CHAPTER NINE HYDROLOGY – SURFACE WATER & FLOODING

9.1 INTRODUCTION

This chapter of the Environmental Impact Assessment Report (EIAR) covers the hydrological assessment of the proposed development. The assessment will cover all natural water bodies including surface freshwater (streams, bogs, ponds, rivers and lakes) which may be affected by the proposed development. Potential impacts from planned future works are also assessed. This chapter also identifies all potential sources of contamination or environmental liability associated with the site.

9.2 ASSESSMENT METHODOLOGY

The assessment of the potential impact of the proposed development on the water bodies was carried out according to the methodology specified by the EPA and the specific criteria set out in the Guidelines on the Information to be Contained in Environmental Impact Statements, 2022, EIA Directive 2014/EU/52, Advice Notes on Current Practice (in preparation of Environmental Impact Statements) (EPA 2003), Planning & Development (Environmental Impact Assessment) Regulations 2018, Guidance for Consent Authorities Regarding Sub-Threshold Development (DoEHLG 2003), Development Management Guidelines (DoEHLG, 2007) and Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018).

Information was assembled from the following sources:

- Site Walk-over
- Geological Survey of Ireland (GSI) online maps and databases
- CFRAMS Flood Mapping from OPW
- EPA online maps and databases
- OSI data map information
- Topographical Survey
- The Drainage Design Report prepared by Garland
- Local Authority record drawings
- Multi-discipline consultation with other design team members
- Ordnance Survey of Ireland, Discovery Series
- Ordnance survey of Ireland (OSI) online historical maps and aerial photographs
- Geology Maps Geological Survey of Ireland (GSI) (1:100,000)
- GSI On-line Groundwater database. Aquifer Classification, Aquifer Vulnerability, Teagasc Soil Classification
- http://www.gsi.ie/Programmes/Groundwater/Groundwater+web+mapping.htm
- http://www.gsi.ie/Old+Mapping.htm#gsi;
- GSI Limerick City East Groundwater Body (GWB)
- Soil Map of Ireland (Second Edition, 1980), National Soil Survey of Ireland, An Foras Talúntais
- National Parks and Wildlife Service On-line database www.npws.ie
- EPA Online Water Quality Mapping; http://www.epa.ie/rivermap

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- OPW Hydro-Data (http://www.opw.ie/hydro-data)
- Met Eireann - Met.ie – monthly climatological data;

9.3 RECEIVING ENVIRONMENT

The proposed development site (Phase 4) is part of a phased development proposal for a large greenfield area or Masterplan Site (MS). This MS is divided into seven different phases of delivery as detailed in Table 1.1 in Chapter 1.0 Introduction. The overall MS layout which illustrates the indicative layout of the subject site and adjoining lands in the ownership of the applicant is displayed on Figure 1.0 in Chapter 1.0 and full details of the proposed development phases are given in Chapter 2.0.

The study area takes a holistic approach and examines the wider MS area whilst focusing on any areas of significance within the proposed Phase 4 development site.

9.3.1 Topography

The overall site has a high point of +18.00mAOD in the north east corner. From here the land falls away to the Southeast, South and West. The ground profile falls to a low point of +5.00mAOD along the southern boundary of the site. The land has typical gradients of 2.3% to the southeast, 2.9% to the south and 7.7% to the west.

Figure 9.1 Site Topographical Survey

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9.3.2 River Catchments

The following section will provide a general description of river catchments identified within the study area.

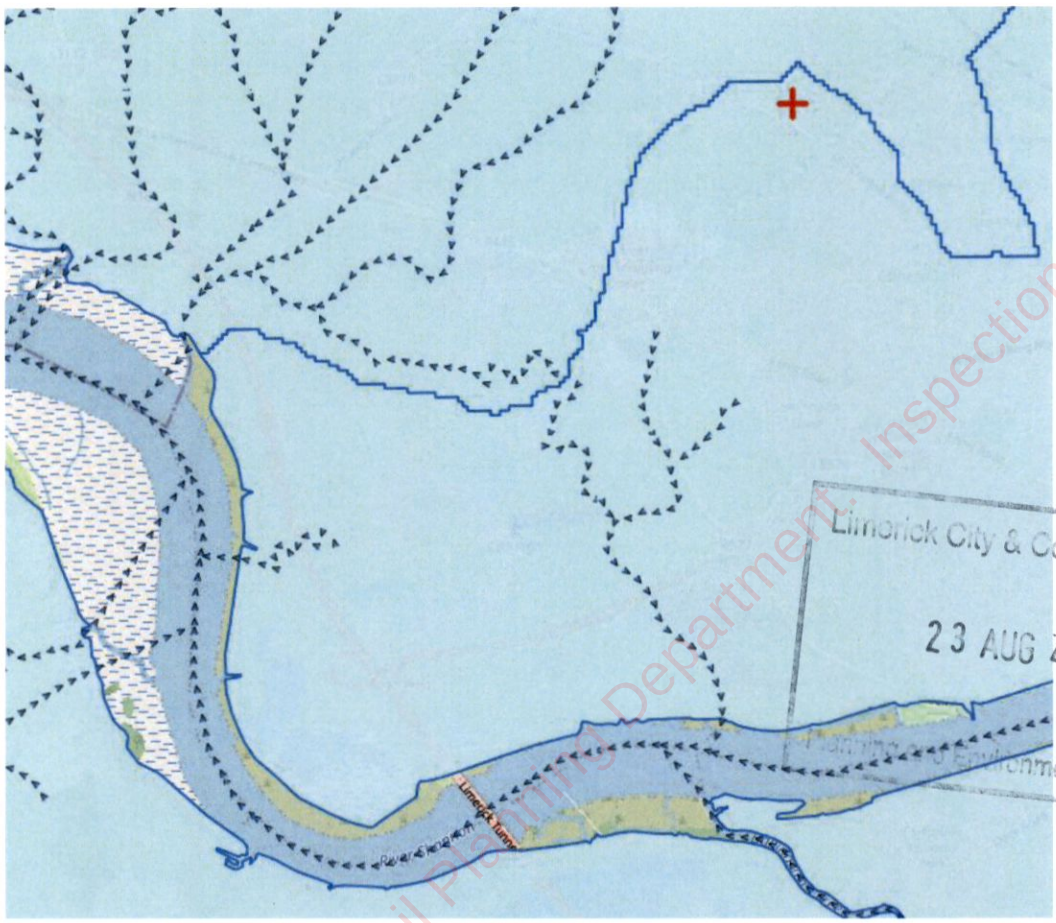

Figure 9.2 River Catchment Mapping (EPA Online Mapping)

9.3.2.1 River Shannon

The proposed development lies within the North Ballycannan sub-basin. This has an area of 27km² and the closest identified drainage path is located approx. 1km from the site. This area is a sub-divide of the Lower Shannon catchment (Hydrometric Area 25) which feeds directly into the River Shannon. The Lower Shannon catchment covers an area of 1,041km². The catchment is characterised by flat limestone plains.

It is anticipated that surface water from the proposed development will flow into the River Shannon via the North Ballycannan surface water drainage network.

9.3.2.2 River Crompaun East

The proposed development lies outside of the Crompaun East sub-basin however it is within approx. 200m of its defined boundary and should be considered as part of this EIAR. The Crompaun East sub-basin has an area of 18km² and feeds directly into the Crompaun River which is a tributary of the River Shannon. The Crompaun East sub-basin is a sub-divide of the Shannon North catchment (Hydrometric Area 27).

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9.3.2.2 Watercourses (Open Land Drains)

The western boundary of the lands contains a watercourse (an open land drain) which services over 60% of the development lands. This drain flows to the north where it connects to an OPW maintained channel reference C7/2 that flows to the West.

The eastern boundary of the lands has established by the under construction Coonagh to Knockalisheen Distributor Road. This road construction and new road has cut the naturally draining off the eastern section of the lands, 15% of the overall development lands, from existing open drains to the east. As part of the aforementioned road project, new open drains are being constructed which will drain the lands to further existing open drains to the North. These open drains will connect to OPW maintained channel reference C7/2/3 which flows north into the aforementioned C7/2 Channel which flows to the West.

Lands to the south of the development land contain a series of drains that are collected by OPW maintained channels C2 and C7/5 which discharge to the West. These service remaining 25% of the development lands. Again the Coonagh to Knockalisheen Distributor Road has cut off the natural flow of the lands at present and as part of the road project, these channels are proposed to be diverted along and under the new distributor road to mimic the pre-road construction drainainge flows.

9.3.3 Flood Risk Assessment (FRA)

As can be seen the extract below from OPW CFRAMs mapping for river flooding in a 1 in 1000 year chance, the lands are outside of the predicted flood zone. The main source of flooding is from the Crompaun River and not directly from the River Shannon.

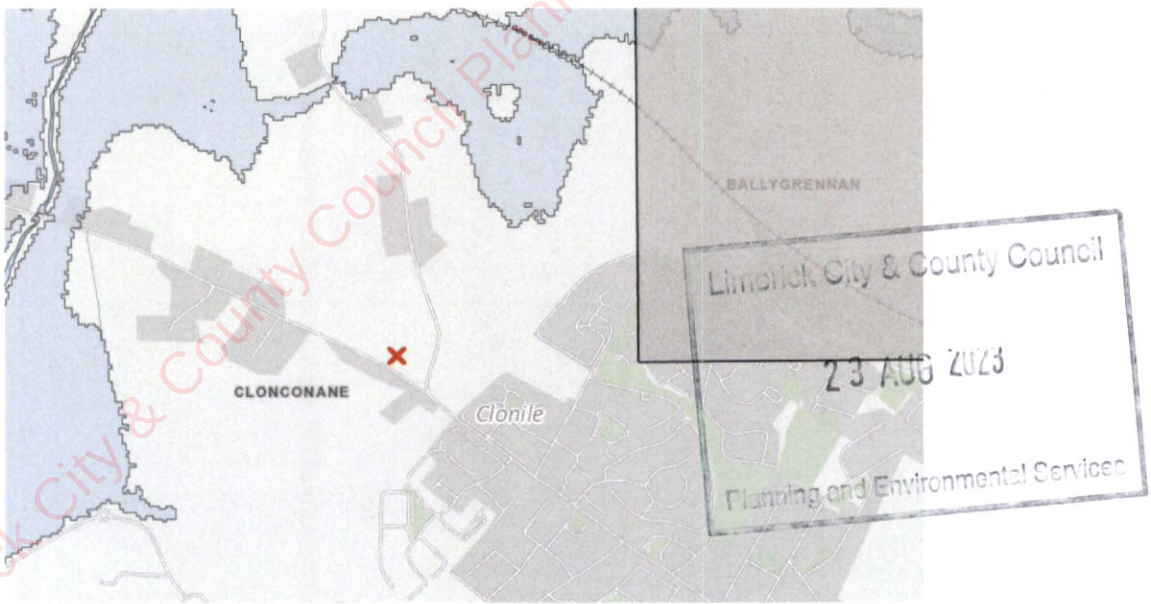

Figure 9.3 CFRAM River Flood Extents Present Day – 1 in 1000 year (Floodinfo.ie)

Furthermore, the extract below from OPW CFRAMs mapping for coastal flooding in a 1 in 1000 year chance. As can be seen, flooding extends to the southern boundary of the development lands. From the topographical survey it was noted that the southern boundary forms a natural low-point for the development and has a general level of +5.00mAOD.

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Figure 9.4 CFRAM Coastal Flood Extents Present Day – 1 in 1000 year (Floodinfo.ie)

Based on the OPW CFRAMs Map the lands are located outside Flood Risk Zones A and B, therefore located in Flood Risk Zone C and have been zoned for residential on this basis.

The flood risk from the North of the site is from flooding of The Crompaum (River) flowing from the North as well as from a stream flowing East to West. The 1 in 1000 year coastal and fluvial flood levels in this area are at 2.90m and 2.15m respectively.

The flood risk from the West is from the Crompaum (River) where the modelled 1 in 1000 year coastal and fluvial flood level in this area is 4.72m and 3.05m respectively. The flood risk from the South is again from the Crompaum (River) where the 1 in 1000 year coastal and fluvial flood levels in this area are at 2.90m and 3.03m respectively.

Existing site levels within the development lands are between 5.0m and 18.0 m AOD.

9.3.4 Surface Water Quality

The EPA carries out river quality monitoring and maintains historic records of the results. Rivers are provided with biotic indices (Q values) to reflect average water quality. These are defined as follow;

Q Value*	WFD Status	Pollution Status	Condition**
Q5, Q4-5	High	Unpolluted	Satisfactory
Q4	Good	Unpolluted	Satisfactory
Q3-4	Moderate	Slightly polluted	Unsatisfactory
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory
Q2, Q1-2, Q1	Bad	Seriously polluted	Unsatisfactory

Table 9.1 EPA River Quality Surveys Biological Classification

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9.3.4.1 River Shannon

The River Shannon Lower at the closest monitoring point (25S01) has a current Q value of 3-4.

Station Code	1972	1976	1984	1987	1990	1993	1996	1999	2002	2008	2011	2012	2014	2015	2017	2018	2021
RS25S011960			4-5														
RS25S012010			4-5														
RS25S012030		4-5	4														
RS25S012050			4														
RS25S012060										3-4	4		4		3-4		3-4
RS25S012110			4														
RS25S012300			4														
RS25S012500	4-5		4	4	4	3-4	3-4	3-4	4	3-4		3-4		3-4		3-4	3
RS25S012600			4	4	4	3-4	3-4	3-4	3-4								

Table 9.2 EPA Biological Quality Rating - Shannon (Lower) 25S01

9.3.4.2 River Crompaun

The River Crompaun East at the closest monitoring point (27C09) has a current Q value of 3.

Station Code	1988	1991	1998	2001	2005	2007	2011	2013	2014	2016	2019	2022
RS27C090300	4-5		4-5	4	4-5				4	3-4	3-4	3-4
RS27C090400		5										
RS27C090500	5											
RS27C090600	4-5	4-5	4-5	3-4	4	4	3-4	3-4		3	3	3

Table 9.3 EPA Biological Quality Rating - Crompaun East 27C09

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There are no water supply abstraction points from either river downstream of the study area.

9.3.5 Proposed Surface Water Drainage

A detailed surface water drainage proposal has been prepared by Garland Consulting Engineers for the lands. Surface water runoff rate is controlled to the greenfield runoff rate. The greenfield runoff rate was determined as the greater of 2 l/s/ha or Qbar as specified in the Limerick Development Plan. The proposal contains Sustainable Urban Drainage Solutions (SUDs) which includes tree pits, bioretention areas and permeable paving and asphalt surfaces. The resulting surface water from the development discharges to a series of stone based infiltration and attenuation areas to promote treatment and infiltration to ground to mimic the natural surface water discharge from the site. Outfall from stone infiltration systems discharges to existing swales or open drains. The surface water from the development is treated via propriety treatment systems to remove containments prior to discharge.

9.4 DESCRIPTION OF EFFECTS

Seven different 'Delivery Phases' of development, as detailed in Chapter 1.0, are proposed to effectively deliver the overall indicative masterplan. This application relates to Phase 4 (54 no. units) as detailed in Chapter 1.0 and 2.0 of this EIAR. Whilst seven different phases are proposed at this point in time, the reality is that some of the phases could be fast-tracked such that two phases advance in construction

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together. This, however, is very much dependent on market conditions and the specific requirements of contractors. In any case, should different phases cumulatively progress together, the overall impacts are unlikely to be different.

In order to ensure an effective and conclusive environmental assessment consistent with best practise, the assessment of potential effects on the environment also examines the collective cumulative effects of the overall development if all seven development phases, as detailed in Chapter 1.0, were implemented. The examination of the 'all phase' development scenario is consistent with best practice in order to examine a 'worst-case' scenario of the project effects.

9.4.1 Construction Effects

No.	Construction Activity	Attribute	Character of Likely Impact
1.	Excavation Activities	Surface Water	The removal of topsoil and localised excavations across the site will potentially increase the vulnerability of open streams and downstream channels and rivers including River Crompaun East and River Shannon.
2.	Excavation Dewatering Works	Surface Water	No impact on the streams or Rivers is anticipated and therefore the risk is considered to be imperceptible.
3.	Fuel storage/usage on site	Surface Water	Open streams, downstream channels and rivers including River Crompaun East and River Shannon are located adjacent to and downstream of the site which could lead to direct overland run-off of fuel or oils to same, especially during runoff from rainfall events
4.	Waste Arisings	Surface Water	Contaminated waste material generated from construction activities may require disposal off-site if not suitable for reuse on site. Temporary storage on site may be required and impacts to surface water courses from direct runoff during rainfall events may occur.
5.	Contaminated land/buried waste	Surface Water	Based upon a visual inspection and the results of the site investigation undertaken to date there is no evidence to indicate the presence of contaminated ground within the site. However there remains a risk posed by any potential buried waste or

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No.	Construction Activity	Attribute	Character of Likely Impact
			contaminated material within the subsurface when disturbed by construction works which could lead to runoff to surface waters.
6.	Vandalism	Surface Water	Pollution due to vandalism of stores or plant poses a risk to potential run-off to surface waters.
7.	Contaminated imported fill	Surface Water	The importation of unsuitable or contaminated fill material for the purpose of reinstatement works or the site access roads may also pose a risk to potential run-off to surface waters.
8.	Construction Works	Surface Water	There may be a risk of surface water pollution through the accidental release of oils, fuels and other contaminants from vehicles.
9.	Concrete Wash Water	Surface Water	Inappropriate disposal or uncontrolled runoff of wash water from concrete trucks or wash down facilities has the potential to impact onrun-off from the site as surface water.

9.4.2 Operational Effects

No.	Activity	Attribute	Character of Potential Impact
1.	Hydrocarbon laden surface water runoff from roads, carparks and general hardstanding	Surface Water	Road surface runoff and poorly designed drainage system being directly channelled to groundwater can result in contamination of the groundwater aquifer. Accidental spillages could contaminate Surface water. All runoff will be discharged to the public mains through Class 1 Bypass Interceptors
2.	Increased surface water flow to the open streams, channels and Rivers which could lead to flooding.	Surface Water	The risk posed to the existing streams and Rivers by increased surface water discharge from the

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No.	Activity	Attribute	Character of Potential Impact
			site. The development will include flow control and SUDS measures.
3.	Wastewater Disposal	Surface Water	All foul water is proposed to be discharged to mains sewer network with no discharge to surface waters or ground waters.
4.	Contaminated land / waste	Future Site Users Surface Water	The potential for contamination not found or caused during the construction stage which would remain within the lands leading to pollution.

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9.5 LIKELIHOOD OF SIGNIFICANT EFFECTS

9.5.4 'Do-Nothing' Effects

If the proposed development did not proceed, there would be no impact on the hydrology of the area. It is envisaged that the land use would remain unchanged as a greenfield site.

9.5.1 Construction Effects

No.	Construction Activity	Attribute	Importance of Attribute	Magnitude of Potential Impact	Significance of Potential Impact
1.	Excavation Activities	Surface Water	Extremely High	Small Adverse	Significant
2.	Excavation Dewatering Works	Surface Water	Extremely High	Negligible	Imperceptible
3.	Fuel storage/usage on site	Surface Water	Extremely High	Small Adverse	Significant
4.	Waste Arisings	Surface Water	Extremely High	Small Adverse	Significant
5.	Contaminated land/buried waste	Surface Water	Extremely High	Small Adverse	Significant
6.	Vandilism	Surface Water	Extremely High	Small Adverse	Significant

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No.	Construction Activity	Attribute	Importance of Attribute	Magnitude of Potential Impact	Significance of Potential Impact
7.	Contaminated imported fill	Surface Water	Extremely High	Small Adverse	Significant
8.	Construction Works	Surface Water	Extremely High	Small Adverse	Significant
9.	Concrete Wash Water	Surface Water	Extremely High	Small Adverse	Significant

9.5.2 Operational Effects

No.	Operational Activity	Attribute	Importance of Attribute	Magnitude of Potential Impact	Significance of Potential Impact
1.	Hydrocarbon laden surface water runoff from roads, carparks and general hardstanding	Surface Water	Extremely High	Small Adverse	Significant
2.	Increased surface water flow to the open streams, channels and Rivers which could lead to flooding.	Surface Water	Extremely High	Small Adverse	Significant
3.	Wastewater Disposal	Surface Water	Extremely High	Small Adverse	Significant
4.	Contaminated land / waste	Future Site Users Surface Water	Extremely High	Small Adverse	Significant

9.5.3 Cumulative Effects

The proposed development comprises a phase of the overall development of the applicant's landholding at this location. An examination of the potential for other projects to contribute cumulatively to the impacts from the proposed development was undertaken during the preparation of this EIAR. The cumulative assessment has regard to the entirety of the masterplan site.

Given the scale of the proposed development and the capacity of the surrounding environment to accommodate a development of this nature and size, it is considered that the overall cumulative Masterplan development will have an imperceptible and long term impact on the surrounding hydrology

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through the construction of additional buildings, infrastructure and hardstanding required for the development.

Potential impacts on water sources and human health may occur should unexpected buried waste or contaminated material be encountered or discharged to surface water during the redevelopment works. However, provided sufficient mitigation measures are in place, as required under this EIAR, the overall impact on the site and regional hydrology will be slight to imperceptible.

The proposed development does need to be considered in conjunction with the works currently underway, delivering the proposed Coonagh to Knockalisheen Distributor Project. This infrastructure project secured consent from An Bord Pleanála in 2021 and was subject to the preparation of an EIAR and Environmental Impact Assessment. This new infrastructure will provide greater connectivity to existing services and facilities in the area.

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9.6 REMEDIAL & MITIGATION MEASURES

9.6.1 Construction Phase

9.6.1.1 Mitigation by Avoidance / Design

HYDROLOGY CONST 1: Back-up plans to deal with the possibility of contamination or fuel spills, *e.g.* pumping of wells or sumps to collect contaminated groundwater for treatment shall be undertaken and included in an overall Construction & Demolition Waste Management Plan (C&DWMP) and Emergency Operation Plan (EOP).

HYDROLOGY CONST 2: Special environmental and human health contingency plans and procedures, following best-practice guidance, shall be developed for the unexpected discovery of contaminated or illegally deposited waste materials. These may include a detailed environmental site investigation, contamination delineation, risk assessment and appropriate remediation under the design and supervision of an experienced contaminated land engineer/hydrogeologist.

HYDROLOGY CONST 3: Chemical analysis will be carried out to assess whether any fill material presents a risk to human and/ or environmental receptors and to determine a suitable on-site or off-site disposal routes.

HYDROLOGY CONST 4: All imported fill material will be sourced from approved and licenced/permitted facilities. All fill material will be confirmed to be inert prior to importation to the site including confirmation of the chemical testing and a visual assessment.

9.6.1.2 Mitigation by Prevention

HYDROLOGY CONST 5: All waste containers (including all ancillary equipment such as vent pipes and refuelling hoses) shall be stored within a secondary containment system (*e.g.* a bund for static tanks or a drip tray for mobile stores and drums). The bunds shall be capable of storing 110% of the tank capacity. Where more than one tank is stored, the bund shall be capable of holding 110% of the largest tank of 25% of the aggregate capacity (whichever is greater). Drip trays used for drum storage

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shall be capable of holding at least 25% of the drum capacity. Where more than one drum is stored the drip tray shall be capable of holding 25% of the aggregate capacity of the drums stored.

HYDROLOGY CONST 6: Silt fencing and berms will be installed strategically around and through the site. The location of the silt fencing and berms will be determined in the construction stage C&DWMP and will be subject to a detailed assessment of the planned works methodology and works area. The purpose of the silt fencing and berms are to prevent silt laden water leaving the site and entering adjoining lands and surface waters.

HYDROLOGY CONST 7: Drainage ditches will be installed to intercept surface water where there is a risk of significant water flow into excavations, adjoining lands or watercourses. A lined attenuation pit shall be constructed at the lowest point to capture any surface water at this point. There will also be a requirement to periodically pump water from excavations. All collected and pumped water will have to be treated prior to discharge. The run-off will be directed through appropriately sized settlement ponds or tanks to remove suspended solids.

HYDROLOGY CONST 8: Monitoring prior to, during and post construction works of surface water and groundwater quality shall be undertaken to ensure minimum disturbance of water quality in the general vicinity of the site. During the construction phase, the monitoring programme will include daily checks, weekly inspections and monthly audits to ensure compliance with the Construction Environmental Management Plan. This will be undertaken in consultation with the wishes of Limerick City & County Council.

HYDROLOGY CONST 9: Waste fuels and materials shall be stored in designated areas that are isolated from surface water drains or open waters (*e.g.* excavations). Skips will be closed or covered to prevent materials being blown or washed away and to reduce the likelihood of contaminated water leakage. Hazardous wastes such as waste oil, chemicals and preservatives, will be stored in sealed containers and kept separate from other waste materials while awaiting collection by a registered waste carrier. Fuelling, lubrication and storage areas and site offices will not be located within 50m of drainage ditches, surface waters or open excavations. Fuel interceptor tanks will be installed on the site to treat any runoff.

HYDROLOGY CONST 10: Wash-out areas on site will be located greater than 50m from any natural watercourse and properly designed with an impermeable liner to contain all cement laden water. No wash-out of ready-mix concrete vehicles shall be located within 10 metres of any temporary or permanent drainage features. Signage shall be erected to clearly identify the wash-out areas. Sufficient wash-out areas shall be provided to cater for all vehicles at peak delivery times.

HYDROLOGY CONST 11: All waste material (both soils and other) generated will be temporarily stored in secure bunded areas thereby preventing the migration of leachate or contaminating substances from impacting on the surrounding environment.

HYDROLOGY CONST 12: Adequate security measures shall be installed on the construction site the design of the construction site layout and security measures required will take account of the sensitivity of the project and potential locations at risk. Security measures will include secure fencing, secure site

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access, securing site plant and equipment, secure storage of materials, sufficient warning signage, and security lighting.

HYDROLOGY CONST 13: All construction vehicles, plant and machinery shall be maintained on a weekly basis and checked daily to ensure any damage or leakages are corrected. Precautions shall be taken to avoid spillages, including:

- Supervision of deliveries and refuelling activities;
- Use of secondary containment e.g. bunds around oil storage tanks;
- Use of drip trays around mobile plant; and
- Designating and using specific impermeable refuelling areas isolated from surface water drains.

9.6.1.3 Mitigation by Reduction

None Required

9.6.2 Operational Phase

9.6.2.1 Mitigation by Avoidance / Design

HYDROLOGY OPER 1: An appropriately designed drainage system has been incorporated into the design of the proposed development. The system has been designed in accordance with accordance with the Greater Dublin Strategic Drainage Study (GDSDS), the CIRIA SUDS Manual 2015 and Recommendations for Site Development Works for Housing Areas published by the Department of the Environment and Local Government. It involves ensuring that suitable protection measures of runoff to surface water including permeable paving, gullies and catch pits, lined attenuation structures and oil-water interceptors are provided.

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9.6.2.2 Mitigation by Prevention

None Required

9.6.2.3 Mitigation by Reduction

None Required

9.7 RESIDUAL EFFECTS

9.7.1 Construction Phase

No.	Construction Activity	Attribute	Significance of Potential Impact Prior to Mitigation	Significance of Potential Impact with Mitigation
1.	Excavation Activities	Surface Water	Significant	Imperceptible
2.	Excavation Dewatering Works	Surface Water	Imperceptible	Imperceptible
3.	Fuel storage/usage on site	Surface Water	Significant	Imperceptible

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No.	Construction Activity	Attribute	Significance of Potential Impact Prior to Mitigation	Significance of Potential Impact with Mitigation
4.	Waste Arisings	Surface Water	Significant	Imperceptible
5.	Contaminated land/buried waste	Surface Water	Significant	Imperceptible
6.	Vandilism	Surface Water	Significant	Imperceptible
7.	Contaminated imported fill	Surface Water	Significant	Imperceptible
8.	Construction Works	Surface Water	Significant	Imperceptible
9.	Concrete Wash Water	Surface Water	Significant	Imperceptible

9.7.1 Operational Phase

No.	Activity	Attribute	Significance of Potential Impact Prior to Mitigation	Significance of Potential Impact with Mitigation
1.	Hydrocarbon laden surface water runoff from roads, carparks and general hardstanding	Surface Water	Significant	Imperceptible
2.	Increased surface water flow to the open streams, channels and Rivers which could lead to flooding.	Surface Water	Significant	Imperceptible
3.	Wastewater Disposal	Surface Water	Significant	Imperceptible
4.	Contaminated land / waste	Future Site Users Surface Water	Significant	Imperceptible

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9.8 MONITORING

9.8.1 Construction Phase

Monitoring prior to, during and post construction works of surface water and groundwater quality shall be undertaken to ensure minimum disturbance of water quality in the general vicinity of the site. During the construction phase, the monitoring programme will include daily checks, weekly inspections and monthly audits to ensure compliance with the Construction Environmental Management Plan. This will be undertaken in consultation with the wishes of Limerick City & County Council.

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Monitoring of any hazardous material stored on-site will form part of the proposed Construction & Waste Management Plan.

9.8.1 Operational Phase

The ongoing monitoring and maintenance of surface water treatment features such as petrol interceptors, gullies, and catch pit manholes

9.9 REFERENCES

TII / NRA Design Manual for Roads and Bridges, 2011

Radon Map of Ireland - http://www.epa.ie/radiation/radonmap/

Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions, May 2009, EC DG XI Environment, Nuclear Safety & Civil Protection Ref: NE80328/D1/3

Guidelines on the information to be contained in Environmental Impact Statements (EPA, 2002),

Geology in Environmental Impact Statements a Guide, (IGI, 2002),

Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, NRA Document.

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CHAPTER TEN AIR QUALITY AND CLIMATE

10.1 INTRODUCTION

This chapter assesses the likely air quality and climate impacts across the proposed Masterplan Site and also the proposed Phase 4 development site. The proposed development will involve the construction of a mix of residential units and associated infrastructure and ancillary works. A full description of the development can be found in Chapter 2.0.

The proposed development forms Phase 4 of an overall masterplan development for the wider site. The masterplan development includes a mix of residential units, a childcare facility and a neighbourhood centre. The masterplan is proposed to be delivered in seven phases in total. Phase 4 of the masterplan development is the focus of this EIAR. However, it was deemed necessary to provide a full assessment of the development in conjunction with the overall masterplan area development to ensure no negative impacts to the environment will occur. As a result the assessments contained within this EIAR chapter includes the entire proposed masterplan development.

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10.2 ASSESSMENT METHODOLOGY

10.2.1 Criteria for Rating of Impacts

Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set.

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2022 (S.I. No. 739 of 2022), which incorporate EU Directive 2008/50/EC, which has set limit values for a number of pollutants. The limit values for NO_2, PM_{10} and $PM_{2.5}$, are relevant to this assessment (see Table 10.1). Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions.

With regards to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development in Ireland. Furthermore, no specific criteria have been stipulated for nuisance dust in respect of this development.

With regard to dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/m^2/day averaged over a one year period at any receptors outside the site boundary. Recommendations from the Department of the Environment, Heritage & Local Government (DEHLG, 2004) apply the TA-Luft

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limit of 350 mg/m^2/day to the site boundary of quarries. This limit value can also be implemented with regard to dust impacts from construction of the proposed development.

Pollutant	**Regulation** Note 1	**Limit Type**	**Value**
Nitrogen Dioxide (NO_2)	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m^3
		Annual limit for protection of human health	40 µg/m^3
NOx	2008/50/EC	Critical level for protection of vegetation	30 µg/m^3 NO + NO_2
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m^3 PM_{10}
		Annual limit for protection of human health	40 µg/m^3 PM_{10}
Particulate Matter (as $PM_{2.5}$) Stage 1	2008/50/EC	Annual limit for protection of human health	25 µg/m^3 $PM_{2.5}$
Particulate Matter (as $PM_{2.5}$) Stage 2 Note 2	2008/50/EC	Annual limit for protection of human health	20 µg/m^3 $PM_{2.5}$

Note 1 EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

Note 2 Stage 2 indicative limit value for $PM_{2.5}$ to be applied from 1 January 2020 after review by the European Commission

Table 10.1 Air Quality Standards Regulations

In April 2023, the Government of Ireland published the Clean Air Strategy for Ireland (Government of Ireland 2023), which provides a high-level strategic policy framework needed to reduce air pollution. The strategy commits Ireland to achieving the 2021 WHO Air Quality Guidelines Interim Target 3 (IT3) by 2026, the IT4 targets by 2030 and the final targets by 2040 (shown in Table 10.2). The strategy notes that a significant number of EPA monitoring stations observed air pollution levels in 2021 above the WHO targets; 80% of these stations would fail to meet the final $PM_{2.5}$ target of 5 µg/m^3. The strategy also acknowledges that "*meeting the WHO targets will be challenging and will require legislative and societal change, especially with regard to both $PM_{2.5}$ and NO_2*". Ireland will revise its air quality legislation in line with the proposed EU revisions to the CAFE Directive, which will set interim 2030 air quality standards and align the EU more closely with the WHO targets.

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Pollutant	Regulation	Limit Type	IT3 (2026)	IT4 (2030)	Final Target (2040)
NO_2	WHO Air Quality Guidelines	24-hour limit for protection of human health	50µg/m³	50µg/m³	25µg/m³
		Annual limit for protection of human health	30µg/ m³	20µg/ m³	10µg/m³
PM (as PM_{10})		24-hour limit for protection of human health	75µg/ m³	50µg/m³	45µg/m³
		Annual limit for protection of human health	30µg/ m³	20µg/ m³	15µg/m³
PM (as $PM_{2.5}$)		24-hour limit for protection of human health	37.5µg/m³	25µg/m³	15µg/m³
		Annual limit for protection of human health	15µg/m³	10µg/m³	5µg/m³

Table 10.2 WHO Air Quality Guidelines

Climate Agreements & Policies

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) (Government of Ireland, 2015) was enacted (the Act). The purpose of the Act was to enable Ireland '*to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050'* (3.(1) of No. 46 of 2015). This is referred to in the Act as the 'national transition objective'. The Act made provision for a national mitigation plan, and a national adaptation framework. In addition, the Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

The first Climate Action Plan (CAP) was published by the Irish Government in June 2019 (Government of Ireland, 2019). The Climate Action Plan 2019 outlined the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlined the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The 2019 CAP also detailed the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The Government published the second Climate Action Plan in November 2021 (Government of Ireland, 2021a) and a third update in December 2022 (Government of Ireland, 2022), with an Annex of Actions published in March 2023.

Following on from Ireland declaring a climate and biodiversity emergency in May 2019, and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme in December 2019, followed by the publication of the Climate Action and Low Carbon Development (Amendment) Act 2021 (hereafter referred to as the 2021 Climate Act) in March 2021. The Climate Act was signed into Law on the 23rd July 2021, giving statutory effect to the core objectives stated within the CAP.

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The purpose of the 2021 Climate Act (Government of Ireland, 2021b) is to provide for the approval of plans "for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050". The 2021 Climate Act will also "provide for carbon budgets and a decarbonisation target range for certain sectors of the economy". The 2021 Climate Act defines the carbon budget as "the total amount of greenhouse gas emissions that are permitted during the budget period".

In relation to carbon budgets, the 2021 Climate Action and Low Carbon Development (Amendment) Act states '*A carbon budget, consistent with furthering the achievement of the national climate objective, shall be proposed by the Climate Change Advisory Council, finalised by the Minister and approved by the Government for the period of 5 years commencing on the 1 January 2021 and ending on 31 December 2025 and for each subsequent period of 5 years (in this Act referred to as a 'budget period')*'. The carbon budget is to be produced for 3 sequential budget periods, as shown in Table 10.3. The carbon budget can be revised where new obligations are imposed under the law of the European Union or international agreements or where there are significant developments in scientific knowledge in relation to climate change. In relation to the sectoral emissions ceiling, the Minister for the Environment, Climate and Communications (the Minister for the Environment) shall prepare and submit to government the maximum amount of GHG emissions that are permitted in different sectors of the economy during a budget period and different ceilings may apply to different sectors. The sectorial emission ceilings for 2030 were published in July 2022 and are shown in Table 10.4. Buildings (Residential) have a 40% reduction requirement and a 2030 emission ceiling of 4 $MtCO_{2eq}$[1].

Sector	Reduction Required	2018 Emissions ($MtCO_{2eq}$)
2021-2025	295 Mt CO_{2eq}	Reduction in emissions of 4.8% per annum for the first budget period.
2026-2030	200 Mt CO_{2eq}	Reduction in emissions of 8.3% per annum for the second budget period.
2031-2035	151 Mt CO_{2eq}	Reduction in emissions of 3.5% per annum for the third provisional budget.

Table 10.3 5-Year Carbon Budgets 2021-2025, 2026-2030 and 2031-2025

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[1] Mt CO_{2eq} denotes million tonnes carbon dioxide equivalent.

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Sector	2018 Emissions ($MtCO_{2eq}$)	Reduction Required	2030 Emission Ceiling ($MtCO_{2eq}$)
Electricity	10.5	75%	3
Transport	12	50%	6
Buildings (Commercial and Public)	2	45%	1
Buildings (Residential)	7	40%	4
Industry	7	35%	4
Agriculture	23	25%	17.25
Other (F-Gases, Waste & Petroleum refining)	2	50%	1

Table 10.4 Sectoral Emission Ceilings 2030

In December 2022, CAP23 was published (Government of Ireland 2022). This is the first CAP since the publication of the carbon budgets and sectoral emissions ceilings, and it aims to implement the required changes to achieve a 51% reduction in carbon emissions by 2030. The CAP has six vital high impact sectors where the biggest savings can be made: renewable energy, energy efficiency of buildings, transport, sustainable farming, sustainable business and change of land-use. CAP23 states that the decarbonisation of Ireland's manufacturing industry is key for Ireland's economy and future competitiveness. There is a target to reduce the embodied carbon in construction materials by 10% for materials produced and used in Ireland by 2025 and by at least 30% for materials produced and used in Ireland by 2030. CAP23 states that these reductions can be brought about by product substitution for construction materials and reduction of clinker content in cement. Cement and other high embodied carbon construction elements can be reduced by the adoption of the methods set out in the Construction Industry Federation 2021 report Modern Methods of Construction. In order to ensure economic growth can continue alongside a reduction in emissions, the IDA Ireland will also seek to attract businesses to invest in decarbonisation technologies.

10.2.2 Construction Phase Methodology

Air Quality

The Institute of Air Quality Management in the UK (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' (2014) outlines an assessment method for predicting the impact of dust emissions from construction activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. The IAQM methodology has been applied to the construction phase of this development in order to predict the likely risk of dust impacts in the absence of mitigation measures and to determine the level of site specific mitigation required. The use of UK guidance is recommended by Transport Infrastructure Ireland (TII) in their guidance document *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022a).

The major dust generating activities are divided into four types within the IAQM guidance (2014) to reflect their different potential impacts. These are:

- Demolition.
- Earthworks.

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- Construction.
- Trackout (movement of heavy vehicles).

The magnitude of each of the four categories is divided into large, medium or small scale depending on the nature of the activities involved. The magnitude of each activity is combined with the overall sensitivity of the area to determine the risk of dust impacts from site activities. This allows the level of site specific mitigation to be determined.

Construction phase traffic also has the potential to impact air quality. The TII guidance *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022a), states that road links meeting one or more of the following criteria can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment. While the guidance is specific to infrastructure projects the approach can be applied to any development that causes a change in traffic.

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- Daily average speed change by 10 kph or more;
- Peak hour speed change by 20 kph or more;
- A change in road alignment by 5m or greater.

The construction stage traffic will lead to an increase of at most 153 AADT and 46 HDV AADT on Old Cratloe Road. These predicted increases are significantly less than the screening criteria outlined above. Therefore, as the construction stage traffic does not meet the above scoping criteria a detailed air assessment of construction stage traffic emissions has been scoped out from any further assessment as there is no potential for significant impacts to air quality.

Climate

Ireland has annual GHG targets which are set at an EU level and need to be complied with in order to reduce the impact of climate change. Impacts to climate as a result of GHG emissions are assessed against the targets set out by the EU under *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013*, which has set a target of 30% reduction in non-ETS sector GHG emissions by 2030 relative to 2005 levels.

As per the EU guidance document *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment* (European Commission, 2013) the climate baseline is first established with reference to EPA data on annual GHG emissions (see Section 10.3.4). The impact of the proposed development on climate is determined in relation to this baseline. The UK Highways Agency has published a DMRB guidance document in relation to climate impact assessments, *LA 114 Climate* (UK Highways Agency 2019). The scoping criteria therein are used to determine whether a detailed climate assessment is required for a proposed project during the construction stage based on a potential greater than 1% change in emissions from the baseline scenario. If emissions will not increase by over 1% then no further assessment is required as there is no potential for significant impacts to climate. The construction stage activities and potential for GHG emissions have been reviewed as part of the construction stage climate assessment and a qualitative assessment conducted.

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10.2.3 Operational Phase Methodology

Air Quality

Operational phase traffic has the potential to impact local air quality as a result of increased vehicle movements associated with the proposed development. The TII scoping criteria detailed in Section 10.2.2.1 were used to determine if any road links are affected by the proposed development and require inclusion in a detailed air dispersion modelling assessment. The proposed development (Phase 4 of the masterplan development) when assessed in isolation will not cause a change in traffic of over 1000 AADT. However, as per the EPA EIA criteria (EPA, 2022) cumulative impacts must also be considered within assessments. While the Phase 4 development in isolation will not lead to an increase of over 1000 AADT, when assessed cumulatively with the other phases 1 – 5 of the masterplan development the traffic volumes are higher and have an increase of over 1000 AADT on a number of road links. In order to assess the full cumulative impact of the development traffic data for the full masterplan development has been provided and assessed by carrying out a detailed air dispersion modelling assessment of operational phase traffic emissions.

The impact to air quality as a result of changes in traffic is assessed at sensitive receptors in the vicinity of affected roads. The TII guidance (2022a) states a proportionate number of representative receptors which are located in areas which will experience the highest concentrations or greatest improvements as a result of the proposed development are to be included in the modelling. The TII criteria state that receptors within 200m of impacted road links should be assessed; roads which are greater than 200m from receptors will not impact pollutant concentrations at that receptor. The TII guidance (2022a) defines sensitive receptor locations as: residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present. A total of 4 no. high sensitivity residential receptors (R1 – R4) were included in the modelling assessment (see Figure 10.1).

The TII guidance (2022a) states that modelling should be conducted for NO_2 and PM_{10} for the base, opening and design years for both the do minimum (do nothing) and do something scenarios. The modelling of PM_{10} can be used to show that the project does not impact on the $PM_{2.5}$ limit value as if compliance with the PM_{10} limit is achieved then compliance with the $PM_{2.5}$ limit will also be achieved. Modelling of operational NO_2 and PM_{10} concentrations has been conducted for the do nothing and do something scenarios using the TII Road Emissions Model (REM) online calculator tool (TII, 2022b).

The following inputs are required for the REM tool: receptor locations, light duty vehicle (LDV) annual average daily traffic movements (AADT), annual average daily heavy duty vehicles (HDV AADT), annual average traffic speeds, road link lengths, road type, project county location and pollutant background concentrations. The *Default* fleet mix option was selected along with the *Intermediate Case* fleet data base selection, as per TII Guidance (TII, 2022b). The *Intermediate Case* assumes a linear interpolation between the *Business as Usual* case – where current trends in vehicle ownership continue and the *Climate Action Plan (CAP)* case – where adoption of low emission light duty vehicles occurs.

Using this input data the model predicts the road traffic contribution to ambient ground level concentrations at the identified sensitive receptors using generic meteorological data. The TII REM uses county-based Irish fleet composition for different road types, for different European emission standards from pre-Euro to Euro 6/VI with scaling factors to reflect improvements in fuel quality,

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retrofitting, and technology conversions. The TII REM also includes emission factors for PM_{10} emissions associated with brake and tyre wear (TII, 2022b). The predicted road contributions are then added to the existing background concentrations to give the predicted ambient concentrations. The ambient concentrations are then compared with the relevant ambient air quality standards to assess the compliance of the proposed development with these ambient air quality standards.

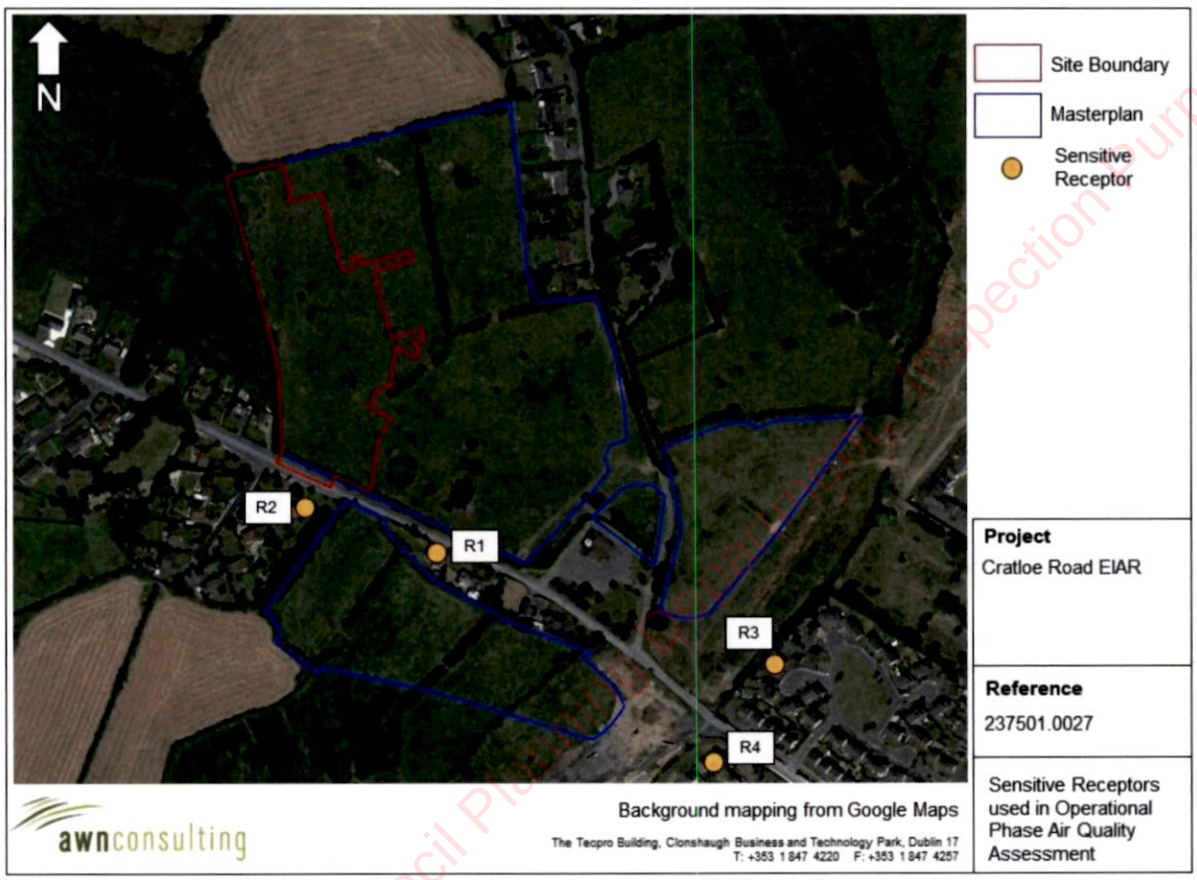

Figure 10.1 Sensitive Receptors used in Operational Phase Air Quality Assessment

The TII document *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022a) details a methodology for determining air quality impact significance criteria for road schemes which can be applied to any project that causes a change in traffic. The degree of impact is determined based on the percentage change in pollutant concentrations relative to the do nothing scenario. The TII significance criteria are outlined in Table 4.9 of *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022a) and reproduced in Table 10.5 below. These criteria have been adopted for the proposed development to predict the impact of NO_2 and PM_{10} emissions as a result of the proposed development.

Long term average concentration at receptor in assessment year	**% Change in concentration relative to Air Quality Standard Value (AQLV)**			
	1%	**2-5%**	**6-10%**	**>10%**
75% or less of AQLV	Neutral	Neutral	Slight	Moderate
76 – 94% of AQLV	Neutral	Slight	Moderate	Moderate
95 – 102% of AQLV	Slight	Moderate	Moderate	Substantial

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Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Standard Value (AQLV)			
	1%	2-5%	6-10%	>10%
103 – 109% of AQLV	Moderate	Moderate	Substantial	Substantial
110% or more of AQLV	Moderate	Substantial	Substantial	Substantial

Source: TII (2022a) Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106

Table 10.5 Air Quality Significance Criteria

Traffic Data Used in Modelling Assessment

Traffic flow information was obtained from Coakley Consulting Engineers for the purposes of this assessment. Data for the Base Year 2021 and the Do Nothing and Do Something scenarios for the Opening Year 2025 and Design Year 2040 were provided. While the Phase 4 development in isolation will not lead to an increase of over 1000 AADT, when assessed cumulatively with the other phases 1 – 5 of the masterplan development the traffic volumes are higher. In order to assess the full cumulative impact of the development, traffic data for the full masterplan development has been provided and assessed (see Traffic Impact Assessment and Chapter 12 for further details).

The traffic data is detailed in Table 10.6. Only road links that met the TII scoping criteria and that were within 200m of identified receptors were included in the modelling assessment. Background concentrations have been included as per Section 10.3.3 of this chapter based on available EPA background monitoring data (EPA, 2022). This traffic data has also been used in the operational phase climate assessment.

Road Name	Speed (kph)	Base Year 2021	Opening Year 2025		Design Year 2040	
			Do Nothing	Do Something	Do Nothing	Do Something
		LDV AADT (HDV AADT)	LDV AADT (HDV AADT)	LDV AADT (HDV AADT)	LDV AADT (HDV AADT)	LDV AADT (HDV AADT)
A - Old Cratloe Rd (East)	50	2,799 (102)	2,947 (105)	5,397 (105)	3,617 (111)	6,072 (105)
B - Old Cratloe Rd (Central)	50	2,702 (98)	2,845 (102)	4,294 (102)	3,510 (107)	4,964 (102)
C - Old Cratloe Rd (West)	50	2,702 (98)	2,845 (102)	3,908 (102)	3,510 (107)	4,578 (102)
D - Old Cratloe Rd	50	2,702 (98)	2,845 (102)	3,458 (102)	3,510 (107)	4,128 (102)
E - Pass/Meelick Rd (Realigned) South	50	196 (4)	206 (4)	1,875 (4)	254 (4)	1,923 (4)
F - Pass/Meelick Rd (Realigned) North	50	196 (4)	206 (4)	1,662 (4)	254 (4)	1,710 (4)
G - Pass/Meelick Rd (North)	50	196 (4)	206 (4)	206 (4)	254 (4)	254 (4)
H - CKDR (North)	100	0 (0)	4,775 (225)	5,020 (225)	5,900 (236)	6,157 (225)
I - CKDR (South)	100	0 (0)	20,055 (945)	21,770 (945)	24,780 (993)	26,544 (945)
J - Old Cratloe Rd (East of CKDR)	50	2,799 (102)	2,945 (107)	3,435 (107)	3,634 (112)	4,129 (107)

Table 10.6 Traffic Data used in Operational Phase Air Quality & Climate Modelling Assessments

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10.2.3.2 Climate

Emissions from road traffic associated with the proposed development have the potential to emit carbon dioxide (CO_2) which will impact climate. The UK Highways Agency DMRB guidance document in relation to climate impact assessments *LA 114 Climate* (UK Highways Agency, 2019b) outlines the following scoping criteria which are used to determine whether a detailed climate assessment is required for a proposed project during the operational stage. During the operational phase, if any of the road links impacted by the proposed development meet the below criteria then further assessment is required.

- A change of more than 10% in AADT;
- A change of more than 10% to the number of heavy duty vehicles; and
- A change in daily average speed of more than 20 km/hr.

There are a number of road links that will experience a change of over 10% in the AADT during the operational phase as a result of the proposed development. As a result a detailed assessment of traffic related carbon dioxide (CO_2) emissions was conducted.

PE-ENV-01104 (TII, 2022a) states that road traffic related emissions information should be obtained from an Air Quality Practitioner. The traffic related emissions were calculated through the use of the TII REM tool (TII, 2022b) which includes detailed fleet predictions for age, fuel technology, engine size and weight based on available national forecasts. The output is provided in terms of CO_2eq for the Base Year 2021, Opening Year 2025 and Design Year 2040. Both the Do Nothing and Do Something scenarios are quantified in order to determine the degree of change in emissions as a result of the proposed development. The traffic data used in the modelling assessment is detailed in Table 10.6.
The EU guidance (2013) also states indirect GHG emissions as a result of a development must be considered, this includes emissions associated with energy usage. In addition to the EU guidance, the Institute of Environmental Management and Assessment (IEMA) guidance note on 'Assessing Greenhouse Gas Emissions and Evaluating their Significance' (IEMA, 2022) states that "*the crux of significance regarding impact on climate is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*". Mitigation has taken a leading role within the guidance compared to the previous edition published in 2017. Early stakeholder engagement is key and therefore mitigation should be considered from the outset of the project and continue throughout the project's lifetime in order to maximise GHG emissions savings.

A number of measures have been incorporated into the overall design of the development to reduce the impact to climate where possible, in line with the objectives of the IEMA guidance (2022).

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10.3 RECEIVING ENVIRONMENT

10.3.1 Site Area Description

The study area for the air quality assessment is limited to a local scale and focusses on sensitive receptors within 350m of the proposed development site (Phase 4) in relation to potential construction dust impacts as per the IAQM guidance (2014). In terms of the operational phase, air quality impacts are likely as a result of traffic emissions from vehicles accessing the site. The operational phase study

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area is limited to sensitive receptors within 200m of impacted road links as per the TII (2022) guidance. A total of 4 no. sensitive receptors were chosen which are within 200m of impacted road links. As per Table 10.6, there are a number of road links that met the TII screening criteria and were included within the air quality assessment. The changes in traffic on other road links in the vicinity of the site were below the screening criteria and were not included within the assessment. As stated previously the traffic assessment includes traffic associated with the entire masterplan development, not just Phase 4 in isolation.

In terms of the climate assessment, as impacts to climate are assessed with reference to national targets and commitments, the study area can be defined as the Republic of Ireland.

Potential impacts as a result of the development of the entire Masterplan area are considered in Section 10.5.4 Cumulative Impacts.

10.3.2 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e traffic levels) (WHO, 2006). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM_{10}, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than $PM_{2.5}$) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles ($PM_{2.5}$ - PM_{10}) will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Shannon Airport meteorological station, which is located approximately 16 km west of the site. Shannon Airport met data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 10.2). For data collated during five representative years (2018 – 2022), the predominant wind direction is westerly to south-easterly with generally moderate wind speeds (Met Eireann, 2023).

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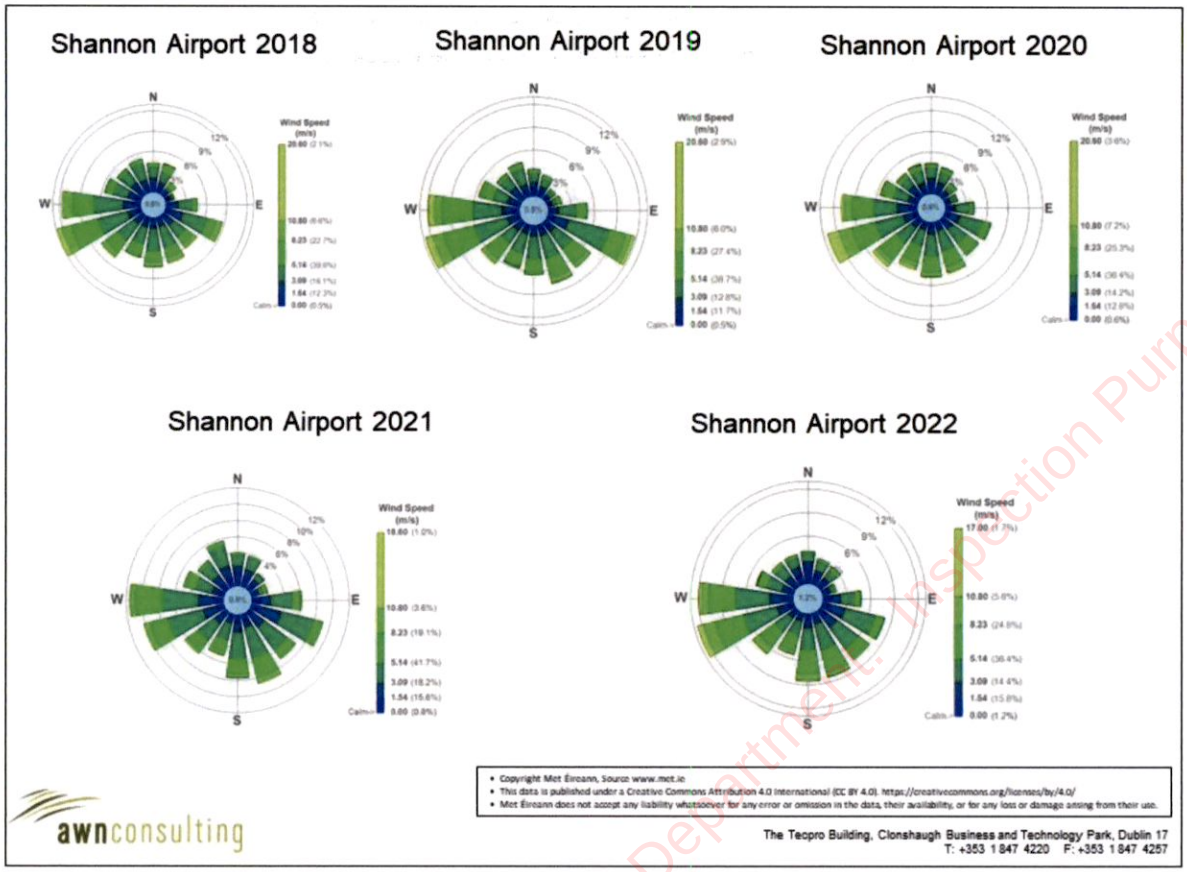

Figure 10.2 Shannon Airport Windroses 2018 - 2022

10.3.3 Baseline Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA. The most recent annual report on air quality in Ireland is "*Air Quality In Ireland 2021*" (EPA, 2022a). The EPA website details the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments (EPA, 2023).

As part of the implementation of the Air Quality Standards Regulations 2022 (S.I. No. 739 of 2022) four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2023). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D.

In terms of air monitoring and assessment, the proposed development site is within Zone C (EPA, 2023). The long-term monitoring data has been used to determine background concentrations for the key pollutants in the region of the proposed development. The background concentration accounts for all non-traffic derived emissions (e.g. natural sources, industry, home heating etc.).

In 2020 the EPA reported that Ireland was compliant with EU legal air quality limits at all locations, however this was largely due to the reduction in traffic due to Covid-19 restrictions. The EPA *Air Quality in Ireland 2020* report details the effect that the Covid-19 restrictions had on air monitoring stations, which included reductions of up to 50% at some monitoring stations which have traffic as a dominant

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source. 2020 concentrations are therefore predicted to be an exceptional year and not consistent with long-term trends. For this reason, the data has been included in the baseline section for representative purposes only and previous long-term data has been used to determine baseline levels of pollutants in the vicinity of the proposed development.

Long-term NO_2 monitoring was carried out at four Zone C locations for the period 2017 – 2021, Kilkenny, Portlaoise, Limerick and Dundalk (EPA, 2022a). Annual mean concentrations of NO_2 range from 5 – 14 µg/m^3 over the 2017 – 2021 period (Table 10.7). Long term average concentrations are significantly below the annual average limit of 40 µg/m^3. In addition, there were no exceedances of the 1-hour limit value of 200 µg/m^3 at any of the monitoring stations, albeit 18 exceedances are allowed per year. Monitoring was conducted at Limerick People's Park in 2019, 2020 and 2021, this station is approximately 3.5 km south-east of the proposed development. Monitored concentrations of NO_2 at this location in Limerick were 13 µg/m^3 and 10 µg/m^3 in 2019 and 2021 respectively. Based on the above information, a conservative estimate of the current background NO_2 concentration in the region of the proposed development is 10 µg/m^3.

Station	Averaging Period Notes 1,2	Year				
		2017	2018	2019	2020	2021
Kilkenny	Annual Mean NO_2 (µg/m^3)	5	6	5	4	4
	99.8th%ile 1-hr NO_2 (µg/m^3)	41	45	42	40	35
Portlaoise	Annual Mean NO_2 (µg/m^3)	11	11	11	11	8
	99.8th%ile 1-hr NO_2 (µg/m^3)	60	68	60	52	49
Dundalk	Annual Mean NO_2 (µg/m^3)	-	14	12	10	11
	99.8th%ile 1-hr NO_2 (µg/m^3)	-	-	69	73	67
Limerick (People's Park)	Annual Mean NO_2 (µg/m^3)	-	-	13	10	10
	99.8th%ile 1-hr NO_2 (µg/m^3)	-	-	0	64	59

Note 1 Annual average limit value - 40 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022). 1-hour limit value - 200 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022).

Table 10.7 Trends in Zone C Air Quality – Nitrogen Dioxide (NO_2)

Continuous PM_{10} monitoring was carried out at five Zone C locations from 2017 – 2021, Galway, Portlaoise, Ennis, Limerick and Dundalk. Concentrations range from 10 – 20 µg/m^3 over the 2017 – 2021 period (see Table 10.8). Hence, long term concentrations are significantly below the annual limit value of 40 µg/m^3. In addition, there were at most 17 exceedances (in Ennis) of the 24-hour limit value of 50 µg/m^3 in 2021 albeit 35 exceedances are permitted per year (EPA, 2022a). Monitoring was conducted in Limerick People's Park c. 3.5 km south-east of the proposed development for the years 2019, 2020 and 2021. Monitored concentrations were 13 µg/m^3 in 2019, 2020 and 2021. Based on the EPA data, a conservative estimate of the current background PM_{10} concentration in the region of the development is 13 µg/m^3.

Station	Averaging Period Notes 1,2	Year				
		2017	2018	2019	2020	2021
Galway	Annual Mean PM_{10} (µg/m^3)	-	15	13	13	11
	24-hr Mean > 50 µg/m^3 (days)	-	0	1	1	0
Ennis	Annual Mean PM_{10} (µg/m^3)	16	16	18	20	19
	24-hr Mean > 50 µg/m^3 (days)	9	4	12	19	17

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Portlaoise	Annual Mean PM_{10} (µg/m³)	10	11	15	12	11
	24-hr Mean > 50 µg/m³ (days)	0	1	0	0	1
Dundalk	Annual Mean PM_{10} (µg/m³)	-	15	14	13	12
	24-hr Mean > 50 µg/m³ (days)	-	0	2	2	0
Limerick (People's Park)	Annual Mean PM_{10} (µg/m³)	-	-	13	13	13
	24-hr Mean > 50 µg/m³ (days)	-	-	4	1	2

Note1 Annual average limit value - 40 µg/m³ (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022). Daily limit value - 50 µg/m³ (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022).

Table 10.8 Trends in Zone C Air Quality – PM_{10}

Average $PM_{2.5}$ levels in Ennis over the period 2017 – 2021 ranged from 10 – 15 µg/m³, with a $PM_{2.5}/PM_{10}$ ratio ranging from 0.63 – 0.78 (EPA, 2022a). Based on this information, a conservative ratio of 0.8 was used to generate an existing $PM_{2.5}$ concentration in the region of the proposed development of 10.4 µg/m³.

Based on the above information the air quality in Zone C locations, such as the Limerick area is generally good, with concentrations of the key pollutants generally well below the relevant limit values. However, the EPA have indicated that road transport emissions are contributing to increased levels of NO_2 with the potential for breaches in the annual NO_2 limit value in future years at locations within urban centres and roadside locations. In addition, burning of solid fuels for home heating is contributing to increased levels of particulate matter (PM_{10} and $PM_{2.5}$). The EPA predict that exceedances in the particulate matter limit values are likely in future years if burning of solid fuels for residential heating continues (EPA, 2022a).

The current background concentrations have been used in the operational phase air quality assessment for both the opening and design year as a conservative approach in order to predict pollutant concentrations in future years. This is in line with the TII methodology (TII, 2022a).

10.3.4 Climate Baseline

Anthropogenic emissions of greenhouse gases (GHGs) in Ireland included in the European Union's Effort Sharing Regulation (ESR) (EU 2018/842) are outlined in the most recent review by the EPA which details emissions up to 2021 (EPA, 2022b). The greenhouse gas emission inventory for 2021 is the first of ten years over which compliance with targets set in the ESR will be assessed. This Regulation sets 2030 targets for emissions outside of the Emissions Trading Scheme (known as ESR emissions) and annual binding national limits for the period 2021-2030. Ireland's target is to reduce ESR emissions by 30% by 2030 compared with 2005 levels, with a number of flexibilities available to assist in achieving this. The ESR was amended in April 2023 and Ireland must now limit its greenhouse gas emissions by at least 42% by 2030. Ireland's ESR emissions annual limit for 2021 is 43.48 Mt CO_2eq. Ireland's 2021 GHG ESR emissions are 46.77 Mt CO_2eq, this is 3.29 Mt CO_2eq more than the annual limit for 2021 (EPA, 2022b). Agriculture continues to be the largest contributor to overall emissions at 38% of the total. Transport, energy industries and the residential sector are the next largest contributors, at 17.7%, 16.5% and 11.1%, respectively. GHG emissions for 2021 are 5.2% higher than emissions in 2020, this is due to a gradual lifting of covid restrictions and an increase in the use of coal and less renewables within electricity generation. Ireland's GHG emissions have increased by 11.4% from 1990 – 2021.

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National total emissions (including Land Use, Land-use Change and Forestry (LULUCF)) for 2021 are 62.11 Mt CO_2eq, these have used 23.5% of the 295 Mt CO_2eq Carbon Budget for the five-year period 2021-2025. This leaves 76.5% of the budget available for the succeeding four years, requiring an 8.4% average annual emissions reduction from 2022-2025 to stay within budget.

10.3.5 Sensitivity of the Receiving Environment

In line with the IAQM guidance document (2014) prior to assessing the impact of dust from a proposed development, the sensitivity of the area must first be assessed as outlined below. Both receptor sensitivity and proximity to proposed works areas are taken into consideration. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties where people are likely to spend the majority of their time, schools and hospitals. Commercial properties and places of work are regarded as medium sensitivity while low sensitivity receptors are places where people are present for short periods or do not expect a high level of amenity.

The surrounding land-use in the vicinity of the proposed development is predominantly agricultural in nature however, there are some residential properties in linear development along the local roads and in large housing estates further to the east. There is 1 no. high sensitivity residential property within 20m of the Phase 4 site boundary. There are a total of 5 no. high sensitivity residential properties greater than 20m but less than 50m of the Phase 4 proposed development boundary (see Figure 10.3). Based on the IAQM criteria outlined in Table 10.9, the worst case sensitivity of the area to dust soiling is considered medium.

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

Table 10.9 Sensitivity of the Area to Dust Soiling Effects on People and Property

In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health impacts. The criteria take into consideration the current annual mean PM_{10} concentration, receptor sensitivity based on type and the number of receptors affected within various distance bands from the proposed construction works. A conservative estimate of the current annual mean PM_{10} concentration in the vicinity of the proposed development is 13 µg/m^3 and there is 1 no. high sensitivity residential property within 20m of the site boundary. There are 5 no. high sensitivity receptors located within 20 – 50 m of the site boundary (see Figure 10.3). Based on the IAQM criteria outlined in Table 10.10, the worst case sensitivity of the area to human health impacts is considered low.

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Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number Of Receptors	Distance from source (m)				
			<20	<50	<100	<200	<350
High	< 24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	**Low**	Low	Low	Low	Low
Medium	< 24 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	< 24 µg/m^3	>1	Low	Low	Low	Low	Low

Table 10.10 Sensitivity of the Area to Dust Related Human Health Impacts

The IAQM guidance also outlines the criteria for determining the sensitivity of an ecological receptor to dust impacts. The sensitivity is determined based on the distance to the source (up to 50m from the site), the designation of the site, (European, National or local designation) and the potential dust sensitivity of the ecologically important species present. There are no ecological sites within 50m of the proposed development and therefore there is no potential for impact and no assessment is required.

Figure 10.3 Sensitive Receptors within 50m of Site

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10.4 DESCRIPTION OF EFFECTS

The proposed development comprises construction of a mix of residential units. The proposed development forms Phase 4 of a masterplan development for the wider site. The Masterplan

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development is proposed to be delivered over 5 phases. A full description of the development is available in Chapter 2.0. Impacts to air quality and climate will occur during both the construction and operational phases of the proposed development.

10.4.1 Construction Phase

During the construction phase construction dust emission have the potential to impact air quality. Dust emissions will primarily occur as a result of site preparation works, earthworks and the movement of trucks on site and exiting the site. There is also the potential for engine emissions from site vehicles and machinery to impact air quality. The construction phase impacts will be short-term in nature. A series of best practice dust mitigation measures will be proposed for the construction phase of the proposed development and therefore impacts are not predicted to be significant.

Engine emissions from site vehicles and machinery have the potential to impact climate through the release of CO_2 and to a lesser extent, other GHGs. However, due to the short-term duration of the construction phase and the relatively small scale of the development these emissions are not predicted to be significant in terms of Ireland's obligations under the EU 2030 GHG targets.

10.4.2 Operational Phase

Engine emissions from vehicles accessing the site have the potential to impact air quality and climate during the operational phase of the development through the release of NO_2, PM_{10}, $PM_{2.5}$ and CO_2. The additional vehicles associated with the operation of the proposed development are not expected to significantly alter the existing traffic on the surrounding road network. Pollutant emissions are not predicted to be significant. Predicted impacts will be long-term in duration.

10.5 LIKELIHOOD OF SIGNIFICANT EFFECTS

10.5.1 Do Nothing Scenario

Under the Do Nothing Scenario no construction works associated with the proposed Phase 4 development will take place and the identified impacts of fugitive dust and particulate matter emissions and emissions from equipment and machinery will not occur. Impacts from increased traffic volumes and associated air emissions from the proposed Phase 4 development will also not occur. However, the proposed development is part of a wider masterplan site. A number of planning applications for earlier phases of the masterplan development have been submitted to Limerick CC.

It is proposed to develop the entire masterplan site on a phased basis, and therefore impacts as a result of construction works and increased traffic will still occur albeit to a lesser extent due to the smaller scale of development. Further details of the construction phasing strategy can be found in Chapter 2.0. The Do Nothing scenario associated with the operational phase, including traffic associated with the additional phases 1 – 5 of the masterplan development, is assessed within Section 10.5.3 and it was found to be imperceptible. Therefore, this scenario can be considered neutral in terms of both air quality and climate.

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10.5.2 Construction Phase

Air Quality

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust. While construction dust tends to be deposited within 350 m of a construction site, the majority of the deposition occurs within the first 50 m. The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction. A review of Shannon Airport meteorological data (see Section 10.3.2) indicates that the prevailing wind direction is westerly to south-easterly and wind speeds are generally moderate in nature. In addition, dust generation is considered negligible on days where rainfall is greater than 0.2 mm. A review of historical 30 year average data for Shannon Airport indicates that on average 211 days per year have rainfall over 0.2 mm (Met Eireann, 2023) and therefore it can be determined that over 57% of the time dust generation will be reduced.

In order to determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the previously established sensitivity of the area (see Section 10.3.4). As per Section 10.2.2.1 the major dust generating activities are divided into four types within the IAQM guidance to reflect their different potential impacts. These are demolition, earthworks, construction and trackout. The magnitude of each category must be determined as per the criteria within the IAQM guidance (2014). The magnitude can be classified as either small, medium or large depending on the scale of the works involved. The magnitude of each activity has been determined below for the proposed Phase 4 development.

- Demolition - There are no demolition works proposed as part of the proposed development as it is a greenfield site.
- Earthworks - The total site area is 2.56 ha which indicates that the site is within the 'large' dust emission category in relation to earthworks activities as per the IAQM criteria (IAQM, 2014).
- Construction - There are a total of 54 units proposed as part of the proposed Phase 4 development, the total building volume to be constructed is within the range of 20,000 m^3 – 100,000 m^3 which is the 'medium' magnitude for construction related dust emissions as per the IAQM criteria (IAQM, 2014).
- Trackout (movement of heavy vehicles) – it is predicted that there will be greater than 10 but less than 50 outward HGV movements per day during the construction phase. Therefore the dust emission magnitude in relation to potential trackout is within the 'medium' category.

The magnitude of each dust emission category is then combined with the sensitivity of the area as per Section 10.3.5 to determine the level of risk in relation to dust emissions from the site. Using the IAQM criteria (IAQM, 2014) there is a medium risk of dust soiling impacts from earthworks, construction and trackout activities and a low risk of dust related human health impacts from earthworks, construction and trackout activities.

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The risk of dust impacts as a result of the proposed development are summarised in Table 10.11 for each activity. The magnitude of risk determined is used to prescribe the level of site specific mitigation required for each activity in order to prevent significant impacts occurring.

Overall, in order to ensure that no dust nuisance occurs during the earthworks, construction and trackout activities, a range of dust mitigation measures associated with a medium risk of dust impacts will be implemented. In the absence of mitigation dust soiling impacts from construction works are predicted to be short-term, localised, negative and slight.

Potential Impact	Dust Emission Risk			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Dust Emission Magnitude	N/A	Large	Medium	Medium
Dust Soiling Risk	N/A	Medium Risk	Medium Risk	Medium Risk
Human Health Risk	N/A	Low Risk	Low Risk	Low Risk

Table 10.11 Summary of Dust Impact Risk used to Define Site-Specific Mitigation

There is also the potential for traffic emissions to impact air quality in the short-term over the construction phase. Particularly due to the increase in HGVs accessing the site. The construction stage traffic has been reviewed and a detailed air quality assessment has been scoped out as none of the road links impacted by the proposed development satisfy the TII assessment criteria in Section 10.2.2.1. It can therefore be determined that the construction stage traffic will have an imperceptible, neutral and short-term impact on air quality.

Climate

There is the potential for a number of greenhouse gas emissions to atmosphere during the construction of the development. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions. The Institute of Air Quality Management document *Guidance on the Assessment of Dust from Demolition and Construction* (IAQM, 2014) states that site traffic and plant is unlikely to make a significant impact on climate. As per Section 10.3.4, Ireland had total GHG emissions of 46.77 Mt CO_2eq in 2021, emissions from the construction phase of the proposed development will be a small fraction of this. Therefore, the potential impact on climate is considered to be imperceptible, direct, neutral and short-term.

Human Health

Dust emissions from the construction phase of the proposed development have the potential to impact human health through the release of PM_{10} and $PM_{2.5}$ emissions. As per Table 10.10 the surrounding area is of low sensitivity to dust related human health impacts. In addition, it has been determined that there is at most a low risk of human health impacts from construction dust emissions (Table 10.11). In the absence of mitigation there is the potential for short-term, negative and imperceptible impacts to human health as a result of construction dust emissions.

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10.5.3 Operational Effects

Air Quality

The potential impact of the proposed development has been assessed by modelling emissions from the traffic generated as a result of the development. To provide for a worst-case assessment traffic associated with the full masterplan development has been included in the air modelling assessment, as this will allow for the impact from the full build out of the site to be determined. The traffic data includes the Do Nothing and Do Something scenarios (see Section 10.2.3.1). The impact of NO_2 and PM_{10} emissions for the opening and design years was predicted at the nearest sensitive receptors to the development. This assessment allows the significance of the development, with respect to both relative and absolute impacts, to be determined.

The TII guidance PE-ENV-01106 (TII, 2022a) details a methodology for determining air quality impact significance criteria for TII road schemes and infrastructure projects however, this significance criteria can be applied to any development that causes a change in traffic. The degree of impact is determined based on both the absolute and relative impact of the proposed development. Results are compared against the 'Do-Nothing' scenario, which assumes that the proposed development is not in place in future years, in order to determine the degree of impact.

The results of the assessment of the impact of the proposed development on NO_2 in the opening year 2025 and design year 2040 are shown in Table 10.12. The annual average concentration is in compliance with the limit value at the worst-case receptors in 2025 and 2040. Concentrations of NO_2 are at most 36% of the annual limit value in 2025 and 29% of the annual limit value in 2040. There are predicted to be some increases in traffic between the opening and design years therefore, any decrease in concentration is due to increased uptake in electric vehicles and lower vehicle exhaust emissions. The TII guidance (2022a) states that the hourly limit value for NO_2 of 200 µg/m^3 is unlikely to be exceeded at roadside locations unless the annual mean is above 60 µg/m^3. As predicted NO_2 concentrations are significantly below 60 µg/m^3 (Table 10.12) it can be concluded that the short-term NO_2 limit value will be complied with at all receptor locations.

The impact of the proposed development on annual mean NO_2 concentrations can be assessed relative to "Do Nothing (DN)" levels. NO_2 concentrations at the receptors assessed will increase as a result of the proposed development when compared with the Do-Nothing scenario. There will be at most an increase of 0.53 µg/m^3 at receptor R1, this is a 4.8% change from baseline conditions. Where the predicted annual mean concentrations are less than 75% of the air quality standard (see Table 10.1) and there is a less than 5% change in concentrations compared with the Do-Nothing scenario then the impact is considered neutral as per the TII significance criteria (see Table 10.5). Therefore, the impact of the proposed development on NO_2 concentrations is neutral.

In relation to changes in PM_{10} concentrations as a result of the proposed development, the results of the assessment can be seen in Table 10.13 for the opening year 2025 and design year 2040. The annual average concentration is in compliance with the limit value at the worst-case receptors in 2025 and 2040. Concentrations of PM_{10} are at most 40% of the annual limit value in 2025 and 40% of the annual limit value in 2040. In addition, the proposed development will not result in any exceedances of the daily PM_{10} limit value of 50 µg/m^3. The impact of the proposed development on annual mean PM_{10} concentrations can be assessed relative to "Do Nothing (DN)" levels. PM_{10} concentrations at the

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receptors assessed will increase as a result of the proposed development when compared with the Do-Nothing scenario. There will be at most an increase of 0.33 µg/m^3 at receptor R1, this is a 2.4% change from baseline conditions. As with NO_2, where the predicted annual mean concentrations are less than 75% of the air quality standard (see Table 10.1) and there is a less than 5% change in concentrations compared with the Do-Nothing scenario then the impact is considered neutral as per the TII significance criteria (see Table 10.5). Therefore, the impact of the proposed development on PM_{10} concentrations is neutral.

Overall, the impact of the proposed development on ambient air quality in the operational stage is considered long-term, localised, neutral, imperceptible and non-significant.

Receptor	Impact Opening Year				Impact Design Year			
	DN	DS	DS-DN	Description	DN	DS	DS-DN	Description
R1	11.1	11.7	0.53	Neutral	10.5	10.7	0.18	Neutral
R2	10.9	11.3	0.33	Neutral	10.4	10.5	0.11	Neutral
R3	10.0	10.0	0.04	Neutral	10.0	10.0	0.02	Neutral
R4	14.2	14.3	0.13	Neutral	11.6	11.6	0.05	Neutral

Table 10.12 Annual Mean NO_2 Concentrations (µg/m^3)

Receptor	Impact Opening Year				Impact Design Year			
	DN	DS	DS-DN	Description	DN	DS	DS-DN	Description
R1	13.8	14.1	0.33	Neutral	13.9	14.2	0.31	Neutral
R2	13.6	13.8	0.21	Neutral	13.7	13.9	0.19	Neutral
R3	13.0	13.0	0.03	Neutral	13.0	13.0	0.03	Neutral
R4	15.8	15.9	0.07	Neutral	15.9	15.9	0.04	Neutral

Table 10.13 Annual Mean PM_{10} Concentrations (µg/m^3)

Climate

There is the potential for increased traffic volumes to impact climate. The change in traffic was reviewed against the DMRB screening criteria outlined in Section 10.2.3.2 (UK Highways Agency, 2019) and a detailed climate assessment of traffic emissions was conducted.

The predicted concentrations of CO_2 for the future years of 2025 and 2040 are detailed in Table 10.14. These are significantly less than the 2025 and 2030 targets set out under EU legislation (targets beyond 2030 are not available). It is predicted that in 2025 the proposed development will increase CO_2 emissions by 0.00028% of the EU 2025 target. Similarly low increases in CO_2 emissions are predicted to occur in 2040 with emissions increasing by 0.00025% of the EU 2030 target.

The potential climate impact of the proposed development is considered neutral, long-term and imperceptible in relation to traffic emissions.

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Year	Scenario	CO_2eq (tonnes/annum)
2025	Do Nothing	1,136
	Do Something	1,245
2040	Do Nothing	1,259
	Do Something	1,343
Increment in 2025		109
Increment in 2040		84
Emission Ceiling (Tonnes) 2025		38,991,362
Emission Ceiling (Tonnes) 2030		33,381,312
Impact in 2025 (%)		0.00028%
Impact in 2040 (%)		0.00025%

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Note 1 Target under *Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013*

Table 10.14 Climate Traffic Impact Assessment

Climate change has the potential to alter weather patterns and increase the frequency of rainfall in future years. As a result of this there is the potential for flooding related impacts on site in future years. However, adequate attenuation and drainage have been provided for to account for increased rainfall in future years as part of the design of this development. Therefore, the impact will be long-term, localised, neutral and imperceptible.

The proposed development has been designed to reduce the impact to climate where possible during operation. A number of measures have been incorporated into the design of the development to ensure the operational phase emissions are minimised. The development will be Nearly Zero Energy Building (NZEB) compliant in accordance with the 2021 Part L requirements. Each building will have a Building Energy Rating (BER) to comply with the NZEB requirements. Renewable technologies in the form of air to water heat pumps will be fitted to each unit. Passive design measures include the use of the building fabric to take advantage of the site constraints/orientation to maximise the daylight factors, natural ventilation and solar benefits. Natural daylight factors in accordance with BRE and CIBSE recommendations have been targeted. Further detail is provided in Chapter 2.0.

Human Health

Traffic related air emissions have the potential to impact air quality which can affect human health. However, air dispersion modelling of traffic emissions has shown that levels of all pollutants are below the ambient air quality standards set for the protection of human health. It can be determined that the impact to human health during the operational stage is long-term, neutral, direct and imperceptible.

10.5.4 Cumulative Effects

Construction Phase

According to the IAQM guidance (2014) should the construction phase of the proposed development coincide with the construction of any other permitted developments within 350m of the site then there is the potential for cumulative dust impacts to the nearby sensitive receptors. A review of recent planning applications for the area was conducted in order to identify sites with the potential for cumulative

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impacts. The Coonagh to Knockalisheen Distributor Project is currently under construction to the east of the proposed development and it is assumed that the major dust generating construction works would be broadly complete before construction begins on the proposed development.

There is the potential for the construction of the various phases of the proposed masterplan development on the site to overlap with each other. It is proposed to construct the full site masterplan (Phase 1 – 5) on a phased basis (see Chapter 1 and Chapter 2 for further details on construction phasing schedule) with each phase running subsequent to the next. Therefore, the potential for concurrent construction works and cumulative construction dust impacts will be minimised as the majority of construction works on one phase will be completed prior to works commencing on the next phase. When considering the construction of the masterplan site as a whole the surrounding area is considered of medium sensitivity to dust soiling and of low sensitivity to dust related human health impacts. This is based on the number of receptors within 20m of the masterplan site boundary (7 no.) and the criteria in Table 10.9 and Table 10.10.

However, as mentioned construction works will not be undertaken on the full site at any one time as works will be on a phased basis, therefore, a smaller number of receptors will be impacted at any one time. The dust mitigation measures outlined in Section 10.6.1 and Appendix 10.1 will be applied throughout the construction phase of the proposed development with similar mitigation implemented for the additional masterplan phases across the site, this will avoid significant cumulative impacts on air quality. With appropriate mitigation measures in place, the predicted cumulative impacts on air quality associated with the construction phase of the proposed development are deemed short-term, negative, slight and not significant.

The construction stage traffic associated with the build-out of the masterplan development has been reviewed and a detailed air quality assessment has been scoped out as none of the road links impacted by the proposed development satisfy the TII assessment criteria in Section 10.2.2.1.

According to the IAQM guidance (2014) site traffic, plant and machinery are unlikely to have a significant impact on climate. Therefore, cumulative impacts are not predicted.

Operational Phase

Cumulative impacts have been incorporated into the traffic data supplied for the operational stage air and climate modelling assessments. The traffic modelled included the traffic associated with the full masterplan development for the site as a worst-case scenario. A total of 4 no. sensitive receptors were chosen for inclusion in the air quality modelling assessment as these are within 200m of impacted road links (see Figure 10.1). As per Table 10.6, there are a number road links that met the TII screening criteria and were included within the air quality assessment. The changes in traffic on other road links in the vicinity of the site were below the screening criteria and were not included within the assessment. The receptors modelled have been chosen as a representative sample of worst-case receptors and impacts at other nearby receptors will be similar or lesser than reported within this assessment. The results of the modelling assessment (Section 10.5.3) show that there is a long-term, neutral and imperceptible impact to air quality and climate during the operational stage.

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10.6 REMEDIAL & MITIGATION MEASURES

10.6.1 Construction Phase

10.6.1.1 Mitigation by Avoidance / Design

No mitigation proposed.

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10.6.1.2 Mitigation by Prevention

AIR QLTY & C CONST 1 - The proposed development has been assessed as having a medium risk of dust soiling impacts and a low risk of dust related human health impacts during the construction phase as a result of earthworks, construction and trackout activities (see Section 10.5.2.1). Therefore, dust mitigation measures appropriate for sites with a medium risk of dust impacts shall be implemented during the construction phase of the proposed development. These measures aim to ensure that no significant nuisance occurs at nearby sensitive receptors. The dust mitigation measures have been developed in the form of a Dust Management Plan which is detailed within Appendix 10.1. The Dust Management Plan as detailed in Appendix 10.1 shall be agreed with the planning authority prior to construction and the measures implemented throughout the construction phase of the proposed development.

AIR QLTY & C CONST 2 - The following best practice measures shall be implemented on site to prevent significant GHG emissions and reduce impacts to climate:

- Prevention of on-site or delivery vehicles from leaving engines idling, even over short periods.
- Ensure all plant and machinery are well maintained and inspected regularly.
- Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site.
- Sourcing materials locally where possible to reduce transport related CO_2 emissions.

10.6.1.3 Mitigation by Reduction

No mitigation proposed.

10.6.2 Operational Phase

10.6.2.1 Mitigation by Avoidance / Design

AIR QLTY & C OPER 1 - The development shall be Nearly Zero Energy Building (NZEB) compliant in accordance with the 2021 Part L requirements. Each building shall have a Building Energy Rating (BER) to comply with the NZEB requirements.

AIR QLTY & C OPER 2 - Renewable technologies in the form of air to water heat pumps shall be fitted to each unit. Passive design measures include the use of the building fabric to take advantage of the site constraints/orientation to maximise the daylight factors, natural ventilation and solar benefits. Natural daylight factors in accordance with BRE and CIBSE recommendations have been targeted.

10.6.2.2 Mitigation by Prevention

No mitigation proposed.

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10.6.2.3 Mitigation by Reduction

No mitigation proposed.

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10.7 RESIDUAL EFFECTS

10.7.1 Construction Phase

Air Quality

When the dust mitigation measures detailed in the mitigation section of this report (Section 10.6.1) and Appendix 10.1 are implemented, the residual effect of fugitive emissions of dust and particulate matter from the site will be short term, direct, negative and imperceptible in nature, posing no nuisance at nearby receptors.

Climate

According to the IAQM guidance (2014) site traffic, plant and machinery are unlikely to have a significant impact on climate. Therefore, the predicted impact is short-term, neutral and imperceptible.

Human Health

Best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the residual effect of construction of the proposed development will be short term, direct, negative and imperceptible with respect to human health.

10.7.2 Operational Phase

Air Quality

Air dispersion modelling of operational traffic emissions associated with the proposed development was carried out using the TII REM tool. The modelling assessment determined that the change in emissions of NO_2 and PM_{10} at nearby sensitive receptors as a result of the proposed development will be neutral. Therefore, the operational phase impact to air quality is long-term, localised, neutral, imperceptible and non-significant.

Climate

Modelling of operational phase CO_2 emissions as a result of the traffic associated with the proposed development was carried out to determine the impact to climate. It was found that emissions of CO_2 will increase by an imperceptible amount as a result of the proposed development and are significantly below the EU 2030 GHG targets. The operational phase impact to climate is long-term, neutral and imperceptible. In addition, the proposed development has been designed to reduce the impact to climate where possible during operation.

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Human Health

Emissions of air pollutants are predicted to be significantly below the ambient air quality standards which are based on the protection of human health. Therefore, impacts to human health are long-term, direct, neutral, non-significant and imperceptible.

10.8 MONITORING

10.8.1 Construction Phase

Monitoring of construction dust deposition along the site boundary to nearby sensitive receptors during the construction phase, particularly during the ground works phases, of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/m^2/day during the monitoring period of 30 days (+/- 2 days).

10.8.1 Operational Phase

There is no monitoring recommended for the operational phase of the development as impacts to air quality and climate are predicted to be imperceptible.

10.9 REFERENCES

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Environmental Protection Agency (2022a) Air Quality Monitoring Report 2021 (& previous annual reports)

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European Commission (2013) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment

German VDI (2002) Technical Guidelines on Air Quality Control – TA Luft

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Government of Ireland (2021b) Climate Action and Low Carbon Development (Amendment) Act 2021 (No. 32 of 2021)

Government of Ireland (2022) Climate Action Plan 2023

Government of Ireland (2023) Clean Air Strategy for Ireland

Institute of Air Quality Management (IAQM) (2014) Guidance on the Assessment of Dust from Demolition and Construction Version 1.1

Institute of Environmental Management & Assessment (IEMA) (2022) Assessing Greenhouse Gas Emissions and Evaluating their Significance

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Met Éireann (2023) Met Eireann website: https://www.met.ie/

The Scottish Office (1996) Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects Of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings

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Transport Infrastructure Ireland (2022b) TII Road Emissions Model (REM): Model Development Report – GE-ENV-01107

Transport Infrastructure Ireland (TII) (2022a) PE-ENV-01104: Climate Guidance for National Rods, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document

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UK Highways Agency (2019) UK Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 14 LA 114 Climate

UK Office of Deputy Prime Minister (2002) Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance

USEPA (1997) Fugitive Dust Technical Information Document for the Best Available Control Measures

World Health Organisation (2006) Air Quality Guidelines - Global Update 2005 (and previous Air Quality Guideline Reports 1999 & 2000)

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Appendix 10.1 – Dust Management Plan

The proposed development has been assessed as having a medium risk of dust soiling impacts and a low risk of dust related human health impacts during the construction phase as a result of earthworks, construction and trackout activities. Therefore, the following dust mitigation measures shall be implemented during the construction phases of the proposed development. These measures are appropriate for sites with a medium risk of dust impacts and aim to ensure that no significant nuisance occurs at nearby sensitive receptors. The mitigation measures draw on best practice guidance from Ireland (DCC, 2018), the UK (IAQM (2014), BRE (2003), The Scottish Office (1996), UK ODPM (2002)) and the USA (USEPA, 1997). These measures will be incorporated into the overall Construction Environmental Management Plan (CEMP) prepared for the site. The measures are divided into different categories for different activities.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before works commence on site. Community engagement includes explaining the nature and duration of the works to local residents and businesses.
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details.

Site Management

- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions. Dry and windy conditions are favourable to dust suspension therefore mitigations must be implemented if undertaking dust generating activities during these weather conditions.
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out

Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Fully enclose specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating Vehicles / Machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.

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- Impose and signpost a maximum-speed-limit of 15 kph haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials.

Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Only remove the cover in small areas during work and not all at once.
- During dry and windy periods, and when there is a likelihood of dust nuisance, a bowser will operate to ensure moisture content is high enough to increase the stability of the soil and thus suppress dust.

Measures Specific to Construction

- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

Measures Specific to Trackout

- A speed restriction of 15 kph will be applied as an effective control measure for dust for on-site vehicles.

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- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10 m from receptors where possible.

Monitoring

- Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results in the site inspection log. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Monitoring of construction dust deposition along the site boundary to nearby sensitive receptors during the ground works phases of the proposed development is required to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/m^2/day during the monitoring period of 30 days (+/- 2 days).

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