

The Great Grid Upgrade

North Humber to High Marnham

Preliminary Environmental Information Report

Volume 3: Appendix 19.1 Climate Change Risk
Assessment

February 2025



nationalgrid

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North Humber to High Marnham Document Control

Document Properties	
Organisation	AECOM
Author	AECOM
Approved by	National Grid
Title	Preliminary Environmental Information Report Appendix 19.1 Climate Change Risk Assessment
Document Register ID	NHHM-NG-ENV-REP-001
Data Classification	Public

Version History			
Document	Version	Status	Description / Changes
Appendix 19.1	1.0	Final	First Issue

1. Introduction

1.1 Overview

- 1.1.1 This appendix presents the results of the Climate Change Risk Assessment (CCRA) for the construction, operation and maintenance of the Proposed Overhead Line in the form of a Climate Change Risk Assessment table. It should be read in conjunction with **Chapter 19 Climate Change**, as well as **Appendix 19.2 ICCI**.
- 1.1.2 Table 1.1 provides the results of the ICCI assessment covering the construction and operational (and maintenance) phases of the Project. The time-period for the initial risk rating of each phase of the Project reflects the obtained climate change projection data for RCP 8.5 (e.g., projections for 2020–2049 cover the estimated construction phase of 4 years between 2028-2031, and projections for 2050 covers the operational phase of the Project).

1.2 Climate Change Risk Assessment

- 1.2.1 Table 1.1 presents the climate change risks associated with each phase of the Project. Future climate projections have been reviewed and the sensitivity of assets have been examined, before commenting on the adequacy of the embedded climate change mitigation measures built into the Proposed Overhead Line.

Identified climate variables are given a significance rating, based upon the likelihood of an impact occurring to the Proposed Overhead Line and the anticipated consequences. This includes consideration of mitigation measures. The significance levels and risk ratings have been evaluated in alignment with Table 19.1 in **Chapter 19 Climate Change**.

Table 1.1 - Climate Change Risk Assessment – construction, operation and maintenance phase

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating <i>(Likelihood x Level of consequence)</i>	Significance level
Construction						
Increased frequency and intensity of winter precipitation	Flooding of site access routes limiting access to site for heavy machinery delaying construction schedules.	<ul style="list-style-type: none"> Appropriate flood mitigation measures are outlined in Appendix 4.1 Draft Outline Code of Construction Practice. This details that construction workers are to undergo training to increase their awareness of environmental issues as applicable to their role on the project. Topics will include but not be limited to flood risk response actions (see GG06, Appendix 4.1). The contractor(s) will subscribe to the Environment Agency’s Flood line service, which provides advance warning of potential local flooding events, and subscribe to the Met Office’s Weather Warnings email alerts system and any other relevant flood warning information (see WO7, Appendix 4.1). The contractor(s) will implement a suitable flood risk 	Likely	Moderate	High	Significant

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating (Likelihood x Level of consequence)	Significance level
		<p>action plan, which will include appropriate evacuation procedures should a flood occur or be forecast (see WO7, Appendix 4.1).</p> <ul style="list-style-type: none"> An Emergency Action Plan will be developed for the construction phase which will outline procedures to be implemented in case of unplanned events, including but not limited to site flooding and pollution incidents (see GG23, Appendix 4.1). 				
Increased frequency and intensity of storm events	More frequent and severe storms can disrupt construction schedules, damage equipment, and pose health and safety risks to workers.	<p>(Refer to Appendix 4.1 Draft Outline Code of Construction, Chapter 11. Water environment).</p> <ul style="list-style-type: none"> An Emergency Action Plan will be developed for the construction phase which will outline procedures to be implemented in case of unplanned events, including but not limited to site flooding and pollution incidents (see GG23, Appendix 4.1). The contractor(s) will subscribe to the Environment Agency's Flood line service, which provides advance warning of potential local 	Moderate	Moderate	High	Not Significant

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating <i>(Likelihood x Level of consequence)</i>	Significance level
		<p>flooding events, and subscribe to the Met Office’s Weather Warnings email alerts system and any other relevant flood warning information. The contractor(s) will implement a suitable flood risk action plan, which will include appropriate evacuation procedures should a flood occur or be forecast, (see WO7, Appendix 4.1).</p> <ul style="list-style-type: none"> • A soil management plan will be delivered prior to construction to present appropriate mitigation measures of potential soil erosion on site, which may occur as a result of storm events and increased frequency and intensity of precipitation (see GG03, Appendix 4.1). • Runoff across the site will be controlled through a variety of methods including header drains, buffer zones where practicable around watercourses, on-site ditches, silt traps and bunding (see GG16, Appendix 4.1). • The contractor(s) will retain vegetation where practicable 				

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating <i>(Likelihood x Level of consequence)</i>	Significance level
		<p>inclusive to maintaining native shrub planting approved by National Grid will be used as a replacement, in accordance with the outline vegetation reinstatement plans included within the Landscape and Ecological Management Plans LEMP, to be produced prior to construction (see GG03, Appendix 4.1). These measures will take into consideration climate change to support stormwater runoff via the selection of appropriate woodland tree and shrub species, as well as adequate monitoring post-planting (also refer to Chapter 6. Landscape).</p> <ul style="list-style-type: none"> • A Biodiversity Net Gain (BNG) assessment will also be followed within the successive EIA, demonstrating habitat impacts and measures for achieving positive biodiversity net gain outcomes considering impacts from extreme climate impacts. 				
Increased annual/ summer	Impact on health and productivity of construction	<ul style="list-style-type: none"> • An appropriate Code of Construction Practice will be produced prior to construction. 	Unlikely	Insignificant	Low	Not Significant

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating (Likelihood x Level of consequence)	Significance level
mean temperatures	workers, necessitating additional measures for heat stress management.	<p>The contractor(s) are to monitor weather reports and schedule work accordingly (see GG06, Appendix 4.1).</p> <ul style="list-style-type: none"> The contractor(s) will subscribe to the Environment Agency's Flood line service, which provides advance warning of potential local flooding events, and subscribe to the Met Office's Weather Warnings email alerts system and any other relevant flood warning information, (see WO7, Appendix 4.1). 				
Increased frequency/severity of heatwaves	Damage to construction plant and equipment, resulting in delays to construction schedule	<ul style="list-style-type: none"> An appropriate CoCP will be produced prior to construction. The contractor(s) are to monitor weather reports and schedule work accordingly. (Refer to Appendix 4.1 Draft Outline Code of Construction) Potential hazardous materials used during construction will be safely and securely stored including use of secondary containment where appropriate. Stored flammable liquids such as diesel will be protected either by double walled tanks or stored in a 	Unlikely	Insignificant	Low	Not Significant

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating (Likelihood x Level of consequence)	Significance level
		bunded area with a capacity of 110% of the maximum stored volume. Spill kits will be located nearby, (see GG15, Appendix 4.1).				
Increased frequency/severity of heatwaves	Increased risk of drought, impacting negatively on vegetation growth and increasing potential for wildfires, and general fire risk. Health and Safety risk and risk to structure.	<ul style="list-style-type: none"> As per item GG03, Appendix 4.1, Landscape planting will take into consideration climate change in the selection of appropriate woodland tree and shrub species planting and habitat creation, as well as considering adequate monitoring post-planting occurs in accordance with the LEMP (also refer to Chapter 6. Landscape). Soil management measures will be set out in a SMP (Soil Management Plan) which will form part of the CoCP, of which both are to be produced prior to construction. This is to include details of measures required for soil restoration where required (see GG03, Appendix 4.1). 	Unlikely	Insignificant	Low	Not Significant
Extreme Precipitation Events	Increased impact of soil runoff, soil moisture and	<ul style="list-style-type: none"> A SMP will be produced prior to construction, presenting appropriate mitigation 	Unlikely	Minor	Low	Not Significant

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating (Likelihood x Level of consequence)	Significance level
	erosion delaying construction timeframes	<p>measures for the impacts of potential soil erosion on site as a result of extreme precipitation events (see GG03 and AS01, Appendix 4.1).</p> <ul style="list-style-type: none"> The SMP and CoCP will set out appropriate soil management measures which is to include details of measures required for soil restoration where required, (see AS01, Appendix 4.1). Runoff across the site will be controlled through a variety of methods including header drains, buffer zones where practicable around watercourses, on-site ditches, silt traps and bunding. The project may include a system of 'cut-off' drains which is to feed into a new header drain as well as surface water runoff measures. (Refer to Chapter 6. Landscape and see item GG16, Appendix 4.1). 				
Extreme Precipitation Events	Increased risk of moisture and damage to bare materials on site,	<ul style="list-style-type: none"> The Code of Construction Practice (item GG15 in Appendix 4.1) details methods for appropriate 	Rare	Insignificant	Low	Not Significant

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating <i>(Likelihood x Level of consequence)</i>	Significance level
	<p>leading to material/equipment damage as well as delays to construction. Increased runoff from material storage</p>	<p>storage of hazardous and non-hazardous materials, should there be leakage or damage as a result of moisture and extreme precipitation events.</p> <ul style="list-style-type: none"> • Potential hazardous materials used during construction will be safely and securely stored including use of secondary containment where appropriate. Fuels, oils and chemicals will be stored responsibly, away from sensitive water receptors. (See GG15, Appendix 4.1). • The contractor(s) will subscribe to the Environment Agency’s service, which provides advance warning of potential local flooding events, and subscribe to the Met Office’s Weather Warnings email alerts system and any other relevant flood warning information. (see W07, Appendix 4.1). • The contractor(s) will implement a suitable flood risk action plan, which will include appropriate evacuation procedures should a flood 				

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating <i>(Likelihood x Level of consequence)</i>	Significance level
		<p>occur or be forecast, (see W07, Appendix 4.1).</p> <ul style="list-style-type: none"> Runoff across the site will be controlled through a variety of methods including header drains, buffer zones where best possible around watercourses, on-site ditches, silt traps and bunding. There will be no intentional discharge of site runoff to ditches, watercourses, drains or sewers without appropriate treatment and agreement of the appropriate authority (except in the case of an emergency). (See item GG16, Appendix 4.1). 				
Increased frequency/severity of Wind/Storms as well as heatwaves	Increase in dust generation during construction activities can degrade air quality on site, impacting worker health and result in construction delays	<ul style="list-style-type: none"> The contractor(s) will subscribe to the Met Office's Weather Warnings email alerts system and any other relevant extreme weather warning information, (see item W07, Appendix 4.1). A CoCP shall be produced prior to construction and is to include measures to manage dust, waste, water, noise, vibration and soil during construction. The contractor(s) shall undertake site 	Unlikely	Insignificant	Low	Not Significant

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating <i>(Likelihood x Level of consequence)</i>	Significance level
		<p>inspections to check conformance to the Management Plans (see item W07, Appendix 4.1).</p> <ul style="list-style-type: none"> • Construction workers will undergo training to increase their awareness of environmental issues as applicable to their role on the project inclusive to dust management and control measures, (see item GG06, Appendix 4.1). • Any activity carried out or equipment located within a construction compound that may produce a noticeable nuisance, including but not limited to dust, noise, vibration and lighting, will be located away from sensitive receptors such as residential properties or ecological sites where practicable. Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site, these are to be covered and protected. (See item GG11, Appendix 4.1). 				

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating <i>(Likelihood x Level of consequence)</i>	Significance level
		<ul style="list-style-type: none"> Prior to construction a Dust Management Plan (DMP) is to be developed and implemented alongside regular site inspections to monitor compliance. The DMP may also include measures to control other emissions, approved by the Local Authority. (See item AQ04, Appendix 4.1). 				
Operation						
Increased summer/ annual mean temperatures	Increasing temperatures can cause thermal expansion of conductors, which can result in the overhead line sag exceeding the current overhead line design parameters. Increasing temperatures can also cause overloading of transformers causing tripping and loss of supply if network designs	<ul style="list-style-type: none"> The project design will be compliant with the guidelines and policies relating to electric and magnetic fields stated in National Policy Statement EN-5, including the International Commission on Non-Ionizing Radiation Protection guidelines (See item GG02, Appendix 4.1). The project design is to allow for appropriate means for thermal modelling of climate impacts, this is to be reviewed further at ES. 	Unlikely	Insignificant	Low	Not Significant

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating <i>(Likelihood x Level of consequence)</i>	Significance level
	are not adapted to increasing demand.					
Increased summer/ annual mean temperatures	Increasing temperatures and heatwaves can create hot and humid temperatures can lead to the switchgear and electronic devices operating above their maximum rated operating temperature, resulting in an increase in the likelihood of faults or maloperation, leading to switchgear's capacity reducing.	<ul style="list-style-type: none"> To ensure all vehicles switch off engines when stationary - no idling vehicles. (See item AQ20, Appendix 4.1). Vehicles will be correctly maintained and operated in accordance with manufacturer's recommendations and in a responsible manner. All plant and vehicles will be required to switch off their engines when not in use and when it is safe to do so. (See item GG13, Appendix 4.1). Electric, or other low carbon plant and equipment should be used where available and where practicable. (See item GG13, Appendix 4.1). 	Unlikely	Insignificant	Low	Not Significant
Increased summer/ annual mean temperatures	Increasing temperatures impact the capacity of the conductors, which in turn impacts the network. Conductors are	<ul style="list-style-type: none"> To ensure efficiency in the overall conductor capacity, consideration to optimising the network generation and reliability will be in consequence of the upgrade for this project. 	Unlikely	Insignificant	Low	Not Significant

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating <i>(Likelihood x Level of consequence)</i>	Significance level
	designed to operate at their maximum temperature.	<ul style="list-style-type: none"> The project will be designed in accordance with all National Grid design standards and operated by National Energy System Operator (NESO) in a safe and efficient manner for the entire design life of the project this takes into account potential future baseline changes like increased summer/ annual mean temperature To further support resilience and efficiency of the network, allowing for f electric, or other low carbon plant and equipment should be used where available and where practicable to minimise electricity demand and prevent system failures during extreme heat. (See item GG13, Appendix 4.1). 				
Increased summer/annual mean temperatures	Increased risk of drought, low water quality and soil deterioration impacting negatively on the ground/foundation, Overhead line can be damaged by this	<ul style="list-style-type: none"> The Project is to provide appropriate mitigation measures in terms of long-term management of the site, presenting 5 years after care/risk management, reestablishing landscape/agriculture and soil erosion as well as details of 	Unlikely	Insignificant	Low	Not Significant

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating (Likelihood x Level of consequence)	Significance level
	instability of the foundation, leading to potential system faults/power outages, as well as strain to the conductors. This can impact power supply, leading to circuits tripping.	measures required for soil restoration. This is to be outlined in the LEMP, and SMP to be produced prior to completion and operation (refer to Chapter 13 Agriculture and Soils, item GG03, Appendix 4.1).				
Increased summer/ annual mean temperatures	Increasing temperatures and heatwaves can create optimal conditions for wildfires. In such conditions sparking of an Overhead Line or substation component (through technical fault or lightning strike) can result in a wildfire occurring, leading to damage to transmission network assets or third-party damage for which National Grid is liable.	<ul style="list-style-type: none"> The Project is to provide appropriate mitigation measures in terms of long-term management of the site, presenting 5 years after care/risk management, reestablishing landscape/agriculture and soil erosion as well as details of measures required for soil restoration. This is to be outlined in the LEMP, and SMP to be produced prior to completion and operation (refer to Chapter 13 Agriculture and Soils, as well as Appendix 4.1). 	Unlikely	Insignificant	Low	Not Significant
Increased frequency and	Increased risk of damage to assets	<ul style="list-style-type: none"> Flood mitigation measures to be detailed in ES, and 	Unlikely	Insignificant	Low	Not Significant

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating <i>(Likelihood x Level of consequence)</i>	Significance level
severity of extreme weather events (storms)	and equipment; disrupting access of maintenance and repair across site. Greater risk of Overhead lines being struck by lightning, this can lead to electrical faults or in extreme cases physical damage to assets, and loss of supply.	<p>otherwise outlined in Chapter 11 – Water environment, inclusive to the consideration of climate change effects and the use of resilient, sustainable materials to be incorporated in design.</p> <ul style="list-style-type: none"> As detailed in Appendix 4.1 Draft Outline Code of Construction practice (item GG15): Stored flammable liquids such as diesel will be protected either by double walled tanks or stored in a bunded area with a capacity of 110% of the maximum stored volume. Spill kits will be located nearby. 				
Increased frequency and severity of extreme weather events (storms)	<p>Extreme rainfall can lead to groundwater flooding as the water table rises above the ground surface.</p> <p>Substations located on peatland are more susceptible to ground instability and sinking as a result of flooding. This could result in the loss or inability</p>	<ul style="list-style-type: none"> Flood mitigation measures to be detailed in ES, and otherwise outlined in Chapter 11 – Water environment, inclusive to the consideration of climate change effects and the use of resilient, sustainable materials to be incorporated in design. As detailed in Appendix 4.1 Draft Outline Code of Construction practice (item W06): the project will incorporate appropriate 	Unlikely	Insignificant	Low	Not Significant

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating <i>(Likelihood x Level of consequence)</i>	Significance level
	for the substation to function impacting the infrastructure of the substation, as well as the equipment housed within, leading to reduced security of supply.	<p>surface water drainage measures.</p> <ul style="list-style-type: none"> The project design will be compliant with the guidelines and policies relating to electric and magnetic fields stated in National Policy Statement EN-5, including the International Commission on Non-Ionizing Radiation Protection guidelines (See item GG02, Appendix 4.1). 				
Increased frequency and severity of extreme weather events (storms)	<p>Physical damage to local habitats and ecology, disruption of Overhead Line conductors as result of vegetation displacement and tree falling caused by storms.</p> <p>Health and safety risks to workers carrying out maintenance work on assets.</p>	<ul style="list-style-type: none"> Landscape planting will take into consideration climate change resilience, and selection of appropriate woodland tree and shrub species planting and habitat creation, as well as considering adequate monitoring post-planting occurs, (also refer to Chapter 6) Landscape and Chapter 8) Ecology). Appropriate control measures are to be fully outlined in the LEMP and SMP to be produced prior to completion and operation as identified in item GG03 in Appendix 4.1, (also refer to Chapter 6) 	Rare	Moderate	Medium	Not Significant

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating (Likelihood x Level of consequence)	Significance level
		Landscape and Chapter 8) Ecology).				
Increase in high wind events	Damage to infrastructure (e.g., pylons/cables), safety of workers, potential disruption or loss in power supply, increased maintenance and repair costs and disruptions to road access for maintenance to restore Overhead Lines and undertake necessary repairs.	<ul style="list-style-type: none"> Avoid maintenance during high wind conditions. The project design will be compliant with the guidelines and policies relating to electric and magnetic fields stated in National Policy Statement EN-5, including the International Commission on Non-Ionizing Radiation Protection guidelines (See item GG02, Appendix 4.1). Climate resilience to be considered across all site-wide assets and infrastructure. 	Rare	Insignificant	Low	Not Significant
Increase in high wind events	Damage to pylons and conductors and surface water run-off.	<ul style="list-style-type: none"> The project design will be compliant with the guidelines and policies relating to electric and magnetic fields stated in National Policy Statement EN-5, including the International Commission on Non-Ionizing Radiation Protection guidelines (See item GG02, Appendix 4.1). Climate resilience to be considered across all site-wide assets and infrastructure. 	Rare	Insignificant	Low	Not Significant

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating <i>(Likelihood x Level of consequence)</i>	Significance level
Drought	Drought conditions impacting vegetation, and risks of wildfire to structure disrupting network operation.	<ul style="list-style-type: none"> Landscape planting will take into consideration climate change resilience, and selection of appropriate woodland tree and shrub species planting and habitat creation, as well as considering adequate monitoring post-planting occurs, (also refer to Chapter 6) Landscape and Chapter 8) Ecology). Appropriate control measures are to be fully outlined in the LEMP, and SMP to be produced prior to completion and operation as identified in item GG03 in Appendix 4.1, (also refer to Chapter 6) Landscape and Chapter 8) Ecology). 	Rare	Insignificant	Low	Not Significant
Drought	Drought conditions – causing shrinking and swelling of clay rich soils, effecting foundations/landscape.	<ul style="list-style-type: none"> The Project is to provide appropriate mitigation measures in terms of long-term management of the site, presenting 5 years after care/risk management, reestablishing landscape/agriculture and soil erosion as well as details of 	Rare	Insignificant	Low	Not Significant

Potential climate hazards	Potential impacts on the Proposed Overhead Line	Mitigation measures	Likelihood	Level of consequence	Risk rating <i>(Likelihood x Level of consequence)</i>	Significance level
		<p>measures required for soil restoration (refer to Chapter 13 Agriculture and Soils, as well as item AS01 in Appendix 4.1).</p> <ul style="list-style-type: none"> • This is to include consideration of appropriate control measures such as using different soil types and buffers where practicable. Site surveys are to be undertaken to determine soil types and exact conditions during the ES stage, (refer to Chapter 13 Agriculture and Soils, as well as item B08 in Appendix 4.1). • The control measures are to be fully outlined in the LEMP, and SMP to be produced prior to completion and operation (refer to Chapter 13 Agriculture and Soils, as well as item GG03 in Appendix 4.1). 				

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