

The Lighthouse Green Fuels Order

Application Reference: EN0110025

Applicant: LGF Projects Limited

Greenhouse Gas Reduction Strategy

Document Reference: 7.5

Revision: 00

APFP Reg 5(2)(q)

Document Information

Author	Arup
Document Title	Greenhouse Gas Reduction Strategy
Document Ref	7.5

Revision record

00	Purpose	DCO Application Submission
	Date	September 2026

Reason for issue record

Information Classification	Date	Reason for Issue
Internal use only		Document first draft. Internal use only.

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Abbreviations

Abbreviation	In Full / Term
ASU	Air Separation Unit
CEMP	Construction Environmental Management Plan
CHP	Combined Heat and Power
CO ₂	Carbon dioxide
DCO	Development Consent Order
ES	Environmental Statement
fCEMP	Framework Construction Environmental Management Plan
GHG	greenhouse gas
HGV	Heavy Goods Vehicle
km	kilometre
kWh	Kilowatt-hour
LGF	Lighthouse Green Fuels
MW	Megawatts
MWe	Megawatts electrical
NPS	National Policy Statement
PINS	Planning Inspectorate
RCBC	Redcar and Cleveland Borough Council
RICS	Royal Institute of Chartered Surveyors
SAF	Sustainable Aviation Fuel
SoS	Secretary of State
STBC	Stockton-on-Tees Borough Council
tCO ₂ e	tonnes of carbon dioxide (CO ₂) equivalent

Executive Summary

- 1.1.1 The Greenhouse Gas (GHG) Reduction Strategy has been prepared in consideration of National Policy Statement (NPS) EN-1 [Ref 2], which states in paragraph 5.3.6 “*Applications should look for opportunities within the proposed development to embed nature-based or technological solutions to mitigate or offset the emissions of construction and decommissioning*”. Paragraph 5.3.7 states “*Steps taken to minimise and offset emissions should be set out in a GHG Reduction Strategy, secured under the Development Consent Order.*”
- 1.1.2 The GHG footprint of the Proposed Development is described noting that the emissions reported do not include the avoided emissions expected from the substitution of conventional jet engine fuel by the low-carbon Sustainable Aviation Fuel (SAF) produced by the Proposed Development.
- 1.1.3 This GHG Reduction Strategy sets out the GHG reduction measures that have been identified and how the Applicant intends to effectively manage GHG emissions throughout the Proposed Development lifecycle, including roles, responsibilities and review activities.

2 Introduction

2.1 Overview

- 2.1.1 This **Greenhouse Gas (GHG) Reduction Strategy (Application Document Ref. 7.5)** has been prepared by Ove Arup and Partners Limited (Arup) on behalf of LGF Projects Limited (the Applicant), to support an application (the Application) seeking development consent for the construction, operation, maintenance and decommissioning of the Lighthouse Green Fuels (LGF) project (the Proposed Development) on land within the administrative boundaries of Stockton-on-Tees Borough Council (STBC) and Redcar and Cleveland Borough Council (RCBC).
- 2.1.2 The Order limits for the Proposed Development are made up of the Main Site and Wider Site, together 'the Site'. A more detailed description of the Site is set out at Section 2.4.
- 2.1.3 The Application has been submitted to the Planning Inspectorate (PINS), and the decision whether to grant a Development Consent Order (DCO) will be made by the Secretary of State (SoS) for Energy Security and Net Zero pursuant to the Planning Act 2008 (the PA 2008) [Ref 1].
- 2.1.4 The Proposed Development comprises a commercial-scale second generation Sustainable Aviation Fuel (SAF) production facility and associated infrastructure.

2.2 The Applicant

- 2.2.1 The Applicant is wholly owned by Alfanar Energy Limited (Alfanar). Alfanar is part of a global project development, manufacturing, and engineering group headquartered in Saudi Arabia. Alfanar has developed significant in-house feedstock-to-SAF expertise. This experience will be utilised to construct and operate the Proposed Development.

2.3 Overview of the Proposed Development

- 2.3.1 The Proposed Development is anticipated to be the UK's first commercial-scale second generation SAF production facility.
- 2.3.2 The Proposed Development includes the construction, operation, maintenance and decommissioning of a commercial-scale facility that will produce approximately 180 million litres of advanced SAF and approximately 30 million litres of renewable naphtha each year.
- 2.3.3 The Proposed Development includes the following elements (the location of each Work No. is shown on the **Works Plans (Application Document Ref. 2.4)**):

Table 2.1 Works Description Summaries

Work Number:	
Work No. 1	SAF production facility comprising: 1A - feedstock pre-treatment facility including flue gas treatment and stack 1B - SAF processing facility including thermal oxidiser, flue gas treatment, and stack 1C - up to two flare structures
Work No. 2	Combined heat and power (CHP) generating station comprising: 2A - boilers and steam turbine generators 2B - flue gas treatment and stack
Work No. 3	Feedstock and intermediate and final product handling and storage
Work No. 4	Cooling infrastructure for SAF production facility and CHP plant
Work No. 5	Bridge and culvert crossings of existing infrastructure
Work No. 6	Marine infrastructure comprising: 6A - construction of permanent quay 6B - permanent quay 6C - capital and maintenance dredging
Work No. 7	Electrical connection works comprising: 7A - underground and overground cable connections to the existing North Bank Supply Point 7B - electrical connection works
Work No. 8	Modified or new natural gas connection and above ground infrastructure (AGI)
Work No. 9	Supply of industrial gases: Only one of Work No. 9A or Work No. 9B would be developed; 9A - industrial gases connection works comprising installation of new and repurposing of oxygen and nitrogen pipeline connections, and connection to existing low pressure nitrogen supply 9B - air separation unit (ASU) facility and connections to Work No. 1
Work No. 10	Modification or removal and replacement of industrial wastewater pipeline connection works
Works No. 11	- Export connection works: 11A - pipeline(s) for the export of SAF and renewable naphtha 11B or 11C - a pipeline for the export of carbon dioxide (CO₂) connecting to AGI by others (being either AGI C1 or C2 of the Northern Endurance Partnership (NEP) transport and storage pipeline) Only one of Work No. 11B or Work No. 11C would be developed
Works No. 12	Surface water attenuation, and drainage and discharge works
Works No. 13	Laydown areas comprising: 13A - temporary construction compounds and laydown areas

	• 13B - permanent laydown and storage
Work No. 14	Access works and private street improvements

- 2.3.4 In addition a range of associated development, both specified and unspecified, is proposed in relation to the above.
- 2.3.5 The new quay on the River Tees (**Work No. 6**) will allow delivery of modular plant and construction materials by ship during construction and biomass and waste wood feedstock during operation, reducing reliance on road transport. Feedstock will be stored (**Work No. 3**) then pre-treated at the Main Site and processed into SAF through gasification and gas-to-liquids processes (**Work No.1**).
- 2.3.6 To support operations, the Proposed Development will include a biomass and waste wood-fired CHP plant (**Work No. 2**) with an electrical output capacity of up to 200 megawatts electrical (MWe), providing a low-carbon energy supply for the SAF process. Cooling infrastructure (**Work No. 4**) will be required for the SAF process and the CHP plant. Connections will provide electricity for start-up and to maintain ancillary site supplies (**Work No. 7**), natural gas for start-up and as auxiliary fuel for some processes during operation (**Work No. 8**), and oxygen and nitrogen which will either be delivered to the Site via pipelines or produced by a new ASU in the Main Site (**Work No. 9A or 9B** respectively). Waste materials, including off-specification materials will be exported from the Main Site by road. Finished products (SAF, and a secondary product of the process, renewable naphtha) will be transferred via pipeline(s) (**Work No. 11A**) to local marine loading facilities for marine export or export by road. CO₂ from the acid gas removal unit in Work No. 1B will be exported via pipeline (**Work No. 11B or Work No. 11C**) subject to a suitable agreement to connect to one of two proximate AGIs in the NEP project.
- 2.3.7 The Proposed Development will also include replacement and new wastewater pipeline connection works (**Work No. 10**), surface water drainage systems (**Work No. 12**) and access and street improvements (**Work No. 14**). Space within the Wider Site is identified for temporary construction and laydown and space within the Main Site identified for permanent laydown and storage areas (**Work No. 13**).
- 2.3.8 The preliminary layout of the Proposed Development is shown on **Indicative General Arrangement Plan (Application Document Ref. 2.5.1)** and **Indicative General Arrangement Isometric (Application Document Ref. 2.5.2)**.

2.4 The Site

- 2.4.1 The Site location and boundary (which is also known as the 'Order limits') are shown on **Site Location Plan (Application Document Ref. 2.1)**. The Site is located in Teesside on land to the north and south of the River Tees with connection corridors crossing the Tees.
- 2.4.2 The Main Site is located in the industrial area of Seal Sands approximately 5km east of Billingham town centre and 4km north-east of Middlesbrough town centre, on the north bank of the River Tees in the borough of Stockton-on-Tees). The majority of the Main Site lies south of Seal Sands Road and largely comprises previously developed land formerly used as a chemical plant from the early 1970s. It was last operated by INEOS Nitriles.
- 2.4.3 The Main Site comprises the main SAF facility development area of the Site, lying to the south and north sides of Seal Sands Road and bounded by the proposed quay in the River Tees, with the River Tees to the east.
- 2.4.4 The eastern boundary of the Main Site is formed by the River Tees, where existing jetties will be demolished and a new quay developed.
- 2.4.5 The Wider Site comprises the connection corridors, including land required for road access, pipelines (including under the River Tees), dredging near to the Main Site, and utility connections and construction laydown in both North Tees and (in the borough of Redcar and Cleveland) South Tees.

2.5 The DCO Process

- 2.5.1 Part 3 of the PA 2008 defines which projects constitute a nationally significant infrastructure project (NSIP). Once classed as an NSIP, development consent (in the form of a DCO) is required under Part 4 of the PA 2008.
- 2.5.2 In legislative terms the Proposed Development comprises both a SAF production facility and a CHP generating station together with development associated with the SAF production facility and the CHP generating station.
- 2.5.3 The construction and operation of the main SAF production facility does not automatically fall within the definition of an NSIP. Therefore, on 12 August 2025, the Applicant formally requested a direction by the SoS for Energy Security and Net Zero, pursuant to section 35(1) of the PA 2008, that the following elements be treated as one for which development consent is required. The Section 35 direction request was made in respect of: a main gasification facility to process sustainably sourced biomass; feedstock pre-treatment, syngas clean-up apparatus; Fischer-Tropsch process units;

refining units; feedstock, intermediates and finished product storage; quayside with ship loading/ offloading infrastructure; supporting infrastructure and utility connections (hereafter called the ‘Specified Elements’).

- 2.5.4 The SoS for Energy Security and Net Zero issued a direction under Section 35 of the PA 2008 [Ref 1] on 08 September 2025 to confirm that the Specified Elements of the Proposed Development, together with any matters/ development associated with them, should be treated as development for which development consent under the PA 2008 is required.
- 2.5.5 The CHP plant (**Work No. 2**) surpasses the 50 Megawatt (MW) threshold for generating stations defined in Section 15 of the PA 2008 and is therefore a NSIP in its own right.
- 2.5.6 An application for development consent for the Proposed Development has been submitted to PINS acting on behalf of the SoS. Subject to the Application being accepted, PINS will then examine it and make a recommendation to the SoS who will then decide whether to grant a DCO.
- 2.5.7 The application for development consent for the Proposed Development supersedes a previous application that was being progressed by Lighthouse Green Fuels Limited centred on a site off Huntsman Drive in Seal Sands, TS2 1TT (PINS ref. EN010150). Statutory consultation on that application took place between 16 May 2024 and 20 June 2024. As shown on the PINS website¹, that application is discontinued.

2.6 The Purpose and Structure of this Document

- 2.6.1 This GHG Reduction Strategy has been developed to present the GHG management principles to reduce and manage GHG emissions related to the Proposed Development, in accordance with the National Policy Statement (NPS) EN-1 [Ref 2], which states in paragraph 5.3.6 *“Applications should look for opportunities within the proposed development to embed nature-based or technological solutions to mitigate or offset the emissions of construction and decommissioning”*. Paragraph 5.3.7 states *“Steps taken to minimise and offset emissions should be set out in a GHG Reduction Strategy, secured under the Development Consent Order.”*
- 2.6.2 Although the NPS requires a GHG Reduction Strategy to focus on construction and decommissioning phases of the Proposed Development, this GHG Reduction Strategy considers the full lifecycle including the operation phase for context and to align with the GHG assessment presented in **Chapter 14: Greenhouse Gas Emissions (ES Volume I,**

¹ <https://national-infrastructure-consenting.planninginspectorate.gov.uk/projects/EN010150>

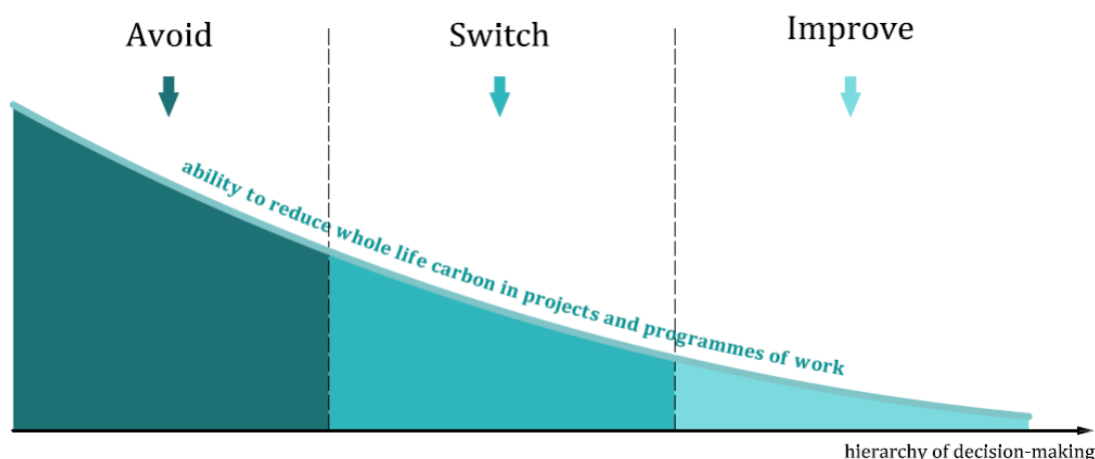
Application Document Ref. 6.1), which this GHG Reduction Strategy should be read in conjunction with.

- 2.6.3 As described in Section 2.3 above, the Proposed Development includes a carbon dioxide (CO₂) pipeline connection to the Northern Endurance Partnership transport and storage network. This would result in the Proposed Development achieving negative carbon emissions, since the captured CO₂ will be biogenic in origin, and will reduce the carbon intensity of the final SAF Product. Until the connection to CO₂ transport and storage infrastructure is available and access agreed, the surplus biogenic CO₂ will be discharged to the atmosphere via a vent. Consequently, the Proposed Development is not dependent on the NEP CO₂ pipeline being operative and the GHG assessment is based on the surplus CO₂ being vented rather than captured as a worst case.
- 2.6.4 As discussed in **Chapter 4: Proposed Development (ES Volume I, Application Document Ref. 6.1)**, in addition, in future, CO₂ from the CHP plant and thermal pre-treatment of feedstock may be sent to a Post-Combustion Carbon Capture Unit (PCCU) and directed via the selected CO₂ export pipeline route (either **Work No. 11B or 11C**) to the Northern Endurance Partnership CO₂ transport and storage network, or other off taker. This would result in the Proposed Development achieving even greater negative carbon emissions and further reducing the carbon intensity of the final SAF Product. Whilst the Main Site design allows sufficient space for a future PCCU to be developed to serve the CHP plant and thermal pre-treatment facility, development of a PCCU does not form part of the Proposed Development, is not considered in the EIA and would be developed under separate consent.
- 2.6.5 The GHG Reduction Strategy is structured as follows:
- Section 3 sets out the approach to the GHG Reduction Strategy;
 - Section 4 describes governance, roles and responsibilities;
 - Section 5 presents the GHG footprint (as calculated by the GHG emissions assessment in **Chapter 14: Greenhouse Gas Emissions (ES Volume I, Application Document Ref. 6.1)**);
 - Section 6 summarises the identified GHG reduction opportunities; and
 - Section 7 describes the review process to facilitate the successful implementation of the GHG Reduction Strategy.

3 Approach

3.1 Introduction

- 3.1.1 National legislation, local policies and Government and Corporate commitments requiring GHG emission reductions over the lifetime of the Proposed Development have informed the development of this GHG Reduction Strategy (refer to **Chapter 14: Greenhouse Gas Emissions (ES Volume I, Application Document Ref. 6.1)**).
- 3.1.2 The GHG Reduction Strategy has been prepared in accordance with the principles set out in Publicly Available Specification (PAS) 2080:2023 – Carbon Management in Buildings and Infrastructure [Ref 4], to help address and manage GHG emissions through the design and implementation of the Proposed Development.
- 3.1.3 This GHG Reduction Strategy describes how the Applicant intends to effectively manage GHG emissions throughout the Proposed Development lifecycle in line with Alfanar’s corporate sustainability policies and ambitions. Considering the GHG impacts associated with the Proposed Development early in the design process will help to realise the greatest benefits.
- 3.1.4 Inset 3.1 demonstrates how there is a decrease in GHG reduction potential over a project’s lifecycle.



Inset 3.1 PAS 2080:2023 Carbon Reduction Hierarchy

- 3.1.5 Inset 3.1 shows that the most significant GHG savings can be made in early stages of a project, when more fundamental decisions are made – for example regarding whether to include a project component and choosing operational techniques or materials.

- 3.1.6 As a project moves beyond the design stage to the delivery and operation phases, reductions in GHG emissions are possible by making processes more efficient. While there is less scope for high-impact reduction measures at the later stages, it is still important to consider reduction measures across all lifecycle stages.

3.2 Objectives

- 3.2.1 The objectives of this GHG Reduction Strategy are to:
- Consider governance, roles and responsibilities associated with GHG management;
 - Describe the GHG emissions associated with the Proposed Development;
 - Identify potential GHG reduction opportunities; and
 - Set out the process for ongoing GHG management, review, communication and training.

3.3 Scope

- 3.3.1.1 The Royal Institute of Chartered Surveyors (RICS) Professional Standard [Ref 3] and BS EN 17472 [Ref 5] outline a modular, lifecycle approach for GHG emissions assessments, providing a framework to consider effects throughout a project's lifecycle. This approach has informed the scope of the GHG assessment in **Chapter 14: Greenhouse Gas Emissions (ES Volume I, Application Document Ref. 6.1)** and the scope of this GHG Reduction Strategy.
- 3.3.2 Effects that are scoped in for the GHG emissions assessment relevant to the construction stage (Modules A1-A5) are:
- extraction, transportation and manufacturing of construction materials and products (A1-A3);
 - transport of construction materials and products to site (A4);
 - construction and installation activities (A5);
 - construction waste and waste management (A5); and
 - construction worker transport (A5).
- 3.3.3 Effects that are scoped in for the GHG emissions assessment relevant to the operation stage (Modules B2-B3 and B6-B8) are:
- maintenance and repair (B2-B3);
 - operational energy use (B6);

- operational water use (B7);
- biomass cultivation, collection and transport to pellet production plant (B8);
- pellet production and transport to LGF plant (B8);
- materials, gases and chemicals utilised during LGF plant operation (B8);
- transport, processing and disposal of operational waste from LGF plant (B8);
- carbon dioxide released from chemical processes during LGF plant operation (B8);
- transport and distribution of low-carbon SAF and naphtha produced at the LGF plant (B8); and
- Transport of workers to the LGF plant during operation (B8).

3.3.4 Effects that are scoped in for the GHG emissions assessment relevant to the decommissioning stage (Module C1-C4) are:

- deconstruction and demolition (C1); and
- transport, waste processing and disposal of construction materials and products (C2-C4).

3.4 GHG management process

3.4.1 The key elements of the GHG management process include:

- Undertaking a GHG assessment – this is set out in **Chapter 14: Greenhouse Gas Emissions (ES Volume I, Application Document Ref. 6.1)** and summarised in Section 5 of this GHG Reduction Strategy;
- Identifying additional GHG reduction opportunities; and
- Developing a GHG Reduction Strategy (this document) – to support the delivery of GHG reduction opportunities across the Proposed Development lifecycle.

4 Governance, roles and responsibilities

- 4.1.1 The Applicant will prepare a GHG Reduction Opportunities Tracker at the start of the detailed design process (following DCO consent) and assign responsibility to individual stakeholders for progressing each of the opportunities throughout the Proposed Development lifecycle.
- 4.1.2 A **Framework Construction Environmental Management Plan** (fCEMP) has been prepared to accompany the DCO application (**Appendix 5A: fCEMP , ES Volume III, Application Document Ref. 6.3**). This will be developed into a detailed CEMP(s) by the appointed Contractor(s) in accordance with a Requirement in Schedule 2 of the **Draft DCO (Application Document Ref. 3.1)**). The CEMP(s) will support the implementation of the measures presented in this GHG Reduction Strategy for the construction stage.

5 GHG footprint

5.1 Approach

5.1.1 The GHG footprint presented in this GHG Reduction Strategy is taken from the GHG emissions assessment in **Chapter 14: Greenhouse Gas Emissions (ES Volume I, Application Document Ref. 6.1)**. Details of the GHG assessment methodology and the evaluation of significance are provided within the chapter.

5.1.2 The GHG assessment methodology seeks to quantify the whole-life GHG emissions associated with the Proposed Development (absolute Proposed Development emissions) and the difference in emissions between the Proposed Development and baseline scenario (net Proposed Development emissions). The assessment has been based on a reasonable worst-case scenario, taking account of embedded mitigation measures (which are set out in Section 14.5 of **Chapter 14: Greenhouse Gas Emissions (ES Volume I, Application Document Ref. 6.1)**).

5.1.3 Review of the GHG footprint enables identification of the stages or activities associated with the Proposed Development that are key sources of GHG emissions. The calculated GHG footprint also provides a basis against which GHG reduction measures can be identified and future GHG quantifications can be compared.

5.1.4 GHG emissions have been assessed using a calculation-based methodology as per the below equation:

Activity data × GHG factor = GHG emissions or removals.

Where:

Activity data – a measure of the quantity of an activity; and

GHG factor – a measure of the GHG emissions per unit of activity

5.1.5 The activity data used to inform the GHG assessment has been provided from the engineering design work undertaken by the Applicant. Where data was unavailable, appropriate industry-recognised assumptions and benchmarks have been used.

5.1.5.1 **Appendix 14A: Greenhouse Gases Data and Assumptions (ES Volume III, Application Document Ref. 6.3)** contains a detailed account of the data sources, limitations and assumptions of the GHG assessment.

5.1.5.2 For the reporting of GHG emissions in this assessment, a 30-year operational study period is considered (2031-2061). The 30-year operational study period, in this case, is considered to reflect the minimum

design life of the Proposed Development. Construction of the Proposed Development is assumed to take place from three to four years between 2028 and 2031. Decommissioning activities are assumed to take place in the final year of the design life of the Proposed Development (2061).

- 5.1.6 A 30-year operational study period has been adopted as a reasonable worst-case scenario. This approach helps ensure that the estimated avoided emissions resulting from the displacement of fossil fuel-based jet fuel with the low-carbon SAF produced by the Proposed Development are not overstated.

5.2 GHG hotspots

- 5.2.1 Table 5.1 presents a breakdown of the GHG emissions according to the different life cycle phases of the Proposed Development.

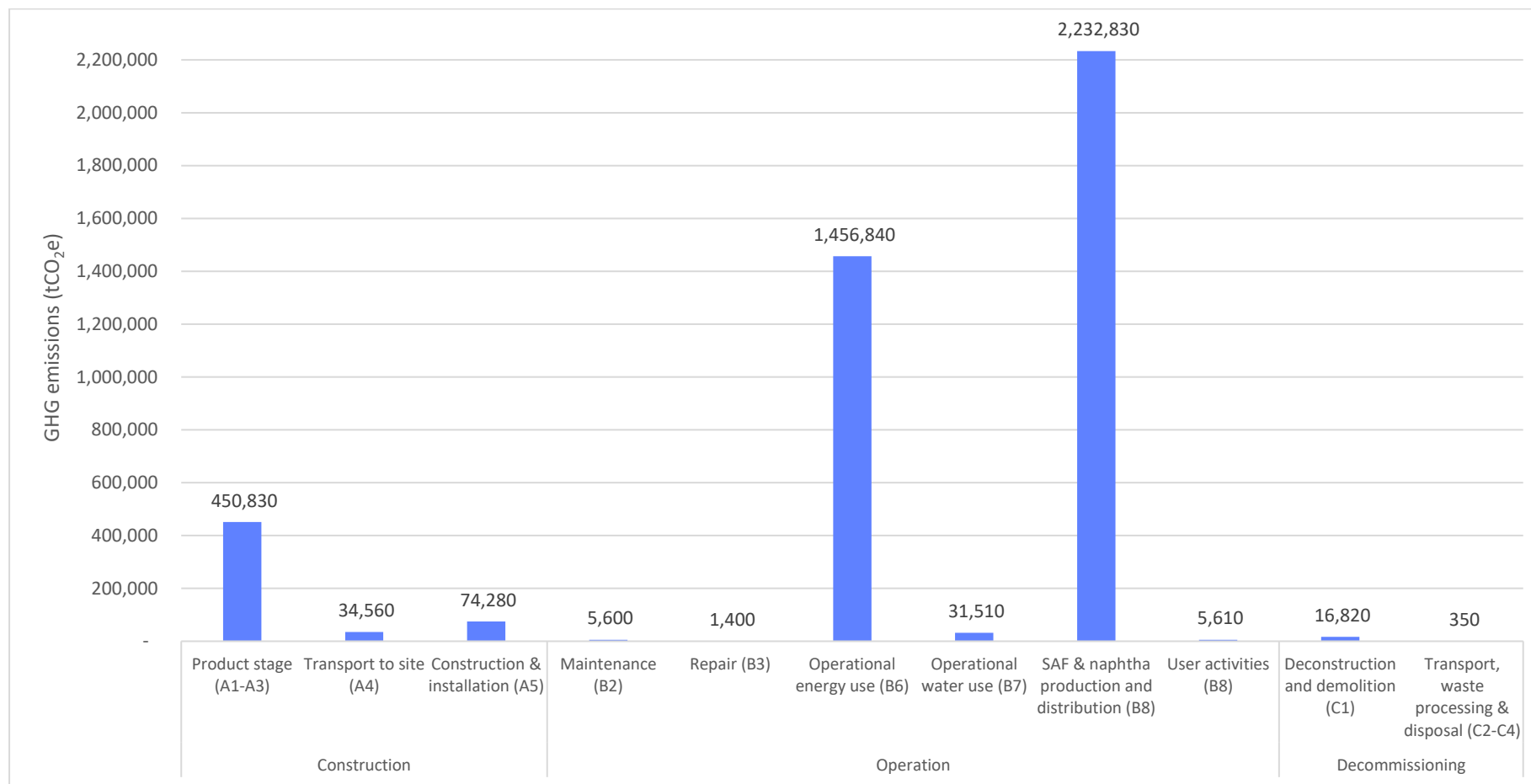
Table 5.1 GHG footprint

Lifecycle module	Source of emissions	GHG emissions ² (tCO ₂ e)
A1-A3 Product stage	Extraction, transportation and manufacture of construction materials	450,830
A4 Transport to site	Transport of construction materials to site	34,560
A5 Construction and installation	Construction activities including demolition	71,520
	Transport and disposal of construction waste	260
	Worker transport	2,500
B2 Maintenance	Maintenance activities	5,600
B3 Repair	Repair activities	1,400
B6 Operational energy use	Energy use associated with the operation of the Proposed Development	1,456,840
B7 Operational water use	Raw water	31,510
B8 Other activities associated with low-carbon SAF and naphtha production and distribution	Biomass cultivation, collection and transport to production plant	968,860
	Pellet production and transport to LGF plant	1,009,430
	Materials, gases and chemicals utilised during LGF plant operation	87,270
	Transport, processing and disposal of operational waste from LGF plant	29,090

² Figures are rounded to the nearest 10. As a result, totals may not precisely match the sum of individual lifecycle modules.

Lifecycle module	Source of emissions	GHG emissions ² (tCO ₂ e)
	Carbon dioxide released from chemical processes during LGF plant operation	67,880
	Transport and distribution of low-carbon SAF and naphtha produced at the LGF plant	70,300
B8 User transport	Operational transport of staff	5,610
C1 Deconstruction/demolition	Deconstruction and demolition activities	16,820
C2 Transport	Transport, processing and disposal of demolition waste	350
C3 Waste processing for reuse, recycling or recovery		
C4 Disposal		
Total Construction (Module A)		559,670
Total Operation (Module B)		3,733,790
Total Decommissioning (Module C)		17,180
Total Lifecycle (Modules A-C)		4,310,640

5.2.2 The GHG footprint is presented graphically in Inset 5.1.

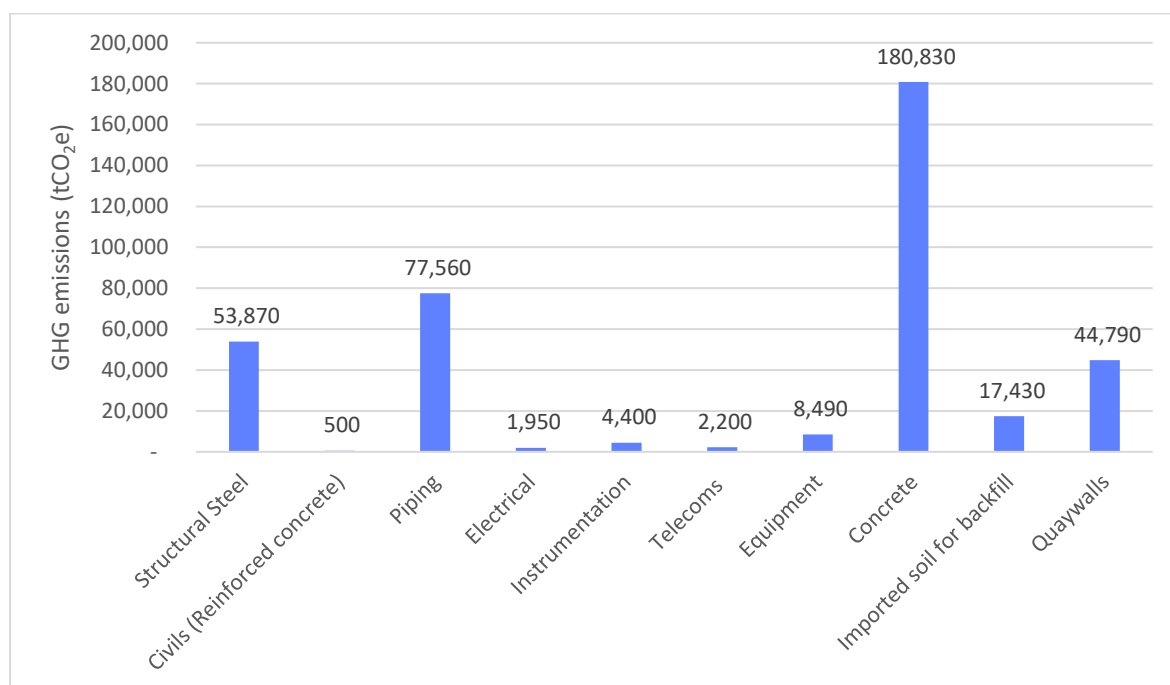


Inset 5.1 GHG emissions for the lifecycle phases of the Proposed Development

5.2.2.1 The breakdown of the GHG emissions of the Proposed Development shows that the vast majority is related to its operational phase, accounting for approximately 87% of the total footprint. This is followed by its construction phase, which accounts for approximately 13%, and finally its decommissioning phase, which contributes less than 1% of total emissions.

Construction phase

5.2.3 The construction phase of the Proposed Development is estimated to result in 0.56 MtCO₂e, equivalent to approximately 13% of the total lifecycle emissions. Within the construction phase, the production of the construction materials (module A1-A3) is estimated to have the highest contribution (81%). Inset 5.2 shows the production impact for the main components of the Proposed Development.

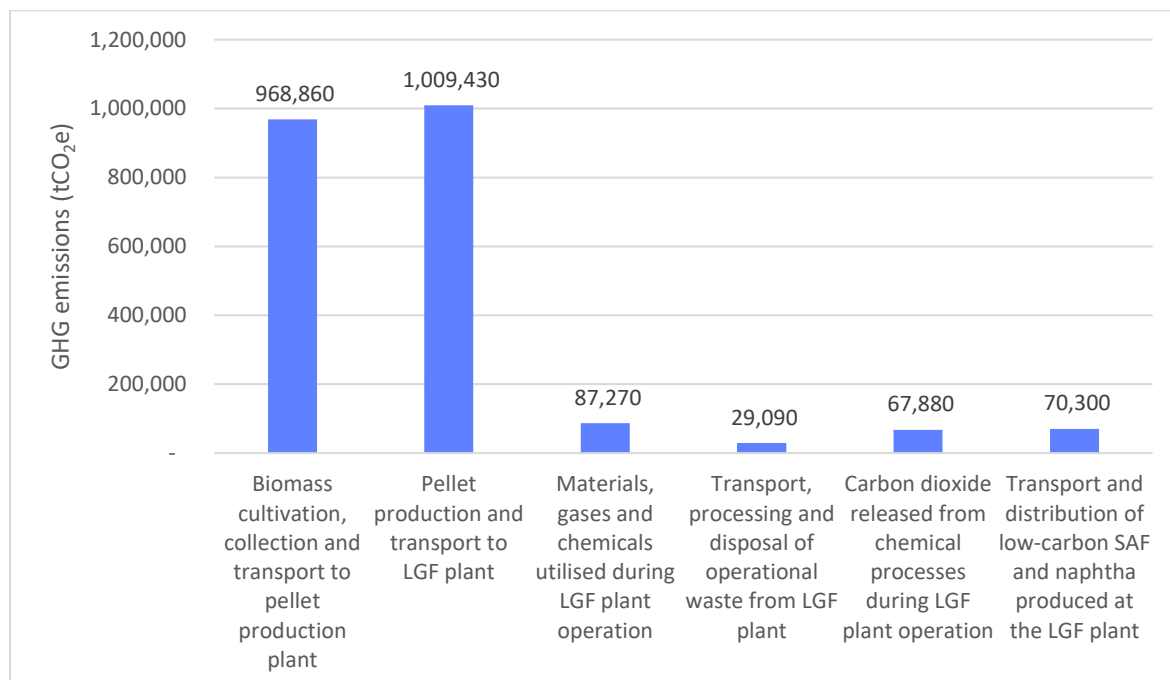


Inset 5.2 GHG emissions related to the production (Module A1-3) of the main components of the Proposed Development

Operational phase

5.2.3.1 The operational phase of the Proposed Development is estimated to result in 3.73 MtCO₂e. This is equivalent to approximately 87% of the total lifecycle emissions associated with the Proposed Development. Within this phase, activities associated with low-carbon SAF and naphtha production and distribution (Module B8) represent the largest contribution, accounting for approximately 60% of total emissions within the operational phase, followed by operational energy use (Module B6) at approximately 39%.

5.2.3.2 As shown in Inset 5.3, the Module B8 activities can be further subdivided into submodules representing the various steps of low-carbon SAF and naphtha production and distribution. Inset 5.3 shows the GHG emissions associated with each of these submodules.



Inset 5.3 GHG emissions associated with each of submodules of Module B8 user activities related to low-carbon SAF and naphtha production

5.2.3.3 The emissions estimated for the Proposed Development reflect a reasonable worst-case scenario and do not account for potential to capture carbon dioxide emissions from the CHP plant and thermal pretreatment activities in future (subject to a separate planning consent) or for future decarbonisation across the SAF production value chain – including upstream and downstream activities such as biomass cultivation, transport, and processing – which is expected to reduce the lifecycle emissions associated with the low-carbon SAF plant over time.

5.2.4 It is also important to highlight that the emissions reported do not include the avoided emissions expected from the substitution (i.e. displacement) of conventional jet engine fuel by the low-carbon SAF produced by the Proposed Development.

5.2.5 The primary purpose of the Proposed Development is to produce low-carbon SAF that displaces conventional Jet A1 fuel, thereby contributing to the decarbonisation of the aviation sector and supporting the UK's SAF Mandate [Ref 6] targets.

- 5.2.6 Over its 30-year operational life, the Proposed Development is expected to produce approximately 180 million litres of low-carbon SAF annually, which equates to a significant reduction in lifecycle GHG emissions when compared to an equivalent volume of traditional jet fuel.
- 5.2.7 The lifecycle emissions of the Proposed Development's low-carbon SAF are approximately 80% lower than those of conventional jet (A1) fuel (refer to Inset 14.5 in **Chapter 14: Greenhouse Gas Emissions, ES Volume I, Application Document Ref. 6.1**). This displacement results in avoided emissions that are directly attributable to the Proposed Development. Over the full operational period, the cumulative avoided emissions are estimated to be in the region of 12.8 MtCO₂e, based on the comparative lifecycle intensity of low-carbon SAF produced by the Proposed Development and jet (A1) fuel (refer to Inset 14.5 in **Chapter 14: Greenhouse Gas Emissions, ES Volume I, Application Document Ref. 6.1**).
- 5.2.8 By comparison, the total lifecycle emissions associated with the Proposed Development - including construction, operation, and decommissioning - are approximately 4.3 MtCO₂e. This means the Proposed Development is expected to deliver a carbon payback ratio of approximately 3:1, whereby for every tonne of GHG emitted across its lifecycle, around 3 tonnes are avoided through low-carbon SAF displacement of jet (A1) fuel. This represents a substantial net climate benefit (refer to Inset 14.5 in **Chapter 14: Greenhouse Gas Emissions, ES Volume I, Application Document Ref. 6.1**).

Decommissioning phase

- 5.2.8.1 The decommissioning of the Proposed Development is estimated to result in 17,180 tCO₂e, corresponding to less than 1% of the lifecycle emissions associated with the Proposed Development. It is anticipated that emissions from the decommissioning phase will in reality be less than estimated at the time of this assessment due to future decarbonisation of surface transport, for example.

6 GHG reduction opportunities

6.1 Construction phase

6.1.1 Key embedded GHG reduction measures for the Proposed Development are:

- use of a brownfield site, reducing the need for extensive demolition and associated emissions; and
- use of modular and prefabricated construction approaches to reduce on-site energy use and waste generation.

6.1.2 **Appendix 5A: fCEMP (ES Volume III, Application Document Ref. 6.3)** includes measures to manage and reduce GHG emissions during construction such as:

- reusing suitable infrastructure already available within the Site where practicable to minimise the use of unnecessary materials (e.g. reusing existing pipelines and connections where possible);
- encouraging the use of construction materials with lower embodied carbon (e.g. higher recycled content);
- increasing recyclability by segregating construction waste to be re-used and recycled, where reasonably practicable;
- the prohibition of on-site burning of waste materials;
- conducting regular planned maintenance of the construction plant and machinery to optimise efficiency;
- the preparation and implementation of a Site Waste Management Plan to minimise waste generation and promote reuse and recycling; and
- the implementation of construction transport measures, including a Framework Construction Traffic Management Plan (fCTMP) and a Framework Construction Workers Travel Plan (fCWTP) (**Appendix 18D and Appendix C to Appendix 18A respectively, ES Volume III, Application Document Ref. 6.3**), to minimise vehicle movements and promote sustainable transport options where available.

6.2 Operation phase

- 6.2.1 As set out in paragraph 5.2.4 and detailed further in **Chapter 14: Greenhouse Gas Emissions (ES Volume I, Application Document Ref. 6.1)**, the total lifecycle emissions associated with the Proposed Development are approximately 4.3 MtCO₂e, but by displacing jet (A1) fuel with low-carbon SAF the Proposed Development will result in approximately 12.8 MtCO₂e of avoided emissions. As such, for every tonne of GHG emitted across the Proposed Development's lifecycle, around 3 tonnes are avoided through low-carbon SAF displacement of jet (A1) fuel (refer to Section 14.6 within **Chapter 14: Greenhouse Gas Emissions (ES Volume I, Application Document Ref. 6.1)**).
- 6.2.2 In addition to the decarbonisation benefits of the products themselves, the Proposed Development incorporates embedded design features to minimise operational emissions. These include:
- on-site generation of low-carbon electricity and steam via a CHP plant;
 - use of sustainably sourced feedstocks in line with SAF Mandate [Ref 6] criteria; and
 - efficient logistics and transport strategies to reduce emissions from feedstock and product movement.
- 6.2.3 As a potential future enhancement and not a mitigation measure included within the current proposal, carbon dioxide from the CHP plant and thermal pretreatment operation could be captured, purified & compressed using an on-site carbon capture and compression plant (to be separately consented). Subject to commercial agreement, this captured carbon dioxide would then be transported for permanent storage via a connection (via either Work No. 11B or 11C) to the Northern Endurance Partnership's consented CO₂ Gathering Network pipeline which will run through and adjacent to the Main Site. This would enable the Proposed Development to further remove direct GHG emissions produced on site. This has not been assessed as part of the GHG Assessment for the Proposed Development, and would be separately consented.

6.3 Decommissioning phase

- 6.3.1.1 To ensure alignment with national climate targets and DCO requirements, a Decommissioning Environmental Management Plan (DEMP) and an Environment Agency DEMP will be prepared at the time of decommissioning. The DEMPs will set out good industry practice measures to minimise GHG emissions, including:
- reuse and recycling of plant, equipment and materials;

- sustainable waste management practices; and
- low-emission demolition and transport methods.

7 Review

- 7.1.1 Review activities to facilitate the successful implementation of the GHG Reduction Strategy will include:
- Preparation of a GHG Reduction Opportunities Tracker at the start of the detailed design stage (following DCO consent) to:
 - i. Review progress of GHG reduction opportunities identified in this GHG Reduction Strategy;
 - ii. Identify new GHG reduction opportunities;
 - iii. Assess feasibility of GHG reduction opportunities; and
 - iv. Incorporate feasible GHG reduction opportunities into design and construction plans and procurement.
 - Updated quantification of GHG emissions (at the end of each lifecycle stage or more frequently as appropriate):
 - i. Update GHG emissions calculations associated with the Proposed Development, to reflect changes related to more accurate activity data and implementation of GHG reduction opportunities.

8 Communication and training

- 8.1.1 To implement this GHG Reduction Strategy, a GHG Reduction Opportunities Tracker will be prepared and used to help communicate and report progress. This will be used to track performance throughout the design, construction and operation phases of the Proposed Development.
- 8.1.2 The GHG Reduction Strategy will be shared and communicated between the Applicant and the Contractor(s) throughout the delivery of the Proposed Development.
- 8.1.3 The Applicant will provide the necessary training to enable the delivery team to manage GHG emissions across the Proposed Development. National initiatives such as the Carbon Literacy Project offer GHG training courses, which may be utilised as part of the necessary training schedule to be provided by the Applicant.
- 8.1.4 The Engineering, Procurement and Construction (EPC) contractor will ensure the relevant members of its design team understand their role in minimising the Proposed Development's GHG emissions, via relevant in-house training or external training provided through professional bodies such as the Institute of Civil Engineers as appropriate.
- 8.1.5 Toolbox Talks will be provided to all construction workers to raise awareness of the GHG reduction measures and encourage ongoing consideration and implementation of task-related GHG reduction opportunities during construction activities.

References

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- Ref 3 RICS Professional Standard (2024). Whole life carbon assessment for the built environment. Available online: https://www.rics.org/content/dam/ricsglobal/documents/standards/Whole_life_carbon_assessment_PS_Sept23.pdf [Accessed June 2026].
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