12. CLIMATE CHANGE

Introduction

12.1 This chapter of the ES assesses the likely significant effects of the Development on the environment in respect of Climate Change. It has been prepared by Barton Wilmore Institute of Environmental Management and Assessment (IEMA) EIA Quality Mark registrants.

Legislative and Policy Framework

National Legislation

12.2 This chapter assesses the effects of the proposed scheme in relation to climate change, in line with the requirements of the 2017 EIA Regulations (as amended):

> *"The EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on climate."*[1]
>
> *"A description of the likely significant effects of the development on the environment resulting from, inter alia: (f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change"*[2].

Climate Change and Sustainable Energy Act

12.3 The Climate Change and Sustainable Energy Act (2006) is an Act of Parliament which aims to boost the number of heat and electricity microgeneration installations in the United Kingdom, helping to cut carbon emissions and reduce fuel poverty. It gives powers to the UK Government to require certain organisations to report on how they are adapting to climate change through the Adaptation Reporting Power.

12.4 The Act provides that the government must set and meet national targets for the number of installed microgeneration systems and informs that the government must promote community energy projects. Local planning authorities may influence the success of community energy schemes through making planning permission for certain developments conditional on the use of such schemes.

[1] S.I. 2017 No. 571: Part 1; 4(2)(C)
[2] S.I. 2017 No. 571: Schedule 4; 5(f)

Climate Change Act 2008 and UK Carbon Plan 2011

12.5 Further to the Climate Change and Sustainable Energy Act (2006), the Climate Change Act (2008) sets a legally binding target for reducing greenhouse gas (GHG) emissions, in particular carbon dioxide (CO_2). As originally enacted, these targets included a reduction of GHG by at least 80% (on 1990 levels) by the year 2050 in the United Kingdom (UK), and a requirement that domestic emissions are reduced by no less than 3% each year.

12.6 In setting these targets, the Act established the Committee for Climate Change (CCC), which is responsible for setting binding interim targets for the Government over five-year periods. In May 2019, the CCC recommend a new emissions target for the UK: a 100% reduction ('net zero') in greenhouse gases by 2050. This change is legislation mandating a 100% reduction in CO_2 emissions by 2050 was approved by the House of Commons on 24th June 2019 and the House of Lords on 26th June 2019 and is now the over-arching carbon reduction target for the Government.

12.7 The government's plans for achieving the emissions reductions it has committed to, including actions and incremental five-year milestones, are set-out in the UK Carbon Plan[3] which includes an interim target of 34% reduction in CO_2 emissions on 1990 levels by the year 2029[i].

The Clean Growth Strategy

12.8 In October 2017, the UK Government published its Clean Growth Strategy (CGS)[ii] setting out ambitious policies and proposals, through to 2032 and beyond, to reduce emissions across the economy and promote clean growth. The CGS provides an 'ambitious' blueprint for Britain's low carbon future, outlining how investment in green energy goes hand – in – hand with economic growth and industrial, commercial and residential strategies. Core to the strategy are actions that will cut emissions, increase efficiency and lower the amount consumers and business spent on energy. The CGS six key areas that together are responsible for 100% of the UK's carbon emissions. These are:

1. Improving business and industry efficiency (25% of UK emissions): Improving business and industry efficiency, improving energy productivity and commercial building standards, delivering industrial energy efficiency, investing in industrial innovation;
2. Accelerating the shift to low-carbon transport (24% of UK emissions): Accelerating the shift to low – carbon transport, supporting the take – up of ultra – low emission vehicles, developing electric vehicle charging network, shifting freight from road to rail and

innovation in Connected and Autonomous Vehicles and electric batteries;

3. Improving our homes (13% of UK emissions): Improving our homes, upgrading energy efficiency across a million homes, strengthening building standards, rolling out het networks, phasing out of high carbon heating;
4. Enhancing the benefits and value of our natural resources (15% of UK emissions): Enhancing the benefits and value of our natural resources, supporting agriculture, a new network of forests, zero avoidable waste by 2050, managing emissions from landfill;
5. Leading the public sector (2% of UK emissions): Leading in the public sector, setting a voluntary 30 percent public sector carbon reduction target by 2020 and funding for energy efficiency improvements in England; and
6. Delivering clean, smart, flexible power (21% of UK emissions): Delivering clean, smart, flexible power, phasing – out of coal, developing new ways of balancing the grid through electricity storage and demand response.

25 Year Environment Plan

12.9 Building on the proposals set out in the CGS, the UK outlined its plans to improve the environment in 'A Green Future: Our 25 Year Plan to Improve the Environment' (2018)[iii]. The 25 Year Environment Plan was published in January 2018 and sets out the UK's approach to deliver on our ambition to leave our environment in a better state than we inherited, and to fully seize the opportunities of clean growth. At a glance, the key proponents of the 25 Year Plan are:

- **Embedding an 'environment net gain' principle for development, including housing and infrastructure:** reforming developer contributions and tariffs to limit environmental damage and secure investment in natural capital.
- **Clean Air:** meeting legally binding targets to reduce emissions of five damaging air pollutants; this should halve the effects of air pollution on health by 2030 and maintaining the continuous improvement in industrial emissions by building on existing good practice and the successful regulatory framework.
- **Reducing the risks of harm from environmental hazards**: We will reduce the risk of harm to people, the environment and the economy from natural hazards including flooding, drought and coastal erosion.
- **Increasing resource efficiency and reducing pollution and waste**: achieving zero avoidable waste by 2050 and eliminating avoidable plastic waste by 2042 and reducing food chain emissions and wastage as well as improving the management of residual waste.
- **Using resources from nature more sustainably and efficiently:** ensure that

resources from nature, such as timber, are used more sustainably and efficiently.

- **Enhancing beauty, heritage and engagement with the natural environment:** making sure that there are high quality, accessible, natural spaces close to where people live and work, particularly in urban areas, and encouraging more people to spend time in them to benefit their health and wellbeing.
- **Mitigating and adapting to climate change:** We will take all possible action to mitigate climate change, while adapting to reduce its impact.

12.10 At the time of writing, The Environment Bill is at the 'Report Stage' within the House of Commons where any further amendments are to be considered and examined. The Environment Bill in its current form legislates that the Secretary of State must prepare an environmental improvement plan, with the aim to significantly improving the natural environment. The current environmental improvement plan is "A green future: our 25 year plan to improve the environment", which as outlined above seeks to holistically tackle specific environmental issues and the wider climate change challenge.

National Planning Policy Framework and Planning Practice Guidance

12.11 The National Planning Policy Framework (NPPF)[iv] which was revised in February 2019 requires developments to "*take a proactive approach to mitigating and adapting to climate change*." Section 14 of the NPPF 'Meeting the challenge of climate change, flooding and coastal change' emphasises the planning system's pivotal role in sustainable development through "*minimising vulnerability and improve resilience to the impacts of climate change*". Paragraph 149 of the NPPF states:

> *"Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure."*

12.12 One of the NPPF's 12 core planning principles is to encourage the effective use of land by reusing land that has been previously developed (paragraphs 17 and 111). The use of Brownfield land helps to regenerate derelict sites and remediate land contaminated by previous uses. It can also help to protect the environment by minimising the use of Greenfield sites for development. The re – use of previously developed land provides a desirable and sustainable approach for accommodating future growth; as such sites are often located close

to existing services and facilities. This can help to increase the likelihood of people choosing more sustainable modes of transport, such as walking, cycling or public transport, thereby helping to reduce carbon emissions and the negative effects of climate change.

12.13 National Planning Practice Guidance (PPG)[v] was published in June 2014 and recognises that the planning system can "*increase resilience to climate change impact through the location, mix and design of development*". The guidance advises how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change.

12.14 Paragraph 005 of the PPG puts forwards recommendations for Local Planning Authorities to consider:

- Identifying no or low-cost responses to climate risks that also deliver other benefits, such as green infrastructure that improves adaptation, biodiversity and amenity;
- Building in flexibility to allow future adaptation if it is needed, such as setting back new development from rivers so that it does not make it harder to improve flood defences in the future; and
- The potential vulnerability of a development to climate change risk over its whole lifetime.

12.15 The PPG on climate change (Paragraph 007) also recognises that every area will have different challenges and opportunities for reducing carbon emissions from new development such as homes, businesses, energy, transport and agricultural related development:

- Robust evaluation of future emissions will require consideration of different emission sources, likely trends taking into account requirements set in national legislation, and a range of development scenarios;
- The distribution of new development and the potential for servicing sites through sustainable transport solutions, are particularly important considerations that affect transport emissions; and
- Different sectors may have different options for mitigation. For example, measures for reducing emissions in agricultural related development include anaerobic digestion, improve slurry and manure storage and improvements to buildings. In more energy intensive sectors, energy efficiency and generation of renewable energy can make a significant contribution to emissions reduction.

12.16 Further detailed guidance is also provided with regards to specific considerations for climate change. For example, the PPG companion document to the NPPF sets out the required approach to climate change for the assessment of flood risk. It provides recommendations for

sensitivity ranges and allowances for future increases in rainfall, sea levels, river flows and tidal effects such as wind speed and wave height. For example, paragraphs 155 and 156 of the NPPF state:

> *"Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.*
>
> *Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards."*

National Planning Policy Framework: Consultation Proposals (2021)[vi]

12.17 A consultation on draft revisions to the NPPF has been released. These revisions include a number of environment-related changes, particularly with regards to flood risk and climate change.

12.18 Revised text regarding achieving sustainable development for plan-making now contains amended wording of the presumption in favour of sustainable development (Paragraph 11(a)) to broaden the high-level objectives for plans to make express reference to the importance of both infrastructure and climate change. Amendments to Paragraph 11 include increased emphasis on the need for plans to mitigate climate change (including by making effective use of land in urban areas).

12.19 Revisions to Chapter 12 (Achieving Well-designed Places) also re-emphasises the need for climate mitigation and adaptation to contribute to the character and quality of urban environments. All new streets are proposed to be tree-lined, with trees incorporated elsewhere within developments as possible.

12.20 Further proposed revisions to Chapter 14 (Meeting the challenge of climate change, flooding and coastal change) relate to the need to take account of all sources of flood risk (emphasis added), whilst utilising green infrastructure to reduce the causes and impacts of flooding, taking an integrated approach to flood risk management.

Regional and Local Planning Policy

Medway Local Plan (adopted 14th May 2003)[vii]

12.21 The policies of the adopted Medway Local Plan provide the basis for all planning decisions within the District. As climate change interfaces with many other disciplines, those policies explicitly relevant to climate change are set out below.

12.22 Policy S2 - Strategic Principles: 'maintaining and improving environmental quality and design standards … a sustainable approach to the location and mix of new development'.

12.23 Policy BNE4 – Energy Efficiency: '*Energy efficiency measures will be sought within development proposals, providing there is no detrimental impact on amenity. In particular, proposals should have regard to: … energy efficient technology including solar panels, combined heat and power/district heating schemes and district wind power schemes; … and the use of building materials of the lowest possible embodied energy.'*

Future Medway Local Plan 2019 to 2037[viii]

12.24 The Future Medway Local Plan sets out a vision for future development in Medway to 2037 and once adopted, will replace the 2003 Medway Local Plan. In doing so, it would become the statutory planning framework for developing planning applications. The publication of the Local Plan is expected in 2021 and to be adopted in 2022.

12.25 The Development Strategy technical document outlines the ambitions for the plan and provides options for how the area could grow, with draft policies for managing development. The following draft policies of relevance to climate change are set out below.

12.26 Medway has set a vision for 2037, with overarching ambitions which include promoting a low carbon economy, seeking to address, mitigate and adapt to climate change.

12.27 **Policy NE5 - Securing Strong Green Infrastructure:** '*development proposals must demonstrate that they are designed to be resilient to, and can adapt to the future impacts of climate change, in strengthening ecological networks'.*

12.28 **Policy NE7 – Flood and Water Management:** The Local Plan will seek to reduce flood risk, promote water efficiency measures and protect and enhance water quality. This includes

through provision of Sustainable Urban Drainage (SuDS) systems. In addition, '*Development will also be required to be resilient to, and adapt to the future impacts of, climate change through the inclusion of adaptation measures.'* These measures include water efficiency measures, minimising vulnerability to flood risk, optimising the use of multi-functional green infrastructure and appropriate buffer spaces between watercourses/habitats and built development.

12.29 **Policy BE1 – Promoting High Quality Design**: Development will be of high quality design, to make a positive contribution and respond appropriately to the character of its surroundings. '*This includes measures to mitigate and adapt to Climate Change.'*

12.30 **Policy BE2 – Sustainable Design**: '*All new development should aim for high standards of sustainable design and construction where possible.'*

12.31 **Policy MWE12 – Low Carbon Development**: '*This policy seeks to implement an energy hierarchy by achieving energy efficiency first, before requiring the implementation of other forms of renewable energy generation on a larger scale… in achieving the energy and carbon dioxide emission requirements of the Building Regulations'.*

Medway Council Climate Emergency[ix]

12.32 In April 2019, Medway Council declared a climate change emergency. The Council committed to developing proposals to address the climate emergency and reduce greenhouse gas emissions.

12.33 Following this declaration, Medway Council began to co-develop the Kent and Medway Energy and Low Emissions Strategy (ELES) in conjunction with Kent County Council[x]. The ELES is a key element of the Council's approach to tackling the climate emergency and is to inform the Council's emerging Climate Change Action Plan. The ELES contains 10 priority actions which are outlined below:

- **Priority 1 - Emission Reduction Pathways to 2050**: Set area and organisational five-year carbon budgets and emission reduction pathways to 2050, with significant reduction by 2030.
- **Priority 2 – Public Sector Decision Making:** Develop a consistent approach across Kent and Medway, to assess, manage and mitigate environmental impacts (both positive and negative), resulting from public sector policies, strategies, service delivery, commissioning and procurement.
- **Priority 3 – Planning and Development**: Ensure climate change, energy, air quality and

environmental considerations are integrated into Local Plans, policies and developments, by developing a clean growth strategic planning policy and guidance framework for Kent and Medway, to drive down emissions and mainstream climate resilience.

- **Priority 4 - Climate Emergency Investment Fund:** Establish a trusted Kent and Medway 'Climate Emergency' carbon sequestration, offset and renewable energy investment scheme and fund.
- **Priority 5 - Building RetroFit Programme:** Set up a Kent and Medway net-zero buildings retrofit plan and programme for public sector, domestic and businesses.
- **Priority 6 – Transport, Travel and Digital Connectivity:** Set up a smart connectivity and mobility modal shift programme – linking sustainable transport, transport innovations, active travel, virtual working, broadband, digital services, artificial intelligence and behaviour change.
- **Priority 7 – Renewable Energy Generation**: Set up an opportunities and investment programme for renewable electricity and heat energy generation.
- **Priority 8 - Green Infrastructure**: Develop a multi-functional, natural capital opportunity and investment programme – focusing on environmental projects that store carbon, increase climate change resilience, improve air quality and increase biodiversity.
- **Priority 9 – Supporting Low Carbon Business**: Develop a support programme for Kent and Medway's Low Carbon Environmental Goods and Services sector.
- **Priority 10 – Communications**: Develop a comprehensive communications, engagement and behaviour change programme targeted at residents, employees, businesses and visitors.

Guidance

Building Regulations

12.34 The Buildings Regulations, specifically Approved Document Part L; 'Conservation of Fuel and Power', determine the energy efficiency and carbon emission standards required by new buildings. Part L addresses controls for:

- insulation values of buildings elements;
- the allowable area of windows, doors and other opening;
- the air permeability of the structure;
- the heating efficiency of boilers;
- hot water storage and lighting;
- mechanical ventilation and air conditioning systems;
- space heating controls;
- airtightness testing of larger buildings;
- solar emission; and
- requirements for Carbon Index ratings.

Institute of Environmental Management and Assessment (IEMA): Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation[xi]

12.35 The Guide to Climate Change Resilience and Adaptation (June 2020) provides an updated framework for the effective consideration of climate change resilience and adaption in the EIA process in line with the UK Town and Country Planning (EIA) Regulations (2017). This document is a revision of the 2015 IEMA guidance on Climate Change Resilience and Adaption in EIA and reflects lessons learnt from emerging practice.

12.36 A step by step method presented within this guidance is set out below and has been incorporated within this Chapter:

- Step 0 – Building climate resilience into the project by considering incorporating resilience during the designs stage and by identifying appropriate mitigation measures;
- Step 1 – Scoping for the EIA; e.g. identify the climate change projections for use in the assessment and identify key climatic variables relevant to the project;
- Step 2 – Defining the future (climate) baseline; define future conditions using selected climate change projections (i.e. increase in rainfall, increase in mean summer temperature and wind strength);
- Step 3 – Identifying and determining sensitivity of receptors;
- Step 4 – Reviewing and determining magnitude of the effect; consider probability and consequence to determine the magnitude of the effect;
- Step 5 – Determination of significance;
- Step 6 – Developing additional adaptation / EIA mitigation measures;
- Step 7 (Development permitted) – Monitoring and adaptive management by implementing mitigation measures.

12.37 EIA Reports produced in line with this guidance are to be proportionate in their approach and not include superfluous assessment that does not address likely material issues.

IEMA Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance[xii]

12.38 IEMA published this guidance (referred to hereafter to as IEMA GHG Guidance) to complement the guidance above, and seeks to assist practitioners with addressing greenhouse gas (GHG) emissions assessment and mitigation in statutory and non – statutory EIA. The guidance indicates that a 'good practice' approach is advocated where GHG emissions are always considered and reported but at varying degrees of detail depending on the project.

12.39 The guidance sets out there are a number of different assessment methods available for measuring and quantifying the GHG emissions associated with the built environment, ranging from general guidance to form standards for the use of an EIA. The Guidance recognising that *'qualitative assessments are acceptable, for example: where data is unavailable or where mitigation measures are agreed early on in the design phase with design and engineering teams'*.

UK Greenhouse Gas Statistics

12.40 The Department for Business, Energy & Industrial Strategy (BEIS)[xiii] reports on energy and emissions projections by source, and reports on local and regional GHG emissions. This has allowed the collection of baseline data for the period 2005-2018 for the Unitary Authority of Medway, as well as Kent and Nationally.

Assessment Methodology

General Approach

12.41 'Climate' is generally understood to mean the weather conditions prevailing over a long period of time and climate change refers to changes in recorded long term climate trends. As a topic for the assessment within EIA, climate change is relatively new. Guidance is evolving and there is no prescribed way in which climate change should be incorporated into an ES, however, some guidance has been prepared by IEMA, discussed further below, which sets out the two main approaches that can be taken to determine a project's climate change impact. These involve identifying:

- The vulnerability of the Development to climate change; and
- The direct and indirect influence on the Development on climate change.

12.42 The vulnerability of the Development to climate change considers effects on the Development as a receptor (this is referred to in IEMA Guidance as Climate Change Resilience and Adaptation). A high-level climate change risk and resilience assessment has been undertaken to identify the potential risks of climate change on the Development and to high design measures to increase its resilience and adaptation to climate hazards, such as extreme hot and cold weather, intense rainfall, high winds and storm events.

12.43 Direct and indirect effects consider effects on environmental receptors as a result of the Development. The GHG Protocol[xiv] defines direct and indirect emissions as follows:

- Direct GHG emissions are emissions from sources that are owned or controlled by the operator. Examples include vehicular emissions, plant use (such as generators) and independent onsite energy generation (oil, gas and diesel);
- Indirect GHG emissions are emissions that are a consequence of the construction of operational activities of the Development but are a result of procurement and / or activities controlled by another entity. Examples include energy generation and the manufacture of materials (known as 'embodied' carbon).

12.44 This Chapter provides a quantitative, assumptions – based assessment of the direct effects of vehicular GHG emissions, in particular CO_2 during operations. Where detailed information is not available, a qualitative appraisal has been undertaken and recommendations are made to limit effects associated with the construction and operation phases of the Development This includes:

- Direct sources of vehicular and plant emissions of CO_2 during construction;
- Direct sources of CO_2 arising from vehicles, plant use and function during operation; and
- Indirect sources arising from generation and consumption during operations.

12.45 In lieu of a prescribed methodology, IEMA guidance on Climate Change Resilience and Adaptation (2020) has been prepared to assist practitioners with the effective consideration "*of both climate change resilience and adaptation in the EIA process*". The guidance stresses that climate change should be an integrated consideration within the EIA, by undertaking an assessment that is "*proportional to the evidence base available to support any assessment*" and focusses on impacts "*specific to project*".

Scope of Assessment

12.46 An assessment proportionate to the outline nature of the planning application has been undertaken. At the detailed design stage, the Applicant will comply with appropriate legislation and policy requirements including the Building Regulations that are in force at the time to avoid or minimise potential effects from the Development on climate, and to ensure that the Development is resilient to the changing climate. The following assessments are considered in terms of the Development. Accordingly, this Climate Change Chapter assesses the effects of climate change on the Development and the effects of the Development on climate change by:

- Establishing the existing baseline conditions (2021);
- Determining future baseline conditions by reviewing climatic projections (including

identifying sensitive receptors);

- Assessing of the likely significant effects of the Development (alone and cumulatively) on the established baseline and future conditions; and
- Identification of mitigation measures;
- Concluding the residual effects.

12.47 The scope of this assessment was agreed with MC in the Scoping Opinion (Appendix 2.2) received on 18th September 2020.

Temporal Scope

12.48 The assessment assumes the Development will be fully operational from 2033 (See Chapter 5). In considering future climate change scenarios, managing climate change resilience and adaption, the IEMA guidance (2020) recommends the use of the UK Climate Projections (UKCP) Website (Met Office, 2018). The latest UKCP is UKCP18 which provides updated observations and climate change projections out to 2100 in the UK. Therefore, this assessment assumes projections for the 2100 as the most far-reaching projection and is considered to be appropriate for the design life of the Development.

Spatial Scope

12.49 The data available to allow an assessment of greenhouse gas emissions from vehicle movements associated with the Development is limited to the study area of the Transport Assessment and the same traffic data has been used as for the Air Quality and Habitats Regulation Assessment (HRA)-specific Ecology assessments within this ES. An Energy Strategy has been prepared for the Development (See Appendix 12.1) which considers the likely energy load from the operational built form. It has a spatial scope of the Site boundary and proposed development zones within it. The Development is anticipated to be fully operational in 2033.Therefore, this chapter is aligned with the Transport, Air Quality and Biodiversity chapter in assessing vehicular emissions from 2028. This allows a worst – case assessment of effects at the local scale. Given that climate change is a global issue, a qualitative assessment of the Development's effects is also made at the global scale.

Determining Significance

12.50 There is currently no industry – wide agreed threshold of carbon emissions which, if exceeded, can be defined as significant or potentially significant. The 2017 IEMA Guidance acknowledges that all emissions could lead to cumulatively significant effects.

12.51 The IEMA Guidance (2017) notes that the cumulative impact of carbon emissions arising from global human activity is considered *major* however, the contribution from individual developments, such as the Development in this ES, could be considered *negligible / low* in the context of the UK's emissions since, in isolation, the quantity of carbon emissions from an individual development is likely to have limited potential to significantly increase atmospheric carbon emissions towards global environmental targets.

12.52 In general EIA practice, the sensitivity of a receptor is typically defined by taking into consideration the vulnerability, value and recoverability of the receptor. With regard to the atmospheric carbon concentrations, the overall sensitivity of receptors is not used to assess significance in this instance.

12.53 An assessment of the significance of effect for the Development's vulnerability to climate changes is provided qualitatively with the most significant risks and opportunities for the project identified using professional judgement. The criteria for identifying the vulnerability of a receptor is outlined in Chapter 2 EIA Methodology of this ES and for the purposes of this Chapter, the sensitivity to change of receptors is considered as high. This view has been taken given the longevity of the life span of the Development and in consideration with the uncertainty of the projected pathway of climate change. A conclusion is drawn as to whether climate changes to likely to lead a significant impact on the Development or not.

Assessing Operational Vehicle Greenhouse Emissions

12.54 The assessment of carbon emissions and the evaluation of their significance is set out in IEMA Guidance (2017). The receptor for the assessment is the global atmosphere; the impacts of GHG emissions, in terms of their contribution to climate change, are global and cumulative in nature, with every tonne contributing to impacts on natural and human systems. The potential impacts of the Development, therefore, contribute to this global issue.

12.55 The climate change impact is assessed as the difference between the carbon emissions associated with the baseline and that associated with the fully completed Development. The study area for carbon emissions assessment is defined by the red line Site boundary and the transport network assessed in the Transport Assessment (refer to Volume 2 of this ES). This transport network assessment is also utilised for the Air Quality Chapter (Chapter 11) of this ES.

12.56 The baseline conditions of the Site were based on the trip rates and existing published data sets (see Table 8.1). The baseline for the Site is defined as the current carbon emissions arising from vehicles in the study area. In terms of transport-related emissions, whilst

forecasting can be carried out to project potential increases in traffic flows, and, by inference, the impact on $C0_2$ levels, the impact of technological changes is harder to infer. This includes the introduction and uptake of electric vehicles. Hence, the assessments broadly assume no impacts in terms of this, other than assumptions which are inherent in the Emissions Factors Toolkit (EFT V10.1)[xv] utilised for the assessment. The updated EFT utilises updated data sets on fleet growth assumptions which were current before the COVID-19 outbreak in the UK. As a result, default fleet outputs from the tool do not reflect short or longer term impacts on emissions in 2020 and beyond resulting from behavioural change during the national or local lockdowns. Therefore, the assessments utilise best practice assumptions, but still represent a worst-case assumption of climate change impacts.

Traffic Flow Data

12.57 24-hour, Average Annual Daily Traffic (AADT) flows (Appendix 12.2) were provided by Vectos Consulting for the following scenarios:

- Baseline (2019);
- 'Do-minimum' (2028) (Baseline + growth + committed developments with Highways Infrastructure Funding (HIF));
- 'Do-something' (2028) (Baseline + growth + committed developments with HIF + the Development)
- 'Do-minimum' (2037) (Baseline + growth + committed development +no HIF)
- 'Do-something' (2037) (Baseline + growth + committed development + no HIF + the Development).

12.58 Traffic data has been provided for 2028 as the projected interim year when the Development will be partially operational but might still have construction works happening on the Site. Traffic data has also been provided for the year 2037 as a 'horizon' year which aligns with the end of the next Medway Local Plan. These scenarios are also in place with and without HIF funding. This funding would provide investment into the Strategic Road Network (SRN) comprising highways improvement, a new railway station and rail service surrounding the Hoo peninsula and therefore whilst this funding is reasonably foreseeable, scenarios have been tested with and without it in place to assess the 'worst case' scenario. Of particular relevance to the Development and traffic modelling for 2028 are improvements to several roundabouts (Four Elms, Main Road Hoo and Bell's Lane).

12.59 A baseline scenario of 2019 was deemed appropriate due to the ongoing COVID-19 pandemic which has altered modal patterns of travel which deemed the use of 2020 and 2021 as baseline

year as unrepresentative of the normal flows of traffic in the area. Baseline traffic flow information has been taken from the Council's Aimsun traffic model.

12.60 Fleet composition was provided utilising the baseline split of Heavy Duty Vehicles (HDV) and total vehicles for each of the forty-one road links assessed as part of the Transport Assessment (See Volume 2 of the ES).

12.61 As per Appendix 12.2, mean vehicle speeds for the links used in the assessment were estimated based on maximum permitted speeds in the area and analysis of the road network. An average of the permitted speed limit per link was taken for each scenario.

12.62 In the absence of pre-defined distances for vehicles, the most recent UK average journey distance is defined by the National Travel Survey[xvi] provided by the Department for Transport as 10.9km (6.8 miles).

Operational Emissions associated with Energy Use

12.63 At this outline stage of the application, a high-level and assumptions-based calculation of anticipated carbon emissions stemming from potential energy use of the Development has been calculated.

12.64 The Energy Strategy (Appendix 12.1) has calculated the 'worst case' estimate electricity requirement for the Development. This has been based off the most energy intensive uses being employed across the Site, in line with Chapter 3 of this ES, and assumes the Development to be used for B8 Mixed Chilled/Frozen uses. This estimated electricity requirement (kVA) has then been converted to kilo watts (kW) on a 100% efficiency basis. This has been done as at this stage of the application, it is not certain what efficiency the energy network might have. Through the use of an online calculator tool[xvii] that uses the current mix of energy generation in the UK, the operational energy use has then been calculated. This is considered a proportionate approach, with actual anticipated energy uses and their associated carbon emissions, to form part of the Reserved Matters Applications for the Development as end users are not known at this stage. Given the conservative assumptions of the energy demand calculation it is considered unlikely that the detailed design will lead to equal or greater demand and the assessment is therefore worst-case.

Vehicle Emissions Factors

12.65 An indicative assessment of emissions factors for $C0_2$ was determined for each scenario using

the traffic data (Appendix 12.2) and DEFRA's EFT (V10.1).

12.66 Assumptions of the inputs used in the carbon modelling are provided in Table 12.1 and details provided at Appendix 12.2.

Table 12.1 Traffic Data Assumptions

Year	2019 Base	2028 'Do-minimum' with HIF	2028 'Do-something' with HIF	2037 'Do-minimum'	2037 'Do-something'
24 hour Average Annual Daily Traffic (AADT) of the Development*	727,717	974,623	1,067,313	806,690	901,419
Average HDV (%)**	16.4	4.1	5.1	5.0	6.56
Average Vehicle Speed (kph)***	69	65	65	69	69
Link Length	10.9km				
Road Type	England – Not London				
* Trips are two way ** Taken as an average of HDV movements per scenario ** based on the median posted speed limit of the roads surrounding the Development					

12.67 The fleet composition for the operational phase was taken from baseline fleet projection and predicted changes in fleet composition owing to the projected development uses. The road type utilised was 'England - not London' to reflect the nature of the Site. The assessment presents a worst-case scenario as it does not consider the use of public transport, including a potential reduction in vehicular trips. The breakdown of emissions for conventional vehicle types includes conventional vehicle categories and does allow for, with some degree of uncertainty, the likely phasing of alternative (electric) vehicles as previously discussed.

Significance Criteria

12.68 In the absence of any significance criteria or a defined threshold, it might be considered that all carbon emissions are significant and beneficial effects only arise if there is a net loss in carbon and emissions. As per the IEMA Guidelines, when evaluating significance, all new GHG emissions contribute to a significant negative environmental effect. The significance of a project's emissions should be based on its net impact, which may be positive or negative, EIA should ensure an assessment addresses the occurrence of GHGs by taking mitigating action. Whilst there is no single preferred method to evaluate significance of effects given this topic is emerging within EIA, the approach to determining the significance of effects has applied available guidance, standard industry practice and profession judgement. The impacts have therefore been defined as either negligible (beneficial) or minor, moderate or major as set

out in Table 12.2.

Table 12.2 Emissions Significance Criteria (Local Level)

Effect Significance	Description of Criteria Emissions from Road Traffic ($C0_2$)
Negligible	Emissions are equal to the emissions predicated in the 2025 'Do-minimum' scenario.
Minor	An increase in emissions predicated in the 2030 'Do-minimum' scenario, but less than 1% of total emissions from Medway's current traffic-related emissions.
Moderate	An increase in emissions predicated in the 2030 'Do-minimum' scenario, but less than 2% of total emissions from Medway's current traffic-related emissions.
Major	An increase in emissions predicated in the 2030 'Do-minimum' scenario, but less than 5% of total emissions from Medway's current traffic-related emissions.

12.69 With regards to anticipated building emissions from operational energy usage, the same criteria outlined in Table 12.2 is applied with to percentage increases compared to Medway's current industry and commercial-related emissions. Again, this is in recognition that any increases in emissions contribute to a significant negative environmental effect.

Assessing Resilience to Climate Change

12.70 To ensure climate change adaptation is assessed, this chapter draws on recognised climate change projections, existing guidance and emerging good practice as well as relevant information presented in the ES and documents, which form part of the planning application to ensure that appropriate project mitigation and risk management is included in the Development design. In particular, this chapter draws upon the findings of Chapter 11 Air Quality, Chapter 08 Biodiversity, Chapter 10 Transport & Access (also see the Transport Assessment at Volume 2 of this ES) and Chapter 09 Water Resources and Flood Risk.

12.71 A comprehensive flood risk assessment (FRA) has been carried out, in consultation with MC, to assess the vulnerability of the Development to all possible types of flooding. The assessment followed technical guidance within the NPPF and examined flood risks at the existing baseline level and at the future baseline for the lifetime of the Development, taking into account projected climate change impacts for all sources of flooding.

12.72 Chapter 08 Biodiversity carried out by Aspect Ecology provides a detailed assessment of potential ecological impacts associated with the Development and evaluates the importance of the habitats and species present on the Site. This Biodiversity Chapter is based on a wide array of surveys, including a Phase 1 Habitat Survey, Preliminary Ecological Appraisal (PEA) and Phase 2 Habitat Survey.

12.73 Furthermore, as a number of biodiversity-related European designations are located within

the site surrounds, Aspect Ecology also produced a Document to Inform an Habitats Regulations Assessment (HRA) under the Conservation of Habitats and Species Regulations 2017 (as amended).

12.74 In doing so, the Document to Inform an HRA (Appendix 8.8) analysed a number of pathways in which the Development may have a potential impact on the European Designations. Following a scoping exercise, the Document to Inform an HRA considered the Medway Estuary and Marshs SPA and Ramsar Sites for the following pathways:

- Coastal squeeze;
- Changes in biotic conditions;
- Changes in abiotic conditions;
- Invasive species;
- Public access/disturbance;
- Changes in species distribution; and
- Air pollution (emisisons from the Development and traffic).

Identifying Climate Change Projections

12.75 The current projections, 'UKCP18', released in November 2018, are now the most up to date climate change projections available. The Met Office states that UKCP18 provides a valid assessment of the UK's future climate over land, but that when considering decisions that are sensitive to projected future changes in summer rainfall, additional information should also be used. In line with IEMA Guidance, this Chapter utilises climate projections using the 'worst case scenario' of future weather projections, and therefore Representative Concentration Pathway (RCP) 8.5 scenarios are used. This worst-case scenario assumes a 'business-as-usual' pathway through a combination of assumptions about high population levels, relatively slow income growth with modest rates of technological change and energy intensity improvements, leading in the long term to high energy demand and GHG emissions in absence of climate change policies[xviii].

12.76 Taking into account the nature and location of the Development, the following climate related parameters are also considered to have the potential to impact upon the operation of the Development:

- Wind (speed, direction and gustiness);
- Temperature; and
- Precipitation.

Assessment of Likely Significant Effects

12.77 The resilience of the Development to climate change impacts is qualitatively assessed, based on professional expertise and judgement, with quantitative evidence where appropriate.

12.78 A high value receptor that has very little resilience to changes in climatic conditions should be considered more likely to be significantly affected than a high value receptor which is more resilient to changes in climatic conditions. If there is uncertainty about how a receptor will adapt to a changing climate, then a precautionary approach should be employed (IEMA, 2015). Therefore, receptors have been assumed to have a high sensitivity to the changing climate.

Limitations and Assumptions

12.79 The following assumptions and limitations that apply to this assessment have been set out in this section.

12.80 This assessment of climate change and greenhouse gas emissions is based on available best practice information.

12.81 The construction phase of the Development is planned to begin in 2021 and be fully completed by 2033, with the climate unlikely to change significantly between the submission of the planning application and commencement of construction in 2021. For this reason, climate change adaptation and resilience during the construction phase has been scoped out of this assessment.

12.82 The decommissioning phase is not considered due to the long design life of the assets and given that emissions with the end of the life of this type of asset are relatively small and therefore unlikely to be significant.

12.83 The initial modelling of carbon emissions for vehicles during operations is illustrative as real – time carbon emissions associated with the Development are not available, thus informing early design discussions and decision making is based on limiting carbon emissions of the Development from the outset.

12.84 The UKCP18 climate change projections are not climate change predictions as they include a degree of uncertainty. As stated in the UKCP18 Science Overview Report[xix].

"While the global and regional projections of future climate use the

> *latest climate models and are diverse they cannot cover all potential future climate outcomes out to 2100 (or beyond in the case of sea level)…"*

12.85 The 21st century projections presented in this report are produced for the Representative Concentration Pathways (RCP)[4] climate change scenarios. The results are therefore subject to any inherent limitations of the assumed emissions scenarios including:

> *"The probabilities represent the relative strength of evidence supporting different plausible outcomes for UK climate, based on the climate models, physical insight, observational evidence and statistical methodology used to produce them. However, they may not capture all possible future outcomes, because, for example, some potential influences on future climate are not yet understood well enough to be included in climate models."*

12.86 The following receptors identified in other ES topic chapters and other supporting documents, and considered potentially sensitive to climate change:

- **Chapter 11: Air Quality:** An increase in temperature can lead to increased surface ozone, allowing more $N0_X$ to convert to nitrogen dioxide ($N0_2$), which may worsen local air quality conditions;
- **Chapter 9 Water Resources and the submitted Flood Risk Assessment (FRA):** recommended 'Contingency Allowances' for Climate Change as guided by the Environment Agency. Considerations include fluvial flooding, groundwater, surface water runoff generation and overland flow, including flood risk receptors (people, property and infrastructure that may be at risk from any flooding, including the Development, any off-site properties and existing sewers). The FRA is to be found at Appendix 9.4.
- **Chapter 8 Biodiversity:** There are potential threats to species both on the Site and to proximate European Sites.

Consultation

12.87 The consultation process is set out in Chapter 2, no additional consultation has taken place in relation to climate change. In the Scoping Opinion for the Development (Appendix 2.2), MC confirmed the requirement to assess the impact of the Development on Climate Change as part of the EIA process.

[4] Established by the Intergovernmental Panel on Climate Change (IPCC).

Baseline Conditions

Current Climate Conditions

12.88 This section summarises current climate conditions for the local area based on historic weather data and information about extreme weather events. The information presented below presents average weather conditions along with exceptional weather occurrences. To maintain relevance to current weather trends the displayed information has been calculated using data collected over the past two decades. The climate profile is taken from closest available data source to the Site, located at Gillingham FC, approximately 4.5km to the south west[xx].

12.89 Regionally, the climate is warm and temperate with a significant rainfall all-year-round. The climate here is classified as 'Ocean Atlantic' (Cfb) by the Köppen-Geiger system; '*these climates are dominated all year round by the polar front, leading to changeable, often overcast weather. Summers are mild due to cool ocean currents, although hotter, stable weather patterns can set in for periods of time. Winters are milder than other climates in similar latitudes, but usually very cloudy'*.

12.90 In a year, the average rainfall is 594.2 mm (48% less than the mean annual UK rainfall). The driest month is July (an average of 38.3 mm). Most of the precipitation here falls in January, averaging 66.6 mm.

12.91 The average annual temperature is 16.2 °C. With an average of 23.3 °C, July is the warmest month. January is the coldest month, with temperatures averaging 8.0 °C.

Current Baseline GHG Emissions for the Region

12.92 The current GHG emissions at the Borough Level are provided in Table 12.3. A breakdown of total GHG emissions from the three main sources for Medway are provided over the period of 2005-2018 utilising the most recent data set. The Per Capita Emissions (tonnes) is compared against Kent and the UK average in Figure 12.1.

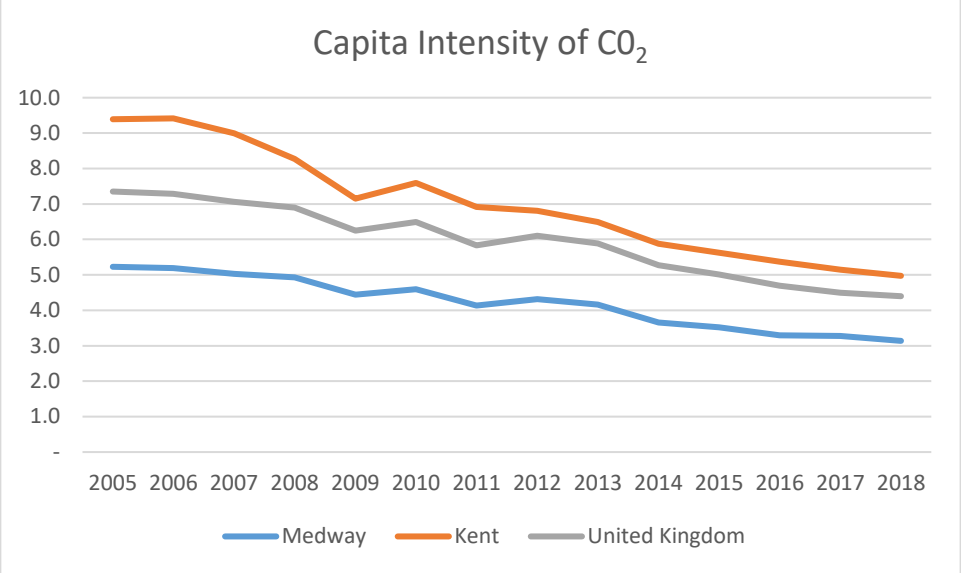
Table 12.3 GHG Emissions within Medway 2005-2018

Year	Industry and Commercial Total (kt CO_2)	Domestic Total (kt CO_2)	Transport Total (kt CO_2)	Grand Total (CO_2)	Population ('000s, mid-year estimate)	Per Capita Emisisons (t)
2005	421.2	568.2	333.4	1,317.9	252.1	5.2
2006	417.0	564.7	338.9	1,314.9	253.5	5.2
2007	404.9	548.6	339.2	1,286.5	255.8	5.0
2008	397.8	551.7	328.8	1,271.7	258.2	4.9
2009	347.1	500.0	316.6	1,156.9	260.2	4.4
2010	363.8	535.4	315.8	1,207.6	262.7	4.6
2011	322.1	469.7	312.0	1,096.0	264.9	4.1
2012	353.5	506.4	306.0	1,157.5	268.1	4.3
2013	335.3	491.9	307.4	1,125.7	270.7	4.2
2014	285.4	411.8	311.2	999.2	273.2	3.7
2015	258.8	403.4	315.5	968.0	275.2	3.5
2016	224.5	376.4	321.6	912.8	277.0	3.3
2017	246.6	351.8	320.4	908.5	277.6	3.3
2018	221.6	351.6	309.2	871.8	277.9	3.1

12.93 Overall, carbon emissions have steadily declined within Medway over the period 2005 to 2018. There has been a downward trend in the contribution of each of the three main sources of emissions, with Industry and Commercial being the largest percentage decrease, at 48% over the thirteen year period. This has led to a resultant decrease in the per capita emissions for Medway where a 40% reduction has been seen over the time period.

12.94 Emissions from transport related sources have continued to fall from 2005-2018. The figure for 2018 is utilised for assessing the significance of predicted transport-related emissions arising from the operational phase of the Development.

Figure 12.1 Capita Intensity For Medway, Kent and the United Kingdom



12.95 Figure 12.1 shows the $C0_2$ per capita emissions of Medway compared against the benchmarks of Kent and the UK. The per capita figure is helpful in demonstrating the average impact on carbon dioxide emissions per person, by dividing the total carbon emissions by the total population. Figure 12.1 also shows that at the local, regional and national scale, per capita emissions have steadily fallen over the thirteen-year time period. It can be seen that Medway has a lower per capita emissions than Kent and the UK. In 2018, the per capita emissions for Medway was 38% less than that of Kent, and 31% less than the UK average.

Air Quality

12.96 The Site is not located within or near to an Air Quality Management Area (AQMA). Medway Council have declared four areas as AQMA. The closest is the Gillingham AQMA was declared in 2010 for annual mean NO_2 concentrations, located along Pier Road in Gillingham approximately 3.6km to the southwest of the Site.

12.97 The Site is surrounded by a mixture of industrial areas and agricultural fields. Immediately to the south of the Site is the River Medway Estuary. Immediately adjacent to the northern part of the Site is Damhead Creek Combined Cycle Gas Turbine (CCGT) Power Station (Drax Power Station) and beyond this is the Kingsnorth Industrial Estate.

Ecology

12.98 The Site supports significant areas of hardstanding associated with the demolished power

station. Habitats considered to comprise important ecological features which are assessed in the Ecology Chapter include Open Mosaic Habitat (OMH), woodland and other trees, semi-improved grassland, waterbodies (ponds and ditches), intertidal mud/sand/shingles/cobbles, off-site habitats support notable plant species and off-site saltmarsh. The habitats within the Site are generally considered to be of importance at a Local or District level. The OMH is considered to be of County importance. Other habitats are present within the Site which do not form important ecological features include for example scrub, tall ruderal vegetation and short mown amenity grass.

12.99 There are also a number of important ecological features which are Designated and proximate to the Site. The Medway Estuary and Marshes Special Protection Area (SPA), Ramsar and Site of Special Scientific Interest (SSSI) sites are adjacent to the southern Site boundary and portions of the western and eastern boundaries. The Medway Estuary Marine Conservation Zone (MCZ) also lies to the southern and eastern Site boundaries. The Chattenden Woods and Lodge Hill SSSI is to be found 2.9km to the north-west and the Tower Hill to Cockham Wood SSSI is 3km to the west.

12.100 Surveys of protected species have found that the Site supports bats, Badger, Water Vole, Great Crested Newts, Reptiles, breeding birds and invertebrates. In addition Otter, Common Seal and Grey Seal are present/likely to be present off-site in the wider area. Generally populations are considered to be of importance at the Local or District level. The breeding bird assemblage is considered to be of County importance and the invertebrate assemblage is considered to be of importance at the Regional-National level in the northern portions of the Site (and Local elsewhere within the Site).

Water Environment

12.101 The majority of the Site is located in Flood Zone 3 as defined by the undefended flood map for planning, which is considered to be at high risk of flooding from the River Medway. EA mapping identifies that formal flood defences are present along the bank of the River Medway with a protection for events up to a 1 in 1000 year event. Secondary flood defences are also present along Damhead Creek and around the perimeter of the former Kingsnorth Power Station.

12.102 The majority of the Site is currently at very low risk of flooding from surface water, with localised areas of low risk of flooding from surface water. No other significant risk of flooding was identified.

Noise

12.103 In summary, the Site currently emits very little noise as the Site is mostly decommissioned, with background sound levels and ambient sound levels being relatively low, reflecting the rural nature of the area and the, now, dormant power station at Kingsnorth.

Future Climate Conditions (up to 2100)

Temperatures

12.104 The central estimate of increase in mean annual temperature is 4.3ºC; it is very unlikely to be less than 2.1ºC and is very unlikely to be more than 6.9ºC. The central estimate of increase in winter mean temperature is 3.6ºC; it is very unlikely to be less than 1ºC and very unlikely to be more than 6.4ºC. The central estimate of increases in summer mean temperature is 5.8 ºC; it is very unlikely to be less than 2.2ºC and very unlikely to be more than 9.5ºC.

Precipitation

12.105 Winter rainfall is projected to increase and summer rainfall is most likely to decrease. The central estimate of change in winter mean precipitation is 27%; it is very unlikely to be less than -10% and is very unlikely to be more than 75%. The central estimate of change in summer mean precipitation is -41%; it is very unlikely to be less than -85% and is very unlikely to be more than 7%.

12.106 With respect to the continued validity of UKCP18 projections for summer rainfall (see above), whilst the full range of summer rainfall outcomes from UKCP18 are considered to remain valid in informing planning decisions, rainfall patterns across the UK are not consistent and will vary dependent on seasonal and regional scales and will continue to vary in the future (Met Office, 2019)[xxi].

Wind Speed and Storms

12.107 Winds associated with major storm events can be some of the most damaging and disruptive events for the UK with implications for property, power networks, road and rail transport and aviation. Calm periods with little wind, particularly over prolonged periods, can affect air quality whilst winds from a particular direction can be a critical factor in the spread of pathogens. Both of these cases are also examples where the combination of factors such as wind, temperature and precipitation can exacerbate their impacts (e.g. air quality issues tend to be worse under conditions of light winds and higher temperatures; pathogen spread can

require wind, temperature and precipitation conditions to be favourable) (Met Office, 2019[xxii]).

12.108 Changes in wind speeds are not currently available at the regional level and there remains considerable uncertainty in the projections, with respect to wind speed. However, there are small changes in projected wind speed (Met Office, 2019). Across the UK, near surface wind speeds are expected to increase in the second half of the 21st century with winter months experiencing more significant impacts of winds (Met Office, 2019). This is accompanied by an increase in frequency of winter storms over the UK. However, the increase in wind speeds is projected to be modest. There are no compelling trends in storminess as determined by maximum gust speeds from the UK wind network over the last four decades[xxiii].

Summary

12.109 The south-east region, where the Site is located, is set to experience hotter, drier summers and milder, wetter winters. With winter precipitation and the number of heavy rain days projected to increase, flooding events may be more likely and occur on a more frequent basis. Conversely, summer precipitation is expected to decrease. Coupled with a central estimate of summer temperatures increasing by 5.8ºC, the area may experience an overall reduction in water resources. Whilst there are large uncertainties in the frequency and intensity of storms increasing under climate change, wind speeds are expected to increase slightly as well.

Likely Significant Effects

Construction Phase

Vehicle Movements

12.110 The Development will have an impact on climate change due to carbon emissions during construction as well as operation. As discussed under 'Assessment Methodology', a detailed quantitative assessment of the embodied carbon associated with the construction of the Development was deemed unfeasible at this outline planning application stage and therefore has not been undertaken. In qualitative terms, embodied carbon arising from the construction of the Development would account for a significant amount of the carbon emissions associated with the project over its whole lifetime. This embodied carbon would arise from:

- Products and materials used in construction (extraction of raw materials, transportation to manufacturing plant, manufacturing and fabrication);
- Transport of construction products and materials to the Site; and
- Construction installation processes.

12.111 During the construction phase, there may be some emissions of CO_2 from construction traffic accessing the Site, non-road mobile machinery and small generators temporarily used to power machinery and equipment on-site. However, these emissions will be infrequent and temporary occurring between 2021 and 2033. These are highly unlikely to make a significant contribution to the overall UK GHG emissions though they will lead to a net increase in carbon in the short term due to the nature of the operations.

12.112 Carbon emissions associated with construction are relatively small when compared with the total user carbon emissions over the study period. As detailed in Chapter 5 Construction Methodology & Phasing of this ES, daily construction vehicle movements are anticipated to be up to 486 LDVs and 200 HDVs per day. Therefore, upon consideration of the baseline traffic flows for the Site (See Appendix 12.1), there is likely to be a local minor-adverse overall effect on the climate from construction vehicle emissions when compared to the baseline of the Site.

12.113 In line with IEMA guidance recognising that all emissions are potentially significant in nature, these construction effects are also significant at the local scale, but are considered not significant at the global scale.

Operational Phase

Vehicular Emissions

12.114 The impacts of carbon emissions arising from the operational stage of the completed Development are identified as having a contribution to climate change.

12.115 The Development will lead to an increase in road traffic on the local road network. For the scenario to the year 2037 without HIF funding, the AADT flow associated without the Development is 806,690 vehicle trips per day. For the scenario to the year 2037 without HIF funding, the AADT flow associated with the Development is 901,149 vehicle trips per day. The 2028 scenario with HIF without the Development has an AADT flow of 974,623 vehicle trips per day. The 2028 scenario with HIF, with the Development has an AADT flow of 1,067,313 vehicle trips per day.

12.116 Therefore, for the 2037 scenario the anticipated operational emissions for traffic associated with the Development will be 93,766 tonnes of $C0_2$ per year (tonnes $C0_2$/yr), whilst with the 2028 HIF scenario, the anticipated operational emissions for traffic associated with the Development will be 81,983 tonnes $C0_2$/yr.

12.117 This increase in vehicular emissions locally would, for disciplines other than climate change, be classified as a negligible effect. However as previously discussed, given that best practice acknowledges that all emissions are potentially all significant, the effect is assessed to be minor-adverse locally. In line with the significance criteria outlined in Table 12.2, the increase in operational vehicle emissions for the Development would be 0.03% of Medway's annual traffic emissions for the year for both scenarios (2028 & 2037). Globally, the increase in emissions is not considered as significant.

Other sources of operational emissions

12.118 As part of this ES Chapter an assessment of the projected GHG emissions stemming from operational energy use is provided. The outline energy strategy (Appendix 12.1) provides an estimate of the total site electricity requirement on the basis of the most energy intensive uses within the parameters set in Chapter 3. This includes utilising the maximum floorspace of B8 (mixed) for chilled/frozen goods which require large amounts of electricity. Through the use of an online calculator tool[xxiv] that uses the current mix of energy generation in the UK, this operational energy use is anticipated to be circa 11,212 Kg of CO_2 equivalent ($C0_2e$) emissions per day. This effect is considered to be minor-adverse at the local level but negligible at the global scale.

12.119 It is anticipated that over time, emissions from the operation of the Development running on a lower- carbon electricity grid may decrease and a decrease in the use of fossil fuel vehicles used for transportation could also result in a decrease in emissions from the operation of the Development[xxv]. Therefore, it is likely that a decarbonising grid will have positive benefits in terms of reducing the carbon emissions associated with the energy requirements of the operational phase of the Development.

Energy Strategy

12.120 Wardell Armstrong has produced an energy strategy for the Development, to be found at Appendix 12.1. The Energy Strategy outlines the nature of the proposals in terms of on-site energy provision with the aim to reduce GHG emissions. It includes potential options and networks which can be explored at the Reserved Matters application stage.

12.121 The Energy Strategy considers a range of low carbon / renewable technologies including:

- Air Source Heat Pumps;
- Ground Source Heat Pumps;
- Solar Photovoltaic;

- Solar Thermal;
- Combined Heat & Power CHP (including Fuel Cell CHP); and
- District Heating

12.122 Owing to the scale of the Development, there is potential to implement energy and emissions reductions technologies and strategies which could not be effectively delivered at a smaller scale. It is envisaged that the Development will aspire to achieve close to 'Net Zero Carbon' status by 2050 in line with national policy.

12.123 This will be achieved through applying the following carbon hierarchy:

- Avoid;
- Reduce;
- Replace;
- Offset.

12.124 The preferred option at this stage is for the Development, where possible, to be solely powered by electricity with no connection to the national gas grid. This is preferred as grid electricity is less carbon intensive than natural gas, particularly as the electricity grid continues to decarbonise.

12.125 The Strategy also states the ambition for site-wide Electric Vehicle (EV) charging networks. At a minimum of one charging point per every ten parking spaces provided.

12.126 The implementation of the options above, where appropriate, will reduce the overall carbon footprint of the Development and lead to a potential reduction in GHG emissions associated with the Development over its lifetime. The Energy Strategy sets the aspiration for the Development to be net-zero by 2050.

Climate Change Adaptation

12.127 This section provides an assessment of the main potential risks presented by a changing climate to the Development, with a particular focus on the increased frequency of extreme weather events.

Temperature

12.128 At this stage of design, it is not clear that the direct effect of the Development on ecological

and human receptor would alter substantially as a result. With the projected trend to warmer conditions, a rise in temperature has the potential to impact on habitat which in turn may affect the behaviour of animals such as birds, while changes in temperature could affect the composition and growth rates of plant communities and invertebrates and habitats. As previously discussed, rises in temperature also create risks to health, well-being and productivity.

Wind

12.129 Over the lifetime of the Development, UKCP18 shows the change in wind speeds and storms is limited to well within the limits of current inter-annual variability. Therefore, no effects are anticipated. Given the maximum parameters of the Development (up to 45m above Fixed Floor Level (FFL) with a stack up to 100m FFL) and the projected modest increase in central wind speeds, it is anticipated that there will be no likely effect as a result of increased wind speeds during the operational phase of the Development.

Biodiversity

12.130 As outlined, the Site supports a range of common and widespread woodland, semi-improved grassland species, significant areas of hardstanding, OMH and waterbodies. These range from ecological features of little importance (e.g shrub and short mown amenity grass) to County importance features with respect to OMH.

12.131 Changes in precipitation and temperature could potentially affect the future of bird assemblages, particularly when taking changes in habitat into consideration.

12.132 Biodiversity net gain will be delivered as part of the Development and this will be detailed at the Reserved Matters stages of the application. This will include habitat retention, creation, enhancement and likely succession of habitats. Through ensuring that the planting is suited to adapt to the climatic changes outlined, through increasing the biodiversity of the Site, it is considered that the Development will be increasingly resilient to the effects of climate change. Although the effects of climate change is uncertain, the enhancement in biodiversity will result in a residual minor beneficial effect.

Noise and Vibration

12.133 The Noise Impact Assessment submitted alongside the planning application has identified that no significant adverse noise effects from the Development will occur.

12.134 As a result of higher temperatures, any building services equipment that provide cooling for the Development are likely to be required to operate at a higher intensity and for longer periods in the future, resulting in increased noise emissions. However, no significant effects are predicted as a consequence.

Air Quality

12.135 There is considerable uncertainty as to how background pollutant concentrations and vehicle emissions factors will change in future years. The analysis within Chapter 11 has shown that the magnitude of change in $N0_x$ and PM impacts resulting from vehicle emission generated by the Development will be 'negligible' at all receptor locations when utilising the Institute of Air Quality Management (IAQM) significance criteria. This is inclusive of any potential on-site energy uses, as detailed in Chapter 3, and any potential impacts on ecological receptors as outlined above.

Precipitation & Flood Risk Assessment

12.136 The risk from increased precipitation is the potential for flooding, particularly if it is associated with extreme events. For the Development this increases the risk for potential destruction/disruption of infrastructure, e.g., flooding to building or disruption to travel. The effects of flooding are discussed later in this chapter. UKCP18 show that over the winter season precipitation is projected to increase.

12.137 The majority of the Site is located in Flood Zone 3 as defined by the undefended flood map for planning, which is considered to be at high risk of flooding from the River Medway. EA mapping identifies that formal flood defences are present along the bank of the River Medway with a protection for events up to a 1 in 1000-year event. Secondary flood defences are also present along Damhead Creek and around the perimeter of the former Kingsnorth Power Station.

12.138 The majority of the Site is currently at very low risk of flooding from surface water, with localised areas of low risk of flooding from surface water. No other significant risk of flooding was identified.

12.139 A surface water drainage strategy is submitted alongside the planning application which will attenuate any increase in runoff caused by the development with an allowance for additional runoff caused by climate change.

12.140 The Drainage Strategy submitted alongside the planning application, in conjunction with the

Flood Risk Assessment, provides inherent mitigation measures aimed to minimise risk of flooding. Operational management plans will be in place which will also entail ongoing water quality monitoring, as well as provision of a surface water drainage network providing attenuation storage on site. Further consideration of the drainage design will be implemented at the reserved matters stage of the Development.

12.141 Furthermore, Sustainable Urban Drainage Systems (SuDS) have been considered during the design process. At this outline stage of application, the exact details of these systems are not specified apart from their location. Areas of Green Infrastructure which are to include SuDS and ecological enhancement will be provided as a buffer between areas of proposed built development and the boundary of the Site. In Parcel 4, there is also a 40 metre wide Ecological 'no building' zone as part of the Green Infrastructure proposed which will include SuDS systems.

12.142 The Flood Risk Assessment identifies the need for the Development to be flood resistant and resilient, including safe access and escape routes for extreme flood events, 'design floods'. This includes:

- 1 in 100 (1%) fluvial flood accounting for climate change; and
- 1 in 1000 (0.5%) tidal/coastal flood accounting for climate change.

12.143 Climate change is projected to increase the likelihood of flooding from most flood sources and therefore an assessment of the effects has been considered over the estimated development lifetime. Given the embedded mitigation[5] and Flood Risk Assessment conducted and submitted as part of the planning application, the magnitude of effect on the operation of the Development is assessed as low and the overall significance of effect is minor-adverse in significance and therefore not significant overall.

Mitigation Measures

Construction

12.144 During the construction phase, the potential for effects is associated with emissions from vehicles and plant, particulate matter and dust associated with construction activities. A Construction Environmental Management Plan (CEMP) will be prepared and agreed with Medway as part of any planning consent. The CEMP will include all best practice measures. As the emissions from construction phase traffic would be temporary, significant impacts are

[5] Outlined in Chapter 3 – Site and Development Description.Also refer to supporting Design and Access Statement.

unlikely. During construction the re-use, recycling and reduction of construction waste will be promoted to reduce the Development's overall carbon footprint by reducing the need to extract raw materials.

12.145 The $C0_2$ emissions of the Development will be calculated at each stage of design as it develops to ensure that it is meeting its project specific targets and legal requirements including the Building Regulations Part L. This will consider both operational $C0_2$ emissions affected by the design, and by embodied carbon. The Development will consider sourcing building materials from sustainable and, where possible, local sources whilst restricting materials which cause environmental harm. This strategy will reduce the overall carbon footprint and associated reductions in GHG emissions associated with the Development over its lifetime. Consideration would be given to the selection of materials used, and lower embodied carbon choices made, where practicable.

GHG Emissions related to Transport

12.146 During the construction phase, a Waste Management Strategy will include an Outline Construction Waste Management Plan to be secured by planning condition, to ensure the segregation of construction materials for ease of re-use and recycling, thus minimising waste to landfill. Where possible and in line with best practice guidance, material will be processed at sites as close to the Site.

Operation

12.147 A Travel Plan (TP) is submitted alongside the planning application and can be found as an appendix to the Transport Assessment (Volume 3 of this ES), which identifies an appropriate package of measures aimed at promoting sustainable travel, with an emphasis of promoting alternatives to the private car. These measures include initiatives such as bike sharing, car pooling, additional bus service provision, electric vehicle charging points and providing sufficient cycle parking. This in turn, is to the effect of mitigating effects on climate change from vehicular emissions.

12.148 A Travel Plan coordinator (TPC) will be appointed to take responsibility of the development and management of the plan. The TPC will ensure that the adoption of the TP is effective and efficient and will be included in all green leases for tenants. The provision of an approved TP will be incorporated into the Section 106 Agreement for the application.

Energy Strategy

12.149 As detailed above, an Energy Strategy (Appendix 12.1) has been produced which details energy provision with the aim to reduce GHG emissions. It includes potential options and networks which can be explored at the Reserved Matters application stage.

Flood Defences

12.150 To maintain the current level of protection of a 1 in 1000 year standard of protection (SoP), the existing flood defences will likely need to be maintained with a potential for further flood defence works required in approximately 50 years. Failure to do so would reduce the SoP to protection against a 1 in 200 year event in 2070. The Applicant has proposed that a new flood defence will be constructed along the western boundary of Parcel 1, which will tie into existing defences to ensure a SoP against a 1 in 1000 year event is maintained. Therefore, future flood defences are considered as a mitigation measure. The details of the flood defences is outlined within the FRA.

Residual Effects

12.151 In accordance with the methodology prescribed in Chapter 2 of this ES, the anticipated residual effects have been classified according to whether they are considered to be negligible, minor, moderate or major; and beneficial or adverse. The mitigation measures outlined above have the potential to further reduce the carbon emissions arising from the Development through influencing behavioural change, where possible.

12.152 In most cases, residual effects during construction will be of a temporary nature, but given that the duration of construction could be up to twelve years, some effects could be regarded as being short-medium term.

12.153 No significant residual effects have been identified in relation to climate change adaptation or emissions reduction.

Cumulative Effects

12.154 The cumulative impact of carbon emissions arising from global human activity is High. This is true to the nature of climate change as a global, cumulative problem. As committed developments have been assessed throughout this ES and particularly through the cumulative vehicular transport scenarios, the potential inter-scheme cumulative effects during the operational phase of the Development have already been considered.

12.155 It is assumed that all committed developments will be required to meet relevant standards for emissions reduction and to comply with related planning policy. On this basis, it is considered appropriate to assume that any applications that are consented include 'reasonable' measures to avoid, reduce and /or offset the generation of greenhouse gas emissions and therefore that no significant cumulative effects are anticipated.

Summary

12.156 To reflect the new requirements of the 2017 EIA Regulations, an assessment has been undertaken of the potential effects of the Development on climate change. This includes the effects of the Development on climate change (climate change mitigation) and the vulnerability of the Development to climate change ('climate change adaptation/resilience').

12.157 The assessment has been undertaken in accordance with published guidance on considering climate change in Environmental Impact Assessment and consequently reviews how climate change has been considered at all stages of project progression and assessment.

12.158 Construction and operation of the Development is likely to result in emissions of CO_2 from direct sources and indirect sources. It is not anticipated that the scale of projected climate change identified will fundamentally alter baseline conditions or the effects included in this ES. Overall, with the design and mitigation measures proposed, the Development is considered to be resilient to projected climate change.

12.159 Indicative results based upon operational vehicular projections for traffic modelling scenarios for 2037 indicate that the anticipated operational emissions for traffic associated with the Development will be 93,766 tonnes of $C0_2$ per year (tonnes $C0_2$/yr), whilst with the 2028 HIF scenario, the anticipated operational emissions for traffic associated with the Development will be 81,983 tonnes $C0_2$/yr. This is considered to be of minor-adverse significance locally.

12.160 Key design principles, such as adherence to the Building Regulations, will be embedded within the Development to minimise climate risks at the Reserved Matters stage.

12.161 Table 12.4 contains a summary of the likely significant effects of the Development.

Table 12.4: Table of Significance – Climate Change

Potential Effect	Nature of Effect (Permanent/ Temporary)	Significance (Major/Moderate/Minor) (Beneficial/Adverse/ Negligible)	Mitigation / Enhancement Measures	Geographical Importance*							Residual Effects (Major/Moderate/ Minor) (Beneficial/Adverse/ Negligible)
				I	UK	E	R	C	B	L	
Construction											
Construction vehicle movements	Permanent	Negligible	CEMP to be secured by condition.	X							Negligible
Completed Development (Vulnerability of the Development to Climate Change)											
Projected increase in mean summer and winter temperatures.	Permanent	Negligible	N/A - No significant climate change resilience effects have been identified	X							Negligible
Projected increase in annual precipitation.	Permanent	Minor Adverse	The area will be protected by flood defences that were designed with climate change effects in mind.	X							Negligible
Projected decrease in mean summer precipitation.	Permanent	Negligible	N/A - No significant climate change resilience effects have been identified	X							Negligible
Extreme weather events (such as heavy and/or Prolonged precipitation and storm events).	Permanent	Negligible	N/A - No significant climate change resilience effects have been identified	X							Negligible
Completed Development (Effects of the Development on Climate Change)											
Vehicular Emissions	Permanent	Minor Adverse (Locally). Expected minor to negligible (Nationally).	Travel Plan to promote sustainable travel.	X							With the implementation of mitigation measures, minor adverse to negligible effects are expected locally and negligible effects nationally.
Building Emissions	Permanent	Moderate to Minor Adverse (Locally). Expected minor to negligible (Nationally).	N/A	X							Negligible

Indirect Emissions (Energy)	Permanent	Moderate to Minor Adverse (Locally). Expected minor to negligible (Nationally).	Energy Strategy to reduce building emissions.	X							Negligible
Cumulative Effects											
Construction											
No significant effects											
Operation											
No significant effects											
*** Geographical Level of Importance** I = International; UK = United Kingdom; E = England; R = Regional; C = County; B = Borough; L = Local											

REFERENCES

[i] HM Government (2011): The Carbon Plan: Delivering Our Low Carbon Future. Available online [Accessed 20.12.2020] at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47613/3702-the-carbon-plan-delivering-our-low-carbon-future.pdf

[ii] HM Government (2017): Clean Growth Strategy [Accessed 20.12.2020] at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700496/clean-growth-strategy-correction-april-2018.pdf

[iii] HM Government (2018): A Green Future: Our 25 Year Plan to Improve the Environment. Available online [Accessed 20.12.2020] at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf

[iv] Ministry of Housing, Communities and Local Government (February 2019): National Planning Policy Framework. [Accessed 20.12.2020] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf

[v] HM Government (October 2019): Planning Practice Guidance. Available online [Accessed 20.12.2020]: https://www.gov.uk/government/collections/planning-practice-guidance

[vi] HM Government. January 2021. National Planning Policy Framework and National Model Design Code: Consultation proposals. Available from: https://www.gov.uk/government/consultations/national-planning-policy-framework-and-national-model-design-code-consultation-proposals/national-planning-policy-framework-and-national-model-design-code-consultation-proposals#chapter-15-conserving-and-enhancing-the-natural-environment

[vii] Medway Local Plan. 2003. Available from: https://www.medway.gov.uk/downloads/file/2400/medway_local_plan_2003

[viii] Medway Council (March 2018) Medway Council Local Plan 2012-2035 Development Strategy Regulation 18 Consultation Report

[ix] Medway Council. 2019. Climate Emergency: https://www.medway.gov.uk/climatechange

[x] Medway Council 2019. Kent and Medway ELES. Available from: https://www.medway.gov.uk/info/200348/climate_change/1214/what_were_doing

[xi] IEMA (June 2020): IEMA Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation

[xii] IEMA. Assessing greenhouse gas emissions and evaluating their significance. [online]. Accessed from: https://www.iaia.org/pdf/wab/EIA%20Guide_GHG%20Assessment%20and%20Significance_IEMA_16May17.pdf

[xiii] BEIS.2020. https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2018

[xiv] GHG Protocol: Available online at: https://ghgprotocol.org/ [accessed 27.01.2021]

[xv] DEFRA.2020. Emissions Factors Toolkit. [Online]. Available from: https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

[xvi] National Statistics. National Travel Survey: 2019 data tables. [Online]. Accessed from: https://www.gov.uk/government/statistics/national-travel-survey-2019

[xvii] https://www.rensmart.com/Calculators/KWH-to-CO2

[xviii] Riahi, K., Rao, S., Krey, V. *et al.* RCP 8.5—A scenario of comparatively high greenhouse gas emissions. *Climatic Change* **109,** 33 (2011). https://doi.org/10.1007/s10584-011-0149-y

[xix] Met Office (Nov 2018, updated March 2019) UKCP18 Science Overview Report. Available at: https://www.metoffice.gov.uk/pub/data/weather/uk/ukcp18/science-reports/UKCP18-Overview-report.pdf [accessed 27.11.20]

[xx] Met Office: Climate Station. Available online at: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/u10hb54gm [accessed 27.11.2020]

[xxi] Met Office (2019): UKCP18 National Climate Projections: An Overview. Available online [accessed 21.12.2020]: https://www.ice.org.uk/getattachment/eventarchive/flooding-conference-2019-cardiff/Carol-McSweeney-(no-notes).pdf.aspx

[xxii] Met Office (2019): UKCP18 Factsheet: Wind. Available online [accessed 21.12.2020]: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-fact-sheet-wind.pdf

[xxiii] Royal Meteorological Society (July 2018): International Journal of Climatology; State of the UK Climate 2017. Available online [accessed 21.10.2020]: https://rmets.onlinelibrary.wiley.com/doi/epdf/10.1002/joc.5798

[xxv] BEIS. 2019. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/931323/updated-energy-and-emissions-projections-2019.pdf