APPENDICES TO CHAPTER 9

Enviroguide
a DNV company

Climate Change Impact Assessment Report

PRESENTED TO

John Connaughton Limited
Station Road and Pace Line, Dunboyne, Co. Meath

DATE
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DOCUMENT CONTROL SHEET

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1 INTRODUCTION AND METHODOLOGY

Enviroguide Consulting has been commissioned to produce a Climate Change Impact Assessment Report (CCIA) on behalf of John Connaughton Limited for a Proposed Large-Scale Residential Development on sites of c. 21.9ha in total and 15.79ha net developable area respectively, on lands at Station Road and Pace Line, Dunboyne, Co. Meath (hereafter referred to as the Proposed Development). A full project description is in included in Section 1.1 of this report.

The contents of this Report provide duty to the requirements of Meath County Council (MCC) for a Climate Change Impact Assessment. It has been undertaken in accordance with Regulation (EU) 2020/852 of the European Parliament and of the Council (the 'Taxonomy Regulation') and 'Technical Annex B: Climate Change Risk Assessment' of the 'Local Authorities Climate Action Planning Guidelines' and provides a qualitative CCRA. A qualitative CCRA supports the identification and prioritisation of potential future climate risks for more detailed analysis and provides a broad understanding of where adaptation actions could be required.

This report can be utilised by the organisation to prepare for meeting EU sustainability reporting requirements under the Corporate Sustainability Reporting Directive (CSRD) and proposed Corporate Sustainability Due Diligence Directive (CSDD). Specifically, Standard ESRS E1-Climate change within the CSRD and environmental due diligence within the incoming CSDDD. Companies that fall under the scope of the Corporate Sustainability Reporting Directive (CSRD) also have to report in their annual reports to what extent their activities are covered by the EU Taxonomy (Taxonomy-eligibility) and comply with the criteria set in the Taxonomy delegated acts (Taxonomy-alignment).

Additionally, this Report provides information to support the relevant public body in carrying out its functions in a manner consistent with national climate plans and strategies and furthering the achievement of the national climate objective as set out under Section 15 of the Climate Action and Low Carbon Development Act 2015, as amended in 2021. Under the Act each local authority is required to prepare a local authority climate action plan for its administrative area. The plans are consistent with the most recent climate action plan and national adaptation framework. The plans are to address, and integrate, mitigation of greenhouse gases, climate change adaptation and strengthened alignment with national climate policy, delivering effective local climate action. The current CCIA report should be reviewed alongside the relevant and current Local Authority Climate Action plan to ensure alignment with relevant objectives and targets.

In accordance with MCC planning requirements, the Report will assess the impact of climate change on the Proposed Development and ensure that the policies and objectives produced and implemented by the local authority in relation to climate change and climate change protection measures, particularly in relation to drainage design, as set out within the Meath County Development Plan 2021-2027 (MCDP), have been incorporated into the Proposed Development design. The relevant policies and objectives of the MCDP have also been carefully considered in the context of associated UN Sustainable Development Goals (SDGs), and their incorporation into the Proposed Development design.

The physical climate risks which may affect the performance of the Proposed Development during its expected lifetime have been identified through a climate risk screening. Climate projections

across the existing range of future scenarios have been examined, along with the Proposed Development location, to gain an understanding of the future risks that climate change may have on the Proposed Development. The vulnerability of the Proposed Development to these risks has been subsequently assessed taking account of relevant adaptation and mitigation measures which have been incorporated into the Development design.

1.1 Project Description

The Proposed Development consists of the construction of a Large-Scale Residential Development on sites of approx 21.9 ha in total and 15.74 ha net developable area respectively, at Lands at Station Road and Pace Line, Dunboyne, Co. Meath in the townlands of Dunboyne, Clonee, Castle Farm and Loughsallagh.

The principal application site is generally bounded by Station Road (L2228) to the south, Dunboyne Train Station and the Iarnród Éireann rail line to the West, a cluster of detached houses to the southeast, greenfield lands to north and east. The application includes also 2 no. roundabouts on the R147 (Old Navan Road).

Permission is sought for a 10-year planning permission for a Large-Scale Residential Development, which in summary, will consist of the following:

a) Construction of 853 no. residential units as follows:

> 1) 398 no. Apartment Units in 3 no. 2-6 storey blocks (A-C) consisting of 121 no. 1-bedroom apartments; 258 no. 2-bedroom apartments; and 19 no. 3-bedroom apartments. All apartment units will be provided with private open space areas in the form of balconies/terraces.
>
> 2) 112 no. Duplex Units in 6 no. 2-4 storey blocks (D-H & J) and partially in 2-6 storey blocks (A-C) consisting of 60 no. 2-bedroom units, 52 no. 3-bedroom units. All duplex units will be provided with private open space areas in the form of balconies/terraces.
>
> 3) 343 no. 1-3 storey houses consisting of 4 no. 2-bedroom units, 308 no. 3-bedroom units, 31 no. 4-bedroom units. Each house will have an associated rear private garden.

b) Residential amenity spaces in Block A (approx. 212 sqm), Block B (approx. 284 sqm) and Block C (approx. 81 sqm);

c) The proposed development also includes a proposed café (approx. 196sqm) with associated outdoor seating area, medical unit 1 (197 sqm), retail unit 2 (approx. 217 sqm), retail unit 3 (approx. 170 sqm), community room (approx. 52 sqm), 2 no. creche facilities (approx. 394 sq m and approx. 400 sqm);

d) Provision of 1192 no. car parking spaces across the development site (inclusive of accessible parking spaces (27 no.) and 1,634 no. bicycle parking spaces for residents and visitors of the scheme provided throughout the development site.

e) 13 no. landscaped public open space amenity areas (approx. 23,925 sqm total);

f) 7 no. communal open spaces associated with the proposed apartments and duplexes will be provided in the form of landscaped areas located in the vicinity of these units (approx. 6,029 sqm total);

g) Section of the Dunboyne Eastern Distributor Road (approx. 865 m long) from the southern site boundary with Station Road (L2228) to the northern boundary of the site. This includes all associated vehicular and pedestrian accesses, carriageways, paths and junctions;

h) New vehicular, pedestrian and cycle connections to Dunboyne Train Station and closure of the existing vehicular access from Station Road (L2228);

i) Upgrade of Station Road (L2228) – proposed Distributor Road junction;

j) Alterations to 2no. roundabouts on the R147 (Old Navan Road):

a. Roundabout at the junction of Station Road (L2228) and Old Navan Road (R147)

b. Roundabout at the entrance to Clonee Village on the R147, at the Ard Cluain apartment scheme and Dunboyne Tennis Club

k) All associated site development works, services provision, infrastructural and drainage works, internal access roads, homezones and cycle and pedestrian infrastructure, provision of ESB substations, bin stores, public lighting, landscaping, and boundary treatment works.

l) Temporary areas allowing for construction: 5m buffer zone along the Distributor Road, compound and spoil storage area

Previous applications have been made or permitted on lands within the red line boundary of the subject proposal: Reg. ref. 24/60063, Reg. ref. 23849, ABP NA29S.314232 DART+ West, Reg. ref. 212395 (ABP 304842), Reg. ref. RA180561 refers. The subject application does not materially amend any of these existing, permitted, or proposed development with only minor works proposed to same.

This planning application is accompanied by an Environmental Impact Assessment Report.

1.2 Legislative and Strategic Context

1.2.1 The EU Taxonomy Framework

Regulation (EU) 2020/852 of the European Parliament and of the Council (the 'Taxonomy Regulation') establishes the criteria for determining whether an economic activity qualifies as environmentally sustainable for the purposes of establishing the degree to which an investment is environmentally sustainable. Commission Delegated Regulation (EU) 2021/2139[1] (the 'Supplementing Regulation') establishes the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives.

The technical screening criteria as outlined within the Supplementing Regulation have been adopted for the purpose of this assessment.

The Supplementing Regulation establishes the technical screening criteria specific to certain economic activities. The Proposed Development, located at Station Road and Pace Line, Dunboyne, Co. Meath consists of the construction of a Large-Scale Residential Development. Therefore, in accordance with Annex II, Section 7.1, of the Supplementing Regulation, the relevant technical screening criteria for the Proposed Development are set out under the "Construction of new buildings".

Annex II Section 7.1 of the Supplementing Regulation sets out the relevant technical screening criteria for the project to make a *'Substantial Contribution to Climate Change Adaptation'.* These technical screening criteria have been adopted in the current assessment to conduct a climate risk and vulnerability assessment and determine the adaptive capacity of the Proposed Development. [2]

Table 1-1 overleaf details the criteria for *"Substantial Contribution to Climate Change Adaptation"* and the associated sections of this Report in which these criteria have been addressed.

[1] Commission Delegated Regulation (EU) of 4.6.2021 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives.

[2] These criteria have been adopted for assessment purposes only and do not suggest that the Proposed Development qualifies as an 'environmentally sustainable' economic activity under the Taxonomy Regulation.

Table 1-1: Substantial Contribution to Climate Change Adaptation Screening Criteria

Substantial Contribution to Climate Change Adaptation Screening Criteria[3]	Relevant Section of this Report
The economic activity has implemented physical and non-physical solutions ('**adaptation solutions'**) that substantially reduce the most important physical climate risks that are material to that activity.	See Section 4 of this report for Climate Risk and Vulnerability Assessment.
The physical climate risks that are material to the activity have been identified from those listed in Appendix A to this Annex by performing a robust **climate risk and vulnerability assessment** with the following steps: a) screening of the activity to identify which physical climate risks from the list in Appendix A to this Annex may affect the performance of the economic activity during its expected lifetime; b) where the activity is assessed to be at risk from one or more of the physical climate risks listed in Appendix A to this Annex, a climate risk and vulnerability assessment to assess the materiality of the physical climate risks on the economic activity; c) an assessment of adaptation solutions that can reduce the identified physical climate risk. The climate risk and vulnerability assessment is proportionate to the scale of the activity and its expected lifespan, such that: a) for activities with an expected lifespan of less than 10 years, the assessment is performed, at least by using climate projections at the smallest appropriate scale; b) for all other activities, the assessment is performed using the highest available resolution, state-of-the-art climate projections across the existing range of future scenarios consistent with the expected lifetime of the activity, including, at least, 10 to 30 year climate projections scenarios for major investments.	See Section 2 of this report for Climate Change Projections. See Section 3 of this Report for Climate Risk Screening. See Section 4 of this report for Climate Risk and Vulnerability Assessment.
The **climate projections** and assessment of impacts are based on best practice and available guidance and take into account the state-of-the-art science for vulnerability and risk analysis and related methodologies in line with the most recent Intergovernmental Panel on Climate Change (IPCC) reports, scientific peer-reviewed publications and open source or paying models.	See Section 2 of this report for Climate Change Projections.

[3] as set out in Annex II, Section 7.1 of the Supplementing Regulation.

Substantial Contribution to Climate Change Adaptation Screening Criteria[3]	Relevant Section of this Report
The **adaptation solutions** implemented: a) do not adversely affect the adaptation efforts or the level of resilience to physical climate risks of other people, of nature, of cultural heritage, of assets and of other economic activities; b) favour nature-based solutions or rely on blue or green infrastructure to the extent possible; c) are consistent with local, sectoral, regional or national adaptation plans and strategies; d) are monitored and measured against pre-defined indicators and remedial action is considered where those indicators are not met; e) where the solution implemented is physical and consists in an activity for which technical screening criteria have been specified in this Annex, the solution complies with the do no significant harm technical screening criteria for that activity.	See Section 4 of this report for Climate Risk and Vulnerability Assessment. See Section 5 of this report for Meath County Development Plan 2021-2027: Relevant Policies and Objectives This report **does not** demonstrate compliance with the relevant criteria for Do No Significant Harm as they relate to the remaining five environmental objectives; and therefore, **does not** demonstrate full compliance with the Taxonomy Regulation.

1.2.2 IPCC Sixth Assessment Reports (AR6)

The Intergovernmental Panel on Climate Change (IPCC) was set up in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) to assess the science related to climate change so that government organisations at all levels would have a scientific basis from which to make decisions regarding climate change. The IPCC assessments of scientific research relating to climate change is written and reviewed by leading scientists worldwide, and then reviewed by experts in their field to ensure the reports reflect the full range of views in the scientific community. The IPCC reports undergo multiple rounds of drafting and review to ensure they are comprehensive and objective and produced in an open and transparent way.

The role of the Intergovernmental Panel on Climate Change (IPCC) is to critically assess the scientific, technical and socio-economic information relevant to understanding the physical science and impacts of human-induced climate change and natural variations, including the risks, opportunities and options for adaptation and mitigation.

The most up to date IPCC report is the Sixth Assessment Report (AR6)[4], which comprises of three Working Groups and a Synthesis Report, three Special Reports, and a refinement to its latest Methodology Report; these are as follows:

- **Working Group I (WGI)** contribution to the Sixth Assessment Report, *Climate Change 2021*: *The Physical Science Basis* was released on 9 August 2021.
- **The Working Group II** contribution, *Climate Change 2022: Impacts, Adaptation and Vulnerability* was released on 28 February 2022.
- **The Working Group III** contribution, C*limate Change 2022: Mitigation of Climate Change* was released on 4 April 2022.
- Special Report 1: *Global Warming of 1.5 ºC* (SR15, October 2018)
- Special Report 2: *Climate Change and Land* (SRCCL, August 2019)
- Special Report 3: *Ocean and Cryosphere in a Changing Climate* (SROCC, September 2019)
- The **AR6 Synthesis Report** integrates the three Working Group reports as well as the findings from the three cross-Working Group Special Reports prepared during this assessment cycle – this report is currently in review and will be finalised in late 2022 or early 2023.

AR6 has adopted a unified framework of climate risk, supported by an increased focus in WGI on low-likelihood, high impact outcomes. Systematic risk framing is intended to aid the formulation of effective responses to the challenges posed by current and future climatic changes and to better inform risk assessment and decision-making. AR6 also makes use of the 'storylines' approach, which contributes to building a robust and comprehensive picture of climate information, allows for a more flexible consideration and communication of risk, and can explicitly address low-likelihood, high-impact outcomes.

[4] Intergovernmental Panel on Climate Change (2022) Sixth Assessment Report (AR6).

The climatic impact-driver (CID) framework adopted in Chapter 12 of IPCC AR6 WGI allows for assessment of changing climate conditions that are relevant for regional impacts and for risk assessment.

1.2.3 Meath County Council Planning Requirements

1.2.3.1 Meath County Council Climate Action Plan 2024-2029

In February 2024, Meath County Council published the Meath County Council Climate Action Plan 2024-2029 (MCC CAP). The CAP includes a range of climate change mitigation actions aimed at reducing Countywide greenhouse gas emissions. It also includes climate adaptation actions aimed at improving the resilience of the County to the impacts of climate change. These actions include those for which the Council is fully accountable across its own buildings, operations, services, and functions; and actions for which the Council can influence, co-ordinate, facilitate and advocate for climate action.

Actions are divided across five thematic areas including:

- Governance and Leadership
- Built Environmental and Transport
- Natural Environment and Green Infrastructure
- Communities: Resilience and Transition
- Sustainability and Resource Management

The CAP sets out how Meath County Council will be responsible for enhancing climate resilience, increasing energy efficiency, and reducing greenhouse gas emissions, across its own assets, services, and infrastructure, to which it is fully accountable for, whilst also demonstrating a broader role of influencing, advocating, and facilitating other sectors, to meet these climate targets and ambitions. This is necessary to ensure that the environmental, social, and economic benefits that come with climate action, can be fully realised. The Council will also continue its efforts in rolling out ambitious climate action projects, drawing down available sources of funding, pursuing citizen and stakeholder engagement, all supported by a progressive policy framework.

The sector of the CAP which is most closely aligns with the Proposed Development is Built Environment and Transport. According to the Plan, built environment includes buildings of domestic, public, industrial, and commercial nature across the County of Meath as well as critical infrastructure like roads, bridges, drainage network, utilities, energy, and communications infrastructure. Buildings contribute a significant proportion of the County's emissions. Optimising energy efficiency and switching to low carbon heat sources in buildings will need to be prioritised in addition to securing renewable energy infrastructure to contribute to national grid decarbonisation and deliver a low carbon alternative to fossil fuels. The protection of the built environment from the negative impacts of climate change is also a priority focus to minimise the exposure of key infrastructure (such as Council owned buildings, roads, stormwater drains, public facilities, and the energy grid) to climate-related hazards. This will require appropriate planning, preparedness, and asset management in liaison with key stakeholders and agencies such as the OPW on flood risk.

As part of the development of the CAP, Meath County Council has undertaken a Climate Change Risk Assessment. The Climate Change Risk Assessment has identified the impacts which climate change is currently having on the County and is likely to have into the future. The Climate Change Risk Assessment is linked with the ongoing planning for Meath County Council in terms of adaptation to the changing climate and continued support services to citizens and businesses.

The risk assessment methodology and findings within the MCC CAP have been considered in Section 3 of this report.

1.2.3.2 Meath County Development Plan 2021-2027

The Meath County Development Plan 2021-2027 (MCDP) is the key strategy document which structures the proper planning and sustainable development of land-use across County Meath over the six-year statutory period of the plan. The Plan seeks to address the physical, economic, social, and environmental needs of the community, in terms of supporting structured new development, protecting the environment, enhancing valued assets and amenities.

The Plan provides a positive vision for Meath which will enable the county to continue to make a significant contribution to national economic recovery by promoting sustainable development and facilitating stable economic growth thus delivering long term benefits for the citizens of the county.

The Strategic Vision of the Development Plan is as follows:

'*To improve the quality of life of all citizens in Meath by creating an environment that supports a vibrant growing economy and a well-connected place to live, learn and do business.'*

Whilst Climate Change policies and mitigation measures are set out at a National and International level, Local Authorities have a central role in the implementation of these policies and in promoting behavioural and attitude change towards climate change.

One of the key objectives contained within the plan is to 'support the transition to a low carbon economy and lead on climate action'. Climate change is a cross-cutting theme of the Plan; however, climate change is specifically addressed in detail as part of Chapter 10 Climate Change.

Chapter 10 of the MCDP 2021-2027 outlines the approach to climate change adaptation and greenhouse gas mitigation, as required by the Planning and Development Act 2000, as amended. This Act highlights the need to reduce the overall quantity of greenhouse gas emissions and to develop an adaptation strategy to manage anticipated future climate risks.

The chapter examines how mitigation and adaptation strategies have been integrated into the main body of the Plan. This is to ensure that the climate change strategy has been developed collaboratively and is fully integrated and consistent with the Policies and Objectives of the Plan; as climate change is one of the cross-cutting themes of the Plan.

Relevant policy objectives as outlined within the MCDP 2021-2027 and their incorporation into the Proposed Development design have been considered in Section 6 of this report.

1.2.3.3 Climate Action and Low Carbon Development Act

The Climate Action and Low Carbon Development Act 2015 (the principal act) set national climate policy on a statutory footing for the first time in Ireland, with the target of pursuing the transition to a low-carbon, climate-resilient, and environmentally sustainable economy by 2050. The principal act was subsequently amended by the Climate Action and Low Carbon Development (Amendment) Act 2021 (the '2021 Act') which sets Ireland on a legally binding path to net-Zero emissions no later than 2050, and to a 51% reduction in emissions by the end of this decade.

The 2021 Act provides a legally binding framework with clear targets and commitments set in law, and ensures the necessary structures and processes are embedded on a statutory basis to ensure Ireland achieves its national, EU and international climate goals and obligations in the near and long term.

The 2021 Act also introduces a requirement for each local authority to prepare a Climate Action Plan, which will include both mitigation and adaptation measures and be updated every five years. Local authority Development Plans will also align with their Climate Action Plan.

Furthermore, Public Bodies are obliged to perform their functions in a manner which is consistent with national climate plans and strategies and furthering the achievement of the national climate objective; this is set out under Section 15 of the Climate Action and Low Carbon Development Act 2015, as amended in 2021:

"Duties of certain bodies

15. *(1) A relevant body shall, in so far as practicable, perform its functions in a manner consistent with—*

(a) the most recent approved climate action plan,

(b) the most recent approved national long term climate action strategy,

(c) the most recent approved national adaptation framework and approved sectoral adaptation plans,

(d) the furtherance of the national climate objective, and

(e) the objective of mitigating greenhouse gas emissions and adapting to the effects of climate change in the State."

This Report has been prepared in accordance with the MCC Climate Action Plan 2024-2029 (and associated climate adaptation and mitigation strategy) and the policies and objectives of the MCC Development Plan 2021-2027 relating to climate action and environmental infrastructure and flood risk. These documents have been developed on foot of national climate action strategies, plans, and objectives and provide a regional approach to climate action, which is the overarching recommendation of national strategies and plans. Therefore, this Report provides information to support the relevant public body in carrying out its functions

under Section 15 of the Climate Action and Low Carbon Development Act 2015, as amended in 2021.

1.2.3.4 National Adaptation Framework (NAF)

Ireland's first statutory National Adaptation Framework (NAF) was published on 19 January 2018 and was developed under the Climate Action and Low Carbon Development Act 2015. The NAF sets out the national strategy to reduce the vulnerability of the country to the negative effects of climate change and to avail of positive impacts.

The NAF builds on the work already carried out under the National Climate Change Adaptation Framework (NCCAF, 2012). The NAF outlines a whole of government and society approach to climate adaptation in Ireland. It also aims to improve the enabling environment for adaptation through ongoing engagement with civil society, the private sector, and the research community.

Under the NAF, several government departments are required to prepare sectoral adaptation plans in relation to the priority areas that they are responsible for, which is to be reviewed once every five years. Local authorities are required to prepare local adaptation strategies. The NAF also aims to ensure ongoing engagement with civil society, the private sector, and the research community.

1.2.4 Sustainable Development Goals

The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity by 2030. The 17 SDGs are integrated—that is, they recognise that action in one area will affect outcomes in others, and that development must balance social, economic, and environmental sustainability. The creativity, knowhow, technology and financial resources from all of society is necessary to achieve the SDGs in every context. At its heart, the SDGs are about global partnership for this call to action. No matter how large or small, and regardless of their industry, all companies can contribute to the SDGs through their sustainability and corporate social responsibility strategies, policies, and processes.

Figure 1-1: UN Sustainable Development Goals

Ireland has published a Sustainable Development Goals National Implementation Plan 2022-2024 to provide a whole-of-government approach to implementing these goals. Sustainable development, climate change and equity are intrinsically intertwined. Climate change impacts can be linked in one way or another to all 17 of the UN Sustainable Development Goals (SDGs). Climate action that considers co-impacts across other SDGs can increase efficiency, reduce costs and support early and ambitious climate action.

This CCIA report focuses primarily on the climate impacts of mitigation and adaptation actions. Identified actions align with the objectives of the following SDGs:

Table 1-2: Relevant SDGs

SDG	Goal	Description
	Ensure availability and sustainable management of water and sanitation for all.	Support efforts to achieve universal access to safe and affordable drinking water and sanitation for all.
	Ensure access to affordable, reliable, sustainable, and modern energy for all.	Support efforts to increase the share of renewable energy in the global energy mix; and, to promote investment in clean energy research, technology and infrastructure.
	Make cities and human settlements inclusive, safe, resilient, and sustainable.	Support efforts to enhance inclusive and sustainable urbanisation, and efforts to protect and safeguard the world's cultural and natural heritage. Ensure access for all to basic services including transport and water services.

SDG	Goal	Description
	Ensure sustainable consumption and production patterns.	Support efforts to achieve the environmentally sound management of all wastes throughout their life cycle, to significantly reduce their release to air, water, and soil, and to substantially reduce waste generation through prevention, reduction, recycling, and reuse.
	Take urgent action to combat climate change and its impacts.	Support efforts to strengthen resilience and adaptive capacity to climate-related hazards and natural disasters, and to integrate climate change measures into company policies, strategy, and planning.
	Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.	Support efforts to prevent and significantly reduce marine pollution of all kinds.
	Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.	Support efforts to ensure the conservation and sustainable use of terrestrial and inland freshwater ecosystems, efforts to halt deforestation and combat desertification, efforts to ensure the conservation of mountain ecosystems and reduce the degradation of natural habitats, and efforts to halt the loss of biodiversity and protect and prevent the extinction of threatened species

In Section 5 of this Report, the relevant policy objectives of the MCC CDP have been carefully considered in the context of the above-listed SDGs, and their incorporation into the Proposed Development design.

1.2.5 Mandatory Sustainability Reporting Considerations

1.2.5.1 Corporate Sustainability Reporting Directive (CSRD)

On 5 January 2023, the Corporate Sustainability Reporting Directive (CSRD) entered into force. It modernises and strengthens the rules concerning the social and environmental information that companies must report. The CSRD is effective from 01 January 2024 for those entities already subject to the NFRD (reporting in 2025) and from 01 January 2025 for all other large companies (reporting in 2026).

Companies subject to the CSRD will have to report according to European Sustainability Reporting Standards (ESRS). The standards are developed in a draft form by the EFRAG, previously known as the European Financial Reporting Advisory Group.

If the client falls in scope for CSRD, the results from this current Climate Change Impact Assessment Report should be reviewed in line with the materiality assessment and annual CSRD disclosure requirements. Specifically, the report and findings may serve as an evidence base for EFRAG Standard ESRS E1 CLIMATE CHANGE.

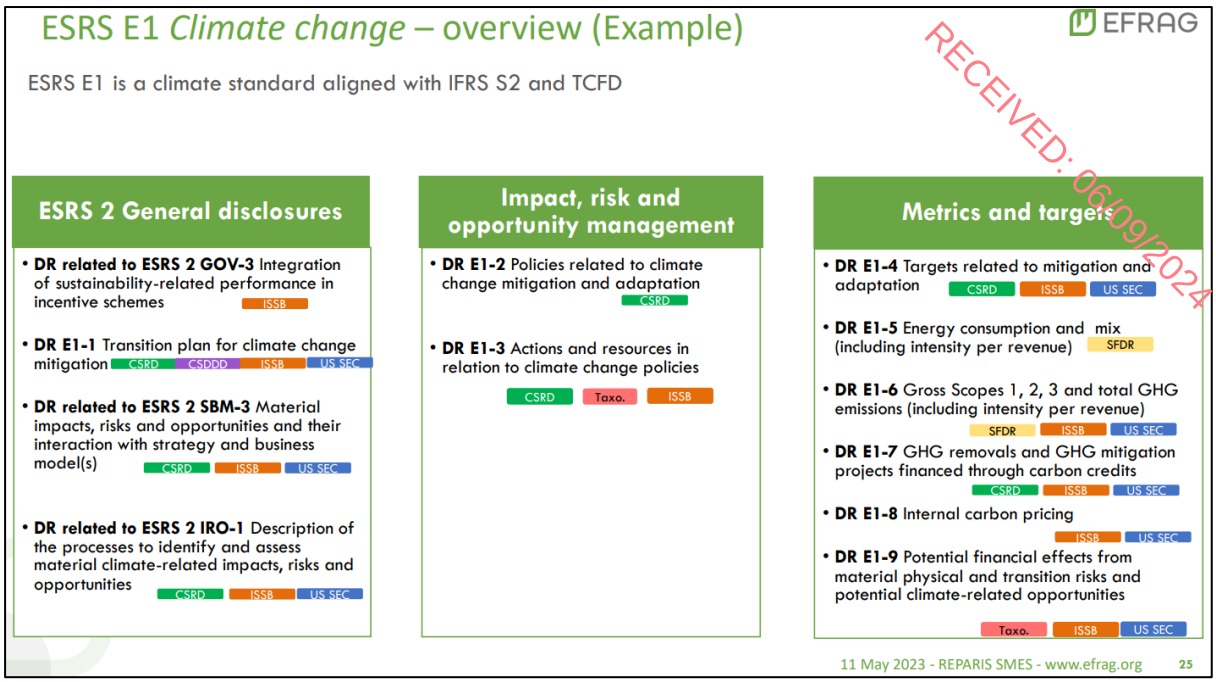

Figure 1-2: ESRS E1 Climate Change: presented by Eric Duvaud, EFRAG SR TEG member (Source: [The first set of ESRS – the journey from PTF to delegated act (adopted on 31 July 2023) – EFRAG])

The data/information from this CCIA should be considered for Impact, Risk and Opportunity Management Disclosure Requirements 20 and 21 below within ESRS E1 CLIMATE CHANGE:

20. The undertaking shall describe the process to identify and assess climate-related impacts, risks and opportunities. This description shall include its process in relation to:

(a) impacts on climate change, in particular, the undertaking's GHG emissions (as required by Disclosure Requirement ESRS E1-6);

(b) climate-related physical risks in own operations and along the upstream and downstream value chain, in particular:

i. the identification of climate-related hazards, considering at least high emission climate scenarios; and

ii. the assessment of how its assets and business activities may be exposed and are sensitive to these climate-related hazards, creating gross physical risks for the undertaking.

(c) climate-related transition risks and opportunities in own operations and along the upstream and downstream value chain, in particular:

i. the identification of climate-related transition events, considering at least a climate scenario in line with limiting global warming to 1.5°C with no or limited overshoot; and

ii. the assessment of how its assets and business activities may be exposed to these climate-related transition events, creating gross transition risks or opportunities for the undertaking.

21. When disclosing the information required under paragraphs 20 (b) and 20 (c) the undertaking shall explain how it has used climate-related scenario analysis, including a range of climate scenarios, to inform the identification and assessment of physical risks and transition risks and opportunities over the short-, medium- and long-term.

Table 1-4 of this Report details the Impact, Risk and Opportunity Management Disclosure Requirements 20 and 21 within ESRS E1 CLIMATE CHANGE, and the associated sections of this Report in which these requirements have been addressed.

1.2.5.2 Corporate Sustainability Due Diligence Directive (CSDDD)

This proposed Directive establishes a corporate due diligence duty. The core elements of this duty are identifying, bringing to an end, preventing, mitigating and accounting for negative human rights and environmental impacts in the company's own operations, their subsidiaries and their value chains. In addition, certain large companies must have a plan to ensure that their business strategy is compatible with limiting global warming to 1.5 °C in line with the Paris Agreement.

The CSDDD is expected to complement the CSRD as it will require companies to implement comprehensive identification, prevention and mitigation processes to eliminate adverse human rights and environmental impacts in the company's own operations, its subsidiaries and value chains. It will also complement the Taxonomy Regulation that requires specific details of what constitute "environmentally sustainable" investments.

It is expected that the CSDDD will require companies in scope to ensure the identification, prevention, mitigation and ability to account for any adverse environmental impacts, with adequate governance, management systems and measures in place to this end.

For instance, regarding adverse climate change impacts, a company would have to obtain quantitative and qualitative information about baseline conditions at higher risk sites or facilities. Identification of adverse impacts would include assessing the environmental context in a dynamic way and at regular intervals, prior to a new activity or relationship; prior to major decisions or changes in the operation; in response to or anticipation of changes in the operating environment; and periodically (at least every 12 months) throughout the life of an activity or relationship. The following Climate Change Impact Assessment can serve as due diligence demonstrating partial compliance with the CSDDD.

1.2.6 Just Transition

The 2021 Climate Action Plan sets out a just transition framework consisting of four principles to underpin both processes and implementation of all climate action policies and measures. The present report primarily examines the impact of climate change. However, we recommend that due consideration be given to the concept of a "just transition," aligning with the Irish Government's framework, to ensure a comprehensive approach to addressing the climate crisis that extends beyond mere climate action.

The just transition framework is made up of four principles:

1. An integrated, structured, and evidence-based approach to identify and plan our response to just transition requirements.
2. People are equipped with the right skills to be able to participate in and benefit from the future net zero economy.

3. The costs are shared so that the impact is equitable and existing inequalities are not exacerbated.
4. Social dialogue to ensure impacted citizens and communities are empowered and are core to the transition process.

1.2.7 Nature

The close relationship between climate and nature emphasises the need for coordinated action that addresses both. While it remains beyond the scope of the current CCIA report, we reiterate our recommendation to consider the impacts of climate and nature in tandem, rather than separately.

Ireland's 4th National Biodiversity Action Plan (NBAP) sets the national biodiversity agenda for the period 2023-2030 and aims to deliver the transformative changes required to the ways in which we value and protect nature. Ireland's planning system has an important role in safeguarding biodiversity by ensuring that new development is sustainable and does not have a negative impact on the environment. The Irish NBAP underscores that there are opportunities to deliver for biodiversity in the assessment of new planning applications, as well as the application of best-practice principles for urban design and landscape management, such as green infrastructure and nature-based solutions.

The NBAP will continue to implement actions within the framework of five strategic objectives, while addressing new and emerging issues:

- Objective 1 - Adopt a Whole of Government, Whole of Society Approach to Biodiversity
- Objective 2 - Meet Urgent Conservation and Restoration Needs
- Objective 3 - Secure Nature's Contribution to People
- Objective 4 - Enhance the Evidence Base for Action on Biodiversity
- Objective 5 - Strengthen Ireland's Contribution to International Biodiversity Initiatives

Local Biodiversity Action Plans (LBAP) further support the objectives of the NBAP and so should also be consulted to identify biodiversity objectives, targets, guidelines for the lifecycle of the proposed development.

Nature acts as a vital regulator of climate, while climate change threatens biodiversity and ecosystem health. To combat these challenges effectively, climate action must integrate efforts to conserve and restore natural ecosystems. By doing so, we can mitigate climate change impacts and protect biodiversity, ensuring a more resilient and sustainable future.

In June 2024, the EU Council formally adopted the Nature Restoration Law. Under the Nature Restoration Law, EU member states will need to restore at least 30% of habitats in poor condition by 2030, 60% by 2040, and 90% by 2050. The regulation sets out specific requirements for different types of ecosystems, including agricultural land, forests, and urban ecosystems. Increasing forest birds' population and making sure there is no net loss on urban green spaces and tree canopy cover until end of 2030 are also key measures of this new law. The regulation will now be published in the EU's Official Journal and enter into force. It will become directly applicable in all member states and specific targets for each sector are likely.

Table 1-3: ESRS E1 Climate Change Requirements

ESRS E1 Climate Change Requirements[5]		Relevant Section of this Report
20. The undertaking shall describe the process to identify and assess climate-related impacts, risks and opportunities. This description shall include its process in relation to:	(a) impacts on climate change, in particular, the undertaking's GHG emissions (as required by Disclosure Requirement ESRS E1-6);	A number of strategies have been outlined in Section 4.3 of this report which will be adopted within the development to maximise low energy use, promote circular waste management, and reduce carbon emissions. Quantification of the Proposed Development's GHG emissions is outside the scope of this assessment.
	(b) climate-related physical risks in own operations and along the upstream and downstream value chain, in particular: (i) the identification of climate-related hazards, considering at least high emission climate scenarios; and (ii) the assessment of how its assets and business activities may be exposed and are sensitive to these climate-related hazards, creating gross physical risks for the undertaking.	See Section 3 of this Report for a Climate Risk Screening which identifies material climate-related hazards based on both intermediate and high-emission scenarios. See Section 4 of this Report for a Climate Risk and Vulnerability Assessment which evaluates these climate-related hazards, the risk factors (Exposure), the current sensitivity and adaptive capacity of the development (Vulnerability), and the subsequent risk level.
	(c) climate-related transition risks and opportunities in own operations and along the upstream and downstream value chain, in particular: (i) the identification of climate-related transition events, considering at least a climate scenario in line with limiting global warming to 1.5°C with no or limited overshoot; and	The Meath County Development Plan 2021-2027 and the Meath County Council Climate Action Plan 2024-2029 both include a robust framework of policies and objectives aimed at driving climate-related transitions. These measures are designed to promote

[5] as set out in the Draft European Sustainability Reporting Standards (ESRS) by the EFRAG (previously known as the European Financial Reporting Advisory Group).

ESRS E1 Climate Change Requirements[5]		Relevant Section of this Report
	(ii) the assessment of how its assets and business activities may be exposed to these climate-related transition events, creating gross transition risks or opportunities for the undertaking.	sustainability, reduce emissions, enhance resilience, and ensure that the county contributes effectively to national and international climate goals. Both of these documents have been included in the context of this report. See Section 5 of this report Meath County Development Plan 2021-2027: Relevant Policies and Objectives and how these have been considered in the current proposal.
21. When disclosing the information required under paragraphs 20 (b) and 20 (c) the undertaking shall explain how it has used climate-related scenario analysis, including a range of climate scenarios, to inform the identification and assessment of physical risks and transition risks and opportunities over the short-, medium- and long-term.		See Section 2 of this Report for Climate Change Projections which includes a climate-related scenario analysis.

2 CLIMATE CHANGE PROJECTIONS

The Supplementing Regulation establishes the Technical Screening Criteria specific to certain economic activities. Annex II, Section 7.1 of the Supplementing Regulation ('the construction of new buildings') includes specific requirements relating to climate projections:

2. The climate risk and vulnerability assessment is proportionate to the scale of the activity and its expected lifespan, such that:

(a) for activities with an expected lifespan of less than 10 years, the assessment is performed, at least by using climate projections at the smallest appropriate scale;

(b) for all other activities, the assessment is performed using the highest available resolution, state-of-the-art climate projections across the existing range of future scenarios consistent with the expected lifetime of the activity, including, at least, 10-to-30-year climate projections scenarios for major investment.

3. The climate projections and assessment of impacts are based on best practice and available guidance and take into account the state-of-the-art science for vulnerability and risk analysis and related methodologies in line with the most recent Intergovernmental Panel on Climate Change reports, scientific peer-reviewed publications and open source or paying models.

The current assessment has utilised climate projections from IPCC AR6 WGI and the IPCC WGI online Interactive Atlas for Northern Europe; and *Climate Ireland* Climate Change Projection Maps[6] in combination with EPA Research Report No. 339[7]. Due to the expected lifespan of the Proposed Development, climate projections have been provided for mid-term and long-term periods (2041–2060, 2041-2070, and 2081–2100).

A new set of illustrative scenarios have been developed by the IPCC AR6 WGI which cover the range of possible future developments of anthropogenic drivers of climate change found in literature, derived from the Shared Socio-economic Pathways (SSPs). Concentration trajectories known as Representative Concentration Pathways (RCPs) were utilised in EPA Research Report No.339. These RCPs were considered by the IPCC in their Fifth Assessment Report (AR5). For this study, intermediate (SSP2-4.5 and RCP4.5) and very high (SSP5-8.5 and RCP8.5) GHG emissions scenarios were utilised in both the medium and long-term periods; this is considered a conservative assumption of future GHG emission paths. These scenarios are detailed in the following Sections.

All "climate-related hazards" have been classified as either "chronic" or "acute". Chronic effects are gradual slow onset developments (e.g., long term rise in mean annual air temperature); whereas acute effects are rapidly developing climate extremes and/or increased variability (e.g., heatwaves).

[6] Climate Ireland - Climate Change Projection Maps.

[7] P. Nolan and J. Flanagan (2020) High-Resolution Climate Projections for Ireland – a Multi-model Ensemble Approach. EPA Research Report No. 339.

2.1 Overview of Climate Modelling

With increasing atmospheric greenhouse gas concentrations driving changes in all aspects of the climate system, climate change is representing an urgent and potentially irreversible threat to human societies globally. Accurate climate projections are a key scientific input for national policymakers when planning for, and adapting to, the challenges posed by climate change.

Climate projections are produced using climate models, which have been developed by scientists over recent decades and are capable of simulating Earth's past, present, and future climate. Global Climate Models (GCMs) are used to model the global impacts on Earth's climate of increasing greenhouse gas concentrations in the atmosphere at a resolution of ~50km or coarser. Regional Climate Models (RCMs) are used to capture key small-scale atmospheric features on the scale of 1-10km, such as local convection and wind gusts. Multi-model ensembles are often used in climate prediction studies to quantify associated model uncertainty.

RCMs utilise the output of GCMs and model regional climates at higher spatial resolutions; this process is known as dynamic downscaling. This approach allows key climate variables to be modelled more precisely, including precipitation; near-surface temperature; and the number and intensity of low-pressure systems. Low pressure systems are the primary driver of precipitation and wind affecting the country; therefore, the added value of RCMs in the modelling of low-pressure systems is of particular importance for Ireland.

Future greenhouse gas concentrations in the atmosphere are also uncertain. To model possible future climate change, varying greenhouse gas concentrations over time are needed as a GCM input. The core set of SSP scenarios used in the AR6 WGI report cover a broad range of emissions pathways, including new low-emissions pathways. They start in 2015 and include scenarios with high and very high greenhouse gas (GHG) emissions (SSP3-7.0 and SSP5-8.5) and CO_2 emissions that roughly double from current levels by 2100 and 2050, respectively; scenarios with intermediate GHG emissions (SSP2-4.5) and CO_2 emissions remaining around current levels until the middle of the century; and scenarios with very low and low GHG emissions and CO_2 emissions declining to net zero around or after 2050, followed by varying levels of net negative CO_2 emissions (SSP1-1.9, SSP1-2.6).

Concentration trajectories known as Representative Concentration Pathways (RCPs) were utilised in EPA Research Report No.339. These RCPs were considered by the IPCC in their Fifth Assessment Report (AR5) and include the following four scenarios: RCP2.6, RCP4.5, RCP6 and RCP8.5. For the EPA study, two RCPs were chosen, RCP4.5 and RCP8.5. RCP4.5 is considered an intermediate scenario, while RCP8.5 is considered to be representative of a potential worst-case scenario.

Figure 2-1 illustrates the future annual emissions of CO_2 and of a subset of key non-CO_2 drivers, across the latest five illustrative scenarios developed by the IPCC:

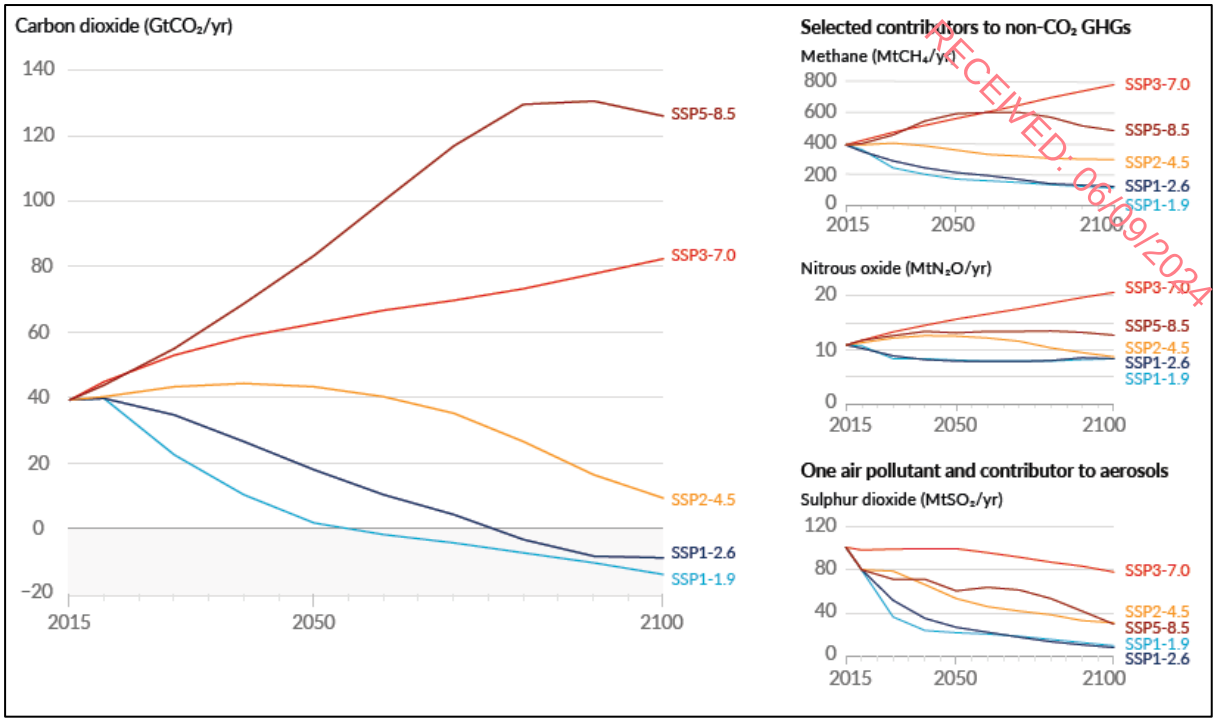

Figure 2-1: Future annual emissions of CO_2 (left) and of a subset of key non-CO_2 drivers (right), across five illustrative scenarios (source: adapted from IPCC AR6 WGI Summary for Policy Makers)

Figure 2-2 illustrates the global surface temperature change relative to 1850-1900 under each scenario:

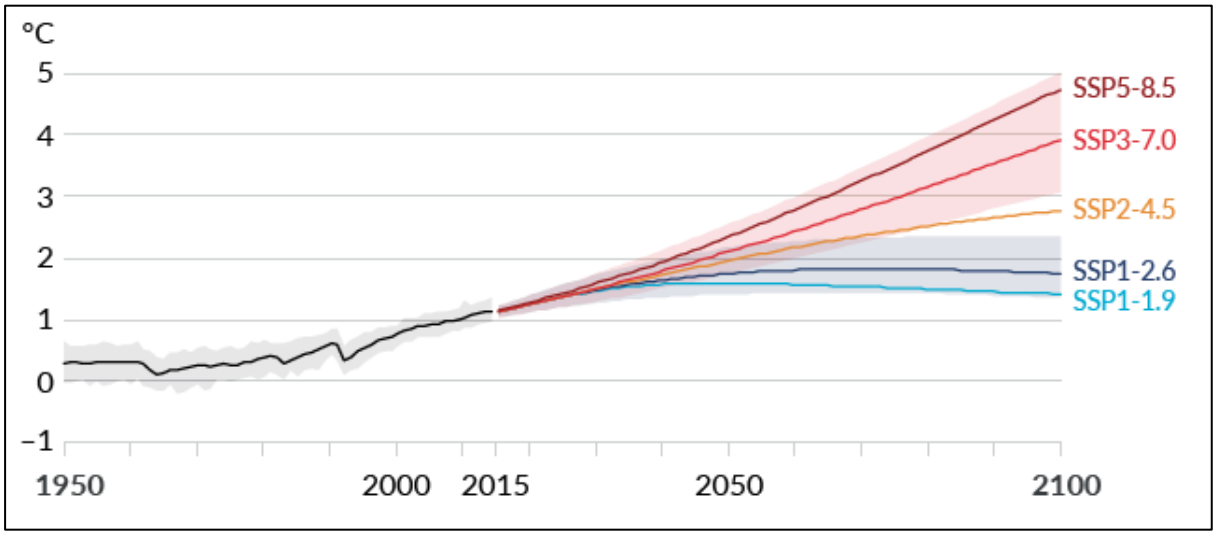

Figure 2-2: global surface temperature change relative to 1850-1900 (source: adapted from IPCC AR6 WGI Summary for Policy Makers)

2.2 IPCC AR6 WGI Regional Climate Projections

IPCC AR6 WGI assesses the current evidence on the physical science of climate change, evaluating knowledge gained from observations, reanalyses, paleoclimate archives and climate model simulations, as well as physical, chemical, and biological climate processes.

The WGI contribution to AR6 is focused on physical and biogeochemical climate science information, with particular emphasis on regional climate changes.

According to IPCC AR6 WGI, sustained changes have been documented in all major elements of the climate system, including the atmosphere, land, cryosphere, biosphere and ocean. Multiple lines of evidence indicate the unprecedented nature of recent largescale climatic changes in the context of all human history. The key findings of the WGI contribution to AR6 are as follows:

- It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred;

- Global surface temperature will continue to increase until at least mid-century under all emissions scenarios considered. Global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO_2 and other greenhouse gas emissions occur in the coming decades;

- Observed increases in well-mixed greenhouse gas (GHG) concentrations since around 1750 are unequivocally caused by human activities;

- Each of the last four decades has been successively warmer than any decade that preceded it since 1850;

- The likely range of total human-caused global surface temperature increase from 1850–1900 to 2010–2019 is 0.8°C to 1.3°C, with a best estimate of 1.07°C;

- Globally averaged precipitation over land has likely increased since 1950, with a faster rate of increase since the 1980s;

- It is virtually certain that the global upper ocean (0–700 m) has warmed since the 1970s and extremely likely that human influence is the main driver;

- Global mean sea level increased by 0.20 [0.15 to 0.25] m between 1901 and 2018. The average rate of sea level rise was 1.3 [0.6 to 2.1] mm/year between 1901 and 1971, increasing to 1.9 [0.8 to 2.9] mm/year between 1971 and 2006, and further increasing to 3.7 [3.2 to 4.2] mm/year between 2006 and 2018.

Key model intercomparisons supporting AR6 include the Coupled Model Intercomparison Project Phase 6 (CMIP6) and the Coordinated Regional Climate Downscaling Experiment (CORDEX), for global and regional models respectively. Results using CMIP Phase 5 (CMIP5) simulations are also assessed. Since AR5, large ensemble simulations, where individual models perform multiple simulations with the same climate forcings, are increasingly used to inform understanding of the relative roles of internal variability and forced change in the climate system, especially on regional scales. The broader availability of ensemble model simulations has contributed to better estimations of uncertainty in projections of future change.

Chapter 12 of IPCC AR6 WGI and the online Interactive Atlas have been utilised in this assessment to summarise climate projections and conduct a detailed inspection of projected changes in climate for the region of the Proposed Development. Chapter 12 of IPCC AR6 WGI provides a comprehensive, region-specific assessment of changing climatic conditions that may be hazardous or favourable for various sectors. The online Interactive Atlas is an online tool that complements the WGI Report by providing flexible temporal and spatial analyses of trends and changes in key atmospheric and oceanic variables, extreme indices and climatic impact-drivers (CIDs), as obtained from several global and regional observational and model simulated datasets used in the report. The Interactive Atlas presents detailed projected global and regional climate changes at near-, mid- and long-term periods, 2021–2040, 2041–2060 and 2081–2100, respectively, for a range of emissions scenarios. Within the Interactive Atlas, spatially aggregated regional information is provided for different predefined sets of regions:

- The sub-continental AR6 WGI reference regions;
- WG II continental regions;
- Monsoon regions;
- Major river basins;
- Small-island regions;
- Ocean biological activity regions.

Under the sub-continental AR6 WGI reference regions, Europe is divided into four climatic regions: Northern Europe (NEU), Western and Central Europe (WCE), Eastern Europe (EEU) and Mediterranean (MED). Ireland is part of NEU, therefore aggregated climate information for this region has been derived for this assessment and is summarised in the following Table 2-1.

The IPCC AR6 WGI describe “climate related hazards” as Climatic Impact Drivers (CID). CIDs are defined by the IPCC as physical climate system conditions (e.g., means, events, extremes) that can be directly connected with having impacts on human or ecological systems. This terminology has been retained in this assessment.

In the following Table 2-1, a summary of projections for NEU has been provided for each CID along with detailed climate projection data, sourced using the WGI online Interactive Atlas. The detailed projections provide the median and 25th to 75th percentile range for each variable under the intermediate (SSP2-4.5) and very high (SSP5-8.5) GHG emissions scenarios in both the medium and long-term periods. In some cases, Atlas data was not available for certain variables; IPCC AR6 WGI summary findings were used to supplement in this case.

Table 2-1: Climate Projections for Northern Europe (Data Source: IPCC AR6 & IPCC WGI online Interactive Atlas)

IPCC Climate Impact Driver Category	IPCC Climate Impact Driver (CID) / Climate-related hazard	IPCC AR6 Summary Findings[8]	IPCC WGI Interactive Atlas Data[9] (SSP2-4.5 Scenario)[10]	IPCC WGI Interactive Atlas Data[11] (SSP5-8.5 Scenario)[12]
Heat and Cold	Temperature Projections (Chronic)	Since AR5, studies have confirmed that the mean warming trend in Europe is increasing. Irrespective of the scenario, it is virtually certain that warming will continue in Europe, and there is high confidence[13] that the observed increase in heat extremes is due to human activities. All temperature trends are very likely to continue for a global warming level (GWL) of 1.5°C or 2°C and 3°C.	**Increase in mean temperature in Medium Term (2041-2060):** Median: +1.5ºC P25-P75: +1.2ºC to +1.9ºC **Increase in mean temperature in Long Term (2081-2100):** Median: +2.4ºC P25-P75: +1.8ºC to +3.0ºC	**Increase in mean temperature in Medium Term (2041-2060):** Median: +2.0ºC P25-P75: +1.5ºC to +2.5ºC **Increase in mean temperature in Long Term (2081-2100):** Median: +4.4ºC P25-P75: +3.6ºC to +5.5ºC
	Heatwave (Acute)	The frequency of heatwaves observed in Europe has very likely increased in recent decades due to human-induced change in atmospheric composition. It is very likely that the frequency of heatwaves will increase during the 21st century regardless of the emissions scenario in each European region, and for 1.5°C and 2°C GWLs.	**Increase in number of days with a maximum temperature above 35ºC in Medium Term (2041-2060):** Median: 0.1 P25-P75: 0 to 0.1 **Increase in number of days with a maximum temperature above 35ºC in Long Term (2081-2100):**	**Increase in number of days with a maximum temperature above 35ºC in Medium Term (2041-2060):** Median: 0.1 P25-P75: 0 to 0.1 **Increase in number of days with a maximum temperature above 35ºC in Long Term (2081-2100):**

[8] Working Group I contribution to the Sixth Assessment Report, Climate Change 2021: The Physical Science Basis. Chapter 12: Climate Change Information for Regional Impact and for Risk Assessment.

[9] IPCC WGI online Interactive Atlas Parameters: Model projection CMIP6; SSP2-2.4 Scenario; Annual; Relative to 1995-2014 Baseline.

[10] This is a "middle of the road" scenario. CO_2 emissions hover around current levels before starting to fall mid-century, but do not reach net-zero by 2100.

[11] IPCC WGI online Interactive Atlas Parameters: Model projection CMIP6; SSP5-8.5 Scenario; Annual; Relative to 1995-2014 Baseline.

[12] This represents the high end of the range of future pathways. CO_2 emissions triple by 2075.

13 Confidence is a qualitative measure of the validity of a finding, based on the type, amount, quality and consistency of evidence (e.g., data, mechanistic understanding, theory, models, expert judgment) and the degree of agreement.

IPCC Climate Impact Driver Category	IPCC Climate Impact Driver (CID) / Climate-related hazard	IPCC AR6 Summary Findings[8]	IPCC WGI Interactive Atlas Data[9] (SSP2-4.5 Scenario)[10]	IPCC WGI Interactive Atlas Data[11] (SSP5-8.5 Scenario)[12]
			Median: 0.1 P25-P75: 0 to 0.2	Median: 0.5 P25-P75: 0.1 to 0.7
	Frost days (Acute)	The frequency of frost days will very likely decrease for all scenarios and all time-horizons with consequences for agriculture and forests. A simple heating degree day index, characterizing heating demand, shows a large observed decreasing trend for winter heating energy demand in Europe. This trend is very likely to continue through the 21st century, with decreases in the range of 20–30% for Northern Europe.	**Decrease in number of frost days in Medium Term (2041-2060):** Median: -19.8 P25-P75: -28.5 to -12.5 **Decrease in number of frost days in Long Term (2081-2100):** Median: -32.6 P25-P75: -39.2 to -26.4	**Decrease in number of frost days in Medium Term (2041-2060):** Median: -27.6 P25-P75: -35.3 to -20.9 **Decrease in number of frost days in Long Term (2081-2100):** Median: -57 P25-P75: -64.5 to -46.8
Wet and Dry	Precipitation (Chronic)	Precipitation has generally increased in northern Europe. It is very likely that precipitation will increase in Northern Europe in December, January, and February under all climate scenarios except RCP2.6[14]/SSP1-2.6 and for both mid- and end-century periods.	**Increase in total precipitation in Medium Term (2041-2060):** Median: 3.3% P25-P75: 1.8% to 4.9% **Increase in total precipitation in Long Term (2081-2100):** Median: 4.9% P25-P75: 2.3% to 7.6%	**Increase in total precipitation in Medium Term (2041-2060):** Median: 4.6% P25-P75: 2.5% to 7.1% **Increase in total precipitation in Long Term (2081-2100):** Median: 10.3% P25-P75: 7.8% to 13.7%
	River Flood Heavy Precipitation and Pluvial Flood (Acute)		**Increase in maximum 1-day precipitation amount in Medium Term (2041-2060):** Median: 5.9% P25-P75: 4.0% to 7.8%	**Increase in maximum 1-day precipitation amount in Medium Term (2041-2060):** Median: 8.3% P25-P75: 6.0% to 9.5%

[14] RCP 2.6 is a "very stringent" pathway. RCP 2.6 is likely to keep global temperature rise below 2°C by 2100.

IPCC Climate Impact Driver Category	IPCC Climate Impact Driver (CID) / Climate-related hazard	IPCC AR6 Summary Findings[8]	IPCC WGI Interactive Atlas Data[9] (SSP2-4.5 Scenario)[10]	IPCC WGI Interactive Atlas Data[11] (SSP5-8.5 Scenario)[12]
		There is medium confidence that river floods will decrease in Northern Europe under RCP8.5[15] and low confidence under RCP2.6. Heavy precipitation frequency trends have been detected and attributed to climate change in with high confidence in Northern Europe.	**Increase in maximum 1-day precipitation amount in Long Term (2081-2100):** Median: 10.3% P25-P75: 6.3% to 13.9%	**Increase in maximum 1-day precipitation amount in Long Term (2081-2100):** Median: 20.2% P25-P75: 14.1% to 24.1%
			Increase in maximum 5-day precipitation amount in Medium Term (2041-2060): Median: 4.7% P25-P75: 3.5% to 6.1% **Increase in maximum 5-day precipitation amount in Long Term (2081-2100):** Median: 8.2% P25-P75: 4.7% to 11.2%	**Increase in maximum 5-day precipitation amount in Medium Term (2041-2060):** Median: 6.5% P25-P75: 4.3% to 8.9% **Increase in maximum 5-day precipitation amount in Long Term (2081-2100):** Median: 16.2% P25-P75: 12% to 20.6%
	Drought (Acute)	Higher precipitation that outweighs the effects of increased evapotranspiration is expected to result in a decrease in streamflow drought frequency in Northern Europe. A reduction of drought length and magnitude is projected for Northern Europe.	**Likely increase in number of consecutive dry days in Medium Term (2041-2060):** Median: 0.2 P25-P75: -0.1 to 0.7 **Increase in number of consecutive dry days in Long Term (2081-2100):** Median: 0.6	**Likely increase in number of consecutive dry days in Medium Term (2041-2060):** Median: 0.3 P25-P75: -0.1 to 0.7 **Increase in number of consecutive dry days in Long Term (2081-2100):** Median: 1.4

15 In RCP 8.5 emissions continue to rise throughout the 21st century. This high-emissions scenario is frequently referred to as “business as usual”, suggesting that is a likely outcome if society does not make concerted efforts to cut greenhouse gas emissions.

IPCC Climate Impact Driver Category	IPCC Climate Impact Driver (CID) / Climate-related hazard	IPCC AR6 Summary Findings[8]	IPCC WGI Interactive Atlas Data[9] (SSP2-4.5 Scenario)[10]	IPCC WGI Interactive Atlas Data[11] (SSP5-8.5 Scenario)[12]
			P25-P75: 0.1 to 0.11	P25-P75: 0.6 to 2.1
Wind	Surface Wind Speed (Chronic)	There is medium confidence that mean surface wind speeds have decreased in Europe as in many other areas of the Northern Hemisphere over the past four decades. Under RCP4.5[16] and RCP8.5 scenarios, projections indicate a decrease in mean wind speed in Northern Europe (medium confidence).	**Negligible change in mean surface windspeed in Medium Term (2041-2060):** Median: -0.8% P25-P75: -1.7% to 0.2% **Decrease in mean surface windspeed in Long Term (2081-2100):** Median: -1.9% P25-P75: -2.9% to -1.2%	**Decrease in mean surface windspeed in Medium Term (2041-2060):** Median: -1.1% P25-P75: -1.6% to -0.5% **Decrease in mean surface windspeed Long Term (2081-2100):** Median: -2.8% P25-P75: -4.5% to -1.2%
	Severe Windstorms (Acute)	There are large uncertainties in past evolutions of windstorms and extreme winds in Europe. Extreme near-surface winds have been decreasing in the past decades according to near-surface observations. Strong winds and extratropical storms are projected to have a slightly increasing frequency and amplitude in the future in Northern Europe.	*No atlas data available for severe windstorms.*	
Snow and Ice	Snowfall (Chronic)	Widespread and accelerated declines in snow depth and snow water equivalent have been observed in Europe. There is high confidence that future snow cover extent and seasonal duration will reduce.	**Decrease in snowfall (mm/day) in Medium Term (2041-2060):** Median: -2.8	**Decrease in snowfall (mm/day) in Medium Term (2041-2060):** Median: -3.9

[16] RCP 4.5 is described by the IPCC as an intermediate scenario. Emissions in RCP 4.5 peak around 2040, then decline. It is a scenario of long-term, global emissions of greenhouse gases, short-lived species, and land-use-landcover which stabilizes radiative forcing at 4.5 Watts per meter squared (W m^2, approximately 650 ppm CO_2-equivalent) in the year 2100 without ever exceeding that value.

IPCC Climate Impact Driver Category	IPCC Climate Impact Driver (CID) / Climate-related hazard	IPCC AR6 Summary Findings[8]	IPCC WGI Interactive Atlas Data[9] (SSP2-4.5 Scenario)[10]	IPCC WGI Interactive Atlas Data[11] (SSP5-8.5 Scenario)[12]
			P25-P75: -4.0 to -1.8 **Decrease in snowfall (mm/day) in Long Term (2081-2100):** Median: -4.8 P25-P75: -5.6 to -3.7	P25-P75: -3.0 to -2.6 **Decrease in snowfall (mm/day) in Long Term (2081-2100):** Median: -7.9 P25-P75: -9.6 to -6.2
	Heavy snowfall, ice storms and hail (Acute)	There is low confidence that climate change will affect ice and snow-related episodic hazards (limited evidence).	*No atlas data available for heavy snowfall, ice storms and hail.*	
Coastal and Oceanic	Sea level rise (Acute)	Relative sea level rise is extremely likely to continue in the oceans around Europe.	**Increase in sea level (metres) in Medium Term (2041-2060):** Median: 0.2 P25-P75: 0.1 to 0.3 **Increase in sea level (metres) in Long Term (2081-2100):** Median: 0.4 P25-P75: 0.2 to 0.5	**Increase in sea level (metres) in Medium Term (2041-2060):** Median: 0.2 P25-P75: 0.1 to 0.3 **Increase in sea level (metres) in Long Term (2081-2100):** Median: 0.5 P25-P75: 0.3 to 0.7
	Coastal flooding (Chronic)	Relative sea level rise is extremely likely to continue around Europe, contributing to increased coastal flooding in low-lying areas. The present-day 1-in-100-year extreme total water level (ETWL) is between 2.5 and 5.0 m around the UK. There is high confidence that extreme total water level (ETWL) magnitude and occurrence frequency will increase throughout Europe. Under RCP4.5, the present day 1-in-100-year ETWL is projected to have median return periods of between 1-in-20-years and	*No atlas data available for coastal flooding.*	

IPCC Climate Impact Driver Category	IPCC Climate Impact Driver (CID) / Climate-related hazard	IPCC AR6 Summary Findings[8]	IPCC WGI Interactive Atlas Data[9] (SSP2-4.5 Scenario)[10]	IPCC WGI Interactive Atlas Data[11] (SSP5-8.5 Scenario)[12]
		1-in-50-years by 2050 and between 1-in-5-years and 1-in-20-years by 2100.		
Other	Compound events	One typical compound event that is observed in the European area is compound flooding due to the combination of extreme sea level events and extreme precipitation events associated with high levels of runoff. Under RCP8.5, the probability of these events is projected to increase along northern European coasts, with the percentage of coastline now experiencing such events at least once every 6 years increasing by between 3% and 11% by the end of the 21st century. Compound events of dry and hot summers have increased in Europe. The probability of such compound events has increased across much of Europe between 1950–1979 and 1984–2013. Compound hot and dry extremes are projected to increase in Europe by mid-century for the Special Report on Emission Scenarios (SRES) A1B and RCP8.5 scenarios.	*No atlas data available for compound events.*	

2.3 Other Relevant Scientific Based Climate Predictions

2.3.1 TRANSLATE: One Climate Resource for Ireland

The TRANSLATE project is a Met Éireann lead initiative to standardise future climate projections for Ireland and develop climate services that meet the climate information needs of decision makers. It is a collaborative effort led by climate researchers from University of Galway – Irish Centre for High End Computing (ICHEC), and University College Cork – SFI Research Centre for Energy, Climate and Marine (MaREI), supported by Met Éireann climatologists.

TRANSLATE focuses on reviewing existing climate models to produce a national set of standardised climate projections. Climate services are then developed from these standardised climate projections to aid climate risk decision making across multiple sectors (for example, transport, energy, water). Climate services can be described as a set of services that communicate climate science data/information into products (for example, indices, risk assessments, uncertainty estimates) tailored to meet climate sensitive decision makers.

TRANSLATE's outputs are produced using a selection of internationally reviewed and accepted models from both CORDEX and high-resolution regional projections produced by ICHEC. Together they demonstrate a range of possible futures for Ireland based on assumptions of global human activity resulting in "least", "more" or "most" climate change. Historical climate data is evaluated against the observational record and corrected to remove any model bias. This correction is then applied to all future data. This allows information to be presented on how the variables change (difference) as well as actual values (absolute).

2.3.1.1 Climate Ireland – Climate Change Projection Maps

Climate Ireland is Ireland’s national adaptation platform and is provided by the Environmental Protection Agency as part of the EPA's climate adaptation work.

The Climate Change Projection Maps viewer has been developed to understand current and projected future climate conditions for Ireland. Observed Climate Information is based on TRANSLATE and Climate Change Projections are based on TRANSLATE along with EPA Research Report No. 339[17] for some variables.

The Climate Data Explorer provides three types of climate information:

- Observed Climate Information: average historical climate data on variables including temperature and precipitation for the period 1976-2005.
- Climate Change Projections (standardised and bias-corrected): future projections of changes for variables such as temperature and precipitation for a selection of time periods, scenarios and global warming levels (from Met Éireann's TRANSLATE project - O'Brien and Nolan (2023)).

[17] P. Nolan and J. Flanagan (2020) High-Resolution Climate Projections for Ireland – a Multi-model Ensemble Approach. EPA Research Report No. 339.

- Climate Change Projections (non-standardised): future projections of changes for variables such as snowfall, driving rain and wind energy for the period 2041-2060 (these projections come from Nolan and Flanagan (2020) and are compared to 1981-2000, rather than the TRANSLATE parameters). As further results come from standardised projects these maps will be replaced.

2.3.1.2 EPA Climate Projections

The EPA's Research Report on Climate Projections for Ireland (Research Report No. 339)[18] employs regional climate modelling to assess the impacts of a warming climate on the 21st-century climate of Ireland. Regional climate models (RCMs) take the outputs from global climate models (GCMs) to produce more refined projections of the potential local and regional impacts of climate change. The RCM simulations were run at high spatial resolution (3.8km and 4km) which allowed for a more realistic representation of important physical processes and enabling a more accurate evaluation of the local impacts of climate change across Ireland.

A multi-model ensemble approach was employed in the study to address the issue of uncertainty. Through the ensemble approach, the uncertainty in the projections can be partly quantified, thus providing a measure of confidence in the projections. Different RCMs were used to downscale outputs from a number of different CMIP5 (Coupled Model Intercomparison Project – Phase 5) GCMs.

Simulations were run for the reference period 1981–2000 and the future period 2041–2060. Differences between the two periods provide a measure of climate change. To account for the uncertainty in future greenhouse gas emissions and changing land use, and how the world will come together to respond to the challenge of climate change, the future climate was simulated under both the Representative Concentration Pathway 4.5 (RCP4.5) and RCP8.5 scenarios. The climate projections of EPA Research Report No. 339 are in broad agreement with previous research, which adds a measure of confidence to the projections.

2.3.2 Ireland's Changing Climate

Ireland's climate is changing in line with global trends, with a temperature increase of, on average, 0.8°C compared with 1900. By the middle of this century (2041 – 2060) the average annual temperatures are projected to increase by between 1–1.2℃ and 1.3–1.6℃ depending on the emissions trajectory. The number of warm days is expected to increase and heat waves are expected to occur more frequently.

Ireland has seen an increase in average annual national rainfall of approximately 60mm or 5% in the period 1981-2010, compared to the 30- year period 1961-1990. Significant reductions are expected in average levels of annual, spring and summer rainfall. Projections indicate a substantial increase in the frequency of heavy precipitation events in Winter and Autumn (approx. 20%).

The rate of global sea level rise for 2006–2015 of 3.6 mm per year, is unprecedented over the last century, and about 2.5 times the rate for 1901–1990. Sea level is projected to continue to

[18] P. Nolan and J. Flanagan (2020) High-Resolution Climate Projections for Ireland – a Multi-model Ensemble Approach. EPA Research Report No. 339.

rise at this rate or greater. All major cities in Ireland are in coastal locations subject to tides, any significant rise in sea levels will have major economic, social and environmental impacts. Rising sea levels around Ireland would result in increased coastal erosion, flooding and damage to property and infrastructure.

Other climate change indicators include the following:

- The last five-year (2015–2019) and ten-year (2010–2019) average temperatures are the warmest on record. Since the 1980s, each successive decade has been warmer than any preceding decade since 1850.
- In Ireland, 2019 was the ninth consecutive year with temperatures above normal.
- Ireland has seen a reduction in the number of frost days and shortening of length of the frost season.
- The number of very intense storms is projected to increase over the North Atlantic region. Projections suggest that the winter track of these storms may extend further south and over Ireland more often.
- Sea surface temperature in Irish waters has increased at a rate of approximately 0.6°C per decade since 1994, which is unprecedented in the 150-year observational record.

The climate projections for the next century indicate that observed climate trends will continue and intensify over the coming decades. Predicted impacts include:

- Changes in wind speeds and storm tracks;
- Increased likelihood of river and coastal flooding;
- Changes in distribution of plant and animal species and in the phenology (the timing of lifecycle events) of native species;
- Water stress for crops, pressure on water supply and adverse impacts on water quality;
- Negative impacts on human health and wellbeing.

Adaptation refers to actions taken to reduce vulnerability and exposure to climate change impacts. The more we reduce global emissions, the less adaptation to the consequences of climate change will be required. However, some impacts are already unavoidable.

The following Table 2-2 provides a summary of climate projections for Ireland and specific climate model simulations for Meath County Council using a combination of the *Climate Ireland* Climate Change Projection Maps[19] and EPA Research Report No. 339[20]. For the

[19] Climate Ireland - Climate Change Projection Maps.

[20] P. Nolan and J. Flanagan (2020) High-Resolution Climate Projections for Ireland – a Multi-model Ensemble Approach. EPA Research Report No. 339.

purposes of this report, the climate variables observed have been determined as “climate-related hazards” and have been grouped according to the IPCC CID Categories.

Climate projections were obtained for the future periods 2041-2060 and 2041-2070. The reference periods have been set at 1976-2005 and 1980-2000. Differences between the reference periods and future periods provide a measure of climate change. The climate scenarios utilised in the assessment are RCP4.5 and RCP8.5

Table 2-2: Climate Projections for Ireland and Meath (Data Source: Climate Ireland Climate Change Projection Maps)

IPCC Climate Impact Driver Category	Climate-related Hazard	Summary of Projections for Ireland[21]	Climate Model Simulations for Meath[22] (RCP4.5 Scenario)	Climate Model Simulations for Meath[22] (RCP8.5 Scenario)
Heat and Cold	Temperature Projections (Chronic) (Reference period 1976-2005; Future period: 2041-2070)	Mid-century mean annual temperatures are projected to increase by 0.6–1.7°C and 1.1–1.9°C for the RCP4.5 and RCP8.5 scenarios, respectively. Temperature projections show a clear west-to-east gradient, with the largest increases in the east.	Mean annual temperature change: +1.3°C Greatest seasonal change in Autumn with an expected increase of +1.6°C	Mean annual temperature change: +1.7°C Greatest seasonal change in Autumn with an expected increase of +2.2°C
	Surface Humidity (Chronic) (Reference Period 1981-2000; Future period: 2041-2060)	Specific humidity [23] is projected to increase substantially (≈10%) for all seasons by the middle of the century. Relative humidity [24] is projected to increase slightly (or show ≈0% change) for all seasons except summer. For summer, relative humidity is expected to decrease in the south-east and increase in the north-west (both RCP scenarios).	Annual mean change in specific humidity: +8.5% Relative humidity is projected to decrease slightly or show ≈0% change.	Annual mean change in specific humidity: +11.5% Relative humidity is projected to increase slightly (0.3%) or show ≈0% change.
	Heatwave[25] (Acute) (Reference period 1976-2005; Future period: 2041-2070)	The large projected increase in high summer temperatures suggests an increase in the number of heatwave events by the middle of the century. The changes range from -0.05 to 0.21 for the RCP4.5 scenario and from 0.04 to 0.28	Change in daily max temperature: +1.2°C Change in the number of heatwave events: +0.2	Change in daily max temperature: +1.7°C Change in the number of heatwave events: +0.4

[21] P. Nolan and J. Flanagan (2020) High-Resolution Climate Projections for Ireland – a Multi-model Ensemble Approach. EPA Research Report No. 339.
[22] Simulations were run for the reference period 1981–2000 and the future period 2041–2060.
[23] Specific humidity is the amount of water vapour in the atmosphere calculated as the ratio of the mass of water vapour to the total mass of the air parcel.
[24] Relative humidity is the ratio of the amount of water vapour present in the air to the greatest amount possible at the same temperature.

IPCC Climate Impact Driver Category	Climate-related Hazard	Summary of Projections for Ireland[21]	Climate Model Simulations for Meath[22] (RCP4.5 Scenario)	Climate Model Simulations for Meath[22] (RCP8.5 Scenario)
		for the RCP8.5 scenario. A sustained increase in the daily maximum temperature is associated with heatwaves.		
	Frost and Ice days (Acute) (Reference period 1976-2005; Future period: 2041-2070)	The large projected decrease in cold nights implies a decrease in the number of frost and ice days by the middle of the century. The number of frost days (days when the minimum temperature is <0°C) is projected to decrease by 22.09 to 8.84 under the RCP 4.5 scenario and 27.75 to 15.50 under the RCP 8.5 scenario. The number of ice days (days when the maximum temperature is <0°C) is projected to decrease by 0.36 to 0.10 in the RCP 4.5 scenario and 0.36 to 0.20 in the RCP 8.5 scenario.	The number of frost days is projected to decrease by -25. No projected change in the number of ice days.	The number of frost days is projected to decrease by -30. No projected change in the number of ice days.
Wet and Dry	Precipitation (Chronic) (Reference period 1976-2005; Future period: 2041-2070)	Substantial decreases in precipitation are projected for the summer months, with reductions up to -8.68% for the majority of the country (90th percentile) for the RCP 4.5 scenario and -15.62% for the RCP 8.5 scenario. Meath, however, indicates a change of 0% to -2% and 0% to -4% in the RCP 4.5 and RCP 8.5 scenarios, respectively. Other seasons, and over the full year, show small projected changes in precipitation with an average 2.86% and 4.81% increase over the whole country in the RCP4.5 and RCP8.5 scenarios, respectively. However, the mid-	Percentage increase in annual mean rainfall: +3% to +5% Percentage increase in spring rainfall: +2% to +5% Percentage change in summer rainfall: 0% to -2% Percentage increase in autumn rainfall: +3% Percentage increase in winter rainfall: +5% to +8%	Percentage increase in annual mean rainfall: +4% to +7% Percentage increase in spring rainfall: +4% to +5% Percentage decrease in summer rainfall: 0% to -4% Percentage increase in autumn rainfall: +7% Percentage increase in winter rainfall: +12% to +18%

IPCC Climate Impact Driver Category	Climate-related Hazard	Summary of Projections for Ireland[21]	Climate Model Simulations for Meath[22] (RCP4.5 Scenario)	Climate Model Simulations for Meath[22] (RCP8.5 Scenario)
		century precipitation climate is expected to become more variable with substantial projected increases in both dry periods and heavy precipitation events. The uncertainty of the mean precipitation projections may be partly attributed to the projected increase in the variability of the future Irish precipitation climate, resulting in an increase in both dry periods and heavy rainfall events.		
	Heavy Precipitation Events (Acute) (Reference period 1976-2005; Future period: 2041-2070)	Changes in the occurrence of heavy rainfall events are of particular importance because of the link with flooding. The projections indicate a decrease in the annual number of wet days[26] for the RCP4.5 (mean value -2.42%) and RCP8.5 (mean value -2.61%) scenarios. There is a projected increase in the annual number of very wet days[27], with mean values of 0.54% and 0.74% for the RCP4.5 and RCP8.5 scenarios, respectively.	Projected (percentage) decrease in the annual number of wet days: -1% to -2.5% *(It is noted that regional details are not reliable because of a large variability in the ensembles).*	Projected (percentage) decrease in the annual number of wet days: -1% to -2% *(It is noted that regional details are not reliable because of a large variability in the ensembles).*
			Projected increase in the annual number of very wet days: +1 *(It is noted that regional details are not reliable because of a large variability in the ensembles).*	Projected increase in the annual number of very wet days: +1.5 *(It is noted that regional details are not reliable because of a large variability in the ensembles).*

[26] A “wet day” is defined as one on which the daily precipitation amount is greater than 20mm.
[27] A “very wet day” is defined as one on which the daily precipitation is greater than 30mm.

IPCC Climate Impact Driver Category	Climate-related Hazard	Summary of Projections for Ireland[21]	Climate Model Simulations for Meath[22] (RCP4.5 Scenario)	Climate Model Simulations for Meath[22] (RCP8.5 Scenario)
	Dry Periods (Acute) (Reference Period 1981-2000; Future period: 2041-2060)	To quantify the potential impact of climate change on future drought events, the change in the number of dry periods[28] was analysed. The projections indicate an increase in the annual number of dry periods for the RCP4.5 and RCP8.5 scenarios (mean value ≈16% for both RCPs). The projected increases in dry periods are largest for summer, with "likely" values of +11% and +48% for the RCP4.5 and RCP8.5 scenarios, respectively.	Percentage increase in the number of annual dry periods: 15% to 20% Percentage increase in the number of summer dry periods: 15% to 30%	Percentage increase in the number of annual dry periods: 12% to 18% Percentage increase in the number of annual dry periods: 20% to 30%
Wind	Wind Speed and Sea Level Pressure (Chronic) (Reference Period 1981-2000; Future period: 2041-2060)	Mid-century mean 10-m wind speeds are projected to decrease for all seasons. The decreases are largest for summer months under the RCP8.5 scenario. The summer reductions in 10-m wind speed range from 0.3% to 3.4% for the RCP4.5 scenario and from 2% to 5.4% for the RCP8.5 scenario. Annual average mean sea level pressure (MSLP) is projected to increase by the middle of the century for both the RCP4.5 (mean value 1.4hPa) and RCP8.5 scenarios (mean value 1.2hPa). There exists a clear south-east to north-west gradient in the projections, with the largest increases in the north. The projected increases in MSLP are some of many possible factors that could contribute to the projections of	Percentage change in annual mean 10-m wind speed: -2% Change in annual average mean sea level pressure: +1.38 to +1.4 hPa	Percentage change in annual mean 10-m wind speed: -2% to -2.5% Change in annual average mean sea level pressure: +1.2 hPa

[28] A dry period is defined as at least 5 consecutive days on which the daily precipitation is less than 1mm.

IPCC Climate Impact Driver Category	Climate-related Hazard	Summary of Projections for Ireland[21]	Climate Model Simulations for Meath[22] (RCP4.5 Scenario)	Climate Model Simulations for Meath[22] (RCP8.5 Scenario)
		decreases in wind speed and wind power and increases in dry periods and heatwave events.		
	Storm Track Projections[29] (Acute) (Reference Period 1981-2000; Future period: 2041-2060)	Projections show a reduction of ≈10% in the numbers of less intense storms affecting Ireland and suggest an eastward extension of the more severe windstorms over Ireland and the UK from the middle of the century. It should be noted that because extreme storms are rare events, the storm projections should be considered with a level of caution.		
Snow and Ice	Snowfall (Chronic) (Reference Period 1981-2000; Future period: 2041-2060)	Annual snowfall is projected to decrease substantially by the middle of the century for the RCP4.5 (mean value 52%) and RCP8.5 scenarios (mean value 63%). The largest decreases are noted over low-lying regions. Averaged over the whole country, the "likely" decreases in mid-century snowfall are 51% and 60% for the RCP4.5 and RCP8.5 scenarios, respectively.	Percentage decrease in mean annual snowfall: -55%	Percentage decrease in mean annual snowfall: -65% to -70%

[29] Given the large societal impacts of extreme storms, there is considerable interest in the potential impact of climate change on extreme cyclonic activity in the North Atlantic. Windstorms and associated high wind speeds are a major source of natural hazard risk for Ireland and many countries across Europe.

IPCC Climate Impact Driver Category	Climate-related Hazard	Summary of Projections for Ireland[21]	Climate Model Simulations for Meath[22] (RCP4.5 Scenario)	Climate Model Simulations for Meath[22] (RCP8.5 Scenario)
Other (Energy Impacts)	Heating degree days[30] (Reference period 1976-2005; Future period: 2041-2070)	The projected change in heating degree days (HDDs) shows that by the middle of the century there will be a greatly reduced requirement for heating in Ireland, with HDDs projected to decrease by 12–17% and 15–21% for the RCP4.5 and RCP8.5 scenarios, respectively. A clear north-to-south gradient is evident for both RCP scenarios, with the largest decreases in the south. Averaged over the whole country, the expected decreases in HDDs are 14% and 18% for the RCP4.5 and RCP8.5 scenarios, respectively.	Percentage decrease in mean annual in HDD: -15% to -20%	Percentage decrease in mean annual in HDD: -20% to -23%
	Cooling degree days[31] (Reference Period 1981-2000; Future period: 2041-2060)	The projections show that cooling degree days (CDDs) are expected to slightly increase, particularly over the east and midlands, suggesting a small increase in air conditioning requirements by the middle of the century. However, the amounts are small compared with HDDs and therefore have a negligible effect on the projected changes in the total energy demand		

[30] A degree day, an estimate of accumulated heat, is defined as the deviation (°C) from a base temperature value. Heating degree days (HDDs) are used by power companies and consumers to estimate the amount of energy required for residential or commercial space heating during the cold season.
[31] Cooling degree days (CDDs) are used to estimate the amount of air conditioning usage during the warm season.

IPCC Climate Impact Driver Category	Climate-related Hazard	Summary of Projections for Ireland[21]	Climate Model Simulations for Meath[22] (RCP4.5 Scenario)	Climate Model Simulations for Meath[22] (RCP8.5 Scenario)
	Solar photovoltaic (PV) power (Reference Period 1981-2000; Future period: 2041-2060)	To assess the impacts of climate change on solar power in Ireland, projections of solar photovoltaic (PV) power were analysed. Results show an expected small decrease in PV by the middle of the century ranging from ≈0 to 4%. The largest decreases are noted in the north of the country and for the RCP8.5 scenario.	Percentage decrease in mean annual in PV: -1% to -2%	Percentage decrease in mean annual in PV: -2% to -3%

3 CLIMATE RISK SCREENING

3.1 Technical Screening Criteria Requirements

For the purposes of the assessment, the methodology outlined in Regulation (EU) 2020/852 of the European Parliament and of the Council (the 'Taxonomy Regulation') and Commission Delegated Regulation (EU) 2021/2139[32] (the 'Supplementing Regulation') for a Climate Risk and Vulnerability Assessment has been adopted.

The 'Supplementing Regulation' establishes the Technical Screening Criteria for '*Substantial contribution to climate change adaptation'* specific to certain economic activities. Annex II, Section 7.1 (2) of the Supplementing Regulation sets out the following criteria for assessing risk on the 'Construction of new buildings':

2. *The physical climate risks that are material to the activity have been identified from those listed in Appendix A to this Annex by performing a robust climate risk and vulnerability assessment with the following steps:*

    a. *screening of the activity to identify which physical climate risks from the list in Appendix A to this Annex may affect the performance of the economic activity during its expected lifetime;*

    b. *where the activity is assessed to be at risk from one or more of the physical climate risks listed in Appendix A to this Annex, a climate risk and vulnerability assessment to assess the materiality of the physical climate risks on the economic activity;*

    c. *an assessment of adaptation solutions that can reduce the identified physical climate risk.*

The first step of the climate risk and vulnerability assessment, as set out in Annex II, Section 7.1 (2) (a) of the Supplementing Regulation (and provided above), is the screening of the activity to identify which physical climate risks from the list in Appendix A of Annex II of the Supplementing Regulation may affect the performance of the economic activity during its expected lifetime. These physical climate risks are provided in Table 3-1.

Table 3-1: Classification of climate related hazards (Source: Appendix A of Annex II of the Commission Delegated Regulation 2021/2139[33])

	Temperature-related	Wind-related	Water-related	Solid mass-related
Chronic	Changing temperature (air, freshwater, marine water)	Changing wind patterns	Changing precipitation patterns and types (rain, hail, snow/ice)	Coastal erosion

[32] Commission Delegated Regulation (EU) of 4.6.2021 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives.

[33] Appendix 2 of this report contains a copy of Appendix A of Annex II of the Supplementing Regulation.

	Temperature-related	Wind-related	Water-related	Solid mass-related
	Heat stress		Precipitation or hydrological variability	Soil degradation
	Temperature variability		Ocean acidification	Soil erosion
	Permafrost thawing		Saline intrusion	Solifluction
			Sea level rise	
			Water stress	
Acute	Heat wave	Cyclone, hurricane, typhoon	Drought	Avalanche
	Cold wave/frost	Storm (including blizzards, dust and sandstorms)	Heavy precipitation (rain, hail, snow/ice)	Landslide
	Wildfire	Tornado	Flood (coastal, fluvial, pluvial, ground water)	Subsidence
			Glacial lake outburst	

The climate risk screening primarily considers the location of the Proposed Development; this allows certain climate-related hazards to be initially excluded from the screening assessment based on location. Climate projections for the area of the Proposed Development along with risk levels as determined by the IPCC AR6 WGI and MCC CCAP are then utilised to determine the climate risks which are material to the Proposed Development. Climate risks that are material to the Proposed Development are then subsequently identified from those listed in Table 3-1.

3.2 Risk Identification

3.2.1 Project Site Location

The Proposed Development is located at sites of c. 21.9ha in total and 15.79ha net developable area respectively, on lands at Station Road and Pace Line, Dunboyne, Co. Meath. The Site is located in the north-east of Dunboyne town and along Station Road, with agricultural fields comprising part of the River Tolka's western floodplain to its north and east and residential lands to the south and west. The Site is located adjacent to Dunboyne train station, with the rail line running along the Site's western boundary.

The site generally slopes from north to south. There is a high point of approximately 72.21 OD Malin and a low point of approximately 68.30 OD Malin. The existing gradient across the site is approximately 1:67.4 and 1:57.7. There is a maximum level difference of 3.9m across the site.

The Site is located approximately 22km west of the Irish Sea at Portmarnock where the highest tide level is ca. 4.5 metres above ordnance datum (AOD) (Malin).

A Ground Investigation Report[34] was carried out for the Site which investigated subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The sequence of strata encountered were consistent across the site and generally comprised:

- Topsoil;
- Glacial Till;
- Fluvioglacial Deposits.

The full details of the strata encountered during the ground investigation are provided in the Ground Investigation Report.

Due to the use of appropriate foundations, the Site will not be prone to subsidence. The topography of the Site and surrounding area would not be prone to landslide risk.

A Flood Risk Assessment (FRA)[35] has been carried out for the Proposed Development which considers the potential flood mechanisms at the Site.

Flood zones are defined in the *"Planning System and Flood Risk Management"* Guidelines as *"geographical areas within which the likelihood of flooding is within a particular range"* (OPW, 2009). There are three types or levels of flood zones defined for the purposes of the Flood Guidelines:

- Flood Zone A – where the probability of Developments within these areas are required to comply with the recommendations of the Planning System and Flood Risk Guidelines for Planning Authorities (DoEHLG / OPW 2009) flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);

- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 and 0.5% or 1 in 200 for coastal flooding);

- Flood Zone C - where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas on the plan which are not in zones A or B.

According to the FRA, review of the Dunboyne area Flood Zones shows the access road to the site is located within Flood Zone B; and the majority of the site is within Flood Zone C.

The principal source of flooding to the site is fluvial. The River Tolka flows from northwest to southeast, east of the main site. The Castle Stream and its tributary flow to the south of the site in an easterly direction. There are a number of drainage ditches within the site boundary which discharge into the Tolka River via its tributary east of the site. These drains are not identified as watercourses on the EPA mapping and so are considered drainage ditches (surface water features). According to OPW Fluvial Flood Map the 1% AEP flood event (Flood

[34] Refer to Ground Investigation Report, Causeway Geotech Ltd, March 2019.
[35] Refer to Flood Risk Assessment, JBA Consulting, August 2024.

Zone A) does not inundate the site with a small section of the site inundated in the 0.1% AEP flood event (Flood Zone B).

The detailed hydrological and hydraulic analysis has been undertaken to verify the CFRAM mapping within the main site boundary and add in additional drainage ditches not previously modelled. The modelling confirms the drainage ditches contain both Flood Zone A and B from overland flows from the Tolka River in their lower reaches. One of these drains in Flood Zone B is proposed to be backfilled as part of the development. Compensatory storage has been designed for the site which compensates for the loss of Flood Zone B. Refer to the FRA for full details.[36]

Pluvial flooding occurs due to insufficient capacity in the local drainage network system which results in overland flows as well as the ponding of water in topographically low points. It is usually associated with high intensity rainfall. Due to the predicted increase in the frequency and intensity of extreme rainfall events, it is prudent that site specific drainage and management measures aimed at mitigating the effects of pluvial flooding are incorporated into the development design. The FRA has indicated that adequate surface water drainage systems will manage the pluvial flood risk. To prevent the risk of pluvial flooding due to overland flow in extreme rainfall events, the drainage network is to be designed in accordance with the regulations e.g., Greater Dublin Strategic Drainage Study (GDSDS) and to take account of flood exceedance for storms return periods exceeding 1% AEP (Annual Exceedance Probability). These measures are discussed in Table 4-1 of this Report.

There are flood risks associated with misuse, neglect, damage, intervention of or lack of intervention attributable to mechanical failure or human error. Such a risk can be caused by blockages in piped systems or lack of maintenance of mechanical devices. The correct operation and maintenance of the drainage system is necessary to reduce the risk of human or mechanical error causing pluvial flood risk from blockage. The storm water network will be maintained regularly as part of the Proposed Development's operational plan and procedure and a number of maintenance measures have been outlined within the Engineering Services Report[37].

The risk of groundwater flooding has been screened out based on the findings of the FRA.

Tidal Flooding is caused by elevated sea levels or overtopping by wave action. The site is located ca. 22km inland from the Irish Sea and the site levels exceed the highest ever recorded or projected tide in the area. The Site is not at risk of tidal flooding due to its geographic location and topography. The risk from tidal flooding is considered extremely low and no flood mitigation measures need to be implemented.

Based on a review of the Proposed Development Site location, the following potential climate-related hazards, as listed in Table 3-1, can be excluded from the screening assessment:

- **Sea level rise:**

[36] Refer to Flood Risk Assessment, JBA Consulting, August 2024.

[37] Refer to Engineering Services Report, DBFL Consulting Engineers, June 2024.

- Due to the elevation of the Site and its position above sea level, it is not expected to be affected by sea level rise.[38]

- **Temperature-related:** permafrost thawing; wildfire.

- The Site is located close to an urban setting; therefore, highly unlikely to be affected by wildfires. Permafrost is not relevant to the Irish climate.

- **Wind-related:** tornado.

- It is possible that thunderstorms with conditions favourable for tornado events and warmer, unstable weather attributed to climate change may be linked. On average, Ireland experiences ten tornadoes per year although many of these are weak and often occur without being noticed. There have been more reports of tornadoes in Ireland in recent years, some of which have caused considerable damage to buildings and local infrastructure. This may indicate that the risk of more powerful tornadoes in Ireland is rising, however there currently lacks tangible evidence on this subject. Therefore, it is recommended that this climate hazard is revisited in line with emerging studies and findings.

- **Solid mass-related:** soil degradation; soil erosion; solifluction; avalanche; landslide; subsidence**.**

- In relation to soil degradation and soil erosion, there will be unavoidable loss of in—situ soil and subsoil from the Proposed Development Site to achieve the required formation levels for the Proposed Development including building foundations, roads, drainage, and other infrastructure. It is anticipated that all excavated soil will be reused on Site, subject to suitability testing and as far as reasonably practical.

- Due to the use of appropriate foundations, the Site will not be prone to subsidence.

- Due to the location and topography of the Site, solifluction has been excluded in the long-term.

- According to the Landslide Susceptibility Map developed by Geological Survey Ireland (GSI), the Proposed Development Site is considered Low in terms of landslide susceptibility.[39]

- Avalanches are not considered relevant based on Irelands historical and future projected climate.

[38] Climate Central - Coastal Risk Screening Tool

[39] Geological Survey Ireland - Landslide Susceptibility Map

3.2.2 IPCC AR6 WGI Climate Impact Drivers and Confidence in Future Changes for Northern Europe and Ireland

The IPCC WGI has developed an Interactive Atlas to demonstrate Climatic Impact-drivers (CIDs) predictions across the globe. CIDs are physical climate system conditions (e.g., means, events, extremes) that affect an element of society or ecosystems. Depending on system tolerance, CIDs and their changes can be detrimental, beneficial, neutral, or a mixture of each across interacting system elements and regions. CID types include heat and cold, wet and dry, wind, snow and ice, coastal and open ocean.

Chapter 12 of IPCC AR6 WGI surveys the links between CIDs and affected sectors and provides a matrix of CIDs for regional sectors that are rated based on their potential impact and risk relevance. Impacts, risks, and opportunities are rarely attributable to a single CID index or threshold, but climate shifts that push conditions outside of expected conditions and beyond tolerance levels are indicative of impact, risk or benefit given vulnerability and exposure. Focus is on direct sectoral connections of a CID rather than cascading or secondary effects. Within each sector there is a multitude of specific sectoral systems that may be affected by CID increases and decreases, with consequences further distinguished by region, background climate and socio-economic or ecological context of the affected asset.

The Proposed Development falls within the sector of the “Built Environment” as per IPCC AR6 WGI. Therefore, CIDs and their associated impact/risk relevance for the Built Environment have been provided in Table 3-2:

Table 3-2: Impacts and Risk Relevance for the "Built Environment”.

Category	CIDs	Impacts and Risk Relevance
HEAT AND COLD	Mean air temperature	High
	Extreme heat	High
	Cold spell	Low/moderate
	Frost	None/low confidence
WET AND DRY	Mean precipitation	None/low confidence
	River flood	High
	Heavy precipitation and pluvial flood	High
	Landslide	Low/moderate
	Aridity	None/low confidence
	Hydrological drought	None/low confidence
	Agricultural and ecological drought	Low/moderate
	Fire weather	Low/moderate
WIND	Mean wind speed	None/low confidence
	Severe windstorm	High
	Tropical cyclone	High
	Sand and dust storm	Low/moderate
SNOW AND ICE	Snow, glacier and ice sheet	None/low confidence
	Permafrost	Low/moderate
	Lake, river and sea ice	None/low confidence
	Heavy snowfall and ice storm	Low/moderate
	Hail	Low/moderate
	Snow avalanche	Low/moderate
	Relative sea level	High

Category	CIDs	Impacts and Risk Relevance
COASTAL AND OCEANIC	Coastal flood	High
	Coastal erosion	High
	Marine heatwave	None/low confidence
	Ocean acidity	None/low confidence
OTHER	Air pollution weather	None/low confidence
	Atmospheric CO_2 at surface	None/low confidence
	Radiation at surface	Low/moderate

The CIDs, and confidence in future changes of climate for Northern Europe are demonstrated in Table 3-3:

Table 3-3: IPCC WGI Interactive Atlas: Regional synthesis Climate Change Predictions for Northern Europe

Category	CIDs	Future Changes	
HEAT AND COLD	Mean surface temperature	High confidence of increase	△
	Extreme heat	High confidence of increase	△
	Cold spell	High confidence of decrease	▽
	Frost	High confidence of decrease	▽
WET AND DRY	Mean precipitation	High confidence of increase	△
	River flood	Medium confidence of decrease	▽
	Heavy precipitation and pluvial flood	High confidence of increase	△
	Landslide	Low confidence in direction of change	—
	Aridity	High confidence of decrease	▽
	Hydrological drought	Low confidence in direction of change	—
	Agricultural and ecological drought	Low confidence in direction of change	—
	Fire weather	Low confidence in direction of change	—
WIND	Mean wind speed	Medium confidence of decrease	▽
	Severe windstorm	Medium confidence of increase	△
	Tropical cyclone	Not relevant	✕
	Sand and dust storm	Not relevant	✕
SNOW AND ICE	Snow, glacier and ice sheet	High confidence of decrease	▽
	Permafrost	High confidence of decrease	▽
	Lake, river and sea ice	High confidence of decrease	▽
	Heavy snowfall and ice storm	Low confidence in direction of change	—
	Hail	Low confidence in direction of change	—
	Snow avalanche	Low confidence in direction of change	—
COASTAL AND OCEANIC	Relative sea level	High confidence of increase	△
	Coastal flood	High confidence of increase	△
	Coastal erosion	High confidence of increase	△
	Marine heatwave	High confidence of increase	△
	Ocean acidity	High confidence of increase	△
OTHER	Air pollution weather	Low confidence in direction of change	—
	Atmospheric CO_2 at surface	High confidence of increase	△
	Radiation at surface	Medium confidence of decrease	▽

The CIDs and predicted changes in future climate for Meath, Ireland are presented in Table 3-4 below, as adapted from the findings in Table 2-2 of this Report:

*Table 3-4: Climate Change Predictions for **Meath** (based on Climate Ireland Climate Change Projection Maps)*

Category	CIDs	Future Changes
HEAT AND COLD	Mean surface temperature	Predicted increase
	Extreme heat	Predicted increase
	Cold spell	Predicted decrease
	Frost	Predicted decrease
WET AND DRY	Mean precipitation	Predicted increase
	River flood	Predicted increase
	Heavy precipitation and pluvial flood	Predicted increase
	Hydrological drought	Predicted increase
	Agricultural and ecological drought	Predicted increase
WIND	Mean wind speed	Predicted decrease
	Severe windstorm	Predicted increase
SNOW AND ICE	Snow, glacier and ice sheet	Predicted decrease
	Heavy snowfall and ice storm	Predicted decrease
COASTAL AND OCEANIC	Relative sea level	Predicted increase
ENERGY IMPACTS (OTHER)	Heating degree days	Predicted decrease
	Cooling degree days	Predicted increase
	Solar photovoltaic (PV) power	Predicted decrease

3.2.3 Meath County Council Climate Action Plan (2024-2029) Risk Statement

Meath County Council undertook a climate change risk assessment as part of the MCC CAP 2024-2029. The purpose of the climate change risk assessment is to better understand the current risks that County Meath faces and provide a view on the potential frequency and impact of future climate events.

Climate hazards include extreme weather events and periods of climate variability. Figure 3-1 provides an illustration of extreme weather events in County Meath (1986 – 2022).

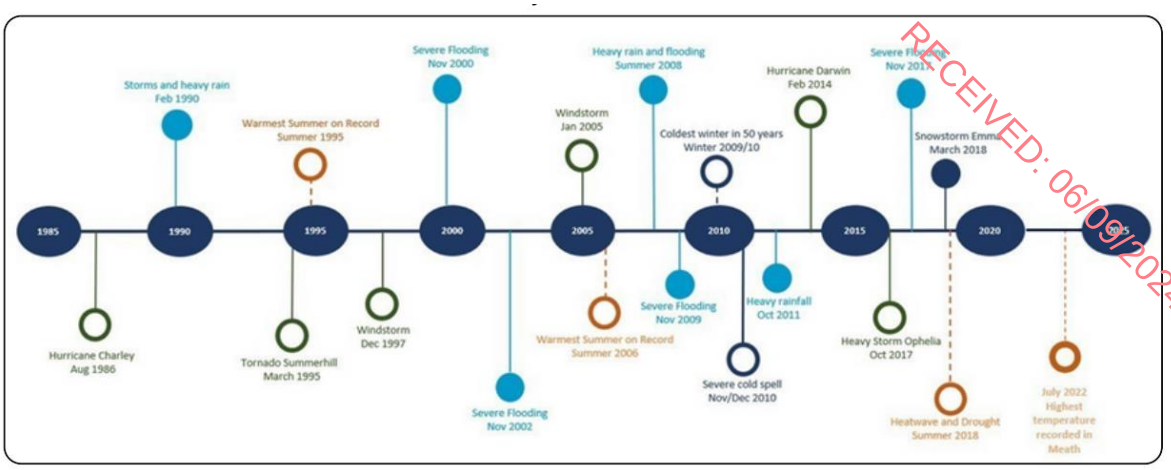

Figure 3-1: Illustration of Extreme Weather Events in County Meath (1986-2022) (Source: MCC CAP)

The assessment identified windstorms as posing the highest level of climate change risk for County Meath. Key impacts from windstorms include damage to buildings and infrastructure such as roads, powerlines, and communications systems. Coastal locations like Laytown and Bettystown will be more exposed to wind as there are no land barriers to slow the wind as there are no land barriers.

Flooding has been identified as posing a relatively high risk for County Meath with impacts experienced on a localised scale including damage to assets and infrastructure and potential for isolation of communities and reduced business activities. Inland locations through which rivers run are exposed to fluvial flooding. There are many small rivers intertwining throughout County Meath, such as the Inny, Delvin, and Broadmeadow. One of the principal rivers in Meath is the Boyne which flows through a number of large urban centres.

Laytown and Bettystown will also be exposed to sea level rise in a high warming scenario. Coastal flooding in Laytown and Bettystown is considered to be a potential risk in a four-degree temperature increase scenario to 2050. The impact of heavy snowfall and cold spells on County Meath will likely decrease due to the decrease in intensity and duration of these events.

The whole of County Meath will be exposed to drought as the frequency and duration of drought events are projected to increase. Agriculture will be particularly vulnerable to drought and water stress for the growth of crops including grass, this in turn will potentially impact livestock.

Assessing the major recent climate events in County Meath shows the impacts and risks associated with climate change. It has become clear that the frequency and intensity of weather events are having a more profound impact on not only the County of Meath, but also Meath County Council's services and operations. This analysis helps Meath County Council better understand the potential climate risk to County Meath, its citizens, and how the County operates. This process aids the development of mitigation and adaptation initiatives that will be undertaken across the County.

The following Table 3-5 describes the future projected changes to climate hazard risk for County Meath, as set out within the MCC CAP.

Table 3-5: Future Projected Changes to Climate Hazard Risk for County Meath (Source: MCC CAP)

Climate Hazard	Change Projections	Summary	Future Frequency
Droughts **Heatwaves** **Flooding**	The climate risks associated with droughts, heatwaves and floods are expected to increase significantly for County Meath as a result of projected increases in the frequency of hazard events and also due to an increase in the areas, assets and populations exposed to these hazards. The risk is exacerbated by not only projected changes in the frequency occurrence of drought and heatwaves but also as a result of projected increases in population and the proportion of population considered vulnerable (those aged 65 years and over). Meath County Council's services are likely to be impacted by these changes with increased pressure on services before, during and after extreme weather events. There will likely be a significant financial impact to Meath County Council due to the likely need to allocate more financial resources towards climate related mitigation and adaptation measures.	These are emerging and increasing risks	
Windstorms	The impact of severe windstorms will likely increase marginally in County Meath. There will be an increase in the intensity of storms but not necessarily the frequency. There will be an increase in the cost of the actions that Meath County Council takes before, during, and after an event e.g., removal of fallen trees, repair of public infrastructure.	This is an increasing risk	
Extreme Cold Heavy Snowfall	The impact of heavy snowfall and cold spells on County Meath will likely decrease due to the decreased intensity and duration of these events., The overall risk of these hazards is projected to reduce in the future, resulting in less risk. These are decreasing risks.	These are decreasing risks	

3.2.4 Identified Climate Risks

The CIDs, and confidence in future changes of climate for Northern Europe, as presented in IPCC AR6 WGI, have been taken into consideration along with the location of the Proposed Development, projected changes in climate for Ireland, and future climate risk levels as determined within the MCC CAP, in order to determine what risks are material to the Proposed Development.

Based on these findings, as presented in Table 3-2 to Table 3-5, the following Table 3-6 indicates the CIDs of relevance to the Proposed Development. Only CIDs which have been assigned as low/moderate or high in IPCC AR6 WGI findings for the "Built Environment" have been included here; anything that has been assigned none/low confidence has been omitted (aside from hydrological drought).

Table 3-6: Climate Risk Screening

Category	CIDs	IPCC Impacts and Risk Relevance to the Built Environment	Predicted Change in CID for Northern Europe and Ireland (Meath)	Included in MCC CAP	Material Risk
HEAT AND COLD	Mean air temperature (chronic)	High	High confidence of increase in Northern Europe. Projections for Meath indicate an increase in mean air temperature.	Yes	**Yes**
	Extreme heat (acute)	High	High confidence of increase in Northern Europe. Projections for Meath indicate an increase in heatwaves.	Yes	**Yes**
	Cold spell (acute)	Low/moderate	High confidence of decrease in Northern Europe. Projections for Meath indicate a decrease in cold spells.	Yes	**No**
WET AND DRY	River flood (acute)	High	Medium confidence of decrease for Northern Europe. Very wet days predicted to increase in Meath.	Yes	**Yes**
	Heavy precipitation and pluvial flood (acute)	High	High confidence of increase for Northern Europe. Very wet days predicted to increase in Meath.	Yes	**Yes**
	Landslide (acute)	Low/moderate	Low confidence in direction of change. The Proposed Development Site is considered Low in terms of landslide susceptibility.	No	**No**
	Hydrological Drought [40] (acute)	None/low confidence	Low confidence in direction of change for Northern Europe. Number of dry periods expected to increase in Meath.	Yes	**Yes**

[40] Though this has been assigned as none/low confidence by the IPCC in terms of impacts and risk relevance to the built environment, climate predictions for Ireland indicate an increase in the frequency and duration of droughts. Therefore, this CID has not been omitted from the current risk screening.

Category	CIDs	IPCC Impacts and Risk Relevance to the Built Environment	Predicted Change in CID for Northern Europe and Ireland (Meath)	Included in MCC CAP	Material Risk
	Agricultural and ecological drought (acute)	Low/moderate	Low confidence in direction of change.	No	**No**
	Fire weather (acute)	Low/moderate	Low confidence in direction of change.	No	**No**
WIND	Severe windstorm (acute)	High	Medium confidence of increase in Northern Europe. Increase in windstorms projected for Ireland with level of caution for uncertainty.	Yes	**Yes**
	Tropical cyclone (acute)	High	Not relevant for location.	No	**No**
	Sand and dust storm (acute)	Low/moderate	Not relevant for location.	No	**No**
SNOW AND ICE	Permafrost thawing (chronic)	Low/moderate	Not relevant for location.	No	**No**
	Heavy snowfall and ice storm (acute)	Low/moderate	Low confidence in direction of change for Northern Europe. Projections for Meath predict a decrease in snowfall.	Yes	**No**
	Hail (acute)	Low/moderate	Low confidence in direction of change.	No	**No**
	Snow avalanche (acute)	Low/moderate	Not relevant for location.	No	**No**
COASTAL & OCEANIC	Relative sea level (chronic)	High	High confidence of increase in Northern Europe. Laytown and Bettystown will also be exposed to sea level rise.	Yes	**No**
	Coastal flood (acute)	High	High confidence of increase in Northern Europe. Due to the location of the site and proximity to the coast, the FRA does not consider coastal flooding to be a risk to the Proposed Development.	Yes	**No**

Category	CIDs	IPCC Impacts and Risk Relevance to the Built Environment	Predicted Change in CID for Northern Europe and Ireland (Meath)	Included in MCC CAP	Material Risk
	Coastal erosion (chronic)	High	High confidence of increase in Northern Europe. Due to the location of the site and proximity to the coast, coastal erosion is not considered to be a risk to the Proposed Development.	Yes	**No**
OTHER	Radiation at surface (chronic)	Low/moderate	Medium confidence of decrease in Northern Europe. The Radon Map for Ireland[41] indicates that the western portion of the Application Site is located in an area where about 1 in 20 homes in this area are likely to have high radon levels and the eastern portion of the Application site is located in an area where about 1 in 10 homes in this area are likely to have high radon levels.	No	**Yes**
	Compound flooding	High	The probability of these events is projected to increase along northern European coasts	No	**Yes**

[41] EPA Radon Map for Ireland

Taking account of the findings presented in Table 3-2 to Table 3-6, the physical climate risks from the list in Appendix A of Annex II of the Supplementing Regulation (as provided in Table 3-1) which may affect the performance of the economic activity during its expected lifetime have been revised in terms of relevancy to the Proposed Development. Table 3-7 presents the physical climate risks which have been deemed relevant to the Proposed Development (highlighted) and those which have been excluded (strikethrough):

Table 3-7: Classification of climate related hazards which are relevant to the Proposed Development

	Temperature-related	Wind-related	Water-related	Solid mass-related
Chronic	Changing temperature (air, freshwater, marine water)	~~Changing wind patterns~~	~~Changing precipitation patterns and types (rain, hail, snow/ice)~~	~~Coastal erosion~~
	~~Heat stress~~		~~Precipitation or hydro-logical variability~~	~~Soil degradation~~
	~~Temperature variability~~		~~Ocean acidification~~	~~Soil erosion~~
	~~Permafrost thawing~~		~~Saline intrusion~~	~~Solifluction~~
			~~Sea level rise~~	
			~~Water stress~~	
Acute	Heat wave	~~Cyclone, hurricane, typhoon~~	Drought	~~Avalanche~~
	~~Cold wave/frost~~	Storm (including blizzards, dust and sandstorms)	Heavy precipitation (rain, hail, snow/ice)	~~Landslide~~
	~~Wildfire~~	~~Tornado~~	Flood (coastal, fluvial, pluvial, ground water)	~~Subsidence~~
			~~Glacial lake outburst~~	

4 CLIMATE RISK AND VULNERABILITY ASSESSMENT

4.1 Technical Screening Criteria Requirements

In accordance with the methodology as outlined in Annex II, Section 7.1 (2) (a) of the Supplementing Regulation, Section 3 of this Report has screened the activity to identify which physical climate risks from the list in Appendix A of Annex II of the Supplementing Regulation may affect the performance of the economic activity during its expected lifetime.

The remaining steps, as set out in Annex II, Section 7.1 (2) of the Supplementing Regulation (and provided above), are to conduct a climate risk and vulnerability assessment to assess the materiality of the physical climate risks on the economic activity and assess the adaptation solutions that can reduce the identified physical climate risk. This has been completed using the IPCC framework on the assessment of risk and is detailed in the following sections.

4.2 Climate Risk and Vulnerability Assessment Framework

The IPCC provides a framework to assess risk. This framework evaluates risks which may emerge due to the overlap of Climate Hazards, Vulnerability, and Exposure[42].

Figure 4-1: IPCC (AR6) Risk Assessment Propeller

[42] IPCC (2022) Working Group II Contribution to the Sixth Assessment Report (AR6), Climate Change 2022: Impacts, Adaptation and Vulnerability.

Section 3 (Climate Risk Screening) identified the following Climate Hazards as posing a potential risk to the Proposed Development:

- Temperature (chronic)
- Temperature (acute)
- Precipitation (acute)
- Drought (acute)
- Wind (acute)
- Compound events (acute)

Table 4-1 below evaluates these Climate Hazards, the risk factors (Exposure), the current sensitivity and adaptive capacity of the development (Vulnerability), and the subsequent risk level. Adaptation solutions that can reduce the identified physical climate risk have been assessed and any further recommendations for additional adaptation and mitigation measures which may improve the Proposed Development's resilience to climate change impacts are also noted.

Table 4-1: Risk and Vulnerability Assessment

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
WET AND DRY	**Temperature (chronic)** *Increase in mean annual air temperature*	Increased cooling days for the buildings, extra power usage.	Landscaping and the use of trees and plants will shade and contribute to the cooling of the air through evapotranspiration[43]. All of the units will be subject to the NZEB (Nearly Zero Energy Building) requirements of the updated Part L Regulations, from 2021 that are in effect. In terms of energy ratings all of the units on site will have a Building Energy Rating (BER) of A2 / A3[44]. A number of low energy technologies are being considered for the development. According to the Energy Statement[45], the following measures will be implemented to reduce the energy consumption of the Proposed Development: • High performance building fabric; • Passive solar; • Energy efficient lighting; • Space heating and controls. The following renewable energy solutions are also proposed: • Solar Photovoltaic (PV); • Combined Heat and Power; • Heat pumps. Heat Recovery Ventilation (HRV) is proposed to ensure a supply of fresh air by extracting air from the "wet" rooms and supplying fresh air to the living spaces via a ducting network. Each system is dedicated to the	Low Risk once existing proposed measures are implemented.	Inspection and maintenance of the PV solar panel and HVAC systems will be carried out periodically and completed in accordance with good practice.

[43] Evapotranspiration is a term used to refer to the combined processes by which water moves from the earth's surface into the atmosphere.
[44] Refer to Energy Statement, McElligott Consulting Engineers, July 2024.
[45] Refer to Energy Statement, McElligott Consulting Engineers, July 2024.

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
			apartment or house it serves and will be independently commissioned as per the current Part F Regulations. Ventilation has a significant bearing on wellbeing and the sustained ventilation rates delivered by a HRV system give quantifiable air flow rates to rooms and this ensures humidity is controlled and carbon dioxide levels are low. The most obvious benefit is that the outgoing stale air heats up the incoming fresh air, reducing the heat load of the apartment The Heating Ventilation Air Conditioning (HVAC) system design has been considered to ensure minimal energy requirements in the building. The proposed HVAC systems will be selected based upon their efficiency performance, which has been assessed to ascertain their coefficient performance in terms of heating, cooling, and hot water generation. Centralised mechanical ventilation and natural ventilation will be considered to provide adequate ventilation with low energy usage. PV solar panels are being considered which will offset Primary Energy associated with electricity. Passive measures will be utilised such as minimising solar gain (glazing selection), high performance U-values, improved air tightness, and improved thermal transmittance and thermal bridging. These measures will significantly contribute towards reducing the loads on the active systems within the building[46].		
	Temperature (acute)	Increased cooling days for buildings, extra power usage.	Due to factors such as climate change, population increase, and construction of high-rise buildings there has been an increase in high internal temperatures.	Low Risk once existing proposed	Inspection and maintenance of the PV solar panels and HVAC systems will be carried out

[46] Refer to Energy Statement, McElligott Consulting Engineers, July 2024.

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
	Increase in frequency and duration of heatwave events		A number of low energy technologies are being considered for the development; the specific combination from the options as listed within the Energy Statement will be decided upon during the detailed design stage and then implemented to achieve an A2 / A3 BER rating[47]. The Heating Ventilation Air Conditioning (HVAC) system design has been considered to ensure minimal energy requirements in the building. The proposed HVAC systems are selected based upon their efficiency performance, which has been assessed to ascertain their coefficient performance in terms of heating, cooling, and hot water generation. Centralised mechanical ventilation and natural ventilation will be considered to provide adequate ventilation with low energy usage. PV solar panels are being considered which will offset Primary Energy associated with electricity. Passive measures will be utilised such as minimising solar gain (glazing selection), high performance U-values, improved air tightness, and improved thermal transmittance and thermal bridging. These measures will significantly contribute towards reducing the loads on the active systems within the building[48].	measures are implemented.	periodically and completed in accordance with good practice.
	Precipitation (acute) *Increase in heavy precipitation and pluvial and river flood*	Pressure on drainage systems.	Risk of fluvial flooding to the site is managed by setting floor levels to the 1% AEP climate change water level, plus a freeboard allowance of at least 500mm, this the case for both MFRS and HEFS scenarios. All buildings have also been located in Flood Zone C, further minimising the risk of inundation. The post-development modelling also confirms there is no increase in flood risk	Low Risk once existing proposed measures are implemented.	No additional measures proposed. A programme of maintenance measures has been detailed in the Engineering Services Report. It will be the

[47] Refer to Energy Statement, McElligott Consulting Engineers, July 2024.
[48] Refer to Energy Statement, McElligott Consulting Engineers, July 2024.

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
			to the site or surrounding lands as a result of the proposed development[49]. In relation to pluvial flooding, is proposed to use a sustainable urban drainage system (SuDS) approach to stormwater management throughout the site, the overall strategy aims to provide an effective system to mitigate the adverse effects of urban stormwater runoff on the environment by reducing runoff rates, volumes and frequency, reducing pollutant concentrations in stormwater, contributing to amenity, aesthetics and biodiversity enhancement and allow for the maximum collection of rainwater for re-use where possible. In addition, SuDS features should aim to replicate the natural characteristics of rainfall runoff for any site by providing control of run-off at source. The proposed network can store water for the 1 in 100-year storm event plus a 20% allowance for climate change. In addition, the designed levels fall away from the buildings so as to route any surcharged surface water away from buildings. The SuDS measures to be provided are as follows: • Permeable pavements; • Green roofs; • Extensive/intensive green roofs; • Cellular attenuation system; • Petrol interceptor; • Infiltration blanket and detention basins; • Ponds; • Bioretention areas and rain gardens; • Tree pits; • Silt trap manhole.		responsibility of the site management team to ensure the drainage system is maintained. Maintenance and clearing of gullies, manholes (including catch pits) and all other SuDS features will ensure adequate performance.

[49] Refer to Flood Risk Assessment, JBA Consulting, August 2024.

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
			The incorporation of the above SuDS elements will provide a sustainable manner in which to disperse surface water from the site, encourage groundwater recharge and provide treatment of run-off and subsequent improvement of discharge quality. Refer to the Engineering Services Report for more detail on the drainage design and each of the above-listed SuDS measures[50]. The proposed on-site surface water drainage sewers have been designed to accommodate flows from a 5-year return event. In addition, the pipe system was checked for the 30-year return period where no flooding from manholes was encountered. A threshold of 150mm is provided from the ground floor level to the surrounding hardstanding area. Where the 150mm offset is not provided, the proposed gradients ensure that surface water runoff is conveyed away from the buildings. Within the site overland flowpaths will be provided to direct run-off from high intensity, short duration storms which might fail to enter the drainage system. Drop kerbs will be provided at road edges at low spots in order to allow overland flow to enter open space areas or discharge to watercourses. Additionally, a minimum freeboard of 500mm has been provided above the 1 in 100-year flood levels to all building floor levels and critical operational areas.[51] The Justification Test was applied and passed as the hydraulic modelling confirms there is no increase in risk		

[50] Refer to Engineering Services Report, DBFL Consulting Engineers, June 2024.
[51] Refer to Engineering Services Report, DBFL Consulting Engineers, June 2024.

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
			elsewhere and the development can manage the risk to itself [52]. Strict separation of surface water and wastewater will be implemented within the development.		
	Drought (acute) *Increase in the number of dry periods*	Potential disruption to residential water supply. Increase use of water for the irrigation of the landscaping.	Water supply is on the public water mains, so disruptions should be minimised and mitigated by Irish Water.	Low risk to building. Moderate risk to irrigation of landscaping.	Consider the installation of rainwater harvesting for irrigation purposes.
WIND	**Wind (acute)** Potential increase in the number of windstorms	Potential for damage to infrastructure and telecommunications, and a risk to human health	Suitable exterior materials are used for the building, and maintenance will take place to ensure all exterior materials are safe and fit for purpose. The long-term durability and maintenance of Materials is an integral part of the Design and Specification of the proposed development [53]. Materials will be selected based on durability and consideration has been given to the requirements of the Building Regulations and includes reference to BS 7543:2015, 'Guide to Durability of Buildings and Building elements, Products and Components', which provides guidance on the durability, design life and predicted service life of buildings and their parts. All common parts of the proposed Apartment buildings and, the durability and performance of these are designed and specified in accordance with Figure 4; Phases of the Life Cycle of BS7543; 2015. (Please see Appendix B of the Building Lifecycle Report for this figure). The common parts are designed to incorporate the guidance, best practice principles and mitigations of Annexes of BS 7543 2015 including: Annex A Climatic	Low Risk once existing proposed measures are implemented, and landscaping is maintained in place as designed.	No additional measures proposed.

[52] Refer to Flood Risk Assessment, JBA Consulting, August 2024.
[53] Refer to Building Lifecycle Report, Brock McClure, July 2024.

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
			Agents affecting Durability Annex B Guidance on materials and Durability Annex C Examples of UK material or component failures Annex D Design Life Data sheets. It is proposed to use brickwork, and self-finished render to envelope; and factory finished and Alu-clad windows and doors and powder coated steel balconies. These materials require no ongoing maintenance[54]. Hard landscaping materials for paving have been selected which are sustainable, robust, and have high slip resistance. Durable and robust finishes to be selected for all bike storage, furniture, bicycle storage units. These materials will be selected to minimise ongoing maintenance inputs[55]. Bins are stored in a secure Bin storage area, which will prevent the risk of causing harm in high winds[56].		
OTHER	**Compound events (acute)** *Increase in the number of compound flooding events*	Increased water runoff and pressure on drainage system	Risk of fluvial flooding to the site is managed by setting floor levels to the 1% AEP climate change water level, plus a freeboard allowance of at least 500mm, this the case for both MFRS and HEFS scenarios. All buildings have also been located in Flood Zone C, further minimising the risk of inundation. The drainage network is designed in accordance with the recommendations of the GDSDS and provides attenuated outlets and associated storage up to the 100-year event. The drainage network for the site has been designed to ensure that it can accommodate the 1 in 100-year rainfall event in surcharged conditions.	Low Risk once existing proposed measures are implemented.	No additional measures proposed. A programme of maintenance measures has been detailed in the Engineering Services Report. It will be the responsibility of the site management team to ensure the drainage system is maintained. Maintenance and cleaning of gullies, manholes (including catch

[54] Refer to Building Lifecycle Report, Brock McClure, July 2024.
[55] Refer to Building Lifecycle Report, Brock McClure, July 2024.
[56] Refer to Operational Waste Management Plan, Enviroguide, July 2024.

IPCC CID Category	Climate Hazard	Risk Factor (Exposure)	Current Sensitivity and Adaptive Capacity of Development (Vulnerability)	Risk with Existing Adaptation Measures	Proposed Additional Adaptation/Mitigation Measures
			Drainage systems have been designed with ample capacity to store any excess storm water, with separate foul and surface water drainage systems to reduce the rate of run-off to the sewer and further reducing the risk of the sewer surcharging[57]. As detailed in the Engineering Services Report[58], the proposed surface water drainage system for this development has been designed as a SuDS system and uses various measures to treat run-off and remove pollutants to improve quality, restrict outflow and control quantity of run-off.		units) and all other SuDS features will ensure adequate performance.
	Radiation at surface	Risk to human health	The Radon Map for Ireland[59] indicates that the western portion of the Application Site is located in an area where about 1 in 20 homes in this area are likely to have high radon levels and the eastern portion of the Application site is located in an area where about 1 in 10 homes in this area are likely to have high radon levels.	Low Risk once existing proposed measures are implemented.	Radon barriers to be installed if required at detailed design stage.

[57] Refer to Engineering Services Report, DBFL Consulting Engineers, June 2024.
[58] Refer to Engineering Services Report, DBFL Consulting Engineers, June 2024.
[59] EPA Radon Map for Ireland

4.3 Mitigation and Adaptation Measures

The Proposed Development shall seek to achieve the greatest standards of sustainable construction and design and has incorporated sustainable building design criteria from the outset which support overall climate change mitigation, including the requirement that the Development does not exceed the threshold set for the nearly zero-energy building (nZEB) requirements in national regulation implementing Directive 2010/31/EU.

A number of low energy technologies are being considered for the development. The proposed approach to achieving Part L (2022) Compliance will be based on a combination of the solutions as described within the Energy Statement[60] and Building Lifecycle Report[61] (and summarised in Table 4-2 below) once a detailed analysis has been completed at detailed design stage. A final decision will be made once capital costs, renewable targets and regulation compliance have all been compared to find the most appropriate solution.

The passive measures included in the design, such as minimising solar gain (glazing selection), and reducing the fabric heat loss through the building envelope by improving the airtightness will significantly contribute towards reducing the loads on the active systems within the building. The active measures have been designed to reduce the primary energy consumption through intelligent control and highly efficient plant and equipment.

In addition, the sustainable design strategy of the Proposed Development shall include: the installation of ducting for EV charging facilities at 20% of the residential units along with a total of 8 no. fully functioning EV chargers in the carpark serving the retail units and creche; close proximity to public transportation networks; water efficiency measures such as low consumption sanitary fittings; and improved indoor environmental quality.

Furthermore, the principles of waste management and the circular economy have been incorporated into both the Construction Phase and Operational Phase to ensure that maximum recycling, reuse, and recovery of waste with diversion from landfill, wherever possible, is being achieved.[62]

The following Table 4-2 summarises the potential measures that will aid in the reduction of energy consumption and carbon emissions:

Table 4-2: Energy Efficiency and Carbon Reduction Measures (Source: Energy Statement and Building Lifecycle Report)

Measure	Description	Benefit
BER Certificates	A Building Energy Rating (BER) certificate will be provided for each apartment in the proposed development which will provide detail of the energy performance of the apartment. A BER is calculated	Higher BER ratings reduce energy consumption and running costs.

[60] Refer to Energy Statement, McElligott Consulting Engineers, July 2024.
[61] Refer to Building Lifecycle Report, Brock McClure, July 2024.
[62] Refer to Operational Waste Management Plan, Enviroguide, July 2024; and Resource & Waste Management Plan, Enviroguide, July 2024.

Measure	Description	Benefit
	through energy use for space and hot water heating, ventilation, and lighting and occupancy. It is proposed to target an A2 rating for the apartments this will equate to the following emissions which are in line with NZEB. A2 – 25-45 kwh/m2/year with CO2 emissions circa 10kg CO2/m2 year *(In order to achieve the NZEB standards, in most cases the above standards will be exceeded in the proposed development).*	
Building Fabric	Before considering efficient building services or renewable energy systems, the form and fabric of a building must be assessed and optimised so as to reduce the energy demand for heating, lighting and ventilation. The U-values being investigated will be in line with the requirements set out by the current regulatory requirements of the Technical Guidance Documents Part L, titled "Conservation of Fuel and Energy Buildings other than Dwellings" - 2021. It is the intention of the design team to exceed the requirements of the building regulations. Target U-Values are identified within the Energy Statement[63].	Lower U-values and improved air tightness is being considered to help minimise heat losses through the building fabric, decrease energy consumption and thus minimise carbon emissions to the environment.
Energy Labelled White Goods	The white good package planned for provision in the apartments will be of a very high standard and have a high energy efficiency rating. It is expected that the below appliance ratings will be provided: • Oven - A plus • Fridge Freezer - A plus • Washer Machine - B	The provision of high rated appliances in turn reduces the amount of electricity required for occupants.
Exhaust Air Heat Pumps	Exhaust Air heat pumps (EAHPs) operate in a very similar manner to the more conventional air source heat pumps and utilise grid supplied electricity to extract thermal energy from a heat source. Each of the apartments will have an Exhaust Air Heat Pump installed where the heat pump extracts heat from the exhaust air of the apartment and transfers the heat to the supply air, hot water and heating system.	The heating of the exhaust air heat pumps is not produced by fossil fuels. They reduce the environmental impact of the apartments through the reduction in CO2 emissions.
Demand Control Ventilation	Demand Control Ventilation is being evaluated as a ventilation strategy to minimize energy usage and noise levels.	The main advantages of Demand Control Ventilation are: • Low noise impact for occupants and adjacent units. • Completely passive therefore no energy required with associated. • Minimal maintenance required.

[63] Refer to Energy Statement, McElligott Consulting Engineers, July 2024.

Measure	Description	Benefit
		• Reduced environmental impact as minimal equipment disposal over life cycle. Full fresh air results in a healthier indoor environment.
Space Heating	For the houses and apartments on the scheme of the proposed low energy solutions will involve the use of best available technology and this will be one or a combination of the following[64]: • Connected to a centralised district heating, beneath the apartments. The primary heat input will come from air to water heat pumps and the secondary heat input from CHP engines and backup boilers will be the final contributor to the system. If the site has a private district heating system this allows for a future waste heat solution to be exploited across the scheme. • Incorporate larger Combined Heat and Power (CHP) engines into the district heating scheme. Units would be sized to achieve a balance between heat demand to the apartments and houses with the extent of electricity that can be used efficiently on site by Landlord services and car charging. • Within the apartments install local exhaust air heat pumps for the generation of HWS. This is the majority energy consumer in the apartments as space heating losses have almost been designed out.	The district heating plant to be installed will be the most efficient of its type at this scale. The heat load can be diversified and therefore lower installed capacity provide. This means the heating plant is better able to modulate to the load and operate at maximum efficiency. Gas distribution is removed from the apartments and there is no carbon monoxide risk to the occupants. On site generation of electricity is more efficient than pulling off the grid and would lower the MIC needed off the ESB. The local exhaust air heat pump would have the lowest operating cost, negligible transmission losses and can be incorporated fully within each unit.
Heat Recovery Ventilation	With the current best practice building methodology to be used at Dunboyne JCL Lands, all the units are targeting an air tightness level of 3m3/m2.hr or better. While this is advantageous for limiting heat loss it is still important to ensure a supply of fresh air and removal of stale and humid air. The heat recovery ventilation (HRV) philosophy is to ensure a supply of fresh air by extracting air from the "wet" rooms and supplying fresh air to the living spaces via a ducting network. Each system is dedicated to the apartment or house it serves and will be independently commissioned as per the current Part F Regulations.[65]	Ventilation has a significant bearing on wellbeing and the sustained ventilation rates delivered by a HRV system give quantifiable air flow rates to rooms and this ensures humidity is controlled and carbon dioxide levels are low. The most obvious benefit is that the outgoing stale air heats up the incoming fresh air, reducing the heat load of the apartment. The importance of controlled ventilation by mechanical systems is now being reflected in the proposed new Part F Regulations but the solution proposed for the Dunboyne JCL Lands units will be at the top end of this scale.
Heat Pumps	Air to water heat pumps are being considered for the houses and this technology has gained significant traction in the last 8 years in the Irish market. Heat pump	As heat pumps are an all electrical solution they can utilise the

[64] Refer to Energy Statement, McElligott Consulting Engineers, July 2024.
[65] Refer to Energy Statement, McElligott Consulting Engineers, July 2024.

Measure	Description	Benefit
	operation would be optimised to improve seasonal efficiency and selected to have generate HWS at the top end of the scale to ensure NZEB targets are met.[66]	sustainable electrical energy delivered to the grid by wind power. Occupiers are advised to have their heat pumps on standby all of the time, trickle charging the house and this allows them to use electricity at night, when at a lower rate and may otherwise go to waste.
PV Solar Panels	PV solar panels are being considered which converts the electricity produced by the PV system (which is DC) into AC electricity. The panels are typically placed on the south facing side of the building for maximum heat gain and in some instances, can also be used to assist the heating system.	PV solar panels offer the benefit of reducing fossil fuel consumption and carbon emissions to the environment. They also reduce the overall requirement to purchase electricity from the grid.
ECAR charging points	The adoption of electric cars is now in the mainstream and with the proximity of this site to work and leisure destinations the occupiers are more likely to opt for electric cars. Please refer to the separate Car Charging Strategy document by McElligott Consulting Engineers provided with the application. The Proposed Development shall include the installation of ducting for EV charging facilities at 20% of the residential units along with a total of 8 no. fully functioning EV chargers in the carpark serving the retail units and creche.	Providing the option of E-car charging points will allow occupants to avail of the ever-improving efficient electric car technologies

4.3.1 Proposed Solutions

The building fabric standards and the technology solutions discussed within the Energy Statement and Building Lifecycle Report will all be assessed in greater detail during the detailed design stage of the project. A cost benefit analysis of all these available solutions will be carried out to determine the correct balance between an efficient building envelope and the most appropriate combination of technology and renewable energy systems.

The proposed approach to achieving Part L Compliance will be based on a combination of the solutions as described within the Energy Statement and Building Lifecycle Report once a detailed analysis has been completed at detailed design stage. A final decision will be made once capital costs, renewable targets and regulation compliance have all been compared to find the most appropriate solution.

4.3.1.1 Energy in Use Measures

The most likely overall solution that will be implemented will include the following measures:

- Meet or exceed minimum U-Value standards.
- Achieve a high level of air tightness (typically 3m^3/m^2/hr).

[66] Refer to Energy Statement, McElligott Consulting Engineers, July 2024.

- Ensure thermal bridging details are designed to meet the performance of the ACDs or an equivalent standard.
- Provide an appropriate combination of technologies to ensure energy consumption is in line with Part L 2022 requirements. This will typically include air source heat pumps for houses and exhaust air heat pumps for the apartments.
- Install centralised mechanical ventilation systems to ensure adequate ventilation rates are achieved in the dwellings to maximising the benefits of the airtight construction.

4.4 Adaptation Measures

In relation to climate change adaption, overall, the climate risks for the Proposed Development are low based on the Site location and the incorporated design measures. Nevertheless, the following actions are recommended to ensure that these adaptive design measures, particularly in relation to drainage, are capable of operating as intended:

- Inspection and maintenance of HVAC systems is carried out periodically and completed in accordance with good practice.

- The correct operation and maintenance of the drainage system is necessary to reduce the risk of human or mechanical error causing pluvial flood risk from blockage. Inspection and maintenance of the drainage systems is carried out periodically and completed in accordance with good practice (particularly after every major storm event, the end of winter (to collect winter debris), mid-summer (to collect dust, flowers and grass-type deposits), and after autumn leaf fall). This will ensure that the drainage systems are capable of managing storm runoff during periods of exceptionally high rainfall. A programme of maintenance measures has been detailed in the Engineering Services Report. It will be the responsibility of the site management team to ensure the drainage system is maintained. Maintenance and cleaning of gullies, manholes (including catch pits) and all other SuDS features will ensure adequate performance.

- It is expected that regular inspection and maintenance of drainage systems will be an effective measure to ensure that the Proposed Development is not at risk of flooding in the future. A regularly maintained drainage system will ensure that it remains effective and in good working order should a large pluvial storm occur. For storms greater than 100-year level, the development has been designed to provide an overland flood route. Additionally, the floor levels of the buildings are set above the 100-year flood levels. However, to account for a worst-case scenario, it is recommended to conduct a risk assessment, as necessary, when deciding the future location and placement of critical infrastructure. Low level and basement areas should be avoided to prevent potential impacts from pluvial flood events.

- In relation to the increase in windstorms, there is currently uncertainty in the projected change of this climate hazard. Therefore, it is recommended to reassess this climate hazard and its potential risk to buildings should projections in future climate indicate a significant increase in windstorms for this location.

- Risk relating to all changing climate hazards should be revisited and assessed periodically and in line with emerging studies to ensure that proper mitigation and adaptation measures are in place.

These recommended additional measures have been presented to John Connaughton Limited who have accepted them and committed to implementing them.

5 MEATH COUNTY DEVELOPMENT PLAN 2021-2027: RELEVANT POLICY OBJECTIVES

In accordance with MCC planning requirements, the preceding sections of this Report have assessed the impact of climate change on the Proposed Development.

The Meath County Development Plan 2021-2027 (MCDP) sets out the Council's proposed policies and objectives for the development of the County over the Plan period; including policies and associated objectives which contribute towards mitigating and adapting to climate change. The format of the Plan aims to facilitate a holistic approach to ensuring Climate Action is at the forefront of all future development within the County, with a selection of policy objectives across a number of chapters all contributing to aid in the transition of the County to a climate resilient low carbon society.

The following Table 5-1 demonstrates that the relevant policies and objectives produced and implemented by MCC in relation to climate change protection measures, particularly in relation to Transport and Built Environment, as set out within the MCDP, have been incorporated into the Proposed Development design. The key risks and associated objectives which are deemed relevant to the Proposed Development have been included here:

These initiatives not only address local environmental challenges but also advance broader sustainability targets set by the UN. Therefore, each relevant policy objective has also been carefully considered in the context of the UN Sustainable Development Goals (SDGs) as outlined within Table 1-3 of this Report, demonstrating that the relevant mitigative or adaptive action to be included in the Proposed Development also aligns with and contributes to the relevant SDG.

Table 5-1: Relevant Policies of the Meath County Development Plan 2021-2027 and associated SDGs

Key Risks	Associated Objectives	Proposed Development Considerations	Relevant SDGs
Built Environment			
• Existing drainage capacity may be exceeded with more extreme rainfall occurrences. • An increase in the prevalence of storm surges puts coastal infrastructure at risk. • Severe flooding may cause road damage and closures.	**INF OBJ 14** To require the use of SuDS within Local Authority Developments and other infrastructural projects in accordance with the Greater Dublin Regional Code of Practice for Drainage Works.	In accordance with the GDSDS it is proposed to use Sustainable Urban Drainage systems (SuDS) for managing stormwater for the Proposed Development. Refer to the Engineering Services Report for details on SuDs measures and attenuation design.[67]	  
	INF OBJ 15 To require the use of SuDS in accordance with the Greater Dublin Regional Code of Practice for Drainage Works for new developments (including extensions).	In accordance with the GDSDS it is proposed to use Sustainable Urban Drainage systems (SUDS) for managing stormwater for the Proposed Development. The aim of the SUDS strategy for the site will be to: • Attenuate storm-water runoff. • Reduce storm-water runoff. • Reduce pollution impact.	

[67] Refer to Engineering Services Report, DBFL Consulting Engineers, June 2024.

Key Risks	Associated Objectives	Proposed Development Considerations	Relevant SDGs
		• Replicate the natural characteristics of rainfall runoff for the site. The proposed SuDs measures for the Proposed Development are as follows: • Permeable pavements; • Green roofs; • Extensive/intensive green roofs; • Cellular attenuation system; • Petrol interceptor; • Infiltration blanket and detention basins; • Ponds; • Bioretention areas and rain gardens; • Tree pits; • Silt trap manhole. The drainage network has been designed in accordance with GDSDS and to take account of flood exceedance for storms return periods exceeding 1% AEP (Annual Exceedance Probability). Refer to the Engineering Services Report for details on SuDs measures and attenuation design.[68]	 
	INF POL 20 To require that a Flood Risk Assessment is carried out for any development proposal, where flood risk may be an issue in accordance with the "Planning System and Flood Risk Management – Guidelines for Planning Authorities" (DoECLG/OPW, 2009). This assessment shall be appropriate to the scale and nature of	A Flood Risk Assessment (FRA)[69] has been carried out for the Proposed Development in accordance with the "Planning System and Flood Risk Management – Guidelines for Planning Authorities" (DoECLG/OPW, 2009) which considers the potential flood mechanisms at the Site and considers the impact of climate change.	

[68] Refer to Engineering Services Report, DBFL Consulting Engineers, June 2024.
[69] Refer to Flood Risk Assessment, JBA Consulting, August 2024.

Key Risks	Associated Objectives	Proposed Development Considerations	Relevant SDGs
	risk to and from the potential development and shall consider the impact of climate change.		
	INF OBJ 21 To restrict new development within floodplains other than development which satisfies the justification test, as outlined in the Planning System and Flood Risk Management Guidelines 2009 for Planning Authorities (or any updated guidelines).	The Proposed Development is not located within a flood plain.	

Key Risks	Associated Objectives	Proposed Development Considerations	Relevant SDGs
	INF OBJ 30 To ensure the County's natural coastal defences, such as beaches, sand dunes, salt marshes and estuary lands, are protected and are not compromised by inappropriate works or forms of development.	The Proposed Development is located ca. 30km from the Meath coastline; therefore, it is not at risk of compromising the county's natural coastal defences, such as beaches, sand dunes, salt marshes, and estuary lands. The Appropriate Assessment (AA) Screening[70] has assessed the potential for the Proposed Development to have significant effects on the following European sites which are protected under the EU Habitats Directive[71] and Birds Directive[72]: • Rye Water Valley/Carton SAC (001398) • North Dublin Bay SAC (000206) • South Dublin Bay SAC (000210) • South Dublin Bay and River Tolka Estuary SPA (004024) • North Bull Island SPA (004006) • Baldoyle Bay SPA (004016) • Malahide Estuary SPA (004025) In conclusion, upon the examination, analysis and evaluation of the relevant information and applying the precautionary principle, it is concluded by the authors of this Report that the possibility may be excluded that the Proposed Development will have a significant effect on any of the European sites listed below: • Rye Water Valley/Carton SAC (001398) • Baldoyle Bay SPA (004016) • Malahide Estuary SPA (004025) These European sites are therefore screened out at this stage of the AA process. In carrying out this AA	

[70] Refer to Appropriate Assessment Screening Report, Enviroguide, August 2024.
[71] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.
[72] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.

Key Risks	Associated Objectives	Proposed Development Considerations	Relevant SDGs
		screening, specific targeted mitigation measures have not been taken into account. However, it is also concluded by the authors of this Report that the possibility cannot be excluded that the Proposed Development will have a significant effect on the European sites listed below: • North Dublin Bay SAC (000206) • South Dublin Bay SAC (000210) • South Dublin Bay and River Tolka Estuary SPA (004024) • North Bull Island SPA (004006) On the basis of the screening exercise carried out above, it can be concluded, on the basis of the best scientific knowledge available and objective information, that the possibility of any likely significant effects on the above listed European sites, whether arising from the project itself or in combination with other plans and projects, cannot be excluded in light of the above listed European sites' conversation objectives. Thus, in an abundance of caution, there is a requirement to proceed to Stage 2 of the AA process; and a Natura Impact Statement (NIS) has been prepared and accompanies this submission[73]. The NIS investigated the likely direct and indirect effects of the proposed works, both during construction and operation, on the integrity and qualifying interests of the four above European Sites, alone and in combination with other plans and projects, taking into account the site's structure, function and conservation objectives, and having regard to best scientific knowledge.	

[73] Refer to Natura Impact Statement, Enviroguide, August 2024.

Key Risks	Associated Objectives	Proposed Development Considerations	Relevant SDGs
		Where potentially significant effects were identified, a range of mitigation and avoidance measures have been suggested to avoid them. This NIS has concluded that, once the avoidance and mitigation measures are implemented as proposed, the Proposed Development will not have an adverse effect on the integrity of the above European sites, individually or in combination with other plans and projects. Where applicable, a suite of monitoring measures has been proposed to confirm the efficacy of said mitigation in relation to ensuring no adverse effects on the habitats or species of the relevant European sites have occurred. As a result of the complete, precise and definitive findings in of this NIS, it has been concluded, beyond reasonable scientific doubt, that the Proposed Development will have no adverse effects on the integrity and extent of North Dublin Bay SAC (000206), South Dublin Bay SAC (000210), South Dublin Bay and River Tolka Estuary SPA (004024) and North Bull Island SPA (004006). Accordingly, the Proposed Development will not adversely affect the integrity of any relevant European site[74].	

[74] Refer to Natura Impact Statement, Enviroguide, August 2024.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

To conclude, this Report has demonstrated the potential impacts of climate change on the Proposed Residential Development on lands at Station Road and Pace Line, Dunboyne, Co. Meath through the preparation of a Climate Risk and Vulnerability Assessment, which has incorporated the following:

- Climate projections (EPA and IPCC) across a conservative range of future scenarios have been examined, along with the Proposed Development location, to gain an understanding of the future risks that climate change may have on the Proposed Development;

- Screening of potential climate hazards relevant to the location of the Proposed Development and the projected changes in future climate for this location to determine what hazards pose a material risk;

- Assessment of identified material risks, taking account of relevant adaptation and mitigation measures which have been incorporated into the Development design, in accordance with the IPCC's Climate Risk Framework;

- Provision of recommended additional actions to further reduce the potential risks of identified climate hazards.

This Report has met the requirements of MCC for a Climate Change Impact Assessment which has assessed the impact of climate change on the Proposed Development and ensures that the policies and objectives produced and implemented by the local authority in relation to climate change and climate change protection measures, as set out within Meath County Development Plan 2021-2027 (MCDP), have been incorporated into the Proposed Development design. Each relevant policy and objective has also been carefully considered in the context of the UN SDGs, and the Report has demonstrated that relevant mitigative or adaptive action to be included in the Proposed Development also aligns with and contributes to the associated SDG.

Furthermore, this Report has provided information to support the relevant public body in carrying out its functions in a manner which is consistent with national climate plans and strategies and furthering the achievement of the national climate objective as set out under Section 15 of the Climate Action and Low Carbon Development Act 2015, as amended in 2021. The current CCIA report should be reviewed alongside the relevant and current Local Authority Climate Action plan to ensure alignment with relevant objectives and targets.

This Report can also be utilised by the organisation to prepare for meeting EU sustainability reporting requirements under the Corporate Sustainability Reporting Directive (CSRD) and proposed Corporate Sustainability Due Diligence Directive (CSDD). Specifically, Standard ESRS E1-Climate change within the CSRD and environmental due diligence within the incoming CSDDD. Companies that fall under the scope of the Corporate Sustainability Reporting Directive (CSRD) also must report in their annual reports to what extent their

activities are covered by the EU Taxonomy (Taxonomy-eligibility) and comply with the criteria set in the Taxonomy delegated acts (Taxonomy-alignment).

6.2 Recommendations

6.2.1 Climate Risk and Vulnerability

The Proposed Development shall seek to achieve the greatest standards of sustainable construction and design and has incorporated sustainable building design criteria from the outset which support overall climate change mitigation, including the requirement that the Development does not exceed the threshold set for the nearly zero-energy building (NZEB) requirements in national regulation implementing Directive 2010/31/EU.

The design of the fabric and plant will satisfy the requirements of new Part L Building Regulations and NZEB, once these measures are confirmed at detailed design stage[75].

The Building Lifecycle Report[76] and Energy Statement[77], which have been prepared for the Proposed Development, outline the proposed elements (based on passive and active measures), that if implemented, will aid in the reduction of energy consumption and carbon emissions, these are as follows:

- BER Certificates.
- Fabric Energy Efficiency.
- Energy Labelled White Goods.
- Air Source Heat Pumps.
- Mechanical Heat Recovery Ventilation.
- Natural Ventilation;
- PV Solar Panels.
- ECAR Charging Points.

Furthermore, the principles of waste management and the circular economy have been incorporated into both the Construction Phase and Operational Phase to ensure that maximum recycling, reuse, and recovery of waste with diversion from landfill, wherever possible, is being achieved.

In relation to climate change adaption, overall, the climate risks for the Proposed Development are low based on the Site location and the incorporated design measures. Nevertheless, the following actions are recommended to ensure that these adaptive design measures, particularly in relation to drainage, are capable of operating as intended:

- Inspection and maintenance of HVAC systems is carried out periodically and completed in accordance with good practice.

[75] Refer to Energy Statement, McElligott Consulting Engineers, July 2024.
[76] Refer to Building Lifecycle Report, Brock McClure, July 2024.
[77] Refer to Energy Statement, McElligott Consulting Engineers, July 2024.

- The correct operation and maintenance of the drainage system is necessary to reduce the risk of human or mechanical error causing pluvial flood risk from blockage. Inspection and maintenance of the drainage systems is carried out periodically and completed in accordance with good practice (particularly after every major storm event, the end of winter (to collect winter debris), mid-summer (to collect dust, flowers and grass-type deposits), and after autumn leaf fall). This will ensure that the drainage systems are capable of managing storm runoff during periods of exceptionally high rainfall. A programme of maintenance measures has been detailed in the Engineering Services Report. It will be the responsibility of the site management team to ensure the drainage system is maintained. Maintenance and cleaning of gullies, manholes (including catch pits) and all other SuDS features will ensure adequate performance.

- It is expected that regular inspection and maintenance of drainage systems will be an effective measure to ensure that the Proposed Development is not at risk of flooding in the future. A regularly maintained drainage system will ensure that it remains effective and in good working order should a large pluvial storm occur. For storms greater than 100-year level, the development has been designed to provide an overland flood route. Additionally, the floor levels of the buildings are set above the 100-year flood levels. However, to account for a worst-case scenario, it is recommended to conduct a risk assessment, as necessary, when deciding the future location and placement of critical infrastructure. Low level and basement areas should be avoided to prevent potential impacts from pluvial flood events.

- In relation to the increase in windstorms, there is currently uncertainty in the projected change of this climate hazard. Therefore, it is recommended to reassess this climate hazard and its potential risk to buildings should projections in future climate indicate a significant increase in windstorms for this location.

- Risk relating to all changing climate hazards should be revisited and assessed periodically and in line with emerging studies to ensure that proper mitigation and adaptation measures are in place.

These recommended additional measures have been presented to John Connaughton Limited who have accepted them and committed to implementing them.

7 REFERENCES

'Technical Annex B: Climate Change Risk Assessment' of the 'Local Authorities Climate Action Planning Guidelines'.

Climate Central - Coastal Risk Screening Tool

Climate Ireland - Climate Change Projection Maps

Commission Delegated Regulation (EU) of 4.6.2021 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council.

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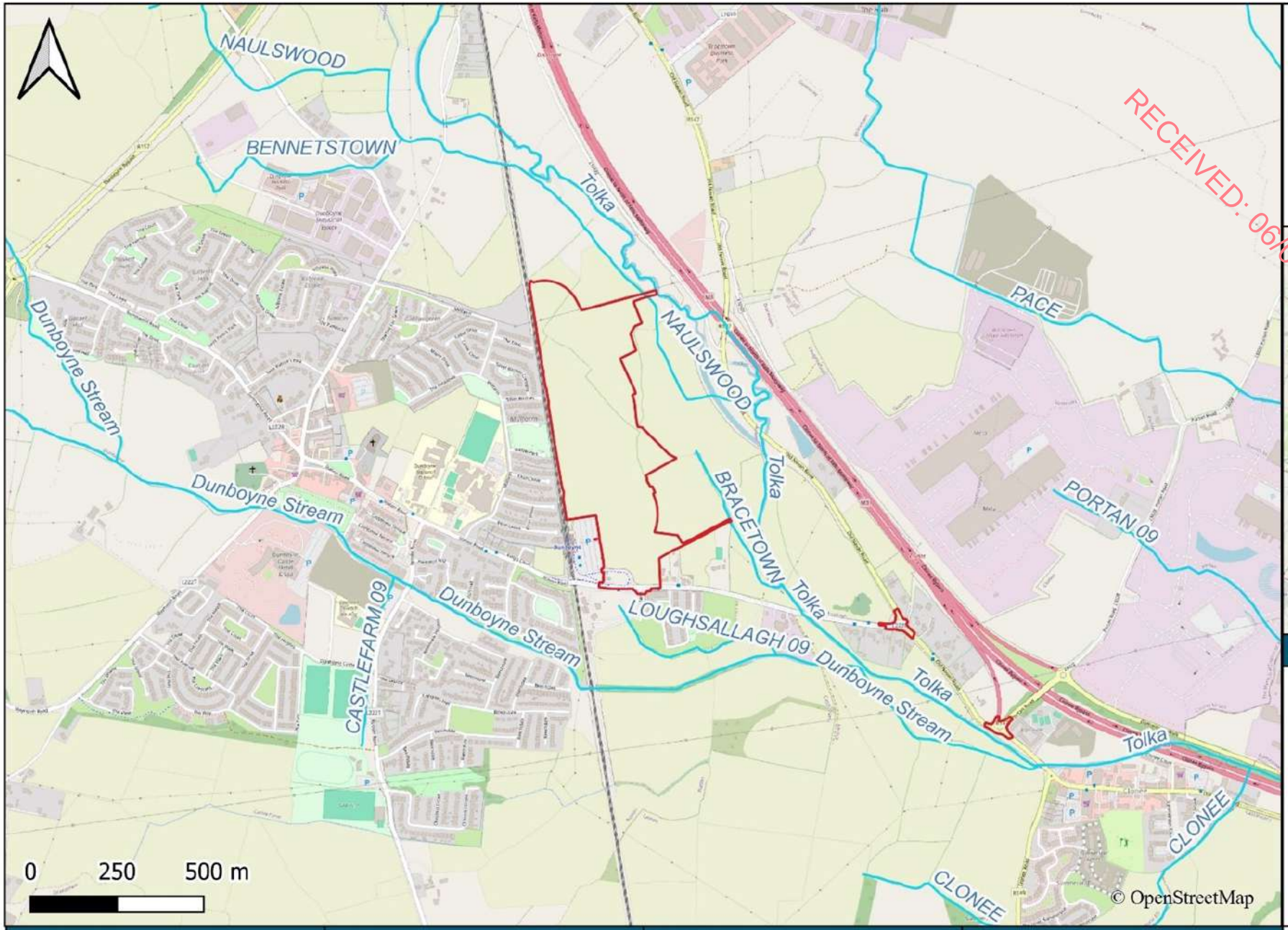
Appendix 1

Site Location and Site Layout



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Legend:

- Site Outline
- EPA River Network

Applicant:	Project:	Location:	Figure Title:
John Connaughton Limited	Large-scale Residential Development	Station Road and Pace Line, Dunboyne, Co. Meath	Site Location

Drawn By: LG	Projection: IRENET95 / Irish Transverse Mercator
Checked: BL	
Date: 26/07/2024	Scale @ A4: 1:15702

Notes:

Site boundaries shown are for illustration purposes only and do not represent legal or exact boundaries


GENERAL NOTES
LEGEND
RECEIVED: 06/09/2024
NOTES:
M'CORM

Appendix 2

Appendix A (Classification of climate-related hazards) from Annex II of the Commission Delegated Regulation (EU) 2021/2139.

APPENDIX A: CLASSIFICATION OF CLIMATE-RELATED HAZARDS[669]

	Temperature-related	Wind-related	Water-related	Solid mass-related
Chronic	Changing temperature (air, freshwater, marine water)	Changing wind patterns	Changing precipitation patterns and types (rain, hail, snow/ice)	Coastal erosion
	Heat stress		Precipitation or hydrological variability	Soil degradation
	Temperature variability		Ocean acidification	Soil erosion
	Permafrost thawing		Saline intrusion	Solifluction
			Sea level rise	
			Water stress	
Acute	Heat wave	Cyclone, hurricane, typhoon	Drought	Avalanche
	Cold wave/frost	Storm (including blizzards, dust and sandstorms)	Heavy precipitation (rain, hail, snow/ice)	Landslide
	Wildfire	Tornado	Flood (coastal, fluvial, pluvial, ground water)	Subsidence
			Glacial lake outburst	

669 The list of climate-related hazards in this table is non-exhaustive, and constitutes only an indicative list of most widespread hazards that are to be taken into account as a minimum in the climate risk and vulnerability assessment.

Construction AADT Summary - Dunboyne LRD Application 2024

Speed Limit by Link (km/h)																													
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
80	80	80	50	80	60	50	50	50	50	50	50	50	50	50	50	50	50	50	60	50	60	50	80	80	80	50	50	50	50

Do-Minimum Scenario

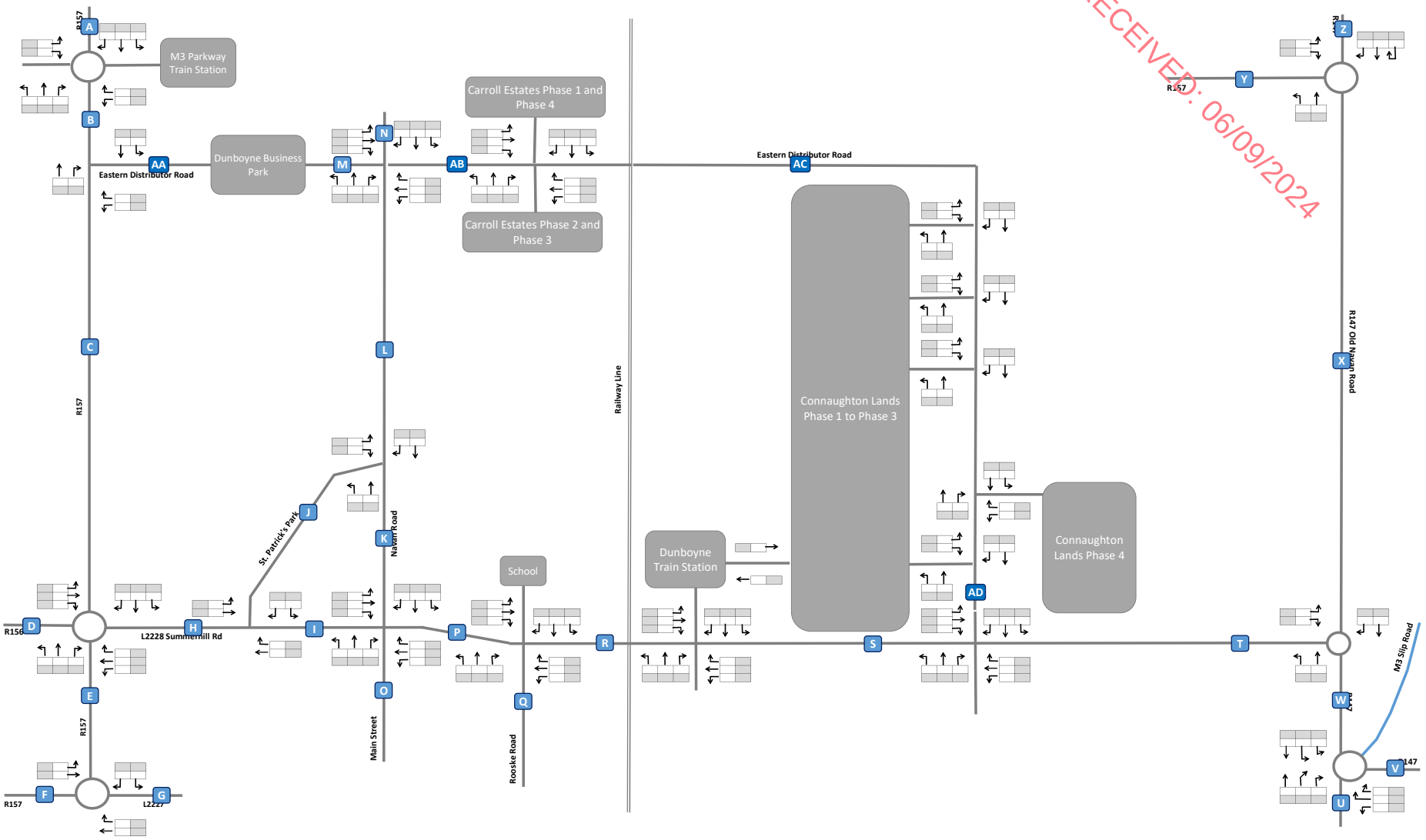
Scenario		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
2026 DM	24 Hr Total	27531	22586	22240	7631	14057	15393	5237	6650	5714	1249	4819	4992	3915	3170	4579	10688	7626	12909	13226	14145	19665	13624	18875	7156	21645	24038	3190	0	0	0
	AADT	26397	21656	21324	7317	13477	14759	5021	6376	5478	1197	4620	4786	3754	3039	4390	10248	7311	12378	12681	13562	18855	13063	18097	6861	20753	23048	3059	0	0	0
	% HGV	2.6%	3.0%	2.8%	5.1%	2.2%	1.8%	1.1%	1.5%	1.4%	1.0%	1.0%	1.3%	2.0%	1.9%	0.5%	1.3%	0.7%	0.8%	1.2%	1.2%	1.4%	2.0%	1.5%	2.4%	4.8%	4.3%	6.0%	0.0%	0.0%	0.0%

Do-Something Scenario Phase 1

Scenario		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
2026 DS	24 Hr Total	27531	22586	22240	7631	14057	15393	5237	6650	5714	1249	4954	5126	4050	3170	4660	10934	7961	13491	14076	15593	20174	14148	19906	7483	21909	24101	3190	0	0	2249
	AADT	26397	21656	21324	7317	13477	14759	5021	6376	5478	1197	4750	4915	3883	3039	4468	10483	7633	12935	13496	14951	19342	13565	19086	7175	21007	23108	3059	0	0	2156
	% HGV	2.6%	3.0%	2.8%	5.1%	2.2%	1.8%	1.1%	1.5%	1.4%	1.0%	1.0%	1.2%	2.0%	1.9%	0.5%	1.3%	0.7%	0.7%	1.1%	1.3%	1.4%	1.9%	1.6%	2.3%	4.8%	4.3%	6.0%	0.0%	0.0%	0.5%

Do-Something Scenario Phase 1 + Construction Trips for Remainder of LRD

Scenario		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
2026 DS + Construction	24 Hr Total	27531	22586	22240	7631	14057	15393	5237	6650	5714	1249	4954	5126	4050	3170	4660	10934	7961	13491	14076	15763	20200	14200	20010	7549	21909	24167	3190	0	0	2419
	AADT	26397	21656	21324	7317	13477	14759	5021	6376	5478	1197	4750	4915	3883	3039	4468	10483	7633	12935	13496	15113	19367	13614	19186	7238	21007	23171	3059	0	0	2319
	% HGV	2.6%	3.0%	2.8%	5.1%	2.2%	1.8%	1.1%	1.5%	1.4%	1.0%	1.0%	1.2%	2.0%	1.9%	0.5%	1.3%	0.7%	0.7%	1.1%	2.1%	1.5%	2.2%	1.9%	3.0%	4.8%	4.5%	6.0%	0.0%	0.0%	5.9%
Difference between 2026 DS & 2026 DS+Construction		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.1%	0.3%	0.4%	0.7%	0.0%	0.2%	0.0%	0.0%	0.0%	5.4%



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Project : Dunboyne Eastern Distributor Road

DRG. Title :

Key:
AM Peak Hour (08:00-09:00)
PM Peak Hour (16:45-17:45)

Dwn: SK	Ckd:	Date:
Ref: p163022\calcs\excel\transport		
Figure:	Rev:	

AADT Summary - Dunboyne LRD Application 2024

Speed Limit by Link (km/h)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
80	80	80	50	80	60	50	50	50	50	50	50	50	50	50	50	50	50	50	60	50	60	60	80	80	80	50	50	50	50

Do-Nothing Scenario

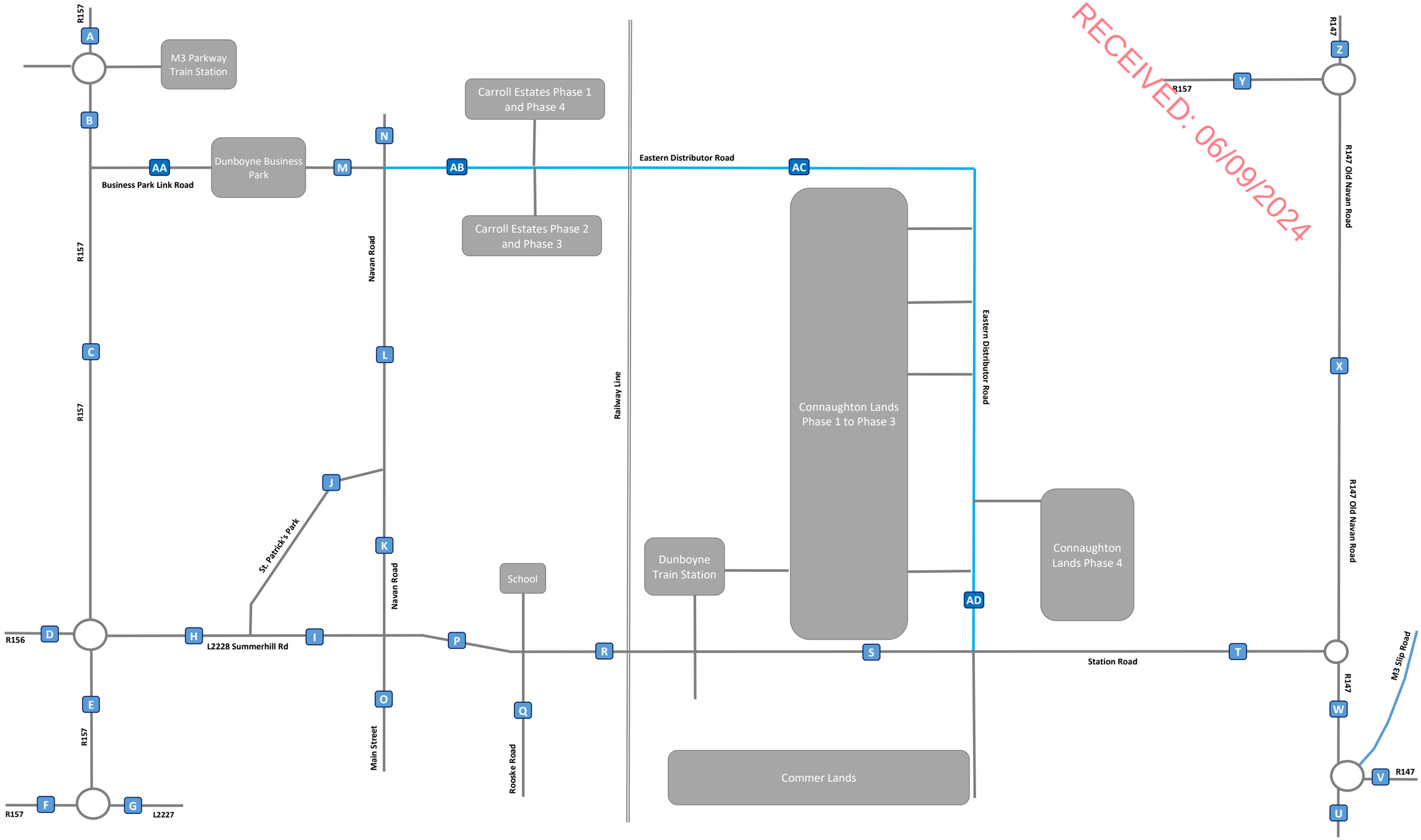
Scenario		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
2023 Base	AM & PM	3390	3168	3154	1184	2082	2332	871	1257	697	610	751	1189	674	500	659	1531	1121	2025	2022	2092	3041	2146	2878	1114	3460	3889	0	0	0	0
	AADT	19376	18107	18027	6767	11900	13329	4978	7185	3984	3487	4292	6796	3852	2858	3767	8751	6407	11574	11557	11957	17381	12266	16450	6367	19776	22228	0	0	0	0
	% HGV	3.2%	3.4%	3.4%	5.2%	2.2%	1.9%	1.5%	3.4%	1.9%	4.8%	1.6%	3.4%	5.6%	2.0%	1.2%	1.4%	0.8%	1.3%	1.2%	1.1%	1.3%	2.0%	1.5%	2.4%	4.8%	4.2%	N/A	N/A	N/A	N/A
2026 DN	AM & PM	3540	3318	3310	1242	2185	2447	914	1319	731	640	788	1248	704	510	692	1605	1176	2122	2122	2195	3191	2252	3020	1169	3631	4081	0	0	0	0
	AADT	20231	18962	18918	7102	12488	13987	5224	7539	4181	3659	4504	7132	4026	2918	3953	9175	6723	12127	12128	12548	18240	12872	17262	6682	20753	23326	0	0	0	0
	% HGV	3.2%	3.4%	3.4%	5.2%	2.2%	1.9%	1.5%	3.4%	1.9%	4.5%	1.5%	3.3%	5.7%	2.0%	1.2%	1.4%	0.8%	1.3%	1.2%	1.1%	1.3%	2.0%	1.5%	2.4%	4.8%	4.2%	N/A	N/A	N/A	N/A
2031 DN	AM & PM	3730	3508	3509	1317	2316	2594	969	1398	775	679	835	1323	743	524	733	1700	1247	2245	2249	2327	3383	2387	3202	1239	3849	4326	0	0	0	0
	AADT	21322	20053	20055	7529	13239	14828	5538	7993	4432	3879	4775	7560	4248	2994	4190	9716	7126	12834	12857	13302	19336	13645	18300	7083	22001	24728	0	0	0	0
	% HGV	3.2%	3.4%	3.4%	5.2%	2.2%	1.9%	1.5%	3.4%	1.9%	4.8%	1.6%	3.4%	5.7%	2.0%	1.2%	1.4%	0.8%	1.3%	1.2%	1.1%	1.3%	2.0%	1.5%	2.4%	4.8%	4.2%	N/A	N/A	N/A	N/A
2041 DN	AM & PM	3901	3679	3687	1384	2434	2726	1018	1469	815	713	878	1390	778	536	770	1785	1310	2356	2364	2445	3555	2508	3364	1302	4044	4421	0	0	0	0
	AADT	22298	21030	21072	7910	13910	15580	5819	8398	4657	4075	5017	7944	4447	3062	4403	10201	7487	13465	13509	13977	20317	14338	19228	7443	23117	25267	0	0	0	0
	% HGV	3.2%	3.4%	3.4%	5.2%	2.2%	1.9%	1.5%	3.4%	1.9%	4.8%	1.6%	3.4%	5.7%	2.1%	1.2%	1.4%	0.8%	1.3%	1.2%	1.1%	1.3%	2.0%	1.5%	2.4%	4.8%	4.3%	N/A	N/A	N/A	N/A

Do-Minimum Scenario

Scenario		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
2026 DM	AM & PM	4618	3789	3731	1280	2358	2582	879	1115	958	209	808	837	657	532	768	1793	1279	2166	2219	2373	3299	2286	3166	1200	3631	4032	535	0	0	0
	AADT	26397	21656	21324	7317	13477	14759	5021	6376	5478	1197	4620	4786	3754	3039	4390	10248	7311	12378	12681	13562	18855	13063	18097	6861	20753	23048	3059	0	0	0
	% HGV	2.6%	3.0%	2.8%	5.1%	2.2%	1.8%	1.0%	1.6%	1.4%	0.6%	0.8%	1.0%	2.0%	1.9%	0.5%	1.3%	0.7%	1.3%	0.5%	1.2%	1.4%	2.0%	1.5%	2.4%	4.8%	4.3%	6.1%	N/A	N/A	N/A
2031 DM	AM & PM	5205	4284	3884	1362	2528	2768	939	1027	838	244	683	673	1156	519	919	1410	1404	1853	1888	2518	3479	2465	3398	1249	3851	4342	985	711	780	916
	AADT	29750	24486	22202	7785	14450	15820	5365	5868	4791	1395	3902	3847	6610	2964	5252	8059	8024	10589	10789	14389	19885	14091	19419	7137	22009	24816	5630	4067	4459	5236
	% HGV	2.5%	2.9%	2.8%	5.1%	2.2%	1.8%	0.9%	1.9%	1.7%	1.5%	26.3%	1.0%	1.6%	2.1%	0.5%	1.4%	0.7%	1.4%	1.2%	1.2%	1.4%	1.9%	1.5%	2.4%	4.8%	4.2%	3.9%	1.2%	0.9%	0.7%
2041 DM	AM & PM	5275	4382	3997	1427	2639	2892	986	1015	813	261	633	693	1174	521	923	1434	1452	1887	1926	2588	3628	2564	3498	1311	4046	4557	1006	740	809	945
	AADT	30149	25045	22843	8157	15083	16530	5635	5804	4645	1493	3618	3962	6711	2979	5274	8194	8299	10786	11006	14790	20737	14654	19993	7491	23125	26046	5752	4231	4625	5402
	% HGV	2.6%	3.0%	2.9%	5.1%	2.2%	1.8%	0.9%	2.0%	1.9%	1.4%	0.6%	1.0%	1.6%	2.1%	0.5%	1.5%	0.7%	1.4%	1.3%	1.2%	1.4%	2.0%	1.5%	2.4%	4.8%	4.2%	4.0%	1.2%	0.9%	0.7%

Do-Something Scenario

Scenario		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
2026 DS	AM & PM	4618	3789	3731	1280	2358	2582	879	1115	958	209	831	860	679	532	782	1834	1335	2193	2316	2612	3383	2372	3337	1255	3675	4043	535	0	0	443
	AADT	26397	21656	21324	7317	13477	14759	5021	6376	5478	1197	4748	4913	3882	3039	4467	10480	7629	12534	13236	14931	19335	13557	19072	7171	21003	23107	3059	0	0	2530
	% HGV	2.6%	3.0%	2.8%	5.1%	2.2%	1.8%	1.0%	1.6%	1.4%	0.6%	0.8%	0.9%	1.9%	1.9%	0.5%	1.3%	0.7%	1.3%	1.1%	1.3%	1.4%	1.9%	1.6%	2.3%	4.8%	4.3%	6.1%	N/A	N/A	0.9%
2031 DS	AM & PM	5280	4359	3884	1362	2528	2808	978	1027	838	244	620	673	1275	519	941	1463	1568	2069	2104	2844	3640	2607	3701	1272	3856	4354	1060	830	871	1404
	AADT	30178	24915	22202	7785	14450	16047	5592	5868	4791	1395	3546	3847	7288	2964	5381	8362	8960	11828	12028	16257	20806	14903	21153	7271	22039	24888	6058	4745	4977	8022
	% HGV	2.5%	2.8%	2.8%	5.1%	2.2%	1.8%	0.9%	1.9%	1.7%	0.0%	0.0%	0.0%	1.4%	2.1%	0.5%	1.4%	0.6%	1.2%	1.1%	1.4%	1.5%	1.8%	1.6%	2.4%	4.8%	4.2%	3.6%	1.3%	1.0%	0.9%
2041 DS	AM & PM	5359	4466	3997	1427	2639	2936	1030	1015	813	261	633	693	1307	521	948	1493	1635	2129	2168	2952	3808	2722	3836	1337	4052	4571	1090	873	914	1495
	AADT	30629	25525	22843	8157	15083	16784	5889	5804	4645	1493	3618	3962	7471	2979	5419	8532	9345	12170	12390	16871	21765	15558	21925	7640	23158	26127	6233	4991	5223	8545
	% HGV	2.6%	2.9%	2.9%	5.1%	2.2%	1.8%	0.9%	2.0%	1.9%	1.4%	0.6%	1.0%	1.5%	2.1%	0.5%	1.4%	0.6%	1.2%	1.1%	1.4%	1.5%	1.8%	1.6%	2.4%	4.8%	4.2%	3.6%	1.2%	0.9%	0.8%



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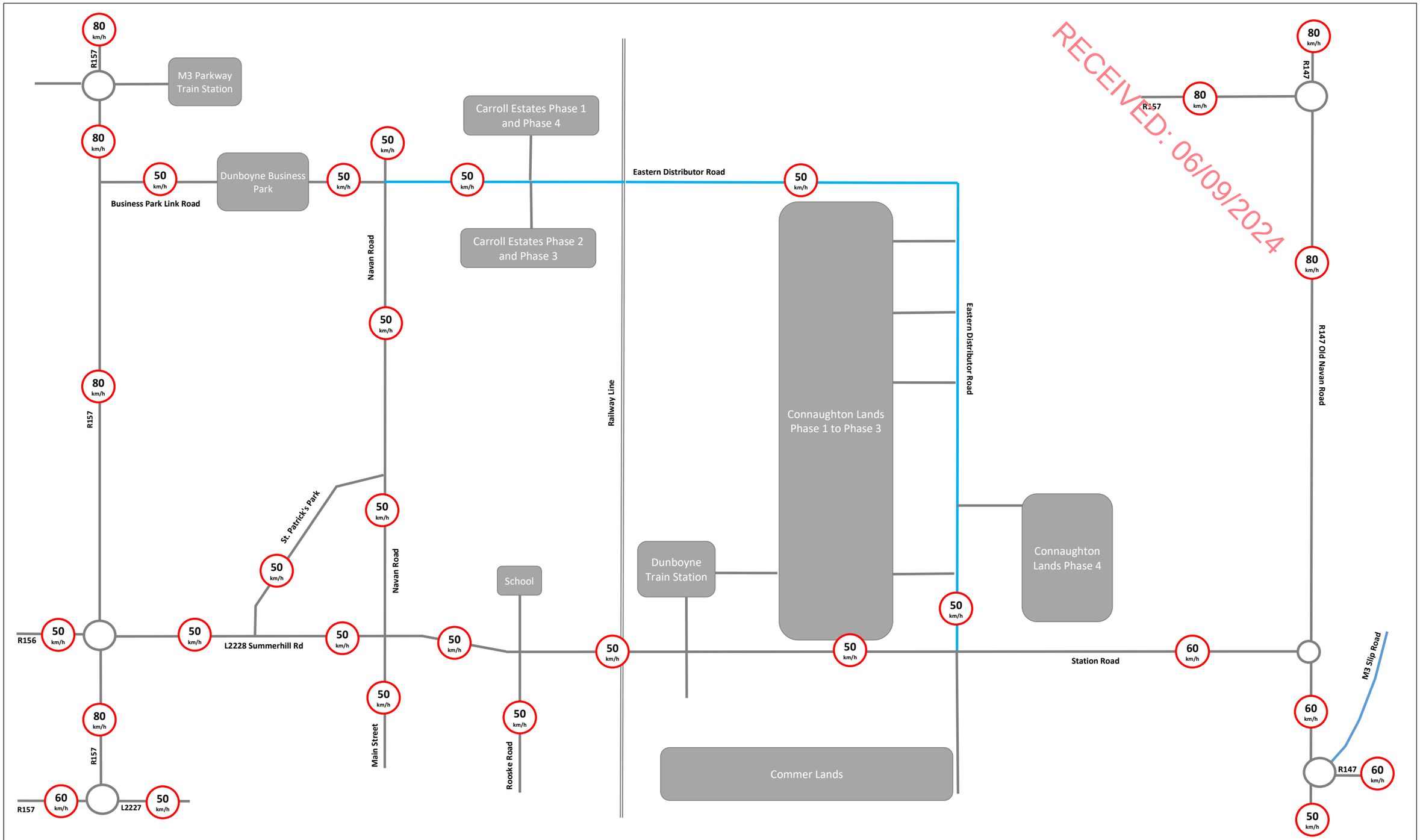
	email: info@dbfl.ie **website:** www.dbfl.ie				**DRG. Title :**		**Ref:** p163022\calcs\excel\transport
							Figure: **Rev:**



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Project : Dunboyne Eastern Distributor Road

DRG. Title :

Key:
- AM Peak Hour (08:00-09:00)
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Dwn:	Ckd:	Date:
SK		

Ref: p163022\calcs\excel\transport

Figure:

Rev: