Tionscadal Soláthair Uisce
Water Supply Project

Environmental Impact Assessment Report (EIAR)

Volume 3 of 6: Environmental Assessment

(Chapter 13) Climate

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Contents

Acronyms and Abbreviations

Acronym	Meaning
AADT	Annual Average Daily Traffic
AMOC	Atlantic Meridional Overturning Circulation
BPS	Booster Pumping Station
BPT	Break Pressure Tank
BSI	British Standards Institution
CAP	Climate Action Plan
CCRA	Climate Change Risk Assessment
CH_4	Methane
CPPA	Corporate Power Purchase Agreement
CO_2	Carbon Dioxide
CO_2eq	Carbon Dioxide Equivalent
DECC	Department of the Environment, Climate and Communications
DHLGH	Department of Housing, Local Government and Heritage
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
ESB	Electricity Supply Board
ESR	Effort Sharing Regulation
ETS	Emissions Trading System
FCV	Flow Control Valve
FRA	Flood Risk Assessment
GGBS	Ground granulated blast furnace slag
GHG	Greenhouse Gas
GSI	Geological Survey Ireland
GWP	Global Warming Potential
HDV	Heavy Duty Vehicle
HEFS	High-End Future Scenario
HLPS	High Lift Pumping Station
HVO	Hydrotreated Vegetable Oil
ICE	Inventory of Carbon and Energy
ISEP	Institute of Sustainability and Environmental Professionals (formerly known as Institute of Environmental Management and Assessment (IEMA))
IPCC	Intergovernmental Panel on Climate Change
kt	Kilotonnes
kWh	Kilowatt hours
LULUCF	Land Use, Land-use Change and Forestry
m^3/s	Cubic metres per second
Mld	Megalitres per day

Acronym	Meaning
MRFS	Mid-Range Future Scenario
Mt	Megatonnes
$MtCO_2eq$	Million tonnes Carbon Dioxide Equivalent
MW	Megawatts
MWp	Megawatts peak
NAF	National Adaptation Framework
NCCRA	National Climate Change Risk Assessment
N_2O	Nitrous oxide
NDC	Nationally Determined Contribution
NewERA	New Economy and Recovery Authority
NFCS	National Framework for Climate Services
NOB	Normal Operating Band
OPW	Office of Public Works
PCAS	Peatland Climate Action Scheme
RCP	Representative Concentration Pathway
REM	Road Emissions Model
RICS	Royal Institution of Chartered Surveyors
RWI&PS	Raw Water Intake and Pumping Station
RWRM	Raw Water Rising Main
SDCC	South Dublin County Council
SEAI	Sustainable Energy Authority of Ireland
SuDS	Sustainable Drainage Systems
TII	Transport Infrastructure Ireland
TPR	Termination Point Reservoir
UKWIR	UK Water Industry Research
UPS	Uninterrupted Power Supply
WTP	Water Treatment Plant

13. Climate

13.1 Introduction

1. This chapter reports the assessment of the likely significant effects of the Proposed Project on climate during the Construction and Operational Phases in accordance with the requirements of the EIA Directive.

2. This chapter sets out the methodology used, describes the existing environment, assesses the predicted effects of the Proposed Project, proposes mitigation measures and assesses residual effects. The assessment has been completed in accordance with the current relevant standards and guidance.

3. Climate is defined as the average weather over a period of time, while climate change is a significant change to the average weather. Climate change is a natural phenomenon but in recent years human activities, through the release of greenhouse gases (GHGs), have impacted on the climate (Intergovernmental Panel on Climate Change (IPCC) 2015). The human release of GHGs is altering the Earth's atmosphere resulting in a 'greenhouse effect'. This effect is causing an increase in the atmosphere's heat-trapping abilities resulting in increased average global temperatures over recent decades. The release of carbon dioxide (CO_2) as a result of burning fossil fuels has been one of the leading factors in the creation of this greenhouse effect. The most significant GHGs are CO_2, methane (CH_4) and nitrous oxide (N_2O).

4. The assessment reported in this chapter has considered the mitigation that has been embedded into the design to avoid or reduce environmental effects. Embedded mitigation is an intrinsic part of the Proposed Project design and therefore the assessment of effects assumes all embedded design measures are in place. Embedded mitigation relevant to this topic is included in Section 13.5.1.

5. Table 13.1 outlines the principal Proposed Project elements. A full description is provided in Chapter 4 (Proposed Project Description), of this Environmental Impact Assessment Report (EIAR).

Table 13.1: Summary of Principal Project Infrastructure

Proposed Project Infrastructure	Outline Description of Proposed Project Infrastructure*
Permanent Infrastructure	
Raw Water Intake and Pumping Station (RWI&PS) (Infrastructure Site) County Tipperary	• The RWI&PS would be located on a permanent site of approximately 4ha on the eastern shore of Parteen Basin in the townland of Garrynatineel, County Tipperary. In addition, approximately 1ha of land would be required on a temporary basis during construction • The RWI&PS has been designed to abstract enough raw water from the River Shannon at Parteen Basin to provide up to 300Mld of treated water by 2050 • The RWI&PS site would include a bankside Inlet Chamber, the Raw Water Pumping Station Building, two Microfiltration Buildings, an Electricity Substation and Power Distribution Building, and Dewatering Settlement Basins. The tallest building on the RWI&PS site would be the Microfiltration Buildings which would be 10.9m above finished ground level. Additionally, there would be a telemetry mast, the top of which would be 14m above finished ground level • Power for the RWI&PS would be supplied via an underground connection to the existing Birdhill 38 kV electricity substation • A new permanent access road from the R494 would be constructed to access the proposed RWI&PS site. This access road would be 5m in width and 670m in length • The RWI&PS site boundary would be fenced with a stock proof fence and a 2.4m high paladin security fence 5m inside the boundary. The site would be landscaped in line with the surrounding environment to reduce its visual impact.

Proposed Project Infrastructure	Outline Description of Proposed Project Infrastructure*
Raw Water Rising Mains (RWRMs) (Pipeline) County Tipperary	• The RWRMs would consist of two 1,500mm underground pipelines made from steel that would carry the raw water approximately 2km from the RWI&PS to the Water Treatment Plant (WTP) at Incha Beg, County Tipperary. The water would be pumped from the pumping station at the RWI&PS to the WTP • Twin RWRMs have been proposed so that one RWRM can be taken out of service for cleaning and maintenance while still providing an uninterrupted flow of raw water through the other RWRM • The RWRMs would include Line Valves, a Lay-By, Air Valves and Cathodic Protection • A 20m wide Permanent Wayleave would provide Uisce Éireann with operational access to the RWRMs.
Water Treatment Plant (WTP) (Infrastructure Site) County Tipperary	• The WTP would be located on a permanent site of approximately 31ha at Incha Beg, County Tipperary, 2.6km north-east of the village of Birdhill, and 2km east of the proposed RWI&PS. In addition, approximately 2.5ha of land would be required on a temporary basis during construction • The WTP would treat the raw water received from the RWI&PS via the RWRMs. Once treated, the High Lift Pumping Station (HLPS) would deliver the treated water onwards from the WTP to the Break Pressure Tank (BPT) at Knockanacree, County Tipperary, via the Treated Water Pipeline • The WTP would comprise of a series of tanks and buildings including the Raw Water Balancing Tanks, Water Treatment Module Buildings, Sludge Dewatering Buildings, Sludge Storage Buildings, Clear Water Storage Tanks and HLPS, an Electricity Substation and Power Distribution Building, and the Control Building. The tallest building on the WTP site would be the Water Treatment Module Buildings which would be up to 15.6m above finished ground level. Additionally, there would be a telemetry mast, the top of which would be 14m above finished ground level • There would also be a potential future water supply connection point at the junction between the permanent access road and the R445 • Power for the WTP would be supplied via an underground connection to the existing Birdhill 38 kV electricity substation. Solar panels would be placed on the roofs of the Chemical Dosing Manifold Building, the Water Treatment Module Buildings, Clear Water Storage Tanks and Sludge Storage Buildings, and at a number of locations on the ground to supplement the mains power supply • A new permanent access road from the R445 would be constructed and would be 6m in width and 640m in length • The WTP site boundary would be fenced with a stock proof fence and a 2.4m high palisade security fence 5m inside the boundary. The site would be landscaped in line with the surrounding environment to reduce its visual impact.
Treated Water Pipeline from the WTP to the BPT (Pipeline) County Tipperary	• The Treated Water Pipeline from the WTP to the BPT would consist of a single 1,600mm underground steel pipeline which would be approximately 37km long. The water would be pumped through this section of the Treated Water Pipeline by the HLPS • The Treated Water Pipeline would include Line Valves, Washout Valves, Air Valves, Manways, Cathodic Protection and Lay-Bys • A 20m wide Permanent Wayleave would provide Uisce Éireann with operational access to the pipeline (this Wayleave has been extended to approximately 30m at some Line Valves to provide access between the Lay-Bys and Line Valves). There would be an additional 10m wide Permanent Wayleave at certain locations for operational access to smaller pipes connecting Washout Valves with permanent discharge locations
Break Pressure Tank (BPT) (Infrastructure Site) County Tipperary	• The BPT would be located on a permanent site of approximately 7ha in the townland of Knockanacree, County Tipperary. In addition, approximately 0.8ha of land would be required on a temporary basis during construction • The BPT would be located at the highest point of the pipeline. It marks the end of the Treated Water Pipeline from the WTP to the BPT and the start of the Treated Water Pipeline from the BPT to the Termination Point Reservoir (TPR) in the townland of Loughtown Upper, at Peamount, County Dublin. It would act as a balancing tank and would be required to manage the water pressures in the entire Treated Water Pipeline during flow changes, particularly during start-up and shut-down • The BPT site would include the BPT and a Control Building. The BPT would be a concrete tank divided into three cells covered with an earth embankment. The BPT tanks would be 5m in height and partially buried below finished ground levels. The Control Building would be 7.5m over finished ground level. Additionally, there would be a telemetry mast, the top of which would be 14m above finished ground level • Access to the BPT site would be via a new permanent access road from the L1064 which would be 5m wide and 794m in length • Power for the BPT would be supplied via an underground connection from the existing overhead power line. Solar panels would be placed on the south facing side of the control building roof, on the BPT and at ground level to the south of the site to supplement the mains power supply • The BPT site boundary would be bounded by the existing hedgerow / tree line with a 2.4m high palisade security fence around the permanent infrastructure. The site would be landscaped in line with the surrounding environment to reduce its visual impact.

Proposed Project Infrastructure	Outline Description of Proposed Project Infrastructure*
Treated Water Pipeline from the BPT to the TPR (Pipeline) Counties Tipperary, Offaly, Kildare and Dublin (within the administrative area of South Dublin County Council)	• The Treated Water Pipeline from the BPT to the TPR would consist of a single 1,600mm underground steel pipeline, approximately 133km long • The water would normally travel through the Treated Water Pipeline by gravity; however, flows greater than approximately 165Mld would require additional pumping from the Booster Pumping Station (BPS) in the townland of Coagh Upper, County Offaly • The Treated Water Pipeline would include Line Valves, Washout Valves, Air Valves, Manways, Cathodic Protection, Lay-Bys and potential future connection points • A 20m wide Permanent Wayleave would provide Uisce Éireann with operational access to the pipeline (this Wayleave has been extended to approximately 30m at some Line Valves to provide access between the Lay-Bys and Line Valves). There would be an additional 10m wide Permanent Wayleave at certain locations for operational access to smaller pipes connecting Washout Valves with permanent discharge locations.
Booster Pumping Station (BPS) (Infrastructure Site) County Offaly	• The BPS would be located on a permanent site of approximately 2.6ha in the townland of Coagh Upper, County Offaly. It would be located approximately 30km downstream from the BPT. In addition, approximately 3ha of land would be required on a temporary basis during construction • The BPS would be required when the demand for water causes the flow through the pipeline to exceed approximately 165Mld • The BPS site would consist of a single-storey Control Building with a basement below. It would have a finished height of 7.6m above finished ground level. There would also be a separate Electricity Substation and Power Distribution Building. Additionally, there would be a telemetry mast, the top of which would be 14m above finished ground level • Power to the BPS would be supplied from an existing 38 kV electricity substation at Birr, through cable ducting laid within the public road network. There would be ground mounted solar panels on the southern side of the BPS site to supplement the mains power supply • The site would be accessed directly from the L3003 • The BPS site boundary would be fenced with a stock proof fence and a 2.4m high palisade security fence between 5m -12m inside the boundary. The site itself would be landscaped in line with the surrounding environment to reduce its visual impact.
Flow Control Valve (FCV) (Infrastructure Site) County Kildare	• The FCV controls the flows in the Treated Water Pipeline from the BPT to the TPR. It would be a small permanent site of approximately 0.5ha in the townland of Commons Upper in County Kildare. In addition, approximately 0.6ha of land would be required on a temporary basis during construction • It would consist of three 700mm diameter FCVs and three flow meters installed in parallel with the Line Valve and housed within an underground chamber • Access to the FCV site would be directly off the L1016 Commons Road Upper. • Power supply to the FCV site would be provided from the existing low voltage network via a combination of overhead lines and buried cables. There would be ground mounted solar panels on the north-eastern side of the site to supplement the mains power supply. • Kiosks at the FCV site would house the Programmable Logic Controller, telemetry and power supply for the Line Valve. There would also be a telemetry mast, the top of which would be 14m above finished ground level • The site boundary would be fenced with a stock proof fence and a 2.4m high palisade security fence 5m inside the boundary.

Proposed Project Infrastructure	Outline Description of Proposed Project Infrastructure*
Termination Point Reservoir (TPR) (Infrastructure Site) County Dublin (within the administrative area of South Dublin County Council)	• The TPR would be located on a permanent site of approximately 8.3ha adjacent to an existing treated water reservoir in the townland of Loughtown Upper, at Peamount, County Dublin (within the administrative area of South Dublin County Council) and would have capacity for 75Ml of treated water supply. In addition, approximately 1.1ha of land would be required on a temporary basis during construction • It would be located at the downstream end of the Treated Water Pipeline from the BPT to the TPR and would be the termination point for the Proposed Project. It would be at this location that the Proposed Project would connect to the existing water supply network of the Greater Dublin Area Water Resource Zone (GDA WRZ) • The TPR would consist of an above-ground storage structure, associated underground Scour Water and Overflow Water tanks and a Chlorine Dosing Control Building. The TPR would be a concrete tank divided into three cells and covered with an earth embankment. The top of the TPR would be 11.2m above finished ground level. The Chlorine Dosing Control Building would be 8.4m over finished ground level. Additionally, there would be a telemetry mast, the top of which would be 14m above finished ground level • Power for the TPR would be supplied via an underground connection to the existing electricity substation at Peamount Reservoir. There would be solar panels on top of a portion of the northern cell of the TPR to supplement the mains power supply • A new permanent access road from the R120 would be constructed and would be 5m wide and 342m in length • The TPR site would be bounded by the existing hedgerow to the west and existing fence to the east with a 2.4m high palisade security fence around the permanent infrastructure. The site itself would be landscaped in line with the surrounding environment to reduce its visual impact.
Proposed 38 kV Uprate Works – Power Supply to RWI&PS and WTP	
Proposed 38 kV Uprate Works Ardnacrusha – Birdhill (Power Supply) Counties Clare, Limerick and Tipperary	• The proposed 38 kV Uprate Works would be necessary to deliver adequate electrical power to the RWI&PS and WTP • The proposed works would include the uprating of the existing Ardnacrusha – Birdhill Line and the replacement of polesets/structures with an underground cable along a section of the Ardnacrusha – Birdhill – Nenagh Line • There would also be works at the existing Birdhill 38 kV electricity substation including the provision of a new 38 kV modular Gas Insulated Switchgear Modular Building, new electrical equipment and lighting, together with new fencing and associated works.
Temporary Infrastructure – Required for Construction Phase Only	
Construction Working Width Counties Tipperary, Offaly, Kildare and Dublin (within the administrative area of South Dublin County Council)	• A Construction Working Width would be temporarily required for the construction of the RWRMs and the Treated Water Pipeline, and the subsequent reinstatement of the land • The Construction Working Width would generally be 50m in width but would be locally wider near features such as crossings, access and egress points from the public road network, Construction Compounds and Pipe Storage Depots
Construction Compounds Counties Tipperary, Offaly, Kildare and Dublin (within the administrative area of South Dublin County Council)	• Eight Construction Compounds would be temporarily required to facilitate the works to construct the Proposed Project. Five Construction Compounds would be located along the route of the Treated Water Pipeline at the following Infrastructure Sites: RWI&PS, WTP, BPT, BPS and TPR, with an additional three Construction Compounds located at Lisgarriff (County Tipperary), Killananny (County Offaly) and Drummond (County Kildare). Construction Compounds would act as a hub for managing the works including plant/material/worker movement, general storage, administration and logistical support • The Principal Construction Compound at the WTP would require 30ha of land during construction • The other three Principal Construction Compounds would require land temporarily during construction ranging between approximately 12ha and 16ha • The four Satellite Construction Compounds at the other permanent Infrastructure Sites (excluding the FCV) would require land during construction ranging between approximately 3ha and 12ha.
Pipe Storage Depots Counties Tipperary, Offaly and Kildare	• Nine Pipe Storage Depots would be temporarily required to supplement the Construction Compounds and would serve the installation of pipe between the WTP and the TPR • Pipe Storage Depots would take direct delivery of the pipe for storage before onward journey to the required location along the Construction Working Width • The Pipe Storage Depots would vary in size and require land temporarily during construction generally ranging between approximately 2ha and 7ha but with one site being larger at 11ha.

* Note all land take numbers in this table are affected by rounding to one decimal place.

6. The primary guidance document used for this climate assessment is the Transport Infrastructure Ireland (TII) PE-ENV-01104: Climate Guidance for National Roads, Light Rail, and Rural Cycleways (Offline & Greenways) - Overarching Technical Document (TII 2022a) and PE-ENV-01105 Climate Assessment of Proposed National Roads – Standard (TII 2022b). While these guidance documents are specific to TII road and infrastructure projects, they have been applied to the current assessment as they are considered best practice; these guidance documents are the only national climate guidance for Environmental Impact Assessment (EIA) and the assessment principles are applicable to any development type. These guidance documents are appropriate for the Proposed Project. The TII guidance is based on the Institute of Sustainability and Environmental Professionals (ISEP) (formerly known as Institute of Environmental Management and Assessment (IEMA)) guidance Assessing Greenhouse Gas Emissions and Evaluating their Significance (ISEP 2022) and Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (ISEP 2020a). The PE-ENV-01104 guidance (TII 2022a) advises that the climate assessment should include the following assessments:

- Greenhouse gas assessment (i.e. the impact of the Proposed Project on the climate): quantifies GHG emissions from a project during its lifetime and contextualises the magnitude of the impact of these emissions against relevant carbon budgets, targets and policy
- Climate change risk assessment (CCRA) (i.e. vulnerability of the Proposed Project to climate change (adaptation)): identifies the impact of a changing climate on a project and receiving environment. The assessment considers a project's vulnerability to climate change and identifies adaptation measures to accommodate climate change impacts.

7. The construction of the Proposed Project is anticipated to run from 2028 through 2032, with the first operational year anticipated to be 2033.

8. This chapter should be read particularly in conjunction with the following chapters of the EIAR and supporting documentation:

- Chapter 4 (Proposed Project Description)
- Chapter 5 (Construction & Commissioning)
- Chapter 7 (Traffic & Transport)
- Chapter 9 (Water) including Appendix A9.4 (Flood Risk Assessment)
- Chapter 10 (Soils, Geology & Hydrogeology)
- Chapter 12 (Air Quality)
- Chapter 19 (Resource & Waste Management)
- Chapter 20 (Risk of Major Accidents and/or Disasters).

9. This assessment has been undertaken and reported by a team of competent experts. Refer to Chapter 2 (The Environmental Impact Assessment Process) for a description of the qualifications and expertise of the specialists that have inputted to this chapter.

13.2 Methodology

10. The methodology used for the climate impact assessment of the Proposed Project included the following steps:

- A review of national GHG emissions to characterise the baseline environment. This used published GHG emissions data from the Environmental Protection Agency (EPA)
- A review of the most applicable guidelines for the assessment of GHG emissions to define the significance criteria for the Construction and Operational Phases of the Proposed Project
- Predictive calculations and impact assessments relating to the likely Construction Phase climatic impacts of the Proposed Project

- Predictive calculations of the potential climatic impacts associated with Operational Phase electrical power requirements, including maintenance and potential reduction in renewable power availability at the Ardnacrusha Generating Station
- Predictive calculations and impact assessments relating to the likely Construction and Operational Phase effects of the Proposed Project on traffic-related GHG emissions
- An assessment of the vulnerability of the Proposed Project to climate change
- Development of mitigation measures to reduce the identified likely potential climatic effects associated with the Proposed Project
- Consideration of the residual climate effects from the Proposed Project following the adoption of the mitigation measures.

11. The assessment has been undertaken with reference to the most applicable guidance documents relating to climate which are set out in Section 13.2.3.

13.2.1 Study Area

13.2.1.1 Greenhouse Gas Assessment – Impact of the Proposed Project on Climate

12. The study area for the climate impact assessment differs from other topics of the EIAR, as emissions from the Proposed Project are compared to sectoral GHG emissions and the relevant sectoral emission budgets. The calculation includes changes that would occur within the Planning Application Boundary and impacts that extend beyond it. For example, the study area includes the new infrastructure that is built but also includes Construction Phase and Operational Phase traffic impacts as determined by the traffic and transport assessment (Chapter 7 of this EIAR). As project-related GHG emissions are assessed at a national scale in terms of alignment with carbon budgets and sectoral emissions ceilings the study area for climate is considered the Republic of Ireland.

13.2.1.2 Climate Change Risk Assessment – Vulnerability of Proposed Project to Climate Change

13. The study area for the effects of future climate change on the Proposed Project has been influenced by current and future baselines, and by the input of other environmental topic experts and the design team. It extends beyond the Planning Application Boundary where appropriate to include areas that are sensitive to future climate change impacts, such as changes in flood risk.

14. The following criteria are considered in relation to the CCRA:

    - Climate hazards: the outcomes of the climate screening, i.e. vulnerability assessment and baseline assessment
    - Project receptors: TII (2022a) state that the project receptors are the asset categories considered in the climate screening. In addition, any critical connecting infrastructure and significant parts of the surrounding environment (e.g. water bodies) that are considered as a part of the indirect, cumulative and in-combination impact assessment are also considered project receptors according to the TII guidance (2022a).

13.2.2 Scope of the Assessment

13.2.2.1 Greenhouse Gas Assessment – Impact of the Proposed Project on Climate

15. To establish the scope of the assessment for GHG emissions, the lifecycle stages and categories outlined in Table 13.2 were reviewed. These are taken directly from the PE-ENV-01104 guidance (TII 2022a) which is based on the modular approach from PAS 2080 (British Standards Institution (BSI) 2023). The lifecycle stages of relevance to the Proposed Project are the Before-Use stage and the Use stage. The End-of-Life stage was not considered relevant for this assessment as the Decommissioning Phase of the Proposed Project has not been assessed. Potable water treatment and conveyance assets are usually rehabilitated and maintained in a long service life.

16. Embodied carbon refers to GHGs emitted during the manufacture, transport and use of building materials, together with end-of-life emissions.

17. For the Proposed Project, Construction Phase embodied GHG emissions were categorised under the following headings: land clearance activities, manufacture of materials and transport to site, construction works (including excavations, construction, water usage, electrical power/fuel usage, and transport) and construction waste products (including transport off-site). These have then been reported under the following headings: pre-construction, construction activities, materials, construction traffic and construction waste.

18. For the Operational Phase, embodied GHG emissions have been considered using the following headings: operational traffic, operational power demand, chemical inputs, potential loss of renewable power and residual waterworks sludge generated.

19. In relation to Operational Phase traffic, TII guidance PE-ENV-01106 Air Quality Assessment of Specified Infrastructure Projects – Overarching Technical Document (TII 2022c) outlines the approach for defining the scope of the air quality assessment of traffic emissions (applying to both Construction and Operational Phase). PE-ENV-01106 states that road links can be defined as being ‘affected’ by a proposed development and should be included in the assessment if:
    - Road alignment will change by 5m or more
    - Annual Average Daily Traffic (AADT) flows will change by 1,000 or more
    - Heavy Duty Vehicle (HDV) (vehicles greater than 3.5 tonnes, including buses and coaches) flows will change by 200 AADT or more
    - Daily average speed change by 10kph or more
    - Peak hour speed will change by 20kph or more.

20. The above criteria are also applicable to the Operational Phase climate assessment of traffic emissions as per the TII PE-ENV-01104 (2022a) guidance. The Operational Phase of the Proposed Project would not cause a change in traffic above the TII screening criteria. Due to the low level changes in traffic, a detailed assessment of Operational Phase traffic emissions has been scoped out of the assessment as there is no potential for significant impacts to climate from Operational Phase traffic emissions.

Table 13.2: Lifecycle Stages and Emission Sources for a Project's GHG Emissions (Reproduced from Table 6.2 of PE-ENV-01104 (TII 2022a))

Lifecycle Stage	Reporting Category	Description	Primary Emissions Sources
Before use	Embodied carbon	Raw material extraction, transportation (within the supply chain up to the point of final factory gate) and manufacturing of products required for the Proposed Project	Embodied carbon (GHG) emissions within the construction materials
	Transport	Transportation of products/materials and construction equipment from point of production/storage to construction site	Fuel consumed for material and plant transportation to construction site
		Transport to works site	Fuel consumed for worker commuting to and from the construction site
	Construction processes	Temporary works, ground works and landscaping	Clearance/demolition activities (including the area of land to be cleared, vegetation/sequestration loss and water use). All advanced works, for example archaeological works, fencing, is included. All ground works including earthworks material, laying and compaction, etc.
		Excavation	GHG emissions from the excavation of material
		On-site energy use	Grid electricity to power auxiliary facilities
			Fuel consumed by construction vehicles and plant
		On-site water use	GHG emissions from the provision of water and treatment of wastewater
		Waste production, transportation and waste management	GHG emissions from the treatment of waste
Use	Material use	Carbon emitted or sequestered directly from the fabric of products and materials once they have been installed as part of infrastructure and it is in normal use	GHG emissions savings arising from planting of different vegetation types and/or rehabilitation activities e.g. peat restoration. For maturing vegetation such as trees, sequestration should be accounted for as the vegetation matures (e.g. <30 years) and once matured (e.g. >30 years)
	Maintenance	Maintenance and repair activities	GHG emissions from energy and fuel use, maintenance vehicles, provision of water and treatment of wastewater during maintenance. Embodied emissions associated with maintenance and repair e.g. resurfacing materials
Use	Operation	Operational energy Operational water Other operational processes	GHG emissions resulting from the consumption of energy and fuel use for infrastructure operation e.g. lighting, signage, Luas Stops GHG emissions resulting from the consumption of water Other could include GHG emissions as a result of management of operational waste
	User emissions	User's utilisation of infrastructure	Tailpipe emissions from vehicle journeys
End of life	Deconstruction	Onsite activities involved in deconstructing, dismantling, and demolishing the infrastructure	GHG emissions from vehicles and fuel use for generators on-site
	Transport	Transport to and from disposal	GHG emissions from the fuel consumed for worker(s) commuting to and from the site
	Waste processing for recovery and disposal	Reuse, recycling and recovery of materials Disposal of materials	Activities associated with treatment and processing for recovery, reuse and recycling of waste materials arising from infrastructure. GHG emissions resulting from final disposal of demolition materials

Lifecycle Stage	Reporting Category	Description	Primary Emissions Sources
Supplementary information beyond the infrastructure lifecycle	Lifecycle benefits and loads beyond the system boundary	GHG emissions from potential reuse and recycling Benefits and loads of additional infrastructure functions	Offsetting carbon emissions of a scheme through credible offsite renewable, planting, rehabilitation, and regenerative schemes

13.2.2.2 Climate Change Risk Assessment – Vulnerability of Proposed Project to Climate Change

21. The assessment includes the consideration of the vulnerability of the Proposed Project to climate change during its lifetime. PE-ENV-01104 (TII 2022a) outlines that the scope should identify vulnerable elements of the Proposed Project which are sensitive to likely climate changes such as increased rainfall and an increased frequency of intense storms.

22. The EPA have compiled a list of potential adverse impacts as a result of climate change including the following which may be of relevance to the Proposed Project:
    - More intense storms and rainfall events
    - Increased likelihood and magnitude of river and coastal flooding
    - Water shortages in summer in the east
    - Adverse impacts on water quality
    - Changes in distribution of plant and animal species.

23. The third item on the list, 'Water shortages in summer in the east', specifically relates to the climate adaptation purpose of the Proposed Project. The Proposed Project is designed to provide a reliable supply of water to the East and Midlands region of the country. A review of the potential worst-case impact of climate change on the source of water for the Proposed Project has been assessed in Appendix A9.1 (Abstraction Assessment). This describes the potential impacts of the abstraction on surface water receptors, including scenarios impacted by climate change on Lough Derg, Parteen Basin, the River Shannon and the various tributaries. Therefore, the effect of climate change and vulnerability of supply is not considered further in this chapter.

24. The assessment of the vulnerability of the Proposed Project to climate change considered only the permanent infrastructure and therefore was limited to the Operational Phase only. Construction Phase vulnerabilities to climate change are not considered as significant as the construction of the Proposed Project will be over a short-term period. Construction Phase vulnerabilities will be managed through best practice measures.

13.2.2.3 Decommissioning Phase

25. The Proposed Project would deliver nationally important strategic infrastructure with individual elements designed with a lifespan of 80 to 100 years. The strategic importance of the Proposed Project for water supply in the Eastern and Midlands Region is such that there is no plan to decommission these structures and Uisce Éireann is committed to maintaining and repairing them into the future. On this basis it is not likely that the structures will be decommissioned and therefore, decommissioning of the Proposed Project has not been considered further in this assessment.

13.2.3 Relevant Guidelines, Policy and Legislation

13.2.3.1 General

26. The assessment has been undertaken with reference to the most appropriate guidance documents relating to climate which are set out in the following sections. In addition to specific climate guidance documents, the Guidelines on the Information to be contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022), Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission 2017), and Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning & Local Government 2018) were considered in the preparation of this chapter.

27. The assessment has made reference to national guidelines, policy and legislation where available, in addition to international standards and guidelines relating to the assessment of GHG emissions and associated climatic impacts. These are summarised below:

- Climate Action and Low Carbon Development Act (Act. No. 46 of 2015) (hereafter referred to as the Climate Act)
- Climate Action and Low Carbon Development (Amendment) Act 2021 (No. 32 of 2021) (hereafter referred to as the 2021 Climate Act)
- National Adaptation Framework (NAF) (Department of the Environment, Climate and Communications (DECC) 2024c)
- Climate Action Plan 2025 (hereafter referred to as the CAP25) (DECC 2025)
- Water Quality and Water Services Infrastructure Sectoral Adaptation Plan (Department of Housing, Local Government and Heritage (DHLGH) 2025)
- European Commission 2030 Climate and Energy Policy Framework (European Commission 2014)
- Technical Guidance on the Climate Proofing of Infrastructure in the Period 2021-2027 (European Commission 2021a)
- 2030 EU Climate Target Plan (European Commission 2021b)
- Clare County Council Climate Action Plan 2024-2029 (Clare County Council 2024)
- Kildare County Council Climate Change Action Plan 2024-2029 (Kildare County Council 2024)
- Limerick City and County Council Climate Action Plan 2024 –2029 (Limerick City and County Council 2024)
- Offaly County Council Climate Action Plan 2024–2029 (Offaly County Council 2024)
- Tipperary County Council Climate Action Plan 2024 –2029 (Tipperary County Council 2024)
- South Dublin County Council Climate Action Plan 2024 – 2029 (South Dublin City Council (SDCC) and Codema 2024)
- TII PE-ENV-01104: Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document (TII 2022a)
- TII PE-ENV-01105: Climate Assessment of Proposed National Roads – Standard (TII 2022b)
- TII GE-ENV-01106: TII Carbon Assessment Tool for Road and Light Rail Projects and User Guidance Document (TII 2025a)
- ISEP Assessing Greenhouse Gas Emissions and Evaluating their Significance (ISEP 2022)
- ISEP EIA Guide to: Climate Change Resilience and Adaptation (ISEP 2020a)
- BSI – PAS 2080:2023 – Carbon Management in Buildings and Infrastructure (BSI 2023)
- ISEP GHG Management Hierarchy (ISEP 2020b)

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

13.2.3.2 International Policy

28. The Paris Agreement (United Nations Framework Convention on Climate Change 2015), which entered into force in 2016, is an important milestone in terms of international climate change agreements and includes an aim of limiting global temperature increases to no more than 2°C above pre-industrial levels, with efforts to limit this rise to 1.5°C. Nationally determined contributions (NDCs) are at the heart of the Paris Agreement and the achievement of these long-term goals. NDCs comprise the efforts and actions by each country to reduce national emissions and adapt to the impacts of climate change. The Paris Agreement requires each country to prepare the NDCs that it intends to achieve, updating and enhancing the NDCs every five years. Countries are required to implement mitigation measures, with the aim of achieving the objectives of such contributions. Each of the EU Member States submit their own NDCs, which contribute to the overall EU NDC.

29. The European Green Deal, published by the European Commission in December 2019, provides an action plan which aims for the EU to be climate neutral by 2050. The European Green Deal highlights that further decarbonisation of the energy sector is critical to reaching climate objectives in 2030 and 2050. The European Green Deal has increased the GHG emissions reduction 2030 target to at least 55% in comparison to 1990 levels. Targets for renewable energy and energy efficiency are also likely to be increased.

30. On 14 July 2021, the European Commission adopted a series of legislative proposals setting out how it intends to achieve climate neutrality in the EU by 2050, including the intermediate target of at least a 55% net reduction in GHG emissions by 2030. The package of proposals is known as the ‘Fit for 55’ package.

31. The package includes revisions to the legislation put forward as part of the Climate and Energy Framework 2021-2030, including the EU Emissions Trading System (ETS), Effort Sharing Regulation (ESR), transport and land use legislation, setting out in real terms the ways in which the Commission intends the EU, including Ireland, to reach EU climate targets under the European Green Deal.

32. The EU ETS was launched in 2005 as the world’s first international company-level ‘cap-and trade’ system for reducing emissions of greenhouse gases cost effectively. The EU ETS regulates the GHG emissions of larger industrial emitters including electricity generation, cement manufacturing and heavy industry.

33. Under this new package of legislative proposals, the sectors of the economy covered by the current ETS must reduce emissions by 61% by 2030 compared to 2005 levels by increasing annual emissions reduction to 4.2% per annum. This is a substantial increase from the previous target which was a 43% reduction by 2030.

34. The non-ETS sector includes all domestic GHG emitters which do not fall under the ETS and thus includes GHG emissions from transport, residential and commercial buildings and agriculture. Under this new package of proposals the Commission is now proposing to reduce emissions under the non-ETS sector or the sectors which fall under the Effort Sharing Regulation by at least 40%, compared to 2005 levels. This is an increase of 11 percentage points compared to the existing target of a 29% emission reduction.

35. The European Climate Law[1] aims to write into law the goal set out in the European Green Deal – for Europe’s economy and society to become climate-neutral by 2050. On 17 September 2020 the Commission adopted a proposal to include a revised EU emissions reduction target of at least 55% by 2030 as part of the European Climate Law.

[1] Regulation (EU) 2021/1119 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 (‘European Climate Law’)

36. The 2021 EU Strategy on Adaptation to Climate Change (European Commission 2021c) sets out the pathway to prepare for the unavoidable impacts of climate change. The aim is that '*by 2050, when we aim to have reached climate neutrality, we will have reinforced adaptive capacity and minimised vulnerability to climate impacts…*' Adaptation refers to measures that can reduce the negative impact of climate change by, for example, ensuring a project is resilient to future increases in storm frequency and rainfall levels.

37. The EU has adopted integrated monitoring and reporting rules to ensure progress towards its 2030 climate and energy targets and its international commitments under the 2015 Paris Agreement.

13.2.3.3 National Policy

38. In 2015, the Climate Act was enacted by the Oireachtas. The purpose of the Climate 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*'. This is referred to in the Climate Act as the 'national transition objective'. The Climate Act allows for the submission of an adaptation framework for Ireland referred to as the 'National Adaptation Framework', which is required to be submitted to government for approval every five years.

39. In May 2019, the Government of Ireland declared a climate and biodiversity emergency. Following on from this, the Government of Ireland's first national Climate Action Plan (CAP) (Department of Communications, Climate Action and Environment 2019a) was published in 2019. It commits to achieving a net zero carbon energy systems objective for Ireland. Since then, subsequent CAPs have been published for 2021, 2023, 2024 and 2025 to continue to guide Ireland towards the national transition objective. While forging towards the 2050 goal, the CAP aims to ensure a 'Just Transition' for those facing particular challenges in adjusting through reskilling, energy poverty schemes and community participation. The road to the national objective should not leave vulnerable groups behind.

40. The 2021 Climate Act was enacted into national law in July 2021. The 2021 Climate Act commits Ireland, in law, to move to a climate-resilient and climate-neutral economy by 2050 in alignment with the European Green Deal, and includes the following elements:

- Establishes a 2050 emissions target
- Introduces a system of successive five-year, economy-wide carbon budgets. The first two carbon budgets covering the periods 2021-2025 and 2026-2030 were announced by the Climate Change Advisory Council in 2021 (with a provisional budget from 2031). The carbon budgets have been used to prepare sectoral emissions ceilings for relevant sectors of the economy
- Strengthens the role of the Climate Change Advisory Council in proposing carbon budgets
- Introduces a requirement to annually revise the CAP and prepare a National Long Term Climate Action Strategy at least every decade
- Introduces a requirement for all local authorities to prepare individual CAPs which will include both mitigation and adaptation measures.

41. The first carbon budget programme proposed by the Climate Change Advisory Council was approved by government and adopted by both Houses of the Oireachtas in April 2022. The carbon budgets comprise three successive five-year budgets. The total emissions allowed under each budget are set out in Table 13.3 as well as the average annual reduction for each five-year period.

Table 13.3: 2021 – 2035 Carbon Budgets

Period	Carbon Budget ($MtCO_2eq$*)	Emission Reduction Target
2021-2025	295	Reduction in emissions of 4.8% per annum for the first budget period
2026-2030	200	Reduction in emissions of 8.3% per annum for the second budget period
2031-2035	151	Reduction in emissions of 3.5% per annum for the third provisional budget

* Million tonnes of carbon dioxide equivalent

42. The 2023 CAP (DECC 2022) provided that the economy-wide carbon budgets will be supplemented by sectoral emissions ceilings, setting the maximum amount of GHG emissions that are permitted in a given sector of the economy during each five-year carbon budget. The sectoral emission ceilings for each sector, published in July 2022 (DECC 2022), are shown in Table 13.4. It should be noted that 5.25$MtCO_2eq$ (million tonnes of carbon dioxide equivalent) of annual emissions reductions are currently unallocated on an economy-wide basis for the second carbon budget period (2026–2030). These will be allocated following a mid-term review and identification of additional abatement measures.

Table 13.4: Sectoral Emission Ceilings (DECC 2022)

Sector	Baseline ($MtCO_2eq$)	Sectoral Emission Ceilings for Each 5-Year Carbon Budget Period ($MtCO_2eq$)		Emissions in Final Year of 2026-20230 Carbon Budget Period ($MtCO_2eq$)	Indicative Emissions % Reduction in Final Year of 2025- 2030 Period (Compared to 2018)
	2018	2021-2025	2026-2030		
Electricity	10	40	20	3	75
Transport	12	54	37	6	50
Built Environment - Residential	7	29	23	4	40
Built Environment - Commercial	2	7	5	1	45
Industry	7	30	24	4	35
Agriculture	23	106	96	17.25	25
Other (F-gases, waste, petroleum refining)	2	9	8	1	50
Land Use, Land-use Change and Forestry (LULUCF)	5	Reflecting the continued volatility for LULUCF baseline emissions to 2030 and beyond, CAP24 puts in place ambitious activity targets for the sector reflecting an EU-type approach.			
Total	**68**				
Unallocated Savings	-	-	26	-5.25	-
Legally Binding Carbon Budgets and 2030 Emission Reduction Targets	**-**	**295**	**200**	**-**	**51**

43. In August 2022, the Irish Government approved the Climate Action Framework for the commercial semi-state sector, including Uisce Éireann. The New Economy and Recovery Authority (NewERA) (NewERA 2022) developed the framework in collaboration with the Department of Public Expenditure and Reform and the DECC to set out binding commitments on climate actions for commercial semi-state companies that adopt it. Uisce Éireann adopted the NewERA Climate Action Framework on 21 October 2022 and therefore its commitments are binding. The NewERA Climate Action Framework provides a mechanism for public bodies to 'lead by example' through five main commitments:

- Governance of climate action objectives at board level
- Emissions measurement and reduction target (CAP target of 51% reduction requirement)
- Measuring and valuing carbon emissions in investment appraisals

- Circular economy and green procurement
- Climate-related disclosures in financial reporting.

44. In April 2023, the Irish Government published a Long-Term Strategy on Greenhouse Gas Emissions Reductions, which was subsequently updated in 2024 (DECC 2024b). This strategy provides a long-term plan on how Ireland will transition towards net carbon zero by 2050, achieving the interim targets set out in the National CAP. The strategy completed a second round of public consultation throughout 2023 and allowed for the development of the 2024 strategy. The consultation highlighted that infrastructure is critical and requires a strong legal framework and fully resources State bodies to expedite energy projects quickly.

45. Public Sector Bodies Climate Action Roadmaps Guidance 2024 (Sustainable Energy Authority of Ireland (SEAI) 2024a) aims to provide a climate action roadmap to encourage strategic vision, coordination, organisation, mobilisation, and planning within the public sector. The roadmap provides both minimum and recommended content on different sectors (e.g. water, food waste, construction, energy use) and recommends additional supporting documents that may assist with the public bodies achieving the aims of the roadmap. The roadmap mandates three overarching targets: to reduce GHG emissions by 51% in 2030; to increase the improvement in energy efficiency in the public sector from the 33% target in 2020 to 50% by 2030; and update Climate Action Roadmaps annually within six months of the publication of the CAP.

46. CAP24 (DECC 2023) published in December 2023 and flagged that climate change will put further pressure on national water resources and that adaptation ahead of time can slow the onset impacts of climate change, such as water supply issues. It set out a number of actions with regard to water infrastructure and resources including:

    - Action AD/24/5 to improve the resilience of Ireland’s water infrastructure through implementation of a Nature Based Solutions Programme
    - Action AD/24/6 to undertake catchment-based quantitative groundwater assessments to highlight zones that are more likely to provide sustainable water supplies in the future
    - Action AD/25/9 to improve the resilience of Ireland’s water infrastructure by progressing implementation and delivery of the four regional plans under Uisce Éireann’s National Water Resources Framework Plan (Irish Water 2021)
    - Action AD/25/13 to develop an updated methodology for groundwater recharge estimation and produce new maps for different future climate scenarios
    - Action AD/25/13 to increase awareness of water conservation and the importance of protecting Ireland’s water resources among students through the Green-Schools Partnership programme.

47. In April 2025, the 2025 CAP (CAP25) was published (DECC 2025). This is the third 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.

48. CAP25 sets actions that will reduce the water sector emissions but also to improve resilience in the water network. Action AD/24/5 was not completed within CAP24 and has been brought into the annex of actions for CAP25. Other actions in CAP25 that relate to the Proposed Project include a Sectoral Adaptation Plan for Water Quality sector (Action AD/25/4) and Sectoral Adaptation Plan for Water Services Infrastructure (Action AD/25/9). Adaptation plans for other sectors (communications, electricity and gas networks, flood risk, transport, etc.) are also called for. CAP25 calls for the development and publication of the first National Climate Change Risk Assessment (Action AD/25/1). CAP25 discusses the Infrastructure, Climate and Nature Fund, and the Future Ireland Fund which commits €3.15 billion for designated environmental projects over the period 2026–2030. Projects to be invested in have not yet been finalised. CAP25 retains the high-impact sectors where the biggest savings can be achieved, while emphasising public sector leadership and green procurement. These sectors include renewable energy, energy

efficiency of buildings, transport, sustainable farming, sustainable business and land-use change. CAP25 also includes targeted actions to decarbonise industrial heat and support the transition to carbon-neutral manufacturing processes. Public sector leadership is strengthened through a new Buying Greener: Green Public Procurement Strategy and Action Plan (2024–2027) (DECC 2024a), the development of mandatory Climate Action Roadmaps, and enhanced emissions monitoring and reporting across government operations. The government has reinforced the public sector's responsibility to lead by example, particularly through climate-proofing operations and sustainable procurement initiatives. To support innovation and ensure future economic resilience, IDA Ireland continues to attract and support businesses investing in climate technologies and low-carbon solutions.

49. CAP25 also reinforces targets first outlined in CAP24 to reduce the embodied carbon of construction materials, with a 10% reduction by 2025 and 30% reduction by 2030 for materials produced and used in Ireland. Cement and high embodied carbon construction materials can be reduced through product substitution, reduced clinker content in cement and uptake of low-carbon construction methods, including those outlined in the Construction Industry Federation 2021 report Modern Methods of Construction (Construction Industry Federation 2021).

50. The NAF (DECC 2024c) was published in June 2024 in line with the five-year requirement of the Climate Act. The plan provides a whole of government and society approach to climate adaptation in Ireland in order to reduce Ireland's vulnerability to climate change risks including extreme weather events, flooding, drought, loss of biodiversity, sea level rise and increased temperatures. Similar to the 'Just Transition' when considering carbon emissions, the NAF aims for 'Just Resilience' stating that:

> '*A climate resilient Ireland will have a reduced reliance on fossil fuel, it will have widely accessible electrified public transport and will have transitioned towards sustainable agricultural practices such as agroforestry and organic farming*.'

51. The NAF highlights that there is a projected increased frequency of droughts, coupled with higher evapotranspiration rates, which could cause reduced river flow, groundwater recharge, and reservoir refill capacity, leading to potential water supply shortages. The NAF warns that national long-term water supply projects must be planned for within budgets to ensure the adaptation required to make Ireland resilient by 2050 and beyond is funded. With respect to the water sector, the NAF states that the potential adaptation measures for the water sector are:

- Fully adopting the 'integrated catchment management' approach
- Improving treatment capacity and network functions for water services infrastructure
- Water resource planning and conservation – on both supply and demand sides
- The inclusion of climate actions in monitoring programmes and research.

52. The National Climate Change Risk Assessment (NCCRA) was published in June 2025 (EPA 2025a). The NCCRA was required to be developed under Action 457 from the 2021 CAP (DECC 2021). Action 457 seeks to '*Further develop Ireland's national climate change risk assessment capacity to identify the priority physical risks of climate change to Ireland*'. The NCCRA uses definitions of the risk determinants from the IPCC Risk Framework (IPCC 2023):

- Hazard – the potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources
- Exposure – the presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected

- Vulnerability – the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts including sensitivity
- Risk – the potential for adverse consequences for human or ecological systems.

53. When considering risk, the NCCRA assesses exposure and vulnerability for two future climate change scenarios or Representative Concentration Pathways (RCPs):
    - RCP4.5 was selected as it represents a scenario aligned with the global temperature trajectory
    - RCP8.5 was selected as it represents a high-emissions scenario and achieves the highest level of modelled temperature increases by the end of the century. Consequently, this scenario will result in the highest level of physical risk for Ireland, and therefore the greatest requirement for adaptation.

54. These scenarios align with a conservative approach to assess risks to Ireland and assume global emission reduction targets are not met. This aligns with the principle of precaution as stated in the NAF (DECC 2024c). In addition to the future climate scenarios, the NCCRA assesses the risk from the future climate during the following timeframes:
    - Present (~2030)
    - Medium term (~2050)
    - Long term (~2100).

55. The Water Quality and Water Services Sectoral Adaptation Plan (DHLGH 2019) was published under the first NAF (Department of Communications, Climate Action and Environment 2018) and, as such, is aligned with national climate policy. The Plan identifies the key vulnerabilities in the water sector and looks to promote greater resilience to safeguard its continued operation. It discusses water resources planning, stating that appropriate water resources planning frameworks (e.g. abstraction licensing and/or drought planning) are crucial to maintain and manage the water supply and demand balance in a sustainable way. The plan states that the security of supply related issues due to reduced availability may lead to the abstraction of new or alternative sources (e.g. aquifers which have not been used in the past). The sectoral plan also notes that historical storms have caused disruption to water supply due to power outages, illustrating the interconnectivity of the two sectors. A further Water Quality and Water Services Infrastructure Sectorial Adaption Plan 2025 (Department of Housing, Local Government and Heritage) was published in November 2025.

56. A National Water Resources Framework Plan (Irish Water 2021) has been prepared as a 25-year strategy for the provision of safe and reliable drinking water. As part of this framework, four regional Water Resources Plans were developed (eastern and midlands, south-west, north-west and south-east) and the outputs of these plans are combined for prioritisation and progression through the future cycles of capital investment planning. The adopted Regional Water Resources Plan – Eastern and Midlands (Irish Water 2022) aims to reduce pressure on the water supply by improving water conservation including achieving a 45% reduction in leakage from 2019 to 2034, and water conservation behaviour change by businesses and the public. The plan projects that a 20% reduction in household water use could lead to a carbon emission reduction of up to 0.45kgCO_2eq per property per day and also reduce the load on the wastewater system that the used water enters.

57. The Electricity & Gas Networks Sector Climate Change Adaptation Plan prepared under the first NAF has been prepared by the DECC (Department of Communications, Climate Action and Environment 2019b) and is aligned with national climate policy. This plan considers future climate change impacts on energy infrastructure and aims to reduce vulnerability by building resilience in the energy sector. The plan proposes to avoid or minimise future adverse impacts within the sector and to exploit opportunities. Steps include: diversification of energy sources; improved communication between relevant stakeholders; a requirement for energy network companies to continue to ensure climate change is taken into account in

planning and design standards and engineering management practices; and identification of vulnerable areas and measures to take with respect to climate impacts. A further Electricity and Gas Networks Climate Change Sectorial Adaption Plan 2025 (Department of Housing, Local Government and Heritage) was published in November 2025.

13.2.3.4 Local Policy

58. The Proposed Project crosses into several different local authority areas, each of which have individual climate change strategies.

59. The Clare County Council Climate Action Plan 2024–2029 (Clare County Council 2024) aims to achieve a 51% reduction in emissions by 2030 as well as identify Clare County Council's vulnerabilities and major risks facing the county due to climate change. The action plan is aligned with the national CAP24. Clare County Council states that is has a vision for the county to become a national leader in climate action, supporting a sustainable low-carbon economy and climate-resilient, biodiverse communities and businesses. The action plan is set out in six sections which review the evidence base, provide climate actions, discuss decarbonisation zones and how the plan can be implemented and monitored.

60. The Limerick City and County Council Climate Action Plan 2024–2029 (Limerick City and County Council 2024) is designed to strengthen the links between national and international climate policy and the delivery of effective climate action at local and community levels, through place-based climate action. The Plan states that Limerick City and County Council can 'Influence', 'Co-ordinate and Facilitate' and 'Advocate' for other sectors in order to help achieve the national climate objectives. The plan notes that future water supplies are at risk from future climate change.

61. The Tipperary County Council Climate Action Plan 2024–2029 (Tipperary County Council 2024) sets out 100 council climate actions including the council's commitment to achieving its own emissions reductions (51%) and energy efficiency (50%) targets. Climate actions are grouped under five key themes:
    - Governance and leadership
    - Built environment and transport
    - Natural environment and green infrastructure
    - Communities: resilience and just transition and sustainability
    - Resource management.

62. Water conservation and climate 'proofing' are at the centre of the mitigation strand, with Action 74 to '*support and inform a climate proofing programme for natural water resources*' which the plan notes is at threat from climate change.

63. The Offaly County Council Climate Action Plan 2024–2029 (Offaly County Council 2024) aims to create a low carbon and climate resilient county, by delivering and promoting best practice in climate action in Offaly through 118 actions. The plan also reviews the actions to date as well as discusses the new actions to assist with Offaly's transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy. The plan has six themes, which are the same as those noted above for the Tipperary County Council Climate Action Plan 2024–2029. Action S6.2.5 states that '*Offaly County Council will investigate current water usages with a view to identifying and implementing water efficiency measures*' as the plan acknowledges the potential water scarcity issues due to future climate change.

64. A key element of Kildare County Council Climate Action Plan 2024–2029 is ensuring that climate adaptation considerations are mainstreamed into all plans and policies and integrated into all operations and functions of the local authority (Kildare County Council 2024).The plan aims to create a low carbon and climate resilient county, by delivering and promoting best practice in climate action in Kildare, stating that every member of society can play its role. The plan discusses the Maynooth decarbonisation zone and how this is incorporated into Local Area Plans. One of the objectives for the built environment and transport sector is the sustainable management of water resources, which the Plan aims to be considered in the local authority planning application process, ensuring the consideration of future impacts of climate change on water availability.

65. The SDCC Climate Action Plan 2024–2029 (SDCC and Codema 2024) outlines SDCC's goals to mitigate GHG emissions and plans to prepare for and adapt to climate change. The SDCC Climate Action Plan highlights the risks that climate change poses to the water supply network. The SDCC Climate Action Plan notes flood protection schemes are being implemented as well as a climate innovation fund to assist in climate action. The SDCC Climate Action Plan states that increased temperatures in water bodies and lower water levels can decrease water quality resulting in short and long-term impacts on the environment and biodiversity.

13.2.4 Data Collection Methods

66. As the climate impact assessment is desk-based, research data and relevant publications from the following organisations have been reviewed:

- SDCC
- Met Éireann
- Climate Ireland
- DECC
- EPA
- Clare County Council
- Kildare County Council
- Limerick City and County Council
- Offaly County Council
- Tipperary County Council
- Sustainable Energy Authority of Ireland.

67. The data and research publications are discussed and referenced in Section 13.2.3.

13.2.4.1 Impact Assessment Data Collection

68. The assessment of the Construction Phase embodied carbon associated with construction materials and activities was undertaken using the TII Carbon Tool (TII 2025a) as detailed in Section 13.2.6.

69. Details on land-use change (peat removal, tree/vegetation felling and planting) associated with the Proposed Project is discussed in Sections 13.4.2.2 to 13.4.2.4.

70. The traffic data used in the assessment of the Construction and Operational Phases (Section 13.4.2.5) was based on that from the traffic and transport assessment in Chapter 7 (Traffic & Transport).

71. Operational Phase data on energy use, chemical use and vulnerability to climate change is discussed in Section 31.4.4 and 13.4.5.

13.2.5 Consultation

72. Consultation responses from key stakeholders, landowners and the public were reviewed and considered in compiling this chapter. Chapter 2 (The Environmental Impact Assessment Process) of the EIAR sets out the approach the Proposed Project has taken with regard to environmental scoping, in particular the EIAR Scoping Methodology Report (Uisce Éireann 2023) in respect of the Proposed Project and also the Environmental Impact Statement Scoping Report[2] (Irish Water 2016) relating to a previous iteration of the project.

73. The scoping consultation responses relevant to climate received from stakeholders are provided in Table 13.5. Further detail on the Proposed Project consultation is included in Chapter 2 (The Environmental Impact Assessment Process) and responses received are in the Water Supply Project: Eastern and Midlands Region – Consultation Report, which forms part of the Strategic Infrastructure Development planning application for the Proposed Project.

Table 13.5: Principal Climate Issues Raised During Scoping Consultation

Consultee	Comment	Relevant EIAR Section
Laois County Council	In the air quality assessment, there is no mention of the effects of greenhouse gas emissions arising from the construction or Operational Phases and the impact of the proposal on climate change. It is the Council's view that the Air Quality impact assessments must include assessments of the impact of the proposal on climate change. No mention is made of fuel/power, chemical and other material requirements (concrete, quarried materials etc.) and associated emissions to air for the construction or Operational Phases. These should be included in the scope.	Refer to Sections 13.4.2 and 13.4.4 of this chapter for assessment of the climate impacts due to the Proposed Project which addresses the comments from Laois County Council.
Laois County Council	No mention is made of the effects of greenhouse gas emissions arising from the Construction or Operational Phases and the impact of the proposal on climate change.	Sections 13.4.2 and 13.4.4 include an assessment of the predicted emissions of GHGs which addresses the comments from Laois County Council.

13.2.6 Appraisal Method for the Assessment of Impacts

74. The climate assessment has been carried out in accordance with the EPA Guidelines (EPA 2022) as well as the climate assessment specific guidance referenced throughout this section.

75. The assessment methodology has been derived with reference to the most appropriate guidance documents (see Section 13.2.3) relating to climate which are referenced where appropriate throughout this chapter.

76. The climate assessment comprises two elements:

- Greenhouse Gas Emissions Assessment – Quantifies the GHG emissions from the Proposed Project over its lifetime, from construction to operation. The assessment compares these emissions to relevant carbon budgets, targets and policy to contextualise magnitude
- Climate Change Risk Assessment (CCRA) – Identifies the impact of a changing climate on the Proposed Project and receiving environment. The assessment considers the Proposed Project's vulnerability to climate change and identifies adaptation measures to increase climate resilience.

77. A detailed discussion on the input data and appraisal methodology for both the Construction and Operational Phases is detailed in the sections below.

[2] As set out in Chapter 2 (The Environmental Impact Process), the Environmental Impact Statement Scoping Report (Irish Water 2016) was based on a previous iteration of the project; however, feedback received from stakeholders informed future scoping and design development and has been considered in this chapter where relevant to the Proposed Project.

13.2.6.1 Appraisal Methods for GHG Assessment

78. The appraisal methods employed to determine the GHG emissions associated with the construction and operational activities of the Proposed Project, including forestry removal, peat removal, potential losses in renewable energy from the Ardnacrusha Generating Station through potentially reduced water availability, Construction and Operational Phase power requirements for site activities, construction for the Proposed Project, construction and maintenance materials, and construction traffic are outlined in this section.

79. The assessment approach set out in PE-ENV-01104 (TII 2022a) aims to quantify the difference in GHG emissions between the Proposed Project and the baseline scenario (without the Proposed Project). The assessment process is guided by the following documents:

- PAS 2080:2023 on Carbon Management in Buildings and Infrastructure (BSI 2023): this provides a framework that allows all parties involved in the development of an infrastructure project to work together to quantify the project's overall carbon impact
- ISEP Assessing Greenhouse Gas Emissions and Evaluating their significance (2nd Edition) (ISEP 2022 GHG Guidance): lays out the process of assessing GHG emissions to understand their significance in the context of an EIA.

13.2.6.1.1 Embodied Construction Emissions

80. Climate change is a result of increased levels of CO_2 and other GHGs in the atmosphere causing the heat-trapping potential of the atmosphere to increase. GHGs can be emitted from vehicles and embodied energy associated with materials used in the construction of a development. Embodied energy refers to the sum of the energy needed to produce a good or service. It incorporates the energy needed in the mining or processing of raw materials, the manufacturing of products and the delivery of these products to site. There is the potential for a number of embodied GHGs and GHG emissions during the Construction Phase of the Proposed Project. Construction vehicles, generators and so on may give rise to CO_2 and N_2O emissions as well as the embodied carbon in the large quantities of material such as stone, concrete and steel that will be required for a project of this magnitude.

81. To provide a consistent approach to GHG assessments TII have developed the Carbon Assessment Tool (TII 2025) for carbon accounting. PE-ENV-01104 (TII 2022a) states that the Climate Practitioner shall use the TII Carbon Tool for the calculation of emissions arising from the construction and maintenance of a proposed project.

82. The Carbon Assessment Tool aligns with TII's project phases as well as Section 7 of PAS 2080 Carbon Management in Buildings and Infrastructure, which was published by the BSI, the Construction Leadership Council and the Green Construction Board in 2023 (BSI 2023) including the conversion factors identified by the SEAI (SEAI 2023a). The tool includes an emission factors library using factors developed by relevant industry bodies, including:

- National Highways Carbon Tool v2.4 used for mass conversion
- Inventory of Carbon and Energy (ICE) (2024) ICE DB Advanced V4.0
- Institution of Civil Engineers (2013) Civil Engineering Standard Method of Measurement 4 Carbon & Price Book 2013
- UK Department for Energy Security and Net Zero (2023 and 2024) Greenhouse Gas Reporting Conversion Factors.

83. The carbon emissions are calculated by multiplying the emission factor by the quantity of the material that would be used over the entire construction/maintenance phase. The TII Carbon Assessment Tool (TII 2025) has been commissioned by TII to assess GHG emissions associated with road infrastructure projects using Ireland-specific emission factors and data; however, the use of the tool was considered appropriate for the Proposed Project as the material types and construction activities are similar. The goal of the tool is to assist project development as a decision-making tool that drives lower carbon infrastructure and to facilitate the integration of environmental issues into infrastructure planning, construction and operation.

84. The assessment commenced with the high-level design, through the pre-construction (site clearance) stage, followed by the assessment of the embodied carbon associated with all materials used in the construction of the Proposed Project, the emissions during the Construction Phase and additionally emissions related to waste generated during the Construction Phase. The tool also assessed ongoing maintenance over the lifetime of the Proposed Project, which is 120 years. It is assumed that end-of-life demolition is not relevant, or likely due to the nature of the Proposed Project and thus there are no emissions associated with this stage.

85. Construction materials and construction activities with associated embodied carbon or GHG emissions are given and discussed in Section 13.4.2. The Proposed Project is expected to have a Construction Phase of approximately five years and is designed with a lifespan of 120 years (based on guidance in EN17472:2022 Sustainability of construction works - Sustainability Assessment of Civil Engineering Works - Calculation Methods (BSI 2022)). Standard maintenance required over the Operational Phase, as indicated through the TII Carbon Tool (TII 2025a), has also been considered as part of the embodied construction emissions.

13.2.6.1.2 Land Use Change

86. The land use change associated with the Construction Phase of the Proposed Project has also been quantified using the TII Carbon Assessment Tool (TII 2025), which considers the loss or gain of carbon sinks. Loss of mixed forest, natural grassland, and peat bogs has the potential to release GHGs, while increasing the amount of these land use types has the potential to absorb GHGs from the atmosphere.

87. Chapter 8 (Biodiversity) and Chapter 11 (Agriculture) have been referenced with respect to land use changes. Areas of land within the Construction Working Width would be returned to landowners, with the only permanent land change being at the infrastructure sites, above ground pipeline infrastructure (such as valves) and within the 20m wide Permanent Wayleave (i.e. certain habitats within the 20m Permanent Wayleave where planting restrictions would apply).

13.2.6.1.3 Road Traffic

88. There would be carbon emissions associated with the Proposed Project due to the construction traffic. Construction Phase traffic emissions have been quantified in the TII Carbon Assessment Tool. This included traffic movements associated with delivery of materials to the Proposed Project as well as construction worker travel. The average HGV category and average LGV categories were selected within the TII Carbon Assessment Tool as a conservative approach. As the exact distances travelled are not precisely known at this stage, an estimated 100km radius was used in order to quantify to the total distance travelled during the Construction Phase of the Proposed Project.

13.2.6.1.4 Operational Phase Power Demands

89. Chapter 4 (Proposed Project Description) sets out the annual average power consumption in 2050 (normal operational levels) associated with the following, which are replicated in Table 13.17:

- Raw water abstraction and pumping

- Water treatment processes
- High lift pumping of the treated water
- Operation of chlorine boosting at the Break Pressure Tank (BPT) and Terminal Point reservoir (TPR)
- Operation of Line Valves on the Raw Water Rising Mains (RWRMs) and Treated Water Pipeline.

90. The CO_2 generated due to the Operational Phase power requirements of the Proposed Project can be calculated using the carbon intensity of the fuel mix. Carbon intensity is the amount of CO_2 that will be released per kilowatt hour (kWh) of energy of a given fuel. For most fossil fuels the value of this is almost constant, but in the case of electricity it would depend on the fuel mix used to generate the electricity and also on the efficiency of the technology employed. This figure is updated by SEAI annually and has dropped by 64% since 1990 driven by an 84% reduction in the use of coal for electrical generation and 54% increase in renewables use in generation. The 2024 SEAI Energy in Ireland Report (SEAI 2024b) states that the current best estimate for the carbon intensity of electricity in 2023 is 254gCO_2/kWh and is the lowest carbon intensity value ever reached in Ireland. For comparison, the carbon intensity of electricity in 2022 was 334gCO_2/kWh.

91. CAP 2019 set a national target that specifies 70% of electricity demand is to be generated by renewables by 2030 for the national grid, increasing renewables to 80% of demand under CAP 2021 (DECC 2021). The CAP23 capacity targets of 22 GW of wind and solar achieve a further 16% emissions reductions over the first two carbon budgets. This would significantly reduce the carbon intensity of the operation of the Proposed Project. Future carbon intensities related to changes in the proportion of renewables are not currently published. SEAI have provided email communication with projected future carbon intensity for grid electricity of 92.9gCO_2/kWh for 2030, reducing to 40.9gCO_2/kWh by 2050. This is an estimation of the potential future carbon intensity; the true value may be lower or higher depending on the carbon intensity of other fuels used to generate the non-renewable percentages and the changes in loss in transformation, transmission and distribution processes.

92. The GHG emissions due to the operational power requirements have been compared against the 2030 electricity sector carbon budget.

13.2.6.1.5 Operational Phase Chemical Input Demands

93. As part of the Operational Phase of the Proposed Project, there would be carbon associated with chemical use for the treatment of water at the Water Treatment Plant (WTP), BPT and TPR. Chemicals are used primarily for the following functions:
    - Raw Water Conditioning
    - Coagulation and flocculation (binds impurities together in lumps which allows them to be removed via filtration, clarification)
    - Water Correction
    - Fluoridation
    - Chlorination.

94. Further details on the chemical use can be found in Appendix A4.1 (Operational Strategy) of the EIAR. Predicted weights of chemicals required for operation have been combined with emission factors sourced from the UK Water Industry Research (UKWIR) Carbon Accounting Workbook (UKWIR 2024) which provides carbon emission factors for commonly used chemicals for the water industry in order to calculate the emissions related to chemical use in the Operational Phase as shown in Table 13.6.

Table 13.6: Operational Phase Chemical Emission Factors

Chemical	Emission Factor (kgCO_2e/kg Chemical)	Source	Delivery Mode
Raw Water Conditioning (Sulphuric Acid)	0.145	UKWIR Carbon Accounting Workbook v19	Liquid
Coagulant (Aluminium Sulphate)	0.1278	UKWIR Carbon Accounting Workbook v19	Liquid
Flocculant (Polyelectrolyte)	0.813	UKWIR Carbon Accounting Workbook v17	Solid
Final Water Correction (Caustic Soda)	0.66	UKWIR Carbon Accounting Workbook v19	Liquid
Fluoridation	0.938	UKWIR Carbon Accounting Workbook v19	Liquid
Chlorination	0.64	UKWIR Carbon Accounting Workbook v19	Liquid

95. It is assumed that the chemicals would be transported in bulk deliveries to the WTP and BPT from Limerick Port, an estimated distance of 27km and 66km respectively. Chemicals transported to the TPR are assumed to be via Dublin Port, an estimated distance of 32km. A standard delivery for chemicals that are in liquid form is 28 tonnes per delivery with five tonnes of solid chemical being delivered per load. Transportation emission factors for HGVs were sourced from the TII Carbon Tool (TII 2025).

13.2.6.1.6 Significance Criteria for the GHG Assessment

96. The significance of effects has been assessed in accordance with the EPA Guidelines (EPA 2022). Refer to Chapter 2 (The Environmental Impact Assessment Process) for a definition of these descriptions and how these relate to the quality, significance and duration of the potential effects.

97. PE-ENV-01104 (TII 2022a) states that significance of GHG effects is based on ISEP guidance (ISEP 2022) which is consistent with the terminology contained within Figure 3.4 of the EPA Guidelines (EPA 2022).

98. The 2022 ISEP guidance (ISEP 2022) sets out the following principles for significance:

- When evaluating significance, all new GHG emissions contribute to a negative environmental impact; however, some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project's emissions should therefore be based on its net impact over its lifetime, which may be positive, negative or negligible
- Where GHG emissions cannot be avoided, the goal of the EIA process should be to reduce the project's residual emissions at all stages
- Where GHG emissions remain significant, but cannot be further reduced, approaches to compensate the project's remaining emissions should be considered.

99. TII states that professional judgement must be taken into account when contextualising and assessing the significance of a project's GHG impact (TII 2022a). TII refer to the ISEP guidance (ISEP 2022) which states that the crux of assessing significance 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*'. The ISEP guidance also states that '*the significance of a project's emissions should therefore be based on its net impact over its lifetime, which may be positive, negative or negligible*', to account for the potential for a development to replace existing development or baseline activity with higher GHG emissions.

100. Significance is determined using the criteria in Table 13.7 (derived from Table 6.7 of PE-ENV-01104 (TII 2022a)) along with a consideration of the following two factors:

- The extent to which the trajectory of GHG emissions from the project aligns with Ireland's GHG trajectory to net zero by 2050
- The level of mitigation taking place.

Table 13.7: GHG Assessment Significance Matrix (Reproduced from PE-ENV-01104 (TII 2022a))

Effects	Significance Level Description	Description
Significant adverse	Major adverse	• The project's GHG impacts are not mitigated • The project has not complied with do-minimum standards set through regulation, nor provided reductions required by local or national policies • No meaningful absolute contribution to Ireland's trajectory towards net zero.
	Moderate adverse	• The project's GHG impacts are partially mitigated • The project has partially complied with do-minimum standards set through regulation, has and have not fully complied with local or national policies • Falls short of full contribution to Ireland's trajectory towards net zero.
Not significant	Minor adverse	• The project's GHG impacts are mitigated through 'good practice' measures • The project has complied with existing and emerging policy requirements • Fully in line to achieve Ireland's trajectory towards net zero.
	Negligible	• The project's GHG impacts are mitigated beyond design standards • The project has gone well beyond existing and emerging policy requirements • Well 'ahead of the curve' for Ireland's trajectory towards net zero.
Beneficial	Beneficial	• The project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration • The project has gone well beyond existing and emerging policy requirements • Well 'ahead of the curve' for Ireland's trajectory towards net zero; provides a positive climate impact.

13.2.6.2 Appraisal Method for CCRA

101. This assessment involves determining the vulnerability of the Proposed Project to climate change. This involves an analysis of the sensitivity and exposure of the Proposed Project to climate hazards which together provide a measure of vulnerability.

102. PE-ENV-01104 (TII 2022a) states that the CCRA is guided by the principles set out in the overarching best practice guidance documents:

- Technical Guidance on the Climate Proofing of Infrastructure in the Period 2021-2027 (European Commission 2021a)
- ISEP Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (2nd Edition) (ISEP 2020a).

103. Technical Guidance on the Climate Proofing of Infrastructure in the Period 2021-2027 (European Commission 2021a) outlines an approach for undertaking a CCRA where there is a potentially significant impact on the proposed development due to climate change. The risk assessment assesses the likelihood and consequence of the impact occurring, leading to the evaluation of the significance of the effect. The role of the climate consultant in assessing the likelihood and impact, described in Section 13.2.6.1.6, is often to facilitate the CCRA process with input from the design team or specific environmental specialists such as hydrologists.

104. First an initial screening CCRA based on the Operational Phase is carried out, according to the TII guidance PE-ENV-01104, with consideration of the NCCRA (EPA 2024a). This is carried out by determining the sensitivity of Proposed Project assets (i.e. receptors) and their exposure to climate change hazards.

105. The Proposed Project asset categories are assigned a level of sensitivity to climate hazards. PE-ENV-01104 (TII 2022a) provides the below list of likely significant asset categories and climate hazards to be considered. The asset categories will vary for development type and need to be determined on a development by development basis:

- Asset categories – pavements; drainage; structures; utilities; landscaping; signs; light posts; buildings; and fences
- Climate hazards – flooding (coastal, pluvial, fluvial); extreme heat; extreme cold; wildfire; drought; extreme wind; lightning and hail; landslides; and fog.

106. The asset sensitivity is based on a High, Medium or Low rating with a score of 1 to 3 assigned as per the criteria below. Asset sensitivity takes into account design mitigation measures:

- High sensitivity – the climate hazard would or is likely to have a major impact on the asset category. This is a sensitivity score of 3
- Medium sensitivity – it is possible or likely the climate hazard would have a moderate impact on the asset category. This is a sensitivity score of 2
- Low sensitivity – it is possible the climate hazard would have a low or negligible impact on the asset category. This is a sensitivity score of 1.

107. For further explanation and context on sensitivity, definitions are also provided by the Climate Proofing of Infrastructure (European Commission 2021a) and the NCCRA (EPA 2024a). The Climate Proofing of Infrastructure states:

- High sensitivity: a critical event that requires extraordinary/emergency business continuity action
- Medium sensitivity: a serious event that requires additional emergency business continuity actions
- Low sensitivity: adverse event that can be absorbed by taking business continuity actions.

108. And the NCCRA states:

- High sensitivity: significant and frequent damages and losses, disturbance of system functionality, long-term effects, large extent and high pervasiveness, potential for crossing impact thresholds or tipping points, cascading effects beyond system boundaries and systemic risk
- Medium sensitivity: moderate and occasional losses and damages, moderate disturbance of system functionality, effects are temporary or unfolding slowly with a moderate extent/pervasiveness
- Low sensitivity: none to low or rare losses and damages. No disturbance of functionality.

109. Once the sensitivities have been identified, the exposure analysis is undertaken. The exposure analysis involves determining the level of exposure of each climate hazard at the project location irrespective of the project type. Exposure is assigned a level of High, Medium or Low as per the below criteria (TII 2022a).

- High exposure – it is almost certain or likely this climate hazard will occur at the project location, i.e. might arise once to several times per year. This is an exposure score of 3
- Medium exposure – it is possible this climate hazard will occur at the project location, i.e. might arise a number of times in a decade. This is an exposure score of 2
- Low exposure – it is unlikely or rare this climate hazard will occur at the project location, i.e. might arise a number of times in a generation or in a lifetime. This is an exposure score of 1.

110. Once the sensitivity and exposure are categorised, a vulnerability analysis is conducted by multiplying the sensitivity and exposure to calculate the vulnerability.

13.2.6.2.1 Significance Criteria for Climate Change Risk Assessment

111. The assessment of vulnerability to climate change combines the outcomes of the sensitivity and exposure analysis with the aim of identifying the key vulnerabilities and potentially significant climate hazards which could impact the Proposed Project. The vulnerability assessment takes any proposed mitigation into account.

Vulnerability = Sensitivity x Exposure

112. Table 13.8 details the vulnerability matrix; vulnerabilities are scored on a high, medium and low scale.

113. TII guidance (TII 2022a) and the EU technical guidance (European Commission 2021a) note that if all vulnerabilities are ranked as low in a justified manner, no detailed climate risk assessment may be needed. Where all vulnerabilities are ranked as low, it can be concluded that climate change vulnerability is not a risk for a project and therefore, the impact is not significant.

114. Where residual medium or high vulnerabilities exist the assessment may need to be progressed to a detailed climate change risk assessment and further mitigation implemented to reduce risks.

Table 13.8: Vulnerability Matrix

		Exposure		
		High (3)	**Medium (2)**	**Low (1)**
Sensitivity	**High (3)**	9 – High	6 – High	3 – Medium
	Medium (2)	6 – High	4 – Medium	2 – Low
	Low (1)	3 – Medium	2 – Low	1 – Low

115. The screening CCRA, discussed in Section 13.4.5, did not identify any residual medium or high risks to the Proposed Project as a result of climate change that were not within the scope of detailed design to alleviate. This is due to the consideration of resilience against future climate vulnerabilities within the design, allowing for early mitigation. Therefore, a detailed CCRA for the Construction and Operational Phases was scoped out.

116. While a CCRA for the Construction Phase was not required, good practice mitigation against climate hazards will still be undertaken as set out in Sections 13.4.3 and 13.4.5.

13.2.7 Construction Flexibility

117. At this stage of the design of the Proposed Project, there are a number of points of detail which cannot be finalised. This is due to factors such as unknown site constraints / obstacles that may affect the design of the infrastructure and its construction. Although a high level of ground investigation has been obtained to inform the design within the planning application for the Proposed Project, further site investigations will be undertaken following grant of planning permission. This will inform the detailed design stage in order to provide a confirmed design for construction. This is a completely standard design approach and as a result, for a linear project of this nature, scale and complexity, it is typical that a level of flexibility is required in respect of the final permanent design. This flexibility is necessary in order to provide a mechanism to overcome these matters during the later stages of the Proposed Project, including the Construction Phase.

118. The assessment reported in this chapter has taken account of this flexibility and assessed all the likely significant effects that could arise within these defined parameters. For this assessment, the likely significant effects reported in this chapter would not change regardless of the alignment or location of infrastructure elements within the defined parameters (i.e. the difference in effects would be imperceptible for the purpose of the assessment).

13.2.8 Difficulties Encountered in Compiling Information

119. The exact design and technical specification for materials will be finalised during the detailed design stage by the appointed Contractor(s). In addition, maintenance plans to mitigate climate vulnerability during Construction and Operational Phases will also be finalised during this stage. A precautionary approach has been taken for the assessment.

120. The information that has informed the assessment is sufficient to identify the likely significant effects. The limitations described in this chapter are not considered to have a material impact on the assessment conclusions.

13.2.9 Cumulative Effects

121. As noted in Chapter 2 (The Environmental Impact Assessment Process), intra-project cumulative effects are described within respective topic chapters, while inter-project cumulative effects are described in Chapter 21 (Cumulative Effects & Interactions). The EIA Directive includes the consideration of existing projects within the cumulative effects assessment and this is addressed through a consideration of the incremental impact of the Proposed Project within the context of the existing baseline as described, and where applicable, the carrying capacity of the environment.

122. The approach to assessing the cumulative effects of GHG emissions differs from that for other environmental topics, as GHG emissions affect the global climate. Therefore, all global cumulative GHG sources are relevant to the effect on climate change. The climate assessment considers the Proposed Project's potential to affect the global climate and the ability of the Irish Government to meet its carbon reduction targets at a national level (as a result of changes in GHG emissions) and the effect of changes in climate on the Proposed Project itself. The national carbon budgets themselves are cumulative since they address carbon emissions from a wide variety of sources across the sectors of the economy. This is detailed in Section 6.8 of PE-ENV-01104 (TII 2022a). Therefore, climate does not require further assessment in the cumulative effects assessment.

13.3 Baseline Environment

13.3.1 Impact of the Proposed Project on Climate

13.3.1.1 Climate Pollutants

123. For the purposes of this assessment, the definition outlined in Council Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC for GHGs has been used. In 'Annex V, C. Methodology Point 5' of the Directive, the relevant GHGs are defined as CO_2, CH_4 and N_2O. CO_2 accounted for 60.6% of total GHG emissions in Ireland in 2022 while CH_4 and N_2O accounted for 29.1% and 9.1% respectively. The main source of CH_4 and N_2O is from the agriculture sector (74.6%).

124. GHGs have different efficiencies in retaining solar energy in the atmosphere and different lifetimes in the atmosphere. In order to compare different GHGs, emissions are calculated on the basis of their Global Warming Potential (GWP) over a 100-year period, giving a measure of their relative heating effect in the atmosphere. The IPCC AR6 Synthesis Report: Climate Change 2023 (IPCC 2023) sets out the global warming potential for a 100-year time period (GWP100) for CO_2 as the basic unit (GWP = 1) whereas CH_4 has a GWP100 equivalent to 29.8 units of CO_2 (for fossil sources) and N_2O has a GWP100 of 273.

13.3.1.2 Existing GHG Emissions Baseline

125. PE-ENV-01104 (TII 2022a) states that a baseline climate scenario should identify GHG emissions without the project for both the current and future baseline, consistent with the study area for the project.

126. Emissions have also been compared against total national GHG emissions in Ireland for 2024 (57.64MtCO_2eq including LULUCF) (EPA 2025b) and against Ireland's non-ETS 2030 target of 27.7MtCO_2eq (as set out in Commission Implementing Decision (EU) 2020/2126 of 16 December 2020 on setting out the annual emission allocations of the Member States for the period from 2021 to 2030 pursuant to Regulation (EU) 2018/842 of the European Parliament and of the Council).

127. Given the circumstances of Ireland's declaration of a climate and biodiversity emergency in May 2019 and the November 2019 European Parliament approval of a resolution declaring a climate and environment emergency in Europe, in conjunction with Ireland's current failure to meet its EU binding targets under the EU Effort Sharing Regulation, changes in GHG emissions either beneficially or adversely are of more significance than previously viewed prior to these declarations. Thus, the baseline climatic environment should be considered a highly sensitive environment for the assessment of impacts.

128. Data published in July 2025 (EPA 2025b) indicates that Ireland exceeded (without the use of flexibilities) its 2024 annual limit set under the EU's Effort Sharing Regulation (ESR) (EU 2018/842) by 1.03MtCO_2eq. However, 2024 was the second consecutive year in which Ireland's emission were below (−4.2%) 1990 levels. ETS[3] emissions decreased (−7.4%) and ESR emissions decreased (−0.5%). Ireland's target is an emission reduction of 626kt of CO_2e by 2030 on an average baseline of 2016 to 2018. The EPA estimate that 2024 total national GHG emissions (excluding LULUCF) have decreased by 2.0% on 2023 levels to 53.75MtCO_2eq, with a 0.7MtCO_2eq (−8.19%) reduction in electricity industries alone. This was driven by an 39.6% share of energy from renewables in 2024 and the complete phase-out of peat for electricity generation. Manufacturing combustion and industrial processes decreased by 4.75% to 6.0MtCO_2eq in 2024 due to declines in fossil fuel usage. The sector with the highest emissions in 2024 was agriculture at 38% of the total, followed by transport at 21.7%. For 2024, total national emissions (including LULUCF) were 57.64MtCO_2eq (EPA 2025b), as shown in Table 13.9.

129. Water treatment falls under the 'Other' category, making up 2.8% of total emissions, with public services accounting for a further 1.3%. Public services had a 7.19% increase in emissions between 2023 and 2024 while wastewater treatment had a 1% increase.

130. The current estimates of National greenhouse gas emissions (including LULUCF) in 2024 are 12.0% below 2018, well off the National Climate ambition of a 51% reduction by 2030. The data indicate that from 2021–2024 Ireland has used 82.8% of the 295MtCO_2eq Carbon Budget for the five-year period 2021–2025. This leaves 17.5% of the budget available for 2025, requiring a substantial 10.3% annual emissions reduction for 2025 to stay within budget.

[3] ETS emissions in this report refers to CO_2 emissions from stationary installations and from domestic aviation. It does not include emissions from intra-EU aviation as those are not considered part of Ireland's total reportable greenhouse gas emissions

Table 13.9: Total National GHG Emissions In 2024 Note 1

Sector	2021 ($MtCO_2eq$)	2022 ($MtCO_2eq$)	2023 ($MtCO_2eq$)	2024 ($MtCO_2eq$)	Total Budget ($MtCO_2eq$) (2021-2025)	% Budget 2021-2025 used	Annual change 2023 to 2024
Electricity	9.893	10.00	7.57	6.95	40.0	85.25%	-8.19%
Transport	11.089	11.76	11.80	11.65	54.0	85.74%	-1.27%
Buildings (Residential)	6.868	5.75	5.35	5.61	29.0	81.31%	4.86%
Buildings (Commercial and Public)	1.444	1.45	1.39	1.49	7.0	82.43%	7.19%
Industry	7.093	6.62	6.31	6.01	30.0	86.77%	-4.75%
Agriculture	21.940	21.80	20.72	20.41	106.0	80.05%	-1.50%
Other Note 2	1.864	1.62	1.81	1.63	9.0	80.33%	-9.94%
LULUCF	4.628	3.98	3.89	3.89	–	–	0
Total including LULUCF	64.819	62.98	58.83	57.64	295.0	**82.81%**	**-2.04%**

Note 1 Reproduced from latest emissions data from the EPA (EPA 2025a)

Note 2 The 'other' category includes petroleum refining, F-gases and waste (emissions from solid waste disposal on land, solid waste treatment (composting and anaerobic digestion), wastewater treatment, waste incineration and open burning of waste).

13.3.1.3 Future GHG Baseline

131. The future baseline with respect to the GHG assessment can be considered in relation to the future climate targets which the assessment results have been compared against. In line with TII (TII 2022a) and ISEP guidance (ISEP 2022), the future baseline is a trajectory towards net zero by 2050.

132. In May 2025, the EPA released the report Ireland's Greenhouse Gas Emissions Projections 2024-2055 (EPA 2025c), which includes total projected emissions and a breakdown of projected emissions per sector under the 'With Existing Measures' and 'With Additional Measures' scenarios. The EPA projections indicate that under the 'With Existing Measures' scenario, Ireland will achieve a reduction of 10% on 2018 levels by 2030. A reduction of 22% by 2030 can be achieved under the 'With Additional Measures' scenario, which is still short of the 42% reduction target, set out in the carbon budgets.

133. Under the 'With Existing Measures' scenario, total GHG emissions (including LULUCF) are predicted to be 60.1$MtCO_2eq$ in 2030 and 51.6$MtCO_2eq$ by 2045. The EPA projections indicate that the 'With Additional Measures' scenario will result in 2030 total GHG emissions of 48.0$MtCO_2eq$ and emissions of 38.7$MtCO_2eq$ in 2045. In addition to the total projected emissions, Table 13.10 shows the projected emissions for both 'commercial and public services' and 'wastewater treatment and discharge' sections of the EPA projected emissions.

Table 13.10:Projected Emissions (EPA 2025b)

Projections	Year	Wastewater Treatment and Discharge ($ktCO_2eq$)	Commercial/Public Services ($ktCO_2eq$)	Total ($ktCO_2eq$) (including LULUCF)
Projections (with existing measures) Note 1	2030	165.93	1,152.81	60,112.01
	2045	185.79	956.13	51,654.05
Projections (with additional measures) Note 2	2030	165.93	611.74	48,011.27
	2045	185.79	90.84	38,782.56

Note 1 With Existing Measures scenario, assume that no additional policies and measures beyond those already in place by the end of the latest national GHG inventory year at the time of the projections compilation (EPA 2025d).

Note 2 With Additional Measures scenario, assume implementation of the With Existing Measures scenario in addition to, based on current progress, further implementation of planned government policies and measures adopted after the end of the latest inventory year.

13.3.2 Vulnerability of the Proposed Project to Climate Change

134. The assessment of vulnerability generally relies on future climate change scenarios rather than baseline data. The only baseline information considered relevant was historical regional weather data.

13.3.2.1 Current CCRA Baseline

135. The region of the Proposed Project has a temperate, oceanic climate, resulting in mild winters and cool summers. The recent weather patterns and extreme weather events recorded by Met Éireann have been reviewed. A noticeable feature of the recent weather has been an increase in the frequency and severity of storms, with notable red warning level events including four in 2017 (Doris, Ophelia, Brian and Dylan), nine in 2018 (Eleanor, Fionn, David, Emma, Hector, Ali, Callum, Diana and Deirdre), seven in 2019 (Erik, Freya, Gareth, Hannah, Lorenzo, Atiyah and Elsa), seven in 2020 (Brendan, Ciara, Dennis, Jorge, Ellen, Aiden and Bella), two in 2021 (Arwen and Barra), two in 2022 (Eunice and Franklin) and two in 2023 (Noa and Agnes), as well as numerous orange warning level storms. Heavier historical rainfall events have also been recorded in recent years including heavy rainfall and flooding. One of the most recent events was Storm Éowyn (January 2025). Storm Éowyn carried with it a status red 'danger to life' weather warning from Met Éireann, as well as resulting in significant coastal and surface flooding, fallen trees, significant and widespread power outages and structural damage across the country.

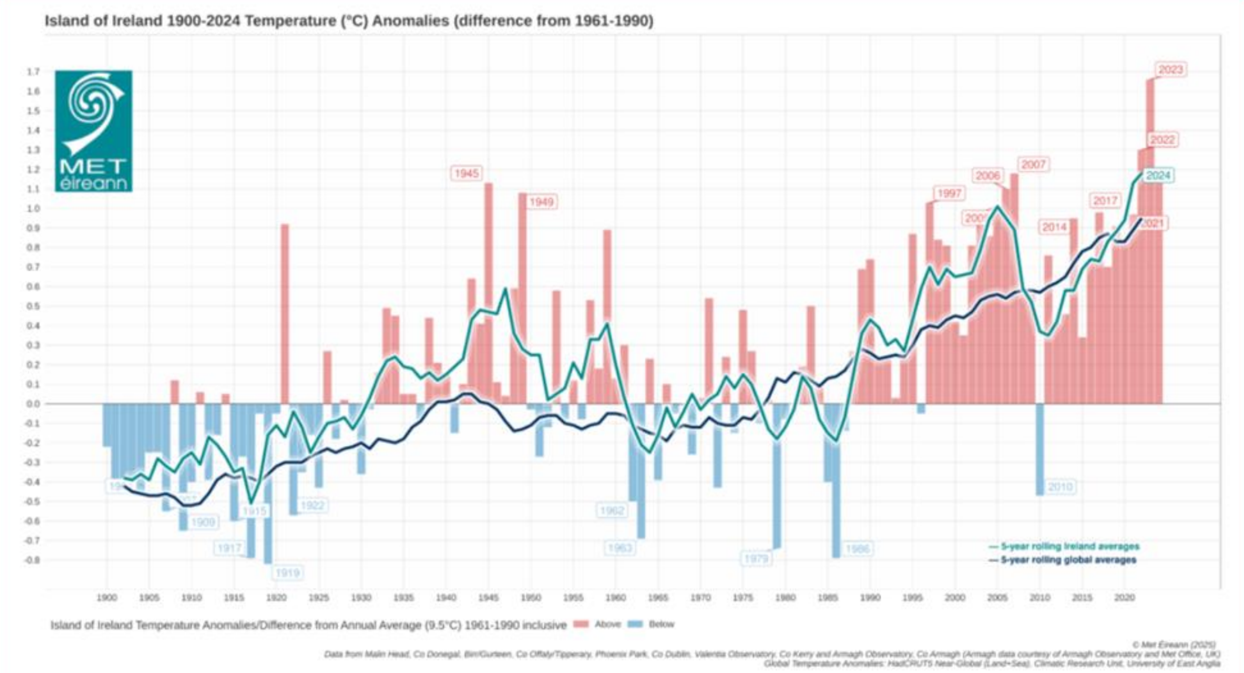
136. The most representative measuring station for the current climate in the region of the western end of the Proposed Project is Shannon Airport, shown in Table 13.11 (Met Éireann 2024a).The Met Éireann weather station at Shannon Airport, County Clare, is the nearest weather and climate monitoring station to the Proposed Project that has meteorological data recorded for the 30-year period from 1991 to 2020. Shannon Airport meteorological station is located approximately south-west of the Proposed Project. Meteorological data recorded at Shannon Airport over the 30-year period from 1991 to 2020 indicates that the wettest months were October to January, and the driest month on average was April. July was the warmest month with a mean temperature of 19.5°C. Record temperatures of 32.0°C were recorded at Shannon Airport in July 2018.

137. The historical regional weather data for Casement Aerodrome, which is representative of the current climate in the region of the eastern end of the Proposed Project, is shown in Table 13.12 (Met Éireann 2024a).

138. Casement Aerodrome meteorological station is located south-east of the Proposed Project. Meteorological data recorded at Casement over the 30-year period from 1991 to 2020 indicates that the wettest months were October and November, and the driest month on average was March. July was the warmest month with a mean temperature of 19.8°C. Heavier historical rainfall events have also been recorded in recent years including heavy rainfall and flooding in the summer of 2008, severe flooding in November 2009, and heavy rainfall in the Greater Dublin Area on 24 October 2011. The rainfall recorded on 24 October 2011 totalled 66.8mm over a nine-hour period at Dublin Airport (closer to the coast than Casement Aerodrome), which has an annual probability of 100 years.

139. Met Éireann's 2024 Climate Statement (Met Éireann, 2025) states 2024's average shaded air temperature in Ireland is provisionally 10.72°C, which is 1.17°C above the 1961-1990 long-term average or 0.55°C above the most recent 1991-2020 long-term average (Diagram 13.1). This is the 4th warmest year on record with 2023 breaking previous records. Seven of the top ten warmest years have occurred since 2005. Record high sea surface temperatures (SST) were recorded in 2022, and in 2024 continued at or near record high levels. 2024 was overall drier than average; however, there were many instances of heavy or intense rainfall which led to flooding events. This trend is predicted to continue with climate change with an increase in both dry periods and heavy rainfall events. Considering the extraordinary data, Met Éireann states that the latest Irish climate change projections indicate further warming in the future, including warmer winters.

140. The record temperatures mean that the likelihood of extreme weather events occurring has increased. This will result in longer dry periods and heavy rainfall events. Storm surges and coastal flooding due to sea level rise. Compound events, where coastal surges and extreme rainfall events occur simultaneously will also increase. Met Éireann has high confidence in maximum rainfall rates increasing but not in how the frequency or intensity of storms will change with climate change.



Island of Ireland annual average temperature anomalies (1961-1990 Long-Term Average) 1900 to 2024: 2024 average shaded air temperature in Ireland is provisionally 10.72°C which is 1.17°C above the 1961-1990 LTA

Diagram 13.1: 1900-2024 Temperature (°C) Anomalies (Differences from 1961-1990) (Met Éireann 2025)

13.3.2.2 Future CCRA Baseline

141. The EPA's Climate Change Research Programme carries out relevant and up to date studies on climate change in Ireland (available at www.epa.ie). Analysis of the meteorological records shows that Ireland's climate is changing in line with global patterns.

142. According to the EPA, climate change is expected to lead to the following adverse effects:

- Sea level rise
- More intense storms and rainfall events
- Increased likelihood and magnitude of river and coastal flooding
- Water shortages in summer in the east
- Adverse impacts on water quality
- Changes in distribution of plant and animal species
- Effects on fisheries sensitive to changes in temperature.

143. The EPA Irish Climate Futures: Data for Decision Making report (EPA 2019) states that it is expected that weather extremes will become more likely and more frequent with future climate change. The EPA Research 386: The Status of Ireland's Climate 2020 report (EPA 2021b) includes a number of climate observations for Ireland. The report states that the annual average surface air temperature in Ireland has increased by approximately 0.9°C over the last 120 years, with a rise in temperatures being observed in all seasons. This compares with a global average temperature estimated to be 1.1°C above pre-industrial levels. The report indicates that the sea level around Ireland has risen by approximately 2 to 3mm per year since the early 1990s. In addition, annual precipitation was 6% higher in the period 1989 to 2018, compared to the 30-year period 1961 to 1990.

144. More recent future climate predictions undertaken by the EPA have been published in Research 339: High-resolution Climate Projections for Ireland – A Multi-model Ensemble Approach (EPA 2020). The future climate was simulated under both RCP4.5 (medium-low) and RCP8.5 (high) scenarios. This study indicates that by the middle of this century (2041 to 2060), the mid-century mean annual temperatures are projected to increase by 1 to 1.2°C and 1.3 to 1.6°C for the RCP4.5 and RCP8.5 scenarios, respectively, with the largest increases in the east. Warming will be enhanced at the extremes (i.e. hot days and cold nights), with summer daytime and winter night-time temperatures projected to increase by 1 to 2.4°C. There will be a substantial decrease of approximately 50% projected in the number of frost and ice days. Summer heatwave events are expected to occur more frequently, with the largest increases in the south. In addition, precipitation is expected to become more variable, with substantial projected increases in the occurrence of both dry periods and heavy precipitation events.

145. The National Framework for Climate Services (NFCS) was founded in June 2022 to streamline the provision of climate services in Ireland and is led by Met Éireann. The aim of the NFCS is to enable the co-production, delivery and use of accurate, actionable and accessible climate information and tools to support climate resilience planning and decision making. In addition to the NFCS, further work has been ongoing into climate projects in Ireland through research under the TRANSLATE project. TRANSLATE (Met Éireann 2024b, 2024c) has been led by climate researchers from the University of Galway – Irish Centre for High End Computing, and University College Cork – SFI Research Centre for Energy, Climate and Marine, supported by Met Éireann climatologists. TRANSLATE's outputs are produced using a selection of internationally reviewed and accepted models from both CORDEX and CMIP5. RCPs provide a broad range of possible futures based on assumptions of human activity. The modelled scenarios include for 'least' (RCP2.6), 'more' (RCP4.5) or 'most' (RCP8.5) climate change (refer to Diagram 13.2).

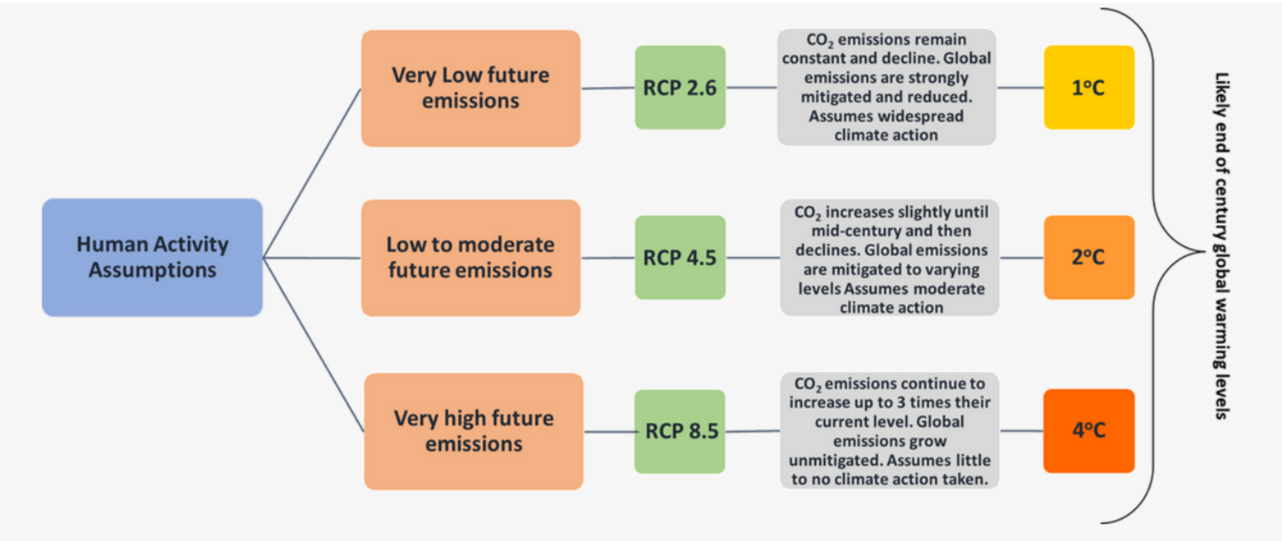


Diagram 13.2: Representative Concentration Pathways Associated Emission Levels (Met Éireann 2024b)

146. TRANSLATE (Met Éireann 2024c) provides the first standardised and bias-corrected national climate projections for Ireland to aid climate risk decision making across multiple sectors (for example, transport, energy, water), by providing information on how Ireland's climate could change as global temperatures increase to 1.5˚C, 2˚C, 2.5˚C, 3˚C or 4˚C. Projections broadly agree with previous projections for Ireland.

147. Ireland's climate is dominated by the Atlantic Meridional Overturning Circulation (AMOC), a large system of ocean currents, including the Gulf Stream, characterised by a northward flow of warm water and a southward flow of cold water. Due to the AMOC, Ireland does not suffer from the extremes of temperature experienced by other countries at a similar latitude. Recent studies have projected that the AMOC could decline by 30 to 40% by 2100, resulting in cooler North Atlantic Sea surface temperatures (Met Éireann 2024b). Met Éireann projects that Ireland will nevertheless continue to warm, although the AMOC cooling influence may lead to reduced warming compared with continental Europe. AMOC weakening is also expected to lead to additional sea level rise around Ireland.

148. With climate change, Ireland's temperature and rainfall will undergo more and more significant changes. For example, on average, summer temperature could increase by more than 2°C, summer rainfall could decrease by 9%, while winter rainfall could increase by 24% (see Diagram 13.3). Future projections also include a 10-fold increase in the frequency of 'summer nights' (values >15°C) by the end of the century; a decrease in the frequency of cold winter nights; and an increase in the number of heatwaves. A heatwave in Ireland is defined as a period of five consecutive days where the daily maximum temperature is greater than 25°C.

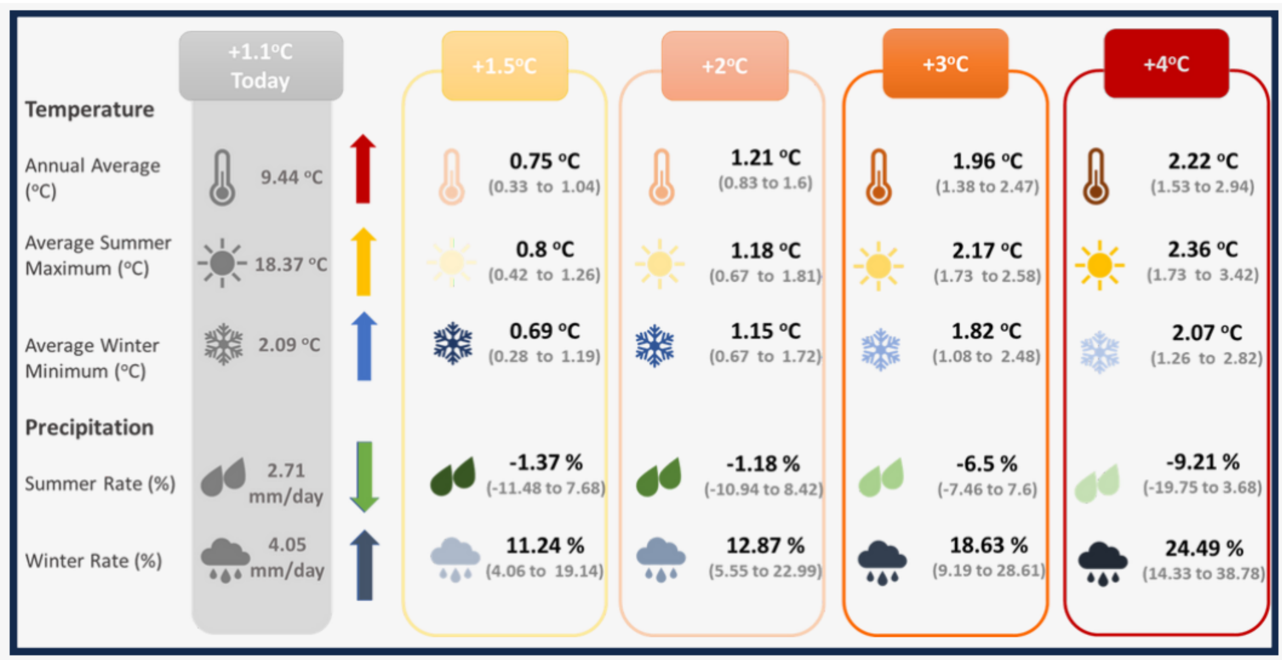


Diagram 13.3: Change of Climate Variables for Ireland for Different Global Warming Thresholds (Met Éireann 2024c)

149. The TRANSLATE research report (Met Éireann 2024c) finds that night-time temperatures will warm more than day-time temperatures, with temperatures increases across all seasons but the highest in the summer (with an increase of 0.5°C to 3.5°C). Autumn is projected to have the highest increase in average minimum temperatures (with an increase of 1.1°C to 4.4°C). The variance is dependent on the scenario that is being reviewed. While these temperatures are projected across all of Ireland, they increase most in the east of the country compared to the west. With respect to rainfall, increases of 4% to 38% are projected; however, this will not be spread across the year as during summer months there are projected decreases in rainfall beyond the 2°C warming scenario.

150. In January 2024 the EPA published Ireland's Climate Change Assessment Synthesis Report (EPA 2024a) which contained four volumes:

- Volume 1: Climate Science: Ireland in a Changing World
- Volume 2: Achieving Climate Neutrality by 2050
- Volume 3: Being Prepared for Ireland's Future Climate
- Volume 4: Realising the Benefits of Transition and Transformation.

151. This report reinforces the existing and future risks arising from climate change. Volume 1 (EPA 2024a) states that under Early action, the temperature increase averaged across the island of Ireland relative to the recent past (1976 to 2005) would reach 0.91°C (0.44 to 1.10°C) by mid-century before falling back to 0.80°C (0.34 to 1.07°C) at the end of the century. Whereas under Late action, by the end of the century it is projected that the temperature increases could be 2.77°C (2.02 to 3.49°C). Heat extremes will become more frequent and more severe and cold extremes will become less frequent and less severe with further warming.

152. Precipitation was 7% higher over the period 1991 to 2020 than over the 1961 to 1990 period. The average future predicted increase in precipitation is <10% in annual mean accumulated. By 2100 projected additional rises in sea level range from 0.32 to 0.6m under early action to 0.63 to 1.01m under late action scenarios, with greater storm surges potentially affecting critical infrastructure along the coastline. Projections of changes in storminess are highly uncertain and translate into large uncertainties in future frequency and intensity of extreme waves.

153. Volume 3 (EPA 2024b) discusses how water supplies will face growing pressures resulting in increased water demand and how options need to be developed, including potential new sources. The report states the key role of critical infrastructure for delivering public services, economic development and a sustainable environment. These are exposed to a range of climate extremes. Failures in critical infrastructure can cascade across other sectors and present a multi-sector risk due to climate change.

154. The report references the EPA's Critical Infrastructure Vulnerability to Climate Change report (EPA 2021a) as the most substantial research project in Ireland to date on climate change and critical infrastructure which assesses the future performance of Ireland's critical infrastructure when climate is considered. The Critical Infrastructure Vulnerability to Climate Change report states with respect to water availability and quality, that flood risk and heatwaves have a medium vulnerability index and the underground supply network has a high vulnerability to snowstorms and cold spells. However, while the vulnerability is high, the exposure is likely to reduce due to future climate change resulting in less cold weather events. The risk assessment highlights the co-dependence of the water sector to the energy sector, and how vulnerability in the energy sector may have cascading impacts.

155. Volume 4 (EPA 2024b) calls for system change, including a transformation of urban settings. It states that meaningful urban transformation can create a better living environment while simultaneously reducing emissions.

156. Climate Ireland data in partnership with the TRANSLATE project (Met Éireann 2024c) have a future projections tool which facilities the viewing of observation data and future predicted modelling scenarios RCP4.5 and RCP8.5 in a web-based GIS format (Climate Ireland 2024). Future projections using the tool for the area of Shannon Airport and Casement Aerodrome are shown in Table 13.13 and Table 13.14. These locations were selected so they can be compared to the historical meteorological data (Table 13.11 and Table 13.12).

Table 13.11: 30-Year Historical Weather Data for Shannon Airport 1991 to 2020 (Met Éireann 2024a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature (degrees Celsius)													
Mean daily max	8.9	9.4	10.9	13.4	16	18.3	19.5	19.1	17.5	14.2	11.1	9.2	14
Mean daily min	3.3	3.3	4	5.8	8.1	10.8	12.6	12.4	10.7	8.1	5.5	3.7	7.4
Mean temperature	6.1	6.3	7.5	9.6	12	14.5	16	15.8	14.1	11.2	8.3	6.4	10.7
Absolute maximum	14.7	15.5	19.6	23	27.8	32	30.2	29.2	25.6	21.9	17.2	15.4	32
Minimum maximum	-2.4	0.7	0.2	5.5	7.5	12.2	13.4	14.3	10.7	7	0.8	-6	-6
Maximum minimum	11.5	12.2	11.7	13	14.4	17.8	18	18.6	17.5	16.2	13.3	12.6	18.6
Absolute minimum	-11.2	-5.1	-5.8	-2.9	0.1	3.1	6.2	4.4	1.7	-2.3	-6.6	-11.4	-11.4
Mean no. of days with air frost	5.2	4.6	3.2	0.6	0	0	0	0	0	0.4	1.9	4.4	20.3
Mean no. of days with ground frost	13	11.8	11.9	7.7	2.9	0.2	0	0	0.8	3.3	8	11.3	70.9
Mean 5cm soil	5	5.1	6.6	9.4	12.9	16	17.2	16.5	14.2	10.7	7.7	5.6	10.6
Mean 10cm soil	5.1	5.2	6.4	9	12.3	15.2	16.6	16.1	14	10.8	7.9	5.8	10.4
Mean 20cm soil	5.8	5.9	7.1	9.5	12.5	15.3	16.7	16.5	14.7	11.7	8.7	6.6	10.9
Relative humidity (%)													
Mean at 0900UTC	87.8	87.9	85	79.3	76.2	76.6	80	82.3	85.1	87.4	89.9	88.9	83.9
Mean at 1500UTC	81.2	75.4	69.8	64.1	63.5	64.6	69.3	69.1	70	75	81	83.5	72.2
Sunshine (hours)													
Mean daily duration	1.7	2.4	3.6	5.4	5.9	5.5	4.4	4.6	3.9	3	2.1	1.5	3.7
Greatest daily duration	8.1	10.2	11.5	13.6	15.6	15.8	15.7	14.4	12.2	10.1	8.3	7.1	15.8
Mean no. of days with no sun	9.1	5.9	5.3	2.3	1.9	1.8	2.1	2.1	2.6	5.1	7.7	10.1	56
Rainfall (mm)													
Mean monthly total	103.8	86.7	75.8	62.3	63.1	69.6	75.8	87.6	77.4	95.5	106.6	115.4	1,019.7
Greatest daily total	38.2	33.8	34.8	40.2	25	45.3	39.5	51	52.3	36.9	29.4	33.5	52.3
Mean no. of days with >= 0.2mm	21.3	18.3	18	16.2	16.2	15.5	18.3	19	17.7	19.9	21.6	21	223
Mean no. of days with >= 0.1mm	16.9	13.9	13.4	11.4	12.1	11.3	13.5	13.7	12.9	15.4	16.8	17.2	168.5
Mean no. of days with >= 5.0mm	7.8	5.8	5.5	4.7	4.6	4.8	4.9	5.8	4.8	7	8	8.5	72.2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Wind (knots)													
Mean monthly speed	10	10.1	9.6	9.2	9	8.5	8.4	8.3	8.4	8.9	9.1	9.7	9.1
Maximum gust	75	86	63	66	52	51	52	61	58	66	69	83	86
Maximum mean 10-minute speed	47	61	44	45	37	37	38	44	44	47	50	57	61
Mean no. of days with gales	2.1	1.2	1.4	0.5	0.5	0.1	0	0.1	0.6	0.9	1	1.5	9.8
Weather (mean no. of days with.)													
Snow or sleet	1.5	1.8	1.2	0.3	0	0	0	0	0	0	0.1	1	5.9
Snow lying at 0900UTC	0.2	0	0.1	0	0	0	0	0	0	0	0	0.1	0.5
Hail	3.1	3.4	2.8	2	0.7	0	0	0.1	0.1	0.5	1	2.3	16
Thunder	0.9	0.4	0.3	0.3	0.5	0.4	0.7	0.5	0.2	0.3	0.3	0.4	5.2
Fog	3.4	2.2	2.4	1.8	1.3	1	0.9	1.6	2.8	3.1	4	3.8	28.3

Table 13.12: 30-Year Historical Weather Data for Casement Aerodrome 1991 to 2020 (Met Éireann 2024a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature (degrees Celsius)													
Mean daily max	8	8.5	10.3	12.4	15.4	18	19.8	19.4	17	13.7	10.3	8.3	13.4
Mean daily min	2.4	2.2	3.1	4.5	6.9	9.6	11.6	11.4	9.6	7.2	4.4	2.6	6.3
Mean temperature	5.2	5.3	6.7	8.5	11.2	13.8	15.7	15.4	13.3	10.4	7.4	5.4	9.9
Absolute maximum	15	17.2	19.8	22.4	25.7	27.6	30.9	28.9	25.2	20.2	17	14.8	30.9
Minimum maximum	-1.9	-0.7	-0.6	3.8	7	10.2	10.7	12.8	9.5	5.1	-3.1	-4.7	-4.7
Maximum minimum	12.1	13	11.5	12.7	14.1	17.2	18.1	18.3	18.4	15.5	13.8	12.7	18.4
Absolute minimum	-12.4	-8.1	-9	-5.9	-3.6	0.3	4.5	2.2	-0.7	-4.3	-9.1	-15.7	-15.7
Mean no. of days with air frost	6.8	7.1	5	2.9	0.8	0	0	0	0.1	1.1	3.7	7.3	34.8
Mean no. of days with ground frost	13.9	13.6	12.8	10.3	4.6	0.7	0	0	1.1	4.7	8.8	13.8	84.5
Mean 5cm soil	3.9	3.9	5.5	8.9	13	16	17.3	16.2	13.1	9.4	6.2	4.3	9.8
Mean 10cm soil	4.1	4	5.3	8	11.7	14.8	16.2	15.3	12.8	9.4	6.4	4.6	9.4
Mean 20cm soil	4.7	4.8	6	8.4	11.7	14.7	16.3	15.7	13.5	10.3	7.3	5.3	9.9

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Relative humidity (%)													
Mean at 0900UTC	88.1	88	85.1	80.2	77.4	77.6	80.2	82.6	85.4	87.1	89.4	89	84.2
Mean at 1500UTC	82.8	77.9	71.7	67.9	66.8	67.6	69.3	69.7	71.9	76.6	82.3	84.8	74.1
Sunshine (hours)													
Mean daily duration	1.7	2.6	3.4	5.2	6.1	5.6	4.9	5	4.2	3.3	2.2	1.5	3.8
Greatest daily duration	8.1	10	11.5	13.8	15.3	16	15.5	14.4	12.3	10.2	8.8	7.3	16
Mean no. of days with no sun	8.7	5.5	4.4	2.5	1.7	2.2	1.6	1.2	2.3	4.1	6.5	9.1	49.8
Rainfall (mm)													
Mean monthly total	65	55.2	51.8	55.3	59.1	65.7	59.4	71.2	61.6	81.6	81.9	75.7	783.5
Greatest daily total	30	35.6	34.18	41.54	36	98.48	33.7	36	51.1	86.1	82	46.8	98.48
Mean no. of days with >= 0.2mm	17.6	15.8	15.5	14.8	15.4	14.8	16.3	16.8	14.9	16.7	17.8	17.5	193.9
Mean no. of days with >= 0.1mm	12.3	11.4	10.2	10.9	10.5	10.1	11.9	11.5	10	12	12.4	13.2	136.4
Mean no. of days with >= 5.0mm	4.7	3.4	3.3	3.8	3.6	3.9	3.7	4.5	4.1	4.7	5.1	5.1	49.9
Wind (knots)													
Mean monthly speed	12.4	12	11.1	9.5	9	8.4	8.4	8.7	9	10.1	10.9	11.7	10.1
Maximum gust	80	74	71	59	62	55	45	53	59	64	64	82	82
Maximum mean 10-minute speed	57	47	47	43	43	41	31	34	41	46	41	54	57
Mean no. of days with gales	3.6	2.2	2.4	0.3	0.4	0.1	0.1	0.2	0.5	1.3	1.9	3.1	16
Weather (mean no. of days with.)													
Snow or sleet	3.2	3.1	2.2	0.7	0.1	0	0	0	0	0	0.6	2	11.9
Snow lying at 0900UTC	1	0.9	0.6	0	0	0	0	0	0	0	0.1	0.7	3.4
Hail	1.1	1.8	2.3	2.7	1.5	0.3	0.2	0	0.1	0.1	0.5	0.7	11.3
Thunder	0.1	0.1	0.2	0.6	0.8	0.9	1.2	1.1	0.4	0.4	0.1	0	6.1
Fog	1.7	1.4	1.8	1.3	1.1	1.1	0.9	1.4	2.6	2.3	1.8	2.2	19.8

Table 13.13: Future Projections (All Seasons – Annual) for Shannon Airport for 2071 to 2100 (Change Relative to 1976 to 2005)

Variable	Projection	
	RCP4.5	RCP8.5
Projected change in average temperature at 2m	12.0 (1.3)	13.3 (1.9)
Change from baseline of number of heatwave events. Events are defined as periods of at least three consecutive days where maximum temperatures exceed >95% of the normal monthly distribution	0.57 (-0.037)	0.77 (0.57)
Precipitation – projection of total mean levels of precipitation	1038 (7.0)	1081 (11.4)
Wet days – projected change (%) in number of days with rainfall >20mm	5.1 (1.5)	6.8 (3.2)
Frost days – number of days when minimum temperatures are <0°C	7.9 (-10.8)	3.3 (-15.3)
Icing days – number of days when maximum temperatures are <0°C	0.01 (-0.11)	0.004 (-0.12)
Wind speed – projected change (%) in wind speed at 10m	Not yet available	Not yet available

Table 13.14: Future Projections (All Seasons – Annual) for Casement Aerodrome for 2071 to 2100 (Change Relative to 1976 to 2005)

Variable	Projection	
	RCP4.5	RCP8.5
Projected change in average temperature at 2m	11.2 (1.5)	12.5 (2.1)
Change from baseline of number of heatwave events. Events are defined as periods of at least three consecutive days where maximum temperatures exceed >95% of the normal monthly distribution	0.64 (0.07)	0.67 (0.2)
Precipitation – projection of average levels of precipitation	800 (6.9)	832 (11.3)
Wet days – projected change (%) in number of days with rainfall >20mm	4.0 (0.78)	4.7 (1.5)
Frost days – number of days when minimum temperatures are <0°C	16.8 (-20.1)	7.6 (-29.3)
Icing days – number of days when maximum temperatures are <0°C	0.05 (-0.15)	0.003 (-0.19)
Wind speed – projected change (%) in wind speed at 10m	Not yet available	Not yet available

13.4 Assessment of Effects

157. The following sections present an assessment of the potential significant climate effects associated with the Construction and Operational Phases of the Proposed Project with respect to the appraisal methods that have been presented in Section 13.2.

158. This section presents an assessment in the absence of mitigation measures, with the exception of embedded mitigation that has been incorporated into the design (e.g. design measures to reduce embodied carbon and reduce operational power demand). Mitigation measures have been proposed in Section 13.5 to prevent or reduce the potential likely significant effects, and the residual effects after the application of mitigation measures are reported in Section 13.6.

13.4.1 Do Nothing Scenario

13.4.1.1 Impact of the Proposed Project on Climate

159. In the event that the Proposed Project does not proceed, the GHG emissions described in Section 13.4.2 would not occur and there would be no change to future climate scenarios.

13.4.1.2 Vulnerability of the Proposed Project to Climate Change

160. The Proposed Project has been designed to provide a reliable supply of water to the east of the country. The Do-Nothing Scenario in the context of the vulnerability of the environment to climate change assumes no changes to the water infrastructure within the extents of the Proposed Project. Without the Proposed Project, the risks to the availability of water detailed in the EPA's Critical Infrastructure Vulnerability to Climate Change report (EPA 2021a) will remain. Further water shortages in the east of Ireland will reduce the available supply, further distorting the supply demand ratio and could potentially lead to an unstable water supply for the Eastern and Midlands Region.

13.4.2 Construction Phase Impact on Climate

161. The greatest risk with respect to Construction Phase activities on climate will be due to embodied energy in the construction materials required for the Proposed Project. Construction works are currently planned to commence in 2028, subject to planning approval from An Coimisiún Pleanála. The construction works are expected to be substantially complete by 2032.

162. Full details of the proposed works are available in Chapter 5 (Construction & Commissioning).

163. The Construction Phase impact assessment considers the likely significant effects due to embodied energy in construction materials, loss of carbon sinks such as forestry and peat, and the GHG emissions due to vehicles related to the Proposed Project during the Construction Phase, including delivery of materials and construction staff transportation. The following sections detail each of these elements which all amount to the total Construction Phase climate impact.

13.4.2.1 Construction Materials and Activities

164. Based on the online TII Carbon Tool (TII 2025), the different activities associated with the Construction Phase of the Proposed Project have been assessed. As shown in Table 13.15, the assessment indicates that the key elements associated with GHG generation during the Construction Phase of the Proposed Project are the embodied carbon of the construction materials (including maintenance materials) and the construction activities. Combined, these account for 77% of all carbon emissions associated with the Construction Phase. Construction related transport is expected to account for 16% of unmitigated emissions. Steel and concrete are the two materials with the most significant embodied carbon. Steel, including the pipeline, and concrete accounts for over 80% of the material emissions. The carbon assessment has assumed an appropriate 'worst-case' approach and has not accounted for potential industry-related improvements in the production process of cement or steel in the future which could improve the carbon intensity of these materials.

165. As set out in Table 13.15, the Proposed Project is estimated to result in total unmitigated Construction Phase GHG emissions of 897,934 tonnes of embodied CO_2eq over a five-year period. This is equivalent to an annualised (over five year construction period) total of 179,587tCO_2eq which is 0.6% of Ireland's non-ETS 2030 target. Emissions are annualised as the Proposed Project's construction is predicted to occur over a five-year period and the emissions targets are targets per year. Over a predicted 120-year lifespan (Royal Institution of Chartered Surveyors (RICS) 2023) (based on guidance in EN 17472:2022) (note the design lifespan is 80–100 years) the annualised unmitigated emissions due to the Construction Phase and ongoing maintenance of the Proposed Project are projected to reach, at most, 7,483 tonnes CO_2eq or 0.03% of Ireland's non-ETS 2030 emissions target.

Table 13.15: Unmitigated[4] Construction Phase GHG Emissions

	Activity	Tonnes CO_2eq	% of Total	Sector
Pre-Construction	Site clearance works	508	0.1%	Industry
	Land use change	40,649	4.5%	LULUCF
Embodied Carbon (Materials)	Asphalt, concrete, aggregate, steel.	585,196	65.2%	Industry
	Maintenance materials over 120-year lifespan	110,422	12.3%	Industry
Construction Activities	Excavation	3,080	0.34%	Industry
	Water use	95	0.01%	Other (including waste and wastewater)
	Generator and electrical use on-site (gas/oil/diesel/electricity)	8,131	0.91%	Energy industries (including electricity generation)
Construction Waste	Recycling and transport of plastic piping, concrete walling, bituminous materials, soil and stone	2,428	0.27%	Other (including waste and wastewater)
Transport	Traffic generated during Construction Phase (including materials, waste and staff transport)	147,427	16.4%	Transport
Total		**897,934**		
Total Annualised over 5-year Construction Phase		**179,587**		
Total Annualised over 120-year lifespan		**7,483**		

13.4.2.2 Agricultural Land Loss

166. The Guidelines for the Calculation of Land Carbon Stocks (European Commission 2010) state that the carbon sequestration value for agricultural land or crop land is zero tonnes of carbon per hectare (ha). This value is also used in the online TII Carbon Assessment Tool (TII 2025) for the category of ‘land principally occupied by agriculture’. Therefore, there would be no reduction in carbon sequestration associated with disturbance of agricultural land for the construction of the Proposed Project. The emissions associated with clearance of 747.4ha of agricultural land has been accounted for within the TII Carbon Assessment Tool and Table 13.15.

13.4.2.3 Loss of Forestry, Transitional Woodland Scrub and Natural Grasslands

167. Forests are an important part of the global carbon cycle and effective management at a regional scale can help to reduce GHG concentrations (IPCC 2006). Transitional woodland scrub and natural grasslands also act as sinks for GHG emissions.

168. The routing of the pipeline included consideration of ecologically sensitive habitat including woodland and avoided these where reasonably practicable. The Proposed Project would require the clearance of 72.3ha of forest, 83.6ha of natural grassland, 7.2ha of woodland scrub and 92.38ha of peat. This clearance work is associated with both temporary and permanent clearance within the Planning Application Boundary. Site clearance works would equate to 508 tonnes of CO_2eq.

169. The area of forestry removal within the Planning Application Boundary, but outside the 20m wide Permanent Wayleave (the Construction Working Width) would be reduced as far as reasonably practicable during the detailed planning of the construction works (post-consent) and so it may be feasible to reduce the extent of the loss.

[4] Unmitigated except for embedded design mitigation

170. Vegetation will generally be reinstated like-for-like. Exceptions to this are habitats that are complex or take a long time to re-establish (as set out in Chapter 8: Biodiversity), or where planting restrictions apply within the 20m Permanent Wayleave (e.g. woodland planting would not be permitted over the wayleave). Carbon sinks that are lost temporarily but will be replaced like-for-like following completion of construction works are not considered in the Construction Phase carbon sink loss assessment. When embedded mitigation of habitat reinstatement is accounted for, the Planning Application Boundary for the Proposed Project has a total area of 22.98ha of forestry, 28.3ha of natural grassland and 1.1ha of woodland scrub considered permanently lost (this is permanent loss from the infrastructure sites, other above ground permanent infrastructure such as valves, and from the 20m Permanent Wayleave, where planting restrictions would apply).

171. Further details on the types of forestry for individual sites can be found in Chapter 8 (Biodiversity). The online TII Carbon Assessment Tool (TII 2025) has been used to estimate the GHG emissions loss of these carbon sinks. This loss is included in Table 13.15 under the activity category of 'Pre-Construction' and equates to 3,010 tonnes of CO_2eq (40,649 tonnes of CO_2eq including peat, see below section) in the absence of mitigation measures.

13.4.2.4 Peat Extraction

172. During the options selection stage, peat bog was considered as a constraint when selecting the preferred pipeline corridor, with options discounted on the basis of traveling through extensive areas of peat compared to the preferred pipeline corridor. Areas of sensitive peat bog, such as undisturbed peat or active raised bog, which act as a carbon sink, were avoided where practicable, including refining the preferred pipeline corridor to avoid areas of degraded raised bog and undisturbed bog remnant (see Appendix A3.1: Pipeline Route Selection Report for further information). In relation to areas of cutover peat or areas of drained bog, the carbon sink potential of these lands is not the same as areas of undisturbed active raised bog. Drained peat no longer acts as a carbon sink and instead acts a carbon source. EPA (2018) studied a range of blanket and cutover raised bogs in Ireland in their assessment. Site specific rates for CO_2 and CH_4 emissions were calculated based on studies at four Irish bogs. The study, over five years, found that the drained bare peat sites were a net annual CO_2 source and resulted in an average emission factor of $1.2tCO_2\text{-}Cha^{-1}\ yr^{-1}$. In terms of CH_4 and N_2O, the net ecosystem exchange (net CO_2 flux between land-atmosphere) was approximately neutral. Therefore, the removal of areas of cutover peat as part of the Proposed Project is not anticipated to result in a significant loss of carbon sink potential of the land. However, the loss of cutover peat has been included in the carbon calculations to provide a conservative, worst case assessment.

173. The route selection process is further detailed in Chapter 3 (Consideration of Reasonable Alternatives). This approach will continue to be adopted during detailed design and where reasonably practicable deeper areas of peat will be avoided to reduce the volume of peat excavated.

174. There are sections of the pipeline that will have to pass through areas of peat. As a result, during the Construction Phase of the Proposed Project, some peat will be excavated in order to build the required infrastructure. As a result of constructing the Proposed Project, 92.38ha of cutover bog is considered temporarily lost (assuming loss within the entirety of the Construction Working Width, which is highly conservative) and 0.94ha of degraded raised bog is considered permanently lost. The 92.38ha of cutover bog will be reinstated as part of the mitigation measures for the Proposed Project and are quantified in Table 13.31. The of 0.94ha of degraded raised bog will also be reinstated, but is considered permanent loss as it cannot be reinstated like-for-like due to the complex underlying processes which contribute to existence of the habitat, and/or time required to re-establish (see Chapter 8: Biodiversity).

175. Peat will be reinstated in the Construction Working Width and 20m wide Permanent Wayleave after works, including the 92.3ha. The Proposed Project will not impact Bord Na Mona's peat rehabilitation plans. Further details on peat loss are contained in Chapter 8 (Biodiversity).

13.4.2.5 Construction Traffic

176. The potential GHG impacts associated with additional construction traffic on the identified construction access routes were determined. Given the nature of the works, redistribution of private road traffic, not related to the Proposed Project, is not considered significant. Conservative assumptions on workers travelling to site includes a 100km radius and use of light goods vehicles over cars. In addition, the emission factors utilised in the online TII Carbon Tool (TII 2025) do not allow for reductions in emissions due to future year projections and therefore are considered conservative.

177. The Proposed Project is estimated to result in total transport-related GHG emissions of 147,427 tonnes of CO_2eq over the five years of construction, or 29,485 tonnes annually. This impact is included in Table 13.15 under the activity category of 'Transport'.

13.4.2.6 Summary of the Overall Impact of the Construction Phase on Climate

178. The impacts due to embodied energy from construction materials, construction traffic, forestry removal and peat removal amount to a total of 897,934 tonnes CO_2eq or 787,513 tonnes CO_2eq when maintenance materials are excluded as these will occur over the Operational Phase, as shown in Table 13.16 and calculated in Section 13.4.2.1 to Section 13.4.2.5 over the five year construction period. The impact of the Proposed Project on climate emissions when annualised over the construction period (five years) is projected to reach, at most, 0.6% of Ireland's non-ETS 2030 emissions target. When annualised over the Construction and Operational Phase lifespan total emissions are 7,483tCO_2eq which is 0.03% of Ireland's non-ETS 2030 emissions target.

179. The embodied carbon calculated as part of this assessment has not included for specific mitigation measures. There will also be improvements in sustainability within the construction industry over time, which will lower carbon emissions. In addition, the embodied carbon is calculated on the basis that all emissions occur over one year, a worst-case consideration.

180. In line with TII (TII 2022a) and ISEP guidance (ISEP 2022), the impact of GHG emissions associated with the Proposed Project on climate is be assessed over its lifetime, rather than for individual phases. The overall impact of the Proposed Project on climate due to GHG emissions is therefore discussed in Section 13.6, where the Operational Phase and mitigation is also taken into account.

Table 13.16: Summary of Unmitigated Construction Phase CO_2eq Emissions

CO_2eq Emission Source		Tonnes CO_2eq	
Embodied energy in construction including land use change		897,934 (787,513 excluding maintenance)	
Annualised (average over construction and operational lifespan)		7,483	
Target/Sectoral Budget	**(tCO_2eq)**	**Annualised Development GHG Emissions**	**% of Relevant Target/Budget (Annualised Over Five-Year Construction Period)**
Ireland's 2024 Total GHG Emissions (existing baseline)	57,640,000	Total GHG Emissions	0.012%
Non-ETS 2030 Target (42% of 2005 levels)	27,722,000	Total GHG Emissions	0.03%
2030 Sectoral Budget (Industry Sector)	4,000,000	Total Industry Emissions	0.14%
2030 Sectoral Budget (Transport Sector)	6,000,000	Total Transport Emissions	0.02%
2030 Sectoral Budget (Energy Industries (including electricity generation))	3,000,000	Total Electricity Emissions	0.002%
2030 Sectoral Budget (Waste Sector, including wastewater)	1,000,000	Total Waste Emissions	0.002%
2030 Sectoral Budget (LULUCF)	N/A	Total LULUCF Emissions	Currently no set budget (See Section 13.2.3.3)

13.4.3 Construction Phase Vulnerability to Climate Change

181. Examples of potential climate impacts during construction are included in Annex D (Climate Proofing and Environmental Impact Assessment) of the Technical Guidance on the Climate Proofing of Infrastructure (European Commission 2021a). Potential impacts of climate change on the Proposed Project include:

- Flood risk due to increased precipitation, and intense periods of rainfall. This includes fluvial and pluvial flooding
- Increased temperatures potentially causing drought, wildfires and prolonged periods of hot weather
- Reduced temperatures resulting in ice or snow
- Geotechnical impacts
- Major storm damage – including wind damage.

182. During the Construction Phase, the Contractor will be responsible for ensuring that the impact of climate change has been assessed. This will include risk assessments for specific weather events which climate change may make more severe. The Construction Phase is considered to be in the short term with regards climate change impacts, and therefore the worst effects of climate are less likely to have occurred. Given this, while mitigation will be put in place as per Section 13.5.2, the potential for significant impact is screened out and not considered further in the chapter.

13.4.4 Operational Phase Impact on Climate

183. Once operational, most of the sources of emissions that would arise during construction will cease. However, operational power requirements will remain. There will also be chemical use associated with the treatment of water and residual waterworks sludge will be generated. In addition, the operation of the Proposed Project would have implications for power generation at the Ardnacrusha Generating Station.

13.4.4.1 Operational Power Demand

184. Uisce Éireann is committed to designing, building and operating assets in a way that maximises energy efficiency.

185. The plant, equipment, building and systems associated with the Proposed Project will be designed, equipped, operated and maintained in such a manner as to use energy efficiently, at a high level of energy performance. Power demand will occur from the following:

- Raw Water Intake and Pumping Station (RWI&PS)
- WTP and High Lift Pumping Station (HLPS)
- BPT
- Booster Pumping Station (BPS)
- TPR
- Other power requirements (including Line Valves, the Flow Control Valve (FCV) and Cathodic Protection system).

186. During the development of the design for the infrastructure, embedded measures have been incorporated into the Proposed Project to reduce the operational power demand. These include the use of gravity feed pipeline for the majority of the route with pumping only required for periods in peak demand and use of renewable energy as set out in Section 13.5 and Table 13.29.

187. There will be an operational power requirement in order to keep the Proposed Project running and Table 13.17 sets out the annual average power consumption in 2050 (at normal operational levels). SEAI have provided email communication with projected future carbon intensity for grid electricity of 40.9gCO_2/kWh by 2050 which has been used in the calculations in Table 13.17, as discussed in Section 13.2.6.1.4.

Table 13.17: Annual Average Power Consumption in 2050 at Normal Operational Levels[5]

Site	Approximate Average Daily Consumption in 2050 (kWh/day)	Approximate Annual Average Consumption in 2050 (MWh/annum))
RWI&PS	26,946	9,835
WTP	50,895	18,577
HLPS	82,080	29,959
BPT	1,496	546
BPS	463	169
TPR	1,232	450
FCV	188	69
Total	**163,300**	**59,605**
CO_2 Associated with Consumption in 2050 (tonnes)	16.68	2439.71
Projected energy industries emissions for 2050 (with additional measures) (tonnes)		3,039,396
Emissions as % of energy industries emissions for 2050 (with additional measures)		0.08%

188. The WTP and HLPS energy requirements account for approximately 81% of the overall Proposed Project annual average power consumption in 2050 at 48,535,000kWh. The RWI&PS will be the next biggest consumer at 17%, with all other elements listed in Table 13.17 consuming less than 0.1% of the overall Proposed Project annual average power consumption.

189. By 2050 the aim is that Ireland will be a climate neutral economy where GHG emissions are balanced or exceeded by the removal of GHGs in line with the 2021 Climate Act. Under this scenario, electricity will be expected to have a very low carbon intensity (SEAI currently estimate it to be 40.9gCO_2/kWh).

190. The Proposed Project, pre-mitigation, will contribute approximately 0.08% of projected energy industries emissions for 2050; see Table 13.17.

191. The Proposed Project may result in a minor reduction in renewable power generation from the Ardnacrusha Generating Station, as water that would usually be used for hydropower is instead abstracted for drinking water purposes. This in turn could increase carbon emissions if power is instead generated from fossil fuels to make up for the reduction of power generated from Ardnacrusha. There are many factors that would affect whether there would be a reduction in power generation from Ardnacrusha, and if so, the amount it would be reduced by, including whether Ardnacrusha is generating at full capacity (the actual generating rate is typically substantially below this), whether the Proposed Project is abstracting at full capacity (during periods of peak demand), and other uses in Parteen Basin that affect water levels.

[5] The Proposed Project is designed to abstract a maximum of 300Mld, however this is the maximum that would be abstracted during periods of peak demand. The quantities of the chemicals that would be used during the operation, residual waterworks sludge generated, and operational power demand is based on 154Mld as this represents a normal average year of operation over the lifetime of the Proposed Project and is therefore appropriate to assess the likely significant effects. While quantities would be greater at 300Mld, this increase would not change the likely significant effects reported in this chapter.

192. While there may be peak periods where renewable power generation is reduced, it is considered that over a normal average year of operation this impact would be negligible as approximately 90%–95% of the long-term average annual flow in the Shannon at Parteen Weir (which is approximately 180m^3/s), is directed through Ardnacrusha, (with a minimum statutory compensation water flow of 10m^3/s directed to the lower Shannon at Parteen Weir) and in comparison the average abstraction for the Proposed Project would be 1.78m^3/s in 2050. The Proposed Project abstraction would simply be another factor, alongside existing considerations like predicted rainfall and power generation demand, that the Electricity Supply Board (ESB) would take account of during their daily operations as they carefully manage water levels within the Normal Operating Band on Lough Derg and within the upper and lower water levels on Parteen Basin, as it does currently. Additionally, over the lifetime of the Proposed Project, the impact would further reduce as the proportion of electricity generated from renewable sources in Ireland increases. Therefore, for the purpose of the climate assessment, any change in carbon emissions from a reduction of renewable power generation at Ardnacrusha would be imperceptible and would not affect the conclusions on likely significant effects.

13.4.4.2 Chemical Demand

193. As part of the Operational Phase of the Proposed Project, there will be carbon associated with chemical use for the treatment of water at the WTP, BPT and TPR. Chemicals are used primarily for the following functions:

- Raw Water Conditioning
- Coagulation and flocculation (binds impurities together in lumps which allows them to be removed via filtration, clarification)
- Water Correction
- Fluoridation
- Chlorination.

194. The predicted weight of chemicals required for operation, as well as the emission factors for the chemicals, are provided in Table 13.18. The weight is based on annual average consumption in 2050 (at normal operational levels).

195. The annual emissions associated with chemical inputs to the water treatment are 4,610tCO_2eq or 0.017% of Ireland's Non-ETS 2030 Target. This figure has the potential to reduce with potential future water treatment technologies and supply chain decarbonisation.

196. The chemicals are assumed to be transported from Limerick Port for the WTP and BPT and from Dublin Port for the TPR, with total annual travel emissions associated with the chemicals shown in Table 13.20, based on the assumptions discussed in Section 13.2.6.1. The annual emissions associated with transportation of the chemical inputs to the water treatment are 45tCO_2eq or 0.0008% of Ireland's 2030 Transport Sectoral budget. This figure has the potential to reduce with potential future water treatment technologies and supply chain decarbonisation.

Table 13.18: Annual Carbon Associated with Chemical Use During Operational Phase

Chemical	Annual Consumption (kg)	Emission Factor ($kgCO_2eq/kg$)	Source	$kgCO_2eq$
Raw Water Conditioning (Sulphuric Acid)	1,874,355	0.145	UKWIR Carbon Accounting Workbook v19	271,781
Coagulant (Aluminium Sulphate)	15,619,628	0.1278	UKWIR Carbon Accounting Workbook v19	1,996,188
Flocculant for water (Poly)	18,744	0.813	UKWIR Carbon Accounting Workbook v17	15,239
Final Water Correction (Caustic Soda)	1,992,900	0.66	UKWIR Carbon Accounting Workbook v19	1,315,314
Fluoridation	56,940	0.938	UKWIR Carbon Accounting Workbook v19	53,410
Chlorination	1,474,800	0.64	UKWIR Carbon Accounting Workbook v19	943,872
Flocculant for sludge treatment	17,082	0.813	UKWIR Carbon Accounting Workbook v17	13,888
Total $kgCO_2eq$				**4,609,692**
Total tCO_2eq				**4,610**
Total as % of Irelands Non-ETS 2030 Target				**0.017%**
Total as % 2030 Sectoral Budget (Waste Sector, including wastewater)				**0.46%**

Table 13.19: Annual Carbon Associated with the Transportation of Chemicals During Operational Phase

Chemical	Standard Delivery Unit (tonnes)	Bulk Deliveries per Year	Kms Travelled	$kgCO_2$ Annually Transport
Raw Water Conditioning (Sulphuric Acid)	28	67	3,618	3,924
Coagulant (Aluminium Sulphate)	28	557	30,078	32,620
Flocculant for water (Poly)	5	4	216	234
Final Water Correction (Caustic Soda)	28	71	3,834	4,158
Fluoridation	28	2	108	117
Chlorination	28	53	3,594	3,898
Flocculant for sludge treatment	5	3	162	176
Total Transport $kgCO_2eq$				**45,126**
Total Transport tCO_2eq				**45**
Total as % 2030 Sectoral Budget (Transport Sector)				**0.0008%**

13.4.4.3 Residual Waterworks Sludge

197. As described in Section 4.6 of Chapter 4 (Proposed Project Description), the water treatment process will create a residual waterworks sludge, as the coagulant chemical binds up the organic material into an insoluble form, which is then removed from the settlement tanks. The process would bring the dry solids content of the sludge cake to approximately 25%. The generated residual waterworks sludge is from water rather than wastewater treatment, so low in organic matter and will not generate biogas, a source of GHG emissions. It is estimated that, operating under normal demand conditions (154Mld), the WTP will produce up to 18,560m^3 of dewatered sludge cake over a one year period.

198. Uisce Éireann, however, views sludge cake as a valuable resource and potential product in a circular economy model (Irish Water 2021). As a result, Uisce Éireann is progressing several potential sustainable options. Recovery/reuse of the solids is the preferred long-term sustainable option for Uisce Éireann aligned with the EU Waste Framework Directive waste hierarchy, after prevention and reduction measures. Uisce Éireann is looking to progress a number of circular economy options for the recovery/reuse of residual waterworks sludge. The residual waterworks sludge will be recovered/reused through one of those options if available once the WTP commences operation. Currently, Uisce Éireann is sending 90% of water sludge from water treatment to sustainable outlets with the remaining 10% being used for landfill capping material (2023 figure, Commission for Regulation of Utilities (CRU) 2025). The worst-case scenario is that this performance remains the same and the current trend for 10% disposal of residual waterworks sludge as waste to landfill continues, resulting in 2,041 tonnes for disposal to a licensed facility per annum.

199. GHGs from sludge occur due to the decomposition of organic compounds in the sludge. The amount of organic material available for breakdown is substantially higher in sludge derived from wastewater treatment plants compared to water treatment plants. Sludge from wastewater treatment plants contains a substantially higher proportion of organic material than the sludge from a water treatment plant which is composed of suspended impurities such as sand, silt, clay and humic particles and an overall lower proportion of organic matter. The UKWIR Carbon Accounting workbook (2024) is the tool UK water companies use for reporting to The Water Services Regulation Authority (Ofwat). The GHG emissions rates from sludge in the UKWIR Carbon Accounting workbook only provides rates for sludge from wastewater treatment facilities. Similarly, the IPPC GHG emission rates for sludge specifically calls out wastewater facilities but does not provide rates from sludge derived from water treatment (IPCC 2006). The residual waterworks sludge is therefore considered not to be a significant source of GHG emissions due to its lower organic carbon availability for degradation.

13.4.4.4 Summary of the Overall Impact of the Operational Phase on Climate

200. The impacts due to embodied carbon associated with maintenance materials (discussed in Section 13.4.2.1), Operational Phase traffic due to chemical deliveries, chemical inputs for water treatment and Operational Phase power demands amount to a total of 8,015 tonnes CO_2eq per annum, as shown in Table 13.20. Conservatively, this equates to an annual impact equal to 0.03% of Ireland's non-ETS 2030 target of 22.72ktCO_2eq (42% reduction on 2005 levels, Regulation (EU) 2023/857 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement, and Regulation (EU) 2018/1999) when divided over the 120-year lifespan of the Proposed Project.

Table 13.20: Summary of Operational Phase CO_2eq Emissions

CO_2eq Emission Source	Tonnes CO_2eq
Annual Operational Phase power (2050)	2,440
Annual Operational Phase traffic (Chemical Inputs)	45
Annual chemical inputs	4,610
Annualised maintenance emissions	920
Total annual emissions: Operational Phase	**8,015**
Total annual emissions as % of Ireland's total GHG emissions (2030 Target)	0.03%

201. The Proposed Project is designed to provide a reliable supply of water to the East and Midlands region of the country which is required due to growing populations and increased pressure on the water supply network in the east of the country made worse by climate change. The Proposed Project will support the delivery of government strategies outlined in the CAP and the Climate Act, with respect to a requirement for climate adaptation.

202. In line with TII (TII 2022a) and ISEP guidance (ISEP 2022), the impact of GHG emissions associated with a proposed project on climate should be assessed over its lifetime, rather than for individual phases. The overall impact of the Proposed Project on climate due to GHG emissions is therefore discussed in Section 13.6, where the Construction Phase and mitigation are also taken into account.

13.4.5 Operational Phase Vulnerability to Climate Change

203. Climate adaptation seeks to increase the resilience of major projects to the adverse impacts of climate change, such as increased flooding or droughts, and comprises measures that are embedded into the design. Mitigation, on the other hand, seeks to reduce the emissions of GHGs by implementing low-carbon energy options. Adaptation during the Operational Phase of the Proposed Project aims to avoid potential climate change impacts having a significant impact on the operation of the Proposed Project.

204. A risk assessment has been conducted for potentially significant effects on the Proposed Project associated with climate change. The risk assessment assesses the likelihood and consequence of potential impacts occurring and then provides an evaluation of the significance of the effect using the framework set out in Section 13.2.6.1.6. In addition to the assessment in this chapter, Chapter 20 (Risk of Major Accidents and/or Disasters) discusses the Proposed Project’s vulnerability to natural disasters, some of which may occur as a result of climate change.

205. To determine the vulnerability of the Proposed Project to climate change, the sensitivity and exposure of the Proposed Project to various climate hazards has first been determined. The following climate hazards have been considered in the context of the Proposed Project: flooding (coastal, pluvial, fluvial), extreme heat, extreme cold, wildfire, drought, extreme wind, lightning, hail, landslides and fog. A sensitivity assessment has been conducted with assistance from the Proposed Project engineers to consider the sensitivity of the proposed infrastructure elements:

- Pipeline (including Treated Water Pipeline and RWRMs)
- TPR
- BPS
- BPT
- RWI&PS
- WTP
- FCV
- Other Infrastructure.

206. The sensitivity of the Proposed Project to the above climate hazards is assessed irrespective of the project location. Sections 13.4.5.1 to 13.4.5.7 detail the sensitivity of the Proposed Project on a scale of high (3), medium (2) and low (1). Once the sensitivity has been established, the exposure of the Proposed Project to each of the climate hazards is determined; this is the likelihood of the climate hazard occurring (i.e. its exposure potential) at the project location and is also scored on a scale of high (3), medium (2) and low (1). The product of the sensitivity and exposure is then used to determine the overall vulnerability of the Proposed Project to each of the climate hazards (Section 13.4.5.8).

207. In addition to the above infrastructure, 38 kV Uprate Works are required in order to provide the new power supply needed for the RWI&PS and WTP. This works will be conducted by the ESB following their own strategic framework Driven to Make a Difference: Net Zero by 2040 Strategy, under which Goal 9 and Goal 13 target adding resilience and adaptation to climate change.

208. The risk to future abstraction due to future climate change has also been considered in Section 13.4.5.9.

13.4.5.1 Pipeline (Including RWRM and Treated Water Pipeline)

13.4.5.1.1 Flooding (Coastal, Pluvial or Fluvial)

209. To assess the risk on infrastructure elements, including the pipeline, a Flood Risk Assessment (FRA) has been carried out as part of the EIAR, and can be found in Appendix A9.4 (Flood Risk Assessment). The FRA includes modelling for the Mid-Range Future Scenario (MRFS), which includes for an additional 20% river flows and extreme rainfall depths, and a 0.5m rise in sea levels; and the High-End Future Scenario (HEFS), which includes for an additional 30% river flows and extreme rainfall depths, and 1m increase in sea level. These levels are set by the Office of Public Works (OPW). The MRFS scenario is intended to represent the 'likely' future scenario based on a range of forecasts. The HEFS represents a more extreme forecast that is at the upper end of accepted projections. The TRANSLATE project (Met Éireann 2024c) is currently working with the OPW to integrate the TRANSLATE data into their future flood scenarios; however, currently the MRFS and HRFS do not directly correlate to RCP4.5 and RCP8.5. RCP4.5 is, however, considered the intermediate or more likely future scenario and RCP8.5 a high-end future scenario.

210. An assessment of the potential flooding impact in the MRFS and HEFS for the Proposed Project, including the pipeline, is detailed in Appendix A9.4 (Flood Risk Assessment). The FRA notes that the locations and elevations of the Proposed Project, including the pipeline, mean they will not be at risk from coastal and estuarine flooding despite the predicted increase in sea level of 0.5m over the next 100 years.

211. The FRA was carried out in accordance with the OPW Guidelines for Planning Authorities 20: The Planning System and Flood Risk Management (OPW 2009). The FRA has concluded that future climate change does not significantly change the risk of flooding. This is because the Proposed Project works have been shown to be at a low risk of flooding and this will not change substantively as a consequence of climate change (see Table 13.21).

212. The pipeline is not considered sensitive to flood risk. However, access to valves may become more difficult if flooding or flood risk increases and becomes more frequent with future climate change. Flood risk on local roads would potentially limit access for short periods; however, the requirements for site visits to Line Valves are rare. Line Valves can be operated remotely from the WTP. Additionally, should a problem arise with a Line Valve, the pipeline can rely on the upstream and downstream Line Valves and operate without interruption until a favourable time is identified to affect the repair (see Appendix A4.1: Operational Strategy for further details).

213. During pipeline operation washouts would be used for emptying sections of pipeline if required for emergency repairs or for routine maintenance. This will only happen on rare occasions, typically every 20 to 30 years (see Appendix A4.1: Operational Strategy for further details). These will be planned events and will only be scheduled during suitable weather conditions to reduce the potential for cascading flood risk. Other principles will apply, such as discharges will only occur during periods when river flows are lower than the mean flow (see Section 6.2 of the FRA (Appendix A9.4) for further details). Additionally, each Line Valve installation incorporates a bypass pipework arrangement and washout facility designed to pump treated water around the Line Valves to sections of pipeline not undergoing maintenance works. This reduces the quantity of water to be discharged to the environment during draindown of any pipeline subsection.

214. It is acknowledged that a failure of the pipeline could result in an unplanned release of water which has the potential to cause localised flooding. The risk of a failure will be reduced by using steel to construct the pipeline, as opposed to concrete. The pipeline will be fitted with telemetry and flow gauges to monitor for any sudden changes in flow that will be indicative of a failure along its length. Discharges may be contained and reduced by closing of valves. The steel pipeline will also be protected against corrosion by means of a remotely monitored impressed current cathodic protection system (see Appendix A4.1: Operational Strategy for further details).

215. Flooding has the potential to cause settlement of soils around the pipeline, in particular if it is paired with periods of drought (see Section 13.4.5.1.4 on drought).

13.4.5.1.2 Extreme Heat

216. Given the underground nature of the pipeline, the sensitivity is low with respect to extreme heat as it is naturally protected from temperature fluctuations.

217. Valves may be susceptible to operational difficulties in extreme temperatures; however, the design and operational measures reduce the sensitivity to low (see Table 13.21). Such measures include (as detailed in Appendix A4.1: Operational Strategy):

- Problems with the Line Valve electrics, actuators or gear boxes are maintainable without needing to drain the pipeline and can be undertaken within a controlled and scheduled timeframe
- Should a problem arise with a Line Valve due to climate change related weather impacts, or other reasons, the pipeline can rely on the upstream and downstream Line Valves and operate without interruption until a favourable time is identified to affect the repair
- Pressure transducers will be provided to monitor water pressure either side of Line Valves
- The Line Valves may be operated either locally or remotely from the WTP control room, therefore removing the need to access them during times of extreme temperatures (or other weather related hazards)
- Should an Air Valve need maintenance, repair or replacement, it can be safely worked on by closing the associated isolating valve while the pipeline is live, with no interruption to the supply.

13.4.5.1.3 Extreme Cold

218. Given the underground nature of the pipeline, the sensitivity is low with respect to extreme cold as it is naturally protected from temperature fluctuations.

219. Valves may be susceptible to operational difficulties in extreme temperatures; however, the design and operational measures set out above under the consideration of extreme heat (Section 13.4.5.1.2) reduce the sensitivity to low (see Table 13.21).

13.4.5.1.4 Drought

220. Drought has the potential to cause settlement of soils around the pipeline, in particular if it is followed by periods of heavy rain or flooding. A key reason for the choice of welded steel for the pipe material is due to its capacity to handle ground movement better than other materials. Susceptible branches of the pipeline at washouts are designed with protective foundation slabs to reduce bending moments from differential settlement. The sensitivity is considered low due to consideration of settlement within the pipeline design. Therefore, the sensitivity of the pipeline to drought is low (see Table 13.21).

13.4.5.1.5 Wind

221. Given the underground nature of the pipeline the sensitivity is low with respect to wind (see Table 13.21) as it is naturally protected from high winds.

13.4.5.1.6 Fog

222. Given the nature of the pipeline there is no significant risk from fog. Therefore, the sensitivity of the pipeline to fog is low (see Table 13.21).

13.4.5.1.7 Lightning and Hail

223. Given the underground nature of the pipeline, the sensitivity is low with respect to lightning and hail as it is naturally protected. However, the power connection at Line Valves could be subject to lightning strike. This has been considered within the design with an uninterruptible power system (UPS) with surge protection included which reduces the sensitivity of the pipeline to lightning and hail from a medium to a low rating.

224. An additional design feature within the twin RWRMs allows one main to be taken out of commission for a time without interrupting supply. This provides a redundancy within the design and reduces the sensitivity (see Table 13.21).

13.4.5.1.8 Coastal Erosion

225. The pipeline is not in close proximity to coastal areas, therefore this hazard has been scoped out.

13.4.5.1.9 Landslide

226. A programme of ground investigations (see Appendices A10.1 and A10.2) has been undertaken to understand ground conditions and to design the infrastructure and construction methods accordingly. The detailed designs will be undertaken to technical standards. Design checks will also be in place at specific points in the programme to check that the standards are met. One area of concern was identified for potential landslip. This hazard was mitigated by proposing a pipe jacked tunnel at a suitable depth at this location. By completing the ground investigations and adjusting the design where needed to ensure soil stability is robust, the pipeline is therefore considered to have a low sensitivity to landslides (see Table 13.21).

Table 13.21: Pipeline Sensitivity to Climate Hazards

Sensitive Receptors (Project Assets)	Sensitivity to Climate Hazards								
	Flooding (Coastal, Pluvial or Fluvial)	Extreme Heat	Extreme Cold	Drought	Wind	Fog	Lightning & Hail	Coastal Erosion	Landslide
RWRMs and Treated Water Pipeline	1	1	1	1	1	1	1	N/A	1
Mechanical/ electrical components (Line Valves and Air Valves)	1	1	1	1	1	1	1	N/A	1
Valve chambers	1	1	1	1	1	1	1	N/A	1
Utilities (including grid connection)	1	1	1	1	1	1	1	N/A	1
Drainage (Washouts)	1	1	1	1	1	1	1	N/A	1
Access roads to valves	1	1	1	1	1	1	1	N/A	1
Note on Sensitivity 1 = Low, 2 = Medium and 3 -= High									

13.4.5.2 Termination Point Reservoir (TPR)

13.4.5.2.1 Flooding (Coastal, Pluvial or Fluvial)

227. For the same reasons discussed for the pipeline in Section 13.4.5.1.1, the TPR will not be at risk from coastal or estuarine flooding.

228. There are no permanent watercourses adjacent to the TPR site; there is a drainage ditch, but this is seasonally dry. The risk of fluvial flooding to the proposed TPR site is therefore considered to be low (see Appendix A9.4).

229. The TPR is located on a high point and therefore the design mitigation focused on the potential for surface water runoff impacts. The site is elevated above surrounding lands with ground levels falling in an east–west direction. Therefore, during extreme storm events, rainfall falling on the site will be able to flow away as there are no barriers present that could cause flood water to accumulate. The TPR access road, and other paved areas, will be designed to incorporate sustainable drainage system (SuDS) principles to limit discharges from the TPR site to the equivalent greenfield site flow rate. Filter drains will disperse surface water to detention basins. Surface water from the attenuation basins will be discharged via an underground pipe to the network of fields and ditches located to the north and west of site. The volume of the attenuation basins has been designed to accommodate flows from a 1 in 100-year storm event plus an uplift in rainfall for climate change. This is described in more detail in Appendix A4.1 (Operational Strategy). The risk of surface water flooding to the TPR site is therefore considered to be low (see Appendix A9.4).

230. The FRA (Appendix A9.4) concluded that there will be no significant change to flood risk as a result of climate change. This is because the Proposed Project works have been shown to be at a low risk of flooding and this will not change substantively as a consequence of climate change. Therefore, the overall sensitivity of the TPR to flood risk is considered low (see Table 13.22).

231. Flooding has the potential to cause settlement of soils around the reservoir and associated infrastructure, in particular if following periods of drought (see Section 13.4.5.2.4 on drought).

13.4.5.2.2 Extreme Heat

232. Given the underground nature of the TPR, the sensitivity is low with respect to extreme heat as it will be naturally protected from temperature fluctuations. There is one above ground building associated with the TPR which controls the chemical dosing of the treated water prior to the treated water entering the Greater Dublin Area Water Resource Zone. The building will house automatic monitoring and testing equipment to measure residual chlorine in the treated water from the WTP, and automatic dosing pipework. Therefore, should extreme temperatures affect the required dosing this will be automatically applied. At detailed design stage the materials used in the TPR will be considered so that they are chosen to be high quality, durable and hard-wearing and chosen to withstand increased variations in temperature in the future as a result of climate change. The chemical dosing building is proposed to be constructed from concrete which has a large mass and is resilient to extreme temperatures. The design will also include appropriate ventilation. The design is considered to have a low sensitivity to extreme heat (see Table 13.22).

13.4.5.2.3 Extreme Cold

233. The sensitivity of the TPR to extreme temperatures, including cold, is considered low (see Table 13.22) due to the underground nature of the reservoir which will protect it from extreme changes in temperature.

13.4.5.2.4 Drought

234. Drought has the potential to cause settlement of soils, in particular if it is followed by periods of heavy rain or flooding. However, the TPR will be constructed in an area of shallow bedrock. Given that bedrock is at a shallow depth, the overburden (layer of soil and rock above the bedrock) will be removed and the structure will be founded on mass reinforced concrete over its footprint (see Chapter 5: Construction & Commissioning). The sensitivity of this is therefore considered low (see Table 13.22).

13.4.5.2.5 Wind

235. Given the underground nature of the TPR, the sensitivity is low with respect to wind as it will be naturally protected from high winds. For above ground elements such as the control building, while the design is not considered to be susceptible to wind due to its low height (8.4m high), concrete construction and placement behind a retaining wall, the appropriate wind loadings for RCP4.5 and RCP8.5 in 2100 will be calculated in line with the relevant structure requirements with consideration during detailed design for more extreme wind loadings which may occur in future due to climate change. The sensitivity of the TPR to wind is therefore considered low (see Table 13.22).

13.4.5.2.6 Fog

236. Given the nature of the TPR, there is no significant risk from fog. Therefore, the sensitivity of the TPR to fog is low (see Table 13.22).

13.4.5.2.7 Lightning and Hail

237. Given the underground nature of the TPR, the sensitivity is low with respect to lightning and hail as it is naturally protected. Mechanical and electrical components, including those associated with the chemical dosing building could be subject to lightning strike. This has been considered within the design with a UPS with surge protection included which means the sensitivity of the TPR is maintained at a low rating (see Table 13.22).

13.4.5.2.8 Coastal Erosion

238. The TPR is not in close proximity to coastal areas, therefore this hazard has been scoped out.

13.4.5.2.9 Landslide

239. A programme of ground investigations (see Appendices A10.1 and A10.2) has been undertaken to understand ground conditions and to design the infrastructure and construction methods accordingly. The detailed design will be undertaken to technical standards and design checks will be in place at specific points in the programme to check that the standards are met. Landslide susceptibility mapping from Geological Survey Ireland (GSI) (GSI 2024) also indicates a low risk and no history of landslides in proximity to the TPR. The TPR is therefore considered to have a low sensitivity to landslides (see Table 13.22).

Table 13.22: TPR Sensitivity to Climate Hazards

Sensitive Receptors (Project Assets)	Sensitivity to Climate Hazards								
	Flooding (Coastal, Pluvial or Fluvial)	Extreme Heat	Extreme Cold	Drought	Wind	Fog	Lightning & Hail	Coastal Erosion	Landslide
Drainage	1	1	1	1	1	1	1	N/A	1
Access roads	1	1	1	1	1	1	1	N/A	1
Buildings	1	1	1	1	1	1	1	N/A	1
Utilities (including grid connection)	1	1	1	1	1	1	1	N/A	1
Mechanical /electrical components	1	1	1	1	1	1	1	N/A	1

13.4.5.3 Break Pressure Tank (BPT)

13.4.5.3.1 Flooding (Coastal, Pluvial or Fluvial)

240. For the same reasons discussed for the pipeline in Section 13.4.5.1.1, the BPT will not be at risk from coastal and estuarine flooding.

241. There are no watercourses adjacent to the BPT site. Fluvial flood risk to the site is therefore considered to be low (see Appendix A9.4).

242. The BPT site is situated near the peak elevation along the Proposed Project with the ground surrounding the site being at a lower elevation; surface water will therefore flow away from the site during extreme rainfall. The BPT access road and other paved areas will be designed to incorporate SuDS principles to limit discharges of rainwater runoff from the BPT site to the equivalent greenfield site flow rate. The roof of the BPT will be grassed to limit surface water runoff. Filter drains will disperse surface water to the infiltration basin or soakaway chambers. The infiltration basin has been designed to accommodate flows from a 1 in 100-year storm with an uplift for climate change. This is described in more detail in Appendix A4.1 (Operational Strategy). The risk of surface water flooding to the BPT site is therefore considered to be low (see Appendix A9.4).

243. The FRA (Appendix A9.4) concluded that there will be no significant change to flood risk as a result of climate change. This is because the Proposed Project works have been shown to be at a low risk of flooding and this will not change substantively as a consequence of climate change. Therefore, the overall sensitivity of the BPT to flood risk is considered low (see Table 13.23).

244. Flooding has the potential to cause settlement of soils around the BPT and associated infrastructure, in particular if following periods of drought (see Section 13.4.5.3.4 on drought).

13.4.5.3.2 Extreme Heat

245. Given the underground nature of the BPT, the sensitivity is low with respect to extreme heat as it is naturally protected from temperature fluctuations. There is one above ground control building associated with the BPT. At detailed design stage the materials used in the BPT will be considered so that they are chosen to be high quality, durable and hard-wearing and chosen to withstand increased variations in temperature in the future as a result of climate change. The design will also include appropriate ventilation. The design is considered to have a low sensitivity to extreme heat (see Table 13.23).

13.4.5.3.3 Extreme Cold

246. The sensitivity of the BPT to extreme temperatures, including cold, is considered low (see Table 13.23) due to the underground nature of the tank which protects it from extreme changes in temperature. At the detailed design stage, materials will be chosen (including, for example, insulation) to build resilience to cold temperatures.

13.4.5.3.4 Drought

247. Drought has the potential to cause settlement of soils, in particular if it is followed by periods of heavy rain or flooding. However, the BPT will be constructed in an area of shallow bedrock. Given that bedrock is at a shallow depth, the overburden (layer of soil and rock above the bedrock) will be removed and the structure will be founded on mass reinforced concrete over its footprint (see Chapter 5: Construction & Commissioning). The sensitivity of this is therefore considered low (see Table 13.23).

13.4.5.3.5 Wind

248. Given the underground nature of the BPT, the sensitivity is low with respect to wind as it is naturally protected from high winds. In addition, the electricity connection will be buried via two underground cable ducts laid along the access road between the connection with an existing electricity overhead line to the control building within the BPT site. For the above ground control building, while the design is not considered to be susceptible to wind due to its low height (7.2m high) and steel framed construction, the appropriate wind loadings for RCP4.5 and RCP8.5 in 2100 will be calculated during detailed design in line with the relevant structure requirements with consideration for more extreme wind loadings which may occur in future due to climate change. The sensitivity of the BPT to wind is therefore considered low (see Table 13.23).

13.4.5.3.6 Fog

249. Given the nature of the BPT there is no significant risk from fog. Therefore, the sensitivity of the BPT to fog is low (see Table 13.23).

13.4.5.3.7 Lightning and Hail

250. Given the underground nature of the BPT, the sensitivity is low with respect to lightning and hail as it is naturally protected. Mechanical and electrical components, including those associated with the control building could be subject to lightning strike. This has been considered within the design with a UPS with surge protection included which means the sensitivity of the BPT is maintained at a low rating (see Table 13.23).

13.4.5.3.8 Coastal Erosion

251. The BPT is not in close proximity to coastal areas, therefore this hazard has been scoped out.

13.4.5.3.9 Landslide

252. A programme of ground investigations (see Appendices A10.1 and A10.2) has been undertaken to understand ground conditions and to design the infrastructure and construction methods accordingly. The detailed design will be undertaken to technical standards and design checks will be in place at specific points in the programme to check that the standards are met. Landslide susceptibility mapping from GSI (GSI 2024) also indicates a low risk and no history of landslides in proximity to the BPT. The BPT is therefore considered to have a low sensitivity to landslides (see Table 13.23).

Table 13.23: BPT Sensitivity to Climate Hazards

Sensitive Receptors (Project Assets)	Sensitivity to Climate Hazards								
	Flooding (Coastal, Pluvial or Fluvial)	Extreme Heat	Extreme Cold	Drought	Wind	Fog	Lightning & Hail	Coastal Erosion	Landslide
Drainage	1	1	1	1	1	1	1	N/A	1
Access roads	1	1	1	1	1	1	1	N/A	1
Buildings	1	1	1	1	1	1	1	N/A	1
Utilities (including grid connection)	1	1	1	1	1	1	1	N/A	1
Mechanical/ electrical components	1	1	1	1	1	1	1	N/A	1

13.4.5.4 Booster Pumping Station (BPS)

13.4.5.4.1 Flooding (Coastal, Pluvial or Fluvial)

253. For the same reasons discussed for the pipeline in Section 13.4.5.1.1, the BPS will not be at risk from coastal and estuarine flooding.

254. With respect to fluvial flooding, the BPS is located adjacent to a tributary of the River Camcor. There is no historic record of flooding at the BPS site. Flood modelling of the tributary of the River Camcor was carried out as part of the National Preliminary Flood Risk Assessment (OPW 2012). The fluvial flood modelling shows the site is located in Flood Zone C – Low risk of flooding. The risk of fluvial flooding to the BPS site is therefore considered to be low (see Appendix A9.4).

255. The BPS site ground levels fall from north-west to south-east towards the tributary of the River Camcor. There are few localised low spots identified which cause ponding of water and pluvial flooding. The BPS site paved areas will be designed to incorporate SuDS principles to limit discharges from the site to the equivalent greenfield site flow rate. Surface water runoff will be conveyed via an underground drainage system to an attenuation pond, located at the front of the site. The volume of the attenuation basin has been designed to accommodate flows from a 1 in 100-year storm event plus an uplift in rainfall for climate change. Stormwater from the attenuation basin will be discharged via an underground pipe to the unnamed tributary of the Camcor River, approximately 200m east of the BPS site. This is described in more detail in Appendix A4.1 (Operational Strategy). The risk of surface water flooding to the BPS site is therefore considered to be low (see Appendix A9.4).

256. The FRA (Appendix A9.4) concluded that there will be no significant change to flood risk as a result of climate change. This is because the Proposed Project works have been shown to be at a low risk of flooding and this will not change substantively as a consequence of climate change. Therefore, the overall sensitivity of the BPS to flood risk is considered low (see Table 13.24).

257. Flooding has the potential to cause settlement of soils around the BPS and associated infrastructure, in particular if following periods of drought (see Section 13.4.5.4.4 on drought).

13.4.5.4.2 Extreme Heat

258. The BPS has some sensitivity with respect to extreme heat. Mechanical and electrical equipment at the BPS will be chosen to protect from overheating during more frequent 'summer'[6] or 'hot'[7] days in future climate change scenarios. The required electricity connection will be buried between the connection with an existing electricity overhead line and the new 38 kV substation that will be within the BPS site, which will provide protection from heat. At detailed design stage the materials used in the BPS will be considered so that they are chosen to be high quality, durable and hard-wearing and chosen to withstand increased variations in temperature in the future as a result of climate change. This will include electrical/mechanical equipment. The design will also include appropriate ventilation.

259. The risk to external transformers and the potential for electrical failure during extreme heat events has been considered. Transformers and all substations and equipment must be designed to ESB specifications. Specification document 18133 - General Specification for Contestably Built HV Substations (ESB 2021) includes details on the design requirements for substations and their associated equipment. These specification documents are reviewed by the ESB every five years which allows the ESB to take future changes in climate and weather into account in their design requirements. As part of the design requirements transformers are fitted with cooling fins or cooling blocks to prevent over-heating. As the transformers will be designed to the required ESB specifications which will take account of changes in climate in future years as part of the review process, transformers are considered of low sensitivity to extreme heat (see Table 13.24).

13.4.5.4.3 Extreme Cold

260. The sensitivity of the BPS to extreme cold is considered low. At the detailed design stage, materials will be chosen (including, for example, insulation) to build resilience to cold temperatures (see Table 13.24).

13.4.5.4.4 Drought

261. Drought has the potential to cause settlement of soils around the BPS, in particular if it is followed by periods of heavy rain or flooding. The detailed design will incorporate settlement calculations and piling will be introduced to support structures where this is considered necessary. The sensitivity of this is considered low due to consideration of settlement within the design of the BPS and its associated infrastructure (see Table 13.24).

13.4.5.4.5 Wind

262. The electricity connection will be buried alongside the access road to the BPS between the connection with an existing electricity overhead line and the new 38 kV substation that will be within the BPS site. The BPS design is not considered to be particularly susceptible to wind due to its low height (7.6m high) and steel framed construction. The appropriate wind loadings for RCP4.5 and RCP8.5 in 2100 will be calculated during detailed design in line with the relevant structure requirements with consideration for more extreme wind loadings which may occur in future due to climate change. The sensitivity of the BPS to wind is therefore considered low (see Table 13.24).

13.4.5.4.6 Fog

263. Given the nature of the BPS, there is no significant risk from fog. Therefore, the sensitivity of the BPS to fog is low (see Table 13.24).

[6] Met Éireann describes a summer day as a day above 25°C

[7] Met Éireann describes a hot day as a day above 30°C

13.4.5.4.7 Lightning and Hail

264. Mechanical and electrical components, including those associated with the control building, could be subject to lightning strike. This has been considered within the design with a UPS with surge protection included which means that the sensitivity of the BPS is reduced from a medium to a low rating (see Table 13.24).

13.4.5.4.8 Coastal Erosion

265. The BPS is not in close proximity to coastal areas, therefore this hazard has been scoped out.

13.4.5.4.9 Landslide

266. A programme of ground investigations (see Appendices A10.1 and A10.2) has been undertaken to understand ground conditions and to design the infrastructure and construction methods accordingly. The detailed design will be undertaken to technical standards and design checks will be in place at specific points in the programme to check that the standards are met. Landslide susceptibility mapping from GSI (GSI 2024) also indicates a low risk and no history of landslides in proximity to the BPS. The BPS is therefore considered to have a low sensitivity to landslides (see Table 13.24).

Table 13.24: BPS Sensitivity to Climate Hazards

Sensitive Receptors (Project Assets)	Sensitivity to Climate Hazards								
	Flooding (Coastal, Pluvial or Fluvial)	Extreme Heat	Extreme Cold	Drought	Wind	Fog	Lightning & Hail	Coastal Erosion	Landslide
Drainage	1	1	1	1	1	1	1	N/A	1
Access roads	1	1	1	1	1	1	1	N/A	1
Buildings	1	1	1	1	1	1	1	N/A	1
Utilities (including grid connection)	1	1	1	1	1	1	1	N/A	1
Mechanical/ electrical components	1	1	1	1	1	1	1	N/A	1

13.4.5.5 Raw Water Intake and Pumping Station Site (RWI&PS)

13.4.5.5.1 Flooding (Coastal, Pluvial or Fluvial)

267. For the same reasons discussed for the pipeline in Section 13.4.5.1.1, the RWI&PS will not be at risk from coastal and estuarine flooding.

268. With respect to fluvial flooding, the effects of future climate change on water levels in Parteen Basin were assessed as part of the Shannon Catchment Flood Risk Assessment and Management Study (OPW 2018). While future climate change would result in an increase in river flows, this will not give rise to an increase in the risk of fluvial flooding to the RWI&PS, given the effect of the Ardnacrusha Generating Station in controlling water levels (see Section 4.2 of the FRA (Appendix A9.4)). In addition, all elements of the RWI&PS that are adjacent to Parteen Basin are designed to be water compatible and so will not be impacted by flooding, and most of the RWI&PS, including all flood vulnerable infrastructure (e.g. the electricity substation and power distribution building), will be located on the raised ground which covers

much of the site so that operation of the abstraction is not affected by flooding. The risk of fluvial flooding to the RWI&PS site is therefore considered to be low (see Appendix A9.4).

269. The RWI&PS site slopes in north–south and east–west directions which will allow rainfall falling on the site to runoff, as there are no locations where deep accumulations of surface water could occur. Rainfall runoff from roads and impermeable areas will be conveyed via a drainage system to a stormwater attenuation tank. A flow control device on the outlet of the tank will limit discharge stormwater flow leaving the tank to the greenfield runoff from the entire RWI&PS site. Flow from the attenuation tank will be conveyed by a drain along the RWI&PS access road to a local watercourse. On the RWI&PS site itself, rainwater from the roofs of the Raw Water Pumping Station Building and the two Microfiltration Buildings will be harvested and taken into the Intake Chamber and the RWRMs Scour Tank respectively. This is described in more detail in Appendix A4.1 (Operational Strategy). The risk of surface water flooding to the RWI&PS site is therefore considered to be low (see Appendix A9.4).

270. The existing bed of Parteen Basin will be re-profiled at the intake site, and flexible concrete revetment mats or panels will be placed on that area and covered with gravel and native bed material to provide slope stability and control river erosion.

271. The FRA completed as part of the Proposed Project (Appendix A9.4) concluded that there will be no significant change to flood risk as a result of climate change. This is because the Proposed Project works have been shown to be at a low risk of flooding as per the findings of the FRA completed as part of the Proposed Project (Appendix A9.4) and this will not change substantively as a consequence of climate change. Therefore, the overall sensitivity of the RWI&PS to flood risk is considered low (see Table 13.25).

272. Flooding has the potential to cause settlement of soils around the RWI&PS and associated infrastructure, in particular if it is paired with periods of drought (see Section 13.4.5.5.4 on drought).

13.4.5.5.2 Extreme Heat

273. The RWI&PS has some sensitivity with respect to extreme heat. Mechanical and electrical equipment will be chosen to protect from overheating during more frequent ‘summer’ or ‘hot’ days in future climate change scenarios. The required electricity connection will be buried between the existing electricity substation and the new electricity substation within the RWI&PS site, which will provide protection from heat. At detailed design stage the materials used in the RWI&PS will be considered so that they are chosen to be high quality, durable and hard-wearing and chosen to withstand increased variations in temperature in the future as a result of climate change. This will include electrical/mechanical equipment. The design will also include appropriate ventilation.

274. The risk to external transformers and the potential for electrical failure during extreme heat events has been considered. As the transformers will be designed to the required ESB specifications which will take account of changes in climate in future years as part of the review process, transformers are considered of low sensitivity to extreme heat (see Table 13.25).

13.4.5.5.3 Extreme Cold

275. The sensitivity of the RWI&PS to extreme cold is considered low. At the detailed design stage, materials will be chosen (including, for example, insulation) to build resilience to cold temperatures (see Table 13.25).

13.4.5.5.4 Drought

276. Drought has the potential to cause settlement of soils around the RWI&PS, in particular if it is followed by periods of heavy rain or flooding. A ground movement impact assessment of the proposed RWI&PS structures has been conducted by the design team. This assessment concluded that the settlement around the structures will be negligible and insignificant. The sensitivity of this is considered low due to consideration of settlement within the design of the RWI&PS and its associated infrastructure (see Table 13.25).

277. The vulnerability of future extraction due to climate related hazards, including drought, is considered separately in Section 13.4.5.9.

13.4.5.5.5 Wind

278. The required electricity connection will be buried from the existing electricity substation to the new electricity substation within the RWI&PS site, which reduces the potential for wind related impacts. For above ground elements such as the buildings, while the buildings are not considered to be susceptible to wind due to their relatively low height (tallest building will be 10.9m high) and their concrete and steel frame construction, the appropriate wind loadings for RCP4.5 and RCP8.5 in 2100 will be calculated during detailed design, in line with the relevant structure requirements for more extreme wind loadings which may occur in future due to climate change.

279. The telecommunications mast on site will be vulnerable to high wind speeds. However, the mast will be anchored against appropriate wind loadings for RCP4.5 and RCP8.5 in 2100 that will be calculated during the detailed design. The sensitivity of the RWI&PS to wind is therefore considered low (see Table 13.25).

13.4.5.5.6 Fog

280. Given the nature of the RWI&PS, there is no significant risk from fog. Therefore, the sensitivity of the RWI&PS to fog is low (see Table 13.25).

13.4.5.5.7 Lightning and Hail

281. The RWI&PS will have a communications mast that could be vulnerable to lightning strike. Power distribution to pumps and other mechanical and electrical components could also be susceptible to lightning strike. This has been considered within the design with a UPS with surge protection included which means the sensitivity of the RWI&PS is maintained at a low rating (see Table 13.25).

13.4.5.5.8 Coastal Erosion

282. The RWI&PS is not in close proximity to coastal areas, therefore this hazard has been scoped out.

13.4.5.5.9 Landslide

283. Due to the location of the RWI&PS, situated on the bank of the eastern shore of Parteen Basin, piles will be required to stabilise the foundations and protect the soil stability. The RWI&PS will be located adjacent to the Fort Henry Embankment, which forms part of Parteen Basin impoundment. During site preparation works, a buffer zone from the embankment will be established where no temporary or permanent works will be allowed. As part of pre-commencement activities in advance of main construction, piezometers will be installed to monitor groundwater before and during construction (see Chapter 5: Construction & Commissioning).

284. A programme of ground investigations (see Appendices A10.1 and A10.2) has been undertaken to understand ground conditions and to design the infrastructure and construction methods accordingly. The detailed design will be undertaken to technical standards and design checks will be in place at specific points in the programme to check that the standards are met. Landslide susceptibility mapping from GSI (GSI 2024) also indicates a low risk and no history of landslides in proximity to the RWI&PS. The RWI&PS is therefore considered to have a low sensitivity to landslides (see Table 13.25).

Table 13.25: RWI&PS Sensitivity to Climate Hazards

Sensitive Receptors (Project Assets)	Sensitivity to Climate Hazards								
	Flooding (Coastal, Pluvial or Fluvial)	Extreme Heat	Extreme Cold	Drought	Wind	Fog	Lightning & Hail	Coastal Erosion	Landslide
Drainage	1	1	1	1	1	1	1	N/A	1
Access roads	1	1	1	1	1	1	1	N/A	1
Buildings	1	1	1	1	1	1	1	N/A	1
Utilities (including grid connection)	1	1	1	1	1	1	1	N/A	1
Mechanical/ electrical components	1	1	1	1	1	1	1	N/A	1

13.4.5.6 Water Treatment Plan (WTP)

13.4.5.6.1 Flooding (Coastal, Pluvial or Fluvial)

285. For the same reasons discussed for the pipeline in Section 13.4.5.1.1, the WTP will not be at risk from coastal and estuarine flooding.

286. With respect to fluvial flooding, the FRA (Appendix A9.4) identified a potential flood risk due to the proposed WTP access road being located in the floodplain of the Kilmastulla River. The access road will be constructed on an embankment so that it is higher than modelled flood levels of the Kilmastulla River, and the design also includes flood relief culverts along its length where it crosses the floodplain and a clear span bridge over the Roran watercourse (see Figure 4.64) so that there is no obstruction to water flowing across the floodplain. A detailed assessment of this flood risk concluded that there will be a low risk of fluvial flooding (see Section 7 of Appendix A9.4).

287. The FRA identifies one area within the main WTP site to be at risk of pluvial flooding due to a localised depression in which surface water runoff could accumulate during large storm events. Construction of the WTP site will remove this depression. The drainage system includes rain water harvesting on building roofs and tanks. Roof and tank cover runoff will be collected in a dedicated, separate pipe network which will outfall into the commissioning lagoons and will ultimately be pumped to the Raw Water Balancing Tanks. General site runoff from internal roads will be taken to an attenuation pond in the south-eastern corner of the WTP site. Both the commissioning lagoons and attenuation pond have been appropriately sized for the probability of extreme rainfall events. This is described in more detail in Appendix A4.1 (Operational Strategy). The risk of surface water flooding to the WTP site is therefore considered to be low (see Appendix A9.4).

288. The FRA (Appendix A9.4) concluded that there will be no significant change to flood risk as a result of climate change. Therefore, the overall sensitivity of the WTP to flood risk is considered low (see Table 13.26).

289. Flooding has the potential to cause settlement of soils around the WTP and associated infrastructure, in particular if following periods of drought (see Section 13.4.5.6.4 on drought).

13.4.5.6.2 Extreme Heat

290. The WTP has some sensitivity with respect to extreme heat. Mechanical and electrical equipment will be chosen to protect from overheating during more frequent 'summer' or 'hot' days in future climate change scenarios. The required electricity connection will be buried between the existing electricity substation and the new electricity substation within the WTP site, which will provide protection from heat. At detailed design stage the materials used in the WTP will be considered so that they are chosen to be high quality, durable and hard-wearing and chosen to withstand increased variations in temperature in the future as a result of climate change. This will include electrical/mechanical equipment. The design will also include appropriate ventilation.

291. The risk to external transformers and the potential for electrical failure during extreme heat events has been considered. As the transformers will be designed to the required ESB specifications which will take account of changes in climate in future years as part of the review process, transformers are considered of low sensitivity to extreme heat (see Table 13.26).

13.4.5.6.3 Extreme Cold

292. The sensitivity of the WTP to extreme cold is considered low. At the detailed design stage, materials will be chosen (including, for example, insulation) to build resilience to cold temperatures (see Table 13.26).

13.4.5.6.4 Drought

293. Drought has the potential to cause settlement of soils around the WTP, in particular if it is followed by periods of heavy rain or flooding. The detailed design will incorporate settlement calculations and piling will be introduced to support structures where this is considered necessary. The sensitivity of this is considered low due to consideration of settlement within the design of the WTP and its associated infrastructure (see Table 13.26).

13.4.5.6.5 Wind

294. The required electricity connection will be buried from the existing Birdhill electricity substation to the new electricity substation within the WTP site, which reduces the potential for wind related impacts. For above ground elements such as the buildings, while the buildings are not considered to be susceptible to wind due to their relatively low height (tallest building is 13.5m high) and their concrete and steel frame construction, the appropriate wind loadings for RCP4.5 and RCP8.5 in 2100 will be calculated during detailed design, in line with the relevant structure requirements for more extreme wind loadings which may occur in future due to climate change.

295. The telecommunications mast on site will be vulnerable to high wind speeds. However, the mast will be anchored against appropriate wind loadings for RCP4.5 and RCP8.5 in 2100 that will be calculated during the detailed design. The sensitivity of the WTP to wind is therefore considered low (see Table 13.26).

13.4.5.6.6 Fog

296. Given the nature of the WTP there is no significant risk from fog. Therefore, the sensitivity of the WTP to fog is low (see Table 13.26).

13.4.5.6.7 Lightning and Hail

297. The WTP will have a communications mast that could be vulnerable to lightning strike. Power distribution to pumps and other mechanical and electrical components could also be susceptible to lightning strike. However surge protection has been included in the assessment as it is an industry standard which means the sensitivity of the WTP is maintained at a low rating (see Table 13.26).

13.4.5.6.8 Coastal Erosion

298. The WTP is not in close proximity to coastal areas, therefore this hazard has been scoped out.

13.4.5.6.9 Landslide

299. A programme of ground investigations (see Appendices A10.1 and A10.2) has been undertaken to understand ground conditions and to design the infrastructure and construction methods accordingly. The detailed design will be undertaken to technical standards and design checks will be in place at specific points in the programme to check that the standards are met. Landslide susceptibility mapping from GSI (GSI 2024) also indicates a low risk and no history of landslides in proximity to the WTP. The WTP is therefore considered to have a low sensitivity to landslides (see Table 13.26).

Table 13.26: WTP Sensitivity to Climate Hazards

Sensitive Receptors (Project Assets)	Sensitivity to Climate Hazards								
	Flooding (Coastal, Pluvial or Fluvial)	Extreme Heat	Extreme Cold	Drought	Wind	Fog	Lightning & Hail	Coastal Erosion	Landslide
Drainage	1	1	1	1	1	1	1	N/A	1
Access roads	1	1	1	1	1	1	1	N/A	1
Buildings	1	1	1	1	1	1	1	N/A	1
Utilities (including grid connection)	1	1	1	1	1	1	1	N/A	1
Mechanical/ electrical components	1	1	1	1	1	1	1	N/A	1

13.4.5.7 Flow Control Valve (FCV)

13.4.5.7.1 Flooding (Coastal, Pluvial or Fluvial)

300. For the same reasons discussed for the pipeline in Section 13.4.5.1.1, the FCV will not be at risk from coastal and estuarine flooding.

301. In relation to fluvial flooding the FRA (see Appendix A9.4) notes that the FCV is located adjacent to a tributary of the River Liffey; however, there is no historic record of flood events at the FCV site. The FCV is located in Flood Zone C which is of low risk to flooding.

302. The FCV is not at risk from pluvial flooding according to the conclusion of the FRA (Appendix A9.4). Drainage from the FCV site paved areas has been designed to incorporate SuDS principles to limit discharges from the site to the equivalent greenfield site flow rate. This would include provision of filter drains to act as attenuation/infiltration devices and would disperse surface and stormwater in a controlled manner to the soakaway located to the north-west of the site.

303. The FRA (Appendix A9.4) concluded that there will be no significant change to flood risk as a result of climate change. This is because the Proposed Project works have been shown to be at a low risk of flooding and this will not change substantively as a consequence of climate change. Therefore, the overall sensitivity of the FCV to flood risk is considered low (see Table 13.27).

13.4.5.7.2 Extreme Heat

304. Given the underground nature of the FCV, the sensitivity is low with respect to extreme heat as it is naturally protected from temperature fluctuations. The design is considered to have a low sensitivity to extreme heat (see Table 13.27).

13.4.5.7.3 Extreme Cold

305. The sensitivity of the FCV to extreme temperatures, including cold, is considered low (see Table 13.27) due to the underground nature of the infrastructure which naturally protects it from extreme changes in temperature. At the detailed design stage, materials will be chosen (including, for example, insulation) to build resilience to cold temperatures.

13.4.5.7.4 Drought

306. Drought has the potential to cause settlement of soils, in particular if it is followed by periods of heavy rain or flooding. However, the FCV will be constructed underground, and the base and walls of the FCV complex would be constructed in reinforced concrete and capped with a precast concrete lid (see Chapter 5: Construction & Commissioning). The sensitivity of this is therefore considered low (see Table 13.27).

13.4.5.7.5 Wind

307. Given the underground nature of the FCV, the sensitivity is low with respect to wind as it is naturally protected from high winds (see Table 13.27).

13.4.5.7.6 Fog

308. Given the nature of the FCV there is no significant risk from fog. Therefore, the sensitivity of the FCV to fog is low (see Table 13.27).

13.4.5.7.7 Lightning and Hail

309. Given the underground nature of the FCV, the sensitivity is low with respect to lightning and hail as it is naturally protected. Mechanical and electrical components, including those associated with the control kiosk are unlikely to be at risk of lightning strike. The sensitivity of the FCV to lightning and hail is low (see Table 13.27).

13.4.5.7.8 Coastal Erosion

310. The FCV is not in close proximity to coastal areas, therefore this hazard has been scoped out.

13.4.5.7.9 Landslide

311. A programme of ground investigations (see Appendices A10.1 and A10.2) has been undertaken to understand ground conditions and to design the infrastructure and construction methods accordingly. The detailed design will be undertaken to technical standards and design checks will be in place at specific points in the programme to check that the standards are met. Landslide susceptibility mapping from GSI (GSI 2024) also indicates a low risk and no history of landslides in proximity to the FCV. The FCV is therefore considered to have a low sensitivity to landslides (see Table 13.27).

Table 13.27: FCV Sensitivity to Climate Hazards

Sensitive Receptors (Project Assets)	Sensitivity to Climate Hazards								
	Flooding (Coastal, Pluvial or Fluvial)	Extreme Heat	Extreme Cold	Drought	Wind	Fog	Lightning & Hail	Coastal Erosion	Landslide
Drainage	1	1	1	1	1	1	1	N/A	1
Access roads	1	1	1	1	1	1	1	N/A	1
Buildings	1	1	1	1	1	1	1	N/A	1
Utilities (including grid connection)	1	1	1	1	1	1	1	N/A	1
Mechanical/ electrical components	1	1	1	1	1	1	1	N/A	1

13.4.5.8 CCRA Significance of Effects

312. The sensitivities of the Proposed Project considered in Section 13.4.5.1 to 13.4.5.7 have been combined with exposure of the infrastructure to future climate change (Section 13.3.2.2) to assess the potential risk to the Proposed Project's assets. The risk is shown in Table 13.28.

Table 13.28: Climate Change Vulnerability Assessment

Sensitivity							
Climate Hazard	**Pipeline**	**TPR**	**BPS**	**BPT**	**RWI&PS**	**WTP**	**FCV**
Flooding (coastal, pluvial or fluvial)	1	1	1	1	1	1	1
Extreme heat	1	1	1	1	1	1	1
Extreme cold	1	1	1	1	1	1	1
Drought	1	1	1	1	1	1	1
Wind	1	1	1	1	1	1	1
Fog	1	1	1	1	1	1	1
Lightning & hail	1	1	1	1	1	1	1
Coastal erosion	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Landslide	0	1	1	1	1	1	1
Future Year Exposure (RCP4.5 / RCP8.5)							
Climate Hazard	**Pipeline**	**TPR**	**BPS**	**BPT**	**RWI**	**WTP**	**FCV**
Flooding (coastal, pluvial or fluvial)	1	1	1	1	1	1	1
Extreme heat	2	2	2	2	2	2	2
Extreme cold	2	2	2	2	2	2	2
Drought	2	2	2	2	2	2	2
Wind	2	2	2	2	2	2	2
Fog	1	1	1	1	1	1	1
Lightning & hail	1	1	1	1	1	1	1
Coastal erosion	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Landslide	1	1	1	1	1	1	1

Vulnerability = Sensitivity x Exposure							
Climate Hazard	**Pipeline**	**TPR**	**BPS**	**BPT**	**RWI**	**WTP**	**FCV**
Flooding (coastal, pluvial or fluvial)	1	1	1	1	1	1	1
Extreme heat	2	2	2	2	2	2	2
Extreme cold	2	2	2	2	2	2	2
Drought	2	2	2	2	2	2	2
Wind	2	2	2	2	2	2	2
Fog	1	1	1	1	1	1	1
Lightning & hail	1	1	1	1	1	1	1
Coastal erosion	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Landslide	1	1	1	1	1	1	1
Vulnerability	**2 (Low)**	**2 (Low)**	**2 (Low)**	**2 (Low)**	**2 (Low)**	**2 (Low)**	**2 (Low)**

313. The Proposed Project includes design measures to reduce the impact of future climate hazards. This includes, for example, avoiding areas of floodplain, or where this has not been feasible (in the case of the WTP access road), including design measures to mitigate the risk. There are elements of the design that will be considered at detailed design, such as choice of building materials and calculating appropriate wind loads. Considering the current design and future detailed design considerations, the vulnerability of the Proposed Project during the Operational Phase to climate hazards is assessed to be low. All elements will be considered in greater detail during detailed design to reduce the vulnerability. Mechanical and electrical elements generally have a shorter lifespan than the main infrastructure works (~15 years) and therefore will require updating periodically. When upgrades are being completed consideration for up-to-date climate change predictions will be made to ensure that elements are appropriate and resilient to future climate change hazards.

314. Given the evolving nature of the global understanding of climate change, consideration of climate adaption is an iterative process. The Proposed Project has designed in resilience at an early stage and will continue designing in resilience during detailed design and throughout construction.

13.4.5.9 Risk to Future Abstraction

315. One of the most significant potential vulnerabilities to the Proposed Project is the risk that future abstraction from Parteen Basin is not viable at the proposed rates due to droughts or other climate-related hazards. The potential impact of increased dry periods due to climate change has been assessed in Appendix A9.1 (Abstraction Assessment) which describes the potential impacts of the abstraction on surface water receptors, including Lough Derg, Parteen Basin, the River Shannon and the various tributaries. The summary of the assessment is provided in Chapter 9 (Water). Section 6 and Annex A (Hydrological Modelling Report) of Appendix A9.1 detail the approach taken for considering how abstraction may be affected by a RCP8.5 Upper 75th allowance scenario for climate change by 2080.

316. The results of the abstraction assessment show that the abstraction is not considered likely to result in a significant effect on any of the surface water receptors, including during a drought and/or as a result of the RCP8.5 Upper 75th allowance climate change scenario. Climate change simulations for the 2080s epoch indicate that simulated lake levels would remain within the Normal Operating Band[8] (NOB) when

[8] The water levels on Lough Derg are managed within a Normal Operating Band and ESB also manage water levels in Parteen Basin within an upper and lower level. At present, the normal water level on Lough Derg and on Parteen Basin is managed to be between the following limits: Parteen Basin - Upper level 30.86mOD Malin Head (33.56mAOD Poolbeg) and Lower level: 30.00mAOD Malin Head (32.70mAOD Poolbeg); Lough Derg - Upper level 30.86mAOD Malin Head (33.56mOD Poolbeg) and Lower level: 30.40mAOD Malin Head (33.10mAOD Poolbeg). Parteen Weir acts as the downstream control structure for water levels in the system. Water levels in Parteen Basin are maintained within the upper and lower levels at all times. During low flow conditions, the lower water level at Parteen Basin (30.0mAOD Malin), must be maintained for dam safety purposes and in doing this ESB ensures that water levels in Lough Derg are within the Normal Operating Band as the waterbodies broadly operate as a combined system, in these conditions.

including the Proposed Project abstraction. The simulated lake levels with the Proposed Project only drop close to the bottom of the NOB once within the 52-year model simulation period – during the modelled 2018 drought event[9]. During the modelled 2018 drought event, with the inclusion of the RCP8.5 Upper 75th allowance climate change scenario, the difference in simulated lake level between the Proposed Project 300Mld scenario and baseline (without Proposed Project) at the lowest point of the drawdown is 168mm. Therefore, even when applying a precautionary approach to consider the 2080s climate change projections to the most impactful drought event (2018) in the 52-year model simulation period, the additional simulated lake level drawdown caused by the inclusion of the Proposed Project is still fitting within the range of ESB normal observed lake level fluctuations, resulting in levels still within the NOB.

13.5 Mitigation and Monitoring Measures

317. This section sets out the measures that have been identified to reduce the potential effects reported in Section 13.4. A schedule of mitigation measures has been formulated for the Construction and Operational Phases of the Proposed Project. The final design will follow the public body requirements under the Green Public Procurement Strategy, including recommendations in Reducing embodied carbon in cement and concrete through public procurement in Ireland (Department of Enterprise, Trade and Employment 2024), and Action Plan 2024-2027 (DECC 2024a), CAP25 and subsequent updates. Where updates to these documents occur, they will be integrated into the mitigation measures, where practicable.

318. The ISEP Greenhouse Gas Management Hierarchy (ISEP 2020b) and TII mitigation hierarchy (see Figure 3.1 of PE-ENV-01105 (TII 2022b)) have been considered when reviewing the strategy for mitigating impacts. Where feasible, the aim was to design out and eliminate potential impacts completely (see Section 13.5.1 for embedded mitigation). Where this was not practicable, mitigation measures were considered to reduce effects. Finally, if impacts cannot be eliminated by design or reduced/substituted, then compensation was considered. This included the use of carbon offsets and replanting of trees. These specific mitigation measures are described in Section 13.5.2.

319. Carbon reduction is an iterative process that will continue throughout the detailed design and construction stages. Uisce Éireann aims to further reduce embodied carbon during these future stages, achieving alignment with PAS 2080 (BSI 2023), which is a global standard for managing infrastructure carbon, through lean design and modern construction methods.

13.5.1 Embedded Mitigation

320. The environment team has worked in close collaboration with the infrastructure design team to avoid or reduce environmental impacts through the Proposed Project design. This is referred to as embedded (or design) mitigation. Embedded mitigation is inherent to the Proposed Project design, and forms part of the project description and construction methodology described in Chapters 4 (Proposed Project Description) and 5 (Construction & Commissioning) of the EIAR. As such, embedded mitigation is considered in the assessment of pre-mitigation effects in Section 13.4. Chapter 3 (Consideration of Reasonable Alternatives) of the EIAR details the reasonable alternatives that have been considered throughout the design development of the Proposed Project, including the environmental factors which have influenced the decision making.

321. For the climate assessment, embedded mitigation includes measures incorporated into the planning stage design with the goal of reducing the embodied carbon associated with the Construction Phase of the Proposed Project as set out in Table 13.29. These measures reduce embodied carbon by reducing the amount of materials required for the Proposed Project and in turn also reduce construction traffic, which reduces construction traffic emissions. Embedded mitigation also includes the consideration of energy efficiency and operational measures to reduce carbon emissions during the Operational Phase. Such measures include, for example, pumps that will operate at variable rates to increase the efficiency of

[9] The 2018 drought shows the biggest impact of the Proposed Project scenarios on the simulated lake levels – see Appendix A9.1, Annex A (Hydrological Modelling Report) for further detail.

operation and hence reduce energy use and pumps which will be phased into operation as demand increases. Measures to reduce operational energy consumption are included in Table 13.29.

322. Embedded mitigation also includes measures that have been incorporated into the design to improve resilience to future climate changes. These design considerations have been discussed in Section 13.4.5 and are not repeated in this section.

Table 13.29: Embedded Mitigation Measures Summary

Infrastructure Element	Activity	Description
RWRMs and Treated Water Pipeline	Reduce the length of tunnels	Tunnels have been reduced as far as practicable at this stage. Tunnelled sections are needed for major constraints such as river crossings, major road crossings and canal/rail crossings, and in certain circumstances, where there are constraints from ground conditions or topography. There are 'potential' tunnels allowed for powerline crossings which may or may not be required and this will be confirmed during detailed design. There may also be an opportunity to optimise based on ground investigations. This will need to be considered at detailed design and will be included in the procurement specification.
RWRMs and Treated Water Pipeline	Reduce friction in pipeline	Steel has lower friction that other options such as concrete and so provides an efficient coating which reduces energy loss and the energy needed to pump water through the pipeline.
RWRMs and Treated Water Pipeline	Increase the operational life of the assets	Steel is expected to have the longest design life compared with other materials which were considered as options for the pipeline material.
RWRMs and Treated Water Pipeline	Increase refurbishment over replacement	Use of cathodic protection to increase the life of the pipeline because the protection allows for identification and rectification of any issues in the integrity of the pipe as early as feasible.
Treated Water Pipeline	Optimise alignment for Parteen abstraction	Alignment was reduced as far as reasonably practicable taking account of other factors including elevation and physical constraints (roads/canal/settlement) and known ground conditions, namely peat.
Treated Water Pipeline	Single pipeline	The design is for a single steel pipeline. There had been an option for a dual pipe design which would have had an estimated 30% to 50% cost and carbon increase compared with the single pipe option that was chosen.
Treated Water Pipeline	Reduce size of pipeline	The size (diameter) of the pipeline reduced down from 2m to 1.6m based on optimising the peak supply and pumping requirements. This size is also consistent throughout the length of the pipeline (i.e. no variable sizing). This reduced the amount of steel required for the pipeline and also the excavation required.
Treated Water Pipeline	Reduce the thickness of the steel pipeline	The thickness of the pipeline has been reduced as far as reasonably practicable at this stage subject to technical requirements – 12.5mm thickness is included in the design.
Treated Water Pipeline	Avoid thrust blocks	Thrust blocks (large concrete structures designed to counteract the forces generated when fluid changes direction) are not within the design, as they are not required for steel pipelines with welded joints (as with the Proposed Project).
Treated Water Pipeline	Reduce operational energy requirements	Use of gravity feed pipeline for majority of the route with pumping only required for periods in peak demand.
Valves	Reduce size of the valves	The valves have been sized according to the expected water supply required.
Valves	Reduce the number of valves	The design of the pipeline has been optimised to reduce the number of valves as far as reasonably practicable. This included reducing the number of air valves along the pipeline.
Valves	Increase refurbishment over replacement	Valves have been designed to allow for isolation, replacement and refurbishment.
Other	Reduce number of buildings	The Proposed Project has been designed with no above-ground buildings at the Flow Control Valve. Structures at Line Valves will be limited to a kiosk for the valve actuators and power connections.
RWI&PS, WTP, BPS	Use of variable power drives	The pumps will operate at variable rates to increase the efficiency of operation and hence reduce energy use.

Infrastructure Element	Activity	Description
RWI&PS, WTP, BPS	Phased increase in pumping	Pumps will be brought online at later stages to meet required demand to reduce power demand.
RWI&PS, WTP	Reduce the number of pumps	The number of pumps has been reduced to the lowest number practicably required to provide a resilient system.
RWI&PS, WTP	Increase efficiency of pumps	Pumping power consumption has been calculated on the basis of 85% efficient pumps and 95% efficient motors at the RWI&PS and the HLPS.
RWI&PS, WTP, BPS	Increase efficiency of process/power requirements	The RWI&PS, WTP and BPS will operate in a duty/assist/stand-by arrangement to increase efficiency and reduce energy use.
RWI&PS	Active real time monitoring so only abstracting what is needed (ramp up and down)	Forecasting and monitoring will be used to predict the volume of water needed and avoid over-abstraction.
RWI&PS, WTP, BPS	Increase the operational life of the assets	Pump operation will be rotated so that the hours of operation result in the same level of wear and extend the operational life of the plant.
RWI&PS	Reduce size of buildings	The buildings have been sized based on the assumed spatial requirements. For example, the pumping station super structure has been reduced as far as reasonably practicable based on these requirements.
WTP	Increase efficiency of process/power requirements	The design aims to increase the efficiency of operation. For example, use of Clear Water Storage Tanks will enable the WTP to run continuously (and therefore, efficiently) even when the High Lift Pumps are not operating.
WTP	Reduce number buildings	The number and size of buildings at the WTP have been reduced as far as reasonably practicable, including: • Reducing the number of sludge buildings to two instead of four • Reducing the number of treatment modules to three instead of four • Merging the administration/control building and visitor centre into one building.
WTP	Recycling of water/ recovery to reduce wastewater	Following treatment and disinfection, washwater and other process water will be returned to the raw water balancing tanks for recirculation through the plant; lagoons in the WTP site will allow tanks to be drained down for maintenance and the water returned to the raw water balancing tanks. Rainwater from roofs of buildings will also drain to the lagoons, for recirculation through the plant.
BPS	Increase efficiency of pumps	Pumping power consumption has been calculated on the basis of 90% efficient pumps within the BPS design.
TPR	Reduce number of buildings/structures	A second 75Mld reservoir was removed through optimisation of the system.
WTP, BPT, BPS, FCV, TPR	Solar energy	Use of solar energy at these locations will reduce the energy demand from the grid.
Route-wide	Nature-based solutions	Nature-based solutions to be utilised in drainage design. This includes SuDS in drainage design (attenuation and infiltration ponds) and rainwater harvesting at the WTP.

13.5.2 Specific Mitigation and Monitoring Measures

323. Specific mitigation measures are proposed to prevent or reduce significant adverse effects. Where appropriate, consideration has been given to the appropriateness of monitoring measures, the purpose of which is to check that the mitigation measures required to prevent or reduce significant adverse effects are delivered and perform as intended, in accordance with the requirements of the EIA Directive.

324. Mitigation and monitoring measures for climate change are described below and are included in the Construction Environmental Management Plan which has been produced to support this EIAR (refer to Appendix A5.1). Mitigation included in the Traffic Management Plan (see Appendix A7.2) is also relevant to the climate assessment. In addition, should the Proposed Project be granted approval by An Coimisiún Pleanála, a PAS 2080 assessment will be completed, to further mitigate emissions through lean design and modern construction methods, during the detailed design.

13.5.2.1 Construction Phase Mitigation of the Impact of the Proposed Project on Climate

13.5.2.1.1 Embodied Carbon Mitigation Measures

325. Table 13.30 details specific mitigation measures which have been adopted to reduce embodied carbon. These measures are designed to align the Proposed Project with CAP25 and the national climate target of a trajectory to net zero by 2050 (and Uisce Éireann's own Net Zero Target by 2040). These measures are not considered within the pre-mitigation assessment of effects reported in Section 13.4. Where a mitigation measure is quantified the achieved carbon saving is set out in this section; other measures are considered qualitative, at this time, due to the saving being currently unknown, i.e. use of electric plant and equipment.

Table 13.30: Mitigation Measures Summary

Infrastructure Element	Activity	Description
Route-wide	Use of a low carbon concrete	Concrete containing Portland cement will be replaced, where feasible, with a low carbon concrete as per the CAP25. An example of a replacement material is 50% ground granulated blast furnace slag (GGBS) although other options also apply and, provided they have an embodied carbon that is as low, or lower, then they are suitable for the final design with respect to the carbon assessment. This exceeds the 30% minimum replacement required for public bodies.
Route-wide	Suppliers to meet their CAP targets	Uisce Éireann will only procure from suppliers in Ireland that meet the industry reduction requirements within the CAP25 for 10% reduction in embodied carbon by 2025 and 30% reduction in embodied carbon by 2030. Where materials are procured outside of Ireland, embodied carbon will be considered as a primary component as part of the tender process. Both the Public Sector Mandate and the Green Public Procurement Strategy will be followed.
Route-wide	Renewable Electrical Power Purchase	A Corporate Power Purchase Agreement (CPPA) will be in place to use electricity generated from renewables for 100% of operational electrical power.
Route-wide	Hydrotreated Vegetable Oil (HVO) replacing diesel	Sustainably sourced HVO will be used in construction plant and equipment as a 100% replacement of fossil fuels where available. HVO use is considered a stepping stone towards the use of electric construction plant as they become available in the market.
Construction Compounds	Phase out generators	Main Construction Compounds will be connected to the electrical grid, via a supplier that can demonstrate renewable origins, rather than use of fossil fuel generators.
Route-wide	Waste targets	The Proposed Project will reduce as far as practicable wastage of materials due to poor timing or over-ordering on-site, thus helping to reduce the embodied carbon footprint of the Proposed Project. In addition, the Proposed Project has targets to reduce the amount of waste going to landfill (see Chapter 19: Resource & Waste Management): • Zero tonnes of recoverable waste disposed of to landfill • 100% beneficial re-use of uncontaminated imported materials (from Temporary Construction Roads) • Uncontaminated excavated peat has a 100% beneficial use if reinstated. The Proposed Project will adhere to the best practice guidelines (EPA 2021c) for the preparation of Resource and Waste Management Plans for construction and demolition projects for directly procured or supported construction projects from 2024.
Construction Compounds	Regular equipment maintenance	All plant and machinery will be maintained and serviced regularly so that they are running efficiently.
Route-wide	Use of recycled materials	Recycled aggregates, preferably sourced on-site, will be used where feasible. Reclaimed rather than recycled steel will be used where feasible.
Route-wide	Reduce transport distances	Use of local suppliers, such as quarries, will reduce the transportation emissions associated with construction materials. Sourcing local aggregates or reusing soil from the excavation will reduce the carbon footprint of the Proposed Project but will also make it more economical.

Infrastructure Element	Activity	Description
Route-wide	Electric Plant and Equipment	Where feasible, electric plant and equipment will be utilised as the next step, after use of HVO, in a transition away from fossil fuels. This market is currently expanding and therefore the potential availability of equipment is likely to shift in the coming years.
Route-wide	Carbon Management Plan	Implement a whole-life Carbon Management Plan aligned to PAS 2080 to inform the detailed design, build and operation.

326. Diesel is used on site during construction to power cranes, generators, dumpers, and other plant and machinery required to conduct construction works. Sustainably sourced Hydrotreated Vegetable Oil (HVO) is an alternative to diesel which has up to 90% savings in CO_2 compared to diesel. HVO can be used directly with no alterations in diesel engines. It is considered to be a transition fuel rather than the long-term solution of hydrogen or electric plant. This is due to sustainability concerns of the sourcing of HVO. To further incentivise the supply of HVO in the transport sector in 2023, the Renewable Transport Fuel Obligation were introduced to allow the award by the National Oil Reserves Agency of additional renewable transport fuel obligation certificates for supply of HVO in the transport sector. This was done to contribute to further decarbonising the hard-to-abate HDV and road haulage sectors in the short term. Minister Eamon Ryan stated[10] in a written response that HVO is expected to meet a large proportion of the increase in biofuel supply to decarbonise the transport sector in the short term as a transition measure. Action TR/25/21 of CAP25 relates to the development of how HVO can decarbonise the HGV sector. The long-term goal is to transition towards electric or hydrogen vehicles. Uisce Éireann is committing to a 100% replacement of the projected diesel requirement for the Proposed Project with HVO, where available, resulting in a saving of 6,408tCO_2eq over the Construction Phase.

327. Uisce Éireann is committing to only procuring from suppliers in Ireland which achieve the target of a decrease by 10% embodied carbon for materials produced and used in Ireland by 2025 in accordance with the CAP23 to CAP25, as far as practicable (and similar targets for international suppliers). Due to this procurement commitment, a reduction factor has been applied to the construction materials for the mitigated scenario. While some materials, such as steel, will not be sourced in Ireland it is known that other EU countries will have their own decarbonisation strategies and therefore the same procurement requirement can be applied. By 2030, the 10% decrease in embodied carbon increases to a 30% decrease and also the implementation of a carbon capture, utilisation and storage framework product substitution for construction materials and reduction of clinker content in cement will assist in this. 2030 is halfway through the construction period so it is likely that between 2025 and 2030 the materials used in construction will decarbonise further than the 10%. In line with the procurement commitment, a 30% reduction in embodied carbon is applied to the material maintenance and 10% reduction applied to the construction stage materials. This is anticipated to result in carbon savings of 91,646tCO_2eq.

328. In addition, the reduction associated with use of a lower embodied carbon concrete such as GGBS, as far as practicable, has been quantified. The majority of concrete is assumed to be RC 32/40Mpa (60%). Lower volumes of RC25/30 (35%) and C12/15 (5%) are also predicted to be used. GGBS is one example of a low carbon concrete and may not be the final option chosen. Technology is rapidly advancing in this area and new innovative products are coming onto the market. Uisce Éireann is committing to using, as far as practicable, a low embodied carbon concrete which is equivalent to the 50% GGBS replacement during construction of the Proposed Project. This is anticipated to result in carbon savings of 58,488tCO_2eq. As the final concrete type and mix is not fully known at this stage, this carbon saving has not been included in the totals in Table 13.31 to maintain a conservative approach to the assessment. The savings have been quantified to illustrate the potential carbon saving achievable through this measure.

[10] https://www.oireachtas.ie/en/debates/question/2023-09-11/255/

13.5.2.1.2 Traffic Mitigation Measures

329. The main mitigation measure for reducing emissions from traffic will be to reduce the number of vehicles required and the distance they have to travel. This includes sourcing from local suppliers where feasible. As set out in Table 13.29 and Table 13.30, there are embedded and specific mitigation measures that will reduce the traffic generated by the Proposed Project.

330. In addition, the following localised mitigation measures will be put in place for construction vehicles, generators and equipment on-site:

- Implement a policy which prevents idling of vehicles both on and off site, including HDV holding sites
- GPS will be used for Construction Phase traffic to monitor construction vehicles using the designated Haul Roads
- Scheduling of deliveries will be planned in order to reduce congestion, trips and wastage as far as practicable
- Construction vehicles will conform to the current EU emissions standards and where reasonably practicable, their emissions will meet upcoming standards prior to the legal requirement date for the new standard. This will reduce emissions from vehicles using the Haul Roads.

331. Traffic mitigation is described in Chapter 7 (Traffic & Transport) and is secured in the Traffic Management Plan (see Appendix A7.2) which will be developed further by the appointed Contractor and put in place for the Construction Phase.

13.5.2.1.3 Peat and Forestry Loss Mitigation Measures

332. The main measures to be adopted to mitigate for the potential GHG emissions due to the loss of peat and forestry will be to seek ways to reduce those losses. The design has reduced loss as far as practicable up to this point through embedded mitigation. Mitigation will take the form of replanting temporary loss like for like within the Construction Working Width, mosaic habitat planting in the 20m wide Permanent Wayleave where there is permanent loss of woodland due to the pipeline and restrictions to planting in the wayleave, and the landscape planting proposals at the infrastructure sites. Replanting will result in a potential saving of 3,241tCO_2eq compared to the baseline scenario.

333. The reinstatement of the cutover bog will be conducted as part of the Proposed Project in line with Appendix A5.3 (Methods of Working in Peat). Where the Proposed Project passes through a bog subject to a Peatland Climate Action Scheme (PCAS) rehabilitation plan, the aim of the reinstatement is to deliver the conditions that exist prior to construction of the Proposed Project so that PCAS implementation, where it applies, continues uninhibited moving forward. The reinstatement of peat will result in carbon savings of 37,261 tCO_2eq.

334. During detailed design and construction, further investigation of any locations where forestry could be retained within construction working areas and avoidance of areas of deep peat within the construction working area will be completed, albeit further savings are expected to be limited due to the detailed consideration already put into the Proposed Project's design.

13.5.2.2 Construction Phase Mitigation for Vulnerability to Climate Change

335. During the Construction Phase, consideration will be given to the Proposed Project's vulnerability to climate impacts. During construction, the appointed Contractor will be required to mitigate against the effects of extreme rainfall/flooding through site risk assessments and method statements. The Contractor will also be required to mitigate against the effects of extreme wind/storms and temperature extremes, through site risk assessments and method statements. Temperatures can affect the performance of some materials, which will require consideration during construction. All materials used during construction will be accompanied by certified datasheets which will set out the limiting operating temperatures.

336. An Emergency Incident Preparedness and Response Plan has been prepared as part of Appendix A5.1 (Construction Environmental Management Plan). This will be developed further and implemented during the Construction Phase. This will be a live document that undergoes monitoring, review and update throughout the lifetime of the Proposed Project. The risk management assessment of major accidents and/or disasters will be developed on an ongoing basis throughout the planning, detailed design, Construction Phase and Operational Phase of the Proposed Project. Activities on-site will be monitored to avoid risk, including from climate change related impacts, increasing over time on the site. It will consider all measures deemed necessary to manage extreme weather events including training of personnel and prevention and monitoring arrangements. The document will also consider emergency preparedness and contingency procedures in place for an extreme weather event on the construction site or within the supply chain.

13.5.2.3 Operational Phase Mitigation of the Impact of the Proposed Project on Climate

337. In addition to the embedded design mitigation measures discussed in Section 13.5.1, the following specific mitigation measures will be put in place during the Operational Phase. These measures are designed to align the Proposed Project with CAP25 and the national climate target of a trajectory to net zero by 2050:

- Implement a whole-life Carbon Management Plan aligned to PAS 2080 to inform the detailed design, build and operation
- Operational Phase electricity will be purchased from certified renewable sources through a Corporate Power Purchase Agreement (CPPA)
- Nearly zero-energy buildings
- Maintain measures to support the Proposed Project's resilience to risks from climate change related impacts as detailed in Chapter 20 (Risk of Major Accidents and/or Disasters)
- The recovery or reuse of residuals such as sludge cake from the WTP (Irish Water 2021) (see also mitigation in Chapter 19: Resource and Waste Management)
- Require operations to achieve high reuse and recycling rates with an aspiration to achieve zero recoverable waste directly to landfill
- Promote the use of bicycles (including push bikes, electric bikes, and cargo bikes) and shared mobility options as an alternative to car use among employees and visitors by creating and maintaining facilities (both inside and outside buildings) that support such options, including secure and accessible bicycle parking, shared mobility parking, and charging stations, as appropriate, with a view to achieving the National Transport Authority's Smarter Travel Mark. While it is noted that many of the sites are rural in nature and cycle to work may not be as feasible as within urban areas, the facilitation and promotion will aim to ensure it is utilised by anyone whom it is feasible for
- Phase out the use of parking in buildings that have access to a range of public transport services and active/shared mobility options for the majority of staff/visitors, while providing that sufficient accessible parking is maintained for those with physical mobility issues

- Procure (purchase or lease) only zero-emission vehicles and act as an international leader in this area. An exception applies where the vehicle is exempt under European Communities (Clean and Energy-Efficient Road Transport Vehicles) (Amendment) Regulations (S.I. 381 of 2021)
- Incorporate appropriate climate action and sustainability training (technical and behavioural, including green procurement training) into learning and development strategies for staff
- Require all senior management to complete a climate action leadership training course
- Implement Green Public Procurement, using the EPA Green Public Procurement Guidance and criteria and Office of Government Procurement's online Green Public Procurement Criteria Search tool as resources
- Public sector procurement contracts for delivery and haulage should specify zero-emissions vehicles where practicable
- Improve the climate resilience of Ireland's water infrastructure, adapting to climate change, through implementation of a nature-based solutions programme. This programme implements a nature-based approach for stormwater/surface water runoff and sludge (Uisce Éireann is stated as the leading body for this action in CAP24 (DECC 2023))
- The Proposed Project will comply with the Revised Energy Performance of Buildings Directive (EU/2024/1275).

338. To indirectly mitigate the CO_2eq emissions associated with the power demands of the Operational Phase calculated in Section 13.4.4.1, a CPPA will be put in place in to purchase all operational energy from renewable sources. The CO_2 emission factor for electricity generated in Ireland by SEAI is discussed in Section 13.2.6.1.4, which states that the carbon intensity of electricity from the national grid is projected to be 92.9gCO_2/kWh in 2030 and 40.92gCO_2/kWh by 2050 (SEAI 2023b). The implementation of a CPPA will result in annual savings of 2,047tCO_2eq based on the Proposed Project's 2050 energy demand and projected national grid carbon intensity. In addition to purchasing all power from renewable suppliers, solar panel installations will be incorporated at the WTP, BPT, BPS, FCV and TPR to provide renewable energy where practicable. The estimated maximum potential from all sites was determined at phase 1 to be 5.1 Megawatts peak (MWp). However, the competition for planting space and the inability to use all the generated power local to the photovoltaic arrays have resulted in a revised design proposal of 4.74MWp with a potential reduction of 860tCO_2eq. Further details can be found in the Uisce Éireann Water Supply Project - Solar Photovoltaic System Design Optimisation Report. Battery Energy Storage Systems will be co-located with the solar panel installations.

13.5.2.4 Operational Phase Mitigation for Vulnerability to Climate Change

339. Design mitigation measures for the vulnerability of the Proposed Project to climate change have been incorporated into the design and taken account of in the assessment reported in Section 13.4.5. Monitoring will include the ongoing management of adaptation and resilience of the Operational Phase to measure effectiveness. If monitoring of adaptation and resilience measures indicates the measures are not effective and climate is impacting on the operation of the Proposed Project, then adaptation measures will be reviewed and updated.

340. The design working life of the Proposed Project is based on the current generation of Eurocodes which include climate data that is 10 to 15 years old. During the operation and maintenance of infrastructure, it will be essential to revisit the available climate data and any critical assumptions. This can be carried out at regular intervals (e.g. 5–10 years) as part of the asset management to address evolving climate risks. Monitoring will include the ongoing management of assets during the Operational Phase to measure the effectiveness of adaptation and resilience measures. If monitoring of adaptation and resilience measures indicates the measures are not effective and climate is impacting on the operation of the Proposed Project, then measures will be reviewed and updated as required.

341. The Proposed Project and Uisce Éireann will maintain a Major Incident Management and Severe Weather Plan (or similar) for the Proposed Project so there is a clear plan in place to protect critical infrastructure during operation from the impacts of severe weather.

13.6 Residual Effects

342. This section reports the residual effects on climate as a result of the Proposed Project, taking account of the mitigation measures set out in Section 13.5.

13.6.1 Construction Phase Impact of the Proposed Project on Climate

343. Based on the online TII Carbon Tool (TII 2025a), the different activities associated with the Construction Phase of the Proposed Project have been assessed. As shown in Table 13.31, the assessment indicates that the key phases of the GHG generation during the Construction Phase of the Proposed Project are the embodied carbon of the construction materials and the construction activities. The quantified mitigation measures are set out in Section 13.5.2.1.

344. Following the adoption of the measures, the Proposed Project is estimated to result in total Construction and Maintenance Phase GHG emissions of 756,680 tonnes embedded CO_2eq over a five-year period compared to 897,934 tonnes CO_2eq prior to mitigation; if maintenance over the Operational Phase is excluded, the mitigated construction GHG emissions are 679,385 tonnes CO_2eq. The total Construction and Maintenance Phase GHG emissions of 756,680 tonnes embedded CO_2eq is equivalent to an annualised total of 0.2% of Ireland's non-ETS 2030 target. Over a predicted construction and operational year lifespan (RICS 2023), the annualised mitigated emissions due to the initial Construction Phase and ongoing maintenance of the Proposed Project are projected to reach, at most, 0.02% of Ireland's non-ETS 2030 emissions target (see Table 13.32).

345. The proposed mitigation measures result in the following quantified carbon savings:

- 2,363 tonnes CO_2eq through the reduction in waste emissions
- 3,241 tonnes CO_2eq through the reduction in land use change (including forestry replanting)
- 37,261 tonnes CO_2eq through peat reinstatement
- 6,408 tonnes CO_2eq through the use of HVO rather than diesel on site
- 336 tonnes CO_2eq through construction compounds being connected to the electrical grid via a supplier that can demonstrate renewable origins
- 91,646 tonnes CO_2eq through the use of the procurement commitment to only use suppliers in Ireland who achieve a 30% reduction in embodied carbon (applied to material maintenance) and 10% reduction (applied to the construction stage materials), as per CAP24 (with similar target for international suppliers).

346. These total quantified emissions savings equal 141,254 tonnes CO_2eq. This saving does not account for the savings made through embedded design choices that were made to reduce carbon, or detailed design opportunities that can further reduce carbon emissions when a PAS 2080 assessment is conducted. There is also a potential saving of 58,488 tonnes CO_2eq through the use of a low carbon concrete however, this has not been included in Table 13.31 (see section 13.5.2.1.1 for further detail).

Table 13.31: Mitigated Construction Phase GHG Emissions

Phase	Activity	Tonnes CO_2eq	% of Total	Sector
Pre-Construction	Site clearance works	508	0.07%	Industry
	land use change (including operational replanting and peat reinstatement in mitigation)	148	0.02%	LULUCF
Embodied carbon (materials)	Asphalt, concrete, aggregate, steel.	526,677	69.60%	Industry
	Maintenance materials over 120 year lifespan	77,295	10.22%	Industry
Construction activities	Excavation	3,080	0.41%	Industry
	Water use	95	0.01%	Other (including waste and wastewater)
	Generator and electrical use on-site (gas/oil/diesel/electricity)	1,387	0.18%	Energy industries (including electricity generation)
Construction waste	Recycling and transport of plastic piping, concrete walling, bituminous materials, soil and stone	65	0.01%	Other (including waste and wastewater)
Transport	Traffic generated during Construction Phase (including materials, waste and staff transport)	147,427	19.5%	Transport
Total			**756,680**	
Total Annualised over 5-year construction phase			**151,336**	
Total annualised over construction and operational lifespan			**6,053**	
% reduction from non-mitigated scenario			**16%**	

Table 13.32: Summary of Mitigated Construction Phase CO_2eq Emissions

CO_2eq Emission Source		Tonnes CO_2eq	
Embodied energy in construction including land use change		756,680	
Annualised (Average over construction and operational years lifespan)		6,053	
Target/Sectoral Budget	**(tCO_2eq)**	**Annualised Development GHG Emissions**	**% of Relevant Target/Budget**
Ireland's 2023 Total GHG Emissions (existing baseline)	57,640,000	Total GHG Emissions	0.011%
Non-ETS 2030 Target	27,722,000	Total GHG Emissions	0.02%
2030 Sectoral Budget (Industry Sector)	4,000,000	Total Industry Emissions	0.12%
2030 Sectoral Budget (Transport Sector)	6,000,000	Total Transport Emissions	0.02%
2030 Sectoral Budget (Energy Industries (including electricity generation))	3,000,000	Total Electricity Emissions	0.0004%
2030 Sectoral Budget (Waste Sector, including wastewater)	1,000,000	Total Waste Emissions	0.0001%
2030 Sectoral Budget (LULUCF)	N/A	Total LULUCF Emissions	Currently no set budget (See Section 13.2.3.3)

347. The impact of the Proposed Project on climate due to GHG emissions should be considered for the development as a whole, over its lifetime, rather than for individual phases, in line with TII (2022a) and ISEP (2022) guidance. The residual effect of the Proposed Project on climate due to Construction Phase GHG emissions, post-mitigation, is therefore discussed in Section 13.6.4 alongside residual Operational Phase impacts.

13.6.2 Operational Phase Impact of the Proposed Project on Climate

348. The embedded design mitigation discussed in Section 13.5.1 has not been quantified, as these were decisions made over the options and design development stages. However, it is considered that these design decisions have made significant carbon savings through the use of lower energy choices and efficiencies within the process.

349. The most significant quantifiable mitigation for the Operational Phase impacts is the use of a CPPA for electricity to operate the Proposed Project. This will save 2,440 tonnes CO_2eq per annum based on 2050 energy demand and projected national grid carbon intensities (SEAI 2023c), or a saving of 75,347 tonnes CO_2eq between 2030 and 2050 (based on the 2050 electrical demand figures but varying grid carbon intensities based on the year). Carbon intensity projections are not available after 2050 from SEAI.

350. The mitigation measures in Table 13.30 also detail that material suppliers must achieve the CAP24 (DECC 2023) target of a 30% reduction in embodied carbon by 2030. As a result, maintenance materials are considered to have a lower embodied carbon, saving 33,127 tonnes CO_2eq from the baseline of 110,422 tonnes CO_2eq over the 120-year lifespan of the Proposed Project (based on current emission factors). The mitigated equivalent is 920 tonnes CO_2eq annually.

351. The impact of the Proposed Project on climate due to GHG emissions should be considered for the development as a whole, over its lifetime, rather than for individual phases, in line with TII (TII 2022a) and ISEP (2022) guidance. The residual effect of the Proposed Project on climate due to Operational Phase GHG emissions, post-mitigation, is therefore discussed in Section 13.6.4 alongside residual Construction Phase impacts.

13.6.3 Operational Phase Vulnerability of the Proposed Project to Climate Change

352. The Proposed Project is not considered vulnerable to climate change in the future as this has been taken account of in the design of the new infrastructure. The Proposed Project has aimed to reduce the vulnerability to flood risk by avoiding areas which are currently within flood risk areas and by including appropriate drainage systems in the design.

353. At the detailed design stage, the construction designs, materials, mechanical and electrical equipment will be chosen with consideration of the future climate hazards associated with RCP4.5 and RCP8.5 in 2100. This will be aided by upcoming standards and guidance including the new generation of Eurocodes which will include future climate risk, and further datasets produced by the TRANSLATE team at Met Éireann.

354. With design mitigation in place, there are no significant risks to the Proposed Project as a result of climate change. In accordance with the EPA Guidelines (EPA 2022), the significance of effect to the Proposed Project as a result of climate change is long term, minor adverse and Not Significant. Additionally, as per the TII guidance (2022a) discussed in Section 13.2.6.2.1 as all climate change related risks have been assessed as ‘low’ the impact of climate change on the Proposed Project is not significant.

355. The Proposed Project in itself will provide a beneficial effect on future vulnerability to climate change because it will provide a resilient drinking water supply into the future, taking account of climate change. The Proposed Project also aligns with the needs stated in the NAF (DECC 2024c) which warn that national long-term water supply projects are needed to deliver the adaptation required to make Ireland resilient by 2050 and beyond.

13.6.4 Conclusion

356. The impact of the Proposed Project on climate due to GHG emissions should be considered for the development as a whole, over its lifetime. This section considers the residual effects due to GHG emissions in both the Construction and Operational Phases, after the inclusion of mitigation measures given in Section 13.5, to assess the overall residual effect on climate from the Proposed Project.

357. The TII guidance (TII 2022a) states that the following two factors should be considered when determining significance:

- The extent to which the trajectory of GHG emissions from the Proposed Project aligns with Ireland's trajectory to net zero by 2050
- The level of mitigation taking place.

358. TII guidance (PE-ENV-01104) further states that a minor adverse (not significant) impact can be described as follows:

- The project's GHG impacts are mitigated through 'good practice' measures
- The project has complied with existing and emerging policy requirements
- Fully in line to achieve Ireland's trajectory towards net zero (and Uisce Éireann's own target to achieve net zero by 2040).

359. The Proposed Project can be considered to align with Ireland's trajectory towards net zero by 2050 as it has reduced its operational emissions through embedded design, CPPAs and alignment with CAP25 (DECC 2025). Alignment with PAS 2080, implemented through a whole-life Carbon Management Plan during detailed design, has the potential to push the design of the Proposed Project beyond current design standards, further reducing its impact on GHG emissions.

360. Considering the qualitative and quantitative mitigation set out in Section 13.5, the significance criteria set out in Section 13.2.6, and the fact that the Proposed Project will align with the current and emerging CAPs and the NAF (DECC 2024c) objectives to provide resilience to the water supply for Ireland's Eastern and Midlands Region, it is concluded that the Proposed Project aligns with these criteria and will have a long-term, minor adverse, Not Significant effect on GHG emissions. The ISEP guidance (ISEP 2022) (which has been embraced by the updated TII guidance (TII 2022a)), describes a minor adverse not significant impact as follows:

> '*A project that is compatible with the budgeted, science based 1.5°C trajectory (in terms of rate of emissions reduction) and which complies with up-to-date policy and 'good practice' reduction measures to achieve that has a minor adverse effect that is not significant. It may have residual impacts but is doing enough to align with and contribute to the relevant transition scenario* […] *a 'minor adverse' or 'negligible' non-significant effect conclusion does not necessarily refer to the magnitude of GHG emissions being carbon neutral*[11] *(i.e. zero on balance) but refers to the likelihood of avoiding severe climate change and achieving net zero by 2050* […] *A 'minor adverse' effect or better is a high bar and indicates exemplary performance where a project meets or exceeds measures to achieve net zero earlier than 2050*.'

361. While similar significance criteria are not set out for climate vulnerability impacts, the primary objective of the Proposed Project is to enable resilience through climate adaptation with a more sustainable water supply to the Eastern and Midlands Region, which can be seen as beneficial in the long term. The purpose of the Proposed Project is to meet the water demands of a growing population in the Eastern and Midlands Region. This in turn will reduce the vulnerability of this region to the effects of climate change and address

[11] Carbon Neutral: '*When anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period irrespective of the time period or magnitude of offsets required*.'

an imbalance between available supply and demand of drinking water. Therefore, while the Proposed Project has an impact on climate, it is also addressing the potential impact of climate change.

362. The potential socio-economic and environmental impacts associated with water shortages will vary depending on a number of factors, including the geographical areas affected and the duration of the shortages. Potential environmental impacts could include health impacts from limited supply and risks to existing supply quality, impacts on economy and growth, constraints on agricultural output through higher demand on existing sources and pressure for over-abstraction on sensitive watercourses. The impact of future dry spells which the EPA states may increase in duration and frequency due to climate change within the east of the country, have the potential to reduce the current supply of water and create an increased number of drinking-water shortages.

363. Considering the vulnerability of the Proposed Project to climate change and the residual GHG emissions, the Proposed Project is considered to be in alignment with the national climate objective, which is set out in section 3 of the Climate Action and Low Carbon Development Act 2015 (as amended by the Climate Action and Low Carbon Development (Amendment) Act 2021):

> '*3. (1) The State shall, so as to reduce the extent of further global warming, pursue and achieve, by no later than the end of the year 2050, the transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy…*'

364. An Coimisiún Pleanála and Uisce Éireann are required in so far as practicable to carry out their functions in a manner consistent with the objectives stated in section 15 of the Climate Action and Low Carbon Development Acts 2015 (as amended). This chapter demonstrates how the Proposed Project is consistent with the objectives of section 15 of the Act (as amended). The EIAR has carried out a greenhouse gas emissions assessment and assessed the Proposed Project's resilience/adaptation to climate change.

365. Greenhouse Gas Emissions Assessment – This assessment considers the Proposed Project's GHG emissions over its lifetime. The assessment analyses these emissions in the context of the relevant carbon budgets, targets and policies to ensure consistency with the most recent approved climate action plan and the most recent approved national long term climate action strategy, and with measures in furtherance of the national climate objective, as discussed in this section. This complies with subsections 15 (1) (a), (b), and (d) of the Act.

366. Climate Change Vulnerability Assessment – This assessment identifies the impact of a changing climate on the Proposed Project and receiving environment in the context of the most recent approved national adaptation framework and approved sectoral adaptation plans. The assessment considers the Proposed Project's vulnerability and adaption to climate change and identifies adaptation measures to increase resilience, as discussed in Section 13.6.3. This covers section 15(1)(c) and (e) of the Act.

367. In addition, the purpose of the Proposed Project is ensuring resilience in the water supply to the Eastern and Midlands Region. Climate change is one of the factors which increases the vulnerability of this supply and therefore the need for the Proposed Project is directly linked to future climate adaptation.

368. The above measures pursue the furtherance of the national climate objective and the objective of mitigating greenhouse gas emissions and adapting to the effects of climate change in the State as far as practicable as required by section 15(1)(d) and(e) of the Acts.

369. Residual effects are summarised in Table 13.33 and Section 13.6.

Table 13.33: Summary of Predicted Construction and Operational Phase Effects (for Criteria see Section 13.2.6)

Assessment Topic	Predicted Impact (Pre-Mitigation and Monitoring)	Predicted Impact (Post-Mitigation and Monitoring)
Overall GHG emissions	Major to moderate adverse, long term and Significant	Minor adverse, long term and Not Significant
Overall climate vulnerability	Minor adverse, long term and Not Significant	Minor adverse, long term and Not Significant

13.7 References

British Standards Institution (BSI) (2022). EN 17472:2022 Sustainability of construction works - Sustainability Assessment of Civil Engineering Works - Calculation Methods.

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