Teddington Direct River Abstraction

Preliminary Environmental Information Report
Appendix 18.1 – In-Combination Climate Impacts

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Appendix 18.1 – In-Combination Climate Impacts

A.1 Introduction

A.1.1 This appendix sets out the preliminary consideration of potential in-combination climate impacts (ICCI) for the Teddington Direct River Abstraction Project (hereafter referred to as 'the Project'). The consideration of ICCI identifies where climate change could potentially worsen, or conversely diminish, a potential effect on receptors identified within other Environmental Impact Assessment (EIA) aspects (i.e. whether the receptor's susceptibility and vulnerability and/or value/importance could change, or whether impacts are increased or decreased in magnitude, based on future climate change projections).

A.2 Methodology

A.2.1 For the preliminary consideration of ICCI reported in this appendix, the following process was undertaken by each EIA aspect:

a. With support from the Applicant climate change resilience and ICCI EIA aspect specialists, projected changes in climate were reviewed and those climate change parameters which are relevant to the assessment of the receptors for the EIA aspect were identified.

b. Any potential ICCIs for each potential impact that has been assessed were identified and qualitatively described (i.e. the impacts assessed as part of the EIA aspect assessment were reviewed against the projected climate changes and a description provided where these could potentially be altered due to the projected future changes in climate).

c. Potential ICCIs during the construction and operation phases of the Project that are likely to be significant are shown in Table A.1 and Table A.2. These ICCIs will be further assessed as part of the delivery of the Environmental Statement (ES), taking into account the results of environmental surveys and modelling (see Section A.5: Next steps).

A.3 Future climate

A.3.1 The future baseline (Section 18.7) of Chapter 18: Climate Change summarises the projected climate conditions for a baseline period (based on 1981–2010 data) and up to three future 30-year time periods. This includes:

a. The 2030s: 2020–2049, representing the period of construction and opening years.

b. The 2060s: 2050–2079, representing an interim operational period to reflect risk to assets or components with shorter life than the overall Project operating life (i.e. <30 years).

c. The 2080s: 2079–2099, representing the end of the temporal scope of the Climate Change Risk Assessment of 60 years after the anticipated opening year of 2033.

A.3.2 The projected changes in climate are summarised below.

a. In general, temperatures will increase, with a greater frequency of hotter, drier summers and warmer, wetter winters.

b. There will be an increase over time in the number of days with high temperatures, and increases in hot spells, heatwaves, dry spells and droughts. The number of air frost days is projected to decrease over time.

c. There is not expected to be a large change in the number of heavy rain days.

d. Sea level rise will impact on the tidal range of the river (i.e. downstream from Teddington Lock), particularly for high tides during spring tides and for storm tides where storm surges lead to additional water entering the Thames Estuary.

e. Increased peak rainfall intensities and peak river flows, combined with increased sea levels, are expected to increase the flood risks for the future baseline, with larger flood extents and depths from rivers, sea and surface water for sites located in high to low flood risk areas.

f. There is unlikely to be a significant increase in average wind speed by the end of the century but there is significant uncertainty associated with short-lived gust frequency. There is, however, the potential for the number of storms to increase over the UK, although the increases are relatively small.

g. The Project will be potentially vulnerable to increased subsidence risk in the future due to increased shrink–swell in the underlying clay geology.

A.4 Preliminary consideration of potential ICCI

A.4.1 A summary of the outcomes of the preliminary consideration of ICCI relevant to each EIA aspect is provided in the associated aspect chapters. The outcomes for each EIA aspect are reported in Table A.1 and Table A.2 for the construction and operation phases, respectively.

A.4.2 Likely significant ICCIs have been identified based on the future climate baseline set out in Chapter 18: Climate Change (Section 18.7) and assumptions about the frequency of operation of the Project set out in Chapter 2: Project Description (Section 2.9).

A.4.3 The in-combination effects are effects that will happen due to the Project and climate change combined.

Table A.1 In-combination climate change assessment table for each EIA aspect – construction phase

Resources/receptor type/groups	Climate change-related hazard	Potential ICCI identified
Water resources and flood risk		
Off-site developed areas including the playing fields at Ham Playing Fields site and the opposite bank of Burnell Avenue site. Construction works, plant and materials at Ham Playing Fields site.	Short-term rise in fluvial and/or tidal flood levels due to increase in river flows and sea level rise or storm surges in the 2030s resulting in increased flood impacts.	An increase in fluvial or tidal flood levels due to climate change could exacerbate potential increased flooding at off-site developed areas due to obstruction of flood flows by construction works and equipment such as cofferdams where used. (Dependence on TE2100 Plan and the River Thames decisions for future flood defence measures.)
Aquatic ecology		
No likely significant ICCIs identified.		
Terrestrial ecology		
No likely significant ICCIs identified.		
Historic environment		
No likely significant ICCIs identified.		
Townscape and visual		
No likely significant ICCIs identified.		
Ground conditions and contaminated land		
Surface water or groundwater receptors.	Increase in frequency and intensity of heavy rainfall events/ flooding. Increase in mean winter rainfall.	An increase in rainfall due to climate change could potentially impact on groundwater quality and surface water quality due to migration of contamination and direct runoff from site during construction.
Materials and waste		
No likely significant ICCIs identified.		
Traffic and transport		

Resources/receptor type/groups	Climate change-related hazard	Potential ICCI identified
No likely significant ICCIs identified.		
Air quality		
Human and ecological receptors.	Lower rainfall and increased number and length of dry periods during summer.	An increase in the number and length of dry periods as a result of climate change could lead to increased dust production during the construction phase.
Noise and vibration		
No likely significant ICCIs identified.		
Socioeconomics, community, access and recreation		
No likely significant ICCIs identified.		
Human health		
No likely significant ICCIs identified.		
Carbon		
Construction activities.	Very high temperatures, heavy rainfall and/or flooding.	Potential increase in carbon emissions associated with construction activities (e.g. as a result of the increased use of raw materials and/or electricity, fuel and/or water consumption).
Major accidents and disasters		
No likely significant ICCIs identified.		

Table A.2 In-combination climate change assessment table for each EIA aspect – operation phase

Resources/receptor type/groups	Climate change-related hazard	Potential ICCI identified
Water resources and flood risk		
Off-site developed areas and site infrastructure at Burnell Avenue site, and site infrastructure at Ham Playing Fields site.	Long-term rising river flows and sea levels and storm surges affecting flood levels.	Potential increased flood risk due to climate change at off-site developed areas due to obstruction of flood flows from the above ground or in river Project infrastructure. (Dependence on TE2100 Plan and the River Thames decisions for future flood defence measures.)
Water-related infrastructure (intake/outfall structures).	Changes in rainfall, river flows, affecting flood levels and volumes.	Increase in rainfall and flows due to climate change could lead to drainage and water-related infrastructure being overwhelmed. Sustainable drainage systems and embankments may require future adaptation due to systems being overwhelmed.
Surface water resources and quality (River Thames and Tidal Thames).	Increased rainfall intensity changes affecting managed surface water runoff and river flow rates.	Potential additional effects on hydromorphology (scour, sediment transport and deposition) and water quality from increased river flow rates.
Surface water resources and quality (River Thames and Tidal Thames).	Prolonged periods of decreased rainfall and droughts affecting managed river flow rates.	Potential impacts on available dilution and quality due to reduced dilution in the River Thames and Tidal Thames.
Groundwater resources.	Changes to rainfall patterns, for example, wetter winters, or more intensive rainfall events.	During wetter winters, with prolonged rainfall, there is potential for additional increased groundwater flood risks where below ground infrastructure impacts shallow groundwater flow.
Water Framework Directive (WFD) status of the water bodies applicable to the Project (Thames Upper Transitional Water Body and Thames (Egham to Teddington)).	Increased rainfall intensity changes affecting managed surface water runoff and river flow rates.	Potential ICCIs on biological indicators, physico-chemical properties and potential effects to hydromorphology which may affect WFD status over time.

Resources/receptor type/groups	Climate change-related hazard	Potential ICCI identified
	Changes in water temperatures and physico-chemical properties at time of Project operation. Sea level rise leading to change in saline/freshwater mixing, estuarine rates of erosion and suspended sediment volumes, tidal prism effects on hydromorphology.	
Aquatic ecology		
No likely significant ICCIs identified.		
Terrestrial ecology (including Biodiversity Net Gain (BNG))		
No likely significant ICCIs identified.		
Historic environment		
No likely significant ICCIs identified.		
Townscape and visual		
Townscape and visual receptors.	Rising temperatures could potentially affect vegetation in the longer term both directly, through drought or flooding, and indirectly, through resilience and susceptibility to pests and disease.	Some existing vegetation may not survive repeated drought or flooding conditions, potentially leading to loss of vegetation or degradation of vegetation due to the Project in combination with climate change. Existing vegetation could become more vulnerable to disease. This could potentially affect townscape character and views.
Ground conditions and contaminated land		
Surface water receptors.	Increase in frequency and intensity of heavy rainfall events/ flooding.	Increase in rainfall due to climate change could potentially impact on surface water quality due to direct runoff from the site.

Resources/receptor type/groups	Climate change-related hazard	Potential ICCI identified
	Increase in mean winter rainfall.	
Groundwater receptors.	Increase in frequency and intensity of heavy rainfall events/ flooding. Increase in mean winter rainfall.	Changes in groundwater levels due to climate change could exacerbate the movement of contaminants in groundwater at the site.
Geological units comprised mostly of clay.	Drought and higher or more variable periods of rainfall.	Changes to rainfall patterns and intensity due to climate change could lead to shrink-swell of clay, exacerbating ground movement.
Materials and waste		
No likely significant ICCIs identified.		
Traffic and transport		
No likely significant ICCIs identified.		
Air quality		
No likely significant ICCIs identified.		
Noise and vibration		
No likely significant ICCIs identified.		
Socioeconomics, community, access and recreation		
Community amenity.	Higher average temperatures and increased number and length of dry and drought periods during summer. Increase in frequency and intensity of heavy rainfall events/ flooding. Increase in mean winter rainfall.	Increased extremes in weather (hotter and drier in summer and wetter in winter) due to climate change combined with changes to community amenity that may also occur from the Project's permanent structures at Burnell Avenue, could impact on pleasantness and feel of an area and the general quality and character of surroundings as well as ability to enjoy space due to potential reduction of resilience of asset(s) and therefore access and usability of asset(s).
Human health		

Resources/receptor type/groups	Climate change-related hazard	Potential ICCI identified
Wider determinants of health – wider societal infrastructure and resources (water supply infrastructure).	Lower rainfall and increased number and length of dry periods during summer.	The public health benefits of the Project in providing drought resilience for public water supplies will become more important.
Carbon		
Repair, maintenance and replacement activities during operation.	Very high temperatures, heavy rainfall and/or flooding resulting in premature asset replacement/repair. Extreme climate events.	Potential increase in carbon emissions associated with increased repair, maintenance and/or replacement of materials and assets (e.g. due to increased degradation of assets and/or materials and/or damage during extreme climate events).
Electricity and chemical consumption during operation.	Increased/extended drought periods.	Potential increase in carbon emissions associated with increased electricity and/or chemical consumption should the Project need to operate more frequently and/or over longer periods than expected.
Major accidents and disasters		
No likely significant ICCIs identified.		

A.5 Next steps

A.5.1 These preliminary identified ICCI will be explored further by each EIA aspect and assessed if needed, as part of the assessment process for the ES. The assessments will identify if any additional mitigation will be required to reduce any potentially significant effects as a result of the assessed ICCI.

A.5.2 As the design of the Project continues to be refined, including the embedded mitigation, and assessments of the potential environmental effects of the Project further defined, the potential for new or additional ICCI will also be investigated by each EIA aspect and assessed if/where necessary and the outcomes presented within the ES.