11 Climate Change and Greenhouse Gases

11.1 Introduction

11.1.1 This chapter of the ES was prepared by Ecolyse Limited and presents an assessment of the likely significant effects of the Development on Climate Change.

11.1.2 GHGs are gaseous compounds that have been identified as contributing to a warming effect in the earth's atmosphere. The primary GHG of concern with respect to the Development is carbon dioxide (CO_2) which is emitted from combustion sources such as vehicular transport and heating and energy plant. Other GHGs also contribute to climate change and these are accounted for based on their Global Warming Potential (GWP). The combined GWP effect of all GHG emissions is presented as carbon dioxide equivalent (CO_2e).

11.1.3 The Climate Change assessment quantifies the Greenhouse Gas (GHG) emissions resulting from the Development and determines their significance in the context of local and national climate change policy and examines its resilience to future climate change.

11.1.4 Mitigation measures are identified, where appropriate, to avoid, reduce or offset any significant adverse effects identified and / or enhance likely beneficial effects. The nature and significance of the likely residual effects are reported.

Competence

11.1.5 The assessment was led by Dr Graham Earl (PhD, IMechE), Director at Ecolyse Ltd. and supported by Laurence Caird (MEarthSci, CSci, MIES, MIAQM), Associate Director at Air Quality Consultants Ltd (AQC).

11.1.6 Dr Earl has over 25 years' experience in the fields of climate change, environment and asset management. Since the formation of Ecolyse six years ago, Dr Earl has developed approaches to assessing GHG emissions and climate change for EIA and has specialised in the assessment of climate change, and preparation of GHG inventories and climate resilience assessments for the purposes of EIAs for numerous light industrial, mixed used housing developments, as well as major infrastructure projects.

11.1.7 Mr Caird has over 15 years' experience in the fields of air quality and greenhouse gas emissions. He has helped shape a methodology for the assessment of greenhouse gas emissions within EIA to satisfy the requirements of the 2017 EIA Regulations and has produced carbon footprints and greenhouse gas assessments for numerous projects requiring EIAs including major residential, commercial and mixed-use developments and industrial facilities.

11.2 Legislation, Planning Policy and Guidance

Legislation Context

11.2.1 The following legislation is relevant to the Development:

- Climate Change Act (2008)[1];

- Climate Change Act 2008 (2050 Target Amendment) Order 2019[2]; and
- The Town and Country Planning (Environmental Impact Assessment) Regulations 2017[3].

Planning Policy Context

National

11.2.2 The following national planning policy is relevant to the Development:

- National Planning Policy Framework (NPPF) (2021)[4].

Local

11.2.3 The following local planning policy is relevant to the Development:

- The Cherwell Local Plan 2011 – 2031[5], Policy Bicester 1: North West Bicester Eco-Town and Ensuring Sustainable Development (ESD) Policies 1 to 5.

Guidance

11.2.4 The following guidance is relevant to the Development:

- Institute of Environmental Management and Assessment (IEMA) guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance (2017)[6] (the 'IEMA Guidance');
- The Greenhouse Gas Protocol Corporate Accounting and Reporting Standard (GHG Protocol)[7];
- Publicly Available Standard (PAS) 2080: 2016 – Carbon Management in Infrastructure[8];
- Committee on Climate Change (CCC), Net Zero Technical Report, 2019[9];
- Committee on Climate Change (CCC), Sixth Carbon Budget, 2021[10];
- Royal Institution of Chartered Surveyors (RICS): Whole life carbon assessment for the built environment, 1st edition[11];
- British Standard EN15978:2011 - Sustainability of construction works[12];
- 2020 Climate Action Framework transforming Cherwell[13];
- CDC Climate Emergency Declaration 2019[14]; and
- CDC, Greenhouse Gas Report, Reporting Year 2019 to 2020[15].

11.3 Assessment Methodology

Consultation

11.3.1 An EIA Scoping Report was submitted to CDC on 29th June 2021 (Appendix 3.2). A Scoping Opinion was received on the 3rd August 2021.

11.3.2 Table 11.1 summarises key comments raised by consultees of relevance to this assessment and how the assessment responded to them.

Table 11.1: Consultation Response Summary

Consultee and Comment	Response
CDC Scoping Opinion (03/08/2021)	
It is noted that you propose to scope this topic out of the ES. However, given the policy requirements set out by Policy Bicester 1 relating to development at NW Bicester (i.e. to achieve a true zero-carbon development), this topic is relevant to the specific characteristics of the development and so it should therefore be scoped into this ES.	A Climate Change chapter was scoped into the ES and is presented through this chapter. This addresses Policy Bicester 1 relating to development at NW Bicester (i.e. to achieve a true zero-carbon development),
CPRE commented on the scoping report. In summary they stated "CPRE notes that the developer is proposing to scope out the impact of climate change from the Environmental Statement (ES). The justification is that "owing to the size of the site and development, any increase in greenhouse gas emissions will not have a material impact on the Government's target for carbon reduction". CPRE believe that this statement could apply to any development and all should aim for reductions in emissions to meet the government target". (the full CPRE response can be viewed in Appendix 3.3 of the ES).	A Climate Change chapter was scoped into the ES and is presented through this chapter.

Study Area and Scope

11.3.3 The scope of the assessment was defined through its:

- Geographic scope;
- Temporal scope; and
- The activities contributing to GHG emissions.

11.3.4 Each is described further below.

Geographic Scope

11.3.5 GHGs contribute to climate change, which is a global environmental effect and as such the study area for the assessment is not limited by any specific geographical scope or defined by specific sensitive receptors.

11.3.6 The geographic scope was therefore determined by identifying emission sources associated with the Development over which the Applicant has some ability to control or influence, as detailed further below.

Temporal Scope

11.3.7 The temporal scope was consistent with assessing the whole lifecycle GHG emissions from the Development. The construction and operational phase of the Development was considered as follows:

- **Construction Phase**: Direct and indirect GHG emissions resulting from the Development over the construction period, which will commence in Q2 2022 and be complete in Q2 2023.
- **Operational Phase**: Direct and indirect GHG emissions resulting from the Development in the assessment year of the completed Development, taken to be 2025. GHG emissions in the assessment year represent the worst case annual GHG emissions for the Development over its lifetime since the economy will be decarbonizing over time consistent with meeting the UK's climate change target to be net zero by 2050. Consideration is also given to likely pathways of GHG emissions from the Development out to 2050.

Activities Contributing to GHG Emissions

11.3.8 The following activities contribute to GHG emissions from the construction of the Development:

- Transport of construction materials to the Site; and
- Emissions embodied in the materials used to construct the Development, from construction machinery and any waste.

11.3.9 The following activities contribute to GHG emissions from the operation of the completed Development:

- Operational energy used by the Development;
- Operational transport activities related to the Development; and
- Repair, maintenance and refurbishment of the Development during its lifetime.

11.3.10 A small number of minor activities were scoped out consistent with the IEMA Guidance. IEMA recommends that activities with emissions that in total equal less than 5% of the lifecycle emissions of the Development are scoped out of the assessment. These are as follows:

Construction:

- GHG emissions due to land use change – Likely to be minimal and be less than 1% of lifetime emissions. Any net increase in land use GHG emissions from the Development will be minimised through the biodiversity and landscape planning for the Site.

Completed Development:

- GHG emissions from the treatment and disposal of waste materials – these are a very small component of the GHG emissions of the Development and will be minimised through standard best practice including the implementation of operational waste management plans.

- GHG emissions associated with water use (including water treatment and supply (pumping)) – these are expected to result in very small contributions to lifetime GHG emissions.

11.3.11 Emissions from decommissioning of the building at the end of its life were also scoped out of the assessment. End of life emissions include demolition of the building, transport of waste, processing of waste and disposal. The UK has committed to achieve net zero carbon emissions from 2050 onwards, therefore by the end of the building's life (over 60 years from completion) it can reasonably be expected that emissions from demolition, transport and waste processing will be net zero. Any residual emissions from waste disposal will be minimal as the waste is largely inert and recyclable and any such emissions will represent a very small proportion of the Development's GHG footprint. As such, it is not considered necessary to include end of life emissions estimates within the assessment.

Establishing Baseline Conditions

11.3.12 The Site is undeveloped land and there are currently no activities resulting in GHG emissions.

11.3.13 Therefore, the existing and future baseline GHG emissions for the purposes of this assessment were considered to be zero, which is a conservative worst-case assumption.

Identifying Likely Significant Effects

11.3.14 The assessment considered the whole life GHG emissions from the Development. This included GHG emissions during the construction and operational phase of the Development.

Construction

11.3.15 The assessment of GHG emissions during construction followed the following approaches:

- The embodied GHG emissions from construction materials, construction equipment and construction waste materials were taken from the Lifecycle Assessment (LCA) completed in support of the BREEAM assessment (appended to the Sustainability Statement submitted with the planning application). The LCA assessment complied with British Standard EN15978 Assessment of Environmental Performance of buildings[12] and considered all the upstream and downstream processes needed to construct the building; and
- GHG emissions from construction traffic were calculated based on predicted construction traffic movements provided by the project transport consultants, average travel distances based on RICS benchmarks[11] and latest government published[16] GHG emission factors for construction vehicles.

Completed Development

11.3.16 The assessment of operational effects of the completed Development adopted the following approaches:

- GHG emissions from operational transport were calculated using government published GHG emission factors[16] and transport trip and distance travelled data by mode provided by the project Transport consultant, DTA Transportation;

- GHG emissions associated with the repair, maintenance and refurbishment of the building during its lifetime are based on the LCA completed in support of the BREEAM assessment;
- GHG emissions from operational energy consumption were based on energy modelling and industry benchmarks; and
- GHG emissions in 2050 were also considered based on published strategies for decarbonisation of the grid and transport modes reflecting UK climate change policy and strategies.

11.3.17 The net increase in GHG emissions from construction and during operation in the assessment year was calculated by comparison to the future baseline emissions, which in this case is assumed to be zero.

11.3.18 The assessment also presents the GHG mitigation being proposed, which follows the principles of the GHG management hierarchy (avoid, reduce, off-set), in order to minimise, as far as reasonably practicable, the anticipated GHG emissions over the Development's lifecycle.

Cumulative Effects

11.3.19 IEMA Guidance makes clear that climate change is *"the largest interrelated cumulative environmental effect"* and therefore the assessment of GHG emissions which contribute to climate is intrinsically cumulative. The geographical location of emissions has no relevance to the assessment and therefore the GHG emissions from other developments considered through cumulative assessment are not distinguishable from any other development nationally. Therefore, the effects of the Development are independent of any local cumulative emissions.

11.3.20 The quantification of the GHG emissions associated with cumulative developments was therefore not undertaken and the cumulative GHG effects were considered to be the same as those for the completed Development.

Determining Effect Significance

11.3.21 For GHG emissions there are no recognised significance criteria and thresholds.

11.3.22 The approach to classifying and defining likely significant effects therefore relies on IEMA Guidance and applying expert judgment on the significance of the Development's lifecycle GHG emissions taking into account:

- Any net change in emissions;
- Their likely contribution to local and national GHG emissions;
- Their consistency with relevant policy; and
- An evaluation of the mitigation measures proposed to avoid, reduce and compensate GHG emissions.

11.3.23 IEMA Guidance identifies three underlying principles which were used to inform the assessment of significance, as follows:

- The GHG emissions from all projects will contribute to climate change, the largest interrelated cumulative environmental effect;

- The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the EIA Directive – e.g., population, fauna and soil; and
- GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant.

11.3.24 Based on these principles, IEMA conclude that:

- All projects create GHG emissions that contribute to climate change;
- Climate change has the potential to lead to significant environmental effects; and
- There is a GHG emission budget that defines a level of dangerous climate change whereby any GHG emission within that budget can be considered as significant.

11.3.25 For the majority of development projects, the individual contribution to total GHG emissions (from local through to global scale) will be very small. However, the IEMA guidance recognises that the contribution of GHG emissions to climate change is a cumulative global issue, and as such it is important for developments of all scales to acknowledge the significance of any increases in GHG emissions, and that the EIA should ensure the project addresses their occurrence by taking appropriate mitigating action.

11.3.26 In terms of mitigation, IEMA recommends that mitigation should in the first instance seek to avoid GHG emissions. Where GHG emissions cannot be avoided, the development should aim to reduce the residual significance of its emissions at all stages. Where additional GHG emissions remain but cannot be further reduced at source, approaches should be considered that compensate for the Development's remaining emissions, for example through offsetting.

Sensitivity of Receptor

11.3.27 The assessment of climate change does not include identification of sensitive receptors, as GHG emissions do not directly affect specific locations, but lead to indirect effects by contributing to climate change.

Assumptions and Limitations

11.3.28 It is necessary to make a number of assumptions when carrying out a greenhouse gas assessment, although assumptions made have generally sought to reflect a realistic worst-case scenario. Key assumptions made in carrying out this assessment include:

- A number of emission sources were scoped out as detailed in para 11.3.10 and 11.3.11, although these are all minor and would not affect the conclusions of the assessment.
- In relation to construction and operational traffic movements, some assumptions were made on trip distance. Average trip distances were adopted to be conservative and ensure a realistic worst case.

11.4 Baseline Conditions

11.4.1 As described in Section 11.3 (paragraph 11.3.13), the baseline GHG emission for the Site is taken to be zero.

Future Baseline

11.4.2 As identified in Section 11.3 (paragraph 11.3.13), were the Development to not come forward, the GHG emissions of the Site would remain at zero.

11.5 Scheme Design and Management

Construction

11.5.1 Measures will be undertaken during the construction phase in order to minimise generation of GHG emissions. This includes adherence to a CEMP that will seek to minimise construction waste (and therefore embodied carbon), use of energy during construction and promote use of fuel-efficient construction vehicles. Additionally, the CEMP will include a construction logistics plan to minimise the number of construction trips.

11.5.2 The Development will also be assessed under BREEAM New Construction (NC) 2018, with a target to achieve a “Very Good” rating, capable of ‘Excellent’.

11.5.3 Reducing GHG emissions from the construction works will include a focus on procurement of sustainable materials that minimise embodied GHG emissions where feasible consistent with meeting BREEAM “Very Good” rating.

Completed Development

11.5.4 The Development has adopted best practice design and use of construction materials to minimise energy consumption of the Site and includes the following:

- Effective built form and orientation and proficient location of services such that the building design is optimised for energy efficiency;
- Use of passive design and energy efficiency features, including building fabrics with good practice levels of insulation and low air permeability, to improve on the Energy Efficiency Standards set out in the building regulations;
- Installation of Photovoltaic (PV) panels on roof areas to offset all electrical energy use from the Development;
- Installation of highly efficient Air-Source Heat Pumps (ASHPs) to regulate temperature; and
- Use of high efficiency LED lighting utilising low-energy control systems such as daylight dimming and occupancy sensing, where applicable.

11.5.5 These measures are primary (inherent design) and can therefore be relied on for the purposes of the assessment.

11.5.6 In addition, electric vehicle charging spaces are also provided for 10% of car parking spaces, with provision for 25% to be made available in the future subject to demand. These are also considered as primary mitigation measures.

11.5.7 Finally, a comprehensive set of design measures have been adopted to ensure the building is resilient to future climate change. These are detailed in Table 11.7 and are also considered as primary mitigation measures.

11.6 Assessment of Effects

11.6.1 The climate change assessment considers the whole life GHG emissions resulting from the Development. The effect of GHG emissions released during the construction and operational phase is not distinguishable; therefore, there is no benefit in considering the likely significant effects separately for these phases. The assessment presents the quantification of the construction and completed Development's GHG emissions together to enable an assessment on the significance of those emissions.

11.6.2 This section is structured as follows:

- Quantification of whole life GHG emissions from the Development;
- Consideration of the GHG emissions in context of local and national policy;
- Assessment of the likely significant effects;
- Consideration of mitigation, monitoring and residual effects; and
- Summary of assessment.

Quantification of Whole Life GHG Emissions from the Development

Construction – Embodied in materials, from construction machinery and waste materials

11.6.3 As described in paragraph 11.3.15, the embodied GHGs in construction materials, from construction activity and waste materials is taken from the LCA for the Development. The LCA calculates these GHG emissions for the Development as 23,258 tonnes CO_2e.

11.6.4 Based on a development lifetime of 60 years, this equates to 388 tonnes/annum. It is however acknowledged that all of these emissions are released during the construction period, prior to operation of the Development.

Construction – Transport

11.6.5 In addition to embodied carbon in the materials used for construction, GHG emissions will be created by transportation of materials to the Site. The calculation of construction transport related GHG emissions for the Development is presented in Table 11.2.

11.6.6 The assessment multiplies government published GHG emission factors[16] for HGV deliveries (assuming the delivery is 100% laden and empty on the return trip) and LDVs by the number of construction trips modelled by the Transport Assessment (Appendix 8.1) and by trip distance. Trip distances are estimated to be 50km for locally sourced materials, e.g. concrete and aggregates, and 300km for nationally manufactured materials, e.g. plasterboard, roofing and façades, based on guidance provide by RICS[11]. It is assumed during the construction phase 50% of HGV movements are local and 50% national, and 100% of LGV movements local.

Table 11.2: Calculation of GHG from Construction Traffic

Mode	2021 Emission Factor ($kgCO_2e/km$)	Distance Travelled (km)		Total CO_2e Emissions (tonnes)[1]
		Number construction deliveries / return trips	Average round trip distance (km)	
HGV local delivery	0.91495 full laden 0.66441 empty	2,860	50	343
HGV national delivery		2,860	300	113
LGV local delivery	0.24017	28,600	50	678
Total				1,134

[1] Calculated by multiplying round trip distance by number of return trips by average of fully laden and empty emission factor as appropriate.

11.6.7 The total GHG from construction traffic is calculated as 1,134 tonnes CO_2e and based on a development lifetime of 60 years, this equates to 19 tonnes / annum. It is however acknowledged that all of these emissions are released during the construction period, prior to operation of the Development.

Operation – Repair, Maintenance and Refurbishment

11.6.8 The GHG emission from the repair, maintenance and refurbishment of the Development over its lifetime have been estimated by the LCA as 316 tonnes CO_2e which is equal to 5 tonnes CO_2e per annum based on a 60-year life.

Operation – Transport

11.6.9 The transport related GHG emissions for the Development in the assessment year (2025) are presented in Table 11.3. The assessment multiplies GHG emission factors published by BEIS[16] for each mode of travel by the number of annual trips by average trip distance by mode (provided by the Transport Assessment).

Table 11.3: Assessment of Transport GHG Emissions from the Development (2025)

Type	Mode	Emission Factors (CO_2e per km or passenger km)	Annual distance travelled (million km per annum)	CO_2e Tonnes (per annum)[1]
Employees	Bus	0.11774	0.07	9
	Motorcycle	0.11355	0.09	10
	Car	0.17148	5.92	1,015
	Car passenger	0.08574[2]	0.49	42
	Bicycle	0	0.22	0
	Pedestrian	0	0.08	0
	Train	0.03549	0.18	6
	Taxi	0.14876	0.02	3
Operational vehicles	HGV	0.86407	9.80	8,468
Total				9,554

[1] CO_{2e} emissions are calculated by multiplying annual distance by CO2e emission factors for each mode
[2] Assumes two people sharing car.

11.6.10 The GHG emissions from transport are therefore 9,554 tonnes per annum in the assessment year. This is worst case emissions from this source since transport sources are decarbonising with time due to take up of electric vehicles and other alternatives that are being encouraged through government policies to meet the UK net zero target. The Development is including EV electric charging points to be supportive of wider government policies and ensure electric vehicles are catered for at the Development.

Operation – Energy Consumption

11.6.11 The CO_2 emissions from energy consumption of the Development are calculated based on the energy assessment modelling detailed in the Sustainability Statement (submitted with the planning application) to inform the design.

11.6.12 Table 11.4 summarises the GHG emissions for regulated and unregulated energy consumption of the completed Development including the PV provision to offset energy demand. Energy consumption is converted to CO_2 based on SAP10 emission factors to ensure consistency with energy modelling. SAP10 emission factors are more conservative than BEIS[16] CO_2e emissions factors and therefore the assessment is worst case

Table 11.4: Assessment of CO_2 Emissions from Energy Consumption

Source	Annual Energy Consumption (kWh/yr)	Annual Carbon Emission (tonnes CO_2/yr)
Buildings and External Lighting	343,688	159
Photovoltaic Panels 2940 sqm	-410,117	-189
Net result	-66,429	-31

11.6.13 The total GHG emissions from energy consumption is therefore -31 tonnes CO_2 per annum.

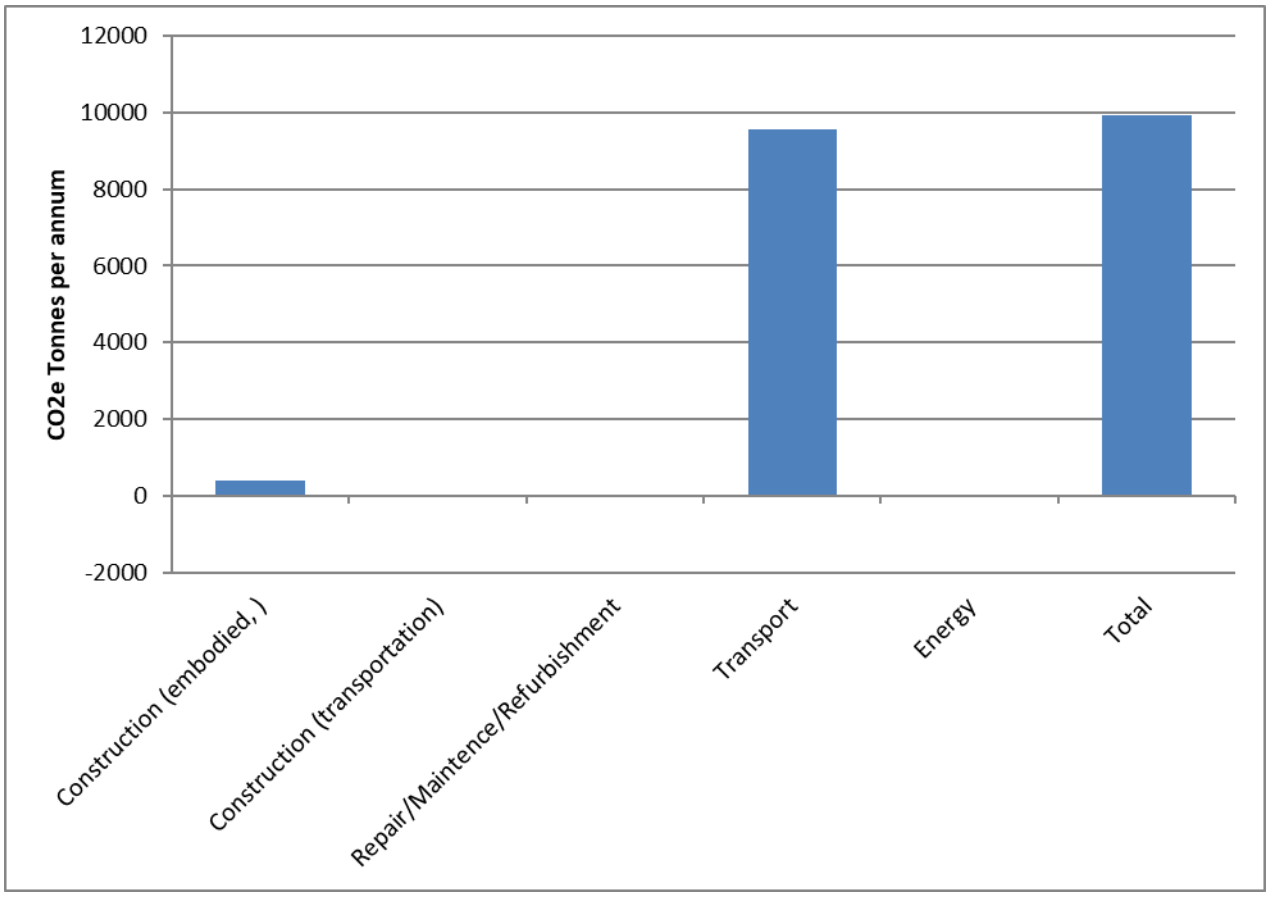
Total GHG Emission Footprint

11.6.14 Table 11.5 and Figure 11.1 summarise the GHG emissions for the Development in the assessment year for each footprint element. The GHG emissions from the construction phase are annualised assuming a 60-year life. Annualising the construction GHG emissions allows them to be compared on a like-for-like basis to the operational GHG emissions which are reported on a per annum basis.

Table 11.5: GHG Footprint for the Development for Assessment Year 2025

Development Phase	Footprint Element	Tonnes of CO_2e / annum	
		Assessment Year	Net Emissions
Construction	Embodied / waste / construction	388	388
	Transport	19	19
Operation	Repair, Maintenance and Refurbishment	5	5
	Transport	9,554	9,554
	Energy	-31	-31
Total		**9,935**	**9,935**

Figure 11.1: Net Change in GHG Emissions for the Development in the Assessment Year



11.6.15 Reference to Table 11.5 shows that the net change in GHG emissions in the assessment year (taking into account both operational and constriction related GHG emissions) is calculated as 9,935 tonnes CO_2e. The most significant source of GHG emissions is from

transport which represent 96% of the net change, although as discussed previously transport emissions are likely to decarbonise with time consistent with government policies to decarbonise this sector.

Consideration of the GHG emissions in the Context of Local and National Policy

Local

11.6.16 The relevant local polices are Policy Ensuring Sustainable Development (ESD) Policies 1 to 5, and Policy Bicester 1: North West Bicester Eco-Town[5]. Each is summarised further below, with an assessment of the Development's performance with the policy.

11.6.17 Policy ESD 1: Mitigating and Adapting to Climate Change states that:

"Measures will be taken to mitigate the impact of development within the District on climate change. At a strategic level, this will include:

- *Distributing growth to the most sustainable locations as defined in this Local Plan*
- *Delivering development that seeks to reduce the need to travel and which encourages sustainable travel options including walking, cycling and public transport to reduce dependence on private cars Designing developments to reduce carbon emissions and use resources more efficiently, including water (see Policy ESD 3 Sustainable Construction) Promoting the use of decentralised and renewable or low carbon energy where appropriate (see Policies ESD 4 Decentralised Energy Systems and ESD 5 Renewable Energy).*

The incorporation of suitable adaptation measures in new development to ensure that development is more resilient to climate change impacts will include consideration of the following:

- *Taking into account the known physical and environmental constraints when identifying locations for development*
- *Demonstration of design approaches that are resilient to climate change impacts including the use of passive solar design for heating and cooling*
- *Minimising the risk of flooding and making use of sustainable drainage methods, and*
- *Reducing the effects of development on the microclimate (through the provision of green infrastructure including open space and water, planting, and green roofs).*

Adaptation through design approaches will be considered in more locally specific detail in the Sustainable Buildings in Cherwell Supplementary Planning Document (SPD)."

11.6.18 Policy ESD 2: Energy Hierarchy and Allowable Solutions, states that: CS1 (para 8) states that developments should:

"In seeking to achieve carbon emissions reductions, we will promote an 'energy hierarchy' as follows:

- *Reducing energy use, in particular by the use of sustainable design and construction measures*
- *Supplying energy efficiently and giving priority to decentralised energy supply*
- *Making use of renewable energy*
- *Making use of allowable solutions."*

11.6.19 Policy ESD 3: Sustainable Construction, states that:

"All new residential development will be expected to incorporate sustainable design and construction technology to achieve zero carbon development through a combination of fabric energy efficiency, carbon compliance and allowable solutions in line with Government policy. Cherwell District is in an area of water stress and as such the Council will seek a higher level of water efficiency than required in the Building Regulations, with developments achieving a limit of 110 litres/person/day. All new non-residential development will be expected to meet at least BREEAM 'Very Good' with immediate effect, subject to review over the plan period to ensure the target remains relevant. The demonstration of the achievement of this standard should be set out in the Energy Statement. The strategic site allocations identified in this Local Plan are expected to provide contributions to carbon emissions reductions and to wider sustainability.

All development proposals will be encouraged to reflect high quality design and high environmental standards, demonstrating sustainable construction methods including but not limited to:

- *Minimising both energy demands and energy loss*
- *Maximising passive solar lighting and natural ventilation*
- *Maximising resource efficiency*
- *Incorporating the use of recycled and energy efficient materials*
- *Incorporating the use of locally sourced building materials*
- *Reducing waste and pollution and making adequate provision for the recycling of waste*
- *Making use of sustainable drainage methods*
- *Reducing the impact on the external environment and maximising opportunities for cooling and shading (by the provision of open space and water, planting, and green roofs, for example); and*
- *Making use of the embodied energy within buildings wherever possible and re-using materials where proposals involve demolition or redevelopment.*

Should the promoters of development consider that individual proposals would be unviable with the above requirements, 'open-book' financial analysis of proposed developments will

be expected so that an independent economic viability assessment can be undertaken. Where it is agreed that an economic viability assessment is required, the cost shall be met by the promoter."

11.6.20 Policy ESD 4: Decentralised Energy Systems sets out that:

"The use of decentralised energy systems, providing either heating (District Heating (DH)) or heating and power (Combined Heat and Power (CHP)) will be encouraged in all new developments.

A feasibility assessment for DH/CHP, including consideration of biomass fuelled CHP, will be required for:

- *All residential developments for 100 dwellings or more*
- *All residential developments in off-gas areas for 50 dwellings or more*
- *All applicationsfornon-domesticdevelopmentsabove1000m^2 floorspace.*

The feasibility assessment should be informed by the renewable energy map at Appendix5 'Maps' and the national mapping of heat demand densities undertaken by the Department for Energy and Climate Change (DECC) (see Appendix 3: Evidence Base).

Where feasibility assessments demonstrate that decentralised energy systems are deliverable and viable such systems will be required as part of the development unless an alternative solution would deliver the same or increased benefit."

11.6.21 Policy ESD 5: Renewable Energy, sets out that:

"The Council supports renewable and low carbon energy provision wherever any adverse impacts can be addressed satisfactorily. The potential local environmental, economic and community benefits of renewable energy schemes will be a material consideration in determining planning applications.

Planning applications involving renewable energy development will be encouraged provided that there is no unacceptable adverse impact, including cumulative impact, on the following issues, which are considered to be of particular local significance in Cherwell:

- *Landscape and biodiversity including designations, protected habitats and species, and Conservation Target Areas*
- *Visual impacts on local landscapes*
- *The historic environment including designated and non-designated assets and their settings*
- *The Green Belt, particularly visual impacts on openness*
- *Aviation activities*
- *Highways and access issues, and*

- *Residential amenity.*

A feasibility assessment of the potential for significant on-site renewable energy provision (above any provision required to meet national building standards) will be required for:

- *All residential developments for 100 dwellings or more*
- *All residential developments in off-gas areas for 50 dwellings or more*
- *All applications for non-domestic developments above1000m^2 floorspace.*

Where feasibility assessments demonstrate that onsite renewable energy provision is deliverable and viable this will be required as part of the development unless an alternative solution would deliver the same or increased benefit. This may include consideration of 'allowable solutions' as Government Policy evolves."

11.6.22 The Development is compliant with

- ESD 1 based on measures detailed in the Framework Travel Plan (FTP) and summarised in Section Mitigation Monitoring and Residual Effects, and in Table 11.7 to ensure resilience to climate change;
- ESD 2 based on inherent design measures to minimise energy consumption (see Section 11.5) and use of PV to ensure GHG emissions from energy use by the completed Development are less than zero;
- ESD 3 based on target of "Very Good" under BREEAM including measures to minimise embodied carbon of materials used, design measures to reduce energy demand and use of PV to ensure GHG from energy use by the completed Development are less than zero; and
- ESD 4 and 5 through use of PV to ensure GHG from energy use by the completed Development are less than zero thus removing the need for any form of decentralised energy supply.

11.6.23 The Strategic Development: Bicester 1 - North West Bicester Eco-Town policy sets out that out a serious of requirements, of which the following are considered relevant to this development:

Zero-carbon development as defined in the Eco-Towns PPS and Eco Bicester One Shared Vision

11.6.24 The Development is complaint with this requirement based on:

- Measures described in the FTP and summarised in Section Mitigation Monitoring and Residual Effects to increase the use of low carbon public transport, including installations of EV points to accelerate the take up of EV vehicles at the Development;
- Design measures to ensure the Development is resilient to future climate change described further in Table 11.7;
- Design measures to minimise energy consumption (see Section 11.5) and use of PV to ensure GHG from energy use by the Completed Development are less than zero; and

- Design measures to achieve target of "Very Good" under BREEAM including measures to minimise embodied carbon of materials used.

11.6.25 Government-published GHG emissions by local authority[17] show the CO_2 emissions for Cherwell District in 2019 (the latest published year) were 545 kilo tonnes CO_2 excluding transport emissions. Excluding transport emission ensures a like for like comparison since transport emissions from the Development include a significant component of national journeys and therefore not comparable to the transport emissions included in CDC inventory which include only the component that sits within the CDC geographic boundary.

11.6.26 On this basis comparing the Development's assessment year emission shows that they would represent 0.07% of this total.

11.6.27 Even accounting for CDC emissions falling by 2025, the Development would still remain a very small component of local emissions.

11.6.28 As the majority of the Development's GHG emissions are associated with transport and energy consumption, the annual emissions are expected to decarbonise year on year in line with local and national policies to decarbonise energy generation and road transport, as discussed further in paragraphs 11.6.31 to 11.6.33. The Development's transport emissions will be minimised through the FTP (Appendix 8.2) and design measures such as installation of EV charging points.

National

11.6.29 The UK has recently legislated a 2050 net zero target following recommendations and analysis completed by the Committee on Climate Change (CCC)[9]. To meet this target the CCC sets carbon budgets to define a pathway to net zero.

11.6.30 The assessment year emissions for the Development coincide with the 4th carbon budget covering the period 2023 to 2027. The 4th carbon budget has been set as 1950 MT CO_2e, or an average annual budget of 390 MT CO_2e. Comparing the Development's GHG emissions (all sources including transport) to the national carbon budget shows that it is 0.003% of the carbon budget and therefore a very small contributor.

11.6.31 In terms of future emissions, the CCC[10] has established a *"balanced net zero pathway"* which considers feasible and cost-effective policy and technology interventions to ensure the UK can meet its new net zero target.

11.6.32 For power generation under this scenario, the CCC consider that 100% of power generation by 2050 will be low carbon and for ground transport it forecasts that all ground transportation (apart from small number of HGVs) will be electrically powered. The CCC therefore forecast that power and ground transportation sectors are largely decarbonised by 2050 with any residual emissions removed through technical and or natural means.

11.6.33 It is therefore reasonable to assume that national policy measures will ensure that energy and transport emissions relating to the Development will be decarbonised consistent with the UK's net zero target. The recent government announcement bringing forward the ban on sale of new vehicles that are not electrically powered to 2030 is an example of policy that is being developed. The installation of EV charging points will ensure the Development can accommodate charging requirements of EV vehicles.

Assessment of Effects

11.6.34 The assessment of the significance of the GHG emission is informed through IEMA guidance, as well as consideration of the net change in GHG in the context of CDC's GHG emissions and consistency of the Development with CDC policies on carbon and climate change.

11.6.35 Comparing the GHG from the Development to CDC GHG emissions shows that these will amount to 0.07% in the assessment year. The Development also meets the requirements of CDC policies on climate change.

11.6.36 IEMA Guidance makes clear however that any increase in GHG emissions should be considered significant, therefore the assessment concludes that the Development will result in a significant adverse effect. However, this will be true of almost any development and the emissions as a result of the Development in isolation are a small component in the context of CDC GHG emissions.

11.6.37 The principles of the IEMA guidance are that where GHGs cannot be avoided, that mitigation should be provided to minimise GHGs. The mitigation is discussed in the following section.

Mitigation, Monitoring and Residual Effects

11.6.38 Mitigation measures adopted by the Development are described for each element of the GHG footprint.

Construction

11.6.39 Mitigation measures adopted by the Development to minimise GHG emissions from the construction phase are inherent in the design and described in Section 11.5. No additional measures are proposed.

Operation

Transport

11.6.40 A FTP has been prepared to accompany the planning application (Appendix 8.2). This describes the short and long-term strategies which will be implemented to encourage sustainable travel and to reduce reliance on private car use. The FTP aims to minimise single car journeys and has set a target of 40% single car use by 2031 consistent with the policy set for the North West Bicester Development. The objectives of the plan are:

- To reduce the number of car trips per unit / dwelling per day;
- To increase membership and participation in a car share scheme;
- To increase employee membership to the local bicycle user group (BUG);
- To increase walking and cycle use;
- To increase the take up and renewal of public transport passes; and
- To increase awareness of benefits of sustainable travel.

11.6.41 To meet these objectives the FTP sets out a number of measures that will be facilitated by the appointment of a Travel Pan Co-ordinator (TPC) as follows;

Measures to Encourage Walking

- Secure changing and shower facilities will be provided within each unit;
- Demand for facilities will be monitored through the staff travel survey and new facilities provided as necessary;
- Information and advice concerning safe pedestrian routes to the site will be available to employees;
- The TPC will explore the potential for improvements to off-site facilities and liaise with the planning authority when necessary;
- The TPC will raise awareness of the health benefits of walking through promotional material; and
- Maps providing safe walking routes indicating distances and times to the most common destinations near to the work place (such as local bus stops).

Measures to Encourage Cycling

- Sheltered and secure cycle parking will be located within each unit;
- Information and advice concerning safe cycle routes to the site will be available to employees;
- The TPC will try to negotiate discounts from cycle shops for staff to purchases a bicycle, the necessary safety equipment and waterproof clothing to enable them to commute to work by cycle;
- The TPC will investigate the initiation of a Bicycle User Group (BUG) to support staff that commute by cycle and to encourage others to do so;
- The TPC will establish contacts with the cycling officers of OCC to ensure input to the further development of any existing cycling strategy in the vicinity of the proposed development and
- The TPC will ensure that the cycle stores and changing facilities that are in place are adequate and maintained.

Measures to Encourage the Use of Public Transport

- Details of relevant bus services will be prominently displayed for the information of employees.
- The TPC will liaise with the bus service operators to ensure that up-to-date timetable and route information is displayed
- The TPC will contact local bus operators to find out whether discounted ticketing initiatives are available; and
- The TPC will seek to encourage the use of public transport.

Measures to Encourage Car Sharing

- The use of Oxfordshire's car sharing database (link: https://oxfordshire.liftshare.com/) will be promoted to employees.
- Car sharers may be given preferential treatment for parking.
- Employers will be encouraged to provide a guaranteed lift home service in emergencies for car sharers.

- A guaranteed lift home service could be extended to cater for 'emergency' or 'short notice' situations for staff that cycle or walk to the development site.

Energy Consumption

11.6.42 Key mitigation measures adopted by the Development to minimise GHG emissions from energy consumption are inherent in the design and described in Section 11.5. No additional measures are proposed.

Mitigation Summary

11.6.43 Table 11.6 sets out an assessment of the Development's approach to mitigation against the mitigation principles described in IEMA guidance (as discussed in paragraph 11.3.26), to avoid and reduce GHGs where practicable and compensate for any residual emissions.

Table 11.6: Development Approach to Mitigation in Accordance with IEMA Mitigation Principles

Development Phase	Avoid and Reduce GHGs
Construction	Good and best practice approach adopted to minimise materials with high embodied carbon. Best practice measures to minimise GHGs from construction activities and adoption of best practice performance standards and guidelines for construction e.g. BREEAM "Very Good" rating Implementation of CEMPs which will include measures to minimise construction journeys.
Operation – Transport	Implementation of FTP with best practice measures to promote use of sustainable transport modes. Installation of on-site EV charging for cars
Operation – Energy	Energy efficiency design measures and on adoption of renewable technologies including PV and ASHPs resulting in less than zero energy emissions from energy consumption by the Development.

Residual Effects

11.6.44 The mitigation measures described above will be implemented to minimise the GHG emissions during construction and throughout the lifetime of the Development, however, a net increase in GHG emissions will remain, as summarised in Table 11.5.

11.6.45 IEMA Guidance makes clear that any increase in GHG emissions should be considered significant. However, the residual emissions are a small component in the context of the local GHG emissions (see paragraph 11.6.25). In addition, mitigation provided follows best practice, is in accordance with relevant local and national policy on climate change and the energy strategy for the Development results in less than zero emissions from the energy consumed by the Development.

11.6.46 It is therefore judged that although the residual effects are described as significant, these have been minimised through an appropriate degree of mitigation consistent with best practice and IEMA Guidance.

Summary of GHG Assessment

11.6.47 The GHG assessment has identified that the Development will lead to GHG emissions, which are described as significant in accordance with IEMA best practice guidance on the assessment of GHGs for EIA. Mitigation is provided to avoid and reduce the GHG emissions, which follows the key principles of GHG mitigation in the IEMA Guidance and is consistent with the requirements of relevant policy.

11.7 Consideration of the Potential Effect of Climate Change on the Development

Context

11.7.1 Climate modelling completed by the meteorological office (UKCP18)[18] is forecasting drier hotter summers, warmer wetter winters and more frequent extreme weather events due to climate change. Indeed, some level of climate change has already happened. For example, annual average UK temperature are 0.9°C higher now than compared with 1961-1990, and sea levels around the UK have risen by 15-20 centimetres since 1900.

11.7.2 At the same time, there are upward trends in rainfall across the UK. Higher levels of winter rainfall have been experienced often in increasingly heavy rainfall events leading to more flooding and damage to buildings and infrastructure. These patterns are consistent with projections of more and heavier rainfall for the UK in a warmer global atmosphere. These changes increase health and safety risks to people and the built environment, increasing costs and disruption for repair and adaptation.

11.7.3 Therefore, there is a need for strategies to mitigate the impact of these events on building stock overall and in particular to ensure that new buildings are designed and constructed to minimise future risks while avoiding over specification and resource use in the meantime.

Climate Risk Assessment

11.7.4 To address future climate change risks a systematic risk assessment has been completed by the design team to identify the impact of expected extreme weather conditions arising from climate change on the building over its projected life cycle. The assessment has covered the installation of building services and renewable systems, as well as structural and fabric resilience aspects and examined potential risks from:

- Flooding and increased precipitation;
- Extreme weather;
- Heat waves (inc. temperature increases);
- Drought (inc. reduced summer rainfall); and
- Subsidence or ground movement.

11.7.5 The risk assessment identified a number of design measures that are incorporated into the Development's design to manage risk from future climate, detailed in Table 11.7.

Table 11.7: Climate Change Resilience Measures

Identified Risk	Reduction / Mitigation measure
Flooding and increased precipitation	▪ Findings of Flood Risk Assessment (FRA) to be addressed within the site drainage design. On-site attenuation to be designed sufficiently for the measured management of surface water generated on site. Drainage design includes a 40% allowance for climate change. ▪ Design includes soft landscaping, permeable paving and appropriate attenuation
Extreme Weather	▪ Cladding to be specified as whole system suited to site exposure. ▪ No roof plant proposed, only PV panel array. ▪ Fixings to be compatible with roofing system.
Heat Waves	▪ Materials to be specified with light colours to help reflection ▪ Cladding systems to be specified to thermal values assessed from thermal modelling assessment. ▪ AC system designed to deliver in a climate change scenario ▪ Design includes external solar shading and specification will include solar control glass.
Drought	▪ Plant drought-resistant plants
Subsidence and Ground Movement	▪ Survey to be undertaken to determine the risks specific to the Site. ▪ Structure designed in accordance with Site Investigation. ▪ Design to include for movement within the foundations and structure.

11.7.6 The design has adopted the measures presented in Table 11.7 above and therefore is considered to be resilient to future climate change.

11.8 Cumulative Effects

11.8.1 As detailed in paragraph 11.3.20 due to nature of the GHG assessment there are no additional cumulative effects.

Table 11.8: Summary of Residual Effects

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Magnitude of Impact	Mitigation and Monitoring	Residual Effect
Construction and Completed Development						
Whole life GHG emissions	Not applicable	Global	Permanent	Major adverse	Adherence to the CEMP BREEAM Very Good rating, capable of 'Excellent' Transport Plan and mode share targets Energy efficient design and use of renewables resulting in less than zero GHG emissions from energy use	Significant adverse
Cumulative Effects						
Whole life GHG emissions	Not applicable	Global	Permanent	Major adverse	as above	Significant adverse

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