Grand Union Canal Transfer

Chapter 10: Climate

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10. Climate

10.1 Introduction

10.1.1 This Preliminary Environmental Information (PEI) Report chapter presents the preliminary assessment of likely significant environmental effects arising from the Proposed Development in relation to a changing global climate. This preliminary assessment follows the methodology outlined within the Environmental Impact Assessment (EIA) Scoping Report and agreed in the EIA Scoping Opinion (provided in **Appendices 5-PD-1 and 5-PD-2** PEI Report **Volume 4**). It is based on the environmental information obtained to date and the description of the Proposed Development as presented in **Chapter 3: The Proposed Development** in PEI Report **Volume 2**. Further review of the potential for significant climate effects will be undertaken and reported in the Environmental Statement (ES).

10.1.2 Potential climate change and carbon impacts were covered in a combined chapter in the EIA Scoping Report but have been split into separate chapters for this PEI Report. The preliminary carbon assessment is presented in **Chapter 9: Carbon** in PEI Report **Volume 2**.

10.1.3 The climate assessment presented in this PEI Report chapter covers the construction and operation of Proposed Development and evaluates the potential risks that may result from climate change. The assessment of climate risk is comprised of the following two components:

a. Climate Change Risk Assessment (CCRA): examines physical climate change risks to the Proposed Development during construction and operation.

b. In-Combination Climate Change Impact (ICCI) Assessment: evaluates any risks that may arise from the combined impacts of the Proposed Development and climate change on the receptors identified by other technical environmental disciplines.

10.1.4 There are no supporting figures or appendices for this chapter.

10.1.5 There are interrelationships between the potential effects of climate change and other environmental topics. Therefore, please also refer to the following:

a. **Chapter 21: Water Environment and Flood Risk** in PEI Report **Volume 2** considers the Proposed Development's vulnerability to flooding and details the proposed defences; and

b. The chapters listed in paragraph 10.5.12, as considered by the ICCI assessment.

10.1.6 It should be noted that the purpose of the Proposed Development is to provide an alternative water supply for the Southeast, which is under increasing pressure from population growth and the effects of climate change, and to reduce the amount of water taken from the environment to protect fragile ecosystems. The Proposed Development is key to delivering a sustainable and reliable water supply for the future in the Southeast and reducing the reliance on water from other sources, including unique chalk stream habitats. It will also secure future water availability for canal navigation, ultimately acting as a measure to increase climate resilience at a national scale.

10.2 Legislation, Policy and Guidance

10.2.1 Legislation, policy[1], and standards and guidance relevant to the scope and method of the climate assessments (CCRA and ICCI) and potential mitigation measures comprises the documents listed below.

Legislative Framework

10.2.2 The Climate Change Act 2008 (Ref. 1) is a key piece of legislation relevant to the climate assessment.

National Policy

10.2.3 National policy considered includes:

a. National Policy Statement for Water Resources Infrastructure (Ref. 2) (the relevant national policy statement that has effect in relation to the Proposed Development);

b. National Planning Policy Framework (NPPF) (Ref. 3); and

c. Third National Adaptation Programme (NAP3) (Ref. 4).

Local Policy

10.2.4 Local policy considered includes relevant Local Plans (both adopted and emerging) and other adopted policy documents produced by the ten local authority administrative areas within which the Proposed Development is

[1] For the purposes of this PEI Report an overview of relevant policy is provided to show how relevant policy has informed scope, method and in some cases mitigation. It is not the purpose of the PEI Report (or the Environmental Statement) to present a review of the compliance of the Proposed Development with the requirements of policy. The Planning Statement, to be submitted with the DCO application, will present an assessment of the extent to which the Proposed Development accords with policy.

situated (refer to Table 1-4 in **Chapter 1: Introduction** in PEI Report **Volume 2)**.

Guidance

10.2.5 Guidance considered includes:

a. The Planning Practice Guidance – Climate Change (Ref. 5);

b. Institute of Environmental Management and Assessment [2] (IEMA) (2020) Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (Ref. 6); and

c. European Commission (2021). Technical Guidance on Climate Proofing of Infrastructure (Ref. 7).

10.3 Consultation

10.3.1 This section provides an overview of consultation undertaken to date in relation to climate.

Phase One Public Consultation

10.3.2 A summary of key topics raised from Phase One Public Consultation undertaken between 11 September to 25 October 2024 with regards to climate is provided below:

a. The risk of water transfer schemes becoming redundant if rainfall patterns change due to climate change; and

b. Concerns regarding more frequent and intense flood events as a result of climate change.

10.3.3 These topics have been taken into consideration in the climate assessment[3].

EIA Scoping

10.3.4 **Table 10-1** provides a summary of the key comments raised in the EIA Scoping Opinion (provided in **Appendix 5-PD-2** in PEI Report **Volume 4**) that have informed the originally proposed scope or required clarification. **Table 10-1** outlines how and where these issues have been addressed within the PEI Report or will be later addressed within the ES to ensure they are taken account of as part of the ongoing climate assessment.

[2] Now the Institute of Sustainability and Environmental Professionals (ISEP).

[3] A Phase One Public Consultation Report has been made available at Phase Two Public Consultation, which sets out activities undertaken to deliver the consultation and provides a summary of the key themes and issues raised, and how the project has considered these.

Table 10-1: Key Issues Raised in Scoping Opinion

Organisation	Comment	How and where addressed
Planning Inspectorate (PINS)	ID: 3.3.2 The scoping report states that as the proposed development is located inland, sea level rise has been scoped out. The Inspectorate agrees that sea level rise may be scoped out.	Comment noted, risks due to sea level rise have not been considered in the CCRA due to the Proposed Development's location.
	ID: 3.3.3 The scoping report explains that UKCP18 climate projections will cover the construction and operational phases of the proposed development. It is noted that UKCP18 is limited to the projection period of 2100, however paragraph 3.8.1 explains that the proposed development will be operated indefinitely. The ES should establish how impacts from climate beyond 2100 will be presented if the proposed development is planned to continue past this point. The applicant's attention is drawn to comments from the Environment Agency (in appendix 2 of this opinion) in this regard.	Beyond 2100 projections of climate change are highly uncertain and largely depend on the emissions scenario (Representative Concentration Pathways (RCPs) / Shared Socio-Economic Pathways (SSPs)) taken by the global society, however they are expected to follow the trends observed this century. Summers are anticipated to become hotter and drier, while winters will become warmer and wetter. There is also anticipated to be an increase in frequency and intensity of extreme weather events. This assessment has considered UKCP18 climate projections for the RCP8.5 scenario up to the period 2070-2099. Projections for this period are considered sufficient to evaluate risk and represent a worst-case climate scenario. Further assessment of climate risk may be required as new climate projections become available, though have been considered qualitatively in the assessment of risk.

10.4 Scope of Assessment

10.4.1 This section identifies the scope of the climate assessment following EIA Scoping and subsequent consultation, design refinement, surveys / studies and assessment.

Scope of Assessment

10.4.2 **Table 10-2** provides a summary of all matters scoped in and out of the climate assessment on the basis of whether they were considered to have the potential to result in significant effects during the EIA Scoping process. The table uses the following coding:

a. In = refers to likely effects that are considered potentially significant and therefore do require further assessment in the EIA.

b. Out = refers to likely effects that are not considered potentially significant and therefore do not require further assessment in the EIA.

c. n/a = refers to where there is no prospect of an effect from a particular Proposed Development Part(s), either due to the particular nature or location of the Proposed Development Part and/or the absence of a receptor within the study area for that particular Proposed Development Part.

Table 10-2: Summary of climate assessment scope

Likely significant impact	Receptor(s)	Parts of the Proposed Development					
		1a	1b	2	3	4a	4b
Climate Change Resilience							
Climate change resilience of the Proposed Development	The Proposed Development may be vulnerable to risks posed by climate change, and as such further assessment will be included within the EIA. The following climate parameters have been scoped into the assessment: extreme weather events, temperature, precipitation, wildfire and wind. Sea level rise has been scoped out of the assessment due to the location of the Proposed Development.	In	In	In	In	In	In
In-Combination Climate Impacts (ICCI)							
In-combination impacts of climate change and the Proposed Development on affected receptors	The ICCI assessment will consider how the resilience of various receptors in the surrounding environment (such as local waterways or local heritage assets) are affected by the Proposed Development in combination with future climatic conditions. The following climate parameters have been scoped into the assessment: extreme weather events, temperature, precipitation, wildfire and wind. Sea level rise has been scoped out of the assessment due to the location of the Proposed Development.	In	In	In	In	In	In

10.5 Assessment Methodology

10.5.1 This section presents the methodology used to assess the potential effects on climate during the construction and operational phases of the Proposed Development.

10.5.2 It should be noted that the methodology described for the CCRA and ICCI assessments deviates from that described in **Chapter 6: Environmental Impact Assessment Methodology** in PEI Report **Volume 2**, as the climate risk assessment examines the impacts of the climate on the Proposed Development, rather than impacts on the surrounding environment.

Climate Change Risk Assessment

10.5.3 The CCRA covers resilience against both gradual climate change, and the risks associated with an increased frequency and intensity of acute climate change events.

10.5.4 Climate risks during construction will be applicable to all parts of the Proposed Development. Therefore, to prevent duplication they are presented at a project-wide level.

10.5.5 Operational climate risks have been identified for each component of the Proposed Development and therefore are presented by Proposed Development Part (**Table 10-4**).

10.5.6 Climate parameters considered in the CCRA were determined through prior experience and professional judgement, and include the following:

a. Extreme weather events;
b. Flood risk;
c. Wildfire risk;
d. Temperature change; and
e. Precipitation change.

10.5.7 The assessment also identifies and accounts for existing resilience measures for each risk.

In-Combination Climate Change Impact Assessment

10.5.8 The ICCI assessment considers the extent to which climate change exacerbates an effect on an environmental receptor considered in other technical assessments. The ICCI assessment methodology has been developed in line with IEMA guidance (Ref. 6). The ICCI assessment considers the impacts and significance identified by each of the assessment topics, but with the added consideration of future climate change projections. The assessment considers the historical (current baseline) and projected climate conditions (future baseline), and the extent to which the identified receptors will be affected by this change.

Defining the Study Area

10.5.9 This section sets out the study areas adopted for the climate assessment.

Climate Change Risk Assessment

10.5.10 The study area for the Climate Change Risk Assessment (CCRA) is the Preliminary Order Limits (including all assets and staff on site) during the construction and operation of the Proposed Development.

10.5.11 The assessment has included all infrastructure and assets associated with the Proposed Development.

In-Combination Climate Change Impact Assessment

10.5.12 The study area for the In-Combination Climate Change Impact (ICCI) Assessment has been determined by other EIA topic assessments, as described in other chapters of this PEI Report. The other relevant topic chapters in PEI Report **Volume 2** include:

a. **Chapter 7: Agriculture and Soils**;
b. **Chapter 11: Cultural Heritage**;
c. **Chapter 12: Ecology – Aquatic**;
d. **Chapter 13: Ecology – Terrestrial**;
e. **Chapter 14: Ground Conditions**;
f. **Chapter 15: Human Health**;
g. **Chapter 17: Major Accidents and Disasters**;
h. **Chapter 18: Material and Waste**;
i. **Chapter 21: Traffic and Transport**; and
j. **Chapter 22: Water Environment and Flood Risk**.

10.5.13 The study area for the ICCI assessment varies by technical discipline. As such, it is not appropriate to assess ICCI risks by Proposed Development Part and is instead evaluated at a project-wide level for each relevant technical discipline for both construction and operation.

Determining Baseline Conditions

10.5.14 This section sets out how baseline conditions were determined for the Proposed Development.

Existing Baseline

10.5.15 The current baseline has been determined by examining historical climate data for the Preliminary Order Limits and surrounding area, sourced from the Met Office website.

10.5.16 To determine the baseline climate conditions, data from the Coleshill (Warwickshire) and Woburn (Bedfordshire) meteorological stations (Ref. 8),

provide climate averages for the period 1981-2010. The two weather stations are referred to as the ‘North Station’ (Coleshill, Warwickshire) and ‘South Station’ (Woburn, Bedfordshire).

10.5.17 It is noted that the observed data available on the Met Office website for the North and South Stations no longer publicly contains information for the time period 1981-2010. However, this dataset has been obtained through manipulation of the web page source code.

Future Baseline

10.5.18 In addition to the existing baseline outlined above, a desk-based study has been undertaken to inform the future baseline characterisation on which the impact assessment is based.

10.5.19 No surveys were required for the CCRA and the ICCI Assessment. The principal data sources used to inform the future baseline conditions are outlined below.

10.5.20 The future baseline across the life cycle of the Proposed Development is based on UK Climate Projections 2018 (UKCP18) data from the Met Office (Ref. 9). Due to the large geographical coverage of the Proposed Development, the 25 km grid squares at either end of the Proposed Development have been used to represent the future baseline, in line with the methodology used to determine the current baseline conditions.

10.5.21 The UKCP18 forms part of the Met Office’s Hadley Centre Climate Programme and provides updated observations and climate change projections up to 2100 for the UK. This peer-reviewed dataset provides the most up-to-date assessment of how the UK climate may change over the 21st century.

10.5.22 UKCP18 uses a range of possible scenarios, classified as Representative Concentration Pathways (RCPs), to inform differing future emission trends. These RCPs *“…specify the concentrations of greenhouse gases that will result in total radiative forcing increasing by a target amount by 2100, relative to preindustrial levels”* (Ref. 9). RCP8.5 is considered to be the worst-case global scenario with the greatest concentration of Greenhouse Gases (GHG) in the atmosphere and has been used as the basis of this assessment as a worst-case scenario.

10.5.23 Climate projections have been collected for the time periods 2010-2039 (short-term, construction), 2040-2069 (medium-term, operation) and 2070-2099 (long-term, operation). While some components of the Proposed Development may have a design life that extends beyond 2100, detailed climate projections are not available past the end of the century.

10.1.1 **Table 10-3** provides an overview of the baseline studies undertaken to inform the climate assessment. The table uses the following coding:

a. ✓ = Completed.
b. O = To be completed for the ES.
c. n/a = Baseline study / survey is not applicable for that Part of the Proposed Development.

Table 10-3: Summary of baseline climate studies

Study / survey[4]	Overview	Date completed	Part of the Proposed Development					
			1a	1b	2	3	4a	4b
Desktop review	A desktop review was undertaken to identify potential existing and future baseline climate conditions, sensitive receptors and likely climate change risks.	October 2025	✓	✓	✓	✓	✓	✓
Desktop review	Consultation with the other technical disciplines. The study area for the In-Combination Climate Change Impact (ICCI) Assessment has been determined by other EIA topic assessments, as described in other chapters of this PEI Report. The other relevant topic chapters in PEI Report **Volume 2** include those described in paragraph 10.5.12.	October 2025	✓	✓	✓	✓	✓	✓

[4] These desktop reviews will be updated for the Environmental Statement.

Assessment of Effects

10.5.24 This section sets out how the scoped in effects have been assessed.

10.5.25 Definitions of magnitude of impact, sensitivity or importance of the receptor and significance of effect are reported in the following sections.

Sensitive Receptors

Climate Change Risk Assessment

10.5.26 The receptor for the CCRA during construction is considered to be the Proposed Development itself, with risks presented at a project-wide level.

10.5.27 The receptor for the CCRA during the operational phase is the Proposed Development itself, as split into the five parts described in **Table 10-4**. The CCRA provides a description of how the Proposed Development has been designed to be more resilient to the climate change impacts identified during the review of the UKCP18 data.

10.5.28 The list of receptors considered for each part of the Proposed Development during operation are listed in **Table 10-4**. The receptors are determined through professional judgement and prior experience, based on the project description in **Chapter 3: The Proposed Development** in PEI Report **Volume 2**.

Table 10-4: CCRA Receptors

Proposed Development Part	Sensitive Receptors
1a: Minworth Advanced Water Treatment Plant (AWTP)	All assets, workers and activities within the Preliminary Order Limits of the Minworth AWTP
1b: Minworth to Atherstone Pipeline	The pipeline structure itself and surrounding ground conditions
2: Works to the Coventry, Oxford and Grand Union canals	Outfall structure, canal bank raising, transfer locks, bypass works (including pumping stations), weir modifications, canal flow, canal users, and the canal network and towpath holistically
3: Works to Daventry and Drayton Reservoirs	Reservoirs, structures and associated users
4a: Abstraction, Storage and Treatment	All assets, workers and activities within the Preliminary Order Limits of the abstraction, storage and treatment facilities
4b: Pipeline to an existing Underground Reservoir near Luton	The pipeline structure itself and surrounding ground conditions

In-Combination Climate Change Impact Assessment

10.5.29 The sensitivity of receptors considered within the ICCI assessment are determined by the relevant technical disciplines and reported in the technical chapters listed in paragraph 10.5.12.

Magnitude of Impacts

Climate Change Risk Assessment

10.5.30 Once potential climate hazards (e.g. heatwaves, fluvial flooding, extreme storm events) have been identified through professional judgement and previous major infrastructure project experience, and based on the climate parameters listed in paragraph 10.5.6, the likelihood of their occurrence during each project phase (construction or operation) is categorised.

10.5.31 The criteria which have been used to determine the likelihood of a climate hazard occurring are detailed in **Table 10-5**. These have been adapted from the European Commission (EC) Technical Guidance on the Climate Proofing of Infrastructure for the period 2021-2027 (Ref. 7). For example, a climate hazard could be increased summer temperatures, leading to the climate risk of a heatwave, while the climate change risk is from the impact on the Proposed Development, e.g. overheated electrical equipment.

Table 10-5: Climate Hazard Likelihood Definitions

Likelihood of Hazard	Qualitative Description	Quantitative Description
Almost Certain	Likely that the event will occur many times (reoccurs frequently)	>90-100% probability that the impact will occur each year
Likely	Likely that the event will occur sometimes (reoccurs infrequently)	>66-90% probability that the impact will occur each year
Moderate	Possible that the event will occur (has occurred rarely)	>33-66% probability that the impact will occur each year
Unlikely	Unlikely that the event will occur (not known to have occurred)	>10-33% probability that the impact will occur each year
Rare	Almost inconceivable that the event will occur	0-10% probability that the impact will occur each year

10.5.32 Following identification of climate hazard likelihood, the likelihood of occurrence of climate impacts have been assessed according to the probability of climate hazard occurring and the likelihood of impact (**Table 10-6**). For example, permanent damage to electrical equipment from heatwaves causing complete loss of operation. The categories and descriptions provided below are based on the IEMA guidance (Ref. 6) and EC technical guidance on climate proofing of infrastructure (Ref. 7).

Table 10-6: Climate Impact Likelihood Description

Likelihood of Impact	Qualitative Description	Quantitative Description
Almost Certain	Likelihood of climate hazard occurring is high and impact is always / almost always going to occur.	~95%
Likely	Likelihood of climate hazard occurring is high and impact often occurs.	~80%
Moderate	Likelihood of climate hazard occurring is high and impact sometimes occurs, or the likelihood of climate hazard is moderate, and impact is likely to occur always / almost always.	~50%
Unlikely	Likelihood of climate hazard occurring is high, but impact rarely occurs or the likelihood of the climate hazard occurring is moderate and impact sometimes occurs or the likelihood of the climate hazard occurring is low and impact is likely to occur always / almost always.	~20%
Rare	All other eventualities – highly unlikely but theoretically possible.	~5%

10.5.33 The consequence of a climate impact is also assessed according to the criteria below, also adapted from IEMA and EC technical guidance (Ref. 6) (Ref. 7), as presented in **Table 10-7**.

Table 10-7: Climate Impact Consequence Description

Consequence of Impact	Description
Catastrophic	Disaster with the potential to shut down, collapse or lose the asset / network; Single or multiple fatalities; Significant environmental harm with widespread effect and recovery longer than one year; Loss of social licence to operate; and/or Permanent financial impact.
Major	Permanent damage to structures / assets; Complete loss of operation / service; Complete / partial renewal of infrastructure; Exceptional environmental damage; and/or Extreme financial impact.
Moderate	Partial infrastructure damage and some loss of service; Some infrastructure renewal; Adverse impact on the environment; and/or Moderate financial impact.
Minor	Localised infrastructure disruption and minor loss of service; No permanent damage; Minor restoration work required; Slight adverse environmental effects; and/or Small financial losses.
Insignificant	No damage to infrastructure; No impacts on the environment; and/or No adverse financial impact.

10.5.34 Climate risks are rated using professional judgement and previous major infrastructure project experience, based on the consequence and likelihood of climate impacts to the Proposed Development

In-Combination Climate Change Impact Assessment

10.5.35 The likelihood of a climate risk occurring and the likelihood of a climate impact to a receptor is then combined to determine the likelihood of an ICCI occurring. This is illustrated in **Table 10-8**.

Table 10-8: ICCI Likelihood Description

ICCI Likelihood Rating	Definition
High	Likelihood of climate hazard occurring is high and impact is always / almost always going to occur.
Moderate	Likelihood of climate hazard occurring is high and impact occurs often or the likelihood of climate hazard occurring is moderate and impact is likely to occur always / almost always.
Low	Likelihood of climate hazard occurring is high, but impact rarely occurs or the likelihood of climate hazard occurring is moderate and impact sometimes occurs or the likelihood of climate hazard occurring is low and impact is likely to occur always / almost always.
Negligible	All other eventualities – highly unlikely but theoretically possible.

10.5.36 Once the likelihood of an ICCI has been identified, the assessment then considers how this will affect the significance of the identified effects.

10.5.37 The ICCI consequence criteria are defined in **Table 10-9** and are based on the change to the significance of the effect already identified by the environmental discipline. To assess the consequence of an ICCI each discipline has assigned a level of consequence to an impact based on the criteria description and their discipline assessment methodology.

Table 10-9: ICCI Consequence Description

ICCI Consequence Rating	Criteria
High	The climate change parameter in-combination with the effect of the Proposed Development causes the significance of the effect on the resource / receptor, as defined by the topic, to increase from negligible, minor, or moderate to major.
Moderate	The climate change parameter in-combination with the effect of the Proposed Development causes the effect on the resource / receptor, as defined by the topic, to increase from negligible or minor, to moderate.

ICCI Consequence Rating	Criteria
Low	The climate change parameter in-combination with the effect of the Proposed Development, causes the significance of the effect on the resource / receptor, as defined by the topic, to increase from negligible to minor.
Negligible	The climate change parameter in-combination with the effect of the Proposed Development does not alter the significance of the effect on the resource / receptor, as defined by the topic.

Significance of Effects

Climate Change Risk Assessment

10.5.38 The significance in the CCRA is determined as a function of the likelihood of a climate change risk occurring and the consequence to the receptor if the risk occurs. The significance criteria are detailed in **Table 10-10**. Where a risk is determined as high or extreme, this has been deemed significant. Low and medium risks are classified as not significant. The assessment takes into account confirmed design and mitigation measures (referred to as embedded mitigation).

Table 10-10: Climate Risk Significance Matrix

Likelihood of Climate Impact	Consequence of Climate Impact				
	Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Rare	Low (NS)	Low (NS)	Medium (NS)	High (S)	Extreme (S)
Unlikely	Low (NS)	Low (NS)	Medium (NS)	High (S)	Extreme (S)
Moderate	Low (NS)	Medium (NS)	High (S)	Extreme (S)	Extreme (S)
Likely	Medium (NS)	High (S)	High (S)	Extreme (S)	Extreme (S)
Almost Certain	High (S)	High (S)	Extreme (S)	Extreme (S)	Extreme (S)
NS = Not Significant, S = Significant					

10.5.39 Where significant climate risks are identified, further measures will be recommended to mitigate residual risk.

In-Combination Climate Change Impact Assessment

10.5.40 The significance of potential effects is determined using the matrix in **Table 10-11**. Where an effect has been identified as medium or high, these will be classed as a likely significant ICCI effect. If likely significant ICCI effects are evaluated, then appropriate additional mitigation measures (secondary mitigation) are identified.

Table 10-11: ICCI Significance Matrix

ICCI Likelihood	Level of Consequence			
	Negligible	**Low**	**Moderate**	**High**
Negligible	Low (NS)	Low (NS)	Medium (NS)	High (S)
Low	Low (NS)	Medium (NS)	Medium (NS)	High (S)
Moderate	Medium (NS)	Medium (NS)	High (S)	Extreme (S)
High	Medium (NS)	High (S)	High (S)	Extreme (S)
NS = Not Significant, S = Significant				

10.5.41 Where significant ICCI risks are identified, further mitigation measures are identified to mitigate residual risk.

Assumptions, Limitations and Uncertainties

10.5.42 The following assumptions and limitations relate to the assessment of climate and ICCI risk:

a. There is inherent uncertainty in climate projection data. The data collected to inform the assessment are a projection of how the climate might change in the region to the year 2099, best representing the climatic conditions on site throughout the Proposed Development's design life;

b. Some aspects of the Proposed Development may have a design life that exceeds 2100. However, the world's population and economies will follow a Shared Socio-Economic Pathway (SSP) that is impossible to project at present. Each SSP produces different future emissions projections, so publicly available climate projections have not been published past the end of this century. For this assessment, it is considered that the worst-case RCP8.5 2070-2099 climate projections give a reasonable enough indication of likely end-of-century climate conditions to determine appropriate risk ratings beyond 2100. As the RCP8.5 climate projections are considered a worst-case scenario, it is possible that actual changes to the climate beyond 2100 will not reach the magnitude seen in the RCP8.5 2070-2099 projections;

c. Hydraulic modelling related to the water environment and flood conditions is still ongoing (see **Chapter 22: Water Environment and Flood Risk** in PEI Report **Volume 2**. Risks will be reevaluated based on updated modelling for the ES;

d. While projections of future climate are quantifiable, the overall assessment of climate risk is reliant on the use of professional judgement and prior experience;

e. The climate risks presented in this chapter are not exhaustive, but are those most relevant to the Proposed Development; and

f. Project environmental design measures and embedded mitigation are subject to change as the assessment progresses, which may affect the rating of climate or ICCI risks.

10.6 Project-Wide Environmental Design, Standards and Management

10.6.1 This section outlines embedded environmental design, standards and/or management related mitigation measures in relation to climate that are generally relevant to the whole Proposed Development. Where embedded environmental design, standards and/or management measures are specific to a Proposed Development Part(s), these have been identified.

10.6.2 Design measures related to the mitigation of flood risk have been proposed on the basis of hydrological modelling of canal flow, considering allowances for climate change and extreme weather events. For more details on proposed flood defences please refer to **Chapter 22: Water Environment and Flood Risk** in PEI Report **Volume 2**.

10.6.3 The design of the Bio-diversity Net Gain (BNG) enhancement will consider climate resilience in the inclusion of appropriate habitats in locations suitable for creation, for example woodland or trees, hedgerows, grassland, ditches and watercourses. These created habitats will be subject to a habitat management and monitoring plan (HMMP) to ensure habitats achieve their target condition or wider outcome for the minimum 30-year period. The Chartered Institute of Ecology and Environmental Management (CIEEM) is preparing guidance on 'habitat creation in a changing climate', in terms of prioritising habitats that provide climate resilience, while maintaining target condition (the agreed upon condition of a created or retained habitat to ensure sufficient net gains from a development) under the effects of climate change.

10.6.4 For example, river restoration (excluding canals) which is required in order to create watercourse habitat units within the BNG metric, can provide increased resilience to flooding events through slowing water flow rates through in-channel works like re-meandering and restoration of wetland habitats within the wider riparian zone. In addition to this, the provision of additional waterbodies such as ponds and scrapes can offset climate impacts through increasing water retention and soil moisture during droughts. This can result in habitats that can both resist and mitigate climate impacts.

Construction Phase

10.6.5 An Outline Construction Environmental Management Plan (Outline CEMP) will be submitted with the Development Consent Order (DCO) application, which will detail best practice on managing climate risks during construction. This will include:

a. Measures to reduce risk when working in extreme weather conditions, including the utilisation of Met Office Long-term forecasts and the appropriate planning of work;

b. Controls to reduce risk when working on or around water bodies; and

c. A safety, health and environment manager will be appointed to manage health and safety risks during construction.

10.6.6 A Preliminary Outline CEMP is included at **Appendix 24-PD-2: Preliminary Outline Construction Environmental Management Plan** in PEI Report **Volume 4**.

Operational Phase

10.6.7 Operational environmental considerations, including climate adaptation / resilience measures, will be detailed in an Outline Operational Environmental Management Plan (Outline OEMP), which will be submitted with the DCO application.

10.6.8 The following environmental design, standards and management measures will be beneficial to ensure the resilience of the scheme against the impacts of climate change and ICCI risks and have been implemented within the design of the Proposed Development:

a. The design of the Proposed Development will enable resilience to climate change effects on the water environment, providing a flexible flow rate at a maximum of 115 megalitres per day (Ml/d). This control of flow will provide resilience to both increased and decreased water availability. The flow water requirement (i.e. total amount of water transferred) will vary over the year with it tending to run at lower rates during the October to April period, then increasing to higher flows over the summer. Detailed controls over the volume and quality of discharges and abstractions will be agreed with and monitored by the Environment Agency through an Environmental Permit / Licence, where required. Any increase or decrease in flow will be planned and gradual over a number of weeks, increasing climate change resilience due to the control of flow;

b. Water storage reservoirs can retain water in case of drought conditions, with a combined six days storage at Daventry and Drayton reservoirs (at full transfer);

c. All pipelines will be constructed to appropriate design standards, considering the potential increase in soil moisture and below ground temperatures;

d. Flood risk assessments (FRA) will inform the design of drainage and flood defence strategies. For more information on the proposed flood

defences for the Proposed Development, please refer to **Chapter 22: Water Environment and Flood Risk** in PEI Report **Volume 2**;

e. The operational controls on the Proposed Development are designed to shut down and prevent transfer of water to vulnerable canal areas where / when there is increased flood risk due to peak rainfall events or stormy conditions, while continuing abstraction from the affected canal pound;

f. Raising of some sections of canal bank levels to maintain a minimum freeboard (vertical distance from the top of the canal bank to the water surface) – required to prevent potential overtopping and prevent water loss;

g. Bypasses, gravity and pumped, will be constructed to allow the increased volume of water to flow around locks;

h. Overflow weirs will be modified to suit the scheme water levels and ensure water is not wasted;

i. Assessments of bridge headroom and structural integrity have been undertaken across the route, and preventative works will be completed where necessary to mitigate any effects on a change in flow velocities. More details of the nature and extent of preventative works will be reported in the ES;

j. Operational monitoring will be undertaken by the Canal & River Trust (the Trust) at regular intervals, ensuring any obstruction to the canal, such as fallen trees, is quickly identified and removed. Further detail on landscaping risks will be reported in the ES;

k. Any outlet structures with automated, moveable weirs which will be screened for public safety and reduce the impact of debris entering. The weir length is sized to ensure that water velocities due to the transfer flow and climate change will not affect canal users or local flora and fauna; and

l. For the water storage at the southern treatment site, a site has been selected that is underlain by impermeable material that will allow the base and the embankment to be designed to protect the structure from increased groundwater infiltration associated with increased rainfall.

10.7 Project-wide Assessment of Effects and Significance

Baseline Conditions

Climate Change Risk Assessment & In-combination Climate Change Impact Assessment

Current Baseline Conditions

10.7.1 The latest annual State of the UK Climate Report (Ref. 8) highlights the following large-scale trends in the UK climate:

a. The UK is warming: Since the 1980s the UK climate has been warming at a rate of approximately 0.25°C per decade. The last three years have all been in the UK's top five warmest on record.

b. Extremes are increasing: Over recent decades, temperature extremes have increased, becoming more frequent and more intense. For example, the hottest summer days have warmed around twice as much as average summer days in some UK areas when comparing the latest decade to 1961-1990.

c. Sea level rise is accelerating: UK sea levels have risen 19.5cm since 1901 with the last three years the three highest on record for annual mean sea level.

d. Winters are getting wetter: October 2023 to March 2024 was the wettest winter half-year on record. In a series from 1767, six of the ten wettest winter half-years (October to March) for England and Wales have been in the 21st Century so far.

e. Longer leaf-on season: The 2024 leaf-on season was 7 days longer than the 1999-2023 baseline. This was largely due to an earlier Spring.

f. Reduction in frost days: Air and ground frosts have reduced by around a quarter since the 1980s.

10.7.2 The baseline data considered for the CCRA and ICCI are presented in **Table 10-12**, and utilise a time period of 1981-2010 for consistency with UKCP18 climate projections.

Table 10-12: Historic climate data for the Proposed Development location

Climatic Variable	North Station: Coleshill (1981-2010)	South Station: Woburn (1981-2010)
Mean annual maximum daily temperature (°C)	13.76	14.05
Mean summer maximum daily temperature (°C)	20.72	21.21
Mean winter minimum daily temperature (°C)	1.42	1.21

Climatic Variable	North Station: Coleshill (1981-2010)	South Station: Woburn (1981-2010)
Mean annual rainfall (mm)	712.41	657.39
Mean summer rainfall (mm)	179.51	161.75
Mean winter rainfall (mm)	174.31	153.17

10.7.3 When considering the baseline climate conditions at either end of the Proposed Development presented in **Table 10-12**, the variance in climate between the two stations is minimal in respect to the observed maximum and minimum temperatures. Annual rainfall levels differ by approximately 8%, which, based on professional judgement, is not considered to materially affect the rating of climate risks. Therefore, it is considered that the current and future baseline climate for the entire Proposed Development is represented by the data from these two stations.

Future Baseline Conditions

10.7.4 A summary of the projected RCP8.5 future baseline climate changes at the northern (Minworth) and southern (Milton Keynes) ends of the Proposed Development is presented in **Table 10-13** and **Table 10-14.**

Table 10-13: North Station Future Baseline Climate Projections

Climatic Variable	Baseline North Station: Coleshill (1981-2010)	RCP8.5 2010-2039	RCP8.5 2040-2069	RCP8.5 2070-2099
Mean annual maximum daily temperature (°C)	13.76	+0.79	+1.98	+3.82
Mean summer maximum daily temperature (°C)	20.72	+1.14	+2.75	+5.48
Mean winter minimum daily temperature (°C)	1.42	+0.63	+1.73	+3.13
Mean annual rainfall (mm)	712.41	+0.95%	-1.29%	+0.2%
Mean summer rainfall (mm)	179.51	-3.73%	-16.52%	-33%
Mean winter rainfall (mm)	174.31	+4.7%	+8.1%	+19.61%

Table 10-14: South Station Future Baseline Climate Projections

Climatic Variable	Baseline South Station: Woburn (1981-2010)	RCP8.5 2010-2039	RCP8.5 2040-2069	RCP8.5 2070-2099
Mean annual maximum daily temperature (°C)	14.05	+0.88	+2.21	+4.01
Mean summer maximum daily temperature (°C)	21.21	+1.16	+2.85	+5.68
Mean winter minimum daily temperature (°C)	1.21	+0.64	+1.76	+3.18
Mean annual rainfall (mm)	657.39	+1.19%	-1.36%	-0.09%
Mean summer rainfall (mm)	161.75	-3.48%	-16.66%	-34.66%
Mean winter rainfall (mm)	153.17	+5.64%	+9.26%	+21.02%

Assessment of Effects and Significance

Climate Change Risk Assessment

Construction Phase

10.7.5 As described in paragraph 10.5.4 construction risks have been assessed at a project-wide level, considering the environmental design measures mentioned in section 10.6.

10.7.6 **Table 10-15** summarises the climate risks during the construction phase of the Proposed Development.

10.7.7 Climate projections for the RCP8.5 scenario (2010-2039) were used to assess potential climate risks during construction in a worst-case climate change scenario.

Table 10-15: Construction Climate Change Risks

Climate Hazard	Potential climate change hazard / impact to the Proposed Development	Environmental Design Measures	Likelihood of climate impact	Consequence	Risk Rating (Significance)	Justification
Increase in summer maximum temperatures	Increasing summer temperatures and extreme heat events can cause damage or failure to construction and electrical equipment, delaying the construction schedule.	The CEMP will include measures to ensure safe working during adverse weather, suitable conditions for equipment operation. The contractor will monitor the Met Office long-term weather forecasts and plan work accordingly.	Unlikely	Insignificant	Low (Not Significant)	Summer maximum temperatures are unlikely to change significantly from the baseline during the construction phase to materially affect the operation of construction equipment.
Increase in summer maximum temperatures	Increases in summer maximum temperatures may lead to unsuitable working conditions, delaying construction and posing health and safety risks.	As above	Unlikely	Minor	Low (Not Significant)	Summer maximum temperatures are unlikely to change significantly from the baseline during the construction phase to materially affect

Climate Hazard	Potential climate change hazard / impact to the Proposed Development	Environmental Design Measures	Likelihood of climate impact	Consequence	Risk Rating (Significance)	Justification
						H&S requirements during construction.
Increase in frequency / intensity of extreme storm events	Flash flooding resulting from extreme rainfall events may cause unsuitable working conditions, delaying construction.	As above	Moderate	Minor	Medium (Not Significant)	Changing climate conditions will be considered in the CEMP, which will detail health and safety requirements for working near / on waterbodies and managing the flood associated risks.
Increase in frequency / intensity of extreme storm events	Flash flooding resulting from extreme rainfall events may damage construction equipment, materials and partially built structures, e.g. earthworks.	As above	Moderate	Minor	Medium (Not Significant)	Changing climate conditions will be considered in the CEMP, which will detail health and safety requirements for working near / on waterbodies and managing the flood associated risks.
Increase in frequency / intensity of extreme storm events	Peak rainfall events may cause stored construction materials to run-off into the canal,	As above	Unlikely	Minor	Low (Not Significant)	Changing climate conditions will be considered in the CEMP, which will

Climate Hazard	Potential climate change hazard / impact to the Proposed Development	Environmental Design Measures	Likelihood of climate impact	Consequence	Risk Rating (Significance)	Justification
	contaminating the waterway, damaging structures, or causing blockages and flooding.					detail health and safety requirements for working near / on waterbodies and managing the flood associated risks.
Increase in frequency / intensity of extreme storm events	Extreme storms and accompanying high winds may delay the construction schedule due to, for, example, preventing crane operation, obstructing site access and generally creating unsafe working conditions.	As above	Moderate	Low	Medium (Not Significant)	The CEMP will detail health and safety, and operational requirements for operation during extreme weather conditions.

10.7.8 The evaluation of climate risks to the Proposed Development during the construction stage (**Table 10-15**) has shown no significant climate risks, as per the climate risk significance matrix presented in **Table 10-10**. Climate risks during construction will primarily be managed through the implementation of the CEMP. Based on these findings the climate effects to the Proposed Development during construction are considered not significant.

Additional Mitigation, Enhancement and Monitoring

10.7.9 No additional mitigation, enhancement or monitoring is required.

Residual Effect

10.7.10 As there is no additional mitigation, enhancement or monitoring required, the residual effect remains the same as that reported for the pre-additional mitigation scenario.

Operational Phase

10.7.11 Potential climate risks during operation are summarised in **Table 10-16** and consider the RCP8.5 scenario (2070-2099) projections as a worst-case scenario.

10.7.12 Climate risk ratings consider the environmental design measures described in section 10.6.

Table 10-16: Operational Climate Change Risks

Climate Hazard	Potential climate change hazard / impact to the Proposed Development	Project Part	Environmental Design Measures	Likelihood	Consequence	Risk Rating (Significance)	Justification
Increase in annual mean temperatures	Higher temperatures can lead to increased evaporation along the length of the canal and within overground reservoirs, reducing the final output.	All	Water storage reservoirs can retain water in case of drought conditions with six days storage at Daventry & Drayton reservoirs.	Unlikely	Minor	Low (Not Significant)	The environmental design measures and operational flexibility should mitigate any potential reduction in water available for input. Further detail will be available within the OEMP
Increase in frequency / intensity of drought conditions	Increased frequency of drought conditions may lead to a reduction in water availability to input into the canal, leading to reduced flow rates.	All	The Proposed Development is designed to be operationally flexible, allowing for the increase of water input during dry	Unlikely	Minor	Low (Not Significant)	While summer precipitation is projected to decrease, alongside increasing drought conditions, the Proposed Development

Climate Hazard	Potential climate change hazard / impact to the Proposed Development	Project Part	Environmental Design Measures	Likelihood	Consequence	Risk Rating (Significance)	Justification
			conditions. Water storage reservoirs can retain water in case of drought conditions with six days storage at the Daventry & Drayton reservoirs.				is designed to provide flexibility in water supply to the South of England to mitigate this issue. Reservoir capacity will likely mitigate any reduction in water supply.
Increase in frequency / intensity of drought conditions	Increased occurrence of drought conditions may lead to lower flow rates, reducing the effective flow over weirs and compromising flow to other water bodies.	2	The Proposed Development is designed to be operationally flexible, allowing for the increase of water input during dry conditions.	Unlikely	Minor	Low (Not Significant)	The designed operational flexibility will account for any reduction in input to maintain a consistent flow rate across the canal.

Climate Hazard	Potential climate change hazard / impact to the Proposed Development	Project Part	Environmental Design Measures	Likelihood	Consequence	Risk Rating (Significance)	Justification
Increase in mean winter rainfall	Increased average winter rainfall may lead to more frequently saturated ground conditions affecting soil stability around the pipeline and compromising structural integrity.	1b, 4b	Pipelines to be constructed to design standards which will be appropriate for the ground conditions (e.g. EN 1993-4-3 (Ref. 10)), considering potentially increased soil moisture.	Unlikely	Minor	Low (Not Significant)	Environmental design measures for pipeline construction and design should mitigate any increase in soil moisture content.
Increase in mean winter rainfall	Increased average winter rainfall can lead to increased levels of soil moisture, resulting in instability of embankments.	2	Remedial works will be completed where there is increased risks of instability.	Unlikely	Major	High (Significant)	Further details on the interactions between hydrological and geotechnical assets will be examined at the ES stage to confirm risks to

Climate Hazard	Potential climate change hazard / impact to the Proposed Development	Project Part	Environmental Design Measures	Likelihood	Consequence	Risk Rating (Significance)	Justification
							canal breaches.
Increase in frequency / intensity of extreme storm events	Extreme storms events and peak rainfall can increase the likelihood of fluvial flood occurrence, inundating the facilities (pump stations, treatment plants, etc. damaging infrastructure and compromising operations.	All	FRA will be conducted for all proposed infrastructure sites, which will inform the design of drainage and flood defence strategies.	Moderate	Minor	Medium (Not Significant)	Flood mitigation measures informed by FRA will mitigate risk.
Increase in frequency / intensity of extreme storm events	Extreme storms events and associated high rainfall can increase the flow rate within the canal, leading to an increase rate of canal bank erosion and risks of canal bank overtopping.	2	Raising of some sections of canal bank levels to maintain a minimum freeboard to prevent potential overtopping,	Unlikely	Major	High (Significant)	Canal interventions are designed to manage flow rate of the canal and resist erosion on vulnerable bank areas, increases in winter

Climate Hazard	Potential climate change hazard / impact to the Proposed Development	Project Part	Environmental Design Measures	Likelihood	Consequence	Risk Rating (Significance)	Justification
			and prevent water loss Proposed pumped and gravity bypasses and overflow weirs will manage maximum canal flows.				precipitation and extreme storm events may increase likelihood into the future. Consequences of canal breaches can be major, further evidence of mitigation measures will be examined at the ES stage.
Increase in frequency / intensity of extreme storm events	Peak rainfall events increasing canal flow rate may cause increased rates of sediment build up at mooring points, basins, winding holes, and other low flow areas of the canal. Potentially	2	Initial hydraulic modelling has been undertaken to assess flow velocities, ensuring they remain low enough to minimise	Unlikely	Moderate	Medium (Not Significant)	Initial hydraulic modelling undertaken in design to minimise this risk to an acceptable level. The results of additional

Climate Hazard	Potential climate change hazard / impact to the Proposed Development	Project Part	Environmental Design Measures	Likelihood	Consequence	Risk Rating (Significance)	Justification
	requiring additional dredging.		sediment disturbance.				modelling will be reviewed and assessed as necessary at the ES stage.
Increase in frequency / intensity of extreme storm events	Increased canal flow rate resulting from extreme rainfall events can lead to increased bridge scour (erosion of bridge foundations), this may lead to the bridge becoming inoperable.	2	Assessments of bridge headroom and structural integrity have been undertaken, with one bridge identified for potential alterations (Bridge 88, Peartree bridge).	Unlikely	Moderate	Medium (Not Significant)	Modifications to Bridge 88 are proposed to increase resilience, assessments of bridge structural integrity completed. Increases in rainfall unlikely to alter headroom heights.
Increase in frequency / intensity of extreme storm events	Extreme storm events and associated high winds can lead to debris falling in / on	2	Operational monitoring will be undertaken at regular intervals,	Moderate	Minor	Medium (Not Significant)	Operational management and maintenance plan will be in

Climate Hazard	Potential climate change hazard / impact to the Proposed Development	Project Part	Environmental Design Measures	Likelihood	Consequence	Risk Rating (Significance)	Justification
	to the canal, obstructing flow and travel.		ensuring any obstruction to the canal is quickly identified and removed.				place to monitor and remove obstructions when they occur, minimising the impact.
Increase in frequency / intensity of extreme storm events	Extreme storm events and associated high winds can lead to debris blocking gravity and pumped bypass intakes / outflow.	2	An outlet structure with automated, moveable weirs which will be screened for public safety and to prevent debris entering. The weir length is sized to ensure that water velocities due to the transfer flow will not affect canal users and local	Moderate	Minor	Medium (Not Significant)	Operational management and maintenance plans will be in place to monitor and remove obstructions when they occur, minimising the impact.

Climate Hazard	Potential climate change hazard / impact to the Proposed Development	Project Part	Environmental Design Measures	Likelihood	Consequence	Risk Rating (Significance)	Justification
			flora and fauna.				
Increase in frequency / intensity of extreme storm events	Extreme rainfall events may lead to increased infiltration of surface water to groundwater, which may subsequently cause contamination.	3, 4a	Liners are included to prevent seepage and protect from groundwater infiltration. Bottom outlets at the Daventry and Drayton reservoirs are designed to allow rapid drawdown of the reservoir in case of emergency (e.g. pollution, structural failure).	Rare	Moderate	Medium (Not Significant)	Environmental design measures are sufficient to mitigate risk of increased infiltration.

10.7.13 Based on the above, there are considered to be two potential significant climate change risks during operation. Therefore, the climate effects on the Proposed Development during operation are considered significant, with more details on the environmental design measures to reduce the risk of canal breaches and associated flooding required at the ES stage. It is anticipated that these risks will be mitigated through further design development and assessment.

Additional Mitigation, Enhancement and Monitoring

10.7.14 Additional mitigation may be required to reduce the significance of identified risks; however, the specifics of this mitigation will not be available until the ES stage when further modelling and technical assessments have been completed.

Residual Effect

10.7.15 As there is additional mitigation still to be determined, the residual effect remains the same as that reported for the pre-mitigation scenario.

In-Combination Climate Change Impact Assessment

Construction and Operation

10.7.16 **Table 10-17** summarises the identified ICCI risks following consultation with the relevant technical disciplines described in paragraph 10.5.12. These risks ratings take into account any embedded environmental design, standards and management.

10.7.17 The following technical disciplines did not identify any ICCI risks to their receptors:

a. **Chapter 7: Agriculture and Soils**;
b. **Chapter 8: Air Quality**;
c. **Chapter 9: Carbon**;
d. **Chapter 11: Cultural Heritage**;
e. **Chapter 15: Human Health**;
f. **Chapter 16: Landscape and Visual**;
g. **Chapter 18: Materials and Waste**;
h. **Chapter 19: Noise and Vibration**;
i. **Chapter 20: Socio-Economics**; and
j. **Chapter 21: Traffic and Transport**.

10.7.18 The following disciplines include a consideration of climate change within their assessment. It is therefore not considered necessary to include these topics within the ICCI assessment.

a. **Chapter 22: Water Environment and Flood Risk** – This chapter considers climate change uplifts across various assessments. National flood mapping allowing for climate change to the 2070s epoch has been used in the assessment of flood risk for fluvial sources and surface water across all Parts of the Proposed Development. Assessment of low flow change, water quality and dissolved oxygen changes for the Rivers Tame and Trent (Part 1a) has used climate change uplifts to the 2040s. Further assessments of flow changes and water quality to the 2070s epoch for the Rivers Tame and Trent, the canals (Part 2) and the Daventry and Drayton Reservoirs (Part 3) will be included in the ES. Assessment of the credible maximum climate change scenario will also be included where required for fluvial flood risk in the ES.

b. **Chapter 12: Ecology – Aquatic –** Assessments of aquatic ecology utilise modelling from the Water Environment and Flood Risk chapter, which consider a climate change allowance.

c. **Chapter 17: Major Accidents and Disasters (MADs) –** The assessment presented with the MADs chapter examines the impact of worst-case accidents and disasters that may be relevant to the project. The future baseline conditions utilised in the MADs assessment considers future climate changes.

Table 10-17: ICCI Risks

Topic / Chapter	Climate Hazard	Likelihood of Climate Hazard	ICCIs Identified	Embedded Mitigation	Likelihood of ICCI	ICCI Consequence	ICCI Significance
Ground Conditions / Groundwater	Increased winter rainfall	Likely	An increase in rainfall may increase the possibility of groundwater levels rising closer to the ground surface / mixing with potential shallower contamination (within Made Ground) which would otherwise not be encountered. This would increase the likelihood of potential impact on groundwater quality.	During construction, groundwater quality may be temporarily adversely affected due to potential ground disturbance / dewatering. The potential rise in groundwater level may require additional dewatering considerations, which may decrease groundwater quality through mobilisation of existing contamination. However, these considerations would be factored into the design. Unacceptable contamination which may be encountered during construction will have been removed, remediated or mitigated to some extent. Maintenance and operation of the Proposed Development will be in accordance with environmental legislation	Low	Low	Medium (Not Significant)

Topic / Chapter	Climate Hazard	Likelihood of Climate Hazard	ICCIs Identified	Embedded Mitigation	Likelihood of ICCI	ICCI Consequence	ICCI Significance
				and good practice. Therefore, it is unlikely that there will be an increased risk to groundwater quality should levels rise once the Proposed Development is in operation.			
Ecology – Terrestrial / Habitats	Increase in frequency / intensity of extreme storm events	Likely	An increase in extreme rainfall events combined with the changes in flow resulting from the Proposed Development has the potential to disrupt the habitat of Water Voles, inundating burrows.	Modelling has been conducted to ensure that changes to the canal water levels will not be large enough to present a noticeable adverse effect on the water vole habitats.	Low	Low	Medium (Not Significant)
Ecology – Terrestrial / Habitats	Increase in frequency / intensity of extreme storm events	Likely	The ecology desk-based assessments have highlighted the presence of habitats of	Further modelling and surveys will be completed at the ES stage to better understand the impacts to habitats as a result of the Proposed Development.	Moderate	Moderate	High (Significant)

Topic / Chapter	Climate Hazard	Likelihood of Climate Hazard	ICCIs Identified	Embedded Mitigation	Likelihood of ICCI	ICCI Consequence	ICCI Significance
			principal importance within or near the Preliminary Order Limits. Climate change has the potential to further disrupt these habitats through increased peak rainfall and storm events. The exact impact of the Proposed Development on these habitats is to be determined at the ES stage.				

10.7.19 Based on the risks described above, there is one significant ICCI risks identified for the operational phase of the Proposed Development.

Additional Mitigation, Enhancement and Monitoring

10.7.20 Additional modelling of habitat changes and water dependencies to be conducted for the ES, where risks will be re-evaluated.

Residual Effect

10.7.21 The requirement for additional mitigation is the subject of further modelling and assessment. Therefore, the residual effect remains the same as that reported for the pre-additional mitigation scenario.

10.8 Summary

10.8.1 **Table 10-18** summarises the residual climate effects of the Proposed Development, following the implementation of any identified additional mitigation, enhancement and/or monitoring.

Table 10-18: Summary of Residual Effects

Description of impact	Sensitivity of receptor	Nature of effect / geographic scale	Magnitude of impact	Initial classification of effect (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual effect significance
Construction Phase						
Climate Change Risk Assessment	High	Long-term, Short-term Local	Low	No significant climate risks	None	No significant climate effects
In-Combination Climate Change Impact Assessment	As defined by relevant technical discipline	Long-term, Short-term Local	Low	No significant ICCI risks	None	No significant ICCI risks
Operational Phase						
Climate Change Risk Assessment	High	Long-term, Short-term Local	Moderate	Two significant climate risks identified	Additional information and modelling of flood risk to be conducted for the ES stage	Two significant climate risks identified due to flood risk.
In-Combination Climate Change Impact Assessment	As defined by relevant technical discipline	Long-term, Short-term Local	Moderate	One significant ICCI risk identified	Additional modelling and surveys will be required for terrestrial ecology for the ES stage	One significant ICCI risk identified for terrestrial ecology

10.9 Combined Effects between Proposed Development Parts

10.9.1 Climate risks to the Proposed Development have been assessed as per their impact on each project part. Where relevant, impacts to the whole project have also been assessed. Therefore, it is not considered relevant or necessary to complete an additional separate climate risk assessment of combined effects.

10.10 Summary and Next Steps

10.10.1 The preliminary assessment of effects has identified two potentially significant climate change risks during the operational phase related to canal breaches and associated flooding. These risks, including the risks to certain culverts, cuttings and embankments, are the subject of ongoing investigation and will be reported in the ES. This will determine the need for and type of remedial works that may be required.

10.10.2 The preliminary assessment has identified one significant ICCI effect related to the disruption of ecological habitats of principal importance. The Proposed Development's impact on the habitats and any additional mitigation required will be explored at the ES stage. Further investigation will also be undertaken into the climate resilience of the BNG proposals.

10.10.3 The information provided in this PEI Report is preliminary, with the final assessment of likely significant effects is to be undertaken and reported at the ES stage.

10.11 References

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