highways england

European Union
European Regional Development Fund

A30 Chiverton to Carland Cross
Environmental Statement

Volume 6 Document Ref 6.4 ES Appendix 14.2
Climate change resilience

HA551502-ARP-EAQ-SW-RP-LE-000009

C01 | A3

22/08/18

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)
APFP Regulation 5(2)(a)

Table of Contents

Table of Tables

14 Appendix 14.2

14.2 Climate change resilience (CCR) assessment

14.2.1 This appendix presents the details of the climate change resilience (CCR) assessment undertaken as part of the ES. The assessment methodology is described in Vol 6 Document Reference 6.2 ES Chapter 14.

CCR assessment summary

14.2.2 This section presents a summary of the results from the climate change resilience assessment, including the assessment of consequence and likelihood of each identified risk and an indicative assessment of the relevant uncertainty. Additional mitigation measures are proposed to increase resilience where relevant.

14.2.3 The likelihood for each risk is qualitatively assessed, as summarised in Table 14-1.

Table 14-1 Likelihood levels for CCR assessment (Ref: 2018, Highways England MPI 57 2018)

Level	Likelihood
Very high	The event occurs multiple times during the lifetime of the project (60 years) e.g. approximately annually, typically 60 events.
High	The event occurs several times during the lifetime of the project (60 years) e.g. approximately once every five years, typically 12 events.
Medium	The event occurs limited times during the lifetime of the project (60 years) e.g. approximately once every 15 years, typically 4 events.
Low	The event occurs during the lifetime of the project (60 years) e.g. once in 60 years.
Very low	The event may occur once during the lifetime of the project (60 years).

14.2.4 The consequence levels are based on network disruption, as summarised in Table 14-2

Table 14-2 Consequence levels for CCR assessment, in accordance with MPI 57 (2018)

Consequence of impact	Description
Very large adverse	National level (or greater) disruption to strategic route(s) lasting more than one week.
Large adverse / beneficial	National level disruption to strategic route(s) lasting more than one day but less than 1 week OR Regional level disruption to strategic route(s) lasting more than one week.
Moderate adverse / beneficial	Regional level disruption to strategic route(s) lasting more than one day but less than one week.
Minor adverse / beneficial	Regional level disruption to strategic route(s) lasting less than one day.
Negligible	Disruption to an isolated section of a strategic route lasting less than one day.

14.2.5 The overall risk is assessed using the matrix depicted in Table 14-1

Table 14-3 Significance matrix, in accordance with MPI 57 (2018)

Consequence	**Very large adverse**	NS	**S**	**S**	**S**	**S**
	Large adverse / beneficial	NS	**S**	**S**	**S**	**S**
	Moderate adverse / beneficial	NS	NS	**S**	**S**	**S**
	Minor adverse / beneficial	NS	NS	NS	**S**	**S**
	Negligible	NS	NS	NS	NS	NS
		Very low	**Low**	**Medium**	**High**	**Very high**
		Likelihood				

Table note: S=Significant

NS=Not significant

Table 14-4 Climate Change Resilience Assessment Summary: High Precipitation

Climate hazard	Trend and likelihood of climate hazard	Potential climate change impact	Potential climate change risk	Stage	Assets and infrastructure impacted by climate change risk	Existing mitigation measures and result on A30 infrastructure	Likelihood of hazard impact (with resilience measures)	Consequence of hazard impact	Risk Level = likelihood of hazard x consequence of hazard	Level of Uncertainty	Proposed additional resilience measures
High precipitation	• No substantial change in annual precipitation • Winter mean daily precipitation is projected to increase by 6.2% for the 2020s, and 21.0% for the 2080s (50%-le, high emissions).	Increased risk of flooding from river/streams, surface and groundwater sources.	Flooding of road surface.	Operation	Drainage and road surface	Attenuation ponds designed for 1/100 year event +20% for climate change (check performed for 40% increase) Climate change allowance in critical drainage areas increased to +40%	Very Low –low flood risk area, mitigation measure design for > 1/60 year event	Moderate adverse – may cause road closure during clean up	**NS**	Medium (due to uncertainty in effects on ground water)	None
			Flooding of access roads and/or road infrastructure.	Operation	Drainage and road surface		Very Low –low flood risk area, mitigation measure design for > 1/60 year event	Moderate adverse– may cause road closure during clean up	**NS**	Medium (due to uncertainty in effects on ground water)	None
			Increase risk of sewage overflow in floodwater causing damage.	Operation	Drainage		Very Low –low flood risk area, mitigation measure design for > 1/60 year event	Moderate adverse– may cause road closure during clean up	**NS**	High	None
			Increased risk of scouring of culverts, potentially leading to culvert failure.	Operation	Structures and drainage		Very Low –low flood risk area, mitigation measure design for > 1/60 year event	Moderate adverse	**NS**	Medium	None
			Increased pore water pressure in embankments/cuttings, leading to instability and increased risk of failure.	Construction/ Operation	Structures, drainage and earthworks	Mitigated through drainage design. Risk has been absorbed by conservative assumptions made during geotechnical design.	Very low – unlikely to occur with conservative design assumptions	Large adverse - may result in longer term disruption to address the failure.	**NS**	Low	None
			Increased erosion at toe of embankment.	Operation	Earthworks	Mitigated through drainage design. Risk has been absorbed by conservative assumptions made during design	Very low – unlikely to occur with conservative design assumptions	Large adverse - failure would result in longer term disruption	**NS**	Low	None
			Water ingress to critical construction equipment.	Construction	Drainage	Drainage on site to be suitably managed, as specified within the CEMP.	Very low- construction timeframe short term so climate change effects unlikely	Negligible- isolated section of road closed short term	**NS**	Low	Resilience guidelines during construction are summarised in Vol. 6 Document reference 6.2 ES Chapter 14 Climate change, Section 10.

Climate hazard	Trend and likelihood of climate hazard	Potential climate change impact	Potential climate change risk	Stage	Assets and infrastructure impacted by climate change risk	Existing mitigation measures and result on A30 infrastructure	Likelihood of hazard impact (with resilience measures)	Consequence of hazard impact	Risk Level = likelihood of hazard x consequence of hazard	Level of Uncertainty	Proposed additional resilience measures
			Water ingress to cables and electrical equipment.	Operation	Drainage and electrical infrastructure	Water tight cables housed in plastic ducts.	Very low- mitigation measures sufficient	Negligible - isolated section of road closed short term	**NS**	Low	None
			Change in ground water level affecting earth pressures and foundation settlement causing possible large ground movement.	Operation	Drainage and earthworks	Mitigated through drainage design Risk has been absorbed by conservative assumptions made during design	Very low - unlikely to occur with conservative design assumptions	Large adverse - would result in longer term disruption	**NS**	Low	None
			Increased risk of debris deposit from water seeping up to the surface through the pavement e.g. calcium sulphate leading to reduced skid resistance.	Operation	Drainage and road surface	Weather and weather effects on traffic considered within pavement design, as per DMRB requirements	Low- not high flood risk area	Minor adverse	**NS**	Medium	None
			Construction site flooding during construction phase, excavations flooded and site roads impassable.	Construction	Drainage	Drainage on site to be suitably managed, as specified within the CEMP.	Very low - construction timeframe short term so climate change effects unlikely. Low flood risk area.	Negligible - isolated section of road may be disrupted/small disruption to construction programme.	**NS**	Low	Resilience guidelines during construction are summarised in Vol. 6 Document reference 6.2 ES Chapter 14 Climate change, Section 10.
			Increased ground water level in winter may lead to flooding of underpasses.	Operation	Drainage	Mitigated through drainage design, incorporating EA climate change allowances for rainfall and river flows.	Low - low flood risk area	Negligible – unlikely to lead to disruption	**NS**	Medium	None
		Increased soil moisture levels.	Increased risk of earthworks failure and landslides. Exacerbated by variation between high and low precipitation events and soil moisture levels.	Construction/ Operation	Earthworks	Has been mitigated through geotechnical and drainage design.	Very low- unlikely to occur with conservative design assumptions	Large adverse - would result in longer term disruption to address the failure	**NS**	Low	None

Climate hazard	Trend and likelihood of climate hazard	Potential climate change impact	Potential climate change risk	Stage	Assets and infrastructure impacted by climate change risk	Existing mitigation measures and result on A30 infrastructure	Likelihood of hazard impact (with resilience measures)	Consequence of hazard impact	Risk Level = likelihood of hazard x consequence of hazard	Level of Uncertainty	Proposed additional resilience measures
		Increased likelihood of debris and sediment run-off.	Reduced capacity of attenuation ponds due to sediment build-up.	Operation	Drainage	Risk to be mitigated through the monitoring and maintenance procedures specified for the relevant attenuation ponds, as detailed in A30 Chiverton to Carland Cross Maintenance and Repair Strategy PCF Stage 3 (HA551502-ARP-HGN-SW-RP-EC-000001).	Very low – risk associated with high uncertainty; sufficient mitigation in place	Minor adverse - may lead to short term disruption during a flood event.	**NS**	Medium	None
			Increased risk of debris washing into drainage gulleys, causing blockages. A blockage may result in flooding and subsequent related effects.	Operation	Drainage	Mitigated through drainage design + monitoring and maintenance procedures proposed for drainage systems as detailed in A30 Chiverton to Carland Cross Maintenance and Repair Strategy PCF Stage 3 (HA551502-ARP-HGN-SW-RP-EC-000001).	Very low – highly uncertain risk and sufficient mitigation in place	Minor adverse - may lead to short term disruption during a flood event.	**NS**	High	None
		Increase in number of wet days may impact the damage to road surface	Increase stripping rate of the road surfaces.	Operation	Road surface	This risk will be managed through the proposed maintenance regimes for road surface, as detailed in A30 Chiverton to Carland Cross Maintenance and Repair Strategy PCF Stage 3 (HA551502-ARP-HGN-SW-RP-EC-000001).	Very low – highly uncertain risk and sufficient mitigation in place	Negligible – unlikely to lead to significant additional disruption	**NS**	High	None
			Increased likelihood of potholing, rutting and cracking from moisture entering and remaining in road surfaces.	Operation	Road surface	This risk will be managed through the proposed maintenance regimes for road surface, as detailed in A30 Chiverton to Carland Cross Maintenance and Repair Strategy PCF Stage 3 (HA551502-ARP-HGN-SW-RP-EC-000001).	Medium – risk possible with changes in rainfall and temperature patterns.	Minor adverse - may lead to speed restrictions and unplanned maintenance, causing disruption.	**NS**	Low	None

Climate hazard	Trend and likelihood of climate hazard	Potential climate change impact	Potential climate change risk	Stage	Assets and infrastructure impacted by climate change risk	Existing mitigation measures and result on A30 infrastructure	Likelihood of hazard impact (with resilience measures)	Consequence of hazard impact	Risk Level = likelihood of hazard x consequence of hazard	Level of Uncertainty	Proposed additional resilience measures
		Increased flow of groundwater	Increased flow of groundwater causing accelerated weathering effects, weakening the embankment. May lead to failure in extreme situations.	Operation	Earthworks	Risk has been absorbed by conservative assumptions made during design.	Very low - unlikely to occur with conservative design assumptions. Risk associated with high uncertainty.	Large adverse - would result in longer term disruption to address the failure.	**NS**	High	None

Table 14-5 Climate Change Resilience Assessment Summary: Low Precipitation

Climate hazard	Trend and likelihood of climate hazard	Potential climate change impact	Potential climate change risk	Operation or Construction stage	Assets and infrastructure impacted by climate change risk	Existing mitigation measures and result on A30 infrastructure	Likelihood of hazard impact (with resilience measures)	Consequence of hazard impact	Risk Level = likelihood of hazard x consequence of hazard	Level of Uncertainty	Proposed additional resilience measures
Low precipitation	• Summer mean daily precipitation is forecast to decrease by 6.9% for the 2020s and 31.4% for the 2080s (High emissions, 50th %-le). • The annual number of dry spells (10+ days with no precipitation), is projected to rise from 2.8 to 3.4 for the 2020s and to 4.7 for the 2080s (High emissions, 50th %-le).	Increased risk of soil shrinkage around foundations of structures.	Potential risk of soil shrinkage impacting foundations, including signal gantries, lighting pylons, bridges, other structures.	Operation	Structures and earthworks	Risk has been absorbed by conservative assumptions made during design.	Very low - unlikely to occur with conservative design assumptions	Large adverse - would result in longer term disruption to address	**NS**	Medium	
		Dry weather for extended periods of time could lead to increased desiccation of soils.	Reduced slope stability and potential earthworks failure during or immediately after summer storm events falling on desiccated soils.	Construction/ Operation	Earthworks	Risk has been absorbed by conservative assumptions made during design.	Very low - unlikely to occur with conservative design assumptions	Large adverse - adverse - would result in longer term disruption to address	**NS**	Medium	
		Reduced inflow into attenuation ponds.	Anaerobic conditions may occur, risking die back of sediment collecting species, reducing attenuation pools functional capacity.	Operation	Drainage	Risk to be mitigated through the monitoring and maintenance procedures specified for the relevant attenuation ponds, as detailed in A30 Chiverton to Carland Cross Maintenance and Repair Strategy PCF Stage 3 (HA551502-ARP-HGN-SW-RP-EC-000001).	Very low – risk associated with high uncertainty; sufficient mitigation in place.	Minor adverse - may lead to short term disruption during a flood event.	**NS**	High	None

Table 14-6 Climate Change Resilience Assessment Summary: High temperatures/heatwave/drought

Climate hazard	Trend and likelihood of climate hazard	Potential climate change impact	Potential climate change risk	Operation or Construction stage	Assets and infrastructure impacted by climate change risk	Existing mitigation measures and result on A30 infrastructure	Likelihood of hazard impact (with resilience measures)	Consequence of hazard impact	Risk Level = likelihood of hazard x consequence of hazard	Level of Uncertainty	Proposed additional resilience measures
High temperatures/ heatwave/ drought	• Mean daily winter temperature is anticipated to rise from 6.3°C to 7.4°C for the 2020s, and to 9.5°C for the 2080s. • Mean daily winter maximum temperature is anticipated to rise from 8.8°C to 10.0°C for the 2020s, and to 11.8°C for the 2080s. • Mean daily winter minimum temperature is anticipated to rise from 3.7°C to 5.1°C for the 2020s, and to 7.7°C for the 2080s. • The number of days with average temperature <0°C is anticipated to fall from 2.27 to 0.96 for the 2020s, and 0.20 for the 2080s	Increased number of hot days may cause thermal expansion.	Increased risk of thermal expansion beyond the design capability, presenting a direct risk of damage to structures and assets	Operation	Structures	Conservative assumptions in the design (in accordance with DMRB) are likely to account for the potential for increased maximum temperatures due to climate change. However, the conservatism of design is reduced with climate change.	Low – assumptions in design makes damage to structures unlikely; however, conservatism is reduced with projected increase in temperature.	Moderate adverse- disruption to scheme whilst damage is addressed.	**NS**	Low	None
		Increase in number of hot days may impact the road surface increasing the danger to road users.	Asphalt surface may exhibit permanent deformation in long periods of hot, sunny conditions.	Operation	Road surface	In the short term (10-20 years) this risk to be managed through the selection of suitable road surface material, as per DMRB requirements. In the long term it is expected that the risk will be absorbed through the maintenance and renewal regimes.	Medium – high temperatures affecting road surface possible.	Minor adverse - may lead to speed restrictions and unplanned maintenance, causing disruption.	**NS**	High	Recommend the consideration of alternative road surface materials as part of renewal cycle to accommodate increased temperatures.
			High temperatures increase the risk of surfacing rutting leading to water ponding in the ruts. Higher temperatures also increase the risk of reduced skid resistance due to fatting and chipping embedment.	Operation	Road surface	This risk to be managed through the selection of suitable road surface material as well as through the proposed maintenance regimes for road surface.	Medium – high temperatures affecting road surface possible.	Minor adverse - may lead to speed restrictions and unplanned maintenance, causing disruption.	**NS**	Medium	Recommend the consideration of alternative road surface materials as part of renewal cycle to accommodate increased temperatures.
		Increased number of hot days may impact the bitumen binder hardening rate.	Inability of bitumen to flex under traffic loads. Increased risk of road surface cracking and fretting with age.	Operation	Road surface	This risk will be managed through the proposed maintenance regimes, as detailed in A30 Chiverton to Carland Cross Maintenance and Repair Strategy PCF Stage 3 (HA551502-ARP-HGN-SW-RP-EC-000001).	Low – number of hot days likely to increases, possible impact on bitumen binder hardening rate; risk associated with high uncertainty.	Minor adverse - may lead to speed restrictions and unplanned maintenance, causing disruption.	**NS**	High	None

Climate hazard	Trend and likelihood of climate hazard	Potential climate change impact	Potential climate change risk	Operation or Construction stage	Assets and infrastructure impacted by climate change risk	Existing mitigation measures and result on A30 infrastructure	Likelihood of hazard impact (with resilience measures)	Consequence of hazard impact	Risk Level = likelihood of hazard x consequence of hazard	Level of Uncertainty	Proposed additional resilience measures
			Risk of being unable to lay road surface layers in hot weather.	Construction	Road surface	Risk to be mitigated by following procedures detailed in the CEMP.	Very low- construction timeframe short term so climate change effects unlikely.	Negligible- short term disruption to construction phase.	**NS**	Low	Resilience guidelines during construction are summarised in Vol. 6 Document reference 6.2 ES Chapter 14 Climate change, Section 10.
		Increased impact of diesel spills.	Decreased viscosity in heat leads to greater spreading of diesel in a smaller timeframe. Higher temperatures and increased number of hot, dry days increase the likelihood of ignition of this diesel leading to road and forest fires.	Operation	Road surface	Risk to be sufficiently mitigated through proposed maintenance procedures.	Very low- risk associated with high uncertainty.	Minor adverse – may cause short term closures	**NS**	High	None
		Increased summer temperatures may impact on performance of electrical equipment.	Reduced efficiency and lifespan of LED luminaires.	Operation	Electrical equipment	The impacts associated with increased ambient temperature to be absorbed within current maintenance procedures. Design life 100,000hours (~25 years).	Medium – possible risk with increased temperatures which may require greater maintenance.	Negligible- maintenance/ replacement causes minimal disruption.	**NS**	Low	None

Table 14-7 Climate Change Resilience Assessment Summary: Extreme cold snap/ low temperatures

Climate hazard	Trend and likelihood of climate hazard	Potential climate change impact	Potential climate change risk	Operation or Construction stage	Assets and infrastructure impacted by climate change risk	Existing mitigation measures and result on A30 infrastructure	Likelihood of hazard impact (with resilience measures)	Consequence of hazard impact	Risk Level = likelihood of hazard x consequence of hazard	Level of Uncertainty	Proposed additional resilience measures
Extreme cold snap/ low temperatures	• Mean daily winter temperature is anticipated to rise from 6.3°C to 7.4°C for the 2020's, and to 9.5°C for the 2080's • Mean daily winter maximum temperature is anticipated to rise from 8.8°C to 10.0°C for the 2020's, and to 11.8°C for the 2080's • Mean daily winter minimum temperature is anticipated to rise from 3.7°C to 5.1°C for the 2020's, and to 7.7°C for the 2080's • The number of days with average temperature <0°C is anticipated to fall from 2.27 to 0.96 for the 2020's, and 0.20 for the 2080's	Impact of extreme cold weather on equipment and infrastructure.	Change of risk of freeze-thaw occurring to road infrastructure and structures.	Operation	Structures, road surface and noise barriers	It is expected that this risk is sufficiently mitigated by the selection of an appropriate concrete mix, as per current DMRB.	Low- absorbed by existing mitigation measures; risk associated with high uncertainty.	Minor adverse - may lead to speed restrictions and unplanned maintenance, causing disruption.	**NS**	High	None
		Overall reduction of cold conditions and snowfall, but cold weather events could be more extreme and unexpected.	General risk of freezing of electrical equipment.	Operation	Electrical equipment	Accounted for in the choice of appropriate electrical equipment.	Low – the likelihood of extreme cold weather events is projected to decrease.	Negligible - minimal disruption to address freezing equipment.	**NS**	Medium	
		Potential decrease in ice on road surfaces from reduced cold days.	Reduced grit/salt used during winter, reducing deterioration of pavement. Number of frost days is projected to decrease. However, cold spells are expected to be more severe and so it is recommended that preparedness levels remain unchanged.	Operation	Road surface	It is recommended that preparedness levels remain unchanged.	Medium – likely that less grit is needed with higher temperatures, however cold spells could worsen requiring more grit.	Negligible (beneficial) – would not cause disruption.	**NS (beneficial)**	Low	

Table 14-8 Climate Change Resilience Assessment Summary: Storms and gales

Climate hazard	Trend and likelihood of climate hazard	Potential climate change impact	Potential climate change risk	Operation or Construction stage	Assets and infrastructure impacted by climate change risk	Existing mitigation measures and result on A30 infrastructure	Likelihood of hazard impact (with resilience measures)	Consequence of hazard impact	Risk Level = likelihood of hazard x consequence of hazard	Level of Uncertainty	Proposed additional resilience measures
Storms and gales	No probabilistic projections	Risk of windborne debris due to extreme winds.	Possible blockage of drainage systems due to obstructions and debris from domestic or third-party objects.	Operation	Drainage	Mitigated through drainage design + monitoring and maintenance procedures proposed for drainage systems, as detailed in A30 Chiverton to Carland Cross Maintenance and Repair Strategy PCF Stage 3 (HA551502-ARP-HGN-SW-RP-EC-000001).	Very low – uncertainty in changes in wind speeds with climate change and sufficient design in place.	Minor adverse - may lead to short term disruption during a flood event.	**NS**	Medium	None
			Increased risk of wind-blown debris on the road, potentially causing disruption.	Operation	Road surface	Mitigated through appropriate design for barriers, lighting columns and landscape.	Very low – uncertainty in changes in wind speeds with climate change and sufficient design in place.	Negligible-short term, minimal disruption to remove debris.	**NS**	High	None
		Increase wind impacting construction activity.	Increase risk of wind interference with construction equipment and workers, particularly with temporary equipment.	Construction	Structures, drainage, earthworks and road surface	Construction practice expected to take into consideration current weather patterns.	Very low - construction timeframe short term so climate change effects unlikely. Changes in wind patterns very uncertain.	Negligible-short term disruption to construction phase.	**NS**	High	Resilience guidelines during construction are summarised in Vol. 6 Document reference 6.2 ES Chapter 14 Climate change, Section 10.
		Increased stress on proposed scheme infrastructure due to extreme winds.	Failure of or damage to bridges as a result of changes in extreme winds.	Operation	Structures and electrical equipment	Risk sufficiently mitigated within current design standards (structures, noise barriers), especially in light of the lack of probabilistic wind projections. Relatively short-span (<50m) heavy bridges, where wind action is not a key design consideration.	Very low - uncertainty in changes in wind speeds with climate change and unlikely with design mitigation.	Large adverse - could result in longer term disruption to repair bridges.	**NS**	High	None
			Failure of or damage to gantries as a result of changes in extreme winds.	Operation	Structures	Risk sufficiently mitigated within current design standards (structures, noise barriers), especially in light of the lack of probabilistic wind projections.	Very low - uncertainty in changes in wind speeds with climate change and unlikely with design mitigation.	Moderate adverse – may cause short-term disruption in case of debris falling on the road.	**NS**	High	None

Table 14-9 Climate Change Resilience Assessment Summary: Lightning

Climate hazard	Trend and likelihood of climate hazard	Potential climate change impact	Potential climate change risk	Operation or Construction stage	Assets and infrastructure impacted by climate change risk	Existing mitigation measures and result on A30 infrastructure	Likelihood of hazard impact (with resilience measures)	Consequence of hazard impact	Risk Level = likelihood of hazard x consequence of hazard	Level of Uncertainty	Proposed additional resilience measures
Lightning	No probabilistic projections. Frequency and severity of storms expected to increase.	Increased risk of lightning strikes.	Indirect/ direct damage to roadside equipment.	Operation	Electrical equipment	Surge protection for LED luminaires not specified at this early stage of design. However, it is likely that manufacturers will offer products with surge protection for LED luminaires locally.	Low – risk associated with high uncertainty but mitigation does not extend to main electrical structure.	Negligible – lighting is only provided for PRoW and pedestrian underpasses; no lighting is provided at junctions, so there will be no effect on disruption.	**NS**	High	None.

Table 14-10 Climate Change Resilience Assessment Summary: Humidity

Climate hazard	Trend and likelihood of climate hazard	Potential climate change impact	Potential climate change risk	Operation or Construction stage	Assets and infrastructure impacted by climate change risk	Existing mitigation measures and result on A30 infrastructure	Likelihood of hazard impact (with resilience measures)	Consequence of hazard impact	Risk Level = likelihood of hazard x consequence of hazard	Level of Uncertainty	Proposed additional resilience measures
Humidity		Increased number of warm moist days.	Risk of accelerated stripping process.	Operation	Road surface	This risk will be managed through the proposed maintenance regimes for road surface, as detailed in A30 Chiverton to Carland Cross Maintenance and Repair Strategy PCF Stage 3 (HA551502-ARP-HGN-SW-RP-EC-000001).	Medium – greater number of warmer moist days possible, impacting road surface.	Minor adverse – may lead to speed restrictions and unplanned maintenance, causing disruption.	**NS**	Medium	None
			Increase in growing season for weeds-causing damage to road infrastructure.	Operation	All	This risk will be managed through the proposed maintenance regimes, as detailed in A30 Chiverton to Carland Cross Maintenance and Repair Strategy PCF Stage 3 (HA551502-ARP-HGN-SW-RP-EC-000001).	Medium - greater number of warmer moist days possible.	Negligible – to be absorbed within maintenance regimes; no additional disruption is expected.	**NS**	Medium	none

Table 14-11 Climate Change Resilience Assessment Summary: Insolation (solar irradiation)

Climate hazard	Trend and likelihood of climate hazard	Potential climate change impact	Potential climate change risk	Operation or Construction stage	Assets and infrastructure impacted by climate change risk	Existing mitigation measures and result on A30 infrastructure	Likelihood of hazard impact (with resilience measures)	Consequence of hazard impact	Risk Level = likelihood of hazard x consequence of hazard	Level of Uncertainty	Proposed additional resilience measures
Insolation (solar irradiation)		The low albedo of asphalt surfacing means an increase in absorption of solar radiation.	Risk of increased road surface temperatures, causing and increased likelihood of cracking and surfacing rutting.	Operation	Road surface	This risk will be managed through the proposed maintenance regimes for road surface, as detailed in A30 Chiverton to Carland Cross Maintenance and Repair Strategy PCF Stage 3 (HA551502-ARP-HGN-SW-RP-EC-000001).	Very low – high uncertainty and maintenance scheme in place.	Minor adverse – may lead to speed restrictions and unplanned maintenance, causing disruption.	**NS**	High	

If you need help accessing this or any other Highways England information, please call **0300 123 5000** and we will help you.

Creative M170036