A57 Link Roads
TR010034
6.5 Environmental Statement
Appendix 4.2 Major Accidents and Disasters Assessment

APFP Regulation 5(2)(a)

Planning Act 2008 Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

June 2021

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1. Introduction

1.1 Background and context

1.1.1 This document considers the significant adverse effects of the A57 Link Roads (formerly referred to as the Trans-Pennine Upgrade Programme (TPU) and hereafter referred to as the Scheme) on the environment deriving from the vulnerability of the Scheme to risks of major accidents and/or disasters relevant to the Scheme. This is in line with the requirements to assess the risks to human health, cultural heritage or the environment due to accidents and disasters, as outlined in Paragraph 5(d) of Schedule 4 to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017[1].

1.1.2 The purpose of this assessment is to identify whether the Scheme is vulnerable to the risk of major accidents and/ or disasters such as flooding, earthquakes and sea level rise. The identification of the risk of major accidents and disasters enables projects to be developed in a manner that provides protection of the environment, for example by making allowances in the design of developments to build resilience to the effects of a flood event arising from future climate change. It is also acknowledged that the earlier in the project life cycle vulnerabilities to major accidents and disasters are identified and assessed, the increased likelihood of any resulting risks being controlled and managed.

1.1.3 The Design Manual for Roads and Bridges (DMRB) LA 104 Environmental assessment and monitoring acknowledges that there is no definition of a major event within the relevant legislation. For the purpose of this assessment the definition from Institute of Environmental Management and Assessment (2020) has been used, which defines a major event "*as an event (for instance, train derailment or major road traffic accident) that threatens immediate or delayed serious environmental effects to human health, welfare and/or the environment and requires the use of resources beyond those of the client or its appointed representatives (i.e. contractors) to manage[2].*"

1.1.4 A major event can be both a man-made hazard (e.g. such a cyber-attack) or a natural hazard (e.g. a landslide). It is also considered that the Scheme could be a source of a major event, for example if a component of the Scheme, for example a proposed structure were to fail and collapse; or the Scheme could be a receptor of a major event, for example a major flood event occurred which inundated the carriageway of the Scheme.

[1] https://www.legislation.gov.uk/uksi/2017/572/schedule/4/made
[2] https://www.iema.net/resources/reading-room/2020/09/28/major-accidents-and-disasters-in-eia-an-iema-primer

1.2 Policy and legislation

1.2.1 The consideration of major accidents and disasters was introduced by the 2014/52/EU EIA Directive[3] (the EIA Regulations). This requires all EIA projects to consider and assess the potential effects of major accidents and disasters and any consequential changes in the predicted effects of the project on the environment as follows:

> *"A Description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters..." (Schedule 4, Paragraph 8)*

1.2.2 DMRB LA 104 requires an assessment of the following

- Vulnerability of the project to risks of major events; and
- Any consequential changes in the predicted effects of that project on environmental factors.

1.2.3 It is stated in the Environmental Impact Assessment Scoping Report (2017)[4] that *"where major events are identified, the ES would describe the potential for any change in the assessed significance of the Scheme on relevant environmental topics in qualitative terms and report the conclusions of this assessment within the individual environmental topics."* The potential effects resulting from a major event and any consequences for receptors are also reported (where applicable) in the individual environmental topic chapters of the ES (Chapters 5 to 15) (TR010034/APP/6.3), for example flood risk is reported on in the Road drainage and water environment chapter.

[3] Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment
[4] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010034/TR010034-000008-TPUP%20-%20Scoping%20Report.pdf

2. Assessment

2.1 Introduction

2.1.1 This section sets out the assessment methodology which has been followed and considered proportionate for this Scheme. This approach has followed an approach similar to that taken on other road schemes of similar size and scope and referred to the Institute of Environmental Management and Assessment (IEMA) Major Accidents and Disasters in EIA Guide[5].

2.1.2 Vulnerability to major accidents and disasters is still an emerging topic within EIA and at the time of writing there is no industry standard methodology. This assessment has adopted a four staged approach which is summarised in this section.

- Stage 1 Long list – This stage included generating a long list of possible major events from the following sources.
  - Professional judgement based on the form and nature of the Scheme and knowledge regarding the surrounding environment.
  - Information provided by the Inspectorate and statutory and non-statutory bodies within the EIA Scoping Opinion
  - Review of the Scheme risk register and the design hazard assessment log
  - The UK Government's National Risk Register 2020[6]
- Stage 2 Screening – Not all major events will be relevant to the Scheme, for example, the Scheme is not located in an area of volcanic activity, therefore the likelihood of this hazard occurring can be confidently screened out of the assessment. The purpose of this stage is to keep the assessment proportionate by using professional judgement to screen the long list of major events to determine those events that are relevant to the Scheme, or where the Scheme may have a realistic sensitivity to a particular event. Any major events that could not realistically occur, due to the type of development and the characteristics of the Scheme geographic location were omitted from the assessment at this stage. This information is provided in Table 1-2.
- Stage 3 Scoping – IEMA (2020) states that *major accidents and/or disasters should be considered as part of an assessment where the development has the potential to cause the loss of life, permanent injury and/ or temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration*. Where it was considered that existing design standards, legal protection, embedded or essential mitigation measures and operational requirements would not be able to manage the risk associated with the major accident and/or disaster, this was scoped in taken forwards to Stage 4. Additionally, if there was not sufficient information available to justify scoping out a major event, a worst-case approach was taken, and the major event was taken forwards to Stage 4.

[5] https://www.iema.net/resources/reading-room/2020/09/28/major-accidents-and-disasters-in-eia-an-iema-primer
[6] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/952959/6.6920_CO_CCS_s_National_Risk_Register_2020_11-1-21-FINAL.pdf

- Stage 4 Assessment – where any major events cannot be scoped out at Stage 3, and where embedded mitigation is unable to remove the potential for the major event to have potential environmental effects, recommendations have been made for additional surveys, assessment and/or design work that would be undertaken as part of the Detailed Design stage.

2.2 Assessment methodology

Assessment definitions

2.2.1 This section stets out the terminology used for the assessment of the vulnerability of the Scheme to risks of major accidents and/or disasters. This is to help set out how this assessment has been undertaken.

- Receptor- Environmental receptor is specifically defined as: features of the environment that are subject to assessment under Article 3 of the EIA Directive, namely population and human health, biodiversity, land, soil, water, air and climate, material assets, cultural heritage and landscape. Receptors relevant to this assessment are set out in Table 2-1.
- Major Event - an event (for instance, train derailment or major road traffic accident) that threatens immediate or delayed serious environmental effects to human health, welfare and/or the environment and requires the use of resources beyond those of the client or its appointed representatives (i.e. contractors) to manage. These potential major events are outlined in Table 2-2.
- Significant environmental effect (in relation to a major accident and/or disasters assessment) - Could include the loss of life, permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration.

Assessment approach

Stage 1 : Long list

2.2.2 A long list of major events was compiled from the sources listed, as stated previously this included both man-made and natural hazards. Hazards were grouped by risk events which are considered to be similar in nature (for example

flooding, storm surges and ground water contamination events were grouped under hydrological disasters). For the full list refer to Table 2-2.

- Geological disasters
- Hydrological disasters
- Meteorological disasters
- Space disasters
- Transport accidents and disasters
- Engineering accidents and failures
- Industrial accidents
- Terrorism, crime and civil unrest
- War
- Biological incidents

Stager 2: Screening

2.2.3 The screening review of the long list of major events was then screened for those which were not considered applicable to the Scheme, i.e. there was not considered to be a source-pathway-receptor linkage to make it possible or extremely unlikely for the major event to occur. This screening exercise allowed for a number of accidents and disasters with no relevance to the UK or the surrounding environment of the Scheme, for example earthquakes to be screened out of any further assessment.

2.2.4 Table 2-2 outlines the major events taken forwards to Stage 3 and are therefore considered to be relevant to the Scheme.

Stage 3: Scoping

2.2.5 The scoping exercise undertaken during stage 3 further categorised the major events into the following two types, based on their relevance to the Scheme

- Type 1: events that could realistically occur, but for which the Scheme and its associated environmental resources and receptors are no more vulnerable than any other development type
- Type 2: events that could occur, and to which the Scheme is particularly vulnerable, or which the construction and operation of the Scheme has a particular capacity to exacerbate.

2.2.6 At this stage, it was also established that a number of events in the long list are already managed by existing legislation and/ or design requirements. These provide design standards, legal protection and operational requirements which are considered as embedded or essential mitigation to already control such hazards. These include but are not limited to:

- Health and Safety at Work etc. Act 1974[7]

[7] https://www.legislation.gov.uk/ukpga/1974/37/contents

- The appointed Principal Contractors on-site health and safety policy (for example the provision of Mental Health First aiders on site during construction)
- Environmental Management Plan (First Iteration)
- The Workplace (Health, Safety and Welfare) Regulations 1992[8]
- Construction (Design and Management) Regulations 2015 (CDM Regulations)[9]
- The Management of Health and Safety at Work Regulations 1999[10]
- Electricity at Work Regulations (1989 No. 635)[11]
- Control Of Major Accident Hazards (COMAH) Regulations 2015[12]
- Relevant DMRB Standards for Highways (for example GG 104 Requirements for safety risk assessment)[13]

2.2.7 This approach ensures a proportional assessment was followed consistently. Further, details are provided in Table 2-2 regarding design measures that have been included in the Scheme design to mitigate/manage effects associated with such potential major events, and/ or measures that would be included within applicable construction and/or operational phase management plans (noting that some actions may be legal requirements).

2.2.8 This ensures double counting is avoided as part of this assessment for those major events which may have already been considered and therefore designed out of the Scheme or are already being sufficiently mitigated. By taking into account these measures, decisions can be made as to whether the major event requires further consideration (i.e. scoped in for Stage 4 assessment) or whether current actions are adequate to avoid potential significant environmental effects.

2.2.9 Table 2-2 also indicates that a number of major events are considered within some of the technical assessments presented within this Environmental Statement, e.g. flood risks and groundwater contamination are considered in Chapter 13: Road Drainage and Water Environment (TR010034/APP/6.3).

Stage 4

2.2.10 For those major events that require further assessment, recommendations have been made for additional surveys, assessment and/or design work that would be undertaken as part of the Detailed Design stage. It is considered that major events would pose a very low but significant risk to the environment, but as a worst-case approach these have been kept scoped in as additional mitigation measures which might be required at the Detailed Design stage, depending on the outcome of additional survey and/or assessment.

[8] https://www.legislation.gov.uk/uksi/1992/3004/contents/made
[9] https://www.hse.gov.uk/construction/cdm/2015/index.htm
[10] https://www.hse.gov.uk/pubns/hsc13.pdf
[11] https://www.legislation.gov.uk/uksi/1989/635/made
[12] https://www.legislation.gov.uk/uksi/2015/483/contents/made
[13] https://www.standardsforhighways.co.uk/dmrb/

2.3 Baseline conditions

2.3.1 The environmental receptors of the Scheme are described in detail in Topic Chapters (Chapters 5 to 15) and are not repeated here. This section (Table 2-1) identifies a set of selected key major event receptors. Specifically, those receptors that may be directly affected by the occurrence of a major event.

Table 2- 1 identified key receptors for major events

Major Event Receptor	Type	Description
Mottram in Longdendale Conservation Area	Cultural Heritage Site	Conservation area Scheduled monument Considered nationally important.
Melandra Castle Roman fort	Cultural Heritage Site	Scheduled monument Considered nationally important.
River Etherow	Aquatic Environment Ecological receptors	High importance in term so surface water and flood risk
Hurstclough Brook		High importance in term so surface water and flood risk
Glossop Brook		High importance in term so surface water and flood risk
Manchester and East Cheshire Carboniferous Aquifers	Aquatic Environment	Secondary aquifer used for local supplies supplying base flow to surface water features.
Key settlements located in and around the study area, including Hattersley, Mottram-in-Longdendale, Hollingworth, Hadfield and Gamesley	People	Residential properties, areas, recreational paths and visitors.
The Scheme	Road users, workers and property	Nationally Significant Infrastructure

2.4 Potential major events

2.4.1 The major events considered during the construction and operational phases are given in Table 2-2 below. For potential major events that have been screened out (stage 2), justification has been provided to support this decision.

Table 2- 3 Major accidents and disasters stage 2, 3 and 4

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	**Relevant to Scheme**	**Type 1 or 2**	**Relevant receptors**	**Embedded mitigation and/ or management actions**	**Manageable with embedded mitigation?**	**If no, what secondary mitigation/ assessment is required?**	**Location of assessment within Environmental Statement**
Geological and ground related disasters							
Avalanches	No – avalanches not relevant in context of Scheme.	-	N/A	N/A	N/A	N/A	N/A
Landslides	Yes – The Scheme's construction requires significant excavations and earth movements	1	• Water resources and ecological receptors • Nearby properties • Nearby cultural Heritage Site • People, drivers and workers	Considered by geotechnical team as a fundamental part of the Scheme design. Appropriate design of the Scheme to applicable standards means that receptors would not be of greater risk as a result of the Scheme.	Y	N/A	N/A
Earthquakes	No – the Scheme is not located within a geologically active area	-	N/A	N/A	N/A	N/A	N/A

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
Sinkholes	Yes – Field drains, ponds, areas of spring issues/sinks and unnamed streams within the DCO boundary	-	• Water resources and ecological receptors • Nearby properties • Nearby Cultural Heritage Site • People, drivers and workers	Considered by geotechnical team as a fundamental part of the Scheme design. Appropriate design of the Scheme to applicable standards means that receptors would not be of greater risk as a result of the Scheme. The nature of the geology beneath the Scheme is such that sinkholes are unlikely to occur.	Y	N/A	N/A
Ground stability	Yes – Significant earth movement and unstable slopes east of Mottram Underpass during construction, leading to collapse	2	• Water resources and ecological receptors • Nearby properties • Nearby Cultural Heritage Site	This is considered by geotechnical team as a fundamental part of the Scheme design (DMRB CD622 Managing Geotechnical Risk) . Appropriate design of the Scheme to applicable standards means that receptors would not be at greater risk as a result of the Scheme. A supplementary ground investigation (on-going at the time of writing) is also being undertaken to	No	If necessary, additional mitigation measures would be identified following completion of the supplementary ground investigation. However, it is not considered that this event would require the use of resources beyond those of the client or its appointed representatives	N/A - this is considered within the Ground Investigation Report (GIR) (TR010034/APP/7.6)

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
			• People, drivers and workers	identify any other additional mitigation measures required.		(i.e. contractors) to manage the loss of life (i.e. not constitute as a major event) therefore, there would not be permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration and therefore would not cause a significant environmental effect.	
Volcanic eruption	No – the Scheme is not located in the vicinity of a volcano. Highly unlikely that a volcanic eruption or ash cloud could significantly impact on any aspect of the Scheme.	-	N/A	N/A	N/A	N/A	N/A

Landfill accidents (gas, migration, leachate leakage, asbestos)	Yes – There are four landfills within 100 m of the Scheme - Given the potential landfill sources and the proposed confined spaces there may be an acute risk to construction / maintenance workers	1	• Water resources and ecological receptors • Nearby properties • People, drivers and workers	Through the appropriate design of the Scheme and the adoption of the construction methods as detailed in the First Iteration Environmental Management Plan (TR010054/APP/7.1), potential effects associated with gas migration, leachate leakage and asbestos would be appropriately managed such that significant effects would be avoided (noted that some actions are needed for legal compliance). The measures detailed within the would be developed into a Second iteration EMP by the appointed Principal Contractor which would be implemented for the duration of the Scheme construction phase. A supplementary ground investigation (on-going at the time of writing) is also being undertaken to identify any other additional mitigation measures required.	No	If necessary, additional mitigation measures would be identified following completion of the supplementary ground investigation. However, it is not considered that this event would require the use of resources beyond those of the client or its appointed representatives (i.e. contractors) to manage the loss of life (i.e. not constitute as a major event) therefore, there would not be permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration and therefore would not cause a significant environmental effect.	Geology and soils (Chapter 9)
Hydrological disasters							
Groundwater contamination events within Source protection zones	Yes – although the baseline conditions have not identified any significant potential sources of contamination	2	• Water resources and ecological receptors • Nearby properties	As part of the supplementary ground investigation (on-going at the time of writing), further soil and groundwater sampling and subsequent analysis will be undertaken. This will further define ground conditions and identify any potential areas/sources of contamination.	N	If necessary, additional mitigation measures would be identified following completion of the supplementary ground investigation. However, it is not considered that this event	Geology and soils (Chapter 9) Road drainage and water environment (Chapter 13)

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
			• People, drivers and workers			would require the use of resources beyond those of the client or its appointed representatives (i.e. contractors) to manage the loss of life (i.e. not constitute as a major event) therefore, there would not be permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration and therefore would not cause a significant environmental effect.	
Geological Fault	Yes – There are 2 Faultlines within the study area of the Scheme. There is possibility of unforeseen ground conditions during construction leading to	2	• Water resources and ecological receptors • Nearby properties	This is considered by the geotechnical team as a fundamental part of the Scheme design. Appropriate design of the Scheme to applicable standards means that receptors would not be at greater risk as a result of the Scheme.	N	If necessary, additional mitigation measures would be identified following completion of the supplementary ground investigation.	N/A - this is considered within the Ground Investigation Report (GIR) (TR010034/APP/7.6)

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
	instability and/or rapid groundwater inflow		• People, drivers and workers	A supplementary ground investigation is also being undertaken to identify any other additional mitigation measures required. It is not considered this event would result in a significant environmental effect (in relation to a major accident and/or disasters assessment)		However, it is not considered that this event would require the use of resources beyond those of the client or its appointed representatives (i.e. contractors) to manage the loss of life (i.e. not constitute as a major event) therefore, there would not be permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration and therefore would not cause a significant environmental effect.	
Limnic eruptions	No – not applicable given that there are no deep-water lakes near to the Scheme.	-	N/A	N/A	N/A	N/A	N/A

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	**Relevant to Scheme**	**Type 1 or 2**	**Relevant receptors**	**Embedded mitigation and/ or management actions**	**Manageable with embedded mitigation?**	**If no, what secondary mitigation/ assessment is required?**	**Location of assessment within Environmental Statement**
Flooding – Fluvial	Yes –Part of the Scheme is located within an area of high to medium risk of flooding (Flood Zones 2 and 3) should the River Etherow overflow its banks and flood defences.	2	• Water resources and ecological receptors • • Nearby properties • People, drivers and workers	Detailed flood modelling has been undertaken as part of the assessment presented in Chapter 13: Road Drainage and the Water Environment to identify, model and evaluate flood risk associated with the Scheme. This has considered both the vulnerability of the Scheme to flooding, and the potential for the Scheme to exacerbate flooding. Appropriate measures have been incorporated into the Scheme design to capture, control, manage, treat and discharge surface water. Allowances have also been made in the design to allow for the effects of future climate change predictions. It is considered that these measures would appropriately manage potential flood risk associated with the Scheme.	Yes	N/A	Road drainage and water environment (Chapter 14) / Flood Risk Assessment (TR010034/APP/5.5)
Flooding (Surface water) Pluvial	Yes – the Scheme is considered to be vulnerable to pluvial flooding	2	• Water resources and ecological receptors • Nearby properties • People, drivers and workers				
Flooding – Groundwater	Yes - The new Mottram underpass which will be located 60 m east of Roe Cross Road, the top of	2	• Water resources and ecological receptors	The mitigation principles to managing this risk during construction and operation include:	N	If necessary, additional mitigation measures would be identified following completion of	Road drainage and water environment (Chapter 14) / Flood

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
	which would be 2 m below ground level and as a result of the associated cutting at Mottram to the east of the underpass		• Nearby properties • People, drivers and workers	Designing the drainage strategy to allow for management of groundwater contributions to surface water flow. Where possible, this would be in keeping with the current groundwater flow pathways. Secant piling is currently planned to be used during construction of the cutting and underpass to reduce impacts of dewatering on the surrounding environment. This would remain in place during operation. Should the groundwater flow direction be perpendicular to the proposed piling, king pin piling can be used to allow groundwater flow across the piling and ensure roundwater flood risk upgradient is not increased.		the supplementary ground investigation. However, it is not considered that this event would require the use of resources beyond those of the client or its appointed representatives (i.e. contractors) to manage the loss of life (i.e. not constitute as a major event) therefore, there would not be permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration and therefore would not cause a significant environmental effect.	Risk Assessment (TR010034/APP/5.5)

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	**Relevant to Scheme**	**Type 1 or 2**	**Relevant receptors**	**Embedded mitigation and/ or management actions**	**Manageable with embedded mitigation?**	**If no, what secondary mitigation/ assessment is required?**	**Location of assessment within Environmental Statement**
Tsunami/ storm surge	No – the Scheme is not located within a coastal area.	-	N/A	N/A	N/A	N/A	N/A
Meteorological disasters							
Cyclonic storm	No – Cyclones do not occur in the UK	-	N/A	N/A	N/A	N/A	N/A
Drought	Yes – Hotter and drier summers will increase soil moisture deficits and increase the likelihood of drought occurrences	1	• Aquatic environment • Landscape • Ecological receptors • People, drivers and workers	Risk is no different from any other road/road users in the UK and specific measures not considered to be required for the Scheme. The Scheme's vulnerability extreme weather incidents as a result of climate change is assessed within the Climate chapter (Chapter 14). It is not considered necessary to undertake any more assessment than is already included in this chapter.	Y	N/A	Climate (Chapter 14)

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	**Relevant to Scheme**	**Type 1 or 2**	**Relevant receptors**	**Embedded mitigation and/ or management actions**	**Manageable with embedded mitigation?**	**If no, what secondary mitigation/ assessment is required?**	**Location of assessment within Environmental Statement**
Storm events e.g. blizzards, cold waves, hailstorms and thunderstorms	Yes – The Scheme is located in an area which could experience storm events	1	• People, drivers and workers	Risk is no different from any other road/road users in the UK and specific measures not considered to be required for the Scheme. The Scheme's vulnerability extreme weather incidents as a result of climate change is assessed within the Climate chapter (Chapter 14). It is not considered necessary to undertake any more assessment than is already included in this chapter.	Y	N/A	Climate (Chapter 14)
Heat wave	Yes - The Scheme is located in an area which could experience heat waves	1	• Aquatic environment • Ecological receptors • People, drivers and workers	Risk is no different from any other road/road users in the UK and specific measures not considered to be required for the Scheme. The Scheme's vulnerability extreme weather incidents as a result of climate change is assessed within the Climate chapter (Chapter 14). It is not considered necessary to undertake any more assessment than is already included in this chapter.	Y	N/A	Climate (Chapter 14)

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	**Relevant to Scheme**	**Type 1 or 2**	**Relevant receptors**	**Embedded mitigation and/ or management actions**	**Manageable with embedded mitigation?**	**If no, what secondary mitigation/ assessment is required?**	**Location of assessment within Environmental Statement**
Tornado	No – The Scheme is not considered to be located within an area vulnerable to tornadoes	-	N/A	N/A	N/A	N/A	N/A
Wildfire	Yes – The Scheme is located within a significant area of scrub and grassland	1	• Aquatic environment • Ecological receptors • People, drivers and workers • Nearby properties	During construction, standard control measures would be implemented by the appointed contractor to manage the risk of fire. During operation however, the risk is no different to similar roads or road users in the locality. Specific measures are therefore not considered to be required as part of the Scheme	Y	N/A	N/A
Air quality event	Yes – The Scheme has the potential to release emissions of air pollutants over the short term	1	• Aquatic environment • Ecological receptors • Nearby properties • People, drivers and workers	The Scheme is unlikely to increase major accidents and disaster events. Also, given that any major accidents and disaster events would be of relatively short duration and temporary, it is considered that there would not be a material effect on annual mean concentrations, and consequently there would not be a significant effect on air quality.	Y	N/A	Air quality (Chapter 5)

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
				The impact on air quality as a result of the Scheme operation has been assessed and it is concluded that the Scheme is likely to result in a significant improvement for human health and it is expected there will be no significant effects on designated habitats. It is not considered necessary to undertake any more assessment than is already included in the assessment provided in the Air quality chapter (Chapter 5).			
Space disasters							
Impact events and airburst	N - The Scheme is not considered to be any more vulnerable than any existing roads	-	N/A	N/A	N/A	N/A	N/A
Solar flare	Yes – This is considered to be an event the Scheme could be vulnerable to	1	• Road users	Solar flares can interrupt radio and other electronic communications. Significant communication and electronic systems are not proposed as part of the Scheme. Therefore, the	Y	N.A	N/A

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	**Relevant to Scheme**	**Type 1 or 2**	**Relevant receptors**	**Embedded mitigation and/ or management actions**	**Manageable with embedded mitigation?**	**If no, what secondary mitigation/ assessment is required?**	**Location of assessment within Environmental Statement**
				Scheme is at no more risk than the existing road.			
Transport accidents/disasters							
Road accident	Yes –The Scheme involves the construction of two offline new link roads.	2	• Aquatic environment • Ecological receptors • People, drivers and workers	During construction a Traffic Management Plan (TR010034/APP/7.5) would be implemented to minimise road accidents resulting from traffic travelling to and from site. Further, the appointed Principal Contractor the Scheme would achieve a cut and fill imbalance, thereby reducing number of offsite plant movements. During operation, the traffic light phasing developed for the Scheme has been designed to minimise the likelihood of road accidents. Further, the health and safety of NMU's in the context of road accidents has been considered within the design of the	Y	N/A	Population and human health (Chapter 12)

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
				Scheme through the provision of safe crossings			
Rail accident	No -The Scheme is not located in the vicinity of a railway line	-	N/A	N/A	N/A	N/A	N/A
Aircraft disaster	N – There are no RAF bases or airports in the vicinity of the Scheme. Risk is no different from any other road/road users in the UK and specific measures not considered to be required for the Scheme.	-	N/A	N/A	N/A	N/A	N/A
Maritime disaster	No – the Scheme is not located in an area susceptible to maritime disasters	-	n/a		N/A	N/A	
Engineering accidents/failures							

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
Bridge/ Underpass failure	Yes – The Scheme proposes the construction of a number of structures, including Old Mill Farm Underpass, Mottram Underpass, Roe Cross Road overbridge, Carrhouse Farm Underpass and River Etherow Bridge	2	People, drivers and workers	Appropriate design of the Scheme to applicable standards means that receptors would not be at greater risk as a result of the Scheme.	Y	N/A	N/A
Gas explosion	Yes – gas mains are located in the vicinity of the Scheme. The construction and operation of the Scheme would require the diversion, relocation or protection of a number of existing utility assets, of this utility	2	People, drivers and workers	Diversions are discussed in the Scheme chapter (Chapter 2) and would be developed further as part of the Detailed Design of the Scheme in consultation with the relevant utility companies and in line with the relevant legislative and design standards. The potential for construction related incidents is covered by safe working practices and CDM regulations	Y	N/A	N/A
Property or bridge	Yes - The Scheme would involve the demolition of a number of properties	2	People, drivers and workers	Risks during demolition have been taken into account with advice from the Applicants appointed buildability advisors (considered as part of	Y	N/A	Air quality (Chapter 5), Noise and

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
demolition accident				design hazard assessment). The required surveys would be carried out prior to demolition activities and the works would be undertaken in accordance with legislative requirements. The impacts from Air quality, Noise and vibration and Population and human health are assessed within Chapters 5, 11 and 12 of the ES respectively and mitigation measures identified, as required. It is not considered necessary to undertake any more assessment than is already included in these chapters			vibration (Chapter 11)
Dam failure	No – no dams are located in proximity to the Scheme	-	N/A	N/A	N/A	N/A	N/A
Flood defence failure	Yes – There are existing flood defences on the River Etherow at within the proximity to the Scheme	2	People, drivers and workers	The baseline flooding conditions, and the impact of the Scheme and the vulnerability of the Scheme to this is assessed within the Road drainage and water environment chapter and the Flood Risk Assessment (TR010034/APP/5.5). It is not	Y	N/A	Road drainage and water environment (Chapter 13), Flood risk assessment (TR010034/APP/5.5)

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
				considered necessary to undertake any more assessment than is already included in this chapter and standalone report			
Mast and tower collapse	Yes – There is a pylon located within the DCO boundary of the Scheme	2	People, drivers and workers	The potential for construction related incidents is covered by safe working practices and CDM regulations	Y	N/A	N/A
Building failure of fire	Yes – There are a number of buildings in proximity to the Scheme	1	People, drivers and workers	Buildings in close proximity of the Scheme are low-rise and predominantly residential. Notwithstanding this, the risk of fires affecting the Scheme is no greater than risks for existing roads	Y	N/A	N/A
Utilities failure	Yes - Numerous utilities are located in the vicinity of the Scheme. The construction and operation of the Scheme would require the diversion, relocation or protection of a number of existing utility assets, including drinking water, waste water, gas,	2	People, drivers and workers	Utilities diversions are discussed in the Scheme chapter (Chapter 2) Information regarding diversion works will be considered in the design process. The potential risk of construction related incidents when undertaking diversion works as part of the Scheme would be covered by relevant legislation	Y	N/A	The Scheme chapter (Chapter 2)

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	**Relevant to Scheme**	**Type 1 or 2**	**Relevant receptors**	**Embedded mitigation and/ or management actions**	**Manageable with embedded mitigation?**	**If no, what secondary mitigation/ assessment is required?**	**Location of assessment within Environmental Statement**
	electricity and telecommunications.						
Cable strike/electrocution	Yes – There are a number of existing electricity cables located within the DCO boundary		People, drivers and workers	The potential for construction related incidents is covered by safe working practices and CDM regulations	Y	N/A	N/A
Collapse of Longdendale Aqueduct	Yes - Collapsing ground - leading to damage to the aqueduct and outpouring of water under pressure	2	• Aquatic environment • Ecological receptors • People, People, drivers and workers	Consultation and surveys are being undertaken with United Utilities to establish how their assets can be protected, and this will continue to be developed further at the Detailed Design stage.	N	If necessary, additional mitigation measures would be identified following completion of the supplementary ground investigation. However, it is not considered that this event would require the use of resources beyond those of the client or its appointed representatives (i.e. contractors) to manage the loss of life (i.e. not constitute as a major event) therefore, there would not be permanent injury and	N/A

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	**Relevant to Scheme**	**Type 1 or 2**	**Relevant receptors**	**Embedded mitigation and/ or management actions**	**Manageable with embedded mitigation?**	**If no, what secondary mitigation/ assessment is required?**	**Location of assessment within Environmental Statement**
						temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration and therefore would not cause a significant environmental effect.	
Industrial accidents							
Defence industry and unexploded ordnance (UXO) risk	Yes – although the site is at low risk from UXO and has not been affected by military activity.	1	• Aquatic environment • Ecological receptors People, People, drivers and workers	The risks posed to the site by exploded ordnance (UXO) are assessed and managed through existing guidance. Nevertheless, the site is at low risk from UXO and has not been affected by military activity and means that receptors would not be at greater risk as a result of the Scheme.	Y	N/A	N/A - this is considered within the Ground Investigation Report (GIR) (TR010034/APP/7.6)
Nuclear power	No - No facilities nearby, whilst the Scheme is at no more risk than the existing	-	N/A	N/A	N/A	N/A	N/A

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
	road. No further mitigation requirements are considered to be needed.						
Oil and gas refinery	No - No facilities nearby, whilst the Scheme is at no more risk than the existing road. No further mitigation requirements are considered to be needed.	-	N/A	N/A	N/A	N/A	N/A
Food industry	No - No facilities nearby, whilst the Scheme is at no more risk than the existing road. No further mitigation requirements are considered to be needed.	-	N/A	N/A	N/A	N/A	N/A
Chemical industry	No - No facilities nearby, whilst the Scheme is at no more risk than the existing road. No further mitigation requirements are considered to be needed.	-	N/A	N/A	N/A	N/A	N/A

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
Manufacturing industry	No - No facilities nearby, whilst the Scheme is at no more risk than the existing road. No further mitigation requirements are considered to be needed.	-	N/A	N/A	N/A	N/A	N/A
Mining and quarrying industry	Yes – there is a quarry near Roe Cross (250 m north) and Mottram Old Mill (Woollen) and several mills and quarries in within 500 m of the DCO boundary	2	People, drivers and workers	Quarrying operations are currently active outside of the Scheme boundary which have been considered within the Geology and soils chapter (Chapter 9), previous ground investigations undertaken as part of the design development and a supplementary ground investigation (currently on-going) processes have considered historic mining activity within the vicinity of the Scheme. Mining hazards are assessed and managed mining hazards through DMRB CD 622 Managing Geotechnical Risk.	Y	N/A	Geology and Soils (Chapter 9)
Crime/war/civil unrest							

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
Bomb/vehicle attack on people	No - There are no features that would make the Scheme more of a terrorist attack target than the existing road. No further mitigation requirements are considered to be needed	-	N/A	N/A	N/A	N/A	N/A
Bomb/vehicle attack on infrastructure	No - There are features that would make the Scheme more of a terrorist attack target than the existing road. No further mitigation requirements are considered to be needed.	-	N/A	N/A	N/A	N/A	N/A
Mass shooting	No - The Scheme is unlikely to be more of a target than the existing road to this type of incident due to low number if exposed targets. No further mitigation requirements	-	N/A	N/A	N/A	N/A	N/A

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
	are considered to be needed.						
Chemical/ gas attack	No - The Scheme is unlikely to be more of a target than the existing road to this type of incident due to low number of exposed targets. No further mitigation requirements are considered to be needed.	-	N/A	N/A	N/A	N/A	N/A
Rioting	No - The Scheme is unlikely to be more of a target than the existing road to this type of incident. No further mitigation requirements are considered to be needed.	-	N/A	N/A	N/A	N/A	N/A
Cyber attack	Yes – As part of the Scheme's design there are various technological	1	People, drivers and workers	No significant roadside technology is proposed, and as such the Scheme would be no more vulnerable than	Y	N/A	N/A

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
	interventions (e.g. traffic lights)			the existing road. The Applicant is accountable to the Secretary of State for Transport for ensuring the resilience of their strategic road network to national security risks, including from terrorism, cyberattack, natural hazards and other risks outlined in the National Risk Assessment. The roadside technology is designed to Highways England security arrangements to mitigate the effects of cyber attacks			
Biological incidents							
Disease epidemics (e.g. COVID-19 pandemic)	Yes - The construction of the Scheme is likely to require a number of people working in close proximity to one another and for the workforce to travel to and from the construction site.	1	People, drivers and workers	The spread of disease as a consequence of the Scheme is not considered to be any greater than that associated with other highway schemes. Standard control measures would be implemented by the appointed contractor during construction. At the time of writing this ES, a number of COVID-19 practices are	Y	N/A	N/A

Stage 1	Stage 2	Stage 3				Stage 4	
Type of event	Relevant to Scheme	Type 1 or 2	Relevant receptors	Embedded mitigation and/ or management actions	Manageable with embedded mitigation?	If no, what secondary mitigation/ assessment is required?	Location of assessment within Environmental Statement
				required to ensure the safety of workers during pre-construction and construction of the Scheme. These will be followed, as required and included in the appointed Principal Contractors site policy.			
Animal Diseases Plants	Yes – The Scheme is located within predominantly agriculture land where livestock are present	2	Aquatic and ecological receptors People Workers Road Users	The spread of disease as a consequence of the Scheme is not considered to be any greater than that associated with other highway schemes. Standard control measures would be implemented by the appointed contractor during construction to handle and dispose of either any diseased plants or injurious weeds, or both and prevent their spread.	Y	N/A	N/A

3. Summary

3.1.1 This report has considered the potential significant adverse effects of the Scheme on the environment deriving from the vulnerability of the Scheme to risks of major accidents and/or disasters relevant to the Scheme.

3.1.2 In the context of this chapter, major events are events which rarely occur due to the mitigation, management or regulatory controls implemented to prevent them.

3.1.3 For major events scoped in (Table 2-2), the assessment concluded that for the majority, there is no likely requirement for further mitigation measures (Stage 4), as based on the information currently available in Topic Chapters (Chapters 5 to 15), it is considered that the risks are anticipated to be as low as reasonably practicable.

3.1.4 For those that did progress to Stage 4, it was due to a worst-case approach as there is still a degree of uncertainty and additional mitigation measures might be required at the Detailed Design stage, depending on the outcome of additional survey and/or assessment. However, it was concluded that these events would not require the use of resources beyond those of the Applicant or its appointed representatives (i.e. contractors) to manage the loss of life (i.e. not constitute as a major event) therefore, there would not be permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration and therefore would not cause a significant environmental effect.

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