Hampshire Water Transfer and Water Recycling Project

Environmental Statement – Chapter 10 Carbon and climate change

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10.1 Introduction

10.1.1 This chapter provides the assessment of the likely significant effects on carbon and climate change from the construction, operation and decommissioning of the Hampshire Water Transfer and Water Recycling Project (hereafter referred to as the 'Proposed Development'), which is being progressed by Southern Water Services Limited ('the Applicant').

10.1.2 This chapter details the legislation, policy and guidance that is relevant to carbon and climate change, summarises the engagement and consultation undertaken to date, sets out the scope and methodology of assessment, and describes the baseline environment. Following this, the likely significant effects from the Proposed Development on carbon and climate change are assessed taking account of embedded primary and tertiary mitigation within the design. The need for any secondary mitigation is then considered along with any proposals for monitoring and/or enhancement. The chapter concludes with a summary of residual effects.

10.1.3 Whilst this Environmental Statement (ES) presents an assessment of the effects that may occur from decommissioning activities of the Proposed Development, the Applicant is not seeking consent for decommissioning.

10.1.4 Carbon and climate change topics considered within this chapter for the Proposed Development are:

1. A carbon assessment, to determine the likely significant effects from the Proposed Development on climate, encompassing life cycle emissions during the construction, operation and decommissioning phases
2. A Climate Change Resilience (CCR) assessment, which evaluates future trends in climate change and the Proposed Development's vulnerability and resilience to such changes

10.1.5 In addition, an In-combination Climate Change Impact (ICCI) assessment is presented in ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6), which considers the potential impacts of climate change to the effects predicted in other chapters. ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6), provides methodology and assessment of likely significant effects for the ICCI assessment. Other relevant information for the ICCI assessment such as consultation and baseline conditions, as well as a summary of the outcome of the ICCI assessment, is presented within this chapter.

10.1.6 This chapter should be read in conjunction with ES Chapter 3 Description of the Proposed Development, Volume I (Document Reference 6.1, DCO Volume 6) which describes the development parameters against which the effects considered in this chapter have been assessed.

10.1.7 In addition, this chapter should be read alongside the relevant parts of other technical chapters in Volume I, namely:

1. ES Chapter 18 Traffic and transport, Volume I (Document Reference 6.1, DCO Volume 6), and the supporting Framework Construction Traffic Management Plan (CTMP), (Document Reference 7.2, DCO Volume 7) - covering likely significant effects related to traffic and transport, and containing measures to reduce vehicle movements, and therefore carbon emissions
2. ES Chapter 19 Water environment, Volume I (Document Reference 6.1, DCO Volume 6) - presents the baseline environment conditions for the water environment such as flood risk which is used to inform the CCR assessment
3. ES Chapter 20 Cumulative and in-combination effects, Volume I (Document Reference 6.1, DCO Volume 6) – an assessment of the cumulative climate change effects i.e. effects from the interrelationship between the Proposed Development and other developments, and an assessment of the in-combination effects i.e. effects from the interaction between the individual effects of the Proposed Development

10.1.8 This chapter is informed by the following appendices, all contained in ES Volume II (Document Reference 6.2, DCO Volume 6):

1. ES Appendix 10.1 Carbon assessment methodology
2. ES Appendix 10.2 Climate change resilience assessment methodology
3. ES Appendix 10.3 In-combination Climate Change Impact assessment

10.2 Legislation, policy and guidance

10.2.1 This section identifies the legislation, policy, guidance and other documentation that has informed the assessment of likely significant effects on carbon and climate change.

Legislation

10.2.2 Table 10-1 lists the legislation relevant to the assessment of the likely significant effects on carbon and climate change considered in the carbon, CCR and ICCI assessments.

Table 10-1 List of relevant legislation

Legislation	Relevance to assessment
Paris Agreement 2015	The Paris Agreement (2015), adopted during the 21st United Nations (UN) Climate Change Conference of the Parties (COP21) in 2015, is a legally binding international treaty aimed at addressing climate change, which the UK signed in 2016. The Paris Agreement commits all parties to the goal of limiting global warming to well below 2°C, preferably to 1.5°C, compared to pre-industrial levels. The Paris Agreement (2015) requires all parties to submit plans to reduce their emissions (along with other climate action) every five years, starting in 2020. As a response to the Paris Agreement's 1.5°C global warming target, the Intergovernmental Panel on Climate Change advised that global emissions needed to reach net zero by around 2050 for this to be achievable. Subsequent updates to the UK's national emission targets have been made with consideration of this target. This includes the Fifth, Sixth and Seventh

Legislation	Relevance to assessment
	Carbon Budgets, which as stated below, are considered as part of determining the significance criteria for the carbon assessment.
The Climate Change Act 2008 and Carbon Budget Orders (2009, 2011, 2016, 2021)	The Climate Change Act 2008 provides the framework for the UK to meet its long-term target of reducing greenhouse gas (GHG) emissions to 'Net Zero' (i.e. at least a 100% reduction) by 2050 from 1990 levels ('climate mitigation'). The Climate Change Act 2008 also established a system of legally-binding 'Carbon Budgets', which were introduced to drive progress towards this target. The likely significance of effect for the outcomes of the carbon assessment uses the relevant Carbon Budgets and to evaluate whether the Proposed Development would have an impact on the UK meeting its Net Zero target set out in the Climate Change Act 2008, and the Carbon Budgets which have been established. The Carbon Budget Order 2011 sets out the carbon budget total for the Fourth (2023 - 2027) Carbon Budget Period. The Carbon Budget Order 2016 sets out the carbon budget total for the Fifth (2028 - 2032) Carbon Budget Period. The Carbon Budget Order 2021 sets out the carbon budget total for the Sixth (2033 - 2037) Carbon Budget Period. In February 2025, the Climate Change Committee recommended a limit of emissions for the Seventh Carbon Budget Period, however at the time of writing this had not been legally adopted.

National policy

10.2.3 The primary policy for determining the application for the Development Consent Order (DCO) for the Proposed Development is the National Policy Statement for water resources infrastructure (NPSWRI). This sets out policies to guide how DCO applications for water resources infrastructure should be decided and how the effects of such infrastructure are considered.

10.2.4 Table 10-2 lists the paragraphs from the NPSWRI and other national policies that are relevant to the carbon, CCR, and ICCI assessments. It also sets out where these policy requirements are addressed within the chapter.

Table 10-2 List of relevant national policy and plans

Relevant paragraph reference	Summary of policy requirement	Where addressed in chapter
National Policy Statement for water resources infrastructure [2025] [1]		
2.2.1, 2.2.3, 2.2.6 – 2.2.7 and 2.2.11	Section 2.2 of the NPSWRI sets out the need for action to address the pressure on water resources as a result of a range of factors, including the impacts of climate change. This includes potential deficits arising from "*the impact of climate change on river flows*", and "*the likelihood of drought, or of its adverse impacts*".	The potential impacts of climate change on the Proposed Development are considered in the CCR assessment in section 10.8 of this chapter. The potential for climate change to affect water resources as detailed in section 2.2 of the NPSWRI supports the need case for the Proposed Development

Relevant paragraph reference	Summary of policy requirement	Where addressed in chapter
	The influence of climate change on water resources is provided in paragraphs 2.2.6 and 2.2.7 of NPSWRI. Paragraph 2.2.6 states *"Climate change will affect the amount and timing of rainfall that supports river flows and replenishes groundwater. It will also influence the demand for water and its quality, as well as the land use – all of which will put pressure on water resources"* Paragraph 2.2.7 states *"The updated assessments in draft Water Resources Management Plans in 2024 estimate that around 642 Ml/d of the additional estimated 4,800 Ml/d capacity needed by 2050 will be attributable to climate change".* *"*	further detailed in Case for the Project (Document Reference 5.6, DCO Volume 5)
2.2.14	Protecting and enhancing the environment: Section 2.2.14 of the NPSWRI highlights the importance of good water quality to the UK wetlands, rivers and chalk streams, and the impact of climate change on good water quality. Paragraph 2.2.14 states *"Having the right flow in our rivers and protecting groundwater levels is essential to support health ecology and enhancing natural resilience to drought. The impacts of climate change and the growing demand for water are putting added pressure on this availability"*	The potential impacts of climate change on the Proposed Development are considered in the CCR assessment in section 10.8 of this chapter. The potential for climate change to affect water resources as detailed in section 2.2.14 of the NPSWRI supports the needs case for the Proposed Development which aims to increase the availability of good quality water.
3.2.2 – 3.2.3	Environmental Impact Assessment: Section 3.2 of the NPSWRI outlines the requirement for the consideration of climate change as part of an Environmental Impact Assessment (EIA), and that the assessment should include potential effects during the design, construction, operation and decommissioning of projects. Paragraph 3.2.2 states *"Water resource infrastructure project will*	The potential impacts of climate change on the Proposed Development are considered in the CCR assessment in section 10.8 of this chapter. The CCR assessment outlines potential climate hazards in each phase of the Proposed Development and assesses its resilience to a range of identified climate hazards.

Relevant paragraph reference	Summary of policy requirement	Where addressed in chapter
	typically be long-term investments which will need to remain operational over many decades, in the face of climate change. Consequently, applicants must consider the effects of climate change when planning the location, design, build, operation and, where appropriate, decommissioning of project" Paragraph 3.2.3 states *"The Environmental Impact Assessment process is required to identify, describe and assess effects on the human health and population, biodiversity, land, soil, water, air, climate, the landscape, material assets and cultural heritage, and the interaction between them."*	
3.7.1 – 3.7.11	Climate change adaptation: Section 3.7 of the NPSWRI sets out guidance for the approach for how climate change is accounted for in policy. Section 3.7 provides an outline for how the Applicant should, and the Secretary of State (SoS) will, take into account the effect of climate change as part of an application for nationally significant infrastructure water resource projects. The parameter that applicants need to consider in relation to climate change adaptation are detailed in paragraphs 3.7.4, 3.7.5 and 3.7.6 NPSWRI. Paragraph 3.7.4 states *"New water resources infrastructure will typically be a long-term investment which will need to remain operational over many decades. Consequently, the application must consider the impacts of climate change at design, build and operational stages".* Paragraph 3.7.6 states that *"Where water resources infrastructure includes safety critical elements, the applicant should apply the high emission scenario at different probability levels so as to include high impact, low likelihood scenarios to those elements*	The requirement to consider the impacts of climate change at different stages of the Proposed Development, as detailed in paragraph 3.7.4 of the NPSWRI, has been complied with in the CCR assessment in section 10.8 of this chapter. The CCR assessment evaluates the resilience of the Proposed Development to climate change during the construction, operation and decommissioning phases. In addition, the requirement to consider the high emission scenario at different probability levels as stated in paragraph 3.7.6 of the NSPWRI has been complied with in the CCR assessment in section 10.8 of this chapter. The CCR assessment uses the latest UK Climate Projections (UKCP) 2018 dataset [2] and the highest emission scenario, called Representative Concentration Pathway (RCP), RCP8.5 in the assessment.

Relevant paragraph reference	Summary of policy requirement	Where addressed in chapter
	critical to the safe operation of the infrastructure".	
4.4.1 – 4.4.16	Climate change mitigation: Section 4.4 of the NPSWRI sets out guidance for nationally significant infrastructure projects applications for water resources concerning the government policy on climate change mitigation. The requirements for the applicants regarding the mitigation of GHG emissions are detailed in paragraphs 4.4.11 and 4.4.13 of the NPSWRI. Paragraph 4.4.11 states *"the applicant should provide evidence of the climate impact of the development and an assessment of emissions associated with construction and operation against the water company's ability to deliver its contribution to the government's targets and commitments".* Paragraph 4.4.13 states: "*Evidence of appropriate mitigation measures (where appropriate incorporating engineering plans on configuration and layout, and use of materials) in design, construction and operation should be presented. The applicant should demonstrate that it has investigated feasible options in terms of using: energy efficient technology or processes* • *energy recovery technologies or processes* • *renewable energy sources, produced either on site or linked to any local renewable energy initiatives* • *greenhouse gas offsetting measures*" With respect to governments decision making, paragraph 4.4.15 states that *"Any increase in greenhouse gas emissions from the project alone is not a reason to refuse development consent for infrastructure to secure water supplies, unless the increase in greenhouse gas emissions resulting*	The requirement to provide evidence of the climate impact of the Proposed Development and an assessment of the emissions is complied with through the provision of the carbon assessment, which is provided in section 10.8 of this chapter. Mitigation measures to reduce carbon emissions from the Proposed Development, as requested in paragraph 4.4.13 of the NPSWRI are provided in sections 10.4 and 10.9 of this chapter. As discussed in section 10.4, the Proposed Development's carbon strategic objective is to deliver solutions in relation to design, construction and operation of the Proposed Development that are optimal in terms of whole life carbon, and reduce GHG emissions to as low as reasonably practicable, having regard to the UK's climate change commitment of achieving net zero emissions by 2050.

Relevant paragraph reference	Summary of policy requirement	Where addressed in chapter
	from the project is so significant that it would have a material impact on the ability of the government to meet its greenhouse gas reduction obligations and commitments". Subsequently, paragraph 4.4.16 states that the SoS will consider the effectiveness of listed mitigation measures to ensure that "*GHG emissions are as low as reasonably practicable*", and that the adequacy of mitigation measures will be a material factor in the decision making process.	
National Planning Policy Framework [2025] [3]		
162 - 169	Meeting the challenges of climate change, flooding and coastal change: Section 14 of the National Planning Policy Framework (NPPF) sets outs guidance for how the planning system for new developments should approach mitigating and adapting to climate change. The NPPF states that development should *"take proactive approach to mitigating and adapting to climate change", and new development "should be planned in ways that:* a) *avoid increased vulnerability to the range of impact arising from climate change…* b) *can help to reduce greenhouse gas emissions, such as through its location, orientation and design."*	The CCR assessment considers the effect of climate change on the Proposed Development in section 10.8. This includes consideration of embedded mitigation for each phase of the Proposed Development to adapt to climate change. The carbon assessment reviews the effect of the Proposed Development on climate change, and specifically with regard to the UKs ability to meet its emission reduction targets. Carbon emissions arising from activities associated with the Proposed Development have been considered as part of the scheme and design development process, as detailed in section 10.4. Mitigation embedded into the design of the Proposed Development that has reduced lifecycle emissions is also provided in section 10.4.
Other policies and plans		
Climate Change Risk Assessment 2022 [4]	The Climate Change Risk Assessment 2022 was produced by the UK government in 2022 to enable compliance with the requirement of undertaking a Climate Change Risk	The CCR assessment considers the effects of climate change on the Proposed Development in section 10.8.

Relevant paragraph reference	Summary of policy requirement	Where addressed in chapter
	Assessment every five years outlined in the Climate Change Act 2008. The report concluded that the most urgent risks for the UK are the risks to people and the economy from climate-related failure of power systems and multiple risks to the UK from climate change impacts overseas. It also presented suggestions for reducing these risks including the consideration of climate change in the development of new infrastructure.	
The UK Net Zero Strategy [5]	The UK Net Zero Strategy 2021 sets out how the UK will deliver on its commitment to reach Net Zero emissions by 2050. It outlines decarbonisation pathways for all sectors of the UK economy.	The carbon assessment considers the emissions associated with the Proposed Development. The ability for the Proposed Development to affect the UK's Net Zero ambitions is considered as part of significance criteria for the assessment, as detailed in section 10.8.
Carbon Budget and Growth Delivery Plan [6]	The Carbon Budget and Growth Delivery Plan sets out the approach for how the Government can meet the statutory Carbon Budgets. It contains an overview of proposals and policies to enable to Carbon Budgets to be met.	The carbon assessment evaluates whether the Proposed Development would affect the UK's ability to meet its emission reduction targets, and limits set out in each established Carbon Budget.
The National Infrastructure Strategy [7]	The National Infrastructure Strategy 2020 is a comprehensive plan set forth by the UK government to transform the country's infrastructure network. The Strategy aligns with the UK's commitment to Net Zero by 2050, and it emphasises the requirement for sustainable and resilient infrastructure.	The carbon assessment considers the emissions associated with the Proposed Development. The ability for the Proposed Development to affect the UK's Net Zero ambitions is considered a part of the significance criteria for the assessment, as detailed in section 10.8. The CCR assessment considers the effect of climate change on the Proposed Development in section 10.8, which included measures to enhance the resilience of the Proposed Development to the projected effects of climate change.

Relevant paragraph reference	Summary of policy requirement	Where addressed in chapter
Environmental Improvement Plan 2025 [8]	The Environmental Improvement Plan 2025 is the UK government's updated framework for enhancing the natural environment, building on the initial 25 Year Environmental Plan [9]. It outlines measurable goals, including strategies for planning for and managing the impacts of climate change.	The carbon assessment considers the emissions associated with the Proposed Development, its contribution to the UK's Net Zero ambitions and the emissions mitigation measures adopted in section 10.8. The assessment details the measures that have been adopted (section 10.4) to reduce emissions associated with the Proposed Development.
Biodiversity 2020: A strategy for England's wildlife and ecosystem services [10]	The Biodiversity 2020 Strategy for England, published by the Department for Environment, Food and Rural Affairs (Defra) in 2011 outlines the aims which include halting the overall loss of England's biodiversity.	The potential for climate change to affect terrestrial and marine biodiversity has been considered in the ICCI assessment, which forms ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6).

Local policy

10.2.5 The local policies listed in Table 10-3 are considered relevant to the carbon, CCR and ICCI assessments for the Proposed Development. While the SoS must determine an application for development consent in accordance with the NPSWRI, it may be that the SoS considers topics of local policy to be matters that are important and of relevant to the determination. In the event that there is any conflict between the local policy and the NPSWRI, the NPSWRI would prevail for the purposes of decision making given the national significance of the infrastructure.

10.2.6 Adopted and emerging development plan policies have also been considered. Adopted and emerging planning policies that are relevant are included in Table 10-3.

Table 10-3 List of relevant local policy

Local planning authority	Relevant local policy	Relevance to assessment
East Hampshire District Council (EHDC)	East Hampshire District Local Plan: Joint Core Strategy (2014) [11]: • CP25 – Flood Risk	Policies CP25 and CP26 outline the requirements for flood risk within the EHDC region, and for the protection of water resources/water quality for developments. These policies are

Local planning authority	Relevant local policy	Relevance to assessment
	• CP26 – Water resources/water quality Draft Our Local Plan 2021 – 2040 Regulation 18 (2024) [12]: • CLIM 1 – Tackling the Climate Emergency • CLIM 2 - Net-Zero Carbon Development: Operational Emissions • CLIM3 -Net-Zero Carbon Development: Embodied Emissions • CLIM4 – Renewable and Low Carbon Energy • CLIM5 – Climate Resilience • NBE7 – Managing Flood Risk	considered in the CCR assessment presented in section 10.8, and the ICCI assessment in ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6). Policies CLIM1 – CLIM4 focus on the reduction of carbon emissions from development in the region. The contents of these policies are considered in the carbon assessment presented in section 10.8. Policy CLIM 5 sets out to ensure that new development is designed to mitigate the risks to human health and well-being associated with climate change. Policy NBE7 outlines the requirements to reduce flooding risk and incorporate measures to mitigate residual risk. This policy is considered in the CCR assessment presented in section 10.8 and the ICCI assessment in ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6).
Eastleigh Borough Council (EBC)	Eastleigh Borough Local Plan (2016 – 2036) Adopted April 2022 [13]: • S1 – Delivering Sustainable Development • DM2 – Environmentally Sustainable Development • DM3 – Adaptation to Climate Change • DM10 – Water and Waste Water • DM11 – Nature Conservation	Policies S1 and DM2 set out the requirement for the consideration for climate change for developments in the region, including limiting carbon emissions and the delivery of sustainable construction. These policies are considered in the carbon assessment presented in section 10.8. Policies DM3, DM10 and DM11 outline measures for adapting to climate change, and specify requirements to avoid adverse environmental impacts for new water infrastructure. In addition, the policies set out the requirements for developments with respect to natural habitats and are considered in the

Local planning authority	Relevant local policy	Relevance to assessment
		CCR assessment presented in section 10.8, and the ICCI assessment in ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6).
Fareham Borough Council (FBC)	Fareham Local Plan 2037 (2023) [14]: • CC1 – Climate Change • CC2 – Managing Flood Risk and Sustainable Drainage Systems • D1 – High Quality Design and Place Making • D4 – Water Quality Resource	Policy CC1 sets out the requirement for sustainable, low carbon design and considerations for the construction of development, and is considered in the carbon assessment presented in section 10.8. Policy D1 sets out the requirements for the design of developments to reduce the use of natural resources and to be adaptable over time. This policy applies to the carbon assessment and CCR assessment presented in section 10.8, and the ICCI assessment in ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6). Policies CC1, CC2 and D4 outline the requirements related to climate change resilience, including flood risk and water resources/water quality in the local area and are considered in the CCR assessment presented in section 10.8, and the ICCI assessment in ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6).
Hampshire County Council (HCC)	Hampshire Minerals and Waste Plan (2013) [15]: • Policy 2: Climate change – mitigation and adaptation Hampshire Minerals and Waste Plan – Partial Update – Proposed Submission Plan (2023) [16]: • Policy 2: Climate change – mitigation and adaptation	Policy 2 of the 2013 Plan sets out the climate change mitigation and adaptation measures in relation to minerals use and waste development including those to reduce carbon emissions, ensure sustainable use of resources, avoid areas of vulnerability to climate change and flood risk. Policy 2 is considered in the carbon and CCR assessments presented in section 10.8, and the ICCI assessment in ES Appendix 10.3 In-combination Climate Change Impact

Local planning authority	Relevant local policy	Relevance to assessment
	Hampshire Climate Change Strategy 2020 - 2025 [17]	assessment, Volume II (Document Reference 6.2, DCO Volume 6). The wording of Policy 2 in the Proposed Submission Plan (2023) is different to the 2013 plan, and states that minerals and waste development will be supported where it enables the transition to carbon neutrality by 2050, and provides resilience to the impacts of climate change through location and design. HCC has set out a Climate Change Strategy for 2020 – 2025, which aims to develop and promote a focus on embedding climate resilience and mitigation across key policies and sectors in Hampshire. The strategic principles, priorities and actions of the Strategy are relevant for the carbon and CCR assessment presented in section 10.8, and the ICCI assessment in ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6).
Havant Borough Council (HBC)	Havant Borough Core Strategy (2011) [18]: • CS11 – Protecting and Enhancing the Special Environment and Heritage of Havant Borough • CS14 – Efficient Use of Resources • CS15 - Flood and Coastal Erosion Risk • CS16 – High Quality Design • DM12 – Mitigating the Impacts of Travel	Policies CS14, CS16 and DM12 set out the requirement for sustainable construction, high quality design and reducing the impacts of travel, and are considered in the carbon assessment presented in section 10.8. Policies CS11 and CS15 outline policy requirements with respect to water resources, flood risk and the impact of developments on the natural environment. These policies are considered in the CCR assessment, presented in section 10.8, and the ICCI assessment in ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6).
Portsmouth City Council (PCC)	Portsmouth Plan (The Portsmouth Core Strategy) (2012) [19]: • PCS12 – Flood Risk	Policies PCS15, D2, and D4 set out the requirement for sustainable design and construction practices, and are

Local planning authority	Relevant local policy	Relevance to assessment
	• PCS15 – Sustainable Design and Construction Portsmouth Local Plan (2038) 'Regulation 18' Consultation Document Draft for consultation September 2021 [20]: • G5 – Flood Risk Drainage • D2 – Sustainable Design and Construction • D4 – Low Carbon and Carbon Neutral Development	considered in the carbon assessment, presented in section 10.8. Policies PCS12 and G5 outline the requirements for flood risk and water resources/water quality for developments in the local area and are applicable for the CCR assessment, presented in section 10.8, and the ICCI assessment in ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6).
Winchester City Council (WCC)	'Your Place Your Plan Winchester District Local Plan' 2020-2040 [21]: • CN1 – Mitigation and adapting to climate change • D1 – High Quality, Well Designed and Inclusive Places • NE6 – Flooding, Flood Risk and the Water Environment	Policies CN1 and D1 outline that development proposals will need to demonstrate that low carbon solutions have been incorporated, and that carbon emissions have been considered as part of the design process. This is covered in the carbon assessment presented in section 10.8. Policy NE6 outlines requirements for flood risk and the impact of developments on the natural environment. These policies are considered in the CCR assessment, presented in section 10.8 and the ICCI assessment in ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6).

Guidance, standards and advice

10.2.7 In addition, the carbon and climate change assessment has been undertaken in accordance with relevant guidance, and has been compiled in accordance with professional standards. The guidance and standards which relate to this assessment are detailed in Table 10-4.

Table 10-4 List of relevant guidance and standards

Guidance	Description	Relevance to assessment
Institute of Sustainability and Environmental Professionals (ISEP) (formerly known as the Institute of Environmental Management and Assessment	This guidance provides guidelines for, and requirements for an assessment, and sets out the key areas for consideration.	This guidance provides a framework for the assessment and significance criteria used in the carbon assessment.

Guidance	Description	Relevance to assessment
(IEMA)) (2022) Assessing Greenhouse Gas Emissions and Evaluating their Significance [22]		
ISEP (2020) Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation [23]	This guidance provides a framework for considering climate change resilience and adaptation in the EIA process.	This guidance is relevant to the CCR assessment as it provides a framework for the consideration of climate change resilience and adaptation. It also advises that developers should incorporate adaptation and resilience measures into the design of the Proposed Development.
The British Standards Institution (BSI) (2023) PAS 2080:2023 Carbon management in building and infrastructure [24]	This standard outlines a carbon management process applicable to buildings and infrastructure.	The methodology for calculating emissions arising from the Proposed Development as part of the carbon assessment is based on the principles of the PAS 2080:2023 framework.
The UK Water Industry Research (UKWIR) (2012) A Framework for Accounting for Embodied Carbon in Water Industry Assets [25]	This guidance provides clear and consistent guidelines for UK water companies to estimate carbon embodied in constructing and maintaining capital assets using recognised sources of information. Although it has been updated with the UKWIR, Calculating whole life/TOTEX Carbon (2022), its foundational principles are still relevant.	The carbon assessment adheres to the UKWIR guidelines for calculating carbon embodied for capital assets associated with the Proposed Development.
UKWIR (2022) Calculating whole life/TOTEX Carbon [26]	This guidance is an update to the UKWIR guidance, a Framework for Accounting for Embodied Carbon in Water Industry Assets (2012), and presents findings of a high-level review of the assessment methods currently used by the water sector.	The carbon assessment considers cradle-to-built asset carbon emissions for each asset, as outlined in the UKWIR guidance.
European Standard (2019) EN15804 (2019) [27]	This is the European standard for the generation of Environmental Production Declaration for construction products.	The standard has been used to provide details of embodied carbon in materials and assets, and was utilised in the carbon modelling.
The Department for Business, Environment, and Industrial Strategy (BEIS) (2023) Green	The BEIS guidance (now, the Department for Energy Security and Net Zero,	The data has been used to calculate emissions from power consumption from the

Guidance	Description	Relevance to assessment
Book supplementary guidance: valuation of energy use and greenhouse gas emissions appraisal [28]	DESNZ) provides data for the projected carbon intensity of the UK grid and sets out the principles of how carbon emissions should be considered in project and programme appraisals.	Proposed Development during construction and operation.

10.3 Consultation, scoping and engagement

Consultation

10.3.1 Feedback received from stakeholders for each consultation relevant to carbon and climate change is summarised within the Consultation Report (Document Reference 5.1, DCO Volume 5), including how the Proposed Development has had regard to the feedback. These cover the consultation responses received for the following consultations:

1. Summer 2022 Consultation
2. Summer 2024 Consultation
3. Spring 2025 Consultation
4. Autumn 2025 Consultation
5. Spring 2026 Consultation

Environmental Impact Assessment scoping

10.3.2 An EIA Scoping Opinion was adopted by the Planning Inspectorate on behalf of the SoS on 31 August 2023. A full list of the EIA Scoping Opinion comments and responses is provided in ES Appendix 5.3 Response to EIA Scoping Opinion, Volume II (Document Reference 6.2, DCO Volume 6).

10.3.3 Comments received in relation to carbon and climate change are set out in Table 10-5, describing how and where these are addressed in the ES.

Table 10-5 Environmental Impact Assessment Scoping Opinion - Planning Inspectorate comments

Scoping Opinion ID	Summary of Scoping Opinion Statement	How the ES addresses the Scoping Opinion comments	Where addressed in the ES
Scoping ID 3.5.1	The EIA Scoping Opinion agreed that decommissioning effects for the carbon assessment could be scoped out.	To provide a precautionary assessment across the ES, carbon emissions during decommissioning have been considered on a high level basis.	Section 10.8
Scoping ID 3.5.1	The EIA Scoping Opinion requested that decommissioning effects should be considered in	The CCR assessment presented in ES Chapter 10 Carbon and climate change, Volume I (Document reference 6.1, DCO Volume	Section 10.8 and ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II

Scoping Opinion ID	Summary of Scoping Opinion Statement	How the ES addresses the Scoping Opinion comments	Where addressed in the ES
	respect of the CCR and ICCI assessments.	6), includes assessment of the construction phase of the Proposed Development.	(Document Reference 6.2, DCO Volume 6).
Scoping ID 3.5.2	The EIA Scoping Opinion disagreed with the proposed approach to scope out the construction phase from the CCR assessment.	These comments are acknowledged, and the CCR assessment includes an assessment of climate risk during the construction phase of the Proposed Development.	Section 10.8
Scoping ID 3.5.3	The EIA Scoping Opinion disagreed with the proposed approach to scope out the construction phase from the ICCI assessment.	The ICCI assessment includes the assessment of climate risks during construction in ES Appendix 10.3 In-combination Climate Change Assessment, Volume II (Document reference 6.2, DCO Volume 6).	ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6).
Scoping ID 3.5.4, 3.5.5 and 3.5.6	The EIA Scoping Opinion agreed with the proposed approach to scope out cumulative effects in the carbon assessment.	This is scoped out of the assessment.	An assessment of emissions from unrelated cumulative developments is scoped out of the assessment in the ES. An assessment of related and consequential projects has been included in ES Chapter 20 Cumulative and in-combination effects, Volume I (Document Reference 6.1, DCO Volume 6).
Scoping ID 3.5.7	The EIA Scoping Opinion requested that the ES includes consideration of carbon emissions associated with the maintenance of all elements of the Proposed Development within the carbon assessment.	The carbon assessment in section 10.8, includes emissions from the maintenance of infrastructure at the Proposed Development.	Section 10.8
Scoping ID 3.5.8	The EIA Scoping Opinion requested that the assessment scenarios adopted in the carbon assessment should be described within the ES,	The definition of the scenarios and identified limitations are provided in within this chapter.	Sections 10.5 and 10.6

Scoping Opinion ID	Summary of Scoping Opinion Statement	How the ES addresses the Scoping Opinion comments	Where addressed in the ES
	together with appropriate justification for their selection, and an explanation of any limitations in the approach.		

Engagement

10.3.4 This section provides details of the ongoing technical engagement that has been undertaken with stakeholders in relation to carbon and climate change.

Environmental Impact Assessment Working Groups

10.3.5 Five EIA Working Groups have been established as forums for ongoing engagement with statutory bodies regarding the Proposed Development. These Working Groups when combined cover all of the assessment topics considered by the EIA. A full description of each of the EIA Working Groups, the key stakeholders, and an overview of the topics presented can be found in ES Chapter 5 EIA approach and methodology, Volume I (Document Reference 6.1, DCO Volume 6). This section presents a summary of the topics covered in the EIA Working Groups which are of relevance for the carbon and climate change chapter, including the Emissions and Transport EIA Working Group and the Resilience EIA Working Group.

10.3.6 The Emissions and Transport EIA Working Group, which includes traffic and transport, air quality and odour, noise and vibration, waste, materials and carbon and climate change has been the main forum for engagement for the carbon assessment. There have been 12 Emission and Transport EIA Working Group meetings held between Summer 2022 and DCO application. Technical officers from EHDC, EBC, Environment Agency (EA), FBC, HCC, HBC, National Highways, Natural England, PCC, South Downs National Park Authority (SDNPA) and WCC attended the EIA Working Group meetings.

10.3.7 The Resilience EIA Working Group, which includes emergency planning, major accidents and disasters, flood risk and climate change, has been the main forum for engagement for the CCR and ICCI assessments. There have been 12 Resilience EIA Working Group meetings held between Summer 2022 and DCO application. Technical officers from EBC, EA, FBC, Hampshire & Isle of Wight Fire & Rescue Authority, HCC, Hampshire Police and Crime Commissioner, HBC, PCC, SDNPA, and WCC attended the EIA Working Group meetings.

10.3.8 A further EIA Working Group separate to the Emissions and Transport, and Resilience Working Groups, was held on 17 December 2025 specifically to agree and outline the approach and outcomes of the carbon, CCR and ICCI assessments.

10.3.9 The following overarching themes were covered across the EIA Working Group meetings:

1. Introduction and background to the Proposed Development.

2. Overview of the baseline environment.
3. EIA scoping which included setting out the proposed approach to EIA scoping, providing an overview of the EIA Scoping Report (Document reference 6.2, DCO Volume 6) and seeking feedback on the EIA Scoping Opinion (Document reference 6.2, DCO Volume 6).
4. An overview of the Preliminary Environmental Information (PEI) Report, including setting out the baseline and approach to mitigation, as well as providing an overview of the PEI Report findings.
5. Updates on the approach to development of the design of the Proposed Development.
6. Briefings on the materials to be consulted on, including design and environmental assessment related matters, ahead of the Summer 2022, Summer 2024 and Spring 2025 Consultations.
7. Approach to mitigation, Commitments Register (ES Appendix 5.5 Commitments Register, Volume II (Document reference 6.2, DCO Volume 6)) and associated management plans to be provided with the DCO application.
8. Consultation feedback and updates on scheme development, and design principles following the Summer 2024 Consultation and PEI Report.
9. Updates on EIA progress and development of mitigation, including management plans and the Commitments Register.
10. An overview of the ES, including setting out the baseline and any updates from the PEI Report, as well as providing an overview of the findings of the EIA.

10.3.10 Comments received as part of the EIA Working Groups and matters resolved in relation to carbon and climate change included:

1. Discussion of the option to explore incorporating renewable energy and other emission reduction measures for the Proposed Development. It was confirmed with the Emissions and Transport EIA Working Group that these measures would be considered as part of the design process of the Proposed Development. The agreed primary/tertiary and secondary mitigation measures are outlined in sections 10.4 and 10.9.
2. It was confirmed with the Emissions and Transport EIA Working Group that whole life carbon emissions would be used to determine significance. Additionally, it was confirmed that the assessment would be carried out in line with the Institute of Sustainability and Environmental Professionals (ISEP) (formerly the Institute of Environmental Management and Assessment) guidance [22].
3. The proposed approach to scope out the construction phase from the CCR assessment was originally confirmed with the Resilience EIA Working Group. However, following receipt of the EIA Scoping Opinion, which requested the assessment of this phase, it was confirmed with the Resilience EIA Working Group that the construction phase would be included in the CCR assessment.
4. Mitigation measures were discussed in the Working Groups, and it was noted that finalised and agreed mitigation measures would be presented in the ES. The primary and tertiary, and secondary mitigation measures are outlined in sections 10.4 and 10.9, respectively.

5. Inclusion of the ICCI assessment was discussed with the Resilience EIA Working Group, and it was agreed that an ICCI assessment would be included in the ES.

10.4 Primary and tertiary mitigation

10.4.1 As described in ES Chapter 3 Description of the Proposed Development, Volume I (Document Reference 6.1, DCO Volume 6), a range of measures have been embedded into the Proposed Development design to avoid or reduce environmental effects. Relevant primary mitigation measures for the carbon assessment and CCR assessment are provided below.

Carbon assessment

10.4.2 The PAS 2080:2023 framework [24] notes the importance of embedded mitigation in reducing the carbon emissions from an infrastructure project. The Carbon Reduction Hierarchy [24] contained within the PAS 2080:2023 framework sets out a structure to 'avoid', 'switch', and 'improve' carbon performance, which has been considered throughout the evolution of the design of the Proposed Development.

10.4.3 The carbon assessment has been undertaken on a precautionary basis using the current iteration of the design, which includes incorporation of primary and tertiary mitigation measures as outlined below. Additional commitments and incentives to reduce carbon emissions to as low as reasonably practicable in line with the requirements of the NPSWRI are secured within the Outline Carbon Management Plan (CMP). Details on the measures included within the Outline CMP are provided in section 10.9.

10.4.4 From early design stages, the Applicant has developed a process to identify, evaluate and where feasible implement (or continue to develop) carbon mitigation measures. The process involves the following key steps:

1. Evaluation of project information, based on scope and design information available.
2. Appraisal of whole life carbon emissions and identification of carbon hotspots.
3. Organisation of carbon mitigation opportunities workshops, involving design teams and carbon specialists, to identify carbon mitigation opportunities.
4. Design reviews by designers to evaluate feasibility of proposed mitigation measures and implement where practicable (embed in design), or capture in opportunities register for future evaluation.
5. Supply chain engagement to understand innovative solutions and market readiness, to feed back into the feasibility analysis and implementation process.

10.4.5 This process would be required to be continued through subsequent design stages and to the end of construction of the Proposed Development.

10.4.6 The Proposed Development's carbon strategic objective is to deliver solutions in relation to design, construction and operation of the Proposed Development that are optimal in terms of whole life carbon, and reduce GHG emissions to as low as reasonably practicable, having regard to the UK's climate change commitment of achieving net zero emissions by 2050. This is aligned with the requirements of the

NPSWRI (specifically paragraph 4.4.16) to ensure that *"greenhouse gas emissions are as low as reasonably practicable*".

10.4.7 Primary and tertiary mitigation measures adopted as part of the design of the Proposed Development to reduce carbon emissions include:

1. The pipelines between the Water Recycling Plant (WRP) site and Bedhampton Springs have been designed so that one section utilises Portsmouth Water's pipelines between Bedhampton Springs and Havant Thicket Reservoir (which are subject to a separate planning consent), therefore reducing the quantity of materials, fuel consumption in on-site construction activities and vehicle movements required for the Proposed Development.
2. The implementation of Sustainable Drainage Systems (SuDS) at both the WRP site and the Above Ground Plant (AGP), as set out in the Design Principles Document (Document Reference 5.11, DCO Volume 5), is anticipated to reduce carbon emissions compared to traditional drainage solutions through a reduction of fuel consumption in on-site construction activities and road vehicle movements.
3. Using resources sustainably across the Proposed Development through the development of strategies for the use of natural resources and material. This includes material reuse on-site in accordance with the waste hierarchy, and where practicable the use of sustainably sourced materials that meet technical requirements. Measures to ensure the use of sustainable resources will be secured through a Materials Management Plan and a Site Waste Management Plan, which will be produced by the appointed Contractor prior to the commencement of construction, as secured in the Outline Construction Environmental Management Plan (CEMP) (Document Reference 7.1, DCO Volume 7).

10.4.8 Decommissioning will be subject to the appropriate permits, consents and regulatory environment at the relevant time. Decommissioning works are assumed to follow good industry practice in place at the time of the works and are expected to be similar in nature to those in the Outline CEMP (Document Reference 7.1, DCO Volume 7).

Climate Change Resilience assessment

10.4.9 Resilience to future climate change has been inherently considered in the design of the Proposed Development. The site selection process for the preferred route has been influenced by a range of parameters, including climate change and, in particular, current and future flood risk. A list of primary and tertiary mitigation measures considered as part of the CCR assessment is presented below:

Construction:

1. The Outline CEMP (Document Reference 7.1, DCO Volume 7), contains measures to reduce the impacts of extreme weather events such as heatwaves and flooding, as well as measures to manage temporary drainage during the construction phase to reduce the risk of flooding. This also includes measures such as the monitoring of on-site weather conditions, incorporating a severe weather protocol such as conditions of extreme heat, and scheduling activities based on the weather forecast. The mitigation measures outlined and secured

in the Outline CEMP (Document Reference 7.1, DCO Volume 7) will be carried forward into a detailed CEMP(s). The detailed CEMP(s) will also include provisions and measures specific to extreme weather conditions, such as additional rest breaks during heatwaves.

2. The Contractor will address temporary trench stability by taking a number of factors into account, such as the presence of high groundwater and unstable granular soils. Temporary works will be designed to meet current and short-term conditions, which will take into account foreseeable weather and climate conditions. Any risk assessments compiled during the construction phase will take into account any relevant emergency procedures
3. Construction activities will avoid floodplains where practicable. Where construction activities are required within flood risk zones, the Contractor will be obliged to carry out a flood risk assessment. Additional measures are secured and detailed in the Outline CEMP (Document Reference 7.1, DCO Volume 7), to reduce and manage the consequences of flooding and prevent entrainment of plant and materials in case of flood events, will be employed when working in Flood Zone 2 or 3 to manage site safety and reduce pollution risk during periods of extreme weather. Some of the measures include signing up to the EA flood warning service and storing machinery in hard standing or sufficiently constrained as not to wash away.
4. As set out and secured in the Outline CEMP (Document Reference 7.1, DCO Volume 7), the detailed CEMP(s) will include a Construction Drainage Plan, to be prepared by the Contractor, to manage the quality and quantity of construction stage drainage and reduce the risk of sediment entrainment. The detailed CEMP(s) will also contain measures to ensure that staff and equipment/stores etc remain safe during times of flooding. Some construction activities in the floodplain will be unavoidable, so a safe management plan will be required which will include measures such as signing up to EA flood warning service, monitoring antecedent conditions in rivers, monitoring weather forecasts, and identifying safe routes of dry access.

Operation:

1. All infrastructure assets will be designed to be resilient for the anticipated climate conditions at the end of their operational life, as secured in the Design Principles Document (Document Reference 5.11, DCO Volume 5). This includes meeting requirements on ambient design temperatures, and wind pressures detailed in relevant British Standards
2. The Proposed Development will use materials that provide sufficient thermal protection to mitigate the risk of increased high temperatures, as secured in the Design Principles Document (Document Reference 5.11, DCO Volume 5).
3. For the below-ground components of the Proposed Development, including the underground pipelines, thermal insulation will be afforded, as secured in the Design Principles Document (Document Reference 5.11, DCO Volume 5).
4. Conditions of infrastructure will be monitored by the Contractor in extreme temperature days, and after windy and stormy conditions, to ensure that operating conditions are suitable as secured in the Operational Environmental Management Plan (OEMP) (Document Reference 7.7, DCO Volume 7).

5. The health and safety of workers during the operatives would be governed by a combination of national legislation, industry codes and local practices. This would include the Health and Safety at Work Act 1974 including the Management of Health and Safety at Work Regulations 1999. The Contractor would prepare, comply and maintain all required risk registers, which will include risks from climate hazards.
6. The design of the Proposed Development includes consideration of the management of flood pathways and optimising the use of SuDS, as stated in ES Appendix 19.1 Flood Risk Assessment, Volume II (Document Reference 6.2, DCO Volume 6). This includes climate change allowances to mitigate the impact of flooding from increased precipitation and rain intensity.
7. As secured in the OEMP (Document Reference 7.7, DCO Volume 7), the replacement of worn components will help to maintain the integrity of the Proposed Development, and increase the resilience of assets and infrastructure to climate hazards during its operational phase. During the replacement of components the Contractor will consider, where practicable, sector or technological developments that support long term climate resilience.
8. Finished floor levels at the AGP will be a minimum of 150mm above-ground level, which is in line with standard UK Building Regulations. The Budds Farm WTW has been designed to account for the H++ climate change allowance and therefore has a floor level of 5.38 mAOD, as secured in the Design Principles Document (Document Reference 5.11, DCO Volume 5).
9. A key measure to ensure resilience of the Proposed Development during drought conditions is the incorporation of a minimum flow of 10Ml/d of recycled water. This will ensure that all mechanical and electrical equipment critical to the operation of the Proposed Development (e.g. pumps and the WRP itself) are left running and in a condition ready to be called upon during the onset of drought. This reduces the risk of failure associated with equipment being left idle outside of drought conditions.
10. The use of Havant Thicket Reservoir provides inherent resilience during a drought, in terms of water storage and availability (approximately 100 days of supply). The WRP site provides further resilience by increasing inflow into the reservoir during drought conditions.
11. In periods of drought conditions, there may be an elevated risk of fire associated to higher temperatures across Hampshire and the South East of England, however measures secured in the OEMP (Document Reference 7.7, DCO Volume 7). This includes undertaking site-specific wildfire risk assessments and the production of an Emergency Response plan which include emergency procedures to be followed in the event of a wildfire affecting the Proposed Development, coordination with Fire and Rescue Services, and post-incident recovery actions.

Decommissioning:

1. Decommissioning will be subject to the appropriate permits, consents and regulatory environment at the relevant time. Decommissioning works are assumed to follow good industry practice in place at the time of the works and are expected to be similar in nature to those in the Outline CEMP (Document Reference 7.1, DCO Volume 7).

In-combination Climate Change Impact assessment

10.4.11 Relevant primary and tertiary mitigation measures for the ICCI assessment are presented within the mitigation sections in the other topic chapters of the ES (ES Chapters 6 to 19, Volume I (Document Reference 6.1, DCO Volume 6)).

10.5 Assessment methodology

Scope of assessment

10.5.1 Likely significant effects requiring assessment may be temporary or permanent direct, indirect, secondary, cumulative, in-combination, beneficial and adverse and may occur during construction, operation, and decommissioning. Likely significant effects on carbon and climate change receptors within the scope of the assessment are summarised in Table 10-6. The scope of the assessment has responded to feedback received as detailed in section 10.3.

10.5.2 The impact of climate change on the Proposed Development during decommissioning is expected to be greater than during the construction phase, therefore, the decommissioning phase is explicitly considered as part of the CCR assessment as detailed in section 10.8. The carbon and ICCI assessments also include a high-level assessment of the decommissioning phase. Refer to ES Chapter 3 Description of the Proposed Development, Volume I (Document Reference 6.1, DCO Volume 6) for additional information on decommissioning.

10.5.3 Cumulative effects are those resulting from the interrelationship between the Proposed Development and other developments (inter-project). These are reported within ES Chapter 20 Cumulative and in-combination effects, Volume I (Document Reference 6.1, DCO Volume 6).

10.5.4 In-combination effects are those that result from the interaction of individual effects combined together on a single receptor or resource at a single point in time.

10.5.5 Where the in-combination effects for carbon and climate change are inherently assessed, these are reported within section 10.8. However, where a receptor is affected by multiple topics and there is the potential for likely significant in-combination effects to occur, these aggregated effects are reported within ES Chapter 20 Cumulative and in-combination effects, Volume I (Document Reference 6.1, DCO Volume 6). There are no in-combination effects related to the carbon or CCR assessments. ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6), examines how predicted impacts identified in other topics chapters may be exacerbated or mitigated by future climate change. It therefore addresses the in-combination effects of climate change and the Proposed Development on the surrounding environmental receptors.

10.5.6 Table 10-6 sets out the summary of the scope for the assessment in this chapter. All scoped out elements as agreed in the EIA Scoping Opinion are confirmed in ES Appendix 5.3 Response to EIA Scoping Opinion, Volume II (Document Reference 6.2, DCO Volume 6).

Table 10-6 Summary of the scope for carbon and climate change assessment

Sub-topic	Construction	Operation	Decommissioning
Carbon assessment	Scoped in	Scoped in	Scoped in
CCR assessment	Scoped in	Scoped in	Scoped in
ICCI assessment	Scoped in	Scoped in	Scoped in

Study area

10.5.7 This section describes the spatial scope (the area which may be impacted) for the assessment as it applies to carbon and climate change.

Carbon assessment

10.5.8 All emissions of carbon (as GHGs) affect the same receptor, the global atmosphere. Emissions released from activities associated with the Proposed Development would have an effect on atmospheric carbon concentration, and a subsequent effect on climate change regardless of where they occur. Therefore, the study area of the carbon assessment is not geographically defined.

10.5.9 The study area for the carbon assessment considers activities associated with the Proposed Development including the following principal components:

1. WRP site
2. Pipelines between Budds Farm WTW and the WRP site
3. Pipelines between the WRP site and Bedhampton Springs
4. Pipeline between the WRP site and Otterbourne Water Supply Works (WSW)
5. AGP

10.5.10 The scope of the carbon assessment includes the quantification of carbon emissions arising from the components of the Proposed Development listed above across their full lifecycle. This includes the construction and operational phases, and a high level estimate of emissions during decommissioning. The assessment encompasses direct sources such as fuel and electricity consumption in plant and equipment owned by the Applicant, and upstream sources such as upstream emissions from the sourcing, manufacturing, and transport of construction materials, and the use of chemicals obtained from the supply chain.

10.5.11 As outlined in Table 10-5, cumulative effects of carbon emissions from other projects was scoped out of the assessment. It has however been identified that there will be some minor connection works that link the Proposed Development to existing infrastructure operated by the Applicant have been included in the GHG assessment, these include:

1. Budds Farm Final Effluent Channel
2. Eastney Transfer Tunnel
3. PW Bedhampton Springs Valve slab
4. Otterbourne WSW

10.5.12 Potential emissions arising from these minor connection works, as well as utility connections, have been accounted for in the carbon assessment through the

inclusion of an uncertainly factor, as discussed in ES Appendix 10.1 Carbon assessment methodology, Volume II (Document Reference 6.2, DCO Volume 6).

Consideration of indirect greenhouse gas emissions

10.5.13 Following the UK Supreme Court ruling in the case of *R (Finch) v Surrey County Council* [2024] UKSC 20, the assessment has considered the potential for a pathway to exist between the Proposed Development and indirect greenhouse gas emissions. In undertaking this assessment, two potential sources of downstream indirect greenhouse emissions have been considered (no upstream indirect greenhouse emissions were identified):

1. Emissions arising from additional infrastructure developments, in connection with the Proposed Development.
2. Emissions associated with upgrades to existing infrastructure, in connection with the Proposed Development.

10.5.14 Some downstream impacts have been identified in relation to the Proposed Development. These relate to existing infrastructure assets that require minor improvements or upgrades as a direct result of the Proposed Development. The upgrades include utility connections required for the Proposed Development, increased fencing and security measures, and the installation of additional CCTV infrastructure, including new masts.

10.5.15 The Applicant has also considered whether any additional pathways to indirect greenhouse gas emissions arise as a result of the Proposed Development, such as the potential for downstream emissions from the consumption of water made available by the Proposed Development. Such potential emissions have not been included in the assessment because no causal connection can be made from the provision of water resources from the Proposed Development to any further activities associated with the use and consumption of that resource. It is unknown how water provided by the Proposed Development would be used, including whether it could be distributed for residential, commercial or industrial purposes, and no such causality can be established whether on a regional or national basis. Accordingly, no additional impact pathways to indirect effects has been established beyond those listed at paragraph 10.5.13.

Climate Change Resilience assessment

10.5.16 The CCR assessment evaluates the vulnerability and resilience of the Proposed Development to the impact of climate change. Therefore, the study area for the CCR assessment is geographically bounded by the area within the Order Limits, and includes all the infrastructure and assets associated with the Proposed Development.

10.5.17 Details of the location of the Proposed Development and the associated assets and infrastructure are set out within ES Chapter 3 Description of the Proposed Development, Volume I (Document Reference 6.1, DCO Volume 6).

In-combination Climate Change Impact assessment

10.5.18 The study area for the ICCI assessment is based upon the extent of the study areas defined in other topic chapters of the ES (ES Chapters 6 to 19, Volume I (Document Reference 6.1, DCO Volume 6)).

Assessment scenarios

10.5.19 ES Chapter 5 EIA approach and methodology, Volume I (Document Reference 6.1, DCO Volume 6), provides an overview of the Proposed Development's approach to the temporal scope (the timescales over which impacts may occur) of the EIA. This section describes the temporal scope for the assessment as it applies to the carbon and climate change.

10.5.20 The temporal scope of the carbon, CCR and ICCI assessments include the construction phase, which is anticipated to be approximately five years starting from 2028. The Proposed Development is anticipated to have an operational lifetime of a minimum of 100 years, however assets and infrastructure that reach the end of their design life would be replaced during this period, and emissions from these activities have been considered as part of the operational phase assessment. Decommissioning would take place after the operational phase, although the timescales for these activities is currently unknown. For the purposes of the assessment, decommissioning is assumed to take place straight after the 100-year operational phase.

Carbon assessment

10.5.21 Carbon emissions have been an inherent component of the decision-making and design process for the Proposed Development. The Proposed Development has been designed with consideration of the PAS2080 [24], UKWIR 2012 and 2022 guidance [25] [26], EN15804 [27] and Green book supplementary guidance [28] as detailed in section 10.2.

10.5.22 Assessment scenarios in carbon terms have been formed upon comparing the outcomes of the assessment to the baseline 'Do Nothing' scenario, in line with the recommended approach in Section 5 of the ISEP guidance [22].

10.5.23 The Proposed Development is required to address a water supply deficit during both normal and drought conditions, while responding to changes to abstraction licences on the Rivers Test and Itchen, and developing capacity to address future forecasts for water resource deficits in the region. Therefore, unlike other conventional carbon assessments in EIA, the development of representative 'Do Nothing' scenarios to determine and assess the likely significant effects on carbon emissions is subject to a number of uncertainties. 'Do Nothing' scenarios for the purposes of the carbon assessment can be formed on a geographical basis (i.e. activities without the Proposed Development within the Order Limits) or on an activity basis (i.e. emissions from current activities that the Proposed Development would replace).

10.5.24 On a geographical basis, there would be a level of emissions associated with activities within the Order Limits from existing land use, including residential properties, community facilities, commercial property and agricultural land as detailed in ES Chapter 12 Land use and agriculture, Volume I (Document

Reference 6.1, DCO Volume 6). Due to the wide variety of activities over a large spatial area, existing emissions from these forms of land use cannot be quantified, therefore the baseline scenarios were derived on an activity basis.

10.5.25 On an activity basis, the Proposed Development is required to address a water supply deficit during both normal and drought conditions. As set out in the Government's Water Resources Planning Guidance 2023, the Applicant is required to plan for how it will provide water in drought conditions, including up to a 1-in-500 year (extreme) drought as part of its water resource planning statutory obligations. The need to address the water supply deficit in an extreme drought has defined the maximum flows and output of the Proposed Development. As noted in paragraph 10.5.23, existing activities that would be replaced by the Proposed Development include abstractions on the Rivers Test and Itchen.

10.5.26 Emissions from these activities are accounted for as part of the Applicant's current emissions, as reported in section 10.7. It is not however possible to disaggregate emissions from these specific abstraction activities that the Proposed Development would replace. Therefore, if the Proposed Development is not constructed, an alternative development may be brought forward to address future water resource deficits in the region, which would result in the release of carbon emissions.

10.5.27 ES Chapter 4 Consideration of alternatives, Volume I (Document Reference 6.1, DCO Volume 6), provides an overview of the evolution of the Proposed Development, and a description of alternatives considered by the Applicant. This included a range of infrastructure solutions, based upon desalination, water recycling and water transfer configurations. An options appraisal process was undertaken to evaluate each of the options, where a comparison to a range of key strategic objectives was undertaken. The expected levels of carbon emissions were one of the criteria used to evaluate each of the options, and specifically whether the option was likely to support the Applicant's emission reduction targets. Initially, the Applicant reviewed nine options in as part of its Regulators' Alliance for Progressing Infrastructure Development (RAPID) Gate 1 submission, which were further refined to six options at RAPID Gate 2.

10.5.28 An overview of expected whole life carbon emissions associated with each of the options considered at the RAPID Gate 2 stage is provided in Table 10-7. It should be noted that carbon emissions for each option were estimated from data available at the time of the assessment, and the configuration and capacity required for the Proposed Development was amended as the design and requirements for the Proposed Development evolved. Therefore, the figures presented in Table 10-7 are for comparison purposes only between different options and configurations that were considered at the time of assessment.

Table 10-7 Estimation of whole life carbon emissions for the RAPID Gate 2 stage

Configuration type	Option no.	Option name	Normal operating scenario (tonnes CO_2e)	Maximum operation scenario (tonnes CO_2e)
Desalination	A.1	75 Ml/d Deployable Output (DO) desalination at Fawley direct to Testwood WSW	746,364	2,115,305

Configuration type	Option no.	Option name	Normal operating scenario (tonnes CO_2e)	Maximum operation scenario (tonnes CO_2e)
	A.2	61 Ml/d DO desalination at Fawley direct to Testwood WSW	Same as A1	Same as A1
Water recycling	B.2	61 Ml/d DO recycled water sent to Environmental Buffer Lake (EBL) and treated at Otterbourne WSW (WRP supplied by Budds Farm WTW)	362,448	872,257
	B.5	75 Ml/d DO recycled water sent to EBL and treated at Otterbourne WSW (WRP supplied by Budds Farm WTW and Peel Common WTW).	Slightly higher than B2	Slightly higher than B2
Havant Thicket Reservoir Transfers	B.4	75 Ml/d DO transfer between Havant Thicket Reservoir and Otterbourne Water Supply Works (augmented with a 15 Ml/d WRP to supplement Havant Thicket Reservoir);	194,835	363,231
	D.2	61 Ml/d DO – raw water transfer from Havant Thicket Reservoir to Otterbourne Water Supply Works	55,271	98,291

10.5.29 Option D.2 was estimated to have the lowest level of carbon emissions, however during the options appraisal process, it was determined that this option could not be scaled up to meet a possible increase in capacity, and therefore was discounted from further consideration. Of the remaining options, B.4 was estimated to have the lowest level of emissions, and would be around 17% and 41% of total emissions compared to the desalination and water recycling options under the maximum operating scenario.

10.5.30 Following this options appraisal process, Option B.4 was selected as the most favourable option, which was used as a basis for the design of the Proposed Development. Therefore, it can be evaluated that the design of the Proposed Development already represents a lower carbon outcome than many of the alternative options that could address the water supply deficit. Justification for selecting Option B.4 are provided in ES Chapter 4 Consideration of alternatives, Volume I (Document Reference 6.1, DCO Volume 6).

10.5.31 Given the uncertainties in estimating emissions for the 'Do Nothing' scenario on a geographical or organisational basis, a precautionary approach was adopted which assumed that the 'Do Nothing' baseline emissions scenario is zero tonnes CO_2 equivalent (CO_2e) per year. However, when contextualising the outcomes of the assessment, reference was made to the selection of the Proposed

Development from the options appraisal process, which forms a lower carbon option to feasible alternatives that could have been taken forward to address future forecasts for water resources deficits in the region.

Climate Change Resilience assessment

10.5.32 The latest UKCP dataset [2] uses emission scenarios known as RCPs (Representative Concentration Pathways), which are based on those used in the Intergovernmental Panel on Climate Change's 'Fifth Assessment Report' [29]. These RCPs relate to GHG concentrations that would achieve specific levels of radiative forcing (a term which refers to the amount of energy that enters the Earth's atmosphere) at the top of the atmosphere by 2100, relative to pre-industrial levels.

10.5.33 Data from three RCPs, RCP2.6, RCP4.5 and RCP8.5, have been utilised in the CCR assessment and additional information with respect to these RCPs are provided in Table 10-12. These RCPs cover a range of emission scenarios over the 21st century, with RCP 8.5 representing a high emissions scenario. Climate change projection data has been accessed for time slices representing the 2030s, 2060s, 2080s and 2099 (where available). Additional information on these scenarios is provided in section 10.7 and paragraph 10.7.31. These scenarios cover the construction and operational phases of the Proposed Development, where climate projection data is available, and have been used to inform the climate variables and hazards considered in the assessment.

10.5.34 As previously described, decommissioning activities are expected to occur after 2100, which is the maximum period for which climate change projection data is available in the UKCP dataset. Due to the high degree of uncertainty in projections beyond this date, climate projections for the decommissioning phase beyond 2100 have not been included in the assessment. The available UKCP dataset climate projections detailed in section 10.7 is assumed to be representative of 2100 and beyond for the decommissioning phase.

In-combination Climate Change Impact assessment

10.5.35 The temporal scope of the ICCI assessment includes the duration of the construction and operation phases as set out in ES Chapter 3 Description of the Proposed Development, Volume I (Document Reference 6.1, DCO Volume 6). The decommissioning phase is also considered at a high level in the ICCI assessment.

Baseline methodology

Desk study

10.5.36 Baseline data collection has been undertaken to obtain information across the study area. This section provides the approach to collecting baseline data.

10.5.37 The following data sources have been accessed to inform the baseline with respect to carbon and climate change (see Table 10-8).

Table 10-8 Data sources used to inform the carbon and climate change assessment

Source of data	Assessment	Baseline data
Applicants RAPID Gate 3+ Carbon Modelling for the Proposed Development	Carbon assessment	Carbon modelling data undertaken for the Proposed Development (accessed June 2025)
Southern Water Net Zero 2050 Plan 2021 [30] Southern Water, 2023 – 2024 Annual Report [31]	Carbon assessment	The Applicant's annual emissions and emission reduction targets (accessed April 2025).
UK Carbon Budget Orders (2009, 2011, 2016, 2021) [32] [33] [34] [35]	Carbon assessment	National carbon budgets used to contextualise emissions from the Proposed Development (accessed April 2025)
Climate Change Committee (formerly Committee on Climate Change) (CCC), The Seventh Carbon Budget, Advice to the Government [36]	Carbon assessment	Recommended limit for the Seventh Carbon Budget, used to contextualise emissions from the Proposed Development from 2037 – 2042.
2022 DESNZ GHG Emissions National Statistics [37]	Carbon assessment	Annual estimates of national, regional, and sectoral GHG emissions in the UK (accessed August 2024)
The Met Office's UKCP [2]	Carbon assessment	Historical climate records and climate projections for the UK and by region (accessed August 2024)
The Met Office Thorney Island Climate Data 2022 [38]	Carbon assessment	Historical Thorney Island Climate Data (accessed June 2025)
Defra UK Climate Change Risk Assessment 2022 [4]	Carbon assessment	Key climate change risks and opportunities across the UK (accessed August 2024)
Relevant local planning authorities, as detailed in Table 10-3	Carbon and CCR assessments	Local planning authority core strategy/local plans (accessed April 2025)

10.5.38 The carbon assessment has been informed by optioneering and carbon modelling undertaken by the Applicant during the design of the Proposed Development. Additional details of data sources used for the carbon assessment are presented in ES Appendix 10.1 Carbon assessment methodology, Volume II (Document Reference 6.2, DCO Volume 6).

Assessment methodology

10.5.39 The general approach to assessment is set out in ES Chapter 5 EIA approach and methodology, Volume I (Document Reference 6.1, DCO Volume 6). However, topic-specific methodologies based on the guidance documents identified in section 10.2, are adopted for the carbon, CCR and ICCI assessments. As a result, the approach to study areas, baseline characterisation, and impact assessment differs from the general approach to the assessment presented in ES Chapter 5 EIA approach and methodology, Volume I (Document Reference 6.1, DCO Volume 6). The carbon and CCR assessment methodologies are summarised in this

section and detailed in ES Appendix 10.1 Carbon assessment methodology, Volume II (Document Reference 6.2, DCO Volume 6) and ES Appendix 10.2 Climate change resilience assessment methodology, Volume II (Document Reference 6.2, DCO Volume 6), respectively. The ICCI assessment methodology is detailed in ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.1, DCO Volume 6).

Carbon assessment

Approach

10.5.40 The approach to the carbon assessment has been undertaken in accordance with ISEP guidance [22] and other standards detailed in section 10.2.

10.5.41 The term 'carbon' used within this chapter includes a range of GHGs including carbon dioxide (CO_2) and the six other gases as referenced in the Kyoto Protocol (methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3) which was incorporated into the second Kyoto Protocol compliance period in 2012. Where practicable, the results of the carbon assessment are expressed in units of CO_2e which recognises that different gases have notably different global warming potential. It is likely that primary emissions from the emissions sources are associated with the release of CO_2, CH_4 and N_2O, but emission factors in the units of CO_2e which encompass all GHGs have been used where practicable.

10.5.42 The carbon modelling undertaken by the Applicant has been carried out in alignment with the RAPID gated process [39], which was established through the partnership of three water regulators; The Water Services Regulation Authority (Ofwat), the EA and the Drinking Water Inspectorate, to facilitate the development of the whole-life carbon of the Proposed Development. This includes consideration of emissions across the lifecycle of the Proposed Development.

10.5.43 Carbon emissions during the construction phase of the Proposed Development arise from activities associated with the implementation of the principal components listed in paragraph 10.5.9 and supporting infrastructure such as temporary construction compounds and roads. The emission sources included as part of the construction phase assessment include embodied carbon in materials, fuel consumption by road vehicles and construction plant and equipment, and waste disposal.

10.5.44 Carbon emissions have also been quantified from operational activities associated with the Proposed Development, and any required maintenance or replacement of assets across the 100-year operational phase. Operational phase emissions were calculated form the following sources:

1. Power consumption from the grid, based on a 24 hour operation
2. Regular transport activities (e.g. treatment chemical deliveries)
3. Operational material use (e.g. chemical use in water treatment)
4. Maintenance activities, including annual/regular routine operational maintenance activities for civil works and mechanical, electrical, instrumentation, controls and automation assets

10.5.45 A high-level estimation of carbon emissions from decommissioning activities associated with the Proposed Development has been undertaken. The decommissioning phase assessment includes activities such as the capping of the main pipelines, the demolition of the WRP site and AGP, and backfilling of the demolished footprint to produce a consistent level surface.

Emission calculations

10.5.46 Carbon emissions have been quantified by multiplying the activity data and a corresponding emission factor. The term 'activity data' refers to quantitative measurement of specific activities that generate emissions within a defined range (e.g. kg of materials, km driven, kW of electricity consumed). An 'emission factor' represents the mass of emissions produced per unit of activity.

10.5.47 Emission calculations have been carried out using carbon models that have been developed using standard designs for the industry, and supplier information for products and materials. Additional details of the data sources of the model and the emissions factors are outlined in ES Appendix 10.1 Carbon assessment methodology, Volume II (Document Reference 6.2, DCO Volume 6).

Assessment criteria

Receptor sensitivity

10.5.48 Carbon emissions are not confined to specific geographical locations. They exert a global impact rather than affecting local receptors that could be assigned a sensitivity level. Consequently, the receptor for the carbon assessment is the global atmosphere, an approach which is in alignment with the ISEP guidance [22]. As such, it is affected by all global sources of GHGs, and is therefore considered to be of 'high' sensitivity to additional emissions.

Impact magnitude

10.5.49 The impact of carbon emissions are, by nature, global and long-term with low reversibility, owing to the long atmospheric lifetime of GHGs and their prolonged effect on the climate system. The magnitude of emissions is defined as the difference between the 'Do Nothing' scenario and emissions arising from the Proposed Development. The ISEP guidance [22] however states that "*it is essential to provide context for the magnitude of GHG emissions reported in the EIA in a way that aids evaluation of these effects by the decision maker*". Context for how significance of effects for the carbon assessment is provided in the section below.

Significance criteria

10.5.50 The ISEP guidance [22] states:

"when evaluating significance, all new GHG emissions contribute to a negative environmental impact; however, some projects will replace existing development or baseline activity that has higher GHG profile. The significance of a project's emissions should therefore be based on its net impact over its lifetime, which may be positive, negative or negligible".

10.5.51 The ISEP guidance recommends that significance criteria align with the Paris Agreement, the UK Carbon Budgets up to 2042 and Net Zero commitments and states:

"The crux of significance is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050" [22].

10.5.52 The ISEP guidance provides relative significance descriptions to assist assessments, specifically in the EIA context. Section VI of the updated ISEP guidance [22] describes five distinct levels of significance which are not solely based on whether a project emits the carbon emissions alone, but how the project makes a relative contribution towards achieving a science-based 1.5°C aligned transition towards Net Zero. The significance levels are presented in Table 10-9.

Table 10-9 Assessment significance criteria, as accessed from the ISEP guidance [22]

Source	Summary
Major adverse	A project's carbon impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK trajectory towards Net Zero.
Moderate adverse	A project's carbon impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements that would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK trajectory towards Net Zero.
Minor adverse	A project's carbon impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with the measures necessary to achieve the UK trajectory towards Net Zero.
Negligible	A project's carbon impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such as radical decarbonisation or Net Zero is achieved well before 2050. A project with negligible effects provides carbon performance that is well 'ahead of the curve' for the trajectory towards Net Zero and has minimal residual emissions.
Beneficial	A project's net carbon impacts are below zero and it causes a reduction in atmospheric GHG concentration, 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.

10.5.53 To determine the likely significance of effects, carbon emissions arising from each phase of the Proposed Development have been evaluated as to whether the Proposed Development would affect national carbon emissions, and the Applicant's ability to meet its emission reduction targets. This aligns with the requirements of the NPSWRI, in particular paragraph 4.4.11 which states "*While it is unlikely that any emissions increase from an individual development of water resources infrastructure will materially affect the government's ability to meet its*

emissions targets, the applicant should provide evidence of the climate impact of the development and an assessment of emissions associated with construction and operation against the water company's ability to deliver its contribution to the government's targets and commitments." Contextualisation of the outcomes of the assessment was also carried out, with reference to the 'Do Nothing' scenario and consideration of carbon emissions associated with alternative options for the Proposed Development.

10.5.54 For this assessment, major and moderate adverse, and beneficial effects are deemed to be significant, in accordance with the ISEP guidance [22].

Climate Change Resilience assessment

10.5.55 The methodology used for the CCR assessment follows ISEP guidance, Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation [23]. This approach differs from the general EIA approach presented in ES Chapter 5 EIA approach and methodology, Volume I (Document Reference 6.1, DCO Volume 6), as mentioned in paragraph 10.5.39.

10.5.56 The purpose of this assessment is to assess the vulnerability and resilience of elements associated with the Proposed Development to climate change. Considering its 100-year operational lifespan, climate change impacts are considered to be most likely to occur during the operational phase of the Proposed Development.

10.5.57 The Proposed Development may be exposed to various climate hazards, which are extreme weather events and chronic climate changes that could harm human, environmental, or infrastructure receptors [23]. Exposure to climate hazards could result in physical damage to infrastructure and components or adverse working conditions during construction and maintenance activities. Climate change risks refer to the potential impacts of climate hazards on the ability of an element to maintain its function or purpose, which could lead to adverse ecological or human consequences [23].

10.5.58 The methodology for the CCR assessment is provided in ES Appendix 10.2 Climate change resilience assessment methodology, Volume II (Document Reference 6.2, DCO Volume 6). The methodology follows a risk based procedure, identifying vulnerable receptors to climate hazards that could arise during the construction, operational and decommissioning phases of the Proposed Development.

10.5.59 The assessment considers the likelihood that various climate hazards would occur, as well as the consequences to the identified receptors associated with the Proposed Development if the climate hazard were to occur. The likelihood/consequence matrices used in the assessment are based on professional judgement and standard industry risk assessment criteria.

10.5.60 The methodology involves a three-step approach:

1. Step 1 includes identifying climate variables, hazards and receptors vulnerable to climate change associated with the Proposed Development.
2. Step 2 involves conducting a climate vulnerability assessment for the identified receptors using a likelihood/consequence matrix. Where climate risks are identified as 'low' in the matrix, the resilience of the Proposed Development is

considered to be 'high', and the effects are considered to be not significant in EIA terms. Any climate risks identified in Step 2 as 'medium' or 'high' are considered in Step 3 of the assessment.

3. Step 3 includes the identification of secondary mitigation measures and the assignment of a residual risk rating. In this case, the significance of effects is determined based on the risk rating identified in Step 2, and the resilience rating identified in Step 3.

In-combination Climate Change Impact assessment

10.5.61 The methodology for the ICCI assessment is aligned with best practice set out in ISEP guidance, Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation [23], which differs from the general EIA approach detailed in ES Chapter 5 EIA approach and methodology, Volume I (Document Reference 6.1, DCO Volume 6), as mentioned in paragraph 10.5.39.

10.5.62 The ICCI assessment considers how climate change, (with reference to the projection data detailed in section 10.7), may affect predicted impacts from the Proposed Development identified by other technical topics of the ES (ES Chapters 6 to 19, Volume I (Document Reference 6.1, DCO Volume 6)). The potential for ICCI effects are assessed based on the nature of impact, identified receptors, and pathways related to climate change hazards. The detailed methodology is presented in ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6).

10.6 Assumptions and limitations

10.6.1 As the Proposed Development is not replacing infrastructure with similar 'outcomes', defining the baseline or 'Do Nothing' scenario has inherent uncertainties. Therefore, to provide a precautionary assessment, the 'Do Nothing' scenario for the carbon assessment has been defined as having zero emissions.

10.6.2 For the carbon assessment, there are uncertainties that need to be accounted for due to the evolving nature of carbon accounting practices and activity data used to inform the carbon modelling. Full details and assumptions adopted as part of the carbon modelling to inform the assessment are provided in ES Appendix 10.1 Carbon assessment methodology, Volume II (Document Reference 6.2, DCO Volume 6).

10.6.3 With respect to the carbon assessment, the main decommissioning activities would take place beyond 2100, where it is likely that many sectors in the UK such as transport and waste disposal would be decarbonised. Therefore, an estimation of emissions during the decommissioning phase is subject to a number of limitations on the detailed information that can be available at the time of the assessment. An assessment of carbon emissions during decommissioning of the Proposed Development has been carried out, however it should be noted that the outcomes are a high level estimate based on information known at the time of assessment.

10.6.4 There is also uncertainty caused by the level of design information available at the time of assessment. This uncertainty has been estimated using Royal Institution of Chartered Surveyors guidance [40], and a risk review of the cost estimate that was produced in parallel with the carbon assessment. Additional details on the

uncertainty associated with the carbon assessment is outlined ES Appendix 10.1 Carbon assessment methodology, Volume II (Document Reference 6.2, DCO Volume 6).

10.6.5 Whilst the DCO does not specify a maximum depth of the Pipeline or foundations at the WRP site and AGP sites, the conclusions in this chapter still represent a reasonable worst case assessment. This is on the basis that an unspecified depth of the Pipeline would require such a substantial increase in emissions to result in a situation which could preclude the UK Government from meeting its relevant UK Carbon Budgets. This is unlikely, based on the emissions associated with the construction of the Pipeline and AGP sites using the depths set out in ES Chapter 3 Description for the Proposed Development, Volume I (Document Reference 6.1, DCO Volume 6).

10.6.6 The CCR assessment has been informed by a climate modelling exercise using the future climate projection data from the UKCP database [2] within the study area. The climate change projection data depends on current and future global GHG emissions, which are uncertain. The RCP scenarios consider various assumptions based on future population dynamics, economic development and international targets for reducing GHG emissions. The three RCP scenarios (RCP2.6, RCP6.0, and RCP8.5) presented in this chapter are considered the most likely to occur over the lifespan of the Proposed Development. However, it is important to note that the scientific community cannot reliably determine which scenario of GHG emissions is most likely.

10.6.7 As climate change projections inherently involve uncertainty, the data provided by UKCP adopts a probabilistic approach using distributed models. The output of these models includes values representing the 10th, 50th and 90th percentiles, which encompass the range of uncertainty and are therefore presented in this chapter to account for the inherent variability of the projections.

10.6.8 The CCR assessment requires climate projection data beyond 2100 to determine the climate conditions during the decommissioning phase. However, the UKCP climate projection data is limited to the year 2099. Therefore, the available UKCP climate projection data up to 2099 is assumed to be representative of 2100 and beyond for the decommissioning phase in the CCR assessment.

10.7 Baseline conditions

10.7.1 To provide an assessment of the likely significant effects of the Proposed Development (in terms of carbon and climate change), it is necessary to identify and understand the baseline conditions in the study area. This provides a reference point against which potential changes in carbon and climate change can be assessed.

Current baseline

10.7.2 Baseline information for each of the study areas for the carbon, CCR and ICCI assessments is set out below.

Carbon emissions

National baseline emissions

10.7.3 Over the lifespan of the Proposed Development, UK emissions are anticipated to reduce as a result of the decarbonisation of many sectors. While a specific pathway for reducing emissions to 2050 and beyond is not yet available, Carbon Budgets have been published up to 2042. These budgets set a cap on the total amount of GHGs the UK can emit over a five-year period. The Sixth Carbon Budget (for the period 2033-2037) is enshrined in UK law by the Carbon Budget Order 2021. In February 2025, the CCC published the Seventh Carbon Budget (for the period 2038-2042), however the UK Government is yet to incorporate the Seventh Carbon Budget into law.

10.7.4 The most recent available GHG emission figures for the UK are the 2024 provisional GHG emissions [41]. The net territorial GHG emissions were estimated to be 371 million tonnes of CO_2e which is a reduction of 3% compared to emissions in 2023, and 54% from 1990. The largest sectors within the UK by emissions contribution are 'Domestic transport' and 'Buildings & product uses' [41].

10.7.5 It is unclear where the water sector sits within the sectors set out in the DESNZ greenhouse gas emissions statistics [42], and the Government has not published sectoral budgets, however Water UK reports emissions from the sector each financial year (1 April – 31 March). The latest available figures from Water UK show that emissions from the sector were approximately 2.5 or 1.6 million tonnes of CO_2e in the 2020 – 2021 financial year, depending on the calculation methodology[1] [42]. These are emissions within the organisational boundary adopted by the sector to calculate GHG emissions, which is defined by the 'appointed business' as per the sector's regulatory framework [43]. This boundary is used for financial reporting and for scoping GHG emissions and is standardised across all water companies. The organisational boundary includes *"gross operational emissions"* and takes into account *"any additional emissions data … being gathered at the discretion of the water company"* [43].

10.7.6 Operational GHG emissions within the water sector are also reported as part of Ofwat's annual Water Company Performance Report. Net GHG emissions are reported using a net location-based approach that includes emission reductions through the export of renewables and biomethane [44]. Emissions in the 2022-2023 financial year within the water sector, as reported in the Water Company Performance Report were approximately 1.2 million tonnes of CO_2e [44].

10.7.7 Whilst emissions from the Water sector were not explicitly used to determine likely significance of effects, they have been provided in this section to provide context for the outcomes of the assessment.

The Applicant's emissions

10.7.8 The Applicant has established emission reduction targets which are outlined in the Our Net Zero Goal [30] document. An interim target has been established to reduce

[1] The GHG Protocol and Defra recommend that GHG emissions are reported for both Market-based and Location-based methodologies. The Market-based approach reflects decisions made by the organisation to purposefully choose its electricity supply, whereas the Location-based method reflects the average emission intensity of the grid where the consumption occurs

Scope 1 and 2 emissions by 35% from a baseline of 2022-2023 by 2035, with an overall emission reduction target of Net Zero by 2050. The interim target takes into account the forecast that emissions will increase by nearly 10% during the business plan period of 2025-2030, which is attributed to population growth [30]. Additionally, the interim target relies on the anticipated decarbonisation of the UK grid. It should be noted that the targets set out in the Our Net Zero Goal document are for the corporate entity of the Applicant, and not specifically for the Proposed Development. Therefore, the outcomes of the significance assessment presented in this chapter are based on the UK's statutory carbon budgets.

10.7.9 The Applicant reports emissions associated with its annual operations. The Applicant's emissions can be categorised into three scopes as follows [45]:

1. Scope 1 - "are direct emissions that are produced from our sites and assets such as process emissions, our vehicle fleet and fuels used on site".
2. Scope 2 – "emissions are indirect energy emission from the generation of electricity provided by energy suppliers."
3. Scope 3 – "are indirect emissions such as the transport and energy emissions from our operational contractors and the emissions associated with the efficiency of electricity distribution".

10.7.10 Emissions for the 2020 – 2021 financial year, which were reported as part of the Applicant's Net Zero Plan, were 91 kilotonnes (kt) of CO_2e. Within this emissions total, 70% were direct emissions from the Applicant's sites and assets (Scope 1), 10% were emissions from purchased electricity from the grid (Scope 2), and 20% were indirect emissions (Scope 3) [45]. Scope 2 emissions were calculated based on the market-based approach, accounting for the carbon benefit from the company's purchase of renewable energy from suppliers [45].

10.7.11 The 2023-24 Annual Report [31] contains the most recent annual emissions total for the Applicant. The figures presented on page 86 of 2023-24 Annual Report [31] are the latest annual emission totals for the Applicant and are part of its Streamlined Energy and Carbon Report, which are replicated in Table 10-10.

Table 10-10 Applicant's greenhouse gas emissions for the 2023-2024 financial year

Scope	Description	Included in scope	2023 – 24 emissions (kt CO_2e)
Scope 1	Direct emissions from activities that the company own or control including combustion of fuel	Gas oil use, process emissions, company transport	63.8
Scope 2	Indirect emissions from purchase of electricity (location-based)	Grid electricity	88.4
Scope 2	Indirect emissions from purchase of electricity (market-based)	Grid electricity	140.3
Scope 3	Other indirect emissions	Business travel on public transport/private vehicles, outsourced activities, grid electricity	253.8

Scope	Description	Included in scope	2023 – 24 emissions (kt CO_2e)
		transmission and distribution, purchased chemicals, waste disposal, purchased fuels: extraction, production, transmission and distribution, embedded emissions, and purchased goods and services.	
Total Scope 1 and 2 Emissions	***Location base approach***		152.2
	Market based approach		204.1
Total Scope 1, 2 and 3 Emissions	***Location based approach***		406.0
	Market based approach		457.9

10.7.12 As stated in paragraph 10.5.24, the Proposed Development is not replacing infrastructure with similar 'outcomes' and would form a new set of activities that would result in the release of emissions. Some existing activities, including the extraction of water from the River Test and Itchen under drought conditions would be replaced by the Proposed Development. Emissions from these activities would be included as part of the Applicant's existing emissions, provided in Table 10-10. It is not possible to specifically disaggregate emissions from these activities, therefore the establishment of zero emissions in the baseline scenario is considered to be a conservative approach.

Climate change resilience – existing climate

10.7.13 Annual average temperatures over the most recent decade (2009 – 2018) have been on average 0.2°C warmer than the 1981 - 2010 average, and 0.9°C warmer than the 1961 - 1990 average in the UK. All top ten warmest years for the UK, in the series from 1884 have occurred since 2002. The most recent decade (2009 – 2018) has been on average 1% wetter than 1981 - 2010, and 5% wetter than the period of 1961 - 1990 for the UK overall [46].

10.7.14 The Proposed Development is located on the south coast of England and currently experiences a coastal climate which is typical of the UK. Existing climate data for the period 1991 - 2020 were accessed from the Thorney Island meteorological station [38], which is representative of weather conditions across the study area for the CCR assessment. Climate variable data for Thorney Island and the UK average are provided in Table 10-11. The climate variables indicate the current climatic conditions of the study area and provide context for potential changes and their impacts on the Proposed Development during the construction, operation, maintenance, and decommissioning phases, which are considered in section 10.8.

Table 10-11 Existing local, regional and national climate conditions for the period 1991-2020 [38]

Climate variable	Units	Thorney Island annual average	England South average	England	UK
Maximum temperature (average over 12 months)	°C	14.8	14.4	13.8	12.8
Minimum temperature (average over 12 months)	°C	7.7	6.2	6.1	5.5
Days of air frost	Days per year	31	42	45	53
Rainfall	mm per year	768	808	870	1163
Days of rainfall ≥ 1mm	Days per year	118	129	135	159
Mean Wind Speed at 10m	Knots	9.6	8.0	8.3	9.3

10.7.15 The data in Table 10-11 outlines the influence of the maritime setting of the study area for the CCR assessment when compared to the average climate in the UK. Annual maximum and minimum temperatures are both higher than the 'England South', 'England' and 'UK' averages, and there are fewer days of air frost. In addition, annual precipitation is 34% less than the 'UK' average. The mean wind speeds are also higher in the study area compared to the 'England South', 'England' and 'UK' averages.

Future baseline

Carbon emissions

10.7.16 The temporal scope of the carbon assessment encompasses the construction, operational and decommissioning phases of the Proposed Development. As noted in paragraph 10.5.25, the Proposed Development is not replacing existing infrastructure with similar 'outcomes' and is being implemented to address future forecasts for water resource deficits in the region. A summary of carbon emissions for potential alternative schemes in comparison to the Proposed Development is provided in Table 10-7. This highlights that emissions from the option used to develop the Proposed Development are lower than alternatives that could have otherwise been developed.

10.7.17 Predicted emissions from the Proposed Development are compared to future national emission targets, and therefore no definition of the future baseline is required with respect to the carbon assessment.

Overview of climate projections

10.7.18 Climate change projections are used to identify changes to climate variables within the study area. Future climate projection data within the UK have been accessed through the UKCP database [2]. The UKCP database contains climate projection data for a variety of parameters for grid scales at different scales across the UK. These include Local (2.2km), Regional (12km), Probabilistic (25km) and Global (60km) grid squares, depending on the climate parameter and variable.

10.7.19 The RCP emission scenarios detailed in paragraph 10.5.33 of this chapter are used in the UKCP dataset. The likelihood of individual RCP's occurring is dependent on current and future carbon emissions and the implementation of mitigation strategies. A description of the RCP scenarios is provided in Table 10-12.

10.7.20 Data for scenario RCP6.0 were not used in the assessment, as climate data for all parameters considered in the assessment were not available in the UKCP dataset. Therefore, data from RCP2.6, RCP6.0 and RCP8.5 at the 10th, 50th and 90th percentiles were used in the assessment. This covers a range of scenarios, from low to high emissions over the 21st century, and a range of probabilities, as per the requirements of the NPSWRI. The RCP8.5 scenario covers a high emissions scenario over the 21st century.

Table 10-12 Summary of the Representative Concentration Pathways emission scenarios considered in the CCR assessment

Representative Concentration Pathways	Scenario description	Increase in global mean surface temperature (°C) by 2081-2100	Parameters
2.6	Stringent mitigation scenario	1.6	Carbon emissions stay at present levels until 2020 and then start to decline.
4.5	Intermediate scenario 1	2.4 (1.7 – 3.2)	Carbon emissions peak around 2040 and then start to decline.
6.0	Intermediate scenario 2	2.8 (2.0 – 3.7)	Decline of global carbon emissions begin around 2080.
8.5	Very high carbon emissions scenario	4.3 (3.2 – 5.4)	Increasing global carbon emissions throughout the 21st century.

10.7.21 The main climate parameters which are contained within the UKCP database and may affect the Proposed Development are:

1. Temperature change
2. Precipitation change
3. Wind speed
4. Sea level rise

10.7.22 Future climate projections are modelled and are strongly dependent on the level of current and future global carbon emissions. Uncertainties associated with these projections are discussed in section 10.6. Where possible, projected climate change data over the design life of the Proposed Development, which is a

minimum of 100 years, have been accessed to inform the future baseline. Climate projection data to the year 2099 are presented, as this is the only data available for some of the climate variables.

10.7.23 By the end of this century, all areas in the UK are projected to be warmer, with more warming expected in the summer than in the winter [46]. During the summer, probabilistic projections show a north/south contrast, with greater increases in maximum summer temperatures over the southern UK compared to northern Scotland [47].

10.7.24 In addition, the projections in the UKCP database suggest that precipitation levels are expected to continue to increase in the winter but decrease during summer months [48]. Future climate change is expected to bring about a change in the seasonality of extremes, such as increases in hourly precipitation extremes [46].

10.7.25 There has been some debate as to whether storm events will increase in frequency and/or intensity in the UK due to climate change, which could cause operational disruption and damage to coastal infrastructure and flooding. Horsburgh et al. [49] concluded that there is no observational evidence for long-term trends in either storminess across the UK or resultant storm surges, and simulations for the 21st century suggest that there will be no significant changes to storm surges. Wolf et al. [50] undertook a study of storms and waves in waters surrounding the UK and concluded that there is a large degree of sensitivity to climate model projections for the North Atlantic storm track, which contains considerable uncertainty. In the near future, natural variability dominates any climate-related trends in storms and waves, and towards the end of the 21st century, there is some consensus that mean 'significant wave height' would decrease, whilst the most extreme wave height would increase.

10.7.26 However, the most recent climate projections for the UK suggest there is still uncertainty regarding the relationship between the intensity and frequency of storms and future climate change [2]. Although the future of storm surges remains uncertain, with no evidence to suggest any variation in frequency or intensity, a change in the severity of future storm surges cannot be ruled out [51].

10.7.27 Global sea levels have risen over the 20th century and are projected to continue rising over the coming centuries. Under all emissions pathway scenarios, sea levels around the UK will continue to rise to 2100 [46], and sea levels are projected to continue rising beyond 2100, even with large reductions in carbon emissions over the 21st century [52].

10.7.28 It is predicted that future extreme sea levels will be driven by changes in mean sea level, and not by the storm surges or changes to tides. It is estimated that currently regional rates of sea level rise around the UK are between 1mm to 2mm per annum, and rates in the south of the UK are higher than some parts of Scotland when vertical land movement (glacial isostatic adjustment since the last ice age) is also taken into consideration [49].

10.7.29 Sea level rise, in addition to other factors such as storms, anthropogenic disturbance, and reduced sediment supply, could lead to an increase in the rate and/or magnitude of observed coastal erosion. The National Coastal Erosion Risk Map [53] which accounts for the latest UK climate projections from the Met Office is referenced in ES Appendix 19.1 Flood Risk Assessment, Volume II (Document Reference 6.2, DCO Volume 6), for the Proposed Development. It is estimated that

28% of the 3,700km England and Wales coastline is experiencing erosion greater than 10cm per year [54].

10.7.30 Changes in atmospheric CO_2 have led to environmental changes in the ocean, most notably an increase in temperature and an increase in the acidity of the ocean. Temperatures within the ocean have increased by approximately 0.13°C per decade over the past 100 years [55].

Climate change projection data within the study area

10.7.31 The projected climate change data within the study area for the main climate parameters were accessed from the UKCP database [2]. The climate projection data represents three time periods, as listed below:

1. 2020 – 2049: representing climate conditions during the construction phase
2. 2050 – 2079: reflecting climate conditions on medium term horizon during the operational phase, with fewer uncertainties within the projection data
3. 2070 – 2099: representative of climate projection data for the furthest time period for most climate variables during the operational phase. This period is expected to experience the greatest impacts related to climate change (for which climate change projection data is available)

10.7.32 The climate projection data were used to inform the future baseline for the CCR and ICCI assessments. A review of the land based and marine based projection data is provided below.

Land based projections – temperature, precipitation and wind

10.7.33 Climate projection data were accessed from a 25km land-based grid cell within the UKCP database (462500, 112500) which contains the majority of the Order Limits. Data from the RCP emissions scenarios RCP2.6, RCP4.5 and RCP8.5 are presented in Table 10-13, Table 10-14 and Table 10-15 respectively.

10.7.34 The climate projection data for the three RCP scenarios shows a trend of increasing annual mean air temperature, and a likely increase in annual precipitation rates, compared to a baseline period of 1981 to 2010.

10.7.35 The data in Table 10-13, Table 10-14 and Table 10-15 illustrate that under all RCP scenarios, annual, summer and winter temperatures are likely to increase during the three time periods. Specifically, under RCP8.5, detailed in Table 10-15, the annual mean air temperature is expected to rise within the range of 0.4°C to 1.64°C between 2020 and 2049, 1.26°C to 3.7°C between 2050 and 2079, and 2.07°C to 5.52°C between 2070 and 2099 (10th and 90th percentile respectively). The data also indicates that temperature increases are likely to be higher in summer compared to winter. Furthermore, under RCP8.5, the maximum summer temperature is projected to rise by 0.31°C to 2.93°C between 2020 and 2029, 1.55°C to 6.39°C between 2050 and 2070, and 2.6°C to 9.47°C between 2070 and 2099 (10th and 90th percentile respectively).

10.7.36 Under RCP8.5, changes to annual precipitation rates are more variable ranging from -4.95% to 7.56% between 2020 and 2049, -7.84% to 10.38% between 2050 and 2079, and -9.8% to 13.38% between 2070 and 2099 (10th and 90th percentile respectively). There is however a distinct seasonal pattern, where there is

predicted to be increased rainfall during the winter months and less rainfall in the summer months in all three RCP scenarios.

Table 10-13 Temperature and precipitation projection data under RCP2.6 within the study area

Season	Climate parameter	Projected change								
		2020-2049			2050-2079			2070-2099		
		10th	50th	90th	10th	50th	90th	10th	50th	90th
Annual	Mean air temperature (°C)	0.35	0.92	1.53	0.41	1.16	1.98	0.40	1.23	2.15
	Precipitation rate (%)	-5.20	0.51	6.47	-5.76	1.31	8.63	-5.21	1.79	8.94
Winter	Mean air temperature (°C)	-0.05	0.71	1.51	-0.01	0.99	1.99	-0.04	0.98	2.06
	Precipitation rate (%)	-4.52	7.70	20.95	-4.05	10.38	26.63	-5.60	10.16	28.70
Summer	Mean air temperature (°C)	0.44	1.36	2.30	0.61	1.70	2.81	0.67	1.85	3.14
	Maximum air temperature (°C)	0.37	1.58	2.80	0.62	1.96	3.36	0.69	2.17	3.79
	Precipitation rate (%)	-30.98	-12.41	6.64	-36.15	-15.29	5.63	-39.89	-17.73	4.41

Table 10-14 Temperature and precipitation projection data under RCP4.5 within the study area

Season	Climate parameter	Projected change								
		2020-2049			2050-2079			2070-2099		
		10th	50th	90th	10th	50th	90th	10th	50th	90th
Annual	Mean air temperature (°C)	0.26	0.79	1.39	0.71	1.61	2.60	1.11	2.25	3.49
	Precipitation rate (%)	-4.80	1.16	7.59	-6.27	1.31	9.00	-6.36	1.96	10.45
Winter	Mean air temperature (°C)	0.005	0.75	1.54	0.36	1.43	2.58	0.54	1.82	3.23
	Precipitation rate (%)	-3.95	7.88	21.44	-5.41	12.30	32.17	-3.35	17.05	40.56
Summer	Mean air temperature (°C)	0.27	1.14	2.05	0.94	2.28	3.79	1.42	3.22	5.11
	Maximum air temperature (°C)	0.13	1.29	2.48	0.82	2.57	4.45	1.38	3.63	6.01
	Precipitation rate (%)	-27.98	-8.29	11.25	-40.84	-16.35	6.10	-51.79	-26.18	-0.18

Table 10-15 Temperature and precipitation projection data under RCP8.5 within the study area

Season	Climate parameter	Projected change								
		2020-2049			2050-2079			2070-2099		
		10th	50th	90th	10th	50th	90th	10th	50th	90th
Annual	Mean air temperature (°C)	0.40	1.02	1.64	1.26	2.48	3.70	2.07	3.78	5.52
	Precipitation rate (%)	-4.95	1.19	7.56	-7.84	1.21	10.38	-9.80	1.68	13.38
Winter	Mean air temperature (°C)	0.14	0.90	1.73	0.76	2.11	3.59	1.22	3.06	5.06
	Precipitation rate (%)	-3.57	9.38	23.95	-3.94	17.59	43.11	-1.16	27.31	61.50
Summer	Mean air temperature (°C)	0.47	1.48	2.44	1.67	3.52	5.40	2.74	5.36	8.06
	Maximum air temperature (°C)	0.31	1.67	2.93	1.55	3.92	6.39	2.63	6.00	9.47
	Precipitation rate (%)	-31.76	-9.65	12.11	-52.83	-23.46	6.69	-68.36	-38.56	0.17

Marine projection – sea level rise

10.7.37 Average sea level rise data from 2007-2100 were accessed for the nearest coastal location (latitude 50.83 N, longitude -1.08 E) (50.83, -1.08) to the Proposed Development, and are presented in Table 10-16. Under all scenarios, sea levels will continue to rise over the lifecycle of the Proposed Development. By mid-century (2060), under RCP8.5, sea level rises are predicted to increase from 0.29m to 0.49m (10th and 90th percentiles respectively) compared to the 1981 – 2000 baseline. These levels increase to 0.58m to 1.04m by the end of the century (2099) (10th and 90th percentiles respectively).

Table 10-16 Projected annual average sea level risk near the Proposed Development relative to 1981-2000 baseline [52]

Time period	Projected change (m)								
	RCP2.6			RCP4.5			RCP8.5		
	10th	50th	90th	10th	50th	90th	10th	50th	90th
2030	0.12	0.15	0.19	0.12	0.15	0.19	0.13	0.16	0.20
2060	0.22	0.29	0.38	0.24	0.32	0.42	0.29	0.38	0.49
2080	0.27	0.37	0.51	0.33	0.44	0.59	0.44	0.58	0.75
2099	0.32	0.45	0.63	0.40	0.55	0.75	0.58	0.78	1.04

10.8 Assessment of likely significant effects

10.8.1 This section presents the assessment of likely significant effects on carbon and climate change from the construction, operation and decommissioning of the Proposed Development. The likely significant effects of the Proposed Development are identified, taking into account primary and tertiary mitigation. Following the assessments, the need for secondary mitigation is considered in section 10.9 and residual effects are explained in section 10.10.

Carbon assessment

10.8.2 This section presents the carbon emissions arising during the construction, operation, and decommissioning of the Proposed Development.

Construction effects

10.8.3 The construction phase of the Proposed Development would result in emissions from the following sources:

1. Embodied carbon in materials - activities associated with the extraction and processing of raw materials and the manufacture of construction products
2. Fuel consumption associated with construction activities, e.g. plant and equipment
3. Transport of materials
4. Disposal of construction waste arisings

10.8.4 Emissions released during the construction phase of the Proposed Development are presented in Table 10-17, and are derived directly from carbon modelling undertaken by the Applicant.

Table 10-17 Carbon emissions during the construction phase of the Proposed Development

Emission source	Construction carbon emissions (tonnes CO_2e)	% of total emissions*
Embodied carbon in materials	100,620	67%
Construction activities	40,220	27%
Transport	6,710	4%
Waste	1,790	1%
Total	**149,330**	
*Values are rounded to whole number; as a result, the total does not sum to exactly 100%		

10.8.5 The total GHG emissions released during the construction phase are estimated to be 149,330 tonnes CO_2e. The largest contributor of emissions during construction phase is embodied carbon in materials which is responsible for 67% of total emissions. Emissions from on-site construction activities, such as fuel consumption by plant and equipment account for 27% the of emissions during the construction phase. The assessment predicted that emissions from off-site transport and disposal of waste arisings during the construction phase contribute 4% and 1%, respectively.

Significance of effect

10.8.6 The construction phase is anticipated to commence in 2028 at the earliest, and is likely to take place for a duration of approximately five years. Therefore, the construction period of the Proposed Development is anticipated to fall within the Fifth Carbon Budget (2028 to 2032) and the Sixth Carbon Budget (2033 to 2037). Estimated emissions during the construction phase would constitute approximately 0.007% and 0.003% of the Fifth and Sixth Carbon Budget, respectively.

10.8.7 Construction of the Proposed Development would result in the release of carbon emissions, which would contribute to global climate change, however they would form a very small contribution to the Fifth and Sixth Carbon Budgets. Therefore, construction of the Proposed Development is unlikely to adversely affect the UK's ability to meet its future carbon reduction targets. Emissions released during the construction phase are confined to a certain time period, and do not affect the Applicant's ability to meet its emission reduction targets.

10.8.8 As emissions from construction of the Proposed Development will not have a material impact on the ability of the UK to meet its carbon reduction obligations and commitments, it can be considered to be fully consistent in carbon terms with existing and emerging policy requirements such as the NPSWRI and the UK's trajectory towards Net Zero. Furthermore, additional mitigation detailed in the Outline CMP (Document Reference 7.8, DCO Volume 7) as discussed in section 10.9, will be adopted to meet the Proposed Development's carbon strategic objective to reduce GHG emissions to as low as reasonably practicable. Therefore, with reference to the significance criteria outlined in Table 10-9, carbon emissions associated with the construction phase of the Proposed Development are considered to have a minor adverse effect, which is not significant in EIA terms.

Operational effects

10.8.9 Emission sources in the operational phase of the Proposed Development are categorised into the following categories:

1. Emissions from grid electricity consumption (e.g. for pumping).
2. Emissions from operational transport activities (e.g. treatment chemical deliveries).
3. Emissions from operational material use (e.g. chemical use in water treatment).
4. Emissions from operational maintenance.
5. Emissions from the activities associated with the extraction and processing of raw materials, and the manufacture of replacement components.

10.8.10 The operational phase carbon emissions presented in this chapter are outputs from the carbon modelling undertaken for the Proposed Development by the Applicant.

10.8.11 Emissions released during the 100-year operational phase of the Proposed Development are presented in Table 10-18.

Table 10-18 Carbon emissions during the operational phase of the Proposed Development

Emission source	Operational carbon emissions (tonnes CO_2e)	% of total emissions*
Grid electricity consumption	16,850	2%
Transport	24,150	3%
Material use (chemicals)	707,230	82%
Maintenance	4,440	1%
Component replacement	103,340	12%
Total (over the assumed 100-year lifespan)	**856,010**	
Annual emissions	**8,560**	

10.8.12 Table 10-18 shows that the operational carbon emissions over the 100-year lifespan would be 856,010 tonnes CO_2e for the Proposed Development. The use of chemicals contributes 82% of the operational emissions for the Proposed Development. The level of carbon emissions from the use of chemicals is subject to a number of parameters, but is ultimately influenced by the supply chain and factors outside of the control of the Applicant. As described in section 10.9, the Applicant would seek to adopt the use of lower carbon chemicals during the lifespan of the Proposed Development to reduce emissions where practicable.

10.8.13 The carbon modelling undertaken to inform the assessment assumed that emissions associated with the use of chemicals would not decrease in intensity over the operational lifespan of the Proposed Development. This is a conservative assumption, as although no empirical data is available regarding the decarbonisation pathway for the water sector, the production and manufacturing of chemicals is likely to benefit from a decrease in the carbon intensity of other sectors such as electricity and transport. The use of chemicals is fundamental to the operation of the Proposed Development, and replacement or reduction of the use of these materials is not currently a feasible option.

10.8.14 The outputs of the carbon modelling highlight that annual emissions are approximately 8,560 tonnes CO_2e. The figure takes into account the replacement of assets and infrastructure that reaches the end of their design life during the design life of the Proposed Development. Therefore, carbon emissions in years where no component replacement takes place would be lower than 8,560 tonnes CO_2e per year. In addition, the carbon emissions from the replacement of components are assumed to have the same carbon intensity as during the construction of the original components, therefore providing a precautionary assessment.

10.8.15 The strategic carbon objective for the Proposed Development is to deliver solutions in relation to design, construction and operation of the Proposed Development that are optimal in terms of whole life carbon emissions and reduce GHG emissions to as low as reasonably practicable, having regard to the UK's climate change commitment of achieving net zero emissions by 2050. A further discussion as to how this is to be achieved is provided in section 10.9. However, to provide a

conservative assessment, likely significance of effect was determined on the basis of the carbon emission values presented in Table 10-18.

Likely significance of effects

10.8.16 Based on the nearest construction start year of 2028, with a five-year construction period, the earliest the Proposed Development is expected to commence operations is in 2034. Therefore, the first four years of full operations are anticipated to be within the Sixth Carbon Budget period (2033 to 2037). Emissions during the subsequent five years would be released within the Seventh Carbon Budget period (2038 to 2042).

10.8.17 Emissions associated with the operation of the Proposed Development would result in a contribution of 0.004% and 0.008% of the Sixth and Seventh Carbon Budgets, respectively. This level of emissions contribution is not considered to be likely to affect the UK being able to meet its emission reduction targets.

10.8.18 Annual emissions during the operational phase of the Proposed Development would be less than 8,560 tonnes CO_2e. As noted, the carbon modelling used to inform the assessment has adopted a number of precautionary assumptions, particularly with respect to the use of chemicals, which forms the largest source of emissions associated with the Proposed Development during the operational phase. There would be however some residual emissions, the Applicant's approach to which is discussed in section 10.9.

10.8.19 One of the Needs for the Proposed Development is to address forecasts of future water resource deficits in the region. As set out in paragraph 10.5.31, emissions in the 'Do Nothing' scenario were established to be zero due to uncertainties in estimating emissions without the Proposed Development in place. This is a highly precautionary approach, as some emissions from existing activities would be accounted for as part of its existing carbon footprint. In addition, the Proposed Development represents a lower carbon option considered to others reviewed as part of the optioneering stage which are referenced in ES Chapter 4, Consideration of alternatives, Volume I (Document Reference 6.1, DCO Volume 6) and in Table 10-7.

10.8.20 The Proposed Development would not affect the UK's ability to meet its emissions reduction targets, and the carbon emissions presented in this chapter are likely to be an overestimation when compared to the 'Do Nothing' scenario. Furthermore, additional mitigation detailed in the Outline Carbon Management Plan (Document Reference 7.8, DCO Volume 7), as discussed in section 10.9, will be adopted to meet the Proposed Development's carbon strategic objective and the NPSWRI requirement to reduce GHG emissions to as low as reasonably practicable. With reference to the significance criteria for the carbon assessment in Table 10-9, the design of the Proposed Development is considered to be fully consistent with applicable policy requirements such as the NPSWRI. Therefore, carbon emissions released during the operational phase of the Proposed Development are considered to have a minor adverse effect, which is not significant in EIA terms.

Decommissioning effects

10.8.21 As stated in paragraph 10.3.5, the EIA Scoping Opinion agreed that decommissioning effects could be scoped out for the carbon assessment.

However, a high-level assessment of the emissions associated with decommissioning activities has been undertaken as part of the carbon assessment.

10.8.22 ES Chapter 3 Description of the Proposed Development, Volume I (Document Reference 6.1, DCO Volume 6) outlines that although the time limit of the Proposed Development is 100 years, its operational life could be longer than this. It is also noted in ES Chapter 3 Description of the Proposed Development, Volume I (Document Reference 6.1, DCO Volume 6), that specific methods for decommissioning are uncertain at present, as the engineering approaches will evolve over time. A summary of the methodology to estimate emissions released during the decommissioning phase is presented in the ES Appendix 10.1 Carbon assessment methodology, Volume II (Document Reference 6.2, DCO Volume 6).

10.8.23 Emissions from the decommissioning phase are predicted to be 110 tonnes CO_2e, with a high degree of uncertainty given the expected progress of decarbonisation of the UK economy and the development of end-of-life strategies over the lifespan of the Proposed Development. This represents a reasonable worst case, it is likely to be lower as the economy decarbonises.

Significance of effects

10.8.24 There are no carbon budgets established beyond 2050 and into the period when decommissioning of the Proposed Development would take place. Estimated emissions from decommissioning of the Proposed Development are expected to be 110 tonnes CO_2e, which would be a short-term and single occurrence. Emissions released during the decommissioning phase are therefore considered to have a minor adverse effect, which is considered to be not significant in EIA terms.

Climate Change Resilience assessment

10.8.25 The potential likely significant effects of climate change on the Proposed Development during the construction and operational phases have been assessed. Additionally, a high-level assessment of the decommissioning phase has been undertaken as part of the CCR assessment. This section provides a summary of the likely climate change variables and the associated hazards anticipated to interact with the Proposed Development during its lifespan.

Construction effects

10.8.26 The construction phase is anticipated to commence in 2028 and take place for a duration of approximately five years. Therefore, the construction of the Proposed Development is expected to end within the 2020–2049 climate horizon from the UKCP dataset. This section provides a summary of changes to climate variables and associated climate hazards which are likely to significantly affect the Proposed Development during the construction phase.

Step 1: Climate hazard assessment

10.8.27 As identified in section 10.7, the main climate variables which could be affected by climate change in the study area are temperature, precipitation, wind speed and sea level rise compounded by storm surges.

10.8.28 The receptors which may be potentially impacted by the climate change hazards during the construction phase are identified as the following:

1. Construction site workers
2. Construction plant and equipment
3. Above ground infrastructure components, including:
    1. WRP site
    1. AGP
    1. Invasive Non-Native Species Treatment at Otterbourne WSW
4. Underground infrastructure components, including:
    1. Pipelines between Budds Farm WTW and the WRP site
    1. Pipelines between the WRP site and Bedhampton Springs
    1. Pipeline between the WRP site and Otterbourne WSW

10.8.29 The relevant climate variables and hazards and affected receptors during the construction phase of the Proposed Development are detailed in Table 10-19. Potential climate hazards were identified from the climate change projection data in Table 10-13, Table 10-14, and Table 10-15 for the 2020-2049 climate horizon, which is considered to be representative of the construction phase. Data for the RCP8.5 scenario has been referenced to represent the high emissions scenario.

Table 10-19 Receptor, climate variables and hazards identified for the construction climate change resilience assessment

Climate variable	Potential climate hazard	Receptors affected
Temperature	**Heatwave** The annual mean air temperature and maximum summer temperature are predicted to increase in all future climate scenarios. For the RCP8.5 scenario, the increases in the summer mean temperature range from 0.47°C to 2.44°C, and the increases in the maximum summer temperature range from 0.31°C to 2.93°C (for the 10th and 90th percentiles respectively) compared to the baseline 1981 - 2010 baseline period. The climate change projection data highlights that temperature increases are likely to be more prominent during summer months compared to winter months.	Construction site workers

Climate variable	Potential climate hazard	Receptors affected
	This may result in more periods of heatwaves or high temperature.	
	Snow and ice The climate projection data highlights that the average temperatures are predicted to increase in winter months, meaning potential impacts associated with snow and ice conditions in the construction phase are likely to decrease.	As snow and ice conditions are likely to be less frequent due to milder winters, none of the identified receptors are considered vulnerable to snow and ice conditions during the construction phase of the Proposed Development.
Precipitation	**Surface water flooding** The climate projection data representative of the construction phase highlights that annual precipitation levels in the study area vary across the different climate scenarios. For the RCP8.5 scenario, the annual precipitation rate is projected to range from a decrease of -4.59% to an increase of 7.33% (for the 10th and 90th percentiles, respectively). There is projected to be a greater increase in precipitation during winter compared with summer, which could lead to more frequent surface water flooding events during winter months. As described in section 10.7, scientific literature highlights that it is considered likely that the UK will experience more frequent and heavy periods of rain, which will increase the risk of surface water flooding.	• Construction site workers • Construction plant and equipment • Above-ground infrastructure components associated with the Proposed Development • Below-ground infrastructure components associated with the Proposed Development
	Fluvial flooding The climate projection data shows that annual precipitation levels in the study area vary, depending on the scenario and probability rating. There is projected to be an increase in precipitation during winter months, in particular, which could lead to more frequent fluvial flooding events during the construction phase for the infrastructure associated with the Proposed Development situated near rivers.	• Construction site workers • Construction plant and equipment • Above-ground infrastructure components associated with the Proposed Development • Below-ground infrastructure components associated with the Proposed Development
	Drought The climate projection data for the construction period highlights that there is likely to be a reduction of rainfall in the summer months, which could lead to	• Construction site workers • Below-ground infrastructure components associated with the Proposed Development

Climate variable	Potential climate hazard	Receptors affected
	drought events. This could lead to dry soil conditions.	
Wind speed	There is uncertainty as to whether climate change will result in differences in annual average wind speeds.	None identified.
Sea level rise	Sea levels are likely to rise because of increased global temperatures, which may affect receptors in coastal areas, such as the construction of the WRP site, and Budds Farm to the WRP Pumping Station. Table 10-16 presents the projected annual average sea level rise near the Proposed Development. Projected sea level rise ranges from 0.13m - 0.20m (for the 10th and 90th percentile, respectively) in RCP8.5. The Flood Risk Assessment (FRA), presented in ES Appendix 19.1 Flood Risk Assessment, Volume II (Document Reference 6.2, DCO Volume 6), highlights that the WRP site is located in proximity to tidally influenced watercourses. However, the topography of the area is elevated above tidal levels and therefore not at risk.	The identified receptors are not considered to be vulnerable to sea level rise during the construction phase.
Tidal flooding	Extreme weather events may result in a greater risk of tidal flooding, which may affect receptors in coastal areas. The FRA presented in ES Appendix 19.1 Flood Risk Assessment, Volume II (Document Reference 6.2, DCO Volume 6), highlights that the WRP site, and Budds Farm to the WRP Pumping Station are located in proximity to tidally influenced watercourses. However, the topography of the area is elevated above tidal levels and therefore not at risk.	The construction phase receptors associated with the Proposed Development are not considered to be vulnerable to tidal flooding.

Step 2: Climate vulnerability assessment

10.8.30 The receptors that are considered to have the potential to be vulnerable to the identified climate hazards, after the consideration of primary and tertiary mitigation measures, specifically, were considered in the climate vulnerability assessment. The risks to the receptors are qualitatively identified through a hazard likelihood and consequence matrix as set out in ES Appendix 10.2 Climate change resilience assessment methodology, Volume II (Document Reference 6.2, DCO Volume 6). The climate vulnerability assessment for the construction phase is presented in Table 10-20.

Table 10-20 Construction phase climate vulnerability assessment

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
Heatwaves	As a result of the likely increases in temperature, particularly during the summer months, there is the potential for periods of heatwave or extreme heat to cause harm to construction site workers.	An Outline CEMP (Document Reference 7.1, DCO Volume 7), contains measures to reduce the impacts of extreme weather events such as heatwaves and flooding, as well as measures to manage temporary drainage during the construction phase to reduce the risk of flooding. This includes measures such as the monitoring of on-site weather conditions, incorporating a severe weather protocol such as conditions of extreme heat, and scheduling activities based on the weather forecast. The mitigation measures secured in the Outline CEMP (Document Reference 7.1, DCO Volume 7) will be carried forward into a detailed CEMP(s), which will be produced by the Contractor. The detailed CEMP(s) will also include provisions and measures specific to extreme weather conditions, such as additional rest breaks during heatwaves.	Very unlikely (1) – the projected climate change data for the construction period shows that increases in temperatures from present day conditions will occur, although the magnitude of change would be limited. Due to the measures that will be adopted during construction, the likelihood of a heatwave to affect construction workers is considered to be very unlikely.	Insignificant (1) – the consequence of heatwaves is anticipated to be insignificant, due to the implementation of measures to protect construction workers.	Low
Surface water flooding	An increase in the frequency and intensity of precipitation events, particularly during the	Construction activities will avoid floodplains where practicable. Where construction activities are required within flood risk zones,	Unlikely (2) - The climate projection data shows that there could be a change in the intensity of	Minor (2) – ES Chapter 19 Water environment, Volume I (Document Reference 6.1, DCO	Low

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
	winter months, could lead to an increase in surface water flood events. This could result in harm to construction site workers, damage to infrastructure under construction, and damage to construction plant and equipment.	the Contractor will be obliged to carry out a flood risk assessment. Additional measures, secured in the Outline CEMP (Document Reference 7.1, DCO Volume 7), to reduce and manage the consequences of flooding and prevent entrainment of plant and materials in case of flood events, will be employed when working in Flood Zone 2 or 3 to manage site safety and reduce pollution risk during periods of extreme weather. Some of the measures include signing up to the EA flood warning service and storing machinery in hard standing or sufficiently constrained as not to wash away. As secured in the Outline CEMP (Document Reference 7.1, DCO Volume 7), the detailed CEMP(s) will include a Construction Drainage Plan, to be prepared by the Contractor, to manage the quality and quantity of construction stage drainage and reduce the risk of sediment entrainment. The detailed CEMP(s) will also contain measures to ensure that staff and equipment/stores etc remain safe during times of flooding. Some	precipitation, particularly in winter months. The adoption of primary and tertiary mitigation means the likelihood of surface water flooding impacts is considered to be unlikely.	Volume 6), predicted that impacts associated with changes to surface water flows during construction would be negligible to minor adverse. The consequences of a surface water flooding event are likely to be small and localised, and therefore are considered to be minor.	

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
		construction activities in the floodplain will be unavoidable, so a safe management plan will be required which will include measures such as signing up to EA flood warning service, monitoring antecedent conditions in rivers, monitoring weather forecasts, and identifying safe routes of dry access.			
Fluvial flooding	An increase in the frequency and intensity of precipitation events, particularly during the winter months, could lead to an increase in fluvial flood events. This could result in harm to construction site workers, damage to infrastructure under construction, and damage to construction plant and equipment.	Construction activities will avoid floodplains wherever practicable. Where construction activities are required within flood risk zones, the Contractor will be obliged to carry out a flood risk assessment. Additional measures, secured in the Outline CEMP (Document Reference 7.1, DCO Volume 7) to reduce and manage the consequences of flooding and prevent entrainment of plant and materials in case of flood events, would be employed when working in Flood Zone 2 or 3 to manage site safety and reduce pollution risk during periods of extreme weather. Some of the measures include signing up to the EA flood warning service and storing machinery in hard standing or	Unlikely (2) – As outlined in ES Appendix 19.1 Flood Risk Assessment, Volume II (Document Reference 6.2, DCO Volume 6), all the above-ground infrastructure of the Proposed Development is located in areas of Flood Zones 1 (low probability). The climate projection data shows that there could be a change in the intensity of precipitation, particularly in winter months. The provision of measures in the in the Outline CEMP (Document Reference 7.1, DCO Volume 7) means the likelihood of fluvial flooding	Minor (2) – fluvial flood events could result in small or localised damage; therefore, the consequence of a surface water flood events is anticipated to be minor during construction.	Low

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
		sufficiently constrained as not to wash away. As secured in Outline CEMP (Document Reference 7.1, DCO Volume 7), the detailed CEMP(s) will include a Construction Drainage Plan, to be prepared by the Contractor to manage the quality and quantity of construction stage drainage and reduce the risk of sediment entrainment. The detailed CEMP(s) will also contain measures to ensure that staff and equipment/stores etc remain safe during times of flooding. Some construction activities in the floodplain will be unavoidable, so a safe management plan will be required which will include measures such as signing up to EA flood warning service, monitoring antecedent conditions in rivers, monitoring weather forecasts, and identifying safe routes of dry access.	impacts is considered to be unlikely.		
Drought	An increase in the frequency and severity of drought conditions could affect soil stability, and the implementation of below-	The Contractor will address temporary trench stability by taking a number of factors into account, such as the presence of high groundwater and unstable	Very unlikely (1) – the projected climate change data for the construction period shows that increases in drought	Insignificant (1) – the consequence of heatwaves is anticipated to be insignificant, due to the	Low

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
	ground infrastructure during construction.	granular soils. Temporary works will be designed to meet current and short-term conditions, which will take into account foreseeable weather and climate conditions. Any risk assessments compiled during the construction phase will take into account any relevant emergency procedures.	conditions from present day conditions are unlikely. The Contractor would consider temporary trench stability during the cable installation process, and amend the construction methodology accordingly to match conditions on-site.	implementation of measures to protect construction workers. Insignificant (1) – the consequence of drought is considered to be low during the construction phase	

Significance of effect

10.8.31 Step 2 of the CCR assessment identified that there is a low risk of climate change impacts to adversely affect the Proposed Development during construction and a high resilience of the Proposed Development to the projected effects of climate change. Therefore, Step 3 of the CCR assessment was not required as this step is only applicable when the risk rating is assessed as 'medium' or 'high'.

10.8.32 In accordance with the methodology outlined in ES Appendix 10.2 Climate change resilience assessment methodology, Volume II (Document Reference 6.2, DCO Volume 6), as the Proposed Development is considered to have a high resilience to the projected effects of climate change during construction, the effects of climate change to the Proposed Development are considered to be not significant.

Operational effects

10.8.33 The likely significant effects of climate change to the Proposed Development during the operational phase have been assessed in this section. The operational phase is anticipated to be at least 100 years. Therefore, the projected climate change data for two time periods, 2050–2079 and 2070–2099, were used to inform the operational phase CCR assessment. This section provides a summary of changes to the climate variables and associated climate hazards which are anticipated to interact with the Proposed Development during the operational phase.

Step 1: Identifying receptors, climate variables and hazards

10.8.34 As identified in section 10.7, the main climate variables which could be affected by climate change in the study area are temperature change, sea level rise, precipitation, and wind speeds.

10.8.35 The receptors which may be potentially impacted by the climate change hazards during the operational phase are identified as the following:

1. Operational workers
2. Above-ground infrastructure components, including:
    1. WRP site
    1. AGP
    1. Invasive Non-Native Species Treatment at Otterbourne WSW
3. Underground infrastructure components, including:
    1. Pipelines between Budds Farm WTW and the WRP site
    1. Pipelines between the WRP site and Bedhampton Springs
    1. Pipeline between the WRP site and Otterbourne WSW

10.8.36 The relevant climate variables and hazards and affected receptors during the operational phase of the Proposed Development are detailed in Table 10-21.

Table 10-21 Receptors, climate variables and hazards identified for the operational phase CCR assessment

Climate variable	Potential climate hazard	Receptors affected
Temperature	**Heatwave** The climate projection data show that annual temperatures and the maximum summer temperatures are predicted to rise over the operational phase of the Proposed Development. This may result in more periods of heatwaves or periods of extreme heat.	• Above-ground infrastructure associated with the Proposed Development • Below-ground infrastructure associated with the Proposed Development • Operational workers
	Snow and ice The climate projection data in show that average temperatures are predicted to increase in winter months, meaning the potential for hazards associated with snow and ice conditions are likely to decrease.	As snow and ice are conditions are likely to be less frequent due to milder winters, none of the identified receptors are considered vulnerable to snow and ice during the operational phase of the Proposed Development
Precipitation	**Surface water flooding** The climate projection data shows that annual precipitation levels in the study area may vary, depending on the scenario and probability. However, the data and scientific literature suggests that it is likely that there will be increase in precipitation during winter months in the UK, which could lead to more frequent surface water flooding events during winter.	• Above-ground infrastructure associated with the Proposed Development • Below-ground infrastructure associated with the Proposed Development • Operational workers
	Fluvial flooding Annual precipitation levels in the study area may vary, but it is likely that there will be an increase in precipitation during winter months, which could lead to more frequent fluvial flooding events during the operational phase of the Proposed Development for the receptors situated near to rivers.	• Above-ground infrastructure associated with the Proposed Development • Below-ground infrastructure associated with the Proposed Development • Operational workers
	Drought The climate projection data shows that there is predicted to be reduced rainfall in the summer months in all climate scenarios, which could lead to drought events during the summer.	• Above-ground infrastructure associated with the Proposed Development • Below-ground infrastructure associated with the Proposed Development
Wind speeds	There is uncertainty as to whether climate change will result in differences in annual average wind speeds. There is potential for more frequent and intense storm events	• Above-ground infrastructure associated with the Proposed Development • Operational workers

Climate variable	Potential climate hazard	Receptors affected
	over the 21st century, where there could be periods of high wind speeds, which may affect above-ground infrastructure.	
Sea level rise	The projected sea level rise for 2060, 2080 and 2099 results in a sea level increase of 0.49m, 0.75m and 1.04m respectively (for the 90th percentile), which may affect receptors in coastal areas such as the WRP site, and Budds Farm to the WRP Pumping Station. The Urban South Hampshire (PUSH) Strategic FRA (SFRA) interactive mapping outputs presented in ES Appendix 19.1 Flood Risk Assessment, Volume II (Document Reference 6.2, DCO Volume 6), highlights that the existing Budds Farm WTW is shown to have a future risk to tidal flooding due to the impact of climate change.	• Above-ground infrastructure associated with the Proposed Development • Below-ground infrastructure associated with the Proposed Development
Tidal flooding	Extreme weather events may result in a greater risk of tidal flooding, which may affect receptors in coastal areas.	• Above-ground infrastructure associated with the Proposed Development • Below-ground infrastructure associated with the Proposed Development • Operational workers

Step 2: Climate vulnerability assessment

10.8.37 The vulnerability of the Proposed Development and its receptors to the climate hazards identified in Table 10-21 are considered in Step 2 of the CCR assessment and outlined in Table 10-22. The receptors that are considered to have the potential to be vulnerable to climate change with consideration of embedded mitigation, were considered in the climate vulnerability assessment. The risks to the receptors are qualitatively identified through a hazard likelihood and consequence matrix as set out in ES Appendix 10.2 Climate change resilience assessment methodology, Volume II (Document Reference 6.2, DCO Volume 6).

Table 10-22 Operational phase climate vulnerability assessment

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
Heatwaves	Due to the projected future increases in the annual and maximum summer temperatures, there is a potential for heatwaves or periods of extreme heat to cause damage to the Proposed Development through fracture of infrastructure, and harm to operational workers	All infrastructure assets will be designed to be resilient for the anticipated climate conditions at the end of their operational life, as secured in the Design Principles Document (Document Reference 5.11, DCO Volume 5). This includes meeting requirements on ambient design temperatures, and wind pressures detailed in relevant British Standards. The Proposed Development will use materials that provide sufficient thermal protection to mitigate the risk of increased high temperatures, as secured in the Design Principles Document (Document Reference 5.11, DCO Volume 5). For the below-ground components of the Proposed Development including the underground pipelines, thermal insulation will be afforded, as secured in the Design Principles Document	Very unlikely (1) – due to the mitigation imposed to increase the resilience of the Proposed Development to heatwaves, the likelihood of heatwaves impacting the Proposed Development is considered to be very unlikely.	Minor (2) – due to the level of resilience incorporated into the design, consequences of a heatwave event are likely to be small and localised, and therefore are considered to be minor.	Low

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
		(Document Reference 5.11, DCO Volume 5). Conditions of infrastructure will be monitored by the Contractor on extreme temperature days, and after windy and stormy conditions, to ensure that operating conditions are suitable as secured in the OEMP (Document Reference 7.7, DCO Volume 7). The health and safety of workers during the operatives will be governed by a combination of national legislation, industry codes and local practices. This would include the Health and Safety at Work Act 1974 including the Management of Health and Safety at Work Regulations 1999. The Contractor will prepare, comply and maintain all required risk registers, which will include risks from heatwaves.			
Surface water flooding	Surface water flooding may lead to impacts to the Proposed Development, such as to damage to	The design of the Proposed Development includes consideration of the management of flood	Unlikely (2) – the climate projection data shows that there is likely to be an increase in the frequency and	Minor (2) – due to the level of resilience incorporated into the design, consequences	Low

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
	infrastructure components and potentially a loss of function, and access, and harm to operational workers. An increase in rainfall intensity due to climate change may lead to an increase of scour and erosion of above-ground structures such as the buildings and structural elements of the WRP and AGP. Increased rainfall intensity can also lead to higher risk of water ingress or egress from structures, structural damage, and reduced design life of the WRP and AGP.	pathways and optimising the use of SuDS, as stated in ES Appendix 19.1 Flood Risk Assessment, Volume II (Document Reference 6.2, DCO Volume 6). This includes climate change allowances to mitigate the impact of flooding from increased precipitation and rain intensity. Maintenance and repair activities for the Proposed Development are secured in the OEMP (Document Reference 7.7, DCO Volume 7). Finished floor levels at AGP will be a minimum of 150mm above-ground level, which is in line with standard UK Building Regulations. The health and safety of workers during the operatives will be governed by a combination of national legislation, industry codes and local practices. This would include the Health and Safety at Work Act 1974 including the	intensity of precipitation events, particularly during the winter months, which could lead to an increase in surface water flood events. Following the implementation of the permanent operational drainage strategies presented in the ES Appendix 19.1 Flood Risk Assessment, Volume II (Document Reference 6.2, DCO Volume 6), the likelihood of a surface water flood event is to affect the Proposed Development is considered to be unlikely.	of a surface water flooding event are likely to be small and localised, and therefore are considered to be minor.	

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
		Management of Health and Safety at Work Regulations 1999. The Contractor will prepare, comply and maintain all required risk registers, which will include risks from surface water flooding.			
Fluvial flooding	Fluvial flooding may impact the Proposed Development, leading to damage to infrastructure components and potentially a loss of function, and access, and harm to operational workers. Fluvial flooding events can also lead to higher risk of water ingress or egress from structures, structural damage, and reduced design life of the WRP and AGP.	The design of the Proposed Development includes consideration of the management of flood pathways and optimising the use of SuDS, as secured in ES Appendix 19.1 Flood Risk Assessment, Volume II (Document Reference 6.2, DCO Volume 6). This includes climate change allowances to mitigate the impact of flooding from increased precipitation and rain intensity. Maintenance and repair activities for the Proposed Development will be undertaken in line with the OEMP (Document Reference 7.7, DCO Volume 7). During the replacement of these components, the Applicant will review technological and sector specific developments	Unlikely (2) – As outlined in ES Appendix 19.1 Flood Risk Assessment, Volume II (Document Reference 6.2, DCO Volume 6), all AGPs are located in areas of Flood Zones 1 (low probability), as such they would be expected to remain safe and operational for their lifetime while taking into account climate change. ES Appendix 19.1 Flood Risk Assessment, Volume II (Document Reference 6.2, DCO Volume 6), also outlines consideration of how climate change may affect the extent of future fluvial flood risk. Therefore, the likelihood of impacts associated with fluvial flooding is considered to be unlikely.	Minor (2) – due to the level of resilience incorporated into the design, consequences of a fluvial flooding event are likely to be small and localised, and therefore are considered to be minor.	Low

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
		which may further support the integrity and resilience of the Proposed Development. Finished floor levels at the AGP will be a minimum of 150mm above-ground level, which is in line with standard UK Building Regulations. The health and safety of workers during the operatives will be governed by a combination of national legislation, industry codes and local practices. This would include the Health and Safety at Work Act 1974 including the Management of Health and Safety at Work Regulations 1999. The Contractor would prepare, comply and maintain all required risk registers, which will include risks from fluvial flooding.			
Drought	Drought periods may affect the functionality of above and below-ground infrastructure, through failure of infrastructure components.	The Proposed Development will be implemented to reduce water stress in the region.	Very unlikely (1) – Due to the incorporation of a minimum flow, and other primary mitigation measures, the likelihood of impacts associated with drought to the	Very unlikely (1) – Due to the incorporation of a minimum flow, and other primary mitigation measures, the likelihood of impacts	Low

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
		A key measure to ensure resilience of the Proposed Development during drought conditions is the incorporation of a minimum flow. During minimum flow, the output will be 10Ml/d of recycled water. This will ensure that all mechanical and electrical equipment critical to the operation of the Proposed Development (e.g. pumps and the WRP itself) are left running and in a condition ready to be called upon during the onset of drought. This reduces the risk of failure associated with equipment being left idle outside of drought conditions. The use of Havant Thicket Reservoir provides inherent resilience during a drought, in terms of water storage and availability (approximately 100 days of supply). The WRP site provides additional resilience by increasing inflow into the reservoir during drought conditions.	Proposed Development is considered to be very unlikely.	associated with drought to the Proposed Development is considered to be very unlikely.	

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
		In periods of drought conditions, there may be an elevated risk of fire associated to higher temperatures across Hampshire and the South East of England, however measures secured in the OEMP (Document Reference 7.7, DCO Volume 7) include the production of an Emergency Response plan for wildfires.			
Wind speeds	Higher periods of wind speeds may lead to damage of above-ground infrastructure, and harm to operational workers.	All infrastructure assets will be designed to be resilient for the anticipated climate conditions at the end of their operational life, as secured in the Design Principles Document (Document Reference 5.11, DCO Volume 5). This includes meeting requirements on ambient design temperatures, and wind pressures detailed in relevant British Standards. Conditions of infrastructure will be monitored by the Contractor on extreme temperature days, and after windy stormy conditions, to ensure that operating conditions are suitable as secured in the	Unlikely (2) – Climate change may increase wind speeds, however there is uncertainty in projections, therefore changes in wind speeds from present day conditions are uncertain. With the adoption of relevant design standards, the likelihood of impacts is considered to be unlikely.	Minor (2) – there could be damage to infrastructure as a result of high winds, but as a result of mitigation in the design and monitoring checks, the consequences are likely to be small and localised, and therefore are considered to be minor.	Low

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
		OEMP (Document Reference 7.7, DCO Volume 7). The health and safety of workers during the operatives will be governed by a combination of national legislation, industry codes and local practices. This would include the Health and Safety at Work Act 1974 including the Management of Health and Safety at Work Regulations 1999. The Contractor would prepare, comply and maintain all required risk registers, which will include risks from high wind speeds.			
Sea level rise	Sea level rise, compounded by storm surges and tidal changes could affect the receptors of the Proposed Development in coastal areas such as the WRP site, the Pipelines between Budds Farm WTW and the WRP site and Budds Farm Pumping Station, by increasing the risk of water	The new pumping station at the Budds Farm WTW has been designed to be resilient to future flood risks, in line with the approach for all water infrastructure assets as secured in the Design Principles Document (Document Reference 5.11, DCO Volume 5). This includes accounting for the H++ climate scenario for sea level rise.	Very unlikely (1) – with the implementation of the embedded mitigation measures, the likelihood of sea level rise causing impacts to the Proposed Development is considered to be very unlikely.	Moderate (3) – in the event of a tidal flooding event, there is potential for damage to receptors in coastal areas, such as the Budds Farm WTW. Consequences are likely to be moderate and require maintenance and repair.	Low

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
	damage and corrosion of non-resistant components.	Finished floor levels at the AGP will be a minimum of 150mm above-ground level, which is in line with standard UK Building Regulations.			
Tidal flooding	Tidal flooding may lead to damage to the Proposed Development, leading to damage to infrastructure components and potentially a loss of function, and access, and harm to operational workers.	Finished floor levels at the AGP will be a minimum of 150mm above-ground level, which is in line with standard UK Building Regulations, as secured in the Design Principles Document (Document Reference 5.11, DCO Volume 5). The health and safety of workers during the operatives will be governed by a combination of national legislation, industry codes and local practices. This would include the Health and Safety at Work Act 1974 including the Management of Health and Safety at Work Regulations 1999. The Contractor would prepare, comply and maintain all required risk registers, which will include risks from tidal flooding.	Very unlikely (1) – with the implementation of the embedded mitigation measures, the likelihood of tidal flooding at the Proposed Development is considered to be very unlikely.	Moderate (3) – in the event of a tidal flooding event, there is potential for damage to receptors in coastal areas, such as the Budds Farm WTW. Consequences are likely to be moderate and require maintenance and repair.	Low

Significance of effect

10.8.38 Step 2 of the CCR assessment identified that there is a low risk of climate change impacts to adversely affect the Proposed Development during operation and a high resilience of the Proposed Development to the projected effects of climate change. Therefore, Step 3 of the CCR assessment was not required as this step is only applicable when the risk rating is assessed as medium or high.

10.8.39 In accordance with the methodology outlined in ES Appendix 10.2 Climate change resilience assessment methodology, Volume II (Document Reference 6.2, DCO Volume 6), as the Proposed Development is considered to have a high resilience to the projected effects of climate change during operation, the effects of climate change to the Proposed Development are considered as not significant.

Decommissioning

10.8.40 Decommissioning of the Proposed Development would likely take place beyond 2100 as the Proposed Development is assumed to have an operational life of a minimum 100 years. The UK climate projection data outlined in section 10.7 presents data to the year 2099 as this is the furthest available data for some climate variables. The climate projection data for the 2070 to 2099 period is assumed to be representative for the year 2100 and beyond for this assessment.

Step 1: Identifying receptors, climate variables and hazards

10.8.41 As identified in section 10.7, the main climate variables which could be affected by climate change in the study area are temperature change, sea level rise, precipitation, and wind speeds.

10.8.42 As detailed in the ES Chapter 3 Description of the Proposed Development, Volume I (Document Reference 6.1, DCO Volume 6), it is assumed that the WRP and AGP would be removed, and the buried pipeline infrastructure would be left in situ at the end of the lifecycle. The specific decommissioning methods for the Proposed Development are uncertain at present but are anticipated to evolve over the operational life of the Proposed Development. In addition, decommissioning works for the Proposed Development are expected to be undertaken using good industry practice and the regulatory framework in place at the time.

10.8.43 The receptors which may be potentially impacted by the climate change hazards during decommissioning are identified as the following:

1. Decommissioning site workers
2. Plant and equipment
3. Above-ground infrastructure components, including:
    1. WRP site
    1. AGP
    1. Invasive Non-Native Species Treatment at Otterbourne WSW

10.8.44 The Proposed Development climate change receptors, climate variables and the identified climate hazards within the decommissioning phase are detailed in Table 10-23.

Table 10-23 Receptors, climate variables and hazards identified for the decommissioning phase CCR assessment

Climate variable	Potential climate hazard	Receptors affected
Temperature	**Heatwave** As detailed in section 10.7, the UK is projected to be warmer across all seasons. In the decommissioning phase of the Proposed Development, for RCP8.5 (very high emission scenario), the probabilistic annual temperature increase of 2.07°C to 5.52°C and the maximum summer temperature increase of 2.63ºC to 9.47ºC, between 2070 and 2099 (10th and 90th percentile respectively), is assumed to be representative of year 2100 and beyond within the Order Limits.	• Site workers
	Snow and ice The climate projection data in show that average temperatures are predicted to increase in winter months, meaning the potential for hazards associated with snow and ice conditions are likely to decrease.	As snow and ice conditions are likely to be less frequent due to milder winters, none of the identified receptors are considered vulnerable to snow and ice conditions during the decommissioning phase of the Proposed Development.
Precipitation	**Surface water flooding** The climate projection data shows that annual precipitation levels in the study area may vary, depending on the scenario and likelihood. However, the data and scientific literature suggests that it is likely that there will be increase in precipitation during winter months in the UK, which could lead to more frequent surface water flooding events during winter.	• Site workers • Plant and equipment • Above-ground infrastructure associated with the Proposed Development
	Fluvial flooding As discussed, annual precipitation levels in the study area may vary, but it is likely that there will be an increase in precipitation during winter months, which could lead to more frequent fluvial flooding events during the decommissioning phase of the Proposed Development for the receptors which would be situated near to rivers.	• Site workers • Plant and equipment • Above-ground infrastructure associated with the Proposed Development
	Drought The climate projection data shows that there is predicted to be reduced rainfall in the summer months in all climate scenarios, which could lead to drought events during the summer.	The Proposed Development would be implemented to reduce water stress in the region. However, none of the receptors associated with

Climate variable	Potential climate hazard	Receptors affected
		the Proposed Development are considered to be vulnerable to drought events.
Wind speeds	**Average wind speeds** There is uncertainty as to whether climate change will result in differences in annual average wind speeds. There is potential for more frequent and intense storm events over the 21st century, where there could be periods of high wind speeds, which may affect site workers and above-ground infrastructure.	• Site workers • Above-ground infrastructure associated with the Proposed Development
Sea level rise	**Sea level rise** The projected sea level rise for the nearest UKCP18 coastal grid square to the Proposed Development. The projected sea level rise for 2099 results in a sea level rise 1.04m (for the 90th percentile), which may affect receptors in coastal areas such as the WRP site. The WRP site and Pipelines between the WRP site and Bedhampton Springs are located within coastal catchment areas.	• WRP site and Budds Farm to WRP Pumping Station
Tidal flooding	**Tidal flooding** Extreme weather events may result in a greater risk of tidal flooding, which may affect receptors in coastal areas.	• Site workers • Plant and equipment • WRP and Budds Farm to WRP Pumping Station

Step 2: Climate vulnerability assessment

10.8.45 The vulnerability of the Proposed Development and its receptors to the climate hazards identified in Table 10-23 are considered in Step 2 of the CCR assessment and outlined in Table 10-24. The receptors that are considered to have the potential to be vulnerable to climate change, with consideration of embedded mitigations, were considered in the climate vulnerability assessment. The risks to the receptors are qualitatively identified through a hazard likelihood and consequence matrix as set out in ES Appendix 10.2 Climate change resilience assessment methodology, Volume II (Document Reference 6.2, DCO Volume 6).

Table 10-24 Decommissioning phase climate vulnerability assessment

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
Heatwaves	Due to the projected future increases in temperature, there is a potential for heatwaves or periods of extreme heat to cause harm to site workers.	Decommissioning will be subject to the appropriate permits, consents and regulatory environment at the relevant time. Decommissioning works are assumed to follow good industry practice in place at the time of the works and are expected to be similar in nature to those in the Outline CEMP (Document Reference 7.1, DCO Volume 7).	Very unlikely (1) – Due to the anticipated measures that would be adopted on-site, the likelihood of a heatwave to affect site workers is considered to be very unlikely.	Insignificant (1) – the consequence of heatwaves is anticipated to be insignificant, due to the implementation of measures to protect site workers during decommissioning.	Low
Surface water flooding	An increase in the frequency and intensity of precipitation events, particularly during the winter months, could lead to an increase in surface water flood events. This could result in harm to site workers, and damage to infrastructure being decommissioned or plant and equipment.	Decommissioning will be subject to the appropriate permits, consents and regulatory environment at the relevant time. Decommissioning works are assumed to follow good industry practice in place at the time of the works and are expected to be similar in nature to those in the Outline	Unlikely (2) – ES Appendix 19.1 Flood Risk Assessment, Volume II (Document Reference 6.2, DCO Volume 6), outlines climate change predictions for the years 2025, 2055, 2085, and 2115. In addition, the AGPs are located within Flood Zone 1 (low probability) and are therefore expected to remain safe and operational throughout their design life,	Minor (2) – due to the level of resilience incorporated into the design, consequences of a surface water flooding event are likely to be small and localised, and therefore are considered to be minor.	Low

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
		CEMP (Document Reference 7.1, DCO Volume 7).	taking climate change into account. The SuDS features forming the surface water management strategy have been designed to accommodate the 1% annual exceedance rainfall event, including a 45% climate change uplift. This uplift reflects the upper-end allowance for the 2070s epoch (2061–2125) within the East Hampshire Management Catchment, ensuring the design is appropriate for the project's lifetime. The SFRA interactive mapping also confirms that the AGP would remain resilient to flood risk during both its operational and decommissioning phases, based on future flood risk mapping for the 2115 horizon adapted from the PUSH SFRA.		
Fluvial flooding	An increase in the frequency and intensity of precipitation events, particularly during the winter months, could lead to an increase in fluvial flood events. This could	Decommissioning will be subject to the appropriate permits, consents and regulatory environment at the relevant time.	Unlikely (2) – ES Appendix 19.1 Flood Risk Assessment, Volume II (Document Reference 6.2, DCO Volume 6), outlines climate change predictions for the years 2025,	Minor (2) – due to the level of resilience incorporated into the design, consequences of a fluvial water flooding event are likely to be	Low

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
	result in harm to construction site workers, damage to infrastructure being decommissioned, and to plant and equipment.	Decommissioning works are assumed to follow good industry practice in place at the time of the works and are expected to be similar in nature to those in the Outline CEMP (Document Reference 7.1, DCO Volume 7).	2055, 2085, and 2115. In addition, the AGPs are located within Flood Zone 1 (low probability) and are therefore expected to remain safe and operational throughout their design life, taking climate change into account. The SuDS features forming the surface water management strategy have been designed to accommodate the 1% annual exceedance rainfall event, including a 45% climate change uplift. This uplift reflects the upper-end allowance for the 2070s epoch (2061–2125) within the East Hampshire Management Catchment, ensuring the design is appropriate for the project's lifetime. The SFRA interactive mapping also confirms that the AGP would remain resilient to flood risk during both its operational and decommissioning phases, based on future flood risk mapping for the 2115 horizon	small and localised, and therefore are considered to be minor.	

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
			adapted from the PUSH SFRA.		
Wind speed	An increase in the frequency and intensity of high wind speed events may damage infrastructure during decommissioning, and cause harm to site workers.	Decommissioning will be subject to the appropriate permits, consents and regulatory environment at the relevant time. Decommissioning works are assumed to follow good industry practice in place at the time of the works and are expected to be similar in nature to those in the Outline CEMP (Document Reference 7.1, DCO Volume 7).	Unlikely (1) – there are uncertainties regarding future wind projections in the UK, particularly over a timescale greater than 100 years, and with adherence to industry practice and relevant regulatory requirements, the likelihood of high wind speed events to affect the Proposed Development is considered to be unlikely.	Minor (2) – there could be damage to infrastructure as a result of high winds, but the consequences are likely to be small and localised over the decommissioning phase, and therefore are considered to be minor.	Low
Sea level rise	Sea level rise, compounded by storm surges and tidal changes could damage infrastructure components and harm site workers in coastal areas during decommissioning.	Decommissioning will be subject to the appropriate permits, consents and regulatory environment at the relevant time. Decommissioning works are assumed to follow good industry practice in place at the time of the works and are expected to be similar in nature to	Unlikely (2) – due to adherence to industry practice and relevant regulatory requirements, the likelihood of sea level rise to affect the Proposed Development in considered to be unlikely.	Minor (2) – due to the level of resilience incorporated into the design, consequences of sea level rise are likely to be small and localised, and therefore are considered to be minor.	Low

Climate variable	Potential climate change impact to the Proposed Development	Primary/tertiary mitigation	Likelihood of climate hazard	Consequence of climate hazard	Risk rating
		those in the Outline CEMP (Document Reference 7.1, DCO Volume 7).			
Tidal flooding	Tidal flooding may lead to damage to the Proposed Development, leading to damage to infrastructure components and harm to site workers.	Decommissioning will be subject to the appropriate permits, consents and regulatory environment at the relevant time. Decommissioning works are assumed to follow good industry practice in place at the time of the works and are expected to be similar in nature to those in the Outline CEMP (Document Reference 7.1, DCO Volume 7).	Unlikely (2) – the ES Appendix 19.1 Flood Risk Assessment, Volume II (Document Reference 6.2, DCO Volume 6), outlines that the risk of tidal flooding at the Proposed Development is low, therefore, the likelihood of such an event is considered to be unlikely.	Minor (2) – due to the level of resilience incorporated into the design, consequences of a tidal flooding event are likely to be small and localised, and therefore are considered to be minor.	Low

Significance of effect

10.8.46 Step 2 of the CCR assessment identified that there is a low risk of climate impacts to adversely affect the Proposed Development during decommissioning, and a high resilience of the Proposed Development to the projected effects of climate change. Therefore, Step 3 of the CCR assessment was not required as this step is only applicable when the risk rating is assessed as medium or high.

10.8.47 In accordance with the methodology outlined in ES Appendix 10.2 Climate Change resilience methodology, Volume II (Document Reference 6.2, DCO Volume 6), as the Proposed Development is considered to have a high resilience to the projected effects of climate change during decommissioning, the effect of climate change to the Proposed Development are considered as not significant.

In-combination Climate Change Impact assessment

10.8.48 The ICCI assessment is presented in ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6). The assessment concludes that the in-combination climate impact for all identified effects predicted in other chapters in the ES was considered to be not significant during the construction and operation phases. It is concluded that there would be a low likelihood of in-combination climate change impacts to adversely affect the Proposed Development in the decommissioning phase.

10.9 Mitigation, monitoring and enhancement

10.9.1 Mitigation measures are defined in ES Chapter 5 EIA approach and methodology, Volume I (Document Reference 6.1, DCO Volume 6), with primary mitigation and tertiary mitigation for carbon and climate change being presented in section 10.4 of this chapter.

Secondary mitigation

Carbon assessment

10.9.2 Carbon emissions from the Proposed Development were assessed to be not significant in section 10.8. However, the Applicant is committed to reducing emissions, and as discussed in paragraph 10.4.6, has established a strategic objective to deliver solutions in relation to design, construction and operation of the Proposed Development that are optimal in terms of whole life carbon, and reduce emissions to as low as reasonably practicable.

10.9.3 The Applicant has established a well defined process to identify carbon mitigation opportunities, which aligns with the PAS 2080:2023 carbon reduction hierarchy. An Outline CMP (Document Reference 7.8, DCO Volume 7) is submitted with the DCO application which contains measures and commitments to reduce carbon emissions across the lifecycle of the Proposed Development. The measures listed in this section and the Outline CMP (Document Reference 7.8, DCO Volume 7) are not relied upon for the assessment of likely significant effects, but outline how the Applicant will seek to reduce emissions.

10.9.4 To ensure that the Applicant and the Contractor meet the carbon strategic objective, the Applicant has defined a set of clear criteria that will be followed to determine the feasibility of mitigation measures identified. All mitigation measures that pass the criteria below will be considered to be implemented as practicable and feasible mitigation measures:

1. Technical feasibility: the mitigation measure is adequate for the Proposed Development and does not adversely affect the Proposed Development's expected performance. The mitigation measure can technically be implemented.
2. Programme alignment: the mitigation measure will not substantially affect or delay the Proposed Development delivery programme and will not add significant risk to it by interfering with other required activities.
3. Market availability: the mitigation measure should be at a technical readiness level that confirms it will be available to procure in the market at the time required.
4. Commercial viability and value to customers: the mitigation measure should be affordable and represent value to customers.

10.9.5 An overview of key secondary mitigation measures from the Outline CMP (Document Reference 7.8, DCO Volume 7) is provided below:

Supply chain engagement

1. The largest source of emissions associated with the Proposed Development during construction and operation would arise from the supply chain (embodied carbon in materials and chemical use) and therefore are outside the direct control of the Applicant. It is however acknowledged that there are opportunities to work with the supply chain for the Proposed Development (prior to and during the construction and operation of the Proposed Development) to support an accelerated decarbonisation of external systems and supply chains to help reduce the carbon impact. For example, incorporating the use of low-carbon pipe materials that meet the performance requirements, where those are available and feasible, into design and commercial arrangements is a key area of engagement with the supply chain that may contribute to the decarbonisation of the Proposed Development.
2. The Applicant will continue the market engagement process post consent which will help evaluate some of the mitigation measures proposed in the Outline CMP (Document Reference 7.8, DCO Volume 7), particularly those related to the use of alternative low carbon materials, and low carbon fuels, where those are feasible and practicable, in line with the key carbon emissions hotspots identified in the assessment.

Setting requirements through procurement

1. The Applicant will continue the market engagement process post consent which will help evaluate some of the mitigation measures proposed in the Outline CMP (Document Reference 7.8, DCO Volume 7), particularly those related to the use of alternative low carbon materials, and low carbon fuels, where those are feasible and practicable, in line with the key carbon emissions hotspots identified in the assessment.

2. The Proposed Development is a large infrastructure project which will be procured through the Direct Procurement for Customers (DPC) model, which involves a competitive tender process to appoint a Contractor. The Applicant will set carbon management requirements for the Contractor during the DPC tender process. This will ensure that the Contractor responsible for delivery of the Proposed Development is contractually required to implement measures to help achieve the carbon strategic objective for the Proposed Development. The nature of the procurement route outlined above requires sufficient flexibility to be maintained to allow the Contractor to bring in further innovation and enable it to deliver carbon reductions as efficiently as practicable.
3. The Applicant will establish mechanisms to incentivise solutions and innovations that will lead to carbon reductions through the DPC tender process that are greater than the established minimum carbon requirements for the Proposed Development.
4. Later iterations of the CMP will be compiled following the tender process which will identify the commitment the Contractor has contractually committed to.
5. The Applicant is exploring options in line with best practice procurement approaches to incentivise the Contractor through the DPC procurement process, which include:
    i. At tender stage, competitive tenderers will be required to identify carbon mitigation measures, to embed these into their proposed tender designs and to quantify carbon savings. The Applicant will evaluate these as part of the tender process.
    ii. Potential financial incentive mechanisms to deliver efficient carbon reductions against key carbon hotspot areas.
    iii. Utilising industry frameworks, such as the Construction Leadership Council 5 Client Carbon Commitments to benchmark levels of carbon emissions commitments against other major infrastructure projects including those consented under the Planning Act 2008 regime.

Mitigation during construction

1. The Applicant and the Contractor will apply solutions that are optimal in terms of carbon in the design and construction of the Proposed Development to ensure that construction emissions are reduced to as low as reasonably practicable.
2. The Applicant will submit an updated version of the carbon assessment, and final evidence for achievement of this target will be presented in a future version of the CMP produced and submitted for approval in accordance with the corresponding requirement in Schedule 2 to the draft DCO (Document reference 3.1, DCO Volume 3).
3. The types of mitigation measures that are likely to contribute most towards a reduction of emissions during the construction phase are listed below. The mitigation including these indicative measures are subject to appropriate feasibility, affordability and deliverability considerations. The measures presented are not an exhaustive list, there are multiple opportunities under each category and further opportunities will identified by the Contractor post procurement:

i. Value engineering of scope to reduce the number or size of assets (i.e. avoid emissions). This could include reducing the size or number of pumping stations/break pressure tanks required.

ii. Optimise material specification (i.e. switch emissions). As an example, this could include procuring pipelines manufactured through low carbon manufacturing processes.

iii. Reuse materials or optimise tunnelling to reduce the amount of grout and disposal required.

4. A Framework CTMP (Document Reference 7.2, DCO Volume 7) is submitted with the DCO application which details mitigation measures that will be adopted during the construction of the Proposed Development to reduce carbon emissions from transport. This includes a strategy that reduces vehicle movements as far as practicable and encourages the use of efficient vehicles to reduce fuel consumption. In addition, the Framework CTMP (Document Reference 7.2, DCO Volume 7) includes measures to prioritise local suppliers and the use of alternative transport options to reduce road vehicle movements.

Mitigation during operation

1. The Applicant as part of its design development to date has investigated measures to reduce operational carbon emissions. The final process selection and design optimisation will be undertaken by the Contractor, and the Applicant will define in the procurement process minimum requirements and incentives to ensure the Contractor will, where feasible, include measures that optimise operational emissions to as low as reasonably practicable. Examples of measures could (subject to feasibility and practicability considerations) include

i. Reducing energy demand associated with the Proposed Development (i.e. avoid emissions).

ii. Reduce the carbon intensity of power supply to the Proposed Development, including through the development of an Energy Strategy for the Proposed Development, which will be embedded into the procurement process. The Applicant has evaluated whether self-generation and on-site renewable generation will be feasible. It was concluded that there are insufficient viable generation opportunities available within the Order Limits to provide meaningful and efficient renewable energy contribution to the Proposed Development power demand. Following these findings, the Applicant set out a process to evaluate what energy procurement routes are more efficient to achieve optimal decarbonisation of power demand. These options include the procurement of power through renewable Power Purchase Agreements (PPAs) and the purchase of Renewable Energy Guarantees of Origin (REGO) backed power. The options will need to meet criteria including their feasibility and whether they represent value for money for customers.

iii. Utilise low carbon fuels for maintenance activities, and the transport of operational chemicals and waste.

iv. Optimise of the consumption of chemicals and use low carbon chemicals where feasible.

v. To manage these emissions areas the Applicant will embed into its procurement process incentivisation for the Contractor to:

- Work with the supply chain to reduce the transport distances and intensity of transport modes for key consumables such as chemicals.
- Utilise low carbon fuels on-site.
- Utilise low carbon fuels for transport for products or waste leaving the site.
- Low carbon maintenance vehicles.

10.9.6 The measures listed above were not incorporated into the carbon modelling to inform the assessment, but will be implemented where practicable, so emissions arising from the Proposed Development are likely to be less than the figures presented in section 10.8.

10.9.7 The Applicant will seek to reduce emissions to as low as reasonably practicable through the adoption of the measures summarised above; additional measures are detailed in the Outline CMP (Document Reference 7.8, DCO Volume 7).

Climate Change Resilience assessment

10.9.8 There are no additional mitigation measures recommended as a result of the CCR assessment. The CCR assessment considered the resilience and vulnerability of the Proposed Development following the implementation of the primary and tertiary mitigation measures. The assessment concluded that residual effects would be not significant.

Monitoring

Carbon assessment

10.9.9 There are no likely significant adverse effects related to the carbon assessment identified either during construction, operation or decommissioning stages of the Proposed Development that require monitoring.

10.9.10 However, actual emissions data will be recorded for the Proposed Development to inform ongoing decisions that could further reduce carbon emissions during the construction phase. The emissions sources that will be monitored, as well as recommended approaches to monitoring approach are secured in the Outline CMP (Document Reference 7.8, DCO Volume 7).

Climate Change Resilience assessment

10.9.11 There are no likely significant adverse effects related to the CCR identified either during construction, operation or decommissioning stages of the Proposed Development that require monitoring.

10.9.12 However, where checks identify damage or reduced performance linked to climate related stresses, appropriate mitigation, repair or operational adjustments will be implemented, as secured in the OEMP (Document Reference 7.7, DCO Volume 7).

10.10 Summary of residual effects

Carbon assessment

10.10.1 Table 10-25 provides a summary of the residual effects relating to the construction, operation and decommissioning of the Proposed Development with regard to carbon assessment receptors.

Table 10-25 Summary of carbon assessment residual effects

Receptor	Impact	Residual effects		
		Construction	Operation	Decommissioning
Global atmosphere	Carbon emissions	Minor adverse (not significant)	Minor adverse (not significant)	Minor adverse (not significant)

Climate Change Resilience assessment

10.10.2 Table 10-26 provides a summary of the residual effects relating to the construction, operation and decommissioning of the Proposed Development with regard to CCR assessment receptors.

Table 10-26 Summary of CCR assessment residual effects

Receptor	Impact	Residual effects		
		Construction	Operation	Decommissioning
Site workers	Heatwaves	Not significant	Not significant	Not significant
	Surface water flooding	Not significant	Not significant	Not significant
	Fluvial flooding	Not significant	Not significant	Not significant
	Drought	N/A	N/A	N/A
	Wind speeds	N/A	Not significant	Not significant
	Sea level rise	N/A	N/A	N/A
	Tidal flooding	N/A	Not significant	Not significant
Plant and equipment	Heatwaves	N/A	N/A	N/A
	Surface water flooding	Not significant	N/A	Not significant
	Fluvial flooding	Not significant	N/A	Not significant
	Drought	N/A	N/A	N/A
	Wind speeds	N/A	N/A	N/A
	Sea level rise	N/A	N/A	N/A
	Tidal flooding	N/A	N/A	Not significant
WRP site	Heatwaves	N/A	Not significant	N/A
	Surface water flooding	Not significant	Not significant	Not significant
	Fluvial flooding	Not significant	Not significant	Not significant
	Drought	N/A	Not significant	N/A
	Wind speeds	N/A	Not significant	Not significant

Receptor	Impact	Residual effects		
		Construction	Operation	Decommissioning
	Sea level rise	N/A	Not significant	Not significant
	Tidal flooding	N/A	Not significant	Not significant
Pipelines between Budds Farm WTW and the WRP site	Heatwaves	N/A	Not significant	N/A
	Surface water flooding	Not significant	Not significant	N/A
	Fluvial flooding	Not significant	Not significant	N/A
	Drought	Not significant	Not significant	N/A
	Wind speeds	N/A	N/A	N/A
	Sea level rise	N/A	Not significant	N/A
	Tidal flooding	N/A	Not significant	N/A
Pipelines between the WRP site and Bedhampton Springs	Heatwaves	N/A	Not significant	N/A
	Surface water flooding	Not significant	Not significant	N/A
	Fluvial flooding	Not significant	Not significant	N/A
	Drought	Not significant	Not significant	N/A
	Wind speeds	N/A	N/A	N/A
	Sea level rise	N/A	Not significant	N/A
	Tidal flooding	N/A	Not significant	N/A
Pipeline between the WRP site and Otterbourne WSW	Heatwaves	N/A	Not significant	N/A
	Surface water flooding	Not significant	Not significant	N/A
	Fluvial flooding	Not significant	Not significant	N/A
	Drought	Not significant	Not significant	N/A
	Wind speeds	N/A	N/A	N/A
	Sea level rise	N/A	Not significant	N/A
	Tidal flooding	N/A	Not significant	N/A
AGP	Heatwaves	N/A	Not significant	N/A
	Surface water flooding	Not significant	Not significant	Not significant
	Fluvial flooding	Not significant	Not significant	Not significant
	Drought	N/A	Not significant	N/A
	Wind speeds	N/A	Not significant	Not significant
	Sea level rise	N/A	Not significant	N/A
	Tidal flooding	N/A	Not significant	N/A
Invasive Non-Native Species Treatment at Otterbourne WSW	Heatwaves	N/A	Not significant	N/A
	Surface water flooding	Not significant	Not significant	Not significant
	Fluvial flooding	Not significant	Not significant	Not significant
	Drought	N/A	Not significant	N/A

Receptor	Impact	Residual effects		
		Construction	Operation	Decommissioning
	Wind speeds	N/A	Not significant	Not significant
	Sea level rise	N/A	Not significant	N/A
	Tidal flooding	N/A	Not significant	N/A

In-combination Climate Change Impact assessment

10.10.3 The ICCI assessment, presented in ES Appendix 10.3 In-combination Climate Change Impact assessment, Volume II (Document Reference 6.2, DCO Volume 6) concludes that the in-combination climate impacts for all identified effects of the Proposed Development would be not significant.

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