

CONTENTS

11.1	INTRODUCTION	1
11.2	RELEVANT POLICY	3
	National Planning Policy Framework & National Policy.....	3
	Planning Practice Guidance.....	3
	Adopted Local Plan.....	3
	Any other relevant policy, legislation or guidance.....	4
11.3	ASSESSMENT METHODOLOGY	6
	Scope.....	6
	<i>Effects Not Considered Significant</i>	6
	<i>Likely Significant Effects</i>	8
	Data sources.....	8
	Assessment approach.....	9
	Extent of the Study Area.....	9
	Emission Scopes & Boundaries.....	9
	Significance criteria.....	10
	<i>Determining Sensitivity of Receptor</i>	11
	<i>Determining the Magnitude of Change</i>	12
	<i>Determining the Level of Effect</i>	13
	Uncertainties and limitations.....	15
	<i>Emission Factors</i>	15
	<i>Energy Strategy</i>	15
	<i>Transport GHG Emissions</i>	15
11.4	BASELINE CONDITIONS	17
	The current baseline.....	17
	<i>Local Authority GHG Emissions</i>	17
	<i>UK Carbon Budgets</i>	17
	The projected future baseline.....	18
11.5	POTENTIAL EFFECTS	20
	Construction stage.....	20
	<i>Construction Emissions</i>	20
	<i>Embodied Carbon</i>	20
	<i>Transportation of Waste</i>	21
	Post-completion stage.....	22
	<i>Fuel and Energy Related Activities (FERA)</i>	23
11.6	MITIGATION MEASURES	25

Construction stage	25
Post-completion stage	25
11.7 RESIDUAL EFFECTS	26
Construction stage	26
Post-completion stage	26
Construction and Post-completion stage (collective effect)	26
Summary of effects	26
11.8 CUMULATIVE EFFECTS	28
<i>Effect Interactions</i>	28
<i>In-combination Effects</i>	28

11.1 INTRODUCTION

11.1.1 This Chapter reports the outcome of the assessment of likely significant environmental effects arising from the Proposed Development in relation to climate change and how these effects can be reduced ("climate change mitigation").

11.1.2 The Chapter describes the scope of the assessment and assessment methodology, and a summary of the baseline information that has informed the assessment.

11.1.3 A number of effects have been avoided in advance of the assessment and where relevant these are clearly stated. The assessment reports on the likely significant environmental effects, the further mitigation measures that are required to prevent, reduce or offset significant adverse effects, or further enhance beneficial effects. The conclusions are provided both in terms of the residual effects and whether these are considered significant.

11.1.4 This Chapter is intended to be read as part of the wider ES with particular reference to the introductory chapters (Chapters 1 – 3). Interactive effects, in the sense of particular impacts affecting other environmental dimensions/topics, are considered in relevant topic chapters and in the concluding chapter (12) of this ES.

11.1.5 The terms "carbon", "carbon dioxide (CO₂)" and "greenhouse gases (GHGs)" are used interchangeably in this Chapter depending on the terminology of referenced documents.

11.1.6 This Chapter has been produced by Lesley Treacy and Paul White from Turley Sustainability.

Technical Area:	Climate Change	Climate Change
Lead Author:	Paul White, Director	Lesley Treacy, Director
Qualifications / Accreditations relevant to technical area and EIA:	MEng Environmental Engineering	MSc Urban and Regional Planning; Dip EIA Management
Years technical experience:	10 years	15 years
Project Experience:	<p>Climate Change Chapter Author - Bourn Airfield – New settlement of 3,500 new homes in South Cambridgeshire</p> <p>Climate Change Chapter Author – Peddimore – New employment park in Birmingham</p> <p>Climate Change Chapter Author – Rail Central – Strategic Rail</p>	<p>Climate Change Chapter - Author – Gamston Fields, – New settlement of 2,250 new homes within Rushcliffe Borough</p> <p>Climate Change Scoping Section - Author – STN Northside – New logistics development in Uttlesford</p> <p>Climate Change Screening Section – Author – Trinity Farm,</p>

	Freight Interchange in South Northamptonshire Climate Change Chapter Author – Junction 11, M42 - Jaguar Landrover's Global Logistics Centre	Logistics development in Knottingley
--	---	--------------------------------------

11.2 RELEVANT POLICY

National Planning Policy Framework & National Policy

11.2.1 Paragraph 7 of the NPPF states that: 'the purpose of the planning system is to contribute to the achievement of sustainable development'. One of the three pillars identified by the NPPF is an environmental objective. This objective contributes to protecting and enhancing our natural, built and historic environment; and, as part of this, helping to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate and adapt to climate change including moving to a low carbon economy.

11.2.2 Additional National Policy relating to climate change includes:

11.2.3 The Climate Change Act 2008¹ which sets a legally-binding target for the UK to reduce its CO2 emissions, was updated in 2019 to amend the target to reduce emissions to net zero by 2050;

11.2.4 The Carbon Plan – Delivering our Low Carbon Future² which sets out how the UK proposes to transition to a low carbon and resilient economy; and

11.2.5 Committee on Climate Change (CCC) report 'Reducing UK emissions: 2020 Progress Report to Parliament'³ provides the latest update on the UK's progress to meeting its carbon reduction targets setting the context for the potential impact of carbon emissions.

Planning Practice Guidance

11.2.6 Planning Practice Guidance (PPG) includes a section on Climate Change and provides further advice on various planning issues associated with development, including those linked to sustainability and renewable energy and underpins the policies within the NPPF. It sets out how local authorities should include policies that protect the local environment and strategies to mitigate and adapt to climate change.

Adopted Local Plan

11.2.7 The Local Plan includes policy relating to climate change including:

¹ Climate Change Act 2008; UK Government; 2008

² The Carbon Plan – Delivering our Low Carbon Future; Department of Energy and Climate Change (DECC); UK Government; 2011

³ CCC report, Reducing UK emissions: 2020 Progress Report to Parliament - <https://www.theccc.org.uk/publication/reducing-uk-emissions-2020-progress-report-to-parliament/>

11.2.8 Policy ESD 1: Mitigating and Adapting to Climate Change: This Policy promotes measures to mitigate the impact of development on climate change by; delivering development that seeks to reduce the need to travel and which encourages sustainable travel options; designing developments to reduce carbon emissions and use resources more efficiently; promoting the use of decentralised and renewable or low carbon energy where appropriate; and incorporation of suitable adaptation measures in new development to ensure that development is more resilient to climate change impacts.

11.2.9 Policy ESD 2: Energy Hierarchy and Allowable Solutions: which promotes use of the energy hierarchy.

11.2.10 Policy ESD 3: Sustainable Construction: requires new development to incorporate sustainable design and construction measures.

11.2.11 Policy ESD 5: Renewable Energy: supports renewable and low carbon energy provision wherever any adverse impacts can be addressed satisfactorily.

Any other relevant policy, legislation or guidance

11.2.12 Cherwell's Environmental Strategy for a Changing Climate (2008) highlights the common need to improve energy efficiency, reduce carbon emissions, encourage the take-up of low carbon and renewable energy technologies, and reduce the need to travel and provide good access to public and other sustainable modes of transport. It notes the need to conserve water, to minimise flood risk, and to be resilient to the impacts of climate change.

11.2.13 The following Guidance on climate change has also been produced:

11.2.14 IEMA Principles Series: Climate Change Mitigation & EIA⁴ provides over-arching principles including that the EIA process should, at an early stage, influence the location and design of projects to optimise GHG performance and limit likely contribution to GHG emissions (hereafter referred to as IEMA Guidance);

11.2.15 IEMA EIA Guide to: Assessing Greenhouse Gas Emissions & Evaluating their Significance⁵; and

⁴ Principles Series: Climate Change Mitigation and EIA; IEMA; 2010

⁵ EIA Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance; IEMA; 2017 (hereafter referred to as IEMA Guidance)

11.2.16 IEMA EIA Guide to: Climate Change Resilience and Adaptation⁶.

⁶ IEMA, Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation, 2020 - <https://www.iema.net/resources/news/2020/06/26/iema-launch-timely-new-eia-guide-for-climate-change-resilience-and-adaptation/>

11.3 ASSESSMENT METHODOLOGY

Scope

11.3.1 Climate change was indirectly examined within the transport and flood sections of the ES Scoping Report September 2020. Since then and following conversations with CDC, a scoping process was undertaken with the EIA team to determine likely significant effects for assessment in the EIA. This is summarised below.

Effects Not Considered Significant

11.3.2 **Construction site employees** – Increased summer temperature may have negative effects during construction including potential health and safety risks associated with sun/heat exposure and dehydration etc. The CEMP will, however, include measures such as the provision of shading, sunscreen and potable water supplies for site workers. These tertiary mitigation measures will form an integral part of the Proposed Development and are included in the Schedule of Mitigation. Following mitigation, such effects are not considered significant.

11.3.3 **Construction stage operations** – Increased summer temperatures, increased winter rainfall and a decrease in summer rainfall may impact operational site conditions during construction, for example through increased flood risk and dust generation. The CEMP will include a section on Climate Change setting out measures to mitigate the impacts of climate change during construction. Given the relatively short-term nature of construction and proposed tertiary mitigation, such effects are not considered significant.

11.3.4 **Site and Local Habitats** – Changing climatic conditions are anticipated to benefit some habitats and species while negatively impacting on others. The England Biodiversity Strategy recognises the potential impact of climate change and provides guidance on mitigation through increasing site biodiversity. The Proposed Development will include a detailed landscape plan which will protect and enhance existing habitats, create new site habitats improving site biodiversity by at least 10%, where appropriate making use of native climate tolerant species. This will help site habitats and species to be resilient to future the effects of climate change. Using measures to enhance the biodiversity of the Application Site and considering the use of climate tolerant species, it is anticipated the development will mitigate the impact of climate change and with any residual effects not considered significant.

11.3.5 **Physical site infrastructure** – Changes to annual temperature and rainfall may impact ground conditions and hence development groundworks and foundations. The Building Regulations include a requirement for homes to be designed and constructed so that risks

from ground movement caused by swelling, shrinkage, or subsidence are minimised. As a result, this potential effect is not considered significant and will not be assessed.

- 11.3.6 **Physical site infrastructure** – Increased winter rainfall may lead to an increased risk of flooding as a result of increased river flows as a function of potentially larger, more intense and more frequent storms. Also, the potential surface water run-off rate and volume from the Application Site could increase as a result of potentially larger, more intense and more frequent storms. This is considered as part of the FRA, the Drainage Strategy and the floodplain compensation scheme and in accordance with legislation and guidance on assessing flood risk assessment, will include consideration of climate change and appropriate mitigation. Mitigation will include:
- 11.3.7 Proposed Development to be located outside the 1 in 100 year + 35% (climate change allowance) floodplain;
- 11.3.8 Finished floor levels of proposed buildings to be set above the 1 in 100 year + 35% (climate change allowance) flood level;
- 11.3.9 Floodplain compensation to be provided for any loss of storage from within the 1 in 100 year + 35% (climate change allowance) floodplain.
- 11.3.10 Drainage Strategy designed to incorporate Sustainable Drainage Systems (SUDS) and to manage a 1 in 100 year + 40% (climate change allowance) storm event.
- 11.3.11 In this context, this potential effect is not considered likely to be significant and will not be considered further by the Climate Change ES chapter.
- 11.3.12 **Building operation** – Changes to summer rainfall may lead to water shortages which may affect building occupants. In this context, the buildings will be designed to seek a higher level of water efficiency than required in the Building Regulations, with the Proposed Development achieving a limit of 110 litres/person/day. Furthermore, species planted on-site will rely on rainwater as opposed to irrigation. As a result, this potential effect is not considered significant and will not be assessed.
- 11.3.13 **Building Occupants** - Increased summer temperatures will lead to an increased risk of summer overheating which could impact on human health and productivity of building occupants. To minimise the risk of overheating, all homes will be designed in accordance with the energy hierarchy and designs will improve thermal efficiency through better insulation of buildings (in line with Policy ESD 3: Sustainable Construction) as well as maximise opportunities for cooling and shading. The homes will be designed to incorporate

best practice on tackling overheating, taking account of the latest UKCIP climate predictions. In this context, this potential effect will not be considered further by the Climate Change ES chapter.

11.3.14 With regards to climate change adaptation, no further sensitive receptors or potentially significant effects have been identified and climate change adaptation is not considered further in the chapter.

Likely Significant Effects

11.3.15 The following effects (**Table 11.1**), in relation to Climate Change Mitigation, are considered potentially significant and are considered within this Chapter.

Table 11.1: Likely Significant Effects

Likely Significant Effect	Applicable Phase
Release of GHG emissions	C / O

C – Construction; and O – Operation

Data sources

11.3.16 Data sources used include the Met Office and Environment Agency’s latest UK climate projections (UKCP18)⁷ which include assumptions about economic, social and physical changes that will influence climate change.

11.3.17 Guidance from IEMA, mentioned above has also been consulted and reports on climate change reviewed. These include the IPCC Special Report⁸ which describes the effects of global warming of 1.5 °C above pre-industrial levels and the CCC 2018 Report⁹ on the UK’s progress towards meeting its carbon budgets.

11.3.18 The Greenhouse Gas Protocol suite of standards provide high-level guidance on GHG assessment and, whilst the Corporate Standard and Scope 3 Standard¹⁰ are intended for organisations to calculate and report GHG emissions, their approach is applicable to estimating future GHG emissions from development projects and its use is recommended by IEMA Guidance.

⁷ UK Climate Projections; UKCP18; Met Office and Environment Agency; 2018

⁸ Global Warming of 1.5°C; Summary for Policymakers; Intergovernmental Panel on Climate Change (IPCC); 2018

⁹ Carbon Budgets: How we Monitor Emissions Targets; Committee on Climate Change; 2018

¹⁰ Greenhouse Gas Protocol: Corporate Value Chain (Scope 3) Standard; World Resources Institute (WRI); 2004.

Assessment approach

11.3.19 The methodology adopted in this assessment is considered to accord with relevant IEMA Guidance. The methodology adopted in this assessment is considered to accord with relevant IEMA Guidance as outlined above and comprises the following components:

11.3.20 Review of legislation, planning policy and guidance relating to climate change mitigation;

11.3.21 Establish GHG assessment scope and boundaries;

11.3.22 Establish baseline conditions;

11.3.23 Estimate GHG emissions from the construction and operational phases of the Proposed Development;

11.3.24 Consider opportunities for GHG emissions reductions from the Proposed Development through appropriate mitigation measures in accordance with IEMA's GHG management hierarchy¹¹; and

11.3.25 Evaluate residual GHG emissions following mitigation within the context of baseline site emissions, local and regional GHG emissions and future UK carbon budgets to establish their context, magnitude and significance.

Extent of the Study Area

11.3.26 For the purposes of assessing effects of the Proposed Development on climate change, the study boundary is considered to comprise the boundary of the Site. However, in some instances, due to the upstream and downstream nature of emissions and emission impacts, the boundary extends beyond this area. This includes emissions associated with the manufacture of construction materials used, or GHG emissions from the generation at a power station of mains electricity that is consumed by the operational development.

Emission Scopes & Boundaries

11.3.27 The GHG assessment boundary includes all key on-site, upstream and downstream emissions that are anticipated from the operation of the Proposed Development. These emissions are categorised as follows in accordance with the Greenhouse Gas Protocol¹²:

¹¹ Special Report: Greenhouse Gas Management & Reporting; IEMA; 2010

¹² Greenhouse Gas Protocol: A Corporate Accounting & Reporting Standard; World Resources Institute (WRI); 2004.

11.3.28 Scope 1 emissions: direct emissions from the combustion of fuels and/ or gases within the Site boundary, during construction, operation and decommissioning;

11.3.29 Scope 2 emissions: indirect emissions associated with the generation of purchased electricity consumed within the Site boundary, during construction, operation and/ or decommissioning; and

11.3.30 Scope 3 emissions: indirect emissions emitted as a consequence of the Proposed Development, upstream or downstream of the Site. This includes the combustion of fuels to transport people, goods or waste during construction; other fuel and energy related emissions (e.g. associated with upstream construction transport and distribution losses); and emissions from the production of goods and construction materials.

11.3.31 Further, to ensure that all emission sources within the above scope are considered, the following categories are also applied to allow their identification:

11.3.32 Stationary combustion: the use of fuels or purchased electricity to generate heat, steam or electricity in stationary equipment (e.g. boilers, heat pumps and generators);

11.3.33 Mobile combustion: the use of fuel or purchased electricity to generate heat, steam or electricity in mobile equipment (e.g. vehicles and construction plant);

11.3.34 Process emissions: the use of fuel or purchased electricity in a process (e.g. the manufacture of materials used in construction); and

11.3.35 Fugitive emissions: the un-controlled release of gases (e.g. leakage of refrigerant gases).

Significance criteria

11.3.36 The assessment of likely significant environmental effects as a result of the Proposed Development (i.e. GHG emissions) has taken into account the construction and operational phases. Table **11.2** presents the assumed timescale for each of these phases. The assessed operational timeframe simply reflects the fact that UK carbon budgets extend to 2050 only, rather than anything relating to the Proposed Development itself.

Table 11.2 Assessed Project Timescale¹³

¹³ The approach to construction timescales is further clarified in **Chapter 2 EIA Methodology**.

Development Phase	First year	Completion / Assessment period	Summary
Construction	2023/4	2026/7	For the purposes of the assessment construction of the Proposed Development is scheduled to commence during 2023 with construction anticipated to finish in 2026.
Operation	2023	2050	For the purposes of assessing a worst case scenario, the Proposed Development is assumed to become fully operational in 2023 and is assessed up to the year 2050. It is anticipated that the Proposed Development will be phased to 2026 and emissions will fall over time due to ongoing grid decarbonisation, however assuming completion in 2023 represents a worst case scenario.

11.3.37 Carbon dioxide equivalency (CO_{2e}) is a quantity that describes, for a given mixture and amount of GHG, the amount of CO₂ that would have the same global warming potential (GWP), when measured over a specified timescale (generally, 100 years). In view of this timescale and the findings of the recent Intergovernmental Panel on Climate Change (IPCC) 1.5°C report that some effects from climate change may be long-lasting or irreversible, the duration of effect is assumed to be long term and permanent.

11.3.38 In addition, as the climatic system does not make a distinction between construction and operational phases, GHG emissions resulting from both construction and operational phases of the Proposed Development collectively has also been considered to provide an overall view of the effect of the Proposed Development.

Determining Sensitivity of Receptor

11.3.39 GHG emissions affect the global climatic system which, in accordance with IEMA Guidance, is considered potentially sensitive to any increase in GHG emissions. This sensitivity may, however, vary depending on the global future response to climate change, for example should a significant global reduction in GHG emissions (compared with the currently increasing emissions) be achieved over time.

11.3.40 Given it is not possible to predict future global GHG emissions, the Met Office and Environment Agency's latest UK climate projections (UKCP18)¹⁴ include assumptions about economic, social and physical changes that will influence climate change. Representative

¹⁴ UK Climate Projections; UKCP18; Met Office and Environment Agency; 2018

Concentration Pathways (RCPs) are a method for capturing these assumptions within a set of scenarios. **Table 11.3** therefore considers the sensitivity of on a scale of **high, medium, low** or **negligible** based on these scenarios.

Table 11.1 Sensitivity of Receptor

Sensitivity of Receptor	Description
High	UKCP18 Representative Concentration Pathway (RCP) 8.5
Medium	UKCP18 Representative Concentration Pathway (RCP) 6.0
Low	UKCP18 Representative Concentration Pathway (RCP) 4.5
Negligible	UKCP18 Representative Concentration Pathway (RCP) 2.6

11.3.41 The IPCC Special Report on the effects of global warming of 1.5 °C¹⁵ above pre-industrial levels and the CCC 2018 report on the UK’s progress towards meeting its carbon budgets¹⁶ both conclude that the world is not currently on track to meet future carbon budgets necessary to avoid potentially dangerous temperature increases.

11.3.42 In this context the IEMA 2020 adaptation and resilience guidance states, *“the use of the high emissions scenarios (Met Office UKCP18 RCP8.5) is recommended, unless the case can be made for using a different, lower emissions scenario.”* As a result the RCP 8.5 scenario is considered the most appropriate for use in this assessment and as a result the sensitivity of the climatic system is considered to be **high**.

Determining the Magnitude of Change

11.3.43 There are currently no published significance criteria for evaluating GHG emissions in the UK. Therefore, the magnitude of change of GHG emissions applied in this assessment is determined through consideration of IEMA Guidance in conjunction with professional judgement.

11.3.44 The magnitude of GHG emissions from the Proposed Development has been determined by establishing the scale of the emissions relative to recent GHG emissions observed within the local area (Cherwell DC administrative area) and Oxfordshire, and also to future UK carbon budgets as presented in **Table 11.4**.

Table 11.4 Magnitude of Change

¹⁵ Global Warming of 1.5°C; Summary for Policymakers; Intergovernmental Panel on Climate Change (IPCC); 2018

¹⁶ Carbon Budgets: How we Monitor Emissions Targets; Committee on Climate Change; 2018

Description of Change	Magnitude of Change
A large increase / decrease in GHG emissions (e.g. >5%) relative to local / regional baseline emissions and future UK Carbon Budgets.	Large
A moderate increase / decrease in GHG emissions (e.g. 3% to 5%) relative to local / regional baseline emissions and future UK Carbon Budgets.	Moderate
A small increase / decrease in GHG emissions (e.g. 1% to 3%) relative to local / regional baseline emissions and future UK Carbon Budgets.	Small
A negligible increase / decrease in GHG emissions (e.g. <1%) relative to local / regional baseline emissions and future UK Carbon Budgets.	Negligible

11.3.45 The magnitude of net GHG emissions (or savings) from a project, how this effect changes (or otherwise) baseline conditions at the local, regional and national level are important components when establishing the magnitude of change which feeds into determining the level of effect. However, the application of professional judgement is a critical additional component, as recognised by IEMA Guidance, and which may result in a different overall significance conclusion than would be suggested by such a comparison alone. For example, development in locations with very low or very high baseline GHG emissions may introduce bias when determining significance solely on the basis of a percentage increase or decrease relative to this baseline.

Determining the Level of Effect

11.3.46 The level of effect has been assessed based on the magnitude of change due to the Proposed Development and the sensitivity of the affected receptor. The level of effect has been based on professional judgement and the matrix set out in **Table 11.5** has been a tool which has assisted with this process.

Table 11.5 Matrix to Support Determining the Level of Effect

		Sensitivity (or value / importance)			
		High	Medium	Low	Negligible
Magnitude of Change	Large	Major	Moderate to Major	Minor to Moderate	Negligible
	Moderate	Moderate to Major	Moderate	Minor	Negligible
	Small	Minor to Moderate	Minor	Negligible to Minor	Negligible

	Negligible	Negligible	Negligible	Negligible	Negligible
--	------------	------------	------------	------------	------------

11.3.47 Whilst **Table 11.5** provides ranges, the level of effect is confirmed as a single level and not a range, informed by professional judgement. For each effect, it has been concluded whether the effect is 'beneficial' or 'adverse'. A statement is also made as to whether the level of effect is '**Significant**' or '**Non Significant**', again based on professional judgement.

11.3.48 The following terms have been used to define the level of effect which can be either 'beneficial' or 'adverse':

11.3.49 **Major effect:** where the Proposed Development is likely to cause a considerable change from the baseline conditions and the receptor has limited adaptability, tolerance is of the highest sensitivity. This effect is considered 'Significant';

11.3.50 **Moderate effect:** where the Proposed Development is likely to cause either a considerable change from the baseline conditions at a receptor which has a degree of adaptability, or tolerance, or a less than considerable change at a receptor that has limited adaptability, tolerance or recoverability. This effect is likely to be considered 'Significant' but is subject to professional judgement;

11.3.51 **Minor effect:** where the Proposed Development is likely to cause a small, but noticeable change from the baseline conditions on a receptor which has limited adaptability, tolerance, or is of the highest sensitivity or a considerable change from the baseline conditions at a receptor which can adapt, is tolerant of the change or/and can recover from the change. This effect is considered less likely to be 'Significant' but is subject to professional judgement; and

11.3.52 **Negligible:** where the Proposed Development is unlikely to cause a noticeable change at a receptor, despite its level of sensitivity or there is a considerable change at a receptor which is not considered sensitive to a change. This effect is 'Non Significant'.

11.3.53 The Greenhouse Gas Protocol suite of standards provide high-level guidance on GHG assessment and, whilst the Corporate Standard and Scope 3 Standard¹⁷ are intended for organisations to calculate and report GHG emissions, their approach is applicable to estimating future GHG emissions from development projects and its use is recommended by IEMA Guidance.

¹⁷ Greenhouse Gas Protocol: Corporate Value Chain (Scope 3) Standard; World Resources Institute (WRI); 2004.

Uncertainties and limitations

11.3.54 To ensure transparency within the EIA process, the following limitations and assumptions have been identified in relation to the climate change mitigation assessment.

Emission Factors

11.3.55 The benchmark factors sourced from the Royal Chartered Institute of Surveyors (RICS) that have been applied to estimate GHG emissions associated with construction activities and materials¹⁸¹⁹ are based on broad building use types and project value which may not wholly reflect the Proposed Development at detailed design. Nevertheless, in the absence of more detailed guidance, these factors are considered well-suited to this assessment of likely embodied carbon.

11.3.56 The future UK electricity grid factors sourced from BEIS²⁰ are projections which may not reflect the actual emissions associated with grid electricity consumption in future. That said, BEIS projections have slightly underestimated the rate of grid decarbonisation in recent years, so any inaccuracy in these projections may serve to over-estimate as well as underestimate GHG emissions associated with the Proposed Development's future electricity demand.

Energy Strategy

11.3.57 Annual operational GHG emissions for the Proposed Development are estimated from using data on annual electricity and gas demands derived from the energy assumptions based on similar projects. It is possible that the energy strategy further develops as part of detailed design however it is considered unlikely that any such changes would materially change the determined magnitude of change or significance of effect identified within the Chapter.

Transport GHG Emissions

11.3.58 The completed Proposed Development will generate additional vehicle trips on the local road network as a result of the operation of the Site, however these effects to air quality are not considered likely to be significant. **Chapter 9: Air Quality** of the ES set out the likely local effects of these vehicle trips in relation to local air quality, however it is not generally possible for current traffic models to estimate net GHG emissions effects from such traffic movements. This is due to the challenge of identifying with any accuracy the proportion of

¹⁸ Whole life carbon assessment for the built environment; 1st Edition; Royal Institute of Chartered Surveyors (RICS); 2017.

¹⁹ Methodology to calculate embodied carbon; 1st Edition; Royal Institute of Chartered Surveyors (RICS); 2014.

²⁰ Department for Business, Energy and Industrial Strategy (2020) 'Greenhouse gas reporting: conversion factors', Website: <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020>

such trips that are wholly additional, and the proportion that are simply trips relocated from elsewhere as a result of the Proposed Development. Given this current challenge, GHG emissions from operational vehicle movements have not been estimated. It is however worth noting that Government plans for the increased use of electric vehicles and other low carbon initiatives for freight transport are anticipated to reduce transport emissions over time reducing this impact.

11.4 BASELINE CONDITIONS

The current baseline

11.4.1 The Site comprises approximately 22.71ha, presently comprising of arable land together with the Gavray Wildlife Meadow. While there are GHG emissions associated with arable farming, as well as carbon sequestration from the Wildlife Meadow these are considered negligible.

11.4.2 Due to low levels of emissions that are anticipated to be generated as a result of current Site activities, a quantitative assessment of baseline emissions has not been made, and for the purposes of this assessment are considered to be zero. This assumption is worse case as it serves to increase the net change GHG emissions at the Site resulting from the Proposed Development.

11.4.3 The emissions that arise as a result of the Proposed Development are instead assessed against UK carbon budgets as well as GHG emissions estimated for the Cherwell District and Oxfordshire administrative areas in 2018. These are set out below.

Local Authority GHG Emissions

11.4.4 **Table 11.6** shows the 2018 GHG emissions for Cherwell District and Oxfordshire taken from the UK local authority and regional carbon dioxide emissions national statistics²¹. The available data shows the total GHG emissions, including estimated emissions from Industrial and Commercial operations. This can be used to contextualise the emissions from the Proposed Development and help determine significance of effect.

Table 11.6 Local Authority Emissions

Emissions Scope	2018 GHG Emissions (ktCO ₂)
Cherwell District Total GHG emissions	1228.9
Oxfordshire Total GHG emissions	4078.9

UK Carbon Budgets

11.4.5 The Climate Change Act 2008 was revised in 2019 to include a 100% carbon reduction target by 2050.

²¹ Department for Business, Energy and Industrial Strategy (2019) 'UK local authority and regional carbon dioxide emissions national statistics 2005 to 2018', Website: <https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2018>

11.4.6 It is the duty of the Secretary of State to set for each succeeding period of five years (beginning with the period 2008 to 2012) an amount for the net UK carbon account (the 'carbon budget') and to ensure the net quantity of emissions does not exceed the carbon budget.

11.4.7 The Government recently adopted the Sixth Carbon Budget which sets the UK emissions limit to 2037 and incorporates the UK's new 100% carbon reduction target. On this basis, this assessment has estimated the level of carbon budgets likely to be required post-2037 to meet the 2050 target. **Table 11.7** sets out the UK carbon budgets, including these estimates (in italics), up to 2050.

Table 11.7 UK Carbon Budgets

Period	GHG Emissions [million tonnes CO ₂ e]
1st carbon budget (2008 – 2012)	3,018
2nd carbon budget (2013 – 2017)	2,782
3rd carbon budget (2018 – 2022)	2,544
4th carbon budget (2023 – 2027)	1,950
5th carbon budget (2028 – 2032)	1,725
6th carbon budget (2033 – 2037)	965
<i>7th carbon budget (2038 – 2042)*</i>	<i>724</i>
<i>8th carbon budget (2043 – 2047)*</i>	<i>483</i>
<i>9th carbon budget (2048 – 2050)*</i>	<i>241</i>

** Information estimated*

11.4.8 On this basis, the UK Carbon Budget across the construction phase (2023-26) is estimated to be 1,560 million tCO₂e, and across the assessed operational phase (2023-50) is estimated to be 6,097 million tCO₂e. The assessed operational timeframe of the Proposed Development (up to the year 2050) is determined by this being the last year for which UK carbon budgets are set rather than being directly related to the Proposed Development itself.

The projected future baseline

11.4.9 The future 'do nothing' scenario is set out below, with regards to the local, regional and national baseline used to contextualise the change in GHG emissions, as set out above in the do nothing scenario these are anticipated to remain the same.

11.4.10 The Site is currently clear of development and comprises arable land agricultural use to be developed, as well as the Gavray Wildlife Meadow to be retained and enhanced. It is assumed this would continue. In this context the Site is anticipated to not emit or sequester any significant GHG emissions.

11.4.11 The local, regional, and national baseline set out above does not change in the future baseline scenario. The local and regional emissions will not change as the existing Site emissions are already accounted for. Nationally the UK carbon budget represents a fixed emissions budget which does not change in relation to the existing Site or its future use

11.5 POTENTIAL EFFECTS

Construction stage

Construction Emissions

11.5.1 The construction of the Proposed Development will result in GHG emissions from activities, both on and off-site, including the consumption of fossil fuels by plant and vehicles, the generation of consumed electricity and the transport to/from Site of workers, materials, and waste.

11.5.2 To assess the level of GHG emissions associated with construction benchmark factors from the Royal Institute of Chartered Surveyors (RICS) embodied carbon guidance have been used for estimating average building construction site GHG emissions where more specific information is not available. The guidance includes the following factor (1,400 kgCO₂e per £100k project value) which has been applied to the project construction stage value to estimate Site GHG emissions as presented in **Table 11.8**.

Table 11.8 Estimated Construction Site GHG Emissions

Parameter	Construction Phase
RICS construction emissions factor	1,400 kgCO ₂ e/£100k
Estimated construction site emissions	499 tCO ₂ e

Embodied Carbon

11.5.3 The RICS 2014 Embodied Carbon methodology provides benchmark estimates of embodied carbon associated with construction materials for various building types which have been used to estimate embodied carbon for the Proposed Development. For the purposes of this assessment appropriate benchmarks for similar building types have been used and combined with maximum floor areas (**Chapter 4: The Proposed Development**) in order to calculate embodied carbon emissions associated with the Proposed Development as presented in **Table 11.9**.

Table 11.9 Estimated Embodied Carbon

Parameter	Value
New development floor area parameters (m ²)	20,125
Estimated embodied carbon (tCO ₂ e)	10,868

Transportation of Waste

11.5.4 An estimate of the quantity of construction waste has been calculated based on benchmarks provided by BRE²² for different uses; this data does not directly correlate with the use classes proposed, so a description of the waste benchmark applied is provided in Table **11.10**.

Table 11.10 Estimated waste generation

Building / Plot	GIA (m ²)	Waste benchmark (tonnes / 100m ²)	Waste Quantity [tonnes]
Housing	20,125	17	3,381

11.5.5 It is assumed that waste will be moved to local resource recovery locations, conservatively estimated to be within 15km of the Site. The quantity of waste moved is calculated by multiplying the total quantity of waste by the distance travelled, resulting in 82,427 tonne.kms; this is multiplied by the current BEIS Emission Factor for an average HGV with average loading (0.86654kgCO₂e/tonne.km) resulting in emissions of 44tCO₂e over the duration of the construction phase.

11.5.6 **Table 11.11** presents total GHG emissions estimates for the construction phase, comprising the Site GHG emissions and embodied carbon emissions as set out above. Average annual construction phase GHG emissions are also presented based on the 3 year construction period.

Table 11.11 Total & Annual Average Construction Phase GHG Emissions

Parameter	Value (tCO ₂ e)
Construction Emissions	499
Waste Transport Emissions	44
Embodied Carbon Emissions	10,868
Total Construction GHG Emissions	11,410
Average Annual Construction GHG Emissions	3,803

11.5.7 A 2013 report by the Department for Business Skills and Innovation (BSI)²³ estimate that 64% of UK building materials are imported from the EU. It is also likely that construction materials to be used in construction will have been manufactured and then stored prior to

²² BRE (2012) 'BRE Waste Benchmark Data', http://www.smartwaste.co.uk/filelibrary/benchmarks%20data/Waste_Benchmarks_for_new_build_projects_by_project_type_31_May_2012.pdf

²³ Monthly Statistics of Building Materials and Components; Commentary; Department for Business Skills & Innovation (BSI); 2013

use, potentially for a number of years. Whilst geographical and temporal boundaries of GHG emissions from construction materials do not therefore closely relate to the local / regional / national GHG emissions used to contextualise the Proposed Development effects, embodied carbon from construction materials are nevertheless included in the assessment to ensure likely environmental effects are not underestimated.

11.5.8 **Table 11.12** presents average annual construction phase GHG emissions in the context of combined 2018 GHG emissions from Cherwell District, Oxfordshire, and also the UK Carbon Budget for the construction phase (2023 - 2026). Annual average construction phase GHG emissions are used for comparison with the Cherwell District administrative boundary and Oxfordshire emissions (given these are also annual emissions), whilst total construction phase GHG emissions are used when comparing with UK Carbon Budgets (given these cover a 3 year period).

Table 11.12 Contextualised Construction Phase GHG Emissions

Context	Construction Phase GHG Emissions (as a %)
UK Carbon Budget	<0.01%
Oxfordshire – Total GHG Emissions	0.07%
Cherwell District – Total GHG Emissions	0.23%

11.5.9 The sensitivity of the climatic system is considered to be **high**. The magnitude of change is considered to be **negligible**. Therefore, there is likely to be a **direct, temporary, medium-term, adverse** effect which is considered to be **negligible**.

Post-completion stage

11.5.10 The operation of the Proposed Development will also result in GHG emissions from the generation of energy. An estimate of the annual energy demands for the Proposed Development has been prepared based on benchmark figures from similar schemes.

11.5.11 It is anticipated that as a minimum the Proposed Development will be designed to meet the Building Regulations Part L 2013 standards. For the purposes of this assessment and to ensure a worst case approach, however, it is assumed that the Proposed Development will perform in line with updates to the Building Regulations in line with the results of the Future Homes Standard (FHS). As a result the GHG emissions estimated for the operational development are likely to be an over-estimate.

11.5.12 Whilst GHG emissions will also be generated as a result of additional operational activities such as mains water consumption, wastewater treatment, and the transport and treatment of waste, emissions from such sources are likely to be small compared to emissions from energy consumption and as a result are excluded from the assessment.

11.5.13 **Table 11.13** presents estimated operational GHG emissions for the first year of assumed operation (2023), as set out within the methodology section of this ES Chapter, as well as emissions over the assessed operational period (2023– 2050). This assessment utilises UK electricity grid factors published by the Department for Business Energy and Strategy (BEIS) (domestic, consumption-based) which reflect the continued decarbonisation of the UK electricity grid from the ongoing uptake of renewables (especially offshore wind) and closure of coal-fired power stations. As a result, operational GHG emissions are anticipated to reduce over time, with emissions in year 1 of operations representing the peak / worst case.

Table 11.13 Operational Phase GHG Emissions

	GHG Emissions [tCO ₂ e]
Year 1 GHG emissions	355
Year 30 GHG emissions	281
30 year cumulative GHG emissions	8,902

11.5.14 The Proposed Development is estimated to result in GHG emissions of 355tCO₂e during the first year of occupation (2023), dropping to 281tCO₂e (in 2050), and accumulating to 8,902 tCO₂e across the assessed operational phase (2023-2050).

Fuel and Energy Related Activities (FERA)

11.5.15 Scope 2 related FERA emissions are as a result of activities related to the use of energy, for example losses from the transmission of energy via the national electricity network. In combination with Scope 2 emissions set out in **Table 11.13** these provide a holistic view of emissions as a direct result of the Proposed Development.

11.5.16 FERA emissions are calculated by multiplying the annual energy demand by the following BEIS Emission Factors for grid electricity and gas. **Table 11.14** also sets out the total operational emissions of the Proposed Development.

Table 11.14 Scope 1,2 and 3 Operational Emissions (2023 – 2050)

Operational Emission Sources	2023 GHG emissions [tCO ₂ e]	2023 – 2050 GHG emissions [tCO ₂ e]
------------------------------	---	--

Operational GHG Emissions	355	8,902
Process GHG Emission	91	2,742
Total GHG operational phase emissions	447	11,643

11.5.17 **Table 11.15** compares these emissions to the estimated UK Carbon Budget for this period, and to 2018 GHG emissions from Cherwell District and Oxfordshire. Operational phase GHG emissions estimated for 2023 are used for comparison with these observed GHG emissions (given this is also annual data), whilst total operational phase GHG emissions for 2023-50 are compared with the UK Carbon Budget.

Table 11.15 Contextualised Operational Phase GHG Emissions

Context	Operational Phase GHG Emissions (as a %)
UK Carbon Budget	<0.01%
Oxfordshire – Total GHG Emissions	0.011%
Cherwell District – Total GHG Emissions	0.036%

11.5.18 Operational GHG emissions from the Proposed Development in 2023 represent only circa 0.036% of Cherwell District’s 2018 GHG emissions, and a significantly smaller proportion of Oxfordshire’s 2018 emissions and future UK carbon budgets.

11.5.19 The sensitivity of the climatic system is considered to be **high**. The magnitude of change is considered to be **negligible**. Therefore, there is likely to be a **direct, temporary, long-term, adverse** effect which is considered to be **negligible**.

11.6 MITIGATION MEASURES

Construction stage

- 11.6.1 During the design phase an assessment will be carried out of the embodied carbon of new buildings to identified potential materials and measures to reduce the embodied carbon of the Proposed Development.
- 11.6.2 Additionally during the construction phase a Site Waste Management Plan (SWMP) will be prepared in order to reduce general construction waste arising and limit GHG emissions.
- 11.6.3 A Construction Environmental Management Plan (CEMP) will be provided in order to manage general environmental related effects during the construction phase. The CEMP is inclusive of measures to reduce GHG emissions during construction, including the monitoring, management and dissemination of energy consumption tracking emissions. At this stage it is not possible to quantify any potential resource use reductions or GHG emissions reductions during construction. In this context a worst case scenario has been assumed.

Post-completion stage

- 11.6.4 The Proposed Development will incorporate A "fabric first" approach with building envelope performance beyond the minimum backstop requirements of the Building Regulations Part L 2013. Energy efficiency measures including 100% low energy (LED) lighting and high efficiency heating systems will be incorporated to reduce operational energy demand.
- 11.6.5 The results of the Future Homes Standard (FHS) announced in January 2021 set out a pathway for an update to the Building Regulations in 2021 which will require homes from June 2022 to achieve a 31% carbon reduction above the current 2013 Regulations. It is anticipated this will require increased fabric performance and use of low carbon renewable energy technologies to reduce emissions.
- 11.6.6 At this stage as this is an outline application it is anticipated that part or all of the site may need to meet the Interim FHS target, however to provide a worst case scenario this assessment has been based on all homes meeting the current 2013 Regulations.

11.7 RESIDUAL EFFECTS

Construction stage

11.7.1 No further mitigation is proposed in relation to construction GHG emissions. While additional mitigation could be applied and reduce emissions this would be unlikely to result in an overall beneficial effect. In the absence of secondary mitigation the residual effect is the same as that reported within the pre-mitigation scenario. This effect is considered to be **not significant**.

Post-completion stage

11.7.2 No further mitigation is proposed in relation to operational GHG emissions. In the absence of secondary mitigation the residual effect is the same as that reported within the pre-mitigation scenario. This effect is considered to be **not significant**.

Construction and Post-completion stage (collective effect)

11.7.3 Collectively, across the construction and operational phase, the Proposed Development is expected to result in 23,054 tonnes CO₂e. **Table 11.16** shows how this compares to the UK Carbon Budget over the operational time period, and how it compares on an annual basis to Cherwell District and Oxfordshire's 2018 GHG emissions.

Table 11.16 In-combination contextualisation of emissions

Carbon budget/Annual Emissions	Proportion of GHG Emissions
UK Carbon Budget	<0.01%
Oxfordshire - Total GHG Emissions	0.08%
Cherwell District - Total GHG Emissions	0.27%

11.7.4 In-combination construction and operational GHG emissions from the Proposed Development represent 0.27% of Cherwell District's 2018 GHG emissions, and a significantly smaller proportion of Oxfordshire's 2018 emissions and future UK carbon budgets.

11.7.5 The sensitivity of the climatic system is considered to be **high**. The magnitude of change is considered to be **negligible**. Therefore, there is likely to be a **direct, permanent, long-term adverse** effect which is considered to be **negligible**.

Summary of effects

11.7.6 The effects identified are summarised in **Table 11.17** below:

Table 11.17: Summary of effects

Potential effect	Significance (pre-mitigation)	Mitigation measure	Significance of residual effect
Construction stage			
Release of GHG emissions through construction	Negligible	Assessment of embodied carbon during design. Use of SWMP and CEMP to manage and monitor waste and construction stage GHG emissions	Negligible
Post-completion stage			
Release of GHG emissions through operation	Negligible	Homes designed in accordance with relevant updates to the Building Regulations.	Negligible
In-combination (construction and post-completion)			
Release of GHG emissions through construction and operation	Negligible	As above	Negligible

11.8 CUMULATIVE EFFECTS

11.8.1 The Chapter has considered both the effect interactions and in-combination effects.

Effect Interactions

11.8.2 Intra-project effects associated with GHG emissions are considered to be limited, where appropriate assumptions and background information in relation to waste and energy consumption have been obtained from supporting documents or benchmark data. No additional intra-project effects are considered likely.

In-combination Effects

11.8.3 The GHG emissions presented in this Chapter are based on circumstances specific to the Proposed Development; whilst external factors could have an effect on the quantity of estimated emissions, reasonable endeavours have been taken to ensure that likely scenarios are accounted for, for example in projections of future emission factors.

11.8.4 The Proposed Development GHG emissions have been assessed and contextualised against local emissions and national carbon reduction targets. The national carbon reduction targets while providing a limit on emissions make an allowance for economic growth, it is considered inter-project effects are accounted for within this target and individual project assessment.

