Huntstown Quarry access on North Road and has considered the possible future control of this junction be signals. It is understood that the objective of the change from priority control is in the interest of improved safety and controlling or reinforcing the priority of the major road over the access road.

The Greater Dublin Cycle Network Plan includes an objective to implement an Inter-urban cycle route (F9) along R135 North Road to Ashbourne. The route will be along the hard shoulders of R135 (formerly N2).

15.5.2 Existing Network Traffic Flows

Traffinomics Transportation Surveys Ltd. carried out classified turning count surveys on the public road network in the vicinity of the site using CCTV on Thurs 08-Sept-2022 between 07:00 and 19:00hrs at the junctions shown on Figure 15.3. A copy of the survey data is provided in Appendix A of the TTA in Appendix 15-1 of this EIAR. The traffic data collected in the turning count surveys is a snapshot of traffic volumes and characteristics on the local road network. Mid-week data was collected to reflect typical weekday traffic patterns and includes the commuter peak periods. The weekday commuter peak periods typically tend to have the heaviest hourly network flows.

Traffic data was collected for the junctions identified in Figure 15-3 where 'J' signifies a classified junction turning count and the number corresponds to the site-specific identifier in the base data provided in Appendix A of the TTA.

- Site 1: Huntstown Quarry Access – Priority Access T-junction
- Site 2: N2 Off-slip (Dogs Trust) – Priority T-junction
- Site 3: Dublin Airport Logistics Park – Roundabout
- Site 4: N2 Southbound On-slip – Traffic Signal Control T-junction
- Site 5: Kilshane Cross – Traffic Signal Control Crossroad
- Site 6: Brock Inn Roundabout
- Site 7: ESB Finglas 220kV Substation T-junction (Not counted)

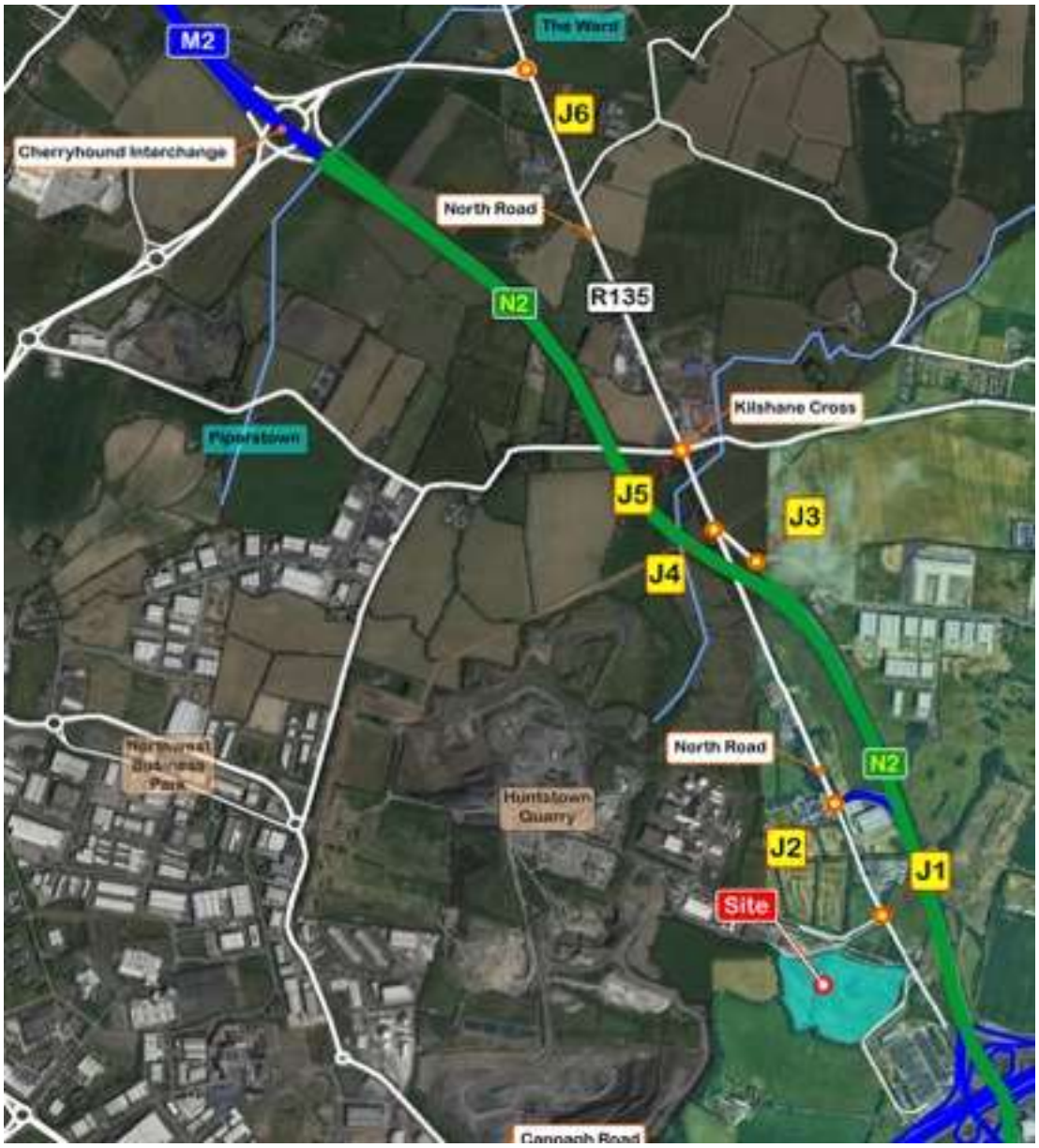


Figure 14-3: Local Road Network Traffic Survey Sites

Daily traffic flows recorded on the receiving road network over the course of the Thurs 08-Sept-2022 surveys are shown in the TTA at Appendix B, Figure 1 'Surveyed Daily Traffic Flows 07:00-19:00hrs', which presents the traffic flow data in network flow diagram format. Each of the numbered Link Roads is identified in TTA Appendix B, Figure 1.

Table 14.2 provides a summary of the recorded traffic flows at Survey Sites 1 through Site 7 over the course of the survey, with the recorded traffic flow and percentage HGV content enumerated between 07:00 and 19:00hrs. Based upon TII Publication PE-PAG-02039 (Oct 2016) Project Appraisal Guidelines Unit 16.1 'Expansion Factors for Short Period Traffic Counts' Table 15.2 also shows an estimate of Annual Average Daily Traffic. The underlying calculation in the derivation of AADT is set out in Section 3.3 of the TTA.

Table 14.2 Surveyed Daily Network Traffic Flows

Road Link		Daily Traffic Flows 07:00-19:00hrs			
		Total	Heavy	%HGV	AADT
1	North Road (South of ESB)	282	52	18%	300
2	North Road (South of Huntstown Quarry)	292	59	20%	311
3	North Road (North of Huntstown Quarry)	2,610	1517	58%	2,777
4	N2 Coldwinters Off-slip	4,590	1538	34%	4,883
5	R135 North Road (Between N2 on/Off Slips)	5,743	2055	36%	6,110
6	N2 Southbound On-slip Link Road	7,248	1804	25%	7,711
7	N2 Southbound On-slip	5,207	1504	29%	5,539
8	R135 North Road (South of Kilshane Cross)	7,657	2023	26%	8,146
9	L3120	5,860	1222	21%	6,234
10	L3125	8,753	1459	17%	9,312
11	R135 North Road (North of Kilshane Cross)	5,165	1041	20%	5,495
12	Blanchardstown (N2/N3) Link Road	5,562	1089	20%	5,917
13	R135 Wards Cross	5,493	800	15%	5,844

In the interest of clarity, Figure 14-4 shows the numbered Links referred to in the Tables which corresponds with the convention applied in the TTA report.

It is best practice in preparing traffic assessments to evaluate the impact of the proposed development during periods when the effects of development generated traffic flows on the receiving road network are likely to be greatest.

The peak hours and associated traffic flows recorded in the Sept-2022 surveys are as follows: Weekday AM Network Peak Hour 08:00-09:00hrs and Weekday PM Network Peak Hour 16:00-17:00hrs. Table 14.3 provides a summary of the recorded two-way peak hour traffic flows on the receiving road network.

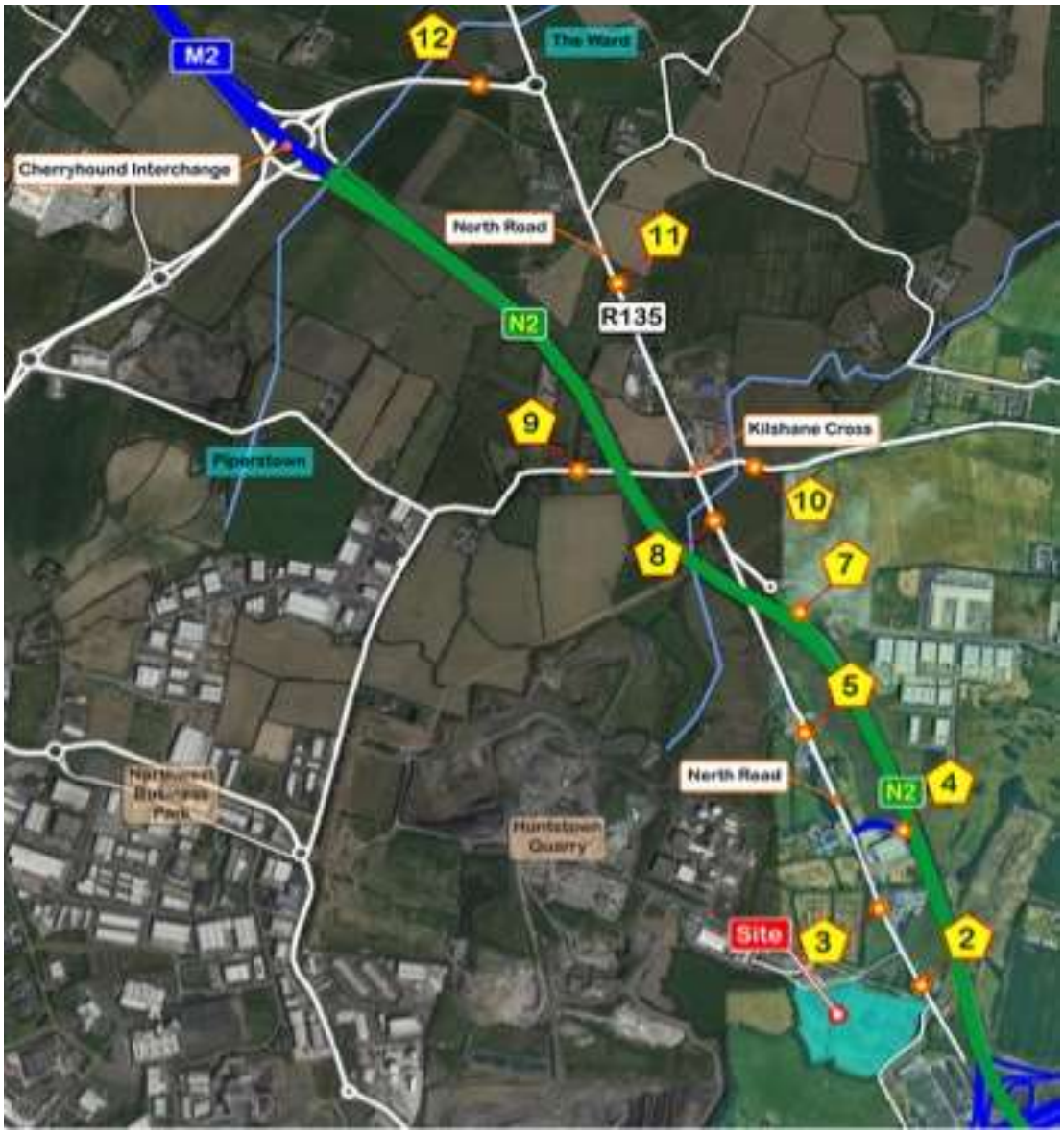


Figure 14-4: Local Road Network Numbered Links

Table 14.3 Surveyed Peak Hour Network Traffic Flows

Road Link		AM Peak Hour Traffic Flows			PM Peak Hour Traffic Flows		
		Total	HGV	%HGV	Total	HGV	%HGV
1	North Road (South of ESB)	25	8	32%	15	1	7%
2	North Road (South of Huntstown Quarry)	26	9	35%	15	1	7%
3	North Road (North of Huntstown Quarry)	246	159	65%	203	51	25%
4	N2 Coldwinters Off-slip	476	106	22%	326	115	35%
5	R135 North Road (Between N2 on/Off Slips)	548	154	28%	502	121	24%
6	N2 Southbound On-slip Link Road	687	159	23%	693	111	16%

7	N2 Southbound On-slip	457	153	33%	608	75	12%
8	R135 North Road (South of Kilshane Cross)	726	184	25%	706	116	16%
9	L3120	517	101	20%	661	88	13%
10	L3125	1054	150	14%	871	93	11%
11	R135 North Road (North of Kilshane Cross)	500	97	19%	541	63	12%
12	Blanchardstown (N2/N3) Link Road	525	89	17%	593	77	13%
13	R135 Wards Cross	471	72	15%	600	54	9%

Corresponding network flow diagrams of the recorded peak hour traffic flows are provided in network flow diagram format in TTA Appendix B, Figure 2 'Surveyed Morning Peak Hour Traffic Flows 08:00-09:00hrs' and Appendix B, Figure 3 'Surveyed Evening Peak Hour Traffic Flows 16:00-17:00hrs'.

In the interest of showing the general pattern of traffic flow on the receiving road network the TTA Figure 3.3 through Figure 3.12 show graphically the daily profile of two-way traffic flows recorded on the link roads covered by the scope of the traffic surveys. The various 'Links' correspond to those set out in Figure 14-3 and correspond with the junction and link numbering regime used in the various network flow diagrams included in TTA Appendix B.

Impacts Operational Stage

14.5.5 Operational Stage Scoping Analysis

Table 14.4 summarises the forecast daily development traffic generation set against the recorded 2022 daily traffic flows expanded to AADT in accordance with TII PE-PAG-02038-01 Unit 16.0 to which the committed development traffic has been added.

Table 14.4 Study Area Daily Traffic Flows AADT

Road Link		Baseline 2022 AADT		Dev. Generated Traffic		Incremental Increase	
		Total	HGV	Total	HGV	Total	HGV
1	North Road (South of ESB)	245	55	0	0	0.0%	0.0%
2	North Road (South of Huntstown Quarry)	248	63	74	162	29%	258%
3	North Road (North of Huntstown Quarry)	1644	1717	74	162	4.5%	9.4%
4	N2 Coldwinters Off-slip	3906	1912	20	54	0.5%	2.8%
5	R135 North Road (Between N2 on/Off Slips)	4540	2516	54	108	1.2%	4.3%
6	N2 Southbound On-slip Link Road	6463	2238	80	153	1.2%	6.8%

7	N2 Southbound On-slip	4610	1914	26	45	0.6%	2.3%
8	R135 North Road (South of Kilshane Cross)	6578	2385	28	62	0.4%	2.6%
9	L3120	4995	1354	13	28	0.3%	2.0%
10	L3125	8437	1828	8	15	0.1%	0.8%
11	R135 North Road (North of Kilshane Cross)	4664	1194	7	19	0.2%	1.6%
12	Blanchardstown (N2/N3) Link Road	4906	1213	4	12	0.1%	1.0%
13	R135 Wards Cross	5123	884	3	7	0.1%	0.8%

Notwithstanding that the proposed development will not be completed and occupied for some time in the future, the forecast traffic generation set against the recent 2022 network traffic flow data shows that save for the immediate section of R135 North Road (Link 2) the proposed development does not have the potential to exceed 5% of daily traffic.

Table 14.5 and Table 14.6 provide summaries of the forecast peak hour traffic generation set against the recorded 2022 two-way peak hour traffic flows on the receiving road network to which the committed development traffic flows have been added but no allowance has been made for traffic growth.

Table 14.5 Study Area Morning Peak Hour Traffic Flows

Road Link		Baseline 2022		Dev. Generated Traffic		Incremental Increase	
		Total	HGV	Total	HGV	Total	HGV
1	North Road (South of ESB)	11	6	0	0	0.0%	0.0%
2	North Road (South of Huntstown Quarry)	18	17	7	10	63%	142%
3	North Road (North of Huntstown Quarry)	147	176	7	10	4.9%	5.9%
4	N2 Coldwinters Off-slip	446	136	3	3	0.8%	2.3%
5	R135 North Road (Between N2 on/Off Slips)	454	189	4	7	0.8%	3.8%
6	N2 Southbound On-slip Link Road	554	179	4	10	0.8%	5.7%
7	N2 Southbound On-slip	328	181	1	3	0.2%	1.5%
8	R135 North Road (South of Kilshane Cross)	605	204	3	4	0.5%	2.1%
9	L3120	407	109	1	2	0.2%	1.5%

10	L3125	1009	162	1	1	0.1%	0.7%
11	R135 North Road (North of Kilshane Cross)	422	104	1	2	0.1%	1.5%
12	Blanchardstown (N2/N3) Link Road	433	102	0	1	0.1%	0.9%
13	R135 Wards Cross	406	68	0	1	0.1%	0.9%

Save for the southern section of R135 North Road either side of Huntstown Quarry site access junction, the forecast development traffic generation set against the recent 2022 network peak hour traffic flow data shows that the proposed development in both the morning peak hour and the evening peak hour does not have the potential to exceed the 10% threshold for the greater receiving road network as set out in the TII Traffic and Transport Assessment Guidelines PE-PDV-02045.

Based upon the 2022 figures and the traffic flow assumptions of development generated traffic the proposed development, save for the short section between the development site and Huntstown Quarry access, does have the potential to increase the two-way daily volume of traffic on the adjoining road network by more than 10% which is the typical threshold triggering a transport assessment.

The data in Table 14.4 and Table 14.5 confirms that save for the southern section of R135 North Road traffic generated by the proposed development does not exceed 5% which is the lower value threshold typically used in the evaluation of traffic impact in congested or sensitive environments.

Table 14.6 Study Area Evening Peak Hour Traffic Flows

Road Link		Baseline 2022		Dev. Generated Traffic		Incremental Increase	
		Total	HGV	Total	HGV	Total	HGV
1	North Road (South of ESB)	18	3	0	0	0.0%	0.0%
2	North Road (South of Huntstown Quarry)	29	20	11	16	61%	400%
3	North Road (North of Huntstown Quarry)	207	113	11	16	5.6%	16%
4	N2 Coldwinters Off-slip	262	147	1	6	0.3%	4.3%
5	R135 North Road (Between N2 on/Off Slips)	431	189	10	10	2.4%	5.6%
6	N2 Southbound On-slip Link Road	649	176	15	15	2.4%	9.2%
7	N2 Southbound On-slip	609	130	5	5	0.9%	3.8%
8	R135 North Road (South of Kilshane Cross)	584	151	5	5	0.8%	3.6%
9	L3120	534	99	2	3	0.3%	3.2%
10	L3125	786	123	2	1	0.2%	0.9%

11	R135 North Road (North of Kilshane Cross)	466	79	1	1	0.3%	1.4%
12	Blanchardstown (N2/N3) Link Road	507	93	1	1	0.1%	0.9%
13	R135 Wards Cross	524	58	1	0	0.1%	0.6%

Based upon the 2022 preliminary scoping evaluation, aside from R135 North Road close to the proposed development which is relatively lightly trafficked no road link is considered likely to experience a peak hour traffic increase above the lower threshold value of 5%.

Based upon the surveyed network traffic flows of September 2022 Table 14.7 summarises development generated turning traffic and the total turning movements at Junction 2 'N2 Off-slip' and Junction 4 'N2 On-slip'. The Table includes the forecast daily development turning traffic set against the estimated 2022 AADT (including committed development traffic) turning traffic at the N2 junctions.

Table 14.7 Study Area Evening Peak Hour Traffic Flows

Junction		Baseline 2022 Turning AADT		Development Generated Traffic Flow		Increase %	
		Total	Heavy	Total	Heavy	Total	Heavy
2	N2 Off-slip (Daily)	8223	3055	236	162	2.9%	5.3%
	N2 Off-slip (AM Peak)	812	273	17	10	2.1%	3.7%
	N2 Off-slip (PM Peak)	600	164	27	16	4.5%	9.8%
4	N2 On-slip (Daily)	11583	3342	162	108	1.4%	3.2%
	N2 On-slip (AM Peak)	1101	307	11	11	1.0%	3.6%
	N2 On-slip (PM Peak)	1114	218	20	20	1.8%	9.2%

The forecast increase in total traffic at the two closest junctions leading to or coming from the national road network is estimated to be in the order 1.5-3.0% of daily traffic flows. In the morning and peak hour the forecast increase in turning movements is in the order of peak hours 1.4-2.1% while in the evening peak hour the estimated increase is in the order of 1.8-4.5%.

14.5.5.1 NRA Thresholds (Evaluation Criteria)

In Ireland, a TTA or a Traffic Impact Assessment must accompany all planning applications for developments which could potentially generate significant traffic volumes. A Traffic and Transport Assessment should be carried out if the proposed development exceeds the following thresholds:

- Development traffic exceeds 10% of the traffic flow on the adjoining road.
- Development traffic exceeds 5% of the traffic flow on the adjoining road where congestion exists or the location is sensitive.
- Residential development in excess of 200 dwellings.

- Retail and leisure development in excess of 1,000m2.
- Office, education and hospital development in excess of 2,500m2.
- Industrial development in excess of 5,000m2.
- Distribution and warehousing in excess of 10,000m2.
- Relevant thresholds for Traffic Assessment where the development has the potential to affect national roads are as follows:
- 100 trips in / out combined in the peak hours for the proposed development.
- Development traffic exceeds 10% of turning movements at junctions with and on National Roads.
- Development traffic exceeds 5% of turning movements at junctions with National Roads if location has potential to become congested or sensitive.
- Industrial development in excess of 5,000m2.
- Distribution and warehousing in excess of 10,000m2.
- 100 on-site parking spaces.
- Sub-threshold criteria for Traffic Assessment are as follows:
- The character and total number of trips per day is such that as to cause concern.
- Location of the site is not consistent with national guidance or local plan policy or accessibility criteria contained in the Development Plan.
- The development is part of incremental development that will have significant transport implications.
- The development may generate traffic at peak times in a heavily trafficked/ congested area or near a junction with a main traffic route.
- The development may generate heavy vehicles in a residential area.
- There are concerns over the development's potential effects on road safety.
- The development is in a tourist area with potential to cause congestion.
- The planning authority considers that the proposal will result in a material change in trips patterns or raises other significant transport implications.

The following sets out the forecast traffic generation scenario against the various standard threshold criteria:

- The proposed development is forecast to generate 17 combined two-way in / out combined movements in the morning peak hour and 27 movements combined two-way in /out in the evening peak hour which is significantly less than the threshold value of 100 trips in / out. In the case of the masterplan development, the equivalent two-way traffic generation is 29 movements in the morning and 60 in the evening which is also less than the threshold value.

- The forecast peak hour traffic flows show that it is unlikely that development traffic will exceed 10% of turning movements on the receiving road network.

- Development traffic at junctions with National Roads will not exceed 5% of turning movements. The forecast is in the order of 3% or less in the case of the junction (Junction 2 – N2 Off-slip at Coldwinters) that is forecast to experience the greatest number of development traffic turning movements.

- The proposed development comprises 2 x 5,032m^2 Industrial Development. The floor area exceeds the Industrial Development threshold of 5,000m^2.

- There are less than 100 on-site parking spaces.

The following sets out the forecast traffic generation scenario against the various sub-threshold criteria for Traffic Assessment are as follows:

- The lands are zoned appropriately and the character and total number of trips in / out combined per day is not such that it should not reasonably give cause for concern.

- The location of the site is consistent with national guidance and local plan policy and is consistent with the accessibility criteria in the Development Plan.

- The development is not part of incremental development that will have significant transport implications.

- The development will generate modest, sub-threshold traffic volumes at peak times in a relatively heavily trafficked area and near junctions with a main traffic route. The greatest increases are significantly lower than the threshold values.

- The development will not generate heavy vehicles in a residential area.

- The site is appropriately zoned and the receiving roads have been designed to cater for traffic with the characteristics of the proposed development accordingly it is not considered that serious concerns should arise with respect to the potential effects on road safety.

- The development is not in a tourist area and has no potential to cause congestion.

Given the forecast peak hour traffic generation it can reasonably be concluded that the impact of the proposed development on the capacity and operation of the receiving road network is not likely to be significant. Nevertheless, a number of the threshold criteria set out in the guidelines are either exceeded or are borderline, accordingly the traffic impact of the proposed development warrants further investigation.

14.5.6 *Operational Stage Impact Assessment*

The capacity of any road network is dictated by the operation of the links and junctions within that network. Capacity assessments of the key junctions in the vicinity of the site are modelled for base and future year scenarios to provide a comparative basis upon which to evaluate the incremental impact of the proposed development and to appraise the overall performance of the road network under future assumed network traffic flow criteria. To prepare a traffic network model various base assumptions are made with respect to the future growth of traffic on the receiving road network.

Regarding the choice of appropriate assessment years the NRA: Traffic and Transport Assessment Guidelines advise as follows; "Timescale: Traffic volumes for opening year, opening +5 and opening year +15. These timescales are fairly standard and should be expected".

The applicant aspires to have the development constructed by the end of 2025 and therefore for the purposes of this traffic assessment the year 2025 was selected as the opening year. In line with the guidance provided in the National Roads Authority 'Traffic and Transport Assessment Guidelines', modelling analyses of the capacity of the receiving road network have been carried out for (1) Opening Year 2025; (2) Opening Year +5yrs 2030, and (3) Opening Year +15yrs 2040.

The following junctions were included in the scope of the modelling assessments:

- Site 1: Huntstown Quarry Access – Priority Access T-junction.
- Site 2: N2 Off-slip (Dogs Trust) – Priority T-junction.
- Site 3: Dublin Airport Logistics Park – Roundabout.
- Site 4: N2 Southbound On-slip – Traffic Signal Control T-junction.
- Site 5: Kilshane Cross – Traffic Signal Control Crossroad.
- Site 6: Brock Inn Roundabout.
- Site 7: ESB Finglas 220kV Substation T-junction (Not counted).

The traffic flow data from the September 2022 surveys forms the basis of the assessments of road network capacity and the assessment of the likely impact of the proposed development on the operation of the receiving road network.

For the purposes of the traffic assessment, traffic generation arising directly from the proposed development has been assumed not to grow over time. Background traffic flows on the public road network have been assumed to grow in accordance with the latest growth factors published by Transport Infrastructure Ireland (TII) in October 2021 in Publication PE-PAG-02017 'Project Appraisal Guidelines for National Roads: Unit 5.3 Travel Demand Projections'.

Central growth rate factors were used to derive the future traffic flows from the surveyed 2022 flows. The growth indices used to derive Opening Year (2025) and; Opening Year +5ys (2030) and Opening Year +15yrs (2040) flows from the surveyed (2022) flows are as follows:

- 2022-2025 (Opening Year) 1.055 (Cars) 1.098 (HGV)
- 2022-2030 (Opening Year +5yrs) 1.153 (Cars) 1.284 (HGV)

- 2022-2040 (Opening Year +15yrs) 1.227 (Cars) 1.474 (HGV)

TII growth factors were directly applied to peak hour traffic data. Growth factors are not always directly applicable to peak hour periods (the peak hour generally spreads out as opposed to intensifying) therefore ignoring this factor and adding growth directly to the peak hour generally results in robust calculations favoured by traffic experts in the assessment of road networks.

The traffic generated by permitted local developments (under construction or not fully unoccupied) were included in the traffic analysis since they neighbour the proposed development and are considered likely to give rise to direct increases in traffic on the local receiving road network in the short-term (over and above those traffic flows recorded in the September 2022 surveys).

The application of TII growth rates to the receiving network is considered likely to account for the cumulative traffic arising as a result of economic growth and development locally over the specified assessment period.

The main corridor upon which the new traffic generated by the development will have an impact is R135 North Road and accordingly the scope of future year assessments focuses on its operation and interaction with the junctions between M50 and The Ward. The assessments aim to show that the infrastructure provided by the receiving road network, including the strategic network, is suitable to accommodate the forecast traffic arising from the proposed development. The various 'do-nothing' and 'do-something' traffic flow scenarios were assessed for the Opening Year 2025, Opening Year +5yrs and the Design Year of 2040.

The future year assessments include for scenarios both with and without the proposed development, so that the incremental impact of development traffic can be evaluated.

Where threshold values are exceeded ordinarily the TRL suite of programs is used to assess network junction performance in the identified peak hours. Where the magnitude of traffic increases is not significant enough to adversely affect the operation of junctions the road network no detailed modelling assessment is carried out, since the increases in traffic flows are of an order that is unlikely to affect junction performance to the degree that it might be measured meaningfully by transport modelling.

The 'do something' scenarios include for the forecast assessment value development traffic flows being added to the forecast network flows derived from the 2022 traffic surveys factored as set out above.

The TII Traffic and Transportation Assessment Guidelines 2014, Table 2.1 'Traffic Management Guidelines Thresholds for Transport Assessments' set out the general threshold value of 10% to determine whether the preparation of a TTA is required to assess how development traffic might affect network operation.

Table 14.8 Evaluation Criteria

Magnitude of Impact	Definition
High	Scale of additional traffic exceeds 25% of do-nothing traffic flow on the receiving road network
Medium	Scale of additional traffic is between 10% and 25% of do-nothing traffic flow on the receiving road network
Low	Scale of additional traffic is between 5% and 10% of do-nothing traffic flow on the receiving road network
Negligible	Scale of additional traffic is less exceeds 2%-5% of do-nothing traffic flow on the receiving road network

In congested or sensitive networks the threshold is typically lowered to 5%. The threshold values are a generally prompt for whether or not detailed junction modelling and a TTA is required. The threshold values are typically used as a reference to determine the significance of effects.

It is standard practice in TTA to reference the scale of percentage increases in traffic flows when assessing the forecast long-term operational impact of proposed developments. As a measure of the potential magnitude of impact or effect on the receiving road network the following has regard to the percentage threshold values set out in the TII guidelines.

The breakdown of the magnitude of impacts is based upon judgement in the scale of percentage impacts of the additional traffic flows imposed on the receiving road network. The magnitude of the effect of development traffic on the receiving road is highlighted in the following tables as per the above evaluation criteria.

Table 14.9 Link 1 – North Road (South of Dev. Access Junction) - Forecast Traffic Impact

Road Link (Survey Site)	Year	AM Peak Hour 08:00-09:00hrs			PM Peak Hour 16:00-17:00hrs			AADT
		LV	HGV	Total	LV	HGV	Total	
North Road (Site 1[12] – Link 1[13]) Do Nothing Scenario	2025	12	7	18	19	3	22	319 (19.0%)
	2030	13	8	20	21	4	25	353 (20.1%)
	2040	13	9	22	22	4	27	382 (21.4%)
North Road (Site 1 – Link 1) Do Something Scenario	2025	12	7	18	19	3	22	319 (19.0%)
	2030	13	8	20	21	4	25	353 (20.1%)
	2040	13	9	22	22	4	27	382 (21.4%)
North Road (Site 1 – Link 1) Incremental Increase	2025	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+0 +(0.0%)
	2030	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+0 +(0.0%)
	2040	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+0.0%	+0 +(0.0%)

[12] Traffic Data Collection Site used in Analysis see Network Flow Diagrams of Appendix B for Index of Site Numbering

[13] see Network Flow Diagrams of Appendix B for Index of Road Links

Table 14.10 Link 2 – North Road (South of Huntstown Quarry)

Road Link (Survey Site)	Year	AM Peak Hour 08:00-09:00hrs			PM Peak Hour 16:00-17:00hrs			AADT
		LV	HGV	Total	LV	HGV	Total	
North Road (Site 1 – Link 2) Do Nothing Scenario	2025	12	8	19	19	4	23	331 (20.9%)
	2030	13	9	22	21	5	26	336 (22.0%)
	2040	13	10	24	22	6	28	397 (23.3%)
North Road (Site 1 – Link 2) Do Something Scenario	2025	19	18	36	30	20	50	567 (40.8%)
	2030	20	19	39	32	21	53	602 (40.3%)
	2040	20	20	41	33	22	55	633 (40.2%)
North Road (Site 1 – Link 2) Incremental Increase	2025	+60.3%	+130%	+88.1%	+57.9%	+364%	+115%	+71.4% (+19%)
	2030	+55.2%	+111%	+78.4%	+53.0%	+311%	+104%	+64.4% (+18%)
	2040	+51.9%	+96.9%	+71.4%	+49.8%	+271%	+96.5%	+59.5% (+17%)

Table 14.11 Link 3 – North Road (North of Huntstown Quarry)

Road Link (Survey Site)	Year	AM Peak Hour 08:00-09:00hrs			PM Peak Hour 16:00-17:00hrs			AADT
		LV	HGV	Total	LV	HGV	Total	
North Road (Site 1 – Link 3) Do Nothing Scenario	2025	145	181	326	205	106	310	3583 (52.3%)
	2030	154	211	365	220	122	342	3997 (54.4%)
	2040	161	240	401	231	138	370	4390 (56.5%)
North Road (Site 1 – Link 3) Do Something Scenario	2025	152	191	343	216	122	337	3819 (53.3%)
	2030	161	221	382	231	138	369	4233 (55.2%)
	2040	168	250	418	242	154	397	4626 (57.2%)
North Road (Site 1 – Link 3) Incremental Increase	2025	+4.8%	+5.5%	+5.2%	+5.4%	+15.2%	+8.7%	+6.6% (+1.0%)
	2030	+4.5%	+4.7%	+4.7%	+5.0%	+13.1%	+7.9%	+5.9% (+0.8%)
	2040	+4.4%	+4.2%	+4.2%	+4.8%	+11.6%	+7.3%	+5.4% (+0.6%)

Table 14.12 Link 4 – N2 Coldwinters Off-slip

Road Link (Survey Site)	Year	AM Peak Hour 08:00-09:00hrs			PM Peak Hour 16:00-17:00hrs			AADT
		LV	HGV	Total	LV	HGV	Total	
N2 (Site 2 – Link 4) Do Nothing Scenario	2025	463	143	605	273	153	427	6157 (33.7%)
	2030	498	161	658	295	177	472	6780 (35.1%)
	2040	524	179	703	312	201	512	7331 (36.7%)
N2 (Site 2 – Link 4) Do Something Scenario	2025	466	146	612	274	159	433	6232 (34.1%)
	2030	501	164	665	296	183	479	6854 (35.5%)
	2040	528	182	710	313	207	519	7406 (37.0%)
N2 (Site 2 – Link 4) Incremental Increase	2025	+0.7%	+2.1%	+1.1%	+0.3%	+3.9%	+1.6%	+1.2% (+0.5%)
	2030	+0.7%	+1.9%	+1.0%	+0.3%	+3.4%	+1.5%	+1.1% (+0.4%)
	2040	+0.7%	+1.7%	+0.9%	+0.3%	+3.0%	+1.3%	+1.0% (+0.4%)

Table 14.13 Link 5 – R135 North Road (Between N2 Off/On-slips)

Road Link (Survey Site)	Year	AM Peak Hour 08:00-09:00hrs			PM Peak Hour 16:00-17:00hrs			AADT
		LV	HGV	Total	LV	HGV	Total	
R135 (Site 4 – Link 5) Do Nothing Scenario	2025	471	196	667	442	194	636	7486 (36.5%)
	2030	508	224	732	478	222	701	8278 (37.9%)
	2040	537	252	788	506	252	758	8983 (39.5%)
R135 (Site 4 – Link 5) Do Something Scenario	2025	475	203	678	452	204	656	7648 (37.1%)
	2030	512	231	743	488	232	721	8439 (38.4%)
	2040	540	259	799	516	262	778	9145 (40.0%)
R135 (Site 4 – Link 5) Incremental Increase	2025	+0.8%	+3.5%	+1.6%	+2.3%	+5.2%	+3.2%	+2.2% (+0.6%)
	2030	+0.7%	+3.1%	+1.4%	+2.1%	+4.5%	+2.9%	+2.0% (+0.6%)
	2040	+0.7%	+2.8%	+1.3%	+2.0%	+4.0%	+2.7%	+1.8% (+0.5%)

Table 14.14 Link 6 – N2 Southbound On-slip Link Road

Road Link (Survey Site)	Year	AM Peak Hour 08:00-09:00hrs			PM Peak Hour 16:00-17:00hrs			AADT
		LV	HGV	Total	LV	HGV	Total	
N2 (Site 4 – Link 6) Do Nothing Scenario	2025	578	183	762	664	173	837	9208 (26.4%)
	2030	629	210	840	717	197	914	10132 (27.5%)
	2040	667	238	906	757	220	978	10926 (28.8%)
N2 (Site 4 – Link 6) Do Something Scenario	2025	583	193	776	679	188	867	9441 (27.3%)
	2030	633	220	853	733	211	944	10365 (28.3%)
	2040	672	248	919	773	235	1008	11159 (29.6%)
N2 (Site 4 – Link 6) Incremental Increase	2025	+0.7%	+5.3%	+1.8%	+2.3%	+8.5%	+3.6%	+2.5% (+1.0%)
	2030	+0.7%	+4.6%	+1.7%	+2.2%	+7.5%	+3.3%	+2.3% (+0.9%)
	2040	+0.6%	+4.1%	+1.5%	+3.0%	+6.7%	+3.1%	+2.1% (+0.8%)

Table 14.15 Link 7 – N2 Southbound On-slip

Road Link (Survey Site)	Year	AM Peak Hour 08:00-09:00hrs			PM Peak Hour 16:00-17:00hrs			AADT
		LV	HGV	Total	LV	HGV	Total	
N2 (Site 3 – Link 7) Do Nothing Scenario	2025	343	193	536	632	134	766	6897 (30.0%)
	2030	372	222	594	682	150	833	7581 (31.2%)
	2040	394	252	646	720	167	888	8177 (32.7%)
N2 (Site 3 – Link 7) Do Something Scenario	2025	344	196	540	638	139	776	6968 (30.4%)
	2030	373	225	598	688	155	843	7651 (31.5%)
	2040	394	255	649	726	172	898	8247 (32.9%)
N2 (Site 3 – Link 7) Incremental Increase	2025	+0.2%	+1.4%	+0.6%	+0.8%	+3.6%	+1.3%	+1.0% (+0.3%)
	2030	+0.2%	+1.2%	+0.6%	+0.8%	+3.2%	+1.2%	+0.9% (+0.3%)
	2040	+0.2%	+1.1%	+0.5%	+0.7%	+2.9%	+1.1%	+0.9% (+0.3%)

Table 14.16 Link 8 – R135 North Road (South of Kilshane Cross) - Forecast Traffic Impact

Road Link (Survey Site)	Year	AM Peak Hour 08:00-09:00hrs			PM Peak Hour 16:00-17:00hrs			AADT
		LV	HGV	**Total**	LV	HGV	**Total**	
R135 (Site 5 – Link 8) Do Nothing Scenario	2025	631	217	847	609	159	768	9504 (27.3%)
	2030	682	248	930	663	184	847	10492 (28.6%)
	2040	721	280	1002	703	210	913	11344 (30.0%)
R135 (Site 5 – Link 8) Do Something Scenario	2025	634	221	855	614	164	778	9594 (27.7%)
	2030	685	252	938	667	189	857	10582 (28.9%)
	2040	724	284	1009	708	215	923	11435 (30.3%)
R135 (Site 5 – Link 8) Incremental Increase	2025	+0.5%	+2.0%	+0.8%	+0.8%	+3.3%	+1.3%	+0.9% (+0.4%)
	2030	+0.4%	+1.7%	+0.8%	+0.7%	+2.8%	+1.2%	+0.9% (+0.3%)
	2040	+0.4%	+1.5%	+0.7%	+0.7%	+2.5%	+1.1%	+0.8% (+0.3%)

Table 14.17 Link 9 – L3120 – Forecast Traffic Impact

Road Link (Survey Site)	Year	AM Peak Hour 08:00-09:00hrs			PM Peak Hour 16:00-17:00hrs			AADT
		LV	HGV	**Total**	LV	HGV	**Total**	
L3120 (Site 5 – Link 9) Do Nothing Scenario	2025	428	117	545	561	105	666	6748 (22.0%)
	2030	467	136	604	612	122	734	7473 (23.1%)
	2040	497	156	653	651	139	790	8086 (24.4%)
L3120 (Site 5 – Link 9) Do Something Scenario	2025	429	119	548	563	108	671	6788 (22.2%)
	2030	468	138	606	614	125	739	7514 (23.3%)
	2040	498	157	655	653	142	795	8126 (24.6%)
L3120 (Site 5 – Link 9) Incremental Increase	2025	+0.2%	+1.4%	+0.5%	+0.3%	+2.9%	+0.7%	+0.6% (+0.3%)
	2030	+0.2%	+1.2%	+0.4%	+0.3%	+2.5%	+0.7%	+0.5% (+0.2%)
	2040	+0.2%	+1.0%	+0.4%	+0.3%	+2.2%	+0.6%	+0.5% (+0.2%)

Table 14.18 Link 10 – L3125- Forecast Traffic Impact

Road Link (Survey Site)	Year	AM Peak Hour 08:00-09:00hrs			PM Peak Hour 16:00-17:00hrs			AADT
		LV	HGV	Total	LV	HGV	Total	
L3125 (Site 5 – Link 10) Do Nothing Scenario	2025	1059	174	1233	825	132	957	10843 (18.3%)
	2030	1150	1998	1348	897	151	1048	11893 (19.1%)
	2040	1219	223	1442	951	170	1122	12762 (20.1%)
L3125 (Site 5 – Link 10) Do Something Scenario	2025	1061	175	1235	826	133	959	10867 (18.4%)
	2030	1152	199	1351	898	152	1050	11916 (19.2%)
	2040	1221	224	1444	953	171	1124	12785 (20.2%)
L3125 (Site 5 – Link 10) Incremental Increase	2025	+0.1%	+0.7%	+0.2%	+0.2%	+0.8%	+0.3%	+0.2% (+0.1%)
	2030	+0.1%	+0.6%	+0.2%	+0.2%	+0.7%	+0.2%	+0.2% (+0.1%)
	2040	+0.2%	+0.6%	+0.2%	+0.2%	+0.1%	+0.4%	+0.2% (+0.1%)

Table 14.19 Link 11 - R135 North Road (North of Kilshane Cross) - Forecast Traffic Impact

Road Link (Survey Site)	Year	AM Peak Hour 08:00-09:00hrs			PM Peak Hour 16:00-17:00hrs			AADT
		LV	HGV	Total	LV	HGV	Total	
R135 (Site 5 – Link 11) Do Nothing Scenario	2025	443	111	554	489	85	574	6208 (21.0%)
	2030	481	129	610	533	98	631	6844 (22.0%)
	2040	510	147	657	565	111	677	7379 (23.3%)
R135 (Site 5 – Link 11) Do Something Scenario	2025	443	113	556	491	86	577	6234 (21.2%)
	2030	482	130	612	534	99	633	6870 (22.2%)
	2040	511	148	659	567	112	679	7406 (23.5%)
R135 (Site 5 – Link 11) Incremental Increase	2025	+0.1%	+1.3%	+0.4%	+0.3%	+1.3%	+0.4%	0.4% (+0.2%)
	2030	+0.1%	+1.2%	+0.3%	+0.3%	+1.1%	+0.4%	0.4% (+0.2%)
	2040	+0.1%	+1.0%	+0.3%	+0.2%	+1.0%	+0.4%	0.4% (+0.2%)

Table 14.20 Link 12 – Blanchardstown Link Road - Forecast Traffic Impact

Road Link (Survey Site)	Year	AM Peak Hour 08:00-09:00hrs			PM Peak Hour 16:00-17:00hrs			AADT
		LV	HGV	Total	LV	HGV	Total	
N2 Link Road (Site 6 – Link 12) Do Nothing Scenario	2025	456	110	566	533	101	634	6494 (20.4%)
	2030	497	128	625	582	117	699	7176 (21.5%)
	2040	528	146	674	618	134	752	7748 (22.7%)
N2 Link Road (Site 6 – Link 12) Do Something Scenario	2025	456	111	568	534	101	635	6510 (20.6%)
	2030	497	129	626	582	118	700	7191 (21.6%)
	2040	528	147	675	619	135	753	7764 (22.9%)
N2 Link Road (Site 6 – Link 12) Incremental Increase	2025	+0.1%	+0.8%	+0.2%	+0.1%	+0.8%	+0.2%	+0.2% (+0.1%)
	2030	+0.1%	+0.7%	+0.2%	+0.1%	+0.7%	+0.2%	+0.2% (+0.1%)
	2040	+0.1%	+0.6%	+0.2%	+0.1%	+0.6%	+0.2%	+0.2% (+0.1%)

Table 14.21 Link 13 – R135 Wards Cross - Forecast Traffic Impact

Road Link (Survey Site)	Year	AM Peak Hour 08:00-09:00hrs			PM Peak Hour 16:00-17:00hrs			AADT
		LV	HGV	Total	LV	HGV	Total	
R135 (Site 6 – Link 13) Do Nothing Scenario	2025	428	73	501	551	63	614	6365 (15.2%)
	2030	466	85	552	601	73	675	7013 (16.0%)
	2040	495	98	593	639	84	723	7544 (17.1%)
R135 (Site 6 – Link 13) Do Something Scenario	2025	428	74	502	552	64	616	6376 (15.3%)
	2030	466	86	552	602	74	676	7024 (16.1%)
	2040	495	98	594	640	84	724	7555 (17.1%)
R135 (Site 6 – Link 13) Incremental Increase	2025	+0.1%	+0.8%	+0.2%	+0.1%	+0.5%	+0.2%	+0.2% (+0.1%)
	2030	+0.1%	+0.7%	+0.2%	+0.1%	+0.4%	+0.2%	+0.2% (+0.1%)
	2040	+0.1%	+0.6%	+0.1%	+0.1%	+0.4%	+0.2%	+0.1% (+0.1%)

The detailed assessment of baseline and forecast future network traffic flows confirms the results of the preliminary scoping assessment of Section 14.7.1 as summarised in Table 14.4, Table 14.5, Table 14.6 and Table 14.7.

The incremental increase in traffic arising from the proposed development in the peak hours is sub-threshold and less than 5% for all but for Link 2 which is the section of North Road between the development access road and the access serving Huntstown Quarry.

For ease of reference the magnitude of traffic effects expressed as incremental values over baseline are highlighted in the Tables using the evaluation criteria set 14.4.6 and Table 14.8. In the case of Link 2 the incremental increases exceeds 10% in all cases. The relative order of magnitude on Link 2 results from the current low traffic flows on this link road.

It is worth noting that in 2012, the N2 North Road was reclassified upon opening of the M2 motorway and this resulted in changes to traffic patterns and volumes in the area. The section of North Road between the Coldwinters N2 Off-slip and the M50 effectively became a cul-de-sac and traffic flows on Link 2 reduced to an AADT in the order of 300(20%).

TII historic traffic counter data shows that Link 2 had an AADT in the order of 29,161(9.8%). Under the provisions of the Fingal Development Plan 2023-2029 this link is due to again become a through route connecting North Road through zoned lands and connecting to the existing Cappogue Roundabout on the Cappagh Road.

Excluding Link 2 North Road (south of Huntstown Quarry Access) the average increase in traffic flows on the surrounding road network in the morning and evening peak hours are summarised as follows:

Table 14.22 Average Percentage Impact on Receiving Road Network

Year	AM Peak Hour 08:00-09:00hrs			PM Peak Hour 16:00-17:00hrs			AADT
	LV	HGV	Total	LV	HGV	Total	
2025	+0.7%	+2.1%	+1.0%	1.1%	3.8%	+1.8%	+1.3%
2030	+0.6%	+1.8%	+0.9%	1.0%	3.3%	+1.6%	+1.2%
2040	+0.6%	+1.6%	+0.9%	1.0%	3.0%	+1.5%	+1.1%

Excluding Link 2 – North Road (south) the average increase in the total traffic flow across the receiving road network in the morning peak hour is less than +1.0%, while the increase in light vehicle traffic is less than +0.7% and for HGV the increase is forecast to be less than +2.1%. In the evening peak hour the forecast increase in total traffic flow is less than +1.8% while the increase in light vehicle traffic is less than +1.1% and for HGV the increase is forecast to be less than +3.8%. The forecast increase in AADT is less than +1.3%.

The only link in the road network to experience potential increases in traffic flow above the +10% threshold is Link 2 which is the section of North Road located to the south of the existing Huntstown Quarry site access. Link 2 is forecast to experience an increase in AADT in the order of +70%. The forecast increase in the total traffic flow on Link 2 in the morning peak hour is approximately +88% while the increase in light vehicle traffic approximately +60% and for HGV the increase is forecast to be approximately +130%. In the evening peak hour the forecast increase in total traffic flow is approximately +115%, while the increase in light vehicle traffic is approximately +58% and for HGV the

increase is forecast to be in the order of +364%. As set out above these percentages are set against a very low baseline flow on the existing cul-de-sac.

Except for the southern section of North Road at Link 2, the forecast increases in traffic on the receiving road network are significantly sub-threshold with all increases in traffic categorised as low or negligible based upon the evaluation criteria set out herein.

With the exception of Link 2, the forecast increases in traffic flows are significantly less than half the lower +5% threshold value used for sensitive areas or where peak hour congestion exists. It follows that the impact of development generated traffic on the receiving road network will not have a significant impact upon capacity and operation of the links and junctions through which it is forecast to travel.

Ordinarily increases in traffic of the order forecast do not warrant detailed computer modelling, as the changes between the 'Do-Nothing' and 'Do-Something' Scenarios is such that it is highly unlikely that a capacity model will show an appreciable differential between the scenarios. Save for Link 12 the impact of the traffic generated by the proposed development is likely to be imperceptible to existing road users on the greater receiving road network.

In the case of Link 2 where the percentage increases in traffic flow are shown to exceed the threshold percentage values, the increases are not significant, especially in the context of the Fingal Development Plan 2023-2029 which seeks to make Link 2 a through route connecting North Road to Cappagh Road in the west.

The baseline morning peak hour traffic flow on Link 2 at the year of opening 2025 is 20 no. vehicles of which 12 no. are light vehicles and 8 no. are HGV. The forecast average increase in the total traffic flow in the morning peak hour is +17 no. vehicles where the forecast increase in light vehicles is approximately +7 no. and the increase in HGV is +10 no.

The baseline evening peak hour traffic flow on Link 2 at the year of opening 2025 is 23 no. vehicles of which 19 no. are light vehicles and 4 no. are HGV. The forecast average increase in the total traffic flow in the evening peak hour is +27 no. vehicles where the forecast increase in light vehicles is approximately +11 no. and the increase in HGV is +16 no.

Based upon the forecast network traffic flows the 15.23 summarises development generated turning traffic and the total turning movements at Junction 2 'N2 Off-slip' and Junction 4 'N2 On-slip'. Table 14.23, Table 14.24 and Table 14.25 include the forecast daily development turning traffic set against the forecast future AADT at the junctions with the N2 for the future years 2025, 2035 and 2040 respectively (including committed development traffic).

Table 14.23 – Junctions with National Roads - Assessment of Future Turning Traffic 2025

Junction		AADT 2025		Dev. Traffic		Increase %	
		Total	Heavy	Total	Heavy	Total	Heavy
2	N2 Off-slip (Daily)	9572	3717	236	162	+2.5%	+4.4%
	N2 Off-slip (AM Peak)	833	284	17	10	+2.0%	+3.5%
	N2 Off-slip (PM Peak)	633	180	27	16	+4.3%	+8.9%
4	N2 On-slip (Daily)	13757	4266	162	108	+1.2%	+2.5%

	N2 On-slip (AM Peak)	1100	320	11	7	+1.0%	+2.2%
	N2 On-slip (PM Peak)	1114	227	20	10	+1.8%	+4.4%

Table 14.24 – Junctions with National Roads - Assessment of Future Turning Traffic 2035

Junction		AADT 2035		Dev. Traffic		Increase %	
		Total	Heavy	Total	Heavy	Total	Heavy
2	N2 Off-slip (Daily)	10341	4289	236	162	+2.3%	+3.8%
	N2 Off-slip (AM Peak)	911	333	17	10	+1.9%	+3.0%
	N2 Off-slip (PM Peak)	692	211	27	16	+3.9%	+7.6%
4	N2 On-slip (Daily)	14890	4908	162	108	+1.1%	+2.2%
	N2 On-slip (AM Peak)	1203	374	11	7	+0.9%	+1.9%
	N2 On-slip (PM Peak)	1218	266	20	10	+1.6%	+3.8%

Table 14.25 – Junctions with National Roads - Assessment of Future Turning Traffic 2040

Junction		AADT 2040		Dev. Traffic		Increase %	
		Total	Heavy	Total	Heavy	Total	Heavy
2	N2 Off-slip (Daily)	10921	4873	236	162	+2.2%	+3.3%
	N2 Off-slip (AM Peak)	969	382	17	10	+1.8%	+2.6%
	N2 Off-slip (PM Peak)	736	242	27	16	+3.7%	+6.6%
4	N2 On-slip (Daily)	15746	5563	162	108	+1.0%	+1.9%
	N2 On-slip (AM Peak)	1280	429	11	7	+0.9%	+1.6%
	N2 On-slip (PM Peak)	1296	305	20	10	+1.5%	+3.3%

The forecast increase in total traffic at the two closest junctions leading to or coming from the national road network in the year of opening is estimated to be in the order 1.2-2.5% of daily traffic flows. In the morning peak hour the forecast increase in junction turning movements is in the order of 1.0-2.0% while in the evening peak hour the estimated increase is in the order of 1.8-4.3%.

Based on the analysis and findings of the traffic impact assessment, it can be concluded that the impact on the receiving road network is below the 5% threshold and is sub-threshold. Therefore, the proposed development will not have a significant adverse impact on the traffic flow or the road network, and the existing infrastructure can accommodate the additional traffic generated by the development.

The impact arising from the realisation of the masterplan development might reasonably be estimated as double that of the proposed Phase 1 development. Given that the Huntstown Circular Economy Hub is intended to be occupied by independent developments where the products of one facility is

expected to be the input to neighbouring facilities it is likely that the overall traffic impact will be less than the simple doubling scenario set out in the traffic flow diagrams of Appendix B. Given the magnitude of impact arising from the proposed development of Phase 1 it is not though necessary to provide a separate analysis for the masterplan.

The objectives of the Fingal Development Plan 2011-2017 that have been realised in recent times and that benefit the Huntstown area include the N2-N3 Link Road which comprises high quality road sections from Tyrrelstown to Cherryhound and from Castaheany to Damastown. The link between Tyrrelstown and the Cherryhound Interchange began construction in September 2011 and was opened in May 2013 and significantly altered the area wide travel demand characteristic of the road network in and around Ballycoolin and Huntstown.

The N2-N3 provides a primary link between the M2 and M3 motorways and also an alternative route to and from the airport. It has provided important infrastructure to serve the Dublin Enterprise Zone which expressly encourages employment, with zones for science & technology developments, warehousing, light industrial and office accommodation.

Fingal Development Plan 2023-2029 has a future objective to connect Cappagh Road at Cappogue to Huntstown R135 North Road. This future road will function as a local distributor road and will serve to provide access to lands zoned GE to the south of Huntstown Quarry.

Fingal County Council has future proposals to provide a western link from the Broghan Roundabout on the R135 (old N2) to Dublin Airport. This East West Link Road scheme is set as development Objective EA04 in the Dublin Airport Local Area Plan 2020. It is envisaged that existing traffic flows at the signal controlled Kilshane Cross on the R135 (North Road) will significantly reduce pending the construction of the airport link road scheme (principally due to re-distribution of traffic flow).

TTA Figure 6.1 is a based upon the location plans provided in this Chapter showing the various junction traffic counts overlain by an excerpt from Dublin Airport Local Area Plan 2020, Figure 8.1 'Dublin Airport Surface Access'. TTA Figure 6.1 shows the western access to the airport highlighted magenta and shows the future link from North Road to Cappagh Road highlighted cyan.

Recent improvements and upgrade of the Kilshane Crossroad junction were implemented as part of development carried out under Planning Reg. Ref. F18A/0146 (Killeen Properties). Improvements include the provision of an additional lane on the eastern arm of the signal-controlled junction together with a left filter lane to North Road (south) and improvement in the provision for pedestrians and cyclists on the approaches to the junction and in the traffic signal operation.

It is understood that the junction of the N2 off-slip at Coldwinters with North Road will be upgraded to signal operation. In the grant of permission determined under Planning Reg. Ref. FW21A/0151 (Huntstown Power) Condition No.22 of the grant of permission for the development requires a special contribution in respect of upgrading the junction of R135 North Road with the northbound slip road from the N2 at Coldwinters.

From a review of that planning file it is understood that Fingal County Council has assessed the operation of the Huntstown Quarry access on North Road and has considered the possible future control of this junction be signals. It is understood that the objective of the change from priority control is in the interest of improved safety and controlling or reinforcing the priority of the major road over the access road.

The network flow diagrams in Appendix B of the TAA show that the development of the North Road link to Cappagh Road will provide the opportunity for development generated traffic to redistribute.

The various percentage diversions to the west of the development site are shown and the assumptions are set out in Section 5.3 'Traffic Distribution of the TAA'.

There is no area-wide mode associated with the addition of either the Dublin Airport Local Area Plan 2020 objective or the objective of the Fingal Development Plan 2023-2029, but it is clear that the addition of these links will afford the opportunity for development traffic to reduce on the R135 North Road.

Since the impact of development traffic on the existing receiving road network is low or negligible it stands to reason, without the need for complex area-wide modelling, to conclude that that the same would be true of development impact once the new infrastructure has been realised.

The assessment calculations show that development traffic will not adversely impact the operation of the N2 Off-slip junction with North Road at Coldwinters and so development traffic is not likely to impact negatively or impeded in any way the upgrade of the junction to signal control. Similarly, the proposed development does not preclude the potential to convert the Huntstown Quarry access to signal control. Development traffic and the connection to the Cappagh Road will effect a balance of flows on the arms of the Huntstown Quarry access junction.

14.6 Impacts: Construction Stage

The construction phase impacts will be short-term. It is expected that the construction period will be in the region of 14 months. It is proposed that construction traffic will access the site via. North Road and the existing access road serving the ESB substation. The construction access shall be located at the proposed development access point and will be managed by signage and flagmen. A banksman and active traffic control will be employed during times when construction activity is more intense, for example as during concrete pours.

The average complement of construction staff is estimated to be in the region of 60 persons, which may rise to a total of 120 persons during peak construction activities. Based upon an expected car occupancy of 1.8 persons per vehicle it is expected that light vehicle traffic generation during the construction phase will be on average approximately 32 trips per day, increasing to a peak of 64 trips per day during peak activities. This accounts for construction staff arriving in the morning and leaving in the evening. There is likely to be some staff generated traffic arising throughout the day for sundry supplies.

Normal site working hours will be 07:00-19:00hrs on weekdays and 08:00-14:00hrs on Saturdays with no working on Sundays or Public Holidays. Construction staff traffic will typically arrive at site prior to the traditional commuter peak hour in the morning and leave after the evening peak hour.

A quantity of soil and subsoil which will need to be excavated to facilitate the proposed development. The volume of material to be excavated has been estimated to be c. 31,136m^3 and this material will be removed from the site for appropriate reuse, recycling or disposal.

The carrying capacity of articulated tipper vehicles is approximately 30 tonnes by weight and 33m^3 by volume. Smaller rigid 8-wheel tippers have a payload capacity of 20 tonnes by weight and 15m^3 by volume. Depending upon the haulage vehicle type the removal of excavated materials has the potential to generate a total of between 943 and 2,075 vehicles. Modern haulage fleets tend to carry a mix of rigid and articulated tippers and it is conservatively estimated that approximately 70% of loads are likely to be transported by articulated vehicles. On this basis the disposal of excavated materials

in the early stages of the project is forecast to generate a total of 1,283 HGV trips which equates to approximately 25 HGV trips per day over a 4-week period.

Average HGV traffic generation arising during subsequent construction activities is expected to be in the region of 25 HGV or less per day. It is understood that the construction will require no movement of abnormal or accompanied loads to or from the site. It is anticipated that the generation of HGVs during the general construction period will be evenly spread throughout the day and as such will not impact significantly during the peak periods.

An appropriate routing strategy for HGVs will be agreed and implemented as part of the Construction Management Plan. For the purposes of this assessment it is assumed that construction traffic would distribute to the network in similar proportions as operational traffic. Given that construction traffic equates to less than half that of the operational phase there is no need for an entirely separate set of calculation and it can reasonably be concluded from the operational analyses that construction traffic is not likely to give rise to reduced operational performance of the local road network.

14.7 Prevention & Mitigation Measures

14.7.1 Design Stage

The proposed design incorporates measures to comply with DMURS, whose primary objectives are; (1) Prioritise pedestrians and cyclists in urban settings without unduly compromising vehicular movement; (2) Provide good pedestrian permeability and connectivity in urban environments to encourage walking. The specific design measures include:

- Street lighting will meet the standards required by Fingal County Council. Light emitting diode (LED) luminaires will be used and positioned to ensure a uniform lighting spread is achieved and dark corners are avoided.

- Proposed segregated footway and cycleways are provided on the access road from North Road which will become the future link between North Road and Cappagh Road to the west. The configuration of cycleways and footways and the turning lanes serving the development are all consistent with the existing Cappagh Road cross-section and the greater road network serving the Dublin Enterprise Zone within which the proposed development site is located.

- Internal provision for pedestrians and cyclists includes for 3.0m shared segregated facilities on both sides of the spine road. High quality and slip resistant materials will be used in the construction and gradients at dropped crossings will be sufficiently shallow to allow access for users of all abilities.

- Sightlines at the junction of the access road and North Road are measured as 120m from a setback of 3.0m. Similarly the sightlines at the proposed development access junction are 120m from a setback of 3.0m. Roadside features and landscaping is so positioned not to obstruct visibility for drivers approaching or emerging from these junctions.

14.7.2 Construction Stage

As part of the Safety Health & Welfare assessment of the construction stage of the project, the Applicant/Developer, and the appointed contractor will develop a site-specific construction traffic management plan. Details of the signing layout regimen will be provided in the Construction Traffic

Management Plan, the detail of which is to be agreed with the Planning Authority prior to work commencing on the site.

Construction Traffic Management Plans are typically prepared for developments involving significant construction activity. The management plan should contain measures to mitigate the effects of construction, addressing issues such as traffic management, hours of working, delivery times and methods of prevention of noise and dust, reinstatement of damaged roadways, footways and grass verges, and the accommodation of construction and staff parking within the development during the construction period.

The construction works associated with the proposed development will involve normal construction activities such as excavation, filling, lifting, pumping, pipe laying, concrete works, mechanical installation etc. A detailed Construction Traffic Management Plan will be drawn up prior to the commencement of construction activities (typically prepared together with programme of works upon appointment of a contractor), in order to minimize the impacts to the environment during construction.

The Construction Traffic Management Plan will detail the allowable working day, construction traffic, parking arrangements and will incorporate environmental protection measures. Provisions to reduce the environmental impact of the construction activities will include the following:

- Requiring contractors to ensure that the public roads in the vicinity of the site are maintained free from all mud, dirt and rubbish, which may arise from or by reason of the execution of the works. To facilitate this, the Contractor could be required to provide a wheel cleaning facility to an approved standard within the construction site.

14.7.3 *Operational Stage*

Mitigation measures are not required.

14.8 **Monitoring**

In the construction stage the Resource & Waste Manager will monitor construction vehicle movements in and out of the site to ensure the guidance set out in the Construction Traffic Management Plan is being followed. Monitoring is not required in the operational stage.

14.9 **Cumulative Impacts**

The road network assessments include for specific local developments other than the proposed development. The developments considered are those already in operation or granted planning permission but yet to be implemented and are set out in detail in Section 15.5.4 and in the Traffic and Transport Assessment Report at Appendix 15.1.

Other future development that may give rise to the generation of new traffic on the receiving roads network is included for by the application of TII published growth rates to all traffic on all routes within the study area. The additional traffic generation arising on the receiving road network assumed in this Chapter through the application of the TII growth rates to traffic survey data collected in 2022 is as follows:

- 2022-2025 (Opening Year) +5.5% (LV) +10.9% (HGV)

- 2022-2030 (Opening Year +5yrs) +15.3% (LV) +28.4% (HGV)
- 2022-2040 (Opening Year +15yrs) +22.7% (LV) +47.4% (HGV)

The cumulative traffic arising from future economic growth and development resulting in traffic growth on the receiving road network are included for in both the 'do nothing' and 'do something' road network assessment scenarios. It is reasonable to expect that traffic arising from the proposed development (and the specific developments) would by definition be included, or at least included in part in the TII growth rates. This factor is disregarded in the traffic assessments that all traffic to the proposed development is considered totally new to the road network for the proposed period of operation commencing in 2025.

14.10 Baseline Scenario

If the proposed development does not proceed traffic volumes will be as per the future year 'baseline' or 'do-nothing' scenarios set out in Tables 14.9 through 14.21.

14.11 Residual Impacts

14.11.1 Construction Stage

Construction traffic will be generated by the proposed development. In the interest of simplicity it is assumed that the buildings and facilities will be developed in a single construction phase. For the purposes of this traffic assessment a singular construction period of fourteen months is envisaged.

All concrete and stone input materials can be sourced from local providers within or close to the Greater Dublin Area. All inert excavation or demolition related waste material generated during construction will be removed from the site and transported to and appropriate Soil Recovery Facility.

The primary generators of traffic on the public road network during construction will be construction staff and the delivery of construction materials. Construction materials for are expected to be predominantly structural steel, cladding and concrete. Based on our experience of similar projects it is estimated that no more than 25 no. HGV trips per day would be required to cater for the delivery of these materials to the site during the most intensive construction period. This figure is considered to represent an upper value construction HGV traffic generation. Average construction HGV traffic generation is expected to be in the region of 15 no. HGV trips per day.

Construction plant for the proposed processing facilities proposed under the current application is expected to mainly consist of rigid body vehicles, 8-wheel tippers, ready mix HGV and articulated vehicles.

In the interest of simplicity the traffic assessment does not include for a separate construction period scenario combined with site operation scenarios. It can easily be appreciated that the proposed on site processing facility cannot generate waste traffic until such time as they are constructed. In all cases the HGV traffic generated by the operation of the proposed facility exceeds by more than double that of the respective construction period accordingly it follows that the traffic scenario where the facilities are operational represents a worst case scenario typically associated with the assessment values used in traffic impact studies.

It is the intention of the Applicant to comply with Local Authority policy on maintaining the roads serving the site clean of dirt and debris associated with the development of the site. If further detail

regarding the control of the construction project and specifically the control of construction traffic is required by the Local Authority it is suggested that a detailed Construction Traffic Management Plan can be prepared prior to the project commencing.

The proposed development includes the construction of a private access road and a new development access junction and will involve road improvement works to the existing ESB access road (programmed to become the future North Road link to Cappagh Road). There will also be site preparatory works which include the movement to earth and transport of road construction materials. Notwithstanding that these activities will require a greater number of personnel on site, it is considered highly unlikely that the daily HGV traffic arising during construction will exceed that of the operational phase and is forecast to be half or less of that volume.

It is acknowledged that the construction of the improved section of new link road will need to be carefully phased and co-ordinated with the Roads Authority so ensure that the impact, principally delays to exiting traffic on North Road arising from the initial construction and site preparation works is controlled. There will clearly be some short-term direct impact arising on the ESB access road arising from the road widening and cycleway/footway construction works and these impacts will be commensurate with general road maintenance type works. These works will be prioritised to provide access to the construction site. Delays to existing road users will be limited to users of the existing ESB access road.

14.11.2 Operational Stage

The likely impact of HGV traffic movements on the local road network is forecast not to be significant and for the most part will have a negligible impact on network capacity and operation. Direct impact is limited to a short section of R135 North Road to the south of Huntstown Quarry Access Junction which is currently a lightly trafficked cul-de-sac where the relative increases in traffic flow are high when compared with the existing background network traffic flow.

This section of North Road was formerly the N2 and under the current proposals in the Fingal Development Plan 2023-2029 the existing cul-de-sac is planned to be re-opened to through traffic to facilitate access to zoned lands such as the proposed development site all located north of the M50 and between North Road and Cappagh Road. Access to the development site via the North Road is consistent with the development plan objectives for the proper and sustainable development of the area.

Based upon detailed assessments and standard industry evaluation criteria it is not envisaged that there will be a significant increase in traffic throughput or impact upon capacity at any junction in the vicinity of the site or on the available haul routes.

In terms of the spatial extent of the impact of HGV traffic, it will be limited to the proposed haul route principally along North Road. The impact of HGV traffic on North Road is expected up to medium-term (i.e. 25 years), occurring 5.5 days a week, between the hours of 07:00 and 19:00 (to 14:00 on Saturdays) and are expected to continue as long as the proposed development has license to operate.

14.11.3 Summary of Residual Impacts

Based on the scale and phasing of the development, the haul routes and the implementation of Traffic Management Plan, construction stage traffic will not result in any localised traffic congestion in the vicinity of the development site. Construction traffic will have a negative, not significant, local, likely and temporary impact on the local road network.

In the operational stage the development will have a negative, not significant, likely, local and long term impact on traffic.

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration
Construction Stage	Negative	Not Significant	Local	Likely	Temporary
Operational Stage	Negative	Not Significant	Local	Likely	Long Term

15. INTERACTION OF THE FOREGOING

15.1 Introduction

Previous Chapters describe the impacts associated with the proposed development and the prevention and mitigation measures that will be implemented. This Chapter discusses the significance of the actual and potential direct, indirect and cumulative effects of the changes due to interaction between relevant receptor. It is based on the physical and environmental conditions of the subject site and the predicted impacts of the development.

15.2 Population & Health/Air/Material Assets: - Traffic

The proposed development has the potential to impact on human beings from air quality, traffic movements and noise. The local road network has the capacity to accommodate the additional traffic and the air quality assessment has established that the development will not result in any breaches of ambient air quality limits. The noise assessment has determined that noise from traffic on a section of the North Road will have a not significant/slight impact

15.3 Land & Geology/Biodiversity

The land take will remove the agricultural product value of the site and the biodiversity value of the existing habitat. The impacts were taken into consideration and appropriate mitigation measures identified.

15.4 Climate/Water

The effects of Climate Change were factored into the design of the surface water drainage system. .

15.5 Climate/Traffic/Material Assets

The development will impact on Climate as a result of increased greenhouse gas emissions from traffic and the raw materials consumption in the construction stage and the energy consumption in the operational stage. The cumulative effects will somewhat off-set by the carbon savings associated with the recycling of materials that would otherwise have gone to landfill and incineration.

Table 15.1 Interactions

		Climate	Land & Soil	Water	Biodiversity	Air	Population & Human Health	Landscape & Visual Impact	Archaeology Architecture Cultural Heritage	Material Assets	Materials Assets Traffic
Climate				√						√	√
Land & Soil					√						
Water											
Biodiversity											
Air											
Population & Human Health						√					√
Landscape & Visual Impact											
Archaeology & Cultural Heritage											
Material Assets :											
Material Assets : Traffic											

16. SUMMARY OF MITIGATION MEASURES

16.1 Introduction

This Chapter presents a summary of the mitigation measures that were incorporated into the Design Stage and those that will be implemented in the Construction and Operational Stages.

16.2 Design Stage

16.2.1 Climate

The design of the surface water drainage system took into account the implications of climate change on future rainfall events.

16.2.2 Land & Soil

Given the nature of the development there are no design stage prevention and mitigation measures to reduce the effects of land take.

16.2.3 Water

16.2.3.1 Surface Water Management

The sustainable drainage features include:

- Rainwater harvesting;
- Permeable paving in car parking areas, and
- Underground storage systems where the rainwater run-off will be temporarily retained and discharged to ground.

To protect the water quality an oil interceptor, designed to remove oil to levels that do not present a significant environmental risk, will be installed upstream of the attenuation system and the permeable pavement will incorporate measures to biodegrade the small amount of oils that could occur due to leaks from parked vehicles. These mitigation measures also protect soil quality.

16.2.4 Biodiversity

It was a design objective to retain the existing boundary hedgerows. A detailed landscape plan has been prepared and it is proposed to augment the boundary hedgerows by planting native shrub species. Additional planting of native shrubs will be carried out inside the boundary to compensate for the loss of the internal hedgerow. The operational lighting scheme will be designed to minimise the impact of external lighting upon bat populations by retaining dark areas around the external boundaries.

16.2.5 Air

An odour control system will be installed in the section of the MRF where the odorous wastes will be processed and stored. The system will involve the abstraction of the air and its treatment in a dust filter to remove dusts and carbon filter to reduce odour levels before it is emitted to the air via a stack. The system will be designed to meet the most stringent odour limit value specified by the EPA. The design, installation and operation of the system will require the EPA's prior approval. Fast opening and closing doors will be fitted on the entrances to the bay where odorous wastes are handled.

16.2.6 Population & Human Health

16.2.6.1 Aviation Safety

The building and surface water drainage system design took into consideration the aviation safety limitations imposed by the proximity to Dublin Airport and the approach path to Casement Aerodrome.

16.2.6.2 Fire Safety

The separation distances between the buildings means that a fire outbreak in one will not spread to any of the others. In the MRF the internal separation distances between materials storage areas/bays will comply with the EPA guidance on fire safety. Certified automatic fire detection and alarm systems will be installed in both buildings that cover all internal areas. Six mains water supplied fire hydrants will be installed. To prevent/reduce risk of arson there will be a security fence around Phase 1.

16.2.7 Landscape & Visual Impacts

The building heights were the lowest that allow the safe internal operations and comply with aviation safety requirements. The height of the stack on the odour control system was determined by the by the air dispersion modelling. The colours of the external building materials were selected to be minimise visual intrusion. It was a design objective to retain the hedgerows around the site boundary and supplement them with additional native tree/shrub plants.

16.2.8 Cultural Heritage

Design stage measures are not required.

16.2.9 Material Assets: Built Services

16.2.9.1 Energy Conservation

The energy conservation measures include:

- Roof mounted solar panels to supplement the electricity supply;
- Insulation of pipes conveying heated water in the washing system in the FCCP;
- Provision of energy efficient artificial lighting systems, and
- Provision of electric vehicle charging points.

16.2.9.2 Water Conservation

Rainwater will be harvested for use on site as greywater in the staff toilets.

16.2.9.3 Waste Management

The design measures to minimise waste generation in the construction stage will be identified in the Detailed Resource & Waste Management Plan that will be prepared at the detailed design stage.

16.2.10 Material Assets Traffic & Transport

The design approach was to:

- Prioritise pedestrians and cyclists in urban settings without unduly compromising vehicle movement, and
- Provide good pedestrian access to encourage walking.

Specific design measures include:

- Use of light emitting diode (LED) luminaires to ensure a uniform lighting spread is achieved and dark corners are avoided;
- Provision of segregated footpaths and cycle lanes on the access road from North Road that will become the future link between North Road and Cappagh Road;
- Provision of shared segregated footpaths and cycle lanes on both sides of the entrance road and the use of high quality and slip resistant materials will at dropped crossings to allow access for users of all abilities, and
- The sightlines at the junctions of the service road and North Road and the development access junction will be 120m from a setback of 3m and positioning of roadside features and landscaping not to obstruct visibility for drivers approaching or emerging from these junctions.

16.3 Construction Stage

An Environmental Clerk of Works will be appointed for the duration of the construction stage and will be responsible for ensuring that the following mitigation measures are implemented.

16.3.1 Climate

As the impact of the greenhouse gas emissions from the construction stage will not be significant, mitigation measures are not needed, however the following best practices will be use to minimise emission from construction traffic, diesel powered equipment and waste generation.

- Planning routes to minimise travel distances for the delivery and removal of materials;
- Efficient use of construction equipment, and
- Minimisation of waste generated from construction activities.

16.3.2 *Land & Soil*

The mitigation measures include:

- Restricting the storage and handling of oils and chemicals to dedicated areas;
- Provision of appropriate storage containers and spill containment measures to retain accidental spills;
- Provision of appropriate equipment and staff training to ensure any spills are quickly cleaned up;
- Carrying out the soil stripping and stockpiling in a manner that minimises the risk of erosion, and
- Operating machinery and materials storage in ways that minimise the risk of soil compaction.

16.3.3 *Water*

The mitigation measures include:

- Restricting the storage and handling of oils and chemicals to appropriately constructed dedicated areas;
- The provision of appropriate storage containers and bunds to retain accidental spills;
- Provision appropriate equipment and staff training to ensure any spills are cleaned up quickly, and,
- Prohibiting the wash out of concrete delivery vehicles on-site.

16.3.4 *Biodiversity*

The measures to mitigate the effects on soils, water and human beings are also effective in protecting biodiversity. In addition,

- Before the start of construction works an invasive species survey will be carried out to establish if Third Schedule invasive species have entered the site since the original survey was completed. If such species are identified a site-specific Invasive Species Management Plan will be prepared and implemented during the works;
- The invasive species Buddleia is present but it is easy to control using a mixture of mechanical removal and herbicide treatment. As the plants are mature, the preferred method of treatment is cutting back to a basal stump or grubbing out followed by the application of herbicide;
- Site lighting will be at the lowest level needed for safety and security purposes and wherever possible will be will be restricted to the working area and set up to avoid overspill and shadows on sensitive habitats outside the construction area;

- Where possible trees will be not be removed between the bird breeding season of 1st March and 31st August;

- Before felling a bat specialist will inspect the trees. The felled trees will not be mulched immediately and will be left lying several hours and preferably overnight to allow any bats within the tree to emerge and avoid accidental death, and

- Treelines outside the proposed development area but adjacent to it and thus at risk, will be clearly marked by a bat specialist to avoid any inadvertent damage.

16.3.5 *Air*

The following measures will be implemented:

- Water spraying of exposed earthworks and haul road during dry weather using mobile units;

- Provision of a wheel cleaner at the site entrance;

- Regular inspection of the approach roads and cleaning as needed using a road sweeper;

- Control of vehicle speeds within the site;

- Minimising material drop heights;

- Planning materials delivery and waste removal routes to minimise travel distances, and

- Efficient use of construction equipment and resources.

16.3.6 *Population & Human Health*

16.3.6.1 Noise

Although noise emissions will be short term and will not exceed the construction noise criteria following mitigation measures will be implemented.

- Works will generally be confined to 7am to 7pm Monday to Friday and 8am to 2pm on Saturday;

- Where plant has to operate between 7am and 8am at locations within 100m of sensitive receptors, standard 'beeper' reversing alarms will be replaced with flat spectrum alarms;

- Construction machinery will be maintained in a satisfactory condition, with exhaust silencers fitted and in good working order, and

- Queuing of trucks near off-site receptors and engine idling will be prohibited.

The Environmental Clerk of Works will act as a liaison officer with the local community. Where evening or night-time works are required, the Environmental Clerk of Works will inform the residents.

16.3.7 *Landscape*

Additional tree/shrub planting will be carried out to supplement the boundary hedgerows. The habitat protection measures described in Section 16.3.4 will be implemented.

16.3.8 *Cultural Heritage*

Prior to the start of the construction works a suitably qualified and experienced archaeologist will be appointed to monitor topsoil stripping and excavations in the eastern part of Phase 1. If subsurface features of archaeological interest are identified construction works in the immediate area of such features will stop and the archaeologist consult with the National Monuments Service, Department of Housing, Local Government and Heritage to determine what actions are required and these will be implemented.

16.3.9 *Material Assets: Built Services*

The connection to the electricity grid will be managed by ESB Networks, which should limit any disruption and ensure that residents/ businesses in the affected areas receive advance notice of the planned disruptions. Construction and demolition waste will be minimised by implementing the recommendations of the Resource & Waste Management Plan.

16.3.10 *Material Assets: Roads*

A Construction Traffic Management Plan will be prepared based on a scope agreed in advance with Fingal County Council. The objective will be to minimise traffic disruption in the vicinity of the site and ensure the safety of both residents and construction staff.

16.4 **Operational Stage**

16.4.1 *Climate*

Operational mitigation measures are not required.

16.4.2 *Land & Soil*

The above ground storage tank and bund and the underground sewers will be subject to regular inspection to ensure they remain watertight. The paved areas will be regularly inspected and repaired as required to maintain the structural integrity.

16.4.3 *Water*

The above ground storage tank and bund and the underground sewers will be subject to regular inspection to ensure they remain watertight. The paved areas will be regularly inspected and repaired as required to maintain the structural integrity.

16.4.4 *Biodiversity*

The primary mitigation relates to bats, as these are considered the most sensitive species in relation to night time lighting, but it will also lessen the impact on other nocturnal species such as hedgehog and otter. The lighting scheme design will consider:

- Light emitting diode (LED) type bulbs that do not emit ultraviolet and infra-red wave lengths will be used as these are the least disruptive to the emergence of bats from roosts at dusk, and subsequent movement to foraging areas, and

- The height of the lighting columns will be kept as low as possible, bearing in mind the need to prevent damage by vandalism.

16.4.5 Air

16.4.5.1 MRF

Wastes will only be accepted and handled inside buildings. The doors of the areas where the odorous wastes are handled will only be opened to allow vehicles to enter and leave. In dry weather paved yards will be damped down to prevent dust emissions from moving vehicles. The diesel powered trucks that transport the wastes will fitted with nitrous oxides reduction systems and engine idling will not be permitted. The EPA licence will set emission limit values for the emissions to air from the odour control unit in the MRF, derived from the odour dispersion modelling assessment.

16.4.5.2 FCCPt

Additional mitigation measures are not required.

16.4.6 Population & Human Health

16.4.6.1 Fire Safety

Members of the public will not have access to the facility and only site staff will be permitted inside the processing buildings. Site visitors will be informed of the safety and fire prevention procedures that must be followed and there will be a policy of only smoking in designated areas.

Safe systems of work will be provided and outside contractors will be obliged to undergo safety inductions before being allowed access operational areas. The inductions will address fire procedures, behaviour on site, housekeeping and specific high risk jobs i.e. hot works procedure & permits.

Fire extinguishers will be positioned at selected locations and staff will be trained to extinguish small fires with appropriate hand held fire. If staff members cannot tackle a fire safely and effectively, the evacuation of all personnel will be the primary priority.

16.4.7 Landscape & Visual Impact Assessment

Periodic visits will be carried out by the landscape specialist to ensure that any defects that may occur are rectified, that the planting is establishing and being correctly maintained.

16.4.8 Cultural Heritage

Mitigation measures are not be required.

16.4.9 Material Assets Built Services

Energy efficiency reviews will be conducted regularly and plant and equipment suppliers will be required to ensure that only the most energy efficient are procured. A preventative maintenance programme will be in place for all equipment to ensure their energy efficiency is optimised. To

minimise demand on the mains water supply rainwater run-off from the building roof will be used as 'grey water' in the staff toilets. The roof mounted solar panels will reduce demand on the national grid.

16.4.10 Material Assets: Traffic & Transport

Mitigation measures are not required.

APPENDICES

APPENDIX 3.1

ENGINEERING REPORT



CIVIL & STRUCTURAL

STRUCTURAL • CIVIL • FIRE

Proposed Development at the Huntstown Economic Hub, Co. Fingal for Rathdrinagh Land ULC

Engineering Report (Planning Application)

Made: ..... MJ

Checked:..... PC

Approved:..... PC

Revision	Description	Made	Checked	Approved	Date
A (Final)	Planning	MJ	PC	PC	08/2023

Proposed Industrial Units
at Huntstown Circular Economic Hub,
Huntstown, Fingal, Co Dublin

Engineering Report (Planning Application)

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1. INTRODUCTION

1.1. Background

This report has been prepared by Coyle Civil & Structural Ltd for a warehouse development at the Huntstown Circular Economic Hub, Huntstown, Co. Fingal.

This engineering report sets out the basis for the planning submission in terms of surface/foul drainage and water supply.

2. PROPOSED DEVELOPMENT

The development consists of a development of 2no industrial warehouse units to be constructed on an existing greenfield site at Huntstown/Coldwinters Tds. The entire site area is approximately 9.655 hectares.

3. SITE INFORMATION

3.1 Site Location

The proposed development is located in Huntstown/Coldwinters, Co Fingal.



Figure 1 Site Location Map

3.2 Site Topography

The existing site falls from east to west with a mound to the centre of the site. Existing services to the site are as detailed in Appendix E of this report.

Connection for the foul sewage and watermain supply are proposed to the North Rd using the existing services. The proposed deign in Appendix A outlines the connection points.

4. WATER SUPPLY

This section describes the existing water supply in the vicinity of the site and summarises the proposed watermain infrastructure required to serve the proposed development.

4.1 Proposed Water Supply

The site will be served by new 150mm HDPE water supply ring main. The connection is proposed to be provided from the existing public road, as per the layout in Appendix A via the existing 150mm uPVC watermain. All watermain infrastructure has been designed in accordance with the Irish Water code of Practice.

Refer to Appendix A for the proposed Foul and Surface Water Drainage Layout and for Watermain Layout drawing.

5. FOUL DRAINAGE

It is proposed to provide new separate surface and foul drainage systems to serve the proposed development. This section describes the existing foul drainage services on or near the site and summarises the additional foul drainage infrastructure required to serve the proposed development.

5.1 Existing Foul Drainage

The nearest available connection to the public foul sewer is located to the North Rd, to the east of the site, it is noted that the foul sewage connection point sits outside the site boundaries.

The existing site is not serviced by foul sewage infrastructure.

5.2 Proposed Foul Drainage

The foul sewer branch pipes conveying the effluent from the development to the main foul drainage system will generally consist of 300mm dia pipes. Given the available gradient to the outfall point a 300mm diameter pipe is required to achieve an adequate self cleansing velocity.

The proposed Irish Water Greater Dublin Orbital Sewer route passes through the site as per Appendix F. A consultation meeting was held with Irish Water on the 13th December 2022 where agreement for the proposed warehouse development was provided in principle.

Refer to Appendix A for the proposed Foul and Surface Water Drainage Layout and for Watermain Layout drawing.

5.2.1 Hydraulic & Organic Loading

Daily foul discharge has been estimated based on the proposed development use in accordance with the EPA and Irish Water guidelines.

The projected total wastewater discharge is as shown in Table 5.1 below:

Total Population	l/person/day	l/day	BOD (g/day per person)	Organic Loading (g/day BOD5)
60	60	3600	25	1500

Table 5.1 - Water Supply, Hydraulic and Organic Loading

Max Design Flow:

= 1500 litres per day.

Assuming 6 times dry weather flow (DWF), the peak hydraulic discharge arising from this development is: 0.42 l/second.

The pipe network has been designed to ensure that sufficient hydraulic capacity and cleansing velocities are achieved, in accordance with Irish Water Code of Practice.

Max Organic Load:

=2.5kg (BOD_5)/day.

Population Equivalent Value:

= 60 P.E.

All foul drainage will be constructed in accordance with Greater Dublin Region Code of Practice for Drainage Works and Irish Water requirements.

6. SURFACE WATER DRAINAGE

It is proposed to provide new separate surface and foul drainage systems to serve the proposed development.

This section outlines the existing surface water drainage services onsite and gives our proposals for the additional surface water drainage requirements as part of the development.

6.1 Existing Surface Water Drainage

The existing site generally drains from east to west, all surface water is dissipated through natural infiltration. There is no natural outfall to the site.

Refer to Appendix A for the proposed Foul and Surface Water Drainage Layout and for Watermain Layout drawing.

6.2 Proposed Surface Water Drainage

The surface storm water design consists of the following components.

- SuD's infiltration soakaway with storage capacity.
- Permeable paving to carpark areas
- Rainwater harvesting to building roofs

It is proposed to harvest the rainwater from the building roofs allowing for attenuation of up to 10,000 litres per industrial unit for further use. As such 2no separate surface water drainage systems have been proposed to separate rainwater from the roof and to collect it in the rainwater harvesting tank. A separate surface water system for trafficked hardstand areas and all ground surface rainwater runoff has been proposed and to be discharged through a by-pass petrol interceptor (Klargester). All rainwater from the site will be stored and infiltrated at site, there is therefore no outfall form the site and the as such the controlled flow rate is 0.0 litres per second per hectare (0l/s/ha).

A BRE 365 infiltration test was carried out as part of the site investigation to the site, details of the infiltration rate can be found in Appendix H.

In order to comply with Fingal CoCo Development Plan requirements, it is necessary to include a SuDS based storm water management system in accordance with the Greater Dublin Strategic Drainage Strategy. The above listed SuD's design items are included through the following;

1. Permeable paving to all car parking areas to allow for self infiltration to the subsoil. Given the turning of heavy duty HGV's it is not possible to provide permeable paving to all hardstand areas.
2. Rainwater harvesting is provided to all roof water in the form of underground rain harvesting butts. The retained water will be used for general washing and vehicle washing.
3. The installation of an underground storage cell with subsoil infiltration (soakaway). The drainage from the hardstand yard areas will be directed to a petrol/oil interceptor and in turn to the storage cell to allow for infiltration to the subsoil.

The surface water drainage system has been designed to ensure adequate capacity is achieved with a minimum self-cleansing velocity in the pipes when flowing half full.

It is noted the previous planning application ref FW20A/0063 made reference to an open swale. Open swales or retention ponds are not a viable means of SuDs for this site. Open swales and ponds attract bird life and the proximity of the site to Dublin Airport would increase the risk to aircraft from increased bird number. This above is addressed further in the Aviation Consultants report accompanying the application.

Refer to Appendix A for the proposed Foul and Surface Water Drainage Layout and for Watermain Layout drawing.

All surface water drainage shall be constructed in accordance with Greater Dublin Region Code of Practice for Drainage Works

7. SUMMARY

- Separate foul and surface water drainage systems will be constructed to serve the site.
- Separate surface water system to collect and harvest water from the roofs for re-use has been proposed.
- Sustainable Drainage Systems designed for the proposed development include: permeable paving to staff car park, rainwater harvesting system, storage and infiltration (soakaway) system.

APPENDIX A
PROPOSED DRAINAGE & WATERMAIN DRAWING

- (AV) On-line Air Valve as per STD-W-22
- (SV) Sluice Valve as per STD-W-15
- (WH) Washout Hydrant as per STD-W-30A with Scour Chamber as per STD-W-30B
- (H) Off-line Hydrant as per STD-W-19
- WM Electromagnetic Meter chamber as per STD-W-26

GREYWATER INLET PIPE TO BUILDING

10,000 LITRE KINGSPAN KLARGESTER BELOW GROUND RAINWATER HARVESTING SYSTEM (ENV0350TKSW)

PROPOSED SUDS BASED PERMEABLE PAVING TO CARPARK AREA

10,000 LITRE KINGSPAN KLARGESTER BELOW GROUND RAINWATER HARVESTING SYSTEM (ENV0350TKSW)

GREYWATER INLET PIPE TO BUILDING

Drainage storage with infiltration - Geocellular storage 20m x 96m. Stormblock Optimum 0.8m x 0.8m x 0.66m, two layers of 3000 pcs, 2407m³ volume. 2335m³ required storage, 72m³ spare capacity.

By-pass Petrol Interceptor Klargester NSBE040 or similar approved

F.F.L. +78.700

G.L. +78.600

Approx location of overhead lines

NOTES:-

This is a planning drawing only and is therefore limited in its capacity to convey the total information, details & specification necessary to complete the works. Any work carried out that is not covered here will be the resonsibility of the persons carrying them out. If any situation arises which would cause a contravention of the building regulations, then the Engineer should be consulted, otherwise the Engineer cannot be held responsible. As these drawings are prepared as planning drawings only, it is strongly recommended that the Engineer be consulted for the preparation of full working drawings. It is solely the clients responsibility to appoint a Qualified Engineer to supervise the project during the construction stage and to prepare structural working drawings for the builder.

ALL WORK AND MATERIALS ARE TO BE IN ACCORDANCE WITH THE CURRENT BUILDING REGULATIONS WHETHER DETAILED ON THIS DRAWING OR NOT.

All dimensions to be taken on site. Do not scale any dimensions from this drawing. This drawing is to be read in conjunction with all other relevant drawings and specifications etc that are issued.

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Project:
Huntstown Circular Economy Hub
Huntstown/Coldwinters, Fingal, Co Dublin

Client: Rathdrinagh Land ULC T/A Irish Recycling

Sheet Title: Drainage & Watermain Layout - Sheet 1

Project No.:		Date:	
22-039		07-03-23	
Drawing No.: C-100.	Scale: As shown.	Rev:	Checked: PC

NOTES:-

This is a planning drawing only and is therefore limited in its capacity to convey the total information, details & specification necessary to complete the works. Any work carried out that is not covered here will be the resonsibility of the persons carrying them out. If any situation arises which would cause a contravention of the building regulations, then the Engineer should be consulted, otherwise the Engineer cannot be held responsible. As these drawings are prepared as planning drawings only, it is strongly recommended that the Engineer be consulted for the preparation of full working drawings. It is solely the clients responsibility to appoint a Qualified Engineer to supervise the project during the construction stage and to prepare structural working drawings for the builder.

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Connection to existing 6" uPVC pipe as per STD-W-05

Outfall to existing manhole

F.F.L. +78.700

ESB Pylon

Approx location of overhead lines

FINGLAS 220KV STATION

Coyle CIVIL & STRUCTURAL

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Project:
Huntstown Circular Economy Hub
Huntstown/Coldwinters, Fingal, Co Dublin

Client: Rathdrinagh Land ULC T/A Irish Recycling

Sheet Title: Drainage & Watermain Layout - Sheet 2

Project No.:		Date:	
22-039.		07-03-23	
Drawing No.: C-101.	Scale: As shown.	Rev:	Checked: PC

APPENDIX B
DRAINAGE SCEDULE

Document Ref; **HCEH Drainage schedule (S3 P1) (1)**

Project: HCEH
Zone: -
Description: Surface Drainage
Network: As shown
Area: -

Schedule Rev.: P1
Drawing Ref.: P0
(including rev.) -

	Issued;	Checked;	Approved;
Name	MJ	MJ	PC
Date	01/03/2023	01/03/2023	01/03/2023

	Pipe Details								*Upstream*						*Downstream*				
Network	Pipe Ref.	Length (m)	Gradient (1:xxx)	Full Bore Vel (m/s)	Internal Dia. (mm)	Pipe Capacity (l/s)	Flow (l/s)	Bedding Type	Chamber Ref.	Chamber Type	Cover Type	Pipe Invert Level (mAOD)	Cover Level (mAOD)	Pipe Cover Depth (m)	Chamber Ref.	Pipe Invert Level (mAOD)	Cover Level (mAOD)	Pipe Cover Depth (m)	Notes
Surface Drainage	S1.000	83.838	296.5	0.75	225	30.0	20.8	Type S	S1	Type C	C1	77.175	78.600	1.200	S4	76.892	78.600	1.483	
	S2.000	49.128	296.0	0.75	225	30.0	29.2	Type Z	S2	Type C	C1	78.430	78.600	-0.055	S3	78.264	78.600	0.111	Drainage run to be replaced with Aco drain and connected to manhole S3 if required
	S2.001	46.864	400.3	0.78	300	55.1	49.7	Type S	S3	Type C	C1	78.189	78.600	0.111	S4	78.072	78.600	0.228	
	S1.001	21.882	121.6	1.42	300	100.7	69.0	Type S	S4	Type C	C1	76.817	78.600	1.483	S17	76.637	78.600	1.663	
	S3.000	52.048	296.9	0.75	225	30.0	28.5	Type S	S5	Type C	C1	77.175	78.600	1.200	S6	77.000	78.600	1.375	
	S3.001	56.759	392.8	0.79	300	55.6	55.1	Type S	S6	Type C	C1	76.925	78.600	1.375	S7	76.780	78.600	1.520	
	S3.002	45.702	392.8	0.79	300	55.6	55.1	Type S	S7	Type C	C1	76.780	78.600	1.520	S14	76.664	78.600	1.636	
	S4.000	51.500	51.5	1.41	150	24.8	21.0	Type S	S8	Type C	C1	80.110	81.460	1.200	S9	79.110	80.460	1.200	
	S4.001	25.777	56.0	1.75	225	69.6	27.9	Type S	S9	Type C	C1	79.035	80.460	1.200	S10	78.575	80.000	1.200	
	S4.002	56.270	48.9	1.87	225	74.5	39.6	Type S	S10	Type C	C1	78.575	80.000	1.200	S11	77.425	78.850	1.200	
	S4.003	55.686	385.0	0.80	300	56.2	53.4	Type S	S11	Type C	C1	77.350	78.850	1.200	S12	77.205	80.000	2.495	
	S4.004	59.128	500.0	0.80	375	88.7	61.3	Type S	S12	Type C	C1	77.130	80.000	2.495	S13	77.012	79.200	1.813	
	S4.005	55.125	500.0	0.80	375	88.7	69.5	Type S	S13	Type C	C1	77.012	79.200	1.813	S14	76.902	78.600	1.323	
	S3.003	13.317	500.0	0.90	450	143.5	115.6	Type S	S14	Type C	C1	76.514	78.600	1.636	S17	76.487	78.600	1.663	
	S5.000	76.818	295.5	0.76	225	30.0	27.5	Type Z	S15	Type C	C1	78.240	78.600	0.135	S16	77.980	78.600	0.395	Drainage run to be replaced with Aco drain and connected to manhole S16 if required
	S5.001	2.984	14.7	3.43	225	136.4	27.5	Type S	S16	Type C	C1	77.980	78.600	0.395	S17	77.777	78.600	0.598	
	S1.002	10.439	500.0	0.99	525	215.4	195.1	Type S	S17	Type C	C1	76.412	78.600	1.663	S34	76.391	78.600	1.684	
	S6.000	41.830	98.9	1.01	150	17.9	6.1	Type S	Saj18	Access Junction	C1	77.250	78.600	1.200	Saj19	76.827	78.600	1.623	
	S6.001	18.553	174.6	0.76	150	13.4	11.1	Type S	Saj19	Access Junction	C1	76.827	78.600	1.623	Saj20	76.721	78.600	1.729	
	S6.002	30.000	296.1	0.75	225	30.0	26.2	Type S	Saj20	Access Junction	C1	76.646	78.600	1.729	Saj21	76.544	78.600	1.831	
	S6.003	40.000	426.5	0.76	300	53.4	43.8	Type S	Saj21	Access Junction	C1	76.469	78.600	1.831	Saj24	76.376	78.600	1.924	
	S7.000	41.830	175.3	0.76	150	13.4	11.0	Type S	Saj22	Access Junction	C1	77.250	78.600	1.200	Saj23	77.011	78.600	1.439	
	S7.001	40.000	296.5	0.75	225	30.0	20.6	Type S	Saj23	Access Junction	C1	76.936	78.600	1.439	Saj24	76.802	78.600	1.573	
	S6.004	12.654	500.0	0.80	375	88.7	62.3	Type S	Saj24	Access Junction	C1	76.301	78.600	1.924	Saj32	76.275	78.600	1.950	
	S8.000	41.841	175.1	0.76	150	13.4	12.5	Type S	Saj25	Access Junction	C1	77.250	78.600	1.200	Saj26	77.011	78.600	1.439	
	S8.001	45.574	296.1	0.75	225	30.0	23.5	Type S	Saj26	Access Junction	C1	76.936	78.600	1.439	Saj27	76.782	78.600	1.593	
	S8.002	31.174	426.5	0.76	300	53.4	38.8	Type S	Saj27	Access Junction	C1	76.707	78.600	1.593	Saj30	76.634	78.600	1.666	
	S9.000	41.830	168.2	0.77	150	13.6	13.6	Type S	Saj28	Access Junction	C1	77.250	78.600	1.200	Saj29	77.001	78.600	1.449	
	S9.001	51.805	238.5	0.84	225	33.5	26.0	Type S	Saj29	Type C	C1	76.926	78.600	1.449	Saj30	76.709	78.600	1.666	
	S8.004	54.998	219.0	1.22	375	134.8	62.3	Type S	Saj31	Access Junction	C1	76.526	78.600	1.699	Saj32	76.275	78.600	1.950	
	S6.005	21.668	500.0	0.90	450	143.5	116.4	Type S	Saj32	Access Junction	C1	76.200	78.600	1.950	Saj33	76.157	78.600	1.993	
	S6.006	4.714	500.0	0.90	450	143.5	116.4	Type S	Saj33	Access Junction	C1	76.157	78.600	1.993	S34	76.148	78.600	2.002	
	S1.003	5.238	500.0	1.08	600	306.0	303.1	Type S	S34	Type C	C1	75.998	78.600	2.002	S Outfall	75.987	78.600	2.013	Outfall to storage and infiltration
Foul Drainage	F1.000	41.331	241.7	1.01	300	71.2	2.4	Type S	Faj1	Access Junction	C1	78.132	78.600	0.168	F2	77.961	78.600	0.339	
	F2.000	1.480	58.5	1.01	100	7.9	0.0	Type S	S3	Type C	C1	78.187	78.600	0.313	F2	78.161	78.600	0.339	
	F1.001	30.397	241.7	1.01	300	71.2	2.4	Type S	F2	Type C	C1	77.961	78.600	0.339	F3	77.836	78.600	0.464	
	F1.002	21.882	59.0	2.05	300	144.9	4.8	Type S	F3	Type C	C1	77.836	78.600	0.464	F5	77.465	78.600	0.835	
	F3.000	1.694	58.5	1.01	100	7.9	0.0	Type S	S16	Type C	C1	77.981	78.600	0.519	F4	77.952	78.600	0.548	
	F3.001	16.808	58.5	1.01	100	7.9	0.0	Type S	F4	Type C	C1	77.952	78.600	0.548	F5	77.665	78.600	0.835	
	F1.003	45.461	240.8	1.01	300	71.3	4.8	Type S	F5	Type C	C1	77.465	78.600	0.835	F10	77.276	79.100	1.524	
	F4.000	41.382	240.6	1.01	300	71.3	2.4	Type S	Faj6	Access Junction	C1	78.141	78.600	0.159	Faj7	77.969	78.600	0.331	
	F4.001	30.879	111.9	1.49	300	105.0	2.4	Type S	Faj7	Access Junction	C1	77.969	78.600	0.331	Faj8	77.693	78.600	0.607	
	F4.002	33.646	241.1	1.01	300	71.3	2.4	Type S	Faj8	Access Junction	C1	77.693	78.600	0.607	F9	77.553	79.000	1.147	
	F4.003	20.941	75.6	1.81	300	127.9	2.4	Type S	F9	Type C	C1	77.553	79.000	1.147	F10	77.276	79.100	1.524	
	F1.004	42.899	241.1	1.01	300	71.3	7.2	Type S	F10	Type C	C1	77.276	79.100	1.524	F11	77.098	79.500	2.102	
	F1.005	39.504	241.1	1.01	300	71.3	7.2	Type S	F11	Type C	C1	77.098	79.500	2.102	F12	76.934	80.010	2.776	
	F1.006	66.505	241.1	1.01	300	71.3	7.2	Type S	F12	Type C	C1	76.934	80.010	2.776	F13	76.659	79.800	2.841	
	F1.007	71.290	241.1	1.01	300	71.3	7.2	Type S	F13	Type C	C1	76.659	79.800	2.841	F14	76.363	79.720	3.057	
	F1.008	55.075	241.1	1.01	300	71.3	7.2	Type S	F14	Type C	C1	76.363	79.720	3.057	F15	76.134	80.640	4.206	
	F1.009	12.865	241.1	1.01	300	71.3	7.2	Type S	F15	Type C	C1	76.134	80.640	4.206	F16	76.081	80.640	4.259	
	F1.010	50.956	241.1	1.01	300	71.3	7.2	Type S	F16	Type C	C1	76.081	80.640	4.259	F17	75.870	80.000	3.830	
	F1.011	48.647	241.1	1.01	300	71.3	7.2	Type S	F17	Type C	C1	75.870	80.000	3.830	F18	75.668	78.000	2.032	
	F1.012	55.188	241.1	1.01	300	71.3	7.2	Type S	F18	Type C	C1	75.668	78.000	2.032	F19	75.439	78.200	2.461	
	F1.013	39.881	241.1	1.01	300	71.3	7.2	Type S	F19	Type C	C1	75.439	78.200	2.461	F20	75.274	78.450	2.876	
	F1.014	23.246	241.1	1.01	300	71.3	7.2	Type S	F20	Type C	C1	75.274	78.450	2.876	F21	75.177	78.750	3.273	

Document Ref; **HCEH Drainage schedule (S3 P1) (1)**

	F1.015	36.852	241.1	1.01	300	71.3	7.2	Type S	F21	Type C	C1	75.177	78.750	3.273	F22	75.024	78.670	3.346	
	F1.016	57.820	241.1	1.01	300	71.3	7.2	Type S	F22	Type C	C1	75.024	78.670	3.346	F23	74.785	78.180	3.095	
	F1.017	8.342	241.1	1.01	300	71.3	7.2	Type S	F23	Type C	C1	74.785	78.180	3.095	F Outfall	74.750	78.155	3.105	Outfall to existing foul network

Notes

1. All covers to new chambers shall be positioned to be opened and the chamber accessed without obstruction. Chamber covers to be orientated to avoid obstructing access where located in close proximity to a safety barrier, where applicable.
2. All man entry chambers shall have access arranged such that the user faces oncoming traffic when entering and exiting.
3. Pipe Cover Depth is distance between finished ground surface level and pipe soffit level.

APPENDIX C
INFILTRATION (SOAKAWAY) STORAGE CALCULATION

SURFACE WATER ATTENUATION & STORAGE

Version 1.04

INPUT			
Total Area to be Drained		24,100	Sq m
Impermeability Factor		0.9	
Storm Return Period	T	100	Yrs
Allowable Discharge **per hectare**		0.00	l/s
Time of Concentration	TC	4.00	min
2 Day M5 (mm) =		53.00	mm
Ratio 60 Minute M5/2 Day M5	r	0.31	
Impermeable Area		21690	Sq m
Allowable Discharge	P	0.00	Cu m/min
60 Minute M5		16.50	mm
Storage Event		Maximum Event	

Storage C = Q*TS - P*(TS + TC) + P^2*TC/Q

W = LN(1.06 * M5-60/(48*r))
X = LN(721/(1 + 15 * D))
Y = LN(48 * r/1.06)
Z = LN(721/16)
LN(M5-D) = LN(D) + W + (X * Y)/Z

Cr = J0 + J1 * (M5-D) + J2 * (M5-D)^2

LN((MT-D)/M5-D)) = Cr * (LN(T) - 1.5)

Project No.:	**HCEH**
Project:	**HCEH**
Date:	**16-Feb-2023**
Designer:	**MJK**

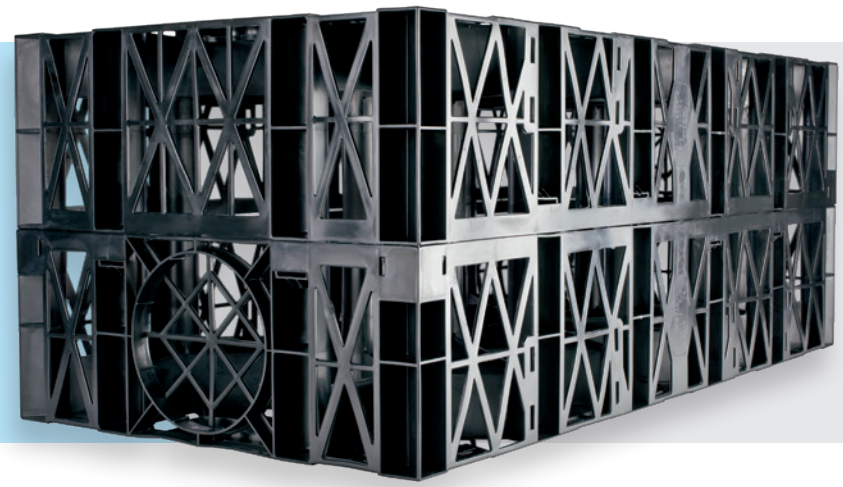
Time of Storm TS	Time of Storm D	Time of Concentration TC	W	X	Y	Z	LN(D)	LN(M5-D)	M5-D	Rainfall Intensity	J0	J1	J2	Cr	M100-D	Rainfall Intensity +20%	Discharge to Storage	Discharge to Storage Q	Storage Required C
Minutes	Hours	Minutes							mm	mm/hr					mm	mm/hr	l/s	Cu.m/min	Cu. m
3	0.050	4.0	0.157	6.021	2.646	3.808	-2.996	1.345	3.839	76.787	0.165	0.008	-0.000305	0.192	6.975	167.410	1008.646	60.519	181.56
5	0.083	4.0	0.157	5.770	2.646	3.808	-2.485	1.682	5.374	64.483	0.165	0.008	-0.000305	0.201	10.023	144.335	869.616	52.177	260.88
7	0.117	4.0	0.157	5.569	2.646	3.808	-2.148	1.879	6.544	56.091	0.165	0.008	-0.000305	0.206	12.416	127.712	769.462	46.168	323.17
10	0.167	4.0	0.157	5.328	2.646	3.808	-1.792	2.068	7.906	47.437	0.165	0.008	-0.000305	0.212	15.252	109.817	661.648	39.699	396.99
13	0.217	4.0	0.157	5.134	2.646	3.808	-1.529	2.195	8.981	41.450	0.165	0.008	-0.000305	0.215	17.511	96.983	584.322	35.059	455.77
16	0.267	4.0	0.157	4.971	2.646	3.808	-1.322	2.290	9.873	37.024	0.165	0.008	-0.000305	0.217	19.389	87.250	525.678	31.541	504.65
20	0.333	4.0	0.157	4.789	2.646	3.808	-1.099	2.386	10.873	32.619	0.165	0.008	-0.000305	0.219	21.486	77.349	466.026	27.962	559.23
25	0.417	4.0	0.157	4.600	2.646	3.808	-0.875	2.478	11.916	28.600	0.165	0.008	-0.000305	0.221	23.654	68.123	410.444	24.627	615.67
30	0.500	4.0	0.157	4.441	2.646	3.808	-0.693	2.550	12.803	25.607	0.165	0.008	-0.000305	0.222	25.471	61.129	368.305	22.098	662.95
45	0.750	4.0	0.157	4.075	2.646	3.808	-0.288	2.701	14.898	19.864	0.235	-0.001	-0.000017	0.220	29.462	47.139	284.011	17.041	766.83
60	1.000	4.0	0.157	3.808	2.646	3.808	0.000	2.803	16.500	16.500	0.235	-0.001	-0.000017	0.217	32.417	38.900	234.374	14.062	843.75
75	1.250	4.0	0.157	3.597	2.646	3.808	0.223	2.880	17.818	14.254	0.235	-0.001	-0.000017	0.216	34.811	33.419	201.347	12.081	906.06
90	1.500	4.0	0.157	3.424	2.646	3.808	0.405	2.942	18.948	12.632	0.235	-0.001	-0.000017	0.214	36.838	29.470	177.559	10.654	958.82
105	1.750	4.0	0.157	3.276	2.646	3.808	0.560	2.993	19.945	11.397	0.235	-0.001	-0.000017	0.213	38.603	26.471	159.487	9.569	1004.77
120	2.000	4.0	0.157	3.147	2.646	3.808	0.693	3.037	20.841	10.421	0.235	-0.001	-0.000017	0.211	40.172	24.103	145.223	8.713	1045.61
135	2.250	4.0	0.157	3.032	2.646	3.808	0.811	3.075	21.658	9.626	0.235	-0.001	-0.000017	0.210	41.588	22.180	133.635	8.018	1082.44
150	2.500	4.0	0.157	2.930	2.646	3.808	0.916	3.110	22.411	8.964	0.235	-0.001	-0.000017	0.209	42.879	20.582	124.006	7.440	1116.05
165	2.750	4.0	0.157	2.837	2.646	3.808	1.012	3.140	23.110	8.404	0.235	-0.001	-0.000017	0.208	44.068	19.230	115.858	6.951	1147.00
180	3.000	4.0	0.157	2.752	2.646	3.808	1.099	3.168	23.764	7.921	0.235	-0.001	-0.000017	0.207	45.170	18.068	108.861	6.532	1175.70
240	4.000	4.0	0.157	2.470	2.646	3.808	1.386	3.260	26.043	6.511	0.250	-0.002	0.000012	0.204	48.992	14.698	88.554	5.313	1275.17
300	5.000	4.0	0.157	2.250	2.646	3.808	1.609	3.330	27.942	5.588	0.250	-0.002	0.000012	0.201	52.116	12.508	75.359	4.522	1356.47
360	6.000	4.0	0.157	2.070	2.646	3.808	1.792	3.387	29.586	4.931	0.250	-0.002	0.000012	0.198	54.785	10.957	66.016	3.961	1425.96
420	7.000	4.0	0.157	1.917	2.646	3.808	1.946	3.435	31.045	4.435	0.250	-0.002	0.000012	0.196	57.130	9.794	59.007	3.540	1486.99
480	8.000	4.0	0.157	1.785	2.646	3.808	2.079	3.477	32.362	4.045	0.250	-0.002	0.000012	0.195	59.230	8.884	53.529	3.212	1541.63
540	9.000	4.0	0.157	1.668	2.646	3.808	2.197	3.514	33.568	3.730	0.250	-0.002	0.000012	0.193	61.136	8.151	49.112	2.947	1591.24
600	10.000	4.0	0.157	1.563	2.646	3.808	2.303	3.546	34.683	3.468	0.250	-0.002	0.000012	0.192	62.886	7.546	45.467	2.728	1636.80
660	11.000	4.0	0.157	1.469	2.646	3.808	2.398	3.576	35.721	3.247	0.250	-0.002	0.000012	0.190	64.508	7.037	42.399	2.544	1679.00
720	12.000	4.0	0.157	1.382	2.646	3.808	2.485	3.603	36.695	3.058	0.250	-0.002	0.000012	0.189	66.020	6.602	39.777	2.387	1718.38
780	13.000	4.0	0.157	1.303	2.646	3.808	2.565	3.627	37.613	2.893	0.250	-0.002	0.000012	0.188	67.440	6.225	37.507	2.250	1755.33
840	14.000	4.0	0.157	1.229	2.646	3.808	2.639	3.650	38.483	2.749	0.250	-0.002	0.000012	0.187	68.779	5.895	35.520	2.131	1790.19
900	15.000	4.0	0.157	1.160	2.646	3.808	2.708	3.672	39.311	2.621	0.250	-0.002	0.000012	0.186	70.048	5.604	33.763	2.026	1823.21
960	16.000	4.0	0.157	1.096	2.646	3.808	2.773	3.691	40.100	2.506	0.250	-0.002	0.000012	0.185	71.255	5.344	32.198	1.932	1854.62
1020	17.000	4.0	0.157	1.035	2.646	3.808	2.833	3.710	40.856	2.403	0.250	-0.002	0.000012	0.184	72.406	5.111	30.794	1.848	1884.57
1080	18.000	4.0	0.157	0.979	2.646	3.808	2.890	3.728	41.581	2.310	0.250	-0.002	0.000012	0.183	73.507	4.900	29.525	1.772	1913.24
1140	19.000	4.0	0.157	0.925	2.646	3.808	2.944	3.744	42.279	2.225	0.250	-0.002	0.000012	0.183	74.563	4.709	28.373	1.702	1940.74
1400	23.333	4.0	0.157	0.720	2.646	3.808	3.150	3.807	45.034	1.930	0.250	-0.002	0.000012	0.180	78.713	4.048	24.390	1.463	2048.74
1900	31.667	4.0	0.157	0.415	2.646	3.808	3.455	3.901	49.459	1.562	0.250	-0.002	0.000012	0.176	85.310	3.233	19.478	1.169	2220.45
2200	36.667	4.0	0.157	0.269	2.646	3.808	3.602	3.946	51.732	1.411	0.227	-0.001	0.000003	0.174	88.668	2.902	17.484	1.049	2307.85
2300	38.333	4.0	0.157	0.225	2.646	3.808	3.646	3.960	52.441	1.368	0.227	-0.001	0.000003	0.173	89.711	2.808	16.920	1.015	2335.01

MAXIMUM STORAGE REQUIRED (Cu. M) = 2335.01

APPENDIX D
SOAKAWAY STORAGE SYSTEM SPEC SHEETS

Product Datasheet

AquaCell Eco



Product description

AquaCell Eco is manufactured from specially reformulated, recycled material and has been specifically designed for shallow, non-trafficked, landscaped applications. AquaCell Eco is NOT suitable for locations subject to high water tables.

Technical specification

Product code / SAP code	6LB025 / 4040289	**Void ratio**	95%
Colour	Black	**Material**	Recycled PP
Dimensions	1m x 0.5m x 0.4m	**Vertical loading**	21.3 tonnes/m^2 (213 kN/m^2)
Weight	7kg	**Lateral loading**	5.2 tonnes/m^2 (52 kN/m^2)
Storage volume	190 litres	**BBA approval**	Certificate 03/4018

Maximum installation depths

Typical soil type	**Maximum depth of installation – to base of units (m)[1]**		
	Soil weight kN/m^3	**Angle of internal friction φ (degrees)[2, 3]**	**Landscaped areas**
Over consolidated stiff clay	20	24	1.53
Silty sandy clay	19	26	1.68
Loose sand and gravel	18	30	2.08
Medium dense sand and gravel	19	34	2.35
Dense sand and gravel	20	38	2.68

Minimum cover depths

	Landscaped areas
Minimum cover depth (m)	0.30[3]

1. These values relate to installations where the groundwater is a minimum of one metre below the base of the excavation.
2. AquaCell Eco units should not be used where groundwater is present.
3. 0.5m cover is required where a ride-on mower may be used.

Assumptions made:
- Ground surface is horizontal
- Shear planes or other weaknesses are not present within the structure of the soil

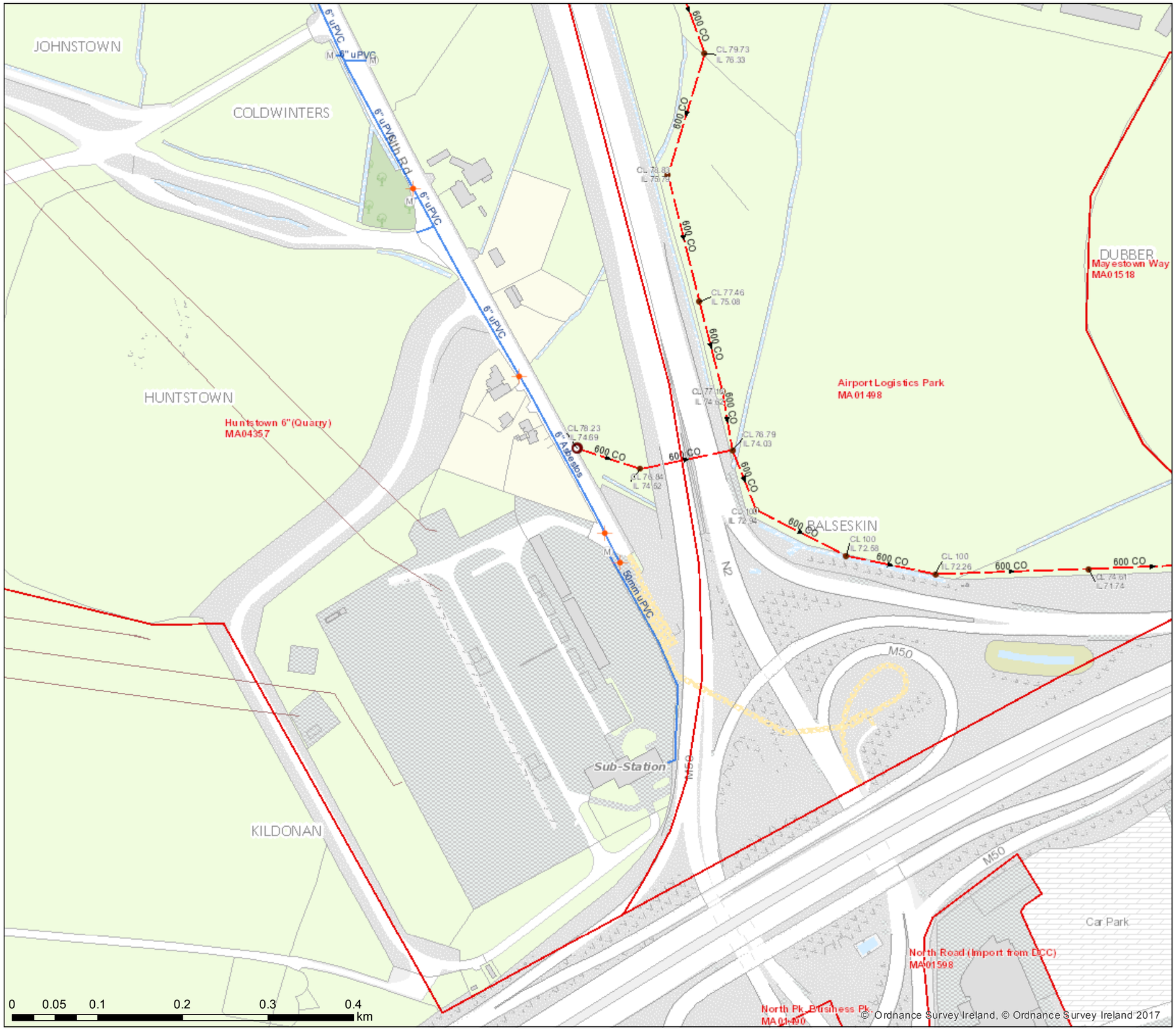
Source: BBA

Wavin Ireland Ltd | Balbriggan | Co Dublin | K32 K840
Tel 01 8020200 | **Email** info.ie@wavin.com | **Website** www.wavin.ie

June 2021

APPENDIX E
EXISTING WATERMAIN LAYOUT
(IRISH WATER)

Balseskin, North Road



UISCE ÉIREANN : IRISH WATER

Print Date: 18/08/2022

Printed by:Irish Water

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Service connection pipes are not generally shown but their presence should be anticipated.

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(including maps or mapping data).
NOTE: DIAL BEFORE YOU DIG Phone: 1850 427 747 or e-mail dig@gasnetworks.ie - The actual position of the gas/electricity distribution and transmission network must be verified on site before any mechanical excavating takes place. If any mechanical excavation is proposed, hard copy maps must be requested from GNI re gas. All work in the vicinity of gas distribution and transmission network must be completed in accordance with the current edition of the Health & Safety Authority publication,
'Code of Practice For Avoiding Danger From Underground Services' which is available from the Health and Safety Authority (1890 28 93 89) or can be downloaded free of charge at www.hsa.ie."

Water Distribution Network
- Water Treatment Plant
- Water Pump Station
- Storage Cell/Tower
- Dosing Point
- Meter Station
- Abstraction Point
- Telemetry Kiosk

Reservoir
- Potable
- Raw Water

Water Distribution Mains
- Irish Water
- Private

Trunk Water Mains
- Irish Water
- Private

Water Lateral Lines
- Irish Water
- Non IW
- Water Casings
- Water Abandoned Lines
- Boundary Meter
- Bulk/Check Meter
- Group Scheme
- Source Meter
- Waste Meter
- Unknown Meter ; Other Meter
- Non-Return
- PRV
- PSV
- Sluice Line Valve Open/Closed
- Butterfly Line Valve Open/Closed
- Sluice Boundary Valve Open/Closed
- Butterfly Boundary Valve Open/Closed
- Scour Valves
- Single Air Control Valve
- Double Air Control Valve
- Water Stop Valves
- Water Service Connections
- Water Distribution Chambers
- Water Network Junctions
- Pressure Monitoring Point
- Fire Hydrant
- Fire Hydrant/Washout

Water Fittings
- Cap
- Reducer
- Tap
- Other Fittings

Sewer Foul Combined Network
- Waste Water Treatment Plant
- Waste Water Pump station

Sewer Mains Irish Water
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow

Sewer Mains Private
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow
- Sewer Lateral Lines
- Sewer Casings

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Inlet Type
- Gully
- Standard
- Other; Unknown

Storm Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Gas Networks Ireland
- Transmission High Pressure Gasline
- Distribution Medium Pressure Gasline
- Distribution Low Pressure Gasline

ESB Networks

ESB HV Lines
- HV Underground
- HV Overhead
- HV Abandoned

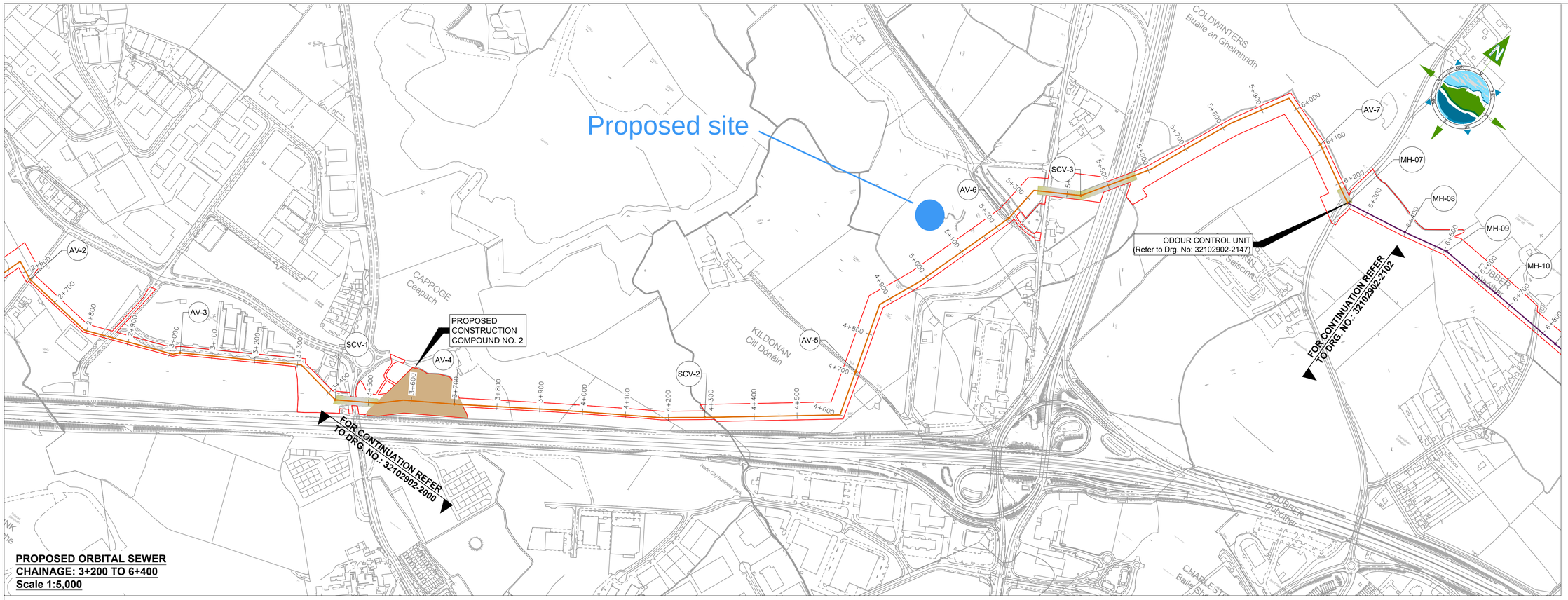
ESB MVLV Lines
- MV Overhead Three Phase
- MV Overhead Single Phase
- LV Overhead Three Phase
- LV Overhead Single Phase
- MVLV Underground
- Abandoned

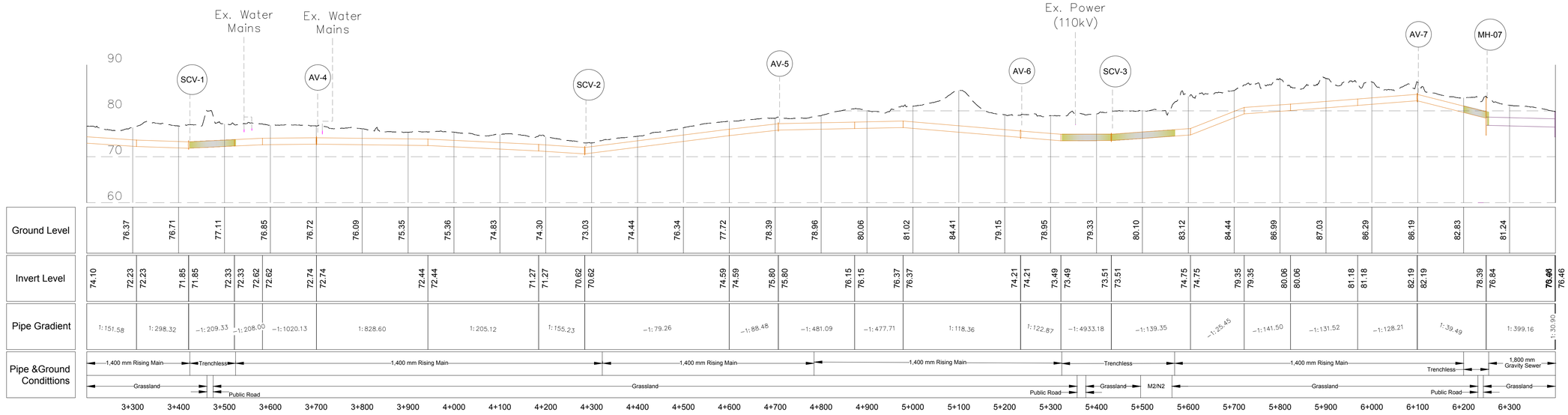
Non Service Categories
- Proposed
- Under Construction
- Out of Service
- Decommissioned

Water Non Service Assets
- Water Point Feature
- Water Pipe
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

APPENDIX F
IRISH WATER GREATER DUBLIN ORBITAL SEWER





PROPOSED ORBITAL SEWER
CHAINAGE: 3+200 TO 6+400
Scale H-1:5,000 / V-1:500

LEGEND:

- PLANNING BOUNDARY
- CONSTRUCTION COMPOUNDS
- PROPOSED WWTP/PS
- PROPOSED ORBITAL SEWER ROUTE (GRAVITY)
- PROPOSED ORBITAL SEWER ROUTE (RISING MAIN)
- PROPOSED OUTFALL PIPELINE ROUTE (LAND BASED SECTION)
- PROPOSED OUTFALL PIPELINE ROUTE (MARINE SECTION)
- PROPOSED TRENCHLESS SECTION
- MANHOLE (MH-1)
- ACCESS CHAMBER (AC-1)
- AIR VALVE (AV-1)
- SCOUR VALVE (SCV-1)

OSI 1:2,500 Sheet No's:
3062-D, 3063-C, 3063-D, 3064-C, 3064-D, 3130-A, 3130-B, 3130-C, 3130-D, 3131-A.

OSI 1:1,000 Sheet No's:
3063-12, 3063-13, 3063-14, 3063-15, 3064-11, 3064-12, 3129-15, 3129-20, 3129-25, 3130-06, 3130-07, 3130-11, 3130-12, 3130-15, 3130-16, 3130-17, 3130-21, 3130-22, 3131-01, 3131-06, 3131-07.

NOTES:

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING.
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
3. ENGINEER/EMPLOYERS REPRESENTATIVE, AS APPROPRIATE, TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
4. THE CONTRACTOR SHALL UNDERTAKE A THOROUGH CHECK FOR THE ACTUAL LOCATION OF ALL SERVICES/UTILITIES, ABOVE AND BELOW GROUND, BEFORE ANY WORK COMMENCES.
5. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev	Date	Description	By	Chkd.
P01	08.06.18	ISSUE FOR PLANNING	AOC	BD

Client: UISCE ÉIREANN / IRISH WATER

Project: Greater Dublin Drainage

Title: PROPOSED ORBITAL SEWER ROUTE - Sheet 2 of 4 -

Scale @ A1:	As Shown		
Prepared by: A. O'Callaghan	Checked: B. Downes	Date: June 2018	
Project Director:	C. O'Keeffe		
Drawing Status:	Planning		

JACOBS TOBIN Patrick J. Tobin & Co. Ltd.

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APPENDIX G
IRISH WATER CORRESPONDENCE

Peter Coyle <peter@coylecs.ie>

FW: Greater Dublin Drainage Project IW/10001369/WL/11a Landowner:- Rathdrinagh Land Ltd.

Paul McCarthy <paul.mccarthy@sretaw.ie> 23 March 2023 at 08:13
To: Peter Coyle <peter@coylecs.ie>
Cc: Jim O'Callaghan <jim@ocallaghanmoran.com>, Ronan Woods <ronan@genesisplanning.co.uk>, Andrew Bunbury <andrewbunbury@parkhood.com>, O'Dwyer & Jones - Aviation Planning <admin@aviationplanning.ie>, "jkeenan@trafficwise.ie" <jkeenan@trafficwise.ie>

Hi all,

Please see below response from Irish Water.

Kind regards

Paul

From: John Donoghue (Wayleaves) <John.Donoghue@water.ie>
Sent: Wednesday 22 March 2023, 16:25
To: Paul McCarthy <paul.mccarthy@sretaw.ie>
Cc: Monika Prokop <monika.prokop@water.ie>
Subject: RE: Greater Dublin Drainage Project IW/10001369/WL/11a Landowner:- Rathdrinagh Land Ltd.

Paul

Thank you for your email below and for forwarding the Site Plan, Service Drawings including the proposed Drainage & Watermain Layout Drawing,

Our Project Management Team ('PMT') have reviewed the service drawings provided and have the following **observations**:

- Foul sewer manhole 14 is just inside the permeant wayleave, can this be relocated outside the corridor? (Including suitable separation distance for any concrete surround)
- Watermain layout shows a valve and washout hydrant in the temporary working area, can this be relocated outside the corridor? (Including suitable separation distance for any concrete surround/ thrust blocks)
- Can the surface water layout be revisited to minimise impacts on the permanent wayleave/ TWA? - If it is not possible to remove gullies and road crossings from the corridor perhaps they could be relocated and realigned to minimise future impacts on GDD constructability?
- Public lighting, is there scope to move the lamp standards out of the permanent wayleave?

In terms of the other queries (as addressed below) our PMT are satisfied that these are sufficiently covered off now, such that Uisce Éireann can make a favourable observation should a planning application be submitted.

Kind regards

John

John Donoghue
Valuation Lead - Major Projects

APPENDIX H
BRE 365 TEST RESULTS

Project No. 22-125
Site Huntstown
Test Location Per 01 Glacial Till

Full analysis not possible using method as described in BRE Digest 365/CIRIA Report 156

	width (m)	length (m)
test pit top dimensions	0.4	1.2
test pit base dimensions	0.4	1.2

test infiltration rate (q) = ####### m/h
depth to groundwater before adding water = Dry
test pit depth 1 m
depth to water surface at start of test 0 m

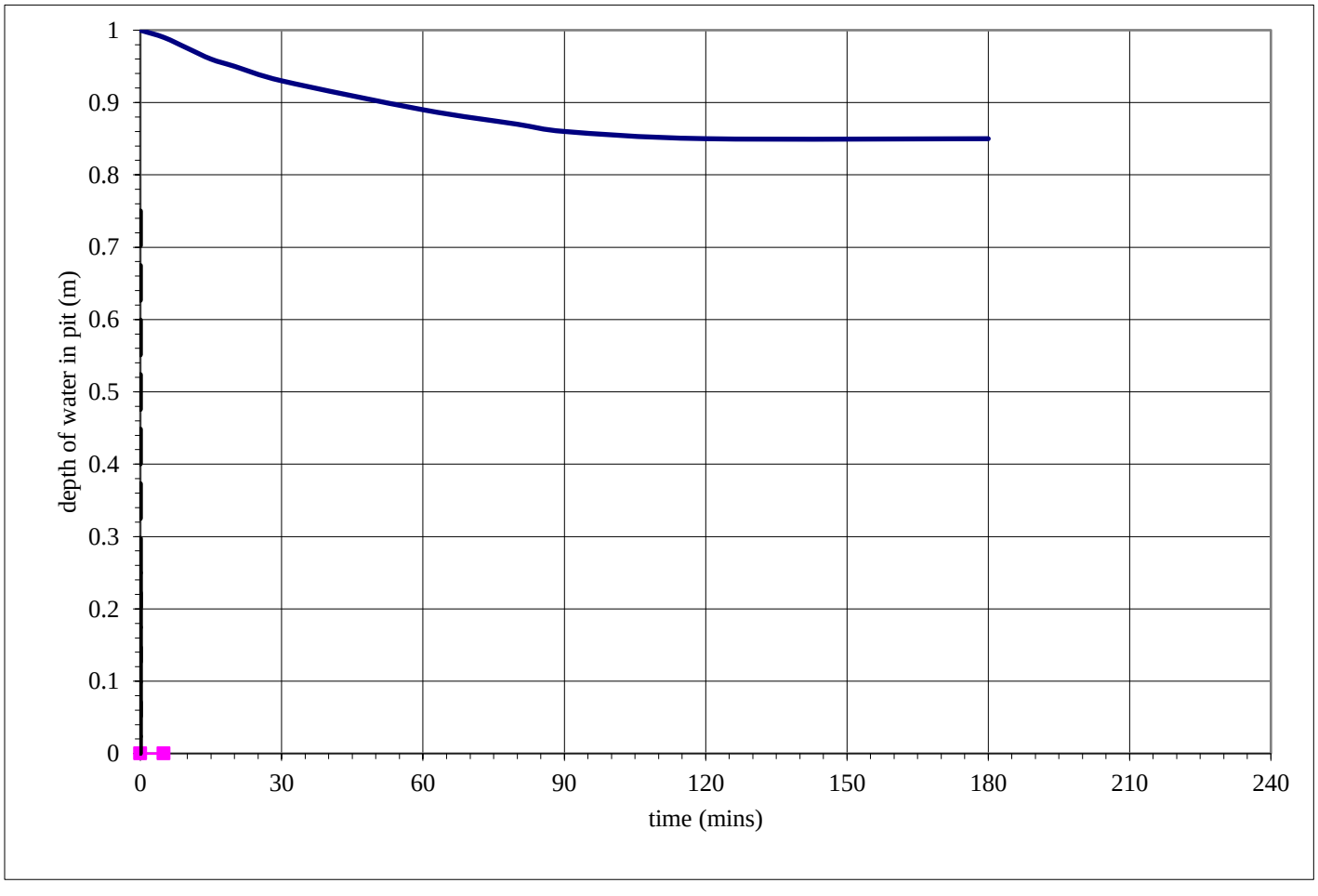
time (mins)	depth to water surface (m)	depth of water in pit (m)	time elapsed from test start (mins)	volume of water lost from test start (m3)	Area of walls and base at 50% drop from test start (m2)	q from start of test (m/min)	q from start of test (m/h)
0	0	1	0	0	3.68		
5	0.01	0.99	5	0.0048	3.664		
10	0.025	0.975	10	0.012	3.64		
15	0.04	0.96	15	0.0192	3.616		
20	0.05	0.95	20	0.024	3.6		
30	0.07	0.93	30	0.0336	3.568		
60	0.11	0.89	60	0.0528	3.504		
80	0.13	0.87	80	0.0624	3.472		
90	0.14	0.86	90	0.0672	3.456		
120	0.15	0.85	120	0.072	3.44		
180	0.15	0.85	180	0.072	3.44		

From graph:

test start - 75% depth at 0.75 m water depth
time is - minutes

test end - 25% depth at 0.25 m water depth
time is - minutes

-	0.25	0.75	#VALUE!	0	2.8800		
-	0.75	0.25	#VALUE!	0.2400	2.0800	#######	#VALUE!



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APPENDIX 3.2

RESOURCE & WASTE MANAGEMENT PLAN

Unit 15
Melbourne Business Park
Model Farm Road
Cork T12 WR89

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E: admin@ocallaghanmoran.com
www.ocallaghanmoran.com

RESOURCE & WASTE MANAGEMENT PLAN

PHASE 1

CIRCULAR ECONOMY HUB

HUNTSTOWN

FINGAL

Prepared For: -

Rathdrinagh Land Unlimited Company

TA

Irish Recycling Ltd

Prepared By: -

O'Callaghan Moran & Associates
Unit 15
Melbourne Business Park
Model Farm Road
Cork
T12 WR89

December 2023

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APPENDIX 1 DRAWINGS

1. INTRODUCTION

Irish Recycling Ltd (IRL) appointed O'Callaghan Moran & Associates to prepare a Resource and Waste Management Plan (RWMP) for Phase 1 of a proposed Circular Economy Hub in Huntstown, Fingal.

The purpose is to provide information necessary to ensure that the management of construction and demolition (C&D) waste at the site is undertaken in accordance with the current industry standards and waste management regulations.

1.1 Methodology

The approach is based on the Environmental Protection Agency 'Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction and Demolition Projects' (2021).

1.2 Relevant Legislation & Guidance

- Protection of the Environment Act 2003, as amended
- The Waste Management Act 1996, as amended
- The Waste Management (Collection Permit) Regulations 2007, (S.I 821) as amended
- European Communities (Waste Directive) Regulations 2011 (SI 126 of 2011) as amended
- Waste Management (Facility Permit and Registration) Regulations 2007, (S.I No. 821 of 2007) as amended
- Waste Management (Licensing) Regulations 2004 (S.I. No. 395 of 2004) as amended
- Waste Management (Packaging) Regulations 2014 (S.I. 282 of 2014), as amended
- European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
- European Union (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended
- Waste Management (Food Waste) Regulations 2009 (S.I. 508 of 2009), as amended
- Waste Management (Hazardous Waste) Regulations, 1998 (S.I. No. 163 of 1998) as amended
- Waste Management (Shipments of Waste) Regulations, 2007 (S.I. No .419 of 2007) as amended
- European Communities (Transfrontier Shipment of Waste) Regulations

- Waste Classification List of Waste & Determining if Waste is Hazardous or Non-hazardous (2015)

- By-Product A Guidance Note A guide to by-products and submitting a by-product notification under Article 27 of the European Communities (Waste Directive) Regulation 2011 (S.I. No 126 of 2011) (Draft)

- By-Product Notification Form Guidance Version 1 (EPA 2022)

- Guidance on Soil and Stone By-products in the context of article 27 of the European Communities (Waste Directive) Regulations 2011 (EPA 2019)

The RWMP also had regard to the Construction Environmental Management Plan (CEMP) prepared for the development.

1.3 Circular Economy

In 2020, the government published its 'Waste Action Plan for a Circular Economy' to inform and direct national and regional waste planning in Ireland over the coming years. It is action focused to embrace the opportunities in becoming a circular economy. While the thrust of the Plan is to prevent waste arising through reuse, its objectives include ensuring that measures support sustainable economic models (for example by supporting the use of recycled over virgin materials).

In advance of the adoption of a National Waste Management Plan the Regional Waste Management Plans remain in place. It is an objective of this RWMP to meet the requirements of the Eastern and Midland Region Waste Management Plan 2015 – 2021, which in line with the European Union Waste Framework Directive, specifies a mandatory target of 70% of C&D wastes to be prepared for reuse, recycling and material recovery (excluding soil and stones) by 2020.

1.4 Detailed Design RWMP

This RWMP will be revised prior to the start of construction to:

- Take consideration of the conditions of the planning permission.

- Identify the members of the Design Team and specify their roles and responsibilities.

- Make provision for the waste prevention and resource recovery measures identified in the detailed design stage.

- Include a post design resource and waste inventory of all residual resources, and

- Identify the roles and responsibilities of the Construction Management Team, including materials procurement.

2. DEVELOPMENT DESCRIPTION

The proposed development is shown Drawing No P001 in the Appendix. The proposed development is Phase 1 of the proposed 9.655 ha Huntstown Circular Economy Hub (Hub). It comprises a Materials Recovery Facility (MRF) (5032m^2), a Food Container Cleaning Plant (5032m^2), two Storage Buildings, paved open yards, weighbridge, car and bicycling parking areas, surface and foul water drainage systems and landscaping.

2.1 Site Layout

The design of the site layout took into consideration the need to:

- Avoid excessive temporary works, e.g. site roads, site offices/foundations, and
- Protect the local natural environment and biodiversity from any adverse impacts associated with the sorting, segregation, storage and transport of construction stage waste.

2.2 Building Design & Layout

2.2.1 Materials Recovery Facility

The building will be a steel portal frame structure with external preformed and profile sheeting on the walls and low pitch roof cladding. It will be 13.5 metres to the eves, with an upper ridge level of approximately 15 metres above ground level. Solar panels will be mounted on the roof and the edge of the roof will be surrounded by an anti-glint and glare parapet. Floor Plans and Elevations are in Appendix 1.

2.2.2 Food Container Cleaning Plant

The building will be a steel portal frame structure with external preformed and profile sheeting on the walls and low pitch roof cladding. It will be 12 metres to the eves, with an upper ridge level of 14 metres above ground level. There will be roof mounted solar panels surrounded by an anti-glint and glare parapet. Floor Plans and Elevations are in Appendix 1

2.3 Services

2.3.1 Water Supply

Water for use in staff welfare facilities and the food container washing plant will be obtained from mains supply. Rainwater from the roofs of the MRF and the Food Container Cleaning Plant will be harvested for use as grey water in the staff toilets.

2.3.2 Wastewater

Sanitary wastewater from the staff toilets and treated wastewater from the washing plant will

discharge to the Uisce Eireann foul sewer that runs along North Road.

2.3.3 Surface Water Drainage

Rainwater run-off from the building roofs will be harvested for on-site use. The car parking areas will have permeable paving. Run—off from the yards will be collected, passed through Class 1 Hydrocarbon Interceptor and discharged to ground via a soakaway.

2.3.4 Electricity Supply

There will be a connection to the national grid and an electrical substation will be provided in the north east corner of the site. The electricity from the roof mounted solar panels will be used directly on site.

2.4 Development Phases

All of the key elements will be constructed in one phase.

3. DETAILED DESIGN STAGE

3.1 Design Team

The Design Team will include, but not be limited, to:

- IRL representative
- Architect
- Civil Engineer
- Quantity Surveyor
- Resource Manager

The roles and responsibilities each team member will be documented.

3.2 Reuse and Recycling Initiatives

3.2.1 Reuse of Existing Site Assets

The site is greenfield with no on-site buildings or infrastructure. Therefore there are no opportunities for the reuse any site assets and no potential for the refurbishment and refit of existing structures to avoid new build.

3.2.2 Article 27 By-Products

The existing topography was taken into consideration at the planning stage to minimise excavations and avoid the need for the import of materials for use as fill and in landscaping. A 'cut and fill' exercise for Phase 1 established that 11,067m^3 of topsoils will be stripped. The proposed landscaping measures site require approximately 9,161m^3 of top soil. This amount will be retained on-site in temporary stockpiles, with the remaining top soil (1,906m^3) sent off-site.

The development will require the excavation of approximately 34,155m^3 of subsoils. Of this, 4,925m^3 will be retained on site in temporary stockpiles for use in the development, with the remainder sent off site. So the total volume of soils to be removed from the site in the construction stage will be 31,136 m^3.

The site is undeveloped and the intrusive geotechnical investigations and a geophysical survey did not identify any evidence of soil contamination. Representative soil samples were collected and sent for laboratory analysis and this confirmed that the soils are clean and meet the criteria for Notification to Environmental Protection Agency (EPA) as Article 27 By-Products for reuse at other developments.

The Resource Manager will be responsible for identifying development sites that have regulatory approval for the acceptance of Article 27 By-Product Soil and Stone and for preparing Article 27 Notifications to the EPA.

3.2.3 Recycled Aggregates

The EPA is currently in the process of introducing a National End of Waste Protocol for End of Waste Recycled Aggregates which is expected to be adopted before the detailed design of Phase 1 begins. It will be a detailed design objective to select recycled aggregates that meet the required geotechnical requirements rather than source over natural aggregates.

The likely construction and demolition waste arising at the proposed development will be assessed at the detailed design stage for their potential to be recycled into aggregates that meet End of Waste Status. Where there is such potential appropriate handling and storage measures will be put in place to minimise the risk of cross contamination with non-recyclable materials.

3.3 Green Procurement Initiatives

The Design Team will endeavour to develop material specifications flexible enough to allow for the variations in reclaimed materials. The Resource Manager will have expert knowledge in waste prevention and will seek to identify development specific methods of waste prevention and minimisation, including reducing the amounts of packaging materials delivered to the site during the works.

3.4 Off Site Construction Initiatives

The Design Team will evaluate the benefits of off-site manufacturing to reduce wastes arising at the development site. Given the nature of the development modular buildings are not an option, but the use of pre-cast structural concrete panels would reduce the residual volumes of concrete blocks, mortars, plaster board arising.

3.5 Materials Optimisation Initiatives

The Design Team will endeavour to simplify the design, layout, building form, structural system, building services and construction sequencing where practical and will investigate the use of standardised sizes for certain materials to help reduce the amount of offcuts produced on site.

3.6 Flexibility and Deconstruction Initiatives

The objective is to ensure that all structures contain materials that can be recycled and, where practicable, easily disassembled during maintenance and refurbishment.

4. KEY MATERIALS AND QUANTITIES

Preliminary estimates of the main construction materials that will be used are given in Table 4.1.

Table 4-1 Construction Materials

Construction Material	Quantity	Unit
Concrete	5,280	m^3
Stone	12,600	m^3
Steel	165	tonne
Drainage Pipes	2,178	m
Cladding & Roofing	19,700	m^2

A preliminary 'cut and fill' exercise has established that the development of Phase 1 requires the excavation and removal off-site of 31,136 m3 of soils**.**

5. PRELIMINARY CONSTRUCTION PROGRAMME

5.1 Construction Programme

The works will comprise the following;

- Set up site office and contractors compound;
- Securing the site and erecting signage;
- Setting out;
- Stripping and stockpiling of topsoils;
- Provision of hardstand for delivery vehicles for unloading and turning;
- Provision of water, wastewater and stormwater services;
- Building and tank construction and paving, and
- Landscaping

5.2 Construction Schedule

The construction programme will be completed in three stages.

Stage 1 – Site Set Up

This will involve the provision of a temporary entrance off the Substation access road; site clearance, set up of site offices and contractors compound, provision of hardstand for vehicles, securing the site and erection of signage and will take one week.

Stage 2 – Site Clearance and Setting Out

This stage will involve the stripping and stockpiling of topsoils and grading to formation level and will take four weeks.

Stage 3 –Construction of new junction on the Substation access road, provision of internal roads and yards and the construction and fit out of the buildings along with the ancillary services and landscaping. This will be completed in approximately 65 weeks.

6. SITE MANAGEMENT

6.1 Waste Types

Wastes generated will include broken concrete blocks/tiles/ceramics; timber and hard plastic off-cuts; metal (aluminium and steel); plasterboard, electrical wire, batteries and damaged equipment; packaging (cardboard, plastic, timber); empty paint tins and adhesive containers; insulation materials; canteen waste from the welfare facilities; waste oil and filters from mobile plant.

At the time the construction works begin if there are no developments authorised to accept Article 27 Notified Soils and Stone within economic transport distances of the Huntstown site then the soil and stone will be classified as a waste and sent to authorised soil recovery facilities

The waste types are listed in Table 6.1 which also includes the List of Waste (LoW) code. This is not an exhaustive list and will be revised at the detailed design stage.

Table 7.1

Waste Type	LoW Code
Concrete, bricks, tiles, ceramics	17 01 01-17 01 03 03 & 17 01 07
Wood, glass and plastic	17 02 01-03
Soil and Stone	17 05 03
Bituminous mixtures	17 03 02
Metals (including their alloys)	17 04 01-07
Gypsum-based construction material	17 08 02
Paper and cardboard	20 01 01
Mixed C&D waste	17 09 04
Electrical and electronic components	20 01 35 20 01 36
Batteries and accumulators	20 01 33 20 01 34
Oil	13 01 10, 13 03 05
Chemicals (e.g. solvents, paints, adhesives)	20 01 13 , 20 01 19, 20 01 27
Insulation materials	17 06 04

All surplus clean soil and stone excavated to achieve formation levels and for foundations and services will be sent off-site for either reuse or recovery. Soil and stone impacted by accidental spills of polluting substances e.g. oils will be sent off-site to authorised waste management facilities.

Pending the completion of the detailed design of the development, which will include the selection of materials to 'design out' waste and reuse and recycling initiatives and the confirmation of the construction methodologies, it is not possible to estimate with any level of accuracy the quantities of C&D waste that will be generated.

6.2 Resource & Waste Manager

Given the scale of the development the Main Contractor will nominate an experienced Construction Stage Resource & Waste Manager who will be responsible for the appropriate segregation and storage of all waste arising in the construction stage, including wastes from the staff welfare facilities.

6.2.1 Regulatory Compliance

The Resource & Waste Manager shall ensure that all wastes arising in the construction stage are sent to waste facilities that are authorised under the Waste Management Act 1996, as amended and/or the Environmental Protection Act 1992, as amended and hold up to date authorisations that approve the acceptance of the specific waste types. These authorisations include:

- Industrial Emissions Licences Waste Licences issued by the EPA, and
- Waste Facility Permits and Certificates of Registration issued by a local authority.

The Resource & Waste Manager shall ensure that all soil and stone meeting the Article 27 By-Product Criteria are only sent to development sites that have planning permission to accept the materials.

6.2.2 Training

The Resource & Waste Manager shall be responsible for instructing construction staff on the appropriate segregation and storage practices for the different waste types. This may be provided as part of general site training needs such as site induction, health and safety awareness and 'tool box talks'.

6.2.3 Records

The Resource & Waste Manager shall be responsible for maintaining the following records of all wastes sent of site

- Details of the waste collector, including the waste collection company name, vehicle registration number and date the wastes were collected,
- Details of the waste management facility to which the materials were sent, including weighbridge records that detail the waste collection company and vehicle registration and quantity of waste accepted.

The Resource & Waste Manager shall be responsible for maintaining the following records of all Article 27 Notified Soil and Stones sent off-site site

- Details of the haulier, vehicle registration number the date the soils were collected and estimates of the quantities,
- Details of the development site to which the materials were sent, including weighbridge records that detail the waste collection company and vehicle registration and quantity of waste accepted.

6.3 On-Site Materials Management

Appropriately sized skips will be provided by a waste collector who holds an up to date Waste Collection Permit from the National Waste Collection Permit Office (NWCPO), which authorises the collection of the waste types that will arise during the construction stage. Dedicated skips will be provided for:

- Concrete rubble, bricks and tiles
- Plasterboard
- Hard plastic off-cuts
- Timber off-cuts
- Metal off-cuts and rebar
- Glass
- Cardboard and plastic packaging
- Non-recyclable packaging (e.g. polystyrene)
- Waste Electrical and Electronic Equipment (wiring, batteries)
- Empty paint tins, adhesive containers and oil cans

Separate wheelie bins will be provided for food waste, mixed dry recyclables and residual waste for wastes arising at staff welfare facilities.

The skips will be located at strategic locations around the site, as decided by the Resource Manager, in areas that are remote from water course. The wheelie bins shall be stored adjacent to the construction workers welfare facilities.

Signage will be provided that informs the site staff of the waste types that can be placed in each skip.

6.3.1 Article 27 Soil & Stone By-Products

Soil and stone meeting the Article 27 Notification Criteria will be stored in designated stockpile area pending consignment to development sites for reuse.

6.3.2 Hazardous Waste Management

The paint tins, adhesive containers and oil cans will be classified as hazardous waste and shall only be placed in a water tight dedicated skip.

Waste oils arising from routine plant maintenance shall be stored in drums or in an enclosed storage unit in the Contactor's Compound.

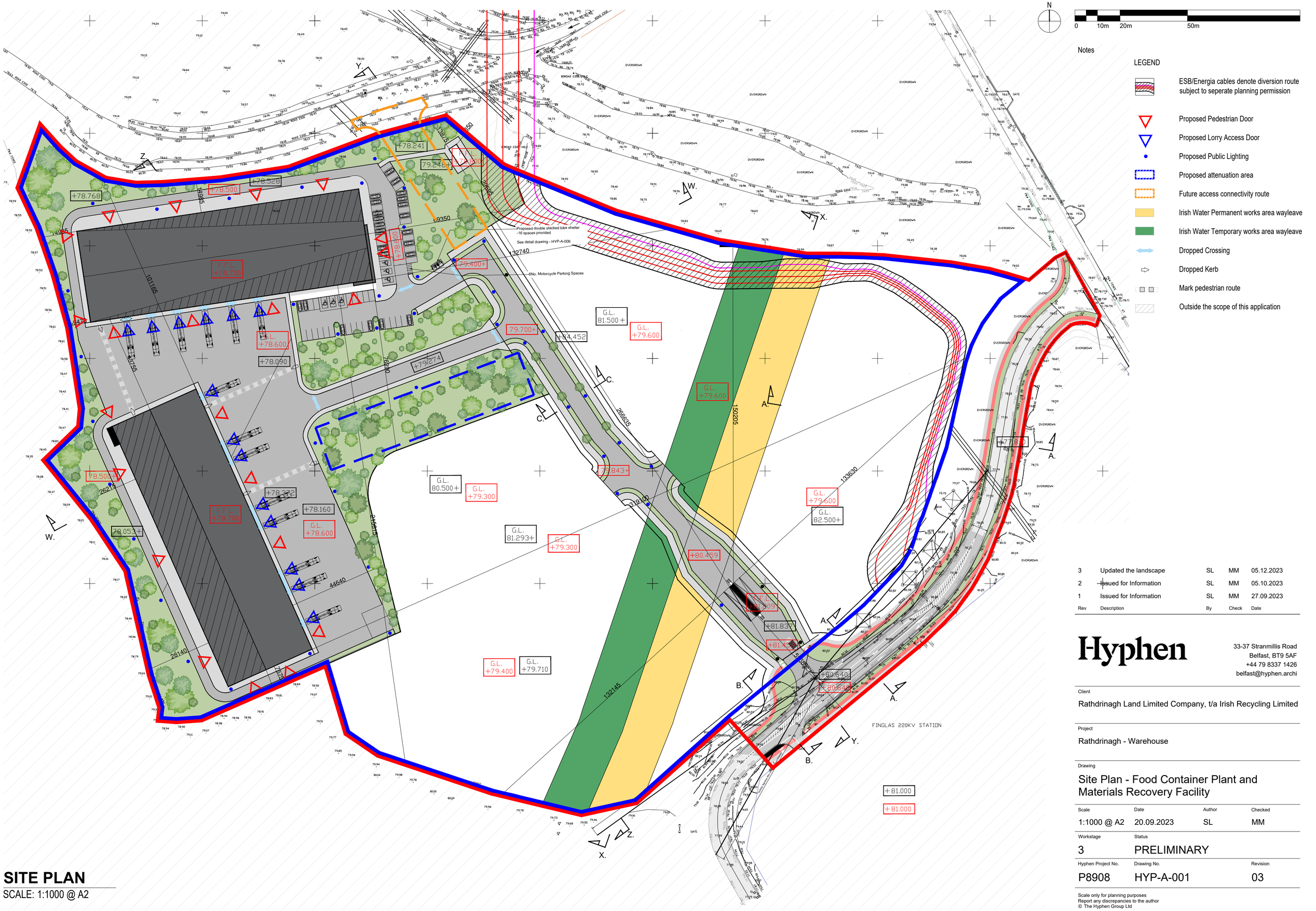
6.3.3 Inspections/Audits

The Resource & Waste Manager will be responsible for regularly inspecting the skips and bins to

- Ensure they are being used appropriately
- Remove non-conforming wastes, and
- That they are removed from the site as required to prevent spillage.

APPENDIX

DRAWINGS



SITE PLAN

SCALE: 1:1000 @ A2

Rev	Description	By	Check	Date
3	Updated the landscape	SL	MM	05.12.2023
2	Issued for Information	SL	MM	05.10.2023
1	Issued for Information	SL	MM	27.09.2023

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Client

Rathdrinagh Land Limited Company, t/a Irish Recycling Limited

Project

Rathdrinagh - Warehouse

Drawing

Site Plan - Food Container Plant and Materials Recovery Facility

Scale	Date	Author	Checked
1:1000 @ A2	20.09.2023	SL	MM

Workstage	Status
3	PRELIMINARY

Hyphen Project No.	Drawing No.	Revision
P8908	HYP-A-001	03

Scale only for planning purposes
Report any discrepancies to the author
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APPENDIX 3.3

CONSTRUCTION & ENVIRONMENTAL MANAGEMENT PLAN

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CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

PHASE 1 CIRCULAR ECONOMY HUB

HUNTSTOWN

FINGAL

Prepared For: -

Rathdrinagh Land Unlimited Company

TA

Irish Recycling Ltd

Prepared By: -

O'Callaghan Moran & Associates
Unit 15
Melbourne Business Park
Model Farm Road
Cork
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November 2023

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1. INTRODUCTION

Irish Recycling Ltd (IRL) appointed O'Callaghan Moran & Associates to prepare a Construction Environmental Management Plan (CEMP) for Phase 1 of a proposed Circular Economy Hub at Huntstown, Fingal. The CEMP defines the measures that will be implemented in the Construction Stage to effectively mitigate adverse environmental effects

1.1 Methodology

The CEMP had regard to the following:

- Construction Industry Research and Information Association (CIRIA) guidance which include 133 Waste Minimisation in Construction (CIRIA 133), and the Control of Water Pollution from Construction Sites, Good Practice Guidelines (CIRIA C532).
- BS 5228 (2009+A1:2014) Code of practice for noise and vibration control on construction and open sites - Noise and Vibration.
- European Communities (Birds and Natural Habitats) Regulations (S.I. No. 477/2011)
- The Construction Stage Prevention & Mitigation Measures in the Environmental Impact Assessment Report.
- Preliminary Resource & Waste Management Plan.
- Provision of adequate environmental training and awareness for all construction staff.

1.2 Revision

This CEMP will be revised following receipt of planning permission and prior to the start of construction works to incorporate any additional mitigation measures that may be imposed by the conditions of the planning permission.

2. PROJECT DESCRIPTION

2.1 Site Location

The site location is shown on Figure 2.1. It is 2.4 km south of Dublin Airport and is close to the M50 to the south and the N2 to the east. It is in an area zoned for heavy industry and is accessed by the North Road.

2.2 Site Layout Surrounding Land Use

The site layout is shown on Drawing No. 220620. It encompasses approximately 9.6 hectares and comprises two fields and a section of an existing roadway that allows access to the site. A hedgerow running north south divides the fields. The western field had been used for animal grazing, but is no longer used for this purpose. The eastern field had been used for tillage but is currently uncultivated. The ground levels rises from the site boundaries (ca 78m OD) to a small hillock in the centre of the site (88mOD).

Usice Eireann permanent and temporary wayleaves run from north to south through the site for the Greater Dublin Orbital Sewer route. There were two 38 kv and one 110 kv overhead powerlines running from south-east to north-west across the north-eastern part of the site, and a 10kv line running from south-west to north-east through the centre of the site, off of which is a south-east to north-west spur. The overhead lines have been removed and laid underground inside the eastern and northern development site boundaries.

2.3 Surrounding Land Use

The site and surrounding area are shown on Figure 2.2. The land use in the vicinity of the site is a mix of quarrying, utilities and agricultural. Huntstown Quarry is 200m to the west; Huntstown Bioenergy anaerobic digestion plant is 150m to the west; Huntstown Power Station is 280m to the north-west; an Eirgrid 220 kv Substation is to the south-east. The southern runway of Dublin Airport is approximately 2.3km from the north-eastern boundary.

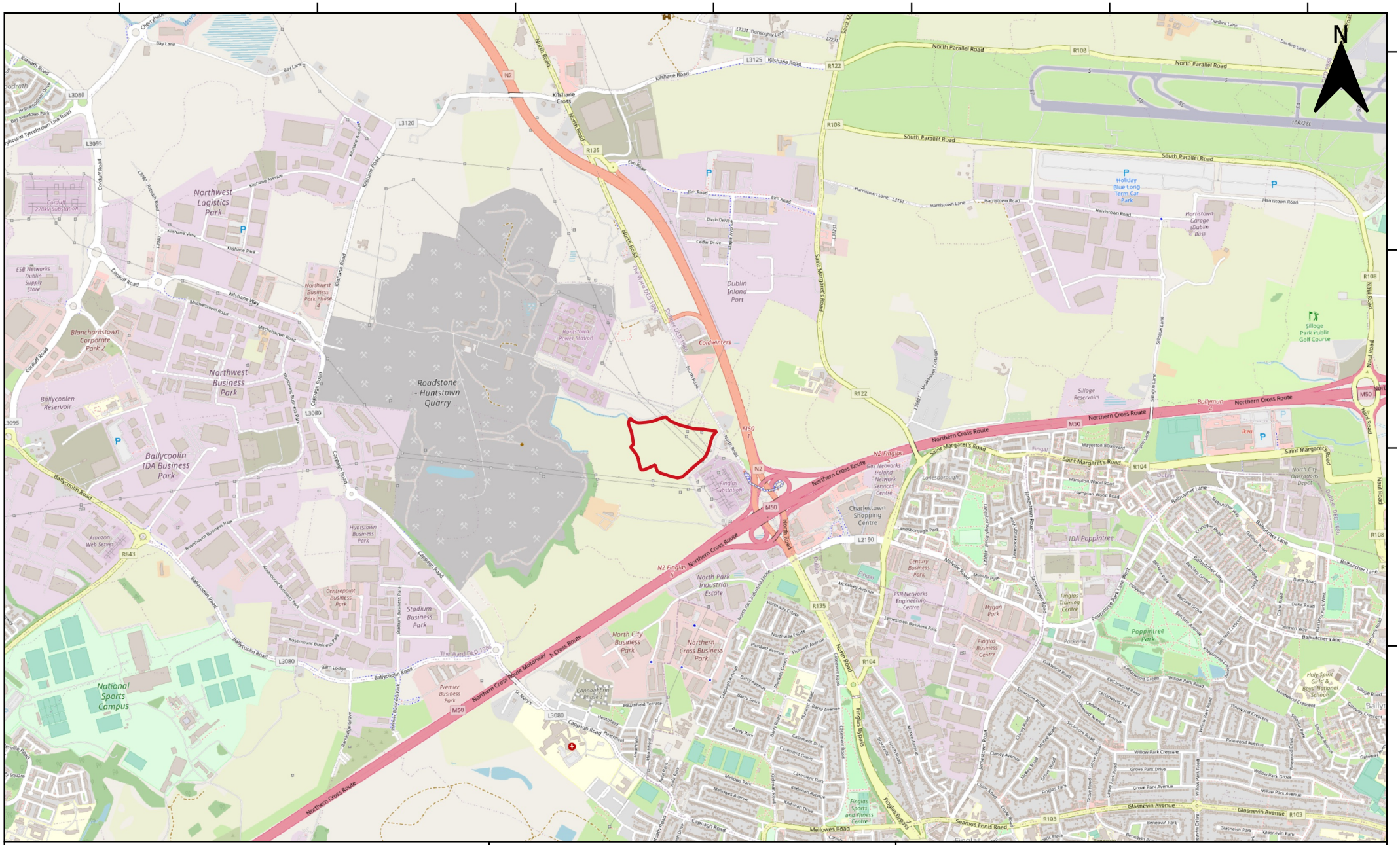
The adjoining lands to the east, south and west are currently used for agriculture. The nearest private residences are on the North Road, approximately 50m from the eastern development site boundary. There is a farmhouse approximately 270m south of the southern boundary.

2.4 Services

There are no existing connections to the Uisce Eireann mains supply, storm sewers and foul water network within the site boundary. There is an Uisce Eireann 150mm water main on North Road and the nearest connection point to the municipal foul sewer is also on North Road.

2.5 Access

The site is accessed via the N2, North Road and the access road to the 220kv Substation.



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CLIENT

Irish Recycling Ltd

TITLE

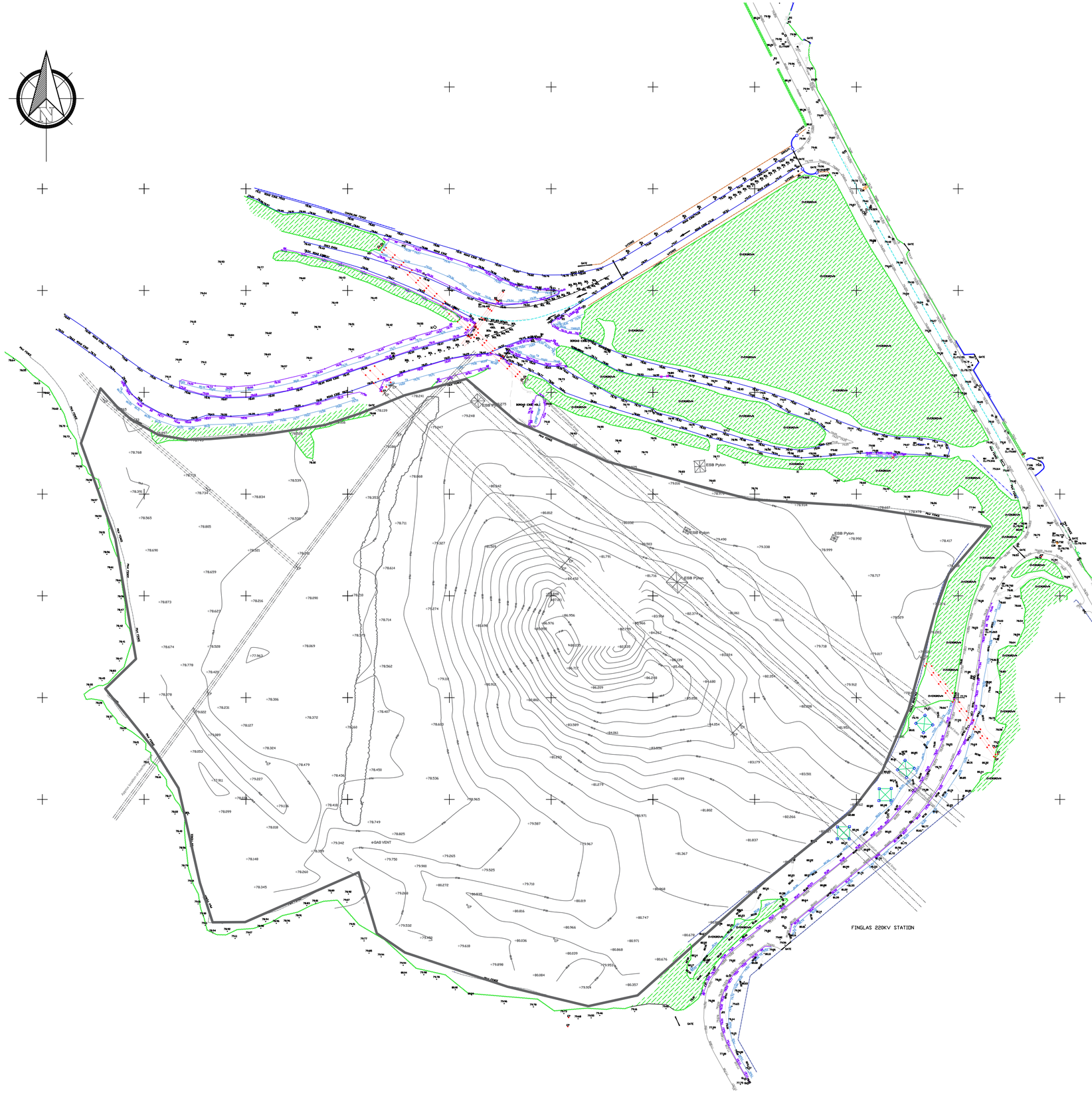
Site Location

DETAILS

Site Boundary

FIGURE 2.1

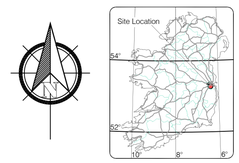
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LEGEND TOPOGRAPHICAL

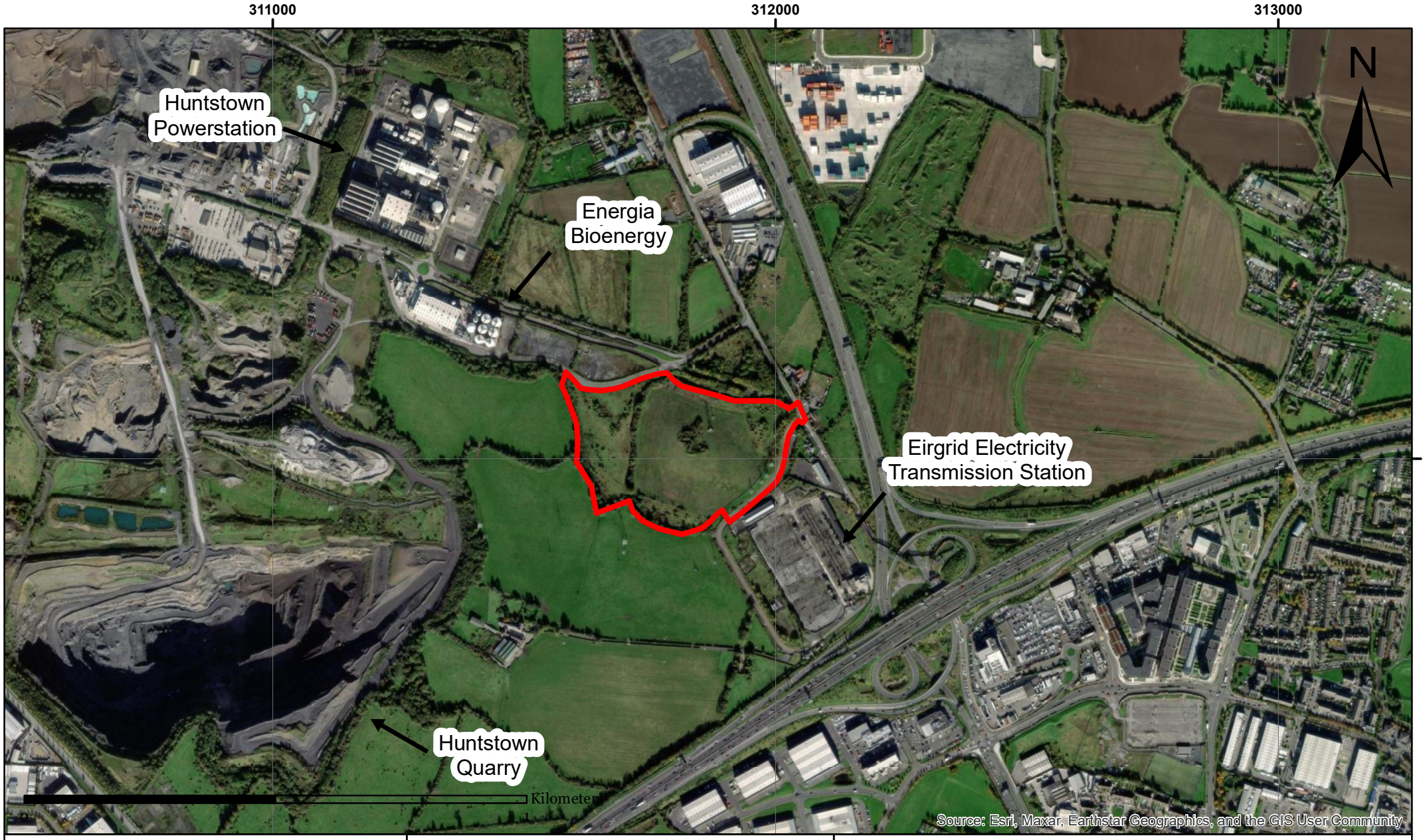
SYMBOLS (CONVENTION)	LINES (CONVENTION)
STN SURVEY STATION	BUILDING
SV SLUICE VALVE	TOP OF BANK
WV WATER VALVE COVER	BOTTOM OF BANK
MH MANHOLE CIRCULAR	FENCE/WALL
MH MANHOLE SQUARE	VOIDED FENCE
GATE GATE	HEDGE
HYDRANT HYDRANT	HEDGE / CHANNEL
BOLLARD CIRC.	KERB / TOP
ROAD GULLY	KERB / TOP
ESB ESB BOX	BUILDING
CIRCLE BOX	OUTLINE
CIRCLE COVER	SURFACE CHANGE
ESB COVER	TOP OF BANK
INSPECTION COVER	SINGLE YELLOW LINE
ESB POLE	FOOTPATH
TELEGRAPH POLE	OVERHEAD
ROAD SIGN	CONTOUR
LAMP POST	
TREE	

Rev.	Date	By	Description

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info@geosurvey.ie
Website:
www.geosurvey.ie

TITLE	TOPOGRAPHICAL SURVEY		
PROJECT	Huntstown Coldwinters Co.Dublin	GRID	ITM
		DATUM	MALIN HEAD
CLIENT	Rathdrinagh Land Unlimited	SCALE	1:1000
DRAWN: A.D./M.S.	DATE: 30.06.2022	SHEET: A1	DRG.NO. 220620

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CLIENT
Irish Recycling Ltd

TITLE
Surrounding Landuse

Details:
Site Boundary

Figure 2.2

2.6 Environmental Setting

2.6.1 Hydrology

The site is in the catchment of the Tolka River, whose main channel is approximately 3 km to the south of the site. There are no streams or water courses either on the site, on in the surrounding lands. The closest significant water feature is a tributary of the Tolka, which is approximately 15km to the south-east. The site is neither in nor adjacent to an area that is at risk of flooding and there are no records of any flood event either at, or in the vicinity of the site.

2.6.2 Geology & Hydrogeology

The subsoils in the west and south of the site and along the northern boundary comprise glacial tills, with gravels in the centre and east. The available site investigation information indicates the range in thickness from 1m in the west to more than 20m in the east. The underlying bedrock is a muddy limestone and is classed as a locally important aquifer.

2.6.3 Biodiversity

The development site had been used for agricultural purposes, with the western field used for animal grazing and the eastern one for tillage. The fields are no longer used for these purposes and are being recolonised by scrub and ruderal species. There are hedgerows/treelines along the southern and western boundaries and between the two fields, with hawthorn, blackthorn, elm and ash present. The nearest designated Natura 2000 Site the South Dublin Bay and River Tolka Estuary Special Protection Area, which is 8.0km to the south-east.

2.7 Archaeology

Archaeological field surveys comprising the geophysical survey and test trenching were completed in 2021 and 2023. The 2023 investigation identified the presence of underground features which will be preserved by record prior to the start of the site clearance works.

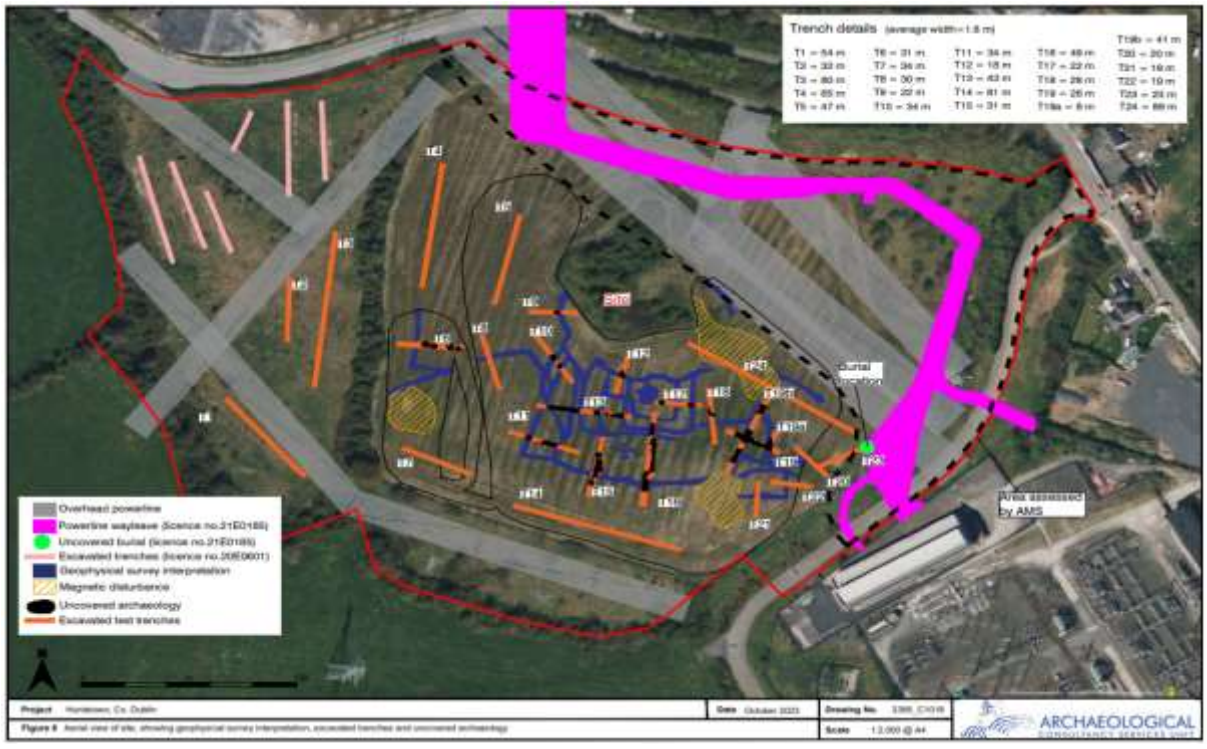


Figure 2.3 Archaeology Field Trenches & Feature

3. DEVELOPMENT DESCRIPTION

The proposed layout is shown Drawing No P001. The proposed development is Phase 1 of the proposed 9.655 ha Huntstown Circular Economy Hub (Hub). It comprises a Materials Recovery Facility (MRF) (5032m^2), a Food Container Cleaning Plant (5032m^2), paved open yards, weighbridge, car and bicycling parking areas, surface and foul water drainage systems and landscaping.

3.1 Building Design & Layout

3.1.1 Materials Recovery Facility

The building will be a steel portal frame structure with external preformed and profile sheeting on the walls and low pitch roof cladding. It will be 13.5 metres to the eves, with an upper ridge level of approximately 15 metres above ground level. Solar panels will be mounted on the roof and the edge of the roof will be surrounded by an anti-glint and glare parapet.

3.1.2 Food Container Cleaning Plant

The building will be a steel portal frame structure with external preformed and profile sheeting on the walls and low pitch roof cladding. It will be 12 metres to the eves, with an upper ridge level of 14 metres above ground level. There will be roof mounted solar panels surrounded by an anti-glint and glare parapet.

3.2 Services

3.2.1 Water Supply

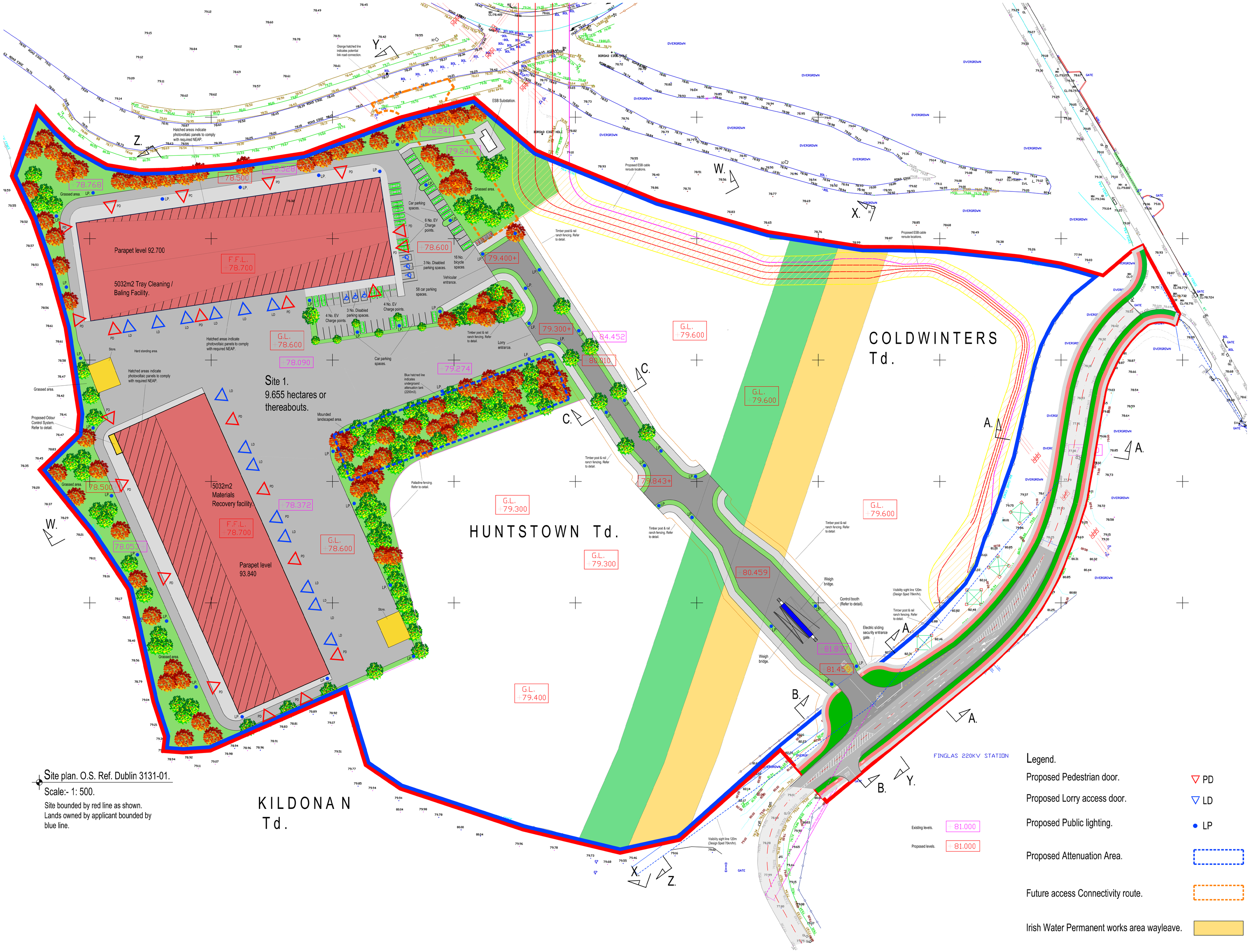
Water for use in staff welfare facilities and the food container washing plant will be obtained from mains supply. Rainwater from the roofs of the MRF and the Food Container Cleaning Plant will be harvested for use as grey water in the staff toilets.

3.2.2 Wastewater

Sanitary wastewater from the staff toilets and treated wastewater from the washing plant will discharge to the Uisce Eireann foul sewer that runs along North Road. Rainwater run-off from external contingency storage areas will be diverted to the foul sewer.

3.2.3 Surface Water Drainage

Rainwater run-off from the building roofs will be harvested for on-site use. The car parking areas will have permeable paving. Run-off from the yards will be collected, passed through Class 1 Hydrocarbon Interceptor and discharged to ground via a soakaway.



Site plan. O.S. Ref. Dublin 3131-01.

Scale:- 1: 500.

Site bounded by red line as shown.
Lands owned by applicant bounded by blue line.

Legend.

- Proposed Pedestrian door. PD
- Proposed Lorry access door. LD
- Proposed Public lighting. LP
- Proposed Attenuation Area.
- Future access Connectivity route.
- Irish Water Permanent works area wayleave.
- Irish Water Temporary works area wayleave.

NOTES:-

This is a Pre Planning Draft proposal drawing only and is therefore limited in its capacity to convey the total information, details & specification necessary to complete the works. Any work carried out that is not covered here will be the responsibility of the persons carrying them out. If any situation arises which would cause a contravention of the building regulations, then the Engineer should be consulted, otherwise the Engineer cannot be held responsible. As this drawing is prepared as a Pre Planning Draft Proposal drawing only, it is strongly recommended that the Engineer be consulted for the preparation of full working drawings. It is solely the clients responsibility to appoint a Qualified Engineer to supervise the project during the construction stage and to prepare structural working drawings for the builder.

ALL WORK AND MATERIALS ARE TO BE IN ACCORDANCE WITH THE CURRENT BUILDING REGULATIONS WHETHER DETAILED ON THIS DRAWING OR NOT.

All dimensions to be taken on site. Do not scale any dimensions from this drawing. This drawing is to be read in conjunction with all other relevant drawings and specifications etc that are issued.

This drawing remains the copyright of Coyle Civil & Structural and may not be copied or reproduced without written consent.

Coyle CIVIL & STRUCTURAL
No. 3 High Street, Monaghan Town,
Co. Monaghan. H18 X635
Tel: 047-72175
Website: www.coylecs.ie
E-mail: info@coylecs.ie

Project: Planning application to construct proposed new serviced Industrial Units and vehicular parking area, access roads and pedestrian footpaths, construct new entrance and all associated siteworks at Huntstown Td, Co. Fingal.

Client: Sretaw.

Sheet Title: Site plan.

Project No.:		Date:
22-039.		25-03-23.
Drawing No.: P001.	Scale: As shown.	Rev: M.	Checked:

3.2.4 Electricity Supply

There will be a connection to the national grid and an electrical substation will be provided in the north east corner of the site. The electricity from the roof mounted solar panels will be used directly on site.

3.3 Development Phases

All of the key elements will be constructed in one phase.

4. CONSTRUCTION ACTIVITIES

4.1 Construction Programme

The works will comprise the following;

- Set up site office and contractors compound;
- Securing the site and erecting signage;
- Setting out;
- Stripping and stockpiling of topsoils;
- Provision of hardstand for delivery vehicles for unloading and turning;
- Provision of water, wastewater and stormwater services;
- Building and tank construction and paving, and
- Landscaping

4.2 Construction Schedule

The construction programme will be completed in three stages.

Stage 1 – Site Set Up

This will involve the provision of a temporary entrance off the Substation access road; site clearance, set up of site offices and contractors compound, provision of hardstand for vehicles, securing the site and erection of signage and will take one week.

Stage 2 – Site Clearance and Setting Out

This stage will involve the stripping and stockpiling of topsoils and grading to formation level and will take four weeks.

Stage 3 –Construction of new junction on the Substation access road, provision of internal roads and yards and the construction and fit out of the buildings along with the ancillary services and landscaping. This will be completed in approximately 65 weeks.

5. METHOD STATEMENT FOR CONSTRUCTION

5.1 Working Hours

The normal working hours shall be 07:00 to 19:00 Monday to Friday (excluding bank holidays) and 08:00 to 14:00 Saturdays, subject to restrictions that may be imposed by the planning permission. Works will not be carried out on Sundays and Public Holidays. Subject to the agreement of Fingal County Council out of hours activities may be required for certain elements.

5.2 Site Preparatory Works

Preparatory works involves Site Set Up by the Contractor which will include the following:

- Setting of access control to the development area and the erection of directional signage as specified in the Construction Stage Traffic Management Plan.
- All construction related traffic will access the site via the entrance off the access road to the Transmission Station.
- Provision of secure compound for the storage of all on-site machinery and materials.
- Construction of internal access roads.
- Provision of services and utilities, and
- Provision of security fencing and perimeter hoarding.

Prior to the commencement of construction, the Contractor will contact the relevant bodies (e.g. ESB, Eirgrid. Gas Networks Ireland, Uisce Eireann) and the landowner to check records and drawings to confirm the locations of existing buried services/utilities.

5.3 Construction Compound

Drawing P013 shows the location of the Construction Compound. The compound will include a site office and welfare facilities, hardstanding for plant and machinery and a designated waste storage area. Suitably robust fencing will be erected along the boundary. It will be serviced with electrical power from an on-site generator and will include Portaloo toilet facilities. The generator will contain a built-in double contained fuel storage tank. All liquid chemicals will be stored in the construction compound in bunded storage areas.

5.4 Excavation Works

Topsoils and subsoils will be excavated to establish formation level for the buildings, roads and underground services, including the oil interceptors and surface water soakaways. Tracked 360-degree excavators will be used to strip the topsoil, and a dumper will be used to move the excavated materials to temporary stockpile locations from where surplus soils will be removed from the site.



SITE COMPOUND PLAN

SCALE 1:750

Coyle
CIVIL & STRUCTURAL

No. 3 High Street, Monaghan Town,
Co. Monaghan. H18 X635

Tel: 047-72175
Website: www.coylecs.ie
E-mail: info@coylecs.ie

Project:	Planning application to construct proposed new serviced Industrial Units and vehicular parking area, access roads and pedestrian footpaths, construct new entrance and all associated siteworks at Huntstown Td, Co. Fingal.
Client:	Rathdrinagh Land Unlimited Company, t/a Irish Recycling Limited.
Sheet Title:	Proposed Site Compound Plan
Project No.: 22-039	Date: 15-11-2023
Drawing No.: P013	Scale: As shown @ A1
Rev:	Checked:

5.5 Concrete Works

Concrete batching will not be carried out on-site. Excess concrete will be removed from the site and concrete washout will not be permitted on the site. Concrete pouring will be monitored to ensure there is no accidental discharge. Accidental spills will not be hosed down.

5.6 Surface Water/Drainage System

There are no surface water drains/water courses inside or adjacent to the site boundary.

5.7 Groundwater

The excavation works will not extend to below the water table and dewatering will not be required.

5.8 Materials – Source and Transportation

The selection and specification of construction materials will be informed by the local availability of these materials. Subject to the necessary constraints of performance, durability and cost, construction materials will be sourced from local suppliers and manufacturers, where possible.

5.9 Oils and Chemical Storage

All oils, fuels, paints and other chemicals will be stored in a secure, bunded, hardstand area. The bund capacity of the bulk oil storage tanks will at a minimum be 110% of the tank. For drum storage, a bund capacity of 25% of the maximum volume of material stored is required. The refuelling and servicing of mobile plant and equipment will only be carried out in a designated hardstand area, where oil spill containment and clean-up equipment will be maintained.

5.10 Traffic Management

A Traffic Management Plan (TMP) will be prepared prior to the start of the site clearance works. The Plan will take into consideration:

- Department of Transport Traffic Signs Manual 2021
- Department of Transport Guidance for the Control and Management of Traffic at Road Works (2010)
- Relevant conditions of the planning permission, and the
- Site Access

There will be a single site entrance. All construction and delivery traffic will access the site via the new junction. The traffic will include:

- Private vehicles use by construction site staff.

- Construction vehicles (excavators, cranes and dump trucks)
- Materials transport vehicles, typically heavy goods vehicles (HGV)

Many staff members will share transport and will generally arrive before 08:00 and leave after 18.00 thereby avoiding morning and evening peak hour traffic. There will, on average, be 5 HGV movement hourly at the busiest times.

The TMP will address the following

- Provision of Warning/Advanced Warning Signs at appropriate locations.
- Speed limits.
- Designated parking areas.
- Maintaining cleanliness of the public roads on the approaches to the site.

5.11 Health and Safety

As required by the Safety, Health and Welfare at Work (Construction) Regulations 2013, the Contractor appointed to complete the development will prepare a Health and Safety Plan that address site specific health and safety issues from the start to the completion of the construction.

The Contractor will provide 'Site Induction' training for all construction staff and ensure all site staff have current 'Safe Pass' cards. All construction staff will receive a full safety briefing and will be provided with all of the safety equipment required by their assigned tasks.

5.12 Site Security

The Contractor will be responsible for site security, including erecting and maintaining adequate fencing.

6. ENVIRONMENTAL PREVENTION & MITIGATION MEASURES

The Construction Stage involves site clearance, excavation, the construction of the processing and storage buildings, electrical sub-station, yards and roadways and the provision of the associated wastewater and surface water drainage systems. HGVs will deliver construction materials and the mobile plant will include excavators, lifting equipment, dumper trucks, compressors, and generators.

The construction works have the potential to impact on the environment through the generation of noise and dust and impacts on air quality, groundwater and ecology. The Main Contractor shall appoint an experienced Environmental Clerk of Works who will be responsible for ensuring the mitigation measures specified in this CEMP are effectively implemented throughout the Construction Stage. This will include the provision of staff induction training and regular 'toolbox' talks.

6.1 Noise & Vibration

The Main Contractor shall be responsible for compliance with the requirements of BS 5228-1:2009+A1:2014 and BS 5228-2:2009+A1:2014 (Code of Practice for Noise and Vibration Control on Construction and Open Sites) and the Safety, Health and Welfare at Work (General Application) Regulations 2007, Part 5 Noise and Vibration.

Although construction phase noise emissions will be short term and given the distance between the site and the nearest sensitive receptor (circa 1km) the following mitigation measures will be implemented.

- Works will in general be confined to the period Monday-Friday 0700-1900, and Saturday 8000-1400.
- Hooting will be prohibited onsite. Drivers of plant and vehicles will be instructed to avoiding hooting at all times.
- Plant used on-site will be maintained in a satisfactory condition and in accordance with manufacturer recommendations. In particular, exhaust silencers will be fitted and operating correctly at all times. Defective silencers shall be immediately replaced.
- Plant items will only be left running during works and will be switched off at all other times. Plant will not be left idling.
- Selection of quiet plant/location of plant; plant which will have the least impact in term of noise will be selected and will be positioned as far away as practical from noise sensitive receptors.
- All vehicles and mobile plant will have effective exhaust silencers, and these will be subject to regular maintenance to ensure they remain fit for purpose. All diesel fuelled plant will have effective air intake silencers.
- Pneumatic percussive tools (air drills, hammers, rammers etc) will be fitted with the manufacturer's recommended mufflers or silencers.

- All noise complaints will be logged by the Clerk of Works in a register and investigated immediately. Details of follow-up action will be included in the register.

6.2 Air

6.2.1 Dust

Dust emissions are likely to arise from earthworks, wind blow from temporary soil stockpiles; construction traffic movements; handling of construction materials and landscaping. Given the distance between Phase 1 and the nearest sensitive receptor the risk of dust soiling at the nearest residences is low; however the following control measures will be implemented at a minimum:

- The Contractor shall prepare a site-specific Dust Management Plan prior to the start of the works.

- Spraying of exposed earthworks, soil stockpiles and site haul roads during dry weather using mobile bowser units.

- Provision of a power wash at the site entrance road to remove dirt from vehicles before they leave the site.

- Paved roads will be regularly swept to remove mud and debris and traffic movements on non-paved areas will be restricted to essential site traffic

- Control of vehicle speeds.

- Material drop heights from plant to plant or from plant to stockpile will be minimised.

- The junction on the access road to the Substation will be inspected daily for cleanliness and cleaned as required using a mechanical road sweeper.

6.2.2 Engine Exhaust Emissions

The following mitigation measures will be implemented

- Construction materials will where possible be sourced locally so as to minimise transport distances.

- Engines will be turned off when machinery is not in use, and

- Regular maintenance of vehicles, plant and equipment.

6.3 Land & Soil

The following mitigation measures will be implemented to minimise the risk of soil contamination:

- Excavation and the stripping of topsoil and subsoils will only be undertaken when absolutely necessary, as this can lead to sediment run off and leaching of nutrients from soils into the groundwater.

- Excavated soils not immediately reused will be stockpiled to minimise the effects of weathering.

- Good housekeeping (daily site clean-ups, use of disposal bins, etc.) and the proper use, storage and disposal of substances and their containers.

- Regular plant maintenance to minimise oil leaks.

- Diesel fuelled plant refuelling will only be undertaken by trained personnel in areas where appropriate spill control materials are to hand (spill mats, oil dry). Any spillages will be immediately contained, and the contaminated soil excavated and sent to an appropriately licensed waste management facility.

- Pouring of cementitious materials will be carried out where possible in dry periods based on weather forecasts. Plastic covers will be available in case of a sudden rainfall event.

- The concrete pumping will be monitored to ensure no accidental discharge.

- Excess concrete will be removed from the site and concrete washout, with the exception of chute cleaning, will not be permitted on the site

- There will be no hosing into surface water drains of spills of concrete, cement, grout or similar materials

6.4 Water

There are no drains or watercourses either inside, or adjacent to the site boundary and the closest water feature is Huntstown Stream, which is approximately 970m north of the site. Therefore there is no requirement to control and manage the flow of surface water run-off from the site into field drains in the construction phase. Currently incident rainfall infiltrates to ground and this will continue to be the case in the construction stage, meaning measures to control and manage the infiltration rate are not required.

The following prevention and mitigation measures will be implemented:

- Excavation and the stripping of topsoil and subsoils will only be undertaken when absolutely necessary, as this can lead to sediment run off and leaching of nutrients from soils into the groundwater.

- Excavated soils not immediately reused will be stockpiled to minimise the effects of weathering.

- Good housekeeping (daily site clean-ups, use of disposal bins, etc.) and the proper use, storage and disposal of substances and their containers.

- Regular plant maintenance to minimise oil leaks.

- Diesel fuelled plant refuelling will only be undertaken by trained personnel in areas where appropriate spill control materials are to hand (spill mats, oil dry). Any spillages will be immediately contained, and the contaminated soil excavated and sent to an appropriately licensed waste management facility.

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- The concrete pumping will be monitored to ensure no accidental discharge.

- Excess concrete will be removed from the site and concrete washout, with the exception of chute cleaning, will not be permitted on the site

- There will be no hosing into surface water drains of spills of concrete, cement, grout or similar materials

6.5 Archaeology

Prior to the start of the construction stage an archaeological investigation will be carried out in the two areas identified as containing archaeological features. The investigations will be carried out by a licence-eligible archaeologist and in compliance with a method statement approved by the Department of Housing, Local Government and Heritage in consultation with the National Museum of Ireland. Following completion of the archaeological investigations there will be no need for prevention and mitigation measures in the construction stage.

6.6 Biodiversity

All works will be confined to within the development site boundary. A minimum 2 m buffer shall be maintained between all working, storage and parking areas and the treelines along the western and southern boundary.

6.6.1 Lighting

- Site lighting will be provided with the minimum luminosity necessary for safety and security purposes. Where possible, lighting will be restricted to the working area and using the cowl and angling noted above, will minimise overspill and shadows on sensitive habitats outside the construction area and

- Site lighting will be positioned and directed so that it does not unnecessarily intrude on adjacent ecological receptors. The primary area of concern is the potential impact at the woodland and treelines. There will be no directional lighting focused towards these areas and cowling and focusing lights downwards will minimise light spillage.

6.6.2 Habitats

- Where possible the hedgerows will be removed outside the period 1st March to 31st August.

- The mitigation measures to protect the trees that will be retained shall comply with the recommendations of the BS5837 TREE SURVEY REPORT for works within the root protection area of the trees and as shown on the Tree Constraints Drawing in Appendix 1.

- Tree and shrub planting and the management of landscaping works will be undertaken by a suitably qualified landscape contractor.

6.6.3 Bats

- The Main Contractor will take all the required measures to ensure works do not harm individual bats by altering working methods or timing to avoid bats, if necessary.

- A number of trees will be removed prior to/during construction. A bat specialist will be retained to ensure that the loss of trees is minimised, and those trees earmarked for retention are adequately protected.

- Tree-felling will be undertaken in the period September to late October/early November. During this period bats are capable of flight and may avoid the risks of tree-felling if proper measures are undertaken.

- Felled trees will not be mulched immediately. Such trees will be left lying several hours and preferably overnight before any further sawing or mulching. This will allow any bats within the tree to emerge and avoid accidental death. The bat specialist will be on-hand during felling operations to inspect felled trees for bats. If bats are seen or heard in a tree that has been felled, work will cease and the local NPWS Conservation Ranger will be contacted.

- Trees will be retained where possible and no 'tidying up' of dead wood and spilt limbs on tree specimens will be undertaken unless necessary for health and safety.

- Treelines outside the proposed development area but adjacent to it and thus at risk, will be clearly marked by a bat specialist to avoid any inadvertent damage.

- During construction directional lighting will be employed to minimise light spill onto adjacent areas. Where practicable during night-time works, there will be no directional lighting focused towards the boundary habitats and focusing lights downwards will be utilised to minimise light spillage.

- Lighting mitigation measures will follow *Bats & Lighting Guidance Notes for: Planners, engineers, architects and developers* (Bat Conservation Ireland, 2010) and *Guidance note 08/18. Bats and artificial lighting in the UK. Bats and the built environment series* (Bat Conservation Trust 2018).

6.6.4 Landscape

It is proposed to and to supplement the existing boundary hedgerows with native species.

7. MONITORING

An Environmental Monitoring Programme will be implemented for the duration of the works. The scope will be based on the conditions of the planning permission and will be confirmed with Fingal County Council in advance of the works. The preliminary scope is below.

7.1 Dust Deposition

It is proposed that a minimum of three monitoring gauges will be located at the site boundary at points closest to the nearest sensitive receptors (residential and farm dwellings). It is proposed to conduct the monitoring at monthly intervals.

The monitoring will be carried out using Bergerhoff gauges specified in the German Engineering Institute VDI 2119 document entitled 'Measurement of Dustfall Using the Bergerhoff Instrument' (Standard Method).

The gauges will be set up such that the containers were approximately 2m above the ground surface. To inhibit the growth of algae, 10ml of copper sulphate will be added to each jar. The monitoring period shall be between 28 and 32 days. The proposed deposition limit is 350 $mg/m^2/day$

7.2 Biodiversity

A bat specialist will attend the site during tree felling to check for the presence of bats.

7.3 Noise Monitoring

If required by the Council noise monitoring will be carried out at noise sensitive locations and frequency agreed with the Council. The monitoring will be in accordance with International Standard ISO 1996-2:2017 Acoustics – Description, measurement and assessment of environmental noise, Part 2: Determination of environmental noise levels (2017). The noise limits will be as conditioned in the planning permission.

7.4 Works Area

The site will be inspected daily to ensure that buffer zones between the working areas and hedgerows are maintained and that the oil and chemical storage and handling areas and the waste storage areas are appropriately managed.

7.5 Landscape Works

Regular inspections will be conducted out to ensure that the landscaping is carried out in accordance with the landscape plans and the tree protection measures are correctly implemented.

7.6 Reporting

The results of the monitoring will be submitted to Fingal County Council.

APPENDIX 1

TREE CONSTRAINTS PLAN



LEGEND:

- Root Protection Area
- Accurate Crown Spread
- Tree Tag Number
- BS 5837 Category Rating
- Tree Species

N

Andrew Boe BSc. (Hons) MArborA : aj.boe@hotmail.co.uk
Independent Arboricultural Consultant: 07834895556

Client

Huntstown Project

Project

Huntstown

Drawing title

Tree Constraints Plan

Date	August/2023
Scale	Various on A1
Drawing number	a 001
Horizontal Datum:	IRLGRID
Vertical Datum:	OSBM

APPENDIX 3.4

LIGHTING REPORT

External Lighting Assessment Report

for

New Industrial Premises,

Huntstown, Co. Dublin

Document Control	
Document No.	CAR-2045-001
Prepared By	FD, AC
Reviewed By	P Carmody
Approved By	P Carmody
Date	Oct 2023
Rev	P
Status	Issued to support planning submission

Revision History		
Date	**Rev**	**Description**

Carmody Engineering
Building Services Engineers
Drogheda, Co. Louth

1 Preamble

This document relates to the proposed external lighting services works for the proposed new building industrial units at Huntstown, Co Meath

The primary design criteria is the requirement set out in section 9.3 of the Dwyer & Jones Design Partnership Aeronautical Assessment Report dated April 2023 ; *which recommends that external lighting on the site to be the cut-ff type (i.e. not showing light above the horizontal)*. The report confirms aviation obstruction lighting is not required.

While not referred to specially we confirm the road schemes fully comply IS EN 1301 Road Lighting

2 Proposal

We attach a copy of drawing; Proposed *External Lighting details* - No. 2045.E600. Rev - & technical information of the luminaires on which the design is based.

The primary design criteria is the requirement set out in section 9.3 of the Dwyer & Jones Design Partnership Aeronautical Assessment Report dated April 2023 ; *which recommends that external lighting on the site to be the cut-ff type (i.e. not showing light above the horizontal)*.

We used AG132 Software package to assess the scheme output for this project as it assesses Obtrusive Light Compliance to *CIE 150:2003 Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations.*

The building mounted luminaires are all designated as G1 glare classification, from the BUG ratings. The acronym, “BUG” (Backlight, Uplight, and Glare) was developed by the Illuminating Engineering Society (IES) and The International Dark Sky Association in order to calculate the light escaping in unwanted directions from an outdoor light fixture.

In their efforts to replace the original “cutoff” system, which applied solely for street lighting, the BUG rating is a comprehensive system for all outdoor lighting. Although there are multiple variables to consider, including site, application, and how the luminaire is installed, BUG ratings serve as a measurement tool to determine the appropriate commercial outdoor lighting for certain applications.

As noted above we have used AGI32 lighting software to assess Obtrusive Light Compliance to CIE-150:2003. In addition to providing horizontal spill contours, the software calculates vertical illuminance and luminance intensity on 10m high grid, placed on adjacent properties or boundaries, based the applicable environmental lighting zone. The software calculates the combined intensity of all luminaires facing these grids and indicates which grid point(s) fail and which luminaire(s) are involved.

The report confirms aviation obstruction lighting is not required. Therefore, additional mitigation of light spill by rear spill shields are not required.

All lighting design complies with the following.

- IS EN 12464-2, 2014 “Lighting for Work Places, Outdoor Work Places
- IS EN 1301 Road Lighting – Part 2 Performance Requirements

APPENDIX 01 Type B1 Luminaire; Realta 20W LED Area 4000K



HIGH PERFORMANCE LUMINAIRES DESIGNED TO MINIMISE LIGHT POLLUTION AND ENERGY CONSUMPTION

IP66 IK10++ / IK10 / IK06 UK CA CE LED

SPECIFICATION

- Graphite full polyester powder finish. Silver option
- Strong high-pressure die-cast LM2 aluminium body
- High efficiency prismatic polycarbonate or borosilicate glass front refractor
- Wide distribution (8W) or area distribution (20W, 34W and 42W) options
- Highly specular, multi-faceted injection moulded vacuum metallised reflector on wide distribution versions
- Excellent distribution with less than 2% upward light component
- Optional photocell control
- Smart External versions with intelligent lighting control for use up to 10 metres mounting height
- SmartScan wireless technology removes the need for control cabling. Ideal for retro-fit
- Fitted with 4000K LEDs

RANGE

	LED	WIDE DISTRIBUTION	AREA DISTRIBUTION	APPROX. kg
SMART EXTERNAL	**IK10 Polycarbonate Cover**			
	8W	**RL 19069SS**		3.9
	20W		**RL 19110SS**	4.0
	34W		**RL 19111SS**	4.0
	42W		**RL 19112SS**	4.0
STANDARD	**IK10++ Polycarbonate Cover**			
	8W	**RL 19071L**		3.8
	20W		**RL 19116L**	3.9
	34W		**RL 19117L**	3.9
	42W		**RL 19118L**	3.9
	IK06 Glass Cover			
	8W	**RL 19073L**		4.6

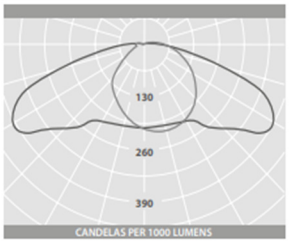
CIRCUIT TYPE -
SMART EXTERNAL **SS - SmartScan**
STANDARD **L - non-dimming (LED)**

SILVER OPTION - add suffix **SV3** e.g. **RL 19069SSSV3** etc.

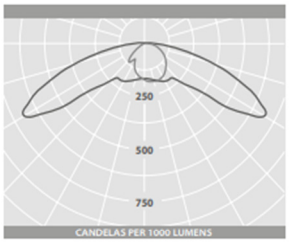
EMERGENCY VERSION - prefix catalogue number with:
ERL - Emergency / TRL - AutoTest (Not available when selecting the **'SS'** suffix)
WRL - SmartScan
e.g. **WRL 19069SS** etc.
Add 0.4kg to weights listed

Photometrics, Accessories, Options and Dimensions pages **3** and **4**

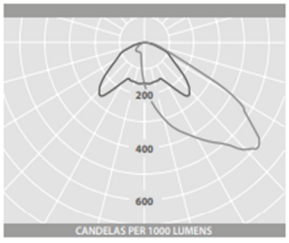
PHOTOMETRIC GUIDE



GLASS COVER (Wide Distribution)
Luminaire Lumen Output:
8W = 1175lm



POLYCARBONATE COVER (Wide Distribution)
Luminaire Lumen Output:
8W = 1320lm



POLYCARBONATE COVER (Area Distribution)
Luminaire Lumen Output:
20W = 2840lm
34W = 4850lm
42W = 5635lm



Single luminaire pole mounting attachment



Twin luminaire pole mounting attachment

ACCESSORIES

DESCRIPTION	CAT. No.	APPROX. kg
Single luminaire pole mounting attachment *(for 60m dia. poles)*	**RL 13759**	1.6
Twin luminaire pole mounting attachment *(for 60m dia. poles)*	**RL 14175**	2.6
76/60mm dia. spigot adaptor *(for retro-fit on 76mm dia. columns)*	**RL 11184**	0.8

OPTIONS

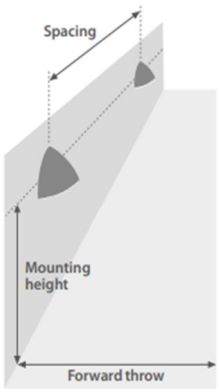
DESCRIPTION	SUFFIX	EXAMPLE
Photocell *(standard versions only)*	**PC**	**RL 19071LPC**
Tamper resistant screws ◆	**T**	**RL 19071LT**

◆ To fasten tamper resistant screws order special screwdriver **KEY 10008**

PERFORMANCE GUIDE - Wide Distribution

Photometric Performance -
8W LED with polycarbonate cover

SPACING	AVERAGE ILLUMINANCE	UNIFORMITY (min/av)
3m mounting height - 3m forward throw		
10m ctrs	22 lux	0.48
15m ctrs	15 lux	0.47
20m ctrs	11 lux	0.22
4m mounting height - 4m forward throw		
10m ctrs	17 lux	0.48
15m ctrs	11 lux	0.45
20m ctrs	8 lux	0.47
5m mounting height - 5m forward throw		
10m ctrs	13 lux	0.42
15m ctrs	9 lux	0.48
20m ctrs	7 lux	0.45



e.g. At 3m mounting height and 10m centres: 22 lux average horizontal illuminance at ground level

APPENDIX 02 Type X1 Luminaire; Aspect Flood 32-LED 49W CLO FO5 4K

TRTLIGHTING
ROAD & TUNNEL SYSTEMS

ASF32C/LED/49W/F05/4K/SV/FG

ASPECT FLOOD

IK08 CE IP66

Project Name/Ref.:	Luminaire Ref.:	Date: **Oct 2023**



Electrical Characteristics

Circuit Watts (CW):	49W
Electrical Class:	Class I
LED CCT:	4000K
LED CRI:	>70
Luminaire Lumens (LL):	6,949Lm
Luminaire Efficacy:	142 LL/CW
Lumen Maintenance:	Projected L90 after 100,000 hours
Driver Output:	Constant Current with AM Dimming
Power Factor	0.95/0.90 (Full Load/Half Load)
Operational Voltage:	220 - 240V AC
Operating Frequency:	50/60Hz
Inrush Current:	65A/160uS (Apk/50%uS)
Running Current:	0.213A
Surge Protection (Com/Dif):	10kV/6kV on request
Photocell Socket:	None
Constant Light Output:	(Enabled)
Part Night Dimming:	Disabled
Driver Manuf./Range:	OSRAM 4DIM 200W

Mechanical Characteristics

Housing Material:	Die-cast Aluminium
Lens/Cover Material:	PMMA/Toughened Safety Glass
Housing Finish:	Chromate-free Pretreat, Polyester Powder
Housing Colours:	RAL 9006 Light Grey
Ingress Protection:	IP66
Weight:	13Kg
Windage:	0.047m²
Impact Resistance:	IK08
Mounting Methods:	Cradle for wall & column mounting
Mounting Inclination:	10° steps for 0° to 180°
Photometric Centre:	Post-top 424mm, wall 386mm
Ambient Temperature:	-20°C to 50°C

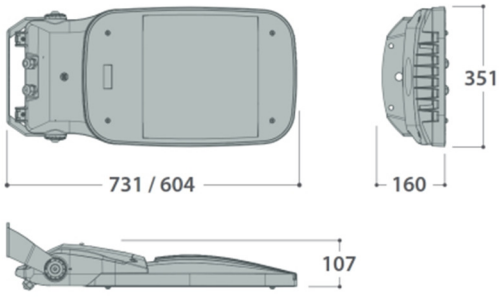
Warranty

Luminaire, LEDs & Driver:	10 Years
Country of Manufacture:	UK

Photometric File

ASF_32LED_49W_CLO_F05_4K_FG.ies

Dimensions



APPENDIX 03 Type X2 Luminaire; Aspect Flood 32-LED 88W CLO FO5 4K

TRTLIGHTING
ROAD & TUNNEL SYSTEMS

ASF32C/LED/88W/F05/4K/SV/FG

ASPECT FLOOD

IK08 CE IP66

Project Name/Ref.:	Luminaire Ref.:	Date: **Oct 2023**



Electrical Characteristics

Circuit Watts (CW):	88W
Electrical Class:	Class I
LED CCT:	4000K
LED CRI:	>70
Luminaire Lumens (LL):	11,498Lm
Luminaire Efficacy:	131LL/CW
Lumen Maintenance:	Projected L90 after 100,000 hours
Driver Output:	Constant Current with AM Dimming
Power Factor	0.95/0.90 (Full Load/Half Load)
Operational Voltage:	220 - 240V AC
Operating Frequency:	50/60Hz
Inrush Current:	65A/160uS (Apk/50%uS)
Running Current:	0.382A
Surge Protection (Com/Dif):	10kV/6kV on request
Photocell Socket:	None
Constant Light Output:	(Enabled)
Part Night Dimming:	Disabled
Driver Manuf./Range:	OSRAM 4DIM 200W

Mechanical Characteristics

Housing Material:	Die-cast Aluminium
Lens/Cover Material:	PMMA/Toughened Safety Glass
Housing Finish:	Chromate-free Pretreat, Polyester Powder
Housing Colours:	RAL 9006 Light Grey
Ingress Protection:	IP66
Weight:	13Kg
Windage:	0.047m²
Impact Resistance:	IK08
Mounting Methods:	Cradle for wall & column mounting
Mounting Inclination:	10° steps for 0° to 180°
Photometric Centre:	Post-top 424mm, wall 386mm
Ambient Temperature:	-20°C to 50°C

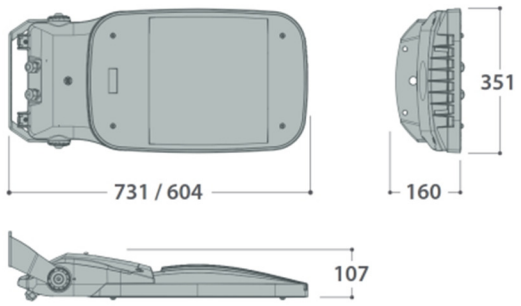
Warranty

Luminaire, LEDs & Driver:	10 Years
Country of Manufacture:	UK

Photometric File

ASF_32LED_88W_CLO_F05_4K_FG.ies

Dimensions



APPENDIX 04 Type X3 Luminaire; Aspect 32-LED 63W CLO GR5 4K

TRTLIGHTING
ROAD & TUNNEL SYSTEMS

ASPECT

AS32C/LED/63W/GR5/4K/SV/G/U76

IK08 CE IP66

Project Name/Ref.:	Luminaire Ref.:	Date: **Oct 2023**



Electrical Characteristics

Circuit Watts (CW):	63W
Electrical Class:	Class I
LED CCT:	4000K
LED CRI:	>70
Luminaire Lumens (LL):	8,986 Lm
Luminaire Efficacy:	143 LL/CW
Lumen Maintenance:	Projected L90 after 100,000 hours
Driver Output:	Constant Current with AM Dimming
Power Factor	0.95/0.90 (Full Load/Half Load)
Operational Voltage:	220 - 240V AC
Operating Frequency:	50/60Hz
Inrush Current:	57A/210uS (Apk/50%uS)
Running Current:	0.274A
Surge Protection (Com/Dif):	8kV/6kV (10kV/6kV on request)
Photocell Socket:	None
Constant Light Output:	(Enabled)
Part Night Dimming:	Disabled
Driver Manuf./Range:	OSRAM 4DIM 200W

Mechanical Characteristics

Housing Material:	Die-cast Aluminium
Lens/Cover Material:	PMMA/Toughened Safety Glass
Housing Finish:	Chromate-free Pretreat, Polyester Powder
Housing Colours:	RAL 9006 Light Grey, RAL 9017 Black
Ingress Protection:	IP66
Weight:	8Kg
Windage:	0.059 m²
Impact Resistance:	IK10
Mounting Methods:	Post Top 60/76mm, Side: 34/42/60/76mm
Mounting Inclination:	-10°, -5°, 0°, 5° & 10°
Photometric Centre:	350mm to Module Centre
Ambient Temperature:	-20°C to 40°C

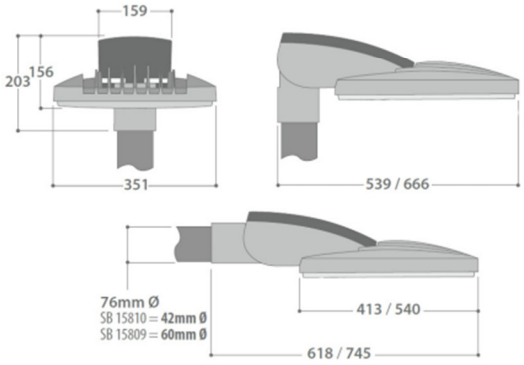
Warranty

Luminaire, LEDs & Driver:	10 Years
Country of Manufacture:	UK

Photometric File

AS_32LED_63W_CLO_GR5 4K_FG.ies

Dimensions



APPENDIX 05 Type X4 Luminaire; Aspect Flood 32-LED 88W CLO FO5 4K

TRTLIGHTING
ROAD & TUNNEL SYSTEMS

ASF32C/LED/88W/F05/4K/SV/FG

ASPECT FLOOD

IK08 CE IP66

Project Name/Ref.:	Luminaire Ref.:	Date: **Oct 2023**



Electrical Characteristics

Circuit Watts (CW):	88W
Electrical Class:	Class I
LED CCT:	4000K
LED CRI:	>70
Luminaire Lumens (LL):	11,498Lm
Luminaire Efficacy:	131LL/CW
Lumen Maintenance:	Projected L90 after 100,000 hours
Driver Output:	Constant Current with AM Dimming
Power Factor	0.95/0.90 (Full Load/Half Load)
Operational Voltage:	220 - 240V AC
Operating Frequency:	50/60Hz
Inrush Current:	65A/160uS (Apk/50%uS)
Running Current:	0.382A
Surge Protection (Com/Dif):	10kV/6kV on request
Photocell Socket:	None
Constant Light Output:	(Enabled)
Part Night Dimming:	Disabled
Driver Manuf./Range:	OSRAM 4DIM 200W

Mechanical Characteristics

Housing Material:	Die-cast Aluminium
Lens/Cover Material:	PMMA/Toughened Safety Glass
Housing Finish:	Chromate-free Pretreat, Polyester Powder
Housing Colours:	RAL 9006 Light Grey
Ingress Protection:	IP66
Weight:	13Kg
Windage:	0.047m²
Impact Resistance:	IK08
Mounting Methods:	Cradle for wall & column mounting
Mounting Inclination:	10° steps for 0° to 180°
Photometric Centre:	Post-top 424mm, wall 386mm
Ambient Temperature:	-20°C to 50°C

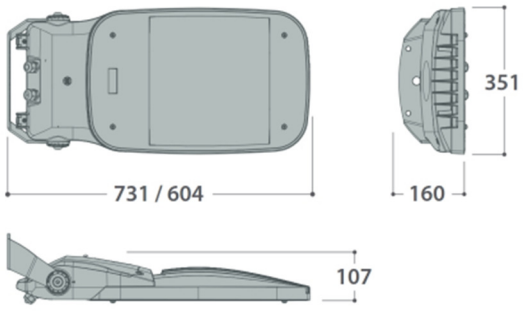
Warranty

Luminaire, LEDs & Driver:	10 Years
Country of Manufacture:	UK

Photometric File

ASF_32LED_88W_CLO_F05_4K_FG.ies

Dimensions



APPENDIX 05 Type X5 Luminaire; Optio Nano 12-LED 39W CLO GR5 4K

TRT LIGHTING ROAD & TUNNEL SYSTEMS

OPTIO NANO

OPN 12-LED/39W/CLO/GR5/4K/SV/E/U76

IK08 CE IP66

Project Name/Ref.:	Luminaire Ref.:	Date: **Aug 2023**



Electrical Characteristics

Circuit Watts (CW):	39W
Electrical Class:	Class I
LED CCT:	4000K
LED CRI:	>70
Luminaire Lumens (LL):	5,829Lm
Luminaire Efficacy:	149Lm/CW
Lumen Maintenance:	Projected L90/B10 after 100,000 hours:0.9
Driver Output:	Constant Current with AM Dimming
Power Factor	0.95/0.90 (Full Load/Half Load)
Operational Voltage:	220 - 240V AC
Operating Frequency:	50/60Hz
Inrush Current:	26A/180uS (Apk/50%uS)
Running Current:	0.109A
Surge Protection (Com/Dif):	10kV/6kV
Photocell Socket:	None
Constant Light Output:	CLO Enabled. (CLO LLMF = 1 x LMF)
Part Night Dimming	U14 (Not Enabled)
Driver Manuf./Range:	Philips Xitanium Xi FP 40W 0.3 - 1.0A SNL DAE

Photometric File

OPN_12 LED 39 CLO GR5 4000K EXP PSO.ies

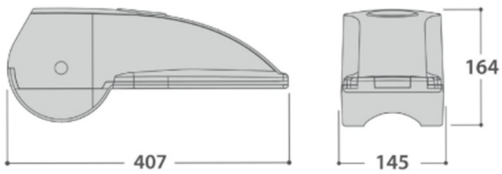
Mechanical Characteristics

Housing Material:	Die-cast LM6 Aluminium
Lens Material:	PMMA
Housing Finish:	Chromate-free Pretreat, Polyester Powder
Housing Colours:	RAL 9006 Light Grey, RAL 9022 Dark Grey
Ingress Protection:	IP66
Weight:	4Kg
Windage:	0.046 m²
Impact Resistance:	IK10 (Body), IK08 (PMMA Lens)
Mounting Methods:	Post Top 60/76mm, Side: 34/42/60/76mm
Mounting Inclination:	-10°, -5°, 0°, 5° & 10°
Photometric Centre:	225mm to Module Centre
Ambient Temperature:	-20°C to 40°C

Warranty

Luminaire, LEDs & Driver:	10 Years
Country of Manufacture:	UK

Dimensions



APPENDIX 07 Type X6 Luminaire; Optio Nano 12-LED 24W CLO GR5 4K

TRTLIGHTING
ROAD & TUNNEL SYSTEMS

OPTIO NANO

OPN 12-LED/24W/CLO/GR5/4K/SV/E/U76

IK08 CE IP66

Project Name/Ref.:	Luminaire Ref.:	Date: **Aug 2023**



Electrical Characteristics

Circuit Watts (CW):	24W
Electrical Class:	Class I
LED CCT:	4000K
LED CRI:	>70
Luminaire Lumens (LL):	3,935Lm
Luminaire Efficacy:	164Lm/CW
Lumen Maintenance:	Projected L90/B10 after 100,000 hours:0.9
Driver Output:	Constant Current with AM Dimming
Power Factor	0.95/0.90 (Full Load/Half Load)
Operational Voltage:	220 - 240V AC
Operating Frequency:	50/60Hz
Inrush Current:	26A/180uS (Apk/50%uS)
Running Current:	0.104A
Surge Protection (Com/Dif):	10kV/6kV
Photocell Socket:	None
Constant Light Output:	CLO Enabled. (CLO LLMF = 1 x LMF)
Part Night Dimming	U14 (Not Enabled)
Driver Manuf./Range:	Philips Xitanium Xi FP 40W 0.3 - 1.0A SNL DAE

Photometric File

OPN_12 LED 24 CLO GR5 4000K EXP PSO.ies

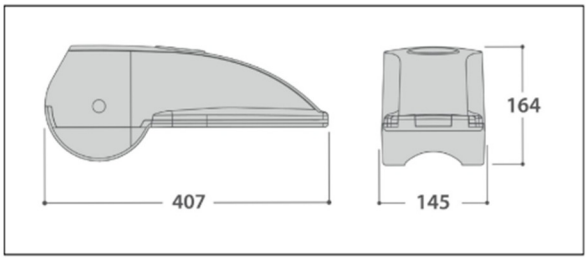
Mechanical Characteristics

Housing Material:	Die-cast LM6 Aluminium
Lens Material:	PMMA
Housing Finish:	Chromate-free Pretreat, Polyester Powder
Housing Colours:	RAL 9006 Light Grey, RAL 9022 Dark Grey
Ingress Protection:	IP66
Weight:	4Kg
Windage:	0.046 m²
Impact Resistance:	IK10 (Body), IK08 (PMMA Lens)
Mounting Methods:	Post Top 60/76mm, Side: 34/42/60/76mm
Mounting Inclination:	-10°, -5°, 0°, 5° & 10°
Photometric Centre:	225mm to Module Centre
Ambient Temperature:	-20°C to 40°C

Warranty

Luminaire, LEDs & Driver:	10 Years
Country of Manufacture:	UK

Dimensions



APPENDIX 08 Type X7 Luminaire; Aspect 64 -LED 102W CLO GR5 4K

TRTLIGHTING ROAD & TUNNEL SYSTEMS

ASPECT

AS64C/LED/102W/GR5/4K/SV/G/U76

IK08 CE IP66

Project Name/Ref.:	Luminaire Ref.:	Date: **Oct 2023**



Electrical Characteristics

Circuit Watts (CW):	102W
Electrical Class:	Class I
LED CCT:	4,000K
LED CRI:	>70
Luminaire Lumens (LL):	15,565 Lm
Luminaire Efficacy:	153 LL/CW
Lumen Maintenance:	Projected L90 after 100,000 hours
Driver Output:	Constant Current with AM Dimming
Power Factor	0.95/0.90 (Full Load/Half Load)
Operational Voltage:	220 - 240V AC
Operating Frequency:	50/60Hz
Inrush Current:	57A/210uS (Apk/50%uS)
Running Current:	0.443A
Surge Protection (Com/Dif):	8kV/6kV (10kV/6kV on request)
Photocell Socket:	None
Constant Light Output:	(Enabled)
Part Night Dimming:	Disabled
Driver Manuf./Range:	OSRAM 4DIM 200W

Mechanical Characteristics

Housing Material:	Die-cast Aluminium
Lens/Cover Material:	PMMA/Toughened Safety Glass
Housing Finish:	Chromate-free Pretreat, Polyester Powder
Housing Colours:	RAL 9006 Light Grey, RAL 9017 Black
Ingress Protection:	IP66
Weight:	8Kg
Windage:	0.059 m²
Impact Resistance:	IK10
Mounting Methods:	Post Top 60/76mm, Side: 34/42/60/76mm
Mounting Inclination:	-10°, -5°, 0°, 5° & 10°
Photometric Centre:	350mm to Module Centre
Ambient Temperature:	-20°C to 40°C

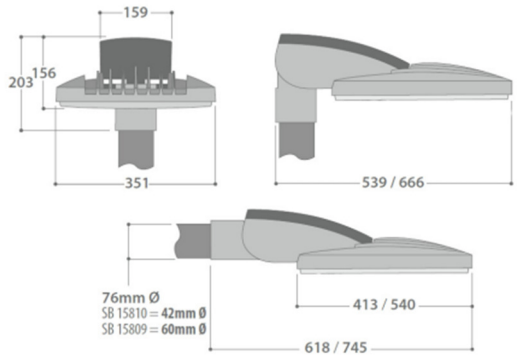
Warranty

Luminaire, LEDs & Driver:	10 Years
Country of Manufacture:	UK

Photometric File

AS_64LED_102_CLO_GR5_4K_FG.ies

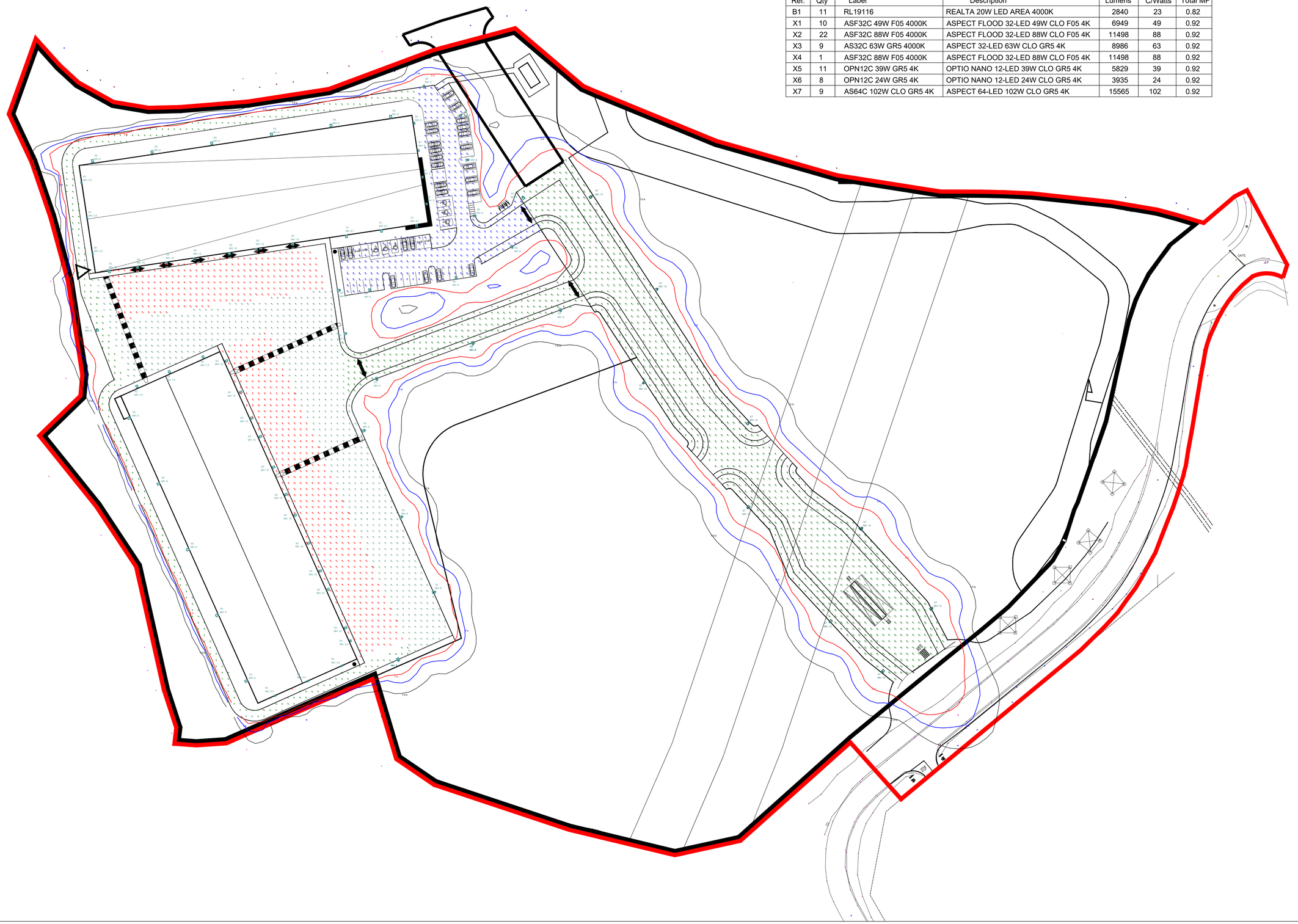
Dimensions



THESE ARE COORDINATION DRAWINGS ONLY TO PROGRESS WORKS AND ARE NOT DESIGN DRAWINGS. ALL DIMENSIONS TO BE CHECKED ON SITE.

Calculation Summary						
Grid Label	Calculation Type	Units	Eav	Emax	Emin	Emin/Eav
Carpark	Illuminance	Lux	19.02	42	7	0.37
Food Cont. Cleaning Building L/Bays	Illuminance	Lux	31.27	46	12	0.38
Loading Yards	Illuminance	Lux	18.79	62	8	0.43
MRF Loading Bays	Illuminance	Lux	31.33	64	13	0.41
Road - Perimeter Access	Illuminance	Lux	14.48	54	4	0.28
Road Site Access - Main	Illuminance	Lux	15.87	45	5	0.32
Road Truck Yard Access	Illuminance	Lux	14.41	46	6	0.42

Luminaire Schedule						
Ref:	Qty	Label	Description	Lumens	C/Watts	Total MF
B1	11	RL19116	REALTA 20W LED AREA 4000K	2840	23	0.82
X1	10	ASF32C 49W F05 4000K	ASPECT FLOOD 32-LED 49W CLO F05 4K	6949	49	0.92
X2	22	ASF32C 88W F05 4000K	ASPECT FLOOD 32-LED 88W CLO F05 4K	11498	88	0.92
X3	9	AS32C 63W GR5 4000K	ASPECT 32-LED 63W CLO GR5 4K	8986	63	0.92
X4	1	ASF32C 88W F05 4000K	ASPECT FLOOD 32-LED 88W CLO F05 4K	11498	88	0.92
X5	11	OPN12C 39W GR5 4K	OPTIO NANO 12-LED 39W CLO GR5 4K	5829	39	0.92
X6	8	OPN12C 24W GR5 4K	OPTIO NANO 12-LED 24W CLO GR5 4K	3935	24	0.92
X7	9	AS64C 102W CLO GR5 4K	ASPECT 64-LED 102W CLO GR5 4K	15565	102	0.92



GENERAL NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL, STRUCTURAL, CIVIL, MECHANICAL & ELECTRICAL DRAWINGS AND ALL RELEVANT SECTIONS OF THE MECHANICAL & ELECTRICAL SPECIFICATIONS.
2. DO NOT SCALE FROM THIS DRAWING.
3. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED. ALL DIMENSIONS TO BE VERIFIED ON SITE AND APPROVED BY THE ENGINEER.



REF X3: ASPECT 32-LED



REF X1, X2,X4 ASPECT 32-LED FLOOD



REF X5, X6, OPTIO NANO 12-LED



REF: B1 REALTA 20W AREA

REV.	DATE	DESCRIPTION	DRN.	CHK.
P	23.10.22	Issued to support planning submission	FD	PC

CARMODY ENGINEERING
Unit 1a, Workspace,
Mayoralty Street, Drogheda,
Co. Louth A92 K260
Tel: +353 (0)41 983 7640
Tel: +353 86 172 5291
Email: info@carmodyeng.ie

Project:

HUNTSTOWN,
CO. DUBLIN

Title:

ELECTRICAL DRAWINGS

PROPOSED EXTERNAL LIGHTING SERVICES

Scale:	Drawn By:	Project No.:	Drawing No.:	Revision:
N.T.S.	F.D.	2045	E600	P
Date: 17/10/2023	Checked By: P.C.			

APPENDIX 4.1

BEST AVAILABLE TECHNIQUES ASSESSMENT

BAT 1. In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS). The scope (e.g. level of detail) and nature of the EMS (e.g. standardised or non-standardised) will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have (determined also by the type and amount of wastes processed).

The EPA licence will specify the scope of the EMS that must be implemented at the MRF. In addition details of the accredited EMS that will be adopted in the operational stage are in Section 3.6 of the EIAR

BAT 2. In order to improve the overall environmental performance of the plant, BAT is to use all of the techniques given below.

(a) Set up and implement waste characterisation and pre-acceptance procedures/

(b) Set up and implement waste acceptance procedures

Waste characterisation and pre-acceptance procedures will be put in place at the MRF as described in Section 3.8.1 of the EIAR. .

(c) Set up and implement a waste tracking system and inventory

The EPA licence will require detailed records of each waste load accepted and dispatched from the installation as described in Sections 3.8.1 and 3.8.3 of the EIAR.

(d) Set up and implement an output quality management system

The objective of the MRF is to maximise the recycling and recovery of incoming materials and documented operational procedure will be prepared that demonstrate how this objective will be achieved. The procedures will be an integral part of the EMS.

(e) Ensure waste segregation

(f) Ensure waste compatibility prior to mixing or blending of waste

(g) Sort incoming solid waste

Upon arrival all wastes will be inspected and then directed to designated processing/storage areas. Operational procedures will be prepared prior to the acceptance of the additional waste types to ensure that appropriate compatibility and blending requirements are implemented.

BAT 3. In order to facilitate the reduction of emissions to water and air, BAT is to establish and to maintain an inventory of waste water and waste gas streams, as part of the environmental management system (see BAT 1).

The scope (e.g. level of detail) and nature of the inventory is generally related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have (determined also by the type and amount of wastes processed).

An inventory of all emissions from the MRF is included in the EIAR

BAT 4. In order to reduce the environmental risk associated with the storage of waste, BAT is to use all of the techniques given below*:*

(a) Optimised storage location
(b) Adequate storage capacity
(c) Safe storage operation
(d) Separate area for storage and handling of packaged hazardous waste.

A Waste Storage Plan will be prepared as described in Section 3.11 of the EIAR

BAT 5. In order to reduce the environmental risk associated with the handling and transfer of waste BAT is to set up and implement handling and transfer procedures.

Handling and transfer procedures will be prepared as part of the implementation of the EMS.

BAT 6. For relevant emissions to water as identified by the inventory of waste water streams (see BAT 3), BAT is to monitor key process parameters (e.g. waste water flow, pH, temperature, conductivity, BOD) at key locations (e.g. at the inlet and/or outlet of the pre-treatment, at the inlet to the final treatment, at the point where the emission leaves the installation).

Not applicable, as there will no wastewater emissions to water.

BAT 7. BAT is to monitor emissions to water with at least the frequency given below, and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.

Not applicable as there will no emissions to water.

BAT 8. BAT is to monitor channelled emissions to air with at least the frequency given below, and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality*.*

The odour control system will be a channelled emission to air and the monitoring requirements will be set in the EPA licence.

BAT 9. BAT is to monitor diffuse emissions of organic compounds to air from the regeneration of spent solvents, the decontamination of equipment containing POPs with solvents, and the physico-chemical treatment of solvents for the recovery of their calorific value, at least once per year using one or a combination of the techniques given below.

Not applicable, as solvents will not be regenerated or treated at the MRF

BAT 10. BAT is to periodically monitor odour emissions.

The applicability is restricted to cases where an odour nuisance at sensitive receptors is expected and/or has been substantiated.

Odour monitoring will be carried out as referenced in Section 10.9.2 of the EIAR

BAT 11. BAT is to monitor the annual consumption of water, energy and raw materials as well as the annual generation of residues and wastewater, with a frequency of at least once per year.

The annual consumption of water, raw material as well as the generation of residues and wastewater will be monitored and reported in the Annual Environmental Report (AER). Wastewater emissions to the foul sewer will be monitored.

BAT 12. In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to set up, implement and regularly review an odour management plan as part of the environmental management system (see BAT 1).

The applicability is restricted to cases where an odour nuisance at sensitive receptors is expected and/or has been substantiated.

An odour management plan will be been prepared as described in Section 10.8.3.3 of the EIAR.

BAT 13. In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to use one or a combination of the techniques given below

(a) Minimising residence times

(b) Using chemical treatment

(c) Optimising aerobic treatment

Refer to BAT 12

BAT 14. In order to prevent or, where that is not practicable, to reduce diffuse emissions to air, in particular of dust, organic compounds and odour BAT is to use an appropriate combination of the techniques given below.

Refer to BAT 12 and Section 10.8.3.4 of the EIAR

***BAT 15. BAT is to use flaring only for safety reasons or for non-routine operating conditions (e.g. start-ups, shutdowns) by using both of the techniques given below*.**

Not Applicable.

BAT 16. In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use both of the techniques given below.

Not Applicable.

BAT 17. In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to set up, implement and regularly review a noise and vibration management plan, as part of the environmental management system (see *BAT 1)*

The applicability is restricted to cases where a noise or vibration nuisance at sensitive receptors is expected and/or has been substantiated.

Although the development will not cause noise or vibration nuisance at a sensitive receptor the best practice measures described in Section 10.8.3.2 of the EIAR will be implemented.

BAT 18. In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to use one or a combination of the techniques given below.

(a) Appropriate location of equipment and buildings

All waste handling and processing will be carried out on inside the buildings.

BAT 19. In order to optimise water consumption, to reduce the volume of waste water generated and to prevent or, where that is not practicable, to reduce emissions to soil and water BAT is to use an appropriate combination of techniques.

All operational areas are paved. The permeable paving the car park is designed to filter out hydrocarbons. Rainwater from operational yards will pass through an oil interceptor before discharging to the soakaway.

BAT 20. In order to reduce emissions to water, BAT is to treat waste water using an appropriate combination of techniques.

- ***Table 6.1*** **BAT-associated emission levels (BAT-AELs) for direct discharges to a receiving water body**

Not applicable as there will not be a direct discharge of a treated wastewater to a receiving water body.

- **Table 6.2: BAT-associated emission levels (BAT-AELs) for indirect discharges to a receiving water body**

Not applicable, as there is no indirect discharge of treated wastewater to a receiving water body.

BAT 21. In order to prevent or limit the environmental consequences of accidents and incidents, BAT is to use all of the specified techniques as part of the accident management plan (see BAT 1)

(a) Protection measures
(b) Management of incidental /accidental emissions
(c) Incident/accident registration and assessment system.

The mitigation measures that will be implemented to prevent or limit the environmental consequences of accidents and incidents are described in the relevant Chapters of the EIAR. As described in Section 3.16 of the EIAR and Accident Prevention Policy and Emergency Response Procedure will be prepared.

BAT 22. In order to use materials efficiently, BAT is to substitute materials with waste.

C&D waste will be processed to produced recycled aggregates that meet End of Waste criteria meaning they will replace quarry won materials.

BAT 23. In order to use energy efficiently, BAT is to use both of the following techniques

(a) Energy efficiency plan

(b) Energy balance record

The energy efficiency measures that will be provided are described in Section 3.14 of the EIAR.

BAT 24. In order to reduce the quantity of waste sent for disposal, BAT is to maximise the reuse of packaging as part of the residues management plan (see BAT 1).

Some applicability restrictions derive from the risk of contamination of the waste posed by the reused packaging.

It is an objective to achieve a 98% recovery and recycling rate for all of the wastes accepted at the MRF.

APPENDIX 4.2

AERONAUTICAL ASSESSMENT

Aeronautical Assessment Report

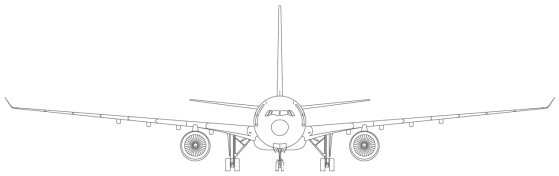
re

Circular Economy Hub

at
Huntstown,
(to east of Mulhuddart)
County Dublin

for
Rathdrinagh Land ULC
(t/a Irish Recycling Ltd.)

April 2023



O'DWYER & JONES DESIGN PARTNERSHIP
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SUMMARY 18

Note: In all maps /diagrams /aerial photos in this report which do not contain a North Point, north lies to the top.

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1. Scope of Report, and Description and Zoning of the Site

1.1 Purpose of this Report:

This Report assesses the aviation impact of the development of Phase #1 of a proposed "Circular Economy Hub" on a site of 9.863 ha. approx. overall at Huntstown in County Dublin. Phase #1 comprises two main buildings: a Materials Recovery Facility, and a Food Container Cleaning Plant.

In particular this Report addresses the requirement stated on page 313 of the current Fingal Development Plan 2023-29 (under *Dublin Airport - Safety*) that "*the effects of proposed development on the safety of aircraft and the safe and efficient navigation thereof*" be assessed.

1.2 Description of the Site:

The site *(outlined in red on the aerial view below)* is located at the west end of Huntstown townland, to north-west of the M50's Junction 5 (where it joins the N2 Roadway) in north County Dublin.

Dublin Airport is to the north-east of the site, with Threshold 10R (of Dublin Airport's east-west Runway 10R/28L) at around 2.4km from the nearest corner of the site, and with the flight path to that runway at around 1.7km north of the site.

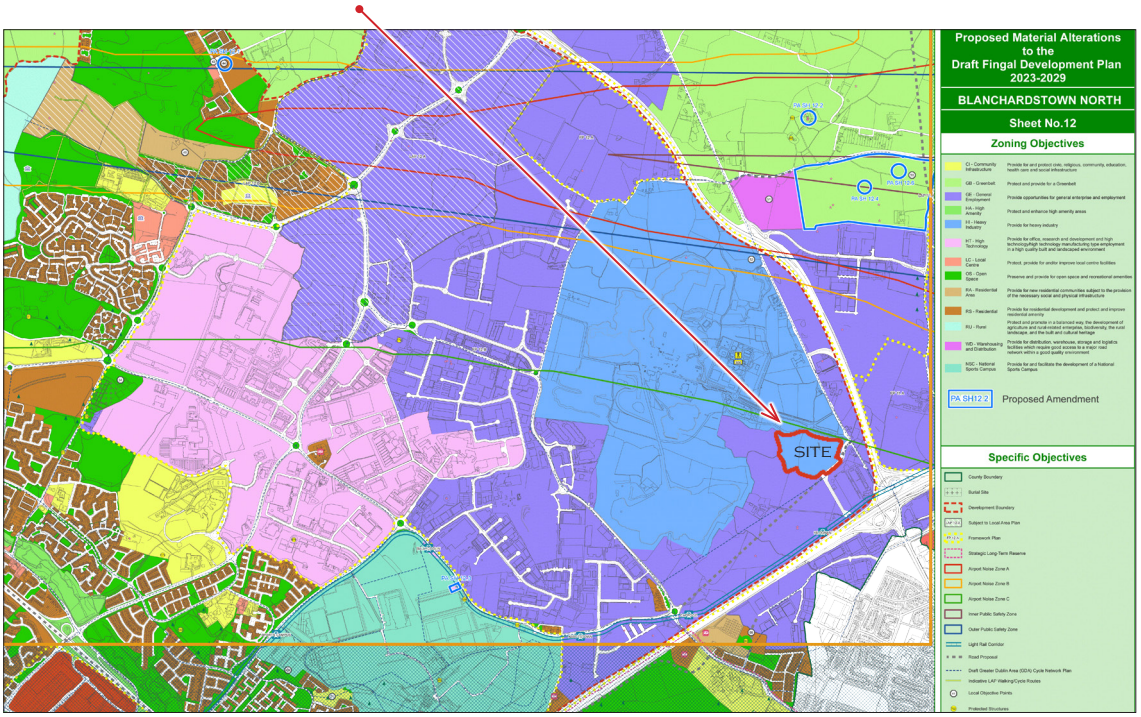
Ground levels on the site vary from around 78m to 86m OD (i.e. 11m-19m above Dublin Airport's datum level), with proposed building floor levels at 78.7m OD.



1.3 **Zoning of the Site:**

All of the site is zoned "HI – Heavy Industry" *(coloured blue)* in the current Fingal Development Plan 2023-29, with Zoning Objective to *"Provide for Heavy Industry."*

The site's location is arrowed on the extract below from Fingal Development Plan Map 12.



1.4 On the Fingal Development Plan Maps it can be seen that this site lies well outside all Airport Public Safety Zones, and just outside the new Airport Noise Zone C (whose outer edge appears as a green line directly north of the Huntstown site).

1.5 Recent significant aviation changes which affect Fingal include the following:

(i) In **December 2017**, the Standards relating to nine international and regional airports in Ireland, including **Dublin Airport**, came **under E.A.S.A.** [European Aviation Safety Agency] control, rather than I.C.A.O. [International Civil Aviation Organization] control as previously, with several changes to airport design specifications (including narrower Approach Surfaces). [This change is referred to in Objective DAO21 on page 313 of the current Fingal Plan 2023-29.]

(ii) In **November 2018, I.C.A.O. issued revised 'Annex 14' Standards** bringing these in line with the new E.A.S.A. airport specifications. [This affects the areas of Fingal above which the "obstacle limitation surfaces" for Casement and Weston Aerodromes extend.]

(iii) In **October 2021**, the UK Modelling Criteria – used as the basis (in 2005) for the **Dublin Airport's Public Safety Zones** – were discontinued (as outdated) in the UK, where much smaller standardized PSZs now apply.

2. Relevant Paragraphs in the current Fingal Development Plan 2023-2029

2.1 Paragraphs relevant to Heavy Industry include the following on page 464 of the Plan:

ZONING OBJECTIVE "HI" HEAVY INDUSTRY

Objective

Provide for heavy industry.

Vision

Facilitate opportunities for industrial uses, activities and processes which may give rise to land use conflict if located within other zonings. Such uses, activities and processes would be likely to produce adverse impacts, for example by way of noise, dust or visual impacts. HI areas provide suitable and accessible locations specifically for heavy industry and shall be reserved solely for such uses.

USE CLASSES RELATED TO ZONING OBJECTIVE

Permitted in Principle		
Abattoir	Concrete/Asphalt	Fuel Depot/Fuel Storage
Heavy Vehicle Park	Industry – Extractive / Quarrying	Industry – High Impact
Office Ancillary to Permitted Use	Open Space	Plant Storage
Restaurant/Café[5]	Retail – Local < 150 sqm nfa[5]	Sustainable Energy Installation[35]
Telecommunications Structures	Utility Installations	Waste Disposal and Recovery Facility (High Impact)

2.2 Section 8 of the Development Plan (on pages 294 to 315) deals with Dublin Airport.

Policy DAP1 (on pp. 303 & 441 of the Plan) refers to the Dublin Airport Local Area Plan of 2020 – one of the Plan's two current "Operational LAPs" – and Objectives DA01 and DA02 (on page 303, and reproduced below) provide for the Safeguarding of Dublin Airport "in accordance with the Dublin Airport Local Area Plan 2020":

In order to meet the demand forecast (as detailed below), enabling infrastructure will have to be provided and it is important that all future development proposals shall not prejudice the orderly operation and continued growth at Dublin Airport. All proposals shall take into account safeguarding associated with key operational features of the airport which include runways, taxiways, obstacle surfaces, radar and control tower sightlines.

Objective DAO1 – Safeguarding Dublin Airport

Facilitate the operation and future development of Dublin Airport, in line with Government policy and the *Dublin Airport Local Area Plan 2020*, or any subsequent LAP or extension of same, recognising its role in the provision of air transport, both passenger and freight.

Objective DAO2

Safeguard the current and future operational, safety, technical and developmental requirements of Dublin Airport and provide for its ongoing development in accordance with the *Dublin Airport Local Area Plan 2020*, or any subsequent LAP or extension of same, having regard to both the environmental impact on local communities and the economic impact on businesses within the area.

2.3 Paragraphs on page 313 of the 2023-2029 Plan refer to Aviation Safety:

Aviation Safety at and around Dublin Airport (and in Fingal in general) is provided for under Objectives DAO14, DAO18, DAO19, DAO20, DAO21, & DAO22 *(reproduced in part below)*. Objective DAO22 refers to Weston Aerodrome. Casement Military Aerodrome (which affects airspace above Fingal to a greater extent than Weston) in not mentioned is the Fingal Plan.

Objective DAO19

Support the review of 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 DAO20

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 DAO21

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. To refer planning applications for any proposals that may be developed in the environs of the airport to the Irish Aviation Authority and daa in accordance with the Obstacle Limitation Requirements of Regulation (EU) No 139 / 2014 (EASA Certification Specifications), previously required under ICAO Annex 14, and which are depicted on the aerodrome operator's map.

Objective DAO22

Have regard to the safety and environmental impacts of aircraft movements associated with Weston Aerodrome in the assessment of any relevant development proposal.

2.4 Aviation Safeguarding and the Dublin Airport Local Area Plan 2020:

The Monitoring (etc.) of the Dublin Airport LAP is referred to on p.441 of the Plan:

Chapter 8 – Dublin Airport

Policy	Implementation	Monitoring (key performance indicator/data source)
Policy DAP1 – Dublin Airport Local Area Plan 2020	Development Management, Airport authorities and external bodies	Safeguard future development of airport to accommodate projected growth. Data source: Various

Within the Dublin Airport Local Area Plan 2020, "Obstacle Limitation", and aviation "Operational Safeguarding" in the vicinity of the Dublin Airport, are referred to on its page 54, and they are provided for in particular in the LAP's Objective OS01 >>.

The Irish Aviation Authority Obstacle Limitation Safeguarding Map sets out the guidance on the type and height of any structures that may be developed at Dublin Airport and its environs.

Fingal County Council will continue to be advised by the relevant statutory bodies regarding the effects of proposed development on the safety of aircraft navigation through the development management process.

OPERATIONAL SAFEGUARDING OBJECTIVE

OBJECTIVE OS01

Control the type and height of any structures that may be developed in the environs of the Airport (in consultation with the Irish Aviation Authority and Dublin Airport) in accordance with the Obstacle Limitation Requirements of Regulation (EU) No 139/2014 (EASA Certification Specifications), previously required under ICAO Annex 14 and which are depicted on the aerodrome operator's safeguarding map.

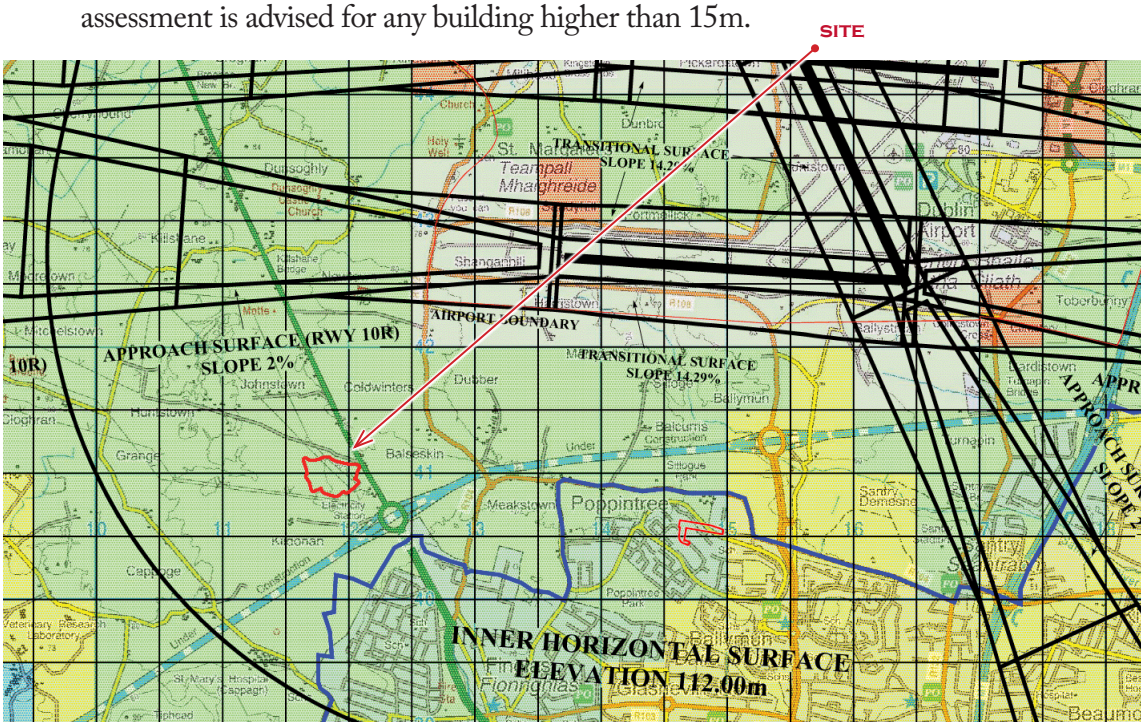
3. Aviation Obstacle Limitation Requirements Which Affect the Site

3.1 The Obstacle Limitation Requirements and Surfaces which currently apply at Dublin Airport are those set down by the European Aviation Safety Agency [EASA] in its Aerodrome Certification Specifications (EASA document CS-ADR-DSN), as noted in Objective OS01 of the Dublin Airport LAP on the previous page. These EASA Specifications supersede the ICAO 'Annex 14' Standards which applied at Dublin Airport up to November 2017.

3.2 The "aerodrome operator's map" referred to in Objective DAO21 of the current 2023-29 Fingal Plan *(illustrated at para. 2.3 above)* – also referred to as the "aerodrome operator's safeguarding map" in Operational Safeguarding Objective OS01 of the Dublin Airport Local Area Plan 2020 *(illustrated at para. 2.4 above)* – is the 'Safeguarding Chart' for Dublin Airport of July 2017, prepared by SLC Associates.

This Chart provides a multi-coloured 0.5 × 0.5km grid with guidelines as to building heights in each grid-square – 0m, 10m, 15m, 45m, 90m – above which it is advised that a proposed development be referred for consultation "with the airport licensee" (i.e. with DAA). It also indicates the principal Obstacle Limitation Surfaces which apply around Dublin Airport (and although stated to be based on former ICAO dimensions in the *IAA Aerodrome Licensing Memorandum* of 2014 – broadly corresponds with current EASA requirements).

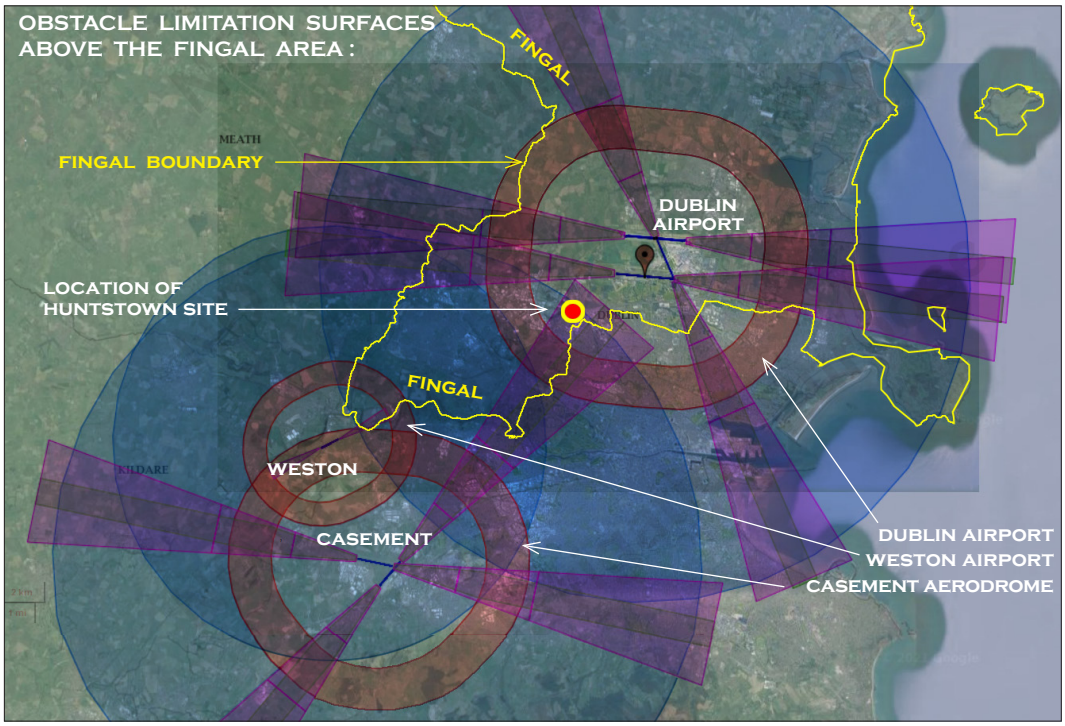
3.3 Below is an extract from this Safeguarding Chart. The Huntstown site (outlined in red below) lies within green grid-squares which have a height dimension of 15m – above which a referral to the airport licensee (DAA) is requested. The proposed 16m-tall Materials Recovery building, to south side of the site, lies in a green grid-square in which assessment is advised for any building higher than 15m.



3.4 **The EASA & ICAO 'Obstacle Limitation Surfaces' which affect Fingal:**

These "Surfaces" are indicated in the diagram below (which is based on Irish Airport Authority "Asset" data of 2019, onto which we have overlaid the outline of Fingal).

The "Surfaces" shown below include the new EASA "Obstacle Limitation Surfaces" for Dublin Airport, and the ICAO "Surfaces" for Casement Aerodrome and Weston Airport. These constitute the principal height restrictions which now apply in the vicinity of the various airports/aerodromes. In the south-west part of Fingal, the "Surfaces" of all three airports overlap (with the lowest Surface being the limiting one).



3.5 The following "Obstacle Limitation Surfaces" lie directly above the Huntstown site:

(i) The Inner Horizontal Surface for Dublin Airport;
(ii) The Approach Surface to Casement Aerodrome's Runway 22;
(iii) The Outer Horizontal Surface for Casement Aerodrome.

The following "Surfaces" are close to (but not directly above) the Huntstown site:

(iv) The Transitional Surface to the south side of Dublin's Runway 10R/28L;
(v) The Approach Surface to Dublin Airport's Runway 10R;
(vi) The Take-Off Climb Surface from Dublin Airport's Runway 28L;
(vii) The Take-Off Climb Surface from Casement Aerodrome's Runway 04.

3.6 A more detailed drawing of all of the above "Surfaces" is shown on the following page, and calculations in relation to the most relevant of these "Surfaces" are provided in Section 5.

3.7 The EASA and ICAO "Obstacle Limitation Surfaces" near the Huntstown Site

3.1 **The Obstacle Limitation Surfaces set out by EASA in its Aerodrome Specifications of December 2017** constitute the principal height restrictions which now apply in the vicinity of Dublin Airport**.** These Specifications differed in a few respects from the ICAO "Annex 14" Standards which previously applied at Dublin Airport. However subsequent updates to the ICAO Standards (in November 2018) have ensured that they now correspond fully with the new EASA Specifications.

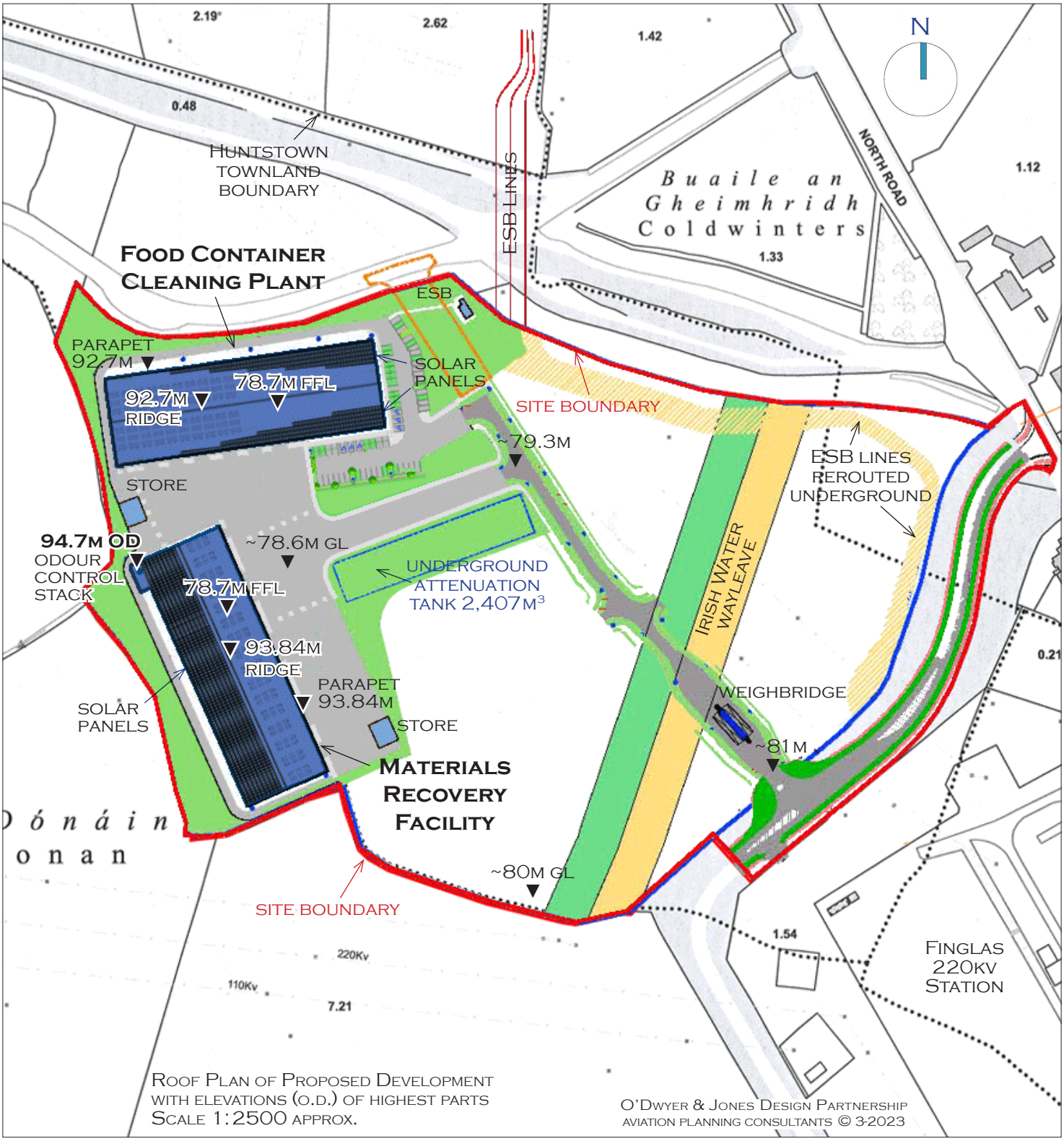
3.2 The EASA Obstacle Limitation Surfaces for Dublin Airport, and the two ICAO Surfaces arising from Casement Aerodrome, which apply at (and in the vicinity of) the Huntstown site *(outlined in red)*, are shown in the following diagram:



3.3 This diagram shows that the Huntstown site – which is at ~1.7km from the centreline of east-west runway 10R/28L, and about 2.4km from Threshold 10R – lies under Dublin Airport's Inner Horizontal Surface, at ~1.3km from the Transitional Surface to the side of Runway 10R/28L.
It also shows that the site additionally lies under the the Approach Surface to Casement Aerodrome's Runway 22 (at 14km from its Threshold 22), and under Casement Aerodrome's Outer Horizontal Surface.

4. Layout and Heights (Elevations O.D.) of the Proposed Development

4.1 **Site and Roof Plan Drawing** of the Development to approximate scale 1:2500 — Phase 1: a Materials Recovery Facility of 15.14m height & 5,032m² floor area, and a Food Container Cleaning Plant of 14m height & 5,216m² floor area, plus two small storage units.



5. Calculations re Aviation "Obstacle Limitation Surfaces" near the Site

5.1 The Site in Relation to the Dublin Airport's "Inner Horizontal Surface":


Annex to ED Decision 2017/021/R

European Aviation Safety Agency

Certification Specifications

and

Guidance Material

for

Aerodromes Design

CS-ADR-DSN

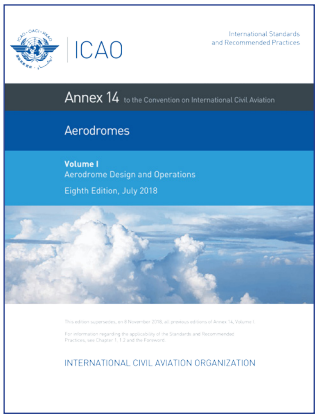
Issue 4
8 December 2017

As defined by EASA [>>], this is a flat Surface which extends to 4km from the centrelines of all runways at Dublin Airport, and which lies at 45m above the airport's datum (set at 67m OD), i.e. it is a flat Surface **at 112m OD**.

This Surface extends above all of the Huntstown site (the site is well within 4km of the runway centrelines).

However, the highest element of the proposed development – which is the odour control unit exhaust stack at the west corner of the Materials Recovery Facility – rises to just **94.7m OD. The proposed development is therefore very comfortably below Dublin Airport's "Inner Horizontal Surface" which lies at directly above the site (at 17.3m above the proposed highest element).**

5.2 The Site in Relation to the two Casement Aerodrome "Surfaces" lying above it:



As indicated in Section 3 above, two of Casement Aerodrome's "Obstacle Limitation Surfaces" also lie above the Huntstown site. These are —
Casement Aerodrome's Outer Horizontal Surface; and
the Approach Surface to Casement's Runway 22.

For Casement Aerodrome, these Surfaces are specified by ICAO >> (rather than by EASA).

Casement Aerodrome's "Outer Horizontal Surface" is now at 145m above the aerodrome's chosen datum (at 86.6m OD), i.e. it is a level surface at **231.6m OD**, and extends for 15km from the aerodrome's reference point.

The **Approach Surface to Casement's Runway 22** extends for 15.06km from the 22 Threshold, and the outer 8.4km of that distance is level at 150m above the elevation of Casement's Threshold 22 (at 306ft amsl /93.3m OD), i.e. the section of this Approach Surface which lies above the Huntstown site is level at **243.3m OD**.

These two Casement "Surfaces" , at 231.6m OD and 243.3m OD, are therefore very substantially higher (by 136.9m and 148.6m) than the highest element of the proposed Huntstown development (which rises to 94.7m OD).

5.3 Other Aviation "Surfaces" in the vicinity of the Huntstown site:

These include:

(i) The Transitional Surface to the south of Dublin Airport's Runway 10R/28L, at 1.28km from the site;

(ii) The Approach Surface to Dublin Airport Runway 10R, at 1.31km from the site;

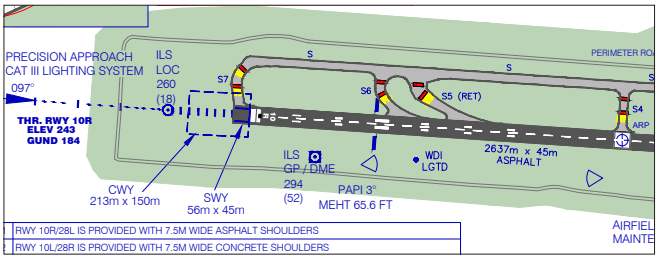
(iii) The Take-off Climb Surface from Dublin Airport Runway 28L, at 1.4km from the site;

(iv) The Inner Approach Surface to Dublin Airport's Runway 10R, at 1.75km from the site; and

(v) The Take-off Climb Surface from Casement Aerodrome's Runway 04, at 0.75km to south-east of the site.

While item (v) above – the Take-off Surface from Casement – is the closest of these nearby Surfaces to the site, it is very significantly higher (at around 370m OD).

Calculations is relation to the distances from the site of the nearest two Dublin Airport "Surfaces" *above* (which safeguard runway 10R/28L >) are as follows:



The site is at 2.4km from Threshold 10R *(above ↗)*, and at 1.7km from the extended centreline of Runway 10R/28L, and is therefore opposite at point along that extended centreline at 1.7km* from Threshold 10R. *[* confirmed as follows $1.7^2 + 1.7^2 = 2.4^2$]*

At 1.7km from Thr10R, the **Approach Surface** will be 772m** wide overall, i.e. at **1,314m from the site**. *** (1700-60 × 15%)×2 + 280m = 772m*
& 1700 - (772÷2) = 1314m

At this point the Approach Surface will have risen 32.8m*** above Thr10R (at 74m), i.e. to 106.8m OD. *** (1700-60)×2% = 32.8m & 32.8+74 = 106.8m*

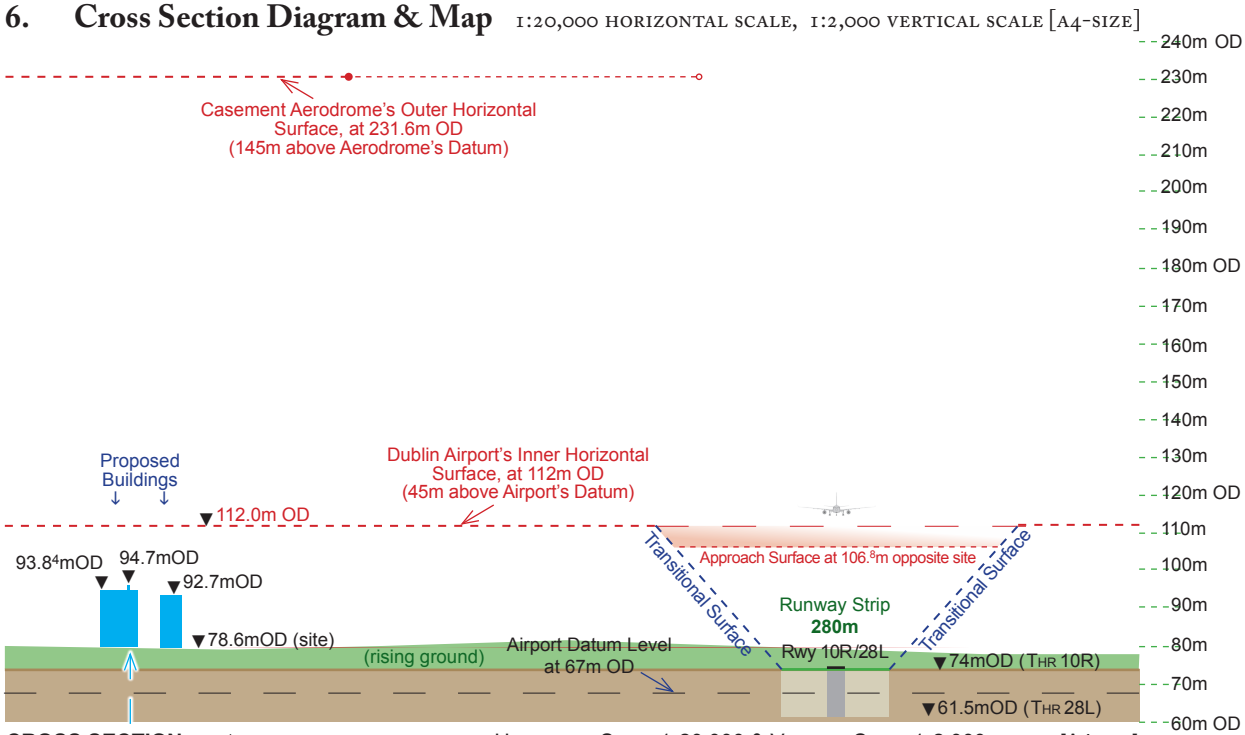
From this point the **Transitional Surface** rises at 14.3% up to the IHS at 112m OD, – i.e. it will extend to 422.4m**** from the runway centreline, so that it will be at **1,278m from the site.** **** (112-106.8)÷14.3% + (772÷2)m = 422.4m*

5.4 Conclusion in relation to all "Obstacle Limitation Surfaces" near the site:

Of the three Surfaces which lie above the Huntstown site, **Dublin Airport's Inner Horizontal Surface is the closest, at 112m OD. This is at 33.4m above ground level on the site, and 17.3m above the highest element of the development.** Consequently the development will not affect any aviation "Obstacle Limitation Surface", but care will need to be taken to ensure that crane operations are limited to ~33m above ground level *(see also para. 8.4 following)*.

A Cross-section and Plan of the above Surfaces are on the following page >.

6. Cross Section Diagram & Map 1:20,000 HORIZONTAL SCALE, 1:2,000 VERTICAL SCALE [A4-SIZE]



CROSS SECTION X-X¹
TAKEN PERPENDICULAR TO RUNWAY 10L/28R

HORIZONTAL SCALE 1:20,000 & VERTICAL SCALE 1:2,000 APPROX.[A4-SIZE]
(NOTE AERONAUTICAL SECTION: VERTICAL SCALE = 10X HORIZONTAL SCALE)

AERIAL PHOTO MAP PLAN SCALE [A4-SIZE] 1:20,000 APPROX. SITE OUTLINE: —



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7. Bird Strike Hazard Mitigation at the Huntstown Site

7.1 FCC Development Plan SuDS Considerations

Paragraph 4.5.2.8 on pages 170-171 of the Fingal Development Plan 2023-2029 (and other subsequent paragraphs in other chapters) outline a Sustainable Urban Drainage System strategy, and refer applicants to the FCC SuDS Guidance Document – "Green/Blue Infrastructure for Development" in Appendix 11 of the Plan. Paragraph 4.5.2.8 also includes the comment *"Underground tanked systems, whether concrete or plastic, are the least favoured means for surface water management and shall only be used when green solutions have proven not feasible"* – a comment which is discussed below in relation to aviation safety considerations.

SuDS also features in various Objectives in the FCC Development Plan 2023-29, including Objective IU011 "SuDS in New Developments", on page 397, which states:
"SuDS shall be incorporated into all parts of a development (open spaces, roads, footpaths, private areas), and have regard to the FCC SuDs Guidance Document – 'Green/ Blue Infrastructure for Development', as amended (Appendix 11), and shall ensure:
That the design of SuDS enhances the quality of open spaces and when included as part of any open space provision, it must contribute in a significant and positive way to the design and quality of the open space.
Open space areas shall not be dominated by SuDS features.
Underground tanked systems, whether concrete or plastic, are the least favoured means for surface water management and shall only be used when green solutions have proven not feasible.
See also Appendix 11 (SuDS Guidance Document), and Chapter 14 Development Management Standards (Section 14.20.3 SuDS)."

7.2 Overall Aviation Safety Considerations

Aviation Safety considerations require assessment of potential bird strike hazard in the landscaping (and in drainage provision) on any site in the vicinity of an airport or aerodrome, or under any flight path.



Guidance on this issue (and on wildlife considerations generally) are provided by various aviation authorities, including –

- The Irish Aviation Authority's recently published manual on "Bird and Wildlife Strike Management at Aerodromes (2021)"; >>
- The International Civil Aviation Organization's Airport Services Manual Part 3 – "Wildlife Control & Reduction"; and
- The Federal Aviation Administration's "Wildlife Hazard Management at Airports."

7.3 An additional aviation safety consideration involves the avoidance or restriction of items which might give rise to glint and glare that could adversely affect pilots on flight paths, or air traffic controllers, at an airport/aerodrome. This is principally analysed in respect of solar/PV panel arrays (using the FAA's "Solar Glare Hazard Analysis Tool"), but can also arise in relation to open bodies of standing water, which are recognised (by aviation analysts) as being potentially more reflective than standard solar/PV panels.

7.4 **Control Measures to Minimise Bird Strike (and Other) Aviation Hazard:**

(i) Control of any bird & wildlife attractants during construction.
(ii) Avoidance of landscape elements which might provide avian food.
(iii) Avoidance of unnecessary standing water features which might attract birds.
(iv) Management of any necessary standing water elements (e.g. flood-control swales) in locations where they will be less attractive to birds.
(v) Implementation of ongoing bird control and deterrence measures.

Landscape measures to minimise glint or glare hazards to aviation include:

(vi) Avoidance of unnecessary standing water in vicinity of flight paths & aerodromes.
(vii) Avoidance of all standing water in direct line of sight from an airport's Control Tower cab.



7.5 From the above list, it can be seen that – on aviation-sensitive sites – the general guidance in regard to SuDS provision might not apply. – In particular the general preference for overground ponds and swales rather than underground solutions (such as attenuation tanks) would be reversed, although permeable ground surfaces would be acceptable at all sites (whether near or far from aviation facilities).

This potential conflict between the standard SuDS guidelines, and considerations of aviation safety, is already recognised by Fingal, for example, in the Cherryhound Local Area Plan, which relates to an area just north of the Huntstown site. This Cherryhound LAP (of 2012) is listed on page 55 of the adopted Fingal Plan 2023-2029 as being one of the "Operational LAPs", and it includes the following statements in respect of Cherryhound:
"… The lands are located under the flight paths of aircraft using Dublin Airport. This may pose considerations on the nature and scale of uses and on provision of noise insulation. …"
and
*"… **Care will be required to ensure that significant bird populations are not attracted to water bodies in view of its proximity to Dublin Airport and its flight paths.** …"*

7.6 Specific Aviation Aspects Affecting the Huntstown Site

As noted above, the Huntstown site has the following aviation-related aspects:

- It is at ~2.4km from a main runway threshold at Dublin Airport (Threshold 10R).
- It is on elevated ground directly under Dublin Airport's "Inner Horizontal Surface".
- Its ground surfaces are directly in view of Dublin Airport's new 90m-tall Control Tower, and in line with the control tower's view towards aircraft landing on Runway 10R.
- It is well within the 13km distance from Dublin Airport, identified as the area of potential bird hazard risk.
- It is directly under the end of the "Approach Surface" to Casement Aerodrome's runway 22; and it is directly under Casement Aerodrome's "Outer Horizontal Surface".

Because of all of the above aviation aspects, the arrangement of landscape and drainage features (and site management) on this site would require that all potential bird strike hazard elements be minimised or eliminated.

In addition, the nature of the intended operations on the site (which involve minimal pedestrian activity, and the transport of potential bird attractants) means that some commonly adopted bird hazard reduction features would be inappropriate. – These would include the locating of swales or ponds close beside well-trafficked pathway and roads – a feature sometimes adopted on sites near aerodromes (and suggested by the IAA) for the reason that birds are discouraged from roosting close to busy populated areas.

7.7 Recommended SuDS Provision, for Aviation Safety reasons, on the Huntstown Site

Any ponds or swales on this site could give rise to a bird strike hazard, and ponds or swales could also give rise to a glint & glare potential affecting visibility from Dublin Airport's Control Tower cab. Consequently, there should be no permanent ponds, and minimal swale provision (if any). In effect, this is a site on which the otherwise "green solutions" (referred to in paragraph 4.5.2.8. of the Fingal Plan, and quoted above) would be "not feasible".



Taking into account the various aviation safety aspects (including bird strike and glint & glare potential, and affecting both Dublin Airport and Casement Aerodrome), the appropriate SuDS provision on this particular site – for aviation safety reasons – would be underground attenuation tank provision (of large capacity, *as proposed* >>), and permeable pavings where possible.

The ongoing management of operations on the site would also require the avoidance of bird strike potential, including the unloading indoors of any potential bird attractant material.

8. The Development in relation to Public Safety Zones and Noise Contours

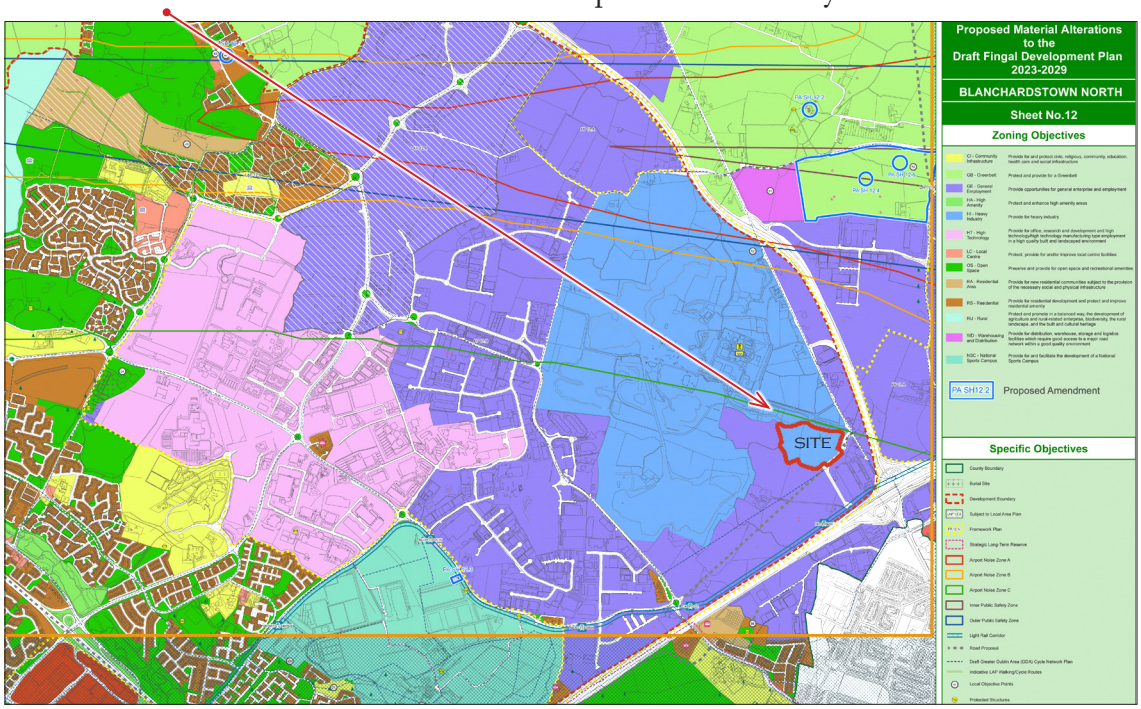
8.1 Aviation Items on the Fingal Development Plan Maps

Two aviation considerations appear on the Fingal Development Plan Maps 2023-29. These are the Public Safety Zones plotted around Dublin Airport within the ERM study of 2000-2005, and the recently updated Dublin Airport Noise Contours. [The previous "Airport Red Approach Areas" have been removed and replaced by written references to the EASA "Obstacle Limitation Surfaces" etc.]

8.2 Dublin Airport Public Safety Zones

Objective DAO19 on page 313 of the 2023-29 Fingal Plan supports "the review" of these Public Safety Zones. Such a review is desirable, as the UK criteria applied in setting out these Zones at Dublin is considered outdated in the UK (as of October 2021) – so that the PSZs at Dublin Airport have become out of step with other international practice, and are currently, for example, ten times the size of the PSZs at the much busier Heathrow and Gatwick Airports.

Below is an extract from the current Fingal Map #12, on which it can be seen that the site lies well outside all of Dublin Airport's Public Safety Zones.



8.3 Dublin Airport Noise Contours

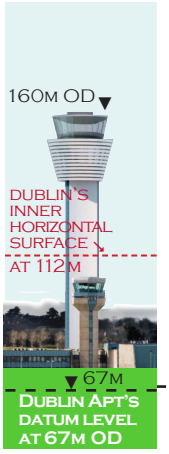
It can also be seen that the site lies just outside the new "Airport Noise Zone C" (marked as a green line in the above Map #12 extract). This means that no special noise insulation is required (in relation to airport noise levels ≥ 54 dB LAeq). In any event, the Circular Economy Hub development is not noise-sensitive.

9. Other Aviation Considerations

9.1 Solar/PV Panels:

Solar/PV panels are to be provided on roofs of the two main buildings *(as indicated on the Roof Plan drawing on page 9)*.

Because the new control tower at Dublin Airport is particularly tall > (extending to 526ft/160m OD, i.e. to more than double the height of the airport's Inner Horizontal Surface), care has been taken in the layout of the rooftop solar/PV panels to ensure that roof parapets (which extend to 1.66m above roof gutter level) will obscure all panels from any view from the new Control Tower cab.



DUBLIN AIRPORT CONTROL TOWER

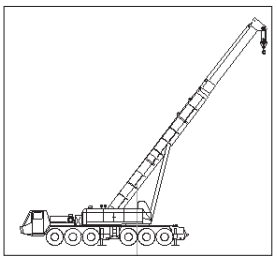
These panels have also been the subject of a separate Glint+Glare Study by Macroworks Ltd. in relation to Dublin Airport's control tower and flight paths. The Macroworks analysis (dated April 2023) found that all proposed solar/PV panels would be satisfactory in relation to the SGHAT Glint & Glare criteria. The Overall Conclusion of the analysis by Macroworks Ltd. is stated as follows in paragraph 6.3 (on page 10) of their report:

> *"Overall Conclusion*
> *From the analysis and discussions contained herein, it is considered that there will not be any hazardous glint and glare effects upon the Dublin Airport aviation receptors identified as a result of the proposed roof mounted solar PV panels."*

9.2 Use of Cranes during Construction:

It is intended that a mobile crane will be used in construction of this development, and it is confirmed that the operating height of any cranes on site will be limited to no more that 33m above (finished) ground level, and 17m above the highest element of the development (i.e. to no higher than 112m OD).

In any event, it will be necessary [under S.I. 215 of 2005 – *'Irish Aviation Authority (Obstacles to Aircraft in Flight) Order'*] for prior notification of the use of any crane/s to be submitted, at least 30 days in advance, to the Irish Aviation Authority and to Dublin Airport Authority, who may need to issue any necessary notifications, and who may require cranes in this location to be fitted with aviation warning lights.



9.3 External Lighting:

As the development is near the flight path to/from Dublin Airport's Runway 10R/28L, it is recommended that external lighting on the site be of the cut-off type (i.e. not showing light above horizontal). However, the proposed development is not in a location, or of a height, where aviation obstruction lighting on it would be required.

10. SUMMARY

10.1 Dublin Airport's & Casement Aerodrome's "Obstacle Limitation Surfaces":

The Huntstown site, at ~2.4km from Runway Threshold 10R, lies well clear of all Approach and Take-off Climb Surfaces for Dublin Airport. It lies directly under Dublin Airport's Inner Horizontal Surface, and under two of Casement Aerodrome's Surfaces – Casement's Outer Horizontal Surface and the Approach to Casement Runway 22. Dublin's Inner Horizontal Surface (at 112m OD) is at 33.4m above the Huntstown site, and at 17.3m above the highest point of the proposed development.

It is confirmed that no aviation "Obstacle Limitation Surface" will be infringed by the proposed development.

10.2 Additional Aviation Considerations:

(a) The Huntstown site lies well outside all of Dublin Airport's **Public Safety Zones**, and outside the **Airport Noise Contours** shown on the Development Plan Maps.

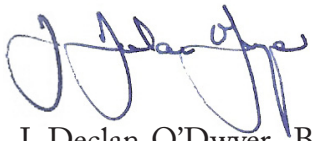
(b) The rooftop **Solar/PV panels** will not be visible from the new control tower, and are the subject of a separate Glint & Glare Study by Macroworks Ltd.

(c) Due to the site's proximity to Dublin Airport, and its location under three "Obstacle Limitation Surfaces" for Dublin Airport and for Casement Aerodrome, it is recommended – for **Bird Strike Hazard** reasons – that SuDS provision be made by means of a large underground attenuation tank.

(d) Arrangements will be made that **Mobile Cranes** use during construction will operate well below 112m OD – i.e. below the level of Dublin Airport's "Inner Horizontal Surface" (which is the nearest "Surface" above the site). And 30 days' advance notice of any crane use will be given to IAA and DAA.

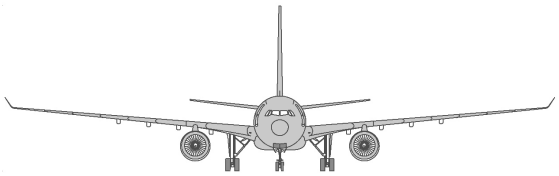
10.3 Overall:

We consider that the proposed Circular Economy Hub development at Huntstown complies fully with all aviation and aeronautical requirements affecting its location.



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17th April 2023
O'Dwyer & Jones Design Partnership
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APPENDIX 6.1

GEOPHYSICAL SURVEY

AGP19087_01

Report on the Geophysical Investigation At Huntstown North for Beauparc Limited

17th April 2019

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PRIVATE AND CONFIDENTIAL

THE FINDINGS OF THIS REPORT ARE THE RESULT OF A GEOPHYSICAL SURVEY USING NON-INVASIVE SURVEY TECHNIQUES CARRIED OUT AT THE GROUND SURFACE. INTERPRETATIONS CONTAINED IN THIS REPORT ARE DERIVED FROM A KNOWLEDGE OF THE GROUND CONDITIONS, THE GEOPHYSICAL RESPONSES OF GROUND MATERIALS AND THE EXPERIENCE OF THE AUTHOR. APEX GEOPHYSICS LTD. HAS PREPARED THIS REPORT IN LINE WITH BEST CURRENT PRACTICE AND WITH ALL REASONABLE SKILL, CARE AND DILIGENCE IN CONSIDERATION OF THE LIMITS IMPOSED BY THE SURVEY TECHNIQUES USED AND THE RESOURCES DEVOTED TO IT BY AGREEMENT WITH THE CLIENT. THE INTERPRETATIVE BASIS OF THE CONCLUSIONS CONTAINED IN THIS REPORT SHOULD BE TAKEN INTO ACCOUNT IN ANY FUTURE USE OF THIS REPORT.

PROJECT NUMBER	AGP19087		
AUTHOR	**CHECKED**	**REPORT STATUS**	**DATE**
KEVIN GALVIN B.A. (MOD)	TONY LOMBARD M.SC (GEOPHYSICS)	V.01	17TH APRIL 2019

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1. EXECUTIVE SUMMARY

APEX Geophysics Limited was requested by Beauparc Limited to carry out a geophysical survey at a site at Huntstown North, Co. Dublin to determine the depth to bedrock across the site.

The site is to be developed which is likely to involve earthworks to level the site including cutting into the small hill.

Historically there had been a gravel pit on the hill and part of it has been excavated and material removed.

The objectives of the survey were to provide information on the nature of the material in the raised part of the site and to determine the depth to rock.

The Geological Survey of Ireland (GSI) subsoils map shows the survey is within gravels derived from limestone surrounded by glacial till derived from limestone. The GSI 1:100,000 Bedrock Geology map indicates that the survey area is underlain by calcareous shale and limestone conglomerate of the Tober Collen Formation.

The survey was carried out on the 8th April 2019 and involved the collection of Electrical Resistivity Tomography profiles and Seismic Refraction profiles.

The interpreted soil thickness across the site ranges from c.1.0m in the western part of the site to greater than 25m.

While geophysical data indicates that the hill in the centre of the site is underlain by predominantly sandy gravelly clay and it is unlikely that bedrock will be encountered during any excavation of the hill. Shallow bedrock is interpreted in the western part of the site.

Bedrock has been interpreted as an upper layer of moderately weathered dark LIMESTONE (1.0m to 5.0m thick) which should be marginally rippable to requiring breaking/blasting; over a layer of slightly weathered to fresh dark limestone which will require breaking/blasting if encountered.

If excavations or ground works are to be carried out on the site then a detailed assessment of excavatability should be carried out combining the results of the geophysical survey, rotary core drilling, strength testing and trial excavation pits using a high powered excavator such as a CAT 336E or more powerful model.

The trial pits should be targeted in the interpreted shallow rock areas and the boreholes carried out in the area of interpreted thick soil.

The findings of the geophysical investigation should be reviewed following any direct investigation.

2. INTRODUCTION

APEX Geophysics Limited was requested by Beauparc Limited to carry out a geophysical survey at a site at Huntstown North, Co. Dublin to determine the depth to bedrock across the raised area in the centre of the site. The site is to be developed which is likely to involve earthworks to level the site including cutting into the small hill. The geophysical survey was carried out to determine the nature of the material beneath the hill.

2.1 Survey Objectives

The objectives of the investigation were to:

- determine the nature of the material in the raised part of the site.
- determine depth to bedrock;

2.2 Site Background

The site consists of c 5.3 ha of open fields located east of the Roadstone Huntstown Quarry. The survey area consists of a small raised hill (c.88mOD) in the centre of the site. The small hill is overgrown with tress and dense vegetation. Part of the hill has been excavated and material removed historically. The GSI 6" sheet indicates that there had been a gravel pit on the hill which would explain the excavated material.



Fig 2.1: Location map (site marked in red).

2.2.1 Soils

The Geological Survey of Ireland (GSI) and Teagasc soils map for the area (Figure 2.2) indicates that the centre of the site consist of gravels derived from limestone surrounded by glacial till derived from limestone.

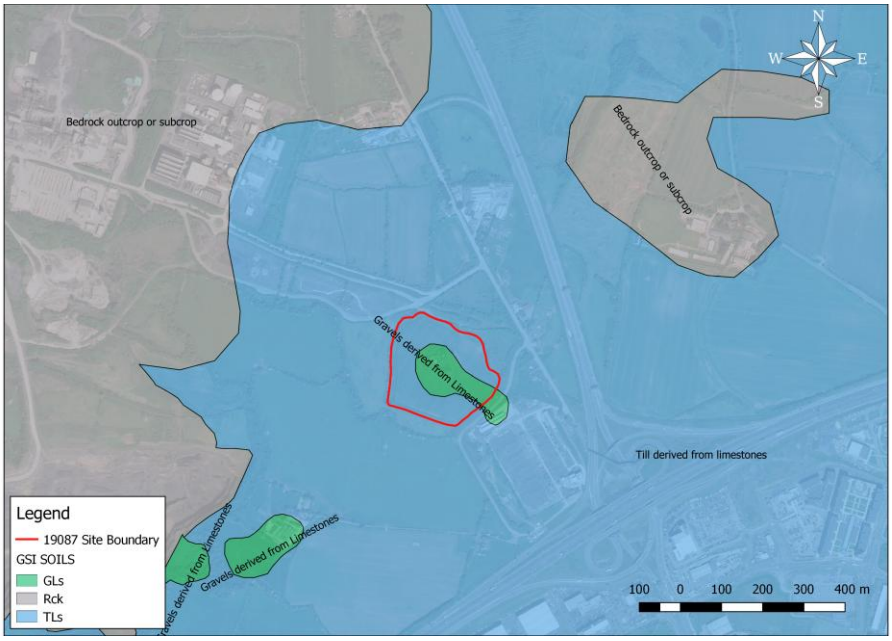


Fig 2.2: The Teagasc soil map (site marked in red).

2.2.2 Geology

The GSI 1:100k Bedrock Geology map (Figure 2.3) indicates that the site is underlain by calcareous shale and limestone conglomerate of the Tober Collen Formation. An anticlinal fold is mapped running though the centre of the site.

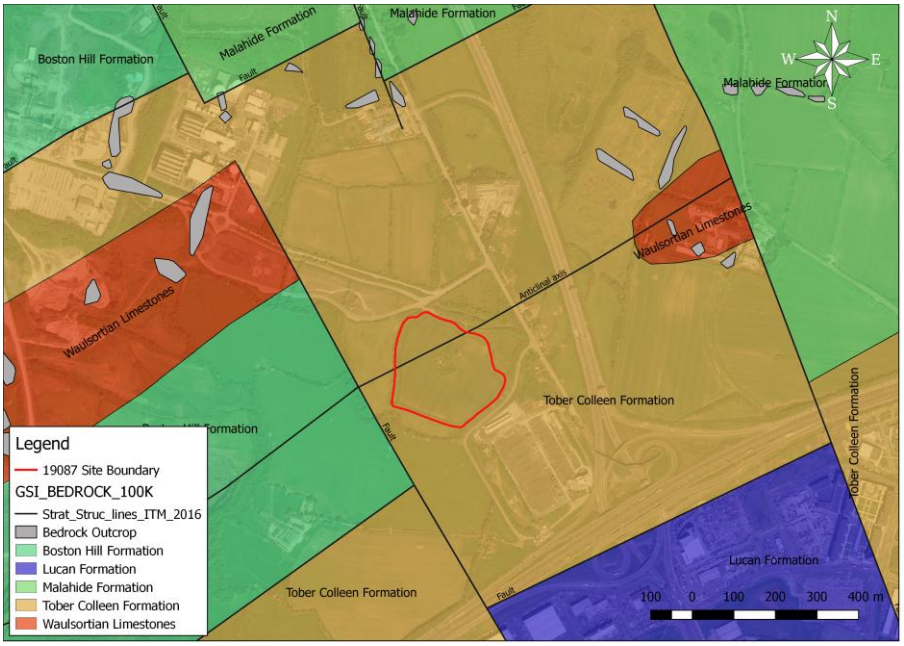


Fig 2.3: The GSI bedrock map (site marked in red).

2.2.3 Historical Data

The historical 6 inch sheet for the area indicates a gravel pit in the centre of the site.

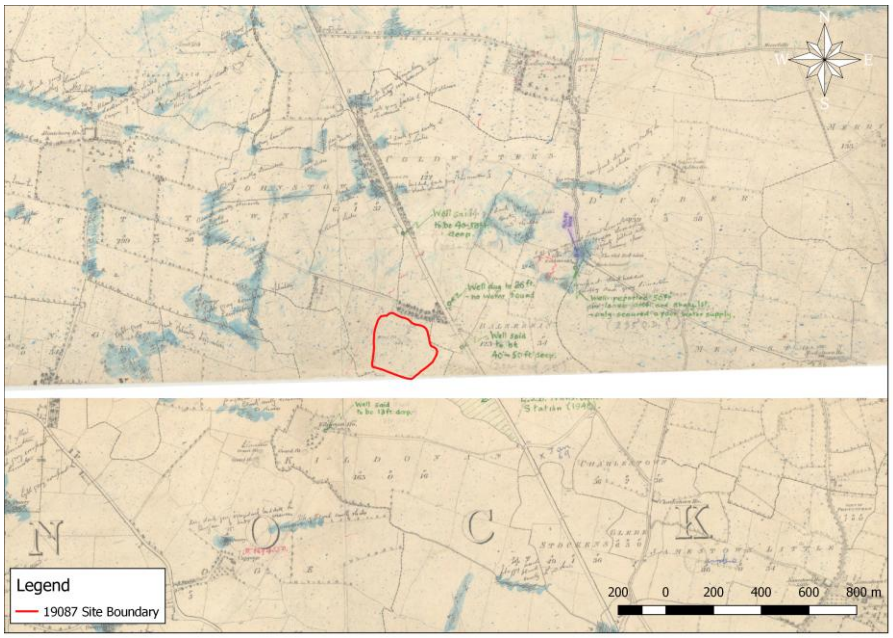


Fig 2.4: The historical 6inch map (site marked in red).

2.2.4 Groundwater Vulnerability

The groundwater vulnerability rating for the site (Figure 2.5) is classified as high to moderate in the southern part of the site.

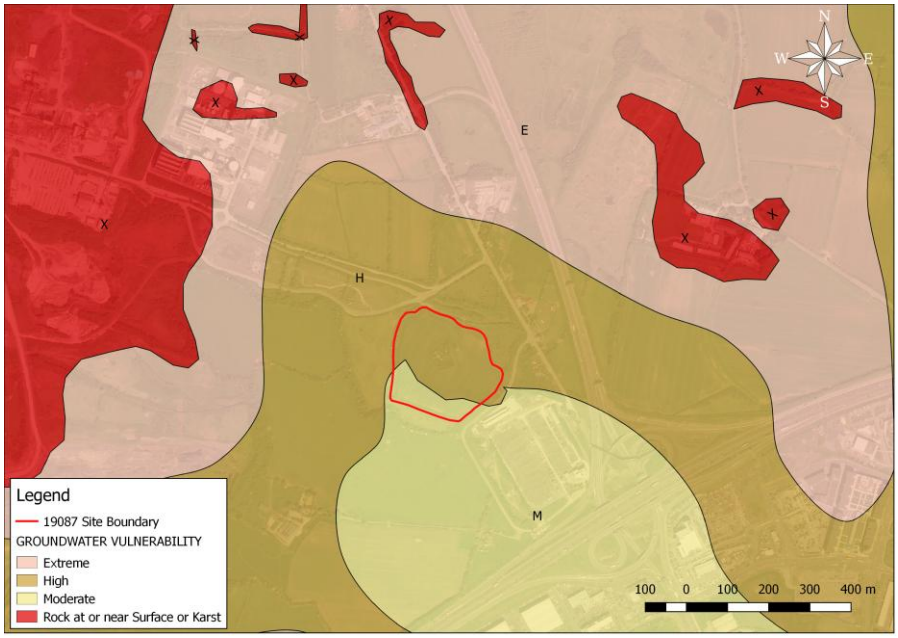


Fig 2.5: The GSI groundwater vulnerability classification map (site marked in red).

2.2.5 Direct Investigation Data

There was no direct investigation (boreholes or trial pits) available for the site.

2.3 Survey Rationale

The investigation consisted of 2D Electrical Resistivity Tomography (ERT) and Seismic Refraction profiling:

ERT images the resistivity of the materials in the subsurface along a profile to produce a cross-section showing the variation in resistivity with depth, depending on the length of the profile. Each cross-section is interpreted to determine the material type along the profile at increasing depth, based on the typical resistivities returned for Irish ground materials.

Seismic Refraction profiling measures the velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities.

As with all geophysical methods the results are based on indirect readings of the subsurface properties. The effectiveness of the proposed approach will be affected by variations in the ground properties. By combining a number of techniques it is possible to provide a higher quality interpretation and reduce any ambiguities which may otherwise exist. Further information on the detailed methodology of each geophysical method employed in this investigation is given in **APPENDIX A: DETAILED METHODOLOGY**.

3. RESULTS

The survey was carried out on the 8th April 2019 and involved the collection of 4 ERT profiles and 4 seismic refraction profiles. The geophysical survey locations are indicated on Drawing AGP19087_01 (Appendix D).

3.1 ERT

Four ERT Profiles (R1 to R4) have been acquired across the site. The resistivity values have been interpreted on the following basis:

Resistivity (Ohm-m)	Interpretation
<100	SILT/CLAY
100-375	Sandy gravelly CLAY (possible weathered rock towards the base)
375-500	Weathered Dark Limestone
>500	Dark Limestone

3.2 Seismic Refraction Profiling

Four seismic refraction spreads were recorded across the site (S1-S4). The seismic refraction data indicated 4 velocity layers which have been interpreted as follows:

Layer	Seismic Velocity (m/s)	Average Seismic Velocity (m/s)	Interpretation	Stiffness/ Rock Quality	Excavatability
1	354-587	444	Soil	Soft/Loose	Diggable
2	689-942	824	Soil	Firm/Medium Dense	Diggable
3	1535-1957*	1842	Soil	Stiff - Very stiff/ Dense – Very Dense	Diggable
			Highly-Moderately Weathered Bedrock	Poor-Fair	Marginally Rippable to Break / Blast
4	2547-3889	3347	Slightly Weathered – Fresh Bedrock	Good	Break/Blast

It should be noted that the cut-off velocity for excavatability will be lower if excavating in trenches.

3.3 Discussion

The ERT and Seismic Refraction datasets have been combined to produce the Interpreted Sections on Drawings AGP19087_R1 to AGP19087_R4 (Appendix D). The combined results are summarised on the following basis:

Layer	Seismic Velocity (m/s)	Average Seismic Velocity (m/s)	Resistivity (Ohm-m)	Interpretation	Stiffness/ Rock Quality	Excavatability
1	354-587	444	<100	SILT/ CLAY	Soft-Firm	Diggable
2	689-942	824				
3	1535-1957	1842	100-375	Sandy gravelly CLAY (possible w.rock towards the base)	Firm-Stiff	Diggable
			375-500	Moderately Weathered Dark LIMESTONE	Fair	Marginally Rippable to Break / Blast
4	2547-3889	3347	>500	Slightly Weathered to Fresh Dark LIMESTONE	Good	Break/Blast

3.3.1 Soils

The soils have been interpreted as topsoil over sandy gravelly clay with silt/clay lenses. Seismic velocities indicate that on average the upper 1.5m of soils will be soft to firm, becoming firm to stiff with depth. The interpreted soil thickness across the site ranges from c.1.0m in the western part of the site to greater than 25m.

3.3.2 Bedrock

Bedrock has been interpreted as dark limestone. Combined resistivity and seismic velocity values have been interpreted as indicating two rock layers: an upper layer of moderately weathered dark LIMESTONE (1.0m to 5.0m thick) which should be marginally rippable to requiring breaking/blasting; over a layer of slightly weathered to fresh dark limestone which will require breaking/blasting if encountered. It should be noted that the cut-off velocity for excavatability will be lower if excavating in trenches. The geophysical data indicates that the hill in the centre of the site is underlain by predominantly sandy gravelly clay and it is unlikely that bedrock will be encountered during any excavation of the hill. However, this should be confirmed by direct investigation.

4. RECOMENDATIONS

If excavations or ground works are to be carried out on the site then a detailed assessment of excavatability should be carried out combining the results of the geophysical survey, rotary core drilling, strength testing and trial excavation pits using a high powered excavator such as a CAT 336E or more powerful model. A detailed discussion on excavatability is contained in Appendix C. The trial pits should be targeted in the interpreted shallow rock areas and the boreholes carried out in the area of interpreted thick soil.

The findings of the geophysical investigation should be reviewed following any direct investigation.

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APPENDIX A: DETAILED METHODOLOGY

A combination of geophysical techniques was used to provide a high quality interpretation and reduce any ambiguities, which may otherwise exist.

Electrical Resistivity Tomography (ERT)

Electrical Resistivity Tomography was carried out to provide information on lateral variations in the overburden material as well as on the underlying overburden and bedrock.

Principles
This surveying technique makes use of the Wenner resistivity array. The 2D-resistivity profiling method records a large number of resistivity readings in order to map lateral and vertical changes in material types. This method involves the use of electrodes connected to a resistivity meter, using computer software to control the process of data collection and storage.

Data Collection
Profiles were recorded using a Tigre resistivity meter, imaging software, two 32 takeout multicore cables and up to 64 stainless steel electrodes. Saline solution was used at the electrode/ground interface in order to gain a good electrical contact required for the technique to work effectively. The recorded data were processed and viewed immediately after surveying.

Data Processing
The field readings were stored in computer files and inverted using the RES2DINV package (Geotomo Software, 2006) with up to 5 iterations of the measured data carried out for each profile to obtain a 2D-depth model of the resistivities.

The inverted 2D resistivity models and corresponding interpreted geology are displayed on the accompanying drawings alongside the processed seismic sections. Profiles have been contoured using the same contour intervals and colour codes. Distance is indicated along the horizontal axis of the profiles.

Seismic Refraction Profiling

Principles
This method measures the velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities.

Seismic profiling measures the p-wave velocity (Vp) of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher Vp velocities while soft, loose or fractured materials have lower Vp velocities. Readings are taken using geophones connected via multi-core cable to a seismograph.

Data Collection

A Geode high resolution 24 channel digital seismograph, 24 10HZ vertical geophones and a 10 kg hammer were used to provide first break information, with a 24 take-out cable (2m spacing). Equipment was carried was operated by a two-person crew.

Readings are taken using geophones connected via multi-core cable to a seismograph. The depth of resolution of soil/bedrock boundaries is determined by the length of the seismic spread, typically the depth of resolution is about one third the length of the profile (e.g. 46m profile ~16m depth). Shots from seven different positions were taken (2 x off-end, 2 x end, 3 x middle) to ensure optimum coverage of all refractors.

Data Processing

The recorded data was processed and interpreted using the ray-tracing and tomographic inversion methods, to acquire depths to boundaries and the P-wave velocities of these layers, using the SeisImager/2D programme from Geometrics.

SeisImager/2D interprets seismic refraction data as a laterally varying layered earth structure. The programme includes three methods for data analysis, time-term inversion, the reciprocal method and tomography.

The tomography method creates an initial velocity model, then traces rays through the model, comparing the calculated and measured traveltimes. The model is then modified and the process repeated to minimise the difference between the calculated and measured times. The data was processed using this method and was then converted to a layer model for display and interpretation.

Approximate errors for Vp velocities are estimated to be +/- 10%. Errors for the calculated layer thicknesses are of the order of +/-20%. Possible errors due to the "hidden layer" and "velocity inversion" effects may also occur (Soske, 1959).

Spatial Relocation

All the geophysical investigation locations were acquired using Trimble Geo 7X high-accuracy GNSS handheld GPS system using the settings listed below. This system allows collecting GPS data with c.20mm accuracy.

Projection:	Irish Transverse Mercator
Datum:	Ordnance
Coordinate units:	Meters
Altitude units:	Meters
Survey altitude reference:	MSL
Geoid model:	Republic of Ireland

APPENDIX B: SEISMIC REFRACTION DATA

The tomographic inversions for the seismic refraction spreads S1 – S4 are shown below:

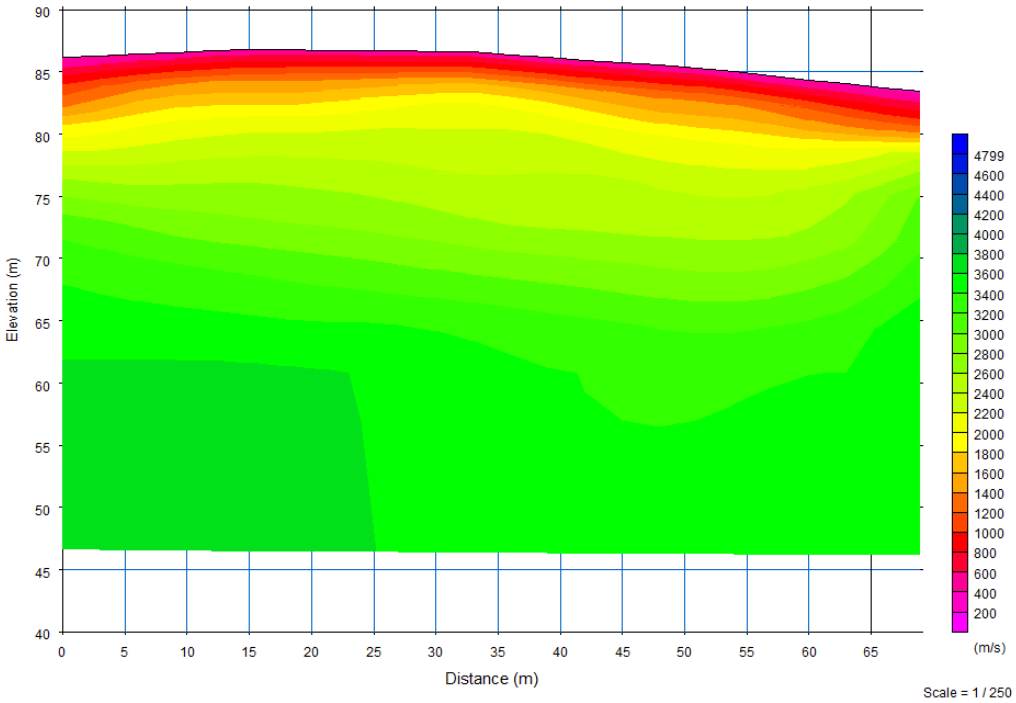


Fig.B.1.Seismic refraction spread S1 Tomographic Inversion.

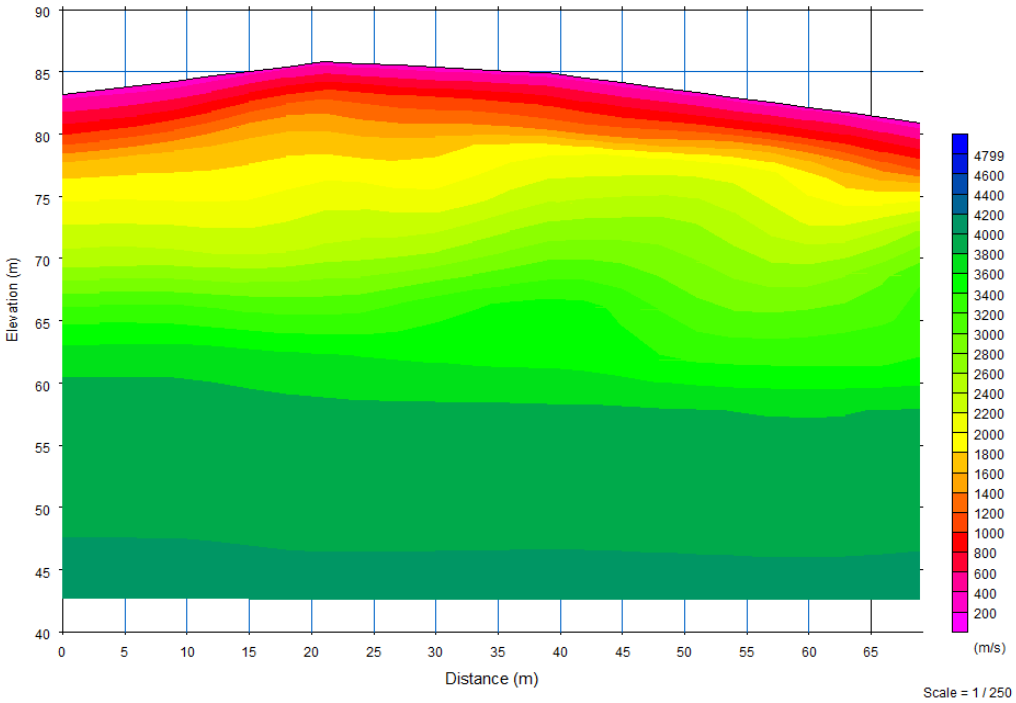


Fig.B.2.Seismic refraction spread S2 Tomographic Inversion.

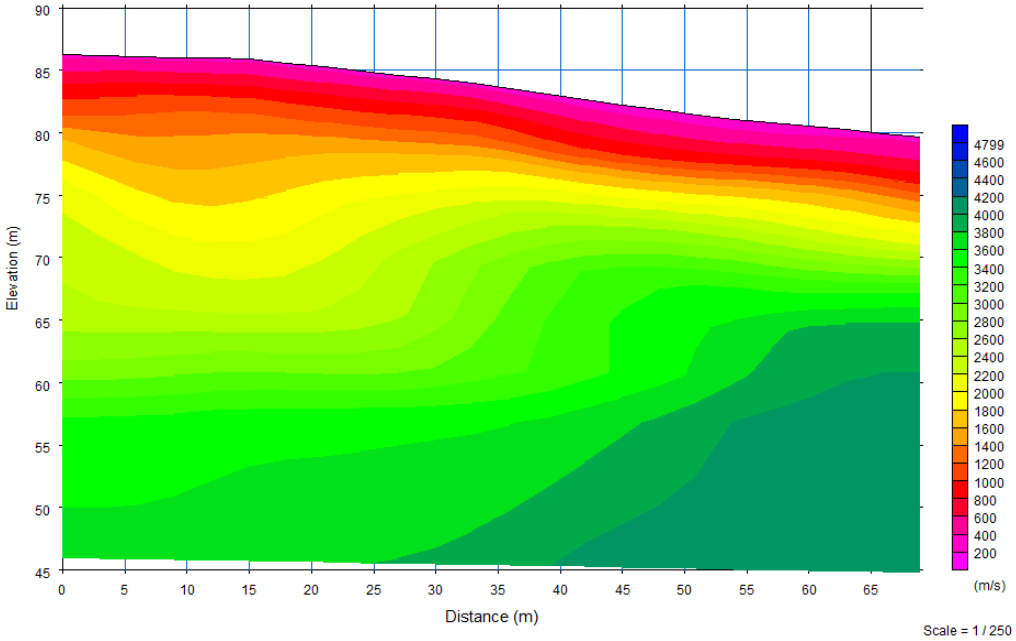


Fig.B.3.Seismic refraction spread S3 Tomographic Inversion.

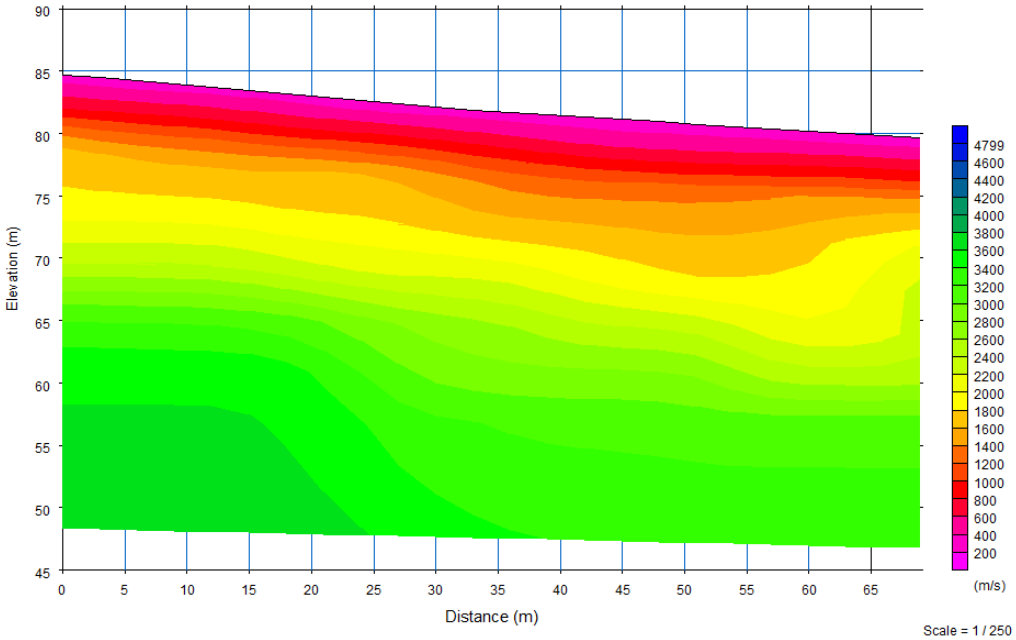


Fig.B.4.Seismic refraction spread S4 Tomographic Inversion.

APPENDIX C: EXCAVATABILITY

The seismic velocity of a rock formation is related to characteristics of the rock mass which include rock hardness and strength, degree of weathering and discontinuities. Usually the velocity is just one of several parameters used in the assessment of excavatability. The excavatability of a rock formation is favoured by the following factors:

- Open fractures, faults and other planes of weakness of any kind
- Weathering
- Brittleness and crystalline nature
- High degree of stratification or lamination
- Large grain size
- Low compressive strength

Weaver (1975) presented a comprehensive rippability rating chart (Fig.1) in which the p-wave velocity value and the relevant geological factors could be entered and assigned appropriate weightings. The total weighted index was found to correlate very well with actual rippability.

Fig.1 Rippability Rating Chart

Rock class	I	II	III	IV	V
Description	Very good rock	Good rock	Fair rock	Poor rock	Very poor rock
Seismic velocity (m/s)	>2150	2150-1850	1850-1500	1500-1200	1200-450
Rating	26	24	20	12	5
Rock hardness	Extremely hard rock	Very hard rock	Hard rock	Soft rock	Very soft rock
Rating	10	5	2	1	0
Rock weathering	Unweathered	Slightly weathered	Weathered	Highly weathered	Completely weathered
Rating	9	7	5	3	1
Joint spacing (mm)	>3000	3000-1000	1000-300	300-50	<50
Rating	30	25	20	10	5
Joint continuity	Non continuous	Slightly continuous	Continuous-no gouge	Continuous-some gouge	Continuous-with gouge
Rating	5	5	3	0	0
Joint gouge	No separation	Slight separation	Separation <1mm	Gouge <5mm	Gouge >5mm
Rating	5	5	4	3	1
Strike and dip orientation	Very unfavourable	Unfavourable	Slightly unfavourable	Favourable	Very favourable
Rating	15	13	10	5	3
Total rating	100-90	90-70*	70-50	50-25	<25
Rippability assessment	Blasting	Extremely hard ripping and blasting	Very hard ripping	Hard ripping	Easy ripping
Tractor horsepower		770/385	385/270	270/180	180
Tractor kilowatts		575/290	290/200	200/135	135

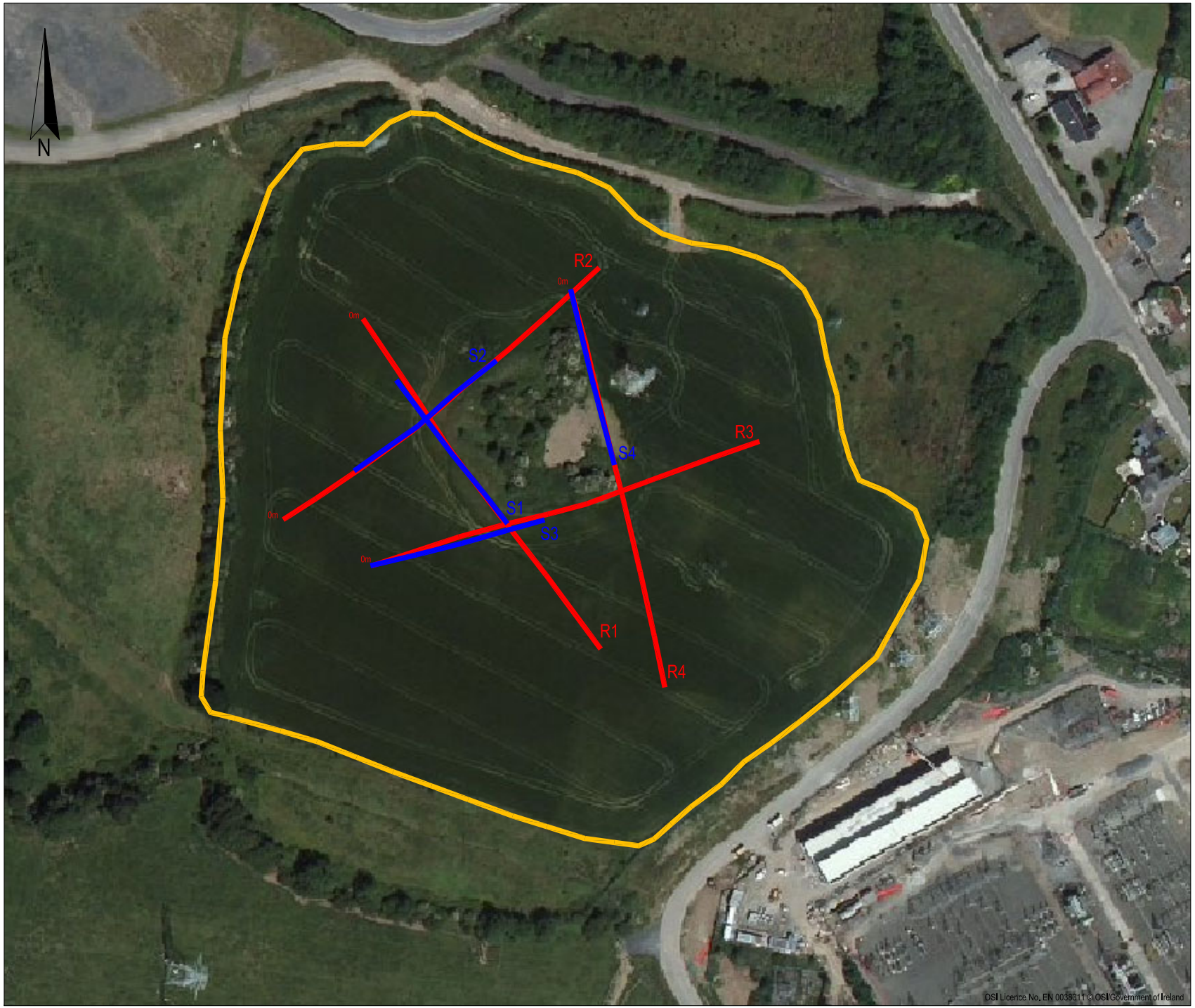
APPENDIX D: DRAWINGS

The information derived from the geophysical investigation as well as correlation with the available direct investigation is presented in the following drawings:

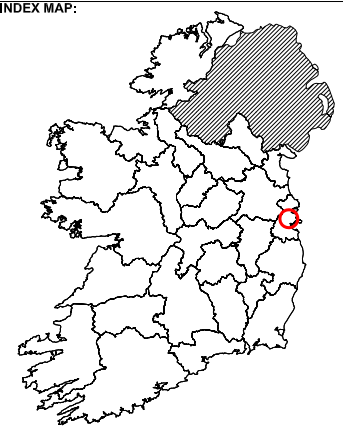
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AGP19087_R1	ERT R1 Results and Interpretation	1:1000 @ A4
AGP19087_R2	ERT R2 Results and Interpretation	1:1000 @ A4
AGP19087_R3	ERT R3 Results and Interpretation	1:1000 @ A4
AGP19087_R4	ERT R4 Results and Interpretation	1:1000 @ A4

FIGURE 1: GEOPHYSICAL LOCATIONS

SCALE 1: 2000



INDEX MAP:



LEGEND:

Site

R1 2D resistivity profile

S1 Seismic refraction profile

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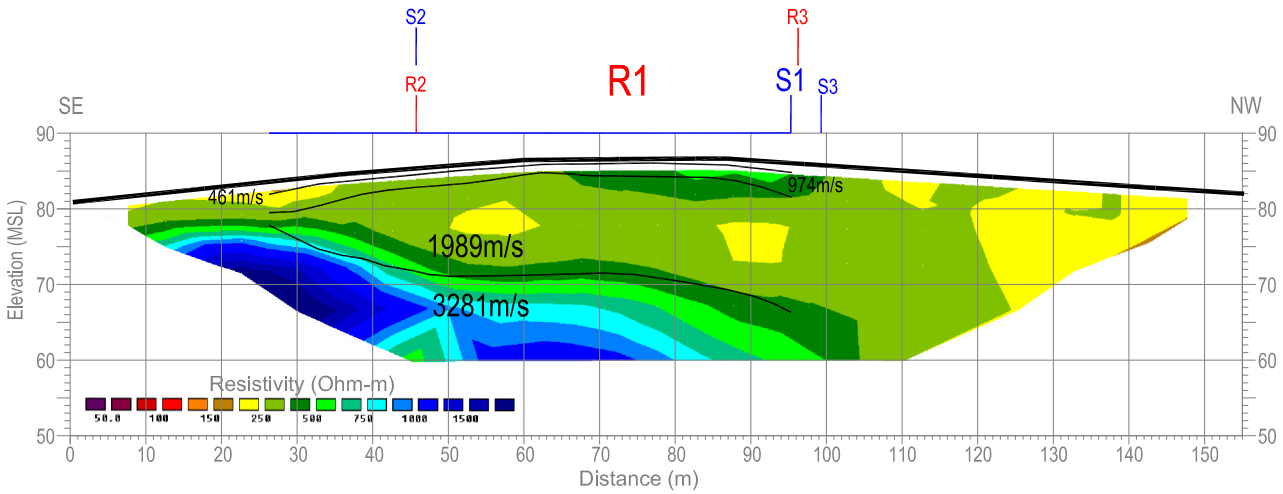
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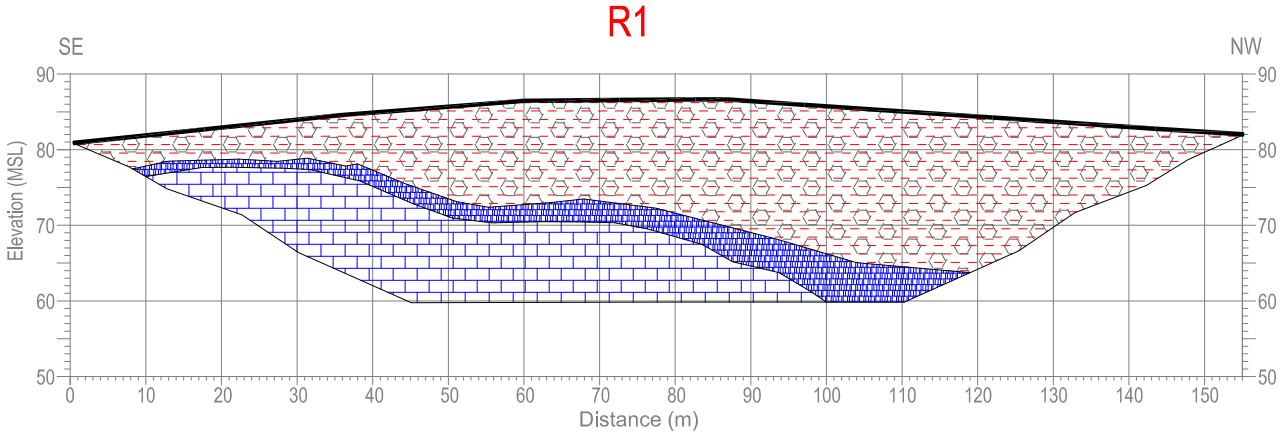
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DRAWING NO:	AGP19087_01
SCALE:	AS INDICATED @ A4
DATE:	17-04-2019

Version:	Date:	Drawn By:	Checked:
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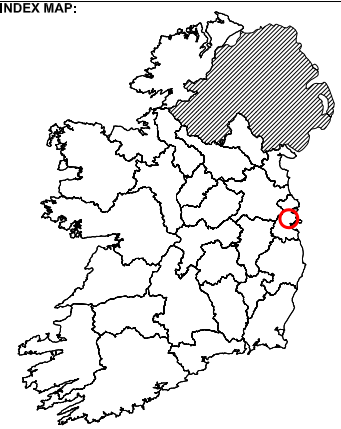
ERT R1 RESULTS AND INTERPRETATION

SCALE 1: 1000





INDEX MAP:



LEGEND:

- SILT/CLAY
- Sandy Gravelly CLAY (possible w.rock towards the base)
- Weathered Dark LIMESTONE
- Dark LIMESTONE
- Seismic refraction layer with interpreted P-wave velocity (1254-1288 m/s)

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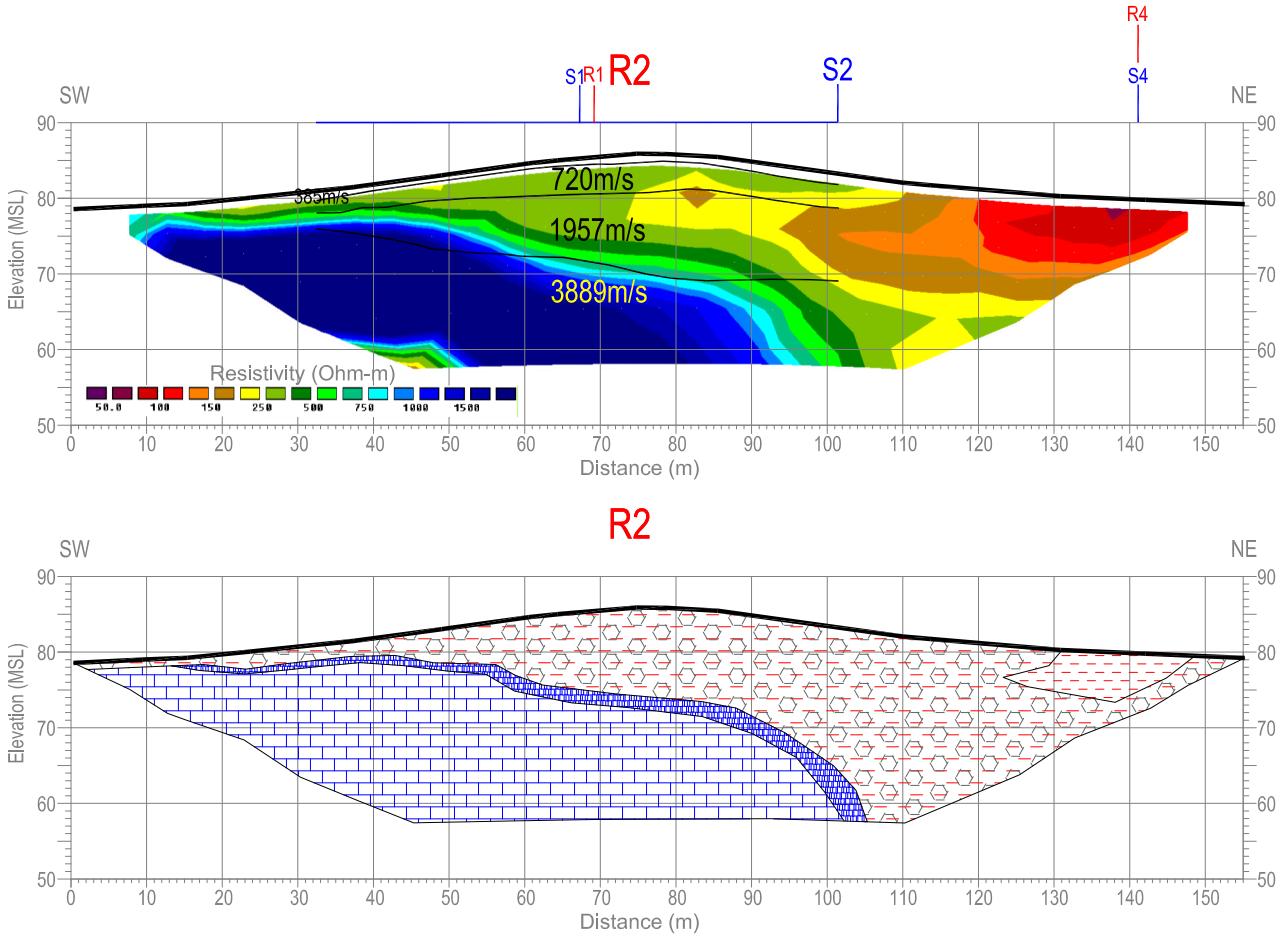
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SCALE:	AS INDICATED @ A4
DATE:	17-04-2019

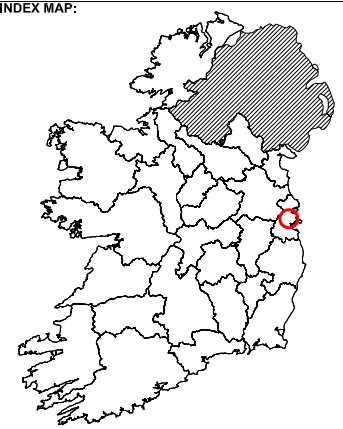
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No.1	17-04-2019	KG	TL

ERT R2 RESULTS AND INTERPRETATION

SCALE 1: 1000



INDEX MAP:



LEGEND:

- SILT/CLAY
- Sandy Gravelly CLAY (possible w.rock towards the base)
- Weathered Dark LIMESTONE
- Dark LIMESTONE
- 1254-1288 m/s — Seismic refraction layer with interpreted P-wave velocity

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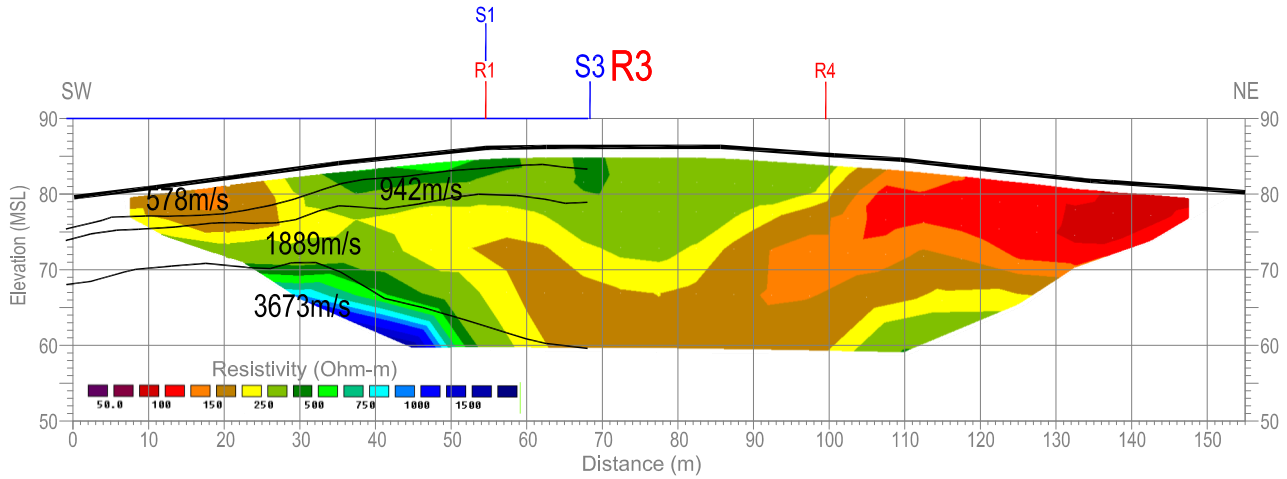
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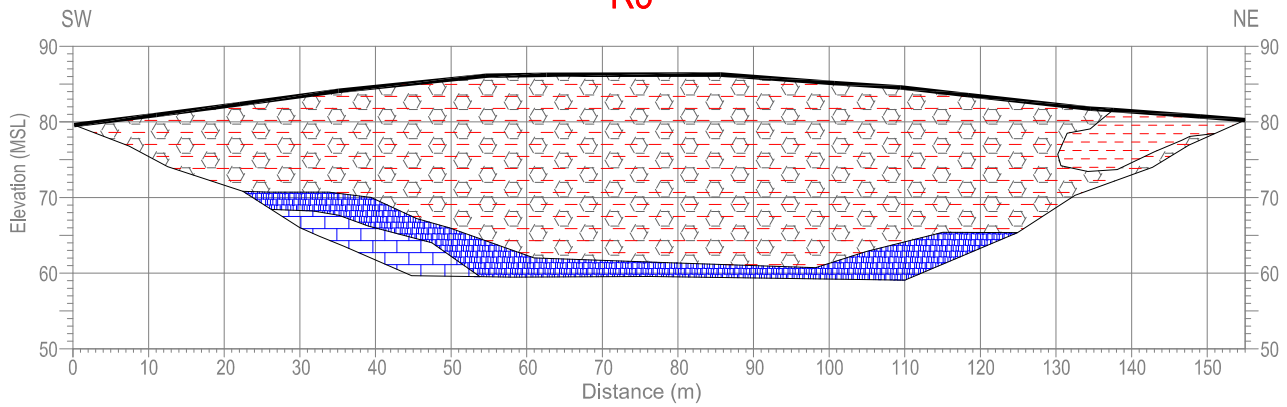
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DATE:	17-04-2019

Version:	Date:	Drawn By:	Checked:
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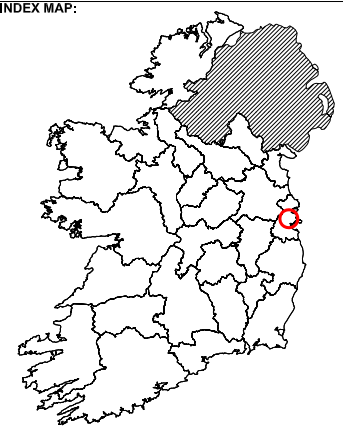
ERT R3 RESULTS AND INTERPRETATION

SCALE 1: 1000





INDEX MAP:



LEGEND:

- SILT/CLAY
- Sandy Gravelly CLAY (possible w.rock towards the base)
- Weathered Dark LIMESTONE
- Dark LIMESTONE
- Seismic refraction layer with interpreted P-wave velocity (1254-1288 m/s)

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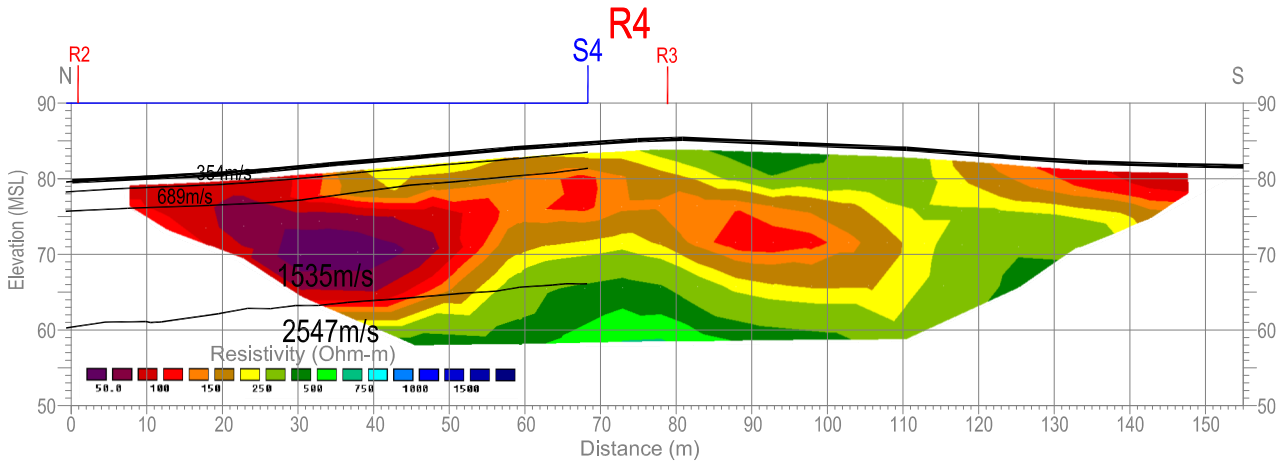
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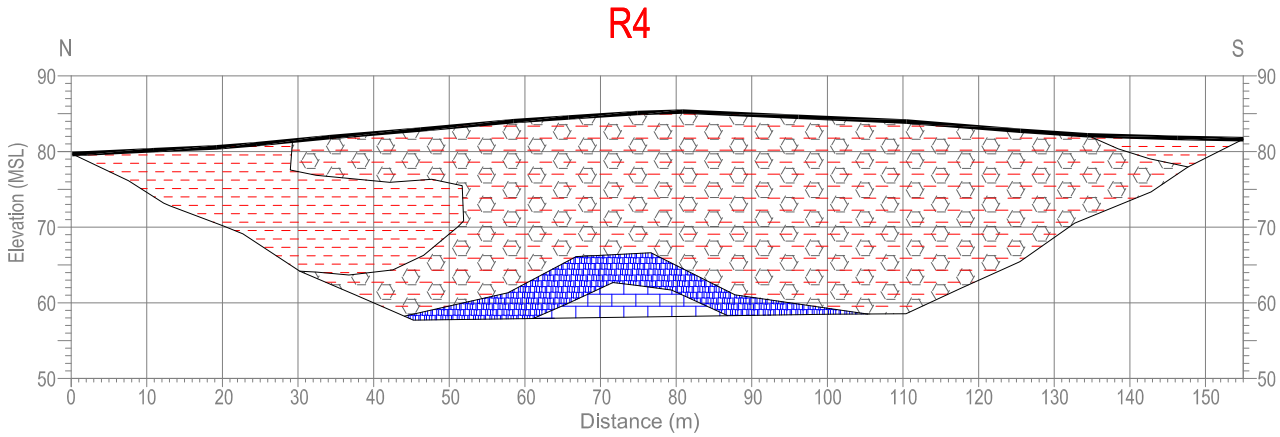
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DRAWING NO:	AGP19087_R3
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DATE:	17-04-2019

Version:	Date:	Drawn By:	Checked:
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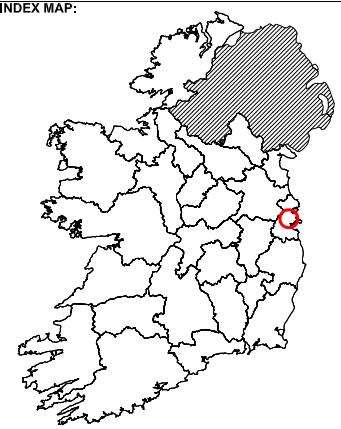
ERT R4 RESULTS AND INTERPRETATION

SCALE 1: 1000





INDEX MAP:



LEGEND:

- SILT/CLAY
- Sandy Gravelly CLAY (possible w.rock towards the base)
- Weathered Dark LIMESTONE
- Dark LIMESTONE
- 1254-1288 m/s — Seismic refraction layer with interpreted P-wave velocity

The information displayed here is to be used in conjunction with Report AGP19087_01 Report on the Geophysical Investigation at Huntstown North for Beauparc Ltd. APEX Geophysics Ltd. 17th April 2019

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CLIENT.:	BEAUPARC LIMITED
DRAWING NO:	AGP19087_R4
SCALE:	AS INDICATED @ A4
DATE:	17-04-2019

Version:	Date:	Drawn By:	Checked:
No.1	17-04-2019	KG	TL

APPENDIX 6.2

SITE INVESTIGATION REPORT

PROPOSED INDUSTRIAL UNITS AT HUNTSTOWN Tc, Co. FINGAL

SITE INVESTIGATION REPORT



Client:	Rathdrinagh Land ULC, T/a Irish Recycling
Engineer:	Coyle Civil & Structural Design Ltd
Completed:	December 2022
Report No.:	22-125



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DOCUMENT CONTROL SHEET:

Client:	**Rathdrinagh Land ULC, T/a Irish Recycling**
Consulting Engineers:	**Coyle Civil & Structural Design Ltd**
Address:	**3 High Street** **Mullaghmonaghan** **Co. Monaghan**
Project Reference:	**22-125**
Site Location:	**Huntstown** **Co. Fingal**
Document Title:	**Site Investigation Report**
Prepared by:	**Marc Robinson** BSc MIEI
Check by:	**Thomas Robinson** BSc CGeol FGS MIQ
Report Status:	**Revision 01**
Issue Date:	**19th December 2022**

Table 7 **Field identification and description of soils**

SOIL **GROUP**	**Very coarse soils**			**Coarse soils**						**Fine soils**					
PRINCIPAL SOIL TYPE	BOULDERS		COBBLES	GRAVEL			SAND			SILT			CLAY		
Particle **size (mm)**	Large boulder	Boulder	Cobble	Coarse	Medium	Fine	Coarse	Medium	Fine	Coarse	Medium	Fine			
	>630	630–200	200–63	63–20	20–6.3	6.3–2.0	2.0–0.63	0.63–0.2	0.2–0.063	0.063–0.02	0.02–0.0063	0.0063–0.002	<0.002		
Visual identification	Only seen complete in pits or exposures. **Difficult** to recover whole **from** boreholes.			Easily visible to naked eye; particle shape can be described; grading can be described.			Visible to naked eye; no cohesion when dry; grading can be described.			Only coarse silt visible with hand lens; exhibits **little** plasticity and marked dilatancy; slightly granular or silky to **the** touch; disintegrates in water; lumps dry quickly; possesses cohesion but can be powdered easily between fingers.			Dry lumps can be broken but not powdered between the fingers; dry lumps disintegrate under water but more slowly than silt; smooth to **the** touch; exhibits plasticity but no dilatancy; sticks **to** the fingers and dries slowly; shrinks appreciably on drying usually showing cracks		
Density/ Consistency	No terms defined. Qualitative description of packing by inspection and ease of excavation.			Classification of relative density on the basis of N value (Table 10), or **field** assessment using hand tests may be made (Table 11).						**Term**	Very **soft**	Soft	Firm	Stiff	Very **stiff**
										Field test	Finger easily pushed **in** up **to** 25 mm. Exudes between fingers	Finger pushed **in** up **to** 10 mm. Moulded by **light finger** pressure	Thumb makes impression easily. Cannot be moulded by fingers. Rolls **to** thread	Can be indented slightly by **thumb.** Crumbles **in rolling thread.** Remoulds	Can be indented by thumb nail. Cannot be moulded, crumbles
Discontinui-ties	Describe spacing of features such as fissures, shears, partings, isolated beds **or** laminae, desiccation cracks, rootlets, etc. Fissured: Breaks into blocks along unpolished discontinuities. Sheared: Breaks into blocks along polished discontinuities.						**Scale of spacing of discontinuities**		**Term**	very widely	widely	medium	closely	very closely	extremely closely
									Mean spacing (mm)	>2 000	2 000–600	600–200	200–60	60–20	<20
Bedding	Describe thickness of beds in accordance with geological **definition. Alternating** layers of materials are Inter-bedded or Inter-laminated and should be described by a thickness term **if** in equal proportions, or by a thickness of and spacing between subordinate layers where unequal.						**Scale of bedding thickness**		**Term**	very thickly bedded	thickly bedded	medium bedded	**thinly** bedded	very **thinly** bedded	thickly lami-nated	**thinly** laminated
									Mean thickness (mm)	>2 000	2 000–600	600–200	200–60	60–20	20–6	<6
Colour	**HUE** can be preceded by **LIGHTNESS** and/or **CHROMA**			Red / Pink / Orange / Yellow / Cream / Brown / Green / Blue / White / Grey / Black Light / - / Dark Reddish / Pinkish / Orange / Yellowish / Brownish / Greenish / Bluish / Greyish						Colours may be **mottled** More than 3 colours is **multi-coloured**					
Secondary constituents	For mixtures involving very coarse soils see **33.4.4.2**			**Term in coarse soils**	slightly (sandy) B)	(sandy) B)	very (sandy) B)	SAND AND GRAVEL		**Term in fine soils**	slightly (sandy) D)	(sandy) D)	very (sandy) F)	Silty CLAY Clayey SILT	Terms used to reflect secondary **fine** constituents where this is **important**
				Proportion secondary A)	<5%	C)	C)	About 50%		**Proportion secondary** A)	<35%	E)	E)		
Mineralogy	Terms can include: glauconitic / micaceous / shelly / organic / calcareous. For example: slightly (glauconitic) / (glauconitic) / very (glauconitic) Carbonate content: slightly calcareous – weak or sporadic effervescence from HCl / calcareous – clear but not sustained effervescence from HCl / highly calcareous – strong, sustained effervescence from HCl. Organic soils contain secondary finely divided or discrete particles of organic matter, often with distinctive smell, might oxidize rapidly. For example: slightly organic – grey / organic – dark grey / very organic – black														
Particle shape	Very angular/Angular/Sub-angular/Sub-rounded/Rounded/Well-rounded A **dominant** shape can be described, for example: Cubic/Flat/Elongate														
PRINCIPAL SOIL TYPE	LARGE BOULDERS	BOUL-DERS	COBBLES	GRAVEL			SAND			SILT			CLAY		
Tertiary constituents	Example terms include: shell fragments / pockets of peat / gypsum crystals / pyrite nodules / calcareous concretions / **flint** gravel / brick fragments / rootlets / plastic bags Qualitative proportions can be given: with rare / with occasional / with numerous/ frequent/ abundant. Proportions are defined on a site or material specific basis, or subjectively														
Geological unit	Name in accordance with published geological maps, memoirs or sheet explanations. For example: RIVER TERRACE DEPOSITS / GLACIAL SAND AND GRAVEL / MADE GROUND / LANGLEY SILT MEMBER / WEATHERED CHARMOUTH MUDSTONE FORMATION / CLAY-WITH-FLINTS / LOWESTOFT FORMATION / EMBANKMENT FILL / ALLUVIUM / TOPSOIL / LAMINATED BEDS, WOOLWICH FORMATION / SHERWOOD SANDSTONE GROUP														

A) Percentage coarse or fine soil type assessed excluding cobbles and boulders. B) Gravelly or sandy and/or silty or clayey. C) Can be described as fine soil depending on mass behaviour. D) Gravelly and/or sandy. E) Can be described as coarse soil depending on mass behaviour. F) Gravelly or sandy.

Abbreviations relating to exploratory hole logs

D	Small disturbed sample
B	Bulk disturbed sample
W	Water sample
E	Environmental Sample
U	Nominal 100mm diameter undisturbed open tube sample
UT	Nominal 100mm diameter undisturbed thin wall open tube sample
P	Nominal 100mm diameter undisturbed piston sample
S	Shelby tube
SPT(S)	Standard penetration test using a split spoon sampler
SPT(C)	Standard penetration test using a 60 degree solid cone sampler
2,4/5,6,8,6	Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length (N value). The length achieved is stated (mm) for any test increment less than 75mm
SPT N = 25	SPT blow count 'N' given by the summation of the blows required to drive the full test length (300mm)
SPT B/L	Incomplete standard penetration test where the full test length was not achieved. The blows 'B' represent the total blows for the given test length 'L' (mm). Refusal when seating blows => 25 and N value => 50 (Extended to 100 in rock)
PID	Photoionization detector (measures volatile Organic Compounds results in ppm)
V	Shear vane test (borehole) Hand vane test (trial pit) Shear strength stated in kPa
dd/mm/yy: 1.00m	Date & water level at the borehole depth at the end of shift or the start of the following shift
Seepage (1) at 2.00m Slight flow (2) at 3.00m Moderate flow (3) at 5.00m Strong flow (4) at 6.00m	Water flow rate and depth struck. Number in brackets is an individual water strike ▽ 1 Depth water struck in borehole ▼ 1 Depth water rose in borehole
TCR (%)	Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run.
SCR (%)	Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures.
RQD (%)	Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run.
FI	Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing
NI	Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles.

1.0 INTRODUCTION

1.1 General

Hanmar Site Investigation Services Ltd was appointed by the client Rathdrinagh Land ULC T/a Irish Recycling in September 2022 to undertake an exploratory ground investigation for Proposed Industrial Units at Huntstown Tc, Co. Fingal. A site location map is presented in Figure 1 and an exploratory borehole location map for the site is shown in Figure 2.

It is proposed to construct a range of industrial units (portal frame structures) along with drainage, hard standings and soft landscaping. This report provides a summary of the ground conditions as encountered by the intrusive exploratory investigations and provides guidance on the geotechnical issues regarding the design of the proposed new development.

All information given in this report is based upon the ground conditions encountered during the site investigation works, and on the results of the laboratory and field tests performed. The recommendations and conclusions in this report are based on the assumptions that the exploratory holes and test results are representative of overall site conditions.

However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those measured during the investigation.

This report was prepared by Hanmar Site Investigation Services Ltd for the use of the Client and the Client's Representative in response to particular instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

1.2 Scope of Works

The initial scope of the ground investigation was designed by the Client/Engineer and was as follows:

- 2 No. boreholes in order to establish the rock, soil and groundwater conditions beneath the site.
- 3 No. trial pits in order to establish the rock, soil and groundwater conditions beneath the site.
- Install groundwater monitoring standpipes.
- 1 No. permeability tests to BRE Digest 365, in order to establish the infiltration rate beneath the site.
- To complete in-situ testing to characterise the encountered strata's properties at the proposed site.
- To complete Laboratory testing on samples to characterise the encountered strata's properties at the proposed site.
- To prepare a report of the site investigation findings.

2.0 METHODOLOGY

2.1 Fieldwork

This report has been prepared following as best as possible with the client's restrictions in scope the guidelines set out in the following: -

- UK Specification for ground Investigation, 2nd edition, Site Investigation Steering Group, published by ICE (2011).
- Site investigation in Construction Part 3: Specification for ground Investigation, Site Investigation Steering Group, published by Thomas Telford Ltd (1993).
- BS5930:2015 Code of Practice for Site Investigation and testing.

It was also undertaken as best as possible in accordance with the guidelines set-out in British Standards Institute (2010), *BS 5930:1999 + A2:2010 Code of Practice for Site Investigations.* Incorporating Amendment Nos. 1 and 2, as partially replaced by:

- *BS EN 1997-2:2007: Eurocode 7. Geotechnical design. Ground Investigation and testing.*
- *BS EN ISO 22475-1:2006: Geotechnical investigation and testing. Sampling methods and groundwater measurements. Technical principles for execution.*
- *BS EN ISO 14688-1:2002: Geotechnical investigation and testing. Identification and classification of soil. Identification and description.*
- *BS EN ISO 14689-1:2004: Geotechnical investigation and testing. Identification and classification of soil. Principles for a classification.*
- *BS EN ISO 14689-1:2003: Geotechnical investigation and testing. Identification and classification of rock. Identification and description.*
- *BS EN ISO 22476-2:2005: Geotechnical investigation and testing. Field testing. Dynamic probing.*
- *BS EN ISO 22476-3:2005: Geotechnical investigation and testing. Field testing. Standard penetration test.*

The fieldworks were completed between the 18th and 19th October 2022 with works being completed under dry sunny conditions and downpour conditions.

2.1.1 Boreholes

2 No. rotary percussive boreholes were excavated using a Massenza MI5 Drilling Rig boring a nominal 200mm borehole supported by a temporary casing system as drilling

progressed. Boreholes extended to a maximum depth of 7.50m below existing ground level.
Borehole locations are as indicated by the exploratory borehole location map presented in Figure 2 and detailed borehole logs are presented in Appendix A.

Borehole BH 01 was dropped from the original scope of works by the client.

2.1.2 Rotary Boreholes

1 No. rotary cored borehole BH 03 was drilled using a Massenza MI5 Rotary coring rig using a T2 101 core barrel and water flush.

Borehole locations are as indicated by the exploratory borehole location map presented in Figure 2 and detailed borehole logs are presented in Appendix A.

2.1.3 Trial Pits

3 No. Machine Excavated Trial Pits were excavated using a 3 ton Bobcat Excavator using a 400mm toothed bucket.

Trial Pit locations are as indicated by the exploratory borehole location map presented in Figure 2 and detailed borehole logs are presented in Appendix B.

2.1.4 Sampling

Small disturbed jar samples were collected at intervals as drilling progressed.
U100 undisturbed samples were attempted but met refusal within the stiff clays.

2.1.5 In-situ testing

Standard Penetration Tests (SPT's) were taken at 1.00m depth intervals in accordance with BS 1377:1990 Code of Practice: Methods of Test for Soils for Engineering Purposes – Part 9 In-Situ Tests.

1 no. infiltration tests were completed at location Per 01. The infiltration pits extended to a maximum depth of 1.00m below existing ground level and trimmed square to allow for the actual measurement of the volume. These were filled with water and monitored in accordance with BRE digest 365 to establish the infiltration rate. Results are given in Appendix C.

2.1.6 Installations

Groundwater monitoring standpipes were installed in all boreholes BH 02 – 03 to a maximum depth of 4.00m. These consisted of slotted 50mm HDPE pipe with a gravel surround and plain 50mm HDPE pipe with a bentonite seal which was topped with a upright cover. Installation details are given on the Borehole installation sheet that accompanies the Borehole logs in Appendix A.

2.1.7 Monitoring

Groundwater level monitoring was completed over 21st October – 19th December 2022. Results are given on the Borehole installation sheet that accompanies the Borehole logs.

2.2 Laboratory Work

Selected soil samples were scheduled for the following range of laboratory tests:

- 2:1 Soil Water Extract
- pH
- Water Soluble Chloride content
- Particle Size Distribution - Sieve
- Particle Size Distribution - Sedimentation
- Moisture Content
- Point Load Testing

All tests were undertaken in accordance with the methods set-out in *BS 1377:1990 Code of Practice: Methods of test for soils for civil engineering purposes.* Test results are included in Appendix D.

Selected soil & water samples were scheduled for environmental testing and comprised of:-

- Waste Acceptance Criteria
- 10 Metals including Cr VI
- Speciated (16) PAHs
- Phenols
- TPH-CWG

- BTEX
- Cyanide (free & total)
- pH
- SOM
- sulphates
- Asbestos
- WAC testing

Test results are included in Appendix E.

3.0 SITE CHARACTERISATION

3.1 Site Location and Description

The works site is located from the North Road and is located within lands run by Roadstone Ltd at Huntstown, Co. Fingal. The site is an agricultural green field site with several electricity pylons running through it. The site is bounded to the north by the North Road, to the east by a major electricity substation, on the southern boundary by agricultural fields and on the western boundary by an industrial complex. The levels across the site rise and fall from the centre.

Table 1 summarises the site details, while Plates 1 – 5 show an overview of the locations.

Table 1: General Site Details

Site Address	Huntstown Tc, Co. Fingal
Irish Grid Reference	711777E 740928N
OS Plans (1:50,000)	Sheet No. 50 Dublin
Current Land Use	Agricultural Field

Plate 1: Site Location (Approximate Locations)

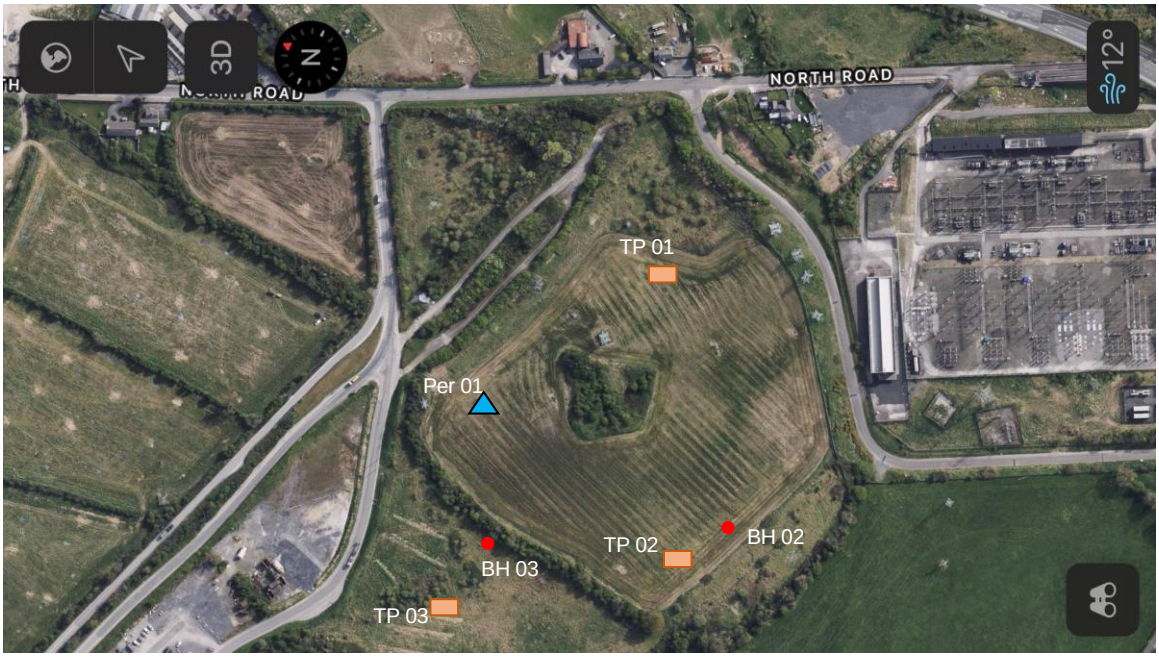


Plate 2: Borehole Location (BH 02)



Plate 3: Borehole Location (BH 03)



Plate 4: Percolation Test Start



Plate 5: Percolation Test Finish



4.0 GEOLOGY

4.1 Geology of site from published records

Geological information was obtained for the site using the following sources of information:

- GSI Geological Map of Ireland Quaternary (1:100,000).
- GSI Geological Map of Ireland Bedrock (1:100,000).

A reproduction of the geology maps for the site are presented as Figures 3 & 4. The maps indicate that the underlying geology of the site is likely to be as follows:

Drift Geology

- Glacial Till – Clay
- Rock at or near surface

Solid Geology

- Carboniferous: Tober Collen Formation – Calcareous Shale, Limestone Conglomerate

4.2 Ground Conditions

The geological context of the site was verified by the sinking of exploratory boreholes, which were excavated to a maximum 7.50m below existing ground level. The ground conditions that were recorded during the investigation are summarised in Table 2, and followed by a general description of the strata encountered.

Table 2: Ground Conditions Summary

Exploratory Hole Reference	Completion Depth (m)	Stratum thickness (m)					
		Topsoil	Made Ground	Recent	Fluvial Glacial	Glacial Till - Clays	Rock mbgl
BH 02	7.50 (Refusal)	0.20	-	-	-	>7.30	-
BH 03	3.70 (Complete)	0.10	-	-	-	1.00	1.10
TP 01	2.50 (Complete)	0.30	-	-	-	>2.20	-

Exploratory Hole Reference	Completion Depth (m)	Stratum thickness (m)					
		Topsoil	Made Ground	Recent	Fluvial Glacial	Glacial Till - Clays	Rock mbgl
TP 02	2.50 (Complete)	0.30	-	-	-	>2.20	-
TP 03	0.75 (Refusal)	0.20	-	-	-	0.55	0.75

Notes: ~ Groundwater strike: S=Seepage, SF= Slight Flow, MF = Moderate Flow, ST = Strong Flow

4.2.1 Made Ground

No Made ground was encountered within all boreholes and trial pits during excavations.

4.2.2 Glacial Till Deposits

Glacial Till deposits were found within all boreholes and trial pits and consisted of a very stiff greyish brown gravelly sandy silty CLAY containing frequent cobbles and boulders. Glacial Till deposits extended to maximum depth of 7.50m below existing ground levels.

4.2.3 Fluvial Glacial Deposits

No Fluvial Glacial Deposits were encountered within boreholes or trial pits during excavations.

4.2.4 Bedrock

Bedrock was encountered within the borehole BH 06 consisting of medium strong highly fractured dark grey fine grained LIMESTONE with thin layers of MUDSTONE close to very close smooth planar moderately open to tight clean dry fractures (CARBONIFEROUS – TOBER COLLEEN FORMATION).

4.3 Groundwater

All boreholes and trial pits were dry during excavations.

5.0 DESIGN CONSIDERATIONS

5.1 Introduction

The foundation requirements would depend on the structural loadings that would be imposed by the proposed structure on the ground, which would need to be calculated by the Structural Engineer for the proposed scheme. However, the following general advice on foundation options can be provided for design purposes.

5.1 Shallow Foundations

The borehole investigation indicates that the glacial soils that underlie the site represent a potential bearing strata for supporting the lightly loaded foundations (eg raft, pad, strip footings). It is estimated that the deposits would have the following net allowable bearing pressures which are listed in table 3.

Table 3: Estimated Allowable Bearing Pressures

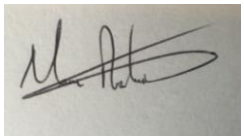
Exploratory Hole Reference	Foundation Depth (m)	Estimated Allowable Bearing Capacity (KPa)
BH 02	1.00	250
BH 03	1.00	250

The exploratory holes scoped by the Engineer are far apart and a more detailed site investigation scope of works should be undertaken to gain a better understand of the rises and falls in the bedrock geology below the site.

5.2 Soil Aggressiveness

The chemical analysis of the sulphate ion (SO4) content of soil samples (2:1 soil water extract), was between 0.044 – 0.052 g/l; with a pH values of 7.7 – 7.9. The results indicate that the soils are of a non-aggressive nature and are suitable for use of design Sulphate class DS-1, ACEC Class AC-1s (BRE Special Digest 1) for buried concrete.

Report Prepared By: -



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Chartered Engineering Geologist

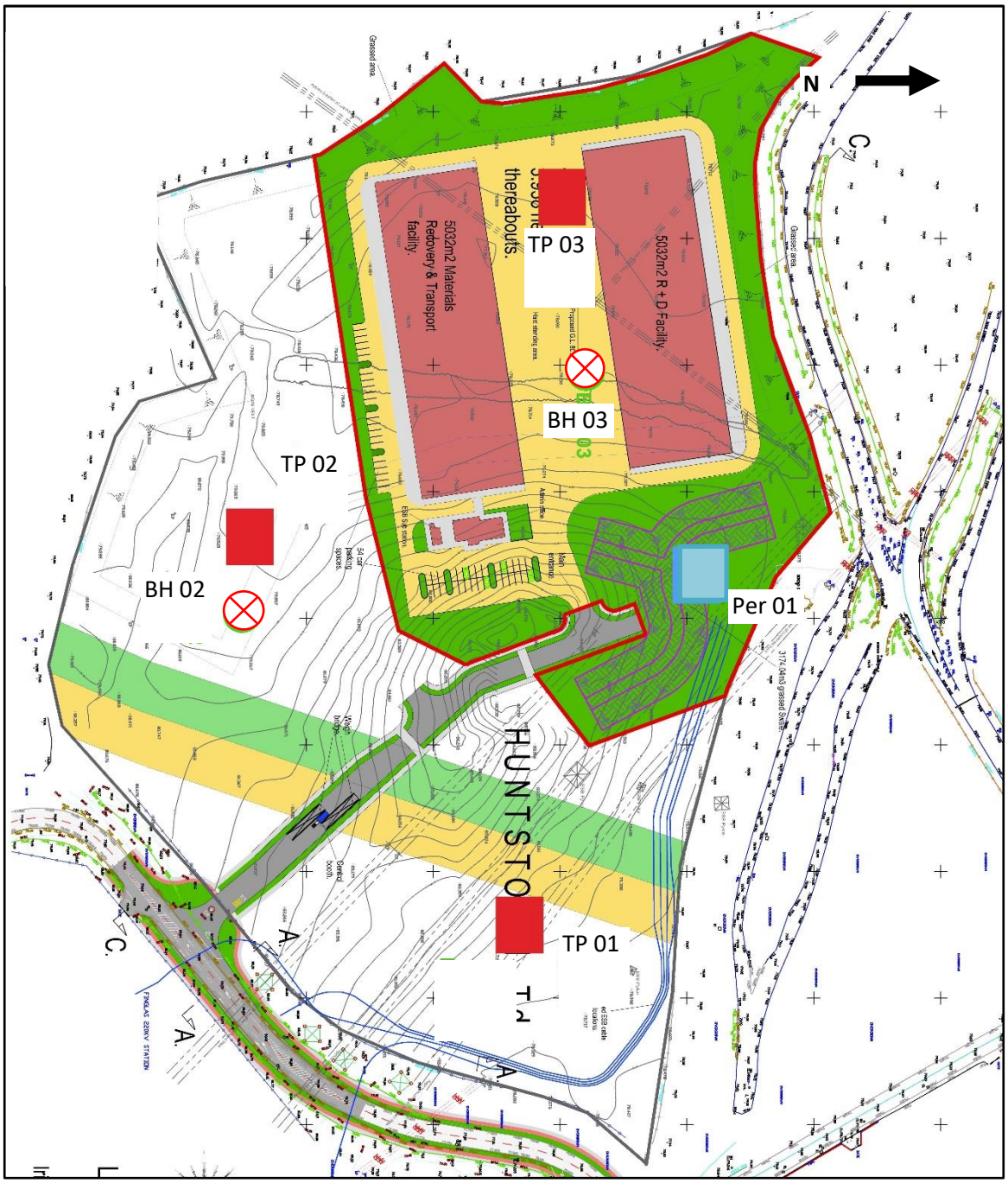
FIGURES



Client **Rathdrinagh Land ULC, T/a Irish Recycling**		Title **Figure 1 Site Location Plan**	
Project **Proposed Industrial Units at Hunstown Tc, Co. Fingal**		Engineer **Coyle Civil & Structural Design Ltd**	
Job Ref 22-125	Scale As Shown	Drawing No 22-125/01	Date Oct 22

HANMAR Site Investigation Services

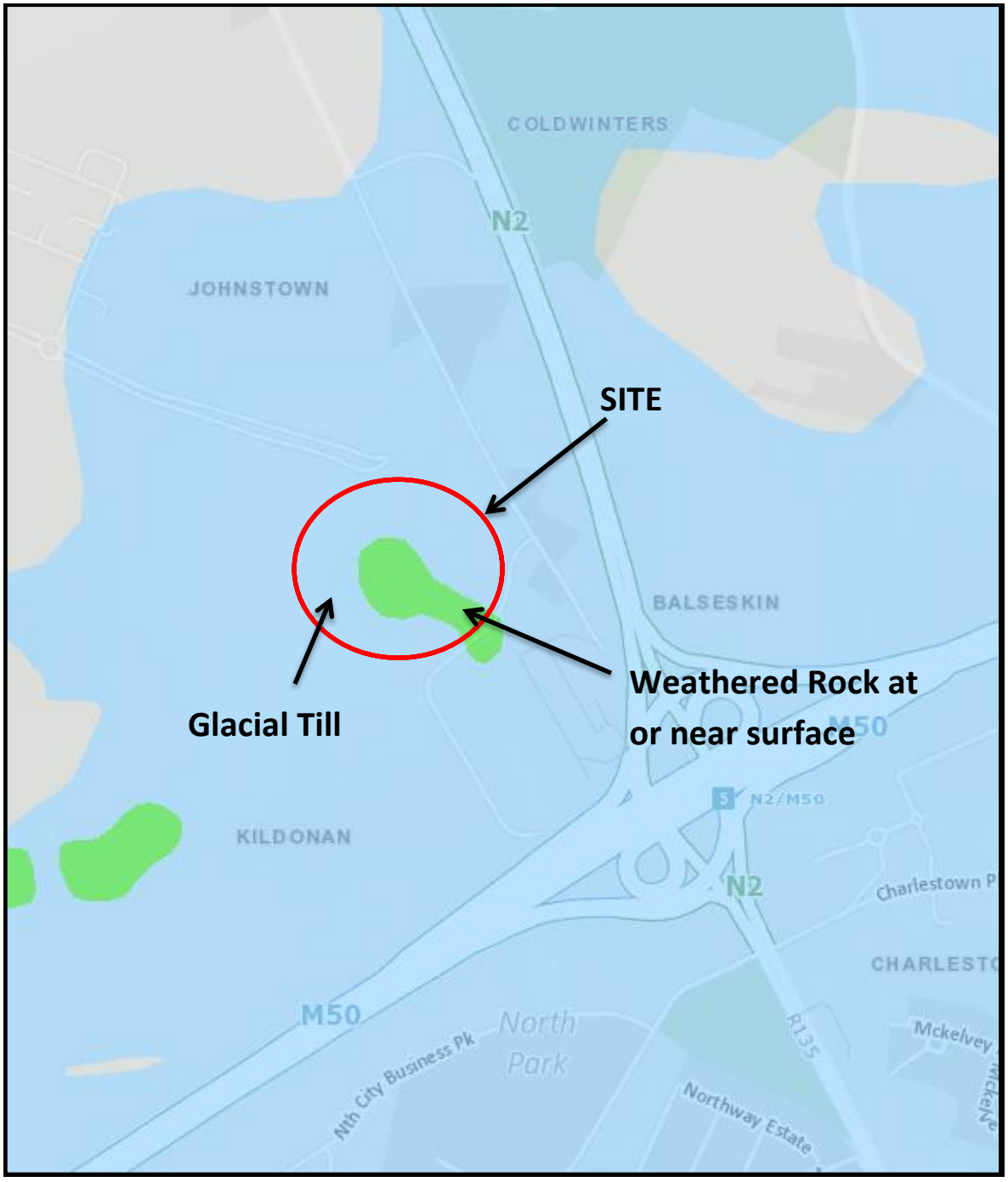
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Client **Rathdrinagh Land ULC, T/a Irish Recycling**		Title **Figure 2 Borehole Location Plan**	
Project **Proposed Industrial Units at Hunstown Tc, Co. Fingal**		Engineer **Coyle Civil & Structural Design Ltd**	
Job Ref 22-125	Scale As Shown	Drawing No 22-125/02	Date Oct 22

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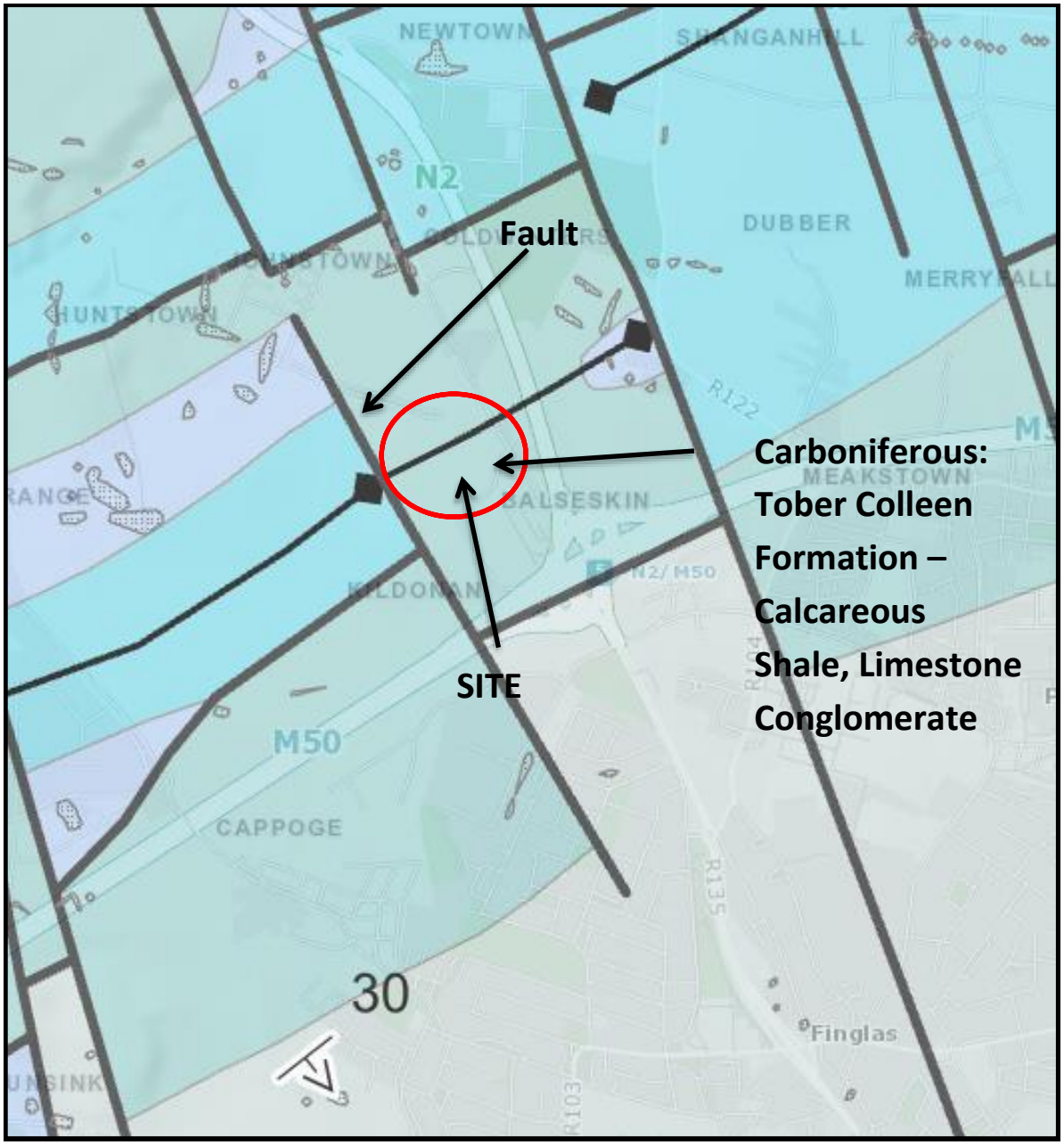
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Client **Rathdrinagh Land ULC, T/a Irish Recycling**		Title **Figure 4 Geology Map Drift**	
Project **Proposed Industrial Units at Hunstown Tc, Co. Fingal**		Engineer **Coyle Civil & Structural Design Ltd**	
Job Ref 22-125	Scale As Shown	Drawing No 22-125/04	Date Oct 22

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Client **Rathdrinagh Land ULC, T/a Irish Recycling**		Title **Figure 4 Geology Map Solid**	
Project **Proposed Industrial Units at Hunstown Tc, Co. Fingal**		Engineer **Coyle Civil & Structural Design Ltd**	
Job Ref 22-125	Scale As Shown	Drawing No 22-125/04	Date Oct 22

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Appendix A

Borehole Logs

HANMAR Site Investigation Services

Site	Borehole Number
Proposed Industrial Units at Huntstown Tc, Co Fingal	02

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Massenza MI5 Rotary rig using hollow stem augers and dynamic sampling.	150mm cased to 3.00m	79.71	Rathdrinagh Land ULC, T/a Irish Recycling	22-125
	Location (Handheld GPS) 711777 E 740928 N	**Dates** 19/10/2022	**Engineer** Coyle Civil & Structural Design	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				E:Environmantal Sample Consists of 2 x plastic tubs, amber glass jar & vial	79.51	(0.20) 0.20	Topsoil		
0.50	E1						Very Stiff greyish brown gravelly sandy silty CLAY containing frequent cobbles and boulders (GLACIAL TILL)		
1.00-1.45	SPT N=32			4,5/8,8,8,8					
1.00	D1								
1.00	E2								
1.50	B1								
2.00-2.25	SPT 50/100			4,5/7,43					
2.00	D2								
2.00	E3								
2.50	B2								
3.00-3.45	SPT N=38			5,7/8,9,9,12					
3.00	D3								
3.50	B3								
						(7.30)			
4.00-4.30	SPT 50/150			10,15/25,25					
4.00	D4								
4.50	B4								
5.00-5.24	SPT 25*/90 50/150			21,4/28,22					
5.00	D5								
5.50	B5								
6.00-6.10	SPT 25*/50 50/50			25/50					
6.00	D6								
6.50	B6								
7.00-7.31	SPT 50/160			7,18/20,22,8					
7.00	D7								
				19/10/2022:DRY	72.21	7.50	Complete at 7.50m		

Remarks
50mm diameter standpipe unstalled
Unable to get casing past 3.00m depth and borehole not staying out due to boulders moving
Virtural refusal met at 7.50m on Obstruction
Chiselling from 6.10m to 6.20m for .5 hours. Excavating from 0.00m to 1.00m for .5 hours.

Scale (approx)	Logged By
1:50	MR

Figure No. 22-125.02

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HANMAR Site Investigation Services

Site	Borehole Number
Proposed Industrial Units at Huntstown Tc, Co Fingal	02

Installation Type	Dimensions	Client	Job Number
Standpipe	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm	Rathdrinagh Land ULC, T/a Irish Recycling	22-125

Location	Ground Level (mOD)	Engineer	Sheet
711777 E 740928 N	79.71	Coyle Civil & Structural Design	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			79.41	0.30	Concrete
					Bentonite Seal
			78.81	0.90	
			78.71	1.00	Gravel Filter
					Slotted Standpipe
			75.71	4.00	
					Bentonite Seal
			72.21	7.50	

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)

Groundwater Observations During Drilling

Date	Start of Shift Time	Start of Shift Depth Hole (m)	Start of Shift Casing Depth (m)	Start of Shift Water Depth (m)	Start of Shift Water Level (mOD)	End of Shift Time	End of Shift Depth Hole (m)	End of Shift Casing Depth (m)	End of Shift Water Depth (m)	End of Shift Water Level (mOD)
19/10/22						pm	7.50	3.00	DRY	

Instrument Groundwater Observations

Inst. [A] Type : Standpipe

Date	Instrument [A] Time	Instrument [A] Depth (m)	Instrument [A] Level (mOD)	Remarks
21/10/22		3.70	76.01	
19/12/22		3.10	76.61	
21/12/22		3.50	76.21	

Remarks
Upright cover fitted

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HANMAR Site Investigation Services

Site	Borehole Number
Proposed Industrial Units at Huntstown Tc, Co Fingal	03

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Massenza MI5 Rotary rig using hollow stem augers and dynamic sampling. Rotary cored using T2 116 barrel	150mm cased to 1.50m	78.32	Rathdrinagh Land ULC, T/a Irish Recycling	22-125
	Location (Handheld GPS) 711698 E 741060 N	**Dates** 18/10/2022	**Engineer** Coyle Civil & Structural Design	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				E:Environmantal Sample Consists of 2 x plastic tubs, amber glass jar & vial	78.22	0.10	Topsoil		
							Very Stiff greyish brown gravelly sandy silty CLAY containing frequent cobbles and boulders (GLACIAL TILL)		
0.50	E1					(1.00)			
1.00	E2								
1.00	D1								
1.00-1.15	SPT 25*/100 50/50			9,16/50	77.22	1.10			
1.50	**TCR** / **SCR** / **RQD** / **FI**			B1			Medium Strong highly fractured dark grey fine grained LIMESTONE with thin layers of MUDSTONEclose to very close smooth planar moderately open to tight clean dry fractures (CARBONIFEROUS - TOBER COLLEEN FORMATION)		
1.50	100 / 100		NI			(2.60)			
3.00	100 / 100		NI						
				18/10/2022:DRY	74.62	3.70			
3.70							Complete at 3.70m		

Remarks
Broken rock jaming in core barrel at 3.70m depth
50mm diameter standpipe unstalled
Rotary cored from 1.50m to 3.70m
Virtural refusal met at 1.50m on Obstruction or possible rockhead
Excavating from 0.00m to 1.00m for .5 hours.

Scale (approx)	Logged By
1:50	MR

Figure No. 22-125.03

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HANMAR Site Investigation Services

Site	Borehole Number
Proposed Industrial Units at Huntstown Tc, Co Fingal	03

Installation Type	Dimensions	Client	Job Number
Standpipe	Internal Diameter of Tube [A] = 150 mm Diameter of Filter Zone = 50 mm	Rathdrinagh Land ULC, T/a Irish Recycling	22-125

Location	Ground Level (mOD)	Engineer	Sheet
711698 E 741060 N	78.32	Coyle Civil & Structural Design	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			78.02	0.30	Concrete
					Bentonite Seal
			77.42	0.90	
			77.32	1.00	Gravel Filter
			74.62	3.70	Slotted Standpipe

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)

Groundwater Observations During Drilling

Date	Start of Shift Time	Start of Shift Depth Hole (m)	Start of Shift Casing Depth (m)	Start of Shift Water Depth (m)	Start of Shift Water Level (mOD)	End of Shift Time	End of Shift Depth Hole (m)	End of Shift Casing Depth (m)	End of Shift Water Depth (m)	End of Shift Water Level (mOD)
18/10/22						pm	3.70	1.50	DRY	

Instrument Groundwater Observations

Inst. [A] Type : Standpipe

Date	Instrument [A] Time	Instrument [A] Depth (m)	Instrument [A] Level (mOD)	Remarks
21/10/22		2.80	75.52	
19/12/22		2.10	76.22	
21/12/22		2.50	75.82	

Remarks
Upright cover fitted

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BH 03 1.50m – 3.70m

Appendix B

Trial Pit Logs

HANMAR Site Investigation Services

Site	Trial Pit Number
Proposed Industrial Units at Huntstown Tc, Co Fingal	TP 01

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
3 ton tracked excavator	0.50m x 2.00m	81.67	Rathdrinagh Land ULC, T/a Irish Recycling	22-125
	Location (Handheld GPS) 711926 E 741045 N	**Dates** 19/10/2022	**Engineer** Coyle Civil & Structural Design	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			Environmental Sample consists of 2x plastic tubs, amber glass jar & glass vial	81.37	(0.30) 0.30	Topsoil		
0.50	B1				(0.30)	Orange brown slightly gravelly sandy silty CLAY containing occasional smooth subrounded cobbles (GLACIAL TILL)		
0.50	E1			81.07	0.60			
1.00	B2					Dark greyish brown gravelly sandy silty CLAY containing occasional cobbles and boulders (GLACIAL TILL)		
1.00	E2							
1.50	B3				(1.90)			
2.00	B4							
2.00	E3							
2.50	B5		19/10/2022:DRY	79.17	2.50	Complete at 2.50m		

Plan

Remarks

Pit dry and stable on completion

Scale (approx)	Logged By	Figure No.
1:50	MR	22-125.TP 01

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TP 01





TP 01

HANMAR Site Investigation Services

Site	Trial Pit Number
Proposed Industrial Units at Huntstown Tc, Co Fingal	TP 02

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
3 ton tracked excavator	0.50m x 2.00m	79.38	Rathdrinagh Land ULC, T/a Irish Recycling	22-125
	Location (Handheld GPS) 711744 E 740935 N	**Dates** 19/10/2022	**Engineer** Coyle Civil & Structural Design	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			Environmental Sample consists of 2x plastic tubs, amber glass jar & glass vial	79.08	(0.30) 0.30	Topsoil		
0.50 0.50	B1 E1				(0.60)	Orange brown slightly gravelly sandy silty CLAY containing occasional smooth subrounded cobbles (GLACIAL TILL)		
1.00 1.00	B2 E2			78.48	0.90	Dark greyish brown gravelly sandy silty CLAY containing occasional cobbles and boulders (GLACIAL TILL)		
1.50	B3				(1.60)			
2.00 2.00	B4 E3							
2.50	B5		19/10/2022:DRY	76.88	2.50	Complete at 2.50m		

Plan

Remarks

Pit dry and stable on completion

Scale (approx)	Logged By	Figure No.
1:50	MR	22-125.TP 02

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TP 02





TP 02

HANMAR Site Investigation Services

Site	Trial Pit Number
Proposed Industrial Units at Huntstown Tc, Co Fingal	TP 03

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
3 ton tracked excavator	0.50m x 2.00m	78.31	Rathdrinagh Land ULC, T/a Irish Recycling	22-125
	Location (Handheld GPS) 711660 E 741073 N	**Dates** 19/10/2022	**Engineer** Coyle Civil & Structural Design	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
			Environmental Sample consists of 2x plastic tubs, amber glass jar & glass vial	78.11	(0.20) 0.20	Topsoil		
0.50	B1				(0.55)	Orange brown slightly gravelly sandy silty CLAY containing occasional smooth subrounded cobbles (GLACIAL TILL)		
0.50	E1		19/10/2022:DRY	77.56	0.75	Complete at 0.75m		

Plan

Remarks

Virtural refusal met at 0.75m on possible rockhead
Pit dry and stable on completion

Scale (approx)	Logged By	Figure No.
1:50	MR	22-125.TP 03

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TP 03





TP 03

Appendix C

In-situ Test Results

Project No. 22-125
Site Huntstown
Test Location Per 01 Glacial Till

Full analysis not possible using method as described in BRE Digest 365/CIRIA Report 156

	width (m)	length (m)
test pit top dimensions	0.4	1.2
test pit base dimensions	0.4	1.2

test infiltration rate (q) = ####### m/h
depth to groundwater before adding water = Dry
test pit depth 1 m
depth to water surface at start of test 0 m

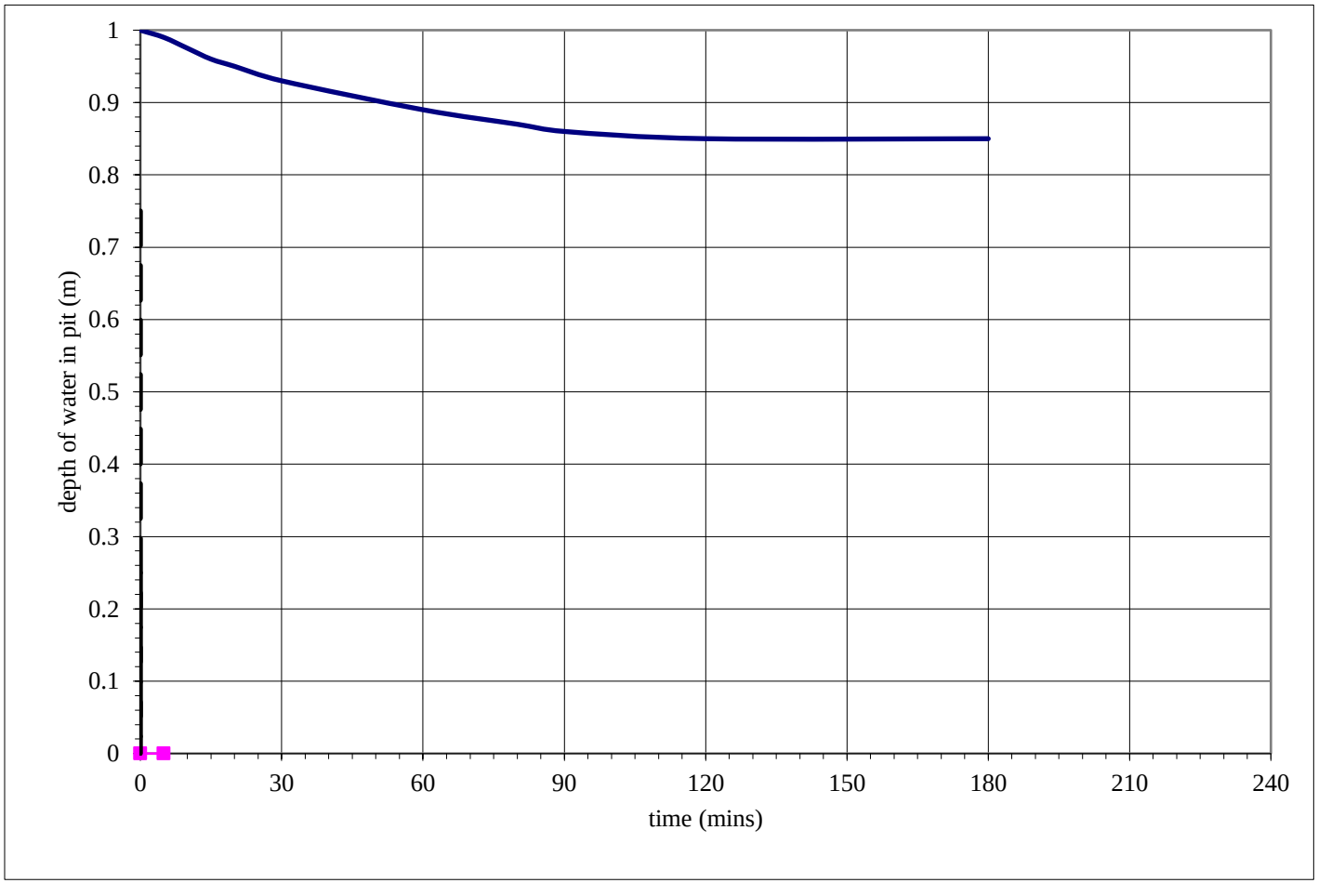
time (mins)	depth to water surface (m)	depth of water in pit (m)	time elapsed from test start (mins)	volume of water lost from test start (m3)	Area of walls and base at 50% drop from test start (m2)	q from start of test (m/min)	q from start of test (m/h)
0	0	1	0	0	3.68		
5	0.01	0.99	5	0.0048	3.664		
10	0.025	0.975	10	0.012	3.64		
15	0.04	0.96	15	0.0192	3.616		
20	0.05	0.95	20	0.024	3.6		
30	0.07	0.93	30	0.0336	3.568		
60	0.11	0.89	60	0.0528	3.504		
80	0.13	0.87	80	0.0624	3.472		
90	0.14	0.86	90	0.0672	3.456		
120	0.15	0.85	120	0.072	3.44		
180	0.15	0.85	180	0.072	3.44		

From graph:

test start - 75% depth at 0.75 m water depth
time is - minutes

test end - 25% depth at 0.25 m water depth
time is - minutes

-	0.25	0.75	#VALUE!	0	2.8800		
-	0.75	0.25	#VALUE!	0.2400	2.0800	#######	#VALUE!



Appendix D

Geotechnical Laboratory Test Results

Huntstown

MOISTURE CONTENT & ATTERBERG LIMITS

Job No. 22-125

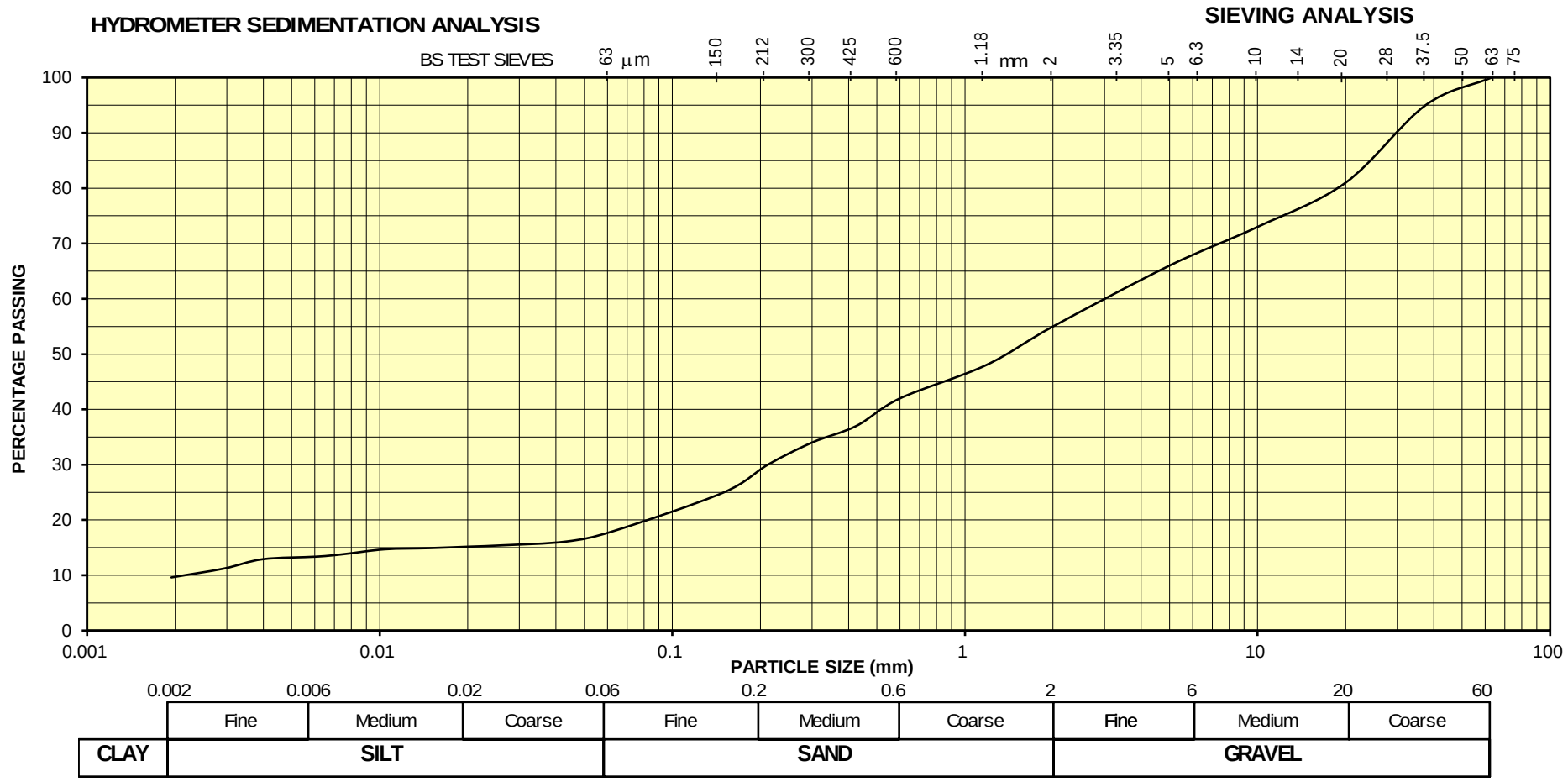
BH No.	Sample Type	Sample No.	Sample Depth (m)	Moisture Content (%)	Moisture Content of 'Fines' * (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Casagrande Classification	Passing 425µm Sieve (%)
BH 02	B	1	1.50	19.8						
TP 01	B	2	1.00	20.1						

BS 1377 : Part 2 : 1990 Tests 3.2, 4.3, 5.3 & 8.3

PARTICLE SIZE DISTRIBUTION

CONTRACT: Huntstown
EXP HOLE No.: BH 02
JOB No.: 22-125
SAMPLE : B2
SAMPLE DEPTH: 2.50 m

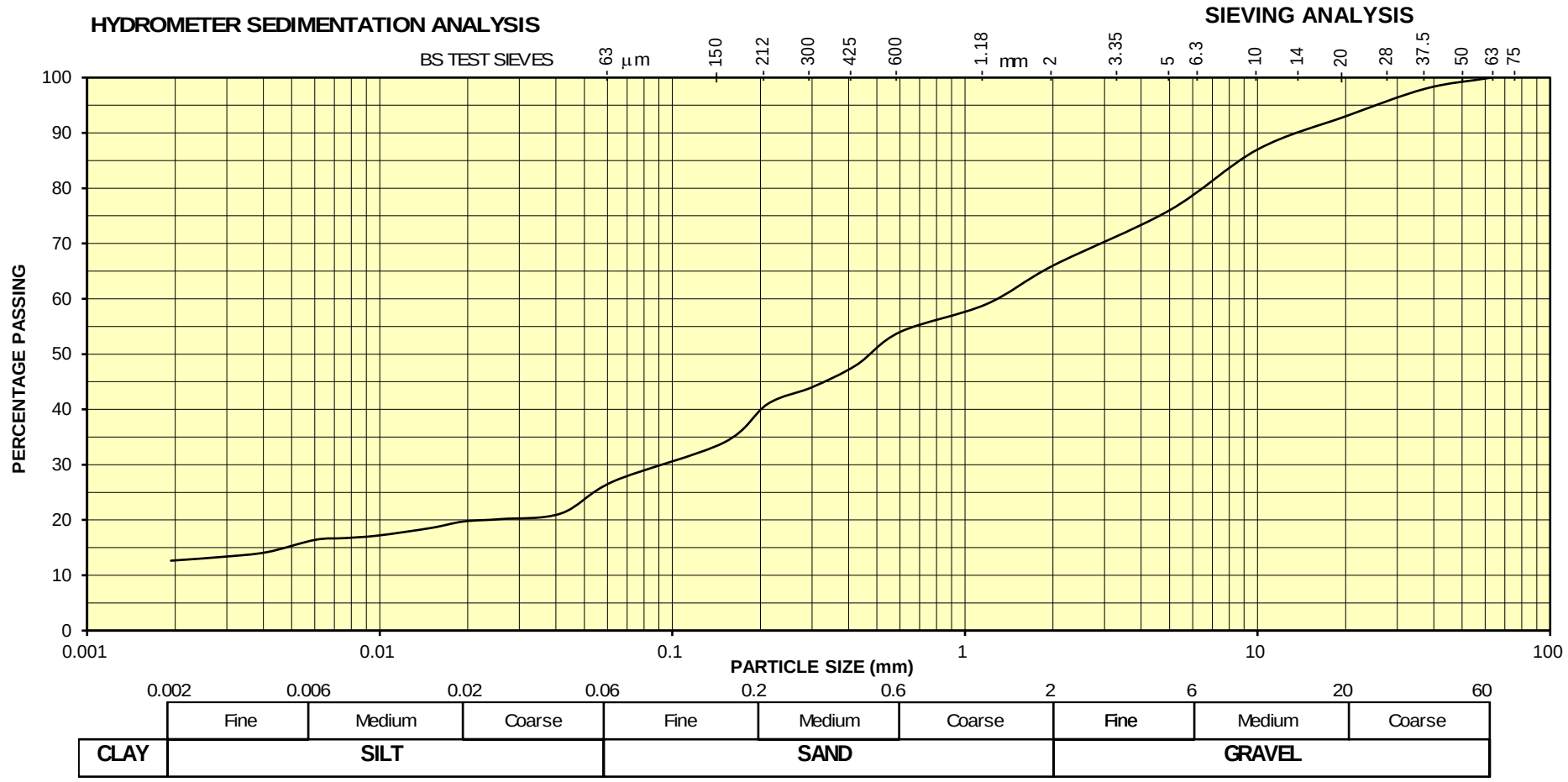
Tests 9.2 & 9.5 of BS1377 : Part 2 : 1990



PARTICLE SIZE DISTRIBUTION

CONTRACT: Huntstown
EXP HOLE No.: TP 01
JOB No.: 22-125
SAMPLE : B2
SAMPLE DEPTH: 1.00 m

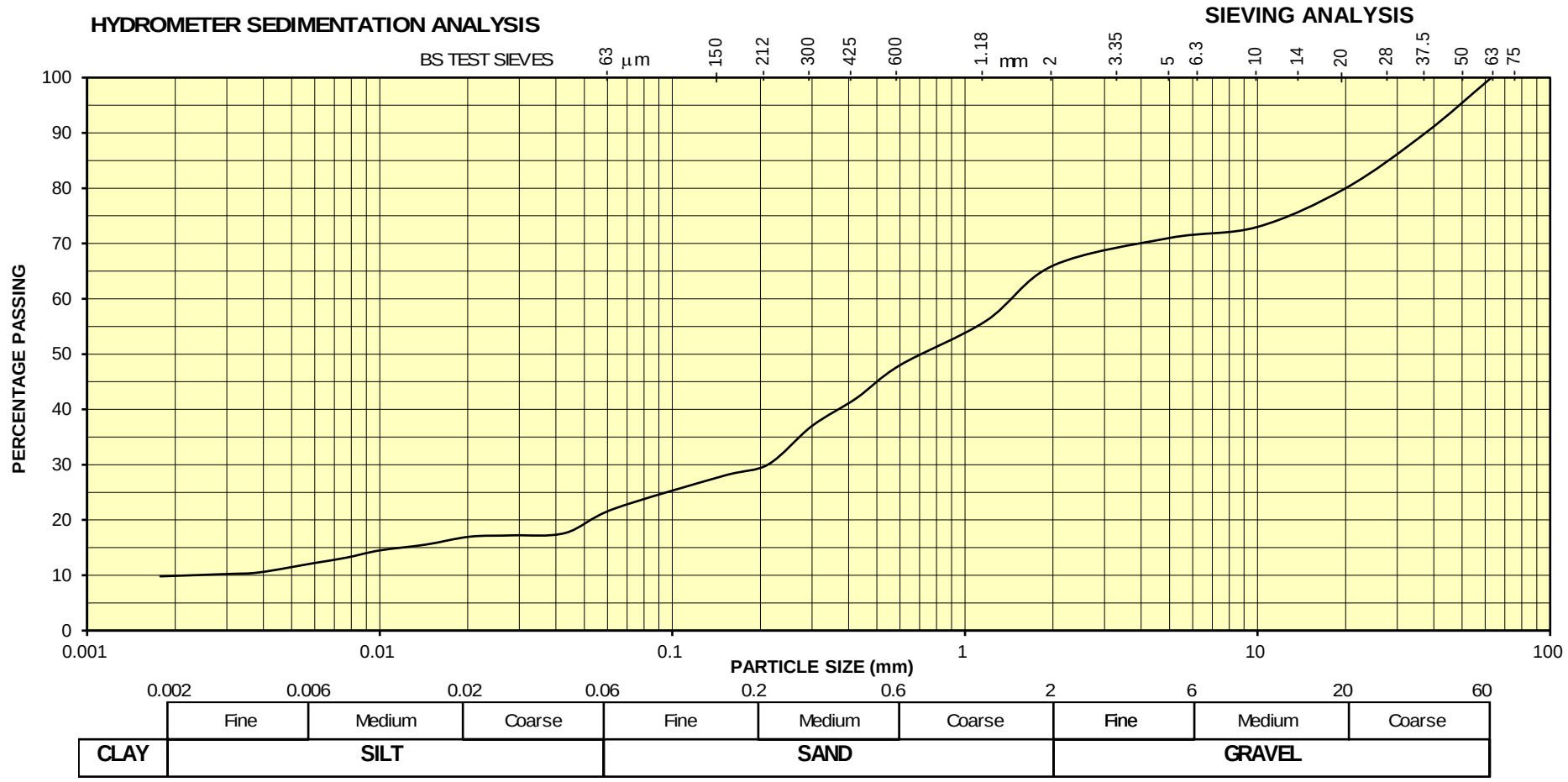
Tests 9.2 & 9.5 of BS1377 : Part 2 : 1990



PARTICLE SIZE DISTRIBUTION

CONTRACT: Huntstown
EXP HOLE No.: TP 02
JOB No.: 22-125
SAMPLE : B3
SAMPLE DEPTH: 1.50 m

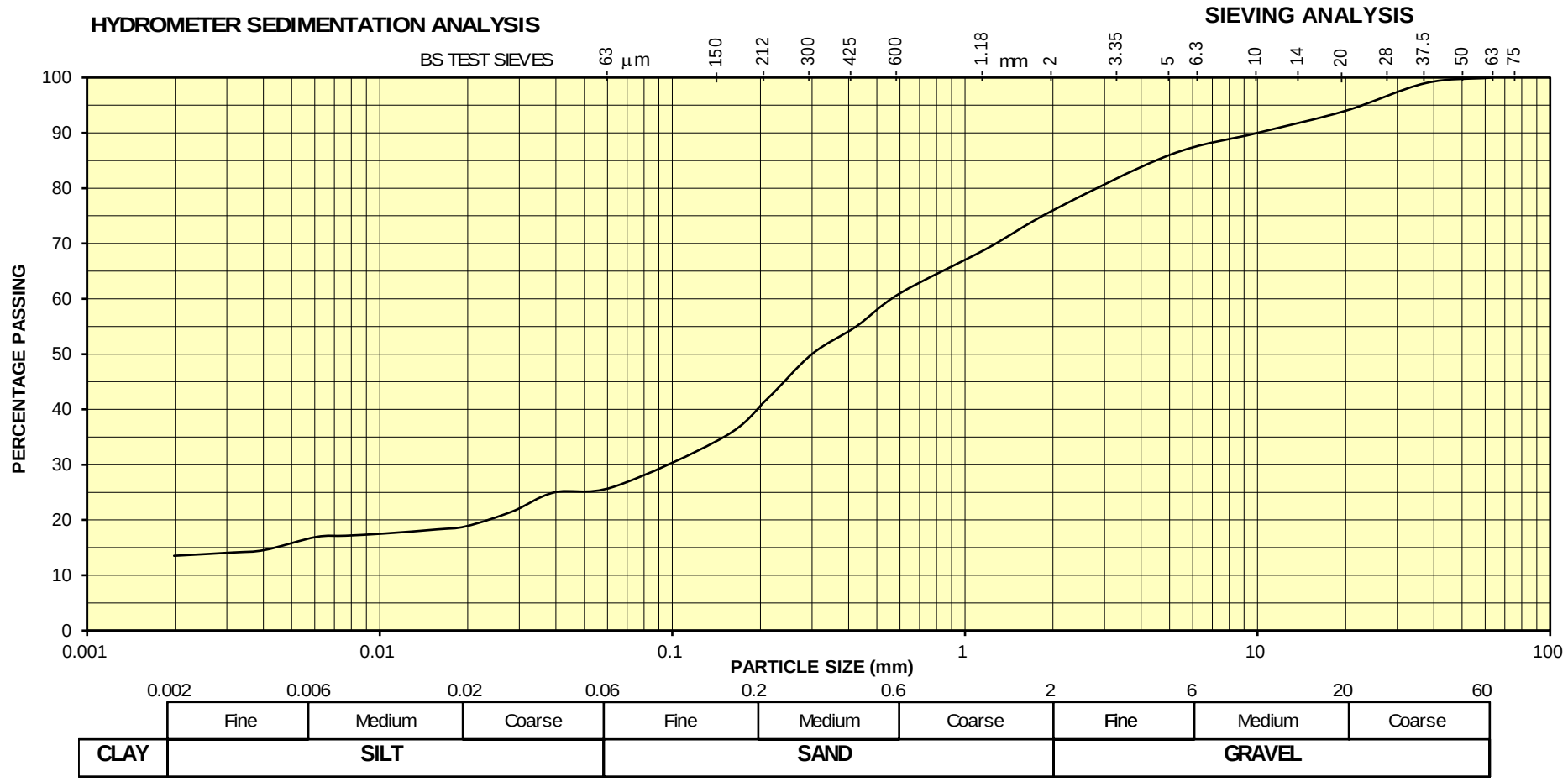
Tests 9.2 & 9.5 of BS1377 : Part 2 : 1990



PARTICLE SIZE DISTRIBUTION

CONTRACT: Huntstown
EXP HOLE No.: TP 03
JOB No.: 22-125
SAMPLE : B1
SAMPLE DEPTH: 0.50 m

Tests 9.2 & 9.5 of BS1377 : Part 2 : 1990



Huntstown

CHEMICAL TESTS

Job No. 22-125

BH No.	Sample Type	Sample No.	Sample Depth (m)	Chloride 2:1 extract (mg/kg)	Organic Matter Content * (%)	Total Sulphate Acid (mg/kg)	Sulphate Content SO_4		pH Value φ
							Soil/water extract (g/l)	Groundwater (g/l)	
BH 02	D	2	2.00	3.8			0.044		7.7
BH 03	D	1	1.00	4.2			0.052		7.9

Contract: Huntstown

Job No.: 22-125

POINT LOAD STRENGTH TEST RESULTS

W = core diameter (Axial test) or specimen width (Irregular lump test)
D = core diameter (Diametral test) or specimen length (Axial test / Irregular lump test)
L = measured applied load for failure
P = actual applied load for failure (L x calibration factor)
D' = distance between platens at point of failure

D_e^2 = D x D' (Diametral test)
D_e^2 = 4/p (W x D') (Axial test / Irregular lump test)
I_s = Uncorrected point load strength (P/D_e^2)
$I_{s(50)}$ = Size corrected point load strength (I_s x F)
F = $(D_e/50)^{0.45}$ Size correction factor for core other than 50mm diameter

Borehole	**Specimen Depth** (m bgl)	**Test Type** A = Axial D = Diametral I = Irregular	**W** (mm)	**D** (mm)	**D'** (mm)	**L** (kN)	**P** (kN)	**De²** (mm2)	**De** (mm)	**Is** (MPa)	**F**	**Is(50)** (MPa)	**Correlated** UCS (MPa)	**Remarks**
BH 03	1.80	A	82	74	74	9.25	8.3	7726	87.90	1.08	1.29	1.39	27.85	Medium Strong
BH 03	2.10	A	82	76	76	10.44	9.4	7935	89.08	1.19	1.30	1.54	30.79	Medium Strong
BH 03	2.80	A	82	77	77	9.01	8.1	8039	89.66	1.01	1.30	1.32	26.30	Medium Strong
BH 03	3.60	A	82	70	70	9.34	8.4	7308	85.49	1.15	1.27	1.47	29.36	Medium Strong

Appendix E

Environmental Laboratory Test Results

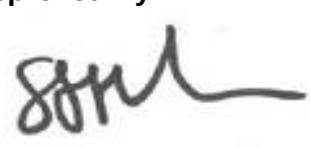
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	22-43568-1
Initial Date of Issue:	05-Jan-2023
Client	Hanmar Site Investigation Services Ltd
Client Address:	Unit 57 Ledcom Industrial Estate Bank Road Larne County Antrim BT40 3AW
Contact(s):	Thomas Robinson
Project	22-125 Proposed Industrial Units at Huntstown Tc, Co Fingal

Quotation No.:		**Date Received:**	11-Nov-2022
Order No.:		**Date Instructed:**	11-Nov-2022
No. of Samples:	3		
Turnaround (Wkdays):	10	**Results Due:**	24-Nov-2022
Date Approved:	03-Jan-2023		

Approved By:



Details: Stuart Henderson, Technical Manager

Results - Soil

Project: 22-125 Proposed Industrial Units at Huntstown Tc, Co Fingal

Client: Hanmar Site Investigation Services Ltd		**Chemtest Job No.:**			22-43568	22-43568	22-43568
Quotation No.:		**Chemtest Sample ID.:**			1544395	1544396	1544397
Order No.:		Client Sample Ref.:			3	2	2
		Sample Location:			2	TP 01	TP 02
		Sample Type:			SOIL	SOIL	SOIL
		Top Depth (m):			2.00	1.00	1.00
		Date Sampled:			19-Oct-2022	19-Oct-2022	19-Oct-2022
		Asbestos Lab:			DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	8.9	11	12
pH	M	2010		4.0	6.9	8.2	6.8
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	1.0	0.79	0.90
Total Sulphur	M	2175	%	0.010	0.088	0.045	0.036
Cyanide (Free)	M	2300	mg/kg	0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50
Thiocyanate	M	2300	mg/kg	5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	2.3	3.7	7.8
Sulphate (Total)	U	2430	mg/kg	100	1400	550	260
Arsenic	M	2455	mg/kg	0.5	4.1	5.3	2.7
Cadmium	M	2455	mg/kg	0.10	0.70	1.0	0.45
Chromium	M	2455	mg/kg	0.5	7.5	9.5	4.2
Mercury	M	2455	mg/kg	0.05	< 0.05	< 0.05	< 0.05
Nickel	M	2455	mg/kg	0.50	15	23	11
Lead	M	2455	mg/kg	0.50	17	9.8	5.1
Selenium	M	2455	mg/kg	0.25	0.48	0.47	< 0.25
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Aliphatic VPH >C5-C6	N	2780	mg/kg	0.05	[B] 0.31	[B] 0.29	[B] 0.30
Aliphatic VPH >C6-C7	N	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05
Aliphatic VPH >C7-C8	N	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05
Aliphatic VPH >C8-C10	N	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05
Total Aliphatic VPH >C5-C10	N	2780	mg/kg	0.25	[B] < 0.25	[B] < 0.25	[B] < 0.25
Aliphatic EPH >C10-C12	N	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0	[B] < 2.0
Aliphatic EPH >C12-C16	N	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aliphatic EPH >C16-C21	N	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0	[B] < 2.0
Aliphatic EPH >C21-C35	N	2690	mg/kg	3.00	[B] < 3.0	[B] < 3.0	[B] < 3.0
Aliphatic EPH >C35-C40	N	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0	[B] < 1.0
Total Aliphatic EPH >C10-C35	N	2690	mg/kg	5.00	[B] < 5.0	[B] < 5.0	[B] < 5.0
Aromatic VPH >C5-C7	N	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05
Aromatic VPH >C7-C8	N	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05
Aromatic VPH >C8-C10	N	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05
Total Aromatic VPH >C5-C10	N	2780	mg/kg	0.25	[B] < 0.25	[B] < 0.25	[B] < 0.25
Aromatic EPH >C10-C12	N	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0	[B] < 1.0

Results - Soil

Project: 22-125 Proposed Industrial Units at Huntstown Tc, Co Fingal

Client: Hanmar Site Investigation Services Ltd		**Chemtest Job No.:**			22-43568	22-43568	22-43568
Quotation No.:		**Chemtest Sample ID.:**			1544395	1544396	1544397
Order No.:		Client Sample Ref.:			3	2	2
		Sample Location:			2	TP 01	TP 02
		Sample Type:			SOIL	SOIL	SOIL
		Top Depth (m):			2.00	1.00	1.00
		Date Sampled:			19-Oct-2022	19-Oct-2022	19-Oct-2022
		Asbestos Lab:			DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic EPH >C12-C16	N	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0	[B] < 1.0
Aromatic EPH >C16-C21	N	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0	[B] < 2.0
Aromatic EPH >C21-C35	N	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0	[B] < 2.0
Aromatic EPH >C35-C40	N	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0	[B] < 1.0
Total Aromatic EPH >C10-C35	N	2690	mg/kg	5.00	[B] < 5.0	[B] < 5.0	[B] < 5.0
Total VPH >C5-C10	N	2780	mg/kg	0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50
Total EPH >C10-C35	N	2690	mg/kg	10.00	[B] < 10	[B] < 10	[B] < 10
Organic Matter	M	2625	%	0.40	2.8	2.2	0.60
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Chrysene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0
Total Phenols	M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10

Results - Single Stage WAC

Project: 22-125 Proposed Industrial Units at Huntstown Tc, Co Fingal

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	22-43568						
Chemtest Sample ID:	1544395						
Sample Ref:	3						
Sample ID:							
Sample Location:	2						
Top Depth(m):	2.00						
Bottom Depth(m):							
Sampling Date:	19-Oct-2022						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	1.6	3	5	6
Loss On Ignition	2610	M	%	3.0	--	--	10
Total BTEX	2760	M	mg/kg	[B] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	[B] < 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	M		6.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	< 0.0020	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	< 0.0002	< 0.0020	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455	U	< 0.0005	< 0.0050	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0044	0.044	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0050	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.025	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.33	3.3	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	66	650	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	2.8	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.9

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 22-125 Proposed Industrial Units at Huntstown Tc, Co Fingal

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	22-43568						
Chemtest Sample ID:	1544396						
Sample Ref:	2						
Sample ID:							
Sample Location:	TP 01						
Top Depth(m):	1.00						
Bottom Depth(m):							
Sampling Date:	19-Oct-2022						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	1.3	3	5	6
Loss On Ignition	2610	M	%	2.4	--	--	10
Total BTEX	2760	M	mg/kg	[B] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	[B] < 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.012	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	< 0.0002	< 0.0020	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455	U	< 0.0005	< 0.0050	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0038	0.038	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0050	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.025	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.23	2.3	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	63	620	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	2.9	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 22-125 Proposed Industrial Units at Huntstown Tc, Co Fingal

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	22-43568						
Chemtest Sample ID:	1544397						
Sample Ref:	2						
Sample ID:							
Sample Location:	TP 02						
Top Depth(m):	1.00						
Bottom Depth(m):							
Sampling Date:	19-Oct-2022						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	0.35	3	5	6
Loss On Ignition	2610	M	%	2.6	--	--	10
Total BTEX	2760	M	mg/kg	[B] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg	[B] < 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	M		6.8	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.0050	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	< 0.0002	< 0.0020	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	0.0007	0.0066	0.5	10	70
Copper	1455	U	< 0.0005	< 0.0050	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0039	0.039	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0050	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455	U	0.008	0.081	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.35	3.5	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	67	670	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.4	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	12

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1544395	3		2	19-Oct-2022	B	Amber Glass 250ml
1544395	3		2	19-Oct-2022	B	Amber Glass 60ml
1544395	3		2	19-Oct-2022	B	Plastic Tub 500g
1544396	2		TP 01	19-Oct-2022	B	Amber Glass 250ml
1544396	2		TP 01	19-Oct-2022	B	Amber Glass 60ml
1544396	2		TP 01	19-Oct-2022	B	Plastic Tub 500g
1544397	2		TP 02	19-Oct-2022	B	Amber Glass 250ml
1544397	2		TP 02	19-Oct-2022	B	Amber Glass 60ml
1544397	2		TP 02	19-Oct-2022	B	Plastic Tub 500g

Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection

Test Methods

SOP	Title	Parameters included	Method summary
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

APPENDIX 7.1

FLOOD RISK ASSESSMENT



CIVIL & STRUCTURAL

STRUCTURAL • CIVIL • FIRE

Project Description:	Flood Risk Assessment Report for a propose Circular Economic Hub at Huntstown/Coldwinters, Fingal, Co Dublin
Project Number:	22-039
Status:	Draft Report
Client:	Rathdrinagh Land Unlimited Company, t/a Irish Recycling Limited
Document No:	22-039/FRA

Issue No	Description	Made	Checked	Approved	Date
(Final)	FRA	MJ/PC	PC	PC	11/2023

FLOOD RISK ASSESSMENT

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APPENDIX A – PROPOSED DEVELOPMENT LAYOUT

1. Introduction

Coyle Civil & Structural Ltd have been engaged to carry out a Flood Risk Assessment for Phase 1 of the proposed 9.863 ha Huntstown Circular Economy Hub comprising Materials Recovery Facility, Food Container Cleaning Plant & ancillaries buldings at Huntstown/Coldwinters Td, Fingal, Co. Dublin for Rathdrinagh Land, t/a Irish Recycling Limited.

This report has been prepared to assess the existing flood risk to the site.

2. Methodology

2.1 Introduction

This report has been prepared in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' herein referred to as 'The Guidelines' as published by the Office of Public Works (OPW) and Department of Environment, Heritage and Local Government (DoHLG) in 2009.

2.2 Definition of Flood Risk

Flood risk is a combination of the likelihood of a flood event occurring and the potential consequences arising from that flood event and is then normally expressed in terms of the following relationship:

Flood risk = Likelihood of flooding x Consequences of flooding.

To fully assess flood risk an understanding of where the water comes from (i.e. the source), how and where it flows (i.e. the pathways) and the people and assets affected by it (i.e. the receptors) is required. Figure 2.1 below shows a source-pathway-receptor model.

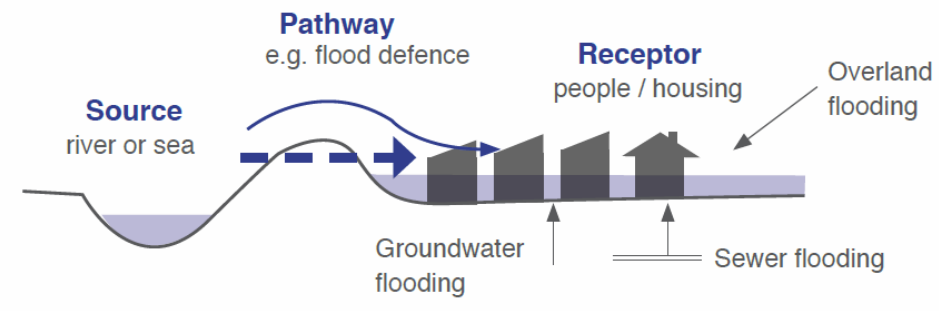


Figure 2.1 Source-Pathway-Receptor Model

The principal sources of flooding are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains. The receptors can include people, their property and the environment. All three elements as well as the vulnerability and exposure of receptors must be examined to determine the potential consequences.

The guidelines set out a staged approach to the assessment of flood risk with each stage carried out only as needed. The stages are listed below:

- Stage I Flood Risk Identification – to identify whether there may be any flooding or surface water management issues.
- Stage II Initial Flood Risk Assessment – to confirm sources of flooding that may affect an area or proposed development, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps.
- Stage III Detailed Flood Risk Assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

2.3 Likelihood of Flooding

The Guidelines define the likelihood of flooding as the percentage probability of a flood of a given magnitude or severity occurring or being exceeded in any given year. It is generally expressed as a return period or annual exceedance probability (AEP). A 1% AEP flood indicates a flood event that will be equalled or exceeded on average once every hundred years and has a return period of 1 in 100 years. Annual Exceedance Probability is the inverse of return period as shown in Table 2.1 below.

Table 2.1 Correlation between return period and AEP

Return Period (years)	Annual Exceedance Probability (%)
1	100
10	10
50	2
100	1
200	0.5
1000	0.1

2.4 Definition of Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range and are split into three categories in The Guidelines:

Flood Zone A
Flood Zone A where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding); Most types of development would be considered inappropriate in this zone. Development in this zone should be avoided and/or only considered in exceptional

circumstances, such as in city and town centres, or in the case of essential infrastructure that cannot be located elsewhere, and where the Justification Test has been applied. Only water-compatible development, such as docks and marinas, dockside activities that require a waterside location, amenity open space, outdoor sports and recreation, would be considered appropriate in this zone.

Flood Zone B
Flood Zone B where the probability of flooding is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 or 0.5% or 1 in 200 for coastal flooding);
Highly vulnerable development, such as hospitals, residential care homes, Garda, fire and ambulance stations, dwelling houses and primary strategic transport and utilities infrastructure, would generally be considered inappropriate in this zone, unless the requirements of the Justification Test can be met. Less vulnerable development, such as retail, commercial and industrial uses, sites used for short-let for caravans and camping and secondary strategic transport and utilities infrastructure, and water-compatible development might be considered appropriate in this zone. In general however, less vulnerable development should only be considered in this zone if adequate lands or sites are not available in Zone C and subject to a flood risk assessment to the appropriate level of detail to demonstrate that flood risk to and from the development can or will adequately be managed.

Flood Zone C
Flood Zone C where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding. Flood Zone C covers all plan areas which are not in zones A or B.

Development in this zone is appropriate from a flood risk perspective (subject to assessment of flood hazard from sources other than rivers and the coast) but would need to meet the normal range of other proper planning and sustainable development considerations.

It is important to note that when determining flood zones the presence of flood protection structures should be ignored. This is because areas protected by flood defences still carry a residual risk from overtopping or breach of defences and the fact that there is no guarantee that the defences will be maintained in perpetuity.

Vulnerability class	Land uses and types of development which include*:
Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).
*Uses not listed here should be considered on their own merits	

Figure 2.2 OPW The Planning System and Flood Risk Management, Classification of vulnerability of different types of development

2.5 Objectives and Principles of the Planning Guidelines

The principle actions when considering flood risk are set out in the planning guidelines and are summarised below:

- *"Flood hazard and potential risk should be determined at the earliest stage of the planning process..."*
- *"Development should preferentially be located in areas with little or no flood hazard thereby avoiding or minimising the risk...."*
- *"Development should only be permitted in areas at risk of flooding when there are no alternative, reasonable sites available..."*
- *"Where development is necessary in areas at risk of flooding an appropriate land use should be selected"*
- *A precautionary approach should be applied, where necessary, to reflect uncertainties in flooding datasets and risk assessment techniques..."*
- *"Land required for current and future flood management... should be pro-actively identified..."*
- *"Flood risk to, and arising from, new development should be managed through location, layout and design incorporating Sustainable Drainage Systems (SuDS) and compensation for any loss of floodplain..."*
- *Strategic environmental assessment (SEA) of regional planning guidelines, development plans and local area plans should include flood risk as one of the key environmental criteria..."*

2.6 The Sequential Approach and Justification Test

The Guidelines outline the sequential approach that is to be applied to all levels of the planning process. This approach should also be used in the design and layout of a development and the broad philosophy is shown in Figure 2.2 below. In general, development in areas with a high risk of flooding should be avoided as per the sequential approach. However, this is not always possible as many town and city centres are within flood zones and are targeted for development.

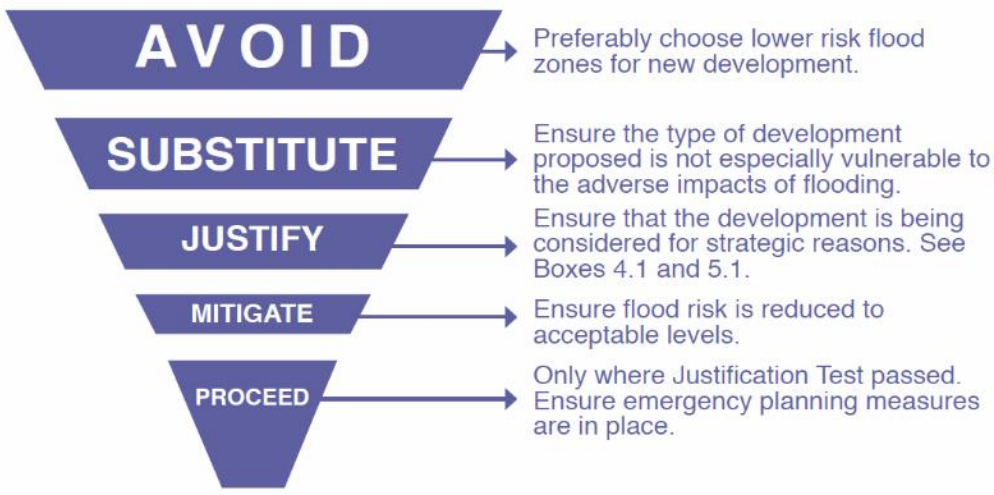


Figure 2.3 Sequential Approaches (Source: The Planning System and Flood Risk Management)

The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of developments that are being considered in areas of moderate or high flood risk. The test comprises the following two processes.

- The first is the Plan-making Justification Test and is used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding.
- The second is the Development Management Justification Test and is used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be inappropriate for that land.

Table 2.2 below illustrates the types of development that would be required to meet the Justification Test.

Table 2.2 Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test (Source: The Planning System and Flood Risk Management)

	Flood Zone A	**Flood Zone B**	**Flood Zone C**
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

3. Study area

The development involves construction of Phase 1 of the proposed 9.863 ha Huntstown Circular Economy Hub comprising Materials Recovery Facility, Food Container Cleaning Plant & Ancillaries at Huntstown Td / Coldwinters Td, Fingal, Co. Dublin for Flood Risk Assessment Report for Rathdrinagh Land Unlimited Company, t/a Irish Recycling Limited.

Site Location is shown in Figure 3.1., proposed Site Layout is shown in Figure 3.2.

Full Site Layout drawings are shown in Appendix A



Figure 3.1 – Site Location



Figure 3.2 – Site Layout and extent of proposed works.

4. Stage 1 – Flood Risk Identification

4.1 General

This Stage I Flood Risk Identification includes a review of the existing information and the identification of any flooding or surface water management issues in the vicinity of the proposed site.

4.2 Information Sources Consulted

The following information sources were consulted as part of the Stage I Flood Risk Identification:

Source	Comments
OPW Flood Info maps consulted	Fluvial, Pluvial, Coastal and Groundwater flooding examined; http://www.floodinfo.ie/map/floodplans/ https://www.floodinfo.ie/map/floodmaps/
Catchment Flood Risk Assessment and Management Study (CFRAM)	https://www.floodinfo.ie/map/floodmaps/
OPW flood records	www.floodmaps.ie
Geological Survey of Ireland (GSI) Maps	GSI Teagasc subsoils map consulted to identify if alluvium is present at development site that may indicate the presence of a watercourse and floodplain

Table 4.1 Information Sources Consulted

4.2.1 Catchment Flood Risk Assessment and Management Study

Information provided by the CFRAM programme led by the OPW is not available for the study location. As per Fig 4.1 below there is no evidence of estimated flooding within or in the vicinity of the site.



Figure 4.1 CFRAM River Flood Extend – Present Day - All Probabilities

4.2.2 National Indicative Fluvial Mapping (NIFM) River Flood Extend

This data shows the modelled extent of land that might be flooded by rivers (fluvial flooding) during a theoretical or 'design' flood event with an estimated probability of occurrence, rather than information for actual floods that have occurred in the past.

The Present Day Scenario is also referred to as the Current Scenario. Present Day Scenario data was generated using methodologies based on historic flood data, without taking account of potential changes due to climate change. The potential effects of climate change have been separately modelled and reported on.

Data has been produced for catchments greater than 5km2 in areas for which flood maps were not produced under the National CFRAM Programme and should be read in this context. River reaches that have been modelled are indicated by the NIFM Modelled River Centrelines dataset.

Flooding from other reaches of river may occur, but has not been mapped, and so areas that are not shown as being within a flood extent may therefore be at risk of flooding from unmodelled rivers (as well as from other sources).

From Fig 4.2 below taken from the Floodinfo.ie there is no evidence of any estimated flooding within or in the vicinity of the site.

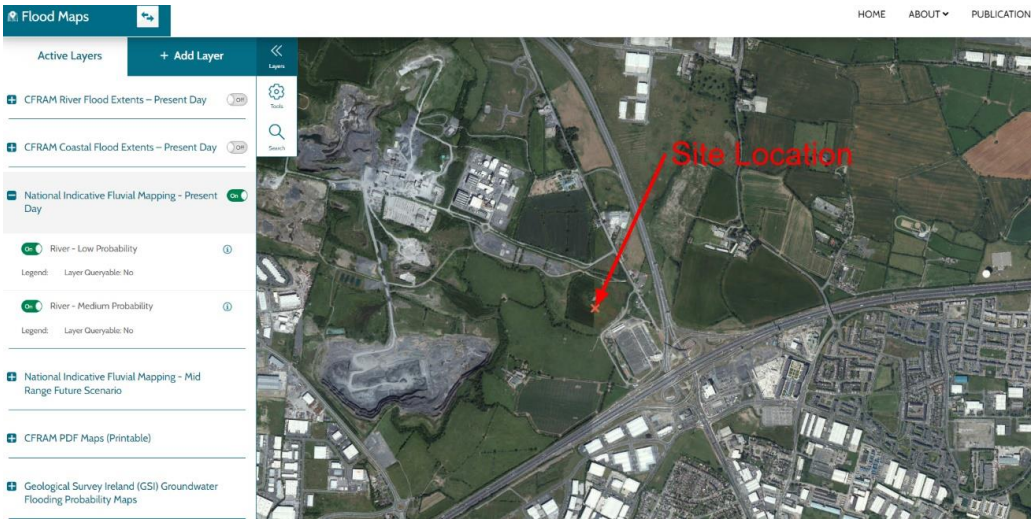


Figure 4.2 National Indicative Fluvial Mapping – Present Day, Low and Medium Probability

The Mid-Range Future Scenario extents where generated taking in the potential effects of climate change using an increase in rainfall of 20%.

Similar to the Fig 4.2 above Fig 4.3 below shows no evidence of any estimated flooding within or in the vicinity of the site.

It should be noted that the nearest site which shows evidence of fluvial flooding is located over 3km away along the Siloge River at J5 - Ballymun on the M50.

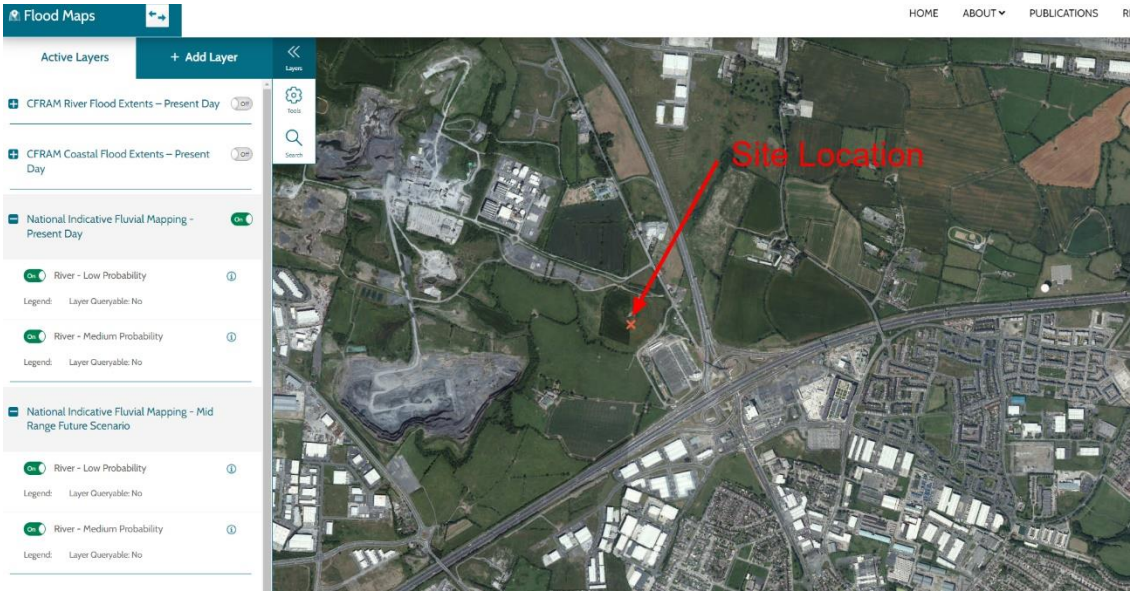


Figure 4.3 NIFM – Mid-Range Future Scenario, Medium Probability (1% AEP)

4.2.3 Arterial Drainage Scheme Channels

Arterial Drainage Schemes were carried out under the Arterial Drainage Act, 1945 to improve land for agriculture and to mitigate flooding. Rivers, lakes weirs and bridges were modified to enhance conveyance, embankments were built to control the movement of flood water and various other work was carried out under Part II of the Arterial Drainage Act, 1945. The purpose of the schemes was to improve land for agriculture, to ensure that the 3 year flood was retained in bank, this was achieved by lowering water levels during the growing season to reduce waterlogging on the land beside watercourses known as callows. Flood protection in the benefiting lands was increased as a result of the Arterial Drainage Schemes.

Evidence of Arterial Drainage Scheme Channels within vicinity of the site are shown below in Fig 4.4. It should be noted that there are no Arterial Drainage Schemes located within the vicinity of the site, the only Arterial Drainage Scheme located near the site is there of the Broadmeadow and Ward scheme located over 500m to the north of the site which in turn flows away from the site in the northern direction.

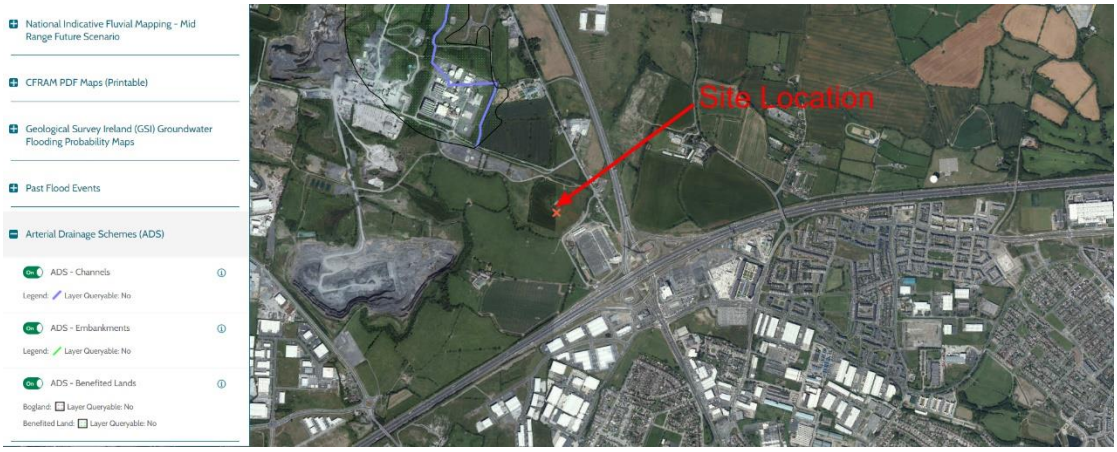


Figure 4.4 – Arterial Drainage Scheme (ADS)

4.2.4 Past Flood Events

A Past Flood Event is defined as the occurrence of recorded flooding at a given location on a given date or on a recurring basis. The event is derived from available flood information documentation including flood event reports, news articles, archive information and photos.

Past flood events are represented on the map in three different ways. Where the boundary of a flood has been mapped, the flood is shown as a shaded area with a blue border defining the extent of the flood. Most floods cannot be shown in this way because the extent of the flood was not mapped at the time. Therefore, floods without extent information are represented with a point symbol at the approximate location of the flood. A flood point symbol is placed at any location mentioned in a report giving details of a flood event. Where more than one flood has occurred in the same location, and to denote a location with recurring flooding, a multiple flood point symbol is used.

Flood boundary marks the approximate extent of a past flood. The Flood Point symbol marks the approximate location of a past flood. A Multiple / Recurring Flood Point symbol marks the approximate location of an area that has been affected by more than one Flood Event.

Fig 4.5 below indicates that there is no evidence of past flood events within or in the vicinity of the site.

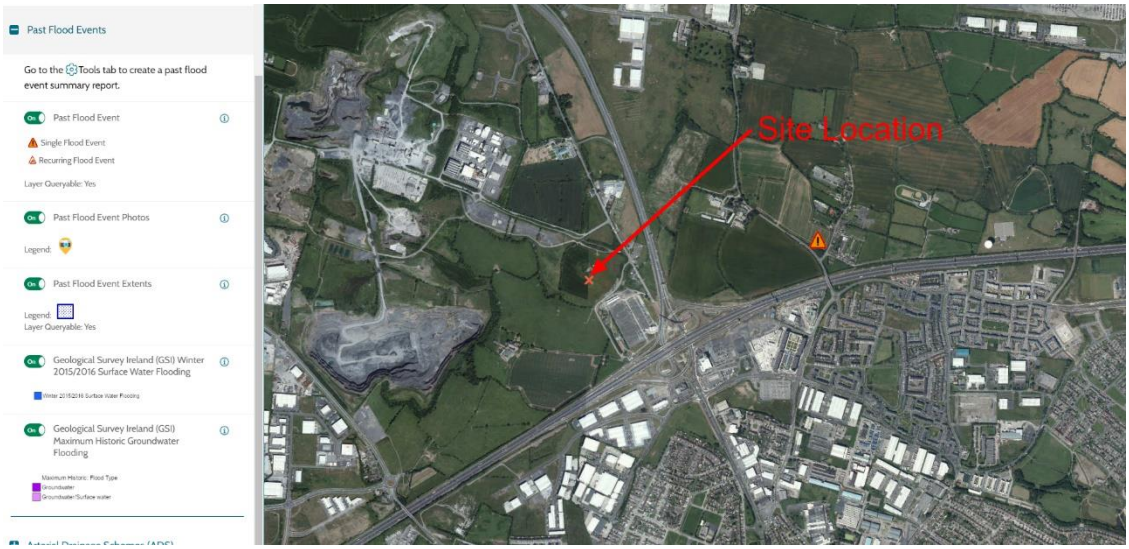


Figure 4.5 Past Flood Events.

4.2.5 Other Sources

The following sources were also examined to identify areas that may be liable to flooding:

Table 4.2 Other Sources

GSI Maps	GSI Teagasc subsoils map shows the proposed development site is underlain by made ground. No evidence of Karst features has been identified within the vicinity of the site.

Extract from GSI map Viewer is shown below at Figures 4.6

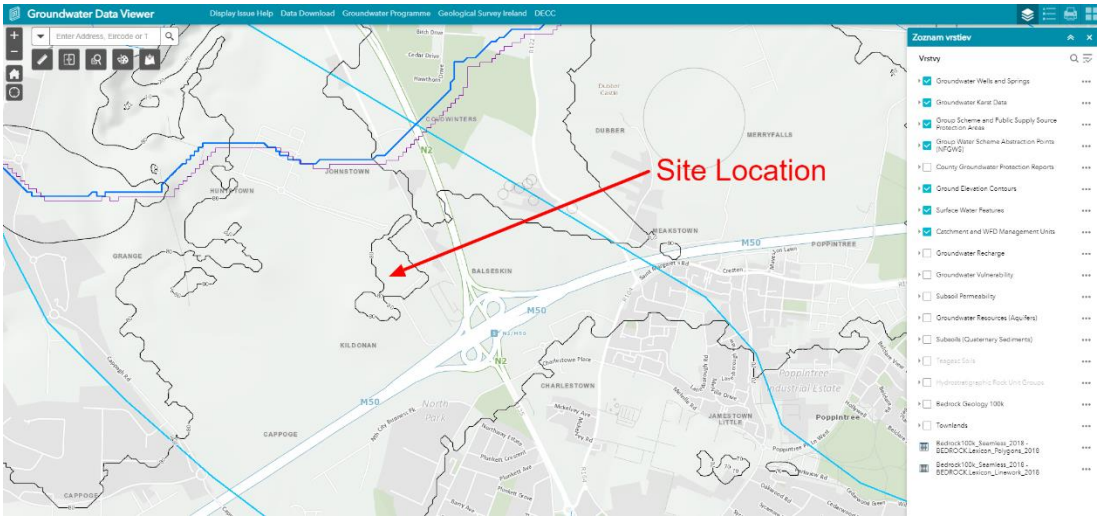


Figure 4.6 Extract from the GSI Map Viewer.

5. STAGE 2 – INITIAL FLOOD RISK ASSESSMENT

5.1 General

A Stage 2 FRA (initial flood risk assessment) was undertaken to:

- Confirm the sources of flooding that may affect the subject site;
- Appraise the adequacy of existing information as identified by the Stage 1 FRA

5.2 Sources of Flooding

Groundwater Flooding

Ground water flooding is a result of upwelling in occurrences where the water table or confined aquifers rise above the ground surface. This tends to occur after long periods of sustained rainfall and/or very high tides. High volumes of rainfall and subsequent infiltration to ground will result in a rising of the water table. Groundwater flooding tends to occur in low - lying areas, where with additional groundwater flowing towards these areas, the water table can rise to the surface causing groundwater flooding.

The sources consulted such as the CFRAM mapping are not available for this location, available GSI records show no indication that the proposed site location is subject to Groundwater derived flooding. As such the proposed site is not considered to require a detailed flood risk assessment with respect to groundwater flooding.

The nearest available record of groundwater flooding is at Cherryhound (Flood ID 21,838), the water level for the flood event is not available. Cherryhound is approx 3.5km from the proposed site and given the minimum 78.700m finished floor level of the designed buildings the proposed location is not deemed to be at risk of flooding.

It is further noted that site investigation carried out to the site included the drilling of 3no boreholes to a maximum depth 72.210m some 6.49m below the proposed finished floor levels and no ground water was encountered.

Pluvial Flood Risk

Pluvial flooding results from heavy rainfall that exceeds ground infiltration capacity or more commonly in Ireland where the ground is already saturated from previous rainfall events. This causes ponding and flooding at localized depressions. Pluvial flooding is commonly a result of changes to the natural flow regime such as the implementation of hard surfacing and improper drainage design.

The sources consulted such as the OPW Flood Maps and OPW Rainfall Flood Plans mapping show no indication that the proposed site is subject to pluvial derived flooding.

The proposed drainage design allows for an attenuated storage and on site soakaway, with the storm water storage provided allowing for 2407m3 capacity including 75m3 of spare storage volume. As such the design included in Appendix A ensures there is no risk of pluvial flooding to the site.

Fluvial Flood Risk

A fluvial, or river flood, occurs when the water level in a river, lake or stream rises and overflows onto the surrounding banks, shores and neighbouring land. The water level rise could be due to excessive rain or snowmelt.

The sources consulted such as the OPW Flood Maps and OPW Flood Plans mapping show no indication that the proposed site is subject to fluvial derived flooding.

The proposed design allows for a finished floor level of 78.700 to the main warehouse buildings and 81.809 to the weighbridge. It is noted that the nearest recorded water level on Floodinfo.ie is located in Sillogue with a recorded water level of 69.85m and a flow rate of 1.29m3/s for a 1/100 flood event. Based on this water level the proposed design allows for a free board of approx 8.85m against a 1/100yr flood event.

Coastal Flood Risk

Coastal flooding is the inundation of land areas along the coast by seawater. Common causes of coastal flooding are intense windstorm events occurring at the same time as high tide (storm surge), and tsunamis.

Storm surge is created when high winds from a windstorm force water onshore — this is the leading cause of coastal flooding and often the greatest threat associated with a windstorm. The effects increase depending on the tide - windstorms that occur during high tide result in devastating storm surge floods. In this type of flood, water overwhelms low-lying land and often causes devastating loss of life and property.

The sources consulted such as the OPW Flood Maps and OPW Flood Plans mapping show no indication that the site is subject to coastal derived.

Based on above site would be allocated as **Flood Zone C.**

5.3 Conclusion of Stage 2 FRA and Mitigation Measures

The information provided in this section identifies that there are no potentially elevated levels of pluvial, fluvial, coastal and groundwater flood risk.

6. STAGE 3 – DETAILED FLOOD RISK ASSESSMENT

6.1 Conclusion of Stage 3 FRA

Stages 1 and 2 of the flood risk assessment of proposed site have indicated that the site is not subject to flooding in low, medium or high probability exceedance events up to 0.1% AEP (1 in 1000 chance in any given year) with 20% climate change factor applied from pluvial, fluvial, coastal or groundwater sources.

Proposed site is located within **Flood Zone C** as per Table 2.2. Proposed site is defined as **Less vulnerable Development** as per OPW The Planning System and Floor Risk Management, Figure 2.2. As such the site is deemed **Appropriate** for the proposed development as per Table 2.2.

7. CONCLUSIONS

Based on current available data for the study location there is no indication of flooding from coastal, pluvial, fluvial and groundwater sources.

The proposed site is located within **Flood Zone C** as per Table 2.2 and is defined as a **Less Vulnerable Development** as per OPW The Planning System and Floor Risk Management, Figure 2.2. Site is **Appropriate** for proposed development as per Table 2.2.

The proposed development is not at risk of flooding, will not obstruct or impede important flow paths, exacerbate flooding in the immediate vicinity or wider area and will not result in residual risk to the area.

APPENDIX A
PROPOSED DEVELOPMENT LAYOUT

- On-line Air Valve as per STD-W-22
- Sluice Valve as per STD-W-15
- Washout Hydrant as per STD-W-30A with Scour Chamber as per STD-W-30B
- Off-line Hydrant as per STD-W-19
- WM Electromagnetic Meter chamber as per STD-W-26

GREYWATER INLET PIPE TO BUILDING

10,000 LITRE KINGSPAN KLARGESTER BELOW GROUND RAINWATER HARVESTING SYSTEM (ENV0350TKSW)

PROPOSED SUDS BASED PERMEABLE PAVING TO CARPARK AREA

STORM TO FOUL CONNECTION TO ALLOW FOR STORAGE AREA OUTFALL TO FOUL LINE

10,000 LITRE KINGSPAN KLARGESTER BELOW GROUND RAINWATER HARVESTING SYSTEM (ENV0350TKSW)

GREYWATER INLET PIPE TO BUILDING

Drainage storage with infiltration - Geocellular storage 20m x 96m. Stormblock Optimum 0.8m x 0.8m x 0.66m, two layers of 3000 pcs, 2407m^3 volume. 2335m^3 required storage, 72m^3 spare capacity.

STORM TO FOUL CONNECTION TO ALLOW FOR STORAGE AREA OUTFALL TO FOUL LINE

By-pass Petrol Interceptor Klargester NSBE040 or similar approved

Approx location of overhead lines

Drainage Layout.

Scale:- 1: 500.

NOTES:-

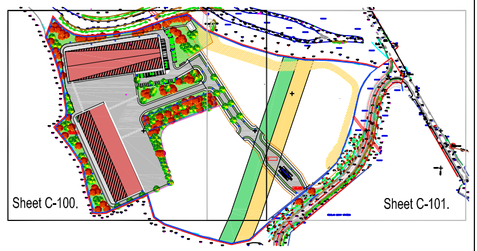
This is a planning drawing only and is therefore limited in its capacity to convey the total information, details & specification necessary to complete the works. Any work carried out that is not covered here will be the responsibility of the persons carrying them out. If any situation arises which would cause a contravention of the building regulations, then the Engineer should be consulted, otherwise the Engineer cannot be held responsible. As these drawings are prepared as planning drawings only, it is strongly recommended that the Engineer be consulted for the preparation of full working drawings. It is solely the clients responsibility to appoint a Qualified Engineer to supervise the project during the construction stage and to prepare structural working drawings for the builder.

ALL WORK AND MATERIALS ARE TO BE IN ACCORDANCE WITH THE CURRENT BUILDING REGULATIONS WHETHER DETAILED ON THIS DRAWING OR NOT.

All dimensions to be taken on site. Do not scale any dimensions from this drawing. This drawing is to be read in conjunction with all other relevant drawings and specifications etc that are issued.

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Key Plan.



Coyle CIVIL & STRUCTURAL

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E-mail: info@coylecs.ie

Project: Phase 1 of the proposed 9.863 ha Huntstown Circular Economy Hub comprising Materials Recovery Facility, Food Container Cleaning Plant & Ancillaries at Huntstown Td / Coldwinters Td, Fingal, Co. Dublin.

Client: Rathdrinagh Land Unlimited Company, t/a Irish Recycling Limited.

Sheet Title: Drainage & Watermain Layout - Sheet 1 of 2.

Project No.: 22-039		Date: 17-04-23	
Drawing No.: C-100.	Scale: As shown.	Rev: B	Checked: PC

Coyle
CIVIL & STRUCTURAL

3 High St, Monaghan
Co Monaghan
H18 X635

APPENDIX 8.1

TREE SURVEY

August 20th, 2023

BS5837 TREE SURVEY REPORT

Site at Huntstown Project

ANDREW BOE BSC (HONS) MARBORA
INDEPENDENT ARBORICULTURAL CONSULTANT
Tel: 07834895556 / Email: ajboe@hotmail.co.uk

Site Huntstown Project

Survey details

This initial BS 5837 2012 tree survey report was requested by Genesis Planning Consultants and concerns the tree population of the above site.

All information proved to the author of this report is assumed to be accurate.

The scope of this report is to complete a BS5837 2012- Trees in relation to construction- specification tree survey of the trees and make recommendations for any tree management required.

The survey was carried out using Visual Tree Assessment (VTA) methodologies from ground level only. No below ground, invasive or destructive tests where undertaken. No soil / root samples were taken for analysis.

Weather conditions during the survey were dry with a light wind.

Due to the changing nature of trees and other site circumstances this report, and any recommendations made are limited to a 1-year period. Any alteration to the subject site, trees or any development could change the current circumstances and may invalidate this report and any recommendations made.

The report is valid only for normal weather conditions. Healthy trees or parts of healthy trees may fail in normal weather situations although the risk is significantly increased in storm conditions and as the consequences of such weather phenomena are unforeseeable the tree surveyor cannot be held liable for any such failures.

Any alteration or deletion from this report shall invalidate it as a whole.

Legal and Policy Information

Tree Protection Orders:

It is the understanding of this report that there is no TPO is in place on this property. However this should be confirmed with the local council before work is started as required.

Wildlife protection:

It is a criminal offence under normal circumstances to disturb or destroy – whether intentional or unintentional - the nesting sites of wild birds or the roost sites of bats, under the 'Wildlife & Countryside Act 1981 and the 'Countryside and Rights of Way Act 2000'. Therefore, avoid carrying out significant tree works during the bird nesting season[mid- March to end of July] and ensure that trees are professionally surveyed for signs of bat roosts and/or bat activity before starting any tree work.

Tree details

This site is located across a number of fields with hedges throughout. The amenity value of the trees could be considered low.

Species include Oak and Ash . There are several private properties bordering the site. This survey has been completed on the basis that the locational information provided on the topographical survey is correct.

The site has a population of trees surveyed as individual trees and as groups.

BS5837 Category.

Each tree or group of trees has been assigned a category from the British standard which can be found in the attached survey schedule.

A. This describes a tree which is a good example of the species and is in a prominent position with many decades of contribution remaining.

B. Trees assigned to this category include healthy attractive trees with remediable defects that are in a condition as to be able to make a significant contribution for a minimum of 20 years.

C. Trees in this category include unremarkable trees of limited merit, small-growing, young species which have a relatively low potential amenity value, and low landscape benefits.

U. Trees assigned to this category are in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years and/or are unsuitable for retention in the proximity of new dwellings or areas of public open space.

For a complete list of observations and recommendations on a tree-by-tree basis please consult the attached tree survey schedule.

The tree population has a diversity of ages with the majority being mature.

For a complete list of observations and recommendations on a tree-by-tree basis please consult the attached tree survey schedule.

Trees Suitable for Retention

Where possible, it is generally considered desirable for Category ‘A’ and Category ‘B’ trees to be retained and incorporated into new developments and layouts. Category ‘U’ trees are not considered to be appropriate for retention.

In assessing the Arboricultural Impact on the trees of the proposed development and which

trees might be suitable for retention in the context of the proposed layout the following

factors should be considered.

- Shading-
- Future Pressure for Tree Removal and Pruning
- Seasonal Nuisance
- Infrastructure
- Direct Damage
- Root Protection Areas
- Future Management
- Demolition/Ground Works
- Construction Activity

Tree constraints Plan- TCP

A Tree Constraint Plan was drawn up.

The Tree Constraint Plan is a clear and accurate plan, drawn using AutoCAD, which is plotted directly onto a topographical site survey. It contains the positions and dimensions of all trees on a site at the time of the initial survey.

The Tree Constraint Plan helps to inform future tree management and tree preservation and protection plans. The tree dimensions used on a Tree Constraint Plan include the crown spreads measured at the four cardinal compass points to create a realistic intimation of their shape.

The Tree Constraint Plan will also include root protection areas to indicate both the above and below ground constraints the trees pose. The categorisations of tree quality in accordance with BS5837:2012 (2005) are also indicated on the plan and colour-coded for easy interpretation. The Legend/ Key to the TCP is shown in **figure 1.**

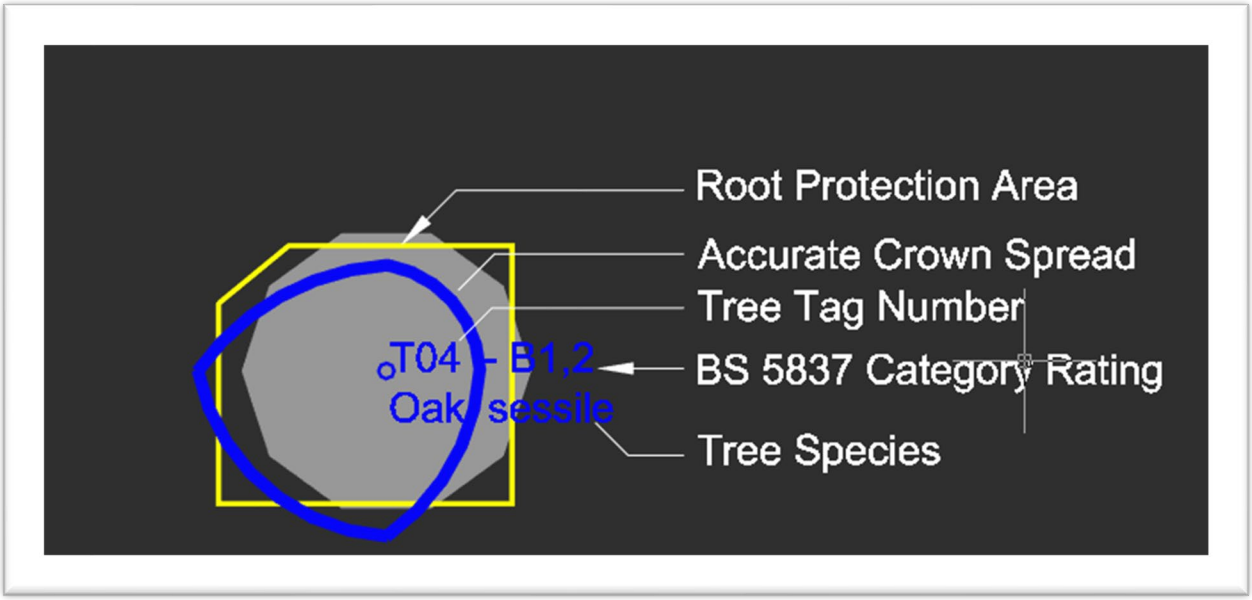


Figure 1- Tree Constraints key

Recommendations

All recommendations are as per the survey schedule below. Recommendations are based on the site at present and may change as its usage develops.

A full tree survey Schedule can be found below.

Each tree or group has been assigned a unique numerical identifying number with the Prefix **'T'** for individual trees and **'G**' for groups of trees.
The following information has been recorded for each tree or group of trees.
All information given is in accordance with British Standards 5837:2012 – Trees in relationto design, demolition and construction – Recommendations.

I. Identification of tree by number value (collates with the associated plans)
II. Common tree species
III. Height (m)
IV. Stem diameter (mm) at 1.5m above ground using a DBH tape (or as per BS5837 figC.1)
V. Branch spread to the four cardinal points (m)
VI. Existing height above ground of first branch and direction (m)
VII. Existing height above ground of canopy (m)
VIII. Life Stage (Young, Semi Mature, Early Mature, Mature, Over Mature)
IX. Estimated Remaining contribution (yrs.) <10, 10+, 20+, 40+
X. General observations; Condition and Preliminary management recommendations;Physical condition and structural defects
XI. Category as per BS5837 Table 1
XII. Root Protection Area (RPA) radius (m)
XIII. Root Protection Area (RPA) m^2

Tree Protection Guidelines

Tree protection plan

Primary tree protection will take the form of Tree Protective fencing as described in **Figure 2.**

The location of tree Protection fencing shown is a suggestion and the final placement should be agreed between the project arboriculturalist and the contractor who will complete the works and must be based on real world limitations.

Location of storage compound and contractors parking

The site has multiple areas for the storage of materials, car parking and staging during construction which are well away from trees.

A final area can be agreed with the arboriculturalist prior to commencement and must avoid all RootProtection areas.

Root protection areas –(RPAS)

The erection of protective fencing as per the Tree Protection Plan (TPP) prior to the

commencement of any works on site will protect the RPA of retained trees.

Existing ground levels should be retained within the RPAs. Intrusions into the soil within the RPAs is generally not acceptable and topsoil within it should remain in situ.

The erection of protective fencing, in this instance, is considered likely to place constraints on elements of the construction and its associated activities and/or possibly limit the working space available, with the subsequent result that incursions into the RPAs of some of the retained trees. Consequently, additional ground protection measures will be required.

Guidance is provided below, which upon adoption, will help to minimise the potential for any detrimental effect that associated ground works and construction might have in respect of retained trees.

Suitable existing hard surfacing that is not proposed for re-use as part of the finished design should be retained to act as temporary ground protection during the construction and, development rather than being removed. The suitability of such surfacing for this purpose should be evaluated by the project arboriculturist and an engineer as appropriate (BS 5837:2012).

The British Standards 5837:2012 advises that new temporary ground protection should be capable of supporting any traffic entering or using the site without being distorted or causing compaction to underlying soil and further provides the following note:

NOTE The ground protection might comprise one of the following:

a) for pedestrian movements only, a single thickness of scaffold boards placed either on top of a driven scaffold frame, so as to form a suspended walkway, or on top of a compression resistant layer (e.g. 100 mm depth of woodchip), laid onto a geotextile membrane;

b) for pedestrian-operated plant up to a gross weight of 2 t, proprietary, inter-linked ground protection boards placed on top of a compression-resistant layer (e.g. 150 mm depth of woodchip), laid onto a geotextile membrane;
c) for wheeled or tracked construction traffic exceeding 2 t gross weight, an alternative system (e.g. proprietary systems or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice, to accommodate the likely loading to which it will be subjected.

Root Protection Fencing.

Protective fencing is essential to preserve root protection areas during the duration of the works.
The location will be agreed with the retained Arboricultural consultant prior to work commencing and will aim to preserve and protect the root systems of retained trees for the duration of the works.
Due to the nature of this site root protection fencing may have to allow for pedestrian movement.
Protective barriers are to be erected prior to the commencement of site works including demolition, soil stripping or movement, bringing onto site of materials, supplies or machinery. Tree works can be undertaken prior to the erection of the barriers.

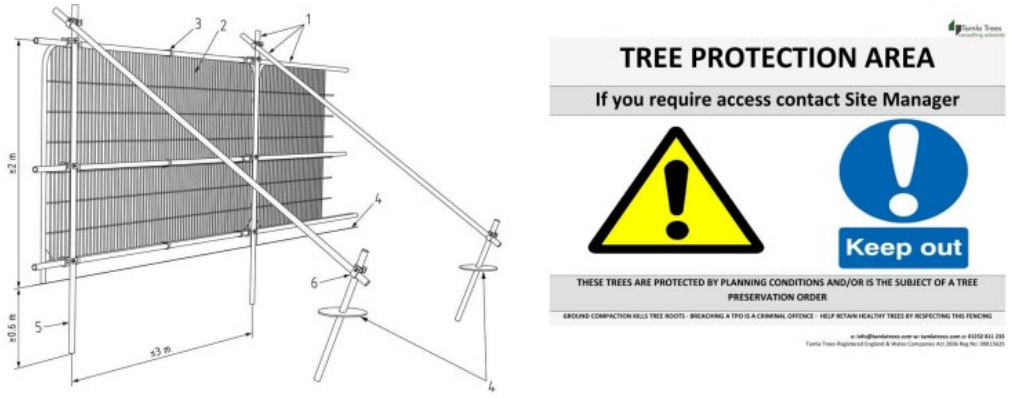
The barriers should be considered essential and should not be removed or altered without prior recommendation by an Arboriculturalist and approval of the local planning authority.

The barrier should consist of a vertical and horizontal framework of scaffold tubing which is adequately braced to resist impacts. The vertical scaffold tubes need to be placed at a distance not exceeding 3m apart and driven securely into the ground for a minimum depth of 0.6m. Care should be taken when locating the vertical poles to avoid underground services and, in the case of the bracing poles, also to avoid any structural roots. The weldmesh or Heras panels need to be a minimum 2.0m tall and are securely attached to the scaffold framework with wire or scaffold clamps.

The wire or scaffold clamps should be secured on the inside of the barrier to avoid easy dismantling. Panels on rubber or concrete feet are not resistant to impact and should not be used.

No fixing shall be made to any tree and all possible care must be taken to prevent damage to tree roots when locating the posts. (Figure 2)

All barriers must be firmly fixed to prevent movement by site personnel or vehicles and include all weather signs with the wording “Construction exclusion zone- keep out”.



To be effective fencing must be robust and clearly signed

Figure 2- Root Protection fencing.

Excavation/Ground Works

The erection of protective fencing and/or use of ground protection, prior to the commencement of any works on site, will allow excavations and ground works to take place without any adverse effect and/or impact on the retained trees.

All plant and vehicles engaged in ground works should either operate outside the RPAs, or run on ground protection in the proximity of retained trees.

Where trees stand adjacent to hard surfaces and/or buildings to be removed, excavation should be undertaken inwards, from within the footprint of the existing hard surfacing or outside of the RPAs.

Hard Surfacing Within the Root Protection Area

General guidance is provided below in the event that a subsequent need transpires.

Arboricultural Practice Note No. 12 describes in detail the requirements of no-dig type installation whilst BS 5837:2012 suggests 'Appropriate sub-base options for new hard surfacing include three-dimensional cellular confinement systems'.

An assessment should be made to establish whether or not the existing site topography lends itself to the installation of a three-dimensional cellular no-dig product upon anticipation of the required and final level changes.

Final on-site measurements should be taken to ascertain the extent of any incursions into the RPA and provide subsequent guidance on the extent of any 'no-dig' installation.

Cross sectional drawings of a suitable product can be seen below (figure 3)

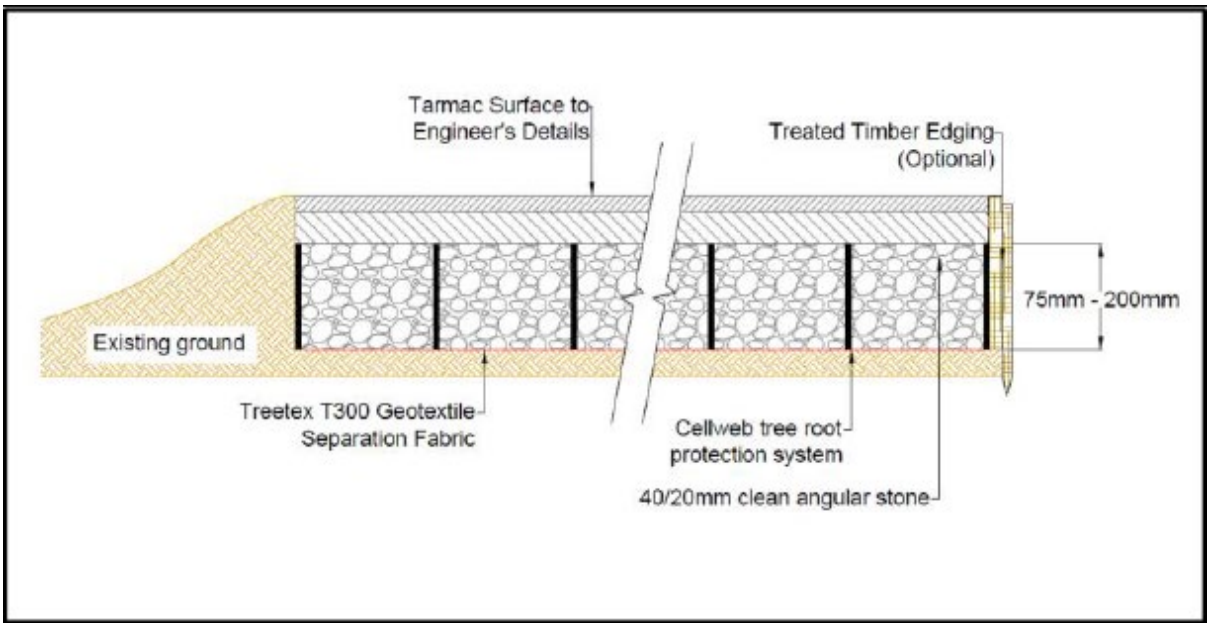


Figure 3. Cross section illustrating a possible permeable tarmac surface finish

General considerations.

To prevent damage to the retained trees, including their roots, within the fenced area (RPA) the following should be avoided.

- Alteration of ground levels, including soil stripping.
- Storage of any materials or equipment, even on a temporary basis.
- Storage of oil, bitumen, cement or other harmful materials, mixed or discharged within 12- m of the trunk of any retained tree and making further allowances for any slope of the ground so prevent running contamination. Phytotoxic materials would include any mineral oil, fuels, cement mortar washings concrete washings, mortar.
- Fires must not be lit beneath or within 12-m of any tree canopies.
- Site operations such as deliveries, site machines, crane jibs etc should be organised to avoid damaging the trunk or crown of trees. Where this conflict is unavoidable then facilitation pruning should be carried out in advance, rather than after damage has occurred. This may also be required to allow demolition operations.
- Mechanical cultivation of the soil as part of landscaping operations.

Direct Damage

Any proposed layout should consider the likelihood of direct damage occurring from incremental root and stem growth and the possibility of the fabric of any new structure being damaged by the whipping of branches against it.

Andrew Boe *BSc (Hons) MArborA*

Tree survey Schedule -

TREE SURVEY TO THE BRITISH STANDARD 5837:2012 "TREES IN RELATION TO CONSTRUCTION - RECOMMENDATIONS"

FIELD KEY:

TREE No.	Tree identification method in sequential order – TXXX=Existing trees, Gx=Group of trees
SPECIES	Species and/or common name;
HEIGHT in (m)	Approximate height of tree in metres;
DBH in (mm)	Stem diameter in millimetres taken at 1.5 metres above ground level; AV=average diameter (see appendix III)
Branch Spread in (m) N - E - S - W	Branch spread in metres reflecting the spread at the four principal compass points; N/A= Not Applicable in woodland settings
Existing height above ground in (m)	Height in metres of crown clearance above existing ground level: To include first significant branch and direction of growth (e.g., 2.5 – N) Height of lower form of Canopy to inform current ground clearance, crown/stem ratio and shading
Life Stage	Age classification (Y=young, SM=semi-mature, EM=early-mature, M=mature, LM=late-mature, OM=over-mature)
Est. remain years	Approximate years remaining (+40=minimum of 40 years, +20=minimum of 20 years, +10=minimum of 10 years, <10 less than 10 years)
General Observations	Condition of tree (good, fair, poor, dead); Structural and/or physiological condition, and/or preliminary management recommendations.
Preliminary management recommendations	Works needed in order to retain tree in current setting or where works would be needed in order to facilitate development.
Physical Condition and Structural Condition	Physiological condition (good, fair, poor, dead); to include and Structural defects such as the presence of any decay, fungal issues, pathogens, defects)
RPA in (m^2)	Area directly calculated from the DBH measurement (single stem/multiple stem variant, as outlined within the Standard, see appendix III);

Appendix 1.

BS5837:2012 Table 1 – Cascade chart for tree quality assessment

Category and definition	Criteria (including subcategories where appropriate)			Identification on plan
Trees unsuitable for retention (see Note)				
Category U Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years	• Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) • Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline • Trees infected with pathogens of significance to the health and/or safety of other trees nearby, or very low quality trees suppressing adjacent trees of better quality *NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve; see [BS5837:2012]* ***4.5.7****.*			
	1 Mainly arboricultural qualities	**2 Mainly landscape qualities**	**3 Mainly cultural values, including conservation**	
Trees to be considered for retention				
Category A **Trees of high quality** with an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of groups or formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)	
Category B **Trees of moderate quality** with an estimated remaining life expectancy of at least 20 years	Trees that might be included in category A, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects, including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value	
Category C **Trees of low quality** with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150 mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value; and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value	

BS5837 Report

Park Hood

Huntstown

Retention Category	No. trees
B	1
C	246
U	18
Total	265

Rem. Contrib.	No. trees
Dead	18
<10 years	64
10+ Years	142
20+ Years	40
40+ Years	1



Ref.	Species	Full Structure	Measurements	Survey Notes	Retention Category	RPA	Comments	Measurements2	Recommendations
T001	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 13 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: 10+ Years	Hedgerow tree. A Single stemmed tree. Poor crown with loss of vigour. Deadwood in the crown. Partially overgrown with Ivy. Pests and Diseases: Ash Dieback Infection Level 2: 25% to 50%	C1	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T002	Elm x18 *(Ulmus sp.)*	Group 18 trees	Height (m): 10 18 stems, avg.(mm): 200 Spread (m): 3N, 3E, 3S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Dead	Group of dead trees within a hedgrow.	U	No RPA due to Retention Category of U.	These trees does not merit retention due to poor condition.	Other Reference: Physiological Cond: Dead Structural Cond: Poor	Fell trees.
T003	Mixed Species Group x40 *(Group, mixed species)*	Hedge 40 trees	Height (m): 5 40 stems, avg.(mm): 200 Spread (m): 2N, 2E, 2S, 2W Crown Clearance (m): 0 Lowest Branch (m): 0(S) Life Stage: Mature Rem. Contrib.: 20+ Years	A mixture of single and multi-stemmed trees. Overgrown hedge.	C1	Area: 3175 sq m.	The surfacing and levels in the RPA should not be altered as long as the tree is being retained.	Other Reference: Physiological Cond: Fair Structural Cond: Fair	No action required.
T004	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 15 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C1	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.

Ref.	Species	Full Structure	Measurements	Survey Notes	Retention Category	RPA	Comments	Measurements2	Recommendations
T005	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 15 Stem Diam(mm): 300 Spread (m): 3N, 3E, 4S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T006	Pedunculate Oak *(Quercus robur)*	Tree	Height (m): 14 Stem Diam(mm): 600 Spread (m): 5N, 5E, 5S, 5W Crown Clearance (m): 2 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: 40+ Years	Hedgerow tree. A Single stemmed tree. Healthy spreading crown. Heavily overgrown with Ivy.	B1	Radius: 7.2m. Area: 163 sq m.	The surfacing and levels in the RPA should not be altered as long as the tree is being retained.	Other Reference: Physiological Cond: Fair Structural Cond: Fair	Sever ivy at base.
T007	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 13 Stem Diam(mm): 400 Spread (m): 3N, 3E, 4S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T008	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 400 Spread (m): 3N, 3E, 4S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T009	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 400 Spread (m): 4N, 4E, 4S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T010	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 15 Stem Diam(mm): 400 Spread (m): 3N, 4E, 3S, 5W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T011	Goat Willow *(Salix caprea)*	Tree	Height (m): 10 Stem Diam(mm): 600 Spread (m): 6N, 6E, 6S, 6W Crown Clearance (m): 0 Lowest Branch (m): 0(S) Life Stage: Mature Rem. Contrib.: 10+ Years	A multi-stemmed tree. Healthy spreading crown.	C1	Radius: 7.2m. Area: 163 sq m.	The surfacing and levels in the RPA should not be altered as long as the tree is being retained.	Other Reference: Physiological Cond: Fair Structural Cond: Fair	No action required.

Ref.	Species	Full Structure	Measurements	Survey Notes	Retention Category	RPA	Comments	Measurements2	Recommendations
T012	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T013	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T014	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T015	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T016	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T017	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 7 Stem Diam(mm): 200 Spread (m): 2N, 2E, 2S, 2W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 2.4m. Area: 18 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T018	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.

Ref.	Species	Full Structure	Measurements	Survey Notes	Retention Category	RPA	Comments	Measurements2	Recommendations
T019	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T020	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T021	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T022	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T023	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T024	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T025	Mixed Species Group x30 *(Group, mixed species)*	Hedge 30 trees	Height (m): 6 30 stems, avg.(mm): 200 Spread (m): 3N, 3E, 3S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: 10+ Years	A mixture of single and multi-stemmed trees. Hedge row Trees	C1	Area: 2312 sq m.	The surfacing and levels in the RPA should not be altered as long as the tree is being retained.	Other Reference: Physiological Cond: Fair Structural Cond: Fair	No action required.
T026	Common Ash x15 *(Fraxinus excelsior)*	Group 15 trees	Height (m): 6 15 stems, avg.(mm): 120 Spread (m): 2N, 2E, 2S, 2W Life Stage: Semi Mature Rem. Contrib.: <10 years	Poor crowns with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 2: 25% to 50%	C	Area: 642 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell trees.

Ref.	Species	Full Structure	Measurements	Survey Notes	Retention Category	RPA	Comments	Measurements2	Recommendations
T027	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 8 Stem Diam(mm): 200 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 2.4m. Area: 18 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T028	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 8 Stem Diam(mm): 200 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 2.4m. Area: 18 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T029	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 8 Stem Diam(mm): 200 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 2.4m. Area: 18 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T030	Common Ash x8 *(Fraxinus excelsior)*	Group 8 trees	Height (m): 6 8 stems, avg.(mm): 200 Spread (m): 2N, 2E, 2S, 2W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Semi Mature Rem. Contrib.: 10+ Years	A mixture of single and multi-stemmed trees. No apparent thinning due to density. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C1	Area: 1089 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T031	Goat Willow *(Salix caprea)*	Tree	Height (m): 3 Stem Diam(mm): 150 Spread (m): 2N, 2E, 2S, 2W Life Stage: Semi Mature Rem. Contrib.: 10+ Years	A multi-stemmed tree. Healthy spreading crown.	C1	Radius: 1.8m. Area: 10 sq m.	Potect if retained.	Other Reference: Physiological Cond: Fair Structural Cond: Fair	No action required.
T032	Common Ash x13 *(Fraxinus excelsior)*	Group 13 trees	Height (m): 6 13 stems, avg.(mm): 120 Spread (m): 2N, 2E, 2S, 2W Life Stage: Semi Mature Rem. Contrib.: <10 years	Poor crowns with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 2: 25% to 50%	C	Area: 1000 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell trees.
T033	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 600 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 7.2m. Area: 163 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T034	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 400 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.

Ref.	Species	Full Structure	Measurements	Survey Notes	Retention Category	RPA	Comments	Measurements2	Recommendations
T035	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 400 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T036	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 600 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 7.2m. Area: 163 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T037	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 400 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T038	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 400 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T039	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 300 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T040	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 300 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T041	Common Ash x6 *(Fraxinus excelsior)*	Group 6 trees	Height (m): 8 6 stems, avg.(mm): 200 Spread (m): 2N, 2E, 2S, 2W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Early Mature Rem. Contrib.: <10 years	Hedgerows Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C1	Area: 268 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T042	Hawthorn *(Crataegus sp.)*	Group	Height (m): 3 Stem Diam(mm): 100 Spread (m): 2N, 2E, 2S, 2W Crown Clearance (m): 0 Lowest Branch (m): 0(S) Life Stage: Mature Rem. Contrib.: 10+ Years	A mixture of single and multi-stemmed trees. Spread over top of small hill.	C1	Area: 1957 sq m.	The surfacing and levels in the RPA should not be altered as long as the tree is being retained.	Other Reference: Physiological Cond: Fair Structural Cond: Fair	No action required.

Ref.	Species	Full Structure	Measurements	Survey Notes	Retention Category	RPA	Comments	Measurements2	Recommendations
T043	Mixed Species Group x100 *(Group, mixed species)*	Group 100 trees	Height (m): 6 100 stems, avg.(mm): 200 Spread (m): 2N, 3E, 2S, 2W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Early Mature Rem. Contrib.: 10+ Years	A mixture of single and multi-stemmed trees. Hedge row Trees	C1	Area: 900 sq m.	The surfacing and levels in the RPA should not be altered as long as the tree is being retained.	Other Reference: Physiological Cond: Fair Structural Cond: Fair	No action required.

APPENDIX 8.2

NRA ECOLOGY GUIDELINES

Appendix 8.2. NRA 2009 Guidelines

Examples of valuation at different geographical scales

Ecological valuation: Examples

International Importance:
 	
• **'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation and Proposed Special Protection Area (pSPA).**
 	
• **Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended).**
• **Features essential to maintaining the coherence of the Natura 2000 Network.[1]**
• **Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive.**
• **Resident or regularly occurring populations (assessed to be important at the national level) [2] of the following:**
  ○ **Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or**
  ○ **Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.**
• **Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).**
• **World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).**
• **Biosphere Reserve (UNESCO Man & The Biosphere Programme).**
• **Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).**
• **Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).**
• **Biogenetic Reserve under the Council of Europe.**
• **European Diploma Site under the Council of Europe.**
• **Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).[3]**

National Importance:
 	
• **Site designated or proposed as a Natural Heritage Area (NHA).**
• **Statutory Nature Reserve.**
• **Refuge for Fauna and Flora protected under the Wildlife Acts.**
• **National Park.**
• **Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.**
• **Resident or regularly occurring populations (assessed to be important at the national level)[4] of the following:**
  ○ **Species protected under the Wildlife Acts; and/or**
  ○ **Species listed on the relevant Red Data list.**
• **Site containing 'viable areas'[5] of the habitat types listed in Annex I of the Habitats Directive.**

County Importance:
 	
• **Area of Special Amenity.[6]**
• **Area subject to a Tree Preservation Order.**
• **Area of High Amenity, or equivalent, designated under the County Development Plan.**
• **Resident or regularly occurring populations (assessed to be important at the County level)[7] of the following:**
  ○ **Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;**
  ○ **Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;**

- **Species protected under the Wildlife Acts; and/or**
- **Species listed on the relevant Red Data list.**

- **Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.**
- **County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, [8] if this has been prepared.**
- **Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.**
- **Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.**

Local Importance (higher value):

- **Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;**
- **Resident or regularly occurring populations (assessed to be important at the Local level)[9]of the following:**
  - **Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;**
  - **Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;**
  - **Species protected under the Wildlife Acts; and/or**
  - **Species listed on the relevant Red Data list.**
- **Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;**
- **Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.**

Local Importance (lower value):

- **Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;**
- **Sites or features containing non-native species that are of some importance in maintaining habitat links.**

1 See Articles 3 and 10 of the Habitats Directive.

2 It is suggested that, in general, 1% of the national population of such species qualifies as an internationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

3 Note that such waters are designated based on these waters' capabilities of supporting salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*).

4It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

5 A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).

6 It should be noted that whilst areas such as Areas of Special Amenity, areas subject to a Tree Preservation Order and Areas of High Amenity are often designated on the basis of their ecological value, they may also be designated for other reasons, such as their amenity or recreational value. Therefore, it should not be automatically assumed that such sites are of County importance from an ecological perspective.

7 It is suggested that, in general, 1% of the County population of such species qualifies as a County important population. However, a smaller population may qualify as County important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

8 BAP: Biodiversity Action Plan

9 It is suggested that, in general, 1%of the local population of such species qualifies as a locally important population. However, a smaller population may qualify as locally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle

APPENDIX 9.1

AIR QUALITY

Huntstown Materials Recovery Facility - Air Quality Appendix

Prepared for:

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April 2023

Final

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Glossary

Term	Definition
g/s	gram per second
kg	kilogram
kg/m³	Kilogram per cubic meter
km	kilometre
km/hr	kilometre per hour
m	metre
m/s	metres per second
m^2	square metres
m^3	cubic metres
m^3/s	cubic metres per second
m^3/hr	cubic metres per hour
mg	milligram
Z_0	roughness length
ou_E/m^3	European odour unit per cubic meter
ou_E/s	European odour unit per second
$\mu g/m^3$	micrograms per cubic meter

Abbreviations	Definition
AG4	Air Guidance 4
BAT	Best available techniques
EPA	Environmental Protection Agency
EF	Emission factor
EU	European Union

APPENDIX A METEOROLOGICAL MODELLING METHODOLOGY

A1 CALCULATION OF Z_0 AND THE ALBEDO AND BOWEN RATIO

According to the AERMET/AERMOD user guides, the Albedo and Bowen ratio should be determined from land use within a 10 km x 10 km rectangle centred on the meteorological station and roughness length, Z_0, should be determined based on land cover within a 1.0 km radius from the meteorological station. If the value of Z0varies significantly by direction, sector dependency should be used with sector width >= 30°. The meteorological data were recorded at Dublin Airport. Details of the meteorological station are listed in Table A.1.

Table A.1 Parameters describing the location of the meteorological station at Dublin Airport

Parameter	Value
Met. station name/identifier	Dublin Airport
Latitude (°)	53.428
Longitude (°)	-6.241
Easting (m)	683301
Northing (m)	5923429
UTM Zone	29 U
Altitude (m, AHD)	71

A1.1 Calculation of Z_0

From the aerial view in Figure A1, the land use within a 1 km radius is predominantly the airport with some cleared land (grassland) and industrial infrastructure (airport hangers, passenger terminals). The sector boundaries, land use, seasonal Z_0 values for each sector and individual sector weights are presented in Table A.2.

Table A.2 Sector boundaries and seasonal Z_o values

Sector	WDir-1	WDir-2	Summer	Autumn	Winter	Spring
A	29	94	0.112	0.112	0.112	0.112
B	94	138	0.070	0.070	0.070	0.070
C	138	225	0.083	0.027	0.009	0.059
D	225	276	0.070	0.070	0.070	0.070
E	276	306	0.082	0.030	0.011	0.061
F	306	338	0.173	0.130	0.097	0.159
G	338	29	0.070	0.070	0.070	0.070

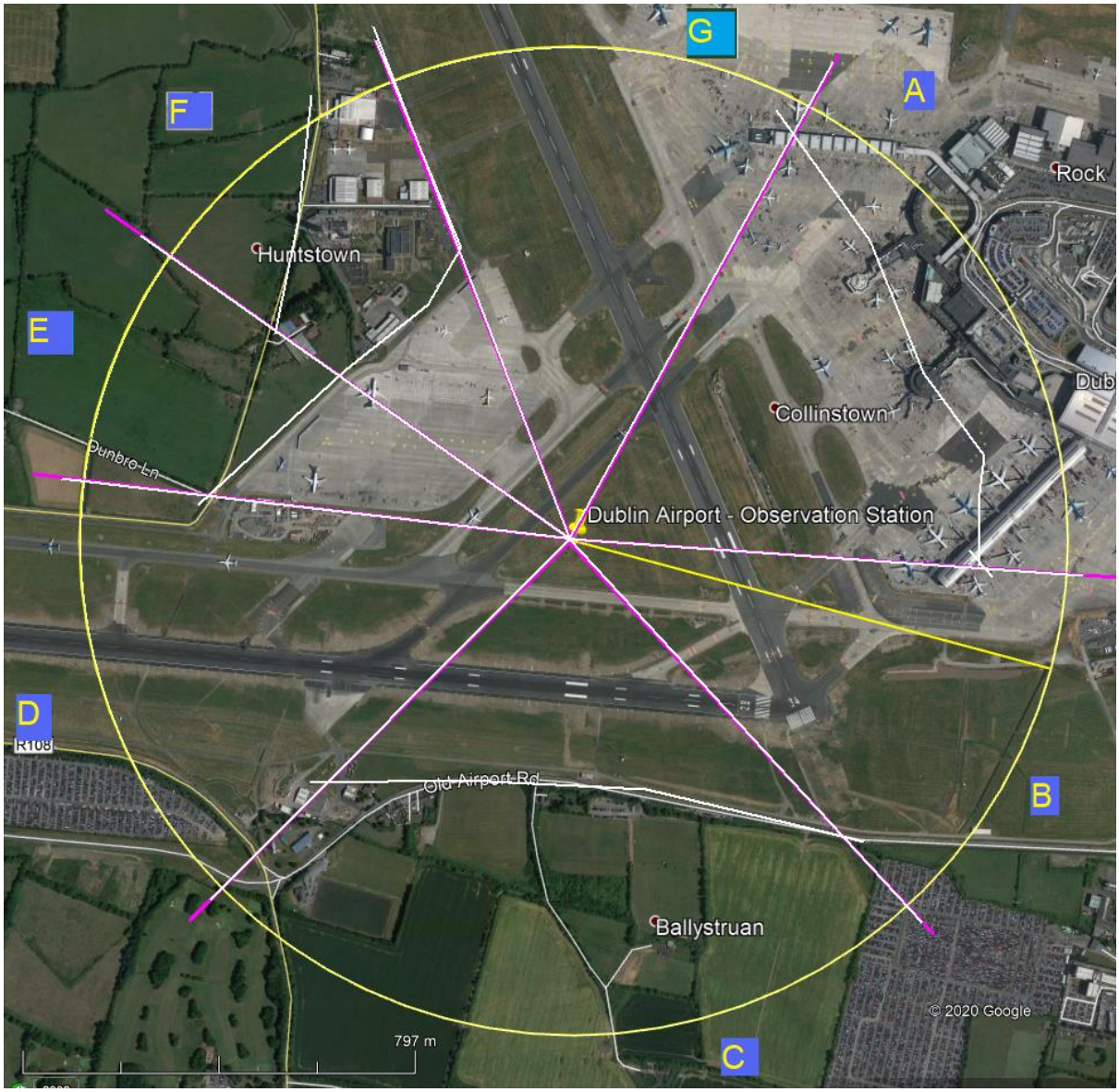


Figure A1 **Land use in the vicinity of the meteorological monitoring site at Dublin Airport**

A1.2 Calculation of Albedo and Bowen Ratio

These should be determined based on land cover within a 10km x 10km domain with no need for sector dependency. A weighted geometric mean should be used to determine the Bowen ratio and a weighted arithmetic mean for the albedo which is subsequently used to calculate the diurnal variation.

From the 10 km aerial view shown in Figure A2, it is evident that the main land use groups are low density residential, industrial/commercial and grass (cleared land). The land use fractions and seasonal Albedo and Bowen ratios are summarized in the Table A.3 and Table A.4.

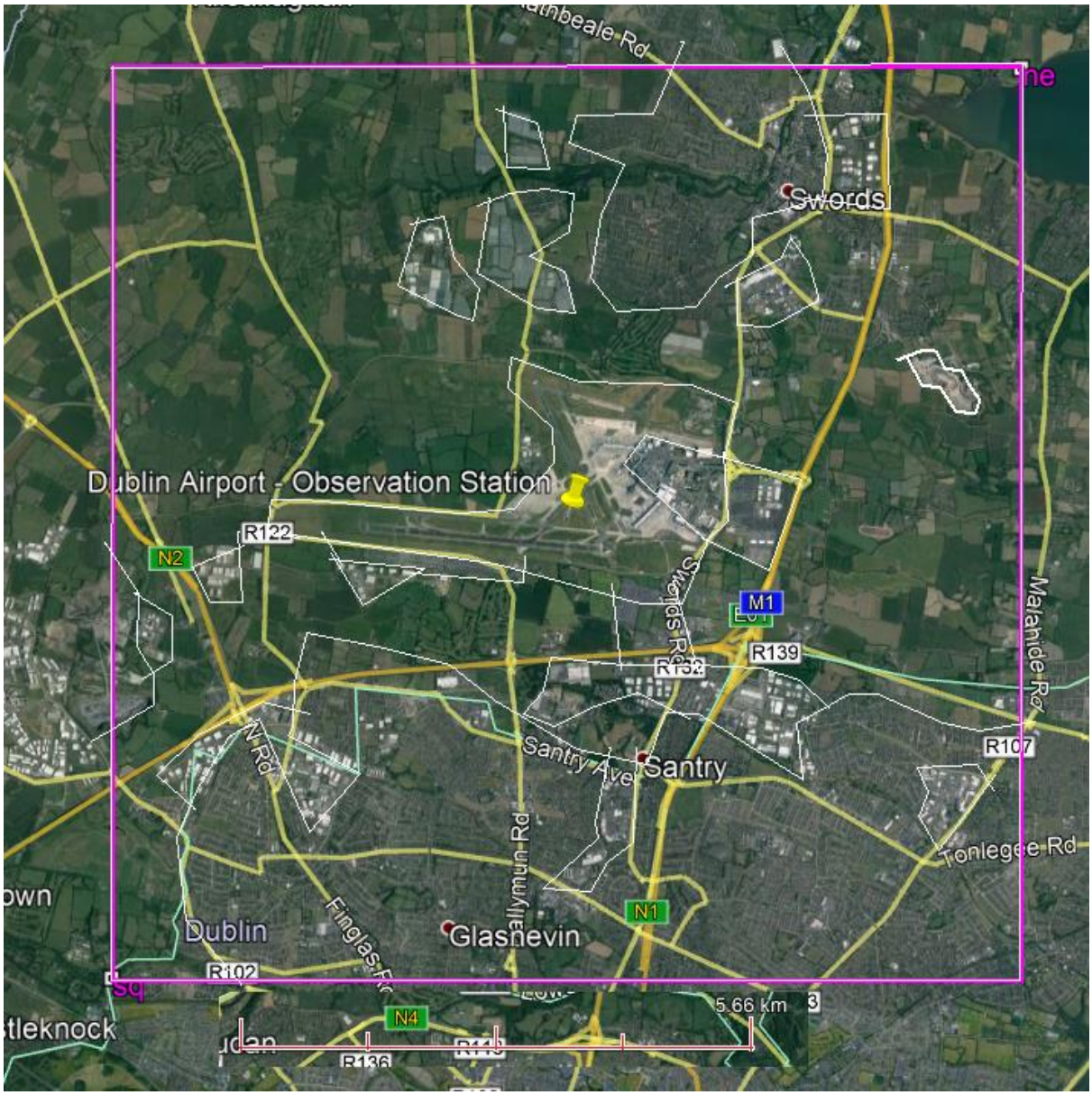


Figure A2 Land cover within a 10km x 10km domain of Dublin Airport monitoring location

Table A.3 Seasonal Albedo values

Land use	Fraction
Airports	0.062
Quarries/Strip mines, gravel	0.007
Low intensity residential	0.304
Industrial/commercial	0.088
Grassland	0.539

Table A.4 Seasonal Bowen Ratio values

Land use	Summer	Autumn	Winter	Spring
Albedo Arithmetic Weighted Average	0.174	0.174	0.191	0.174
Bowen Ratio Geometric Mean	0.883	1.066	1.066	0.608

APPENDIX 10.1

NOISE ASSESSMENT

dBA
damian brosnan acoustics

project

Noise & vibration impact assessment

Huntstown Circular Economy Hub – Stage 1

Proposed materials recovery facility & food container cleaning plant

where

Huntstown, Co. Dublin

when

February-March 2023

why

Planning application EIAR

client

Rathdrinagh Land Unlimited Company Huntstown Circular Economy Hub

prepared by

Damian Brosnan BSc MSc MIOA MIEI



report no.	date	no. of pages	status
398.1.1	**04.04.23**	**36 (0 appendices)**	**Issue to client**

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Summary

Damian Brosnan Acoustics carried out an assessment of potential noise and vibration impacts associated with a proposal to construct a materials recovery building and food tray cleaning building as part of stage 1 of the proposed Huntstown Circular Economy Hub at Huntstown, Co. Dublin. The proposed development will most likely require an industrial emissions licence from the EPA.

The proposed development site is located on the northwest side of the M50-N2 interchange. The site is accessed from North Road, a cul de sac which runs parallel to the N2, serving a number of dwellings and facilities in the Huntstown and Coldwinters area. The local soundscape is entirely dominated by road traffic noise 24/7. Despite the commercial character of the area, a number of residential dwellings lie in proximity to the development site.

While the loudest construction activity may be audible at the nearest receptors, noise levels will be lower than identified criteria. Construction noise impacts will be imperceptible to not significant, and will be temporary. No vibration impacts will arise. Once commissioned, residual noise impacts at surrounding receptors will be imperceptible. A BS 4142:2014 assessment indicates that no adverse impacts will arise. There will be no adverse noise impact on the local population or on human health. No cumulative impacts of significance will arise.

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This report was prepared by Damian Brosnan, who has the following qualifications and experience:
●BSc (Honours) 1993 (University College Cork) ●Postgraduate diploma in Acoustics & Noise Control 2009 (Institute of Acoustics) ●MSc (Distinction) in Applied Acoustics 2015 (University of Derby) ●Certificate of competence in workplace noise risk assessment (Institute of Acoustics) ●Member of Institute of Acoustics (MIOA) & secretary of Irish IOA branch ●Founding member of Association of Acoustic Consultants of Ireland (AACI) ●Member of Engineers Ireland (MIEI) ●Engaged with CPD through IOA & EI ●Lead author of *Environmental noise guidance for local authority planning & enforcement departments* (AACI, 2019) ●1996-2001: Noise Officer with Cork County Council ●2001-2014: Partner with DixonBrosnan Environmental Consultants, specialising in EIA ●Since 2015, principal at Damian Brosnan Acoustics

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Glossary

Ambient	Total noise environment at a location, including all sounds present.
A-weighting	Weighting or adjustment applied to sound level to approximate non-linear frequency response of human ear. Denoted by suffix A in parameters such as $L_{Aeq\,T}$, $L_{AF10\,T}$, etc.
Background level	A-weighted sound pressure level of residual noise exceeded for 90 % of time interval T. Denoted $L_{AF90\,T}$.
Broadband	Noise which contains roughly equal energy across frequency spectrum. Does not contain tones, and is generally less annoying than tonal noise.
Decibel (dB)	Unit of noise measurement scale. Based on logarithmic scale so cannot be simply added or subtracted. 3 dB difference is smallest change perceptible to human ear. 10 dB difference is perceived as doubling or halving of sound level. Examples of decibel levels are as follows: 20 dB: very quiet room; 30-35 dB: night-time rural environment; 55-65 dB: conversation; 80 dB: busy pub; 100 dB: nightclub. **Throughout this report noise levels are presented as decibels relative to 20 µPa**.
Effect	Consequence of an impact.
Extraneous	Noise emissions unrelated to source under consideration.
Fast response	0.125 seconds response time of sound level meter to changing noise levels. Denoted by suffix F in parameters such as $L_{AF10\,T}$, $L_{AF90\,T}$, etc.
Frequency	Number of cycles per second of a sound or vibration wave. Low frequency noise may be perceived as hum, while whine represents higher frequency. Range of human hearing approaches 20-20,000 Hertz.
Hertz (Hz)	Unit of frequency measurement.
Impact	Change resulting from an action, such as implementation of a project.
Impulse	Noise which is of short duration, typically less than one second, sound pressure level of which is significantly higher than background.
Interval	Time period T over which noise parameters are measured at position. Denoted by T in $L_{Aeq\,T}$, $L_{AF90\,T}$, etc.
L_{AE}	A-weighted sound exposure level. Measure of noise level of an event, standardised to interval of one second, and containing same acoustic energy as actual event.
$L_{Aeq\,T}$	Equivalent continuous sound pressure level during interval T, effectively representing average A-weighted noise level of ambient noise environment.
$L_{AF10\,T}$	A-weighted sound pressure level exceeded for 10% of interval T, usually used to quantify traffic noise.
$L_{AF90\,T}$	A-weighted sound pressure level exceeded for 90% of interval T, usually used to quantify background noise. May also be used to describe noise level from continuous steady or almost-steady source, particularly where local noise environment fluctuates.
L_{day}	The A-weighted long term average incident sound pressure level determined over all the daytime periods of a year, where the daytime period is typically 0700-1900 h.
L_{den}	Day-evening-night noise level. Calculated from separate L_{day}, $L_{evening}$ and L_{night} levels using formula specified in *EU Directive 2002/49/EC*.
$L_{evening}$	The A-weighted long term average incident sound pressure level determined over all the evening periods of a year, where the evening period is typically 1900-2300 h.
L_{night}	The A-weighted long term average incident sound pressure level determined over all the night-time periods of a year, where the night-time period is typically 2300-0700 h.
L_{WA}	A-weighted sound power level generated by source due to conversion of work energy into noise energy.
Masking	Rendering inaudible of one noise source by another source(s) which may be louder, or may contain significant acoustic energy in same part of frequency spectrum. In latter case, any tone(s) in original source emissions may become inaudible.

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Noise sensitive location Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires absence of noise at nuisance levels.

1/3 octave band Frequency spectrum may be divided into octave bands. Upper limit of each octave is twice lower limit. Each octave may be subdivided into thirds, allowing greater analysis of tones.

Peak particle velocity (PPV) Rate of change of displacement of particles in solid medium due to vibration, measured as mm/s. Usually used to assess vibration in relation to activities such as blasting as correlates well with human perception of vibration and property damage.

Residual level Noise level remaining when specific source is absent or does not contribute to ambient.

Reverberant level Sound pressure level in room where emitted acoustic energy is balanced by room surface absorption, resulting in steady noise level.

R_w Overall sound reduction index provided across a range of frequencies, determined from laboratory measured sound insulating properties of material or building element in each frequency band.

Sound pressure Deviation over ambient atmospheric pressure due to passing sound wave. Human ear is sound pressure detector, and thus acoustic parameters ultimately relate to sound pressure. Sound pressure level is ratio of measured sound pressure to reference value.

Soundscape Acoustic environment as perceived, experienced or understood by listeners, taking context into account.

Specific level $L_{Aeq\,T}$ level produced by specific noise source under consideration during interval T, measured directly or by estimation or calculation.

Tone Character of noise caused by dominance of one or more frequencies which may result in increased noise nuisance.

Z-weighting Standard weighting applied by sound level meters to represent linear scale. Denoted by suffix Z in parameters such as $L_{Zeq\,T}$, $L_{ZF90\,T}$, etc. Typically used to describe spectral band levels.

In this report units are generally presented using US National Institute Of Standards & Technology guidelines.

Uncertainty

u_i Standard uncertainty, related to instrumentation.

c_i Coefficient of sensitivity, specifically related to individual measurement factors listed below.

Residual factor c_i = 1 dB where source dominates, >20 dB where source becomes masked. u_i = 0.5 dB. c_iu_i range = 0.5 to >10 dB.

Weather factor c_iu_i = 2 dB in downwind and crosswind conditions, otherwise c_iu_i >2 dB. Levels representative of contemporaneous conditions only.

Anemometer factor 2 m anemometer height may increase meteorological uncertainty. 10 m height impractical during survey.

Precipitation factor Precipitation = 0 mm during reported intervals. c_iu_i = 0 dB.

Operations factor Levels representative of contemporaneous operating conditions only. c_iu_i <1 dB.

Location factor c_iu_i = 0 dB at free field positions. c_iu_i = 0.4 dB at near field and reflective field positions.

Instrument factor IEC 61672-1 class 1 specifications. u_i = 0.5 dB.

Combined uncertainty 3 dB to >10 dB, depending on position. Variation chiefly due to meteorology and residual noise intrusion.

Expanded uncertainty 6 dB to >10 dB, 95 % coverage.

All reasonable and practical efforts were applied to minimise uncertainty throughout survey.

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1 Introduction

1.1 Overview

1.1.1 The applicant proposes to construct stage 1 of the Huntstown Circular Economy Hub at Huntstown, Co. Dublin. Stage 1 will consist of a materials recovery facility (**MRF**) and food container cleaning (**FCC**) plant. An application for planning permission, accompanied by an environmental impact assessment report (**EIAR**), will be submitted to Fingal County Council. Damian Brosnan Acoustics was instructed by O'Callaghan Moran & Associates, on behalf of the applicant, to carry out a noise and vibration impact assessment for inclusion as an appendix to the EIAR.

1.1.2 Potential noise and vibration impacts may be divided into the following categories:

- Construction phase noise impacts on surrounding receptors.
- Construction phase vibration impacts on surrounding receptors.
- Post-completion noise impacts on surrounding receptors.
- Post-completion vibration impacts on surrounding receptors.

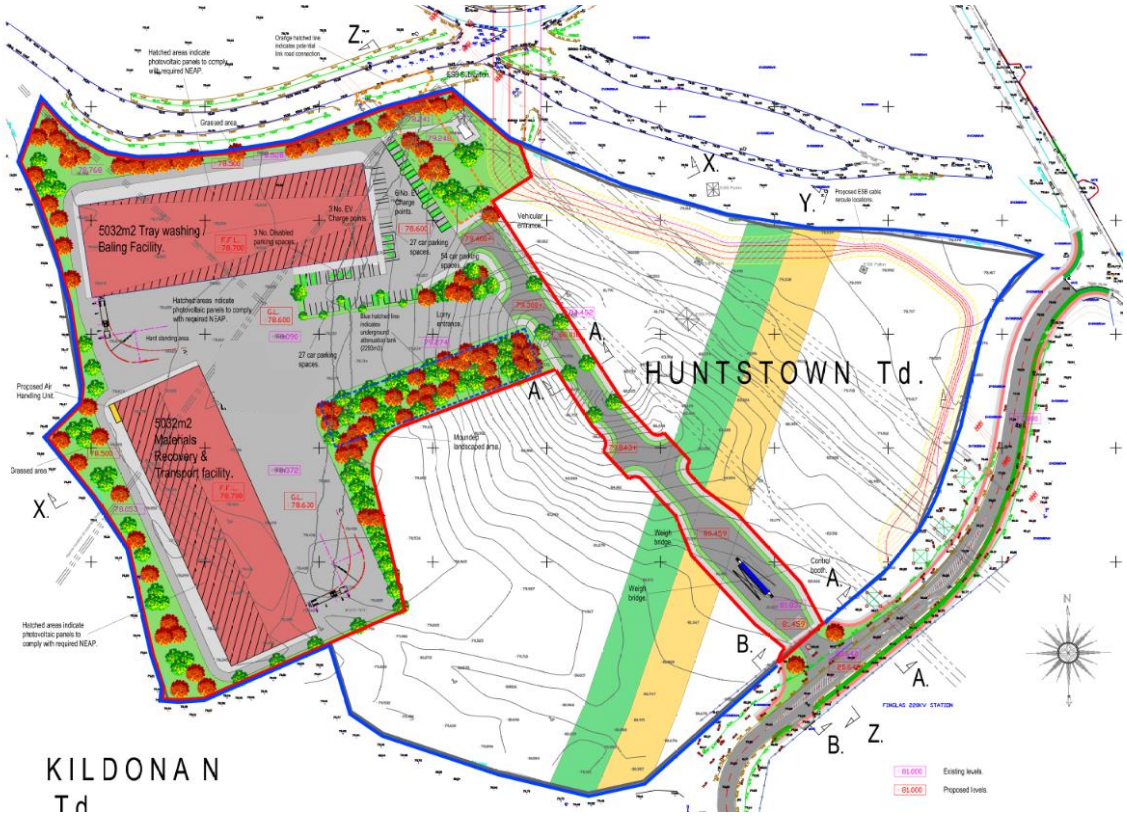
1.1.3 Following a preliminary scoping exercise, it was concluded that the proposed development will not give rise to any vibration impacts following commissioning, and this category has therefore been scoped out. The remaining three categories are assessed in this report.

1.2 Development summary

1.2.1 The proposed Circular Economy Hub will ultimately consist of several industrial buildings on a 21 ha greenfield site at Huntstown. The current application relates to stage 1, consisting of two buildings on a 9.3 ha plot (**figure 1**). One of these will house the MRF facility, while the second will house the FCC facility. The application will also include ancillary infrastructure such as drainage, and certain enabling works relating to subsequent stages of the hub project.

1.2.2 At the MRF, waste streams will be imported to the building by van and truck. Within the building, the various streams will be sorted into recoverable and recyclable streams for subsequent delivery to appropriate facilities. In due course, stages 2 and 3 are likely to include such facilities. Waste streams likely to be processed in the MRF building include residual municipal solid waste, organic waste, dry recyclables, and construction and demolition waste from a mixture of domestic and commercial sources. Processing will be undertaken using stationary processing lines which will variously incorporate a picking station, bag shredder, trommel, overband magnet, eddy current separator and wind sifter. Processed waste streams will be compacted, bale wrapped or stored loosely as appropriate. A mobile grab and front end loader will be used to manage the waste. All operations will be undertaken internally, apart from limited external storage of certain waste streams.

Figure 1: Stage 1 of Huntstown Circular Economy Hub. N



1.2.3 At the FCC unit, food trays imported by vans and trucks will be washed, sanitised and dried using a mostly automated process. All operations will be undertaken internally.

1.2.4 Additional plant will include an odour control unit at the MRF, a switch room, back-up generator, and electrical substation. Waste management will be undertaken on a 24/7 basis. In this regard, it is noted that the proposed development site lies in an industrial area. The proposed development will require an industrial emissions licence from the Environmental Protection Agency (**EPA**).

1.3 Assessment methodology

1.3.1 Typical ambient noise levels across the local area were measured, and these used to identify appropriate construction phase noise criteria. Likely construction plant were identified, and their noise emissions data used to predict noise levels at surrounding receptors. Predicted levels were assessed in the context of identified criteria, and mitigation measures identified where required. Potential sources of vibration during the construction phase were also identified, and impacts assessed by reference to commonly applied criteria.

1.3.2 Noise sources associated with the commissioned development were reviewed, and potential impacts assessed in light of relevant criteria. Such impacts relate to operational noise emissions arising onsite, and road traffic. Appropriate mitigation measures were identified.

1.3.3 The assessment was undertaken having regard to guidance set out in *Guidelines on the information to be contained in environmental impact assessment reports* (Environmental Protection Agency, 2022). Several other documents consulted during the preparation of this report are listed in **section 8**, and referenced in the text as appropriate.

1.3.4 This report was prepared by Damian Brosnan (qualifications and experience listed on **page 2**). No difficulties were encountered in preparing the report.

2 Standards & guidance

2.1 Construction phase noise

2.1.1 There are no national mandatory noise limits relating to temporary construction works. In granting planning permission, a local authority may stipulate construction phase noise limits applicable to daytime, evening, night-time and weekend hours as appropriate. There are no national guidelines available regarding the selection of such limits. Many local authorities chose to apply a 65 dB $L_{Aeq\,T}$ limit.

2.1.2 The chief noise guidance document applied in Ireland and the UK in construction phase noise assessments is *British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise* (2014). Annex E of the document sets out several methods to draw up suitable noise criteria applicable to the construction phase of a project. The most appropriate method here is the 'ABC method', which provides for the selection of criteria based on existing ambient noise data. On the basis of noise data recorded at the study site, as discussed below, a daytime $L_{Aeq\,1\,h}$ criterion of 65 dB is recommended. This criterion is identical to that typically applied by local authorities, and is thus applied in this assessment. The $L_{Aeq\,1\,h}$ parameter describes the total noise emissions from all construction sources occurring during any 1 h period, averaged over that hour.

2.1.3 BS 5228:2009 states that the 65 dB criterion is applicable to the periods Monday-Friday 0700-1900 h and Saturday 0700-1300 h. Construction operations are unlikely to be undertaken during evening or night-time hours or on Sundays. This assessment therefore applies the 65 dB criterion in respect of all construction works.

2.1.4 The 65 dB criterion is considered applicable to surrounding receptors, in their immediate curtilage. In this regard, the Environmental Protection Agency (**EPA**) document *NG4 Guidance note for noise: Licence applications, surveys and assessments in relation to scheduled activities* (2016) defines a noise sensitive location as:

Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires absence of noise at nuisance levels.

2.1.5 As construction projects tend to be relatively short, and as construction areas are usually localised and mobile, the 65 limit is typically not subject to any additional criteria such as tone and impulse restrictions.

2.2 Construction phase vibration

2.2.1 As with noise, there are no national limits relating to groundborne vibration, and reference is usually made to guidance set out in *British Standard BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration* (2014). **Table 1** presents guidance included in the document with respect to human perception of peak particle velocity (**PPV**), the most commonly applied descriptor of groundborne vibration.

Table 1: Human perception of vibration, from BS 5228-2:2009.

PPV	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10.0 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

2.2.2 During construction projects, reference is usually made to criteria relevant to buildings, in order to avoid potential cosmetic or structural damage. The National Roads Authority (**NRA**, now TII) document *Good practice guidance for the treatment of noise during the planning of national road schemes* (2014) has seen increasing application to non-road projects due to the absence of any other Irish guidance. NRA criteria, listed in **table 2**, are informed by documents such as *British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration* (1993). The criteria apply at the closest part of any relevant building or structure.

Table 2: Building vibration criteria, from NRA (2014).

Frequency	<10 Hz	10-50 Hz	>50 Hz
PPV	8 mm/s	12.5 mm/s	20 mm/s

2.2.3 NRA limits set out above are considerably lower than criteria recommended by two international authorities, as presented in **table 3**. The criteria presented are those below which cosmetic damage (hairline cracking, etc.) to buildings is unlikely to occur. Limits relating to structural damage are significantly higher.

Table 3: Recommended vibration limits.

Structure	Lower frequencies	Higher frequencies	Source*
Modern dwellings	<40 Hz: 19 mm/s	>40 Hz: 51 mm/s	1
Older dwellings	<40 Hz: 12.7 mm/s	>40 Hz: 51 mm/s	1
Industrial & heavy commercial	4-15 Hz: 50 mm/s	>15 Hz: 50 mm/s	2 & 3
Residential & light commercial	4-15 Hz: 15-20 mm/s	>15 Hz: 20-50 mm/s	2 & 3

*Sources:
1 *US Bureau of Mines Report RI 8507: Structural response and damage produced by ground vibration from surface mines blasting* (1980).
2 *British Standard BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration* (2014).
3 *British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration* (1993).

2.3 Operational phase noise - Absolute

2.3.1 There are no national mandatory noise limits applicable to commissioned developments. With respect to commercial noise emissions, most environmental noise guidance documents issued across Europe ultimately derive limits from guidance issued by the World Health Organisation (**WHO**). The WHO document *Guidelines on community noise* (1999) sets out guideline values considered necessary to protect communities from environmental noise. With respect to residential settings, the document notes that an outdoor $L_{Aeq\ 16\ h}$ level of 55 dB is an indicator of serious annoyance during daytime and evening hours, with 50 dB being an indicator of moderate annoyance.

2.3.2 The 55 dB criterion has become the de facto daytime limit applied by most Irish regulatory authorities to commercial and industrial operators. Although the WHO criterion applies to daytime periods of 16 hours, authorities typically specify shorter periods, and thus limits such as $L_{Aeq\ 15\ min}$, $L_{Aeq\ 30\ min}$ and $L_{Aeq\ 1\ h}$ are variously applied. In issuing licences to industrial and waste management facilities, the EPA typically specifies a daytime $L_{Aeq\ T}$ limit of 55 dB at receptors. The EPA considers daytime to be 0700-1900 h. A similar daytime limit is usually included in noise conditions attached to planning permission issued by local authorities.

2.3.3 The WHO's 1999 guidance document recommends an external night-time criterion of 45 dB to prevent sleep disturbance. Although the WHO document *Night noise guidelines for Europe* (2009) makes reference to a 40 dB night-time criterion, this relates to the $L_{night,outside}$ parameter, which is the long term average measured throughout a whole year. The 45 dB criterion is considered more appropriate for short term measurement intervals. As before, $L_{Aeq\ 15\ min}$, $L_{Aeq\ 30\ min}$ and $L_{Aeq\ 1\ h}$ night-time intervals are variously applied by regulatory authorities, rather than the 8 hour period to which the WHO's 45 dB criterion applies. The EPA considers that night-time refers to 2300-0700 h.

2.3.4 Neither of the WHO documents identified above makes reference to evening periods, and indeed their 1999 document assumes that daytime extends to 2300 h. However, a trend towards the separate assessment of evening impacts is currently evident, partly driven by the EPA's NG4 document. The original 2012 version of the document introduced the evening period 1900-2300 h. The NG4 document recommends an evening criterion of 50 dB, applicable externally at receptors.

2.3.5 Many authorities require that a penalty be added to measured noise levels where emissions are tonal and/or impulsive. NG4 specifies the addition of a 5 dB penalty to site specific $L_{Aeq\ T}$ levels measured during daytime or evening hours. During night-time hours, the EPA prohibits tones and impulses entirely, stating that such characteristics should not be 'clearly audible or measurable'.

2.3.6 The proposed development will require an industrial emissions licence from the EPA. In assessing the licence application, the EPA is likely to have regard to their NG4 document. NG4 criteria are set out in **table 4**. The criteria are considered relevant to noise sources at the proposed development. Rather than allowing daytime and evening levels to be rated for tonal or impulsive features, the table assumes that such features are avoided at all times. Criteria apply externally at receptors.

Table 4: Noise criteria recommended by the EPA.

Period	Parameter	Limit
0700-1900 h	$L_{Aeq\,T}$	55 dB
1900-2300 h	$L_{Aeq\,T}$	50 dB
2300-0700 h	$L_{Aeq\,T}$	45 dB

2.3.7 The NG4 document includes a methodology to derive lower limits where a site is located in a 'quiet area' or an 'area of low background noise'. The proposed development site is not located in a quiet area, being situated in proximity to several major roads, and a number of industrial and infrastructural facilities. Noise levels measured in the local area, as discussed below, indicate that the development site is also not located in an area of low background noise. Thus lower criteria are not warranted, and **table 4** criteria are considered relevant to this assessment.

2.4 Operational phase noise - Relative

2.4.1 In addition to the absolute criteria set out in **table 4**, the impact of noise emissions from commercial sources may be assessed by reference to relative criteria. The most commonly applied standard here is *British Standard BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound* (2019) which provides for the comparison of specific $L_{Aeq\,T}$ levels (i.e. noise levels attributable to the source in question) with background levels, and provides an indication of impact depending on the difference. Specific levels may be rated to take tonal, impulsive and other characteristics into account. The standard notes that the background noise environment may include existing industrial emissions unrelated to the specific source.

2.4.2 BS 4142:2014 states that a difference of 10 dB or more between specific and background levels indicates a significant adverse impact. A difference of 5 dB suggests an adverse impact, with lower differences suggesting reduced impacts. The standard adds that the perception of impact will be increased or reduced depending on local context.

2.4.3 Noise impacts may also be assessed by reference to *Guidelines for environmental noise impact assessment* (Institute of Environmental Management & Assessment, 2014) (**IEMA**) which sets out guidance on impacts by comparison with ambient levels. **Table 5** sets out a scale adapted from IEMA and EPA guidance. The table is considered relevant to total ambient $L_{Aeq\,T}$ levels i.e. $L_{Aeq\,T}$ levels attributable to the proposed development may be compared to existing $L_{Aeq\,T}$ levels.

Table 5: Assessment of impact by reference to increase over existing noise levels.

Change	Impact	Effect
<2 dB	Imperceptible	Capable of measurement, but without significant consequences
2-4 dB	Not significant	Causes noticeable changes to soundscape, but without significant consequences
4-6 dB	Slight	Causes noticeable changes to soundscape without affecting its sensitivities
6-10 dB	Moderate	Alters soundscape in manner consistent with existing and emerging baseline trends
10-15 dB	Significant	Alters soundscape due to source character, magnitude, duration or intensity
15-20 dB	Very significant	Significantly alters soundscape due to source character, magnitude, duration or intensity
>20 dB	Profound	Obliterates soundscape

2.4.4 Local offsite receptors are currently subject to existing traffic noise levels on the surrounding road network. The proposed development will increase traffic volumes locally, with a consequent increase in traffic noise levels. The *Design manual for roads and bridges* (UK Highway Agency, 2011) (**DMRB**) notes that the resulting noise impact is linked to the magnitude of the noise increase. **Table 6** sets out the DMRB guidance. Included in the table are impact categories listed by the EPA in their 2022 EIAR guidance document.

Table 6: DMRB assessment guidance.

Increase	Subjective rection	DMRB impact	EPA impact
0 dB	None	No change	Neutral
0-3 dB	Imperceptible	Negligible	Imperceptible to not significant
3-5 dB	Perceptible	Minor	Not significant to slight
5-10 dB	Up to a doubling of loudness	Moderate	Slight to moderate
>10 dB	Doubling of loudness or greater	Major	Significant to profound

2.5 Noise action plan

2.5.1 The *Draft noise action plan for Fingal County 2019-2023* (Fingal County Council, 2018) describes a strategic plan based on noise mapping undertaken in 2017 ('round 3' mapping). Preparation of the plan is a requirement of *Directive 2002/49/EC of the European Parliament and of the Council relating to the assessment and management of environmental noise* (2002), transposed into Irish law by the *European Communities (environmental noise) Regulations 2018* (SI No. 549/2018). The directive requires preparation of noise plans for all roads with annual traffic volumes over 3 million vehicles. The nearest major roads are the M50 motorway and national route N2 which run to the south and east of the site respectively, within several hundred metres. A number of other roads to the north (L3125), east (North Road and R122), and west (L3120 and Cappagh Road) are also subject to mapping.

2.5.2 The noise action plan proposes the following limits:

- Desirable low noise levels are defined as areas with a daytime level below 55 dB and/or a night-time level below 50 dB.
- Undesirable high noise levels are defined as areas where daytime and night-time levels exceed 70 and 55 dB respectively.
- Absolute daytime and night-time values below 55 and 45 dB define a 'quiet area'.
- Perceived or 'relatively quiet' areas are those which provide a perceived sense of tranquillity despite their proximity to areas of high noise.

2.5.3 While larger rail lines are subject to mapping, there are no lines in proximity. However, Dublin Airport, which lies within 2 km of the development site, is subject to a separate noise action plan, titled *Draft noise action plan for Dublin Airport 2019-2023* (Fingal County Council, 2018). Planning policy guidance in the plan relates chiefly to encroachment of sensitive development towards the airport. The proposed development does not constitute sensitive development.

3 Baseline

3.1 Location

3.1.1 The proposed development site is located on the northwest side of the M50-N2 interchange. The stage 1 plot, to which to which this application refers, lies at the western end of the proposed Circular Economy Hub site. The overall hub site is shown in **figure 2**. The 9.3 ha stage 1 site is positioned 290 m from the N2, and 480 m from the M50. The site topography is level, and is currently under grass.

3.1.2 The site is accessed from North Road, a cul de sac which runs parallel to the N2, serving a number of dwellings and facilities in the Huntstown and Coldwinters area. Facilities located in this area include a large electrical transformer station situated immediately adjacent to the interchange. Access to the proposed development site will be provided from a private roadway serving the transformer station and a residential dwelling. Other facilities in the local area include a bioenergy facility 130 m from the site's northwest corner, and Huntstown power station further northwest. The access road serving these also serves a large active quarry and soil recovery facility. A number of commercial premises lie along North Road, including the Dog's Trust complex.

Figure 2: Proposed stage 1 site delineated yellow. N



3.2 Receptors

3.2.1 There are no receptors on the proposed development site. Despite the commercial character of the area, a number of residential dwellings lie in proximity to the development site (**figure 3**). The nearest receptors are as follows:

- A cluster of three dwellings lies 220 m east of the site on North Road, representing the nearest receptors. One of these houses a veterinary clinic.
- Scattered dwellings lie further north, including the Ravenswood Estate community housing project at 830 m.
- An isolated farmhouse 280 m southwest of the site (Kildonan House) is accessed from the private road serving the transformer station. It is unclear if the dwelling is currently occupied.

3.2.2 Other receptors are scattered in several directions, all of which lie over 700 m from the site. A number of residential estates lie to the south and southeast, in addition to apartment complexes at Charlestown. Given the elevated ambient noise levels across the study area, as discussed below, receptors beyond 500 m are highly likely to be outside audible range of the proposed project.

Figure 3: Nearest residential receptors, delineated white. The Ravenswood Estate community housing project is delineated yellow, and the Baleskin reception centre orange. N



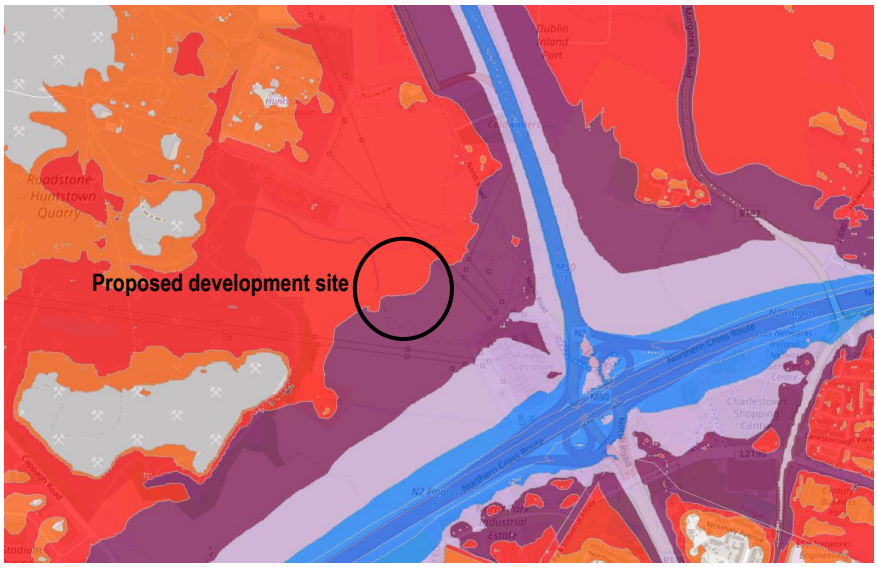
3.2.3 All receptors in proximity to the site are residential. There are no particularly vulnerable receptors such as hospitals or nursing homes within 500 m. Commercial and power-related facilities, including their offices, are not considered noise sensitive. The dog's trust facility to the north is also not considered a noise sensitive location.

3.3 Noise mapping

3.3.1 The *Draft noise action plan for Fingal County 2019-2023* includes maps relating to the road network in the vicinity of the site, as required by Directive 2002/49/EC. Relevant traffic mapping is shown in **figures 4 & 5**. L_{den} levels at the proposed development site reach 65 dB, and exceed 65 dB at the nearest dwelling cluster on North Road as well as at Kildonan House to the southwest. L_{night} levels are also elevated, exceeding 55 dB across the local area. These levels are high, reflecting the 24 h dominance of road traffic, and approach the 'undesirable high' noise level thresholds set out in the noise action plan. On this basis, it is evident that the proposed development site is unlikely to be suitable for residential development without considerable mitigation measures. The site is, however, suitable for a proposed waste management facility.

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3.3.2 Noise mapping presented in the *Draft noise action plan for Dublin Airport 2019-2023* (**figures 6 & 7**) indicates that the proposed development site and nearest receptors lie immediately outside mapped noise contours.

Figure 6 ⇨

Air traffic L_{den} contours.



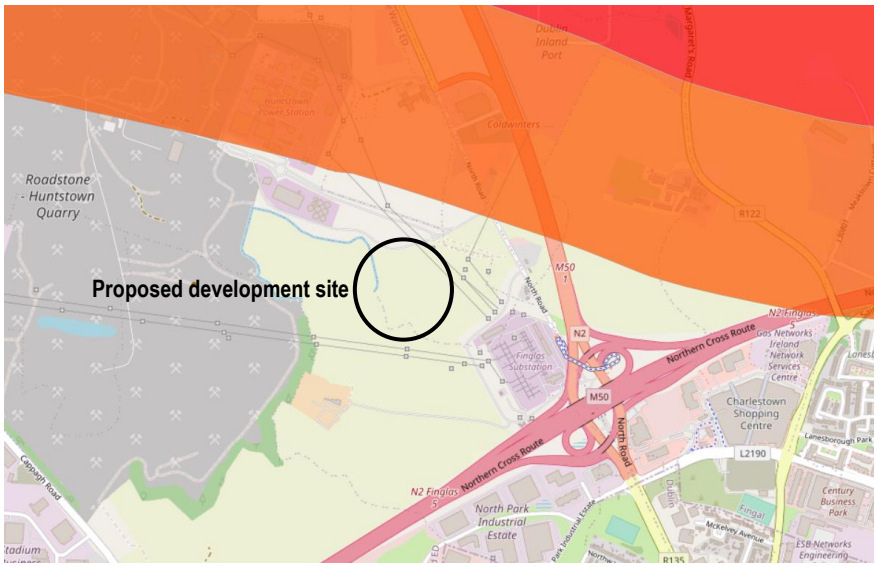
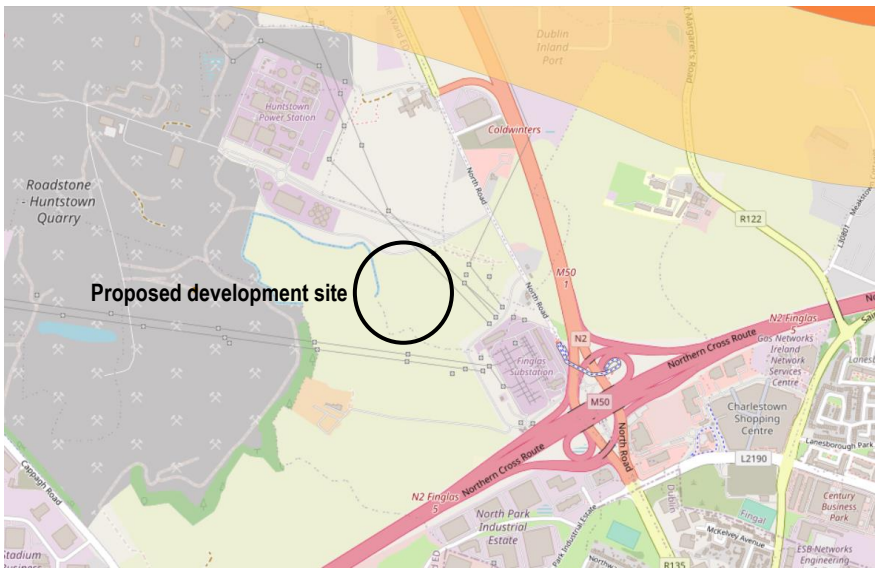


Figure 7 ⇨

Air traffic L_{night} contours.





3.4 Noise survey

3.4.1 In order to quantify the local noise environment, a baseline noise survey was undertaken 23.02.23—24.02.23. Monitoring was carried out at three positions described in **table 7**, and shown in **figure 8** and **photographs 1-3**. Survey methodology, equipment specifications and weather conditions are listed in **table 8**. Recorded time history profiles are shown in **figures 9-11**. Noise data are presented in **table 9** and summarised in **table 10**.

Table 7: Baseline noise stations.

Ref.	ITM NGR	Description	Purpose
N1	711650 740917	SW corner of site	To represent farmhouse to SW (access to farmhouse not possible)
N2	711992 741125	Adjacent to North Road, 200 m E of site boundary	To represent 3 dwellings nearby
N3	711893 741310	Field NW of site, 190 m from site boundary	To represent 3 dwellings nearby

Photograph 1 ⇨
N1, looking SW towards distant farmhouse.



Photograph 2 ⇨
N2, looking SE towards dwelling on North Road.



Photograph 3 ⇨
N3, looking N towards dwellings on North Road.



Figure 8: Baseline noise stations. N

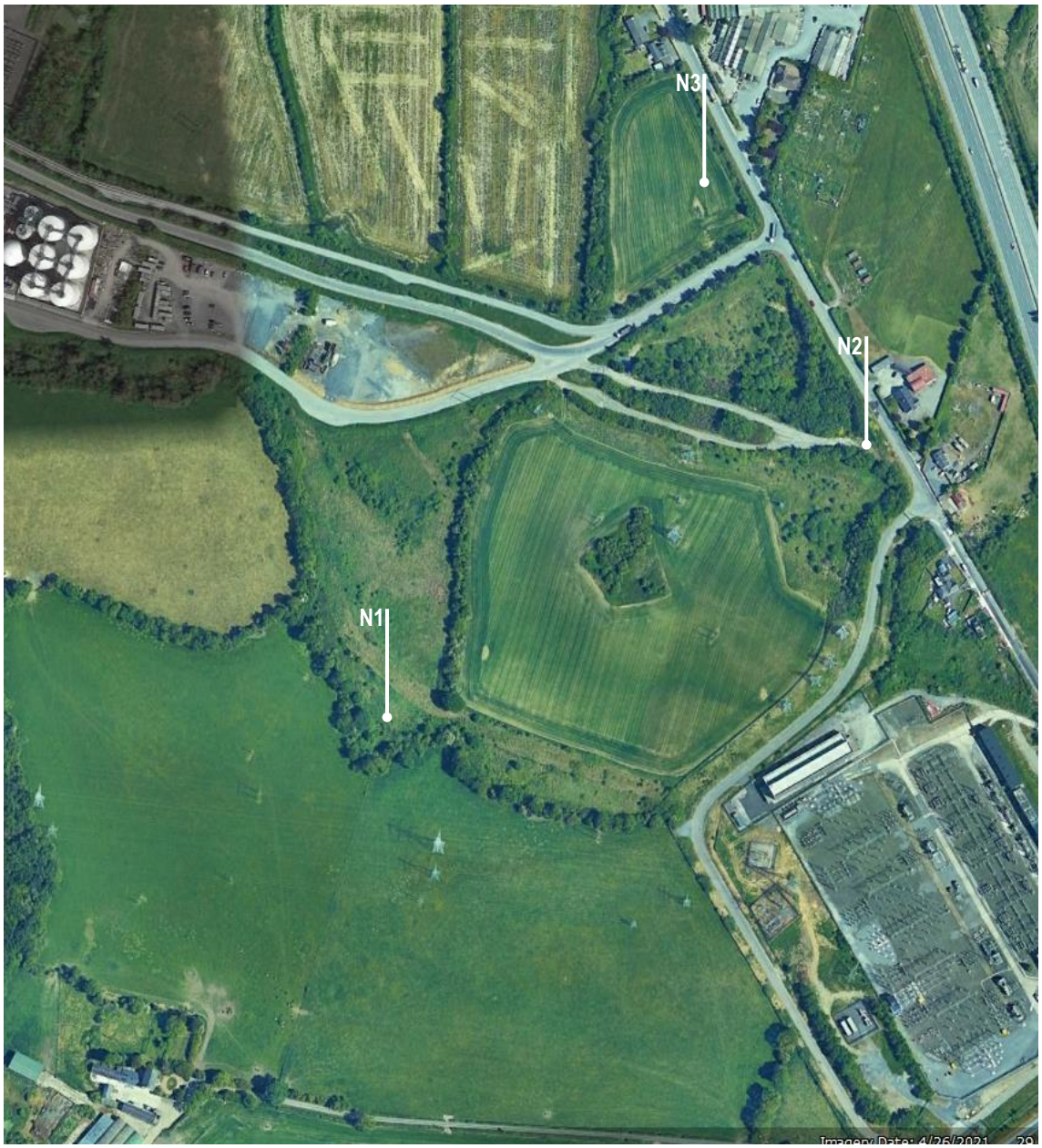


Figure 9: $L_{Aeq\ 1\ s}$ profile at N1.

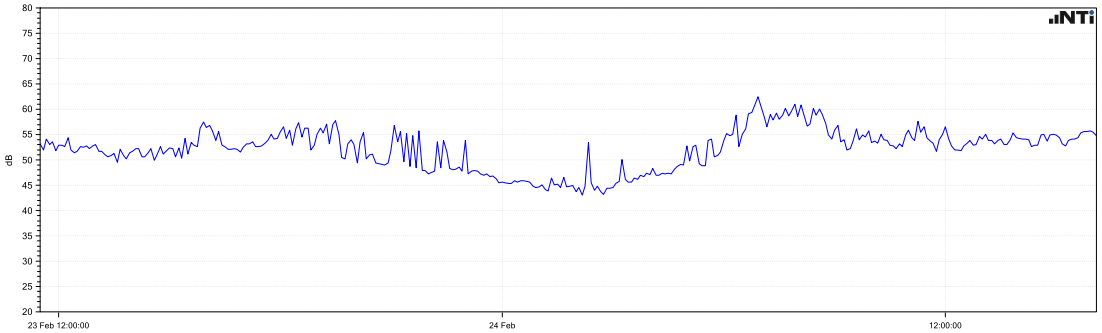


Figure 10: $L_{Aeq\,1\,s}$ profile at N2.

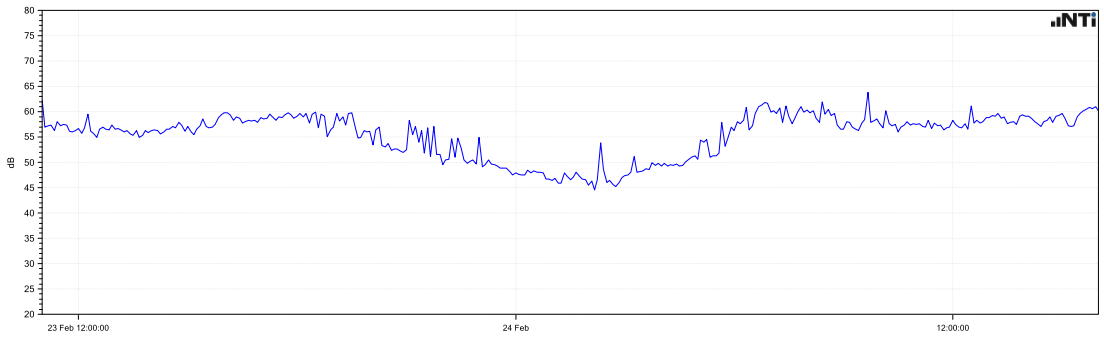


Figure 11: $L_{Aeq\,1\,s}$ profile at N3.

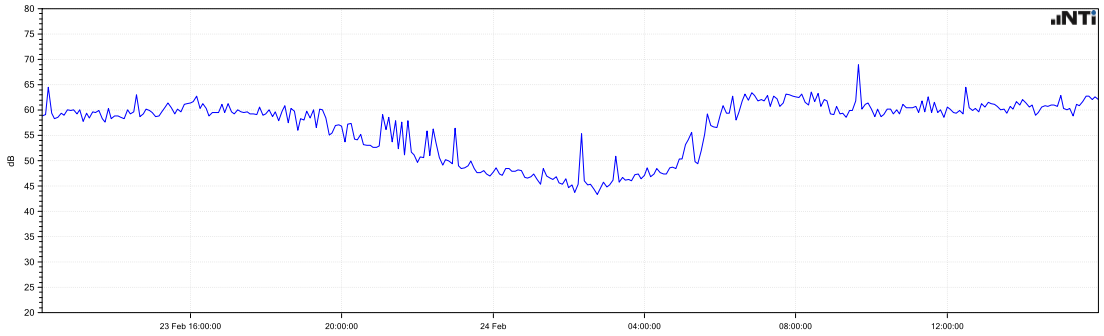


Table 8: Baseline survey details.

Weather	
Cloud cover	20 % at set up, increasing to 100 % overnight, clearing to 30 % on 24.02.23
Precipitation	0 mm
Temperature	9 °C at set up, falling to 8 °C overnight, rising to 10 °C on 24.02.23
Wind direction	NE on 23.02.23, veering NW overnight, and remaining at NW on 24.02.23
Wind speed	0-3 m/s throughout
WS measurement	Anemo anemometer 2 m above ground level
Field details	
DB1 calibration	Station N2 23.02.23 1050 @ 39.3 mV/Pa
DB4 calibration	Station N3 23.02.23 1143 @ 39.8 mV/Pa
DB5 calibration	Station N1 23.02.23 1117 @ 41.9 mV/Pa
Acoustic field	Free field
Microphone height	1.5 m above ground level
Standard	ISO 1996 (2016 & 2017)
Survey operator	Damian Brosnan BSc MSc MIOA MIEI
Instruments	
Calibrator	Bruel & Kjaer Type 4231 Serial: 3017723 Verification: 16.02.22
SLM DB1	NTi Audio XL2 Serial A2A-13658-E0 Microphone A14735 Pre-amp 7066 Verification 13.05.21
SLM DB4	NTi Audio XL2 Serial A2A-15429-E0 Microphone A16329 Pre-amp 7945 Verification 16.02.22
SLM DB5	NTi Audio XL2 Serial A2A-17932-E0 Microphone A18747 Pre-amp 9220 Verification 17.02.22
Certificates	Available on request

Table 9: Noise data (dB).

Station ⇨	N1			N2			N3		
Interval ⇩	$L_{Aeq\ T}$	$L_{AF10\ T}$	$L_{AF90\ T}$	$L_{Aeq\ T}$	$L_{AF10\ T}$	$L_{AF90\ T}$	$L_{Aeq\ T}$	$L_{AF10\ T}$	$L_{AF90\ T}$
1100-1130	-	-	-	57	59	55	-	-	-
1130-1200	53	54	50	57	59	55	-	-	-
1200-1230	53	54	50	57	58	54	60	62	56
1230-1300	53	54	50	57	58	55	60	62	56
1300-1330	51	53	49	56	58	54	59	62	56
1330-1400	51	53	49	56	57	54	59	61	55
1400-1430	52	53	49	56	58	54	59	62	55
1430-1500	52	53	49	57	58	55	60	63	56
1500-1530	52	54	49	57	59	55	60	63	56
1530-1600	55	59	50	58	61	56	61	63	57
1600-1630	55	57	52	59	60	57	61	63	58
1630-1700	52	53	51	58	59	57	60	62	58
1700-1730	53	54	51	59	60	57	60	61	58
1730-1800	54	56	52	59	61	58	59	61	57
1800-1830	56	59	52	59	61	56	60	62	56
1830-1900	55	56	51	58	59	54	59	61	55
1900-1930	56	60	51	59	61	55	59	63	55
1930-2000	53	56	49	56	58	53	57	59	53
2000-2030	52	52	49	55	55	52	56	57	52
2030-2100	50	50	48	52	54	51	53	55	51
2100-2130	54	58	48	56	59	51	57	60	51
2130-2200	52	51	47	54	54	49	55	54	49
2200-2230	51	51	47	53	53	50	54	53	49
2230-2300	50	49	47	51	51	49	52	52	48
2300-2330	48	49	46	50	51	48	49	51	47
2330-0000	46	48	45	48	50	47	48	49	46
0000-0030	46	47	44	48	49	47	48	50	46
0030-0100	45	47	43	47	49	46	47	49	45
0100-0130	45	47	43	47	48	45	47	49	44
0130-0200	45	47	43	47	49	44	46	48	43
0200-0230	48	47	42	49	49	44	49	47	43
0230-0300	44	46	42	46	48	44	45	46	43
0300-0330	47	47	44	49	50	46	47	48	44
0330-0400	47	48	45	49	51	47	47	48	45
0400-0430	47	48	46	50	51	48	48	49	46
0430-0500	50	50	47	51	52	49	49	50	47
0500-0530	51	51	48	53	53	50	53	53	48
0530-0600	53	53	49	56	57	51	58	60	52
0600-0630	56	59	50	58	60	54	60	63	55
0630-0700	60	63	53	61	64	57	63	66	57
0700-0730	58	62	54	60	63	55	62	65	57
0730-0800	60	63	54	60	62	55	62	65	57
0800-0830	59	63	54	60	63	56	62	65	58
0830-0900	57	61	52	59	61	55	61	64	56
0900-0930	54	56	51	57	58	55	60	62	57
0930-1000	55	57	52	60	61	56	64	65	58
1000-1030	54	55	51	58	59	55	60	62	56
1030-1100	54	56	51	58	59	55	60	63	56
1100-1130	56	56	51	57	59	56	61	63	57
1130-1200	54	56	51	57	59	55	60	62	56
1200-1230	53	55	50	58	59	55	61	63	56
1230-1300	54	55	51	58	60	56	60	62	57
1300-1330	54	55	52	59	61	57	61	63	58
1330-1400	54	56	52	59	60	56	61	63	58
1400-1430	54	55	51	58	60	56	60	63	57
1430-1500	55	56	52	59	61	57	61	63	58
1500-1530	54	56	52	58	60	56	60	62	57
1530-1600	55	57	53	61	62	58	62	64	60

Table 10: Noise data summary (dB). Data for the period 1100-1600 h used in the L_{den} calculation are taken from 23.02.23. Averages are arithmetic.

Period ⇩	Station ⇨	N1		N2		N3	
		Range	Average	Range	Average	Range	Average
0700-1900 h	$L_{Aeq\ 30\ min}$	51-60	54	56-61	58	59-64	61
	$L_{AF10\ 30\ min}$	53-63	56	57-63	60	61-65	63
	$L_{AF90\ 30\ min}$	49-54	51	54-58	56	55-60	57
1900-2300 h	$L_{Aeq\ 30\ min}$	50-56	52	51-59	55	52-59	55
	$L_{AF10\ 30\ min}$	49-60	53	51-61	56	52-63	57
	$L_{AF90\ 30\ min}$	47-51	48	49-55	51	48-55	51
2300-0700 h	$L_{Aeq\ 30\ min}$	44-60	49	46-61	51	45-63	50
	$L_{AF10\ 30\ min}$	46-63	50	48-64	52	46-66	52
	$L_{AF90\ 30\ min}$	42-53	46	44-57	48	43-57	47
24 h	L_{den}	59		61		62	
2300-0700	L_{night}	52		53		54	

3.4.2 The soundscape at all three stations was entirely dominated by distant road traffic, with traffic on national route N2 being more intrusive than M50 traffic. Intermittent North Road traffic was also significant at station N3, chiefly associated with truck movements related to the nearby Roadstone quarry. All three stations were influenced by local bird song/calls and aircraft movements. Noise emissions from quarry plant were slightly audible at N1.

3.4.3 The dominance of distant traffic is reflected in the relatively high noise levels measured, and in particular the elevated $L_{AF90\ 30\ min}$ levels. Daytime and evening $L_{AF90\ 30\ min}$ levels exhibit a narrow range, suggesting little or no break in distant traffic. Night-time levels show a wider range, attributable to occasional lulls in traffic. L_{den} and L_{night} levels measured across all three stations are relatively high.

3.4.4 **Table 11** presents a comparison of measured and mapped road traffic L_{den} and L_{night} levels at the three baseline stations. Mapped levels are estimated from mapping contours. At all three stations, measured levels are lower than mapped levels. Relatively large discrepancies were observed at N1 and N2, being greater than the 1-4 dB discrepancy typically observed in most projects. The most likely explanation here is that the northeast and northwest breezes prevailing during the survey significantly minimised M50 traffic noise levels, and indeed it was noted during the survey that N2 traffic noise masked M50 traffic noise. In contrast, traffic noise mapping indicates that M50 noise contours ordinarily exhibit a considerably wider corridor than N2 contours.

Table 11: Comparison of measured and mapped road traffic L_{den} and L_{night} levels (dB).

Station ⇨	N1		N2		N3	
Parameter ⇨	**L_{den}**	**L_{night}**	**L_{den}**	**L_{night}**	**L_{den}**	**L_{night}**
Measured	59	52	61	53	62	54
Mapped	66	58	68	60	64	58
Discrepancy	7	6	7	7	2	4

3.5 Future trends

3.5.1 EPA EIAR guidance recommends that a noise impact assessment should include a description of the likely evolution of the future receiving acoustic environment in the absence of the proposed development. The local noise environment is urban in character, being dominated by road traffic noise on a 24/7 basis. Traffic volumes are likely to continue to increase into the future, resulting in gradually increasing noise levels. While engine noise emissions will reduce due to increasing take-up of electric vehicles, it is noted that traffic noise above 50 km/h arises chiefly from tyre noise, and such tyre noise is unlikely to be less in electric vehicles. Thus the increasing proportion of electric vehicles in the national car fleet is unlikely to result in a decrease in traffic noise levels across the study site.

3.5.2 With respect to the development site itself, it is expected that, should the proposed development not proceed (the 'do nothing' scenario), no noise emissions are expected to arise other than those from land management practices, depending on how the site is used into the future.

4 Construction phase impacts

4.1 Construction noise

4.1.1 Construction will commence within six months of grant of planning permission, and will be managed from a temporary onsite compound. The overall construction project is expected to last 14 months. Construction hours will generally be 0700-1900 Monday-Friday and 0800 to 1400 on Saturday, but may vary. Construction works will include the following activities, undertaken variously throughout the construction phase and in different areas of the site:

- Soil stripping and temporary stockpiling.
- Installation of a temporary site compound.
- Provision of hardcore stone on yard areas.
- Excavation of foundations and services trenches.
- Installation of services.
- Steel frame erection.
- Pouring and floating of floor slabs.
- Block work, cladding and roof work.
- Building fit out and installation of plant.
- Laying of yard surfaces.
- Site landscaping.

4.1.2 During the construction phase, the chief source of noise emissions will be plant used onsite. Construction plant required onsite at various stages of the project is listed in **table 12**. The table includes details of typical sound pressure levels, taken from BS 5228-1:2009.

Table 12: Expected construction plant required across site (band $L_{Zeq\,T}$ dB at 10 m, and total $L_{Aeq\,T}$).

Plant	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	Total $L_{Aeq\,T}$
Discharging concrete mixer truck	80	69	66	70	71	69	64	58	75
Tracked excavator (22 t)	80	83	76	73	72	70	69	66	78
Wheeled backhoe loader (9 t)	68	67	63	62	62	61	54	47	67
Lifting platform	78	76	62	63	60	59	58	49	67
Mobile generator	78	71	66	62	59	55	56	49	65
Dumper	84	81	74	73	72	68	61	53	76
6x6 dump truck	88	90	80	79	76	71	65	61	81
Vibro-roller	88	83	69	68	67	65	62	59	74
Telescopic handler	85	79	69	67	64	62	56	47	71
Truck (driving)	73	78	78	78	74	73	68	66	80

4.1.3 Noise emissions arising during the construction phase of the proposed development will vary considerably due to several reasons:

- Throughout the construction phase, plant associated with different activities will relocate around the site as required.
- Different plant will be required at different times, and construction operations will vary on a daily basis.
- Each machine may operate under different loading conditions or be in varying states of repair.
- Construction works may be concentrated for certain periods, followed by periods of inactivity. Localised works may require several hours of intense activity.
- During later stages of the construction phase, emissions from some operations will be screened by previously completed structures.

4.1.4 From the foregoing, it is clear that construction phase noise emissions will vary, and it is not possible or practical to calculate a single sound power output figure for the entire site. With respect to surrounding noise sensitive receptors, worst case scenario emissions will arise when localised works are undertaken close to their respective boundaries. An extreme worst case scenario consists of construction activity simultaneously occurring at the nearest points to offsite receptors, involving plant with the greatest noise output. In this scenario, operations may occur simultaneously in two zones:

- Zone 1: Construction works near the northeast corner.
- Zone 2: Construction works near the southwest corner.

4.1.5 For the purposes of modelling, it is assumed that operations in both zones will involve a tracked excavator, discharging mixer truck, 6x6 dump truck and telescopic handler in simultaneous use at the nearest point of the works zone. Such a scenario is unlikely to arise, but is applied here to represent an extreme worst case scenario. Noise emissions from these were modelled using DGMR iNoise Pro v2022 software. Input parameters were as follows:

- Model algorithm: *International Standard ISO 9613-2:1996 Acoustics: Attenuation of sound during propagation outdoors – Part 2 General method of calculation* (1996).

- Ground cover: Bare and compacted ground assumed in work areas, otherwise ground under grass.
- Screening: None.
- Conditions: 10 °C and 70 % RH.
- Receiver height: 4 m.
- Plant output data taken from **table 12**. 31.5 Hz levels (not provided in BS 5228) assumed to be same as 63 Hz levels.

4.1.6 The model output is shown in **figure 12**. $L_{Aeq\ 1\ h}$ levels predicted at receptors are listed in **table 13**. Levels will be considerably lower than the 65 dB criterion discussed in **section 2.1**.

Figure 12: Predicted construction phase $L_{Aeq\ 1\ h}$ levels.

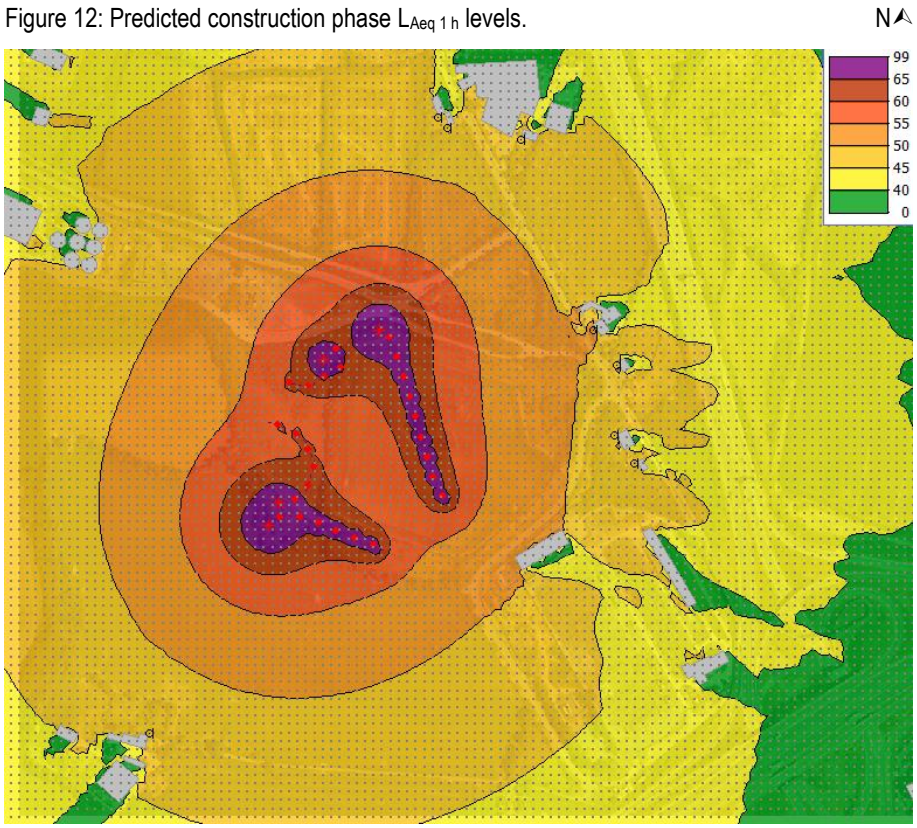


Table 13: Worst case scenario construction phase $L_{Aeq\ 1\ h}$ levels predicted at receptors (dB).

Receptor	$L_{Aeq\ 1\ h}$
Kildonan House to SW	48
Dwelling E of site, S of access road entrance	48
Dwelling opposite access road entrance	50
Veterinary clinic dwelling	51
2 dwellings opposite commercial park to N	48-49
Dwelling at commercial park to N	48

4.2 Construction traffic

4.2.1 During the construction phase, vehicles will arrive at, and depart from, the site during the working day. Vehicle movements will be associated with workers' arrival and departure, and delivery of materials. The approximate numbers of workers employed onsite over the entire construction period will fluctuate depending on schedule. Numbers are unlikely to exceed 60 at any time. Construction traffic volumes will be inconsequential in the context of existing truck traffic associated with a number of existing commercial facilities, particularly a substantial quarry and soil recovery facility at Huntstown. Thus construction phase traffic noise impacts are expected to be imperceptible.

4.3 Construction vibration

4.3.1 Potential sources of groundborne vibration during the construction phase are as follows:

- Delivery truck movements: Trucks may give rise to vibration at positions adjacent to the road. However, such emissions are typically imperceptible beyond 10 m, and are highly unlikely to be perceptible at dwellings alongside site access routes. North Road is currently subject to a large number of daily truck movements.
- Plant movements: The movement of plant onsite is not considered to constitute a source of groundborne vibration, and is not listed in typical vibration documents such as BS 5228-2:2009. In addition, plant machinery used onsite is likely to be small to mid-sized, and similar to those used on other urban construction projects.
- Ground works: Excavation of trenches and pits for foundation and services will be required. These activities are not typically associated with offsite groundborne vibration impacts. Piling is not proposed. In addition, rock breaking is unlikely to be required.
- Vibro-rolling: While the vibro-roller will generate high levels of vibration at the point of operation, experience at other sites indicates that such vibration is typically immeasurable beyond 50 m.

4.3.2 On the basis of the foregoing, PPV levels at all receptors are expected to be considerably lower than criteria listed in **tables 1-3**, and indeed are expected to be below measurement threshold. It follows that construction operations are unlikely to be perceptible offsite, or to cause cosmetic or structural damage to buildings.

4.4 Overall construction phase impacts

4.4.1 Construction phase noise levels at all receptors will be markedly lower than the 65 dB criterion recommended by BS 5228:2009. BS 5228:2009 source noise data suggest that construction phase emissions will not be tonal. Apart from hammering, emissions are also unlikely to be impulsive. Hammering will be sporadic. Associated noise emissions will be brief and localized.

4.4.2 It is reiterated here that the above predictions are based on an entirely worst case scenario, with simultaneous operation of several plant items at the nearest respective points of the site. These activities are highly unlikely to be undertaken at the same time due to project phasing and working logistics. Typically, most operations at a particular

location onsite require just 1-2 machines. Thus, throughout the entire construction phase, $L_{Aeq\ 1\ h}$ levels at receptors are expected to be considerably lower than the 65 dB criterion. On this basis, construction phase noise impacts will be temporary and not significant.

4.4.3 No impacts are expected in relation to construction traffic. In addition, no vibration impacts are expected.

5 Operational phase impacts

5.1 Noise emissions

5.1.1 The proposed development is summarised in **section 1.2**. The development will consist of two similarly sized buildings, at the northwest and southwest corners of the site (see **figure 1** above). The former will house the FTC operation, while the latter will house the MRF facility. At both units, waste streams will be imported by vans and trucks.

5.1.2 Within the MRF, noise emissions will arise from the following sources:

- Stationary processing lines which will variously include trommels, shredders, optical separators, magnets, eddy current separators, wind sifters, picking lines, compactor units and bale wrapping units.
- The C&D processing line will additionally include crushing and screening equipment.
- A mobile grab and front end loader will be used to manage waste.
- A telescopic loader will be used to manage bulky items, and to load baled waste onto trucks for offsite delivery.
- Negative air pressure will be maintained in the building using an air management system which will also include an odour control unit. This system will be installed at the rear of the building, and will discharge through a 16 m stack.

5.1.3 In the FCC building, the following sources will generate noise emissions:

- Trays, crates, and similar items used in the food industry will be washed and sanitised by an automated cleaning line. The line will be managed by several employees.
- Up to two electric forklift trucks will be used to move tray and crate stacks within the building, upstream and downstream of the cleaning line, including loading/unloading of vans and trucks.

5.1.4 All MRF and FCC operations will be confined to the respective buildings. Access to the buildings will be provided by roller shutter doors. In the MRF building, these doors will be fast-acting in order to assist in maintenance of negative air pressure and odour control. No external activities will be undertaken, apart from vehicle movements on yards, and limited external storage of certain baled MRF waste streams pending removal offsite. Management of the latter will require occasional telescopic loader activity in the external yard.

5.1.5 Additional noise sources will include a switch room and electrical room. Noise emissions from these will be negligible. A proposed back-up generator will be used only during power outages, and will not constitute a routine noise source.

5.1.6 The site will be accessed at intervals throughout the day by vans and trucks. The number of truck movements is expected to average 162 during the daytime (i.e. 81 inward and 81 outward trips), with a typical hourly maximum of 19 movements during peak hours. A small number of movements may occur during the evening and night-time, falling to an expected average of two movements per hour. All vehicles will enter and exit the site via a gate on the southern boundary. Employees will park in a carpark near the proposed FTC building. In the context of existing traffic noise in the local area, noise emissions from employee car movements will be negligible.

5.1.7 It is proposed to undertake waste management operations on a 24/7 basis. Thus operations in both buildings will be carried out through the evening and night-time. Vehicle movements will also arise on a 24/7 basis, subject to permission, although traffic movements during the evening and night-time will be sporadic.

5.1.8 Expected noise emissions associated with the above sources are listed in **table 14**. Noise data previously measured by Damian Brosnan Acoustics at several facilities indicate that noise emissions from electric forklift trucks in the FCC unit will be entirely negligible in the context of emissions from the washing line, and forklift truck emissions may therefore be discounted.

Table 14: Operational plant noise emissions (dB, band levels Z-weighted).

Plant	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	Total $L_{Aeq\,T}$
MRF internal operations[1]	79	82	84	83	80	76	78	73	68	84
Mobile grab[2]	64	64	60	63	64	62	57	51	45	66
Telescopic loader[3]	85	85	79	69	67	64	62	56	47	71
Air management & odour plant[4]	89	75	72	71	71	67	65	61	61	73
FTC washing line[5]	73	74	84	80	78	75	68	66	62	80
Truck[6]	111	104	100	101	101	101	96	90	85	104

Data source:

[1]Reverberant $L_{Zeq\,T}$ levels measured in building at similar facility (processing lines and front end loader) in Dublin measured 2021 by Damian Brosnan Acoustics.

[2]Wheeled excavator $L_{Zeq\,T}$ at 10 m, from BS 5228:2009. 31.5 Hz value assumed to be same as 63 Hz value.

[3]$L_{Zeq\,T}$ at 10 m, from BS 5228:2009. 31.5 Hz value assumed to be same as 63 Hz value.

[4]Noise emissions data are currently unavailable for the proposed odour control unit. Data measured at other sites suggest a typical A-weighted sound power level of 72-74 dB. Spectral data are unavailable, and data from a cooling tower are applied pro rata here, given that both sources generate a similar broadband spectrum.

[5]Noise data are currently available. Noise data measured 2018 by Damian Brosnan Acoustics at an IBC washing facility in Dublin indicate a reverberant $L_{Aeq\,T}$ level of 81 dB. On the assumption that the applicant will be required to achieve occupational health noise criteria, a reverberant $L_{Aeq\,T}$ level of 80 dB is applied here. Spectral data are taken from the 2018 measurement, adjusted pro rata.

[7]Sound power level taken from the DGMR iNoise database.

5.1.9 For the purposes of predictive modelling, three scenarios were identified:

- Daytime: All processing operations underway in both buildings, including stationary processing lines, grab and loader activity in the MRF building, with both forklift trucks in use in the FCC building. In addition, telescopic loader activity on the external yard near the MRF building. MRF air management plant and odour control unit operating continuously. 19 truck and 10 van movements per hour assumed.
- Evening: As during the daytime, with truck and van movements each reducing to four movements per hour.
- Night-time: As during the evening, with movements further reducing to two per hour.

5.1.10 Noise levels associated with the three scenarios were modelled using DGMR iNoise Pro v2022 software. Input parameters were as follows:

- Model algorithm: *International Standard ISO 9613-2:1996 Acoustics: Attenuation of sound during propagation outdoors – Part 2 General method of calculation* (1996).
- Receiver height: 4 m.
- Plant output data: Sound power levels or sound pressure levels as appropriate taken from **table 14**.
- Building envelope: Insulated 50 mm Kingspan cladding is assumed (facades and roof), over a mass concrete wall. Sound reduction index values taken from Kingspan specifications sheet.
- Doors: One open roller shutter door assumed (MRF east façade and FCC south façade).

5.1.11 The model output is shown in **figures 13-15**. Predicted $L_{Aeq\ 30\ min}$ levels at the nearest dwellings are presented in **table 15**.

Figure 13.8 Predicted operational phase $L_{Aeq\ 30\ min}$ levels – Daytime.

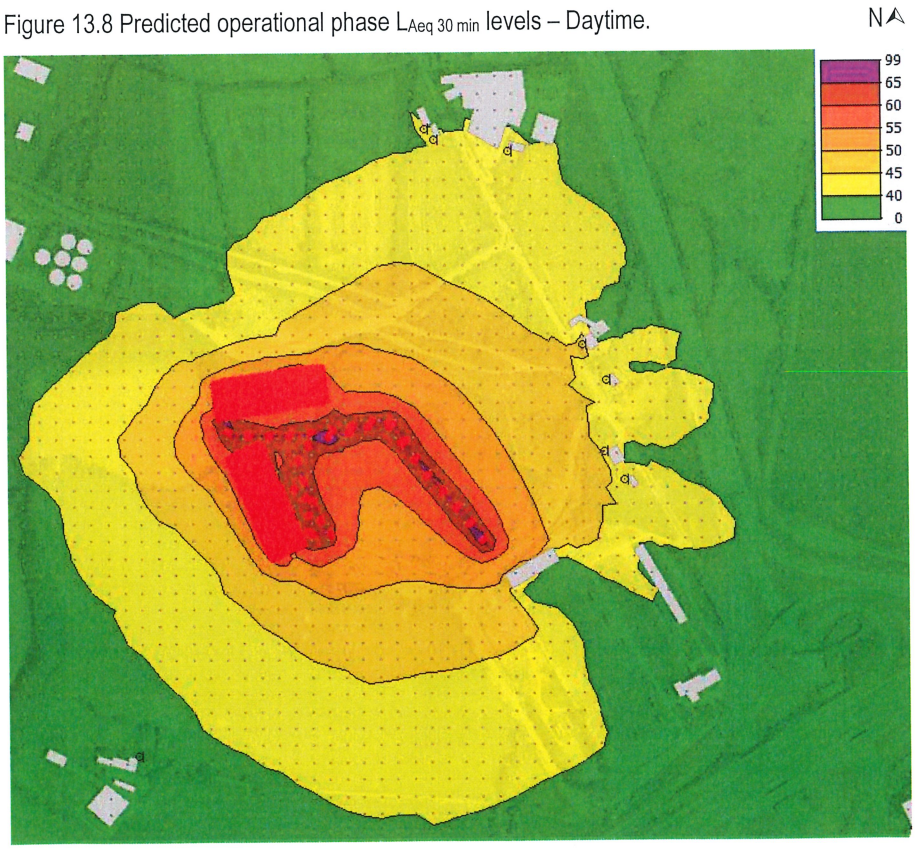


Figure 13.9 Predicted operational phase $L_{Aeq\ 30\ min}$ levels – Evening.

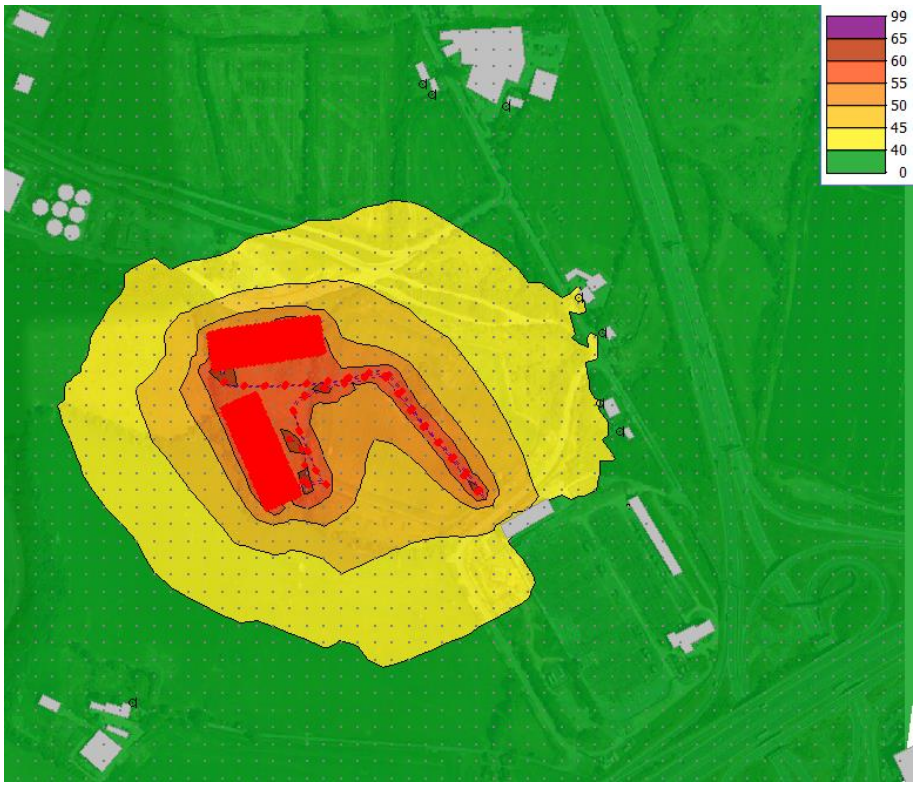


Figure 13.10 Predicted operational phase $L_{Aeq\ 30\ min}$ levels – Night-time.

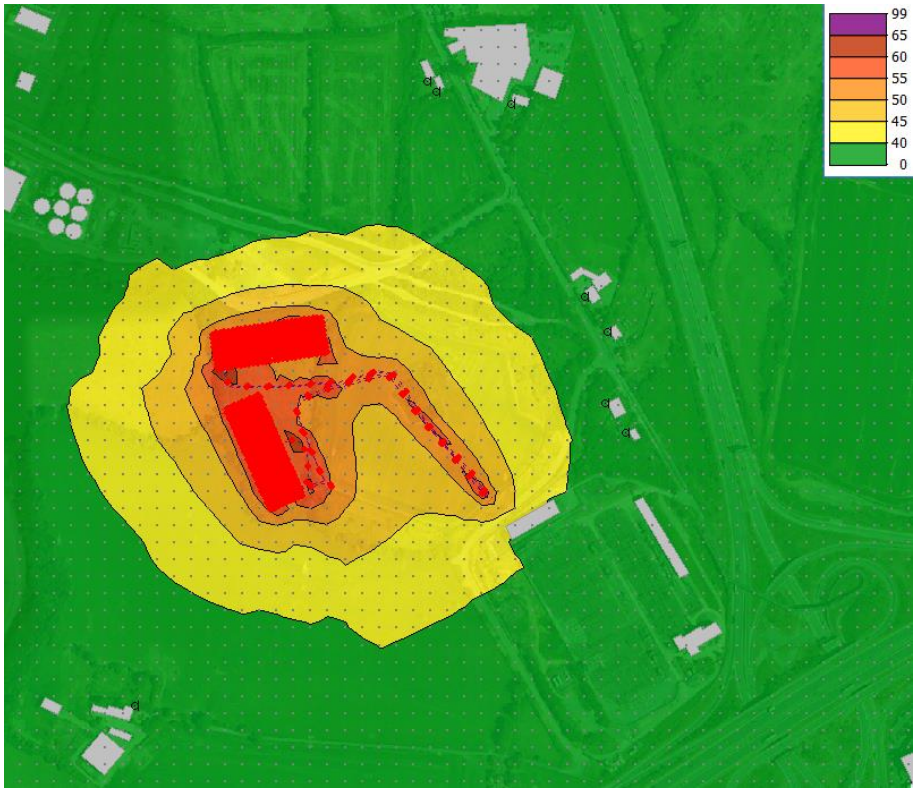


Table 15: Predicted operational phase $L_{Aeq\ 30\ min}$ levels.

Receptor	Daytime	Evening	Night-time
Kildonan House to SW	38	36	36
Dwelling E of site, S of access road entrance	44-45	39-40	38
Dwelling opposite access road entrance	46	41	40
Veterinary clinic dwelling	46	41	39
2 dwellings opposite commercial park to N	40-41	36-37	35-36
Dwelling at commercial park to N	42	37	36

5.2 Operational phase traffic

5.2.1 All vehicles accessing the site will use North Road. Existing daytime traffic movements, including HGV movements, are elevated on North Road due to traffic associated with several surrounding facilities, particularly a large quarry at Huntstown. A road traffic assessment undertaken in 2022 indicates that the number of vehicle movements to the immediate north of the quarry entrance is 2610 during the period 0700-1900 h, with 1514 HGV movements. In this context, daytime traffic volumes associated with the proposed development will be entirely negligible.

5.2.2 The road traffic assessment indicates that, south of the quarry entrance, the number of daytime movements reduces to 292, with 58 HGV movements. The proposed development will significantly increase traffic volumes on a 200 m road segment here. There are two dwellings adjacent to this segment, one of which includes a veterinary clinic. During daytime hours, the development will increase the number of HGV movements on this segment from 58 to 162, with a similar increase expected in car and van movements. The resulting increase in road traffic noise level at these dwellings will be 4 dB. With reference to **table 6**, this represents a not significant to slight adverse impact.

5.2.3 The proposed development will give rise to sporadic vehicle movements during evening and night-time hours, with approximately two truck movements per hour expected between 2300 and 0700 h. $L_{Aeq\ 30\ min}$ levels at dwellings adjacent to North Road resulting from these movements may be calculated using:

$$L_{Aeq\ 30\ min} = L_{AE} + 10\log N - 10\log T$$

where the L_{AE} describes the sound exposure level during a typical truck pass, N is the number of passes, and T is the time interval. A passing truck will typically generate a sound exposure level of 80 dB at 10 m, the typical separation distance to local roadside dwellings. On this basis, $L_{Aeq\ 30\ min}$ levels associated with up to two movements per hour will be 48 dB at 10 m. It follows that $L_{Aeq\ 30\ min}$ levels associated with HGV movements on North Road during evening and night-time hours will be lower than existing baseline levels as described in **section 3.4**.

5.3 Operational phase impacts

5.3.1 Predicted operational phase $L_{Aeq\ 30\ min}$ levels may be assessed in light of three sets of criteria. The first of these relates to criteria recommended by the EPA, based on WHO guidance, as set out in **table 4** above. An assessment of compliance with these criteria is presented in **table 16**. The assessment indicates that the proposed development will comply with EPA criteria at the nearest dwellings. Levels will also comply at more distant dwellings.

5.3.2 The second assessment method relates to BS 4142:2014 which provides for the comparison of specific $L_{Aeq\ T}$ levels (i.e. noise levels attributable to the source in question) with background levels. **Table 17** presents this assessment. Background levels are taken from **table 10**. In all cases, operational noise levels will be lower than background $L_{AF90\ 30\ min}$ levels, which at all receptors are dominated by road traffic. It follows that no adverse impacts will arise. It should be noted that BS 4142:2014 does not differentiate a separate evening period, and the assessment of a separate evening period here is applied in order to adopt an overly rigorous assessment.

5.3.3 Finally, the increase in $L_{Aeq\ 30\ min}$ levels arising from the proposed development may be assessed in light of IEMA guidance. This assessment is presented in **table 18**. Baseline $L_{Aeq\ 30\ min}$ levels are again taken from **table 10**. In all cases, impacts will be imperceptible, again due to high existing baseline noise levels resulting from road traffic.

Table 16: Operational phase $L_{Aeq\ 30\ min}$ levels v EPA criteria.

Receptor	Period	Predicted $L_{Aeq\ 30\ min}$ dB	Criterion $L_{Aeq\ 30\ min}$ dB	Compliance
Kildonan House to SW	0700-1900 h	38	55	✓
	1900-2300 h	36	50	✓
	2300-0700 h	36	45	✓
Dwelling E of site, S of access road entrance	0700-1900 h	44-45	55	✓
	1900-2300 h	39-40	50	✓
	2300-0700 h	38	45	✓
Dwelling opposite access road entrance	0700-1900 h	46	55	✓
	1900-2300 h	41	50	✓
	2300-0700 h	40	45	✓
Veterinary clinic dwelling	0700-1900 h	46	55	✓
	1900-2300 h	41	50	✓
	2300-0700 h	39	45	✓
2 dwellings opposite commercial park to N	0700-1900 h	40-41	55	✓
	1900-2300 h	36-37	50	✓
	2300-0700 h	35-36	45	✓
Dwelling at commercial park to N	0700-1900 h	42	55	✓
	1900-2300 h	37	50	✓
	2300-0700 h	36	45	✓

Table 17: Operational phase $L_{Aeq\ 30\ min}$ levels v BS 4142:2014.

Receptor	Period	Predicted $L_{Aeq\ 30\ min}$ dB	Background $L_{AF90\ 30\ min}$ dB	Impact
Kildonan House to SW	0700-1900 h	38	51	No impact
	1900-2300 h	36	48	No impact
	2300-0700 h	36	46	No impact
Dwelling E of site, S of access road entrance	0700-1900 h	44-45	56	No impact
	1900-2300 h	39-40	51	No impact
	2300-0700 h	38	48	No impact
Dwelling opposite access road entrance	0700-1900 h	46	56	No impact
	1900-2300 h	41	51	No impact
	2300-0700 h	40	48	No impact
Veterinary clinic dwelling	0700-1900 h	46	56	No impact
	1900-2300 h	41	51	No impact
	2300-0700 h	39	48	No impact
2 dwellings opposite commercial park to N	0700-1900 h	40-41	57	No impact
	1900-2300 h	36-37	51	No impact
	2300-0700 h	35-36	47	No impact
Dwelling at commercial park to N	0700-1900 h	42	57	No impact
	1900-2300 h	37	51	No impact
	2300-0700 h	36	47	No impact

Table 18: Operational phase $L_{Aeq\ 30\ min}$ levels v IEMA guidance.

Receptor	Period	Predicted $L_{Aeq\ 30\ min}$ dB	Baseline $L_{Aeq\ 30\ min}$ dB	Combined $L_{Aeq\ 30\ min}$ dB	Increase dB	Impact
Kildonan House to SW	0700-1900 h	38	54	54	0	Imperceptible
	1900-2300 h	36	52	52	0	Imperceptible
	2300-0700 h	36	49	49	0	Imperceptible
Dwelling E of site, S of access road entrance	0700-1900 h	44-45	58	58	0	Imperceptible
	1900-2300 h	39-40	55	55	0	Imperceptible
	2300-0700 h	38	51	51	0	Imperceptible
Dwelling opposite access road entrance	0700-1900 h	46	58	58	0	Imperceptible
	1900-2300 h	41	55	55	0	Imperceptible
	2300-0700 h	40	51	51	0	Imperceptible
Veterinary clinic dwelling	0700-1900 h	46	58	58	0	Imperceptible
	1900-2300 h	41	55	55	0	Imperceptible
	2300-0700 h	39	51	51	0	Imperceptible
2 dwellings opposite commercial park to N	0700-1900 h	40-41	61	61	0	Imperceptible
	1900-2300 h	36-37	55	55	0	Imperceptible
	2300-0700 h	35-36	50	50	0	Imperceptible
Dwelling at commercial park to N	0700-1900 h	42	61	61	0	Imperceptible
	1900-2300 h	37	55	55	0	Imperceptible
	2300-0700 h	36	50	50	0	Imperceptible

5.4 Cumulative impacts

5.4.1 Site inspections and baseline noise monitoring indicate that the local soundscape is entirely dominated by road traffic noise. Although a number of commercial and industrial noise sources are located in the surrounding area, noise emissions from these do not contribute to the soundscape at receptors. The only exception here is Kildonan House to the southwest of the site, where quarry operations are audible during the daytime.

5.4.2 Predictive noise modelling indicates that noise emissions from the proposed development will be lower than baseline noise levels at receptors, and thus cumulative impacts will not arise. While cumulative impacts will arise in relation to an increase in North Road traffic, increases will be negligible north of the quarry entrance. South of the entrance, the proposed development will generate an increase in traffic noise levels of 4 dB, resulting in a not significant to slight impact. It follows that the proposed development will not give rise to any cumulative noise impacts of significance.

6 Mitigation

6.1 Construction stage

6.1.1 Construction phase $L_{Aeq\ 1\ h}$ levels at all receptors will be lower than the 65 dB criterion recommended by BS 5228:2009. No vibration impacts will arise. Although construction phase noise emissions will be short term, and will not exceed construction phase criteria, the applicant nonetheless proposes to apply the following mitigation measures throughout the construction phase:

- Construction operations will in general be confined to the periods Monday-Friday 0800-1800 h and Saturday 0800-1800 h.
- Hooting will be prohibited onsite. Drivers of plant and vehicles will be instructed to avoiding hooting at all times.
- Plant used onsite during the construction phase will be maintained in a satisfactory condition and in accordance with manufacturer recommendations. In particular, exhaust silencers will be fitted and operating correctly at all times. Defective silencers will be immediately replaced.
- Queuing of trucks on North Road will be prohibited.
- Machinery not in active use will be shut down.
- A site representative will be appointed as a liaison officer with the local community.
- All complaints of noise received during the construction phase will be logged in a register, and investigated immediately. Details of follow-up action will be included in the register.
- Where it is proposed to import potentially noisy plant to the site, the potential impact of noise emissions will be assessed in advance.
- Guidance set out in British Standard BS 5228:2009 with respect to noise control will be applied throughout the construction phase.

6.2 Operational stage

6.2.1 No specific mitigation measures are warranted, as impacts at offsite receptors will be imperceptible. The applicant, however, proposes to apply the following general measures:

- Both the MRF and FCC buildings shall be constructed so as to avoid any gaps at cladding joints.
- Prior to selection of the air management system and odour control unit, noise emissions data shall be assessed to ensure that emissions are entirely broadband in character.
- All mobile plant shall be fitted with flat spectrum reversing alarms.
- Hooting will be prohibited onsite. Drivers of plant and vehicles will be instructed to avoiding hooting at all times.
- Plant used onsite will be maintained in a satisfactory condition and in accordance with manufacturer recommendations.
- A site representative will be appointed as a liaison officer with the local community.
- All complaints of noise received will be logged in a register, and investigated immediately. Details of follow-up action will be included in the register.

6.3 Monitoring

6.3.1 Given that baseline noise levels are elevated, construction phase noise monitoring is not warranted. Once operational, the facility will require a licence from the EPA. Any licence granted is likely to include noise limits and noise monitoring requirements. A monitoring programme will be commissioned by the operator in compliance with the licence conditions.

7 Summary of effects

7.1 While the loudest construction activity may be audible at the nearest receptors, noise levels will be lower than identified criteria. There will be extended periods when little or no emissions arise. Construction noise impacts will be imperceptible to not significant, and will be temporary. No vibration impacts will arise.

7.2 Once commissioned, residual noise impacts at surrounding receptors will be imperceptible. A BS 4142:2014 assessment indicates that no adverse impacts will arise. No indirect impacts or interactive effects have been identified. There will be no adverse noise impact on the local population or on human health. No cumulative impacts of significance will arise.

7.3 The assessment of impacts on human health is typically undertaken by reference to WHO guidance, which has been revised over the last four decades according as noise and health studies have been published. The WHO currently recommends the following:

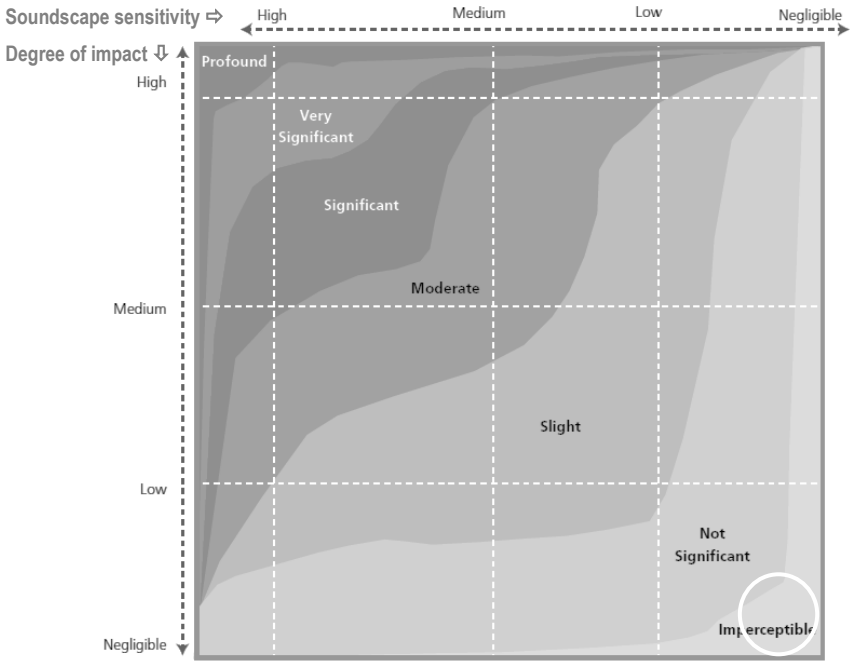
- In residential settings, a daytime/evening $L_{Aeq\ 16\ h}$ level of 50 dB is an indicator of moderate annoyance.
- A night-time $L_{Aeq\ 8\ h}$ level of 45 dB is recommended to prevent sleep disturbance.

7.4 The proposed development will not result in any breach of the above criteria. On this basis, it is considered that there will be no adverse noise impact on the local population or on human health. Impacts and effects are summarised in **table 19**.

Table 19: Assessment of impacts & effects.

Informed by EPA 2022 & IEMA 2014 guidance regarding impact (noise level change) & effect (consequence of impact)
Impact Imperceptible at all receptors; Truck movements on North Road will give rise to impacts at two dwellings south of the quarry entrance which will be not significant to slight ***imperceptible*** *(<2 dB change);* ***not significant*** *(2-4 dB change);* ***slight*** *(4-6 dB change);* ***moderate*** *(6-10 dB change);* ***significant*** *(10-15 dB change);* ***very significant*** *(15-20 dB change);* ***profound*** *(>20 dB change)*
Extent Site is located in a commercial/industrial area dominated by road traffic noise, with a small number of local residential receptors *development area size, receiving area affected, number of receptors affected, proportion of population affected*
Context Local area is commercial/industrial in character, and proposed development will conform with soundscape *conformity or contrast with existing & emerging soundscape*
Probability Effects are unlikely ***likely*** *(reasonably expected to occur);* ***unlikely*** *(reasonably expected not to occur)*
Duration Long term ***momentary*** *(seconds or minutes);* ***brief*** *(<1 day);* ***temporary*** *(<1 year);* ***short term*** *(1-7 years);* ***medium term*** *(7-15 years);* ***long term*** *(15-60 years);* ***permanent*** *(>60 years)*
Frequency Noise emissions will arise daily 24/7 *occurrence*
Reversibility Impacts are entirely reversible ***reversible*** *(may be undone in the future);* ***irreversible*** *(cannot be undone following onset, thus permanent)*
Indirect impact No indirect impacts identified *secondary impacts not directly attributable to development, often removed from site*
Cumulative impact Cumulative impacts are unlikely due to masking of existing commercial/industrial sources by road traffic noise *combined impacts with other projects or sources*
Worst case impact Impact determination is not dependent on mitigation measures, and thus mitigation failure will not affect outcome *where mitigation measures substantially fail*
Indeterminable impact Indeterminable impacts are unlikely *where full consequences of change in soundscape cannot be described*
Quality of effect Neutral impacts are expected at all receptors; Traffic movements on North Road south of the quarry entrance are likely to result in slightly adverse impacts at two dwellings ***positive*** *(improves soundscape);* ***neutral*** *(no perceptible changes);* ***adverse*** *(reduces quality of soundscape)*

Table 19 continued.

Informed by EPA 2022 & IEMA 2014 guidance regarding impact (noise level change) & effect (consequence of impact)
Significance of effect Site impacts imperceptible at all receptors; Traffic impacts increasing to not significant to slight at two receptors on North Road south of the quarry entrance ***imperceptible*** *(capable of measurement, but without significant consequences);* ***not significant*** *(causes noticeable changes to soundscape, but without significant consequences);* ***slight*** *(causes noticeable changes to soundscape without affecting its sensitivities);* ***moderate*** *(alters soundscape in manner consistent with existing and emerging baseline trends);* ***significant*** *(alters soundscape due to source character, magnitude, duration or intensity);* ***very significant*** *(significantly alters soundscape due to source character, magnitude, duration or intensity);* ***profound*** *(obliterates soundscape)*
Overall residual effect On the basis of the foregoing, the overall residual effect is circled white in the diagram. 

8 References

Report RI 8507: Structural response and damage produced by ground vibration from surface mines blasting (US Bureau of Mines, 1980).

British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration (1993).

International Standard ISO 9613-2:1996 Acoustics: Attenuation of sound during propagation outdoors – Part 2 General method of calculation (1996)

Guidelines on community noise (World Health Organisation, 1999).

Directive 2002/49/EC of the European Parliament and of the Council relating to the assessment and management of environmental noise (2002), transposed into Irish law by the *European Communities (environmental noise) Regulations 2018 (SI no. 549/2018)*.

Night noise guidelines for Europe (World Health Organisation, 2009).

Design manual for roads and bridges (UK Highways Agency, 2011).

British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (2014).

British Standard BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (2014).

Good practice guidance for the treatment of noise during the planning of national road schemes (National Roads Authority (now Transport Infrastructure Ireland), 2014).

Guidelines for environmental noise impact assessment (Institute of Environmental Management & Assessment, 2014).

NG4 Guidance note for noise: Licence applications, surveys and assessments in relation to scheduled activities (EPA, 2016).

International Standard ISO 1996-2:2017 Acoustics – Description, measurement and assessment of environmental noise, Part 2: Determination of environmental noise levels (2017).

Draft noise action plan for Fingal County 2019-2023 (Fingal County Council, 2018).

Draft noise action plan for Dublin Airport 2019-2023 (Fingal County Council, 2018).

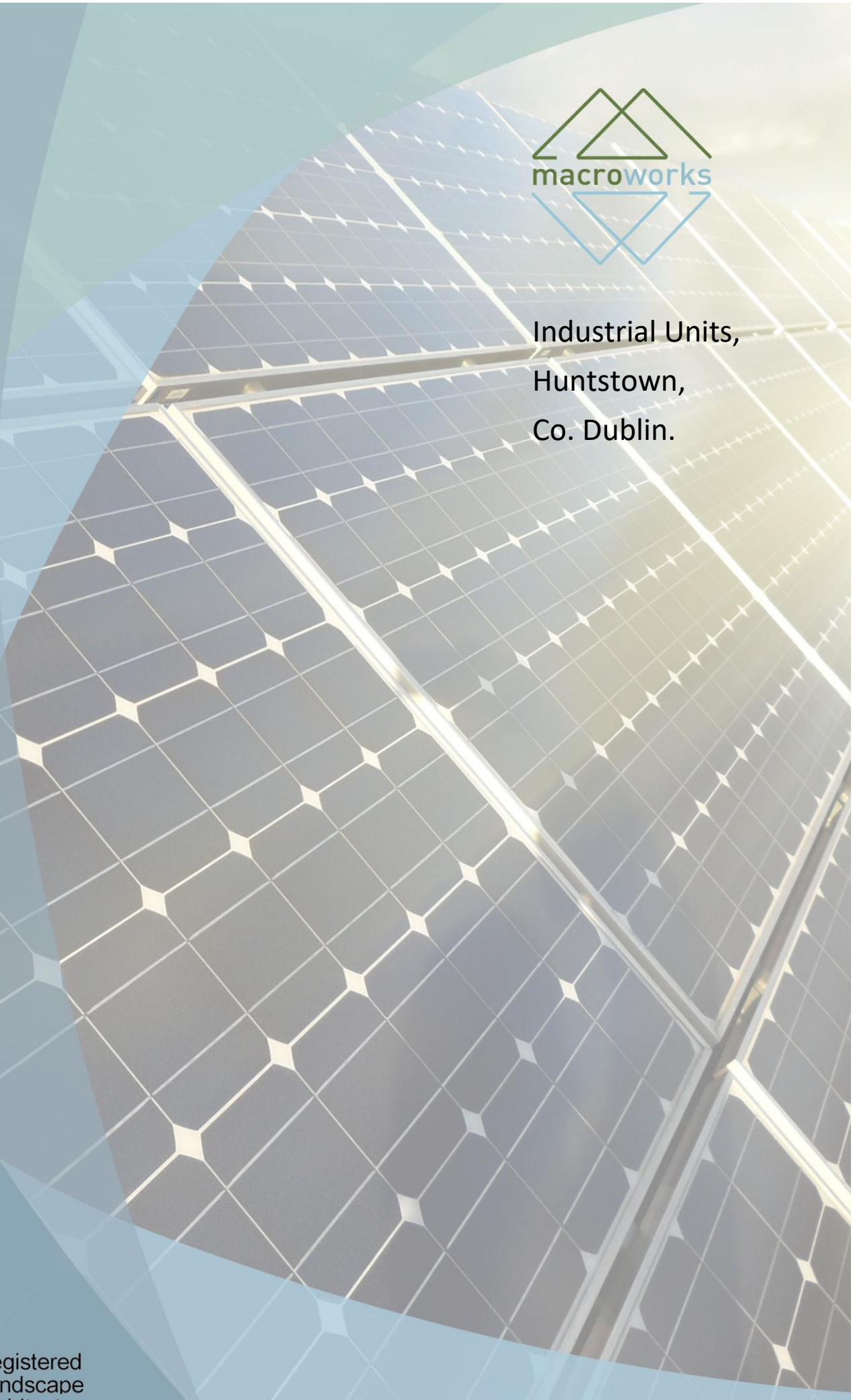
British Standard BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (2019).

Guidelines on the information to be contained in environmental impact assessment reports (EPA, 2022).

APPENDIX 10.3

GLINT & GLARE

GLINT AND GLARE ASSESSMENT



macroworks

Industrial Units,
Huntstown,
Co. Dublin.

Registered Landscape Architect

April 2023

GLINT AND GLARE ASSESSMENT

Executive Summary

The proposal is for a roof mounted photovoltaic solar panel installation on the roof of the proposed industrial units in Huntstown townland, County Dublin. The proposed solar arrays wer assessed to determine whether they will have the potential to cause any glint or glare impacts upon specific aviation receptors at Dublin Airport – notably the air traffic control tower and the runway approaches.

An in-depth analysis of the proposed photovoltaic panel installation with regard to the indicated aviation receptors has predicted that there is the potential for glare effects upon aircraft approaching all the runways at Dublin Airport, however, it is of a lower-level of intensity, that is deemed by the Federal Aviation Authority (FAA) to be of low risk to this category of receptor, thus deemed an acceptable level of glare. The analysis also indicated the potential for a level of glare at the new, taller Air Traffic Control Tower which is considered unacceptable by the FAA. However, a detailed visibility analysis determined that the design and orientation of the proposed buildings upon which the array is proposed, affords the panels additional screening, preventing any potential glint or glare at the Air Traffic Control Tower as a result of the proposed roof mounted installation of photovoltaic panels.

1 INTRODUCTION

Macro Works Ltd. was commissioned to undertake a glint and glare assessment report for a proposed roof mounted photovoltaic (PV) panel installation on the roofs of two proposed industrial units in Huntstown townland, County Dublin (Figure 1 and Figure 2 refer). The proposed development is located approximately 500m west of the N2 national primary road and approximately 600m north of the M50 motorway. The PV panels will remain in a fixed position throughout the day and year (i.e. they will not rotate to track the movement of the sun).



Figure 1: Aerial view (Google Earth Pro) showing the location of the proposed PV panels (red pin).

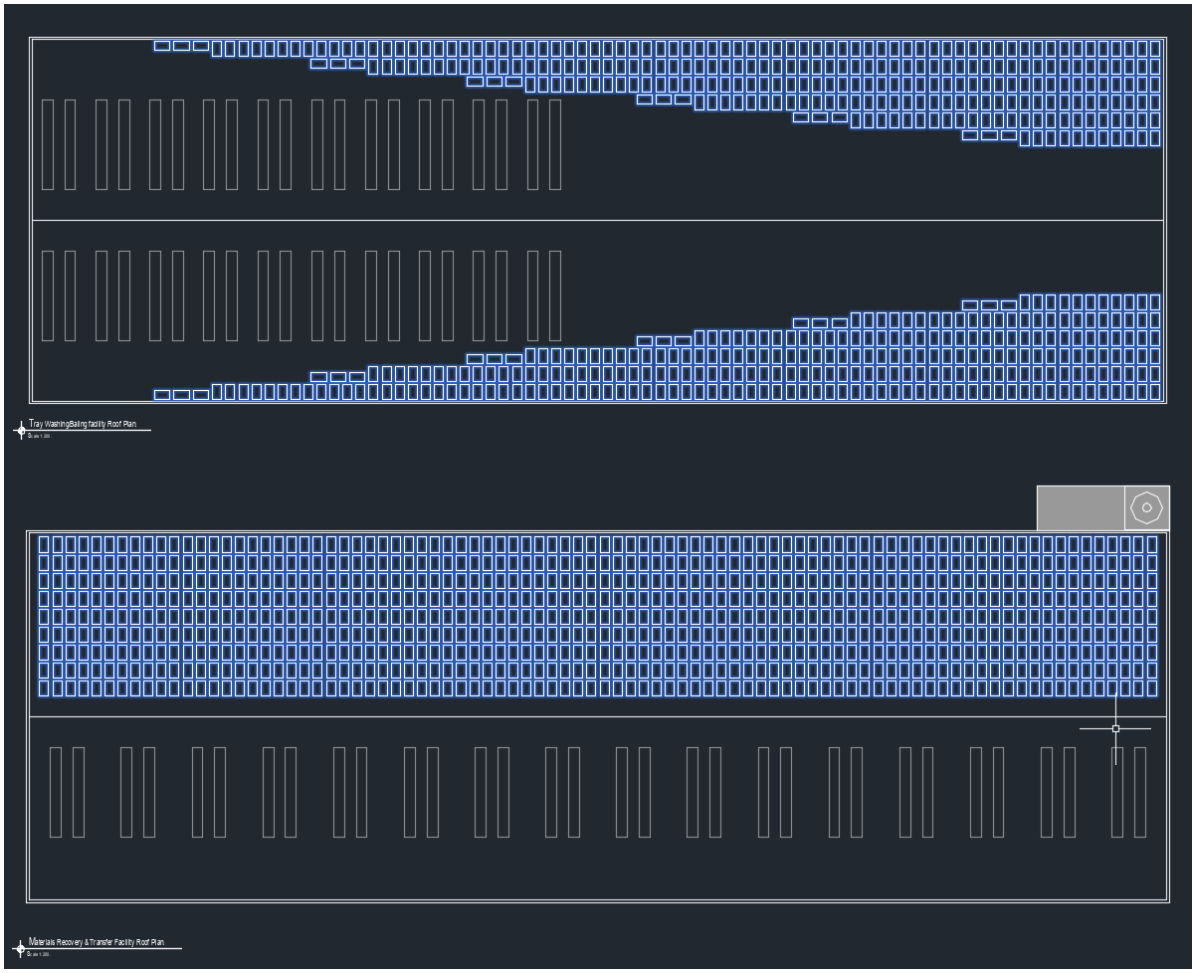


Figure 2: Extract from drawing "22-039 S Industrial units REV E.dwg" showing the proposed roof layouts of with the proposed PV panels (blue).

2 STATEMENT OF AUTHORITY

Macro Works' relevant experience includes nineteen years of analysing the visual effects of a wide range of infrastructural and commercial development types. This experience includes numerous domestic and international wind and solar energy developments. Macro Works has assessed the effects of glint and glare for many solar development sites throughout Ireland to date.

3 METHODOLOGY

The process for dealing with aviation receptors is as follows:

1. The Federal Aviation Administration (FAA) approved Solar Glare Hazard Analysis Tool (SGHAT) is used to determine if any of these aviation receptors has the potential to theoretically experience glint or glare. This tool also calculates the intensity of such reflectance and whether it is acceptable by FAA standards.

2. SGHAT does not account for terrain screening or screening provided by surface elements such as existing vegetation or buildings, therefore the results of the SGHAT may need to be considered, in conjunction with an assessment of existing intervening screening that may be present, to establish if reflectance can actually be experienced at the receptors.
3. Finally, if necessary, additional assessment is undertaken using Macro Works' bespoke model which would into account any screening provided by any proposed mitigation measures.

4 GUIDANCE

Guidance has been prepared by the Federal Aviation Authority[1] to address the potential hazards that solar developments may pose to aviation activities, and this has been adopted for use by the Irish Aviation Authority. SGHAT was developed in conjunction with the FAA in harmony with this guidance and is commonly regarded as the accepted industry standard by aviation authorities internationally when considering the glint and glare effects upon aviation related receptors.

4.1 FEDERAL AVIATION AUTHORITY

Within the FAA's interim policy, a 'Review of Solar Energy System Projects on Federally Obligated Airports'[2] it states:

> *"To obtain FAA approval to revise an airport layout plan to depict a solar installation and/or a ''no objection'' to a Notice of Proposed Construction Form 7460–1, the airport sponsor will be required to demonstrate that the proposed solar energy system meets the following standards:*
>
> - *No potential for glint or glare in the existing or planned Airport Traffic Control Tower (ATCT) cab, and*
> - *No potential for glare or ''low potential for after-image'' (shown in green in Figure 1* [Figure 3 refers]*) along the final approach path for any existing landing threshold or future landing thresholds (including any planned interim phases of the landing thresholds) as shown on the current FAA-approved Airport Layout Plan (ALP). The final approach path is defined as two (2) miles from fifty (50) feet above the landing threshold using a standard three (3) degree glidepath."*

In summary, glare at an ATCT is not acceptable but glare with a *''low potential for after-image''* is acceptable along final approach paths to runways.

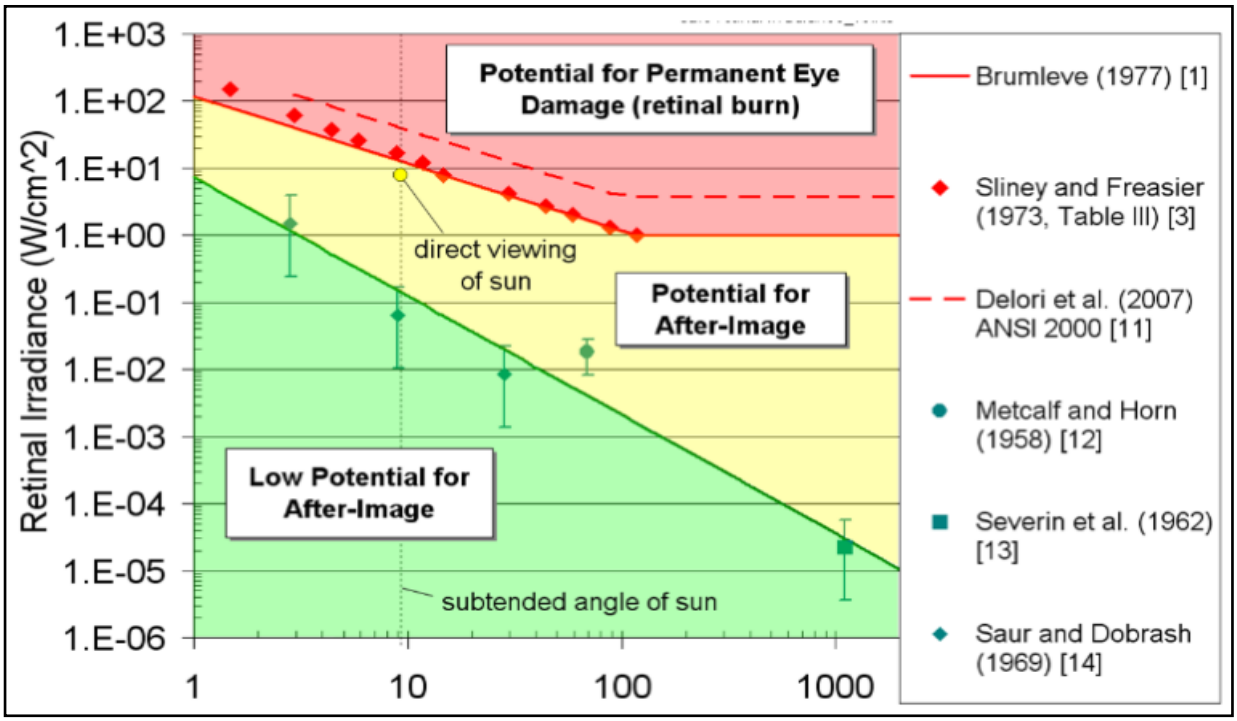
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[1] Harris, Miller, Miller & Hanson Inc.. (November 2010). Technical Guidance for Evaluating Selected Solar Technologies on Airports; 3.1.2 Reflectivity. *Technical Guidance for Evaluating Selected Solar Technologies on Airports*. Available at: https://www.faa.gov/airports/environmental/policy_guidance/media/airport-solar-guide.pdf

[2] Federal Aviation Administration (FAA). (2013). Department of Transportation - Federal Aviation Administration. *Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports*. Vol 78 (No 205), 63276-63279.

4.2 SOLAR GLARE HAZARD ANALYSIS TOOL

The SGHAT was designed to determine whether a proposed solar energy project would result in the potential for ocular impact as depicted on the Solar Glare Hazard Analysis Plot (Figure 3 refers). SGHAT analyses ocular impact over the entire calendar year in one minute intervals from when the sun rises above the horizon until the sun sets below the horizon. One of the principal outputs from the SGHAT report is a glare plot per receptor that indicates the time of day and days per year that glare has the potential to occur. SGHAT plot classifies the intensity of ocular impact as either Green Glare, Yellow Glare or Red Glare. These colour classifications are equivalent to the FAA's definitions regarding the level of ocular impact e.g. 'Green Glare' in the SGHAT is synonymous to the FAA's *"low potential for after-image','* and so forth. The various correlations are illustrated on the Solar Glare Hazard Analysis Plot**.**



Solar Glare Ocular Hazard Plot: The potential ocular hazard from solar glare is a function of retinal irradiance and the subtended angle (size/distance) of the glare source. It should be noted that the ratio of spectrally weighted solar illuminance to solar irradiance at the earth's surface yields a conversion factor of ~100 lumens/W. Plot adapted from Ho et al., 2011.

Chart References: Ho, C.K., C.M. Ghanbari, and R.B. Diver, 2011, Methodology to Assess Potential Glint and Glare Hazards from Concentrating Solar Power Plants: Analytical Models and Experimental Validation, J. Solar Energy Engineering, August 2011, Vol. 133, 031021-1 – 031021-9.

Figure 3: Figure 1 from the FAA Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports

5 IDENTIFICATION OF RELEVANT RECEPTORS

5.1 RUNWAY APPROACHES

Dublin Airport is an international airport operated by the Dublin Airport Authority. Dublin Airport currently hosts 3 operational runways 10/28 and 16/34 and 10L/28R which was recently constructed and commenced operations in August 2022. 10L/28R was constructed to the north of the Airport to help accommodate increasing passenger numbers and runs parallel to runway 10/28, to the south. It is envisaged that this will eventually render the 16/34 runway as a purely taxiing runway (**Error! Reference source not found.**6 refers). All 6 runway approaches will be assessed.

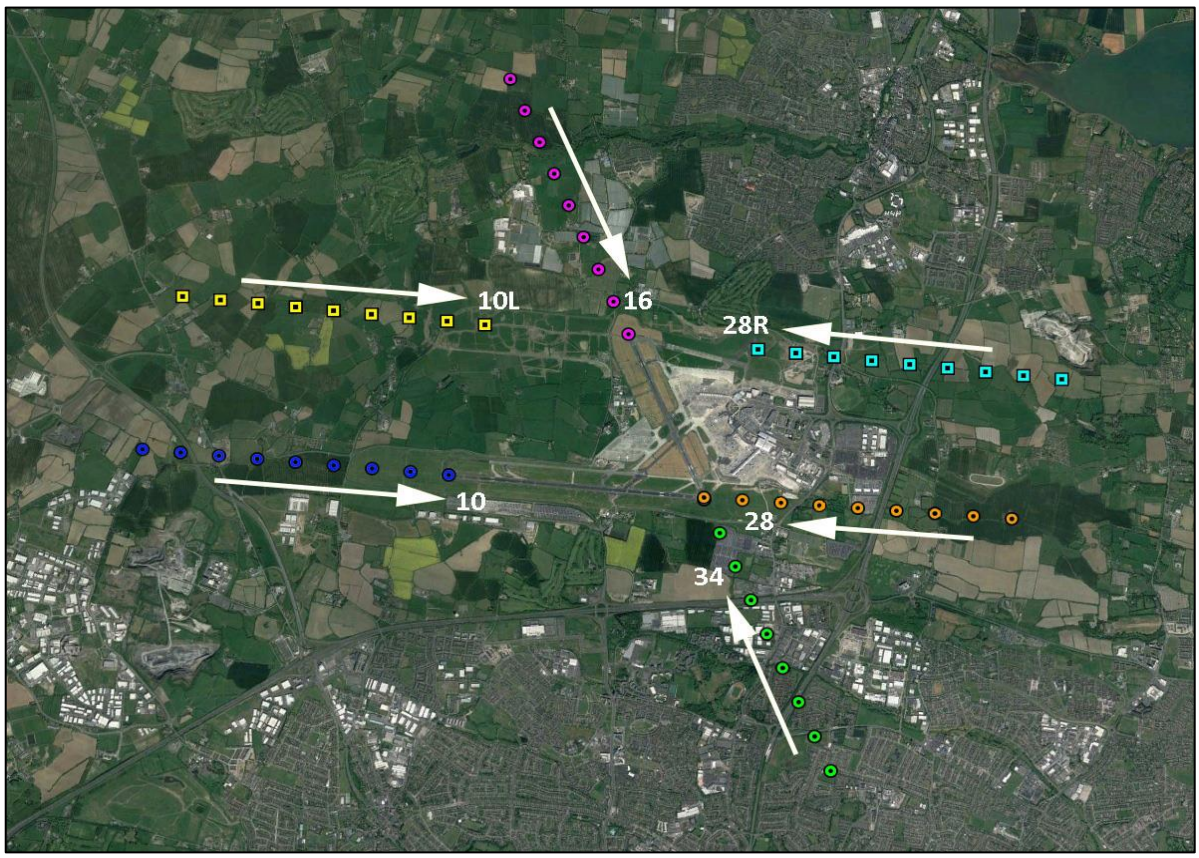


Figure 4: Aerial view (Google Earth Pro) showing 2 mile approach lines to runways at Dublin Airport (at ¼ mile intervals) as assessed by SGHAT. Includes the newly opened northern runway (10L and 28R.)

5.2 AIR TRAFFIC CONTROL TOWERS

Dublin Airport has two Air Traffic Control Towers (ATCT). The older ATCT has a viewing height of 21.9m Above Ground Level (AGL) (Ref: '1-ATCT' in SGHAT) and is located to the west of the main terminal buildings (Figure 5 refers). The second, newer ATCT has a viewing height of 75.6m Above Ground Level (AGL) (Ref: '2-ATCT' in SGHAT) and is also located to the west of the main terminal buildings (Figure 5 refers). Both ATCTs will be assessed.



Figure 5: Location of the Air Traffic Control Towers at Dublin Airport (red centre icons).

6 RESULTS

6.1 RUNWAY APPROACHES

The SGHAT results are contained in Appendix A and show that of the six runway approaches analysed, all six have the theoretical potential to receive glare (10L, 10, 16, 28R, 28 and 34). In all instances SGHAT calculated the potential glare to be '*Green Glare*'. SGHATs '*Green Glare*' classification regarding the intensity of the potential glare is synonymous with FAA's *'low potential for temporary after image'*. *'Green Glare'* / glare with a *'low potential for temporary after image,'* regardless of the number of minutes per year, is considered by the FAA to be an **acceptable level of reflectance effect for runway approaches**.

6.2 AIR TRAFFIC CONTROL TOWERS

The SGHAT results contained in Appendix A also show the theoretical potential for glare at both of the ATCT's at Dublin Airport (1-ATCT and 2-ATCT). SGHAT calculated this potential glare to be '*Green Glare*'. SGHATs '*Green Glare*' classification regarding the intensity of the potential glare is synonymous with FAA's *'low potential for temporary after image'*. *'Green Glare'* / glare with a *'low*

potential for temporary after image,' regardless of the number of minutes per year, is considered by the FAA to be an **unacceptable intensity of reflectance effect for an ATCT**.

These results are not unexpected or uncommon as the SGHAT software does not account for screening as a result of intervening terrain, buildings or vegetation, therefore a 3D visibility analysis was undertaken from the new, taller ATCT at Dublin Airport. Furthermore, it should also be noted that visibility of panels is not a precursor for glare impacts as panels may be visible but not cause any glare, depending on a number of factors i.e. panel orientation.

6.2.1 Visibility Analysis

A viewshed analysis was carried out for the taller Air Traffic Control Tower at Dublin Airport (2-ATCT) to identify what portions of the proposed development are theoretically visible. In the case of Dublin Airport where there are two ATCTs, if there is no potential for visibility from the taller ATCT (worst-case scenario), there will be no potential for visibility from the smaller ATCT, thus a visibility analysis from the smaller ATCT (1-ATCT) is not required. This analysis was undertaken with the aid of a high resolution digital surface model (DSM) to produce a Zone of Theoretical Visibility (ZTV) map (Figure 6 refers). The proposed buildings and PV panels were incorporated into the DSM model. The result of this analysis shows that there is no potential for inter-visibility between the ATCT (2-ATCT) and the areas of PV panels at the proposed development – potentially visible area are indicated in yellow on Figure 6. Thus, there will be **no potential for glint or glare to occur at either of the ATCTs**.



Figure 6: Viewshed / Zone of Theoretical Visibility (ZTV) map, showing the areas within the application site that are potentially visible (yellow pattern) from the taller air traffic control tower (2-ATCT) at Dublin Airport.

6.3 OVERALL CONCLUSION

From the analysis and discussions contained herein, it is considered that there will not be any hazardous glint and glare effects upon the Dublin Airport aviation receptors identified as a result of the proposed roof mounted solar PV panels.

APPENDIX A:

SGHAT RESULTS

RUNWAYS APPROACHES AND AIR TRAFFIC CONTROL TOWERS (ATCT)

FORGESOLAR GLARE ANALYSIS

Project: **Dublin Airport SGHAT**
Site configuration: **Hunststown Td**
Analysis conducted by Luis Dominguez (luis@macroworks.ie) at 09:29 on 21 Mar, 2023.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	PASS	Flight path receptor(s) do not receive yellow glare
ATCT(s)	FAIL	Receptor(s) marked as ATCT receive green and/or yellow glare

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 86659.12200
Methodology: V2



PV Array(s)

Name: Array 1
Axis tracking: Fixed (no rotation)
Tilt: 5.0°
Orientation: 352.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.408324	-6.319673	78.70	13.19	91.89
2	53.408306	-6.319904	78.70	13.19	91.89
3	53.408312	-6.319912	78.70	13.12	91.82
4	53.408305	-6.320002	78.70	13.12	91.82
5	53.408316	-6.320016	78.70	12.99	91.69
6	53.408303	-6.320189	78.70	12.99	91.69
7	53.408308	-6.320197	78.70	12.93	91.63
8	53.408302	-6.320287	78.70	12.93	91.63
9	53.408312	-6.320301	78.70	12.80	91.50
10	53.408301	-6.320453	78.70	12.80	91.50
11	53.408307	-6.320461	78.70	12.73	91.43
12	53.408300	-6.320550	78.70	12.73	91.43
13	53.408310	-6.320571	78.70	12.60	91.30
14	53.408297	-6.320738	78.70	12.60	91.30
15	53.408303	-6.320746	78.70	12.53	91.23
16	53.408296	-6.320835	78.70	12.53	91.23
17	53.408307	-6.320850	78.70	12.41	91.11
18	53.408296	-6.321001	78.70	12.41	91.11
19	53.408301	-6.321009	78.70	12.34	91.04
20	53.408295	-6.321099	78.70	12.34	91.04
21	53.408305	-6.321113	78.70	12.21	90.91
22	53.408294	-6.321264	78.70	12.21	90.91
23	53.408299	-6.321273	78.70	12.14	90.84
24	53.408293	-6.321362	78.70	12.14	90.84
25	53.408302	-6.321364	78.70	12.04	90.74
26	53.408428	-6.319695	78.70	12.04	90.74
27	53.408324	-6.319673	78.70	13.19	91.89

Name: Array 2
Axis tracking: Fixed (no rotation)
Tilt: 5.0°
Orientation: 172.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.408176	-6.319642	78.70	13.19	91.89
2	53.408072	-6.319619	78.70	12.04	90.74
3	53.407946	-6.321289	78.70	12.04	90.74
4	53.407955	-6.321290	78.70	12.14	90.84
5	53.407961	-6.321201	78.70	12.14	90.84
6	53.407968	-6.321196	78.70	12.21	90.91
7	53.407979	-6.321044	78.70	12.21	90.91
8	53.407983	-6.321033	78.70	12.24	90.94
9	53.407992	-6.321035	78.70	12.34	91.04
10	53.407999	-6.320945	78.70	12.34	91.04
11	53.408005	-6.320940	78.70	12.41	91.11
12	53.408017	-6.320788	78.70	12.41	91.11
13	53.408029	-6.320779	78.70	12.53	91.23
14	53.408036	-6.320689	78.70	12.53	91.23
15	53.408043	-6.320684	78.70	12.60	91.30
16	53.408056	-6.320511	78.70	12.60	91.30
17	53.408069	-6.320501	78.70	12.73	91.43
18	53.408075	-6.320412	78.70	12.73	91.43
19	53.408082	-6.320406	78.70	12.80	91.50
20	53.408094	-6.320255	78.70	12.80	91.50
21	53.408106	-6.320245	78.70	12.93	91.63
22	53.408113	-6.320156	78.70	12.93	91.63
23	53.408120	-6.320150	78.70	12.99	91.69
24	53.408133	-6.319977	78.70	12.99	91.69
25	53.408145	-6.319968	78.70	13.12	91.82
26	53.408152	-6.319878	78.70	13.12	91.82
27	53.408159	-6.319873	78.70	13.19	91.89
28	53.408176	-6.319642	78.70	13.19	91.89

Name: Array 3
Axis tracking: Fixed (no rotation)
Tilt: 4.0°
Orientation: 248.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.407488	-6.321343	78.70	13.60	92.30
2	53.407555	-6.321073	78.70	15.08	93.78
3	53.406540	-6.320362	78.70	15.08	93.78
4	53.406473	-6.320632	78.70	13.60	92.30
5	53.407488	-6.321343	78.70	13.60	92.30

Flight Path Receptor(s)

Name: 10L Runway
Description: None
Threshold height: 15 m
Direction: 95.8°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 120.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.436880	-6.280253	71.90	15.20	87.10
Two-mile	53.439822	-6.328592	74.90	180.90	255.80

Name: 10 Runway
Description: None
Threshold height: 15 m
Direction: 95.8°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 120.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.422405	-6.289520	74.00	15.30	89.30
Two-mile	53.425327	-6.337846	80.30	177.60	257.90

Name: 16 Runway
Description: None
Threshold height: 15 m
Direction: 156.1°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 120.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.436699	-6.261764	66.50	15.20	81.70
Two-mile	53.463138	-6.281428	69.70	180.70	250.40

Name: 28R Runway
Description: None
Threshold height: 15 m
Direction: 275.9°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 120.0°



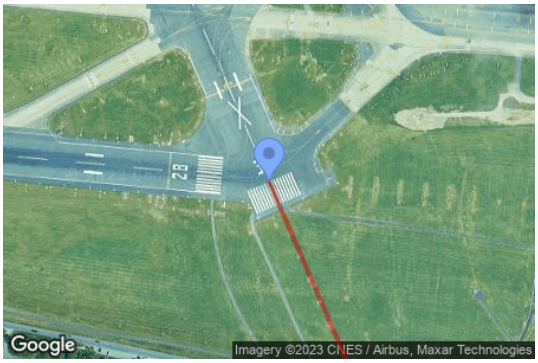
Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.435084	-6.240975	65.50	15.30	80.80
Two-mile	53.432097	-6.192645	34.00	215.50	249.50

Name: 28 Runway
Description: None
Threshold height: 15 m
Direction: 275.5°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 120.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.420299	-6.251111	62.00	15.20	77.20
Two-mile	53.417517	-6.202763	41.90	204.00	245.90

Name: 34 Runway
Description: None
Threshold height: 15 m
Direction: 336.6°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 120.0°

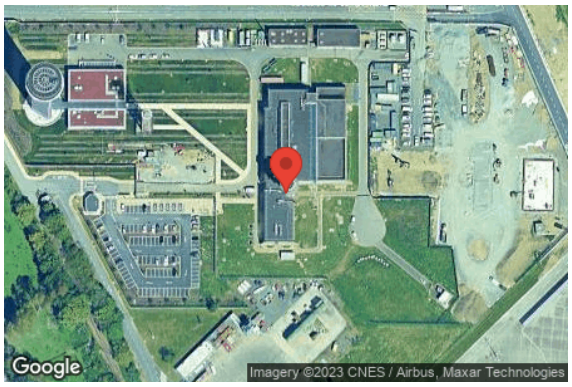


Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.420211	-6.249810	62.20	15.30	77.50
Two-mile	53.393680	-6.230504	49.00	197.10	246.10

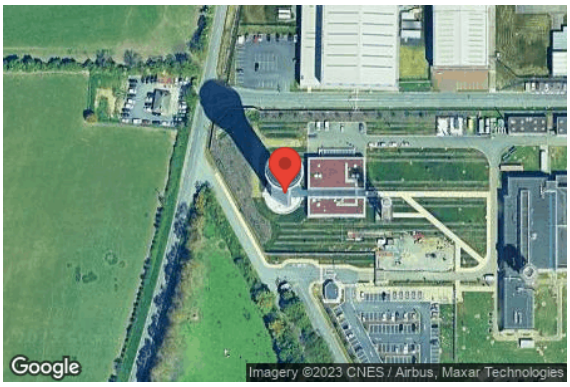
Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
1-ATCT	1	53.428489	-6.262201	65.90	21.90
2-ATCT	2	53.428937	-6.264259	65.60	75.60

Map image of 1-ATCT



Map image of 2-ATCT



GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
Array 1	5.0	352.0	49,122	0	-
Array 2	5.0	172.0	3,348	0	-
Array 3	4.0	248.0	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
10L Runway	12868	0
10 Runway	21805	0
16 Runway	9173	0
28R Runway	1809	0
28 Runway	1597	0
34 Runway	3729	0
1-ATCT	678	0
2-ATCT	811	0

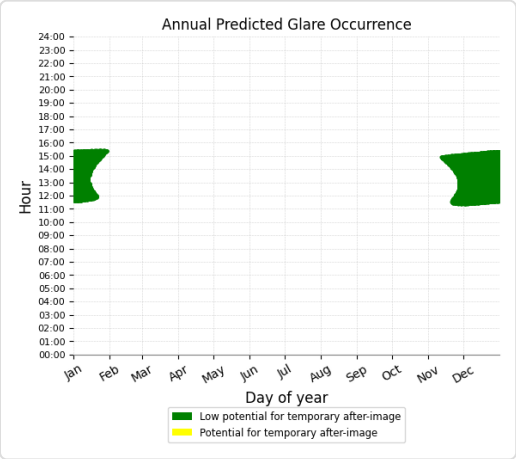
Results for: Array 1

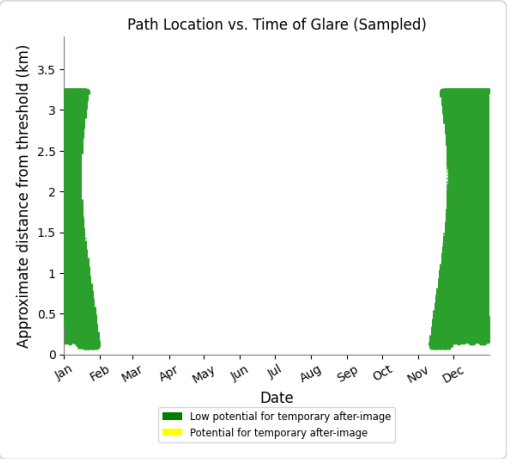
Receptor	Green Glare (min)	Yellow Glare (min)
10L Runway	12868	0
10 Runway	21805	0
16 Runway	9173	0
28R Runway	1807	0
28 Runway	1000	0
34 Runway	980	0
1-ATCT	678	0
2-ATCT	811	0

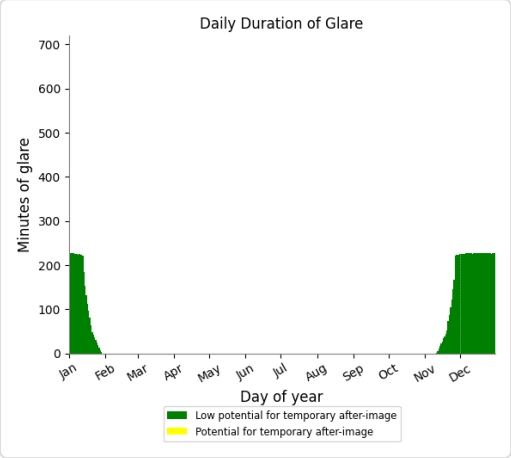
Flight Path: 10L Runway

0 minutes of yellow glare

12868 minutes of green glare



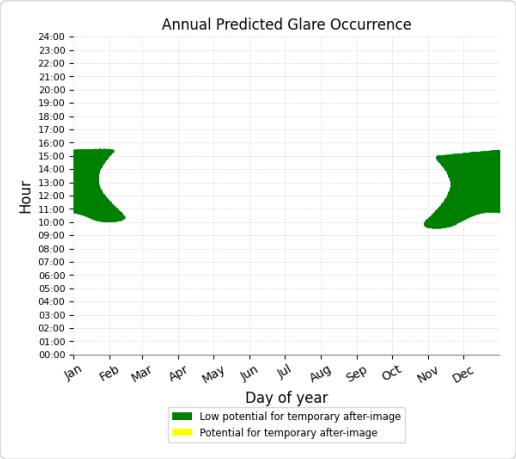


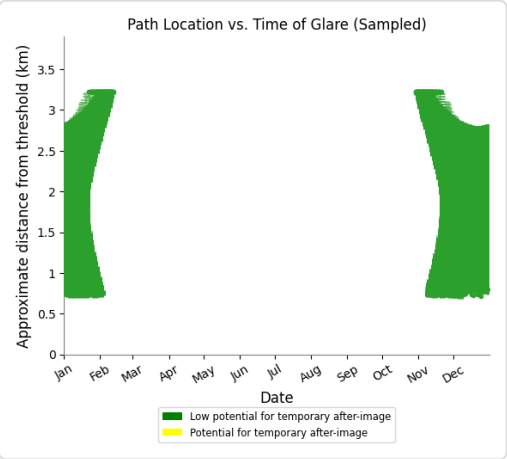


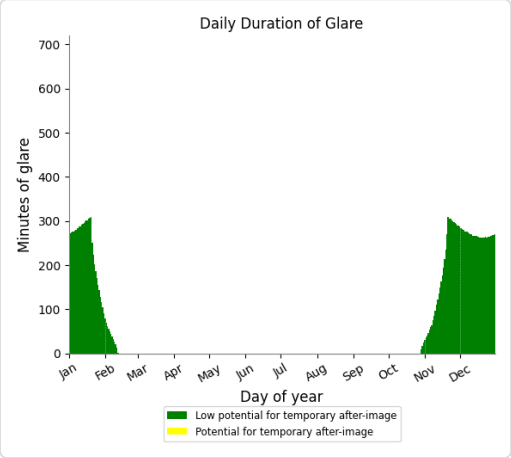
Flight Path: 10 Runway

0 minutes of yellow glare

21805 minutes of green glare



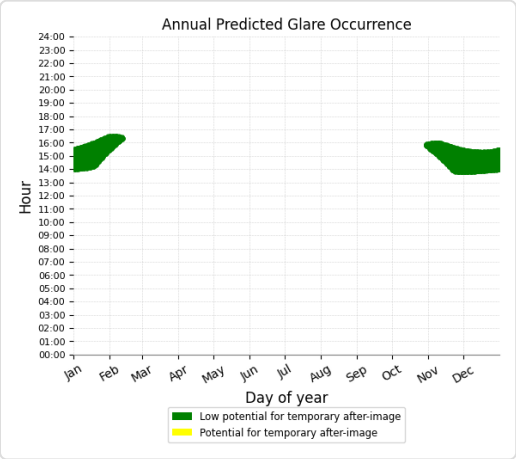


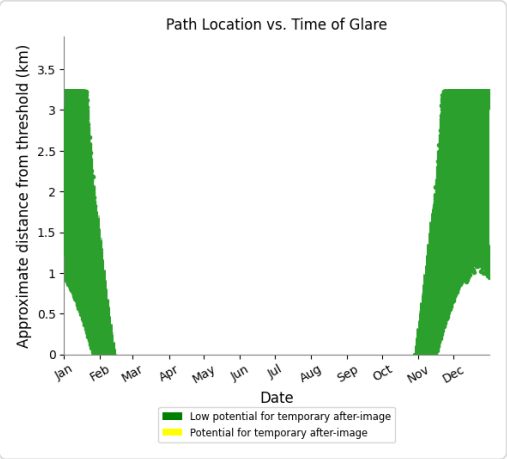


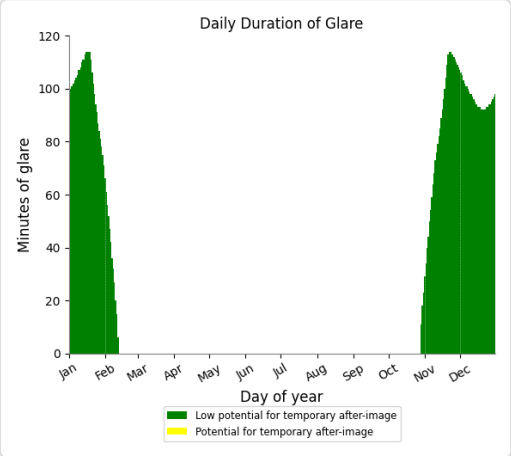
Flight Path: 16 Runway

0 minutes of yellow glare

9173 minutes of green glare



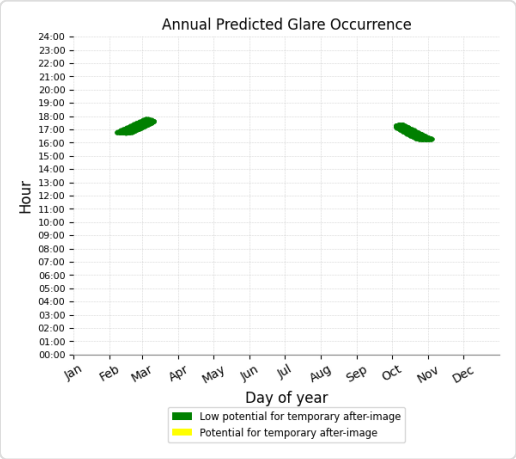


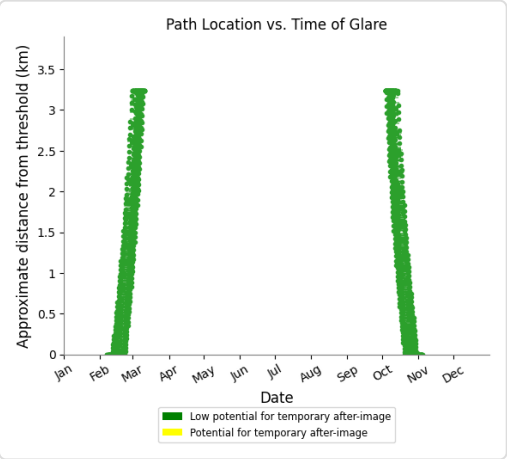


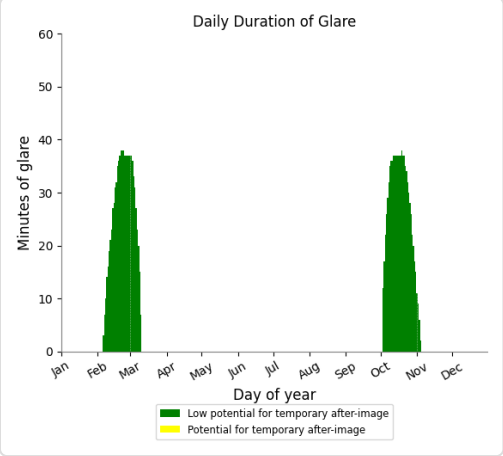
Flight Path: 28R Runway

0 minutes of yellow glare

1807 minutes of green glare



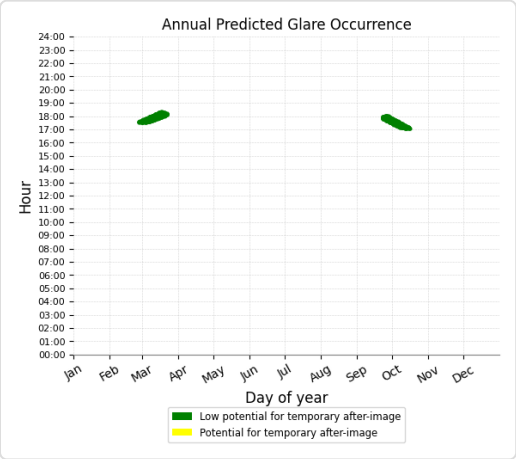


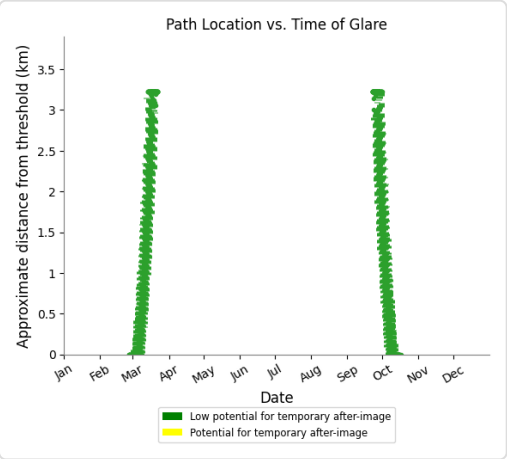


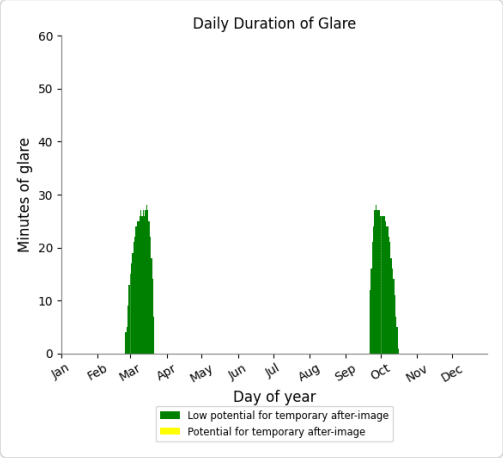
Flight Path: 28 Runway

0 minutes of yellow glare

1000 minutes of green glare

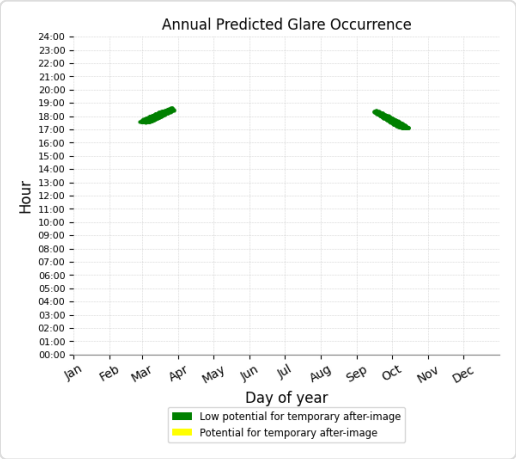


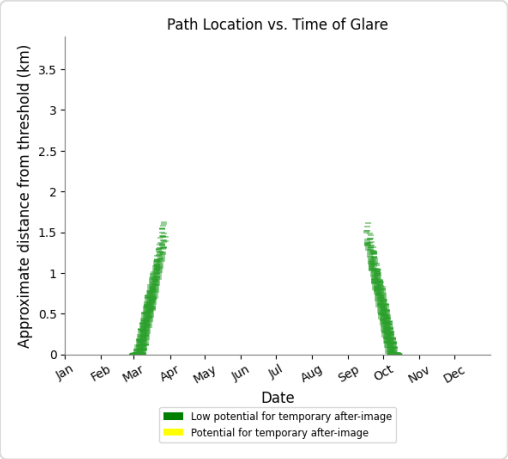


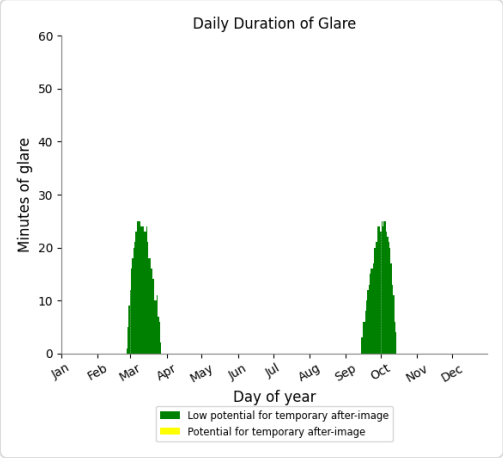


Flight Path: 34 Runway

0 minutes of yellow glare
980 minutes of green glare

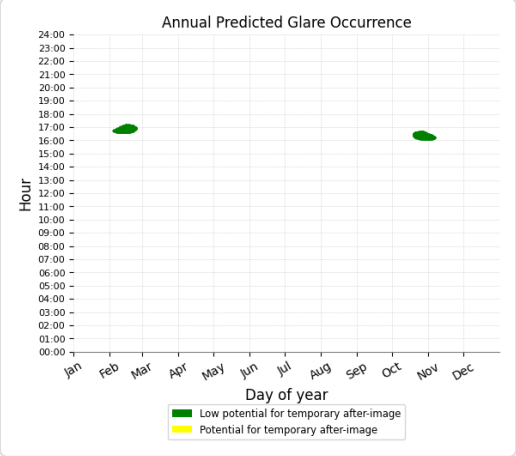


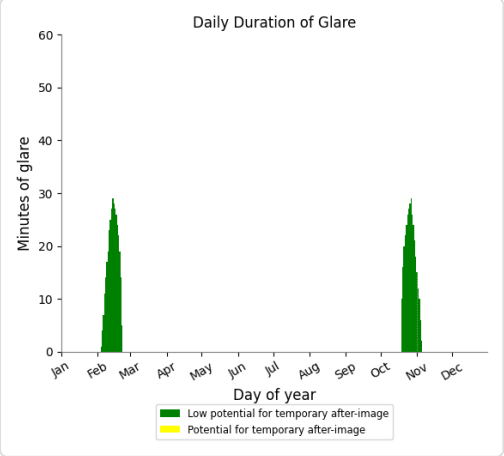




Point Receptor: 1-ATCT

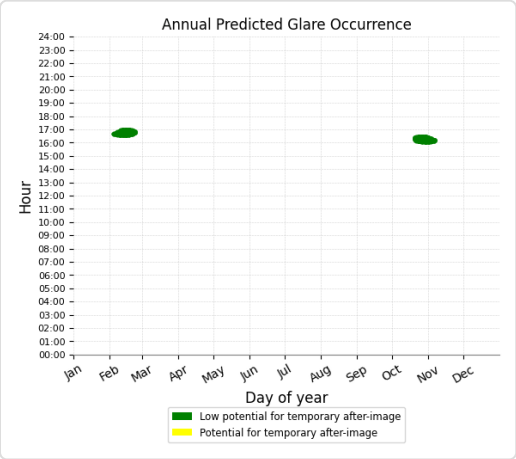
0 minutes of yellow glare
678 minutes of green glare

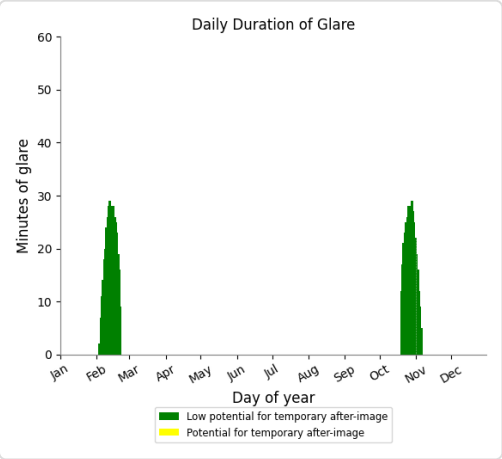




Point Receptor: 2-ATCT

0 minutes of yellow glare
811 minutes of green glare





Results for: Array 2

Receptor	Green Glare (min)	Yellow Glare (min)
10L Runway	0	0
10 Runway	0	0
16 Runway	0	0
28R Runway	2	0
28 Runway	597	0
34 Runway	2749	0
1-ATCT	0	0
2-ATCT	0	0

Flight Path: 10L Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: 10 Runway

0 minutes of yellow glare
0 minutes of green glare

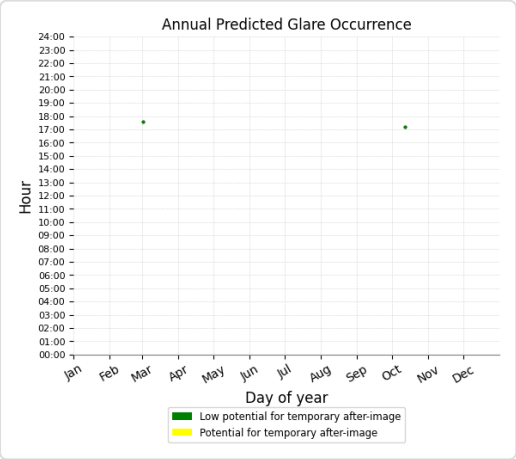
Flight Path: 16 Runway

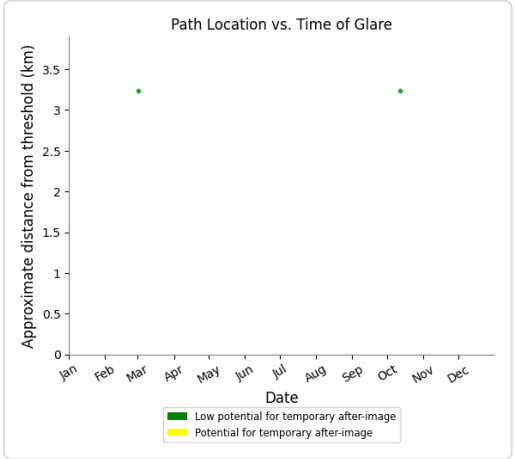
0 minutes of yellow glare
0 minutes of green glare

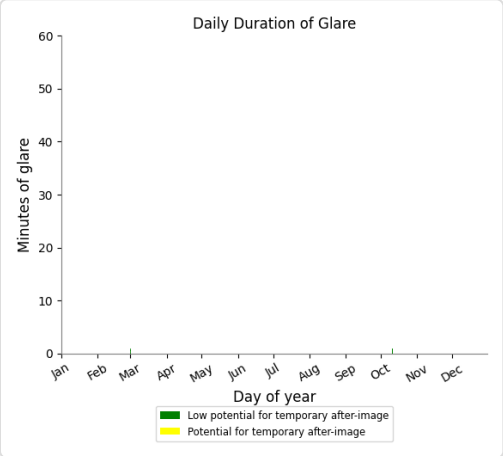
Flight Path: 28R Runway

0 minutes of yellow glare

2 minutes of green glare



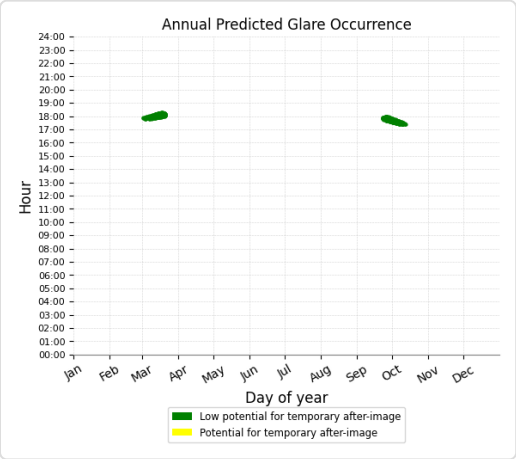


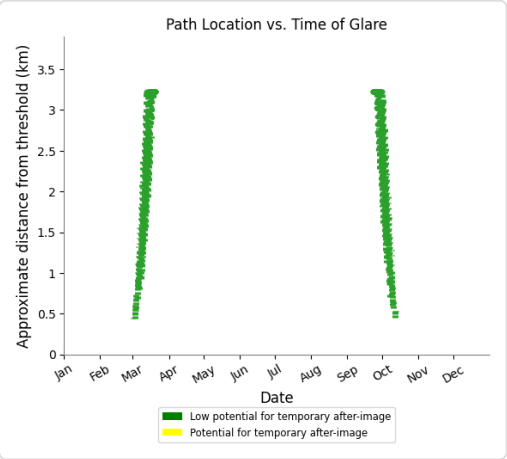


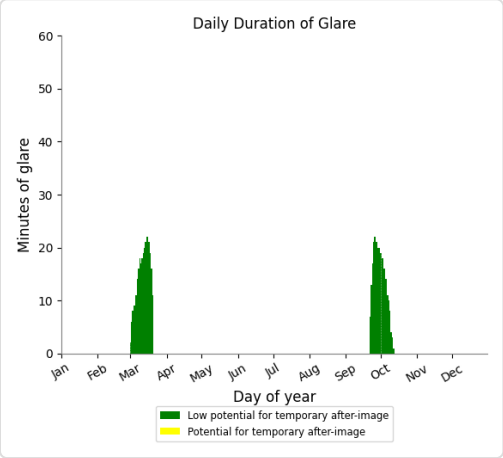
Flight Path: 28 Runway

0 minutes of yellow glare

597 minutes of green glare

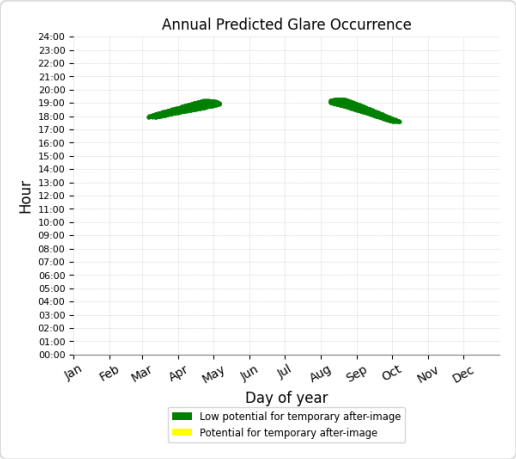


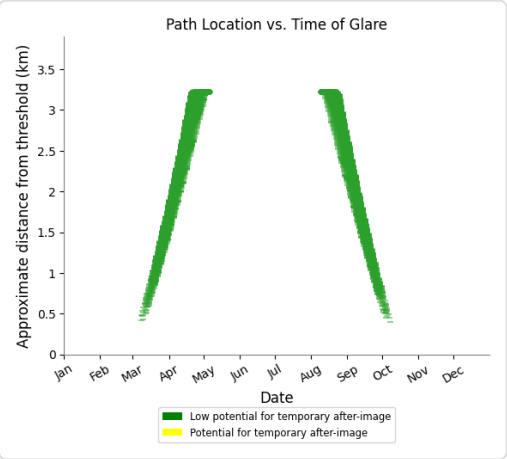


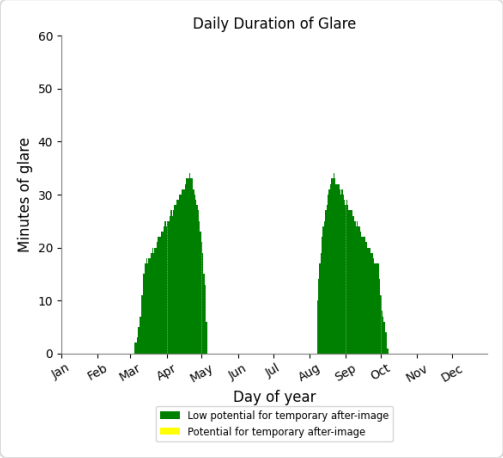


Flight Path: 34 Runway

0 minutes of yellow glare
2749 minutes of green glare







Point Receptor: 1-ATCT

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: 2-ATCT

0 minutes of yellow glare
0 minutes of green glare

Results for: Array 3

Receptor	Green Glare (min)	Yellow Glare (min)
10L Runway	0	0
10 Runway	0	0
16 Runway	0	0
28R Runway	0	0
28 Runway	0	0
34 Runway	0	0
1-ATCT	0	0
2-ATCT	0	0

Flight Path: 10L Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: 10 Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: 16 Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: 28R Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: 28 Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: 34 Runway

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: 2-ATCT

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to V1 algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

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FORGESOLAR GLARE ANALYSIS

Project: **Dublin Airport SGHAT**
Site configuration: **Hunststown Td**
Analysis conducted by Luis Dominguez (luis@macroworks.ie) at 09:29 on 21 Mar, 2023.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	PASS	Flight path receptor(s) do not receive yellow glare
ATCT(s)	FAIL	Receptor(s) marked as ATCT receive green and/or yellow glare

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 86659.12200
Methodology: V2



PV Array(s)

Name: Array 1
Axis tracking: Fixed (no rotation)
Tilt: 5.0°
Orientation: 352.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.408324	-6.319673	78.70	13.19	91.89
2	53.408306	-6.319904	78.70	13.19	91.89
3	53.408312	-6.319912	78.70	13.12	91.82
4	53.408305	-6.320002	78.70	13.12	91.82
5	53.408316	-6.320016	78.70	12.99	91.69
6	53.408303	-6.320189	78.70	12.99	91.69
7	53.408308	-6.320197	78.70	12.93	91.63
8	53.408302	-6.320287	78.70	12.93	91.63
9	53.408312	-6.320301	78.70	12.80	91.50
10	53.408301	-6.320453	78.70	12.80	91.50
11	53.408307	-6.320461	78.70	12.73	91.43
12	53.408300	-6.320550	78.70	12.73	91.43
13	53.408310	-6.320571	78.70	12.60	91.30
14	53.408297	-6.320738	78.70	12.60	91.30
15	53.408303	-6.320746	78.70	12.53	91.23
16	53.408296	-6.320835	78.70	12.53	91.23
17	53.408307	-6.320850	78.70	12.41	91.11
18	53.408296	-6.321001	78.70	12.41	91.11
19	53.408301	-6.321009	78.70	12.34	91.04
20	53.408295	-6.321099	78.70	12.34	91.04
21	53.408305	-6.321113	78.70	12.21	90.91
22	53.408294	-6.321264	78.70	12.21	90.91
23	53.408299	-6.321273	78.70	12.14	90.84
24	53.408293	-6.321362	78.70	12.14	90.84
25	53.408302	-6.321364	78.70	12.04	90.74
26	53.408428	-6.319695	78.70	12.04	90.74
27	53.408324	-6.319673	78.70	13.19	91.89

Name: Array 2
Axis tracking: Fixed (no rotation)
Tilt: 5.0°
Orientation: 172.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.408176	-6.319642	78.70	13.19	91.89
2	53.408072	-6.319619	78.70	12.04	90.74
3	53.407946	-6.321289	78.70	12.04	90.74
4	53.407955	-6.321290	78.70	12.14	90.84
5	53.407961	-6.321201	78.70	12.14	90.84
6	53.407968	-6.321196	78.70	12.21	90.91
7	53.407979	-6.321044	78.70	12.21	90.91
8	53.407983	-6.321033	78.70	12.24	90.94
9	53.407992	-6.321035	78.70	12.34	91.04
10	53.407999	-6.320945	78.70	12.34	91.04
11	53.408005	-6.320940	78.70	12.41	91.11
12	53.408017	-6.320788	78.70	12.41	91.11
13	53.408029	-6.320779	78.70	12.53	91.23
14	53.408036	-6.320689	78.70	12.53	91.23
15	53.408043	-6.320684	78.70	12.60	91.30
16	53.408056	-6.320511	78.70	12.60	91.30
17	53.408069	-6.320501	78.70	12.73	91.43
18	53.408075	-6.320412	78.70	12.73	91.43
19	53.408082	-6.320406	78.70	12.80	91.50
20	53.408094	-6.320255	78.70	12.80	91.50
21	53.408106	-6.320245	78.70	12.93	91.63
22	53.408113	-6.320156	78.70	12.93	91.63
23	53.408120	-6.320150	78.70	12.99	91.69
24	53.408133	-6.319977	78.70	12.99	91.69
25	53.408145	-6.319968	78.70	13.12	91.82
26	53.408152	-6.319878	78.70	13.12	91.82
27	53.408159	-6.319873	78.70	13.19	91.89
28	53.408176	-6.319642	78.70	13.19	91.89

Name: Array 3
Axis tracking: Fixed (no rotation)
Tilt: 4.0°
Orientation: 248.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	53.407488	-6.321343	78.70	13.60	92.30
2	53.407555	-6.321073	78.70	15.08	93.78
3	53.406540	-6.320362	78.70	15.08	93.78
4	53.406473	-6.320632	78.70	13.60	92.30
5	53.407488	-6.321343	78.70	13.60	92.30

Flight Path Receptor(s)

Name: 10L Runway
Description: None
Threshold height: 15 m
Direction: 95.8°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 120.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.436880	-6.280253	71.90	15.20	87.10
Two-mile	53.439822	-6.328592	74.90	180.90	255.80

Name: 10 Runway
Description: None
Threshold height: 15 m
Direction: 95.8°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 120.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.422405	-6.289520	74.00	15.30	89.30
Two-mile	53.425327	-6.337846	80.30	177.60	257.90

Name: 16 Runway
Description: None
Threshold height: 15 m
Direction: 156.1°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 120.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.436699	-6.261764	66.50	15.20	81.70
Two-mile	53.463138	-6.281428	69.70	180.70	250.40

Name: 28R Runway
Description: None
Threshold height: 15 m
Direction: 275.9°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 120.0°



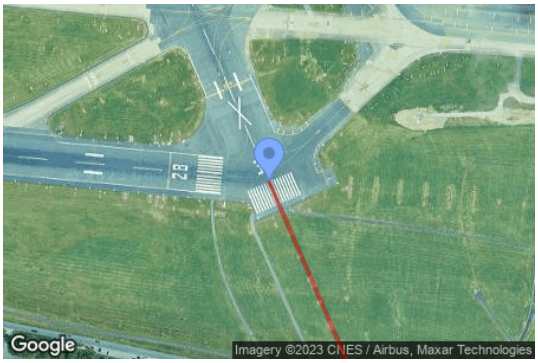
Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.435084	-6.240975	65.50	15.30	80.80
Two-mile	53.432097	-6.192645	34.00	215.50	249.50

Name: 28 Runway
Description: None
Threshold height: 15 m
Direction: 275.5°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 120.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.420299	-6.251111	62.00	15.20	77.20
Two-mile	53.417517	-6.202763	41.90	204.00	245.90

Name: 34 Runway
Description: None
Threshold height: 15 m
Direction: 336.6°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 120.0°

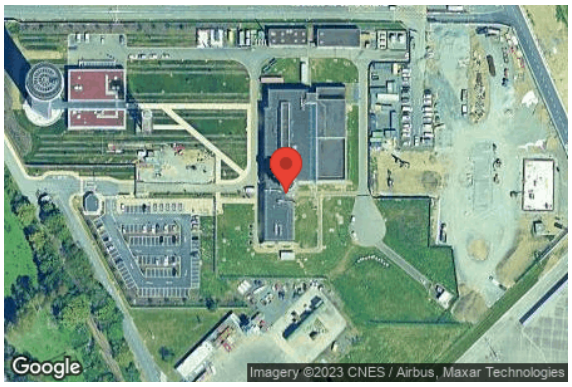


Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	53.420211	-6.249810	62.20	15.30	77.50
Two-mile	53.393680	-6.230504	49.00	197.10	246.10

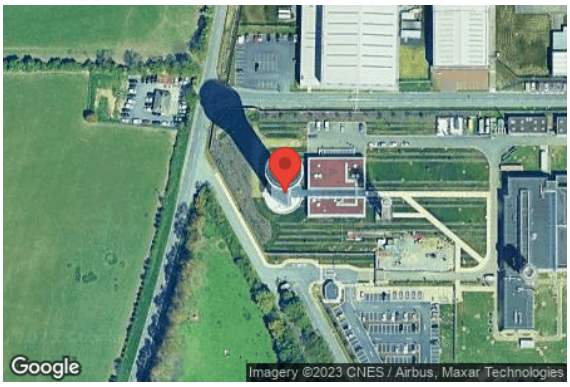
Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
1-ATCT	1	53.428489	-6.262201	65.90	21.90
2-ATCT	2	53.428937	-6.264259	65.60	75.60

Map image of 1-ATCT



Map image of 2-ATCT



GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
Array 1	5.0	352.0	49,122	0	-
Array 2	5.0	172.0	3,348	0	-
Array 3	4.0	248.0	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
10L Runway	12868	0
10 Runway	21805	0
16 Runway	9173	0
28R Runway	1809	0
28 Runway	1597	0
34 Runway	3729	0
1-ATCT	678	0
2-ATCT	811	0

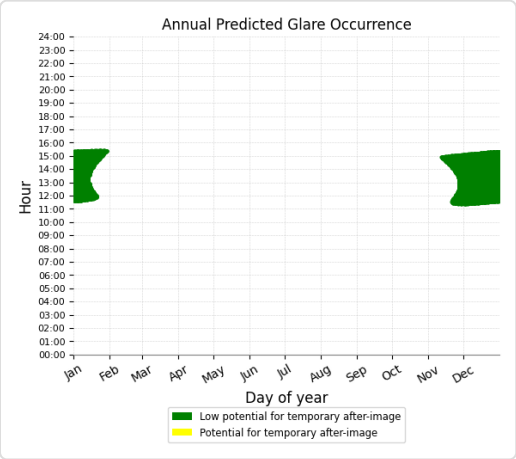
Results for: Array 1

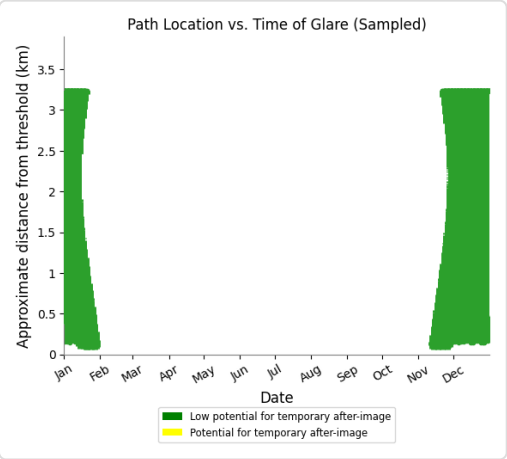
Receptor	Green Glare (min)	Yellow Glare (min)
10L Runway	12868	0
10 Runway	21805	0
16 Runway	9173	0
28R Runway	1807	0
28 Runway	1000	0
34 Runway	980	0
1-ATCT	678	0
2-ATCT	811	0

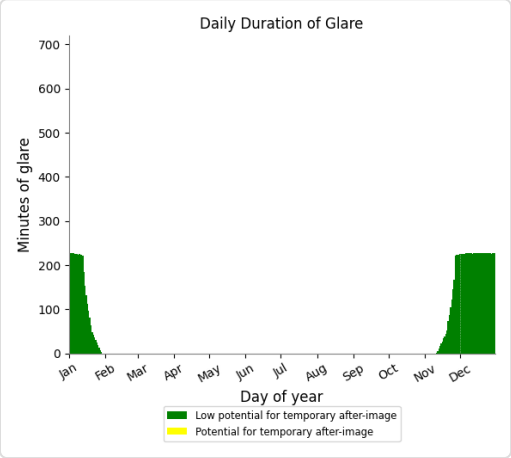
Flight Path: 10L Runway

0 minutes of yellow glare

12868 minutes of green glare



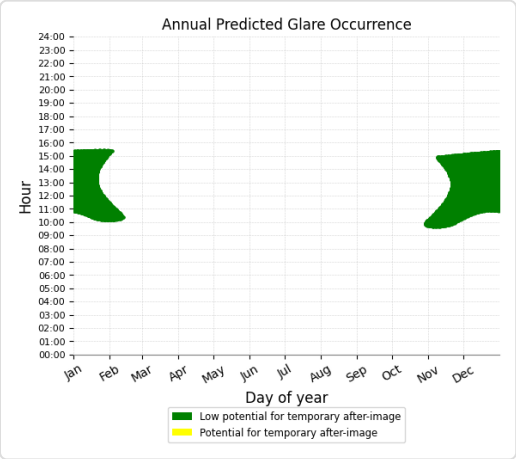


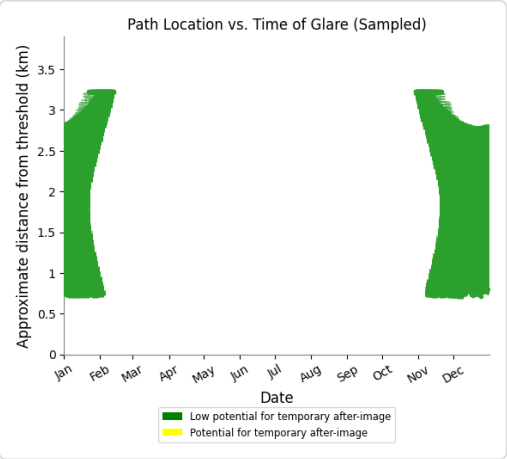


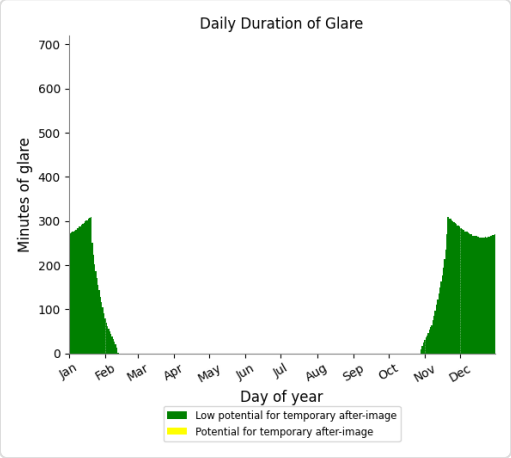
Flight Path: 10 Runway

0 minutes of yellow glare

21805 minutes of green glare



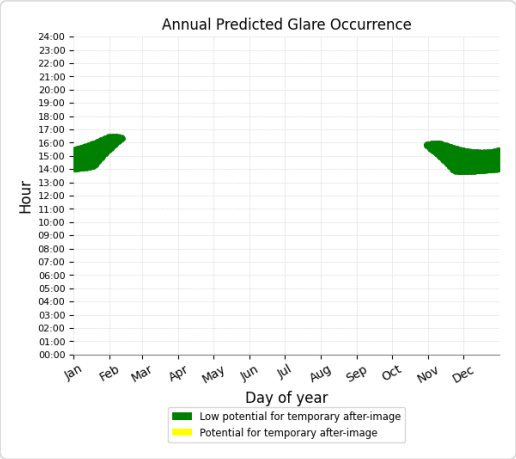


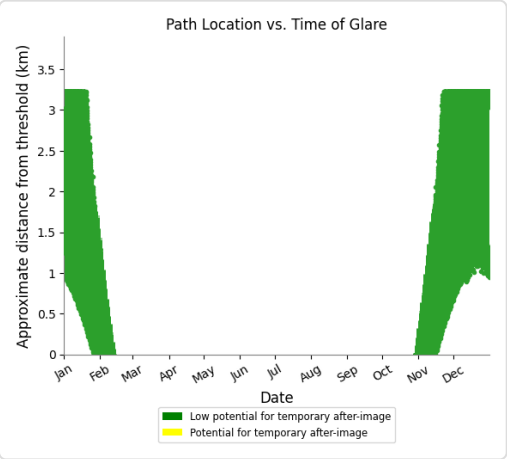


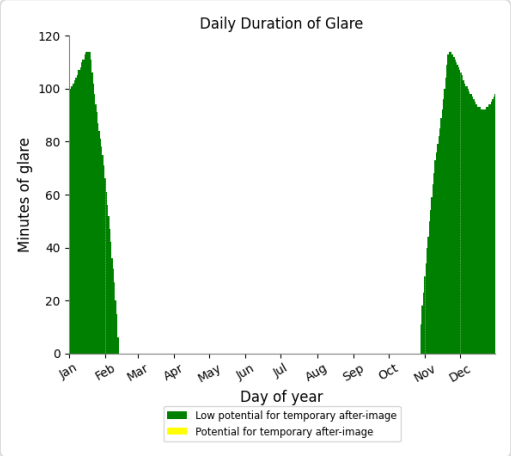
Flight Path: 16 Runway

0 minutes of yellow glare

9173 minutes of green glare



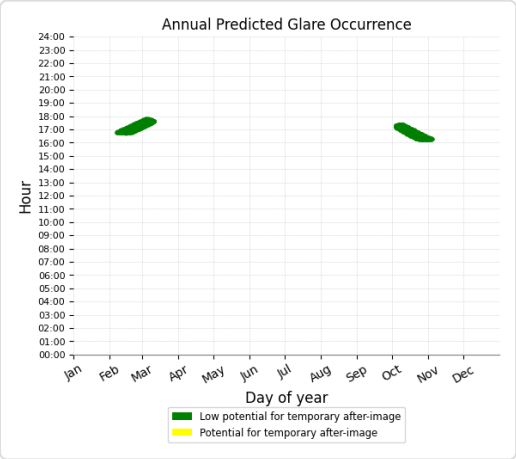


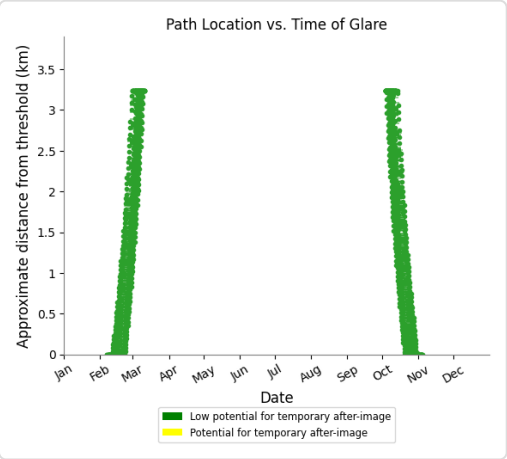


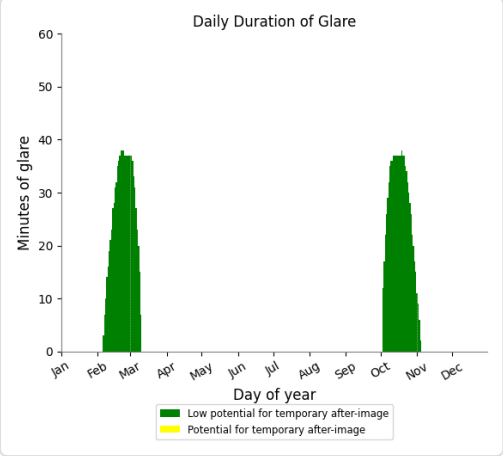
Flight Path: 28R Runway

0 minutes of yellow glare

1807 minutes of green glare



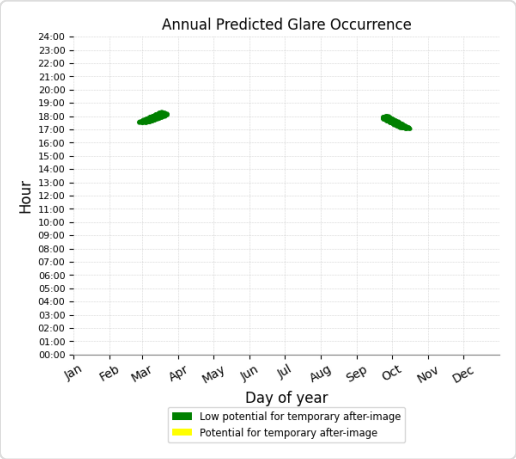


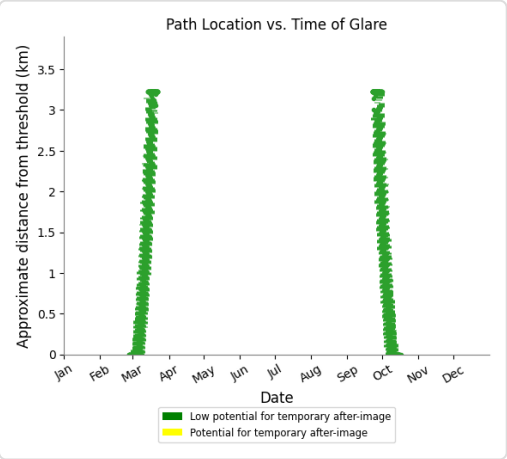


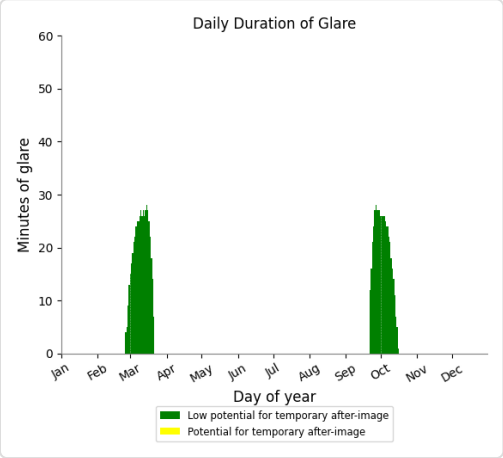
Flight Path: 28 Runway

0 minutes of yellow glare

1000 minutes of green glare

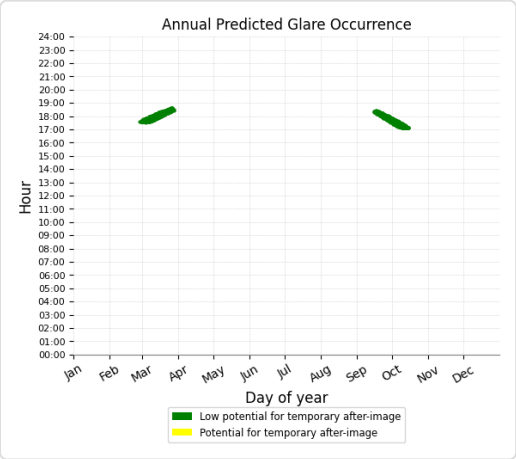


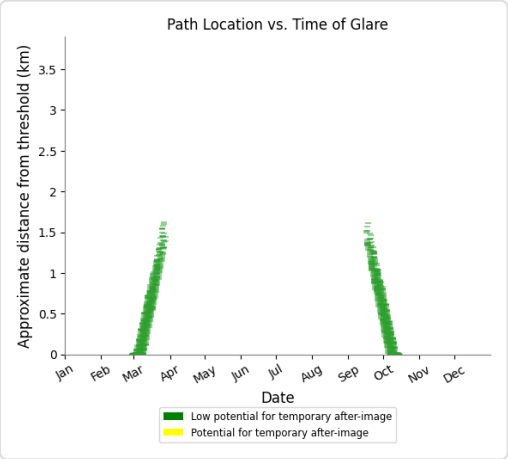


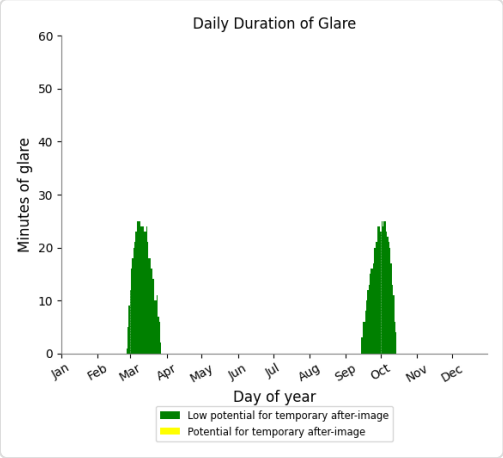


Flight Path: 34 Runway

0 minutes of yellow glare
980 minutes of green glare

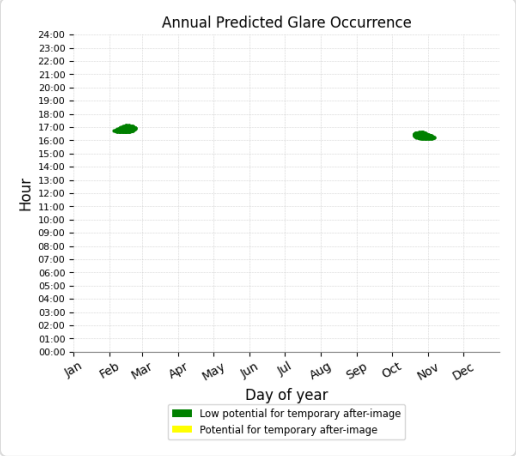


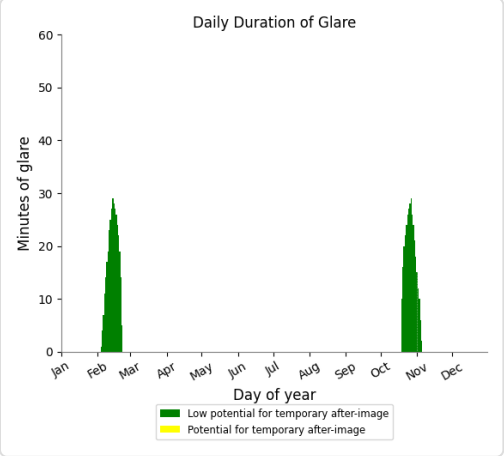




Point Receptor: 1-ATCT

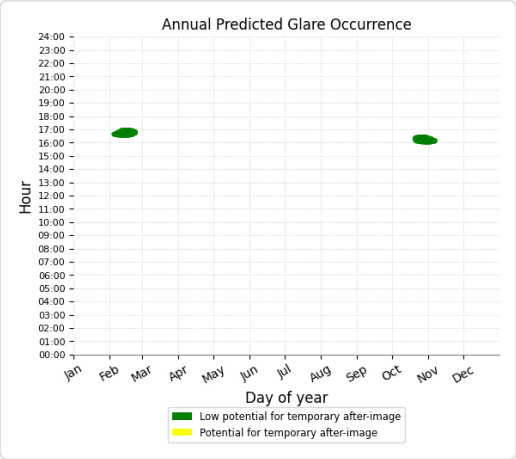
0 minutes of yellow glare
678 minutes of green glare

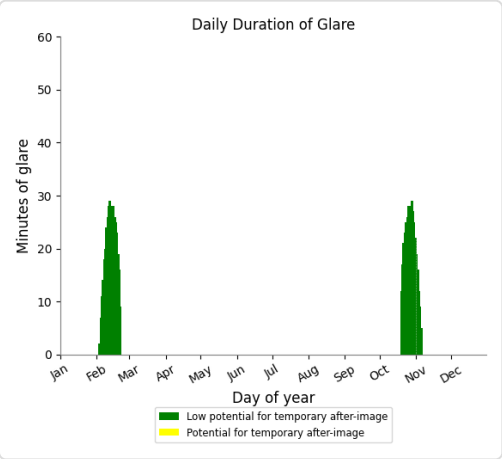




Point Receptor: 2-ATCT

0 minutes of yellow glare
811 minutes of green glare





Results for: Array 2

Receptor	Green Glare (min)	Yellow Glare (min)
10L Runway	0	0
10 Runway	0	0
16 Runway	0	0
28R Runway	2	0
28 Runway	597	0
34 Runway	2749	0
1-ATCT	0	0
2-ATCT	0	0

Flight Path: 10L Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: 10 Runway

0 minutes of yellow glare
0 minutes of green glare

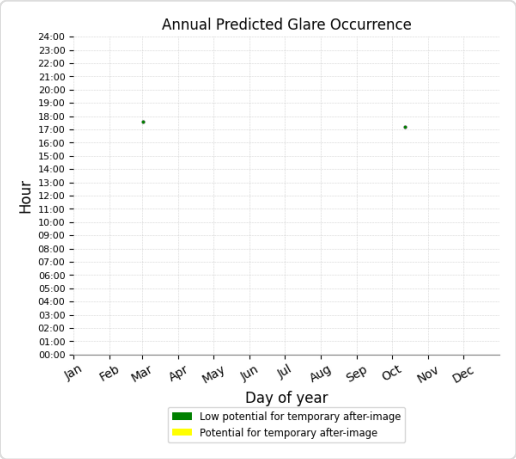
Flight Path: 16 Runway

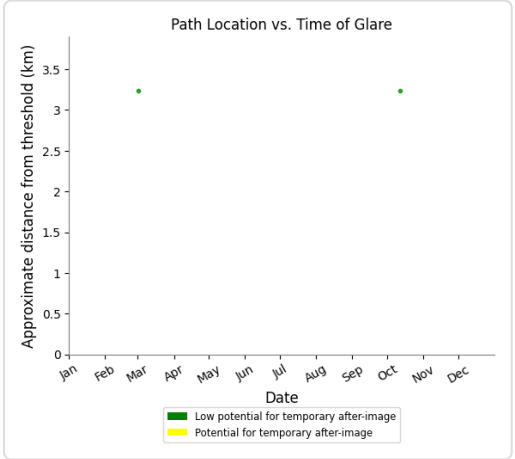
0 minutes of yellow glare
0 minutes of green glare

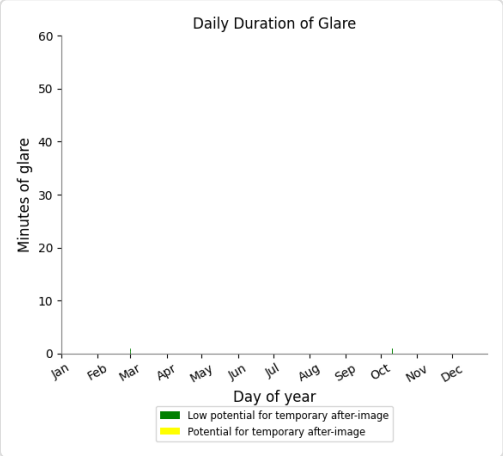
Flight Path: 28R Runway

0 minutes of yellow glare

2 minutes of green glare



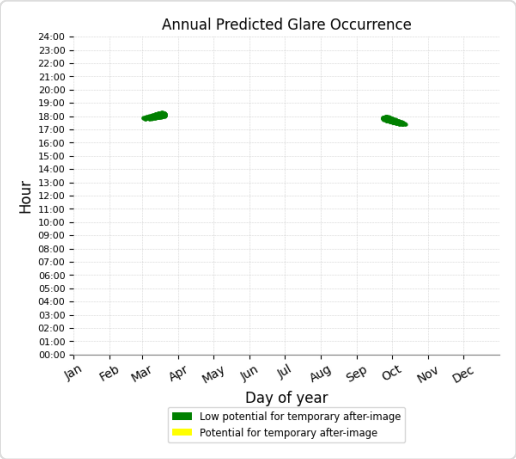


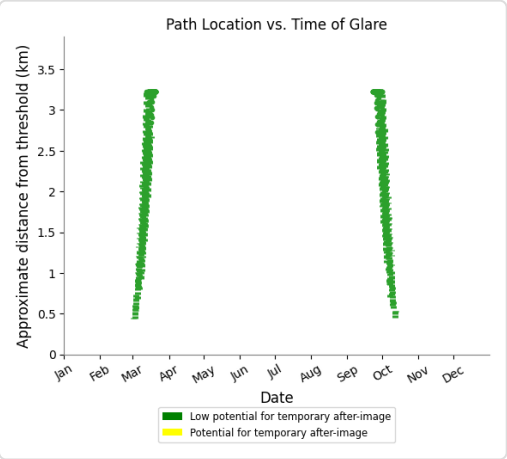


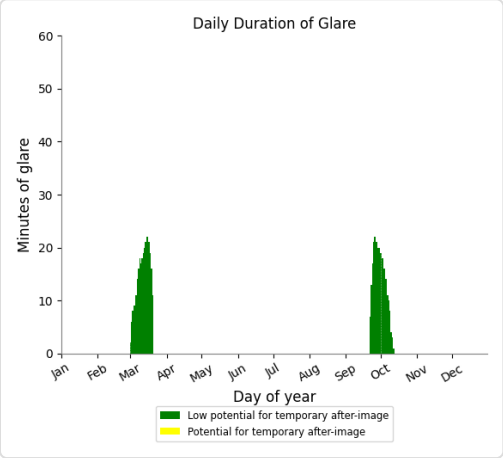
Flight Path: 28 Runway

0 minutes of yellow glare

597 minutes of green glare

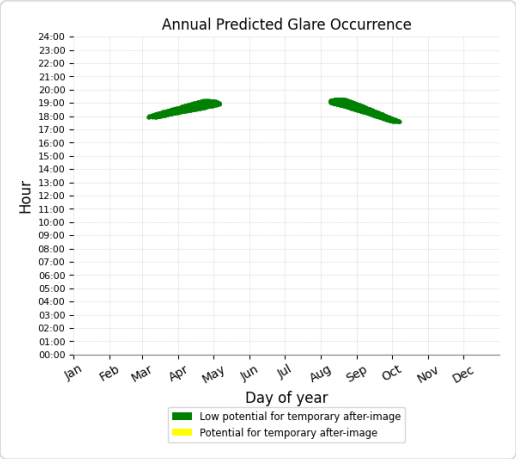


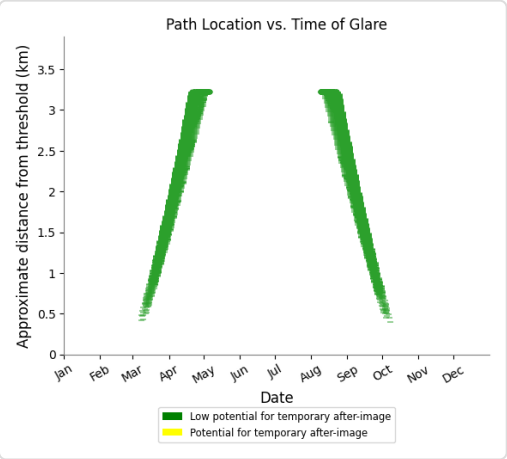


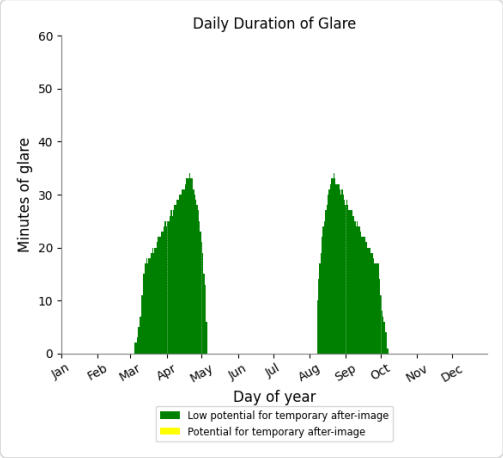


Flight Path: 34 Runway

0 minutes of yellow glare
2749 minutes of green glare







Point Receptor: 1-ATCT

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: 2-ATCT

0 minutes of yellow glare
0 minutes of green glare

Results for: Array 3

Receptor	Green Glare (min)	Yellow Glare (min)
10L Runway	0	0
10 Runway	0	0
16 Runway	0	0
28R Runway	0	0
28 Runway	0	0
34 Runway	0	0
1-ATCT	0	0
2-ATCT	0	0

Flight Path: 10L Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: 10 Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: 16 Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: 28R Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: 28 Runway

0 minutes of yellow glare
0 minutes of green glare

Flight Path: 34 Runway

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: 2-ATCT

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to V1 algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

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APPENDIX 11.1

TREE CONSTRAINTS PLAN

August 20th, 2023

BS5837 TREE SURVEY REPORT

Site at Huntstown Project

ANDREW BOE BSC (HONS) MARBORA
INDEPENDENT ARBORICULTURAL CONSULTANT
Tel: 07834895556 / Email: ajboe@hotmail.co.uk

Site Huntstown Project

Survey details

This initial BS 5837 2012 tree survey report was requested by Genesis Planning Consultants and concerns the tree population of the above site.

All information proved to the author of this report is assumed to be accurate.

The scope of this report is to complete a BS5837 2012- Trees in relation to construction- specification tree survey of the trees and make recommendations for any tree management required.

The survey was carried out using Visual Tree Assessment (VTA) methodologies from ground level only. No below ground, invasive or destructive tests where undertaken. No soil / root samples were taken for analysis.

Weather conditions during the survey were dry with a light wind.

Due to the changing nature of trees and other site circumstances this report, and any recommendations made are limited to a 1-year period. Any alteration to the subject site, trees or any development could change the current circumstances and may invalidate this report and any recommendations made.

The report is valid only for normal weather conditions. Healthy trees or parts of healthy trees may fail in normal weather situations although the risk is significantly increased in storm conditions and as the consequences of such weather phenomena are unforeseeable the tree surveyor cannot be held liable for any such failures.

Any alteration or deletion from this report shall invalidate it as a whole.

Legal and Policy Information

Tree Protection Orders:

It is the understanding of this report that there is no TPO is in place on this property. However this should be confirmed with the local council before work is started as required.

Wildlife protection:

It is a criminal offence under normal circumstances to disturb or destroy – whether intentional or unintentional - the nesting sites of wild birds or the roost sites of bats, under the 'Wildlife & Countryside Act 1981 and the 'Countryside and Rights of Way Act 2000'. Therefore, avoid carrying out significant tree works during the bird nesting season[mid- March to end of July] and ensure that trees are professionally surveyed for signs of bat roosts and/or bat activity before starting any tree work.

Tree details

This site is located across a number of fields with hedges throughout. The amenity value of the trees could be considered low.

Species include Oak and Ash . There are several private properties bordering the site. This survey has been completed on the basis that the locational information provided on the topographical survey is correct.

The site has a population of trees surveyed as individual trees and as groups.

BS5837 Category.

Each tree or group of trees has been assigned a category from the British standard which can be found in the attached survey schedule.

A. This describes a tree which is a good example of the species and is in a prominent position with many decades of contribution remaining.

B. Trees assigned to this category include healthy attractive trees with remediable defects that are in a condition as to be able to make a significant contribution for a minimum of 20 years.

C. Trees in this category include unremarkable trees of limited merit, small-growing, young species which have a relatively low potential amenity value, and low landscape benefits.

U. Trees assigned to this category are in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years and/or are unsuitable for retention in the proximity of new dwellings or areas of public open space.

For a complete list of observations and recommendations on a tree-by-tree basis please consult the attached tree survey schedule.

The tree population has a diversity of ages with the majority being mature.

For a complete list of observations and recommendations on a tree-by-tree basis please consult the attached tree survey schedule.

Trees Suitable for Retention

Where possible, it is generally considered desirable for Category ‘A’ and Category ‘B’ trees to be retained and incorporated into new developments and layouts. Category ‘U’ trees are not considered to be appropriate for retention.

In assessing the Arboricultural Impact on the trees of the proposed development and which

trees might be suitable for retention in the context of the proposed layout the following

factors should be considered.

- Shading-
- Future Pressure for Tree Removal and Pruning
- Seasonal Nuisance
- Infrastructure
- Direct Damage
- Root Protection Areas
- Future Management
- Demolition/Ground Works
- Construction Activity

Tree constraints Plan- TCP

A Tree Constraint Plan was drawn up.

The Tree Constraint Plan is a clear and accurate plan, drawn using AutoCAD, which is plotted directly onto a topographical site survey. It contains the positions and dimensions of all trees on a site at the time of the initial survey.

The Tree Constraint Plan helps to inform future tree management and tree preservation and protection plans. The tree dimensions used on a Tree Constraint Plan include the crown spreads measured at the four cardinal compass points to create a realistic intimation of their shape.

The Tree Constraint Plan will also include root protection areas to indicate both the above and below ground constraints the trees pose. The categorisations of tree quality in accordance with BS5837:2012 (2005) are also indicated on the plan and colour-coded for easy interpretation. The Legend/ Key to the TCP is shown in **figure 1.**

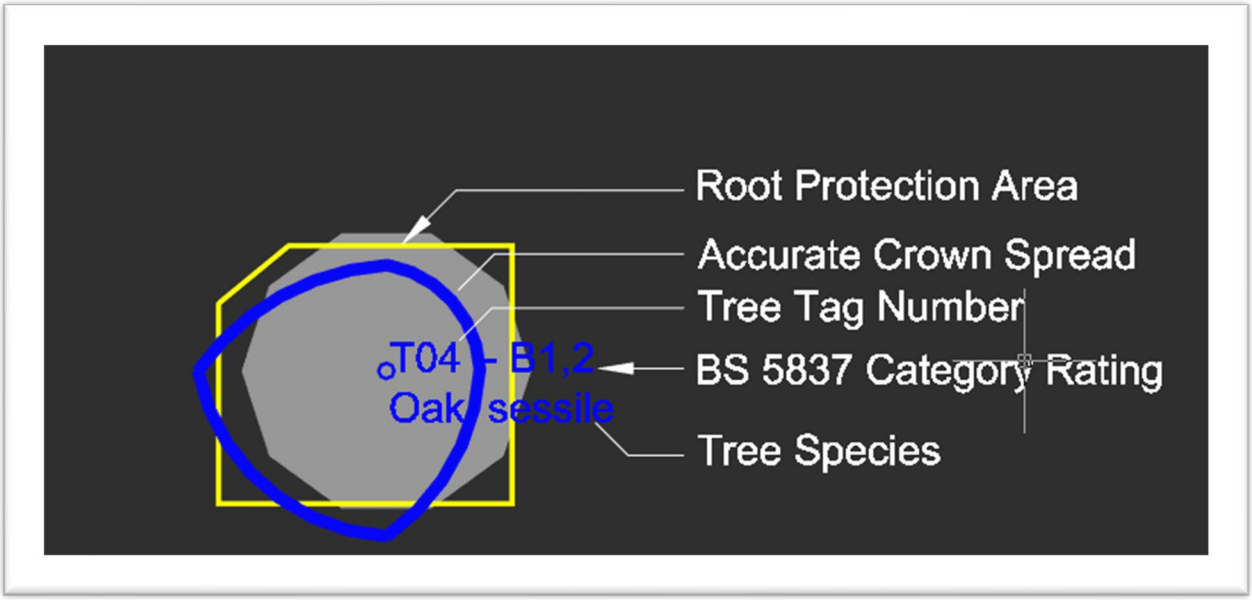


Figure 1- Tree Constraints key

Recommendations

All recommendations are as per the survey schedule below. Recommendations are based on the site at present and may change as its usage develops.

A full tree survey Schedule can be found below.

Each tree or group has been assigned a unique numerical identifying number with the Prefix **'T'** for individual trees and **'G**' for groups of trees.
The following information has been recorded for each tree or group of trees.
All information given is in accordance with British Standards 5837:2012 – Trees in relationto design, demolition and construction – Recommendations.

I. Identification of tree by number value (collates with the associated plans)
II. Common tree species
III. Height (m)
IV. Stem diameter (mm) at 1.5m above ground using a DBH tape (or as per BS5837 figC.1)
V. Branch spread to the four cardinal points (m)
VI. Existing height above ground of first branch and direction (m)
VII. Existing height above ground of canopy (m)
VIII. Life Stage (Young, Semi Mature, Early Mature, Mature, Over Mature)
IX. Estimated Remaining contribution (yrs.) <10, 10+, 20+, 40+
X. General observations; Condition and Preliminary management recommendations;Physical condition and structural defects
XI. Category as per BS5837 Table 1
XII. Root Protection Area (RPA) radius (m)
XIII. Root Protection Area (RPA) m^2

Tree Protection Guidelines

Tree protection plan

Primary tree protection will take the form of Tree Protective fencing as described in **Figure 2.**

The location of tree Protection fencing shown is a suggestion and the final placement should be agreed between the project arboriculturalist and the contractor who will complete the works and must be based on real world limitations.

Location of storage compound and contractors parking

The site has multiple areas for the storage of materials, car parking and staging during construction which are well away from trees.

A final area can be agreed with the arboriculturalist prior to commencement and must avoid all RootProtection areas.

Root protection areas –(RPAS)

The erection of protective fencing as per the Tree Protection Plan (TPP) prior to the

commencement of any works on site will protect the RPA of retained trees.

Existing ground levels should be retained within the RPAs. Intrusions into the soil within the RPAs is generally not acceptable and topsoil within it should remain in situ.

The erection of protective fencing, in this instance, is considered likely to place constraints on elements of the construction and its associated activities and/or possibly limit the working space available, with the subsequent result that incursions into the RPAs of some of the retained trees. Consequently, additional ground protection measures will be required.

Guidance is provided below, which upon adoption, will help to minimise the potential for any detrimental effect that associated ground works and construction might have in respect of retained trees.

Suitable existing hard surfacing that is not proposed for re-use as part of the finished design should be retained to act as temporary ground protection during the construction and, development rather than being removed. The suitability of such surfacing for this purpose should be evaluated by the project arboriculturist and an engineer as appropriate (BS 5837:2012).

The British Standards 5837:2012 advises that new temporary ground protection should be capable of supporting any traffic entering or using the site without being distorted or causing compaction to underlying soil and further provides the following note:

NOTE The ground protection might comprise one of the following:

a) for pedestrian movements only, a single thickness of scaffold boards placed either on top of a driven scaffold frame, so as to form a suspended walkway, or on top of a compression resistant layer (e.g. 100 mm depth of woodchip), laid onto a geotextile membrane;

b) for pedestrian-operated plant up to a gross weight of 2 t, proprietary, inter-linked ground protection boards placed on top of a compression-resistant layer (e.g. 150 mm depth of woodchip), laid onto a geotextile membrane;
c) for wheeled or tracked construction traffic exceeding 2 t gross weight, an alternative system (e.g. proprietary systems or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice, to accommodate the likely loading to which it will be subjected.

Root Protection Fencing.

Protective fencing is essential to preserve root protection areas during the duration of the works.
The location will be agreed with the retained Arboricultural consultant prior to work commencing and will aim to preserve and protect the root systems of retained trees for the duration of the works.
Due to the nature of this site root protection fencing may have to allow for pedestrian movement.
Protective barriers are to be erected prior to the commencement of site works including demolition, soil stripping or movement, bringing onto site of materials, supplies or machinery. Tree works can be undertaken prior to the erection of the barriers.

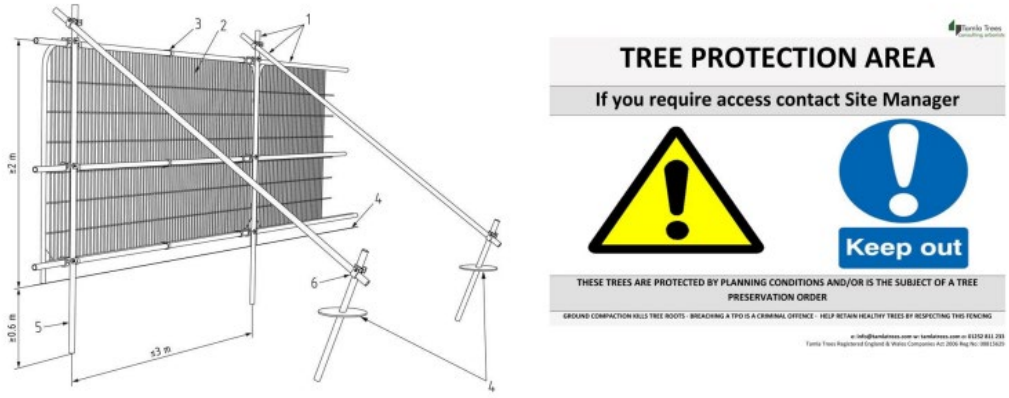
The barriers should be considered essential and should not be removed or altered without prior recommendation by an Arboriculturalist and approval of the local planning authority.

The barrier should consist of a vertical and horizontal framework of scaffold tubing which is adequately braced to resist impacts. The vertical scaffold tubes need to be placed at a distance not exceeding 3m apart and driven securely into the ground for a minimum depth of 0.6m. Care should be taken when locating the vertical poles to avoid underground services and, in the case of the bracing poles, also to avoid any structural roots. The weldmesh or Heras panels need to be a minimum 2.0m tall and are securely attached to the scaffold framework with wire or scaffold clamps.

The wire or scaffold clamps should be secured on the inside of the barrier to avoid easy dismantling. Panels on rubber or concrete feet are not resistant to impact and should not be used.

No fixing shall be made to any tree and all possible care must be taken to prevent damage to tree roots when locating the posts. (Figure 2)

All barriers must be firmly fixed to prevent movement by site personnel or vehicles and include all weather signs with the wording “Construction exclusion zone- keep out”.



To be effective fencing must be robust and clearly signed

Figure 2- Root Protection fencing.

Excavation/Ground Works

The erection of protective fencing and/or use of ground protection, prior to the commencement of any works on site, will allow excavations and ground works to take place without any adverse effect and/or impact on the retained trees.

All plant and vehicles engaged in ground works should either operate outside the RPAs, or run on ground protection in the proximity of retained trees.

Where trees stand adjacent to hard surfaces and/or buildings to be removed, excavation should be undertaken inwards, from within the footprint of the existing hard surfacing or outside of the RPAs.

Hard Surfacing Within the Root Protection Area

General guidance is provided below in the event that a subsequent need transpires.

Arboricultural Practice Note No. 12 describes in detail the requirements of no-dig type installation whilst BS 5837:2012 suggests 'Appropriate sub-base options for new hard surfacing include three-dimensional cellular confinement systems'.

An assessment should be made to establish whether or not the existing site topography lends itself to the installation of a three-dimensional cellular no-dig product upon anticipation of the required and final level changes.

Final on-site measurements should be taken to ascertain the extent of any incursions into the RPA and provide subsequent guidance on the extent of any 'no-dig' installation.

Cross sectional drawings of a suitable product can be seen below (figure 3)

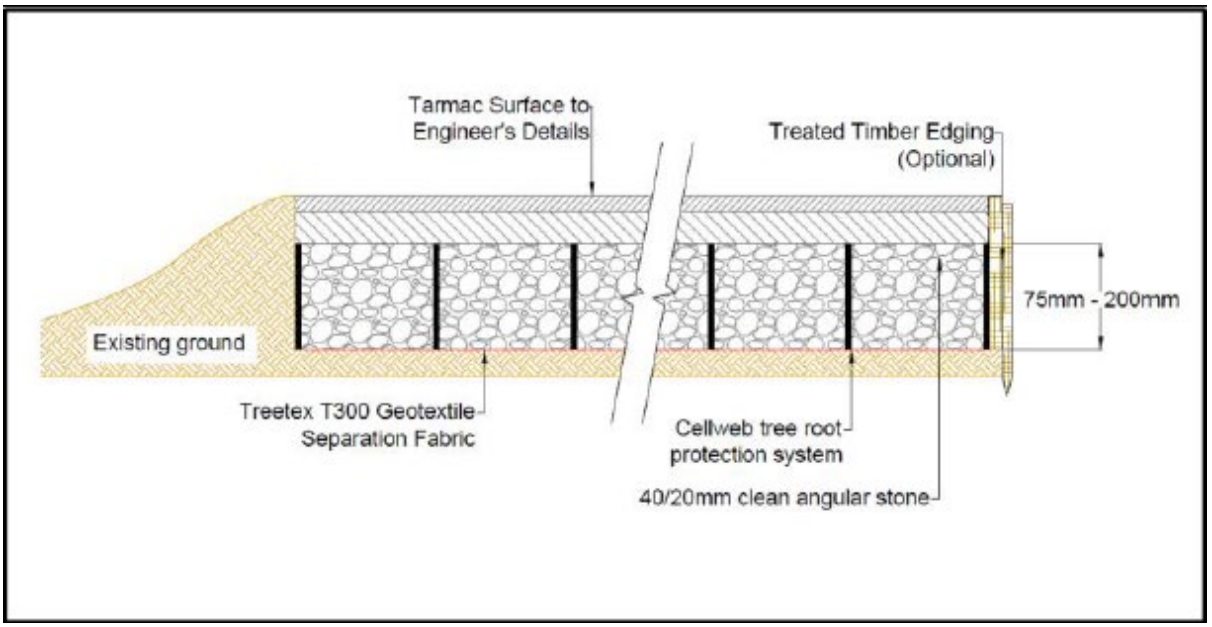


Figure 3. Cross section illustrating a possible permeable tarmac surface finish

General considerations.

To prevent damage to the retained trees, including their roots, within the fenced area (RPA) the following should be avoided.

- Alteration of ground levels, including soil stripping.
- Storage of any materials or equipment, even on a temporary basis.
- Storage of oil, bitumen, cement or other harmful materials, mixed or discharged within 12- m of the trunk of any retained tree and making further allowances for any slope of the ground so prevent running contamination. Phytotoxic materials would include any mineral oil, fuels, cement mortar washings concrete washings, mortar.
- Fires must not be lit beneath or within 12-m of any tree canopies.
- Site operations such as deliveries, site machines, crane jibs etc should be organised to avoid damaging the trunk or crown of trees. Where this conflict is unavoidable then facilitation pruning should be carried out in advance, rather than after damage has occurred. This may also be required to allow demolition operations.
- Mechanical cultivation of the soil as part of landscaping operations.

Direct Damage

Any proposed layout should consider the likelihood of direct damage occurring from incremental root and stem growth and the possibility of the fabric of any new structure being damaged by the whipping of branches against it.

Andrew Boe *BSc (Hons) MArborA*

Tree survey Schedule -

TREE SURVEY TO THE BRITISH STANDARD 5837:2012 "TREES IN RELATION TO CONSTRUCTION - RECOMMENDATIONS"

FIELD KEY:

TREE No.	Tree identification method in sequential order – TXXX=Existing trees, Gx=Group of trees
SPECIES	Species and/or common name;
HEIGHT in (m)	Approximate height of tree in metres;
DBH in (mm)	Stem diameter in millimetres taken at 1.5 metres above ground level; AV=average diameter (see appendix III)
Branch Spread in (m) N - E - S - W	Branch spread in metres reflecting the spread at the four principal compass points; N/A= Not Applicable in woodland settings
Existing height above ground in (m)	Height in metres of crown clearance above existing ground level: To include first significant branch and direction of growth (e.g., 2.5 – N) Height of lower form of Canopy to inform current ground clearance, crown/stem ratio and shading
Life Stage	Age classification (Y=young, SM=semi-mature, EM=early-mature, M=mature, LM=late-mature, OM=over-mature)
Est. remain years	Approximate years remaining (+40=minimum of 40 years, +20=minimum of 20 years, +10=minimum of 10 years, <10 less than 10 years)
General Observations	Condition of tree (good, fair, poor, dead); Structural and/or physiological condition, and/or preliminary management recommendations.
Preliminary management recommendations	Works needed in order to retain tree in current setting or where works would be needed in order to facilitate development.
Physical Condition and Structural Condition	Physiological condition (good, fair, poor, dead); to include and Structural defects such as the presence of any decay, fungal issues, pathogens, defects)
RPA in (m^2)	Area directly calculated from the DBH measurement (single stem/multiple stem variant, as outlined within the Standard, see appendix III);

Appendix 1.

BS5837:2012 Table 1 – Cascade chart for tree quality assessment

Category and definition	Criteria (including subcategories where appropriate)			Identification on plan
Trees unsuitable for retention (see Note)				
Category U Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years	• Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) • Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline • Trees infected with pathogens of significance to the health and/or safety of other trees nearby, or very low quality trees suppressing adjacent trees of better quality *NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve; see [BS5837:2012]* ***4.5.7****.*			
	1 Mainly arboricultural qualities	**2 Mainly landscape qualities**	**3 Mainly cultural values, including conservation**	
Trees to be considered for retention				
Category A **Trees of high quality** with an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of groups or formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)	
Category B **Trees of moderate quality** with an estimated remaining life expectancy of at least 20 years	Trees that might be included in category A, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects, including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value	
Category C **Trees of low quality** with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150 mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value; and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value	

BS5837 Report

Park Hood

Huntstown

Retention Category	No. trees
B	1
C	246
U	18
Total	265

Rem. Contrib.	No. trees
Dead	18
<10 years	64
10+ Years	142
20+ Years	40
40+ Years	1



Ref.	Species	Full Structure	Measurements	Survey Notes	Retention Category	RPA	Comments	Measurements2	Recommendations
T001	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 13 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: 10+ Years	Hedgerow tree. A Single stemmed tree. Poor crown with loss of vigour. Deadwood in the crown. Partially overgrown with Ivy. Pests and Diseases: Ash Dieback Infection Level 2: 25% to 50%	C1	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T002	Elm x18 *(Ulmus sp.)*	Group 18 trees	Height (m): 10 18 stems, avg.(mm): 200 Spread (m): 3N, 3E, 3S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Dead	Group of dead trees within a hedgrow.	U	No RPA due to Retention Category of U.	These trees does not merit retention due to poor condition.	Other Reference: Physiological Cond: Dead Structural Cond: Poor	Fell trees.
T003	Mixed Species Group x40 *(Group, mixed species)*	Hedge 40 trees	Height (m): 5 40 stems, avg.(mm): 200 Spread (m): 2N, 2E, 2S, 2W Crown Clearance (m): 0 Lowest Branch (m): 0(S) Life Stage: Mature Rem. Contrib.: 20+ Years	A mixture of single and multi-stemmed trees. Overgrown hedge.	C1	Area: 3175 sq m.	The surfacing and levels in the RPA should not be altered as long as the tree is being retained.	Other Reference: Physiological Cond: Fair Structural Cond: Fair	No action required.
T004	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 15 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C1	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.

Ref.	Species	Full Structure	Measurements	Survey Notes	Retention Category	RPA	Comments	Measurements2	Recommendations
T005	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 15 Stem Diam(mm): 300 Spread (m): 3N, 3E, 4S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T006	Pedunculate Oak *(Quercus robur)*	Tree	Height (m): 14 Stem Diam(mm): 600 Spread (m): 5N, 5E, 5S, 5W Crown Clearance (m): 2 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: 40+ Years	Hedgerow tree. A Single stemmed tree. Healthy spreading crown. Heavily overgrown with Ivy.	B1	Radius: 7.2m. Area: 163 sq m.	The surfacing and levels in the RPA should not be altered as long as the tree is being retained.	Other Reference: Physiological Cond: Fair Structural Cond: Fair	Sever ivy at base.
T007	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 13 Stem Diam(mm): 400 Spread (m): 3N, 3E, 4S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T008	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 400 Spread (m): 3N, 3E, 4S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T009	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 400 Spread (m): 4N, 4E, 4S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T010	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 15 Stem Diam(mm): 400 Spread (m): 3N, 4E, 3S, 5W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T011	Goat Willow *(Salix caprea)*	Tree	Height (m): 10 Stem Diam(mm): 600 Spread (m): 6N, 6E, 6S, 6W Crown Clearance (m): 0 Lowest Branch (m): 0(S) Life Stage: Mature Rem. Contrib.: 10+ Years	A multi-stemmed tree. Healthy spreading crown.	C1	Radius: 7.2m. Area: 163 sq m.	The surfacing and levels in the RPA should not be altered as long as the tree is being retained.	Other Reference: Physiological Cond: Fair Structural Cond: Fair	No action required.

Ref.	Species	Full Structure	Measurements	Survey Notes	Retention Category	RPA	Comments	Measurements2	Recommendations
T012	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T013	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T014	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T015	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T016	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T017	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 7 Stem Diam(mm): 200 Spread (m): 2N, 2E, 2S, 2W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 2.4m. Area: 18 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T018	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.

Ref.	Species	Full Structure	Measurements	Survey Notes	Retention Category	RPA	Comments	Measurements2	Recommendations
T019	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T020	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T021	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T022	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T023	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T024	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 12 Stem Diam(mm): 300 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T025	Mixed Species Group x30 *(Group, mixed species)*	Hedge 30 trees	Height (m): 6 30 stems, avg.(mm): 200 Spread (m): 3N, 3E, 3S, 3W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Mature Rem. Contrib.: 10+ Years	A mixture of single and multi-stemmed trees. Hedge row Trees	C1	Area: 2312 sq m.	The surfacing and levels in the RPA should not be altered as long as the tree is being retained.	Other Reference: Physiological Cond: Fair Structural Cond: Fair	No action required.
T026	Common Ash x15 *(Fraxinus excelsior)*	Group 15 trees	Height (m): 6 15 stems, avg.(mm): 120 Spread (m): 2N, 2E, 2S, 2W Life Stage: Semi Mature Rem. Contrib.: <10 years	Poor crowns with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 2: 25% to 50%	C	Area: 642 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell trees.

Ref.	Species	Full Structure	Measurements	Survey Notes	Retention Category	RPA	Comments	Measurements2	Recommendations
T027	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 8 Stem Diam(mm): 200 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 2.4m. Area: 18 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T028	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 8 Stem Diam(mm): 200 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 2.4m. Area: 18 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T029	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 8 Stem Diam(mm): 200 Spread (m): 3N, 3E, 3S, 3W Life Stage: Mature Rem. Contrib.: <10 years	A Single stemmed tree. Poor crown with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 2.4m. Area: 18 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T030	Common Ash x8 *(Fraxinus excelsior)*	Group 8 trees	Height (m): 6 8 stems, avg.(mm): 200 Spread (m): 2N, 2E, 2S, 2W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Semi Mature Rem. Contrib.: 10+ Years	A mixture of single and multi-stemmed trees. No apparent thinning due to density. Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C1	Area: 1089 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T031	Goat Willow *(Salix caprea)*	Tree	Height (m): 3 Stem Diam(mm): 150 Spread (m): 2N, 2E, 2S, 2W Life Stage: Semi Mature Rem. Contrib.: 10+ Years	A multi-stemmed tree. Healthy spreading crown.	C1	Radius: 1.8m. Area: 10 sq m.	Potect if retained.	Other Reference: Physiological Cond: Fair Structural Cond: Fair	No action required.
T032	Common Ash x13 *(Fraxinus excelsior)*	Group 13 trees	Height (m): 6 13 stems, avg.(mm): 120 Spread (m): 2N, 2E, 2S, 2W Life Stage: Semi Mature Rem. Contrib.: <10 years	Poor crowns with loss of vigour. Pests and Diseases: Ash Dieback Infection Level 2: 25% to 50%	C	Area: 1000 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell trees.
T033	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 600 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 7.2m. Area: 163 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T034	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 400 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.

Ref.	Species	Full Structure	Measurements	Survey Notes	Retention Category	RPA	Comments	Measurements2	Recommendations
T035	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 400 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T036	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 600 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 7.2m. Area: 163 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T037	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 400 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T038	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 400 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 4.8m. Area: 72 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T039	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 300 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T040	Common Ash *(Fraxinus excelsior)*	Tree	Height (m): 16 Stem Diam(mm): 300 Spread (m): 5N, 5E, 5S, 5W Life Stage: Mature Rem. Contrib.: <10 years	Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C	Radius: 3.6m. Area: 41 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T041	Common Ash x6 *(Fraxinus excelsior)*	Group 6 trees	Height (m): 8 6 stems, avg.(mm): 200 Spread (m): 2N, 2E, 2S, 2W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Early Mature Rem. Contrib.: <10 years	Hedgerows Pests and Diseases: Ash Dieback Infection Level 1: 0% to 25%	C1	Area: 268 sq m.	This tree does not merit retention due to disease.	Other Reference: Physiological Cond: Poor Structural Cond: Poor	Fell tree.
T042	Hawthorn *(Crataegus sp.)*	Group	Height (m): 3 Stem Diam(mm): 100 Spread (m): 2N, 2E, 2S, 2W Crown Clearance (m): 0 Lowest Branch (m): 0(S) Life Stage: Mature Rem. Contrib.: 10+ Years	A mixture of single and multi-stemmed trees. Spread over top of small hill.	C1	Area: 1957 sq m.	The surfacing and levels in the RPA should not be altered as long as the tree is being retained.	Other Reference: Physiological Cond: Fair Structural Cond: Fair	No action required.

Ref.	Species	Full Structure	Measurements	Survey Notes	Retention Category	RPA	Comments	Measurements2	Recommendations
T043	Mixed Species Group x100 *(Group, mixed species)*	Group 100 trees	Height (m): 6 100 stems, avg.(mm): 200 Spread (m): 2N, 3E, 2S, 2W Crown Clearance (m): 1 Lowest Branch (m): 1(S) Life Stage: Early Mature Rem. Contrib.: 10+ Years	A mixture of single and multi-stemmed trees. Hedge row Trees	C1	Area: 900 sq m.	The surfacing and levels in the RPA should not be altered as long as the tree is being retained.	Other Reference: Physiological Cond: Fair Structural Cond: Fair	No action required.

APPENDIX 11.2

GREEN INFRASTRUCTURE PLAN

Park Hood

GREEN INFRASTRUCTURE PLAN REPORT

HUNTSTOWN MRF

NOVEMBER 2023/ PROJECT NO. 7670

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DOCUMENT DETAILS
Project Number: 7670
Project Name: Huntstown MRF

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Prepared	Reviewed	Issue date	Revision
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1.0 Introduction

1.0 Introduction

This Green Infrastructure Plan (GIP) has been prepared by Park Hood Chartered Landscape Architects following a request for further information by Fingal County Council in June 2023 in respect of a proposed Materials Recovery Facility along with a Food Container Cleaning Plant at Huntstown Townland and Coldwinters Townland, Co Dublin (Planning Reference: FW23A/0111). The development is phase one of the Huntstown Circular Economy Hub.

The GIP is to be read in conjunction with the following drawings:

- 7670-L-2100 Landscape Masterplan
- 7670-L-2101 Landscape Plan - Phase One - Huntstown Circular Economy Hub
- 7670-L-2102 Phase One
- 7670-L-RPT-01 Landscape Management and Maintenance Plan
- 7670-L-2700 Development Impact Plan



Proposed phased works



Site Application Boundary

1.1 What is a Green Infrastructure Plan?

The following summaries what such a plan is based on Green Infrastructure Planning Principles: An Integrated Literature Review (Renato Monteiro, José C. Ferreira and Paula Antunes 2020):-

"Green infrastructure is a strategically planned network of natural and semi-natural areas, including green and blue spaces and other ecosystems, designed and managed to deliver a wide range of ecosystem services at various scales. Apart from the ecological functions, green infrastructure, as a planning tool, contributes to social and economic benefits, leading to the achievement of sustainable, resilient, inclusive and competitive urban areas. Despite recent developments, there is still no consensus among researchers and practitioners regarding the concept of green infrastructure as well as its implementation approaches, which makes it often difficult for urban planners and other professionals in the field to develop a robust green infrastructure in some parts of the world. To address this issue, an integrative literature review was conducted to identify which green infrastructure planning principles should be acknowledged in spatial planning practices to promote sustainability and resilience. As a result of this literature review, the most common eight green infrastructure planning principles were selected-connectivity, multifunctionality, applicability, integration, diversity, multiscale, governance, and continuity. These principles intend to promote and simplify the development and use of green infrastructure by different academic and implementation organizations and provide a more defined model for sustainable landscape management in order to help practitioners and decision makers during the conceptualization and planning of green infrastructure."

Within the Fingal County Development Plan 2023 -2029, it notes within Chapter 9 Introduction, the following:-

Green infrastructure can be understood as a planned network of interconnected natural areas such as parks, rivers and open spaces that help to conserve natural ecosystem functions. Green infrastructure planning results in environmental, economic and social benefits by providing nature-based solutions to development objectives. This approach results in resilient urban landscapes adapted for and reducing the negative effects of climate change.
It subsequently sets out the following objectives and policies:-

- 9.5.2 Green Infrastructure and Planning A key objective of green infrastructure planning is that green infrastructure management and provision is integrated with plans for growth and development. All proposals for development must take account of the County's strategic green infrastructure resources and ensure that these are protected, managed and enhanced as new development takes place. In addition, proposals for development must seek to provide for the protection and provision of green infrastructure which addresses the five green infrastructure themes identified in the Development Plan in a coherent and integrated manner.
- 14.18 Green Infrastructure and Natural Heritage Existing green infrastructure should be identified at the initial stages of the planning process for development and should guide the design of an appropriate site layout. Applicants shall submit an Integrated Green Infrastructure Plan as part of pre-planning submissions to the Council. This plan shall show existing natural features (hedgerows, significant trees, waterbodies) and the proposed green infrastructure network within the development. These proposals should include; ¨ Details of open space development proposals. ¨ Urban and river ecological corridors. ¨ SuDS measures. ¨ Green roofs and walls location and specifications. ¨ Locations of bird, bat and invertebrate boxes. ¨ Permeable paving (grasscrete or similar). ¨ Tree-lined streets. ¨ Biodiversity enhancement of private gardens and hedgerow management proposals. ¨ Linkages to the surrounding open space and/or natural landscapes. ¨ Walking and cycling infrastructure in the area.
- Objective DMSO124 – Integrated Green Infrastructure Plan Require the submission of an Integrated Green Infrastructure Plan as part of planning applications for residential developments over 50 units and all commercial developments over 2000 sqm.

2.0 Site Context

The site is located in the townland of Coldwinters just to the north of the M50 Motorway and to the west of the N2. It is accessed via the North Road. It encompasses 9.8292 hectares and comprises two fields and a section of an existing road along the eastern boundary. The western field had been used for farm animal grazing, but is no longer used for this purpose. The eastern field had been used for tillage, but is currently uncultivated. The ground levels rises from the site boundaries to a small hillock in the centre of the site.

There are overhead powerlines running from south-east to northwest across the north-eastern and central parts of the site.

It is in an area zoned for heavy industry in the Fingal Development Plan 2023 to 2029.







2.1 Site Context

The surrounding land use {Figure 2.2) is very mixed and includes Huntstown Quarry, Huntstown Bioenergy (an anaerobic digestion plant owned by the applicant), Huntstown Power Station and an Eirgrid 220 kv Substation. The adjoining lands to the east, south and west are currently used for agriculture. The southern runway of Dublin Airport is approximately 2.4km from the north-eastern boundary. Consequently the landscape has a heavily disturbed character with functional, utilitarian and brownfield characteristics with any remnant fields bound by such land-uses and not having a pristine or highly valued landscape character. In general, the landscape would be rated as one of low landscape sensitivity, value and condition. Further, it is not overlooked by any designated views or prospects, is not near an amenity area and is not close to any cultural and historic sites.





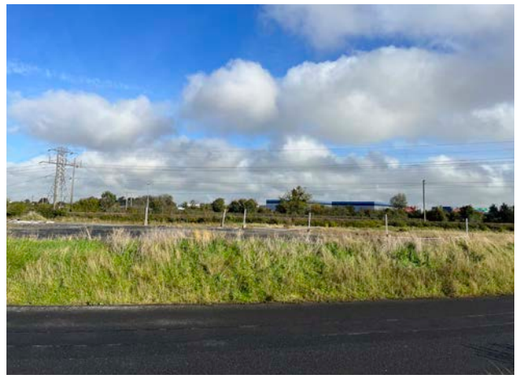








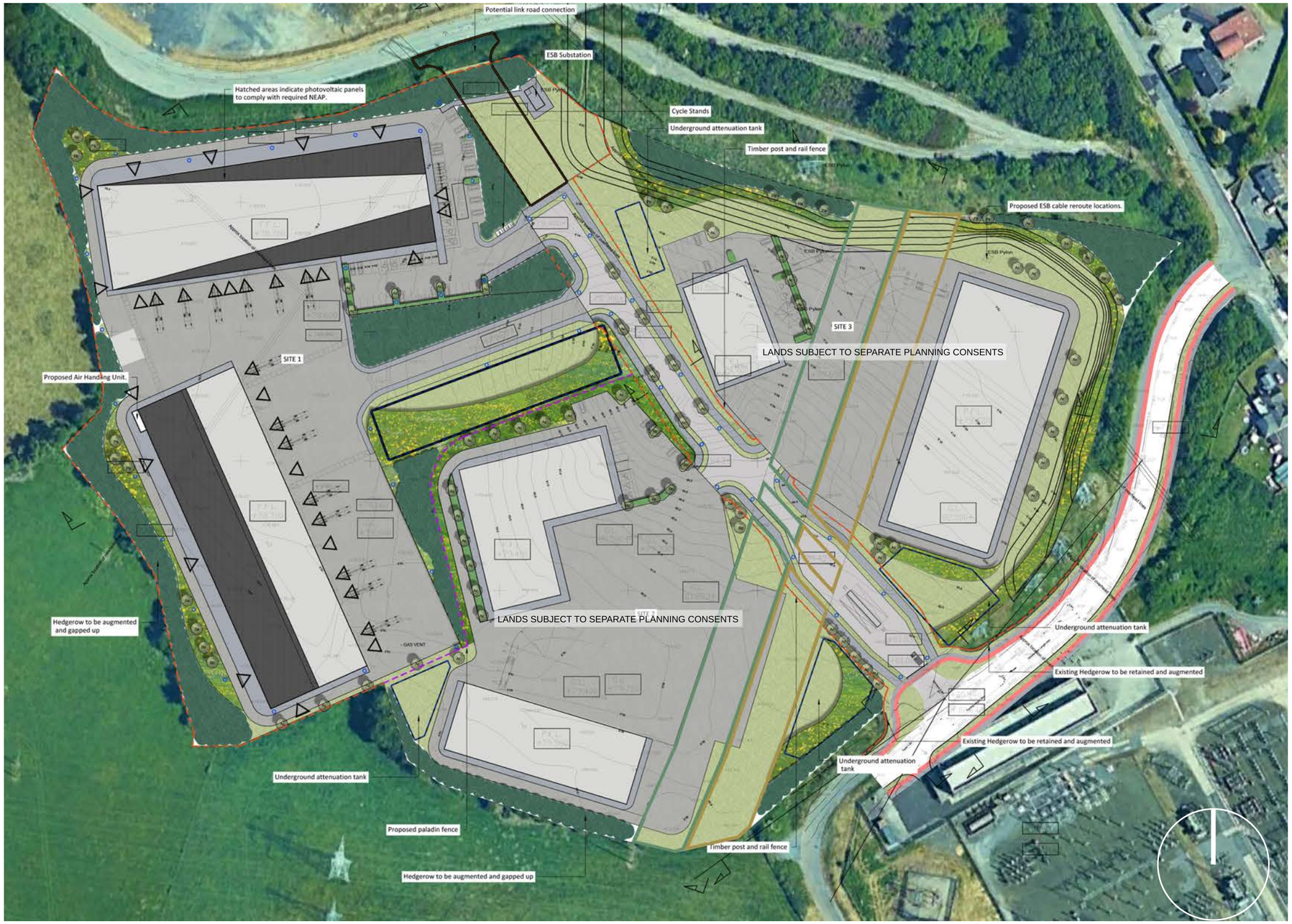








3.0 Landscape Proposal

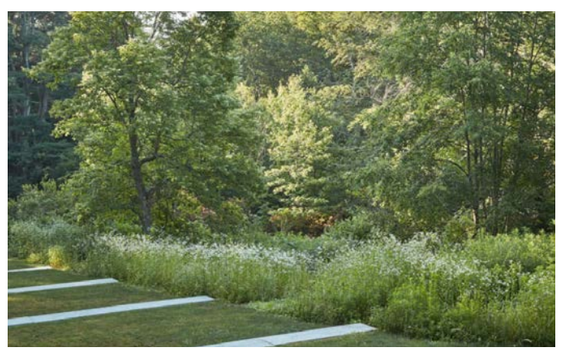


The landscape designs associated with the proposed development of the site are based on the concept of gapping up and augmentation of boundary hedgerows, enhancing the general landscape treatments within the site and ensuring adequate screen boundaries are created around and through the site. Plants selected are indigenous and species selection follows from those identified within the All-Ireland Pollinator Plan (and appropriate reference to the Draft Fingal Biodiversity Action Plan 2022-2030) to ensure successful plant establishment that will merge visually and ecologically into this area. Internally, the site will include grass, hedgerows and gravel areas though these areas are visually obscured from any publicly accessible areas. The client objective for these areas is to ensure the landscape has a neat, clean and easily maintained character.

Landscape works to be undertaken by an ALCI approved landscape contractor and in accordance with BS 4428:1989 Code of practice for general landscape operations (excluding hard surfaces).

Mitigation measures include proposals to reduce dust generation which can present visual intrusion but this would not have a significant bearing on any local or publicly accessible areas.

The design rationale is to provide tree lined avenues along the internal roads with planted verges, pathways and further shrub planting between the buildings and parking areas.



4.0 POLICY GINHP3 GREENING OF DEVELOPMENTS



POLICY GINHP3 GREENING OF DEVELOPMENTS

In broad terms the Application Site extends to 98292m² of which the proposed Materials Recovery Facility, associated yards and access (i.e. paved areas) extend to 19128m² in phase 1 and 40022m2 site wide. The remnant area of the site is to be landscaped or includes existing hedgerows / vegetation which is to be retained and augmented. In total the proposed planting includes the following:-

Phase 1

- 45 no. Standard Trees;
- 1129 linear meters of new hedgerows;
- 278 linear meters of retained and augmented hedgerows;
- 4945 m² of native woodland planting;
- 2083 m² of meadow seeding;
- 160 m² of shrub planting;
- 6595 m² of grass seeding.

If the wider site is built out, this will include further planting works that would further contribute to the environmental quality, setting and character of the site and includes the following:

Wider Site (Phase 1,2 & 3)

- 118 no. Standard Trees;
- 1129 linear meters of new hedgerows;
- 436 linear meters of retained and augmented hedgerows;
- 8082 m² of native woodland planting;
- 3786 m² of meadow seeding;
- 1308 m² of shrub planting;
- 13893 m² of grass seeding.

Green roofs were considered for the buildings associated with the proposed Materials Recovery Facility but as these are being used for solar PV panels, this was not viable. Further, brown roofs and water harvesting was not considered appropriate given the nature of the proposed land-use.

Working with the project engineers, natural SUDs measures are incorporated into the proposal including swales, permeable paving to correlate with Policy CINHP3.

Stockpiles of soil will not be located on sites that will result in these having their own detrimental effects on the local area. Any un-natural spoil heaps or stockpile areas to be re-graded and reformed to tie in with the natural topography.

Any bare ground and earth will be seeded with an appropriate grass mixture to minimise erosion and potential dust problems Restoration of any areas disturbed during extractive process to be undertaken immediately following completion of operations period via grass seeding with a green characteristic anticipated to return to these areas within 2 months. Consequently the site will have a significantly improved landscape with this being or a more managed, species diverse and greener nature as well as resulting in a more wooded character as this matures than it currently has or has had for some time.

5.0 POLICY GINHO15 SUDS

POLICY GINHOI5 SUDS
The subject site is not subject to flooding and the associated Drainage Report for this application (Coyle) demonstrates there is no risk of flooding on the site.
The proposal includes a Storm Water Management Plan prepared by the project engineers based on guidance and recommendations set out in the Greater Dublin Strategic Drainage Study and the SuDs Manual. This will include swales, permeable paving, ???? See the Engineering Assessment Report.



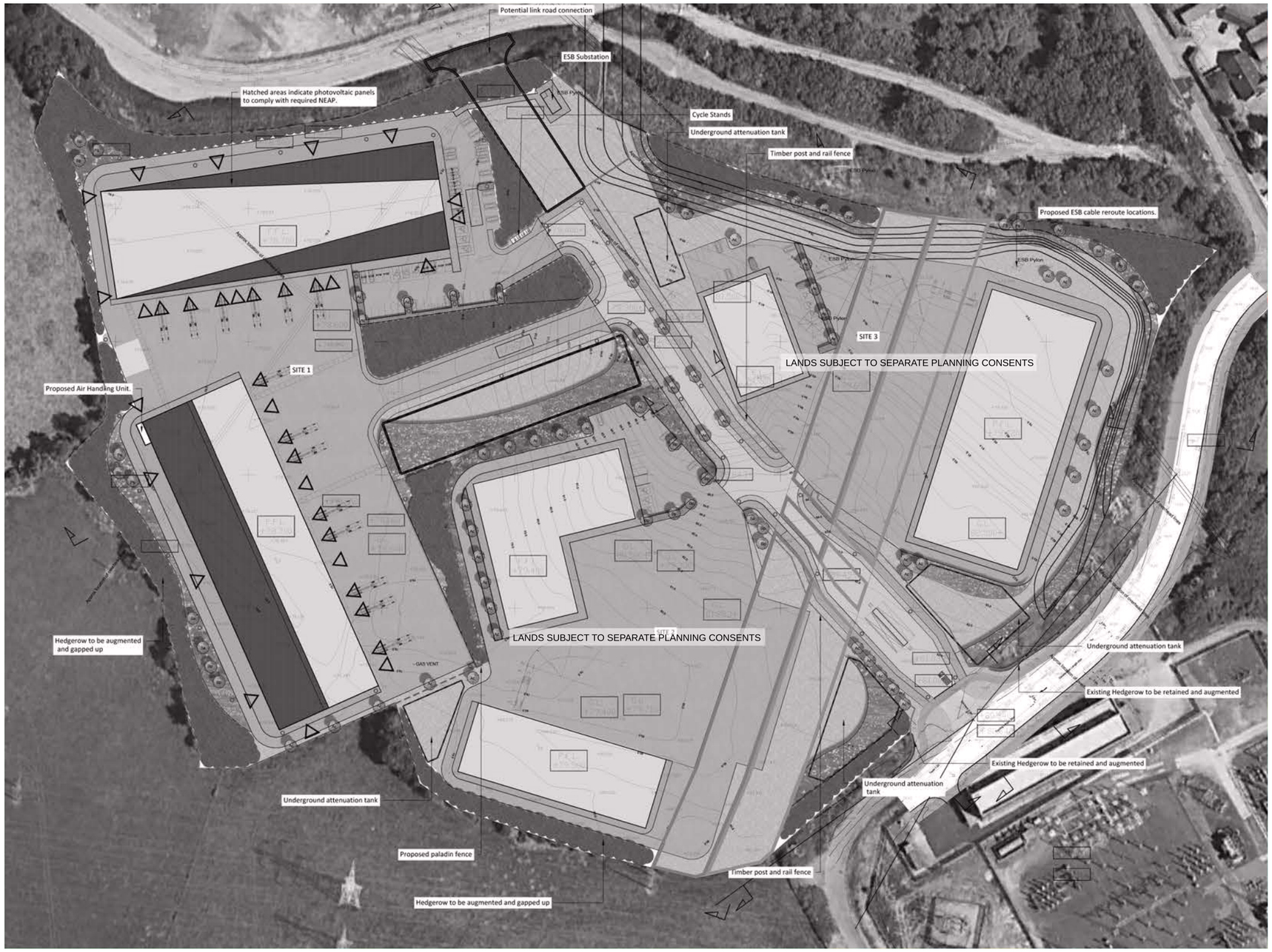
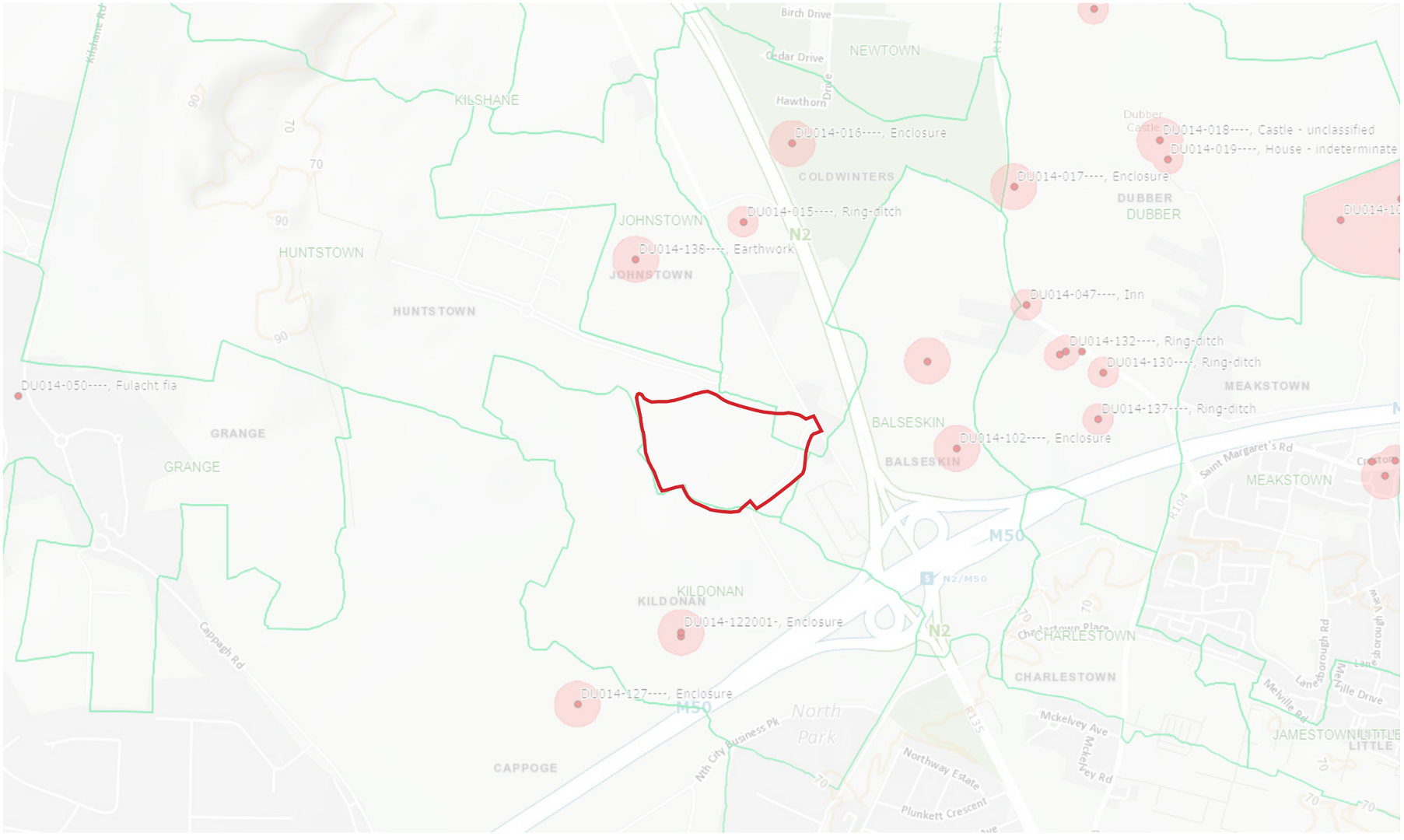


DIAGRAM SHOWING ATTENUATION TANKS / DRAINAGE STRATEGY

6.0 POLICY GINHP8 ARCHAEOLOGY AND GREEN INFRASTRUCTURE

NEED TO GET ARCHAEOLOGUY REPORT AND REVIEW.



6.1 OBJECTIVE GINH018 HERITAGE LANDSCAPE

The site is not part of or close to any site that would be considered of heritage significance or associated with any sites of heritage importance. The nearest landscapes are sufficiently distant from the site for them to be affected in terms of views or character by any activity on this site.

Sites and Monuments Records (SMR)

7.0 OBJECTIVE GINH021 INTEGRATION OF GREEN INFRASTUCTURE

Maps available from the Environmental Protection Agency (EPA) indicate no protected landscapes, environment or ecology areas on or close to the Application Site.
The integration of green infrastructure on the site boundaries (mainly existing hedgerows) and new landscape areas will allow for improved wooded corridors across the wider site through the planting of over 118 trees, 1129 linear meters of hedgerows and 8082m² of woodland across the site (extending to 8.2% of the site).
The collective planting and landscape works will contribute to the wider green infrastructure in relation of landscape character benefit, ecological / environmental worth and visual amenity of the site.



8.0 OBJECTIVE GINH025 REWILDING

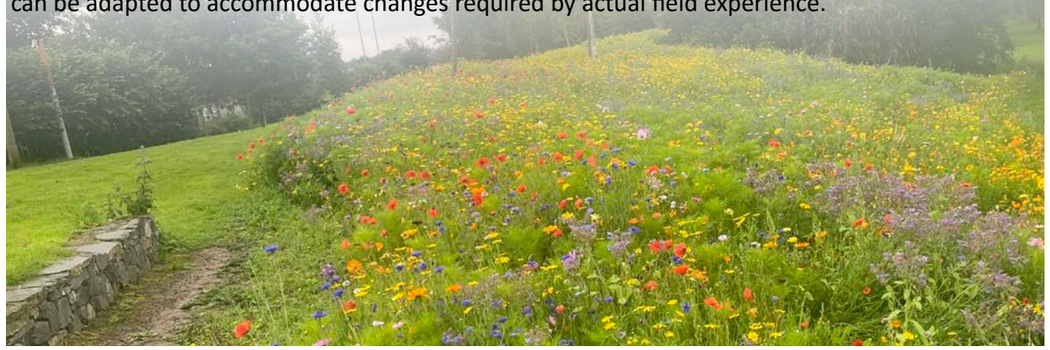






Planting and species follow those identified within the All-Ireland Pollinator Plan (and appropriate reference to the Draft Fingal Biodiversity Action Plan 2022-2030).
The management of the site will ensure the control of noxious weeds such as Ragwort (Jacobaea vulgaris)

POLICY GINHP21 PROTECTION OF EXISTING TREES AND HEDGEROWS
Trees were subject to a Tree Survey in September 2023 by Arborist Andy Boe and noted the "amenity value of the trees could be considered low." It identified 43 no. trees, groups of trees or hedgerows across the site which equated to 265 no. trees.
Protection measures for hedgerows or trees will be undertaken (in accordance with BS5837:2012) across the application site during the operational period including keeping appropriate "buffer" distances across root zones of mature trees of approximately 5m;
There will be a five year guarantee after construction that all the proposed planting works still exist and have established in line with landscape design expectations. This will ensure that no planting has been removed or damaged due to the subsequent construction or plant failure. Procedures will be implemented whereby any failed or stressed vegetation or grass planted will be replaced as soon as they are identified. Monitoring will also ensure that there is no ponding of water due to differential settlement or any other severe differential settlement of surface layers. Regular monitoring will be undertaken to determine success of landscape operations and ensure they are behaving in the manner anticipated at design stage. If required, elements of the design can be adapted to accommodate changes required by actual field experience.



9.0 POLICY GINHP21 PROTECTION OF EXISTING TREES AND HEDGEROWS

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Regular monitoring will be undertaken to determine success of landscape operations and ensure they are behaving in the manner anticipated at design stage. If required, elements of the design can be adapted to accommodate changes required by actual field experience.



Example of Tree protective fencing



Tree Constraints Plan courtesy of Andy Boe

9.1 OBJECTIVE GINH046 TREE REMOVAL

Development Impact Plan

KEY

Application site

Outline plan of roads, dwellings and other built elements that form the key components of the proposed planning application

Tree Protection Zone as defined in accordance with *BS 5837:2012 Trees in relation to Design, Demolition and Construction. Recommendations* (As identified in Andrew Boe Tree Survey August 2023.)

Tree protection barrier

Proposed Works to Existing trees

Trees identified as Category B - Trees of moderate quality with an estimated life expectancy of at least 20 years to be felled to facilitate development. Tree No. T006

Trees identified as Category C - Trees of low quality with an estimated life expectancy of at least 10 years, or young trees with a stem diameter below 150mm and to be retained.

Trees identified as Category C - Trees of low quality with an estimated life expectancy of at least 10 years, or young trees with a stem diameter below 150mm to be felled to facilitate development. Tree No. T001, T004, T005, T007, T008, T009, T010, T026(G), T030(G), T031, T042.

Trees identified as Category U - Those in such condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years.

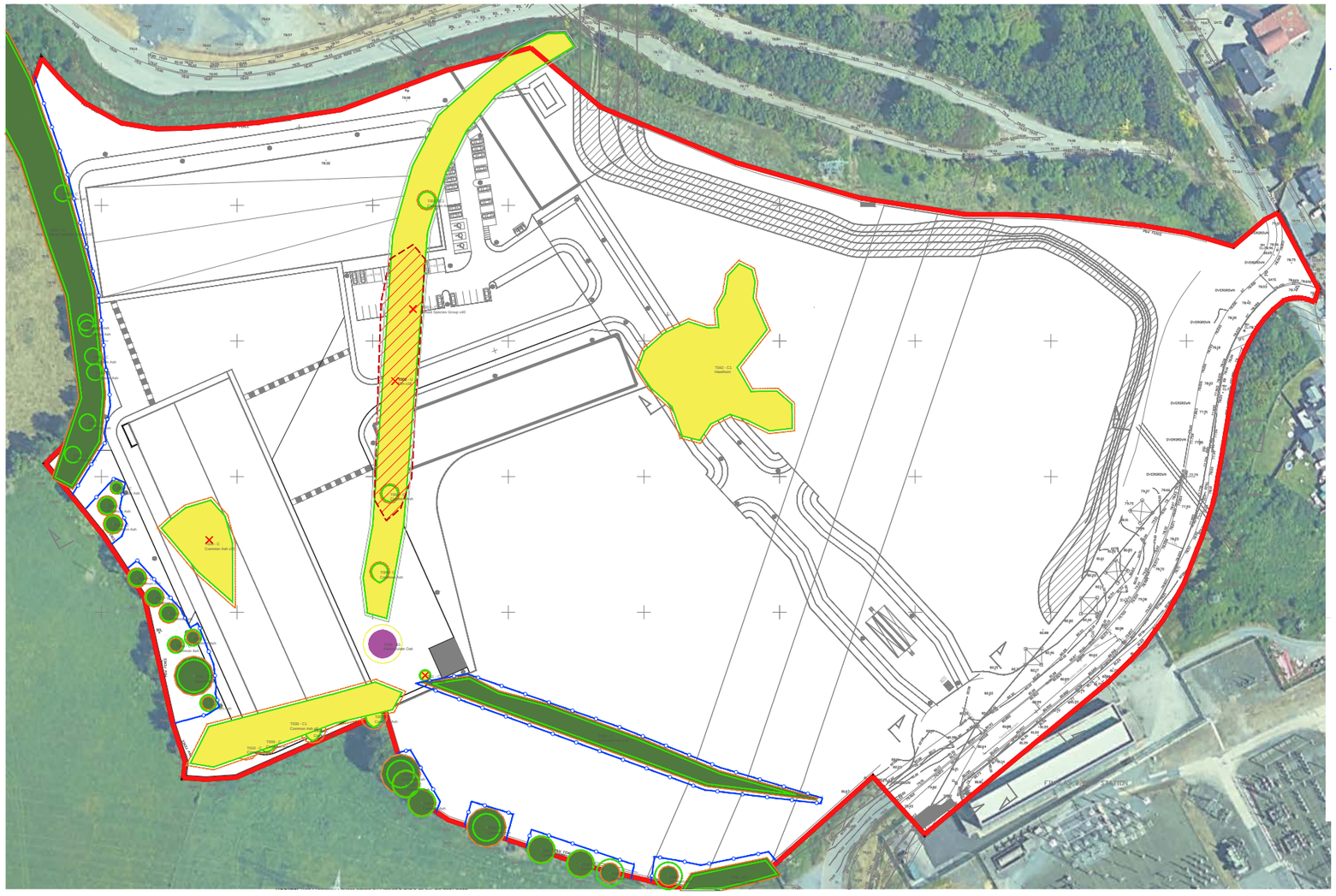
Trees noted as being in "Poor" condition and recommended for felling as per Tree Survey Report 2023. Trees Nos. T2(G)

TABLE SUMMARY FOR ALL TREE QUANTITIES

TOTAL NOS OF TREES SURVEYED	QTY
Total number of trees surveyed within the site including individual trees, groups and hedges	265

FELLED - Subject to below condition	QTY
Trees noted as being in "Poor" condition and recommended for felling as per Tree Survey report 2023	18
Trees and woodland groups noted as being low quality in Tree Survey 2023 to be felled to facilitate development.	72
Trees and woodland groups noted as being in moderate condition in Tree Survey 2023 to be felled to facilitate development.	1
TOTAL	91

RETAINED - Subject to below conditions	QTY
Trees and woodland groups to be retained	174

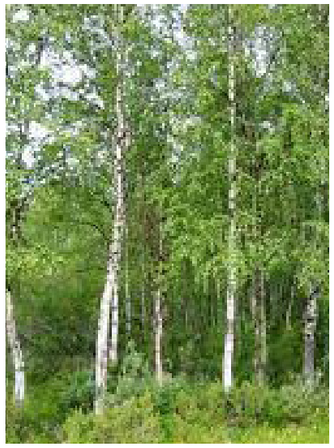


There are no Tree Preservation Orders in place on this site.
The Tree Survey (Andy Boe September 2023) notes “Where possible, it is generally considered desirable for Category ‘A’ and Category ‘B’ trees to be retained and incorporated into new developments and layouts. Category ‘U’ trees are not considered to be appropriate for retention”.
Apart from one Oak tree (T006) graded Category ‘B’ and another group of Elm trees (T002) graded Category ‘U’, all the trees / hedgerows / groups surveyed on this site are graded ‘C’ and defined as low quality or unremarkable and thereby limited landscape.
The extent of tree or hedgerow removal is set out on Dwg. No. 7670-L-2700 Development Impact Plan.

9.2 POLICY GINHP22 TREE PLANTING

- Proposed Woodland Planting - 8082 sqm
- Proposed Tree Planting - 118no.
- Proposed Hedgerow Planting - 1129 Linear metres
- Proposed Wildflower Planting - 3786 sqm
- Proposed Shrub Planting - 1308 sqm
- Proposed lawn - 13893 sqm

The proposed development includes the following tree species:



Betula Pendula



Acer campestre ‘Field maple’



Prunus Avium ‘Plena’



Sorbus acuparia

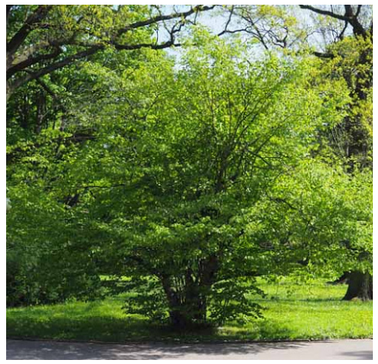


Pinus sylvestris ‘Scots pine’



10.0 PROPOSED PLANTING

10.1 Buffer planting



Corylus avellana



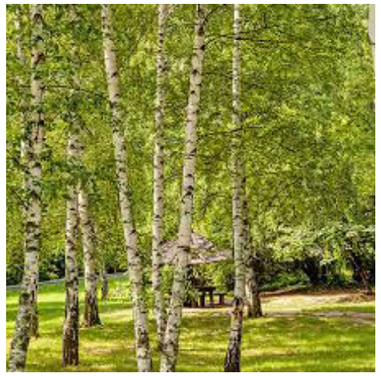
Pinus sylvestris



Viburnum opulus



Euonymus europaeus



Betula pendula



Crataegus monogyna



Prunus avium



Ilex aquifolium



Sambucus nigra

10.2 Shrub planting



Hebe albicans Red Edge
Lilac-blue summer flowers appear on short spikes, fading to white, among grey-green leaves with narrow red margins and veining when young. This small, spreading, evergreen shrub makes an attractive low, informal hedge or edging plant for a mixed border. In an urban or coastal site, it needs protection from cold, drying winds.



Pyracantha 'Orange Glow'
Dense, spiny, fast growing evergreen hedge with clusters of white flowers in June and masses of bunches of spherical, very colourful berries in autumn.



Cornus alba 'Sibirica'
Medium-sized suckering deciduous shrub forming a thicket of slender red stems, becoming bright crimson in winter. Leaves ovate, turning reddish in autumn.



Viburnum tinus 'Lucidum'
'Lucidum' is a vigorous, evergreen shrub, to 4m tall, with narrowly-ovate to oblong, glossy, dark green leaves to 10cm long. Small, creamy-white flowers are borne in flattened flowerheads, up to 10cm in diameter, from late winter into spring and are followed by blue-black berries

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APPENDIX 11.3

LANDSCAPE MANAGEMENT PLAN

LANDSCAPE MANAGEMENT AND MAINTENANCE PLAN

Huntstown Circular Economy Hub – Phase One

prepared on behalf of

Rathdrinagh Land Limited

November 2023 / Project No.7670

parkhood.com

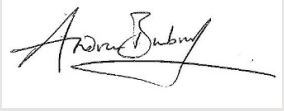
Project Title: Huntstown Circular Economy Hub Phase One

Document Title: Landscape Management and Maintenance Plan

Client Name:	Rathdrinagh Land Limited
Document Reference:	7670/HCEH1/LMMP/AB
Project Number:	7670

Quality Assurance

Approval Status in accordance with Park Hood's IMS (ISO 14001:2015, ISO 9001:2015 and ISO 45001:2018 & SSIP).

Issue	Date	Report Prepared by	Planting and Landscape Management Advice
Draft	*25-10-2023*	*Oisin Crossan*	*Tom Kaiser*
Reviewed	*01-11-2023*	*Andrew Bunbury CLMI Landscape Architect and Director; Park Hood*	
Planning Issue	*03-11-2023*		

Disclaimer

All feasible and reasonable attempts have been made to ensure that the information provided by a range of public sector institutions and presented in this report is accurate and up-to-date. Park Hood is not responsible for accidental perpetuation of inaccuracies in these records and any consequent effect on the conclusions in this report.
This report has been prepared by Park Hood with all reasonable skill, care and diligence within the General Terms and Conditions of the Contract with the client.

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1 Contract Requirements

2 Site Information and Introduction

3 Landscape Softworks – Establishment Maintenance

4 Landscape Softworks – Long term Management

5 Landscape Hardworks – Long term Management

6 Conclusions

7 Appendices

Notes

This document is to be read in conjunction with the following drawings and documents:

- Drawing No. 7670-L-2100 Landscape Masterplan
- Drawing No. 7670-L-2101 Phase One Landscape Proposals 1-500
- Drawing No. 7670-L-2102 Phase One Landscape Proposals 1-1000
- Drawing No. 7670-L-2700 Development Impact Plan
- Drawing No. 7670-L-RPT-02 Green Infrastructure Plan

1.0 INTRODUCTION

Purpose and Scope

1.1 The Landscape Management and Maintenance Plan has been prepared with regard to the *Fingal County Development Plan 2023 to 2029* which is the relevant plan covering the subject site. The plan is part of a standard requirement for the planning application process and relates to the management proposals for external landscape areas which are part of this proposed development.

1.2 The proposed development is Phase 1 of the proposed 9.56 ha Huntstown Circular Economy Hub. It comprises a Materials Recovery Facility, a Food Container Cleaning Plant and ancillaries.

1.3 The Plan shall be taken to include this document and any supporting plans, reports and specifications approved as for this proposed Materials Recovery Facility. This includes any documentation containing quantitative and qualitative information about the external areas of the site that will be useful to those responsible for managing and maintaining them. Phase 1 comprises the MRF (5,302m^2), Food Container Cleaning Plant (5,302m^2), two Storage Buildings, paved open yards, weighbridge, car and bicycling parking areas, surface and foul water drainage systems, landscaping.

1.4 The Management Plan sets out the management aims and objectives for the site along with the specific management objectives for each landscape component, and the associated maintenance works required on an Annual and Occasional basis. Annual Works are those works that will be required every year, such as watering, weeding and cleaning. Occasional Works are those that will be required on an irregular or cyclical basis, such as repairs and renewals.

Contract Requirements

1.5 The company undertaking any part of the works:

- must adhere to all local government legislations and regulations concerning their respective industry;
- must adhere to all local government legislations and regulations concerning health and safety; and
- must be a member of the local statutory body representing and regulating their respective industry.

1.6 Any personnel working on site:

- must be supervised by an appointed senior member of staff;
- must be suitable trained in their respective task;
- must hold the necessary government approved certificates if required (i.e., use of chemicals, machinery etc.)

1.7 Any hazardous material:

- has to be correctly labelled, stored and used as per the concerning local government regulations;
- shall only be used by a supervised, trained, certified (if applicable) and appointed member of staff; and
- must be approved for use by a representative of the owner.

Health & Safety

1.8 Management of all areas will be undertaken in accordance with current Health and Safety regulations and Safety, Health and Welfare at Work Acts 2005 and 2010. This will include the Safe System of Work Plan (SSWP) which complements the Safety Statement required under the Safety, Health and Welfare at Work Act.

1.9 This will include staff must undergoing a site health and safety induction course regarding the site-specific issues and submission of a Health and Safety Plan prior to commencement of any works.

2.0 SITE INFORMATION AND INTRODUCTION

Table 1 General Site Information	
Site Location	Lands in the townlands of Huntstown and Coldwinters
Council Authority	Fingal County Council
Client	Rathdrinagh Land Limited t/a Irish Recycling Limited
Nature of Development	Phase 1 of the proposed 9.56 ha Huntstown Circular Economy Hub. It comprises a Materials Recovery Facility, a Food Container Cleaning Plant and ancillaries.

Table 2 Landscape Works and Types Summary	
Summary description of external Landscape treatments, areas and components	**Soft Landscape Areas** include the following elements: • (Management of) existing trees and hedgerows; • Grass Seeding; • Groundcover and shrub planting; • Tree and woodland planting; • Buffer Planting; and • Hedgerow planting **Hard Landscape Areas** include the following elements: • Footpaths / hard landscape treatments; • Roads; • Walls and Copings; and • Gates, railings and fencing.

Management Plan Objectives

2.1 The aim of the Management Plan is to coordinate a high standard for maintenance and management of landscape elements across the site to ensure successful visual integration of the development proposal into the surroundings and to protect and enhance nature conservation interests in accordance with the design objectives in the approved planning documents. This includes the appropriate maintenance of existing retained and proposed landscape components within an easily maintained comprehensive landscape framework that can provide (where possible) a diversity of landscape experiences.

2.2 The objectives are summarised as follows:

- To ensure a high standard of sustainable management of all landscape areas in a neat, tidy and substantially weed free condition;
- To ensure that all seeded areas are established and maintained in a condition that contributes to the visual amenity of the MRF site and local area;
- To establish and maintain tree and shrub planting to provide an overall landscape framework and landscape character;
- To maintain and enhance biodiversity and fulfil all legal requirements in relation to the protection and management of ecological features and the protection and management of protected species.
- To ensure health and safety to minimise risk of injury and damage to people and property;
- To provide a mechanism or monitoring and review with practices reviewed on an annual basis in accordance with changing site circumstances and the views of key stakeholders.

2.3 There will be a five-year guarantee after construction that all the proposed planting works still exist and is established in line with landscape design expectations. This is to ensure that no planting has been removed or damaged due to the subsequent construction or plant failure.

2.4 If removal of any tree is necessary, agreement shall be reached with the Council as to replacement with matching or appropriate species in the next planting season.

Landscape Maintenance Specifications and Drawings

2.5 Landscape works to be undertaken by an ALCI approved landscape contractor and in accordance with BS 4428:1989 Code of practice for general landscape operations (excluding hard surfaces). The general landscape proposals are indicated on Drawing No. 7670-L-2100 to 2102 Landscape Masterplan and / Landscape Proposals.

2.6 When using pesticides, the Contractor must use a certified operator and take appropriate safety precautions in accordance with the European Communities (Sustainable Use of Pesticides) and Sustainable Use Directive (SUD) Regulations and the Irish National Action Plan for the Sustainable Use of Pesticides (Plant Protection Products) Feb 2019 .

2.7 Plant supply shall be obtained from a nursery that are members of the Horticultural Trades Association Nursery Certification Scheme and approved by the project and local authority landscape architect.

2.8 All planting stock shall be of local provenance or if unavailable national provenance. Origin and provenance have the meaning given in the National Plant Specification and grown in Ireland corresponding to the lists provided in the All-Ireland Pollinator Plan 2015-2020.

Ground Preparation

2.9 Prior to cultivation, planted areas shall be cleared of all loose debris, rubbish, stones over 25mm in diameter, roots, and other extraneous matter. Grass and weeds shall be sprayed with 'Glyphosate' or

similar *SUP / SUD* approved herbicide.

2.10 Topsoil Depths: spread over prepared subsoil in layers not exceeding 150 mm, each layer firmed before spreading the next. Top Soils shall comply with multipurpose grade within *BS 3882:2015: Specification for Top Soil.* Overall minimum depths after firming and settlement to be:-

- Shrub / Hedgerow areas 500 mm
- Lawn and Grass areas 150mm

2.11 Planted areas to be cultivated to a depth of 300mm by hand or rotovator, incorporating planting compost, soil improver and fertilizer base dressing of the types. The topsoil shall have been reduced to a fine tilth on completion of the cultivation works.

Timetable for Landscape Works

2.12 The landscape works shall be undertaken by the end of the next available planting season and during the following periods:

- Deciduous trees and shrubs: Late October to late March;
- Conifers and evergreens: September/ October or April/ May; and
- Container grown plants: At any time if ground and weather conditions are favourable.

Proposed Standard Tree Planting

2.13 Tree supply and planting shall correspond to *BS 8545:2014 Trees: from nursery to independence in the landscape - Recommendations*. Planting of trees shall be undertaken in favourable weather conditions between October 31st to March 31st.

2.14 Tree pits shall be excavated to suitable dimensions to accommodate roots or root-balls or baskets with bases and sides broken up to a minimum depth of 150mm to assist drainage and root penetration. Any unsuitable material such as large clay lumps, bricks, concrete, timber and sand shall be removed off-site. All tree pits shall be backfilled, after planting, with a 3:1 volume mixture of topsoil and mulching compost/manure or similar approved.

2.15 The planted trees shall be full and well-shaped with crowns thinned by 30% according to good horticultural practice and in a manner that does not affect the overall stature, structure or good appearance of the tree. All work shall conform to a minimum standard as set out in *BS 4043:1989 Recommendations for transplanting root-balled trees.*

Proposed Woodland Belts

2.16 Trees supply and planting shall correspond to *BS 8545: 2014 Trees: from nursery to independence in the landscape - Recommendations*. Planting of trees shall be undertaken in favourable weather conditions between October 31st to March 31st.

2.17 Transplants shall be of the size stated in the schedules and conform to *BS 3936 - Part 1: Nursery stock specification for trees and shrubs*. Planting pockets 400x400x300mm deep with cultivated and evenly incorporated: organic manure 100mm layer over area of pit, fertiliser 35g at 2.0m centres.

Proposed Shrub and Groundcover Planting

2.18 Shrub plants to be planted at 2 to 3 plants per m² to linear strip to base of bank. Transplants and container grown shrubs shall be of the size stated and conform to *BS 3936 - Part 1: Nursery stock specification for trees and shrubs.*

2.19 Planting pockets 400x400x300mm deep with cultivated and evenly incorporated: organic manure 100mm layer over area of pit, fertiliser 35g. 75mm depth bark mulch dressing on completion of planting.

Hedgerow Planting

2.20 Hedgerow plants to be planted at 4 per linear meter (in double staggered row at 500mm centres) to top of bank. Transplants shall be of the size stated, shall conform to *BS 3936 - Part 1: Nursery stock specification for trees and shrubs*.

2.21 Planting pockets 400x400x300mm deep with cultivated and evenly incorporated: organic manure 100mm layer over area of pit, fertiliser 35g. 50mm depth bark mulch dressing on completion of planting.

Grass Seeding

2.22 To be undertake with a grass seed suitable for general amenity areas. Sowing rate 35g per m².

Performance Criteria

2.23 Performance criteria are indicators for assessing the quality and success of the particular plant mixtures used for a purpose i.e., screen planting, seeding, tree planting etc. Such indicators will be based upon aspects such as:-

- Health and condition of planting;
- Plant growth; and
- Achievement of desired visual effect.

Existing Trees and Boundary Hedgerows

2.24 There are existing hedgerows to be retained and protected (in accordance with the recommendations included in BS 5837: 2012). This covers:-

- The provision of adequate fencing around trees to prevent harmful encroachment / damage by vehicles or storage of materials during construction;
- The avoidance of any reduction in levels in the root protection area of individual trees; and
- Inspect for disease, dead wood or storm damage and, if necessary, treat or carry out tree surgery accordingly (using advice of qualified tree surgeon if necessary).

Protection Measures during Construction Works – Generally

2.25 A protective barrier, 2.3m high and comprising a vertical and horizontal framework of scaffolding, well braced to resist impacts and securely supporting weldmesh panels, (as illustrated in Figs 2 & 3 of

BS5837:2012) shall be erected around the base of all trees to be retained on site. No construction traffic, materials or debris will be permitted within this zone of protection.

Protection Measures – Post Construction

2.26 The management company will be responsible for the maintenance and upkeep of trees within the property boundary. Protected trees should be visually reviewed annually by the managing company and subject of regular ongoing health and condition inspections undertaken at 5-year intervals.

3.0 LANDSCAPE SOFTWORKS – ESTABLISHMENT MAINTENANCE

General Introduction

3.1 Establishment maintenance will form part of the landscape contractors works. The period of establishment maintenance will be 12 months after the completion of the planting and grassing works prior to handover.

3.2 Prior to handing over, all plants deaths shall be replaced, and all defects made good to the satisfaction of the landscape architect and/or the management company.

Establishment Maintenance Operations – Grass Areas

3.3 The developer and contractor shall be responsible for maintaining all grassed areas in a neat and tidy, weed free and litter free condition, throughout the complete growing season, or when the landscape works are completed, whichever is the later.

Works required prior to First Cut

3.4 When the new sward has reached a height of 50mm the contractor shall remove all loose debris, stones and rubbish above 25mm in any direction prior to cutting. Following the surface clearance and prior to cutting the contractor shall lightly roll all newly grassed areas with a smooth and even weight.

First Cut

3.5 All new grass sward shall be given first cut at least two days after rolling. The first cut shall leave not less than 35mm height.

Subsequent and Management

3.6 Grass shall be cut regularly (a total of 12-16 times during the growth season) to a length consistent with the season and quality of growth. The normal establishment of cut shall be 25mm. All arisings shall be removed if the height of the grass exceeds 100mm prior to cutting.

3.7 All established grass areas shall receive an application of an approved top dressing (N:P:K) (20:10:10) at the rate of 15g/M2 as directed by the site management or landscape architect.

3.8 Any areas of settlement or local depressions shall be made up and re-sown by the contractor at his own expense.

3.9 The edges of seeded areas, adjacent to shrub beds and margins are to be carefully trimmed square and to a true line. The contractor should note that this also applies to the area around the base of trees planted in grass areas.

3.10 All areas of failed grass shall be reinstated using the seed mix as specified within the landscape contract, with ground cultivation prior to seeding meeting the same requirements.

3.11 All new grass areas shall be handed over as complete, well established sward at the end of the establishment maintenance period.

Establishment Maintenance Operations – Planting operations

3.12 Weed Control: All planted areas shall be kept entirely weed free throughout the establishment maintenance period, using approved residual and translocated herbicides, or mechanical means, or a combination of both.

3.13 Wind Firming: All plants shall be inspected at monthly intervals for wind firmness, and re-firmed as necessary.

3.14 Stakes & Tree Ties Checking: Stakes shall be checked monthly for firmness, and re-firmed as necessary, and all tree and plant ties inspected and loosened as required.

3.15 Pruning: Shall be carried out on a monthly basis, and will include the removal of minor dead wood or damaged wood. Formative pruning shall be undertaken at the appropriate time of the year for the species involved in order to enhance the plants best feature e.g., flowering, stem colour etc.

3.16 Inorganic Fertilizer: All shrub-planting areas shall receive a fertilizer top dressing in July of 'Osmocote' slow-release fertilizer (N:P:K) (18:11:10) to be lightly raked in.

3.17 Watering: All plants shall be watered as required during the establishment maintenance period to ensure survival of all plant material. Suggested water requirements for tree irrigation are as per following **Table 3 Watering Requirements** below.

Table 3	**Watering Requirements for Establishment Maintenance Period (in days)**					
	Feathered	Light Standard	Standard	Heavy Standard	Extra Heavy Standard	Semi-Mature
Girth (cm)	6	6-8	8-10	10-12	12-14	14-16
Height (m)	1.8-3.0	2.4-2.7	2.7-3.0	3.0-3.6	3.6-4.2	4.2-4.8
Estimated daily* transpiration rate (litres)	1	1	1.2	2	3	4
Suggested first season summer watering requirements (litres per month)	36	36	45	75	115	150
*Calculations for transpiration and suggested watering requirements are based on a typical Plane Tree in a tree pit ameliorate with 25% peat and with a 50mm mulch layer. The figures are approximate and are for guidance only. Allow an extra day for every 10mm of rainfall.						

3.18 Litter Removal: Litter that may have accumulated in grass and planted areas must be lifted and removed from the site each month.

3.19 Failed Planting Areas: Prior to the end of the establishment maintenance period, the contractor will receive from the landscape architect a list of plant material that must be replaced by the contractor. Any plant material which has failed to establish, or has died, throughout this period must be replaced with healthy plant stock of similar specification at the contractors own expense. Successfully established plant material shall be those plants showing positive signs of growth i.e., shoot extension and growth over time. Breaking into leaf is not to be taken as evidence of successful establishment.

3.20 Handover of Planted Areas: All newly planted areas shall be handed over as complete and well established at the end of the establishment maintenance period.

4.0 LANDSCAPE SOFTWORKS – LONG TERM MANAGEMENT

Grass Areas

4.1 Performance Criteria: Grassed areas shall have good grass cover without obvious bare patches.

4.2 Maintenance Objectives: To establish and maintain an even cover of grass sward.

Maintenance Operations Years 1 – 20

- Grass Cutting: All grassed areas will be maintained between 20 – 40mm in height during April to August inclusive and between 30 – 50mm at all other times;
- Frequency of cuts may be up to 20 cuts per annum, dependent on the length of the growing season and weather, with the majority undertaken during the spring and summer months. Clippings may be let fly, but all adjacent hard surfaces shall be swept clean after cutting with all clippings removed to contractors tip;
- Grass Verges & Edges: All edges to grassed areas against buildings, footpaths, roadways, trees and any other obstruction shall be kept neat and tidy. Border edges shall be clipped and not exceed 50mm length at any time;
- Weeding: Spot weeding of isolated areas of weed infestation may be undertaken using an approved selective herbicide; and
- Reinstatement of failed areas: All areas of failed grass shall be reinstated using the seed mix as specified within the original landscape contract, with ground cultivation prior to seeding meeting the same requirements.

Groundcover and Shrub Planting Areas

4.3 Performance Criteria: By year 5 all ground cover planting shall have achieved closed canopy and shall have been thinned and pruned.

4.4 Maintenance Objectives: To establish and maintain a weed free cover of healthy growth, clipped or pruned as necessary to give a neat and tidy finish contained within the planted area.

Maintenance Operations Years 1 – 3

- Monthly inspection for wind firming and watering to establish good growth;
- Annual application of an approved fertilizer in July of 17:17:17, N:P:K at a rate of 30g/M2; and
- Remove and replace all dead, dying and diseased or vandalized plant material, replacements to be as originally specified within the main landscape contract or as agreed with Management Company.

Maintenance Operations Years 3 – 5

- Annual application of an approved residual herbicide in the winter months, with removal or spot treatment with an approved translocated herbicide during the main growing season;

- In the appropriate season for the species involved, prune and tidy the plants removing dead, dying or diseased plant material;
- Selectively thin plants that are restricting the natural and attractive development of their neighbours; and
- Remove all arising from site.

Maintenance Operations Years 5 – 20

Operations to include the above, plus:

- Bi – annually prune and tidy the plants removing all dead, dying or diseased plant material from the site; and
- Replace as necessary all shrubs that are not contributing satisfactorily to overall objectives of the landscape management plan. Replacements shall be approved with the supervising officer.

Hedgerows

4.5 Performance Criteria: All hedges shall have a complete canopy and be managed to form a continuous impenetrable thicket to the desired height by year 5.

Maintenance Operations Years 1 – 3

- Monthly inspection for wind firming and watering as required ensuring establishment and survival of plant material;
- Pruning shall be directed at maintaining true and even levels as necessary during the growing season, with all arisings removed from site;
- The first cut can commence when all danger of frost has receded. When cutting avoid strong sunlight, best carried out on a dull and wet day;
- The last cut shall commence no later than 4 weeks before the first frost. Annual application of an approved fertilizer in July of 17:17:17, N:P:K at a rate of 30g/M2;
- Maintain the planted area weed free by applying an annual dressing of an approved residual herbicide in the winter months and spot treatment with an approval translocated herbicide during the growing season; and
- Remove and replace all dead, dying, diseased or damaged plant material, replacements to be as originally specified within the main landscape contract, or as agreed with management company representative.

Maintenance Operations Years 3-20

Operations to include the above, plus:

- Maintain top and side of hedges in a rectangular profile using suitable, approved mechanical methods, to true and even levels. Remove any cuttings lodged in the surface of the hedge and rake up and remove all arisings; and

- Maintain weeds or grass growth at the base of the hedge to a maximum height of 100mm by regular hand cutting or by application of an approved residual herbicide.

Woodland Belts

4.6 Performance Criteria: By year 7, shrub planting will have achieved closed canopy and have been thinned and pruned; and

4.7 Maintenance Operations: To establish and maintain a wooded landscape, allowing plants to achieve natural form whilst avoiding obstruction to footways and windows.

Maintenance Operations Years 1 – 3

- Hand hoe all planted areas fortnightly during the main growing season in order to maintain a substantially weed free soil surface. This can be reduced to monthly out with the main growing season;
- Monthly inspection for wind firming and watering to establish good growth;
- Annual application of an approved fertilizer in July of 17:17:17, N:P:K at a rate of 30g/M2;
- In the appropriate season for the species involved, prune and tidy the plants removing dead, dying or diseased plant material, and to develop the desired characteristics;
- Remove intermediate plants that restrict the natural and attractive development of their neighbours;
- Remove and replace all dead, dying, diseased or damaged plant material, replacements to be as originally specified within the main landscape contract or as agreed with the supervising officer; and
- Remove all arising from site.

Maintenance Operations Years 3 – 10

Operations to include the above, plus:

- Maintain woodland substantially weed free by applying an annual application of an approved residual herbicide in the winter months, with removal or spot treatment with an approved translocated herbicide during the main growing season.

Maintenance Operations Years 10 – 20

Operations to include the above, plus:

- Prune trees as necessary, in appropriate season to achieve their desirable screening or wooded effect and to prevent them from overgrowing footways or blocking light from windows;
- Replace as necessary all trees and scrub that are not contributing satisfactorily to the overall objectives of the landscape management plan.

Standard Tree Planting

4.8 Performance Criteria: To provide a healthy growing tree that contributes to the overall aesthetics of the landscape.

4.9 Maintenance Objectives: To ensure establishment and maintenance of trees with a well-shaped habit.

Maintenance Operations Years 1 – 3

- Monthly inspection for wind firming and watering as required ensuring establishment and survival of plant material (fortnightly during dry spells);
- Bi-monthly tree tie check to ensure that the trees are not being strangled by support. Loosening of trees ties as necessary;
- Maintain a 1m diameter area of weed free soil around the base of each tree by hand. This to be carried out monthly during the main growing season and bi-monthly thereafter;
- Annual application of an approved fertilizer in July of 17:17:17, N:P:K at a rate of 60g/tree;
- Remove and replace all dead, dying, diseased or damaged plant material, replacements to be as originally specified within the main landscape contract, or as agreed with the supervising officer;
- Prune the trees to remove any dead, dying or diseased shoots and limbs to create a balanced form for future growth, remove; and
- Tree Guards and Grilles: Where supplied and fitted, tree guards (mild steel and 'Weldmesh') are to be inspected, re-fixed or replaced as necessary to original specification and to prevent chaffing of tree.

Maintenance Operations Years 3-5

Operations to include the above, plus:

- Removal of tree stakes, tree ties and tree guards as necessary, as trees become wind firm and established to prevent strangulation of tree.

Maintenance Operations Years 5-20

Operations to include the above, plus:

- Some selective thinning of tree groups may be required during this period, at years 10 and 20;
- Visibility Splays: Any vegetation other than grass on visibility splays or road sight lines will be kept to below 600mm above channel lines on road. In addition, the visibility splay will be kept free of all structures or vegetation other than that approved in the planning consent.

Watering

4.10 In any period of extended drought ensure survival of all plants, for recommended water requirements refer to Table 3 for guidance.

Existing Trees

4.11 Management Objectives:

- To maintain the trees in as healthy and attractive condition for as long as possible;
- To ensure continuity in tree cover and their contribution to the landscape structure, biodiversity, and screening/amenity value of the site;
- To ensure that trees are healthy and safe, particularly in places in proximity to adjacent properties and with public access; and
- In certain locations, arising's from woodland management activity can be used as basis for opportunities for amphibians, invertebrates and bryophytes micro-habitats by leaving piles of dead wood or recumbent dead logs.

Maintenance Operations – Annual and Occasional

- Trees should be regularly visually checked for the presence of any diseased or rotten wood; fungal or other infections/disease; and stability. If any such issues are identified then the advice of qualified Arboricultural consultant should be sought immediately;
- The health of the trees shall be monitored and any works required for health and safety or to promote the health and sustainability of existing trees shall be identified, scheduled and actioned at a suitable time of year;
- All works should be completed at an appropriate time of year and in accordance with relevant EU legislation. Where possible this should be outside of the bird nesting season (i.e., between October through to March inclusive). In any event according to the nature of the works, there may be an additional requirement for monitoring or a watching brief by a qualified ecologist to ensure there are no nesting birds or bats present;
- All works shall be carried out by a skilled, qualified and approved Arboricultural Contractor in accordance with *BS3998: 2010 'Tree Work - Recommendations*.
- Where possible, and where health and safety constraints permit, arisings may be formed into habitat piles within public open spaces, and standing dead wood maybe left within the woodland to provide additional dead wood habitats to maximise invertebrate biodiversity. All other brushwood and logs that result from surgery and felling of trees on site shall be removed off site. Brushwood may be chipped on site, but all wood chippings resulting from these operations shall be raked up, bagged and removed;
- Where surgery works affect carriageways or public roads, the Arboricultural Contractor shall ensure the relevant permissions and road control permits are obtained, and all necessary health and safety parameters are met;
- Selective thinning and coppicing of existing scrub and trees is to be assessed on site. This will allow trees and shrubs to develop diversity of form and different types of nesting, feeding and foraging

habitat and extend the potential life of individual plants. Additional thinning of the scrub areas may be required at intervals following an initial selective thin and coppice. The timing of thinning should be informed by an assessment on site. A competent person, such as a qualified arboriculturist should plan thinning and coppicing operations. All thinning and coppicing operations should be undertaken between October and February; and

- Possible damage to drainage/services and adjoining building foundations must be considered before choosing a replacement tree species and location.

Monitoring Objectives and Performance Criteria

4.12 At the end of the defects liability period (1 year), the overall soft landscape areas shall be in a visually neat and tidy condition and completed to the contract specification prior to handing over to the appointed management company. The management company will inspect all areas of seeding and planting regularly throughout the year, to ensure the landscape management objectives are achieved.

4.13 The landscape sub-contractors with responsibility for the site shall record all site visits, maintenance operations undertaken and any other significant events i.e., fire, theft or vandalism of plant materials. This information shall be used to prepare an annual report at the end of each year that will summarize maintenance operations together with an assessment by the contractor of the current state of the site.

4.14 The appointed supervising officer shall prepare a long-term review after years 5, 10, 15 and 20. This report shall summarize the management undertaken together with an assessment of the performance of the landscaped areas against the performance criteria stated within this plan. This review shall include recommendations for improving the management plan, if necessary, dependant on findings.

5.0 LANDSCAPE HARDWORKS – LONG TERM MANAGEMENT

Paved Areas

5.1 Performance Criteria: All hard surface areas shall remain in good repair and free of any trip hazards.

5.2 Maintenance Objectives: To repair any sunken/raised paving elements, making good damaged units or subsistence to match original materials and retain the paved areas in clean condition.

Maintenance Operations

- Annual inspections of hard surface areas and maintenance carried out as necessary e.g., re-pointing as required;
- Sweep with pedestrian equipment and dispose arisings (1 x per month, March – September);
- Apply herbicide, weed wipe (1 x per year); and
- Clean paved surfaces according to manufacturer's recommendations including removal of stained surfaces and removal of chewing gum.

Gates, Fencing, Barriers & Bollards

5.3 Performance Criteria: All fences shall remain in good visual condition.

5.4 Maintenance Objectives: To repair any damaged elements and ensure barriers succeed in design objective e.g., protect planting.

Maintenance Operations

- Annual inspections of hard works areas and maintenance carried out as necessary;
- Extension or strengthening of barriers as required;
- Clean bollards and barriers only according to manufacturer's recommendation; and
- Repaint fencing as required and as per manufacturer's recommendation.

Walls and Copings

5.5 Performance Criteria: All walls, planters and copings shall remain in good visual condition.

5.6 Maintenance Objectives: To repair any structural damage as required and retain surfaces in clean condition.

Maintenance Operations

- Annual inspections of hard surface areas and maintenance carried out as necessary;
- Maintain and clean painted surfaces;
- Remove graffiti as required; and
- Repaint and/or re-point as required and as per manufacturer's recommendation.

Light Fittings

5.7 Performance Criteria: All external lighting within public realm areas should remain in good working order and good visual condition.

5.8 Maintenance Objectives: To maintain lighting fitting in good working order.

Maintenance Operations

- Regular inspections and repair as necessary;
- Clean and/or repaint as required and as per manufacturer's recommendation;
- All repair works to be carried out according to the latest H&S and BS legislation; and
- All repair works to be inspected and signed off by a certified electrician.

6.0 GENERAL SUMMARY

Introduction

6.1 All works, materials and operations will be in accordance with relevant legislation, European Standards, Regulations (including the CDM Regulations) and Codes of Practice.

6.2 It is important that all maintenance activities, significant events, surveys and monitoring activities are recorded. These provide an effective database against which the effects of maintenance and management activities can be assessed.

6.3 The landscape contractor responsible for maintaining the site shall maintain a record of site visits and the maintenance operations undertaken. The landscape contractor shall also record any significant events, i.e., fire, theft or vandalism of plant material or fencing. Specialist Contractors may be used on an as needs basis to complete specialist operations and/or occasional works.

Process for Monitoring and Review

6.4 The Landscape Management Plan and maintenance schedules will be monitored and assessed for their effectiveness on an annual basis for the first five years following the completion of the development. The review will include advice from specialist consultants as required (such as a qualified arboriculturist and ecologist), the Landscape Management Contractor and other stakeholders. The review shall include (as appropriate):

- Technical Reports - advising on particular aspects such as protected species, general management and health & safety issues;
- Records / Attendance sheets demonstrating the maintenance work undertaken;
- Site visit to assess landscape components, condition, and need for any mitigation or enhancement; and
- Record and Minutes.

Annual Reviews

6.5 The landscape contractor will prepare an annual report at the end of each year of maintenance that shall be made available to the appointed member of the management committee supervising the maintenance contract.

6.6 The report will include a summary of the maintenance tasks undertaken during the course of the year together with an assessment by the landscape contractor of their perceived effects be they positive or negative. The appointed member will prepare a long-term review report after 5, 10 and 15 years of the maintenance contract.

6.7 The report shall include a brief summary of the preceding period of the management plan together with an assessment of the performance of the landscape areas against the performance criteria stated in this plan. The review shall also include recommendation for future maintenance including potential remedial or enhancement works.

Five Year Review

6.8 The Landscape Management Plan will be reviewed every five years, or as required to ensure the satisfactory management of the landscape in perpetuity.

Appendix A Management and Maintenance Report

SAMPLE MAINTENANCE REPORT			
Date		**Weather**	
Start Time		**Finish Time**	
Personnel on Site			
Staff Names		**Skills**	
Tasks Undertaken			
Management Tasks	**Tick Box**	**Comments**	
Cutting Grass	☐		
Weeding	☐		
Strimming Meadow	☐		
Pruning	☐		
Dead-heading	☐		
Litter Picking	☐		
Weed Spraying	☐	Specify chemicals and location	
		_____	
Other	☐		
Tasks incomplete			
Management Task	**Specify Reasons**		
Management and Maintenance Notes			
Date of next site Visit			

Management Signoff			
Site Foreman		**Signature**	
Approved Manager		**Signature**	

Appendix B Specifications for Replacements - Post planting

Plant Material Generally

B1 Trees, shrubs and other plant materials as specified on the drawing shall be supplied from an approved source. Landscape products will be obtained from sustainable sources and from suppliers committed to sustainability.

B2 All trees and shrubs shall correspond exactly with the species, varieties and sizes shown on the planting plan, and shall comply with the relevant sections of *BS 3936 - Part 1: Nursery stock specification for trees and shrubs.*

B3 All shrubs, hedging plants, whips, feathered whips and climbing plants shall be properly grown, healthy, well established nursery transplants of good form, stock & strain, and shall have a well-developed fibrous root system.

Trees and Woodland Areas

B4 All trees shall have a well – balanced crown with an established framework of branches consistent with the species, a single straight stem and a well-developed fibrous rooting system.

B5 Bare rooted trees, where specified shall conform to the above.

B6 Root-balled trees, where specified shall be supplied with a root-ball of diameter and depth appropriate to the size and species of the tree. The minimum diameter shall be no less than ten times the diameter of the stem measured at 300mm above ground level. The root-ball shall be thoroughly moistened, prior to lifting from the nursery.

Appendix C Maintenance Task Schedules

Month	Location	Task	Duration	Comments
January	Lawn Shrubs/Borders	Cut and collect arising Weeding/Litter picking	Every 3 weeks Every 3 weeks	
February	Lawn Shrubs/Borders	Cut and collect arising Weeding/Litter picking	Every 3 weeks Every 3 weeks	
March	Lawn Shrubs/Borders Roses Rhododendrons Topiary	Apply slow release fertiliser Cut and collect arising Apply Medium release fertiliser Weeding/Litter picking Mulch all beds Apply slow release fertiliser Remove dead buds Prune dead wood Prune into shape	Once Every 2 weeks Once Every 2 weeks Once Once Once Once Once	10%N:5%P_2O_5:3%K_2O 7%N:7%P_2O_5:7%K_2O 15%N:6%P_2O_5:12%K_2O Only light prune
April	Lawn Shrubs/Borders	Cut and collect arising Weeding/Litter picking	Every 2 weeks Every 2 weeks	
May	Lawn Shrubs/Borders Rhododendrons	Cut and collect arising Weeding/Litter picking Apply herbicide/pesticide Dead Heading	Every 2 weeks Every 2 weeks Once Every 2 weeks	Aphids, Vine Weevil, Black Spot, Mildew etc. Start as soon as the flowers are going over
June	Lawn Shrubs/Borders	Water on Sulphate of Ammonium Cut and collect arising Weeding/Litter picking	Once Weekly Weekly	Only necessary if lawn appears pale Aphids, Vine Weevil, Black Spot, Mildew etc.

	Rhododendrons	Apply herbicide/pesticide Dead Heading	Every 2 weeks Weekly	
July	Lawn Roses Shrubs/Borders Rhododendrons	Water on Sulphate of Ammonium Cut and collect arising Apply slow release fertiliser Dead Heading Weeding/Litter picking Apply herbicide/pesticide Dead Heading	Once Weekly Once Weekly Weekly Every 2 weeks Weekly	Only necessary if lawn appears pale 15%N:6%P_2O_5:12%K_2O Aphids, Vine Weevil, Black Spot, Mildew etc.
August	Lawn Roses Shrubs/Borders Rhododendrons Topiary	Cut and collect arising Dead Heading Weeding/Litter picking Apply herbicide/pesticide Dead Heading Prune into shape	Weekly Weekly Weekly Every 2 weeks Weekly Once	 Aphids, Vine Weevil, Black Spot, Mildew etc. Only guidance prune
September	Lawn Shrubs/Borders Rhododendrons Lavenders	Apply slow release fertiliser Aerate and overseed Cut and collect arising Weeding/Litter picking Apply herbicide/pesticide Apply medium release fertiliser Dead Heading Dead Heading	Once Once Every 2 weeks Every 2 weeks Once Once Every 2 weeks Every 2 weeks	10%N:5%P_2O_5:3:K_2O Aphids, Vine Weevil, Black Spot, Mildew etc. 7%N:7%P_2O_5:7%K_2O
October	Lawn Roses Shrubs/Borders Rhododendrons Lavender Climber Topiary Hedges	Cut and collect arising Prune back Weeding/Litter picking Prune back Apply herbicide/pesticide Prune out dead wood Cut back Prune back Prune into shape Prune into shape	Every 2 weeks Once Every 2 weeks Every 2 weeks Once Once Once Once Once Once	 Aphids, Vine Weevil, Black Spot, Mildew etc. Hard prune and shaping for next year Hard prune and shaping for next year

			Once	
November	Lawn Shrubs/Borders	Cut and collect arising Weeding/Litter picking Apply herbicide	Every 2 weeks Every 2 weeks Every 2 weeks	
December	Lawn Shrubs/Borders	Cut and collect arising Weeding/Litter picking Apply herbicide	Every 3 weeks Every 3 weeks Every 3 weeks	

APPENDIX 12.1

ARCHAEOLOGY REPORT

KILKENNY ARCHAEOLOGY
Archaeological Consultants

ARCHAEOLOGICAL IMPACT ASSESSMENT REPORT:
PROPOSED RESEARCH AND DEVELOPMENT BUILDING, HUNTSTOWN/COLDWINTERS, COUNTY DUBLIN



Client:
Rathdrinagh Land Ltd., c/o Beauparc, Renewable Energy Solutions, Ballymount Road Upper, Ballymount, Dublin 24

Archaeological Excavation Licence:
20E0601

Planning Reference:
FW20A/0063

Report author and licenced archaeologist:
Cóilín Ó Drisceoil MA MIAI

12.3.2021

Kilkenny Archaeology
12 Parliament Street
Kilkenny City

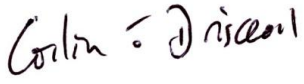
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Client	Rathdrinagh Land Ltd., c/o Beauparc, Renewable Energy Solutions, Ballymount Road Upper, Ballymount, Dublin 24
Document title	Archaeological Impact Assessment Report: Proposed Research and Development Building, Huntstown/Coldwinters, County Dublin
Document type	Archaeological Impact Assessment
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Planning Reference	FW20A/0063
Archive location	Kilkenny Archaeology, 12 Parliament street, Kilkenny
Report author	Cóilín Ó Drisceoil MA MIAI

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CÓILÍN Ó DRISCEOIL MA MIAI

Managing Director and Licenced Archaeologist

12.3.2021

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1. INTRODUCTION

This report details the results of an archaeological impact assessment of a proposed research and development building development at Huntstown/Coldwinters, Co. Dublin (Figures 1, 3). The report was commissioned by the client to respond to a request for Further Information from Fingal County Council in relation to planning application reference FW20A/0063. This report presents the results of archaeological test excavations undertaken within the development site by the author in December 2020 under archaeological excavation licence reference 20E0601, as well as historical and archaeological research which is used to present an assessment of the potential impact(s) of the development on archaeology. Finally, mitigation measures to ameliorate any potential adverse affects are recommended.



Figure 1: Location of proposed development site (Ordnance Survey Ireland).

2. THE PROPOSED DEVELOPMENT AND REASON FOR ARCHAEOLOGICAL INTERVENTION

2.1 Description of development

Planning permission is being sought from Fingal County Council for construction of a single storey 5,000m2 research and development building, which will specialise in developing pilot scale circular economy solutions for a range of discarded resources; including associated office and welfare facilities (Figure 2). The development includes

fencing and boundary treatment, signage, internal access roadways and a site entrance. Permission is also sought for all associated site works and services.

2.2 Reason for archaeological intervention

Item 7 of the Further Information request from Fingal County Council requests the following in relation to planning application reference FW20A/0063:

7. The applicant is requested to submit an Archaeological Impact Assessment in order to assess the potential impact, (if any), of the proposed development on possible archaeological remains in the area.

(i) This Assessment should be carried out by a suitably qualified archaeologist. No sub-surface work should be undertaken in the absence of the archaeologist without his/her express consent;

(ii) The archaeologist should carry out any relevant documentary research and inspect the site. Test trenches may be excavated at locations chosen by the archaeologist (licensed under the National Monuments Acts 1930-2004), having consulted the site drawings.

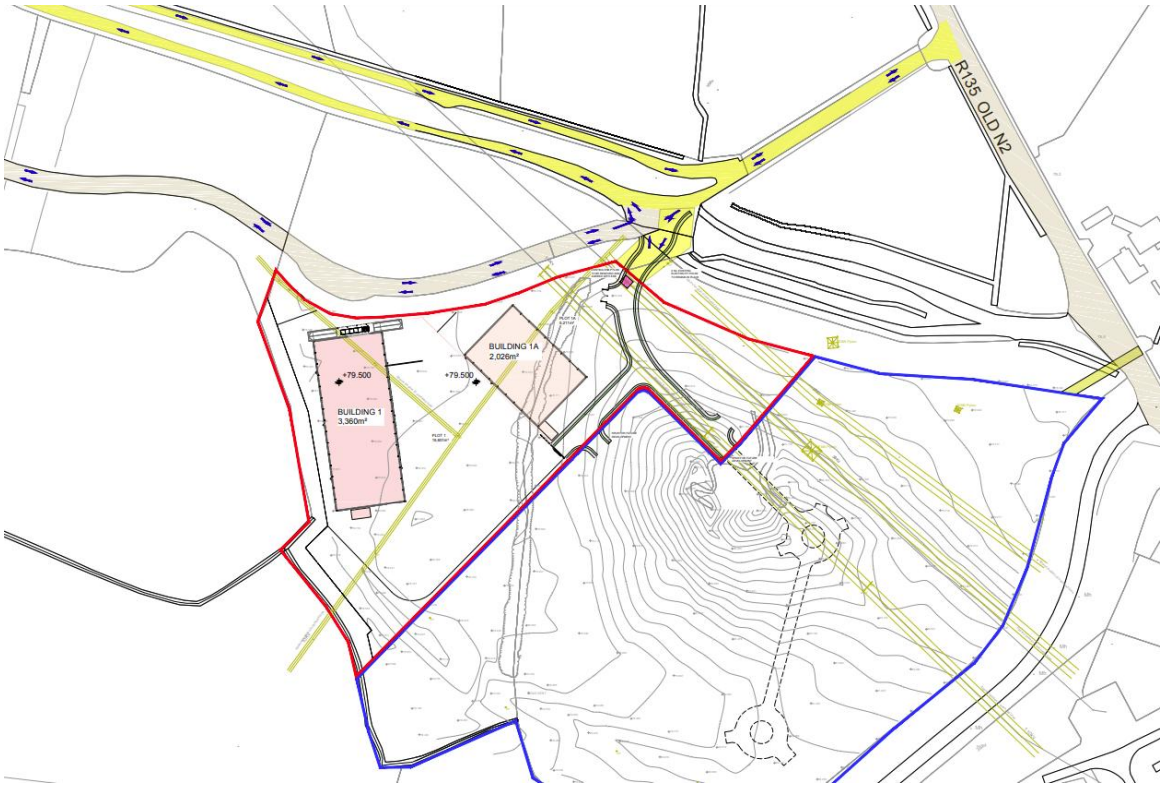


Figure 2: Proposed development layout (Loscher Moran Design Practice)



Figure 3: Proposed development area from south, December 2020.

3. ASSESSMENT METHODOLOGY

The assessment methodology responds to the further information request and conforms to the methodologies recommended in 'Framework and Principles for the Protection of the Archaeological Heritage' issued by the Dept. of Arts, Heritage, Gaeltacht and the Islands (1999). It is also in conformance with the requirements of the Fingal Development Plan 2017-23, section 10.1 of which contains the objective to 'Ensure archaeological remains are identified and fully considered at the very earliest stages of the development process, that schemes are designed to avoid impacting on the archaeological heritage. Require that proposals for linear development over one kilometre in length; proposals for development involving ground clearance of more than half a hectare; or developments in proximity to areas with a density of known archaeological monuments and history of discovery; to include an Archaeological Impact Assessment and refer such applications to the relevant Prescribed Bodies'.[1] The content

[1] https://www.fingal.ie/sites/default/files/2019-03/Fingal%20Development%20Plan%202017-2023%20-%20Written%20Statement_compressed_compressed.pdf

of this report is also in accordance with the legislative frameworks of the *National Monuments Acts 1930-2004*, the *Heritage Act 2000* and the *European Convention on the Protection of the Archaeological Heritage (ratified by Ireland 1997)*.

3.1 Assessment Components

This assessment comprised a desk-based study, a field survey of the application area and archaeological test excavations.

Desk-based study

The desk study aims to present, through a review of primary and secondary documentary sources (see bibliography), the archaeological and historical background to the proposed development area and to describe previous archaeological investigations that have been undertaken within the vicinity of the site.

Field Survey

Field inspection is undertaken with the aim of identifying any potential impacts that the development may have upon recorded archaeological monuments in the environs of the application area and also to identify any previously unrecorded archaeological monuments or areas of archaeological potential.

Archaeological Test Excavations

Archaeological test excavations (under archaeological excavation licence reference 20E0601) were undertaken across the site in December 2020, in accordance with a method statement submitted to the National Monuments Service and the National Museum of Ireland. This report presents an overview of the findings of the test-excavations.

Sites and Monuments Record Reference	**Townland**	**Description**
DU014-122001-	Kildonan	This monument was subject to geophysical survey (Licence no. 09R195) and test excavation (Licence no. 10E0462) as part of the proposed Metro West development. A sub rectangular enclosure (35m x 25m.) was identified on the geophysical survey and confirmed through test excavation. Two postholes were located either side of the ditch (0.55m wide and 0.25m deep) suggesting the possibility of a palisade. Two corn-drying kilns (DU014-122002-; DU014-122003-) are situated at the S of the enclosure (O'Donovan 2010, 18).
DU014-122002-	Kildonan	This monument was subject to geophysical survey (Licence no. 09R195) and test excavation (Licence no. 10E0462) as part of the proposed Metro West development. A comma-shaped corn-drying kiln and the probable flue of a second corn-drying kiln were located to the S of an enclosure (DU014-122001-). The former (2.1m wide and 0.51m deep) contained three fills (O'Donovan 2010, 17).
DU014-102----	Baleskin	A large circular enclosure visible as a crop mark on an aerial photograph (SMR file; pers. comm. T. Condit). Relatively low lying field north of M50 and west of N2. No visible remains.
DU014-124----	Baleskin	Located in large arable field close to the field's northern boundary, c. 148m north-east of a large cropmark enclosure (DU014-102----), cropmarks indicate the presence of a subsurface ditch. The cropmarks are visible on Google Earth imagery on 24 June 2018, viewed on 17 September 2020. The enclosure is subcircular in plan (diam. c. 32.3m N–S x c. 24.5m E–W). There is no evidence for an entrance gap through the ditch (diam. c.2m). A linear cropmark, a subsurface ditch, can be seen adjoining the enclosure along its southern perimeter.
DU014-015----	Coldwinters	Located in pasture (formerly the green of a golf course) between the Dublin-Ashbourne Road and the N2. A circular cropmark (diam. c. 15m) visible on an aerial photograph (CUCAP, BDQ 66). Not visible at ground level.

Table 1: Sites and Monuments Record monuments within environs of proposed development site.

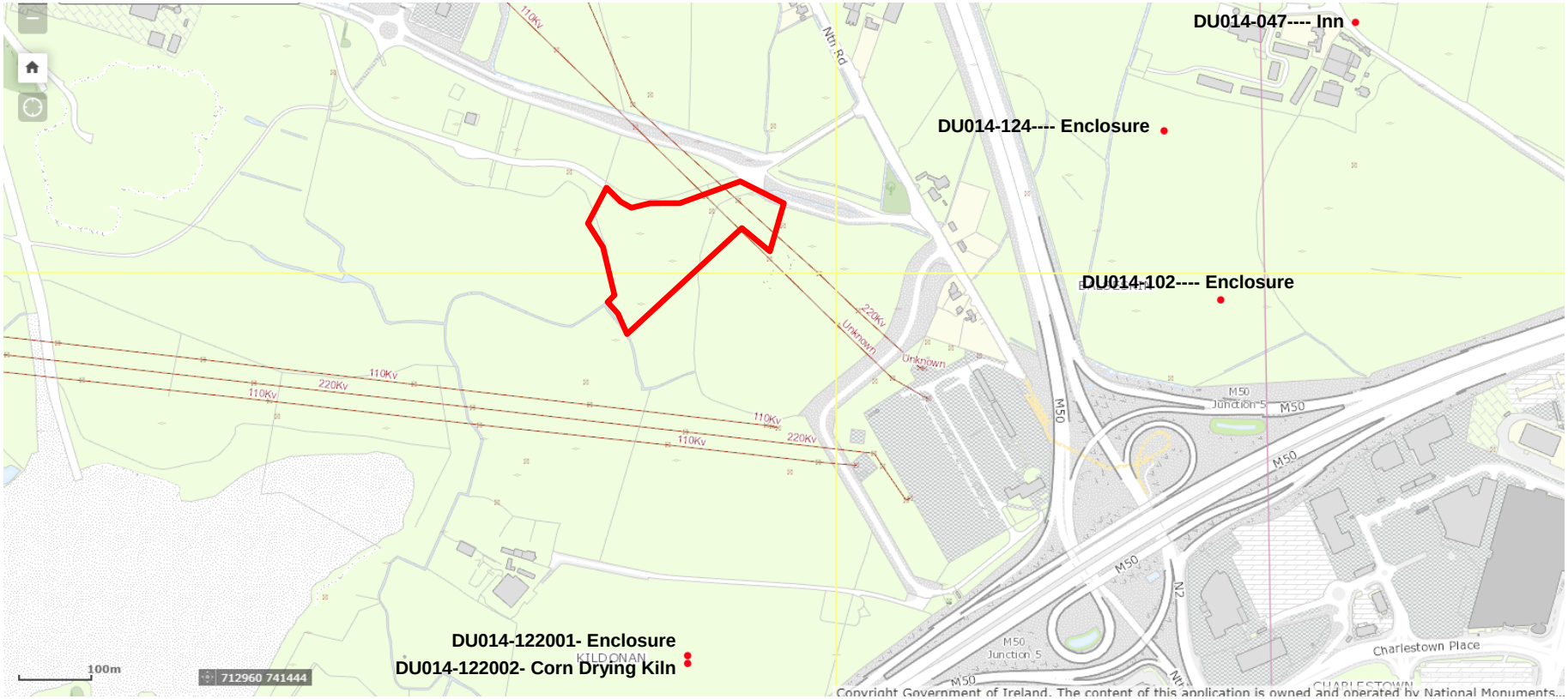


Figure 4: Proposed development area and surrounding Recorded Monuments (see Table 1).

4. ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

4.1 Introduction

The proposed development area is a 22 acres greenfield site located between the M50 motorway 450m to its east and the Huntstown Power Station 520m to its north-west, 2.5 km north-west of Finglas in north Co. Dublin (Figure 1). The western part of the site is a scrub field and is defined on the west by a field boundary (Figure 3). A second field boundary traverses the site on the east and marks the division with a second tillage field to the east (Figure 1). This field contains a steep hill which has been partially quarried for gravel. The gravel pit is marked on the first edition Ordnance Survey map and subsequent editions (Figures 7, 8).

4.2 Archaeological Background

The following is a chronological review of the archaeology and history of the application area and its surrounding landscape. All cultural heritage sites (protected and non-protected by law) within a c. 2 km radius of the application area were reviewed to ensure the fullest and most comprehensive picture of settlement in the area. This zone is hereto referred to as the study area while the proposed location of the development is referred to as the subject site. Note that the descriptions on RMP sites that follow are sourced largely from www.archaeology.ie. Summaries of archaeological investigations in the Excavation Bulletins are referenced in the text. Copies of the RMP entries are in table 1 and the excavation bulletin entries are set out in Appendix 1.

Prehistoric Period

Only five prehistoric sites (pre c. 500 AD) are known within the study area. The low number may be attributed to the flat terrain and heavy soils of north county Dublin (Dineen and Sutton 2003). The most significant prehistoric site is a Neolithic causewayed enclosure in Kilshane townland [DU014-093], which is located 1.5 km north of the application site on a gently undulating gravel ridge associated with tributaries of the Ward River. This site was uncovered during excavations that were carried out in advance of the N2 Finglas-Ashbourne road scheme in 2004 (Moore 2008). These types of monuments are the oldest substantial Neolithic monument type in Ireland. The enclosure was oval

shaped (NW-SE 38.5m, NE-SW 27.5m) and was defined by a series of segmented ditches. There was no evidence of an internal or an external bank, which may have been ploughed out. Many of these ditch segments contained large quantities of animal bone in their deposits (Moore 2004, NRA 2005).

Later prehistoric evidence is also present in the study area. Ring-ditch [DU014-015], which is located 500m to the north of the application site in the townland of Coldwinters (Figure 4). It is a type of funerary monument that can date from the Early Bronze Age through to the Late Iron Age. The example at Coldwinters is no longer visible at ground level. It was identified on old aerial photographs prior to its locality being transformed into a golf course. The photograph showed a circular cropmark with a diameter of 15m. A second ring-ditch [DU014-100], known only as a cropmark, is 1200m to NE of the application site in Newtown. The position of these two ring-ditches on relatively high points in the local terrain with prominent views is a common occurrence for this monument type in Ireland. Bronze Age funerary activity in the form of cremation pits and a single inhumation were also found at the causewayed enclosure in Kilshane. A flanged axe find from Newtown townland is also known (NMI Reg. No. 1962: 259).

Two burnt mound sites [DU014-050 & Site 1 of 03E1450] are further instances of prehistoric activity in the study area. These site types are amongst the most commonly found monument type in Ireland and are often associated with water sources. Site DU014-050 is located in Grange townland 1300m west of the application site. It was discovered during the excavation of the Northeast gas pipeline in 1988 (Conway 2000a). The works exposed a surface spread of charcoal-blackened soil and peat-cracked stone (6m E-W; 5m N-S). Site 1 of 03E1450 contained a burnt spread (3.5m by c. 10m with an average depth of 0.15m) and associated features. This site was found on the N2 Finglas-Ashbourne road project in the townland of Newtown, 1km north of the application site. It was found adjacent to a natural waterlogged peat basin. There was no indication of the nearest water source of the burnt spread in Grange but it is located not far from a tributary of the Tolka River. A third possible burnt mound site was reported by Simpson (1994) in an area to the south of the central quarry deposits (see Dineen and Sutton, 2003 – precise location not known). Burnt mounds are often found in close proximity to water sources because their function was to boil water in troughs dug into the ground. This was done through the heating of stones in a fire adjacent to the trough and then the placement of these stones within the trough to boil the water. The reasons for what the

boiling water was used for vary from ritual activity, cooking, to brewing beer. These sites are fairly easy to identify in the landscape because they leave behind a waste pile of shattered blackened stones, often forming a horseshoe shape around a trough. Many have been ploughed out over the centuries but black stained soil and shattered stone is often detected when topsoil is removed ahead of building or infrastructural developments.



Figure 5: Baleskin DU014-102---- enclosure



Figure 6: Baleskin DU014-124---- enclosure

Early Medieval Period

The study area is within the plain of Brega and earliest historical records note that the Síl nÁedo Sláine, a dynasty of the southern Uí Néill, were the dominant rulers in the area during the early medieval period (Byrne 1973, 88 in Dineen and Sutton, 2003). The most dominant monument from this era (500 – 1169 AD) is the ringfort. Ringforts were defended farmsteads comprising most commonly a circular space enclosure by a defence ditch and bank (univallate) or a series of ditches and banks (bivallate or multivallate). These monuments were primarily settlement foci and may also have been for people to retreat into at times of conflict, or enclosures to protect cattle. Sometimes within such monuments souterrains have been found, which are stone or wooden lined tunnels leading to chambers or hidden exits. Four possible ringforts, five enclosures and one souterrain fall within the study area. All but one of the ringforts is extant. The nearest ringfort to the application site is c. 1.3km to the N in the townland of Newtown within the site of a former golf club. This levelled monument [DU014-006002] was recorded prior to its destruction in 1953 and from cropmarks seen on later aerial photography. Stout and Stout (1992) recorded two phases of construction – a roughly circular 45m diameter enclosure and the second phase a 90m diameter enclosure with a surrounding ditch and bank – the classic ringfort design. O'Carroll (2004), who rediscovered the site in a phase of archaeological testing for an industrial development, said of the monument that it 'displays characteristics of an early medieval multivallate ringfort', and that a piece of probable prehistoric pottery was found within its extent. The discovery of pottery lends weight to Stout's interpretation of two phases of construction – perhaps one prehistoric and one early medieval, rather than both as possible ringforts as Stout suggests. Elsewhere in Newtown, a probable levelled ringfort [DU014-097] was identified from cropmarks on aerial photography c. 250m east of [DU014-006.001], itself another possible ringfort adjacent to [DU014-006.002]. Also in Newtown is an oval enclosure [DU014-007]. An enclosure [DU014-016] recorded from aerial photography in neighbouring Coldwinters townland with a diameter of 45m may also have been a ringfort. It was not relocated during testing by O'Carroll (2004), probably she says because it was removed by landscaping for the golf course. The site is located 800m east of the application area. Another possible enclosure is recorded 1100m to the east at DU014-017.

Two enclosures in Baleskin [DU014-124---- and DU014-102----] are represented by cropmarks and are located 650m and 750m to the east of the application area respectively

(Figures 4, 5, 6). Three enclosures (possible ringforts) and a possible souterrain are located in Cloghran, 1.7 – 1.8km west of the application site. These were again identified as cropmarks on aerial photography. The one considered most likely to have been a ringfort [DU014:014.001) was on a north facing slope under tillage and had an irregular oval shape (dims. 40m E-W; 30m N-S). The remaining two [DU014:014.001 and DU014:014.001:002] were in similar topographic positions to DU014:014.001 and were subcircular (dims.30m E-W; 42m N-S) and oval (dims. c. 40m NW-SE; 33m E-W) in plan respectively. The possible souterrain [DU014:001.003] was identified within the latter possible ringfort [DU014:014.002]. Finally, one more ringfort [DU014-029] is known from Cappoge 1.5km south of the application site. Unlike the other possible ringforts mentioned, this one is still visible, albeit damaged from farm machinery. It is on level land which slopes away slightly to the SW. This site comprises a circular platform (diam. 34m; H 1-1.8m). The bank has not survived and there are no traces of an external ditch. It is possible that some of the churches and graveyards discussed in the next section may have early medieval origins, although this is not certain. A possible candidate is a series of 123 Christian burials excavated on the northeast gas pipeline in 1988, many of whom were children and adolescents (site 99E0220, 1800m NW of application site) (Conway 2000b, Mount 2012).

Medieval Period

The arrival of the Anglo-Normans signalled profound changes in the cultural and political landscape of Ireland. King Henry II in 1172 made Hugh de Lacy palatinate of the lands of Meath, which probably included the Barony of Castleknock. De Lacy then granted Hugh Tyrell the lands of Castleknock on behalf of the king. Tyrell was the first of eight to assume the title Baron of Castleknock into the 14th century (Ball 1920). There are scarce references to Huntstown townland during the medieval period and medieval monuments occupy it and its environs. The name itself is thought to translate as the land of the Hunt family, an Anglo-Norman family who briefly feature in documentary sources until the 14th century, when the last member of the lineage was executed for treason (Dineen and Sutton, 2003. The Statute Rolls of Ireland record that Huntstown townland was under the control of Nicholas Barnwell in 1463-4, although Conbhui (1962) notes that this refers to Huntstown of Santry Parish and not the Huntstown of the application site.

Anglo-Norman settlement in this part of Ireland was characterised initially by the development of motte and bailey castles, which were often set up along strategic locations overlooking rivers or important routeways. They comprised a large earthen mound on top of which would have been a timber castle within a palisade. A fosse or moat would have encircled the mound to provide added defensive security, and sometimes an outer area known as a bailey was constructed. This too was delineated by a defensive ditch or palisade. There are two motte and bailey castles within the study area – Newtown [DU014-013] and Dunsoghly (known on the six inch map as Connaberry Moat) [DU014-005.003]. Newtown is 900m north-west of the application site and Dunsoghly a 1.7km away in the same direction. At less than 1km away along an open flat landscape, the proposed development area may have come under the control of the motte at Newtown. The John Rocque map of 1760 (Figure 7) depicts a pond c.400m north of the application site from which a stream drains northwards to pass very close to the motte. The motte was destroyed in 1952. It was recorded prior to its removal as a circular platform (diam. 28m; H 3m) which was enclosed around the base by a wide fosse. This flat-topped platform was further enclosed by an oval earthwork or bailey (dims. 100m E-W; 70m N-S). The site is visible as a soil mark on aerial photographs and is also hachured on the six inch map. Pre-development testing in the vicinity of the monument in 2001 failed to uncover contemporary archaeological deposits (Fitzpatrick 2003). Unlike Newtown, Dunsoghly motte still partially survives on a natural rise in the landscape not least because a modern farm is built on the top of it. However, it is not possible to discern at ground level. Its mound is oval shaped and measures 80m NE-SW; 65m SE-NW; H 3m. Traces of an outer bank are visible on an aerial photograph.

Castle forms in Ireland changed from mottes to tower houses as the Middle Ages progressed. Tower houses are substantial stone structures that are often square or rectangular shaped with few windows. Their design reflects the high levels of hostilities that were present during this period in Ireland. There are two tower houses in the study area. One is at Dunsoghly [DU014-005001] approximately 250m NW of Dunsoghly motte and c. 2km from the application site, and the second at Cappoge [DU014-027], 1.6km south of the application site. The absence of a tower house near the motte at Newtown would suggest the previous prominence of this area may have waned at the expense of nearby Dunsoghly.

Dunsoghly castle [DU014-005001] is a well preserved tower house dating to the late 15th-century. It is associated with the Plunkett family (Tutty, 1979, 155-7). It is four storeys high and has four corner towers. It is built of limestone - the rock so often quarried in the study area - and contains dressed stone quoins and a base batter. Passage though the ground floor entrance leads to a vaulted chamber where evidence of wicker-work is evident above. Three of the four towers contain chambers and the fourth a stairwell leading up to the first floor, which is lit by tall rectangular windows. Other features include a fire place and a garderobe, corbels for the second floor level, roof timbers for the third floor level, musket holes, battlements, and Tudor style chimneys on the roof. Adjoining the castle is the medieval church DU014-005002. Cappoge castle has not survived the like Dunsoghly. This tower house is depicted on a drawing of 1776 by Gabriel Beranger as a three storey structure and in a written account of 1778 by Austin Cooper it is described as a three-storey tower house with corner turret. It was knocked down before 1860. The Woodcock family was associated with this castle from the thirteenth to the sixteenth century (Ball 1920, 18-19). An earthwork marked on six inch historic mapping and visible on aerial photography in Ballycoolen townland was listed as a moated site [DU014-025] but archaeological investigations found that it was a natural feature (Mount 2012). It measures 40m x 30m and 20m high. A possible church, burying ground and a domestic well are marked on the first edition map [DU014-012 001-3] 1km north of the application site at Kilshane. However, no burials or an associated church have been found and this area has been subjected to extensive quarrying (Mount 2012). Excavations to the north of the latter site uncovered a medieval cemetery (99E0220) (Excavations 1988, 17).

Post-Medieval Period

There is a substantial increase in the number of cultural heritage sites within the study area during the post-medieval period (*c.* 17th to *c.* 19th century). Twenty structures date to this period. None are recorded in the National Inventory of Architectural Heritage for Fingal but five entries appear in the Sites and Monuments Record. These include a 16th / 17th century probable fortified house at Dubber [DU014-018], which is 1.8km from the application site, a house in the same area built out of the ruins of Dubber castle [DU084-017], an Inn in Dubber [DU014-017], and two houses / a chapel and a crucifixion plaque at Dunsoghly [DU005-002, -004, -005, -006], 1.9km NE of the application site. Fourteen quarries and six gravel pits, including that situated immediately to the east of the subject site, probably date from the post-medieval period. These may

have been used to source the stone work for the buildings and gravel for lane surfaces and other building purposes. Such quarries are pre-emptive of Huntstown quarry today, which was opened in the 1970s and not developed from an earlier quarry. Two limekilns are also known from the study area. Given the substantial increase in cultural heritage sites and associated literary sources for this period, the rest of this section will focus exclusively on Huntstown townland.



Figure 7: Approximate location (arrowed) of proposed development area on 1760 John Rocque map of north Dublin.

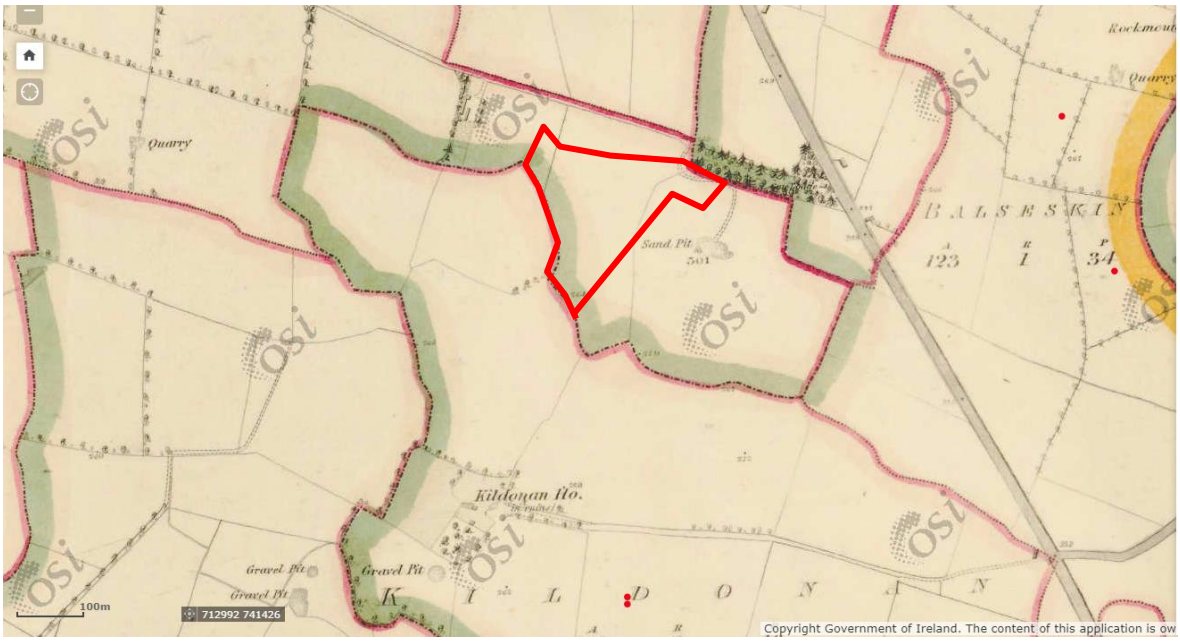


Figure 8: Proposed development area on first edition Ordnance Survey map 1840 (Sheet 14 extract).

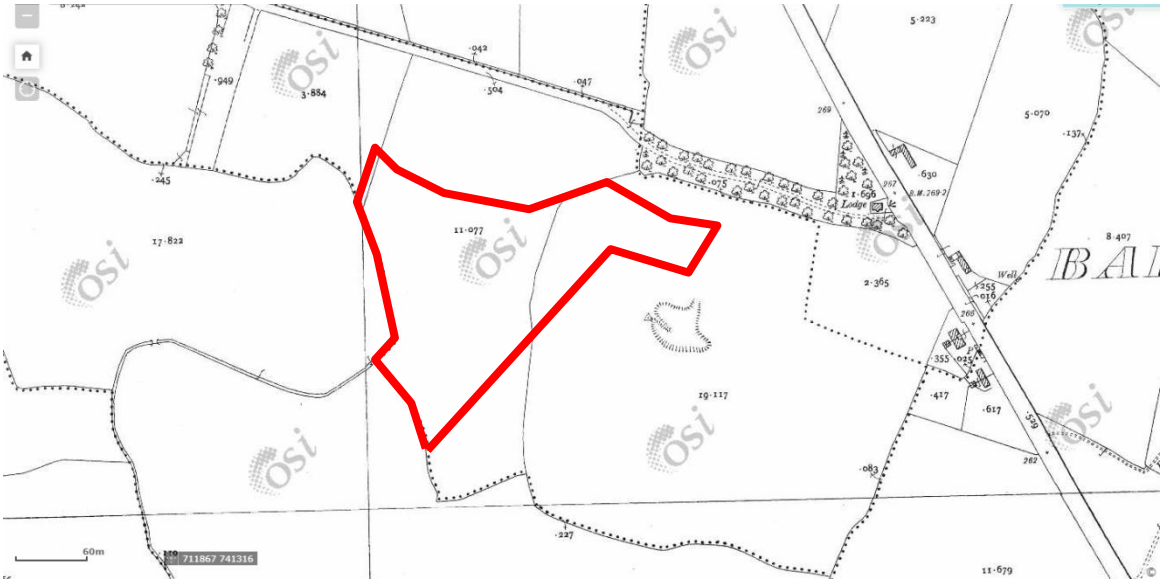


Figure 9: Proposed development on site location on 25-inch Ordnance Survey map 1910 (extract).

There are references to Huntstown in historical sources although there are three townlands with the name of Huntstown in Dublin, two of which are in the Barony of Castleknock and one in the Barony of Coolock. Care is thus needed when assigning documentary evidence to Huntstown townland. References to the Luttrell and MacFarlane families in 16th to 19th century records relate to Huntstown of Mulhuddart Parish in Castleknock. Huntstown of Mulhuddart is noted in 1540 as forming part of the

lands of St Mary's Abbey (Conbhui 1962). The 1656 Civil Survey of Dublin notes that Huntstown townland was the property of James Barnwell of Dunbro. It also states that Huntstown called Huntstown & Mestallstown belonged to Martin Dillon of Huntstown (Mount 2012). However, the entries probably relates to Huntstown of Santry Parish in Coolock, which is near Dunbro and was associated with the aforementioned Nicholas Barnwell in the medieval period. Genealogical sources support this view as they record that a Martin Dillon (b1635) married Alison Barnwell (b1649) and that they had a family in Huntstown.

The earliest mentioned definitive person linked to Huntstown of Castleknock Parish is a merchant by the name of Hoxes Cotes 'of Huntstown and Johnston in Castleknock Parish, Co. Dublin, 1766' who is mentioned in association with an estate map in the National Archives. The estate almost certainly includes Huntstown house, which is labelled 'Newtown' on the Rocque map of 1760 (Rocque instead labels Kilshane house as 'Huntstown') and which is shown on six inch and 25 inch historic mapping (Figure 7). There are no other houses in Huntstown or Johnstown on the Rocque map. Given that Cotes is from 'Huntstown and Johnstown', the application site probably falls within his former estate.

The site of Huntstown house is 1.4 km NW of the application area. The house has been entirely removed by Huntstown quarry, which now covers an extensive area of Huntstown and neighbouring townlands (Mount 2012). The house is difficult to make out on the 1760 map but it appears to be made up of five buildings and an adjoining formal garden, all within a large square plot of land (Figure 7). The map shows that its original entrance was to the south off the Finglas-Cloghran Rd near Cappoge Castle. There was also a lane linking Huntstown house with Kilshane house. The fields surrounding the house are depicted, probably schematically, as a mixture of tillage and pasture.

The Rocque map of 1760 depicts no buildings or features of archaeological significance in the approximate area of the application site (it is difficult to precisely place the location of the application site on this map). A pond is shown on the Rocque map c.300m north of the application site (Figure 7).

The layout of Huntstown House differs on the historic six inch map of 1843 compared to the Rocque map (compare Figures 7 and 8). This reflects changing styles and increased wealth between 1760 and 1843. The house plan has T-shaped and L-shaped wings that semi-enclose a courtyard. A formal garden is still shown and the lands of the estate take on a more managed appearance with neatly subdivided fields, including the field of the application site. The entrance approach to Huntstown House also changes with the southern lane to Cappoge and the northern lane to Kilshane being superseded by a west-east aligned lane linking the house to the Dublin-Slane Road. This lane today is the main access route to Huntstown Quarry and to the application site, which is located in a field immediately south of this lane. The six inch map shows an area of trees at the point where the new road met the Dublin-Slane Rd, making it difficult to discern the nature of the entrance at that time. There was no gate lodge there like there was at the entrance to Huntstown House at the opposite side of the townland, which itself is not as old as the house as it is not depicted on the 1760 map (Figure 7).

The Griffiths Valuation, which was the primary valuation of property in Ireland between 1847 and 1864, indicates that the person who lived in Huntstown House when the survey for Dublin was completed in 1853 was Mr. Christopher Kelly. He did not own the house but leased it from Anthony Hawkins, Esq. Mr Kelly also leased the three fields east of his house which formed the eastern end of Huntstown townland. These totalled 91 acres. The presence of the new road dissecting the townland from west to east, the construction of Mr Kelly's house and the leasing of associated land, and the renting out of the gate lodge all point to the original estate of Huntstown House being sold at some point to a property developer, perhaps Anthony Hawkins Esq. or an earlier developer, and being put to economic gain. The presence of the sandpit in the field to the east of the application site also supports this hypothesis.

Aerial photographs from recent years show the larger (west) field in the application area has been disturbed by construction works, probably associated with the adjoining road network and Huntstown Power Station.

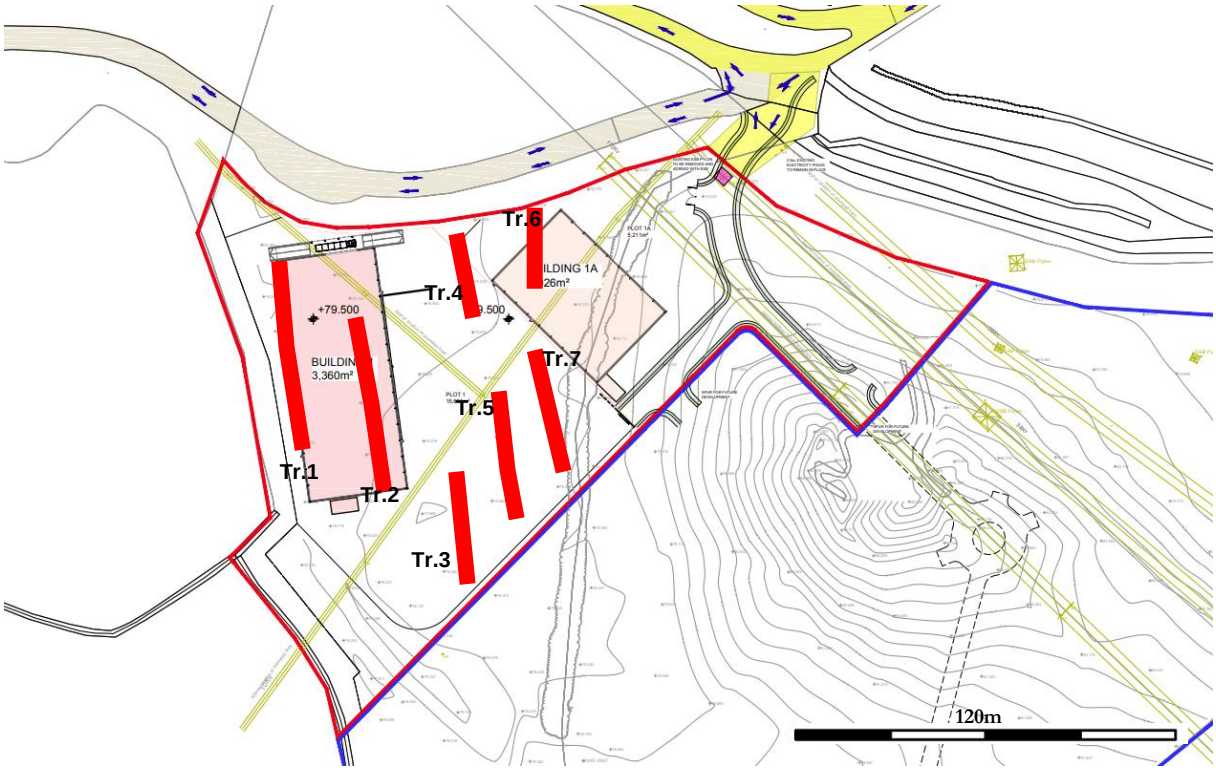


Figure 10: Location of 20E0601 archaeological test trenches overlain on proposed development layout plan.



Figure 11: 20E0601 Test-Trench 1 from north.



Figure 12: 20E0601 Test-Trench 2 from north.



Figure 13: 20E0601 Test-Trench 3 from north.



Figure 14: 20E0601 Test-Trench 4 from north.



Figure 15: 20E0601 Test-Trench 5 from north.



Figure 16: 20E0601 Test-Trench 6 from north.



Figure 17: 20E0601 Test-Trench 7 from south.

5. ARCHAEOLOGICAL TEST EXCAVATIONS

5.1 Introduction

The following provides the results of archaeological testing within the application site in December 2020. In total seven archaeological test-trenches were excavated across the site by a 10 ton tracking machine with a toothless grading bucket (Figure 10).Trenches were excavated to the level of the underlying glacial subsoil. Overhead power lines precluded test trenching across much of the site as these areas had to be avoided with the mechanical excavator.

5.2 Results

Test-trench 1 (Figures 10, 11)

This trench measured 60m L x 2m W and was excavated to an average depth of 0.4m. The sod and topsoil was 0.3m deep and had been previously disturbed throughout much of the length of the trench. Underlying the topsoil was a hard glacial boulder clay and gravel. Nothing of archaeological interest was noted.

Test-trench 2 (Figures 10, 12)

This trench measured 57m L x 2m W and was excavated to an average depth of 0.4m. The sod and topsoil was 0.3m deep and had been previously disturbed throughout much of the length of the trench. Underlying the topsoil was a hard glacial boulder clay and gravel. Nothing of archaeological interest was noted.

Test-trench 3 (Figures 10, 13)

This trench measured 36m L x 2m W and was excavated to an average depth of 0.4m. The sod and topsoil was 0.3m deep and had been previously disturbed throughout much of the length of the trench. Underlying the topsoil was a hard glacial boulder clay and gravel. Nothing of archaeological interest was noted.

Test-trench 4 (Figures 10, 14)

This trench measured 25m L x 2m W and was excavated to an average depth of 0.4m. The sod and topsoil was 0.3m deep and had been previously disturbed throughout much of the length of the trench. Underlying the topsoil was a hard glacial boulder clay and

gravel. Various modern field drains were noted cutting the glacial clays. Nothing of archaeological interest was noted.

Test-trench 5 (Figures 10, 15)
This trench measured 40m L x 2m W and was excavated to an average depth of 0.4m. The sod and topsoil was 0.3m deep and had been previously disturbed throughout much of the length of the trench. Underlying the topsoil was a hard glacial boulder clay and gravel. Nothing of archaeological interest was noted.

Test-trench 6 (Figures 10, 16)
This trench measured 25m L x 2m W and was excavated to an average depth of 0.4m. The sod and topsoil was 0.3m deep and had been previously disturbed throughout much of the length of the trench. Underlying the topsoil was a hard glacial boulder clay and gravel. Nothing of archaeological interest was noted.

Test-trench 7 (Figures 10, 17)
This trench measured 40m L x 2m W and was excavated to an average depth of 0.4m. The sod and topsoil was 0.3m deep and had been previously disturbed throughout much of the length of the trench. Underlying the topsoil was a hard glacial boulder clay and gravel. Nothing of archaeological interest was noted.

6. ARCHAEOLOGICAL IMPACT STATEMENT

6.1 Impact Statement and Mitigation Recommendations

The outcome of desk study research, archaeological test excavations, a review of previous excavations and inspection of the application site and its surrounds facilitates the collation of a comprehensive archaeological impact statement and archaeological mitigation strategy for the proposed development. The proposed development area is a 22 acre green-field site that does not contain any previously recorded archaeological or built heritage sites. The closest Recorded Monument to the application area is a ring ditch site [DU014-015----] which is situated 500m to its north (Figure 4). Archaeological

test excavations within the application site did not uncover any archaeological deposits, features, structures or objects within the excavated trenches (Figure 10).

Notwithstanding the absence of evidence for archaeological materials within the application site the scale of the development (22 acres) gives rise to the possibility that archaeological materials could be impacted upon during construction of the development. Accordingly, as mitigation it is recommended that a structured programme of archaeological monitoring by a suitably experienced archaeologist of all sub-surface groundworks, including site investigations, associated with the development shall be undertaken under licence to the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht. Should archaeological materials be encountered during the course of the works the monitoring archaeologist shall be empowered to halt construction works in the affected area pending receipt of further recommendations from the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht.

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Appendix 1: Previous licenced archaeological excavations in environs of proposed development area.

Dublin
1994:091
'Dunsoghly Castle', Dunsoghly
Medieval tower house
O154410
A watching brief was carried out at Dunsoghly Castle during the construction of the film set for Braveheart in July 1994. The construction of the film set necessitated minor excavation in four separate areas in the immediate vicinity of the castle. Three of these four areas involved digging several holes 0.4m wide and 0.6m deep to receive wooden posts for the mock houses. The fourth area involved the excavation of a trench 9m wide, 7m in length and 1m deep which would act as a ditch or moat under the drawbridge. The film set was constructed on the south side of the castle and none of the four areas were excavated to subsoil.

In Area 1 to the south-west of the castle, the topsoil was 0.15m in depth and lay over a light brown sandy soil. The only finds recovered were sherds of post-medieval willow pattern. Below the topsoil in Areas 2 and 3 to the south of the castle, a 0.1m thick stony layer was uncovered. The stones were about 50mm in size and may have formed part of a path although they did not seem hardpacked. No finds were recovered. The trench opened in Area 4 to the south of the castle revealed a 0.3m thick topsoil above a yellow clay which extended to a depth of 0.58m under which was a yellow/grey layer extending to the bottom of the 0.96m deep trench. Like Areas 2 and 3, no finds were recovered. The only finds from the site came from a narrow ESB trench running southwards away from the set which was not excavated under archaeological supervision. The finds included clay pipes, sherds of black glazed earthenware and an iron stake or hook. This trench was excavated through the topsoil and an underlying grey loam and disturbed a stone wall or drain.
Donald Murphy, Archaeological Consultancy Services, 30 Laurence St., Drogheda, Co. Louth.

Dublin
1999:161
BALLOUGH TO KILSHANE GAS PIPELINE
Various
SMR 7:15, 11:84, 14:0490
99E0395
Monitoring of topsoil removal for the construction of the northern section of the new NEP 3 gas pipeline was undertaken between April and September 1999. The pipeline will extend south from Ballough as far as Brownsbarn, Co. Dublin, reusing sections of the previously excavated NEP 1 and 2 pipelines (1983 and 1988). The first stage of this route saw monitoring of the pipeline excavation from Ballough to Kilshane. The remaining stages of pipeline construction south of Kilshane as far as Brownsbarn will be undertaken from summer 2000.

From Broghan the pipeline extended to Kilshane, following the line of NEP 2 between the townlands of Kilshane and Broghan. The pipeline itself switched to 5m east of the original line, and the original wayleave was reused and slightly widened to the end of this stage of pipeline at the block valve at Kilshane. The cemetery site at Kilshane (SMR 14:0490) uncovered during the NEP 2 operation (Margaret Gowen in Excavations 1988, 17) lies c. 420m north-east of the block valve. The cemetery extends to the west of the former pipeline corridor and may extend into the adjacent field on that side. The eastern limit of the burial area was defined during excavation.

Geophysical survey was undertaken before an archaeological assessment of the site took place, providing a number of targets for testing. A single archaeological feature was revealed and excavated in a location east of the cemetery site and does not appear to be related to it (see No. 253 below).

No further archaeological features or burials were encountered during monitoring of the pipeline construction.
Malachy Conway for Margaret Gowen & Co. Ltd, 2 Killiney View, Albert Road Lower, Glenageary, Co. Dublin.

Dublin
1999:253
KILSHANE
Unenclosed cemetery
31037 24281
SMR 14:48
99E0220
An assessment and subsequent monitoring (see No. 161 above) of topsoil removal were undertaken at Kilshane, Co. Dublin, as part of the reinforcement of the Brownsbarn to Ballough Gas Pipeline (formerly known as the Northeastern Pipelines, Phases I and II). The name Kilshane contains the element 'Kil', or Cill, signifying a church, while the second element is less certain, but in at least one other instance (in County Limerick) a church site called Cill Senaig has been anglicised as Kilshane. That being the case, the County Dublin site may well represent the church of Senach.

The site, first discovered on removal of topsoil during the Phase II pipeline operation in 1988, is in a flat, low-lying area c. 0.5 miles to the west of the N2, near St Margaret's. During Phase II pipeline operations an unenclosed cemetery comprising 123 individuals was revealed over a 21m stretch of the pipeline corridor (see report by Margaret Gowen in Excavations 1988, 17). Consequent to this discovery, the site was included in the SMR by the National Monuments and Historic Properties Service.

The new reinforcement pipeline corridor runs parallel to the existing and archaeologically resolved area of 1988 and thereby encroached the SMR constraint area for the cemetery site. Geophysical survey of the proposed corridor was undertaken before the assessment.

In summary, the assessment revealed one feature of archaeological potential, and no further features or finds were revealed during subsequent monitoring of topsoil-stripping before pipe-laying.

Magnetic gradiometry and electrical soil-resistivity surveys were undertaken at the site. The former technique indicated strong ferrous (iron) interference within the western area of the survey grid, along with two anomalies representing possible ditch features. One

these anomalies is just beyond the disturbance zone caused by the existing gas pipe and is almost certainly ditch F140 revealed in the NEP II 1988 operation. Various clusters of small anomalies were also discerned, along with regular linear-trending anomalies, suggesting changes in the underlying geology. The resistivity survey revealed a number of low-resistance linear trends, which coincide with the magnetic anomalies, indicating possible ditches. However, the majority of the resistivity responses appeared to reflect natural variations in resistance values across the site, especially along the western edge of the survey grid, which would suggest disturbance from the pipe and 1988 construction. The same may also be said of a number of linear trends in the north-eastern corner of the survey grid, which equate with plough action or other modern disturbances.

Four test-trenches were excavated across the proposed 30m wayleave realignment corridor. The trenches were directly east of the area excavated and resolved in 1988. The position of the trenches was largely determined by the anomalous responses from the geophysical survey carried out before the assessment.

Trenches 1 and 2 were conjoined in T-shaped plan, with Trench 1 orientated north-west/south-east and Trench 2 set perpendicular to its centre and extending away in a south-west direction. The position of Trench 1 was determined by the double-ditch-like response from the geophysical survey, which correlates with a ditch excavated at the eastern limit of the 1988 NEP II pipeline corridor and which appeared to mark the eastern boundary of the cemetery. The position of Trench 2 was also determined by geophysical responses, in this case a number of roughly west-east-lying linear anomalies. Trenches 3 and 4 were conjoined in T-shaped plan, as with Trenches 1 and 2, and were positioned south of these. Only a few limited anomalous responses were detected in the southern portion of the survey grid, and the position of Trenches 3 and 4 was largely designed to test a number of these responses as well as to examine areas that failed to give a response.

Trench 1 was positioned 112m from the eastern field boundary and measured 22m by 2m. Removal of topsoil 0.25-0.3m deep revealed two modern drainage features between 0.4 and 0.5m wide and cut directly into subsoil, which in this area was brown, sandy clay containing frequent stones. The eastern half of the test-trench was completely devoid of features and was characterised by grey clay subsoil with less stone than on the western side.

Trench 2, 29m by 2.1m, was conjoined with Trench 1. Several roughly north-west/south-east-aligned features, mostly natural, were revealed on removal of topsoil. Only one item of archaeological significance was revealed, a west-east linear feature, which extended beyond the western limit of the test-trench. The feature, initially defined by several longitudinally set stones, was characterised by a roughly linear spread of dark soil containing charcoal and numerous (apparently heat-shattered) angular stones. The feature, which survived in the trench in a truncated form, was up to 1.9m long by at most 0.75m wide and at its deepest point, the west section, was found to be up to 0.15m deep. A single fragment of iron slag was recovered from the fill of the feature at the western section. The east end of the feature was rounded in plan and delimited by iron staining in the subsoil. It was significantly shallower than the western end and contained a thin lens of grey clay flecked with charcoal, overlying and partially cutting into the brown clay subsoil at this point. The western section of the feature comprised charcoal-flecked, grey clay overlying a deposit of orange, friable ash and a basal deposit of soil charcoal. None of the stones either within or forming the limits of the feature were found to be burnt. It was estimated that the feature could extend, at most, only a further 0.3m beyond the

western section face, which was confirmed during later monitoring. In attempting to date this feature, and also taking into account that some possible fragments of bone were associated with the uppermost fill deposit, it would seem that the feature is fairly late, possibly after AD 1700.

The excavation of Trenches 3 and 4 failed to reveal deposits, features or finds of archaeological significance. A simple sequence of topsoil, between 0.25m and 0.3m deep, was found to overlie either yellow/brown clay or grey boulder clay.

No further features were revealed during topsoil removal of the pipeline corridor in late July 1999. The solitary archaeological feature, revealed in Trench 2, appears to be an isolated linear feature, which in the absence of clearly datable finds would appear to be post-17th-century in date.
Malachy Conway for Margaret Gowen & Co. Ltd, 2 Killiney View, Albert Road Lower, Glenageary, Co. Dublin.

Dublin
1999:269
NEWTOWN LINK ROAD, ST MARGARET'S
Cultivation furrows
O120418
99E0028
A second phase of monitoring of topsoil-stripping was undertaken from 10 to 12 March 1999. The area to be stripped lay outside and to the north of the area that had previously been studied archaeologically for the construction of the new road. The area had to be stripped to allow the laying of a drainage pipe leading from the road north to the stream that flows north-eastwards just east of Connaberry Motte and for the construction of a paddock.

As this area lay outside the study area and was close to Connaberry Motte and Dunsoghly Castle, the topsoil was removed using a toothless grading bucket. A series of cultivation furrows was uncovered. They were aligned roughly north-south and were regularly spaced, 3m apart. They varied from less than 55m wide and from 20mm or less to 60mm wide. They were only visible where they cut into subsoil and did not survive in the north-west side of the stripped area, owing to the stony nature of the underlying subsoil there. The furrows were filled with grey, loamy silt, and no finds were retrieved from any of them. However, several sherds of medieval pottery (North Leinster cooking wares and wheel-thrown Dublin wares) were uncovered from the topsoil that overlay them.

The furrows are the remains of ridge-and-furrow cultivation, which is probably of medieval date. The proximity of the site to both the Connaberry Motte and to Dunsoghly Castle means that the cultivation system could have been used by the occupants of either site.
Claire Walsh, Archaeological Projects Ltd, 25A Eaton Square, Terenure, Dublin 6W.

Dublin
2000:0213
BROWNSBARN–KILSHANE BORD GÁIS ÉIREANN PIPELINE
Various
00E0043
Monitoring of topsoil construction for the southern section of the new North-Eastern

Pipeline 3 was carried out in mid-2000. The Bord Gáis Éireann pipeline will extend south from Ballough to Brownsbarn, Co. Dublin, reusing sections of the previously excavated NEP 1 and NEP 2 (1983 and 1988, see Excavations 1988, 43, note by Margaret Gowen). The first stage of the Ballough to Brownsbarn pipeline involved topsoil-stripping from Ballough to Kilshane. This was monitored by Malachy Conway in 1999 (Excavations 1999, 50–1, 99E0395). The construction of the southern section entailed the monitoring of topsoil-stripping from Kilshane to Brownsbarn.

From the southernmost portion of the pipeline at Brownsbarn to the Naas Road (N7) the pipeline ran through relatively low-lying land that has been intensively farmed. A series of plough-truncated cut features was detected in this area. A small, undated pit in Cheeverstown townland contained occasional fragments of animal bone. To the north of this, the possible remains of a fulacht fiadh were revealed in Kingswood townland. This consisted of a pit filled with a mix of charcoal-blackened clay and silt with heat-shattered stone. A large field boundary ditch running on a south-west/north-east axis was found closeby. A possible flint thumbnail scraper was found in ploughsoil at this point.

To the north of the Naas Road in Baldonnell Lower townland a cluster of small, shallow, burnt spreads were observed. These remained undated. Further north in Ballyowen townland an elaborate French drain was revealed. This was composed of mortared side-walls and large lintel stones. To the north of the N4 Galway road in Fonthill townland, a burnt spread was detected on the southern bank of the Liffey. This was resolved by John Ó Néill under licence 00E0447 (see below No. 298).

On the north bank of the Liffey, in Astagob townland, a small modern layer of burnt material was revealed. In December 2000, owing to difficulties in tunnelling under the Liffey at this point, the contractors sought to construct an interconnector pipe between the completed northern section of the pipeline and the previously constructed NEP 2 pipeline some 400m to the east. This entailed excavation along the Strawberry Beds road parallel to the Liffey. A stretch of some 100m was excavated through a ploughed field. A single masonry wall on a north–south axis was revealed. This is likely to be associated with an industrial complex referred to as the 'New Holland Fruit and Starch Works', depicted on the 1843 1:10,560 Ordnance Survey map (Sheet 17). In the northern part of Astagob townland a small subcircular pit was excavated. This had a charcoal-rich fill.

Further north, in Ballycoolen townland, a small pit containing charcoal and vitreous slag-like material was found. In the townland of Mitchelstown two modern metalled surfaces were revealed. A shallow charcoal-rich pit was found to the north of this.
Ian W. Doyle, Margaret Gowen & Co. Ltd, 2 Killiney View, Albert Road Lower, Glenageary, Co. Dublin.

Dublin
2000:0214
BALLYCOOLIN ROAD, CAPPOGE
Adjacent to castle
31064 23986
SMR 14:27
99E0724
Four test-trenches were mechanically excavated in the field opposite the site of Cappoge Castle on the site of a proposed industrial/warehouse development. Field-walking, previously carried out for the purposes of an EIS, located considerable amounts of medieval pottery and oyster shell in the north-western portion of the site, furthest away

from the castle site. Further quantities of oyster shell and sherds of post-medieval pottery were recorded closer to the castle, near a triangular hollow, which was filled with water.

Three of the test-trenches extended radially from that point of the site closest to the castle site for a distance of c. 200m, and a further test-trench was excavated across the north-western portion of the site.

The results of the trenches excavated closest to the site of the castle did not indicate the presence of archaeological deposits. It is likely, therefore, that if associated structures or features existed to the west of the site they are located closer to the castle or underneath the road. Trench 4 did not locate archaeological activity to the north-west of the site. The ploughsoil, however, was rich in pottery, glass and clay pipe fragments. The pottery spanned all periods from the late medieval to the present and was evenly scattered throughout the field.

The evidence from the test-trenching would therefore suggest that the area of the proposed development had always been a greenfield site and that the surface finds were introduced with the topsoil at some period during the last twenty years.
Franc Myles, Margaret Gowen & Co. Ltd, 2 Killiney View, Albert Road Lower, Glenageary, Co. Dublin.

Dublin
2001:430
Huntstown
No archaeological significance
31064 23986
01E1108
A monitoring brief was undertaken in advance of the expansion of an existing quarry at Huntstown, Finglas, Co. Dublin. The area of topsoil-stripping was c. 10–12 acres. Nothing of archaeological significance was noted throughout all subsurface works within the development area.
Fintan Walsh, Irish Archaeological Consultancy Ltd, 8 Dungar Terrace, Dun Laoghaire, Co. Dublin.
Dublin
2001:456
Newtown
Site of motte and bailey
SMR 14:13
01E1214
An assessment of a proposed development in the townland of Newtown, Kilshane, Co. Dublin, found that one monument, the site of a possible motte and bailey, was located within its boundary. The site was visited in 1952 by a representative from the National Museum of Ireland, prior to its demolition. It was recorded as a circular platform 28m in diameter and 3m in height. The base of the flat-topped platform was enclosed by a wide ditch, which was in turn enclosed by an oval earthwork (100m by 70m). At present the site is only visible as a soil-mark on aerial photographs. Consequently, monitoring of ground disturbance at the site was recommended by the assessment.

Seven test-pits were excavated. No features or artefacts of archaeological significance were revealed. The trenches excavated were small in comparison to the area of the proposed development. Consequently, while no archaeological features were encountered, it is possible that such features do exist, particularly in the vicinity of the

motte and bailey site in the north.
Fiona Rooney, Archaeological Consultancy Ltd, Ballydavid South, Athenry, Co. Galway.

Dublin
2002:0449
Airport–Balbriggan Bypass
Monitoring
00E0953
This report comprises the results of the monitoring of topsoil-stripping and of trenches dug before fence construction and drainage on the Northern Motorway/Airport–Balbriggan Bypass, Contract 1, during 2000 and 2001. The part of the route involved in this phase of the motorway was in County Dublin. The townlands affected by the stripping were Barryspark, Cloghran, Commons East, Drinan, Green Fields, Lissenhall Great, Lissenhall Little, Mantua, Marshallstown, Seatown East, Seatown West and Stockhole.

During the monitoring, four archaeological features were uncovered; as a result, three excavations were undertaken.

Site 1, Stockhole Lane, was reported on in Excavations 2000, No. 342, 00E0376.
Site 2, Stockhole Lane, was reported on in Excavations 2000, No. 343, 00E0950.
Site 3, Stockhole Lane, was reported on in Excavations 2000, No. 344, 00E0951.
Site 4, Drinan (NGR 31937.586 245631.433), consisted of several small areas of charcoal-enriched soil and was 30m to the west of a stream. It was securely fenced off, but subsequently the fencing was removed and the site was destroyed by the subcontractors on the drainage scheme. This area has been scheduled by Fingal County Council to be used as a graveyard.

Site 5, Mantua, had been disturbed previously by the construction of Swords Industrial Park. One area of possible archaeological significance was uncovered during topsoil removal. On examination it was found to consist of charcoal-enriched soil and burnt ?animal bone. Rotten grass was identified beneath this layer. The deposit was considered to result from work in the adjoining (not associated) building site.

Editor's note: Though carried out in 2001, this excavation was not reported on in time for inclusion in the bulletin of that year.
Patricia Lynch, 27 Hilltown Way, Swords, for Valerie J. Keeley Ltd.

Dublin
2002:0450
Airport–Balbriggan ByPass, Phase 2
Monitoring
00E0953 ext.
Monitoring of trial-pits, topsoil-stripping and drainage trenches was carried out on the second contract of the Airport–Balbriggan Bypass. The following townlands were affected, before the construction of the motorway, bridge, trial-pits, drainage trenches, and access and slip roads: Baldrummon, Ballough, Ballystrane, Bellinstown, Coldwinters, Corduffhall, Hedgestown, Jordanstown, Lissenhall Great, Lissenhall Little, Nevitt, Newtowncorduff, Richardstown, Rowans Little, Staffordstown, Thomondtown, Turvey and Woodpark, all in County Dublin. Twenty-four archaeological features were uncovered, and 22 investigations were undertaken.

Site 1, Bellinstown, see No. 473 below, 01E0744: Iron Age ring-barrow with three phases of burial activity;
Site 2, Lissenhall Little (Excavations 2001, No. 444, 01E1074): Early Neolithic habitation site, excavated by Fiona O'Reilly;
Site 3, Staffordstown, see No. 683 below, 01E0831: fulacht fiadh;
Site 4, Coldwinters (Excavations 2001, No. 344, 99E0548 ext.): prehistoric ritual site, excavated by Hilary Opie;
Sites 5 (1 and 2), Coldwinters (Excavations 2001, No. 345, 01E1062): (1) fulacht fiadh, (2) Late Neolithic pit, excavated by Kieran Campbell;
Site 6, Woodpark, see No. 693 below, 01E1156: small Bronze Age pit with burnt-mound material;
Site 7, Richardstown, 02E0050: small Bronze Age pit containing cremated bone, not excavated;
Site 8, Newtowncorduff (Excavations 2001, No. 457, 01E1124): Iron Age ring-ditch with associated Neolithic arrowheads, excavated by John Channing;
Site 9, Nevitt, see No. 633 below, 01E1155: no archaeological significance;
Site 10, Woodpark, see No. 694 below, 01E1157: no archaeological significance;
Site 11, Woodpark, see No. 696 below, 02E0051: small pit with associated medieval pottery;
Site 12, Ballystrane, see No. 469 below, 02E0052: no archaeological significance;
Site 13, Ballystrane, see No. 468 below, 00E0953 ext.: no archaeological significance;
Site 14, Richardstown, see No. 654 below, 02E0014: the feature was modern in origin;
Site 15, Richardstown, see No. 656 below, 02E0128: kilns excavated by Kieran Campbell;
Site 16, Corduffhall, see No. 502 below, 02E0038: burnt-mound material, not excavated;
Site 17, Ballough, see No. 457 below, 02E0078: ditch containing medieval pottery, excavated by Robert M. Chapple;
Site 18, Corduffhall, see No. 501 below, 01E1158: no archaeological significance;
Site 19, Woodpark, see No. 695 below, 02E0042: no archaeological significance;
Site 20, Thomondtown, see No. 690 below, 01E1159: fulacht fiadh;
Site 21, Thomondtown, see No. 691 below, 01E1160: fulacht fiadh;
Site 22, Colecot, see No. 500 below, 00E0953 ext.: possible fulacht fiadh;
Site 23, Ballough, see No. 458 below, 01E1138, Bronze Age pits and related burnt-mound material, excavated by Robert M. Chapple;
Site 24, Nevitt, see No. 634 below, 02E0053: no archaeological significance.

Editor's note: Though carried out in 2001, this excavation was not reported on in time for inclusion in the bulletin of that year.
Patricia Lynch, 27 Hilltown Way, Swords, for Valerie J. Keeley Ltd.

Dublin
2002:0636
Newtown
Near motte and bailey
SMR 14:13
01E1214 ext.
Testing was recommended to assess the potential impact on archaeological remains in the area of the proposed development at Newtown, Kilshane, and to establish a buffer zone around the motte and bailey situated in a field proposed for development. During 2001 seven test-pits were excavated by Fiona Rooney; no features or artefacts of archaeological significance were revealed (Excavations 2001, No. 456).

Nineteen test-trenches were mechanically excavated. The soil profiles in the trenches were fairly uniform, and any changes recorded appear to have been the result of varying topography as opposed to anthropogenic factors. The ground was generally drier, and the bedrock closer to the surface, in areas where the ground was higher than the surrounding area. The softer dark material and sand recognised in the trenches to the west of the field were a result of the ground being low lying and close to the stream that forms the western boundary of the field. A notable feature of all trenches was the lack of finds from the topsoil, apart from some fragments of black earthenware, blue-patterned delft and glass.

A number of features were recognised. A ditch, 2.45m wide, running north-west/south-east was noted at the base of Trench 13, with a small fragment of brown glass in its fill. An old field drain that was cut into the subsoil and disturbed by two relatively modern field drains was revealed in Trench 16. A small fragment of brown earthenware was noted in the upper part of the fill mixed between the large stones. Two flint nodules were found in the fill at the base of the cut. A linear cropmark could be seen running approximately east–west across the field, and a large ditch was recognised in Trench 17 where this cropmark crossed the trench. This feature may be associated with an old field boundary marked on the OS maps or may represent the ditch for a large drainage pipe. At the base of Trench 10 a small modern post-hole and a circular pit containing wood fragments were revealed.

Nothing of archaeological significance was noted. The area south of Trenches 1 and 13 and west of Trench 12 can be said to have been resolved; however, the area north of Trenches 1 and 13 and east of Trench 12 has not been resolved. This line should represent the limit of the buffer zone surrounding the monument.
Martin Fitzpatrick, Arch. Consultancy Ltd, Ballydavid South, Athenry, Co. Galway.

Dublin
2004:0612
KILSHANE
Neolithic segmented enclosure, Early Bronze Age activity
311000 242900
03E1359 ext.
This excavation was undertaken as part of the archaeological mitigation in advance of the N2 Finglas-Ashbourne road scheme (Appendix II). A geophysical survey was carried out by GSB Prospection in 2002, which recorded a number of possible archaeological features in Testing Area 5 (GS 2 Area 25). Pre-development testing subsequently carried out by David Bonner in October 2003 (03E1359) exposed a small number of archaeological deposits, interpreted as a ditch and ditch-like feature containing burnt stone, both undated. The licence was transferred to Dermot G. Moore in March 2004 and, from 15 March to 22 July 2004, excavation of Site 5 was carried out by a team of 43 archaeologists.

Site 5, which comprised three distinct areas, Sites 5a, 5b and 5c, was situated on a gently undulating gravel ridge associated with tributaries of the Ward River and was located in a large irregular-shaped field bordered by the Kilshane road to the south and the N2 to the east. Open drains and hedgerows formed of mature hedge plants and trees bounded the area of the site to the north and west. A commercial glasshouse was located on the north-western side of the enclosure. Site 5a was situated atop this ridge at 80.53-81.3m OD, while Site 5b was situated north of Site 5a at 80.3m OD. Site 5c, situated north-west

of Site 5a, lies at 81.04m OD.

Initially, two areas were topsoil-stripped in February 2004 (consisting of a total of 199m2) around the area of a possible ditch/gully feature (later designated Site 5a) and a linear feature (designated Site 5b) identified during the testing phase in October 2003. The topsoil-stripping was carried out using a tracked mechanical digger equipped with a 2m-wide toothless ditching bucket. Upon commencing investigation of these features, it became obvious that the area of Site 5a was considerably greater in extent. A further programme of topsoil-stripping was therefore initiated, which expanded the Site 5a stripped area to 1335m2. This included the excavation of two geological test-trenches to determine the nature of the natural boulder clay and gravel deposits into which most of the archaeological deposits were cut. While the excavation was ongoing, the commercial glasshouse was demolished and the underlying topsoil stripped, adding a further 3500m2 to the opened area. A number of extensions to Site 5a were also added, as well as expansion of the area opened at Site 5b and a series of test-trenches to the west of Site 5a.

The main enclosure ditch on Site 5a was excavated in a series of fourteen box sections, ranging in length from 2.4m to 11.25m, to determine the structure and sequence of the ditch deposits and method of construction. Longitudinal sections were also cut through a number of the baulks to determine the sequence of deposition of individual deposits within identified ditch segments and to define an entranceway. The smaller causewayed ditch uncovered in Site 5c was also excavated by box section.

A detailed excavation strategy was put in place to retrieve as much information as possible from the enclosure ditch and its fills, especially the animal bone layer, due to the quality of preservation and the uniqueness of such a deposit from an Irish prehistoric site. All archaeological features interior and exterior to the enclosure were excavated, in addition to a number of geological features that were investigated to determine their archaeological potential.

The natural deposits defined on the site consisted of three types. The first was glacial gravel clay of unknown depth consisting of firm mixed grey/brown gritty gravel with frequent small stone and pebble inclusions. Ice wedges were identified within this deposit where exposed in the excavated ditch sections. Overlying this was a deposit of frequent angular and sub-angular stones and cobbles (of limestone/greywacke) within compacted mixed brown/grey silty clay with a depth of 0.2-0.35m, which occurred predominantly in the interior of Site 5a and to the west-north-west of the excavated area. This deposit appears to have become exposed due to a combination of natural erosion of the slight ridge on which the enclosure is set and plough action over the years.

Overlying this substantial deposit of stone was a mixed deposit of firm pale-grey/orange coarse sand gravel. This deposit occurred predominantly at the northern and southern limits of the excavated area and was cut by the enclosure ditch and a number of features, especially in the northern portion of the site. This deposit appears to represent the 'B' horizon material of the overlying topsoil. In addition to the main geological deposits, a smaller series of deposits was identified during the period of excavation consisting of the remains of decomposed siltstones and calcareous rocks, while others were simply irregular depressions in the natural filled with yellow/yellow-brown sands and fine gravels.

Site 5a

The earliest activity is defined by the construction and infilling of a large ditched enclosure dating to mid-Neolithic times. The enclosure was almost egg-shaped, coming to a notable point (the 'apex') in the north. Once the limits were defined prior to excavation, it was noted that the shape of the ditch was very irregular and the reason for this became apparent during the excavation. The ditch had been excavated in a series of interconnecting regular and irregular segments.

The overall plan of the ditch shows that its long axis was aligned north-west/south-east and that it had maximum external dimensions of 45m northwest/south-east by 34m. The width of the ditch varied around its circumference (1.9-3.8m) and enclosed an area 38.5m north-west/south-east by 27.5m, totalling c. 850m2. The western side of the ditch bowed inwards, off line with the rest of the ditch, which followed a gentle curve north to south. However, there were sharp turns noted, particularly at three locations: the apex, the south-east and the south-west. This is quite probably due to the method of construction of the ditch.

The average length of a segment was 8.9m, the shortest being 6m and the longest c. 13m. The segments were interconnecting and were probably dug by different work groups. The alteration in direction of the line of the ditch at the apex and in other segments may be due to inaccurate ditch digging between the different work groups. This would also add to the suggestion that the segments were dug at different times.

During the excavation, the segments were primarily defined by changes in direction of the ditch and slight changes in height where the segments connected. The profile of the ditch, especially the individual ditch segments, varied from gentle U-shaped to V-shaped (generally, wide U-shaped profile in the centre of the segments and V-shaped at the ends).

In plan, some of the segments appeared to have considerable breaks between them but in most this can be seen as the remains/evidence of the segment terminals, which were sloping rather than vertical-sided terminals. Tentative evidence for the method of ditch excavation is shown by the presence of portions of antler tines in some of the ditch fills, although as yet only one was recognised from primary fill deposits.

Soon after the ditch was cut, it began to silt up (sometimes irregularly) around its circumference. Probably at this stage a segmented ditch with at least four defined causeways was constructed in the area designated as Site 5c to the north-west.

Once the initial natural slumping and silting in the base of the ditch began, a large volume of animal bone was deposited around the full circumference of the ditch. The bone assemblage, consisting of 60-70 individual cattle, is the largest Neolithic bone assemblage from an excavated context (Finbar McCormick, pers comm.). The cattle bone was placed in both a disarticulated and articulated state with apparent selection of certain bones, such as vertebra or long bones, to be deposited together.

In some areas of the ditch the bone appeared to have been deposited from the exterior, while in others it was deposited from the interior. None of the animal bone recovered appeared to have any distinct butchery marks (this has yet to be confirmed) and the deposition of the bone varied from each area of the ditch, indicating a number of possible phases of deposition, with some distinctions noted within individual segments. Fully articulated cattle skeletons were noted, primarily in the easternportion of the ditch, where at least three were found in close proximity. Amongst the bone were large stones

and boulders, which may have eroded from the sides, possibly due to water action.

As the bone was being deposited, the silting continued and at the same time there was a series of slumps into the ditch, probably from the upcast material interior and exterior to the ditch. A further series of infillings took place, culminating in the placement of pottery within the ditch. This consisted of a large mid-Neolithic broad-rimmed, round bottomed vessel, which appears to have been deliberately placed on top of this sealing deposit in the south-eastern portion of the ditch. Other fragmentary pieces of ceramic material were recovered from just above the bone layer in the northwestern section of the enclosure ditch and these also may prove, using thin section analysis, to be Neolithic. The enclosure then appears to have been abandoned for a considerable period of time.

The next major activity occurs in the Early to Middle Bronze Age, with the deposition within the ditch of a relatively uniform deposit of orange sandy clay. This appears to have been deliberately placed into the ditch around its full circumference, possibly to seal the earlier (Neolithic) activity. The deposition of the orange clay appears to have been immediately preceded by deposition of charcoal/wood lenses, especially in the western portion of the enclosure.

The deposition of the orange sandy clay within the ditch is another intriguing aspect of the site, with a number of questions relating to the origin of this material and why such a considerable deposit was placed in the ditch. Artefactual material and animal-bone fragments were also recovered from this orange clay deposit. Two suggestions are that the orange clay material was derived from the basal topsoil material or that it was derived from either the interior or exterior of the site, possibly from the creation of a bank. However, there was no evidence of an external or internal bank encountered during the excavation, but this may have been ploughed out.

The next defined phase of activity on Site 5a occurs during the Early Bronze Age. This activity consists primarily of a series of deposits and features associated with the later stages of the main enclosure ditch and a series of cut features, some of which, based on ceramic associations, may date to the Earlier Bronze Age.

Set on to and in many cases cut into the orange clay deposit sealing the fills of the enclosure ditch was a series of deposits, shallow scoops and pits. Most of these were located along the eastern portion of the ditch. Many of the scoops and pits intercut each other and almost all were filled with the same generally homogeneous fill, which seems to represent a midden deposit. The size and depth of these pits and scoops varied considerably, but none appear to have exceeded 0.2m in depth. Within these scoops were ash/cinder deposits and burnt and unburnt bone (some of which appears to be human). The animal-bone remains appear, on preliminary identification, to be pig and possibly ovicaprid. Some of the bone had been worked into pins or awls. Also within this deposit was a large range of lithic material in the form of flint manufacturing debris and finished tools. The predominant components of the flint manufacturing debris consisted of small pebble cores and fine micro-debitage. The secondary worked material consisted predominantly of small, high-quality thumbnail scrapers, a fine hollow-based flint arrowhead and a reworked small barb and tanged arrowhead. A well-made flint piercer and a large hollow scraper (of non-pebble flint) were also recovered. The hollow scraper represents a non-Early Bronze Age tool type and may be directly associated with the initial construction of the enclosure. Chert, quartz and other coarse stone material were also well represented.

However, it is the ceramic remains which dominate the artefactual assemblage. These consist of a substantial quantity of high-quality Early Bronze Age ceramic styles in the form of funerary and high status/ceremonial wares such as food vessels, cordoned urns, cinerary urns, Irish bowl food vessels and a small range of as yet unidentified ceramics. In many cases several ceramic styles were deposited together, with at least six different types (based on decoration and form) being recovered from one single square metre. On some occasions, burnt or partially burnt stone was also found within the deposit.

Generally overlying the artefact-rich deposit was a relatively compact metalled surface, which had its greatest extent in the extreme eastern area of the ditch. The function of this metalled deposit may have been to formally seal the midden deposit. Overlying the metalled deposit was a less artefact-rich horizon, which appears to have been partially disturbed. The extent of this deposit is greater than the underlying deposit and variants were found in the northern, southern and western portions of the enclosure ditch. A small number of inter-connecting pits containing material similar to the artefact-rich horizon were also uncovered in the northern area of the enclosure ditch (near the apex).

Associated with this Early Bronze Age activity in the ditch were a number of features located within and without the enclosure. In the northern area of the site, three rather mysterious features were also uncovered. These appear to be cremation pits, which contained unusual sloping red-orange burnt soil deposits upon which were set thin deposits of finely 'pounded' or crushed burnt bone. As two of these pits are directly associated with burials of single bones, their true function still awaits clarification. They do, however, seem to be connected with the artefact-rich horizon in the upper portion of the enclosure ditch.

During the course of the excavation of the interior of the main enclosure, a number of features were uncovered which gave the impression of having been cleaned out (sterilised) in antiquity. Several appear to have been pits for probable unprotected cremations, with much of the cremation deposits (and the putative pots into which they were placed) having been 'cleaned out' of the pits as the material was deposited into the ditch.

The only intact burial was that of a single crouched inhumation, located south of the centre point of the enclosure. The burial was orientated east-west in a shallow oval pit with no evident grave goods. It was in an extremely degraded condition due to the nature of preservation. The grave might have been tampered with, which may account for the lack of grave goods.

A further series of rather irregular features was also encountered within the interior of the enclosure and these consisted of irregularly shaped pits, which contained small amounts of charcoal and occasionally burnt bone and pottery. The pottery recovered appeared to date to the Early Bronze Age. Only one feature, a hearth, represents activity later in the Bronze Age.

Some medieval activity also occurred on Site 5a, which took the form of a large pit group with deposits of stone and medieval pottery, and another single large pit associated with a north-south-running field boundary. A second parallel field boundary was noted on the south-eastern part of the site. The last phase of activity consisted of a large east-west post-medieval culvert drain and a number of north-southrunning culvert drains, which were all part of agricultural improvements to the land, which had since been used for pasture and crops.

Site 5b
The archaeological activity located within the confines of this area consisted of a south-northoriented linear feature c. 9.5m in length. It varied in width from 0.44m to 0.96m and up to 1.05m where it became very shallow at its northern end. It had a variable depth of 0.1-0.2m and contained only two distinct fills. The basal fill consisted of partially burnt sandy clay with some charcoal flecking, while the upper fill consisted of grey/black sandy clay with much charcoal flecking and occasional burnt stone. Small quantities of burnt bone (and snail shell) were also recovered from the upper fill. Each of the deposits was sampled and when these are analysed a fuller determination can be made as to the function of this feature. For the moment, the linear feature in Site 5b is interpreted as a burnt-out field boundary, with the burnt bone possibly representing small rodents or birds trapped within the hedgerow. However, the fills of the feature also may suggest burnt-mound activity.

Site 5c
The area designated as Site 5c (located in the area of the now demolished commercial greenhouse) produced better and more definitive evidence of a causewayed ditch. This feature ran approximately north-south and had an excavated extent of c. 70m. The ditch itself had a variable depth of 0.13-0.48m, with the smaller depths occurring at the terminals of segments and the greater depths at the centre of segments. Width also varied between 0.99m and 1.77m and this corresponds to the centre and terminals of segments. At the northern and southern ends of this ditched feature, the width narrowed considerably, to 0.5m.

At present, at least four narrow causeways have been identified. The ditch itself was filled by a series of deposits, some of which contained charcoal, animal bone (predominantly cattle) and mollusc (snail) remains. Although, a number of lithic finds were recovered from the various deposits, the only artefact of note was a complete leaf-shaped arrowhead from the uppermost fill of one ditch segment. The recovery of this projectile point from such a location would tend to indicate that the causewayed ditch is Neolithic in construction.

The form of the ditch also varied, especially in the southern area of Site 5c, where the ditch not only narrowed but also divided into two. Although severely truncated by the insertion of the concrete reservoir associated with the commercial glasshouse, the ditch then appeared to deepen and widen before it was lost under modern activity. In this location, two distinct fills were evident, one of which produced a small irregular pebble core and a quantity of mollusc shell.

Also on Site 5c, the only other probable prehistoric feature was a small hearth pit containing burnt and unburnt animal bone. It is also significant to note that the upper homogeneous fill of the large west-east-running double culvert produced two retouched pieces of flint and one small thumbnail scraper. It would appear likely that the deposit within which these three secondary worked pieces were found was derived from somewhere close by, possibly from the two large pit features on the northern edge of Site 5a.

In summary, the main enclosure ditch seems to fall into the causewayed enclosure tradition or at the very least a variation of it, if not by the presence of causeways across the line of the ditch (which may have been removed) then by the segmented nature of the ditch construction; also the apparent deposition in individual segments of grouped

cattle-bone deposits, of which there is an exceptionally large quantity, and the presence on top of the sealing deposits of a mid-late decorated Neolithic vessel of broad-rimmed type. In addition, the presence of the outer segmented ditch to the north-west (Site 5c) would lend further weight to the causewayed enclosure hypothesis.
Dermot G. Moore, for Cultural Resource Development Services Ltd, Unit 4, Dundrum Business Park, Dundrum, Dublin 14.

Dublin
2004:0631
NEWTOWN
Burnt spread
31155 24233
03E1450 ext.
The site (Site 1) was excavated as part of the archaeological mitigation in advance of the N2 Finglas-Ashbourne road scheme (Appendix II) between 6 and 20 April 2004. It was located within the townland of Newtown, Co. Dublin. The site was formerly within an open golf course and is located c. 0.5km north of the M50 Finglas-Ashbourne interchange adjacent to the east of the existing N2. Due to the location of the site within a former golf course, the terrain has been heavily landscaped. The entire site was contained within the footprint of the road-take, with all exposed features of archaeological significance fully excavated.

The removed topsoil consisted of dark loamy soil and varied in depth between 0.2m and 1.4m, with anaverage depth of c. 0.4m. The natural subsoil consisted of a layer of yellowish-brown silty clay.

Excavation was carried out in two separate areas separated by a distance of c. 15m. Area 1 measured c. 20m by 13m and contained the remains of a spread of burnt-mound material, measuring 3.5m by c. 10m with an average depth of 0.15m, which was located adjacent to the south of a natural waterlogged peat basin. This basin measured c. 15m east-west and extended beyond the limit of excavation to the north. Two pits and a subcircular trough containing heat-shattered stones and charcoal-rich deposits were excavated in the vicinity of the burnt spread. No archaeological finds were encountered during the excavation. Within the peat basin a large number of preserved timbers were encountered. While most of the wood consisted of natural brushwood and branch material, two large split roundwood logs were positioned roughly parallel to each other. Although no evidence of woodworking was apparent, it cannot be ruled out that they may have been deliberately deposited within the basin to serve as an artificial subdivision, possibly contemporary with the burnt spread.

Area 2, c. 15m to the north of Area 1, covered an area measuring in total 24m2. The only archaeological feature encountered here was a small and shallow isolated deposit of burnt-mound material. No finds were recovered. The proximity and nature of this deposit could indicate that it was contemporary with the burnt-mound material in Area 1.
Holger Schweitzer, for CRDS Ltd, Unit 4, Dundrum Business Park, Dublin 14.

Dublin
2005:409
COLDWINTERS/NEWTOWN
Prehistoric/medieval
31250 24150
05E0236

A levelled site (SMR 14:6) and two further sites (14:16 and 14:53) which were recorded from aerial photography were tested in Coldwinters as part of a planning application for Logistic warehousing units. The site had been used as a golf course in the recent past. Site 14:6 was located and found to exhibit significant subsurface archaeological features. Whilst the monument displays characteristics of an early medieval multivallate ringfort, a feature within the monument complex has yielded a sherd of pottery of probable prehistoric date. Site 14:16 was not located, and testing did not reveal anything of archaeological significance. It is likely, therefore, that landscaping undertaken during construction of the golf course has removed any traces of the monument. Site 14:53 was not located during the testing. The many features such as bunkers and tees in the vicinity of the monument site, and the landscaping required to create the golf course, may have served to remove all traces of the monument.
Ellen O'Carroll, The Archaeology Company, 17 Castle Street, Dalkey, Co. Dublin.

Dublin
2008:384
Dublin Airport Logistics Park, Coldwinters
Testing
312074 241782
05E0236
Testing was undertaken in the area of a proposed development at Dublin Airport Logistics Park, Coldwinters, Co. Dublin. The area was formerly used as a golf-course (St Margaret's). The overall area of development comprises a total of some 62.6ha on lands divided between the townlands of Coldwinters and Newtown. It is bounded to the north and south by field boundaries, to the east by the R122 and to the west by the N2 dual carriageway. A private road linking the N2 and the R122 runs through the centre of the development site. The development consists of warehouse facilities and ancillary groundworks. Some areas of the development site have already undergone different phases of archaeological investigations, including two episodes of large-scale intensive testing which took place in an area to the north of the present site in 2005 by Ellen O'Carroll (Excavations 2005, No. 409) and in 2007 by Michael Tierney and M. Rooney.

Testing was undertaken between 9 and 19 June 2008. A total of 32 trenches with a total length of 3,423m were opened, 10m apart, across the site. The work was completed using a mechanical excavator fitted with a 2.4m grading bucket to excavate topsoil to the level of potential archaeological horizons. The area was under high thick grass and all the features associated with the golf-course were levelled out prior to the development. The topsoil largely consisted of a brownish-yellow sandy clay, 0.2–0.4m in depth, overlying a layer of dark-greyish-brown sandy clay, 0.2–0.4m in depth, with moderate to frequent stones. The subsoil was a mid-greyish-brown sandy clay with moderate inclusions of stones. Besides a number of land drains associated with the golf-course and a few modern field boundaries, there was no evidence of any deposits or features of archaeological significance uncovered during the testing of the site.
James Lyttleton, The Archaeology Company, Hamilton House, Emmet Square, Birr, Co. Offaly

Dublin
2008:474
Lissenhall–Jordanstown, Trunk Water Mains Project
Monitoring
319226 249176 to 318873 257417
DU008–062, DU012–002, DU008–023

08E0178
Monitoring was undertaken along the route of the proposed Lissenhall–Jordanstown trunk water mains project from April 2008. This is currently ongoing as works are at present (January 2008) c. 45% complete. The works comprise of 9.2km of new trunk water main from the Lissenhall interchange of the M1 Motorway, along the R132 to the Jordanstown reservoir. This passes through the townlands of Lissenhall Little, Belinstown, Staffordstown Turvey, Coldwinters, Thomondtown, Corduff Common, Corduff, Staffordstown, Dunganstown, Newtowncor-duff, Ballough, Regeens, Oberstown and Jordans-town. Nothing of archaeological significance has been revealed to date.
James Kyle, Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow.

Dublin
2008:481
Newtown
Monitoring
311443 242076
08E0043
Monitoring of groundworks at the site of the proposed Kilshane Recycling Park in Newtown townland, Kilshane, Co. Dublin, were carried out in January and February 2008. The proposed development was a greenfield site prior to groundworks and is located in a field immediately to the south of the site of a motte and bailey, DU014–013. Nothing of archaeological significance was uncovered in the areas where topsoil-stripping took place during this phase of the development.
Nicola Rohan, ADS Ltd, 110 Amiens Street, Dublin 1.

Meath
2003:1373
Coldwinters
No archaeological significance
02E1353 ext.
Monitoring was carried out by Laurence McGowan on behalf of Neil O'Flanagan in September and October 2003 on the excavation of five engineering test-pits in Coldwinters golf course. This was part of additional geotechnical site investigations along the proposed route of the N2 Finglas-Ashbourne realignment. The proposed road scheme is approximately 17km long, commencing at the M50 interchange in Dublin and extending to the townland of Rath, north of Ashbourne, Co. Meath.

Two sites are located within the golf course, the site of a ring-ditch (SMR 14:15) and a possible ringfort (SMR 14:16) outside but adjacent to the route. Previous monitoring of geotechnical site investigation in this area was carried out by Hilary Opie between August and October 2002 (Excavations 2002, No. 1522, 02E1353). No features of archaeological significance were uncovered during this testing. A geophysical survey of this route, carried out in 2002 by GSB Prospection Ltd, did not produce any anomalies of archaeological significance in this area.

No finds or features of an archaeological nature were found in any of the test-pits during the additional geotechnical site investigations.
Neil O'Flanagan, 3 Manor Street, Stoneybatter, Dublin 7, for Judith Carroll, Network Archaeology Ltd.

Dublin
Huntstown 18E0561
Archaeological monitoring was carried out in advance of the construction of a wastewater treatment plant associated with the development of a Bioenergy Plant (FW13A/0089) at Huntstown, Finglas. The site had been previously entirely stripped of topsoil as part of a program of works associated with the construction of an existing power plant just north of this location. Construction of the power plant was completed in 2007. The area of the wastewater treatment plant and associated tank farm was covered in 200-400mm of compacted Clause 804-type material, which had been placed on top of a geotextile membrane. The hardcore in turn had been tarred over. The removal of the Clause 804-type material and the geotextile by mechanical excavator was monitored. No topsoil was present beneath the geotextile layer, which had been placed directly on top of the mid to dark yellowy-brown silty clay glacial till subsoil. From examining the surrounding landscape, an estimated 0.3-0.45m of topsoil and perhaps 0.1-0.2m of the subsoil had also been removed. This would have truncated any shallow archaeological deposits which may have been present on site but no deeper archaeological features were noted during the current phase of works, suggesting that there were no archaeological features present previously on site.
Níall Garahy, Archaeology and Built Heritage

APPENDIX 12.2

ARCHAEOLOGY - ACS REPORT



ACS

Archaeological Assessment (Test Trenching) at Huntstown, Co. Dublin

ARCHAEOLOGICAL
CONSULTANCY
SERVICES UNIT

Licence No.: 23E0872

ITM: 711800, 740999

RMP/SMR Nos: N/A

Donald Murphy

Report Status: Final

18th October 2023

ACSU Ref.: 2395

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PROJECT DETAILS

Project	Archaeological Assessment at Huntstown, Co. Dublin
Report Type	Archaeological Test Trenching
Licence No.	23E0872
Site	Huntstown, Co. Dublin
Townland	Huntstown
RMP	N/A
ITM	711800, 740999
Consultant	Archaeological Consultancy Services Unit, 21 Boyne Business Park, Greenhills, Drogheda, County Louth
Excavation Director	Donald Murphy
Report Author	Donald Murphy and Billy Sines
Report status	Final
Report Date	18th October 2023
ACSU Ref.	2395

Revision	Date	Description	Status	Author	Reviewed	Approved
0	18/10/2023	Archaeological Assessment (Testing Report)	Final	B.S & D.M	L.C	D.M

EXECUTIVE SUMMARY

Archaeological test trenching was carried out in compliance with the method statement approved under licence 23E0872 issued by the Department of Housing, Local Government and Heritage in consultation with the National Museum of Ireland. The location of the test trenches was informed by the footprint of the proposed development and associated groundworks.

Several phases of archaeological activity were carried out within the application area prior to the current phase of activity. These were carried out in the northwest corner of the site (immediately west of the current phase of works) and north-northeast of the current phase of works. Previous works included a geophysical survey carried out on lands north of the current site by J. M Leigh Surveys Ltd under licence No. 19R0159. This was not located within the current site but was carried out as part of the undergrounding of cables project which traverses the current application site. Archaeological features including an enclosure and associated features were identified. Archaeological testing was subsequently carried out on the lands north of the current site following the aforementioned geophysical survey. This was carried out by IAC Ltd under licence No. 19E0645. Again this was not located within the current site but was carried out as part of the undergrounding of cables. This archaeological testing confirmed the results of the aforementioned geophysical survey. An Archaeological Assessment was also carried out in the northwest corner of the current application site by Cóilín Ó Drisceoil of Kilkenny Archaeology under licence 20E0601. No features of archaeological significance were identified during the course of this assessment. Archaeological monitoring of the undergrounding of cables was carried out in the northern and northeastern extent of the current application site by AMS under licence 21E0185. Human remains were recovered and appeared to be localised. These were discovered during the final stage of trenching for the ESB powerline and were archaeologically excavated in the Autumn of 2023. Further testing and a geophysical survey were also carried out in lands north of the current site under licence 21E0185 and 21R0064. A geophysical survey of the current application site was carried out by ACSU Ltd. This was carried out under licence 23R0419 and buried archaeological remains were identified.

Under the current phase of works, a total of 24 test trenches were excavated, each measuring 1.8m in width. In total, 979m of linear trenches were excavated. The test trenches were excavated down to the natural subsoil, which varied throughout the site but was generally comprised of a mid-orangish brown clay with occasional small subangular stones. Towards the top of the hill near an area previously quarried, the natural subsoil contained a grey sandy gravel and pockets of pebbles and small areas of a compacted light blueish grey clay.

A total of 36 features were identified during test trenching, consisting of linear and pit features. Due to the quantity and extent of these features, interpretation is based on the results listed in Tables 3 and 4 and the results of the geophysical investigation carried out at the site. Of note is C1201, which was orientated east to west and was

previously identified during the geophysical survey. It is interpreted as a ditch that enclosed a possible habitation site located at the summit of the hill.

The linear and pit features found on the southern slope of the hill are considered to be part of potential field systems associated with the enclosed settlement. A section of C1903 (Plate 24) revealed a ditch measuring 4m in width and with a depth of 1.2m. The ditch features a step or shelf measuring 2m in width before dropping off to the base. This feature also appears to be the same as C1902 (Plate 23). The size and location of this feature would suggest a substantially large ditch was used to demarcate the outer boundary of the fields used by the settlement. The features uncovered probably represent a substantial Early Medieval complex.

While no diagnostic artefacts were recovered during testing, the absence of pottery combined with the interpretation of an enclosing ditch at the summit of the hilltop suggests the presence of an early medieval enclosed settlement and associated field systems to the south. The development as proposed will have a direct impact on the identified archaeology and as preservation in situ is not an option, mitigation can only be achieved through archaeological excavation.

It is recommended that all features of archaeological significance should be resolved prior to the commencement of any construction works within the site. It is proposed that the two areas containing archaeological features measuring 316m2 and 10118m2 be stripped of topsoil under archaeological supervision and that they are archaeologically resolved and preserved by record. This should be carried out by a licence-eligible archaeologist and in compliance with a method statement approved by the Department of Housing, Local Government and Heritage in consultation with the National Museum of Ireland.

NON-ARCHAEOLOGICAL INFORMATION

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

2	3	E	0	8	7	2	X

Site Owner:	Rathdrinagh Land Unlimited Company (Trading as Irish Recycling LTD)
Address:	12 Merrion Square, Dublin 2
Planning Authority:	Fingal County Council
Planning Reg. No.:	FW23A/0111
Excavation Type:	Test Trenching
Contractor/Developer:	Rathdrinagh Land Unlimited Company (Trading as Irish Recycling LTD)
Site	Huntstown, Co. Dublin

Description of Proposed Development

We Rathdrinagh Land Unlimited Company (Trading as Irish Recycling LTD) intend to apply to the aforementioned Planning Authority for permission for development on lands at Huntstown Townland and Coldwinters Townland, Co Dublin. The development will consist of the construction of a Materials Recovery Facility along with a Food Container Cleaning Plant. The development is phase one of the Huntstown Circular Economy Hub and will include for the following works:

1. The development will consist of the erection 2no. separate buildings and associated site area for use as a Circular Economy Hub.

2. The processes to be carried out within the Materials Recovery Facility building include for the sorting of range of wastes into recoverable and recyclable streams. Recoverable wastes to processed will include for potential recyclables. This building will include for an external odour control plant with associated flue.

3. The processes to be carried out in the Food Container Cleaning Plant building will provide a centralised washing/sterilisation facility for large food retailers in the area to facilitate re-use of containers.

4. The 2no. buildings to be constructed will incorporate ancillary office and staff facilities along with solar PV panels and signage.

5. The development of associated access roads, turning/loading areas, footways, parking areas, electric vehicle charge points, landscaping, lighting, fencing, bicycle and bin storage facilities and associated site works.

6. The provision of an ESB substation.

7. The provision of ancillary external storage areas.

8. The reprofiling of existing ground levels within the site and associated works to include for infilling and reprofiling of lands within the overall site area.

9.The provision of a new site entrance with associated works to facilitate vehicular and pedestrian access along with associated upgrade works to the adjacent public road to include for provision of footpaths and cycle paths.

10. The provision of a weighbridge and associated staff building at the entrance.

11 The provision of perimeter fencing and security gates.

12. The provision of all associated hard and soft landscaping works.

13. Provision of attenuation tanks and associated infrastructure as part of the surface water system along with installation of a bypass petrol interceptor.

14. All ancillary site development, landscaping and construction works to facilitate foul; water and service networks.

The Materials Recovery Facility will require an EPA Industrial Emissions Licence. An Environmental Impact Assessment Report (EIAR) has been prepared and accompanies this application.

Archaeological Condition

The assessment is to be carried out in response to a Further Information Request Item 14h attached to Planning reference FW23A/0111 by Fingal County Council

14h. The applicant is requested to expand the limited study area, with regard to the Archaeological Impact Assessment Report submitted as part of the EIAR, in order to consider the impact of the proposed development on the entire site area and include for geophysical survey and test trenching where features are identified.

Impact Statement and recommendations

The archaeological assessment in the form of test trenching at the site in Huntstown revealed a series of linear features and pits which are suggestive of early medieval settlement at the site. The development as proposed will have a direct impact on the identified archaeology and as preservation in situ is not an option, mitigation can only be achieved through archaeological excavation.

It is recommended that all features of archaeological significance should be resolved prior to the commencement of any construction works within the site. It is proposed that the two areas containing archaeological features

measuring 316m2 and 10118m2 be stripped of topsoil under archaeological supervision and that they are archaeologically resolved and preserved by record. This should be carried out by a licence-eligible archaeologist and in compliance with a method statement approved by the Department of Housing, Local Government and Heritage in consultation with the National Museum of Ireland.

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1. INTRODUCTION

This report outlines the results of an archaeological assessment (test trenching) at a site at Huntstown, Co. Dublin (ITM 711800, 740999, Figures 1-2).

The assessment was carried out in response to a Further Information Request Item 14(h) attached to Planning reference No. FW23A/0111 by Fingal County Council. The site lies adjacent to and south of the access to the Huntstown Power Station, west of North Road and to the northwest of Junction 5 (M50 with N2). It consists of two fields.

The aim of the test trenching was to target anomalies identified during the geophysical survey (23R0419; Murphy, 2023) and to assess their archaeological significance and potential. There are no Recorded Monuments and no Protected Structures located within the site.

The site, however, is located within a highly sensitive archaeological landscape. During the recent geophysical survey (23R0419) buried archaeological remains were identified. The southern portion of Field 2 was suitable to survey and an extensive settlement complex that included an enclosure and associated features was recorded. In addition, human remains were uncovered in May 2023 during monitoring (21E0185; Hickey, 2023) of the trenching for redirection of the power lines (permitted under Planning Ref. No. FW21A/0144). The remains were recorded within the southeast portion of Field 2 and are currently being preserved by record. Furthermore, test trenching was carried out in the northwest portion of the site (20E0601; O'Driscoll, 2021) although no features were identified. To the north of the site, a bivallate enclosure and pre-Famine vernacular structure was recorded and since excavated (19E0635; Bailey, 2019; 21E0185; Hickey, 2023).

2. NATURAL & CULTURAL LANDSCAPE

2.1 Natural Landscape

The site is located in the townland of Huntstown, Co. Dublin (ITM 711800, 740999; Figures 1 – 2). The site lies adjacent to and south of the access to the Huntstown Power Station, west of North Road and to the northwest of Junction 5 (M50 with N2). It consists of two fields: Field 1 and Field 2. Field 1 was rough terrain and with heavy overgrowth, while Field 2 up until recently, was an agricultural field and features a hill covered with trees covering an area of c.0.291 hectares. The northern slopes of this hill have been previously quarried while the southwestern to southeastern slops appeared to be relatively undisturbed.

The underlying geology at the site is described as Calcareous shale and limestone conglomerate as part of the Tober Colleen Formation, which was first identified in 1986 and replaced the Rush Slate, which measures 50m to 250m in thickness. (Geological Survey of Ireland).

2.2 Cultural Landscape

A review of available historic mapping for the area was carried out to include the Ordnance Survey of Ireland, including the 6-inch (surveyed 1836 – published 1843; Figure 3) and 25-inch (surveyed 1906 – published 1909; Figure 4). Potential archaeological or cultural heritage features are marked on such maps and provide a useful resource in identifying sites, particularly if they no longer have any above-ground remains.

The site is located within two large fields on the 1836 map with a strip of trees north of the eastern field. An east to west aligned road runs from the west up as far as the strip of trees to the east. A small laneway runs from the end of the road into the eastern field and stops at a sand pit, roughly one third of the length of the field. There are no structures within the two fields. On the third edition map the laneway down to the sand quarry has gone, suggesting the quarry was abandoned. The rest of the fields remain the same.

2.3 Archaeological Background

The site is located within the county of Dublin, in the townland of Huntstown (Baile an Huntaigh) in the Barony and Civil Parish of Castleknock.

Huntstown townland (https://www.logainm.ie/17230.aspx) can be identified as early as c. AD 1550 as Moche Huntyston in the Calendar of Fiants of Queen Elizabeth. Fiants were warrants, grants of land, appointments to offices and other matters directed to the Irish Chancery under the Great Seal.

Prehistoric Period

The earliest known settlements in Ireland can be dated to the Mesolithic period (6000-4000BC). The most common evidence for the presence of Mesolithic activity includes scatters of worked flint and middens (mounds of domestic refuse) which consisted largely of marine mollusc shells. Middens occur most frequently along the coast and near water sources including rivers and lakes. Currently there is no evidence for Mesolithic settlement within the environs of the proposed development site.

In the Neolithic period (4000-2500BC) with the introduction of farming, communities became more settled and less nomadic. Their economy was focused on cereal cultivation and rearing livestock. People changed from being food collectors, scavengers, hunters and fishers to cultivating land, growing crops and managing, breeding and

controlling stock. This required forest clearance and working poorer soils. Pottery was also being produced and is found in significant quantities on archaeological sites. Field boundaries were built and territorial markers were also constructed to allow future prospectors to see that the land is taken. Megalithic tombs acted as both a territorial marker and as a ritual monument within the community. There are four types of tombs, court cairn, portal, passage and wedge. The court, portal and passage style tombs belong solely to the Neolithic period, while the wedge tomb transitions from the Neolithic to the Bronze Age. Only five prehistoric sites are recorded within the study area, the most significant being the Neolithic enclosure in the townland of Kilshane (DU014-093), located c. 1.5km north of the proposed development site. The large segmented ditched enclosure contained large amounts of cattle bone in its deposits and had no evidence of an internal or external bank (Moore 2004).

The Bronze Age (c. 2400-800BC) is marked by the use of bronze – the first metal in Ireland. Changes in society were visible, especially in burial practices. The megalithic tombs were replaced by individual burials, with cremated or inhumated bones in cists, often with pottery as grave goods. Burials are often found on high ground and frequently megalithic structures were reused in Bronze Age burial practices. Different forms of burial were seen. Barrows were also being constructed during this period, as well as ceremonial monuments such as henges. Fulachta fiadh are Bronze Age cooking sites characterized by a crescent-shaped mound of burnt stone. Groups of these monuments are often found in damp areas where the trough used for cooking would naturally fill with water. Stones were heated on a fire and then thrown into the trough until the water was hot enough to cook with (although alternative uses such as bathing have also been suggested for these monuments). After use, the stones were removed from the trough and placed around its edge until the characteristic crescent-mound was formed.

A Ring-ditch (DU014-100) seen as a cropmark, lies c. 1.1km from the site. This funerary monument, that dated from the Bronze Age right through to the Iron Age, is not visible above ground. It is visible as a cropmark, circular in shape with a diameter of c. 45m.

Two burnt mounds or fulachta fiadh sites are located c. 1.3km west of the proposed development site in the townland of Grange (DU014-050). Discovered during the monitoring of the excavation of the Northeast gas pipeline, they consisted of charcoal rich soil with heat fractured stone (Conway 2000).

Medieval period

The Early Medieval period (AD 400–1169) saw tribal kingdoms, known as túath, of which there were c. 150 in the country. They comprised of inhabitants living in defended homesteads known as ringforts or raths, many of which are still traceable in the fields around Coldwinters and Huntstown today. The number of ditches and banks surrounding a rath is thought to be a testament to the status of the occupiers (Edwards 1996). During this period, the proposed development site was situated in the Tuath of Tuirbe, later known as Fine Gall, a territory controlled by the dynasty of the Ui Chormaic kings (MacCotter 2008). There are a number of possible Ringforts in the

townland of Newtown (DU014-00602, DU014-007 and DU014-053), an enclosure in Coldwinters (DU014-016-), an enclosure in Dubber (DU014-017—) and an enclosure in Cappogue (DU014-029—). An excavation (99E0220) in Kilshane townland revealed a large cemetery (DU014-048--) indicative of a large-scale settlement within the area.

The Late Medieval period (1100-1600) in Ireland saw the invasion of the Normans, which began in 1169, when Diarmait MacMorrough, the deposed King of Leinster, sought help from Henry II. Henry II permitted some of his subjects to go and help, an advance party of Anglo-Normans arrived in Ireland from South Wales, with followers from France and Flanders. A year later a stronger party arrived under Richard de Clare (Strongbow), Earl of Pembroke. The Anglo-Normans colonized Ireland at an alarming rate. Ireland was designated a lordship and Henry II, assigned the lordship to his youngest son John and from there the outlines of a royal administration were developed (Ryan, 1994).

Henry II made Hugh de Lacy palatinate of the lands of Meath in 1172, which probably included Castleknock (O'Drisceoil 2020). De Lacy then granted Hugh Tyrell the lands of Castleknock on behalf of the king (ibid). Anglo-Norman settlement in Ireland was characterised initially by the development of motte and bailey castles. Motte and bailey castles were established along strategic locations overlooking rivers or important routeways (ibid). Mottes consist of a mound of earth, generally circular in plan, with a flat summit where a wooden tower / building (known as a bretésche), was located (O'Sullivan & Downey 2007).

Mottes were often built around natural topographical features, such as rock outcrops, low narrow ridges or eskers. The technique used to construct mottes has been described as ring-and-fill (O'Keeffe 2007). The circumference of the mound was first marked out at ground level with two revetting walls or earthen banks. Within these rings, the motte was built up carefully with alternative layers of soil, turf and deposits such as sand and gravel. Another technique was to pile up soil and other material around a small mound or a pre-existing prehistoric mound (ibid)

There are two motte and bailey castles within the environs of the proposed development; Newtown (DU014-013) situated c. 0.9km northwest and Dunsoghly (DU014-005.003) c. 1.7km northwest of the site. The Motte in Newtown was recorded as a circular platform (100m east to west; 70m north to south), prior to its removal in 1952. An earthwork depicted on the first edition O.S. map in Ballycoolen townland is listed as a moated site (DU014-025), however, an archaeological investigation discovered it was a natural feature (Mount 2012).

Dunsoghly castle (DU0145-005001), situated c. 2km north of the proposed development, is a well-preserved tower house built in the 15th century by Sir Rowland Plunkett. The Plunkett family lived in the castle for 500 years and were known among the great catholic families of the Pale (Tutty 1972). The site of Cappoge Castle (DU014-027-) lies c. 1.7km to the southwest. Cappoge castle, built by The Woodcocke family, was depicted in a drawing

in 1776 by Gabriel Beranger as a three-storey structure. It was demolished sometime prior to 1860 (Ó'Drisceoil 2020).

Post-Medieval Period

Huntstown house is located c.1.4km northwest of the proposed development site. The earliest documented evidence linking a person to Huntstown House was in 1766 when a merchant by the name of Hoxes Cotes was mentioned with an estate map (ibid). On the Rocque map of 1760 the map shows the house is made up of several buildings with a main entrance to the south. A lane links Huntstown House with Kilshane house.

Several quarries and gravel pits are recorded within the environs of the site, including the sand pit within the proposed development site, which probably dates from the post-medieval period. There was an increase in building and the construction of laneways in this period requiring a source for stone and gravel.

2.4 Previous Archaeological Investigations

A geophysical survey (23R0419; Murphy 2023) was previously carried out on this site, with buried archaeological remains identified within the south portion of Field 2 (Figures 5-10). The anomalies represent an extensive settlement complex that includes an enclosure and associated features (see below for details.). Furthermore, in 2020, Kilkenny Archaeology test trenched the northern extent of the western field (Field 1). This was carried out under licence 20E0601(Ó'Drisceoil, 2021), with no features identified. Human remains were uncovered adjacent to the site, in May 2023 during monitoring (21E0185; Hickey, 2023) of the trenching for the redirection of the power lines along the north and east side of Field 2 (permitted under Planning Ref. No. FW21A/0144). To the north of the site, a bivallate enclosure and pre-Famine vernacular structure was identified and since excavated (19E0635; Bailey, 2019; 21E0185; Hickey, 2023).

Listed below (Table 1) are the details of these previous archaeological investigations. The information is derived from the Summary Accounts of Archaeological Excavations in Ireland (www.excavations.ie).

Table 1: Previous archaeological investigations in the environs of the site

Excavation.ie reference	Licence No.	Site Type	Investigation Type
2017:872- Coldwinters, Dublin	17E0436	Ring-ditch	Test trenching
2021:238 – Coldwinters, Dublin	17E0436	Ring-ditch	Archaeological excavation

Excavation.ie reference	Licence No.	Site Type	Investigation Type
2005:409-Coldwinters/Newtown, Dublin	05E0236	Prehistoric/medieval	Archaeological testing
2006:568 -Balseskin, Dublin	05E0063	No archaeological significance	Archaeological testing
2008:384-Dublin Airport Logistics Park, Coldwinters, Dublin	05E0236	Nothing of archaeological significance	Archaeological testing
2017:424-Coldwinters, Dublin	17E0285	Enclosure; Cremation	Archaeological monitoring and excavation
2010:283 – Merryfalls, Dublin	10E0459	Enclosure	Archaeological testing
2018:820- Huntstown, Dublin	18E0561	No archaeology found	Archaeological monitoring
2021:266:Huntstown and Johnstown, Old Ashbourne Road, Dublin	21E0185	Bivallate enclosure and vernacular structure	Archaeological excavation

The site was subject to a geophysical survey (23R0419; Murphy 2023), with buried archaeological remains identified. These are located within Field 2 and appear to represent an extensive settlement complex consisting of the following:

- The partial remains of an oval enclosure slightly offset to the south and surrounding the pre-existing quarry. The enclosure consists of a curving negative anomaly commencing at the south-western edge of the quarry and continuing southeast, east and then curving back to the north along the east side into an area of magnetic interference. A portion of the north-eastern edge of the enclosure appears to return westwards immediately east of the quarry. Overall, the enclosure measures 80m NW-SE by 65m NE-SW. The existing 19th-century quarry has impacted the northwest portion of the enclosure and a significant part of the interior. The southern extent of the enclosure appears to have a gap where it opens into a possible field or annex at the southwest corner.

- A series of linear and curvilinear anomalies that extend southwards from the enclosure and east-west across the gentle south-facing slope of the ridge. These have associated small and larger negative features that could represent pits or kilns. The north-south and east-west aligned linear anomalies probably represent field systems or other rectangular enclosures associated with the main enclosure on the summit of the ridge. The anomalies appear to extend eastwards towards the site where human remains consisting of two individuals were recently identified. There is therefore a possibility that further human burials might be present within the site. The complex to the south of the enclosure measures 125m east-west by 65m north-south approximately.

Test trenching under licence 20E0601 (Ó'Drisceoil, 2021) was carried out in the northwest portion of the site. Seven test trenches were excavated. No archaeological deposits, features, structures or objects were identified in any of the trenches. It recommended a structured programme of archaeological monitoring to be carried out.

To the north of the site, a bivallate enclosure and pre-Famine vernacular structure was identified and since excavated (19E0635; Bailey, 2019; 21E0185; Hickey, 2023). One of the sites corresponded with known geophysical anomalies and had been previously tested (19E0635, Bayley 2019). Area 1 was a bivallate enclosure, which proved to be more substantial than initially suspected; the other area (Area 2) was a pre-Famine vernacular structure (Hickey 2023). In May 2023, as part of a separate development, a wayleave for power lines was excavated along the north and east sides of the present development site. Disarticulated human remains were inadvertently disturbed by the groundworks, at the edge of the eastern field. There was a minimum of two individuals represented in the skeletal remains (Mullins 2023). These were recently preserved by record.

2.5 Record of Monuments and Places (RMP)

The site does not contain any Recorded Monuments listed within the Record of Monuments and Places (RMP) or Sites and Monuments Record (SMR). The following (Table 2) is a list of monuments located within the immediate environs (Figure 2). These descriptions are derived from the National Monuments Service Archaeological Survey Database (http://maps.archaeology.ie/historicenvironment/).

Table 2: Recorded Monuments in the environs of the site

DU014-122001	Enclosure
This monument was subject to geophysical survey (Licence no. 09R195) and test excavation (Licence no. 10E0462) as part of the proposed Metro West development. A sub-rectangular enclosure 35m by 25m was	

identified and confirmed through test excavation. Two postholes were located either side of the ditch (0.55m wide and 0.25m deep) suggesting the possibility of a palisade. Two corn-drying kilns (DU014-122002-; DU014-122003-) are situated at the S of the enclosure (O'Donovan 2010, 18).	
DU014-122002	Kiln –corn-drying
This monument was subject to geophysical survey (Licence no. 09R195) and test excavation (Licence no. 10E0462) as part of the proposed Metro West development. A comma shaped corn drying-drying kiln and the probable flue of a second corn-drying kiln were located to the S of an enclosure (DU014-122001). The former (2.1m wide and 0.51m deep) (O'Donovan 2010).	
DU014-102	Enclosure
A large circular enclosure visible as a crop mark on an aerial photograph (SMR file; pers. comm. T. Condit). Relatively low-lying field north of M50 and west of N2. No visible remains	
DU014-124	Enclosure
Located in large arable field close to the field's northern boundary, c. 148m north-east of a large crop mark enclosure (DU014-102-_, cropmarks indicate the presence of a subsurface ditch. The cropmarks are visible on Google Earth imagery 24 June 2018. The enclosure is subcircular in plan (diam. C. 32.3m N-S by c. 24.5m E-W). there is no evidence for an entrance gap through the ditch. A linear cropmark, a subsurface ditch, can be seen adjoining the enclosure along its southern perimeter.	
DU014-132	Ring-ditch
Located in large arable field close to the field's N boundary, c. 320m NE of a large cropmark enclosure (DU014-102----), cropmarks indicate the presence of an arrangement of four ring-ditches. The ring-ditches are visible on Google Earth imagery	
DU014-133	Ring-ditch
Located in large arable field close to the field's N boundary, c. 295m NE of a large cropmark enclosure (DU014-102----), cropmarks indicate the presence of an arrangement of four ring-ditches. The ring-ditches are visible on Google Earth imagery	

DU014-047	Inn
The OS 6-inch map shows the Old Red Lion. It is mentioned in the Finglas, County Dublin, Vestry Books for the year 1675 (1916, 33). Site within overgrown uneven pasture beside road. No visible remains.	
DU014-138	Earthworks
In tillage field. Circular-shaped cropmark (diam. c. 45m) with possible outer enclosing ditches visible on Apple Maps orthoimage and Google Earth orthoimages. See attached orthoimage taken from Apple Maps and Google Earth orthoimage	

2.6 Protected Structures and National Inventory of Architectural Heritage (NIAH)

There are no Protected Structures as listed in the *Fingal Development Plan 2023-2029*, located within the site of the proposed development nor within the environs of the site. Neither are there any structures recorded in the National Inventory of Architectural Heritage (NIAH).

2.7 Stray Finds

The Topographical Files of the National Museum of Ireland were also consulted to assess the area's archaeological potential. These files list all archaeological artefacts in the care of or known to the museum. Such a record can provide evidence for human settlement or activity in the absence of physical remains or documentary references. No such finds were recorded for the townland of Huntstown.

2.8 Aerial Photography

In addition to examining the various editions of the OS maps, aerial photographs from the Geological Survey of Ireland, dating from between 1995 and 2013 and the google aerial imagery dating between 2002 and 2022 were consulted.

The 1995 black and white aerial image shows a roughly cut road meandering from the west and edging to the south and east of the site. The east to west road that stopped at the trees to the north now continues through the trees and meets a northwest to southeast aligned road to the east. A much larger national road is seen to the south and southeast. In the field immediately southeast, a sub-station has been constructed. In the 1999 image the south and east road that edged the site is back under grass. The road to the north of the site breaks in two with vegetation in the centre before merging with the road to the east. In 2005, a new development was being

constructed in a narrow strip of land to the northwest, south of the road. A road runs south of the new development site and cuts along the northwestern corner of the proposed development site. The quarry is visible by the overgrown vegetation.

Google Pro Earth images were also studied. In 2003 the power lines with ESB poles are clearly visible in both fields together with a number of pylons in the eastern field and four pylons outside the southeastern edge of the site. In 2008, the ground is freshly dug up to and around the pylons east of the overgrown sand quarry. On the 2018 aerial, faint crop marks corresponding with geophysical survey anomalies can be seen.

3. ARCHAEOLOGICAL ASSESSMENT

3.1 Site Description

The site consisted of a roughly triangular field of neglected rough grassland that sloped downhill from the centre from an old abandoned quarry. The site was bounded on all sides by mature hedgerows and trees and lay to the east of the M50 motorway and N2 junction.

3.2 Methodology

Test trenching was carried out in accordance with the IAI Code of Conduct for Archaeological Assessment Excavation (IAI 2006). The test trenches were excavated to the natural subsoil or where applicable, to the surface of potential archaeological deposits/features. The latter were cleaned by hand to determine their horizontal extent and the spoil from excavated test trenches was examined for finds.

All excavated trenches and archaeological deposits/features were recorded using ArcGIS Survey123 and digital photography. Digital photography images were taken using a high-resolution digital camera with a minimum resolution of 10 Megapixels.

3.3 Previous Investigations carried out within the application site

Several phases of archaeological activity were carried out within the application site prior to the current phase of work. This was carried out in the northwest corner of the site (immediately west of the current phase of works) and north-northeast of the current phase of works.

3.3.1 Geophysical Survey - by J. M Leigh Surveys Ltd (licence No. 19R0159)

A geophysical survey was carried out on lands north of the current site by J. M Leigh Surveys Ltd under licence No. 19R0159. This was not located within the current site but was carried out as part of the undergrounding of lines. The geophysical survey identified the probable remains of an oval enclosure (c.42m by 50m). Numerous responses and trends were identified within the enclosure and most likely represent the remains of pits and ditches. A possible outer ditch and associated field system were identified to the east. Two clusters of isolated responses are evident in the southern half of the application area and may represent ploughed-out and damaged archaeology.

3.3.2 Archaeological Testing – by IAC Ltd (licence No. 19E0645)

Archaeological testing was subsequently carried out on the lands north of the current site following the aforementioned geophysical survey. This was carried out by IAC Ltd under licence No. 19E0645. This was not located within the current site but was carried out as part of the undergrounding of lines. This archaeological testing across the site confirmed the results of the geophysical survey that indicated the presence of an enclosure and associated linear features and pits.

3.3.3 Archaeological Assessment via Test Trenching - Cóilín Ó Drisceoil of Kilkenny Archaeology (Licence No. 20E0601)

An Archaeological Assessment was previously carried out in the northwest corner of this site by Cóilín Ó Drisceoil of Kilkenny Archaeology (Figures 8-9) under licence 20E0601. This Assessment involved a desk-based study, a field survey and the excavation of test trenches. A total of seven test trenches were excavated. No features of archaeological significance were identified during the course of this assessment.

3.3.4 Archaeological Monitoring and Testing of the undergrounding of cables – by AMS (Licence No. 21E0185)

Archaeological monitoring of the undergrounding of cables was carried out in the northern and northeastern extent of this site by AMS (Figures 8-9) under licence 21E0185. Human remains were recovered as a result of archaeological monitoring of the undergrounding of cables in the eastern extent of the site (Figure 8). These were discovered during the final stage of trenching for the ESB powerline and were archaeologically excavated in the Autumn of 2023. Further testing and a geophysical survey were also carried out in lands north of the current site under licence 21E0185 and 21R0064.

3.4 Geophysical Survey of the Application Site

A geophysical survey of the application site was carried out by ACSU Ltd. This was carried out under licence 23R0419; (Murphy 2023) and buried archaeological remains were identified. These are located within Field 2 and appear to represent an extensive settlement complex consisting of the following:

• The partial remains of an oval enclosure slightly offset to the south and surrounding the pre-existing quarry. The enclosure consists of a curving negative anomaly commencing at the south-western edge of the quarry and continuing southeast, east and then curving back to the north along the east side into an area of magnetic interference. A portion of the north-eastern edge of the enclosure appears to return westwards immediately east of the quarry. Overall, the enclosure measures 80m NW-SE by 65m NE-SW. The existing 19th-century quarry has impacted the northwest portion of the enclosure and a significant part of the interior. The southern extent of the enclosure appears to have a gap where it opens into a possible field or annex at the southwest corner.

• A series of linear and curvilinear anomalies that extend southwards from the enclosure and east-west across the gentle south-facing slope of the ridge. These have associated small and larger negative features that could represent pits or kilns. The north-south and east-west aligned linear anomalies probably represent field systems or other rectangular enclosures associated with the main enclosure on the summit of the ridge. The anomalies appear to extend eastwards towards the site where human remains consisting of two individuals were recently identified. There is therefore a possibility that further human burials might be present within the site. The complex to the south of the enclosure measures 125m east-west by 65m north-south approximately.

3.5 Results of Current Investigations within the Application Site

Archaeological test trenching was carried out in compliance with the method statement approved under licence 23E0872 issued by the Department of Housing, Local Government and Heritage in consultation with the National Museum of Ireland. The location of the test trenches was informed by the footprint of the proposed development and associated groundworks (Figures 8-9).

A total of 24 test trenches were excavated, each measuring 1.8m in width. In total, 979m of linear trenches were excavated (Figures 8, 9, 11, 12). The test trenches were excavated down to the natural subsoil which varied throughout the site (See Plate 3 for example), but was generally comprised of a mid-orangish brown clay with occasional small subangular stones. Towards the top of the hill near an area previously quarried, the natural subsoil contained a grey sandy gravel and pockets of pebbles and small areas of a compacted light blueish grey clay.

A total of 36 features were identified during test trenching, consisting of linear and pit features (Figures 8-9, 11-13). Due to the quantity and extent of these features, interpretation is based on a combination of the results listed

in Tables 3 and 4 as well as the results of the geophysical investigation carried out at the site. Of note is C1201 (Plate 15) which was orientated east to west and was previously identified during the geophysical survey. It is interpreted here as a ditch that enclosed a possible habitation site located at the summit of the hill.

The linear and pit features found on the southern slope of the hill are considered to be part of potential field systems associated with the enclosed settlement. A section of C1903 (Plate 24) revealed a ditch measuring 4m in width and with a depth of 1.2m (Figure 13). The ditch features a step or shelf measuring 2m in width before dropping off to the base. This feature also appears to be the same as C1902 (Plate 23). The size and location of this feature suggest a substantially large ditch was used to demarcate the outer boundary of the fields used by the settlement.

Table 3: Trench descriptions

Trench	L(m)	W(m)	D(m)	Basic Description
1	53.7m	1.8m	0.3m to 0.5m	(Plate 1) Sod, topsoil and subsoil measured a depth of 0.3m to 0.5m. The natural subsoil was a compact dark blueish-grey and mid-greyish-brown clay with frequent small subangular stones. Several land drains ran along the base of this trench. Nothing of archaeological significance in this trench.
2	32.1m	1.8m	0.2m to 0.4m	(Plate 2) Sod, topsoil and subsoil measured a depth of 0.2m to 0.4m. The natural subsoil was a compact mid-greyish yellow and mid-blueish-grey clay with frequent small subangular stones. Nothing of archaeological significance in this trench.
3	80.2m	1.8m	0.2m to 0.4m	Sod, topsoil and subsoil measured a depth of 0.2m to 0.4m. The natural subsoil was a compact mid-grey and greyish-orange clay with frequent small subangular stones. Some modern ceramic found along the base of the trench. Nothing of archaeological significance in this trench.

Trench	L(m)	W(m)	D(m)	Basic Description
4	64.8m	1.8m	0.3m to 1m	Sod, topsoil and subsoil measured a depth of 0.3m to 1m. Located in an area of made-up ground where a pylon once stood. The natural subsoil was a compact mid-orangish brown clay. Nothing of archaeological significance in this trench.
5	47.15m	1.8m	0.4m	Sod, topsoil and subsoil measured a depth of 0.4m. The natural subsoil was a compact mid-orangish brown clay and a mid-grey stoney gravel. Nothing of archaeological significance.
6	30.9m	1.8m	1m	Sod, topsoil and subsoil measured a depth of 1m. Located in an area of made-up ground on the surface. There is about 0.6m of made-up ground above about 0.2m of the old topsoil and 0.2m of subsoil. The natural subsoil was a compact mid-yellowish orange clay with frequent small subangular stones. Several archaeological features and potential archaeological features were identified in this trench (Figure 11). C601 was the cut of a possible irregular shaped feature. Filled with a compact mid-blackish grey silty clay with occasional small subangular stones. C602 was the cut of a possible north-south running linear feature. Filled with a compact light to mid-grey clay with occasional small subangular stones. C603 was the cut of a possible north-south running linear feature. Filled with a compact mid-grey clay (like mudstone) with frequent small subangular stones.

Trench	L(m)	W(m)	D(m)	Basic Description
				C604 (Plate 11) was the cut of a north-south running linear feature. Filled with a compact dark greyish black silty clay with frequent small subangular burnt stones. C605 was the cut of a possible north-south running linear feature. Filled with a compact mid-brownish grey silt clay with frequent small subangular stones. C606 was the cut of a possible irregular-shaped pit. Filled with a compact mid-grey clay with occasional small subangular burnt stone. C607 was the cut of a possible north-south running linear feature. Filled with a compact light greyish brown, silty clay with occasional small subangular stones.
7	33.7m	1.8m	0.6m	Sod, topsoil and subsoil measured a depth of 0.6m. The natural subsoil was a compact, mid-orangish brown sandy clay. Nothing of archaeological significance in this trench.
8	29.3m	1.8m	0.6m	Sod, topsoil and subsoil measured a depth of 0.6m. The natural subsoil was a compact, orange-brown clay for much of the trench. There was a firm, mid-grey stoney gravel natural in the northern end of the trench. This change corresponded with an anomaly that was picked up in the geophysical survey. Nothing of archaeological significance in this trench.
9	22.5m	1.8m	0.4m	(Plate 4) Sod, topsoil and subsoil measured a depth of 0.4m. The natural subsoil was a firm, mid-

Trench	L(m)	W(m)	D(m)	Basic Description
				grey stoney gravel with sand. One archaeological feature was found in this trench. C901 (Plate 12; Figure 12)) was the cut of a north-south running linear feature. Filled with a compact dark greyish brown clay. Fill contained some small subangular stones and animal bone.
10	26.1m	1.8m	0.4m	(Plate 5) Sod, topsoil and subsoil measured a depth of 0.4m. The natural subsoil was a firm, mid-greyish brown stoney gravel with pockets of sand. Two archaeological features were found in this trench. C1001 (Figure 12; Plate 13) was the cut of a northeast-to-southwest running linear feature. Filled with a compact light brown clay. Contained frequent small subangular stones and animal bone. C1002 (Figure 12; Plate 14) was the cut of an east-west running linear feature Filled with a compact mid-greyish brown clay. Contained occasional small subangular stones and animal bone.
11	33.7m	1.8m	0.5m	Sod, topsoil and subsoil measured a depth of 0.5m. The natural subsoil was a compact mid-brownish orange clay. Two archaeological features were found in this trench. C1101 (Figure 12) was the cut of a possible north-south running linear feature. Filled with a compact mid-greyish brown clay. Fill contained some animal bone.

Trench	L(m)	W(m)	D(m)	Basic Description
				C1102 (Figure 12) was the cut of a possible north-south running linear. Filled with a compact mid-greyish brown clay. Fill contained some animal bone.
12	19.2m	1.8m	0.4m	Sod, topsoil and subsoil measured a depth of 0.4m. The natural subsoil was a compact mid-orange brown clay and a firm, mid-brownish grey sandy gravel. One archaeological feature found in this trench. C1201 (Figure 12; Plate 15) was the cut of an east-west running linear feature. It was likely the enclosure ditch that encircled the hilltop that was identified on the geophysical survey. Filled with a compact mid-greyish brown silt clay. Fill contained animal bone and charcoal.
13	43.3m	1.8m	0.6m	Sod, topsoil and subsoil measured a depth of 0.6m. The natural was a compact mid-orangish brown clay with patches of sand and gravel. A number of archaeological features were found in this trench. C1301 (Figure 12; Plate 16) was the cut of a north-south running linear feature. Filled with a compact mid-greyish brown clay. The fill contained some animal bone. C1302 (Figure 12) was the cut of a possible northeast to southwest running curvilinear. Filled with a compact mid-greyish brown clay with occasional small subangular stones. Appears to run into C1301.

Trench	L(m)	W(m)	D(m)	Basic Description
				C1303 (Figure 12) was the cut of a small oval shaped pit. Filled with a compact mid-greyish brown, clay. Fill contained some charcoal. C1304 (Figure 12) was the cut of a possible north-south running linear feature. Filled with a compact mid-greyish brown clay. Contained occasional small subangular stones and animal bone. C1305 (Figure 12) was the cut of a possible north-south running linear feature. Filled with a compact mid-greyish brown silt clay with occasional subangular stones. C1306 (Figure 12) was a large spread of fill containing charcoal and animal bone. May be the intersection of many intercutting linear features. Compact mid-brownish grey silty clay.
14	80.5m	1.8m	0.4m	(Plate 6) Sod, topsoil and subsoil measured a depth of 0.4m. The natural subsoil was a compact mid-orangish brown clay with pockets of a firm, mid grey stoney gravel. A southeast-to-northwest running field drain was found at the west end of the trench. Nothing of archaeological significance was found in this trench.
15	31m	1.8m	0.5m	Sod, topsoil and subsoil measured a depth of 0.5m. The natural subsoil was a compact mid-orangish brown clay. Several archaeological features were found in this trench. C1501 (Figure 12) was the cut of a possible linear feature. Filled with a compact, light greyish-brown clay.

Trench	L(m)	W(m)	D(m)	Basic Description
				C1502 (Figure 12) was the cut of a possible linear feature Filled with a compact mid-greyish brown clay. C1503 (Figure 12) was the cut of a possible large pit or north-south running linear feature. Filled with a compact mid-greyish brown silt clay. C1504 (Figure 12) was the cut of a possible east west running linear feature. Filled with a compact mid-greyish brown clay.
16	48.8m	1.8m	1m	(Plate 7) Sod, topsoil and subsoil measured a depth of 1m. The natural subsoil was a compact mid-orangish brown clay. Several archaeological features were found in this trench. C1601 (Figure 12; Plate 17) was the cut of a linear feature. Filled with a compact mid-greyish brown, silty clay with frequent small to medium subangular stones. C1602 (Figure 12) was the cut of a possible linear feature. Filled with a compact mid-greyish brown, silty clay with frequent small subangular stones. C1603 (Figure 12) was a possible spread of a compact mid to dark blackish grey, silty clay with frequent small subangular stones. C1604 (Figure 12; Plate 18) was the cut of a wide linear feature. Filled with a compact mid-greyish brown, silty clay with occasional small subangular stones.

Trench	L(m)	W(m)	D(m)	Basic Description
				C1605 (Figure 12) was the cut of a linear feature. Filled with a mid-greyish brown, silty clay with occasional small subangular stones.
17	20m	1.8m	0.4m	(Plate 8) Sod, topsoil and subsoil measured a depth of 0.4m. The natural subsoil was a firm, mid-grey sandy gravel. Two archaeological features were identified in this trench. C1701 (Figure 12; Plate 19) was the cut of a north south running linear feature. Filled with a compact mid-greyish brown clay with occasional small subangular stones. C1702 (Figure 12; Plate 20) was the cut of a possible north south running linear feature. Filled with a compact mid-greyish brown clay. Contained small subangular stones and some animal bone.
18	27m	1.8m	0.4m to 1m	Sod, topsoil and subsoil measured a depth of 0.4m to 1m. The natural subsoil was a compact mid-orange brown clay. Possibly some evidence of hill wash in this trench. One archaeological feature found in this trench. C1801 (Figure 12; Plate 21) was the cut of a southeast to northwest running curvilinear feature Filled with a compact dark greyish-brown clay.
19	151m	1.8m	0.4m to 1m	(Plate 9) The trench was extended multiple times. Sod, topsoil and subsoil measured a depth of 0.4m to 1m. The natural subsoil was a compact mid-greyish brown and mid-orange brown clay with occasional small subangular stones. Several archaeological features found in this trench.

Trench	L(m)	W(m)	D(m)	Basic Description
				C1901 (Figure 12; Plate 22) was a spread that contained a lot of charcoal. Aligns to a north south running anomaly on a geophysical survey. Filled with a compact mid-greyish brown silty clay. Very frequent charcoal. C1902 (Figure 12; Plate 23) was the cut of a linear feature that may represent the outer east edge of a rectangular enclosure on the south slope of the ridge. Filled with a compact dark greyish-brown clay. Contained some animal bone. C1903 may be the return of this linear feature. C1903 (Figures 12-13; Plate 24) was the cut of a large possible linear feature, running east to west, which may be the return of C1902. Filled with a compact dark greyish-brown silty clay. A section was dug which revealed a 2m wide shelf at a depth of 0.5m then a further drop to the base of 0.7m. C1904 (Figure 12; Plate 25) was the cut of an oval-shaped pit or the end of a linear feature. Filled with a compact greyish-brown silty clay. C1905 (Figure 12; Plate 26) was the cut of a possible pit, filled with a compact greyish-brown silty clay. Located along the limit of excavation of the trench.
20	19.7m	1.8m	0.8m	Sod, topsoil and subsoil measured a depth of 0.8m. The natural subsoil was a compact mid-orangish brown sandy clay with frequent small subangular stones. Nothing of archaeological significance found in this trench.

Trench	L(m)	W(m)	D(m)	Basic Description
21	18m	1.8m	0.3m	Sod, topsoil and subsoil measured a depth of 0.3m. The natural subsoil was a compact mid-orange brown and grey clay. Nothing of archaeological significance in this trench.
22	18.8m	1.8m	0.3m	Sod, topsoil and subsoil measured a depth of 0.3m. The natural was a compact mid-orangish brown and mid-grey clay. Nothing of archaeological significance in this trench.
23	22.7m	1.8m	0.3m	Sod, topsoil and subsoil measured a depth of 0.3m. The natural subsoil was a compact mid-brownish orange clay and a firm, mid-grey sandy gravel. Evidence of former ESB pylons were found in this trench. Nothing of archaeological significance in this trench.
24	89.6m	1.8m	0.8m	(Plate 10) Sod, topsoil and subsoil measured a depth of 0.8m. The natural subsoil was a mix of a compact mid-orangish brown clay with pockets of grey sand and dark stone. A lot of disturbance from the adjacent quarrying activity.

Table 4: Context Descriptions (Figure 12)

Context No.	Trench	Length	Width	Depth	Description
C1					Sod and topsoil.
C2					Natural subsoil. Mixed throughout the site. Majority was a compact, mid-orangish brown clay with occasional small subangular stones.

Context No.	Trench	Length	Width	Depth	Description
					The area located on the slopes of the hill near the area of the quarrying contained a more firm/friable, grey sandy gravel natural. There were also areas with a compact light to mid grey and blueish grey clay.
C601	6	2m	1m avg.		Cut of a possible irregular shaped feature. Filled with a compact mid-blackish grey silt clay with occasional small subangular stones.
C602	6	>1.8m	0.6m		Cut of a possible north-south running linear feature. Filled with a compact light to mid-grey clay with occasional small subangular stones.
C603	6	>1.8m	0.8m		Cut of a possible north-south running linear feature. Filled with a compact mid-grey clay (like mudstone) with frequent small subangular stones.
C604	6	>1.8m	0.6m		Cut of a north-south running linear. Filled with a compact dark greyish black silty clay with frequent small subangular burnt stones.
C605	6	>1.8m	0.5m		Cut of a possible north-south running linear feature. Filled with a compact mid-brownish grey silty clay with frequent small subangular stones.
C606	6	1.5m	0.3m avg.		Cut of a possible irregular shaped pit. Filled with a compact mid-grey clay with occasional small subangular burnt stone.
C607	6	>1.8m	2m		Cut of a possible north-south running linear feature. Filled with a compact light greyish brown, silt clay with occasional small subangular stones.

Context No.	Trench	Length	Width	Depth	Description
C901	9	>1.8m	1.5m		Cut of a north-south running linear. Filled with a compact dark greyish brown clay. Filled contained some small subangular stones and animal bone.
C1001	10	>2m	1.3m		Cut of a northeast to southwest running linear feature. Filled with a compact light brown clay. Frequent small subangular stones and animal bone.
C1002	10	>1.8m	2.5m		Cut of an east-west running linear feature. Filled with a compact mid greyish brown clay. Contained occasional small subangular stones and animal bone.
C1101	11	>1.8m	2m		Cut of a possible north-south running linear feature. Filled with a compact mid-greyish brown clay. Some animal bone in the fill.
C1102	11	6m	>1.8m		Cut of a possible north-south running linear feature. Filled with a compact mid-greyish brown clay. Some animal bone in the fill.
C1201	12	>1.8m	1m	0.6m	Cut of an east-west running linear feature. Likely the enclosure ditch that encircled the hilltop that was identified on the geophysical survey. Filled with a compact mid-greyish brown silty clay (C1202). Contained animal bone and charcoal (Figure 13).
C1202	12		1m	0.6m	Filled C1201. A compact mid-greyish brown silty clay. Contained animal bone and charcoal (Figure 13).
C1301	13	>1.8m	2m		Cut of a north-south running linear feature. Filled with a compact mid-greyish brown clay. Some animal bone in the fill.

Context No.	Trench	Length	Width	Depth	Description
C1302	13	>2m	1.3m		Cut of a possible northeast to southwest running curvilinear. Filled with a compact mid-greyish brown clay with occasional small subangular stones. Appears to run into C1301.
C1303	13	0.9m	0.65m		Cut of a small oval shaped pit. Filled with a compact mid-greyish brown, clay/ Some charcoal in the fill.
C1304	13	>1.8m	2m		Cut of a possible north-south running linear. Filled with a compact mid-greyish brown clay. Occasional small subangular stones and animal bones in the fill.
C1305	13	>1.8m	1.6m		Cut of a possible north-south running linear feature. Filled with a compact mid-greyish brown silt clay with occasional subangular stones.
C1306	13				A large spread of fill containing charcoal and animal bone. May be the intersection of many intercutting linears. Compact mid-brownish grey silty clay.
C1501	15	>1.8m	2m		Cut of a possible linear feature. Filled with a compact light greyish-brown clay.
C1502	15	>1.8m	4m		Cut of a possible linear feature. Filled with a compact mid-greyish brown clay.
C1503	15	6m	1.8m		Cut of a possible large pit or north-south running linear feature. Filled with a compact mid-greyish brown silt clay.
C1504	15	>1.8m	3m		Cut of a possible east-west running linear feature. Filled with a compact mid-greyish brown clay.

Context No.	Trench	Length	Width	Depth	Description
C1601	16	>1.8m	3m		Cut of a linear. Filled with a compact mid greyish brown, silt clay with frequent small to medium subangular stones.
C1602	16	5m	>1.8m		Cut of a possible linear feature. Filled with a compact mid-greyish brown, silt clay with frequent small subangular stones.
C1603	16	>1.8m	2.5m		Possible spread of a compact mid to dark blackish grey, silty clay with frequent small subangular stones.
C1604	16	>1.8m	4m		Cut of a wide linear feature. Filled with a compact, mid-greyish brown, silty clay with occasional small subangular stones.
C1605	16	>1.8m	2m		Cut of a linear feature. Filled with a mid-greyish brown silty clay with occasional small subangular stones.
C1701	17	>1.8m	1.4m	0.5m	Cut of a north-south running linear feature (Figure 13). Filled with a compact mid-greyish brown clay with occasional small subangular stones (C1703).
C1702	17	>1.8m	2.8m		Cut of a possible north-south running linear feature. Filled with a compact mid-greyish brown clay. Frequent small subangular stones and some animal bone in the fill.
C1703	17		1.4m	0.5m	Filled C1701. A compact mid-greyish brown clay. Frequent small subangular stones and some animal bone in the fill (Figure 13).
C1801	18	>2m	0.5m		Cut of a southeast to northwest running curvilinear. Filled with a compact dark greyish-brown clay.

Context No.	Trench	Length	Width	Depth	Description
C1901	19	>2m	3m	0.2m	A spread that contained a lot of charcoal. Aligns to a north-south running anomaly on a geophysical survey. Filled with a compact mid-greyish brown silty clay. Very frequent charcoal.
C1902	19	>4m	3m		Cut of a linear feature that may represent the outer east edge of a rectangular enclosure on the south slope of the ridge. Filled with a compact dark greyish-brown clay. Contained some animal bone. C1903 may be the return of this linear.
C1903	19	>1.8m	4m	1.2m	Cut of a large possible linear feature, running east to west, May be the return of C1902. Filled with a compact dark greyish-brown silty clay (C1906) and redeposited natural subsoil (C1907). A section was dug which revealed a 2m wide shelf at a depth of 0.5m then a further drop to the base of 0.7m.
C1904	19	1.6m	1m		Cut of oval-shaped pit or the end of a linear feature. Filled with a compact greyish-brown silty clay.
C1905	19	> 0.6m	0.8m		Cut of possible pit, filled with a compact greyish brown silty clay. Located along the limit of excavation of the trench.
C1906	19		4m	1.2m	Filled C1093. A compact dark greyish-brown silty clay (Figure 13).
C1907	19		0.30m	1.2m	Filled C1903. Redeposited natural subsoil slumped against south inner slope of ditch (Figure 13).

4. MATERIAL CULTURE

4.1 Finds

No finds of archaeological significance were recovered during testing. However, animal bone was present in many of the features across the site.

5. DATING

No dating evidence was observed in the form of diagnostic artefacts during the course of the archaeological test trenching. Similarly, no soil samples were taken from the site for radiocarbon dating. However, the lack of pottery sherds combined with the observed archaeological features suggests a late iron age/early medieval date to the site.

6. DISCUSSION

The entire application site at Huntstown has now been fully assessed. Parts of the site including the north-west corner, the north side and the north-eastern corner were assessed previously by others (see Section 3 above). The areas not previously assessed were investigated as part of the present contract. The results of the geophysical survey and test trenching at the site in Huntstown suggest a possible enclosure at the summit of the hill, with the linear features running down the slope of the hill to the south representing associated field systems. This type of archaeology is characteristic of early medieval settlement.

Settlement in early medieval Ireland (AD 400-1100) is characterised by enclosed habitation sites such as raths, cashels and crannógs (O'Sullivan et al, 2013). Raths are more commonly known as ringforts and refer to enclosures with earthen banks and ditches enclosing a habitation site (ibid). The term fort implies a militaristic nature to these settlements as a defendable fortress, however, the archaeological evidence suggests that while being defendable, their primary use was to protect cattle which was the basis of wealth during the period (McCormick and Murray, 2007). Early medieval society was agricultural and while some sites incorporating multiple banks and ditches have been interpreted as royal sites, the majority are better interpreted as enclosed farmsteads (O'Sullivan et al 2012).

The northern slope of the hill at Huntstown has been previously quarried, and habitation evidence may have been disturbed or removed as a result. However, while speculative until the features are excavated archaeologically, the curvilinear feature identified during the geophysical survey at the site suggests this was the enclosure ditch of a settlement based at the summit of the hill with linear features running to the south related to the associated field systems.

7. RECOMMENDATIONS

The entire application site at Huntstown has now been fully assessed. Parts of the site including the north-west corner, the north side and the north-eastern corner were assessed previously by others (see Section 3 above). The areas not previously assessed were investigated as part of the present contract. The archaeological assessment in the form of test trenching at the site in Huntstown revealed a series of linear features and pits which are suggestive of early medieval settlement at the site. The development as proposed will have a direct impact on the identified archaeology and as preservation in situ is not an option, mitigation can only be achieved through archaeological excavation.

It is recommended that all features of archaeological significance should be resolved prior to the commencement of any construction works within the site. It is proposed that the two areas containing archaeological features measuring 316m2 and 10118m2 be stripped of topsoil under archaeological supervision and that they are archaeologically resolved and preserved by record. This should be carried out by a licence-eligible archaeologist and in compliance with a method statement approved by the Department of Housing, Local Government and Heritage in consultation with the National Museum of Ireland.

8. POST-EXCAVATION PROGRAMME

No post-excavation work is necessary at this time.

9. EXCAVATION BULLETIN

SITE: Huntstown, Co. Dublin

LICENCE: 23E0872

ITM: 711800, 740999

AGE AND SITE TYPE: Ealy medieval

JOB TYPE: Test Trenching

DATE: 18/10/2023

Archaeological test trenching was carried out in compliance with the method statement approved under licence 23E0872 issued by the Department of Housing, Local Government and Heritage in consultation with the National Museum of Ireland. The location of the test trenches was informed by the footprint of the proposed development and associated groundworks.

A total of 24 test trenches were excavated, each measuring 1.8m in width. In total, 979m of linear trenches were excavated. The test trenches were excavated down to the natural subsoil which varied throughout the site but generally comprised of a mid-orangish brown clay with occasional small subangular stones. Towards the top of the hill near an area previously quarried, the natural contained a grey sandy gravel and pockets of pebbles and small areas of a compacted light blueish grey clay.

A total of 36 features were identified during test trenching, consisting of linear and pit features. Due to the quantity and extent of these features, interpretation is based on a combination of the results from testing as well as the results of the geophysical investigation carried out at the site. Of note is C1201 which was orientated east to west and was previously identified during the geophysical survey. It is interpreted here as a ditch that enclosed a possible habitation site located at the summit of the hill.

The linear and pit features found on the southern slope of the hill are considered to be part of potential field systems associated with the enclosed settlement. A section of C1903 revealed a ditch measuring 4m in width and with a depth of 1.2m. The ditch features a step or shelf measuring 2m in width before dropping off to the base. This feature also appears to be the same as C1902. The size and location of this feature suggest a substantially large ditch was used to demarcate the outer boundary of the fields used by the settlement.

While no diagnostic artefacts were recovered during testing, the absence of pottery combined with the interpretation of an enclosing ditch at the summit of the hilltop suggests the presence of an early medieval enclosed settlement and associated field systems to the south.

The development as proposed will have a direct impact on the identified archaeology and as preservation in situ is not an option, mitigation can only be achieved through archaeological excavation. It is recommended that all features of archaeological significance should be resolved prior to the commencement of any construction works

within the site. It is proposed that the two areas containing archaeological features measuring 316m2 and 10,118m2 be stripped of topsoil under archaeological supervision and that they are archaeologically resolved and preserved by record. This should be carried out by a licence-eligible archaeologist and in compliance with a method statement approved by the Department of Housing, Local Government and Heritage in consultation with the National Museum of Ireland.

Donald Murphy, Archaeological Consultancy Services Unit, Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth

10. PUBLICATION PLAN

An account of this licenced test trenching assessment and its results will be published online as an excavation bulletin at www.excavations.ie (see Section 9).

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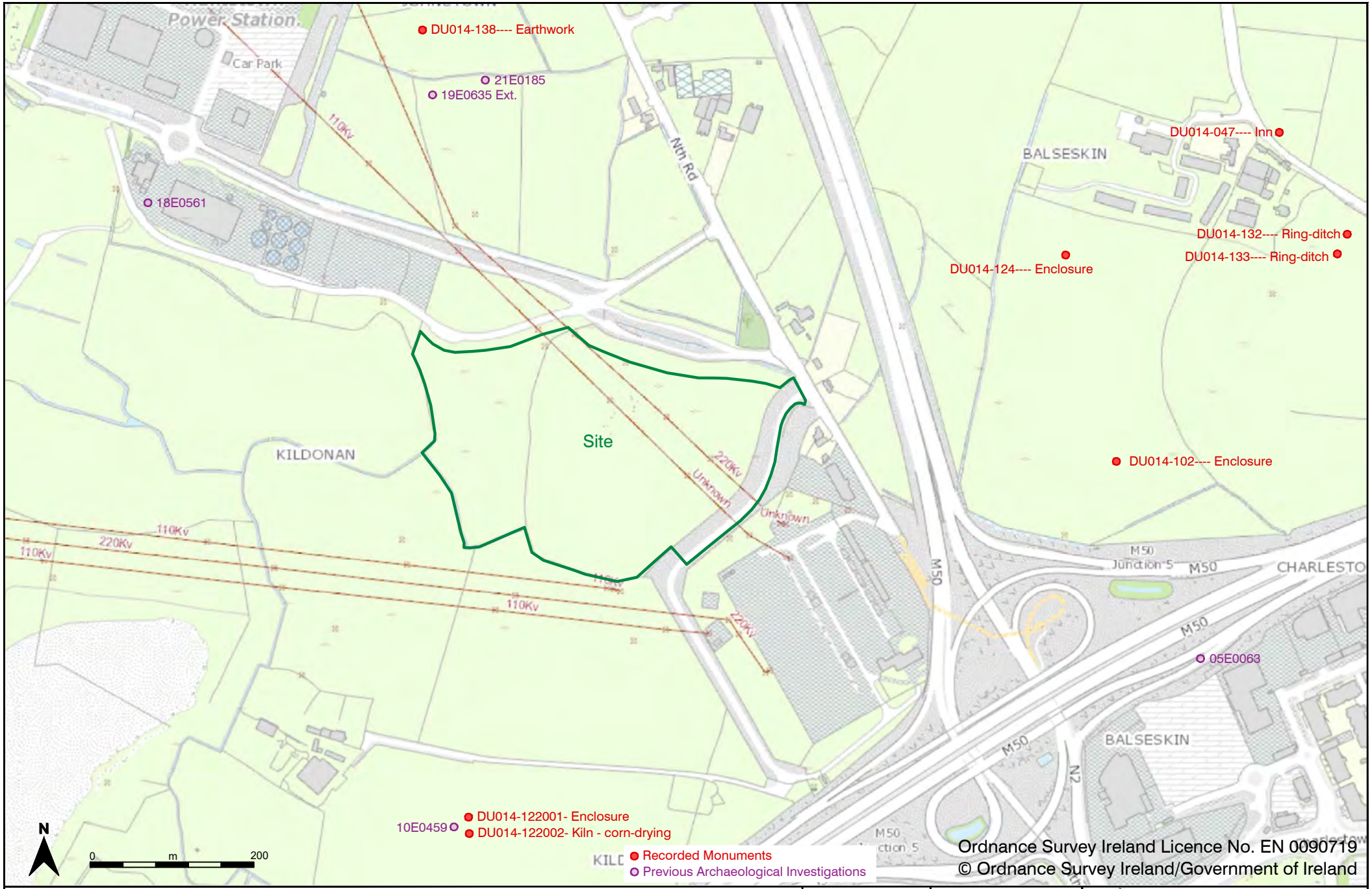


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Project Huntstown, Co. Dublin		**Date** October 2023	**Drawing No.** 2395_C1011
Figure 1 Location of site			**Scale** 1:100,000 @ A4

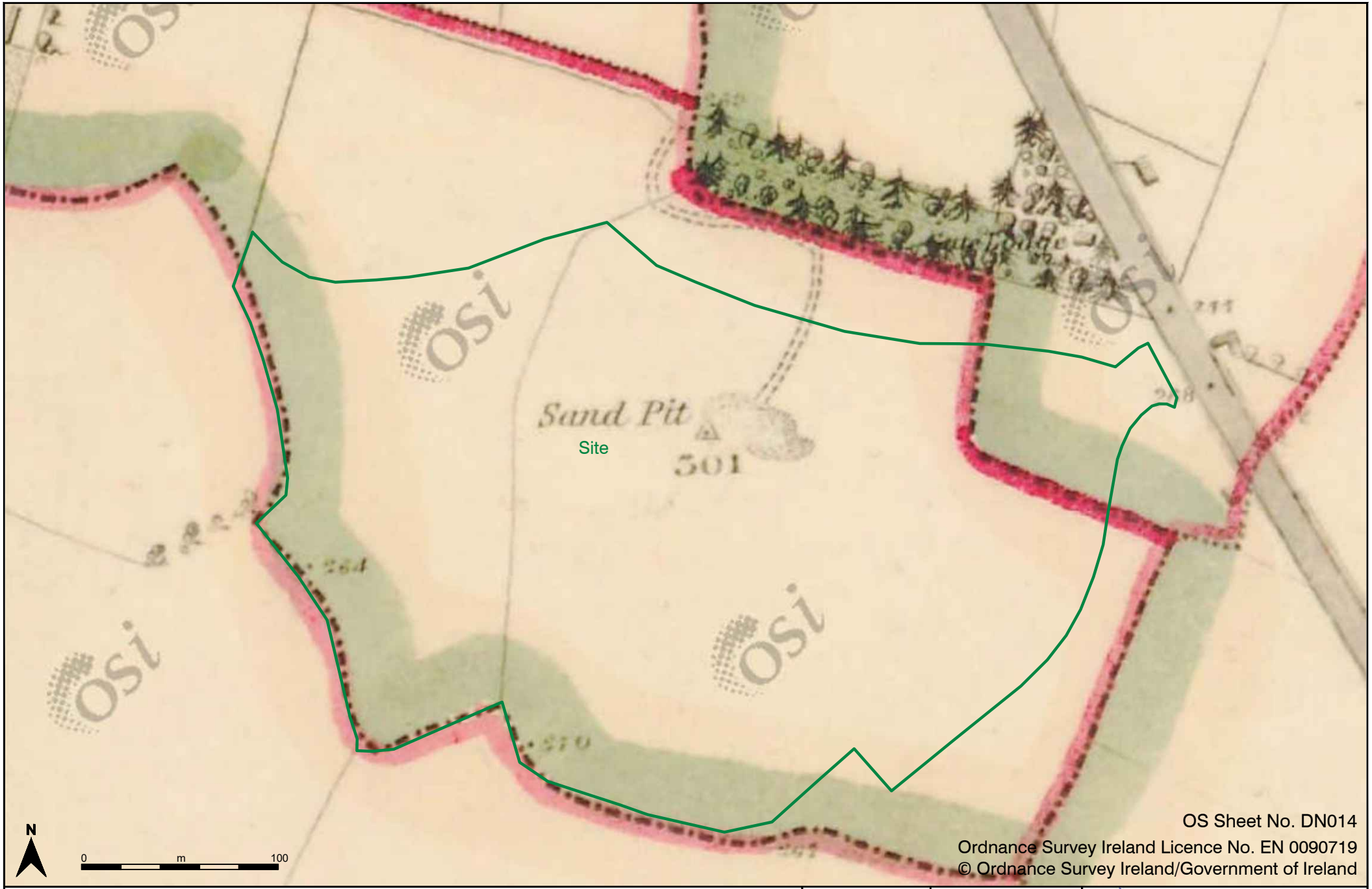
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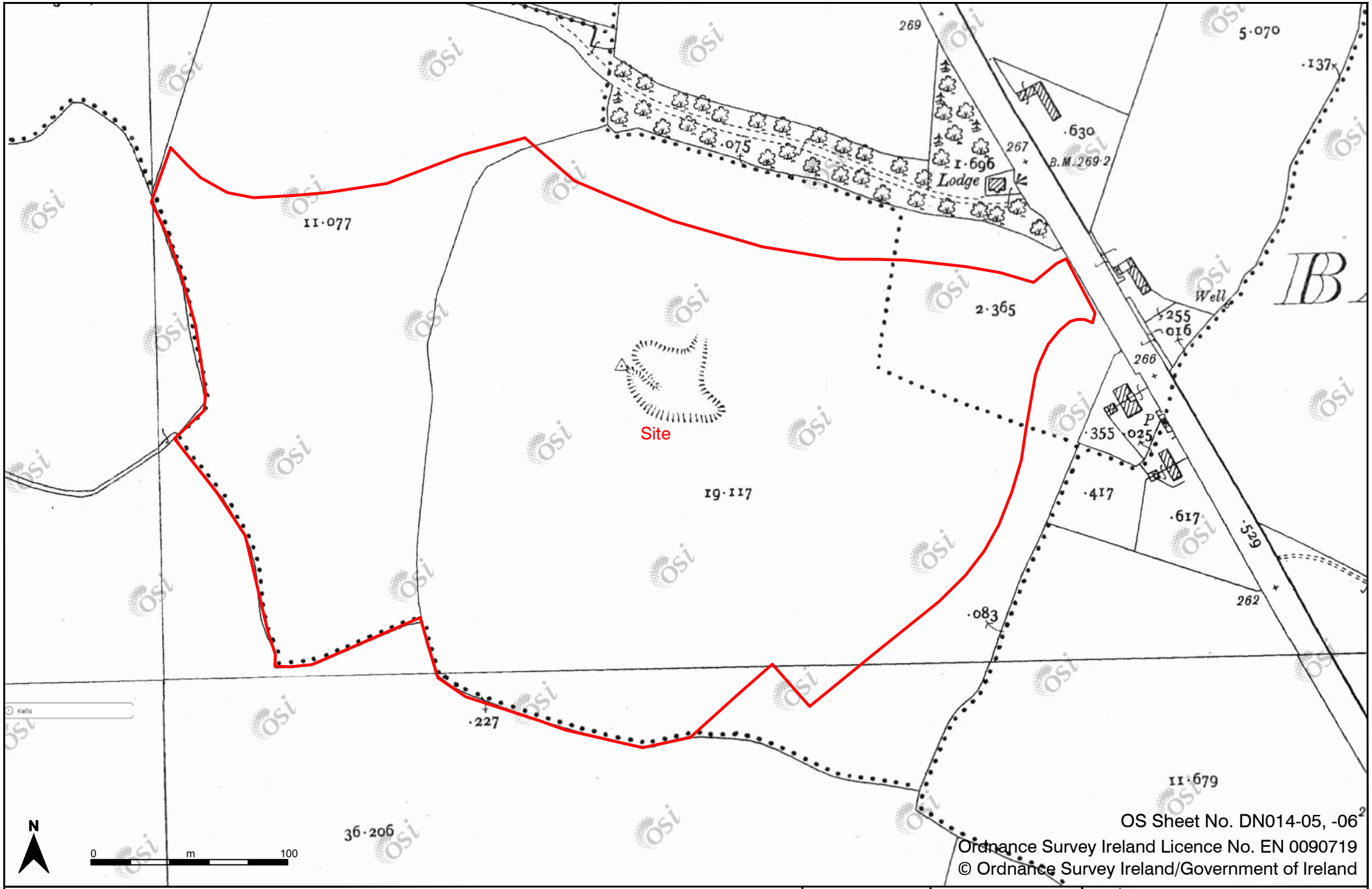
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Project Huntstown, Co. Dublin		**Date** October 2023	**Drawing No.** 2395_1012
Figure 2 Location of site, previous archaeological investigations and nearby *Sites and Monuments Record* sites			**Scale** 1:6,000 @ A4

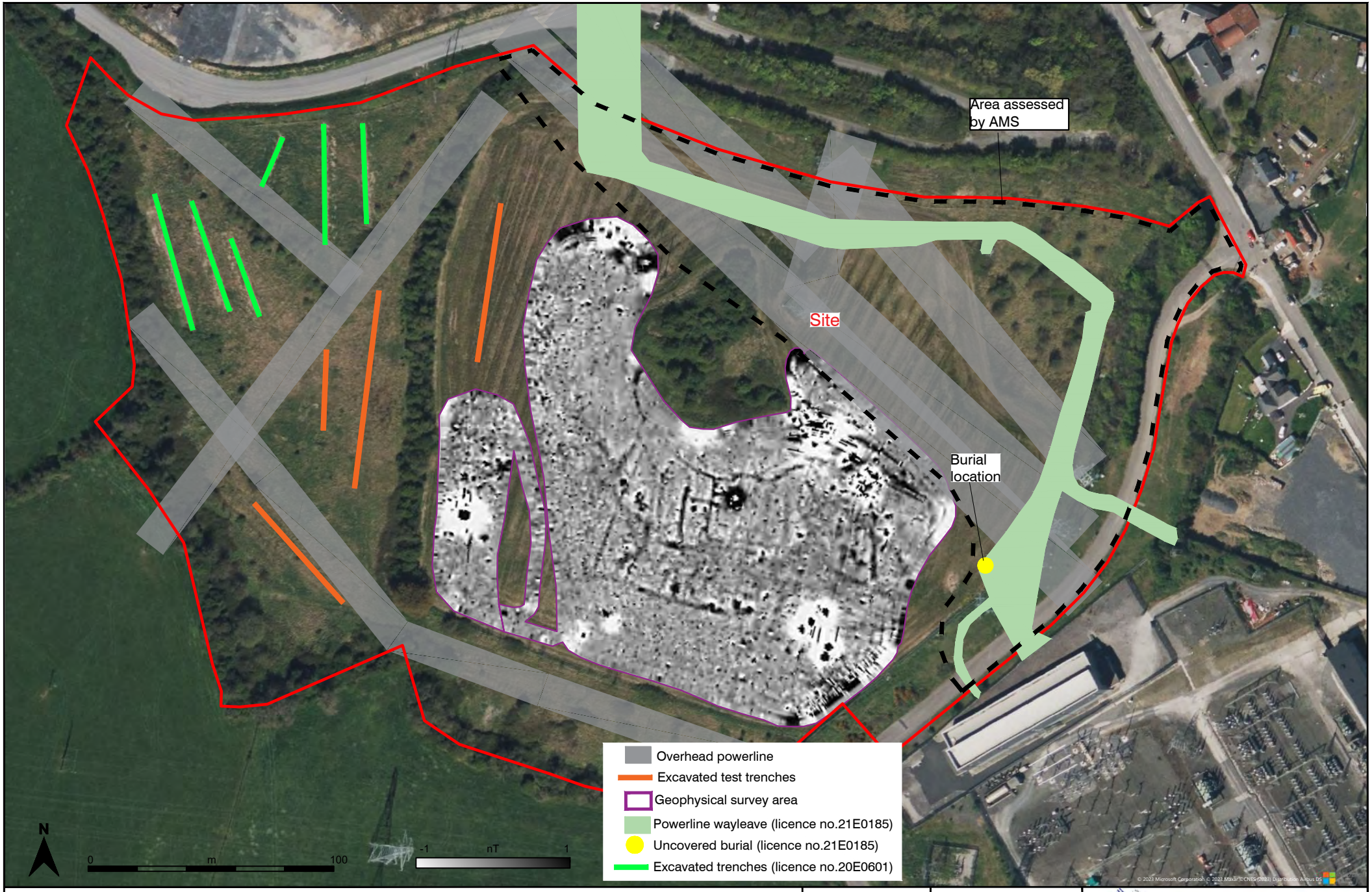
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Project Huntstown, Co. Dublin	**Date** October 2023	**Drawing No.** 2395_C1013	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 3 Extract from 1st edition Ordnance Survey (OS) 6-inch map (surveyed 1836 - published 1843), showing location of site		**Scale** 1:2,500 @ A4	

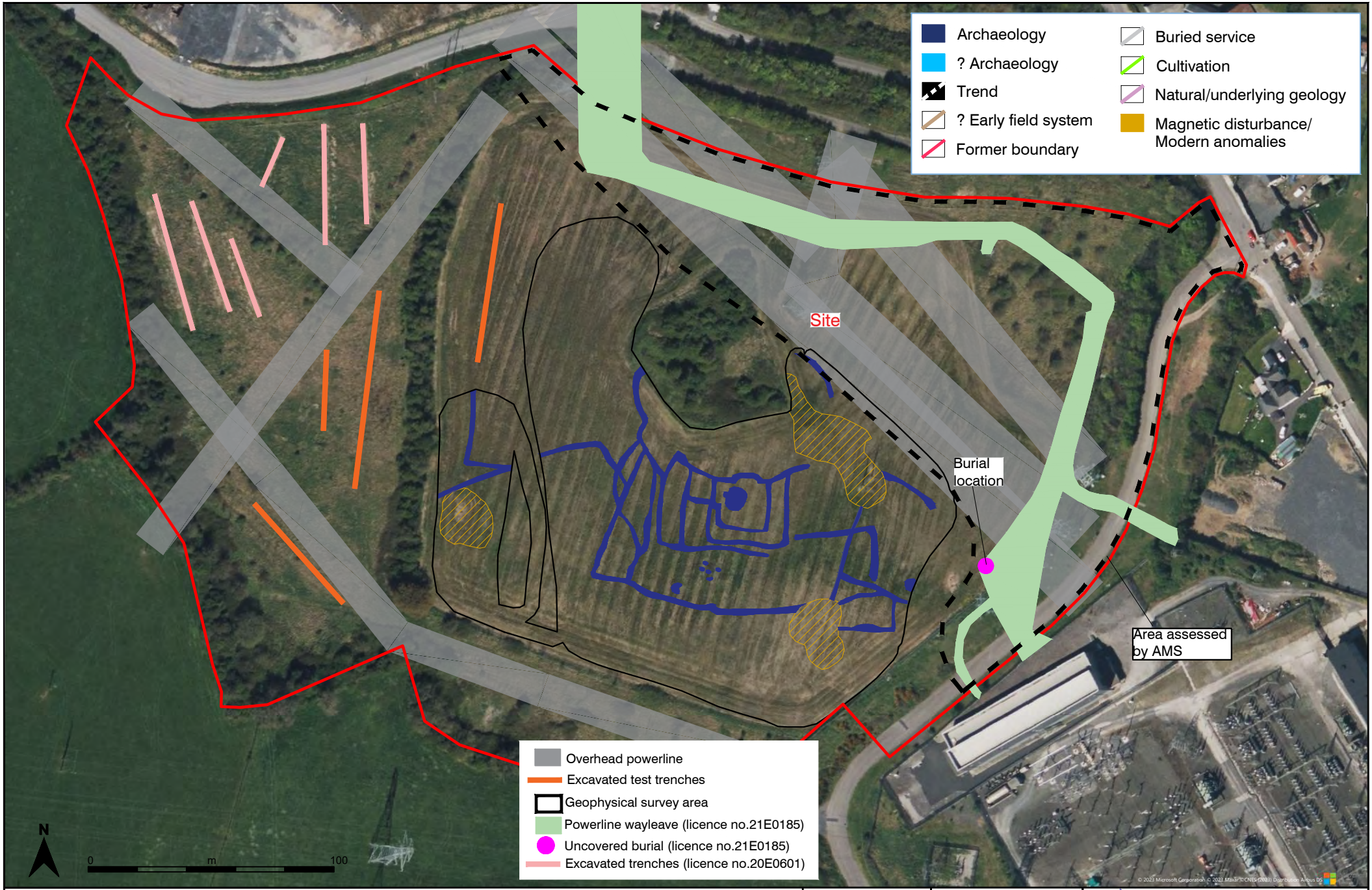


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Figure 4 Extract from 3rd edition Ordnance Survey (OS) 25-inch map (surveyed 1906 - published 1909), showing location of site		**Scale** 1:2,500 @ A4	

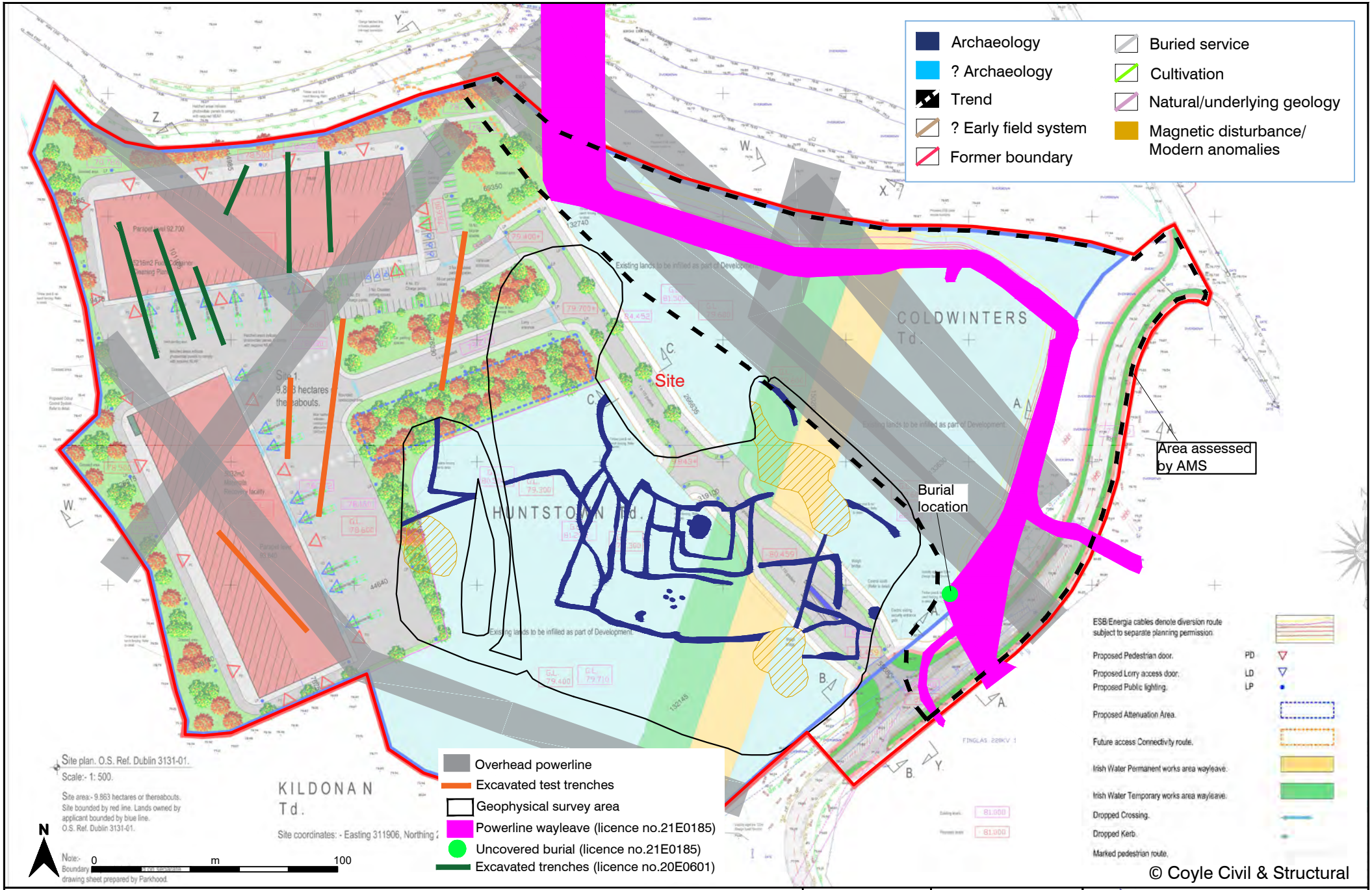


Project Huntstown, Co. Dublin		**Date** October 2023	**Drawing No.** 2395_C1015
Figure 5 Aerial view of site and geophysical survey results (greyscale image), showing extent of wayleave excavated under licence no. 21E0185 and location of uncovered burial			**Scale** 1:2,000 @ A4

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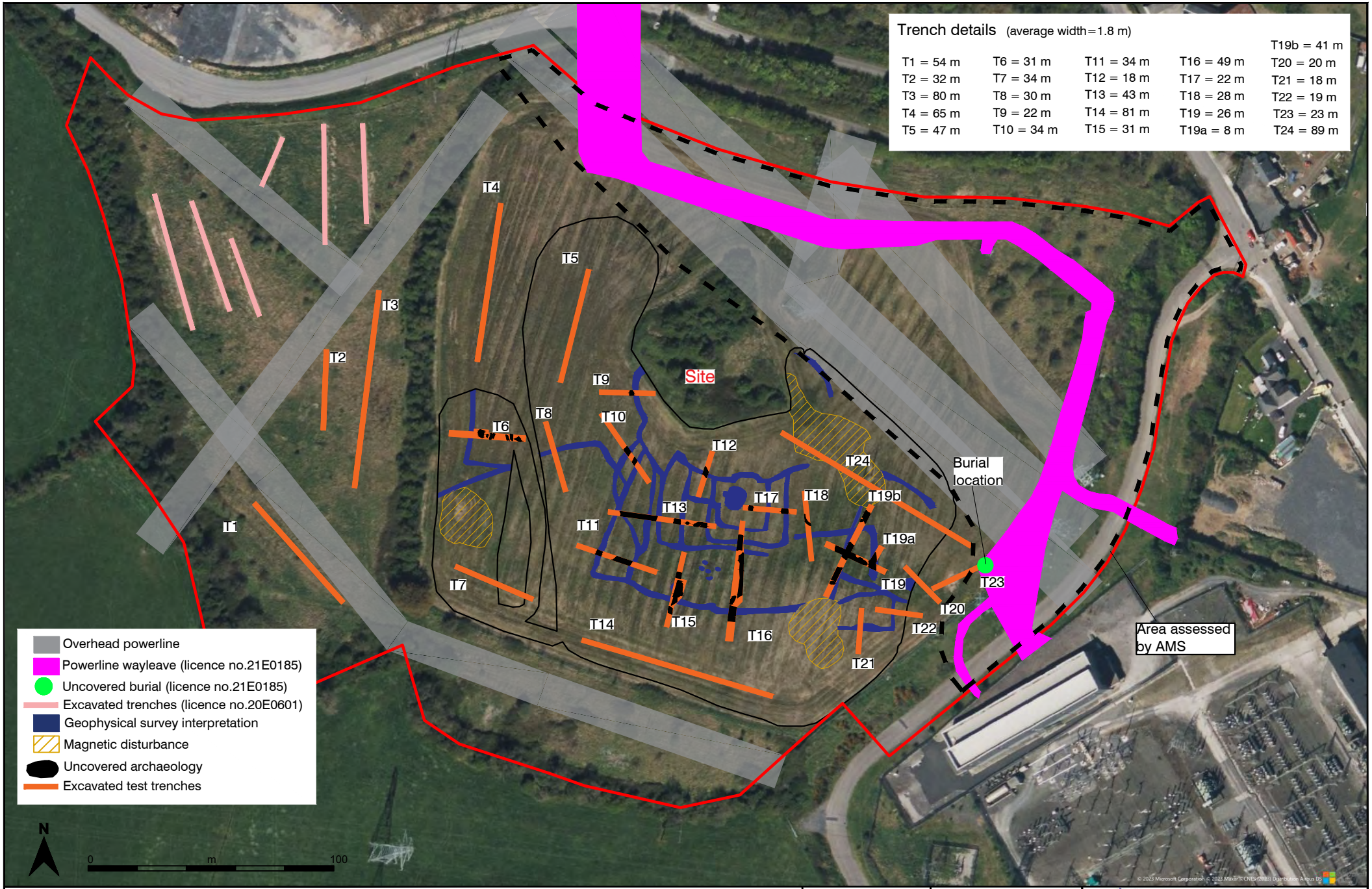


Project Huntstown, Co. Dublin	**Date** October 2023	**Drawing No.** 2395_C1016	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 6 Aerial view of site and geophysical survey interpretation, showing extent of wayleave excavated under licence no. 21E0185 and location of uncovered burial		**Scale** 1:2,000 @ A4	

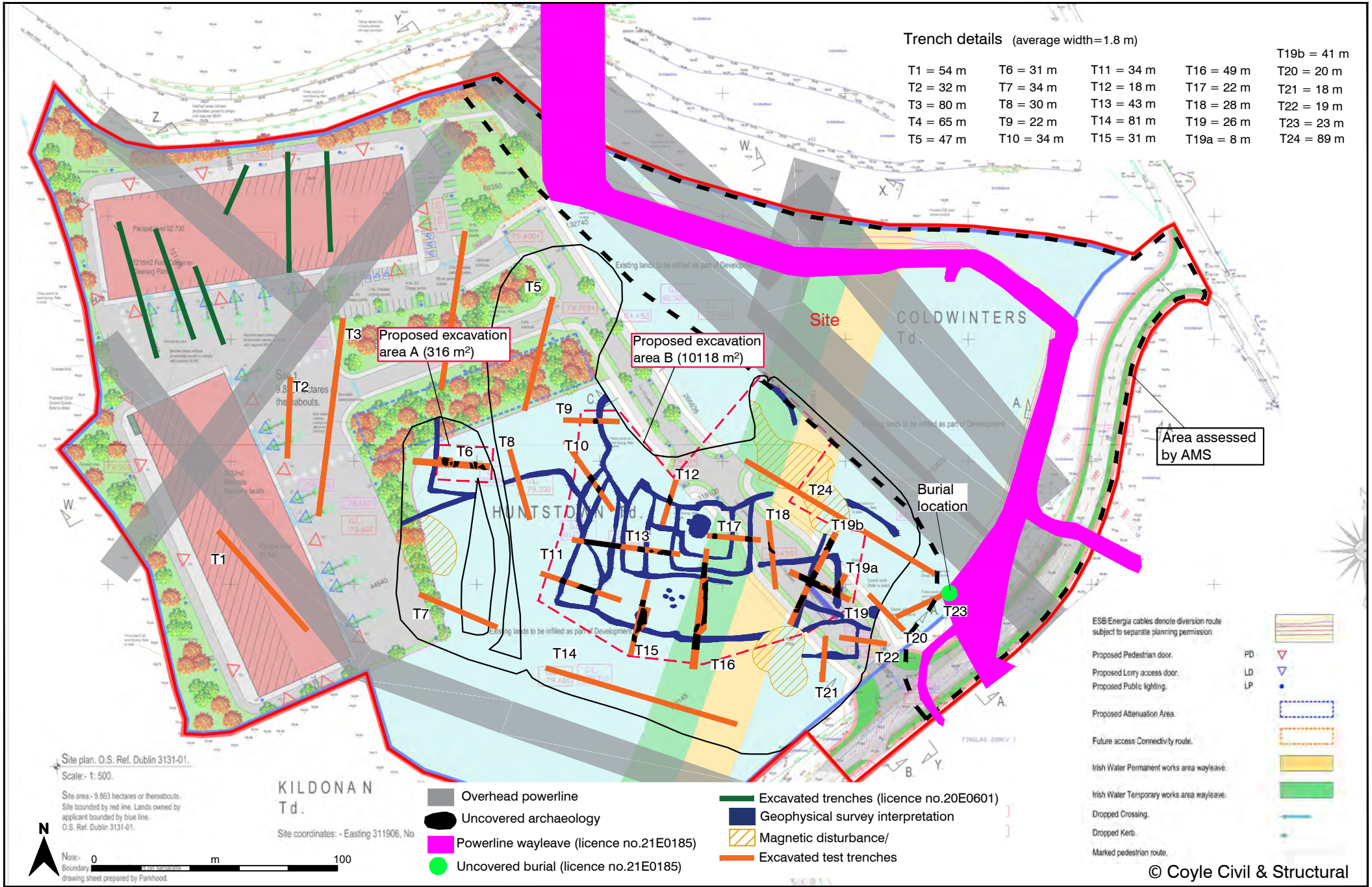


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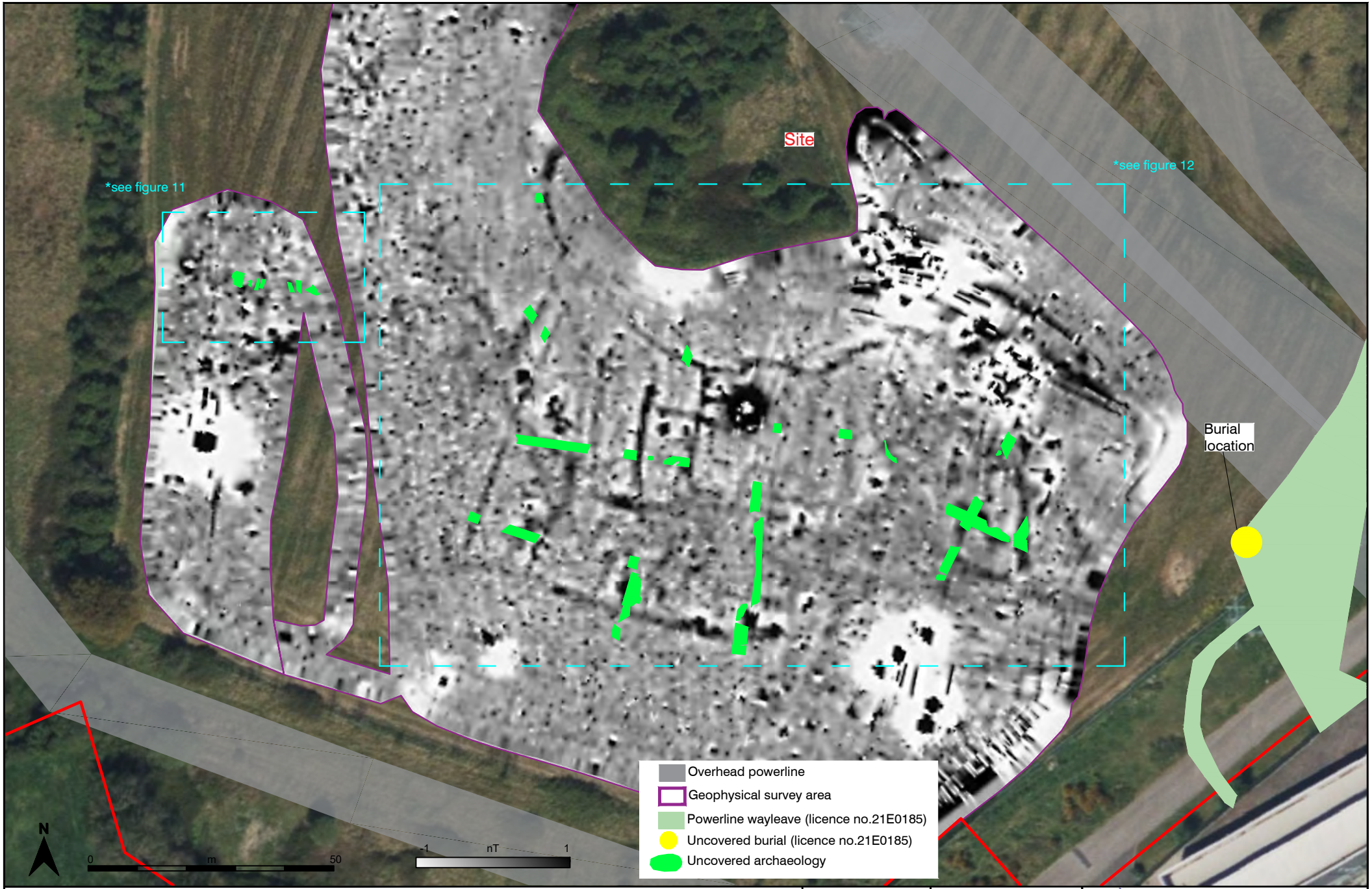
Project Huntstown, Co. Dublin	**Date** October 2023	**Drawing No.** 2395_C1017	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 7 Detail of site development and geophysical survey interpretation, showing extent of wayleave excavated under licence no. 21E0185 and location of uncovered burial		**Scale** 1:2,000 @ A4	



Project Huntstown, Co. Dublin	**Date** October 2023	**Drawing No.** 2395_C1018	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 8 Aerial view of site, showing geophysical survey interpretation, excavated trenches and uncovered archaeology		**Scale** 1:2,000 @ A4	

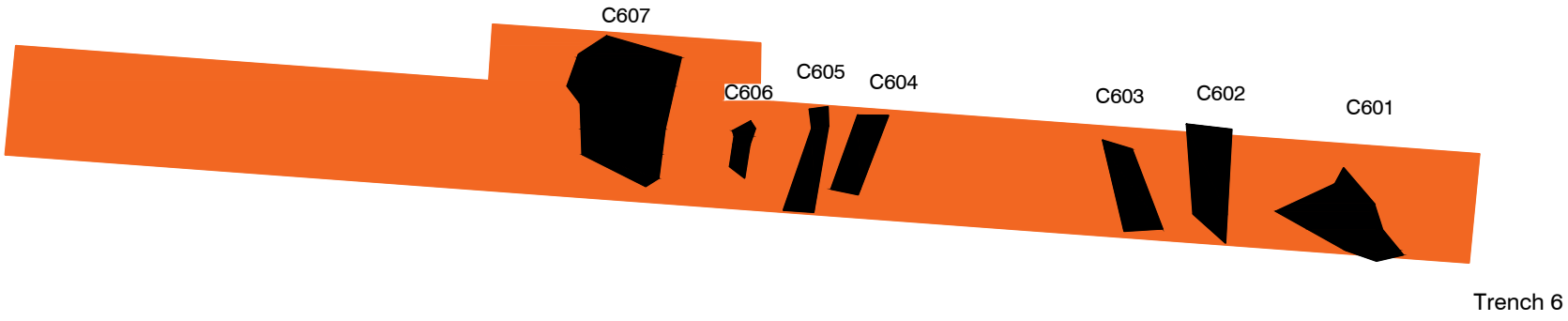


Project Huntstown, Co. Dublin	**Date** October 2023	**Drawing No.** 2395_C1019	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 9 Detail of site development, showing geophysical survey interpretation, excavated trenches, uncovered archaeology and proposed excavation areas		**Scale** 1:2,000 @ A4	



Project Huntstown, Co. Dublin		**Date** October 2023	**Drawing No.** 2395_C1020
Figure 10 Uncovered archaeology overlaying geophysical survey results (greyscale image)			**Scale** 1:1,000 @ A4

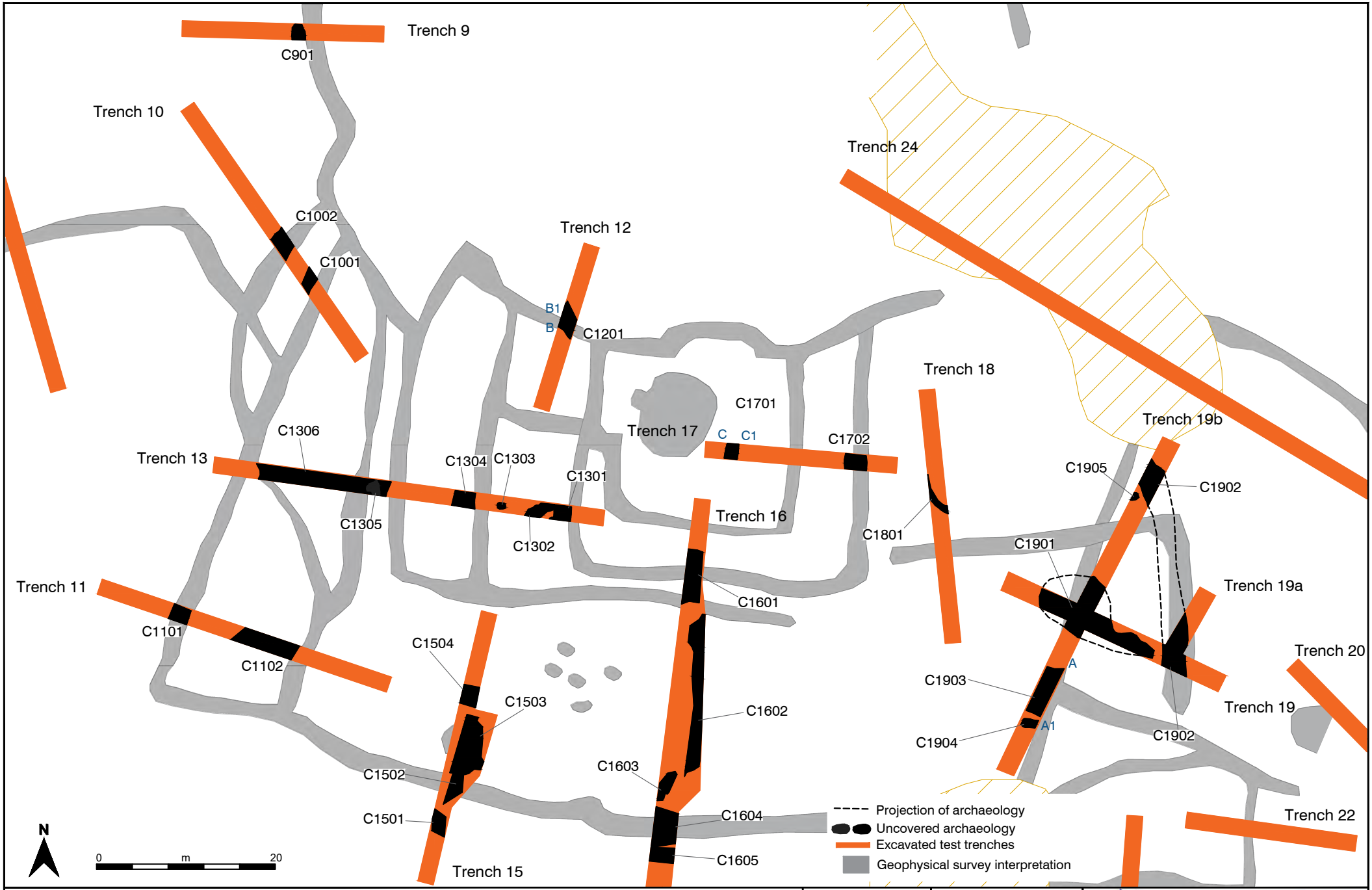
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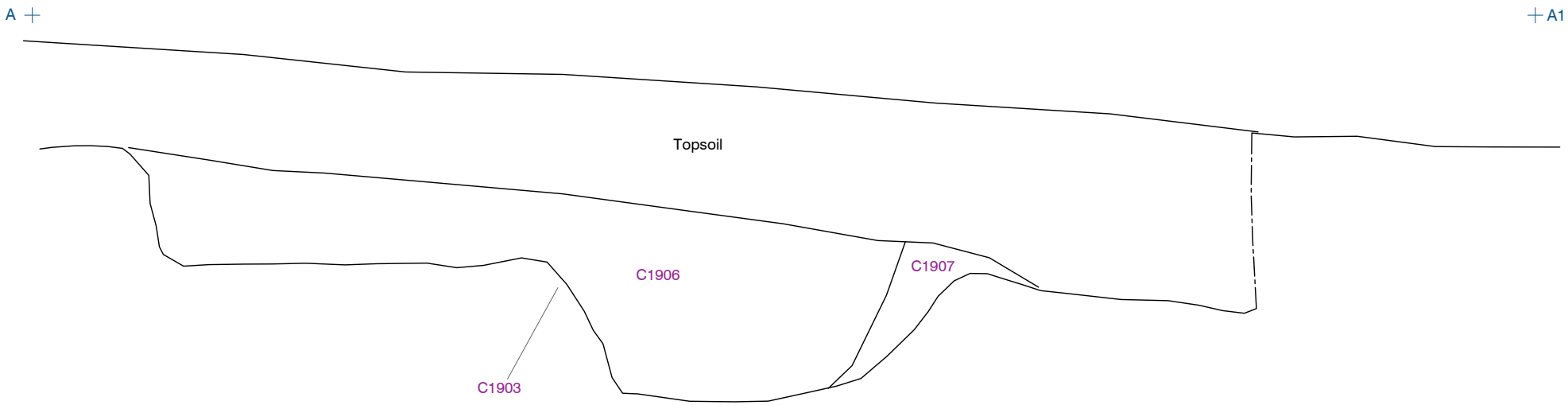
Project Huntstown, Co. Dublin	**Date** October 2023	**Drawing No.** 2395_C1021	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 11 Details of archaeological features uncovered in Trench 6		**Scale** 1:150 @ A4	



Project Huntstown, Co. Dublin		**Date** October 2023	**Drawing No.** 2395_C1022
Figure 12 Details of archaeological features uncovered in Trench 9 to 13 and Trench 15 to 19			**Scale** 1:550 @ A4

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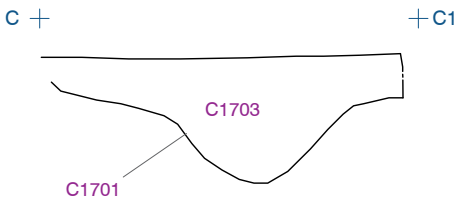
Section of ditch C1903 in trench 19 (northwest-facing)

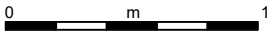


Section of ditch C1201 in trench 12 (southeast-facing)



Section of ditch C1701 in trench 17 (south-facing)





Project Huntstown, Co. Dublin		**Date** October 2023	**Drawing No.** 2395_C1023
Figure 13 Details of excavated sections			**Scale** 1:30 @ A4

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Project Huntstown, Co. Dublin	**Date** October 2023	**Drawing No.** 2395_C1024	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 14 Aerial view of site, showing geophysical survey interpretation, excavated trenches and adjacent site assessed by IAC		**Scale** 1:2,000 @ A4	



Plate 1: Trench 1 with modern land drains facing west



Plate 2: Trench 6 facing east



Plate 3: Change in natural subsoil in Trench 8, facing east.



Plate 4: Trench 9 facing east, with summit of hill in background



Plate 5: Trench 10 facing northwest



Plate 6: Trench 14 with field drain, facing southeast



Plate 7: Trench 16 facing north



Plate 8: Trench 17 facing west



Plate 9: Trench 19 facing southeast



Plate 10: Trench 24 facing northwest



Plate 11: C604 facing east



Plate 12: C901 linear facing north



Plate 13: C1001 linear facing southwest



Plate 14: C1002 linear facing southeast



Plate 15: C1201 linear facing east



Plate 16: C1301 linear facing north



Plate 17: C1601 in Trench 16 facing southwest



Plate 18: C1604 linear in Trench 16 facing northwest



Plate 19: C1701 linear facing south



Plate 20: C1702 linear facing north



Plate 21: C1801 curvilinear facing northwest



Plate 22: C1901 spread facing south



Plate 23: C1902 linear facing north



Plate 24: C1903 linear facing southwest



Plate 25: C1904 pit/linear facing east



Plate 26: C1905 pit facing south



Plate 27: Excavated section through C1903 facing East



Plate 28: Overview of archaeology in Trench 19—C1902 to fore facing NW



Plate 29: C1901 spread facing east in Trench 19



Plate 30: C1503 facing north in Trench 13