13.0 Climate Change

13.1 Introduction

13.1.1 This chapter of the Environmental Statement ('ES') has been prepared by Turley Sustainability & ESG on behalf of the applicant. It assesses the proposed development described in chapter 2 in relation to Climate Change.

13.1.2 This chapter supersedes previous assessment of the proposed development due to updates to IEMA Climate Change guidance.

13.1.3 The chapter describes the technical consultation that has been undertaken during the EIA, the scope of the assessment and assessment methodology, and a summary of the baseline information that has informed the assessment. The assessment reports on the likely significant environmental effects and any mitigation measures proposed to prevent, reduce or offset significant adverse effects, or further enhance beneficial effects.

13.1.4 This chapter comprises two parts, Part 1 'GHG emissions' (Section 13.3) addresses the impact of the proposed development on climate change as a result of Greenhouse Gas ('GHG') emissions, and Part 2 'Climate Change Resilience' (Section 13.8).

13.1.5 The ES chapter is supported by a Sustainability and Energy Statement (July 2025) also prepared by Turley Sustainability & ESG (Appendix 13.1) which replaces the previously submitted Energy Statement prepared by Brookbanks and also addresses received from Bioregional, CDC's sustainability advisors, during the planning process.

13.1.6 This chapter has been prepared by Paul White (Meng, PISEP). Paul has 15 years of experience in providing sustainability and climate change support for new developments. This includes writing and supporting over 50 Climate Change ES chapters.

13.2 Relevant Policy

National Planning Policy Framework

13.2.1 National Planning Policy Framework (NPPF) (December 2024)[1] recognises the key role planning has to play in mitigating climate change and supporting the transition to a low carbon economy. Introduced within the December 2024 update, paragraph 163 states that 'the need to mitigate and adapt to climate change should also be considered in preparing and assessing planning applications, taking into account the full range of potential climate change impacts'.

National Planning Practice Guidance

13.2.2 Planning Practice Guidance (PPG) (February 2024)[2] includes guidance on Climate Change noting there is a requirement for local authorities to include policies to tackle climate change.

Adopted Local Plan

13.2.3 The Cherwell District Council Local Plan 2011 – 2031 (Part 1)[3] includes a number of climate change related policies, including:

- Policy ESD1 Mitigating and adapting to climate change – Development should seek to reduce the need to travel and encourage sustainable travel options, reduce carbon emissions and use resources more efficiently, promote the use of decentralised and renewable or low carbon energy where appropriate. The development should also incorporate adaptation measures to ensure it is resilient to climate change.

- Policy ESD2 Energy hierarchy and allowable solutions – Development should promote the energy hierarchy to reduce energy use through sustainable design and construction measures, supplying energy efficiently, giving priority to decentralised energy and making use of renewable energy.

- Policy ESD3 Sustainable Construction – All new residential development will be expected to incorporate sustainable design and construction technology to achieve net zero carbon development through a combination of fabric energy efficiency, carbon compliance and allowable solutions. Residential development should also achieve 110 l/p/d water efficiency. Development should demonstrate high quality design and sustainable construction methods.

[1] MHCLG (2024). National Planning Policy Framework. Available at: National Planning Policy Framework - Guidance - GOV.UK
[2] MHCLG (2024), Planning Practice Guidance. Available at: Planning practice guidance - GOV.UK
[3] CDC (2015), Adopted Cherwell Local Plan 2011 – 2031 (Part 1). Available at: Adopted Cherwell Local Plan 2011-2031 (Part 1) | Adopted Cherwell Local Plan 2011-2031 (Part 1) | Cherwell District Council

- Policy ESD4 Decentralised energy systems – Decentralised energy systems are encouraged for new development. A feasibility assessment is required for residential development for 100 dwellings or more.

- Policy Bicester 1: North West Bicester Eco-Town – Sets out the overarching requirements for development at Bicester, including requirements for net zero development, creation of a carbon management plan, energy strategy, water cycle study, sustainable management of waste, monitoring of embodied impacts of construction, use of sustainability metrics to monitor development, consideration of overheating, and demonstration that climate change mitigation and adaptation measures in line with Policies ESD 1-5 have been incorporated.

13.2.4 The Cherwell Residential Design Guide Supplementary Planning Document[4] notes new development in Cherwell should consider sustainability objectives at the masterplan, plot and building scale; incorporate innovation in a manner which reinforces the principles of good urban design; create robust places which can adapt to future changes in the way we live and use technology; create healthy buildings which provide a safe and comfortable environment for their inhabitants.

13.2.5 In 2020 Cherwell District Council adopted a Climate Change Declaration and published the 2020 Climate Action Framework[5]. The Climate Action Framework sets out the Council's commitment to becoming climate neutral by 2030. The Framework identifies five key areas for action Transport, connectivity and planning, Natural Carbon Management, Infrastructure business and systems, Waste and consumption, and Buildings and Housing.

Emerging Local Plan

The Cherwell Local Plan Review 2042

13.2.6 Cherwell District Council (CDC) is preparing a new Local Plan. The consultation (Regulation 19) on the draft of the Cherwell Local Plan Review 2042 was held between 19th December 2024 and 25th February 2025. The Submission Local Plan was approved by CDC Executive on 1 July 2025 and by Full Council on 21 July 2025, and was submitted to the Secretary of State for Housing, Communities and Local Government for independent examination, on 31 July 2025. Officers prepared a Schedule of Proposed Changes and Minor Modifications which they consider would improve and update the draft plan in view of the representations received and updated evidence. These will be submitted for consideration by the Inspector at the examination and if appropriate may form the basis for future Main Modifications to the Submission Local Plan as

[4] CDC (2018), Cherwell Residential Design Guide Supplementary Planning Document. Available at: Cherwell Residential Design Guide Supplementary Planning Document (SPD) (July 2018) | Supplementary planning documents - completed | Cherwell District Council
[5] CDC (2020), Cherwell Climate Action Framework. Available at: Climate Action | Climate Action | Cherwell District Council

recommended by the Inspector in order to make the plan sound and/or legally compliant. As such, at this time, only limited weight can be attributed to the emerging Local Plan as a material planning consideration.

Any other relevant policy, legislation or guidance

13.2.7 The Climate Change Act 2008[6] was revised in 2019 to set a 100% carbon reduction target (net zero) by 2050.

13.2.8 National Planning Policy Framework (NPPF) (December 2024)[7] recognises the key role planning has to play in mitigating climate change and supporting the transition to a low carbon economy.

13.2.9 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017[8] require the consideration of contributions from projects to climate change through the release of greenhouse gas (GHG) emissions and how such effects will be reduced ("climate change mitigation").

13.2.10 The Government's Net Zero Strategy (October 2021)[9] recognises the importance of the planning system to combating climate change and supporting sustainable growth.

13.2.11 The UK's Sixth Carbon Budget[10] was implemented in April 2021, enshrining in law a new target to reduce GHG emissions by at least 78% by 2035.

13.2.12 The Committee on Climate Change has published the proposed Seventh Carbon Budget[11] to further reduce emissions.

13.2.13 The 2025 Future Homes Standard (FHS) and Future Buildings Standard (FBS) consultation[12] was published in December 2023 which requires homes to achieve a 75% carbon reduction beyond Part L 2013, removing the use of fossil fuel and requiring increased fabric efficiency and use of low carbon renewable energy generation. The Government announced in June 2025 that the FHS will likely be published in Autumn 2025, and implemented in 2026.

[6] HM Government (2019) UK Climate Change Act 2008 (2050 Target Amendment) Order 2019. Available at: https://www.legislation.gov.uk/uksi/2019/1056/introduction/made
[7] MHCLG (2024). National Planning Policy Framework (NPPF). Available at: National Planning Policy Framework - Guidance - GOV.UK
[8] The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 No. 571. Available at: http://www.legislation.gov.uk/uksi/2017/571/contents/made
[9] BEIS (2021). Net Zero Strategy: Build Back Greener. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1033990/net-zero-strategy-beis.pdf
[10] BEIS (2021). Press Release: UK enshrines new target in law to slash emissions by 78% by 2035. Available at: https://www.gov.uk/government/news/uk-enshrines-new-target-in-law-to-slash-emissions-by-78-by-2035
[11] Climate Change Committee (2025) 7th carbon budget. Available at: The Seventh Carbon Budget - Climate Change Committee
[12] HM Government (2023) The Future Homes and Buildings Standard: 2023 consultation. Available at: https://www.gov.uk/government/consultations/the-future-homes-and-buildings-standards-2023-consultation

13.2.14 Future Building Standard (FBS)[13] (2021) adopted in June 2022 requires that new non-residential development should achieve an average 27% CO_2 improvement on the Part L 2013 standard, it is anticipated that from 2026 new non-residential buildings will be required to achieve a similar carbon reduction as proposed for the 2025 FHS.

13.2.15 IEMA's EIA Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA, 2022)[14] (IEMA's GHG Assessment Guidance) – provides guidance on the assessment of GHG emissions.

13.2.16 RIBA 2030 Climate Challenge[15] – provides good and best practice guidance on reducing energy demand and embodied carbon for residential and non-residential development.

13.2.17 LETI Climate Emergency Design Guide (2020)[16] and LETI's Embodied Carbon Target Alignment (2021)[17] – provide good and best practice for upfront embodied carbon and operational energy for residential and non-residential buildings.

[13] HM Government (2022) The Future Buildings Standard. Available at: https://www.gov.uk/government/consultations/the-future-buildings-standard
[14] EIA Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA, 2022). Available at: https://www.iema.net/preview-document/assessing-greenhouse-gas-emissions-and-evaluating-their-significance
[15] RIBA 2030 Climate Challenge. Available at: 2030 Climate Challenge (architecture.com)
[16] LETI Climate Emergency Design Guide. Available at: https://www.leti.london/_files/ugd/252d09_3b0f2acf2bb24c019f5ed9173fc5d9f4.pdf
[17] LETI (2021). Embodied Carbon Alignment Target. Available at: https://www.leti.uk/_files/ugd/252d09_25fc266f7fe44a24b55cce95a92a3878.pdf

13.3 Part 1: Assessment Methodology

Scope

13.3.1 The Site will form the principal study area for the assessment; however, the assessment will include off-site GHG emissions/savings such as those associated with the manufacture and transportation of construction materials, and those associated with the off-site generation (e.g. at a power station) of grid electricity consumed by the completed proposed development once occupied.

Data sources

13.3.2 No statutory consultee exists in relation to climate change, and as a result consultation has focussed on a review of the Local Plan, and other local guidance set out above.

Assessment approach

13.3.3 There is at present no single accepted methodology for the assessment of GHG emissions within EIA. The proposed assessment methodology outlined below is therefore based on application of IEMA's GHG Assessment guidance, together with professional judgement.

13.3.4 Determining the magnitude and significance of climate change effects (GHG emissions or savings) from new development remains an emerging practice and is complex given the local scale at which GHG emissions typically occur in contrast to the global and transboundary nature of climate change.

13.3.5 In line with IEMA's GHG Assessment guidance, the approach taken in this assessment is to estimate GHG emissions resulting from the construction and post-completion stages of the proposed development and to evaluate these emissions in the context of baseline GHG emissions from the Site, emissions from the local area (Cherwell District Council), Oxfordshire and South East England, as well as the future carbon budgets proposed for Cherwell and the UK. The results will be considered in the context of the mitigation proposed and how this supports the UK Net Zero pathway.

13.3.6 Furthermore, and in accordance with IEMA guidance, consideration is also given to the contribution of the proposed development to a science-based net zero trajectory in line with the 2015 Paris Agreement's 1.5°C pathway[18].

[18] IPCC (2019). Global warming of 1.5°C. Available at: https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_Low_Res.pdf

13.3.7 The applied methodology therefore comprises the following components:

- Establish national and local legislation, policy and guidance relating to climate change mitigation;
- Establish baseline conditions with respect to GHG emissions at the Site, Cherwell District Council (CDC), Oxfordshire and South East England;
- Establish future baseline conditions with respect to GHG emissions from future carbon budgets proposed for Cherwell and the UK;
- Calculate GHG emissions resulting from the construction and post-completion stages of the proposed development;
- Evaluate primary and tertiary GHG mitigation measures in place for the proposed development;
- Evaluate project's GHG emissions in the context of baseline emissions and future carbon budgets to establish their context and magnitude;
- Appraise the contribution of the proposed development to the UK's net zero trajectory;
- Establish whether secondary mitigation is required to reduce adverse effects or enhance beneficial effects; and
- Establish the level of effect in relation to GHG and whether it is significant or not.

13.3.8 The timescales for the construction and operation phases of the proposed development are set out in **Table 13.1**.

Table 13.1: Assessed Project Timescales

Development Phase	First Year	Completion/ Assessment Period	Summary
Construction	2027	2042	Construction of the proposed development is scheduled to commence in 2027. For the purpose of this assessment and to ensure the worst-case scenario it is assumed the proposed development will be completed over 15 years.

Post-completion	2034	2042	For the purpose of this assessment the proposed development is assumed to be fully operational from 2034, midway through construction as the build out rate is not confirmed. This provides a reasonable worst-case scenario. Operational GHG emissions are assessed up to the end of 2042 to enable comparison with the UK carbon budgets ending 2042. GHG emissions will continue beyond this point, however as the Proposed Development will be all-electric GHG emissions will reduce over time in line with the decarbonisation of the electricity network. Assessing beyond this point is not considered necessary.

Significance criteria

13.3.9 The assessment of likely significant environmental effects as a result of the proposed development has taken into account the construction and post-completion stages. The following sections define the approach adopted within the assessment for the determination of sensitivity (or value / importance), magnitude of change (or impact), the level of effect and significance.

Determining the Magnitude of Change

13.3.10 The magnitude of change has been considered as the change experienced from the current baseline conditions at the sensitive receptor and has been considered on a scale of **large, medium, small** or **negligible**.

13.3.11 There are currently no published or agreed significance criteria for evaluating GHG emissions in EIA. Therefore, the magnitude of change of GHG emissions estimated from the proposed development is determined by establishing their scale relative to recent GHG emissions from Cherwell District Council, Oxfordshire and South East England, and also to future CDC and UK carbon budgets as presented in **Table 13.4**, together with professional judgement.

Table 13.2: Magnitude of Impacts

Magnitude of Change	Description of Change
Large	A large increase/decrease in GHG emissions (>10%) relative to baseline emissions and/or future carbon budgets
Medium	A medium increase/decrease in GHG emissions (5% – 10%) relative baseline emissions and/or future carbon budgets
Small	A small increase/decrease in GHG emissions (1% – 5%) relative to baseline emissions and/or future carbon budgets
Negligible	A negligible increase/decrease in GHG emissions (<1%) relative to baseline emissions and/or future carbon budgets

13.3.12 The magnitude of GHG emissions (or savings) from a project, how this effect changes (or otherwise) baseline conditions and/or future carbon budgets at the local, regional and national level are also important components when establishing the magnitude of change. However, how much the project contributes (or otherwise) to the UK's net zero trajectory is a critical additional component as recognised by IEMA Guidance. This is factored into determining the magnitude of change using professional judgement.

Determining Sensitivity of Receptor

13.3.13 The sensitivity of affected receptors has been considered on a scale of **high, medium, low** or **negligible**.

13.3.14 GHG emissions affect the global climate system which, in accordance with IEMA guidance, is considered potentially sensitive to any additional GHG emissions. This sensitivity may, however, vary depending on the future global response to climate change, for example should a significant global reduction in GHG emissions (compared with the currently increasing emissions) be achieved over time. IEMA's latest EIA guide to climate change adaptation and resilience recommends the use of the Met Office UKCP18 high emissions scenarios (known as RCP8.5), unless the case can be made for using a different, lower emissions scenario. The RCP 8.5 scenario is considered most appropriate for this assessment and as a result the sensitivity of the global climate system is considered to be **high**.

Determining the Significance of Effect

13.3.15 The level of effect has been informed by the magnitude of change due to the proposed development and the evaluation of the sensitivity of the affected receptor. The level of effect has been determined using professional judgement and **Table 13.3** has also assisted with this process. For each effect, it has been concluded whether the effect is 'beneficial' or 'adverse'.

Table 13.3: Significance of Effects

MAGNITUDE	SENSITIVITY			
	High	**Medium**	**Low**	**Negligible**
Large	Major	Major	Moderate	Minor
Moderate	Major	Moderate	Minor	Negligible
Small	Moderate	Minor	Minor	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

13.3.16 The following terms (adapted from IEMA guidance) have been used to define the level of the effects:

- **Major effect:** GHG mitigation measures are not in line with a science-based 1.5°C aligned transition to net zero for that project type, and net GHG emissions equate to a large increase (e.g. ≥10%) relative to baseline local/regional/national emissions and/or future local carbon budgets. A project with major adverse effects is locking in GHG emissions and does not make a meaningful contribution to the national trajectory to net zero.

- **Moderate effect:** GHG mitigation measures are partly in line with a science-based 1.5°C aligned transition to net zero for that project type, and net GHG emissions equate to a small to medium increase (e.g.>5%) relative to baseline local/regional/national emissions and/or future local carbon budgets. A project with moderate adverse effects complies with some up-to-date policy and good practice but is locking in some emissions and makes only a partial contribution to the national trajectory to net zero.

- **Minor effect:** GHG mitigation measures are in line with a science-based 1.5°C aligned transition to net zero for that project type, and net GHG emissions equate to a small increase (e.g. <5%) relative to baseline local/regional/national emissions and/or future local carbon budgets. A project with minor adverse effects complies with up-to-date policy and good practice reduction measures and makes a contribution to the national trajectory to net zero.

- **Negligible:** GHG mitigation measures are in line with a science-based 1.5°C aligned transition to net zero for that project type, with minimal residual emissions. A project with negligible effects complies with up-to-date and emerging policy and best practice and plays a part in achieving the rate of transition required by nationally set policy e.g. net zero.

- **Beneficial:** net GHG impacts are below zero and the project results in a reduction in atmospheric GHG concentrations, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact. It should be noted that the latest IEMA guidance on GHGs in EIA does not seek to differentiate between different levels of beneficial effect (minor, moderate, major) or whether they would be 'Significant/Not Significant'.

13.3.17 The duration of the effect has been assessed as either 'short-term', 'medium-term' or 'long-term'. Short-term is considered to be up to 1 year, medium-term is considered to be between 1 and 10 years and long-term is considered to be greater than 10 years.

13.3.18 Carbon dioxide equivalency (CO_2e) is a quantity that describes, for a given mixture and amount of GHG, the amount of CO_2 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 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 of the built elements of the proposed development is assumed to be **long-term**.

13.3.19 For each residual effect, a statement has been made as to whether the level of effect is 'Significant' or 'Not Significant'. This determination has been based on professional judgement and / or relevant guidance/legislation where applicable.

Uncertainties and limitations

13.3.20 To ensure transparency within the EIA process, the following limitations and assumptions have been identified:

- The assessment of the level of effect and whether the effect is 'significant' or not is based, in part, on professional judgement.

- The future UK electricity grid factors sourced from DESNZ are projections which may not reflect the actual emissions associated with grid electricity consumption in future. However, DESNZ 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 under-estimate GHG emissions associated with the proposed development's future electricity demand.

- The completed and operational proposed development will generate additional vehicle trips on the local road network as a result of the operation of the Site. However, it is very likely that the majority of these trips already occur on the UK network in some form. It is not possible to determine whether trips associated with the proposed development are truly 'Net New', it is therefore not possible to quantify the direct GHG emissions from transport associated with the proposed development. While it is not possible to directly quantify these emissions it is noted that it is the Government's aim to reduce emissions from vehicles, with the sale of fossil fuel based vehicles banned from 2030. A Transport Assessment and Travel Plan have been prepared by Jubb with a number of sustainable movement and transport measures proposed for the development.

13.4 Part 1: Baseline Conditions

The current baseline

13.4.1 The site currently comprises a series of agricultural fields that are a mixture of arable and grazed. Whilst the existing Site may result in the release of GHG emissions, the scale of such GHG emissions is considered likely to be limited. For the purposes of the GHG emissions assessment, baseline GHG emissions from the Site are assumed to be zero, an approach that helps ensure a reasonable 'worst-case' scenario regarding the GHG effect of the proposed development.

Local and Regional GHG Emissions

13.4.2 **Table 13.4** presents the most recent (2022) data on baseline GHG emissions for the CDC administrative area, Oxfordshire and South East England as sourced from Government's UK Local Authority & Regional CO_2 Emissions Statistics[19]. Assumed baseline GHG from the Site are also presented. This baseline data is used to contextualise GHG emissions from the proposed development and determine the magnitude of change.

Table 13.4: Baseline Site, Local & Regional GHG Emissions

Geographical Area	2022 GHG Emissions (tonnes CO_2e)
Current Site	0
CDC	1,162,900
Oxfordshire	4,063,900
South East England	41,418,800

The projected future baseline

13.4.3 The future baseline conditions regarding GHG emissions have been established in the form of carbon budgets proposed for Cherwell via the Tyndall Centre[20] and the UK[21] as presented in **Table 13.5**. These will be used to contextualise GHG emissions from the proposed development in order to establish the magnitude of its net GHG effect.

[19] DESNZ (2024). UK Local Authority and Regional Carbon Dioxide Emissions National Statistics: 2005 to 2022. Available at: https://www.gov.uk/government/collections/uk-local-authority-and-regional-greenhouse-gas-emissions-national-statistics
[20] Tyndall Centre (2025), Carbon budget Report. Available at: Local and Regional Implications of the United Nations Paris Agreement on Climate Change
[21] DESNZ (2021), Carbon Budgets. Available at : https://www.gov.uk/guidance/carbon-budgets

Table 13.5: Local and National Carbon Budgets (tonnes CO_2e)

Period	UK	Cherwell
2018 – 2022	2,544,000,000	4,100,000
2023 – 2027	1,950,000,000	2,500,000
2028 – 2032	1,725,000,000	1,200,000
2033 – 2037	965,000,000	500,000
2038 – 2042[22]	535,000,000	300,000
2043 – 2047	Not yet set	100,000
2048 - 2100	Not yet set	100,000

13.4.4 In order to determine whether the Proposed Development is aligned with and makes an appropriate contribution to the UK's net zero trajectory, it is necessary to provide context for the magnitude of GHG emissions. LETI Climate Emergency Design Guide (2020)[23] and LETI's Embodied Carbon Target Alignment (2021)[24], and RIBA 2030 Climate Challenge[25] provide guidance for embodied carbon and upfront carbon for residential and non-residential buildings to ensure the construction industry delivers the significant reductions necessary in order to have a realistic prospect of achieving net zero for the whole UK building stock by 2050.

13.4.5 Embodied carbon is the total GHG emissions and removals associated with materials and construction processes throughout the whole lifecycle of a building (RICS lifecycle modules A1-A5, B1-B5 and C1-C4). As such embodied carbon comprises construction (or upfront) carbon (typically accounting for the large majority of embodied carbon), together with emissions during building use and end of life.

13.4.6 Upfront carbon is the GHG emissions associated with materials and construction processes up to practical completion (RICS lifecycle modules A1-A5), excluding any biogenic carbon sequestered in construction products and materials (e.g. timber). As such upfront carbon relates to emissions occurring during a buildings' construction stage and is the focus of this chapter (alongside operational emissions).

13.4.7 **Table 13.6** sets out the LETI 2020 Design targets, RIBA 2030 Climate Challenge targets, and emerging Plan Targets for embodied carbon for new residential and non-residential buildings. These provide context for determining whether the mitigation proposed aligns with good or best practice.

[22] Published by the Committee on Climate Change in 2025 but not yet incorporated into law
[23] LETI (2021), Climate Emergency Design Guide. Available at: Climate Emergency Design Guide | LETI
[24] LETI (2021), Embodied Carbon Target Alignment. Available at: Carbon Alignment | LETI
[25] RIBA(2020), 2030 Climate Challenge. Available at: 2030 Climate Challenge

Table 13.6: Operational and Embodied Carbon Guidance

and **Operational Energy and Embodied Carbon Targets**				
LETI Design Guide Targets				
	Business as usual	**2020**	**2025 – N/A**	**2030**
Upfront Carbon – Office (A1-A5) ($kgCO_2e/m^2$)	950	600		350
Operational Energy – Office(kWh/m^2/year)		55		
Upfront Carbon – Residential (A1-A5) ($kgCO_2e/m^2$)	850	500		300
Operational Energy – Residential (kWh/m^2/year)		35		
Upfront Carbon – Retail (A1-A5) $kgCO_2e/m^2$	850	550		300
Operational Energy – Retail (kWh/m^2/year)				
Upfront Carbon – School (A1-A5) $kgCO_2e/m^2$	750	600		300
Operational Energy – School (kWh/m^2/year)		65		
RIBA 2030 Climate Challenge Targets				
	Business as usual	**2020 – N/A**	**2025**	**2030**
Whole Life Carbon – Office (A1-D4) $kgCO_2e/m^2$	1,400		970	750
Operational Energy – Office (kWh/m^2/year)	130		75	55
Whole Life Carbon – Residential (A1-D4) $kgCO_2e/m^2$	1,200		800	35
Operational Energy – Residential (kWh/m^2/year)	120		60	35
Whole Life Carbon – Schools (A1-D4) $kgCO_2e/m^2$	1,000		675	540
Operational Energy – Schools (kWh/m^2/year)	130		70	60

Emerging Plan Targets	
Space heating (all development) (kWh/m^2/year)	<20
Total Energy – Residential (kWh/m^2/year)	35
Total Energy – Non-residential (kWh/m^2/year)	65
Upfront Embodied Carbon ($kgCO_2e/m^2$)	675

13.5 Part 1: Potential Effects

Construction stage

13.5.1 The following effects (**Table 13.7**) are considered to have the potential to be significant and have been assessed and reported within this chapter.

Table 13.7: Effects considered likely to be significant (construction stage)

Likely significant effect	Receptors
GHG emissions	Global climatic system

Post-completion stage

13.5.2 The following effects (**Table 13.8**) are considered to have the potential to be significant and have been assessed and reported within this chapter.

Table 13.8: Effects considered likely to be significant (post-completion stage)

Likely significant effect	Receptors
GHG emissions	Global climatic system

13.6 Part 1: Mitigation Measures

Construction stage

13.6.1 The proposed mitigation which has been evaluated as part of the construction stage assessment is outlined below.

13.6.2 To reduce construction stage GHG emissions embodied carbon will be assessed as part of each phase of development including a Lifecycle Carbon Assessment to assess the upfront embodied carbon (Stages A1-A5) of proposed house types / building types to demonstrate how upfront embodied carbon will be reduced, going beyond the LETI 2020 Business as Usual estimates, with the buildings designed to achieve the following upfront embodied carbon targets;

- Residential development <800 $kgCO_2/m^2$
- Commercial development <900 $kgCO_2/m^2$
- Community use development <800 $kgCO_2/m^2$
- Primary school <700 $kgCO_2/m^2$

13.6.3 A LCA will be prepared as part of the detailed design of the proposed Solar PV array and will aim to reduce upfront embodied carbon of materials by 10%.

Post-completion stage

13.6.4 To reduce operational stage GHG emissions the Proposed Development will be built to meet the requirements of the forthcoming Building Regulations 2025, including the Future Homes Standard (FHS) (whereby residential development will achieve at least a 75% carbon reduction beyond Part L 2013) and the Future Buildings Standard (FBS).

13.6.5 To support the Government's Net Zero vehicle transition the Proposed Development will include Electric Vehicle Charging Infrastructure in line with Part S of the Building Regulations[26].

[26] Building Regulations Part S. Available at: https://www.gov.uk/government/publications/infrastructure-for-charging-electric-vehicles-approved-document-s

13.7 Part 1: Assessment of Environmental Impacts

13.7.1 **Table 13.9** sets out the development's components in accordance with chapter 2 'Proposed Development', together with the assumptions used in this assessment.

Table 13.9: Proposed development's components and assumptions

Use Class and Quantum	Area	Assumptions
Residential		
Up to 3,100 new dwellings (C3 use) (this includes all houses and apartments and assisted living units)	92 sqm each	An average dwelling of 92 sqm is assumed based on similar developments
Non-domestic (new build offices)		
Commercial development (including employment and business space)	7,050 sqm	Energy performance data for office use has been used to assess this element to provide a worst case scenario
Community use space (including the proposed mixed use space)	1,100 sqm	Energy performance data for retail use has been used to assess this element to provide a worst case scenario
Non-domestic (new build schools)		
Primary school (F1 use)	2,000 sqm	Assumed area based on similar schemes, and utilises school energy performance data from similar schemes
Energy generation		
Solar PV Array	5 MWp	

Construction stage

13.7.2 The construction stage of the proposed development will result in GHG emissions both on- and off-site, from a range of activities including the manufacture of construction materials and products, the transport of materials and waste on- and off-site, the consumption of fossil fuels and electricity by site plant and vehicles, and the treatment of residual construction waste.

13.7.3 In order to estimate baseline construction stage GHG emissions including mitigation, baseline performance has been considered using the business as usual figures set out in the LETI Carbon Alignment paper, and proposed performance is based on meeting the upfront embodied carbon figures set out in **Section 13.6**. This is applied to the floor areas and development scale set out in **Table 13.9.**

13.7.4 **Table 13.10** below presents annual and total construction stage GHG emissions calculated for the proposed development.

Table 13.10: Construction Phase GHG emissions

	Baseline Business as Usual GHG Emissions	**Proposed Development GHG Emissions (tCO_2e)**	**Proposed Development Annual GHG Emissions (tCO_2e)**
Residential development	242,420	228,160	15,211
Commercial development	6,698	6,345	423
Community uses	935	880	59
Primary school	1,500	1,400	93
Solar PV Array[27]	7,383	7	0
Total	**258,935**	**236,792**	**15,786**

13.7.5 **Table 13.11** presents construction emissions as a proportion of baseline emissions from CDC, Oxfordshire and South East, and also future UK carbon budgets. In order to assess the worst-case scenario, annual average construction emissions are used for comparison with the baseline CDC, Oxfordshire and South East of England emissions (given these are also annual emissions), whilst total construction emissions are compared with UK carbon budgets for that period.

[27] Embodied carbon has been estimated based on data from the Longfield Solar PV Climate Change Assessment. Available at: Documents | Longfield Solar Farm

Table 13.11: Construction Stage GHG emissions in Context

Context	Construction Phase GHG Emissions (as a %)
Baseline emissions	
CDC	1.36%
Oxfordshire	0.38%
South East	0.038%
Carbon budgets	
UK 4th Carbon Budget (2023 – 2027)	0.0041%
UK 5th Carbon Budget (2028 – 2032)	0.0046%
UK 6th Carbon Budget (2033 – 2037)	0.0082%
UK 7th Carbon Budget (2038 – 2042)	0.012%

13.7.6 It should be noted that CDC carbon budget proposed by Tyndall Centre relate to emissions from the energy system only, whereas construction emissions from the proposed development will largely comprise those from the manufacture and transport of construction products and materials. Construction GHG emissions are therefore not readily comparable given a significant proportion of these emissions are likely to occur outside the geographical and/or temporal boundary of CDC carbon budget.

13.7.7 The construction stage GHG emissions represent c.1.36% of local annual emissions and <1% of national carbon budget, therefore the magnitude of emissions is consider to be small.

13.7.8 Performance beyond the business as usual embodied carbon performance set out in Table 13.6 is considered to represent good practice regarding construction carbon and therefore the proposed development is considered to make an appropriate contribution to the UK net zero trajectory for this issue.

13.7.9 The sensitivity of the climate system is considered to be high. The magnitude of change is considered to be small. The proposed development's construction GHG emissions are considered to comprise current and emerging good practice and contribute to the UK's net zero trajectory. Therefore, there is likely to be a direct, temporary, long-term, adverse effect which is considered to be minor.

13.7.10 This effect is considered to be **Not Significant.**

Post-completion stage

13.7.11 The post-completion stage of the proposed development will result in GHG emissions from the generation of energy consumed by the proposed dwellings and non-residential development.

13.7.12 In order to estimate post-completion stage GHG emissions the following data has been used;

- Residential development – 2025 FHS modelling for a typical housetype
- Commercial development – RIBA 2030 Office 2025 target
- Community use development - 2025 FBS modelling for a retail development
- Primary school – RIBA 2030 School 2025 target
- Solar PV array – Estimated annual output of 4,870MWh taken from the Sustainability and Energy Addendum.

13.7.14 **Table 13.12** presents estimated post-completion stage GHG emissions for the first year of assumed occupation (2027), for the last year of the assessed period (2042) as well as emissions over the assessed period (2027 – 2042). The assessment includes the net GHG emissions from the proposed buildings offset against the GHG emissions saved by the Solar PV array energy generation.

13.7.15 As the assessment uses UK electricity grid factors which reflect the continued decarbonisation of the UK electricity grid, operational GHG emissions are anticipated to reduce over time, with emissions in year 1 representing the peak/worst-case.

Table 13.12: Post-completion stage GHG emissions

	Post-completion stage GHG emissions (tCO_2e)
Year 1 (2034)	143
Year 8 (2042)	65
Total (2034-2042)	1,049

13.7.16 **Table 13.13** presents operational emissions as a proportion of baseline emissions from CDC, Oxfordshire and the South East of England, and also future UK and local carbon budgets. In order to assess the worst case scenario, peak annual operational emissions are used for comparison with baseline CDC, Oxfordshire and the South East of England emissions, whilst cumulative operational emissions are compared with UK and local carbon budgets for that period.

Table 13.13: Post-completion stage GHG emissions in Context

Context	**Post-completion GHG Emissions (as a %)**
CDC	0.012%
Oxfordshire	0.0035%
South East	0.00035%
UK 6th Carbon Budget (2033 – 2037)	0.00001%
UK 7th Carbon Budget (2038 - 2042)	0.00010%

CDC Carbon Budget (2033 - 2037)	0.13%
CDC Carbon Budget (2038 - 2042)	0.17%

13.7.17 Peak annual emissions represent <1% of local emissions and carbon budgets, resulting in a negligible magnitude of change.

13.7.18 Performance in line with the FHS, FBS, and RIBA 2030 Climate Challenge targets for 2025 is considered to represent good practice regarding operational carbon and therefore the proposed development is considered to make an appropriate contribution to the UK net zero trajectory for this issue.

13.7.19 The sensitivity of the climate system is considered to be high. The magnitude of change is considered to be negligible. The proposed development's operational GHG emissions are considered to comprise current and emerging good practice and contribute to the UK's net zero trajectory. Therefore, there is likely to be a direct, temporary, long-term, adverse effect which is considered to be minor.

13.7.20 This effect is considered to be **Not Significant.**

Construction and Post Completion Stage GHG Emissions In Combination

13.7.21 A combined assessment of GHG emissions has been provided considering the construction and operational GHG emissions.

13.7.22 **Table 13.14** presents the construction stage and operational emissions as a proportion of baseline emissions from CDC, Oxfordshire and the South East of England, as well as future Local and UK carbon budgets. In order to assess the worst case scenario, peak annual operational emissions are used for comparison with baseline CDC, Oxfordshire and South East of England emissions, whilst cumulative operational emissions from 2034 – 2042 are compared with UK budgets for that period.

Table 13.14: In combination construction and operational GHG Emissions in Context

Context	In-combination GHG Emissions (as a %)
CDC	1.36%
Oxfordshire	0.39%
South East	0.04%
UK 4th Carbon Budget (2023 – 2027)	0.004%
UK 5th Carbon Budget (2028 – 2032)	0.005%

UK 6th Carbon Budget (2033 – 2037)	0.002%
UK 7th Carbon Budget (2038 – 2034)	0.012%

13.7.23 The sensitivity of the Global Climate System is considered to be high. The magnitude of change is considered to be small. The approach to reducing construction stage and post completion stage emissions aligns with current good practice. Therefore, there is likely to be a direct, temporary, long-term, adverse effect which is considered to be minor. This effect is considered to be **Not Significant**.

Secondary Mitigation

13.7.24 No secondary mitigation or enhancement is required/has been identified.

Residual Impact Assessment

13.7.25 In the absence of further Secondary Mitigation the residual effects remain the same.

13.7.26 The sensitivity of the Global Climate System is considered to be high. The magnitude of change is considered to be small. The approach to reducing construction stage and post completion stage emissions aligns with current good practice. Therefore, there is likely to be a direct, temporary, long-term, adverse effect which is considered to be minor. This effect is considered to be **Not Significant**.

Summary of effects

13.7.27 The effects identified are summarised in **Table 13.15** below:

Table 13.15: Summary of effects

Potential effect	Significance (pre-mitigation)	Mitigation measures	Significance of residual effect
Construction stage			
GHG emissions		To reduce construction stage GHG emissions embodied carbon will be assessed as part of each Phase including a Lifecycle Carbon Assessment (LCA) to assess the upfront embodied carbon (Stages A1-A5) of proposed house types / building types to demonstrate how upfront embodied carbon	**Minor adverse**

		will be reduced, with the buildings designed to achieve the following upfront embodied carbon targets; Residential development <800 $kgCO_2/m^2$ Commercial development <900 $kgCO_2/m^2$ Community use development <800 $kgCO_2/m^2$ Primary school <700 $kgCO_2/m^2$ A LCA will be prepared as part of the detailed design of the proposed Solar PV array and will aim to reduce upfront embodied carbon of materials by 10%.	
Post-completion stage			
GHG emissions		To reduce operational stage GHG emissions the Proposed Development will be built to meet the requirements of the forthcoming Building Regulations including the Future Homes Standard (FHS) (whereby residential development will achieve at least a 75% carbon reduction beyond Part L 2013) and the Future Buildings Standard (FBS). To support the Government's Net Zero vehicle transition the Proposed Development will include Electric Vehicle Charging Infrastructure in line with Part S of the Building Regulations	**Minor adverse**

Constriction and Post Completion Stage			
GHG emissions		As above	**Minor adverse**

13.8 Part 1: Cumulative Effects

13.8.1 IEMA'S GHG Guidance recognises the cumulative contributions of all GHG emission sources to global climate change and the climatic system as a sensitive receptor. For this reason, the approach to cumulative effects assessment of GHGs differs from many other EIA topics where projects within a geographically bounded study area are considered.

13.8.2 For GHGs, unlike air pollution for example, there is no greater climate change effect from a local GHG emissions source than from one on the other side of the world. Indeed, all global cumulative GHG sources are relevant to the effect on climate change, which is taken into account when defining the global climatic system receptor as being of high sensitivity to further emissions.

13.8.3 Effects of GHG emissions from specific cumulative projects therefore in general should not be individually assessed, as there is no basis for selecting any particular (or more than one) cumulative project that has GHG emissions for assessment over any other.

13.8.4 Instead, the contextualisation of GHG emissions incorporates by its very nature the cumulative contributions of other GHG sources which make up that context, whether geographical (in the case of local and UK carbon budgets) or sector-bounded. Therefore, a form of cumulative assessment of GHG emissions / savings has already been undertaken.

13.9 Part 2: Assessment Methodology

Scope

13.9.1 The study area for climate resilience refers to the impact of climate on the proposed development, therefore, the study area is the proposed development's site boundary.

Data sources

13.9.2 No statutory consultee exists in relation to climate change, and as a result consultation focussed on a review of the Local Plan, and other local guidance set out above.

Assessment approach

13.9.3 The following approach is proposed for the climate change resilience assessment in accordance with IEMA's EIA Guide to Climate Change Adaptation & Resilience, including:

- Establish baseline climate conditions (e.g. monthly and annual average temperature and rainfall) for the Site area from long term monitoring data from the closest Met Office automatic weather station;
- Review the Met Office's latest climate projections (UKCP18) for the Site area to establish predicted changes to baseline temperature and rainfall for the 2020s (construction phase) and 2050s & 2080s (future occupation phase) under the "high emissions scenario" (RCP8.5) in accordance with IEMA's guidance;
- Consideration of the UK Climate Change Risk Assessment alongside the UKCP18 impacts to identify potential risks and receptors;
- Consideration of standard mitigation and mitigation inherent to the design of the Proposed Development either required by legislation or guidance or included as part of a best practice design process;
- Establish whether actionable mitigation is required to reduce adverse effects or enhance beneficial effects;
- Establish the level of effect and whether it is significant or not;
- The climate resilience assessment will consider the construction and occupation phases of the Proposed Development.

Significance criteria

13.9.4 The assessment of potentially significant environmental effects as a result of the proposed development has taken into account the construction and post-completion stage.

Determining the Magnitude of Change

13.9.5 The magnitude of change has been considered as the change experienced from the current baseline conditions considering the probability and consequence of the effect. This has been considered in **Table 13.16** on the scale of **large, medium, small** and **negligible**, including a consideration of the probability of the effect occurring within the time period of the proposed development, and nature of the consequences likely given the nature of the proposed development.

Table 13.16: Magnitude of Effects

Magnitude of Change	Description
Large	Ongoing annual impact with the potential for extreme events to cause operational or structural damage. For example, higher temperatures causing a major failure in structures or buildings with the potential for injury.
Moderate	Seasonal impact with the potential for climatic events to cause operational or structural damage. For example, increased summer maximum temperatures could affect structures through the movement of materials, foundations etc., or impact on building occupants through overheating.
Small	Increased maintenance required to mitigate annual operational impacts. For example, increased winter rainfall could cause damage to drainage systems resulting in additional maintenance requirements.
Negligible	Impacts are minimised through mitigation which is inherent to design, or unlikely to be required. For example, mitigation inherent to good practice construction will help mitigate the impacts of climate change through construction.

Determining Sensitivity of Receptor

13.9.6 The sensitivity of affected receptors has been considered on a scale of **high, medium, low,** or **negligible.**

13.9.7 This considers the susceptibility and vulnerability of the receptor to the effects of climate change. For example a receptor with high susceptibility and vulnerability has no ability to withstand/not be substantially altered by the projected changes to the existing/prevailing

climatic factors, and is directly dependent on existing/prevailing climatic factors and reliant on these specific existing climate conditions continuing in future, or only able to tolerate a very limited variation in climate conditions.

13.9.8 In the case of the proposed development the most sensitive receptors are considered to be those where an impact may lead to a risk or injury to humans or that may constitute safety of critical infrastructure.

13.9.9 **Table 13.17** considers susceptibility and vulnerability together to determine sensitivity providing examples which are relevant to the proposed development.

Table 13.17: Sensitivity of Receptor

Sensitivity of receptors	Description
High	Receptor has a high sensitivity to the climate effect and potential impacts, and/or receptor includes safety critical infrastructure which if damaged could result in significant risks to people and/or property.
Medium	Receptor has a moderate sensitivity to the climate effect and potential impacts, and/or receptor includes potential impacts site infrastructure or building/Site occupants which if impacted may affect health or Site operations. For example, without mitigation Site infrastructure and operations may be at risk from increased winter rainfall and flooding.
Low	Receptor has a low sensitivity to potential climatic effects and mitigation is inherent to design, or unlikely to be required. For example, mitigation inherent to good practice construction will help mitigate the impacts of climate change through construction.
Negligible	Receptor has no sensitivity to potential climatic effects and mitigation is inherent to design, or unlikely to be required. For example, climate change is not likely to impact on below ground archaeological remains.

Determining the Significance of Effect

13.9.10 The level of effect has been informed by the magnitude of change due to climate change and the evaluation of the sensitivity of the affected receptor. The level of effect has been determined using professional judgement and **Table 13.18** has been a tool which has assisted with this process.

13.9.11 Whilst **Table 13.18** provides ranges, the level of effect is confirmed as a single level and not a range, informed by professional judgement.

Table 13.18: Significance of Effects

MAGNITUDE	SENSITIVITY			
	High	**Medium**	**Low**	**Negligible**
Large	Major	Major	Moderate	Minor
Moderate	Major	Moderate	Minor	Negligible
Small	Moderate	Minor	Minor	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

13.9.12 For each effect, it has been concluded whether the effect is 'beneficial' or 'adverse.' The following terms have been used to define the level of the effects identified and these can be 'beneficial' or 'adverse'.

- Major effect: where the Proposed Development is likely to be exposed to a considerable change from the baseline conditions and the receptor has limited adaptability, tolerance or recoverability or is of the highest sensitivity.

- Moderate effect: where the Proposed Development is likely to be exposed to either a considerable change from the baseline conditions at a receptor which has a degree of adaptability, tolerance or recoverability or a less than considerable change at a receptor that has limited adaptability, tolerance or recoverability.

- Minor effect: where the Proposed Development is likely to be exposed to a small, but noticeable change from the baseline conditions on a receptor which has limited adaptability, tolerance or recoverability or is of the highest sensitivity; or where the proposed development is likely to be exposed to 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.

- Negligible effect: where the Proposed Development is unlikely to be exposed to 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.

13.9.13 The duration of the effect has been assessed as either 'short-term,' 'medium-term' or 'long-term'. Short-term is considered to be up to 1 year, medium-term is considered to be between 1 and 10 years and long-term is considered to be greater than 10 years.

13.9.14 Effects are also considered in terms of whether they are temporary or permanent in their nature. Temporary effects may be short lived, i.e. those associated with seasonal effects, with permanent effects likely to be associated with longer term changes. Direct effects are those which have a direct link to climate change, i.e. flooding as a result of increasing winter rainfall. Indirect effects may include for example heat related illnesses due to increase in frequency and intensity of heat extremes or disruption to supply chains as a result of climate change.

13.9.15 For each effect, a statement has been made as to whether the level of effect is '**Significant**' or '**Not Significant**'. This determination has been based on professional judgement and/or relevant guidance/legislation where applicable.

Uncertainties and limitations

13.9.16 To ensure transparency within the EIA process, the following limitations and assumptions have been identified.

13.9.17 The UK climate projections are dependent on future GHG emission assumptions. UKCP18 uses scenarios for future GHGs that are based on assumptions on future population, economic development and the mitigation of GHG emissions towards international targets. The real world may follow a different pathway altogether and the scientific community cannot reliably place probabilities on which scenario of GHG emissions is most likely. For the purposes of the assessment the 2080s RCP8.5 scenario has been considered as a worst case.

13.10 Part 2: Baseline Conditions

The current baseline

13.10.1 Current baseline climate condition for the application site area has been established from the Met Office's closest automatic weather station at Oxford[28] as set out below in **Table 13.19**. This shows current temperatures and rainfall patterns which are predicted to change as a result of climate change.

Table 13.19: Baseline climatic data

Description	Baseline data
Summer maximum temperature (C)	21.8
Average summer rainfall (mm per month)	51.1
Average winter rainfall (mm per month)	54.1

The projected future baseline

13.10.2 For the UK, climate change is expected to lead to increasing annual temperatures, increasing winter rainfall and decreasing summer rainfall. Future baseline climate conditions for the application site area have been established from the Met Office's latest climate projections UKCP18 for the 25km OS grid square within which the site is located (462500, 212500) as presented in Table 13.20. Projected changes to seasonal and annual temperature and rainfall relative to the current Met Office baseline (1981-2010) climate conditions for Oxford are also presented.

13.10.3 These projections comprise predicted changes to baseline conditions for the UKCP18's "high emissions scenario" (known as RCP8.5) as recommended by IEMA's EIA guide to: Climate Change Resilience & Adaptation (2020). 50th percentile values are reported which means there is considered to be equal probability of a higher or lower observed value for that projection. As such these projections are considered to represent a reasonable worst case for the purposes of the EIA climate resilience assessment work.

Table 13.20: Future climate baseline

Description	2020s - construction		2050s - medium term operation		2080s – long term operational	
	Change to baseline	Projection	Change to baseline	Projection	Change to baseline	Projection
Summer maximum temperature (C)	21.8	1.2	23.0	2.9	24.7	4

[28] Met Office, Long term climate averages (1981 – 2010). Available at : Oxford Location-specific long-term averages

Average summer rainfall (mm per month)	51.1	-6%	48.0	-22%	39.9	-36%
Average winter rainfall (mm per month)	54.1	6%	57.3	11%	60.0	22%

13.10.4 In addition to increasing temperatures and changing rainfall patterns other potential climatic changes include:

- Increasing wind speed; and
- Increasing winter storms, including more severe storms.

13.10.5 Specific metrics for these changes are not available. It is noted that while wind speeds may increase these changes are small compared to differences between individual years, and further research is required to determine long term projections of winter storm activity.

13.11 Part 2: Potential Effects

13.11.1 The UK Climate Projections provide guidance on the anticipated effects of climate change. Using these projections, the UK Climate Change Risk Assessment (UKCCRA)[29], updated in 2022, identifies potential risks and impacts of climate change across a number of areas including Infrastructure, Health, communities and the Built Environment. Key risks from the UKCCRA which potentially relate to the proposed development are summarised below.

- N1 – Risks to species and habitats from climate change;
- N5 - Risks and opportunities for natural carbon stores, carbon sequestration and GHG emissions from changing climatic conditions, including temperature change and water scarcity
- I2 – Risks for infrastructure from flooding;
- I7 – Risks to infrastructure from subsidence;
- I10 - Risks to energy from high and low temperatures, high winds, lightning
- H1 – Risks to health and wellbeing form high temperatures;
- H3 – Risks to people, communities and buildings from flooding;
- H5 – Risks to building fabric;
- H10 – Risks to water quality and household water supplies;
- B1 – Risks to businesses from flooding;
- B3 – Risks to business from water scarcity; and
- B5 – Risks to business operations due to high temperatures.

13.11.2 **Table 13.21** sets out the potential climate change effects and receptors drawn from a review of the climate projections and the UK Climate Risk Assessment which may be significant and have been assessed and reported within this chapter.

Table 13.21: Potential Effects and Receptors

Potential Effects	**Receptors**	**Description**
Construction and Post Completion Stage		
Increasing temperatures, decreasing summer rainfall, increasing winter rainfall	**Site Instructure and Site Structures**	**Changing temperatures and precipitation** may impact on ground conditions leading to ground movement affecting **Site Infrastructure** and **Site Structures**
Construction		
Increasing annual temperatures	**Human Health**	**Increasing annual temperatures** may increase the risk of overheating impacting on

[29] DEFRA (2022), UK Climate Change Risk Assessment 2022. Available at: UK Climate Change Risk Assessment 2022 - GOV.UK

		Human Health (construction employees)
Increasing winter rainfall	**Construction Operations**, **Site Compounds**, **Materials**, **Plant and Equipment**	**Increasing winter rainfall** may impact on **Construction Operations**, **Site Compounds**, **Materials**, **Plant and Equipment** due to increased risks of flooding
Post Completion Stage		
Increasing winter rainfall	**Site Structure, Site Infrastructure**, **End Users, Site Habitats and Species**	**Increasing winter rainfall** may impact on **Site Structures** and **Site Infrastructure**, **End Users,** and **Site Habitats and Species** as a result of flooding
Increasing summer temperatures	**Human Health, Site Infrastructure**	**Increasing summer temperatures** may impact on **Human Health and Site Infrastructure** as a result of overheating
Increasing annual and summer temperatures and Decreasing summer rainfall	**Site Habitats and Species**	**Increasing annual and summer temperatures and Decreasing summer rainfall** may impact on **Site Habitats** and Species due to changing climate space
Decreasing summer rainfall	**End users and Site Operations**	**Decreasing summer rainfall** may impact on **Human Health** and **Site Operations** as a result of reduced water availability

13.12 Part 2: Mitigation Measures

Construction stage

13.12.1 The following mitigation is proposed to provide climate change adaptation and resilience.

Changing temperatures and precipitation may impact on ground conditions leading to ground movement affecting **Site Infrastructure** and **Site Structures.**

13.12.2 The Building Regulations[30] require new development to consider the impact of ground movement in foundation design. Changes to future climate including temperature and rainfall may cause ground conditions to change impacting site infrastructure and structures, therefore the proposed development will be designed in accordance with current guidance and best practice. This will include foundation depths being increased as a minimum to the NHBC standard depths for cohesive materials, and meet Future Building Standards to increase climate resilience. Consideration will also be given to how an increase in tree canopy coverage will need to assess the impact on soil shrinkage to a higher level of detail, to ensure that houses are built to tolerate the future changing climate.

Increasing annual temperatures may increase the risk of overheating impacting on **Human Health** (construction employees).

13.12.3 A Construction Environmental Management Plan (CEMP) will be prepared to support the construction of the Proposed Development and will set out measures to reduce risks to human health from overheating such as provision of shaded refuges and potable water supplies during construction.

Increasing winter rainfall may impact on **Construction Operations**, **Site Compounds**, **Materials**, **Plant and Equipment** due to increased risks of flooding.

13.12.4 A Construction Environmental Management Plan (CEMP) will be prepared to support the construction of the Proposed Development and will set out measures to reduce risk to the Site compounds and wider area from flooding, including appropriate measures such as raised levels, temporary drainage and pollution prevention systems.

[30] MHCLG (2013), Building Regulations Part A. Available at: Structure: Approved Document A - GOV.UK

Post Completion Stage

Increasing winter rainfall may impact on **Site Structures** and **Site Infrastructure**, **End Users,** and **Site Habitats and Species** as a result of flooding.

13.12.5 The majority of the site is within Flood Zone 1, with a low probability of fluvial flooding (less than 0.1% chance of flooding in any year). A small area sits withing fluvial Flood Zone 2 and 3. Three ordinary water courses cross the site which merge and discharge from the southern edge of the site. To mitigate the potential risk of flooding all development will be located outside of the modelled flood extent areas incorporating an 8m buffer, taking into account climate change.

13.12.6 To manage surface water the Proposed Development will incorporate a range of Sustainable Drainage Systems (SuDS) features including swales to store and reduce the flow of water. The detailed drainage strategy will incorporate measures to accommodate a 1- in 100-year flood event plus a 40% allowance for climate change.

Increasing summer temperatures may impact on **Human Health** as a result of overheating.

13.12.7 Overheating will be considered during the detailed design of individual homes and buildings in accordance with the cooling hierarchy, which prioritises the use of passive cooling measures to minimise energy use.

13.12.8 All residential development will demonstrate that the risk of overheating has been mitigated in accordance with Part O of the Building Regulations[31]. Part O of the Building Regulations requires residential development to consider the effects of overheating, updated in 2021 to take better account of the potential effects of climate change.

13.12.9 Non-residential development will be assessed utilising thermal dynamic modelling and in accordance with CIBSE Guide TM52[32], taking account of future climate scenarios to identify potential overheating risks and incorporate appropriate mitigation.

13.12.10 The ventilation strategy for individual buildings will be confirmed at detailed design and consider measures to promote high levels of energy efficiency and good indoor air quality.

[31] MCHLG (2022), Building Regulations Part O. Available at: https://www.gov.uk/government/publications/overheating-approved-document-o
[32] CIBSE (2013), TM52 The limits of thermal comfort: avoiding overheating (2013). Available at: TM52: The Limits of Thermal Comfort: Avoiding Overheating in European Buildings | CIBSE

Increasing summer temperatures may impact on **Site Infrastructure** affecting the solar array and generation equipment

13.12.11 Increasing summer temperatures has the potential to impact on the solar array and energy generation equipment which can be affected by higher temperatures impacting efficiency.

13.12.12 The design of the energy generation systems will give consideration to the impact of increasing temperatures, specifying equipment and appropriate cooling systems to maintain system generation and efficiency.

Increasing annual and summer temperatures and Decreasing summer rainfall may impact on **Site Habitats** and Species due to changing climate space

13.12.13 A number of mitigation and enhancement measures have been proposed through landscape design and ecological assessment of the Site. The Green Infrastructure proposals for the Site aim to minimise habitat loss, protecting high value habitats and connectivity across the site, incorporating watercourses, ponds, hedgerows and woodlands. The Proposed Development will include significant new green infrastructure including new species-rich grassland, woodland habits, wetlands, and scrub, as well as enhancement of retained habitats. Through these measures the Proposed Development will be able to achieve a >10% increase in Biodiversity Net Gain (BNG).

13.12.14 Increasing site biodiversity helps mitigate the effects of climate change on Site Habitats and Species and aligns with the England Biodiversity Strategy[33] and Natural England Climate Change Adaptation Manual[34].

Decreasing summer rainfall may impact on **Human Health** and **Site Operations** as a result of reduced water availability.

13.12.15 To reduce water use and provide resilience to reducing summer rainfall the development will include:

- Dwellings will target a water efficiency standard of 110 l/p/d.
- Non-domestic uses will target a water efficiency standard of the equivalent of 2 Wat01 water efficiency BREEAM credits.
- The Proposed Development will also consider the potential for rainwater harvesting to store water for irrigation of the development's green spaces.

[33] DEFRA (2011), Biodiversity 2020: A strategy for England's wildlife and ecosystem services. Available at: https://www.gov.uk/government/publications/biodiversity-2020-a-strategy-for-england-s-wildlife-and-ecosystem-services
[34] Natural England (2020), Climate Change Adaptation Manual. Available at: https://publications.naturalengland.org.uk/publication/5679197848862720

13.13 Part 2: Assessment of Environmental Impacts

13.13.1 The potential effects outlined through **Table 13.22** have been summarised below and assessed against the assessment criteria and provides an assessment of the proposed development's resilience incorporating the mitigation noted above.

Table 13.22: Climate Change Resilience Assessment

Effects and Receptor	Sensitivity/ Importance/Value	Magnitude of Change	Type of Effect	Significance of Effect
Construction				
Increasing summer temperatures may increase the risk of overheating impacting on **Human Health** (construction employees)	Medium	None	Temporary Short term Direct Adverse	Negligible (Not Significant)
Increasing winter rainfall may impact on **Construction Operations**, **Site Compounds**, **Materials**, **Plant and Equipment** due to increased risks of flooding	Medium	None	Temporary Short term Direct Adverse	Negligible (Not Significant)
Operation				
Increasing winter rainfall may impact on **Site Structures** and **Site Infrastructure**, **Human Health,** and **Site Habitats and Species** as a result of flooding	Medium	None	Temporary Long-term Direct Adverse	Negligible (not significant)
Increasing summer temperatures may impact on **Human Health** as a result of overheating	Medium	Low	Temporary Long-term Direct Adverse	Minor (not significant)
Increasing annual and summer	Medium	None	Permanent Long-term	Negligible

temperatures and Decreasing summer rainfall may impact on **Site Habitats** and Species due to changing climate space			Direct Adverse	(Not Significant)
Decreasing summer rainfall may impact on **Human Health** and **Site Operations** as a result of reduce water availability	Medium	None	Temporary Long-term Direct Adverse	Negligible (Not Significant)

Secondary Mitigation

13.13.2 No secondary mitigation or enhancement is required/has been identified.

Residual Impact Assessment

13.13.3 In the absence of further Secondary Mitigation the residual effects remain the same.

13.13.4 The sensitivity of the environmental receptors is considered to be medium. The magnitude of change is considered to be low to none. Therefore, there are likely to be direct, temporary, short and long-term, adverse effects which are considered to be negligible to minor. These effects are considered to be **Not Significant.**

Summary

13.13.5 **Table 13.23** provides a summary of the effects, receptors, residual effects and conclusions of significance considered within the chapter.

13.13.6 The table only provides a summary of the residual effects identified within the assessment. Details of all mitigation that has been taken into account is summarised within chapter 2.

Table 13.23: Summary of Residual and Significant Effects

Effect and Receptor	**Proposed Development**	
	Residual Effect	**Is the Effect Significant?**
Construction Stage		
Increasing summer temperatures may increase the risk of overheating impacting on **Human Health** (construction employees)	Negligible	No
Increasing winter rainfall may impact on **Construction Operations**, **Site Compounds**, **Materials**, **Plant and Equipment** due to increased risks of flooding	Negligible	No
Operational Stage		
Increasing winter rainfall may impact on **Site Structures** and **Site Infrastructure**, **Human Health,** and **Site Habitats and Species** as a result of flooding	Negligible	No
Increasing summer temperatures may impact on **Human Health** as a result of overheating	Minor	No
Increasing annual and summer temperatures and Decreasing summer rainfall may impact on **Site Habitats** and Species due to changing climate space	Negligible	No
Decreasing summer rainfall may impact on **Human Health** and **Site Operations** as a result of reduce water availability	Negligible	No

Cumulative Effects

13.13.7 The assessment of Climate Change relates to effects on the Proposed Development, as such there are no cumulative effects.