Intermodal Logistics Park North Ltd

INTERMODAL LOGISTICS PARK NORTH (ILPN)

Intermodal Logistics Park North (ILPN) Strategic Rail Freight Interchange (SRFI)

Project reference TR510001

Preliminary Environmental Information Report (PEIR)

Chapter 17: Energy and Climate Change

October 2025

Planning Act 2008

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

This document forms a part of a Preliminary Environmental Information Report (PEIR) for the Intermodal Logistics Park North (ILPN) project.

A PEIR presents environmental information to assist consultees to form an informed view of the likely significant environmental effects of a proposed development and provide feedback.

This PEIR has been prepared by the project promoter, Intermodal Logistics Park North Ltd. The Proposed Development is described in Chapter 3 of the PEIR and is the subject of a public consultation.

Details of how to respond to the public consultation are provided at the end of Chapter 1 of the PEIR and on the project website:

https://www.tritaxbigbox.co.uk/our-spaces/intermodal-logistics-park-north/

This feedback will be taken into account by Intermodal Logistics Park North Ltd in the preparation of its application for a Development Consent Order for the project.

Chapter 17 ◆ Energy and Climate Change

PRELIMINARY NOTE

17.1 In this Preliminary Environmental Information Report (PEIR) chapter, the potential mitigation of operational energy use impacts has been assessed on the basis of estimated on-site solar photovoltaic (PV) energy generation reported in the draft Outline Energy Strategy (Appendix 17.5) and a principle of using on-site PV to mitigate the impact of estimated operational energy demand. The draft strategy shows estimates of the PV generation that could be achieved within the available roof space relative to the estimated demand, as annualised averages. However, the actual quantum of PV that may be provided as part of the Proposed Development remains subject to further engineering study, commercial considerations and engagement with the distribution network operator. Further information will be provided in the Environmental Statement. This may mean that there is an increase in the magnitude and significance of post-mitigation operational energy use emission effects reported in the ES than has been reported at this stage in this PEIR chapter.

INTRODUCTION

17.2 This chapter of the PEIR has been produced by members of the Savills Environment and Infrastructure team, who are Practitioner and Full members of the Institute of Environmental Management and Assessment (IEMA). It has been reviewed and approved by a Chartered Environmentalist.

17.3 This chapter of the PEIR presents the findings of Environmental Impact Assessment (EIA) work undertaken concerning potential impacts of the Proposed Development on and due to climate change.

17.4 Climate change in the context of EIA can be considered broadly in two domains: the impact of greenhouse gas (GHG) emissions caused or avoided directly or indirectly by the Proposed Development, which contribute to climate change; and the potential impact of changes in climate on the development, which could affect it directly or could modify its other environmental impacts.

17.5 The impact of flood risk on the Proposed Development resulting from climate change has been assessed in Chapter 14: Surface water and flood risk (including climate change allowance) and so is not assessed further in this chapter. Further information is also contained within Appendix 17.2: Climate Risk Assessment.

17.6 There are other potential intra-relationships between climate change and environmental topic areas, which are reported in the respective topic chapters of this PEIR in the implications of climate change section.

17.7 This PEIR chapter:

- presents the environmental baseline established from desk studies, surveys and consultation to date;
- describes the designed-in and committed mitigation measures;
- presents the potential environmental effects on, and due to, climate change arising from the Proposed Development, based on the information gathered and the analysis and assessments undertaken;
- identifies any assumptions and limitations encountered in compiling the environmental information; and
- highlights any necessary monitoring and/or mitigation measures that could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process.

17.8 This PEIR chapter is supported by the following technical appendices:

- Appendix 17.1 with details of GHG emissions and carbon budgets;
- Appendix 17.2 with details of climate projections and risk assessment;
- Appendix 17.3 with details of inter-related climate change effects;
- Appendix 17.4 with details of the embodied carbon assessment; and
- Appendix 17.5 with the draft Outline Energy Strategy.

17.9 GHG emissions are normally expressed as carbon dioxide equivalents, explained in the methodology section below, and are therefore often referred to as 'carbon' as a shorthand (e.g. when speaking of 'low-carbon power' or 'carbon reduction targets').

RELEVANT LAW, POLICY AND GUIDANCE

17.10 Climate change policy and legislation at a local and national level forms part of the context used to judge the significance of GHG emission effects, together with published advice of experts on the adequacy of that policy and on measures needed to successfully implement it. Treaties at an international level provide further background to the national and local climate change commitments.

17.11 There is much legislation and policy concerning climate change, energy, transport, the built environment and management of the natural environment in general, which is not exhaustively listed; this summary focuses on aspects of legislation or policy of most relevance to the construction and operation of the Proposed Development.

International

Kyoto Protocol

17.12 The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change (UNFCCC), which set binding emission reduction targets for the 192 parties to the Kyoto Protocol[1]. The targets cover the emissions of six greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3). These gases are commonly referred to as the 'Kyoto basket' of greenhouse gases. Under the Kyoto Protocol, subsequent treaties and the UNFCCC process, the UK has made a series of commitments to reduce its national GHG emissions.

Paris Agreement

17.13 The Paris Agreement is a binding international treaty on climate change adopted by 196 parties at the UN Climate Change Conference (COP21) in 2015. Its overarching goal is to hold *'the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels'*[2]. It was reaffirmed by the Glasgow Pact in 2021 at COP26[3].

17.14 Under Article 4 of the Paris Agreement, parties are required to communicate their intended domestic GHG mitigation targets. The UK's updated Nationally Determined Contribution (NDC) under the Paris Agreement (revised in September 2022 in light of the Glasgow Climate Pact) commits the UK to reducing economy-wide GHG emissions by at least 68% by 2030 compared to 1990 levels. At COP29 in November 2024, the UK pledged to make its next NDC an 81% reduction on 1990 levels by 2035 and this was confirmed in the UK's formal submission to the UN Framework Convention on Climate change (UNFCC) in January 2025[4].

National

National Policy Statement for National Networks (NPSNN)

17.15 The NPSNN identifies the potential contribution that rail freight could make to reducing greenhouse gas emissions, with an estimated reduction of 76% per tonne per km travelled when compared to road freight, which equates to around 1.4 m tonnes of carbon dioxide emissions saved each year. The NPSNN estimates that each freight train can remove up to 76 heavy goods vehicles (HGVs) from the road and that the rail freight industry resulted in 5.56 million fewer lorry journeys in 2020/21.

17.16 The NPSNN sets out four design principles developed by the National Infrastructure

[1] United Nations (1998): Kyoto Protocol to the United Nations Framework Convention on Climate Change https://unfccc.int/resource/docs/convkp/kpeng.pdf, accessed 09/07/25
[2] United Nations (2015): Paris Agreement, https://unfccc.int/sites/default/files/english_paris_agreement.pdf, accessed 07/07/25.
[3] United Nations (2021): Glasgow Pact, https://unfccc.int/process-and-meetings/the-paris-agreement/the-glasgow-climate-pact-key-outcomes-from-cop26, accessed 09/07/25
[4] UK Government (2025): United Kingdom of Great Britain and Northern Ireland's 2035 Nationally Determined Contribution, https://unfccc.int/sites/default/files/2025-01/UK%27s%202035%20NDC%20ICTU.pdf, accessed 09/07/25

Commission, one of which focuses on climate, covering both mitigation of carbon emissions and adaptation to climate change. This design principle is for development that:

'*…includes opportunities to enable decarbonisation, incorporates flexibility, and builds resilience against climate change. The functionality of projects, including fitness for purpose, resilience and sustainability, is equally important*.'

17.17 In terms of climate change adaptation, paragraph 4.39 states that '*applicants must consider the direct (e.g., flooding of road or rail infrastructure) and indirect (e.g., flooding of other parts of the road or rail network) impacts of climate change when planning the location, design, build, operation and maintenance*.'

17.18 Regarding climate change mitigation, paragraphs 5.28 to 5.30 note that the construction and operation of a project will result in GHG emissions and so steps should be taken to avoid, and where unavoidable, reduce or mitigate climate change impacts, although there will likely be residual emissions.

17.19 Paragraph 5.31 requires all proposals for national network infrastructure projects to include a Whole Life Carbon Assessment. Additionally, paragraph 5.35 states that '*having regard to current knowledge, a carbon management plan should be produced as part of the Development Consent Order submission and include:*

- *a Whole Life Carbon assessment for the project*
- *an explanation of the steps that have been taken to drive down the carbon impacts of the project*
- *how construction and operational emissions and, where applicable, emissions from maintenance activities, have been reduced as much as possible using the carbon reduction hierarchy (e.g., as set out in PAS2080) (recognising that in the case of road projects while the developer can estimate the likely emissions from road traffic, it is not solely responsible for controlling them)*
- *whether and how any residual carbon emissions will be (voluntarily) offset or removed using a recognised framework (any offsetting of emissions should not be included in the Whole Life Carbon Assessment headline figures)*
- *where there are residual emissions, the level of emissions and the impact of those on any relevant statutory carbon budgets*'

17.20 With respect to carrying out EIAs, the NPSNN provides guidance on assessment of carbon emissions associated with infrastructure projects, including that these can be compared against UK carbon budgets and the net zero target in the Climate Change Act 2008.

Net zero legislation and policy

17.21 The Climate Change Act 2008 (as amended in 2019)[5] commits the UK government to reducing

[5] Climate Change Act 2008 (c. 27) as amended by The Climate Change Act 2008 (2050 Target Amendment) Order 2019, https://www.legislation.gov.uk/ukpga/2008/27/contents, accessed 10/07/25

GHG emissions by at least 100% of 1990 levels by 2050: a net zero target. The Act requires the UK government to set interim carbon budgets for the UK, in view of the urgency to reduce GHG emissions and severe consequences of more than a 1.5°C rise in global average temperature (in line with the Paris Agreement and Glasgow Pact). The Climate Change Act 2008 also established the Climate Change Committee (CCC) with a statutory role to give advice to government on carbon budgets, to report on progress in reducing carbon, and to give advice on national climate risks and adaptation. Advice from the CCC, while not adopted policy, is normally taken on board in producing carbon budgets for the net zero target due to the Committee's statutory role and is strongly relevant to consider. This is discussed further below.

17.22 At present, the Fourth, Fifth and Sixth Carbon Budgets, set through The Carbon Budget Orders 2011, 2016 and 2021, are 1,950 $MtCO_2$ for 2023 to 2027, 1,725 $MtCO_2$ for 2028 to 2032 and 965 $MtCO_2$ for 2033 to 2037. The Sixth Carbon Budget is the first that is consistent with the UK's net zero target, requiring a 78% reduction in GHG emissions by 2035 from 1990 levels. The UK's current NDC commits the UK to reducing economy-wide GHG emissions by at least 68% by 2030 compared to 1990 levels and as noted above, the next NDC is an 81% reduction on 1990 levels by 2035. Recommendations for the Seventh Carbon Budget (2038-2042) have been published by the Climate Change Committee and will be considered by the government during 2025.

17.23 Under s.14 of the Climate Change Act 2008, the UK government must report on its proposals and policies for meeting each carbon budget. The Carbon Budget Delivery Plan 2023[6] is the present such report. The plan indicates that the quantified emission reductions predicted from the implementation of current policies are expected to be sufficient to deliver the Fourth and Fifth Carbon Budgets but may fall short of the Sixth Carbon Budget. However, in May 2024, the Delivery Plan was found to be unlawful following a judicial review and so the Secretary of State is required to produce a new plan by 29 October 2025, following an extension of six months from the previous deadline.

17.24 The Net Zero Strategy (Build Back Greener), as revised in 2022 after court challenge, sets out the UK's plans to achieve net zero emissions by 2050[7]. For transport, the strategy states that a modal shift of freight from road to more sustainable alternatives, such as rail, will be supported and encouraged. Furthermore, the rail network will be net zero emissions by 2050 through a sustained, long-term programme of investment in rail electrification, supported by deployment of battery and hydrogen-powered trains, with the aim of removing all diesel-only trains from the network by 2040. These policies are further supported by the Transport Decarbonisation Plan, published in 2021 and revised in 2023. Other relevant policies of the Net Zero Strategy include promoting the transition to low carbon buildings through increased energy efficiency and improved resource efficiency.

[6] Carbon Budget Delivery Plan (2023): https://assets.publishing.service.gov.uk/media/6424b2d760a35e000c0cb135/carbon-budget-delivery-plan.pdf, accessed 11/07/25

[7] DESNZ and BEIS (2022): The Net Zero Strategy (Build Back Greener), https://www.gov.uk/government/publications/net-zero-strategy, accessed 10/07/25.

17.25 The Future of Freight Plan[8] reaffirms the government's commitment to a freight and logistics sector that is cost-efficient, reliable, resilient, environmentally sustainable and valued by society. In terms of environmental sustainability, the key vision is to achieve a net zero freight and logistics sector by 2050. In addition to this, the plan supports and promotes the modal shift of freight, from road to rail, and seeks to maximise opportunities for this modal shift. The government has committed to a target of at least a 75% growth in freight carried by rail by 2050[9].

17.26 Progress on the Net Zero Strategy policies was captured in early 2023 by the Powering Up Britain: Net Zero Growth Plan policy paper[10]. Headline policies are around decarbonising the freight sector through the Zero Emission Road Freight Demonstrator programme and accelerating the decarbonisation of the UK's building stock, including through a commitment to reduce total energy consumption from buildings and industry by 15% by 2030, relative to 2021 levels.

17.27 The UK Infrastructure: A 10 Year Strategy (2025)[11] sets out the UK Government's long-term infrastructure plans in accordance with the UK's 2050 net zero target. The Strategy highlights the importance of good intercity road and rail connections, as well as good connections to ports, freeports and investment zones, to enable the efficient movement of freight and services at each stage of the journey.

Advice of the Climate Change Committee

17.28 The Climate Change Committee (CCC) has a statutory role under the Climate Change Act 2008 to provide advice to the government on setting carbon budgets, monitoring UK progress in meeting them, and on evidence-based policy measures that could be used for their achievement. It also advises on national climate risks, adaptation and resilience measures and progress towards implementing these.

17.29 In the latest review of UK progress in meeting carbon budgets, the overriding advice of the CCC has been that whilst emissions are continuing to decline, the pace of emissions reductions will need to increase to achieve the UK's 2030 NDC and longer-term targets. This will increasingly require focus on the transport, buildings, agriculture and industry sectors, driven by the electrification of key technologies.

17.30 The Committee's most recent budget advice was on setting the Seventh Carbon Budget. Headline points in the 'Balanced Pathway' of measures suggested are an increase in industrial electrification (including use of construction plant and battery-electric vehicles to decarbonise all HGVs), increase in low-carbon electricity supply and increased energy efficiency measures

[8] DfT (2022): Future of Freight: a long-term plan, https://assets.publishing.service.gov.uk/media/62b9a2ec8fa8f53572e3db68/future-of-freight-plan.pdf, accessed 16/07/25.
[9] DfT (2023): Rail freight growth target, https://www.gov.uk/government/publications/rail-freight-growth-target/rail-freight-growth-target, accessed 16/07/25.
[10] DESNZ (2023): Powering Up Britain: The Net Zero Growth Plan, https://assets.publishing.service.gov.uk/media/642556c560a35e000c0cb167/powering-up-britain-net-zero-growth-plan.pdf, accessed 11/07/25
[11] HM Treasury (2025): UK Infrastructure: A 10 Year Strategy, https://www.gov.uk/government/publications/uk-infrastructure-a-10-year-strategy, accessed 11/07/25

deployed across most sectors. Resource efficiency is also a key element of the Balanced Pathway for industry, with specific reference to reducing construction waste, reducing over-design and reusing components. In terms of rail freight, the CCC recommends increasing the share of electrified track on which a growing number of electric trains can travel, with a small role for hydrogen-powered and battery-electric trains in the medium term. All fully-diesel trains should be removed from both passenger and freight operations by 2040, whilst diesel-electric hybrids will continue to operate on non-electrified freight routes until 2050.

Climate change risk, resilience and adaptation

17.31 Under s.56 of the Climate Change Act 2008, the UK publishes a five-yearly national climate risk assessment, the latest being from 2022. This is developed based on advice from the CCC.

17.32 The national priority risk areas identified (most relevant to the Proposed Development) are:

- *'risks to infrastructure networks (water, energy, transport, ICT) from cascading failures;*
- *risks to transport networks from slope and embankment failure;*
- *risks to transport from high and low temperatures, high winds, lightning;*
- *risks to business sites from flooding;*
- *risks to business from disruption to supply chains and distribution networks;*
- *risks to international law and governance from climate change overseas that will impact the UK;*
- *risks from climate change on international trade routes;*
- *risks to energy generation from reduced water availability; and*
- *risks to energy from high and low temperatures, high winds, lightning*'.

17.33 The response to climate risks through resilience and adaptation actions are set out in the National Adaptation Programme (NAP), with the most recent being NAP3 published in 2023. With respect to infrastructure and the built environment, it notes that priorities are water supply safeguarding, transport network resilience and addressing overheating in buildings.

Other national planning policy

17.34 The National Planning Policy Framework (NPPF) (December 2024, as amended February 2025), states with regard to climate change that the core planning principle of the NPPF is that the planning system should:

'…support the transition to net zero by 2050 and take full account of all climate impacts including overheating, water scarcity, storm and flood risks and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy

and associated infrastructure.' (paragraph 161).

17.35 'Low-carbon' technologies are defined in the NPFF at page 77-78 as '*…those that can help reduce emissions (compared to conventional use of fossil fuels*).'

17.36 In paragraphs 161 (quoted above) and 162, the NPPF refers to the need for planning to provide climate adaptation and resilience:

'*Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating and drought from rising temperature*.' (paragraph 162).

Local planning policy

St Helens Borough Local Plan up to 2037

17.37 The St Helens Borough Local Plan in Policy LPA01 outlines a spatial strategy for the Borough, which includes a requirement for new development proposals '*to mitigate their contribution to climate change and to adapt to its impacts*'.

17.38 Policy LPA02 of the Local Plan states development principles including the need to '*lower St Helens Borough's carbon footprint and adapt to the effects of climate change*'.

17.39 Policy LPC13, Renewable and Low Carbon Energy Development sets out a requirement for new developments '*to meet high standards of sustainable design and construction and minimise carbon emissions to a 19% carbon reduction against Part L 2013 unless proven unviable'*. In addition, proposals for new development within a strategic employment site '*must, unless this is shown not to be practicable or viable, ensure that at least 10% of their energy needs can be met from renewable and / or other low carbon energy source(s)*.'

Places for Everyone Joint Development Plan

17.40 The Places for Everyone Joint Development Plan (2024) is the shared Development Plan document for Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford and Wigan.

17.41 It includes Policy JP-S2: Carbon and Energy which identifies measures to support the aim of a carbon neutral Greater Manchester no later than 2038, with a dramatic reduction in GHG emissions. It sets out requirements for new development to be net zero carbon in construction unless it can be demonstrated that it is not practicable or financially viable.

17.42 It also includes Policy JP-S4: Flood Risk and the Water Environment which identifies the need for climate change effects to be taken into consideration in designing schemes, including solutions such as Sustainable Drainage Systems. It also highlights the need for water conservation.

Wigan Local Plan – Core Strategy

17.43 The Wigan Local Plan Core Strategy was adopted in September 2013. Since March 2024,

several policies have been replaced by policies in the Places for Everyone Plan and no longer form part of the borough's Development Plan. However, Policy CP 10, which is still included in the Local Plan, has a requirement for new development to include '*measures to minimise the impact of and adapt to climate change and conserve natural resources and meet established national standards for sustainability and national carbon reduction targets*'.

Warrington Local Plan 2021/22–2038-39

17.44 The Warrington Local Plan, adopted in December 2023, includes a vision for Warrington to be a '*carbon neutral, exemplar green town*" with new development built '*to the highest levels of energy efficiency*' (pages 23-24). This vision is reflected in strategic objective W6:

'*W6. To minimise the impact of development on the environment through the prudent use of resources and ensuring development contributes to reducing carbon emissions, is energy efficient, safe and resilient to climate change and makes a positive contribution to improving Warrington's air quality*.' (page 27).

17.45 It also feeds through to policies INF1 on sustainable transport to reduce carbon emissions, policy ENV7 supporting renewable and low-carbon energy development, and policy ENV2 with respect to climate resilience in flood risk and water management.

Guidance

17.46 This assessment has been carried out with reference to the following guidance:

- the Institute of Sustainability and Environmental Professionals (ISEP, formerly IEMA) guide 'Assessing Greenhouse Gas Emissions and Evaluating their Significance'[12];
- the ISEP Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation, 2020[13];
- the Greenhouse Gas Protocol suite of documents (WRI and WBCSD, 2004)[14];
- Valuation of Energy Use and Greenhouse Gas: Supplementary guidance to the HM Treasury Green Book (BEIS, 2023)[15];

[12] IEMA (2022): Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance. 2nd Edition. [Online] Available at: https://www.iema.net/resources/blog/2022/02/28/launch-of-the-updated-eia-guidance-on-assessing-ghg-emissions, accessed 11/07/25.
[13] IEMA (2020): Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation. [Online] Available at: https://www.iema.net/resources/reading-room/2020/06/26/iema-eia-guide-to-climate-change-resilience-and-adaptation-2020, accessed 11/07/25.
[14] WRI and WBCSD (2004): The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard. Revised edition, Washington and Geneva: WRI and WBCSD.
[15] DESNZ (2023): Valuation of Energy Use and Greenhouse Gas: Supplementary guidance to the HM Treasury Green Book. [Online] Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal, accessed 11/07/25.

- UK Government GHG Conversion Factors for Company Reporting (DEZNZ, 2025)[16];
- UK Green Building Council (UKGBC) guidance on 'A Framework for Measuring and Reporting of Climate-related Physical Risks to Built Assets'[17]; and
- The principles of PAS 2080 Section 7 (BSI, 2023).

CONSULTATION TO DATE

17.47 The Applicant submitted an EIA Scoping Report to the Planning Inspectorate in October 2024. This outlined the work undertaken to date and sought advice from the Inspectorate on the likely significant effects of the Proposed Development and the topics that needed to be assessed as part of the EIA. A Scoping Opinion was received in December 2024 and has been used to inform the EIA process for the Proposed Development. A summary of the main comments received and how these have been addressed are set out in the table below.

[16] DESNZ (2025): Greenhouse gas reporting: conversion factors 2025. [Online] Available at: https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting, accessed: 11/07/25.
[17] UKGBC (2022): A Framework for Measuring and Reporting of Climate-related Physical Risks to Built Assets. [Online] Available at: https://ukgbc.org/wp-content/uploads/2022/02/UKGBC-Measuring-and-Reporting-Physical-risk-Report.pdf, accessed 11/07/25.

Table 17.1 Scoping and informal consultation summary

Consultee	Consultee Comment	Response
EIA Scoping Consultation		
The Planning Inspectorate	No matters have been proposed to be scoped out of the assessment. The assessment should also take account of any changes in rail movements as a result of the Proposed Development. The Scoping Report notes that there are no plans to decommission the Proposed Development and that decommissioning effects would not therefore considered within the ES. The Inspectorate notes however that the Proposed Development may include provision of energy infrastructure such as photovoltaics and battery storage. There is no information in the Scoping Report to indicate the lifespan of these facilities and whether they would be decommissioned or whether works would be required to extend their operational life at any point. The Inspectorate does not therefore agree that decommissioning effects can be scoped out of the assessment at this stage. The ES should provide a proportionate description of all decommissioning activities or describe those activities required to extend operational life, where these are relevant. Where significant effects are likely to occur as a result of such works, these should be assessed in the ES.	The Applicant notes this comment and an assessment of GHG emissions arising from rail movements has been conducted, presented in the 'Potential Effects Prior to Additional Mitigation' section below. There is a distinction between decommissioning of the development and the ordinary maintenance, repair, refurbishment or replacement of buildings, equipment and other materials within the development during its operation. The draft DCO does not seek powers to decommission the proposed development and this has been scoped out of the EIA overall. Replacement intervals for solar PV and battery storage systems have been considered and the embodied carbon of this included in the assessment of operational effects. Maintenance and repair of buildings and other site infrastructure has been included in the embodied carbon assessment, estimated using typical percentage uplifts against the initial construction-phase embodied carbon.

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17.48 No further consultation regarding energy and climate change has been undertaken to date.

METHODOLOGY AND DATA SOURCES

Predicting effects – GHG emissions

17.49 In overview, GHG emissions have been estimated by applying published emissions factors and/or benchmark data to activities required for the Proposed Development. The emissions factors relate to a given level of activity, a physical or chemical process, or amount of fuel, energy or materials used to the mass of GHGs released as a consequence.

17.50 Further detail of the approach, data inputs, assumptions and boundaries of the calculations is given in Appendix 17.1: GHG Emissions and Carbon Budgets.

17.51 The GHGs considered in this assessment are those in the 'Kyoto basket' of global warming gases expressed as their CO_2-equivalent (CO_2e) global warming potential (GWP). GWPs used are typically the 100-year factors in the Intergovernmental Panel on Climate Change Sixth Assessment Report or as otherwise defined in emissions factors and for national reporting under the UNFCCC.

17.52 The main emissions sources within the boundary of the assessment comprise:

- the 'embodied carbon' of materials used in construction;
- transport of materials to site and use of construction plant;
- operational energy consumption;
- operational transport, both rail and road movements; and
- land use change.

Impact magnitude

17.53 As GHG emissions can be quantified directly and expressed based on their GWP, the magnitude of impact is reported numerically as tCO_2e rather than requiring a descriptive scale.

Receptor sensitivity

17.54 GHG emissions have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The global atmospheric mass of the relevant GHGs and consequent warming potential, expressed in tCO_2e, has therefore been treated as a single receptor of high sensitivity. It is considered to be of high sensitivity given the importance of the global climate as a receptor, the limited and decreasing capacity to absorb further GHG emissions without severe climate change resulting, and the cumulative contribution of GHG emission sources.

Effect significance

17.55 The ISEP assessment guidance for GHG emissions describes five levels of significance for emissions resulting from a development, each based on whether the GHG emission impact of the development will support or undermine a science-based 1.5°C compatible trajectory towards net zero.

17.56 To aid in considering whether effects are significant, the guidance recommends that GHG emissions should be contextualised against pre-determined carbon budgets, or applicable existing and emerging policy and performance standards where a budget is not available or not meaningfully applicable at the scale of development assessed. It is a matter of professional judgement to integrate these sources of evidence and evaluate them to determine significance.

17.57 Taking the guidance into account, the following have been considered in contextualising the Proposed Development's GHG emissions:

- the magnitude of net GHG emissions in construction and operation as a percentage of national and local authority carbon budgets;
- the GHG emissions intensity of the Proposed Development construction at lifecycle stages A1–A5 (materials and products manufacturing, transport to site, and installation) relative to business-as-usual and good-practice performance benchmarks;
- the GHG emissions intensity of the Proposed Development's operational energy use relative to business-as-usual and good-practice performance benchmarks;
- the net change in GHG emissions from transport in operation, including the shift of freight from road to rail transport compared to a future baseline without the Proposed Development; and
- whether the Proposed Development contributes to, and is in line with, the applicable UK policy for GHG emissions reductions, where this policy is consistent with science-based commitments to limit global climate change to an internationally-agreed level (as determined by the UK's current NDC under the Paris Agreement).

17.58 Effects from GHG emissions are described in this chapter as adverse, negligible or beneficial based on the following definitions, which closely follow the examples in Box 3 of the ISEP guidance.

- **Major Adverse**: the Proposed Development's GHG impacts would not be compatible with the UK's net zero trajectory. Its GHG impacts would not be mitigated, or may be compliant only with do-minimum standards set through regulation. The Proposed Development would not provide further emissions reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.
- **Moderate Adverse**: the Proposed Development's GHG impacts would not be fully

compatible with the UK's net zero trajectory. Its GHG impacts would be partially mitigated and may partially meet the applicable existing and emerging policy requirements, but it would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.

- **Minor Adverse**: the Proposed Development's GHG impacts would be compatible with the UK's 1.5°C-aligned trajectory and would be fully consistent with up-to-date policy and good practice emissions reduction measures. The Proposed Development may have residual emissions, but these are substantially reduced. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.

- **Negligible**: the Proposed Development would achieve emissions mitigation that goes well beyond existing and emerging policy compatible with the 1.5°C-aligned trajectory, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well ahead of the curve for the trajectory towards net zero and has minimal residual emissions.

- **Beneficial**: the Proposed Development would result in emissions reductions from the atmosphere, whether directly or indirectly, compared to the without-project baseline. As such, the net GHG emissions would be below zero. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.

17.59 **Major** and **moderate adverse** effects and **beneficial** effects are considered to be **significant**.

17.60 Minor adverse and negligible effects are considered to be not significant.

Geographical scope

17.61 GHG emissions have a global effect rather than directly affecting any specific local receptor. The impact of GHG emissions occurring due to the Proposed Development on the global atmospheric concentration of the relevant GHGs, expressed in CO_2e, have been considered in the assessment. As GHG impacts are global and cumulative with all other sources, no specific geographical study area is defined for the identification of receptors or assessment of effects.

17.62 However, GHG emissions caused by an activity are often categorised into 'scope 1', 'scope 2' or 'scope 3' emissions, following the guidance of the WRI and the WBCSD Greenhouse Gas Protocol suite of guidance documents.

- Scope 1 emissions: released directly by the entity being assessed, e.g. from combustion of fuel;

- Scope 2 emissions: caused indirectly by consumption of imported energy, e.g. from generating electricity supplied through the national grid; and

- Scope 3 emissions: caused indirectly in the wider supply chain, e.g. the embodied carbon in materials, transportation, or the disposal of waste products.

17.63 The assessment has sought to include emissions from all three scopes, where this is material and reasonably possible from the information and emissions factors available, to capture the impacts attributable to the Proposed Development.

17.64 The majority of GHG emissions are likely to occur within the territorial boundary of the UK and hence within the scope of the UK's national carbon budgets. However, in recognition of the climate change effect of GHG emissions (wherever occurring) and the need, as identified in national policy, to avoid carbon leakage overseas when reducing UK emissions, potential scope 3 GHG emissions that may physically occur outside the UK have been considered where relevant.

Temporal scope

17.65 GHG emissions from the construction and occupation phases of the Proposed Development have been assessed. As the application is not for a time-limited consent, and there is no end-of-life stage defined, decommissioning effects have not been assessed.

17.66 The varying atmospheric residence time of GHGs once emitted, and their differing climate impact, has been considered through the use of 100-year GWP factors to express these in a common CO_2e metric.

17.67 The timing of GHG emission impacts and mitigation (reductions) is also a part of evaluating the significance of effects, due to the cumulative heating effect of changing GHG concentrations in the atmosphere. For example, achieving net zero or reduced emissions by 2035 instead of 2045 would avoid a decade of cumulative heating, with consequences in the long term for the likelihood of remaining with a global 1.5°C or 2°C average temperature change.

Predicting effects – climate risks

17.68 A risk assessment matrix approach has been used to evaluate the potential impact of climatic hazards, consequence, likelihood and resulting risk profile to the Proposed Development. This has been informed by the UKGBC guidance 'A Framework for Measuring and Reporting of Climate-related Physical Risks to Built Assets'.

17.69 The risk assessment is provided in Appendix 17.2, which defines the qualitative scales used to describe the probability and consequence of each hazard, and how the resulting risk score is determined. Receptor sensitivity is not directly defined, but rather a range of risk consequences from 'minor' to 'severe' is used, the definitions of which are formulated with regard to the sensitivity of buildings, businesses and workers to hazards.

17.70 The scale of risk is from 'very low' to 'very high'. Risk ratings greater than '**moderate'** have been considered to be **significant**.

Geographical scope

17.71 The UKCP18 dataset provides probabilistic projections in 25 km grid squares. The primary geographical scope is the 25 km grid square in which the Proposed Development is located. However, regional and national trends from the UKCP18 overview report have also been

considered as further context.

Temporal scope

17.72 Given the longevity of its operational lifetime (not being proposed to be subject to a time-limited consent), the temporal scope of the assessment has been based on probabilistic climate change anomaly projections for the time periods 2030-2059 and 2070-2099 to consider the initial period after completion and long-term risks out to the end of the century.

Predicting effects – inter-related effects

17.73 The assessment has considered how impacts of the Proposed Development, in combination with the effects of climate change, may affect receptors throughout the construction phase and occupational lifetime.

17.74 There are two ways in which climate change could exacerbate or ameliorate the effects of the Proposed Development on sensitive receptors. Firstly, climate change could alter the sensitivity of receptors or the baseline environment, thereby increasing the significance of effects; and secondly, climate change could modify an impact pathway, i.e. by changing the magnitude or spatial extent and introducing new receptors.

17.75 The assessment is qualitative only and does not aim to be determinative of significance levels, which have been assessed in the applicable ES topic chapters; but it identifies where there is the potential for inter-related effects to increase or decrease the significance of effects reported alone.

17.76 The potential avenues for inter-related effects are presented in Appendix 17.3.

Geographical scope

17.77 The geographical scope for inter-related effects would be that of the individual impact pathways, as reported in the respective ES topic chapters.

Temporal scope

17.78 The inter-related effects of climate change on the Proposed Development have been assessed for the construction and occupation phase.

Assumptions and limitations

17.79 The following are the key uncertainties or data limitations at PEIR stage, discussed together with how these have been managed using a conservative (worst-case) approach.

- **Emission factors for activity data**. There is uncertainty inherent in the use of emission factors to estimate the GHG emissions from activity data, particularly where the carbon intensity of activities is likely to reduce over time in line with the UK's decarbonisation strategy. To mitigate this, emission factors used in national GHG reporting have been used where available: these are present-day factors, and applied to the opening year of the Proposed Development, they are therefore a conservative position.

- **Construction materials and works**. Due to the early stage of development design, limited information is available about proposed construction materials and activities. At this PEIR stage, embodied carbon of the warehouse unit demises including main and ancillary buildings, yards and car parks have been modelled based on prior Whole Life Carbon Assessments (WLCA) of similar units (taken from WLCA modelling of similar schemes of the Applicant), with a 15% uplift to account for this early design uncertainty. GHG emissions from other site infrastructure such as roads and railhead have also been calculated, utilising information from design drawings and indicative cost plans, which estimate quantities and specifications of the main elements of the Proposed Development. Assumptions and exclusions specific to embodied carbon are set out within the Embodied Carbon Report (Appendix 17.4 of this PEIR). This initial assessment is sufficient to screen the potential significance of the construction stage (as a component of the whole lifecycle effect of the Proposed Development) and to recommend good-practice mitigation for the detailed design stage in due course. It is expected that further information will be developed for the ES stage.

- **Operational energy demand**. Energy use during operation of the Proposed Development has been estimated by MBA Consulting Engineers Ltd. and reported within the Energy Strategy (Appendix 17.5). Energy use figures have been projected based on expected energy demand considering occupancy, heating and provision for electric vehicle charging, based on experience of similar developments and building use. Further dynamic simulation modelling will be undertaken at detailed design stage to verify the energy use figures. The proposed electricity generation by solar photovoltaics (PV) specified in the Energy Strategy could utilise up to the maximum available and useable roofspace, excluding that needed for rooflights, maintenance walkways and plant. For the PEIR, the initial estimates of energy use and PV capacity is sufficient to identify the potential significance during operation of the Proposed Development. However, it should be noted that the current assessment of post-mitigation effects are on the basis of a potential quantum of PV that remains to be confirmed, and therefore this may change and be re-assessed at the ES stage, which may change the conclusion as to the significance of effects from operational energy use.

- **Rail emissions**. Rail emissions were calculated by applying published GHG emission factors for rail freight to the total distance travelled by freight trains for the Proposed Development and tonnes of cargo carried by these freight trains, informed by the ILPN RFI rail expert, Baker Rose Consultants. The published emission factors reflect a mix of largely diesel-fuelled rail freight locomotives rather than electric, which is currently typical for routes across the UK, although the proposed development railport supports electric traction power. This is therefore a conservative position with respect to the potential benefits of rail freight. Further assumptions specific to the assessment of rail emissions are contained within Appendix 17.1: GHG Emissions and Carbon Budgets.

- **Road emissions**. At this PEIR stage, outputs from the strategic road modelling of mitigated impacts are not available. Therefore, some of the emissions associated with construction and operational traffic movements have not been calculated. These emissions will be calculated and presented for the ES stage and this may change the conclusion as to the net effect and significance of transport emissions.

- **Land use change**. GHG emissions associated with the loss of habitats (and associated soil and vegetation carbon stocks) during construction and GHG sequestration associated with the creation of habitats (and associated vegetation and carbon stocks) during operation have been assessed within this PEIR. This is based on the Biodiversity Net Gain (BNG) assessment completed for the PEIR stage, which is subject to further refinement. Therefore, GHG emissions associated with land use change will be updated for the ES stage. As a conservative measure, it has been assumed that where habitat is lost, all vegetation carbon stocks and a proportion of soil carbon stocks from 'high' soil disturbance are lost.

- **Future climate**. There is substantial uncertainty about the magnitude of future changes in global and UK climate. In assessing climate risks, a high magnitude of change scenario and the high end of probabilistic projections have therefore been used, shown in Appendix 17.2.

- **Overall approach**. While uncertainty cannot be eliminated using available information, these approaches allow an initial evidenced judgement to be made at PEIR stage, with further detail to be provided at ES stage, concerning whether net impacts are likely to be adverse or beneficial and whether the resulting effects are likely to be significant. The approach is intended to be conservative, subject to the specific caveats noted above about quantum of PV and transport emissions.

BASELINE CONDITIONS

Baseline environment

Impact of the Proposed Development on climate change

17.80 As described in PEIR Chapter 2, the Main Site currently comprises predominantly agricultural land, while the Western Rail Chord comprises scrub and areas of woodland. Depending on the composition, woodland, other vegetation and soil carbon can be important stocks that may be lost through disturbance due to proposed built development. Land used intensively for agriculture is typically associated with minor GHG emissions per hectare (ha) from decline in soil carbon stocks, plus emissions from use of fuel in machinery, fertiliser and other supplies. Areas of woodland on the other hand are associated with higher GHG stocks per ha and sequester carbon through growth, so changes in these has greater potential to materially impact the total GHG emissions arising from the Proposed Development. Importantly, the area of woodland created is larger than the area of woodland to be lost. The GHG emissions associated with land use change is provided within the assessment section below.

17.81 A number of other uses exist at the Main Site, including various agricultural buildings and businesses described in Chapter 2, Kenyon Hall Airfield (a small airfield used for recreational flying of small propeller planes), and Warrington Model Flying Club for radio-controlled model aircraft.

17.82 There will currently be some GHG emissions associated with these uses. However, as a conservative measure, the baseline GHG emissions are treated as zero, therefore treating all

Proposed Development emissions as an increase from the baseline. As existing land uses may in practice be displaced, rather than extinguished, this is a reasonable scenario.

Climate change resilience

17.83 UK Climate Projections first published in 2018 (UKCP18) have been developed by the UK Climate Impacts Programme (UKCIP) to provide projections for future climate scenarios and trends. This shows that climate change over the next few decades is likely to mean milder wetter winters and hotter, drier summers in the UK, with greater frequency and intensity of weather extremes. At the present rate of global climate change, this may be considered part of the known future baseline.

17.84 UKCP18 projections for the 25 km grid square in which the Proposed Development is located are presented in Appendix 17.2. In summary, there will be an increase in the intensity of seasonal precipitation trends: precipitation is predicted to decrease during the driest season, and increase during the wettest season and the wettest month, in line with the UK trend of milder, wetter winters and hotter, drier summers. However, precipitation is also predicted to increase in the driest month. Temperatures are anticipated to increase annually relative to the 1981-2010 baseline, both during the coldest and hottest seasons and months. Finally, humidity is also expected to increase during both the summer and winter, and hence the annual average will increase.

EMBEDDED MITIGATION MEASURES

17.85 Inherently, as an SRFI, the Proposed Development is intended to result in reduced carbon emissions and contribute to the UK's Net Zero target by encouraging transfer of freight from road to rail, which is more energy-efficient than road transport.

17.86 A Carbon Management Plan has been prepared as required by the NPSNN. Implementation of the Carbon Management Plan will be secured by a DCO requirement and this therefore forms part of the committed mitigation. However, in some cases the Carbon Management Plan approach is for more detail of mitigation measures to be established in subsequent post-consent stages of design, and so aspects of it also fall into the further recommended mitigation section of this chapter.

17.87 Other embedded mitigation that forms part of the Proposed Development includes:

- A landscape strategy that incorporates elements including tree and shrub planting and surface water features, which can help to reduce overheating associated with climate change and potentially provide minor carbon sequestration.
- PV renewable energy generation within the DCO Site, provided as part of the Proposed Development and with provision on warehouse roofs for additional installation by tenants.
- A new energy centre designed with flexibility to incorporate low/zero carbon technologies such as battery storage as set out in the Energy Strategy.

- An outline Construction Environmental Management Plan (oCEMP) that includes requirements to use well-maintained construction plant compliant with prevailing emission standards, to minimise plant idling, minimise materials wastage and recycle construction waste. It also includes good-practice measures to manage climate risks to the construction workforce.
- An outline Construction Traffic Management Plan (oCTMP) that will help manage and mitigate construction highway impacts and consequently reduce the HGV transport-related GHG emissions. The oCTMP will also contain measures to encourage active, public or shared travel modes for construction workers, which will reduce GHG emissions from private car transport.
- A Site Waste and Materials Management Plan (SWMMP) setting targets for waste diversion from landfill, recycling, and for efficient handling of materials.
- A Delivery, Servicing and Heavy Goods Vehicle (HGV) Management Strategy that sets out the preferred routes for HGVs travelling to and from the DCO Site, promoting operational efficiency by ensuring HGVs have clear, efficient access to the strategic road network.
- A Sustainable Access and Movement Strategy (SAMS) that outlines how people can travel to, from, and within the DCO Site in a way that supports environmental, social, and economic sustainability. It will focus on promoting walking, cycling, public transport, and reducing car dependency.
- The Rail Terminal serving rail lines that are already electrified using Overhead Line Equipment (OLE), meaning that all types of freight trains will be able to access the terminal, including electric, trimodal (electric, battery and diesel) and diesel, including diesel trains run on HVO (hydrotreated vegetable oil).
- A mobility hub within the Proposed Development, which are highly visible, safe and accessible spaces where public, shared and active travel modes are co-located. It is envisaged that a mix of bus stop(s) with Real Time Passenger Information [RTPI] and cycle parking will be provided.
- Bus services aligned with shift times, reducing reliance on private cars.
- A Framework Travel Plan which includes measures such as an electronic Travel Welcome Pack, car sharing, information on the existing local cycle routes and bus services to promote sustainable travel habits.
- UK Building Regulations and good engineering practice for civil, structural and process engineering design, including providing for safety margins (e.g. for wind loading) and operational resilience to a range of temperature and humidity conditions.
- Building design to follow the energy hierarchy of be lean (use less energy), be clean (supply energy efficiently), be green (use renewable energy) and off set. Passive design measures to be lean include:

- an efficient building envelope with enhanced U-values beyond the Part L2 (2021 England incorporating 2024 amendments) limiting values;
  - reduced air permeability to reduce heating demand in the winter months, and reduce heat losses through infiltration further;
  - consideration for the extent of glazed area, balanced between factors such as thermal efficiency, overheating and daylighting;
- glazed façades to provide natural daylighting and reduce reliance on artificial lighting, but combined with solar control glazing to manage heat gain in summer;
  - balanced g-value for translucent elements to ensure optimised internal conditions in both the winter and summer months; and
  - solar shading to be incorporated wherever possible.

- Active design measures include:
  - LED lighting systems and smart controls;
  - rooftop solar PV systems;
  - on-site microgrid with backup generation and storage, combined with renewables, for energy resilience
  - electrical infrastructure designed to facilitate future battery energy storage;
  - variable speed drives on all mechanical plant and equipment;
  - energy recovery ventilation (ERV/HRV) to recover energy from exhaust air;
- building energy management system (BEMS/BMS) with sub-metering to monitor and optimise energy use in real-time;
  - rainwater harvesting for non-potable uses like truck washing or landscaping; and
  - low-flow fixtures to reduce water consumption in restrooms or wash stations.

POTENTIAL EFFECTS PRIOR TO ADDITIONAL MITIGATION

Main Site and Western Rail Chord

Construction – GHG emissions

17.88 The construction phase will involve earthworks to prepare the ground levels, other civils work, construction of buildings, internal roads and utilities, and planting of landscaping. Construction of the Proposed Development will cause direct and indirect GHG emissions from the fuel and energy used by construction plant and in the 'embodied carbon' of materials

used. The embodied carbon refers to the indirect emissions in the supply chain for those materials: extracting and transporting the raw materials, manufacturing them into products, and delivery of those products to the DCO Site.

Embodied carbon, transport and site works

17.89 The greatest contribution to construction stage emissions is from the embodied carbon within the warehouse unit demises including main and ancillary buildings, yards and car parks. An embodied carbon assessment has been conducted for the Proposed Development, undertaken by Ridge and Partners LLP. Embodied carbon impacts have been calculated for the warehouse units and ancillary buildings, site infrastructure and rail infrastructure. The calculations for warehouse units, ancillary buildings and the associated solar PV and potential battery energy storage systems include the embodied carbon of materials for life cycle modules A1 to A5 (raw material extraction, transport to manufacturing plant, manufacturing, delivery to site and site work). The calculations for site and rail infrastructure have focussed on the embodied carbon of materials for life cycle modules A1 to A3 (i.e. excluding delivery to site and site work). Embodied carbon emissions and associated embodied carbon emissions intensity for each element of the Proposed Development are shown in Table 17.2, below.

Table 17.2 Embodied carbon impacts of the Proposed Development

Aspect	Embodied carbon emissions (tCO_2e)
Warehouse units and ancillary buildings	291,729
Site infrastructure	10,765
Rail infrastructure	51,527
Additional solar PV*	124,550
Battery storage*	14,108
Total	**492,679**

**with indicative assumptions about potential maximum installed capacity, above that included in the base assumptions for the warehouse units; see Appendix 17.1 for further discussion*

17.90 Transportation GHG emissions from delivery of materials to site has been included in the embodied carbon figures given above for the warehouse and ancillary buildings and associated PV and potential battery systems only. Construction workforce transport emissions will be calculated at ES stage when traffic modelling data is available.

17.91 Paragraph 17.57 defined the ways in which GHG impact magnitude could be contextualised

to aid in determining significance of effects: as a percentage of applicable carbon budgets; by comparison to benchmarked emissions intensity; and with reference to whether the impact is in line with national net zero- and Paris Agreement-compatible policy goals for carbon reduction.

17.92 The total national carbon budget for the 2028 to 2037 construction period (comprising the Fifth and Sixth Carbon Budgets) is 2,690 $MtCO_2e$. The Proposed Development's construction-stage GHG emissions would be 0.018% of this total.

17.93 The existing total GHG emissions baseline in St Helens, Wigan and Warrington in 2023 (the latest year available, from DESNZ statistics; see Appendix 17.1 for sources) is shown in Table 17.3, below. The construction-stage GHG emissions (divided over 10 years from 2028 to 2037) would be equivalent to around 4–5% of the present-day baseline annual emissions in each of these local authorities, or around 1.5–1.6% of their combined emissions.

Table 17.3 Local authority present-day baseline emissions

Local authority	2023 baseline emissions			
	Grand total (tCO_2e)	Proposed Development proportion	Total under authority's influence (tCO_2)*	Proposed Development proportion
St Helens	1,065,676	4.6%	985,640	5.0%
Wigan	1,176,685	4.2%	1,058,137	4.7%
Warrington	1,245,978	4.0%	1,140,729	4.3%
Combined	3,488,339	1.4%	3,184,506	1.5%

* *excluding large industrial sites, railways, motorways, land-use, livestock and soils*

17.94 The Tyndall Centre for Climate Change Research has recommended national and local authority-specific carbon budgets up to 2100 that, in its research, are considered to be an equitable distribution and compatible with a 1.5°C-aligned trajectory for the UK. The Tyndall Centre carbon budgets are more stringent than the UK national budgets (as advised by the Climate Change Committee): the recommended budgets for St Helens and Warrington would result in achieving near zero carbon no later than 2041, and for Wigan no later than 2042.

17.95 The recommended future carbon budget for St Helens, Wigan and Warrington combined, over the construction period from 2028–2037, is approximately 5,800,000 tCO_2. The construction-stage GHG emissions would be equivalent to 8% of this recommended budget.

17.96 Construction of the warehouse units and ancillary buildings has a predicted embodied carbon intensity of 484 $kgCO_2e/m^2$ GIA when considering life-cycle stages A1–A5. Appendix 17.1 presents a range of embodied carbon benchmarks, ranging from business-as-usual benchmarks to more ambitious targets that require embodied carbon reductions in line with a trajectory towards net zero. The construction phase is expected to be from 2028 to 2037.

17.97 At 484 $kgCO_2e/m^2$ GIA for the A1–A5 stages, the Proposed Development would perform substantially better than present-day business-as-usual benchmarks, which are set out in the appendix. It would perform better than the LETI 2020 good-performance target of 600 $kgCO_2e/m^2$ and better than the UK Net Zero Carbon Buildings Standard's performance target[18] of 540 $kgCO_2e/m^2$ for storage and distribution projects constructed from 2028. This is the case even though the embodied carbon figure includes some elements of site roads and drainage, for example, that go beyond the building-based benchmarks referenced. However, based on the present-day predicted carbon intensity without further mitigation, it could fall short of the tightening performance target of 260 $kgCO_2e/m^2$ by 2037, the end of the construction period. Taking the averaged performance target over the 10 years of the construction period under that standard, 397 $kgCO_2e/m^2$, the present-day predicted carbon intensity of 484 $kgCO_2e/m^2$ is higher than this by around 22%.

17.98 The calculation of an embodied carbon emissions intensity for the road and rail infrastructure would not be appropriate as this type of benchmarking is based on internal floor area of buildings, which is not applicable to more mixed types of infrastructure and equipment. Similarly, the available performance target recommendations from the standards referenced above are also expressed based on building floorspace and so not well applicable to the other infrastructure.

17.99 These are predicted to make a relatively smaller contribution to the total embodied carbon than the warehouse buildings, being around 18% of the combined total of buildings and infrastructure (excluding additional PV and batteries). While GIA-based benchmarks or targets are not applicable, the embodied carbon from infrastructure can be managed through the PAS2080 framework including setting reduction targets based on PAS2080 guidance published by the Institute of Civil Engineers as set out in the Carbon Management Plan.

17.100 The embodied carbon of solar PV and battery energy storage systems is estimated to amount to around 160,000 tCO_2e, which could be a little under a third of the total embodied carbon of the Proposed Development. However, as discussed further in Appendix 17.1, the actual quantum to be installed will depend on site energy demand, to be determined in later phases, and may be lower in practice. Energy modelling and the potential scale of solar PV is detailed in the Energy Strategy in Appendix 17.5.

17.101 As shown above, the UK national carbon budgets do not provide a useful scale of context for individual development emissions, but the trajectory of GHG reductions towards the UK's net zero goal that they define is relevant: the Fifth Carbon Budget (2028-32) and Sixth Carbon Budget (2033-2037) require a 32% and 62% national reduction respectively compared to the baseline period of the Third Carbon Budget (2018-22). The Seventh Carbon Budget recommended by the Climate Change Committee for 2038–2042 would require a further 79%

[18] UK Net Zero Carbon Buildings Standard Pilot Version Rev 2 (2025) : https://www.nzcbuildings.co.uk/pilotversion

reduction.

17.102 National planning policy and expert guidance, referenced at the start of this chapter, requires '*radical reductions in GHG emissions*' in the UK economy and built environment. The NPSNN requires that *'construction* […] *emissions* […] *have been reduced as much as possible using the carbon reduction hierarchy'*. Local policy for all three authorities also emphasises the importance of carbon reduction for development projects

17.103 Advice from the Climate Change Committee is that there is a need for a significant increase in the pace of emission reductions and on-the-ground delivery of policy measures to achieve the UK's net zero emissions. Based on the construction-phase GHG emissions and embodied carbon emissions intensity, the Proposed Development is predicted to improve on business-as-usual design, and to meet benchmark performance targets for embodied carbon from several sources that are intended to be compatible with the UK's net zero trajectory.

17.104 Taking these contextual factors into consideration, and in line with the significance of effect definitions set out in paragraph 17.57 and the **high** sensitivity of the receptor, it is judged that the construction impact of the Proposed Development's buildings and associated site and rail infrastructure would initially have a **minor adverse** effect that is **not significant**.

17.105 Over the course of ten years of phased construction, and when judged in the context of tightening carbon budgets and performance targets to maintain a trajectory towards net zero, the construction impact of these elements of the Proposed Development could become a **moderate adverse** effect that is **significant** prior to further mitigation. Further mitigation is summarised later in this chapter and will be secured through the Carbon Management Plan submitted with the Application.

17.106 The additional solar PV and, if installed, battery energy storage elements could add materially to the embodied carbon impact. The scale of installed systems is not confirmed, but based on maximum estimates at this stage, is also judged to contribute a **moderate adverse** effect that is significant. However, it should be noted that this is a trade-off against the benefits of on-site renewable generation in operation, which are assessed in sections below.

Land use change

17.107 The areas of habitat to be lost and habitat to be created have been provided by the ecological consultants for the Proposed Development. Habitats have been categorised into five groups of similar carbon stocks that could be affected by loss and sequestration: cropland, grassland, woodland, heathland/shrub and hedges. For the construction phase, the total vegetation and soil carbon estimated to be lost is 13,514 tCO_2e, which is equivalent to 3.8% of the GHG emissions from the warehouse units and ancillary buildings, road infrastructure and rail infrastructure embodied carbon. The GHG emissions from habitat loss has been calculated conservatively, assuming that all vegetation carbon and 10% of soil carbon (consistent with a 'very high disturbance' factor) would be released into the atmosphere during the construction phase, although in practice this would depend on the use or decay of wood products and how extensively soil carbon is disturbed.

17.108 Habitat creation has the potential to progressively mitigate the loss of carbon from the construction stage by providing carbon sequestration over time. This is a long-term process,

so while the planting would occur at the construction stage, its potential effects have been assessed within the operational section below.

17.109 The ISEP guidance indicates that emission sources individually comprising less than 1% of total emissions, and collectively up to 5%, can be excluded from an assessment. The GHG emissions from habitat loss across the various habitat types are estimated to be less than 5% of the total emissions during construction. Therefore, whilst the habitat loss contributes to the **minor** to **moderate adverse** construction stage effect, this is only to a *de minimis* extent.

Operation – GHG emissions

17.110 During operation, the Proposed Development would cause direct and indirect GHG emissions due to the use of electricity and combustion of fuel from road and rail traffic generated by the Proposed Development. These will largely occur outside the physical site boundary, and although a number of key aspects of development design can strongly influence these emissions, it is also acknowledged that there is an identified need for rail-related warehousing in the North West (presented in the Market Needs Report) and so these emissions might also occur at more dispersed locations without the Proposed Development.

17.111 Supply of potable water and treatment of wastewater are considered to be *de minimis* sources, unlikely to be a material source of emissions relative to energy and transport, and have not been assessed further.

Energy use

17.112 An Energy Strategy has been prepared to quantify the predicted operational energy demand from the Proposed Development and proposed supply from the electricity grid together with on-site PV. The predicted annual average demand from occupancy and heating is 36,110 MWh/annum for the buildings and infrastructure. When also considering EV charging and potential future electric goods vehicle charging, demand could be as much as 176,610 MWh/annum. Further details of these predictions are set out in the Energy Strategy.

17.113 Based on the upper figure, operational emissions from grid-supplied energy consumption would equate to up to 43,440 tCO_2e/annum when using present-day emission factors, or 11,853 tCO_2e/annum using projected first year of operation (2038) emission factors, as shown in Table 17.4 below.

17.114 The energy use intensity (EUI) of electricity demand for the buildings would be approximately 60 kWh per m^2 GIA per year (36,110 MWh divided by 602,861 m^2 GIA).

Table 17.4 GHG emissions from operational energy use (without PV)

Element	Expected annual demand (MWh)	Operational carbon emissions (present-day emission factor) (tCO_2e/annum)	Operational carbon emissions (projected opening year emission factor) (tCO_2e/annum)

Occupancy only	27,140	6,660	1,821
Occupancy and heating	36,110	8,861	2,424
Occupancy, heating and EV (electric vehicle) charging	48,890	11,998	3,281
Occupancy, heating, EV and EGV (electric goods vehicle) charging	176,610	43,340	11,853

17.115 PV panels will supply energy to the Proposed Development with zero directGHG emissions from use. As reported within the Energy Strategy, the PV panels would be capable of generating 67,880 MWh of electricity per year at the maximum level of installation proposed. Table 17.5 demonstrates the associated GHG emissions arising from energy use within the Proposed Development, with the addition of energy generated by the PV panels. As shown, operational energy emissions would be reduced to 26,682 tCO_2e/annum when using present-day emissions factors, or 7,297 tCO_2e/annum when using projected first year of operation (2038) emission factors.

Table 17.5 GHG emissions from operational energy use with PV provision

Element	Expected annual demand (MWh)	PV annualised yield (MWh)	Operational carbon emissions (present-day emission factor) (tCO_2e/annum)	Operational carbon emissions (projected opening year emission factor) (tCO_2e/annum)
Occupancy only	27,140	67,880	0	0
Occupancy and heating	36,110	67,880	0	0
Occupancy, heating and EV charging	48,890	67,880	0	0

Occupancy, heating, EV and EGV charging	176,610	67,880	26,682	7,297

17.116 The Proposed Development's predicted energy use intensity of around 60 kWh per m^2 GIA per year would be around twice that recommended by the UK Net Zero Carbon Buildings Standard Pilot Version for unconditioned storage and distribution warehouses (which is 32 kWh per m^2 GIA per year for projects commenced in 2028 and ratchets down to 23 kWh per m^2 GIA per year for 2037). However, it would be more similar to the recommended energy use intensity for conditioned storage, which is 72 kWh per m^2 GIA per year for projects commenced in 2028 and ratchets down to 48 kWh per m^2 GIA per year for 2037. The Proposed Development would have a mixture of conditioned and unconditioned storage depending on tenant needs.

17.117 The predictions from the Energy Strategy, as set out above, indicate that electricity demand for electric car and potentially electric goods vehicle charging in future could become greater than that for the buildings. This has been included in the total tCO_2e estimated for electricity supply to the site, although it is worth noting that providing such electric car and potentially electric goods vehicle charging is also part of mitigating wider transport emissions.

17.118 The Energy Strategy has shown that PV utilising up to the maximum likely available roof space could generate the annualised equivalent of 2.5 times the predicted occupancy demand for electricity and 1.4 times the estimated occupancy and electric car charging demand, but not the full estimated potential demand for electric goods vehicle charging in future if that were to eventuate.

17.119 PV generation is variable and times of low or high generation will not necessarily coincide with the peaks and troughs of tenant energy demand. The figures presented above, from the Energy Strategy, are annualised averages. They assume in effect that all PV generation can be utilised, whether this is managed through storing any excess in batteries for use later at times of higher demand, or by exporting excess to the electricity grid. Management of this depends on development of battery storage and grid connection capacity, which can only be determined and optimised as actual tenant electricity needs become known as the development is built out and occupied.

17.120 The Energy Strategy's principle is to aim to meet the equivalent of the Proposed Development's demand on site through PV (which has been shown to be feasible within the available roof space for demand as predicted at this stage) and to develop battery storage and/or grid connection capacity as is needed over time as the profiles of PV generation and tenant electricity use become established.

Building maintenance and repair

17.121 There may also be GHG emissions from maintenance (lifecycle module B2) and repair (lifecycle module B3) work during the buildings' lifetimes. While this is difficult to calculate as it is dependent on occupier choices, it is possible to estimate these emissions based on the Proposed Development's up-front embodied carbon. As explained further in Appendix 17.1,

B2 emissions have been calculated by applying a benchmark of 10 $kgCO_2e/m^2$ GIA to the buildings to be provided as part of the Proposed Development, while B3 emissions have been calculated as 25% of B2 emissions.

17.122 In total, with a 15% early design contingency uplift, GHG emissions from the B2 phase would be 6,933 tCO_2e and from the B3 phase would be 1,733 tCO_2e.

17.123 In addition to this, solar PV and battery storage systems have a finite working life and are likely to need replacing during the Proposed Development's operating lifetime. These are both areas of advancing technology (and operating life), which may lead to different technologies/suppliers for replacement in future, and the carbon intensity of manufacturing is likely to be reduced in future. Qualitatively, it can be estimated that the embodied carbon impact of one or more battery replacements over the Proposed Development's operating life may amount to a combined further impact that is of a similar magnitude to the initial installation impact.

Road and rail freight and commuting

17.124 The Proposed Development will serve up to 16 trains per day. An assessment of GHG emissions arising from the additional rail movements has been undertaken based on data provided by Baker Rose Consultants. The direct effect of the additional rail movements (32 two-way movements per day) would result in total GHG emissions of 39,418 tCO_2e/annum including direct scope 1 fuel combustion emissions and the scope 3 supply chain emissions for diesel fuel production. Though this represents an increase in GHG emissions, it is important to consider this in the context of HGV movements that the rail freight would be replacing. As set out within the NPSNN, tonne for tonne, rail freight produces fewer CO_2 emissions than if the freight were moved by road.

17.125 In total, the Proposed Development is estimated to result in an approximate saving of 111 million HGV road miles per annum in comparison with moving the equivalent capacity of freight via road using non-rail-connected logistics sites. This calculation of net reduction in HGV road miles has taken into account a proportion of 'backtracking' from the Proposed Development to end destinations for off-site customers of the railport.

17.126 As a result, the switch from road to rail could save approximately 133,641 tCO_2e/annum using present-day emission factors. In this scenario, the Proposed Development would be 77% more efficient than the movement of freight by HGV, which is in fact slightly higher than the NPSNN's estimate of a typical 76% benefit.

17.127 It is important to emphasise that the magnitude of this benefit depends on the utilisation of the rail terminal. The Project Description explains that it will take some years to build up to full volume. In interim years, the absolute magnitude of benefit would therefore also be expected to scale up but the percentage saving from road-to-rail switch would be similar based on present-day emission factors.

17.128 Railport operation also requires short-distance HGV movements or specialised tugs to move containers between cranes and storage/warehouse areas. Assuming these are initially diesel-fuelled, GHG emissions are estimated as 318 tCO_2e/annum.

17.129 Additional HGV movements for freight transport not associated with the railport operation and hence not included in the data set out above will be assessed at the ES stage when transport modelling has been undertaken, together with GHG emissions from worker commuting to the Proposed Development site.

Combined effect

17.130 Paragraph 17.57 defined the ways in which GHG impact magnitude could be contextualised to aid in determining significance of effects: as a percentage of applicable carbon budgets; by comparison to benchmarked emissions intensity; and with reference to whether the impact is in line with national net zero- and Paris Agreement-compatible policy goals for carbon reduction.

17.131 Taking first the annual direct and indirect GHG emissions arising from the Proposed Development, i.e. from rail movements, electricity and fuel use on site, maintenance, repair and replacement, and worker commuting[19], these would be equivalent to 2% of the combined total GHG emissions baseline in 2023 for the three local authorities within which the Proposed Development is located; 37% of the Tyndall Centre recommended combined annual carbon budgets for these authorities in 2035[20], and 0.03% of the national carbon budget in that year. This is shown in Table 17.6.

Table 17.6 Operational GHG impacts of the Proposed Development

Aspect	Operational emissions (tCO_2e / annum)*	Percentage of 2023 baseline GHG emissions for local authorities	Percentage of 2035 recommended carbon budget for local authorities	Percentage of 2035 national carbon budget
Rail, electricity, fuel and commuting emissions and maintenance	75,084	2%	42%	0.04%
Emissions from net reduction in off-site HGV miles	-133,641	4%	74%	0.07%

[19] these latter figures will be included at the ES stage

[20] As the Proposed Development will be phased, the mid year of the 2030–2039 development programme has been chosen for comparison, conservatively retaining present-day emission factors for transport and electricity use. Carbon budgets will tighten over the development programme, but emissions from electricity and transport are also expected to reduce.

Net emissions	-58,557	2%	33%	0.03%

* conservatively using present-day emission factors

17.132 When moving to consider the net change in direct and indirect GHG emissions, i.e. arising from the benefit of reducing HGV miles but subtracting the other operational emission impacts from that benefit, this would be a reduction of 58,557 tCO_2e/annum using present-day emission factors. As shown in Table 17.6, that would be equivalent to 2% of the combined total GHG emissions baseline in 2023 for the three local authorities within which the Proposed Development is located; 33% of the Tyndall Centre recommended combined annual carbon budgets for these authorities in 2035[20], and 0.03% of the national carbon budget in that year. These comparisons indicate the magnitude of potential benefit, in which the avoided HGV emissions could be equivalent to over a quarter of the local authorities' whole recommended future year budgets, albeit this benefit is felt nationally rather than being localised in this area.

17.133 The energy use intensity in the Proposed Development's buildings is predicted to be similar to that recommended by the UK Net Zero Carbon Buildings Standard Pilot Version for conditioned storage but around twice that recommended for unconditioned storage. The Proposed Development would have a mixture of conditioned and unconditioned storage depending on tenant needs. The Energy Strategy proposes to meet on-site energy demand through PV on building roofs, which has been shown to be feasible within the available roof space, and to develop the Energy Centre with necessary battery storage and/or grid export capacity over time to manage the variability of PV generation against the profile of tenants' energy needs.

17.134 National policy, reflected in the Net Zero Strategy (Build Back Greener), the Transport Decarbonisation Plan and the Future of Freight Plan, supports the modal shift of freight from road to rail to achieve the UK's plans to achieve net zero emissions by 2050. The NPSNN recognises that choosing rail can help reduce carbon emissions within the transport sector, particularly during the transition to electric vehicles, and therefore plays an important role in a low carbon economy.

17.135 Moreover, the government has committed to a rail freight growth target of at least 75% by 2050. To be able to successfully achieve that growth target, the right infrastructure needs to be in place, providing the necessary capacity and capability to support growth. Saving approximately 111 million HGV road miles per year, the Proposed Development would therefore contribute to the modal shift of freight from road to rail and the government's rail freight growth target, which are policy-supported measures that would help the UK achieve net zero by 2050.

17.136 Summing up, and taking first the direct and indirect GHG emissions arising from the Proposed Development, in line with the significance of effect definitions set out in paragraph 17.58 and the **high** sensitivity of the receptor, it is judged that these emissions could have a **minor** to **moderate adverse** effect that may be **significant**, prior to consideration of further mitigation and of the net effect including reduction in HGV miles. This conclusion will be reviewed at the ES stage when further information is available, particularly concerning traffic impacts, and further mitigation would be identified where appropriate.

17.137 When then considering the overall net change in GHG emissions compared to the future baseline of road freight transport, taking the contextual factors discussed above into consideration, and in line with the significance of effect definitions set out in paragraph 17.58 and the **high** sensitivity of the receptor, it is judged that this would overall constitute a **beneficial** effect that is **significant**.

Landuse change

17.138 For new woodland, grassland, heathland/shrub and hedges that would be created, the total carbon sequestered could amount to 13,125 tCO_2e. As a conservative measure, soil carbon sequestration has not been included within the new grassland, heathland/shrub and hedgerow habitats on the basis that the baseline position is not a zero-carbon soil. However, qualitatively, it is anticipated that over time the soil carbon lost during the construction phase would be replenished, with a higher soil carbon stock associated with grassland, heathland/shrub and hedgerow habitats in comparison to cropland habitats (which form the majority of habitats to be lost). As such, the total carbon sequestered is likely to exceed the total carbon lost from habitat loss reported in the construction stage.

17.139 It will take several decades for all habitats to reach maturity and for this mitigation to be realised, and the continuing store of carbon depends on these habitats being retained in perpetuity. As such, while the potential carbon benefits of habitat creation are noted, they are not relied upon as verified carbon offsets to mitigate construction or operational impacts.

Net construction and operational effect – GHG emissions

17.140 The net effect of construction and operational GHG emissions will be discussed more fully at the ES stage when further information is available. However, based on the information available at this stage, five years of operational benefit from the Proposed Development due to avoided HGV miles at full rail terminal capacity would be equivalent to paying back the construction-stage emissions, using present-day emission factors.

17.141 In practice it is likely to take some years for use of the rail terminal to build up to full capacity and reach that full level of beneficial impact. However, equally in that case it would be expected to take some years for all construction emissions to be incurred, as freight handling and warehouse capacity on the site (comprising the majority of embodied carbon emissions) would be developed in a phased manner in line with demand.

17.142 Only if growth in warehousing and other site infrastructure construction becomes decoupled from growth in the utilisation of the rail terminal, i.e. if the Proposed Development became in practice primarily road-served, would payback of the construction carbon cost fail to be made through the operational savings from modal shift to rail freight. That is not the intention for the Proposed Development and would be controlled by the warehouse floorspace thresholds that trigger the requirement to complete the rail terminal, as specified in paragraph 3.132 of Chapter 3: Proposed Development Description.

17.143 Overall, therefore, this suggests that the net effect from construction and operation is likely to remain a **beneficial** effect that is **significant**.

Construction – climate risks

17.144 The construction phase is expected to be from 2028 to 2037. Climate change in the UK is ongoing but conditions in the near future, during the early construction period, are not likely to differ substantially to those encountered at present. Greater change may become apparent towards the end of the construction period and risks have been considered on that basis.

17.145 Potential climatic risks during the construction period are to the workforce, for example in summer 'heatwave' conditions with high peak temperatures, to the public from increased risk of construction dust in drought conditions, and also the risk of programme disruption, for example where snow / ice, high wind or waterlogged ground prevent certain construction works. The risk assessment in Appendix 17.2 indicates that before consideration of mitigation, workforce risk could be moderate, which is considered to be significant. Other risks would be low, which is not significant.

17.146 These risks are also typical of the existing climate, and it is considered that construction contractors are routinely adapted to them, including by managing construction workforce safety as required under the Health and Safety at Work Act 1974. Embedded mitigation secured via the oCEMP includes implementation of a Dust Management Plan, managing construction workforce welfare, health and safety to adapt to climate risks in line with the HSE's advice for outdoor working, and managing surface water drainage to limit risk from high precipitation events.

17.147 Climate risks during the construction phase with implementation of the embedded mitigation are therefore judged to be **low** and **not significant**.

Operation – climate risks

17.148 Potential climatic risks to the Proposed Development have been assessed for the periods of 2030-59 and 2070-99 for a high global emissions scenario.

17.149 The climate projections data show likely increased severity of seasonal precipitation trends: precipitation is predicted to decrease during the driest season and increase during the wettest season. Temperatures are anticipated to increase annually relative to the 1981-2010 baseline, both during the coldest and hottest seasons and months. Finally, humidity is also expected to increase during both the summer and winter, as well as the annual average. Further detail of this is set out in Appendix 17.2.

17.150 The main hazards considered potentially applicable to the Proposed Development in operation are:

- pluvial flooding of the DCO Site or access;
- overheating of equipment due to high temperatures or increased cooling demand;
- high temperatures leading to increased energy demand for cooling;
- high temperatures and temperature fluctuations causing thermal contraction and expansion of road surfaces and rail infrastructure, leading to cracking or warping;

- structural damage caused by extreme storm and wind events;
- slope/embankment failure caused by extreme rainfall or storm and wind events;
- heat stress to buildings leading to expansion and buckling;
- disruption or storm damage to the wider road or rail network, including disruption to rail network due to extreme heat;
- ground shrinking and swelling due to excessive rainfall and drought cycles, leading to subsidence;
- decline in water resource supply caused by drought, affecting potable water use and landscaping;
- landscaping/habitat failure or increased watering and maintenance requirements; and
- health, safety and wellbeing risk to operational workforce in high temperatures both indoors and outdoors.

17.151 Appendix 17.2 sets out the risk assessment matrix for these hazards, considering probability, consequence and embedded mitigation.

17.152 Potential flood risk and adaptation of the DCO Site in order to mitigate it, with appropriate climate change allowances in line with EA guidance, is detailed in Chapter 14: Surface Water and Flood Risk. Significance of effect and mitigation are set out within that chapter.

17.153 Of the remaining identified hazards, cracking of road surfaces, risk of fire, subsidence, structural damage, disruption to the off-site rail and road networks, and decline in water resource supply are judged to be a moderate or greater risk especially in the longer term. Peak summer temperature increase could also become a high risk to the operational workforce given the physical labour including operating plant outdoors involved in warehousing operations. **Moderate** or greater risks are considered to potentially be **significant**.

17.154 Other risks assessed in Appendix 17.2 were considered to be low and not significant.

PROPOSED ADDITIONAL MITIGATION MEASURES

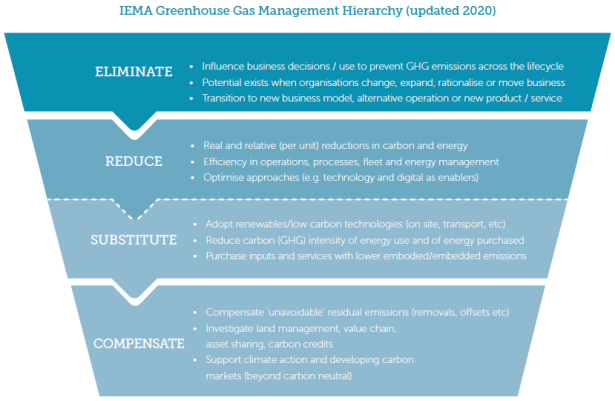
Main Site and Western Rail Chord

Construction – GHG emissions

17.155 Due to the embedded mitigation, minor adverse effects that are not significant were initially predicted for the construction stage but with the potential to become moderate adverse and significant if not further mitigated over the course of the ten-year phased construction programme. As a matter of good-practice, further opportunities for mitigation have been recommended where appropriate, along with a strategy to secure delivery of the embedded

mitigation. This is in line with the NPSNN requirement to show that *'construction* […] *emissions* […] *have been reduced as much as possible using the carbon reduction hierarchy'*. The hierarchy referred to is that published by ISEP in 2020[21], namely to eliminate, reduce, substitute or compensate for emissions:

Figure 17.1 Greenhouse Gas Management Hierarchy



17.156 The Carbon Management Plan sets these mitigation measures out in full. In overview, the strategy for carbon management and further mitigation takes into consideration the phased nature of the Proposed Development and the fact that warehouse units may be delivered and customised for a variety of tenants. The strategy therefore focuses on setting and securing performance targets, together with suggesting current good-practice measures to achieve these, but recognising that the state of the art is likely to move on.

17.157 In this respect, PAS2080:2023[22] and associated guidance from the ICE[23] and the CLC[24] provide a helpful structure for roles and responsibilities at each project stage. In brief, the suggested structure of roles and responsibilities means that at the current early design stage, the Applicant's responsibility as the project owner and initial designer is to:

- take account of whole-life carbon in decision-making and procurement;
- apply the carbon reduction hierarchy (which under PAS2080 may be summarised as 'avoid / switch / improve');
- set a clear carbon vision, leadership and initial carbon reduction target for the works;

[21] ISEP (formerly IEMA) (2020): GHG Management Hierarchy updated for net-zero, available at https://www.isepglobal.org/articles/ghg-management-hierarchy-updated-for-net-zero, accessed 25/07/25
[22] BSI (2023): Carbon Management in Infrastructure and Built Environment, https://www.bsigroup.com/en-GB/insights-and-media/insights/brochures/pas-2080-carbon-management-in-infrastructure-and-built-environment/, accessed 25/07/25
[23] ICE (2023): Guidance Document for PAS2080. Available at https://www.ice.org.uk/media/vm0nwehp/2023-03-29-pas_2080_guidance_document_april_2023.pdf, accessed 25/07/25
[24] CLC (undated): Guidance Document for PAS2080. Available at https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2019/06/Guidance-Document-for-PAS2080_vFinal.pdf, accessed 25/07/25

and

- not over-constrain the design specification too early, which may limit carbon reduction and innovation opportunities.

17.158 Carbon management should be set as a factor in the procurement decision for appointing a design and construction contractor or for managing an internal delivery team. This could be on the basis of a contractor's or internal team's own performance record, documented corporate strategy and targets for moving towards net zero, and/or specific carbon management and innovation questions at tendering stage.

17.159 At the further design and delivery stage, the lead responsibility for managing carbon and achieving reductions will typically transition to the appointed design and construction contractor or delivery team, with the project owner being in a monitoring role.

17.160 The Carbon Management Plan sets construction-stage carbon performance targets that are aligned with the UK's net zero trajectory. For warehouses and associated buildings, these targets are based on compliance with the 'upfront carbon' standards in the UK Net Zero Carbon Buildings Standard[18] with the additional recommendation that these are applied to each phase or plot of development based on start year for those works, rather than the overall site commencement date, so that the appropriate targets in future years are used. For other site infrastructure, the targets are based on the top-down method suggested in Example 2a of the ICE guidance on implementing PAS2080:2023.

17.161 To secure the specific means of making the targeted embodied carbon reductions, whole-life carbon assessment (updating the information submitted with the DCO application) should be undertaken at each detailed design phase and for the as-built development, to guide and then confirm achievement of the carbon performance standards, in line with PAS2080 and the UK Net Zero Carbon Buildings Standard. The assessments should follow the RICS guidance 'Whole Life Carbon Assessment (WLCA) 2nd Edition'[25] and where appropriate, e.g. for site infrastructure works, should follow BS EN 17472:2022 (or any update prevailing at the time for either).

17.162 It remains important that the embodied carbon implications of the design are considered in parallel with the operational energy use emissions and with a view to maintenance requirements, in order to optimise GHG emissions across the duration of the development's expected lifetime. For example, whilst designing more lightweight buildings may reduce the embodied carbon associated with construction, the reduced thermal mass of the buildings may have negative implications for operational energy use due to reduced thermal store and insulating properties. Detailed dynamic thermal modelling is required alongside WLCA in order to arrive at an optimal solution for buildings.

17.163 Good working practices have been set in the oCEMP for the Proposed Development. Key further mitigation recommendations relate to the emerging availability of low-carbon plant and other equipment. At the time of writing, fully electric, hybrid or hydrogen-adapted (fuel cell or hydrogen reciprocating engine power pack) plant is starting to become available as

[25] RICS (2023): Whole life carbon assessment for the built environment, 2nd edition, https://www.rics.org/content/dam/ricsglobal/documents/standards/Whole_life_carbon_assessment_PS_Sept23.pdf

demonstrators or available on the market from the major manufacturers. Such plant is likely to become more widely available at the time of construction work from 2030 onwards and there is an opportunity to work with equipment supplier/hire firms to be an early adopter. Similarly, for welfare cabins, site lighting and similar equipment which incorporates on-site renewable energy supply should be procured: typically units with PV panels and battery storage are becoming commercially available.

17.164 Finally, in relation to landuse change during the construction stage, the 'Construction Code of Practice for the Sustainable Use of Soils on Construction Sites'[26] should be followed, which sets out management measures for topsoil and subsoil.

Operation – GHG emissions

17.165 The overall operational effect, considering the comparison to a future baseline of continued road freight transport, has been predicted to be significantly beneficial due to the modal shift to rail freight. However, within that, there are adverse effects from electricity and fuel use and the remaining road transport; and there are also opportunities to further enhance the modal shift and landscape planting benefits.

17.166 As a matter of good-practice, further opportunities for mitigation and enhancement have therefore been recommended where appropriate, along with a strategy to secure delivery of the embedded mitigation. This is in line with the NPSNN requirement to show '*how* […] *operational emissions and, where applicable, emissions from maintenance activities, have been reduced as much as possible using the carbon reduction hierarchy*' and for '*applicants* [to] *look for opportunities within the design of the proposed development to embed nature-based or technological solutions to mitigate, capture or offset the emissions of construction*'.

17.167 The NPSNN also recognises that '*in the case of road projects*[27] *while the developer can estimate the likely emissions from road traffic, it is not solely responsible for controlling them*' but there are important opportunities to influence these emissions and facilitate road traffic decarbonisation.

17.168 The Carbon Management Plan sets these mitigation measures out in full. In overview, the strategy for carbon management and further mitigation takes into account the opportunities to influence, through design, tenants' and development users' operational GHG emissions as well as those from the directly operated site infrastructure.

17.169 The Decarbonising Transport strategy[28] and the Future of Freight plan[8] both foresee a mixture of electrification and potential use of hydrogen alongside biofuels as the pathway for this sector. The sale of new petrol and diesel cars is due to be phased out in the 2030s and HGVs

[26] Defra (2009): Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, available at: https://assets.publishing.service.gov.uk/media/5b2264ff40f0b634cfb50650/pb13298-code-of-practice-090910.pdf, accessed 14/08/25

[27] aspects of road development and road transport form part of the Proposed Development

[28] DfT (2021): Decarbonising Transport A Better, Greener Britain, available at: https://assets.publishing.service.gov.uk/media/610d63ffe90e0706d92fa282/decarbonising-transport-a-better-greener-britain.pdf, accessed 25/07/25

in the 2040s. The government's recent Hydrogen Update to the Market[29] notes that while '*battery electric will remain the dominant technology for cars, vans and buses*[,] *hydrogen and its derivatives will have an important, complementary role to play in decarbonising heavier transport applications*'. It also highlights the Tees Valley Hydrogen Hub demonstrator project for refuelling[30]; and there are examples of hydrogen-powered tugs being trialled, for example at Exeter Airport[31]. Manufacturers of terminal tractors and shunts (also referred to as tugs in this chapter) are offering electric models[32] with examples in operation at certain ports[33].

17.170 Electrification and/or hydrogen fuel are therefore likely to play a role in decarbonising the tugs for container movements, cars and buses for the workforce's commuting, the HGVs for onward freight transport, and the locomotives for rail freight. The Carbon Management Plan proposes that insofar as possible the Proposed Development design anticipates and future-proofs for these developments through the following main measures:

- providing for additional future high-capacity electric vehicle (EV) charging capacity in car parking areas (for example laying conduit and cabling, even if not all initially energised), notwithstanding exemptions under the current Building Regulations Part S;
- reserving space in the detailed design for a future tug and HGV charging or hydrogen refuelling area; and
- considering grid connection and site distribution network capacity in the Energy Centre design with a view to future vehicle charging or hydrogen production need (discussed below).

17.171 The Energy Strategy has set out estimated electricity demand together with proposals for on-site solar PV and a centralised Energy Centre with battery storage. As discussed above, decarbonising transport is expected to involve more widespread EV adoption and potential hydrogen fuel cell use. The Proposed Development's grid connection capacity and on-site distribution network should therefore be sized with future EV charging needs in mind, though this is not possible to quantify definitively at this stage. Consideration should also be given to capacity for electrolytic hydrogen production for vehicle / plant fuelling within the site in future. Modular containerised electrolysis systems available on the market. It is not possible to say definitively what the uptake of hydrogen-fuelled vehicles may be, and how much demand for refuelling will eventuate, but consideration of this in future is included in the

[29] DESNZ (2025): Hydrogen Update to the Market July 2025, available at: https://assets.publishing.service.gov.uk/media/6880b2139fab8e2e86160efe/hydrogen-update-to-the-market-2025.pdf, accessed 25/07/25
[30] DfT (2024): Tees Valley hydrogen transport hub: successful bidder, available at: https://www.gov.uk/government/publications/tees-valley-hydrogen-transport-hub-successful-bidders/tees-valley-hydrogen-transport-hub-successful-bidders, accessed 25/07/25
[31] edie (2025): Exeter airport runs aircraft turnaround using hydrogen-powered equipment. https://www.edie.net/exeter-airport-runs-aircraft-turnaround-using-hydrogen-powered-equipment/, accessed 25/07/25
[32] Kalmar (nd): Kalmar TX Electric Terminal Tractor, available at: https://www.kalmarglobal.com/equipment/terminal-tractors/tx-electric-terminal-tractor-shunt-truck/, accessed 28/07/25
[33] Terberg (2025): Fleet of 20 electric Terberg terminal tractors continues to excel at DP World Callao, available at: https://www.terbergspecialvehicles.com/en/news/dpworld-callao-electric-fleet/, accessed 28/07/25

Carbon Management Plan.

17.172 The centralised Energy Centre with battery storage plus the PV also offers the opportunity to arbitrage times of low- and high-carbon intensity electricity supply for the site, and could also play a role in demand-side response and smart/flexible grid operation, which forms an important part of NESO's plans for the grid under the Clean Power 2030 strategy[34]. This can aid both the Proposed Development and tenants in meeting future net zero carbon operational targets. However, this is subject to the capacity of the Proposed Development's grid connection. In further stages of design, further engagement with both the DNO and NESO should be carried out to inform opportunities to make best use of the Energy Centre to the benefits of both site tenants and grid decarbonisation.

17.173 The feasibility and potential benefit of a low-temperature heating/cooling loop from centralised air- or ground-source heat pumps (A/GSHPs) and adsorption chillers within the Energy Centre should also be explored, as this may be a more efficient solution then individual ASHP or chiller systems on buildings, especially given the likely mix of chilled/non-chilled warehouse spaces and need for resilience future temperature extremes in the UK. Consideration of this is included in the Carbon Management Plan.

17.174 With regard to energy use in buildings, the Carbon Management Plan sets energy use intensity (EUI) targets for warehouses and associated buildings that are aligned with the UK's net zero trajectory. These targets are based on compliance with the EUI standards in the UK Net Zero Carbon Buildings Standard[19] with the recommendation (for clarity) that these are applied to each phase or plot of development based on start year for those works, rather than the overall site commencement date, so that the appropriate targets in future years are used.

17.175 Given the emerging technology choices, phased nature of the development and the fact that occupiers' electricity demand will also become clearer over time, the key tenet of the Energy Strategy is to set a net zero carbon goal but take a staged, flexible and responsive approach to achieving that over time.

17.176 Finally, the NPSNN recommends embedding nature-based solutions to mitigate emissions, which is relevant to the landscape planting. The Carbon Management Plan proposes that when developing the detailed planting schedule, consideration is given to fast-growing tree species that maximise carbon sequestration in the planting mix. However, this needs to be balanced against climate resilience and biodiversity goals which may require a more diverse species mix.

Construction – climate risks

17.177 No further mitigation, beyond that to be secured as embedded mitigation via the oCEMP, is considered to be required. However, for clarity, the following good-practice measures for construction workers' welfare, drawn from HSE guidance[35], have been incorporated into the oCEMP.

[34] NESO (2025): Preparing the way for Clean Power by 2030, available at: https://www.neso.energy/news/preparing-way-clean-power-2030, accessed 25/07/25
[35] HSE, undated: Outdoor Working. https://www.hse.gov.uk/temperature/employer/outdoor-working.htm

17.178 Cold environments:

- Ensure the personal protective equipment issued is appropriate.
- Provide mobile facilities for warming up, and soup or hot drinks.
- Introduce more frequent rest breaks.
- Consider delaying the work until warmer times of the year without compromising on safety.
- Make sure workers can recognise the early symptoms of cold stress, such as a cough or body aches.

17.179 Hot environments:

- Reschedule work to cooler times of the day where needed.
- Provide more frequent rest breaks and introduce shading to rest areas.
- Provide free access to cool drinking water.
- Introduce shading in areas where people are working.
- Encourage workers to remove personal protective equipment when resting to help encourage heat loss.
- Make sure workers can recognise the early symptoms of heat stress.

Operation – climate risks

17.180 The climate risk assessment identified potentially significant long-term risks to the physical infrastructure of the site, to the safety and wellbeing of the workforce, to the off-site transport, electricity and telecoms networks the development relies upon, and to potable water supplies.

17.181 The primary mitigation for building structural risks is compliance with the Building Regulations, following appropriate geotechnical ground investigation, and with an appropriate engineering allowance as safety margin in designs. For rail infrastructure, extreme summer temperatures in particular also need to be allowed for. It is recommended that future climatic conditions using up-to-date UKCP18 projections data (or equivalent at the time) including the 'extreme values' dataset are specifically considered during detailed civil engineering, rail engineering and architectural design.

17.182 The on-site Energy Centre with PV and battery storage provides an opportunity for resilience to electricity grid disruptions; the capacity of this has been discussed above.

17.183 Decline in water resource supply or quality can be managed through SuDS and water efficiency measures, although United Utilities has an obligation to have a 25-year plan for customer supplies.

17.184 Workforce health and safety would be expected to be managed under the applicable legislation, which in future may entail measures such as adapting outdoor working hours, providing shade, and providing cooled welfare spaces with water for outdoor work during high temperature extremes.

17.185 Given the physical labour in warehouse operations together with operating plant outdoors, this is a key aspect to consider in detailed design. The Energy Strategy has identified the importance of solar control glazing and balanced g-values for translucent elements to manage heat gain in summer and ensure optimised internal conditions in both the winter and summer months. It also identified the need for external solar shading, which could include solar PV canopies over car parking areas, use of the site landscaping to provide shading around roads and external working areas, and shading canopies for warehouse loading docks.

17.186 A package of good-practice mitigation measures are also proposed to be included for the management of the DCO Site through a requirement in the DCO, to ensure a high-quality environment is maintained throughout, including its shared areas of public realm. Recommendations for this are included in Appendix 17.2.

RESIDUAL ENVIRONMENTAL EFFECTS

Main Site and Western Rail Chord

Construction – GHG emissions

17.187 With full implementation of the embedded and further mitigation, the residual effect is predicted to be **minor adverse** and **not significant**.

Operation – GHG emissions

17.188 With full implementation of the embedded and further mitigation, the residual effect of the direct and indirect GHG emissions from Proposed Development site operation is predicted to be **minor adverse** and **not significant**.

17.189 The overall net effect, taking into account the reduction in HGV miles compared to the future baseline, is predicted to be a **beneficial effect** that is **significant** and has opportunities for further enhancement.

Construction – climate risks

17.190 Additional mitigation is not required beyond the embedded mitigation secured via the oCEMP and so the residual effect would remain **low** and **not significant**.

Operation – climate risks

17.191 With full implementation of the embedded and further mitigation, it is considered that the Proposed Development's risks could be reduced to **low** and **not significant**.

CUMULATIVE AND IN-COMBINATION EFFECTS

17.192 All developments that emit GHGs have the potential to impact the atmospheric mass of GHGs as a receptor, and so may have a cumulative impact on climate change. Consequently, cumulative effects due to other specific local development projects are not predicted individually but are taken into account when considering the impact of the Proposed Development by defining the atmospheric mass of GHGs as a high sensitivity receptor.

17.193 Similarly, the cumulative effect of all other developments globally on predicted future climatic conditions, and hence the risk assessment and resilience/adaptation measures, has been taken into account through use of the RCP8.5 scenario in the probabilistic climate change projections (see Appendix 17.2) so a separate cumulative assessment is not required.

IMPLICATIONS OF CLIMATE CHANGE

17.194 Climate change could cause inter-related effects, in which it exacerbates or ameliorates the effects of the Proposed Development on sensitive receptors (i.e. the inter-related effects of climate change with other environmental impact pathways).

17.195 Inter-related effects are those that interact spatially and/or temporally, resulting in multiple effects, or effects of a greater significance, upon a single receptor. The inter-related effects of climate change can be considered in two categories:

- climate change altering the sensitivity of receptors or the baseline environment, thereby increasing the significance of effects; and
- climate change modifying an impact pathway, i.e. by changing the magnitude or spatial extent and introducing new receptors.

17.196 These have been assessed within each technical chapter of the PEIR as applicable, under this section heading (Implications of Climate Change). Each author has considered the impact of climate change on the Proposed Development and adaptations to climate change, utilising the UKCP18 climate change projections, concluding as to whether potential climate change may alter the predicted effects, and if so, in what way.

17.197 The main areas where there is a potential for inter-related effects are considered to be the following. The potential significance is assessed further, as applicable, in the inter-related effects sections of respective ES chapters.

- Landscape planting: increased temperatures and drought conditions, or increased soil erosion from extreme weather events, could cause landscape planting to fail.
- Ecology: climatic changes could reduce the resilience of receptors or change the distribution of habitats and species affected.
- Air pollutant dispersion: a change in prevailing weather patterns and localised changes in atmospheric chemistry could impact air pollutant dispersion, thereby affecting short-term and potentially annual-average concentrations. Additionally, increased

temperatures could lead to a greater sensitivity to episodes of poor air quality, e.g. for people with long-term respiratory or cardiovascular health conditions.

- Noise conditions: increased temperatures could lead to a greater sensitivity to noise due to open windows/doors for ventilation.
- Potable water supply: increased temperatures and drought conditions could reduce the resilience of potable water supply.
- Flood risk: increased peak rainfall intensity, sustained wet periods and/or greater frequency of storm events can all affect on- and off-site flood risk.
- Transport network resilience: extreme weather events could reduce the resilience of the transport network to additional traffic generation and rail freight journeys.

17.198 The future climatic conditions and the potential nature of inter-related effects are discussed further in Appendix 17.3.

SUMMARY AND CONCLUSIONS

Approach and policy context for assessing significance

17.199 The climate change chapter has assessed the potential effect of greenhouse gas emissions resulting from the Proposed Development, potential climate risks to the development, and the potential for climate change to inter-relate with other environmental effects that are reported in this PEIR.

17.200 Emission of primarily carbon dioxide with trace methane and nitrous oxide greenhouse gases would be caused by the Proposed Development during its construction and operation. The total emissions have been expressed as carbon dioxide equivalents based on the global warming potential of each gas. Together they are often referred to as 'carbon' as a shorthand (e.g. when speaking of 'low-carbon power' or 'carbon reduction targets').

17.201 The climate is expected to change over the course of the Proposed Development's lifetime. Climate risks and the potential for inter-related environmental effects have been assessed on the basis of modelled future climatic conditions, referred to as climate projections, using information from the Met Office.

17.202 The significance of effects has been determined through professional judgement, using guidance from the Institute of Sustainability and Environmental Professionals and the UK Green Building Council, and using the context of climate change legislation, policy and expert body recommendations.

17.203 The UK has a binding requirement under the Climate Change Act 2008 to reduce greenhouse gas emissions to a net zero level by 2050. In the interim period, five-yearly carbon budgets define a trajectory of reduced emissions over time to meet that goal. The UK has made a commitment internationally to reduce greenhouse gas emissions by at least 81% by 2035 (from the a 1990 baseline) under the UN Framework Convention on Climate Change. The UK's

legislated Sixth Carbon Budget for the period 2033-2037 requires a 78% reduction by 2035. This requires action to reduce greenhouse gas emissions from sources both large and small, all of which contribute to the cumulative effect on climate change.

17.204 National and local policy recognises a declared "*climate emergency*" requiring "*radical reductions in greenhouse gas emissions*" and climate risk adaptation through the planning system. Policy gaps and delivery challenges to achieving this are noted by the government's advisory bodies on infrastructure and climate change, particularly around building energy efficiency, low-carbon heating and sustainable transport. Significant risks in the UK from a changing climate are also highlighted in national and local policy, requiring resilience and adaptation actions to be delivered through development planning.

17.205 A range of policy including the Future of Freight Plan, Transport Decarbonisation Plan and the Net Zero Strategy for the UK all proposes greater use of rail freight (along with electrification). The National Policy Statement for National Networks highlights the much lower greenhouse gas emissions per tonne of freight moved by rail than by road. It also calls for developments to avoid or reduce greenhouse gas emissions, provide a Carbon Management Plan, and build resilience against climate change.

Baseline environment

17.206 The current physical baseline condition of the Main Site with regard to greenhouse gas emissions is its use primarily as agricultural land, typically associated with minor GHG emissions per hectare from decline in soil carbon stocks. There is scrub and some woodland at the Western Rail Chord Site. Existing carbon stocks and fluxes are therefore considered to be low, but change in these through loss of habitat and new habitat creation has been assessed.

17.207 The current climatic baseline is likely to change, with climate change over the next few decades meaning milder wetter winters and hotter, drier summers in the UK, with greater frequency and intensity of weather extremes. At the present rate of global climate change, this may be considered part of the known future baseline. These general UK trends are reflected in the site-specific projections analysed in the assessment.

Uncertainties

17.208 Key uncertainties in the greenhouse gas emissions impact assessment concern the use of emission factors for activity data; the estimation of construction materials and works at an early design stage; the estimation of operational energy demand and supply at an early design stage; and the projections of modal shift from road and rail freight transport. To mitigate these uncertainties, a conservative approach has been adopted to allow an initial evidenced judgement to be made at this PEIR stage concerning whether net impacts are likely to be adverse or beneficial and whether the resulting effects are likely to be significant. At this PEIR stage, outputs from the strategic road modelling are not available, so emissions from construction and some operational traffic movements have not been assessed, but are expected to be assessed at the ES stage.

17.209 There is also uncertainty about the magnitude of future changes in global and UK climate. In assessing climate risks, a high magnitude of change scenario and the high end of the Met

Office probabilistic projections have therefore been used to be precautionary.

Construction effects and mitigation

17.210 The Proposed Development would cause greenhouse gas emissions directly and indirectly from manufacturing the materials used in construction (the 'embodied carbon'), delivery of materials to the site, and use of construction plant and energy on-site. These have been assessed based on typical building designs used by the Applicant in other developments and based on specific materials estimates for the proposed rail-related infrastructure. The embodied carbon of solar photovoltaic panels has also been included based on the maximum amount that could be deployed, together with an estimate for potential battery storage. The construction-stage greenhouse gas emissions are estimated to be in the order of 492,679 tonnes of carbon dioxide equivalent (tCO_2e). Loss of woodland could contribute a further 13,514 tCO_2e of lost carbon stocks.

17.211 Significance has been judged through comparing the absolute emissions to local and national carbon budgets, net zero policy, and comparing the carbon intensity to good-practice benchmarks for buildings of this type. The warehouse buildings, the largest contributor to the embodied carbon total, are predicted to have a carbon intensity that performs well compared to good-practice targets for the early years of construction. However, at this early design stage, detail of mitigating construction-stage greenhouse gas emissions across all aspects of the Proposed Development during the phased construction programme remains to be determined (controlled through the Carbon Management Plan). The significance of effect is judged to be **minor** to **moderate adverse** which would be **significant** at the latter end of that range.

17.212 Further mitigation proposed through the Carbon Management Plan is to set and achieve carbon intensity targets that are consistent with the UK's net zero trajectory, to be determined through following a recognised standard (with the UK Green Building Council's Net Zero Carbon Building Standard being recommended) for buildings and through guidance for target-setting under PAS2080:2023 for other site infrastructure. Design measures to achieve this would be informed by whole-life carbon assessment at the detailed design stage.

17.213 The construction phase is expected to be from 2028 to 2037. Climate change in the UK is ongoing but conditions in the near future, during the early construction period, are not likely to differ substantially to those encountered at present. Greater change may become apparent towards the end of the construction period and risks have been considered on that basis.

17.214 Potential climatic risks during the construction period are to the workforce, for example in summer 'heatwave' conditions with high peak temperatures, and to the public from increased risk of construction dust in drought conditions. Programme disruption, for example where snow and ice, high wind or waterlogged ground prevent certain construction works, is also a risk. Before consideration of mitigation, workforce risk could be **moderate**, which is considered to be **significant**. Other risks would be **low**, which is **not significant**.

17.215 These risks are also typical of the existing climate, and it is considered that construction contractors are routinely adapted to them, including by managing construction workforce safety as required under the Health and Safety at Work Act 1974. Embedded mitigation

secured via the oCEMP includes implementation of a Dust Management Plan, managing construction workforce welfare, health and safety to adapt to climate risks in line with the HSE's advice for outdoor working, and managing surface water drainage to limit risk from high precipitation events.

17.216 Climate risks during the construction phase with implementation of the embedded mitigation are therefore judged to be **low** and **not significant**.

Operational effects and mitigation

17.217 In operation, the Proposed Development would cause direct and indirect greenhouse gas emissions due to the use of electricity and combustion of fuel from road and rail traffic. Energy use, and the amount of demand that could be met by on-site solar photovoltaic panels, has been predicted in the Energy Strategy for the Proposed Development. The Energy Strategy's principle is to aim to meet the equivalent of the Proposed Development's demand as an annual average on site through solar photovoltaic generation, which has been shown to be feasible within the available roof space for demand as predicted at this stage. The remaining greenhouse gas emissions from grid-supplied electricity on an annual average basis are therefore expected to be minimal, estimated as up to 7,297 tCO_2e/annum (conservatively using the present-day carbon intensity of electricity generation) if there is additional electricity demand from electric goods vehicle charging in future.

17.218 Building maintenance, repair or possible refurbishment during the Proposed Development's operating life could cause additional embodied carbon emissions. Solar photovoltaic panels and any battery storage could also need replacing during the operating lifetime. This is difficult to predicted at the planning stage but has been estimated using published benchmarks and would contribute to the significance of operational effects.

17.219 The Proposed Development would serve up to 16 trains per day. Baker Rose Consultants have predicted the freight routes, train miles and the road miles that would be avoided by switching from road to rail freight. This takes into account a proportion of 'backtracking' from the Proposed Development to end destinations for off-site customers of the railport. In total, the Proposed Development is estimated to result in an approximate saving of 111 million lorry miles per annum in comparison with moving the equivalent capacity of freight via road using non-rail-connected logistics sites. This switch from road to rail could save approximately 133,641 tCO_2e/annum using present-day emission factors. In this scenario, the rail freight transport utilising the Proposed Development would be 77% more efficient than the movement of freight by lorry.

17.220 Other road traffic generation has not been assessed at PEIR stage as transport modelling data was not available. This will be assessed at the ES stage.

17.221 Taking into account the energy use intensity of the Proposed Development and on-site renewable supply compared to good-practice benchmarks, the maintenance and the use of container tugs and short-distance lorry movements, the significance of effect in operation is judged to be **minor** to **moderate adverse**, which would be **significant** at the latter end of that range. However, the off-site benefit of switching a large volume of freight from road to rail transport would be a **beneficial effect** that is **significant** and would exceed the on-site adverse

effect. It is important to emphasise that the magnitude of this benefit depends on the utilisation of the rail terminal. The Project Description explains that it will take some years to build up to full volume. In interim years, the absolute magnitude of benefit would therefore also be expected to scale up. When other road traffic generation is assessed at ES stage, this may also reduce the net benefit of the road-to-rail savings.

17.222 Further mitigation proposed through the Carbon Management Plan is to achieve energy use intensity and renewable supply targets that are consistent with the UK's net zero trajectory, to be determined through following a recognised standard (with the UK Green Building Council's Net Zero Carbon Building Standard being recommended). Consideration of energy storage to manage on-site supply and demand, the needs of future electric vehicle charging, and the potential for hydrogen vehicle fuelling in future has been recommended.

17.223 Potential climatic risks to the Proposed Development have been assessed for the periods of 2030-59 and 2070-99 for a high global emissions scenario. The climate projections data show likely increased severity of seasonal precipitation trends: precipitation is predicted to decrease during the driest season and increase during the wettest season. Temperatures are anticipated to increase annually relative to the 1981-2010 baseline, both during the coldest and hottest seasons and months. Finally, humidity is also expected to increase during both the summer and winter, as well as the annual average.

17.224 A range of potential hazards to the Proposed Development have been considered. Potential flood risk and adaptation of the DCO Site in order to mitigate it, with appropriate climate change allowances in line with EA guidance, is detailed in Chapter 14: Surface Water and Flood Risk. Significance of effect and mitigation are set out within that chapter.

17.225 Of the remaining identified hazards, cracking of road surfaces, risk of fire, subsidence, structural damage, disruption to the off-site rail and road networks, and decline in water resource supply are judged to be a moderate or greater risk especially in the longer term. Peak summer temperature increase could also become a high risk to the operational workforce given the physical labour including operating plant outdoors involved in warehousing operations. **Moderate** or greater risks are considered to potentially be **significant**.

17.226 Further mitigation includes a recommendation for climate projections to be considered in the detailed design, including shading and cooling (discussed in the Energy Strategy), landscape planting and the sustainable drainage system. Workforce health and safety would be expected to be managed under the applicable legislation, which in future may entail measures such as adapting outdoor working hours, providing shade, and providing cooled welfare spaces with water for outdoor work during high temperature extremes.

Inter-related effects

17.227 Climate change could also cause inter-related effects with other environmental impact pathways, for example by causing species and habitats to be less resilient to other impacts from the Proposed Development. The impact of climate change on the development and adaptations to climate change has been considered by each author of the Environmental Statement topic chapters, using climate change projections, to conclude as to whether

potential climate change may alter the predicted effects, and if so, in what way.

Residual and whole-life effects

17.228 With full implementation of the embedded and further mitigation, as controlled through the Carbon Management Plan, the residual greenhouse gas emission effects of construction are predicted to be reduced to **minor adverse** and **not significant**.

17.229 Additional mitigation for climate risks, beyond the embedded mitigation secured via the oCEMP, was not required and so the residual effect would remain **low** and **not significant**.

17.230 With full implementation of the embedded and further mitigation, as controlled through the Carbon Management Plan and Energy Strategy, the residual greenhouse gas emission effects of operation are predicted to be reduced to **minor adverse** and **not significant**.

17.231 The overall net operational effect, taking into account the reduction in lorry miles compared to the future baseline, is predicted to be a **beneficial effect** that is **significant**.

17.232 Considering the net whole-life effect, based on the information available at this stage, five years of operational benefit from the Proposed Development due to avoided lorry miles at full rail terminal capacity would be equivalent to paying back the construction-stage emissions, using present-day emission factors. This payback period may be affected by assessment of other road traffic generation at ES stage.

17.233 In practice it is likely to take some years for use of the rail terminal to build up to full capacity and reach that full level of beneficial impact. However, equally in that case it would be expected to take some years for all construction emissions to be incurred, as freight handling and warehouse capacity on the site (comprising the majority of embodied carbon emissions) would be developed in a phased manner in line with demand.

17.234 Only if growth in warehousing and other site infrastructure construction becomes decoupled from growth in the utilisation of the rail terminal, i.e. if the Proposed Development became in practice primarily road-served, would payback of the construction carbon cost fail to be made through the operational savings from modal shift to rail freight. That is not the intention for the Proposed Development and would be controlled by the warehouse floorspace thresholds that trigger the requirement to complete the rail terminal, as specified in paragraph 3.132 of the Chapter 3: Proposed Development Description.

17.235 Overall, therefore, this suggests that the net effect from construction and operation is likely to remain a **beneficial effect** that is **significant**.

Table 17.7 Summary of effects

Receptor	Receptor sensitivity	Magnitude of impact	Potential effect prior to further mitigation	Proposed further mitigation or enhancement	Residual effect	Significance
Main Site and Western Rail Chord						
Construction phase						
Atmospheric concentration of GHGs	High	GHG emissions from construction material use ('embodied carbon'), delivery, on-site construction activity, workforce commuting and land-use change: **506,192 tCO_2e** (workforce commuting assessment is pending ES stage)	**Minor** to **moderate adverse (significant)**	Carbon Management Plan setting net zero carbon compatible targets and measures to achieve these	Would be reduced to **minor adverse**	Would be reduced to **not significant**
Construction workforce and programme	High	Risks to workforce health and safety from extreme weather including heatwaves; disruption to construction works and programme from same	**Low (not significant)**	Securing good-practice embedded mitigation through the final oCEMP	**Low**	**Not significant**
Operation phase						
Atmospheric concentration of GHGs	High	GHG emissions from electricity and fuel use, maintenance and repair, rail freight movements, new road traffic	**Minor** to **moderate adverse (significant)**	Carbon Management Plan setting net zero carbon compatible	Would be reduced to **minor**	Would be reduced to **not**

Receptor	Receptor sensitivity	Magnitude of impact	Potential effect prior to further mitigation	Proposed further mitigation or enhancement	Residual effect	Significance
		movements and land-use change: **7,615 tCO_2e/annum** (road traffic assessment is pending ES stage; landscape planting is not counted as an offset to be conservative; PV replacement is not quantitatively included)		targets and measures to achieve these	**adverse**	**significant**
Atmospheric concentration of GHGs	High	Net GHG emissions from the change in HGV road freight traffic compared to the future baseline, after subtracting the above emissions: **-126,025 tCO_2e/annum**	**Beneficial (significant)**	Carbon Management Plan with future-proofing measures to support decarbonisation of road and rail freight	**Beneficial**	**Significant**
Development buildings, operations and workforce	High	Risks to workforce health and safety from extreme weather including heatwaves; risks to structures, development operation and off-site networks from same	**Moderate to high (significant)**	Design and operational climate resilience measures including structural design, shading, water efficiency and cooling	Would be reduced to **low**	Would be reduced to **not significant**