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/m^3
Concrete emission factor	413.0	kg CO_2-e/m^3
[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.

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[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

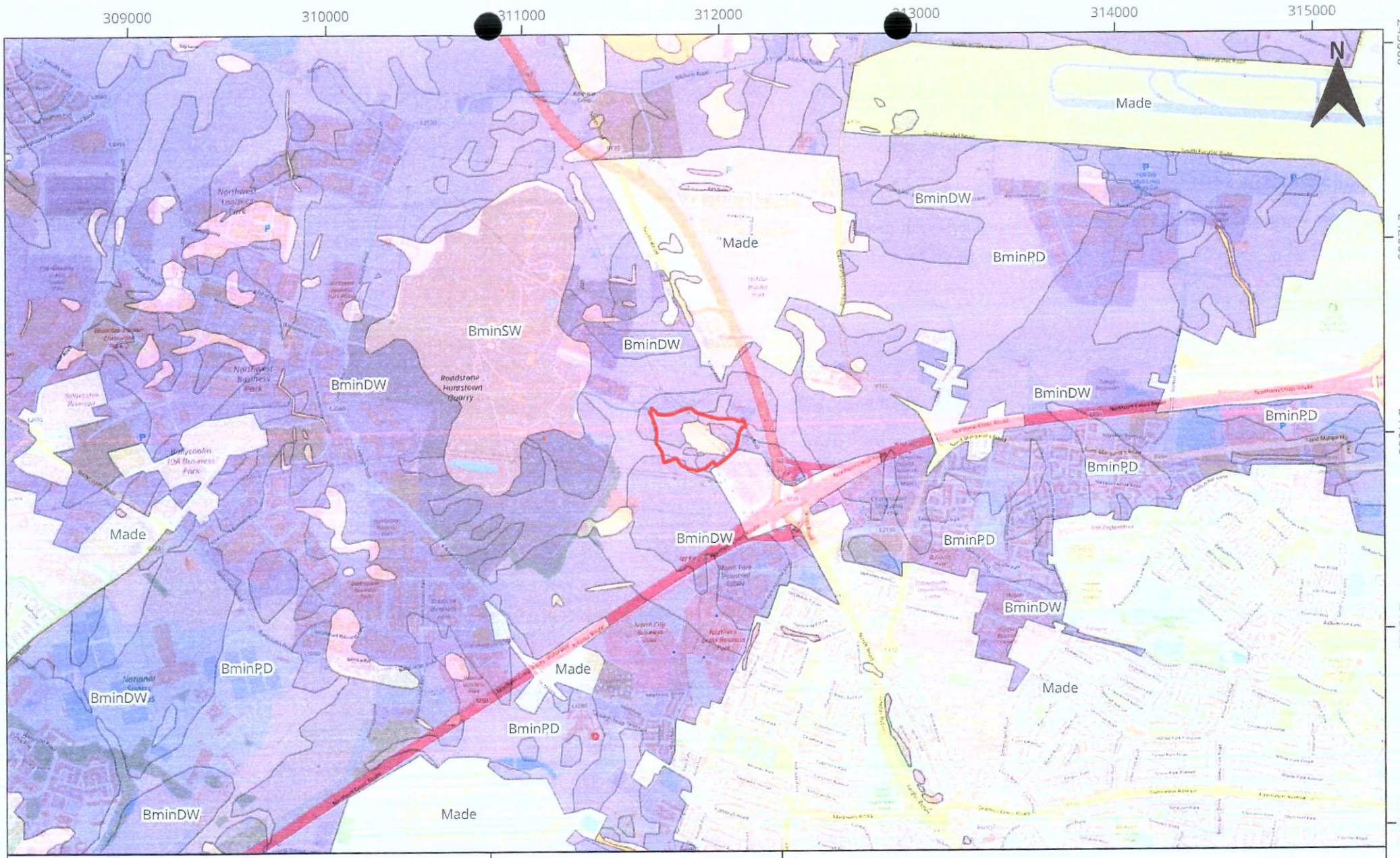
6.5.2.1 Topsoils

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.



O'Callaghan Moran & Associates Environmental Management for Business Unit 15 Melbourne Business Park, Model Farm Road, Cork. Tel. (021) 4345366 email: info@ocallaghanmoran.com	CLIENT Irish Recycling Ltd	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
	TITLE Soils Distribution	FIGURE 6.1

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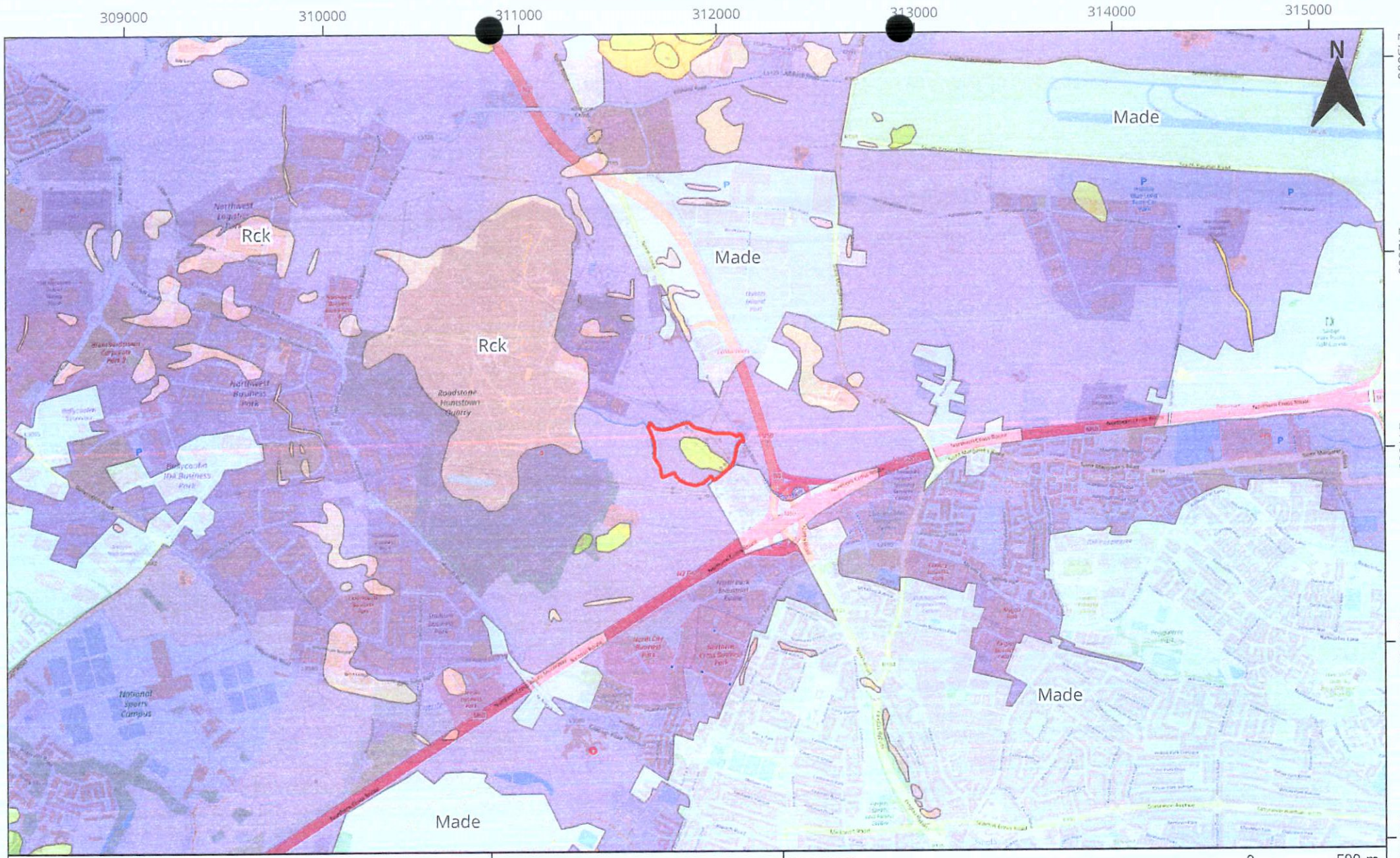

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Environmental Management for Business

CLIENT
Irish Recycling Ltd

TITLE
Subsoils

DETAILS

Site Boundary

Subsoils

GLs - Limestone sands and gravels (Carboniferous)

Rck - Bedrock at surface

TLs - Limestone till (Carboniferous)

A - Alluvium undifferentiated

Made - Made ground

0 500 m

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).

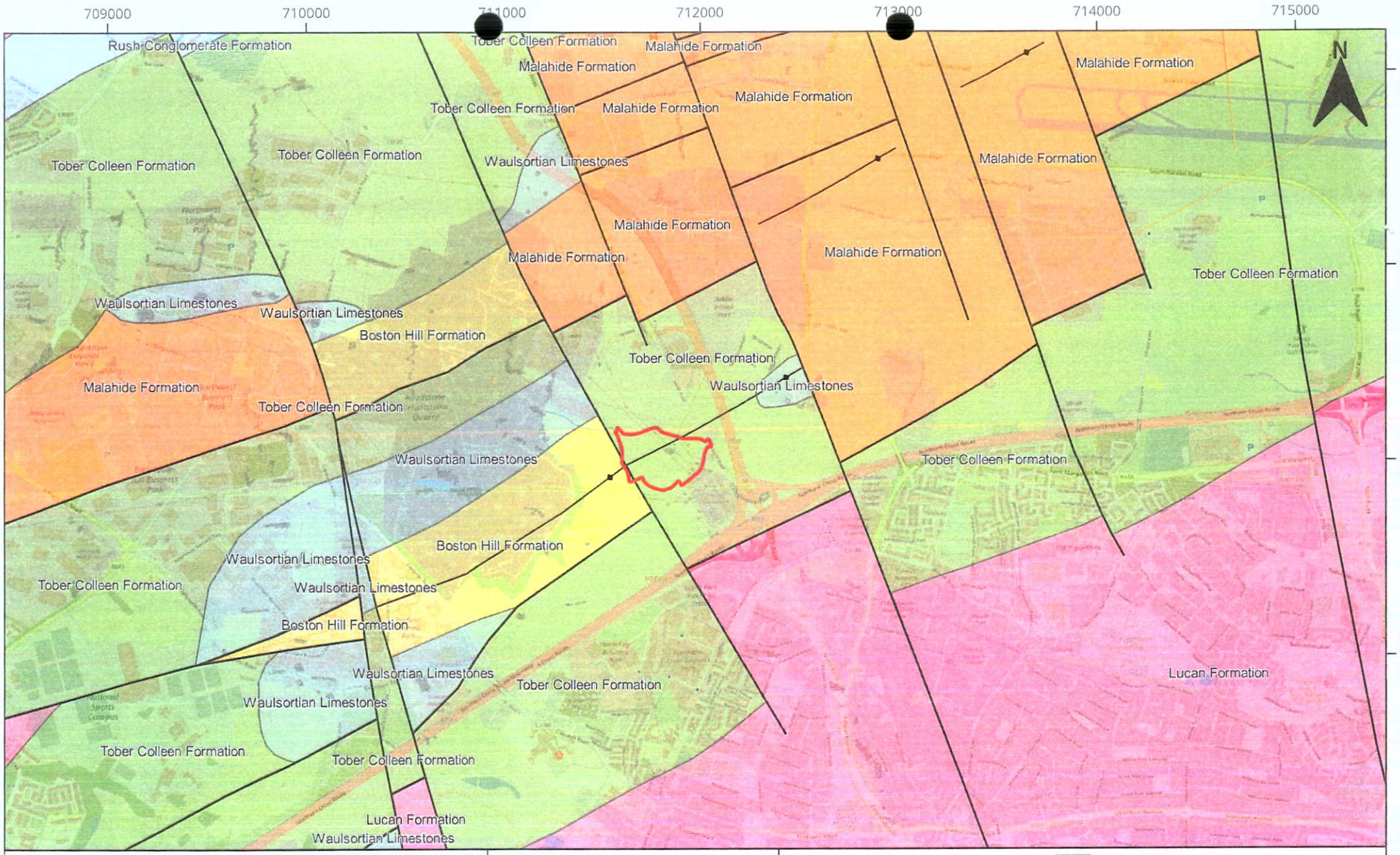
6.5.3 Soil Quality

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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Environmental Management for Business

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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CLIENT: Irish Recycling Ltd

TITLE: Site Investigation Locations

DETAILS

0 20 m

Site Boundary

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

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

FIGURE 6.4

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 proposed development will contribute to the cumulative land take in the area zoned for Heavy Industry.

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;

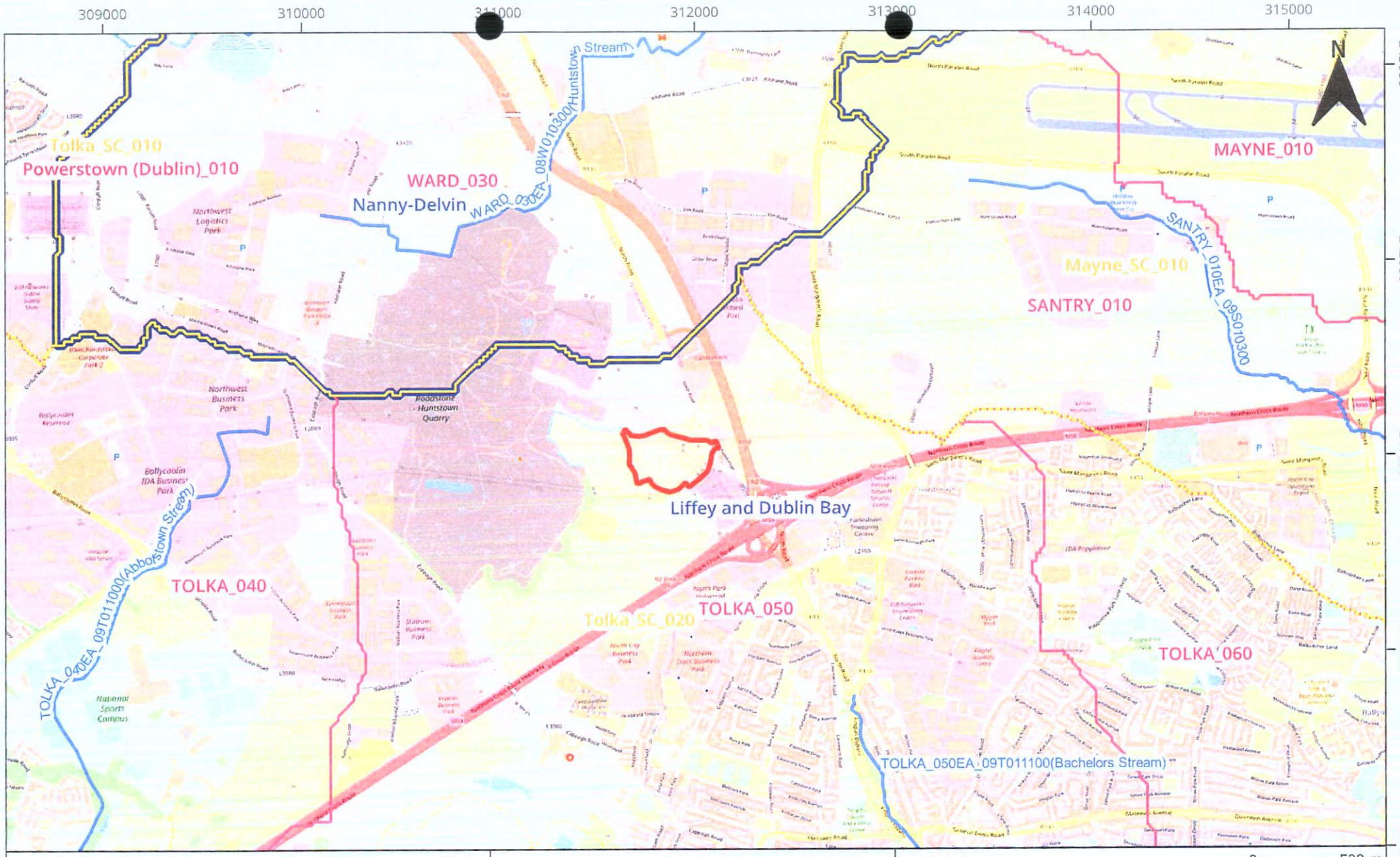
- Excavation works for building foundations, roads sub-base and underground services measures;
- Construction of the buildings, paved yards and installation of drainage systems, and
- Operational stage impacts.

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

- 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

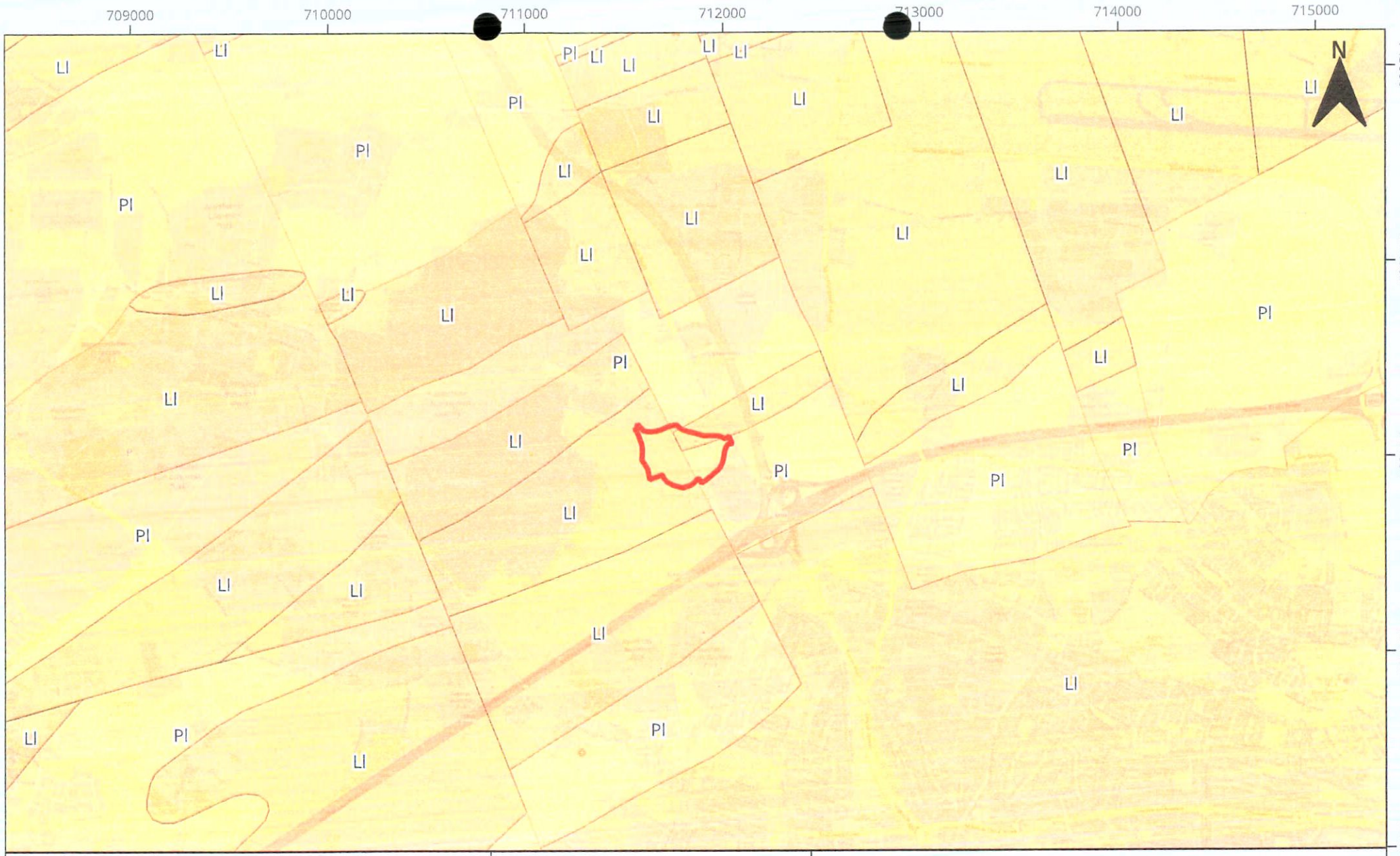
The subsoils, while water bearing are not classified as an aquifer. Groundwater was not encountered during the drilling of the boreholes and the excavation of the trial pits completed by Hanmar in September 2022. Groundwater standpipes were installed in the two boreholes (BH02 and BH-03) as shown on 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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Environmental Management for Business

CLIENT
Irish Recycling Ltd

TITLE
Aquifer Classification

DETAILS

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.

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.

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CLIENT: Irish Recycling Ltd

TITLE: Aquifer Vulnerability

DETAILS

- Site Boundary
- Vulnerability
  - X - Bedrock near Surface
  - E - Extreme
  - H - High
  - L - Low
  - M - Moderate
  - Water

FIGURE 7.3

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**

The proposed development will not contribute to any cumulative impacts on surface water. 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.

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

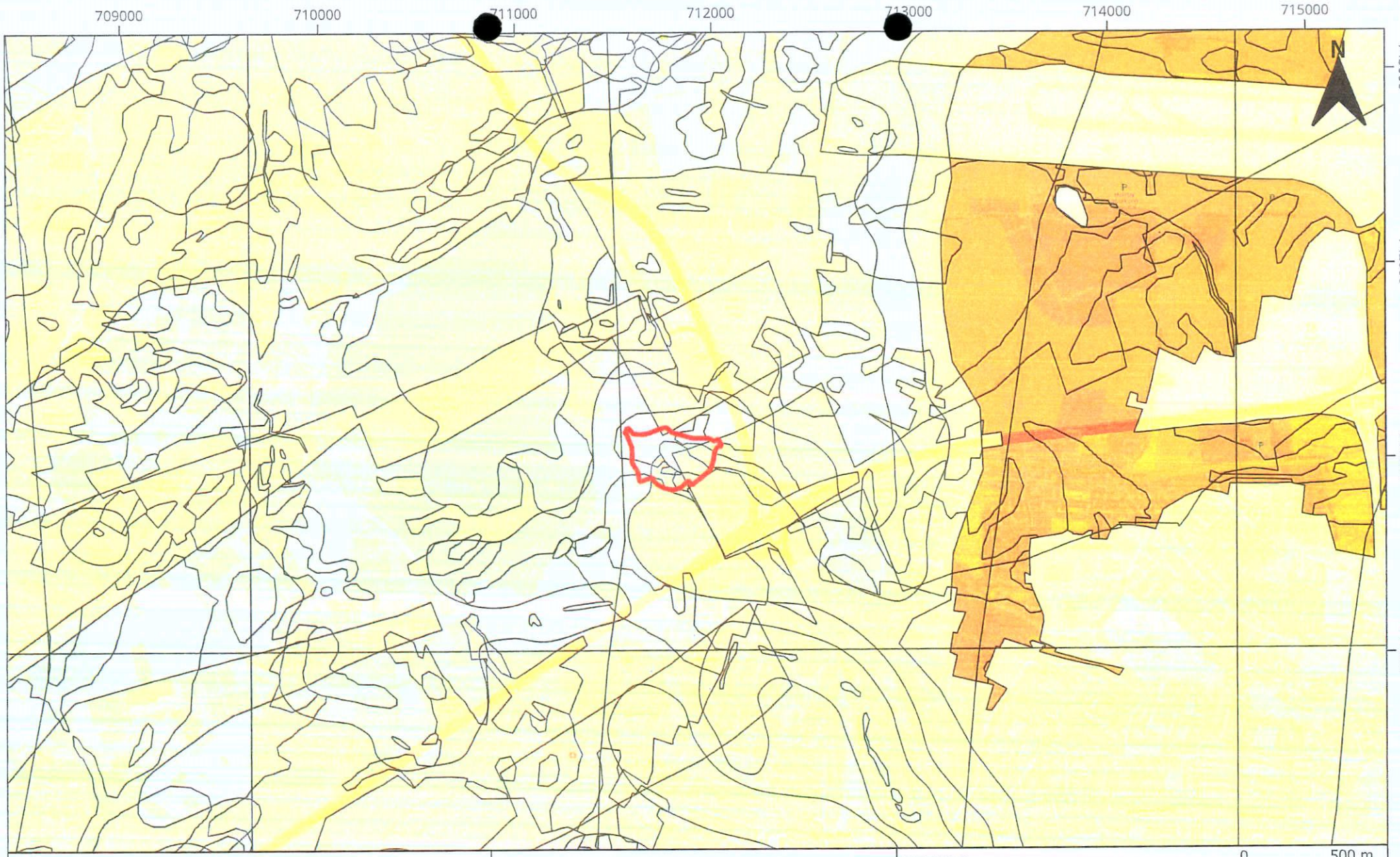
There will be no emissions to on or off-site water features water and therefore no impacts on surface water. The rainwater harvesting will reduce the recharge rate and affect the bedrock aquifer's

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



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Environmental Management for Business

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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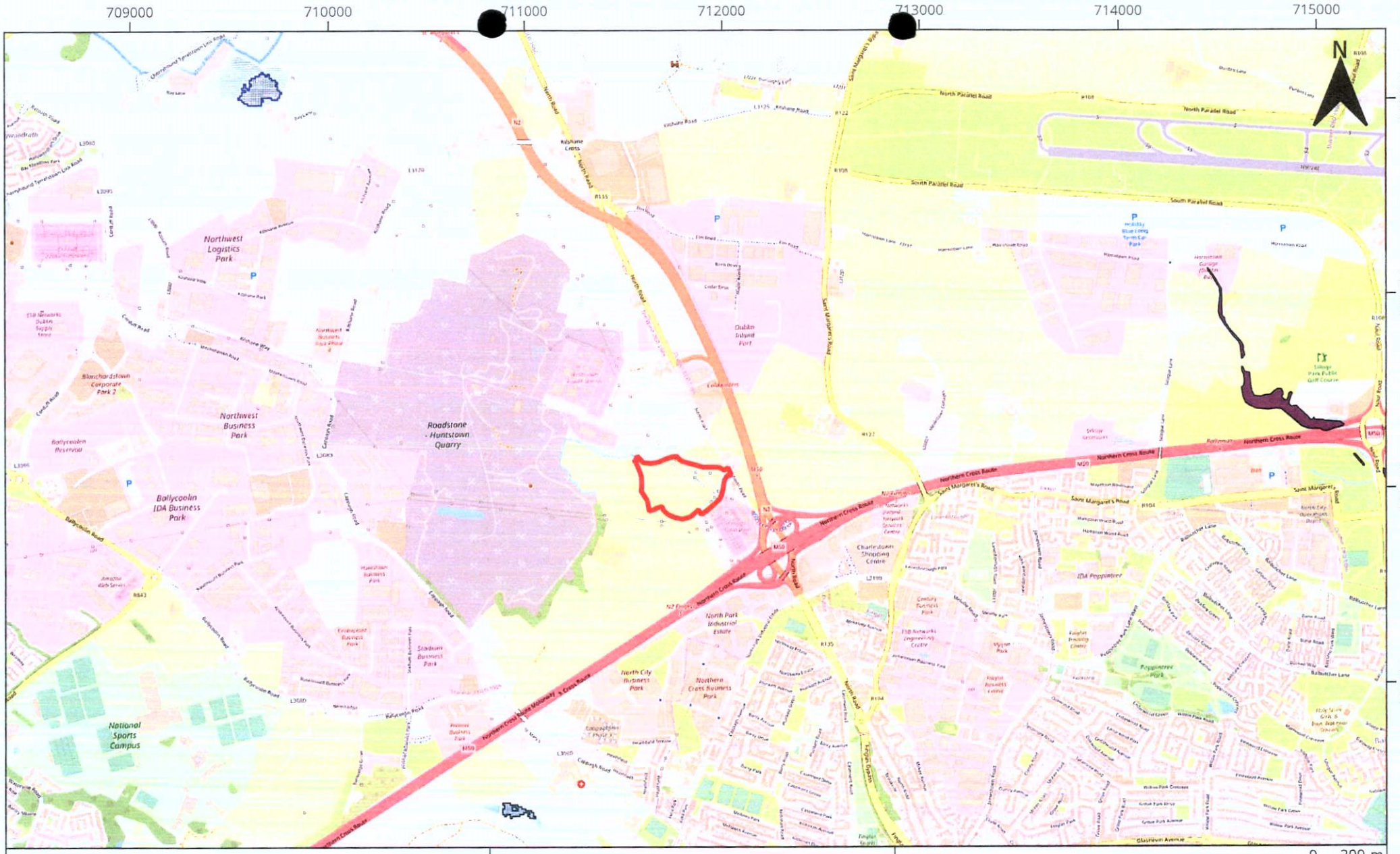

Environmental Management for Business

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email: info@ocallaghanmoran.com

CLIENT

Irish Recycling Ltd

TITLE

Flood Risk

DETAILS

- Site Boundary
- Rivers
- GSI Surface Water Flood Map 2015-2016
- GSI Historic Groundwater Flood Map
- CFRAM River Flood Extents Medium Probability

0 200 m

FIGURE 7.5

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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 on 1st March 2021 and updated in August 2022. The trees were described and recorded as either individual trees or groups. All were marked on a site drawing, but as they were not subsequently plotted on a topographic survey their positions should be regarded as approximate. 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.

South Dublin Bay and River Tolka Estuary SPA

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.

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FIGURE 8.1

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