Uisce Éireann

Greater Dublin Drainage Project
Addendum

Appendix 8C
Greenhouse Gas Assessment

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SECTION 1 Greenhouse Gas (GHG) Assessment

1.1 Introduction

This Appendix to Chapter 8A (Air and Climate) of the Environmental Impact Assessment Report (EIAR) Addendum presents the full assessment of the impact of greenhouse gas (GHG) emissions from the proposed Greater Dublin Drainage (GDD) Planning Remittal for the RBSF Project (hereafter referred to as the Proposed RBSF Component) on climate during both the Construction and the Operational Phases (a summary of which is included within the main Chapter 8A (Air and Climate) in Volume 4A Part A of the EIAR Addendum).

The GHG assessment within this Appendix recognises and responds to developments in climate-related legislation, policy, and guidance which have emerged since the submission of the original planning application in 2018 and describes and assesses the likely direct and indirect significant effects of the Proposed RBSF Component on climate, in accordance with the requirements of Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (hereafter referred to as the Environmental Impact Assessment (EIA) Directive).

The requirement to reconsider the climate aspects for the Proposed RBSF Component reflects the advancement in the EIA process in relation to carbon emission assessments since the submission of the EIAR in the 2018 planning application. These advancements are primarily driven by the accelerating impacts of climate change and the introduction by the Irish Government of 'net zero' targets by 2050 for the public sector and the introduction of legally binding GHG reduction targets. A climate assessment was originally reported in Chapter 8 (Air and Climate) in Volume 4 Part A of the EIAR in 2018 planning application, which was limited to reporting of the estimated GHG emissions. To reflect the advancement in the EIA process, this updated assessment has been undertaken for the Proposed RBSF Component, with reference to the most appropriate guidance documents relating to climate (referred to in Section 1.2.1).

In addition to specific climate guidance documents, the following updated guidelines were considered and consulted in the preparation of this Appendix:

- The Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the updated EPA Guidelines) (EPA 2022).

As outlined in the EIAR in the 2018 planning application, the Proposed RBSF Component is located on an 11.4ha site at Newtown, Dublin 11. The Proposed RBSF Component will aid with the greater GDD project which forms a significant component of a wider strategy to meet future wastewater treatment requirements within the Greater Dublin Area (GDA), as identified in a number of national, regional, and local planning policy documents. The plant, equipment, buildings, and systems associated with the Proposed RBSF Component will be designed, equipped, operated, and maintained in such a manner to ensure a high level of decarbonisation, energy performance, energy efficiency and deployment of renewable forms of energy. An independent GHG assessment has been completed for the other elements of the GDD and is reported as part of this EIAR Addendum.

The description of the RBSF remains as presented in Section 4.11 (Description of the Proposed Regional Biosolids Storage Facility) in Chapter 4 (Description of the Proposed Project) in Volume 2 Part A of the EIAR in the 2018 planning application, as supplemented by Section 4.11 (Description of the Proposed Regional Biosolids Storage Facility) in Chapter 4A (Description of the Proposed Regional Biosolids Storage Facility) in Volume 2A Part A of this EIAR Addendum.

The GHG assessment within this Appendix evaluates the impact of the GHG emissions from the Proposed RBSF Component and compares the quantified outputs against the relevant sectoral carbon budgets (refer to Section 1.2.3 and sectoral emissions ceilings for 2030 set out in the Sectoral Emissions Ceilings September 2022 documents (Government of Ireland 2022a) (i.e., construction emissions are compared against the Industry budget and operational emissions are compared against the Other (sub-category Waste) budget).

To ensure that GHG emissions from infrastructure projects align with the Government's national climate objectives, consideration must be given to the impact of the whole life carbon of a scheme and not isolated elements. Therefore, it is recommended that the evaluation of the impact of the GHG emissions of the Proposed RBSF Component be considered with the impact of the GHG emissions of the RBSF to provide a cumulative, whole-system comparison against the relevant sectoral carbon budgets.

This GHG assessment recognises and responds to developments in climate-related legislation, policy, and guidance which have emerged since the submission of the original planning application in 2018 and describes and assesses the likely direct and indirect significant effects of the Proposed RBSF Component on climate,

This GHG assessment is based on a reasonable worst-case scenario with respect to the most significant potential carbon emissions arising from the Proposed RBSF Component based on project information available at this stage of the Proposed RBSF Component and considers emissions from both Construction and Operational Phases.

This Appendix should be read in conjunction with the following Chapters, and their Appendices, which present related impacts arising from the Proposed RBSF Component and proposed mitigation measures to ameliorate the potential impacts (which shall be detailed in Section 1.5 of this assessment):

- Section 4.11 (Description of the Proposed Regional Biosolids Storage Facility) in Chapter 4 (Description of the Proposed Project) in Volume 2 Part A of the EIAR in the 2018 planning application, as supplemented by Section 4.11 (Description of the Proposed Regional Biosolids Storage Facility) in Chapter 4A (Description of the Proposed Regional Biosolids Storage Facility) in Volume 2A Part A of this EIAR Addendum;
- Chapter 5 (Consideration of Alternatives) in Volume 2 Part A of the EIAR in the 2018 planning application, as supplemented by Chapter 5A (Consideration of Alternatives) in Volume 2A Part A of this EIAR Addendum;
- Chapter 17 (Summary of Mitigation) in Volume 4 Part A of the EIAR in the 2018 planning application, as supplemented by Chapter 17A (Summary of Mitigation) in Volume 4A Part A of this EIAR Addendum; and
- Outline Construction Environmental Management Plan (CEMP) included in the 2018 planning application, as supplemented by the Addendum to the CEMP, which is a standalone document in this Addendum.

1.1.1 Greenhouse Gas Emissions Considerations

The updated Climate Action Plan 2023 (CAP 2023) (Government of Ireland 2022b) identified that climate change will result in further pressure on water resources and that Uisce Éireann (formerly Irish Water) need to provide sectoral resilience to the impacts of climate change. The Proposed RBSF Component, while having an impact on climate, is also designed to provide such resilience by providing capacity to meet the demand based on population forecasts to 2040.

As noted in Section 1.1, this assessment considers the total GHG emissions anticipated as a result of the construction and operation of the Proposed RBSF Component and describes and assesses the likely significant effects of the Proposed RBSF Component on climate, in accordance with the requirements of the EIA Directive.

Climate represents long-term weather patterns and considers environmental aspects such as climate change resulting from GHG emissions. Potential emissions of GHGs from the Proposed RBSF Component that can contribute to climate change include carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Climate impacts are considered by taking account of the existing baseline, the nature and magnitude of the projected impacts and compliance with relevant standards and recent industry guidance and best practice which considers the life cycle carbon emissions footprint of infrastructure projects.

The GHG primarily generated from the Construction Phase will be CO_2 which is emitted from the burning of fossil fuels during product manufacture, transportation, construction, and installation activities.

In relation to the Operational Phase of the Proposed RBSF Component, the principle GHGs of concern are CO_2 released from various energy systems associated with the operations, fugitive CH_4 emissions from proposed storage of dewatered sludge. Although typically emitted in lower volumes than CO_2, the global warming potential (GWP) of both CH_4 and N_2O are considerably higher than CO_2 (refer to Section 1.3.1) and therefore, require quantification as tonnes of carbon dioxide equivalents (t CO_{2e}) to evaluate the relative impact of these GHGs.

Number 32 of 2021 – Climate Action and Low Carbon Development (Amendment) Act 2021 (hereafter referred to as the 2021 Climate Act) outlines a series of specific actions including to provide for carbon budgets and sectoral emissions ceilings to apply to different sectors of the economy. These carbon budgets are determined as part of a grouping of three five-year periods calculated on an economy-wide basis, starting with the periods 2021 to 2025, 2026 to 2030, and 2031 to 2035 (refer to Section 1.2.3). In September 2022, the Government adopted Sectoral Emissions Ceilings for each relevant sector within the limits of each carbon budget and, against which the impact of the Proposed RBSF Component is evaluated. For the Construction Phase of the Proposed RBSF Component the relevant sector emissions ceiling which applies is the 'Industry' sector, whilst for emissions during the Operational Phase, the sectoral emissions ceiling which applies is 'Other' (sub-category 'Waste').

The Operational Phase of the Proposed RBSF Component is estimated to commence in 2029 and CO_2 emissions will be generated (as indirect emissions) as a result of the electricity power demand of the proposed RBSF. CO_2 emissions from the operational power demand of the Proposed RBSF Component is calculated using the carbon intensity of the fuel mix used in the generation of electricity nationally. As a national target of up to 80% of electricity demand by renewables by 2030 for the national grid has been set in the CAP 2023 the impact of the decarbonisation of the national electricity grid is considered in this assessment.

1.2 Methodology

To align with the requirements of EIA Directive, the climate assessment should describe the likely significant effects on the environment resulting from both the:

- Impact of the Proposed RBSF Component on climate arising from GHG emissions; and
- Vulnerability of the Proposed RBSF Component to climate change (climate adaptation).

The scope of this appendix includes an assessment of the impact of the Proposed RBSF Component on climate arising from GHG emissions. The measurement and quantification of the GHG emissions associated with the Proposed RBSF Component is based upon the methodology proposed in the Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (hereafter referred to as the IEMA GHG Guidance) (IEMA 2022). It further aligns with the methodology and requirements used for assessing and reporting the effects of climate on highways projects (other large infrastructure projects), and the effect on climate of greenhouse gas from construction, operation and maintenance projects as set out in United Kingdom Highway Agency (UKHA) Design Manual for Roads and Bridges (DMRB) - LA 114 Climate, 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 Transport Infrastructure Ireland (TII) PE-ENV-01105: Climate Assessment Standard for Proposed National Roads (TII, 2022b).

From the IEMA GHG Guidance, the GHG quantification within this assessment follows the principles outlined in the GHG Protocol Corporate Standard, International Organization for Standardization (ISO) ISO 14064-2 Greenhouse gases – Part 2 (ISO 2019) and British Standard institute (BSI) British Standard (BS) PAS 2080:2023 Carbon Management in Buildings and Infrastructure (BSI 2023). Based on the methodologies outlined in each standard, this assessment seeks to quantify the difference in GHG emissions between the Proposed RBSF Component and the "do nothing" scenario (as detailed in Section 1.3). The assessment results reflect the difference in whole life net GHG emissions between these two options.

The assessment includes all material emissions during the construction and operational phases of the Proposed RBSF Component within the boundary defined in Section 1.2.1.

From the IEMA GHG Guidance, the GHG assessment should incorporate the following six-step methodological framework:

- Set the scope and boundaries of the GHG assessment (refer to Section 1.2.1);
- Develop the baseline scenario (refer to Section 1.3);
- Select of emissions calculation methodologies (refer to Section 1.2.5);
- Data collection (refer to Section 1.2.4);
- Calculation of GHG emissions inventory ; and
- Consider mitigation opportunities and repeat previous two steps (refer to Section 1.5).

This methodology assesses the total net impact of the Proposed RBSF Component by calculating the GHG emissions from both the Construction and Operational Phases using the approach outlined below:

- A detailed review of GHG emissions has been undertaken in order to characterise the baseline environment. This has been undertaken using emissions data available from sources identified in Section 1.3;
- A review of appropriate national and international guidelines for the assessment of GHG emissions has been completed to define the significance criteria for the Construction and Operational Phases of the Proposed RBSF Component (refer to Section 1.2.2);
- Predictive calculations and impact assessments relating to the likely Construction Phase climate impacts of the Proposed RBSF Component have been completed (Section 1.4);
- Predictive calculations and impact assessments relating to the likely Operational Phase electrical power demand, process emissions and maintenance have been completed (Section 1.4);
- A schedule of mitigation measures has been provided to demonstrate the mitigation hierarchy adopted to incorporate GHG emissions reduction opportunities in the design to reduce climate impacts (refer to Section 1.5);
- The potential predicted residual impact is compared against the following targets and sectoral carbon budgets:
    - Ireland's non- Emission Trading Scheme (ETS) 2030 target of 33.4Mt CO_{2e} (million tonnes of carbon dioxide equivalent) (as outlined 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 2021 to 2030 pursuant to Regulation (EU) 2018/842 of the European Parliament and of the Council);
    - 2030 Industry sectoral carbon budget (Government of Ireland 2022) for Construction Phase emissions of 4Mt CO_2e;
    - 2030 'Other' ('Waste') sectoral carbon budget (Government of Ireland 2022) for Operational Phase Emissions of 1Mt CO_2e; and
    - The residual impact comparison is reported in Section 1.6.

1.2.1 Study Area

The Proposed RBSF Component covers 11.4ha site. Full details of the Proposed RBSF Component Description can be found in Section 4.11 (Description of the Proposed Regional Biosolids Storage Facility) in Chapter 4 (Description of the Proposed Project) in Volume 2 Part A of the EIAR in the 2018 planning application, as supplemented by Section 4.11 (Description of the Proposed Regional Biosolids Storage Facility) in Chapter 4A (Description of the Proposed Regional Biosolids Storage Facility) in Volume 2A Part A of this EIAR Addendum.

The Proposed RBSF Component is generally located at Newtown, Dublin 11, 1.5 km north of the M50 junction and less than 100 m to the east of the N2. To the south and east the land use is industry (Quarry and commercial units) There are a small number of residential properties (<10) on the site boundary to the south. In addition, there are some agricultural areas to the north of the Proposed RBSF Component.

In accordance with the recently published IEMA GHG Guidance (IEMA 2022), the approach to assessing the cumulative effects of GHG emissions differs from that for other environmental topics (e.g., odour

emissions or dust), as GHG emission impacts and the resulting effects cannot be evaluated within a geographically bounded study area. Therefore, all global cumulative GHG sources are relevant to the effect on climate change which needs to be factored when defining the study area and receptor. The receptor, in the case of GHG emissions, is the atmospheric concentration of GHGs and it is defined as being of 'high' sensitivity to further emissions. With respect to the requirement for a cumulative assessment PE-ENV-01104 (TII, 2022c) states that

"*for GHG Assessment as the global climate and impacts on the receptor from a project are not geographically constrained, the normal approach for cumulative assessment in EIA is not considered applicable.*"

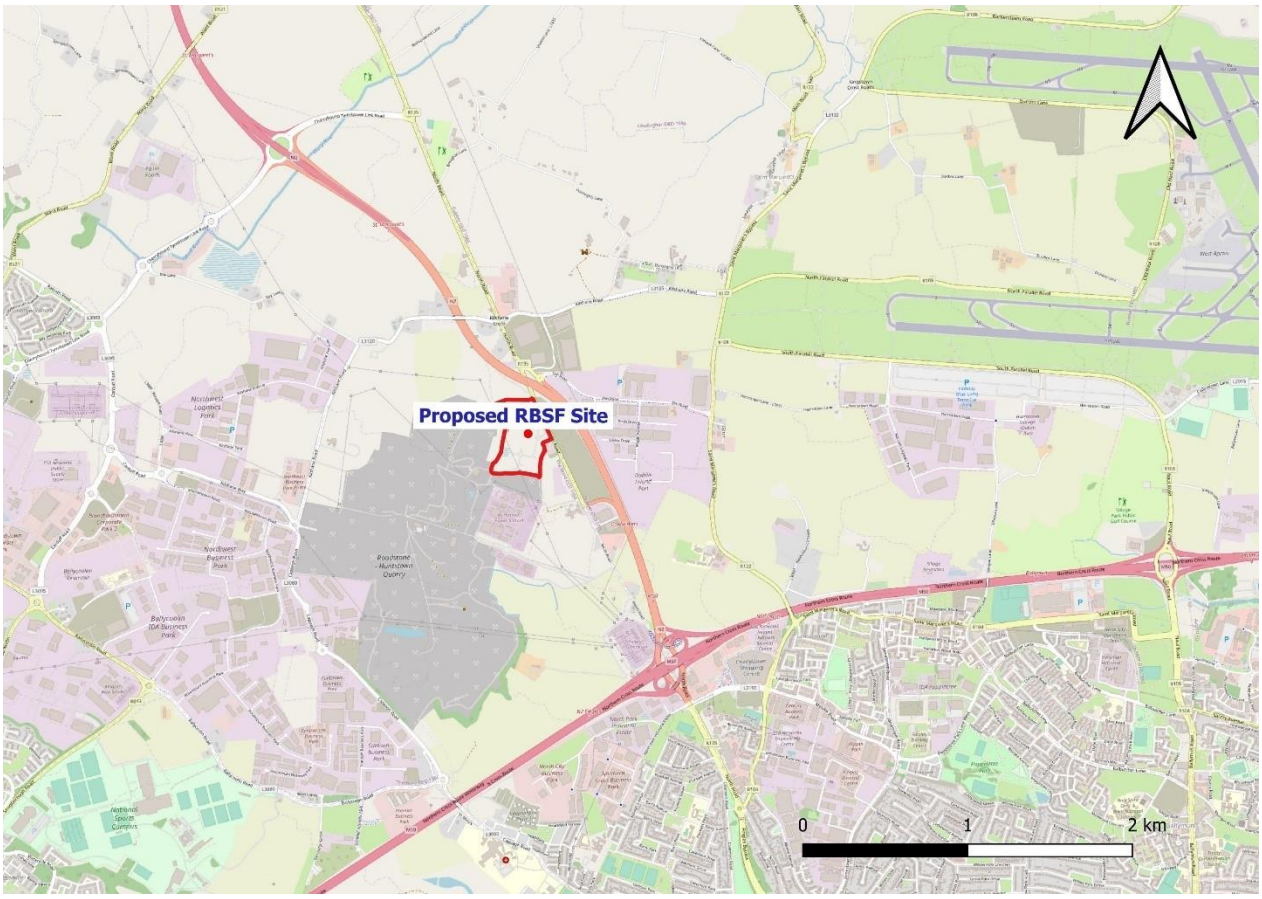
However, by presenting the GHG impact of a project in the context of its alignment to Ireland's trajectory of net zero and any sectoral carbon budgets, this assessment will demonstrate the potential for the project to affect Ireland's ability to meet its national carbon reduction target. As Ireland is currently exceeding these targets (see Section 1.3.2) this agrees with the IMEA principal of the receptor being "highly" sensitive.

The contextualization of the impacts of GHG emissions from the Proposed RBSF Component should incorporate the cumulative contributions of other GHG sources, even if not based on a geographical boundary.

The Irish Government has defined national and sectoral carbon budgets which are compatible with international climate commitments, and with the 2021 Climate Act in which specific actions to provide for carbon budgets and sectoral emissions ceilings for different sectors of the economy were defined. The Government's Sectoral Emissions Ceilings (Government of Ireland 2022) were published in September 2022. GHG emissions assessed within the study area will be compared to both the national and sectoral 'Industry' and 'Other' (sub-category 'Waste') GHG emissions targets, as detailed in Section 1.2.3.

The study area for climate includes all new infrastructural elements to be provided as part of the Proposed RBSF Component (refer to Image 1.1), and includes GHG emissions from both the Construction and Operational Phases. The objective of the updated GHG emissions assessment in this case is to determine the percentage contribution of the Proposed RBSF Component's net emissions to the national and sectoral carbon budgets for both the Construction and Operational Phases based on the carbon budgets allocated to each of the relevant sectors, as detailed in the recently published Sector Emissions Ceilings.

Image 1.1: Project Boundary for the GHG Emissions Assessment from the Proposed RBSF Component's Infrastructural Elements

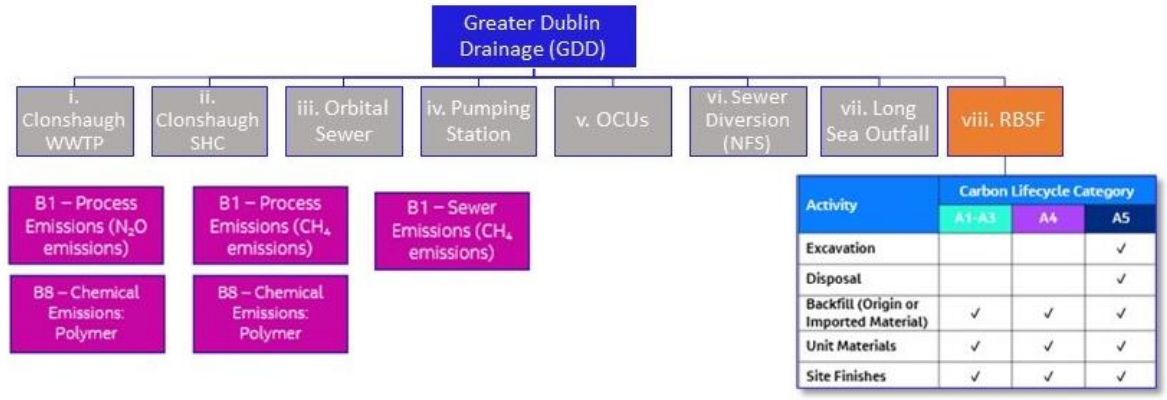


1.2.1.1 System Boundary

The system boundary relevant for this GHG assessment includes all material emissions, direct or indirect, generated during the life cycle stages of the Proposed RBSF Component. Annual emissions, in addition to the overall lifetime of the Proposed RBSF Component are considered. The system boundary for the GHG emissions assessment for the Proposed RBSF Component aligns with those presented in BS EN 15987 Sustainability of construction works (BSI 2011) and in PAS 2080:2023 Carbon Management in Buildings and Infrastructure (BSI 2023) which represents good practice for life cycle carbon quantification in infrastructure projects.

A model-based scenario quantification approach was adopted to assess the impact of emissions from within the system boundary. A purpose-built model was created to calculate the anticipated GHG emissions from both the Construction (including embodied carbon) and Operational Phases of the Proposed RBSF Component using a series of calculations, industry standard emissions factors and assumptions to calculate a carbon footprint for the Proposed RBSF Component. The carbon footprint takes account of all anticipated GHG emissions including CO_2, CH_4, and N_2O, which are normalised and reported as t CO_2e. Image 1.2 indicates the infrastructural element, project lifecycle stage and primary emissions sources included in the model (based on the life cycle carbon assessment methodology in BS EN 15987 Sustainability of construction works (BSI 2011) and in PAS 2080:2023 Carbon Management in Buildings and Infrastructure (BSI 2023)).

Image 1.2: System Boundary Included Within Purpose-Built Emissions Assessment Model



Activity	Carbon Lifecycle Category		
	A1-A3	A4	A5
Excavation			✓
Disposal			✓
Backfill (Origin or Imported Material)	✓	✓	✓
Unit Materials	✓	✓	✓
Site Finishes	✓	✓	✓

Activities that do not significantly change the result of the assessment where expected emissions are less than 1% of total emissions and do not exceed a maximum total of 5% of total emissions as per the IEMA GHG Guidance, are excluded from the scope of the assessment.

1.2.1.2 Temporal Boundary

A reference study period of 50 years was selected for the GHG emissions assessment based on the typical design working life (DWL) for permanent buildings and structures in accordance with IS EN 1990 Basis of structural design (Eurocode). This study period incorporates both the Before-Use Stages (A1-A5) and the Use Stage (B1-B9) modules based on BS EN 15987 Sustainability of construction works (BSI 2011) and in PAS 2080:2023 Carbon Management in Buildings and Infrastructure (BSI 2023) assessment life cycle information as detailed in section (a) and has been selected to assess the anticipated GHG emissions which may potentially influence the objectives of the 2021 Climate Act in relation to achieving net zero carbon by 2050.

1.2.2 Relevant Guidelines, Policy and Legislation

Since the submission of the planning application in 2018 there has been considerable movement regarding climate-related government policy, EIA legislation, GHG assessment guidance and best practice that are recognised in this updated assessment.

The GHG assessment has been undertaken with reference to the most appropriate guidance documents relating to climate change which are set out in the following sections. In addition to specific climate guidance documents, the updated EPA Guidelines (EPA 2022) were considered and consulted in the preparation of the updated GHG assessment.

The GHG assessment has made reference to national guidelines and legislation, where available, in addition to international standards and guidelines relating to the assessment of GHG emissions and associated climatic impact.

These include:

- The 2021 Climate Act;
- CAP 2023 (Government of Ireland 2022b);
- EIA Directive;
- Project Ireland 2040 – National Planning Framework (hereafter referred to as the NPF) (Government of Ireland 2020a);
- Water Quality and Water Services Infrastructure. Climate Change Sectoral Adaptation Plan (prepared under the NAF) (Government of Ireland 2019a);
- Department of Transport, Tourism and Sport (DTTAS) Transport - Climate Change Sectoral Adaptation Plan (prepared under the NAF) (Government of Ireland 2019b);

- Fingal County Council (FCC) Climate Change Action Plan 2019 – 2024 (FCC and Codema 2019);
- Fingal Development Plan 2017 – 2023 (FCC 2017);
- Fingal Development Plan 2023 – 2029 (FCC 2023);
- 2030 Climate and Energy Policy Framework (European Commission 2014);
- The Sustainable Energy Authority of Ireland (SEAI) IS399 Energy Efficient Design Management - Business & Public Sector (SEAI 2014);
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Commission 2013);
- Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a system for greenhouse gas emission allowance trading within the Union and amending Council Directive 96/61/EC;
- The Department of the Environment, Climate and Communications (DECC) General Scheme of the Climate Action Amendment Bill (hereafter referred to as the General Scheme Bill) (DECC 2021);
- IEMA GHG Guidance (IEMA 2022);
- IEMA EIA Guide to: Climate Change Resilience and Adaptation (2020) (IEMA 2020a);
- GHG Management Hierarchy updated for net-zero (IEMA 2020b);
- Technical guidance on the climate proofing of infrastructure in the period 2021-2027 (European Commission 2021a);
- Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change (European Commission 2021b);
- Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment (as amended) (hereafter referred to as the Urban Wastewater Treatment Directive (UWWTD)); and
- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (hereafter referred to as the Water Framework Directive (WFD)).

1.2.2.1 International and National Guidelines, Policy and Legislation

Ireland is a party to the United Nations Framework Convention on Climate Change (UNFCCC 1992), and the Kyoto Protocol (UNFCCC 1997). Together with the Paris Agreement (UNFCCC 2015), which entered into force in 2016, these provide the international legal framework for addressing climate change. It requires all signatories to strengthen their climate change mitigation efforts to keep global warming to well below 2°C this century and to pursue efforts to limit global warming to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst recognising that peaking of emissions will take longer for developing countries.

Contributions to GHG emissions were based on Nationally Determined Contributions (NDC's) which formed the foundation for climate action after 2020. Significant progress was also made in the Paris Agreement on elevating climate adaptation in response to climate change onto the same level as action to cut and curb emissions.

In order to meet the commitments under the Paris Agreement, the European Union (EU) enacted Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013 (hereafter referred to as the GHG Regulation). The GHG Regulation aims to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the ETS and non-ETS sectors amounting to 43% and 30% respectively, by 2030 compared to 2005. The ETS is an EU-wide scheme which regulates the emissions of larger industrial emitters (e.g., electricity generation and cement manufacturing). The non-ETS sector includes all domestic GHG emitters, which do not fall under the ETS including GHG emissions from transport, residential, commercial buildings, public sector and agriculture.

The purpose of the Climate Action and Low Carbon Development Act 2015 (hereafter referred to as the 2015 Climate Act), was to enable Ireland '*to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy the end of the year 2050*'. This is referred to in the 2015 Climate Act as the 'national transition objective'.

The 2015 Climate Act made provision for a national mitigation plan (which was struck down by the Supreme Court on 31 July 2020). However, the 2021 Climate Act subsequently removed any reference to a national mitigation plan, instead referring to both the former Climate Action Plan 2019 (hereafter referred to as the 2019 CAP) (Government of Ireland 2019c) and a series of National Long-Term Climate Action Strategies.

The Climate Act Adaptation Plan, referred to as the National Climate Change Adaptation Framework (DCCAE 2018), which is required to be submitted to the Government for approval every 5 years, outlines a range of objectives to:

- Specify the national strategy for adaptation measures in different sectors which reduce the vulnerability of the state to the negative effects of climate changes that may occur; and
- Take account of any existing obligation of the State under the law of the EU or any international agreement.

The first Climate Action Plan (CAP) was the 2019 CAP and this outlined the status across key sectors including electricity, transport, public service, industry and agriculture and included broadscale measures required for each sector to achieve ambitious decarbonisation targets. An updated CAP was published in 2021 (Government of Ireland 2021a) and a subsequent update published in 2023 (i.e. CAP23) (Government of Ireland 2023).

The CAP 2023 (Government of Ireland 2022b) also detailed the required governance arrangements for implementation which includes:

- Carbon-proofing of policies;
- The establishment of carbon budgets;
- A strengthened Climate Change Advisory Council; and
- Greater accountability to the Oireachtas.

In May 2019, Ireland declared a climate and biodiversity emergency and in November 2019 the European Parliament approved a resolution declaring a climate and environment emergency in Europe. Following on from the publication of the General Scheme Bill by the Government in 2021, the 2021 Climate Act was published in July 2021 giving statutory effect to the core objectives stated within the 2019 CAP. This legislation amended s.15 of the 2015 Climate Act to provide that relevant bodies, must, in so far as is practical, perform their duties in a manner consistent with the most recent climate action plan, long-term climate action strategy, national adaptation framework and sectoral adaptation plans, as well as with the furtherance of the national climate objective, aim of reducing GHGs and adapting to climate change in the State.

In relation to climate, the Programme for Government – Our Shared Future (Government of Ireland 2020b) committed to an average 7% per annum reduction in overall GHG emissions from 2021 to 2030 (51% reduction over the decade) with an ultimate aim to achieve net zero emissions by 2050.

The 2021 Climate Act provided for the establishment of the Climate Change Advisory Council (hereafter referred to as the Advisory Council) with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations. In addition, the 2021 Climate Act states that:

> '*A carbon budget, consistent with furthering the achievement of the national climate objective, shall be proposed by the Advisory Council, finalised by the Minister and approved by the Government for the period of five years commencing on the 1 January 2021 and ending on 31 December 2025 and for each subsequent period of five years (in this Act referred to as a 'budget period')*.'

1.2.2.2 Regional Policy and Guidelines

As outlined, FCC (with Codema) developed a Climate Change Action Plan 2019 – 2024 in 2019 (FCC and Codema 2019), with considerations to International, European, and National agreements, legislation and regulations including the 2015 Climate Act, NAF (DCCAE 2018) and the NPF (Government of Ireland 2020a). Under the NAF, sectoral adaptation plans were required to be prepared and submitted to the government for approval by 30 September 2019. The implementation, monitoring and future iterations of the Fingal Climate Change Action Plan 2019 – 2024 will be consistent with approved sectoral adaptation and currently sets out goals to mitigate GHG emissions and plans to prepare for and adapt to climate change.

The Climate Change Action Plan 2019 – 2024 sets out the current and future climate change impacts and GHG emissions levels in Fingal, through the development of adaptation and mitigation baselines and examines the future impacts that climate change may have on the region, setting out the first iteration of actions that will be used to reduce the source and effect of these impacts. The Climate Change Action Plan 2019 – 2024 focuses on two key approaches required to tackle climate change, namely, mitigation, consisting of actions to reduce current and future GHG emissions and, adaptation, which consists of actions to reduce impacts already happening (and that are projected to happen in the future) from climate change. The Climate Change Action Plan 2019 – 2024 considers the particular risks to impact areas including critical infrastructure (e.g., wastewater infrastructure), which includes assets such as treatment plants and pumping stations and notes that sea level rise and flooding have the greatest future risk when both the likelihood and consequence are evaluated. This GHG emissions reduction objective was also recognised in the Fingal Development Plan 2017-2023 (FCC 2017), Two Year Progress Report in relation to Energy and Climate Change objectives (specifically Objective EN23).

Uisce Éireann is a high energy user with an annual cost estimated at €85M in 2020. In their 2015 Water Services Strategic Plan, Uisce Éireann noted that energy efficiency has not been a primary consideration in the construction and operation of water and wastewater treatment infrastructure in the past (Uisce Éireann 2015). Since the publication of the Water Services Strategic Plan, a greater focus on energy efficiency on Uisce Éireann sites has been rolled out and a dedicated sustainability team put in place. By 2020, Uisce Éireann achieved over 32% improvement in energy-efficiency performance with a corresponding saving of over 75,000 tonnes of carbon (Uisce Éireann 2020). Uisce Éireann now have a target of 50% improvement in energy-efficiency performance by 2030. Uisce Éireann produce 210,000 tonnes of CO_2 annually (not including process emissions) and they are the largest consumer of electricity in the public sector at roughly 21%; 90% of energy consumption is in the form of electricity (Uisce Éireann 2020).

1.2.3 Carbon Budgets and Sectoral Ceilings

As noted in Section 1.2.2.1, the 2021 Climate Act outlines a series of specific actions to provide for carbon budgets and sectoral emissions ceilings for different sectors of the economy. These carbon budgets are to be determined as part of a grouping of three five-year periods calculated on an economy-wide basis, starting with the periods 2021 to 2025, 2026 to 2030, and 2031 to 2035 (refer to Table 1.1). In September 2022, the Government adopted Sectoral Emissions Ceilings (Government of Ireland, Sectoral Emissions Ceilings September 2022) for each relevant sector within the limits of each carbon budget and, against which the impact of the Proposed RBSF Component is evaluated. The Sectoral Emissions Ceilings published for 2030 are outlined in Table 1.2.

Table 1.1: Carbon Reduction Required for the Next Thee 5-Yearly Periods Commencing with 2021 – 2025

Budget Period	Reduction Required (Mt CO_{2e})[1]	2018 Emissions (Mt CO_{2e})
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 budget period

Note 1: Source (Department of Taoiseach 2022)

For the Construction Phase of the Proposed RBSF Component, the relevant sector emissions ceiling which applies is the 'Industry' sector which has a 35% reduction required by 2030 and an emissions ceiling of 4Mt CO_{2e} (or 4,000kt (kilotonnes) CO_{2e}).

The sector emissions ceiling which applies to the Operational Phase of the Proposed RBSF Component is 'Other' (sub-category 'Waste'), which has a 50% reduction required by 2030 and an emissions ceiling of 1Mt CO_{2e} (or 1,000kt CO_{2e}). Within the 'Other' sector, the sub-category of 'Waste' has an emissions ceiling of 0.6Mt CO_{2e} (or 600kt CO_{2e}).Table 1.2: Sectoral Emissions Ceilings and Total Amount of Permitted GHG Emissions Per Sector to 2030 Compared to 2018 Emissions Baseline (Sectoral Emissions Ceilings, Government of Ireland 2022)

Sector	Baseline (Mt CO_{2e})	Carbon Budgets (Mt CO_{2e})		2030 Emissions (Mt CO_{2e})	Indicative Emissions % Reduction in Final Year of 2025-2030 Period (Compared to 2018)
	2018	2021-2025	2026-2030		
Transport	12	54	37	6	50
Electricity	10	40	20	3	75
Built Environment - Residential	7	29	23	4	40
Built Environment - Commercial	2	7	5	1	45
Agriculture	23	106	96	17.25	25
LULUCF[1]	5	xxx	xxx	xxx	xxx
Industry	7	30	24	4	35
Other (F-gases, waste, petroleum refining)	2	9	8	1	50
Unallocated Savings	-	7	5	-5.25	-
Total	**68**	**xxx**	**xxx**	**-**	**-**
Legally Binding Carbon Budgets and 2030 Emission Reduction Targets	**-**	**295**	**200**	**-**	**51**

Note 1: LULUCF – Land Use, Land-Use Change and Forestry

In 2021, the European Commission published the Commission Notice - Technical guidance on the climate proofing of infrastructure in the period 2021 – 2027 (hereafter referred to as the Technical Guidance on Climate) (European Commission 2021), in order to improve climate considerations in infrastructure projects by integrating climate change mitigation and adaptation measures into the development of infrastructure projects. The Technical Guidance on Climate notes that infrastructure projects need to take account of the likely significant changes in the frequency and intensity of extreme weather events which will occur due to climate change. In addition, the Technical Guidance on Climate recognises the impact that most projects will have on carbon emissions, compared to the baseline, through the project life cycle (from construction to end-of-life) and through indirect activities that occur because of the project. The Technical Guidance on Climate recognises that while a certain specific project may not have an individual net carbon reduction effect, the delivery of the project is integral to an overall plan that reduces emissions.

Ireland's first national adaptation strategy, published by the former Department of the Environment, Community and Local Government (DECLG) in December 2012, titled the National Climate Change Adaptation Framework - Building Resilience to Climate Change (hereafter referred to as the NCCAF) (DECLG 2012), was the first step in developing a national policy in Ireland to address the anticipated impacts of climate change through a structured programme of action on adaptation. This non-statutory framework was replaced in January 2018 by the NAF (DCCAE 2018). The NAF identified 12 sectors which must prepare sectoral adaptation plans including for water services infrastructure. The NAF requires that local authorities (31 county and city county councils nationally) develop long-term local climate change adaptation strategies and integrate these strategies into plans and policies that come under their remit (development plans etc.).

The government's long-term overarching 'Project Ireland 2040' strategy to build a more sustainable and resilient future aligns investment planning with stated National Strategic Objectives (Government of Ireland National Planning Framework 2018). The NPF (Government of Ireland 2020a) and Project Ireland 2040 - National Development Plan 2021 – 2030 (hereafter referred to as the NDP) (Government of Ireland 2021b) combine to form 'Project Ireland 2040'. The NPF sets the vision and strategy for national development to 2040, with the NDP providing the enabling investment to implement the strategy. The NDP includes the Proposed RBSF Component as one of the NSOs under 'Sustainable Management of Water and Other Environmental Resources'. In a Circular Economy, and under the Whole of Government Circular Economy Strategy 2022 – 2023 'Living More, Using Less' (hereafter referred to as the Circular Economy Strategy) (Government of Ireland 2021c), a national policy framework is set out to support the transition to a circular economy in which the '*inherent value of products, materials and our natural resources is maintained for as long as possible'*. The NDP states that '*while the overall focus of Government waste policy is on prevention and waste minimisation, investment in indigenous waste treatment capacity remains critical to our environmental and economic well-being*'.

The NDP sets out Sectoral Strategies (Water) including the Water Services Policy Statement 2018 – 2025 (hereafter referred to as the WSPS) (Government of Ireland 2020c) which outlines the Government's expectations for the delivery and development of water and wastewater services in the years ahead against the strategic objective themes of Quality, Conservation and Future Proofing. The WSPS sets out and prioritises the investment requirements to meet environmental obligations under the UWWTD and the WFD mandated River Basin Management Plans. The NDP includes the Proposed RBSF Component as a Strategic Investment Priority which will deliver critical outcomes for consumers and communities by continuing to prioritise investment to improve water and wastewater quality through significant capital projects and delivery of national programmes, in addition to meet changing legislative and regulatory requirements and, future economic, housing and population demands.

1.2.4 Data Collection and Collation

1.2.4.1 Baseline Data Collection

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

- FCC;
- Department of Housing, Planning and Local Government (DHPLG);
- DCCAE;
- EPA;
- SEAI;
- Intergovernmental Panel on Climate Change (IPCC); and
- IEMA.

The data and publications listed are discussed and referenced in Section 1.1.1, Section 1.2 and Section 1.3.

Predictions of GHG emissions from the Proposed RBSF Component, for both the Construction and Operational Phases, were prepared using the emission factors derived from the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2019), Civil Engineering Standard Method of Measurement 2019 (CESMM4 Revised) (Institute of Civil Engineers 2019), The Inventory of Carbon and Energy (ICE) database (BG10/2011) (BSRIA and Bath University 2011), and using the project phases and activity data set out in the British Standard institute (BSI) British Standard (BS) BS EN 15987 Sustainability of construction works (BSI 2011).

Project Activity Data forming the basis of the emissions calculations as detailed in Section 1.2.4.2, was sourced from the documents referenced in Section 1.1 and the Proposed RBSF Component Planning Drawings included in the 2018 planning application, in addition to the updated Planning Drawings which form part of the Addendum.

As noted in Section 1.2.1, the assessment of the Construction Phase embodied carbon was undertaken using a purpose-built model. A comparison of this model has been undertaken with the recently published

online TII Carbon Assessment Tool (2023) to verify that the most recent emission factors and guidance have been incorporated into the model, which has been purpose built to assess the emissions from the Proposed RBSF Component.

1.2.4.2 Impact Assessment Data Collection

Detailed data used in the assessment of traffic related emissions for the Construction and Operational Phases of the Proposed RBSF Component was sourced from Chapter 13 (Traffic) in Volume 4 Part A of the EIAR in the 2018 planning application, as supplemented by Chapter 13A (Traffic) in Volume 4A Part A of this EIAR Addendum.

In addition, the primary Greater Dublin Drainage (GDD) project team who prepared the seven other main elements of the Planning Remittal have provided data including the volumes of biosolids required to be stored within the RBSF.

1.2.5 Appraisal Method for Assessment of Impacts

The impact assessment appraisal method reported in this Section considers the total volume of carbon anticipated to be used in the construction and operation of the Proposed RBSF Component. The IEMA GHG Guidance (IEMA 2022) states that the crux of significance regarding impact on climate is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050. This is also reiterated within 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).

The assessment aims to quantify the difference in GHG emissions between the Proposed RBSF Component and the baseline scenario (the alternative project / solution in place of the Proposed RBSF Component). This is done by calculating the difference in whole life net GHG emissions between the two options. The IEMA GHG Guidance does not recommend a particular approach for this due to variations of situations, but instead, it sets out advice for the key common components necessary for undertaking a GHG emissions assessment. During the assessment, IEMA recommend the use of a reasonable worst-case scenario rather than an absolute worst-case scenario. This approach is also recommended by TII in PE-ENV-01104 (TII, 2022a). The IEMA GHG Guidance states that GHG emissions assessment should incorporate the six steps (detailed in Section 1.2) into any climate assessment.

The method used to calculate the GHG emissions (or removal value) associated with the Proposed RBSF Component, in accordance with IEMA GHG Guidance, is as follows:

GHG emission factor x Activity data = GHG emission or removal

Activities that do not significantly change the result of the assessment can be excluded, where expected emissions are less than 1% of total emissions, and where all such exclusions should be clearly stated and total a maximum of 5% of total emissions as per the IEMA GHG Guidance.

Mitigation has taken a leading role within the IEMA GHG Guidance compared to the previous edition published in 2017 (2017 IEMA guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance). Early engagement is key and therefore the mitigation measures which were considered from the outset of the Proposed RBSF Component (and to be continued throughout the Proposed RBSF Component's lifetime in order to maximise GHG emissions savings) are detailed in Section 1.5.

When considering the cumulative assessment, all global cumulative GHG sources are relevant to the effect on climate change and the assessment approach is outlined in Section 1.2.1.

The specific appraisal methods utilised in order to complete the assessment in accordance with the IEMA GHG Guidance are detailed in Section 1.2.5.1 and Section 1.2.5.2. In addition to the IEMA GHG Guidance, the Guidance from 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), Transport Infrastructure Ireland (TII) PE-ENV-01105: Climate Assessment Standard for Proposed National Roads (TII, 2022b) and United Kingdom Highway Agency (UKHA) Design Manual for Roads and Bridges (DMRB) - LA 114 Climate (hereafter referred to as LA114 Climate) (UKHA 2019) were consulted and this outlines a recommended approach for determining the significance of both the Construction and Operational Phase carbon effects for a large (road, greenway or) infrastructure project. Using this approach, the proposed methodology considers the overall volume of emissions (from all of the different sources of emissions set out) for the Construction Phase and the Operational Phase and provides an overall determination on whether that would be a significant effect. While the Proposed RBSF Component is not a highways project, the methodology for assessment of impacts is relevant. The assessment is broken down into stages (construction and operational) and individual assessment techniques for each of these stages are conducted in the same manner as for highways, rail, housing or commercial projects and developments.

The approach is based on comparing the current baseline scenario and the net project GHG emissions to the relevant carbon budgets. The sectoral carbon budgets which were published in July 2022 are detailed in Table 1.2.1 and Table 1.2.2 in Section 1.2.3, with an overall target of 51% reduction by 2030 and can be used for impact assessment alongside Ireland's non-ETS 2030 emissions target. A detailed discussion of the input data and appraisal methodology for both the Construction and Operational Phases is detailed in Section 1.2.5.1 and Section 1.2.5.2.

The GHG systems boundary for assessment and life cycle stages scoped in are discussed in the Section 1.3 and Section 1.4. At a high level, they include pre-construction, products utilised in construction, the construction activities, maintenance of materials during the design life of the Proposed RBSF Component, and the use of, or Operational Phase. Given the extent of the Operational Phase, LA 114 Climate states that decommissioning should be excluded from the boundary of the climate assessment. This approach is replicated in the Transport Infrastructure Ireland (TII 2022) Climate Guidance for National Roads, Light Rail, and Rural Cycleways (Offline & Greenways) – Overarching Technical Documents) (hereafter referred to as the TII Climate Guidance) (TII 2022), where it is noted that the temporal boundary of the assessment should be appropriate to the type of infrastructure being developed. In the case of the Proposed RBSF Component, the expected design life in accordance with the IS EN 1990 Basis of structural design (Eurocode) is 50 years.

1.2.5.1 Construction Phase Appraisal Method

Embodied Emissions During the Construction Phase

Section 3.13 of LA114 Climate (UKHA 2019) recommends that, when calculating GHG emissions for a project's life cycle, '*an industry recognised carbon calculation tool(s)*' should be used. The embodied construction emissions for the Proposed RBSF Component were calculated using the purpose-built model described in Section 1.2.1 and compared to the format of the online TII Carbon Tool (TII 2023). Both the purpose-built model and the TII Carbon Tool use emission factors from recognised sources including the Carbon and Price Book database (CESSM 2013). In addition, emission factors relevant to the assessment of wastewater treatment infrastructure was included, namely, the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2019), CESMM4 Revised (Institute of Civil Engineers 2019), The Inventory of Carbon and Energy (ICE) database (BG10/2011) (BSRIA and Bath University 2011) and using the project phases and activity data set out in BS EN 15987 Sustainability of construction works (BSI 2011). The carbon emissions are calculated by multiplying the emission factor by the quantity of the material that will be used over the entire construction / maintenance phase as detailed in Section 1.2.5. It should be noted that the online TII Carbon Tool (TII 2023) has been commissioned by TII to assess GHG emissions associated with infrastructure projects using Ireland-specific emission factors and data, and which have been adopted for the assessment of the Proposed RBSF Component emissions.

The assessment commences with 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 RBSF Component (based on the engineering design schedule of materials and quantities), the emissions during the Construction Phase activities and emissions related to waste generated during the Construction Phase.

The Construction Phase of the Proposed RBSF Component will result in GHG emissions from various sources, as detailed in Table 1.3. Embodied carbon refers to GHGs emitted during the manufacture, transport, construction and installation of building materials and equipment. As part of the Proposed RBSF Component, Construction Phase embodied GHG emissions are assessed under the following headings:

- Land Use Change;
- Manufacture of materials and transport to site;
- Construction and installation works (including excavations, construction, water usage, personnel travel); and
- Construction waste material including off site transport.

Detailed information for the Proposed RBSF Component including predicted construction material volumes were provided by the design team for the Proposed RBSF Component. The infrastructure associated with the Proposed RBSF Component is expected to have a construction period of approximately 18 months (amended from 12 months in the EIAR in the 2018 planning application) and an expected design life of 50 years. This increase in construction programme duration can be attributed to progression of the project design and changes to the market that have occurred since the 2018 planning application.

Standard maintenance required during the operation of the Proposed RBSF Component is considered. Given the extent of the Operational Phase (50 years), decommissioning should be excluded from the climate assessment based on references previously cited.

Table 1.3: Sources and Life Cycle Stages for the Proposed RBSF Components Potential GHG Emissions

Emission Stage	Lifecycle Sub-Stage	Potential Sources of Emissions (Not Exhaustive)
Construction Phase	Material (Product) Embodied Emissions: including raw material supply and manufacture	• Concrete (of various compositions / grades) • Steel (of various compositions/grades/finishes) and •
	Transportation to Site Emissions	Transportation of construction materials to and from site including laden and unladen Heavy Goods Vehicle (HGV) movements.
	Construction Activity Emissions	• Plant machinery operation in the installation of the proposed asset. • Excavation and disposal of excavated material. • Aggregate backfilling and emissions associated with the quantity of backfill. • Laying of hardstanding areas (e.g., footpaths and road areas).
	Land Use Change	Emissions mobilised from vegetation or soil loss during construction
Operational (Use-Phase)	Fugitive Emissions	Emissions associated with the use / operation of the proposed treatment assets, and in the case of biosolids storage (e.g., N_2O, CH_4, emissions) and associated and fugitive emissions.
	Maintenance and Repair Emissions	Emissions associated with expected regular maintenance and repair activities and covers the materials, energy and / or chemicals used in ongoing and regular maintenance and repair activities.
	Capital Replacement Emissions	Emissions associated with regular replacement of assets / components
	Energy Emissions	Emissions associated with the operational energy requirements of proposed process and operation hours (fuel / electricity consumption).
Opportunities for Reduction	GHG emissions potential of recovery including reuse and recycling GHG emissions potential of benefits and loads of additional functions associated with the study system.	Reuse of biosolid product for land spreading in agriculture Use of renewables for energy demand Covering of biosolids during storage

Traffic Data During the Construction Phase

The use of heavy goods vehicles (HGVs) and traffic related to transportation to site during Construction Phase activities, as set out in Table 1.3, is expected to be a source of emissions at and near the Proposed RBSF Component site, with the emissions of CO_2 as the principle GHG of concern.

Due to the scale of the Proposed RBSF Component, traffic modelling was undertaken to determine the projections of HGV traffic generated during the Construction Phase as part of the EIAR in the 2018 planning application (refer to Chapter 13 (Traffic) in Volume 4 Part A of the EIAR in the 2018 planning application, as supplemented by Chapter 13A (Traffic) in Volume 4A Part A of this EIAR Addendum, for detailed methodology and definition of scope of assessment) and based on the likely number of deliveries of construction materials, the removal of waste materials from the Proposed RBSF Component and the arrival and departure of workers and staff.

The change in GHG emissions due to the Construction Phase traffic impacts of the Proposed RBSF Component have been assessed based on emissions derived using the United Kingdom (UK) Government Greenhouse gas reporting: conversion factors 2022 (UK Government 2022) and Developing CO_2 Baselines

– A Step-by-Step Guide for Your Local Authority (Codema 2017). The emission factors used to convert traffic-related energy use to CO_2 emissions are based on typical fuel types used for Irish infrastructure construction projects.

Land Use Changes

The land use change associated with the Construction Phase of the Proposed RBSF Component has also been assessed using the approach outlined in Table 1.3. Trees are a natural carbon sink and absorb CO_2 from the atmosphere helping in the reduction of climate change. Any felling of trees has the potential to result in a loss of this carbon sink thus increasing the levels of CO_2 in the atmosphere. In contrast, increased planting of trees on suitable lands will, over time, help to increase the carbon sink potential of the land and benefit climate. The change in land use associated with the Proposed RBSF Component, including felling and planting of trees and vegetation, has been assessed using the methodology outlined in the IPCC 'Guidelines on National GHG Inventories – Chapter 4: Forest Land' (IPCC 2006) and as supplemented by the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2019).

1.2.5.2 Operational Phase Appraisal Method

The most significant potential sources of GHG emissions for the Operational Phase of the Proposed RBSF Component are related to emissions of CO_2 associated with electricity power demand of the proposed RBSF.

In addition to electricity-related emissions, there is also the potential for fugitive process emissions of N_2O from the proposed storage of biosolids.

There is also the potential for road traffic related emissions associated with the Operational Phase of the Proposed RBSF Component, including from the delivery of consumables and the import of biosolids to the site, the removal of solids residuals for further use, and workers accessing the site. Standard maintenance and repair and capital replacement required over the Operational Phase have also been considered as part of the Operational Phase emissions.

Operational Phase Power Requirements

The CO_2 (which is a GHG) generated due to the electricity power demand of the proposed proposed RBSF, can be calculated using the carbon intensity of the fuel mix used in the generation of electricity nationally. 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 will 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. The Energy in Ireland 2021 Report (SEAI 2021) states that the carbon intensity of electricity was 296gCO_2/kWh (grams of carbon dioxide per kilowatt hour) in 2020 which was based on 36.5% of the national grid electricity being generated from renewable sources. The 2021 CAP originally set a national target of up to 80% of electricity demand by renewables by 2030 for the national grid which is considered in this assessment in determining the GHG emissions and resulting impact from the Operational Phase of the Proposed RBSF Component. It is anticipated that by 2030 the carbon intensity of the national grid electricity will be 66gCO_2/kWh (Statement by CEO Electricity Supply Board 2022). In addition, the current projections presented see the energy supply reaching 0gCO_2/kWh by 2036. This would significantly further reduce the carbon intensity of the operation of the Proposed RBSF Component.

The GHG emissions due to the operational power requirements can be compared against the waste sector's carbon budget, the details of which are referred to in Section 1.2.3.

Operational Phase Process Emissions

The Operational Phase accounts for emissions associated with the use / operation of the proposed biosolids storage. For the purposes of this assessment, the emissions from the biosolids in storage have been quantified based on current IPCC factors for nitrous oxide (N_2O) and methane (CH_4) global warming potentials (GWP). The assessment includes emissions from wastewater sludge generated at the Proposed Project and Ringsend WwTP.

The rate of N_2O and CH_4 emitted due to biosolids storage is taken from Table 2 of the document entitled *"Sewage sludge as fertiliser – environmental assessment of storage and land application options"* (Willén et al 2017). This provides an emission factor for dewatered biosolids storage during the Autumn-Spring period as shown in Table 1.4. Adopting a conservative (worst-case) approach, therefore, the emission factor for CO_2eq emitted as fugitive emissions from the biosolids will be considered to be the rate for emissions without a cover of 88.3 Total CO_2eq per Mg. This factor is multiplied by the rate of biosolids to RBSF annually. The rate of biosolids to the RBSF annually is a factor of the requirement for storage from the Ringsend WWTP sludge production and the existing storage facility max capacity. The projected biosolids load is 2,375 tDS/yr.

Table 1.4: Operational Phase Process Emissions

Storage Autumn-Spring	N_20 (kg Mg^{-1} SS)	CH_4 (kg Mg^{-1} SS)
Emission without a cover	0.26	0.40
Emission with a cover	0.03	0.40
Emission with a cover and ammonia treatment	0.00	0.24

Storage Autumn-Spring	N_20 as CO_2eq (kg Mg^{-1} SS)	CH_4 as CO_2eq (kg Mg^{-1} SS)	Total CO_2eq per dewatered tonne sludge
Emission without a cover	78.37	9.95	88.32
Emission with a cover	8.85	10.03	18.88
Emission with a cover and ammonia treatment	0.00	6.08	6.08

Emissions associated with transportation of the digested dewatered sludge (both indigenous and imported) to the proposed RBSF have been included in the emissions assessment.

The system boundary (refer to Section 1.2.1.1) applied for quantifying emissions associated with biosolids does not extend beyond the RBSF for further use.

Traffic Emissions During Operation

Estimates of the amount of HGV traffic to be generated during the Operational Phase of the Proposed RBSF Component were based on the likely quantities of waste materials that will be removed from the site, and the quantity of consumables (e.g. spares) that will be delivered to the proposed RBSF site, in addition to the arrival and departure of workers and staff. Projections of traffic generated during the Operational Phase were completed in Chapter 13 (Traffic) in Volume 4 Part A of the EIAR in the 2018 planning application, as supplemented by Chapter 13A (Traffic) in Volume 4A Part A of this EIAR Addendum; and are considered within the traffic emissions during the Operational Phase.

1.2.6 Impact Assessment Criteria

1.2.6.1 Construction and Operational Phase Significance Criteria

An assessment is not solely based on whether a project emits GHG emissions alone, but how it makes a relative contribution towards achieving a science based 1.5°C aligned transition towards net zero (IEMA 2022). This updated assessment considers the significance of the predicted GHG emissions from the Proposed RBSF Component, the extent to which the emissions align with Ireland's GHG trajectory to net zero by 2050.

The Transport Infrastructure Ireland (TII) guidance document entitled PE-ENV-01104 Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document (TII, 2022a) outlines a recommended approach for determining the significance of both the construction and operational phases of a development. While this project is not a roads project, the broad approach set out in PE-ENV-01104 is appliable. The approach is based on comparing the 'Do Something' scenario and the net project GHG emissions (i.e. Do Something – Do Minimum) to the relevant carbon budgets (Department of the Taoiseach, 2022). With the publication of the Climate Action Act in 2021, sectoral carbon budgets have been published for comparison with the Net CO_2 project GHG emissions from the proposed development.

Following the publication of the 2021 Climate Act (July 2021), sectoral carbon budgets were published by the Government of Ireland in July 2022 and are used for comparison with the net CO_2 GHG emissions from the Proposed RBSF Component in this assessment. In the case of the Proposed RBSF Component, the

GHG emissions from the Construction Phase will be compared to the 'Industry' sector carbon budget and GHG emissions from the Operational Phase will be compared to the 'Other (Waste)' sector carbon budget as detailed in Section 1.2.3.

When considering the aspect of significance, there are three overarching principles which are particularly relevant in the IEMA Principles Series: Climate Change Mitigation & EIA (IEMA 2010):

- The GHG emissions from all projects will contribute to climate change, the largest interrelated cumulative environmental effect;
- The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the EIA Directive (e.g., human health, biodiversity, water, land use, air quality); and
- GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, and as such, any GHG emissions or reductions from a project might be considered to be significant. The environmental limit is the national global GHG emission budget that defines a level of dangerous climate change, and any GHG emission that contributes to exceedance of that budget or threatens efforts to stay within it can be considered as significant.

The IEMA GHG Guidance (IEMA 2022) document builds on those principles with three points:

- 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; and
- Where GHG emissions remain significant, but cannot be further reduced, approaches to compensate the project's remaining emissions should be considered.

The criteria for determining the significance of effects in this assessment consider the IEMA GHG Guidance which ensures consistency with the terminology contained with Figure 3.4 of the updated EPA Guidelines (EPA 2022). The IEMA criteria for determining the significance of effects involves a two-stage process that defines the magnitude of the impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further below.

Following the Irish Government's declaration of a climate and biodiversity emergency in May 2019 and considering that Ireland is currently failing to meet its binding targets under the GHG Regulation, consideration regarding the **sensitivity** of the receptor is based on the approach recommended in the IEMA GHG Guidance. This approach states that the assessment of the cumulative effects of GHG emissions differs from that for other environmental topics (e.g., odour emissions or dust), as GHG emission impacts and the resulting effects cannot be evaluated within a geographically bounded study area. All global cumulative GHG sources are relevant to the effect on climate change, and this is considered when defining the receptor (i.e., the receptor is the atmospheric concentration of GHGs, which is considered to be of 'high' sensitivity to further emissions given the severe consequences of global climate change and the cumulative contributions of all GHG emission sources). Effects of GHG emissions from specific cumulative projects in the RBSF are therefore not individually assessed in this Appendix.

In relation to climate, there is no project specific assessment criteria, but the Proposed RBSF Component will be assessed against the recommended IEMA GHG Guidance significance determination. This takes account of any embedded or committed mitigation measures that form part of the design. The levels of significance considered are:

- **Major or Moderate Adverse Impact (Significant):** A project that follows a 'business-as-usual' or 'Do Minimum' approach and is not compatible with the net zero trajectory by 2050 (i.e., when anthropogenic emissions of GHGs to the atmosphere are balanced by anthropogenic removals over a specified period) or a sectoral based transition to net zero targets, would result in a significant adverse effect. This assessment differentiates between the 'level' of significant adverse effects (e.g., 'moderate' or 'major' adverse effects) and considers the need for the Proposed RBSF Component in the context of meeting

broader sustainability and environmental objectives (e.g., providing resilience, and compliance with the UWWTD). A project's impact can shift from significant adverse to non-significant effects by incorporating mitigation measures that substantially improve on 'business-as-usual' and meet or exceed the science-based emissions trajectory of ongoing but declining emissions towards net zero. Meeting the minimum standards set through existing policy or regulation cannot necessarily be taken as evidence of avoiding a significant adverse effect. This is particularly true where policy lags behind the necessary levels of GHG emission reductions for a science based 1.5°C compatible trajectory towards net zero;

- **Minor Adverse Impact (Not Significant):** 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, would have a minor adverse effect that is not significant. The project 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 (i.e., when anthropogenic emissions of GHGs to the atmosphere are balanced by anthropogenic removals over a specified period irrespective of the time period or magnitude of offsets required), 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;
- **Negligible Impact (Not Significant):** A project that achieves emissions' mitigation that substantially surpass the reduction trajectory, or substantially surpass existing and emerging policy that is compatible with that trajectory, and has minimal residual emissions, is assessed as having a negligible effect that is not significant. It should be noted that these impacts will be reported as *Neutral* within this document; and
- **Beneficial Impact (Significant):** A project that causes GHG emissions to be avoided or removed from the atmosphere has a beneficial effect that is significant. Only projects that actively reverse (rather than only reduce) the risk of severe climate change can be judged as having a beneficial effect.

The criteria for determining the significance of effects in this assessment are set out in TII's recent Climate Guidance document PE-ENV-01104 (TII, 2022a) which ensures consistency with the terminology contained with Figure 3.4 of the updated EPA Guidelines (EPA 2022a). The significance of GHG effects set out in PE-ENV-01104 (TII, 2022a) is based on IEMA guidance (IEMA, 2022) which is consistent with the terminology contained within Figure 3.4 of the EPA's (2022) 'Guidelines on the information to be contained in Environmental Impact Assessment Reports'. TII (TII 2022a) states that professional judgement must be taken into account when contextualising and assessing the significance of a project's GHG impact. In line with IEMA Guidance (IEMA, 2022), TII state 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".

Significance is determined using the criteria outlined in Table 1.5 (derived from Table 6.7 of PE-ENV-01104 (TII, 2022a)) along with 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; and
- The level of mitigation taking place.

Table 1.5: TII GHGA Significance Criteria

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; and 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, and have not fully complied with local or national policies; and 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; and 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; and 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 atmosphere GHG concentration. The project has gone well beyond existing and emerging policy requirements; and Well 'ahead of the curve' for Ireland's trajectory towards net zero, provides a positive climate impact.

As further context to this approach to significance, it is recognised that there are many activities and sectors which are contributing to net GHG emissions in Ireland. Large industrial and power GHG emissions are captured in the context of the EU-wide ETS, which has set defined targets that are being met due to the structure of the Cap-and-Trade mechanism, which allows the price of carbon to rise to ensure that GHG emissions are reduced at least cost. Most other activities such as agriculture, transport, built environment, waste and smaller industry, however, are subject to the GHG Regulation which has set a specific target for Ireland of a 30% reduction in GHG emissions by 2030.

As noted in Section 1.2.3 (and as recommended in the TII Climate Guidance (TII 2022)), the assessment must use sectoral, local, or national carbon budgets to contextualise the Proposed RBSF Component's GHG impact. Ireland's national and sectoral carbon budgets are used in this assessment to contextualise the magnitude of GHG emissions from the Proposed RBSF Component for both the Construction and Operational Phases, in order to demonstrate the level of impact of additional GHG emissions on Ireland's ability to meet its reduction targets.

At this stage of the Proposed RBSF Component, it should be noted that the origin of all products and materials to be procured is not known. It has been assumed, therefore, that the emissions arising from materials assessed may potentially contribute to Ireland's carbon budget thereby representing a conservative approach, which is reflected within the limitations of the assessment.

1.3 Baseline Environment

1.3.1 Climate Pollutants

Climate is defined as the average weather over a period of time, whilst 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 GHGs, have impacted on the climate (IPCC 2022). The release of anthropogenic 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 the past number of decades. The release of CO_2, as a result of burning fossil fuels, has been one of the leading factors in the creation of this 'Greenhouse Effect'.

GHGs have different efficiencies in retaining solar energy in the atmosphere and different lifetimes in the atmosphere. To compare different GHGs, emissions are calculated on the basis of their Global Warming Potential (GWPs) over a 100-year period, giving a measure of their relative heating effect in the atmosphere. The IPCC Sixth Assessment Report (AR6) (IPCC 2021) sets out the global warming potential for a 100-year time period (GWP100) for CO_2 as the basic unit (GWP = 1), whereas methane gas (CH_4) has a global warming potential equivalent to 25 units of CO_2, and N_2O has a GWP100 of 298.

For the purposes of this assessment, the definition outlined in Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 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', GHGs are defined as CO_2, CH_4 and N_2O. Emissions quantities for each of these GHGs are normalised to calculate the total GHG emissions and are reported as a CO_2 'equivalent' (or CO_2e) based on the applicable GWP multiplier outlined above.

In Ireland's National Inventory Report 2023 – Greenhouse Gas Emissions 1990-2022 (hereafter referred to as the 2023 EPA GHG Inventory) (EPA 2023), the total emissions of GHG in Ireland for 2022 (without LULUCF) were reported as 60,764kt CO_2e.

In 2022 CO_2 accounted for 60.4% of total GHG emissions, while CH_4 and N_2O accounted for 29.0% and 9.4%, respectively. The main source of CH_4 and N_2O in Ireland is from the agricultural sector with 'waste' accounting for 2.0% of the overall total N_2O emissions and 4.1% of the overall total CH_4 (EPA 2023). In relation to emissions from wastewater treatment and discharge (category 5.D), Section 7.5 of the 2023 EPA GHG Inventory states that:

> *'the IPCC Level 3 emission source categories relevant under 5.D Wastewater Treatment and Discharge in 2021 are 5.D.1 Domestic Wastewater (CH_4) and (N_2O). Total CH_4 and N_2O emissions from these activities amounted to 156.0 kt CO_2e in 2021'.*

1.3.2 Existing GHG Emissions Baseline

The IEMA GHG Guidance (IEMA 2022) identifies baseline emissions as the existing and future emissions within the assessment boundary without construction and operation of the project. A baseline climate scenario should identify, consistent with the study area for the project, GHG emissions without the project for both the current and future baseline.

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 GHG 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 is considered a highly sensitive environment for the assessment of impacts.

In relation to the Effort Sharing Decision, the ESR Regulation (Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013), and amending regulation (26/04/2023 - Regulation (EU) 2023/857 - Amending Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030) sets out binding annual GHG emission targets for Member States for the period 2021 to 2030 to achieve a 30% reduction in GHG emissions (compared to 2005 levels) by 2030 for Ireland. This will be Ireland's contribution to the EU objective to reduce EU emissions by 40% by 2030 compared to 1990 levels (DECC 2021).

According to projections from the EPA in relation to Ireland's Greenhouse Gas Emissions Projections 2022 – 2040 (EPA 2023) Ireland has exceeded its 2022 annual limit set under EU's Effort Sharing Decision (Decision No. 406/2009/EC on the effort of member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020) by 3.72 million tonnes CO_2eq (Mt CO_2e). These annual limits have been reduced further from 2023 onwards as Ireland's Effort Sharing commitment increased from a 30% reduction on the 2005 level by 2030 to a 42% reduction. For 2022, the total national emissions were 60.764Mt CO_2e (excluding LULUCF), as shown in Table 1.6. This represents a 1.9% increase compared to 2021 figures. The sector with the highest emissions is agriculture at 34% of the total, followed by transport at 17%. GHG emissions from the 'Waste' sector increased by 4.9% in 2022 (0.867Mt CO_2e).

Table 1.6: Total National GHG Sectoral Emissions in 2021 and 2022 and Percentage Change

Mt CO_2e[1]	2021	2022	% Total 2022 (including LULUCF)	% Change from 2021 to 2022
Agriculture	23.626	23.337	34%	-2.1
Transport	10.978	11.634	17%	6.0
Energy Industries	10.262	10.076	15%	-1.8
Residential	6.992	6.105	9%	-12.7
Manufacturing Combustion	4.614	4.288	6%	-7.1
Industrial Processes	2.475	2.289	3%	-7.5
F-Gases	0.745	0.741	1%	-0.5
Commercial Services	0.765	0.767	1%	0.2
Public Services	0.672	0.659	1%	-1.9
Waste Note 2	0.726	0.867	1%	4.9
LULUFC	7.338	7.305	11%	-0.5
National total excluding LULUFC	61.955	60.764	89%	-1.9
National total including LULUFC	62.293	68.069	100%	-1.8

Note 1: Reproduced from Latest emissions data on the EPA website (EPA 2023)

Note 2: Waste includes emissions from solid waste disposal on land, solid waste treatment (composting and anaerobic digestion), wastewater treatment, waste incineration and open burning of waste

The 2023 EPA GHG Inventory (EPA 2023) reported, under IPCC Level 3 emission source category '*5.D Emissions from Wastewater Treatment and Discharge*', that total CH_4 and N_2O emissions from these activities amounted to 156 kt CO_2e in 2021 (it should be noted that CO_2 emissions from wastewater were not considered in the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2019) because these are of biogenic origin and should not be included in national total emissions).

1.4 Potential Impacts

In the context of the Proposed RBSF Component, the potential impact on climate change related emissions on the surrounding environment must be considered for each of two distinct phases:

- Construction Phase; and
- Operational Phase.

During the Construction Phase, the potential impacts on climate emissions are considered with respect to the embodied carbon used for the construction of the Proposed RBSF Component. This impact has been assessed using a purpose-built model to calculate emissions from a wastewater and sludge treatment facility and is based on the online TII Carbon Assessment Tool (TII 2023), as outlined in Section 1.2.4.2. In addition, the impact of GHG emissions due to Construction Phase traffic movements on the climate have been included in the model.

For both the Construction and Operational Phases, the following impact scenarios have been assessed:

- **Do Nothing** (DN) – In this scenario the Proposed RBSF Component is not constructed;
- **Do Something, Scenario A** – In this scenario, both the unmitigated and mitigated GHG emissions associated with the Proposed RBSF Component are quantitatively assessed, including all elements detailed in Section 4.11 (Description of the Proposed Regional Biosolids Storage Facility) in Chapter 4 (Description of the Proposed Project) in Volume 2 Part A of the EIAR in the 2018 planning application, as supplemented by Section 4.11 (Description of the Proposed Regional Biosolids Storage Facility) in Chapter 4A (Description of the Proposed Regional Biosolids Storage Facility) in Volume 2A Part A of this EIAR Addendum, and considering the study area and boundary detailed in Section 1.2.1; and
- **Do Something, Scenario B** – In this scenario the GHG emissions associated with a number of the reasonable alternatives considered is qualitatively evaluated in comparison to the Proposed RBSF Component, incorporating the committed mitigation measures.

1.4.1 Construction Phase

1.4.1.1 Do nothing

Without the construction of the Proposed RBSF Component, the GHG emissions associated with the Construction Phase of the Proposed RBSF Component would not occur and the GHG emissions experienced within the study area would remain largely unchanged. It is noteworthy that, while GHG emissions will not occur within the study area if the Proposed RBSF Component is not constructed, GHG emissions will still occur somewhere because biosolids storage infrastructure must be provided to cater for existing and future wastewater treatment requirements, in accordance the Urban Wastewater Treatment Directive (UWWTD).

1.4.1.2 Do Something (Proposed RBSF Component)

During the Construction Phase of the Proposed RBSF Component, works will be undertaken to construct and install infrastructure. The construction activities and phasing for the Construction Phase of the Proposed RBSF Component are described in greater detail in both the Outline CEMP and the Engineering Design Report submitted in the 2018 planning application, as supplemented by the Outline CEMP Addendum and Engineering Design Report Addendum in this remittal application. While the total Construction Phase period will be approximately 18 months (amended from 12 months in the EIAR in the 2018 planning application) period to the final Operational Phase, individual activities will have shorter durations. The programme detailed in the Outline CEMP identifies the estimated duration of works at each sub-section. Works are envisaged to proceed concurrently on multiple work-fronts to minimise the overall construction duration.

The Construction Phase construction activities will predominately involve site clearance, earthworks and excavation, transportation of materials to and from site, construction of temporary construction compounds, trenching, horizontal directional drilling, construction of access and internal roads, foundation laying, reinforced concrete works, erection of structural frames, buildings, and tanks.

During the Construction Phase, all of these activities will have the potential to generate GHG emissions on-site.

Construction Phase Carbon Calculations

To quantify the Construction Phase embodied carbon for the Proposed RBSF Component, a purpose-built model was created (refer to Section 1.2.1), including Ireland-specific emission factors and data, where available.

In the purpose-built carbon assessment model, embodied carbon for the Construction Phase has been assessed based on project life cycle stages identified in BS EN 15978 Sustainability of Construction Works (BSI 2011) and the construction activities associated with each stage. Detailed project information, including tonnage of material, excavation volumes, maintenance and repair requirements, was used in the assessment of embodied carbon.

The Proposed RBSF Component is estimated to result in total Construction Phase CO_2e emissions of 2.97 kt embodied carbon over an estimated 18-month period, equivalent to an annualised total of 1.94 kt CO_2e. As shown in

, the assessment indicates that the key stages for GHG emissions generation are associated with the embodied carbon of the construction materials which account for 95.9 % of all carbon emissions for the Construction Phase. Construction activities and transportation to (and from) site are expected to account for almost 0.6 % of Construction Phase emissions.

Table 1.7: Construction Phase t CO_2e Emissions for the Proposed RBSF Component

Construction Phase – Stage Description	Construction Phase – Stage BS EN 15978:2011 Reference)	kt CO_2e / Total	kt CO_2e – Annualised for 18 Months	% of Total
Embodied Carbon Product Stage	A1 – A3	2.80	1.86	95.9%
Construction Transportation	A4	0.02	0.01	0.6%
Construction Activities	A5	0.10	0.07	3.4%
Maintenance and Repair Allowance[NOTE1]	B2 – B3	0.06	0.00	0.1%
Total	**-**	**2.97**	**1.94**	100%

Note 1: Includes annualised maintenance and repair allowance 2% of B2 – B3 in carbon assessment calculations

The predicted annualised embodied carbon emissions averaged over the full Construction Phase were directly compared with Ireland's annual emissions budgets and targets, namely:

- Total national GHG emissions in Ireland for 2022 (68.069kt CO_2e (EPA Ireland's Latest Emissions Data updated April 2023)) (refer to Section 1.3.2); and
- Ireland's non-ETS 2030 target of 33,381kt CO_2e (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 2018/842 of the European Parliament and of the Council) (refer to Section 1.3).

Construction Phase Traffic

As noted in Section 1.2.5.1, due to the scale of the Proposed RBSF Component, traffic modelling was undertaken to determine the projections of construction traffic generated during the Construction Phase as part of the EIAR in the 2018 planning application (refer to Chapter 13 (Traffic) in Volume 4 Part A of the EIAR in the 2018 planning application, as supplemented by Chapter 13A (Traffic) in Volume 4A Part A of this EIAR Addendum, for detailed methodology and definition of scope of assessment).

For the carbon assessment, the emission factors used to convert traffic-related energy use for the Construction Phase to CO_2 emissions are based on typical fuel types used for Irish infrastructure construction projects and have been assessed based on emission factors derived using both the Greenhouse gas reporting: conversion factors 2023 (UK Government 2023) and Developing CO_2 Baselines – A Step-by-Step Guide for Your Local Authority (Codema 2017).

GHG emissions associated with expected HGV movements (principally CO_2 from fuel combustion) required to transport the materials extracted and delivered to site(s) are included within the Embodied Carbon (A1 – A3 Life Cycle Stages) assessment. In addition, GHG emissions associated with passenger cars journeys for construction staff travelling to and from construction sites over the entire Construction Phase period, are also included in the carbon assessment.

Passenger car emission estimates are based on predictions of the total number of two-way vehicle movements over the period as a worst-case scenario, as detailed in Chapter 13 (Traffic) in Volume 4 Part A of the EIAR in the 2018 planning application, as supplemented by Chapter 13A (Traffic) in Volume 4A Part A of this EIAR Addendum,. This assumes the use of an average sized diesel car, therefore representing

a highly conservative worst-case scenario. The unmitigated GHG emissions associated with passenger vehicle movements annualised for the Construction Phase are estimated at 0.02 kt CO_2e per year.

1.4.1.3 Land Use Change

For the Proposed RBSF Component, the land take will predominantly be from agricultural land to facilitate the installation of the RPBF. 2010/335/: Commission Decision of 10 June 2010 on guidelines for the calculation of land carbon stocks for the purpose of Annex V to Directive 2009/28/EC state that the carbon sequestration value for agriculture land (or crop land) is zero tonnes of carbon per hectare (a value which is also used in the TII Carbon Assessment Tool (TII 2023), for land principally occupied by agriculture. As the carbon sequestration value for agricultural land is zero, the land take required is not considered to impact carbon sequestration. Overall, there will be a Negligible impact on carbon sequestration as a result of the Construction Phase of the Proposed RBSF Component leading to a Not Significant impact on climate.

1.4.1.4 Contextualisation of Construction Phase Emissions

Compatibility with National GHG Emissions and Non-ETS Targets

As calculated using the purpose-built carbon assessment model, the Proposed RBSF Component will result in total Construction Phase GHG emissions of 2.97kt CO_2e over an 18-month period, equivalent to an annualised total of 1.94kt CO_2e, or 0.0058% of Ireland's non-ETS 2030 target or 0.0029% of the national GHG emissions (in 2022). Over the predicted 50-year design life the annualised emissions due to the initial Construction Phase and ongoing maintenance of the Proposed RBSF Component will reach at most 0.0002 % of Ireland's non-ETS 2030 emissions target.

Compatibility with Sectorial Budgets

In 2022, the Irish Government introduced a 2030 'Industry' sector carbon budget emissions cap of 24Mt CO_2e which has been determined as being compatible with net zero and international climate commitments. The 24Mt CO_2e carbon budget for the five-year period between 2026 and 2030 aligns with the Construction Phase of the Proposed RBSF Component, which equates to an emission ceiling of 4.8Mt CO_2e per year (or 4,800kt CO_2e per year). The percentage contribution of the annualised carbon emissions from the Proposed RBSF Component is estimated to be 0.040% of Ireland's 2030 'Industry' sector carbon budget.

1.4.1.5 Do Something (Alternatives Considered)

In accordance with the UWWTD, wastewater treatment infrastructure must be provided to cater for both current and projected future demand, GHG emissions will occur as a result of the Construction Phase activities required to construct the assets. For each of the alternative scenarios considered, the materials and activities necessary to construct the infrastructure would be the same but would differ principally in the location where the assets are constructed. Therefore, a comparison of the GHG emissions from the Proposed RBSF Component relative to the alternative solutions is considered to be the same with no quantifiable difference in the GHG emissions from the various configurations.

1.4.1.6 Summary of Construction Phase Potential Impacts

Based on the current design details, the sum of the total Construction Phase related unmitigated GHG emissions, including future maintenance, is 1.94kt CO_2e. Over the predicted 50-year design life, the annualised emissions due to the initial Construction Phase and ongoing maintenance of the Proposed RBSF Component are estimated to be 0.0058% of Ireland's non-ETS 2030 emissions target or 0.04% of the 'Industry' sector carbon budget. It should be noted that, until the detailed design for the Proposed RBSF Component is completed, a conservative approach is taken in considering the construction materials that will be used within the final design, rather than underestimate the embodied carbon by assuming the lowest carbon option as a default for all structural and operational requirements.

The Proposed RBSF Component represents a section of a larger significant wastewater infrastructure project, and the embodied carbon emissions are indicative of construction activity related emissions for projects of this scale. The relative impact of the Construction Phase for the alternative scenarios considered for the Proposed RBSF Component is considered to be the same since the principal activities would remain the same and there would be no quantifiable difference in the GHG emissions for the different configurations.

Considering the aspect of significance, the IEMA GHG Guidance approach (IEMA 2022) states that GHG emissions have a combined environmental effect that is approaching a scientifically defined limit, and as such, any GHG emissions or reductions from a project may be considered as significant. The IEMA GHG Guidance further advises that the significance criteria for impacts must be taken from the project as a whole over its life cycle rather than from individual elements.

Therefore, the potential impact to climate of the Construction Phase of the Proposed RBSF Component, prior to mitigation, will be Minor Adverse (Not Significant) and Short-Term. Mitigation will be required in order to minimise the contribution of the embodied carbon due to construction materials and transportation activities. This mitigation has the potential to reduce any adverse impacts of the Proposed RBSF Component.

1.4.2 Operational Phase

For the Operational Phase, the potential unmitigated and mitigated impact scenarios referred to in Section 1.4.1 have been considered. The Proposed RBSF Component is expected to have a design life of 50-years and will provide storage for the treated biosolids that will be produced at the Proposed Project and Ringsend WwTP.

1.4.2.1 Do Nothing

Should the Proposed RBSF Component not proceed, the Do Nothing scenario represents a scenario whereby the GHG emissions related to the Operational Phase would not occur. Under this scenario, the GHG emissions experienced within the study area will remain largely unchanged based on the current population figures. However, as the population within the agglomeration increases, aligned with forecasted growth, the volume of wastewater generated will increase concurrently. Even with embedded planning commitments to upgrade the eight existing WwTPs within the agglomeration to their ultimate capacity, it is anticipated that projected population growth will exceed the committed upgrade capacity by 2025. The sludge resulting from additional wastewater load will place undue pressure on existing infrastructure, posing a risk to optimal operation and consistent compliance. The climatic impact would be adverse under this scenario as the Do-Nothing approach would not:

- Provide infrastructure aligned with the aims of the Greater Dublin Strategic Drainage Strategy (GDSDS) (Uisce Éireann 2005) to provide an environmentally sustainable Regional Drainage Strategy consistent with the WFD;
- Comply with the requirements of the UWWTD;
- Assist the completion of Action AD/23/14 (Chapter 22 Adaptation of CAP23 (Government of Ireland 2023)) to improve the resilience of Ireland's water infrastructure to the impacts of climate change; and
- Provide storage of biosolids during periods when their land spreading is not permitted, as required in rules set out by the Department of Agriculture, Food and Marine to comply with the European Union's Nitrates Directive.

Chapter 5 (Consideration of Alternatives) in Volume 2 Part A of the EIAR submitted in the 2018 planning application, as supplemented by Chapter 5A (Consideration of Alternatives) in this EIAR Addendum, details five Major Negative impacts under Environmental Objectives including Biodiversity, Population and Human Health, Water, Air Quality and Material Assets, in the absence of the Proposed RBSF Component.

1.4.2.2 Do Something (Proposed RBSF Component)

The Proposed RBSF Component includes a regional biosolids storage facility (RBSF) serving the Greater Dublin region, for the storage of treated wastewater sludge (biosolids) prior its re-use on agricultural lands. The sources of biosolids to be stored at the RBSF are the Ringsend WwTP and the GDD WwTP.

To reduce the impact of the Proposed RBSF Component on the climate, mitigation measures are embedded within the current design to minimise GHG emissions from the Operational Phase. This Section outlines both the unmitigated and mitigated operational emissions to exemplify the benefits of the Proposed RBSF Component design.

The treatment process of sludge prior to arriving at the RBSF results in 'biosolids', a biologically stable product with pathogens (viruses, bacteria) reduced to the extent that renders it safe for use in agriculture, and containing high levels of plant nutrients, e.g. nitrogen and phosphorus. The level of pathogen reduction from the treatment process is such that the biosolids can be transported and stored without any further health protection measures being necessary, subject however to compliance with all applicable waste regulations.

The biosolids is also dewatered or dried to give two products for transport to storage: a 'cake' (approximately 26% dry solids) or a dry granular material (approximately 92% dry solids). Both of these materials are high in nutrients and are used as soil conditioners and fertilisers in agriculture. Both are generically termed 'biosolids', i.e. a fully treated sludge product which is biologically stable, has a low odour with pathogens reduced to the extent that renders it safe for use in agriculture. The cake material is known as "biocake" and the drier granular material is known as "biofert".

Fertilisers, such as biosolids, are not permitted to be spread on land between 15 October and 12 January , therefore during this time the biosolids must be stored or used for another purpose. These rules are set out by the Department of Agriculture, Food and Marine to comply with the European Union's Nitrates Directive. Storage volumes will be provided at the RBSF to cater for a 4-month period to allow for the non-growing periods in winter and summer.

Unmitigated Emissions

The unmitigated operational carbon has been assessed for the Proposed RBSF Component based on the purpose-built calculation tool described in Section 1.2.5. The unmitigated operational carbon represents a scenario without use of renewable energy on site. The breakdown of the unmitigated emission sources is shown in Table 1.8. The assessment indicates that GHG emissions from both process emissions (CH_4 and N_2O) account for over 90% of unmitigated emissions.

Table 1.8: Unmitigated Operational Phase t CO_2e Emissions for the Proposed RBSF Component

Operational Phase – Stage Description	Operational Phase – Stage (BS EN 15978:2011 Reference)	kt CO_2e / 50 Years	kt CO_2e – Annualised for 50 Years	% of Total
Process / Fugitive (Direct) Emissions	B1	46.42	0.93	97%
Energy	B6	1.07	0.02	2%
Chemical Usage	B8	0.13	0.00	0%
Total	**-**	**47.61**	**0.95**	100%

The assessment of direct (process and fugitive) emissions for the Proposed RBSF Component are based on emissions calculated using the purpose-built tool, the Proposed RBSF Component will result in unmitigated Operational Phase emissions of 47.61kt CO_2e over its 50-year design life, which is equivalent to an annualised total of 0.0029% of Ireland's non-ETS 2030 target, based on annualised emissions of 0.95kt CO_2e. In order to minimise the contribution of the operational carbon from the Operational Phase of the Proposed RBSF Component, mitigation is embedded within the selected option to reduce the impact of the anticipated emissions.

Mitigated Emissions

As noted in Section 1.4.2.2, the Proposed RBSF Component consists of a regional biosolids storage facility. This option has been selected to facilitate the provision storage of treated sludge from WWTP prior to it being spread on land as a fertiliser during the appropriate season.. In order to mitigate energy demand, and the carbon impact of the RBSF, up to 25% of the energy demand is to be provided by onsite renewables.

A comparison between the mitigated and unmitigated emissions is shown in Table 1.9.

Table 1.9: Operational Phase t CO_2e Emissions (Unmitigated Versus Mitigated) over the Proposed RBSF Component 50-Year design life

Operational Phase – Stage Description	Impact Source	kt CO_2e / 50 Years
Unmitigated	Process / Fugitive (Direct) Emission	46.42
Mitigated		46.42
Emission Reduction		0.00
% Change		0.00%
Unmitigated	Energy (Indirect) Emissions	0.02
Mitigated		0.02
Emission Reduction		-0.01
% Change		-25%
Unmitigated	Chemicals (Indirect) Emissions	0.13
Mitigated		0.13
Emission Reduction		0.00
% Change		0.00%
Unmitigated	Total	47.61
Mitigated		47.34
Emission Reduction		-0.27
% Change		-0.56%

As outlined in Table 1.9, the energy benefits from renewable will be able to satisfy 25% of the Proposed RBSF Component's energy demand which will reduce demand on the national grid.

1.4.2.3 Land Use Change

Overall, there will be a Negligible impact on carbon sequestration as a result of the Operational Phase of the Proposed RBSF Component, leading to a Not Significant impact on climate.

1.4.2.4 Contextualisation of Operational Phase Emissions

At present, an estimated 80% of the population in Ireland is connected to the public wastewater sewer network, which equates to a population equivalent of 4,024,000PE. The Proposed RBSF Component infrastructure will provide storage capacity primarily for the connected wastewater sludge load from the Proposed Project and existing Ringsend WwTP ,.

Compatibility with National GHG Emissions and Non-ETS Targets

As calculated using the purpose-built carbon assessment model, the Proposed RBSF Component will result in total mitigated Operational Phase GHG emissions of 47.34kt CO_2e over a 50-year period, equivalent to an annualised total of 0.0028kt CO_2e, or 0.028% of Ireland's non-ETS 2030 target or 0.0014 % of the national GHG emissions (in 2022).

Compatibility with Sectoral Budgets

In 2022, the Irish Government introduced a 2030 'Other (Waste)' sectoral carbon budget emissions cap of 4Mt CO_2e, which has been determined as being compatible with net zero and international climate commitments. The 4Mt CO_2e carbon budget for the five-year period between 2026 to 2030 aligns with the commencement of the Operational Phase of the Proposed RBSF Component, which equates to an emission ceiling of 0.6Mt CO_2e per year (or 600kt CO_2e per year) by 2030. The percentage contribution of the annualised carbon emissions from the Proposed RBSF Component are estimated to be 0.157% of Ireland's 2030 'Other (Waste)' sectoral carbon budget.

As noted in Section 1.2.1.1, the N_2O emissions from the land spreading of biosolids once they leave the RBSF is not included in the system boundary assessment. As noted in Section 1.4.2.4, the Proposed RBSF Component will provide biosolids storage capacity associated with the treatment of municipal wastewater for the Proposed Project and the existing the Ringsend WwTP.

1.4.2.5 Do Something (Alternatives Considered)

As noted in Section 1.4.1.5, wastewater treatment infrastructure must be provided to cater for both the current and projected future demand in accordance with the UWWTD, to a level of secondary treatment for agglomerations above a threshold of 10,000PE. Alternative design solutions to the Proposed RBSF Component were considered and are detailed in Chapter 5 (Consideration of Alternatives) in Volume 2 Part A of the EIAR submitted in the 2018 planning application, as supplemented by Chapter 5A (Consideration of Alternatives) in Volume 2A Part A of this EIAR Addendum.

- Reuse in Agriculture;
- Reuse in Non- Agricultural Land;
- Thermal Processes – e.g. incineration;
- Landfill;
- Energy crops/silviculture; and
- Land remediation.

It is Irish Water's policy to continue with beneficial re-use in agriculture as the favoured route for the disposal of biosolids in accordance with the National Wastewater Sludge Management Plan (NWSMP). The NWSMP concluded that the re-use of biosolids as a fertiliser to be spread on agricultural land is the most sustainable disposal route. The Plan considered the requirements for seasonal storage of treated sludge and states that, ''where appropriate, sludge storage facilities will be developed to serve a number of local plants and/or a wider regional need''.

98% of Irish wastewater sludges are beneficially reused in agriculture. The use of properly treated wastewater sludge, in accordance with a nutrient management plan under the Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998 (S.I. No. 148 of 1998), can avoid any adverse environmental impact on receiving waters as the quantity of phosphorus is monitored and controlled to match the quantity required by the crop being grown. The use of digested sludge in particular has been shown to improve nitrogen uptake in plants. The organic content and slow-release nature of wastewater sludge compared to artificial fertiliser has added benefits in improving the condition of soil and reducing the potential for run-off of nutrients.

Reuse of biosolids in non-agricultural land includes use in energy crops, forestry and land remediation. However, there are limited ongoing options for both forestry and land remediation. The NWSMP recommended that this is reviewed on an ongoing basis to identify potential outlets.

The main alternative outlet for wastewater sludge internationally is incineration. Other thermal processes, including gasification and pyrolysis, are currently being developed internationally and are expected to be available on a commercial scale in the coming years. Incineration has the potential for energy recovery however there are significant capital and operating costs associated with all thermal processes.

Landfill is rejected as an alternative as the use of landfill for disposal of wastewater sludge is effectively banned by the Landfill Directive due to the requirement to set limits on the acceptance of biodegradable organic waste. Landfill is no longer considered to be a sustainable outlet for wastewater sludge and will only be considered as a short-term emergency outlet where reuse options are not available.

Each feasible alternative considered would require the use of comparable quantities of materials, construction activities and transportation to provide the required assets which would result in embodied carbon emissions.

In addition to other biosolids use and disposal alternatives, alternative Regional Biosolids Storage Facility Sites, design and Site Layout Alternatives were also considered within the assessment. The chosen site was deemed particularly suitable from a transportation perspective in catering for biosolids from both the GDD WwTP and the Ringsend WwTP.

1.4.2.6 Summary of Operational Phase Potential Impacts

The potential CO_2e emissions from both direct and indirect emissions for the Operational Phase of the Proposed RBSF Component have been assessed.

During the Operational Phase of the Proposed RBSF Component the dominant source of GHGs will be as a result of direct emissions (predominantly fugitive emissions of CH_4 and N_2O). Additionally, GHGs will be indirectly emitted (as CO_2) resulting from the plant's energy demand.

Storage / Fugitive Emissions

The proposed RBSF has been designed as to store biosolids prior to land spreading at a suitable time of year. Biosolids, are not permitted to be spread on land between 15 October and 12 January in the areas of the country where there is the most likely demand, for the biosolids to be stored at the RBSF. These rules are set out by the Department of Agriculture, Food and Marine to comply with the European Union's Nitrates Directive. Storage volumes will be provided at the RBSF to cater for a 4-month period to allow for the non-growing periods in winter and summer. The biosolids are biologically stable product which minimises the potential for fugitive emissions during the storage period.

Energy Emissions

Indirect emissions associated with the energy usage for the Proposed RBSF Component have been directly reduced by the inclusion of on-site renewable energy generation which can satisfy over 25% of the facility energy demand.

In addition, to reduce energy demand, the plant equipment, buildings and systems associated with the Proposed RBSF Component will be designed, equipped, operated and maintained in such a manner to ensure a high level of energy performance with efficient use of energy. The Proposed RBSF Component will be designed following the requirements set out in IS399 Energy Efficient Design Management (SEAI 2014) and the detailed design will account for requirement of the Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (EPBD) requiring Near Zero Energy Buildings.

In addition to the on-site production of heat and power, based on the timeline for the decarbonisation of the national grid, it is anticipated that the associated electricity emission factors will reduce to 0.066kgCO_2e/kWh (kilograms of carbon dioxide per kilowatt hour) by 2030 [source: statement by ESB Chief Executive at EPA Climate Conference 2023]. This reduced emission factor has been assumed within the carbon model and applied to the anticipated emissions from year-one of the Operational Phase for the design life of the Proposed RBSF Component.

Overall Operational Phase Emissions

As outlined in Table 1.9, a comparison between the unmitigated and mitigated scenarios, reported as 0.27kt CO_2e, indicates a potential 0.56% decrease in total emissions for the Operational Phase of the Proposed RBSF Component, equating to 0.005kt CO_2e per annum.

1.5 Mitigation Measures and Monitoring

The mitigation measures which will reduce GHG emissions, formulated for both the Construction and Operational Phases of Proposed RBSF Component, are differentiated within this Section, as follows:

- Committed mitigation measures embedded within the Proposed RBSF Component design;
- Mitigation measures formulated for the Construction and Operational Phases of the Proposed RBSF Component as part of the EIAR submitted in the 2018 planning application, and
- Additional mitigation measures recommended as part of the assessment completed for this EIAR Addendum.

It is key to note that some of the mitigation measures detailed in Chapter 17 (Summary of Mitigation) in Volume 4 Part A of the EIAR in the 2018 planning application, will support the reduction of carbon emissions from the Proposed RBSF Component.

In addition, the RBSF Engineering Design Report (included as a standalone document in the 2018 planning application) details some of the sustainable design elements of the Proposed RBSF Component which are already integrated into the Proposed RBSF Component and support the reduction of carbon emissions in the Construction and Operational Phases. The sustainable design elements are detailed in the following sections.

1.5.1 Embodied Carbon Mitigation Measures

The Proposed RBSF Component will incorporate a number of committed embedded mitigation measures with respect to the Construction and Operational Phases which will contribute to the reduction of its impact on climate related GHG emissions.

The embedded mitigation measures incorporated within the Proposed RBSF Component design are detailed in Section 1.4.2.2 and Section 1.4.2.6 of this assessment.

1.5.2 Construction Phase

The embodied carbon of construction materials, transportation and activities will be the dominant source of GHG emissions as a result of the Construction Phase of the Proposed RBSF Component.

1.5.3 Embodied Carbon

The main source of GHG emissions from the Construction Phase will be the embodied carbon of the construction materials, activities and waste emissions associated with the Proposed RBSF Component.

Mitigation Measures (Included in the EIAR in the 2018 Planning Application)

The following mitigation measures were included in the EIAR in the 2018 planning application and will be incorporated into the Proposed RBSF Component to support the reduction of embodied carbon associated with the Construction Phase:

- The design will be optimised to minimise the requirements for raw materials;
- The appointed contractor(s) will prepare and implement a Waste Management Plan adopting measures to minimise waste and manage materials effectively. Waste generated during the Construction Phase will be carefully managed according to the accepted waste hierarchy set out in Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (hereafter referred to as the Waste Framework Directive), which gives precedence to prevention, minimisation, reuse and recycling over disposal with energy recovery and finally disposal to landfill;
- In particular, vehicles on-site, including delivery vehicles, will be prevented from leaving engines idling, even over short periods; and
- Waste of materials due to poor timing or over ordering on site will be minimised.

Additional Mitigation Measures for this EIAR Addendum

The following additional mitigation measures will be incorporated into the Proposed RBSF Component and will support the reduction of embodied carbon associated with the Construction Phase:

- A whole-life Carbon Management Plan will be implemented and will be aligned to the revised PAS 2080:2023 Carbon Management in Buildings and Infrastructure (BSI 2023). Through carbon management planning, emissions reduction actions can be identified early to inform design solutions with low embodied carbon and that are aligned with targets set in CAP 2023 (Government of Ireland 2022b) Chapter 13 Industry Table 3.5 Key Metrics to Deliver Abatement in Industry;
- Lifecycle assessments for major asset components will be undertaken and recommendations will be implemented to influence the procurement of low carbon / sustainable / locally sourced materials and equipment, where possible; and
- Materials procured for major asset components will have verified Environmental Product Declarations (EPDs).

1.5.3.1 Traffic Emissions Mitigation Measures

The construction traffic GHG emissions associated with the Construction Phase of the Proposed RBSF Component will be short-term and temporary in nature. Construction vehicles, staff transport and generators will give rise to the majority of emissions of CO_2 or N_2O, the assessment of which is included in the Construction Phase carbon assessment for stages A1 to A5 (refer to Table 1.7) of the Proposed RBSF Component.

Mitigation Measures (Included in the EIAR in the 2018 Planning Application)

The following mitigation measures were included in the EIAR in the 2018 planning application will be implemented and will support the minimisation and reduction of emissions:

- Restricted HGV movements into and out of site to avoid peak traffic shall be in force during both construction and operational phases
- A Preliminary and Detailed Traffic Management Plan will be created by Uisce Éireann and adhered to for the works in full consultation and agreement with Fingal Co. Council, An Garda Siochana, the Fire Service and the Ambulance service.
- Tracked excavators will be moved to and from the site on low-loaders and will not be permitted to drive on the street pavements.
- Wheel washers / judder bars will be placed at all site access points to minimise the migration of detritus onto the public roads. The roads will be inspected and cleaned on a regular basis. Reference also Vol. 4 Section Water 4.6.1.2.
- An Application for an Abnormal Load Permit will be made to Fingal Co. Council in advance for any abnormal loads exceeding the thresholds laid out in the Road Traffic (Construction and Use of Vehicles) Regulations 2003. Where possible, abnormal load movements will be restricted to evening or night time to minimise distribution to local traffic and traffic on strategic routes.

Additional Mitigation Measures for this EIAR Addendum

The following additional mitigation measures will be incorporated into the Proposed RBSF Component and will support the reduction of transport emissions associated with the Construction Phase:

- Construction vehicles will conform to the latest EU emissions standards, and where reasonably practicable, emissions will meet upcoming (new) standards to ensure emissions on construction access routes are minimised; and
- On-road vehicles including passenger vehicles and shuttle buses for staff transportation must comply with set emissions standards (2023).

1.5.3.2 Summary of Construction Phase Impacts Following the Implementation of Mitigation Measures

The GHG emissions associated with the Construction Phase of the Proposed RBSF Component will be short-term and temporary in nature. The appointed contractor(s) will update and finalise the CEMP and CTMP to recognise and include the need to manage GHG emissions during the Construction Phase. An outline CTMP and CEMP were included in the 2018 planning application. The predicted impacts to climate across the timeframe of the Proposed RBSF Component due to the Construction Phase will be short-term, negligible and not significant.

Table 1.10: Summary of Predicted Construction Phase Impacts Following the Implementation of Mitigation Measures

Assessment Topic	Potential Impact (Pre-Mitigation)	Predicted Impact (Post-Mitigation)
Embodied Carbon	Negative, Significant and Short-Term	Negative, Not Significant and Short-Term
Traffic Emissions	Negative, Significant and Short-Term	Neutral, Not Significant and Short-Term
Combined Construction Emissions	Negative, Significant and Short-Term	Negative, Not Significant and Short-Term

1.5.4 Operational Phase

As outlined in Section 1.4.2.6, the key sources of emissions during the Operational Phase will be related to direct (process and fugitive) emissions, energy use and chemical demand.

1.5.4.1 Mitigation Measures

The following additional mitigation measures will be incorporated into the Proposed RBSF Component and will support the reduction of emissions associated with the Operational Phase:

- A whole-life Carbon Management Plan will be implemented and will be aligned to the Revised PAS 2080:2023 Carbon Management in Buildings and Infrastructure (BSI 2023) to inform the operation of the Proposed RBSF Component using a purpose built carbon assessment tool and aligned to an industry adopted and verified assessment tool such as TII's online Carbon Assessment Tool (2023);
- Net zero for operational emissions in relation to both process and energy related emissions will be supported through energy demand reduction, solar pv to meet some of the demand, increased energy efficiency and implementation of process control optimisation;
- A comprehensive Operational Commissioning Plan will be developed and implemented to demonstrate that the RBSF is run using robust and modern methods to minimise emissions during the storage stage;
- Investigation if ammonia treatment or covering of biosolids during storage a viable option to reduce fugitive emissions. This reduced emission as shown in Table 1.4 and detailed in research "*Sewage sludge as fertiliser – environmental assessment of storage and land application options*" (Willén et al 2017).
- Fugitive emissions will be minimised by ensuring effective containment through detailed design stage; and
- Scheduled capital replacement and regular planned maintenance will minimise carbon emissions.

In line with the National Planning Framework (NPF) (Government of Ireland 2020a), the Proposed RBSF Component will deliver a renewable energy use solution through on-site energy recovery and power generation. This is in alignment with National Policy Objective 55 (referred to in Sections 11.2.3 and 12 of the Climate Action Plan 2023) seeking to meet national objectives towards achieving a low carbon economy.

In addition, the Proposed RBSF Component will support National Policy Objective 56 to sustainably manage waste generation and support circular economy principles by providing a storage facility for biosolids during times of the year that are unsuitable for land spreading. The biosolids support both circular and bioeconomy processes by producing a biosolid fertiliser which can replace the demand for and use of petrochemically based fertiliser products, manufactured outside of Ireland.

1.5.4.2 Summary of Operational Phase Emissions Impacts following Mitigation

Table 1.9 of Section 1.4.2.2 provides the annual GHG emissions from the Proposed RBSF Component. The emissions have been compared with the estimated total GHG emissions in Ireland in 2021, Ireland's non-ETS emissions for 2030 and the 'Waste' sectoral carbon budget for 2030 (refer to Section 1.2.3).

The predicted impacts to climate over the lifetime of the Proposed RBSF Component due to the Operational Phase, following the implementation of mitigation measures, will be Slight Adverse, Not Significant and Long Term in line with the criteria set out in Table 1.9 and the EPA Guidance (EPA 20222). This conclusion is reached as the project complies with current and emerging policy requirements, with GHG impacts mitigated.

Table 1.11: Summary of Predicted Operational Phase Impacts Following the Implementation of Mitigation Measures

Assessment Topic	Potential Impact (Pre-Mitigation)	Predicted Impact (Post-Mitigation)
Process / Fugitive Emissions	Slight Adverse, Not Significant and Long Term	Slight Adverse, Not Significant and Long Term
Energy Emissions	Slight Adverse, Not Significant and Long Term	Slight Adverse, Not Significant and Long Term
Chemical Emissions	Slight Adverse, Not Significant and Long Term	Slight Adverse, Not Significant and Long Term
Combined Operational Phase	Slight Adverse, Not Significant and Long Term	Slight Adverse, Not Significant and Long Term

While the GHG emissions from the Proposed RBSF Component are predicted to be generally significant, the co-benefits of the Proposed RBSF Component extend beyond the impact of the emissions. Providing a circular biosolid fertiliser product, representing a sustainable development approach.

1.6 Residual Impacts

1.6.1 Construction Phase

The Proposed RBSF Component is estimated to result in total Construction Phase GHG emissions of 1.95kt CO_2e over an 18 month construction period, equivalent to an annualised total of 0.0058% of Ireland's non-ETS 2030 emissions target and 0.040% of Ireland's carbon sectoral ('Industry') budget for 2030. The embodied carbon emissions associated with the Construction Phase of the Proposed RBSF Component will be short-term and temporary in nature. Nevertheless, the impact on the climate, following the implementation of mitigation measures, as outlined in Table 1.10 will be Slight Adverse, Not Significant and Long Term. The mitigation measures proposed will have the effect of reducing carbon emissions during the Construction Phase.

1.6.2 Operational Phase

The Proposed RBSF Component is estimated to result in total Operational Phase GHG emissions of 47.34kt CO_2e over a 50-year operational period, equivalent to an annualised total of 0.0028% of Ireland's non-ETS 2030 emissions target and 0.157% of Ireland's carbon sectoral ('Waste') budget for 2030. The Proposed RBSF Component will provide biosolids storage capacity associated with the treatment of municipal wastewater primarily for the Proposed Project and the existing Ringsend WwTP..

The GHG emissions associated with the Operational Phase of the Proposed RBSF Component will be long-term and significant in nature. Nevertheless, there are considerable co-benefits of providing a biosolids storage facility which supports both the circular and bioeconomy processes by producing a biosolid fertiliser which can replace the demand for and use of petrochemically based fertiliser products, manufactured outside of Ireland. The RBSF takes a treated wastewater sludge from the Proposed Project (with capacity to municipal wastewater to 500,000PE and a sludge treatment to a capacity of 750,000PE) and the existing Ringsend WwTP (2.4M PE). This supports:

- The key WFD objectives (Article 4 of the WFD);
- The NAF (DCCAE 2018);
- The objectives of the Planning and Development Act 2000 (as amended), and
- The Policy objective PM30 of the Fingal Development Plan 2017 – 2023 which encourages '*the production of energy from renewable sources*', including CHP (this is now policy CAP13 in the recently published Fingal Development Plan 2023 – 2029 (FCC 2023)).

Mitigated operational emissions will be 0.0028% of Ireland's non-ETS 2030 target and 0.157% of the 2030 sectoral carbon budget for 'Waste'.

Based on the analysis outlined above, the GHG emissions kt CO_2e associated with the Operational Phase of the Proposed RBSF Component, following the implementation of mitigation measures, will be Slight Adverse, Not Significant and Long Term, as per Table 1.5 TII GHGA Significance Criteria.

1.7 Difficulties Encountered in Compiling Information

The exact volumes of materials, location of waste disposal sites, sourcing of products and technical specification for materials will be finalised during the detailed design stage by the appointed contractor(s). Throughout this assessment, efforts have been made to provide the most likely, or a conservative scenario when a most likely scenario is not known, of the embodied carbon assessment.

In addition, climate impact assessment criteria and guidance are changing and maturing, and therefore, the requirements for assessment may change between publication of this document and assessment by An Bord Pleanála.

1.8 References

BSI (2011). *BS EN 15987 Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method*.

BSI (2016). *PAS 2080:2016 Carbon Management in Infrastructure*

BSI (2023). *Revised PAS 2080:2023 Carbon Management in Buildings and Infrastructure*

CESSM (2013). *Carbon and Price Book database*

Codema (2017). *Developing CO_2 Baselines – A Step-by-Step Guide for Your Local Authority*

CSO (2016). CSO Population Projection M2F2 results. [Online] Available at https://www.cso.ie/en/releasesandpublications/ep/p-plfp/populationandlabourforceprojections2017-2051/populationprojectionsresults/

DCCAE (2017). *National Mitigation Plan*

DCCAE (2018). *National Adaptation Framework. Planning for a Climate Resilient Ireland*

DCCAE (2021a). *Climate Action Plan 2021*

DECC (2021). *General Scheme of the Climate Action Amendment Bill*

DECLG (2012). *National Climate Change Adaptation Framework - Building Resilience to Climate Change*

EPA (2022). *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*

EPA (2023). *Ireland's National Inventory Report 2023 – Greenhouse Gas Emissions 1990-2022*

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

European Commission (2014). 2030 *Climate and Energy Policy Framework*

European Commission (2021a). *Technical guidance on the climate proofing of infrastructure in the period 2021-2027*

European Union (2009).

FCC (2017). *Fingal Development Plan 2017-2023*

FCC and Codema (2019). *Climate Change Action Plan 2019 – 2024*

Fingal County Council (2023). *Fingal Development Plan 2023 – 2029*

Government of Ireland (2019a). *Water Quality and Water Services Infrastructure. Climate Change Sectoral Adaptation Plan*

Government of Ireland (2019b). *Transport - Climate Change Sectoral Adaptation Plan*

Government of Ireland (2019c). *Climate Action Plan (2019)*

Government of Ireland (2020a). *Project Ireland 2040 – National Planning Framework*

Government of Ireland (2020b). *Programme for Government – Our Shared Future*

Government of Ireland (2020c). *Water Services Policy Statement 2018 – 2025*

Government of Ireland (2021a). *Climate Action Plan 2021*

Government of Ireland (2021b). *Project Ireland 2040 - National Development Plan 2021 – 2030*

Government of Ireland (2021c). *Whole of Government Circular Economy Strategy 2022 – 2023 'Living More, Usual Less'*

Government of Ireland (2023). *Climate Action Plan 2023*

IEMA (2010). *IEMA Principles Series: Climate Change Mitigation & EIA*

IEMA (2020a). *IEMA EIA Guide to: Climate Change Resilience and Adaptation (2020*)

IEMA (2020b). *GHG Management Hierarchy updated for net-zero*

IEMA (2022). *Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance*

Institute of Civil Engineers (2019). *Civil Engineering Standard Method of Measurement 2019 (CESMM4 Revised)*

IPCC (2019). 2019 *Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*

IPCC (2021). *The IPCC Sixth Assessment Report (AR6)*

ISO (2019). *SO 14064-2 Greenhouse gases – Part 2*

SEAI (2014). *IS399 Energy Efficient Design Management - Business & Public Sector*

SEAI (2021). *Energy in Ireland 2021*

TII (2022). Carbon Assessment Tool (Version 2.1)

TII (2022). PE-ENV-01104 *Climate Guidance for National Roads, Light Rail, and Rural Cycleways (Offline & Greenways) – Overarching Technical Documents)*

TII (2023) *Online Carbon Assessment Tool* https://tiicarbontool.azurewebsites.net/

UK Government (2023). *Greenhouse gas reporting: conversion factors 2023*

UKHA (2019). *Design Manual for Roads and Bridges (DMRB) - LA 114 Climate*

UNFCCC (1992). *United Nations Framework Convention on Climate Change*

Uisce Éireann (2005). *Greater Dublin Strategic Drainage Strategy*

Uisce Éireann (2015). *Water Services Strategic Plan.*

Uisce Éireann (2020). *Sustainable Energy Strategy Irish Water EED Irish Study Visit Presentation December 2020.*

Willén et al (2017) *Sewage sludge as fertiliser – environmental assessment of storage and land application options. Journal of Water Science & Technology*. doi: 10.2166/wst.2016.584

Directives and Legislation

Commission Implementing Decision (EU) 2020/2126 of 16 December 2020 on setting out the annual emission allocations of the Member States for the period 2021 to 2030 pursuant to Regulation (EU) 2018/842 of the European Parliament and of the Council

Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment (as amended)

Decision No. 406/2009/EC on the effort of member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a system for greenhouse gas emission allowance trading within the Union and amending Council Directive 96/61/EC

Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC

Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment

Number 32 of 2021 – *Climate Action and Low Carbon Development (Amendment) Act 2021*

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